Wave Driven Ar–N$_2$–H$_2$ Plasma J. HENRIQUES, F.M. DIAS, E. TATAROVA, C.M. FERREIRA, IPFN, INSTITUTO SUPERIOR TECNICO, 1049-001 LISBOA, PORTUGAL

TEAM — An experimental investigation of the spatial structure of an Ar–N$_2$–H$_2$ plasma torch is presented. A surface wave induced microwave (2.45 GHz) plasma torch is created using a conventional, surfaguide based set-up. A cylindrical, fused quartz discharge tube (with internal and external radii $R_1=7.5$ mm and $R_2=9.0$ mm, respectively) is filled by an Ar(78%)–N$_2$(20%)–H$_2$(2%) gas mixture at atmospheric pressure. A spectroscopic imaging system able to couple the plasma-emitted radiation into a SPEX 1250M spectrometer, equipped with a nitrogen cooled CCD camera, was used to measure 2D(r,z) profiles of emission intensities and line profiles. Abel inversion has been applied to derive the radial profiles from the side-on measurements. The H$\beta$ line profiles have been measured to determine the corresponding Doppler temperature and the electron density. The measurements are well fitted by Voigt profiles, whose Gaussian and Lorenzian components have been deconvoluted. In this way, hyperthermal hydrogen atoms have been detected. The measured Doppler temperatures (5,000–8,000 K) are higher than the rotational temperature by a factor of about 2. The 2D map of the electron density ($5\times10^{12}$–$5\times10^{13}$ cm$^{-3}$) was also obtained. Acknowledgement—This work was supported by the Fundaçāo para a Ciência e a Tecnologia, Ministério da Ciência, Tecnologia e Ensino Superior, Portugal

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