

# FREQUENCY DOUBLED CR:FOSTERITE LASER FOR TWO PHOTON FLASH PHOTOLYSIS OF CAGED COMPOUNDS

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As the range of multi-photon imaging and excitation processes continue to grow, laser technology must be developed to meet the demand of such new applications. One such example is in the case of multi-photon photolysis, where a laser source with sufficiently high photon density is required to uncage active molecules to instigate a localised chemical reaction. Flash photolysis is widely applied in cell physiology to initiate neurotransmitter and other ligand-receptor interaction and is often combined with electrophysiology and optical imaging. The majority of caged compounds are photolysed using single photon excitation, with ultra-violet light with wavelengths around 300 nm. Consequently, efficient two photon uncaging requires an ultrashort pulsed source ranging between approximately 600 and 650 nm. This is out-with the capability of conventional solid-state laser gain media and hence a solution to this technology limitation is sought.

We report a frequency-doubled fs-pulsed Cr:Fosterite laser source suitable for multi-photon photolysis and microscopy application. This source delivers tunable light between 620 and 640 nm and for further system flexibility, a compact system to alter the pulse the pulse from <100 fs to <15 ps is included at the design stage.

Tailoring of the pulse duration for the chosen sample and microscope objective lens is performed using dispersive optical fibre, circumventing the need of high-loss gratings. This flexible source at this useful wavelength range potentially enables the study of known and experimental caged compound that will facilitate a more localised release of caged molecules deeper into biological tissues than conventional single photon excitation methods can provide.

Firstly applied to caged fluorescein compounds, in the longer term this source will be used with neuroscience collaborators at CNRS (Paris) to determine the critical pulse duration for multiphoton photolysis of caged glutamate, with a view to *in vivo* applications.