

## **Pulse Height Analysis diagnostic for impurity behaviour studies at W7-X**

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Pulse height analysis (PHA) system at Wendelstein 7-X (W7-X) is a diagnostic dedicated for measurements of soft X-ray spectra integrated along line of sight that crosses close to the plasma center. It consists of three channels which are dedicated for observation of high-, medium- and light-Z elements. Total energy range of the PHA spectra is from about 0.5 up to 20 keV. The system is equipped with silicon detectors, two covered by 8 $\mu$ m of beryllium foil and one covered by thin Polymer window which allows observation of low energy region. Furthermore, each channel has possible to apply additional filter which defines energy range. Taking into account that the PHA is sensitive to incoming photon flux the system has been equipped with changeable pinholes. The diagnostic has been commissioned and tested during the first operation of the W7-X [1]. During second operation phase, OP1.2, it was routinely operated and delivered information about plasma impurities. The temporal resolution is 60-100 ms what is sufficient for observation of impurities behavior during the discharge and also for observation of decay time of injected impurities in experiments devoted for transport studies [2-3].

Analysis of the Bremsstrahlung radiation can deliver information about the electron temperature [4] and suprathermal electrons, if they are present in the plasma. Moreover, the intensity of the continuum radiation combined with simulations allows to determine  $Z_{\text{eff}}$  value.

In the contribution, description of the PHA system at W7-X, its capabilities and limitations, delivered information and first results will be presented.

[1] N. Krawczyk, et al. Fusion Engineering and Design 123, 1006-1010 (2017)

[2] M. Kubkowska, et al. Fusion Engineering and Design 136, 58-62 (2018)

[3] M. Kubkowska, et al. Review of Scientific Instruments 89, 10F111 (2018)

[4] N. Krawczyk, et al. Fusion Engineering and Design 136, 1291-1294 (2018)