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Introduction The European XFEL (X-ray Free Electron Laser) will have five independent undulators and a beam distribution to 15 experimental stations. In the start-up version, 3 undulators and 6 experimental stations will be built initially. The scientific areas of these initial experiments will cover a wide range of applications, including coherent scattering, single particle imaging, plasma physics and time-resolved diffraction and spectroscopy. The x-ray pulses created in the undulators have to be characterized by photon diagnostics in order to find and tune the SASE (Self-Amplified Stimulated Emission) process and to provide beam information to users.

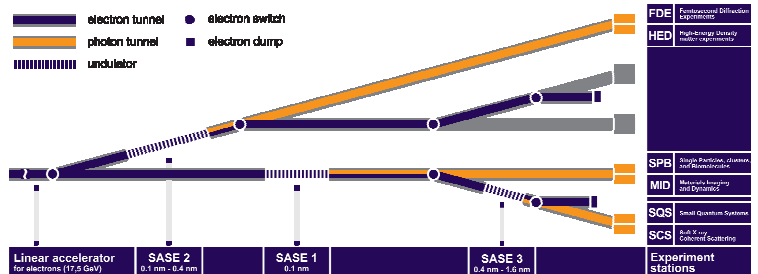


Figure 1: Beamlines

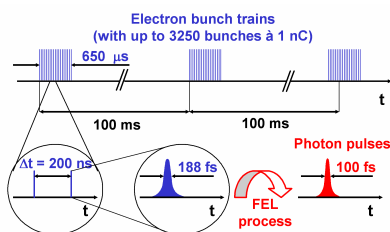


Figure 2: Temporal structure of the laser

Challenges - what is unique about the European XFEL ?

- repetition rate / pulse train structure: the pulse trains at 10Hz contain up to 3000 x-ray pulses with only 200ns spacing (5MHz within pulse train)
- peak power of 20 GW during the 100fs pulse, and high average power during the pulse train of 10 kW
- parallel construction and operation of three undulators with in total six experiments

collaborations welcome for XFEL diagnostics !!

Baseline photon diagnostics

- intensity [photons/pulse]
- pulse energy [mJ]
- transverse beam position per pulse
- 2D image

