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THE QUANTUM SPACETIME SEMINAR SERIES

Some model *anticommuting* qubit Hamiltonians with extensively degenerate many-body spectra

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Venue: A 304

We discuss a class of lattice S=1/2 quantum Hamiltonians with bond-dependent couplings with quantum spin liquidity introduced recently by the author. These models have a mutually «anticommuting» algebra of extensively many local Z_2 conserved charges -- the adjective in the title for these quantum spin liquids. This mutual algebra is like the algebra of quantum spin-1/2 local degrees of freedom however arising in the structure of the *local conserved charges*. As provable consequences, these models have finite residual entropy density in the ground state with a simple but non-trivial degeneracy counting and concomitant quantum spin liquidity. The spin liquidity relies also on a geometrically site-interlinked character that is natural for *anticommuting* local conserved charges composed of spin-1/2 operators or Paulis, in contrast to e.g. the bond-interlinked character of the local Z_2 conserved plaquette charges of the Kitaev honeycomb spin-1/2 model which leads to a mutually commuting algebra. We will discuss the connections and differences of this kind of quantum spin liquidity in relation to many-body topological order found in some gapped quantum spin liquids -- the canonical example being the Kitaev toric code which belongs to the more general class of Levin-Wen or string net constructions with mutually commuting algebras of conserved charges. We will make several new exact statements on the possible infinite dimensional representations of the «anticommuting» many-body operator algebra present in this model class. Could these qubit Hamiltonians be qubit-regularized versions of some objects of interest for the quantum structure of space-time?

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