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A H-plane coupling high power microwave synthesizer

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The high power synthesizer was based on the 3dB waveguide directional coupler structure. In order to improve the power capacity, a new structure without matching disc in the coupling region was proposed. Besides, the structure was analyzed theoretically and simulated numerically. Firstly, according to the mode matching method, the amplitude and phase of the odd and even modes in the coupling region were obtained. Then, based on the principle of quarter-wavelength impedance matching and the propagation characteristics of the working modes, the quantitative relationship between the key structural variables of the coupling region was established and an initial values were given with a reflection coefficient of -20 dB. After the optimization by the finite element method for the electromagnetic field, the reflection coefficient of each port was below -33 dB and the isolation between input ports was 34dB. The phase difference of the output port to the two input ports was 89.92° and the transmission coefficients of the two coupled channels were -3.013dB and -3.026dB.

The scatter parameters were measured by an Agilent E5071C vector network analyzer. The reflection coefficient of the input port was less than -24dB at 3.7GHz and the isolation between the input ports was 26dB. The phase difference of the output port to the two input ports was 90.4°, and the transmission coefficient of the output port to the two input ports were -3.27 and -3.02dB, respectively. The measured results agree with the simulation results within the error range. The high power test was based on a TH2103A klystron, the synthesis power of 400kW/3s was obtained with the power of the isolation port less than 3.3kW.

References

[1] G.T.Hoang, A.Becoulet, J.Jacquinot, et al., A Lower hybrid current drive system for ITER, Nucl. Fusion 49(2009) 075001(11pp).

[2] H.Do, S.Park, J.H.Jeong,et al., Test result of 5GHz, 500kW CW prototype klystron for KSTAR LHCD system, Fusion Engineering and Design 86(2011) 992-995.

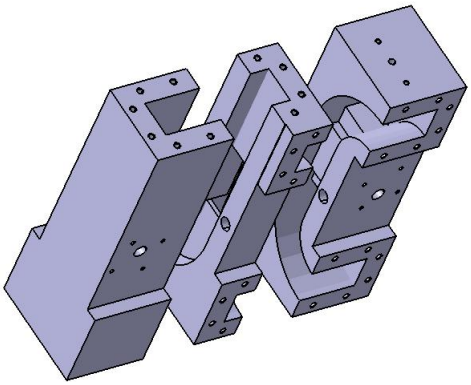

Figure 1Three parts of the recombiner