香港科技大學(廣州)
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Floquet Code

Definition and Low-weight Measurement

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Outline

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Floquet Code needs more attention

- "Quantum error-correcting codes are a key ingredient for fault-tolerant quantum computation." [1]
- Design of quantum error correction codes concerns the improvement of [2]

  a) Code distance
  b) Ease of implementing logical gates
  c) Tradeoffs between the number of logical qubits and distance

- Surface code is not optimal by standard a) and c) [3] but has higher threshold in practice [4] due to **low-weight measurement** and **lower connectivity** hardware requirements compare to many families of qLDPC codes [5, 6]
- Floquet code is a family of codes that pushes these strength of surface code even further [7]

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Floquet Code has high threshold

- Threshold of $0.2\% - 0.3\%$ without native weight-2 measurement compare to $0.5\% - 0.7\%$ for surface code (why is there a range?) [7]
- Thershold of $1.5\% - 2.0\%$ with native weight-measurements [7]
- 6.4% on photonic platform [8]
- $\frac{k}{n} \to \frac{1}{2}$ on qudit codes [9]
- $5.6x$ fewer physical qubits are needed to implement Floquet code at depolarizing noise of 0.1% [5]

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Terms

- “The teraquop footprint is the number of physical qubits required to create a logical qubit reliable

enough to survive one trillion operations."

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