Abstract Submitted
for the GEC10 Meeting of
The American Physical Society

Anomalous Doppler Broadening of Hydrogen Lines Caused by Exotermic Reactions JAYR AMORIM, Laboratório Nacional de Ciência e Tecnologia do Bioetanol-CTBE, Caixa Postal 6170. CEP 13083-970, Campinas, SP, Brazil, JORGE LOUREIRO, Instituto de Plasmas e Fusao Nuclear, Instituto Superior Tecnico, 1049-001, Lisboa, Portugal — Large controversy is nowadays associated with possible explanations of the anomalous Doppler broadening of hydrogen Balmer lines observed in low-pressure plasma discharges. The interest was triggered by the observation of extraordinary wide wings on the spectrum of atomic hydrogen emitted lines. For full clearness of this point we present in this work a theoretical study in which the three-dimensional and one-dimensional velocity distributions of product species created by an exothermic reaction $H_2^+ + H_2 \rightarrow H_3^+ + H$, with internal energy defect ΔE, are determined using energy conservation requirement. It is shown that deviations relatively to Maxwell-Boltzmann distribution are significant as ΔE increases and hence the profiles of H($n \geq 3$) emitting atoms created in the sequence of this reaction are not Gaussian. The determination of the species temperature from the full-width at half- maximum of hydrogen Balmer lines, as well as the fit of these lines by multimodel Gaussian functions are questioned.

Jayr Amorim
Laboratório Nacional de Ciência e Tecnologia do Bioetanol-CTBE,
Caixa Postal 6170. CEP 13083-970, Campinas, SP, Brazil

Date submitted: 28 May 2010 Electronic form version 1.4