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Measurements of energetic electrons in a Current-Free Double layer. NJAAL GULBRANDSEN, ASHILD FREDRIKSEN, University of Tromso — In inductively coupled helicon sources, current-free double layers (CFDL) can be formed self-consistently without external current forcing. The CFDLs are evidenced by an ion beam formed as a result of a potential drop between the source and the diffusion chamber. The electrons in the double layer play an important role in balancing the ion beam current, but apart from some observations of electron energy probability functions (EEPFs) by means of Langmuir probes, little information has up to now been obtained about the electron population. By means of an inverted retarding field energy analyzer (RFEA) we have measured for the first time the high-energy part of the electron distribution along the radial direction in the diffusion chamber. In this configuration, the RFEA repeller grid is set to a large positive potential, repelling ions and collecting electrons through the discriminator grid. We find a prominent peak of high-energy electrons up to 60 eV at the footprint of the magnetic field lines emerging from the layer near the wall of the source. This coincides with increased electron temperatures and ion densities at this position. Another small but significant distribution of electrons at energies more than 100 eV are observed within the region of the ion beam itself.

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