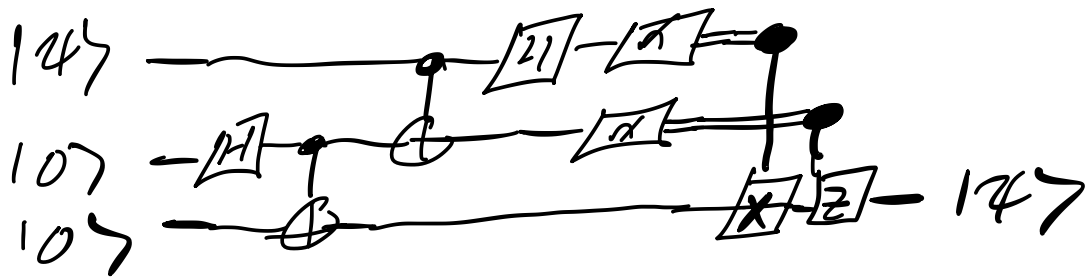


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- Behavior for any G , any π
 - A few classes of G (any π)

Quick SWAP Example

Teleportation



$$|\psi\rangle|0\rangle + |\psi\rangle|1\rangle$$

$$= \alpha|00\rangle + \beta|10\rangle + \alpha|01\rangle + \beta|11\rangle$$

$$\rightarrow \alpha|00\rangle + \beta|11\rangle + \alpha|01\rangle + \beta|10\rangle$$

$$\rightarrow \alpha|00\rangle + \alpha|10\rangle + \beta|01\rangle - \beta|11\rangle$$

$$+ \alpha|01\rangle + \alpha|11\rangle + \beta|00\rangle - \beta|10\rangle$$

$$= |00\rangle[\alpha|0\rangle + \beta|1\rangle]$$

$$+ |01\rangle[\beta|0\rangle + \alpha|1\rangle]$$

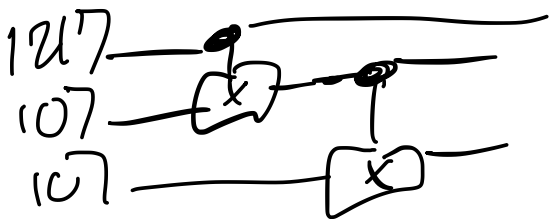
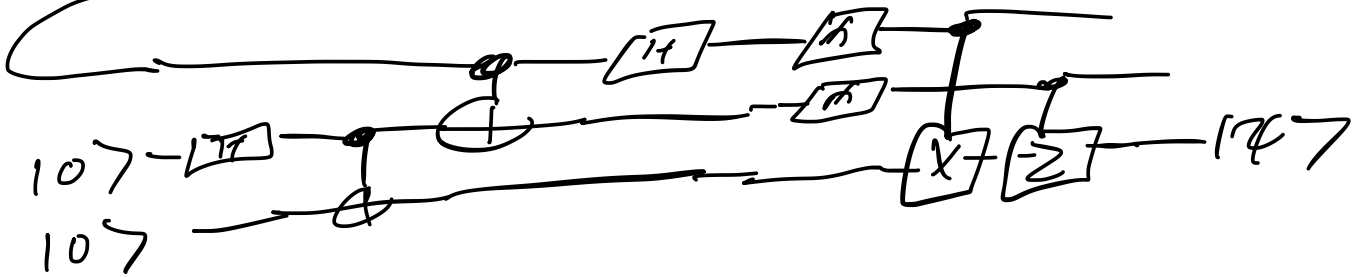
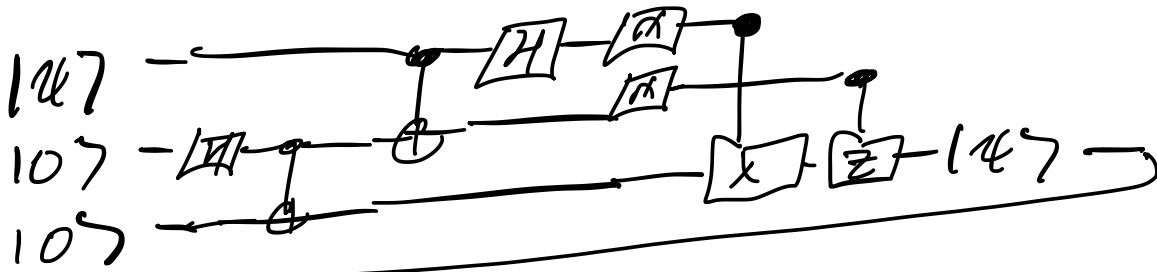
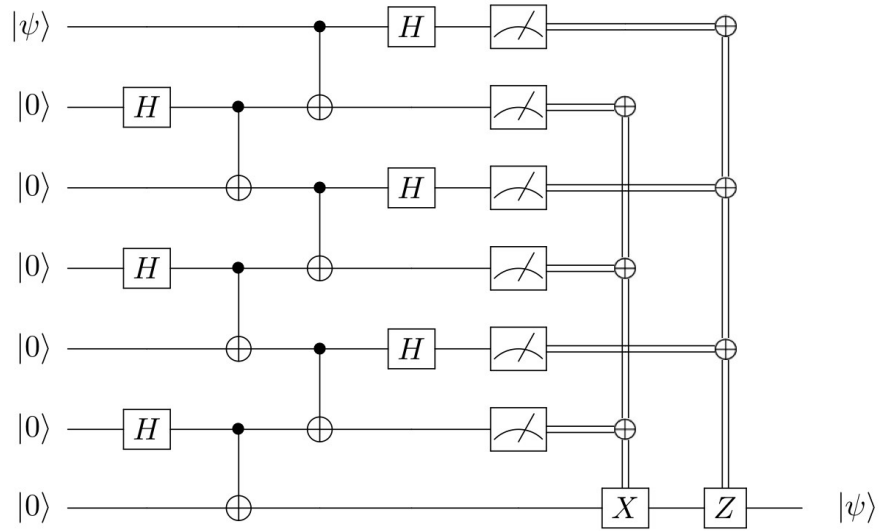
$$+ |10\rangle[\alpha|0\rangle - \beta|1\rangle]$$

$$+ |11\rangle[-\beta|0\rangle + \alpha|1\rangle]$$

$$= |00\rangle|\psi\rangle + |01\rangle X|\psi\rangle + |10\rangle Z|\psi\rangle$$

$$+ |11\rangle ZX|\psi\rangle$$

Long range teleportation in constant depth



$$\alpha|000\rangle + \beta|100\rangle$$

$$\alpha|000\rangle + \beta|111\rangle$$

