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The role of ECE interferometry at JET in the upcoming DT campaign

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The diagnostic suite of JET includes three electron cyclotron emission (ECE) interferometers. Two Martin-Puplett interferometers measure ECE spectra mainly in ordinary (O) and extraordinary (X) mode polarisations, respectively, along a horizontal line of sight close to the vessel midplane. They provide absolutely calibrated electron temperature profiles (from 2nd harmonic X and 1st harmonic O-mode), covering both the low and high field sides (limited by X-mode harmonic overlapping), for a large range of the magnetic fields used at JET (1.7-3.8 T).

Since 2019, data produced by the X-mode interferometer can be accessed by the JET real-time data network and employed as inputs for control systems, with 16 ms temporal resolution. These data are used to monitor the electron temperature profile hollowness during the ramp-up phase of hybrid discharges [2]. The main aim is to identify discharges that will not reach high-performance conditions or are at a high risk of disruption, in order to terminate them safely, and minimize wastage of the limited neutron budget of the upcoming D-T campaign.

The third interferometer at JET collects radiation at 10.3° with respect to the radial direction, separating O and X mode polarizations. Its main goal is the identification of signs of a non-Maxwellian bulk electron population [3] that could be associated to the presence of fast ions.

Data collected by these diagnostics will be used to investigate the discrepancies between ECE and Thomson scattering Te measurements observed in the past in high temperature plasmas [4]. The reliability of diagnostics in future burning plasma experiments such as ITER will be discussed in this contribution. Additionally, measured ECE spectra will be compared with the results of simulations using the SPECE code [5].

[a] See the author list of E. Joffrin et al. 2019 Nuclear Fusion 59 112021,

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