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**The potential of a cylindrical emissive probe**<sup>1</sup> AMNON FRUCHT-  
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nology — When a probe is emissive, the electron flux from the plasma is partially  
balanced by the opposite emitted electron flux, so that the probe floating potential  
gets closer to the plasma potential. Emissive probes can then be used for estimat-  
ing the plasma potential. However, it is desirable to know how small the voltage  
between the emissive probe and the plasma is. It can be shown analytically that for  
an emissive planar probe, the plasma-probe voltage is reduced from 5.2 Te for argon  
to about 0.95 Te. For a cylindrical probe, the voltage is smaller than for the planar  
probe. Chen and Arnush calculated the dependence on the ratio of the Debye length  
and the probe radius of the voltage between a non-emissive cylindrical probe and a  
plasma [1]. We extend their analysis to an emissive cylindrical probe. As in [1], we  
take the ion angular momentum as zero, so that orbital motion effects are absent  
[2]. We find how the voltage between an emissive cylindrical probe and a plasma  
is reduced as the emitted current increases and reach saturation, and calculate how  
this voltage decreases when the ratio of Debye length and probe radius increases. [1]  
F. F. Chen and D. Arnush, Phys. Plasmas 8, 5051 (2001). [2] J. E. Allen, Physica  
Scripta 45, 497 (1992).

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