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PolFEL - the new Free Electron Laser research infrastructure in Poland

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PolFEL is the first Free Electron Laser (FEL) research infrastructure under development in Poland. This new large research facility is being built at the National Centre for Nuclear Research (NCBJ) near Warsaw. It will feature a range of experimental stations covering a wide portion of the electromagnetic spectrum, from THz, through IR, up to VUV and EUV, as well as Ultrafast Electron Diffraction (EUD) and Very High Energy Electron (VHEE) stations. Two separate electron accelerators are being developed for the project. First is the accelerator of the photon line, whose purpose is to generate coherent pulses of electromagnetic radiation in the THz range. Second is the accelerator of the electron line. Both accelerators will utilize superconducting TESLA resonant cavities with a resonant frequency of 1.3 GHz.

The superconducting linac based on two Rossendorf-like accelerating cryomodules and including all superconducting electron gun, has been designed in order to deliver 20 pC – 250 pC electron bunches to superradiant THz undulator. IR-VUV range will be covered by a set of Nd:YLF and Ti sapphire generators and OPAs enabling the flexible choice of wavelength, pulse duration and repetition rate as well as pulse shaping. The light source facility combined in this way will be complemented with a continuous wave, MeV ranged UED beamline dedicated for solid and gasous samples.

Currently, work on the construction of the accelerator bunker is underway and the major components procurement is being completed. The installation will begin in the half of 2025 aiming at the commissioning and first light in 2026. In this paper, I will show the basic parameters and features of the research device being built and its main planned research goals for which it will be used in the future.

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