From bi-Maxwellian to Maxwellian EEDFs in the divertor region with increasing the plasma density of the COMPASS tokamak

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This work presents the results from the swept probe measurements in the divertor region of the COMPASS tokamak\cite{1} in D-shaped, L-mode discharges with plasma current from 140 to 260 kA, toroidal magnetic field $B_T = 1.15$ T and varying line-average electron densities from 3 to $8 \times 10^{19}$ m$^{-3}$ during the discharge. The current-voltage characteristics data were processed using the first-derivative probe technique\cite{2,3}. This technique allows to evaluate the plasma potential and the real electron energy distribution function (EEDF), respectively the electron temperature and density.

The EEDF was studied during the density scan. At low line-average electron density of $4 \times 10^{19}$ m$^{-3}$ in the whole divertor region the EEDF is bi-Maxwellian with low-energy electron population with temperatures 4-5 eV and high energy electron group with temperatures 11-18 eV. With increasing the line-average electron density in the high field side the EEDF appears to be Maxwellian, while in the low field side it remains bi-Maxwellian. Above $7 \times 10^{19}$ m$^{-3}$ line-average electron density the EEDF is found to be a Maxwellian in the whole divertor region. Possible reasons for the phenomenon observed is discussed on the base of model calculations.

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\bf{References:}