# Hypergraph-Based Contextuality

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Quantum contextuality finds applications in quantum communication, quantum computation, and quantum foundational studies and has been substantiated by numerous experiments. That prompted generation of sets of quantum observables capable to reveal contextuality for any quantum state of a given dimension, the so-called state independent contextual sets. Recently a general method for vector generation of Kochen-Specker (KS) contextual sets for even-dimensional spaces based on vector hypergraphs has been designed [1, 2, 3, 4] which superseded the previous methods. In the present contribution we shall present a novel method based on McKay-Megill-Pavičić (MMP) hypergraphs that enables us to obtain arbitrary many related hypergraph sets in an arbitrary dimensional space. The method contains our previous methods. In the very talk we shall present thousands of 3-dim hypergraph contextual sets that have not been known or obtained ever before. They contain from 192 down to 5 vectors and their critical sets are spanned with 54 down to 5 vectors. They include all previously known sets like Conway-Cohen 31 vector set, Yu-Oh 13 vector set, or Klyachko-Can-Binicioglu-Shumovsky pentagram.

## References

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[2] M. Pavičić and N. Megill. Vector Generation of Quantum Contextual Sets in Even Dimensional Hilbert Spaces. *Entropy*, 20(12), 928 (2018). `https://doi.org/10.3390/e20120928`.

[3] M. Pavičić and N. Megill. Vector Generation of Contextual Sets. *EPJ Web of Conferences*, 198, 00009 (2019). `https://doi.org/10.1051/epjconf/201919800009`.

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