SIMULATIONS FROM PHOTON SOURCE TO DETECTOR

Photon Source
- XFEL
- Synchrotron
- Optical Laser
- Pump-Probe

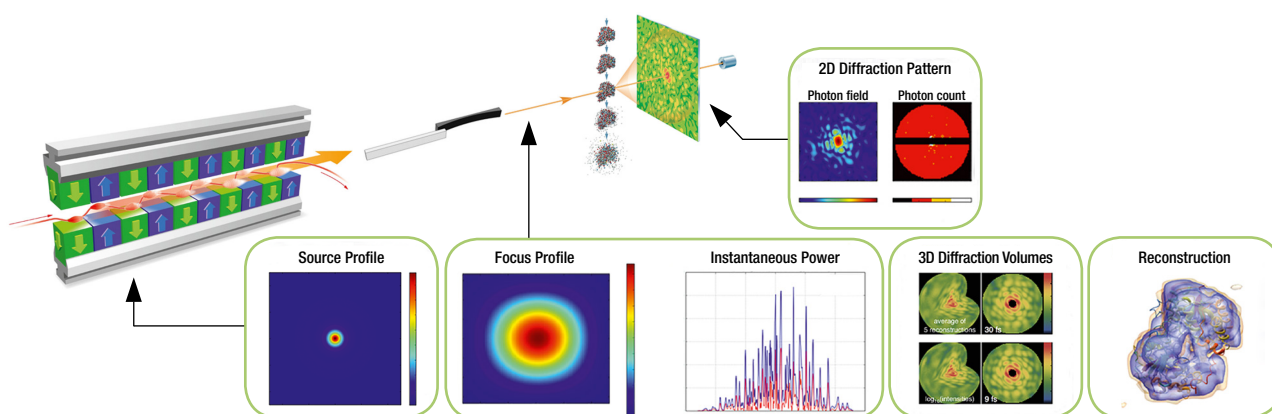**Photon Propagation**
- Lenses
- Mirrors

Target/Sample
- Single particles
- Solids, surfaces
- Liquids
- Plasmas

Detection
- Diffraction
- Scattering
- Spectroscopy

Photon Data Analysis
- Structure determination
- Electronic structure
- Transport
- Relaxation and thermodynamics

The key objective of SIMEX is to develop and implement a simulation platform for users and facility operators to fully simulate experiments at free-electron laser, synchrotron and high power laser sources.

The simulations track the photons on their way from the source through the optics and the interaction region, all the way to the detector. Samples range from weakly scattering biomolecules, density modulations following laser–matter interaction to dynamically compressed matter at conditions similar to planetary cores.

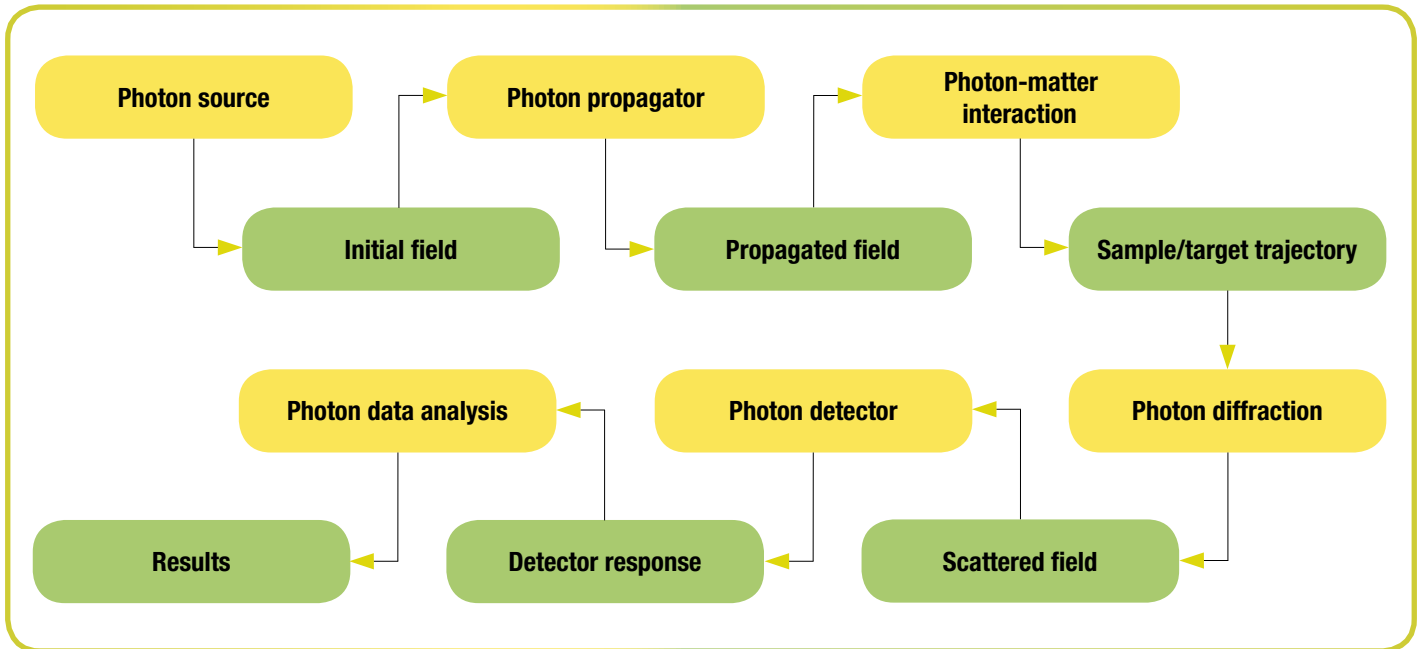Scientists from EUCALL's photon science facilities have collected individual software modules which simulate each link of the photon science experiment chain – from the photons generated at the photon source, the beam propagation through the optics, the photon-matter interaction at the sample, the interaction of incident photons onto the detector, and finally the analysis of the data recorded by the detector.

These individual parts of the chain have been linked together using interface software, so that the data output of one module becomes the data input to the next.

EUCALL
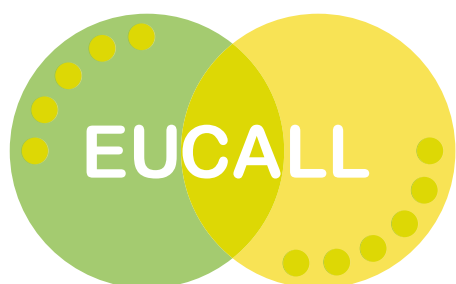
Simulation of Experiments – SIMEX
The European Cluster of Advanced Laser Light Sources

SIMEX provides python scriptable user-interfaces to advanced simulation software and data interfaces for inter-process data communication.

| Photon source | → | Photon propagator | → | Photon-matter interaction |
| Initial field | → | Propagated field | → | Sample/target trajectory |

| Photon data analysis | ← | Photon detector | ← | Photon diffraction |
| Results | ← | Detector response | ← | Scattered field |

SIMEX is an open source software platform which simulates:

- single-particle imaging ● x-ray scattering ● x-ray spectroscopy ● x-ray probing of shock compressed warm dense matter
- x-ray probing of short pulse laser excited matter ● laser-plasma acceleration based x-ray sources

The SIMEX platform is open source and can be downloaded at:

www.github.com/eucall-software/simex_platform

www.eucall.eu
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