TriM Scope

Beam Multiplexer for Multifocal Multiphoton Microscopy

description

LaVision BioTec's TriMScope is based on a patented beamsplitter that splits up an incoming laser beam into up to 64 beams which are scanned simultaneously in the object plane. This results in either 64 times brighter images or 64 times higher image acquisition rates compared to standard single beam multiphoton scanning microscopes. The foci in the object plane are aligned in a single line and the number of foci can be easily switched from 64 to 32, 16, 8, 4 and to a single beam. With optional resonant scanner image rates up to 4000 Hz are possible.

The TriMScope beam divider is a compact and easy-to-use device that utilizes exclusively flat optics for dividing the incoming beam with high light efficiency, avoiding aberrations and producing equally intense foci in the sample. As the beams are inherently shifted with respect to each other by several picoseconds, there is no cross-talk. Spatial and axial resolutions are diffraction limited. In addition, single line excitation can easily be coupled into the input slit of an imaging spectrograph yielding real-time spectral sectioning in the x-y and x-z planes.

microscopes

invert and upright microscopes from Leica, Nikon, Olympus and Zeiss

laser

Ti:Sapphire lasers from Spectra-Physics, Coherent, etc.

frame rate

The frame rate depends on the CCD camera.

frame rate:	with CCD-camera Andor iXon DV885 31 Hz @ 1004 x1002 pixel

scan rate

max. scan rate:	1.2 kHz with non resonant scanner

scan area/ FOV

The FOV depends on the CCD chip size and the magnification of the objective. The following values correspond to the Andor iXon DV 885 CCD camera (chip size 8.0 × 7.0 mm^2).

100 x Objective:	80 x 80 µm^2
63 x Objective:	127 x 127 µm^2
20 x Objective:	400 x 400 µm^2

transmission

> 70% within the TriM Scope
@ 710 – 980 nm

z-drive

objective driven via a precision stepper motor

speed:	10 Hz @ 0.9 µm step size
min. step size:	25 nm

time multiplexing

time delay between adjacent beams	680 fs

LaVision BioTec GmbH • Meisenstraße 65 • D-33607 Bielefeld • Germany
www.lavisionbiotec.com • info@lavisionbiotec.com
Tel: +49 (0) 521 2997 710 • Fax: +49 (0) 521 2997 701

inter-foci separation

100 x Objective: 300 nm
63 x Objective: 476 nm
20 x Objective: 1500 nm

The focal spot size is diffraction limited and depends on the objective.

foci size

63 x Objective: ≈ 300 nm
@ λ_{laser} = 800 nm
$NA_{objective}$: 1.4

polarization of adjacent foci

The polarization of foci alternates between S and P.

Arrangement: s-p-s-p-s-p…

variable number of foci

The foci are arranged in a line. The number of foci can be set via software. The length of the line is proportional to the number of foci.

number of foci: 1, 2, 4, 8, 16, 32, 64
point/line scan toggle switch

chirp compensation

optical dispersion causes broadening of the laser pulse leading to a linear decrease in 2-photon induced fluorescence signal. TriMScope has a chirp compensation arrangement based on prisms.

chirp compensation: laser pulse width down to 120 fs at the sample plane based on the original pulse width of 100 fs.

intensity control

via motorized crossed polarizer arrangement at the input

power requirements

110V/220V ; 5A

dimensions

$60 \times 42 \times 18$ cm^3

weight

42 kg

upgrade spectral unmixing

The line of 64 foci lends itself for convenient coupling onto the input slit of an imaging spectrograph allowing spectral-resolved imaging.

upgrade FRAP

An additional visible laser can be coupled in the optical path which can be scanned via the XY scanner and used for FRAP studies or uncaging.

upgrade 3D FLIM

TriM Scope in conjunction with LaVision's ultrahigh rep. rate, picosecond gated PicoStar HR (200ps gate width @ 110 MHz rep. rate) camera allows real-time 3D FLIM.

customized systems

We specialize in offering customized turn-key systems. Please feel welcome to contact us to discuss your special needs and requirements.