Plasmonic localization microscopy for highly sensitive detection of bacterial gliding and intracellular protein perfusion

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Abstract: Surface-enhanced nanoplasmonic structures can create locally amplified electromagnetic near-fields as a consequence of evanescent field localization on metallic substrates. The creation of localized fields has been investigated in many past studies because the approach allows the potential to improve detection sensitivity and to enhance resolving power in imaging applications. Application of nanoplasmonics to super-resolution microscopy for improvement of resolving power has drawn tremendous attention for imaging molecular processes typically difficult, if not impossible, to observe under the diffraction limit. While emerging approaches such as STED and STORM have been extremely successful to produce super-resolved images, we explore an alternative approach based on nanoplasmonics by which achievable resolution may be customized to fit specific imaging needs and at the same time a conventional optical system may be used. For this goal, we will also discuss deconvolution of measured images. Feasibility studies performed on visualizing internalization of virus particles, sliding microtubules and bacterial motility on random and periodic nanopatterns will be presented [1-4]. Enhancement of axial resolution for the detection of intracellular protein distribution is also reported by extraordinary light transmission using graded plasmonic nanoapertures [5].

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