

**Multi-Photon Imaging**

Multi-Photon Excitation (MPE) imaging has been successfully applied in biological microscopy with sub-picosecond ( $\sim 100$ fs) pulse duration. Shorter pulse ( $\sim 10$ fs) can generate higher nonlinear effect and thus is preferable in MPE imaging. However, due to the high-order dispersion generated by the optical media, the femtosecond pulse can be severely distorted. It is therefore of great importance to measure and control the pulse in biological microscopy. By using nonlinear phase scanning, MIIPS can accurately generate specific pulse phase at the destination spot. This gives us the possibility to study on the effect of electromagnetic field of the femtosecond pulse to the biological sample. For example, high localized focal spot, low photobleaching rate, and selective excitation are all proved to be effective with the control of the ultrashort pulse. This work will open a new area of femtosecond pulse application on biomedical optical microscopy.

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