The top circuit is equivalent to

Check that bottom circuit works:

\[ |14\rangle \otimes |0\rangle = \sum_b c_b |b\rangle \otimes |0\rangle \xrightarrow{\text{H}} \frac{1}{\sqrt{2}} \sum_b c_b |b\rangle \otimes |c\rangle \xrightarrow{\text{V(\alpha)}} \frac{1}{\sqrt{2}} \sum_b c_b |b\rangle \otimes |c\rangle \]

= \frac{1}{\sqrt{2}} \sum_b c_b |b\rangle |\bar{c}\rangle

= \frac{1}{\sqrt{2}} |0\rangle |c\rangle + |1\rangle |\bar{c}\rangle

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\[ U^+ = V(x)I \otimes H \]

\[ U^+ = V(x)I \otimes H = I \otimes H \]

\[ U^+ = \text{Z} \otimes X \]

\[ |\psi\rangle \]

\[ |\phi\rangle \]

\[ |\psi\rangle \]

\[ |\phi\rangle \]

\[ |\psi\rangle \]

\[ |\phi\rangle \]
To do a unitary, we actually have to do $HU$ at the input to get rid of the $H$ at the output.

$$|\psi\rangle \xrightarrow{H} |H\psi\rangle$$

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$$|\psi\rangle \xrightarrow{H} |H\psi\rangle$$

$$|\psi\rangle \xrightarrow{H} |H\psi\rangle$$
Leaving out the Pauli corrections, we have our single-qubit-measurement circuit up to Pauli errors.

\[ |\psi\rangle \xrightarrow{U X U \otimes X} W Z U \xrightarrow{X^b Z^a W} |\phi\rangle \]

This is the same measurement circuit we got in the lectures by a different route.