Number 176

# AGS Studies Report

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Subject Additional Position Studies on the Beam Catcher at E-20

## Observations and Conclusion

Following Report No. 175, it was decided to refine the Catcher/Dump studies further and try to decouple injection from rf dumping of the beam at higher energies.

We tried to set up a window to collect Ring Loss Radiation Monitor data around injection 40 msec to 60 msec. This attempt failed due to an apparent cross-talk between the RLRM system and one quad that inhibited the beam.

The machine was set up in the following configuration:

1. The beam was accelerated to 200 msec at which point the rf was turned off and the beam dumped.

2. A window was set up from 190 msec to 240 msec to collect RLRM data at the dumping stage.

3. Automatically data was collected for the total cycle 40 msec to 10 msec before $T_0$ of the next cycle.

4. Assuming little loss between injection and dump, subtracting the data in 2. from 3. will give injection losses.

No skew data were collected.

Observations:

The data were extended to catcher positions of 1200 mils at the expense of (10-15)% beam loss. This loss was later eliminated by energizing the horizontal bumps around E20.

Figures 1 and 2 show the total radiation loss around the machine with and without the subtraction of E20 and F2 (the receptors of forward and backward scattering from the beam hitting the catcher). In contrast to earlier studies it appears that the catcher at position 1000 or more can reduce the radiation in the machine by approximately a factor of 3, Fig. 1(b) and Fig. 2(b).

Figure 2(C) shows the injection losses to be relatively flat at the intensity $6 \times 10^{12}$ circulating protons. This may change as we go to higher intensities.

The bumps on the A & L regions Figures 3a, 5b, were investigated. It appears that scatters from the catcher at 700 mils get caught in a restricting aperture at L12 (magnets 11 and 12). This itself causes a bump in the A region. Otherwise all other apertures are shadowed by the catcher at 600 mils.

With the catcher at 0 position, other "hot" spots (high loss areas compared to their surroundings), were C(6,8), D6, E14, F14, F18, G2, G16 and J16. The ones before the catcher C, D, E behaved similarly, see Figure 4. The rest were plotted Figure 6(a,b,c,d,e) all see the dominant effect of scattering from the catcher. G2 shows a possible precursor to the bump seen in L12.

Figures 7 and 8 show the F region using the long RLRM; and the special short radiation monitors. All activation data reflect the catcher shadowing the majority of the apertures at 600-700 mils and maximal shadowing at 900-1000 mils. The apparent plateau may be due to the 7 GeV energy at which the beam was dumped. This is low enough for the catcher to absorb most of the secondaries produced. Such may not be the case for dumping at higher energies.

A subsequent study will pursue dumping at higher energies and the effects of skew.

Figure 1

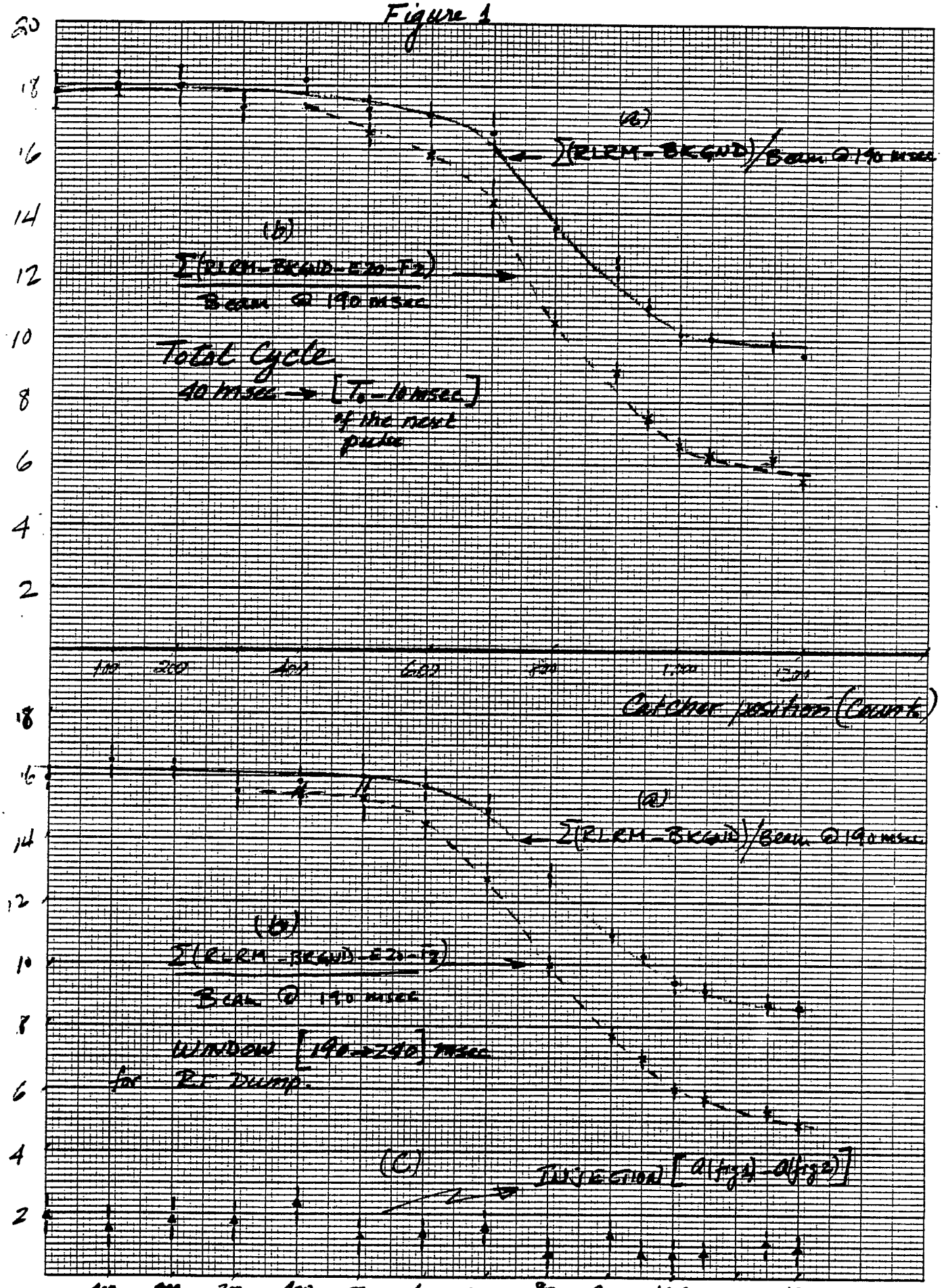
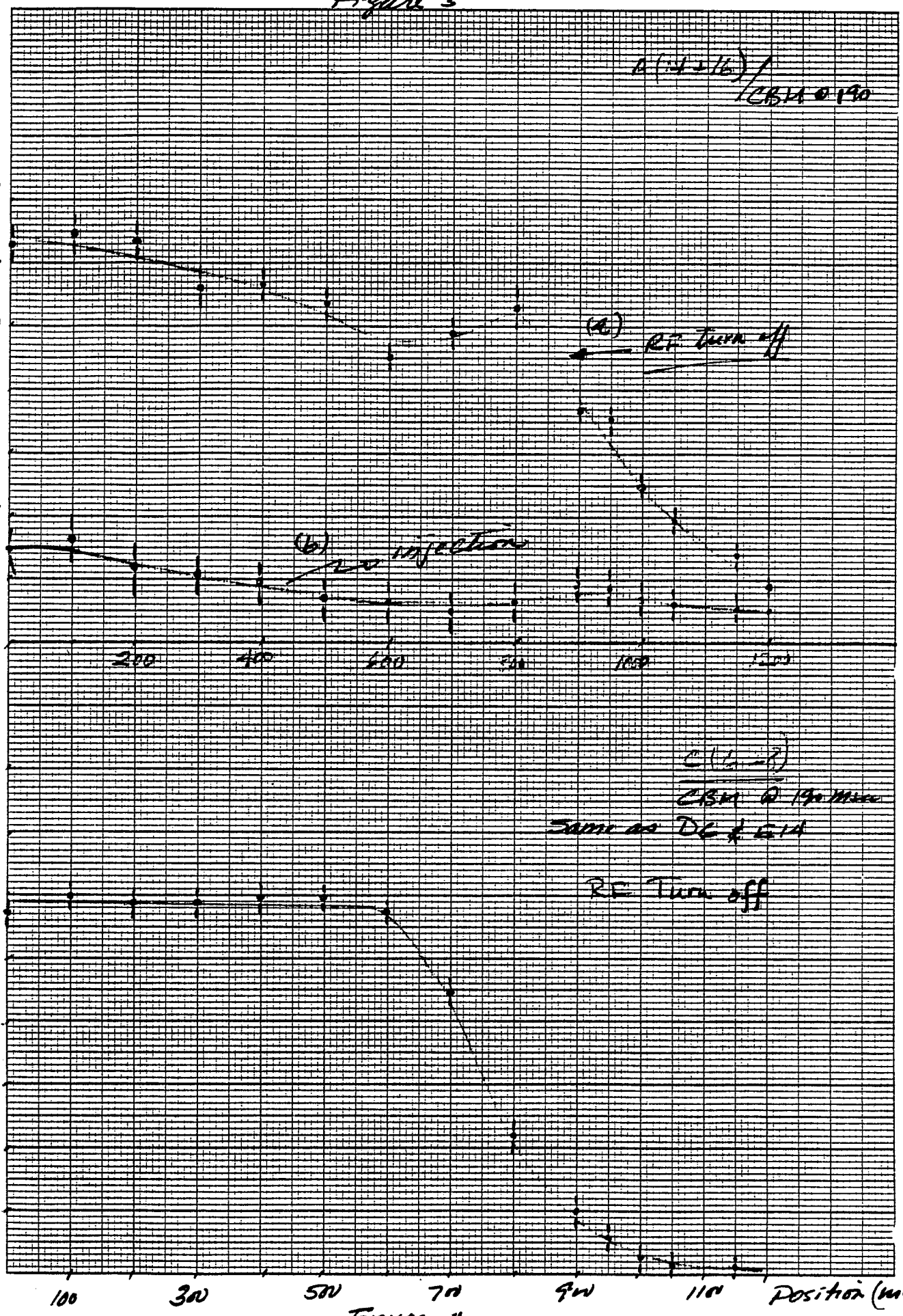



Figure 2

46 1323
K+E 10 X 10 TO ½ INCH 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

Figure 3

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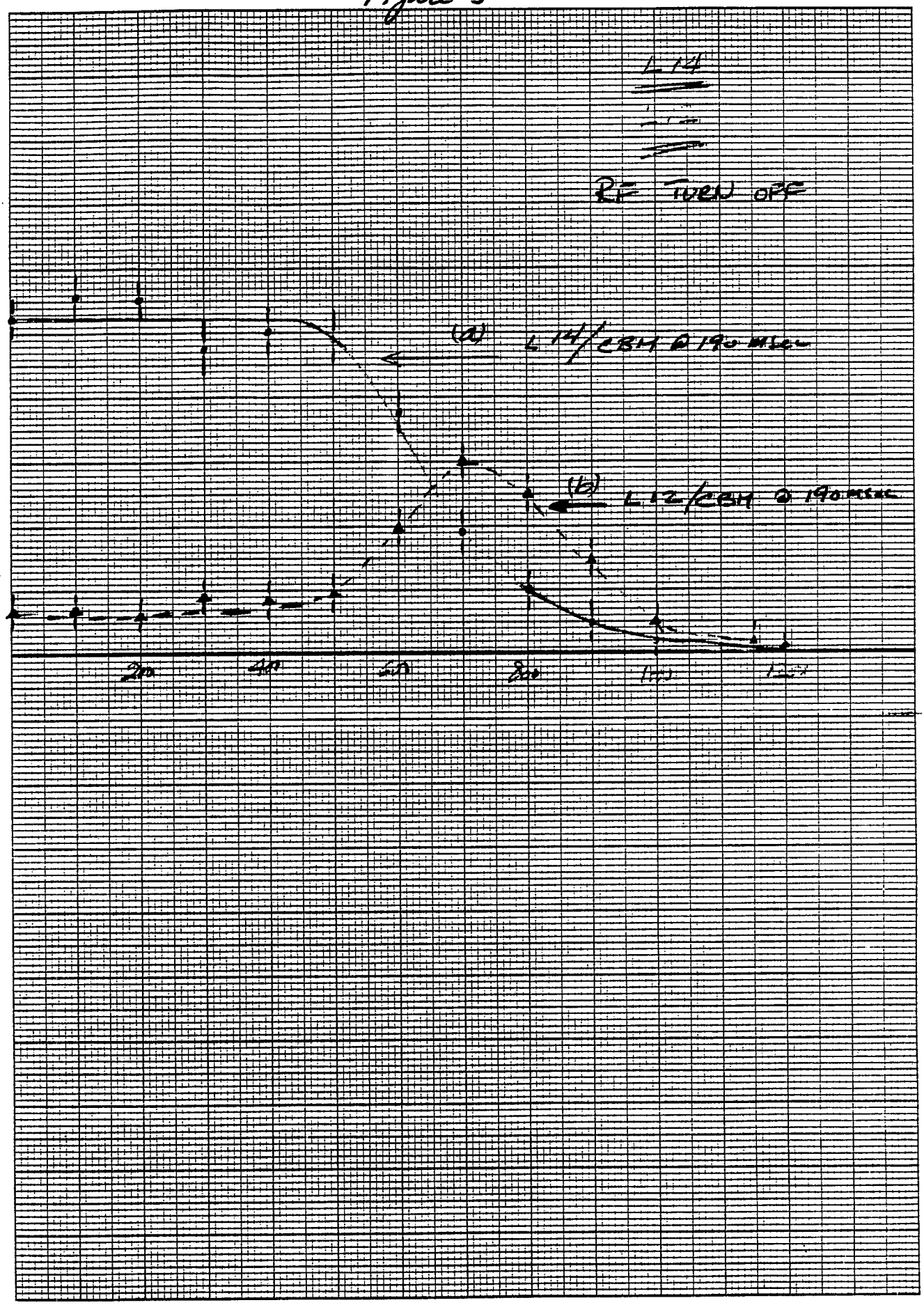
K•E 10 X 10 TO ½ INCH 7 X 10 INCHES KEUFFEL & ESSER CO. MADE IN U.S.A.

Figure 4

Figure 5

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10 X 10 TO ½ INCH 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
K•E

Fig 6 (a, b, e, a, e)

RF TURN OFF

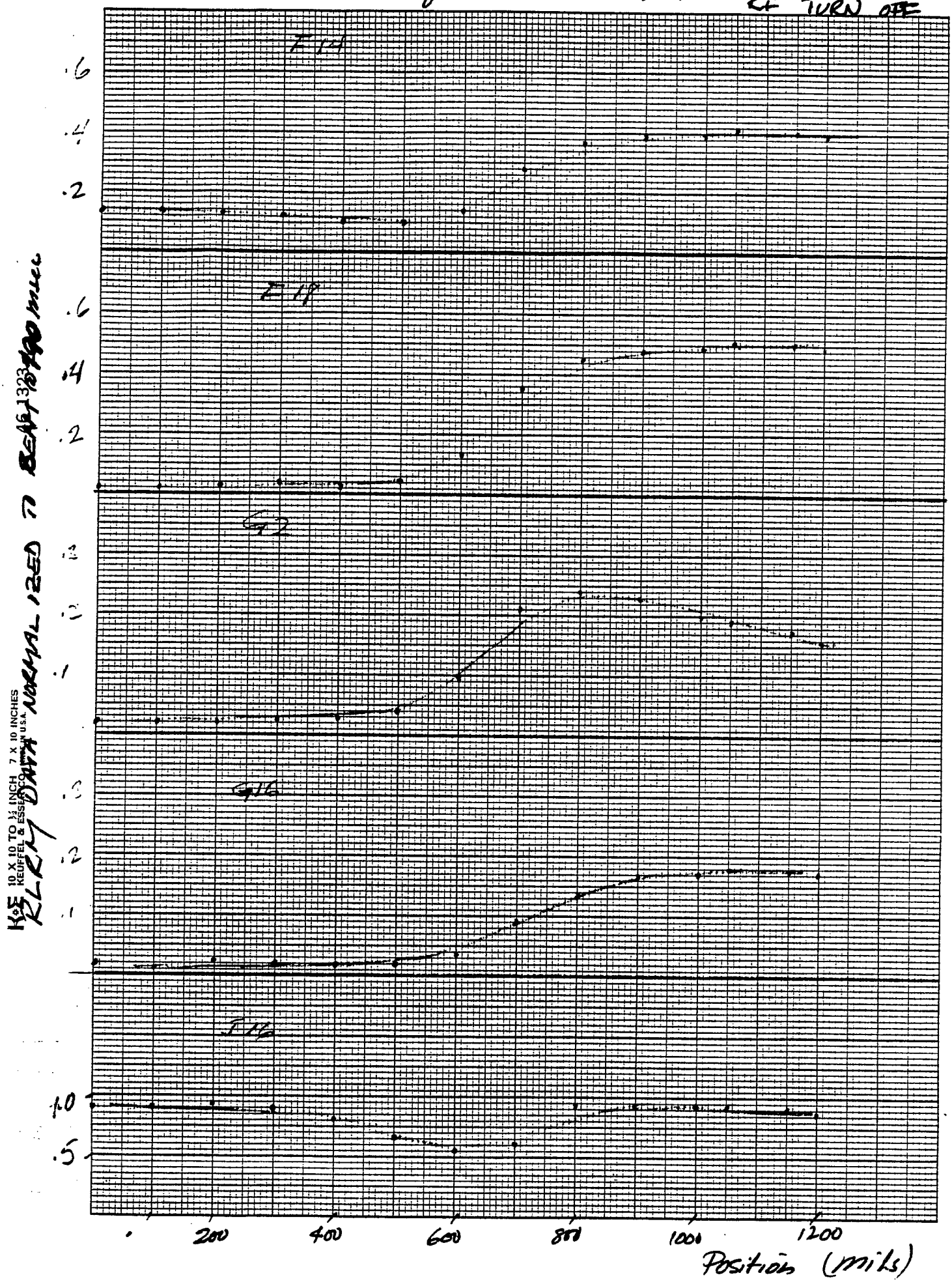
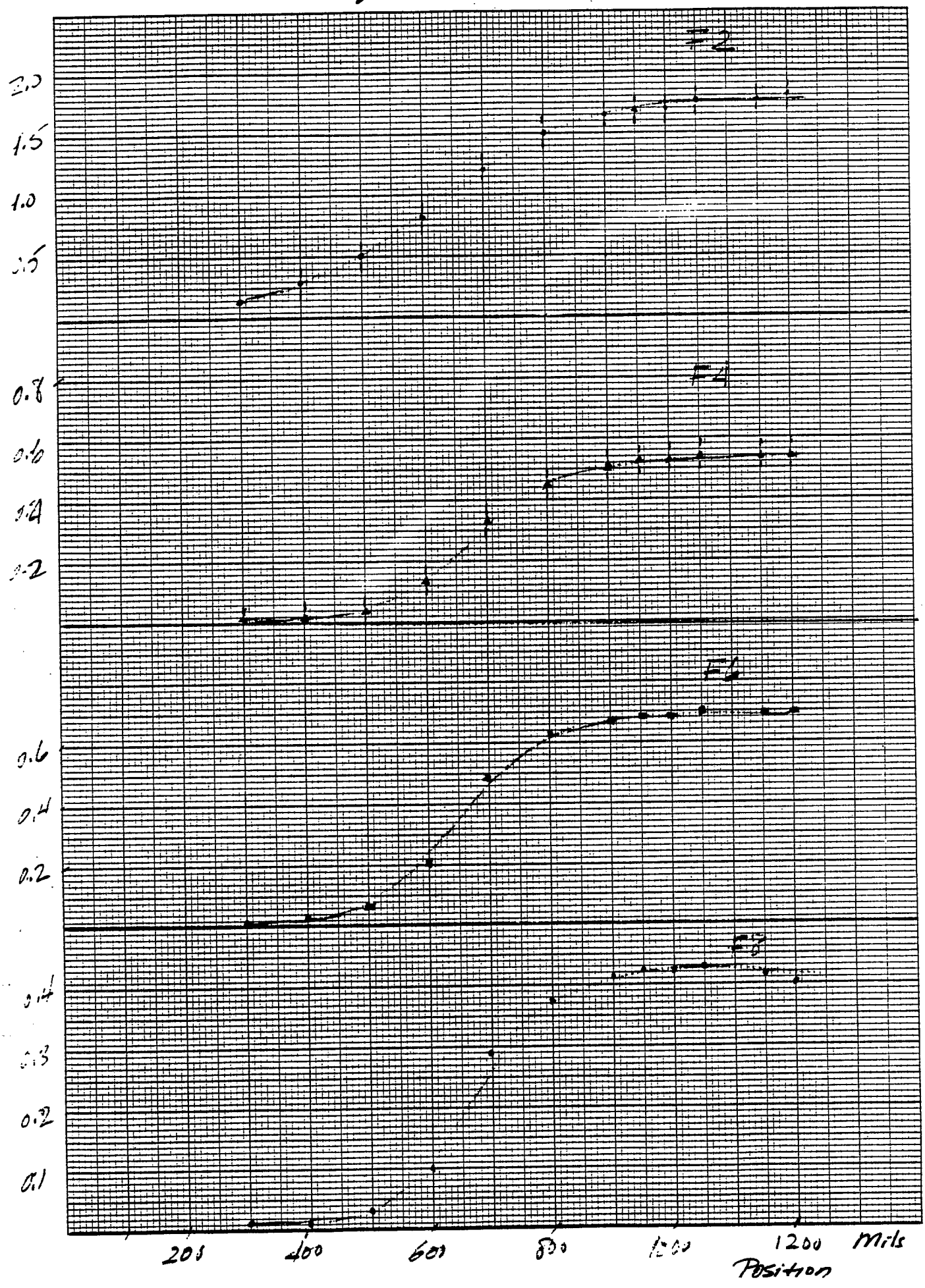


Figure 7

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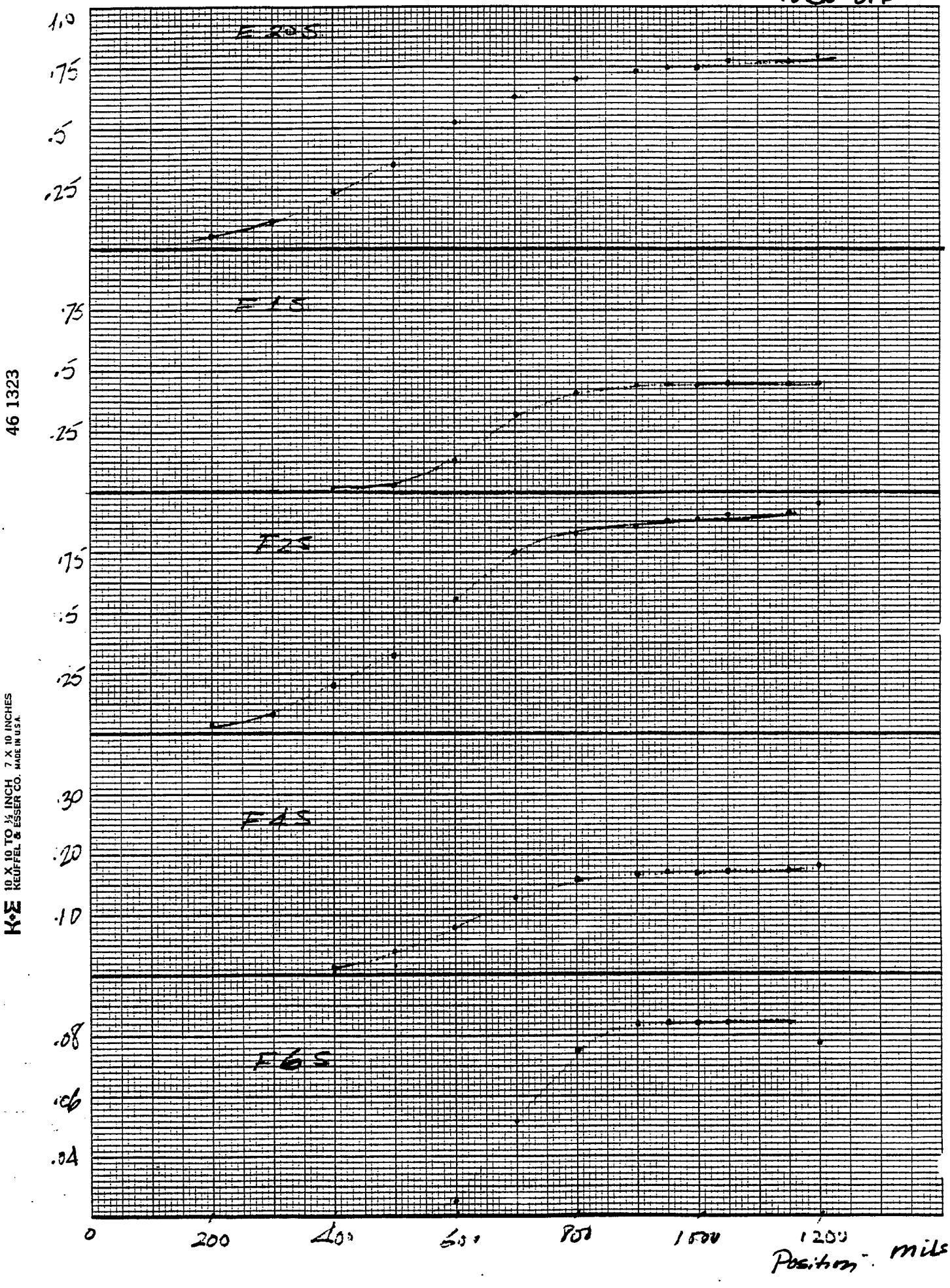
K+E 10 X 10 TO ½ INCH 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

Figure 8

RF TURN OFF