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14.49 Plasma impurities observed by a pulse height analysis diagnostic during the divertor campaign of the Wendelstein 7-X stellarator

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The soft X-ray pulse height analyzer (PHA) installed at Wendelstein 7-X stellarator is a 3-channel system that collects spectra from 0.25 to 20 keV. X-ray fluxes are line integrated for a line-of-sight that crosses near to the plasma center with temporal and spatial resolution of 100 ms and 2.5 cm (depending on slit sizes). During the 1st W7-X experimental campaign, OP1.1, the PHA was commissioned and tested, while during the 1st part of the 2nd campaign, OP1.2a, all 3 PHA channels were optimized individually to achieve good quality spectra. This was made by optimizing absorber-foil selection, which defines the detected energy range, and remotely controlled pinhole size, which defines photon flux. This paper reports on the PHA optimization process and presents results obtained during W7-X operation with a carbon divertor. Light impurities, e.g., carbon and oxygen, were observed as well as mid- to high-Z elements, e.g., sulfur, chlorine, chromium, iron and nickel. X-ray lines from several elements were observed after laser blow-off injection of impurity, e.g., silicon, titanium, iron and tungsten, and during discharges with prefill or gas puff of neon or argon. Their presence was confirmed by other spectroscopic diagnostics, e.g., by the High-Efficiency XUV Overview Spectrometer.

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