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## ABSTRACT

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## Central limit theorems for braided coin tosses

**Abstract**: We consider certain representations of the infinite braid group on the hyperfinite  $II_1$  factor. These representations are parametrized by a unimodular complex number  $\omega$  and allow us to introduce so-called  $\omega$ -shifts which interpolate between the usual tensor shift ( $\omega = 1$ ) and the CAR shift in its Jordan-Wigner form ( $\omega = -1$ ). We set up braided sequences of quantum coin tosses and study their central limit laws. We show that such sequences provide central limit laws which interpolate between the normal distribution ( $\omega = 1$ ) and the symmetric Bernoulli distribution ( $\omega = -1$ ). These central limit laws depend only on the real parameter  $q = \Re \omega$ , but differ from distributions of q-Gaussian random variables for |q| < 1, starting the 8-th moment. We provide concrete moment formulas for these laws through the combinatorics of directed ordered pair partitions. If time permits, I will address multivariate versions of these central limit laws which describe the distribution of ' $\omega$ -semicircular systems'. Such systems corresponds to ' $\omega$ -circular systems' (introduced by Mingo and Nica in 2001), as 'q-semicircular systems' (aka 'q-Gaussian systems') correspond to 'q-circular systems'.

This is joint work with Ayman Alahmade (Taibah University).

- Ayman Alahmade. Algebraic Central Limit Theorems in Noncommutative Probability. PhD Thesis, University College Cork. https://cora.ucc.ie/handle/10468/12591 (2022).
- [2] Ayman Alahmade, and Claus Köstler. Central limit theorems for braided coin tossing. In Preparation.