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12.13 Suprathermal electron diagnostics for the COMPASS tokamak using vertical ECE radiometer

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COMPASS is a compact-sized tokamak operated at IPP Prague. A heterodyne radiometer is available for electron cyclotron emission (ECE) diagnostics, originally employed for electron Bernstein wave emission (EBE). Recently, extensive runaway electron (RE) experiments motivated enhancements of suprathermal electron diagnostics, which have been so far focused on runaway losses [O. Ficker et al., NF 2017]. A new passive diagnostic using the ECE heterodyne radiometer has been designed and utilized. Simulations using the SPECE code [D. Farina et al., AIP Conf. Proc. 2008], which aided to the final diagnostic design, are presented. The radiometer antenna is oriented vertically and thus measures along the line of a constant toroidal magnetic field. This setup yields information about the electron velocity distribution and its time evolution. The detected signal can be attributed to the 3rd harmonic emission from 50 – 140 keV electrons. First results of extraordinary and ordinary mode (X/O mode) measurements in low-density, optically thin plasma ($n_e < 3 \times 10^{19} \text{ m}^{-3}$) is presented. A correlation between vertical ECE diagnostic and HXR diagnostic can be observed in the data and it is also in agreement with the assumed runaway electron energies that are measurable by the two diagnostic methods.

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