Electron acceleration and efficient THz generation from TW laser driven surface plasma

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Irradiation of thin (10-μm) copper film irradiated with a relativistic femtosecond laser pulse is a convenient scheme for efficient generation of bright X-rays and THz radiation. Characteristic $K\alpha$ line is sufficient for X-ray fs diagnostics of nonstationary states of matter, providing 10^8 photons/sr/pulse. We further experimentally investigated in which range of parameters it is possible to obtain a beam of accelerated electrons in this case for future pump-probe studies with these types of radiation. We compared the divergence and energy spectrum of electrons in the direction "through the target" and in specular reflection, compared several materials of the solid target. The electron yield turned out to be the best from a thin metal foil in specular reflection (broad energy spectrum from 0.5 to 5 MeV in a weakly collimated electron beam), and the THz yield turned out to be the highest from a quartz thick disk, the energy of the THz pulse was as high as several μJ. The mechanisms of generation of these types of radiation and the possibility of increasing their efficiency are discussed. This work is partly supported by RFBR grant (20-21-00140).