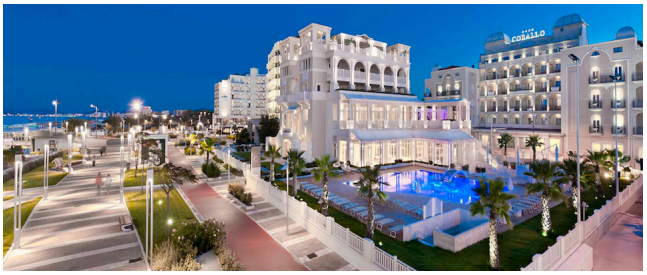

Contribution ID: **81** Type: **oral**

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

Friday, 9 June 2023 09:30 (20 minutes)

The SPHINX project aims building an ultrafast X-ray holographic camera able to record images of microscopic samples and of their internal parts with nanometer resolution. The application is based on a new implementation of the phase-contrast holography that overcomes the main limitations encountered in the current systems (mostly based on absorption-contrast), 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 energy range. Unlike the 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 limited 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 could be, according to the beam and sample sizes, a polycapillary micro semi-lens or a combination of the former with a parabolic monocapillary. The main advantage of "imperfect"optics (not providing a point-like focus) is their divergence, driven mostly by the single fiber. This allows sending on the same detector area both the object and the reference beams, condition unreachable with a Fresnel lens or a crystal mirror. Moreover, the femtosecond exposure time permits holographic reconstruction of in-vivo cell elements, viruses and nanorobotic devices during ultrafast molecular processes, yet unexplored by imaging techniques.

Primary author: ILIESCU, Mihail Antoniu

Presenter: ILIESCU, Mihail Antoniu

Session Classification: S1 & S4: Beams Interactions & New Concepts