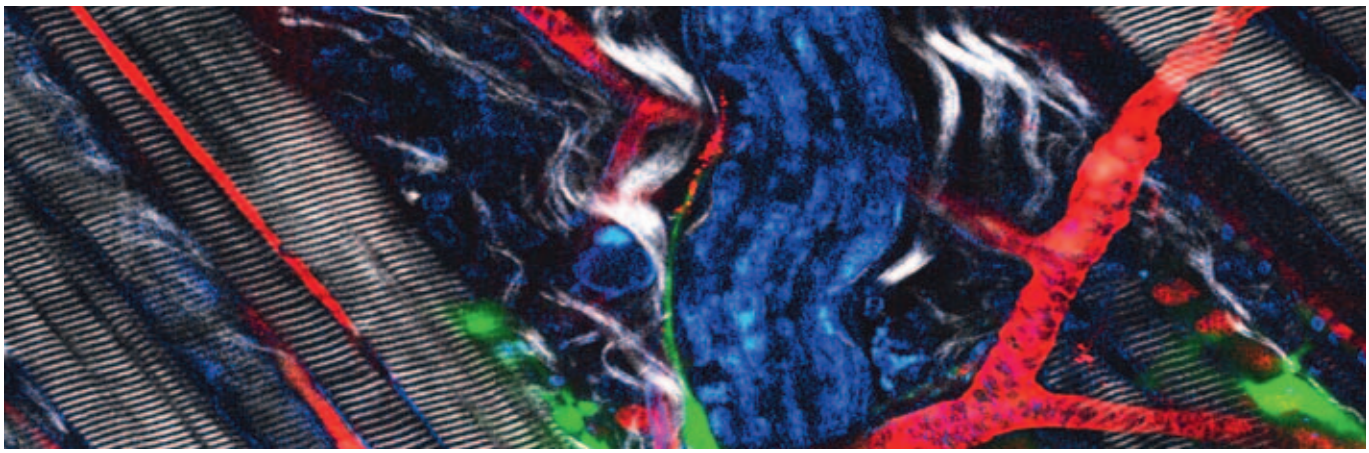
LaVision BioTec

OPO

>> *Optical Parametric Oscillator [OPO] Package for deep tissue imaging* <<



- Excitation of red dyes
- Reduced photo toxicity and bleaching
- High penetration depth
- 1100 - 1600 nm @ 200 fs

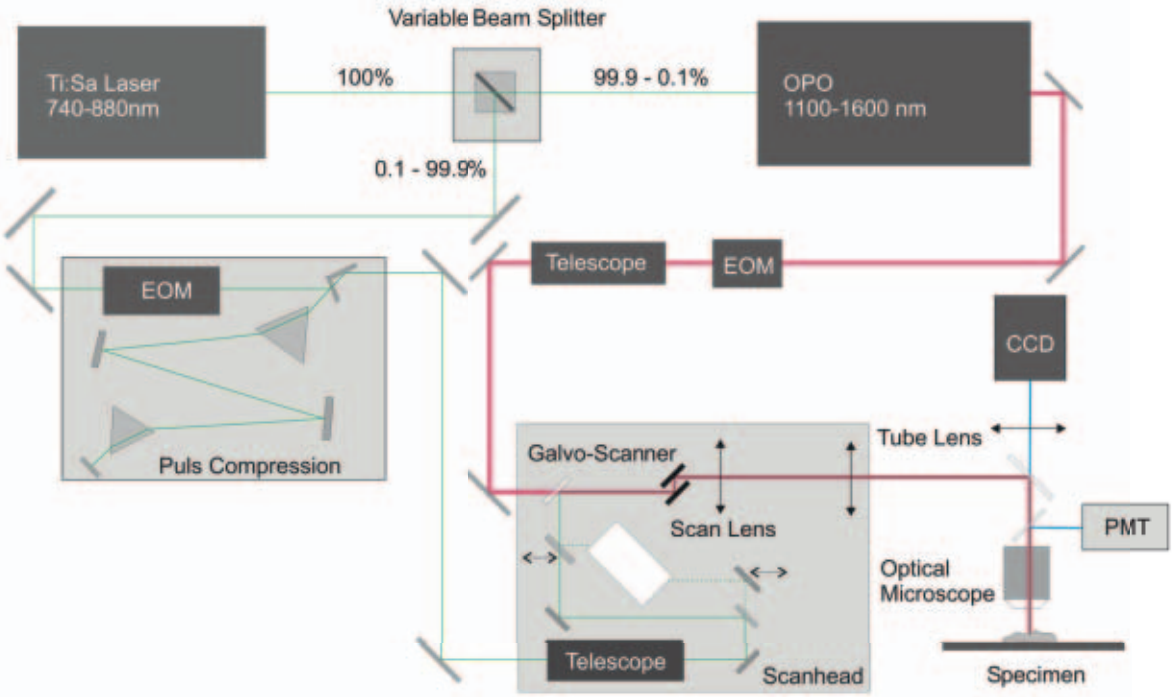
Extended infrared multiphoton imaging

Most standard 2-photon microscopes are equipped with Ti:Sapphire lasers that deliver NIR laser radiation in the spectral range between 680-1040 nm. Therefore 2-photon microscopy is limited to blue, green and yellow dyes or fluorescent proteins - red dyes or red fluorescent proteins are almost excluded from this deep imaging technique. Exciting red dyes or red fluorescent proteins requires pulsed laser radiation in the far infrared (>1100 nm), which is delivered by OPOs.

Technique/physics behind the OPO

OPOs are passive laser-like devices that are designed for operation with mode-locked Ti:Sapphire lasers. The OPO converts the short Ti:Sa laser radiation into tuneable radiation of longer wavelengths. In 2-photon microscopy setups the Ti:Sapphire laser pumps the OPO at 740-880 nm (@ fixed wavelength) and the OPO delivers tunable fs laser radiation from 1100 to 1600 nm.

OPO setup



LaVision BioTec's flexible approach

LaVision BioTec's flexible approach LaVision BioTec's OPO package provides a flexible motorized beam splitter that allows to set the fraction of light used for pumping the OPO, while the other fraction excites blue/green/yellow fluorophores simultaneously. The fraction used for exciting blue/green/yellow fluorophores passes a negative pulse compressor to ensure laser pulse length < 150 fs within the sample. Ti:Sa laser and OPO wavelengths can be tuned independently to excite blue/green/yellow respectively red fluorophores most efficiently.

Benefits for 2-photon microscopy

Extended infrared radiation delivered by the OPO offers following advantages:

1. Access to red dyes/fluorescent protein
2. Significantly reduced photo toxicity and bleaching rate
3. Higher penetration depth (depending on the specimen up to a factor of 2)

Literature

1.1419-24Biophysical J. 2010 Feb; 98: 715–723.Expanding Two-Photon Intravital Microscopy to the Infrared by Means of Optical Parametric Oscillator.Herz J, Siffrin VD, Hauser AE, Brandt AU, Leuenberger T, Radbruch H, Zipp F, Niesner RA.

2.Curr Opin Biotechnol. 2009 Mar 25.Infrared multiphoton microscopy: subcellular-resolved deep tissue imaging.Andresen V, Alexander S, Heupel WM, Hischberg M, Hoffman RM, Friedl P.

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