

## **High Power ITER ECH Prototype Transmission Line Testing\***

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The 170 and 127.5 GHz ITER ECH transmission system is the responsibility of the US ITER team. The system is based on circular corrugated waveguide and miter bends and must operate at a frequency, power and pulse length that are much greater on ITER than previously encountered. Low power testing of components is currently underway<sup>1</sup> and some long pulse high power testing has been performed at JAEA<sup>2,3</sup> at 170 GHz. However, in order to develop and qualify components prior to procurement of a full set of 24 transmission lines, a high power test of a nearly complete prototype transmission line is desirable to confirm the performance at realistic cw operating conditions. A high power prototype transmission line testing facility is being designed based on existing power supplies and a 170 GHz gyrotron. Procurement of the 170 GHz gyrotron is expected to take up to two years, and a full 1 MW cw tube will not be available without additional work. A 140 GHz long pulse 400 kW gyrotron can be used in the initial round of tests. Testing of the nearly complete transmission line at 1 MW can be performed with a modest power (~0.5 MW) tube and a resonant ring configuration that is being tested at ORNL<sup>4</sup>. Testing at levels > 2 MW cw will be possible using a resonant ring with a transmission loss of 10-20%. Details of a proposed transmission line test stand at ORNL will be presented.

[1] M. Shapiro, Overview of ITER ECH Trans. Loss (2006)

[2] R.A. Olstad, et al, 3<sup>rd</sup> IAEA Tech. Meeting on ECRH in ITER

[3] M. Saigusa, et al, Fusion Engr & Design **74** p473-478 (2005)

[4] T.S. Bigelow, Proc. 22<sup>nd</sup> Int. Conf Infrared & MM Waves(1997)

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