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O5.303 Concentric double hollow grid cathode discharges

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Multiple complex space-charge structures in unmagnetized low temperature plasmas, such as fireballs or inverted fireballs, arise from ionization phenomena near electrodes or due to local constraints [1,2]. The generation of such complex space-charge structures is often accompanied by plasma instabilities. [3,4]. Recently strong emphasis has been laid on the dynamics of such individual structures generated on various geometrical electrode configurations [5]. We present a new system, consisting of two concentric spherical hollow grids with aligned orifices, investigated by Langmuir probes and non-linear dynamics analysis. Negative biases of this system lead to the formation of two complex space charge structures on the orifices (Fig. 1).
The overall dynamics of the current-voltage characteristic (I-V trace) of each discharge is characterized by strong oscillatory behaviour with various waveforms correlated with jumps in the static I-V trace. Space-resolved measurements through the two aligned orifices of the two grids show a peak increase of electron temperature and particle density inside the two space-charge structures. The effects of the biases and Ar pressure on the overall spatial distribution of all plasma parameters are investigated. Two important working points of the concentric double hollow grid cathode discharges are revealed which could make this configuration suitable as an electron source.

References
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