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TITULO: Topological Quantum Codes on Compact Surfaces

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ABSTRACT:

In this talk we propose a construction procedure of classes of topological quantum error correcting codes on compact surfaces. We will consider both genus g =1, the Euclidian case and genus g >= 2, the hyperbolic case. For the toric case (g =1) a construction procedure of toric quantum error correcting codes is presented via a group theory approach by using of square lattice tiling of the torus. This construction reproduces known codes and generates countless new classes of toric quantum codes. Class [[d2; 2; d]] provides the best codification rate.
For genus g >= 2 we make use of tools of hyperbolic geometry and graph theory. The hyperbolic case generalizes toric codes construction. We also tabulate the possible surface codes with genus 2, 3, 4 and 5. In particular, this construction reproduces the class of codes obtained when considering the embedding of complete graphs Ks, for s = 1 mod 4, on surfaces with appropriate genus. We also show a table comparing the rate of different codes when fixing the distance to 3, 4, and 5.