Quantum Nonlinear Networks for Sensing and Information Technologies

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Networks comprised of qubits/spins or nonlinear photonic (*e.g.*, Kerr) elements are gaining prominence in various quantum technologies: quantum simulations, computing, communication, sensing and thermodynamic devices. Yet, to enable such technological applications, the collective quantum state of the network should be purified from the ambient thermal noise and their subsequent unitary manipulations should be controllable and tractable. These goals are challenging, both theoretically and experimentally. We have addressed these challenges in several works where we have put forth effective universal strategies for collective network-state purification from highly mixed thermal states towards low-entropy, non-Gaussian target states and their use as tractable, nonlinear building blocks in various sensors or interferometric devices [1-5]. Promising experimental and conceptual directions are identified for further development of network-based technologies.

References

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