

## Theory of Gyrotron Amplifier in a Vane-Loaded Waveguide with Inner Dielectric Material

**Authors :** Reyhaneh Hashemi, Shahrooz Saviz

**Abstract :** In his study, we have survey the theory of gyrotron amplifier in a vane-loaded waveguide with inner dielectric material. Dispersion relation for electromagnetic waves emitted by a cylindrical waveguide that provided with wedge-shaped metal vanes projecting radially inward from the wall of the guide and exited in the transverse-electric mode was analysed. From numerical analysis of this dispersion relation, it is shown that the stability behavior of the fast-wave mode is dependent of the dielectric constant. With a small axial momentum spread, a super bandwidth is shown to be attainable by a mixed mode operation. Also, with the utilization from the numeric analysis of relation dispersion. We show that in the -speed mode, the constant is independent de-electric. With the ratio of dispersion of smell, high -bandwith was obtained for the combined mode. And at the end, we were comparing the result of our work (vane-loaded) by the waveguide with a smooth wall.

**Keywords :** gyrotron amplifier, waveguide, vane-loaded waveguide, dielectric material, dispersion relation, cylindrical waveguide, fast-wave mode, mixed mode operation

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