# COMPACT MAGNETICALLY INSULATED TRANSMISSION LINE OSCILLATOR

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A compact MILO (Magnetically Insulated Transmission Line Oscillator), a high power microwave source, is being developed to fit into a 6" diameter, vacuum sealed envelope. An axial cylindrical design scheme similar to [1] with 4 active and 2 choke cavities and explosive emission cathode is used. Expected output power and frequencies are in the GW range at 2.2 – 2.6 GHz.

The design geometry of the active components has been selected on the basis of a full scale 3-D simulation made with the "MAGIC" electromagnetic finite difference time domain particle-in-cell (FDTD PIC) code from "ATK Mission Systems" [2]. A number of MILO geometries were investigated with a spatial resolution of 0.1 – 1 mm. Geometries providing steady and efficient generation of microwaves were found.

The experimental setup includes the "Thor" Marx generator combined with the pulse forming transmission line, generating pulses of 50 – 80 ns with output voltage of 0.5 – 1.5 MV, and total output energy up to 10 KJ. The voltage, current and other parameters in the MILO and pulse forming line are monitored with sensors placed across the system. Vacuum in the test area is provided by a turbo molecular pump. To prevent damage to the electronic controller, the pump is connected to the vacuum chamber via a long high voltage ceramic insulator.

Critical problems in the designing of a compact vacuum sealed MILO are the geometry of the device, the compact vacuum interface, and the explosive emission cathode with low out-gassing. The efficiency and output power of the compact MILO device depends on the input voltage, which is limited by breakdown of the vacuum interface.

1. S. E. Calico, M. C. Clark, R. W. Lemke, M. C. Scott, "Experimental and theoretical investigations of a Magnetically Insulated line Oscillator (MILO)", SPIE, vol. 2557, pp. 50-59, 1995.

2. B. Goplen, L. Ludeking, D. Smithe, and G. Warren, "User-Configurable MAGIC Code for Electromagnetic PIC Calculations," Computer Physics Communications, Vol. 87, Nos. 1 & 2, May 1995, pp. 54-86.