SIMTRUM

Broad Bandwidth Fiber Laser

2023 V1

For customized projects please Contact us:

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SIMTRUM

Broad Bandwidth Fiber Laser

The Cyclone is a broad bandwidth femtosecond fibre laser. It provides the shortest pulses on the market generated by a fibre laser, less than 20 fs pulses. Cyclone provides outstanding peak power (>120 kW) over a wide spectrum of 950-1150nm.
These parameters allow for increased brightness and reduced photodamage, making the Cyclone laser perfect for multiphoton microscopy, SHG microscopy and a variety of other non-linear processing and spectroscopy applications.
It is a cost-effective, maintenance-free femtosecond fibre laser with best-in-class performance.

Dispersion Pre-Compensator

Cyclone Laser
Rack-Mountable
Fiber Connecting Laser and Dispersion Pre-Compensator

Feature

Cost-Effective

- Low-cost/high performance and quality laser
- 50kEur - 70kEur
- Minimal cost of ownership
- 2 -year standard warranty. Extended warranty: <3kEur/year
- Simple microscope configuration
- No tuning means no beam pointing hence simplified microscope

Robust, Compact and Simple

- Fiber laser –nearlyplug & play
- Straightforward installation (<2hours).
- Air-cooled
- >10.000 hours lifetime

Simplified Multicolor Excitation

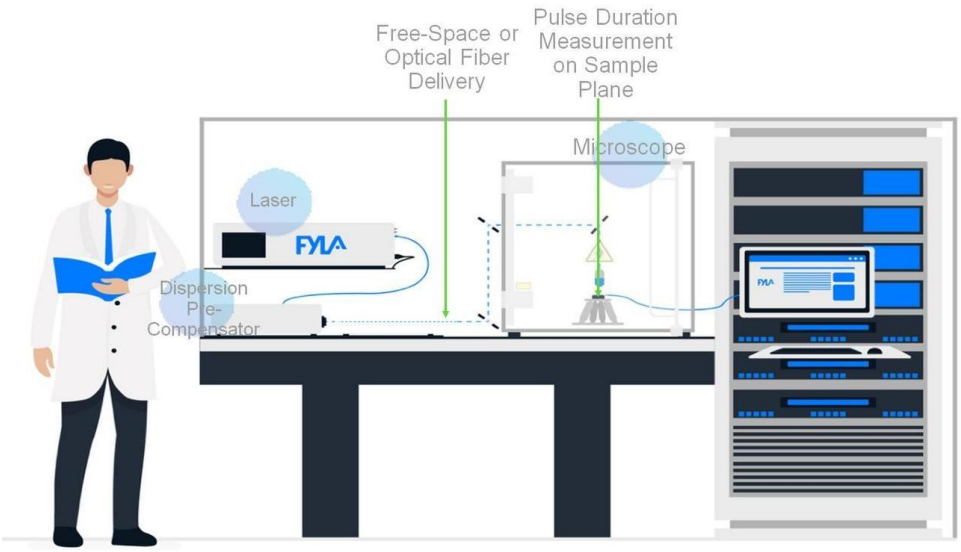
- Broadband emission. Not Tuning
- Simultaneous excitation of blue, green and red labels.
- Conventional level sofau to fluorescence

Brightness and Deep Penetration

- NIR 15-20 fs pulses on the sample Plane
- 10x higher peakpowerand photon flux than 100fs laser
- Lower thermal damage

More Advantages

- Light can be delivered to the microscope free-space or with a dispersionless optical fiber
- Pulse duration can be dynamically adjusted with the dispersion pre_x0002_compensator. Minimum pulse duration at the sample plane (15-20fs)
- Pulse duration can be measured at the optical sample
- No wavelength tuning. Simpler, more robust and economical optical set-up

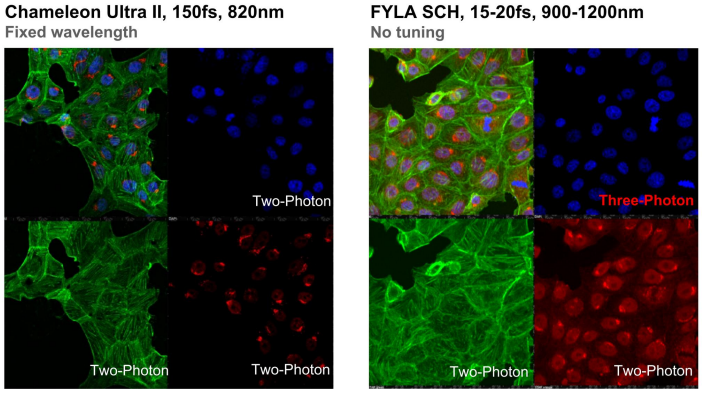


Application

Brightness and deep penetration

1)Multiphoton Image of an Abberior Cell. Star Green (green). Star Red (red). DAPI (blue)

- Simultaneous imaging of all fluorophores in the blue, green and red regions
- Brighter images at longer wavelengths(red-shifted labels)
- Equivalent image brightness with green and blue labels (three-photon)
- Autofluorescence levels remain comparable to tunable excitation



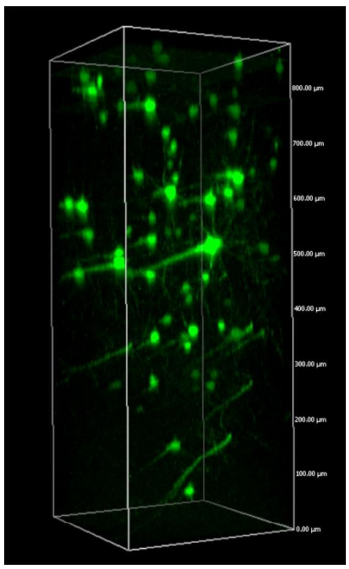
Microscope: Nikon Eclipse Inverted Microscope, A1 Objective Lens: Nikon´s CFI75 Apochromat 25XC W 1300 Courtesy of Prof. Alberto Diaspro and Dr. Paolo Bianchini at IIT-Italian Institute of Technology, Genoa, Italy

Application

Brightness and deep penetration

2)Two-Photon Fluorescence Image of a Clarified Brain.Expressing GFP, Labelling the Cytoplasm of Neurons

- Images as deep as 900um can be imaged. Possibly deeper too. Not deeper samples have been tested
- Shorter pulses deliver higher peak power for enhanced image brightness
- Longer wavelengths in the NIR are better suited for red shifted labels (compared to Ti:Sapphire lasers) and for deeper penetration



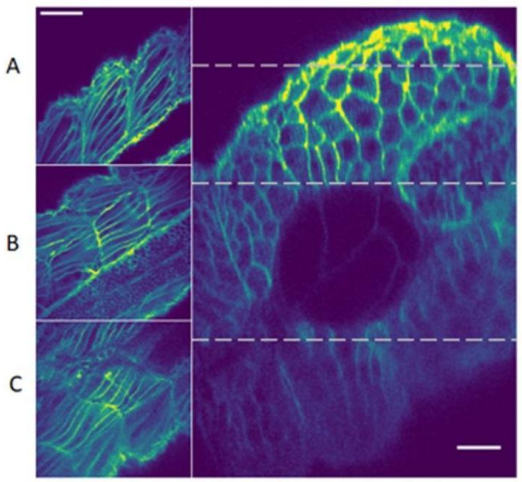
Illumination: FYLA Cyclone Laser (15-20fs) (900-1200nm)
Microscope:Nikon Eclipse Inverted Microscope, A1
Objective Lens: Nikon´s CFI75 Apochromat 25XC W 1300
Courtesy of Prof. Alberto Diaspro and Dr. Paolo Bianchini at IIT-Italian Institute of Technology, Genoa, Italy

3)Two-Photon Microscopy Image of a Zebrafish Embrio

Two-Photon Microscopy Image. Tail of a 2-days-old transgenic line zebrafish embryo (Caax-GFP)expressing GFP in all cell membranes.

Illumination: Cyclone Laser
Detector: Hamamatsu H9305-04 PMT

Courtesy of Dr. Pablo Loza, Dr. Gustavo Castro and Marina Cunquero at SLN Lab at ICFO (Barcelona),Spain



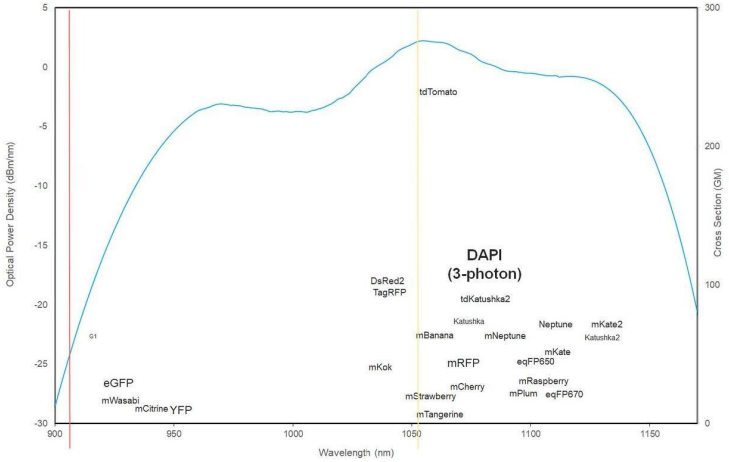
TPEF images of the tail of a 2-days-old transgenic line zebrafish embryo (Caax-GFP) expressing GFP in all cell membranes.(A-C) intensity-normalised images corresponding to 26,71,150um depth.(D) The complete resliced image of a Z-stack composed of 300 imimages(0.71um step spacing).Scale bar:(A-C) 40 um,(D) 20um.

Technical Performance

Simultaneous colour excitation

- Cyclone provides a broad bandwidth across 900-1200nm. All labels (including green fluorophores such as eGFP and blue fluorophores such as DAPI) can be excited simultaneously within this spectral region,using two-photon or three-photon excitation
- Tuning is not required. The target samples are excited and the emitted fluorescence can be collected simultaneously using multiple spectral channels
- Autofluorescence remains similar to conventional tunable excitation since the emission spectrum is independent of the excitation spectrum
- This provides a simpler, more robust and economical optical set-up

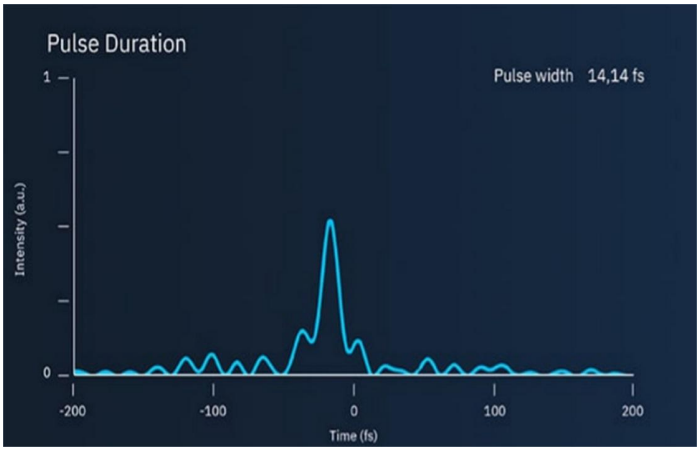
Simultaneous Colour Excitation



Pulse duration

- Cyclone provides the shortest pulses of an all fiber laser, of the order of15fs at the sample plane
- The pulse duration has been measured using two different methods
  1) A suitable Femtochrome autocorrelator
  2) Retreiving it from second harmonic generation spectrum
- A dispersión pre-compensator compresses the pulses at the output of the Cyclone. This can be dynamically adjusted to compensate the dispersion introduced by the optics of the microscope and to deliver 15-20fs pulses on the sample plane

Pulse Duration

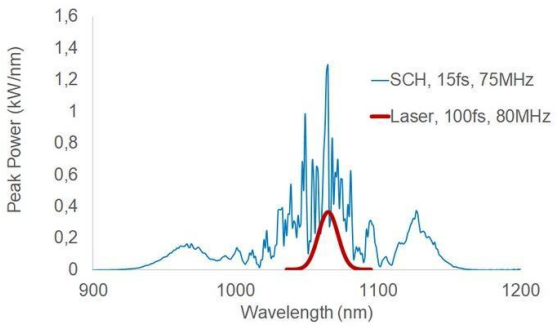


Technical Performance

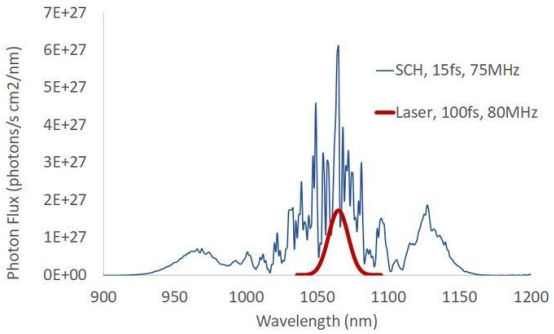
Peak power and photon flux

- The short pulses delivered by the Cyclone generate extremely high peak powers
- For an average power of 50mW, the Cyclone laser provides a peak power of 54kW, compared to 6kW provided by a conventional 100fs laser. 7 times higher
- Consequently, the photon flux is also 7 times higher with the pulses provided by the Cyclone laser, compared to a 100fs laser

Peak Power

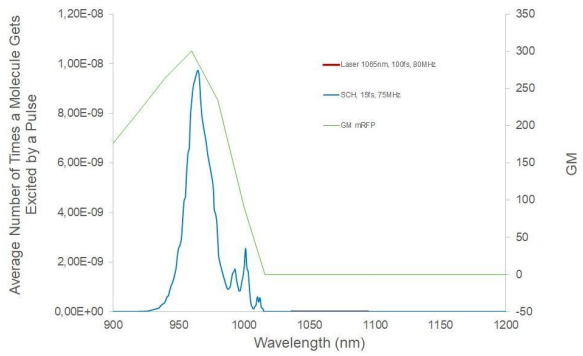


Photon Flux



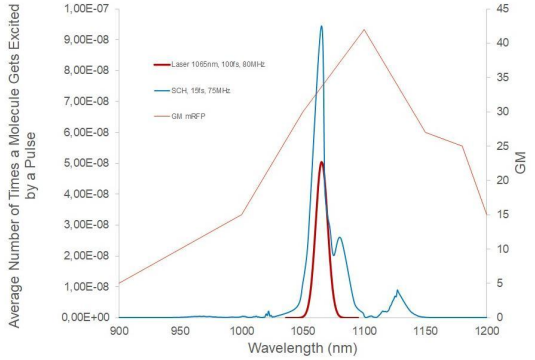
Excitation efficiency

eGFP



Number of eGFP molecules that get excited by two-photon excitation. Cyclone laser(blue) vs conventional 100fs laser (red)

mRFP

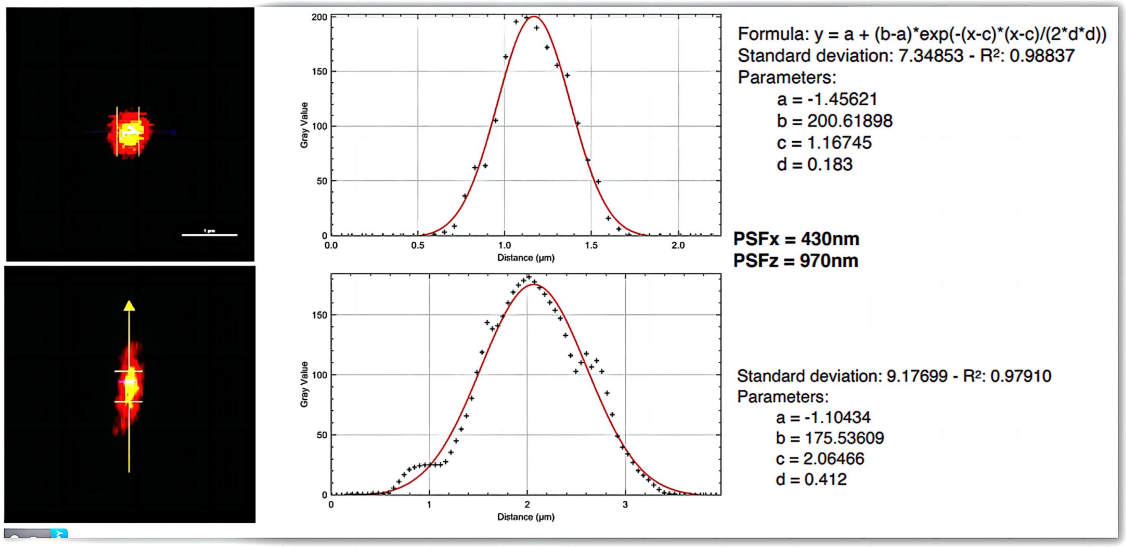


Number of mRFP molecules that get excited by two-photon excitation. Cyclone laser (blue) vs conventional 100fs laser (red)

Technical Performance

Point Spread Function

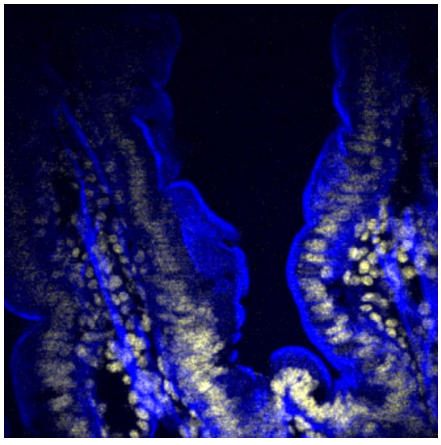
Excellent Point Spread Factor:Better tann 430nm in the X axis,better than 970nm in the Z axis



Illumination: Cyclone Laser (15-20fs) (900-1200nm).Microscope: Nikon Eclipse Inverted Microscope, A1.Objective Lens: Nikon´s CFI75 Apochromat 25XC W 1300.Courtesy of Prof. Alberto Diaspro at IIT-Italian Institute ofTechnology, Genoa, Italy

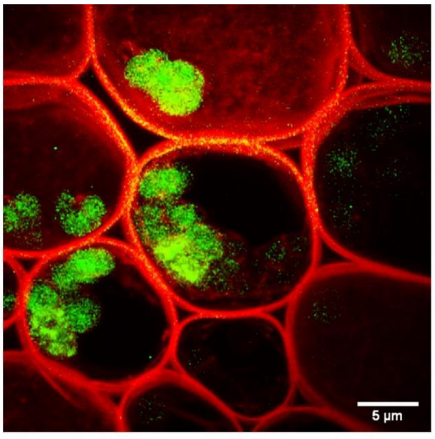
Simultaneous Multicolour Excitation

Mouse Intestine



Two-Photon Microscopy Image. Mouse intestine section stained with Sytox Green labelling the nuclei and Alexa Fluor 568 phalloidin labelling the actin filaments.
Illumination: Cyclone Laser
Microscope: Home-made
Detector: Hamamatsu H9305-04 PMT
Courtesy of Dr. Pablo Loza at SLN Lab at ICFO (Barcelona), Spain

Convallaria Majalis



Two-Photon Microscopy Image. Chloroplasts (green) and cell walls (red).
Projection of a Z-stack.
Illumination: Cyclone Laser
Microscope: Home-made
Detector: Hamamatsu H9305-04 PMT

Specification

Product name	Broad Bandwidth Fiber Laser（Cyclone）
Spectral Range	950-1150 nm
Pulse Duration	15-20 fs
Average Power	>150 mW
Optical Peak Power	>120 mW
Repetition Rate	80 MHz
Power Stability	<0.5% over 3 h
Polarization	Unpolarized
Output Port	Free space
Free space	Collimated, single-mode across full spectrum
Beam Diameter	2.4 mm (1/e2 at 1064 nm)
Spatial Mode	<1.2 Fundamental Gaussian
Cooling	Conductive
Dispersion Pre-Compensati	-4000 fs2 to +2500 fs2
Power Requirements	220/110V 50-60 Hz
Operating Temperature	20 - 30 ºC
Dimensions	436x560x151 mm (WxDxH)

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