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# Resonnant excitation of surface plasma waves in the relativistic regime: electron bunches and high order harmonic generation

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Exploiting the ultra-high contrast laser facility UHI100 in Saclay we observed the acceleration of an electron beam driven by surface plasma waves (SPW) and the generation of high order harmonic along the surface of opportunely structured targets. Our experimental results clearly show a strong enhancement of both the energy and the number of electrons emitted from such targets irradiated at an incidence angle close to the resonant value for SPW excitation when compared to flat targets. High current (almost 120 pC) electron emission is concentrated in a narrow cone close to the target surface, with energy spectra peaking at 5-8 MeV and reaching up to ~20 MeV that we succeeded to reproduce with massively parallel 2D and 3D numerical simulations. Standard target translation stages motion speed are high enough to renew the target surface and get repetition rates of some tens of Hz that making such electron bunches an interesting candidate for a broad-range of applications such as pulsed radiolysis experiments, electron microscopy, ultra-fast electron diffraction or medical applications. It should be pointed out that a grating-like structure can be also produced on the target surface using opportunely modulated transient plasma gradients.

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