

Abstract for an Invited Paper  
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**Towards a practical quantum repeater**

ALEX KUZMICH, Georgia Institute of Technology

Quantum mechanics provides a mechanism for absolutely secure communication between remote parties. For distances greater than 100 kilometers direct quantum communication via optical fiber is not viable, due to fiber losses, and intermediate storage of the quantum information along the transmission channel is necessary. This led to the concept of the quantum repeater, proposed in 1998 by Briegel, Dür, Cirac, and Zoller. In 2001, Duan, Lukin, Cirac, and Zoller have proposed to use atomic ensembles as the basic memory elements for the quantum repeater. We will outline our program on the use of atomic ensembles as an interface for quantum information transfer and the prospects for long distance quantum networks.