

O4.205 Identification of coupling mechanisms between ultraintense laser light and dense plasmas

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See the full abstract here <http://ocs.ciemat.es/EPS2019ABS/pdf/O4.205.pdf>

The interaction of intense laser beams with plasmas created on solid targets involves a rich non-linear physics. Because such dense plasmas are reflective for laser light, the coupling with the incident beam occurs within a thin layer at the interface between plasma and vacuum. One of the main paradigms used to understand this coupling, known as Brunel mechanism, is expected to be valid only for very steep plasma surfaces.

Despite innumerable studies, its validity range remains uncertain, and the physics involved for smoother plasma-vacuum interfaces is unclear, especially for ultrahigh laser intensities. We report the first comprehensive experimental and numerical study of the laser-plasma coupling mechanisms as a function of the plasma interface steepness, in the relativistic interaction regime. Our results reveal a clear transition from the temporally-periodic Brunel mechanism to a chaotic dynamic associated to stochastic heating. By revealing the key signatures of these two distinct regimes on experimental observables, we provide an important landmark for the interpretation of future experiments.

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