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Quantum Key Distribution based on Silicon Integrated Photonic Devices DARIUS BUNANDAR, NICHOLAS HARRIS, ZHESHEN ZHANG, Massachusetts Inst of Tech-MIT, RAN DING, TOM BAEHR-JONES, MICHAEL HOCHBERG, Coriant Advanced Technology Group, JEFFREY SHAPIRO, FRANCO WONG, DIRK ENGLUND, Massachusetts Inst of Tech-MIT — We present a compact quantum key distribution (QKD) transmitter near a 1550-nm wavelength using microring modulators implemented on a silicon-on-insulator photonics platform. The transmitter generates time-bin based qubits with a temporal FWHM of 940 ps and an extinction ratio beyond 16 dB. We prove the feasibility of the transmitter with a coherent one-way QKD protocol, where the bit string is encoded in the arrival time of the time-bin qubits and possible eavesdropping is monitored via the intereference visibility of neighboring time-bin qubits [1]. The receiver consists of an asymmetric beamsplitter, which provides a random choice of measurement basis, followed by either a superconducting nanowire single-photon detector (SNSPD) or an unbalanced Michelson interferometer with SNSPDs. This experiment demonstrates the feasibility of high-speed QKD based on CMOS-compatible silicon photonics integrated circuits.

[1]B. Korzh, C. C. W. Lim, R. Houlmann, N. Gisin, M. J. Li, D. Nolan, B. Sanguinetti, R. Thew, and H. Zbinden, Nature Photonics **9**, 163–168 (2015)

Darius Bunandar
Massachusetts Inst of Tech-MIT

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