

## Boosting Local Field Enhancement by on-Chip Nanofocusing and Impedance-Matched Plasmonic Antennas - DTU Orbit (08/11/2017)

### Boosting Local Field Enhancement by on-Chip Nanofocusing and Impedance-Matched Plasmonic Antennas

Strongly confined surface plasmon-polariton modes can be used for efficiently delivering the electromagnetic energy to nanosized volumes by reducing the cross sections of propagating modes far beyond the diffraction limit, that is, by nanofocusing. This process results in significant local-field enhancement that can advantageously be exploited in modern optical nanotechnologies, including signal processing, biochemical sensing, imaging, and spectroscopy. Here, we propose, analyze, and experimentally demonstrate on-chip nanofocusing followed by impedance-matched nanowire antenna excitation in the end-fire geometry at telecom wavelengths. Numerical and experimental evidence of the efficient excitation of dipole and quadrupole (dark) antenna modes are provided, revealing underlying physical mechanisms and analogies with the operation of plane-wave Fabry-Pérot interferometers. The unique combination of efficient nanofocusing and nanoantenna resonant excitation realized in our experiments offers a major boost to the field intensity enhancement up to  $\sim 12000$ , with the enhanced field being evenly distributed over the gap volume of  $30 \times 30 \times 10 \text{ nm}^3$ , and promises thereby a variety of useful on-chip functionalities within sensing, nonlinear spectroscopy and signal processing.

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