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COMPLEX LINE SHAPES IN NON-THERMAL LABORATORY PLASMA

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Non-thermal, or cold, atmospheric discharges have recently emerged as the most investigated and most promising laboratory plasma sources. In the last two decades they have been extensively studied both theoretically and experimentally. Optical emission spectroscopy is systematically applied to the task of obtaining data on plasma parameters and processes. However, the non-equilibrium nature, space inhomogeneity and transient nature of these plasmas pose limitations on line profile analysis. In addition, similarly to astrophysical plasmas, complex spectral line shapes are occasionally observed, that cannot be explained using standard models for line shape analysis e.g. Doppler or pressure broadening. To perform line analysis in such cases, new and advanced fitting procedures must be developed, often paired with fast imaging and electrical measurement to complete the unknowns in the method. In this presentation we will show several experimental studies of non-thermal plasma which use complex atomic line profiles, both from hydrogen and non-hydrogen spectrum. It will be shown how the inhomogeneity of plasma in time in space, presence of strong sheaths and line-of-sight effects are mirrored in the shape of the spectral line.