

Research Proposal of Zouhair Mouayn

1. Coherent states and real Julia sets

We propose to replace the coefficients $z^n/\sqrt{n!}$ of the canonical coherent states by a set of orthogonal polynomials on a specific Julia set associated with a quadratic mapping. We will make use of the orthogonality measure of these polynomials to obtain a suitable resolution of the identity of quantum states Hilbert space \mathcal{H} . These states are superposition of eigenstates of a Hamiltonian which should acts on \mathcal{H} and could be connected with the Julia set.

References

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- [2] M. F. Barnsley, A. N. Harrington and JS Geronimo.: Orthogonal polynomials associated with invariant measures on Julia sets, *Bull. Amer. Math. Soc.* **7** (2) 381-384 (1982).
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2. Coherent States and q -Orthogonal Polynomials

The true-polyanalytic spaces [1] play an important role in both Frame Theory and Quantum Physics. Therefore studying their q -deformations is of great interest because this will lead to new results in signal analysis and quantum mechanics. Precisely, our purpose is to investigate properties of new q -analogues of complex Hermite polynomials [2] in connection with the physics of q -deformed oscillators [3]. The goal is to construct new q -coherent states (q -CS) and new q -frames. These q -CS will be attached to higher Euclidean Landau levels of the uniform magnetic field. Thus, the work has twofold purpose in its essence it is directed toward both the physics, signal analytic mathematical and q -calculus communities.

References

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