1051-81-167   **Seung-Moon Hong*** (`seungmoon.hong@utoledo.edu`), Department of Mathematics, 2801 W. Bancroft Street, Toledo, OH 43606. *On symmetrization of 6j-symbols and Levin-Wen Hamiltonian.*

We will talk about spherical fusion categories and their 6j-symbols. More specifically the 6j-symbols in the well-known examples are invariant under the symmetry group of the tetrahedron. V. Turaev showed that a ribbon category with unimodality allows symmetrized 6j-symbols, and which implies that the state sum model on closed 3-manifold is invariant under the bistellar moves on triangulations. However this need not be the case in general. We define the mirror conjugate symmetry of $6j$-symbols instead and show that 6j-symbols of any unitary spherical category can be normalized to have this property.

As an application, we discuss an exactly soluble model on a honeycomb lattice. For the Levin-Wen Hamiltonian on a honeycomb lattice, it was assumed that the 6j-symbols have tetrahedral symmetry and it was shown that the Hamiltonian is exactly soluble. Levin and Wen also asserted in the paper that the Hamiltonian is hermitian. We prove that the Levin-Wen Hamiltonian is exactly soluble and hermitian on a unitary spherical category. In the proof, the mirror conjugate symmetry plays an important role. (Received August 24, 2009)