MATERIAL EMISSION INVESTIGATION OF EXPLOSIVE EMISSION CATHODES IN VACUUM SEALED TUBES

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The goal of this presentation is to present preliminary data on material emission of explosive emission cathodes in vacuum sealed tubes using laser spectroscopy and laser induced fluorescence. A triode geometry vircator (driven by a 1.5 kJ compact Marx Generator) is the primary vacuum sealed tube under investigation, and is 6 inches in diameter and 11 inches in length. The cathode is made of a neutral metal and may contain gas particles on the surface that explode during excitation. It is unclear what species is evolved as the plasma front moves away from the cathode and toward the anode.

The measured output of the triode geometry vircator driven by the Marx Generator produces voltages up to 300 kV[1], currents up to 30 kA[1] and an estimated peak radiated power of 135 MW[1].

The diagnostic system used to probe for the unknown species consists of a neodymium-doped yttrium aluminium garnet (Nd: YAG) pump laser, an optical parametric oscillator (OPO), a vacuum sealed tube (a triode-geometry vircator), a spectrograph and a high-speed ICCD camera. The laser system (Nd: YAG and OPO) has the capability to be tuned to a wide range of wavelengths from 206 nm to 2.6 μm. The Nd: YAG laser is capable of pumping the OPO with energy up to 1.8 J per pulse with a pulse width of 3 ns or 7 ns.

1. J. Walter, J. Dickens, M. Kristiansen, "Performance of a Compact Triode Vircator and Marx Generator System," 17th IEEE International Pulsed Power Conference, June 2009, pp. 133-137.