

Seminar Notice

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Theoretical Physics Department

Title:	Magnons in a honeycomb ferromagnet
Speaker:	Saikat Banerjee, Nordic Institute of Theoretical Physics, Nordita, Sweden
Date:	January 10, 2017 (Tuesday)
Time:	04:00 p.m.
Venue:	Theoretical Physics Seminar Room (R/No.-C406), 3rd Floor, Centenary Building, IACS
Abstract:	<p>The original discovery of the Dirac electron dispersion in graphene led naturally to the question of Dirac cone stability with respect to interactions, and the Coulomb interaction between electrons was shown to induce a logarithmic renormalization of the Dirac dispersion. With the rapid expansion of the list of compounds and quasiparticle bands with linear band touching, the concept of bosonic Dirac materials has emerged. At the single particle level, these materials closely resemble the fermionic counterparts. However, how the changed particle statistics affects the stability of Dirac cones has yet to be determined. Here we study the effect of interactions focusing on the honeycomb ferromagnet - where the quasiparticles are magnetic spin waves (magnons) with the same dispersion as the electrons for graphene. We demonstrate that magnon-magnon interactions lead to a significant renormalization of the bare band structure. The charge neutrality and Dirac spectrum of magnons result in finite lifetime effects with significant momentum dependence near the nodes and a temperature-dependent shift of the magnon bands. We also address the question of the edge and surface states for a finite system. We applied these results to chromium tri-halides CrX_3 ($X = \text{F}, \text{Cl}, \text{Br}$ and I), the class of ferromagnets where the magnetic Cr atoms are arranged in weakly coupled honeycomb layers. Our theory qualitatively accounts for hitherto unexplained anomalies in neutron scattering data from 40 years ago for CrBr_3. We expand the theory of ferromagnets beyond the standard Dyson theory and point to new exciting physics of Bose systems on non-Bravais lattices (e.g. honeycomb).</p>

All are cordially invited to attend the seminar