

Abstract

X-Ray Free Electron Lasers (XFELs)

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Fourth-generation light sources use X-ray free electron lasers (XFELs) to produce extraordinary bright and coherent X-rays, with peak brightnesses about 10 orders of magnitude greater than what is available at third generation light sources. These \$B-class tools enable new science in biology, chemistry, and materials science, and experimental time on them is in high demand. There are three operating fourth generation light source facilities worldwide, with more in the construction and design phase, including a future 42-keV XFEL at the Los Alamos. This short course will cover the basics of XFEL theory and operation and will provide a review of existing and planned XFELs. Specific design challenges and required preliminary research for the Los Alamos XFEL will be included to illustrate how these devices are designed and built.