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Symmetric States on the Octonionic Bloch Ball[1]

MATTHEW GRAYDON, University of Waterloo, Perimeter Institute for Theoretical Physics, Institute for Quantum Computing — Finite-dimensional homogeneous self-dual cones arise as natural candidates for convex sets of states and effects in a variety of approaches towards understanding the foundations of quantum theory in terms of information-theoretic concepts. The positive cone of the ten-dimensional Jordan-algebraic spin factor is one particular instantiation of such a convex set in generalized frameworks for quantum theory. We consider a projection of the regular 9-simplex onto the octonionic projective line to form a highly symmetric structure of ten octonionic quantum states on the surface of the octonionic Bloch ball. A uniform subnormalization of these ten symmetric states yields a symmetric informationally complete octonionic quantum measurement. We discuss a Quantum Bayesian reformulation of octonionic quantum formalism for the description of two-dimensional physical systems. We also describe a canonical embedding of the octonionic Bloch ball into an ambient space for states in usual complex quantum theory.

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