

NEW COHERENT FEMTOSECOND SOFT X-RAY FEL FACILITY AT DUKE UNIVERSITY

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Abstract

At the Free Electron Laser (FEL) Laboratory of Duke University, we are under operating a 275 MeV S-band linac as the injector of Duke OKI-15 FEL facility. Since the linac occupies about 30% space of our 140 m long linac tunnel and we have lots of spare machine components, we want to build a new linac based FEL facility by upgrading our injector linac. Due to limitation in available budget, however, we will divide our project into three phases. At the first phase, we will install an RF photoinjector, two bunch compressors, and a short undulator to generate coherent femtosecond SASE source at the infrared range. At the second phase, we will upgrade our beam diagnostic and RF systems and install four 4.5 m long in-vacuum undulators to generate FEL photon at the vacuum ultraviolet (VUV) range with the seeded High Gain Harmonic Generation (HG) technology. At the third phase, we will increase beam energy to 700 MeV and add a revolver in-vacuum undulator to generate coherent femtosecond soft X-ray FEL photon at 3.7 nm with the HG and SASE technologies. In this paper, we describe detail things on our new linac based coherent femtosecond soft X-ray FEL facility.

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