Chaos Encryption in Real Life: A Field Demonstration of Telecommunication with a Chaotic Carriers

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Chaotic signals have been proposed as broadband information carriers with the potential of providing a high level of robustness and privacy in data transmission [1]. Laboratory demonstrations of chaos-based optical communications have already shown the potential of this technology [2] in the 90'th, but a field experiment using commercial optical networks has been only undertaken recently [3]. Here we report the demonstration of high-speed long distance communications based on chaos synchronization over a commercial fiber-optic channel. An optical carrier generated by a chaotic laser is used to encode a message for transmission over 120 km of installed optical fiber belonging to the metropolitan area network of the city of Athens, Greece. The message is decoded via synchronization with a second laser, which performs a chaotic filtering of the encoded transmitted signal. Transmission rates in the gigabit/s range are achieved (see figure), with corresponding bit-error rates below 10^{-7}. The system uses matched pairs of semiconductor lasers as chaotic emitters and receivers, and off-the-shelf fiber-optic telecommunication components. Our results show that information can be transmitted at high bit rates using deterministic chaos in a manner that is robust to perturbations and channel disturbances unavoidable under "real-world" conditions.

[1] K. M. Cuomo et al. IEEE Trans. Circuits Systems II **40**, 626 (1993).

[2] G. D. Van Wiggeren, and R. Roy, Science **279**, 1198 (1998).

[3] A. Argyris et al., Nature **438**, 343 (2005).