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ultrashort PW lasers pulse interaction with target and ion acceleration

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The unique exploratory mission of laser driven ion acceleration research is to build the scientific foundation needed to develop high energy laser-particle accelerators.

This presentation will discuss the ion acceleration obtained on 1.5 PW laser. The newly found scenario of ion acceleration offers more favorable proton energy scaling with laser intensity than it is known for “ordinary” so-called Target-Normal-Sheath-Acceleration. For the first time the ion energy scaling law for acceleration process in the ultra-short regime was extend beyond 1020 W/cm².

However, at ultrahigh contrast of the laser pulse on the electron density profile at the target surface a regular structure is generated during the interaction which acts as a grating and some of the diffraction maxima is under back reflection angle [1]. This back reflection of the order of 1% of laser energy, measured in the experiments, can lead to a serious constraints on both the laser operation (cause damage) and the conditions of interaction.

These investigations are closely related to recent development or imminently anticipated development of laser technology to bring the existing laser systems to a multi-PW level.

[1] S. Ter-Avetisyan et al., Optics Express, 24, 28104 (2016)

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