

Abstract Submitted
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Radio Frequency Plasma-Based Non-ambipolar Electron Source¹

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A Radio Frequency (RF) plasma-based electron source that does not rely on electron emission at a cathode has been constructed and is able to produce 15 A of electron current when using 15 sccm Ar, 1200 W RF power at 13.56 MHz. All of the random electron flux in the device is extracted through an electron sheath resulting in total non-ambipolar flow when the ratio of the ion loss area to the electron loss area is approximately equal to the square root of the ratio of the ion mass to the electron mass, and the ion sheath potential drop at the chamber walls is much larger than T_e/e . The Non-ambipolar Electron Source (NES) has an axial expanding magnetic field of 100 Gauss that creates a uniform plasma potential across a 1cm diameter aperture allowing for uniform electron extraction without the need for grids. The electron current extracted from NES is 300 times greater than the Bohm current that could be extracted through the same aperture. NES has comparable current densities to and the promise of longer operational lifetimes than conventional electron sources such as hollow cathodes, where the operational lifetime is ultimately limited by cathode deterioration.

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