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Quantum networking with trapped ions and photons¹

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Quantum networks using light as a carrier of quantum information between remote quantum memories could enable distributed and scalable processing of quantum information and quantum communication. I describe a series of experiments that link multiple trapped atomic ions through the interference and coincidence detection of photons emitted by each ion. This includes the implementation of a probabilistic gate between the hyperfine clock states of two ytterbium ions separated by about 1 meter, and its application to the teleportation of quantum information between remote atomic ions.

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