Abstract Submitted
for the GEC19 Meeting of
The American Physical Society

Iodine RF-ICP for Electric Propulsion: Global Model and Experimental Comparisons FLORIAN MARMUSE, CYRIL DRAG, ANNE BOURDON, JEAN-PAUL BOOTH, ROMAIN LUCKEN, Laboratoire de Physique des Plasmas, PIETRO CONGEDO, DEFI - INRIA - CMAP, NICOLAS SISOURAT, Laboratoire de Chimie Physique Matire et Rayonnement , OLIVIER LE MAITRE, LIMSI, PASCAL CHABERT, Laboratoire de Physique des Plasmas — Iodine can be a replacement for Xenon as propellant for electric propulsion devices, being cheaper and allowing denser storage without pressurized system. Despite such thrusters being available on the market, the community lacks a better understanding of iodine Inductively Coupled Plasmas (ICP) and better methods to diagnostic them. Here we present an updated version of a global model for plasma ICPs, deriving temperatures and densities of six species linked by 16 reactions, and the plasma impedance, as well as thruster performances if the ICP is connected to a set of biased grids. An uncertainty quantification strategy has been applied to present a model with absolute uncertainties as well as indications of the sources of those uncertainties. We also present several experimental techniques applied to measure key plasma parameters: Langmuir probe measurements for electron density and temperature, I absorption at 1315nm for I density and temperature, I2 absorption for I2 density to compare with pressure measurements, and emission spectroscopy. As an example, the recombination effect is shown to be much stronger than anticipated by models and some hypothesis are made to explain this, leading to new constraints on the value of the I2 recombination coefficient at the walls.

Florian Marmuse
Laboratoire de Physique des Plasmas

Date submitted: 31 May 2019 Electronic form version 1.4