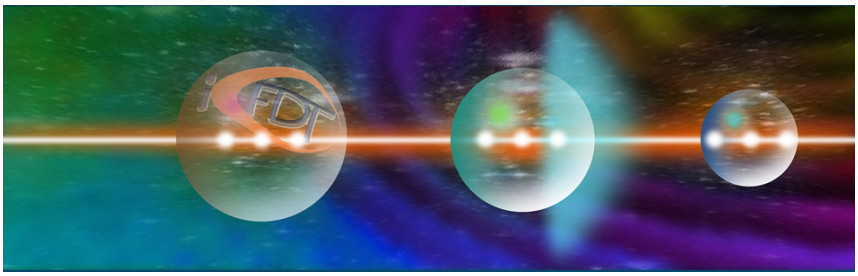

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Detector challenges at (low energy) Free Electron Lasers

Thursday, 4 October 2018 11:35 (20 minutes)

Free electron lasers (FEL) and 3rd/4th-generation storage rings operating in the (soft) X-ray regime offer a unique combination of properties such as extreme brightness, ultra-short pulse duration as well as temporal and lateral coherence. These properties are anticipated and are actually being proven to provide new scientific opportunities for time resolved structural studies. This enables for instance a new class of single shot coherent diffraction X-ray imaging from a huge variety of samples. However, these photon sources impose demanding constraints on both, beam diagnostics and imaging detectors, as the high peak brilliance of the generated beams implies that many photons may arrive simultaneously on the same detector area thus compelling for charge integration schemes while at the same time single-photon resolution in weakly illuminated areas is required. Such applications calls for detectors and associated readout electronics able to acquire and process up to Giga byte of data in a time comparable to the FEL repetition rate, which usually is in the range of 10-120 frames/second.
Additional detector challenges are imposed, when soft x-rays are utilized since here window-less and in–vacuum sensors are compulsory.
By means of some selected applications at storage rings and FELs the associated detector challenges will be discussed and some examples of specific detector developments and beam diagnostics will be presented.

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