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Two-dimensional self-consistent model of an end-Hall (gridless) ion source[1] NOUREDDINE OUDINI, GERJAN HAGELAAR, LAURENT GARRIGUES, JEAN-PIERRE BOEUF, LAPLACE (LAboratoire PLAsma et Conversion d'Energie), CNRS and Université de Toulouse, France — In an end-Hall source an ion beam is extracted from a magnetized plasma and accelerated by the plasma electric field without grids. The principles of end-Hall sources is similar to that of Hall effect thrusters (or closed-drift thrusters) but their design is optimized for processing applications (ion-beam assisted deposition or substrate cleaning) rather than propulsion. The beam divergence is larger in end-Hall ion sources and these sources can operate at low ion energy. Although end-Hall sources are commonly used in the surface processing industry, no detailed modeling of these sources is available and their operation is quite empirical. We present a self-consistent, two-dimensional quasi-neutral model of an end-Hall ion source. The model is used to improve the understanding of the basic physics of these plasma sources and to quantify the parameters controlling the properties of the extracted ion beam. Plasma properties and ion beam characteristics as a function of gas flow rate, discharge current, and magnetic field configuration, are discussed.

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Jean-Pierre Boeuf
LAPLACE (LAboratoire PLAsma et Conversion d'Energie),
CNRS and Université de Toulouse, France

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