

# Frontier of Dynamic Materials Using Ultrafast X-ray Radiography

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The study of matter under extreme conditions is a highly interdisciplinary subject with broad applications to materials science, plasma physics, geophysics and astrophysics. Understanding the processes which dictate physical properties in warm dense plasmas and condensed matter, requires studies at the relevant length-scales (e.g., interatomic spacing) and time-scales (e.g., phonon period). Experiments performed at XFEL lightsources across the world, combined with dynamic compression, provide ever-improving spatial- and temporal-fidelity to push the frontier. This talk will cover a very broad range of conditions, and give examples of case-studies closely related to geophysics, astro(bio)physics, planetary-, and fusion energy-sciences, as enabled by microstructure visualization and control from *in situ*, ultrafast X-ray imaging.