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A helicon hydrogen plasma source for PMI studies[1] R. GOULDING, G. CHEN, S. MEITNER, L. OWEN, F.W. BAITY, J.B.O. CAUGHMAN, M. COLE, Oak Ridge National Laboratory — Linear plasma devices are important tools for studying phenomena occurring in the plasma material interface (PMI) regions of fusion experiments. An electrodeless rf helicon based plasma source is being designed and constructed at ORNL for possible use in a high power flux ($\sim$ 20 MW/m^2) linear PMI test device. The source will produce high density hydrogen and deuterium plasmas with density $>10^{19}$ m^{-3}, and total ion production $\geq 10^{21}$s^{-1}. It consists of a 1.3 m long, 15 cm diameter vacuum chamber, with a helical antenna transmitting rf power at f= 10-26 MHz through a cylindrical aluminum nitride (AlN) vacuum window, and four circular coils creating an axial magnetic field with $|B| \leq$ 1T. Preliminary modeling using the EMS2D code indicates that antenna plasma loading $\geq 5\ \Omega$ should be acheivable, permitting coupled power $P >$ 50 kW. The device will operate for pulse lengths up to 3 s, with data obtained permitting the design of a later steady state version. The design will be reviewed, as well as well as power deposition and electric field profiles calculated using EMS2D and CST Microwave Studio. Thermal stress calculations for the AlN window will also be reported.

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