Beitrag ID: **69** Typ: **Talk**

Experimental observation of anomalous instability-driven relativistic surface emission

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Efficiency limit relativistic harmonic generation from solid targets (ROM) has recently been demonstrated experimentally. Multi-petawatt laser facilities will soon be able to harness this mechanism to generate intense coherent attosecond harmonic foci suitable for probing the quantum vacuum via fully optical means. However, experiment has demonstrated that efficiency scaling with harmonic order falls faster than ROM theory or 1D PIC simulations predict, a significant limitation for X-ray ROM applications. Simulations have revealed that this surprising deviation of XUV ROM harmonic generation efficiency is correlated with the emergence of a second anomalously propagating instability-driven harmonic beam. Here we show experimental evidence of this novel beam simultaneously with observation of the specularly emitted ROM beam, identify their qualitative differences and demonstrate that each mechanism can be finely controlled. In contrast with the ROM beam, the anomalous beam has a remarkably shallow efficiency scaling making it a promising candidate for water-window harmonic generation and biological imaging, while its strongly modulated lower orders could yield new information on the plasma conditions at the interaction region.

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Sitzung Einordnung: Session 9 - Short Pulse 2