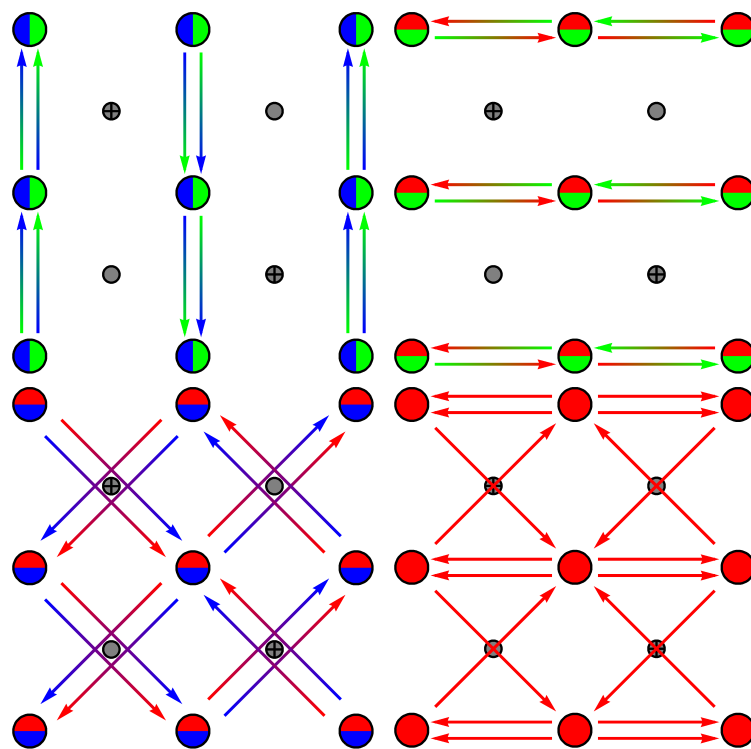


Another thesis on SNS junctions: numerical simulations and calculations



Master's Thesis

by

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Ich erkläre hiermit, dass die Arbeit selbstständig angefertigt, alle benutzten Quellen und Hilfsmittel vollständig und genau angegeben und alles kenntlich gemacht wurde, das aus Arbeiten anderer unverändert oder mit Abänderungen entnommen ist.

Karlsruhe, den 24. Januar 2017

.....
(**Alexander Gawrilow**)

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Overview

1 Introduction

2 Analytical Model

2.1 Basics of the quasiclassical model

In figure 2.1 a schematic SNS junction is depicted. The setup is two dimensional with width W and length L . The NS-interfaces are parallel to the y -axis and are placed at $x = \pm L/2$. Each of the superconducting leads has a phase χ_1 and χ_2 and the overall phase difference is $\chi = \chi_1 - \chi_2$. The superconducting gap parameter is only present in the superconducting leads and zero in the normal region and can be expressed as

$$\Delta(x) = |\Delta|e^{i\chi_1}\Theta(-L/2 - x) + |\Delta|e^{i\chi_2}\Theta(x - L/2) \quad (2.1)$$

Assumptions for model: * Superconducting gap is stepfunction like * ballistic sample with totally absorbing boundaries * fermi wave length is small compared to other length scales in the system: ** cyclotron radius $r_B \gg L$, L is the length of the sample - \downarrow straight trajectories is alright as an assumption ** low temperature limit: $k_B T \ll \hbar v_F / L$ ** coherence length: $\lambda_F \ll \zeta$ ** magnetic field penetration depth $\lambda_F \ll \lambda_L$ ** sample length: $\lambda_F \ll L$ * both charge carrier density and chemical potential in BLG are sufficiently high, therefore single band model is alright * Following approach of Zagoskyn (with Eilenberger equations): formula for I_c . Each contribution to critical current depends on the length of the trajectory and on the phase gained along it

In 2.1 the schematics of a SNS junction is depicted. The junction consists of two superconducting leads and a normal metal layer in the middle.

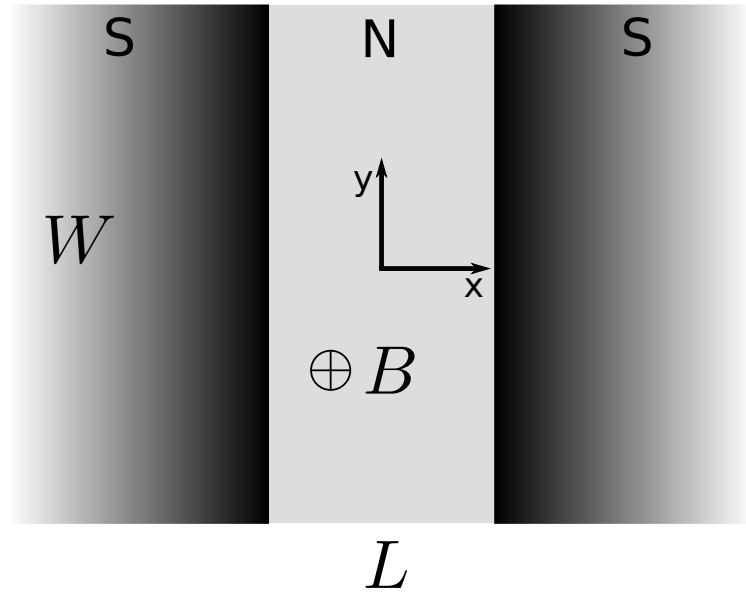


Figure 2.1: Schematic representation of a short and wide SNS junction.

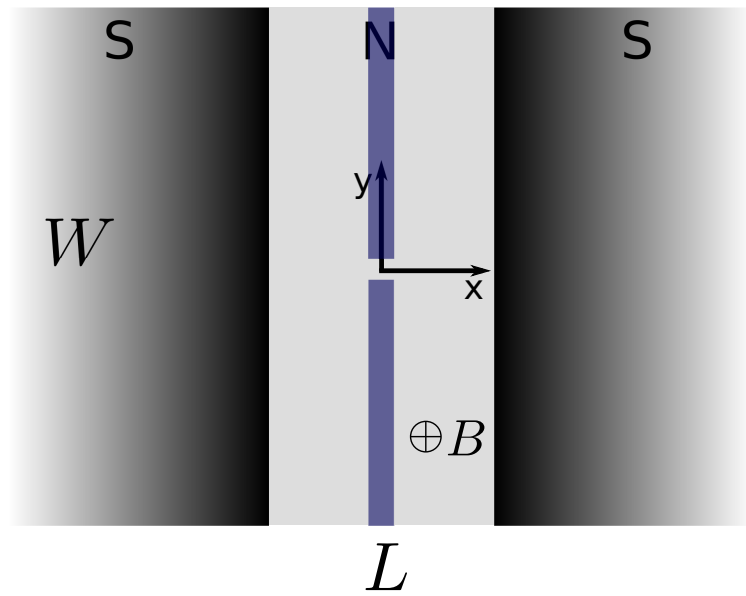


Figure 2.2: Schematic representation of a short and wide SNS junction with QPC setup.

3

Conclusion and Outlook

A

Appendix

