Chapter 30
Mapping the Local Density of States of Periodic Plasmonic Nanostructures with Stochastic Super-resolution

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Abstract Periodic plasmonic nanostructures have been found promising in controlling the directivity and efficiency of solid-state lighting devices, in particular LED-pumped phosphors. Due to the inhomogeneous spatial distribution of the photonic resonances of periodic plasmonic nanostructures, their influence on the emission is strongly dependent on the position of emitters relative to the nanostructures. Therefore, mapping the local dependence of directivity and efficiency can be a key to understand and optimize the devices. Here we introduce a method of mapping local directivity and efficiency of emitters coupled to periodic nanostructures based on stochastic super-resolution. As an example, we show measurements of local density of states (LDOS) induced by a hexagonal lattice of aluminum nanoantennas with a spatial resolution of $\sim$40 nm. With FDTD simulation, we demonstrate that the variation of the decay rate of the emitters in the investigated sample is hardly influenced by the lattice modes and mainly governed by single-particle LDOS variations.

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