

## EXTATIC

### Extreme-ultraviolet and X-ray Training in Advanced Technologies for Interdisciplinary Cooperation

#### EXTATIC Project Proposal 2016

<b>Project Title</b>	Instrumentation for extreme-ultraviolet ultrafast pulses
<b>Home University</b>	University of Padova
<b>Home University Supervisor</b>	Prof. Piergiorgio Nicolosi
<b>Host University</b>	University of Southampton
<b>Host University Supervisor</b>	Dr. Bill Brocklesby
<b>Third University</b>	
<b>Third Supervisor</b>	
<b>Associated Partner(s)</b>	National Research Council – Institute of Photonics and Nanotechnologies
<b>Associated Partner Supervisor(s)</b>	Dr. Luca Poletto
<b>Project Outline (max 250 words)</b>	<p>The study of structural arrangement and motion of nuclei are nowadays directly accessible by the availability of ultrafast sources in the extreme-ultraviolet (XUV) spectral region, such as high-order laser harmonics (HHs) and free-electron-lasers (FELs). HHs, that are produced by the interaction between a very intense ultrashort pulsed laser and a gas jet, represent a table-top source of high brightness XUV radiation with high degree of coherence and peak intensity, that allows the investigation of matter with sub-femtosecond resolution. FEL sources generate spatially coherent XUV/X-ray radiation with characteristics similar to the light from conventional optical lasers, ultrashort time duration and extremely high peak brilliance.</p> <p>The Institute of Photonics and Nanotechnologies of the National Research Council of Padova, Italy (CNR-IFN PD) is widely recognized for its expertise in the development of instrumentation for generation and photon handling of ultrafast pulses both for HHs and FELs: ultrafast monochromators, focusing and micro-focusing sections, spectrometers, pump-probe optical schemes. Instrumentation realized by CNR-IFN PD is used both in FEL facilities (FLASH and FERMI) and in HH beamlines (Italy, UK, Germany, Switzerland). CNR-IFN PD is presently involved in the realization of ultrafast monochromators for innovative beamlines with femtosecond and resolution to be realized in the framework of international collaborations. The role of the Institute will be the design, realization and characterization of the photon handling section and the measurements of the spectral and temporal properties of the generated pulses. The candidate will be involved in the design activities, lab characterization of the optical components, beamline commissioning and first pump-probe experiment.</p>
<b>Relevant Reference(s)</b>	<ol style="list-style-type: none"> <li>1. G. Sansone, L. Poletto, M. Nisoli, <b>High-energy attosecond light sources</b>, INVITED REVIEW, Nat. Photonics, <b>5</b>, 655 (2011)</li> <li>2. L. Poletto, F. Frassetto and P. Villorosi, <b>Ultrafast Grating Instruments in the Extreme Ultraviolet</b>, INVITED PAPER, J. Sel. Top. Quant. Electron. <b>18</b> 1, 467 (2012)</li> <li>3. L. Poletto et al, <b>Micro-focusing of attosecond pulses by grazing-incidence toroidal mirrors</b>, Opt. Express <b>21</b>, 13040 (2013)</li> </ol>

	4. L. Poletto et al, <b>Double-configuration grating monochromator for extreme-ultraviolet ultrafast pulses</b> , Appl. Opt. <b>53</b> , 5879 (2014)
<b>Lead University Profile</b>	The candidate will be hosted by CNR-IFN PD ( <a href="http://www.pd.ifn.cnr.it/">http://www.pd.ifn.cnr.it/</a> ), that is specialized in the design and realization of optical systems for scientific and industrial applications, in the test and characterization of optical systems and detectors, and in the characterization of thin films, development of adaptive optical systems, metrology and gas spectroscopy. In particular, the research activity on instrumentation for ultrafast pulses is carried on by 4 CNR personnel. The candidate will be inserted in a team that is strongly involved in national and international collaborations regarding ultrafast optics and pump-probe techniques.