

Demonstration of temporal cloaking

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Recent research has uncovered a remarkable ability to manipulate and control electromagnetic fields to produce effects such as perfect imaging and spatial cloaking. To achieve spatial cloaking, the index of refraction is manipulated to flow light from a probe around an object in such a way that a "hole" in space is created, and it remains hidden. Alternatively, it may be desirable to cloak the occurrence of an event over a finite time period, and the idea of temporal cloaking was proposed in which the dispersion of the material is manipulated in time to produce a "time hole" in the probe beam to hide the occurrence of the event from the observer. This approach is based on accelerating and slowing down the front and rear parts, respectively, of the probe beam to create a well controlled temporal gap in which the event occurs so the probe beam is not modified in any way by the event. The probe beam is then restored to its original form by the reverse manipulation of the dispersion. Here we present an experimental demonstration of temporal cloaking by applying concepts from the time-space duality between diffraction and dispersive broadening. We characterize the performance of our temporal cloak by detecting the spectral modification of a probe beam due to an optical interaction while the cloak is turned off and on and show that the event is observed when the cloak is turned off but becomes undetectable when the cloak is turned on. These results are a significant step toward the development of full spatio-temporal cloaking.

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