

## **SPECTROSCOPIC SINGLE-MOLECULE LOCALIZATION MICROSCOPY (SSMLM)**

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Traditional single molecule localization microscopy analyses the spatial distributions of photons emitted by individual molecules to reconstruct super-resolution optical images. To further push the envelope of this imaging technology, we developed spectroscopic single molecule localization microscopy (sSMLM) that is capable of capturing the inherent spectroscopic signatures of photons from individual stochastic radiation events. sSMLM further improved the spatial resolution of single molecule localization microscopy through spectral discrimination to identify the photons emitted from individual molecules. As a result, we demonstrated a resolution of sub-10 nm without significantly increase the total number of image frames through a novel regression method. Using sSMLM, we demonstrated simultaneous multi-color super-resolution imaging, where the number of fluorescence labels can have largely overlapping emission spectra with only minute differences. In addition, we further investigated intrinsic stochastic fluorescence emission from unstained nucleotides using sSMLM, seeking potential label-free super-resolution imagin.

