
Condensed Matter Theory

Master-thesis 2013/2014

The successful applicant is a highly motivated and ambitious student with good grades. There may be possibilities for excellent students to continue with a Ph.D degree and also to publish their master-thesis work in prestigious journals.

Description Currently, it is of considerable interest, and potentially of great technological importance, to investigate the transport of charge and spin in nano-scale hybrid structures with functional properties such as superconductivity, ferromagnetism, and/or spin-orbit coupling. Besides the rich physics displayed by such systems from a fundamental physics point of view, a main goal is to achieve a tunable flow of charge- and spin-currents. This could lead to novel functionality in nanotechnological devices. For instance, such charge- and spin-currents can be used to manipulate the magnetization direction of a material, which has a direct application in the magnetoresistive random access memory technology of computers. Another exciting topic in condensed matter physics is the appearance of various quantum states of matter and their associated phase transitions. Such transitions can to some extent be experimentally controlled, for instance in Bose-Einstein condensates loaded onto optical lattices, which offers a wealth of rich physics to explore.

Possible topics for the master-thesis include:

- 1) Superconductivity and proximity effects in novel structures
- 2) Magnetization dynamics and spin-transfer torques
- 3) Quantum phase transitions

The student should have a strong background in quantum mechanics and preferably some familiarity with software such as MATLAB and Maple.

Contact For more information, contact associate professor Jacob Linder (jacob.linder@ntnu.no), room E5-123.