

The European XFEL Project

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The European XFEL project is a 4th generation photon source to be built in Hamburg. Electron bunches, accelerated to 17.5GeV by the XFEL linac, are distributed to three SASE long undulators. There photon pulses with full lateral coherence and wavelengths between 0.1nm and 4.9nm (12.4keV and 0.8keV) are generated for three beamlines. It will deliver around 1012 photons within each 100fs pulse, reaching a peak brilliance of 10^{33} photons s⁻¹mm⁻² mrad⁻² (0.1%BW)⁻¹.

Thus it will offer unprecedented possibilities in photon science research including nano-object imaging and studies (e.g. by coherent X-ray scattering) and ultra fast dynamic analysis of plasma and chemical reactions (e.g. by X-ray photo correlation spectroscopy).

The detector requirements for such studies are extremely challenging: position sensitive area detectors have to provide a dynamic range of $\geq 10^4$, with single-photon sensitivity, while withstanding radiation doses up to 1GGy (TID). Furthermore the detectors have to record data from “trains” of up to 3000 photon pulses, delivered at 5MHz, which repeat every 100ms. Three consortia have picked up the challenge to build pixel detectors for the European XFEL: DepFet, HPAD and LPD. Besides the European XFEL source and the related experimental techniques, the concepts and specialities of the DepFet, HPAD and LPD detectors are discussed

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