

Electron Temperature estimation in Wendelstein 7-X stellarator using Pulse Height Analysis (PHA) system

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The Pulse Height Analysis (PHA) system installed at W7-X is mainly designed to identification of plasma impurities in the soft X-ray range. Due to three Silicon Drift Detectors (SDD) fitted with 8- μm Be window (the first and second energy channel) and a very thin polymer window (the third channel), PHA diagnostic enabling measurements of X-ray emission from 250 eV up to 20 keV. Spectra collected by this diagnostic are characterized by energy resolution not worse than 180 eV and temporal resolution around 100 ms. Additionally, spectra collected by PHA system can provide information about electron temperature (T_e) from plasma center. In this work experimental investigation of electron temperature is presented. This parameter has been estimated by analyzing the continuum slope of observed X-ray emission. Determination of T_e was based on the exponential dependence of the continuum radiation on photon energy assuming Maxwellian distribution. Some experimental results of the measurements of T_e obtained during the second operational phase of W7-X (OP1.2a and OP1.2b) have been presented and compared to the results from other diagnostic (e.g. Thomson Scattering).

Keywords: PHA system, electron temperature, Wendelstein 7-X, soft X-ray plasma diagnostic