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Characterization of a compact ECR microwave plasma source for the purpose of examining early stage tungsten fuzz growth[1] DAVID DONOVAN, DEAN BUCHENAUER, JOSH WHALEY, Sandia National Laboratory — Exposure of tungsten to low energy (< 100 eV) helium plasmas at temperatures between 900-1900 K in both laboratory experiments [1] and tokamaks [2] has been shown to cause severe nanoscale modification of the near surface, termed tungsten fuzz growth. Fuzz formation can lead to non-sputtered erosion and dust formation. To better compare with models being developed for the fuzz formation, we are exploring the use of a compact ECR plasma in situ with scanning tunneling microscopy to investigate the early stages of helium induced tungsten migration under these conditions. Here we report on preliminary characterization of the plasma source for helium plasmas with a desired ion flux of $\sim 5 \times 10^{18}$ ions m^{-2} s^{-1} on the tungsten surface. The characterization is performed using a cylindrical Langmuir probe capable of moving axially along the direction of the plasma as well as rotationally between fully exposed and fully removed from the plasma. Variations in background pressure, plasma density, and total input power are discussed.

[1] M.J. Baldwin and R.P. Doerner, Nucl. Fusion 48 (2008) 035001; M.J. Baldwin and R.P. Doerner, J. Nucl. Mater. 404 (2010) 165.
[2] G.M. Wright, D. Brunner, M.J. Baldwin, et al, Nucl. Fusion 52 (2012) 042003.

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