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Critical scattering in classical and quantum critical systems

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We report on a study of critical scattering in classical and nearly quantum critical antiferromagnets (AFMs). The energy width of the critical scattering was determined by high-resolution neutron spin-echo at TRISP at the MLZ in Munich. The classical systems studied include the $s=5/2$ AFMs Rb_2MnF_4 and MnF_2 with quasi 2D and 3D spin interactions, respectively. Both compounds are Heisenberg AFMs with a small uniaxial anisotropy resulting from dipolar spin-spin couplings, which leads to a crossover in the critical dynamics close to the Neel-Temperature (TN). By means of our high-resolution measurement we were able to identify the dynamical critical exponents z for both longitudinal and transverse fluctuations. Thus discrepancies between experiment and theory observed in previous three-axis studies could be resolved. For a study of quantum critical systems, we chose the $\text{CeCu}(6-x)\text{Au}(x)$ series, which exhibits a quantum critical point at $x=0.1$ separating nonmagnetic ($x<0.1$) and magnetically ordered ground states ($x>0.1$). First measurements at $\text{CeCu}_{5.8}\text{Au}_{0.2}$ (TN=0.22K) show a hitherto unexplained dynamical critical exponent.

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