Development of IR-FEL facility for Sustainable Science in Kyoto University

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In an infrared region, since a tunable coherent light can selectively induce a specific molecular reaction, FEL can enhance the efficiency of chemical and biological reaction. For example, most of biochemistry molecules have stretching vibration frequencies of C=N and C=O double bonds, corresponding to wavelength in the region of 5.6-6.2 μm. On the other hand, there is a probability that the 8-13 μm FEL creates new materials and microfabrications of semiconductor circuits and hence is available for solar-cell research. Thus we have constructed IR-FEL facility (KU-FEL) to push the research on the "Sustainable Science" at Institute of Advanced Energy, Kyoto University. The FEL system consists of a compact linac and an undulator to generate 4-13 μm FEL. The linac consists of thermionic RF gun and 3-m S-band accelerator tube which are fed by 10 MW and 20 MW rf powers, respectively[1]. The linac successfully accelerated 40 MeV electron beam in the newly restored Laboratory for Photon and Charged Particle Research[2]. The electron beam characterization and the magnetic field measurement of the undulator have been performed to estimated the obtainable laser beam parameters[3]. During the characterization we have developed a new beam diagnostic method which employs a computer tomography technique[4]. After the beam conditioning, final focusing, bunch compression, and so on, we will generate the FEL in 12μm wavelength in this autumn.

References

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