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A 250 GHz Photonic Band Gap Gyrotron Amplifier[1] EMILIO A. NANNI, SAMANTHA M. LEWIS, MICHAEL A. SHAPIRO, RICHARD J. TEMKIN, Massachusetts Institute of Technology — Initial results for a high power 250 GHz gyrotron traveling wave tube (gyro-TWT) amplifier will be presented. The amplifier uses a novel photonic band gap (PBG) interaction circuit that confines the TE_{03}-like mode for operation. Stability from oscillations in lower order modes is provided by the PBG circuit. At 26.6 kV and 0.25 A the gyro-TWT operates with peak small signal gain of 27.3 dB at 251 GHz. The instantaneous -3 dB bandwidth of the amplifier at peak gain is 0.4 GHz. The amplifier can be tuned for operation from 245-254 GHz. A peak output power of 7.5 W has been measured. Experimental results taken over a wide range of parameters, 15-30 kV and 0.25-0.5 A, show good agreement with a theoretical model in the small signal gain regime. The theoretical model incorporates cold test measurements for the transmission line, input coupler, PBG waveguide and mode converter.

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