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Potential of an Energy Recovery Linac (ERL) X-ray Source for Structural Studies. D. Szebenyi*, CHESS, Cornell Univ., Ithaca, NY 14853 [*for the LEPP/CHESS/MacCHESS development team.]

A new type of X-ray source using ERL technology is under development at Cornell (<http://erl.chess.cornell.edu>). A bright electron beam is produced using a DC photo cathode injector, accelerated to 5 GeV in a superconducting (SC) linac, passed once through a series of undulators to produce X-rays, and then dumped - with recovery of nearly all of the energy stored in the beam. A repetition rate of up to 1.3 GHz is possible. The resulting X-ray beams are small, round, very brilliant and highly coherent. All standard crystallography experiments can be done at the ERL source, as well as frontier X-ray experiments which are difficult or impossible at current synchrotron sources. These include phase contrast imaging on the nanometer scale, time-resolved studies using 100 femtosecond pulses, and 3D structures of non-periodic specimens at near atomic resolution. A prototype electron injector, first SC accelerating cavity, and beam dump are under construction with an \$18M award from the National Science Foundation, and planning for the 5 GeV machine is well underway. Input from potential users is being sought; much has already been obtained through a June 2006 series of workshops on the scientific potential of the ERL.