Abstract Submitted
for the GEC07 Meeting of
The American Physical Society

Hydrogen Balmer-Line Broadening in a Water-Vapor Microwave Plasma Source ELENA TATAROVA, FRANCISCO DIAS, BORIS GORDIETS, CARLOS FERREIRA, CENTRO DE FISICA DOS PLASMAS, INSTITUTO SUPERIOR TECNICO, 1049-001 LISBOA, PORTUGAL TEAM — Emission spectroscopy was used for the diagnostic of a large-scale, slot-antenna excited microwave (2.45 GHz) plasma source operating in water vapor at low-pressures (1 mbar). The Doppler temperatures corresponding to the broadening of the H_β line at 486.1 nm are in the range 2,500-3,000 K, and much higher than the rotational temperatures ($\sim$500 K) determined from the Q-branch (in the wavelength range 600-610 nm) of the Fulcher-α band $[d^2\Pi_u(v = 0) \rightarrow a^3\Sigma_g^+(v = 0)]$. Kinetic considerations demonstrate that the electron-ion and ion-ion recombination processes, respectively $H_3O^+ + e \rightarrow H_2O + H^*_{hot} + \Delta E_1$ and $H_3O^+ + OH^- \rightarrow H_2O + H_2 + O^*_{hot} + \Delta E_2$ can be the source of "hot" hydrogen and oxygen atoms provided H_3O^+ is the main positive ion in the water plasma. "Hot" atoms were also detected in the far remote plasma zone of the source up to 30 cm away from the slot-antennas. Acknowledgment: This study was funded by FCT/FEDER in the framework of the project "Ecological Plasma Engineering Laboratory" POCI/FIS/61679/2004.

Elena Tatarova

Date submitted: 15 Jun 2007 Electronic form version 1.4