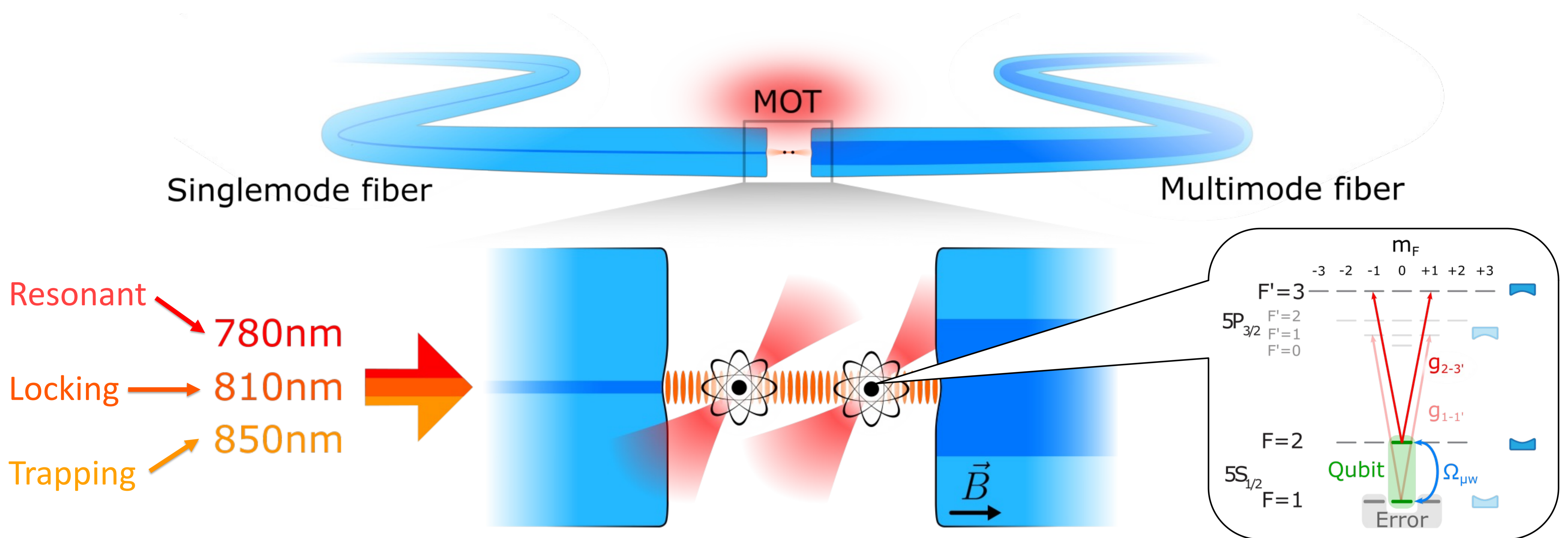


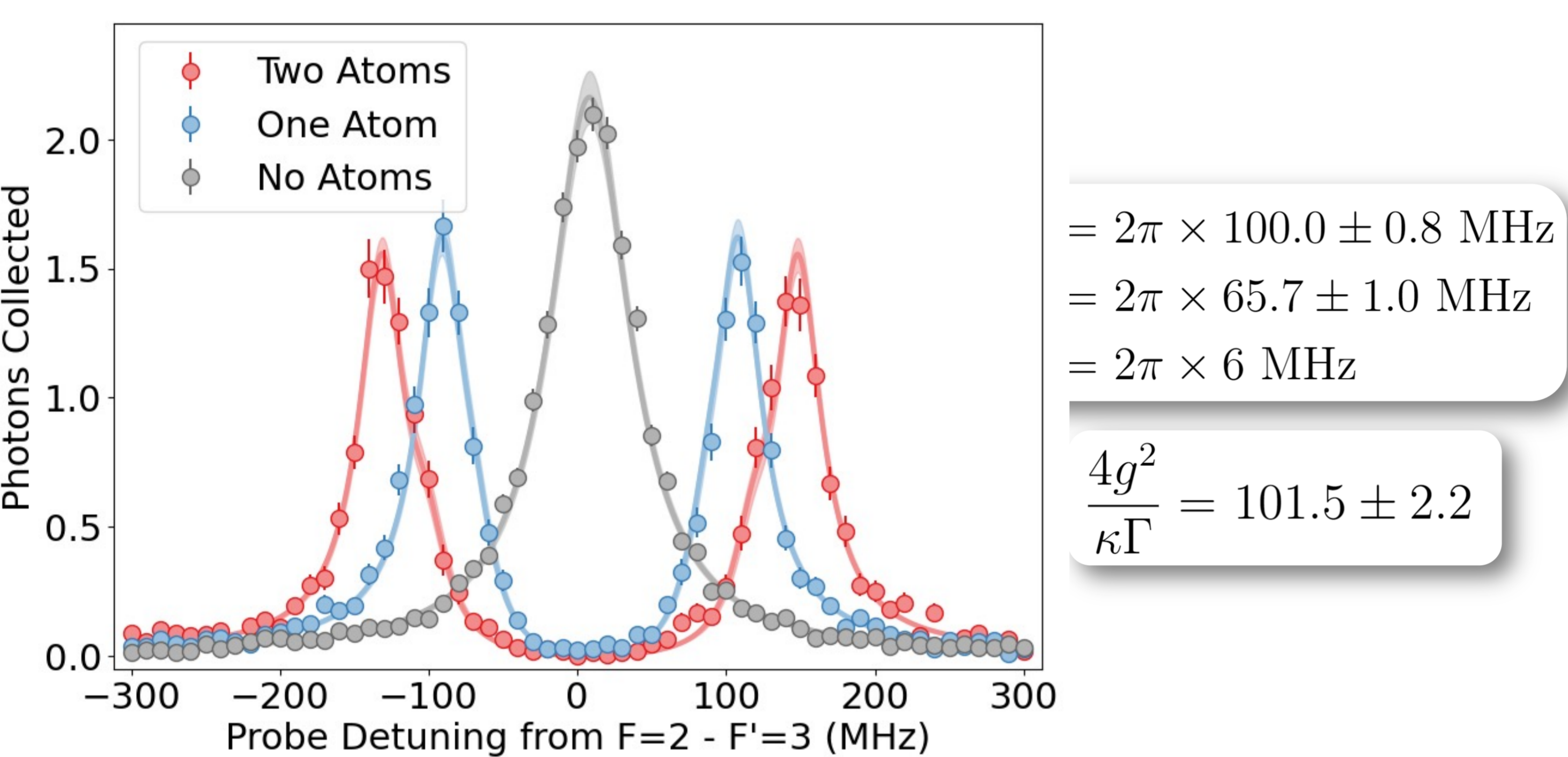
Cavity-Mediated Entanglement Generation with Error Detection

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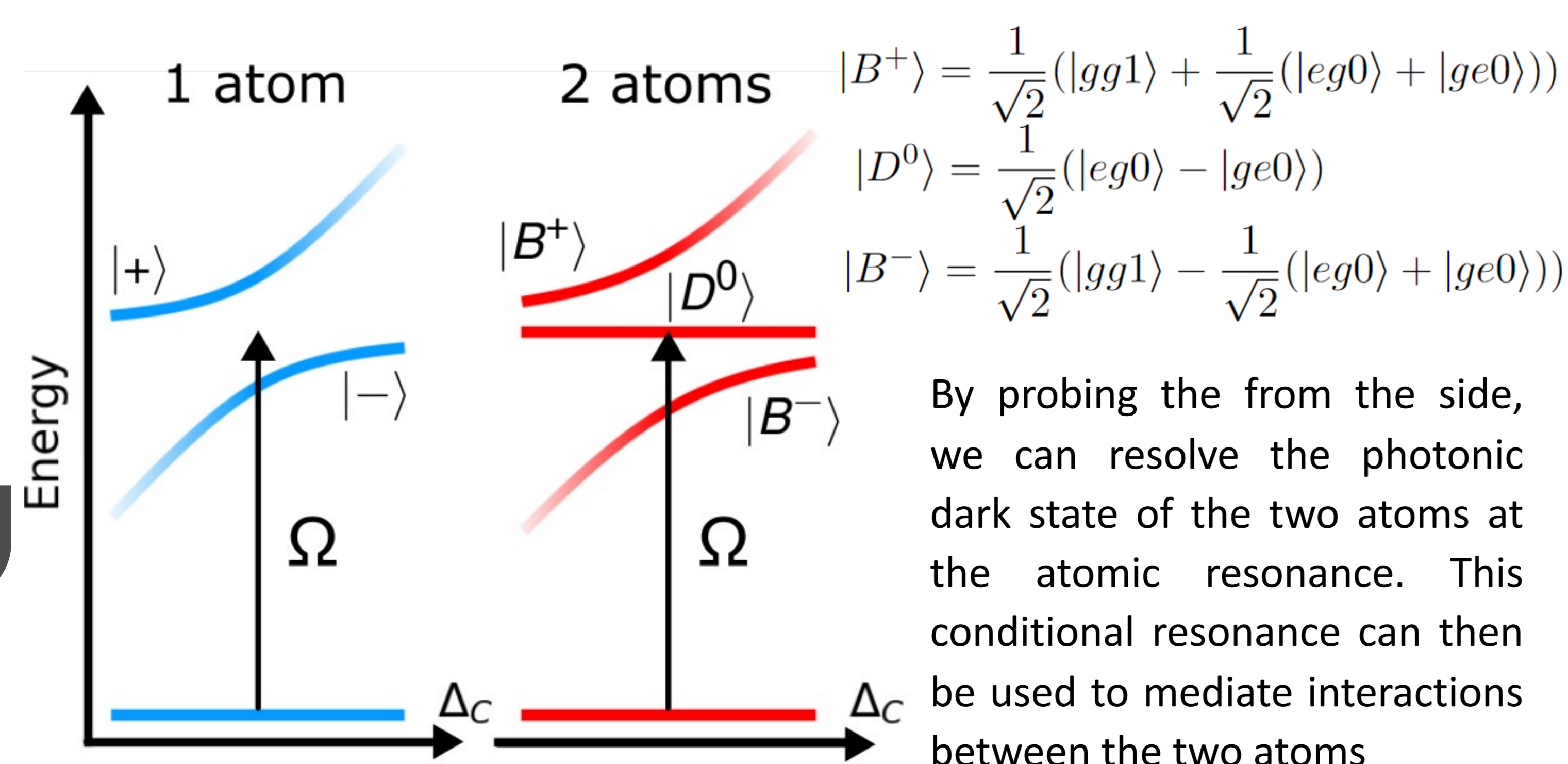
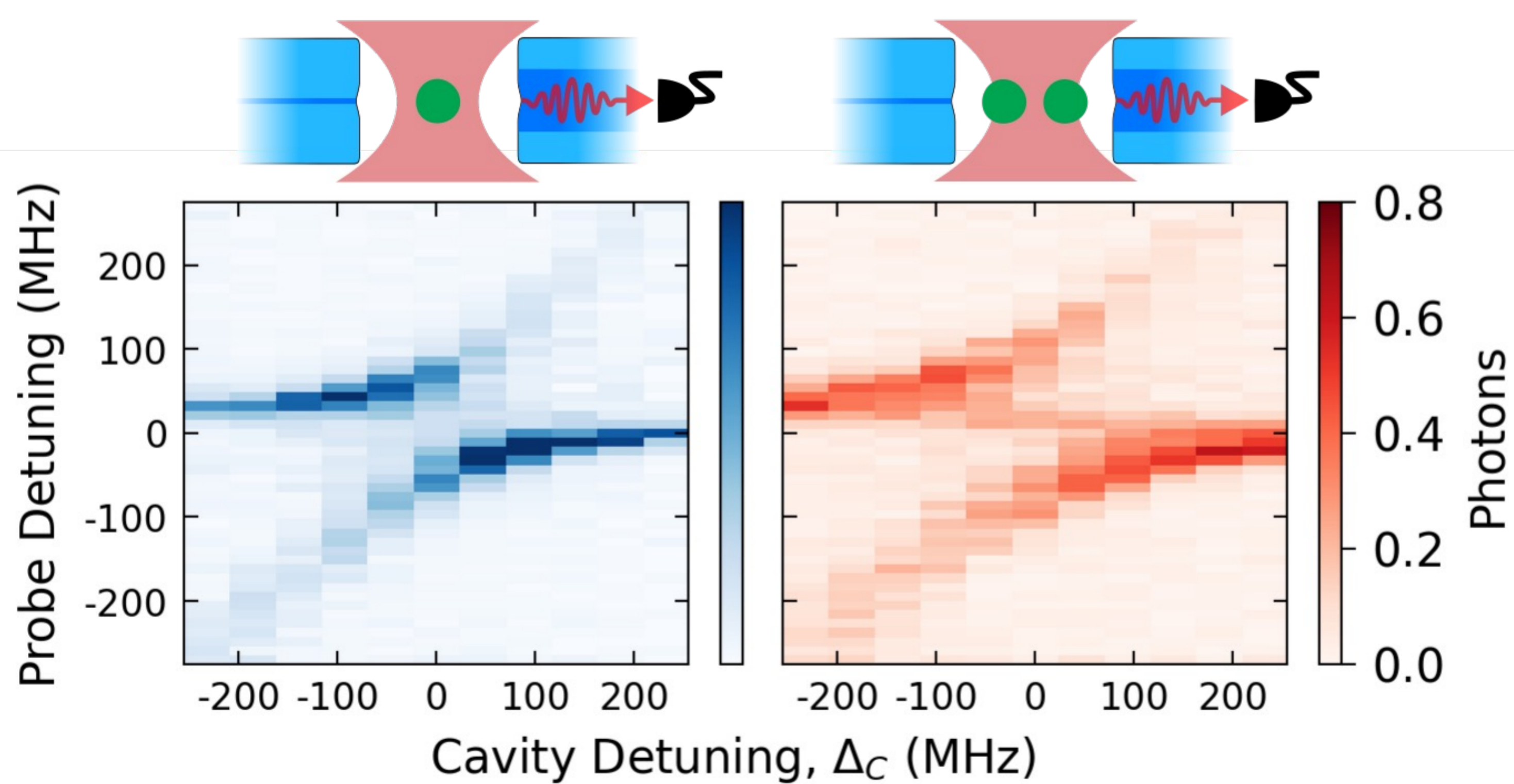


Vacuum Rabi Splitting

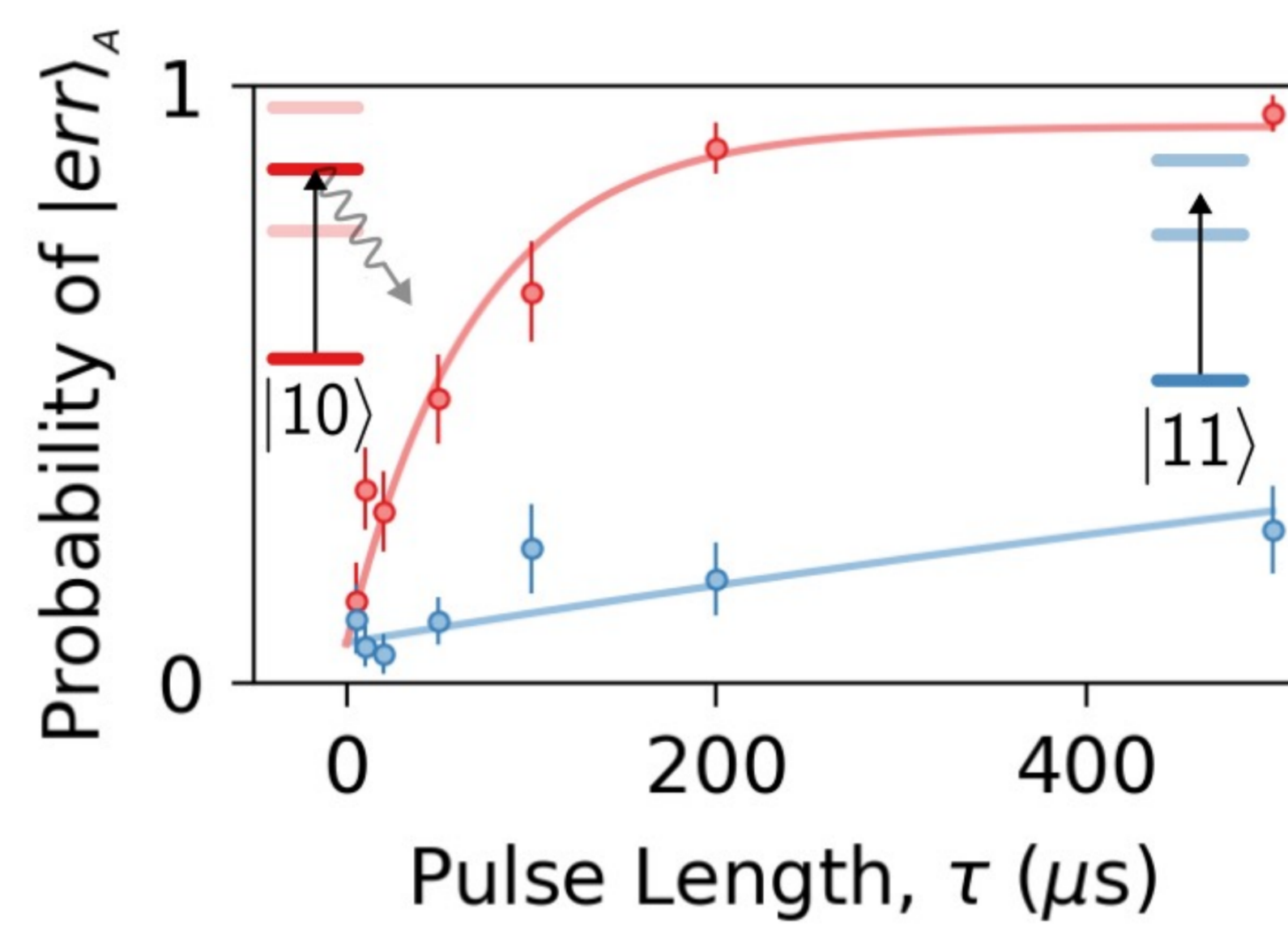


We measure a vacuum rabi splitting, yielding a cooperativity of 102(2). With two atoms coupled to the cavity we see the expected $\sqrt{2}$ coupling enhancement to the g .

Photonic Dark State

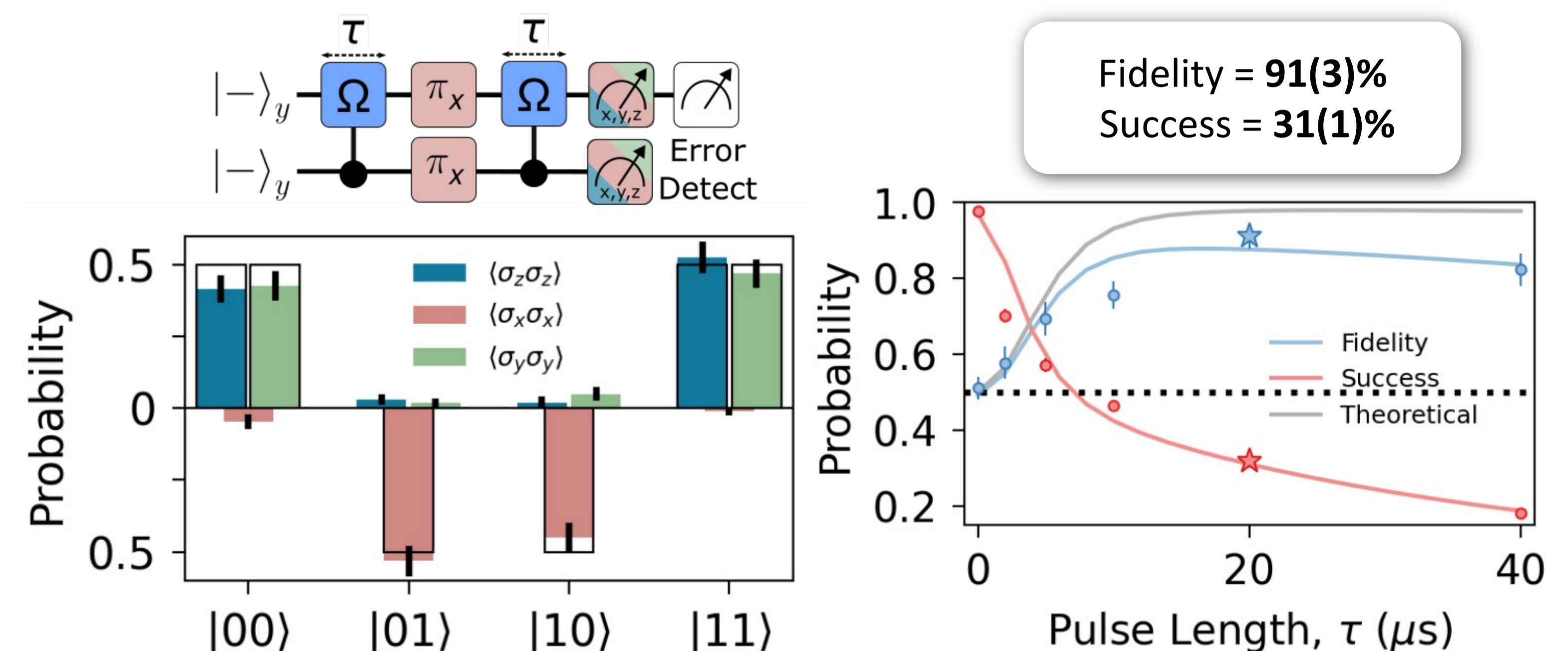


Cavity Carving with Error Detection



Now introducing two qubit states we find that the $|11\rangle$ state will act as a single atom coupled to the cavity and experience a suppressed excitation. The $|10\rangle$ state will directly couple to the dark state and will decay at the atomic decay rate.

Using this state dependent decay, we effectively carve out the $|10\rangle$ of our wavefunction while leaving the rest. By post-selecting on atom A not being in the error state at the end of the gate, we are left with an entangled state.



Cavity-Mediated Gate with Error Detection

By coherently driving between the $|10\rangle$ state and the dark state we perform a full 2π oscillation and acquire a relative π phase on the $|10\rangle$ state, realizing a controlled-phase gate. Here we prepare the $|1+\rangle$ and we observe a π phase shift into the $|1-\rangle$ state.

Uncorrected Fidelity = **60(2)%**
Corrected Fidelity = **76(2)%**
Success = **69(1)%**

