Abstract Submitted
for the GEC15 Meeting of
The American Physical Society

Experiments and numerical simulations to estimate the accuracy of probe assisted laser photo-detachment for negative ion density and temperature measurements NISHANT SIRSE, Dublin City University, NOUREDDINE OUDINI, Centre de Développement des Technologies Avancées, Algeria, BERT ELLINGBOE, Dublin City University, Ireland — Pulsed laser photo-detachment is the most commonly used technique to measure negative ion density and temperature in electronegative plasmas. The technique is based on measuring the excess electron current produced by the photo-detachment of negative ions. It is considered that the negative ion density is proportional to a rise in electron current following laser pulse, whereas, the temperature of negative ions is estimated based on the recovery of electron current to its value prior to the photo-detachment. During the photo-detachment process it is assumed that the background plasma remains unchanged. However, an electrostatic potential barrier is formed between the laser column (electropositive column) and the surrounding electronegative plasma in order to prevent the outward flow of electrons from the electropositive plasma column. The strength of the potential barrier depends on the various parameters such as electronegative ($\alpha = n_-/n_e$), laser wavelength etc. Neglecting potential barrier leads to an erroneous estimation of negative ion density and temperature. In the present work we have investigated the above effects by using computer simulation which is further verified by experiments in an inductively coupled oxygen plasma.

Nishant Sirse
Dublin City University, Ireland

Date submitted: 19 Jun 2015 Electronic form version 1.4