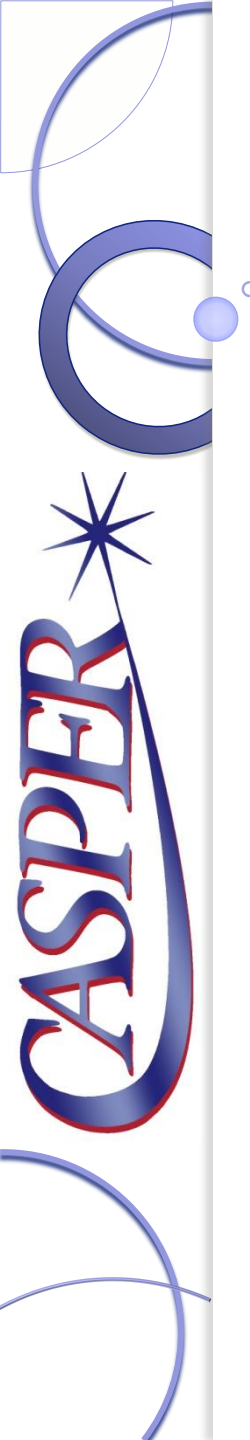# A Consistent Model of Plasma - The Potential in a Glass Box

Naoki Ellis, Lori Scott, Mudi Chen, Lorin S. Matthews, Truell Hyde

Center for Astrophysics, Space Physics, & Engineering Research
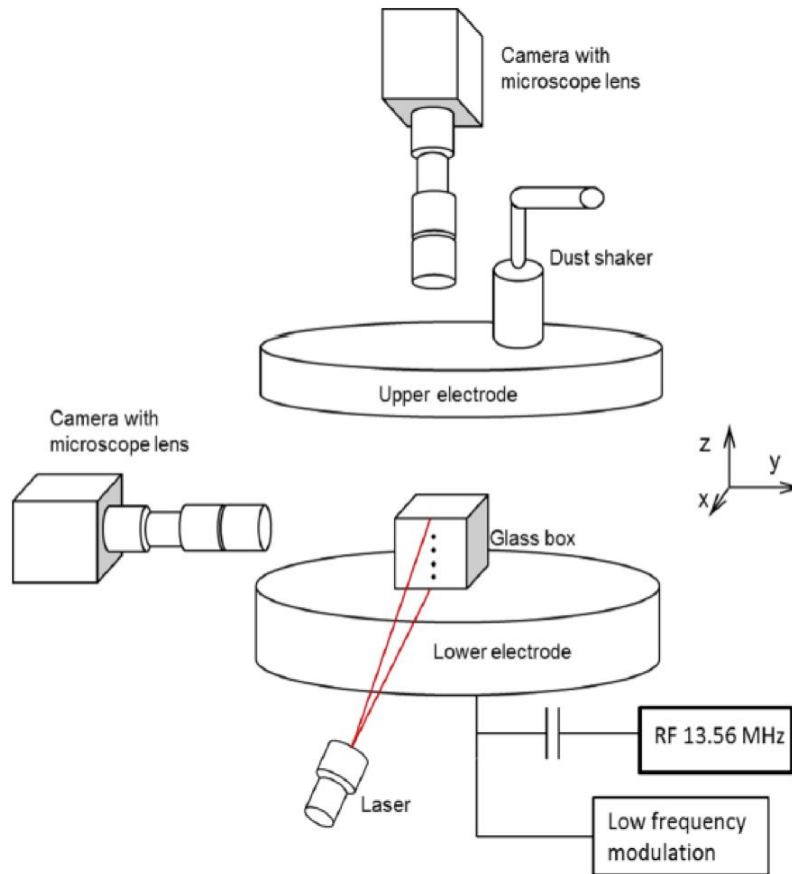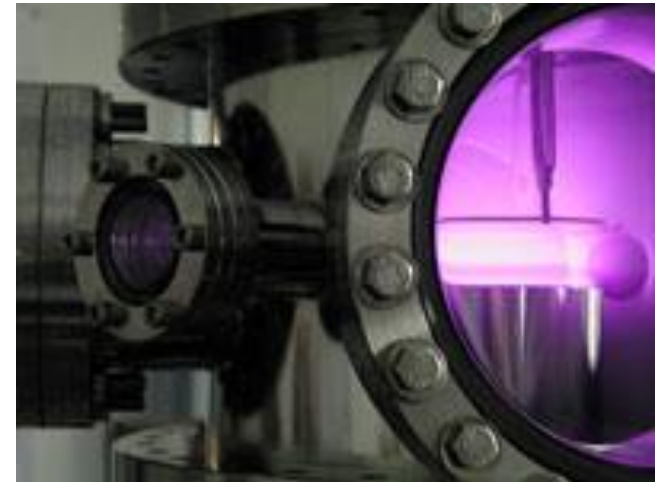*Baylor University*

Overview

- About the Experiment
- Background
- Method
- Results
- Conclusion

About the Experiment

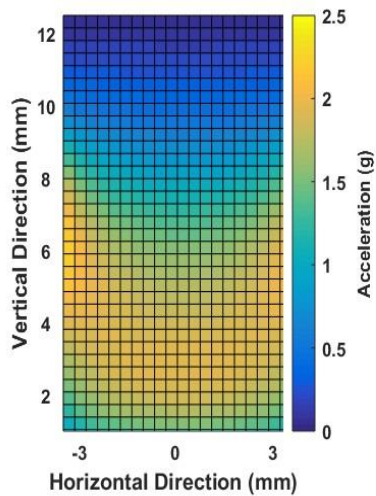**Schematic of Experiment
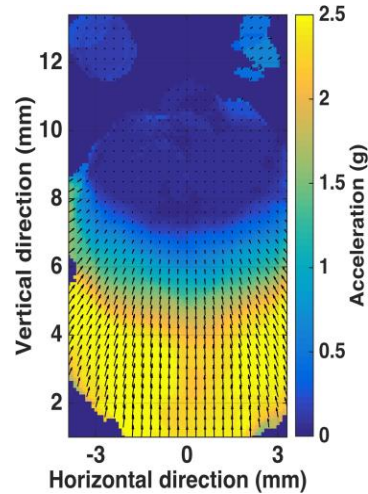with Glass Box**

GEC Reference Cell
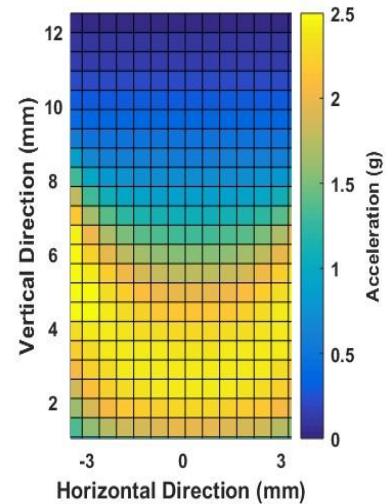
Background

Constant Debye Length

Model

Experiment

(150 mTorr, 60 V$_{pp}$)

Varying Debye Length

Model

Experiment

(150 mTorr, 60 V$_{pp}$)

4
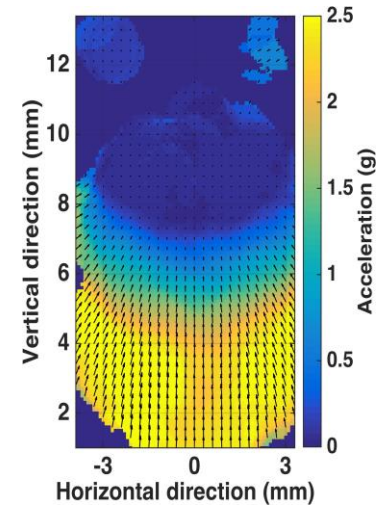
Method

Calc. Potential (Φ) on Walls

Calc. Charges on Walls (Q)

End of Loop?

No

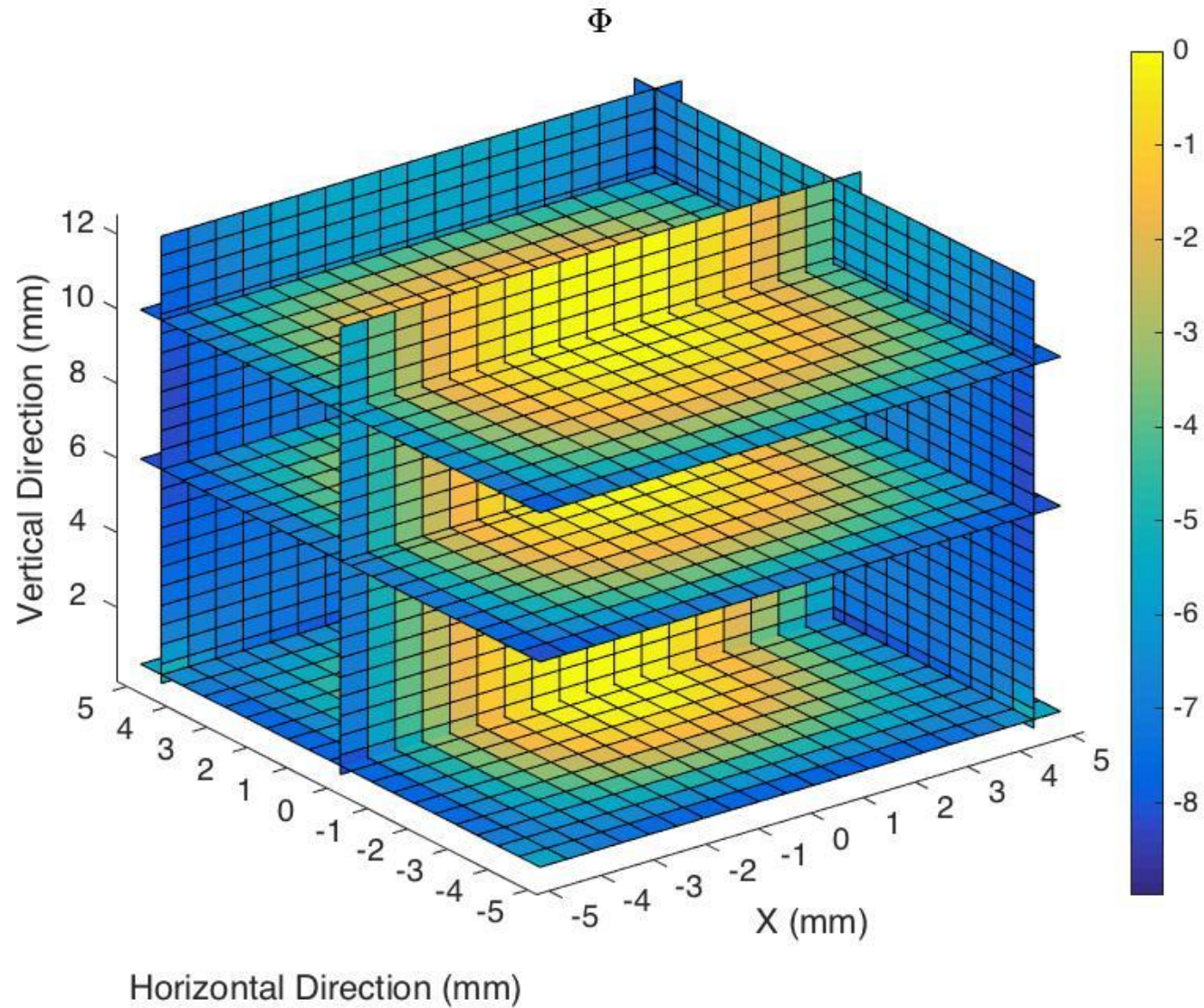$$\Phi = \sum_n \frac{k_e Q_n}{r_n} * e^{-\sum_m (\frac{r_m}{\lambda_D})}$$

Yes

$$n_i = \frac{n_{i,\ fluidv0}}{\sqrt{\frac{2Fx_{\ net}\Delta x}{\dot{m}_i} + \frac{2Fy_{\ net}\Delta y}{\dot{m}_i} + \frac{2Fz_{\ net}\Delta z}{\dot{m}_i} + 3v_0}}$$

$$E = -\nabla\Phi$$

$$n_e = n_0 e^{-\frac{q_e\Phi}{k_b Te}}$$
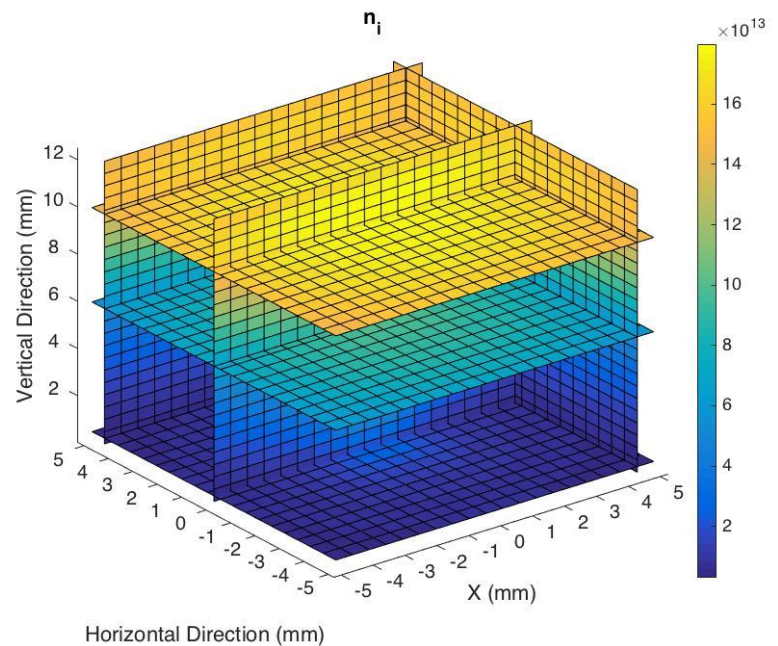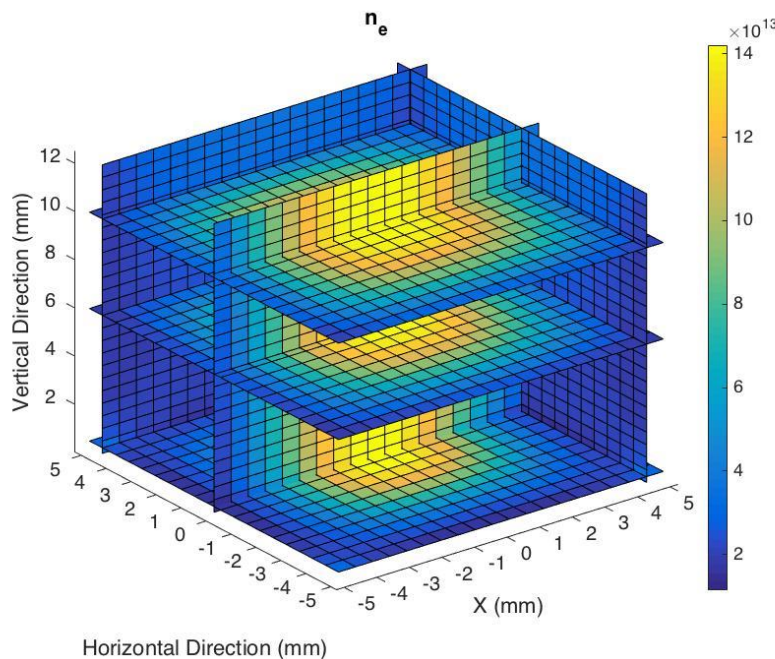
Generate Acceleration Maps

$$\frac{1}{\lambda_D} = \sqrt{\frac{q_i^2 n_i}{\varepsilon_0 k_b T_i} + \frac{q_e^2 n_e}{\varepsilon_0 k_b T_e}}$$

Results

Conclusion

More data is needed to progress