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Exact Solution for Two-Color Laser Induced Photoemission from a Biased Metal Surface

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Laser-induced electron emission is essential to the development of ultrafast electron microscopes, tabletop particle accelerators and x-ray sources, and novel quantum nanocircuits [1-3]. In particular, two-color laser induced photoemission from a metal nanotip [4] provides great flexibility for the coherent control of emitted electron distribution by using the interference effect. By solving the time-dependent Schrödinger equation [5,6], we construct an exact analytical solution for nonlinear ultrafast electron emission from a dc biased metal surface illuminated by two-color laser fields. Our results reveal various emission processes, including photo-induced over-barrier emission, and tunneling emission, for different dc and laser fields, and recover the trend in the experimentally measured energy spectra [4,7]. We find a strong dc electric field not only opens up tunneling emission channels, but also introduces intense modulation to the two-color emission current. Different combinations of the dc field and phase difference of the two lasers could offer a promising method of controlling electron dynamics in ultrashort spatiotemporal scales.

[1] P. Zhang, et al., Appl. Phys. Rev. 4, 011304(2017).
[2] E. Forati, et al., Nat. Communications 7, 13399 (2016).
[3] P. Zhang, and Y. Y. Lau, J. Plasma Phys. 82, 595820505 (2016).
[4] M. Forster, et al., Phys. Rev. Lett. 117, 217601 (2016).
[5] P. Zhang and Y. Y. Lau, Sci. Rep. 6, 19894 (2016).
[6] Y. Luo, and P. Zhang, Phys. Rev. B, 98, 165442 (2018).
[7] M. Schenk, et al., Phys. Rev. Lett. 105, 257601 (2010).

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