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Fusion bialgebras and Fourier analysis. Analytic obstructions for unitary categorification.
(English) Zbl 07399496

Summary: We introduce fusion bialgebras and their duals and systematically study their Fourier analysis. As an application, we discover new efficient analytic obstructions on the unitary categorification of fusion rings. We prove the Hausdorff-Young inequality, uncertainty principles for fusion bialgebras and their duals. We show that the Schur product property, Young’s inequality and the sum-set estimate hold for fusion bialgebras, but not always on their duals. If the fusion ring is the Grothendieck ring of a unitary fusion category, then these inequalities hold on the duals. Therefore, these inequalities are analytic obstructions of categorification. We classify simple integral fusion rings of Frobenius type up to rank 8 and of Frobenius-Perron dimension less than 4080. We find 34 ones, 4 of which are group-like and 28 of which can be eliminated by applying the Schur product property on the dual. In general, these inequalities are obstructions to subfactorize fusion bialgebras.

MSC:
46L89 Other “noncommutative” mathematics based on C*-algebra theory
18M20 Fusion categories, modular tensor categories, modular functors
16T10 Bialgebras
43A99 Abstract harmonic analysis

Keywords:
quantum Fourier analysis; subfactors; planar algebras; fusion rings; unitary categorification

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SageMath

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References:
[12] Janson, S., Roots of polynomials of degrees 3 and 4 (2010), preprint
[19] Kaplansky, I., Bialgebras, Lecture Notes in Mathematics (1975), Department of Mathematics, University of Chicago, iv+57 pp · Zbl 1311.16029
[23] Liu, Z., Yang-Baxter relation planar algebras, preprint
[34] Palcoux, S. (2020)
[38] Serre, J. P., Topics in Galois Theory, Research Notes in Mathematics, vol. 1 (2008), xvi+120 pp

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