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Magnetic fluctuations and specific heat in Na_xCoO_2 near a Lifshitz Fermi surface topological transition[1] SERGEY SLIZOVSKIY, Department of Physics, Loughborough University, Loughborough LE11 3TU, UK, JOSEPH BETOURAS, Loughborough University, ANDREY CHUBUKOV, Department of Physics, University of Wisconsin-Madison, Madison, WI 53706, USA — We analyze the temperature and doping dependence of the specific heat $C(T)$ in Na_xCoO_2. This material was conjectured to undergo a Lifshitz -type topological transition at $x = x_c = 0.62$, in which a new electron Fermi pocket emerges at the Γ point, in addition to the existing hole pocket with large k_F. The data show that near $x = x_c$, the temperature dependence of $C(T)/T$ at low T gets stronger as x approaches x_c from below and then reverses the trend and changes sign at $x \geq x_c$. We argue that this behavior can be quantitatively explained within the spin-fluctuation theory. We show that magnetic fluctuations are enhanced near x_c at momenta around k_F and their dynamics changes between $x \leq x_c$ and $x > x_c$, when the new pocket forms. We demonstrate that this explains the temperature dependence of $C(T)/T$. We show that at larger x ($x > 0.65$) the system enters a magnetic quantum critical regime where $C(T)/T$ roughly scales as $\log T$. This behavior extends to progressively lower T as x increases towards a magnetic instability at $x \approx 0.75$.

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