ISR RUNNING-IN

Run 91, 22 GeV/c, Ring 1, 20 bunches (22.7.71)

Working Line : 22 FA

A stack was made in stages of about 1 A with long waiting periods at each level of current, during which the evolution of pressure and beam loss-rate was observed. RF scans were taken at the beginning and the end of each waiting period.

Up to the 3 A level nothing particularly remarkable was seen. Loss rates were low and pressures rather constant at each level, increasing slightly with each current step. The results can be summarised as follows:

18.56 to 19.17 hr

I = 1.0422 - 1.0419 A

\[ \frac{1}{I} \frac{dI}{dt} = 1.4 \times 10^{-6} \text{ min}^{-1} \]

P (VG 349.1) = 4.1 \times 10^{-10} \text{ torr}

\[ \langle P \rangle = 2.6 \times 10^{-10} \text{ torr} \]

P_{NS} = 1.3 \times 10^{-10} \text{ torr.}

Loss rate is a factor of 4 below that calculated from P_{NS} on the vacuum printout, presumably because at this level the residual gas is mainly H_2.

19.26 to 19.51 hr

I = 2.0334 - 2.0300 A (some losses from RF scans)

P (VG 349.1) = 4.5 \times 10^{-10} \text{ torr}

\[ \langle P \rangle = 2.75 \times 10^{-10} \text{ torr} \]

19.53 to 20.05 hr

I = 3.0070 A

P(VG 349.1) = 5.3 \times 10^{-10} \text{ torr}

\[ \langle P \rangle = 2.9 \times 10^{-10} \text{ torr} \]
Things became interesting at the 4 A level, because an unusually low loss rate was observed for this current. In fact the latter part of the original experimental programme was postponed in order to make long-term observations on this stack, which was kept for over an hour. The evolution of current and pressure is shown on the figure, where pressures have been plotted on different linear scales from the PLVG (R1) printout and currents have been taken from the CDEC printout.

[Note: there are appreciable discrepancies between the currents indicated by PLVG, CDEC and the Nixie display, which are a nuisance for these low loss rates.]

The stack decayed at about $2 \times 10^{-5}$ min$^{-1}$ at the beginning of the period, increasing to around $2.5 \times 10^{-5}$ min$^{-1}$ at the end. These rates are a factor of 2 higher than those calculated from $F_{NS}$, suggesting a higher proportion of heavier gases at this level. At 21.06 the pressures level off but rise again slightly between 3 and 8 minutes after dumping Ring 2 stack!

The RF scan tracings show nothing very special except the usual slight dilution of the density peaks.

The stack was destroyed (½ hour late!) by a series of abrupt losses coinciding with pulses on the dump recorder:

<table>
<thead>
<tr>
<th>Time</th>
<th>Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>21.39</td>
<td>4.1</td>
</tr>
<tr>
<td>21.40</td>
<td>3.7</td>
</tr>
<tr>
<td>21.41</td>
<td>1.8</td>
</tr>
<tr>
<td>21.41</td>
<td>1.1</td>
</tr>
</tbody>
</table>

Conclusions

Although the original experiment was not completed we hit upon a recipe, rather time-consuming, for making a low-loss stack of 4 A. It seems worthwhile to repeat this on a future run, spending less time at the lower current levels, to see if a similar procedure could be useful for physics runs.

B.W. Montague

Distribution
ISR Group Leaders E. Brouzet MPS
Running In Committee M. Höfert HP
RUN 91, 22 GeV/c, R1, 20 bunches (22.7.71)

\( P_{NS} = 2.4 \times 10^{-10} \text{ torr} \)

R2 DUMPED AT 21.09 h

\( P_{NS} = 3.5 \times 10^{-10} \text{ torr} \)
RUN 91, RING 1

SCANS 4, 5
1.040 A

SCANS 6, 7
2.028 A

SCANS 8, 9
3.041 A

SCANS 10, 11
4.16 A

INT

+0.6 +20.7 +38.0 mm

INT

+0.6 +20.7 +38.0 mm