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Enhancement of signal to noise ratio through temporal pulse shaping

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The quest to probe deeper into biological tissue has led to the development of many microscopic techniques ranging from the linear regime, such as bright-field microscopy, to higher order nonlinear optical microscopy (NLOM) techniques. These NLOM permit intrinsic 3D imaging with submicron spatial resolution, decreased photodamage to tissue, increased depth of penetration, as well as the ability to perform label-free imaging. This research focuses on the enhancement of signal to noise ratio obtained in NLOM through temporal pulse shaping and phase manipulation of the excitation pulses. The application and effects of this pulse shaping and manipulation on contrast enhancement, as applied to examples including nonlinear crystals and biological tissues, will be discussed.

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