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Cross-correlated shot noise in three-terminal superconducting hybrid nanostructures

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We work out a unified theory describing both nonlocal electron transport and cross-correlated shot noise in a three-terminal normal-superconducting-normal (NSN) hybrid nanostructure. We describe noise cross correlations both for subgap and overgap bias voltages and for arbitrary distribution of channel transmissions in NS contacts. We specifically address a physically important situation of diffusive contacts and demonstrate nontrivial behavior of nonlocal shot noise exhibiting both positive and negative cross correlations depending on the bias voltages. For this case, we derive a relatively simple analytical expression for cross-correlated noise power which contains only experimentally accessible parameters.

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