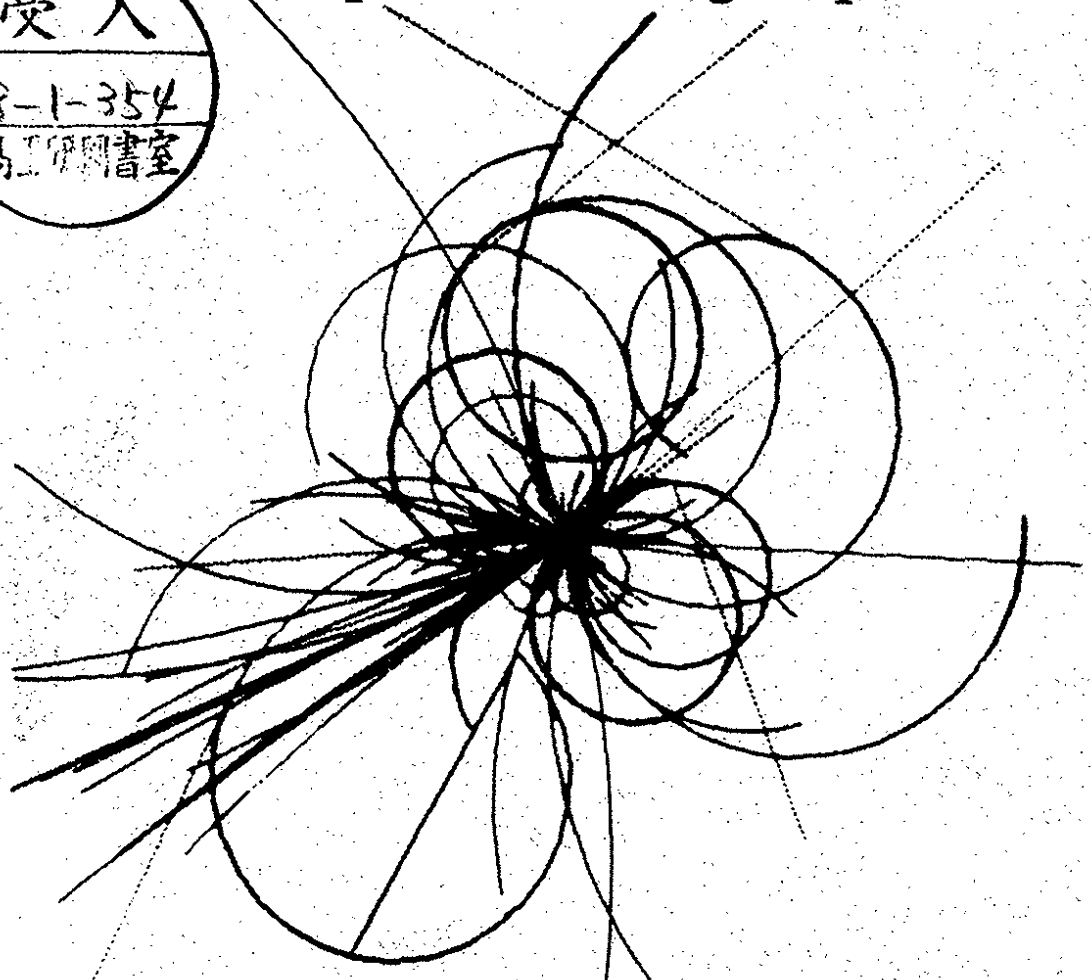
The Superconducting Super Collider



The 90° (September 1987) SSC Lattice

A.A. Garren and D.E Johnson
SSC Central Design Group

September 1987

THE 90° (SEPTEMBER 1987) SSC LATTICE

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September 1987

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ABSTRACT

The lattice design of the 90° (September 1987) SSC lattice is described. Plots show the structure and orbit functions of the lattice components, output from the SYNCH program give parameter values and orbit functions for injection and collision optics, tables and plots are given for the tuning between the two optical configurations, and output from the MAD program provides geometrical survey data.

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Introduction

The purpose of this report is to present the parameters and optical properties of the September 1987, 90° lattice. This lattice resembles the CDR lattice qualitatively, but differs significantly in the cell phase advance and design of the dispersion suppressors and straight sections. The present lattice is superior to the CDR lattice in terms of sensitivity to magnet errors, beam optics of the dispersion suppressors and straight sections, and ease of tuning between the injection and collision configurations.

As with the CDR lattice, the beamlines are separated vertically by 70 cm, with independent 6.6 Tesla magnets; there are eight straight sections located in two clusters. The cell phase advance has been raised from 60° to 90° and its length increased from 196 m to 228.5 m.

Global Structure

The lattice has a racetrack shape with eight straight sections placed in two clusters of four each, see Figure 1. The clusters on the left and right sides of the figure are called the near and far clusters respectively. Their lattice structure and orbit functions (with collision optics) are shown in Figures 2 and 3.

Two of the straight sections in each cluster are experimental interaction regions (IRs) where the beams cross vertically. The IRs in the near cluster are low-β areas with ± 20 m free space about the interaction point (IP) and a design luminosity of $\mathcal{L} = 10^{33}\mathrm{cm}^{-2}\mathrm{s}^{-1}$; those in the far cluster are medium-β IRs with ± 120 m free space and a luminosity of $\mathcal{L} = 5 \times 10^{31}\mathrm{cm}^{-2}\mathrm{s}^{-1}$.

The other two straight sections in each cluster are configured as utility regions. The injection, beam abort, rf and other systems are located in the near cluster utility straight sections, while the utility straight sections in the far cluster, though optically identical to those in the near cluster, are reserved for future development as IRs.

The near and far clusters are connected by the top and bottom arcs, each of which contains 143 identical FODO cells.

Each straight section is part of a module consisting of a half-cell, a dispersion suppressor, the long straight section, another dispersion suppressor, and a full cell; the module is

matched at both ends to the beta functions and dispersion of the regular cells, and each cluster consists of four such modules.

The module structure is antisymmetric about the center of the straight section: it is mirror symmetric about that point, but the signs of the corresponding quadrupole gradients are opposite. The β–functions consequently have the property that β_x on one side of the IP reflects into β_y on the other and *vice-versa.*

The modules are identical in length and horizontal bending angle, and have betatron phase advances equal to odd multiples of 90° (which do not change between collision and injection optics). These phases are chosen to produce partial cancellation of chromatic perturbations between pairs of identical modules.[2–5]

On either side of the the IP, the two beams pass through common quadrupole triplets which have opposite horizontal and vertical focussing actions on the two beams. By choosing the polarity of the quadrupoles directly above and below each other on the two beamlines to be opposite, this focussing relation between the two beamlines becomes universal.

Another global feature concerns the disposition of the correction spools; these are situated symmetrically with respect to the straight section centers, so they alternate from the upstream to the downstream ends of the half-cells in successive bending regions. The magnets and spools of the two beamlines are always above and below each other. The reason for this arrangement is to make the lattices of the two rings essentially identical.

Arc Cells C

A diagram of a half-cell is shown schematically in Figure 4. Each 114.25 meter long half-cell contains six 6.61 Tesla (at 20 TeV) dipoles, a 230 T/m quadrupole, and a correction 'spool piece' containing an orbit correcting dipole, a trim quadrupole, a chromaticity sextupole, and higher-order correction coils. The spool pieces occur in all of the cells, including those in the cluster modules. The cell phase advance is 90°, rather than 60°, the value of the CDR cells. The orbit functions of a cell are shown in Figure 5.

Dispersion Suppressors

A dispersion suppressor consists of two cells, each having 3/4 the length, 2/3 the bending, and the same phase advance (90°) as a normal cell. Consequently the proper

dispersion of these cells is half that of the normal cells, while the actual dispersion makes a cosine wave oscillation through the suppressor from the cell proper value at one end to zero at the other end. The shortness of these suppressors decreases the distance between interaction points. Moreover, since they have an $M = -1$ transfer matrix, they map the cell β–functions to the ends of the straight sections, providing favorable initial conditions for the IR optics.

Because of the asymmetry in the arc half-cells due to the spool pieces, the blocks of four dipoles in each suppressor half-cell must be positioned separately. These positions are reflected about the straight section centers, and are somewhat different for the suppressors in which the spools are shifted toward the nearest straight section than for those in which they are shifted away from the straight section. The suppressor half-cells are regular in total length and quadrupole length and their magnets are on the main bus. The dispersion suppressors in the bending region between two straight sections are shown in Figure 6.

Utility Straight Sections

A utility cluster module is shown in Figure 7. The utility straight sections are used for injection, beam abort and rf systems, as well as beam halo scrapers. Injection and rf take place in the outer drift spaces and beam abort in the inner ones. The outer quadrupoles have the same aperture and gradient as the cell quadrupoles; the inner ones have large aperture and low gradients due to the larger β values in them.

Experimental Crossing Straight Sections

The two proton beams collide at the IP at the center of each experimental straight section or IR. The low-β IRs (Figures 8, 9 and 10) have 20 meters of magnet-free space on either side of the IP for detectors, and β values of 8 m and 0.5 m for the injection and collision optics respectively. The medium-β IRs (Figures 11, 12 and 13) have $\pm$120 m about the IP, and β values of 60 m and 10 m.

The beams are focussed to waists at the IP by quadrupole triplets Q1, Q2, Q3 (really quadruplets–there are two Q2s) through which both beams pass. Just beyond the triplets, proceeding away from the IP, the beams are separated by dipole splitter magnets and led into separated, parallel beamlines. Both beams pass through a vertical separation

and dispersion matching region, which will be described below, and then through a region containing three quadrupoles, Q4, Q5, Q6, which complete the β–function matching between the IP and the cells (since the dispersion suppressors have $M = -1$ transforms). The quadrupole lengths are such that the gradients do not exceed those of the cells. Note that Q5 and Q6 are well separated and have the same sign, which simplifies tuning of the IR: the tuning between injection and collision optics consists mainly of weakening Q5 and strengthening Q6, see Figures 14 and 16.

With this design, large β values exist only in the inner triplet in the collision optics. For the injection optics, the largest β is in Q5, which is a large aperture, low gradient quadrupole, similar to the inner quadrupoles of the utility straight section.

Vertical Beam Splitting and Dispersion Matching

Figures 8 and 11 show side views of the vertical beamlines of the two rings to the right of the two types of IPs. Between the inner and outer triplets, each beamline makes two 17.5 cm vertical steps separated by a horizontal region with eight quadrupoles comprising two 90° cells which have an $M = -1$ transfer matrix (the $M = -1$ region). These quadrupoles eliminate the vertical dispersion caused by the vertical bends, but are invisible for the β–matching between the IP and the dispersion suppressor.

Comparison with the CDR lattice

In the IRs of the CDR lattice, Q4 was not in the outer region with Q5 and Q6, but rather in the center of the $M = -1$ quadrupole string, where it perturbed the vertical dispersion cancellation for the injection optics. This different arrangement of the outer triplet, Q4, Q5, Q6, was responsible for the large secondary β peak in the $M = -1$ quadrupoles of the CDR design.

Optics

Two principal optical configurations are included, an injection optics where β^* is large at the IPs, and an experimental optics where β^* is much smaller. For each optics, both low-β IRs are tuned identically, as are the two medium-β IRs.

The SYNCH program[6] was used for designing this lattice. Survey data was obtained using the program MAD.[7] Chromatic properties of the lattice are given in another

report.[8] Earlier, less optimized versions of the 90° lattice have been described in other publications.[9,10]

Acknowledgements

We wish to thank Ardith Kenney for useful additions to SYNCH, and James Niederer for providing a SYNCH to MAD translation facility. We have also benefitted from comments and suggestions from Alex Chao, Don Groom, Mike Harrison, Peter Limon, Steve Peggs and Jack Peterson. We would particularly like to thank Rene Donaldson for her help with this report.

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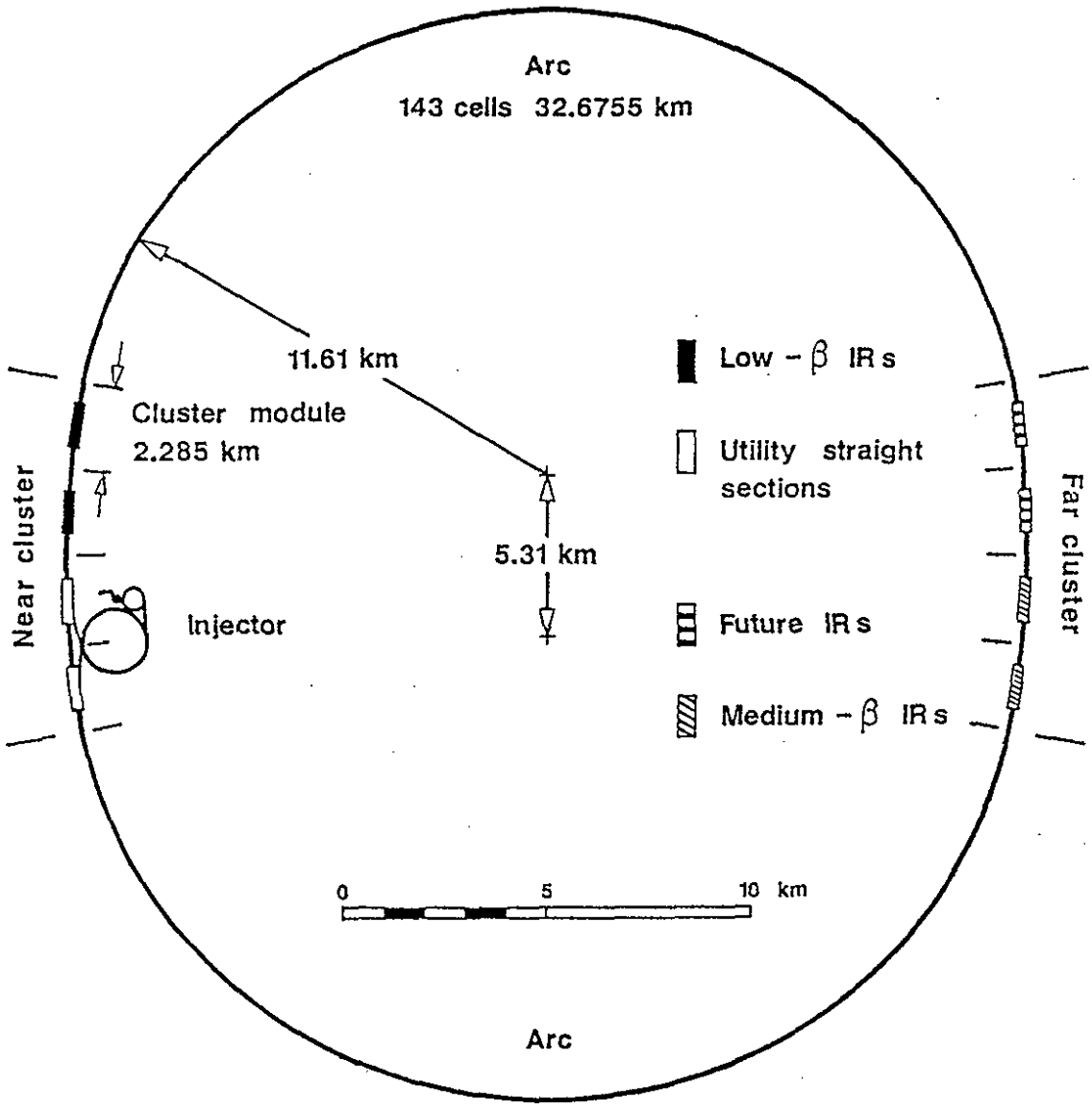


Figure 1. SSC Ring Layout

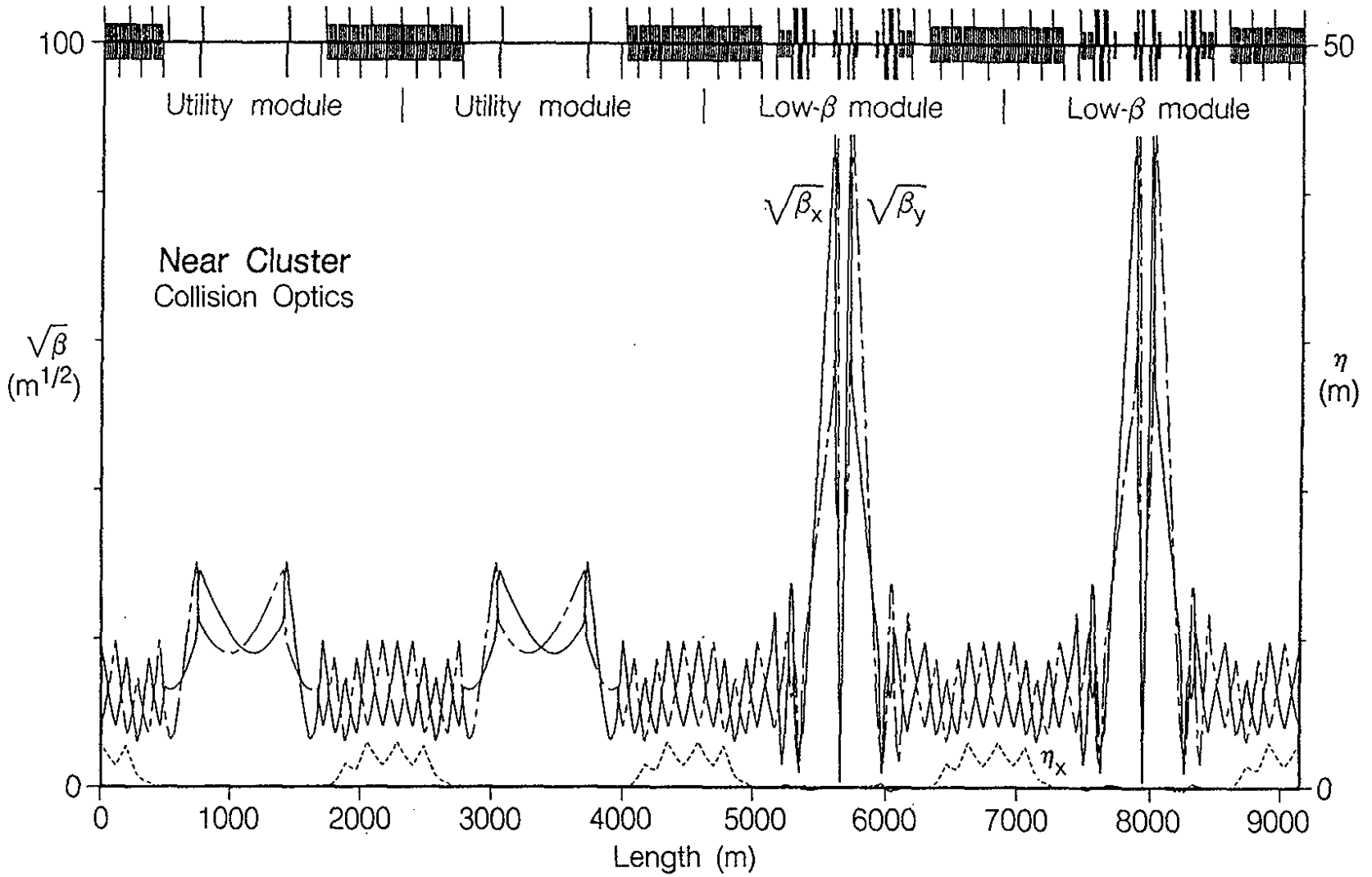


Figure 2. Near Cluster Lattice Structure and Collision Optics β-functions

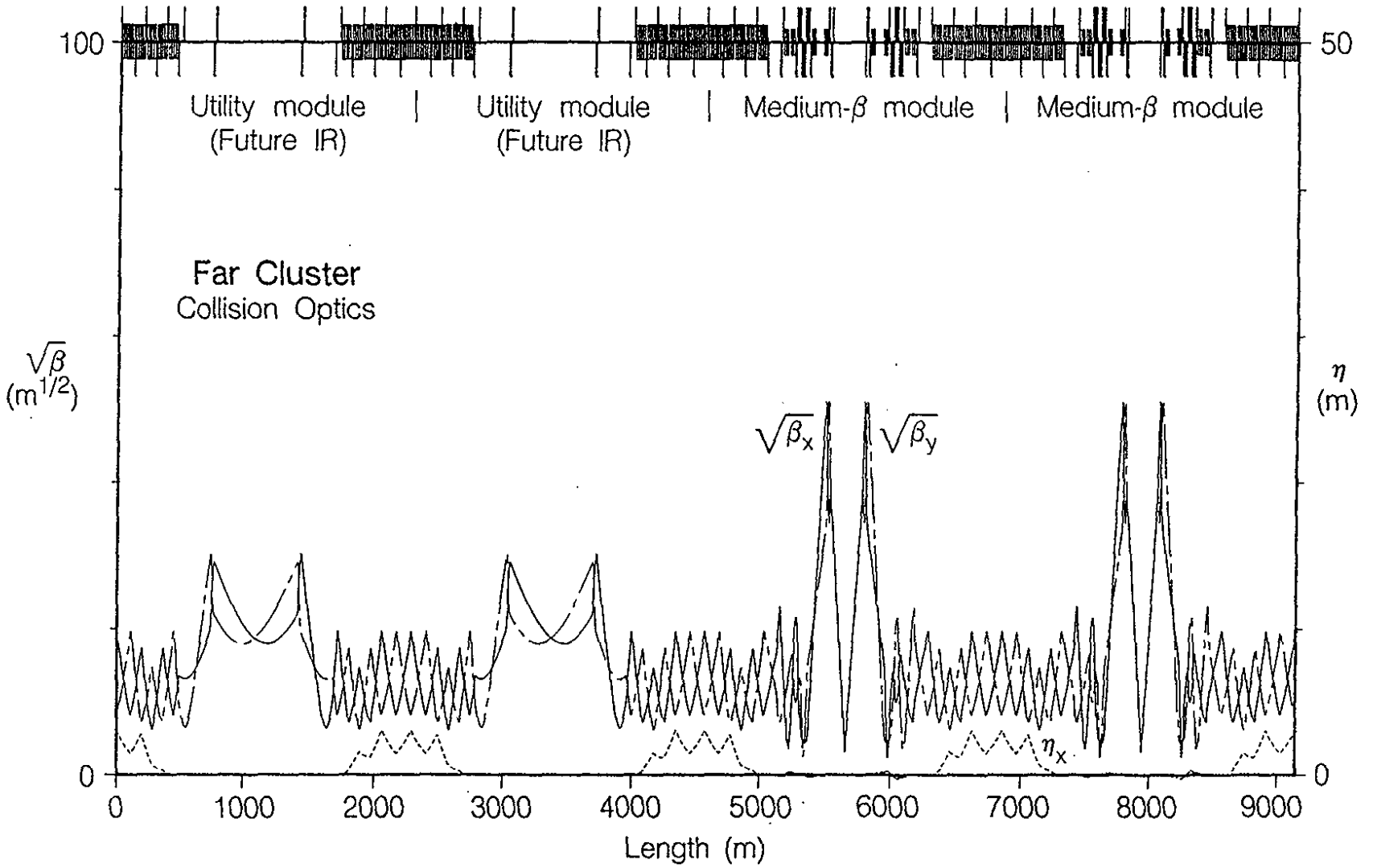
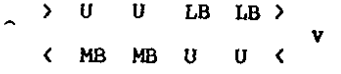


Figure 3. Far Cluster Lattice Structure and Collision Optics β-functions

SYNCH RUN L90 SSC 90 DEGREE CELL LATTICE SYNCH VERSION VAX.8704

10 Nov. 1987
Cell main quads set for nu=96.275
Trim quads produce nux=95.285, nuy=95.265
Trim quads and sextupoles in all normal cells
Insertions fitted to cells with trim quads off



6.60 T, 230 T/M.
ARCS ---
114.25 METER HALF-CELLS, SIX 16.54 M DIPOLES
3.64 M QUADRUPOLE, 6.57 M SPOOL DRIFT, 0.8 M DIPOLE SEPARATION DRIFTS.
ALL SPOOLS DOWNSTREAM FROM QUADS.

VERTICAL BEAM SEPARATING SECTION --- CONTAINS STEP WITH TWO 90 DEGREE CELLS
--- 70 CM BEAMLINE SEPARATION

ARCS CONTAIN 143 CELLS EACH
TWO 1256.75 METER LONG CROSSING STRAIGHTS WITH +- 20 METERS FREE SPACE (LB)
TWO 1256.75 METER LONG CROSSING STRAIGHTS WITH +-120 METERS FREE SPACE (MB)
2285 METERS BETWEEN IP'S
FOUR 1256.75 METER UTILITY STRAIGHTS (U), TWO IN FAR CLUSTER ARE FUTURE IRS
STRAIGHTS SEPARATED BY 2 CELL, 3/4 LENGTH, 90 DEG DISPERSION SUPPRESSORS
STRAIGHTS LB, MB, AND U IMBEDDED IN 2285 M CLUSTER MODULES
MODULULES FITTED TO CELLS WITH TRIM QUADS OFF
90 DEG PHASE INTERVALS BETWEEN STRAIGHTS (MOD 180 DEG)
3832 DIPOLES IN RING, CIRCUMFERENCE 83631 M, TUNES 95.285, 95.265

QUADRUPOLES ARE ALL SPLIT IN TWO, WITH A MARKER WHOSE NAME BEGINS WITH #
IN THE CENTER. QUAD LENGTHS ARE THOSE OF THE HALF-QUADRUPOLES.

MOMENTUM = 20 TEV/C

```
***   BRHO    =           //  66712.8
***   RHO     =           //  10087.4440
***   B0      =           //  6.61344935
***   B0      =           //  BRHO      /          RHO
***   RHOI    =           //  1.        /          RHO
***   RHI     =           //  1.        /          RHO
***   MUX     =           //  .25
***   MUY     =           //  .25
***   BR      =           //  1.0
```

```
      -- CELLS AND ARCS (143 CELLS EACH, 4 X 35 = 140 WITH SEXTUPOLES)

***   .BB     BML         //  B    O    B    O    B    O    B    O    B
***   .SPF    BML         //  OPM  QFC  SF   QFC  OOC
***   .SPD    BML         //  OPM  QDC  SD   QDC  OOC
***   ,FD     BML         //  QF   .SPF .BB  O    QD
***   ,DF     BML         //  QD   .SPD .BB  O    QF
***   ,C      BML         //  ,FD  ,DF
***   FD,     BML   -1    //  ,DF
***   DF,     BML   -1    //  ,FD
***   C,      BML         //  FD,  DF,
***   .FD     BML         //  #QF  ,FD
***   .DF     BML         //  #QD  ,DF
***   .C      BML         //  .FD  .DF
***   .CD     BML         //  .DF  .FD
***   FD.     BML         //  #QF  FD,
***   DF.     BML         //  #QD  DF,
***   C.      BML         //  FD.  DF.
***   .ARC    BML         //    4( .C      ) #135 135( ,C      )   4( .C      )
```

```
     -- ARC CELLS

***   #QF     DRF          //
***   #QD     DRF          //
***   #135    DRF          //
***   LCH     =            //  114.25
***   LQ      =            //  1.82
***   LQC     =            //  1.0
***   LB      =            //  16.54
***   O       DRF          //  0.8
***   OPM     DRF          //  1.035
***   OOC     DRF          //  3.535
***   OOS     DRF          //  6.57
***   B       MAG          //  LB        0.        BR        RHOI
***   SXKF    PARA         //  0.0
***   SXKD    PARA         //  -0.0

***   SRX     SUB    0   0 //
.....................................................................................................................
***   SF      SXTP         //  0.        SXKF      BR
***   SD      SXTP         //  0.        SXKD      BR
***           END    0   0 //
.....................................................................................................................

***   KFC     PARA         //  0.
***   KDC     PARA         //  0.

***   SRC     SUB    0   0 //
.....................................................................................................................
***   QFC     MAG          //  LQC       KFC       BR
***   QDC     MAG          //  LQC       KDC       BR
***           END    0   0 //
.....................................................................................................................

***   SRG     SUB    0   0 //
.....................................................................................................................
***   QF      MAG          //  LQ        KF        BR
***   QD      MAG          //  LQ        KD        BR
***   CF      MMM          //  .C
***           END    0   0 //
.....................................................................................................................

***           CALL         //  SRX

***           CALL         //  SRC
```

```
***   KF      PARA          //  0.34287987   -2
***   KD      PARA          //  -.34287576   -2
***   K       PARA          //  .342877815   -2
***   QF      MAG           //  LQ          K          BR
***   QD      MAG           //  LQ          -K         BR

***   FD      MMM           //  .FD
***   DF      MMM           //  .DF
***   FDR     REF           //  DF
***   DFR     REF           //  FD
***   CF      MMM           //  .C
***   CD      MMM           //  .CD
***   RCD     REF           //  CD
***   BXF     BETA    2     //  CF
***   AXF     BETA    3     //  CF
***   XF      BETA    5     //  CF
***   XPF     BETA    6     //  CF
***   BYF     BETA   12     //  CF
***   AYF     BETA   13     //  CF
***   OOOO    DRF           //  110.61
***   DFO     MMM           //  QD    OOOO QF
```

-- DISPERSION SUPPRESSORS

3/4 length cell, 2/3 normal bending to give 1/2 normal dispersion,
i.e. 4 normal dipoles/half-cell.
Quadrupoles have gradient same as those in normal cells.

```
***   .BB4    BML          //  B     O     B     O     B     O     B

      Odd IRs:

***   \SPF    BML          //  OPM   QFC   SF    QFC   DOG1
***   \SPD    BML          //  OPM   QDC   SD    QDC   DOG1
***   |FD1    BML          //  #QSF  QSF   OOG1  .BB4  OG1   QSD
***   |DF1    BML          //  #QSD  QSD   OOG1  .BB4  OG1   QSF
***   |C1     BML          //  |FD1 |DF1
***   \FD1    BML          //  #QSF  QSF   \SPF  .BB4  OG1   QSD
***   \DF1    BML          //  #QSD  QSD   \SPD  .BB4  OG1   QSF
***   \FD2    BML          //  #QSF  QSF   OOG2  .BB4  OG2   QSD
***   \DF2    BML          //  #QSD  QSD   OOG2  .BB4  OG2   QSF
***   \FD3    BML          //  #QSF  QSF   OOG3  .BB4  OG3   QSD
***   \DF3    BML          //  #QSD  QSD   OOG3  .BB4  OG3   QSF
***   \FD4    BML          //  #QSF  QSF   OOG4  .BB4  OG4   QSD
***   \DF4    BML          //  #QSD  QSD   OOG4  .BB4  OG4   QSF
***   \FB4    BML          //  #QSF  QSF   OOG4  .BB4  OG4
***   \DB4    BML          //  #QSD  QSD   OOG4  .BB4  OG4
***   \CCD    BML          //  |DF1 \FD2  \DF3  \FD4
***   \CCF    BML          //  |FD1 \DF2  \FD3  \DF4
***   CCF\    BML    -1    //  \CCF
***   \SUP    BML          //  \CCD  DFO   CCF\

***   \DSD    BML          //  \DF1  \FD2  \DF3  \FB4
***   \DSF    BML          //  \FD1  \DF2  \FD3  \DB4
***   DSF\    BML    -1    //  \DSF

      Even IRs:

***   ;FD1    BML          //  #QSF  QSF   OH1   .BB4  OOH1  QSD
***   ;DF1    BML          //  #QSD  QSD   OH1   .BB4  OOH1  QSF
***   ;FD2    BML          //  #QSF  QSF   OH2   .BB4  OOH2  QSD
***   ;DF2    BML          //  #QSD  QSD   OH2   .BB4  OOH2  QSF
***   ;FD3    BML          //  #QSF  QSF   OH3   .BB4  OOH3  QSD
***   ;DF3    BML          //  #QSD  QSD   OH3   .BB4  OOH3  QSF
***   ;FD4    BML          //  #QSF  QSF   OH4   .BB4  OOH4  QSD
***   ;DF4    BML          //  #QSD  QSD   OH4   .BB4  OOH4  QSF
***   ;FB4    BML          //  #QSF  QSF   OH4   .BB4  OOH4
***   ;DB4    BML          //  #QSD  QSD   OH4   .BB4  OOH4
***   ;CCD    BML          //  ;DF1  ;FD2  ;DF3  ;FD4
***   ;CCF    BML          //  ;FD1  ;DF2  ;FD3  ;DF4
***   CCF;    BML    -1    //  ;CCF
***   ;SUP    BML          //  ;CCD  DFO   CCF;

***   ;DSD    BML          //  ;DF1  ;FD2  ;DF3  ;FB4
***   ;DSF    BML          //  ;FD1  ;DF2  ;FD3  ;DB4
***   DSF;    BML    -1    //  ;DSF
```

```
***   #QSF   DRF          //
***   #QSD   DRF          //
***   LB4    =            //  68.56
***   LHS    =            //  85.6875
***   OOG1   DRF          //  7.6622
***   LQSF   PARA         //  0.244795      1
***   LQSD   PARA         //  0.244795      1
***   KS     =            //  K         *         1.

***   SDS0   SUB    0   0 //
.....................................................................................................
***   OG1    DRF        4 //              LHS       OOG1 LQSF LQSD LB4
***   QSF    MAG          //  LQSF        KS        BR
***   QSD    MAG          //  LQSD        -KS       BR
***   CS1    MMM          //  |C1
***          END    0   0 //
.....................................................................................................

***   LQS    =            //  2.44795
***   QSF    MAG          //  LQS         KS        BR
***   QSD    MAG          //  LQS         -KS       BR
```

Odd IRs:

```
***   GOO1   PARA         //  0.76622       1
***   GOO2   PARA         //  0.85281       1
***   GOO3   PARA         //  0.81974       1
***   GOO4   PARA         //  0.821225      1

***   ODD    SUB    0   0 //
.....................................................................................................
***   OOG1   DRF          //  GOO1
***   OG1    DRF        4 //              LHS       OOG1 QSF  QSD  LB4
***   OOG2   DRF          //  GOO2
***   OG2    DRF        4 //              LHS       OOG2 QSF  QSD  LB4
***   OOG3   DRF          //  GOO3
***   OG3    DRF        4 //              LHS       OOG3 QSF  QSD  LB4
***   OOG4   DRF          //  GOO4
***   OG4    DRF        4 //              LHS       OOG4 QSF  QSD  LB4
*** - TODD   TRKB         //  \SUP CD
***          END    0   0 //
.....................................................................................................

 ***          CALL         //  ODD

***   SPOO   =            //  3.035
***   DOG1   DRF        1 //              OOG1      SPOO
***   DSGF   MMM          //  DSF\
***   DSGD   MMM          //  \DSD
```

Even IRs:

```
***   HOO1    PARA          //  0.77777       1
***   HOO2    PARA          //  0.69329       1
***   HOO3    PARA          //  0.72950       1
***   HOO4    PARA          //  0.725925      1

***   EVEN    SUB     0   0 //
.....................................................................................................................
***   OOH1    DRF           //  HOO1
***   OH1     DRF         4 //              LHS       OOH1 QSF  QSD  LB4
***   OOH2    DRF           //  HOO2
***   OH2     DRF         4 //              LHS       OOH2 QSF  QSD  LB4
***   OOH3    DRF           //  HOO3
***   OH3     DRF         4 //              LHS       OOH3 QSF  QSD  LB4
***   OOH4    DRF           //  HOO4
***   OH4     DRF         4 //              LHS       OOH4 QSF  QSD  LB4
*** - TEVN    TRKB          //  ;SUP RCD
***           END     0   0 //
.....................................................................................................................


***           CALL          //  EVEN

***   DSHF    MMM           //  DSF;
***   DSHD    MMM           //  ;DSD
***   LSSH    =             //  628.375   +       LQS
=====================================================================================================================
```

```
     -- UTILITY STRAIGHT

***    #UC     DRF           //
***    #4QU    DRF           //
***    #QU3    DRF           //
***    #2QU    DRF           //
***    #QU1    DRF           //
***    #QU4    DRF           //
***    #3QU    DRF           //
***    #QU2    DRF           //
***    #1QU    DRF           //

***    .UDF    BML           //  QU4a #QU4 QU4a DU34 QU3a #QU3 QU3a DU23
  *                           //  QU2a #QU2 QU2a DU12 QU1a #QU1 QU1a DU0

***    .UFD    BML           //  QU4b #4QU QU4b DU34 QU3b #3QU QU3b DU23
  *                           //  QU2b #2QU QU2b DU12 QU1b #1QU QU1b DU0

***    UFD.    BML    -1     //  .UFD
***    .U      BML           //  .UDF #UC  UFD.
***    .UTL    BML           //  .FD  \DSD .U   DSF\ C.
***    UTL.    BML           //  FD.  ;DSD .U   DSF; .C
***    .UU     BML           //  .UTL UTL. CF   #QF
***    $$U     BML           //  FD   DSGD .U   DSGF FDR  DFR

***    LQU4    PARA          //  0.313915       1
***    LQU3    PARA          //  0.182000       1
***    LQU2    PARA          //  0.64095        1
***    LQU1    PARA          //  0.58375        1
***    LU34    PARA          //  0.357347       2
***    LU23    PARA          //  0.2350191      3
***    LU12    PARA          //  0.66137        1
***    KU1     PARA          //  0.1644927     -2
***    KU2     =             //  -KU1       *          1.
***    KU3     =             //  K          *          1.
***    KU4     =             //  -K         *          1.
***    MUTL    =             //  2.25

***    SUTL    SUB     0   0 //
.....................................................................................................................
***    DU12    DRF           //  LU12
***    DU34    DRF           //  LU34
***    DU23    DRF           //  LU23
***    DU0     DRF       11  //              LSSH       LQU4 LQU4 DU34 LQU3 LQU3 DU23 LQU2 LQU2
  *                          //  DU12 LQU1 LQU1
***    QU1a    MAG           //  LQU1       KU1        BR
***    QU2a    MAG           //  LQU2       KU2        BR
***    QU3a    MAG           //  LQU3       KU3        BR
***    QU4a    MAG           //  LQU4       KU4        BR
***    QU1b    MAG           //  LQU1       -KU1       BR
***    QU2b    MAG           //  LQU2       -KU2       BR
***    QU3b    MAG           //  LQU3       -KU3       BR
***    QU4b    MAG           //  LQU4       -KU4       BR
*** -  TUTL    TRKB          //  $$U  CF
***            END    0   0 //
.....................................................................................................................
=====================================================================================================================
```

M = -1 CHANNEL

```
***   #QVF   DRF          //
***   #QVD   DRF          //
***   #BV+   DRF          //
***   #BV-   DRF          //
***   #BS+   DRF          //
***   #BS-   DRF          //

***   .FDV   BML          //  OOV  QVF  #QVF QVF  O    QVD  #QVD QVD  OOV
***   .DFV   BML          //  OOV  QVD  #QVD QVD  O    QVF  #QVF QVF  OOV
***   .CFV   BML          //  .FDV .DFV
***   .CDV   BML          //  .DFV .FDV
***   .M1F   BML          //  .CFV .CFV
***   .M1D   BML          //  .CDV .CDV
***   CFV'   BML          //  .FDV OOV  QVD  #QVD QVD  O    QVF  #QVF QVF
***   CDV'   BML          //  .DFV OOV  QVF  #QVF QVF  O    QVD  #QVD QVD
***   'M1F   BML          //  .CFV CFV'
***   'M1D   BML          //  .CDV CDV'

***   OV     DRF          //  0.4
***   LMM1   =            //  135.
***   LMO8   =            //  LMM1       /          8.
***   KV     =            //  K          *          1.
***   LQVF   PARA         //  0.60500000    1
***   LQVD   PARA         //  0.60500000    1

***   SRV    SUB    0   0 //
-------------------------------------------------------------------------------------------------------------------------------
***   OOV    DRF        3 //             LMO8       OV   LQVF LQVD
***   QVF    MAG          //  LQVF       KV         BR
***   QVD    MAG          //  LQVD       -KV        BR
***   CFV    MMM          //  .CFV
***            END    0   0 //
-------------------------------------------------------------------------------------------------------------------------------

***   OOV    DRF          //  4.375
***   LQV    PARA         //  0.60500000    1
***   QVF    MAG          //  LQV        KV         BR
***   QVD    MAG          //  LQV        -KV        BR
```

VERTICAL BENDING REGIONS

Low-beta straights

```
***   .C+-    BML          //  D3   #BV+ BV1+ D    #BV+ BV1+ D    #BV+ BV1+ DLV1
 *                         //  #BV- BV1- D    #BV- BV1- D    #BV- BV1- DL3

***   .C-+    BML          //  D3   #BV- BV1- D    #BV- BV1- D    #BV- BV1- DLV1
 *                         //  #BV+ BV1+ D    #BV+ BV1+ D    #BV+ BV1+ DL3

***   .V+-    BML          //  D4   #BV+ BV2+ D    BV2+ #BV+ DLV2
 *                         //  #BV- BV2- D    BV2- #BV- D

***   .V-+    BML          //  D4   #BV- BV2- D    BV2- #BV- DLV2
 *                         //  #BV+ BV2+ D    BV2+ #BV+ D

***   .VD+    BML          //  .C+- 'M1D .V+-
***   .VF-    BML          //  .C-+ 'M1F .V-+
***   .VD-    BML          //  .C-+ 'M1D .V-+
***   .VF+    BML          //  .C+- 'M1F .V+-

***   VD+.    BML   -1     //  .VD+
***   VF-.    BML   -1     //  .VF-
***   VD-.    BML   -1     //  .VD-
***   VF+.    BML   -1     //  .VF+
--
***   D       DRF          //  1.0
***   D3      DRF          //  7.0
***   DLV1    DRF          //  136.1646
***   DLV2    DRF          //  19.28465

***   LBV1    =            //  5.0
***   B0V1    =            //  5.08156584
***   RV1     =            //  B0V1       /          BRHO
***   BV1+    MAGV         //  LBV1       0.         BR         RV1
***   BV1-    MAGV         //  LBV1       0.         BR         -RV1

***   LBV2    =            //  16.54
***   B0V2    =            //  B0         *          1.
***   RV2     =            //  B0V2       /          BRHO
***   BV2+    MAGV         //  LBV2       0.         BR         RV2
***   BV2-    MAGV         //  LBV2       0.         BR         -RV2

***   LLV1    =            //  170.1646
***   LLV2    =            //  87.44465
***   D4      DRF        2 //             90.        LLV2 D
```

Medium-beta straights

```
***   ,C+-    BML          //  D3    #BV+ BV1+ D     #BV+ BV1+ D     #BV+ BV1+ D     #BV+ BV1+
  *                        //  D     #BV+ BV1+       DMV1      #BV- BV1- D
  *                        //  #BV-  BV1- D     #BV- BV1- D     #BV- BV1- D     #BV- BV1- DM3

***   ,C-+    BML          //  D3    #BV- BV1- D     #BV- BV1- D     #BV- BV1- D     #BV- BV1-
  *                        //  D     #BV- BV1-       DMV1      #BV+ BV1+ D
  *                        //  #BV+  BV1+ D     #BV+ BV1+ D     #BV+ BV1+ D     #BV+ BV1+ DM3

***   ,V+-    BML          //  D4    #BV+ BV2+ D     BV2+ #BV+ DMV2
  *                        //  #BV-  BV2- D     BV2- #BV- D

***   ,V-+    BML          //  D4    #BV- BV2- D     BV2- #BV- DMV2
  *                        //  #BV+  BV2+ D     BV2+ #BV+ D

***   LMV1    DRF          //  120.89876
***   DMV1    DRF          //  62.89876
***   DMV2    DRF          //  19.28465

***   ,VD+    BML          //  ,C+- 'M1D ,V+-
***   ,VF-    BML          //  ,C-+ 'M1F ,V-+
***   ,VD-    BML          //  ,C-+ 'M1D ,V-+
***   ,VF+    BML          //  ,C+- 'M1F ,V+-

***   VD+,    BML   -1     //  ,VD+
***   VF-,    BML   -1     //  ,VF-
***   VD-,    BML   -1     //  ,VD-
***   VF+,    BML   -1     //  ,VF+
```

```
     -- LOW-BETA STRAIGHT SECTION

***   #IPL   DRF          //
***   #QL1   DRF          //
***   #QL2   DRF          //
***   #QL3   DRF          //
***   #QL4   DRF          //
***   #QL5   DRF          //
***   #QL6   DRF          //
***   #1QL   DRF          //
***   #2QL   DRF          //
***   #3QL   DRF          //
***   #4QL   DRF          //
***   #5QL   DRF          //
***   #6QL   DRF          //

***   TPO.   BML          //       DL0  QL1a #QL1 QL1a 0
  *                       //  QL2a #QL2 QL2a 0    QL2a #QL2 QL2a 0
  *                       //  QL3a #QL3 QL3a

***   TPI.   BML          //  #IPL DL0  QL1b #1QL QL1b 0
  *                       //  QL2b #2QL QL2b 0    QL2b #2QL QL2b 0
  *                       //  QL3b #3QL QL3b

***   .TPO   BML   -1     //  TPO.
***   .TPI   BML   -1     //  TPI.

***   SSO.   BML          //  QL4a #QL4 QL4a DL45 QL5a #QL5 QL5a DL56 QL6a #QL6 QL6a
***   SSI.   BML          //  QL4b #4QL QL4b DL45 QL5b #5QL QL5b DL56 QL6b #6QL QL6b

***   .SSI   BML   -1     //  SSI.
***   .SSO   BML   -1     //  SSO.

***   .IUD   BML          //  .SSI VF+. .TPI
***   .IDU   BML          //  .SSI VF-. .TPI
***   .OUD   BML          //  .SSO VD-. .TPO
***   .ODU   BML          //  .SSO VD+. .TPO

***   IUD.   BML   -1     //  .IUD
***   IDU.   BML   -1     //  .IDU

***   .XUD   BML          //  .OUD IUD.
***   .XDU   BML          //  .ODU IDU.

***   $INI   BML          //  .SSI L343 .M1F L341 .TPI
***   $INO   BML          //  .SSO L343 .M1D L341 .TPO
***   INI$   BML   -1     //  $INI

     -- Low-beta module without vertical bends, with lumped cells and suppressors:
***    $$$X   BML          //  FD   DSGD $INO INI$ DSGF FDR  DFR

     -- Vertical bends added:
***    $LUD   BML          //  FD   DSGD .XUD DSGF FDR  DFR
***    .LUD   BML          //  .FD  \DSD .XUD DSF\ C.
***    .LDU   BML          //  FD.  ;DSD .XDU DSF; .C

     -- Two low-beta IRs:
***    *ZLB   BML          //  .LUD #QF  LDU  CF   #QF
```

```
***   LQL1    PARA          //   0.7129700    1
***   LQL2    PARA          //   0.5648300    1
***   LQL3    PARA          //   0.6648800    1
***   LQL4    PARA          //   0.5059700    1
***   LQL5    PARA          //   0.5837500    1
***   LQL6    PARA          //   0.2133975    1
***   LL46    PARA          //   0.1350000    3

***   DL0     DRF           //  20.
***   DL45    DRF           //  2.7955

***   L343    DRF         1 //             90.        OOV

***   DL56    DRF         7 //             LL46       LQL4 LQL4 DL45 LQL5 LQL5 LQL6 LQL6

***   DL34    DRF        21 //             LSSH       DL0  LQL1 LQL1 O    LQL2 LQL2 O    LQL2
  *                       //  LQL2 O      LQL3 LQL3  LMM1 LQL4 LQL4 DL45 LQL5 LQL5 DL56 LQL6
  *                       //  LQL6
***   L341    DRF         1 //             DL34       L343

***   DL3     DRF         2 //             L341       LLV1 D3


***   SRSL    SUB     0   0 //
.....................................................................................................
***   QL1a    MAG           //  LQL1       KL1        BR
***   QL2a    MAG           //  LQL2       KL2        BR
***   QL3a    MAG           //  LQL3       KL3        BR
***   QL4a    MAG           //  LQL4       KL4        BR
***   QL5a    MAG           //  LQL5       KL5        BR
***   QL6a    MAG           //  LQL6       KL6        BR
***   QL1b    MAG           //  LQL1       -KL1       BR
***   QL2b    MAG           //  LQL2       -KL2       BR
***   QL3b    MAG           //  LQL3       -KL3       BR
***   QL4b    MAG           //  LQL4       -KL4       BR
***   QL5b    MAG           //  LQL5       -KL5       BR
***   QL6b    MAG           //  LQL6       -KL6       BR
*** - TINS    TRKB          //  $$$X CF
***           END     0   0 //
.....................................................................................................
```

MEDIUM-BETA STRAIGHT SECTION

```
***   #IPM   DRF          //
***   #QM1   DRF          //
***   #QM2   DRF          //
***   #QM3   DRF          //
***   #QM4   DRF          //
***   #QM5   DRF          //
***   #QM6   DRF          //
***   #1QM   DRF          //
***   #2QM   DRF          //
***   #3QM   DRF          //
***   #4QM   DRF          //
***   #5QM   DRF          //
***   #6QM   DRF          //

***   TPO,   BML          //       DM0  QM1a #QM1 QM1a O
  *                       //  QM2a #QM2 QM2a D    QM2a #QM2 QM2a O
  *                       //  QM3a #QM3 QM3a

***   TPI,   BML          //  #IPM DM0  QM1b #1QM QM1b O
  *                       //  QM2b #2QM QM2b D    QM2b #2QM QM2b O
  *                       //  QM3b #3QM QM3b

***   ,TPO   BML   -1     //  TPO,
***   ,TPI   BML   -1     //  TPI,

***   SSO,   BML          //  QM4a #QM4 QM4a DM45 QM5a #QM5 QM5a DM56 QM6a #QM6 QM6a
***   SSI,   BML          //  QM4b #4QM QM4b DM45 QM5b #5QM QM5b DM56 QM6b #6QM QM6b

***   ,SSI   BML   -1     //  SSI,
***   ,SSO   BML   -1     //  SSO,

***   ,IUD   BML          //  ,SSI VF+, ,TPI
***   ,IDU   BML          //  ,SSI VF-, ,TPI
***   ,OUD   BML          //  ,SSO VD-, ,TPO
***   ,ODU   BML          //  ,SSO VD+, ,TPO

***   IUD,   BML   -1     //  ,IUD
***   IDU,   BML   -1     //  ,IDU

***   ,XUD   BML          //  ,OUD IUD,
***   ,XDU   BML          //  ,ODU IDU,

***   :INI   BML          //  ,SSI L343 .M1F M341 ,TPI
***   :INO   BML          //  ,SSO L343 .M1D M341 ,TPO
***   INI:   BML   -1     //  :INI

    -- Medium-beta module, no vertical bends, lumped cells and suppressors:
***   :::X   BML          //  FD   DSGD :INO INI: DSGF FDR  DFR

    -- Vertical bends added:
***   :MUD   BML          //  FD   DSGD ,XUD DSGF FDR  DFR
***   .MUD   BML          //  .FD  \DSD ,XUD DSF\ C.
***   .MDU   BML          //  FD.  ;DSD ,XDU DSF; .C

    -- Two medium beta IRs:
***   *ZMB   BML          //  .MUD #QF  MDU  CF   #QF
```

```
***   LQM1   PARA          //  0.37762       1
***   LQM2   PARA          //  0.43722       1
***   LQM3   PARA          //  0.56483       1
***   LQM4   PARA          //  0.53569       1
***   LQM5   PARA          //  0.64095       1
***   LQM6   PARA          //  0.244795      1
***   LM46   PARA          //  0.1225        3

***   DM0    DRF           //  120.
***   DM45   DRF           //  4.0

***   DM56   DRF        7  //            LM46      LQM4 LQM4 DM45 LQM5 LQM5 LQM6 LQM6

***   LM34   DRF       21  //            LSSH      DM0  LQM1 LQM1 O    LQM2 LQM2 D    LQM2
  *                        //  LQM2 O    LQM3 LQM3 LMM1 LQM4 LQM4 DM45 LQM5 LQM5 DM56 LQM6
  *                        //  LQM6

***   M341   DRF        1  //            LM34      L343
***   DM3    DRF        2  //            M341      LMV1 D3


***   SRSM   SUB    0   0  //
.....................................................................................................................
***   QM1a   MAG           //  LQM1      KM1       BR
***   QM2a   MAG           //  LQM2      KM2       BR
***   QM3a   MAG           //  LQM3      KM3       BR
***   QM4a   MAG           //  LQM4      KM4       BR
***   QM5a   MAG           //  LQM5      KM5       BR
***   QM6a   MAG           //  LQM6      KM6       BR
***   QM1b   MAG           //  LQM1      -KM1      BR
***   QM2b   MAG           //  LQM2      -KM2      BR
***   QM3b   MAG           //  LQM3      -KM3      BR
***   QM4b   MAG           //  LQM4      -KM4      BR
***   QM5b   MAG           //  LQM5      -KM5      BR
***   QM6b   MAG           //  LQM6      -KM6      BR
*** - TINM   TRKB          //  :::X CF
***          END    0   0  //
.....................................................................................................................
```

A15

```
------ OUTPUT ------

The following quadrupoles have equal length:
  QF      QD      QU3
  QS      QM6
  QL2     QM3
  QU1     QL5
  QM5     QU2
The full interface quad (QF   QSF) has the same length
as the full quad (QL6  QL6)
```

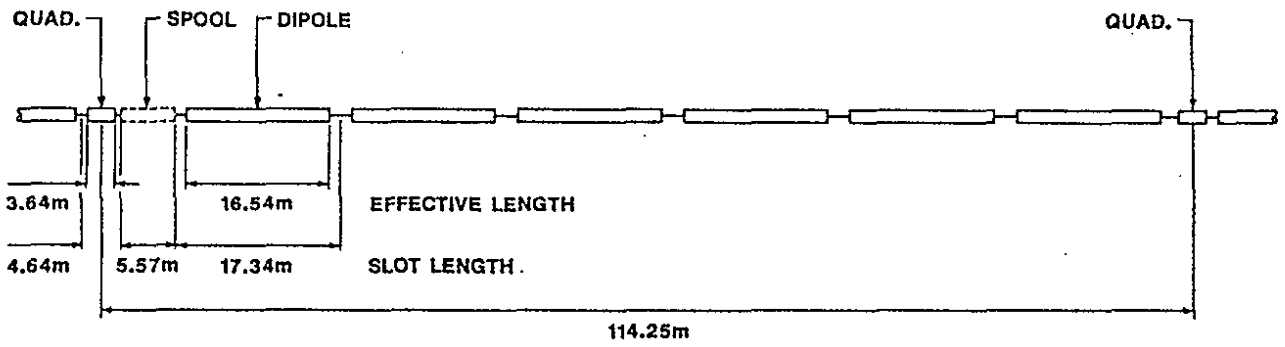


Figure 4. Layout of Arc Half-cell

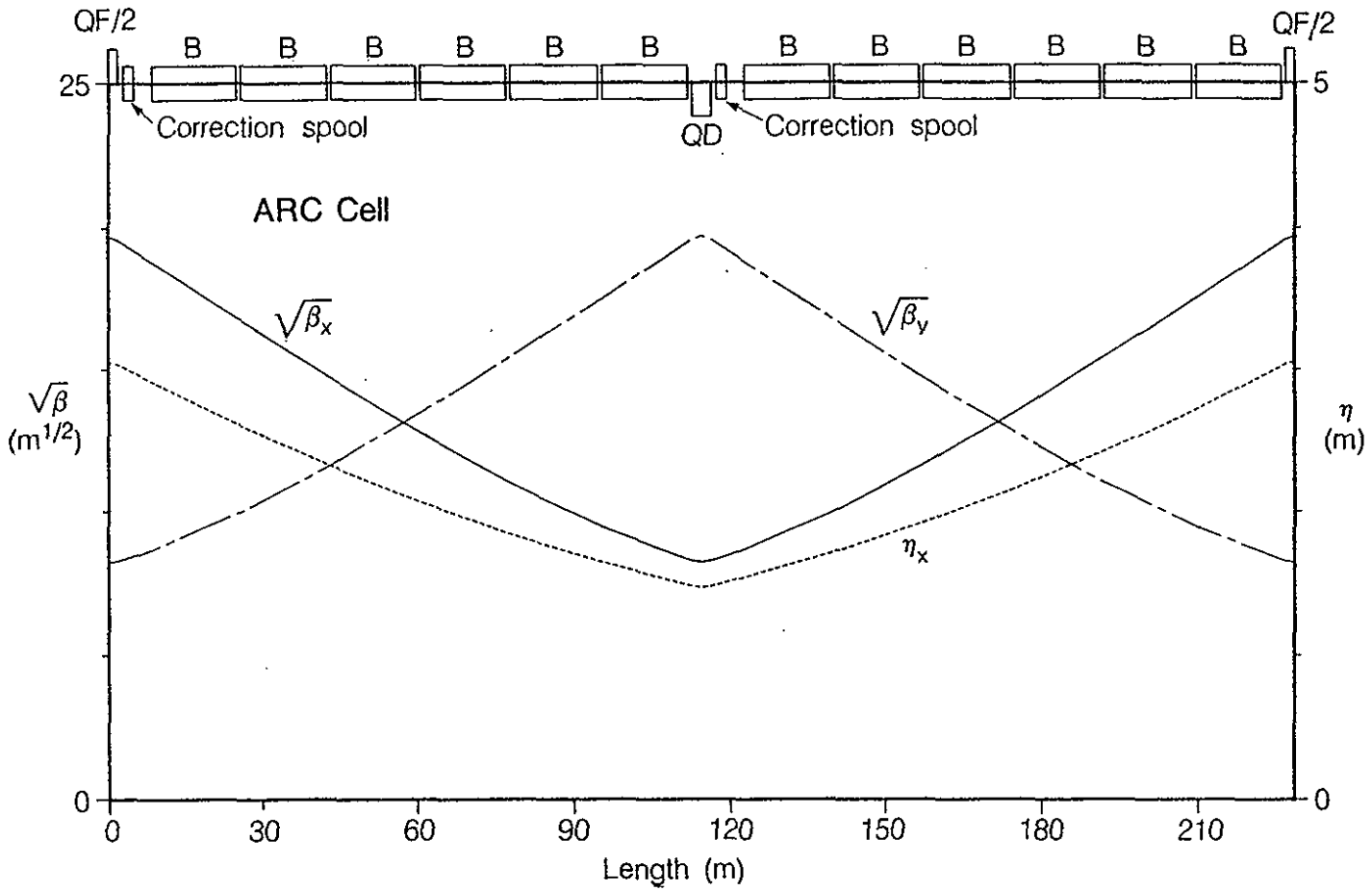


Figure 5. Lattice and β-functions of Arc Cell

CELLS

Trim quads on, adjusted to give NUX=95.285, NUY=95.265

```
***          PRNT          //  K     LQ    LQC   LB
 *                         //  OOS   OPM   OOC   O     RHO   LCH   BRHO  BO
```

K	LQ	LQC	LB	OOS	OPM
0.003428778	1.820000000	1.000000000	16.540000000	6.570000000	1.035000000
OOC	**O**	**RHO**	**LCH**	**BRHO**	**BO**
3.535000000	0.800000000	10087.444000000	114.250000000	66712.800000000	6.613449353

Injection:

```
***   KFC     PARA          //  0.11484157   -6
***   KDC     PARA          //  0.39724458   -6

***           CALL          //  SRC

***   CC      CYC   -1 302 //  .C
```

BETATRON FUNCTIONS OF CC -- Cell with trim quads on at injection values

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
1	#QF	0.0000	0.00000	0.00000	388.17565	67.59134	3.05226	0.00000	0.0000	-0.00003	0.00001	0.00025	0.00000
21	#QD	114.2500	0.12462	0.12459	67.56710	388.21541	1.46769	0.00000	0.0000	-0.00003	0.00015	0.00025	0.00000

```
CIRCUMFERENCE =  69007.0000 M          THETX =   5.94213559 RAD      NUX =   75.27272      DNUX/(DP/P) =  -95.61720
      RADIUS = 10982.8052 M            THETY =   0.00000000 RAD      NUY =   75.25295      DNUY/(DP/P) =  -95.61371
(DS/S)/(DP/P)=  0.0001855              TGAM=(  73.41694,    0.00000)

MAXIMA     --- BETX(    1) =   388.17565    BETY(   21) =   388.21541     XEQ(    1) =     3.05226     YEQ(   40) =     0.00000
MINIMA     --- BETX(   21) =    67.56710    BETY(    1) =    67.59134     XEQ(   21) =     1.46769     YEQ(   40) =     0.00000
```

Collision:

```
***   KFC     PARA          //  0.11320056    -6
***   KDC     PARA          //  0.40675544    -6

***           CALL          //  SRC

***   CC      CYC     1 302 //  .C
```

BETATRON FUNCTIONS OF CC -- Cell with trim quads on at collision values

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
0		0.0000	0.00000	0.00000	388.17540	67.59158	3.05226	0.00000	0.0000	-0.00003	0.00000	0.00025	0.00000
1	#QF	0.0000	0.00000	0.00000	388.17540	67.59158	3.05226	0.00000	0.0000	-0.00003	0.00000	0.00025	0.00000
2	QF	1.8200	0.00075	0.00427	383.79197	68.41133	3.03540	0.00000	0.0000	2.39938	-0.45212	-0.01876	0.00000
3	OPM	2.8550	0.00118	0.00666	378.84412	69.36609	3.01598	0.00000	0.0000	2.38116	-0.47035	-0.01876	0.00000
4	QFC	3.8550	0.00160	0.00894	374.09937	70.32439	2.99722	0.00000	0.0000	2.36359	-0.48796	-0.01876	0.00000
5	SF	3.8550	0.00160	0.00894	374.09937	70.32439	2.99722	0.00000	0.0000	2.36359	-0.48796	-0.01876	0.00000
6	QFC	4.8550	0.00203	0.01119	369.38975	71.31793	2.97845	0.00000	0.0000	2.34603	-0.50557	-0.01876	0.00000
7	OOC	8.3900	0.00359	0.01888	353.02335	75.11233	2.91213	0.00000	0.0000	2.28379	-0.56781	-0.01876	0.00000
8	B	24.9300	0.01193	0.04964	282.29161	98.71187	2.61534	0.00000	0.0045	1.99261	-0.85901	-0.01712	0.00000
9	O	25.7300	0.01239	0.05092	279.11470	100.09755	2.60164	0.00000	0.0045	1.97853	-0.87309	-0.01712	0.00000
10	B	42.2700	0.02305	0.07374	218.48135	133.79585	2.33196	0.00000	0.0086	1.68733	-1.16429	-0.01548	0.00000
11	O	43.0700	0.02364	0.07469	215.79289	135.66998	2.31958	0.00000	0.0086	1.67324	-1.17838	-0.01548	0.00000
12	B	59.6100	0.03760	0.09159	165.25862	179.46706	2.07702	0.00000	0.0122	1.38203	-1.46957	-0.01385	0.00000
13	O	60.4100	0.03837	0.09230	163.05864	181.82965	2.06594	0.00000	0.0122	1.36794	-1.48366	-0.01385	0.00000
14	B	76.9500	0.05703	0.10502	122.62401	235.72549	1.85049	0.00000	0.0154	1.07671	-1.77486	-0.01221	0.00000
15	O	77.7500	0.05808	0.10556	120.91254	238.57653	1.84073	0.00000	0.0154	1.06263	-1.78894	-0.01221	0.00000
16	B	94.2900	0.08334	0.11537	90.57800	302.57114	1.65240	0.00000	0.0182	0.77138	-2.08014	-0.01057	0.00000
17	O	95.0900	0.08475	0.11578	89.35506	305.91063	1.64394	0.00000	0.0182	0.75730	-2.09422	-0.01057	0.00000
18	B	111.6300	0.11850	0.12351	69.12096	380.00402	1.48273	0.00000	0.0208	0.46605	-2.38542	-0.00893	0.00000
19	O	112.4300	0.12035	0.12384	68.38656	383.83196	1.47558	0.00000	0.0208	0.45196	-2.39951	-0.00893	0.00000
20	QD	114.2500	0.12462	0.12459	67.56714	388.21540	1.46769	0.00000	0.0208	-0.00003	0.00015	0.00025	0.00000
21	#QD	114.2500	0.12462	0.12459	67.56714	388.21540	1.46769	0.00000	0.0208	-0.00003	0.00015	0.00025	0.00000
22	QD	116.0700	0.12889	0.12534	68.38675	383.83087	1.47649	0.00000	0.0208	-0.45201	2.39980	0.00943	0.00000
23	OPM	117.1050	0.13129	0.12577	69.34128	378.88214	1.48624	0.00000	0.0208	-0.47024	2.38158	0.00943	0.00000
24	QDC	118.1050	0.13357	0.12619	70.29933	374.13675	1.49567	0.00000	0.0208	-0.48782	2.36382	0.00942	0.00000
25	SD	118.1050	0.13357	0.12619	70.29933	374.13675	1.49567	0.00000	0.0208	-0.48782	2.36382	0.00942	0.00000
26	QDC	119.1050	0.13581	0.12662	71.29255	369.42687	1.50509	0.00000	0.0208	-0.50540	2.34606	0.00942	0.00000
27	OOC	122.6400	0.14351	0.12818	75.08579	353.06024	1.53841	0.00000	0.0208	-0.56765	2.28382	0.00942	0.00000
28	B	139.1800	0.17428	0.13652	98.68090	282.32779	1.70784	0.00000	0.0235	-0.85890	1.99263	0.01106	0.00000
29	O	139.9800	0.17556	0.13698	100.06640	279.15086	1.71669	0.00000	0.0235	-0.87298	1.97854	0.01106	0.00000
30	B	156.5200	0.19839	0.14764	133.76180	218.51712	1.91324	0.00000	0.0264	-1.16422	1.68734	0.01270	0.00000
31	O	157.3200	0.19934	0.14823	135.63582	215.82864	1.92340	0.00000	0.0264	-1.17831	1.67326	0.01270	0.00000
32	B	173.8600	0.21624	0.16218	179.43113	165.29361	2.14706	0.00000	0.0298	-1.46953	1.38206	0.01434	0.00000
33	O	174.6600	0.21695	0.16296	181.79365	163.09358	2.15853	0.00000	0.0298	-1.48362	1.36798	0.01434	0.00000
34	B	191.2000	0.22968	0.18161	235.68837	122.65726	2.40931	0.00000	0.0335	-1.77483	1.07678	0.01598	0.00000

35	O	192.0000	0.23022	0.18266	238.53936	120.94568	2.42209	0.00000	0.0335	-1.78891	1.06270	0.01598	0.00000
36	B	208.5400	0.24002	0.20791	302.53289	90.60807	2.69998	0.00000	0.0377	-2.08010	0.77150	0.01762	0.00000
37	O	209.3400	0.24044	0.20933	305.87232	89.38494	2.71408	0.00000	0.0377	-2.09419	0.75742	0.01762	0.00000
38	B	225.8800	0.24816	0.24306	379.96393	69.14605	3.01908	0.00000	0.0424	-2.38535	0.46622	0.01926	0.00000
39	O	226.6800	0.24850	0.24491	383.79176	68.41137	3.03449	0.00000	0.0424	-2.39944	0.45213	0.01926	0.00000
40	QF	228.5000	0.24925	0.24918	388.17540	67.59158	3.05226	0.00000	0.0424	-0.00003	0.00000	0.00025	0.00000

CIRCUMFERENCE = 69007.0000 M THETX = 5.94213559 RAD NUX = 75.27272 DNUX/(DP/P) = -95.61712
RADIUS = 10982.8052 M THETY = 0.00000000 RAD NUY = 75.25279 DNUY/(DP/P) = -95.61347
(DS/S)/(DP/P)= 0.0001855 TGAM=(73.41695, 0.00000)

MAXIMA	---	BETX(	40) =	388.17540	BETY(	21) =	388.21540	XEQ(	1) =	3.05226	YEQ(40) = 0.00000
MINIMA	---	BETX(	21) =	67.56714	BETY(	1) =	67.59158	XEQ(	21) =	1.46769	YEQ(40) = 0.00000

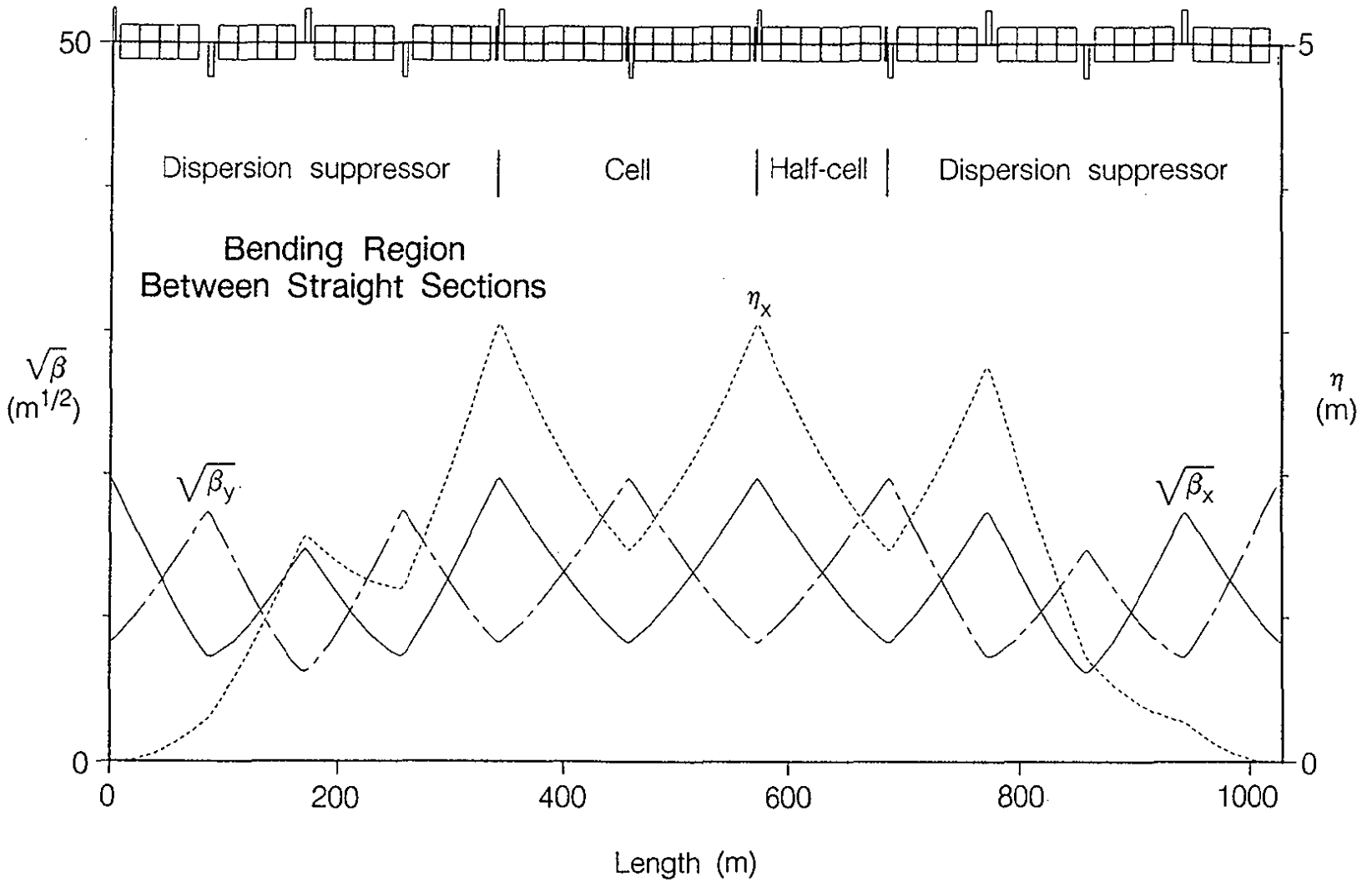


Figure 6. Bending Region Between two Straight Sections

DISPERSION SUPPRESSORS

```
***          PRNT          //  KS   K    LQS  DOG1 OOG1 OOG2 OOG3 OOG4 OG1  OG2  OG3  OG4
 *                         //  OOH1 OOH2 OOH3 OOH4 OH1  OH2  OH3  OH4
```

KS 0.003428778	K 0.003428778	LQS 2.447950000	DOG1 4.627200000	OOG1 7.662200000	OOG2 8.528100000
OOG3 8.197400000	OOG4 8.212250000	OG1 4.569400000	OG2 3.703500000	OG3 4.034200000	OG4 4.019350000
OOH1 7.777700000	OOH2 6.932900000	OOH3 7.295000000	OOH4 7.259250000	OH1 4.453900000	OH2 5.298700000
OH3 4.936600000	OH4 4.972350000				

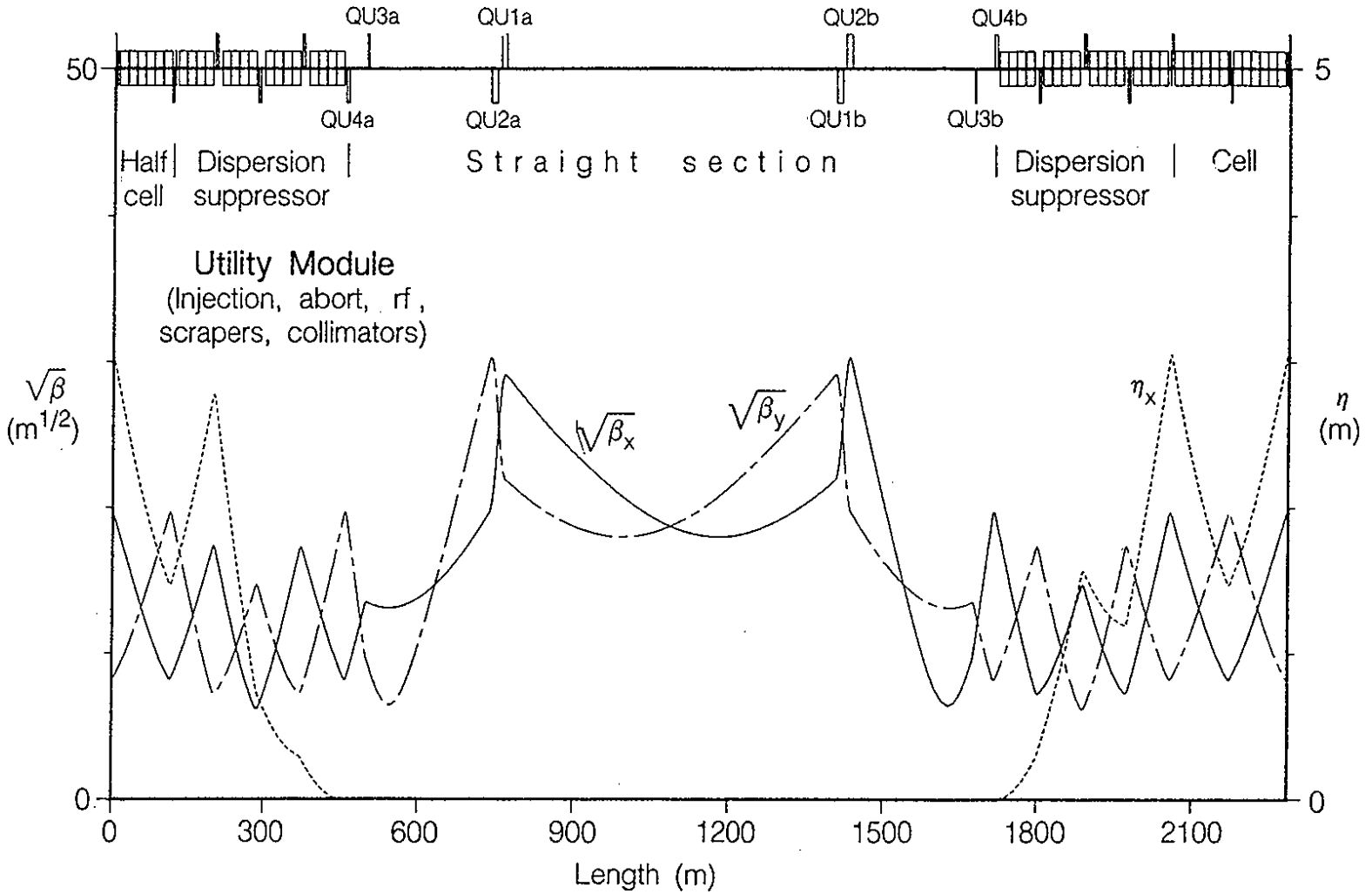


Figure 7. Utility Module

UTILITY MODULE

```
***          CALL   1     //  SUTL

***   PR3    PRNT         //  LSSH DU34 DU23 DU12 DU0  LQU4 LQU3 LQU2 LQU1
  *                       //  KU1  KU2  KU3  KU4  K
```

LSSH	DU34	DU23	DU12	DU0	LQU4
630.822950000	35.734700000	235.019100000	6.613700000	319.043150000	3.139150000

LQU3	LQU2	LQU1	KU1	KU2	KU3
1.820000000	6.409500000	5.837500000	0.001644927	-0.001644927	0.003428778

KU4	K
-0.003428778	0.003428778

Beta functions through two utility modules and one lumped cell:

```
***   UU     CYC    1     //  .UU
```

BETATRON FUNCTIONS OF UU -- Utility Module

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
0		0.0000	0.00000	0.00000	388.18612	67.58123	3.05253	0.00000	0.0000	0.00000	0.00000	0.00025	0.00000
1	#QF	0.0000	0.00000	0.00000	388.18612	67.58123	3.05253	0.00000	0.0000	0.00000	0.00000	0.00025	0.00000
2	QF	1.8200	0.00075	0.00427	383.80247	68.40090	3.03567	0.00000	0.0000	2.39947	-0.45207	-0.01876	0.00000
3	OPM	2.8550	0.00118	0.00666	378.85442	69.35554	3.01625	0.00000	0.0000	2.38125	-0.47029	-0.01876	0.00000
4	QFC	3.8550	0.00160	0.00894	374.10952	70.31373	2.99748	0.00000	0.0000	2.36364	-0.48790	-0.01876	0.00000
5	SF	3.8550	0.00160	0.00894	374.10952	70.31373	2.99748	0.00000	0.0000	2.36364	-0.48790	-0.01876	0.00000
6	QFC	4.8550	0.00203	0.01119	369.39984	71.30713	2.97872	0.00000	0.0000	2.34604	-0.50551	-0.01876	0.00000
7	OOC	8.3900	0.00359	0.01888	353.03337	75.10109	2.91239	0.00000	0.0000	2.28380	-0.56775	-0.01876	0.00000
8	B	24.9300	0.01193	0.04965	282.30118	98.69911	2.61558	0.00000	0.0045	1.99263	-0.85898	-0.01713	0.00000
9	O	25.7300	0.01239	0.05093	279.12424	100.08474	2.60188	0.00000	0.0045	1.97854	-0.87306	-0.01713	0.00000
10	B	42.2700	0.02305	0.07375	218.49024	133.78252	2.33218	0.00000	0.0086	1.68735	-1.16429	-0.01549	0.00000
11	O	43.0700	0.02364	0.07470	215.80174	135.65665	2.31979	0.00000	0.0086	1.67327	-1.17837	-0.01549	0.00000
12	B	59.6100	0.03760	0.09160	165.26660	179.45418	2.07721	0.00000	0.0122	1.38206	-1.46960	-0.01385	0.00000
13	O	60.4100	0.03837	0.09231	163.06657	181.81682	2.06613	0.00000	0.0122	1.36797	-1.48369	-0.01385	0.00000
14	B	76.9500	0.05703	0.10504	122.63086	235.71411	1.85066	0.00000	0.0154	1.07675	-1.77492	-0.01221	0.00000
15	O	77.7500	0.05808	0.10557	120.91934	238.56524	1.84090	0.00000	0.0154	1.06266	-1.78900	-0.01221	0.00000
16	B	94.2900	0.08333	0.11538	90.58352	302.56230	1.65254	0.00000	0.0182	0.77143	-2.08023	-0.01057	0.00000
17	O	95.0900	0.08475	0.11580	89.36051	305.90193	1.64409	0.00000	0.0182	0.75734	-2.09431	-0.01057	0.00000
18	B	111.6300	0.11850	0.12352	69.12492	379.99874	1.48285	0.00000	0.0208	0.46609	-2.38554	-0.00893	0.00000
19	O	112.4300	0.12035	0.12385	68.39044	383.82688	1.47571	0.00000	0.0208	0.45201	-2.39963	-0.00893	0.00000
20	QD	114.2500	0.12462	0.12460	67.57089	388.21081	1.46781	0.00000	0.0208	0.00000	0.00000	0.00025	0.00000
21	#QSD	114.2500	0.12462	0.12460	67.57089	388.21081	1.46781	0.00000	0.0208	0.00000	0.00000	0.00025	0.00000
22	QSD	116.6980	0.13034	0.12561	69.05809	380.30412	1.48353	0.00000	0.0208	-0.61168	3.20777	0.01261	0.00000
23	OPM	117.7330	0.13271	0.12605	70.34558	373.69585	1.49658	0.00000	0.0208	-0.63228	3.17704	0.01261	0.00000
24	QDC	118.7330	0.13495	0.12648	71.63004	367.37145	1.50919	0.00000	0.0208	-0.65218	3.14736	0.01261	0.00000
25	SD	118.7330	0.13495	0.12648	71.63004	367.37145	1.50919	0.00000	0.0208	-0.65218	3.14736	0.01261	0.00000
26	QDC	119.7330	0.13715	0.12692	72.95429	361.10642	1.52180	0.00000	0.0208	-0.67207	3.11767	0.01261	0.00000
27	DOG1	124.3602	0.14682	0.12904	79.59997	332.88986	1.58016	0.00000	0.0208	-0.76415	2.98031	0.01261	0.00000
28	B	140.9002	0.17506	0.13831	110.32142	242.42260	1.80232	0.00000	0.0236	-1.09325	2.48930	0.01425	0.00000
29	O	141.7002	0.17620	0.13884	112.08336	238.45873	1.81372	0.00000	0.0236	-1.10917	2.46555	0.01425	0.00000
30	B	158.2402	0.19628	0.15213	154.21796	165.01968	2.06299	0.00000	0.0267	-1.43826	1.97454	0.01589	0.00000
31	O	159.0402	0.19710	0.15291	156.53192	161.87942	2.07570	0.00000	0.0267	-1.45418	1.95079	0.01589	0.00000
32	B	175.5802	0.21163	0.17311	210.07921	105.46858	2.35209	0.00000	0.0304	-1.78326	1.45978	0.01753	0.00000
33	O	176.3802	0.21224	0.17433	212.94516	103.15193	2.36611	0.00000	0.0304	-1.79918	1.43603	0.01753	0.00000
34	B	192.9202	0.22307	0.20702	277.90453	63.76930	2.66962	0.00000	0.0345	-2.12823	0.94502	0.01917	0.00000
35	OG1	197.4896	0.22559	0.21922	297.76945	55.75276	2.75721	0.00000	0.0345	-2.21915	0.80937	0.01917	0.00000
36	QSF	199.9375	0.22689	0.22641	302.52795	53.06817	2.77569	0.00000	0.0345	0.28861	0.29480	-0.00409	0.00000
37	#QSF	199.9375	0.22689	0.22641	302.52795	53.06817	2.77569	0.00000	0.0345	0.28861	0.29480	-0.00409	0.00000
38	QSF	202.3855	0.22819	0.23380	294.98202	52.82646	2.73725	0.00000	0.0345	2.77280	-0.19539	-0.02727	0.00000
39	OOG2	210.9136	0.23319	0.25851	249.83068	57.58830	2.50471	0.00000	0.0345	2.52162	-0.36298	-0.02727	0.00000
40	B	227.4536	0.24581	0.29901	174.47292	74.97220	2.06727	0.00000	0.0382	2.03447	-0.68804	-0.02563	0.00000
41	O	228.2536	0.24655	0.30069	171.23661	76.08564	2.04677	0.00000	0.0382	2.01091	-0.70376	-0.02563	0.00000
42	B	244.7936	0.26554	0.33035	112.77343	104.74240	1.63645	0.00000	0.0413	1.52374	-1.02881	-0.02399	0.00000
43	O	245.5936	0.26668	0.33156	110.35429	106.40108	1.61726	0.00000	0.0413	1.50018	-1.04454	-0.02399	0.00000
44	B	262.1336	0.29708	0.35272	68.78635	146.33069	1.23405	0.00000	0.0436	1.01300	-1.36959	-0.02235	0.00000

BETATRON FUNCTIONS OF UU -- Utility Module

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
45	O	262.9336	0.29895	0.35358	67.18441	148.53461	1.21617	0.00000	0.0436	0.98943	-1.38531	-0.02235	0.00000
46	B	279.4736	0.34903	0.36889	42.51218	199.73707	0.86008	0.00000	0.0453	0.50224	-1.71036	-0.02071	0.00000
47	OG2	283.1771	0.36349	0.37175	39.19612	212.67529	0.78338	0.00000	0.0453	0.39315	-1.78315	-0.02071	0.00000
48	QSD	285.6250	0.37359	0.37355	38.23345	217.06332	0.74057	0.00000	0.0453	0.00280	0.00291	-0.01432	0.00000
49	#QSD	285.6250	0.37359	0.37355	38.23345	217.06332	0.74057	0.00000	0.0453	0.00280	0.00291	-0.01432	0.00000
50	QSD	288.0729	0.38370	0.37536	39.16834	212.64719	0.71301	0.00000	0.0453	-0.38732	1.78873	-0.00823	0.00000
51	OOG3	296.2704	0.41414	0.38195	47.49133	184.64841	0.64551	0.00000	0.0453	-0.62800	1.62684	-0.00823	0.00000
52	B	312.8103	0.45844	0.39857	76.29774	136.23532	0.52286	0.00000	0.0462	-1.11362	1.30019	-0.00660	0.00000
53	O	313.6103	0.46009	0.39952	78.09832	134.16765	0.51759	0.00000	0.0462	-1.13711	1.28439	-0.00660	0.00000
54	B	330.1503	0.48699	0.42266	123.74573	97.08267	0.42206	0.00000	0.0470	-1.62271	0.95775	-0.00496	0.00000
55	O	330.9503	0.48801	0.42398	126.36086	95.56291	0.41810	0.00000	0.0470	-1.64620	0.94195	-0.00496	0.00000
56	B	347.4903	0.50508	0.45644	188.84876	69.80605	0.34969	0.00000	0.0476	-2.13178	0.61530	-0.00332	0.00000
57	O	348.2903	0.50575	0.45828	192.27841	68.83421	0.34704	0.00000	0.0476	-2.15527	0.59950	-0.00332	0.00000
58	B	364.8303	0.51728	0.50183	271.60610	54.40547	0.30575	0.00000	0.0482	-2.64083	0.27285	-0.00168	0.00000
59	OG3	368.8645	0.51956	0.51386	293.39121	52.52539	0.29899	0.00000	0.0482	-2.75927	0.19318	-0.00168	0.00000
60	QSF	371.3125	0.52086	0.52128	300.90371	52.77238	0.29183	0.00000	0.0482	-0.28857	-0.29477	-0.00416	0.00000
61	#QSF	371.3125	0.52086	0.52128	300.90371	52.77238	0.29183	0.00000	0.0482	-0.28857	-0.29477	-0.00416	0.00000
62	QSF	373.7604	0.52216	0.52851	296.17828	55.45140	0.27869	0.00000	0.0482	2.20569	-0.80711	-0.00656	0.00000
63	OOG4	381.9727	0.52686	0.54945	261.28643	70.71630	0.22483	0.00000	0.0482	2.04307	-1.05169	-0.00656	0.00000
64	B	398.5127	0.53841	0.57898	199.11858	113.65344	0.12991	0.00000	0.0485	1.71557	-1.54427	-0.00492	0.00000
65	O	399.3127	0.53906	0.58009	196.38635	116.14333	0.12598	0.00000	0.0485	1.69972	-1.56810	-0.00492	0.00000
66	B	415.8527	0.55465	0.59853	145.57664	176.16338	0.05818	0.00000	0.0486	1.37220	-2.06068	-0.00328	0.00000
67	O	416.6527	0.55553	0.59925	143.39378	179.47953	0.05555	0.00000	0.0486	1.35636	-2.08451	-0.00328	0.00000
68	B	433.1927	0.57716	0.61153	103.94277	256.58249	0.01487	0.00000	0.0487	1.02883	-2.57710	-0.00164	0.00000
69	O	433.9927	0.57840	0.61202	102.30933	260.72491	0.01356	0.00000	0.0487	1.01298	-2.60092	-0.00164	0.00000
70	B	450.5327	0.60879	0.62068	74.21746	354.91078	0.00000	0.00000	0.0487	0.68544	-3.09351	0.00000	0.00000
71	OG4	454.5520	0.61773	0.62242	69.02739	380.25970	0.00000	0.00000	0.0487	0.60584	-3.21321	0.00000	0.00000
72	QU4a	457.6912	0.62508	0.62371	67.69357	387.56784	0.00000	0.00000	0.0487	-0.17616	0.91143	0.00000	0.00000
73	#QU4	457.6912	0.62508	0.62371	67.69357	387.56784	0.00000	0.00000	0.0487	-0.17616	0.91143	0.00000	0.00000
74	QU4a	460.8303	0.63232	0.62503	71.28954	369.07133	0.00000	0.00000	0.0487	-0.98224	4.91426	0.00000	0.00000
75	*DU34*	*496.5650*	*0.68389*	*0.65410*	*176.68354*	*104.86960*	*0.00000*	*0.00000*	*0.0487*	*-1.96711*	*2.47916*	*0.00000*	*0.00000*
76	QU3a	498.3850	0.68551	0.65697	181.88157	97.19913	0.00000	0.00000	0.0487	-0.87813	1.75133	0.00000	0.00000
77	#QU3	498.3850	0.68551	0.65697	181.88157	97.19913	0.00000	0.00000	0.0487	-0.87813	1.75133	0.00000	0.00000
78	QU3a	500.2050	0.68709	0.66004	183.02806	92.02315	0.00000	0.00000	0.0487	0.25058	1.10337	0.00000	0.00000
79	DU23	735.2241	0.85975	1.00849	385.97249	904.33475	0.00000	0.00000	0.0487	-1.11411	-4.55973	0.00000	0.00000
80	QU2a	741.6336	0.86229	1.00961	427.82581	901.40842	0.00000	0.00000	0.0487	-5.56221	5.00596	0.00000	0.00000
81	#QU2	741.6336	0.86229	1.00961	427.82581	901.40842	0.00000	0.00000	0.0487	-5.56221	5.00596	0.00000	0.00000
82	QU2a	748.0431	0.86444	1.01081	535.08833	781.69619	0.00000	0.00000	0.0487	-11.54799	13.24873	0.00000	0.00000
83	DU12	754.6568	0.86617	1.01233	698.82120	616.32792	0.00000	0.00000	0.0487	-13.20863	11.75517	0.00000	0.00000
84	QU1a	760.4943	0.86738	1.01399	817.28647	516.93772	0.00000	0.00000	0.0487	-6.70460	5.58793	0.00000	0.00000
85	#QU1	760.4943	0.86738	1.01399	817.28647	516.93772	0.00000	0.00000	0.0487	-6.70460	5.58793	0.00000	0.00000
86	QU1a	766.3318	0.86849	1.01587	849.58867	480.91897	0.00000	0.00000	0.0487	1.27481	0.69716	0.00000	0.00000
87	DU0	1085.3750	0.96785	1.15750	350.66541	350.59451	0.00000	0.00000	0.0487	0.28900	-0.28868	0.00000	0.00000
88	#UC	1085.3750	0.96785	1.15750	350.66541	350.59451	0.00000	0.00000	0.0487	0.28900	-0.28868	0.00000	0.00000
89	DU0	1404.4181	1.10948	1.25689	480.77486	849.32201	0.00000	0.00000	0.0487	-0.69681	-1.27452	0.00000	0.00000

BETATRON FUNCTIONS OF UU -- Utility Module

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
90	QU1b	1410.2556	1.11136	1.25799	516.78112	817.03120	0.00000	0.00000	0.0487	-5.58610	6.70239	0.00000	0.00000
91	#1QU	1410.2556	1.11136	1.25799	516.78112	817.03120	0.00000	0.00000	0.0487	-5.58610	6.70239	0.00000	0.00000
92	QU1b	1416.0931	1.11302	1.25921	616.13950	698.60416	0.00000	0.00000	0.0487	-11.75145	13.20441	0.00000	0.00000
93	DU12	1422.7068	1.11454	1.26093	781.45532	534.92354	0.00000	0.00000	0.0487	-13.24452	11.54431	0.00000	0.00000
94	QU2b	1429.1163	1.11574	1.26309	901.12902	427.69554	0.00000	0.00000	0.0487	-5.00429	5.56039	0.00000	0.00000
95	#2QU	1429.1163	1.11574	1.26309	901.12902	427.69554	0.00000	0.00000	0.0487	-5.00429	5.56039	0.00000	0.00000
96	QU2b	1435.5258	1.11686	1.26563	904.05296	385.85666	0.00000	0.00000	0.0487	4.55843	1.11363	0.00000	0.00000
97	DU23	1670.5450	1.46530	1.43829	92.04253	183.08053	0.00000	0.00000	0.0487	-1.10334	-0.25082	0.00000	0.00000
98	QU3b	1672.3649	1.46837	1.43987	97.21861	181.93431	0.00000	0.00000	0.0487	-1.75142	0.87823	0.00000	0.00000
99	#3QU	1672.3649	1.46837	1.43987	97.21861	181.93431	0.00000	0.00000	0.0487	-1.75142	0.87823	0.00000	0.00000
100	QU3b	1674.1849	1.47125	1.44148	104.88961	176.73534	0.00000	0.00000	0.0487	-2.47936	1.96753	0.00000	0.00000
101	DU34	1709.9196	1.50031	1.49304	369.10125	71.31292	0.00000	0.00000	0.0487	-4.91434	0.98261	0.00000	0.00000
102	QU4b	1713.0588	1.50163	1.50027	387.59719	67.71535	0.00000	0.00000	0.0487	-0.91117	0.17630	0.00000	0.00000
103	#4QU	1713.0588	1.50163	1.50027	387.59719	67.71535	0.00000	0.00000	0.0487	-0.91117	0.17630	0.00000	0.00000
104	QU4b	1716.1979	1.50292	1.50762	380.28649	69.04899	0.00000	0.00000	0.0487	3.21376	-0.60591	0.00000	0.00000
105	OG4	1720.2173	1.50466	1.51656	354.93327	74.23961	0.00000	0.00000	0.0487	3.09403	-0.68549	0.00000	0.00000
106	B	1736.7573	1.51332	1.54695	260.73132	102.33235	0.01356	0.00000	0.0487	2.60137	-1.01298	0.00164	0.00000
107	O	1737.5573	1.51381	1.54818	256.58820	103.96579	0.01487	0.00000	0.0487	2.57753	-1.02882	0.00164	0.00000
108	B	1754.0973	1.52609	1.56981	179.47243	143.41563	0.05555	0.00000	0.0487	2.08484	-1.35630	0.00328	0.00000
109	O	1754.8973	1.52681	1.57069	176.15575	145.59838	0.05818	0.00000	0.0487	2.06101	-1.37214	0.00328	0.00000
110	B	1771.4373	1.54525	1.58628	116.12702	196.40532	0.12598	0.00000	0.0489	1.56829	-1.69962	0.00492	0.00000
111	O	1772.2373	1.54636	1.58692	113.63682	199.13739	0.12991	0.00000	0.0489	1.54446	-1.71546	0.00492	0.00000
112	B	1788.7773	1.57590	1.59848	70.69581	261.30144	0.22483	0.00000	0.0492	1.05173	-2.04294	0.00656	0.00000
113	OOG4	1796.9896	1.59684	1.60317	55.43087	296.19108	0.27869	0.00000	0.0492	0.80707	-2.20554	0.00656	0.00000
114	QSD	1799.4375	1.60407	1.60447	52.75168	300.91552	0.29767	0.00000	0.0492	0.29488	0.28882	0.00897	0.00000
115	#QSD	1799.4375	1.60407	1.60447	52.75168	300.91552	0.29767	0.00000	0.0492	0.29488	0.28882	0.00897	0.00000
116	QSD	1801.8854	1.61150	1.60578	52.50377	293.40156	0.32277	0.00000	0.0492	-0.19291	2.75962	0.01157	0.00000
117	OG3	1805.9196	1.62353	1.60806	54.38180	271.61377	0.36946	0.00000	0.0492	-0.27261	2.64115	0.01157	0.00000
118	B	1822.4596	1.66711	1.61958	68.80402	192.27757	0.57443	0.00000	0.0499	-0.59935	2.15547	0.01321	0.00000
119	O	1823.2596	1.66895	1.62025	69.77563	188.84761	0.58500	0.00000	0.0499	-0.61515	2.13198	0.01321	0.00000
120	B	1839.7996	1.70141	1.63733	95.52904	126.35487	0.81709	0.00000	0.0511	-0.94188	1.64630	0.01485	0.00000
121	O	1840.5996	1.70274	1.63835	97.04870	123.73959	0.82897	0.00000	0.0511	-0.95769	1.62281	0.01485	0.00000
122	B	1857.1396	1.72589	1.66525	134.13302	78.09032	1.08818	0.00000	0.0526	-1.28441	1.13712	0.01649	0.00000
123	O	1857.9397	1.72683	1.66690	136.20072	76.28971	1.10137	0.00000	0.0526	-1.30021	1.11363	0.01649	0.00000
124	B	1874.4796	1.74346	1.71121	184.61552	47.48390	1.38770	0.00000	0.0547	-1.62692	0.62795	0.01813	0.00000
125	OOG3	1882.6770	1.75005	1.74165	212.61594	39.16196	1.53632	0.00000	0.0547	-1.78885	0.38724	0.01813	0.00000
126	QSF	1885.1250	1.75186	1.75176	217.03332	38.22734	1.56480	0.00000	0.0547	-0.00330	-0.00283	0.00509	0.00000
127	#QSF	1885.1250	1.75186	1.75176	217.03332	38.22734	1.56480	0.00000	0.0547	-0.00330	-0.00283	0.00509	0.00000
128	QSF	1887.5729	1.75366	1.76187	212.64777	39.19008	1.56118	0.00000	0.0547	1.78253	-0.39314	-0.00805	0.00000
129	OG2	1891.2764	1.75653	1.77633	199.71404	42.50615	1.53137	0.00000	0.0547	1.70977	-0.50225	-0.00805	0.00000
130	B	1907.8164	1.77183	1.82641	148.52854	67.18009	1.41182	0.00000	0.0571	1.38487	-0.98953	-0.00641	0.00000
131	O	1908.6164	1.77270	1.82829	146.32532	68.78218	1.40670	0.00000	0.0571	1.36916	-1.01309	-0.00641	0.00000
132	B	1925.1564	1.79386	1.85869	106.40765	110.35488	1.31427	0.00000	0.0593	1.04424	-1.50037	-0.00477	0.00000
133	O	1925.9564	1.79506	1.85983	104.74944	112.77432	1.31045	0.00000	0.0593	1.02853	-1.52394	-0.00477	0.00000
134	B	1942.4964	1.82472	1.87881	76.10005	171.24578	1.24513	0.00000	0.0614	0.70360	-2.01122	-0.00313	0.00000

BETATRON FUNCTIONS OF UU -- Utility Module

POS	S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
135 O	1943.2964	1.82640	1.87955	74.98687	174.48258	1.24263	0.00000	0.0614	0.68788	-2.03478	-0.00313	0.00000
136 B	1959.8364	1.86689	1.89217	57.60608	249.85281	1.20443	0.00000	0.0634	0.36295	-2.52206	-0.00149	0.00000
137 OOG2	1968.3645	1.89159	1.89717	52.84438	295.01221	1.19173	0.00000	0.0634	0.19541	-2.77330	-0.00149	0.00000
138 QSD	1970.8125	1.89897	1.89847	53.08631	302.55997	1.20033	0.00000	0.0634	-0.29491	-0.28885	0.00853	0.00000
139 #QSD	1970.8125	1.89897	1.89847	53.08631	302.55997	1.20033	0.00000	0.0634	-0.29491	-0.28885	0.00853	0.00000
140 QSD	1973.2604	1.90616	1.89977	55.77181	297.80200	1.23364	0.00000	0.0634	-0.80963	2.21918	0.01873	0.00000
141 OG1	1977.8298	1.91836	1.90229	63.79067	277.93678	1.31922	0.00000	0.0634	-0.94527	2.12827	0.01873	0.00000
142 B	1994.3698	1.95104	1.91312	103.18056	212.97630	1.64256	0.00000	0.0658	-1.43622	1.79921	0.02037	0.00000
143 O	1995.1698	1.95226	1.91372	105.49751	210.11030	1.65886	0.00000	0.0658	-1.45997	1.78329	0.02037	0.00000
144 B	2011.7098	1.97246	1.92826	161.91332	156.56170	2.00931	0.00000	0.0688	-1.95090	1.45423	0.02201	0.00000
145 O	2012.5098	1.97324	1.92908	165.05376	154.24767	2.02692	0.00000	0.0688	-1.97465	1.43831	0.02201	0.00000
146 B	2029.0498	1.98652	1.94915	238.49486	112.11094	2.40449	0.00000	0.0725	-2.46556	1.10925	0.02365	0.00000
147 O	2029.8498	1.98705	1.95029	242.45875	110.34887	2.42340	0.00000	0.0725	-2.48931	1.09334	0.02365	0.00000
148 B	2046.3898	1.99632	1.97852	332.92430	79.62402	2.82809	0.00000	0.0768	-2.98019	0.76427	0.02529	0.00000
149 DOG1	2051.0170	1.99844	1.98819	361.13968	72.97709	2.94509	0.00000	0.0768	-3.11753	0.67222	0.02529	0.00000
150 QFC	2052.0170	1.99888	1.99039	367.40442	71.65256	2.97038	0.00000	0.0768	-3.14721	0.65232	0.02529	0.00000
151 SF	2052.0170	1.99888	1.99039	367.40442	71.65256	2.97038	0.00000	0.0768	-3.14721	0.65232	0.02529	0.00000
152 QFC	2053.0170	1.99931	1.99263	373.72852	70.36781	2.99567	0.00000	0.0768	-3.17689	0.63243	0.02529	0.00000
153 OPM	2054.0520	1.99975	1.99500	380.33649	69.08000	3.02184	0.00000	0.0768	-3.20761	0.61183	0.02529	0.00000
154 QSF	2056.5000	2.00076	2.00072	388.24173	67.59248	3.05253	0.00000	0.0768	0.00043	-0.00002	-0.00025	0.00000
155 #QSF	2056.5000	2.00076	2.00072	388.24173	67.59248	3.05253	0.00000	0.0768	0.00043	-0.00002	-0.00025	0.00000
156 #QF	2056.5000	2.00076	2.00072	388.24173	67.59248	3.05253	0.00000	0.0768	0.00043	-0.00002	-0.00025	0.00000
157 QF	2058.3200	2.00151	2.00499	383.85589	68.41233	3.03476	0.00000	0.0768	2.40024	-0.45215	-0.01926	0.00000
158 O	2059.1200	2.00184	2.00684	380.02678	69.14704	3.01935	0.00000	0.0768	2.38615	-0.46624	-0.01926	0.00000
159 B	2075.6600	2.00956	2.04057	305.91075	89.38656	2.71433	0.00000	0.0815	2.09487	-0.75743	-0.01762	0.00000
160 O	2076.4600	2.00998	2.04199	302.57024	90.60973	2.70023	0.00000	0.0815	2.08077	-0.77152	-0.01762	0.00000
161 B	2093.0000	2.01979	2.06724	238.55636	120.94797	2.42232	0.00000	0.0857	1.78947	-1.06272	-0.01598	0.00000
162 O	2093.8000	2.02032	2.06829	235.70448	122.65958	2.40953	0.00000	0.0857	1.77538	-1.07680	-0.01598	0.00000
163 B	2110.3400	2.03305	2.08694	181.79348	163.09653	2.15873	0.00000	0.0894	1.48405	-1.36800	-0.01434	0.00000
164 O	2111.1400	2.03376	2.08772	179.43027	165.29660	2.14726	0.00000	0.0894	1.46996	-1.38208	-0.01434	0.00000
165 B	2127.6800	2.05066	2.10167	135.62275	215.83227	1.92357	0.00000	0.0927	1.17862	-1.67328	-0.01270	0.00000
166 O	2128.4800	2.05161	2.10226	133.74824	218.52078	1.91341	0.00000	0.0927	1.16453	-1.68736	-0.01270	0.00000
167 B	2145.0200	2.07445	2.11292	100.04469	279.15517	1.71684	0.00000	0.0957	0.87317	-1.97856	-0.01106	0.00000
168 O	2145.8200	2.07573	2.11338	98.65889	282.33213	1.70799	0.00000	0.0957	0.85908	-1.99265	-0.01106	0.00000
169 B	2162.3600	2.10651	2.12172	75.05971	353.06523	1.53853	0.00000	0.0984	0.56771	-2.28384	-0.00943	0.00000
170 OOC	2165.8950	2.11420	2.12328	71.26611	369.43200	1.50521	0.00000	0.0984	0.50544	-2.34608	-0.00943	0.00000
171 QDC	2166.8950	2.11645	2.12370	70.27284	374.14176	1.49579	0.00000	0.0984	0.48782	-2.36368	-0.00943	0.00000
172 SD	2166.8950	2.11645	2.12370	70.27284	374.14176	1.49579	0.00000	0.0984	0.48782	-2.36368	-0.00943	0.00000
173 QDC	2167.8950	2.11873	2.12413	69.31481	378.88673	1.48636	0.00000	0.0984	0.47021	-2.38129	-0.00943	0.00000
174 OPM	2168.9300	2.12113	2.12456	68.36036	383.83486	1.47661	0.00000	0.0984	0.45197	-2.39951	-0.00943	0.00000
175 QD	2170.7500	2.12540	2.12531	67.54061	388.21828	1.46781	0.00000	0.0984	0.00014	0.00017	-0.00025	0.00000
176 #QD	2170.7500	2.12540	2.12531	67.54061	388.21828	1.46781	0.00000	0.0984	0.00014	0.00017	-0.00025	0.00000
177 QD	2172.5700	2.12967	2.12606	68.35932	383.83366	1.47571	0.00000	0.0984	-0.45168	2.39984	0.00893	0.00000
178 O	2173.3700	2.13152	2.12639	69.09328	380.00519	1.48285	0.00000	0.0984	-0.46577	2.38575	0.00893	0.00000
179 B	2189.9100	2.16528	2.13411	89.31931	305.90216	1.64409	0.00000	0.1009	-0.75708	2.09448	0.01057	0.00000

BETATRON FUNCTIONS OF UU -- Utility Module

POS	S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
180 O	2190.7100	2.16670	2.13453	90.54191	302.56226	1.65254	0.00000	0.1009	-0.77117	2.08040	0.01057	0.00000
181 B	2207.2500	2.19197	2.14434	120.87032	238.56031	1.84090	0.00000	0.1038	-1.06247	1.78913	0.01221	0.00000
182 O	2208.0500	2.19302	2.14487	122.58154	235.70897	1.85066	0.00000	0.1038	-1.07656	1.77504	0.01221	0.00000
183 B	2224.5900	2.21168	2.15760	163.01199	181.80809	2.06613	0.00000	0.1070	-1.36784	1.48378	0.01385	0.00000
184 O	2225.3900	2.21246	2.15831	165.21181	179.44532	2.07721	0.00000	0.1070	-1.38193	1.46969	0.01385	0.00000
185 B	2241.9300	2.22642	2.17521	215.74384	135.64552	2.31979	0.00000	0.1106	-1.67320	1.17842	0.01549	0.00000
186 O	2242.7300	2.22700	2.17616	218.43224	133.77131	2.33218	0.00000	0.1106	-1.68729	1.16434	0.01549	0.00000
187 B	2259.2700	2.23767	2.19899	279.06529	100.07259	2.60188	0.00000	0.1146	-1.97855	0.87307	0.01713	0.00000
188 O	2260.0700	2.23813	2.20027	282.24223	98.68695	2.61558	0.00000	0.1146	-1.99263	0.85898	0.01713	0.00000
189 B	2276.6100	2.24647	2.23104	352.97561	75.08931	2.91239	0.00000	0.1192	-2.28387	0.56772	0.01876	0.00000
190 OOC	2280.1450	2.24803	2.23873	369.34261	71.29560	2.97872	0.00000	0.1192	-2.34612	0.50547	0.01876	0.00000
191 QFC	2281.1450	2.24846	2.24098	374.05245	70.30227	2.99749	0.00000	0.1192	-2.36373	0.48786	0.01876	0.00000
192 SF	2281.1450	2.24846	2.24098	374.05245	70.30227	2.99749	0.00000	0.1192	-2.36373	0.48786	0.01876	0.00000
193 QFC	2282.1450	2.24888	2.24326	378.79752	69.34417	3.01625	0.00000	0.1192	-2.38134	0.47025	0.01876	0.00000
194 OPM	2283.1800	2.24931	2.24565	383.74576	68.38962	3.03567	0.00000	0.1192	-2.39957	0.45202	0.01876	0.00000
195 QF	2285.0000	2.25006	2.24992	388.13039	67.57000	3.05254	0.00000	0.1192	-0.00045	0.00002	-0.00025	0.00000
196 #QF	2285.0000	2.25006	2.24992	388.13039	67.57000	3.05254	0.00000	0.1192	-0.00045	0.00002	-0.00025	0.00000
197 QF	2286.8200	2.25081	2.25419	383.74899	68.38947	3.03476	0.00000	0.1192	2.39869	-0.45198	-0.01926	0.00000
198 O	2287.6200	2.25115	2.25604	379.92235	69.12391	3.01935	0.00000	0.1192	2.38461	-0.46607	-0.01926	0.00000
199 B	2304.1600	2.25887	2.28979	305.85318	89.35885	2.71433	0.00000	0.1239	2.09357	-0.75733	-0.01762	0.00000
200 O	2304.9600	2.25929	2.29121	302.51474	90.58184	2.70023	0.00000	0.1239	2.07949	-0.77141	-0.01762	0.00000
201 B	2321.5000	2.26910	2.31646	238.53944	120.91757	2.42232	0.00000	0.1281	1.78842	-1.06267	-0.01598	0.00000
202 O	2322.3000	2.26963	2.31751	235.68923	122.62911	2.40953	0.00000	0.1281	1.77434	-1.07676	-0.01598	0.00000
203 B	2338.8400	2.28236	2.33617	181.80852	163.06563	2.15873	0.00000	0.1318	1.48326	-1.36801	-0.01434	0.00000
204 O	2339.6400	2.28307	2.33694	179.44657	165.26572	2.14726	0.00000	0.1318	1.46917	-1.38210	-0.01434	0.00000
205 B	2356.1800	2.29997	2.35090	135.66105	215.80303	1.92357	0.00000	0.1351	1.17807	-1.67336	-0.01270	0.00000
206 O	2356.9800	2.30092	2.35149	133.78740	218.49167	1.91341	0.00000	0.1351	1.16399	-1.68745	-0.01270	0.00000
207 B	2373.5200	2.32374	2.36216	100.09757	279.12977	1.71684	0.00000	0.1381	0.87288	-1.97870	-0.01106	0.00000
208 O	2374.3200	2.32502	2.36261	98.71224	282.30696	1.70799	0.00000	0.1381	0.85880	-1.99279	-0.01106	0.00000
209 B	2390.8600	2.35578	2.37095	75.11847	353.04585	1.53853	0.00000	0.1408	0.56767	-2.28405	-0.00943	0.00000
210 OOC	2394.3950	2.36347	2.37251	71.32500	369.41411	1.50521	0.00000	0.1408	0.50545	-2.34630	-0.00943	0.00000
211 QDC	2395.3950	2.36572	2.37294	70.33171	374.12431	1.49579	0.00000	0.1408	0.48784	-2.36390	-0.00943	0.00000
212 SD	2395.3950	2.36572	2.37294	70.33171	374.12431	1.49579	0.00000	0.1408	0.48784	-2.36390	-0.00943	0.00000
213 QDC	2396.3950	2.36800	2.37336	69.37363	378.86973	1.48636	0.00000	0.1408	0.47024	-2.38151	-0.00943	0.00000
214 OPM	2397.4300	2.37039	2.37379	68.41908	383.81833	1.47661	0.00000	0.1408	0.45202	-2.39974	-0.00943	0.00000
215 QD	2399.2500	2.37466	2.37454	67.59977	388.20277	1.46781	0.00000	0.1408	-0.00015	-0.00017	-0.00025	0.00000
216 #QSD	2399.2500	2.37466	2.37454	67.59977	388.20277	1.46781	0.00000	0.1408	-0.00015	-0.00017	-0.00025	0.00000
217 QSD	2401.6980	2.38038	2.37555	69.08826	380.29705	1.48231	0.00000	0.1408	-0.61207	3.20754	0.01211	0.00000
218 OH1	2406.1519	2.39024	2.37749	74.93513	352.31373	1.53626	0.00000	0.1408	-0.70068	3.07534	0.01211	0.00000
219 B	2422.6919	2.42030	2.38621	103.55670	258.70197	1.75017	0.00000	0.1435	-1.02976	2.58438	0.01375	0.00000
220 O	2423.4919	2.42152	2.38671	105.21705	254.58596	1.76117	0.00000	0.1435	-1.04568	2.56064	0.01375	0.00000
221 B	2440.0319	2.44288	2.39909	145.25076	178.00054	2.00219	0.00000	0.1465	-1.37474	2.06968	0.01539	0.00000
222 O	2440.8319	2.44375	2.39981	147.46308	174.70804	2.01450	0.00000	0.1465	-1.39066	2.04593	0.01539	0.00000
223 B	2457.3719	2.45914	2.41841	198.90848	115.14896	2.28263	0.00000	0.1501	-1.71970	1.55498	0.01703	0.00000
224 O	2458.1719	2.45978	2.41953	201.67274	112.67999	2.29626	0.00000	0.1501	-1.73562	1.53123	0.01703	0.00000

BETATRON FUNCTIONS OF UU -- Utility Module

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
225	B	2474.7119	2.47118	2.44931	264.52924	70.14724	2.59150	0.00000	0.1541	-2.06465	1.04028	0.01867	0.00000
226	OOH1	2482.4896	2.47559	2.46915	297.84917	55.76092	2.73671	0.00000	0.1541	-2.21939	0.80941	0.01867	0.00000
227	QSF	2484.9375	2.47689	2.47634	302.60718	53.07629	2.75419	0.00000	0.1541	0.28904	0.29477	-0.00441	0.00000
228	#QSF	2484.9375	2.47689	2.47634	302.60718	53.07629	2.75419	0.00000	0.1541	0.28904	0.29477	-0.00441	0.00000
229	QSF	2487.3855	2.47819	2.48373	295.05753	52.83485	2.71518	0.00000	0.1541	2.77388	-0.19547	-0.02741	0.00000
230	OH2	2492.6842	2.48119	2.49933	266.48894	55.45802	2.56996	0.00000	0.1541	2.61774	-0.29959	-0.02741	0.00000
231	B	2509.2242	2.49297	2.54186	187.95473	70.74413	2.13022	0.00000	0.1579	2.13039	-0.62460	-0.02577	0.00000
232	O	2510.0242	2.49365	2.54365	184.56496	71.75607	2.10961	0.00000	0.1579	2.10682	-0.64032	-0.02577	0.00000
233	B	2526.5642	2.51116	2.57520	122.93254	98.31360	1.69698	0.00000	0.1610	1.61944	-0.96533	-0.02413	0.00000
234	O	2527.3642	2.51221	2.57648	120.36029	99.87071	1.67768	0.00000	0.1610	1.59587	-0.98105	-0.02413	0.00000
235	B	2543.9042	2.53994	2.59901	75.63035	137.69967	1.29216	0.00000	0.1635	1.10848	-1.30607	-0.02249	0.00000
236	O	2544.7042	2.54164	2.59992	73.87565	139.80195	1.27417	0.00000	0.1635	1.08490	-1.32179	-0.02249	0.00000
237	B	2561.2442	2.58740	2.61615	46.04871	188.90232	0.91578	0.00000	0.1652	0.59750	-1.64680	-0.02085	0.00000
238	OOH2	2568.1771	2.61350	2.62166	39.18034	212.68097	0.77123	0.00000	0.1652	0.39319	-1.78303	-0.02085	0.00000
239	QSD	2570.6250	2.62361	2.62346	38.21719	217.06830	0.72796	0.00000	0.1652	0.00295	0.00308	-0.01457	0.00000
240	#QSD	2570.6250	2.62361	2.62346	38.21719	217.06830	0.72796	0.00000	0.1652	0.00295	0.00308	-0.01457	0.00000
241	QSD	2573.0730	2.63372	2.62527	39.15107	212.65127	0.69967	0.00000	0.1652	-0.38705	1.78893	-0.00859	0.00000
242	OH3	2578.0096	2.65276	2.62913	43.68821	195.47016	0.65728	0.00000	0.1652	-0.53203	1.69142	-0.00859	0.00000
243	B	2594.5496	2.70135	2.64479	69.32205	144.92148	0.52882	0.00000	0.1662	-1.01778	1.36473	-0.00695	0.00000
244	O	2595.3496	2.70317	2.64568	70.96929	142.75056	0.52326	0.00000	0.1662	-1.04127	1.34892	-0.00695	0.00000
245	B	2611.8896	2.73267	2.66740	113.44858	103.53171	0.42191	0.00000	0.1670	-1.52700	1.02223	-0.00531	0.00000
246	O	2612.6896	2.73378	2.66864	115.91058	101.90878	0.41767	0.00000	0.1670	-1.55050	1.00643	-0.00531	0.00000
247	B	2629.2296	2.75229	2.69913	175.23485	74.01978	0.34344	0.00000	0.1676	-2.03621	0.67973	-0.00367	0.00000
248	O	2630.0296	2.75301	2.70087	178.51159	72.94485	0.34051	0.00000	0.1676	-2.05971	0.66393	-0.00367	0.00000
249	B	2646.5696	2.76537	2.74238	254.68016	56.38568	0.29340	0.00000	0.1681	-2.54540	0.33723	-0.00203	0.00000
250	OOH3	2653.8646	2.76962	2.76378	293.38036	52.51661	0.27861	0.00000	0.1681	-2.75963	0.19314	-0.00203	0.00000
251	QSF	2656.3125	2.77093	2.77121	300.89484	52.76364	0.27080	0.00000	0.1681	-0.28902	-0.29474	-0.00434	0.00000
252	#QSF	2656.3125	2.77093	2.77121	300.89484	52.76364	0.27080	0.00000	0.1681	-0.28902	-0.29474	-0.00434	0.00000
253	QSF	2658.7605	2.77223	2.77844	296.17177	55.44238	0.25744	0.00000	0.1681	2.20518	-0.80702	-0.00656	0.00000
254	OH4	2663.7328	2.77500	2.79172	274.73132	64.20434	0.22483	0.00000	0.1681	2.10675	-0.95512	-0.00656	0.00000
255	B	2680.2728	2.78596	2.82417	210.45476	103.94753	0.12991	0.00000	0.1684	1.77937	-1.44774	-0.00492	0.00000
256	O	2681.0728	2.78657	2.82538	207.62044	106.28297	0.12597	0.00000	0.1684	1.76353	-1.47156	-0.00492	0.00000
257	B	2697.6128	2.80128	2.84543	154.69788	163.11032	0.05817	0.00000	0.1686	1.43613	-1.96419	-0.00328	0.00000
258	O	2698.4128	2.80211	2.84620	152.41273	166.27208	0.05555	0.00000	0.1686	1.42030	-1.98801	-0.00328	0.00000
259	B	2714.9528	2.82241	2.85939	110.84476	240.18360	0.01487	0.00000	0.1686	1.09288	-2.48064	-0.00164	0.00000
260	O	2715.7528	2.82357	2.85991	109.10882	244.17168	0.01356	0.00000	0.1686	1.07704	-2.50446	-0.00164	0.00000
261	B	2732.2928	2.85210	2.86912	78.89591	335.16736	0.00000	0.00000	0.1686	0.74961	-2.99709	0.00000	0.00000
262	OOH4	2739.5521	2.86778	2.87236	69.05590	380.25009	0.00000	0.00000	0.1686	0.60590	-3.21330	0.00000	0.00000
263	QU4a	2742.6912	2.87512	2.87365	67.72256	387.55909	0.00000	0.00000	0.1686	-0.17638	0.91124	0.00000	0.00000
264	#QU4	2742.6912	2.87512	2.87365	67.72256	387.55909	0.00000	0.00000	0.1686	-0.17638	0.91124	0.00000	0.00000
265	QU4a	2745.8304	2.88236	2.87496	71.32090	369.06402	0.00000	0.00000	0.1686	-0.98278	4.91400	0.00000	0.00000
266	DU34	2781.5651	2.93391	2.90403	176.75693	104.87389	0.00000	0.00000	0.1686	-1.96775	2.47910	0.00000	0.00000
267	QU3a	2783.3851	2.93552	2.90691	181.95645	97.20366	0.00000	0.00000	0.1686	-0.87831	1.75125	0.00000	0.00000
268	#QU3	2783.3851	2.93552	2.90691	181.95645	97.20366	0.00000	0.00000	0.1686	-0.87831	1.75125	0.00000	0.00000
269	QU3a	2785.2051	2.93710	2.90998	183.10271	92.02802	0.00000	0.00000	0.1686	0.25088	1.10327	0.00000	0.00000

BETATRON FUNCTIONS OF UU -- Utility Module

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
270	DU23	3020.2242	3.10976	3.25842	385.82113	904.18340	0.00000	0.00000	0.1686	-1.11344	-4.55897	0.00000	0.00000
271	QU2a	3026.6337	3.11230	3.25954	427.65504	901.25754	0.00000	0.00000	0.1686	-5.55978	5.00513	0.00000	0.00000
272	#QU2	3026.6337	3.11230	3.25954	427.65504	901.25754	0.00000	0.00000	0.1686	-5.55978	5.00513	0.00000	0.00000
273	QU2a	3033.0432	3.11446	3.26074	534.87174	781.56536	0.00000	0.00000	0.1686	-11.54311	13.24651	0.00000	0.00000
274	DU12	3039.6569	3.11618	3.26225	698.53534	616.22482	0.00000	0.00000	0.1686	-13.20304	11.75320	0.00000	0.00000
275	QU1a	3045.4944	3.11740	3.26392	816.94977	516.85133	0.00000	0.00000	0.1686	-6.70165	5.58699	0.00000	0.00000
276	#QU1	3045.4944	3.11740	3.26392	816.94977	516.85133	0.00000	0.00000	0.1686	-6.70165	5.58699	0.00000	0.00000
277	QU1a	3051.3319	3.11850	3.26580	849.23649	480.83873	0.00000	0.00000	0.1686	1.27446	0.69703	0.00000	0.00000
278	DU0	3370.3750	3.21790	3.40743	350.55900	350.61125	0.00000	0.00000	0.1686	0.28858	-0.28885	0.00000	0.00000
279	#UC	3370.3750	3.21790	3.40743	350.55900	350.61125	0.00000	0.00000	0.1686	0.28858	-0.28885	0.00000	0.00000
280	DU0	3689.4182	3.35953	3.50681	480.96313	849.46412	0.00000	0.00000	0.1686	-0.69731	-1.27474	0.00000	0.00000
281	QU1b	3695.2557	3.36141	3.50791	516.98620	817.16795	0.00000	0.00000	0.1686	-5.58854	6.70351	0.00000	0.00000
282	#1QU	3695.2557	3.36141	3.50791	516.98620	817.16795	0.00000	0.00000	0.1686	-5.58854	6.70351	0.00000	0.00000
283	QU1b	3701.0932	3.36307	3.50913	616.38676	698.72112	0.00000	0.00000	0.1686	-11.75637	13.20662	0.00000	0.00000
284	DU12	3707.7069	3.36459	3.51085	781.77199	535.01308	0.00000	0.00000	0.1686	-13.25009	11.54624	0.00000	0.00000
285	QU2b	3714.1164	3.36579	3.51301	901.49689	427.76707	0.00000	0.00000	0.1686	-5.00653	5.56132	0.00000	0.00000
286	#2QU	3714.1164	3.36579	3.51301	901.49689	427.76707	0.00000	0.00000	0.1686	-5.00653	5.56132	0.00000	0.00000
287	QU2b	3720.5259	3.36690	3.51555	904.42447	385.92106	0.00000	0.00000	0.1686	4.56011	1.11383	0.00000	0.00000
288	DU23	3955.5450	3.71536	3.68820	92.01363	183.06136	0.00000	0.00000	0.1686	-1.10332	-0.25067	0.00000	0.00000
289	QU3b	3957.3650	3.71843	3.68979	97.18933	181.91479	0.00000	0.00000	0.1686	-1.75123	0.87826	0.00000	0.00000
290	#3QU	3957.3650	3.71843	3.68979	97.18933	181.91479	0.00000	0.00000	0.1686	-1.75123	0.87826	0.00000	0.00000
291	QU3b	3959.1850	3.72130	3.69140	104.85932	176.71591	0.00000	0.00000	0.1686	-2.47899	1.96744	0.00000	0.00000
292	DU34	3994.9197	3.75038	3.74296	369.04763	71.30124	0.00000	0.00000	0.1686	-4.91405	0.98248	0.00000	0.00000
293	QU4b	3998.0588	3.75169	3.75020	387.54363	67.70410	0.00000	0.00000	0.1686	-0.91148	0.17629	0.00000	0.00000
294	#4QU	3998.0588	3.75169	3.75020	387.54363	67.70410	0.00000	0.00000	0.1686	-0.91148	0.17629	0.00000	0.00000
295	QU4b	4001.1980	3.75298	3.75755	380.23661	69.03744	0.00000	0.00000	0.1686	3.21291	-0.60581	0.00000	0.00000
296	OOH4	4008.4572	3.75622	3.77323	335.15923	78.87631	0.00000	0.00000	0.1686	2.99674	-0.74955	0.00000	0.00000
297	B	4024.9972	3.76543	3.80176	244.17283	109.08834	0.01356	0.00000	0.1686	2.50425	-1.07706	0.00164	0.00000
298	O	4025.7972	3.76595	3.80292	240.18509	110.82430	0.01487	0.00000	0.1686	2.48042	-1.09290	0.00164	0.00000
299	B	4042.3372	3.77914	3.82323	166.27889	152.39427	0.05555	0.00000	0.1687	1.98790	-1.42040	0.00328	0.00000
300	O	4043.1372	3.77991	3.82406	163.11731	154.67959	0.05817	0.00000	0.1687	1.96408	-1.43624	0.00328	0.00000
301	B	4059.6772	3.79996	3.83877	106.29214	207.60751	0.12597	0.00000	0.1688	1.47154	-1.76375	0.00492	0.00000
302	O	4060.4772	3.80117	3.83938	103.95674	210.44219	0.12991	0.00000	0.1688	1.44771	-1.77959	0.00492	0.00000
303	B	4077.0172	3.83361	3.85034	64.21325	274.72805	0.22483	0.00000	0.1691	0.95516	-2.10710	0.00656	0.00000
304	OH4	4081.9896	3.84689	3.85311	55.45083	296.17208	0.25744	0.00000	0.1691	0.80707	-2.20556	0.00656	0.00000
305	QSD	4084.4375	3.85412	3.85441	52.77197	300.89697	0.27620	0.00000	0.1691	0.29474	0.28865	0.00879	0.00000
306	#QSD	4084.4375	3.85412	3.85441	52.77197	300.89697	0.27620	0.00000	0.1691	0.29474	0.28865	0.00879	0.00000
307	QSD	4086.8855	3.86155	3.85572	52.52513	293.38423	0.30064	0.00000	0.1691	-0.19321	2.75930	0.01121	0.00000
308	OOH3	4094.1805	3.88295	3.85997	56.39507	254.68855	0.38243	0.00000	0.1691	-0.33728	2.54512	0.01121	0.00000
309	B	4110.7205	3.92445	3.87232	72.95500	178.52815	0.58142	0.00000	0.1699	-0.66392	2.05950	0.01285	0.00000
310	O	4111.5205	3.92619	3.87304	74.02992	175.25173	0.59170	0.00000	0.1699	-0.67972	2.03602	0.01285	0.00000
311	B	4128.0605	3.95668	3.89155	101.91765	115.93234	0.81781	0.00000	0.1711	-1.00635	1.55040	0.01449	0.00000
312	O	4128.8605	3.95792	3.89266	103.54046	113.47048	0.82940	0.00000	0.1711	-1.02215	1.52692	0.01449	0.00000
313	B	4145.4005	3.97964	3.92216	142.75567	70.99210	1.08263	0.00000	0.1726	-1.34878	1.04130	0.01613	0.00000
314	O	4146.2005	3.98052	3.92398	144.92635	69.34480	1.09553	0.00000	0.1726	-1.36457	1.01782	0.01613	0.00000

BETATRON FUNCTIONS OF UU -- Utility Module

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
315	B	4162.7405	3.99619	3.97254	195.46861	43.70743	1.37588	0.00000	0.1746	-1.69118	0.53221	0.01777	0.00000
316	OH3	4167.6771	4.00004	3.99158	212.64725	39.16835	1.46359	0.00000	0.1746	-1.78867	0.38727	0.01777	0.00000
317	QSF	4170.1250	4.00185	4.00169	217.06308	38.23371	1.49193	0.00000	0.1746	-0.00285	-0.00285	0.00534	0.00000
318	#QSF	4170.1250	4.00185	4.00169	217.06308	38.23371	1.49193	0.00000	0.1746	-0.00285	-0.00285	0.00534	0.00000
319	QSF	4172.5730	4.00366	4.01179	212.67477	39.19664	1.48967	0.00000	0.1746	1.78320	-0.39320	-0.00719	0.00000
320	OOH2	4179.5059	4.00916	4.03787	188.89388	46.06454	1.43982	0.00000	0.1746	1.64695	-0.59742	-0.00719	0.00000
321	B	4196.0459	4.02539	4.08362	139.78911	73.88584	1.33445	0.00000	0.1769	1.32190	-1.08464	-0.00555	0.00000
322	O	4196.8459	4.02631	4.08533	137.68665	75.64012	1.33001	0.00000	0.1769	1.30618	-1.10820	-0.00555	0.00000
323	B	4213.3859	4.04883	4.11306	99.85481	120.35805	1.25176	0.00000	0.1790	0.98111	-1.59542	-0.00391	0.00000
324	O	4214.1859	4.05012	4.11410	98.29761	122.92958	1.24863	0.00000	0.1790	0.96539	-1.61899	-0.00391	0.00000
325	B	4230.7259	4.08167	4.13162	71.73914	184.54415	1.19750	0.00000	0.1810	0.64032	-2.10620	-0.00227	0.00000
326	O	4231.5259	4.08346	4.13230	70.72721	187.93292	1.19568	0.00000	0.1810	0.62460	-2.12977	-0.00227	0.00000
327	B	4248.0659	4.12600	4.14408	55.44239	266.44413	1.17166	0.00000	0.1830	0.29952	-2.61698	-0.00063	0.00000
328	OH2	4253.3646	4.14161	4.14708	52.82014	295.00437	1.16831	0.00000	0.1830	0.19537	-2.77306	-0.00063	0.00000
329	QSD	4255.8125	4.14900	4.14838	53.06179	302.55112	1.17878	0.00000	0.1830	-0.29476	-0.28868	0.00920	0.00000
330	#QSD	4255.8125	4.14900	4.14838	53.06179	302.55112	1.17878	0.00000	0.1830	-0.29476	-0.28868	0.00920	0.00000
331	QSD	4258.2605	4.15619	4.14968	55.74610	297.79249	1.21352	0.00000	0.1830	-0.80929	2.21927	0.01922	0.00000
332	OOH1	4266.0382	4.17604	4.15409	70.13080	264.47446	1.36303	0.00000	0.1830	-1.04019	2.06452	0.01922	0.00000
333	B	4282.5782	4.20583	4.16550	112.66161	201.62343	1.69455	0.00000	0.1855	-1.53120	1.73542	0.02086	0.00000
334	O	4283.3782	4.20695	4.16613	115.13053	198.85949	1.71124	0.00000	0.1855	-1.55495	1.71951	0.02086	0.00000
335	B	4299.9182	4.22555	4.18153	174.68932	147.42150	2.06987	0.00000	0.1886	-2.04594	1.39041	0.02250	0.00000
336	O	4300.7182	4.22627	4.18240	177.98183	145.20958	2.08787	0.00000	0.1886	-2.06969	1.37449	0.02250	0.00000
337	B	4317.2582	4.23865	4.20377	254.56793	105.18462	2.47362	0.00000	0.1923	-2.56066	1.04540	0.02414	0.00000
338	O	4318.0582	4.23915	4.20499	258.68399	103.52472	2.49293	0.00000	0.1923	-2.58441	1.02948	0.02414	0.00000
339	B	4334.5982	4.24787	4.23506	352.29653	74.91280	2.90579	0.00000	0.1967	-3.07535	0.70038	0.02578	0.00000
340	OH1	4339.0521	4.24981	4.24492	380.28001	69.06863	3.02062	0.00000	0.1967	-3.20756	0.61176	0.02578	0.00000
341	QSF	4341.5000	4.25082	4.25064	388.18619	67.58123	3.05254	0.00000	0.1967	0.00000	0.00000	0.00025	0.00000
342	#QSF	4341.5000	4.25082	4.25064	388.18619	67.58123	3.05254	0.00000	0.1967	0.00000	0.00000	0.00025	0.00000
343	#QF	4341.5000	4.25082	4.25064	388.18619	67.58123	3.05254	0.00000	0.1967	0.00000	0.00000	0.00025	0.00000
344	QF	4343.3200	4.25157	4.25491	383.80254	68.40090	3.03567	0.00000	0.1967	2.39947	-0.45207	-0.01876	0.00000
345	OPM	4344.3550	4.25200	4.25730	378.85449	69.35554	3.01625	0.00000	0.1967	2.38125	-0.47029	-0.01876	0.00000
346	QFC	4345.3550	4.25242	4.25958	374.10959	70.31373	2.99749	0.00000	0.1967	2.36364	-0.48790	-0.01876	0.00000
347	SF	4345.3550	4.25242	4.25958	374.10959	70.31373	2.99749	0.00000	0.1967	2.36364	-0.48790	-0.01876	0.00000
348	QFC	4346.3550	4.25285	4.26183	369.39991	71.30713	2.97872	0.00000	0.1967	2.34604	-0.50551	-0.01876	0.00000
349	OOC	4349.8900	4.25441	4.26952	353.03344	75.10109	2.91239	0.00000	0.1967	2.28380	-0.56775	-0.01876	0.00000
350	B	4366.4300	4.26275	4.30029	282.30124	98.69911	2.61558	0.00000	0.2012	1.99263	-0.85898	-0.01713	0.00000
351	O	4367.2300	4.26321	4.30157	279.12430	100.08474	2.60188	0.00000	0.2012	1.97854	-0.87306	-0.01713	0.00000
352	B	4383.7700	4.27387	4.32440	218.49028	133.78252	2.33218	0.00000	0.2053	1.68735	-1.16429	-0.01549	0.00000
353	O	4384.5700	4.27446	4.32534	215.80178	135.65665	2.31979	0.00000	0.2053	1.67327	-1.17837	-0.01549	0.00000
354	B	4401.1100	4.28842	4.34224	165.26663	179.45418	2.07721	0.00000	0.2089	1.38206	-1.46960	-0.01385	0.00000
355	O	4401.9100	4.28919	4.34295	163.06660	181.81681	2.06613	0.00000	0.2089	1.36797	-1.48369	-0.01385	0.00000
356	B	4418.4500	4.30785	4.35568	122.63088	235.71411	1.85066	0.00000	0.2121	1.07675	-1.77492	-0.01221	0.00000
357	O	4419.2500	4.30890	4.35622	120.91936	238.56524	1.84090	0.00000	0.2121	1.06266	-1.78900	-0.01221	0.00000
358	B	4435.7900	4.33415	4.36602	90.58353	302.56230	1.65254	0.00000	0.2150	0.77143	-2.08023	-0.01057	0.00000
359	O	4436.5900	4.33557	4.36644	89.36052	305.90193	1.64409	0.00000	0.2150	0.75734	-2.09431	-0.01057	0.00000

BETATRON FUNCTIONS OF UU -- Utility Module

POS	S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
360 B	4453.1300	4.36932	4.37416	69.12493	379.99874	1.48285	0.00000	0.2175	0.46609	-2.38554	-0.00893	0.00000
361 O	4453.9300	4.37117	4.37450	68.39044	383.82688	1.47571	0.00000	0.2175	0.45201	-2.39963	-0.00893	0.00000
362 QD	4455.7500	4.37544	4.37524	67.57089	388.21081	1.46781	0.00000	0.2175	0.00000	0.00000	0.00025	0.00000
363 #QD	4455.7500	4.37544	4.37524	67.57089	388.21081	1.46781	0.00000	0.2175	0.00000	0.00000	0.00025	0.00000
364 QD	4457.5700	4.37971	4.37599	68.39045	383.82688	1.47661	0.00000	0.2175	-0.45201	2.39963	0.00943	0.00000
365 OPM	4458.6050	4.38210	4.37643	69.34496	378.87851	1.48636	0.00000	0.2175	-0.47023	2.38140	0.00943	0.00000
366 QDC	4459.6050	4.38438	4.37685	70.30304	374.13331	1.49579	0.00000	0.2175	-0.48784	2.36380	0.00943	0.00000
367 SD	4459.6050	4.38438	4.37685	70.30304	374.13331	1.49579	0.00000	0.2175	-0.48784	2.36380	0.00943	0.00000
368 QDC	4460.6050	4.38663	4.37728	71.29633	369.42332	1.50521	0.00000	0.2175	-0.50545	2.34619	0.00943	0.00000
369 OOC	4464.1400	4.39432	4.37883	75.08992	353.05580	1.53853	0.00000	0.2175	-0.56770	2.28395	0.00943	0.00000
370 B	4480.6800	4.42509	4.38718	98.68662	282.31975	1.70799	0.00000	0.2202	-0.85894	1.99272	0.01106	0.00000
371 O	4481.4800	4.42637	4.38763	100.07220	279.14266	1.71684	0.00000	0.2202	-0.87303	1.97863	0.01106	0.00000
372 B	4498.0200	4.44920	4.39830	133.76906	218.50637	1.91341	0.00000	0.2231	-1.16426	1.68741	0.01270	0.00000
373 O	4498.8200	4.45015	4.39888	135.64315	215.81779	1.92357	0.00000	0.2231	-1.17835	1.67332	0.01270	0.00000
374 B	4515.3600	4.46705	4.41284	179.43980	165.28126	2.14726	0.00000	0.2265	-1.46957	1.38209	0.01434	0.00000
375 O	4516.1600	4.46776	4.41361	181.80238	163.08118	2.15873	0.00000	0.2265	-1.48366	1.36801	0.01434	0.00000
376 B	4532.7000	4.48049	4.43227	235.69832	122.64440	2.40953	0.00000	0.2302	-1.77486	1.07678	0.01598	0.00000
377 O	4533.5000	4.48102	4.43332	238.54936	120.93282	2.42232	0.00000	0.2302	-1.78895	1.06269	0.01598	0.00000
378 B	4550.0400	4.49083	4.45857	302.54398	90.59581	2.70023	0.00000	0.2344	-2.08013	0.77147	0.01762	0.00000
379 O	4550.8400	4.49125	4.45999	305.88346	89.37273	2.71433	0.00000	0.2344	-2.09422	0.75738	0.01762	0.00000
380 B	4567.3800	4.49897	4.49373	379.97604	69.13547	3.01935	0.00000	0.2391	-2.38538	0.46615	0.01926	0.00000
381 O	4568.1800	4.49931	4.49558	383.80392	68.40089	3.03476	0.00000	0.2391	-2.39946	0.45207	0.01926	0.00000
382 QF	4570.0000	4.50005	4.49985	388.18751	67.58123	3.05253	0.00000	0.2391	0.00002	0.00000	0.00025	0.00000
383 CF	4798.5000	4.74929	4.74906	388.18612	67.58123	3.05253	0.00000	0.2815	0.00000	0.00000	0.00025	0.00000
384 #QF	4798.5000	4.74929	4.74906	388.18612	67.58123	3.05253	0.00000	0.2815	0.00000	0.00000	0.00025	0.00000

CIRCUMFERENCE = 4798.5000 M THETX = 0.18364216 RAD NUX = 4.74929 DNUX/(DP/P) = -6.73593
RADIUS = 763.7050 M THETY = 0.00000000 RAD NUY = 4.74906 DNUY/(DP/P) = -6.73604
(DS/S)/(DP/P)= 0.0000587 TGAM=(130.55841, 0.00000)

MAXIMA --- BETX(287) = 904.42447 BETY(79) = 904.33475 XEQ(343) = 3.05254 YEQ(384) = 0.00000
MINIMA --- BETX(240) = 38.21719 BETY(127) = 38.22734 XEQ(294) = 0.00000 YEQ(384) = 0.00000

VERTICAL CROSSINGS

M = -1 Section:

```
***          PRNT        //  LQV  OOV  O    KV   K
```

LQV	OOV	O	KV	K
6.050000000	4.375000000	0.800000000	0.003428778	0.003428778

```
***          CYC    0  -1 //  .FDV
```

MATCHED BETATRON FUNCTIONS OF M=-1 SECTION CELL

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
0		0.0000	0.00000	0.00000	93.12263	23.11359	0.00000	0.00000	0.0000	0.00000	0.00000	0.00000	0.00000
1	OOV	4.3750	0.00747	0.02977	93.32817	23.94171	0.00000	0.00000	0.0000	-0.04698	-0.18928	0.00000	0.00000
2	QVF	10.4250	0.01819	0.06605	82.99616	31.21203	0.00000	0.00000	0.0000	1.68270	-1.06228	0.00000	0.00000
3	#QVF	10.4250	0.01819	0.06605	82.99616	31.21203	0.00000	0.00000	0.0000	1.68270	-1.06228	0.00000	0.00000
4	QVF	16.4750	0.03205	0.09059	55.92930	51.85438	0.00000	0.00000	0.0000	2.60241	-2.49124	0.00000	0.00000
5	O	17.2750	0.03441	0.09295	51.85438	55.92930	0.00000	0.00000	0.0000	2.49124	-2.60241	0.00000	0.00000
6	QVD	23.3250	0.05895	0.10681	31.21203	82.99616	0.00000	0.00000	0.0000	1.06228	-1.68270	0.00000	0.00000
7	#QVD	23.3250	0.05895	0.10681	31.21203	82.99616	0.00000	0.00000	0.0000	1.06228	-1.68270	0.00000	0.00000
8	QVD	29.3750	0.09523	0.11753	23.94171	93.32817	0.00000	0.00000	0.0000	0.18928	0.04698	0.00000	0.00000
9	OOV	33.7500	0.12500	0.12500	23.11359	93.12263	0.00000	0.00000	0.0000	0.00000	0.00000	0.00000	0.00000
10	REFL	67.5000	0.25000	0.25000	93.12263	23.11359	0.00000	0.00000	0.0000	0.00000	0.00000	0.00000	0.00000

```
CIRCUMFERENCE =     67.5000 M          THETX =   0.00000000 RAD      NUX =    0.25000      DNUX/(DP/P) =   -0.30873
      RADIUS =    10.7430 M           THETY =   0.00000000 RAD      NUY =    0.25000      DNUY/(DP/P) =   -0.30873
(DS/S)/(DP/P)=  0.0000000               TGAM=(   0.00000,   0.00000)

MAXIMA     --- BETX(    1) =     93.32817    BETY(    8) =     93.32817     XEQ(   10) =     0.00000     YEQ(   10) =     0.00000
MINIMA     --- BETX(    9) =     23.11359    BETY(    1) =     23.11359     XEQ(   10) =     0.00000     YEQ(   10) =     0.00000
```

Vertical bends:

```
***          PRNT        //  LBV1 LBV2 B0V1 B0V2 D3   DLV1 DL3  DLV2 D4   DMV1 DM3  DMV2
```

LBV1	LBV2	B0V1	B0V2	D3	DLV1
5.000000000	16.540000000	5.081565840	6.613449353	7.000000000	136.164600000
DL3	**DLV2**	**D4**	**DMV1**	**DM3**	**DMV2**
25.483150000	19.284650000	1.555350000	62.898760000	0.861390000	19.284650000

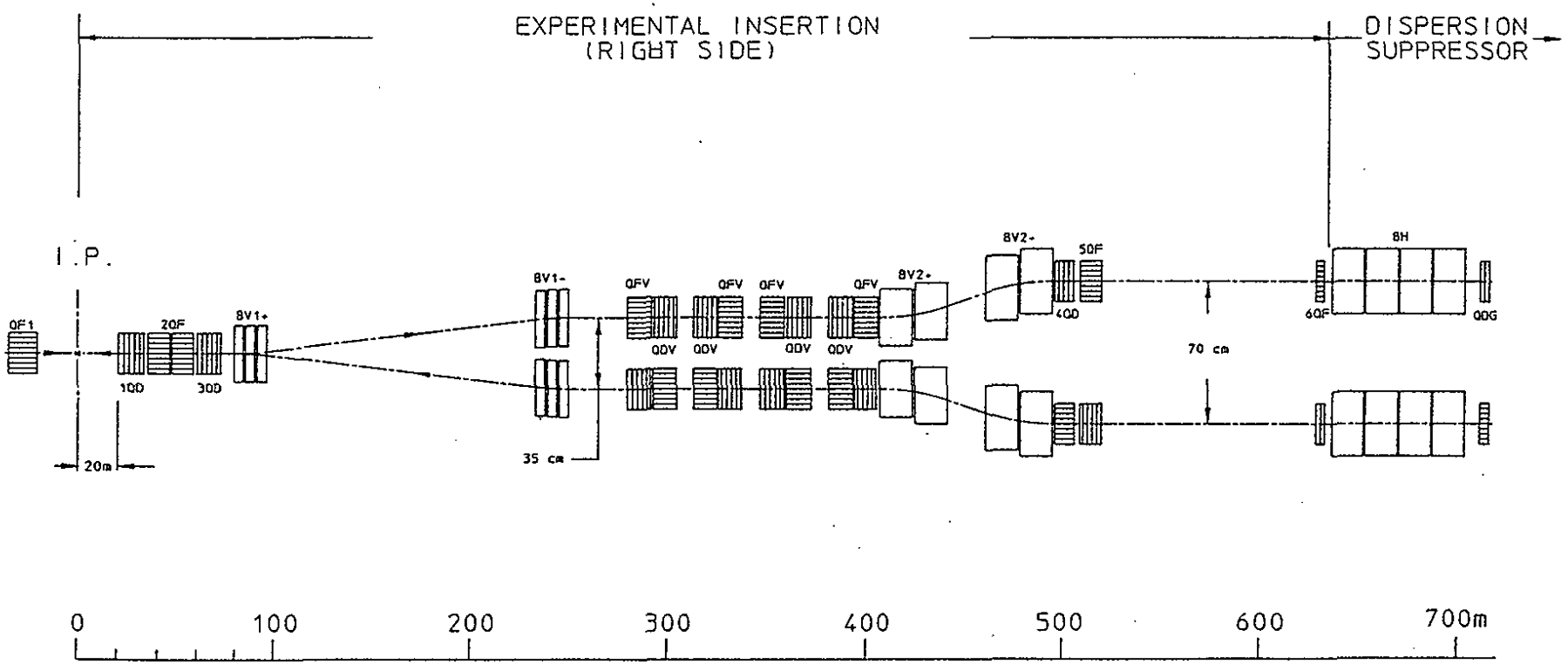


Figure 8. Elevation View of Low-β IR (right side)

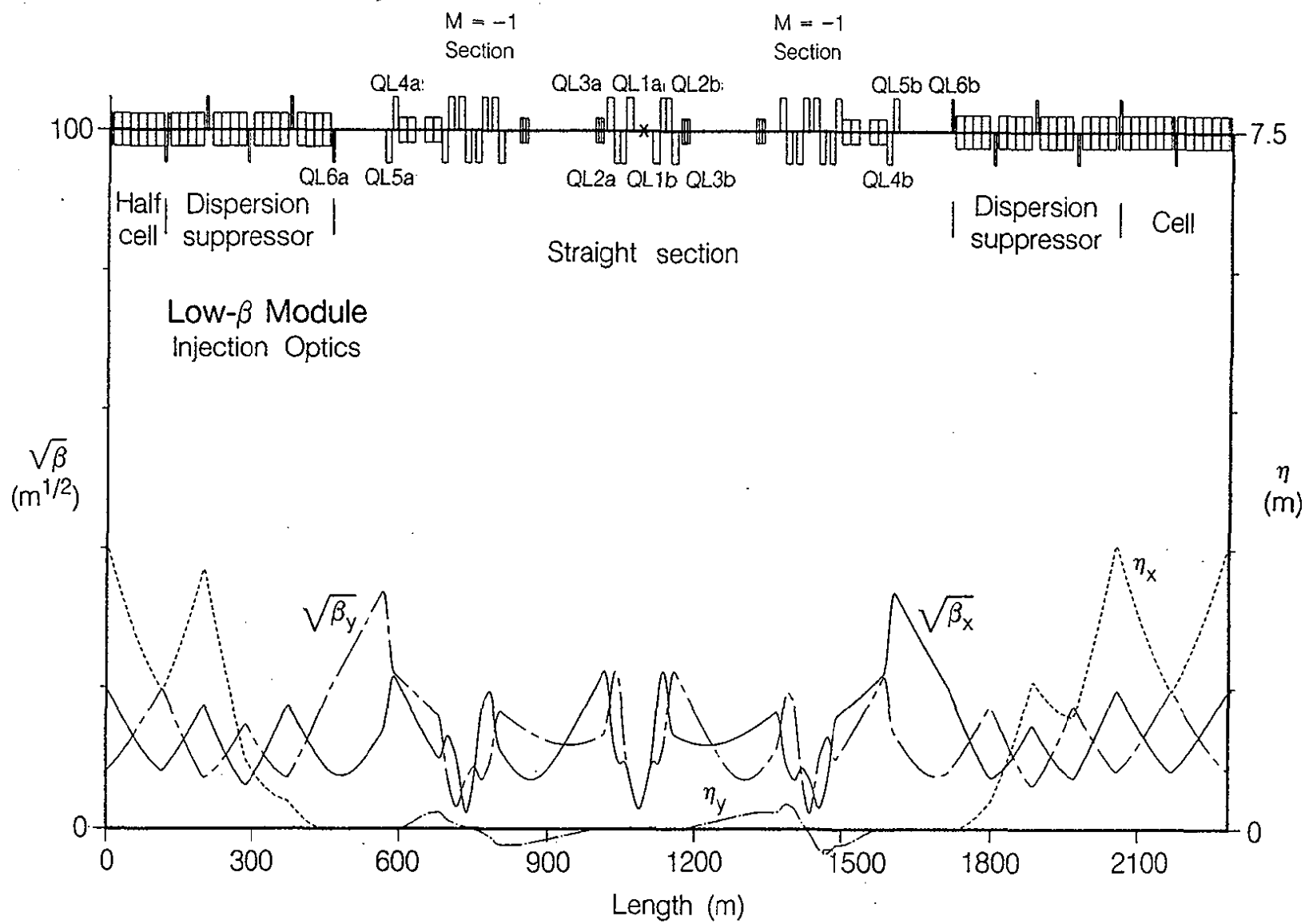


Figure 9. Low-β Module; Injection Optics

LOW-BETA MODULE

```
     Injection optics:
***   BL*     =            //  8.0
***   KL1     PARA         //  0.33917210   -2
***   KL2     PARA         //  -.34311096   -2
***   KL3     PARA         //  0.34337636   -2
***   KL4     PARA         //  0.34284391   -2
***   KL5     PARA         //  -.26970915   -2
***   KL6     PARA         //  -.48908702   -3

***           CALL   1     //  SRSL

***   LDU     MMM          //  .LDU

***           PRNT         //  D     D3    DLV1 DLV2 DL3  D4
  *                        //  LQL1  LQL2  LQL3 LQL4 LQL5 LQL6
  *                        //  DL0   O     D    D3   D4   DL34 DL45 DL56
  *                        //  LSSH  LMM1  L341 L343
  *                        //  KL1   KL2   KL3  KL4  KL5  KL6
```

D	D3	DLV1	DLV2	DL3	D4
1.000000000	7.000000000	136.164600000	19.284650000	25.483150000	1.555350000
LQL1	LQL2	LQL3	LQL4	LQL5	LQL6
7.129700000	5.648300000	6.648800000	5.059700000	5.837500000	2.133975000
DL0	O	D	D3	D4	DL34
20.000000000	0.800000000	1.000000000	7.000000000	1.555350000	288.272750000
DL45	DL56	LSSH	LMM1	L341	L343
2.795500000	106.142150000	630.822950000	135.000000000	202.647750000	85.625000000
KL1	KL2	KL3	KL4	KL5	KL6
0.003391721	-0.003431110	0.003433764	0.003428439	-0.002697091	-0.000489087

Beta functions through two low-beta modules and one cell;
print at markers of first module only:

```
***   ZZLB    CYC   -1     //  *ZLB
```

BETATRON FUNCTIONS OF ZZLB -- Low-beta Module, injection optics

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
1	#QF	0.0000	0.00000	0.00000	388.18609	67.58125	3.05254	0.00000	0.0000	0.00000	0.00000	0.00025	0.00000
21	#QSD	114.2500	0.12462	0.12460	67.57089	388.21084	1.46781	-0.00001	0.0000	0.00000	0.00000	0.00025	0.00000
37	#QSF	199.9375	0.22689	0.22641	302.52797	53.06816	2.77569	0.00000	0.0208	0.28861	0.29480	-0.00409	0.00000
49	#QSD	285.6250	0.37359	0.37355	38.23345	217.06330	0.74057	0.00001	0.0345	0.00280	0.00291	-0.01432	0.00000
61	#QSF	371.3125	0.52086	0.52128	300.90368	52.77239	0.29183	0.00000	0.0453	-0.28857	-0.29477	-0.00416	0.00000
73	#QL6	456.6860	0.62274	0.62330	66.68198	393.24242	0.00000	0.00001	0.0482	0.49406	-2.86608	0.00000	0.00000
77	#QL5	570.7996	0.84758	0.65000	219.04088	1082.49395	0.00000	0.00001	0.0487	-4.94334	13.09135	0.00000	0.00000
81	#QL4	584.4924	0.85452	0.65285	450.01809	540.01220	0.00000	0.00001	0.0487	-5.01201	10.68581	0.00000	0.00000
84	#BV+	590.5521	0.85661	0.65479	455.08205	476.77173	0.00000	0.00001	0.0487	2.90243	1.54117	0.00000	0.00000
88	#BV+	624.6321	0.87179	0.66755	281.30417	379.94327	0.00000	0.05589	0.0487	2.19668	1.30003	0.00000	0.00328
90	#BV-	643.9167	0.88461	0.67619	204.28111	332.43512	0.00000	0.11913	0.0487	1.79733	1.16349	0.00000	0.00328
94	#BV-	677.9967	0.92184	0.69463	105.82737	261.35174	0.00000	0.17500	0.0485	1.09158	0.92228	0.00000	0.00000
97	#QVD	685.6021	0.93380	0.69956	102.76288	217.51423	0.00000	0.16414	0.0482	-1.10774	5.57742	0.00000	-0.00355
101	#QVF	698.5021	0.94938	0.71748	169.38259	60.50049	0.00000	0.09444	0.0482	-1.04374	3.49798	0.00000	-0.00439
106	#QVF	719.3521	0.97412	0.91622	87.12085	9.74553	0.00000	0.03667	0.0482	3.63548	-0.28348	0.00000	-0.00178
110	#QVD	732.2521	1.04369	1.03052	10.64354	39.38393	0.00000	0.01883	0.0482	1.19981	-1.46654	0.00000	-0.00160
115	#QVD	753.1021	1.37072	1.08683	63.61971	74.83160	0.00000	-0.01886	0.0482	-4.55499	0.34972	0.00000	-0.00160
119	#QVF	766.0020	1.38632	1.12082	273.04671	49.44097	0.00000	-0.03668	0.0482	-7.92628	0.24380	0.00000	-0.00178
124	#QVF	786.8520	1.39593	1.17388	355.30763	100.19511	0.00000	-0.09445	0.0482	5.33456	-3.45825	0.00000	-0.00439
128	#QVD	799.7520	1.40466	1.18678	155.73813	252.95903	0.00000	-0.16414	0.0482	4.46292	-4.46054	0.00000	-0.00355
133	#BV+	840.6602	1.47765	1.21322	61.27714	215.73795	0.00000	-0.17405	0.0482	0.51873	0.72644	0.00000	0.00038
136	#BV+	846.6602	1.49401	1.21773	55.79798	207.27562	0.00000	-0.17081	0.0481	0.39447	0.68395	0.00000	0.00076
139	#BV+	852.6602	1.51181	1.22243	51.80997	199.32308	0.00000	-0.16529	0.0481	0.27020	0.64147	0.00000	0.00114
142	#BV-	993.8248	1.74644	1.36795	388.23088	159.33111	0.00000	-0.00493	0.0480	-2.65338	-0.35817	0.00000	0.00076
145	#BV-	999.8248	1.74881	1.37386	420.81707	163.88402	0.00000	-0.00131	0.0480	-2.77765	-0.40065	0.00000	0.00038
148	#BV-	1005.8248	1.75099	1.37960	454.89442	168.94672	0.00000	0.00003	0.0480	-2.90191	-0.44313	0.00000	0.00000
151	#QL3	1019.4736	1.75549	1.39171	462.31068	211.07708	0.00000	0.00003	0.0480	7.93134	-5.12663	0.00000	0.00000
155	#QL2	1032.5707	1.76282	1.39841	170.87741	467.85455	0.00000	0.00005	0.0480	6.92428	-7.11353	0.00000	0.00000
159	#QL2	1044.6673	1.77971	1.40245	88.51958	418.00834	0.00000	0.00004	0.0480	0.93663	10.55896	0.00000	0.00000
163	#QL1	1058.2453	1.80411	1.41246	86.24871	115.20037	0.00000	0.00002	0.0480	1.23181	5.97892	0.00000	0.00000
166	#IPL	1085.3750	2.00917	1.61617	8.00000	8.00130	0.00000	0.00000	0.0480	-0.00001	0.00017	0.00000	0.00000
169	#1QL	1112.5047	2.21291	1.82124	115.20578	86.22928	0.00000	-0.00001	0.0480	-5.97942	-1.23158	0.00000	0.00000
173	#2QL	1126.0827	2.22292	1.84565	418.03968	88.50191	0.00000	-0.00002	0.0480	-10.55997	-0.93656	0.00000	0.00000
177	#2QL	1138.1793	2.22695	1.86254	467.89476	170.84825	0.00000	-0.00002	0.0480	7.11393	-6.92325	0.00000	0.00000
181	#3QL	1151.2764	2.23366	1.86987	211.09896	462.23873	0.00000	-0.00004	0.0480	5.12696	-7.93028	0.00000	0.00000
184	#BV+	1164.9252	2.24577	1.87437	168.96931	454.82811	0.00000	-0.00004	0.0480	0.44300	2.90131	0.00000	0.00000
187	#BV+	1170.9252	2.25151	1.87655	163.90813	420.75773	0.00000	0.00129	0.0480	0.40053	2.77709	0.00000	0.00038
190	#BV+	1176.9252	2.25742	1.87892	159.35669	388.17804	0.00000	0.00491	0.0480	0.35805	2.65286	0.00000	0.00076
193	#BV-	1318.0898	2.40290	2.11354	199.34976	51.81839	0.00000	0.16528	0.0480	-0.64136	-0.27012	0.00000	0.00114
196	#BV-	1324.0898	2.40760	2.13133	207.30090	55.80529	0.00000	0.17080	0.0480	-0.68383	-0.39436	0.00000	0.00076
199	#BV-	1330.0898	2.41211	2.14769	215.76178	61.28303	0.00000	0.17404	0.0479	-0.72631	-0.51860	0.00000	0.00038
204	#QVF	1370.9980	2.43854	2.22068	252.96916	155.72448	0.00000	0.18610	0.0478	4.46094	-4.46234	0.00000	0.00371
208	#QVD	1383.8980	2.45144	2.22940	100.19549	355.26936	0.00000	0.25971	0.0478	3.45849	-5.33380	0.00000	0.00278
213	#QVD	1404.7480	2.50451	2.23902	49.43422	273.01167	0.00000	0.20621	0.0478	-0.24359	7.92542	0.00000	-0.00731
217	#QVF	1417.6480	2.53850	2.25462	74.81673	63.60968	0.00000	0.08200	0.0478	-0.34954	4.55441	0.00000	-0.00875

BETATRON FUNCTIONS OF ZZLB -- Low-beta Module, injection optics

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
222	#QVF	1438.4980	2.59483	2.58165	39.37525	10.64568	0.00000	-0.08199	0.0478	1.46617	-1.20000	0.00000	-0.00875
226	#QVD	1451.3980	2.70915	2.65122	9.74571	87.12851	0.00000	-0.20621	0.0478	0.28326	-3.63561	0.00000	-0.00731
231	#QVD	1472.2480	2.90785	2.67596	60.50780	169.38702	0.00000	-0.25970	0.0478	-3.49821	1.04397	0.00000	0.00278
235	#QVF	1485.1480	2.92577	2.69153	217.53055	102.76140	0.00000	-0.18610	0.0478	-5.57763	1.10793	0.00000	0.00371
238	#BV+	1492.7533	2.93070	2.70350	261.36787	105.82258	0.00000	-0.17500	0.0478	-0.92212	-1.09132	0.00000	0.00000
242	#BV+	1526.8333	2.94914	2.74073	332.44191	204.25238	0.00000	-0.11912	0.0475	-1.16338	-1.79686	0.00000	0.00328
244	#BV-	1546.1180	2.95778	2.75355	379.94563	281.25571	0.00000	-0.05588	0.0473	-1.29991	-2.19612	0.00000	0.00328
248	#BV-	1580.1980	2.97054	2.76873	476.76953	454.98498	0.00000	0.00000	0.0474	-1.54117	-2.90155	0.00000	0.00000
251	#4QL	1586.2577	2.97247	2.77083	540.00981	449.91900	0.00000	0.00000	0.0474	-10.68577	5.01117	0.00000	0.00000
255	#5QL	1599.9504	2.97532	2.77777	1082.48945	218.98789	0.00000	0.00000	0.0474	-13.09130	4.94239	0.00000	0.00000
259	#6QL	1714.0640	3.00203	3.00265	393.24188	66.69236	0.00000	0.00000	0.0474	2.86607	-0.49444	0.00000	0.00000
271	#QSD	1799.4375	3.10405	3.10450	52.76737	301.01497	0.29767	0.00000	0.0474	0.29480	0.28865	0.00897	0.00000
283	#QSF	1885.1250	3.25179	3.25173	217.04987	38.23376	1.56480	0.00000	0.0479	-0.00296	-0.00244	0.00509	0.00000
295	#QSD	1970.8125	3.39894	3.39847	53.06823	302.43207	1.20033	0.00000	0.0534	-0.29483	-0.28867	0.00853	0.00000
311	#QSF	2056.5000	3.50075	3.50075	388.21039	67.58079	3.05253	0.00000	0.0621	0.00010	-0.00041	-0.00025	0.00000
312	#QF	2056.5000	3.50075	3.50075	388.21039	67.58079	3.05253	0.00000	0.0755	0.00010	-0.00041	-0.00025	0.00000
332	#QD	2170.7500	3.62537	3.62532	67.56296	388.36931	1.46781	0.00000	0.0755	0.00006	-0.00001	-0.00025	0.00000
352	#QF	2285.0000	3.75000	3.74989	388.16288	67.58196	3.05253	0.00000	0.0971	-0.00012	0.00041	-0.00025	0.00000
355	#QF	4798.5000	4.74922	4.74905	388.18609	67.58125	3.05254	0.00000	0.2365	0.00000	0.00000	0.00025	0.00000

CIRCUMFERENCE = 4798.5000 M THETX = 0.18364216 RAD NUX = 4.74922 DNUX/(DP/P) = -8.52397
RADIUS = 763.7050 M THETY = 0.00000000 RAD NUY = 4.74905 DNUY/(DP/P) = -8.52367
(DS/S)/(DP/P)= 0.0000581 TGAM=(131.15821, 0.00000)

MAXIMA --- BETX(256) = 1134.92084 BETY(75) = 1134.92546 XEQ(355) = 3.05254 YEQ(209) = 0.26005
MINIMA --- BETX(111) = 5.01926 BETY(220) = 5.01907 XEQ(149) = 0.00000 YEQ(229) = -0.26004

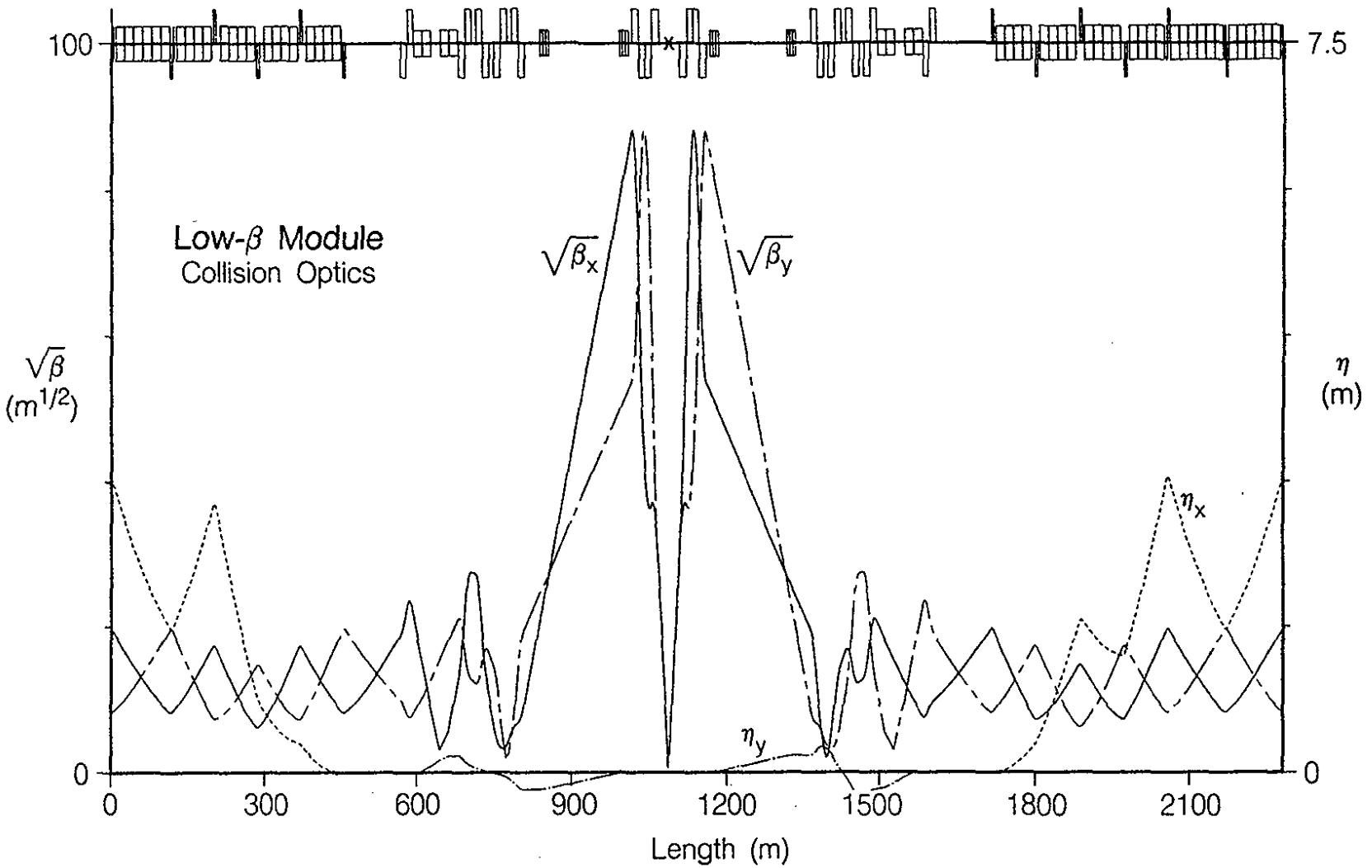


Figure 10. Low-β Module; Collision Optics

```
     Collision optics:
***   BL*     =           //  0.5
***   KL1     PARA        //  0.34467282   -2
***   KL2     PARA        //  -.34018226   -2
***   KL3     PARA        //  0.32501414   -2
***   KL4     PARA        //  0.32715443   -2
***   KL5     PARA        //  -.11626270   -2
***   KL6     PARA        //  -.32320211   -2

***           CALL        //  SRSL

***   LDU     MMM         //  .LDU

***           PRNT        //  KL1  KL2  KL3  KL4  KL5  KL6
```

KL1	KL2	KL3	KL4	KL5	KL6
0.003446728	-0.003401823	0.003250141	0.003271544	-0.001162627	-0.003232021

Beta functions through two low-beta modules and one cell,
print everywhere in first module:

```
***   ZZLB    CYC     1     //  *ZLB
```

BETATRON FUNCTIONS OF ZZLB -- Low-beta Module, collision optics

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
0		0.0000	0.00000	0.00000	388.18609	67.58123	3.05254	0.00002	0.0000	0.00000	0.00000	0.00025	0.00000
1	#QF	0.0000	0.00000	0.00000	388.18609	67.58123	3.05254	0.00002	0.0000	0.00000	0.00000	0.00025	0.00000
2	QF	1.8200	0.00075	0.00427	383.80244	68.40090	3.03567	0.00002	0.0000	2.39947	-0.45207	-0.01876	0.00000
3	OPM	2.8550	0.00118	0.00666	378.85439	69.35554	3.01625	0.00002	0.0000	2.38125	-0.47029	-0.01876	0.00000
4	QFC	3.8550	0.00160	0.00894	374.10949	70.31373	2.99749	0.00002	0.0000	2.36364	-0.48790	-0.01876	0.00000
5	SF	3.8550	0.00160	0.00894	374.10949	70.31373	2.99749	0.00002	0.0000	2.36364	-0.48790	-0.01876	0.00000
6	QFC	4.8550	0.00203	0.01119	369.39981	71.30713	2.97872	0.00002	0.0000	2.34604	-0.50551	-0.01876	0.00000
7	OOC	8.3900	0.00359	0.01888	353.03334	75.10109	2.91239	0.00002	0.0000	2.28380	-0.56775	-0.01876	0.00000
8	B	24.9300	0.01193	0.04965	282.30116	98.69912	2.61558	0.00003	0.0045	1.99263	-0.85898	-0.01713	0.00000
9	O	25.7300	0.01239	0.05093	279.12422	100.08475	2.60188	0.00003	0.0045	1.97854	-0.87306	-0.01713	0.00000
10	B	42.2700	0.02305	0.07375	218.49022	133.78254	2.33218	0.00004	0.0086	1.68735	-1.16429	-0.01549	0.00000
11	O	43.0700	0.02364	0.07470	215.80172	135.65667	2.31979	0.00004	0.0086	1.67327	-1.17838	-0.01549	0.00000
12	B	59.6100	0.03760	0.09160	165.26658	179.45422	2.07721	0.00005	0.0122	1.38206	-1.46960	-0.01385	0.00000
13	O	60.4100	0.03837	0.09231	163.06656	181.81686	2.06613	0.00005	0.0122	1.36797	-1.48369	-0.01385	0.00000
14	B	76.9500	0.05703	0.10504	122.63085	235.71417	1.85066	0.00006	0.0154	1.07675	-1.77492	-0.01221	0.00000
15	O	77.7500	0.05808	0.10557	120.91933	238.56530	1.84090	0.00006	0.0154	1.06266	-1.78900	-0.01221	0.00000
16	B	94.2900	0.08333	0.11538	90.58351	302.56237	1.65254	0.00007	0.0182	0.77143	-2.08023	-0.01057	0.00000
17	O	95.0900	0.08475	0.11580	89.36050	305.90201	1.64409	0.00007	0.0182	0.75734	-2.09431	-0.01057	0.00000
18	B	111.6300	0.11850	0.12352	69.12492	379.99884	1.48285	0.00008	0.0208	0.46609	-2.38554	-0.00893	0.00000
19	O	112.4300	0.12035	0.12385	68.39044	383.82698	1.47571	0.00008	0.0208	0.45201	-2.39963	-0.00893	0.00000
20	QD	114.2500	0.12462	0.12460	67.57089	388.21091	1.46781	0.00008	0.0208	0.00000	0.00000	0.00025	0.00000
21	#QSD	114.2500	0.12462	0.12460	67.57089	388.21091	1.46781	0.00008	0.0208	0.00000	0.00000	0.00025	0.00000
22	QSD	116.6980	0.13034	0.12561	69.05808	380.30422	1.48353	0.00008	0.0208	-0.61168	3.20777	0.01261	0.00000
23	OPM	117.7330	0.13271	0.12605	70.34558	373.69594	1.49658	0.00008	0.0208	-0.63228	3.17704	0.01261	0.00000
24	QDC	118.7330	0.13495	0.12648	71.63003	367.37154	1.50919	0.00008	0.0208	-0.65218	3.14736	0.01261	0.00000
25	SD	118.7330	0.13495	0.12648	71.63003	367.37154	1.50919	0.00008	0.0208	-0.65218	3.14736	0.01261	0.00000
26	QDC	119.7330	0.13715	0.12692	72.95428	361.10651	1.52180	0.00008	0.0208	-0.67207	3.11767	0.01261	0.00000
27	DOG1	124.3602	0.14682	0.12904	79.59997	332.88994	1.58016	0.00007	0.0208	-0.76415	2.98031	0.01261	0.00000
28	B	140.9002	0.17506	0.13831	110.32142	242.42267	1.80232	0.00006	0.0236	-1.09325	2.48930	0.01425	0.00000
29	O	141.7002	0.17620	0.13884	112.08336	238.45879	1.81372	0.00006	0.0236	-1.10917	2.46555	0.01425	0.00000
30	B	158.2402	0.19628	0.15213	154.21797	165.01972	2.06299	0.00005	0.0267	-1.43826	1.97454	0.01589	0.00000
31	O	159.0402	0.19710	0.15291	156.53193	161.87946	2.07570	0.00005	0.0267	-1.45418	1.95079	0.01589	0.00000
32	B	175.5802	0.21163	0.17311	210.07922	105.46860	2.35209	0.00004	0.0304	-1.76326	1.45978	0.01753	0.00000
33	O	176.3802	0.21224	0.17433	212.94517	103.15195	2.36612	0.00004	0.0304	-1.79918	1.43603	0.01753	0.00000
34	B	192.9202	0.22307	0.20702	277.90455	63.76931	2.66962	0.00003	0.0345	-2.12823	0.94502	0.01917	0.00000
35	OG1	197.4896	0.22559	0.21922	297.76947	55.75277	2.75721	0.00003	0.0345	-2.21915	0.80937	0.01917	0.00000
36	QSF	199.9375	0.22689	0.22641	302.52797	53.06817	2.77569	0.00003	0.0345	0.28861	0.29480	-0.00409	0.00000
37	#QSF	199.9375	0.22689	0.22641	302.52797	53.06817	2.77569	0.00003	0.0345	0.28861	0.29480	-0.00409	0.00000
38	QSF	202.3855	0.22819	0.23380	294.98204	52.82647	2.73725	0.00003	0.0345	2.77280	-0.19539	-0.02727	0.00000
39	OOG2	210.9136	0.23319	0.25851	249.83070	57.58830	2.50471	0.00002	0.0345	2.52162	-0.36298	-0.02727	0.00000
40	B	227.4536	0.24581	0.29901	174.47293	74.97219	2.06727	0.00002	0.0382	2.03447	-0.68804	-0.02563	0.00000
41	O	228.2536	0.24655	0.30069	171.23662	76.08563	2.04677	0.00002	0.0382	2.01091	-0.70376	-0.02563	0.00000
42	B	244.7936	0.26554	0.33035	112.77344	104.74238	1.63645	0.00002	0.0413	1.52374	-1.02881	-0.02399	0.00000
43	O	245.5936	0.26668	0.33156	110.35430	106.40106	1.61726	0.00002	0.0413	1.50018	-1.04453	-0.02399	0.00000
44	B	262.1336	0.29708	0.35272	68.78636	146.33065	1.23405	0.00001	0.0436	1.01300	-1.36959	-0.02235	0.00000

BETATRON FUNCTIONS OF ZZLB -- Low-beta Module, collision optics

POS	S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
45 O	262.9336	0.29895	0.35358	67.18441	148.53457	1.21617	0.00001	0.0436	0.98943	-1.38531	-0.02235	0.00000
46 B	279.4736	0.34903	0.36889	42.51218	199.73702	0.86008	0.00001	0.0453	0.50224	-1.71036	-0.02071	0.00000
47 OG2	283.1771	0.36349	0.37175	39.19612	212.67524	0.78338	0.00001	0.0453	0.39315	-1.78315	-0.02071	0.00000
48 QSD	285.6250	0.37359	0.37355	38.23345	217.06327	0.74057	0.00001	0.0453	0.00280	0.00291	-0.01432	0.00000
49 #QSD	285.6250	0.37359	0.37355	38.23345	217.06327	0.74057	0.00001	0.0453	0.00280	0.00291	-0.01432	0.00000
50 QSD	288.0729	0.38370	0.37536	39.16834	212.64714	0.71301	0.00001	0.0453	-0.38732	1.78873	-0.00823	0.00000
51 OOG3	296.2704	0.41414	0.38195	47.49133	184.64837	0.64551	0.00000	0.0453	-0.62800	1.62684	-0.00823	0.00000
52 B	312.8103	0.45844	0.39857	76.29773	136.23528	0.52286	0.00000	0.0462	-1.11362	1.30019	-0.00660	0.00000
53 O	313.6103	0.46009	0.39952	78.09831	134.16761	0.51759	0.00000	0.0462	-1.13711	1.28439	-0.00660	0.00000
54 B	330.1503	0.48699	0.42266	123.74572	97.08265	0.42206	-0.00001	0.0470	-1.62271	0.95775	-0.00496	0.00000
55 O	330.9503	0.48801	0.42398	126.36085	95.56289	0.41810	-0.00001	0.0470	-1.64620	0.94195	-0.00496	0.00000
56 B	347.4903	0.50508	0.45644	188.84875	69.80604	0.34969	-0.00001	0.0476	-2.13178	0.61530	-0.00332	0.00000
57 O	348.2903	0.50575	0.45828	192.27839	68.83420	0.34704	-0.00001	0.0476	-2.15527	0.59950	-0.00332	0.00000
58 B	364.8303	0.51728	0.50183	271.60607	54.40547	0.30575	-0.00002	0.0482	-2.64083	0.27285	-0.00168	0.00000
59 OG3	368.8645	0.51956	0.51386	293.39119	52.52539	0.29899	-0.00002	0.0482	-2.75927	0.19318	-0.00168	0.00000
60 QSF	371.3125	0.52086	0.52128	300.90368	52.77238	0.29183	-0.00002	0.0482	-0.28857	-0.29477	-0.00416	0.00000
61 #QSF	371.3125	0.52086	0.52128	300.90368	52.77238	0.29183	-0.00002	0.0482	-0.28857	-0.29477	-0.00416	0.00000
62 QSF	373.7604	0.52216	0.52851	296.17826	55.45141	0.27869	-0.00002	0.0482	2.20569	-0.80711	-0.00656	0.00000
63 OOG4	381.9727	0.52686	0.54945	261.28640	70.71631	0.22483	-0.00003	0.0482	2.04307	-1.05169	-0.00656	0.00000
64 B	398.5127	0.53841	0.57898	199.11856	113.65346	0.12991	-0.00004	0.0485	1.71557	-1.54427	-0.00492	0.00000
65 O	399.3127	0.53906	0.58009	196.38633	116.14336	0.12597	-0.00004	0.0485	1.69972	-1.56810	-0.00492	0.00000
66 B	415.8527	0.55465	0.59853	145.57662	176.16342	0.05817	-0.00005	0.0486	1.37220	-2.06068	-0.00328	0.00000
67 O	416.6527	0.55553	0.59925	143.39377	179.47958	0.05555	-0.00005	0.0486	1.35636	-2.08451	-0.00328	0.00000
68 B	433.1927	0.57716	0.61153	103.94276	256.58256	0.01487	-0.00006	0.0487	1.02883	-2.57710	-0.00164	0.00000
69 O	433.9927	0.57840	0.61202	102.30932	260.72497	0.01356	-0.00006	0.0487	1.01298	-2.60092	-0.00164	0.00000
70 B	450.5327	0.60879	0.62068	74.21746	354.91087	0.00000	-0.00008	0.0487	0.68544	-3.09351	0.00000	0.00000
71 OG4	454.5520	0.61773	0.62242	69.02739	380.25979	0.00000	-0.00008	0.0487	0.60584	-3.21321	0.00000	0.00000
72 QL6a	456.6860	0.62272	0.62330	67.52784	388.40510	0.00000	-0.00008	0.0487	0.10031	-0.58501	0.00000	0.00000
73 #QL6	456.6860	0.62272	0.62330	67.52784	388.40510	0.00000	-0.00008	0.0487	0.10031	-0.58501	0.00000	0.00000
74 QL6a	458.8200	0.62774	0.62418	68.16274	385.20451	0.00000	-0.00008	0.0487	-0.39928	2.07747	0.00000	0.00000
75 DL56	564.9621	0.74951	0.71529	344.55847	99.66511	0.00000	-0.00004	0.0487	-2.20473	0.61269	0.00000	0.00000
76 QL5a	570.7996	0.75207	0.72508	385.40328	89.26677	0.00000	-0.00003	0.0487	-4.88440	1.14502	0.00000	0.00000
77 #QL5	570.7996	0.75207	0.72508	385.40328	89.26677	0.00000	-0.00003	0.0487	-4.88440	1.14502	0.00000	0.00000
78 QL5a	576.6371	0.75429	0.73647	461.64545	73.62945	0.00000	-0.00003	0.0487	-8.34839	1.49828	0.00000	0.00000
79 DL45	579.4326	0.75521	0.74288	509.51802	65.59696	0.00000	-0.00003	0.0487	-8.77648	1.37508	0.00000	0.00000
80 QL4a	584.4924	0.75670	0.75616	555.77073	57.70102	0.00000	-0.00002	0.0487	-0.10827	0.22880	0.00000	0.00000
81 #QL4	584.4924	0.75670	0.75616	555.77073	57.70102	0.00000	-0.00002	0.0487	-0.10827	0.22880	0.00000	0.00000
82 QL4a	589.5521	0.75819	0.76998	511.58889	60.70342	0.00000	-0.00002	0.0487	8.59522	-0.83867	0.00000	0.00000
83 D	590.5521	0.75851	0.77257	494.54482	62.40881	0.00000	-0.00002	0.0487	8.44886	-0.86673	0.00000	0.00000
84 #BV+	590.5521	0.75851	0.77257	494.54482	62.40881	0.00000	-0.00002	0.0487	8.44886	-0.86673	0.00000	0.00000
85 BV2+	607.0921	0.76592	0.80635	255.09746	98.75652	0.00000	0.01354	0.0487	6.02801	-1.33083	0.00000	0.00164
86 D	608.0921	0.76656	0.80794	243.18780	101.44625	0.00000	0.01518	0.0487	5.88165	-1.35889	0.00000	0.00164
87 BV2+	624.6321	0.78452	0.82906	88.66379	154.07451	0.00000	0.05586	0.0487	3.46080	-1.82298	0.00000	0.00328
88 #BV+	624.6321	0.78452	0.82906	88.66379	154.07451	0.00000	0.05586	0.0487	3.46080	-1.82298	0.00000	0.00328
89 DLV2	643.9167	0.89935	0.84522	9.61541	234.82096	0.00000	0.11910	0.0487	0.63823	-2.36410	0.00000	0.00328

BETATRON FUNCTIONS OF ZZLB -- Low-beta Module, collision optics

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
90	#BV-	643.9167	0.89935	0.84522	9.61541	234.82096	0.00000	0.11910	0.0487	0.63823	-2.36410	0.00000	0.00328
91	BV2-	660.4567	1.15839	0.85482	28.54346	320.70095	0.00000	0.15978	0.0485	-1.78261	-2.82815	0.00000	0.00164
92	D	661.4567	1.16364	0.85531	32.25506	326.38532	0.00000	0.16142	0.0485	-1.92898	-2.85621	0.00000	0.00164
93	BV2-	677.9967	1.20379	0.86235	136.10646	428.54388	0.00000	0.17498	0.0482	-4.34983	-3.32024	0.00000	0.00000
94	#BV-	677.9967	1.20379	0.86235	136.10646	428.54388	0.00000	0.17498	0.0482	-4.34983	-3.32024	0.00000	0.00000
95	D4	679.5521	1.20552	0.86292	149.99153	438.94001	0.00000	0.17498	0.0482	-4.57747	-3.36388	0.00000	0.00000
96	QVD	685.6021	1.21076	0.86511	235.34097	424.48511	0.00000	0.16412	0.0482	-10.11516	5.65232	0.00000	-0.00355
97	#QVD	685.6021	1.21076	0.86511	235.34097	424.48511	0.00000	0.16412	0.0482	-10.11516	5.65232	0.00000	-0.00355
98	QVD	691.6521	1.21390	0.86769	415.77946	313.31469	0.00000	0.13287	0.0482	-20.94675	11.94774	0.00000	-0.00667
99	O	692.4521	1.21419	0.86811	449.97118	294.49193	0.00000	0.12753	0.0482	-21.79290	11.58070	0.00000	-0.00667
100	QVF	698.5021	1.21591	0.87218	675.12224	198.38267	0.00000	0.09443	0.0482	-13.85212	4.96420	0.00000	-0.00439
101	#QVF	698.5021	1.21591	0.87218	675.12224	198.38267	0.00000	0.09443	0.0482	-13.85212	4.96420	0.00000	-0.00439
102	QVF	704.5521	1.21722	0.87763	757.84076	164.05162	0.00000	0.07331	0.0482	0.75645	0.94578	0.00000	-0.00267
103	OOV	708.9271	1.21815	0.88198	751.26152	155.99709	0.00000	0.06164	0.0482	0.74737	0.89526	0.00000	-0.00267
104	OOV	713.3021	1.21908	0.88656	744.76171	148.38463	0.00000	0.04997	0.0482	0.73830	0.84473	0.00000	-0.00267
105	QVF	719.3521	1.22044	0.89300	647.00637	157.14188	0.00000	0.03667	0.0482	14.73794	-2.35226	0.00000	-0.00178
106	#QVF	719.3521	1.22044	0.89300	647.00637	157.14188	0.00000	0.03667	0.0482	14.73794	-2.35226	0.00000	-0.00178
107	QVF	725.4021	1.22225	0.89841	417.20437	210.19320	0.00000	0.02801	0.0482	21.64340	-6.78035	0.00000	-0.00111
108	O	726.2021	1.22257	0.89900	383.29505	221.18479	0.00000	0.02712	0.0482	20.74324	-6.95913	0.00000	-0.00111
109	QVD	732.2521	1.22609	0.90279	203.85592	279.74589	0.00000	0.01884	0.0482	10.14663	-2.31203	0.00000	-0.00160
110	#QVD	732.2521	1.22609	0.90279	203.85592	279.74589	0.00000	0.01884	0.0482	10.14663	-2.31203	0.00000	-0.00160
111	QVD	738.3021	1.23246	0.90621	116.68021	272.57069	0.00000	0.00822	0.0482	4.86039	3.44798	0.00000	-0.00188
112	OOV	742.6771	1.23976	0.90891	78.19113	243.30594	0.00000	0.00000	0.0482	3.93712	3.24111	0.00000	-0.00188
113	OOV	747.0521	1.25116	0.91195	47.78064	215.85134	0.00000	-0.00822	0.0482	3.01385	3.03423	0.00000	-0.00188
114	QVD	753.1021	1.28133	0.91706	22.48897	157.81701	0.00000	-0.01884	0.0482	1.34003	6.15353	0.00000	-0.00160
115	#QVD	753.1021	1.28133	0.91706	22.48897	157.81701	0.00000	-0.01884	0.0482	1.34003	6.15353	0.00000	-0.00160
116	QVD	759.1521	1.34121	0.92550	12.56975	79.08636	0.00000	-0.02712	0.0482	0.36753	6.31079	0.00000	-0.00111
117	O	759.9520	1.35157	0.92722	12.03949	69.31947	0.00000	-0.02802	0.0482	0.29529	5.89782	0.00000	-0.00111
118	QVF	766.0020	1.43999	0.95336	10.47850	20.60201	0.00000	-0.03667	0.0482	-0.04816	2.48874	0.00000	-0.00178
119	#QVF	766.0020	1.43999	0.95336	10.47850	20.60201	0.00000	-0.03667	0.0482	-0.04816	2.48874	0.00000	-0.00178
120	QVF	772.0520	1.52433	1.07389	13.10991	3.92488	0.00000	-0.04998	0.0482	-0.36843	0.38218	0.00000	-0.00267
121	OOV	776.4270	1.57030	1.24820	17.99189	6.16987	0.00000	-0.06164	0.0482	-0.74745	-0.89532	0.00000	-0.00267
122	OOV	780.8020	1.60260	1.31334	26.19026	19.59293	0.00000	-0.07331	0.0482	-1.12646	-2.17281	0.00000	-0.00267
123	QVF	786.8520	1.63243	1.34173	38.59716	61.84561	0.00000	-0.09443	0.0482	-0.83775	-5.10085	0.00000	-0.00439
124	#QVF	786.8520	1.63243	1.34173	38.59716	61.84561	0.00000	-0.09443	0.0482	-0.83775	-5.10085	0.00000	-0.00439
125	QVF	792.9020	1.65518	1.35182	44.80955	153.62396	0.00000	-0.12753	0.0482	-0.14577	-10.69849	0.00000	-0.00667
126	O	793.7020	1.65801	1.35261	45.05738	171.22255	0.00000	-0.13287	0.0482	-0.16401	-11.29974	0.00000	-0.00667
127	QVD	799.7520	1.67800	1.35675	53.97715	302.56611	0.00000	-0.16412	0.0482	-1.37150	-9.49404	0.00000	-0.00355
128	#QVD	799.7520	1.67800	1.35675	53.97715	302.56611	0.00000	-0.16412	0.0482	-1.37150	-9.49404	0.00000	-0.00355
129	QVD	805.8020	1.69288	1.35952	81.09526	382.23200	0.00000	-0.17498	0.0482	-3.29679	-3.11834	0.00000	0.00000
130	OOV	810.1770	1.70017	1.36128	112.74357	410.05452	0.00000	-0.17498	0.0482	-3.93710	-3.24109	0.00000	0.00000
131	DL3	835.6602	1.71911	1.36951	408.44600	593.46041	0.00000	-0.17498	0.0482	-7.66674	-3.95605	0.00000	0.00000
132	BV1+	840.6602	1.72089	1.37081	488.77230	633.72228	0.00000	-0.17403	0.0481	-8.39852	-4.09632	0.00000	0.00038
133	#BV+	840.6602	1.72089	1.37081	488.77230	633.72228	0.00000	-0.17403	0.0481	-8.39852	-4.09632	0.00000	0.00038
134	D	841.6602	1.72121	1.37106	505.71570	641.94297	0.00000	-0.17365	0.0481	-8.54488	-4.12437	0.00000	0.00038

BETATRON FUNCTIONS OF ZZLB -- Low-beta Module, collision optics

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
135	BV1+	846.6602	1.72267	1.37226	594.82340	683.88802	0.00000	-0.17079	0.0481	-9.27666	-4.26464	0.00000	0.00076
136	#BV+	846.6602	1.72267	1.37226	594.82340	683.88802	0.00000	-0.17079	0.0481	-9.27666	-4.26464	0.00000	0.00076
137	D	847.6602	1.72293	1.37249	613.52308	692.44535	0.00000	-0.17003	0.0481	-9.42302	-4.29269	0.00000	0.00076
138	BV1+	852.6602	1.72413	1.37360	711.41219	736.07356	0.00000	-0.16527	0.0480	-10.15480	-4.43295	0.00000	0.00114
139	#BV+	852.6602	1.72413	1.37360	711.41219	736.07356	0.00000	-0.16527	0.0480	-10.15480	-4.43295	0.00000	0.00114
140	DLV1	988.8248	1.73447	1.38972	6190.43406	2463.46999	0.00000	-0.00969	0.0480	-30.08342	-8.25314	0.00000	0.00114
141	BV1-	993.8248	1.73459	1.39004	6494.92720	2546.70242	0.00000	-0.00493	0.0480	-30.81521	-8.39335	0.00000	0.00076
142	#BV-	993.8248	1.73459	1.39004	6494.92720	2546.70242	0.00000	-0.00493	0.0480	-30.81521	-8.39335	0.00000	0.00076
143	D	994.8248	1.73462	1.39010	6556.70397	2563.51717	0.00000	-0.00416	0.0480	-30.96156	-8.42140	0.00000	0.00076
144	BV1-	999.8248	1.73474	1.39041	6869.97852	2648.43217	0.00000	-0.00131	0.0480	-31.69335	-8.56160	0.00000	0.00038
145	#BV-	999.8248	1.73474	1.39041	6869.97852	2648.43217	0.00000	-0.00131	0.0480	-31.69335	-8.56160	0.00000	0.00038
146	D	1000.8248	1.73476	1.39047	6933.51157	2665.58342	0.00000	-0.00093	0.0480	-31.83970	-8.58965	0.00000	0.00038
147	BV1-	1005.8248	1.73487	1.39076	7255.56753	2752.18093	0.00000	0.00003	0.0480	-32.57149	-8.72985	0.00000	0.00000
148	#BV-	1005.8248	1.73487	1.39076	7255.56753	2752.18093	0.00000	0.00003	0.0480	-32.57149	-8.72985	0.00000	0.00000
149	D3	1012.8248	1.73502	1.39116	7718.73985	2875.77346	0.00000	0.00003	0.0480	-33.59599	-8.92623	0.00000	0.00000
150	QL3a	1019.4736	1.73516	1.39150	7073.16997	3440.82760	0.00000	0.00003	0.0480	125.99637	-80.09138	0.00000	0.00000
151	#QL3	1019.4736	1.73516	1.39150	7073.16997	3440.82760	0.00000	0.00003	0.0480	125.99637	-80.09138	0.00000	0.00000
152	QL3a	1026.1224	1.73534	1.39176	4679.70916	5215.78998	0.00000	0.00004	0.0480	216.57955	-199.53299	0.00000	0.00000
153	O	1026.9224	1.73537	1.39178	4339.59700	5539.92816	0.00000	0.00004	0.0480	208.56064	-205.63974	0.00000	0.00000
154	QL2a	1032.5707	1.73564	1.39192	2629.15167	7353.53292	0.00000	0.00004	0.0480	105.14083	-103.74810	0.00000	0.00000
155	#QL2	1032.5707	1.73564	1.39192	2629.15167	7353.53292	0.00000	0.00004	0.0480	105.14083	-103.74810	0.00000	0.00000
156	QL2a	1038.2190	1.73606	1.39204	1788.48772	7717.97783	0.00000	0.00004	0.0480	49.03979	41.57644	0.00000	0.00000
157	O	1039.0190	1.73613	1.39205	1710.88500	7651.59895	0.00000	0.00004	0.0480	47.96361	41.39716	0.00000	0.00000
158	QL2a	1044.6673	1.73673	1.39218	1365.98528	6423.14255	0.00000	0.00004	0.0480	15.29216	168.16861	0.00000	0.00000
159	#QL2	1044.6673	1.73673	1.39218	1365.98528	6423.14255	0.00000	0.00004	0.0480	15.29216	168.16861	0.00000	0.00000
160	QL2a	1050.3156	1.73741	1.39235	1339.83997	4121.12873	0.00000	0.00003	0.0480	-10.49703	224.53828	0.00000	0.00000
161	O	1051.1156	1.73750	1.39238	1356.68832	3769.69733	0.00000	0.00003	0.0480	-10.56342	214.75097	0.00000	0.00000
162	QL1a	1058.2453	1.73834	1.39285	1270.16802	1696.08466	0.00000	0.00002	0.0480	21.98147	92.88113	0.00000	0.00000
163	#QL1	1058.2453	1.73834	1.39285	1270.16802	1696.08466	0.00000	0.00002	0.0480	21.98147	92.88113	0.00000	0.00000
164	QL1a	1065.3750	1.73944	1.39385	800.50250	800.41684	0.00000	0.00001	0.0480	40.00013	39.99623	0.00000	0.00000
165	DL0	1085.3750	1.98546	1.63993	0.50000	0.50004	0.00000	0.00000	0.0480	-0.00001	-0.00039	0.00000	0.00000
166	#IPL	1085.3750	1.98546	1.63993	0.50000	0.50004	0.00000	0.00000	0.0480	-0.00001	-0.00039	0.00000	0.00000
167	DL0	1105.3750	2.23148	1.88589	800.50312	800.44780	0.00000	-0.00002	0.0480	-40.00015	-39.99700	0.00000	0.00000
168	QL1b	1112.5047	2.23248	1.88699	1696.25916	1270.07428	0.00000	-0.00002	0.0480	-92.89030	-21.97945	0.00000	0.00000
169	#1QL	1112.5047	2.23248	1.88699	1696.25916	1270.07428	0.00000	-0.00002	0.0480	-92.89030	-21.97945	0.00000	0.00000
170	QL1b	1119.6344	2.23294	1.88782	3770.07659	1356.58252	0.00000	-0.00002	0.0480	-214.77218	10.56299	0.00000	0.00000
171	O	1120.4344	2.23298	1.88792	4121.54269	1339.73484	0.00000	-0.00002	0.0480	-224.56044	10.49660	0.00000	0.00000
172	QL2b	1126.0827	2.23315	1.88860	6423.78230	1365.87350	0.00000	-0.00002	0.0480	-168.18496	-15.29052	0.00000	0.00000
173	#2QL	1126.0827	2.23315	1.88860	6423.78230	1365.87350	0.00000	-0.00002	0.0480	-168.18496	-15.29052	0.00000	0.00000
174	QL2b	1131.7310	2.23327	1.88919	7652.35631	1710.73990	0.00000	-0.00002	0.0480	-41.40086	-47.95915	0.00000	0.00000
175	O	1132.5310	2.23329	1.88927	7718.74113	1788.33539	0.00000	-0.00002	0.0480	-41.58016	-49.03521	0.00000	0.00000
176	QL2b	1138.1793	2.23341	1.88969	7354.25593	2628.92222	0.00000	-0.00003	0.0480	103.75869	-105.13126	0.00000	0.00000
177	#2QL	1138.1793	2.23341	1.88969	7354.25593	2628.92222	0.00000	-0.00003	0.0480	103.75869	-105.13126	0.00000	0.00000
178	QL2b	1143.8276	2.23355	1.88996	5540.46907	4339.21245	0.00000	-0.00003	0.0480	205.66021	-208.54176	0.00000	0.00000
179	O	1144.6276	2.23357	1.88999	5216.29864	4679.29381	0.00000	-0.00004	0.0480	199.55284	-216.55993	0.00000	0.00000

BETATRON FUNCTIONS OF ZZLB -- Low-beta Module, collision optics

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
180	QL3b	1151.2764	2.23382	1.89017	3441.15882	7072.53589	0.00000	-0.00004	0.0480	80.09949	-125.98468	0.00000	0.00000
181	#3QL	1151.2764	2.23382	1.89017	3441.15882	7072.53589	0.00000	-0.00004	0.0480	80.09949	-125.98468	0.00000	0.00000
182	QL3b	1157.9252	2.23417	1.89031	2876.04538	7718.04255	0.00000	-0.00005	0.0480	8.92746	33.59335	0.00000	0.00000
183	D3	1164.9252	2.23457	1.89046	2752.43578	7254.90672	0.00000	-0.00004	0.0480	8.73105	32.56892	0.00000	0.00000
184	#BV+	1164.9252	2.23457	1.89046	2752.43578	7254.90672	0.00000	-0.00004	0.0480	8.73105	32.56892	0.00000	0.00000
185	BV1+	1169.9252	2.23486	1.89057	2665.82676	6932.87522	0.00000	0.00091	0.0480	8.59075	31.83738	0.00000	0.00038
186	D	1170.9252	2.23492	1.89059	2648.67331	6869.34680	0.00000	0.00129	0.0480	8.56269	31.69103	0.00000	0.00038
187	#BV+	1170.9252	2.23492	1.89059	2648.67331	6869.34680	0.00000	0.00129	0.0480	8.56269	31.69103	0.00000	0.00038
188	BV1+	1175.9252	2.23522	1.89071	2563.74785	6556.09423	0.00000	0.00415	0.0480	8.42240	30.95948	0.00000	0.00076
189	D	1176.9252	2.23529	1.89074	2546.93111	6494.32163	0.00000	0.00491	0.0480	8.39434	30.81313	0.00000	0.00076
190	#BV+	1176.9252	2.23529	1.89074	2546.93111	6494.32163	0.00000	0.00491	0.0480	8.39434	30.81313	0.00000	0.00076
191	BV1+	1181.9252	2.23560	1.89086	2463.68920	6189.84821	0.00000	0.00967	0.0480	8.25404	30.08155	0.00000	0.00114
192	DLV1	1318.0898	2.25172	1.90120	736.11281	711.25532	0.00000	0.16528	0.0480	4.43337	10.15352	0.00000	0.00114
193	#BV-	1318.0898	2.25172	1.90120	736.11281	711.25532	0.00000	0.16528	0.0480	4.43337	10.15352	0.00000	0.00114
194	BV1-	1323.0898	2.25284	1.90240	692.48060	613.37882	0.00000	0.17004	0.0480	4.29307	9.42178	0.00000	0.00076
195	D	1324.0898	2.25307	1.90266	683.92252	594.68162	0.00000	0.17080	0.0480	4.26501	9.27542	0.00000	0.00076
196	#BV-	1324.0898	2.25307	1.90266	683.92252	594.68162	0.00000	0.17080	0.0480	4.26501	9.27542	0.00000	0.00076
197	BV1-	1329.0898	2.25427	1.90412	641.97386	505.58613	0.00000	0.17366	0.0479	4.12472	8.54367	0.00000	0.00038
198	D	1330.0898	2.25452	1.90444	633.75249	488.64514	0.00000	0.17404	0.0479	4.09666	8.39732	0.00000	0.00038
199	#BV-	1330.0898	2.25452	1.90444	633.75249	488.64514	0.00000	0.17404	0.0479	4.09666	8.39732	0.00000	0.00038
200	BV1-	1335.0898	2.25582	1.90622	593.48739	408.33072	0.00000	0.17499	0.0478	3.95636	7.66556	0.00000	0.00000
201	DL3	1360.5730	2.26404	1.92517	410.06766	112.68633	0.00000	0.17500	0.0478	3.24132	3.93600	0.00000	0.00000
202	OOV	1364.9480	2.26580	1.93246	382.24315	81.04763	0.00000	0.17500	0.0478	3.11857	3.29570	0.00000	0.00000
203	QVF	1370.9980	2.26857	1.94735	302.57353	53.93752	0.00000	0.18610	0.0478	9.49441	1.37122	0.00000	0.00371
204	#QVF	1370.9980	2.26857	1.94735	302.57353	53.93752	0.00000	0.18610	0.0478	9.49441	1.37122	0.00000	0.00371
205	QVF	1377.0480	2.27272	1.96735	171.22555	45.01726	0.00000	0.22080	0.0478	11.30008	0.16438	0.00000	0.00788
206	O	1377.8480	2.27350	1.97019	153.62645	44.76885	0.00000	0.22710	0.0478	10.69880	0.14613	0.00000	0.00788
207	QVD	1383.8980	2.28360	1.99296	61.84556	38.55827	0.00000	0.25971	0.0478	5.10098	0.83711	0.00000	0.00278
208	#QVD	1383.8980	2.28360	1.99296	61.84556	38.55827	0.00000	0.25971	0.0478	5.10098	0.83711	0.00000	0.00278
209	QVD	1389.9480	2.31199	2.02282	19.59199	26.16371	0.00000	0.26005	0.0478	2.17283	1.12515	0.00000	-0.00267
210	OOV	1394.3230	2.37713	2.05515	6.16910	17.97638	0.00000	0.24838	0.0478	0.89526	0.74624	0.00000	-0.00267
211	OOV	1398.6980	2.55146	2.10116	3.92500	13.10447	0.00000	0.23672	0.0478	-0.38232	0.36734	0.00000	-0.00267
212	QVD	1404.7480	2.67198	2.18548	20.60476	10.48499	0.00000	0.20621	0.0478	-2.48905	0.04737	0.00000	-0.00731
213	#QVD	1404.7480	2.67198	2.18548	20.60476	10.48499	0.00000	0.20621	0.0478	-2.48905	0.04737	0.00000	-0.00731
214	QVD	1410.7980	2.69811	2.27383	69.32769	12.05168	0.00000	0.15010	0.0478	-5.89845	-0.29540	0.00000	-0.01104
215	O	1411.5980	2.69983	2.28418	79.09562	12.58206	0.00000	0.14127	0.0478	-6.31146	-0.36757	0.00000	-0.01104
216	QVF	1417.6480	2.70827	2.34401	157.83426	22.50016	0.00000	0.08200	0.0478	-6.15412	-1.33979	0.00000	-0.00875
217	#QVF	1417.6480	2.70827	2.34401	157.83426	22.50016	0.00000	0.08200	0.0478	-6.15412	-1.33979	0.00000	-0.00875
218	QVF	1423.6980	2.71338	2.37417	215.87377	47.78677	0.00000	0.03313	0.0478	-3.03446	-3.01321	0.00000	-0.00757
219	OOV	1428.0730	2.71642	2.38557	243.33041	78.18965	0.00000	0.00000	0.0478	-3.24134	-3.93601	0.00000	-0.00757
220	OOV	1432.4480	2.71912	2.39287	272.59724	116.66703	0.00000	-0.03312	0.0478	-3.44822	-4.85882	0.00000	-0.00757
221	QVF	1438.4980	2.72253	2.39924	279.77199	203.81626	0.00000	-0.08199	0.0478	2.31234	-10.14365	0.00000	-0.00875
222	#QVF	1438.4980	2.72253	2.39924	279.77199	203.81626	0.00000	-0.08199	0.0478	2.31234	-10.14365	0.00000	-0.00875
223	QVF	1444.5480	2.72633	2.40276	221.20437	383.20345	0.00000	-0.14126	0.0478	6.95985	-20.73728	0.00000	-0.01104
224	O	1445.3480	2.72692	2.40308	210.21165	417.10299	0.00000	-0.15010	0.0478	6.78105	-21.63714	0.00000	-0.01104

BETATRON FUNCTIONS OF ZZLB -- Low-beta Module, collision optics

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
225	QVD	1451.3980	2.73233	2.40489	157.15454	646.83443	0.00000	-0.20621	0.0478	2.35256	-14.73302	0.00000	-0.00731
226	#QVD	1451.3980	2.73233	2.40489	157.15454	646.83443	0.00000	-0.20621	0.0478	2.35256	-14.73302	0.00000	-0.00731
227	QVD	1457.4480	2.73877	2.40625	148.39525	744.55118	0.00000	-0.23671	0.0478	-0.84468	-0.73710	0.00000	-0.00267
228	OOV	1461.8230	2.74334	2.40718	156.00719	751.04047	0.00000	-0.24838	0.0478	-0.89520	-0.74617	0.00000	-0.00267
229	OOV	1466.1980	2.74770	2.40811	164.06116	757.60912	0.00000	-0.26004	0.0478	-0.94571	-0.75524	0.00000	-0.00267
230	QVD	1472.2480	2.75315	2.40943	198.39253	674.90492	0.00000	-0.25970	0.0478	-4.96432	13.84863	0.00000	0.00278
231	#QVD	1472.2480	2.75315	2.40943	198.39253	674.90492	0.00000	-0.25970	0.0478	-4.96432	13.84863	0.00000	0.00278
232	QVD	1478.2980	2.75721	2.41114	294.50466	449.81691	0.00000	-0.22710	0.0478	-11.58107	21.78640	0.00000	0.00788
233	O	1479.0980	2.75763	2.41143	313.32801	415.63542	0.00000	-0.22079	0.0478	-11.94812	20.94046	0.00000	0.00788
234	QVF	1485.1480	2.76022	2.41458	424.50139	235.25050	0.00000	-0.18609	0.0478	-5.65240	10.11223	0.00000	0.00371
235	#QVF	1485.1480	2.76022	2.41458	424.50139	235.25050	0.00000	-0.18609	0.0478	-5.65240	10.11223	0.00000	0.00371
236	QVF	1491.1980	2.76240	2.41981	438.95528	149.92458	0.00000	-0.17500	0.0478	3.36412	4.57636	0.00000	0.00000
237	D4	1492.7533	2.76297	2.42155	428.55838	136.04298	0.00000	-0.17500	0.0478	3.32048	4.34871	0.00000	0.00000
238	#BV+	1492.7533	2.76297	2.42155	428.55838	136.04298	0.00000	-0.17500	0.0478	3.32048	4.34871	0.00000	0.00000
239	BV2+	1509.2933	2.77001	2.46173	326.39350	32.22744	0.00000	-0.16144	0.0475	2.85636	1.92791	0.00000	0.00164
240	D	1510.2933	2.77051	2.46698	320.70885	28.51797	0.00000	-0.15980	0.0475	2.82830	1.78155	0.00000	0.00164
241	BV2+	1526.8333	2.78010	2.72610	234.82535	9.62452	0.00000	-0.11912	0.0473	2.36418	-0.63927	0.00000	0.00328
242	#BV+	1526.8333	2.78010	2.72610	234.82535	9.62452	0.00000	-0.11912	0.0473	2.36418	-0.63927	0.00000	0.00328
243	DLV2	1546.1180	2.79627	2.84082	154.07640	88.71216	0.00000	-0.05588	0.0473	1.82304	-3.46180	0.00000	0.00328
244	#BV-	1546.1180	2.79627	2.84082	154.07640	88.71216	0.00000	-0.05588	0.0473	1.82304	-3.46180	0.00000	0.00328
245	BV2-	1562.6580	2.81739	2.85877	101.44687	243.26843	0.00000	-0.01520	0.0474	1.35892	-5.88259	0.00000	0.00164
246	D	1563.6580	2.81898	2.85941	98.75710	255.17996	0.00000	-0.01356	0.0474	1.33086	-6.02895	0.00000	0.00164
247	BV2-	1580.1980	2.85276	2.86682	62.40895	494.65637	0.00000	0.00000	0.0474	0.86673	-8.44966	0.00000	0.00000
248	#BV-	1580.1980	2.85276	2.86682	62.40895	494.65637	0.00000	0.00000	0.0474	0.86673	-8.44966	0.00000	0.00000
249	D	1581.1980	2.85535	2.86714	60.70354	511.70206	0.00000	0.00000	0.0474	0.83867	-8.59602	0.00000	0.00000
250	QL4b	1586.2577	2.86916	2.86863	57.70109	555.88222	0.00000	0.00000	0.0474	-0.22880	0.10939	0.00000	0.00000
251	#4QL	1586.2577	2.86916	2.86863	57.70109	555.88222	0.00000	0.00000	0.0474	-0.22880	0.10939	0.00000	0.00000
252	QL4b	1591.3174	2.88245	2.87012	65.59700	509.60967	0.00000	0.00000	0.0474	-1.37508	8.77917	0.00000	0.00000
253	DL45	1594.1129	2.88885	2.87104	73.62946	461.72259	0.00000	0.00000	0.0474	-1.49828	8.35089	0.00000	0.00000
254	QL5b	1599.9504	2.90025	2.87326	89.26674	385.45575	0.00000	0.00000	0.0474	-1.14502	4.88618	0.00000	0.00000
255	#5QL	1599.9504	2.90025	2.87326	89.26674	385.45575	0.00000	0.00000	0.0474	-1.14502	4.88618	0.00000	0.00000
256	QL5b	1605.7879	2.91004	2.87582	99.66502	344.59298	0.00000	0.00000	0.0474	-0.61269	2.20607	0.00000	0.00000
257	DL56	1711.9300	3.00115	2.99767	385.20285	68.08698	0.00000	0.00000	0.0474	-2.07746	0.39899	0.00000	0.00000
258	QL6b	1714.0640	3.00203	3.00269	388.40342	67.45233	0.00000	0.00000	0.0474	0.58501	-0.10012	0.00000	0.00000
259	#6QL	1714.0640	3.00203	3.00269	388.40342	67.45233	0.00000	0.00000	0.0474	0.58501	-0.10012	0.00000	0.00000
260	QL6b	1716.1980	3.00291	3.00769	380.25814	68.95002	0.00000	0.00000	0.0474	3.21320	-0.60515	0.00000	0.00000
261	OG4	1720.2173	3.00465	3.01664	354.90933	74.13477	0.00000	0.00000	0.0474	3.09350	-0.68479	0.00000	0.00000
262	B	1736.7573	3.01331	3.04706	260.72304	102.20843	0.01356	0.00000	0.0474	2.60095	-1.01253	0.00164	0.00000
263	O	1737.5573	3.01380	3.04830	256.58058	103.84115	0.01487	0.00000	0.0474	2.57713	-1.02838	0.00164	0.00000
264	B	1754.0973	3.02608	3.06995	179.47629	143.28055	0.05555	0.00000	0.0474	2.08456	-1.35611	0.00328	0.00000
265	O	1754.8973	3.02679	3.07083	176.16006	145.46300	0.05818	0.00000	0.0474	2.06073	-1.37196	0.00328	0.00000
266	B	1771.4373	3.04524	3.08643	116.13863	196.26813	0.12598	0.00000	0.0476	1.56813	-1.69969	0.00492	0.00000
267	O	1772.2373	3.04635	3.08708	113.64867	199.00032	0.12991	0.00000	0.0476	1.54431	-1.71554	0.00492	0.00000
268	B	1788.7773	3.07588	3.09864	70.71078	261.17118	0.22483	0.00000	0.0479	1.05169	-2.04328	0.00656	0.00000
269	OOG4	1796.9896	3.09682	3.10334	55.44589	296.06726	0.27869	0.00000	0.0479	0.80710	-2.20600	0.00656	0.00000

BETATRON FUNCTIONS OF ZZLB -- Low-beta Module, collision optics

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
270	QSD	1799.4375	3.10405	3.10464	52.76683	300.79650	0.29767	0.00000	0.0479	0.29480	0.28733	0.00897	0.00000
271	#QSD	1799.4375	3.10405	3.10464	52.76683	300.79650	0.29767	0.00000	0.0479	0.29480	0.28733	0.00897	0.00000
272	QSD	1801.8855	3.11148	3.10594	52.51961	293.29219	0.32277	0.00000	0.0479	-0.19311	2.75720	0.01157	0.00000
273	OG3	1805.9197	3.12350	3.10822	54.39915	271.52335	0.36946	0.00000	0.0479	-0.27279	2.63888	0.01157	0.00000
274	B	1822.4597	3.16706	3.11975	68.82608	192.25307	0.57443	0.00000	0.0486	-0.59945	2.15376	0.01321	0.00000
275	O	1823.2597	3.16890	3.12042	69.79785	188.82582	0.58500	0.00000	0.0486	-0.61525	2.13030	0.01321	0.00000
276	B	1839.7997	3.20136	3.13749	95.55338	126.37920	0.81709	0.00000	0.0498	-0.94191	1.64519	0.01485	0.00000
277	O	1840.5997	3.20268	3.13851	97.07308	123.76566	0.82897	0.00000	0.0498	-0.95771	1.62173	0.01485	0.00000
278	B	1857.1397	3.22583	3.16541	134.15693	78.14271	1.08818	0.00000	0.0514	-1.28436	1.13661	0.01649	0.00000
279	O	1857.9397	3.22677	3.16706	136.22454	76.34289	1.10137	0.00000	0.0514	-1.30016	1.11315	0.01649	0.00000
280	B	1874.4797	3.24340	3.21132	184.63629	47.54360	1.38770	0.00000	0.0534	-1.62679	0.62804	0.01813	0.00000
281	OOG3	1882.6771	3.24999	3.24172	212.63429	39.21788	1.53632	0.00000	0.0534	-1.78868	0.38761	0.01813	0.00000
282	QSF	1885.1250	3.25179	3.25181	217.05046	38.28236	1.56480	0.00000	0.0534	-0.00297	-0.00284	0.00509	0.00000
283	#QSF	1885.1250	3.25179	3.25181	217.05046	38.28236	1.56480	0.00000	0.0534	-0.00297	-0.00284	0.00509	0.00000
284	QSF	1887.5730	3.25360	3.26191	212.66301	39.24603	1.56118	0.00000	0.0534	1.78298	-0.39352	-0.00805	0.00000
285	OG2	1891.2765	3.25646	3.27635	199.72601	42.56443	1.53137	0.00000	0.0534	1.71020	-0.50250	-0.00805	0.00000
286	B	1907.8165	3.27177	3.32637	148.52800	67.23723	1.41182	0.00000	0.0558	1.38520	-0.98921	-0.00641	0.00000
287	O	1908.6165	3.27263	3.32825	146.32426	68.83880	1.40670	0.00000	0.0558	1.36948	-1.01275	-0.00641	0.00000
288	B	1925.1565	3.29379	3.35863	106.39762	110.39062	1.31427	0.00000	0.0580	1.04446	-1.49945	-0.00477	0.00000
289	O	1925.9565	3.29500	3.35977	104.73906	112.80858	1.31045	0.00000	0.0580	1.02874	-1.52300	-0.00477	0.00000
290	B	1942.4965	3.32466	3.37875	76.08425	171.23942	1.24513	0.00000	0.0601	0.70371	-2.00970	-0.00313	0.00000
291	O	1943.2965	3.32634	3.37949	74.97088	174.47378	1.24263	0.00000	0.0601	0.68799	-2.03324	-0.00313	0.00000
292	B	1959.8365	3.36684	3.39211	57.58821	249.78364	1.20443	0.00000	0.0621	0.36296	-2.51995	-0.00149	0.00000
293	OOG2	1968.3646	3.39155	3.39711	52.82685	294.90456	1.19173	0.00000	0.0621	0.19536	-2.77090	-0.00149	0.00000
294	QSD	1970.8125	3.39893	3.39841	53.06869	302.44272	1.20033	0.00000	0.0621	-0.29483	-0.28736	0.00853	0.00000
295	#QSD	1970.8125	3.39893	3.39841	53.06869	302.44272	1.20033	0.00000	0.0621	-0.29483	-0.28736	0.00853	0.00000
296	QSD	1973.2605	3.40612	3.39971	55.75344	297.67990	1.23364	0.00000	0.0621	-0.80941	2.21965	0.01873	0.00000
297	OG1	1977.8299	3.41833	3.40224	63.77032	277.81071	1.31922	0.00000	0.0621	-0.94506	2.12867	0.01873	0.00000
298	B	1994.3699	3.45102	3.41307	103.15419	212.84118	1.64256	0.00000	0.0645	-1.43607	1.79936	0.02037	0.00000
299	O	1995.1699	3.45224	3.41367	105.47089	209.97495	1.65886	0.00000	0.0645	-1.45981	1.78343	0.02037	0.00000
300	B	2011.7099	3.47244	3.42822	161.88255	156.42597	2.00931	0.00000	0.0676	-1.95080	1.45412	0.02201	0.00000
301	O	2012.5099	3.47322	3.42904	165.02283	154.11213	2.02692	0.00000	0.0676	-1.97455	1.43819	0.02201	0.00000
302	B	2029.0499	3.48650	3.44913	238.46166	111.98371	2.40449	0.00000	0.0712	-2.46552	1.10888	0.02365	0.00000
303	O	2029.8499	3.48703	3.45028	242.42548	110.22225	2.42340	0.00000	0.0712	-2.48927	1.09295	0.02365	0.00000
304	B	2046.3899	3.49631	3.47854	332.89064	79.51440	2.82809	0.00000	0.0755	-2.98021	0.76363	0.02529	0.00000
305	DOG1	2051.0171	3.49843	3.48822	361.10622	72.87372	2.94509	0.00000	0.0755	-3.11756	0.67151	0.02529	0.00000
306	QFC	2052.0171	3.49887	3.49043	367.37103	71.55061	2.97038	0.00000	0.0755	-3.14725	0.65160	0.02529	0.00000
307	SF	2052.0171	3.49887	3.49043	367.37103	71.55061	2.97038	0.00000	0.0755	-3.14725	0.65160	0.02529	0.00000
308	QFC	2053.0171	3.49930	3.49267	373.69520	70.26733	2.99567	0.00000	0.0755	-3.17693	0.63169	0.02529	0.00000
309	OPM	2054.0521	3.49973	3.49504	380.30325	68.98107	3.02184	0.00000	0.0755	-3.20765	0.61108	0.02529	0.00000
310	QSF	2056.5000	3.50074	3.50077	388.20938	67.49534	3.05253	0.00000	0.0755	0.00011	0.00000	-0.00025	0.00000
311	#QSF	2056.5000	3.50074	3.50077	388.20938	67.49534	3.05253	0.00000	0.0755	0.00011	0.00000	-0.00025	0.00000
312	#QF	2056.5000	3.50074	3.50077	388.20938	67.49534	3.05253	0.00000	0.0755	0.00011	0.00000	-0.00025	0.00000
313	QF	2058.3200	3.50149	3.50504	383.82507	68.31409	3.03476	0.00000	0.0755	2.39972	-0.45156	-0.01926	0.00000
314	O	2059.1200	3.50183	3.50690	379.99679	69.04787	3.01935	0.00000	0.0755	2.38564	-0.46566	-0.01926	0.00000

BETATRON FUNCTIONS OF ZZLB -- Low-beta Module, collision optics

POS	S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
315 B	2075.6600	3.50955	3.54068	305.89628	89.27313	2.71433	0.00000	0.0802	2.09444	-0.75715	-0.01762	0.00000
316 O	2076.4600	3.50997	3.54210	302.55645	90.49585	2.70023	0.00000	0.0802	2.08035	-0.77125	-0.01762	0.00000
317 B	2093.0000	3.51977	3.56738	238.55522	120.82987	2.42232	0.00000	0.0844	1.78913	-1.06273	-0.01598	0.00000
318 O	2093.8000	3.52031	3.56842	235.70388	122.54152	2.40953	0.00000	0.0844	1.77504	-1.07683	-0.01598	0.00000
319 B	2110.3400	3.53304	3.58709	181.80264	162.98431	2.15873	0.00000	0.0881	1.48380	-1.36832	-0.01434	0.00000
320 O	2111.1400	3.53375	3.58787	179.43983	165.18490	2.14726	0.00000	0.0881	1.46971	-1.38242	-0.01434	0.00000
321 B	2127.6800	3.55065	3.60183	135.63919	215.73645	1.92357	0.00000	0.0914	1.17845	-1.67390	-0.01270	0.00000
322 O	2128.4800	3.55160	3.60242	133.76494	218.42597	1.91341	0.00000	0.0914	1.16436	-1.68800	-0.01270	0.00000
323 B	2145.0200	3.57443	3.61309	100.06540	279.08628	1.71684	0.00000	0.0944	0.87309	-1.97949	-0.01106	0.00000
324 O	2145.8200	3.57571	3.61354	98.67972	282.26474	1.70799	0.00000	0.0944	0.85900	-1.99359	-0.01106	0.00000
325 B	2162.3600	3.60648	3.62189	75.08165	353.03381	1.53853	0.00000	0.0971	0.56772	-2.28507	-0.00943	0.00000
326 OOC	2165.8950	3.61418	3.62344	71.28792	369.40951	1.50521	0.00000	0.0971	0.50547	-2.34737	-0.00943	0.00000
327 QDC	2166.8950	3.61642	3.62387	70.29460	374.12188	1.49579	0.00000	0.0971	0.48785	-2.36500	-0.00943	0.00000
328 SD	2166.8950	3.61642	3.62387	70.29460	374.12188	1.49579	0.00000	0.0971	0.48785	-2.36500	-0.00943	0.00000
329 QDC	2167.8950	3.61870	3.62429	69.33651	378.86949	1.48636	0.00000	0.0971	0.47024	-2.38262	-0.00943	0.00000
330 OPM	2168.9300	3.62110	3.62473	68.38197	383.82039	1.47661	0.00000	0.0971	0.45201	-2.40086	-0.00943	0.00000
331 QD	2170.7500	3.62537	3.62548	67.56230	388.20889	1.46781	0.00000	0.0971	0.00006	-0.00127	-0.00025	0.00000
332 #QD	2170.7500	3.62537	3.62548	67.56230	388.20889	1.46781	0.00000	0.0971	0.00006	-0.00127	-0.00025	0.00000
333 QD	2172.5700	3.62964	3.62622	68.38155	383.82958	1.47571	0.00000	0.0971	-0.45190	2.39837	0.00893	0.00000
334 O	2173.3700	3.63149	3.62656	69.11586	380.00344	1.48285	0.00000	0.0971	-0.46599	2.38430	0.00893	0.00000
335 B	2189.9100	3.66524	3.63428	89.34811	305.94340	1.64409	0.00000	0.0996	-0.75724	2.09333	0.01057	0.00000
336 O	2190.7100	3.66665	3.63470	90.57097	302.60532	1.65254	0.00000	0.0996	-0.77133	2.07926	0.01057	0.00000
337 B	2207.2500	3.69192	3.64450	120.90394	238.63597	1.84090	0.00000	0.1025	-1.06258	1.78829	0.01221	0.00000
338 O	2208.0500	3.69296	3.64504	122.61535	235.78596	1.85066	0.00000	0.1025	-1.07667	1.77422	0.01221	0.00000
339 B	2224.5900	3.71162	3.65776	163.04870	181.90729	2.06613	0.00000	0.1057	-1.36791	1.48326	0.01385	0.00000
340 O	2225.3900	3.71240	3.65847	165.24862	179.54534	2.07721	0.00000	0.1057	-1.38200	1.46918	0.01385	0.00000
341 B	2241.9300	3.72636	3.67536	215.78190	135.75736	2.31979	0.00000	0.1093	-1.67322	1.17822	0.01549	0.00000
342 O	2242.7300	3.72694	3.67630	218.47031	133.88348	2.33218	0.00000	0.1093	-1.68731	1.16414	0.01549	0.00000
343 B	2259.2700	3.73761	3.69911	279.10294	100.18619	2.60188	0.00000	0.1133	-1.97851	0.87318	0.01713	0.00000
344 O	2260.0700	3.73807	3.70039	282.27983	98.80036	2.61558	0.00000	0.1133	-1.99260	0.85910	0.01713	0.00000
345 B	2276.6100	3.74641	3.73112	353.01113	75.19377	2.91239	0.00000	0.1179	-2.28378	0.56814	0.01876	0.00000
346 OOC	2280.1450	3.74797	3.73880	369.37747	71.39686	2.97872	0.00000	0.1179	-2.34602	0.50595	0.01876	0.00000
347 QFC	2281.1450	3.74839	3.74105	374.08712	70.40254	2.99748	0.00000	0.1179	-2.36363	0.48836	0.01876	0.00000
348 SF	2281.1450	3.74839	3.74105	374.08712	70.40254	2.99748	0.00000	0.1179	-2.36363	0.48836	0.01876	0.00000
349 QFC	2282.1450	3.74882	3.74333	378.83198	69.44341	3.01625	0.00000	0.1179	-2.38124	0.47077	0.01876	0.00000
350 OPM	2283.1800	3.74925	3.74571	383.78000	68.48777	3.03567	0.00000	0.1179	-2.39946	0.45256	0.01876	0.00000
351 QF	2285.0000	3.75000	3.74998	388.16386	67.66723	3.05253	0.00000	0.1179	-0.00013	-0.00001	-0.00025	0.00000
352 #QF	2285.0000	3.75000	3.74998	388.16386	67.66723	3.05253	0.00000	0.1179	-0.00013	-0.00001	-0.00025	0.00000
353 LDU	4570.0000	4.49998	4.49995	388.18755	67.58123	3.05253	-0.00003	0.2365	0.00002	0.00000	0.00025	0.00000
354 CF	4798.5000	4.74921	4.74916	388.18609	67.58123	3.05254	0.00002	0.2789	0.00000	0.00000	0.00025	0.00000
355 #QF	4798.5000	4.74921	4.74916	388.18609	67.58123	3.05254	0.00002	0.2789	0.00000	0.00000	0.00025	0.00000

CIRCUMFERENCE = 4798.5000 M THETX = 0.18364216 RAD NUX = 4.74921 DNUX/(DP/P) = -43.71963
RADIUS = 763.7050 M THETY = 0.00000000 RAD NUY = 4.74916 DNUY/(DP/P) = -43.71541
(DS/S)/(DP/P)= 0.0000581 TGAM=(131.15821, 0.00000)
MAXIMA --- BETX(175) = 7718.74113 BETY(182) = 7718.04255 XEQ(1) = 3.05254 YEQ(209) = 0.26005
MINIMA --- BETX(166) = 0.50000 BETY(166) = 0.50004 XEQ(149) = 0.00000 YEQ(229) = -0.26004

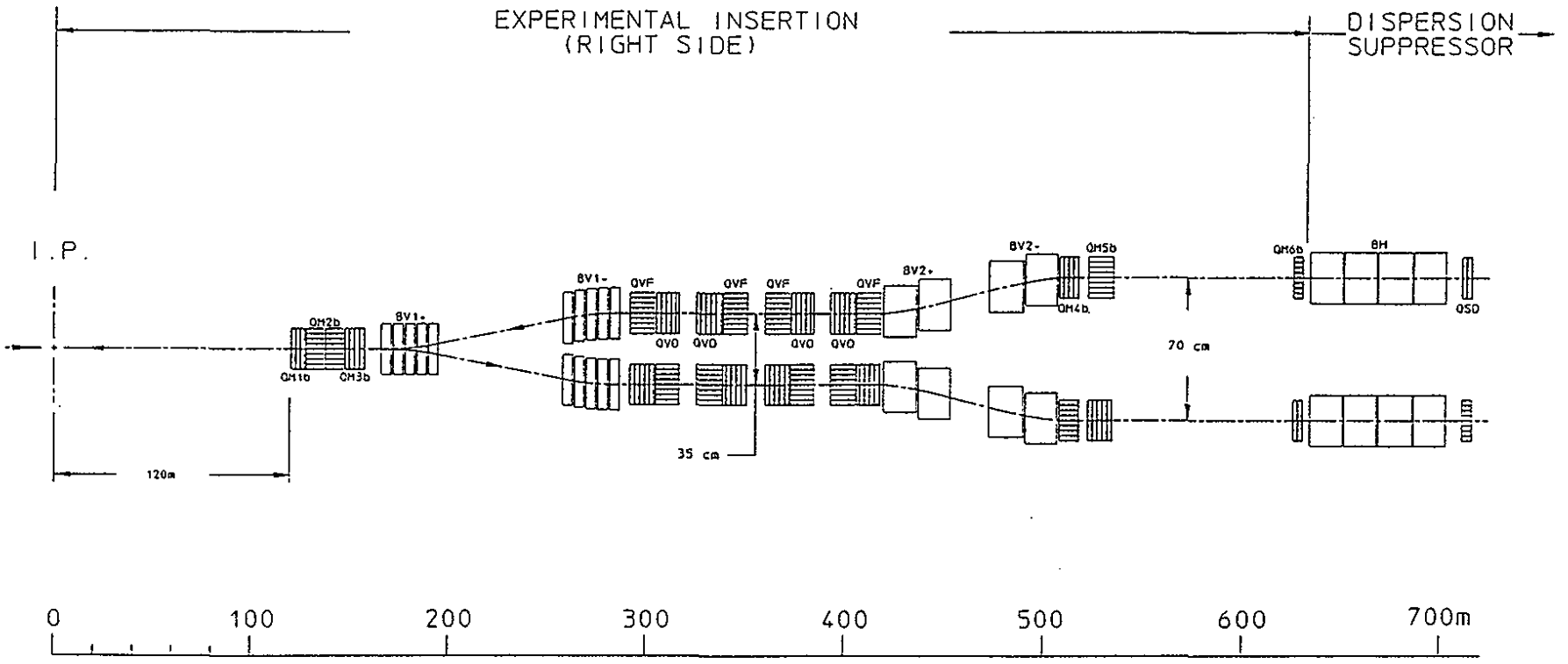


Figure 11. Elevation View of Medium-β IR (right side)

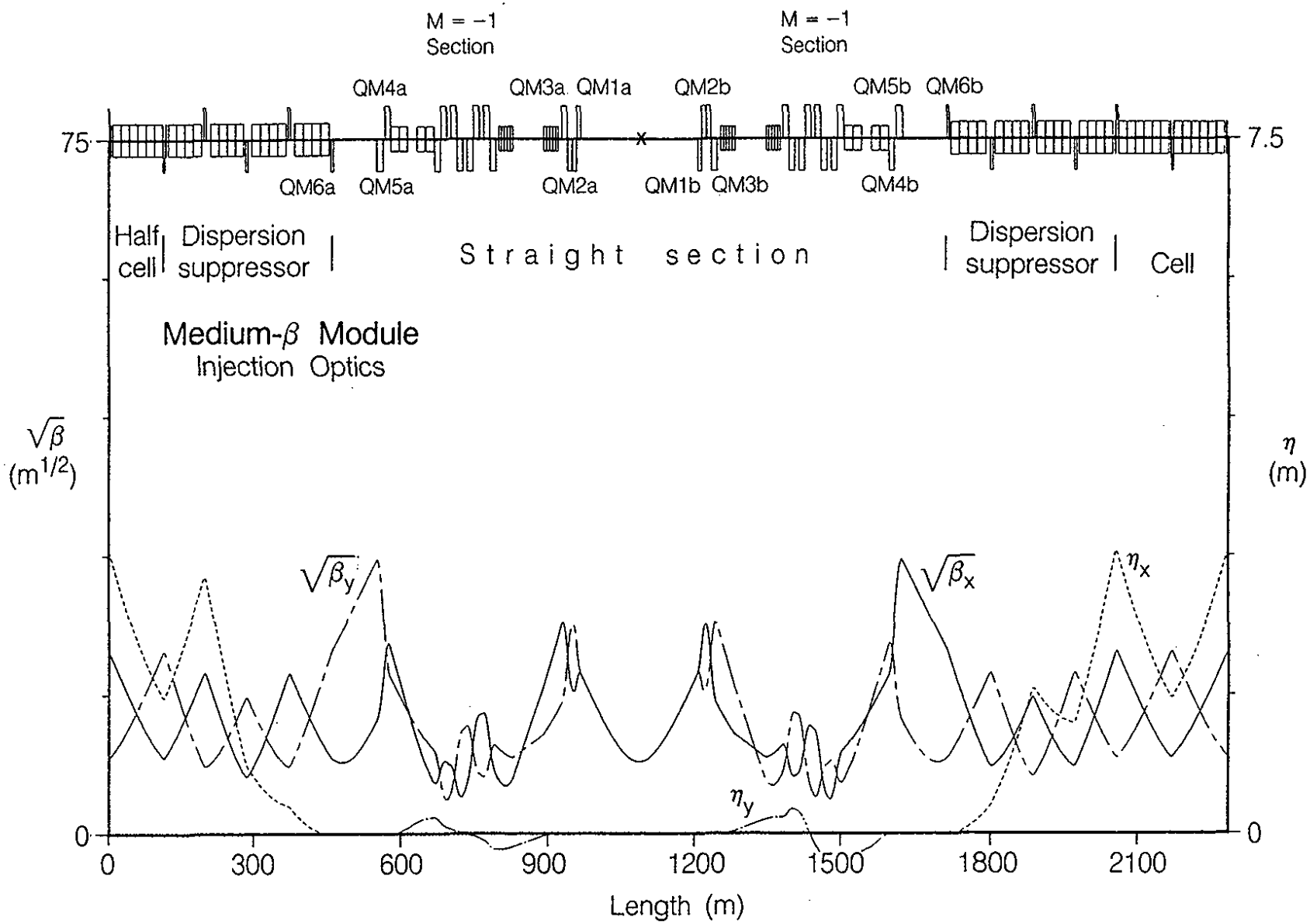


Figure 12. Medium-β Module; Injection Optics

MEDIUM-BETA MODULE

Injection optics:

```
***   BM*     =          //  60.
***   KM1     PARA       //  0.33375330   -2
***   KM2     PARA       //  -.34236200   -2
***   KM3     PARA       //  0.34514668   -2
***   KM4     PARA       //  0.34344617   -2
***   KM5     PARA       //  -.25087127   -2
***   KM6     PARA       //  -.67338532   -3

***           CALL       //  SRSM

***   MDU     MMM        //  .MDU

***           PRNT       //  LQM1 LQM2 LQM3 LQM4 LQM5 LQM6
  *                      //  DM0  O    D    D3   D4   LM34 DM45 DM56
  *                      //  LSSH LMM1 LM46 M341 L343 DMV1 DM3
  *                      //  KM1  KM2  KM3  KM4  KM5  KM6
```

LQM1	LQM2	LQM3	LQM4	LQM5	LQM6
3.776200000	4.372200000	5.648300000	5.356900000	6.409500000	2.447950000
DM0	**O**	**D**	**D3**	**D4**	**LM34**
120.000000000	0.800000000	1.000000000	7.000000000	1.555350000	214.385150000
DM45	**DM56**	**LSSH**	**LMM1**	**LM46**	**M341**
4.000000000	90.071300000	630.822950000	135.000000000	122.500000000	128.760150000
L343	**DMV1**	**DM3**	**KM1**	**KM2**	**KM3**
85.625000000	62.898760000	0.861390000	0.003337533	-0.003423620	0.003451467
KM4	**KM5**	**KM6**			
0.003434462	-0.002508713	-0.000673385			

Beta functions through two medium-beta modules and one cell,
print at markers of first module only:

```
***   ZZMB    CYC   -1     //  *ZMB
```

BETATRON FUNCTIONS OF ZZMB -- Medium-beta Module, injection optics

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
0		0.0000	0.00000	0.00000	388.18609	67.58124	3.05254	0.00000	0.0000	0.00000	0.00000	0.00025	0.00000
1	#QF	0.0000	0.00000	0.00000	388.18609	67.58124	3.05254	0.00000	0.0000	0.00000	0.00000	0.00025	0.00000
21	#QSD	114.2500	0.12462	0.12460	67.57089	388.21088	1.46781	0.00001	0.0000	0.00000	0.00000	0.00025	0.00000
37	#QSF	199.9375	0.22689	0.22641	302.52797	53.06816	2.77569	0.00000	0.0208	0.28861	0.29480	-0.00409	0.00000
49	#QSD	285.6250	0.37359	0.37355	38.23345	217.06328	0.74057	0.00001	0.0345	0.00280	0.00291	-0.01432	0.00000
61	#QSF	371.3125	0.52086	0.52128	300.90368	52.77239	0.29183	0.00000	0.0453	-0.28857	-0.29477	-0.00416	0.00000
73	#QM6	457.0000	0.62349	0.62342	66.45104	394.59489	0.00000	-0.00001	0.0482	0.44803	-2.63488	0.00000	0.00000
77	#QM5	555.9287	0.82250	0.64980	180.87642	821.23194	0.00000	-0.00001	0.0487	-4.13638	10.45965	0.00000	0.00000
81	#QM4	571.6951	0.83167	0.65455	413.29153	339.68203	0.00000	-0.00001	0.0487	-3.83080	7.95803	0.00000	0.00000
84	#BV+	578.0520	0.83409	0.65787	405.72161	285.27451	0.00000	-0.00001	0.0487	3.78586	1.81307	0.00000	0.00000
88	#BV+	612.1320	0.85359	0.68196	191.56983	179.14805	0.00000	0.05587	0.0487	2.49793	1.30096	0.00000	0.00328
90	#BV-	631.4167	0.87487	0.70177	109.28076	134.56042	0.00000	0.11911	0.0487	1.76914	1.01112	0.00000	0.00328
94	#BV-	665.4967	0.97160	0.75400	32.58863	83.09725	0.00000	0.17499	0.0485	0.48121	0.49894	0.00000	0.00000
97	#QVD	673.1020	1.01113	0.76977	31.15526	67.00679	0.00000	0.16413	0.0482	-0.41764	1.83185	0.00000	-0.00355
101	#QVF	686.0020	1.05976	0.82800	58.92718	19.37842	0.00000	0.09444	0.0482	-0.73677	0.89845	0.00000	-0.00439
106	#QVF	706.8520	1.11834	1.02744	46.38415	30.33738	0.00000	0.03667	0.0482	1.13195	-1.59253	0.00000	-0.00178
110	#QVD	719.7520	1.19399	1.06403	17.10918	105.46851	0.00000	0.01884	0.0482	0.43168	-2.71947	0.00000	-0.00160
115	#QVD	740.6020	1.35204	1.09013	44.18574	125.83263	0.00000	-0.01885	0.0482	-2.14654	2.07788	0.00000	-0.00160
119	#QVF	753.5020	1.37811	1.11533	141.41240	53.14178	0.00000	-0.03668	0.0482	-3.32501	1.56973	0.00000	-0.00178
124	#QVF	774.3520	1.39846	1.19619	153.95501	42.18235	0.00000	-0.09444	0.0482	2.92984	-0.87563	0.00000	-0.00439
128	#QVD	787.2520	1.42020	1.23025	58.23135	87.36926	0.00000	-0.16413	0.0482	2.13250	-1.19022	0.00000	-0.00355
133	#BV+	803.5384	1.48711	1.25994	30.01020	80.19920	0.00000	-0.17404	0.0482	0.36627	0.45322	0.00000	0.00038
136	#BV+	809.5384	1.52093	1.27224	26.97548	75.30165	0.00000	-0.17080	0.0481	0.13952	0.36304	0.00000	0.00076
139	#BV+	815.5384	1.55684	1.28527	26.66181	71.48626	0.00000	-0.16528	0.0481	-0.08724	0.27286	0.00000	0.00114
142	#BV+	821.5384	1.59141	1.29890	29.06918	68.75301	0.00000	-0.15747	0.0480	-0.31399	0.18268	0.00000	0.00152
145	#BV+	827.5384	1.62188	1.31298	34.19760	67.10191	0.00000	-0.14738	0.0480	-0.54074	0.09250	0.00000	0.00190
148	#BV-	895.4372	1.74343	1.44672	281.86092	123.83333	0.00000	-0.01903	0.0479	-3.10679	-0.92803	0.00000	0.00152
151	#BV-	901.4372	1.74661	1.45410	320.50296	135.51073	0.00000	-0.01084	0.0479	-3.33355	-1.01821	0.00000	0.00114
154	#BV-	907.4372	1.74941	1.46084	361.86604	148.27025	0.00000	-0.00493	0.0479	-3.56030	-1.10838	0.00000	0.00076
157	#BV-	913.4372	1.75190	1.46700	405.95017	162.11189	0.00000	-0.00132	0.0479	-3.78705	-1.19856	0.00000	0.00038
160	#BV-	919.4372	1.75413	1.47264	452.75534	177.03563	0.00000	0.00002	0.0479	-4.01381	-1.28873	0.00000	0.00000
163	#QM3	932.0855	1.75819	1.48288	502.61137	235.60503	0.00000	0.00002	0.0479	5.67458	-5.90747	0.00000	0.00000
167	#QM2	942.9060	1.76267	1.48818	287.08933	460.27073	0.00000	0.00003	0.0479	6.73438	-8.76502	0.00000	0.00000
171	#QM2	952.6504	1.76887	1.49128	238.19942	493.03944	0.00000	0.00003	0.0479	-1.22397	5.74444	0.00000	0.00000
175	#QM1	961.5988	1.77422	1.49480	300.81114	330.35427	0.00000	0.00002	0.0479	-1.78853	6.16071	0.00000	0.00000
178	#IPM	1085.3750	1.95242	1.67292	59.99959	60.00102	0.00000	0.00000	0.0479	-0.00001	0.00009	0.00000	0.00000
181	#1QM	1209.1512	2.13055	1.85112	330.33880	300.78816	0.00000	-0.00002	0.0479	-6.16049	1.78836	0.00000	0.00000
185	#2QM	1218.0996	2.13406	1.85647	493.01784	238.18174	0.00000	-0.00002	0.0479	-5.74425	1.22385	0.00000	0.00000
189	#2QM	1227.8440	2.13717	1.86267	460.25182	287.06887	0.00000	-0.00002	0.0479	8.76459	-6.73394	0.00000	0.00000
193	#3QM	1238.6645	2.14246	1.86715	235.59649	502.57676	0.00000	-0.00003	0.0479	5.90719	-5.67423	0.00000	0.00000
196	#BV+	1251.3128	2.15271	1.87121	177.03093	452.72524	0.00000	-0.00003	0.0479	1.28862	4.01349	0.00000	0.00000
199	#BV+	1257.3128	2.15835	1.87344	162.10852	405.92365	0.00000	0.00131	0.0479	1.19845	3.78677	0.00000	0.00038
202	#BV+	1263.3128	2.16451	1.87593	148.26818	361.84276	0.00000	0.00493	0.0479	1.10828	3.56004	0.00000	0.00076
205	#BV+	1269.3128	2.17125	1.87874	135.50990	320.48260	0.00000	0.01083	0.0479	1.01810	3.33331	0.00000	0.00114
208	#BV+	1275.3128	2.17862	1.88191	123.83369	281.84320	0.00000	0.01902	0.0479	0.92793	3.10658	0.00000	0.00152

BETATRON FUNCTIONS OF ZZMB -- Medium-beta Module, injection optics

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
211	#BV-	1343.2116	2.31235	2.00346	67.10873	34.19772	0.00000	0.14738	0.0479	-0.09250	0.54068	0.00000	0.00190
214	#BV-	1349.2116	2.32643	2.03393	68.75973	29.06996	0.00000	0.15747	0.0479	-0.18267	0.31394	0.00000	0.00152
217	#BV-	1355.2116	2.34007	2.06851	71.49279	26.66308	0.00000	0.16528	0.0478	-0.27284	0.08720	0.00000	0.00114
220	#BV-	1361.2116	2.35310	2.10442	75.30792	26.97709	0.00000	0.17081	0.0477	-0.36301	-0.13954	0.00000	0.00076
223	#BV-	1367.2116	2.36539	2.13823	80.20512	30.01199	0.00000	0.17405	0.0477	-0.45319	-0.36628	0.00000	0.00038
228	#QVF	1383.4979	2.39508	2.20514	87.37322	58.23307	0.00000	0.18610	0.0476	1.19036	-2.13251	0.00000	0.00371
232	#QVD	1396.3980	2.42914	2.22688	42.18258	153.95715	0.00000	0.25971	0.0476	0.87573	-2.92982	0.00000	0.00278
237	#QVD	1417.2480	2.51000	2.24722	53.13754	141.41216	0.00000	0.20621	0.0476	-1.56955	3.32506	0.00000	-0.00731
241	#QVF	1430.1480	2.53520	2.27330	125.82091	44.18479	0.00000	0.08200	0.0476	-2.07765	2.14655	0.00000	-0.00875
246	#QVF	1450.9980	2.56131	2.43136	105.45825	17.10843	0.00000	-0.08199	0.0476	2.71920	-0.43170	0.00000	-0.00875
250	#QVD	1463.8980	2.59790	2.50701	30.33478	46.38458	0.00000	-0.20621	0.0476	1.59234	-1.13202	0.00000	-0.00731
255	#QVD	1484.7480	2.79733	2.56558	19.38029	58.92999	0.00000	-0.25970	0.0476	-0.89855	0.73676	0.00000	0.00278
259	#QVF	1497.6480	2.85556	2.61422	67.01221	31.15717	0.00000	-0.18610	0.0476	-1.83194	0.41766	0.00000	0.00371
262	#BV+	1505.2533	2.87133	2.65374	83.10296	32.59045	0.00000	-0.17500	0.0476	-0.49891	-0.48122	0.00000	0.00000
266	#BV+	1539.3333	2.92355	2.75047	134.56331	109.27954	0.00000	-0.11912	0.0473	-1.01108	-1.76904	0.00000	0.00328
268	#BV-	1558.6180	2.94337	2.77175	179.14895	191.56373	0.00000	-0.05588	0.0471	-1.30090	-2.49778	0.00000	0.00328
272	#BV-	1592.6980	2.96746	2.79125	285.27286	405.69827	0.00000	0.00000	0.0472	-1.81307	-3.78549	0.00000	0.00000
275	#4QM	1599.0549	2.97078	2.79367	339.68018	413.26577	0.00000	0.00000	0.0472	-7.95799	3.83072	0.00000	0.00000
279	#5QM	1614.8213	2.97553	2.80284	821.22787	180.86197	0.00000	0.00000	0.0472	-10.45961	4.13619	0.00000	0.00000
283	#6QM	1713.7500	3.00190	3.00188	394.59412	66.44942	0.00000	0.00000	0.0472	2.63487	-0.44818	0.00000	0.00000
295	#QSD	1799.4375	3.10405	3.10449	52.76740	300.96041	0.29767	0.00000	0.0472	0.29480	0.28847	0.00897	0.00000
307	#QSF	1885.1250	3.25179	3.25173	217.04996	38.24053	1.56480	0.00000	0.0477	-0.00296	-0.00258	0.00509	0.00000
319	#QSD	1970.8125	3.39894	3.39844	53.06818	302.45776	1.20033	0.00000	0.0532	-0.29483	-0.28849	0.00853	0.00000
335	#QSF	2056.5000	3.50075	3.50073	388.21022	67.56894	3.05253	0.00000	0.0619	0.00010	-0.00027	-0.00025	0.00000
336	#QF	2056.5000	3.50075	3.50073	388.21022	67.56894	3.05253	0.00000	0.0753	0.00010	-0.00027	-0.00025	0.00000
356	#QD	2170.7500	3.62537	3.62532	67.56302	388.31460	1.46781	0.00000	0.0753	0.00006	-0.00018	-0.00025	0.00000
376	#QF	2285.0000	3.75000	3.74989	388.16306	67.59371	3.05253	0.00000	0.0969	-0.00012	0.00027	-0.00025	0.00000
379	#QF	4798.5000	4.74922	4.74903	388.18609	67.58124	3.05254	0.00000	0.2361	0.00000	0.00000	0.00025	0.00000

CIRCUMFERENCE = 4798.5000 M THETX = 0.18364216 RAD NUX = 4.74922 DNUX/(DP/P) = -6.42732
RADIUS = 763.7050 M THETY = 0.00000000 RAD NUY = 4.74903 DNUY/(DP/P) = -6.42743
(DS/S)/(DP/P)= 0.0000580 TGAM=(131.25703, 0.00000)

MAXIMA --- BETX(280) = 869.85139 BETY(75) = 869.85559 XEQ(1) = 3.05254 YEQ(233) = 0.26005
MINIMA --- BETX(253) = 13.66948 BETY(102) = 13.66868 XEQ(161) = 0.00000 YEQ(253) = -0.26004

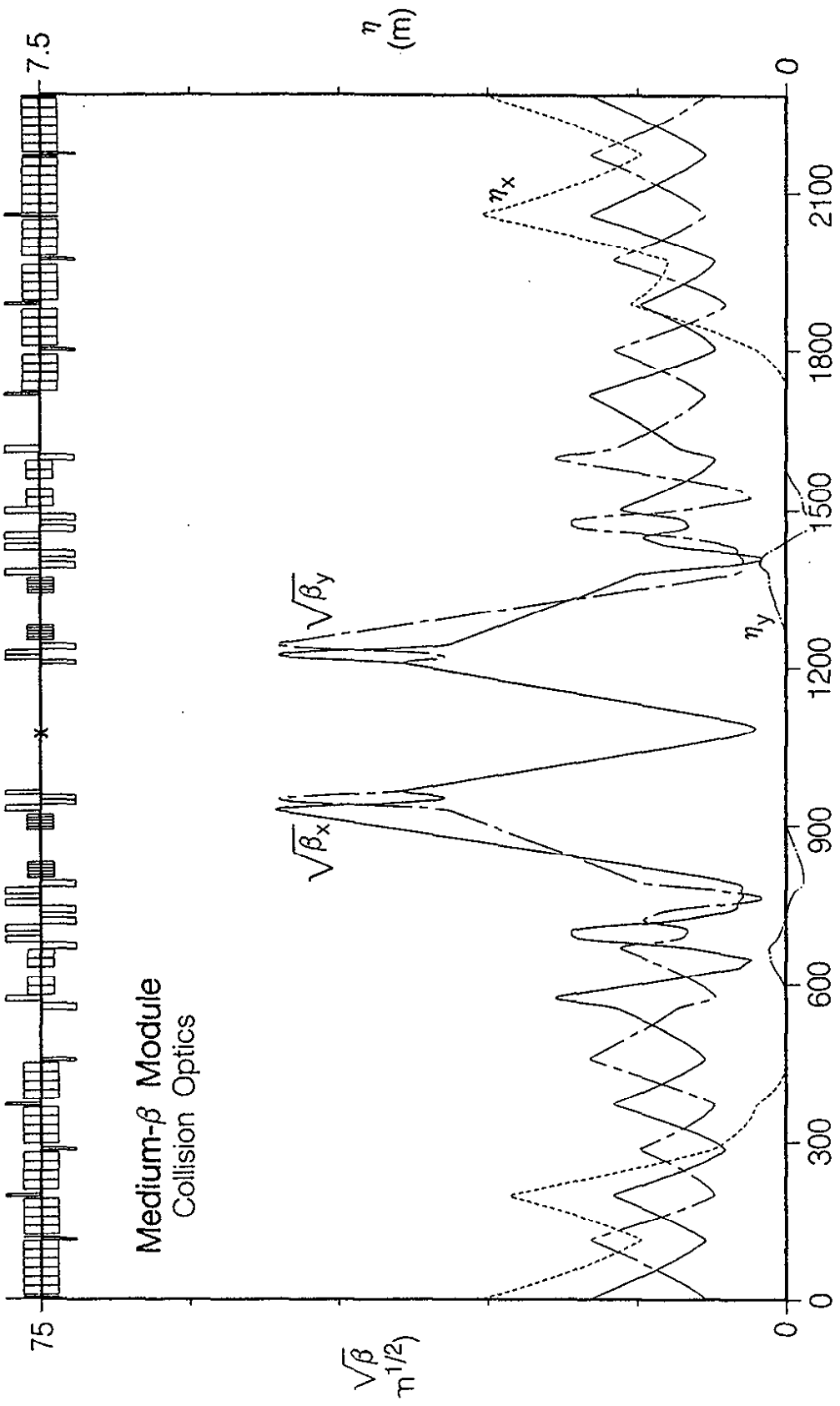


Figure 13. Medium-β Module; Collision Optics

Collision optics:

```
***   BM*     =          //  10.
***   KM1     PARA       //  0.33974410   -2
***   KM3     PARA       //  0.32653215   -2
***   KM4     PARA       //  0.31634889   -2
***   KM2     PARA       //  -.33450094   -2
***   KM5     PARA       //  -.13639178   -2
***   KM6     PARA       //  -.27877345   -2

***           CALL       //  SRSM

***   MDU     MMM        //  .MDU

***           PRNT       //  KM1  KM2  KM3  KM4  KM5  KM6
```

KM1	KM2	KM3	KM4	KM5	KM6
0.003397441	-0.003345009	0.003265321	0.003163489	-0.001363918	-0.002787734

Beta functions through two medium-beta modules and one cell,
print everywhere in first module:

```
***   ZZMB    CYC    1     //  *ZMB
```

BETATRON FUNCTIONS OF ZZMB -- Medium-beta Module, collision optics

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
0		0.0000	0.00000	0.00000	388.18609	67.58123	3.05254	0.00001	0.0000	0.00000	0.00000	0.00025	0.00000
1	#QF	0.0000	0.00000	0.00000	388.18609	67.58123	3.05254	0.00001	0.0000	0.00000	0.00000	0.00025	0.00000
2	QF	1.8200	0.00075	0.00427	383.80244	68.40089	3.03567	0.00001	0.0000	2.39947	-0.45207	-0.01876	0.00000
3	OPM	2.8550	0.00118	0.00666	378.85439	69.35554	3.01625	0.00001	0.0000	2.38125	-0.47029	-0.01876	0.00000
4	QFC	3.8550	0.00160	0.00894	374.10949	70.31373	2.99749	0.00001	0.0000	2.36364	-0.48790	-0.01876	0.00000
5	SF	3.8550	0.00160	0.00894	374.10949	70.31373	2.99749	0.00001	0.0000	2.36364	-0.48790	-0.01876	0.00000
6	QFC	4.8550	0.00203	0.01119	369.39981	71.30713	2.97872	0.00002	0.0000	2.34604	-0.50551	-0.01876	0.00000
7	OOC	8.3900	0.00359	0.01888	353.03334	75.10109	2.91239	0.00002	0.0000	2.28380	-0.56775	-0.01876	0.00000
8	B	24.9300	0.01193	0.04965	282.30116	98.69913	2.61558	0.00002	0.0045	1.99263	-0.85898	-0.01713	0.00000
9	O	25.7300	0.01239	0.05093	279.12422	100.08476	2.60188	0.00002	0.0045	1.97854	-0.87306	-0.01713	0.00000
10	B	42.2700	0.02305	0.07375	218.49022	133.78255	2.33218	0.00003	0.0086	1.68735	-1.16429	-0.01549	0.00000
11	O	43.0700	0.02364	0.07470	215.80172	135.65668	2.31979	0.00003	0.0086	1.67327	-1.17838	-0.01549	0.00000
12	B	59.6100	0.03760	0.09160	165.26658	179.45424	2.07721	0.00004	0.0122	1.38206	-1.46960	-0.01385	0.00000
13	O	60.4100	0.03837	0.09231	163.06656	181.81688	2.06613	0.00004	0.0122	1.36797	-1.48369	-0.01385	0.00000
14	B	76.9500	0.05703	0.10504	122.63085	235.71419	1.85066	0.00005	0.0154	1.07675	-1.77492	-0.01221	0.00000
15	O	77.7500	0.05808	0.10557	120.91933	238.56533	1.84090	0.00005	0.0154	1.06266	-1.78900	-0.01221	0.00000
16	B	94.2900	0.08333	0.11538	90.58351	302.56241	1.65254	0.00005	0.0182	0.77143	-2.08023	-0.01057	0.00000
17	O	95.0900	0.08475	0.11580	89.36050	305.90204	1.64409	0.00005	0.0182	0.75734	-2.09432	-0.01057	0.00000
18	B	111.6300	0.11850	0.12352	69.12492	379.99888	1.48285	0.00006	0.0208	0.46609	-2.38554	-0.00893	0.00000
19	O	112.4300	0.12035	0.12385	68.39044	383.82702	1.47571	0.00006	0.0208	0.45201	-2.39963	-0.00893	0.00000
20	QD	114.2500	0.12462	0.12460	67.57089	388.21095	1.46781	0.00006	0.0208	0.00000	0.00000	0.00025	0.00000
21	#QSD	114.2500	0.12462	0.12460	67.57089	388.21095	1.46781	0.00006	0.0208	0.00000	0.00000	0.00025	0.00000
22	QSD	116.6980	0.13034	0.12561	69.05808	380.30427	1.48353	0.00006	0.0208	-0.61168	3.20777	0.01261	0.00000
23	OPM	117.7330	0.13271	0.12605	70.34558	373.69599	1.49658	0.00006	0.0208	-0.63228	3.17704	0.01261	0.00000
24	QDC	118.7330	0.13495	0.12648	71.63003	367.37158	1.50919	0.00006	0.0208	-0.65218	3.14736	0.01261	0.00000
25	SD	118.7330	0.13495	0.12648	71.63003	367.37158	1.50919	0.00006	0.0208	-0.65218	3.14736	0.01261	0.00000
26	QDC	119.7330	0.13715	0.12692	72.95428	361.10655	1.52180	0.00006	0.0208	-0.67207	3.11767	0.01261	0.00000
27	DOG1	124.3602	0.14682	0.12904	79.59997	332.88998	1.58016	0.00006	0.0208	-0.76415	2.98031	0.01261	0.00000
28	B	140.9002	0.17506	0.13831	110.32142	242.42269	1.80232	0.00005	0.0236	-1.09325	2.48930	0.01425	0.00000
29	O	141.7002	0.17620	0.13884	112.08336	238.45882	1.81372	0.00005	0.0236	-1.10917	2.46555	0.01425	0.00000
30	B	158.2402	0.19628	0.15213	154.21797	165.01974	2.06299	0.00004	0.0267	-1.43826	1.97454	0.01589	0.00000
31	O	159.0402	0.19710	0.15291	156.53193	161.87948	2.07570	0.00004	0.0267	-1.45418	1.95079	0.01589	0.00000
32	B	175.5802	0.21163	0.17311	210.07922	105.46861	2.35209	0.00003	0.0304	-1.78326	1.45978	0.01753	0.00000
33	O	176.3802	0.21224	0.17433	212.94517	103.15196	2.36612	0.00003	0.0304	-1.79918	1.43603	0.01753	0.00000
34	B	192.9202	0.22307	0.20702	277.90455	63.76931	2.66962	0.00002	0.0345	-2.12823	0.94502	0.01917	0.00000
35	OG1	197.4896	0.22559	0.21922	297.76947	55.75277	2.75721	0.00002	0.0345	-2.21915	0.80937	0.01917	0.00000
36	QSF	199.9375	0.22689	0.22641	302.52797	53.06817	2.77569	0.00002	0.0345	0.28861	0.29480	-0.00409	0.00000
37	#QSF	199.9375	0.22689	0.22641	302.52797	53.06817	2.77569	0.00002	0.0345	0.28861	0.29480	-0.00409	0.00000
38	QSF	202.3855	0.22819	0.23380	294.98204	52.82647	2.73725	0.00002	0.0345	2.77280	-0.19539	-0.02727	0.00000
39	OOG2	210.9136	0.23319	0.25851	249.83070	57.58830	2.50471	0.00002	0.0345	2.52162	-0.36298	-0.02727	0.00000
40	B	227.4536	0.24581	0.29901	174.47293	74.97219	2.06727	0.00002	0.0382	2.03447	-0.68804	-0.02563	0.00000
41	O	228.2536	0.24655	0.30069	171.23662	76.08563	2.04677	0.00002	0.0382	2.01091	-0.70376	-0.02563	0.00000
42	B	244.7936	0.26554	0.33035	112.77344	104.74237	1.63645	0.00002	0.0413	1.52374	-1.02881	-0.02399	0.00000
43	O	245.5936	0.26668	0.33156	110.35430	106.40105	1.61726	0.00002	0.0413	1.50018	-1.04453	-0.02399	0.00000
44	B	262.1336	0.29708	0.35272	68.78636	146.33064	1.23405	0.00002	0.0436	1.01300	-1.36959	-0.02235	0.00000

BETATRON FUNCTIONS OF ZZMB -- Medium-beta Module, Collision Optics

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
45	O	262.9336	0.29895	0.35358	67.18441	148.53456	1.21617	0.00002	0.0436	0.98943	-1.38531	-0.02235	0.00000
46	B	279.4736	0.34903	0.36889	42.51218	199.73700	0.86008	0.00001	0.0453	0.50224	-1.71036	-0.02071	0.00000
47	OG2	283.1771	0.36349	0.37175	39.19612	212.67521	0.78338	0.00001	0.0453	0.39315	-1.78315	-0.02071	0.00000
48	QSD	285.6250	0.37359	0.37355	38.23345	217.06324	0.74057	0.00001	0.0453	0.00280	0.00291	-0.01432	0.00000
49	#QSD	285.6250	0.37359	0.37355	38.23345	217.06324	0.74057	0.00001	0.0453	0.00280	0.00291	-0.01432	0.00000
50	QSD	288.0729	0.38370	0.37536	39.16834	212.64711	0.71301	0.00001	0.0453	-0.38732	1.78873	-0.00823	0.00000
51	OOG3	296.2704	0.41414	0.38195	47.49133	184.64834	0.64551	0.00001	0.0453	-0.62800	1.62684	-0.00823	0.00000
52	B	312.8103	0.45844	0.39857	76.29773	136.23526	0.52286	0.00000	0.0462	-1.11362	1.30019	-0.00660	0.00000
53	O	313.6103	0.46009	0.39952	78.09831	134.16760	0.51759	0.00000	0.0462	-1.13711	1.28439	-0.00660	0.00000
54	B	330.1503	0.48699	0.42266	123.74572	97.08264	0.42206	0.00000	0.0470	-1.62271	0.95775	-0.00496	0.00000
55	O	330.9503	0.48801	0.42398	126.36085	95.56288	0.41810	0.00000	0.0470	-1.64620	0.94195	-0.00496	0.00000
56	B	347.4903	0.50508	0.45644	188.84875	69.80604	0.34969	-0.00001	0.0476	-2.13178	0.61530	-0.00332	0.00000
57	O	348.2903	0.50575	0.45828	192.27839	68.83420	0.34704	-0.00001	0.0476	-2.15527	0.59950	-0.00332	0.00000
58	B	364.8303	0.51728	0.50183	271.60607	54.40547	0.30575	-0.00001	0.0482	-2.64083	0.27285	-0.00168	0.00000
59	OG3	368.8645	0.51956	0.51386	293.39119	52.52539	0.29899	-0.00001	0.0482	-2.75927	0.19318	-0.00168	0.00000
60	QSF	371.3125	0.52086	0.52128	300.90368	52.77238	0.29183	-0.00001	0.0482	-0.28857	-0.29477	-0.00416	0.00000
61	#QSF	371.3125	0.52086	0.52128	300.90368	52.77238	0.29183	-0.00001	0.0482	-0.28857	-0.29477	-0.00416	0.00000
62	QSF	373.7604	0.52216	0.52851	296.17826	55.45141	0.27869	-0.00002	0.0482	2.20569	-0.80711	-0.00656	0.00000
63	OOG4	381.9727	0.52686	0.54945	261.28640	70.71632	0.22483	-0.00002	0.0482	2.04307	-1.05169	-0.00656	0.00000
64	B	398.5127	0.53841	0.57898	199.11856	113.65347	0.12991	-0.00003	0.0485	1.71557	-1.54427	-0.00492	0.00000
65	O	399.3127	0.53906	0.58009	196.38633	116.14337	0.12597	-0.00003	0.0485	1.69972	-1.56810	-0.00492	0.00000
66	B	415.8527	0.55465	0.59853	145.57662	176.16344	0.05817	-0.00004	0.0486	1.37220	-2.06069	-0.00328	0.00000
67	O	416.6527	0.55553	0.59925	143.39377	179.47959	0.05555	-0.00004	0.0486	1.35636	-2.08451	-0.00328	0.00000
68	B	433.1927	0.57716	0.61153	103.94276	256.58259	0.01487	-0.00005	0.0487	1.02883	-2.57710	-0.00164	0.00000
69	O	433.9927	0.57840	0.61202	102.30932	260.72500	0.01356	-0.00005	0.0487	1.01298	-2.60092	-0.00164	0.00000
70	B	450.5327	0.60879	0.62068	74.21746	354.91091	0.00000	-0.00006	0.0487	0.68544	-3.09351	0.00000	0.00000
71	OG4	454.5520	0.61773	0.62242	69.02739	380.25984	0.00000	-0.00006	0.0487	0.60584	-3.21321	0.00000	0.00000
72	QM6a	457.0000	0.62346	0.62343	67.30703	389.67717	0.00000	-0.00006	0.0487	0.10085	-0.61237	0.00000	0.00000
73	#QM6	457.0000	0.62346	0.62343	67.30703	389.67717	0.00000	-0.00006	0.0487	0.10085	-0.61237	0.00000	0.00000
74	QM6a	459.4479	0.62924	0.62443	68.02889	386.18947	0.00000	-0.00006	0.0487	-0.39737	2.02917	0.00000	0.00000
75	DM56	549.5192	0.74297	0.69077	277.69823	128.15588	0.00000	-0.00004	0.0487	-1.93045	0.83560	0.00000	0.00000
76	QM5a	555.9287	0.74643	0.69924	319.94464	111.32652	0.00000	-0.00003	0.0487	-4.78342	1.74086	0.00000	0.00000
77	#QM5	555.9287	0.74643	0.69924	319.94464	111.32652	0.00000	-0.00003	0.0487	-4.78342	1.74086	0.00000	0.00000
78	QM5a	562.3382	0.74929	0.70962	404.96823	85.17233	0.00000	-0.00003	0.0487	-8.72867	2.26317	0.00000	0.00000
79	DM45	566.3382	0.75074	0.71798	477.84726	68.21697	0.00000	-0.00003	0.0487	-9.49109	1.97567	0.00000	0.00000
80	QM4a	571.6951	0.75239	0.73222	536.71341	54.25385	0.00000	-0.00002	0.0487	-1.16320	0.70930	0.00000	0.00000
81	#QM4	571.6951	0.75239	0.73222	536.71341	54.25385	0.00000	-0.00002	0.0487	-1.16320	0.70930	0.00000	0.00000
82	QM4a	577.0520	0.75401	0.74853	501.29053	52.08162	0.00000	-0.00002	0.0487	7.57445	-0.29160	0.00000	0.00000
83	D	578.0520	0.75433	0.75157	486.25808	52.68566	0.00000	-0.00002	0.0487	7.45801	-0.31244	0.00000	0.00000
84	#BV+	578.0520	0.75433	0.75157	486.25808	52.68566	0.00000	-0.00002	0.0487	7.45801	-0.31244	0.00000	0.00000
85	BV2+	594.5920	0.76158	0.79589	271.40304	68.72036	0.00000	0.01354	0.0487	5.53202	-0.65701	0.00000	0.00164
86	D	595.5920	0.76218	0.79819	260.45544	70.05521	0.00000	0.01518	0.0487	5.41558	-0.67784	0.00000	0.00164
87	BV2+	612.1320	0.77754	0.83014	113.16392	98.17741	0.00000	0.05586	0.0487	3.48959	-1.02241	0.00000	0.00328
88	#BV+	612.1320	0.77754	0.83014	113.16392	98.17741	0.00000	0.05586	0.0487	3.48959	-1.02241	0.00000	0.00328
89	DMV2	631.4167	0.84088	0.85595	21.87801	145.35870	0.00000	0.11911	0.0487	1.24401	-1.42416	0.00000	0.00328

BETATRON FUNCTIONS OF ZZMB -- Medium-beta Module, Collision Optics

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
90	#BV-	631.4167	0.84088	0.85595	21.87801	145.35870	0.00000	0.11911	0.0487	1.24401	-1.42416	0.00000	0.00328
91	BV2-	647.9567	1.07838	0.87148	12.58190	198.16885	0.00000	0.15979	0.0485	-0.68197	-1.76871	0.00000	0.00164
92	D	648.9567	1.09036	0.87228	14.06229	201.72710	0.00000	0.16143	0.0485	-0.79842	-1.78954	0.00000	0.00164
93	BV2-	665.4967	1.17713	0.88364	72.32970	266.62358	0.00000	0.17499	0.0482	-2.72440	-2.13406	0.00000	0.00000
94	#BV-	665.4967	1.17713	0.88364	72.32970	266.62358	0.00000	0.17499	0.0482	-2.72440	-2.13406	0.00000	0.00000
95	D4	667.0520	1.18037	0.88456	81.08619	273.31241	0.00000	0.17499	0.0482	-2.90551	-2.16647	0.00000	0.00000
96	QVD	673.1020	1.18979	0.88806	134.31192	265.22882	0.00000	0.16412	0.0482	-6.25713	3.44623	0.00000	-0.00355
97	#QVD	673.1020	1.18979	0.88806	134.31192	265.22882	0.00000	0.16412	0.0482	-6.25713	3.44623	0.00000	-0.00355
98	QVD	679.1520	1.19521	0.89219	245.49970	196.71844	0.00000	0.13287	0.0482	-12.88349	7.40006	0.00000	-0.00667
99	O	679.9520	1.19570	0.89285	266.54860	185.05975	0.00000	0.12754	0.0482	-13.42764	7.17330	0.00000	-0.00667
100	QVF	686.0020	1.19857	0.89930	407.56227	125.84616	0.00000	0.09444	0.0482	-8.89708	3.02013	0.00000	-0.00439
101	#QVF	686.0020	1.19857	0.89930	407.56227	125.84616	0.00000	0.09444	0.0482	-8.89708	3.02013	0.00000	-0.00439
102	QVF	692.0520	1.20073	0.90783	464.29033	105.70216	0.00000	0.07331	0.0482	-0.08388	0.44759	0.00000	-0.00267
103	OOV	696.4270	1.20223	0.91453	465.06576	102.00307	0.00000	0.06165	0.0482	-0.09337	0.39791	0.00000	-0.00267
104	OOV	700.8020	1.20373	0.92147	465.92423	98.73871	0.00000	0.04998	0.0482	-0.10286	0.34823	0.00000	-0.00267
105	QVF	706.8520	1.20588	0.93102	411.07465	107.51602	0.00000	0.03667	0.0482	8.78642	-1.85922	0.00000	-0.00178
106	#QVF	706.8520	1.20588	0.93102	411.07465	107.51602	0.00000	0.03667	0.0482	8.78642	-1.85922	0.00000	-0.00178
107	QVF	712.9020	1.20871	0.93883	270.64200	147.59181	0.00000	0.02802	0.0482	13.44631	-5.03970	0.00000	-0.00111
108	O	713.7020	1.20920	0.93967	249.55782	155.76981	0.00000	0.02713	0.0482	12.90891	-5.18279	0.00000	-0.00111
109	QVD	719.7520	1.21449	0.94500	138.24520	200.89712	0.00000	0.01885	0.0482	6.25320	-1.96158	0.00000	-0.00160
110	#QVD	719.7520	1.21449	0.94500	138.24520	200.89712	0.00000	0.01885	0.0482	6.25320	-1.96158	0.00000	-0.00160
111	QVD	725.8020	1.22355	0.94971	85.24761	199.36686	0.00000	0.00822	0.0482	2.87017	2.20385	0.00000	-0.00188
112	OOV	730.1770	1.23312	0.95338	62.20780	180.64551	0.00000	0.00000	0.0482	2.39607	2.07532	0.00000	-0.00188
113	OOV	734.5520	1.24655	0.95744	43.31636	163.04878	0.00000	-0.00822	0.0482	1.92197	1.94679	0.00000	-0.00188
114	QVD	740.6020	1.27500	0.96410	27.86799	122.82460	0.00000	-0.01884	0.0482	0.73741	4.42134	0.00000	-0.00160
115	#QVD	740.6020	1.27500	0.96410	27.86799	122.82460	0.00000	-0.01884	0.0482	0.73741	4.42134	0.00000	-0.00160
116	QVD	746.6520	1.31344	0.97468	23.93994	64.78248	0.00000	-0.02712	0.0482	-0.06121	4.76766	0.00000	-0.00111
117	O	747.4520	1.31874	0.97677	24.06471	57.38867	0.00000	-0.02801	0.0482	-0.09475	4.47461	0.00000	-0.00111
118	QVF	753.5020	1.35864	1.00589	23.69330	20.08790	0.00000	-0.03667	0.0482	0.15355	1.94660	0.00000	-0.00178
119	#QVF	753.5020	1.35864	1.00589	23.69330	20.08790	0.00000	-0.03667	0.0482	0.15355	1.94660	0.00000	-0.00178
120	QVF	759.5520	1.40180	1.09891	20.65189	6.23939	0.00000	-0.04998	0.0482	0.32795	0.43738	0.00000	-0.00267
121	OOV	763.9270	1.43742	1.22481	18.80883	6.06691	0.00000	-0.06164	0.0482	0.09332	-0.39795	0.00000	-0.00267
122	OOV	768.3020	1.47457	1.30610	19.01877	13.20352	0.00000	-0.07331	0.0482	-0.14131	-1.23328	0.00000	-0.00267
123	QVF	774.3520	1.52346	1.35032	20.18262	38.41984	0.00000	-0.09444	0.0482	-0.04295	-3.10763	0.00000	-0.00439
124	#QVF	774.3520	1.52346	1.35032	20.18262	38.41984	0.00000	-0.09444	0.0482	-0.04295	-3.10763	0.00000	-0.00439
125	QVF	780.4020	1.57114	1.36663	19.97329	94.86030	0.00000	-0.12754	0.0482	0.07609	-6.60841	0.00000	-0.00667
126	O	781.2020	1.57753	1.36790	19.88378	105.73514	0.00000	-0.13287	0.0482	0.03580	-6.98514	0.00000	-0.00667
127	QVD	787.2520	1.62322	1.37461	23.93661	187.16261	0.00000	-0.16412	0.0482	-0.73348	-5.90613	0.00000	-0.00355
128	#QVD	787.2520	1.62322	1.37461	23.93661	187.16261	0.00000	-0.16412	0.0482	-0.73348	-5.90613	0.00000	-0.00355
129	QVD	793.3020	1.65555	1.37908	39.15695	237.00159	0.00000	-0.17499	0.0482	-1.88665	-1.98418	0.00000	0.00000
130	OOV	797.6770	1.67020	1.38192	57.89385	254.76185	0.00000	-0.17499	0.0482	-2.39607	-2.07531	0.00000	0.00000
131	DM3	798.5384	1.67248	1.38245	62.10816	258.35261	0.00000	-0.17499	0.0482	-2.49637	-2.09326	0.00000	0.00000
132	BV1+	803.5384	1.68314	1.38541	89.98289	279.80590	0.00000	-0.17404	0.0481	-3.07857	-2.19740	0.00000	0.00038
133	#BV+	803.5384	1.68314	1.38541	89.98289	279.80590	0.00000	-0.17404	0.0481	-3.07857	-2.19740	0.00000	0.00038
134	D	804.5384	1.68485	1.38598	96.25648	284.22153	0.00000	-0.17365	0.0481	-3.19501	-2.21823	0.00000	0.00038

BETATRON FUNCTIONS OF ZZMB -- Medium-beta Module, Collision Optics

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
135	BV1+	809.5384	1.69193	1.38867	131.11763	306.92458	0.00000	-0.17080	0.0481	-3.77721	-2.32238	0.00000	0.00076
136	#BV+	809.5384	1.69193	1.38867	131.11763	306.92458	0.00000	-0.17080	0.0481	-3.77721	-2.32238	0.00000	0.00076
137	D	810.5384	1.69311	1.38919	138.78850	311.59016	0.00000	-0.17004	0.0481	-3.89365	-2.34321	0.00000	0.00076
138	BV1+	815.5384	1.69814	1.39165	180.63605	335.54296	0.00000	-0.16528	0.0480	-4.47586	-2.44735	0.00000	0.00114
139	#BV+	815.5384	1.69814	1.39165	180.63605	335.54296	0.00000	-0.16528	0.0480	-4.47586	-2.44735	0.00000	0.00114
140	D	816.5384	1.69900	1.39212	189.70420	340.45849	0.00000	-0.16413	0.0480	-4.59230	-2.46818	0.00000	0.00114
141	BV1+	821.5384	1.70274	1.39437	238.53816	365.66102	0.00000	-0.15747	0.0480	-5.17450	-2.57232	0.00000	0.00152
142	#BV+	821.5384	1.70274	1.39437	238.53816	365.66102	0.00000	-0.15747	0.0480	-5.17450	-2.57232	0.00000	0.00152
143	D	822.5384	1.70339	1.39481	249.00359	370.82650	0.00000	-0.15594	0.0480	-5.29094	-2.59315	0.00000	0.00152
144	BV1+	827.5384	1.70628	1.39688	304.82395	397.27874	0.00000	-0.14738	0.0479	-5.87314	-2.69729	0.00000	0.00190
145	#BV+	827.5384	1.70628	1.39688	304.82395	397.27874	0.00000	-0.14738	0.0479	-5.87314	-2.69729	0.00000	0.00190
146	DMV1	890.4372	1.72109	1.41446	1504.31667	819.00125	0.00000	-0.02760	0.0479	-13.19708	-4.00749	0.00000	0.00190
147	BV1-	895.4372	1.72159	1.41541	1639.19842	859.59676	0.00000	-0.01903	0.0479	-13.77928	-4.11161	0.00000	0.00152
148	#BV-	895.4372	1.72159	1.41541	1639.19842	859.59676	0.00000	-0.01903	0.0479	-13.77928	-4.11161	0.00000	0.00152
149	D	896.4372	1.72169	1.41560	1666.87342	867.84082	0.00000	-0.01751	0.0479	-13.89572	-4.13244	0.00000	0.00152
150	BV1-	901.4372	1.72215	1.41649	1808.74158	909.68588	0.00000	-0.01084	0.0479	-14.47792	-4.23657	0.00000	0.00114
151	#BV-	901.4372	1.72215	1.41649	1808.74158	909.68588	0.00000	-0.01084	0.0479	-14.47792	-4.23657	0.00000	0.00114
152	D	902.4372	1.72223	1.41667	1837.81386	918.17985	0.00000	-0.00970	0.0479	-14.59436	-4.25740	0.00000	0.00114
153	BV1-	907.4372	1.72265	1.41751	1986.66843	961.27443	0.00000	-0.00494	0.0479	-15.17656	-4.36152	0.00000	0.00076
154	#BV-	907.4372	1.72265	1.41751	1986.66843	961.27443	0.00000	-0.00494	0.0479	-15.17656	-4.36152	0.00000	0.00076
155	D	908.4372	1.72273	1.41768	2017.13798	970.01829	0.00000	-0.00418	0.0479	-15.29300	-4.38235	0.00000	0.00076
156	BV1-	913.4372	1.72311	1.41848	2172.97896	1014.36236	0.00000	-0.00132	0.0479	-15.87520	-4.48647	0.00000	0.00038
157	#BV-	913.4372	1.72311	1.41848	2172.97896	1014.36236	0.00000	-0.00132	0.0479	-15.87520	-4.48647	0.00000	0.00038
158	D	914.4372	1.72318	1.41864	2204.84580	1023.35612	0.00000	-0.00094	0.0479	-15.99164	-4.50729	0.00000	0.00038
159	BV1-	919.4372	1.72353	1.41940	2367.67318	1068.94965	0.00000	0.00001	0.0479	-16.57384	-4.61141	0.00000	0.00000
160	#BV-	919.4372	1.72353	1.41940	2367.67318	1068.94965	0.00000	0.00001	0.0479	-16.57384	-4.61141	0.00000	0.00000
161	D3	926.4372	1.72398	1.42041	2605.41249	1134.53000	0.00000	0.00001	0.0479	-17.38892	-4.75721	0.00000	0.00000
162	QM3a	932.0855	1.72432	1.42116	2529.95224	1315.11966	0.00000	0.00001	0.0479	30.28157	-28.31778	0.00000	0.00000
163	#QM3	932.0855	1.72432	1.42116	2529.95224	1315.11966	0.00000	0.00001	0.0479	30.28157	-28.31778	0.00000	0.00000
164	QM3a	937.7338	1.72472	1.42175	1967.78935	1819.68740	0.00000	0.00002	0.0479	65.76591	-64.09379	0.00000	0.00000
165	O	938.5338	1.72479	1.42182	1863.97093	1923.68265	0.00000	0.00002	0.0479	64.00712	-65.90026	0.00000	0.00000
166	QM2a	942.9060	1.72521	1.42214	1444.78168	2397.53378	0.00000	0.00002	0.0479	33.90382	-40.15799	0.00000	0.00000
167	#QM2	942.9060	1.72521	1.42214	1444.78168	2397.53378	0.00000	0.00002	0.0479	33.90382	-40.15799	0.00000	0.00000
168	QM2a	947.2782	1.72574	1.42241	1245.43218	2596.43918	0.00000	0.00002	0.0479	12.65867	-4.36139	0.00000	0.00000
169	D	948.2782	1.72587	1.42248	1220.24430	2605.16967	0.00000	0.00002	0.0479	12.52921	-4.36910	0.00000	0.00000
170	QM2a	952.6504	1.72645	1.42275	1188.18566	2478.84769	0.00000	0.00002	0.0479	-5.04120	32.64273	0.00000	0.00000
171	#QM2	952.6504	1.72645	1.42275	1188.18566	2478.84769	0.00000	0.00002	0.0479	-5.04120	32.64273	0.00000	0.00000
172	QM2a	957.0226	1.72702	1.42305	1312.21562	2058.31440	0.00000	0.00002	0.0479	-23.92874	61.48183	0.00000	0.00000
173	O	957.8226	1.72711	1.42311	1350.78136	1961.11912	0.00000	0.00002	0.0479	-24.27843	60.01227	0.00000	0.00000
174	QM1a	961.5988	1.72753	1.42346	1470.01930	1616.27502	0.00000	0.00002	0.0479	-6.78617	32.77811	0.00000	0.00000
175	#QM1	961.5988	1.72753	1.42346	1470.01930	1616.27502	0.00000	0.00002	0.0479	-6.78617	32.77811	0.00000	0.00000
176	QM1a	965.3750	1.72794	1.42385	1450.00637	1449.86592	0.00000	0.00001	0.0479	12.00006	11.99912	0.00000	0.00000
177	DM0	1085.3750	1.96471	1.66066	9.99995	10.00053	0.00000	0.00000	0.0479	-0.00001	-0.00024	0.00000	0.00000
178	#IPM	1085.3750	1.96471	1.66066	9.99995	10.00053	0.00000	0.00000	0.0479	-0.00001	-0.00024	0.00000	0.00000
179	DM0	1205.3750	2.20148	1.89738	1450.00930	1449.98206	0.00000	-0.00002	0.0479	-12.00007	-11.99960	0.00000	0.00000

BETATRON FUNCTIONS OF ZZMB -- Medium-beta Module, Collision Optics

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
180	QM1b	1209.1512	2.20187	1.89779	1616.43296	1469.99274	0.00000	-0.00002	0.0479	-32.78108	6.78630	0.00000	0.00000
181	#1QM	1209.1512	2.20187	1.89779	1616.43296	1469.99274	0.00000	-0.00002	0.0479	-32.78108	6.78630	0.00000	0.00000
182	QM1b	1212.9274	2.20221	1.89822	1961.30878	1350.75513	0.00000	-0.00002	0.0479	-60.01784	24.27821	0.00000	0.00000
183	O	1213.7274	2.20228	1.89831	2058.51307	1312.18973	0.00000	-0.00002	0.0479	-61.48752	23.92853	0.00000	0.00000
184	QM2b	1218.0996	2.20258	1.89888	2479.08471	1188.16009	0.00000	-0.00002	0.0479	-32.64561	5.04135	0.00000	0.00000
185	#2QM	1218.0996	2.20258	1.89888	2479.08471	1188.16009	0.00000	-0.00002	0.0479	-32.64561	5.04135	0.00000	0.00000
186	QM2b	1222.4718	2.20285	1.89946	2605.41668	1220.21576	0.00000	-0.00002	0.0479	4.36975	-12.52866	0.00000	0.00000
187	D	1223.4718	2.20291	1.89959	2596.68488	1245.40254	0.00000	-0.00002	0.0479	4.36204	-12.65812	0.00000	0.00000
188	QM2b	1227.8440	2.20319	1.90011	2397.75870	1444.74488	0.00000	-0.00002	0.0479	40.16199	-33.90270	0.00000	0.00000
189	#2QM	1227.8440	2.20319	1.90011	2397.75870	1444.74488	0.00000	-0.00002	0.0479	40.16199	-33.90270	0.00000	0.00000
190	QM2b	1232.2162	2.20351	1.90054	1923.86127	1863.92091	0.00000	-0.00003	0.0479	65.90662	-64.00515	0.00000	0.00000
191	O	1233.0162	2.20358	1.90061	1819.85600	1967.73613	0.00000	-0.00003	0.0479	64.09997	-65.76388	0.00000	0.00000
192	QM3b	1238.6645	2.20417	1.90100	1315.23918	2529.88062	0.00000	-0.00003	0.0479	28.32059	-30.28045	0.00000	0.00000
193	#3QM	1238.6645	2.20417	1.90100	1315.23918	2529.88062	0.00000	-0.00003	0.0479	28.32059	-30.28045	0.00000	0.00000
194	QM3b	1244.3128	2.20492	1.90135	1134.63057	2605.33589	0.00000	-0.00003	0.0479	4.75787	17.38866	0.00000	0.00000
195	D3	1251.3128	2.20593	1.90180	1069.04114	2367.60019	0.00000	-0.00003	0.0479	4.61204	16.57358	0.00000	0.00000
196	#BV+	1251.3128	2.20593	1.90180	1069.04114	2367.60019	0.00000	-0.00003	0.0479	4.61204	16.57358	0.00000	0.00000
197	BV1+	1256.3128	2.20669	1.90214	1023.44151	2204.77505	0.00000	0.00092	0.0479	4.50788	15.99144	0.00000	0.00038
198	D	1257.3128	2.20685	1.90222	1014.44658	2172.90861	0.00000	0.00131	0.0479	4.48705	15.87500	0.00000	0.00038
199	#BV+	1257.3128	2.20685	1.90222	1014.44658	2172.90861	0.00000	0.00131	0.0479	4.48705	15.87500	0.00000	0.00038
200	BV1+	1262.3128	2.20765	1.90260	970.09691	2017.06930	0.00000	0.00416	0.0479	4.38289	15.29286	0.00000	0.00076
201	D	1263.3128	2.20781	1.90268	961.35197	1986.60003	0.00000	0.00493	0.0479	4.36205	15.17641	0.00000	0.00076
202	#BV+	1263.3128	2.20781	1.90268	961.35197	1986.60003	0.00000	0.00493	0.0479	4.36205	15.17641	0.00000	0.00076
203	BV1+	1268.3128	2.20866	1.90309	918.25226	1837.74665	0.00000	0.00969	0.0479	4.25789	14.59426	0.00000	0.00114
204	D	1269.3128	2.20884	1.90318	909.75731	1808.67458	0.00000	0.01083	0.0479	4.23706	14.47782	0.00000	0.00114
205	#BV+	1269.3128	2.20884	1.90318	909.75731	1808.67458	0.00000	0.01083	0.0479	4.23706	14.47782	0.00000	0.00114
206	BV1+	1274.3128	2.20973	1.90364	867.90756	1666.80725	0.00000	0.01750	0.0479	4.13289	13.89565	0.00000	0.00152
207	D	1275.3128	2.20992	1.90374	859.66260	1639.13239	0.00000	0.01902	0.0479	4.11206	13.77921	0.00000	0.00152
208	#BV+	1275.3128	2.20992	1.90374	859.66260	1639.13239	0.00000	0.01902	0.0479	4.11206	13.77921	0.00000	0.00152
209	BV1+	1280.3128	2.21086	1.90424	819.06280	1504.25120	0.00000	0.02759	0.0479	4.00790	13.19703	0.00000	0.00190
210	DMV1	1343.2116	2.22845	1.91905	397.29842	304.78101	0.00000	0.14738	0.0479	2.69755	5.87282	0.00000	0.00190
211	#BV-	1343.2116	2.22845	1.91905	397.29842	304.78101	0.00000	0.14738	0.0479	2.69755	5.87282	0.00000	0.00190
212	BV1-	1348.2116	2.23052	1.92194	370.84374	248.96386	0.00000	0.15595	0.0479	2.59339	5.29061	0.00000	0.00152
213	D	1349.2116	2.23095	1.92259	365.67780	238.49909	0.00000	0.15747	0.0479	2.57255	5.17416	0.00000	0.00152
214	#BV-	1349.2116	2.23095	1.92259	365.67780	238.49909	0.00000	0.15747	0.0479	2.57255	5.17416	0.00000	0.00152
215	BV1-	1354.2116	2.23321	1.92633	340.47307	189.66855	0.00000	0.16414	0.0478	2.46839	4.59194	0.00000	0.00114
216	D	1355.2116	2.23368	1.92719	335.55712	180.60110	0.00000	0.16528	0.0478	2.44756	4.47550	0.00000	0.00114
217	#BV-	1355.2116	2.23368	1.92719	335.55712	180.60110	0.00000	0.16528	0.0478	2.44756	4.47550	0.00000	0.00114
218	BV1-	1360.2116	2.23614	1.93222	311.60235	138.75721	0.00000	0.17005	0.0477	2.34340	3.89328	0.00000	0.00076
219	D	1361.2116	2.23666	1.93340	306.93639	131.08709	0.00000	0.17081	0.0477	2.32256	3.77683	0.00000	0.00076
220	#BV-	1361.2116	2.23666	1.93340	306.93639	131.08709	0.00000	0.17081	0.0477	2.32256	3.77683	0.00000	0.00076
221	BV1-	1366.2116	2.23935	1.94049	284.23158	96.22988	0.00000	0.17366	0.0477	2.21840	3.19461	0.00000	0.00038
222	D	1367.2116	2.23991	1.94220	279.81561	89.95710	0.00000	0.17405	0.0477	2.19757	3.07816	0.00000	0.00038
223	#BV-	1367.2116	2.23991	1.94220	279.81561	89.95710	0.00000	0.17405	0.0477	2.19757	3.07816	0.00000	0.00038
224	BV1-	1372.2116	2.24287	1.95285	258.36076	62.08658	0.00000	0.17500	0.0476	2.09340	2.49594	0.00000	0.00000

BETATRON FUNCTIONS OF ZZMB -- Medium-beta Module, Collision Optics

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
225	DM3	1373.0729	2.24341	1.95514	254.76975	57.87303	0.00000	0.17500	0.0476	2.07546	2.39563	0.00000	0.00000
226	OOV	1377.4479	2.24624	1.96979	237.00823	39.14008	0.00000	0.17500	0.0476	1.98432	1.88618	0.00000	0.00000
227	QVF	1383.4979	2.25072	2.00214	187.16697	23.92384	0.00000	0.18610	0.0476	5.90635	0.73324	0.00000	0.00371
228	#QVF	1383.4979	2.25072	2.00214	187.16697	23.92384	0.00000	0.18610	0.0476	5.90635	0.73324	0.00000	0.00371
229	QVF	1389.5479	2.25742	2.04786	105.73683	19.87324	0.00000	0.22080	0.0476	6.98534	-0.03595	0.00000	0.00788
230	O	1390.3479	2.25869	2.05425	94.86168	19.96300	0.00000	0.22710	0.0476	6.60859	-0.07625	0.00000	0.00788
231	QVD	1396.3980	2.27501	2.10194	38.41971	20.17638	0.00000	0.25971	0.0476	3.10771	0.04247	0.00000	0.00278
232	#QVD	1396.3980	2.27501	2.10194	38.41971	20.17638	0.00000	0.25971	0.0476	3.10771	0.04247	0.00000	0.00278
233	QVD	1402.4480	2.31923	2.15084	13.20287	19.01901	0.00000	0.26005	0.0476	1.23329	0.14076	0.00000	-0.00267
234	OOV	1406.8230	2.40052	2.18799	6.06638	18.81373	0.00000	0.24838	0.0476	0.39791	-0.09383	0.00000	-0.00267
235	OOV	1411.1980	2.52643	2.22360	6.23943	20.66112	0.00000	0.23672	0.0476	-0.43747	-0.32843	0.00000	-0.00267
236	QVD	1417.2480	2.61945	2.26673	20.08957	23.70639	0.00000	0.20621	0.0476	-1.94679	-0.15369	0.00000	-0.00731
237	#QVD	1417.2480	2.61945	2.26673	20.08957	23.70639	0.00000	0.20621	0.0476	-1.94679	-0.15369	0.00000	-0.00731
238	QVD	1423.2980	2.64856	2.30661	57.39374	24.07696	0.00000	0.15010	0.0476	-4.47500	0.09502	0.00000	-0.01104
239	O	1424.0980	2.65065	2.31192	64.78820	23.95174	0.00000	0.14127	0.0476	-4.76807	0.06150	0.00000	-0.01104
240	QVF	1430.1480	2.66123	2.35034	122.83527	27.87687	0.00000	0.08200	0.0476	-4.42171	-0.73719	0.00000	-0.00875
241	#QVF	1430.1480	2.66123	2.35034	122.83527	27.87687	0.00000	0.08200	0.0476	-4.42171	-0.73719	0.00000	-0.00875
242	QVF	1436.1980	2.66789	2.37878	163.06268	43.32240	0.00000	0.03313	0.0476	-1.94693	-1.92170	0.00000	-0.00757
243	OOV	1440.5730	2.67195	2.39221	180.66068	62.21075	0.00000	0.00000	0.0476	-2.07547	-2.39563	0.00000	-0.00757
244	OOV	1444.9480	2.67562	2.40177	199.38334	85.24596	0.00000	-0.03312	0.0476	-2.20400	-2.86956	0.00000	-0.00757
245	QVF	1450.9980	2.68033	2.41084	200.91332	138.23384	0.00000	-0.08199	0.0476	1.96178	-6.25213	0.00000	-0.00875
246	#QVF	1450.9980	2.68033	2.41084	200.91332	138.23384	0.00000	-0.08199	0.0476	1.96178	-6.25213	0.00000	-0.00875
247	QVF	1457.0480	2.68566	2.41613	155.78197	249.52825	0.00000	-0.14126	0.0476	5.18324	-12.90684	0.00000	-0.01104
248	O	1457.8480	2.68650	2.41662	147.60327	270.60903	0.00000	-0.15010	0.0476	5.04014	-13.44413	0.00000	-0.01104
249	QVD	1463.8980	2.69431	2.41945	107.52388	411.01670	0.00000	-0.20621	0.0476	1.85940	-8.78465	0.00000	-0.00731
250	#QVD	1463.8980	2.69431	2.41945	107.52388	411.01670	0.00000	-0.20621	0.0476	1.85940	-8.78465	0.00000	-0.00731
251	QVD	1469.9480	2.70385	2.42160	98.74529	465.85181	0.00000	-0.23671	0.0476	-0.34819	0.10337	0.00000	-0.00267
252	OOV	1474.3230	2.71079	2.42310	102.00933	464.98884	0.00000	-0.24838	0.0476	-0.39787	0.09388	0.00000	-0.00267
253	OOV	1478.6980	2.71750	2.42460	105.70805	464.20892	0.00000	-0.26004	0.0476	-0.44755	0.08439	0.00000	-0.00267
254	QVD	1484.7480	2.72603	2.42676	125.85222	407.48499	0.00000	-0.25970	0.0476	-3.02020	8.89592	0.00000	0.00278
255	#QVD	1484.7480	2.72603	2.42676	125.85222	407.48499	0.00000	-0.25970	0.0476	-3.02020	8.89592	0.00000	0.00278
256	QVD	1490.7980	2.73247	2.42963	185.06753	266.49310	0.00000	-0.22710	0.0476	-7.17352	13.42535	0.00000	0.00788
257	O	1491.5980	2.73314	2.43012	196.72658	245.44779	0.00000	-0.22079	0.0476	-7.40029	12.88128	0.00000	0.00788
258	QVF	1497.6480	2.73727	2.43554	265.23871	134.27891	0.00000	-0.18609	0.0476	-3.44628	6.25609	0.00000	0.00371
259	#QVF	1497.6480	2.73727	2.43554	265.23871	134.27891	0.00000	-0.18609	0.0476	-3.44628	6.25609	0.00000	0.00371
260	QVF	1503.6980	2.74077	2.44497	273.32163	81.06163	0.00000	-0.17500	0.0476	2.16662	2.90510	0.00000	0.00000
261	D4	1505.2533	2.74169	2.44820	266.63232	72.30645	0.00000	-0.17500	0.0476	2.13422	2.72398	0.00000	0.00000
262	#BV+	1505.2533	2.74169	2.44820	266.63232	72.30645	0.00000	-0.17500	0.0476	2.13422	2.72398	0.00000	0.00000
263	BV2+	1521.7933	2.75305	2.53502	201.73188	14.05450	0.00000	-0.16144	0.0473	1.78963	0.79790	0.00000	0.00164
264	D	1522.7933	2.75384	2.54701	198.17346	12.57515	0.00000	-0.15980	0.0473	1.76880	0.68145	0.00000	0.00164
265	BV2+	1539.3333	2.76938	2.78448	145.36109	21.89012	0.00000	-0.11912	0.0471	1.42421	-1.24463	0.00000	0.00328
266	#BV+	1539.3333	2.76938	2.78448	145.36109	21.89012	0.00000	-0.11912	0.0471	1.42421	-1.24463	0.00000	0.00328
267	DMV2	1558.6180	2.79518	2.84780	98.17818	113.20214	0.00000	-0.05588	0.0471	1.02244	-3.49033	0.00000	0.00328
268	#BV-	1558.6180	2.79518	2.84780	98.17818	113.20214	0.00000	-0.05588	0.0471	1.02244	-3.49033	0.00000	0.00328
269	BV2-	1575.1580	2.82714	2.86315	70.05515	260.51907	0.00000	-0.01520	0.0472	0.67786	-5.41637	0.00000	0.00164

BETATRON FUNCTIONS OF ZZMB -- Medium-beta Module, Collision Optics

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
270	D	1576.1580	2.82943	2.86375	68.72026	271.46825	0.00000	-0.01356	0.0472	0.65703	-5.53282	0.00000	0.00164
271	BV2-	1592.6980	2.87375	2.87100	52.68531	486.34984	0.00000	0.00000	0.0472	0.31244	-7.45880	0.00000	0.00000
272	#BV-	1592.6980	2.87375	2.87100	52.68531	486.34984	0.00000	0.00000	0.0472	0.31244	-7.45880	0.00000	0.00000
273	D	1593.6980	2.87679	2.87132	52.08126	501.38389	0.00000	0.00000	0.0472	0.29161	-7.57525	0.00000	0.00000
274	QM4b	1599.0549	2.89310	2.87294	54.25345	536.80666	0.00000	0.00000	0.0472	-0.70930	1.16402	0.00000	0.00000
275	#4QM	1599.0549	2.89310	2.87294	54.25345	536.80666	0.00000	0.00000	0.0472	-0.70930	1.16402	0.00000	0.00000
276	QM4b	1604.4118	2.90735	2.87460	68.21645	477.92413	0.00000	0.00000	0.0472	-1.97565	9.49324	0.00000	0.00000
277	DM45	1608.4118	2.91570	2.87604	85.17168	405.02880	0.00000	0.00000	0.0472	-2.26316	8.73059	0.00000	0.00000
278	QM5b	1614.8213	2.92609	2.87890	111.32568	319.98530	0.00000	0.00000	0.0472	-1.74085	4.78466	0.00000	0.00000
279	#5QM	1614.8213	2.92609	2.87890	111.32568	319.98530	0.00000	0.00000	0.0472	-1.74085	4.78466	0.00000	0.00000
280	QM5b	1621.2308	2.93456	2.88236	128.15493	277.72593	0.00000	0.00000	0.0472	-0.83560	1.93127	0.00000	0.00000
281	DM56	1711.3021	3.00090	2.99612	386.18812	67.98727	0.00000	0.00000	0.0472	-2.02917	0.39731	0.00000	0.00000
282	QM6b	1713.7500	3.00190	3.00190	389.67584	67.26504	0.00000	0.00000	0.0472	0.61236	-0.10064	0.00000	0.00000
283	#6QM	1713.7500	3.00190	3.00190	389.67584	67.26504	0.00000	0.00000	0.0472	0.61236	-0.10064	0.00000	0.00000
284	QM6b	1716.1980	3.00291	3.00764	380.25857	68.98372	0.00000	0.00000	0.0472	3.21319	-0.60535	0.00000	0.00000
285	OG4	1720.2173	3.00465	3.01659	354.90979	74.17000	0.00000	0.00000	0.0472	3.09349	-0.68497	0.00000	0.00000
286	B	1736.7573	3.01331	3.04700	260.72360	102.24786	0.01356	0.00000	0.0472	2.60095	-1.01260	0.00164	0.00000
287	O	1737.5573	3.01380	3.04824	256.58114	103.88070	0.01487	0.00000	0.0472	2.57713	-1.02845	0.00164	0.00000
288	B	1754.0973	3.02608	3.06988	179.47688	143.32078	0.05555	0.00000	0.0472	2.08455	-1.35608	0.00328	0.00000
289	O	1754.8973	3.02680	3.07076	176.16065	145.50318	0.05818	0.00000	0.0472	2.06073	-1.37193	0.00328	0.00000
290	B	1771.4373	3.04524	3.08636	116.13919	196.30548	0.12598	0.00000	0.0474	1.56814	-1.69956	0.00492	0.00000
291	O	1772.2373	3.04635	3.08700	113.64924	199.03745	0.12991	0.00000	0.0474	1.54431	-1.71540	0.00492	0.00000
292	B	1788.7773	3.07588	3.09856	70.71126	261.20197	0.22483	0.00000	0.0477	1.05170	-2.04303	0.00656	0.00000
293	OOG4	1796.9896	3.09682	3.10326	55.44631	296.09366	0.27869	0.00000	0.0477	0.80710	-2.20570	0.00656	0.00000
294	QSD	1799.4375	3.10405	3.10456	52.76724	300.82091	0.29767	0.00000	0.0477	0.29480	0.28784	0.00897	0.00000
295	#QSD	1799.4375	3.10405	3.10456	52.76724	300.82091	0.29767	0.00000	0.0477	0.29480	0.28784	0.00897	0.00000
296	QSD	1801.8855	3.11148	3.10587	52.52002	293.31362	0.32277	0.00000	0.0477	-0.19311	2.75789	0.01157	0.00000
297	OG3	1805.9197	3.12350	3.10814	54.39957	271.53936	0.36946	0.00000	0.0477	-0.27279	2.63953	0.01157	0.00000
298	B	1822.4597	3.16706	3.11967	68.82651	192.25057	0.57443	0.00000	0.0484	-0.59945	2.15423	0.01321	0.00000
299	O	1823.2597	3.16890	3.12034	69.79828	188.82258	0.58500	0.00000	0.0484	-0.61525	2.13076	0.01321	0.00000
300	B	1839.7997	3.20136	3.13742	95.55374	126.36370	0.81709	0.00000	0.0496	-0.94191	1.64547	0.01485	0.00000
301	O	1840.5997	3.20268	3.13844	97.07343	123.74973	0.82897	0.00000	0.0496	-0.95771	1.62200	0.01485	0.00000
302	B	1857.1397	3.22583	3.16534	134.15713	78.12076	1.08818	0.00000	0.0511	-1.28435	1.13671	0.01649	0.00000
303	O	1857.9397	3.22677	3.16699	136.22474	76.32081	1.10137	0.00000	0.0511	-1.30015	1.11323	0.01649	0.00000
304	B	1874.4797	3.24340	3.21127	184.63626	47.52176	1.38770	0.00000	0.0532	-1.62678	0.62794	0.01813	0.00000
305	OOG3	1882.6771	3.24999	3.24168	212.63411	39.19838	1.53632	0.00000	0.0532	-1.78867	0.38743	0.01813	0.00000
306	QSF	1885.1250	3.25179	3.25178	217.05024	38.26345	1.56480	0.00000	0.0532	-0.00297	-0.00289	0.00509	0.00000
307	#QSF	1885.1250	3.25179	3.25178	217.05024	38.26345	1.56480	0.00000	0.0532	-0.00297	-0.00289	0.00509	0.00000
308	QSF	1887.5730	3.25360	3.26188	212.66275	39.22708	1.56118	0.00000	0.0532	1.78298	-0.39345	-0.00805	0.00000
309	OG2	1891.2765	3.25646	3.27633	199.72571	42.54513	1.53137	0.00000	0.0532	1.71021	-0.50248	-0.00805	0.00000
310	B	1907.8165	3.27177	3.32637	148.52757	67.22066	1.41182	0.00000	0.0556	1.38520	-0.98939	-0.00641	0.00000
311	O	1908.6165	3.27263	3.32824	146.32382	68.82253	1.40670	0.00000	0.0556	1.36948	-1.01295	-0.00641	0.00000
312	B	1925.1565	3.29379	3.35863	106.39712	110.38442	1.31427	0.00000	0.0578	1.04446	-1.49986	-0.00477	0.00000
313	O	1925.9565	3.29500	3.35977	104.73855	112.80304	1.31045	0.00000	0.0578	1.02874	-1.52342	-0.00477	0.00000
314	B	1942.4965	3.32466	3.37875	76.08373	171.25129	1.24513	0.00000	0.0599	0.70371	-2.01034	-0.00313	0.00000

BETATRON FUNCTIONS OF ZZMB -- Medium-beta Module, Collision Optics

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
315	O	1943.2965	3.32634	3.37949	74.97037	174.48666	1.24263	0.00000	0.0599	0.68799	-2.03389	-0.00313	0.00000
316	B	1959.8365	3.36684	3.39211	57.58776	249.82127	1.20443	0.00000	0.0619	0.36295	-2.52081	-0.00149	0.00000
317	OOG2	1968.3646	3.39155	3.39711	52.82646	294.95768	1.19173	0.00000	0.0619	0.19536	-2.77186	-0.00149	0.00000
318	QSD	1970.8125	3.39894	3.39841	53.06831	302.49948	1.20033	0.00000	0.0619	-0.29483	-0.28787	0.00853	0.00000
319	#QSD	1970.8125	3.39894	3.39841	53.06831	302.49948	1.20033	0.00000	0.0619	-0.29483	-0.28787	0.00853	0.00000
320	QSD	1973.2605	3.40613	3.39971	55.75306	297.73799	1.23364	0.00000	0.0619	-0.80941	2.21962	0.01873	0.00000
321	OG1	1977.8299	3.41833	3.40224	63.76993	277.86893	1.31922	0.00000	0.0619	-0.94506	2.12866	0.01873	0.00000
322	B	1994.3699	3.45102	3.41307	103.15380	212.89840	1.64256	0.00000	0.0643	-1.43607	1.79942	0.02037	0.00000
323	O	1995.1699	3.45224	3.41367	105.47050	210.03207	1.65886	0.00000	0.0643	-1.45982	1.78350	0.02037	0.00000
324	B	2011.7099	3.47244	3.42821	161.88225	156.47966	2.00931	0.00000	0.0673	-1.95081	1.45425	0.02201	0.00000
325	O	2012.5099	3.47322	3.42903	165.02254	154.16559	2.02692	0.00000	0.0673	-1.97456	1.43833	0.02201	0.00000
326	B	2029.0499	3.48651	3.44911	238.46154	112.03131	2.40449	0.00000	0.0710	-2.46552	1.10909	0.02365	0.00000
327	O	2029.8499	3.48703	3.45026	242.42538	110.26951	2.42340	0.00000	0.0710	-2.48927	1.09316	0.02365	0.00000
328	B	2046.3899	3.49631	3.47851	332.89080	79.55335	2.82809	0.00000	0.0753	-2.98022	0.76392	0.02529	0.00000
329	DOG1	2051.0171	3.49843	3.48819	361.10647	72.90992	2.94509	0.00000	0.0753	-3.11757	0.67181	0.02529	0.00000
330	QFC	2052.0171	3.49887	3.49039	367.37130	71.58620	2.97038	0.00000	0.0753	-3.14726	0.65191	0.02529	0.00000
331	SF	2052.0171	3.49887	3.49039	367.37130	71.58620	2.97038	0.00000	0.0753	-3.14726	0.65191	0.02529	0.00000
332	QFC	2053.0171	3.49930	3.49264	373.69549	70.30229	2.99567	0.00000	0.0753	-3.17694	0.63200	0.02529	0.00000
333	OPM	2054.0521	3.49973	3.49500	380.30356	69.01538	3.02184	0.00000	0.0753	-3.20766	0.61140	0.02529	0.00000
334	QSF	2056.5000	3.50074	3.50073	388.20974	67.52875	3.05253	0.00000	0.0753	0.00010	0.00005	-0.00025	0.00000
335	#QSF	2056.5000	3.50074	3.50073	388.20974	67.52875	3.05253	0.00000	0.0753	0.00010	0.00005	-0.00025	0.00000
336	#QF	2056.5000	3.50074	3.50073	388.20974	67.52875	3.05253	0.00000	0.0753	0.00010	0.00005	-0.00025	0.00000
337	QF	2058.3200	3.50149	3.50500	383.82545	68.34767	3.03476	0.00000	0.0753	2.39972	-0.45171	-0.01926	0.00000
338	O	2059.1200	3.50183	3.50685	379.99717	69.08167	3.01935	0.00000	0.0753	2.38563	-0.46580	-0.01926	0.00000
339	B	2075.6600	3.50955	3.54062	305.89682	89.30971	2.71433	0.00000	0.0800	2.09443	-0.75718	-0.01762	0.00000
340	O	2076.4600	3.50997	3.54204	302.55700	90.53246	2.70023	0.00000	0.0800	2.08035	-0.77127	-0.01762	0.00000
341	B	2093.0000	3.51977	3.56731	238.55587	120.86539	2.42232	0.00000	0.0842	1.78913	-1.06264	-0.01598	0.00000
342	O	2093.8000	3.52031	3.56835	235.70454	122.57689	2.40953	0.00000	0.0842	1.77504	-1.07674	-0.01598	0.00000
343	B	2110.3400	3.53304	3.58702	181.80335	163.01471	2.15873	0.00000	0.0879	1.48380	-1.36811	-0.01434	0.00000
344	O	2111.1400	3.53375	3.58779	179.44055	165.21496	2.14726	0.00000	0.0879	1.46971	-1.38221	-0.01434	0.00000
345	B	2127.6800	3.55065	3.60176	135.63991	215.75767	1.92357	0.00000	0.0912	1.17845	-1.67358	-0.01270	0.00000
346	O	2128.4800	3.55160	3.60234	133.76566	218.44668	1.91341	0.00000	0.0912	1.16436	-1.68767	-0.01270	0.00000
347	B	2145.0200	3.57443	3.61301	100.06607	279.09428	1.71684	0.00000	0.0942	0.87309	-1.97905	-0.01106	0.00000
348	O	2145.8200	3.57571	3.61346	98.68039	282.27203	1.70799	0.00000	0.0942	0.85901	-1.99314	-0.01106	0.00000
349	B	2162.3600	3.60648	3.62181	75.08223	353.02452	1.53853	0.00000	0.0969	0.56773	-2.28452	-0.00943	0.00000
350	OOC	2165.8950	3.61418	3.62337	71.28848	369.39620	1.50521	0.00000	0.0969	0.50547	-2.34679	-0.00943	0.00000
351	QDC	2166.8950	3.61642	3.62379	70.29515	374.10740	1.49579	0.00000	0.0969	0.48786	-2.36441	-0.00943	0.00000
352	SD	2166.8950	3.61642	3.62379	70.29515	374.10740	1.49579	0.00000	0.0969	0.48786	-2.36441	-0.00943	0.00000
353	QDC	2167.8950	3.61870	3.62422	69.33705	378.85383	1.48636	0.00000	0.0969	0.47025	-2.38202	-0.00943	0.00000
354	OPM	2168.9300	3.62110	3.62465	68.38250	383.80349	1.47661	0.00000	0.0969	0.45202	-2.40026	-0.00943	0.00000
355	QD	2170.7500	3.62537	3.62540	67.56283	388.19000	1.46781	0.00000	0.0969	0.00006	-0.00078	-0.00025	0.00000
356	#QD	2170.7500	3.62537	3.62540	67.56283	388.19000	1.46781	0.00000	0.0969	0.00006	-0.00078	-0.00025	0.00000
357	QD	2172.5700	3.62964	3.62615	68.38208	383.80911	1.47571	0.00000	0.0969	-0.45190	2.39874	0.00893	0.00000
358	Q	2173.3700	3.63149	3.62648	69.11639	379.98239	1.48285	0.00000	0.0969	-0.46599	2.38466	0.00893	0.00000
359	B	2189.9100	3.66524	3.63420	89.34868	305.91187	1.64409	0.00000	0.0994	-0.75724	2.09360	0.01057	0.00000

BETATRON FUNCTIONS OF ZZMB -- Medium-beta Module, Collision Optics

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
360	O	2190.7100	3.66666	3.63462	90.57154	302.57336	1.65254	0.00000	0.0994	-0.77133	2.07953	0.01057	0.00000
361	B	2207.2500	3.69192	3.64443	120.90449	238.59670	1.84090	0.00000	0.1023	-1.06258	1.78847	0.01221	0.00000
362	O	2208.0500	3.69296	3.64496	122.61589	235.74641	1.85066	0.00000	0.1023	-1.07667	1.77439	0.01221	0.00000
363	B	2224.5900	3.71162	3.65769	163.04916	181.86361	2.06613	0.00000	0.1055	-1.36790	1.48333	0.01385	0.00000
364	O	2225.3900	3.71240	3.65839	165.24908	179.50154	2.07721	0.00000	0.1055	-1.38199	1.46926	0.01385	0.00000
365	B	2241.9300	3.72636	3.67529	215.78221	135.71259	2.31979	0.00000	0.1091	-1.67321	1.17820	0.01549	0.00000
366	O	2242.7300	3.72694	3.67624	218.47062	133.83873	2.33218	0.00000	0.1091	-1.68730	1.16412	0.01549	0.00000
367	B	2259.2700	3.73761	3.69905	279.10305	100.14364	2.60188	0.00000	0.1131	-1.97850	0.87307	0.01713	0.00000
368	O	2260.0700	3.73807	3.70033	282.27992	98.75800	2.61558	0.00000	0.1131	-1.99259	0.85899	0.01713	0.00000
369	B	2276.6100	3.74641	3.73108	353.01095	75.15676	2.91239	0.00000	0.1177	-2.28377	0.56793	0.01876	0.00000
370	OOC	2280.1450	3.74797	3.73877	369.37723	71.36139	2.97872	0.00000	0.1177	-2.34601	0.50572	0.01876	0.00000
371	QFC	2281.1450	3.74839	3.74101	374.08686	70.36754	2.99748	0.00000	0.1177	-2.36362	0.48813	0.01876	0.00000
372	SF	2281.1450	3.74839	3.74101	374.08686	70.36754	2.99748	0.00000	0.1177	-2.36362	0.48813	0.01876	0.00000
373	QFC	2282.1450	3.74882	3.74329	378.83171	69.40888	3.01625	0.00000	0.1177	-2.38123	0.47053	0.01876	0.00000
374	OPM	2283.1800	3.74925	3.74568	383.77971	68.45373	3.03567	0.00000	0.1177	-2.39945	0.45232	0.01876	0.00000
375	QF	2285.0000	3.75000	3.74994	388.16353	67.63372	3.05253	0.00000	0.1177	-0.00012	-0.00006	-0.00025	0.00000
376	#QF	2285.0000	3.75000	3.74994	388.16353	67.63372	3.05253	0.00000	0.1177	-0.00012	-0.00006	-0.00025	0.00000
377	MDU	4570.0000	4.49998	4.49988	388.18755	67.58123	3.05253	-0.00002	0.2361	0.00002	0.00000	0.00025	0.00000
378	CF	4798.5000	4.74922	4.74909	388.18609	67.58123	3.05254	0.00001	0.2785	0.00000	0.00000	0.00025	0.00000
379	#QF	4798.5000	4.74922	4.74909	388.18609	67.58123	3.05254	0.00001	0.2785	0.00000	0.00000	0.00025	0.00000

CIRCUMFERENCE = 4798.5000 M THETX = 0.18364216 RAD NUX = 4.74922 DNUX/(DP/P) = -13.54391
RADIUS = 763.7050 M THETY = 0.00000000 RAD NUY = 4.74909 DNUY/(DP/P) = -13.54324
(DS/S)/(DP/P)= 0.0000580 TGAM=(131.25703, 0.00000)

MAXIMA --- BETX(186) = 2605.41668 BETY(194) = 2605.33589 XEQ(1) = 3.05254 YEQ(233) = 0.26005
MINIMA --- BETX(234) = 6.06638 BETY(121) = 6.06691 XEQ(161) = 0.00000 YEQ(253) = -0.26004

```
     SSC MAIN RING

     Near cluster:

***   .CLW    BML          //  .UTL UTL. .LUD .LDU

     Far cluster:

***   .CLE    BML          //  .UTL UTL. .MUD .MDU

     Ring:

***   .SSC    BML          //  .CLE .ARC .CLW .ARC $QF
     ------------------------------------------------------------------------

     Print beta functions only at markers

     Injection optics:

***   KFC     PARA         //  0.11484157   -6
***   KDC     PARA         //  0.39724458   -6

***           CALL         //  SRC

***   BL*     =            //  8.0
***   KL1     PARA         //  0.33917210   -2
***   KL2     PARA         //  -.34311096   -2
***   KL3     PARA         //  0.34337636   -2
***   KL4     PARA         //  0.34284391   -2
***   KL5     PARA         //  -.26970915   -2
***   KL6     PARA         //  -.48908702   -3

***           CALL         //  SRSL

***   BM*     =            //  60.
***   KM1     PARA         //  0.33375330   -2
***   KM2     PARA         //  -.34236200   -2
***   KM3     PARA         //  0.34514668   -2
***   KM4     PARA         //  0.34344617   -2
***   KM5     PARA         //  -.25087127   -2
***   KM6     PARA         //  -.67338532   -3

***           CALL         //  SRSM


***   RING    CYC   -1   1 //  .SSC      SF   SD   0.        0.
-------------------------------------------------------------------------------
```

H1

BETATRON FUNCTIONS OF RING -- Injection optics

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
0		0.0000	0.00000	0.00000	388.16865	67.59092	3.05186	0.00001	0.0000	-0.00004	0.00001	0.00025	0.00000
1	#QF	0.0000	0.00000	0.00000	388.16865	67.59092	3.05186	0.00001	0.0000	-0.00004	0.00001	0.00025	0.00000
21	#QSD	114.2500	0.12462	0.12459	67.56802	388.21400	1.46773	0.00001	0.0000	-0.00004	0.00014	0.00025	0.00000
37	#QSF	199.9375	0.22690	0.22639	302.52108	53.07583	2.77585	0.00000	0.0208	0.28857	0.29480	-0.00409	0.00000
49	#QSD	285.6250	0.37360	0.37352	38.23479	217.06347	0.74075	-0.00001	0.0345	0.00278	0.00306	-0.01432	0.00000
61	#QSF	371.3125	0.52087	0.52126	300.90479	52.76476	0.29226	-0.00001	0.0453	-0.28853	-0.29477	-0.00416	0.00000
73	#QU4	457.6912	0.62509	0.62370	67.69118	387.56771	0.00008	-0.00001	0.0482	-0.17614	0.91128	0.00000	0.00000
77	#QU3	498.3850	0.68551	0.65696	181.87528	97.20503	-0.00002	0.00000	0.0487	-0.87812	1.75130	0.00000	0.00000
81	#QU2	741.6336	0.86230	1.00959	427.83980	901.27417	-0.00057	0.00003	0.0487	-5.56241	5.00520	-0.00001	0.00000
85	#QU1	760.4943	0.86739	1.01397	817.31412	516.86142	-0.00079	0.00002	0.0487	-6.70484	5.58708	-0.00001	0.00000
88	#UC	1085.3750	0.96785	1.15748	350.67451	350.61610	-0.00054	0.00001	0.0487	0.28903	-0.28883	0.00000	0.00000
91	#1QU	1410.2556	1.11137	1.25796	516.76433	817.15321	-0.00027	-0.00001	0.0487	-5.58590	6.70341	0.00000	0.00000
95	#2QU	1429.1163	1.11575	1.26306	901.09884	427.75881	-0.00033	-0.00001	0.0487	-5.00411	5.56124	0.00000	0.00000
99	#3QU	1672.3649	1.46838	1.43984	97.22112	181.91416	0.00028	-0.00001	0.0487	-1.75144	0.87823	0.00000	0.00000
103	#4QU	1713.0588	1.50163	1.50025	387.60202	67.70518	0.00052	-0.00001	0.0487	-0.91115	0.17627	0.00000	0.00000
115	#QSD	1799.4375	1.60408	1.60446	52.75006	300.90459	0.29776	-0.00001	0.0487	0.29489	0.28867	0.00897	0.00000
127	#QSF	1885.1250	1.75187	1.75174	217.03064	38.23308	1.56460	0.00000	0.0492	-0.00333	-0.00283	0.00509	0.00000
139	#QSD	1970.8125	1.89898	1.89844	53.08830	302.54616	1.20012	0.00002	0.0547	-0.29493	-0.28870	0.00853	0.00000
155	#QSF	2056.5000	2.00076	2.00070	388.24594	67.58247	3.05201	0.00001	0.0634	0.00055	-0.00004	-0.00025	0.00000
156	#QF	2056.5000	2.00076	2.00070	388.24594	67.58247	3.05201	0.00001	0.0768	0.00055	-0.00004	-0.00025	0.00000
176	#QD	2170.7500	2.12541	2.12529	67.53210	388.22798	1.46765	0.00001	0.0768	0.00021	-0.00028	-0.00025	0.00000
196	#QF	2285.0000	2.25009	2.24987	388.10357	67.60024	3.05239	0.00000	0.0984	-0.00049	0.00003	-0.00025	0.00000
216	#QSD	2399.2500	2.37469	2.37446	67.60201	388.20337	1.46781	-0.00002	0.1192	-0.00016	-0.00002	-0.00025	0.00000
228	#QSF	2484.9375	2.47692	2.47627	302.61402	53.06868	2.75418	-0.00001	0.1408	0.28908	0.29478	-0.00441	0.00000
240	#QSD	2570.6250	2.62364	2.62340	38.21593	217.06753	0.72796	-0.00001	0.1540	0.00296	0.00293	-0.01457	0.00000
252	#QSF	2656.3125	2.77096	2.77113	300.89347	52.77130	0.27082	0.00000	0.1652	-0.28905	-0.29475	-0.00434	0.00000
264	#QU4	2742.6912	2.87516	2.87356	67.72481	387.56035	0.00001	0.00002	0.1681	-0.17640	0.91139	0.00000	0.00000
268	#QU3	2783.3851	2.93555	2.90682	181.96254	97.19803	0.00001	0.00001	0.1686	-0.87832	1.75129	0.00000	0.00000
272	#QU2	3026.6337	3.11233	3.25946	427.64194	901.39203	0.00000	-0.00001	0.1686	-5.55959	5.00589	0.00000	0.00000
276	#QU1	3045.4944	3.11743	3.26384	816.92381	516.92785	0.00000	-0.00001	0.1686	-6.70142	5.58784	0.00000	0.00000
279	#UC	3370.3750	3.21793	3.40735	350.55003	350.59060	-0.00001	-0.00002	0.1686	0.28854	-0.28870	0.00000	0.00000
282	#1QU	3695.2557	3.36144	3.50784	517.00193	817.04577	-0.00002	-0.00003	0.1686	-5.58873	6.70250	0.00000	0.00000
286	#2QU	3714.1164	3.36582	3.51294	901.52522	427.70363	-0.00003	-0.00002	0.1686	-5.00671	5.56048	0.00000	0.00000
290	#3QU	3957.3650	3.71846	3.68972	97.18686	181.93458	0.00001	0.00000	0.1686	-1.75121	0.87825	0.00000	0.00000
294	#4QU	3998.0588	3.75172	3.75012	387.53861	67.71427	0.00001	0.00000	0.1686	-0.91150	0.17632	0.00000	0.00000
306	#QSD	4084.4375	3.85415	3.85433	52.77347	300.90874	0.27621	0.00001	0.1686	0.29472	0.28881	0.00879	0.00000
318	#QSF	4170.1250	4.00188	4.00161	217.06587	38.22797	1.49194	0.00001	0.1691	-0.00282	-0.00285	0.00534	0.00000
330	#QSD	4255.8125	4.14903	4.14832	53.05989	302.56409	1.17878	0.00001	0.1746	-0.29475	-0.28883	0.00920	0.00000
342	#QSF	4341.5000	4.25085	4.25057	388.18103	67.59139	3.05252	0.00000	0.1830	-0.00003	0.00000	0.00025	0.00000
343	#QF	4341.5000	4.25085	4.25057	388.18103	67.59139	3.05252	0.00000	0.1967	-0.00003	0.00000	0.00025	0.00000
363	#QD	4455.7500	4.37548	4.37516	67.56734	388.21712	1.46773	-0.00002	0.1967	-0.00001	0.00015	0.00025	0.00000
383	#QF	4570.0000	4.50010	4.49975	388.17028	67.59130	3.05213	-0.00001	0.2175	-0.00003	0.00001	0.00025	0.00000
403	#QSD	4684.2500	4.62472	4.62434	67.56686	388.21369	1.46758	-0.00001	0.2391	-0.00004	0.00015	0.00025	0.00000
419	#QSF	4769.9375	4.72700	4.72614	302.51838	53.07553	2.77520	0.00000	0.2599	0.28855	0.29480	-0.00409	0.00000
431	#QSD	4855.6250	4.87370	4.87327	38.23544	217.06362	0.74051	0.00001	0.2736	0.00278	0.00305	-0.01432	0.00000

BETATRON FUNCTIONS OF RING -- Injection optics

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
443	#QSF	4941.3125	5.02097	5.02101	300.90468	52.76503	0.29211	0.00001	0.2844	-0.28852	-0.29477	-0.00416	0.00000
455	#QM6	5027.0000	5.12360	5.12316	66.44759	394.59419	0.00023	0.00001	0.2873	0.44802	-2.63502	0.00000	0.00000
459	#QM5	5125.9287	5.32261	5.14953	180.88196	821.26927	0.00025	0.00001	0.2878	-4.13655	10.45999	0.00000	0.00000
463	#QM4	5141.6951	5.33178	5.15429	413.30629	339.70023	0.00035	0.00001	0.2878	-3.83098	7.95832	0.00000	0.00000
466	#BV+	5148.0520	5.33420	5.15761	405.73662	285.29138	0.00034	0.00001	0.2878	3.78596	1.81304	0.00000	0.00000
470	#BV+	5182.1320	5.35370	5.18169	191.57861	179.16522	0.00019	0.05588	0.2878	2.49802	1.30097	0.00000	0.00328
472	#BV-	5201.4167	5.37498	5.20151	109.28647	134.57653	0.00010	0.11912	0.2878	1.76922	1.01116	0.00000	0.00328
476	#BV-	5235.4967	5.47171	5.25373	32.58975	83.10927	-0.00004	0.17500	0.2876	0.48127	0.49902	0.00000	0.00000
479	#QVD	5243.1020	5.51123	5.26950	31.15557	67.01618	-0.00008	0.16413	0.2873	-0.41759	1.83214	-0.00001	-0.00355
483	#QVF	5256.0020	5.55987	5.32772	58.92583	19.37997	-0.00017	0.09444	0.2873	-0.73670	0.89865	0.00000	-0.00439
488	#QVF	5276.8520	5.61845	5.52717	46.38180	30.33326	-0.00019	0.03666	0.2873	1.13191	-1.59236	0.00000	-0.00178
492	#QVD	5289.7520	5.69410	5.56376	17.10837	105.45800	-0.00012	0.01883	0.2873	0.43163	-2.71930	0.00000	-0.00160
497	#QVD	5310.6020	5.85215	5.58987	44.18773	125.82502	-0.00009	-0.01886	0.2873	-2.14667	2.07762	0.00000	-0.00160
501	#QVF	5323.5020	5.87822	5.61507	141.41989	53.14090	-0.00011	-0.03668	0.2873	-3.32520	1.56956	0.00000	-0.00178
506	#QVF	5344.3520	5.89857	5.69592	153.96350	42.18714	-0.00007	-0.09445	0.2873	2.93000	-0.87582	0.00000	-0.00439
510	#QVD	5357.2520	5.92030	5.72997	58.23447	87.38155	-0.00001	-0.16413	0.2873	2.13263	-1.19042	0.00000	-0.00355
515	#BV+	5373.5384	5.98722	5.75966	30.01097	80.21071	0.00006	-0.17404	0.2873	0.36633	0.45330	0.00000	0.00038
518	#BV+	5379.5384	6.02103	5.77196	26.97557	75.31212	0.00008	-0.17081	0.2872	0.13957	0.36313	0.00000	0.00076
521	#BV+	5385.5384	6.05694	5.78499	26.66125	71.49558	0.00011	-0.16528	0.2872	-0.08718	0.27296	0.00000	0.00114
524	#BV+	5391.5384	6.09152	5.79862	29.06801	68.76110	0.00014	-0.15747	0.2871	-0.31394	0.18279	0.00000	0.00152
527	#BV+	5397.5384	6.12199	5.81270	34.19584	67.10869	0.00016	-0.14738	0.2871	-0.54070	0.09262	0.00000	0.00190
530	#BV-	5465.4372	6.24354	5.94644	281.85479	123.81918	0.00046	-0.01902	0.2870	-3.10678	-0.92783	0.00000	0.00152
533	#BV-	5471.4372	6.24672	5.95382	320.49665	135.49419	0.00049	-0.01083	0.2870	-3.33353	-1.01800	0.00000	0.00114
536	#BV-	5477.4372	6.24952	5.96056	361.85958	148.25125	0.00051	-0.00493	0.2870	-3.56029	-1.10817	0.00000	0.00076
539	#BV-	5483.4372	6.25201	5.96672	405.94359	162.09032	0.00054	-0.00131	0.2870	-3.78705	-1.19834	0.00000	0.00038
542	#BV-	5489.4372	6.25424	5.97236	452.74867	177.01142	0.00057	0.00003	0.2870	-4.01380	-1.28851	0.00000	0.00000
545	#QM3	5502.0855	6.25830	5.98261	502.60533	235.57163	0.00059	0.00003	0.2870	5.67446	-5.90661	-0.00001	0.00000
549	#QM2	5512.9060	6.26278	5.98790	287.08676	460.20471	0.00044	0.00005	0.2870	6.73427	-8.76374	-0.00001	0.00000
553	#QM2	5522.6504	6.26899	5.99101	238.19830	492.96839	0.00039	0.00005	0.2870	-1.22402	5.74362	0.00000	0.00000
557	#QM1	5531.5988	6.27433	5.99452	300.81084	330.30650	0.00043	0.00004	0.2870	-1.78858	6.15983	0.00000	0.00000
560	#IPM	5655.3750	6.45252	6.17265	60.00222	60.00600	-0.00003	0.00001	0.2870	0.00003	-0.00003	0.00000	0.00000
563	#1QM	5779.1512	6.63066	6.35083	330.32116	300.80074	-0.00052	-0.00003	0.2870	-6.16014	1.78858	-0.00001	0.00000
567	#2QM	5788.0996	6.63417	6.35618	492.99123	238.18946	-0.00064	-0.00002	0.2870	-5.74393	1.22403	-0.00001	0.00000
571	#2QM	5797.8440	6.63728	6.36239	460.22679	287.07498	-0.00062	-0.00003	0.2870	8.76412	-6.73394	0.00001	0.00000
575	#3QM	5808.6645	6.64257	6.36687	235.58356	502.58340	-0.00045	-0.00004	0.2870	5.90687	-5.67416	0.00001	0.00000
578	#BV+	5821.3128	6.65282	6.37093	177.02117	452.72788	-0.00039	-0.00004	0.2870	1.28855	4.01366	0.00000	0.00000
581	#BV+	5827.3128	6.65846	6.37315	162.09962	405.92437	-0.00038	0.00130	0.2870	1.19838	3.78692	0.00000	0.00038
584	#BV+	5833.3128	6.66462	6.37565	148.26013	361.84176	-0.00036	0.00492	0.2870	1.10821	3.56018	0.00000	0.00076
587	#BV+	5839.3128	6.67136	6.37845	135.50268	320.48008	-0.00035	0.01082	0.2870	1.01804	3.33343	0.00000	0.00114
590	#BV+	5845.3128	6.67873	6.38163	123.82728	281.83935	-0.00033	0.01901	0.2870	0.92786	3.10669	0.00000	0.00152
593	#BV-	5913.2116	6.81247	6.50319	67.11038	34.19278	-0.00016	0.14738	0.2870	-0.09255	0.54060	0.00000	0.00190
596	#BV-	5919.2116	6.82654	6.53366	68.76199	29.06614	-0.00015	0.15747	0.2870	-0.18272	0.31384	0.00000	0.00152
599	#BV-	5925.2116	6.84018	6.56824	71.49565	26.66058	-0.00013	0.16528	0.2869	-0.27289	0.08708	0.00000	0.00114
602	#BV-	5931.2116	6.85321	6.60415	75.31136	26.97612	-0.00012	0.17080	0.2868	-0.36306	-0.13967	0.00000	0.00076
605	#BV-	5937.2116	6.86551	6.63797	80.20911	30.01274	-0.00010	0.17404	0.2868	-0.45323	-0.36643	0.00000	0.00038

BETATRON FUNCTIONS OF RING -- Injection optics

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
610	#QVF	5953.4979	6.89519	6.70487	87.37803	58.24024	-0.00006	0.18609	0.2867	1.19042	-2.13285	0.00000	0.00371
614	#QVD	5966.3979	6.92925	6.72661	42.18476	153.97856	0.00000	0.25970	0.2867	0.87580	-2.93027	0.00000	0.00278
619	#QVD	5987.2479	7.01011	6.74695	53.13811	141.43264	0.00011	0.20621	0.2867	-1.56951	3.32554	0.00001	-0.00731
623	#QVF	6000.1479	7.03530	6.77302	125.82008	44.19091	0.00021	0.08200	0.2867	-2.07759	2.14689	0.00001	-0.00875
628	#QVF	6020.9979	7.06141	6.93107	105.45573	17.10680	0.00023	-0.08199	0.2867	2.71919	-0.43155	0.00000	-0.00875
632	#QVD	6033.8979	7.09801	7.00673	30.33346	46.37789	0.00014	-0.20620	0.2867	1.59231	-1.13187	0.00000	-0.00731
637	#QVD	6054.7479	7.29745	7.06531	19.38057	58.92423	0.00010	-0.25969	0.2867	-0.89862	0.73658	0.00000	0.00278
641	#QVF	6067.6479	7.35567	7.11395	67.01533	31.15660	0.00011	-0.18609	0.2867	-1.83206	0.41751	0.00000	0.00371
644	#BV+	6075.2533	7.37144	7.15347	83.10723	32.59215	0.00010	-0.17499	0.2867	-0.49895	-0.48138	0.00000	0.00000
648	#BV+	6109.3333	7.42366	7.25020	134.57043	109.29537	0.00001	-0.11912	0.2864	-1.01112	-1.76930	0.00000	0.00328
650	#BV-	6128.6179	7.44348	7.27147	179.15744	191.59040	-0.00004	-0.05588	0.2862	-1.30093	-2.49809	0.00000	0.00328
654	#BV-	6162.6979	7.46756	7.29097	285.28337	405.74911	-0.00012	0.00000	0.2863	-1.81309	-3.78589	0.00000	0.00000
657	#4QM	6169.0548	7.47088	7.29339	339.69210	413.31663	-0.00014	0.00000	0.2863	-7.95823	3.83127	0.00000	0.00000
661	#5QM	6184.8212	7.47563	7.30256	821.25456	180.88249	-0.00025	0.00000	0.2863	-10.45991	4.13675	0.00000	0.00000
665	#6QM	6283.7500	7.50201	7.50160	394.60052	66.43979	-0.00026	-0.00001	0.2863	2.63496	-0.44812	0.00000	0.00000
677	#QSD	6369.4375	7.60415	7.60423	52.76498	300.94961	0.29748	-0.00002	0.2863	0.29482	0.28831	0.00897	0.00000
689	#QSF	6455.1250	7.75191	7.75145	217.04643	38.24607	1.56440	0.00000	0.2868	-0.00302	-0.00258	0.00509	0.00000
701	#QSD	6540.8125	7.89905	7.89815	53.07111	302.44473	1.20029	0.00001	0.2923	-0.29485	-0.28834	0.00854	0.00000
717	#QSF	6626.5000	8.00085	8.00045	388.21604	67.55930	3.05279	0.00001	0.3010	0.00023	-0.00029	-0.00025	0.00000
718	#QF	6626.5000	8.00085	8.00045	388.21604	67.55930	3.05279	0.00001	0.3144	0.00023	-0.00029	-0.00025	0.00000
738	#QD	6740.7500	8.12548	8.12506	67.55336	388.32391	1.46796	0.00002	0.3144	0.00013	-0.00062	-0.00025	0.00000
758	#QF	6855.0000	8.25013	8.24959	388.13453	67.62359	3.05266	0.00000	0.3360	-0.00017	0.00027	-0.00025	0.00000
778	#QSD	6969.2500	8.37475	8.37416	67.58079	388.10893	1.46766	-0.00001	0.3568	-0.00008	0.00033	-0.00025	0.00000
790	#QSF	7054.9375	8.47700	8.47601	302.56360	53.04735	2.75353	-0.00001	0.3784	0.28875	0.29452	-0.00441	0.00000
802	#QSD	7140.6250	8.62371	8.62317	38.22789	217.11937	0.72773	-0.00001	0.3917	0.00288	0.00258	-0.01456	0.00000
814	#QSF	7226.3125	8.77100	8.77084	300.89213	52.78547	0.27067	0.00000	0.4028	-0.28873	-0.29450	-0.00434	0.00000
826	#QM6	7312.0000	8.87362	8.87298	66.46071	394.49321	0.00015	0.00001	0.4057	0.44801	-2.63387	0.00000	0.00000
830	#QM5	7410.9287	9.07261	8.89937	180.86437	820.94244	0.00056	0.00001	0.4062	-4.13595	10.45620	0.00001	0.00000
834	#QM4	7426.6951	9.08178	8.90412	413.25687	339.55779	0.00084	0.00001	0.4062	-3.83033	7.95533	0.00001	0.00000
837	#BV-	7433.0520	9.08420	8.90744	405.68581	285.16774	0.00083	0.00001	0.4062	3.78567	1.81259	-0.00001	0.00000
841	#BV-	7467.1320	9.10370	8.93154	191.54680	179.07361	0.00055	-0.05587	0.4062	2.49775	1.30049	-0.00001	-0.00328
843	#BV+	7486.4167	9.12498	8.95136	109.26471	134.50374	0.00039	-0.11911	0.4063	1.76896	1.01067	-0.00001	-0.00328
847	#BV+	7520.4967	9.22174	9.00361	32.58449	83.07102	0.00011	-0.17499	0.4060	0.48104	0.49851	-0.00001	0.00000
850	#QVD	7528.1020	9.26126	9.01939	31.15341	66.98976	0.00006	-0.16412	0.4058	-0.41777	1.83105	-0.00001	0.00355
854	#QVF	7541.0020	9.30990	9.07762	58.92961	19.37912	-0.00002	-0.09444	0.4058	-0.73696	0.89806	-0.00001	0.00439
859	#QVF	7561.8520	9.36847	9.27699	46.39064	30.34408	-0.00012	-0.03667	0.4058	1.13201	-1.59252	0.00000	0.00178
863	#QVD	7574.7520	9.44411	9.31358	17.11186	105.47252	-0.00014	-0.01884	0.4058	0.43180	-2.71915	0.00000	0.00160
868	#QVD	7595.6020	9.60215	9.33969	44.18053	125.82011	-0.00027	0.01885	0.4058	-2.14617	2.07808	-0.00001	0.00160
872	#QVF	7608.5020	9.62823	9.36489	141.39119	53.12996	-0.00044	0.03667	0.4058	-3.32443	1.56974	-0.00001	0.00178
877	#QVF	7629.3520	9.64858	9.44578	153.92975	42.16453	-0.00043	0.09444	0.4058	2.92939	-0.87526	0.00001	0.00439
881	#QVD	7642.2520	9.67032	9.47985	58.22161	87.33570	-0.00023	0.16413	0.4058	2.13213	-1.18994	0.00001	0.00355
886	#BV-	7658.5384	9.73724	9.50955	30.00709	80.17563	-0.00009	0.17404	0.4058	0.36610	0.45278	0.00001	-0.00038
889	#BV-	7664.5384	9.77106	9.52185	26.97441	75.28331	-0.00004	0.17080	0.4057	0.13935	0.36261	0.00001	-0.00076
892	#BV-	7670.5384	9.80697	9.53488	26.66275	71.47309	0.00001	0.16528	0.4056	-0.08740	0.27243	0.00001	-0.00114
895	#BV-	7676.5384	9.84154	9.54852	29.07212	68.74499	0.00006	0.15747	0.4056	-0.31416	0.18225	0.00001	-0.00152

BETATRON FUNCTIONS OF RING -- Injection optics

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
898	#BV-	7682.5384	9.87201	9.56260	34.20252	67.09900	0.00011	0.14738	0.4055	-0.54091	0.09208	0.00001	-0.00190
901	#BV+	7750.4372	9.99354	9.69631	281.88703	123.88564	0.00067	0.01902	0.4055	-3.10694	-0.92842	0.00001	-0.00152
904	#BV+	7756.4372	9.99672	9.70368	320.53083	135.56769	0.00071	0.01084	0.4055	-3.33369	-1.01859	0.00001	-0.00114
907	#BV+	7762.4372	9.99952	9.71042	361.89567	148.33183	0.00076	0.00493	0.4055	-3.56045	-1.10876	0.00001	-0.00076
910	#BV+	7768.4372	10.00201	9.71658	405.98153	162.17804	0.00081	0.00131	0.4055	-3.78720	-1.19894	0.00001	-0.00038
913	#BV+	7774.4372	10.00424	9.72221	452.78841	177.10632	0.00086	-0.00002	0.4055	-4.01395	-1.28911	0.00001	0.00000
916	#QM3	7787.0855	10.00830	9.73246	502.64417	235.69416	0.00091	-0.00002	0.4055	5.67510	-5.90952	-0.00001	0.00000
920	#QM2	7797.9060	10.01278	9.73775	287.10554	460.43872	0.00070	-0.00003	0.4055	6.73492	-8.76800	-0.00002	0.00000
924	#QM2	7807.6504	10.01898	9.74085	238.20990	493.21516	0.00064	-0.00003	0.4055	-1.22387	5.74671	0.00000	0.00000
928	#QM1	7816.5988	10.02433	9.74436	300.82107	330.46859	0.00072	-0.00003	0.4055	-1.78842	6.16308	0.00000	0.00000
931	#IPM	7940.3750	10.20254	9.92249	59.99062	59.97676	0.00019	0.00000	0.4055	-0.00008	0.00021	0.00000	0.00000
934	#1QM	8064.1512	10.38068	10.10074	330.38910	300.83486	-0.00037	0.00003	0.4055	-6.16150	1.78825	-0.00001	0.00000
938	#2QM	8073.0996	10.38419	10.10608	493.09436	238.22492	-0.00047	0.00002	0.4055	-5.74521	1.22369	-0.00001	0.00000
942	#2QM	8082.8440	10.38730	10.11229	460.32435	287.12929	-0.00047	0.00003	0.4055	8.76591	-6.73573	0.00001	0.00000
946	#3QM	8093.6645	10.39259	10.11677	235.63443	502.69272	-0.00036	0.00004	0.4055	5.90809	-5.67590	0.00001	0.00000
949	#BV-	8106.3128	10.40283	10.12083	177.06027	452.83773	-0.00034	0.00004	0.4055	1.28881	4.01415	0.00000	0.00000
952	#BV-	8112.3128	10.40847	10.12305	162.13562	406.02835	-0.00034	-0.00130	0.4055	1.19863	3.78741	0.00000	-0.00038
955	#BV-	8118.3128	10.41463	10.12554	148.29305	361.93983	-0.00034	-0.00492	0.4055	1.10846	3.56067	0.00000	-0.00076
958	#BV-	8124.3128	10.42137	10.12835	135.53256	320.57221	-0.00034	-0.01082	0.4055	1.01829	3.33393	0.00000	-0.00114
961	#BV-	8130.3128	10.42874	10.13152	123.85416	281.92550	-0.00034	-0.01901	0.4055	0.92811	3.10719	0.00000	-0.00152
964	#BV+	8198.2116	10.56246	10.25303	67.10561	34.20859	-0.00034	-0.14738	0.4055	-0.09233	0.54113	0.00000	-0.00190
967	#BV+	8204.2116	10.57654	10.28349	68.75463	29.07550	-0.00035	-0.15747	0.4054	-0.18251	0.31438	0.00000	-0.00152
970	#BV+	8210.2116	10.59018	10.31806	71.48574	26.66346	-0.00035	-0.16528	0.4054	-0.27268	0.08763	0.00000	-0.00114
973	#BV+	8216.2116	10.60321	10.35397	75.29892	26.97247	-0.00035	-0.17081	0.4053	-0.36285	-0.13913	0.00000	-0.00076
976	#BV+	8222.2116	10.61551	10.38779	80.19419	30.00253	-0.00035	-0.17405	0.4052	-0.45303	-0.36588	0.00000	-0.00038
981	#QVF	8238.4979	10.64520	10.45473	87.35903	58.20864	-0.00033	-0.18610	0.4052	1.19021	-2.13166	0.00001	-0.00371
985	#QVD	8251.3979	10.67926	10.47648	42.17562	153.89692	-0.00019	-0.25971	0.4052	0.87556	-2.92883	0.00001	-0.00278
990	#QVD	8272.2479	10.76014	10.49683	53.13426	141.36432	-0.00008	-0.20622	0.4052	-1.56961	3.32368	0.00000	0.00731
994	#QVF	8285.1479	10.78534	10.52291	125.81964	44.17423	-0.00004	-0.08200	0.4052	-2.07780	2.14569	0.00000	0.00875
999	#QVF	8305.9979	10.81144	10.68095	105.46293	17.11553	0.00003	0.08199	0.4052	2.71916	-0.43196	0.00000	0.00875
1003	#QVD	8318.8979	10.84803	10.75657	30.33816	46.39873	0.00007	0.20621	0.4052	1.59240	-1.13207	0.00000	0.00731
1008	#QVD	8339.7479	11.04744	10.81513	19.37999	58.93174	0.00019	0.25970	0.4052	-0.89837	0.73721	0.00001	-0.00278
1012	#QVF	8352.6479	11.10567	10.86377	67.00396	31.15040	0.00032	0.18610	0.4052	-1.83161	0.41793	0.00001	-0.00371
1015	#BV-	8360.2533	11.12144	10.90331	83.09106	32.57860	0.00035	0.17500	0.4052	-0.49875	-0.48083	0.00000	0.00000
1019	#BV-	8394.3333	11.17368	11.00008	134.54088	109.24372	0.00035	0.11912	0.4049	-1.01093	-1.76873	0.00000	-0.00328
1021	#BV+	8413.6179	11.19350	11.02136	179.12080	191.51666	0.00035	0.05588	0.4047	-1.30075	-2.49751	0.00000	-0.00328
1025	#BV+	8447.6979	11.21759	11.04087	285.23505	405.63537	0.00035	0.00001	0.4047	-1.81293	-3.78529	0.00000	0.00000
1028	#4QM	8454.0548	11.22091	11.04329	339.63666	413.20666	0.00037	0.00001	0.4047	-7.95708	3.82977	0.00001	0.00000
1032	#5QM	8469.8212	11.22566	11.05246	821.12813	180.84454	0.00054	0.00000	0.4047	-10.45846	4.13538	0.00001	0.00000
1036	#6QM	8568.7500	11.25204	11.25144	394.56366	66.47089	0.00025	0.00000	0.4047	2.63451	-0.44806	0.00000	0.00000
1048	#QSD	8654.4375	11.35418	11.35405	52.77428	300.90876	0.27610	0.00000	0.4047	0.29472	0.28880	0.00879	0.00000
1060	#QSF	8740.1250	11.50190	11.50134	217.06677	38.22816	1.49134	0.00000	0.4052	-0.00280	-0.00285	0.00534	0.00000
1072	#QSD	8825.8125	11.64906	11.64804	53.05896	302.56322	1.17853	-0.00001	0.4107	-0.29475	-0.28883	0.00920	0.00000
1084	#QSF	8911.5000	11.75088	11.75029	388.17935	67.59104	3.05228	0.00000	0.4191	-0.00005	0.00000	0.00025	0.00000
1085	#QF	8911.5000	11.75088	11.75029	388.17935	67.59104	3.05228	0.00000	0.4328	-0.00005	0.00000	0.00025	0.00000

BETATRON FUNCTIONS OF RING -- Injection optics

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
1105	#QD	9025.7500	11.87550	11.87488	67.56849	388.21769	1.46790	0.00000	0.4328	-0.00002	0.00014	0.00025	0.00000
1125	#QF	9140.0000	12.00012	11.99947	388.17202	67.59164	3.05293	0.00000	0.4536	-0.00001	0.00001	0.00025	0.00000
1145	#QD	9254.2500	12.12475	12.12406	67.56571	388.21314	1.46789	0.00001	0.4752	-0.00003	0.00015	0.00024	0.00000
1165	#QF	9368.5000	12.24937	12.24866	388.17920	67.59103	3.05225	0.00000	0.4960	-0.00005	0.00000	0.00025	0.00000
1185	#QD	9482.7500	12.37400	12.37325	67.56850	388.21765	1.46749	0.00000	0.5176	-0.00002	0.00014	0.00024	0.00000
1205	#QF	9597.0000	12.49862	12.49784	388.17218	67.59165	3.05159	0.00000	0.5384	-0.00001	0.00001	0.00025	0.00000
1225	#QD	9711.2500	12.62325	12.62243	67.56570	388.21318	1.46750	-0.00001	0.5600	-0.00003	0.00015	0.00025	0.00000
1245	#QF	9825.5000	12.74787	12.74702	388.17904	67.59102	3.05227	0.00000	0.5808	-0.00005	0.00000	0.00025	0.00000
1265	#QD	9939.7500	12.87249	12.87161	67.56851	388.21762	1.46789	0.00000	0.6024	-0.00002	0.00014	0.00025	0.00000
1285	#135	10054.0000	12.99711	12.99620	388.17233	67.59166	3.05293	0.00000	0.6232	-0.00001	0.00001	0.00025	0.00000
6416	#QF	40901.5000	46.64552	46.63577	388.16885	67.59090	3.05187	0.00000	0.6448	-0.00004	0.00001	0.00025	0.00000
6436	#QD	41015.7500	46.77014	46.76036	67.56806	388.21399	1.46774	0.00000	6.3678	-0.00004	0.00014	0.00025	0.00000
6456	#QF	41130.0000	46.89476	46.88495	388.18250	67.59177	3.05280	0.00000	6.3886	-0.00002	0.00000	0.00025	0.00000
6476	#QD	41244.2500	47.01939	47.00954	67.56616	388.21685	1.46797	0.00001	6.4102	-0.00001	0.00015	0.00025	0.00000
6496	#QF	41358.5000	47.14401	47.13413	388.16875	67.59091	3.05266	0.00000	6.4310	-0.00004	0.00001	0.00025	0.00000
6516	#QD	41472.7500	47.26864	47.25872	67.56804	388.21394	1.46765	0.00000	6.4526	-0.00004	0.00014	0.00024	0.00000
6536	#QF	41587.0000	47.39326	47.38331	388.18260	67.59177	3.05173	0.00000	6.4734	-0.00002	0.00000	0.00025	0.00000
6556	#QD	41701.2500	47.51788	47.50790	67.56618	388.21690	1.46742	-0.00001	6.4950	-0.00001	0.00015	0.00025	0.00000
6576	#QF	41815.5000	47.64251	47.63249	388.16865	67.59092	3.05186	0.00000	6.5158	-0.00004	0.00001	0.00025	0.00000
6596	#QSD	41929.7500	47.76713	47.75709	67.56802	388.21389	1.46773	0.00000	6.5374	-0.00004	0.00014	0.00025	0.00000
6612	#QSF	42015.4375	47.86941	47.85889	302.52108	53.07583	2.77585	0.00000	6.5582	0.28857	0.29480	-0.00409	0.00000
6624	#QSD	42101.1250	48.01611	48.00601	38.23479	217.06353	0.74075	0.00000	6.5719	0.00278	0.00306	-0.01432	0.00000
6636	#QSF	42186.8125	48.16337	48.15376	300.90479	52.76475	0.29226	0.00000	6.5827	-0.28853	-0.29477	-0.00416	0.00000
6648	#QU4	42273.1912	48.26760	48.25619	67.69118	387.56760	0.00008	0.00000	6.5856	-0.17614	0.91128	0.00000	0.00000
6652	#QU3	42313.8851	48.32802	48.28945	181.87528	97.20500	-0.00002	0.00000	6.5861	-0.87812	1.75130	0.00000	0.00000
6656	#QU2	42557.1337	48.50480	48.64208	427.83980	901.27405	-0.00057	-0.00001	6.5861	-5.56241	5.00520	-0.00001	0.00000
6660	#QU1	42575.9944	48.50990	48.64646	817.31412	516.86134	-0.00079	-0.00001	6.5861	-6.70484	5.58708	-0.00001	0.00000
6663	#UC	42900.8750	48.61036	48.78998	350.67451	350.61603	-0.00054	0.00000	6.5861	0.28903	-0.28883	0.00000	0.00000
6666	#1QU	43225.7557	48.75388	48.89046	516.76433	817.15331	-0.00027	0.00000	6.5861	-5.58590	6.70341	0.00000	0.00000
6670	#2QU	43244.6164	48.75826	48.89556	901.09885	427.75887	-0.00033	0.00000	6.5861	-5.00411	5.56124	0.00000	0.00000
6674	#3QU	43487.8650	49.11088	49.07233	97.22112	181.91418	0.00028	0.00000	6.5861	-1.75144	0.87823	0.00000	0.00000
6678	#4QU	43528.5588	49.14414	49.13274	387.60202	67.70517	0.00052	0.00000	6.5861	-0.91115	0.17627	0.00000	0.00000
6690	#QSD	43614.9375	49.24658	49.23696	52.75006	300.90450	0.29776	0.00000	6.5861	0.29489	0.28867	0.00897	0.00000
6702	#QSF	43700.6250	49.39437	49.38423	217.03064	38.23309	1.56460	0.00000	6.5866	-0.00333	-0.00283	0.00509	0.00000
6714	#QSD	43786.3125	49.54149	49.53093	53.08830	302.54623	1.20012	-0.00001	6.5921	-0.29493	-0.28870	0.00853	0.00000
6730	#QSF	43872.0000	49.64327	49.63319	388.24594	67.58246	3.05201	0.00000	6.6008	0.00055	-0.00004	-0.00025	0.00000
6731	#QF	43872.0000	49.64327	49.63319	388.24594	67.58246	3.05201	0.00000	6.6142	0.00055	-0.00004	-0.00025	0.00000
6751	#QD	43986.2500	49.76792	49.75779	67.53210	388.22787	1.46765	0.00000	6.6142	0.00021	-0.00028	-0.00025	0.00000
6771	#QF	44100.5000	49.89260	49.88237	388.10357	67.60024	3.05239	0.00000	6.6358	-0.00049	0.00003	-0.00025	0.00000
6791	#QSD	44214.7500	50.01720	50.00695	67.60201	388.20348	1.46781	0.00001	6.6566	-0.00016	-0.00002	-0.00025	0.00000
6803	#QSF	44300.4375	50.11942	50.10876	302.61402	53.06868	2.75418	0.00000	6.6782	0.28908	0.29478	-0.00441	0.00000
6815	#QSD	44386.1250	50.26614	50.25590	38.21593	217.06747	0.72796	0.00000	6.6915	0.00296	0.00293	-0.01457	0.00000
6827	#QSF	44471.8125	50.41347	50.40363	300.89347	52.77131	0.27082	0.00000	6.7026	-0.28905	-0.29475	-0.00434	0.00000
6839	#QU4	44558.1912	50.51766	50.50606	67.72481	387.56045	0.00001	-0.00001	6.7055	-0.17640	0.91139	0.00000	0.00000
6843	#QU3	44598.8851	50.57806	50.53932	181.96254	97.19805	0.00001	0.00000	6.7060	-0.87832	1.75129	0.00000	0.00000

BETATRON FUNCTIONS OF RING -- Injection optics

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
6847	#QU2	44842.1337	50.75483	50.89195	427.64194	901.39215	0.00000	0.00000	6.7060	-5.55959	5.00589	0.00000	0.00000
6851	#QU1	44860.9944	50.75993	50.89633	816.92381	516.92793	0.00000	0.00000	6.7060	-6.70142	5.58784	0.00000	0.00000
6854	#UC	45185.8750	50.86044	51.03984	350.55003	350.59067	-0.00001	0.00001	6.7060	0.28854	-0.28870	0.00000	0.00000
6857	#1QU	45510.7557	51.00395	51.14034	517.00193	817.04566	-0.00002	0.00001	6.7060	-5.58873	6.70249	0.00000	0.00000
6861	#2QU	45529.6164	51.00833	51.14543	901.52522	427.70357	-0.00003	0.00001	6.7060	-5.00671	5.56047	0.00000	0.00000
6865	#3QU	45772.8650	51.36097	51.32221	97.18686	181.93455	0.00001	0.00000	6.7060	-1.75121	0.87825	0.00000	0.00000
6869	#4QU	45813.5588	51.39423	51.38262	387.53861	67.71427	0.00001	0.00000	6.7060	-0.91150	0.17632	0.00000	0.00000
6881	#QSD	45899.9375	51.49666	51.48682	52.77347	300.90882	0.27621	-0.00001	6.7060	0.29472	0.28881	0.00879	0.00000
6893	#QSF	45985.6250	51.64438	51.63411	217.06587	38.22796	1.49194	0.00000	6.7065	-0.00282	-0.00285	0.00534	0.00000
6905	#QSD	46071.3125	51.79154	51.78081	53.05989	302.56402	1.17878	0.00000	6.7120	-0.29475	-0.28884	0.00920	0.00000
6917	#QSF	46157.0000	51.89336	51.88306	388.18103	67.59139	3.05252	0.00000	6.7204	-0.00003	0.00000	0.00025	0.00000
6918	#QF	46157.0000	51.89336	51.88306	388.18103	67.59139	3.05252	0.00000	6.7341	-0.00003	0.00000	0.00025	0.00000
6938	#QD	46271.2500	52.01798	52.00765	67.56734	388.21723	1.46773	0.00001	6.7341	-0.00001	0.00015	0.00025	0.00000
6958	#QF	46385.5000	52.14261	52.13224	388.17028	67.59129	3.05213	0.00000	6.7549	-0.00003	0.00001	0.00025	0.00000
6978	#QSD	46499.7500	52.26723	52.25683	67.56686	388.21358	1.46758	0.00000	6.7765	-0.00004	0.00015	0.00025	0.00000
6994	#QSF	46585.4375	52.36951	52.35864	302.51838	53.07553	2.77520	0.00000	6.7973	0.28855	0.29480	-0.00409	0.00000
7006	#QSD	46671.1250	52.51621	52.50576	38.23544	217.06368	0.74051	0.00000	6.8110	0.00278	0.00305	-0.01432	0.00000
7018	#QSF	46756.8125	52.66347	52.65351	300.90468	52.76502	0.29211	0.00000	6.8218	-0.28852	-0.29477	-0.00416	0.00000
7030	#QL6	46842.1860	52.76535	52.75553	66.67852	393.24156	0.00023	0.00000	6.8247	0.49405	-2.86622	0.00000	0.00000
7034	#QL5	46956.2997	52.99020	52.78223	219.05038	1082.54340	0.00022	0.00000	6.8252	-4.94359	13.09181	0.00000	0.00000
7038	#QL4	46969.9924	52.99714	52.78508	450.03887	540.03952	0.00029	0.00000	6.8252	-5.01227	10.68621	0.00000	0.00000
7041	#BV+	46976.0521	52.99923	52.78702	455.10341	476.79742	0.00028	0.00000	6.8252	2.90254	1.54112	0.00000	0.00000
7045	#BV+	47010.1321	53.01441	52.79978	281.31868	379.97164	0.00018	0.05588	6.8252	2.19678	1.30000	0.00000	0.00328
7047	#BV-	47029.4167	53.02722	52.80842	204.29215	332.46428	0.00012	0.11912	6.8252	1.79741	1.16348	0.00000	0.00328
7051	#BV-	47063.4967	53.06445	52.82686	105.83300	261.38098	0.00001	0.17500	6.8250	1.09165	0.92229	0.00000	0.00000
7054	#QVD	47071.1021	53.07641	52.83179	102.76806	217.53976	-0.00001	0.16413	6.8247	-1.10777	5.57799	0.00000	-0.00355
7058	#QVF	47084.0021	53.09199	52.84971	169.39023	60.50857	-0.00005	0.09444	6.8247	-1.04375	3.49839	0.00000	-0.00439
7063	#QVF	47104.8521	53.11673	53.04842	87.12375	9.74483	-0.00008	0.03667	6.8247	3.63565	-0.28333	0.00000	-0.00178
7067	#QVD	47117.7521	53.18630	53.16274	10.64341	39.37865	-0.00006	0.01884	6.8247	1.19985	-1.46640	0.00000	-0.00160
7072	#QVD	47138.6021	53.51334	53.21906	63.62297	74.82665	-0.00009	-0.01885	6.8247	-4.55525	0.34957	0.00000	-0.00160
7076	#QVF	47151.5021	53.52893	53.25305	273.06153	49.44064	-0.00013	-0.03668	6.8247	-7.92672	0.24365	0.00000	-0.00178
7081	#QVF	47172.3521	53.53855	53.30611	355.32720	100.20356	-0.00012	-0.09444	6.8247	5.33485	-3.45866	0.00000	-0.00439
7085	#QVD	47185.2521	53.54728	53.31901	155.74671	252.98490	-0.00006	-0.16413	6.8247	4.46317	-4.46110	0.00000	-0.00355
7090	#BV+	47226.1602	53.62026	53.34544	61.27906	215.76604	0.00007	-0.17404	6.8247	0.51879	0.72647	0.00000	0.00038
7093	#BV+	47232.1602	53.63662	53.34996	55.79917	207.30332	0.00009	-0.17081	6.8246	0.39452	0.68399	0.00000	0.00076
7096	#BV+	47238.1602	53.65442	53.35465	51.81046	199.35033	0.00011	-0.16528	6.8246	0.27026	0.64151	0.00000	0.00114
7099	#BV-	47379.3248	53.88906	53.50015	388.22320	159.33302	0.00054	-0.00493	6.8245	-2.65338	-0.35803	0.00000	0.00076
7102	#BV-	47385.3248	53.89143	53.50606	420.80939	163.88421	0.00055	-0.00132	6.8245	-2.77765	-0.40051	0.00000	0.00038
7105	#BV-	47391.3248	53.89361	53.51180	454.88677	168.94516	0.00057	0.00002	6.8245	-2.90191	-0.44298	0.00000	0.00000
7108	#QL3	47404.9736	53.89811	53.52392	462.30429	211.07052	0.00057	0.00002	6.8245	7.93118	-5.12633	-0.00001	0.00000
7112	#QL2	47418.0707	53.90544	53.53062	170.87590	467.83448	0.00034	0.00003	6.8245	6.92416	-7.11309	-0.00001	0.00000
7116	#QL2	47430.1673	53.92233	53.53465	88.51983	417.98749	0.00023	0.00003	6.8245	0.93658	10.55857	0.00000	0.00000
7120	#QL1	47443.7453	53.94673	53.54466	86.25038	115.19270	0.00020	0.00002	6.8245	1.23178	5.97865	-0.00001	0.00000
7123	#IPL	47470.8750	54.15178	53.74840	8.00009	8.00118	-0.00004	0.00000	6.8245	0.00004	0.00003	-0.00001	0.00000
7126	#1QL	47498.0047	54.35553	53.95345	115.20128	86.23705	-0.00031	-0.00001	6.8245	-5.97923	-1.23158	-0.00002	0.00000

BETATRON FUNCTIONS OF RING -- Injection optics

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
7130	#2QL	47511.5827	54.36554	53.97785	418.02549	88.50647	-0.00059	-0.00001	6.8245	-10.55966	-0.93648	-0.00001	0.00000
7134	#2QL	47523.6793	54.36957	53.99475	467.87993	170.85196	-0.00062	-0.00002	6.8245	7.11366	-6.92326	0.00001	0.00000
7138	#3QL	47536.7764	54.37628	54.00208	211.09310	462.24263	-0.00041	-0.00003	6.8245	5.12677	-7.93020	0.00001	0.00000
7141	#BV+	47550.4252	54.38839	54.00658	168.96589	454.82823	-0.00035	-0.00003	6.8245	0.44294	2.90145	0.00000	0.00000
7144	#BV+	47556.4252	54.39413	54.00876	163.90543	420.75617	-0.00034	0.00131	6.8245	0.40047	2.77722	0.00000	0.00038
7147	#BV+	47562.4252	54.40004	54.01113	159.35469	388.17493	-0.00033	0.00492	6.8245	0.35799	2.65298	0.00000	0.00076
7150	#BV-	47703.5898	54.54551	54.24577	199.36075	51.81736	-0.00007	0.16528	6.8245	-0.64139	-0.27026	0.00000	0.00114
7153	#BV-	47709.5898	54.55021	54.26356	207.31229	55.80598	-0.00006	0.17081	6.8245	-0.68387	-0.39451	0.00000	0.00076
7156	#BV-	47715.5898	54.55473	54.27992	215.77356	61.28558	-0.00005	0.17404	6.8244	-0.72634	-0.51876	0.00000	0.00038
7161	#QVF	47756.4980	54.58116	54.35290	252.98157	155.74560	0.00003	0.18610	6.8243	4.46119	-4.46300	0.00000	0.00371
7165	#QVD	47769.3980	54.59406	54.36162	100.19992	355.31925	0.00004	0.25971	6.8243	3.45868	-5.33459	0.00000	0.00278
7170	#QVD	47790.2480	54.64712	54.37124	49.43493	273.05092	0.00010	0.20622	6.8243	-0.24354	7.92654	0.00000	-0.00731
7174	#QVF	47803.1480	54.68112	54.38683	74.81606	63.61888	0.00016	0.08200	6.8243	-0.34949	4.55508	0.00000	-0.00875
7179	#QVF	47823.9980	54.73744	54.71388	39.37359	10.64489	0.00016	-0.08199	6.8243	1.46614	-1.20003	0.00000	-0.00875
7183	#QVD	47836.8980	54.85177	54.78345	9.74531	87.13268	0.00009	-0.20621	6.8243	0.28321	-3.63593	0.00000	-0.00731
7188	#QVD	47857.7480	55.05046	54.80819	60.51112	169.40182	0.00003	-0.25970	6.8243	-3.49840	1.04395	0.00000	0.00278
7192	#QVF	47870.6480	55.06838	54.82376	217.54196	102.77252	0.00001	-0.18610	6.8243	-5.57791	1.10795	0.00000	0.00371
7195	#BV+	47878.2533	55.07331	54.83572	261.38128	105.83543	0.00000	-0.17500	6.8243	-0.92215	-1.09154	0.00000	0.00000
7199	#BV+	47912.3333	55.09175	54.87295	332.45695	204.28182	-0.00007	-0.11912	6.8240	-1.16341	-1.79714	0.00000	0.00328
7201	#BV-	47931.6180	55.10039	54.88577	379.96141	281.29646	-0.00010	-0.05588	6.8238	-1.29992	-2.19643	0.00000	0.00328
7205	#BV-	47965.6980	55.11315	54.90095	476.78632	455.04905	-0.00017	0.00000	6.8239	-1.54118	-2.90192	0.00000	0.00000
7208	#4QL	47971.7577	55.11509	54.90304	540.02826	449.98193	-0.00019	0.00000	6.8239	-10.68609	5.01191	0.00000	0.00000
7212	#5QL	47985.4504	55.11794	54.90998	1082.52474	219.01767	-0.00028	0.00000	6.8239	-13.09169	4.94311	0.00000	0.00000
7216	#6QL	48099.5640	55.14464	55.13487	393.24822	66.68269	-0.00026	0.00001	6.8239	2.86617	-0.49437	0.00000	0.00000
7228	#QSD	48184.9375	55.24666	55.23673	52.76494	301.00410	0.29748	0.00001	6.8239	0.29482	0.28850	0.00897	0.00000
7240	#QSF	48270.6250	55.39441	55.38395	217.04633	38.23931	1.56440	0.00000	6.8244	-0.00302	-0.00244	0.00509	0.00000
7252	#QSD	48356.3125	55.54155	55.53068	53.07116	302.41907	1.20029	-0.00001	6.8299	-0.29485	-0.28852	0.00854	0.00000
7268	#QSF	48442.0000	55.64336	55.63297	388.21621	67.57113	3.05279	-0.00001	6.8386	0.00023	-0.00043	-0.00025	0.00000
7269	#QF	48442.0000	55.64336	55.63297	388.21621	67.57113	3.05279	-0.00001	6.8520	0.00023	-0.00043	-0.00025	0.00000
7289	#QD	48556.2500	55.76799	55.75755	67.55330	388.37856	1.46796	-0.00001	6.8520	0.00013	-0.00045	-0.00025	0.00000
7309	#QF	48670.5000	55.89264	55.88208	388.13435	67.61186	3.05266	0.00000	6.8736	-0.00017	0.00041	-0.00025	0.00000
7329	#QSD	48784.7500	56.01725	56.00668	67.58084	388.05357	1.46766	0.00001	6.8944	-0.00008	0.00016	-0.00025	0.00000
7341	#QSF	48870.4375	56.11951	56.10853	302.56381	53.05397	2.75353	0.00001	6.9160	0.28875	0.29438	-0.00441	0.00000
7353	#QSD	48956.1250	56.26621	56.25566	38.22786	217.15082	0.72773	0.00001	6.9293	0.00288	0.00275	-0.01456	0.00000
7365	#QSF	49041.8125	56.41350	56.40334	300.89207	52.77466	0.27067	0.00000	6.9405	-0.28873	-0.29435	-0.00434	0.00000
7377	#QL6	49127.1860	56.51538	56.50538	66.69168	393.08416	0.00015	-0.00001	6.9433	0.49405	-2.86476	0.00000	0.00000
7381	#QL5	49241.2997	56.74020	56.53209	219.01641	1082.02399	0.00060	-0.00003	6.9438	-4.94267	13.08569	0.00001	0.00000
7385	#QL4	49254.9924	56.74714	56.53494	449.96306	539.77747	0.00084	-0.00002	6.9438	-5.01128	10.68117	0.00001	0.00000
7388	#BV-	49261.0521	56.74923	56.53688	455.02503	476.56447	0.00084	-0.00002	6.9438	2.90218	1.54050	-0.00001	0.00000
7392	#BV-	49295.1321	56.76441	56.54965	281.26354	379.78043	0.00064	-0.05590	6.9438	2.19645	1.29940	-0.00001	-0.00328
7394	#BV+	49314.4167	56.77723	56.55829	204.24913	332.29611	0.00052	-0.11914	6.9439	1.79711	1.16289	-0.00001	-0.00328
7398	#BV+	49348.4967	56.81447	56.57674	105.80958	261.25251	0.00031	-0.17501	6.9437	1.09138	0.92172	-0.00001	0.00000
7401	#QVD	49356.1021	56.82643	56.58167	102.74603	217.43465	0.00028	-0.16414	6.9434	-1.10759	5.57515	0.00000	0.00356
7405	#QVF	49369.0021	56.84201	56.59960	169.35664	60.48209	0.00032	-0.09445	6.9434	-1.04365	3.49661	0.00000	0.00439
7410	#QVF	49389.8521	56.86676	56.79830	87.11003	9.74972	0.00018	-0.03667	6.9434	3.63492	-0.28353	-0.00001	0.00178

BETATRON FUNCTIONS OF RING -- Injection optics

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
7414	#QVD	49402.7521	56.93633	56.91258	10.64363	39.38364	0.00001	-0.01884	6.9434	1.19965	-1.46609	-0.00001	0.00160
7419	#QVD	49423.6021	57.26335	56.96890	63.61059	74.81003	-0.00030	0.01886	6.9434	-4.55425	0.34995	-0.00002	0.00160
7423	#QVF	49436.5021	57.27894	57.00290	273.00360	49.42133	-0.00060	0.03668	6.9434	-7.92496	0.24388	-0.00002	0.00178
7428	#QVF	49457.3521	57.28856	57.05598	355.24940	100.15289	-0.00065	0.09445	6.9434	5.33372	-3.45690	0.00001	0.00439
7432	#QVD	49470.2521	57.29729	57.06889	155.71208	252.85818	-0.00042	0.16415	6.9434	4.46219	-4.45894	0.00001	0.00355
7437	#BV-	49511.1602	57.37029	57.09533	61.26985	215.66884	-0.00014	0.17406	6.9434	0.51855	0.72591	0.00001	-0.00038
7440	#BV-	49517.1602	57.38665	57.09985	55.79284	207.21279	-0.00011	0.17082	6.9433	0.39429	0.68343	0.00001	-0.00076
7443	#BV-	49523.1602	57.40445	57.10455	51.80694	199.26643	-0.00007	0.16530	6.9432	0.27003	0.64096	0.00001	-0.00114
7446	#BV+	49664.3248	57.63906	57.25005	388.26495	159.39337	0.00079	0.00494	6.9432	-2.65347	-0.35850	0.00001	-0.00076
7449	#BV+	49670.3248	57.64142	57.25596	420.85219	163.95019	0.00082	0.00132	6.9432	-2.77773	-0.40097	0.00001	-0.00038
7452	#BV+	49676.3248	57.64361	57.26170	454.93054	169.01673	0.00086	-0.00001	6.9432	-2.90199	-0.44345	0.00001	0.00000
7455	#QL3	49689.9736	57.64810	57.27381	462.34344	211.16777	0.00087	-0.00002	6.9432	7.93206	-5.12890	-0.00001	0.00000
7459	#QL2	49703.0707	57.65543	57.28051	170.88706	468.05750	0.00054	-0.00003	6.9432	6.92483	-7.11665	-0.00002	0.00000
7463	#QL2	49715.1673	57.67233	57.28454	88.52150	418.19010	0.00039	-0.00002	6.9432	0.93682	10.56354	0.00000	0.00000
7467	#QL1	49728.7453	57.69673	57.29454	86.24614	115.25020	0.00039	-0.00001	6.9432	1.23194	5.98155	-0.00001	0.00000
7470	#IPL	49755.8750	57.90181	57.49824	7.99949	7.99821	0.00003	0.00000	6.9432	-0.00017	0.00037	-0.00001	0.00000
7473	#1QL	49783.0047	58.10553	57.70336	115.22180	86.24821	-0.00039	0.00000	6.9432	-5.98016	-1.23223	-0.00002	0.00000
7477	#2QL	49796.5827	58.11554	57.72776	418.09232	88.53047	-0.00077	0.00001	6.9432	-10.56119	-0.93716	-0.00002	0.00000
7481	#2QL	49808.6793	58.11957	57.74465	467.95095	170.91263	-0.00082	0.00001	6.9432	7.11490	-6.92608	0.00001	0.00000
7485	#3QL	49821.7764	58.12627	57.75198	211.12212	462.42141	-0.00056	0.00002	6.9432	5.12765	-7.93359	0.00001	0.00000
7488	#BV-	49835.4252	58.13838	57.75648	168.98435	455.01225	-0.00052	0.00002	6.9432	0.44319	2.90232	0.00000	0.00000
7491	#BV-	49841.4252	58.14412	57.75866	163.92099	420.92984	-0.00052	-0.00131	6.9432	0.40071	2.77807	0.00000	-0.00038
7494	#BV-	49847.4252	58.15003	57.76102	159.36739	388.33846	-0.00051	-0.00493	6.9432	0.35823	2.65382	0.00000	-0.00076
7497	#BV+	49988.5898	58.29553	57.99561	199.31652	51.79873	-0.00048	-0.16528	6.9432	-0.64122	-0.26981	0.00000	-0.00114
7500	#BV+	49994.5898	58.30022	58.01341	207.26608	55.78202	-0.00047	-0.17080	6.9431	-0.68370	-0.39407	0.00000	-0.00076
7503	#BV+	50000.5898	58.30474	58.02978	215.72541	61.25647	-0.00047	-0.17404	6.9431	-0.72618	-0.51834	0.00000	-0.00038
7508	#QVF	50041.4980	58.33117	58.10279	252.92835	155.67910	-0.00043	-0.18609	6.9430	4.46017	-4.46136	0.00001	-0.00371
7512	#QVD	50054.3980	58.34408	58.11152	100.18033	355.17900	-0.00024	-0.25969	6.9430	3.45789	-5.33280	0.00001	-0.00278
7517	#QVD	50075.2480	58.39715	58.12114	49.43062	272.95434	-0.00008	-0.20620	6.9430	-0.24372	7.92338	0.00001	0.00731
7521	#QVF	50088.1480	58.43115	58.13674	74.81650	63.60129	-0.00003	-0.08199	6.9430	-0.34971	4.55340	0.00000	0.00875
7526	#QVF	50108.9980	58.48747	58.46372	39.37947	10.64284	0.00007	0.08199	6.9430	1.46619	-1.19934	0.00000	0.00875
7530	#QVD	50121.8980	58.60177	58.53331	9.74711	87.09066	0.00011	0.20620	6.9430	0.28338	-3.63402	0.00000	0.00731
7535	#QVD	50142.7480	58.80047	58.55806	60.49763	169.31614	0.00026	0.25969	6.9430	-3.49761	1.04342	0.00001	-0.00278
7539	#QVF	50155.6480	58.81840	58.57364	217.49419	102.72157	0.00044	0.18609	6.9430	-5.57672	1.10730	0.00001	-0.00371
7542	#BV-	50163.2533	58.82333	58.58561	261.32464	105.78514	0.00046	0.17499	6.9430	-0.92200	-1.09119	0.00000	0.00000
7546	#BV-	50197.3333	58.84177	58.62285	332.39092	204.21117	0.00045	0.11911	6.9427	-1.16328	-1.79689	0.00000	-0.00328
7548	#BV+	50216.6180	58.85041	58.63568	379.89058	281.21708	0.00045	0.05587	6.9425	-1.29980	-2.19623	0.00000	-0.00328
7552	#BV+	50250.6980	58.86317	58.65086	476.70793	454.95921	0.00044	-0.00002	6.9425	-1.54108	-2.90182	0.00000	0.00000
7555	#4QL	50256.7577	58.86511	58.65295	539.94148	449.89863	0.00046	-0.00002	6.9425	-10.68453	5.01051	0.00001	0.00000
7559	#5QL	50270.4504	58.86796	58.65989	1082.35689	218.98626	0.00063	-0.00001	6.9425	-13.08982	4.94192	0.00001	0.00000
7563	#6QL	50384.5640	58.89467	58.88471	393.21143	66.70184	0.00025	0.00000	6.9425	2.86570	-0.49410	0.00000	0.00000
7575	#QSD	50469.9375	58.99668	58.98657	52.77428	300.90876	0.27610	0.00000	6.9425	0.29472	0.28880	0.00879	0.00000
7587	#QSF	50555.6250	59.14441	59.13385	217.06677	38.22815	1.49134	0.00001	6.9430	-0.00280	-0.00285	0.00534	0.00000
7599	#QSD	50641.3125	59.29156	59.28056	53.05896	302.56327	1.17853	0.00002	6.9486	-0.29475	-0.28883	0.00920	0.00000
7611	#QSF	50727.0000	59.39339	59.38281	388.17935	67.59106	3.05228	0.00000	6.9569	-0.00005	0.00000	0.00025	0.00000

BETATRON FUNCTIONS OF RING -- Injection optics

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
7612	#QF	50727.0000	59.39339	59.38281	388.17935	67.59106	3.05228	0.00000	6.9706	-0.00005	0.00000	0.00025	0.00000
7632	#QD	50841.2500	59.51801	59.50740	67.56849	388.21766	1.46790	0.00000	6.9706	-0.00002	0.00014	0.00025	0.00000
7652	#QF	50955.5000	59.64263	59.63199	388.17202	67.59162	3.05293	-0.00001	6.9914	-0.00001	0.00001	0.00025	0.00000
7672	#QD	51069.7500	59.76726	59.75658	67.56571	388.21317	1.46789	-0.00002	7.0130	-0.00003	0.00015	0.00024	0.00000
7692	#QF	51184.0000	59.89188	59.88117	388.17920	67.59105	3.05225	0.00000	7.0338	-0.00005	0.00000	0.00025	0.00000
7712	#QD	51298.2500	60.01650	60.00576	67.56850	388.21763	1.46749	0.00000	7.0554	-0.00002	0.00014	0.00024	0.00000
7732	#QF	51412.5000	60.14112	60.13036	388.17218	67.59163	3.05159	0.00001	7.0762	-0.00001	0.00001	0.00025	0.00000
7752	#QD	51526.7500	60.26575	60.25495	67.56570	388.21320	1.46750	0.00002	7.0978	-0.00003	0.00015	0.00025	0.00000
7772	#QF	51641.0000	60.39037	60.37954	388.17904	67.59104	3.05227	0.00000	7.1186	-0.00005	0.00000	0.00025	0.00000
7792	#QD	51755.2500	60.51500	60.50413	67.56851	388.21759	1.46789	0.00000	7.1402	-0.00002	0.00014	0.00025	0.00000
7812	#135	51869.5000	60.63962	60.62872	388.17233	67.59164	3.05293	-0.00001	7.1610	-0.00001	0.00001	0.00025	0.00000
12943	#QF	82717.0000	94.28802	94.26829	388.16885	67.59091	3.05187	0.00001	7.1826	-0.00004	0.00001	0.00025	0.00000
12963	#QD	82831.2500	94.41265	94.39288	67.56806	388.21410	1.46774	0.00001	12.9057	-0.00004	0.00014	0.00025	0.00000
12983	#QF	82945.5000	94.53727	94.51747	388.18250	67.59176	3.05280	0.00000	12.9264	-0.00002	0.00000	0.00025	0.00000
13003	#QD	83059.7500	94.66189	94.64206	67.56616	388.21674	1.46797	-0.00002	12.9480	-0.00001	0.00015	0.00025	0.00000
13023	#QF	83174.0000	94.78652	94.76665	388.16875	67.59092	3.05266	-0.00001	12.9688	-0.00004	0.00001	0.00025	0.00000
13043	#QD	83288.2500	94.91114	94.89124	67.56804	388.21405	1.46765	-0.00001	12.9904	-0.00004	0.00014	0.00024	0.00000
13063	#QF	83402.5000	95.03576	95.01583	388.18260	67.59176	3.05173	0.00000	13.0112	-0.00002	0.00000	0.00025	0.00000
13083	#QD	83516.7500	95.16039	95.14042	67.56618	388.21679	1.46742	0.00002	13.0328	-0.00001	0.00015	0.00025	0.00000
13103	#QF	83631.0000	95.28501	95.26501	388.16865	67.59092	3.05186	0.00001	13.0536	-0.00004	0.00001	0.00025	0.00000

H10

CIRCUMFERENCE = 83631.0000 M THETX = 6.28318531 RAD NUX = 95.28501 DNUX/(DP/P) = -133.92555
RADIUS = 13310.2870 M THETY = 0.00000000 RAD NUY = 95.26501 DNUY/(DP/P) = -133.92132
(DS/S)/(DP/P)= 0.0001563 TGAM=(79.97589, 0.00000)

MAXIMA --- BETX(7213) = 1134.95731 BETY(7032) = 1134.97569 XEQ(7812) = 3.05293 YEQ(7166) = 0.26005
MINIMA --- BETX(7068) = 5.01904 BETY(7177) = 5.01866 XEQ(7479) = -0.00084 YEQ(986) = -0.26006

SEXTUPOLE STRENGTHS ----- KSF = 0.61229195E-02 KSD = -0.12266437E-01

Collision optics:

```
***   SXKF   PARA        //  0.0
***   SXKD   PARA        //  -0.0

***          CALL        //  SRX

***   KFC    PARA        //  0.11320056   -6
***   KDC    PARA        //  0.40675544   -6

***          CALL        //  SRC

***   BL*    =           //  0.5
***   KL1    PARA        //  0.34467282   -2
***   KL2    PARA        //  -.34018226   -2
***   KL3    PARA        //  0.32501414   -2
***   KL4    PARA        //  0.32715443   -2
***   KL5    PARA        //  -.11626270   -2
***   KL6    PARA        //  -.32320211   -2

***          CALL        //  SRSL

***   BM*    =           //  10.
***   KM1    PARA        //  0.33974410   -2
***   KM3    PARA        //  0.32653215   -2
***   KM4    PARA        //  0.31634889   -2
***   KM2    PARA        //  -.33450094   -2
***   KM5    PARA        //  -.13639178   -2
***   KM6    PARA        //  -.27877345   -2

***          CALL        //  SRSM


***   RING   CYC   -1   1 //  .SSC      SF   SD   0.        0.
```

BETATRON FUNCTIONS OF RING -- Collision optics

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
0		0.0000	0.00000	0.00000	388.16838	67.59110	3.05185	-0.00001	0.0000	-0.00004	0.00001	0.00025	0.00000
1	#QF	0.0000	0.00000	0.00000	388.16838	67.59110	3.05185	-0.00001	0.0000	-0.00004	0.00001	0.00025	0.00000
21	#QSD	114.2500	0.12462	0.12459	67.56805	388.21397	1.46773	-0.00005	0.0000	-0.00004	0.00014	0.00025	0.00000
37	#QSF	199.9375	0.22690	0.22639	302.52095	53.07604	2.77585	-0.00002	0.0208	0.28857	0.29480	-0.00409	0.00000
49	#QSD	285.6250	0.37360	0.37352	38.23476	217.06353	0.74075	-0.00001	0.0345	0.00278	0.00306	-0.01432	0.00000
61	#QSF	371.3125	0.52087	0.52126	300.90503	52.76454	0.29226	0.00001	0.0453	-0.28853	-0.29477	-0.00416	0.00000
73	#QU4	457.6912	0.62509	0.62370	67.69122	387.56760	0.00008	0.00005	0.0482	-0.17614	0.91127	0.00000	0.00000
77	#QU3	498.3850	0.68551	0.65696	181.87529	97.20517	-0.00002	0.00002	0.0487	-0.87812	1.75130	0.00000	0.00000
81	#QU2	741.6336	0.86230	1.00959	427.83947	901.27030	-0.00056	-0.00004	0.0487	-5.56241	5.00518	-0.00001	0.00000
85	#QU1	760.4943	0.86739	1.01397	817.31351	516.85921	-0.00079	-0.00003	0.0487	-6.70484	5.58705	-0.00001	0.00000
88	#UC	1085.3750	0.96785	1.15748	350.67463	350.61663	-0.00054	-0.00005	0.0487	0.28903	-0.28884	0.00000	0.00000
91	#1QU	1410.2556	1.11137	1.25796	516.76473	817.15672	-0.00028	-0.00006	0.0487	-5.58591	6.70344	0.00000	0.00000
95	#2QU	1429.1163	1.11575	1.26306	901.09952	427.76064	-0.00034	-0.00004	0.0487	-5.00411	5.56126	0.00000	0.00000
99	#3QU	1672.3649	1.46838	1.43984	97.22115	181.91361	0.00028	0.00001	0.0487	-1.75144	0.87823	0.00000	0.00000
103	#4QU	1713.0588	1.50163	1.50025	387.60228	67.70489	0.00053	0.00001	0.0487	-0.91115	0.17627	0.00000	0.00000
115	#QSD	1799.4375	1.60408	1.60446	52.75011	300.90419	0.29777	0.00004	0.0487	0.29489	0.28866	0.00897	0.00000
127	#QSF	1885.1250	1.75187	1.75174	217.03050	38.23325	1.56460	0.00001	0.0492	-0.00333	-0.00283	0.00509	0.00000
139	#QSD	1970.8125	1.89898	1.89844	53.08828	302.54584	1.20012	0.00000	0.0547	-0.29493	-0.28869	0.00853	0.00000
155	#QSF	2056.5000	2.00076	2.00069	388.24621	67.58217	3.05200	-0.00001	0.0634	0.00055	-0.00004	-0.00025	0.00000
156	#QF	2056.5000	2.00076	2.00069	388.24621	67.58217	3.05200	-0.00001	0.0768	0.00055	-0.00004	-0.00025	0.00000
176	#QD	2170.7500	2.12541	2.12529	67.53222	388.22786	1.46765	-0.00005	0.0768	0.00021	-0.00029	-0.00025	0.00000
196	#QF	2285.0000	2.25009	2.24987	388.10280	67.60101	3.05239	-0.00002	0.0984	-0.00049	0.00003	-0.00025	0.00000
216	#QSD	2399.2500	2.37469	2.37445	67.60196	388.20350	1.46781	-0.00001	0.1192	-0.00016	-0.00001	-0.00025	0.00000
228	#QSF	2484.9375	2.47692	2.47626	302.61415	53.06847	2.75418	0.00001	0.1408	0.28908	0.29478	-0.00441	0.00000
240	#QSD	2570.6250	2.62364	2.62340	38.21596	217.06744	0.72796	0.00004	0.1540	0.00296	0.00292	-0.01457	0.00000
252	#QSF	2656.3125	2.77096	2.77113	300.89323	52.77152	0.27082	0.00001	0.1652	-0.28905	-0.29475	-0.00434	0.00000
264	#QU4	2742.6912	2.87516	2.87356	67.72477	387.56049	0.00001	0.00001	0.1681	-0.17640	0.91140	0.00000	0.00000
268	#QU3	2783.3851	2.93555	2.90682	181.96253	97.19789	0.00001	0.00000	0.1686	-0.87832	1.75129	0.00000	0.00000
272	#QU2	3026.6337	3.11233	3.25946	427.64227	901.39592	0.00000	-0.00006	0.1686	-5.55959	5.00591	0.00000	0.00000
276	#QU1	3045.4944	3.11743	3.26384	816.92440	516.93007	0.00000	-0.00005	0.1686	-6.70143	5.58786	0.00000	0.00000
279	#UC	3370.3750	3.21793	3.40735	350.54991	350.59009	-0.00001	0.00000	0.1686	0.28854	-0.28869	0.00000	0.00000
282	#1QU	3695.2557	3.36144	3.50784	517.00153	817.04224	-0.00002	0.00004	0.1686	-5.58872	6.70247	0.00000	0.00000
286	#2QU	3714.1164	3.36582	3.51294	901.52455	427.70179	-0.00003	0.00003	0.1686	-5.00670	5.56045	0.00000	0.00000
290	#3QU	3957.3650	3.71846	3.68972	97.18683	181.93511	0.00001	0.00003	0.1686	-1.75121	0.87825	0.00000	0.00000
294	#4QU	3998.0588	3.75172	3.75012	387.53836	67.71456	0.00001	0.00002	0.1686	-0.91150	0.17632	0.00000	0.00000
306	#QSD	4084.4375	3.85415	3.85432	52.77343	300.90915	0.27621	0.00002	0.1686	0.29472	0.28881	0.00879	0.00000
318	#QSF	4170.1250	4.00188	4.00161	217.06602	38.22780	1.49194	-0.00001	0.1691	-0.00282	-0.00285	0.00534	0.00000
330	#QSD	4255.8125	4.14903	4.14832	53.05992	302.56438	1.17878	-0.00004	0.1746	-0.29475	-0.28884	0.00920	0.00000
342	#QSF	4341.5000	4.25085	4.25057	388.18078	67.59168	3.05252	-0.00002	0.1830	-0.00003	0.00000	0.00025	0.00000
343	#QF	4341.5000	4.25085	4.25057	388.18078	67.59168	3.05252	-0.00002	0.1967	-0.00003	0.00000	0.00025	0.00000
363	#QD	4455.7500	4.37548	4.37516	67.56738	388.21714	1.46773	-0.00001	0.1967	-0.00001	0.00015	0.00025	0.00000
383	#QF	4570.0000	4.50010	4.49975	388.17003	67.59149	3.05213	0.00001	0.2175	-0.00003	0.00001	0.00025	0.00000
403	#QSD	4684.2500	4.62472	4.62434	67.56690	388.21365	1.46758	0.00005	0.2391	-0.00004	0.00015	0.00025	0.00000
419	#QSF	4769.9375	4.72700	4.72614	302.51824	53.07574	2.77520	0.00002	0.2599	0.28855	0.29480	-0.00409	0.00000
431	#QSD	4855.6250	4.87370	4.87326	38.23541	217.06370	0.74051	0.00001	0.2736	0.00278	0.00306	-0.01432	0.00000

BETATRON FUNCTIONS OF RING -- Collision optics

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
443	#QSF	4941.3125	5.02097	5.02101	300.90493	52.76481	0.29211	-0.00001	0.2844	-0.28852	-0.29477	-0.00416	0.00000
455	#QM6	5027.0000	5.12357	5.12316	67.30358	389.67627	0.00023	-0.00005	0.2873	0.10086	-0.61252	0.00000	0.00000
459	#QM5	5125.9287	5.24654	5.19897	319.93810	111.33988	0.00049	-0.00003	0.2878	-4.78337	1.74098	0.00001	0.00000
463	#QM4	5141.6951	5.25251	5.23195	536.70451	54.26174	0.00062	-0.00002	0.2878	-1.16323	0.70937	0.00000	0.00000
466	#BV+	5148.0520	5.25445	5.25130	486.25063	52.69350	0.00059	-0.00002	0.2878	7.45784	-0.31248	-0.00001	0.00000
470	#BV+	5182.1320	5.27765	5.32985	113.16397	98.18517	0.00026	0.05587	0.2878	3.48954	-1.02236	-0.00001	0.00328
472	#BV-	5201.4167	5.34099	5.35566	21.87887	145.36375	0.00007	0.11911	0.2878	1.24402	-1.42407	-0.00001	0.00328
476	#BV-	5235.4967	5.67724	5.38335	72.32594	266.61912	-0.00025	0.17499	0.2876	-2.72428	-2.13388	-0.00001	0.00000
479	#QVD	5243.1020	5.68990	5.38777	134.30539	265.22221	-0.00035	0.16412	0.2873	-6.25685	3.44629	-0.00002	-0.00355
483	#QVF	5256.0020	5.69868	5.39901	407.54369	125.84045	-0.00060	0.09444	0.2873	-8.89671	3.02014	-0.00001	-0.00439
488	#QVF	5276.8520	5.70599	5.43074	411.05713	107.50561	-0.00060	0.03667	0.2873	8.78601	-1.85892	0.00001	-0.00178
492	#QVD	5289.7520	5.71460	5.44472	138.23985	200.87400	-0.00034	0.01884	0.2873	6.25292	-1.96126	0.00002	-0.00160
497	#QVD	5310.6020	5.77511	5.46382	27.86795	122.80811	-0.00013	-0.01884	0.2873	0.73736	4.42081	0.00001	-0.00160
501	#QVF	5323.5020	5.85876	5.50561	23.69441	20.08492	-0.00006	-0.03667	0.2873	0.15353	1.94630	0.00001	-0.00178
506	#QVF	5344.3520	6.02357	5.85003	20.18267	38.42157	0.00007	-0.09444	0.2873	-0.04289	-3.10763	0.00001	-0.00439
510	#QVD	5357.2520	6.12332	5.87432	23.93539	187.16264	0.00014	-0.16412	0.2873	-0.73343	-5.90598	0.00001	-0.00355
515	#BV+	5373.5384	6.18325	5.88512	89.97834	279.80029	0.00028	-0.17404	0.2873	-3.07844	-2.19721	0.00001	0.00038
518	#BV+	5379.5384	6.19204	5.88838	131.11134	306.91658	0.00034	-0.17080	0.2872	-3.77706	-2.32217	0.00001	0.00076
521	#BV+	5385.5384	6.19825	5.89136	180.62778	335.53238	0.00040	-0.16528	0.2872	-4.47568	-2.44713	0.00001	0.00114
524	#BV+	5391.5384	6.20285	5.89408	238.52768	365.64768	0.00046	-0.15747	0.2871	-5.17430	-2.57209	0.00001	0.00152
527	#BV+	5397.5384	6.20639	5.89659	304.81102	397.26245	0.00052	-0.14738	0.2871	-5.87292	-2.69704	0.00001	0.00190
530	#BV-	5465.4372	6.22170	5.91513	1639.14097	859.53406	0.00117	-0.01903	0.2870	-13.77884	-4.11118	0.00001	0.00152
533	#BV-	5471.4372	6.22226	5.91621	1808.67872	909.61794	0.00123	-0.01084	0.2870	-14.47746	-4.23612	0.00001	0.00114
536	#BV-	5477.4372	6.22276	5.91723	1986.59991	961.20104	0.00129	-0.00494	0.2870	-15.17608	-4.36106	0.00001	0.00076
539	#BV-	5483.4372	6.22322	5.91819	2172.90455	1014.28336	0.00134	-0.00132	0.2870	-15.87470	-4.48599	0.00001	0.00038
542	#BV-	5489.4372	6.22364	5.91911	2367.59265	1068.86483	0.00140	0.00001	0.2870	-16.57332	-4.61092	0.00001	0.00000
545	#QM3	5502.0855	6.22444	5.92087	2529.86727	1315.01167	0.00145	0.00001	0.2870	30.28050	-28.31533	-0.00002	0.00000
549	#QM2	5512.9060	6.22533	5.92185	1444.73386	2397.33327	0.00109	0.00002	0.2870	33.90266	-40.15451	-0.00003	0.00000
553	#QM2	5522.6504	6.22656	5.92246	1188.14714	2478.63805	0.00099	0.00002	0.2870	-5.04108	32.64009	0.00000	0.00000
557	#QM1	5531.5988	6.22765	5.92317	1469.97253	1616.13657	0.00110	0.00001	0.2870	-6.78600	32.77542	0.00000	0.00000
560	#IPM	5655.3750	6.46482	6.16039	10.00033	10.00118	-0.00002	0.00000	0.2870	0.00003	-0.00038	-0.00001	0.00000
563	#1QM	5779.1512	6.70199	6.39750	1616.36137	1469.93004	-0.00119	-0.00002	0.2870	-32.77966	6.78615	-0.00002	0.00000
567	#2QM	5788.0996	6.70269	6.39859	2478.97562	1188.10711	-0.00147	-0.00002	0.2870	-32.64421	5.04127	-0.00002	0.00000
571	#2QM	5797.8440	6.70330	6.39982	2397.65379	1444.67729	-0.00145	-0.00002	0.2870	40.16020	-33.90098	0.00002	0.00000
575	#3QM	5808.6645	6.70428	6.40071	1315.18217	2529.75825	-0.00107	-0.00002	0.2870	28.31933	-30.27885	0.00002	0.00000
578	#BV+	5821.3128	6.70604	6.40151	1068.99561	2367.48235	-0.00097	-0.00002	0.2870	4.61181	16.57290	0.00000	0.00000
581	#BV+	5827.3128	6.70696	6.40193	1014.40377	2172.79885	-0.00094	0.00131	0.2870	4.48682	15.87434	0.00000	0.00038
584	#BV+	5833.3128	6.70793	6.40239	961.31181	1986.49808	-0.00091	0.00493	0.2870	4.36184	15.17578	0.00000	0.00076
587	#BV+	5839.3128	6.70895	6.40289	909.71973	1808.58016	-0.00089	0.01084	0.2870	4.23685	14.47720	0.00000	0.00114
590	#BV+	5845.3128	6.71003	6.40345	859.62751	1639.04523	-0.00086	0.01903	0.2870	4.11186	13.77861	0.00000	0.00152
593	#BV-	5913.2116	6.72856	6.41876	397.28599	304.75700	-0.00057	0.14738	0.2870	2.69742	5.87249	0.00000	0.00190
596	#BV-	5919.2116	6.73107	6.42230	365.66687	238.47897	-0.00054	0.15748	0.2870	2.57243	5.17385	0.00000	0.00152
599	#BV-	5925.2116	6.73379	6.42691	335.54763	180.58462	-0.00052	0.16528	0.2869	2.44744	4.47521	0.00000	0.00114
602	#BV-	5931.2116	6.73677	6.43311	306.92825	131.07396	-0.00049	0.17081	0.2868	2.32245	3.77657	0.00000	0.00076
605	#BV-	5937.2116	6.74003	6.44191	279.80875	89.94705	-0.00047	0.17405	0.2868	2.19746	3.07792	0.00000	0.00038

BETATRON FUNCTIONS OF RING -- Collision optics

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
610	#QVF	5953.4979	6.75083	6.50187	187.16366	23.92028	-0.00037	0.18610	0.2867	5.90620	0.73313	0.00001	0.00371
614	#QVD	5966.3979	6.77512	6.60168	38.41966	20.17553	-0.00015	0.25970	0.2867	3.10765	0.04233	0.00002	0.00278
619	#QVD	5987.2479	7.11955	6.76645	20.08856	23.70984	0.00012	0.20621	0.2867	-1.94667	-0.15368	0.00001	-0.00731
623	#QVF	6000.1479	7.16134	6.85005	122.82859	27.87811	0.00033	0.08200	0.2867	-4.42147	-0.73709	0.00001	-0.00875
628	#QVF	6020.9979	7.18044	6.91055	200.90302	138.22480	0.00042	-0.08199	0.2867	1.96166	-6.25159	0.00000	-0.00875
632	#QVD	6033.8979	7.19442	6.91916	107.51881	410.98406	0.00031	-0.20621	0.2867	1.85929	-8.78382	-0.00001	-0.00731
637	#QVD	6054.7479	7.22614	6.92648	125.84811	407.44805	0.00032	-0.25970	0.2867	-3.02015	8.89523	0.00001	0.00278
641	#QVF	6067.6479	7.23738	6.93525	265.23177	134.26506	0.00046	-0.18609	0.2867	-3.44623	6.25555	0.00001	0.00371
644	#BV+	6075.2533	7.24180	6.94792	266.62607	72.29786	0.00045	-0.17500	0.2867	2.13412	2.72374	0.00000	0.00000
648	#BV+	6109.3333	7.26949	7.28420	145.36034	21.89307	0.00031	-0.11912	0.2864	1.42415	-1.24474	0.00000	0.00328
650	#BV-	6128.6179	7.29530	7.34751	98.17940	113.20772	0.00022	-0.05588	0.2862	1.02240	-3.49036	0.00000	0.00328
654	#BV-	6162.6979	7.37386	7.37071	52.68801	486.35319	0.00008	0.00001	0.2863	0.31244	-7.45870	0.00000	0.00000
657	#4QM	6169.0548	7.39321	7.37265	54.25640	536.80840	0.00005	0.00001	0.2863	-0.70934	1.16417	0.00000	0.00000
661	#5QM	6184.8212	7.42620	7.37861	111.33150	319.98277	0.00001	0.00000	0.2863	-1.74092	4.78477	0.00000	0.00000
665	#6QM	6283.7500	7.50200	7.50163	389.68243	67.25503	-0.00026	0.00000	0.2863	0.61242	-0.10063	0.00000	0.00000
677	#QSD	6369.4375	7.60415	7.60429	52.76486	300.80972	0.29748	-0.00001	0.2863	0.29481	0.28769	0.00897	0.00000
689	#QSF	6455.1250	7.75191	7.75150	217.04655	38.26914	1.56440	0.00000	0.2868	-0.00302	-0.00289	0.00509	0.00000
701	#QSD	6540.8125	7.89904	7.89812	53.07121	302.48624	1.20029	0.00000	0.2923	-0.29485	-0.28771	0.00854	0.00000
717	#QSF	6626.5000	8.00085	8.00045	388.21583	67.51884	3.05278	0.00000	0.3010	0.00024	0.00003	-0.00025	0.00000
718	#QF	6626.5000	8.00085	8.00045	388.21583	67.51884	3.05278	0.00000	0.3144	0.00024	0.00003	-0.00025	0.00000
738	#QD	6740.7500	8.12548	8.12513	67.55328	388.19915	1.46796	0.00001	0.3144	0.00013	-0.00123	-0.00025	0.00000
758	#QF	6855.0000	8.25013	8.24964	388.13423	67.66437	3.05266	0.00001	0.3360	-0.00018	-0.00005	-0.00025	0.00000
778	#QSD	6969.2500	8.37475	8.37414	67.58094	388.23639	1.46766	0.00001	0.3568	-0.00008	0.00092	-0.00025	0.00000
790	#QSF	7054.9375	8.47700	8.47600	302.56364	53.02218	2.75354	0.00000	0.3784	0.28875	0.29487	-0.00441	0.00000
802	#QSD	7140.6250	8.62371	8.62324	38.22780	217.04655	0.72773	-0.00001	0.3917	0.00288	0.00199	-0.01456	0.00000
814	#QSF	7226.3125	8.77100	8.77088	300.89246	52.82033	0.27066	0.00000	0.4028	-0.28873	-0.29485	-0.00434	0.00000
826	#QM6	7312.0000	8.87359	8.87296	67.31697	389.70803	0.00015	-0.00001	0.4057	0.10078	-0.61149	0.00000	0.00000
830	#QM5	7410.9287	8.99654	8.94880	319.97243	111.24784	0.00071	0.00000	0.4062	-4.78369	1.74023	0.00001	0.00000
834	#QM4	7426.6951	9.00250	8.98181	536.75405	54.20566	0.00093	0.00000	0.4062	-1.16314	0.70894	0.00000	0.00000
837	#BV-	7433.0520	9.00444	9.00118	486.29309	52.63689	0.00089	0.00000	0.4062	7.45870	-0.31211	-0.00001	0.00000
841	#BV-	7467.1320	9.02765	9.07981	113.16673	98.12390	0.00045	-0.05587	0.4062	3.48985	-1.02260	-0.00001	-0.00328
843	#BV+	7486.4167	9.09099	9.10563	21.87577	145.31833	0.00019	-0.11911	0.4063	1.24402	-1.42465	-0.00001	-0.00328
847	#BV+	7520.4967	9.42725	9.13332	72.34179	266.63439	-0.00026	-0.17499	0.4060	-2.72483	-2.13508	-0.00001	0.00000
850	#QVD	7528.1020	9.43991	9.13774	134.33352	265.25319	-0.00038	-0.16412	0.4058	-6.25808	3.44562	-0.00002	0.00355
854	#QVF	7541.0020	9.44868	9.14898	407.62500	125.87395	-0.00068	-0.09443	0.4058	-8.89838	3.01990	-0.00002	0.00439
859	#QVF	7561.8520	9.45600	9.18069	411.13498	107.57549	-0.00071	-0.03666	0.4058	8.78780	-1.86099	0.00001	0.00178
863	#QVD	7574.7520	9.46461	9.19466	138.26411	201.03267	-0.00043	-0.01883	0.4058	6.25415	-1.96354	0.00002	0.00160
868	#QVD	7595.6020	9.52511	9.21375	27.86883	122.92368	-0.00022	0.01886	0.4058	0.73760	4.42445	0.00000	0.00160
872	#QVF	7608.5020	9.60876	9.25550	23.69023	20.10654	-0.00019	0.03668	0.4058	0.15364	1.94841	0.00000	0.00178
877	#QVF	7629.3520	9.77360	9.60000	20.18195	38.40680	-0.00003	0.09444	0.4058	-0.04311	-3.10744	0.00001	0.00439
881	#QVD	7642.2520	9.87334	9.62429	23.94014	187.15052	0.00009	0.16412	0.4058	-0.73368	-5.90667	0.00001	0.00355
886	#BV-	7658.5384	9.93325	9.63510	89.99771	279.82301	0.00030	0.17403	0.4058	-3.07904	-2.19846	0.00001	-0.00038
889	#BV-	7664.5384	9.94205	9.63836	131.13851	306.95496	0.00038	0.17080	0.4057	-3.77776	-2.32353	0.00001	-0.00076
892	#BV-	7670.5384	9.94825	9.64133	180.66392	335.58771	0.00045	0.16527	0.4056	-4.47648	-2.44860	0.00001	-0.00114
895	#BV-	7676.5384	9.95285	9.64406	238.57394	365.72126	0.00053	0.15746	0.4056	-5.17519	-2.57366	0.00001	-0.00152

BETATRON FUNCTIONS OF RING -- Collision optics

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
898	#BV-	7682.5384	9.95640	9.64656	304.86857	397.35556	0.00061	0.14737	0.4055	-5.87391	-2.69872	0.00001	-0.00190
901	#BV+	7750.4372	9.97170	9.66509	1639.40715	859.93842	0.00150	0.01901	0.4055	-13.78092	-4.11409	0.00001	-0.00152
904	#BV+	7756.4372	9.97226	9.66617	1808.97048	910.05776	0.00158	0.01082	0.4055	-14.47964	-4.23913	0.00001	-0.00114
907	#BV+	7762.4372	9.97276	9.66719	1986.91842	961.67763	0.00166	0.00491	0.4055	-15.17835	-4.36417	0.00001	-0.00076
910	#BV+	7768.4372	9.97322	9.66816	2173.25097	1014.79799	0.00174	0.00129	0.4055	-15.87707	-4.48921	0.00001	-0.00038
913	#BV+	7774.4372	9.97364	9.66907	2367.96813	1069.41881	0.00182	-0.00004	0.4055	-16.57579	-4.61425	0.00001	0.00000
916	#QM3	7787.0855	9.97444	9.67083	2530.26449	1315.72049	0.00189	-0.00004	0.4055	30.28542	-28.33152	-0.00002	0.00000
920	#QM2	7797.9060	9.97533	9.67181	1444.95811	2398.65288	0.00143	-0.00006	0.4055	33.90808	-40.17753	-0.00003	0.00000
924	#QM2	7807.6504	9.97656	9.67242	1188.32857	2480.01988	0.00130	-0.00006	0.4055	-5.04169	32.65737	0.00001	0.00000
928	#QM1	7816.5988	9.97765	9.67313	1470.19370	1617.05077	0.00145	-0.00005	0.4055	-6.78685	32.79305	0.00001	0.00000
931	#IPM	7940.3750	10.21484	9.91020	9.99858	9.99707	0.00007	-0.00001	0.4055	-0.00011	0.00062	-0.00001	0.00000
934	#1QM	8064.1512	10.45199	10.14748	1616.67681	1470.29229	-0.00138	0.00004	0.4055	-32.78594	6.78678	-0.00003	0.00000
938	#2QM	8073.0996	10.45270	10.14856	2479.45698	1188.41680	-0.00172	0.00003	0.4055	-32.65044	5.04154	-0.00002	0.00000
942	#2QM	8082.8440	10.45331	10.14980	2398.11731	1445.07725	-0.00169	0.00004	0.4055	40.16808	-33.91140	0.00003	0.00000
946	#3QM	8093.6645	10.45428	10.15069	1315.43458	2530.48803	-0.00126	0.00005	0.4055	28.32488	-30.28862	0.00003	0.00000
949	#BV-	8106.3128	10.45605	10.15148	1069.19800	2368.18973	-0.00114	0.00005	0.4055	4.61281	16.57681	0.00000	0.00000
952	#BV-	8112.3128	10.45696	10.15190	1014.59443	2173.45993	-0.00112	-0.00129	0.4055	4.48779	15.87814	0.00000	-0.00038
955	#BV-	8118.3128	10.45793	10.15236	961.49106	1987.11430	-0.00109	-0.00491	0.4055	4.36277	15.17945	0.00000	-0.00076
958	#BV-	8124.3128	10.45895	10.15286	909.88790	1809.15298	-0.00107	-0.01081	0.4055	4.23776	14.48076	0.00000	-0.00114
961	#BV-	8130.3128	10.46003	10.15342	859.78494	1639.57609	-0.00104	-0.01900	0.4055	4.11274	13.78205	0.00000	-0.00152
964	#BV+	8198.2116	10.47856	10.16872	397.34501	304.91368	-0.00076	-0.14737	0.4055	2.69799	5.87456	0.00000	-0.00190
967	#BV+	8204.2116	10.48106	10.17226	365.71924	238.61149	-0.00073	-0.15746	0.4054	2.57297	5.17580	0.00000	-0.00152
970	#BV+	8210.2116	10.48379	10.17686	335.59368	180.69441	-0.00071	-0.16527	0.4054	2.44795	4.47704	0.00000	-0.00114
973	#BV+	8216.2116	10.48677	10.18307	306.96832	131.16249	-0.00068	-0.17079	0.4053	2.32294	3.77828	0.00000	-0.00076
976	#BV+	8222.2116	10.49002	10.19186	279.84317	90.01574	-0.00066	-0.17403	0.4052	2.19792	3.07951	0.00000	-0.00038
981	#QVF	8238.4979	10.50083	10.25176	187.18174	23.94601	-0.00055	-0.18609	0.4052	5.90697	0.73389	0.00002	-0.00371
985	#QVD	8251.3979	10.52512	10.35149	38.42087	20.18289	-0.00026	-0.25969	0.4052	3.10797	0.04336	0.00002	-0.00278
990	#QVD	8272.2479	10.86957	10.51635	20.09245	23.68466	0.00008	-0.20620	0.4052	-1.94716	-0.15368	0.00002	0.00731
994	#QVF	8285.1479	10.91135	10.60002	122.85607	27.86741	0.00030	-0.08199	0.4052	-4.42246	-0.73781	0.00001	0.00875
999	#QVF	8305.9979	10.93045	10.66051	200.94667	138.28203	0.00044	0.08198	0.4052	1.96214	-6.25517	0.00000	0.00875
1003	#QVD	8318.8979	10.94442	10.66912	107.54082	411.19731	0.00034	0.20619	0.4052	1.85976	-8.78932	0.00000	0.00731
1008	#QVD	8339.7479	10.97614	10.67644	125.86744	407.69384	0.00042	0.25968	0.4052	-3.02045	8.89970	0.00001	-0.00278
1012	#QVF	8352.6479	10.98738	10.68521	265.26602	134.35873	0.00063	0.18608	0.4052	-3.44650	6.25909	0.00001	-0.00371
1015	#BV-	8360.2533	10.99180	10.69786	266.65775	72.35704	0.00064	0.17499	0.4052	2.13456	2.72527	0.00000	0.00000
1019	#BV-	8394.3333	11.01949	11.03412	145.36718	21.87119	0.00050	0.11911	0.4049	1.42444	-1.24389	0.00000	-0.00328
1021	#BV+	8413.6179	11.04529	11.09748	98.17694	113.16063	0.00042	0.05587	0.4047	1.02260	-3.48990	0.00000	-0.00328
1025	#BV+	8447.6979	11.12387	11.12068	52.67751	486.29804	0.00028	-0.00001	0.4047	0.31248	-7.45893	0.00000	0.00000
1028	#4QM	8454.0548	11.14322	11.12262	54.24458	536.76155	0.00026	0.00000	0.4047	-0.70914	1.16300	0.00000	0.00000
1032	#5QM	8469.8212	11.17621	11.12859	111.30703	319.98062	0.00032	0.00000	0.4047	-1.74058	4.78366	0.00000	0.00000
1036	#6QM	8568.7500	11.25203	11.25152	389.64597	67.32738	0.00025	0.00002	0.4047	0.61216	-0.10077	0.00000	0.00000
1048	#QSD	8654.4375	11.35418	11.35410	52.77424	300.90934	0.27610	0.00006	0.4047	0.29472	0.28881	0.00879	0.00000
1060	#QSF	8740.1250	11.50190	11.50139	217.06692	38.22802	1.49134	0.00002	0.4052	-0.00280	-0.00285	0.00534	0.00000
1072	#QSD	8825.8125	11.64905	11.64810	53.05899	302.56325	1.17853	-0.00001	0.4107	-0.29474	-0.28883	0.00920	0.00000
1084	#QSF	8911.5000	11.75088	11.75034	388.17908	67.59129	3.05228	-0.00002	0.4191	-0.00005	0.00000	0.00025	0.00000
1085	#QF	8911.5000	11.75088	11.75034	388.17908	67.59129	3.05228	-0.00002	0.4328	-0.00005	0.00000	0.00025	0.00000

BETATRON FUNCTIONS OF RING -- Collision optics

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
1105	#QD	9025.7500	11.87550	11.87493	67.56853	388.21799	1.46790	-0.00007	0.4328	-0.00002	0.00015	0.00025	0.00000
1125	#QF	9140.0000	12.00012	11.99952	388.17179	67.59188	3.05293	-0.00002	0.4536	-0.00001	0.00001	0.00025	0.00000
1145	#QD	9254.2500	12.12475	12.12411	67.56575	388.21283	1.46789	0.00000	0.4752	-0.00004	0.00016	0.00024	0.00000
1165	#QF	9368.5000	12.24937	12.24871	388.17893	67.59128	3.05225	0.00002	0.4960	-0.00005	0.00000	0.00025	0.00000
1185	#QD	9482.7500	12.37399	12.37330	67.56854	388.21795	1.46749	0.00007	0.5176	-0.00002	0.00015	0.00024	0.00000
1205	#QF	9597.0000	12.49862	12.49789	388.17194	67.59189	3.05159	0.00002	0.5384	-0.00001	0.00001	0.00025	0.00000
1225	#QD	9711.2500	12.62324	12.62248	67.56574	388.21286	1.46750	0.00000	0.5600	-0.00003	0.00016	0.00025	0.00000
1245	#QF	9825.5000	12.74787	12.74707	388.17878	67.59127	3.05226	-0.00002	0.5808	-0.00005	0.00000	0.00025	0.00000
1265	#QD	9939.7500	12.87249	12.87166	67.56855	388.21792	1.46789	-0.00007	0.6024	-0.00002	0.00015	0.00025	0.00000
1285	#135	10054.0000	12.99711	12.99625	388.17209	67.59189	3.05293	-0.00002	0.6232	-0.00001	0.00001	0.00025	0.00000
6416	#QF	40901.5000	46.64552	46.63574	388.16859	67.59109	3.05186	0.00000	0.6448	-0.00004	0.00001	0.00025	0.00000
6436	#QD	41015.7500	46.77014	46.76033	67.56809	388.21406	1.46773	-0.00005	6.3678	-0.00004	0.00014	0.00025	0.00000
6456	#QF	41130.0000	46.89476	46.88492	388.18226	67.59206	3.05280	-0.00003	6.3886	-0.00002	0.00000	0.00025	0.00000
6476	#QD	41244.2500	47.01939	47.00951	67.56620	388.21677	1.46797	-0.00005	6.4102	-0.00001	0.00016	0.00025	0.00000
6496	#QF	41358.5000	47.14401	47.13410	388.16848	67.59110	3.05267	0.00000	6.4310	-0.00004	0.00001	0.00025	0.00000
6516	#QD	41472.7500	47.26864	47.25870	67.56807	388.21400	1.46766	0.00005	6.4526	-0.00004	0.00014	0.00024	0.00000
6536	#QF	41587.0000	47.39326	47.38329	388.18236	67.59206	3.05173	0.00003	6.4734	-0.00002	0.00000	0.00025	0.00000
6556	#QD	41701.2500	47.51788	47.50788	67.56622	388.21682	1.46742	0.00005	6.4950	-0.00001	0.00016	0.00025	0.00000
6576	#QF	41815.5000	47.64251	47.63247	388.16838	67.59110	3.05185	0.00000	6.5158	-0.00004	0.00001	0.00025	0.00000
6596	#QSD	41929.7500	47.76713	47.75706	67.56805	388.21395	1.46773	-0.00005	6.5374	-0.00004	0.00014	0.00025	0.00000
6612	#QSF	42015.4375	47.86940	47.85886	302.52095	53.07604	2.77585	-0.00002	6.5582	0.28857	0.29480	-0.00409	0.00000
6624	#QSD	42101.1250	48.01611	48.00598	38.23476	217.06354	0.74075	-0.00004	6.5719	0.00278	0.00306	-0.01432	0.00000
6636	#QSF	42186.8125	48.16337	48.15373	300.90503	52.76454	0.29226	0.00000	6.5827	-0.28853	-0.29477	-0.00416	0.00000
6648	#QU4	42273.1912	48.26760	48.25617	67.69122	387.56757	0.00008	0.00005	6.5856	-0.17614	0.91127	0.00000	0.00000
6652	#QU3	42313.8851	48.32802	48.28942	181.87529	97.20516	-0.00002	0.00003	6.5861	-0.87812	1.75130	0.00000	0.00000
6656	#QU2	42557.1337	48.50480	48.64206	427.83947	901.27030	-0.00056	-0.00001	6.5861	-5.56241	5.00518	-0.00001	0.00000
6660	#QU1	42575.9944	48.50990	48.64644	817.31351	516.85921	-0.00079	-0.00001	6.5861	-6.70484	5.58705	-0.00001	0.00000
6663	#UC	42900.8750	48.61036	48.78995	350.67463	350.61661	-0.00054	-0.00005	6.5861	0.28903	-0.28884	0.00000	0.00000
6666	#1QU	43225.7557	48.75388	48.89043	516.76473	817.15672	-0.00028	-0.00010	6.5861	-5.58591	6.70344	0.00000	0.00000
6670	#2QU	43244.6164	48.75826	48.89553	901.09952	427.76064	-0.00034	-0.00007	6.5861	-5.00411	5.56126	0.00000	0.00000
6674	#3QU	43487.8650	49.11088	49.07231	97.22115	181.91362	0.00028	-0.00002	6.5861	-1.75144	0.87823	0.00000	0.00000
6678	#4QU	43528.5588	49.14414	49.13272	387.60228	67.70489	0.00053	0.00000	6.5861	-0.91115	0.17627	0.00000	0.00000
6690	#QSD	43614.9375	49.24658	49.23693	52.75011	300.90418	0.29777	0.00004	6.5861	0.29489	0.28866	0.00897	0.00000
6702	#QSF	43700.6250	49.39437	49.38420	217.03050	38.23325	1.56460	0.00002	6.5866	-0.00333	-0.00283	0.00509	0.00000
6714	#QSD	43786.3125	49.54149	49.53090	53.08828	302.54586	1.20012	0.00003	6.5921	-0.29493	-0.28869	0.00853	0.00000
6730	#QSF	43872.0000	49.64327	49.63316	388.24621	67.58217	3.05200	0.00000	6.6008	0.00055	-0.00004	-0.00025	0.00000
6731	#QF	43872.0000	49.64327	49.63316	388.24621	67.58217	3.05200	0.00000	6.6142	0.00055	-0.00004	-0.00025	0.00000
6751	#QD	43986.2500	49.76792	49.75776	67.53222	388.22784	1.46765	-0.00005	6.6142	0.00021	-0.00029	-0.00025	0.00000
6771	#QF	44100.5000	49.89260	49.88234	388.10280	67.60101	3.05239	-0.00003	6.6358	-0.00049	0.00003	-0.00025	0.00000
6791	#QSD	44214.7500	50.01720	50.00692	67.60196	388.20352	1.46781	-0.00005	6.6566	-0.00016	-0.00001	-0.00025	0.00000
6803	#QSF	44300.4375	50.11942	50.10873	302.61415	53.06847	2.75418	0.00000	6.6782	0.28908	0.29478	-0.00441	0.00000
6815	#QSD	44386.1250	50.26614	50.25587	38.21596	217.06743	0.72796	0.00004	6.6914	0.00296	0.00292	-0.01457	0.00000
6827	#QSF	44471.8125	50.41347	50.40360	300.89323	52.77152	0.27082	0.00002	6.7026	-0.28905	-0.29475	-0.00434	0.00000
6839	#QU4	44558.1912	50.51766	50.50603	67.72477	387.56052	0.00001	0.00005	6.7055	-0.17640	0.91140	0.00000	0.00000
6843	#QU3	44598.8851	50.57805	50.53929	181.96253	97.19790	0.00001	0.00002	6.7060	-0.87832	1.75129	0.00000	0.00000

BETATRON FUNCTIONS OF RING -- Collision optics

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
6847	#QU2	44842.1337	50.75483	50.89193	427.64227	901.39592	0.00000	-0.00010	6.7060	-5.55959	5.00591	0.00000	0.00000
6851	#QU1	44860.9944	50.75993	50.89631	816.92440	516.93007	0.00000	-0.00008	6.7060	-6.70143	5.58786	0.00000	0.00000
6854	#UC	45185.8750	50.86044	51.03981	350.54991	350.59012	-0.00001	-0.00003	6.7060	0.28854	-0.28869	0.00000	0.00000
6857	#1QU	45510.7557	51.00395	51.14031	517.00153	817.04224	-0.00002	0.00001	6.7060	-5.58872	6.70247	0.00000	0.00000
6861	#2QU	45529.6164	51.00833	51.14540	901.52455	427.70179	-0.00003	0.00001	6.7060	-5.00670	5.56045	0.00000	0.00000
6865	#3QU	45772.8650	51.36097	51.32219	97.18683	181.93510	0.00001	0.00004	6.7060	-1.75121	0.87825	0.00000	0.00000
6869	#4QU	45813.5588	51.39423	51.38259	387.53836	67.71456	0.00001	0.00003	6.7060	-0.91150	0.17632	0.00000	0.00000
6881	#QSD	45899.9375	51.49666	51.48679	52.77343	300.90917	0.27621	0.00005	6.7060	0.29472	0.28881	0.00879	0.00000
6893	#QSF	45985.6250	51.64438	51.63408	217.06602	38.22780	1.49194	0.00000	6.7065	-0.00282	-0.00285	0.00534	0.00000
6905	#QSD	46071.3125	51.79154	51.78079	53.05992	302.56436	1.17878	-0.00005	6.7120	-0.29475	-0.28884	0.00920	0.00000
6917	#QSF	46157.0000	51.89336	51.88303	388.18078	67.59168	3.05252	-0.00003	6.7204	-0.00003	0.00000	0.00025	0.00000
6918	#QF	46157.0000	51.89336	51.88303	388.18078	67.59168	3.05252	-0.00003	6.7341	-0.00003	0.00000	0.00025	0.00000
6938	#QD	46271.2500	52.01798	52.00762	67.56738	388.21717	1.46773	-0.00005	6.7341	-0.00001	0.00015	0.00025	0.00000
6958	#QF	46385.5000	52.14261	52.13221	388.17003	67.59149	3.05213	0.00000	6.7549	-0.00003	0.00001	0.00025	0.00000
6978	#QSD	46499.7500	52.26723	52.25680	67.56690	388.21362	1.46758	0.00005	6.7765	-0.00004	0.00015	0.00025	0.00000
6994	#QSF	46585.4375	52.36951	52.35861	302.51824	53.07574	2.77520	0.00002	6.7973	0.28855	0.29480	-0.00409	0.00000
7006	#QSD	46671.1250	52.51621	52.50573	38.23541	217.06371	0.74051	0.00004	6.8110	0.00278	0.00306	-0.01432	0.00000
7018	#QSF	46756.8125	52.66347	52.65348	300.90493	52.76481	0.29211	0.00000	6.8218	-0.28852	-0.29477	-0.00416	0.00000
7030	#QL6	46842.1860	52.76533	52.75550	67.52439	388.40413	0.00023	-0.00005	6.8247	0.10032	-0.58516	0.00000	0.00000
7034	#QL5	46956.2997	52.89469	52.85727	385.39681	89.27944	0.00053	-0.00003	6.8252	-4.88437	1.14514	0.00001	0.00000
7038	#QL4	46969.9924	52.89932	52.88835	555.76310	57.70958	0.00063	-0.00003	6.8252	-0.10832	0.22885	0.00000	0.00000
7041	#BV+	46976.0521	52.90112	52.90475	494.53862	62.41772	0.00059	-0.00003	6.8252	8.44870	-0.86681	-0.00001	0.00000
7045	#BV+	47010.1321	52.92714	52.96124	88.66426	154.08695	0.00022	0.05584	6.8252	3.46076	-1.82300	-0.00001	0.00328
7047	#BV-	47029.4167	53.04196	52.97740	9.61593	234.83359	0.00002	0.11908	6.8252	0.63827	-2.36409	-0.00001	0.00328
7051	#BV-	47063.4967	53.34641	52.99453	136.10054	428.55370	-0.00035	0.17495	6.8250	-4.34967	-3.32016	-0.00001	0.00000
7054	#QVD	47071.1021	53.35338	52.99729	235.33145	424.49267	-0.00045	0.16408	6.8247	-10.11479	5.65257	-0.00002	-0.00355
7058	#QVF	47084.0021	53.35852	53.00436	675.09661	198.38358	-0.00076	0.09441	6.8247	-13.85163	4.96437	-0.00002	-0.00439
7063	#QVF	47104.8521	53.36305	53.02518	646.98330	157.13653	-0.00074	0.03664	6.8247	14.73737	-2.35204	0.00002	-0.00178
7067	#QVD	47117.7521	53.36870	53.03497	203.84927	279.73146	-0.00041	0.01881	6.8247	10.14625	-2.31177	0.00002	-0.00160
7072	#QVD	47138.6021	53.42395	53.04924	22.48904	157.80507	-0.00011	-0.01887	6.8247	1.33998	6.15319	0.00001	-0.00159
7076	#QVF	47151.5021	53.58260	53.08554	10.47901	20.59945	0.00001	-0.03668	6.8247	-0.04814	2.48851	0.00001	-0.00178
7081	#QVF	47172.3521	53.77504	53.47391	38.59511	61.84931	0.00018	-0.09442	6.8247	-0.83769	-5.10102	0.00001	-0.00439
7085	#QVD	47185.2521	53.82062	53.48893	53.97435	302.57615	0.00022	-0.16409	6.8247	-1.37145	-9.49421	0.00001	-0.00355
7090	#BV+	47226.1602	53.86351	53.50298	488.75498	633.72683	0.00064	-0.17398	6.8247	-8.39827	-4.09620	0.00001	0.00038
7093	#BV+	47232.1602	53.86528	53.50443	594.80289	683.89108	0.00070	-0.17074	6.8246	-9.27639	-4.26451	0.00001	0.00076
7096	#BV+	47238.1602	53.86675	53.50578	711.38822	736.07500	0.00077	-0.16522	6.8246	-10.15450	-4.43281	0.00001	0.00114
7099	#BV-	47379.3248	53.87721	53.52222	6494.74699	2546.62952	0.00227	-0.00482	6.8245	-30.81440	-8.39296	0.00001	0.00076
7102	#BV-	47385.3248	53.87735	53.52259	6869.78849	2648.35457	0.00234	-0.00120	6.8245	-31.69252	-8.56120	0.00001	0.00038
7105	#BV-	47391.3248	53.87749	53.52294	7255.36742	2752.09851	0.00240	0.00013	6.8245	-32.57064	-8.72944	0.00001	0.00000
7108	#QL3	47404.9736	53.87778	53.52368	7072.97610	3440.71989	0.00237	0.00015	6.8245	125.99287	-80.08873	-0.00004	0.00000
7112	#QL2	47418.0707	53.87826	53.52410	2629.08036	7353.29710	0.00144	0.00022	6.8245	105.13793	-103.74463	-0.00006	0.00000
7116	#QL2	47430.1673	53.87935	53.52436	1365.94913	6422.93352	0.00104	0.00020	6.8245	15.29171	168.16328	-0.00001	-0.00001
7120	#QL1	47443.7453	53.88096	53.52502	1270.13564	1696.02741	0.00100	0.00010	6.8245	21.98086	92.87814	-0.00002	-0.00001
7123	#IPL	47470.8750	54.12807	53.77213	0.50001	0.50006	-0.00001	0.00000	6.8245	0.00004	-0.00053	-0.00004	0.00000
7126	#1QL	47498.0047	54.37510	54.01916	1696.20998	1270.04508	-0.00117	-0.00009	6.8245	-92.88765	-21.97880	-0.00006	0.00000

BETATRON FUNCTIONS OF RING -- Collision optics

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
7130	#2QL	47511.5827	54.37577	54.02077	6423.59859	1365.83803	-0.00227	-0.00009	6.8245	-168.18020	-15.28997	-0.00006	0.00000
7134	#2QL	47523.6793	54.37603	54.02187	7354.04673	2628.84867	-0.00242	-0.00013	6.8245	103.75569	-105.12818	0.00003	-0.00001
7138	#3QL	47536.7764	54.37644	54.02235	3441.06178	7072.33179	-0.00166	-0.00021	6.8245	80.09718	-125.98090	0.00004	0.00000
7141	#BV+	47550.4252	54.37718	54.02263	2752.35937	7254.69351	-0.00148	-0.00022	6.8245	8.73076	32.56810	0.00000	0.00000
7144	#BV+	47556.4252	54.37754	54.02277	2648.60034	6869.14322	-0.00145	0.00112	6.8245	8.56241	31.69024	0.00000	0.00038
7147	#BV+	47562.4252	54.37791	54.02291	2546.86149	6494.12746	-0.00142	0.00475	6.8245	8.39406	30.81235	0.00000	0.00076
7150	#BV-	47703.5898	54.39434	54.03337	736.10028	711.22064	-0.00073	0.16522	6.8245	4.43324	10.15317	0.00000	0.00114
7153	#BV-	47709.5898	54.39569	54.03484	683.91148	594.65109	-0.00070	0.17075	6.8245	4.26489	9.27509	0.00000	0.00076
7156	#BV-	47715.5898	54.39714	54.03661	633.74286	488.61854	-0.00067	0.17399	6.8244	4.09654	8.39700	0.00000	0.00038
7161	#QVF	47756.4980	54.41119	54.07953	302.57180	53.93116	-0.00044	0.18608	6.8243	9.49430	1.37115	0.00001	0.00371
7165	#QVD	47769.3980	54.42621	54.12515	61.84584	38.55254	-0.00019	0.25969	6.8243	5.10095	0.83700	0.00002	0.00278
7170	#QVD	47790.2480	54.81459	54.31768	20.60366	10.48607	0.00014	0.20621	6.8243	-2.48893	0.04727	0.00002	-0.00731
7174	#QVF	47803.1480	54.85089	54.47619	157.82770	22.50142	0.00037	0.08201	6.8243	-6.15390	-1.33973	0.00001	-0.00875
7179	#QVF	47823.9980	54.86515	54.53142	279.76232	203.80703	0.00048	-0.08196	6.8243	2.31222	-10.14304	0.00000	-0.00875
7183	#QVD	47836.8980	54.87494	54.53707	157.14997	646.79870	0.00036	-0.20615	6.8243	2.35245	-14.73207	-0.00001	-0.00731
7188	#QVD	47857.7480	54.89576	54.54161	198.38934	674.86238	0.00038	-0.25964	6.8243	-4.96429	13.84790	0.00001	0.00278
7192	#QVF	47870.6480	54.90284	54.54676	424.49656	235.23365	0.00054	-0.18606	6.8243	-5.65239	10.11163	0.00001	0.00371
7195	#BV+	47878.2533	54.90559	54.55373	428.55430	136.03172	0.00054	-0.17497	6.8243	3.32039	4.34848	0.00000	0.00000
7199	#BV+	47912.3333	54.92272	54.85829	234.82587	9.62589	0.00037	-0.11912	6.8240	2.36413	-0.63940	0.00000	0.00328
7201	#BV-	47931.6180	54.93889	54.97300	154.07843	88.71760	0.00028	-0.05589	6.8238	1.82301	-3.46188	0.00000	0.00328
7205	#BV-	47965.6980	54.99538	54.99900	62.41173	494.66360	0.00011	-0.00004	6.8239	0.86674	-8.44964	0.00000	0.00000
7208	#4QL	47971.7577	55.01178	55.00081	57.70399	555.88847	0.00009	-0.00004	6.8239	-0.22883	0.10954	0.00000	0.00000
7212	#5QL	47985.4504	55.04286	55.00543	89.27162	385.45675	0.00005	-0.00004	6.8239	-1.14508	4.88634	0.00000	0.00000
7216	#6QL	48099.5640	55.14464	55.13488	388.40996	67.44229	-0.00026	-0.00002	6.8239	0.58507	-0.10011	0.00000	0.00000
7228	#QSD	48184.9375	55.24666	55.23684	52.76445	300.78537	0.29748	-0.00003	6.8239	0.29481	0.28717	0.00897	0.00000
7240	#QSF	48270.6250	55.39441	55.38400	217.04678	38.28806	1.56440	0.00000	6.8244	-0.00303	-0.00283	0.00509	0.00000
7252	#QSD	48356.3125	55.54155	55.53059	53.07159	302.42947	1.20029	0.00004	6.8299	-0.29484	-0.28720	0.00854	0.00000
7268	#QSF	48442.0000	55.64335	55.63296	388.21548	67.48543	3.05278	0.00002	6.8386	0.00024	-0.00002	-0.00025	0.00000
7269	#QF	48442.0000	55.64335	55.63296	388.21548	67.48543	3.05278	0.00002	6.8520	0.00024	-0.00002	-0.00025	0.00000
7289	#QD	48556.2500	55.76799	55.75768	67.55276	388.21812	1.46796	0.00003	6.8520	0.00013	-0.00172	-0.00025	0.00000
7309	#QF	48670.5000	55.89264	55.88214	388.13455	67.69790	3.05266	0.00000	6.8736	-0.00018	-0.00001	-0.00025	0.00000
7329	#QSD	48784.7500	56.01725	56.00661	67.58146	388.21991	1.46766	-0.00004	6.8944	-0.00008	0.00142	-0.00025	0.00000
7341	#QSF	48870.4375	56.11951	56.10850	302.56407	52.99636	2.75354	-0.00002	6.9160	0.28876	0.29483	-0.00441	0.00000
7353	#QSD	48956.1250	56.26621	56.25578	38.22751	217.05460	0.72773	-0.00002	6.9293	0.00288	0.00149	-0.01456	0.00000
7365	#QSF	49041.8125	56.41350	56.40337	300.89331	52.84494	0.27066	0.00000	6.9405	-0.28874	-0.29481	-0.00434	0.00000
7377	#QL6	49127.1860	56.51535	56.50530	67.53828	388.42314	0.00015	0.00004	6.9433	0.10024	-0.58362	0.00000	0.00000
7381	#QL5	49241.2997	56.64469	56.60716	385.43230	89.14664	0.00079	0.00002	6.9438	-4.88461	1.14393	0.00001	0.00000
7385	#QL4	49254.9924	56.64931	56.63829	555.80737	57.61929	0.00096	0.00002	6.9438	-0.10811	0.22838	0.00000	0.00000
7388	#BV-	49261.0521	56.65112	56.65471	494.57558	62.32350	0.00091	0.00002	6.9438	8.44955	-0.86593	-0.00002	0.00000
7392	#BV-	49295.1321	56.67714	56.71127	88.66433	153.95326	0.00040	-0.05585	6.9438	3.46099	-1.82273	-0.00002	-0.00328
7394	#BV+	49314.4167	56.79197	56.72744	9.61374	234.69596	0.00011	-0.11909	6.9439	0.63815	-2.36416	-0.00002	-0.00328
7398	#BV+	49348.4967	57.09641	56.74458	136.12722	428.44158	-0.00040	-0.17496	6.9437	-4.35040	-3.32084	-0.00002	0.00000
7401	#QVD	49356.1021	57.10338	56.74734	235.37492	424.40442	-0.00055	-0.16409	6.9434	-10.11652	5.64984	-0.00003	0.00355
7405	#QVF	49369.0021	57.10852	56.75441	675.21503	198.36989	-0.00095	-0.09442	6.9434	-13.85391	4.96246	-0.00002	0.00439
7410	#QVF	49389.8521	57.11305	56.77523	647.09111	157.18980	-0.00094	-0.03665	6.9434	14.73998	-2.35437	0.00002	0.00178

BETATRON FUNCTIONS OF RING -- Collision optics

POS	S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
7414 #QVD	49402.7521	57.11870	56.78502	203.88085	279.87820	-0.00054	-0.01882	6.9434	10.14800	-2.31446	0.00003	0.00160
7419 #QVD	49423.6021	57.17394	56.79928	22.48927	157.92817	-0.00020	0.01886	6.9434	1.34022	6.15663	0.00001	0.00159
7423 #QVF	49436.5021	57.33262	56.83554	10.47677	20.62624	-0.00009	0.03668	6.9434	-0.04821	2.49087	0.00001	0.00178
7428 #QVF	49457.3521	57.52506	57.22395	38.60348	61.80915	0.00013	0.09443	6.9434	-0.83795	-5.09914	0.00001	0.00439
7432 #QVD	49470.2521	57.57063	57.23898	53.98646	302.46426	0.00022	0.16410	6.9434	-1.37171	-9.49223	0.00001	0.00355
7437 #BV-	49511.1602	57.61351	57.25303	488.83598	633.66594	0.00082	0.17400	6.9434	-8.39950	-4.09737	0.00002	-0.00038
7440 #BV-	49517.1602	57.61528	57.25449	594.89931	683.84491	0.00091	0.17076	6.9433	-9.27773	-4.26579	0.00002	-0.00076
7443 #BV-	49523.1602	57.61675	57.25583	711.50138	736.04483	0.00100	0.16524	6.9432	-10.15595	-4.43420	0.00002	-0.00114
7446 #BV+	49664.3248	57.62721	57.27227	6495.62943	2547.34694	0.00312	0.00486	6.9432	-30.81840	-8.39687	0.00002	-0.00076
7449 #BV+	49670.3248	57.62735	57.27264	6870.71958	2649.11954	0.00321	0.00124	6.9432	-31.69663	-8.56522	0.00002	-0.00038
7452 #BV+	49676.3248	57.62749	57.27299	7256.34847	2752.91231	0.00330	-0.00010	6.9432	-32.57485	-8.73356	0.00002	0.00000
7455 #QL3	49689.9736	57.62778	57.27373	7073.92770	3441.78664	0.00326	-0.00011	6.9432	126.01001	-80.11510	-0.00006	0.00000
7459 #QL2	49703.0707	57.62825	57.27415	2629.43112	7355.63627	0.00199	-0.00016	6.9432	105.15215	-103.77917	-0.00008	0.00000
7463 #QL2	49715.1673	57.62935	57.27441	1366.12782	6425.00894	0.00144	-0.00015	6.9432	15.29390	168.21608	-0.00002	0.00000
7467 #QL1	49728.7453	57.63096	57.27507	1270.29689	1696.59722	0.00139	-0.00008	6.9432	21.98385	92.90781	-0.00002	0.00000
7470 #IPL	49755.8750	57.87810	57.52194	0.49994	0.49992	0.00001	0.00000	6.9432	-0.00015	0.00101	-0.00005	0.00000
7473 #1QL	49783.0047	58.12510	57.76921	1696.44873	1270.32730	-0.00158	0.00007	6.9432	-92.90054	-21.98524	-0.00009	0.00000
7477 #2QL	49796.5827	58.12576	57.77082	6424.49291	1366.18443	-0.00309	0.00007	6.9432	-168.20343	-15.29540	-0.00008	0.00000
7481 #2QL	49808.6793	58.12602	57.77192	7355.06618	2629.57130	-0.00331	0.00010	6.9432	103.77026	-105.15862	0.00005	0.00000
7485 #3QL	49821.7764	58.12644	57.77240	3441.53546	7074.34160	-0.00226	0.00016	6.9432	80.10839	-126.01824	0.00005	0.00000
7488 #BV-	49835.4252	58.12718	57.77268	2752.73351	7256.79576	-0.00203	0.00016	6.9432	8.73213	32.57600	0.00001	0.00000
7491 #BV-	49841.4252	58.12753	57.77282	2648.95818	6871.15176	-0.00199	-0.00118	6.9432	8.56375	31.69796	0.00001	-0.00038
7494 #BV-	49847.4252	58.12790	57.77296	2547.20339	6496.04434	-0.00196	-0.00480	6.9432	8.39538	30.81991	0.00001	-0.00076
7497 #BV+	49988.5898	58.14434	57.78342	736.16874	711.57250	-0.00109	-0.16524	6.9432	4.43386	10.15670	0.00001	-0.00114
7500 #BV+	49994.5898	58.14568	57.78489	683.97264	594.96158	-0.00106	-0.17076	6.9431	4.26549	9.27845	0.00001	-0.00076
7503 #BV+	50000.5898	58.14713	57.78666	633.79708	488.88970	-0.00102	-0.17401	6.9431	4.09711	8.40019	0.00001	-0.00038
7508 #QVF	50041.4980	58.16119	57.82954	302.58592	53.99752	-0.00072	-0.18608	6.9430	9.49497	1.37186	0.00002	-0.00371
7512 #QVD	50054.3980	58.17621	57.87509	61.84606	38.61281	-0.00033	-0.25969	6.9430	5.10120	0.83815	0.00003	-0.00278
7517 #QVD	50075.2480	58.56460	58.06752	20.60835	10.47485	0.00013	-0.20621	6.9430	-2.48946	0.04836	0.00002	0.00731
7521 #QVF	50088.1480	58.60089	58.22623	157.85751	22.48773	0.00044	-0.08200	6.9430	-6.15493	-1.34036	0.00002	0.00875
7526 #QVF	50108.9980	58.61515	58.28147	279.80775	203.90038	0.00062	0.08197	6.9430	2.31276	-10.14919	0.00000	0.00875
7530 #QVD	50121.8980	58.62494	58.28712	157.17215	647.16312	0.00048	0.20617	6.9430	2.35296	-14.74184	-0.00001	0.00731
7535 #QVD	50142.7480	58.64576	58.29165	198.40704	675.29829	0.00057	0.25966	6.9430	-4.96452	13.85541	0.00002	-0.00278
7539 #QVF	50155.6480	58.65283	58.29679	424.52629	235.40704	0.00084	0.18607	6.9430	-5.65257	10.11770	0.00001	-0.00371
7542 #BV-	50163.2533	58.65559	58.30376	428.58104	136.14810	0.00085	0.17498	6.9430	3.32082	4.35088	-0.00001	0.00000
7546 #BV-	50197.3333	58.67272	58.60818	234.82906	9.61152	0.00064	0.11912	6.9427	2.36439	-0.63797	-0.00001	-0.00328
7548 #BV+	50216.6180	58.68888	58.72304	154.07334	88.65855	0.00052	0.05589	6.9425	1.82318	-3.46099	-0.00001	-0.00328
7552 #BV+	50250.6980	58.74538	58.74905	62.40090	494.57738	0.00032	0.00002	6.9425	0.86674	-8.44973	-0.00001	0.00000
7555 #4QL	50256.7577	58.76178	58.75086	57.69240	555.81127	0.00029	0.00003	6.9425	-0.22867	0.10796	0.00000	0.00000
7559 #5QL	50270.4504	58.79287	58.75549	89.25121	385.43832	0.00032	0.00002	6.9425	-1.14479	4.88454	0.00000	0.00000
7563 #6QL	50384.5640	58.89467	58.88481	388.37415	67.54819	0.00025	0.00002	6.9425	0.58480	-0.10023	0.00000	0.00000
7575 #QSD	50469.9375	58.99668	58.98664	52.77424	300.90935	0.27610	0.00004	6.9425	0.29472	0.28881	0.00879	0.00000
7587 #QSF	50555.6250	59.14441	59.13393	217.06692	38.22802	1.49134	0.00000	6.9430	-0.00280	-0.00285	0.00534	0.00000
7599 #QSD	50641.3125	59.29156	59.28064	53.05899	302.56325	1.17853	-0.00003	6.9486	-0.29474	-0.28883	0.00920	0.00000
7611 #QSF	50727.0000	59.39338	59.38289	388.17908	67.59129	3.05228	-0.00002	6.9569	-0.00005	0.00000	0.00025	0.00000

BETATRON FUNCTIONS OF RING -- Collision optics

POS		S(M)	NUX	NUY	BETAX(M)	BETAY(M)	XEQ(M)	YEQ(M)	ZEQ (M)	ALPHAX	ALPHAY	DXEQ	DYEQ
7612	#QF	50727.0000	59.39338	59.38289	388.17908	67.59129	3.05228	-0.00002	6.9706	-0.00005	0.00000	0.00025	0.00000
7632	#QD	50841.2500	59.51800	59.50748	67.56853	388.21799	1.46790	-0.00004	6.9706	-0.00002	0.00015	0.00025	0.00000
7652	#QF	50955.5000	59.64263	59.63207	388.17179	67.59187	3.05293	-0.00001	6.9914	-0.00001	0.00001	0.00025	0.00000
7672	#QD	51069.7500	59.76725	59.75666	67.56575	388.21282	1.46789	0.00002	7.0130	-0.00004	0.00016	0.00024	0.00000
7692	#QF	51184.0000	59.89188	59.88125	388.17893	67.59128	3.05225	0.00002	7.0338	-0.00005	0.00000	0.00025	0.00000
7712	#QD	51298.2500	60.01650	60.00584	67.56854	388.21796	1.46749	0.00004	7.0554	-0.00002	0.00015	0.00024	0.00000
7732	#QF	51412.5000	60.14112	60.13043	388.17194	67.59188	3.05159	0.00001	7.0762	-0.00001	0.00001	0.00025	0.00000
7752	#QD	51526.7500	60.26575	60.25502	67.56574	388.21286	1.46750	-0.00002	7.0978	-0.00003	0.00016	0.00025	0.00000
7772	#QF	51641.0000	60.39037	60.37961	388.17878	67.59127	3.05226	-0.00002	7.1186	-0.00005	0.00000	0.00025	0.00000
7792	#QD	51755.2500	60.51499	60.50420	67.56855	388.21792	1.46789	-0.00004	7.1402	-0.00002	0.00015	0.00025	0.00000
7812	#135	51869.5000	60.63962	60.62879	388.17209	67.59189	3.05293	-0.00001	7.1610	-0.00001	0.00001	0.00025	0.00000
12943	#QF	82717.0000	94.28802	94.26828	388.16859	67.59109	3.05186	-0.00001	7.1826	-0.00004	0.00001	0.00025	0.00000
12963	#QD	82831.2500	94.41265	94.39288	67.56809	388.21408	1.46773	-0.00005	12.9056	-0.00004	0.00014	0.00025	0.00000
12983	#QF	82945.5000	94.53727	94.51747	388.18226	67.59206	3.05280	-0.00002	12.9264	-0.00002	0.00000	0.00025	0.00000
13003	#QD	83059.7500	94.66189	94.64206	67.56620	388.21674	1.46797	-0.00001	12.9480	-0.00001	0.00016	0.00025	0.00000
13023	#QF	83174.0000	94.78652	94.76665	388.16848	67.59110	3.05267	0.00001	12.9688	-0.00004	0.00001	0.00025	0.00000
13043	#QD	83288.2500	94.91114	94.89124	67.56807	388.21403	1.46766	0.00005	12.9904	-0.00004	0.00014	0.00024	0.00000
13063	#QF	83402.5000	95.03576	95.01583	388.18236	67.59206	3.05173	0.00002	13.0112	-0.00002	0.00000	0.00025	0.00000
13083	#QD	83516.7500	95.16038	95.14042	67.56622	388.21680	1.46742	0.00001	13.0328	-0.00001	0.00016	0.00025	0.00000
13103	#QF	83631.0000	95.28501	95.26501	388.16838	67.59110	3.05185	-0.00001	13.0536	-0.00004	0.00001	0.00025	0.00000

H20

CIRCUMFERENCE = 83631.0000 M THETX = 6.28318531 RAD NUX = 95.28501 DNUX/(DP/P) = -218.55467
RADIUS = 13310.2870 M THETY = 0.00000000 RAD NUY = 95.26501 DNUY/(DP/P) = -218.55018
(DS/S)/(DP/P)= 0.0001563 TGAM=(79.97590, 0.00000)

MAXIMA --- BETX(7479) = 7719.59310 BETY(7460) = 7720.20123 XEQ(7812) = 3.05293 YEQ(615) = 0.26005
MINIMA --- BETX(7470) = 0.49994 BETY(7470) = 0.49992 XEQ(7479) = -0.00339 YEQ(635) = -0.26005

SEXTUPOLE STRENGTHS ----- KSF = 0.99920956E-02 KSD = -0.20017944E-01

END OF SYNCH RUN L90

Table I – Low–β tuning chart. Values are in Tesla/meter for 20 TeV.

β^*(m)	QL1	QL2	QL3	QL4	QL5	QL6
0.5	229.7786	−226.9213	216.8419	218.4298	−77.7179	−215.5864
1.0	229.5261	−227.6686	219.6034	221.7219	−117.1551	−190.0402
2.0	229.5261	−228.5559	222.8211	224.4503	−145.4697	−153.8465
3.0	229.5261	−229.0538	224.7974	225.7615	−158.0692	−126.1793
4.0	229.5261	−229.3488	226.1631	226.5463	−165.5456	−103.0793
6.0	225.2230	−228.7669	228.0423	228.7268	−175.1840	−62.8827
8.0	226.2587	−228.8995	229.0778	228.7268	−179.9363	−32.6188

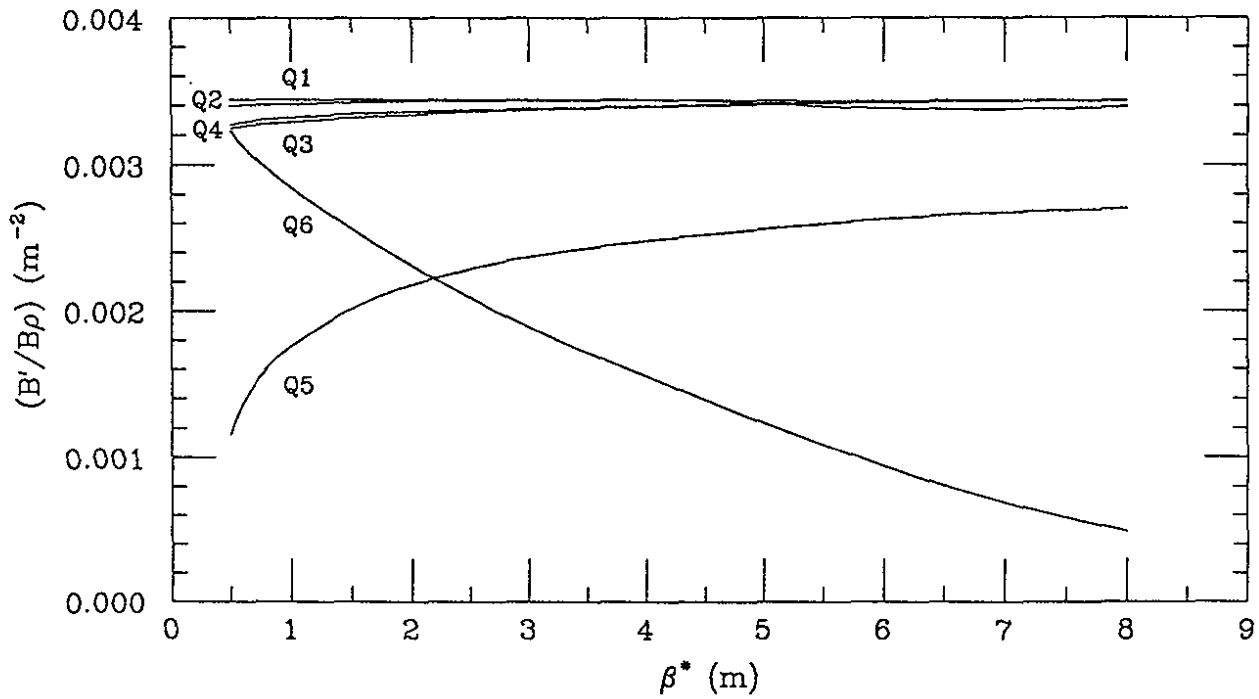


Figure 14. Low-β Module; Quadrupole Tuning Curves

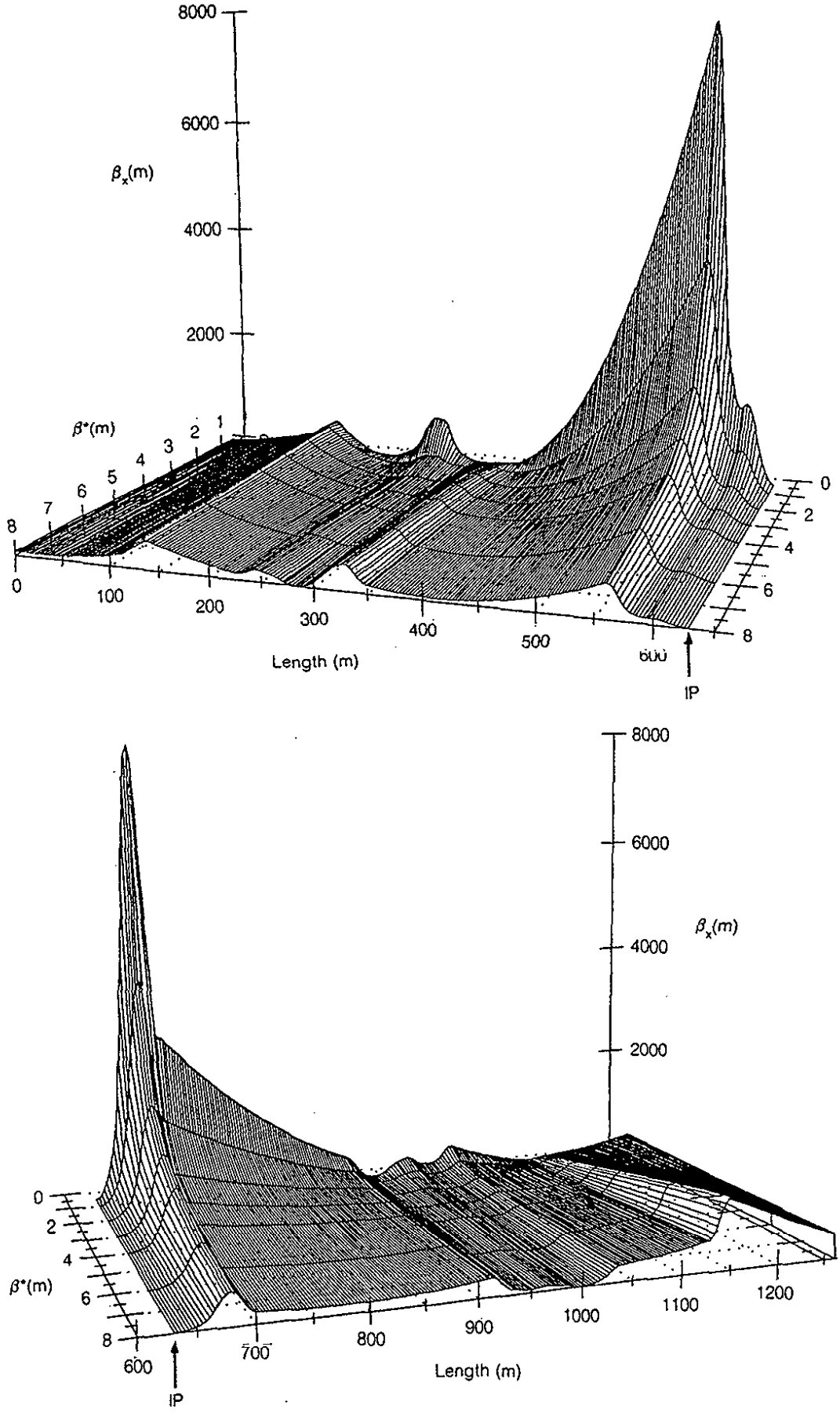


Figure 15. Low-β Module; Horizontal Beta Function during Tuning

Table II – Medium–β tuning chart. Values are in Tesla/meter for 20 TeV.

β^*(m)	QM1	QM2	QM3	QM4	QM5	QM6
10	226.6579	−223.1574	217.8398	211.0508	−91.0033	−185.9805
15	221.9826	−223.5479	222.5220	216.1266	−114.5596	−166.4224
20	221.9826	−224.6783	225.2875	218.4111	−128.0629	−149.9404
30	221.9826	−226.2613	228.6613	221.9000	−144.7089	−120.3168
40	221.9826	−227.2674	230.2023	224.7109	−155.0271	−93.2111
50	221.7807	−227.8300	230.6348	227.1582	−162.1928	−67.9825
60	222.6302	−228.3949	230.2613	229.1346	−167.3741	−44.8902

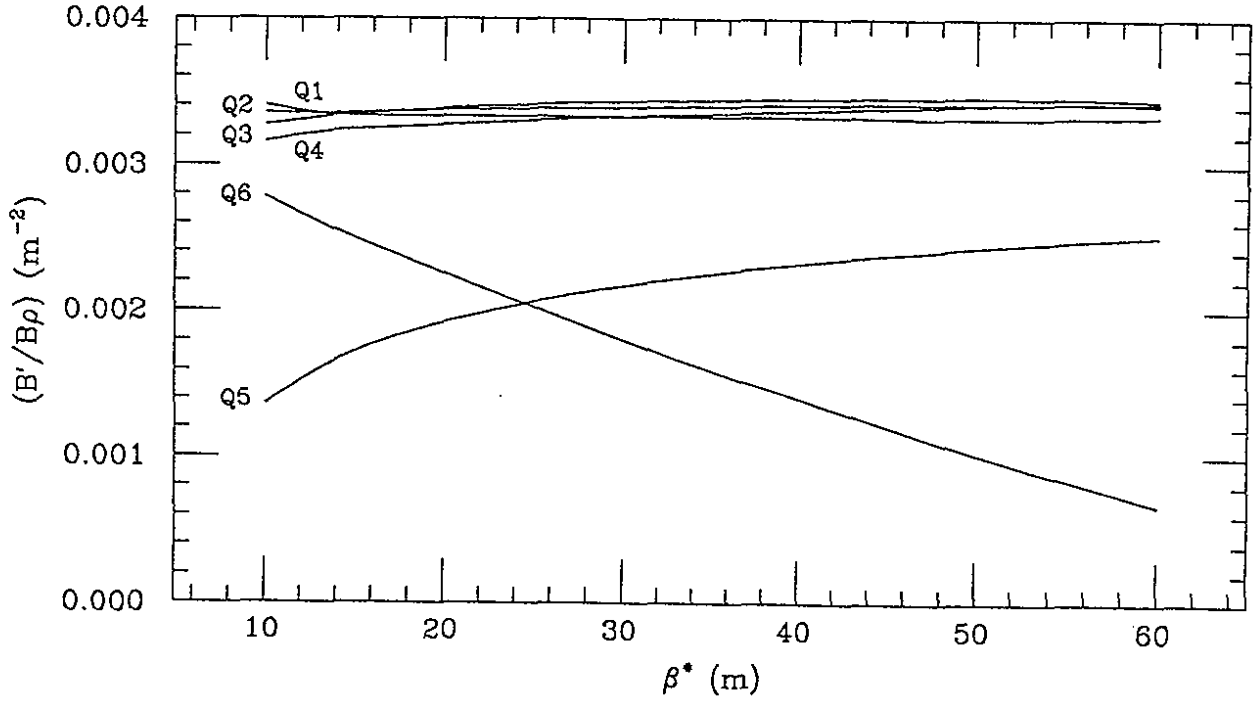


Figure 16. Medium-β Module; Quadrupole Tuning Curves

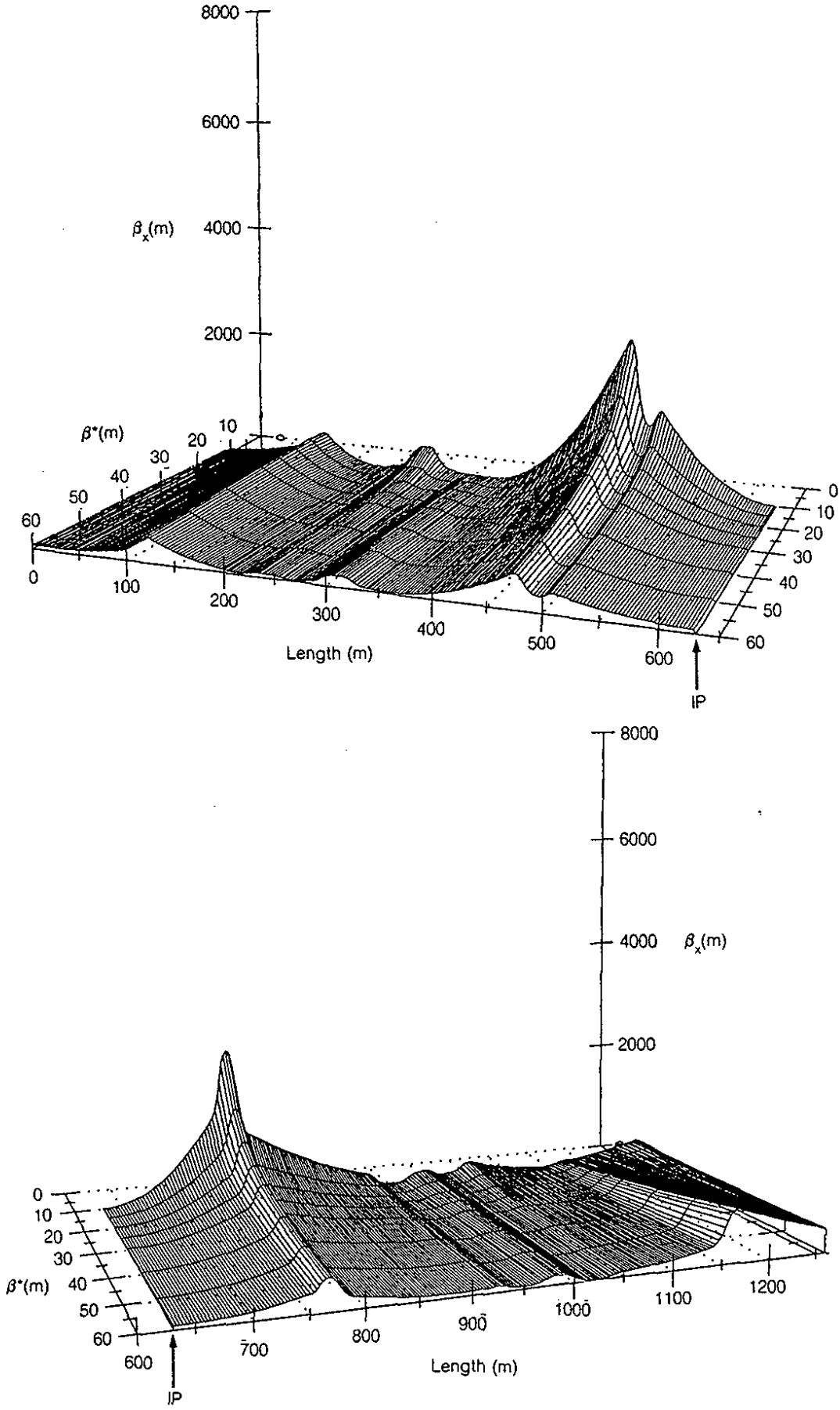


Figure 17. Medium-β Module; Horizontal Beta Function during Tuning

SSC 90 DEGREE CELL LATTICE "MAD" VERSION: 6.01/03

SURVEY OF BEAM LINE ".SSC ", RANGE = #S / #E"

POS. NO.	ELEMENT NAME	OCC. NO.	SEQUENCE SUM(L) M	SEQUENCE ARC M	I I	POSITIONS X M	POSITIONS Y M	POSITIONS Z M	I I	ANGLES THETA RAD	ANGLES PHI RAD	ANGLES PSI RAD
BEGIN	.SSC	1	0.000000	0.000000		4553.088671	0.000000	11444.339154		4.876355	0.000000	0.000000
1	END ARC	1	0.000000	0.000000		4553.088671	0.000000	11444.339154		4.876355	0.000000	0.000000
	BEGIN FAR CLUSTER											
89	#UC	1	1085.375000	1085.375000		3477.712239	0.000000	11590.831024		4.840283	0.000000	0.000000
280	#UC	2	3370.375000	3370.375000		1202.669257	0.000000	11788.865869		4.758300	0.000000	0.000000
561	#IPM	1	5655.375000	5655.375000		-1080.947747	-0.350000	11800.269285		4.676317	0.000000	0.000000
932	#IPM	2	7940.375000	7940.375000		-3357.801988	-0.350000	11624.287123		4.594333	0.000000	0.000000
	END FAR CLUSTER											
1126	BEGIN ARC	2	9140.000000	9140.000000		-4547.398703	0.000000	11470.455737		4.548423	0.000000	0.000000
6578	END ARC	3	41815.500000	41815.500000		-4553.093880	0.000000	-11444.337056		1.734763	0.000000	0.000000
	BEGIN NEAR CLUSTER											
6666	#UC	3	42900.875000	42900.875000		-3477.717447	0.000000	-11590.828922		1.698690	0.000000	0.000000
6857	#UC	4	45185.875000	45185.875000		-1202.674465	0.000000	-11788.863759		1.616707	0.000000	0.000000
7126	#IPL	1	47470.875000	47470.875000		1080.942592	-0.350000	-11800.267165		1.534724	0.000000	0.000000
7473	#IPL	2	49755.875000	49755.875000		3357.796937	-0.350000	-11624.284987		1.452741	0.000000	0.000000
	END NEAR CLUSTER											
7655	BEGIN ARC	4	50955.500000	50955.500000		4547.393703	0.000000	-11470.453590		1.406830	0.000000	0.000000
END	.SSC	1	83631.000000	83631.000000		4553.088798	0.000000	11444.339203		-1.406830	0.000000	0.000000

TOTAL LENGTH =	83631.000000	ARC LENGTH =	83631.000000		
ERROR(X) =	0.127217E-03	ERROR(Y) =	0.315847E-15	ERROR(Z) =	0.487384E-04
ERROR(THETA) =	-0.715771E-08	ERROR(PHI) =	-0.260384E-19	ERROR(PSI) =	0.752897E-20

POS. NO.	ELEMENT NAME	OCC. NO.	SEQUENCE SUM(L) M	SEQUENCE ARC M	I I	POSITIONS X M	POSITIONS Y M	POSITIONS Z M	I I	ANGLES THETA RAD	ANGLES PHI RAD	ANGLES PSI RAD
BEGIN	.SSC	1	0.000000	0.000000		4553.088671	0.000000	11444.339154		4.876355	0.000000	0.000000
1	END ARC	1	0.000000	0.000000		4553.088671	0.000000	11444.339154		4.876355	0.000000	0.000000
	BEGIN FAR CLUSTER											
2	#QF	1	0.000000	0.000000		4553.088671	0.000000	11444.339154		4.876355	0.000000	0.000000
22	#QSD	1	114.250000	114.250000		4440.285697	0.000000	11462.461738		4.866517	0.000000	0.000000
38	#QSF	1	199.937500	199.937500		4355.573012	0.000000	11475.348643		4.859959	0.000000	0.000000
50	#QSD	2	285.625000	285.625000		4270.778446	0.000000	11487.685294		4.853400	0.000000	0.000000
62	#QSF	2	371.312500	371.312500		4185.904494	0.000000	11499.463397		4.846841	0.000000	0.000000
	BEGIN UTILITY											
74	#QU4a	1	457.691200	457.691200		4100.269578	0.000000	11510.772849		4.840283	0.000000	0.000000
78	#QU3a	1	498.385050	498.385050		4059.908086	0.000000	11515.963162		4.840283	0.000000	0.000000
82	#QU2a	1	741.633650	741.633650		3818.646162	0.000000	11546.988399		4.840283	0.000000	0.000000
86	#QU1a	1	760.494350	760.494350		3799.939502	0.000000	11549.393995		4.840283	0.000000	0.000000
89	#UC	1	1085.375000	1085.375000		3477.712239	0.000000	11590.831024		4.840283	0.000000	0.000000
92	#QU1b	1	1410.255650	1410.255650		3155.484975	0.000000	11632.268053		4.840283	0.000000	0.000000
96	#QU2b	1	1429.116350	1429.116350		3136.778315	0.000000	11634.673648		4.840283	0.000000	0.000000
100	#QU3b	1	1672.364950	1672.364950		2895.516391	0.000000	11665.698886		4.840283	0.000000	0.000000
104	#QU4b	1	1713.058800	1713.058800		2855.154899	0.000000	11670.889199		4.840283	0.000000	0.000000
	END UTILITY											
116	#QSD	3	1799.437500	1799.437500		2769.444796	0.000000	11681.613974		4.833724	0.000000	0.000000
128	#QSF	3	1885.125000	1885.125000		2684.352327	0.000000	11691.692815		4.827165	0.000000	0.000000
140	#QSD	4	1970.812500	1970.812500		2599.195343	0.000000	11701.211197		4.820607	0.000000	0.000000
156	#QSF	4	2056.500000	2056.500000		2513.978359	0.000000	11710.176511		4.814048	0.000000	0.000000
157	#QF	2	2056.500000	2056.500000		2513.978359	0.000000	11710.176511		4.814048	0.000000	0.000000
177	#QD	1	2170.750000	2170.750000		2400.260356	0.000000	11721.183542		4.804210	0.000000	0.000000
197	#QF	3	2285.000000	2285.000000		2286.439570	0.000000	11731.071305		4.794372	0.000000	0.000000
217	#QSD	5	2399.250000	2399.250000		2172.527020	0.000000	11739.838841		4.784534	0.000000	0.000000
229	#QSF	5	2484.937500	2484.937500		2087.042089	0.000000	11745.724238		4.777976	0.000000	0.000000
241	#QSD	6	2570.625000	2570.625000		2001.520741	0.000000	11751.054377		4.771417	0.000000	0.000000
253	#QSF	6	2656.312500	2656.312500		1915.966143	0.000000	11755.821130		4.764858	0.000000	0.000000
	BEGIN UTILITY											
265	#QU4a	2	2742.691200	2742.691200		1829.691661	0.000000	11760.058618		4.758300	0.000000	0.000000
269	#QU3a	2	2783.385050	2783.385050		1789.040691	0.000000	11761.926243		4.758300	0.000000	0.000000
273	#QU2a	2	3026.633650	3026.633650		1546.048404	0.000000	11773.090022		4.758300	0.000000	0.000000
277	#QU1a	2	3045.494350	3045.494350		1527.207578	0.000000	11773.955625		4.758300	0.000000	0.000000
280	#UC	2	3370.375000	3370.375000		1202.669257	0.000000	11788.865869		4.758300	0.000000	0.000000
283	#QU1b	2	3695.255650	3695.255650		878.130937	0.000000	11803.776113		4.758300	0.000000	0.000000
287	#QU2b	2	3714.116350	3714.116350		859.290111	0.000000	11804.641716		4.758300	0.000000	0.000000
291	#QU3b	2	3957.364950	3957.364950		616.297824	0.000000	11815.805495		4.758300	0.000000	0.000000
295	#QU4b	2	3998.058800	3998.058800		575.646853	0.000000	11817.673120		4.758300	0.000000	0.000000
	END UTILITY											
307	#QSD	7	4084.437500	4084.437500		489.347268	0.000000	11821.364192		4.751741	0.000000	0.000000
319	#QSF	7	4170.125000	4170.125000		403.716003	0.000000	11824.462221		4.745182	0.000000	0.000000
331	#QSD	8	4255.812500	4255.812500		318.066192	0.000000	11826.996187		4.738624	0.000000	0.000000
343	#QSF	8	4341.500000	4341.500000		232.401730	0.000000	11828.973896		4.732065	0.000000	0.000000
344	#QF	4	4341.500000	4341.500000		232.401730	0.000000	11828.973896		4.732065	0.000000	0.000000
364	#QD	2	4455.750000	4455.750000		118.165133	0.000000	11830.688202		4.722227	0.000000	0.000000
384	#QF	5	4570.000000	4570.000000		3.917199	0.000000	11831.278586		4.712389	0.000000	0.000000
404	#QSD	9	4684.250000	4684.250000		-110.331014	0.000000	11830.744992		4.702551	0.000000	0.000000
420	#QSF	9	4769.937500	4769.937500		-196.011063	0.000000	11829.631190		4.695992	0.000000	0.000000
432	#QSD	10	4855.625000	4855.625000		-281.682075	0.000000	11827.961148		4.689434	0.000000	0.000000
444	#QSF	10	4941.312500	4941.312500		-367.340235	0.000000	11825.727093		4.682875	0.000000	0.000000

POS. NO.	ELEMENT NAME	OCC. NO.	SEQUENCE SUM(L) M	SEQUENCE ARC M	I I	POSITIONS X M	POSITIONS Y M	POSITIONS Z M	I I	ANGLES THETA RAD	ANGLES PHI RAD	ANGLES PSI RAD
	BEGIN MEDIUM BETA											
456	#QM6a	1	5027.000000	5027.000000		-452.981904	0.000000	11822.931384		4.676317	0.000000	0.000000
460	#QM5a	1	5125.928750	5125.928750		-551.846297	0.000000	11819.363555		4.676317	0.000000	0.000000
464	#QM4a	1	5141.695150	5141.695150		-567.602440	0.000000	11818.794946		4.676317	0.000000	0.000000
467	#BV+	1	5148.052050	5148.052050		-573.955205	0.000000	11818.565687		4.676317	0.000000	0.000000
471	#BV+	2	5182.132050	5182.132050		-608.012974	-0.055880	11817.336606		4.676317	-0.003279	0.000000
473	#BV-	1	5201.416700	5201.416700		-627.284975	-0.119120	11816.641116		4.676317	-0.003279	0.000000
477	#BV-	2	5235.496700	5235.496700		-661.342744	-0.175000	11815.412036		4.676317	0.000000	0.000000
480	#QVD	1	5243.102050	5243.102050		-668.943146	-0.175000	11815.137752		4.676317	0.000000	0.000000
484	#QVF	1	5256.002050	5256.002050		-681.834754	-0.175000	11814.672518		4.676317	0.000000	0.000000
489	#QVF	2	5276.852050	5276.852050		-702.671190	-0.175000	11813.920571		4.676317	0.000000	0.000000
493	#QVD	2	5289.752050	5289.752050		-715.562798	-0.175000	11813.455337		4.676317	0.000000	0.000000
498	#QVD	3	5310.602050	5310.602050		-736.399235	-0.175000	11812.703389		4.676317	0.000000	0.000000
502	#QVF	3	5323.502050	5323.502050		-749.290843	-0.175000	11812.238155		4.676317	0.000000	0.000000
507	#QVF	4	5344.352050	5344.352050		-770.127279	-0.175000	11811.486208		4.676317	0.000000	0.000000
511	#QVD	4	5357.252050	5357.252050		-783.018887	-0.175000	11811.020974		4.676317	0.000000	0.000000
516	#BV+	3	5373.538440	5373.538440		-799.294682	-0.175952	11810.433612		4.676317	-0.000381	0.000000
519	#BV+	4	5379.538440	5379.538440		-805.290778	-0.179189	11810.217224		4.676317	-0.000762	0.000000
522	#BV+	5	5385.538440	5385.538440		-811.286872	-0.184712	11810.000836		4.676317	-0.001143	0.000000
525	#BV+	6	5391.538440	5391.538440		-817.282963	-0.192519	11809.784449		4.676317	-0.001523	0.000000
528	#BV+	7	5397.538440	5397.538440		-823.279052	-0.202612	11809.568061		4.676317	-0.001904	0.000000
531	#BV-	3	5465.437200	5465.437200		-891.133519	-0.330957	11807.119322		4.676317	-0.001523	0.000000
534	#BV-	4	5471.437200	5471.437200		-897.129611	-0.339145	11806.902934		4.676317	-0.001143	0.000000
537	#BV-	5	5477.437200	5477.437200		-903.125704	-0.345049	11806.686546		4.676317	-0.000762	0.000000
540	#BV-	6	5483.437200	5483.437200		-909.121800	-0.348667	11806.470159		4.676317	-0.000381	0.000000
543	#BV-	7	5489.437200	5489.437200		-915.117897	-0.350000	11806.253771		4.676317	0.000000	0.000000
546	#QM3a	1	5502.085500	5502.085500		-927.757968	-0.350000	11805.797615		4.676317	0.000000	0.000000
550	#QM2a	1	5512.906000	5512.906000		-938.571429	-0.350000	11805.407377		4.676317	0.000000	0.000000
554	#QM2a	2	5522.650400	5522.650400		-948.309490	-0.350000	11805.055949		4.676317	0.000000	0.000000
558	#QM1a	1	5531.598800	5531.598800		-957.252069	-0.350000	11804.733228		4.676317	0.000000	0.000000
561	#IPM	1	5655.375000	5655.375000		-1080.947747	-0.350000	11800.269285		4.676317	0.000000	0.000000
564	#QM1b	1	5779.151200	5779.151200		-1204.643426	-0.350000	11795.805343		4.676317	0.000000	0.000000
568	#QM2b	1	5788.099600	5788.099600		-1213.586005	-0.350000	11795.482622		4.676317	0.000000	0.000000
572	#QM2b	2	5797.844000	5797.844000		-1223.324065	-0.350000	11795.131194		4.676317	0.000000	0.000000
576	#QM3b	1	5808.664500	5808.664500		-1234.137526	-0.350000	11794.740956		4.676317	0.000000	0.000000
579	#BV+	8	5821.312800	5821.312800		-1246.777598	-0.350000	11794.284800		4.676317	0.000000	0.000000
582	#BV+	9	5827.312800	5827.312800		-1252.773695	-0.351333	11794.068412		4.676317	-0.000381	0.000000
585	#BV+	10	5833.312800	5833.312800		-1258.769790	-0.354951	11793.852024		4.676317	-0.000762	0.000000
588	#BV+	11	5839.312800	5839.312800		-1264.765884	-0.360854	11793.635637		4.676317	-0.001143	0.000000
591	#BV+	12	5845.312800	5845.312800		-1270.761975	-0.369042	11793.419249		4.676317	-0.001523	0.000000
594	#BV-	8	5913.211560	5913.211560		-1338.616443	-0.497388	11790.970510		4.676317	-0.001904	0.000000
597	#BV-	9	5919.211560	5919.211560		-1344.612531	-0.507480	11790.754122		4.676317	-0.001523	0.000000
600	#BV-	10	5925.211560	5925.211560		-1350.608623	-0.515288	11790.537735		4.676317	-0.001143	0.000000
603	#BV-	11	5931.211560	5931.211560		-1356.604717	-0.520810	11790.321347		4.676317	-0.000762	0.000000
606	#BV-	12	5937.211560	5937.211560		-1362.600813	-0.524047	11790.104959		4.676317	-0.000381	0.000000
611	#QVF	5	5953.497950	5953.497950		-1378.876608	-0.525000	11789.517597		4.676317	0.000000	0.000000
615	#QVD	5	5966.397950	5966.397950		-1391.768216	-0.525000	11789.052363		4.676317	0.000000	0.000000
620	#QVD	6	5987.247950	5987.247950		-1412.604652	-0.525000	11788.300415		4.676317	0.000000	0.000000
624	#QVF	6	6000.147950	6000.147950		-1425.496260	-0.525000	11787.835182		4.676317	0.000000	0.000000
629	#QVF	7	6020.997950	6020.997950		-1446.332696	-0.525000	11787.083234		4.676317	0.000000	0.000000
633	#QVD	7	6033.897950	6033.897950		-1459.224304	-0.525000	11786.618000		4.676317	0.000000	0.000000

POS. NO.	ELEMENT NAME	OCC. NO.	SEQUENCE SUM(L) M	SEQUENCE ARC M	I I	POSITIONS X M	Y M	Z M	I I	ANGLES THETA RAD	PHI RAD	PSI RAD
638	#QVD	8	6054.747950	6054.747950		-1480.060741	-0.525000	11785.866053		4.676317	0.000000	0.000000
642	#QVF	8	6067.647950	6067.647950		-1492.952349	-0.525000	11785.400819		4.676317	0.000000	0.000000
645	#BV+	13	6075.253300	6075.253300		-1500.552751	-0.525000	11785.126535		4.676317	0.000000	0.000000
649	#BV+	14	6109.333300	6109.333300		-1534.610520	-0.580879	11783.897455		4.676317	-0.003279	0.000000
651	#BV-	13	6128.617950	6128.617950		-1553.882521	-0.644120	11783.201965		4.676317	-0.003279	0.000000
655	#BV-	14	6162.697950	6162.697950		-1587.940290	-0.699999	11781.972884		4.676317	0.000000	0.000000
658	#QM4b	1	6169.054850	6169.054850		-1594.293054	-0.699999	11781.743625		4.676317	0.000000	0.000000
662	#QM5b	1	6184.821250	6184.821250		-1610.049198	-0.699999	11781.175015		4.676317	0.000000	0.000000
666	#QM6b	1	6283.750000	6283.750000		-1708.913591	-0.699999	11777.607187		4.676317	0.000000	0.000000
	END MEDIUM BETA											
678	#QSD	11	6369.437500	6369.437500		-1794.533999	-0.699999	11774.222371		4.669758	0.000000	0.000000
690	#QSF	11	6455.125000	6455.125000		-1880.130371	-0.699999	11770.276174		4.663199	0.000000	0.000000
702	#QSD	12	6540.812500	6540.812500		-1965.698907	-0.699999	11765.766505		4.656641	0.000000	0.000000
718	#QSF	12	6626.500000	6626.500000		-2051.236360	-0.699999	11760.701391		4.650082	0.000000	0.000000
719	#QF	6	6626.500000	6626.500000		-2051.236360	-0.699999	11760.701391		4.650082	0.000000	0.000000
739	#QD	3	6740.750000	6740.750000		-2165.225841	-0.699999	11752.998319		4.640244	0.000000	0.000000
759	#QF	7	6855.000000	6855.000000		-2279.134024	-0.699999	11744.174212		4.630406	0.000000	0.000000
779	#QSD	13	6969.250000	6969.250000		-2392.949884	-0.699999	11734.229925		4.620568	0.000000	0.000000
791	#QSF	13	7054.937500	7054.937500		-2478.248948	-0.699999	11726.082466		4.614009	0.000000	0.000000
803	#QSD	14	7140.625000	7140.625000		-2563.493303	-0.699999	11717.381252		4.607451	0.000000	0.000000
815	#QSF	14	7226.312500	7226.312500		-2648.678500	-0.699999	11708.118780		4.600892	0.000000	0.000000
	BEGIN MEDIUM BETA											
827	#QM6a	2	7312.000000	7312.000000		-2733.801143	-0.699999	11698.298045		4.594333	0.000000	0.000000
831	#QM5a	2	7410.928750	7410.928750		-2832.041303	-0.699999	11686.646066		4.594333	0.000000	0.000000
835	#QM4a	2	7426.695150	7426.695150		-2847.697962	-0.699999	11684.789076		4.594333	0.000000	0.000000
838	#BV-	15	7433.052050	7433.052050		-2854.010615	-0.699999	11684.040350		4.594333	0.000000	0.000000
842	#BV-	16	7467.132050	7467.132050		-2887.853342	-0.644120	11680.026363		4.594333	0.003279	0.000000
844	#BV+	15	7486.416700	7486.416700		-2907.003658	-0.580879	11677.755000		4.594333	0.003279	0.000000
848	#BV+	16	7520.496700	7520.496700		-2940.846385	-0.525000	11673.741012		4.594333	0.000000	0.000000
851	#QVD	9	7528.102050	7528.102050		-2948.398799	-0.525000	11672.845243		4.594333	0.000000	0.000000
855	#QVF	9	7541.002050	7541.002050		-2961.209009	-0.525000	11671.325861		4.594333	0.000000	0.000000
860	#QVF	10	7561.852050	7561.852050		-2981.913883	-0.525000	11668.870116		4.594333	0.000000	0.000000
864	#QVD	10	7574.752050	7574.752050		-2994.724093	-0.525000	11667.350734		4.594333	0.000000	0.000000
869	#QVD	11	7595.602050	7595.602050		-3015.428967	-0.525000	11664.894990		4.594333	0.000000	0.000000
873	#QVF	11	7608.502050	7608.502050		-3028.239177	-0.525000	11663.375608		4.594333	0.000000	0.000000
878	#QVF	12	7629.352050	7629.352050		-3048.944051	-0.525000	11660.919863		4.594333	0.000000	0.000000
882	#QVD	12	7642.252050	7642.252050		-3061.754261	-0.525000	11659.400481		4.594333	0.000000	0.000000
887	#BV-	17	7658.538440	7658.538440		-3077.927290	-0.524047	11657.482246		4.594333	0.000381	0.000000
890	#BV-	18	7664.538440	7664.538440		-3083.885527	-0.520810	11656.775557		4.594333	0.000762	0.000000
893	#BV-	19	7670.538440	7670.538440		-3089.843761	-0.515288	11656.068868		4.594333	0.001143	0.000000
896	#BV-	20	7676.538440	7676.538440		-3095.801993	-0.507480	11655.362179		4.594333	0.001523	0.000000
899	#BV-	21	7682.538440	7682.538440		-3101.760222	-0.497388	11654.655491		4.594333	0.001904	0.000000
902	#BV+	17	7750.437200	7750.437200		-3169.186254	-0.369042	11646.658286		4.594333	0.001523	0.000000
905	#BV+	18	7756.437200	7756.437200		-3175.144486	-0.360854	11645.951597		4.594333	0.001143	0.000000
908	#BV+	19	7762.437200	7762.437200		-3181.102720	-0.354951	11645.244909		4.594333	0.000762	0.000000
911	#BV+	20	7768.437200	7768.437200		-3187.060956	-0.351333	11644.538220		4.594333	0.000381	0.000000
914	#BV+	21	7774.437200	7774.437200		-3193.019193	-0.350000	11643.831530		4.594333	0.000000	0.000000
917	#QM3a	2	7787.085500	7787.085500		-3205.579455	-0.350000	11642.341794		4.594333	0.000000	0.000000
921	#QM2a	3	7797.906000	7797.906000		-3216.324639	-0.350000	11641.067339		4.594333	0.000000	0.000000
925	#QM2a	4	7807.650400	7807.650400		-3226.001214	-0.350000	11639.919629		4.594333	0.000000	0.000000
929	#QM1a	2	7816.598800	7816.598800		-3234.887329	-0.350000	11638.865673		4.594333	0.000000	0.000000

POS. NO.	ELEMENT NAME	OCC. NO.	SEQUENCE SUM(L) M	SEQUENCE ARC M	I I I	POSITIONS X M	POSITIONS Y M	POSITIONS Z M	I I	ANGLES THETA RAD	ANGLES PHI RAD	ANGLES PSI RAD
932	#IPM	2	7940.375000	7940.375000		-3357.801988	-0.350000	11624.287123		4.594333	0.000000	0.000000
935	#QM1b	2	8064.151200	8064.151200		-3480.716648	-0.350000	11609.708573		4.594333	0.000000	0.000000
939	#QM2b	3	8073.099600	8073.099600		-3489.602763	-0.350000	11608.654617		4.594333	0.000000	0.000000
943	#QM2b	4	8082.844000	8082.844000		-3499.279338	-0.350000	11607.506907		4.594333	0.000000	0.000000
947	#QM3b	2	8093.664500	8093.664500		-3510.024522	-0.350000	11606.232452		4.594333	0.000000	0.000000
950	#BV-	22	8106.312800	8106.312800		-3522.584784	-0.350000	11604.742716		4.594333	0.000000	0.000000
953	#BV-	23	8112.312800	8112.312800		-3528.543021	-0.348667	11604.036027		4.594333	0.000381	0.000000
956	#BV-	24	8118.312800	8118.312800		-3534.501257	-0.345049	11603.329338		4.594333	0.000762	0.000000
959	#BV-	25	8124.312800	8124.312800		-3540.459491	-0.339145	11602.622649		4.594333	0.001143	0.000000
962	#BV-	26	8130.312800	8130.312800		-3546.417723	-0.330957	11601.915960		4.594333	0.001523	0.000000
965	#BV+	22	8198.211560	8198.211560		-3613.843755	-0.202612	11593.918755		4.594333	0.001904	0.000000
968	#BV+	23	8204.211560	8204.211560		-3619.801984	-0.192519	11593.212067		4.594333	0.001523	0.000000
971	#BV+	24	8210.211560	8210.211560		-3625.760216	-0.184712	11592.505379		4.594333	0.001143	0.000000
974	#BV+	25	8216.211560	8216.211560		-3631.718450	-0.179189	11591.798690		4.594333	0.000762	0.000000
977	#BV+	26	8222.211560	8222.211560		-3637.676687	-0.175952	11591.092001		4.594333	0.000381	0.000000
982	#QVF	13	8238.497950	8238.497950		-3653.849716	-0.175000	11589.173765		4.594333	0.000000	0.000000
986	#QVD	13	8251.397950	8251.397950		-3666.659926	-0.175000	11587.654383		4.594333	0.000000	0.000000
991	#QVD	14	8272.247950	8272.247950		-3687.364800	-0.175000	11585.198638		4.594333	0.000000	0.000000
995	#QVF	14	8285.147950	8285.147950		-3700.175010	-0.175000	11583.679257		4.594333	0.000000	0.000000
1000	#QVF	15	8305.997950	8305.997950		-3720.879884	-0.175000	11581.223512		4.594333	0.000000	0.000000
1004	#QVD	15	8318.897950	8318.897950		-3733.690094	-0.175000	11579.704130		4.594333	0.000000	0.000000
1009	#QVD	16	8339.747950	8339.747950		-3754.394968	-0.175000	11577.248385		4.594333	0.000000	0.000000
1013	#QVF	16	8352.647950	8352.647950		-3767.205178	-0.175000	11575.729004		4.594333	0.000000	0.000000
1016	#BV-	27	8360.253300	8360.253300		-3774.757591	-0.175000	11574.833234		4.594333	0.000000	0.000000
1020	#BV-	28	8394.333300	8394.333300		-3808.600318	-0.119120	11570.819247		4.594333	0.003279	0.000000
1022	#BV+	27	8413.617950	8413.617950		-3827.750635	-0.055880	11568.547883		4.594333	0.003279	0.000000
1026	#BV+	28	8447.697950	8447.697950		-3861.593362	0.000000	11564.533896		4.594333	0.000000	0.000000
1029	#QM4b	2	8454.054850	8454.054850		-3867.906015	0.000000	11563.785171		4.594333	0.000000	0.000000
1033	#QM5b	2	8469.821250	8469.821250		-3883.562674	0.000000	11561.928180		4.594333	0.000000	0.000000
1037	#QM6b	2	8568.750000	8568.750000		-3981.802833	0.000000	11550.276201		4.594333	0.000000	0.000000
	END MEDIUM BETA											
1049	#QSD	15	8654.437500	8654.437500		-4066.861051	0.000000	11539.912280		4.587775	0.000000	0.000000
1061	#QSF	15	8740.125000	8740.125000		-4151.849496	0.000000	11528.990952		4.581216	0.000000	0.000000
1073	#QSD	16	8825.812500	8825.812500		-4236.764167	0.000000	11517.510100		4.574657	0.000000	0.000000
1085	#QSF	16	8911.500000	8911.500000		-4321.602491	0.000000	11505.478059		4.568099	0.000000	0.000000
1086	#QF	8	8911.500000	8911.500000		-4321.602491	0.000000	11505.478059		4.568099	0.000000	0.000000
1106	#QD	4	9025.750000	9025.750000		-4434.586735	0.000000	11488.522246		4.558261	0.000000	0.000000
	END FAR CLUSTER											
1126	BEGIN ARC	2	9140.000000	9140.000000		-4547.398703	0.000000	11470.455737		4.548423	0.000000	0.000000
1127	#QF	9	9140.000000	9140.000000		-4547.398703	0.000000	11470.455737		4.548423	0.000000	0.000000
1147	#QD	5	9254.250000	9254.250000		-4660.027478	0.000000	11451.280278		4.538585	0.000000	0.000000
1167	#QF	10	9368.500000	9368.500000		-4772.462157	0.000000	11430.997726		4.528747	0.000000	0.000000
1187	#QD	6	9482.750000	9482.750000		-4884.691859	0.000000	11409.610045		4.518909	0.000000	0.000000
1207	#QF	11	9597.000000	9597.000000		-4996.705722	0.000000	11387.119303		4.509071	0.000000	0.000000
1227	#QD	7	9711.250000	9711.250000		-5108.492904	0.000000	11363.527679		4.499233	0.000000	0.000000
1247	#QF	12	9825.500000	9825.500000		-5220.042587	0.000000	11338.837454		4.489395	0.000000	0.000000
1267	#QD	8	9939.750000	9939.750000		-5331.343974	0.000000	11313.051019		4.479557	0.000000	0.000000
6418	#QF	13	40901.500000	40901.500000		-5447.989756	0.000000	-11259.607337		1.813466	0.000000	0.000000
6438	#QD	9	41015.750000	41015.750000		-5336.960813	0.000000	-11286.542679		1.803628	0.000000	0.000000
6458	#QF	14	41130.000000	41130.000000		-5225.672257	0.000000	-11312.384436		1.793790	0.000000	0.000000
6478	#QD	10	41244.250000	41244.250000		-5114.134861	0.000000	-11337.130106		1.783953	0.000000	0.000000
6498	#QF	15	41358.500000	41358.500000		-5002.359419	0.000000	-11360.777294		1.774115	0.000000	0.000000

POS. NO.	ELEMENT NAME	OCC. NO.	SUM(L) M	ARC M	I I	X M	Y M	Z M	I I	THETA RAD	PHI RAD	PSI RAD
6518	#QD	11	41472.750000	41472.750000		-4890.356749	0.000000	-11383.323712		1.764277	0.000000	0.000000
6538	#QF	16	41587.000000	41587.000000		-4778.137692	0.000000	-11404.767177		1.754439	0.000000	0.000000
6558	#QD	12	41701.250000	41701.250000		-4665.713109	0.000000	-11425.105615		1.744601	0.000000	0.000000
6578	END ARC	3	41815.500000	41815.500000		-4553.093880	0.000000	-11444.337056		1.734763	0.000000	0.000000
	BEGIN NEAR CLUSTER											
6579	#QF	17	41815.500000	41815.500000		-4553.093880	0.000000	-11444.337056		1.734763	0.000000	0.000000
6599	#QSD	17	41929.750000	41929.750000		-4440.290906	0.000000	-11462.459639		1.724925	0.000000	0.000000
6615	#QSF	17	42015.437500	42015.437500		-4355.578221	0.000000	-11475.346544		1.718366	0.000000	0.000000
6627	#QSD	18	42101.125000	42101.125000		-4270.783655	0.000000	-11487.683195		1.711807	0.000000	0.000000
6639	#QSF	18	42186.812500	42186.812500		-4185.909703	0.000000	-11499.461298		1.705249	0.000000	0.000000
	BEGIN UTILITY											
6651	#QU4a	3	42273.191200	42273.191200		-4100.274787	0.000000	-11510.770749		1.698690	0.000000	0.000000
6655	#QU3a	3	42313.885050	42313.885050		-4059.913295	0.000000	-11515.961062		1.698690	0.000000	0.000000
6659	#QU2a	3	42557.133650	42557.133650		-3818.651371	0.000000	-11546.986299		1.698690	0.000000	0.000000
6663	#QU1a	3	42575.994350	42575.994350		-3799.944711	0.000000	-11549.391894		1.698690	0.000000	0.000000
6666	#UC	3	42900.875000	42900.875000		-3477.717447	0.000000	-11590.828922		1.698690	0.000000	0.000000
6669	#QU1b	3	43225.755650	43225.755650		-3155.490184	0.000000	-11632.265950		1.698690	0.000000	0.000000
6673	#QU2b	3	43244.616350	43244.616350		-3136.783524	0.000000	-11634.671545		1.698690	0.000000	0.000000
6677	#QU3b	3	43487.864950	43487.864950		-2895.521600	0.000000	-11665.696782		1.698690	0.000000	0.000000
6681	#QU4b	3	43528.558800	43528.558800		-2855.160107	0.000000	-11670.887095		1.698690	0.000000	0.000000
	END UTILITY											
6693	#QSD	19	43614.937500	43614.937500		-2769.450004	0.000000	-11681.611869		1.692131	0.000000	0.000000
6705	#QSF	19	43700.625000	43700.625000		-2684.357535	0.000000	-11691.690710		1.685573	0.000000	0.000000
6717	#QSD	20	43786.312500	43786.312500		-2599.200551	0.000000	-11701.209092		1.679014	0.000000	0.000000
6733	#QSF	20	43872.000000	43872.000000		-2513.983567	0.000000	-11710.174405		1.672455	0.000000	0.000000
6734	#QF	18	43872.000000	43872.000000		-2513.983567	0.000000	-11710.174405		1.672455	0.000000	0.000000
6754	#QD	13	43986.250000	43986.250000		-2400.265564	0.000000	-11721.181437		1.662618	0.000000	0.000000
6774	#QF	19	44100.500000	44100.500000		-2286.444779	0.000000	-11731.069199		1.652780	0.000000	0.000000
6794	#QSD	21	44214.750000	44214.750000		-2172.532228	0.000000	-11739.836735		1.642942	0.000000	0.000000
6806	#QSF	21	44300.437500	44300.437500		-2087.047297	0.000000	-11745.722131		1.636383	0.000000	0.000000
6818	#QSD	22	44386.125000	44386.125000		-2001.525950	0.000000	-11751.052270		1.629824	0.000000	0.000000
6830	#QSF	22	44471.812500	44471.812500		-1915.971351	0.000000	-11755.819022		1.623266	0.000000	0.000000
	BEGIN UTILITY											
6842	#QU4a	4	44558.191200	44558.191200		-1829.696869	0.000000	-11760.056510		1.616707	0.000000	0.000000
6846	#QU3a	4	44598.885050	44598.885050		-1789.045899	0.000000	-11761.924135		1.616707	0.000000	0.000000
6850	#QU2a	4	44842.133650	44842.133650		-1546.053612	0.000000	-11773.087914		1.616707	0.000000	0.000000
6854	#QU1a	4	44860.994350	44860.994350		-1527.212786	0.000000	-11773.953516		1.616707	0.000000	0.000000
6857	#UC	4	45185.875000	45185.875000		-1202.674465	0.000000	-11788.863759		1.616707	0.000000	0.000000
6860	#QU1b	4	45510.755650	45510.755650		-878.136145	0.000000	-11803.774002		1.616707	0.000000	0.000000
6864	#QU2b	4	45529.616350	45529.616350		-859.295319	0.000000	-11804.639604		1.616707	0.000000	0.000000
6868	#QU3b	4	45772.864950	45772.864950		-616.303032	0.000000	-11815.803383		1.616707	0.000000	0.000000
6872	#QU4b	4	45813.558800	45813.558800		-575.652061	0.000000	-11817.671008		1.616707	0.000000	0.000000
	END UTILITY											
6884	#QSD	23	45899.937500	45899.937500		-489.352476	0.000000	-11821.362079		1.610148	0.000000	0.000000
6896	#QSF	23	45985.625000	45985.625000		-403.721211	0.000000	-11824.460108		1.603590	0.000000	0.000000
6908	#QSD	24	46071.312500	46071.312500		-318.071399	0.000000	-11826.994074		1.597031	0.000000	0.000000
6920	#QSF	24	46157.000000	46157.000000		-232.406938	0.000000	-11828.971783		1.590472	0.000000	0.000000
6921	#QF	20	46157.000000	46157.000000		-232.406938	0.000000	-11828.971783		1.590472	0.000000	0.000000
6941	#QD	14	46271.250000	46271.250000		-118.170341	0.000000	-11830.686088		1.580634	0.000000	0.000000
6961	#QF	21	46385.500000	46385.500000		-3.922407	0.000000	-11831.276472		1.570796	0.000000	0.000000
6981	#QSD	25	46499.750000	46499.750000		110.325806	0.000000	-11830.742877		1.560958	0.000000	0.000000
6997	#QSF	25	46585.437500	46585.437500		196.005855	0.000000	-11829.629075		1.554400	0.000000	0.000000
7009	#QSD	26	46671.125000	46671.125000		281.676868	0.000000	-11827.959033		1.547841	0.000000	0.000000

POS. NO.	ELEMENT NAME	OCC. NO.	SEQUENCE SUM(L) M	SEQUENCE ARC M	I I	POSITIONS X M	Y M	Z M	I I	ANGLES THETA RAD	PHI RAD	PSI RAD
7021	#QSF	26	46756.812500	46756.812500		367.335028	0.000000	-11825.724977		1.541283	0.000000	0.000000
	BEGIN LOW BETA											
7033	#QL6a	1	46842.186025	46842.186025		452.662925	0.000000	-11822.940592		1.534724	0.000000	0.000000
7037	#QL5a	1	46956.299650	46956.299650		566.702315	0.000000	-11818.825126		1.534724	0.000000	0.000000
7041	#QL4a	1	46969.992350	46969.992350		580.386107	0.000000	-11818.331303		1.534724	0.000000	0.000000
7044	#BV+	29	46976.052050	46976.052050		586.441865	0.000000	-11818.112762		1.534724	0.000000	0.000000
7048	#BV+	30	47010.132050	47010.132050		620.499634	-0.055880	-11816.883682		1.534724	-0.003279	0.000000
7050	#BV-	29	47029.416700	47029.416700		639.771635	-0.119120	-11816.188192		1.534724	-0.003279	0.000000
7054	#BV-	30	47063.496700	47063.496700		673.829404	-0.175000	-11814.959111		1.534724	0.000000	0.000000
7057	#QVD	17	47071.102050	47071.102050		681.429806	-0.175000	-11814.684827		1.534724	0.000000	0.000000
7061	#QVF	17	47084.002050	47084.002050		694.321414	-0.175000	-11814.219593		1.534724	0.000000	0.000000
7066	#QVF	18	47104.852050	47104.852050		715.157851	-0.175000	-11813.467646		1.534724	0.000000	0.000000
7070	#QVD	18	47117.752050	47117.752050		728.049459	-0.175000	-11813.002412		1.534724	0.000000	0.000000
7075	#QVD	19	47138.602050	47138.602050		748.885895	-0.175000	-11812.250464		1.534724	0.000000	0.000000
7079	#QVF	19	47151.502050	47151.502050		761.777503	-0.175000	-11811.785230		1.534724	0.000000	0.000000
7084	#QVF	20	47172.352050	47172.352050		782.613939	-0.175000	-11811.033283		1.534724	0.000000	0.000000
7088	#QVD	20	47185.252050	47185.252050		795.505547	-0.175000	-11810.568049		1.534724	0.000000	0.000000
7093	#BV+	31	47226.160200	47226.160200		836.387085	-0.175952	-11809.092712		1.534724	-0.000381	0.000000
7096	#BV+	32	47232.160200	47232.160200		842.383180	-0.179189	-11808.876324		1.534724	-0.000762	0.000000
7099	#BV+	33	47238.160200	47238.160200		848.379275	-0.184712	-11808.659936		1.534724	-0.001143	0.000000
7102	#BV-	31	47379.324800	47379.324800		989.451950	-0.345049	-11803.568890		1.534724	-0.000762	0.000000
7105	#BV-	32	47385.324800	47385.324800		995.448046	-0.348667	-11803.352502		1.534724	-0.000381	0.000000
7108	#BV-	33	47391.324800	47391.324800		1001.444142	-0.350000	-11803.136114		1.534724	0.000000	0.000000
7111	#QL3a	1	47404.973600	47404.973600		1015.084063	-0.350000	-11802.643875		1.534724	0.000000	0.000000
7115	#QL2a	1	47418.070700	47418.070700		1028.172643	-0.350000	-11802.171533		1.534724	0.000000	0.000000
7119	#QL2a	2	47430.167300	47430.167300		1040.261374	-0.350000	-11801.735274		1.534724	0.000000	0.000000
7123	#QL1a	1	47443.745300	47443.745300		1053.830541	-0.350000	-11801.245588		1.534724	0.000000	0.000000
7126	#IPL	1	47470.875000	47470.875000		1080.942592	-0.350000	-11800.267165		1.534724	0.000000	0.000000
7129	#QL1b	1	47498.004700	47498.004700		1108.054643	-0.350000	-11799.288743		1.534724	0.000000	0.000000
7133	#QL2b	1	47511.582700	47511.582700		1121.623810	-0.350000	-11798.799057		1.534724	0.000000	0.000000
7137	#QL2b	2	47523.679300	47523.679300		1133.712540	-0.350000	-11798.362798		1.534724	0.000000	0.000000
7141	#QL3b	1	47536.776400	47536.776400		1146.801120	-0.350000	-11797.890455		1.534724	0.000000	0.000000
7144	#BV+	34	47550.425200	47550.425200		1160.441041	-0.350000	-11797.398216		1.534724	0.000000	0.000000
7147	#BV+	35	47556.425200	47556.425200		1166.437138	-0.351333	-11797.181829		1.534724	-0.000381	0.000000
7150	#BV+	36	47562.425200	47562.425200		1172.433233	-0.354951	-11796.965441		1.534724	-0.000762	0.000000
7153	#BV-	34	47703.589800	47703.589800		1313.505909	-0.515288	-11791.874394		1.534724	-0.001143	0.000000
7156	#BV-	35	47709.589800	47709.589800		1319.502003	-0.520810	-11791.658007		1.534724	-0.000762	0.000000
7159	#BV-	36	47715.589800	47715.589800		1325.498099	-0.524048	-11791.441619		1.534724	-0.000381	0.000000
7164	#QVF	21	47756.497950	47756.497950		1366.379636	-0.525000	-11789.966282		1.534724	0.000000	0.000000
7168	#QVD	21	47769.397950	47769.397950		1379.271244	-0.525000	-11789.501048		1.534724	0.000000	0.000000
7173	#QVD	22	47790.247950	47790.247950		1400.107681	-0.525000	-11788.749100		1.534724	0.000000	0.000000
7177	#QVF	22	47803.147950	47803.147950		1412.999289	-0.525000	-11788.283866		1.534724	0.000000	0.000000
7182	#QVF	23	47823.997950	47823.997950		1433.835725	-0.525000	-11787.531919		1.534724	0.000000	0.000000
7186	#QVD	23	47836.897950	47836.897950		1446.727333	-0.525000	-11787.066685		1.534724	0.000000	0.000000
7191	#QVD	24	47857.747950	47857.747950		1467.563769	-0.525000	-11786.314737		1.534724	0.000000	0.000000
7195	#QVF	24	47870.647950	47870.647950		1480.455377	-0.525000	-11785.849503		1.534724	0.000000	0.000000
7198	#BV+	37	47878.253300	47878.253300		1488.055780	-0.525000	-11785.575219		1.534724	0.000000	0.000000
7202	#BV+	38	47912.333300	47912.333300		1522.113549	-0.580879	-11784.346139		1.534724	-0.003279	0.000000
7204	#BV-	37	47931.617950	47931.617950		1541.385550	-0.644120	-11783.650649		1.534724	-0.003279	0.000000
7208	#BV-	38	47965.697950	47965.697950		1575.443319	-0.699999	-11782.421568		1.534724	0.000000	0.000000
7211	#QL4b	1	47971.757650	47971.757650		1581.499076	-0.699999	-11782.203027		1.534724	0.000000	0.000000

POS. NO.	ELEMENT NAME	OCC. NO.	SEQUENCE SUM(L) M	SEQUENCE ARC M	I I	POSITIONS X M	Y M	Z M	I I	ANGLES THETA RAD	PHI RAD	PSI RAD
7215	#QL5b	1	47985.450350	47985.450350		1595.182869	-0.699999	-11781.709205		1.534724	0.000000	0.000000
7219	#QL6b	1	48099.563975	48099.563975		1709.222258	-0.699999	-11777.593739		1.534724	0.000000	0.000000
	END LOW BETA											
7231	#QSD	27	48184.937500	48184.937500		1794.528896	-0.699999	-11774.220246		1.528165	0.000000	0.000000
7243	#QSF	27	48270.625000	48270.625000		1880.125268	-0.699999	-11770.274049		1.521607	0.000000	0.000000
7255	#QSD	28	48356.312500	48356.312500		1965.693804	-0.699999	-11765.764379		1.515048	0.000000	0.000000
7271	#QSF	28	48442.000000	48442.000000		2051.231257	-0.699999	-11760.699266		1.508489	0.000000	0.000000
7272	#QF	22	48442.000000	48442.000000		2051.231257	-0.699999	-11760.699266		1.508489	0.000000	0.000000
7292	#QD	15	48556.250000	48556.250000		2165.220738	-0.699999	-11752.996193		1.498651	0.000000	0.000000
7312	#QF	23	48670.500000	48670.500000		2279.128920	-0.699999	-11744.172086		1.488813	0.000000	0.000000
7332	#QSD	29	48784.750000	48784.750000		2392.944781	-0.699999	-11734.227798		1.478975	0.000000	0.000000
7344	#QSF	29	48870.437500	48870.437500		2478.243844	-0.699999	-11726.080339		1.472417	0.000000	0.000000
7356	#QSD	30	48956.125000	48956.125000		2563.488199	-0.699999	-11717.379125		1.465858	0.000000	0.000000
7368	#QSF	30	49041.812500	49041.812500		2648.673397	-0.699999	-11708.116653		1.459299	0.000000	0.000000
	BEGIN LOW BETA											
7380	#QL6a	2	49127.186025	49127.186025		2733.484250	-0.699999	-11698.332898		1.452741	0.000000	0.000000
7384	#QL5a	2	49241.299650	49241.299650		2846.803591	-0.699999	-11684.892420		1.452741	0.000000	0.000000
7388	#QL4a	2	49254.992350	49254.992350		2860.400984	-0.699999	-11683.279673		1.452741	0.000000	0.000000
7391	#BV-	39	49261.052050	49261.052050		2866.418505	-0.699999	-11682.565953		1.452741	0.000000	0.000000
7395	#BV-	40	49295.132050	49295.132050		2900.261232	-0.644120	-11678.551965		1.452741	0.003279	0.000000
7397	#BV+	39	49314.416700	49314.416700		2919.411549	-0.580879	-11676.280602		1.452741	0.003279	0.000000
7401	#BV+	40	49348.496700	49348.496700		2953.254276	-0.525000	-11672.266615		1.452741	0.000000	0.000000
7404	#QVD	25	49356.102050	49356.102050		2960.806689	-0.525000	-11671.370845		1.452741	0.000000	0.000000
7408	#QVF	25	49369.002050	49369.002050		2973.616899	-0.525000	-11669.851463		1.452741	0.000000	0.000000
7413	#QVF	26	49389.852050	49389.852050		2994.321774	-0.525000	-11667.395718		1.452741	0.000000	0.000000
7417	#QVD	26	49402.752050	49402.752050		3007.131983	-0.525000	-11665.876336		1.452741	0.000000	0.000000
7422	#QVD	27	49423.602050	49423.602050		3027.836858	-0.525000	-11663.420592		1.452741	0.000000	0.000000
7426	#QVF	27	49436.502050	49436.502050		3040.647068	-0.525000	-11661.901210		1.452741	0.000000	0.000000
7431	#QVF	28	49457.352050	49457.352050		3061.351942	-0.525000	-11659.445465		1.452741	0.000000	0.000000
7435	#QVD	28	49470.252050	49470.252050		3074.162152	-0.525000	-11657.926083		1.452741	0.000000	0.000000
7440	#BV-	41	49511.160200	49511.160200		3114.785562	-0.524048	-11653.107859		1.452741	0.000381	0.000000
7443	#BV-	42	49517.160200	49517.160200		3120.743798	-0.520810	-11652.401170		1.452741	0.000762	0.000000
7446	#BV-	43	49523.160200	49523.160200		3126.702033	-0.515288	-11651.694481		1.452741	0.001143	0.000000
7449	#BV+	41	49664.324800	49664.324800		3266.683971	-0.354951	-11635.067909		1.452741	0.000762	0.000000
7452	#BV+	42	49670.324800	49670.324800		3272.842207	-0.351333	-11634.361220		1.452741	0.000381	0.000000
7455	#BV+	43	49676.324800	49676.324800		3278.800444	-0.350000	-11633.654531		1.452741	0.000000	0.000000
7458	#QL3a	2	49689.973600	49689.973600		3292.354242	-0.350000	-11632.046954		1.452741	0.000000	0.000000
7462	#QL2a	3	49703.070700	49703.070700		3305.360180	-0.350000	-11630.504358		1.452741	0.000000	0.000000
7466	#QL2a	4	49715.167300	49715.167300		3317.372582	-0.350000	-11629.079602		1.452741	0.000000	0.000000
7470	#QL1a	2	49728.745300	49728.745300		3330.856072	-0.350000	-11627.480364		1.452741	0.000000	0.000000
7473	#IPL	2	49755.875000	49755.875000		3357.796937	-0.350000	-11624.284987		1.452741	0.000000	0.000000
7476	#QL1b	2	49783.004700	49783.004700		3384.737801	-0.350000	-11621.089609		1.452741	0.000000	0.000000
7480	#QL2b	3	49796.582700	49796.582700		3398.221292	-0.350000	-11619.490372		1.452741	0.000000	0.000000
7484	#QL2b	4	49808.679300	49808.679300		3410.233694	-0.350000	-11618.065616		1.452741	0.000000	0.000000
7488	#QL3b	2	49821.776400	49821.776400		3423.239632	-0.350000	-11616.523019		1.452741	0.000000	0.000000
7491	#BV-	44	49835.425200	49835.425200		3436.793430	-0.350000	-11614.915443		1.452741	0.000000	0.000000
7494	#BV-	45	49841.425200	49841.425200		3442.751667	-0.348667	-11614.208753		1.452741	0.000381	0.000000
7497	#BV-	46	49847.425200	49847.425200		3448.709903	-0.345049	-11613.502064		1.452741	0.000762	0.000000
7500	#BV+	44	49988.589800	49988.589800		3588.891841	-0.184712	-11596.875493		1.452741	0.001143	0.000000
7503	#BV+	45	49994.589800	49994.589800		3594.850076	-0.179189	-11596.168804		1.452741	0.000762	0.000000
7506	#BV+	46	50000.589800	50000.589800		3600.808312	-0.175952	-11595.462115		1.452741	0.000381	0.000000

POS. NO.	ELEMENT NAME	OCC. NO.	SEQUENCE SUM(L) M	SEQUENCE ARC M	I I I	POSITIONS X M	Y M	Z M	I I I	ANGLES THETA RAD	PHI RAD	PSI RAD
7511	#QVF	29	50041.497950	50041.497950		3641.431722	-0.175000	-11590.643890		1.452741	0.000000	0.000000
7515	#QVD	29	50054.397950	50054.397950		3654.241932	-0.175000	-11589.124509		1.452741	0.000000	0.000000
7520	#QVD	30	50075.247950	50075.247950		3674.946806	-0.175000	-11586.668764		1.452741	0.000000	0.000000
7524	#QVF	30	50088.147950	50088.147950		3687.757016	-0.175000	-11585.149382		1.452741	0.000000	0.000000
7529	#QVF	31	50108.997950	50108.997950		3708.461890	-0.175000	-11582.693637		1.452741	0.000000	0.000000
7533	#QVD	31	50121.897950	50121.897950		3721.272100	-0.175000	-11581.174255		1.452741	0.000000	0.000000
7538	#QVD	32	50142.747950	50142.747950		3741.976975	-0.175000	-11578.718510		1.452741	0.000000	0.000000
7542	#QVF	32	50155.647950	50155.647950		3754.787184	-0.175000	-11577.199129		1.452741	0.000000	0.000000
7545	#BV-	47	50163.253300	50163.253300		3762.339598	-0.175000	-11576.303359		1.452741	0.000000	0.000000
7549	#BV-	48	50197.333300	50197.333300		3796.182325	-0.119120	-11572.289372		1.452741	0.003279	0.000000
7551	#BV+	47	50216.617950	50216.617950		3815.332642	-0.055880	-11570.018008		1.452741	0.003279	0.000000
7555	#BV+	48	50250.697950	50250.697950		3849.175369	0.000000	-11566.004021		1.452741	0.000000	0.000000
7558	#QL4b	2	50256.757650	50256.757650		3855.192890	0.000000	-11565.290300		1.452741	0.000000	0.000000
7562	#QL5b	2	50270.450350	50270.450350		3868.790283	0.000000	-11563.677553		1.452741	0.000000	0.000000
7566	#QL6b	2	50384.563975	50384.563975		3982.109623	0.000000	-11550.237076		1.452741	0.000000	0.000000
	END LOW BETA											
7578	#QSD	31	50469.937500	50469.937500		4066.856051	0.000000	-11539.910135		1.446182	0.000000	0.000000
7590	#QSF	31	50555.625000	50555.625000		4151.844497	0.000000	-11528.988806		1.439623	0.000000	0.000000
7602	#QSD	32	50641.312500	50641.312500		4236.759167	0.000000	-11517.507954		1.433065	0.000000	0.000000
7614	#QSF	32	50727.000000	50727.000000		4321.597491	0.000000	-11505.475913		1.426506	0.000000	0.000000
7615	#QF	24	50727.000000	50727.000000		4321.597491	0.000000	-11505.475913		1.426506	0.000000	0.000000
7635	#QD	16	50841.250000	50841.250000		4434.581735	0.000000	-11488.520100		1.416668	0.000000	0.000000
	END NEAR CLUSTER											
7655	BEGIN ARC	4	50955.500000	50955.500000		4547.393703	0.000000	-11470.453590		1.406830	0.000000	0.000000
7656	#QF	25	50955.500000	50955.500000		4547.393703	0.000000	-11470.453590		1.406830	0.000000	0.000000
7676	#QD	17	51069.750000	51069.750000		4660.022477	0.000000	-11451.278131		1.396992	0.000000	0.000000
7696	#QF	26	51184.000000	51184.000000		4772.457156	0.000000	-11430.995579		1.387154	0.000000	0.000000
7716	#QD	18	51298.250000	51298.250000		4884.686859	0.000000	-11409.607897		1.377316	0.000000	0.000000
7736	#QF	27	51412.500000	51412.500000		4996.700722	0.000000	-11387.117155		1.367478	0.000000	0.000000
7756	#QD	19	51526.750000	51526.750000		5108.487904	0.000000	-11363.525530		1.357640	0.000000	0.000000
7776	#QF	28	51641.000000	51641.000000		5220.037587	0.000000	-11338.835305		1.347802	0.000000	0.000000
7796	#QD	20	51755.250000	51755.250000		5331.338974	0.000000	-11313.048870		1.337964	0.000000	0.000000
12947	#QF	29	82717.000000	82717.000000		5447.984675	0.000000	11259.609487		-1.328126	0.000000	0.000000
12967	#QD	21	82831.250000	82831.250000		5336.955731	0.000000	11286.544829		-1.337964	0.000000	0.000000
12987	#QF	30	82945.500000	82945.500000		5225.667176	0.000000	11312.386585		-1.347802	0.000000	0.000000
13007	#QD	22	83059.750000	83059.750000		5114.129779	0.000000	11337.132254		-1.357640	0.000000	0.000000
13027	#QF	31	83174.000000	83174.000000		5002.354337	0.000000	11360.779442		-1.367478	0.000000	0.000000
13047	#QD	23	83288.250000	83288.250000		4890.351667	0.000000	11383.325860		-1.377316	0.000000	0.000000
13067	#QF	32	83402.500000	83402.500000		4778.132610	0.000000	11404.769325		-1.387154	0.000000	0.000000
13087	#QD	24	83516.750000	83516.750000		4665.708027	0.000000	11425.107762		-1.396992	0.000000	0.000000
13103	END ARC	1	83631.000000	83631.000000		4553.088798	0.000000	11444.339203		-1.406830	0.000000	0.000000
END	.SSC	1	83631.000000	83631.000000		4553.088798	0.000000	11444.339203		-1.406830	0.000000	0.000000

TOTAL LENGTH = 83631.000000 ARC LENGTH = 83631.000000
ERROR(X) = 0.127217E-03 ERROR(Y) = 0.315847E-15 ERROR(Z) = 0.487384E-04
ERROR(THETA) = -0.715771E-08 ERROR(PHI) = -0.260384E-19 ERROR(PSI) = 0.752897E-20

PARAMETER, ELEMENT LIST

B0	PARA	0.66134494	1
B0V1	PARA	0.50815658	1
B0V2	PARA	0.66134494	1
BL*	PARA	0.50000000	0
BM*	PARA	0.10000000	2
BR	PARA	0.10000000	1
BRHO	PARA	0.66712800	5
GOO1	PARA	0.76622000	1
GOO2	PARA	0.85281000	1
GOO3	PARA	0.81974000	1
GOO4	PARA	0.82122500	1
HOO1	PARA	0.77777000	1
HOO2	PARA	0.69329000	1
HOO3	PARA	0.72950000	1
HOO4	PARA	0.72592500	1
K	PARA	0.34287781	-2
KDC	PARA	0.40675544	-6
KFC	PARA	0.11320056	-6
KL1	PARA	0.34467281	-2
KL2	PARA	-.34018225	-2
KL3	PARA	0.32501413	-2
KL4	PARA	0.32715442	-2
KL5	PARA	-.11626270	-2
KL6	PARA	-.32320210	-2
KM1	PARA	0.33974409	-2
KM2	PARA	-.33450093	-2
KM3	PARA	0.32653214	-2
KM4	PARA	0.31634888	-2
KM5	PARA	-.13639178	-2
KM6	PARA	-.27877344	-2
KS	PARA	0.34287781	-2
KU1	PARA	0.16449270	-2
KU2	PARA	-.16449270	-2
KU3	PARA	0.34287781	-2
KU4	PARA	-.34287781	-2
KV	PARA	0.34287781	-2

LB	PARA	0.16540000	2
LB4	PARA	0.68560000	2
LBV1	PARA	0.50000000	1
LBV2	PARA	0.16540000	2
LCH	PARA	0.11425000	3
LHS	PARA	0.85687500	2
LL46	PARA	0.13500000	3
LLV1	PARA	0.17016460	3
LLV2	PARA	0.87444650	2
LM46	PARA	0.12250000	3
LMM1	PARA	0.13500000	3
LMO8	PARA	0.16875000	2
LMQ6	PARA	0.24479500	1
LQ	PARA	0.18200000	1
LQC	PARA	0.10000000	1
LQL1	PARA	0.71297000	1
LQL2	PARA	0.56483000	1
LQL3	PARA	0.66488000	1
LQL4	PARA	0.50597000	1
LQL5	PARA	0.58375000	1
LQL6	PARA	0.21339750	1
LQM1	PARA	0.37762000	1
LQM2	PARA	0.43722000	1
LQM3	PARA	0.56483000	1
LQM4	PARA	0.53569000	1
LQM5	PARA	0.64095000	1
LQS	PARA	0.24479500	1
LQSD	PARA	0.24479500	1
LQSF	PARA	0.24479500	1
LQU1	PARA	0.58375000	1
LQU2	PARA	0.64095000	1
LQU3	PARA	0.18200000	1
LQU4	PARA	0.31391500	1
LQV	PARA	0.60500000	1
LQVD	PARA	0.60500000	1
LQVF	PARA	0.60500000	1
LSSH	PARA	0.63082295	3
LU12	PARA	0.66137000	1
LU23	PARA	0.23501910	3
LU34	PARA	0.35734700	2
MUTL	PARA	0.22500000	1
RHI	PARA	0.99133140	-4
RHO	PARA	0.10087444	5
RHOI	PARA	0.99133140	-4
RV1	PARA	0.76170777	-4
RV2	PARA	0.99133140	-4
SPOO	PARA	0.30350000	1
SXKD	PARA	-.20017944	-1
SXKF	PARA	0.99920956	-2

D	DRF	1.000000
D3	DRF	7.000000
D5	DRF	1.555350
DL0	DRF	20.000000
DL34	DRF	288.272750
DL45	DRF	2.795500
DL56	DRF	106.142150
DLV1	DRF	136.164600
DLV2	DRF	19.284650
DLV3	DRF	25.483150
DM0	DRF	120.000000
DM45	DRF	4.000000
DM56	DRF	90.071300
DMV1	DRF	62.898760
DMV3	DRF	0.861390
DOG1	DRF	4.627200
DU0	DRF	319.043150
DU12	DRF	6.613700
DU23	DRF	235.019100
DU34	DRF	35.734700
L341	DRF	202.647750
L343	DRF	85.625000
LM34	DRF	214.385150
LMV1	DRF	120.898760
M341	DRF	128.760150
O	DRF	0.800000
OG1	DRF	4.569400
OG2	DRF	3.703500
OG3	DRF	4.034200
OG4	DRF	4.019350
OH1	DRF	4.453900
OH2	DRF	5.298700
OH3	DRF	4.936600
OH4	DRF	4.972350
OOC	DRF	3.535000
OOG1	DRF	7.662200
OOG2	DRF	8.528100
OOG3	DRF	8.197400
OOG4	DRF	8.212250
OOH1	DRF	7.777700
OOH2	DRF	6.932900
OOH3	DRF	7.295000
OOH4	DRF	7.259250
OOOO	DRF	110.610000
OOS	DRF	6.570000
OOV	DRF	4.375000
OPM	DRF	1.035000
OV	DRF	0.400000

B	MAG	LB		BR	RHOI
QD	MAG	LQ	-K	BR	
QDC	MAG	LQC	KDC	BR	
QF	MAG	LQ	K	BR	
QFC	MAG	LQC	KFC	BR	
QL1a	MAG	LQL1	KL1	BR	
QL1b	MAG	LQL1	-KL1	BR	
QL2a	MAG	LQL2	KL2	BR	
QL2b	MAG	LQL2	-KL2	BR	
QL3a	MAG	LQL3	KL3	BR	
QL3b	MAG	LQL3	-KL3	BR	
QL4a	MAG	LQL4	KL4	BR	
QL4b	MAG	LQL4	-KL4	BR	
QL5a	MAG	LQL5	KL5	BR	
QL5b	MAG	LQL5	-KL5	BR	
QL6a	MAG	LQL6	KL6	BR	
QL6b	MAG	LQL6	-KL6	BR	
QM1a	MAG	LQM1	KM1	BR	
QM1b	MAG	LQM1	-KM1	BR	
QM2a	MAG	LQM2	KM2	BR	
QM2b	MAG	LQM2	-KM2	BR	
QM3a	MAG	LQM3	KM3	BR	
QM3b	MAG	LQM3	-KM3	BR	
QM4a	MAG	LQM4	KM4	BR	
QM4b	MAG	LQM4	-KM4	BR	
QM5a	MAG	LQM5	KM5	BR	
QM5b	MAG	LQM5	-KM5	BR	
QM6a	MAG	LMQ6	KM6	BR	
QM6b	MAG	LMQ6	-KM6	BR	
QSD	MAG	LQS	-KS	BR	
QSF	MAG	LQS	KS	BR	
QU1a	MAG	LQU1	KU1	BR	
QU1b	MAG	LQU1	-KU1	BR	
QU2a	MAG	LQU2	KU2	BR	
QU2b	MAG	LQU2	-KU2	BR	
QU3a	MAG	LQU3	KU3	BR	
QU3b	MAG	LQU3	-KU3	BR	
QU4a	MAG	LQU4	KU4	BR	
QU4b	MAG	LQU4	-KU4	BR	
QVD	MAG	LQV	-KV	BR	
QVF	MAG	LQV	KV	BR	
BV1+	MAGV	LBV1		BR	RV1
BV1-	MAGV	LBV1		BR	-RV1
BV2+	MAGV	LBV2		BR	RV2
BV2-	MAGV	LBV2		BR	-RV2
SD	SXTP		SXKD	BR	
SF	SXTP		SXKF	BR