

Minutes of the ABS Meeting held on 20th May 1999

Persons present: M. Arruat, P. Bryant, F. di Maio, S. Hancock, A. Jansson, E. Jensen, M. Lindroos, D. Manglunki, M. Martini, M. Pace, P. Royer, J. Schinzel, Y. Uythoven, E. Wildner.

Topic: ABS software tools

1. WinAGILE (P. Bryant)

The WinAGILE package is a powerful interactive beam optics package freely available from <http://nicewww.cern.ch/~bryant>. The author, P. Bryant, has included a number of ABS functions in the latest version:

- Closed orbit:
 - Provided a lattice a closed orbit resulting from random errors can be generated, statistics for the orbit excursions is provided.
 - A measured orbit can be read from a file (Ascii format).
 - A correction can be applied (three methods available).
 - A correction can be applied to a certain part of the orbit (leaving other parts untouched).
 - An orbit bump can be created (3, 4 or 5 magnet bumps) from given x and x' values at a specific point. The orbit can later be corrected without 'losing' the bump.
 - A closed orbit can also be generated from a so-called "kick-file".
- Transfer line: the beam can be steered to certain pre-chosen values of x and x' and a certain point in the transfer line.
- On-line HELP available for all functions (manual on its way).

2. BeamOptics99 (P. Royer)

The Mathematica package BeamOptics has been the workhorse of the ABS project since the start of the ABS activities in the PS Division. The package has lately been improved with new functions where quadrupolar lenses are treated as proper long quadrupoles. An overview of the new functionalities in BeamOptics can be found at :

http://nicewww.cern.ch/~lindroos/Abs/Minutes/ABS_Meeting2.html

Word version at:

http://nicewww.cern.ch/~lindroos/Abs/Minutes/ABS_Meeting2.doc

3. **ABS in PS Operation** (M. Pace)

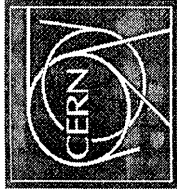
The ABS project aims to provide operation with 'easy-to-use' and 'easy-to-adapt' ABS tools for PS operation. Two years of development have today provided us with a PS optics database (ORACLE based) and a number of generic software modules for ABS application programs. Since the start-up '99, several ABS applications which make use of these facilities have been completed. An overview of these latest developments can be found in the enclosed slides. PowerPoint version:

http://nicewww.cern.ch/~lindroos/Abs/Minutes/20_5_99_myslides.ppt

M. Lindroos.

Distribution:

ABS Team
PS/DI Group
PS Group Leaders



ABS for Operation in 1999

Marine Pace.



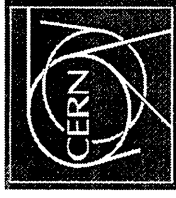
ABS 2nd generation-Motivations

- ◆ Existing ABS has been successfully used since 1996 ...
- ◆ But it suffers from drawbacks :
 - Several implementations (& duplication) of common procedures
 - Many local files to store optics and machine parameters
 - A dedicated program for each ABS correction
 - Dependence on energy (hard-coded in program)
- ◆ => existing ABS too “expensive” to support new corrections

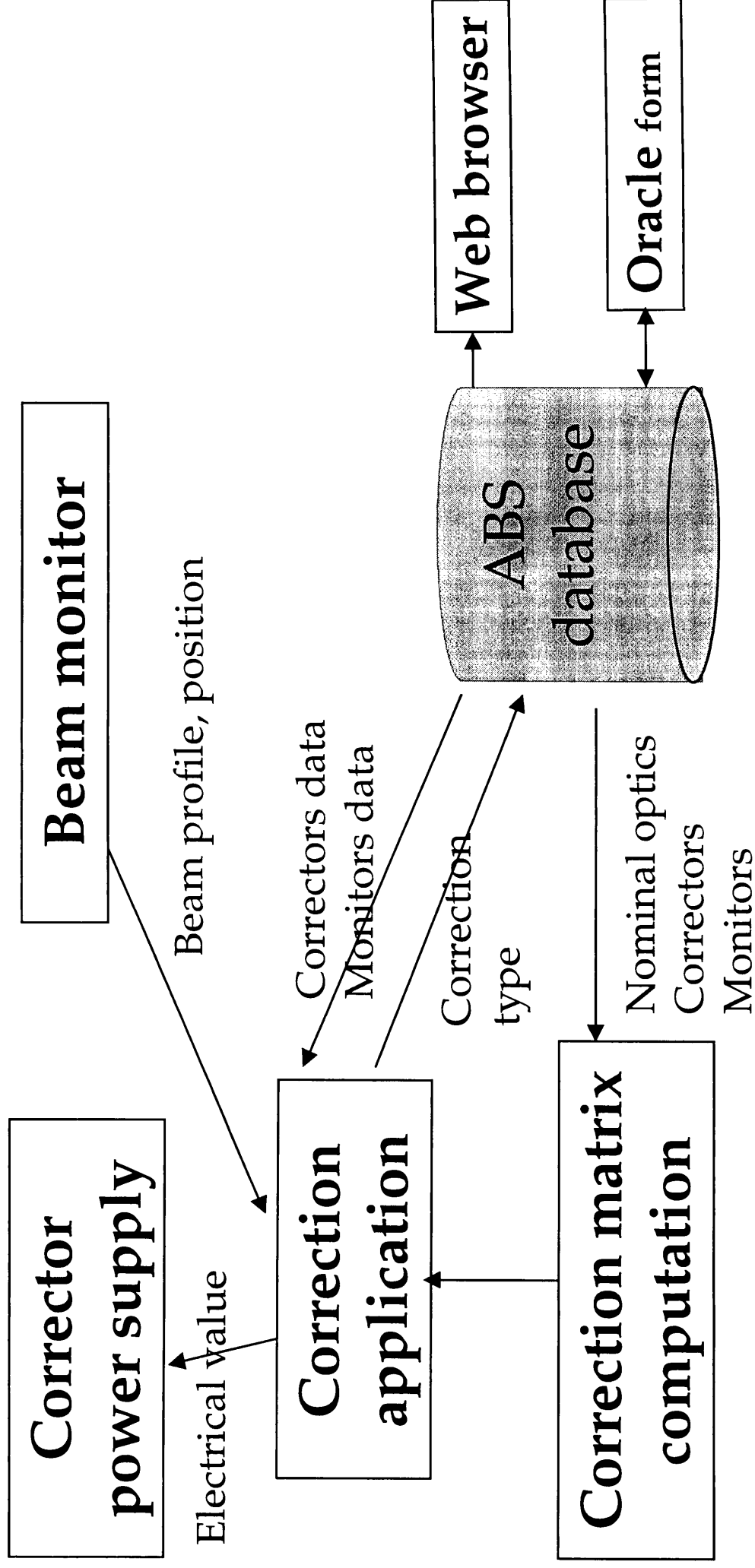


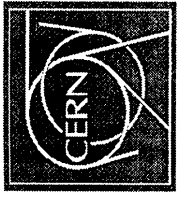
ABS 2nd generation - Aims

- ◆ **Data-driven programs**
 - optics + correction data + (matrices) stored in a common DB
- ◆ **Generic correction software**
 - shared by ALL types of corrections and ALL machines parts
- ◆ **NO dedicated ABS programs**
 - is an option available in existing Measurement programs:
- ◆ **Independence from particle type and energy**
 - beam rigidity computed on-line for conversion of magnetic parameter into electrical value
- ◆ **Very easy to implement a new correction**
 - only requires the description in DB (nominal optics, monitors, correctors)



ABS 2nd generation Control architecture





ABS 2nd generation Responsibilities

- ◆ **DataBase (DB) implementation**
 - Josi Schinzel PS/CO
- ◆ **Machine description in DB**
 - CPS , TT2 : Marine, PSB, lines to PS : Mats + Andreas, AD : J-L Mary
- ◆ **Measurement programs including ABS**
 - J-F Comblin, R.Hoh, M.Arruat,...
- ◆ **ABS correction generic software**
 - M.Arruat + J-F Comblin ("Manual" ABS for AD)
- ◆ **On-line validation of correction**
 - Marine, Mats, Michel Martini,...

ABS 2nd generation

Which corrections in 1999 ?



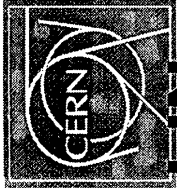
- ◆ **PSB : *NEW TRAJECTORY* program (pickups)**
 - LIN - PSB steering (either all 4 rings or 1 single ring)
 - PSB-BTM steering (“ ”)
 - PSB-BTP steering (“ ”)

- ◆ **CPS : *ORBIT* program (Codd pickups)**
 - E+, E-, P+ coherent oscillations at injection
 - P+ closed orbit at low energy

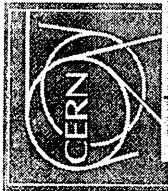
- ◆ **TT2 : *SEMFILS* program**
 - P+ steering in TT2 for CT-extracted beam , FAST-extracted beam
 - P+ matching in TT2

ABS 2nd generation

Which corrections in 1999 ?



- ◆ **LIN - PSB steering (either all 4 rings or 1 single ring)**
 - “New Trajectory” Validated
- ◆ **PSB-BTM and PSB-BTP steering (“ ”)**
 - “New Trajectory” Validated
- ◆ **CPS coherent oscillations at injection**
 - “Orbit” Validated (P+), being tested (E+ E-)
- ◆ **CPS closed orbit at low energy**
 - “Orbit” Validated (P+), being tested (E+ E-)
- ◆ **TT2 steering**
 - “Semfils” Validated
- ◆ **TT2 matching**
 - “Semfils” Being tested



ABS included in PS / ORBIT program for :
 H and V Coherent oscillations at injection (P+, E+, E-)
 H and V Closed orbit at low energy (P+, E+, E-)

ABS ON
 ABS OFF

codd

File View Option Control Help

(TAN) C Train : 250 LHC 15 Dec 3 17:41:37

Sensib.: 5e11 Sigma = 51% Bunch = 1 Turn = 1

MBP1 = 2.0
 MBP2 = 1.8

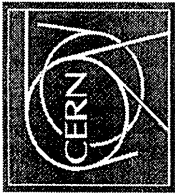
Horizontal Trajectory

Sections

One Shot Unfreeze Freeze

AQN done. Seems to be OK.

GENERIC ABS CORRECTION PROGRAM



Correction type
Monitors list

Correctors list
Computed corrections
Control of correctors

absintf_popup

Correction Types
 HSteering
 VSteering

Monitors Selection

PS_UHV10
PS_UHV13
PS_UHV15
PS_UHV17
PS_UHV20
PS_UHV23
PS_UHV25
PS_UHV27
PS_UHV30
PS_UHV33
PS_UHV35
PS_UHV37
PS_UHV40
PS_UHV43
PS_UHV45

Averaging
Number : 1

Command
Send Measure

ABS application : Horizontal Steering

File Help

Operation: PSB-CPS,PR,RING; optics of a complete PS turn starting in Section 1, including QFO&QDE-Includes all UHV(Pups)

Power Supplies	Angle	Electric Value
PR.DHZ01	0.000 mrad	0.000 Amp
PR.DHZ03	0.000 mrad	0.000 Amp
PR.DHZ05	0.000 mrad	0.000 Amp
PR.DHZ07	0.000 mrad	0.000 Amp
PR.DHZ09	0.000 mrad	0.000 Amp
PR.DHZ11	-0.000 mrad	-0.000 Amp
PR.DHZ13	0.000 mrad	0.000 Amp
PR.DHZ15	0.000 mrad	0.000 Amp
PR.DHZ17	0.000 mrad	0.000 Amp
PR.DHZ19	0.000 mrad	0.000 Amp

Power Supplies	Angle	Electric Value
PR.DHZ03	0.096 mrad	3.046 Amp
PR.DHZ11	-0.075 mrad	-2.372 Amp

of correctors rms values

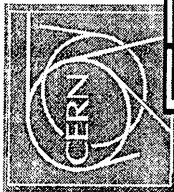
0 Corr.	24.302 mm
1 Corr.	11.505 mm
2 Corr.	11.255 mm

RMS Graph

of correctors to use: 2

Compute Send to HW Back Forward

```
[ 3 17:43:39] Computing correction with 2 Correctors
[ 3 17:43:39] Wait : .....
[ 3 17:43:43]
[ 3 17:43:43] Done
```



ABS included in SEMFILS/SEMGRIDS

program for :
H and V steering and matching corrections

ABS ON
ABS OFF

File Controls Options View File Option

Beam profile and emittance measurements with SEM-grids

Pls: MDRPS F16X.IMSG 22 - PR.DCBEFIRA 88.3E10 Dec 8 11:08:20 1998
F16X.AMSG 15374 -

$\epsilon(2\sigma)$: 0.36 $\pi \mu\text{m}$ $\Delta p/p$: 0.500 E-3
Beam rigidity (Bp): 88.04

F16.MSF257

Status HEV IN A 80
D 60
C 40
Gain 2 R 20
Plane a 0
HOR g 0

Wire Nbs Step: 0.50 mm 64.2% ADC Range

Spline fit	
$4\sigma^2/\beta$	0.22 $\pi \mu\text{m}$
μ	2.61 mm
σ	0.76 mm
J	316.94
G	1.67
E	0.12

F16.MSF267

Status HEV IN A 50
D 40
C 30
Gain 2 R 20
Plane a 0
HOR g 0

Wire Nbs Step: 0.35 mm 43.9% ADC Range

Spline fit	
$4\sigma^2/\beta$	0.60 $\pi \mu\text{m}$
μ	-1.17 mm
σ	1.41 mm
J	426.20
G	0.60
E	-0.10

F16.MSF277

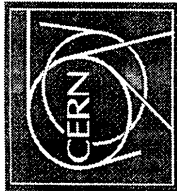
Status HEV IN A 40
D 30
C 20
Gain 2 R 10
Plane a 0
HOR g 0

Wire Nbs Step: 0.50 mm 35.9% ADC Range

Spline fit	
$4\sigma^2/\beta$	0.50 $\pi \mu\text{m}$
μ	-5.39 mm
σ	1.81 mm
J	317.38
G	0.72
E	0.35

Rest Position Single Shot Unfreeze Run Math

Programme in pause !!!



ABS included in PSB TRAJECTORY program for : H and V steering in LIN-PSB (P+) H and V steering in BTM and BTP (P+)

File View Option Control Help

psb trajectory May 18 14:42:24

psb_trajectory - Injection

ABS ON
 ABS OFF

Pick-ups	HORIZONTAL				VERTICAL			
	Ring 1	Ring 2	Ring 3	Ring 4	Ring 1	Ring 2	Ring 3	Ring 4
LT.U10	1.583	2.020	1.683	1.825	-1.564	-1.345	-1.108	-0.873
LT.U20	-2.511	-1.894	-1.994	-1.629	2.466	2.131	2.331	1.966
LT.U30	-1.683	-1.565	-0.871	-1.110	3.507	2.983	2.514	1.579
LT.U40	-1.277	-1.055	-0.645	-0.405	-1.654	-2.256	-1.872	-2.077

HORIZONTAL

VERTICAL

One Shot
Unfreeze
Freeze

Injection rigidity: 1.03727

ABS included in SEMFILS/SEMGRIDS program :

H and V steering and matching corrections

File: SEMFILS

Co-Tools: Options View File

PLS: SEMFILS 22 - PR.DOCSEIRA B33.1E10 May 17 16:18:22 1999

FILE: SEMFILS 20JR -

SIZE: 1.71 MBY ADVP: 1.01 MBY

Sp: 16.72 Sps: 0.319

absorb popup

Resolution: 1000

Electron gun: ELectron gun

Magnification: Magnification

Line selection:

- F10: MSF257
- F16: MSF258
- F16: MSF267
- F16: MSF268
- F16: MSF277
- F16: MSF278

Average: 1

Number: 1

Unit: Unit

Send Measure

Resolution: 1000

Electron gun: ELectron gun

Magnification: Magnification

Status: FILE: MSF257

Beam: 20.0

Plane: 15.0

Calib: 10.0

Step: 0.50 nm

11.6% FOC Range

Status: FILE: MSF267

Beam: 20.0

Plane: 15.0

Calib: 10.0

Step: 0.35 nm

10.7% FOC Range

Status: FILE: MSF277

Beam: 10.0

Plane: 8.0

Calib: 6.0

Step: 0.35 nm

10.7% FOC Range

Power supply: COILC Electric value

F16: MSF257 -14.27 Amv 92.42 Amv

F16: MSF267 -13.70 Amv 118.15 Amv

F16: MSF277 -13.70 Amv 114 Amv

Correction: angle: Electric value: -2.18 Amv

Collectors: MS values

COILC: 7.28 Amv

Beam: 11.1 Amv

PHS: PHS Graph

File Help

Warning: UNDEFINED

TI2: 0000 based on DT exception. Valid for steering and matching corrections

Corrections to use:

Correct Send to HCB Back Screen

ABS included in PSB /TRAJECTORY program : H and V steering corrections



psb_trajectory
Help

File View Option Control
SFTPRO 2 May 18 14:45:14

HORIZONTAL

Pick-ups Ring 1 Ring 2 Ring 3 Ring 4 Ring 1 Ring 2 Ring 3 Ring 4

LT.U10	1.593	2.075	1.592	1.735	-1.421	-1.224	-0.894	-0.610
LT.U20	-2.376	-1.799	-1.510	-1.271	2.431	2.158	2.155	1.775
LT.U30	-1.753	-1.671	-0.589	-0.789	3.667	3.154	2.468	1.514
LT.U40	-1.290	-1.065	-0.611	-0.373	-1.787	-2.415	-1.932	-2.051

Ring 1 Horizontal

Ring 2 Horizontal

Ring 3 Horizontal

Ring 4 Horizontal

VERTICAL

Ring 1 Vertical

Ring 2 Vertical

absintf.pptpp

Correction Types
 HSteering
 VSteering

Monitors Selection

LT3.U10
LT3.U20
LT3.U30
LT3.U40
LT3.U50
LTB3.U10
LTB3.U20
LTB3.U30
LTB3.U40
LTB3.U50
BI3.U10
BI3.U20
BI3.U30
BI3.U40

File Help

Operation: LI-INJECTION-BR.PROTON,RING3
PSB-PI-R3

Power Supplies	Angle	Electric Value
<input checked="" type="checkbox"/> LT.DHZ10	0.87 mrad	-3.00 Amf
<input checked="" type="checkbox"/> LT.DHZ20	1.39 mrad	-4.80 Amf
<input checked="" type="checkbox"/> LT.DHZ30	-0.00 mrad	0.00 Amf
<input checked="" type="checkbox"/> LT.DHZ40	0.72 mrad	-2.50 Amf
<input checked="" type="checkbox"/> LT.DHZ50	-0.17 mrad	0.60 Amf
<input checked="" type="checkbox"/> LTB.DHZ10	0.33 mrad	-1.14 Amf
<input checked="" type="checkbox"/> LTB.DHZ20	0.43 mrad	-1.50 Amf
<input checked="" type="checkbox"/> LTB.DHZ30	-0.58 mrad	2.00 Amf
<input checked="" type="checkbox"/> LTB.DHZ40	0.82 mrad	-2.84 Amf
<input checked="" type="checkbox"/> BI.DHZ10	-0.84 mrad	-2.41 Amf
<input checked="" type="checkbox"/> BI.DHZ20	-0.49 mrad	-1.40 Amf
<input checked="" type="checkbox"/> BI.DHZ30	0.43 mrad	1.93 Amf

Correctors to use: 2

Compute Send to Hit Rank Forward

Corrections

Power Supplies	Angle	Electric Value
LTB.DHZ10	-0.40 mrad	1.38 Amp.
BI3.DHZ50	0.92 mrad	2.64 Amp.

RMS values

# of correctors	RMS values
0 Corr.	7.62 mm
1 Corr.	4.62 mm
2 Corr.	3.14 mm

RMS Graph

ABS application : Horizontal Steering

of correctors to use: 2

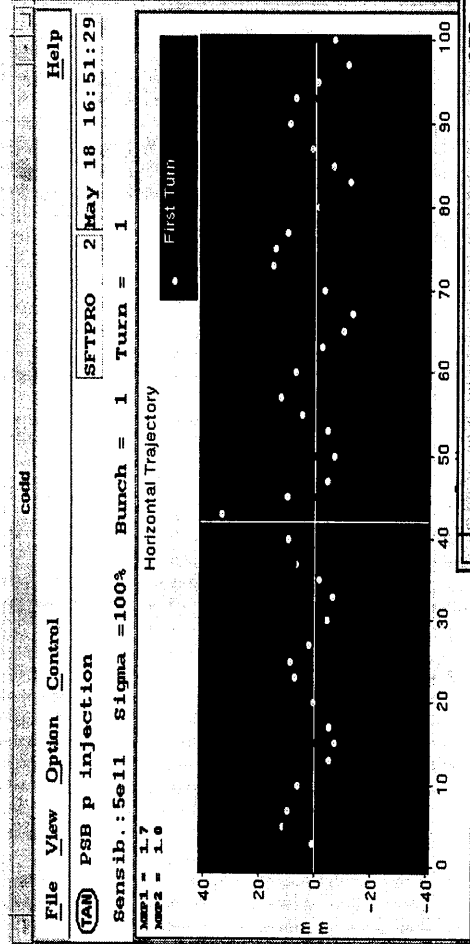
Compute Send to Hit Rank Forward

[18 14:44:26] Computing correction with 2 Correctors
 [18 14:44:26] Wait :
 [18 14:44:35]
 [18 14:44:35] Done



ABS included in PS / ORBIT program :

H and V Coherent oscillations at injection (P+, E+, E-)
 H and V Closed orbit at low energy (P+, E+, E-)



absintf.popsup

Correction Types
 HSteering
 VSteering

Monitors Selection

PS. UHV47
PS. UHV50
PS. UHV53
PS. UHV55
PS. UHV57
PS. UHV60
PS. UHV63
PS. UHV65
PS. UHV67
PS. UHV70
PS. UHV73
PS. UHV75
PS. UHV77
PS. UHV80

ABS application : Horizontal Steering

File Help

Operation: CPS-INJECTION.PROTON

Power Supplies	Correctors	Angle	Electric Value
<input checked="" type="checkbox"/> BTP. DHZ40		0.49 mrad	3.91 Amp.
<input checked="" type="checkbox"/> PI. SMH42		-52.03 mrad	32176.92 Amp.
<input checked="" type="checkbox"/> PI. KFA45		-4.20 mrad	303000.00 V

Power Supplies	Angle	Electric Value
PI. KFA45	-0.74 mrad	53584.32 V
BTP. DHZ40	-0.05 mrad	-0.41 Amp.

# of correctors	rms values
0 Corr.	87.33 mm
1 Corr.	70.41 mm
2 Corr.	70.33 mm

RMS Graph

0 Corr. 87.33 mm
 1 Corr. 70.41 mm
 2 Corr. 70.33 mm

of correctors to use: 2

Compute Send to HW Back Forward

[18 17:01:01] Computing correction with 2 Correctors
 [18 17:01:01] Halt :
 [18 17:01:17] Done

