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Extraction of electron energy distribution functions from Langmuir probes using integrated step function response and regularized least squares solver AHMED ELSAGHIR, STEVE SHANNON, NC State University, Department of Nuclear Engineering — Electron energy distribution function (EEDF) extraction from Langmuir probe data is an ill-posed problem due to the integral relationship between electron current and EEDF with respect to probe voltage. Curve fitting solutions to extract this EEDF assume a specific type of distribution. Point by point extraction of the second derivative relationship uses a small fraction of the integrated data to extract the EEDF. Recently EEDF extraction techniques have been evaluated using regularized solutions to the integral problem.[1] These techniques do not assume any mathematical representation of the EEDF and solve the integral problem for any function that best represents the EEDF. In this paper the electron current for arbitrary functions is derived assuming that the electron density is a sum of step functions representing such a function. This technique for EEDF extraction is validated by adding noise to numerically generated data and using a regularized least squares method to calculate the original function by solving for the individual step function contribution to the total electron current. The methodology, reconstruction, and comparison to current best-known methods will be presented.

[1]Gutiérrez-Tapia and Flores-Llamas, Phys. Plasmas **11** 5102 (2004)

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