

Annihilator CSS Construction for Polycyclic Codes over Finite Chain Rings

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Quantum codes are a class of error-correcting codes designed to protect quantum information by detecting and correcting errors in quantum systems. The CSS (Calderbank-Shor-Steane) construction is a well-known method for building quantum codes from classical codes that preserve duality. Depending on the duality type, this method is known as either the Euclidean CSS construction or the Hermitian CSS construction.

Polycyclic codes are classical linear codes that remain invariant under the polycyclic shift operator. It is known that polycyclic codes and their Euclidean duals do not share the same structure, making the Euclidean CSS construction inapplicable to polycyclic codes.

The annihilator dual of polycyclic codes provides an alternative duality concept that, unlike the Euclidean dual, preserves the polycyclic structure. In this presentation, we introduce the annihilator CSS construction, a novel approach for constructing quantum codes from polycyclic codes over finite chain rings equipped with the annihilator dual.