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Asymmetric thermal linehape broadening in a dimerised antiferromagnet - evidence for strong correlations at finite temperature B. LAKE, Helmholtz Zentrum Berlin fur Materialien und Energie, Germany (HZB), D.L. QUINTERO-CASTRO, A.T.M.N. ISLAM, (HZB), E.M. WHEELER, Institut Laue Langevin, Grenoble, France, C. BALZ, (HZB), M. MANSSON, Laboratory for Solid State Physics, ETH Zurich, Switzerland (ETHZ), K.C. RULE, (HZB), S. GVASALIYA, A. ZHELUDEV, (ETHZ) — In the conventional picture of thermal effects in magnetism, the excitations are long-lived at low temperatures and their lifetime decreases with temperature. The explanation is that thermally activated excitations collide with each other limiting their lifetimes - observed experimentally as a symmetric Lorentzian energy broadening of the lineshape. This is confirmed for gapless magnets with long-range magnetic order. Here the excitations interact only weakly and fluctuate among the large range of available states in an uncorrelated manner. The damping is due simply to loss of coherence associated with the reduced lifetime. The concept of thermal decoherence and symmetric Lorentzian linewidth broadening is assumed to apply to all magnetic systems. This presentation will discuss $Sr_3Cr_2O_3$ which is 3-dimensional network of antiferromagnetic dimers with gapped magnon excitations. High resolution inelastic neutron scattering reveals that its lineshape broadens *asymmetrically* with increasing temperature. This indicates that far from becoming increasingly incoherent with temperature, the excitations behave collectively like a strongly correlated gas of hard-core Bosons.

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