



École doctorale de Physique en Île de France

ED564

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COURS

MESOSCOPIC SUPERCONDUCTIVITY

Hugues POTHIER

SPEC, CEA-Saclay

Superconductivity at the mesoscopic scale has been an extremely active field of research in the last 25 years. I will review the phenomena that have been discovered, which help understanding superconductivity and allow fabricating new types of electronic devices. The following subjects will be treated:

- Small superconducting islands : when does the size become relevant? Can the parity of the number of electrons be relevant?
- Superconductivity in conductors with a small number of transport channels: can a supercurrent flow through a single atom? What is the mesoscopic description of the Josephson effect?
- Proximity effect: how does superconductivity propagate into non-superconducting materials?
- Quantum circuits based on Josephson junctions: can one build artificial atoms out of superconductors? Which fundamental experiments does it allow to perform? What are the different kinds of superconducting quantum bits?

A large part of the course will be devoted to the description of experimental methods used for probing the transport properties of superconductors: circuits fabrication, measurements of current-voltage characteristics, of small supercurrent, of the local density of states, circuit quantum electrodynamics (c-QED) setups...

7 two-hours courses

at 9.30 am., on Tuesdays

From April 18th to May 30th 2017

Salle L361 – Département de Physique de l'ENS – 3^{ème} étage – 24 rue Lhomond 75005 Paris

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