Abstract

Quantum MDS Codes of Distance Three

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Similar to classical MDS codes, quantum MDS codes are quantum error-correcting codes (QECC) with parameters $[[n, k, d]]_q$ such that the quantum Singleton bound $k \leq n + 2 - 2d$ is reached. Quantum MDS (QMDS) codes are known to exist for $n \leq q + 1$ and all admissible parameters, as well as for certain other parameters, including $n = q^2 + 1$ and specific values d.

While classical linear codes can be shortened to any length, i. e., from a code $[n, k, d]$ one obtains a code $[n - r, k' \geq k - r, d' \geq d]$ for any r, $0 \leq r \leq k$, this is in general not true for quantum codes. Therefore, the existence of QMDS codes $[[q^2 + 1, q^2 + 3 - 2d, d]]_q$ does not directly imply the existence of QMDS codes $[[n, n + 2 - 2d, d]]_q$ for all n, $2d - 1 \leq n \leq q^2 + 1$.

The talk addresses this problem in general and discusses details of the construction of QMDS codes of distance three in particular.