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Conceptual Design of the THz Undulator for the PoFEL Project

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PoFEL 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. PoFEL 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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Primary authors: WIECHECKI, Jaroslaw (National Synchrotron Radiation Centre Solaris); Mr ZIEMIANSKI, Daniel (Cracow University of Technology); KRAWCZYK, Pawel (National Centre for Nuclear Research); Mr ROMANOWICZ, Pawel (Cracow University of Technology); NIETUBYĆ, Robert (National Centre for Nuclear Research)

Presenter: WIECHECKI, Jaroslaw (National Synchrotron Radiation Centre Solaris)

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