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Microwave Discharge in a Supersonic Flow of Simulated Martian Atmospheric Gas[1] D.J. DRAKE, S. POPOVIC, L. VUSKOVIC, Old Dominion University — Martian entry plasma can be considered a high-volume plasma reactor that is sustained by the dissipation of the spacecraft's kinetic energy. It was estimated that several kg of O_2 could be "harvested" during entry. However, the entry plasma parameters vary considerably depending on the spacecraft's trajectory. Probable range of plasma parameters was evaluated using the existing Martian atmospheric data and all recorded probe trajectories. Comparison to the existing simulation facilities is discussed. An alternative desk-top supersonic flow apparatus is devised for the study of aerothermodynamic and chemical properties of a simulated Martian atmospheric gas (SMAG). We performed detailed laboratory measurements of the excited-species populations in the supersonic flow of weakly ionized SMAG. A cylindrical cavity was used to sustain a discharge in SMAG in the pressure range of 100-600 Pa and a stationary acoustic shock wave was generated by an oblique solid body. Excited state populations of Ar and atomic oxygen were measured using absolute emission and absorption spectroscopy. Comparison was made in a model free flow and across the shock front. The gas and electron temperature were determined from the CO rotational spectra and Ar spectra, respectively.

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