Superconductivity: fundamentals and applications

Prof. Dr Angelo Di Bernardo

Course logistics

• Total credits: 10
• Winter semester 2020/2021
• 4 hours of lectures/week (Mon 15:15-16:45, Thur 15:15-16:45)
• plus 2 hours of exercises/week (time to be defined with students)
• Final exam: oral examination (45 min)
• For more info please email angelo.dibernardo@uni-konstanz.de

Aim of the course

• To review the basics of superconductivity and its main technological applications
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Course outline

• Basic properties
  Superconducting transition, thermodynamics, electrodynamics, Meissner effect
  type-I and type-II superconductors

• Theoretical descriptions and models
  Microscopic Bardeen-Cooper-Schrieffer theory, phenomenological Ginzburg-Landau
  theory, electron tunnelling in superconductors, unconventional superconductivity

• Josephson effect
  Basic phenomena and devices based on it

• Applications of superconductivity (with latest research findings)
  Ultrasensitive magnetometers, particle detectors, magnetic levitation trains,
  RF and microwave filters, low-dissipation digital circuits and quantum computing
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https://www.dibernardo.uni-konstanz.de/

Sources
https://www.jrailpass.com/blog/maglev-bullet-train
https://physics.aps.org/articles/v2/24
https://arxiv.org/abs/1903.03435v1
https://www.zurich.ibm.com/st/quantum/