

Equal superposition

$$\begin{aligned} |\psi\rangle &= \frac{1}{\sqrt{2}}|0\rangle + \frac{1}{\sqrt{2}}|1\rangle \\ &= |+\rangle \end{aligned}$$

$$\text{Prob}\{+1\} = 1 \text{ (state } |+\rangle)$$

$$\text{Prob}\{-1\} = 0 \text{ (state } |-\rangle)$$

Maximally mixed state

$$\begin{aligned} \rho &= \frac{1}{2}|0\rangle\langle 0| + \frac{1}{2}|1\rangle\langle 1| \\ &= \frac{1}{2}|+\rangle\langle +| + \frac{1}{2}|-\rangle\langle -| \end{aligned}$$

$$\text{Prob}\{+1\} = \frac{1}{2} \text{ (state } |+\rangle)$$

$$\text{Prob}\{-1\} = \frac{1}{2} \text{ (state } |-\rangle)$$