# Zeeman Stark line shapes affected by periodic electric fields

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Atoms and ions emitting in a plasma are often subjected to periodic electric fields which can affect the emitted line shapes. Such conditions are typical in non-equilibrium plasmas where ion sound and Langmuir waves are frequently observed. In laboratory settings and magnetic fusion devices, radio frequency waves (rf) are employed for heating and current drive. Spectroscopic measurements of regions heated by the rf field are crucial for enhancing our understanding of wave-plasma coupling [1]. Modeling the effect of periodic electric fields has a long history involving various line shape formalisms, and has often focused on a monochromatic and linearly polarized wave $\vec{E}_w \cos(\omega t + \varphi)$, where $\varphi$ is a random phase. In this study, we explore the utility of computer simulations in understanding the impact of the particle microfield and a concurrent periodic electric field on line shapes. By solving numerically the Schrödinger equation for a hydrogen emitter, we accurately capture the complex dynamics of our physical system. Several groups employ such computer simulations today, and a recent comparison of the outcomes from their codes has been performed for hydrogen lines in a periodic electric field [2], which will be briefly reviewed and updated here. We will also examine the influence of the magnitude $E_w$ and the frequency ω of the wave, and present the application of the simulation to cases where both the magnetic field and the different electric fields affect the line shape.

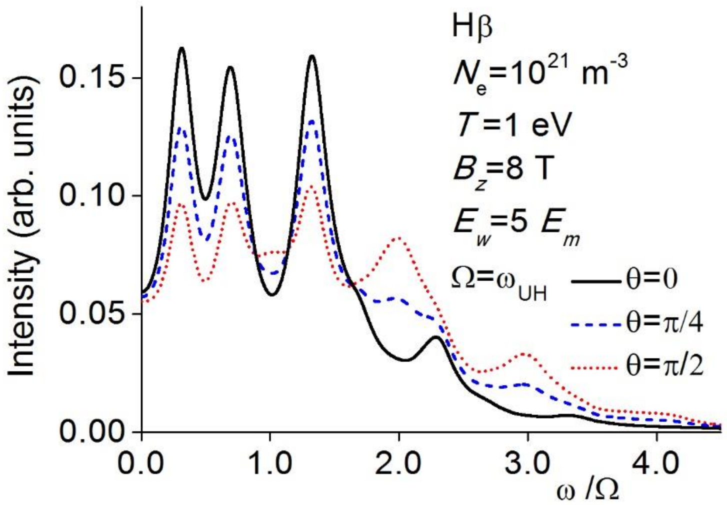


**Figure 1.** Hβ line observed at different angles with the magnetic field, for a wave magnitude equal to five time the average plasma microfield and an oscillation frequency equal to the upper hybrid frequency.

## References

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