POWERFUL TERAHERTZ PULSES FROM RELATIVISTIC LASER-PRODUCED PLASMAS

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Recently Terahertz radiation from laser-produced plasmas has attracted much interest since plasmas can work at arbitrarily high laser intensity. However, only few experiments with relativistic laser pulses are reported. The THz generation is either not understood well. We have systematically studied strong THz radiation from solid targets driven by relativistic laser pulses. The experiments are carried out using femtosecond and picosecond laser systems, respectively. THz radiation with a pulse energy of tens μJ/sr (driven by femtosecond pulses), even hundreds μJ/sr (driven by picosecond pulses) is observed.

In this talk, we will present the THz polarization, temporal waveform, angular distribution and energy dependence on the laser energy and discuss the THz generation mechanisms. We find that the THz radiation depends on the preplasma density scale length. For the femtosecond laser-driven case, the THz radiation is probably attributed to the self-organized transient fast electron currents formed along the target surface when the plasma density profile is steep. However, when a relativistic picosecond laser pulse interacts with a large-scale inhomogeneous preplasma, we find the THz radiation originates from both the SRS-induced plasma waves and the self-modulated wakefields excited in the large scale preplasma, instead of electron currents.

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