PL-03-05

Optical quantum computers with quantum teleportation

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Biography

Akira Furusawa received his MS degree in applied physics and Ph.D. degree in physical chemistry from The University of Tokyo, Japan, in 1986 and 1991, respectively. His research interests cover the area of nonlinear optics, quantum optics, and quantum information science. He is currently Professor of Applied Physics, School of Engineering, The University of Tokyo and the Deputy Director of RIKEN Center for Quantum Computing. Professor Furusawa has authored more than 100 papers in leading technical journals and conferences, which include the first realization of unconditional quantum teleportation, which was achieved in 1998 at California Institute of Technology as a visiting scientist at Professor Jeff Kimble's lab. He received the Ryogo Kubo Memorial Award in 2006, the JSPS prize in 2007, the Japan Academy Medal in 2007, the International Quantum Communication Award in 2008, the Toray Science and Technology prize in 2015, and the Medal with purple ribbon in 2016. He is a member of the Physical Society of Japan, the Japanese Society of Applied Physics, and OPTICA.

Abstract

We did the first experiment of unconditional quantum teleportation at Caltech in 1998 [1]. Then we did various related experiments like quantum teleportation network [2], teleportation of Schrödinger's cat state [3], and deterministic quantum teleportation of photonic qubits [4]. We invented the scheme of teleportation-based quantum computing in

2013 [5]. In this scheme, we can multiplex quantum information in the time domain and we can build a large-scale optical quantum computer only with four squeezers, five beam splitters, and two optical delay lines [6]. Our present goal is to build a super quantum computer with 100GHz clock frequency and hundred cores. Toward this goal we started to combine our optical quantum computer with 5G technologies [7].

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