Electric probes in plasmas

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This paper provides a background for the use of Langmuir and gridded energy analyzer probes in diagnosing plasmas with varied characteristics. Theory is illustrated which governs the analysis of data from, and the design of these probes. Several probe analysis techniques and some of their typical problems are presented.

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1. Introduction

Electric and magnetic probes are among the earliest and most basic plasma diagnostics. They are used in a wide variety of plasmas ranging from the low-density, low-magnetic field space plasmas to those at the edge of fusion research devices. Interest in probes has increased and waned over the years since Irving Langmuir first explored their usefulness. They have lately enjoyed a revival in fusion research because of the recently recognized importance conferred upon the plasma edge. Although electric probes are fairly straightforward to design, build and operate, theoretical models used to analyze the resultant data can be quite complicated. Generally, the degree of difficulty encountered in applying the selected model depends on what accuracy is desired.