



# Examples of CSS Codes

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# Steane Code

Fewer qubits than Shor's code. Uses Hamming code to corrects flip errors (X errors) and the dual of the Hamming code, the [7,3,4] code, to correct for phase flip errors (Z errors)

***IIIXXXX***

***IXXIIXX***

***XIXIXIX***

***IIIZZZZ***

***IZZIIZZ***

***ZIZIZIZ.***

**$X_L = XXXXXX$**

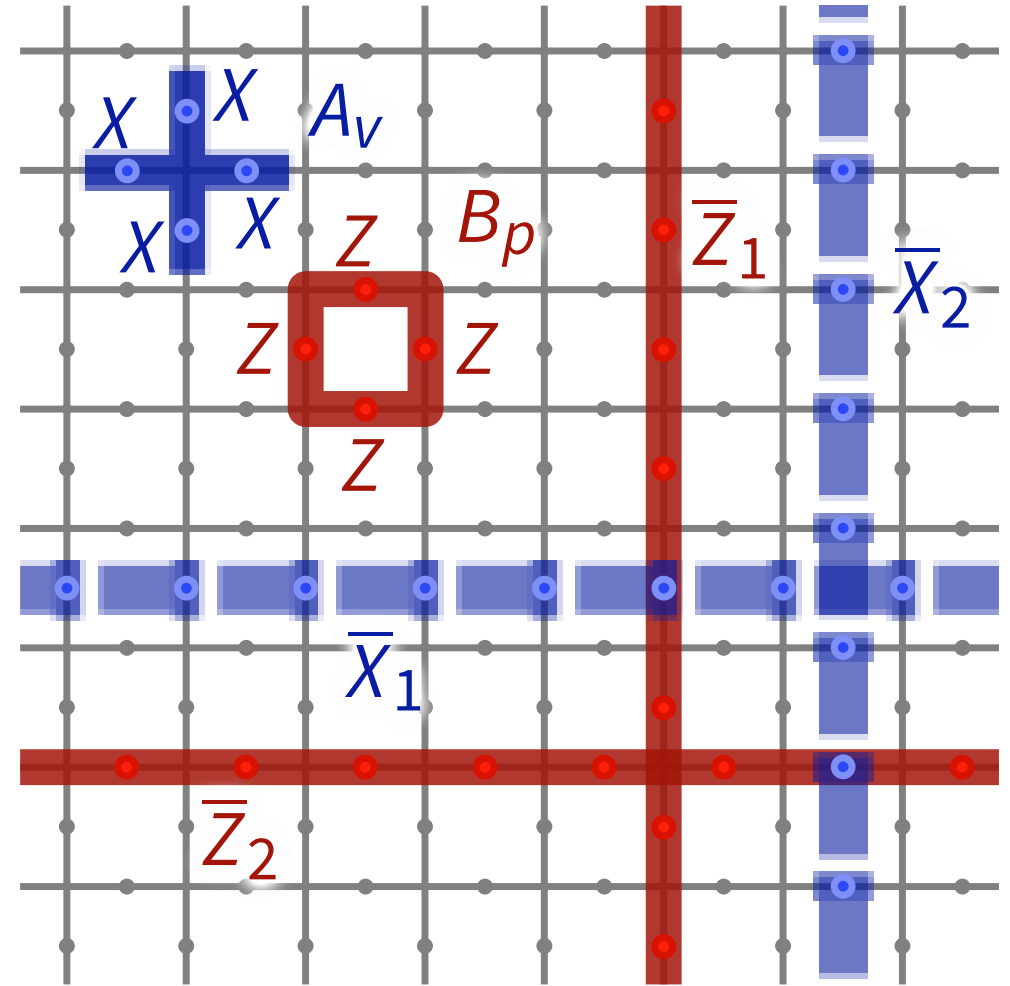
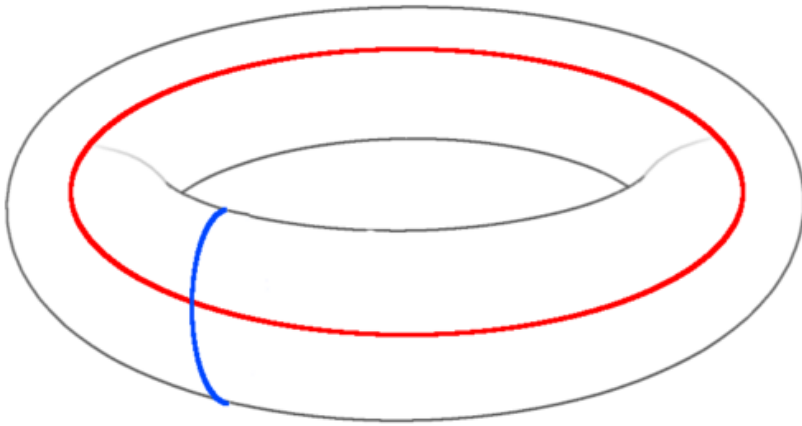
**$Z_L = ZZZZZZ.$**

$$|0\rangle_L = \frac{1}{\sqrt{8}} [ |0000000\rangle + |1010101\rangle + |0110011\rangle + |1100110\rangle \\ + |0001111\rangle + |1011010\rangle + |0111100\rangle + |1101001\rangle ]$$

$$|1\rangle_L = X_L |0\rangle_L.$$

# Kitaev toric code

- High threshold
- Corrects local errors



# Surface code

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- Toric code on surface with boundary
- High threshold
- Corrects local errors

