Temporal Cloaking at Telecommunications Rates

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Thanks to seminal advances in metamaterials, substantial progress in demonstrating cloaks of invisibility, once confined to science fiction, has been reported by numerous laboratories. Such cloaks guide light around a region in space, ideally leaving any object in the cloaked region undetectable and leaving the probing light itself undisturbed. A recent proposal suggested extending such research in metamaterial-based spatial cloaks into the time domain [1]. Drawing on the formal mathematical equivalence between paraxial diffraction and narrowband dispersion, investigators soon thereafter demonstrated a first such temporal cloak which hides events in time by creating a temporal gap in a probe beam that is subsequently closed up [2]. However, because this cloak exploited a split-time lens created using nonlinear optical phase modulation, the high power of an amplified femtosecond laser was required, limiting the cloak to isolated events at a repetition rate of 41 KHz with a fractional cloaking window of only 1 part in 10^6.

In our laboratory we have exploited commercial integrated phase modulators in conjunction with dispersive propagation to demonstrate an alternative technique for temporal cloaking which operates at low power and at telecommunication data rates. We succeed in cloaking 46% of the entire time axis and conceal digital data at 12.7 Gb/sec, with and without cloaking.

Examples of temporal cloaking. Pseudorandom data (left) and specific data (right) data at 12.7 Gb/sec, with and without cloaking.

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