Confocal light microscopy at 1 nm: Locating colloids at maximum resolution MATTHEW BIERBAUM, BRIAN D. LEAHY, ALEXANDER A. ALEMI, ITAI COHEN, JAMES P. SETHNA, Cornell University — We present PERI, a method to locate colloidal spheres at the information theoretic limit using a generative model for confocal microscope images. Without modification to the microscope we resolve positions and radii to 1 nm, which we verify with experimental data. Employing Monte Carlo techniques, we recover the probability distributions for all particle positions and radii, microscope point spread function, laser intensity fluctuation, scan parameters, and signal to noise ratio in a single fit. Using this technique we explore precision measurements of dense colloidal suspensions including standard quantities such as mean squared displacement and the pair correlation function.

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