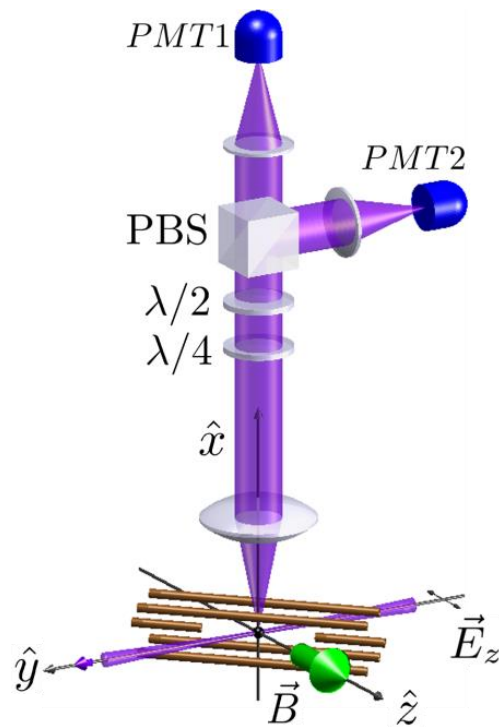
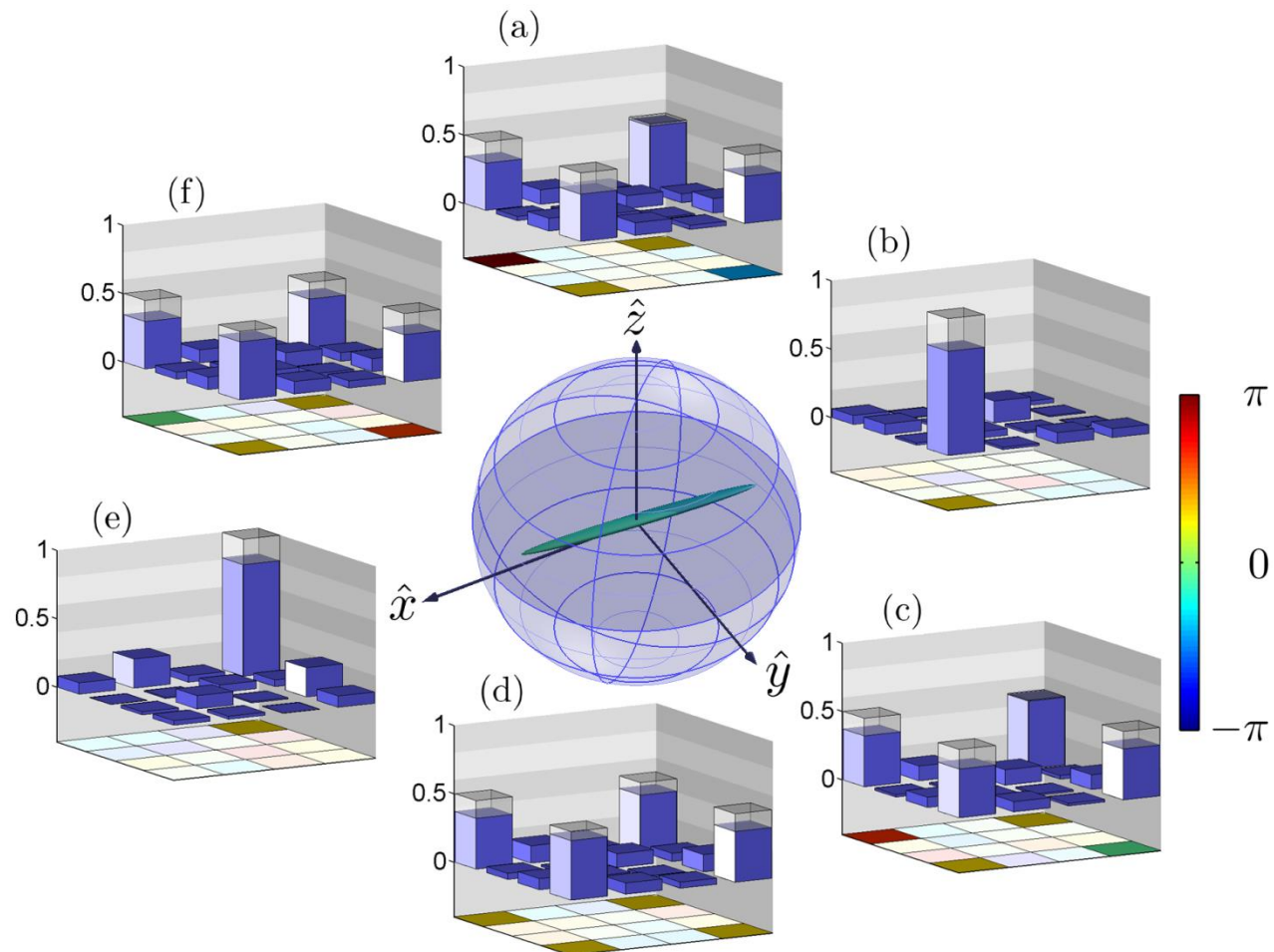


Atom-photon entanglement

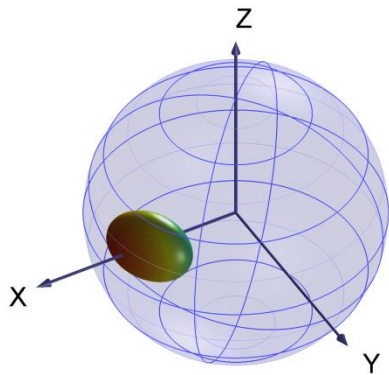


Ion-photon state tomography

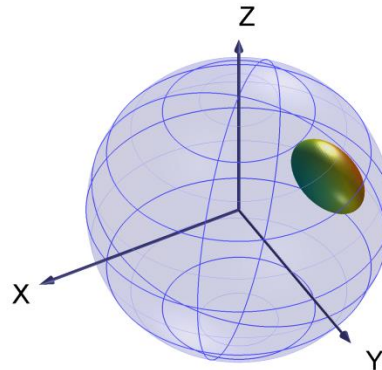
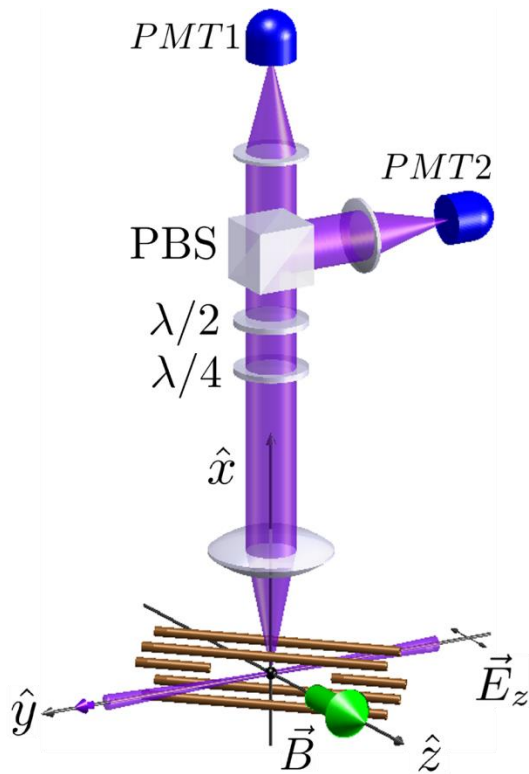
$$|x\rangle\langle x| \otimes a_{\vec{x}, \vec{E}_+}^\dagger + |-x\rangle\langle -x| \otimes a_{\vec{x}, \vec{E}_-}^\dagger$$



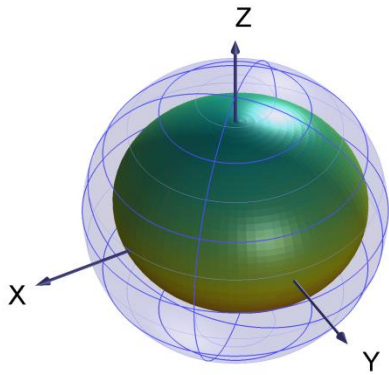
Spin projection



$$|x\rangle\langle x| \otimes a_{\vec{x}, \vec{E}_+}^\dagger + |-x\rangle\langle -x| \otimes a_{\vec{x}, \vec{E}_-}^\dagger$$

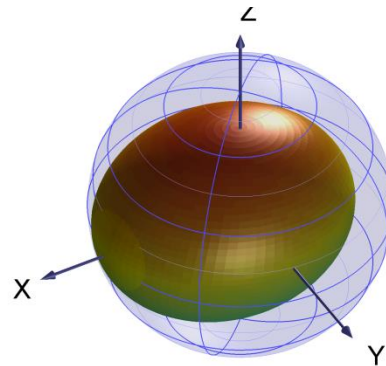


Spin rotations



Linear polarization basis: $\vec{\sigma} \cdot \vec{E}_{z/y}^* = \sigma_{z/y}$

$$U_{int} = \sigma_z \sigma_z \otimes a_{\vec{x}, \vec{E}_z}^\dagger + \sigma_y \sigma_z \otimes a_{\vec{x}, \vec{E}_y}^\dagger$$



$$= I \otimes a_{\vec{x}, \vec{E}_z}^\dagger + i\sigma_x \otimes a_{\vec{x}, \vec{E}_y}^\dagger$$

↑
Rayleigh

↑
Raman

