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Temporal Evolution of Arc Emission From Laser REMPI Triggering of Air Spark Gap JARED MILES, STEVEN ADAMS, Propulsion Directorate, Air Force Research Laboratory, WPAFB/WSU COLLABORATION — A laser-triggering scheme for air spark gap switches was conceived and optical emission during breakdown was analyzed to investigate arc formation. The scheme utilized a pulsed ultraviolet laser to generate resonant enhanced multi-photon ionization (REMPI) within the atmospheric air medium of a spark gap switch. With an applied voltage below the self-breakdown level, the laser-induced pre-ionization initiated avalanche breakdown within the gap and the subsequent triggering of the switch. The pre-ionization was made possible by utilizing resonant 2-photon absorption, exciting $O_2(X^3\Sigma_g^-)$ to the $O_2(C^3\Pi_g$, v=2) state, followed by ionization with an additional laser photon. The focused laser beam created a pre-ionization channel within the gap establishing the arc path. The spectral and spatial distributions of the emission as a function of time were analyzed to help determine the mechanism for arc formation. Spectral images of the $N_2(C\ ^3\Pi_u$ - $B\ ^3\Pi_g)$ bands indicated when direct electron impact was the dominant source of ionization, while N^+ atomic ion bands indicated that voltage collapse and thermal ionization was occurring.

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