Single-particle Studies of Nanostructure Surface Fields

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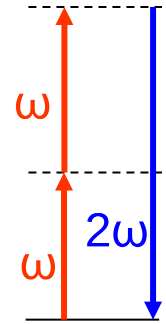
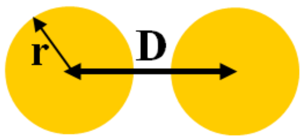
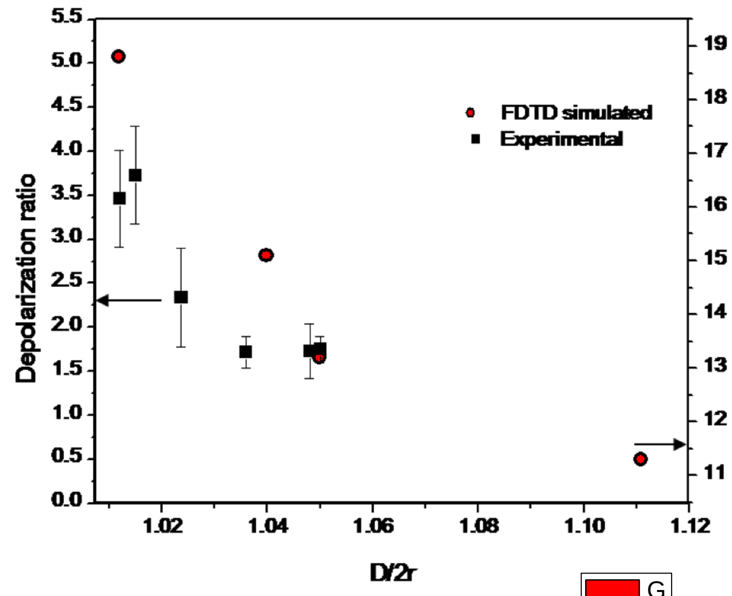
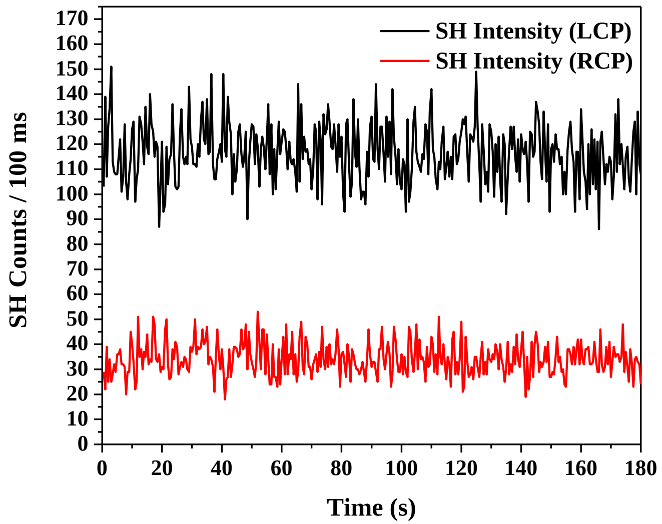
Metal nanostructures have a characteristic localized surface plasmon resonance, which can be used to concentrate electromagnetic fields into small volumes when nanoparticles are assembled into an array. These fields can play a role in increased solar-energy-conversion technologies, and for the enhancement of applied spectroscopy techniques. We have used single-particle SHG measurements to characterize nanoscale surface fields.





Right: Experimental SHG depolarization ratios and numerical simulations were used to study distance dependent surface fields of nanoparticle dimers. The strong agreement between experimental and numerical data demonstrates the sensitivity of SHG measurements to nanoscale surface fields.





Left: Differential SHG is measured using circularly polarized light, indicating the nanoparticle surface fields are chiral. The extent of chirality is quantified (below) and summarized for several single nanostructures (right). Future research will exploit these fields for plasmon-enhanced magnetic field studies.

$$SHG-CDR = \frac{2\left(I_{2\omega}^{LCP} - I_{2\omega}^{RCP}\right)}{I_{2\omega}^{LCP} + I_{2\omega}^{RCP}}$$