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Matter Chern-Simons Theories in a Background Magnetic Field

We study large N 2+1 dimensional fermions in the fundamental representation of an $SU(N)_k$ Chern Simons gauge group in the presence of a uniform background magnetic field for the U(1) global symmetry of this theory. The magnetic field modifies the Schwinger Dyson equation for the propagator in an interesting way; the product between the self energy and the Greens function is replaced by a Moyal star product. Employing a basis of functions previously used in the study of non-commutative solitons, we are able to exactly solve the Schwinger Dyson equation and so determine the fermion propagator. The propagator has a series of poles (and no other singularities) whose locations yield a spectrum of single particle energies at arbitrary t' Hooft coupling and chemical potential. The usual free fermion Landau levels spectrum is shifted and broadened out; we compute the shifts and widths of these levels at arbitrary t'Hooft coupling. As a check on our results we independently solve for the propagators of the conjecturally dual theory of Chern Simons gauged large N fundamental Wilson Fisher bosons also in a background magnetic field but this time only at zero chemical potential. The spectrum of single particle states of the bosonic theory precisely agrees with those of the fermionic theory under Bose-Fermi duality.

SPECIAL DAY!　**SPECIAL TIME!**　**SPECIAL ROOM!**

Tuesday, July 2, 2019
3:30pm
403 Physical Sciences Building