Contribution ID: **128** Contribution code: **WEP46** Type: **Contributed Poster**

Development of a Table-Top THz Free-Electron Laser with a Microtron Accelerator and a Hybrid Electro-Magnetic Undulator

Wednesday 24 August 2022 16:20 (20 minutes)

We were able to realize a compact microtron accelerator with 5 MeV electron beam acceleration energy and a hybrid electro-magnetic undulator that can vary the magnetic field of 1.07 T at 0.74 T. The electron beam is accelerated by an RF electric field of a 1-cell acceleration cavity and recirculated by a uniform magnetic field of the microtron main chamber. Through the re circulation process, the electron beam energy 5 MeV, energy spread 0.5%, pulse width 5 μs, and electron beam acceleration current are 48 mA. Hybrid electro-magnetic undulator set Iron buses in hybrid planar undulator structures and generate electro-magnet effects.The undulator has an iron pole in the form of a comb and can easily install one turn of electromagnet coil using a copper tube. This undulator can adjust the applied current to adjust the magnetic field strength to 0.74–1.07T, when the standard deviation of the maximum magnetic field strength distribution is very accurate with less than 0.5%. The trajectory of the electron beam of the undulator inside has the stable less than the 3 mm.

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Session Classification: Wednesday posters

Track Classification: Photon beamline instrumentation & undulators