

## THz radiation yield from Polfel undulator

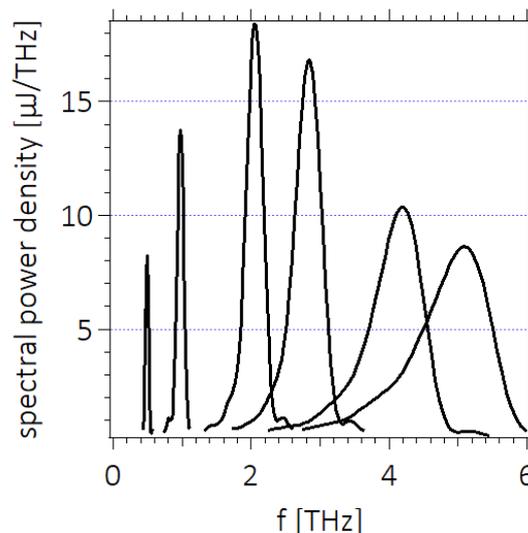
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The PolFEL will be an open access users' laboratory providing electromagnetic radiation ranging from terahertz frequencies to extreme ultraviolet (EUV). Radiation in these ranges will be sourced from separate sources based on: electron accelerators, solid-state lasers, and high-harmonic generation systems, respectively. A superconducting continuous wave linac, specifically designed for THz radiation, will contain two HZDR-like cryomodules and a permanent magnet, tunable-gap undulator. Electrons accelerated up to 70 MeV (up to 57 MeV in cw mode) will be shaped in bunches with charges up to 250 pC and will proceed with 1 kHz repetition. Individually driven cavity structures and bunch compressor placed downstream, enable to obtain 10  $\mu\text{m}$  long bunches with a peak current of 2000 A at the undulator entrance. The undulator, which has been designed in-house, is currently being assembled in the institute's workshop. Radiation simulations have been performed to provide data for optical path design and to evaluate the performance capabilities of the experimental endstation. Pulse energy, angular, and spectral distributions have been calculated using the TEUFEL program and using linac beam dynamics simulations results from the ASTRA program. The results showed that frequency range from 0.5 THz to 5 THz will be accessible for experimental use with pulse energies in microjoules range, in a 0.1 relative bandwidth. The Figure below shows spectral power density distributions calculated for first harmonic radiation for selected beam energies and maximal achievable undulator parameters  $K=5.4$ . The distribution centred at 5.1 THz will be accessible in long pulses mode only.



Spectral power density calculated for beam energies 15 MeV, 23 MeV, 33 MeV, 57 MeV and 70 MeV