Mlle Patricia SHINNIE E-6

ISR-OP/FL/TV/svw

28th May, 1979

ISR PERFORMANCE REPORT

Physics Run Analysis No. 1 - 1979

Period 1 - 9th March to 12th April 1979

1. INTRODUCTION

This report gives a summary of the physics running conditions from run 1010 (10th March) to run 1023 (9th April) which corresponds to ISR running period 1.

After the long January-February shutdown, the machine appeared to be in good shape. In spite of computer and analog scanner problems at the start which resulted in many beam diagnostic devices not being fully operational, the physics running schedule could be implemented without major delays.

The first physics run was at 26.6 GeV/c, the following nine runs were at 31.4 GeV/c.

Gradual improvement in 31.4 GeV/c performance made it possible to reach, at the end of the period (run 1022) a new luminosity record with $L = 2.3\ 10^{31} cm^{-2}s^{-1}$ ($\sim 4.7\ 10^{31}\ cm^{-2}s^{-1}$ in I1). During run 1023 a record in integrated luminosity was reached with $4.10^{36} cm^{-2}$ over 62 hours stable beam running.

The Solenoid could not be powered again from the start due to contamination in the refrigeration system.

The Open Axial Field Magnet (OAFM) installed during the shutdown in I8, was in operation for the first time during the last three runs of the period without any visible disturbing effect on the beam conditions.

The vacuum chamber in the I6 intersection region had to be realigned, up to 6 mm vertical misalignment errors having been discovered. This could partly explain the radiation problems observed last year downstream of R2.

In the I3 region the installation of new vertical and radial collimators as well as new dump blocks has been completed.

In I8 the new experiment R807 was set up during this period for study of Large Transverse Momentum Phenomena using the Open Axial Field Magnet facility, whilst R806 continued at the same time to take data.

In the other intersections R108, R209, R415, R501 and R607 continued to take data.

2. START-UP, FILLING AND ACCELERATION

As the low-β was switched on for every run, LBAC (ELSA type) working lines were used during the set-ups. Small corrections of the vertical closed orbit had to be introduced when the OAFM was powered. The expected tilts could be compensated by adjusting a few radial field magnets.

The collimator positions, in order to reduce the radiation in the intersection during set-up and filling, are now set automatically by computer in an optimum position based on closed orbit measurements at injection.

Currents in the range of 28-35 Amps were stacked at 26 GeV/c. Stable RF behaviour and the use of the BLC system made it possible to reduce the current losses to a minimum during acceleration. Good on-line control and correction, if needed, of the working line by means of the tracking Q-diagram meter and c the closed orbits during the phase displacement acceleration process, made it possible to keep currents after acceleration in the range of 25 to 33 Amps.

After filling and accelerating the first beam, vertical bumps of 3 to 6 mm were introduced separating the beams and avoiding perturbing effects due to beam-beam interactions during filling and acceleration of the second beam. When re-optimising both beams, vertical steering was performed with only two intersections at a time. Good values of h_{eff} (4.1 - 4.3 mm) were achieved during runs 1014 - 1020 and 1022.

Although all these beam manipulations are very time consuming, the average set-up time could be maintained in the order of 12 hours.

3. PHYSICS RUNNING CONDITIONS

A summary of the physics parameters is given in table I.

The total stable beam hours and the integrated luminosities are given in the following table.

Momentum GeV/c	Stable beam hours	∫ lums x time x $10^{35} cm^{-2}$
26.4	29	17.6
31.4	463	232.7

Beams were lost only once due to a faulty power supply (run 1010).
The 2 to 15 minutes background structure of beam 2 was observed during most of the runs. The reason for the sudden presence and mysterious disappearance

is still unknown.

The new collimator system appeared to be effective in reducing background in the intersections. The collimator positions were set-up empirically in the beginning due to the high number of collimators (10 per ring) and experience had to be gained progressively. Compromises had to be found: generally too strong collimation of beam 2 helped I1 and I6 at the expense of I4.

Good conditions could be attained with collimators close to the beams and released progressively during the runs. This method led to an important reduction in the number of clean-ups.

Permanent monitoring of the background in each intersection has been improved by use of a new 6-channel chart recorder for each ring. It was very convenient when adjusting collimators to follow the behaviour of the different background values in all intersections used at the same time.

Conditions in intersections

R108 had no solenoid in operation and was only testing.

R209 had high background rates from beam 1 just after clean-ups (induced radiation from I3?).

R415, with reduced luminosity (max. : $10^{31}cm^{-2}s^{-1}$) was the main demander for clean-ups and as usual were sensitive to beam 2 fluctuations.

R607 had fairly good conditions in spite of the presence of a small hot spot downstream of beam 2.

R806/807 with and without OAFM had good working conditions in general.

CONCLUSIONS

The ISR restart after the winter shutdown was without any major problems. Set-ups at the start of the running period were lengthened by Argus-Nord computer link problems.

The performance at 31 GeV of last year (reached just before Christmas) was reached again in the 2nd part of this period and was not limited by the new OAFM set-up.

The completion of the new collimation system and new beam observation devices, now essential during stable beams, proved to be very powerful for background control in each intersection.

F. Lemeilleur T. Verbeeck

RUN	P1 P2 GEV/C	WL1	WL2	SHAVING : R1	SHAVING : R2	DENSITY A/MM R1	DENSITY A/MM R2	STACK TOP R1	STACK TOP R2	STACK BOTTOM R1	STACK BOTTOM R2	I.INITIAL AMP. R1	I.INITIAL AMP. R2	HEFF MM IN.	HEFF MM FIN.	DH/DT :/H INIT.	L.INI 10E3
1010	26/26	AC	AC	30	30	.53	.45	33	30	-26	-30	31.26	27.27	3.7	4.2	.9	23.0
1010	26/26	AC	AC	30	30	.51	.46	33	28	-26	-25	30.12	24.44	5.1	5.3	.7	14.5
1011	31/31	AC	AC	25	25	.44	.44	32	32	-31	-31	27.93	27.50	4.5	5.6	.8	16.8
1013	31/31	AC	AC	25	25	.39	.38	34	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
1016	31/31	AC	AC	30	30	.29	.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	27.39	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

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
										WORKING CONDITIONS FOR EXPERIMENTERS — INTERSECTIONS													
010	26/26	31.26	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
010	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
011	31/31	27.93	27.50	26.13	25.74	12	4	14.0	52	2	2	2	2	2	0	2	2	2	2	2	2	0	2
013	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
014	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
016	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
018	31/31	28.49	27.34	26.08	26.04	17	2	14.0	52	0	3	1	2	1	0	1	0	3	2	2	1	0	1
019	31/31	28.96	29.26	27.91	28.89	14	2	15.0	39	0	2	2	2	2	0	1	0	2	2	2	2	0	1
020	31/31	22.93	27.39	22.37	26.89	7	3	13.0	42	0	2	2	2	2	0	2	0	2	2	2	2	0	2
022	31/31	29.99	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
023	31/31	33.53	27.76	31.88	26.62	10	3	18.0	62	0	2	2	2	2	0	1	0	2	2	2	2	0	1

NO DATA...0 FAIR.....3
VERY GOOD.1 BAD......4
GOOD......2

Table 1

PERIOD I

SPECIAL COMMENTS

****

RUN	
1010	SFM+LB.FAIRLY GOOD COND.BEAM 2 LOST DUE TO P.S.FAULT.
1010	REFILL R2.GOOD AND STABLE WORKING CONDITIONS.
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.
1015	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+OAFM.QUITE GOOD RUN.
1022	SFM+LB+OAFM.QUITE GOOD CONDITIONS.I4 PERTURBED BY R2 BG.STRUCTURE.
1023	SFM+LB+OAFM.QUITE GOOD WORKING CONDITIONS.VERY GOOD IN I8.