Protecting Quantum Information Against Decoherence

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Abstract: Recent advances in quantum optics and quantum information technology (QIT) have revealed, without doubt, that fundamentally quantum-mechanical phenomena can enable improvements beyond the classical limits for a variety of tasks, ranging from communication to computing and from metrology to imaging. At the heart of these tasks lies the manipulation of entanglement and faithful node-to-node transmission of quantum information carriers (qubits), which may be solitary, entangled or a subsystem of a larger entangled system. During the process, qubits will unavoidably interact with the environment which induces decoherence and reduces the purity of the states. Thus, efficient and faithful implementation of quantum information tasks requires robust and state-independent decoherence-suppressing measures to protect qubits.

In this talk, I will briefly summarize fundamental concepts and toolbox of photonic QIT, and then I will introduce our experimental efforts towards the realization of robust and faithful qubit distribution using decoherence-free subspaces and entanglement distillation protocols.

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(light refreshments 1:45 p.m.)
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Bio: Dr. Ozdemir received BSc (1992) and MSc (1995) from the Middle East Technical University (METU), Ankara, Turkey, and PhD (2000) from Shizuoka University, Hamamatsu, Japan all in electrical and electronics engineering with research on SPR sensors and optical-feedback effects in laser diodes for sensing applications. Since 2000 he is involved in research on quantum optics and quantum information science: 2000-2003 as a researcher for Japan Science and Technology (JST) Agency; 2003-2004 as a research professor at the Graduate University for Advanced Studies (soken-dai), Japan, and since 2004 as a senior scientist and project group leader for JST at Osaka University, Japan.