FEL2022



Contribution ID: 248 Contribution code: WEP49

Type: Contributed Poster

Conceptual Design of the THz Undulator for the PolFEL Project

Wednesday, 24 August 2022 17:10 (20 minutes)

PolFEL will be the first free-electron laser facility in Poland. It will be driven with RF continuous-wave superconducting linac including an SRF injector furnished with a lead film superconducting photocathode. PolFEL will provide a wide wavelength range of electromagnetic radiation from 0.6 mm down to 60 nm. The linac will be split into three branches. Two of them will feed undulators chains dedicated for VUV, and IR radiation emission, respectively, and a single THz undulator will be settled in the third branch. The design of the THz undulator has been recently accomplished. It consists of a 1560 mm long permanent magnet's structure ordered as a Halbach array of 8 periods. Large blocks dimensions, gap flux zeroing at full opening and 0.5 THz -5 THz wavelengths range imposed on the undulator significantly influenced the final shape of the device, including blocks holders, girders and frame robustness unto magnetic forces, and hindered manufacturing and assembling processes. The following publication presents the challenges and solutions that were accompanying the conceptual phase.

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Session Classification: Wednesday posters

Track Classification: Photon beamline instrumentation & undulators