Summary for the General Public

Optical Coherence Tomography (OCT) is an interferometric imaging technique providing high resolution cross-sectional views (tomograms) of objects. The axial resolution of OCT for the probing light at infrared and optical wavelengths is limited to about 1 μm. An evident way to improve the resolution is the reduction of the wavelength of the probing light. Optical Coherence Tomography using broad bandwidth radiation in the extreme ultraviolet (EUV) and soft X-ray SXR) spectral ranges in the wavelength range from about 1 nm to about 100 nm was proposed by the German Partner. This variant of OCT, referred as XCT, has been recently demonstrated using synchrotrons and tomographic images of nanostructures with an axial resolution better than 18 nm for extreme ultraviolet and a resolution better than 8 nm for soft X-ray radiation were achieved, however, the limited access to synchrotron facilities prevented the detailed studies of a new imaging technique.

Investigations on the XCT technique with the use of laboratory sources of extreme ultraviolet and soft X-rays will be performed under the project. In the studies laser plasma EUV and SXR sources based on a gas puff target irradiated with nanosecond laser pulses, developed by the Polish Partner, and laser-driven sources based on high-order harmonic generation (HHG) process, developed by the German Partner, will be used. The final goal of the study is to demonstrate a new 3D imaging technique in the nanoscale that will be useful for applications both in scientific research and industrial technologies.

A new XCT imaging technique was originally developed by the German Partner. The main reason to choose this research topic in the joint project was the use of unique laser plasma sources of EUV and soft X-rays developed by the Polish Partner in the XCT technique.