# An analysis of the Spekkens toy theory with connection to Wootters discrete phase space

## ABSTRACT

The toy model of Spekkens is a formalism which can partially describe quantum mechanics. The theory deals with the (epistemic) states of a spin-1/2 particle, or qubits and it is closely related to the discrete phase space formalism of Wootters and collaborators. One can apply the stabilizer formalism for finding similarities of these two models. Noting that MUB basis vectors are obtained by eigenstates of generalized Pauli operators, the MUB basis vectors are thus the set of stabilizer states. Galvao has characterized the set of states with non-negative Wigner function class; they form the convex hull of the stabilizer states used as the MUB basis vectors. By combining both approaches, one can show epistemic states that are analogous to the convex hull of the stabilizer states (used as basis vectors in the MUB set) always make valid nonmaximal knowledge epistemic states.

**Keyword:** Discrete phase space; Quantum theory; Wigner functions