Working Group 4 - Applications

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- Microprobing of biological cells and tissue for cancer studies and treatments
- X-ray micro- and nano-imaging for, eg, bio-medical issues, also exploiting phase contrast techniques
- X-ray mammography exploiting monochromatic sources and phase contrast methodologies
- In-the-field measurements of pollutants, eg, particulates
- In-the-field measurements of structural and compositional characteristics of materials related to cultural heritage
- EUV lithography and metrology
- XUV photoabsorption studies of atoms and ions
- Metrology of nanostructures
- Investigation of isochoric heating and K_{α} generation in laser plasmas
- Time-Resolved X-ray Diffraction by Using Table-Top Laser Plasma Sources
- Innovative XUV and X-ray Plasma Spectroscopy to Explore Extreme States of Matter

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Multidisciplinary Applications

1. **Investigations of elemental content, microporosity, etc. of rocks using ion and X-ray microprobes**
2. **Investigation of Porcelain Art by Means of Combined μPIXE and μCT Measurements**
3. **Case studies on utilization of synchrotron radiation and lab based sources for μCT of biominerals**
4. **X-ray microbeam facility for single cell irradiation; results of first experiments on cancer cells**
5. **Improved biocompatibility of surfaces by EUV treatment**
6. **Graphene Oxide reduction by an EUV laser source**

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X-Ray microscopy

1. **EUV dark-field microscopy for defect inspection**

1. **X-ray wave guide for phase contrast microscopy with laboratory source**

2. **High-Definition X-Ray Polarimetry**

3. **X-ray microscope development for water window imaging**

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Surface Modification and Nanopatterning

1. **Interaction of EUV pulses with solids: investigation of surface structure and ablation products**

2. **Physico-chemical surface modification of polymers using a laser-plasma EUV source**

3. **Application of laser plasma EUV sources in processing polymers and nanoimaging**

4. **Damage and ablation of optical materials under focused EUV radiation from a table-top LPP source**

5. **Time resolved EUV pump-probe microscopy of fs-laser induced nanostructure formation**

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Lithography and Metrology

1. **13.5 nm lithography systems using Xe and Sn sources**
2. **Beyond EUV lithography at 6x nm, development of sources**
3. **Resolution enhancement in short wavelength and X-ray lithography**
4. **Development of systems for mass blank inspection at 13.5 nm**
5. **Laboratory based extreme ultraviolet reflectometry for analysis of ultra thin films**
6. **Novel anti-counterfeiting technique by EUV lithography using EUV irradiation of LiF**

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Coherent EUV/ X-ray production – Photoionization Processes

1. **Applications of free electron laser (FEL) radiation**

1. **Applications of discharge x-ray laser systems**

1. **Multiphoton ionization in intense EUV free electron laser fields**

1. **High harmonic production and applications (CDI)**

1. **X-ray and IR cross correlation experiments at the LCLS free electron laser facility**

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What next ?
(Challenges & Opportunities)

Strong focus on EUV and X-ray metrology –
LPP, DPP, XRTs, Synchrotrons, Free Electron Lasers,…

Future pre-doctoral and doctoral training

Further ‘real world and problem-driven’ academic-industrial collaboration

EUVL – key bottleneck remains - source flux limitation……..

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