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A Versatile Aperture less Near-field and Far-field Spectroscopic Microscope for Biological and Material Applications[1] DEREK NOWAK, A.J. LAWRENCE, ERIK SÁNCHEZ, Portland State University — Traditional light microscopy suffers from the diffraction limit, which limits the spatial resolution to $\lambda/2$. Near-field optical microscopes allow for imaging at resolutions lower than the diffraction limit. Using a combination of a hybrid atomic force microscope and an inverted optical microscope, resolutions below 20 nm have been demonstrated. The imaging probes for the AFM are specially shaped metal tips that are illuminated with the excitation light. This technique has been named tip enhanced near-field optical microscopy (TENOM). We are developing a system that will allow the imaging of the fluorescence from almost any visible chromophore without changing filters or excitation wavelength for resolutions below 20 nm, using two-photon excitation. The microscope's ability to image samples at atmospheric pressure, room temperature, and in solution makes it a very promising tool for the biological and material science communities. A single computer, simple control circuits, FPGA data acquisition, and a simplified optical system control the microscope. This versatility will enable the end user to custom design experiments from con-focal far-field single molecule imaging to high resolution scanning probe microscopy imaging.

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