Contribution ID: **879** Contribution code: **MOPM107** Type: **Poster Presentation**

Techniques for fabrication of crystalline undulators as an innovative intense source of ⍰-rays

Monday, 8 May 2023 16:30 (2 hours)

High-intensity, monochromatic X and ⍰-rays are a powerful tool for applied science in all fields. Free-Electrons Lasers can generate soft X-rays. A magnetic undulator's shortest possible oscillation period is ˜1 cm, which restricts the photon energy to hundreds of keV at GeV-range electron energies. Inverse Compton Scattering, which needs powerful lasers, may provide hard X-rays and ⍰-rays.
An interesting alternative is crystalline undulators (CU), i.e., a periodically bent crystal in which channeled charged particles follow the bending of the crystalline planes, thus generating e.m. radiation in analogy with standard magnetic undulators. The oscillation period can be lowered to sub-millimetric size, resulting in tens of MeV in photon energy using GeV electron beams[1]. A CU has the great advantage of being a passive and highly sustainable element, requiring neither magnets nor intense lasers.
Different techniques for producing CU, by taking advantage of modern technologies, will be illustrated. The grooving method[2], low-pressure chemical vapor deposition[3], ion implantation, and pulsed laser melting can provide a periodic deformation field that leads to a periodic bending of the crystal structure.
References:
[1] Novel Light Sources Beyond Free Electron Lasers, A.Korol; A.V. Solov'yov, Springer Cham, (2022)
[2] R. Camattari et al., Phys. Rev. Accel. Beams 22 (2019) 044701
[3] L. Lanzoni et al., International Journal of Engineering Science 46 (2008) 917

Funding Agency

Funding EU Commission EIC Pathfinder

Footnotes

I have read and accept the Privacy Policy Statement

Yes

Primary authors: BANDIERA, Laura (Istituto Nazionale di Fisica Nucleare); NEGRELLO, Riccardo (Istituto Nazionale di Fisica Nucleare)

Co-authors: SYTOV, Alexei (Istituto Nazionale di Fisica Nucleare); MAZZOLARI, Andrea (Istituto Nazionale di Fisica Nucleare); DE SALVADOR, Davide (Univ. degli Studi di Padova); SGARBOSSA, Francesco (Univ. degli Studi di Padova); PATERNÒ, Gianfranco (Istituto Nazionale di Fisica Nucleare); LANZONI, Luca (Universita' degli Studi di Modena e Reggio Emilia); ROMAGNONI, Marco (Universita' degli Studi di Milano); SOLDANI, Mattia (Istituto Nazionale di Fisica Nucleare); GUIDI, Vincenzo (Istituto Nazionale di Fisica Nucleare)

Presenter: NEGRELLO, Riccardo (Istituto Nazionale di Fisica Nucleare)

Session Classification: Monday Poster Session

Track Classification: MC2: Photon Sources and Electron Accelerators: MC2.T15: Undulators and Wigglers