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Evaluation of photon energy and bandwidth jitter of SASE-FEL beam using hard X-ray spectrometer at European XFEL

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The European X-ray Free Electron Laser (EuXFEL) is a user facility delivering soft and hard X-ray FEL radiation. It provides X-rays with high brilliance and intensities in the photon energy range of 0.5 keV to 25 keV. 2700 pulses at 10 Hz with femtosecond up to 4.5 MHz pulse repetition rate. The FEL radiation which is created by the Self Amplified Spontaneous Emission (SASE) process, whose stochastic nature gives rise to shot-to-shot fluctuations of the pulse energy and spectrum. In order to cover these variations, the High Resolution hard X-ray single-shot (HIREX) spectrometer has been installed in the Hard X-ray beamlines SASE1 and SASE2. The HIREX spectrometer is an online device, based on a bent diamond and Silicon crystal as a dispersive element and a MHz-repetition rate GOTTHARD strip detector. The SASE2 HIREX spectrometer is identical to the HIREX spectrometer installed at SASE1 with the difference that it does not provide gratings that can be used as a beam splitter. Thus, the spectrometer crystal has to be placed in the direct beam to collect energy spectra. In this contribution, we will present the measurement results of central photon energy and bandwidth jitter of the SASE-FEL beam at different photon energies. Further, we will also focus on the automation of the HIREX spectrometer for instrument beamlines with a single push button.

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Footnotes

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Yes

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