DESCRIPTION FOR THE GENERAL PUBLIC

For many years intense development of scientific research and advanced technologies connected with creation, measurements and applications of electromagnetic radiation from extreme ultraviolet (EUV) and soft X-ray (SXR) ranges takes place. The EUV and SXR radiation spans the wavelength range between ultraviolet and X-rays used for radiography. The radiation, especially EUV strongly interacts with matter which means that it propagates only in vacuum. For this reason is not present in normal conditions on Earth but is common in Space. Measurements of radiation of this kind using the Space telescopes allow to obtain important information concerning astrophysics or astrochemistry.

EUV and SXR radiation can be produced in laboratory conditions and is being applied for investigation of electronic and molecular structure of matter, laboratory simulation of extreme states of matter existing in stars or Jovian planets, X-ray microscopy etc. Such sources are synchrotrons, free electron lasers and plasma sources. Each of the sources is specific and has unique properties. During last years intense development of investigations using free electron lasers or plasma sources took place. Free electron lasers deliver radiation pulses with very short time duration at the level of 10^{-14}s. The radiation pulse can be focused to a very small spot allowing to obtain extremely high power density, impossible to obtain using other sources. On the other hand the pulse energy is very low at the level of microjoules. Interaction of such radiation pulse with matter results in interesting physical phenomena connected in some cases with the EUV emission. Due to very low energy of the driving pulse, measurement of the EUV radiation is a serious problem in many cases. The problem concerns especially situations where high vacuum cannot be maintain during experimental investigations.

A main goal of this project is development of a detection system allowing to measure EUV radiation pulses of low intensity, in experimental conditions, where commonly used instruments cannot be employed.

The detection system planned to be developed in frame of the project will work in two basic regimes. The first one will allow for absolute measurements of photons emitted due to inner-shell transitions in ions produced as a result of photoionization. This kind of measurements are planned to be performed in frame of projects realized using free electron lasers.

The second regime concerns measurements of EUV radiation emitted from photoionized plasmas in narrow spectral bands with time resolution. This type of investigations will be conducted employing plasma EUV sources. Plasma temperature in such sources reaches hundreds thousands kelvins. It can be produced as a result of high current discharge or interaction of high power laser pulses with matter. In frame of this project time resolved investigation of photoionized plasmas are planned using the developed detection system.