PROTON SYNCHROTRON BOOSTER (PSB)

PARAMETER LIST (VERSION 4)

COMPILED BY C. BOVET AND K.H. REICH

NOTE THIS LIST GIVES A CONSISTENT SET OF NOMINAL VALUES, (WITHOUT MARGINS)
* DENOTE CHANGES MADE SINCE PREVIOUS VERSION

1. MAIN PARAMETERS

DESIGN ENERGY, MOMENTUM	INJECTION	TI	49.74	MEV
		PI	309.53	MEV/C
	TRANSFER	TT	800.0	MEV
		PT	1463.3	MEV/C
NUMBER OF SUPERPOSED RINGS			4	
* REVOLUTION PERIOD	(INJECTION		1.672	MU S
	(TRANSFER		0.622	MU S
PROTON PER CYCLE		NTOT	1.0E13	
PROTON PER RING		N/RING	2.5E12	
LENGTH OF PERIOD		LP	9.818	M
LENGTH OF STRAIGHT SECTION 1		L1	2.540	M
LENGTH OF STRAIGHT SECTIONS 2 OR 5		L2	.265+.014	M
LENGTH OF STRAIGHT SECTIONS 3 OR 4		L3	.575+.015	M
REPETITION TIME (MINIMUM)		T	1.20	S
RISE TIME		TR	600	MS
FLAT TOP TIME		TT	80	MS

2. GEOMETRY

AVERAGE RADIUS	R	25	M
CIRCUMFERENCE	C	157.0796	M
MAGNETIC BENDING RADIUS	RO	8.238878	M
LENGTH OF STRAIGHT SECTION PATH	LSS	2.654000	M
LENGTH OF TRIPLET PATH	LT	3.928077	M
LENGTH OF BENDING MAGNET PATH	LM	1.617700	M
CENTRE TO STRAIGHT SECTION RADIUS	RSS	24.977487	M
CENTRE TO TRIPLET RADIUS	RT	24.914744	M
BEAM LEVEL III (AS CPS)		433.660	M
VERTICAL DISTANCE OF RINGS		0.360	M

3. ORBIT PARAMETERS

LATTICE	D-L4-F-L5-B-L1-B-L2-F-L3-D			
BETATRON FREQUENCY	(HOR	QH	4.60	
	(VERT	QV	4.85	
PHASE ADVANCE PER PERIOD	(HOR	MUH	103.6	DEG
	(VERT	MUV	109.1	DEG
HORIZONTAL BETA FUNCTION	(MEAN	BETA H	5.62	M
	(MAX	BETA H	7.18	M
VERTICAL BETA FUNCTION	(MEAN	BETA V	6.83	M
	(MAX	BETA V	18.33	M
TUNING RANGE AT INJECTION		QH,QV	4-5	
MOMENTUM COMPACTION FUNCTION	(MAX	R.ALFAP	1.44	M
	(MIN	R.ALFAP	1.04	M
TRANSITION ENERGY / REST ENERGY		GAMMA TR	QH-.17	
BEAM EMITTANCE AT INJECTION	(HOR	EH	130 PI 1.E-6	
	(VERT	EV	40 PI 1.E-6	
BEAM EMITTANCE AT TRANSFER (CPS INJECTION POINT)	(HOR	EH	33 PI 1.E-6	
	(VERT	EV	12 PI 1.E-6	
CAPACITANCE CONSTANT	(INJ	GO	2.9	
	(TRANSFER	GO	4.3	

4. BENDING MAGNETS

	NUMBER OF UNITS		NB	32+1	
	PHYSICAL LENGTH OF UNIT		LB	1.7290	M
	MAGNETIC LENGTH (ON ORBIT)		LM	1.6177	M
*	LENGTH OF YOKE		LY	1.5370	M
	MAGNETIC LENGTH (STRAIGHT)		LEQU	1.6150	M
	WIDTH OF CORE		WB	0.71	M
	TOTAL HEIGHT OF CORE		HB	1.52	M
	TOTAL GAP HEIGHT		HBG	70	MM
	TOTAL GAP WIDTH		WBG	238	MM
*	MAGNETIC FIELD AT	(309.53 MEV/C)	BI	0.12553	T
*		(1463.3 MEV/C)	BT	0.59343	T
	MOMENTUM/FIELD COEFFICIENT		P/B	2.46997	GEV/C/T
	COILS,TOTAL NUMBER OF TURNS PER GAP		NBT	12	TURNS
	WEIGHT OF ONE COMPLETE UNIT		MBT	12.7	TON
	TOTAL IRON WEIGHT		MBI	400	TON
	TOTAL COPPER WEIGHT		MBC	24	TON
	TOTAL INDUCTANCE OF 33 UNITS		LBI	0.164	H
	TOTAL RESISTANCE OF 33 UNITS (35 DEG)		RB	0.350	OHM
	CURRENT DENSITY (FOR IRMS=1800 A)		JBRMS	4.8	A/MM2
	TOTAL STORED ENERGY (MAX)		WBM	630	KJ
	TOTAL POWER LOSSES (FOR IRMS=1800 A)		PBLT	1.10	MW

5. QUADRUPOLES

NUMBER OF UNITS	(UNIT F	NF	32	
	(UNIT D	ND	16	
BORE RADIUS		RB	60	MM
PHYSICAL LENGTH	(UNIT F	LF	0.566	M
	(UNIT D	LD	0.944	M
MAGNETIC LENGTH	(UNIT F	LFM	0.5027	M
	(UNIT D	LDM	0.8811	M

8. RF ACCELERATING SYSTEM

NUMBER OF CAVITIES PER RING		NC	1	
HARMONIC NUMBER		H	5	
* ACCELERATING FREQUENCY	(INJECTION	NU	2.990	MHZ
	(TRANSFER	NU	8.033	MHZ
DESIGN ENERGY GAIN PER TURN		ERF	1.0	KEV
SYNCHRONOUS PHASE ANGLE (FOR B DOT =0.8 T/S)		PHI-S	4.8	DGR
		SIN PHI-S	0.084	
PEAK CAVITY VOLTAGE	(DURING CYCLE	UM	12	KV
	(AT TRANSFER	UM	2.3	KV
CAVITY SHUNT IMPEDANCE	(MIN)	ZC	12	K OHM
RF POWER LOSS PER CAVITY	(MAX)	PC	6	KW

BEAM CHARACTERISTICS

AVERAGE CIRCULATING BEAM	(INJECTION		0.240	A
	(TRANSFER		0.643	A
SYNCH.OSCIL.FREQUENCY	(AFTER TRAPPING	NU-S	5500	HZ
	(AT TRANSFER	NU-S	2180	HZ
BUCKET AREA AT INJECTION			2.5	MEV RAD
BUNCH PARAMETERS	FROM LINAC	DEL E	+-150	KEV
		DP/P	+-1.5E-3	
	AFTER TRAPPING	DEL E	+-340	KEV
		DP/P	+-3.4E-3	
		DEL FI	230	DEG
	AT TRANSFER	DEL E	+-1450	KEV
		DEL	+-.0018	
		DP/P	+-1.2E-3	
		DEL FI	145	DEG
		DEL D	50	NS
		DEL L	12.7	M
BUNCH AREA	AT TRANSFER	A	6	MEV RAD
			0.1	EVS
			0.007	RAD
BUNCHING FACTOR			0.27	
NOMINAL SPACING)			125	NS
OF BUNCH CENTRES)			31.4	M

9. VACUUM SYSTEM

VACUUM CHAMBER INSIDE TOTAL DIMENSIONS				
BENDING MAGNET	NOMINAL	(HOR	132	MM
		(VERT	63	MM
	UNDER VACUUM		60.8	MM
QUADRUPOLES		(HOR	135	MM
		(VERT	121	MM
LONG STRAIGHT SECTION	(DIAMETER)		120	MM
DESIGN PRESSURE			UNDER 1.E-7 TORR	
NUMBER OF 440 L/S SPUTTER ION PUMPS FOR 4 RINGS			44	
NUMBER OF MECHANICAL PUMP GROUPS			10	
NUMBER OF TI-SUBLIMATION PUMPS			4	
NUMBER OF MANIFOLDS			31	

DISTRIBUTION (OPEN)
MPS-SI LIST 2
ISR SENIOR STAFF

ISSUE "F" 14.5.70 PEARCE
ISSUE "E" 9.3.70 Bamberger
ISSUE "D" 15.1.70 Bamberger.
ISSUE "C" 7.1.70 Bamberger

Issue J 31.10.70 NP.
ISSUE "H" 15.10.70 PIANFETTI
ISSUE "G" 5.7.70 PianPetti

ISSUE "K" 3.6.71 PianPetti

BEAM TRANSPORT AND OBSERVATION EQUIPMENT IN P.S.B

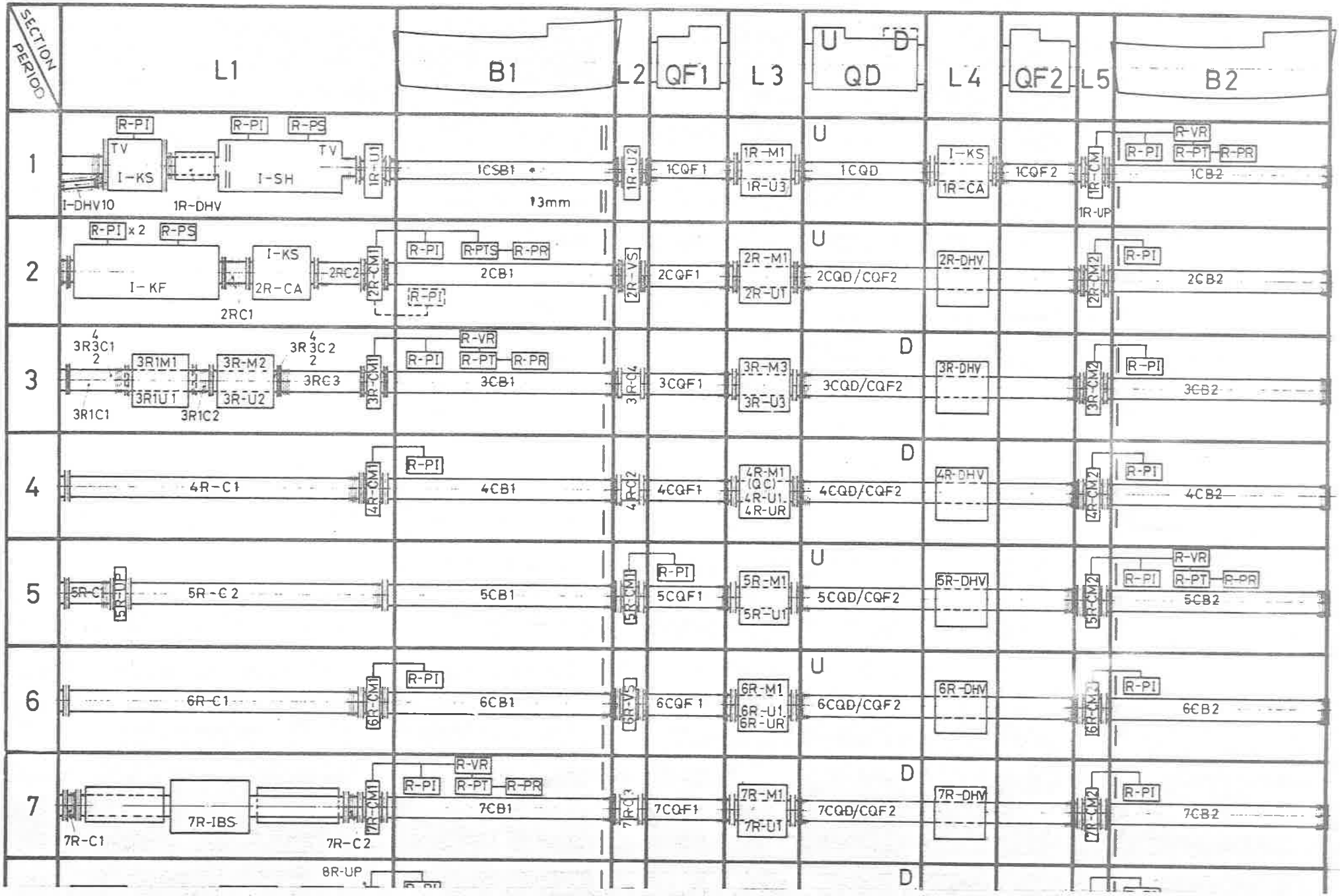
(FOR ABBREVIATIONS SEE SI/NOTE ME/69-3)

SI. 1.40.0.1020.4K

	L1	B1	L2	QF1	L3	QD (U / D)	L4	QF2	L5	B2
1	1.PI: I-KS, DH DV; 1.PI + 1PS: I-SH, TV; ●	CB ϕ 3mm. Special	●		M ●	QD.U	I-KS		PG ϕ	
2	1.PI + 1.PS.: I-KF, I-KS; PI		⋈		M ●	QD.U	DH DV		PI	
3	R1 → M ● S; M S ●; MS 19; PB				M ●	QD.D	DH DV		PI	
4	MS 18; PI				M Q ○ C	QD.D	DH DV		PI	
5	ϕ (RFC)		PI		M ●	QD.U	DH DV		PG	
6	Reserved for gas curtain; PI		⋈		M ● ○	QD.U	DH DV		PI	
7	R1 IBS-Special + PI; R2-R4 IBS-Normal; PG				M ●	QD.D	DH DV		PI	
8	M S; MS 18; TR (MS19); ϕ; PI ϕ		⋈		M Q ○ C	QD.D	DH DV		PI	
9	TA; PG				M ●	QD.U	DH DV		PI	
10	PI				M ● ○	QD.U	DH DV		PI	
11	DH DV; M S; MS 19; PG		PI ϕ		M ●	QD.D	DH DV		PI	
12	KQ; MS 18; PI		⋈		M Q ○ C	QD.D	DH DV		PG	CB with special RF Connection
13	RFC	CB with special RF Connections	PI		M ●	QD.U	DH DV		PG	
14	DH DV; 1.PI + 2PS: E-K		⋈		M ●	QD.U	ED ϕ		PG	Special CS ϕ 9mm
15	1.PI + 2.PS: TV, E-S; DH DV; E D	BS Special			M ●	QD.D	ED		PI	
16	M S; MS 18; MS 19; DH DV; PI		⋈		M Q ○ C	QD.D	I-KS		PG	BS CB with special L1 connections

● PICK UP ELECTRODE
○ RADIAL CONTROL ELECTRODE
|ϕ| PHASE ELECTRODE INCLUDING MANIFOLD
ϕ WIDE BAND ELECTRODE

BEAM STOPPER
BEAM SCRAPER
SECTOR VALVE
MANIFOLD


SECTION
PERIOD
L1
B1
L2
QF1
L3
U
D
QD
L4
QF2
L5
B2
1
R-PI
TV
I-KS
R-PI
R-PS
TV
I-SH
1R-U1
I-DHV10
1R-DHV
1CSB1
13mm
1R-U2
1CQF1
1R-M1
1R-U3
U
1CQD
I-KS
1R-CA
1CQF2
1R-CM1
1R-UP
R-VR
R-PI
R-PT
R-PR
1CB2
2
R-PI x 2
R-PS
I-KF
I-KS
2R-CA
2RC2
2RC1
2R-CM1
R-PI
R-PTS
R-PR
2CB1
R-PI
2R-VS
2CQF1
2R-M1
2R-U1
U
2CQD/CQF2
2R-DHV
2R-CM2
R-PI
2CB2
3
3R3C1
2
3R1M1
3R1U1
3R1C1
3R1C2
3R-M2
3R-U2
3R3C2
2
3RC3
3R-CM1
R-VR
R-PI
R-PT
R-PR
3CB1
3R-C4
3CQF1
3R-M3
3R-U3
D
3CQD/CQF2
3R-DHV
3R-CM2
R-PI
3CB2
4
4R-C1
4R-CM1
R-PI
4CB1
4RC2
4CQF1
4R-M1
(QC)
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4R-DHV
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5R-C2
5CB1
5R-CM1
R-PI
5CQF1
5R-M1
5R-U1
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5R-CM2
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6R-CM1
R-PI
6CB1
6R-VS
6CQF1
6R-M1
6R-U1
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6R-DHV
6R-CM2
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7R-C2
7R-CM1
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R-PI
R-PT
R-PR
7CB1
7R-C3
7CQF1
7R-M1
7R-U1
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7CQD/CQF2
7R-DHV
7R-CM2
R-PI
7CB2
8R-UP
D