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## Study of an ERL-Based X-Ray FEL

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We propose to develop an energy-recovery-linac (ERL)-based X-ray free-electron laser (FEL). Taking advantage of the demonstrated high-efficiency energy recovery of the beam power in the ERL, the proposed concept offers the following benefits: i) recirculating the electron beam through high-gradient SRF cavities shortens the linac, ii) energy recovery in the SRF linac saves the klystron power and reduces the beam dump power, iii) the high average beam power produces a high average photon brightness. In addition, such a concept has the capability of optimized high-brightness CW X-ray FEL performance at different energies with simultaneous multipole sources. In this paper, we will present the preliminary results on the study of optics design and beam dynamics.

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