SEMINAIRE DE LA MATIERE CONDENSEE

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Phase transitions and magnon stability in gapped quantum spin chains

Mardi 9 mai à 14h 30
Salle de conférence 15 – Bâtiment 563

Quantum S=1 chains have a very rich phase diagram that includes gapped quantum spin liquids, exotic quantum spin solids, and incommensurate quantum-critical states. A very interesting issue is the stability of magnons in the various phases. The present talk addresses this problem experimentally, through a comparison of inelastic neutron spectra measured for the S=1 quasi-1D bond-alternating antiferromagnet NTENP, the uniform anisotropic S=1 -chain Haldane-gap compound NDMAP, and the uniform isotropic ``composite'' Haldane spin chain IPA-CuCl3. In modest applied fields the spectra of NDMAP and IPA-CuCl3 feature three sharp gap excitations. However, in the latter material, the magnon spectrum terminates at a certain critical wave vector, due to an unusual 2-magnon decay process. In NTENP, even at the zone-center, only two of the 3 magnon branches are true long-lived single-particle states, with the 3rd mode being anomalously weak and broadened due to magnon interactions. Above the critical field of magnon condensation, the spectral differences become even more pronounced. NDMAP retains a triplet of massive long-lived excitations. In IPA-CuCl3 there are also three sharp modes, but one is actually gapless. In NTENP only one sharp excitation branch is observed, but there is evidence of additgapped continua.

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