



Contribution ID: 2

Type: **not specified**

Opening talk: Recoil dominated electron-photon beam collisions, a way towards novel radiation sources, advanced secondary beams and new phenomena in astrophysics

Monday, 23 September 2024 09:10 (50 minutes)

Recoil dominated electron-photon beam collisions, a way towards novel radiation sources, advanced secondary beams and new phenomena in astrophysics.

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Abstract: Revisiting 100 years of Compton scattering, with emphasis on deep recoil regime of electron-photon collisions, spanning the full kinematics range from direct Compton effect of photons on targets to inverse Compton scattering of relativistic electrons with photon beams, let us discover some new effects of entropy exchange between the colliding beams. These phenomena have great potentialities for applications in several fields: from spectral purification effects that can be exploited for compact & sustainable mono-chromatic gamma ray sources, to plasma heating by trapped electrons in magnetic bottles, from advanced secondary beam production (positrons, muons) with very small emittance, to exotic effects of stopping ultra-high energy electrons with 255.5 keV X-rays, that may have impacts in the astro-physical field. Advanced plasma based GeV-class electron accelerators may represent the natural cradle for test experiments of deep recoil electron-photon interactions due to their compactness, versatility and flexibility to arrange beam-lines within a multi-faceted lay-out of electron beams and radiation of diverse nature (lasers, FELs, betatron beams, ICS X-rays, channeling radiation beams). Last but not least, exploring the deep recoil regime fundamental investigations of QED interactions may become feasible in dynamical ranges never explored before.

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