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Novel high-intensity X and Gamma-rays sources using crystals

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The research is focused on finding new ways to generate high-intensity, monochromatic X and gamma-rays, surpassing the capabilities of existing methods. While Free-Electron Lasers (FEL) have limitations on photon energy, and Inverse Compton Scattering relies on powerful lasers, the search for alternatives continues. TECHNO-CLS, a PATHFINDER project funded by the European Innovation Council, is dedicated to crafting innovative gamma-ray Light Sources (LSs), utilizing linear, bent, or periodically bent crystals. Similar to magnetic undulators, crystals leverage a strong interplanar electrostatic field to prompt particle oscillation, resulting in electromagnetic radiation. By reducing the oscillation period to sub-mm dimensions, these undulators can produce tens of MeV in photon energy when exposed to GeV electron beams*. As a passive and sustainable element, CLSs show great promise. In the initial phase of the project, we identified techniques to realize CLSs, using alternated pattern deposition on silicon, using simulation to optimize the pattern and conducted experiments at CERN PS with Tungsten and Iridium crystals.

Footnotes

- A.V. Korol, A.V. Solov'yov, Novel Lights Sources Beyond Free Electron Lasers, Particle Acceleration and Detection series, Springer Nature Switzerland, Cham (2022), 214 p., ISBN: 978-3-031-04281-2

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