

replacing DPP17-2017-000988.

Abstract Submitted  
for the DPP17 Meeting of  
The American Physical Society

**Route to Chaos due to ion sheath oscillations observed in plasma bubble**<sup>1</sup> MARIAMMAL MEGALINGAM, BORNALI SARMA, ARUN SARMA, VIT University Chennai Campus — The report is intended to investigate experimentally nonlinear behavior of fluctuations in current carrying unstable plasma and compared with the theory that describes ion dynamics in the sheath and pre-sheath region. Plasma bubbles are created in bulk plasma by negatively biased spherical mesh grid of 80% optical transparency inserted in bulk plasma of the system. Argon plasma is produced in cylindrical chamber of 350 mm in length and 400 mm in diameter by hot cathode filament discharge method. The spherical mesh grid can congregate the particles from the plasma radially in presence or absence of biasing. A virtual anode structure has formed around the bubble when all electrons are reflected. A radially movable Langmuir and emissive probe are used to measure basic parameters. Sheath instability inside the bubble has observed, there appears regime of quasi-periodicity with various frequencies. Scanning has done throughout the bubble to understand fluctuations and its associated instabilities. These instabilities are leading to chaos through a region of quasi-period to period doubling at different positions inside the bubble. Experimentally observed ion sheath oscillations are confirmed with some theoretical analysis

<sup>1</sup>The authors would like to thank Indian Space Research Organisation(ISRO) for their grant and support.

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Date submitted: 18 Jul 2017

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