Convergent

EPIC Technology Meeting on Advanced Photonics in Urology
SURGICAL THULIUM HYBRID LASERS

EPIC European Photonics Industry Consortium

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- Complete portfolio of multiemitter diode lasers for medical applications and fiber laser pumping
  - Up to 250 W emitted power at 976 nm 200um fiber pigtail
  - Up to 250 W emitted power at 920 nm 200um fiber pigtail
  - 140 W QCW multiemitter at 793 nm
  - Up to 70 W emitted power at 450 nm
- High brilliance for high efficiency multi-plexing, efficiency >54%

convergent — Diode Fab – Torino

Blue-Wavelength Lyrae Multiemitter: Product Overview

Key Features

- From 30W to 80 Max Output Power (CW)
- 50 mm and 105 mm core, 0.22 NA fiber
- NA fill < 0.15 or 0.18 (see fiber option)
- 30% high wall plug efficiency
- 450nm emitted wavelength

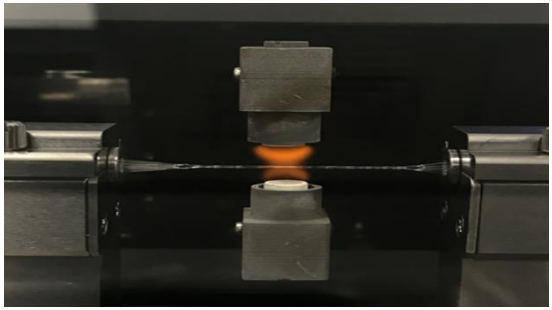
Lyrae Multiemitter parametric characteristics

		δL-030-F			δL-060-F			δL-040-G			δL-080-G				
		s - package			d – package			s - package			d – package				
Parameter	Sym	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Unit	Notes
Laser Characteristics at:		30W Output Power (*)			60W Output Power (*)			40W Output Power (*)			80W Output Power (*)				
Operating current (BOL)	Iop			4			4			4			4	A	
Operating voltage	Vop			30			60			45			90	V	
Wall plug efficiency	WPE		30			30			30			30		%	
Emitted Wavelength	Wv		450			450			450			450		nm	
Numerical Aperture (95% power)	B_NA		0.18			0.18			0.15			0.15		%	
Fiber Characteristics															
Fiber core diameter			50			50			105			105		um	
Fiber cladding diameter			125			125			125			125		um	
Coating material		Acrylate			Acrylate			Acrylate			Acrylate				
Fiber NA			0.22			0.22			0.22			0.22			
Pigtail length		1.2		2	1.2		2	1.2		2	1.2		2	m	
Attenuation (450nm)			0.06			0.06			0.06			0.06		dB/m	
Bending radius		25			25			25			25			mm	
Operating Conditions (environmental)															
Operating temperature			25			25			25			25		°C	
Relative humidity			50			50			50			50		%	no condensing

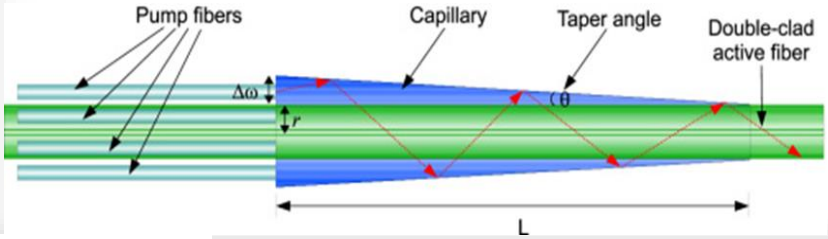
Notes: (*) T= 20°C

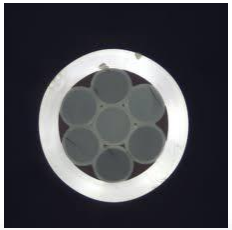
Rev. 001	Lyrae δL-serie Fiber Coupled Multiemitter Laser Diode	Page 1 of 3

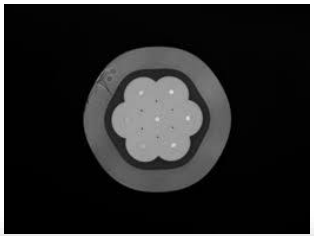
➢ Wide variety of home made fiber components



- Pump combiners capability in our class 10000 clean room:
- 19x1 with 135/155um input fiber, 20/400 output fiber
- 7x1 with 135/155um and 200/220um input fiber, 20/400 output fiber
- 6+1x1 with 135/155um input fiber and 20/250um output fiber
- Different version of Output Combiners 3x1, 4x1 and 7x1 have been developped to match all the production requirements for industrial and medical lasers.
- Delivering fiber cables AR coated in QBH, D80 and SMA 905 versions.

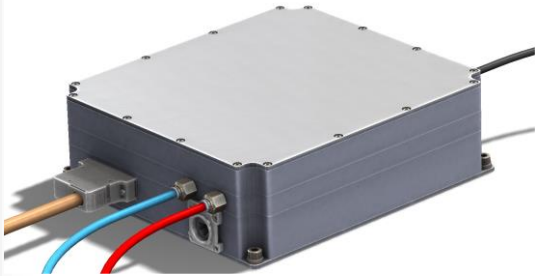


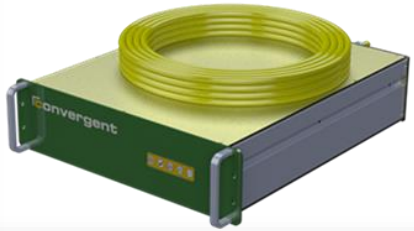




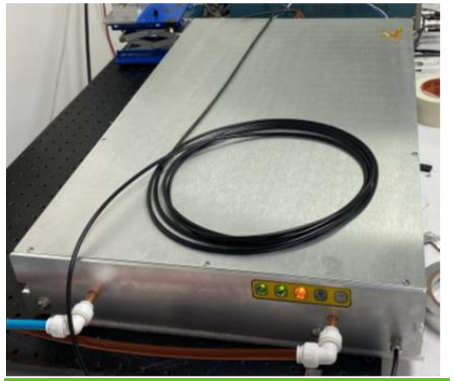
Thulium fiber laser is the new revolutionary tool for several surgery applications.

A survey by the *World Journal of Urology* demonstrated the great potential and numerous technological advantages of the Thulium fiber laser compared to the established Ho:YAG sources for urological applications.





Convergent Photonics offers Thulium Fiber laser with wide range of power CST200 and 1940nm+1550nm (or combined with 450nm). It currently supports ***urology***, ***thoracic*** and ***pulmonary***, ***ent*** and ***general*** surgery applications.



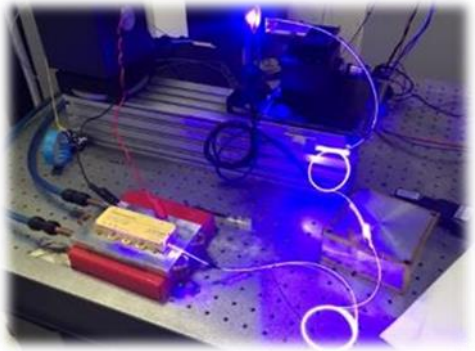
Thulium Fiber Laser

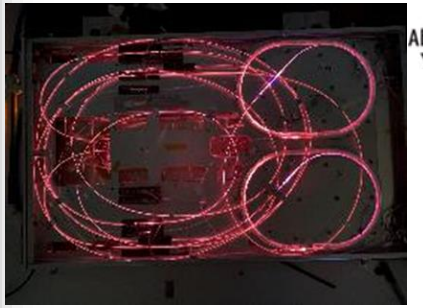
- CW output power 250W
- QCW Peak Power 1250W
- Rep Rate 1- 2500Hz
- Pulse width 100us - 15ms
- Pulse Energy up to 12J

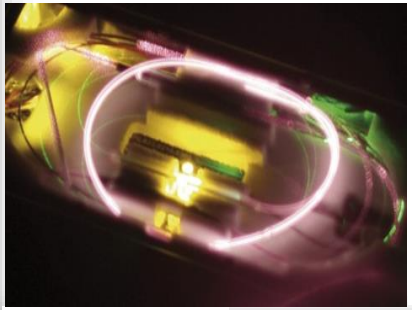
Hybrid Thulium fiber lasers with optimized wavelengths combination from the same delivering output fiber connector:

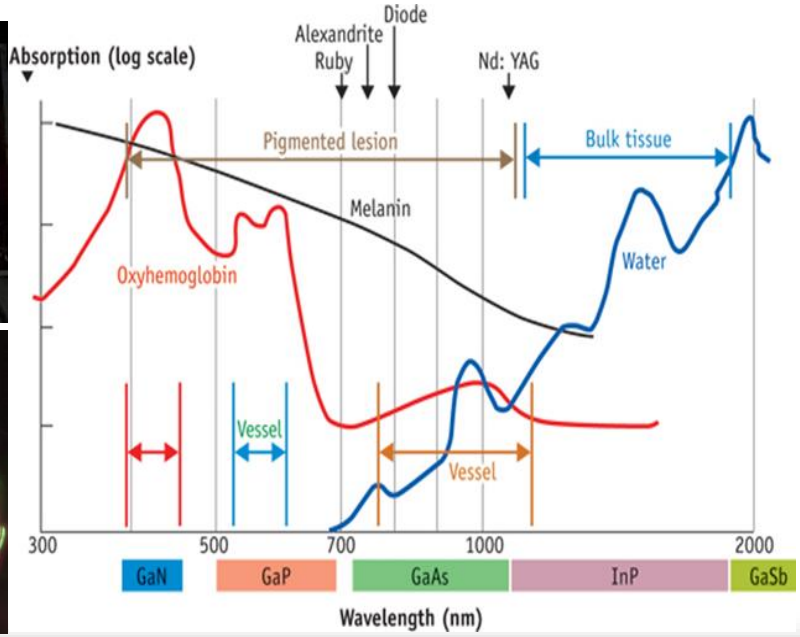
1)Thulium(**1940nm**)+Er/Yb fiber laser module(**1550nm**)

2)Thulium laser module (**1940nm**) + Blue laser diode at (**450nm**)









BLOOD COMPOSITION:

55% PLASMA (**91%Water**)

44% **Red blood cell**

ABSORPTION PEAKS:

WATER ~1550nm

OXYHEMOGLOBIN ~450nm

Hybrid Thulium fiber laser

	Min	Typ.	Max
Wavelength Erbium (Option Blue diode laser)	1550nm	1550nm (450nm)	1550nm (460nm)
Wavelength Thulium	1930nm	1940nm	1950nm
Nominal Peak Output Power	1300W		
Average Power	250W (@1940nm) - 50W (@1550nm) - 60W (@450nm) -		
Pulse Energy @ 1940nm	0.2J		12J
Pulse Width	0.2ms		12ms
Power Tunability	10%		100%
Pulsing Frequency	1Hz		2000Hz
Delivery Fiber	100um core		
Feeding Fiber Length	1.5m or longer		
Output Connector	Optical quartz block/ SMA / D80 connector		
Safety	PLe		
Diode Pointing Laser	650nm with < 3mW		
Electrical Power Consumption		1000W	1250W EOL
Voltage	80VDC and 24VDC		
Operating Environment	15° C		30° C
Cooling	Water		
Relative Humidity	< 95% non-condensing		
Dimension	450x170x630mm		
Weight	22 Kg		
Ingress Protection Rating (IEC60529)	**IP54 (NEMA13 equivalent)**		

What Convergent R&D is looking for:

- Special active and passive fibers
- Coating suppliers at exotic wavelengths
- High performance thermal interface materials

As Convergent Photonics we are looking for:

- Technical Partnership and projects collaborations to create a successful business
- To satisfy mutual needs, multiple level of semiconductor laser and fiber laser integration

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