

Given a state on two systems

$$|\psi\rangle = \sum_a \alpha_a |a\rangle_1 |\phi_a\rangle_2 ; \quad \langle\psi|\psi\rangle = 1$$

The probability of measuring  $|a'\rangle$   
(eigenstate of some op)

$$|\tilde{\phi}\rangle_2 = \sum_a \alpha_a \langle a'|a\rangle_1 |\phi_a\rangle_2$$

$$\text{Prob}_a = \langle\tilde{\phi}|_2 |\tilde{\phi}\rangle_2$$

After the meas. the state is

$$|\tilde{\psi}\rangle = \frac{|a'\rangle_1 |\phi\rangle_2}{\sqrt{\text{Prob}_a}} \quad (\text{Product state})$$

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state reduction and prob. if  
measurement on a 2 part system  
where only one part is measured.