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Modeling degenerate pulsed electron matter waves with partial quantum coherence[1] SAM KERAMATI, ERIC JONES, HERMAN BATELAAN, Univ of Nebraska - Lincoln — With the advent of femtosecond laser-driven nanotip electron sources, degenerate electron beams now seem to be within reach. Electron beam degeneracy is characterized by electron antibunching; the signature of the fermionic Hanbury Brown-Twiss effect. The strength of the observed antibunching signal in an electron coincidence experiment is determined by the combined effects of the source polarization and the degree of quantum coherence of the beam. Low quantum coherences will lead to miniscule antibunching signals similar to the case reported in reference [1] with an unpolarized CW electron source. Such tiny signals are not differentiable from the effect of Coulomb repulsion of neighboring electrons [2]. Thus, to observe the Hanbury Brown-Twiss effect unambiguously, the degree of quantum coherence must not be too small, as afforded by nanotip sources. In this work, we model quantum partial coherence in two different ways. In the first approach we propagate a mixed state using the Feynman path integral technique. In the second approach, quantum decoherence theory is used to obtain a partially coherent two-electron state by tracing over environmental states. [1] H. Kiesel, et al., Nature 418, 392 (2002) [2] G. Baym, et al., arXiv: 1212.4008 (2012)

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