

# **A spectroscopy method for high-energy photons in intense fields**

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In the extreme conditions of an intense laser pulse interacting with an ultrarelativistic electron beam, the electrons can produce a large number of photons in the MeV - GeV energy range. These emissions are of great interest, for instance, in strong field experiments such as [1,2] to investigate non-linear Compton scattering. Therefore, it is vital to have detectors which can operate for general photon sources in the high energy and flux conditions generated in these experiments.

A pair-production based gamma ray detector, as described in [3], has been developed to provide a reliable determination of the photon spectrum in such environments. This spectrometer has been tested at the Apollon Laser Facility, France, demonstrating a promising reconstruction of the spectral shape of a bremsstrahlung beam produced by GeV-scale wakefield electrons.

[1] Abramowicz, H., Acosta, U., Altarelli, M. et al. Conceptual design report for the LUXE experiment. Eur. Phys. J. Spec. Top. 230, 2445–2560 (2021). <https://doi.org/10.1140/epjs/s11734-021-00249-z>

[2] The FACET-II SFQED Collaboration, Probing Strong-field QED at FACET-II (SLAC E-320), (to appear) (2019).

[3] Fleck, K., Cavanagh, N. & Sarri, G. Conceptual Design of a High-flux Multi-GeV Gamma-ray Spectrometer. Sci Rep 10, 9894 (2020). <https://doi.org/10.1038/s41598-020-66832-x>