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P3.066 Broad band ECE measuremenst in ECW heated plasmas

Wednesday, 19 September 2018 11:00 (2 hours)

The Wendelstein 7-X (W7-X) experiment is equipped with an Electron Cyclotron Resonance Heating installation consisting of 10 gyrotrons capable of delivering upto 7.5 MW of Electron Cyclotron Wave power at the 140 GHz resonance in the plasma. Normally, the gyrotron power is delivered in a very narrow band of several 100 MHz around the gyrotron frequency and the gyrotrons are optimized to deliver power only at this frequency. In practice, the gyrotron central frequency will shift several 100 MHz during start-up while excitation of spurious modes inside the gyrotrons may lead to power at frequencies spaced several GHz away from the resonance. These effects do not hinder gyrotron operation, but the power at unintended frequencies is a problem for sensitive microwave receivers, typically measuring power levels in the sub μW range. For protection these generally employ notch filters such as fundamental mode interference cavities.
This paper focuses on the effect of spurious gyrotron power on the recently installed Michelson Interferometer at W7-X. In the case of a Michelson Interferometer many modes are required to enter the instrument preventing the use of single mode notch filters. More-over, the very wide band, 50 ... 500 GHz means that any spurious modes from any of the 10 gyrotrons may affect the ECE spectrum.
Data on spurious gyrotron modes is used to assess the potential impact on the ECE spectrum while laboratory tests on the Michelson are used to assess non-linear response of the instrument in the case of excessive power at specific frequencies. It is expected that the work is complemented with experimental data from the W7-X experimental campaign OP1.2b, scheduled to start in the summer of 2018.

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