MPS/CO Computer 69-4
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PROGRAM 'SPILL' FOR ON-LINE ANALYSIS OF SLOW EJECTION BURST WAVE-FORM

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This program gives the effective spill time and frequency spectrum of the slow ejected burst. The analysis concerns the overall burst wave-form and the low frequency ripple (magnetically induced, up to about 3 KHz). The high frequency ripple (RF structure) is filtered out and thus neglected. The program is selected using the button "SPILL" on the MCR program request unit and the results are displayed on the computer memoscope.

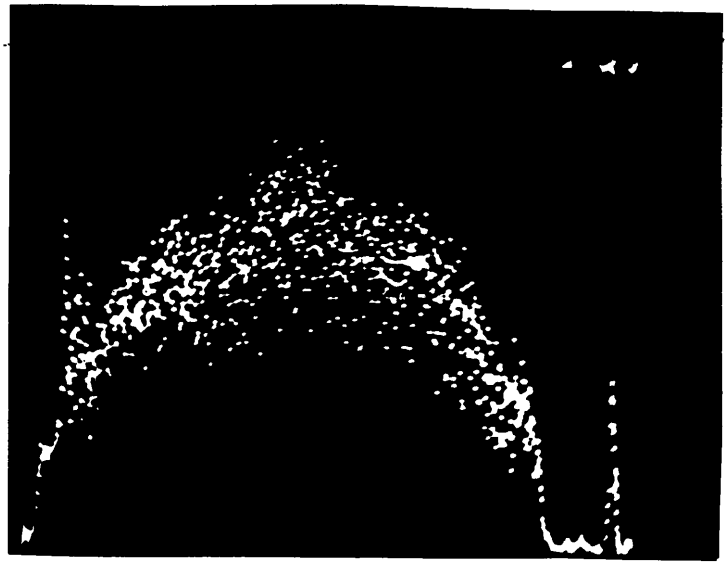
The effective spill-length of the burst is defined as

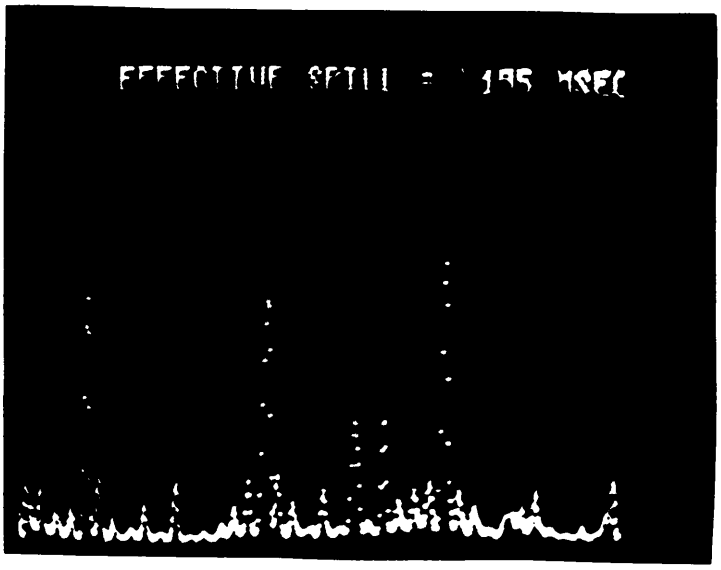
$$Te = \frac{\left[\int m(t)\,dt\right]^2}{\int m^2(t)\,dt}$$

where $m(t)$ is the burst wave-form and the integrations are carried out over the entire burst length.

The frequency spectrum of the burst is defined and discussed in detail in reference 1.

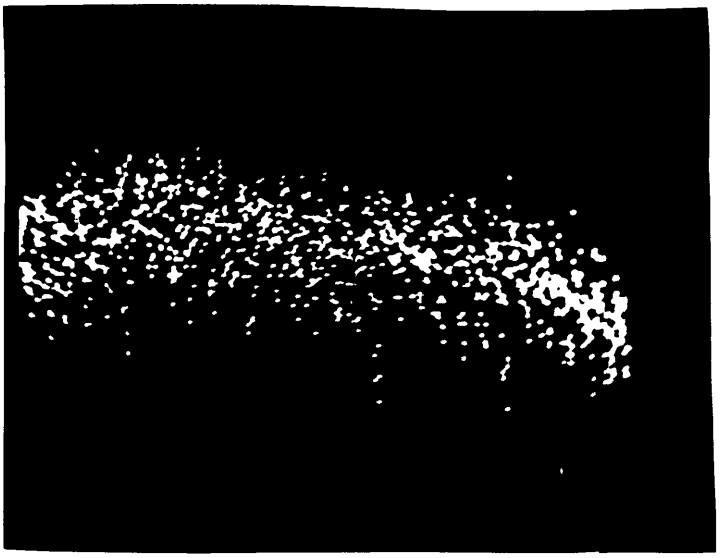
The program operates by taking 1024 samples of the burst waveform, at 4 KHz. The samples are then reproduced on the computer memoscope to ensure correct adjustment of the





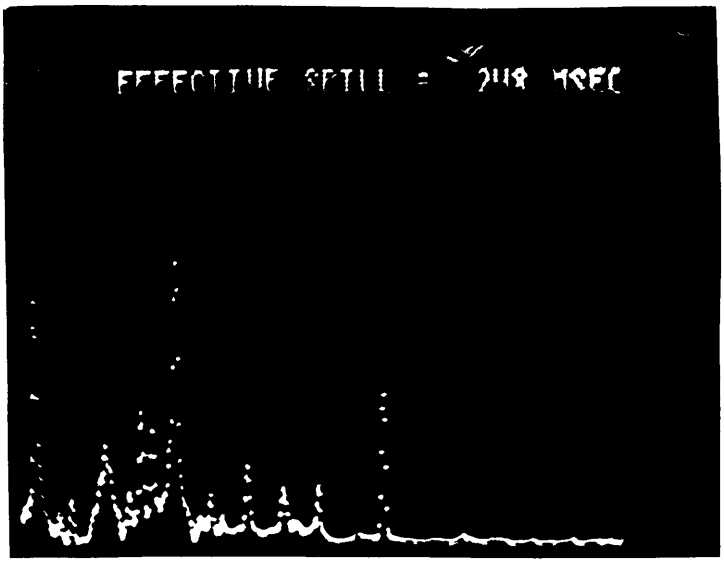
timing and the amplitude scaling (first photograph). The hardware used for the sampling is described in reference 2. After 45 seconds of computation the computer gives the output on the memoscope as shown in the second photograph. Full scale on the frequency spectrum is one half the sampling frequency, i.e. 2 KHz. A record of the frequency spectrum can be punched out on cards by raising the Sense Switch 1 on the IBM front panel before calling the program. This enables more accurate off-line plots of the spectrum to be made.

The magnetically induced ripple can be analysed in more detail by changing the sampling rate to 10 KHz (see ref. 2) and adjusting the timing so that, say, the centre 102.4 msec of the burst is sampled. This gives samples as in the third photograph and an output as on the fourth photograph. Full scale on the spectrum is now 5 KHz and it is seen that no significant frequencies exist above about 3 KHz. For a horizontal line (i.e. no ripple) the effective spill indicated would be 256 msec. Thus the duty factor introduced by the low frequency ripple is



$$\text{Duty factor} = \frac{\text{Indicated effective spill}}{256 \text{ msec}}$$

$$\text{in this case} = \frac{248}{256} = 0.93$$



G. Shering

References

1. On-line Fourier analysis of an ejected proton burst, G. Shering, S. Summerhill, MPS/Int.CO 69-9

2. Fast sampling facility for the PS IBM 1800, S. Summerhill, MPS/Int.CO 69-11, 2 May 1969

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