Abstract Submitted
for the GEC18 Meeting of
The American Physical Society

Efficient Switching of a Microwave Pulse Compressor by a Laser Initiated Gas Discharge YOAV HADAS, JACOB COHEN, Rafael, JOHN LEOPOLD, YAKOV KRASIK, Technion — Microwave Pulse Compressor (MPC) is an HPM device designed for generation of 100's of MW's thru amplification. The amplification is based upon time compression of an initial Microwave (RF) pulse characterized by a long (usec) duration to a short (ns) output pulse, ideally increasing the RF power by the duration ratio of the pulses. The MPC utilizes a pressurized RF resonator. Initiating a discharge in the gas, forms in a thin plasma channel sufficient to reduce the Q factor of the resonator, i.e. switch the resonator from a storage phase to a release phase. This switching enables the accumulated RF power to be radiated outside the system. We demonstrate experimentally an efficient way to cause a discharge in the pressurized gas, filling the resonator, by focusing an intense (˜1GW) laser pulse inside the MPC volume. We found that as the accumulated energy inside the resonator increases, the time delay between lasing and switching decreases. We were able to simulate this phenomenon by 2D-Lsp hybrid PIC modeling where we assume that the resonator is pressurized with gas, uniformly distributed background electron density of 103 cm-3 and seed electrons density occupying the laser focal region. Electron impact ionization develops self consistently with the oscillating RF field which eventually creates a plasma channel sufficient for the MPC switching. We fitted the seed electron density and the volume of the focal region to match the experimental results.

Yoav Hadas
Rafael

Date submitted: 28 May 2018 Electronic form version 1.4