**ECE diagnostics at the Wendelstein 7-X stellarator**

Matthias Hirsch1, Melina Arvanitou1,2, Neha Chaudhary1, Celine Dyhring1,2,

Udo Höfel1, Mathias Stern1, Johan W Oosterbeek1, Gavin Weir1 and Robert C Wolf 1,2

*1 Max-Planck-Institute for Plasma Physics, Greifswald, Germany*

*2 Technical University of Berlin, Berlin, Germany*

The ECE diagnostic at the Wendelstein 7-X stellarator (B=2.5T) comprises a radiometer system and a Michelson interferometer sharing the same Gaussian optics with slim sightline for maximum resolution across the plasma center. Both systems use notch filters to cope with the strong ECRH stray-radiation background of the 140 GHz gyrotrons.

The 32 channel radiometer covering the 2nd harmonic X-mode (126 to 162 GHz) is used for the study of various plasma dynamics. Absolute calibration enables profile inference that applies Bayesian forward analysis using the radiation transport code TRAVIS. A standard branch aims on overnight or even intershot availability of the Te profile evolution by Maximum a Posteriori methods. On top of that and for individual cases a full Markov Chain Monte Carlo analysis allows to assess the probability distribution of the priors as well as enables integrated data analysis that addresses the pressure- and some extent the density profile as well.

ECRH power switching is used to measure the power deposition zone of individual gyrotrons via a break-in-slope analysis of the ECE signals. This is in support of advanced W7-X scenarios with the ECRH plant providing at present 8 MW - e.g. for high-density O2 heating, or for off-axis heating and current drive allowing profile and configuration control, respectively. The spatial resolution of ECE is improved for this by an additional zoom radiometer with 16 channels densely spread over a 4 GHz wide band that can be tuned to vary the radial position of the measurement by means of an additional tunable local oscillator.

Broadband ECE analysis with the Michelson interferometer covers also higher harmonics where the optically grey 3rd harmonic allows to track core Te and even provides profile information in high-density plasmas (n> 1.2 1020 m-3) where classical ECE fails as the optically thick X2 mode is in cut-off. This is of particular relevance for high-density discharges heated by O2-ECRH where microwave absorption depends critically on Te. A continuously measuring radiometer for the 3rd harmonic X3 is in preparation for this purpose.

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