

Abstract Submitted  
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**Frontier Science at XFELs** EMMA MCBRIDE, Deutsches Elektronen Synchrotron (DESY) — 4<sup>th</sup> generation light sources have the potential to revolutionize our understanding of matter at extreme conditions, generating x-rays that are a billion times brighter than existing sources. Delivering hard x-rays with a typical pulse length of less than 100 fs, these sources can effectively freeze ionic motion, allowing us to enter a new regime of time-resolved measurements. These exceptionally bright x-rays allow, for example, diffraction, Thompson scattering or phase-contrast imaging in a single shot. At MEC at the LCLS, and at the HED instrument at the European XFEL coming online in 2015, both long and short pulse lasers play a key part in accessing extreme states of matter, previously inaccessible to laser plasma techniques. In this talk I will particularly focus on potential applications in the field of dynamic compression, utilising long pulse nanosecond lasers to drive materials to multi-megabar pressures. I will show pioneering results using XFEL beams to probe, *in situ*, the often complex response of these materials over a wide variety of conditions. Furthermore, I will discuss the potential advances in this already exciting field with the advent of the HiBEF beamline at the European XFEL.

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