

Simultaneous single-molecule imaging using discrete PSF engineering
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Simultaneous multicolor localization or single-molecule imaging typically requires the use of multiple cameras, or the splitting of the camera field of view into distinct regions for each emission band. The result is either a more expensive and more complex instrument, or sacrificing the amount of data that can be collected.

In this presentation I will introduce the Circulator, an optical device that allows simultaneous and robust multiplexing of SMLM imaging by encoding the emission color into the PSF, without requiring more than one camera or sacrificing field of view. By virtue of its compact nature, the Circulator can be readily introduced into existing imaging systems. I will demonstrate how this device can be used to achieve four-color simultaneous SMLM, using just a single camera and the full achievable field of view. The device can also be readily combined with other PSF-shaping devices, allowing the parallel encoding of e.g. emitter depth. Beyond SMLM, the system can also be used to acquire data from more samples in multicolor single-molecule experiments, such as FRET or multicolor single-particle tracking, or to perform single-molecule spectroscopy.