Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Investigation of Partially Ionized Plasma Chemistry of Hydroxylammonium Nitrate FORREST KIDD, KRISTINA LEMMER, Western Michigan University — Future space missions require an efficient and versatile method of propulsion. One possibility is the use of dual-mode-propulsion. Dual-mode-propulsion combines the high specific impulse of electric propulsion with the high thrust of chemical propulsion. However, to effectively implement dual-mode-propulsion a propellant that can be used in both electric and chemical propulsion is required. Ionic liquids are one class of propellants currently being investigated for their use in dual-mode-propulsion systems. Hydroxylammonium Nitrate (HAN) is the ionic liquid of interest in this study. HANs chemistry and decomposition have been thoroughly investigated at pressures above atmospheric pressure; however, the chemistry of partially ionized HAN is not well understood. Ab-initio modelling is used to determine the chemistry of key ion-neutral reactions and to develop a reaction network for HAN plasma. Calculations using Density Functional Theory and Coupled Cluster Singles Doubles with approximate Triples corrections are performed. This will allow for accurate modelling of HANs interaction with thruster components and prevent premature failure.

Forrest Kidd
Western Michigan University

Date submitted: 11 Jul 2016 Electronic form version 1.4