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Review of Recent Advances in the Analytical Theory of Stark Broadening of Spectral Lines in Plasmas: Applications to Laboratory Discharges and Astrophysical Objects

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There is presented an overview of latest advances in the analytical theory of Stark broadening of spectral lines and their applications to various types of laboratory and astrophysical plasmas. They include: 1) In-depth study of intra-Stark spectroscopy in the x-ray range in relativistic laser-plasma interactions; 2) X-ray spectroscopy based diagnostics of GigaGauss magnetic fields during relativistic laser-plasma interactions; 3) influence of magnetic-field-caused modifications of trajectories of plasma electrons on the width of hydrogen/deuterium spectral lines: applications to white dwarfs; 4) Stark broadening of hydrogen/deuterium spectral lines by a relativistic electron beam: analytical results and applications to magnetic fusion; 5) advanced analytical treatment of the Stark broadening of hydrogenic spectral lines by plasma electrons; 6) Stark broadening of hydrogenic spectral lines by one- or two-dimensional stochastic electric fields; 7) the shape of spectral lines of two-electron Rydberg atoms/ions: a peculiar Stark broadening; 8) on the counterintuitive dependence of the dynamical Stark width of hydrogenic spectral lines on the electron density.