Complete vector characterization of tightly focused electric fields via nonlinear scattering by nanospheres DAVID KUPKA, RANDY BARTELS, Colorado State University — We introduce an algorithm for characterizing a 3D focal field valid under tight focusing conditions utilizing far field third harmonic (TH) collection. This allows reconstruction of the focal field from a charge-coupled device (CCD) image. A nano-particle, acting as a point source probe in a focal volume, generates a localized TH signal carrying mixed vector polarization information in the far field. When scanned throughout the volume, a series of intensity patterns captured in the far field are mapped to these localized point sources. The spatial mapping resolution is limited by the size and position control of the probe. We present simulation results of the far field CCD images produced for a variety of common incident field polarizations under both low numerical aperture (NA) and high NA conditions. Each image, analyzed by integration over selected regions, provides initial estimates for parameters describing the focal vector field. A Nelder-Mead simplex algorithm allows complete reconstruction of the vector point spread function from the captured far-field intensity, yielding both longitudinal and transverse field components in the focal volume.

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