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Keynote - How to meet the X-ray Photon-Science Detector Challenge?

Tuesday, 14 March 2023 10:35 (1 hour)

X-ray photon sources continue their exponential improvement in source brilliance.

X-ray Free-Electron Lasers (FELs) have revolutionized the field of X-ray photon science. For instance, with their intense and ultra-short X-ray pulses, they opened up the field of time-resolved experiments down to the femtosecond. Another area is the study of materials under extreme conditions. So far, FELs have been either low repetition rate machines (warm accelerators), or burst-mode machines (superconducting accelerators). New developments of the accelerator, however, now permit the construction of high repetition rate machines operating in continuous wave mode, with up to a million pulses per second continuously. This requires the development of new detectors and detector technologies.

Synchrotron storage rings worldwide are upgrading their accelerators to so-called multi-bend achromats, resulting in a 10 to 100-fold increase in brilliance and up to a 1000-fold increase in coherent flux, especially at higher energies. These Diffraction Limited Storage Rings (DLSR) will make some photon-starved experiments more feasible but, more importantly, open up completely new scientific possibilities. Also here, new detectors and detector technologies are required.

I will give a short overview of the ongoing X-ray source developments and their consequences on the X-ray detector requirements. The main part of the presentation will be dedicated to ongoing developments in the community, with a special focus on DESY.

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