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Abstract
Distributed-loss gyrotron traveling-wave amplifiers (gyro-TWTs) with high-gain, broadband, and millimeter-wave capabilities have been demonstrated. Most structures with distributed wall losses are stabilized in gyro-TWTs that operate at low beam currents. Attenuating severs are added to the interaction circuit of a distributed-loss gyro-TWT to prevent high beam currents that result in mode competition. Simulation results show that gyrotron backward-wave oscillations (Gyro-BWOs) are not effectively suppressed by the lossy section; in constrast, the severed sections can effectively enhance the start-oscillation threshold of gyro-BWOs in the proposed gyro-TWT. Meanwhile, localized reflective oscillations seem not to occur in the gyro-TWT unless it operates at a high magnetic field or with a high interaction length. The stable gyro-TWT, operating in the low-loss mode, is predicted to yield a peak output power of 405 kW at 33 GHz with an efficiency of 20 %, a saturated gain of 77 dB and a 3 dB bandwidth of 2.5 GHz for a 100kV, 20 A electron beam with an axial velocity spread of .

The gyrotron backward wave oscillator (gyro-BWO) is a promising source of coherent millimeter wave radiation based on the electron maser instability on a backward waveguide mode. Development of high-power microwave devices in the W band for commercial, industrial, and military applications is attracting considerable interest. We quote the stationary nonlinear simulation code to analysis, including the interaction length saturation characteristic, oscillation conditions of transverse modes, oscillation conditions of axial modes and frequency tuning rang, meanwhile tapering waveguide structure is used for optimizing output power and bandwidth of gyro-BWO and increasing distributed wall losses is employ to enhance the stability of the gtro-BWO. The stable gyro-BWO operating in the low mode, is predicted to yield a peak output power of 100 kW at 96 GHz with an efficiency of 20 %, and a 3 dB frequency tuning ranges 1.6 GHz for a 100kV, 5 A electron beam with an axial velocity spread of .
Advisory Committee Yi Sheng Yeh - advisor

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