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Single-molecule detection of near-infrared phthalocyanine dyes YOU LI, BRIAN CANFIELD, LLOYD DAVIS, University of Tennessee Space Institute — The major advantage associated with near-IR monitoring is the fact that few compounds show intrinsic fluorescence in this region of the spectrum. Phthalocyanine dyes provide excellent photostability and hence are an attractive candidate for fluorescence bioassay applications. However, because of their small Stokes shifts, non-standard methods are needed for separation of fluorescence from scattered laser light. We have developed a custom confocal microscope that uses a low-cost laser diode operating at 665.8 nm for sample excitation and an angle-tuned Raman notch filter to block scattered laser radiation and provide high-throughput of fluorescence. Also, a diffraction grating is used to isolate the laser excitation wavelength from the block broadband luminescence of the laser. We have used the system to observe photon bursts from single molecules of zinc phthalocyanine fluorophores in an ethanol solution. The autocorrelation function of the photon trace provides a measure of the signal-to-noise ratio. We also discuss ongoing experiments to characterize the limits of detection of near-infrared fluorophores in aqueous solution using the microscope.

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