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Continuous frequency multiplication in a strongly driven modulated nanowire[1] KATHLEEN HAMILTON, ALEXEY KOVALEV, AMRIT DE, LEONID PRYADKO, University of California, Riverside — High-order harmonic generation in a bulk solid strongly driven by a few-cycle pulsed infrared laser has recently been observed [1]. We consider the possibility of observing an analogous effect using a continuously driven, single-band one-dimensional metal. In the absence of phonon scattering, the quantum efficiency of frequency tripling for such a system can be as high as 93%. Combining the Floquet quasi-energy spectrum with the Keldysh Green's function technique, we derive the quantum transport equation for strongly and rapidly driven electrons in the presence of weak scattering by phonons. The power absorbed from the driving field is continuously dissipated by phonon modes, leading to a quasi-equilibrium in the electron distribution. We assume terahertz frequency range, and use the Kronig-Penny model with varying effective mass to establish dimensions and modulation periodicity of an InAs/InP nanowhisker. Driving such nanowhiskers could lead to efficient third and higher-harmonic generation. [1] S. Ghimire et al., Nature Physics 7, 138-141 (2011).

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