High-Q Fano Resonances in All-Dielectric Metasurfaces

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In recent years, metasurfaces have demonstrated their capability to drive the evolution of photonic technologies by replacing bulky optical components with ultrathin, integrable, and high performance devices ready for mass scale production. Metasurfaces consist of a large number of nanoresonators, also known as meta-atoms, whose arrangement influences light scattering, resulting in local modulation of amplitude and phase of the emerging field.

In this work, we report on the full suppression of forward scattering achieved by a nanostructured Silicon Nitride surface. The numerical model reveals that a simple geometrical pattern such as a square lattice of nanopillars sustains Fano-like resonances with Q-factor as high as $3.5 \cdot 10^5$ that can be revealed in a simple detection scheme.

Our findings show that a simple array of pillars is a valuable nanophotonic platform to control light scattering at the nanoscale, which is crucial to foster both linear and nonlinear effects.