§20. Calculation of Tuning Map of FPA Output Cavity for Wide Band Transmitter

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High power steady state transmitter has developed and the test has done successfully [1]. The feature of this transmitter is that it has very wide frequency range. Figure 1 shows the drawing of final power amplifier (FPA) output cavity. The output cavity of FPA consists of double coaxial cavity structure and the cross section of the outermost wall is rectangular shape and the innermost is circular. The design value of the frequency range is 25 to 100 MHz. However, in some frequency we could not get good tuning point. Figure 2 shows the tuning map on the two stubs of FPA output cavity obtained by cold test. At higher power it is more difficult to get good tuning point especially in the low frequency. Then, it is important to understand the characteristic of matching circuit and we simulate the output cavity tuning map by calculation.

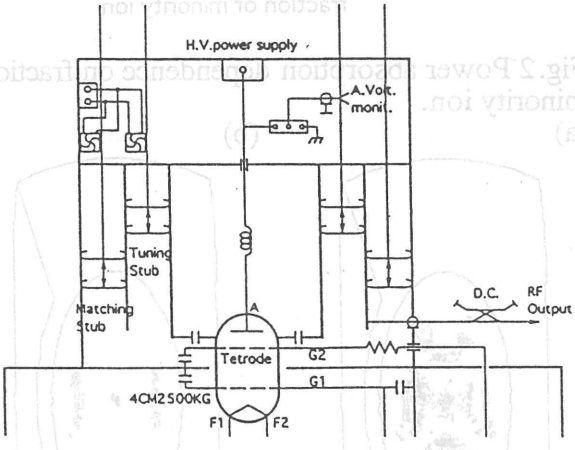

Fig.1 Schematic drawing of FPA output cavity.

Figure 3 shows the equivalent circuit of the FPA output cavity. Z_{RT} is the impedance of tetrode tube, Z_{Cpsg} is the capacitance between the plate and the screen grid (150 pF), Z_T is the impedance of the tuning stub and Z_M is the impedance of the matching stub. Z_M looks like an inductance in the case of relatively lower frequency and looks like a capacitance in higher frequency case. The output impedance of this circuit is easily calculated. The condition of impedance matching is applied and the length of stubs are decided as shown in Fig. 4. If we use the 150 Ω of the Z_{RT}, agreement between the experimental and calculational results are relatively well. We also calculated the case that the shape of the cavity is modified and got the qualitatively good result. We hope to make use of this calculation to improve the output in the low frequency.

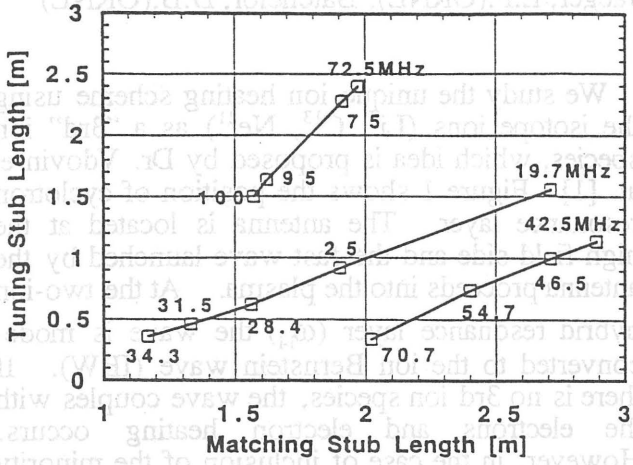

Fig.2 Frequency tuning map on the two stubs obtained by cold test.

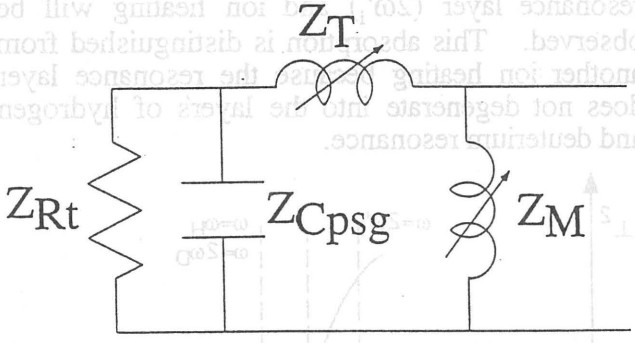

Fig.3 Equivalent circuit of FPA output cavity.

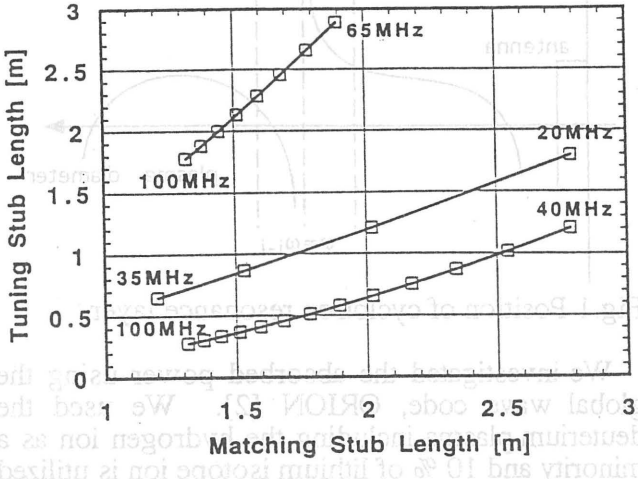

Fig.4 Frequency tuning map on the two stubs obtained by calculation.

Reference

1) Kumazawa, R., et al. : Fusion Tech. (1996)617.