Stuttgarter Physikalisches Kolloquium

Max-Planck-Institut für Intelligente Systeme
Max-Planck-Institut für Festkörperforschung
Fachbereich Physik, Universität Stuttgart

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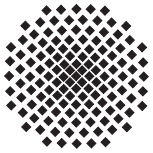

Dienstag, 30. Januar 2018 | **17.15 Uhr** | **Hörsaal 2 D5**

Stuttgarter Max-Planck-Institute, Heisenbergstraße 1, 70569 Stuttgart-Büsnau

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The European X-Ray Free-Electron Laser (XFEL) in Hamburg

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Abstract

Since the 1960's it became apparent that electron accelerators are the most brilliant X-ray sources for experiments in fields including physics, materials science, chemistry and structural biology; this lead to the worldwide development of synchrotron radiation sources, based on circular accelerators and storage rings. In recent years, a further giant step was taken by sources based on linear accelerators, the Free-Electron Lasers (FEL), producing X-ray pulses with peak brilliance exceeding that of synchrotron beams by up to 9 orders of magnitude, with ultra-short duration, in the region of ~ 10 fs (10^{-14} s), and with a high (laser-like) degree of transverse coherence. The latest addition to the handful of existing X-ray FEL sources, the European XFEL, located in Hamburg and supported by 12 countries, welcomed its first users in September 2017. This talk summarizes the scientific motivations and the main features of the new source, comprising a 17.5 GeV superconducting linac accelerator, almost 2 km long, a system of three (later to be upgraded to five) undulators. When fully commissioned, it shall distribute up to 27 000 ultrashort (~ 10 fs) pulses of coherent radiation in a 3 to 25 keV range of photon energy with the two hard X-ray undulators, while the soft X-ray undulator should cover the range from 250 eV up to 3 keV.

The position of this new European facility in the worldwide context of X-ray free-electron lasers, and the scientific expectations it rises shall be discussed with a few examples.