microsphere (when considered in isolation). Low objective NAs of approximately 0.075 yield the maximum observed increases in backscattering. Due to the wavelength-averaging scheme of the broadband imaging system, the measured peak backscattering enhancement was found to be about 10 dB less than calculated theoretically for monochromatic illumination.

We demonstrated experimentally that a gold nanoparticle as small as 50 nm can be readily detected using broadband visible light via the nanojet backscattering enhancement phenomenon. This size nanoparticle caused a measured 3:1 (200%) increase in the measured backscattering intensity of the adjacent 4.4 μm diameter microsphere when positioned within its nanojet. We found that this backscattering enhancement factor can be further increased if the objective NA is adjusted to the optimum value.

Overall, the backscattering enhancement phenomenon of the photonic nanojet affords the possibility of broadband visible light detection of gold nanoparticles even smaller than 50 nm. The lower bound on the detectable nanoparticle size will ultimately be determined by the dynamic range of the optical measurement system, i.e., its ability to distinguish fractional (less than 100%) enhancements of the backscattering of the nanojet-generating microsphere in the presence of the background.

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