MUBs in generalized probabilistic theories

In a joint work with T. Patarek and B. Dakic (http://iopscience.iop.org/1367-2630/12/5/053037I I showed that the principle of limited information content gives rise to the existence of measurements whose results cannot be simultaneously predicted with certainty (mutually complementary measurements). However, it does not specify the number of these measurements. Therefore, models different than classical theory (with no complementary measurements) and quantum theory (e.g., with three complementary measurements for the simplest quantum system (qubit)) are compatible with the principle. An example of the theories is quaternionic mechanics in which the amplitudes are based on quaternionic instead of complex numbers. We showed that a higher number of complementary measurements leads to a higher computational power for the theories. Moreover, all these theories can be simulated by complex quantum mechanics provided additional degrees of freedom are consumed.