

Abstract Submitted  
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**Generating up to  $10^{17}$  photons per second with energies reaching 400-MeV** SZYMON PUSTELNY, Jagiellonian University in Krakow, GAMMA FACTORY COLLABORATION — The Gamma Factory (GF) is a proposal aiming at generation of up to  $10^{17}$  photons/s of the energies reaching 400 MeV. This exceeds the available  $\gamma$ -sources by several orders of magnitude. The idea is based on resonant scattering of light on ultrarelativistic (the Lorentz factor  $\gamma_L$  between 10 and 2900) highly-stripped (very few electrons) ions. Due to the relativistic Doppler effect, the energy of the incident photons is boosted in the ion frame  $2\gamma_L$  times. Since the energy can be tuned by changing  $\gamma_L$ , this enables conventionally unavailable spectroscopy of various physical systems. Due to the ultrarelativistic motion of the ions, in the lab frame, spontaneously emitted photons are directed along the ion-propagation direction, boosting the energy of the photons by another factor of  $2\gamma_L$ . In turn, the energy of the photons is increased  $4\gamma_L^2$  (e.g., conversion of 100-nm “light” into  $10^{-15}$  m radiation). Intensity of the radiation is very high as the conversion is resonant. During the presentation, the principles of the GF will be discussed and challenges of optical pumping of such ultrarelativistic highly charged ions will be discussed. Potential applications of the GF for “exotic atomic physics will be also presented.

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