

Abstract Submitted  
for the DPP12 Meeting of  
The American Physical Society

**94 GHz Over-moded Traveling Wave Tube (TWT)<sup>1</sup>** ELIZABETH J. KOWALSKI, MICHAEL A. SHAPIRO, WILLIAM C. GUSS, RICHARD J. TEMKIN, Massachusetts Institute of Technology, Plasma Science and Fusion Center — There is great interest in increasing the power and bandwidth of slow wave devices in order to meet developing requirements at W Band frequencies. One approach to W-Band amplifiers is the use of over-moded W-band TWTs. The design and cold test of an over-moded 94 GHz Coupled-Cavity Traveling Wave Tube (TWT) with operation in the rectangular  $TM_{31}$  mode is discussed. Lower order modes in the over-moded TWT are suppressed with selective dielectric loading. This over-moded design allows for a larger cavity size, easier manufacturing, and larger beam tunnel than the equivalent fundamental-mode circuit; these factors lead to a large gain and high average power in the TWT at 94 GHz. Simulations with CST Particle Studio show 31 dB of gain with 300 W peak output power for the over-moded TWT design. Cold test results for a 9-cavity structure agree well with HFSS simulations. This design and experiment will be useful in expanding the use of TWTs to higher frequency ranges and impinging on the THz gap. The design also considers the practicality of experimentally testing this over-moded TWT. The over-moded TWT experiment is planned and is currently in set-up.

<sup>1</sup>Supported by the US DOE Office of Science Graduate Fellowship Program, DOE Office of Fusion Energy Sciences, and Air Force Office of Scientific Research

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Date submitted: 13 Jul 2012

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