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PROTON SYNCHROTRON BOOSTER (PS3)

Monsieur Jean BOUCHERON

F

PARAMETER LIST (VERSION 3)

COMPILED BY C. BOVET AND K.H. REICH

NOTE THIS LIST GIVES A CONSISTENT SET OF NOMINAL VALUES, (WITHOUT
----- MARGINS)
CHANGES MAY STILL OCCUR AND NEW VERSIONS WILL BE ISSUED

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		1.668	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 (VERT	QH QV	4.60 4.85	
PHASE ADVANCE PER PERIOD	(HOR (VERT	MUH MUV	103.6 109.1	DEG DEG
HORIZONTAL BETA FUNCTION	(MEAN (MAX	BETA H BETA H	5.62 7.18	M M
VERTICAL BETA FUNCTION	(MEAN (MAX	BETA V BETA V	6.83 18.33	M M
TUNING RANGE AT INJECTION		QH, QV	4-5	
MOMENTUM COMPACTION FUNCTION	(MAX (MIN	R.ALFAP R.ALFAP	1.44 1.04	M M
TRANSITION ENERGY / REST ENERGY		GAMMA TR \approx QH-.17		
BEAM EMITTANCE AT INJECTION	(HOR (VERT	EH EV	130 PI 1.E-6 40 PI 1.E-6	
BEAM EMITTANCE AT TRANSFER (CPS INJECTION POINT)	(HOR (VERT	EH EV	33 PI 1.E-6 12 PI 1.E-6	
CAPACITANCE CONSTANT	(INJ (TRANSFER	GO GO	2.9 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
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 (1463.3 MEV/C	BI BT	0.125320 0.592436	T 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 (UNIT D	NF ND	32 16	
BORE RADIUS		RB	60	MM
PHYSICAL LENGTH	(UNIT F (UNIT D	LF LD	0.566 0.944	M M
MAGNETIC LENGTH	(UNIT F (UNIT D	LFM LDM	0.5027 0.8811	M M
HEIGHT OF YOKE		HL	1.640	M
WIDTH OF YOKE		WL	0.56	M
MAGNETIC FIELD GRADIENT AT	(309.53 MEV/C (1463.3 MEV/C	GLI GLT	0.813 4.830	T/M T/M
COILS, NUMBER OF TURNS PER POLE		NLP	2	TURNS
WEIGHT OF ONE COMPLETE UNIT	(UNIT F (UNIT D	MFT MDT	3.13 5.64	TON TON
IRON WEIGHT	(32 F LENSES (16 D LENSES	MFI MDI	93 85	TON TON

COPPER WEIGHT	(32 F LENSES	MFC	5.95	TON
	(16 D LENSES	MDC	4.64	TON
WEIGHT OF ONE TRIPLET, GIRDER, CORR. MAGNETS			14.1	TON
INDUCTANCE	(32 F LENSES	LFI	7.7E-3	H
	(16 D LENSES	LDI	6.7E-3	H
RESISTANCE	(32 F LENSES	RF	0.076	OHM
	(16 D LENSES	RD	0.056	OHM
CURRENT DENSITY (RMS)		JLRMS	4.8	A/MM2
TOTAL STORED ENERGY (MAX)	(32 F LENSES	WFM	30.0	KJ
	(16 D LENSES	WDM	26.0	KJ
TOTAL POWER LOSSES	(32 F LENSES	PFLT	0.240	MW
	(16 D LENSES	PDLT	0.180	MW

6. CORRECTING MAGNETS

HORIZONTAL DIPOLES	(NUMBER		4*17	
	(DEFLECTION		2	MRAD
VERTICAL DIPOLES	(NUMBER		4*17	
	(DEFLECTION		2	MRAD
NORMAL QUADRUPOLES	(NUMBER		8	
	(STRENGTH		0.052	T
SKEW QUADRUPOLES	(NUMBER		12	
	(STRENGTH		0.020	T
SEXTUPOLES	(NUMBER		20	
	(STRENGTH		2.4	T/M
OCTUPOLES	(NUMBER		20	
	(STRENGTH		85	T/M2

7. MAIN MAGNET POWER SUPPLY

CABLE RESISTANCE (BENDING+QUADRUPOLES)	RC	0.024	OHM
TOTAL RESISTANCE (BEND.+QUAD.+CABLES+FILTER)	RT	0.507	OHM
TOTAL INDUCTANCE (BEND.+QUAD.+CABLES+FILTER)	LT	0.180	H
FILTER INDUCTANCE	LF	0.005	H
MAXIMUM VOLTAGE	UM	2040	V
MAXIMUM CURRENT	IM	2758	A
INJECTION CURRENT	II	585	A
STAND BY CURRENT	IO	300	A
MEAN CURRENT (RMS), FOR IO=300 A	I	1800	A
MAXIMUM DC POWER	PDCM	5.65	MW

FLAT-TOP DC POWER	PDCF	3.8	MW
MAXIMUM ACTIVE POWER	PAC	6.6	MW
MINIMUM ACTIVE POWER	PAM	0.02	MW
MAXIMUM APPARENT POWER	SAC	7.0	MVA
MAXIMUM REACTIVE POWER	QAC	2.0	MVAR
<u>Q-TUNING POWER SUPPLIES</u>			
MAXIMUM VOLTAGE	UM	370	V
MAXIMUM CURRENT	IM	220	A
MAXIMUM SLOPE	SM	2	KA/S

8. RF ACCELERATING SYSTEM

NUMBER OF CAVITIES PER RING	NC	1	
HARMONIC NUMBER	H	5	
ACCELERATING FREQUENCY (INJECTION)	NU	2.997	MHZ
(TRANSFER)	NU	8.033	MHZ
DESIGN ENERGY GAIN PER TURN	ERF	1.0	KEV
SYNCHRONOUS PHASE ANGLE	PHI-S	4.8	DGR
(FOR B DOT = 0.8 T/S)	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 $\beta\gamma$	+/-0.0018	
	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			36	
NUMBER OF MECHANICAL PUMP GROUPS			10	
NUMBER OF TI-SUBLIMATION PUMPS			6	
NUMBER OF MANIFOLDS			30	

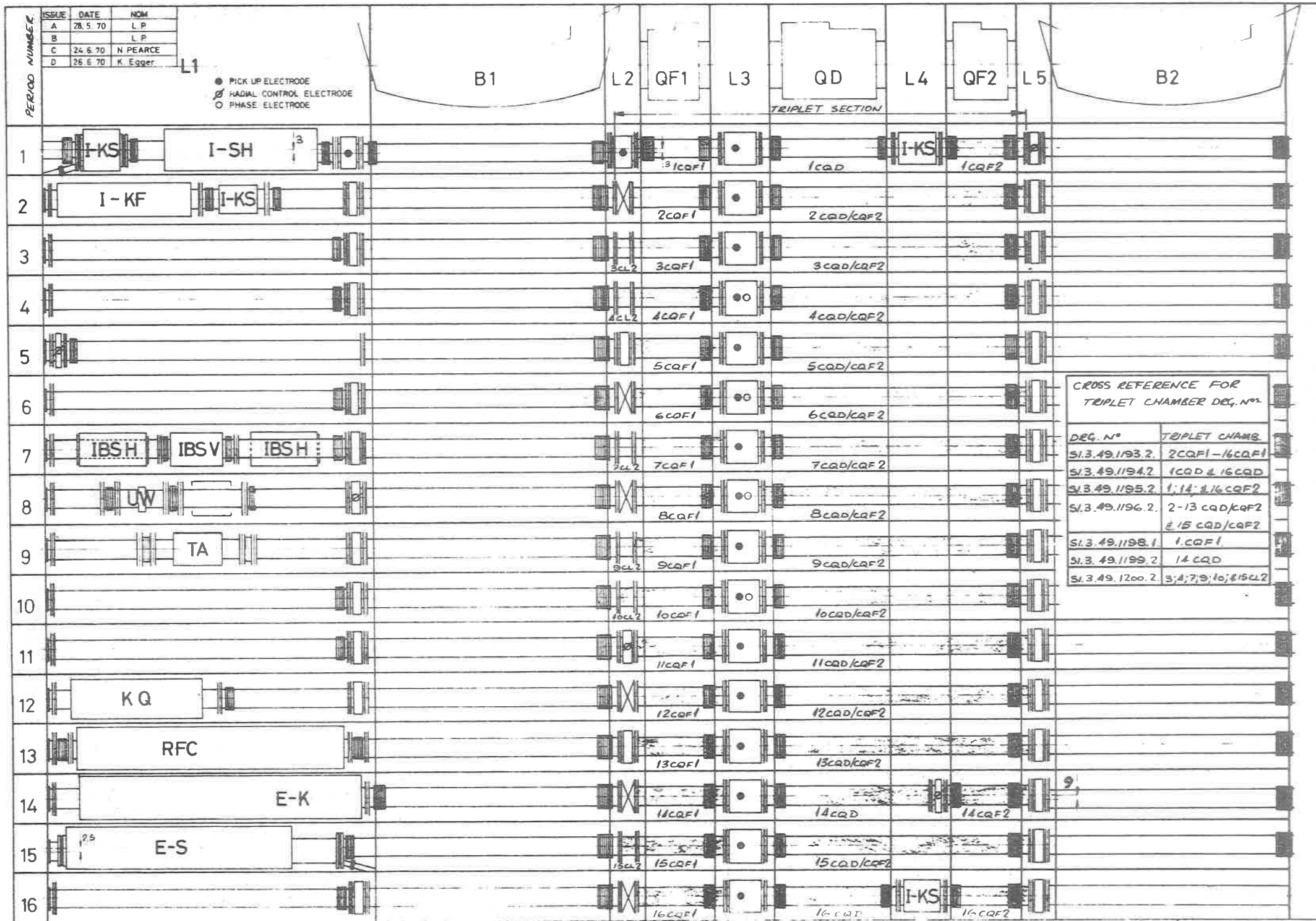
DISTRIBUTION (OPEN)
MPS-SI LIST 2
ISR SENIOR STAFF

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 "H" 15.10.73 PIANFETTI
 ISSUE "G" 3.7.70 PIANFETTI

	L1	B1	L2	L3	QD	L4	QF2	L5	B2
1	1.PI I-KS 3V I-SH TV	CB 3mm. Special		M	QD.U	I-KS		PG φ	
2	1.PI + 1.PS. I-KF I-KS		X	M	QD.U	DH DV		PI	
3	← 1.09m → M.S			M	QD.D	DH DV		PI	
4				GO C	QD.D	DH DV		PG	
5	φ (RFC)		PI	M	QD.U	DH DV		PI	
6	Reserved for gas curtain		X	M	QD.U	DH DV		PI	
7	R4 IBS-Special + PI R1-R3 IBS-Normal			M	QD.D	DH DV		PI	
8	M.S 2 TR		X	GO C	QD.D	DH DV		PI	
9	TA			M	QD.U	DH DV		PI	
10				M	QD.U	DH DV		PI	
11	← 1.09m → M.S DH DV		PI φ	M	QD.D	DH DV		PI	
12	KQ		X	GO 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 + 2.PS E-K		X	M	QD.U	ED φ		PG	Special CS 9mm
15	1.PI + 2.PS TV E-S DH DV E D	BS Special		M	QD.D	ED		PI	
16	M.S DH DV		X	GO C	QD.D	I-KS		PG	BS CB with special 7/1 connections

BEAM TRANSPORT AND OBSERVATION EQUIPMENT
 (FOR ABBREVIATIONS SEE PI NOTE NE/69-3)
 IN P.S.B
 SI 1.60.1020.41

- PICK UP ELECTRODE
- RADIAL CONTROL ELECTRODE
- ⊗ PHASE ELECTRODE INCLUDING MANIFOLD
- ⊗ WIDE BAND ELECTRODE
- BEAM STOPPER
- ▮ BEAM SCRAPER
- ⊞ SECTOR VALVE
- ▮ MANIFOLD



LAYOUT (SCHEMATIC) OF VACUUM CHAMBER IN PS-B RING

FIG 3