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Dynamics of model systems with correlated disorder

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In condensed matter, frustration emerges from the impossibility to satisfy all constraints simultaneously. Oftentimes, this leads to exotic phases of matter with quasi-particle excitations. One such example is the Coulomb phase of spin ice which has emergent monopole excitations. The Coulomb phase has a highly degenerate ground state but with long-range correlation whose signature are the pinch points appearing in the (static) structure factor. In this project, we are interested in one such material, $CsNiCrF_6$[1], which is described by not one but three Coulomb phases: charge ice, displacement ice and a pyrochlore Heisenberg-like spin liquid. One characteristic property of this material is the structural correlated disorder. This provides an environment for the study of the interplay between frustrated magnetism and correlated disorder. We investigate both the magnetic and vibrational dynamics of model systems with correlated disorder of the type found in $CsNiCrF_6$.

[1] Fennell *et al.*, Nature Physics **15**, 60 (2019)
[2] Robert *et al.*, PRL **101**, 117207 (2008)

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