

Quantum Field Theory

Ling-Fong Li

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Final Project due Wed Jan 7

This project will count for 50% of final grade and attendance 25%, homework 25%. Work out any one of the following problem. The write-up should be around 3 to 4 pages long and will make up 50% of the final grade for this semester. The write-up should be laid out logically in English and include essential points. You can look information from the net but you should use you own words to describe the physics rather than just copying the whold thing. Any formula used should quote the source and reference.

1. Landau theory of superfluid in terms of field theory, including the following elements
 - (a) Interacting Hamiltonian for dilute gas approximation
 - (b) Bogoliubov transformation
 - (c) Eigenvalues for the Hamiltonian
 - (d) Landau's criterion for the superfluidity
2. Monopole, including
 - (a) Classical monopole and electric charge quantization
 - (b) Dirac string
 - (c) 't Hooft-Polyakov monopole.
3. Dirac algebra in arbitrary dimension, including
 - (a) Construction of matrices in Dirac algebra in arbitray dimension
 - (b) Dimensionalities of the spinors
 - (c) Spinor representations of $O(n)$ group
4. Sudakov form factor, including
 - (a) Derivation
 - (b) High energy behavior