

Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Quantum State Spaces over Associative Composition Algebras¹

MATTHEW GRAYDON, University of Waterloo — Wootters pointed out that a theory of quantum mechanics could be formulated without probability amplitudes [1]. Usual quantum theory over the complex field is among those in a hierarchy of theories indexed by their capacity, as defined in [2]. We explore the structure of quantum state spaces over associative composition algebras within the general Quantum Bayesian framework proposed by Fuchs and Schack [2]. We consider the possibility of expanding self-adjoint operators in terms of symmetric informationally complete bases for different algebraic modules. We chart the geometry of quantum state space on the corresponding probability simplexes by imposing a self-adjoint positive semi-definite nature to the pure states and their convex hull.

[1] W. K. Wootters, “Quantum Mechanics without Probability Amplitudes,” *Foundations of Physics*, Vol. 16, No. 4 (1985)

[2] C. A. Fuchs and R. Schack, “Quantum-Bayesian Coherence,” arXiv:0906.2187v1 [quant-ph] (2009)

¹This work was supported in part by the U. S. Office of Naval Research (Grant No. N00014-09-1-0247).

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Date submitted: 08 Dec 2009

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