Ultra-intense x-rays: Understanding the atomic response and designing applications

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B101 Engineering

Abstract

The first hard x-ray free-electron laser (XFEL) burst onto the world scene in 2009 at SLAC, bringing a billion-fold increased intensity for coherent, energy-tunable x-ray pulses. Beyond being a notable engineering feat, using 14-GeV electrons, 1-km linac and 100-m undulator, these intense x-ray pulses enable nonlinear x-ray processes, creation of novel states of matter and represent a starting point of the quest toward single biomolecule imaging. In this talk, I will discuss experiments designed to understand and control non-linear atomic response and their relationship to applications in warm dense matter research and serial femtosecond crystallography. Given these and other fascinating applications, the appetite for x-rays has grown and this talk will provide some perspectives on XFEL, storage ring and table-top x-ray facilities.

Bio:

Linda Young is the Director of the X-ray Science Division at the Advanced Photon Source at Argonne National Laboratory. The Advanced Photon Source is the nation’s premier high-energy x-ray synchrotron facility, with 66 operating beam lines and roughly 5000 users per year. She obtained her Sc.B. from MIT in 1976 and Ph.D. from the University of California, Berkeley in 1981. After a two-year postdoc at The University of Chicago she joined Argonne National Laboratory in the Physics Division. In 1994 she became Group Leader for Atomic Physics, and, in 2007, an Argonne Distinguished Fellow. Her research has touched many subfields of atomic and nuclear physics, including most recently, ultrafast x-ray physics, but also precision measurement, cold atom applications for trace analysis, and polarized target production. She is a fellow of the American Physical Society, associate editor of Applied Physics Letters and Structural Dynamics. She has been on numerous national committees and was the Chair of the Division of Atomic Molecular and Optical Physics of the American Physical Society in 2014.