RF Book

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1. In phase operation

The computer calculations show that there exists sufficient criteria to realize control of amplitude and phase for this mode. The criteria is substantially different than for 3ϕ operation so we will have to work out a plan to easily change the servo logic. However, there is no urgency to completing this work now so it will be indefinitly deferred.

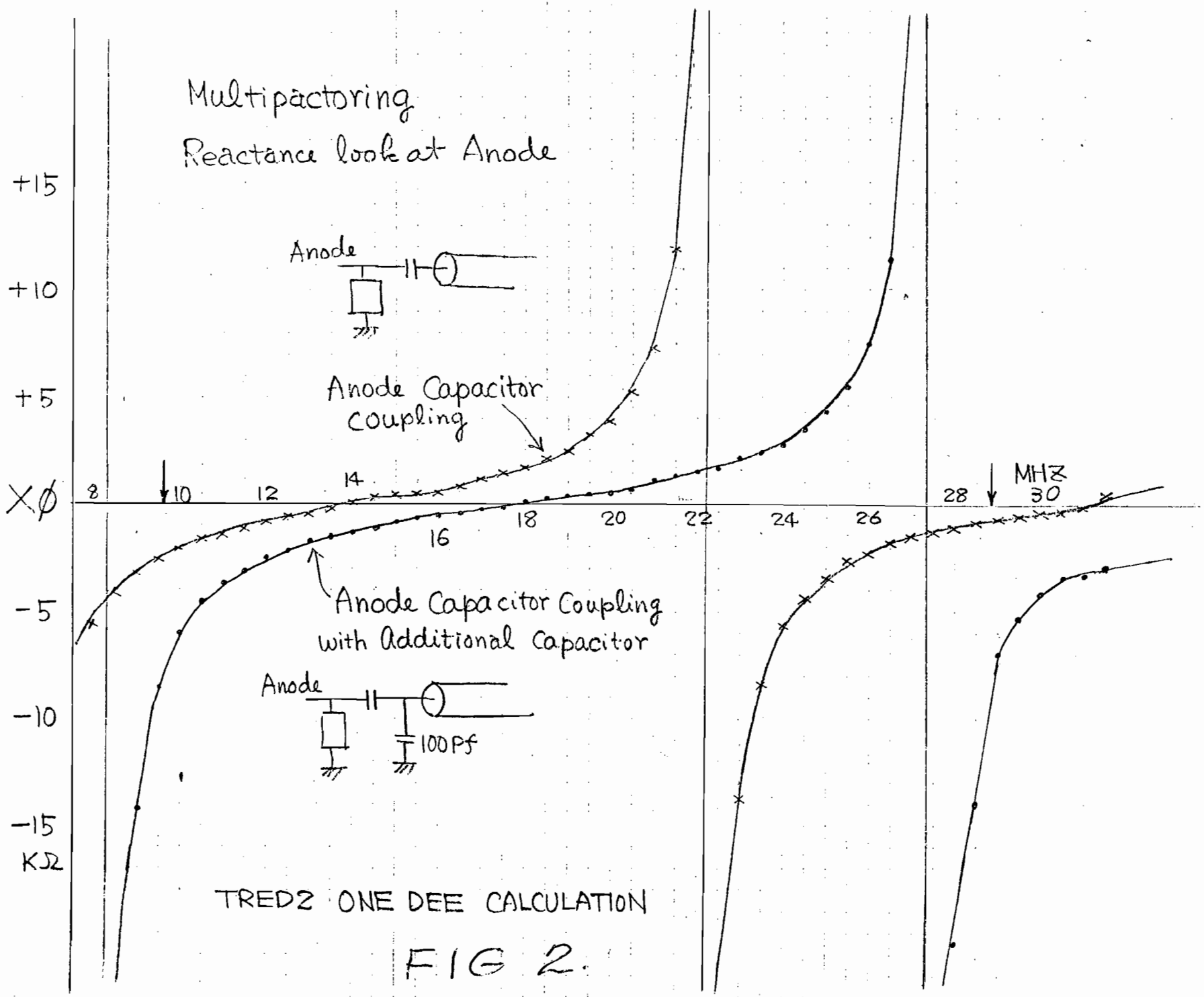
2. Easing the turn on problem near 20 MHz.

The transmission line from the transmitter to the dee will be $\gamma/2$ long at 20 MHz. Fig. 2 shows the impedance presented to the tube as a function of frequency when the dee is multipactoring, presenting a load of $\simeq$10 ohms to the coupler. The impedance becomes very high at 20 MHz which means that we would have to reduce the tube current to a very low value to avoid having excessive screen current. If we break through the multipactoring threshold (from 200 to 500 volts) then there is no problem, but it will be difficult to break through this threshold with such a low tube current.

To avoid this problem, when we are operating between 18 and 22 MHz we will add 100 pf to the transmitter end of the transmission line and readjust the output coupling capacitor and the transmitter stem short position. Then operation should be o.k. We will try this soon.

3. Vacuum Problems

We lost quite a few days back in early September because of vacuum problems and another week on this trip. The problem in September was due to a leak between the inside of the inner transmission line and the vacuum, which was solved by pumping on this line. Then when we turned the rf on the vacuum went sour and we found a big leak at the x-ray window flange and another in the weld of the coupler insulator. When these leaks were sealed, we were able to come on at 100 kV with no trouble (the x-ray making finger was removed). However,



TRED2 ONE DEE CALCULATION

FIG 2.

after a few minutes the vacuum pressure would climb to 5 x 10^{-5} T and we had to shut down for a few minutes for it to recover. The cryopump temperature was 16°K and the forevac on the turbine pump was 10 microns.

After 20 minutes we gave up and reconditioned the cryopump. The next day, on turning on, now with 10°K we immediately got to 100 kV and after 10 minutes the pressure leveled off at 1.5 x 10^{-5} and the forepump read 1 micron. The conclusion is that the pumping speed for whatever we are pumping is considerably lower at 16°K than at 10°K.

4. Driver and final grid tuners

The final grid tuner open loop response to the phase servo with the position loop closed was not good, showing considerable hysteresis. There was very little hysteresis in the follow pot voltage so corroborated by visual inspection, we conclude that the arm from the torque transmitter to the coil is bending. The immediate thought was to make this more rigid. However, using an empirical technique we found we were able to make the closed loop respond stably with the circuit of Figure 3, below.

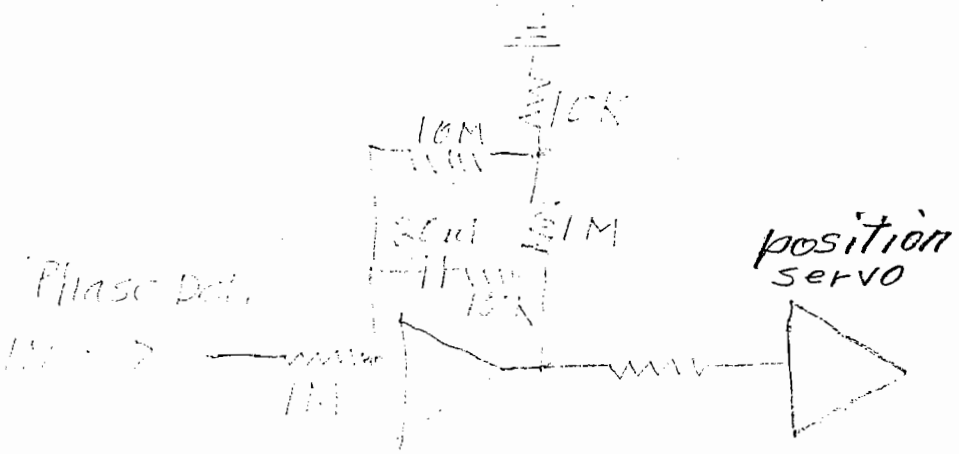


FIG. 3

The driver grid tuner servo is well behaved and should impose no problems.

5. Test stand performance

After the vacuum problems had been solved the test stand performed well but required 50 kW to achieve 100 kV. We only ran at 20.2 MHz, a bad place, but it was fairly easy to break through multipactoring, meaning that the surfaces are beginning to become conditioned.

6. Plans

The screen by pass condenser is to be redesigned to make vacuum impregnation easier and to thus produce a more reliable result. The fine tuner is to be built and installed. The new chain drive and motor drive for the transmitter stem is to be installed. Documentation for all the low level electronics and controls is to be completed so that parts can be procured for all three stations, and the equipment built. During the first part of November we propose to prove out the amplitude regulator, and the driver and final grid servoes over the entire frequency range and hopefully will be able to terminate use of the test stand by the middle of November so that all the transmitters can be installed in their final locations.

Meanwhile, some work will proceed on the K800. The transmitter tube is ordered. Work is to proceed apace on the half scale resonator model. Modifications to the K500 anode box design will be made in November so that the K800 box can be built.