The Energy Recovery Linac (ERL) as a Driver for X-Ray Producing Insertion Devices

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Storage rings have served well as x-ray sources, achieving continued increases in flux and brilliance. While further improvements in performance may still be expected, the performance of these machines is constrained by radiation fluctuations and by the Touschek effect. The practical effect of the radiation fluctuations is to limit the minimum 6D emittance of the rings in general, and particularly the bunch length. The Touschek effect limits the lifetime and the bunch charge density. These effects can be ameliorated by using a linac to accelerate the beam to the requisite energy before passing it through undulators to produce the x-rays. If the beam is discarded after producing x-rays, radiation and collision effects are no longer limiting. This approach has not been used because prohibitive amounts of energy would be required to produce the beam. However, by using energy recovery in a superconducting linac, the energy can be recycled to accelerate new electrons. This would allow the use of currents comparable to those in storage rings, but with superior emittance, bunch length and flexibility. The concept of a 5-7 GeV facility using this principle is described and parameter goals given.

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