

P.F. Note #7.

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1. R.F. Finger contact tester

Fig. 1 shows the set up.

Taking 115 pf as the value of the capacity on the open end of the $\pm 58.8 \text{ ohm}$ line we have $\theta = \arctan \frac{63}{58} = .826 \text{ rad}$.

the electrical length of the line at 21.5 MHz = .75 rad.
and $I_c = .01587 \text{ V}$.

The current at the vacuum end of the line is

$$I_F = V \sin \theta / Z_\phi + I_c \cos \theta = V \left(\frac{.735}{58} + .01 \right) = .0234$$

$$= .0234 V_c$$

$$\text{and } V_F = V_c \cos \theta - I_c Z_\phi \sin \theta = (.735 - .686) V = .05 V_c$$

so the finger current will be .0234 V_c

and for 10 amps, $V_c = 427.4 \text{ volts rms}$.

The divider was calibrated at $V_c = 50 \text{ volts}$ using a 1N38 peak detector diode and is 1000/1.

Results . At a current of 36 amps, the aluminum foil evaporated and the photomultipliers showed evidence of sparking just prior to this event. The aluminum foil was replaced with 1 mil brass and ~~the~~ 36 amps was passed through the set up in air. As a check on the calibration it was observed that the foil became too hot to touch which is consistent with the calculated power density of 4 watts per sq. in at this current. Meanwhile, a leak developed so the test could not be repeated in vacuum at this time. The finger and its mating surface shows no evidence of damage!!

Some one mil copper foil is being purchased and the finger tests will continue next month. It is hoped that we can destroy the finger before anything else is destroyed!

each resonator & amplifier circuit was built in a 4" x 6" al. minibox 3" high and the boxes were symmetrically arranged and bolted to a chassis containing the 3 bias knobs for the FET's. The coupling capacitors were easily removable.

The individual resonators, with the couplers removed were set to be able to be tuned with the small trimmers from 8.12 to 8.40 MHz.

The gains of the 3 FET's can be adjusted with the bias pots and set to 0 with 0 bias. With a bias ~~giving~~ giving a d.c. current of 100 ma in a FET, the taps run at about 3 V, P-P.

Results

#1 Before the FET's were added, resonator #1 was fed at its tap via a 500 Ω resistor and it was observed that:

- 3 phase operation was easily achievable
- to achieve a rotation of 1-2-3
2 was tuned higher & 3 lower than 1
- To achieve a rotation 1-3-2, 3 was tuned higher and 2 lower than 1.
- The relative amplitudes were about $1 \pm 20\%$.
- The criterion for tuning seemed straightforward.
- A preferred mode is for two resonators to be in phase, the other ~~out of~~ 180° out of phase.

The FET's and lines as shown in the sketch were then connected and the rotation 1-2-3 was achieved.

It was then determined that the amplitudes could be ~~tuned~~ made equal by adjusting the bias pots.

There are an infinite set of tuning and bias values which will result in 3 ϕ operation with equal amplitudes.

For example, with ~~200~~ in one case 3 ϕ balanced operation was achieved and then 3 or 2 FET's were pulled. 1 & 3 now operated 180° out of phase and 2 was shifted 90° and at half amplitude.

One thing is obvious: although 3 ϕ operation is achievable with only one transmitter, it is much easier to adjust the tuning with three transmitters, and the relative amplitudes can now ~~be~~ easily be controlled.

6.
3. 3 ϕ high Q model

The assembly drawing is complete and as soon as a draftsman is available the detailed dwg. can be made. The Moog valves and cylinders to operate the variable condensers are being tested. One works but leaks oil. Another leaks oil badly. The other 2 need to be tested.

4. Plans

The walking short is being detailed. Hopefully we can have the first walking short mechanically tested by Aug.

Hopefully the 3 ϕ high Q model will be ready for r.f. tests in Aug.

Maybe Gup will have to send the valves somewhere for rehabilitation.

The vacuum system for the r.f. finger test is to be rehabilitated by June 6 for further r.f. tests.

Meanwhile we must build phase detectors and amplitude and phase servos to be used on the 3 ϕ models. Some IC's and transformers have been ordered and perhaps we can close loops in July. If all is successful we can make up our minds by Sept 1 what the r.f. system will look like and prepare specifications to go out on bid for the long lead time expensive items: the synthesizer and the power supply.