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A combined model for femtosecond laser induced photoemission with laser heating and quantum tunneling[1] MIHIR PANT, LAY KEE ANG, Singapore University of Technology and Design — Ultrafast laser induced electron emission has garnered considerable interest in recent years because of its application in imaging, future light sources and in the development of ultrafast optical transistors. The photoemission process involves multiple physical processes: laser heating, quantum tunneling and acceleration by the ponderomotive force. Previous models for photoemission have only included some of these effects. In this paper, we combine the simulations of non-equilibrium heating with time-dependent quantum simulations under a spatially varying field to obtain a model which can capture all three effects. We find that many features of the emission process can only be captured by the combined model. Furthermore, the assumptions made by older models are found to be valid only under certain conditions. Our model is also compared with the classical Einstein photoelectric effect and we find differences in the emission order because of heating and the finite pulsewidth. The relative contribution of different energy levels in the emission process is also studied.

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