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X-Ray generation by the laser-plasma interaction in the regime of relativistic electronic spring ARKADY GONOSKOV, THOMAS BLACKBURN, Chalmers University of Technology, SE-41296 Gothenburg, Sweden, MANUEL BLANCO, M. T. FLORES-ARIAS, Universidade de Santiago de Compostela, 15782 Santiago de Compostela, Spain, BENJAMIN WETTERVIK, MATTIAS MARKLUND, Chalmers University of Technology, SE-41296 Gothenburg, Sweden — Inducing and controlling relativistic motion of surface electrons in overdense plasmas with high-intensity lasers is a promising way to produce X-rays with unique properties, including high brightness, ultra-short duration and tunable polarization. Although the well-studied *relativistic oscillating mirror* (ROM) regime provides robust generation of high harmonics, the amplitude of the outgoing light in this regime is always equal to that of the incident radiation because the conversion takes place continuously without energy accumulation. This restriction can be overcome by increasing the laser intensity and/or decreasing the plasma density such that $n/a < 10$. In this case the plasma acts as a spring, first accumulating up to 60% of the energy of one laser cycle, then re-emitting it in the form of a burst of high harmonics. Under optimal conditions this burst can be both 100 times shorter in duration and 100 times higher in intensity. The theory of *relativistic electronic spring* (RES) [Gonoskov *et al.* PRE **84**, 046403 (2011)] describes a wide variety of interaction scenarios in this regime and provides insight into the underlying physics. The talk will concern the prospects of creating and controlling XUV bursts of exceptional brightness in the RES regime.

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