

# Theory of Superconductivity, Herbstsemester 2018

## **I. Introduction and phenomenology**

I.1 Infinite conductivity and ideal diamagnetism

## **II. The Bardeen-Cooper-Schrieffer (BCS) theory**

II.1 Cooper instability

II.2 Attractive interaction

II.3 The BCS ground state

II.4 Alternative method: Bogoliubov transformation

II.5 Thermodynamic quantities

II.6 Tunneling phenomena

II.7 Electrodynamics of superconductors

## **III. Ginzburg-Landau (GL) theory**

III.1 GL free energy

III.2 The GL equation

III.3 The linearized GL equation; type I and type II superconductors

## **IV. The Josephson effects**

IV.1 The Josephson equations

IV.2 The RCSJ model

IV.3 Josephson junctions and magnetic fields; the DC SQUID

IV.4 The Cooper pair box

IV.5 Superconducting quantum bits

## **V. Fluctuation effects**

V.1 Resistance of a thin superconducting wire

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