Abstracts

Nonresonant perturbation measurements on dispersion and interaction impedance characteristics of helical slow-wave structures

S.J. Rao, S. Ghosh, P.K. Jain and B.N. Basu. "Nonresonant perturbation measurements on dispersion and interaction impedance characteristics of helical slow-wave structures." 1997 Transactions on Microwave Theory and Techniques 45.9 (Sep. 1997 [T-MTT]): 1585-1593.

A nonresonant perturbation (NRP) theory is developed from first principles for the measurement of dispersion and interaction impedance characteristics of a helical slow-wave structure (SWS). The phase of the reflected signal from a test helical structure varies when a perturber, also in the form of a helix, is moved along the axis of the test structure. The variation of phase with perturber position is interpreted to find the phase velocity of the structure under test. The interaction impedance of the structure is found by measuring the change in the axial phase-propagation constant of the structure as a dielectric rod is placed along the axis of the structure. Measurements are carried out with the help of an automated setup using an HP 8510 vector network analyzer (VNA) and a PC to collect the phase informations for the various precisely controlled positions of the perturber using a stepper motor, which is also interfaced with the PC. The experimental and theoretical values of the phase velocity and the interaction impedance of a typical "cold" experimental helical structure for a wide-band TWT are found to be close within 0.5% and 5%, respectively, in an octave band of 8-16 GHz.

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