Title:

Stabilized Quantum Key Distributed with Adiabatic Semiconductor Laser

Abstract:

With actively feedback controlling wavelength/phase/power stabilization of a semiconductor distributed feedback laser diode (DFBLD) transceiver in adiabatic package, the optical quantum key distribution (QKD) and communication with differential phase shift (DPS) keying protocol is demonstrated for point-to-point network scenario. To implement the DFBLD-based single-photon QKD in DWDM-PON, novel technologies including thermo-isolation of DFBLD/DI, self-feedback control of DFBLD, active feedback of delay interferometry (DI), master-to-slave optical injection-locking (OIL), asymmetric DPS-QKD encoding/decoding protocol, frequency/phase-locking algorithm, will be established for realizing 25-100km short-/long-reach metropolitan and backbone with flexible clock rate ranging from 0.1 to 10 Gbit/s. The narrow-linewidth DFBLD single-photon QKD carrier with ultralow wavelength drift under feedback thermal control, master-slave injection locking, or interfered wavelength/phase locking, in combination with the decoding by a self-feedback 1-bit-delay interferometer and receiving by a pulsed-gating low-dark-current SPAD can perform the asymmetric digital subscriber link (ADSL) with high-bit-rate encoding (at 0.1-10 Gbit/s) and low-bit-rate (0.01-1 Mbit/s) receiving algorithm for realizing short/long-distance SMF DPS-QKD. These key components such as the actively feedback controlled QKD carrier, the software-controlled/self-feedback DPS decoder, the asymmetric DPS-QKD protocol synthesizer, will open a new era for the networking industry of optical quantum cryptography.