

X-ray Photon Diagnostics at the European XFEL

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The presentation will give an overview of the photon diagnostics concept and the X-ray beam monitoring devices that are under development and construction for the European XFEL facility (XFEL.EU). Initially, measurements of the spontaneous undulator radiation are required to adjust the machine to the desired lasing condition. Later, online monitoring of the Self-Amplified Spontaneous Emission radiation is mandatory for user experiments due to its significant shot-to-shot variations. Particular challenges for XFEL.EU diagnostics are the large operating range (280 eV to 25 keV fundamental), the high single-shot pulse intensities, which can induce single-shot damage, and the 4.5 MHz intra bunch train pulse repetition rate, potentially inflicting heat load damage to diagnostics devices and complicating the diagnostics readout.

The range of presented devices and techniques includes the gas-based online monitors for intensity, beam position, spectrum and polarization, solid state online devices with minimal invasiveness such as the transmissive spectrometer, transmissive screens, diamond detectors, and backscattering monitors, monitors for temporal photon pulse properties, and finally the invasive commissioning devices like MCP-based detector, K-monochromator, imaging stations and wavefront sensors. Experimental results with prototype detectors will be presented and can be discussed in more detail.