A quantum material undergoes dynamics from the act of measurement itself, described in terms of quantum backaction. This measurement dynamics, such as wavefunction collapse, occurs from the coherent quantum properties of photonic transport and scattering.

A one-dimensional dispersive Jaynes-Cummings chain

The qubits have diffusive behavior when detecting photon fluctuations of the scattered light.

Measurement backaction in a Jaynes-Cummings chain

The qubits undergo projective measurement when detecting the phase of the scattered light.

Quantum measurement backaction

When the resonators are no longer weakly interacting (\( J \sim \chi \)), a crossover occurs and qubits B and C undergo projective measurement.

Conclusion

- A one-dimensional chain of Jaynes-Cummings systems show correlated effects from measurement backaction by measuring scattered light in a certain basis
- A Jaynes-Cummings lattice tends to have two distinct phases, where excitations are localized or delocalized

References

- P. M. Harrington & the Murch Research Lab