

## Excessive Doppler Broadening in spectra from Molecular Plasma

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The so called "excessive line broadening" is a well-established effect in the spectrum from low pressure hydrogen plasma [1]. This phenomenon is explained by the so-called Field Acceleration Model (FAM), see for instance [2]. According to FAM, three types of hydrogen ions,  $H^+$ ,  $H_2^+$  and  $H_3^+$ , are accelerated in the electric field and then undergo charge exchange reactions with  $H_2$  molecule. Thereby, fast atoms are created, typically with kinetic energies of several hundreds of eV, with velocities in the electric field direction. Due to the Doppler shift in emission, the spectral lines are seen as very broad with a distinctive shape which depends on field direction. Experimental investigations were performed in a number of papers, see the references in [1] and [3]. Monte Carlo model was also applied for production and transport of fast H atoms in low pressure plasma [4]. The incidence of fast H atoms was shown to be important for astrophysical plasma e.g. [5]. Moreover, similar effect was also detected in nitrogen plasma, although less pronounced [6]. In this presentation, the excessive Doppler broadening is examined in a low-pressure discharge for three lines of Balmer series. The fast atoms reached velocities up to 500 km/s. In addition, the same experiment is conducted in nitrogen and oxygen, and excessive broadening was detected using high-resolution spectrometer.

### References

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