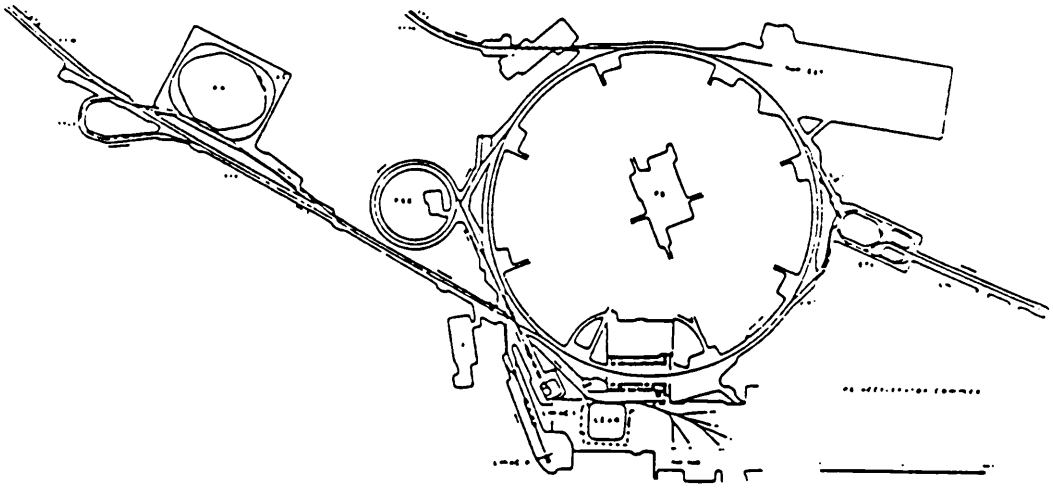
EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

CERN/PS 90-02(OP)
May 1990

STATISTICS OF PS OPERATION



1989

G. AZZONI

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STATISTICS OF PS OPERATION

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Explanatory note

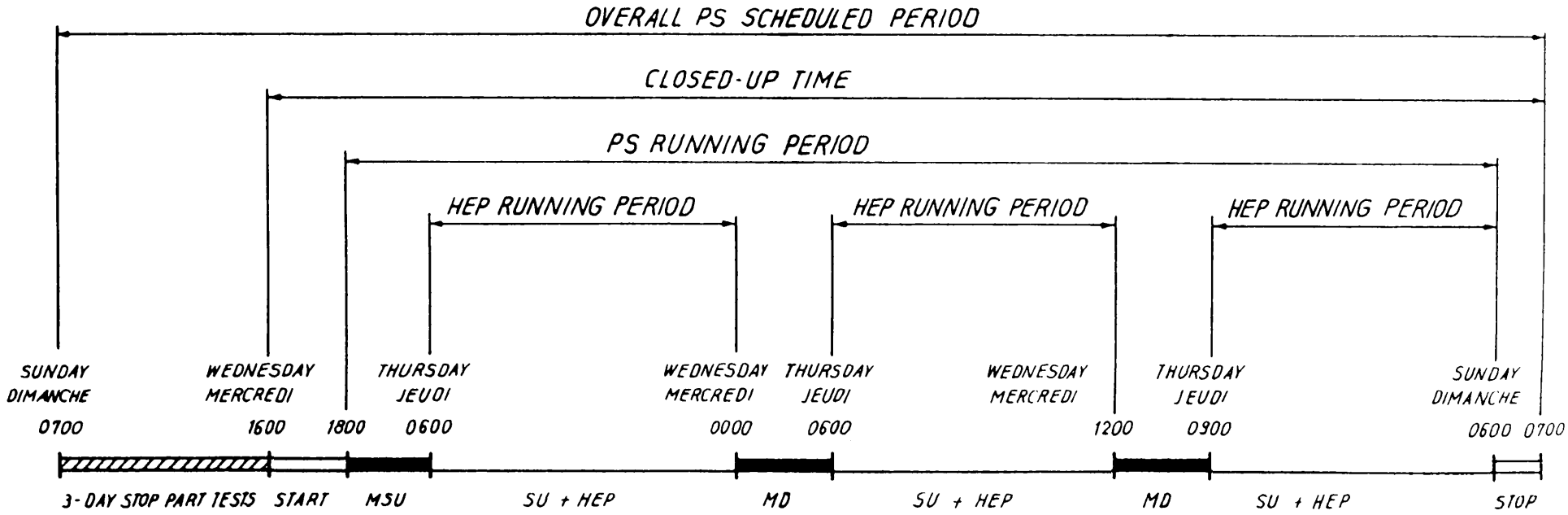
In order to clarify the figures quoted, it is necessary to give definitions of the headings for the various tables and to specify the time involved.

OVERALL PS SCHEDULES PERIOD is defined as the time which elapses between the end of one PS running period and the end of the next.

PS RUNNING PERIOD is defined as the time of continuous PS operation from the scheduled end of a PS start-up until the beginning of the next shutdown procedure and includes stops for breakdowns, etc.

HEP RUNNING PERIOD is a period of continuous PS operation for high energy physics. They are several such periods per PS running period, not necessarily of equal length and separated by a machine development period.

EXEMPLE OF A RUNNING PERIOD



MSU : Machine Setting-up

MD : PS and/or Booster and/or LPI Machine Development

SU : Setting-up

HEP : High Energy Physics (including SPS, AA, LEAR and East Hall)

- TABLE 1a: A VIEW OF PS PERFORMANCE FOR 1989

- TABLE 1b: A VIEW OF PS PERFORMANCE FOR 1989

- TABLE 1c: A VIEW OF PS PERFORMANCE FOR 1989

- TABLE 2 : STATISTICS OF PS OPERATION

For each "overall PS scheduled period", the following statistics are given:

Clock time : total number of hours in the "overall PS scheduled period"

Closed-up time is the total of the following:
- HEP : time used for high energy physics
- MD : time used for machine development
- MSU : time used for machine setting-up
- start/stop : time allocated to starting up and stopping the PS.

Partial tests (P.T.) : time taken for magnet, Linac and PSB testing, prior to PS start-up.

Cooling-down and miscellaneous : time allowed for PS cooling-down plus all the other time not included under the various headings of this chapter.

- TABLE 3 : DISTRIBUTION OF HEP TIME

Under this heading the time used for high energy physics is divided into four distinct categories (expressed as a percentage of total hours of HEP time), viz:

ON TIME	RUNNING %	: time during which the beam is actually used for high energy physics
	SETTING-UP %	: high energy operation setting-up time attributed to HEP
OFF TIME	FAULT %	: self-explanatory
	USER REQUEST %	: time during which PS is stopped at HEP users request

- TABLE 4 : HEP STATISTICS OF INTENSITY AND NUMBER OF PULSES

The total intensity, the total number of accelerated beam pulses and the average intensity are given. These are calculated for the entire HEP time in each "PS running period".

- TABLE 5 : TOTAL DISTRIBUTION OF BEAM INTENSITY (HEP)

  The distribution of the beam between the various targets* and ejection* systems is given for the HEP time of each "PS running period". Totals and percentages are quoted for the year 1989.

- TABLE 6 : HEP STATISTICS

  This gives the total number of hours of HEP time, the total number of accelerated beam pulses, the total intensity and the average intensity computed over the total time for the year 1989. The same figures are given for the period 1960-1988 inclusive and under "Grand Total" are given the overall totals and overall average for 1989.

- TABLE 7 : DISTRIBUTION OF MD TIME

  Under this heading the time used for machine development is divided into two distinct categories, viz:

  ON TIME RUNNING % : self-explanatory
  OFF TIME FAULTS % : self-explanatory.

- TABLE 8 : MD STATISTICS OF INTENSITY AND NUMBER OF PULSES

  The total intensity, the total number of accelerated beam pulses and the average intensity are given. These are calculated for the entire MD time in each "PS running period".

- TABLE 9 : TOTAL DISTRIBUTION OF BEAM INTENSITY (MD)

  The distribution of the beam between the various targets* and ejection* systems is given for the MD time of each "PS running period". Totals and percentages are quoted for the year 1989.

- TABLE 10: DISTRIBUTION OF MSU TIME

  Under this heading the time used for machine setting-up is divided into two distinct categories, viz:

  ON TIME % : self-explanatory.
  OFF TIME % : self-explanatory.

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* See annex 6 for the meaning of this heading.

- TABLE 11 : MSU STATISTICS OF INTENSITY AND NUMBER OF PULSES

The total intensity, the total number of accelerated beam pulses and the average intensity are given. These are calculated for the entire MSU time in each "PS running period".

- TABLE 12 : TOTAL DITRIBUTION OF BEAM INTENSITY (MSU)

The distribution of the beam between the various targets* and ejection* systems is given for the MSU time of each "PS running period". Totals and percentages are quoted for the year 1989.

- TABLE 13 : STATISTICS

This gives the total number of hours of HEP + MD + MSU time, the total number of accelerated beam pulses, the total intensity and the average intensity computed over the total time for the year 1989. Under "Grand Total" are given the overall totals and overall average for 1960-1989 inclusive.

- TABLE 14 and 14bis : FAULT DISTRIBUTION BY SYSTEM

These tables give the breakdown time per "PS running period" according to the various PS system**: table 14 for protons and table 14bis for leptons. Totals and percentages for 1989 are given.

- TABLE 15 : VARIATIONS OF AVERAGE INTENSITY (HEP)

The evolution of average intensity during HEP time of each "PS running period" is plotted on a graph.

- TABLE 16 : PERCENTAGE OF FAULTS

This graph shows the percentage of faults per "PS running period".

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* See Annex 6 for the meaning of this heading.

** See Annex 1 for the meaning of this heading.

- TABLE 17 : AVAILABILITY FOR THE SPS AND AA IN PERCENTAGE

This graph shows the availability for the SPS and AA in percentage. It is calculated for the HEP time of each "PS running period" according to the formulae:

$$\frac{\text{HEP time - (HEP faults + continuous transfer faults during HEP)}}{\text{HEP time}} \quad \text{for SPS}$$

and

$$\frac{\text{AA running-in time - Total PS faults (as seen by AA)}}{\text{AA running-in time}} \quad \text{for AA}$$

- TABLE 18 : FAULT DISTRIBUTION BY SYSTEM (Number of faults/Total time)

This table gives the breakdown time for the year 1989, according to the various PS systems**. The faults are further subdivided into particular time slices as follows :

0 to 10 minutes
10 to 20 minutes
20 min. to 1 hour
1 to 3 hours
3 to 6 hours
more than 6 hours

- TABLE 19 : FAULT DISTRIBUTION BY SYSTEM FOR THE BOOSTER (number of faults/total time) (B. Mangeot)

This table gives the breakdown time for the Booster only, for the year 1989.

- TABLE 20 : FAULT DISTRIBUTION BY SYSTEM for AAC (number of faults/ total time) (J. Kuczerowski)

This table gives the breakdown time for the AA only, for 1989.

- TABLE 21 : STATISTIQUES AAC (J. Kuczerowski)

Recapitulatif pour l'année 1989. See also PS/OP/Note 90-7.

** See Annex 1 for the meaning of this heading.

- TABLE 22 : 1989 PS SCHEDULE

- TABLE 23 : LEAR STATISTICS (S. Baird)

  Statistics for 1989.

- TABLE 24 : ANNUAL STATISTICS FOR THE PS COMPLEX (MONTHLY)

- TABLE 25 : EVOLUTION OF FAULT DISTRIBUTION BY SYSTEM SINCE 1981

- TABLE 26 : TOTAL PSB INTENSITY PER RING AND NUMBER OF PULSES

  The distribution of the beam between the different transformers is given for each "PS running period". Total intensity and number of pulses are quoted for 1989.

- TABLE 27 : STATISTICS OF PS INTENSITY AND FAULTS SINCE 1981

- TABLE 28 : LPI STATISTICS

  LPI functioning in 1989.

Acknowledgements

We want to thank J. Boillot, B. Frammery, L. Henny, S. Baird, K. Priestnall, and J. Kuczerowski for their help in the preparation of this document.

References

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J. Boillot, Monthly Management Reports; Programme des Accélérateurs PS en 1990, PS/OP/Note 90-1.

Y. Renaud, J. Kuczerowski, Statistiques AAC - Run1, PS/OP/Note 89-25. J. Kuczerowski, Récapitulatif Statistiques AAC - Run 2, PS/OP/Note 89-33; idem Run 3, PS/OP/Note 90-3; Statistiques annuelles AAC, PS/OP/Note 90-7.

G. Azzoni, J. Boillot, B. Frammery, K. Priestnall, PS/OP/Note 90-9, PS lepton statistics (period 3).

TABLE 1a

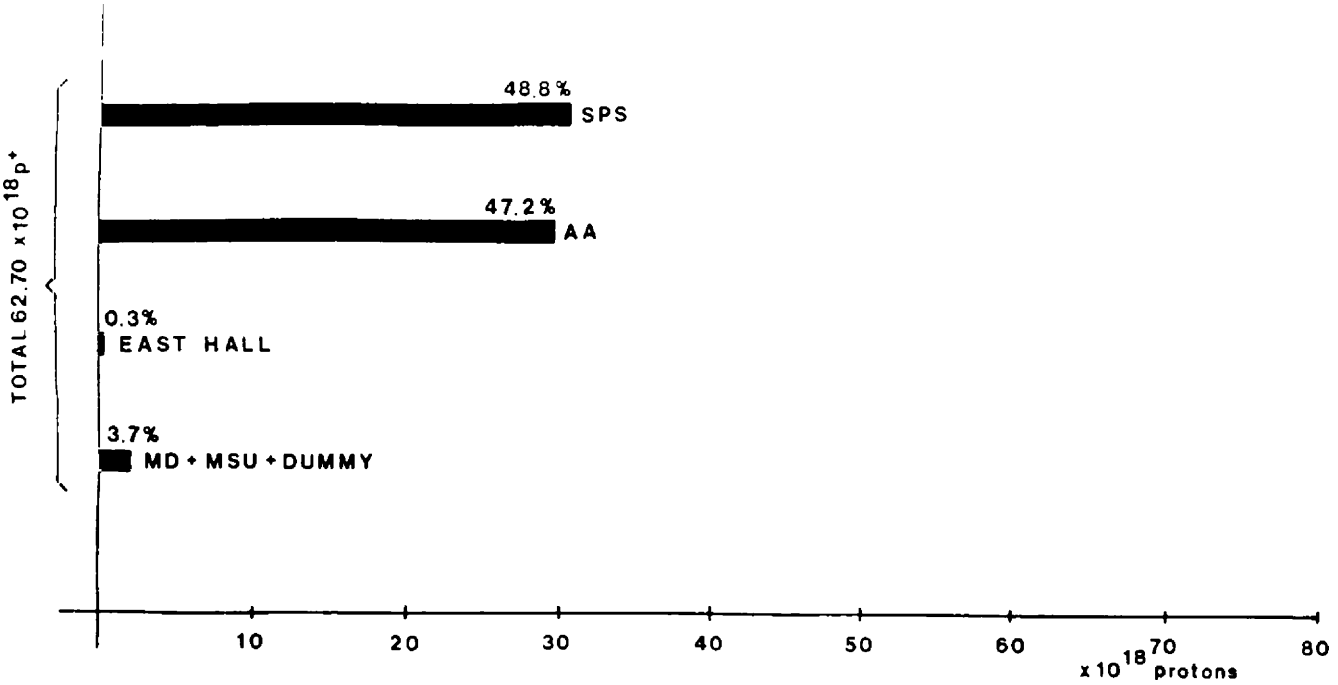


Fig.1 GENERAL DISTRIBUTION OF p^+ ACCELERATED BY THE PS IN 1989

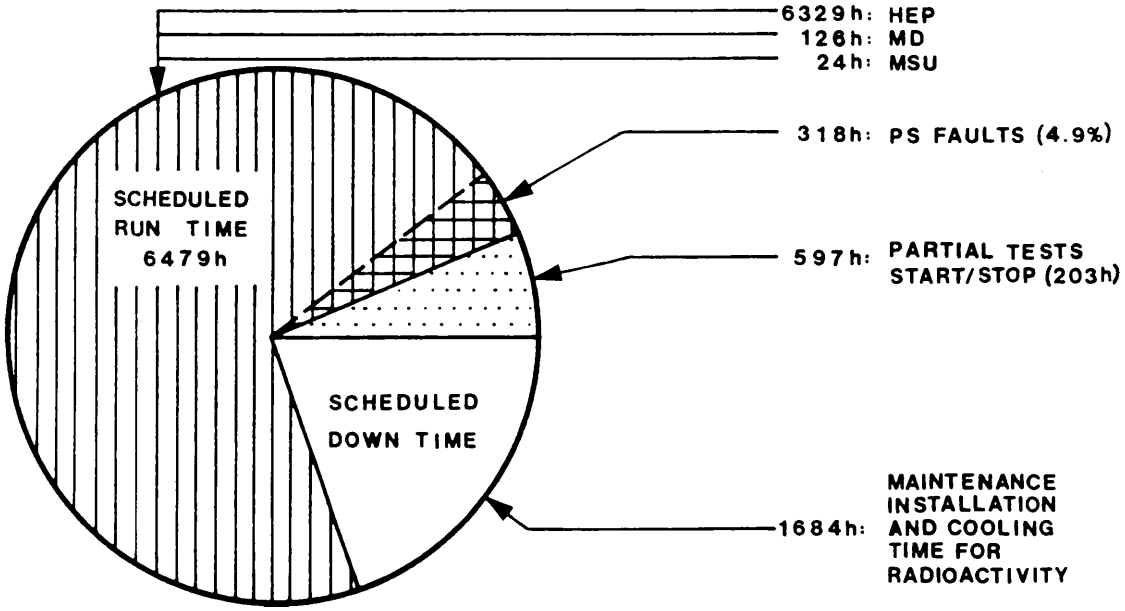


Fig.2 DIVISION OF PS CAKE FOR 1989

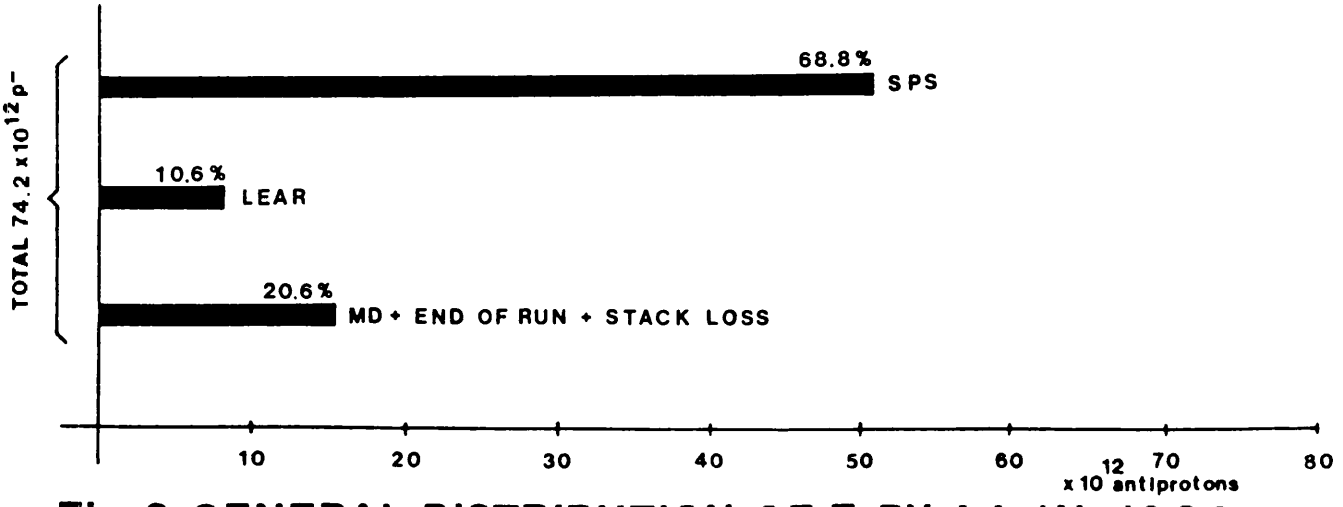


Fig.3 GENERAL DISTRIBUTION OF $\bar{p}$ BY AA IN 1989

TABLE 1b

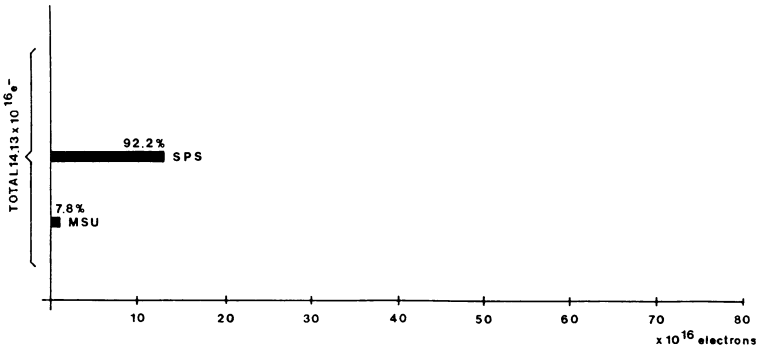


Fig.1 GENERAL DISTRIBUTION OF ELECTRONS ACCELERATED BY THE PS IN 1989

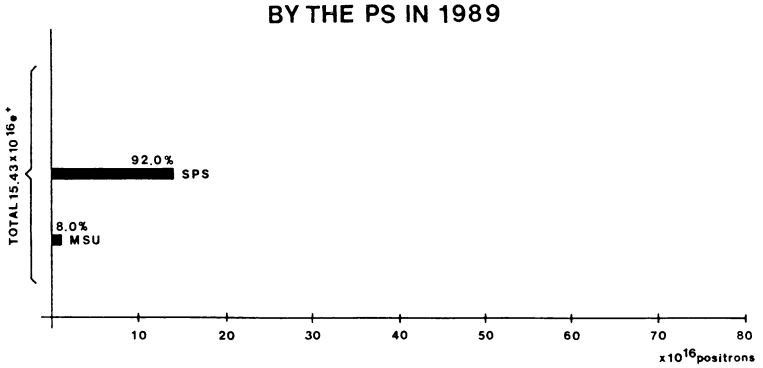


Fig.2 GENERAL DISTRIBUTION OF POSITRONS ACCELERATED BY THE PS IN 1989

TABLE 2

STATISTICS OF PS OPERATION

WEEK NO	CLOCK TIME	CLOSED - UP TIME							TOTAL		P.T.	MAINT. AND INSTAL.	COOLING DOWN AND MISCELLAN
		HEP		M.D.		M.S.U.		START/ STOP					
	(HOURS)	SCHEDULED (HOURS)	WORKED (HOURS)	SCHEDULED (HOURS)	WORKED (HOURS)	SCHEDULED (HOURS)	WORKED (HOURS)	(HOURS)	SCHED (HOURS)	WORKED (HOURS)	(HOURS)	(HOURS)	(HOURS)
1 - 8	1 320										320	1000	
9 - 25	2 856	2 641	2 641					197*	2 838	2 838	8		10
26	168											60	108
27-40	2 352	2 242	2 242	36	36	12	12	3	2293	2293	32	24	3
41	168											60	108
42-51	1 680	1 446	1 446	90	90	12	12	3	1551	1 551	34	24	71
52	216												216
TOTAL (HOURS)	8 760	6 329	6 329	126	126	24	24	203	6 682	6 682	394	1 168	516
PERCENT CLOCK TIME	100.0	72.3	72.3	1.4	1.4	0.3	0.3	2.3	76.3	76.3	4.5	13.3	5.9
PERCENT CLOSED UP TIME	—	94.7	94.7	1.9	1.9	0.4	0.4	3.0	—	100.0	—	—	—

(*)36 HEURES: PS TECHNICAL STOP

DISTRIBUTION OF HEP TIME IN HOURS (IN %)

WEEK Nº	ON TIME		OFF TIME		TOTAL HOURS OF HEP WORKED
	RUNNING	SETTING -UP	FAULTS	USER REQUEST	
1		SCHEDULED	SHUT	DOWN	
2		"	"	"	
3		"	"	"	
4		"	"	"	
5		"	"	"	
6		"	"	"	
7		"	"	"	
8		"	"	"	
9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	2 509.46 (95.0)		131.14 (5.0)		2 641.00
26		SCHEDULED	SHUT	DOWN	
27 28 29 30 31 32 33 34 35 36 37 38 39 40	2 124.52 (95.2)		117.08 (4.8)		2 242.00
41		SCHEDULED	SHUT	DOWN	
42 43 44 45 46 47 48 49 50 51	1 270.53 (87.9)		62.37 (4.3)	112.30 * (7.8)	1 446.00
52		SCHEDULED	SHUT	DOWN	
TOTAL %	93.3		4.9	1.8	100.00
TOTAL HOURS	5 905.31		310.59	112.30	6 329.00

(*) CRITICAL PERIOD

TABLE 4

HEP STATISTICS OF INTENSITY AND Nº OF PULSES

WEEK Nº	TOTAL INTENSITY $[10^{16} p^+]$	AVERAGE INTENSITY $[Tpp^{-1}]$	NUMBER OF PULSES
1	SCHEDULED	SHUT DOWN	
2	"	" "	
3	"	" "	
4	"	" "	
5	"	" "	
6	"	" "	
7	"	" "	
8	"	" "	
9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	2 360.7	5.33	4 430 000
26	SCHEDULED	SHUT DOWN	
27 28 29 30 31 32 33 34 35 36 37 38 39 40	2 511.6 (89.0 e^+) (69.2 e^-)	8.70 (0.08) (0.07)	2 888 000 (1 043 000) (1 043 000)
41	SCHEDULED	SHUT DOWN	
42 43 44 45 46 47 48 49 50 51	1 294.3 (52.9 e^+) (61.1 e^-)	7.94 (0.07) (0.08)	1 630 000 (723 000) (723 000)
52	SCHEDULED	SHUT DOWN	
TOTAL	6 166.6	6.89	8 948 000

UNITS = p^+ (10^{16}) d (10^{15}) (charges) O^{8+} (10^{14}) (charges) e^+ (10^{15}) e^- (10^{15}) S (10^{13}) (charges)

TOTAL DISTRIBUTION OF BEAM INTENSITY (HEP)

WEEK Nº	FAST EJECTIONS								SLOW EJECTION		DUMP TARGETS 47-48 D2-D3	TOTAL
			SPS									
	16							58	62			
	AA	TST	SPP		SFT			SPN	PHY.			
	p^+	p^+	p^+	e^+	p^+	d	O^{8+}	e^-	p^+	d	p^+	p^+
9-25	2 267.5	11.6	48.7						13.4		19.5	2 360.7
27-40	423.9	11.8		89.0	1965.1			69.2	5.4		105.4	2 511.6
42-51	243.9	2.8		52.9	1044.2			61.1	1.3		2.1	1 294.3
TOTAL	2 935.3	26.2	48.7	141.9	3009.3			130.3	20.1		127.0	6 166.6
PERCENT	47.6	0.4	0.8	—	48.8			—	0.3		2.1	100 0

UNITS= $p^+(10^{16})$ $d(10^{15})$ (charges) $O^{8+}(10^{14})$ (charges) $e^+(10^{15})$ $e^-(10^{15})$ $S(10^{13})$ (charges)

TABLE 5

TABLE 6

HEP STATISTICS

YEAR	TOTAL HOURS OF HEP WORKED	TOTAL NUMBER OF PULSES ACCELERATED	TOTAL NUMBER OF PROTONS [10^{16}]	AVERAGE [Tpp^{-1}]
TOTAL FOR 1989	6 329.0	8 948 000	6 166.6	6.89
TOTAL FOR 1960...1988	146 924.8	219 112 267	96 740.8	4.42
GRAND TOTAL 1960...1989	153 253.8	228 060 267	102 907.4	4.51

$1 Tpp^{-1} = 10^{12} pp^{-1}$

DISTRIBUTION OF MD TIME IN HOURS (IN %)

WEEK NO	ON TIME		OFF TIME		TOTAL HOURS OF HEP WORKED
	RUNNING	SETTING -UP	FAULTS	USER REQUEST	
1		SCHEDULED	SHUT	DOWN	
2		"	"	"	
3		"	"	"	
4		"	"	"	
5		"	"	"	
6		"	"	"	
7		"	"	"	
8		"	"	"	
9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25					
26		SCHEDULED	SHUT	DOWN	
27 28 29 30 31 32 33 34 35 36 37 38 39 40	32.39 (90.6)		3.21 (9.4)		36.00
41		SCHEDULED	SHUT	DOWN	
42 43 44 45 46 47 48 49 50 51	83.46 (93.1)		0.44 (0.8)	5.30 * (6.1)	90.00
52		SCHEDULED	SHUT	DOWN	
TOTAL %	92.4		3.2	4.4	100.00
TOTAL HOURS	116.25		4.05	5.30	126.00

(*)CRITICAL PERIOD

TABLE 8

MD STATISTICS OF INTENSITY AND Nº OF PULSES

WEEK Nº	TOTAL INTENSITY $[10^{16} p^{+}]$	AVERAGE INTENSITY $[T p p^{-1}]$	NUMBER OF PULSES
1	SCHEDULED	SHUT DOWN	
2	"	" "	
3	"	" "	
4	"	" "	
5	"	" "	
6	"	" "	
7	"	" "	
8	"	" "	
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26	SCHEDULED	SHUT DOWN	
27			
28			
29			
30			
31			
32			
33			
34	58.7	8.76	67 000
35			
36			
37			
38			
39			
40			
41	SCHEDULED	SHUT DOWN	
42			
43			
44			
45			
46	34.0	5.67	60 000
47			
48			
49			
50			
51			
52	SCHEDULED	SHUT DOWN	
TOTAL	92.7	7.30	127 000

UNITS = p^{+} (10^{16}) d (10^{15}) (charges) O^{8+} (10^{14}) (charges) e^{+} (10^{15}) e^{-} (10^{15}) S (10^{13}) (charges)

TOTAL DISTRIBUTION OF BEAM INTENSITY (MD)

WEEK NO	FAST EJECTIONS								SLOW EJECTION		DUMP TARGETS 47-48 D2-D3	TOTAL
			SPS									
	16							58	62			
	AA	TST	SPP		SFT			SPN	PHY.			
	p^+	p^+	p^+	e^+	p^+	d	O^{8+}	e^-	p^+	d	p^+	p^+
9-25												
27-40	2.8				9.7						46.2	58.7
42-51	6.1	2.3			25.6							34.0
TOTAL	8.9	2.3			35.3						46.2	92.7
PERCENT	9.6	2.5			38.1						49.8	100.0

UNITS= $p^+(10^{16})$ $d(10^{15})$ (charges) $O^{8+}(10^{14})$ (charges) $e^+(10^{15})$ $e^-(10^{15})$ $S(10^{13})$ (charges)

TABLE 9

TABLE 10

DISTRIBUTION OF MSU TIME IN HOURS (IN %)

WEEK No	ON TIME		OFF TIME		TOTAL HOURS OF HEP WORKED
	RUNNING	SETTING -UP	FAULTS	USER REQUEST	
1		SCHEDULED	SHUT	DOWN	
2		"	"	"	
3		"	"	"	
4		"	"	"	
5		"	"	"	
6		"	"	"	
7		"	"	"	
8		"	"	"	
9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25					
26		SCHEDULED	SHUT	DOWN	
27 28 29 30 31 32 33 34 35 36 37 38 39 40	11.46 (98.3)		0.14 (1.7)		12.00
41		SCHEDULED	SHUT	DOWN	
42 43 44 45 46 47 48 49 50 51	9.43 (80.8)		2.17 (19.2)		12.00
52		SCHEDULED	SHUT	DOWN	
TOTAL %	89.6		10.4		100.00
TOTAL HOURS	21.29		2.31		24.00

MSU STATISTICS OF INTENSITY AND Nº OF PULSES

WEEK Nº	TOTAL INTENSITY $[10^{16} p^+]$	AVERAGE INTENSITY $[Tpp^{-1}]$	NUMBER OF PULSES
1	SCHEDULED	SHUT DOWN	
2	"	" "	
3	"	" "	
4	"	" "	
5	"	" "	
6	"	" "	
7	"	" "	
8	"	" "	
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26	SCHEDULED	SHUT DOWN	
27			
28			
29			
30			
31	10.0	3.33	30 000
32			
33			
34	(8.7 e^+)	(0.08)	(102 000)
35			
36	(6.7 e^-)	(0.07)	(102 000)
37			
38			
39			
40			
41	SCHEDULED	SHUT DOWN	
42			
43			
44	0.2	2.00	1 000
45			
46	(3.7 e^+)	(0.07)	(51 000)
47			
48			
49	(4.3 e^-)	(0.08)	(51 000)
50			
51			
52	SCHEDULED	SHUT DOWN	
TOTAL	10.2	3.29	31 000

UNITS = $p^+(10^{16})$ $d(10^{15})$ (charges) $O^{8+}(10^{14})$ (charges) $e^+(10^{15})$ $e^-(10^{15})$ $S(10^{13})$ (charges)

TABLE 12

TOTAL DISTRIBUTION OF BEAM INTENSITY (MSU)

WEEK NO	FAST EJECTIONS								SLOW EJECTION		DUMP TARGETS 47-48 D2-D3	TOTAL
			SPS									
	16							58	62			
	AA	TST	SPP		SFT			SPN	PHY.			
	p^+	p^+	p^+	e^+	p^+	d	O^{8+}	e^-	p^+	d	p^+	p^+
9 - 25												
27-40				8.7	8.0			6.7	1.0		1.0	10.0
42-51				3.7	0.2			4.3				0.2
TOTAL				12.4	8.2			11.0	1.0		1.0	10.2
PERCENT				-	80.4			-	9.8		9.8	100.0

UNITS= $p^+(10^{16})$ $d(10^{15})$ (charges) $O^{8+}(10^{14})$ (charges) $e^+(10^{15})$ $e^-(10^{15})$ $S(10^{13})$ (charges)

PS STATISTICS
FOR HEP + MD + MSU

YEAR	TOTAL HOURS OF HEP WORKED	TOTAL NUMBER OF PULSES ACCELERATED	TOTAL NUMBER OF PROTONS [10^{16}]	AVERAGE [Tpp^{-1}]
TOTAL FOR 1989	6 479.0	9 106 000	6 269.5	9.68
TOTAL FOR 1960...1988	152 280.3	228 218 841	99 304.6	4.35
GRAND TOTAL 1960...1989	158 759.3	237 324 841	105 574.1	4.45

$1Tpp^{-1} = 10^{12}pp^{-1}$

TABLE 14

YEAR 1989	1/1 26/2	27/2 25/6	26/6 2/7	3/7 1/10	2/10 8/10	9/10 24/12	25/12 31/12	TOTAL
TIME WORKED HEP+MD +MSU (HOURS)	SCHEDULED SHUT DOWN	2 641	SCHEDULED SHUT DOWN	2 290	SCHEDULED SHUT DOWN	1548	SCHEDULED SHUT DOWN	6 479
BREAK-DOWN TIME (HOURS)		131.14		120.43		65.38		317h35'
BREAK-DOWN TIME %		5.0		5.2		4.2		4.9

[p+]

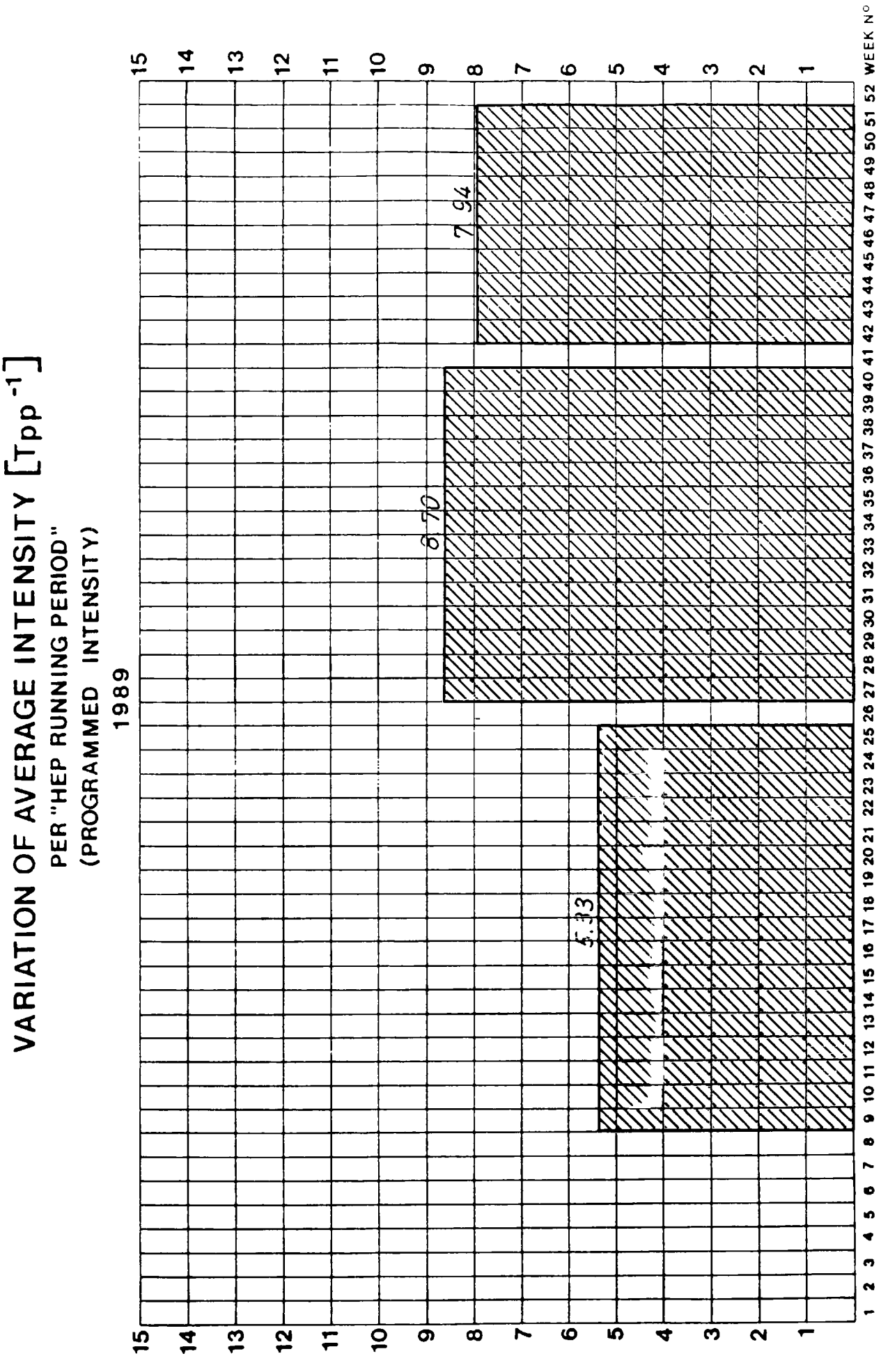
FAULT DISTRIBUTION BY SYSTEM (HOURS)									PERCENTAGE	
									OF TOTAL TIME WORKED : 6479 h	OF TIME LOST : 317h35'
MACHINE	MAIN MAGNET & AUXIL.		3.13		1.28		-	4.41	0.07	1.48
	MAIN GENE-RATOR		14.29		5.10		0.23	20.02	0.31	6.30
	LINAC		23.23		9.50		7.58	41.11	0.64	12.97
	BOOSTER	SCHEDULED SHUT DOWN	13.41	SCHEDULED SHUT DOWN	14.27	SCHEDULED SHUT DOWN	15.54	44.02	0.68	13.85
	INJECT.		4.33		9.26		1.41	15.40	0.24	4.94
	ACCEL.		15.57		48.17		6.41	70.55	1.09	22.32
	VACUUM		-		0.20		1.33	1.53	0.03	0.60
	EJECT.& TARGETS		17.27		3.19		12.52	33.38	0.52	10.58
	CONTROL SECURITY		10.25		6.09		3.23	19.57	0.31	6.30
	BEAM TRANS-PORT		4.54		12.02		3.03	19.59	0.31	6.30
	MISCELL.		0.17		0.02		-	0.19	-	0.10
	LPI									
	EXTER. FAULTS		22.55		10.13		12.10	45.18	0.70	14.26

[e⁺e⁻]

YEAR 1989	1/1 26/2	27/2 25/6	26/6 2/7	3/7 1/10	2/10 8/10	9/10 24/12	25/12 31/12	TOTAL
TIME WORKED HEP+MD +MSU (HOURS)	SCHEDULED SHUT DOWN	"	SCHEDULED SHUT DOWN	2 290	SCHEDULED SHUT DOWN	1 548	SCHEDULED SHUT DOWN	3838
BREAK-DOWN TIME (HOURS)		"		275.53		91.57		367.50
BREAK-DOWN TIME %		"		12.1		5.9		9.6

FAULT DISTRIBUTION BY SYSTEM (HOURS)									PERCENTAGE OF TOTAL TIME WORKED = 3838h	PERCENTAGE OF TIME LOST = 367h50'
MACHINE	MAIN MAGNET & AUXIL.	SCHEDULED SHUT DOWN	"	SCHEDULED SHUT DOWN	2.27	SCHEDULED SHUT DOWN	4.43	SCHEDULED SHUT DOWN	7.10	0.19	1.96
	MAIN GENE-RATOR				6.52				6.52	0.18	1.88
	LINAC										
	BOOSTER		"		1.00				1.00	0.03	0.27
	INJECT.				2.14		2.10		4.24	0.12	1.14
	ACCEL.		"		60.33		0.56		61.29	1.60	16.72
	VACUUM				0.28				0.28	0.01	0.14
	EJECT.& TARGETS		"		3.14		3.29		6.43	0.18	1.82
	CONTROL SECURITY				6.46		0.36		7.22	0.19	2.02
	BEAM TRANS-PORT				12.35		2.20		14.55	0.39	4.06
	MISCELL.										
	LPI				170.31		62.00		232.31	6.06	63.22
	EXTER. FAULTS				9.13		15.43		24.56	0.65	6.77

TABLE 15


VARIATION OF AVERAGE INTENSITY [Tpp⁻¹]
PER "HEP RUNNING PERIOD"
(PROGRAMMED INTENSITY)
1989
15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
7.94
8.70
5.33
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 WEEK N°

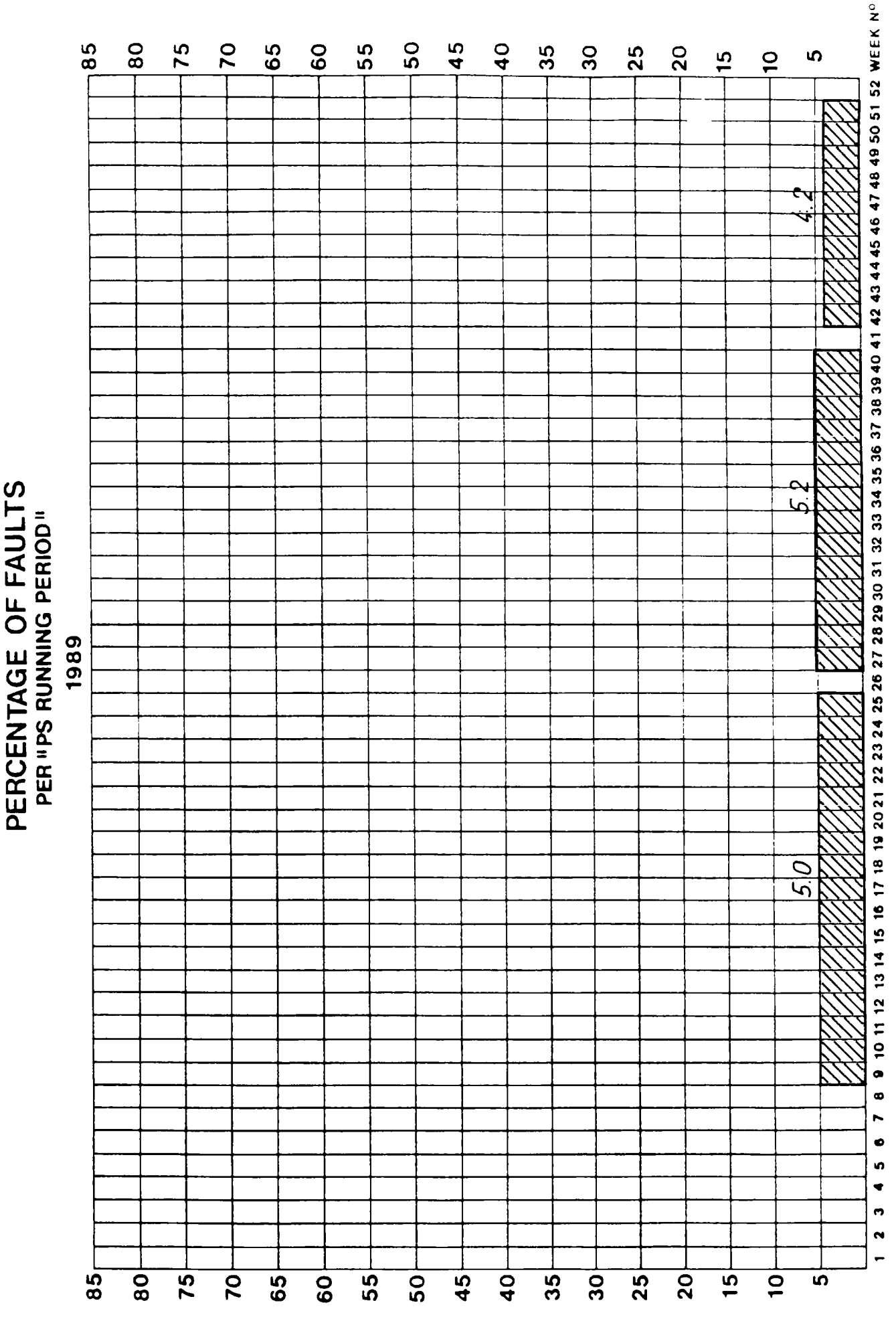
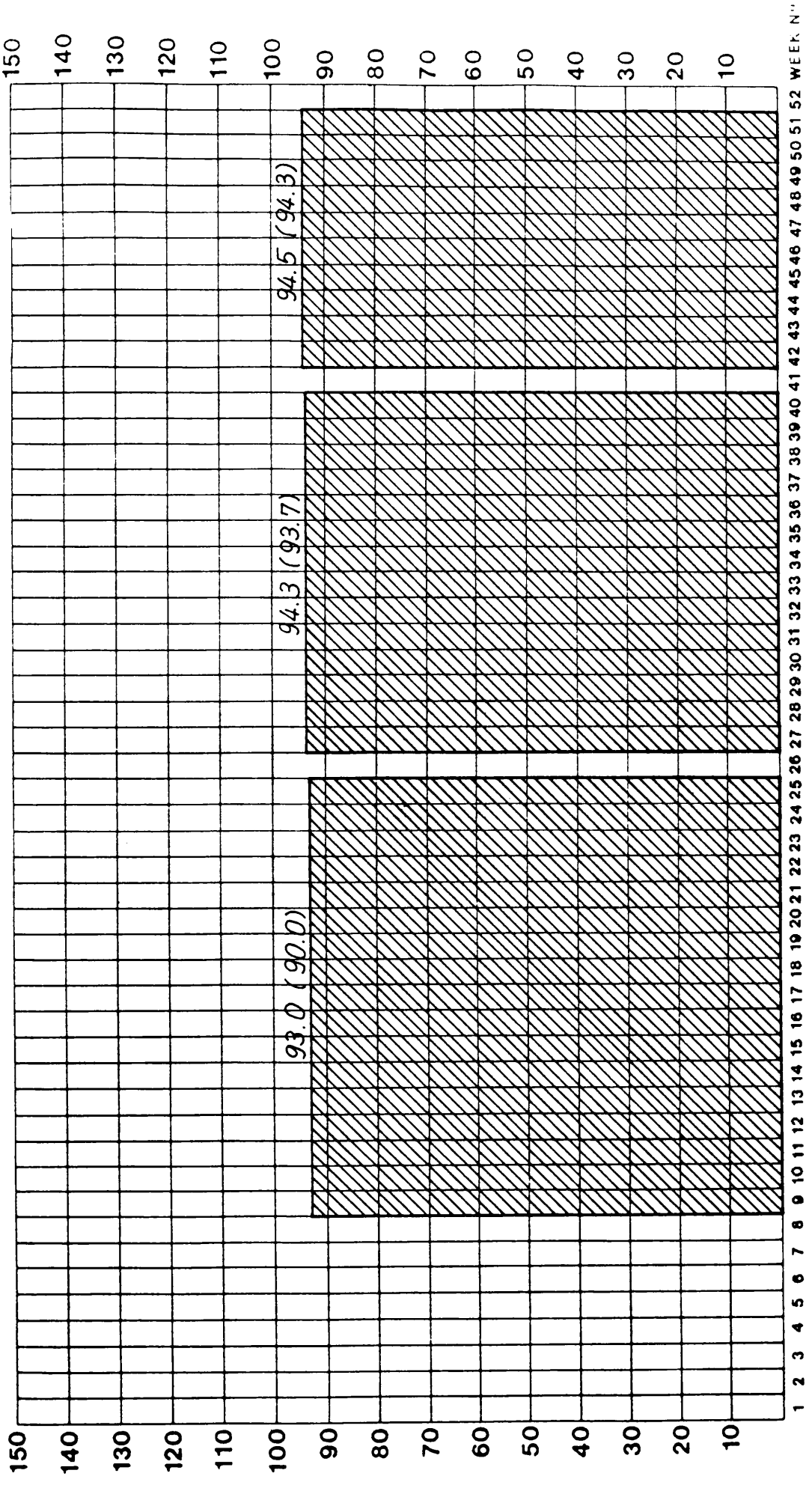

PERCENTAGE OF FAULTS
PER "PS RUNNING PERIOD"
1989
85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 WEEK N°
5.0
5.2
4.2

TABLE17


AVAILABILITY FOR THE SPS AND AA IN PERCENTAGE
PER "HEP RUNNING PERIOD"
(AA)
93.0 (90.0)
94.3 (93.7)
94.5 (94.3)
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 WEEK N

(p^+) FAULT DISTRIBUTION BY SYSTEM (Number of faults/ Total time)

YEAR 1989	0'- 10' 290/21^h.46'	10'- 20' 117/25^h.49'	20'- 1H 135/76^h.13'	1H - 3H 71/117^h.21'	3H - 6H 10/41^h.46'	> 6H 3/34^h.40'	TOTAL 626/317^h.35'
MAIN MAGNET & AUXILIARIES	5/0.17	1/0.10	5/2.56	1/1.18	-	-	12/4.41
MAIN GENERATOR	58/3.58	14/3.00	6/4.03	5/9.01	-	-	83/20.02
LINAC	32/2.23	11/2.19	16/8.52	11/19.03	2/8.34	-	72/41.11
BOOSTER	20/1.43	20/4.43	17/9.15	12/19.45	2/8.36	-	71/44.02
INJECTION	23/1.29	9/2.04	11/5.18	4/6.49	-	-	47/15.40
ACCELERAT.	56/4.05	25/5.42	32/17.12	10/15.58	1/3.12	2/24.46	126/70.55
VACUUM	-	-	1/0.20	1/1.33	-	-	2/1.53
EJECTION & TARGETS	48/3.58	15/2.55	16/10.08	8/13.14	1/3.23	-	88/33.38
CONTROL	18/1.17	11/2.26	17/9.34	4/6.40	-	-	50/19.57
BEAM TRANSPORT	10/1.02	7/1.34	8/4.27	4/7.01	1/5.55	-	30/19.59
MISCELL.	5/0.19	-	-	-	-	-	5/0.19
EXT. FAULTS	15/1.15	4/0.56	6/4.08	11/16.59	3/12.06	1/9.54	40/45.18

TABLE 18

TABLE 19

REPARTITION DES PANNES BOOSTER ANNEE 1989

		1' - 10'	11' - 20'	21' - 1h	1h - 3h	3h - 6h	>6h	TOTAL
MAGNET	Nombre	1		2	4			7
	Duree	2'		82'	366'			7h30
ALIM.	Nombre	15	9	13	6	2		45
	Duree	84'	127'	454'	577'	434'		27h56
KICKER	Nombre							0
	Duree							0h00
ACCEL.	Nombre	1	6	2	2			11
	Duree	7'	86'	58'	136'			4h47
VACUUM	Nombre	1			1			2
	Duree	5'			93'			1h38
CONTROL	Nombre	3	5	2	1	2		13
	Duree	11'	84'	68'	165'	443'		12h51
MISCEL.	Nombre	3	5	2	2			12
	Duree	21'	87'	69'	196'			6h13
EXT. FLT	Nombre	10	3	4	3			20
	Duree	59'	60'	174'	294'			9h47
TOTAL	Nombre							110
	Duree							70h42

FAULT DISTRIBUTION BY SYSTEM FOR AAC
Number of faults/Total time

ANNEE 1989	0..10mn	10..20mn	20mn..1h	1h..3h	3h..6h	> 6h	Total
	86	66	127	69	17	17	382
	6h18mn	10h11mn	61h26mn	115h26mn	68h48mn	176h44mn	438h53mn
INJECTION	2	11	24	17	4	2	60
	0h10mn	1h40mn	13h27mn	29h11mn	14h33mn	31h11mn	90h12mn
EJECTION	3	2	2				7
	0h12mn	0h20mn	0h45mn				1h17mn
RINGS AAC			7	6	1	2	16
			4h01mn	9h38mn	3h55mn	16h00mn	33h34mn
AA ---> AC	2	3	20	2	3	1	31
	0h06mn	0h27mn	8h08mn	2h21mn	11h30mn	7h57mn	30h29mn
KICKERS	6	1	7	1	1		16
	0h19mn	0h10mn	3h10mn	1h00mn	3h30mn		8h09mn
SHUTTERS							0
							0h00mn
R.F.	4	10	19	11	1	1	46
	0h16mn	1h27mn	9h39mn	19h03mn	3h35mn	11h00mn	45h00mn
COOLING	8	6	5	3	1	2	25
	0h24mn	1h01mn	2h55mn	5h30mn	3h45mn	16h00mn	29h35mn
VACUUM		3	2				5
		0h28mn	0h40mn				1h08mn
CONTROLS	3		11	12			26
	0h15mn		6h23mn	19h03mn			25h41mn
TIMING	1	2	1	2			6
	0h04mn	0h20mn	0h30mn	2h20mn			3h14mn
SECURITY		1	3	1			5
		0h10mn	1h30mn	1h00mn			2h40mn
WATER	5	25	16	9	4	8	67
	0h24mn	3h48mn	6h46mn	18h00mn	20h20mn	86h31mn	135h49mn
DIVERS	52	2	10	5	2	1	72
	4h08mn	0h20mn	3h32mn	8h20mn	7h40mn	8h05mn	32h05mn

TABLE 21

PS/OP/JK

10-01-1990

STATISTIQUES AAC

ANNEE 1989

1) FONCTIONNEMENT DU AAC
- Heures prévues : 5883h
- Heures réalisées : 6037h

2) PANNES PS
- Total des pannes PS vues par AAC : 471h 59mn
- Disponibilité PS--->AAC : 92.1 %

3) PANNES AAC
- Total des pannes AAC : 435h 03mn (336 Pannes)
- AAC down time sans pertes de stack: 7.2 %
- AAC down time avec pertes de stack: 12.5 %

Répartition des différentes pannes

INJECTION	: 90h 12mn (60)	COOLING	: 29h 35mn (25)
EJECTION	: 1h 17mn (7)	VACUUM	: 1h 08mn (5)
RINGS AAC	: 33h 34mn (16)	CONTROLS	: 25h 41mn (26)
AA ---> AC	: 30h 29mn (31)	TIMING	: 3h 14mn (6)
KICKERS	: 8h 09mn (16)	SECURITY	: 2h 40mn (5)
SHUTTERS	: 0h 00mn (0)	WATER	: 135h 49mn (67)
R.F.	: 45h 00mn (46)	DIVERS	: 32h 05mn (72)

4) FONCTIONNEMENT EFFECTIF DU AAC
- Sans les pertes de stack : 5601h 57mn soit 92.7 %
- Avec les pertes de stack : 5279h 38mn soit 87.4 %

5) PRODUCTION D'ANTIPROTONS : 74199.2 E9
- Temps de production : 2391h 10mn
- Taux de production : 31.0 E9/h

6) PERTES DE STACK PAR PANNES AA : 7942.75 E9(soit 10.70 %)
- Temps de perte équivalent : 322h 19mn soit 5.3 %

7) STACK MAXIMUM DURANT LA PERIODE : 1310.6E9 le 9 AOUT

8) PBARS DIVERS (ME,fin de RUN,18kV): 7325.4 E9(soit 9.87 %)

9) TRANSFERTS
- Pbars délivrés au SPS : 51033.5 E9(soit 68.77 %)
- Pbars délivrés au LEAR : 7897.55 E9(soit 10.64 %)

1989 PS SCHEDULE

TABLE 22

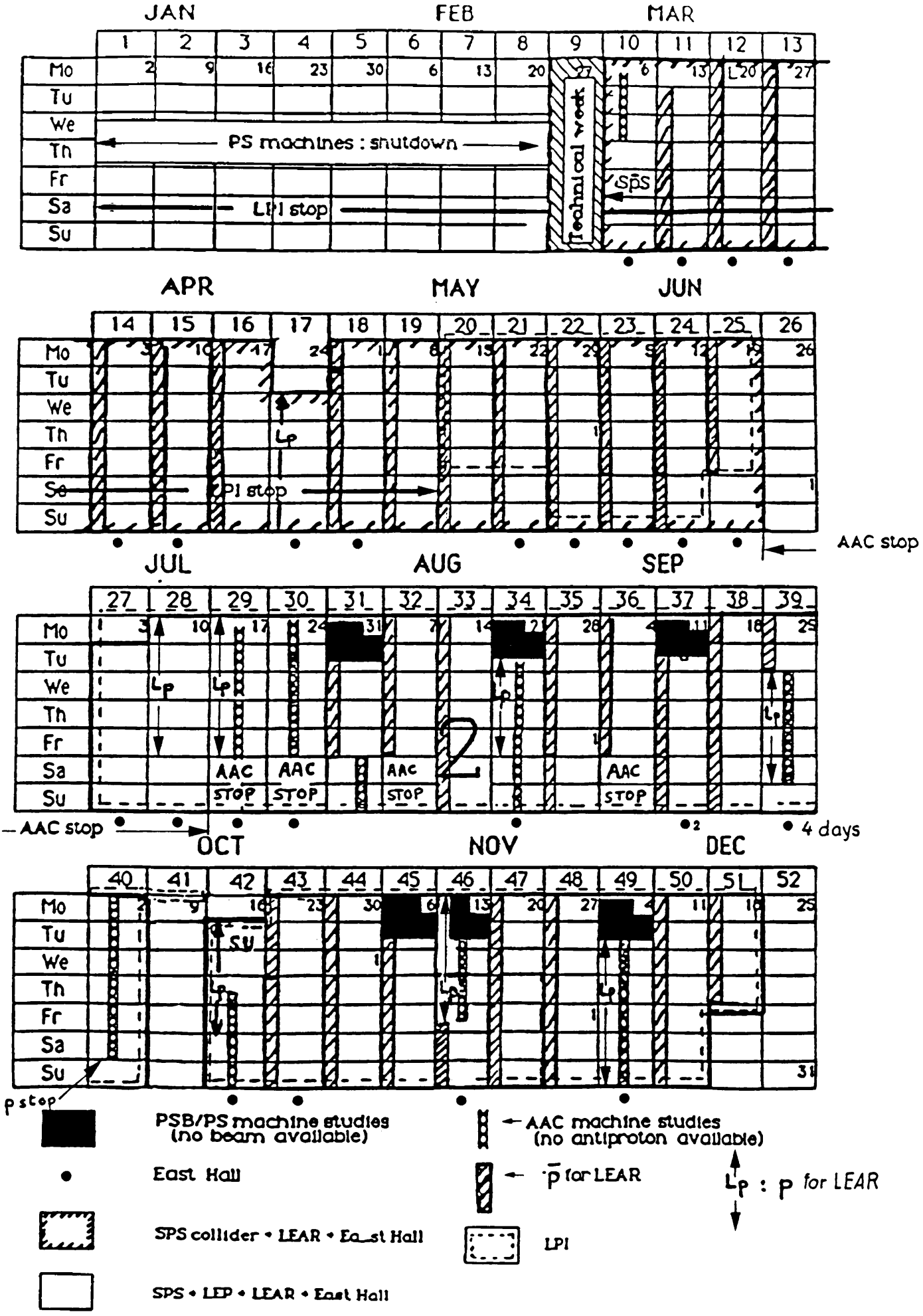


TABLE 23

STATISTICS FOR LEAR OPERATION IN 1989

Table 3
Statistics for LEAR operation in 1989

Scheduled physics running time	3483 hours
Scheduled setting-up time	1820 "
Achieved setting-up time[1]	1848 "
Total number of pulses injected	2070
Total number of pulses extracted for physics	1656
Total number of antiprotons injected	$7.1\ 10^{12}$
Total number of antiprotons ready for extraction for physics	$4.5\ 10^{12}$
1) Includes physics, setting-up and machine development	

1989 TECHNICAL PARAMETERS

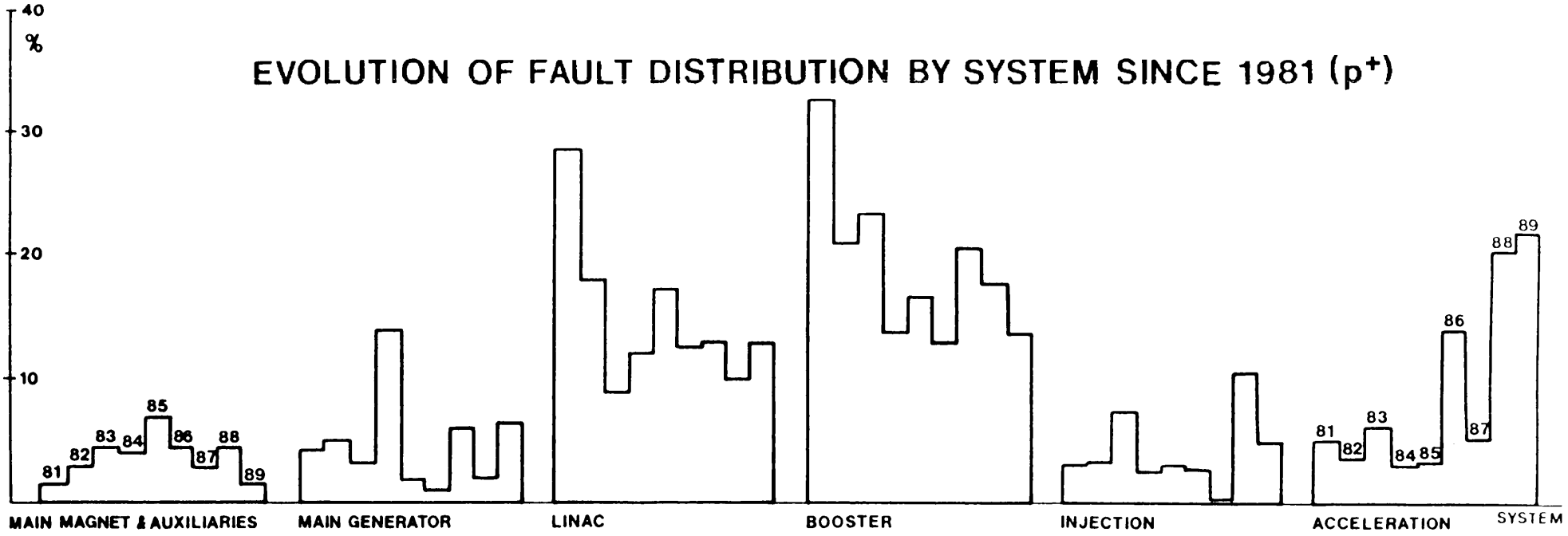
ACCELERATORS	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	TOTAL
SC													
Hours scheduled for physics		408	483	296	408	684	145	s	412	344	378	461	4019
Hours given to physics		389	472	249	384	672	140	h	389	334	371	439	3839
Hours given/hours scheduled		95.3	97.7	84.1	94.1	98.3	96.5	u	94.4	97.1	98.2	95.2	95.5
Hours scheduled for MD + Setting-up		132	6	194	228	0	0	t	184	28	134	7	913
Hours given to machine development + SU		132	6	195	228	0	0	d	203	29	134	7	934
Total hours scheduled		540	489	490	636	684	145	o	596	372	512	468	4932
Total hours realised		521	478	444	612	672	140	w	592	363	505	446	4773
								n					
PS													
Hours scheduled for physics		-	616	684	744	597	618	744	684	502	660	480	6329
Hours given to physics (3)		-	567	649	711	583	585	706	641	491	635	450	6018
Hours given/hours scheduled		-	92	94.9	95.5	97.65	94.6	94.9	93.7	97.8	96.2	93.8	95.1
Hours scheduled for MD + Setting-up	s	32	128	36	0	1	14	0	36	15	60	31	353
Hours given to machine development + SU	h	32	128	36	0	1	14	0	32	13	59	31	346
Total hours scheduled	u	32	744	720	744	598	632	744	720	517	720	511	6682
Total hours realized	t	32	695	685	711	584	599	706	673	504	694	481	6364
- LINAC 2													
Hours scheduled	d	68	744	720	744	598	632	744	720	518	720	511	6719
Hours realized	o	66	735	715	735	598	631	739	716	517	715	503	6668
Hours realized/Hours scheduled	w	97.0	98.8	99.3	98.8	100	99.8	99.3	99.4	99.8	99.3	98.43	99.2
- PSB	n												
Hours scheduled		32	744	720	744	598	632	744	720	517	720	511	6682
Hours realized		32	738	715	740	596	630	739	713	512	704	500	6621
Hours realized/Hours scheduled		100	99.2	99.3	99.4	99.6	99.7	99.3	99.0	99.0	97.8	97.9	99.1
- AA/AC													
Hours scheduled			744	720	744	600	224	636	666	444	720	510	6008
Hours realized (1)			659	574	538	568	195	560	616	437	654	501	5303
Hours realized/Hours scheduled			88.6	79.7	72.3	94.7	87.5	88	92.5	98.4	90.8	98.2	88.3
- LINAC 1													
Hours scheduled			552	156	264	120	648	87	60	110	100	96	2193
Hours realized			504	153	258	80	642	86	60	110	100	96	2089
Hours realized/Hours scheduled		s	91.3	98.1	97.7	66.7	99.1	98.85	100	100	100	100	95.3
- LP1		h		s									
Hours scheduled		u	s	h	232	608	744	744	720	567	720	510	4845
Hours realized		t	h	u	198	578	648	697	691	546	706	473	4537
Hours realized/Hours scheduled			u	t	85.3	95.1	87.1	93.7	96.0	96.3	98.1	92.8	93.6
as PS injector scheduled		d	t	d	0	0	539	720	670	522	702	464	3617
as PS injector realized		o		o	0	0	507	673	647	510	689	428	3454
		w	d	w									
LEAR		n	o	n									
Hours scheduled for physics ($\bar{p}$)			w	528	628	428	0	245	552	200	568	334	3483
Number of spills given to physics (2)			n	245	284	219	0	236	245	42	252	155	1678
Number of spills lost				20	11	13	0	28	14	11	5	11	113
Efficiency				92.3	96.3	94.4	0	89.4	94.6	79.3	98.1	93.4	93.7
Hours scheduled for MD + SU ($p\bar{p}$)			700	168	116	124	160	208	72	66	110	96	1820
Hours given " " " "			600	168	116	132	280	208	72	66	110	96	1848

(1) included pbar stack losses
(2) 1 hour spill time in general
(3) including East Hall

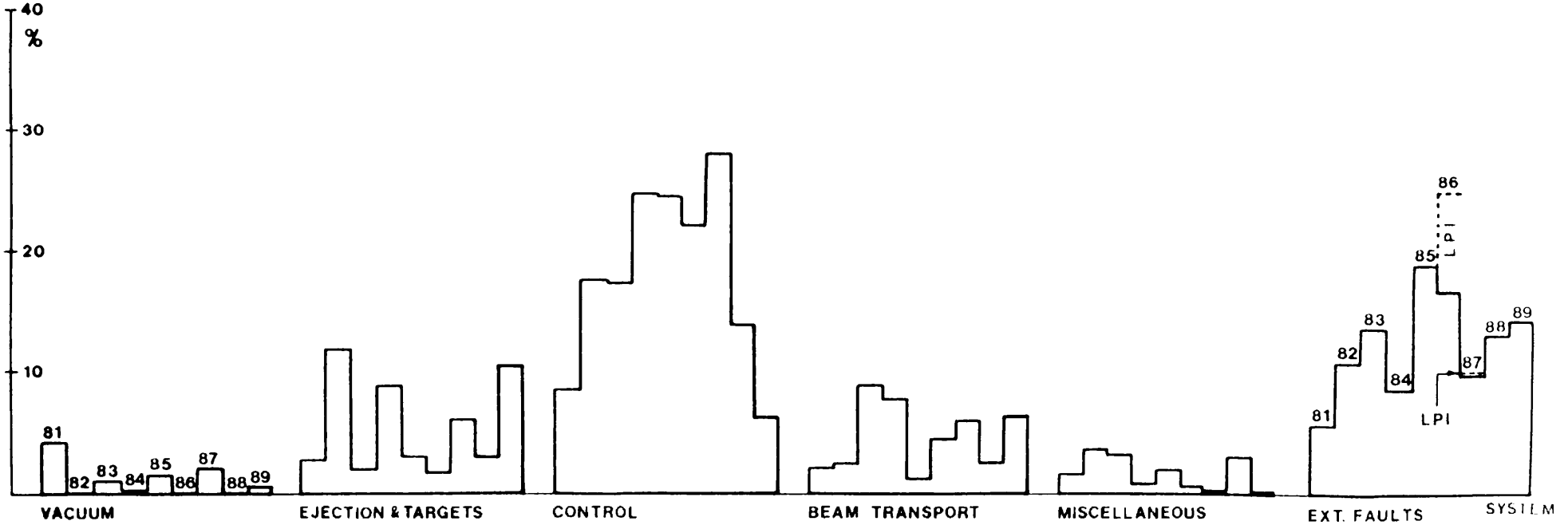
TABLE 24

TABLE 25

EVOLUTION OF FAULT DISTRIBUTION BY SYSTEM SINCE 1981 (p^+)



TOTAL: **1981** = $513^h47'$ **1982** = $492^h15'$ **1983** = $498^h56'$ **1984** = $494^h03'$ **1985** = $419^h51'$ **1986** = $393^h20'$ **1987** = $264^h04'$
1988 = $386^h04'$ **1989** = $317^h35'$



TOTAL PSB INTENSITY PER RING AND N° OF PULSES

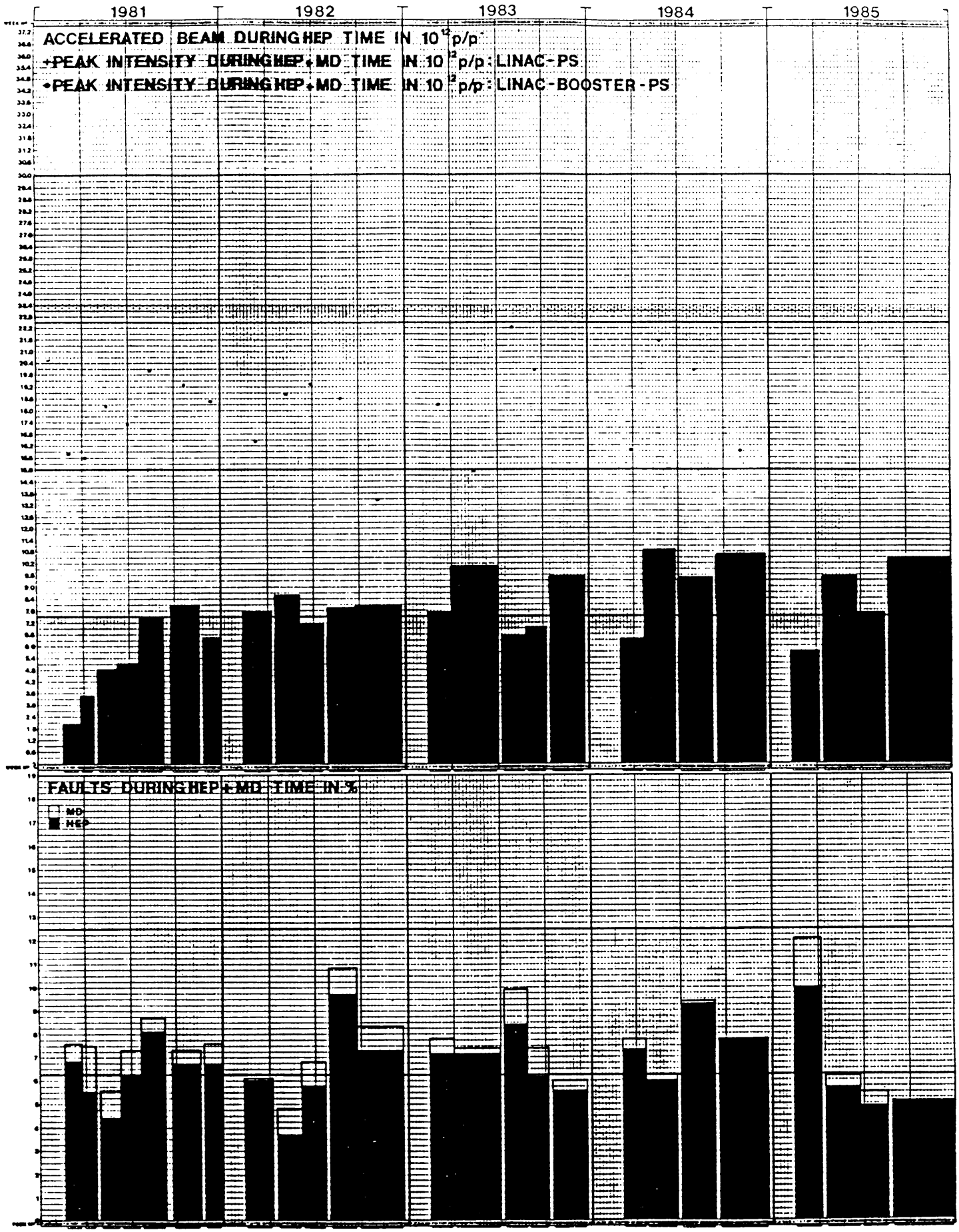
ALL VALUES ARE IN 10^{16} PROTONS

WEEK N°		RING 4	RING 3	RING 2	RING 1	TOTAL
9-25	TRA 20	180	3 304	2 677	383	6 544
	INJECTION	115	1 922	1 657	64	3 758
	CAPTURE	84	1 584	1 313	48	3 029
	ACCELERATION	56	1 322	1 183	30	2 591
	OUT					2 389
	PULSES(10^3)					4 351
27-40	TRA 20	1 282	1 806	1 632	1 412	6 132
	INJECTION	795	986	911	753	3 445
	CAPTURE	667	850	774	618	2 909
	ACCELERATION	682	808	783	609	2 882
	OUT					2 763
	PULSES(10^3)					3 422
42-51	TRA 20	876	972	860	878	3 586
	INJECTION	496	517	468	468	1 949
	CAPTURE	388	428	398	384	1 598
	ACCELERATION	350	356	355	340	1 401
	OUT					1 400
	PULSES(10^3)					1 839
	TRA 20					
	INJECTION					
	CAPTURE					
	ACCELERATION					
	OUT					
	PULSES(10^3)					
TOTAL	TRA 20	2 338	6 082	5 169	2 673	16 262
	INJECTION	1 406	3 425	3 036	1 285	9 152
	CAPTURE	1 139	2 862	2 485	1 050	7 536
	ACCELERATION	1 088	2 486	2 321	979	6 874
	OUT					6 552
	PULSES(10^3)					9 612

• UNTIL 1989 RING 4 - - - 1 INVERTED

TABLE 26

TABLE 27-1


1981
1982
1983
1984
1985
ACCELERATED BEAM DURING HEP TIME IN 10^12 p/p
+PEAK INTENSITY DURING HEP + MD TIME IN 10^12 p/p : LINAC-PS
•PEAK INTENSITY DURING HEP + MD TIME IN 10^12 p/p : LINAC-BOOSTER-PS
FAULTS DURING HEP + MD TIME IN %
MD
HEP

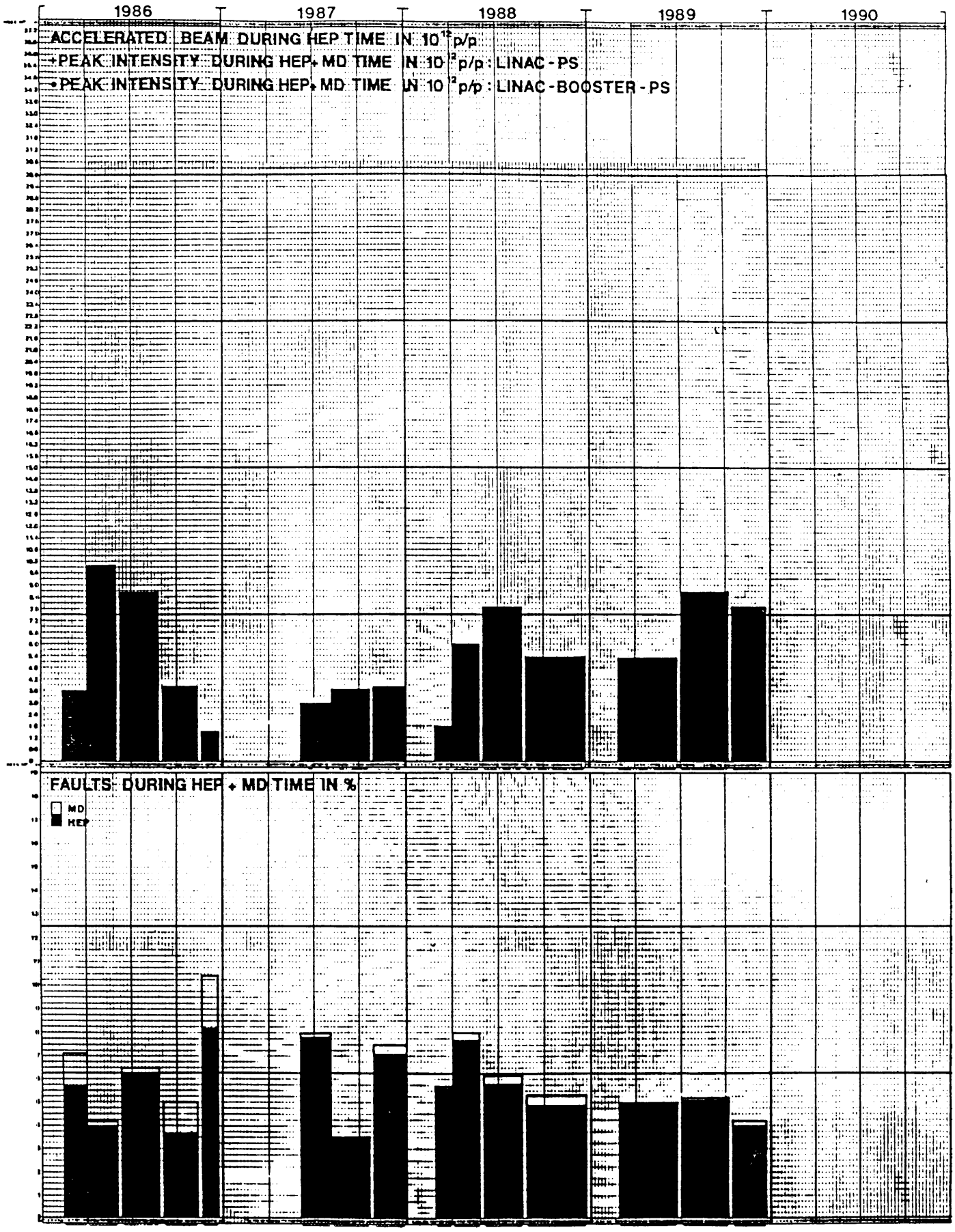

1986
1987
1988
1989
1990
ACCELERATED BEAM DURING HEP TIME IN 10^12 p/p
+PEAK INTENSITY DURING HEP+ MD TIME IN 10^12 p/p : LINAC - PS
•PEAK INTENSITY DURING HEP+ MD TIME IN 10^12 p/p : LINAC - BOOSTER - PS
FAULTS DURING HEP + MD TIME IN %
MD
HEP

TABLE 28

LPI Statistics 1989

LPI started up in May with the formation of the LIL sections followed by the setting-up of the machine in preparation for the production run.

At the end of June, beam was provided for the PS setting-up followed by the LEP run in July.

Production continued until Christmas with a week's shutdown in October.

Total LPI run time -	4850 hrs.	
LPI tests and commissioning -	800 hrs.	
Total LPI production time -	4050 hrs.	scheduled.
	3797 hrs.	given.
	93.7 %	efficiency.

Included in the LPI production time is:

Production for PS/LEP -	3624 hrs.	scheduled
	3391 hrs.	given.
	93.6 %	efficiency.

FAULT DISTRIBUTION BY SYSTEM

1. Main magnet and auxiliaries

   Here are gathered all the faults of the PS magnets, the cooling system, the PFW's, the "high energy": quadrupoles, sextupoles, octupoles, the Tekelec type power supplies, the power supplies for type "D" and "M", the equipment for "B" and "C" trains, the shims.

2. Main generator

   All the faults concerning the main magnet power supply are classed in this section.

3. Linacs I and II

   All the Linac faults (including controls) for the old (Linac I) and the new (Linac II) are found here, except for vacuum faults (see the vacuum diagram annexed).

4. Booster

   All the Booster faults (vacuum, RF, controls, etc.) are classed here, beginning from I-VS2 (BI.VVS10) up to T-VS5 (BTP.VVS20) for the vacuum; the ejection line to the PS up to T-QU5 (TP.QNO10) inclusive (transfer line) for the magnet units; the transfer line up to and including TIS (PI.SMH42) for the magnet power supplies and for demineralised water supply).

5. Injection

   This section comprises all the faults related to 1 GeV injection and e^+/e^- injection.

6. Acceleration

   All the faults related to the radio-frequency (beam control, cavities, etc.) which can be defined as active equipment are found here; plus all the faults concerning what can be called the passive part, I_p measuring system, the ACEM detectors, the pick-up stations. (See annex 2 for passive part).

7. Vacuum

All faults related to the PS, Linac I, Linac II, Booster, FT16, FA58, FT62, HTE, HTP, LIL/EPA, AA, ACOL and LEAR are found here, according to their position in the layout. (See vacuum diagrams annexed).

8. Ejection - targets

Here are classed all the faults concerning the ejections: 16, 58, 62, LEAR, the dump targets, the measurement targets, the TV's, the measuring transformers to extracted beam, the SEC's and BLM's.

9. Control

All the faults of the various parts of the centralised PS computer system are found here, plus the security (beam stoppers, fire detection equipment, etc.), the timing (pulse distribution to Linac, MCR, CB, etc.).

Note: 1) the faults due to security are put here.

2) as indicated in 3 and 4, the controls faults are included for the Linacs and the Booster as in the past.

10. Miscellaneous

All the faults found here will be dealt with in detail in Annex 3.

11. Beam transport

All the faults related to the separators, the magnets, the quadrupoles and their cooling system, the vaccum ejected beams, the septa and the hydrogen targets are to be found in this section; plus the ATP, FT16, FTS, FT62 and FA58 lines.

12. External faults

All the faults which are not attributed to an element found in or around the PS, i.e. thunderstorms, mains failures, stops due to SB causes (water supply, water pump below door 4, ventilation, etc.) are classed here. (Details in Annex 4).

13. LPI

Here are classed all the faults concerning the LPI.

N.B.: for the attribution of the single fault to an equipment, please consult the PS/OP/Note 86-29 (Nomenclature des équipements du PS).

CONTENU

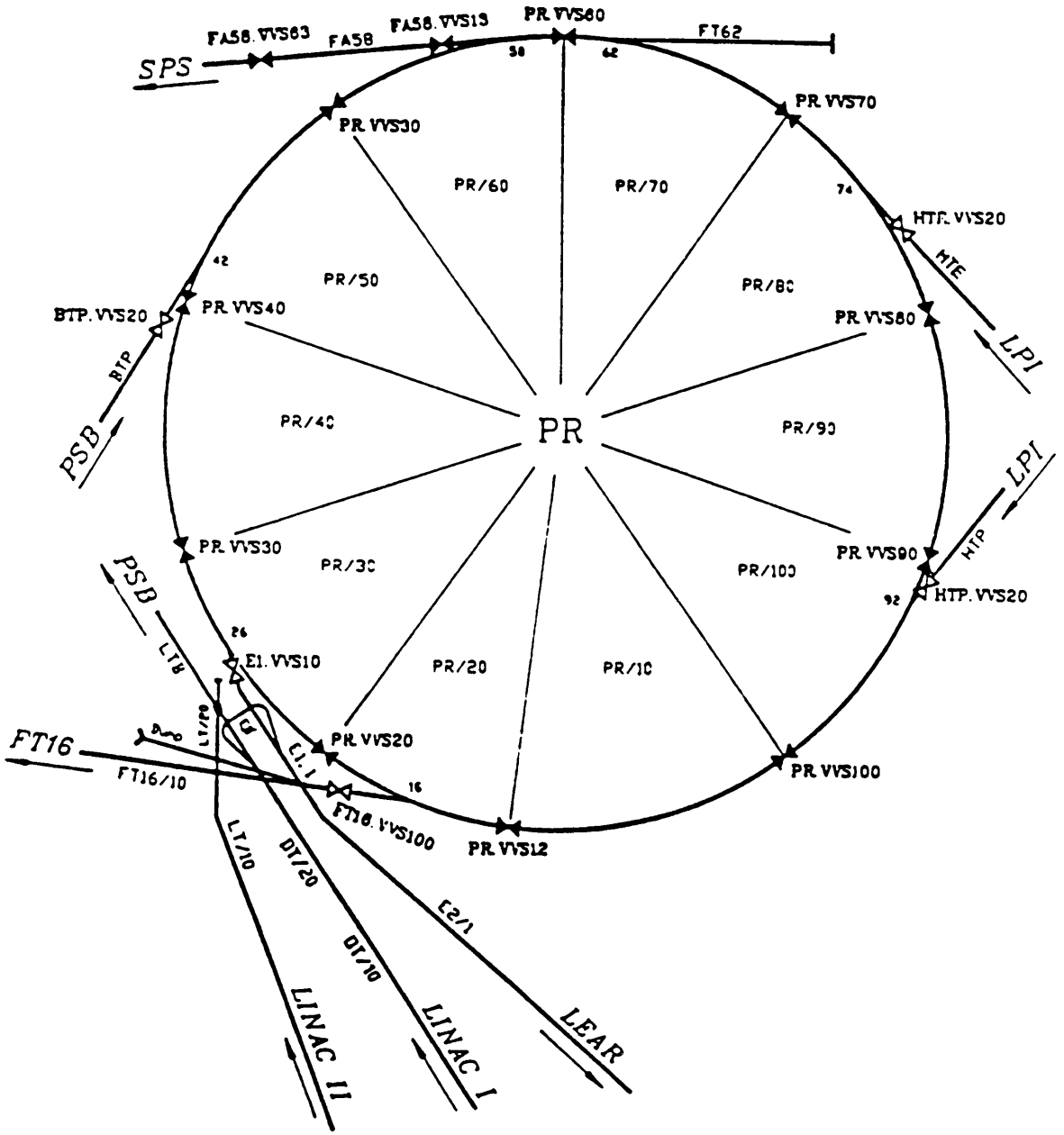
ANNEX 1-4

PS/ML/VAC/ar
23987

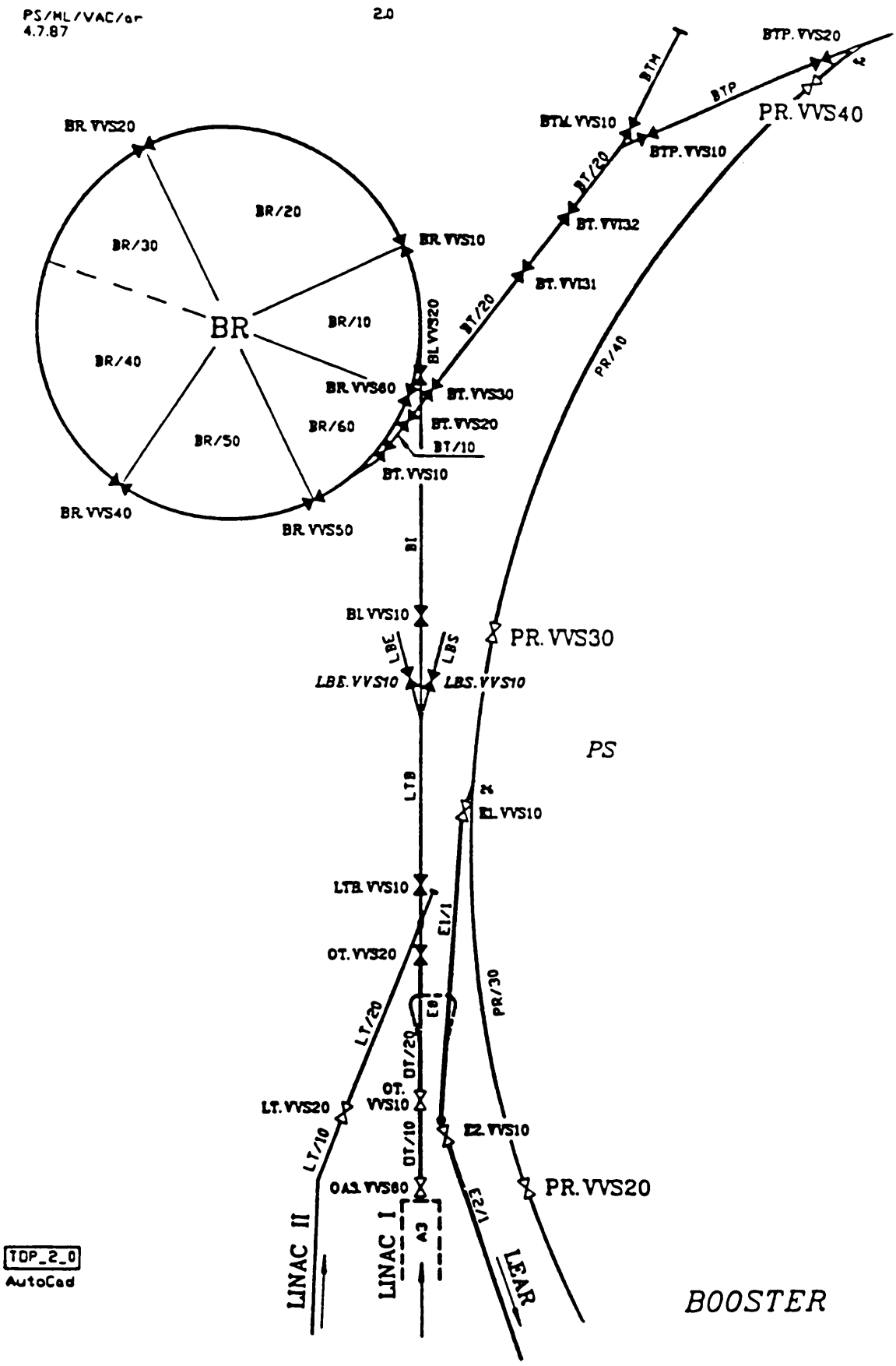
1.0

PS

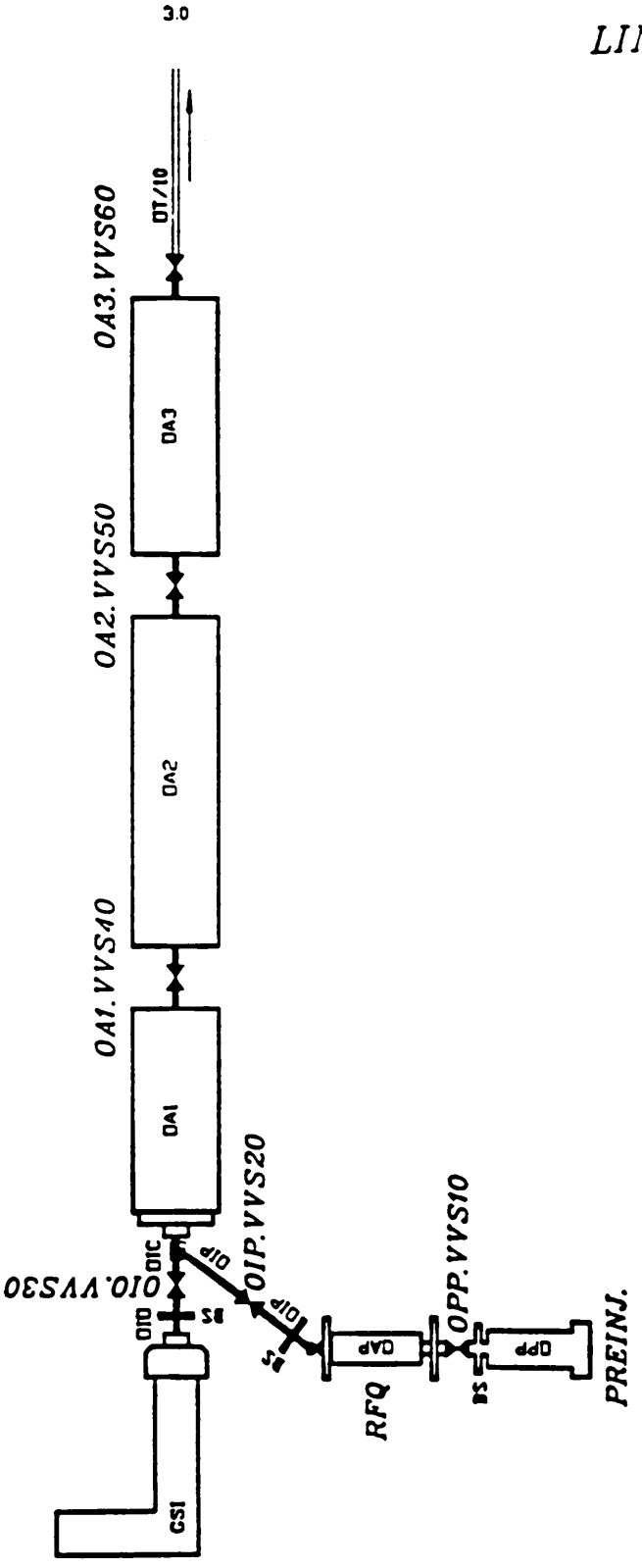
PR – (PS RING)



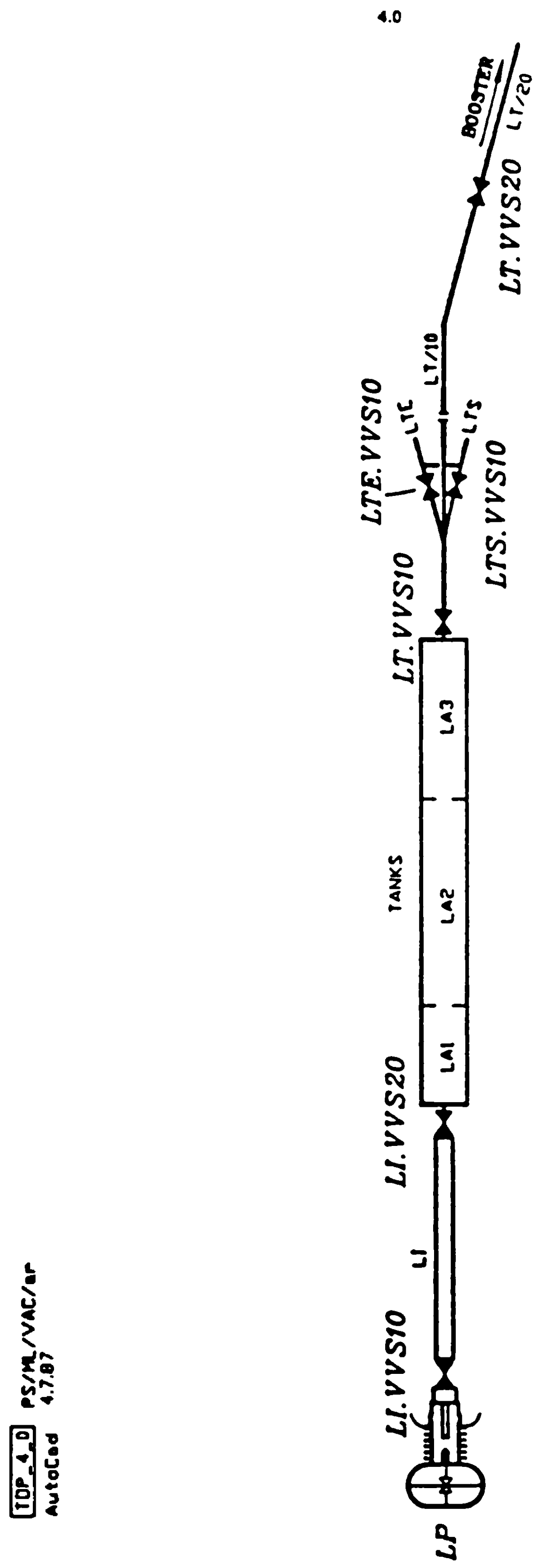
TDP_1_0
AutoCad


PS/ML/VAC/ar
4.7.87
2.0
BR
BR/10
BR/20
BR/30
BR/40
BR/50
BR/60
BR.VVS10
BR.VVS20
BR.VVS30
BR.VVS40
BR.VVS50
BL.VVS20
BT/10
BT/20
BT.VVS10
BT.VVS20
BT.VVS30
BT.VVI31
BT.VVI32
BTM
BTP
BTM.VVS10
BTP.VVS10
BTP.VVS20
PR.VVS40
PR/40
BI
BL.VVS10
LBE
LBS
LBE.VVS10
LBS.VVS10
PR.VVS30
PS
LTB
EL.VVS10
LTB.VVS10
E1/1
OT.VVS20
E1/2
PR/30
LT/20
DT/20
OT.VVS10
LT.VVS20
LT/10
DT/10
E2.VVS10
OA3.VVS80
PR.VVS20
E2/1
A3
LINAC II
LINAC I
LEAR
BOOSTER
TOP_2_0
AutoCad

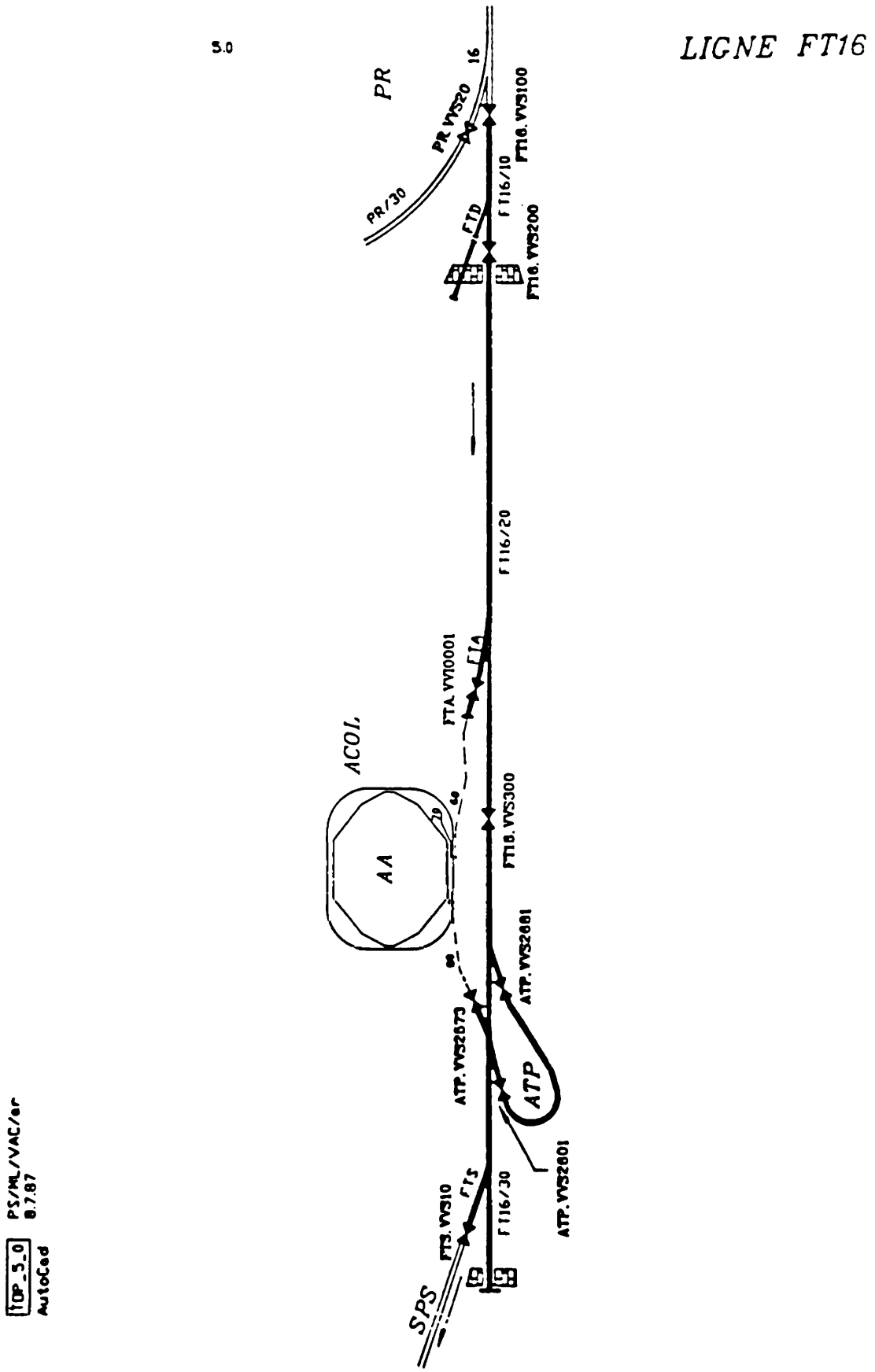
ANNEX 1-6

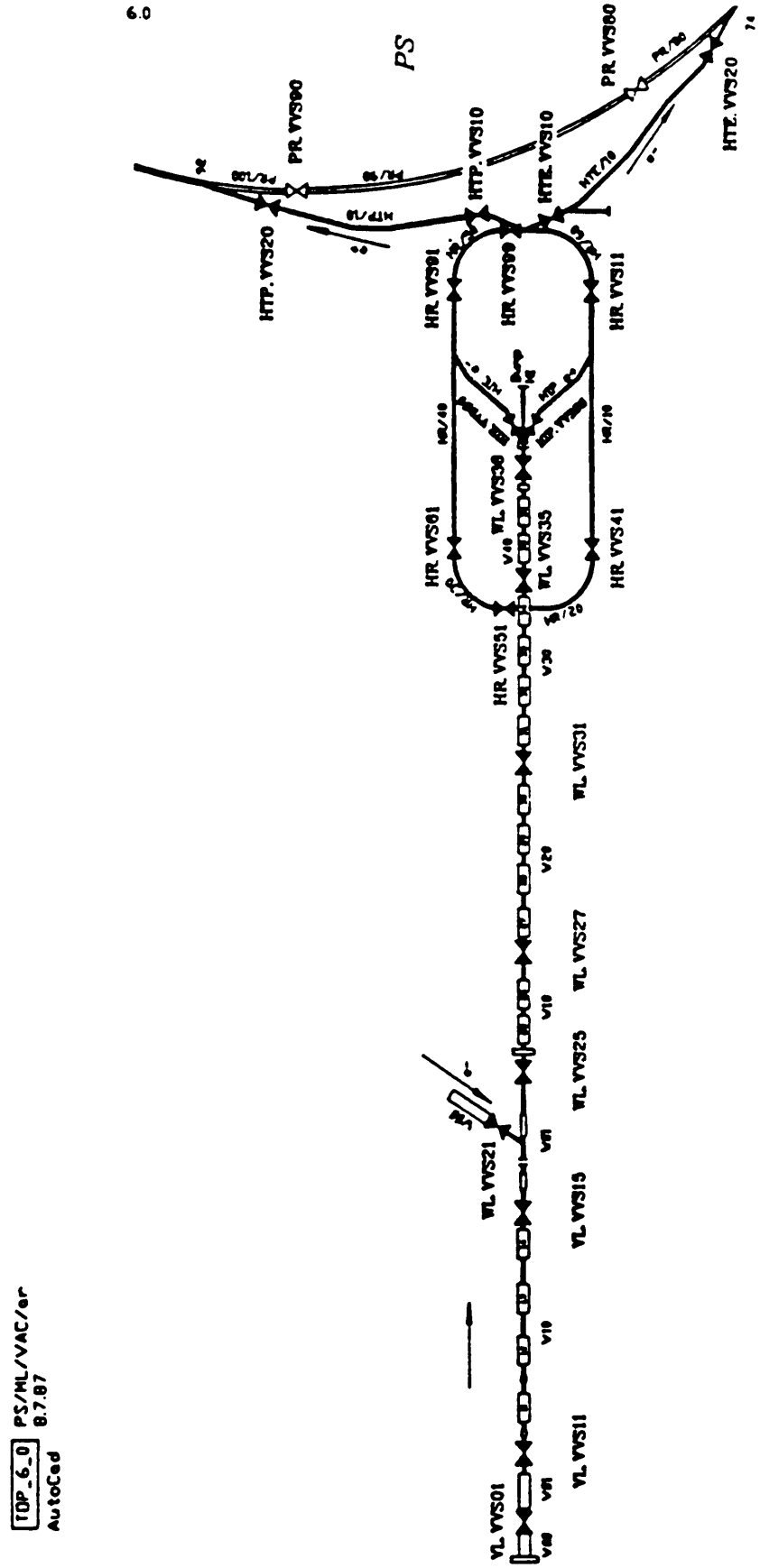

LINAC I
3.0
DT/10
OA3.VVS60
OA3
OA2.VVS50
OA2
OA1.VVS40
OA1
OIC
OIP
OIP.VVS20
OIO.VVS30
OID
SS
QIP
QPP
OPP.VVS10
RFQ
PREINJ.
CSI
TOP_3_0
AutoCad
PS/ML/VAC/ar
4.7.87

LINAC II

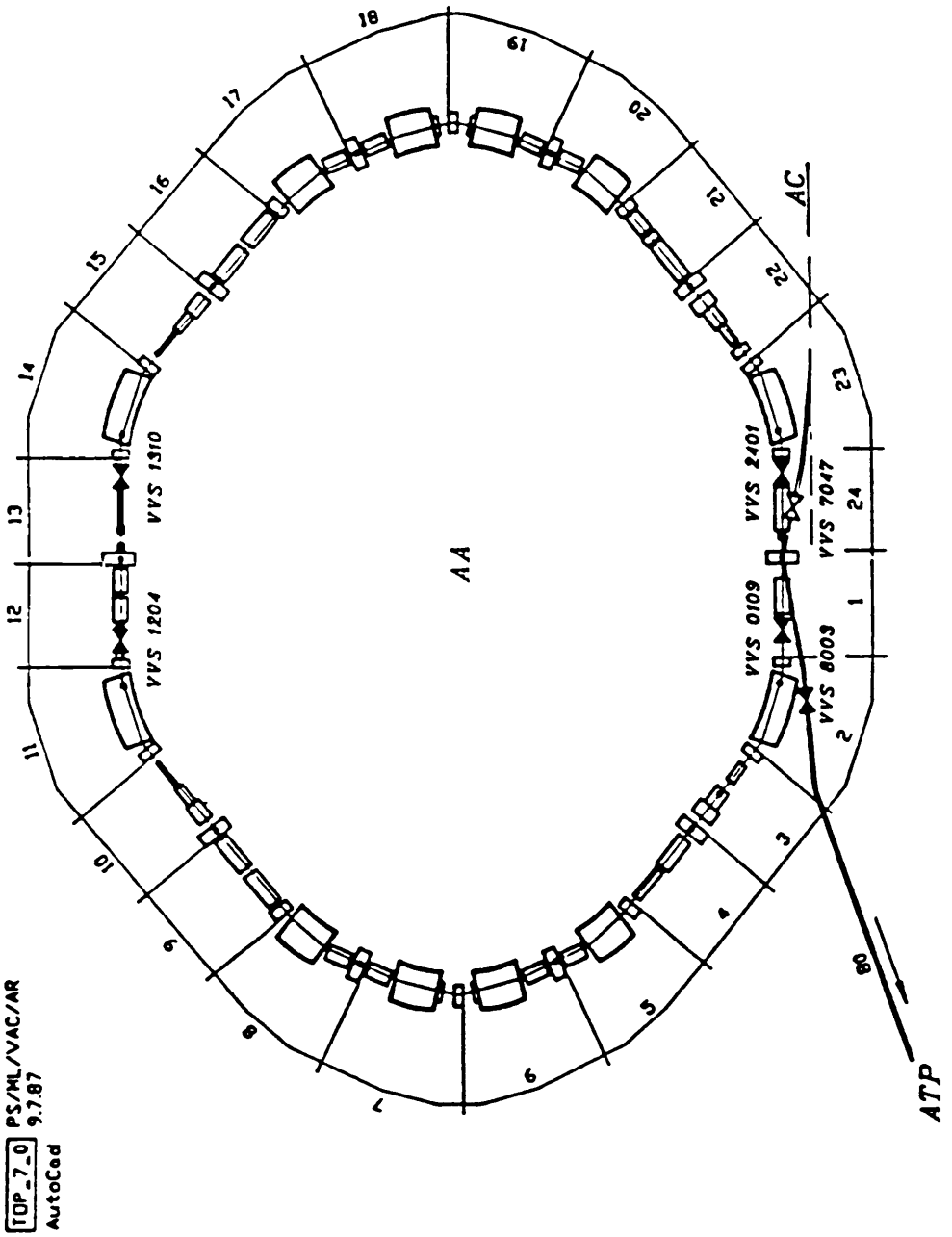

4.0
BOOSTER
LT/20
LT.VVS20
LT/10
LTE.VVS10
LTE
LTS
LTS.VVS10
LT.VVS10
LA3
TANKS
LA2
LA1
LI.VVS20
LI
LI.VVS10
LP
TDP_4_0
AutoCad
PS/ML/VAC/ar
4.7.87

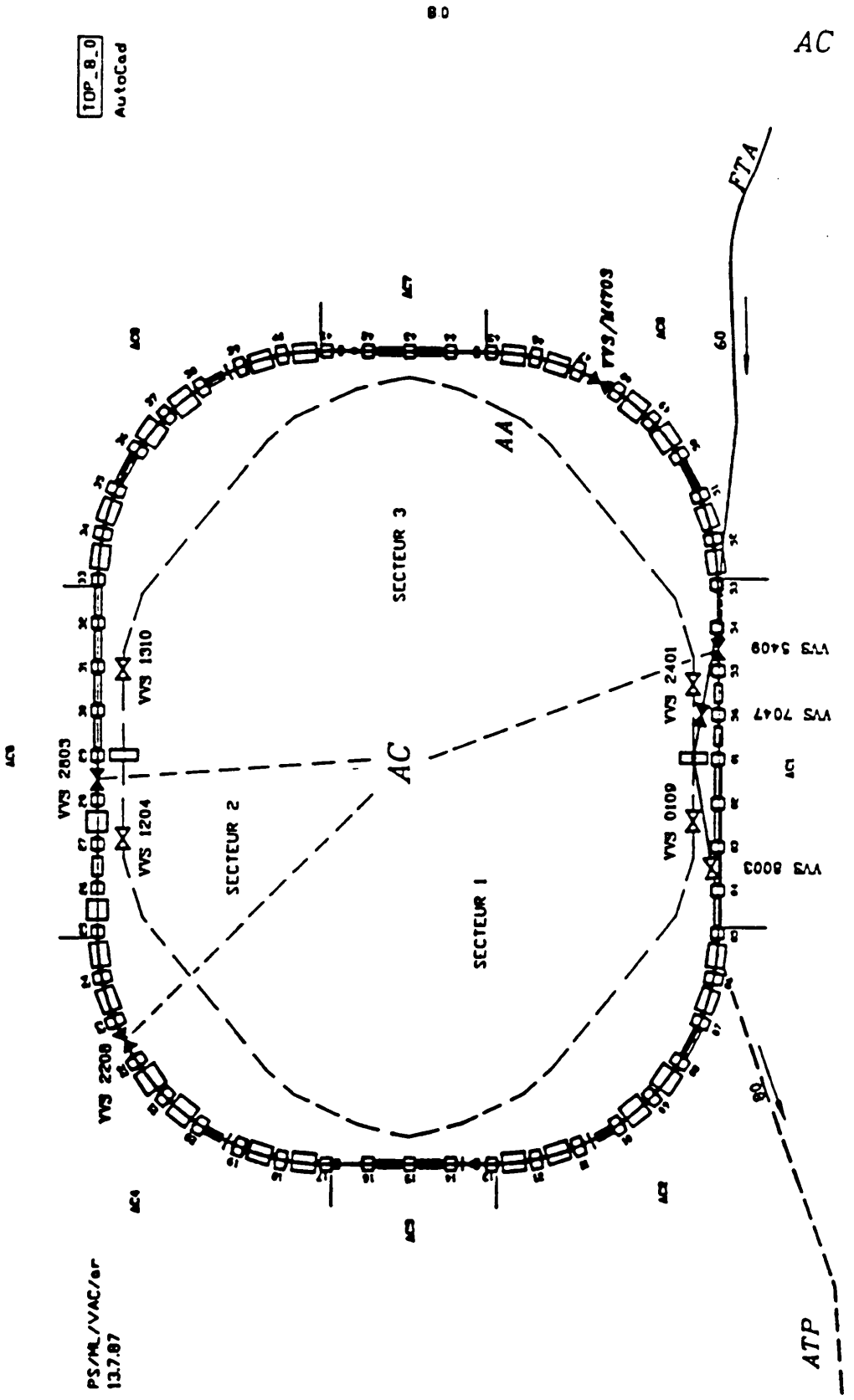
ANNEX 1-8


5.0
LIGNE FT16
PR
PR/30
PR VS20
16
FT16. VS100
F116/10
FTD
FT16. VS200
F116/20
FTA. VV10001
FTA
ACOL
AA
FT16. VS300
ATP. VS2681
ATP. VS2673
ATP
ATP. VS2601
FTS
FT5. VS10
F116/30
SPS
TOP_5_0
AutoCad
PS/ML/VAC/or
8.7.87

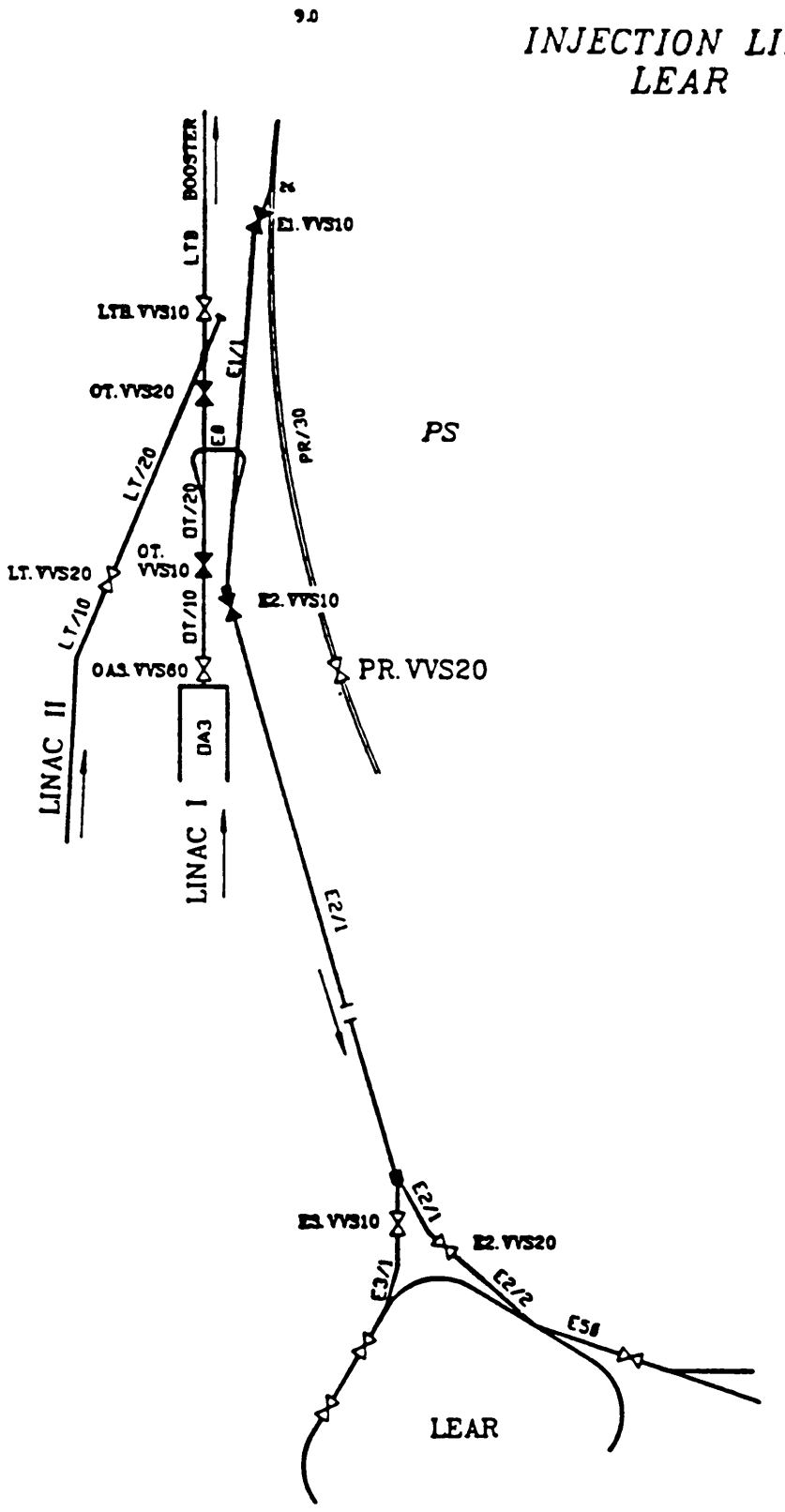

6.0
PS
LIL / EPA
PR.VV390
HTP.VV310
HTE.VV310
PR.VV360
HTE.VV320
HTP.VV320
HR.VV391
HR.VV390
HR.VV311
HR.VV341
HR.VV331
TL.VV336
TL.VV335
TL.VV321
TL.VV325
TL.VV327
TL.VV331
TL.VV315
TL.VV311
TL.VV301
TOP_6_0
PS/ML/VAC/er
8.7.87
AutoCad

ANNEX 1-10


7.0
AA
AC
VVS 1310
VVS 1204
VVS 2401
VVS 7047
VVS 0109
VVS 8003
ATP
TOP_7_0 PS/ML/VAC/AR
9.7.87
AutoCad


AC
FTA
AA
AC
ATP
SECTEUR 1
SECTEUR 2
SECTEUR 3
VVS 2803
VVS 1310
VVS 1204
VVS 2200
VVS 2401
VVS 0109
VVS 8003
VVS 7047
VVS 3409
VVS/M4703
TOP_8_0
AutoCad
PS/ML/VAC/er
13.7.87

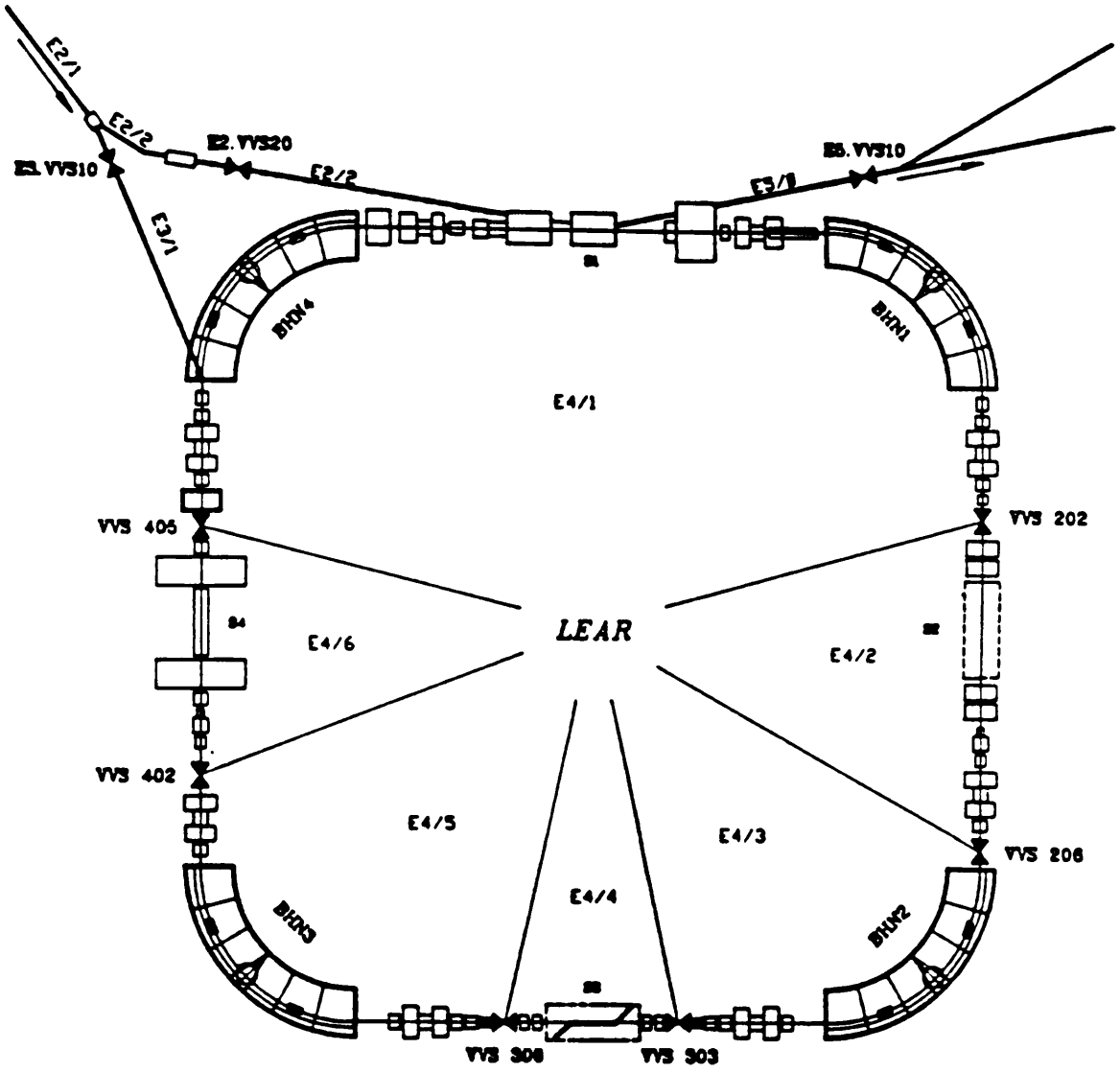
ANNEX 1-12



TDP_9_0 PS/ML/VAC/AR
AutoCad 6.7.87

10.0

RING LEAR



TOP_10_0
AutoCad

PS/ML/VAC/er
14.7.87

ANNEX 2

PASSIVE PART ACCELERATION FAULTS (number of hours) - 1989

NO FAULTS

ANNEX 3

MISCELLANEOUS FAULTS (Number of hours) - 1989

0h03	No reason found	(Period 1)
0h03	Adjustment	"
0h04	Operating fault	"
0h07	" "	
0h02	Operating fault	(Period 2)

TOTAL = 0H19

EXTERNAL FAULTS (Number of hours) - 1989

9h54	Mains failure	(Period 1)
0h02	" "	"
1h00	" "	"
5h00	" "	"
0h06	" "	"
0h09	" "	"
0h08	" "	"
0h03	" "	"
0h02	" "	"
0h07	" "	"
0h04	" "	"
0h02	" "	"
0h27	" "	"
1h30	" "	"
1h20	" "	
1h06	" "	
1h55	" "	
0h08	Mains failure	(Period 2)
0h02	" "	"
0h05	" "	"
0h03	" "	"
0h10	" "	"
0h53	" "	"
1h02	" "	"
3h03	" "	"
0h07	" "	"
0h16	" "	"
0h51	" "	"
1h35	SPS	"
1h58	ST	"
1h37	SPS	(Period 3)
0h14	Mains failure	"
1h10	" "	"
0h30	" "	"
0h47	" "	"
2h46	" "	"
4h03	" "	"
0h07	Installation target for Isolde	"
0h40	" "	
0H16	DI	

TOTAL = 45h18

ANNEX 5

FAULT EXCEDING 6 HOURS (Number of hours) - 1989

09h54	Mains failure	(Period 1)
08h44	114 MHz cavity	(Period 2)
16h02	" "	"

TOTAL = 34h40

EXPLANATION OF PS USERS

AA	proton beam production for AA	at 26 GeV/c
TST	proton beam tests for AA	at 3,5 GeV/c
SPP(p^+)	proton beam for collider	at 26 GeV/c
SPP(e^+)	positron beam for SPS	at 3,5 GeV/c
SFT(p^+)	proton beam for SPS fixed target	at 14 GeV/c
SFT(d)	deuteron beam for " " "	at 10 GeV/c/n
SFT(O^{8+})	oxygen ions for SPS fixed target	at 10 GeV/c/n
SFT(S)	sulphur ions for SPS fixed target	at 10 GeV/c
SPN(e^-)	electron beam for SPS	at 3,5 GeV/c
PHY(p^+)	proton beam for East Hall	at 24 GeV/c
PHY(d)	deuteron beam for East Hall	at 12 GeV/c/n
PHY(O^{8+})	oxygen ions for East-Hall	at 12 GeV/c/n

DUMP TARGETS : beam on the internal dump targets 47 ou 48 in the PS or in dump line D2 or D3 at different energies.

LEA(p^-)	antiproton beam for LEAR	at 0,6 GeV/c
SPN(p^-)	antiproton beam for SPS	at 26 GeV/c
SFT(α)	alpha beam for SPS	at 10 GeV/c/n

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