Abstracts

The Coupled-Cavity Transmission Maser-Engineering Design

F.E. Goodwin, J.E. Kiefer and G.E. Moss. "The Coupled-Cavity Transmission Maser-Engineering Design." 1964 Transactions on Microwave Theory and Techniques 12.3 (May 1964 [T-MTT]): 349-358.

The experimental design of an X-band microwave maser amplifier which uses a new type of slow-wave circuit is described. A detailed theoretical analysis of the circuit is presented in a companion paper. The slow-wave circuit consists of a cascade of iris-coupled ruby resonators separated by garnet isolators. This unit provides significant reduction in size and weight over previously reported maser slow-wave circuits. The microwave properties of the solid ruby resonator are treated in detail, and the passive bandwidth of the single transmission cavity and its relation to the iris susceptance are shown. Experimental techniques involved in obtaining and measuring precise iris susceptance are presented. A step-by-step procedure for designing an amplifier having a given gain and tuning range is also presented. Typical performance characteristics include a gain of 30 db, instantaneous bandwidth of 25 Mc and a noise temperature of 15°K. An electronic tuning range of 200 Mc has been achieved in one configuration with a 20 db gain and a 25-Mc bandwidth. The weight of the maser-dewar unit, filled with 6 liters of helium for 24 hours of operation is less than 40 pounds. The design of the dewar enables the cryogenic system to work over a wide range of vertical angles, thus facilitating the use of the maser at the feed of a large steerable antenna.

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