ISP RUNNING-IN

Run 97 - August 11, 1971 - 13.00 - 16.00 h
Ring 1 - 22 GeV/c - 20 bunches - 22 FA
Injection - 32.7 mm
Clearing electrodes +3.5 and 0 kV

Intra-beam scattering experiment.

1. Purpose and conclusions

The aim of the experiment was a comparison of the life times of two stacks, one stacked in the normal fashion and one stacked with a strong resonance in it. The latter should decay more rapidly but it did not. Small displacements of the beam should wipe out particles near the resonance and yield a longer life time after the operation. The contrary was found. Thus if there is a phenomenon which alters the beam life time in the vicinity of a resonance then it is not intra-beam scattering.

2. Normal stack

A stack was made with the 22 FA working line, it had the following decay rates

at 4.11 A : \(3.25 \times 10^{-4} \text{ min}^{-1}\) for 6 min.

at 4.11 A : \(5.5 \times 10^{-5} \text{ min}^{-1}\) for 4 min.

Moving the beam out by 2 mm with the slowest motion of the ramp generator and back caused some 20 mA to disappear. Then there was a sudden loss to about 3.5 A, followed by about 2 min. of decay at a rate of \(5.7 \times 10^{-3} \text{ min}^{-1}\). After that the decay rate was

at 3.53 A : \(2.15 \times 10^{-4} \text{ min}^{-1}\) for 10 min.

3. First stack with resonance in the middle

The following Q changes were made \(\Delta Q_H = +0.03\), \(\Delta Q_V = -0.02\).
A stack made to about 4 A had the RF scan shown as Fig. 1. Moving it
2 mm. out, 2 mm. in, 2 mm. in, 2 mm. out gave the RF scan shown as Fig. 2, suggesting that indeed the region near the resonance is wiped out.

4. **Second stack with resonance in the middle**

This stack had the following decay rates

\[
\text{at } 4.03 \text{ A : } 4 \times 10^{-4} \text{ min}^{-1} \text{ for 19 min.}
\]

The loss per minute varied between 0.4 and 6.9 mA. The stack was RF scanned, unsuccessfully because the scope had become too hot, and moved 2 mm. out, 2 mm. in, 2 mm. in, 2 mm. out; this caused a loss of about 0.3 A. The new life time was

\[
\text{at } 3.65 \text{ A : } 2.3 \times 10^{-3} \text{ min}^{-1} \text{ for 6 min.}
\]

The losses per minute were 18.7, 0.8, 4.1, 15.0, 2.2, 10.0 mA; the high losses occurred during relatively short intervals which were clearly seen on the beam current display and the recorder as shown in Fig. 3. It is this erratic behaviour which excluded intra-beam scattering as a possible mechanism because it should behave smoothly being a diffusion process. The experiment was abruptly terminated when the main power supply tripped at 15.51.

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