Boosting the localization precision of dSTORM

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To date, advanced fluorescence microscopy methods for resolution enhancement are based on either on-off fluorophores (for dSTORM or STED) or Structured Illumination Microscopy (SIM) and deconvolution routines. Despite their great success, the first group suffers from low temporal resolution while SIM has intrinsically a very limited resolution improvement. Combining optical with plasmonic approaches opens exciting perspectives: So called surface plasmons in specially designed nanostructures can generate extremely high photon densities in a nanoscopic volume that is much lower than the Abbe criteria usually allows. The interaction of fluorophores with plasmonic surfaces enables amplified fluorescence, increased photostability [1] and distance dependent dynamical [2] and spectral emission shifts [3].
The strength of the approach is that ─ except for the coated cover glasses ─ no special microscope setup is required. Here we show that biocompatible plasmonic nanostructures fabricated on microscopy slides improve the resolution of the super-resolution technique dSTORM. The enhanced signal-to-noise ratio induced by the metal-dielectric coating sharpens the localization precision by up to 50 %. Furthermore, we demonstrate improved Fluorescence Correlation Spectroscopy and thus the versatility of the method to allow for more precise or/and faster acquisition.

References:

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