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Experimental observation of multiple reflections of highly energetic electron beams by the boundary sheaths in capacitive discharges¹ EDMUND SCHUNGEL, JULIAN SCHULZE, UWE CZARNETZKI, Ruhr-University Bochum — In capacitively coupled radio frequency (CCRF) discharges operated at low pressures stochastic electron heating is dominant. It leads to the acceleration of highly energetic electron beams by the expanding plasma boundary sheaths. Such beams can propagate through the entire plasma bulk at low enough pressure and low enough electron-neutral collision frequencies. In 1991 Wood et al. [1] demonstrated by a PIC simulation that under certain conditions such electron beams can be reflected several times between the opposing boundary sheaths. This effect leads to an enhanced confinement of highly energetic electrons in the discharge. Here these reflections are observed experimentally in CCRF discharges of different geometries including the case that the plasma is in contact with a floating wall and that it is confined between two electrodes (powered and grounded) of equal surface areas by a glass cylinder. Phase resolved optical emission spectroscopy is verifying the previously obtained simulation results.

[1] Wood B. P. PhD thesis, University of California at Berkeley, 1991

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Edmund Schüngel Ruhr-University Bochum

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