Extreme field science

Sergei V. Bulanov

Advanced Beam Technology Division, Japan Atomic Energy Agency,
8-1-7 Umemidai, Kizugawa, Kyoto 619-0215, Japan

The progress in the development of such the extreme light sources as the laser systems generating the ultra short optical pulses of high intensity will open new horizons for studying of a wide range of the fundamental science and astrophysics problems and also for numerous important applications including material science and medicine. The laser accelerated charged particle energy is expected to exceed the TeV limit. The regimes of dominant radiation reaction, which completely change the electromagnetic wave-matter interaction, will be revealed in the laser plasma experiments, resulting in a new extremely powerful source of ultra short high brightness gamma-ray pulses. In the experiments on the fundamental physics the possibility of abundant electron-positron pair creation via the multi-photon processes, and possibility of reaching the critical field of Quantum Electrodynamics which would lead to the vacuum polarization and breakdown, are attracting high attention.