Abstract Submitted
for the GEC19 Meeting of
The American Physical Society

Kinetic Investigation of the Planar Multipole Resonance Probe CHUNJIE WANG, Ruhr University Bochum, MICHAEL FRIEDRICHS, Leuphana University Lneburg, JUNBO GONG, Ruhr University Bochum, JENS OBERRATH, Leuphana University Lneburg, RALF PETER BRINKMANN, Ruhr University Bochum — Active Plasma Resonance Spectroscopy (APRS) is a well-established plasma diagnostic method: A radio frequency signal is coupled into the plasma via a probe or antenna, excites it to oscillate, and the response is evaluated via a mathematical model. Many APRS probes are invasive and perturb the plasma by their physical presence. The planar Multipole Resonance Probe (pMRP) [1] solves this problem: It can be integrated into the chamber wall and minimizes the perturbations. Previous work has studied the pMRP in the frame of the cold plasma model (Drude model) [2], missing important effects like collision-less damping. In this work, a kinetic model is developed to investigate the behavior of the pMRP more closely. This model consists of the collision-less Vlasov equation, which is coupled with the Poisson equation under the electrostatic approximation. The spectral response of the probe-plasma system is found by calculating the complex admittance. This model covers kinetic effects and overcomes the limitations of the cold plasma model. [1] C. Schulz, T. Styrnoll, P. Awakowicz, I. Rolfes, IEEE Trans. Instrum. Meas. 64, 857 (2015). [2] M. Friedrichs and J. Oberrath, J. EPJ Techn. Instrum. 5, 7 (2018).

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Date submitted: 03 Jun 2019 Electronic form version 1.4