RF NOTE #34 214-0035-01-01_00 August 29, 1978
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Phase Shifter

Figure 1 shows the phase shifting scheme described in this note.

This phase shifter is the descendant of the scheme originally proposed in the RF#28. The original was modified for frequency response reasons, namely the op amp network, though working fine at low frequency, led to a quite intractable frequency response at hi frequencies (> 100 KHz). Another problem with 3 variable resistors instead of 2,is in an output shunting which makes the amplitude regulation far from theoretical. These problems have been alleviated by using hi frequency op-amps, one in inverting the other non-inverting configuration, driven in parallel.

Circuit Performance

Graph #1 shows $\Delta\phi$ as a function of Vin, (DC) and |Vout| of the RF signal as a fn. of Vin. (DC) $|F| = |\tilde{F}| = 820$ mV
$\Delta\phi$ max = 36° $\left|\frac{\text{Vout max}}{\text{Vout min}}\right| = 1.2$

Graphs #2 show the frequency response of the shifter, showing a response of around 100 KHz. $\Delta\phi$ here was measured with our mixer - l.p. filter, which is flat to above 1 MHz.

Construction

3 phase shifters will be mounted in 1 NIM module, each followed by a gain amp to bring the output level up to the input level. Trim pots are used to optimize the output. Approximate quiescent values are indicated on the cirucit diagram. The op amps are TL081, all mosfets are VMP 4s.

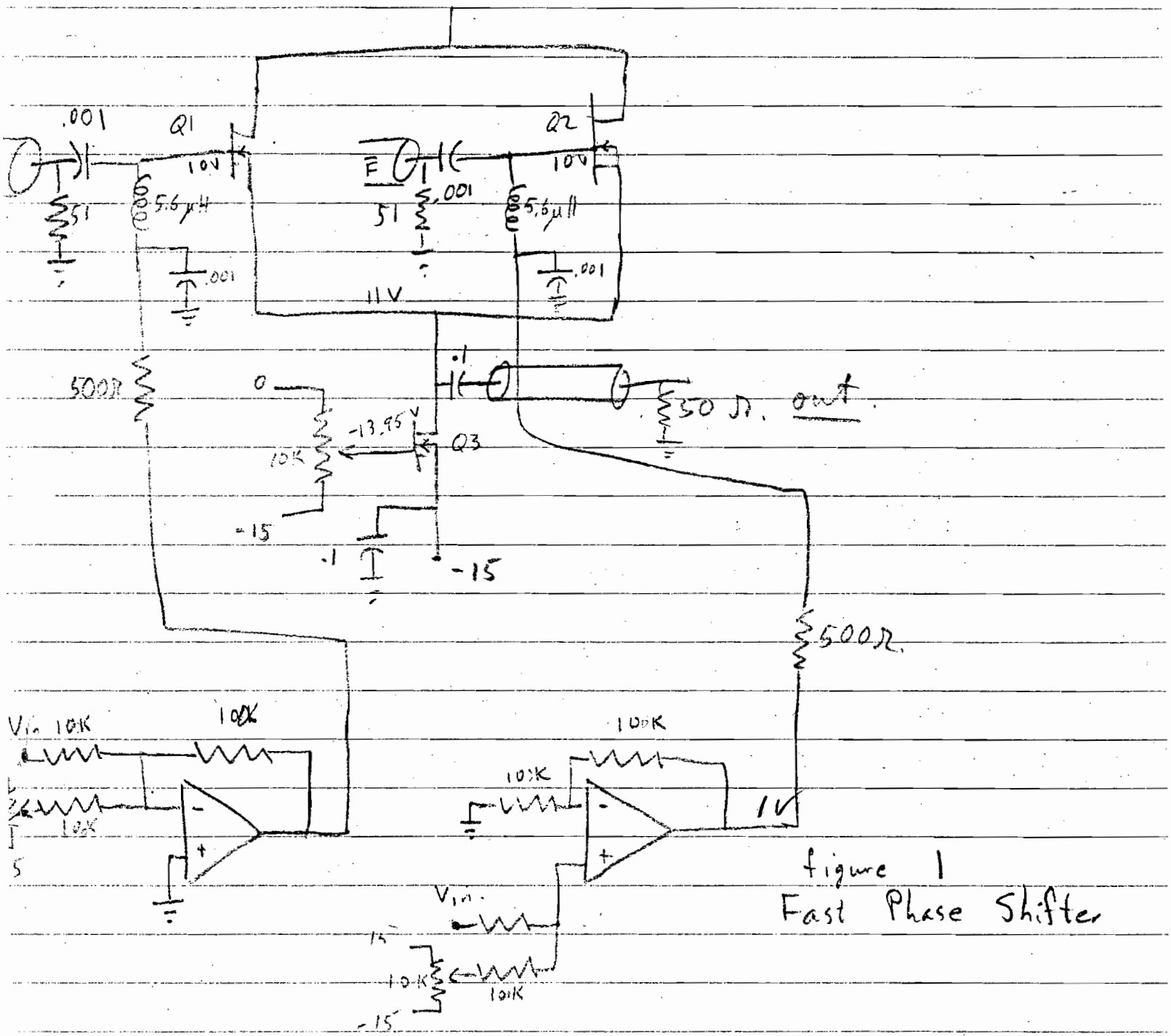
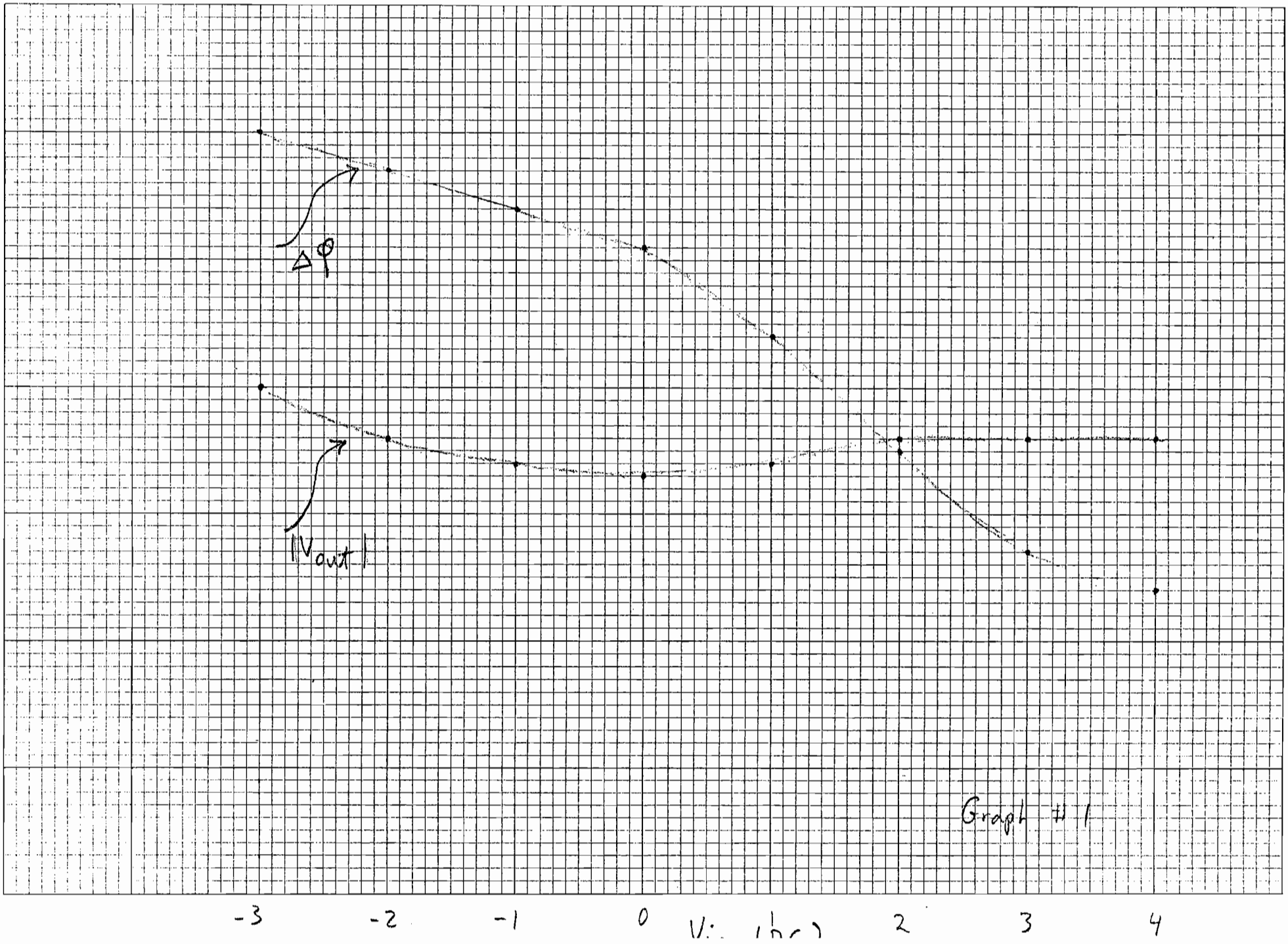
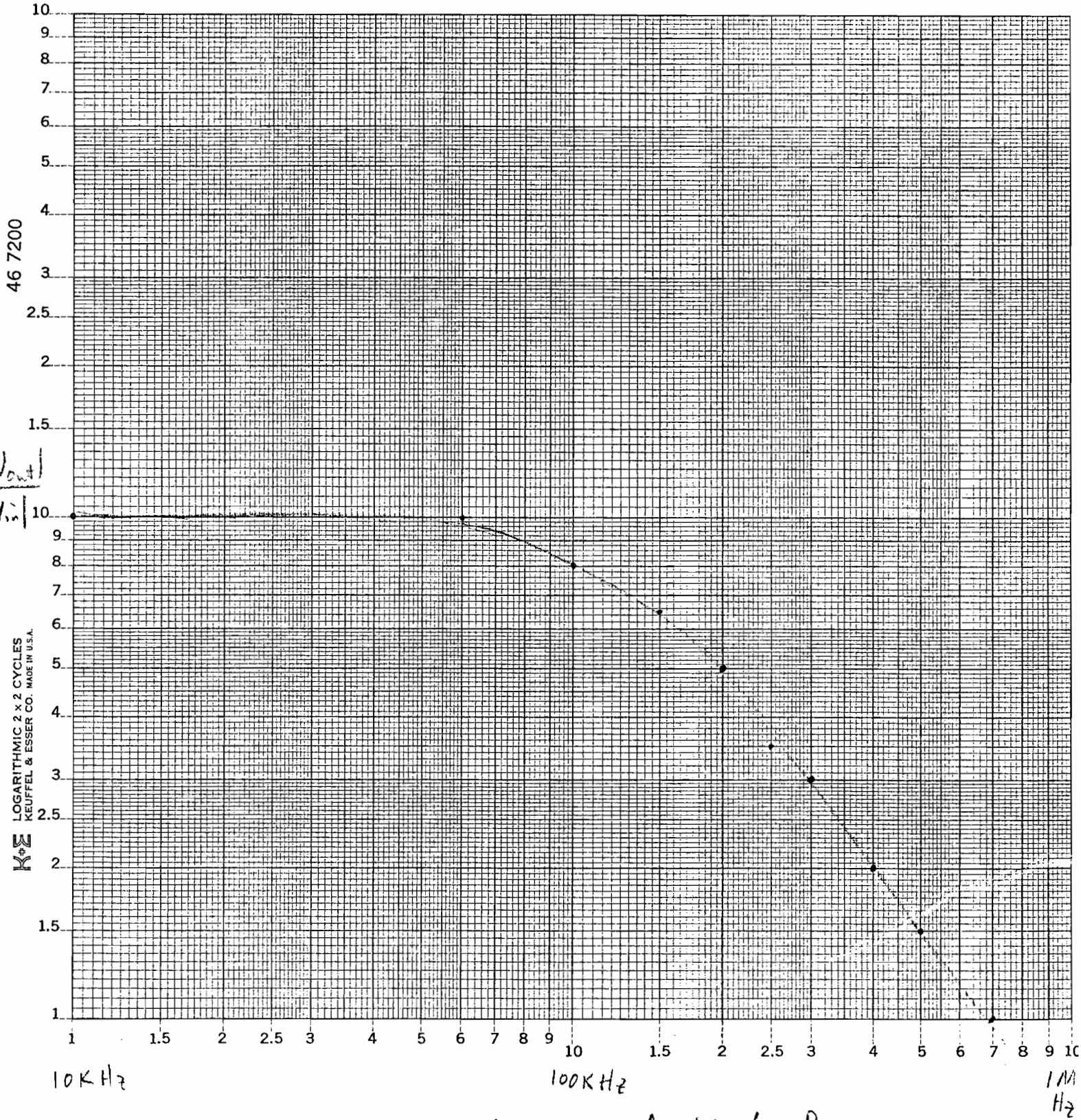


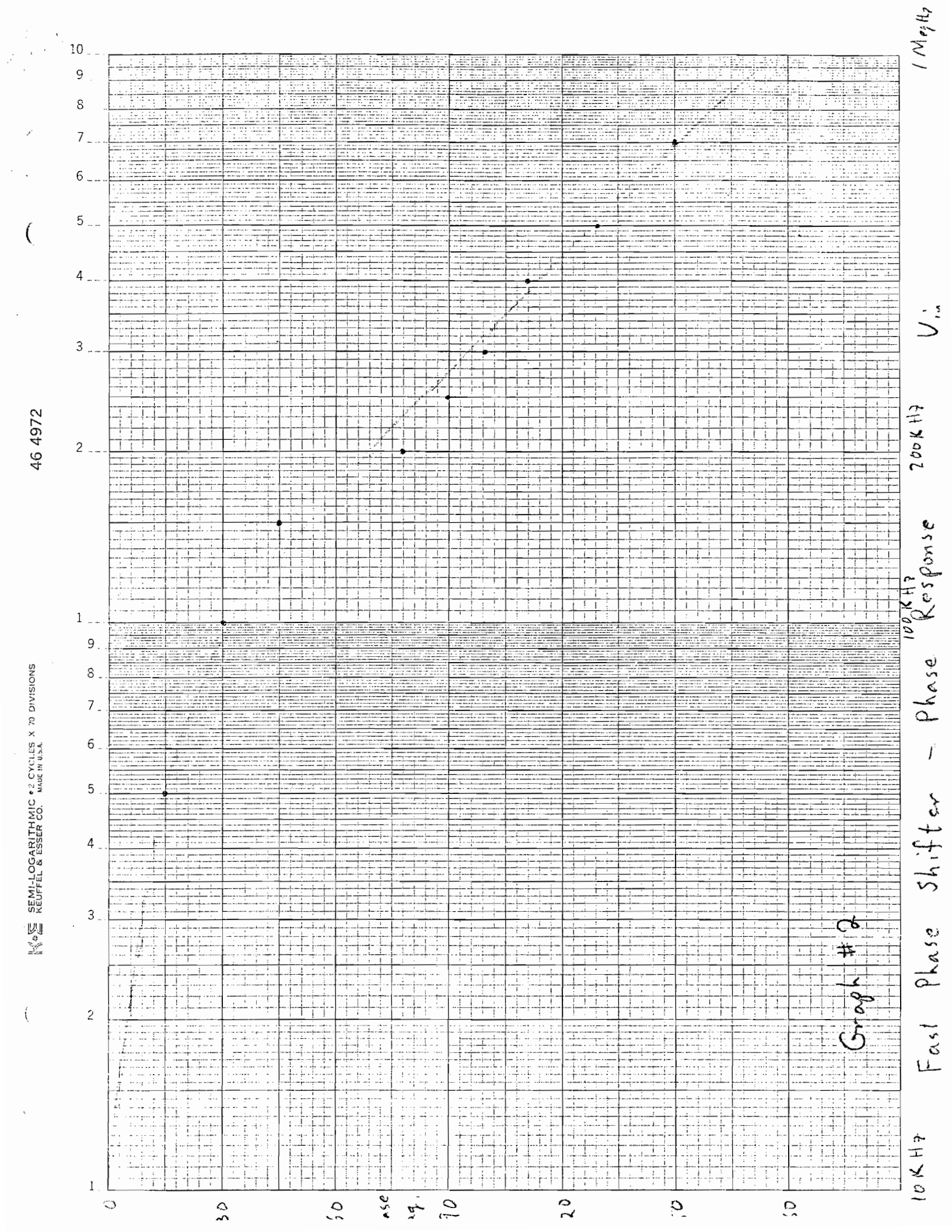
figure 1
Fast Phase Shifter





Fast Phase Shifter Amplitude Response (normalized)

Graph # 2


Fast Phase Shifter - Phase Response
Graph #6
10KHz
100KHz
200KHz
1 MegHz
46 4972
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