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Measurement of Electron Density Using the Multipole Resonance Probe, Langmuir Probe and Optical Emission Spectroscopy in Low Pressure Plasmas with Different Electron Energy Distribution Functions MORITZ OBERBERG, NIKITA BIBINOV, STEFAN RIES, PETER AWAKOW-ICZ, Ruhr-University Bochum, INSTITUTE OF ELECTRICAL ENGINEERING AND PLASMA TECHNOLOGY TEAM — In recently publication<sup>[1]</sup>, the young diagnostic tool Multipole Resonance Probe (MRP) for electron density measurements was introduced. It is based on active plasma resonance spectroscopy (APRS). The probe was simulated und evaluated for different devices. The geometrical and electrical symmetry simplifies the APRS model, so that the electron density can be easily calculated from the measured resonance. In this work, low pressure nitrogen mixture plasmas with different electron energy distribution functions (EEDF) are investigated. The results of the MRP measurement are compared with measurements of a Langmuir Probe (LP) and Optical Emission Spectroscopy (OES). Probes and OES measure in different regimes of kinetic electron energy. Both probes measure electrons with low kinetic energy (<10 eV), whereas the OES is influenced by electrons with high kinetic energy which are needed for transitions of molecule bands. By the determination of the absolute intensity of  $N_2(C-B)$  and  $N_2^+(B-X)$  electron temperature and density can be calculated. In a non-maxwellian plasma, all plasma diagnostics need to be combined. [1] C. Schulz et al., IEEE Sensors Journal, 14, No. 10, 2014.

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