# Extracting single electron wavefunctions from a quantum electrical current

Arthur Marguerite , Benjamin Roussel , Rémi Bisognin , Manohar Kumar , Clément Cabart , Jean-Marc Berroir , Erwann Bocquillon , Bernard Plaçais , Yong Jin , Antonella Cavanna , Ulf Gennser , Pascal Degiovanni , and Gwendal Feve*[1]

[1]Laboratoire Pierre Aigrain (LPA) – École normale supérieure - Paris, Université Pierre et Marie Curie - Paris 6, Université Paris Diderot - Paris 7, Centre National de la Recherche Scientifique : UMR8551 – Département de Physique Ecole Normale Supérieure 24, rue Lhomond F-75231 Paris Cedex 05, France

**Résumé**

Quantum nanoelectronics has entered an era where quantum electrical currents are built from single to few on-demand elementary excitations.
To date however, very limited tools have been implemented to characterize them. In this work, we present a quantum current analyzer able to extract single particle excitations present within a periodic quantum electrical current without any a priori hypothesis. Our analyzer combines two-particle interferometry and signal processing
to extract the relevant electron and hole wavefunctions localized aroundeach emission period and their quantum coherence from one emission period to the other. This quantum current analyzer opens new possibilities for the characterization and control of quantum electrical currents in nanoscale conductors and for investigations of entanglement in quantum electronics down to the single electron level.

*Intervenant