Spatiotemporal Hologram: from Concept to Applications

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The rapid advancement of spatiotemporal light field manipualtion in recent years has garnered significant attention from researchers [1, 2]. This talk will introduce the concept of spatiotemporal hologram recently proposed that enables precise joint control of the amplitude and phase of light fields in both space and time. By drawing an analogy with the computer generated holography in the spatial domain, we experimentally realize spatiotemporal hologram and generate a series of previously unimaginable spatiotemporal optical wave packets [3]. The generation of several novel spatiotemporal optical wavepackets, including perfect spatiotemporal optical vortex [4], spatiotemporal Laguerre–Gaussian and Hermite–Gaussian modes [5], spatiotemporal tophat fields [3] and spherical harmonic localized wavepackets [6] will be shown to illustrate the power of this technique. Finally, future perspective of further developments and applications of this technology will be presented.

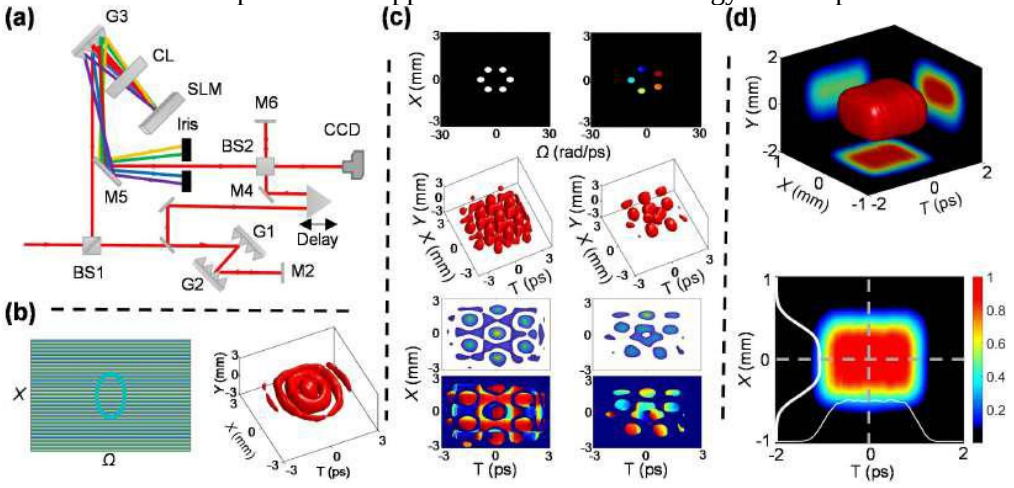

Fig. 1: Complex STWP generation using spatiotemporal hologram. (a) Realization of spatiotemporal complex amplitude modulation with redistribution of energy into other diffraction orders; (b) Demonstration of spatiotemporal Bessel wavepacket; (c) Experimental results of spatiotemporal optical time crystals and spatiotemporal optical time quasi-crystals via complex-amplitude modulation; (d) 3D iso-surface of the generated spatiotemporal flat-top wavepacket [3].

References:

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