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Ring 2, 26 GeV/c

Vacuum Limit Ring 2 (short term)Summary and Conclusions

The maximum (record) current of 30.4 A which was lost immediately after stacking to saturation exposed one important pressure bump (at 860 in S10) and several minor pressure rises in the 10^{-11} torr range. That at VG 860 reached 7.10^{-10} torr - a rather modest pressure bump which is not normally sufficient to destroy a more modest beam current of 20 - 25 A. Unfortunately there was rather a large gap in our gauging between the adjacent gauges VG 848.7 and 864 - neither of which moved at all and the true bump may have been higher. Previously 848 has been noted as a pressure bump region - the present run suggests that its centre may be located (as found in other similar regions) more towards 852 or 856. It is thus a pity that the work load in the November shutdown did not permit us to bake this arm at 350° C as originally planned.

A similar and recently limiting and persistent pressure bump at 648 in fact seems to have been eliminated by the 350° C bakeout of the 648 - 662 arm of I7.

The slow developing and long-term limiting (~ 20 A) pressure bump at 364 in I4 was just noticeable during the short time taken to reach 30 A.

Once again a rather striking symmetry (see later) is seen between the several small pressure bumps which have been observed.

The value of such high current runs is certainly very real for the vacuum group. However, although we obtained 30 A with only the one moderately important pressure rise at 860 we know that Ring 2 is limited to < 20 A for useful long term operation by the slow pressure bump at 364. This again underlines the importance of maintaining a proper balance between short record current runs and long high intensity (test) runs.

Experiment

A record current of 30.4 A was obtained after stacking had been interrupted at the 6, 12, 18 and 24 A levels for working line adjustments*. Stacking saturated at the 30.4 A and was followed immediately by a rapid current decay and then beam loss.

The following vacuum details were observed:

860 VG 860 began to rise above its equilibrium value of 7.10^{-11} torr at about the 20 A level, appeared to stabilise at 1.10^{-10} torr during the 7 minute interval at 24 A and then continued to rise with increasing current to reach a peak of $\sim 7.10^{-10}$ torr at 30.4 A. Recovery to the starting pressure was more or less instantaneous when the beam was lost.

The clearing current from octant 1 followed the same pattern - the current was small and stable ($\sim 0.1 \mu\text{A}$) at 24 A although already double its value of 18 A. Thereafter this clearing current increased progressively more rapidly and exceeded full scale ($2.5 \mu\text{A}$) at the 30 A level.

Adjacent gauges 848.7 and 864.2 did not appear above the 4.10^{-11} torr threshold.

216 VG 216 started to increase above its equilibrium value of $1.5.10^{-11}$ torr at ~ 25 A and reached $1.5.10^{-10}$ torr at the maximum beam current. At this moment the rate of rise was very steep. After beam loss the recovery was much slower than for VG 860. No clearing currents were recorded for octant 2.

Elsewhere in Ring 2 the following small pressure increases were noted on the vacuum gauge pressure plots:

* Spectra and η values at 632 were also measured during these periods - see PR 26.11.74 (ISR-VA/OG/nb).

VG 364 : $1.8 \cdot 10^{-11} \rightarrow 3.10^{-11}$ torr (note that this is the gauge at the slow developing pressure bump region in I⁴ which has so far limited long term operation of R2 to ~ 20 A).

VG 564 : $3.10^{-11} \rightarrow 5.10^{-11}$ torr

VG 616.3 : $8.10^{-12} \rightarrow 2.10^{-11}$ torr

VG 764 : $3.5 \cdot 10^{-11} \rightarrow 6.10^{-11}$ torr

VG 112 : $5.10^{-11} \rightarrow 6.10^{-11}$ torr

As is often the case the grouping of even these minor pressure rises is striking: 364, 564, 764 on outer arcs close to an intersection (two of these positions are previously noted pressure bumps, only 564 is new); 216 and 616.3 near inner arc sector valves (216 has been noted in earlier reports); 112 at an outer arc sector valve.

It should be noted that the small pressure rises have been detected by scanning visually the graphical computer outputs. Unfortunately something less than 50% of the gauges could be plotted in this way from the data collected - hence the remainder have not been scanned except by the repetitive PLVG set with a threshold of 4.10^{-11} torr. Further, of those plotted a certain number are too noisy during the stacking process to be useful.

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