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Plasmonic nanostructures for multiscale light amplification AIQING CHEN, ULRICH WELP, VITALII VLASKO-VLASOV, Argonne Natinal Laboratory, MSD, RYAN MILLER, ELENA SHEVCHENKO, LEONIDAS OCOLA, STEPHEN GRAY, Argonne National Laboratory, CNM, EUGENE DEPRINCEIII, Georgia Institute of Technology — We demonstrate experimentally a multiscale plasmonic design for giant light amplification using gold nanoparticles self-assembled in gratings on a metal mirror with thin dielectric spacer. The successive increase of the light enhancement factors upon addition of individual plasmonic elements in the design is tested by measurement of the Raman signal from R6G and benzenethiol molecules on clusters of nanoparticles, their ordered arrays on dielectric, semiconducting, and metal substrates, and on metal substrate with gratings. High fidelity of our structures as SERS substrates are confirmed by areal maps of the Raman response. FDTD numerical calculations are in a good agreement with our experimental measurements.

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