Quantum Communication, Computing, & Measurement

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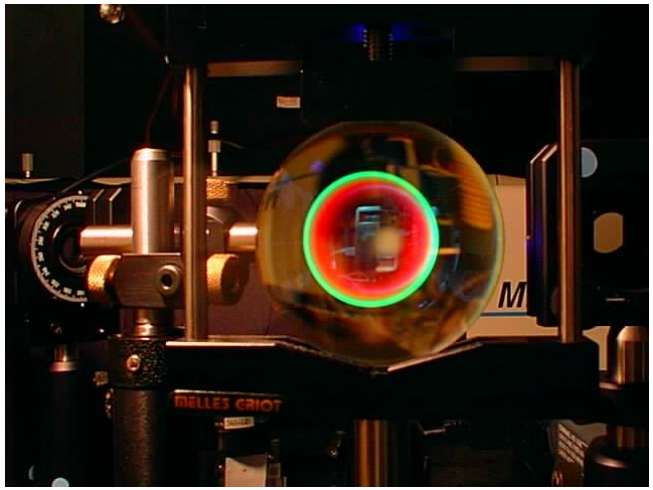
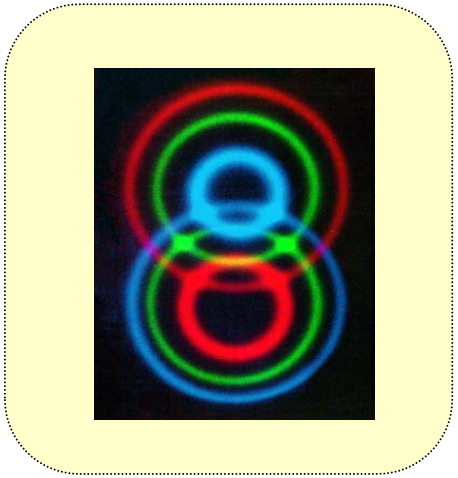
- ***Efficient generation of entangled-photon states***





1990s

Physical Review Letters, v. 71, p.3893 (1993).
Physical Review Letters, v. 75, p.4337 (1995)

- ***Quantum Imaging***

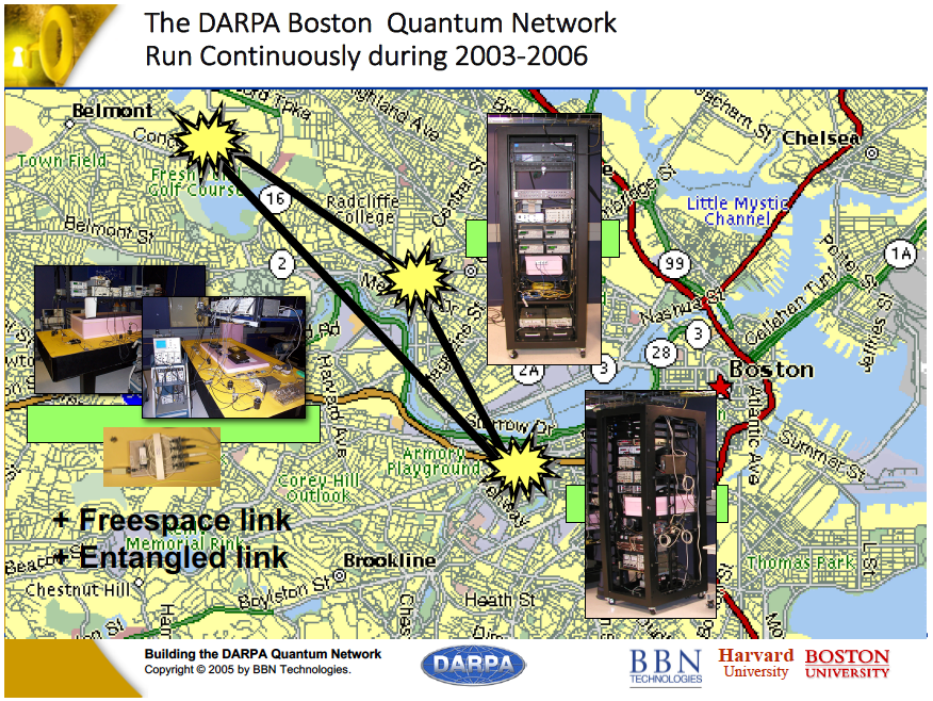
Physical Review A, v. 52, p. R3429 (1995).
Physical Review Letters, v. **74**, p. 3600 (1995).

- ***Quantum Metrology***

Applied Optics, v. 37, p.3455 (1998)
Metrologia , v. 32, p.479 (1996)

2000s

- ***DARPA Quantum Cryptography Network over commercial fiber in metro Boston***



- ***Engineering specialty entanglement and its practical applications***

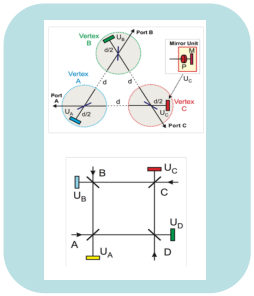
Physical Review A, **v. 73**, 063802 (2006).
Optics Express, **v. 14**, 10060-10072 (2006)

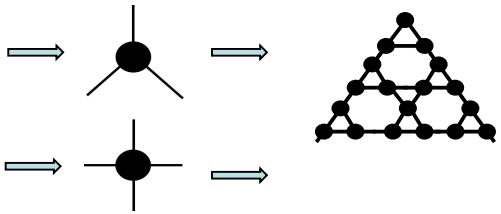
- ***Quantum-inspired imaging, tomography, and microscopy***

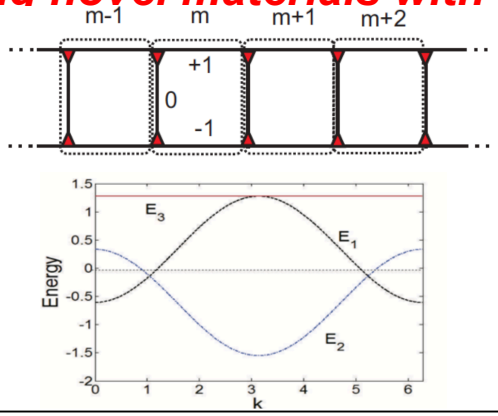
Physical Review Letters, **v. 91**, 083601 (2003).

Current - *Reversible linear-optical multiports → New approach to quantum-optical networking and information processing*

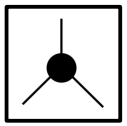
- ***Quantum simulation of complex Hamiltonians → Designing novel materials with desired electronic properties and topological features.***





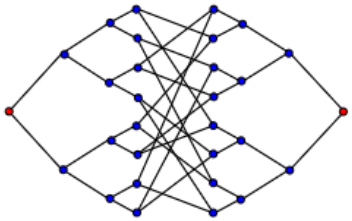


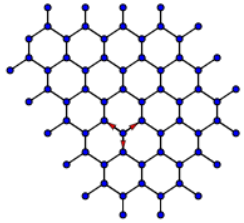
- ***Quantum walks with Grover coins → Faster search and information processing***

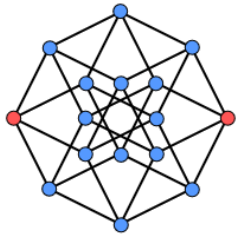


$$U = -\frac{i}{3}\begin{pmatrix} 1 & -2 & -2 \\ -2 & 1 & -2 \\ -2 & -2 & 1 \end{pmatrix}$$

Grover's coin





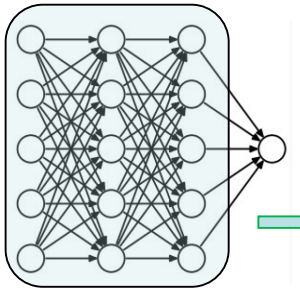


- ***Reversible quantum walks on graphs***

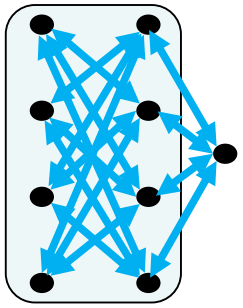
  → *Quantum Neural Networks*

Phys. Rev. A 96, 013858 (2017); Phys. Rev. A 95, 042109 (2017);
Phys. Rev. A 93, 043845 (2016); Opt. Express 26, 27201 (2018);
New Journal of Physics 20, 093032 (2018)

Standard Neural Net



Quantum reversible neural network



On-chip integration and miniaturization is a major task

More Information

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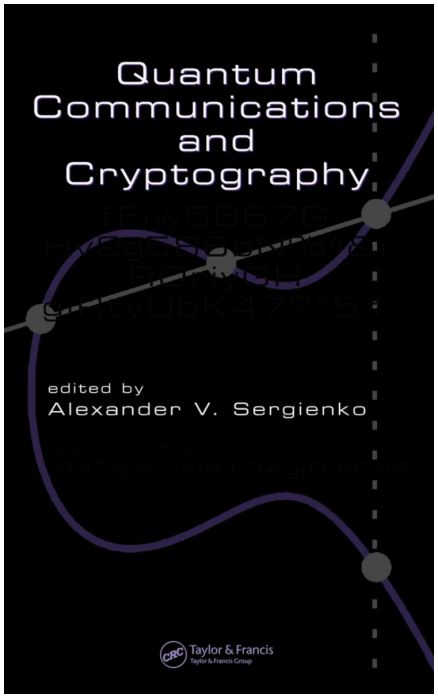

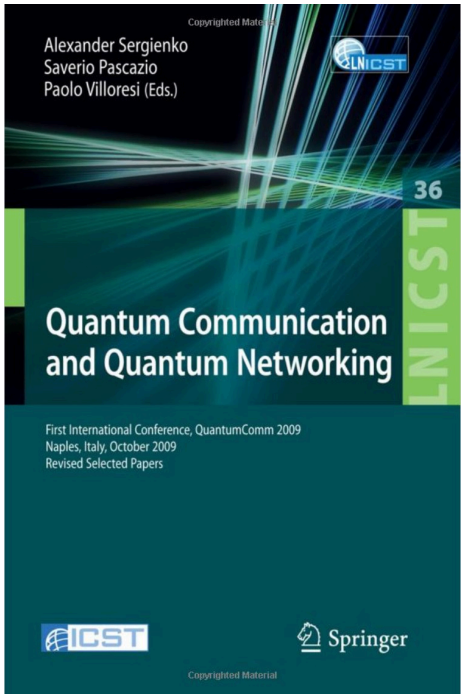

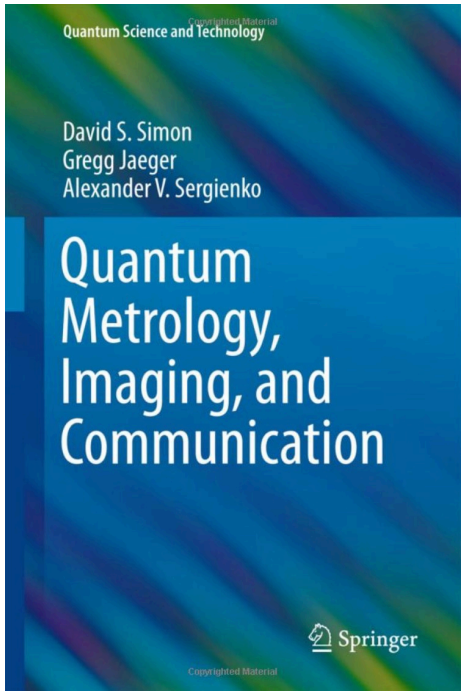

Quantum Physics → Quantum Engineering → Quantum Technology