EXPERIMENTS (16.3.61 and 25.3.61)

CONCERNING SHORT TARGET BURST PRODUCTION USING RF KO

Purpose :

a) Production of short target burst with the RF KO at higher energies (~28 GeV) than till now (limit 24 GeV).

b) To establish a convenient, reliable set-up of the operating parameters and to learn more things for an optimum design of the arrangement.

Working scheme intended :

1) To find and assure a convenient working position target beam, with the appropriate advance of target motion with respect to RF pulse (problem : target bouncing and overshoot).

2) To study the operation at different energies up to 28 GeV.

3) To study the influence of different RF KO set-ups on the burst (pulse duration, frequency, excitation strength, which can now be increased for the first time up to 80 Gauss).

4) To produce the burst by using either the radial or the vertical RF KO device, possibility provided by a specially shaped target (form 1).

The experiments on the 16.3.1961 with an Al target of form 1 (see fig. 1).

By lack of space in the vacuum chamber we could not increase the target width.

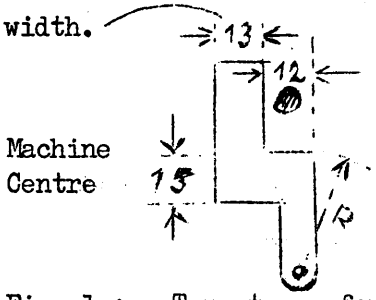


Fig. 1 : Target form 1
Material Al
Thickness 15 mm

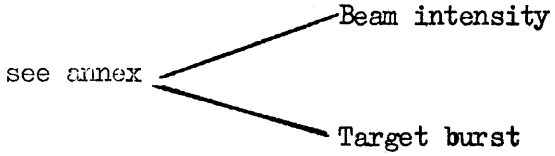


Fig. 2

(horizontal scale inversed)

(The first attempt to the 28 GeV point of operation was interrupted by a long disturbance in machine operation. Because of the time becoming short, we decided to continue at 24 GeV; the RF set-up being known at this energy).

Results (from photographed oscillograms).

Strength of RF KO excitation field	40 Gs	80 Gs
Target burst duration	100 μs	60 μs ⊠
Delay from the start of RF KO pulse to burst	170 μs	70 μs ⊠
Beam consumption in target	30-40 o/o	30-40 o/o ⊠

⊠ See Fig. 2.

a) As long as the RF pulse length lasts longer than the burst exists, no remarkable effects on these bursts were found.
See table 1 for more details of the set-up.

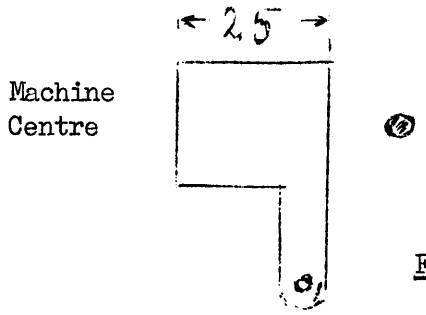
b) The type of jitter often complained about in earlier RF KO-target applications (a year ago) was not observed when a proper synchronism between the RF KO and target timing had been established.

Discussion :

The occurrence of the very short bursts (60 - 100 μs) and incomplete beam consumption was brought in connection with the target shape and the strong RF KO action lasting during the burst. The mechanism is probably that the beam is radially shifted in subsequent passages over the target and "leaves" the target (partly) at the inside, of course under considerable blow-up.

For getting more target efficiency the target form had to be changed. Targets with a larger radial extension had to be provided.

The experiments on the 25.3.61 with Al targets of form 2 (see fig. 3).



Thickness : 5 and 15 mm

Fig. 3.

Results :

A very stable operation was noted at 23 and 27 GeV.

For the set-up see table 1.

TABLE 1

Set-up	17.3.61 Form 1	25.3.61 Form 2	
RF field	40; 80 Gs	40; 80 Gs	40; 80 Gs
RF pulse length	350 µs	350 µs	350 µs
RF trigger	11400 Gs	11610 Gs	13510 Gs
RF exc. freq.	594,5 kHz	608 kHz	593,6 kHz
p.f.w. current	380 A	340 A	900 A
Target trigger	10800 Gs	10470 Gs	12470 Gs
Target position	0	-15 mm	-10 mm
Beam position	10	+ 3 mm	+ 3 mm

The integrating terminal of the counter was replaced by a cable matching resistor of 75 .

a) The shape of the target bursts observed was more unsymmetrical than at the experiences referred to in the section before, the balk of the burst being of rather short duration (in the order of 100 μs), but the first then showing a rather long and weak tail. (As the RF structure could be seen on that tail, it is not a counter-saturation effect!).

b) The beam consumption in the target is estimated to be 50-60 o/o; so 20-30 o/o higher than with target form 1.

c) The burst length from the 5mm Al target was somewhat longer (~ 50 o/o) than from the 15 mm Al target.

General :

Due to the very restricted time it was impossible to go further on with the intended programme. Though a very incomplete information has been fixed, the above results seem to us worth being noted, especially as the shortest burst length (60 μs) up to now stated is concerned.

This small burst length occurred in connection with the stronger RF KO deflection.

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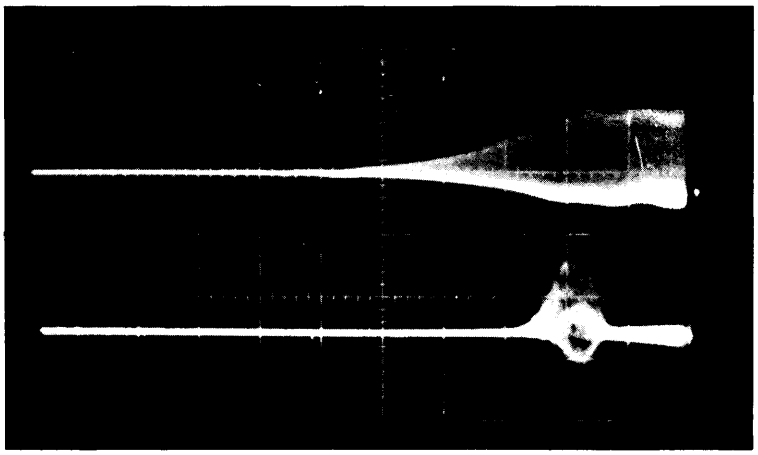

Fig. 2 1 unit = 50μs