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A Travelling Wave Sustained Hydrogen Discharge ELENA TATAROVA, EDGAR FELIZARDO, FRANCISCO DIAS, CARLOS FERREIRA, Institute of Plasmas and Nuclear Fusion, Instituto Superior Tecnico, Lisbon, BORIS GORDIETS, Lebedev Physics Institute, Moscow — An investigation of the spatial structure of a long H_2 plasma column sustained by a propagating surface wave (SW) is presented. The discharge is created using a surfatron-based setup powered by a 500 MHz generator, whose output was varied from 65 to 100 W, and takes place inside a Pyrex tube. Plasma-emitted radiation is collected perpendicularly to the discharge tube by an optical system comprising an imaging optical fiber coupled to a SPEX 1250M spectrometer equipped with a nitrogen cooled CCD camera. Phase and amplitude measurements using a vector voltmeter were carried out in order to obtain the SW dispersion characteristics. The gas temperature ranges from about 700K, at the beginning of the column, to about 350 at its end. Selective heating of H atoms has been detected. The Doppler temperatures corresponding to the H_γ line broadening are much higher than the gas temperature. The experimental results are analyzed in the framework of a self-consistent kinetic model, which accounts for the main plasma balances governing the discharge production, including bulk and surface processes. The experimental gas and H atom temperatures and atomic line intensities confirm the main trends of the model predictions. The crucial role of the wall conditions on the discharge physics is analyzed.

Elena Tatarova
Institute of Plasmas and Nuclear Fusion, Instituto Superior Tecnico, Lisbon

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