High-intensity laser-plasma interaction

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Ultrashort high-intensity laser interaction with a sharp-edged over-dense plasma has become an attractive mechanism for the generation of fast particles [1]. Through suitable physical conditions between the laser and periodic gratings on the vacuum plasma interface, it is possible to excite Surface Plasma Waves (SPW), increasing the absorption of the laser energy up to 75% [2] as well as accelerating particles to the relativistic limit [2, 3]. The physical conditions for the SPW excitation vary depending on both the plasma density and the laser intensity [3], in particular, relativistic corrections to the electron density need to be considered. In this work, we suggest how to take into account these characteristics theoretically in the dispersion relation and we verify the outcoming resonant matching conditions using a two-dimensional Particle In Cell (PIC) code [4]. These results can be used to optimize and control all possible applications of high-intensity laser-plasma interaction [1, 2, 3].

References

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