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COMMENT

Cloaking nanosecond events at any time

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The concept of cloaking has never failed to fascinate scientific researchers. In recent years, the idea has ignited a whole new trend of research effort when extended to temporal domain. A typical temporal cloak conceals events from probing light by creating a temporal intensity gap (cloaking time) that will later be closed back by manipulating the speed of light leveraging the chromatic dispersion in dielectric media. Therefore, the observer will only see a continuous probing light but will never realize the temporal events that happens during the temporal gap. Previous experimental demonstrations primarily relied on parametric- or phase-modulator (PM)-based time lens to realize temporal cloaking, which had finite temporal aperture and only concealed events at a fixed time period. Consequently, the cloaking time is so far limited to around 200 ps and practical applications are still unforeseeable.

Recently, Zhou et al. [1] has demonstrated a programmable temporal cloak with significantly enhanced cloaking time using a brand-new type of time lens. The time lens first generates a coherent broad-band optical frequency comb and a following electrically-tuned microring resonator (ET-MRR) provides linearly-scanned filtering. Consequently, the output is linearly chirped, which is equivalent to a conventional time lens. Most importantly, the ET-MRR not only achieves large modulation depth as the parametric time lenses, it is also programmable by generating arbitrary electrical driving signals. With the combined strength, ET-MRR opens temporal cloaks at arbitrary time and the cloaking time is also tunable from 0.449 to 3.365 ns. The cloaking capacity is 17 times larger than the previous record, finally bringing temporal cloaking technique to the nanosecond regime.

Admittedly the current performance might not directly lead to practical applications, but it will definitely inspires more subsequent research effort. The scalability of the cloaking time is related to the bandwidth of frequency comb generator and the free spectral range of the ET-MRR, which has not been fully explored yet. Moreover, the application of the new ET-MRR-based time lens is certainly not restricted to temporal cloaking. It would be technically fascinating to explore its application in temporal magnification or temporal Fourier transform, which might also bring new breakthroughs. Last but not least, for more useful application, the programmability of temporal cloaking should not only be realized in the time domain, but also in the spatial domain: i.e., concealing events at arbitrary positions along the transmission link, which we expect to see in the near future.

Reference

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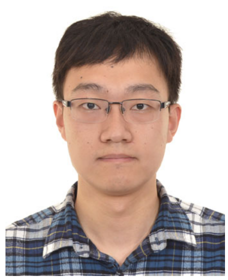

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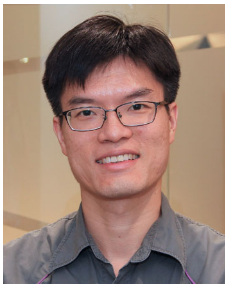

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