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Controlled Filament Non-Local Discharge (CFND) . GEORGE H. MILEY, U of Illinois, Urbana-Champaign, Urbana, IL 61801 — Recently there has been increased interest in methods to achieve non-local electron effects to tailor the electron energy distribution (EED) for special applications like singlet delta oxygen (SDO) generation. However, a way to favor SDO production (requires an E/N $\sim$ 10 Td = 10^{-16} Vcm^2) while still having a high pressure and large volume has not been achieved. Here we present an innovative new concept – the controlled filament non-local discharge (CFND) in an effort to overcome these shortcomings. The CFND uses micro protrusions on the cathode surface to produce a multi-filament breakdown. The filaments create highly non-equilibrium beam-like electrons embedded in the background plasma discharge, providing control over the volume E/N. The micro-projection cathode design will be discussed and is the key to achieving the CFND. The high electric fields at the projection tips imitate micro arc discharges, enabling discharge breakdown with a relatively low applied voltage despite a high pressure. Once initiated, the discharge voltage drops as a non-local discharge develops over the volume. It is estimated that after initial breakdown at 600 V, an E/N of 10^{-16} Vcm^2 is obtained at roughly atmospheric pressure in oxygen with an applied voltage of 100 V in planar electrode geometry at a spacing of 10 cm.

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