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Geometric Frustration and Dimensional Reduction at a Quantum Critical Point¹

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The universality class of a critical point depends on a few properties such as the symmetry of the underlying model, the range of the interactions, the number of components of the order parameter, and the space dimensionality. Usually these properties do not change when the system approaches its critical point. However, this is not true in general. For instance, it is natural to ask what happens when the coupling along one of the spatial dimensions vanishes right at the critical point. This is the case of a Bose Einstein Condensation quantum phase transition whenever the underlying lattice consists of layers coupled by a geometrically frustrated interaction. We will show in this talk that this results in a dimensional reduction at the quantum critical point as manifested by its critical exponents. Our theoretical predictions for the critical temperature as a function of the chemical potential correspond very well with recent measurements in BaCuSi₂O₆ [S. E. Sebastian *et al*, Nature **411**, 617 (2006)].

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