Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Geometric interpretation of spin correlations and applications to ultracold physics TONY MIRASOLA, KENNETH WANG, IAN G. WHITE, JACOB HOLLINGSWORTH, RICK MUKHERJEE, KADEN R.A. HAZZARD, Rice University — Abstract: We develop a general method to visualize spin correlations and demonstrate its broad usefulness for different models realized in ultracold matter, from fermions in lattices to trapped ions and ultracold molecules. We provide a one-to-one map between the spin correlations and certain three-dimensional objects, analogous to the map between single spins and Bloch vectors. This makes the geometric structure of the correlations manifest. Moreover, much as one can reason geometrically about dynamics using a Bloch vector – e.g. a magnetic field causes it to precess and dephasing causes it to shrink – we show that analogous reasoning holds for our visualization of correlations for real physical spin models. Applying this to ultracold matter, we find that seemingly mysterious and complicated dynamics becomes straightforward to understand in this representation.

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Date submitted: 11 Nov 2016 Electronic form version 1.4