Abstracts

Accurate Phase-Length Measurements of Large Microwave Networks (Dec. 1966 [T-MTT])

J. Weaver and R. Alvarez. "Accurate Phase-Length Measurements of Large Microwave Networks (Dec. 1966 [T-MTT])." 1966 Transactions on Microwave Theory and Techniques 14.12 (Dec. 1966 [T-MTT]): 623-629.

The stanford two-mile linear accelerator uses 240, single-input-port, four output-port, S-band, rectangular-waveguide networks to feed RF energy sixty to seventy feet from the klystrons above ground to ten-foot-long, disk-leaded, circular-waveguide, accelerator sections below ground. During installation it is necessary to permanently adjust the phase lengths of the four network branches to be within ±4.5 electrical degrees of the design lengths for RF wave and electron beam synchronization. A modulated reflection phase-length comparison method is used, whereby a small signal is sent into each branch and reflected, in turn, by a diode switch, which is turned on and off at a 1 kHz rate. A null occurs in the amplitude modulation of the sum of a large reference signal and the small reflected signal, when the two signals are nearly in-phase quadrature. The reflectors are placed so that the network branches are properly adjusted when the nulls from all branches occur for the same setting of a variable phase shifter in the measurement line. Small mismatches and multiple power divisions do not affect the accuracy of this method. Frequency, temperature, and air pressure are the main environmental conditions affecting the measurement and are discussed along with the design of the reflecting diode switch, which is mounted in a vacuum-sealed waveguide flange.

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