ADD. L. Scarfe

ISR-ES/FB/11

10th November, 1971

ISR RUNNING-IN

Runs 117', 122 and 122'

Tests of septum magnet for experiment R 201

The first high current septum magnet of experiment R 201 (magnet EM1 / R 201) was operated in the presence of beam stacks in order to study its effect on lifetime and background.

Conclusion: it was found that, under normal circumstances and using the slow rate of change in the magnet current, the effects on the ISR performance appear acceptable. More observations during physics runs are needed to confirm this.

1. Magnet characteristics

The magnet is a 4 turn, electric septum type, sitting above the vacuum chamber of Ring 1, just downstream of I2 (see, eg., the layout drawing posted up in the SRC). Its field is horizontal.

- Maximum excitation current : 20 KA
- " " " available at present (limited by the power supply): about 16 KA
- Iron yoke length : 1.7 m
- useful aperture : 60 mm (horizontal) x 100 mm (vertical)
- Maximum power dissipation : 550 kW
- Time constant : 60 ms
- Maximum field in gap : 1.64 T

The magnet can be moved up and down by 600 mm and tilted around a horizontal axis by 200 mrad.

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2. Run 117' (15 GeV)

During one hour at the end of the physics run the magnet was excited slowly from zero current up to about 16 KA at a constant rate of about 1 KA/minute.

The magnet was horizontal and in its closest position relative to the vacuum chamber.

Currents in Ring 1 :		$\sim$ 2.97 A
Ring 2 :		$\sim$ 1.84 A

During the test the background rates in the intersections increased by different amounts, quoted by the experimenters as :

I 2 :	R 1	up by 20% (at the level of 6 or 8 KA), then normal again
I 4 :	R 2	up 2x (at the level 6 KA)
	R 1 and R 2	up 3x (at the level 16 KA)
I 6 :	R 2	up 20x (at the level 10 KA)

The background came in spikes.

When reaching 16 KA, the power supply tripped, due to an internal protection intended to prevent overloading its present, inadequate, transformer. The beam in Ring 1 was lost instantaneously, down to a level of a fraction of one mA. It was found that the clearing electrodes in Octant 1 of Ring 1 had tripped; this seems to indicate that a high fraction of the beam was lost there. Il also reported a high residual background (from induced radiation, presumably).

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The dump had not fired: it was triggered manually to dispose the residual beam. The vacuum pressures were recorded before the test and just after the beam was lost: a small difference appeared.

Average :	before test	2.49	10^{-10} torr
	after test	2.77	10^{-10} torr

The beam of Ring 2 was not affected.

3. Run 122 (22 GeV)

Before physics preparations started, a (very noisy) stack was made in Ring 1 (about 1.01 A) and the magnet tested again. Magnet position: mid-point of magnet gap centre line 160 mm above ISR medium plane; 59 mrad forward tilt; this brings the forward end in its closest position to the vacuum chamber.
The current was raised slowly (at about 1 KA/minute) from 10 A (stand-by value) to 5 KA; then slowly down to 4.6 KA (value desired for the physics run); then fast down (in about 1 second) to 150 A; then fast up to 5.6 KA, then slowly down to 4.6 KA and kept constant throughout the rest of runs 122 and 122'.
No effect was seen on the circulating current. The background from R1 in I2 was recorded: it showed a small increase (factor less than 2) during the slow adjustments, and an increase of about 5x and strong spikes during the fast changes. The background from R1 (and R2, to check cross-talk) in I1 was also recorded: it shows spikes, and a slight increase during the fast adjustments.

Ring 2 current was zero during this test.

4. Run 122' (22 GeV)

During the last hour of the physics run, a test was made as follows:

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- Beams: R1 0.807 A R2 1.027 A
- Magnet position: same as during Run 122
- Current cycle:

starting value	4.6 KA
up slowly to	15.7 "
down slowly to	~ 0 "
up fast to	15.8 "
down fast to	~ 0 "
up fast to	16.2 "

simulate fault on power supply, to observe effect of trip.

- Effect on stacks:
  - R2: none
  - R1:
    - none during slow adjustments
    - two small drops (less than 1 mA) coincident with the "up fast" adjustments. Loss of about 20% of the beam when tripped.
- Effect on background in I2: some spikes and slight increase (much less than a factor of 2) during slow adjustments Large increase (factor of 100) during fast adjustments (specially on "up fast"), settling down again to its normal value afterwards. Large spike at tripping.

F. Bonaudi

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BEAM DECAY

RUN 122'

R1 I_1 = 0.8419A

R2 I_2 = 1.0640A

22 GeV / 4h.

9 - 10 Nov. 1971