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**Genetic Optimization of Optical Nanoantennas** CARLO FORESTIERE, ALYSSA PASQUALE, Department of Electrical and Computer Engineering & Photonic Center, Boston University, ANTONIO CAPRETTI, Department of Electrical Engineering, Università degli Studi di Napoli Federico II, SYLVANUS LEE, Department of Electrical and Computer Engineering & Photonic Center, Boston University, GIOVANNI MIANO, Department of Electrical Engineering, Università degli Studi di Napoli Federico II, ANTONELLO TAMBURRINO, DAEIMI, Universita degli Studi di Cassino, LUCA DAL NEGRO, Department of Electrical and Computer Engineering & Photonic Center, Boston University — Metal nanostructures can act as plasmonic nanoantennas (PNAs) due to their unique ability to concentrate the light over sub-wavelength spatial regions. However engineering the optimum PNA in terms of a given quality factor or objective function. We propose a novel design strategy of PNAs by coupling a genetic optimization (GA) tool to the analytical multi-particle Mie theory. The positions and radii of metallic nanosphere clusters are found by requiring maximum electric field enhancement at a given focus point. Within the optimization process we introduced several constraints in order to guarantee the physical realizability of the tailored nanostructure with electron-beam lithography (EBL). Our GA optimization results unveil the central role of the radiative coupling in the design of PNA and open up new exciting pathways in the engineering of metal nanostructures. Samples were fabricated using techniques and surface-enhancement Raman scattering measures were performed confirming the theoretical predictions.

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