Some applications of the discrete Fourier transform to the SIC-POVM problem

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Abstract

Several interesting structures in finite dimensional Hilbert space hinge on Heisenberg groups, and Heisenberg groups enjoy symplectic automorphisms. For SIC-POVMs symplectic transformations of order three are of special interest. The discrete Fourier transform is of order 4. I will give a number of examples where the discrete Fourier transform plays an important role in the SIC-POVM problem. Some of them are taken from the literature [1, 2, 3], some of them are new.

References

[1] A. Einstein, Méthode pour la détermination de valeurs statistique d'observations concernant des grandeurs soumises à des fluctuations irrégulièrs. *Archive des Sciences*, **37**: 254-256, 1914.

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[3] M. Appleby, I. Bengtsson, M. Grassl, M. Harrison and G. McConnell. SIC-POVMs from Stark units: Prime dimensions $n^2 + 3$. *Journal of Mathematical Physics*, **63** (11), 2022.