Madame Patricia MARTUCCI E-6

ISR PERFORMANCE REPORT

Physics Run Analysis No. 4 - 1979.

Period 6 - Run 1074 to run 1088
(14 November to 19 December 1979)

1. Introduction:

The physics running requirements for this last period of 1979 were at 31.1 GeV/c (8runs) and 22.5 GeV/c (3 runs).
Throughout this period many runs were perturbed by accidental beam losses due to 18 KV power failures (runs 1077-1087-1088), power supply faults (1081-1083-1084) and water cooling problems on the SFM and the R1 main magnet (runs 1077-1085).
During run 1085, when the ISR was powered with one single transformer, the switch-on of R1 main magents was the cause of a power surge and the consequent 18KV dip switched off probably some auxiliary power supplies of ring 2.
Beam 2 was lost and pierced a hole in the vacuum chamber in SS416.
About 50 hours were lost for physics due to repair.
Experiments R 209 and R 607 achieved to take data during this period.
A complete summary of 1979 physics runs is given at the end of this report.
The total stable beam hours has reached 2360 hours of which 91 hours were needed for beam adjustments, clean-ups, Q shifts etc.
The total integrated luminosity over the whole year and calculated with I5 reference monitors has reached 1,28. $10^{38} cm^{-2}$.

2. Filling conditions:

Table I shows the main filling parameters and the performance achieved at the start of data taking for each run.
Four runs were filled at 22 GeV/c without any major difficulties (with one refill during run 1077). Including three refills (runs 1081-1084-1085), eleven runs were at 31.4. GeV/c. The last part of run 1088 (31.4 GeV/c) was also perturbed and refilled at 26.6 GeV/c in order to complete the experiment in I6 which was scheduled to stop at the end of the year.
The acceleration procedure went in general very smoothly. Some difficulties were however experienced during runs 1081, when both 31.4 GeV/c beams were lost during the final beam optimisation. Beam 2 was lost again later during the acceleration process.
In order to reduce the losses due to beam-beam effects, six mm vertical beam seperation were usually applied in each intersection before stacking and

accelerating the second beam. Careful attention was paid to the working lines, the closed orbits and also the stack stability by means of the FFT during the acceleration procedure.

Due to saturation problems, co measurements with RF acceleration sweeps appeared to be unreliable. Therefore computer calculated corrections for orbit distortionwere not applied in some cases and do explain part of our difficulties.

By using the BLC'S and optimising the cavity voltages, the losses per RF sweep could be maintained at a low value (5-15 mA). A few random RF sweeps with high current losses (50-100 mA) were observed during runs 1084-1085-1087-1088, and may explain some of the beam losses during acceleration.

3. Physics running conditions and behaviour:

The following table gives the total stable beam time and the integrated luminosity achieved during this running period.

Momentum GeV/c	Stable beam hours	$\int_x$ Luminosity time 10^{35} cm^{-2}
22	172	100,4
26	15	7,7
31	250	169,7

During this last period, the periodic background structure is ring 2 was again present during many 31.4 GeV/c runs (1074-1079-1083-1084-1085) perturbing strongly I1 and I4. The background structure has not been observed during 22 GeV/c runs.

During run 1084 an interesting observation was made through the FFT device: a strong horizontal transverse excitation peak was detected, in beam 2. Some correlations could be made with the background periodicity but further investigations will be necessary in order to understand better the cause of this strange frequency excitation. On the other hand, no correlation with the background structure could be observed by varying some magnets water cooling temperature inlet.

I1 and I4 who were generally perturbed by the background periodicity, recovered generally good workable conditions when doing clean-ups and/or vertical beam steerings. Collimation helped also in reducing the general high background levels.

Spikes on beam 2 background could be correlated with small power supply current changes in Low-B quadrupoles (1079), LBQ8 and LBQ9 hardware faults were also

the cause of 3 beam losses 1081/R1 - 1083/R2 - 1084/R1.
Coupling compensations in the presence of a stack using the FFT device were applied during a few runs (1075-1084-1088) and gave promising results i.e. improving the current decay rates and the luminosity decrease (See: PR.17.8.79, Observation of coupling using the BTF and PR 17.1.1980, Observations and Measurement of Betatron Coupling on Physics stacks by J.P. Koutchouk).
After the repair of the hole in the vacuum chamber in sector SS416 the ISR has been powered through the 3 CERN transformers (runs 1087 - 1088). The introduced PS booster cycle were clearly seen on the background recorders.

4. Conclusions:

A lot of time was lost for physics due to unusual 18 KV perturbations, high level of hardware fault and a hole pierced in beam 2 vacuum chamber. Acceleration to 31.4 GeV/c is still time consuming and needs good optimisation of all machine parameters.
Based on beam transfer function observations, the operational use of the FFT device turned out to be a necessary and convenient tool for optimising beam diagnostics and the study of beam instabilities.

F. Lemeilleur
T. Verbeeck

FILLING PARAMETERS
****

RUN	P1 P2 GLV/C	AL1 AL2	SHAVING %		DENSITY A/IN		STACK TOP		STACK BUTTON		I.INITIAL AMP.		HEAT TIP		DP/DT %/S	L.INIT 10E30
			R1	R2	R1	R2	R1	R2	R1	R2	R1	R2	T1.	T2.	T1.	
1075	22/22	SB SB	30	30	.45	.48	35	36	-35	-30	31.04	31.77	4.9	7.5	2.2	20.8
1077	22/22	SB SB	30	30	.58	.55	35	33	-28	-28	35.93	34.08	4.4	6.6	1.3	28.0
1077	22/22	SB SB	30	30	.59	.53	35	33	-33	-32	33.50	33.73	4.8	5.3	1.2	23.4
1078	22/22	SB SB	30	30	.55	.49	34	34	-31	-32	35.44	32.29	5.1	8.0	1.8	22.6
1088	26/26	AC AC	25	25	.56	.54	34	36	-14	-11	26.12	25.57	4.1	5.3	1.9	16.0
1074	31/31	AC AC	25	25	.50	.46	32	30	-36	-37	34.01	30.73	4.4	5.8	.7	23.4
1079	31/31	AC AC	25	25	.56	.48	33	34	-37	-36	34.72	33.28	4.1	5.5	.8	28.4
1081	31/31	AC AC	30	30	.44	.49	34	33	-29	-34	27.28	32.25	4.1	4.2	.6	21.4
1081	31/31	AC AC	30	30	.53	.48	36	34	-31	-32	31.59	31.93	4.1	4.9	1.0	24.8
1083	31/31	AC AC	30	30	.54	.46	32	33	-35	-34	36.06	35.58	4.3	4.5	.7	25.8
1084	31/31	AC AC	30	30	.52	.48	33	30	-37	-35	35.92	31.16	4.9	5.0	.5	22.6
1084	31/31	AC AC	30	30	.46	.48	35	33	-28	-31	28.68	30.70	4.5	4.6	.3	19.4
1085	31/31	AC AC	30	30	.54	.51	31	29	-36	-37	34.01	34.01	4.8	5.2	1.6	24.5
1087	31/31	AC AC	30	30	.42	.34	26	34	-32	-33	23.45	22.40	4.8	5.5	.5	11.1
1088	31/31	AC AC	30	30	.42	.46	39	32	-31	-36	28.99	30.69	4.6	5.5	.7	18.6

Table 1

PHYSICS PARAMETERS
****

RUN	P1 P2 GEV/C	I INIT AMP R1	I INIT AMP R2	I FIN AMP R1	I FIN AMP R2	DI/DT PPM/MN R1	DI/DT PPM/MN R2	L AVE 10E30	TIME HOURS	RING 1 I1	RING 1 I2	RING 1 I4	RING 1 I5	RING 1 I6	RING 1 I7	RING 1 I8	RING 2 I1	RING 2 I2	RING 2 I4	RING 2 I5	RING 2 I6	RING 2 I7	RING 2 I8
1041	15/15	20.66	19.50	19.44	18.53	3	2	5.4	38	2	2	2	2	1	0	2	2	2	2	2	1	0	2
1042	15/15	23.15	19.64	21.39	17.99	11	4	6.1	37	2	2	2	2	1	0	2	2	2	2	2	1	0	2
1043	15/15	18.92	19.10	16.80	16.74	10	4	4.8	29	2	2	2	2	2	0	2	2	2	2	2	2	0	2
1043	15/15	17.04	16.97	16.70	10.60	4	3	4.4	8	2	2	2	2	2	0	2	2	2	2	2	2	0	2
1045	22/22	32.05	33.07	0.00	0.00	5	3	19.1	24	2	2	2	2	1	0	2	2	2	2	2	1	0	2
1045	22/22	29.92	30.04	28.91	29.07	10	2	17.5	31	2	2	2	2	2	0	2	2	2	2	2	2	0	2
1047	22/22	19.40	23.93	18.31	23.30	3	5	8.8	35	2	2	2	2	2	0	2	2	2	2	2	2	0	2
1048	22/22	30.80	32.95	0.00	0.00	12	5	16.8	20	3	2	2	2	2	0	2	3	2	2	2	2	0	2
1049	22/22	30.22	31.43	28.80	30.56	8	4	15.0	36	2	2	2	2	2	0	2	2	2	2	2	2	0	2
1050	22/22	30.96	33.95	0.00	0.00	9	4	15.8	15	1	1	1	1	1	0	1	1	1	1	1	1	0	1
1050	22/22	29.19	35.80	28.30	33.30	3	15	17.0	38	3	2	2	2	2	0	2	2	2	2	2	2	0	2
1050	22/22	31.00	31.28	30.55	31.10	5	4	17.0	15	2	2	2	2	2	0	2	2	2	2	2	2	0	2
1052	22/22	27.99	30.05	0.00	0.00	1	3	16.5	13	2	2	2	2	2	0	2	2	2	2	2	2	0	2
1054	22/22	29.92	33.10	0.00	32.80	10	2	18.5	17	2	2	2	2	2	0	2	2	2	2	2	2	0	2
1054	22/22	18.45	30.75	17.95	29.84	20	5	11.2	10	2	2	2	2	2	0	2	2	2	2	2	2	0	2
1055	22/22	19.56	32.24	18.52	31.19	20	8	11.5	31	2	2	2	2	2	0	2	2	2	2	2	2	0	2
1056	22/22	20.51	31.17	20.05	29.72	5	8	12.3	36	2	2	2	2	2	0	2	2	2	2	2	2	0	2
1058	22/22	31.20	31.86	29.47	31.02	13	5	15.8	38	2	2	2	2	2	0	2	2	2	2	2	2	0	2
1059	22/22	30.97	30.04	0.00	30.01	10	1	16.4	3	0	2	2	2	2	0	2	0	2	3	2	2	0	2
1059	22/22	29.46	29.76	0.00	0.00	7	17	13.1	49	0	3	2	2	2	0	2	0	2	3	2	2	0	2
1061	22/22	31.68	33.21	0.00	32.77	6	2	19.8	27	0	2	2	2	2	0	0	0	2	2	2	2	0	0
1061	22/22	35.25	31.65	34.18	30.61	9	8	17.7	24	2	2	2	2	2	0	2	2	2	2	2	2	0	2
1062	22/22	30.90	30.12	28.99	29.07	11	5	15.2	54	2	2	2	2	2	0	2	2	2	2	2	2	0	2
1064	22/22	31.63	32.69	28.70	26.27	16	11	14.4	52	0	3	2	2	2	0	2	0	3	3	2	2	0	2
1066	22/22	32.30	32.38	30.88	31.39	10	2	18.1	37	0	2	2	2	1	0	1	0	2	2	2	1	2	1
1067	22/22	33.65	31.49	31.12	29.20	12	5	16.7	41	0	2	2	2	1	0	2	0	2	2	2	1	0	2
1067	22/22	29.19	31.35	27.79	30.89	11	3	15.8	38	2	2	2	2	2	0	2	2	2	2	2	2	0	2
1068	22/22	30.07	31.92	0.00	29.20	16	7	14.7	55	2	2	2	2	2	0	2	2	2	2	2	2	0	2
1069	22/22	35.35	33.52	34.65	0.00	10	13	20.2	16	3	3	3	3	2	0	3	3	4	4	3	3	0	4
1070	22/22	36.95	36.66	0.00	0.00	5	2	24.8	14	2	2	2	2	2	0	2	2	2	3	2	2	0	2
1070	22/22	32.83	29.95	30.49	29.01	15	6	16.6	40	0	2	2	2	2	0	2	0	2	2	2	2	0	2
1071	22/22	27.58	34.42	26.63	32.27	4	5	15.9	34	2	2	2	2	2	0	2	2	2	2	2	2	0	2
1071	22/22	33.42	33.21	31.97	32.20	19	2	19.9	38	2	2	2	2	2	0	2	2	2	2	2	2	0	2
1075	22/22	31.04	31.77	28.20	30.02	15	7	15.6	58	0	2	2	2	2	0	2	0	2	3	2	2	0	3
1077	22/22	35.93	34.03	0.00	0.00	5	2	22.7	47	0	2	2	2	2	0	2	0	2	2	2	2	0	2
1077	22/22	33.50	33.73	33.42	33.69	5	2	22.3	9	3	2	2	2	2	0	2	2	2	2	2	2	0	2
1078	22/22	35.43	32.20	31.98	28.52	13	8	17.0	58	2	3	2	2	2	0	2	2	2	2	2	2	0	2
1010	26/26	31.20	27.27	30.18	0.00	3	7	21.5	11	0	2	2	2	2	0	2	0	2	3	2	2	0	2
1010	26/26	30.12	24.44	29.60	24.20	5	2	14.0	18	0	2	2	2	0	0	2	0	2	2	2	0	0	2
1088	26/26	26.12	25.57	25.93	25.10	8	25	14.2	15	0	0	0	2	2	0	2	0	0	0	2	2	0	2
1011	31/31	27.93	27.50	26.13	25.71	12	4	14.0	52	2	2	2	2	2	0	2	2	2	2	2	2	0	2
1013	31/31	25.68	25.42	24.24	24.33	13	6	11.0	53	0	2	2	2	1	0	2	0	2	2	2	1	0	2
1014	31/31	23.98	22.39	22.48	21.54	14	2	11.0	54	2	2	2	2	2	0	2	2	2	3	2	2	0	2
1016	31/31	19.91	30.50	18.28	26.87	25	5	11.0	54	0	2	2	2	0	0	1	0	2	2	2	0	0	1
1018	31/31	28.49	27.34	26.05	26.04	17	2	14.0	52	0	3	1	2	1	0	1	0	3	2	2	1	0	1
1019	31/31	28.90	29.26	27.91	24.89	14	2	15.0	39	0	2	2	2	2	0	1	0	2	2	2	2	0	1
1020	31/31	22.93	27.39	22.37	26.99	7	3	13.0	42	0	2	2	2	2	0	2	0	2	2	2	2	0	2
1022	31/31	29.05	31.59	28.51	28.72	15	2	18.0	55	0	2	2	2	2	0	2	0	2	2	2	2	0	2
1023	31/31	33.53	27.76	31.83	26.62	19	3	18.0	62	0	2	2	2	2	0	1	0	2	2	2	2	0	1
1025	31/31	25.61	30.04	23.29	28.13	22	2	12.9	56	3	3	3	2	2	0	2	3	3	3	2	2	0	2
1026	31/3 1	31.64	27.99	29.70	25.97	11	7	15.6	57	2	2	2	2	2	0	2	2	2	2	2	2	0	2
1028	31/31	27.67	27.72	27.27	27.31	12	5	13.8	14	2	2	2	2	2	0	2	2	2	2	2	2	0	2
1029	31/31	22.90	32.40	22.40	31.64	1	1	14.0	25	2	2	2	2	2	0	2	2	3	2	2	2	0	2
1030	31/31	25.55	32.21	22.12	29.59	21	2	11.3	39	1	2	2	2	2	0	1	2	1	2	2	2	0	1
1033	31/31	30.42	32.18	29.55	31.72	8	1	18.4	42	1	1	1	1	1	0	1	1	1	1	1	1	0	1
1034	31/31	32.62	32.80	30.57	30.03	13	4	17.4	58	1	1	1	1	1	0	1	1	1	1	1	1	0	1
1036	31/31	29.42	30.83	0.00	0.00	11	2	18.5	4	2	2	2	2	2	0	2	2	2	2	2	2	0	2
1036	31/31	30.24	31.90	0.00	0.00	12	2	18.5	27	3	3	2	2	2	0	2	2	2	2	2	2	0	2
1037	31/31	23.73	25.26	23.13	23.72	8	19	8.2	43	2	2	2	2	2	0	2	2	2	2	2	2	0	2
1038	31/31	32.14	31.03	31.76	30.98	8	1	21.0	6	2	2	2	2	2	0	2	2	2	2	2	2	0	2
1038	31/31	27.97	30.60	27.37	25.90	7	6	15.1	33	4	2	4	2	3	0	3	4	2	4	2	3	0	3
1074	31/31	34.01	30.73	33.01	29.19	5	3	19.4	52	2	2	2	2	2	0	2	2	2	2	2	2	0	2
1079	31/31	34.72	33.20	33.55	30.63	6	3	23.5	51	2	2	2	2	2	0	2	2	2	2	2	2	0	2
1081	31/31	27.23	32.25	0.00	0.00	2	2	21.3	2	2	2	2	2	2	0	2	2	2	2	2	2	0	2
1081	31/31	31.59	31.93	31.12	30.98	5	5	22.2	26	2	2	2	2	2	0	2	3	3	4	2	2	0	3
1083	31/31	35.06	35.58	0.00	0.00	3	5	25.0	7	3	2	2	2	2	0	2	4	2	3	2	2	0	2
1084	31/31	35.92	31.16	0.00	0.00	4	3	19.9	55	2	2	2	2	2	0	2	2	2	2	2	2	0	2
1084	31/31	28.66	30.70	28.67	30.63	1	1	19.3	7	2	2	2	2	2	0	2	2	2	2	2	2	0	2
1085	31/31	34.01	34.01	0.00	0.00	7	7	23.1	9	2	2	2	2	2	0	2	4	3	4	2	2	0	2
1085	31/31	29.49	30.61	0.00	0.00	1	1	24.3	2	2	2	2	2	2	0	2	2	2	2	2	2	0	2
1087	31/31	23.45	22.40	21.79	21.33	35	10	9.8	26	3	2	2	2	2	0	2	3	2	3	2	2	0	2
1088	31/31	28.99	30.69	0.00	0.00	10	40	16.8	13	2	2	2	2	2	0	2	2	2	2	2	2	0	2

NO DATA...0 FAIR......
VERY GOOD.1 BAD.......4

FILLING PARAMETERS
****

RUN	P1 P2 GEV/C	WL1 WL2	SHAVING % P1 P2	DENSITY A/MM P1 P2	STACK TOP P1 P2	STACK BOTTOM P1 P2	I. INITIAL AMP. P1 P2	HEFF MM IN. FIN.	DH/DT %/H INIT.	L. INIT 16E30
1041	15/15	LB LB	25 25	.35 .35	33 30	-25 -29	20.96 19.50	6.4 8.2	.7	9.3
1042	15/15	LB LB	30 30	.39 .39	26 28	-38 -31	23.15 19.64	6.0 7.5	.8	7.6
1043	15/15	LB LB	30 30	.30 .32	32 33	-24 -32	18.92 19.10	6.3 7.3	.7	5.7
1047	15/15	LB LB	30 30	.33 .35	36 35	-11 -10	17.84 15.97	6.0 6.7	.8	4.5
1045	22/22	SB SB	20 20	.50 .52	31 29	-30 -39	32.95 30.97	4.0 5.0	2.5	24.1
1046	22/22	SB SB	25 25	.48 .52	35 30	-23 -28	29.92 30.04	4.0 5.6	2.5	22.5
1047	22/22	SB SB	25 25	.36 .39	37 41	-17 -21	19.10 23.93	4.3 6.3	2.9	10.8
1048	22/22	SB SB	25 25	.52 .53	33 33	-26 -29	30.36 32.95	5.1 6.7	1.3	19.8
1049	22/22	SB SB	25 25	.48 .50	37 32	-26 -31	30.22 31.43	5.2 7.4	1.3	18.0
1050	22/22	SB SB	20 20	.47 .50	40 40	-26 -28	30.26 33.05	5.2 6.0	1.2	20.2
1051	22/22	SB SB	20 20	.46 .51	33 33	-32 -33	29.49 35.80	4.9 7.1	1.3	21.7
1052	22/22	SB SB	25 25	.50 .51	40 40	-22 -21	31.09 31.28	5.4 6.1	.9	18.0
1053	22/22	SB SB	25 25	.44 .48	40 39	-24 -24	27.99 30.05	4.6 5.6	1.4	16.2
1054	22/22	SB SB	20 20	.48 .53	37 37	-25 -25	29.93 33.19	4.6 6.0	1.8	21.5
1054	22/22	SB SB	30 30	.40 .51	33 38	-12 -22	18.45 30.75	4.5 5.4	2.2	12.7
1055	22/22	SB SB	25 25	.35 .51	36 40	-20 -24	19.56 32.24	4.5 6.4	1.4	14.1
1056	22/22	SB SB	35 20	.42 .50	38 38	-11 -24	20.51 31.17	4.1 6.5	2.4	15.5
1058	22/22	SB SB	30 30	.53 .54	33 31	-26 -27	31.20 31.86	5.3 7.1	1.3	18.9
1059	22/22	SB SB	30 30	.49 .47	32 33	-31 -30	30.97 30.04	5.6 5.7	.4	16.5
1050	22/22	SB SB	30 30	.46 .47	32 34	-29 -31	29.46 29.76	5.4 7.3	.6	10.2
1061	22/22	SB SB	30 30	.52 .52	35 33	-26 -31	31.68 33.21	4.5 6.2	1.6	23.4
1061	22/22	SB SB	25 25	.62 .52	35 32	-28 -31	35.25 31.65	5.7 6.7	1.2	19.4
1062	22/22	SB SB	30 30	.44 .49	34 32	-35 -30	30.90 30.12	4.9 7.4	1.7	18.9
1064	22/22	SB SB	30 30	.55 .55	34 33	-29 -30	31.63 32.69	5.0 8.5	.6	20.0
1065	22/22	SB SB	30 30	.53 .53	30 34	-31 -28	32.30 32.38	4.8 6.8	1.1	21.9
1067	22/22	SB SB	30 30	.60 .55	33 32	-30 -31	33.65 31.49	5.2 7.9	1.3	20.5
1067	22/22	SB SB	30 30	.48 .50	33 38	-34 -30	29.19 31.35	4.9 6.7	1.0	18.8
1068	22/22	SB SB	30 30	.49 .53	30 33	-32 -28	30.07 31.92	5.0 7.9	.9	19.2
1069	22/22	SB SB	30 30	.58 .56	33 34	-28 -27	35.35 33.52	5.1 6.5	1.1	23.6
1070	22/22	SB SB	30 30	.62 .51	34 31	-26 -30	36.25 30.66	5.0 5.8	.7	26.7
1070	22/22	SB SB	30 30	.55 .48	34 34	-30 -29	32.83 29.05	4.9 6.8	1.2	20.2
1071	22/22	SB SB	30 30	.40 .54	37 33	-31 -30	27.58 34.42	4.8 6.9	1.9	19.6
1071	22/22	SB SB	30 30	.54 .55	34 30	-28 -30	33.42 33.21	4.6 6.6	.9	24.3
1075	22/22	SB SB	30 30	.45 .48	35 36	-35 -30	31.04 31.77	4.9 7.5	2.2	20.0
1077	22/22	SB SB	30 30	.58 .55	35 33	-28 -28	35.93 34.08	4.4 6.8	1.3	28.0
1077	22/22	SB SB	30 30	.56 .53	35 33	-33 -32	33.50 33.73	4.8 5.3	1.2	23.6
1073	22/22	SB SB	30 30	.55 .40	34 34	-31 -32	35.44 32.26	5.1 8.0	1.9	22.6
1010	22/22	AC AC	30 30	.53 .45	33 30	-26 -30	31.26 27.27	5.7 4.2	.9	23.6
1010	22/22	AC AC	30 30	.51 .48	33 26	-26 -25	30.12 24.44	5.1 5.3	.7	14.5
1008	22/22	AC AC	25 25	.56 .54	31 36	-14 -11	26.12 25.57	4.1 5.3	1.9	10.9
1011	31/31	AC AC	20 35	.44 .44	32 32	-31 -31	27.03 27.50	4.5 5.9	.3	18.5
1013	31/31	AC AC	25 35	.39 .38	31 25	-32 -41	25.68 25.42	5.2 6.0	.7	12.5
1014	31/31	AC AC	40 40	.38 .37	35 34	-28 -27	23.98 22.39	4.1 5.6	.8	13.1
1015	31/31	AC AC	30 30	.39 .45	33 35	-37 -32	19.91 30.50	4.7 6.1	.7	13.7
1018	31/31	AC AC	50 50	.43 .43	34 37	-32 -27	28.49 27.34	5.0 5.6	.7	15.4
1019	31/31	AC AC	30 30	.41 .43	34 36	-36 -32	28.96 29.26	5.2 6.0	.7	16.2
1020	31/31	AC AC	25 25	.42 .40	27 34	-27 -34	22.93 27.38	4.3 5.5	.7	14.6
1022	31/31	AC AC	30 30	.45 .47	35 32	-32 -36	29.99 31.59	4.1 5.4	1.8	23.0
1023	31/31	AC AC	30 30	.48 .47	34 33	-36 -36	33.53 27.76	4.4 5.9	.9	21.3
1025	31/31	AC AC	30 30	.55 .55	34 34	-32 -35	29.64 30.04	4.6 7.0	.7	17.5
1026	31/31	AC AC	30 30	.45 .39	35 38	-36 -34	31.84 27.96	4.6 6.0	.7	18.3
1028	31/31	AC AC	30 30	.38 .40	36 35	-38 -35	27.67 27.72	5.3 6.6	.6	14.5
1029	31/31	AC AC	25 25	.36 .47	26 35	-38 -34	22.20 32.40	4.7 5.2	.7	15.8
1030	31/31	AC AC	15 15	.36 .45	35 37	-37 -34	25.56 32.21	6.0 6.7	.9	13.8
1031	31/31	AC AC	20 20	.45 .47	33 34	-34 -35	30.49 32.48	4.7 5.6	.7	21.0
1034	31/31	AC AC	20 20	.46 .49	34 33	-37 -34	32.02 32.80	4.7 7.2	.7	22.5
1035	31/31	AC AC	25 25	.42 .44	33 36	-37 -34	29.49 30.53	4.8 5.0	.7	18.6
1036	31/31	AC AC	25 25	.44 .47	32 35	-36 -32	30.24 31.98	4.7 5.5	.7	20.4
1037	31/31	AC AC	25 25	.40 .44	33 28	-27 -30	23.73 25.26	6.0 7.2	.6	9.1
1038	31/31	AC AC	30 30	.46 .49	34 36	-35 -26	32.14 31.66	4.4 5.1	1.1	22.7
1038	31/31	AC AC	20 20	.40 .18	34 35	-35 -27	27.97 30.66	4.7 6.0	.7	18.3
1074	31/31	AC AC	25 25	.50 .46	32 30	-36 -37	34.01 30.73	4.4 5.8	.7	23.4
1072	31/31	AC AC	25 25	.50 .48	33 34	-37 -36	34.72 33.26	4.1 5.5	.8	28.4
1081	31/31	AC AC	30 30	.44 .49	34 33	-29 -34	27.28 32.25	4.1 4.2	.6	21.4
1081	31/31	AC AC	30 30	.53 .48	30 34	-31 -32	31.59 31.93	4.1 4.9	1.0	24.8
1083	31/31	AC AC	30 30	.54 .46	32 33	-35 -34	36.05 35.58	4.3 4.5	.7	25.8
1084	31/31	AC AC	30 30	.52 .48	33 30	-37 -35	35.92 31.10	4.9 6.0	.5	22.8
1084	31/31	AC AC	30 30	.46 .48	35 33	-28 -31	28.68 30.70	4.5 6.6	.3	19.4
1085	31/31	AC AC	30 30	.54 .51	31 29	-36 -37	34.01 34.01	4.8 5.2	1.6	24.5
1085	31/31	AC AC	30 30	.43 .44	33 32	-35 -37	29.49 30.91	3.7 3.8	1.0	24.5
1087	31/31	AC AC	30 30	.42 .34	26 34	-32 -33	23.45 22.46	4.8 5.5	.5	11.1
1088	31/31	AC AC	30 30	.42 .40	30 32	-31 -36	28.99 30.69	4.8 5.5	.7	18.6

SPECIAL COMMENTS
****

RUN

1041 LB+SOL,FAILY GOOD COND,CLEAN-UPS FOR I4,SOME SPIKES IN R1.
1042 LB+SOL+AFM,QUITE GOOD WORKING CONDITIONS.
1043 LB+SOL+AFM,AGOOD RUNNING COND,BEAMS LOST DUE TO SOL FAULT,REFILL.
1044 LB+AFM,VERY GOOD CONDITIONS,LOW BACKGROUNDS.
1045 LB+SOL+AFM,VERY STABL BEAMS LOST DUE TO VACUUM VALVES CLOSUPE,REFILL
1045 FAILY GOOD COND,SPIKES,BEAMS BLOWN-UP AT THE END.
1047 LB+SOL+AFM,QUITE GOOD WITH SOME SPIKES,BG STRUCTURE IN R1.
1048 GOOD COND AFTER CLEAN UPS,BG INCREASING RAPIDELY,BEAMS LOST DUE TO VACUUM.
1049 LB+SOL+AFM,QUITE GOOD COND, CLEAN-UPS IN R1 FOR I1+I2.
1050 LB+SOL+AFM,VERY GOOD COND,BEAMS LOST DUE TO DAFM INTERLOCK FAULT,REFILL.
1050 GOOD COND EXCEPT FOR I1 R1,SPIKY AT THE END,BEAMS BLOWN-UP,REFILL.
1050 LB+SOL+AFM,QUITE GOOD COND,LOW BACKGROUNDS.
1052 LB+SO,STABLE AND GOOD COND,BEAMS LOST DUE TO SOLENOID FAULT,REFILL.
1054 LB+SOL+AFM,VERY QUIET BG,R1 LOST DUE TO PRESSURE RISE IN S51,REFILL.
1054 GOOD COND,HIGH LOSS RATE IN R1 DUE TO PRESSURE BUMP,R2 LOST AT THE END.
1055 GOOD COND,BG STRUCTURE IN R1,LIMITED CURRENT IN R1 DUE TO PRESSURE BUMP.
1056 GOOD AND QUIET COND WITH FEW CLEAN-UPS,AT THE END BEAM 2 ONLY FOR I1.
1058 LB+SOL+AFM QUIET COND,SMALL CURRENT LOSSES IN R2
1059 LB+SOL+AFM,SPIKES PERTURBED COND,IN I4,R1 LOST DUE TO UNKNOWN FAULT
1059 REFILL,LB+SOL+AFM,FAST BLOW-UP I1 R1,SOME SPIKES IN R1+P2.
1059 BOTH BEAMS LOST DUE TO 18KV.
1061 LB+SOL+AFM,STABLE AND QUIET COND,R1 LOST DUE TO UNKNOWN FAULT
1061 REFILL R1,LB+SOL+AFM,CLEAN-UP FOR I2,SOME SPIKES IN BOTH BEAMS
1062 LB+SOL+AFM,GOOD COND,PETRTURATING FOR I2,CLEAN-UPS MAINLY FOR I2.
1062 SMALL CURRENT LOSSES IN R1.
1064 SOL+LB+AFM,GOOD COND,CLEAN-UPS FOR I2,SPIKES WITH HIGH BEAM LOSSES IN R1+R2
1065 LB+SOL+AFM,VERY GOOD AND STABLE WORKING COND,CLEAN-UPS FOR I4
1067 SOL+LB+AFM,GOOD COND WITH GROWING-UP BACKGROUND FOR I2,SPIKES IN R1
1067 REFILL,LB+SOL+AFM,GOOD COND,CLEAN-UPS FOR I2,COLL VERY EFFECT IN BG REDUCT.
1068 SOL+LB+AFM,GOOD COND,LARGE SPIKES IN R2,R1 LOST DUE TO 18KV SPIKES
1069 SOL+LB+AFM,BACK STRUCTURE IN R2,SMALL AND LARGE CURRENT LOSSES IN R2
1069 BEAM 2 LOST DUE TO POWER SUPPLY FLUCTUATION
1070 SOL+LB+AFM,GOOD TO FAIR COND,IN I4,BOTH BEAMS LOST DURING Q-SHIFT IN R1
1070 REFILL,SOL+LB+AFM,GUOD COND,SMALL SPIKES IN R1+P2,CLEAN-UPS MAINLY FOR I2.
1071 LB+SOL+AFM,PRETTY GOOD CONDITIONS.
1071 LB+SOL+AFM,LOW BG,GOOD COND, SMALL SPIKES IN R2.
1075 LB+SOL+AFM,RATHER GOOD COND,CLEAN-UPS FOR I4+I8 IN R2.
1077 LB+SOL+AFM,GOOD COND,DITSY IN R1,BEAMS LOST DUE TO POWER FAILURE,REFILL.
1077 LB+AFM,SPIKES IN R1,BEAMS LOST DUE TO SFM WATER COOLING FAULT.
1078 LB+AFM,GOOD TO FAIR COND,CLEAN-UPS+V STEERING FOR I1+I2+I8.
1010 SFM+LB,FAIRLY GOOD COND,BEAM 2 LOST DUE TO P.S.FAULT.
1010 REFILL R2,GOOD AND STABLE WORKING CONDITIONS.
1088 LB,SPECIAL RUN FOR TD,GOOD COND.
1011 SFM+LB,QUITE GOOD CONDITIONS,MANY CLEAN-UPS.
1013 SFM+LB,GOOD AND STABLE WORKING CONDITIONS,PRESENCE OF STRUCTURE ON R2 BG.
1014 SFM+LB,QUITE GOOD RUN,EXEPT FOR I4 DISTURBED BY THE STRUCTURE ON R2 BG.
1016 SFM+LB,RATHER GOOD CONDITIONS,VERY GOOD IN I8.
1018 SFM+LB,GOOD WORKING CONDITIONS,MANY CLEAN-UPS TO IMPROVE I2 CONDITIONS.
1019 SFM+LB,GOOD WORKING CONDITIONS,VERY FEW CLEAN-UPS.
1020 SFM+LB+DAFM,QUITE GOOD RUN.
1022 SFM+LB+DAFM,QUITE GOOD CONDITIONS,I4 PERTURBED BY R2 BG STRUCTURE.
1023 SFM+LB+DAFM,QUITE GOOD WORKING CONDITIONS,VERY GOOD IN I8.
1025 DAFM+LB GOOD TO FAIR I1+I4 IN R2,LARGE AND REGULAR SPIKES IN R2.
1025 GOOD AFTER CLEAN-UP.
1026 DAFM+LB,SPIKES FROM TIME TO TIME IN R1+R2,DISTURBING I2+I4,R2 STRUCTURE.
1028 DAFM+LB,GOOD COND AFTER CLEAN-UPS,BOTH BEAMS LOST DUE TO 18KV(THUNDERSTORM)
1029 DAFM+LB,HIGH BG IN R2 FOR I2,VERY STABLE CONDITIONS.
1030 SFM+LB+DAFM, GOOD AND STABLE WORKING CONDITIONS.
1033 SFM+LB,VERY GOOD COND FOR ALL INTERSECTIONS,ISP POWER FROM SINGLE TRANSFO.
1034 SFM+LB ON, GOOD AND STABLE WORKING CONDITIONS.
1036 LB ON,GOOD COND,BOTH BEAMS LOST DUE TO SFM FAULT, REFILL
1036 LB,REFILL,GOOD TO FAIR COND FOR I1+I2,MANY 18KV SPIKES,R1+R2 LOST,SFM FAULT
1037 SOL+LB ON, QUITE GOOD AND STABLE CONDITIONS.
1038 SOL+LB ON,GOOD COND,R1 HAD TO BE DUMPED FOR SFM COMPENSATOR REPAIR
1038 SOL+LB,REFILL R1,FAIR TO BAD COND IN I1+I4,MANY CLEAN-UPS+BEAM ADJUSTEMENTS
1074 LB+SOL+AFM,BG STRUCTURE IN R2 PERTURBED I4,FAIRLY GOOD COND.
1079 LB+SOL+AFM,QUIET AND STABLE BG,SOME SPIKES IN R2,BG STRUCTURE IN R2.
1081 LB+SOL+AFM,R1 LOST DUE TO PS FAULT,R2 LOST DURING Q SHIFT,REFILL.
1081 LB+SOL+AFM,FAIR COND IN R2,BAD FOR I4,SPIKES IN R2.
1083 LB+SOL+AFM,IMPORTANT BG STRUCTURE IN R2, R2 LOST DUE TO PS FAULT.
1084 LB+SOL+AFM,GOOD COND,BG STRUCTURE,BEAMS LOST DUE TO SFM FAULT,REFILL.
1084 LB+SOL+AFM,GOOD CONDITIONS.
1085 LB+SOL+AFM,HIGH BG IN R2,STRUCTURE PERTURBED I1+I4,R1 LOST,R2 LOST 18KVREFILL
1085 R1 LOST WATER FLOW FAULT,R2 LOST WHEN POWERING MAIN MAG R1,HOLE IN VAC CHAMB
1087 LB+AFM,FAIR TO GOOD COND,I1+I4 HIGH BG.
1088 LB+AFM,STABLE COND,BG SLOWLY INCREASING,BEAMS LOST DUE TO POWER FAILURE.

15 Gev/c

22 Gev/c

26 Gev/c

31 Gev/c