Partial Measurements

Simply - partial measurement allows us to measure only one of a quantum system that has more than one qubit.

For example:

If we had a state...

$$|\psi\rangle = \frac{1}{2}|00\rangle - \frac{i}{2}|10\rangle + \frac{1}{\sqrt{2}}|11\rangle$$

we can ask our self, what is the probability that the second qubit is a $\emptyset$?

Well we can see that there are only 2 options $\alpha|00\rangle + \beta|10\rangle$ where $\alpha = \frac{1}{2}$ & $\beta = \frac{-i}{2}$. In order to get the probability get the 2-norm of both states and then sum them.

$$\alpha = \left\|\frac{1}{2}\right\|^2 = \frac{1}{2}^2 = \frac{1}{4} \qquad \beta = \left\|\frac{-i}{2}\right\|^2 = \frac{1}{2} \qquad \text{then get their sum}$$

$\alpha + \beta = \frac{1}{4} + \frac{1}{2} = \frac{3}{4}$, so we have a $\frac{3}{4}$ chance of getting state $\emptyset$ as the second qubit.

normalization of 2 qubit state $\rightarrow \sqrt{2^2} = \underline{2}$