Abstracts

A Low-Temperature Microwave Noise Standard

C.L. Trembath, D.F. Wait, G.F. Engen and W.J. Foote. "A Low-Temperature Microwave Noise Standard." 1968 Transactions on Microwave Theory and Techniques 16.9 (Sep. 1968 [T-MTT] (Special Issue on Noise)): 709-714.

An X-band thermal noise source is described that consists of a waveguide termination, cooled in a cryogenic environment, along with temperature and pressure monitors and controls. With liquid helium as the cryogen, the effective noise output at the room temperature flange can be set to values around the boiling point of helium (4.2°K) with an accuracy of ± 0.05°K. With liquid nitrogen as the cryogen, the output temperature can be set to values around 77°K with an accuracy of ±0.13°K. This accuracy is made possible by several unique features. First, the terminating waveguide section is a vapor bulb thermometer with the absorbing load surrounded with the cryogenic liquid. Second, heat exchangers are used to permit an unusually short waveguide transition seetion between cryogenic and room temperature. Third, an absolute pressure regulator is used to control the cryogen boil-off rate resulting in a temperature stability of 0.003°K for helium and 0.02°K for nitrogen. At present, the useful accuracy of the standard is limited to ±0.1°K because of uncertainties in the insertion loss (about 0.001 dB) of mating room temperature flanges.

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