WAVELENGTH DEPENDENT CHARACTERIZATION OF A MULTIMODE FIBER ENDOSCOPE

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Imaging at several millimetres depth in tissue, while maintaining the sub-micron resolution available in standard light microscopes, requires new types of endoscopes. Multimode fibers have shown promise as flexible and high-resolution endoscopes, but advanced adaptive optics is needed to overcome the phase offsets between the propagation modes in the fiber which scrambles the image [1].

For non-linear imaging methods, the problem is further exacerbated by the requirements of simultaneously focusing multiple wavelengths to allow focusing of femtosecond laser pulses at the sample plane. Additionally, the pulse length should be kept short, requiring dispersion compensation, that might vary across the sample area.

GRIN fibers have shown promise as probes for multi-photon fluorescence imaging due to their lower dispersion as compared to step index fibers [2]. Here, we investigate the frequency dependent light transmission and spectral dispersion at the sample plane using crossed-beam interferometry and a tunable single frequency Ti:Sapphire laser. We also investigate the change in point spread function as the wavelength changes, when the endoscope is used as a point scanning imaging device. The overall aim of this investigation is to allow delivery of femtosecond pulses with a specific chirp to the imaging area.

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