Numerical Aperture Increasing Lens Assisted Microscopy and Spectroscopy

ANTHONY N. VAMIVAKAS, MESUT G. ERASLAN, M. SELIM UNLU, Dept. of Electrical and Computer Engineering, Boston University, BENNETT B. GOLDBERG, Dept. of Physics, Boston University — A Numerical Aperture Increasing Lens (NAIL) is used for high resolution far-field microscopy and spectroscopy of semiconductor nanostructures. Incorporating NAIL into our low temperature confocal microscope, we have been able to perform high collection efficiency spectroscopy of single, self-assembled InGaAs/GaAs quantum dots. We plan to exploit the measured six-fold collection efficiency increase in our system to enhance the signal-to-noise ratio in a Hanbury-Brown Twiss (HBT) interferometer. In an attempt to quantify the far-field optical resolution of our NAIL assisted thermal microscope, we are using a pulsed UV laser to generate a thermal radiation source in Si with a spatial extent less than .5 micrometers. Previously, we experimentally demonstrated an optical resolution of 1.4 micrometers when imaging semiconductor integrated circuits.

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