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The free energy of the large- N fermionic Chern–Simons theory in the ‘temporal’ gauge on $\mathbb{R}^2$ and S^2

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Most of the computational evidence for the Bose–Fermi duality of fundamental fields coupled to $U(N)$ Chern–Simons theories originates in the large- N calculations performed in the light-cone gauge. In this paper, we use another gauge, the ‘temporal’ gauge, to evaluate the finite temperature partition function of $U(N)$ coupled regular and critical fermions on $\mathbb{R}^2$ at large N . We first set up the finite temperature gap equations, and then use tricks we invented like ‘symmetrization’ to solve these equations exactly and evaluate the partition function. Our final results are in perfect agreement with earlier light-cone gauge results. The success of our ‘temporal’ gauge calculation potentially opens a path to computations that are awkward in light-cone gauge but more natural in the ‘temporal’ gauge, e.g. the evaluation of the thermal free energy on a finite-sized sphere.

Link to publication (if applicable)

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