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Structure Probing by Holographic Imaging at Nanometer scale with X-ray lasers (SPHINX)

Friday 13 October 2023 12:00 (30 minutes)

The SPHINX project aims building femtosecond-exposure X-ray holographic cameras for imaging microscopic samples and their internal parts (in-vivo cell elements, viruses and nanorobotic devices) with nanometer resolution. The proposal is based on a new implementation of phase-contrast holography that overcomes the limitations encountered by the absorption-contrast systems, namely the low energy range, the limited detector granularity and the weak illumination. As a practical solution, a combination of polycapillary lenses, large X-Ray CCD arrays with small pixel size and XFEL sources will allow splitting the beam, focusing, magnification and phase-contrast imaging in the keV range. Unlike absorption-based methods, where angles increase with the energy, the refractive diffraction reduces the diffraction limit together with the characteristic angles, both essential for the resolving power (given the X-ray detector pitch), while also eliminating the shadow effect and giving access to full structure probing. The key parameters are defined by the focusing optics, which consists in a micro semi-lens or a combination of the former with a parabolic monocapillary. The advantage of "non-perfect"optics (diffuse focusing) is their divergence, driven by the single fiber. This allows sending on the same detector area both object and reference beams, condition unreachable with a lens or a mirror.

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