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Detecting Unruh radiation with full inverse Compton scattering performed at plasma accelerators

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The availability of high brightness GeV-class electron beams at EupraXia@LNF makes it the ideal laboratory to explore the Full Inverse Compton Scattering (FICS) process, that has been theoretically predicted but still never experimentally observed. FICS occurs when relativistic electrons of any energy are impinged by photons of 255 keV of energy.

Electrons transfer all their kinetic energy to photons, leading to the most extreme levels of deceleration in the (present) universe, up to 10^{30} m/s². The effect is also related to Unruh radiation photon energies in the MeV range. Thanks to the high brightness of the electron beams available at EupraXia@LNF, the FICS collision luminosity can achieve levels adequate for the generation of a significant rate of FICS events, allowing to possibly detect MeV-class Unruh photons generated in the interaction, together with electron-positron pairs popping out of Dirac's vacuum due to the trespassing of the Schwinger's field limit (10^{18} V/m). The modeling of a possible experiment at EupraXia will be presented, aiming at showing the large potentialities of a FICS experiment in addressing strategic and advanced scientific subjects in fundamental physics.

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