

P2.1054 ECE diagnostic measurements during first W7-X divertor campaign

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see full abstract here

<http://ocs.ciemat.es/EPS2019ABS/pdf/P2.1054.pdf>

The electron cyclotron emission (ECE) diagnostic system of W7-X is comprised of a 32 channel radiometer for detecting the 2nd harmonic emission¹ in the frequency range from 126 to 162 GHz and a Michelson interferometer providing broadband spectra² that share the same line of sight. The EC emission was measured throughout the first W7-X divertor campaign. From that, calibrated electron temperature profiles were derived for a variety of magnetic configurations, heating- and density scenarios. Beyond blackbody conditions, the emission from hot core electrons is observed as well. Plasma dynamics has been studied also comprising the effects of pellet injection, ECRH induced heatwaves and ECCD driven fast temperature crashes as well as spontaneous propagating Te-perturbations, MHD phenomena and edge crashes reminiscent of ELMs.

Inference of the local electron temperature profile from the measured ECE radiation temperature spectra requires the iterative use of the radiation transport code TRAVIS and can be performed using forward modelling with the Bayesian analysis framework MINERVA. Steady state operation of W7-X employs detached scenarios as they have been developed in this campaign at operation densities beyond the 2nd harmonic X-mode cut-off, i.e. at $n_e > 1.2 \cdot 10^{20} \text{ m}^{-3}$ heated e.g. by the ECRH in O2 polarization. In view of these high densities, the diagnostic capability of the 3rd harmonic EC emission is being explored as an option to provide access to a continuous electron temperature measurement under conditions where the 2nd harmonic cannot be used.

¹ M. Hirsch et al. Proc of the 20th Workshop on Electron Cyclotron Emission (ECE) and Electron Cyclotron Resonance Heating (ECRH), May 14-17 2018, EPJ Web of Conferences

² N. Chaudhary et al., this conference

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