BOOSTING RESOLUTION IN FLUORESCENCE IMAGING BY MIRROR ENHANCED LOCALIZATION MICROSCOPY

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Single-molecule localization microscopy (SMLM) methods have evolved as powerful tools to image cellular structures with virtually molecular resolution. Here, we demonstrate that higher photon yield at lower background on biocompatible metal-dielectric coatings substantially improves the SMLM performance, and increases the localization precision by twofold [1].
The strength of the approach is that ─ except for the coated cover glass ─ no special microscope setup is required. We show that biocompatible metal-dielectric nanostructures fabricated on microscopy coverslips improve the resolution of direct stochastic optical reconstruction microscopy (dSTORM). The enhanced signal-to-noise ratio induced by the metal-dielectric coating sharpens the localization precision, and exceeds Widefield and Total Internal Reflection Fluorescence (TIRF) dSTORM performance without the need for a special TIRF objective lens in a much simpler setup. The resolution improvement relies solely on easy-to-fabricate nanocoatings on standard glass coverslips, and is spectrally and spatially tunable as experimentally demonstrated for dual-color SMLM in cells. Moreover, height dependent spectral shifts of a fluorophore in vicinity of a metal-dielectric coating allow for 3D reconstructions of molecular distributions and interactions in live cells with nanometer precision.

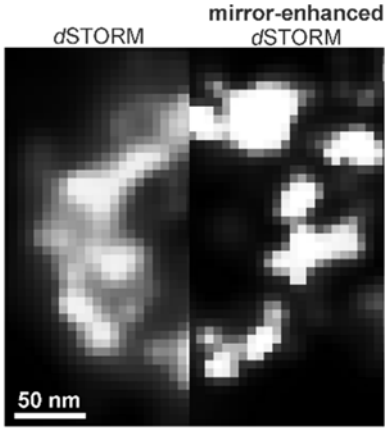

Figure 1: Conventional (left) and mirror-enhanced dSTORM (right) images of a single nuclear pore complex rings.

References:

[1] H.S. Heil, B. Schreiber, R. Götz, M. Emmerling, M.-C. Dabauvalle, G. Krohne, S. Höfling, M. Kamp, M. Sauer, and K.G. Heinze, "Sharpening emitter localization in front of a tuned mirror", *Light: Science and Applications,* **7**, 99 (2018).