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Efficient Forward Second-Harmonic Generation from Archimedean Nanospirals RODERICK DAVIDSON, JED ZIEGLER, GUILLERMO VARGAS, SERGEY AVANESYAN, RICHARD HAGLUND, Vanderbilt University, APPLIED OPTICAL PHYSICS TEAM — High electric field enhancements resulting from the plasmonic resonances in nanoparticle antennas create efficient harmonic generators. These nanoscale nonlinear sources also show significant enhancements in conversion efficiency as asymmetry is introduced into the plasmonic geometry on both the inter-particle and intra-particle level. The nanospiral shows a unique form of asymmetry because it is not the result of an altered symmetric system nor does it have any axis of symmetry. These experiments show that this asymmetry results in a highly efficient harmonic generator as well as an interesting two-dimensionally chiral optical element. This nonlinear signal demonstrated sensitivity to tuning both linear and circular polarization states of incident light as well as conversion between these states. We report SHG conversion efficiencies ($7.8*10^{-9}$) that are amongst the highest reported in the field of plasmonics using a 15 fs pulse at a wavelength of 800nm. We also observe selective conversion between fundamental and emitted polarization states. These results are interesting for applications requiring optical control of high energy light from nanoscale sources.

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