

## FM 48: Focus Talk: Quantum Memories &amp; Interfaces

Time: Wednesday 11:00–12:00

Location: 2004

**Focus Talk** FM 48.1 Wed 11:00 2004  
**Photonic Quantum Memories and Interfaces** — ●HUGUES DE  
RIEDMATTEN — ICFO, Castelldefels (Barcelona), Spain

The coherent and reversible transfer of quantum information between matter and light is an important requirement in quantum information science. It enables the realization of a quantum memory for light, which is required in many applications in this field, including optical quantum computing and quantum information networks. Quantum memories are also crucial building blocks for quantum repeaters that have been proposed to overcome losses in the transport of photonic quantum information over long distances.

In this talk, I will introduce the physical processes and some of the

protocols that have been proposed to demonstrate a quantum memory for light in atomic and solid-state media. I will also describe the experimental state of the art and recent progresses in this very active field of research. The main focus will be on approaches based on collective effects in large ensembles of atoms, implemented both in atomic gases and in the solid state with rare-earth doped crystals. These systems are attractive because they allow efficient and long-lived storage of a large number of quantum bits, without the use of high-finesse cavities to enhance the light-matter interaction. I will also briefly introduce other systems enabling quantum memories with quantum processing capabilities between stored qubits. Finally, I will introduce quantum interfaces allowing quantum state transfer between disparate remote quantum systems using single photons.