Abstract Submitted for the MAR17 Meeting of The American Physical Society

The Tenfold Way: Fermionic Systems with N-body interactions¹ VIJAY B. SHENOY, ADHIP AGARWALA, ARIJIT HALDAR, Indian Institute of Science — We provide a systematic treatment of the tenfold way of classifying fermionic systems that naturally allows for the study of those with arbitrary N-body interactions. We identify four types of symmetries that such systems can possess, which consist of one ordinary type (usual unitary symmetries), and three *non*-ordinary symmetries (such as time reversal, charge conjugation and sublattice). Focusing on systems that possess no non-trivial ordinary symmetries, we demonstrate that the non-ordinary symmetries are strongly constrained. This approach not only leads very naturally to the tenfold classes, but also obtains the canonical representations of these symmetries in each of the ten classes. We also provide a group cohomological perspective of our results in terms of projective representations. We then use the canonical representations of the symmetries to obtain the structure of Hamiltonians with arbitrary N-body interactions in each of the ten classes. We show that the space of N-body Hamiltonians has an affine subspace (of a vector space) structure in classes which have either or both charge conjugation and sublattice symmetries. Our results can help address open questions on the topological classification of interacting fermionic systems.

¹Supported by DST/CSIR, India

Vijay B. Shenoy Indian Institute of Science

Date submitted: 10 Nov 2016

Electronic form version 1.4