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Demonstration of a sub-Poissonian free electron emitter[1] SAM KERAMATI, WILL BRUNNER, T. J. GAY, HERMAN BATELAAN, University of Nebraska - Lincoln — Femtosecond-laser-driven nanotip electron sources have been widely studied in recent years. The relatively large spatial coherence lengths attainable through such point-like emitters, along with the possibility to drive them using ultrashort laser pulses to achieve high temporal resolution, have been the main incentives in this pursuit. The statistical distribution of the emitted photoelectrons has yet to be scrutinized experimentally. Furthermore, any hints of Pauli degeneracy pressure will be manifest in deviations from the steady-state emission statistics [1]. Implementing a double-detector coincidence technique, we inspected the photoelectron distribution originated from an electrochemically etched tungsten nanotip needle. The emitter was operated at room temperature with a near-IR Ti:Sapphire laser oscillator having few-nJ output pulses of duration 100 fs, at a repetition rate of 76 MHz. Contrary to the assumption that the emission must be random, we found that the photoemission distribution is manifestly sub-Poissonian for both sharp and broad tips with approximate geometrical radii of 50 nm and 400 nm, respectively. [1] S. Keramati, E. Jones, J. Armstrong, and H. Batelaan, In "Advances in Imaging and Electron Physics", Elsevier (2020), Vol. 213, Ch.1.

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