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Invited Lecture

USE OF STARK EFFECT FOR MEASUREMENT OF MACROSCOPIC ELECTRIC FIELD IN LABORATORY PLASMAS

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The emission spectroscopy methods for measuring the macroscopic electric field in laboratory plasma are presented. The occurrence of macroscopic electric filed is a consequence of space charge build up. It is a common feature of discharge sheaths, streamer heads, double layers and can also be found in astrophysical plasma. The methods are based on polarization-dependent Stark splitting and shifting of atomic lines in the presence of a relatively strong electric field. First group of methods is based on Stark effect of hydrogen beta and alpha line. Second group of methods is based on Stark splitting and shifting of several helium lines and their forbidden counterparts. Line fitting procedures were developed that take into account components of a given atomic transitions, provide higher accuracy compared to simple evaluation and enable measurements of lower field values. The shift calculations and fitting procedures were experimentally tested and verified by measuring the field distribution in the cathode fall of a low pressure glow discharge. These methods were then applied as experimental tools in various types of discharges by taking into account specific line broadening processes. Due to their *ab initio* basis the Stark methods can be used for measuring electric field spatiotemporal distributions in diverse plasmas, independently of other plasma parameters and fulfillment of special conditions.