

The Linac Coherent Light Source and its X-Ray Optics Needs

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The Linac Coherent Light Source (LCLS) will soon begin operation as a free-electron laser producing intense femtosecond pulses of coherent x-rays in the wavelength range 1.5-15Å. This machine, which will utilize the SLAC linear accelerator, is now in the detailed design phase. Major construction will start in late 2005, and first operation will take place in 2008. The characteristics of the LCLS radiation will be qualitatively different from that produced by other x-ray sources, including synchrotron light sources, and so the LCLS will have unique requirements for x-ray optics. Though the average power will be less than one watt, the peak intensity of the x-ray pulse will approach 10 GW, and even unfocused, the peak power density will be sufficient to damage many materials. Low-z materials such as beryllium, boron carbide, diamond, and silicon are less susceptible to this damage, so these materials will be preferred for LCLS optical elements. A full range of optical elements will be needed, including apertures and slits, beam stops, attenuators, mirrors, focusing elements, and monochromators. This talk will present the current plans for the LCLS source and experimental stations, the x-ray optics needs of the anticipated experiments, and some thoughts on how the optics needs can be met.