Contribution ID: **130** Contribution code: **S3 Accelerators and Synchrotron Radiations** Type: **Poster Presentation**

Design of the prototype quadrupole magnet for a compact THz radiation source

The terahertz (THz) region of the electromagnetic spectrum covering the frequency range from 0.1 to 10 THz has attracted much attention in terms of new scientific and industrial applications. We are considering producing the THz radiation with an accelerator source based free-electron laser (FEL). The main goal is to achieve intense THz radiation at tunable frequencies of between 0.5 and 5.0 THz, with a high peak power and narrow bandwidth. To generate high-intensity THz radiation, a high-quality electron beam is controlled passing through a periodic field undulator. In order to optimize electron beam properties, the quadrupole magnet is one of the key components. The quadrupole magnet for this system was designed with the magnetic field gradient of 5 T/m2 at operating point. The dimensional tolerances keep within the range of ±5 μm. The prototype quadrupole magnet is in the process of fabrication. The engineering design of prototype quadrupole magnet will be shown in this presentation.

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Session Classification: Poster: S3 Accelerators and Synchrotron Radiations

Track Classification: Accelerators and Synchrotron Radiations