International scientific conference

“Algebraic and Geometric Methods of Analysis”

Book of abstracts

May 28 - June 3, 2019

Odesa, Ukraine

Conference webpage: *imath.kiev.ua/~topology/conf/agma2019/*

List of topics

- Algebraic methods in geometry
- Differential geometry in the large
- Geometry and topology of differentiable manifolds
- General and algebraic topology
- Dynamical systems and their applications
- Geometric problems in mathematical analysis
- Geometric and topological methods in natural sciences
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On isometries satisfying deformed commutation relations

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We consider certain perturbation of family of pairwise orthogonal isometries. Namely, we study properties and representation theory of C^*-algebra $\mathcal{E}^q_{1,n}$ generated by isometries t, s_j, $j=\overline{1,n}$, subject to the relations

$$s_i^* s_j = 0,\ i \neq j, \quad t^* s_j = q s_j t^*.$$

In recent paper [1] was studied the C^*-algebra $\mathcal{E}^q_{n,m}$ with $n,m \geq 2$, generated by families $\{t_j\}_{j=1}^m$ and $\{s_i\}_{i=1}^n$. In particular, it was shown that for $|q|<1$ one has $\mathcal{E}^q_{n,m} \simeq \mathcal{E}^0_{n,m}$ and for $|q|=1$ the C^*-isomoprphism class of quotient of $\mathcal{E}^q_{n,m}$ by the unique largest ideal is independent of q and isomorphic to the tensor product of Cuntz algebras $\mathcal{O}_n \otimes \mathcal{O}_m$.

We show that the result for $|q|<1$ remains true for $\mathcal{E}^q_{1,n}$.

Theorem 1. *For any $q \in \mathbb{C}$, $|q|<1$, one has an isomorphism $\mathcal{E}^q_{1,n} \simeq \mathcal{E}^0_{1,n}$.*

Notice that the proof contains an explicit construction of the required isomorphism, which is similar to the one given in [1].

For the case $|q|=1$ we obtain the following facts.

Definition 2. The Fock representation, π^q_F, of $\mathcal{E}^q_{1,n}$, is the unique up to unitary equivalence irreducible $*$-representation having the vacuum vector Ω, $||\Omega||=1$, such that

$$\pi^q_F(s_j^*)\Omega = 0, \quad \pi^q_F(t^*)\Omega = 0, \quad j=\overline{1,n}.$$

Theorem 3. *The Fock representation of $\mathcal{E}^q_{1,n}$ exists and is faithful.*

Theorem 4. *The C^*-algebra $\mathcal{E}^q_{1,n}$ is nuclear.*

Also we prove an analog of Wold decomposition Theorem for such family of isometries, and study irreducible representations corresponding to each of its components.

References

[1] A. Kuzmin, V. Ostrovskyi, D. Proskurin and R. Yakymiv. On q-tensor product of Cuntz algebras, preprint (2019), https://arxiv.org/abs/1812.08530