Status of Hard X-ray Energy Recovery Linac (ERL) Light Sources

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ABSTRACT:

The status of the Energy Recovery Linac (ERL) hard x-ray light sources is summarized. The fundamental x-ray beam properties from storage ring sources, such as the source size, spectral brightness, and pulse duration follow from the dynamic equilibrium characteristic of the magnetic lattice that is the storage ring. Advances in laser-driven photoelectron sources and superconducting linacs allow the acceleration of electron bunches with superior properties for synchrotron radiation, and superconducting linac energy recovery allows the development of an x-ray ring without the need for electron storage. Relevant properties include x-ray beams of extraordinary spectral brightness and small source size, with concomitant high transverse coherence, x-ray pulse durations below 100 femtoseconds, and flexibility of operation. ERLs are capable of hosting practically all experiments now being carried out at storage rings while also enabling new types of experiments. Progress is reported on development of the required high-spectral brightness photo-injectors and superconducting linacs and implications for x-ray applications.