APR20-2020-000309
ET

Abstract for an Invited Paper
for the APR20 Meeting of
the American Physical Society

X-ray optical cavities for next generation XFELs[1]

RYAN LINDBERG[2], Argonne Natl Lab

Over the past two decades, several X-ray free-electron laser (XFEL) facilities have been built that now deliver X-rays of unprecedented intensity and brightness for science. While this represents a monumental achievement, the X-ray longitudinal coherence, stability, and intensity is limited because all present XFELs are single-pass amplifiers that start from noise. One way to improve the longitudinal coherence and ultimate performance is to follow the example of atomic lasers: build an optical cavity. This talk will discuss recent research efforts aimed at developing such an optical cavity for an XFEL. I will begin by describing the basic X-ray components and physics, paying particular attention to the high-quality optical elements needed to recirculate X-rays. Recent work at Argonne and other labs has shown that X-ray components with the performance characteristics required for an XFEL can be built. These advances have led to the recent funding of a collaborative effort between Argonne and SLAC to install a rectangular X-ray cavity at the LCLS-II. I will describe our plans to design and build such a cavity, and then test its performance and FEL gain at the LCLS using two electron bunches.

[1]Work supported by U.S. Dept. of Energy Office of Sciences under Contract No. DE-AC02-06CH11357
[2]This submission is an invited talk for the "Emerging Technologies for Future Accelerators" session