ISR-OP/PB/mh September 5th, 1971

ISR RUNNING-IN

RUN 103 - BEAM TRANSFER AND INJECTION AT 10.5 GeV/c

1. Purpose and Conclusions

The circulating beam current at this energy was low in previous runs. It was the aim to note all injection conditions and see if injection could be done better.

It was found that beam loss happened 100 msec after injection, which makes it not very probable that injection errors cause the loss.

2. B.T. Currents

During RUN 100 and 103 the currents in the B.T. magnets, for centered beam on the monitors, were established. They are now available as list 10GP in the Argus computer.

During run 100, current adjustments were made on 21 of 56 currents. (changes of the order of 0,5% of the theoretical values). During this run only 12 changes were needed. In future, like for the other energies, mainly injection region magnets need adjusting.

3. Injection

Injection in ring 2 took some time, due to a switch in the A2 building that was in the wrong position. The kicker fired at the wrong moment.

Injection in ring 1, was optimised, and gave no more that 1 mm amplitude betatron oscillations. The pick-up signals formed a straight line, and there was less than 0,2 Volts p.p. filter signal on the injection oscilloscope (filter gain normal).

There was an impression loss of current after injection. The pick-up signal (covering the first 100 μsec) did not show much loss. The current transformer indicated a decay after 100 milliseconds. The PIDC plotter graph is given as fig.1 where this is clearly visible.

As injection errors influence the beam only shortly after injection (60 μsec) it is not likely that the loss is due to this.

4. Efficiency

Ring 2 behaved as ring 1. The losses are indicated in the following table.

TABLE 1

Losses in transfer and after injection

CT 103	$14.4 \times 10^{+11}$ p.	CT 103	14.7×10^{11} p
CT 349	$14.2 \times 10^{+11}$ p.	CT 449	14.6×10^{11} p
loss TT2	1.4 %	loss TT1	0.7 %
current Ring 1	47.0 mA	current Ring 2	54 mA
loss Ring 1	35 %	loss Ring 2	27 %

5. Aperture

It was tried if changing the dump block position from +5,0mm to 0.0mm had any influence. There are no change in efficiency.

Also changing the inflector position did not improve either current or the signal of the ion chamber at the inflector.

6. Injection Orbit

The position of the injection orbit, measured with the frequency counter, was -34mm for Ring 2. Ring 2 had bare machine plus initial closed orbit corrections.

Ring 1 which at that moment had 10FA and 10 CO, gave-39mm.

7. Scan

The pick-up scan for ring 1 done by Autin is given in tables 2 and 3.

Ring 1 had during this measurement bare machine and 10CO + 10 QC .

8. Emittance

A) In the transfer lines, the emittance was measured on the SEM-grid monitors, and also calculated from beam widths on LS-monitors.

In table 4 these widths readings are given. The first column gives the widths for a theoretical beam of $E_H = 2\Pi$ mm.mrad and $E_V = 1\Pi$ mm mrad. The second column shows the width as measured on the LS monitors ; the third of the SEMG-monitors.

The SEMG-readings indicate lower emittances than the LS-readings.

mon.	E_H	E_V
SEMG	1.1Π	0.7Π
LS	2.0Π	1.0Π

This difference must be explained by

1) the fact that on LS-monitor one might interprete halo around the lightspot as beam.
2) the SEMG-monitors do not show the sides of the beam well; the signals disappear in the noise of cable plus electronics, and are out off.

B) In the rings not all the SEMG monitors were working. In tables 5 and 6 we see the results.

The emittance in both Rings corresponds well with the values measured in the beam transfer line.

Due to the faulty monitors, the matching of the beam could not be tested.

There was no time to measure the width of the circulating beam, with the scrapers, or with the inflector. Keil measured the horizontal width several hours later. He found 5mm r.m.s. betatron amplitude in the horizontal plane. See his note of August 31st.

P. BRUMMER

Distribution :

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Fig 1.

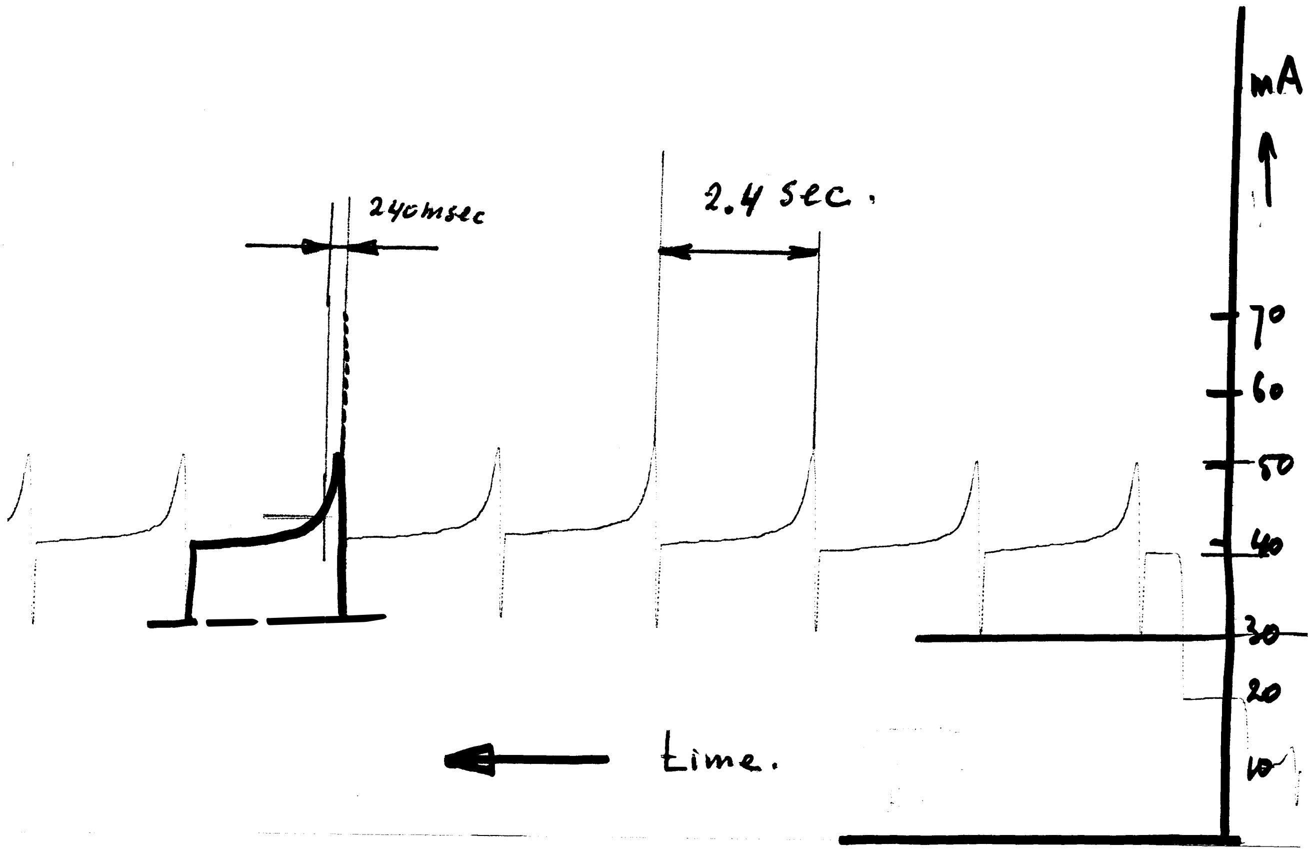
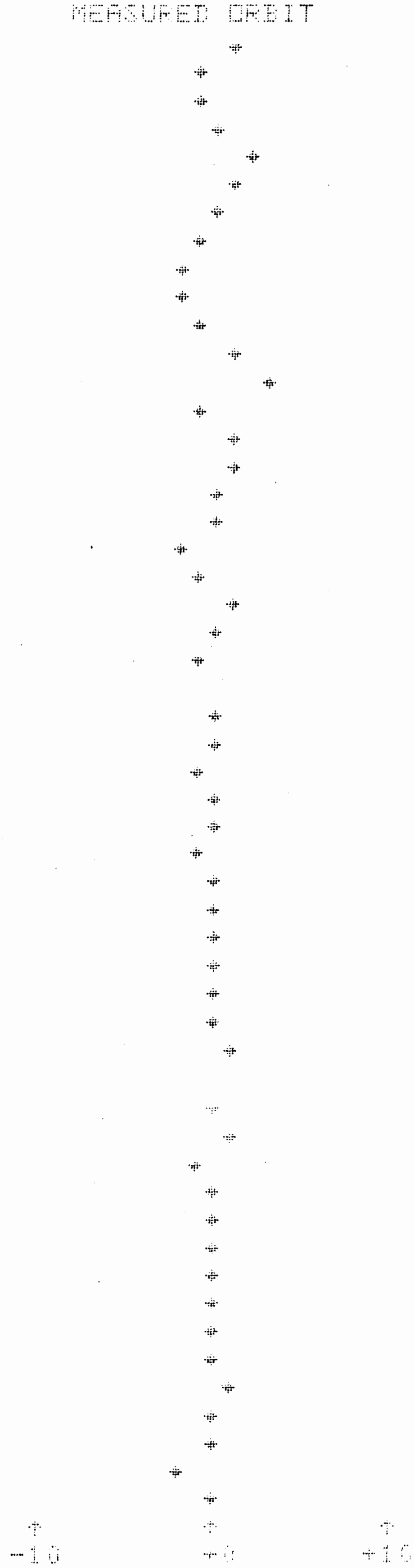


TABLE 2

NG 1 VERTICAL PLANE
ADINGS TAKEN ON 710830 AT 132801
= 8.000
OMENTUM(GEV/C)= 10.734
VERAGE ORBIT(MMS)= -0.1(MEAS)

PU	MMS
3	1.4
7	-0.9
9	-1.0
1	0.4
0	1.9
1	0.7
3	-0.3
5	-1.4
1	-1.7
5	-2.1
3	-0.5
1	1.0
7	3.1
3	-1.3
3	0.7
7	1.1
9	0.1
1	0.3
3	-1.7
1	-0.5
3	1.2
3	0.4
1	-1.3
5	FAULT
3	0.1
1	-0.2
5	-1.3
5	-0.1
7	-0.2
9	-1.2
1	-0.4
3	-0.2
1	0.0
5	0.3
7	-0.3
1	0.4
5	1.0
[illegible]	FAULT
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	-1.3
[illegible]	-0.0
[illegible]	0.2
[illegible]	0.4
[illegible]	-0.1
[illegible]	-0.4
[illegible]	-0.4
[illegible]	-0.8
[illegible]	0.9
[illegible]	0.3
[illegible]	-0.4
[illegible]	-1.7
[illegible]	0.4



PEAK TO PEAK(MMS)= 5.2

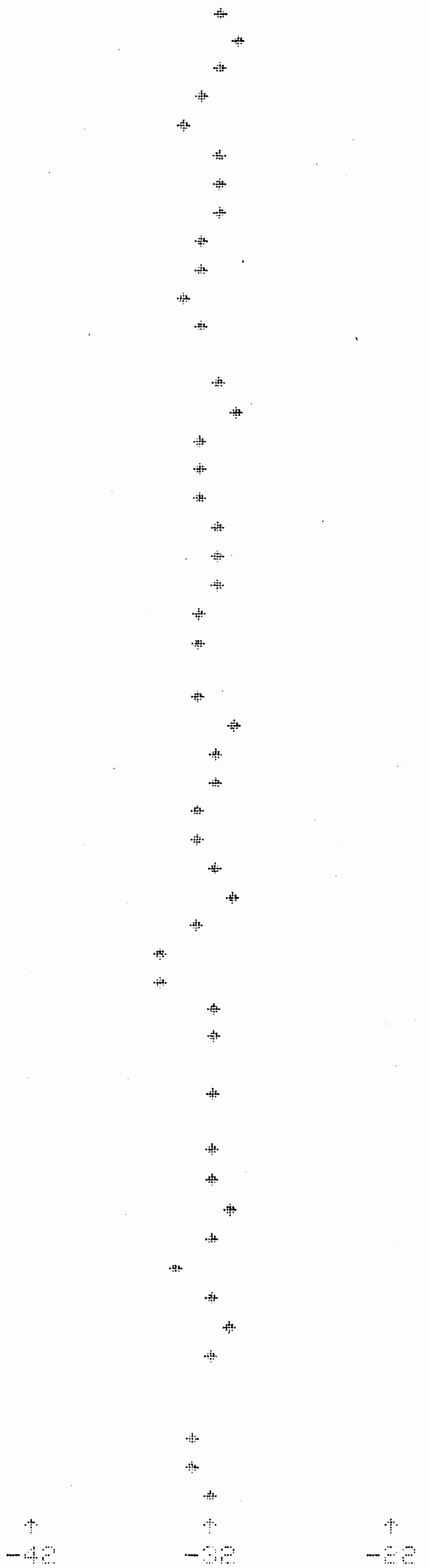
TABLE. 3

DATA FROM FILE [illegible]
RING 1 HORIZONTAL PLANE
READINGS TAKEN ON 710830 AT 132801
Q= 8.000
MOMENTUM(GEV/C)= 10.734   MOMENTUM ERROR(GEV/C)=-0.017
AVERAGE ORBIT(MMS)= -32.4(CALC)

Anneau 1
p = 10.7342 GeV/c
Run 103

PLOT CORRECTED FOR MOMENTUM COMPACTION

PU	MMS
965	-30.9
957	-30.1
949	-31.2
941	-32.6
933	-33.8
921	-32.6
913	-32.7
905	-32.7
761	-31.8
745	-33.2
733	-40.8
721	-33.6
717	FAULT
705	-32.6
665	-29.7
657	-32.4
649	-32.0
[illegible]1	-32.1
633	-31.7
621	-32.0
613	-32.0
605	-33.0
561	-32.0
545	FAULT
533	-40.7
521	-32.3
505	-32.1
465	-31.2
457	-32.6
445	-32.7
441	-31.3
413	-30.4
401	-33.4
313	-35.4
305	-35.4
261	-31.7
245	-31.4
[illegible]3	FAULT
221	-33.2
205	FAULT
165	-31.4
157	-31.3
149	-30.7
141	-31.9
133	-35.0
121	-32.3
113	-30.9
105	-32.1
161	FAULT
145	FAULT
133	-40.0
121	-33.5
105	-32.1



PEAK TO PEAK(MMS)= 4.5

TABLE 4

Width at different monitors

Monitor	W_H (E = 2Π)	W_V (E = Π)	Measured at 10GeV. LS		Measured at 10GeV.SEMG	
	theoretical	theor.	W_H	W_V	W_H	W_V
	mm	mm	mm	mm	mm	mm
LS 102	6.2	3.9	6.5	4	2.72	2.48
LS 103	8.6	2.7	7.	3	4.6	2.3
LS 105	7.6	4.9	8	8		
LS 107	10.1	3.4	8	2		
LS 210	4.7	7.9	3.5	8		
LS 231	8.2	3.6	8	3.5		
LS 382	5.9	5.1				
SG 340	5.6	5.4			6.3	4.55
SG 342	5.8	5.5			5.2	6.4
SG 344	5.8	5.4			4.2	6.7
LS 348	7.9	5.5				
LS 349	6.0	9.2	3.5	7		
LS 351	5.8	4.8				
LS 352	5.8	4.0				
LS7175	8.5	3.5				
LS7174	8.7	3.6				
LS 408	6.8	4.3	3.5	4.5		
LS 416	5.2	5.5	3.5	5.5		
SG 426	5.2	5.4			3.74	4.44
SG 428	5.2	5.4			3.90	3.52
SG 430	5.2	5.6			3.42	4.91
LS 442	5.2	5.4	3.5	5		
LS 448	7.6	5.7	5	5		
LS 449	5.9	9.3	4.5	8.5		
LS 451	5.9	4.8	5	3.5		
LS 452	5.9	4.1	5.5	3		
LS2485	8.5	3.5	6	3		
LS2486	8.7	3.6	12	3		

TABLE 5

Ring monitors in Ring 1

Monitor	Plane	Width mm	Emmittance mm. mrad Π
SG 3496	H	5.5	0.8
SG 7495	H	6.38	1.0
SG 3496	H	5.4	0.8
SG 7495	H	6.4	1.1
SG 3496	H	5.71	0.9
SG 7495	H	5.58	0.8
SG 3496	V	2.24	0.4
SG 7495	V	2.84	0.6
SG 3496	V	2.0	0.3
SG 7495	V	3.0	0.6
SG 3496	V	2.35	0.4
SG 7495	V	3.0	0.6

TABLE 6

Ring monitors in Ring 2

Monitor	Plane	Width mm	Emittance mm.mrad XΠ
2648	H	6.67	1.5
4163	H	7.2	1.4
2163	H	5.3	0.7
2640	H	6.9	1.6
4163	H	7.7	1.6
2163	H	6.0	0.9
2648	V	3.2	0.5
4163	V	2.9	.6
2163	V	3.4	.6
2648	V	3.2	.5
4163	V	2.9	.6
2163	V	3.4	.7