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European XFEL: Status and Overview of Research Instrumentation

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The European XFEL is a new international research installation that is currently under construction in the Hamburg area in Germany. The facility will generate new knowledge in almost all the technical and scientific disciplines that are shaping our daily life–including nanotechnology, medicine, pharmaceutics, chemistry, materials science, power engineering and electronics. The ultra-high brilliance femtosecond X-ray flashes of coherent radiation will be produced in a 3.4-kilometre-long facility. Most of it will be housed in tunnels deep below ground. Three sites will provide access to the tunnels and the experiment stations. In its start-up configuration, the European XFEL will comprise 3 self-amplified spontaneous emission (SASE) light sources–undulators operating in energy ranges 3 - 25 keV (SASE 1 and SASE 2) and 0.2 - 3 keV (SASE 3), respectively. The world-unique feature of this XFEL is the possibility to provide up to 27.000 ultra-short flashes (10 - 100 fs) that makes the facility particular suitable for time-resolved spectroscopies including photoemission, (resonance) inelastic X-ray scattering and imaging studies in the range of moderate and hard X-ray photons. Six experimental stations optimized for particular purposes will be installed. Each experiment requires light with special properties, such that the stations are permanently assigned to the different light sources (beamlines) of the European XFEL. In June 2013, underground civil engineering work (tunnels, shafts, halls) has been finished at all three construction sites. In this presentation status and further parameters of the European XFEL facility as well as planned research instrumentation are reviewed.