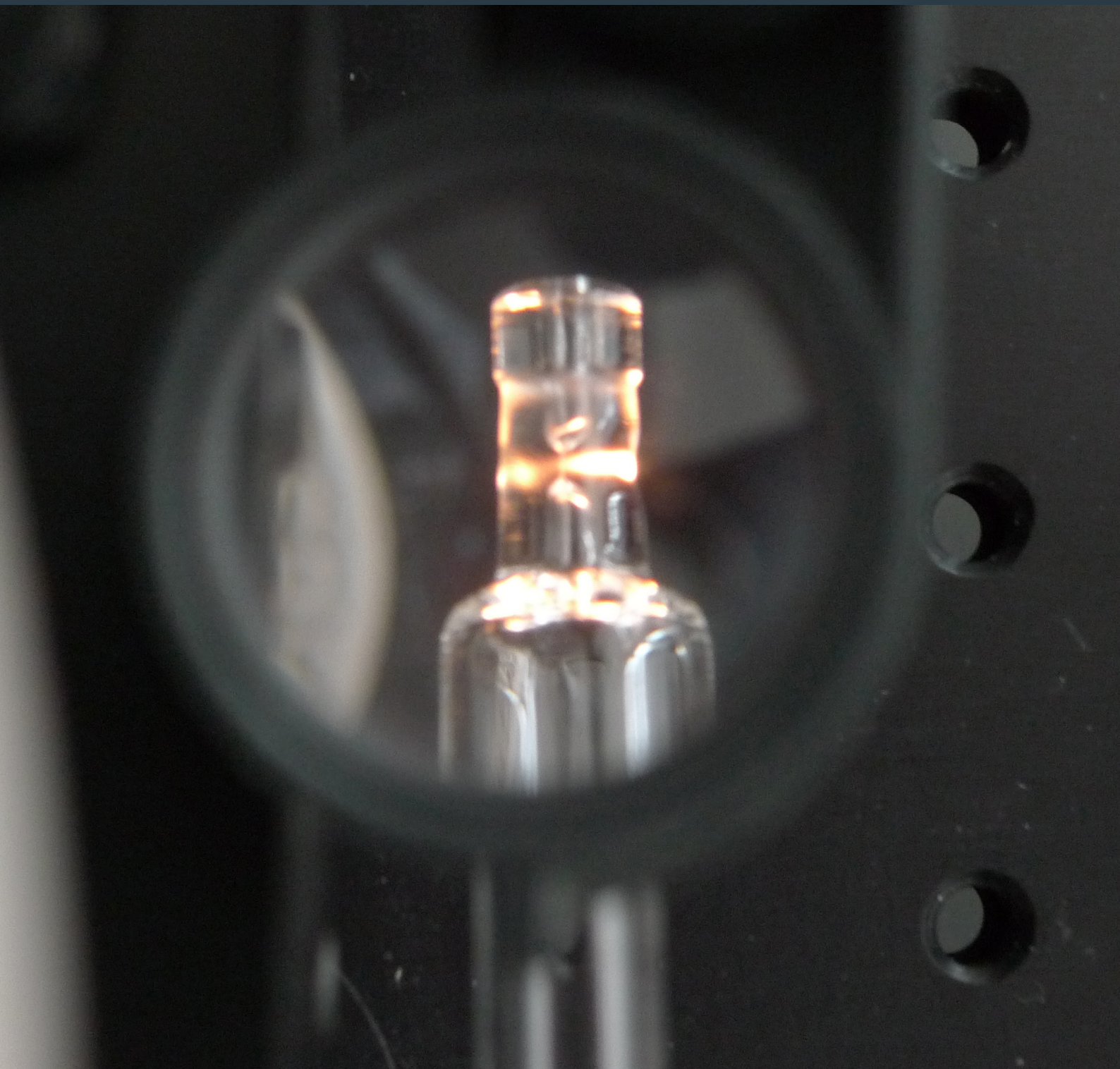
Medical Laser
Innovative Laser Systems

INDUSTRIAL APPLICATIONS



3m.i.k.r.o.n.™

High-power, diode-pumped laser technology

3m.i.k.r.o.n.™ is the technology platform for compact, efficient, fast and reliable lasers for a wide range of potential applications in the field of medical engineering and industry. It enables a new generation of innovative mid-IR lasers based on diode-pumped solid-state technology, operating at wavelengths of 2 to 3 µm using different types of laser crystals (e.g. Er:YAG, Er:YLF, Tm:YAG).

Beam Quality
3m.i.k.r.o.n.™ offers high beam quality and accordingly high focusability.

Speed
3m.i.k.r.o.n.™ enables repetition rates up to 1 kHz.

Efficiency and TCO
Because of higher efficiency electricity consumption and cooling demands are reduced drastically compared to flash lamp pumped lasers. Higher efficiency and lack of consumables reduce the TCO drastically in comparison to CO2 lasers.

Life time and availability
Compared to flash lamps laser diodes are of longer life time. Compared to CO^2 lasers no consumables like laser gas are needed. Both effects involve longer maintenance intervals and thus higher availability.

Compactness
3m.i.k.r.o.n.™ modules are very compact due to their smaller pump sources and cooling systems, leading to laser devices, which are more convenient to use.

Flexibility
The wider range of adjustable laser parameters (pulse energy, pulse duration, repetition rate) offers a high level of flexibility for different applications.

Reliability
3m.i.k.r.o.n.™ modules are maintenance free and allow for robust construction of laser devices.

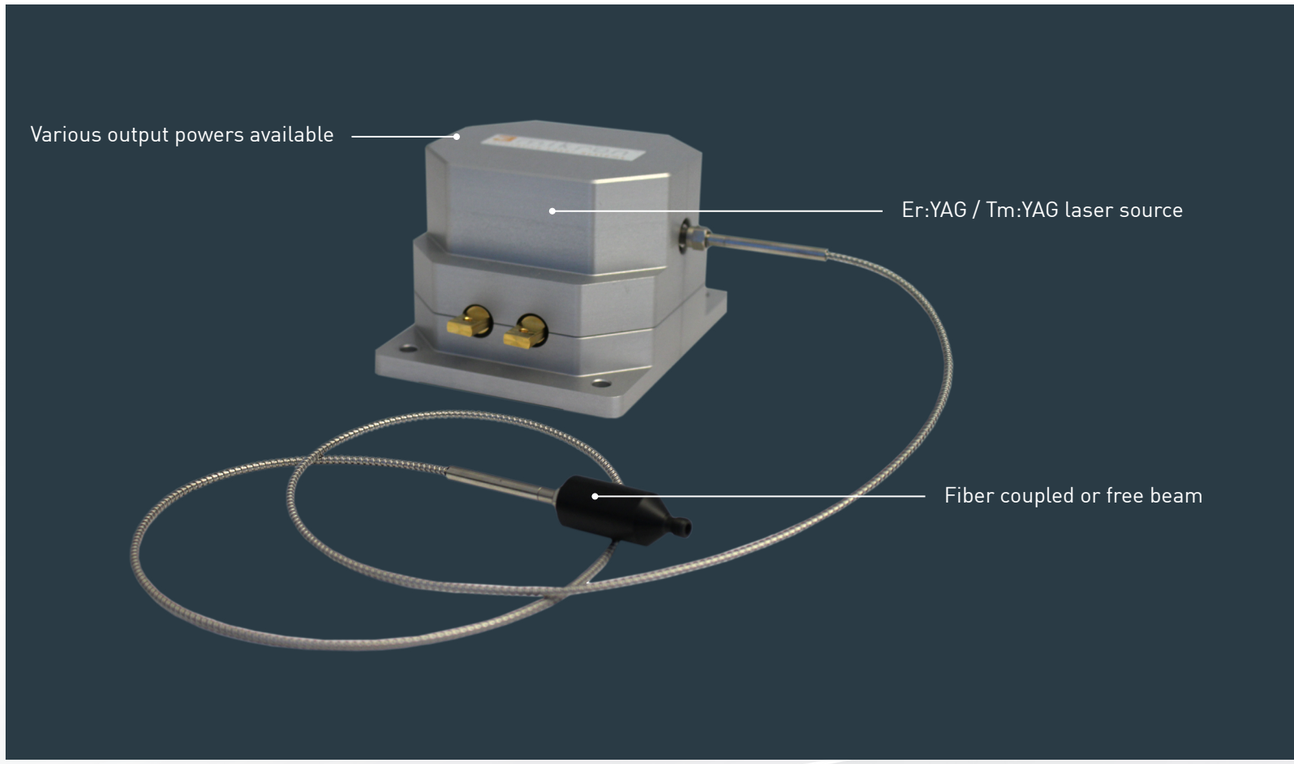
Process efficiency
The very good absorption of many organic materials at 3 µm wavelength allows for a very efficient cutting process.
The 3 µm technology combines the benefits of CO^2 and solid state lasers.

LASER PARAMETERS

High power Mid-IR laser sources	
Technology	Monolithic DPSSL
Wavelength	2940 nm / 2020 nm
Average Output Power (max)	up to 100 W
Pulse Energy (max)	up to 8 J [1]
Pulse Repetition Rate	up to 1 kHz
Pulse Duration	up to 20 ms [1]
Duty Cycle (max)	up to 10 %
Mode of Operation	Pulsed
Ideal Fiber Diameter	100 - 450 µm
Beam Quality	M^2 < 50
Efficiency (optical-optical)	~ 10 %
Divergence (half angle) (mrad)	< 50 mrad
Beam Diameter	1.6 mm
Beam Shape (focus)	top hat like

[1] @ 2020 nm with Pantec Ultrapulse Mode (on request only)

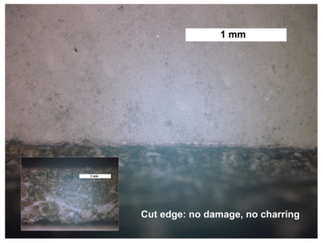
All research experiments on the following pages were done with 3m.i.k.r.o.n.™ Er:YAG laser sources ranging from 20 to 30 W average output power.



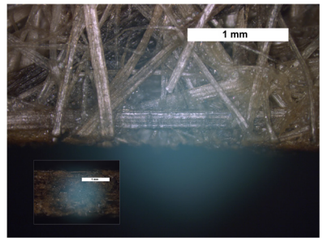
ORGANIC MATTER CUTTING

Cutting, perforating, partly scoring

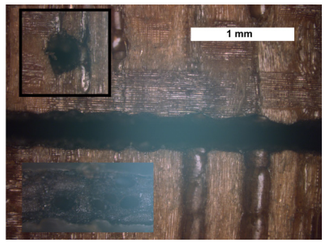
High flexibility: many different materials possible. Leather, wood, compounds ... High cutting quality and speed.



Cutting of Leather 1.3 mm thick
Speed: 1.0 m / min



Cutting of organic compound 1.5 mm thick
Speed: 1.2 m / min (wood/resin)

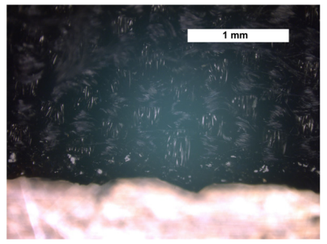


Cutting and perforation of wood 0.6 mm
Speed: 7 m / min and 40 m / min

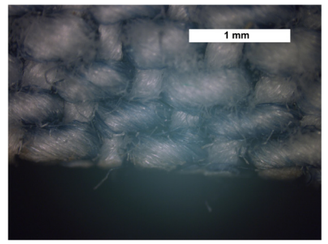
TEXTILE CUTTING

Cutting, perforating

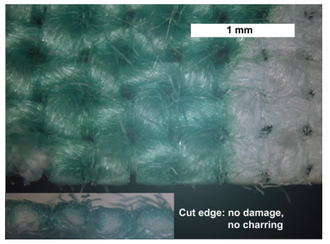
High flexibility: many different materials possible. Alcantara, Cotton, Fleece ... High cutting quality and speed.



Cutting of Alcantara
Speed: 8 m / min



Cutting of Jeans
Speed: 7 m / min

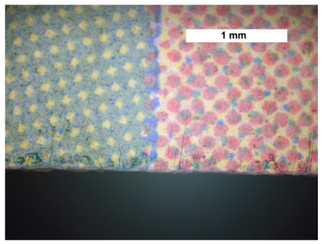


Cutting of Cotton
Speed: 10 m / min

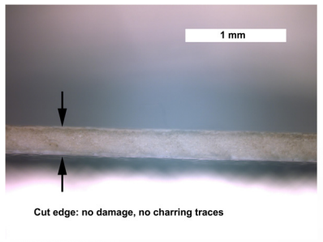
PAPER CUTTING

Cutting, perforating, scoring

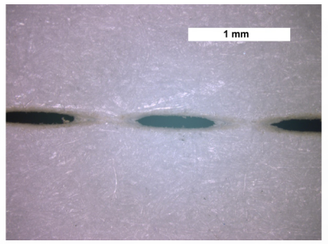
Outstanding cutting quality and speed. No burning and no soot stains.



Cutting of printed paper (80 g / m^2)
Speed: 40 m / min



Cutting of plain paper (300 g / m^2)
Speed: 10 m / min



Long hole perforation of paper (80 g / m^2)
Speed: 75 m / min

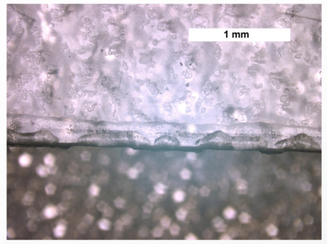
All experiments were done in cooperation with CHRISTOPH DEININGER, Ingenieurbüro für optische Technologien in Reutlingen, Germany

CHRISTOPH DEININGER
Ingenieurbüro für optische Technologien

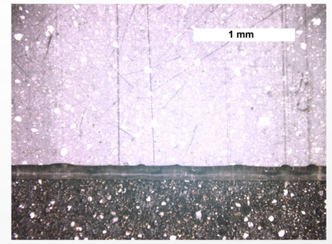
PLASTIC CUTTING

Cutting, perforating and in special cases even welding

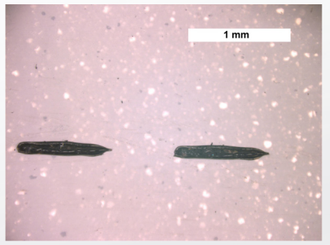
High flexibility: many different materials possible. PP, PE, PEN, PET, antistatics, etc. High cutting quality and speed.



Cutting of PP
Speed: 10 m / min



Cutting of PE low density
Speed: 8 m / min



Long hole perforation of PEN
Speed: 20 m / min

High Power
3 µm DPSSL Modules

. Compact monolithic laser systems
. Highly efficient diode pumping
. Fiber-coupled versions available
. No high-voltage required
. Reduced waste heat
. Maintenance free
. Process variability

Specifications

	DPM-2 (Er:YAG) free / fiber [1]	DPM-25 (Er:YAG) free / fiber [1]	DPM-50 (Er:YAG) free / fiber [1]
Optical Parameters			
. Wavelength	2940 nm	2940 nm	2940 nm
. Average Output Power (max)	2 / 1.2 W	25 / 16 W	50 / 33 W
. Pulse Energy (max)	20 [2] / 13 [2] mJ	300 [2] / 200 [2] mJ	600 [2] / 400 [2] mJ
. Pulse Repetition Rate	up to 1 kHz	up to 1 kHz	up to 1 kHz
. Pulse Duration	40 to 1000 [3] µs	40 to 1000 [3] µs	40 to 1000 [3] µs
. Average Current (max)	30 A	25 A	25 A
. Mode of Operation	Pulsed	Pulsed	Pulsed
. Efficiency (optical-optical)	> 10 %	> 10 %	> 10 %
. Beam Shape (focus)	top hat like	top hat like	top hat like
. Free Beam Quality	M^2 < 5	M^2 < 25	M^2 < 50
. Free Beam Diameter	0.6 mm	1.6 mm	1.6 mm
. Free Divergence (half angle)	< 25 mrad	< 25 mrad	< 50 mrad
. Fiber Diameter GeO2 [1]	~ 230 µm (NA ‹ 0.2)	~ 230 µm (NA ‹ 0.2)	~ 420 µm (NA ‹ 0.2)
Cooling Requirements			
. Coolant	Distilled water with Algaecide and Corrosion Inhibitor	Distilled water with Algaecide and Corrosion Inhibitor	Distilled water with Algaecide and Corrosion Inhibitor
. Coolant Temperature	20 to 35 °C	20 to 25 °C	20 to 25 °C
. Coolant Flow Rate	≥ 1 lpm	> 5 lpm	≥ 6 lpm
. Coolant Pressure	(1 - 3) bar	(2 - 5) bar	(3 - 5) bar
. Required Cooling Power	~ 150 W @ 25 °C Environment Temperature	≥ 540 W @ 25 °C Environment Temperature	≥ 780 W @ 25 °C Environment Temperature
Electrical Parameters			
. Diode Forward Voltage	2 V	~ 20 V	~ 30 V
. Diode Forward Current	350 A Pulsed	300 A Pulsed	300 A Pulsed
. Average Power Consumption (max)	< 120 W incl. 2 TECs	< 450 W	< 900 W
Mechanical Dimensions			
. W x D x H	30 x 32 x 25 mm	120 x 96 x 75 mm	120 x 120 x 75 mm
. Weight	60 g	1.5 kg	1.7 kg
. Emission Height	-	47.5 mm	47.5 mm

[1] Fiber as specified by Pantec
[2] For pulse durations > 600 µs
[3] 600 µs standard, 1000 µs on request

High Power
2 µm DPSSL Modules

. Compact monolithic laser systems
. Highly efficient diode pumping
. Fiber-coupled versions available
. No high-voltage required
. Reduced waste heat
. Maintenance free
. Process variability

Specifications

	DPM-25 (Tm:YAG) free / fiber [1]	DPM-50 (Tm:YAG) free / fiber [1]	DPM-100 (Tm:YAG) free / fiber [1]
Optical Parameters			
. Wavelength	2020 nm	2020 nm	2020 nm
. Average Output Power (max)	25 / 20 W	50 / 40 W	100 / 80 W
. Pulse Energy (max)	250 / 200 mJ	(0.5 - 4 [2]) / (0.4 - 3.2 [2]) J	(1 - 8 [2]) / (0.8 - 6.4 [2]) J
. Pulse Repetition Rate (max)	500 Hz	500 Hz	500 Hz
. Pulse Duration	100 to 500 µs	100 to 500 (20 000 [2]) µs	100 to 500 (20 000 [2]) µs
. Average Current (max)	8 A	7 A	7 A
. Mode of Operation	Pulsed	Pulsed	Pulsed
. Efficiency (optical-optical)	> 15 %	> 20 %	> 20 %
. Beam Shape (focus)	top hat like	top hat like	top hat like
. Free Beam Quality	M^2 < 20	M^2 < 30	M^2 < 40
. Free Beam Diameter	1.6 mm	1.6 mm	1.6 mm
. Free Divergence (half angle)	< 20 mrad	< 30 mrad	< 40 mrad
. Fiber Diameter Low-OH [1]	~ 100 µm (NA ‹ 0.2)	~ 150 µm (NA ‹ 0.2)	~ 200 µm (NA ‹ 0.2)
Cooling Requirements			
. Coolant	Distilled water with Algaecide and Corrosion Inhibitor	Distilled water with Algaecide and Corrosion Inhibitor	Distilled water with Algaecide and Corrosion Inhibitor
. Coolant Temperature	25 °C	25 °C	25 °C
. Coolant Flow Rate	> 4 lpm	≥ 5 lpm	≥ 6 lpm
. Coolant Pressure	(2 - 5) bar	(3 - 5) bar	(3 - 5) bar
. Required Cooling Power	≥ 350 W @ 25 °C Environment Temperature	≥ 500 W @ 25 °C Environment Temperature	≥ 750 W @ 25 °C Environment Temperature
Electrical Parameters			
. Diode Forward Voltage	< 40 V	< 75 V	< 130 V
. Diode Forward Current	150 A	150 A	150 A
. Average Power Consumption (max)	< 500 W	< 750 W	< 1000 W
Mechanical Dimensions			
. W x D x H	120 x 96 x 75 mm	120 x 96 x 75 mm	120 x 120 x 75 mm
. Weight	1.5 kg	1.6 kg	1.7 kg
. Emission Height	47.5 mm	47.5 mm	47.5 mm

[1] Fiber as specified by Pantec
[2] With Pantec Ultrapulse Mode (on request only)

Our services

- Laser development and system integration from prototyping to complete devices
- Customized laser sources
- Optical and mechnical design
- Contract development/manufacturing
- Medical device consulting (IP, Medical CE, ..)

Pantec Biosolutions AG · Medical Laser
Industriering 21 · 9491 Ruggell · Liechtenstin
Tel: +423 377 13 33 · Fax: +423 377 13 34
3um@pantec.com · www.pantec-medicallaser.com

301664A-01-DTS IndustrialApplication