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On Floating Potential of Emissive Probes in a Partially-Magnetized Plasma[1] YEVGENY RAITSES, BRIAN KRAUS, Princeton Plasma Physics Laboratory — We compare measurements of plasma potential in a cross-field Penning discharge from two probes: swept biased Langmuir probe and floating emissive probe. The plasma potential was deduced from the first derivative of the Langmuir probe characteristic. In previous studies [1], the emissive and swept biased probes were placed at the channel exit of a Hall thruster (HT). Measurements showed that the emissive probe floats below the plasma potential, in agreement with conventional theories. However, recent measurements in the Penning discharge indicate a floating potential of a strongly-emitting hot probe above the plasma potential. In both probe applications, xenon plasmas have magnetized electrons and non-magnetized ions with similar plasma densities (10^{10} - 10^{11} cm^{-3}). Though their electron temperatures differ by an order of magnitude (Penning 5 eV, HT 50 eV), this difference cannot explain the difference in measurement values of the hot floating potential because both temperatures are much higher than the emitting wire. In this work, we investigate how the ion velocity and other plasma parameters affect this discrepancy between probe measurements of the plasma potential. [1] J. P. Sheehan, Y. Raitses, N. Hershkowitz, I. Kaganovich, and N. J. Fisch, Phys. Plasmas 18, 073501 (2011).

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