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Langmuir probe in magnetized plasma: Study of the diffusion parameter

J.L. Jauberteau; I. Jauberteau; O.D. Cortázar; A.M. Megia Macías

Abstract-

In low-temperature magnetized plasma, Langmuir probe measurements must be corrected because of the electron diffusion through the sheath, which is formed around the probe collector. The correction factor, which is called the electron diffusion or electron sink parameter, depends on many other parameters such as the probe geometry, the electron diffusion coefficient, the sheath thickness, or the potential profile through the sheath. Based on a previous work, we determine the values of this parameter under different experimental conditions and we study the effect of the electron energy, of the probe-biased voltage, and of the magnetic field intensity on this parameter. The results are compared with theoretical models published in the literature. An empirical equation is determined to fit the diffusion parameter value versus magnetic field intensity.

Index Terms- electron diffusion parameter, electron energy distribution function, Langmuir probe, magnetized plasma, plasma parameter

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