R.F. Note 73

May 8, 1981
J. Riedel

K800 Transmitter Stem

It would be desirable to decrease the length of the transmitter stem so that its length is less than 12 feet, giving us the option of using push rods. Even it we don't use push rods it is desirable not to have to add on the 4 foot lengths as in the K500 transmitter.

Remember that just below the anode box we modified the stem so that there was a one inch gap between the inner and outer conductors for a distance of 14 inches. This was done so that we could cover the range 9 to 32 MHz without having to switch on a capacitor at the anode. Well, if we make this section 36 inches long we can cover the range 9 to 30 MHz with an outer conductor length of 125 inches (max short distance of 157 inches from ground flange), and the range of the short (ΔL) of 82 inches.

So, for the K800, it is recommended that we do this and use push rods so that we can have a loop and optical sensor on the carriage, and eliminate the bicycle chain. It is also recommended that we turn the transmitter upside down so that the push rods are sticking up. Fig. 1 shows the pos. vs. freq. for this arrangement.

The equivalent capacity varies from 459 to 124 pf and the output coupler for 200 kW delivered varies from 88 to 29 pf. A 1 pf fine tuner can cause a $\Delta F/F$ of from .1% to .4%.

If the 8 ohm section is made to be 79Ω, the total length would be 237 inches and the equivalent capacities would halve. Maximum dissipated power is 1kW (at 9MHz). The max short current is 50 amps. Maximum power density occurs on the inner conductor at 27 MHz just above the short, and is 3 watts/sq.in. This is about twice the density of the K500 transmitter stem, so I think we should water cool the carriage and the stem. Perhaps if we increase the air flow, for example by blowing air through the inner conductor as well as by the fingers, it will not be necessary to water cool the stem.

Table one, for the record, shows some calculated results. Fig. 2 shows the transmitter standing alongside the test resonator.

F	L	V_A	W	Q_o	Q'	R_s	R_s'	C_{coup}	C_{eq}	I_{max}	
9	151	18KV	930	4700	21	181	810	88	459	380	
12	114	"	960	5200	27	175	"	66	395	450	
15	97	"	940	5600	39	180	"	53	331	510	
18	86	"	870	5900	50	194	"	44	268	540	
20	82	"	800	6000	55	211	"	39	227	540	
22	78	"	710	6200	58	236	"	36	191	520	
24	75	"	619	6500	60	270	"	33	159	490	
26	73	"	520	7000	58	322	"	30	134	440	
27	71	"	480	7500	56	350	"	29	124	410	
		"									

TABLE I

L = inches to screen flange

Q' = Q of anode ckt when delivering 200KW

R_s' = R_s " " " " " " in OHMS

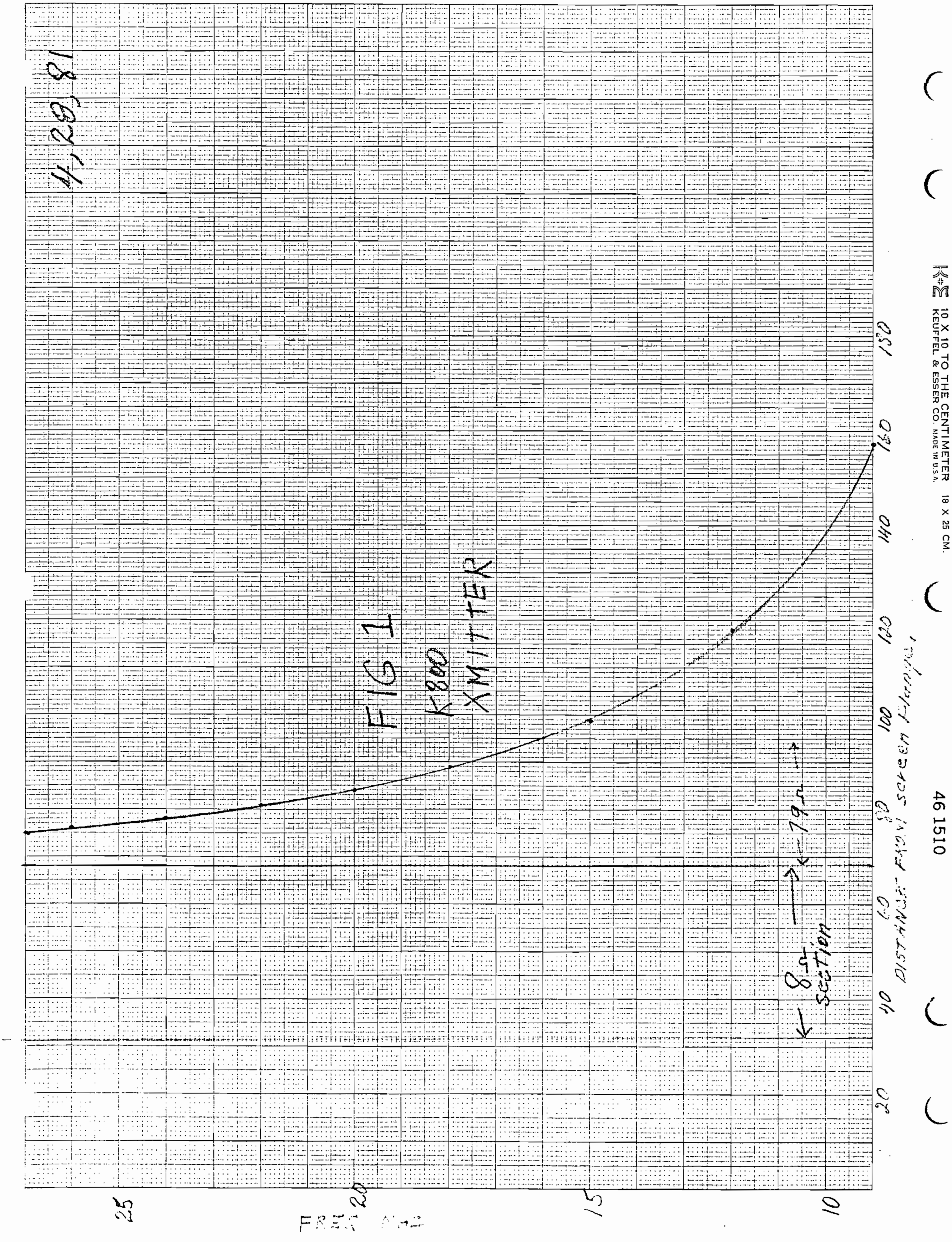
W in watts, Rs in KΩ, C in pf.

the significance of Q' is to show the tuning accuracy requirements of the Xmitter resonator.

Update on Progress of the K500

The three transmitters are assembled and the water circuits will be completed by May 11, 1981. Testing of the C transmitter with control and monitoring from the P.S. balcony will commence at that time. As more modules are produced by the electronics shop we will then sucessively test stations B&A and then by June 1 will be able to test all three transmitters into their 50 kW dummy loads simultaneously.

All the hardware for the six moving shorts is on hand and awaiting assembly. The critical path to beam time seems to be finishing the liner and vacuum enclosures and making the system leak tight. There is still a lot of work to be done.


4/29/81
FIG 1
K800
XMITTER
8 section
79
25
20
15
10
20
40
60
80
100
120
140
160
180
FREQ MHz
10 X 10 TO THE CENTIMETER 18 X 25 CM.
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 1510

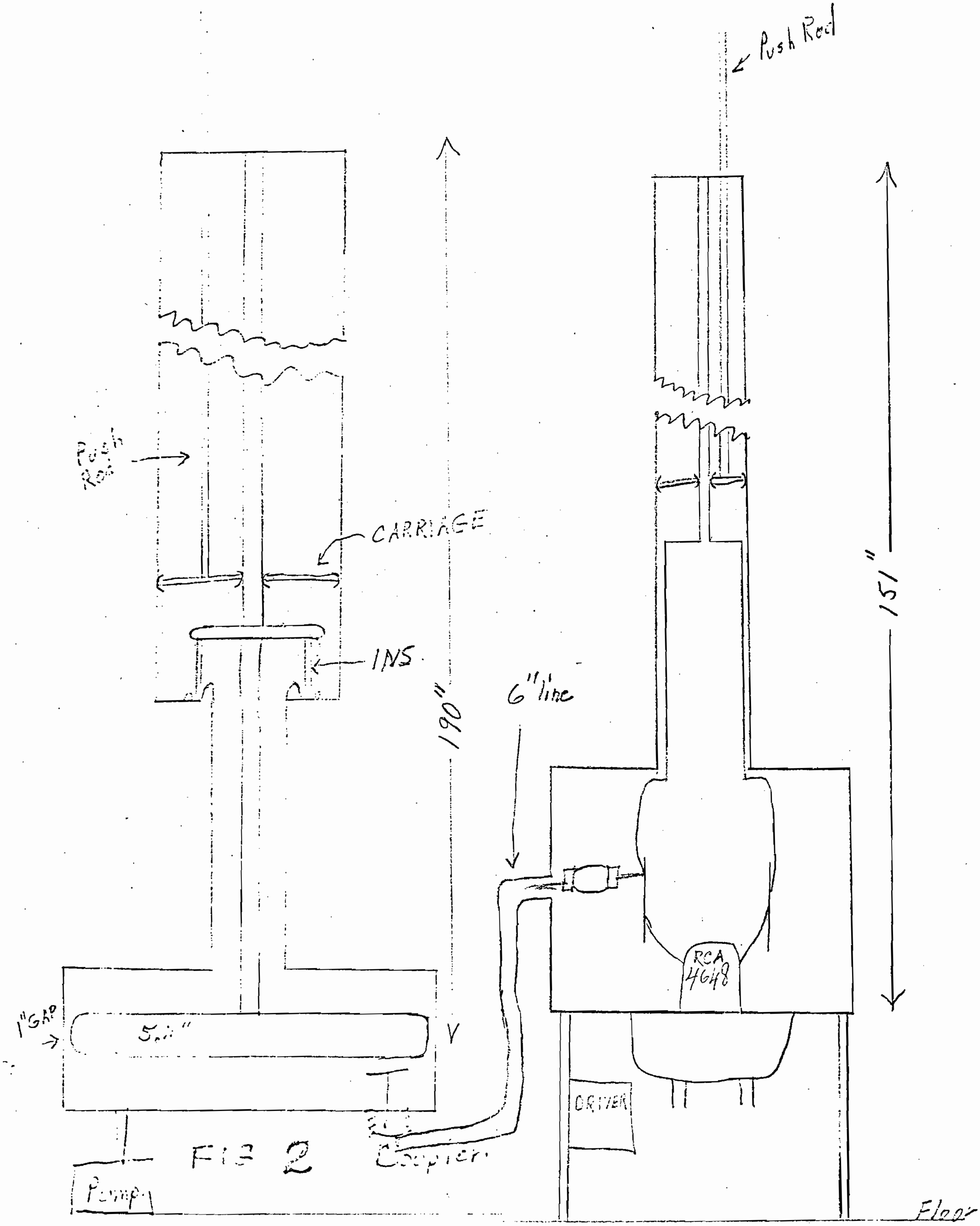

Push Rod
Push Rod
CARRIAGE
INS
190"
6" line
151"
1" GAP
RCA 4648
DRIVER
Coupler
Pump
Floor

FIG 2