Locking the Plasma Potential with an Anodic Surface\textsuperscript{1} MATTHEW HOPKINS, BENJAMIN YEE, EDWARD BARNAT, Sandia National Laboratories, SCOTT BAALRUD, BRETT SCHEINER, University of Iowa — It is often assumed that a small positively biased electrode immersed into a bulk plasma has negligible impact on the bulk plasma properties, including the plasma potential. This is an assumption in many diagnostic devices, such as a Langmuir probe. In this poster we present a detailed study including simulations and experiments to determine the size scales when such an immersed positive interface has non-negligible impact on the plasma \cite{1}. That is, we answer the question, what is the largest size for an anodic surface before it influences the plasma?.

Letting $\mu = \sqrt{2m_e/m_i}$, we find that if the ratio of anode area $(A_A)$ to grounded wall area $(A_W)$ $A_A/A_W \times 1 \times \mu$, we can expect little impact on the bulk plasma, but as $A_A/A_W \rightarrow 1.7 \times \mu$ we see significant influence, and at $A_A/A_W 1.7 \times \mu$, we expect the plasma potential to become locked to, and therefore controlled by, the anode potential. \cite{1} Hopkins, Yee, Baalrud, Barnat, Phys. Plasmas 23, 063519 (2016).

\textsuperscript{1}This work was supported by the Office of Fusion Energy Science at the U.S. Department of Energy under contract DE-AC04-94SL85000.

Matthew Hopkins
Sandia National Laboratories

Date submitted: 02 Jun 2017

Electronic form version 1.4