Eric Galtier

age 41, dual citizenship (French and American)

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Ph. D. in plasma physics

Qualifications and experiences

jun. 2022 – present **Lead Staff Scientist and Instrument Lead of the Matter in Extreme Conditions hutch**, *SLAC, National Accelerator Laboratory*, Menlo Park.

jul. 2017 – may 2022 **Staff Scientist**, *SLAC, National Accelerator Laboratory*, Menlo Park.

jun. 2014 – jun. 2017 **Associate Instrument Scientist**, *SLAC, National Accelerator Laboratory*, Menlo Park.

jun. 2011 – may 2014 **Research Associate**, *SLAC, National Accelerator Laboratory*, Menlo Park.

nov. 2010 – may 2011 **Post Doctoral position**, *LULI, Laboratoire pour l'Utilisation des Lasers Intenses*, Palaiseau.

oct. 2007 – nov. 2010 **Ph. D.**, *Sorbonne University Pierre and Marie Curie*, Paris, With Highest Honors and oral examining board's utmost praise.

Title *Study of plasmas created by X-ray laser-matter interaction*

User support and FEL beamline operation at LCLS

User experiments

- Conducted about 65 experiments at MEC (about half as first Point of Contact, and the other half as second Point of Contact). It does not include In-House beamtimes and experiments that I have setup but for which I was not in the operation team (e.g. standard configurations).
- First Point of Contact of 2 user experiments executed within the recent LaserNetUS network.
- Was Safety Laser System Officer of MEC for 6 years maintaining and training a QLO/LCA worker database of up to 90 personnels. Developed the Split-Mode of the Laser Safety System at MEC to improve setup and operation efficiencies while preserving safe working conditions.
- Participated to the 8 High Power Laser Workshops and organizing one. This workshop is dedicated to the science and progress done at MEC for the High Energy Density community.

Beamline operation

- Routinely perform the alignment of the FEL down to the interaction point located in the MEC target chamber, including focusing and timing with either the long pulse or the short pulse laser systems, as well as the various diagnostics provided by the hutch.
- Comprehensive and wide knowledge of the MEC hutch subsystems allowing rapid problem identification and solving.
- Have performed experiments at SXR, XPP, XCS and CXI.

FEL research and development

- Developed the X-Ray Diffraction standard configuration (both collinear and perpendicular geometries) for the long pulse laser delivery.
- Pioneered new X-ray imaging techniques using FEL in HED environments.
- Pioneered new X-ray spectroscopy techniques for extreme environments (e.g. X-ray Transmission Crystal Spectrometer).
- Developed precise techniques to align and time HED experiments with the FEL coupled to either the long pulse (high energy, up to 60 J) or the short pulse (high intensity up to 10^{19} W/cm^2) laser systems.
- Investigated the Electromagnetic Pulses impact on in-house X-ray detectors, leading to the design of a new sensor's body better shielded against EMP.
- Collaborate on 3D hydrodynamic simulations for the X-ray Laser Oscillator project.
- Collaborate on the development of GHz readout X-ray cameras to take advantage of the multi-pulse capabilities of the LCLS beam.
- Lead scientist of the Experimental Systems in the MEC-U project.

High Energy Density research

Experimental

- Free electron laser facilities:
  - LCLS, USA: pioneered a new X-ray technique to investigate population kinetics in HED plasmas using resonant photo-pumping of specific electronic population in a HED plasma. Investigation of hot electron filamentation via X-ray imaging of the interaction between a high intensity laser and solid copper.
  - PAL-XFEL, Korea: investigated phase transition in iron at high strain rates using chirped optical laser pulse as driven.
  - FLASH/XFEL-HED, Germany: investigated fundamental physics of the interaction of high intensity X-ray lasers with solids.
- High energy and high intensity optical laser facilities:
  - TPW, USA: development of a high repetition rate proton source from a cryogenic hydrogen source (implemented imaging systems of the jet and EMP probes).
  - JLF-Titan (LLNL), USA: investigation of magnetic reconnection in double pulse laser interaction with copper wires (implemented a high-resolution X-ray spectrometer).
  - PALS (IPP/IoP), Czech Republic, and ELFIE (LULI), France: investigation of hot electron transport in solids (implemented spectroscopy techniques and performed the experiments).
- Diagnostics: high spatial and temporal resolution XUV- and X-ray spectroscopy in high energy density plasmas, XRD (X-ray diffraction), XRI/PCI (X-ray Imaging/Phase Contrast Imaging) and VISAR (velocity interferometer system for any reflector) of laser-induced shocks in solids, X-ray Thomson scattering spectroscopy in warm dense matter, IXS (Inelastic X-ray Scattering), betatron-driven XANES.

Numerical

- Atomic structure and transition rates codes (CATS, FAC).
- Line broadening (PPP) and spectral models (NOMAD, FLYCHK, SCFLY).
- 1D and 3D Radiative hydrodynamic codes (HELIOS, FLASH). MPI/OpenMP hybrid implementation on the SLAC servers.
- Genetic algorithm coupled to a Hartree-Fock code for spectroscopic analysis. Phase retrieval algorithm for PCI and algorithm for non-linear reconstruction of high resolution X-ray spectra. Time tool analysis package for short pulse laser timing with an FEL.

Theoretical

- Detailed atomic physics in dense plasmas. Complete analysis chain from hydrodynamic coupled to detailed atomic physics calculations.
- Stark broadening and interference effects theories in dense and magnetized plasmas.

Computational

- Robust skill in computer programming on all platforms (Mac, Windows, Unix).
- *Languages*: Fortran (77, 90, 95, 2003), C, Python, Visual basic, XHTML, PhP, CSS, Javascript, MySQL.
- *Compilers*: Intel Fortran, AbSoft, GCC, Gfortran.
- *Softwares*: SolidWorks, Matlab, Mathematica, ImageJ, LaTeX 2_ε, git, svn.

Teaching and mentoring experience

2020 – present Co-advisor of one PhD student with Imperial College, London.

Topic *Warm Dense Matter studies with X-ray Absorption Near Edge Spectroscopy using ultra-fast laser wakefield acceleration-produced betatron radiation.*

2016 – 2018 Mentor for 3 undergraduate students at MEC. Research topics were ranging from EMP data analysis software to prototyping and building of an X-ray spectrometer for extreme environment.

2007 – 2010 Teaching geometrical optics and electrokinetics to undergraduate students (64h per year).