Coherent Light Generation using Relativistic Mirrors in Plasma

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When a relativistically intense laser pulse interacts with a solid-density target, the laser-induced surface plasma density modulation forms a relativistic oscillating mirror [1-5], which generates trains of attosecond pulses composed of phase-locked harmonics propagating at the reflection angle, due to the near-light-speed oscillations of the surface electrons. Our latest research [1] reveals that under certain conditions, the mirror surface undergoes self-modulation which leads to electron nanobunching and consequently emission of bright, coherent extreme ultraviolet (XUV) radiation propagating along the surface, effectively breaking the law of reflection. This mechanism shows a higher conversion efficiency for generating XUV radiation compared to traditional laser-driven sources, offering promising prospects for applications in both science and technology. Additionally, we report results from our ongoing study on coherent light generation using relativistic plasma mirrors propagating at constant velocity [6-8], formed by non-linear plasma waves driven either by laser or charged particle beams.

References

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