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Shot noise and s-o coherent control of entangled and spin polarized electrons. J. CARLOS EGUES, University of Sao Paulo and University of Basel, GUIDO BURKARD, University of Basel, DANIEL SARAGA, University of Basel, JOHN SCHLIEMANN, University of Regensburg and University of Basel, DANIEL LOSS, University of Basel — We extend our previous work on shot noise for entangled and spin polarized electrons in a beam-splitter geometry with spin-orbit (s-o) interaction in the incoming leads. Besides accounting for both the Dresselhaus and the Rashba spin-orbit terms, we present general formulas for the shot noise of singlet and triplets states derived within the scattering approach. We determine the full scattering matrix of the system for the case of leads with two orbital channels coupled via a weak s-o interaction inducing channel anti-crossings. We show that this interband coupling gives rise to an additional modulation angle which allows for further coherent control of the electrons. We also derive explicit shot noise formulas for a variety of correlated pairs (e.g., Bell states) and lead spin polarizations. Interestingly, the singlet and \textit{each} of the triplets defined along the quantization axis perpendicular to lead 1 and in the plane of the beam splitter display distinctive shot noise for injection energies near the channel anti-crossings – one can tell apart all the triplets through noise measurements. Finally, we find that backscattering within lead 1 reduces the visibility of the noise oscillations. This work was supported by NCCR Nanoscale Science, EU-Spintronics, CNPq, Swiss NSF, DARPA, ARO, and ONR (to appear in PRB).

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