

Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Hole Properties In and Out of Magnetization Plateaus in 2-d Antiferromagnet¹ IMAM MAKHFUDZ, PIERRE PUJOL, Laboratoire de Physique Théorique–IRSAMC, CNRS and Université de Toulouse, UPS, France — We study the signatures of magnetization plateaus and the presence or absence of Goldstone modes in terms of their effects on the physics of holes in hole-doped two-dimensional antiferromagnet defined on square lattice. Holes with quadratic dispersion around Fermi point existing at infinitesimally small doping and linear dispersion around nearly circular Fermi surface at finite but low doping are investigated. They are coupled to an effective gauge field, generated by the spin sector, which subsequently mediates interaction between the holes. We find that out-of-plateaus case leads to algebraically decaying long-range interaction between fermionic holes with both Coulombic and dipolar forms, whereas in-plateaus case leads to short-range (local) interaction. We show that the spectral peak is significantly broadened in the out-of-plateaus case, while the spectral weight is still sharply-peaked in the in-plateau case. This conclusion holds in both infinitesimally small doping limit and in the more realistic finite doping case. We also extend the result obtained for 1-D system where finite hole doping gives rise to a shift in the magnetization value of the plateaus. Reference: arXiv:1411.1713

¹IM is supported by grant No. ANR-10-LABX-0037 of the Programme des Investissements d’Avenir of France

Imam Makhfudz
Laboratoire de Physique Théorique–IRSAMC,
CNRS and Université de Toulouse, UPS, France

Date submitted: 07 Nov 2014

Electronic form version 1.4