ISR-RF/MdJ/mp

1st September, 1972

ISR PERFORMANCE REPORT

Run 217, 23.8.1972, 26 GeV/C, Ring 2

1. Scanning with noisy buckets

The technique used in this experiment was the same as the one used during Run 176. Noise of different power level, bandwidth and center frequency was injected in the scanning system to cause FM modulation of the scanning frequency.

The results obtained when scanned with added white noise are very similar (see figures 1 and 2) to those obtained during Run 176.

When scanned with filtered noise of constant bandwidth (20 Hz) and varying center frequency and power level, the sharp cut-off frequency between almost normal scan signals and signals similar to scans obtained with the high frequency scanning cavity, could be clarified.

It seems that distorted scanning signals can be obtained for each center frequency when sufficient power is injected. The amount of power required to generate the distorted signals increases when the center frequency is further away from the phase oscillation frequency, as can be seen from pictures 3 to 5. 60 mV is needed to generate a distorted scan at f_{center} = 20 Hz, 100 at f_c = 320 Hz and 160 mV at f_c = 420 Hz.

2. Lifetime of bunched beam under the influence of noise

Single shots were injected and kept bunched, noise was injected in the RF system and the lifetime of the bunched beam was observed as function of noise level, bandwidth, etc. Since we had some doubts about the proper functioning of the filter , experiments were done mainly with white noise.

The main conclusions are :

a) with normal phase-lock the bunch structure disappears equally fast for all bunches. The speed with which the bunch structure disappears is directly proportional to the power of the noise injected

b) with missing bunch phase lock, the bunch structure disappears first for the bunches farthest away from the bunch to which the system is locked

c) the bunch oscillations become very violent under the influence of the noise

d) when the beam is kept bunched without the phase lock system, very little noise is required to let the bunch structure disappear.

B. Zotter M.J. de Jonge

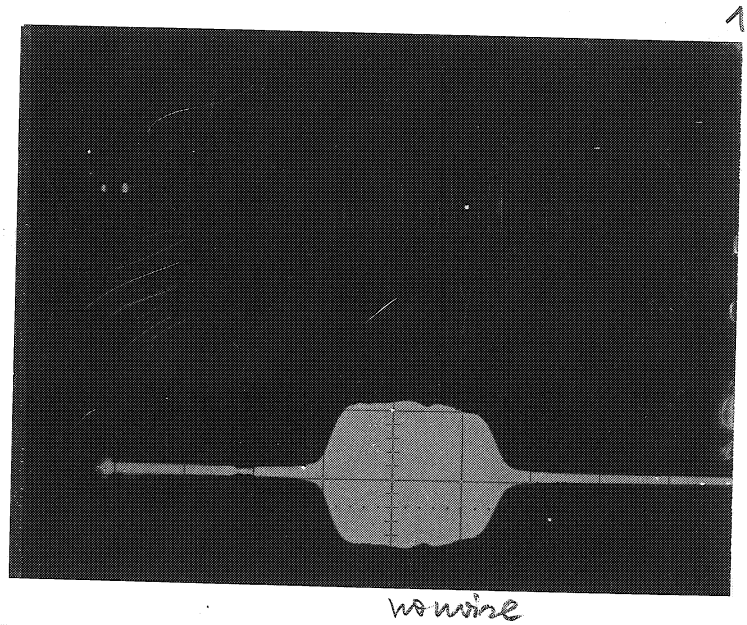

Fig 1: Normal scan without added noise

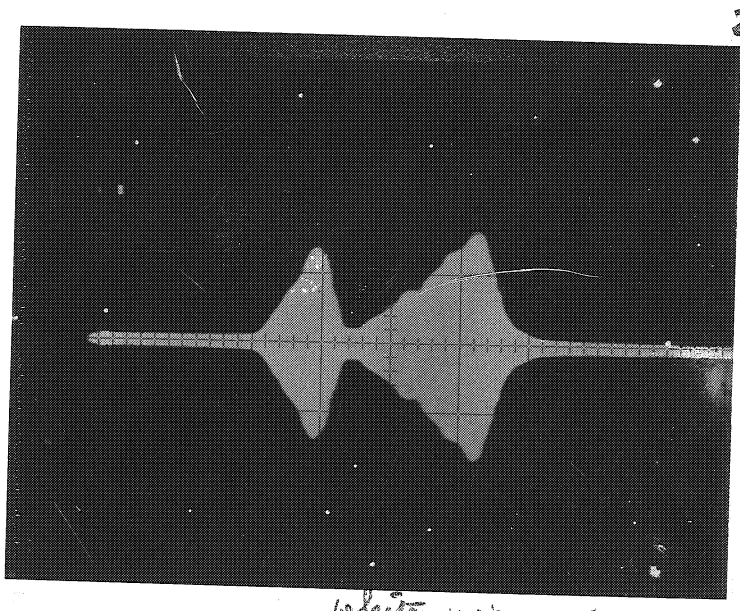

Fig 2: Scan with added white noise of 60 mV rms

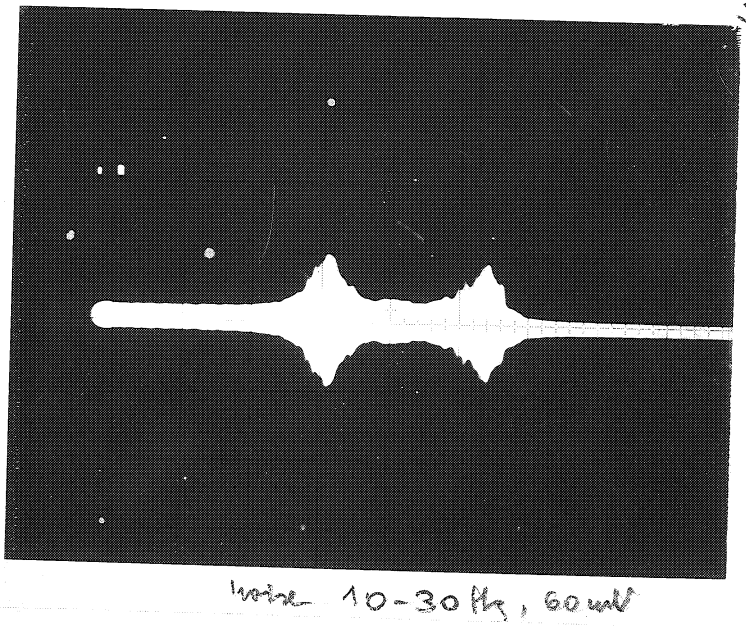

Fig 3: Scan with bandwidth-limited noise 10–30 Hz, 60 mV rms

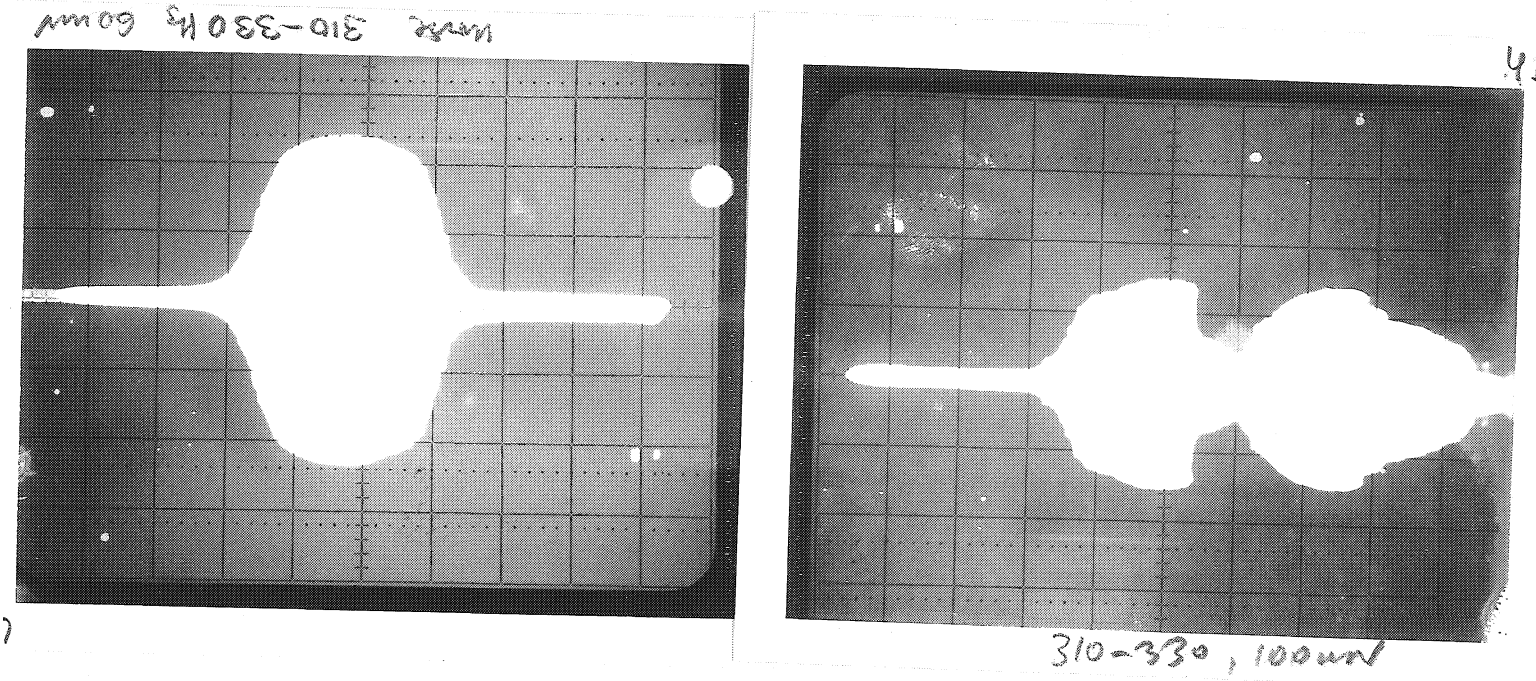

Fig 4 a and b: scans with bandwidth-limited noise 310 – 330 Hz, 60 mV and 100 mV rms

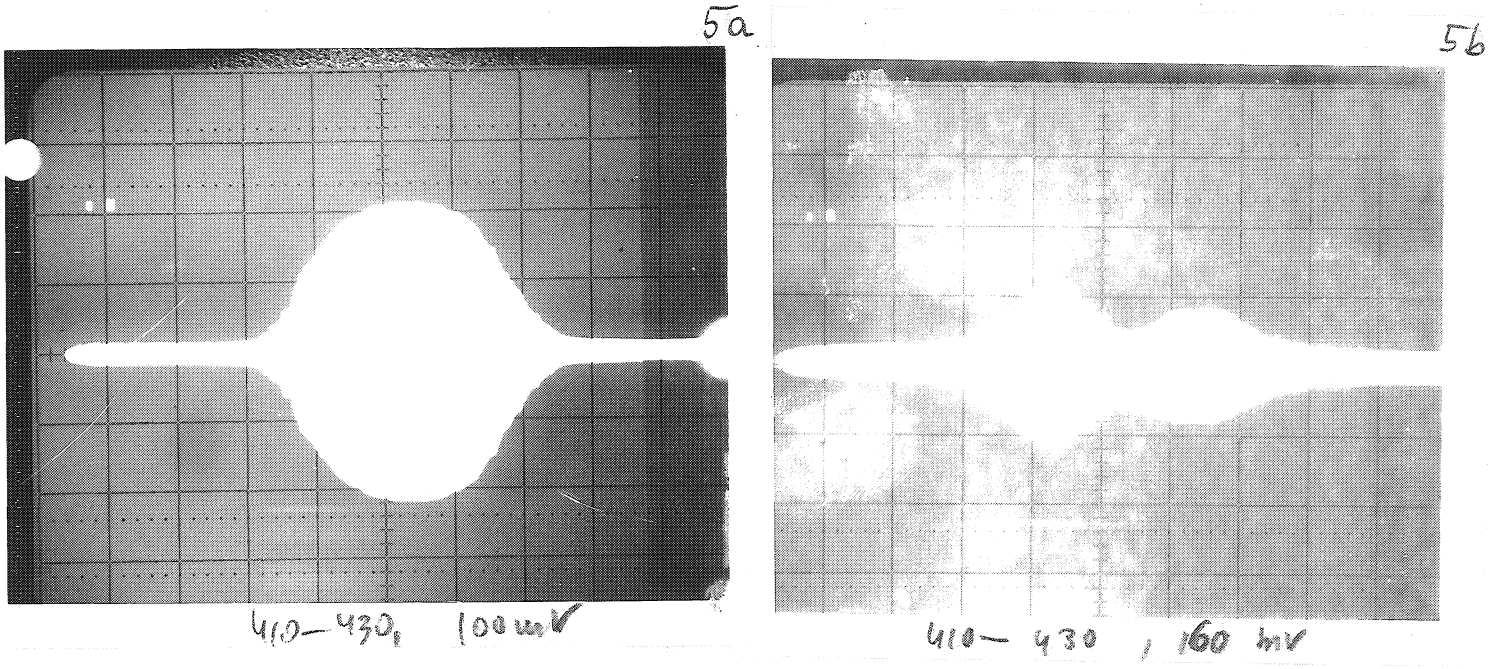

Fig 5 a and b: scans with bandwidth-limited noise 410–430 Hz, 100 and 160 mV rms