ISR-MA/LR/ww May 21, 1971

ISR RUNNING-IN

Run 54 - May 18, 1971

Both rings, 4 bunches, 26 GeV/c

Stacking and lifetime experiments (18.15 to 20.00 h)

The first stack in ring 1 was made at 18.17 h, i.e. 2.15 h after first ejection from PS, at the working line obtained by saturation compensation by PFW (ARGUS file 26SA) with the addition of -10 % current in T_{D1} (see Gourber's report). Stacking was at the top, with acceleration to about 65 mm from the injection orbit.

The PS ejected current was lower than usual and about 11 mA per pulse were stacked when no visible loss occurred, which was the case up to 700 mA. 1 A was reached in 95 pulses. At the level of 1.33 A, when stacking was still progressing at the rate of 5 m A/pulse, a brickwall-type loss occurred, but no filter output was observed. After having hit the brickwall twice again at about 1.3 A, stacking was stopped at 1.2311 A, where the beam remained, without any initial loss. The current reading was still the same after 10 minutes and had decreased by 0.2 m A after 27 minutes, giving an average decay rate of 6.10^{-6} min $^{-1}$ over that interval. The decay rate increased to 6.10^{-5} min $^{-1}$ during repetitive injection and initial stacking in ring 2; then suddenly a fast decay started, when the stack in ring 2 had reached 1.05 A. The current in ring 1 fell below 1 A in 6 seconds, and below 800 m A in one minute, with irregular fluctuations. An RF scan made after the loss showed that the bottom part of the stack had been strongly depleted.

The first stack in ring 2 was started at 18.55 h, at the working line obtained by saturation compensation by PFW (ARGUS file 26SA) with the addition of -5 % current in T_{D1} (see Gourber's report). Stacking was at the top, with same settings as in ring 1. Contrary to ring 1, losses during the stacking process started at 50 m A already, probably due to a resonance sitting near the top of the stack, and it took 133 pulses to reach 1 A. A small brickwall-type loss occured at 1.1 A, and at the same time vertical filter output was observed. When stacking was stopped (again at about 1.1 A) a very fast loss occured, accompanied by vertical filter output at a frequency of the order of 80 KHz.

While the current in ring 2 stabilized at about 715 m A, a new stack was made in ring 1 at 19.15 h, under the same conditions as the first one, but stopping at 1.1117 A, before hitting the brick wall. Also this stack remained extremely stable until a new stack was made in ring 2, but had suddenly the same precipitous decay as the previous one, when the stack in ring 2 reached 800 m A. This time it could be definitely observed that the sudden loss in ring 1 coincided with the appearence of vertical filter output in ring 2.

The second stack in ring 2 was made with 6 mm earlier stop of acceleration, but the losses during stacking were as bad as in the first one. A certain number of pulses were also lost during the stacking process, so that at about 880 m A the bottom of the stack must have reached the same region of the aperture which it had reached at 1.1 A in the first stack. At this moment a brick wall-type loss was observed: as said above, vertical filter output was already present since 800 m A level. The brick wall was hit twice more at about the same level, always with advanced appearence of vertical filter output at a frequency of about 80 KHz: the second hit corresponded with the stop of stacking, which was followed by a very fast decay below 600 m A. During the brick wall hitting exercise and the subsequent fast, irregular decay in ring 2, the beam in ring 1 was continuing its rather fast and irregular decay, and a weak vertical filter output at 80 KHz also appeared in ring 1. This filter output in ring 1 disappeared and the beam became stable as soon as the beam in ring 2 was dumped.

The ensemble of the above observations seem to constitute an evidence of an instability in ring 1 being triggered by the occurrence of a similar instability in ring 2.

Since both the frequency of the filter output and the fact that it appeared as a vertical signal suggested that the the instability was due to an inadequate spread of the vertical Q in the stack, the sextupoles of both rings were excited to produce

$$\Delta \frac{dQv}{dp/p} = 1.0$$

This excitation was accompanied by a re-setting of the Tewilliger quads to obtain an acceptably lossless aperture scan (see Gourber's report): $T_{D1} = 0$ in ring 1.

Under this new condition, stacks of 0,9234 A in ring 2 and of 1,0970 A in ring 1 were obtained without any appearance of filter outputs or brick wall phenomena. These stacks were used from 20.00 h to 23.00 h for luminosity measurements, with vertical steering at several crossing points, with small losses.

At 23.00 h the inflectors were withdrawn (with shutters open) but the dumps were left in the position which they had when the stacks were made, i.e. vertically displaced by about 6 mm. The current decay during the undisturbed periods of the physics run was as follows:

	Ring 1		Ring 2	
Time (hour)	Current (A)	Decay rate (min^{-1})	Current (A)	Decay rate (min^{-1})
23.05	1.0872	$2.5 \cdot 10^{-5}$	0.9204	$1.1 \cdot 10^{-5}$
02.25	1.0818		0.9184	
	Change in excitation of secptum magnet in I_2			
02.35	1.0810	$5.9 \cdot 10^{-5}$	0.9111	$1.5 \cdot 10^{-5}$
06.30	1.0658			

The faster decay in ring 1 may have been due to the beam grazing the septum.

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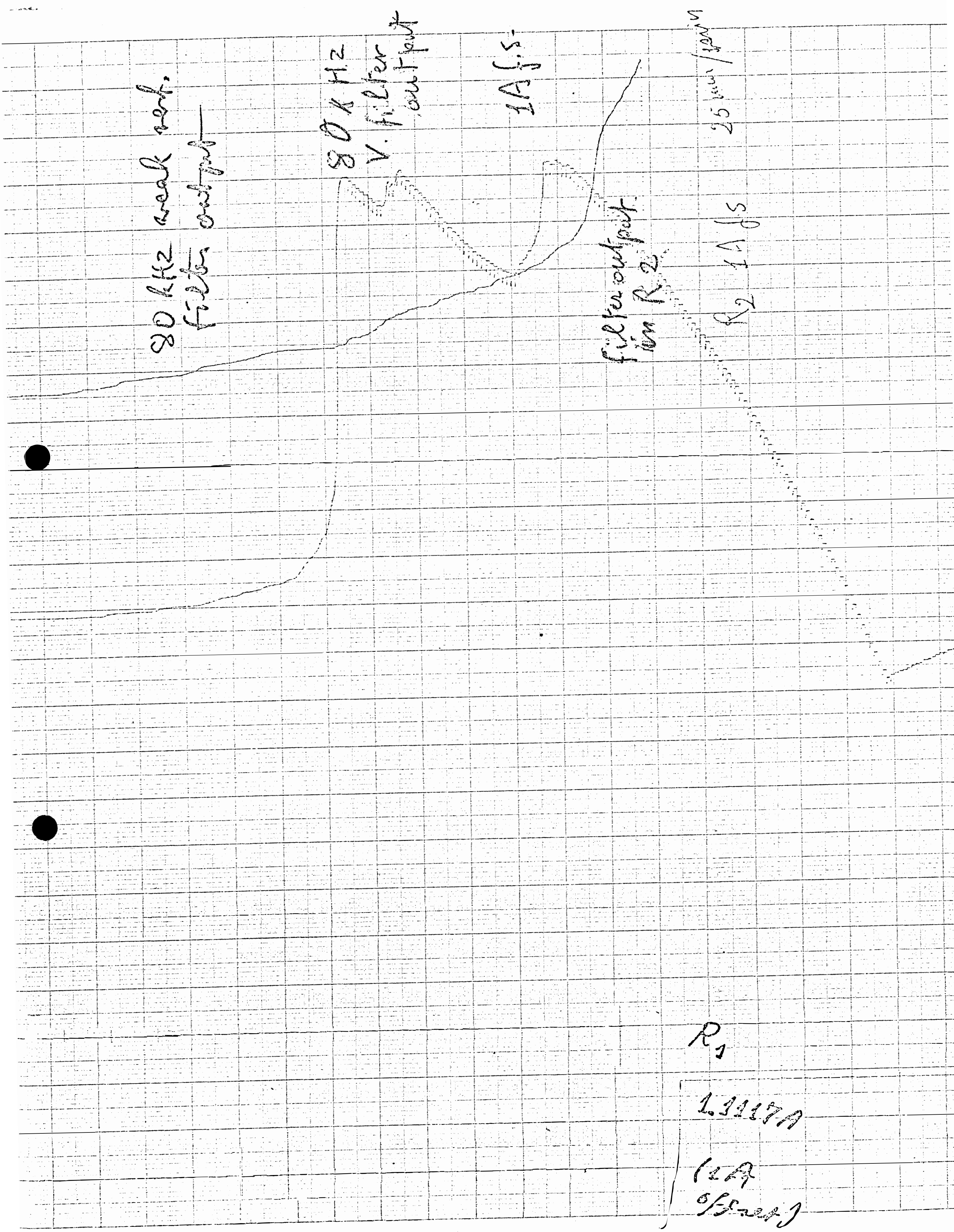

Second shock in R_2
in presence of 1.1117 A beam in R.1