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# Gamma Factory's high intensity particle beams and their potential impact on the future accelerator-technology-driven research.

New directions in science are launched by new tools more often than by new concepts.

At the present time characterised by incremental increase of the energy and intensity of particle beams, Gamma Factory (GF) proposes leaps in the intensity (up to 7 orders of magnitude), quality (low emittance, polarisation CP-tagging, flavour tagging), and precision control of several types of particle beams.

The primary(ions), secondary(photons) and tertiary (polarised positrons, muons, neutrino, neutrons, radioactive ions) GF beams can be produced with unprecedented power-plug power efficiency – outperforming the present schemes by several orders of magnitude.

GF proposes to extend the scientific programme of the LHC in multiple branches of science (particle, nuclear, atomic, astro, accelerator and applied physics) with reasonable investment costs and small environmental impact – by using the plug power which can be generated by the GF-beam-driven, waste transmuting, subcritical nuclear reactor.

The GF beam beam-cooling techniques and new methods of producing beams of polarised muons allow to improve the measurement precision of the Standard Model parameters and to produce exclusively Higgs bosons in photon-photon collisions.

The GF experimental programme, if implemented at CERN, could follow the HL-LHC phase, and can be executed while waiting for the next, large-scale, energy-frontier accelerator project.

In this talk we plan to present both ongoing the GF R&D studies (including the very recent world record in the stored laser-photon beam power, the status of the GF proof-of-principle SPS experiment, and the results of quantitative studies of selected Gamma Factory physics applications.

## Secondary track

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