

EQC – Lösungen 7

Aufgabe 1:

$$|00\rangle = \begin{pmatrix} 1 \\ 0 \\ 0 \\ 0 \end{pmatrix} \quad |01\rangle = \begin{pmatrix} 0 \\ 1 \\ 0 \\ 0 \end{pmatrix} \quad |10\rangle = \begin{pmatrix} 0 \\ 0 \\ 1 \\ 0 \end{pmatrix} \quad |11\rangle = \begin{pmatrix} 0 \\ 0 \\ 0 \\ 1 \end{pmatrix}$$

$$A = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix}$$

$$B = \begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix}$$

$$U1 = A |00\rangle = \begin{pmatrix} 1 \\ 0 \\ 0 \\ 0 \end{pmatrix}$$

$$U2 = A |01\rangle = \begin{pmatrix} 0 \\ 0 \\ 0 \\ 0 \end{pmatrix}$$

$$U3 = A |10\rangle = \begin{pmatrix} 0 \\ 0 \\ 0 \\ 0 \end{pmatrix}$$

$$U4 = A |11\rangle = \begin{pmatrix} 0 \\ 0 \\ 0 \\ 0 \end{pmatrix}$$

$$T1 = B \mid 00 > = \begin{pmatrix} 0 \\ 0 \\ 0 \\ 0 \end{pmatrix}$$

$$T2 = B \mid 01 > = \begin{pmatrix} 0 \\ 1 \\ 0 \\ 0 \end{pmatrix}$$

$$T3 = B \mid 10 > = \begin{pmatrix} 0 \\ 0 \\ 0 \\ 0 \end{pmatrix}$$

$$T4 = B \mid 11 > = \begin{pmatrix} 0 \\ 0 \\ 0 \\ 0 \end{pmatrix}$$

$$C = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & -1 \end{pmatrix}$$

$$V1 = C \mid 00 > = \begin{pmatrix} 1 \\ 0 \\ 0 \\ 0 \end{pmatrix}$$

$$V2 = C \mid 01 > = \begin{pmatrix} 0 \\ -1 \\ 0 \\ 0 \end{pmatrix}$$

$$V3 = C \mid 10 > = \begin{pmatrix} 0 \\ 0 \\ -1 \\ 0 \end{pmatrix}$$

$$V4 = C \mid 11 > = \begin{pmatrix} 0 \\ 0 \\ 0 \\ -1 \end{pmatrix}$$

Aufgabe 2:

$$\mid x > = \begin{pmatrix} \alpha \\ \beta \\ \gamma \\ \delta \end{pmatrix}$$

$$A = \begin{pmatrix} \alpha\alpha^* & \alpha\beta^* & \alpha\gamma^* & \alpha\delta^* \\ \beta\alpha^* & \beta\beta^* & \beta\gamma^* & \beta\delta^* \\ \gamma\alpha^* & \gamma\beta^* & \gamma\gamma^* & \gamma\delta^* \\ \delta\alpha^* & \delta\beta^* & \delta\gamma^* & \delta\delta^* \end{pmatrix}$$

$$C = \begin{pmatrix} 2\alpha\alpha^* - 1 & 2\alpha\beta^* & 2\alpha\gamma^* & 2\alpha\delta^* \\ 2\beta\alpha^* & 2\beta\beta^* - 1 & \beta\gamma^* & \beta\delta^* \\ 2\gamma\alpha^* & 2\gamma\beta^* & 2\gamma\gamma^* - 1 & 2\gamma\delta^* \\ 2\delta\alpha^* & 2\delta\beta^* & 2\delta\gamma^* & 2\delta\delta^* - 1 \end{pmatrix}$$

$$C \mid 00 > = \begin{pmatrix} 2\alpha\alpha^* - 1 \\ 2\beta\alpha^* \\ 2\gamma\alpha^* \\ 2\delta\alpha^* \end{pmatrix} = \begin{pmatrix} \frac{-1}{2} \\ \frac{1}{2} \\ \frac{1}{2} \\ \frac{1}{2} \end{pmatrix}$$

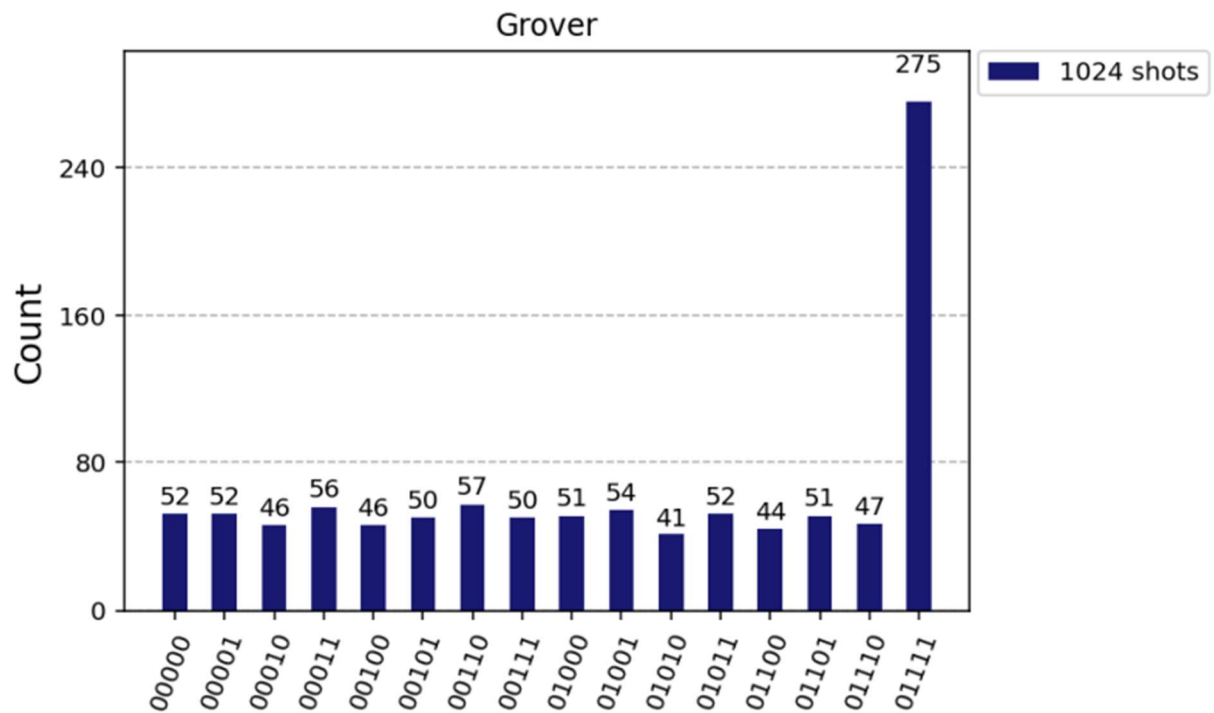
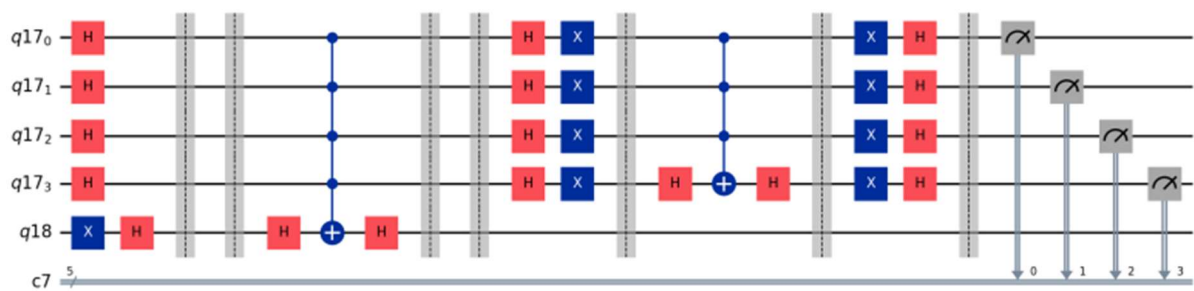
$$C \mid 01 > = \begin{pmatrix} 2\alpha\beta^* \\ 2\beta\beta^* - 1 \\ 2\gamma\beta^* \\ 2\delta\beta^* \end{pmatrix} = \begin{pmatrix} \frac{1}{2} \\ \frac{-1}{2} \\ \frac{1}{2} \\ \frac{1}{2} \end{pmatrix}$$

$$C \mid 10 > = \begin{pmatrix} 2\alpha\gamma^* \\ 2\beta\gamma^* \\ 2\gamma\gamma^* - 1 \\ 2\delta\gamma^* \end{pmatrix} = \begin{pmatrix} \frac{1}{2} \\ \frac{1}{2} \\ \frac{-1}{2} \\ \frac{1}{2} \end{pmatrix}$$

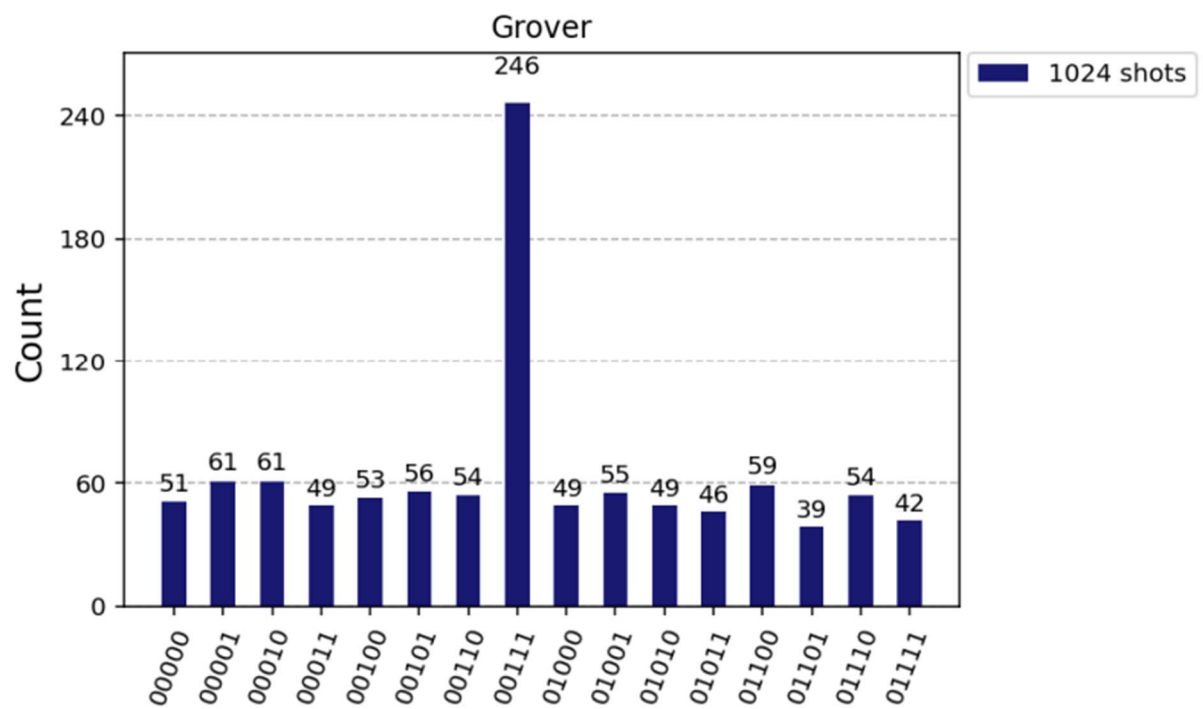
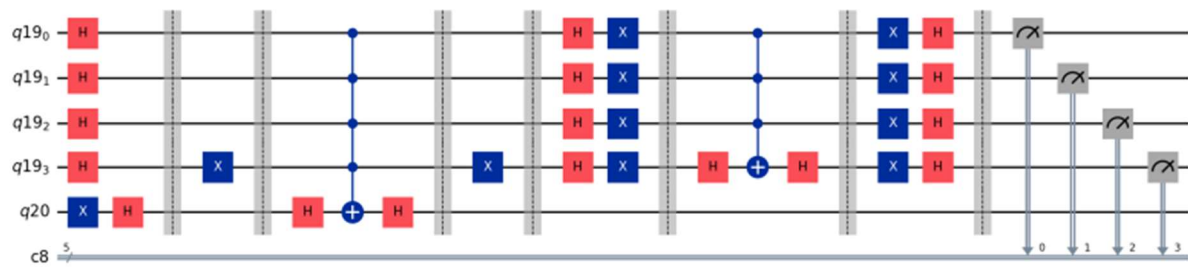
$$C | 11 \rangle = \begin{pmatrix} 2\alpha\delta^* \\ 2\beta\delta^* \\ 2\gamma\delta^* \\ 2\delta\delta^* - 1 \end{pmatrix} = \begin{pmatrix} \frac{1}{2} \\ \frac{1}{2} \\ \frac{1}{2} \\ \frac{-1}{2} \end{pmatrix}$$

Aufgabe 3:

$$- A \wedge B \wedge C \wedge D$$



$$- A \wedge B \wedge C \wedge \neg D$$



- $\neg A \wedge \neg B \wedge C \wedge D$

