

FOCUSLIGHT

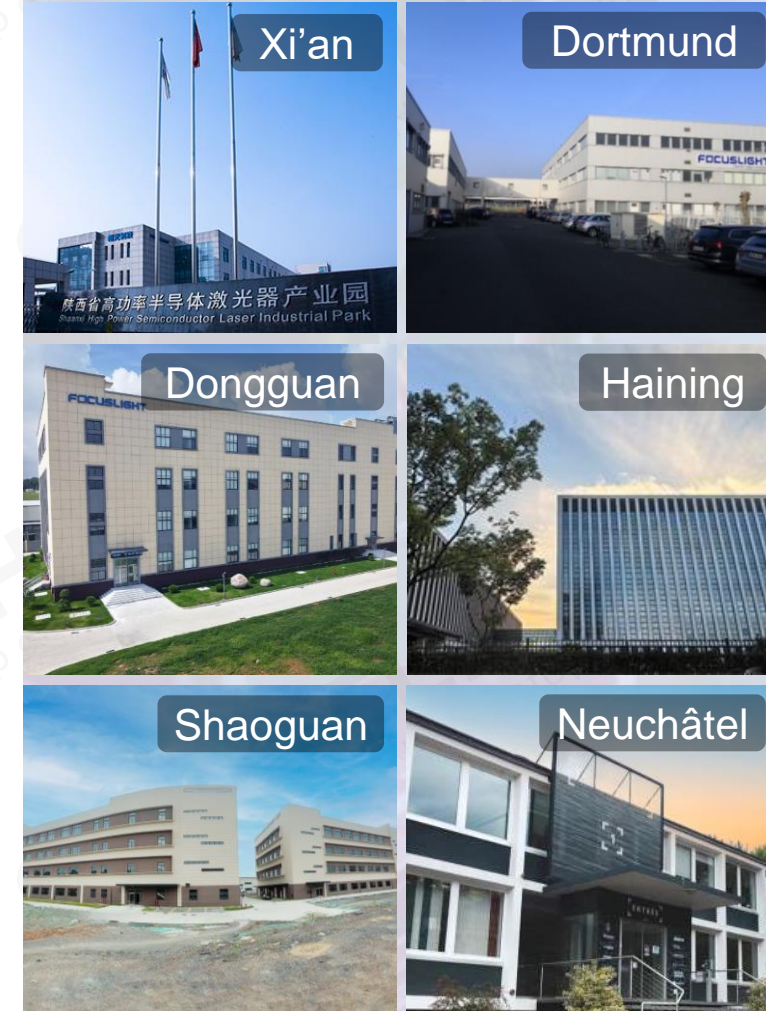
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Focuslight Overview

- Founded in 2007 by Dr. Victor X. Liu, headquartered in Xi'an, China.
- A fast-growing company that develops and manufactures **high-power diode laser components and materials** (photon generation) and **laser optics** (photon control) used in various industries and applications.
- Business scope is being extended by developing and manufacturing **photonic application modules, assemblies, and sub-systems** (photonics application solutions) with a focus on automotive, pan-semiconductor, and medical & health application solutions.
- Public listed company in the Shanghai Stock Exchange (Ticker Symbol: 688167).



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Milestones

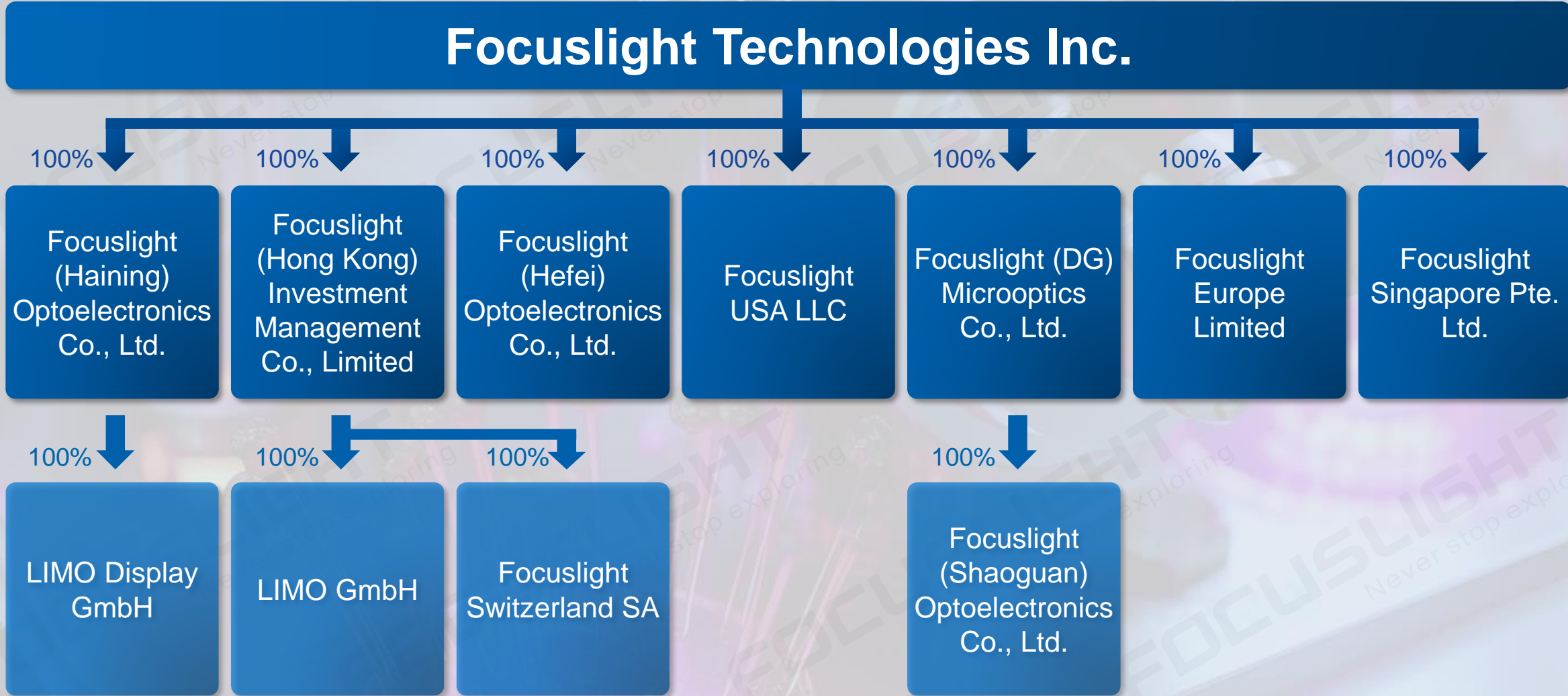
Products



Technology and Development



Focuslight Corporate and Subsidiaries



Key Facts & Figures



Employees

>850



Yearly Revenue Proportion
Invested into R&D

~16%



Last Year (2023)
Revenue

561M RMB



Patents Valid
Worldwide

>430



Facility Worldwide

>43,000m²

Clean Room Worldwide

>11,000m²



ISO 9001
ISO 14001
ISO 45001
IATF 16949
Certified

Corporate Management Team



Dr. Xingsheng Liu (Victor)
Chairman, CEO

- Research and management experience in America (Virginia Tech, Corning, Coherent, nLight)
- 100+ publications, 300+ patents, 30+ invited papers internationally
- Committee Member of SPIE and IEEE, served or serving as chair or committee member of international conferences

CORNING



COHERENT

nLIGHT



Dr. Chung-En Zah
CTO

- 30+ years of research experience in America (Corning, Bellcore)
- 300+ publications, 50+ patents in optoelectronics and telecommunication
- IEEE Fellow, OSA Fellow, 2x R&D 100 award winner

THORLABS

CORNING

Bellcore
Bell Communications Research



Mr. Guowei Zhu (Gavin)

Corporate VP of Quality,
President of Automotive BU,
Director of Corporate R&D

- Over 20 years experience in international automotive companies
- Rich plant P&L and operations management experience
- Familiar with IATF quality management system, KPI management, team building and plant operations management by World Class Manufacturing (WCM) & Lean manufacturing

MAGNET
MARELLI



BorgWarner

GST
SETON
AUTOLEATHER



Ms. Yiping Ye (Alison)
Board Director, CFO

- Over 15 years management experience and multi-field business practices, familiar with LTC, IPD and intercultural cooperation
- In-depth understanding and rich operational experience in market development, project operation and business management



HUAWEI

Hanergy
汉能



Mr. Ye Tian

Board Director,
Corporate VP of Global Sales,
China Sales Director

- Over 15 years' experience in market development, product marketing and sales
- Received the certificate of CEIBS' Leadership Acceleration Program

PHILIPS Lighting



Dr. Reinhard Voelkel
Chief Strategy Officer

- MSc in Physics and PhD in Natural Sciences, both at the University of Erlangen-Nürnberg
- +35 years of professional experience in the field of micro-optics, with expertise in strategic leadership, business development, and innovation

SÜSS MicroOptics

Karl Süss

FAU
FRIEDRICH-ALEXANDER
UNIVERSITÄT
ERLANGEN-NÜRNBERG

Hugle

unine
Université de Neuchâtel

Schweizerische Eidgenossenschaft
Staatssekretariat für Bildung,
Forschung und Innovation SBF

Sand Hill
Angels

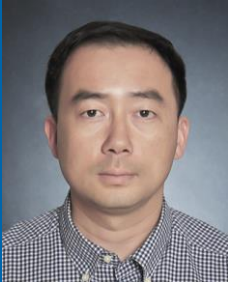
Corporate Management Team



Ms. Xuefeng Zhang (Jennifer)

Board Secretary, Marketing Director

- 13 years photonics industry international business experience
- In-depth understanding and rich experience in sales, marketing and business development.



Mr. Jinchao Qu

President of Diode Laser BU,
President of Medical & Health BU

- Extensive years of product marketing and sales management experience
- Outstanding track record in previous roles as Asia Sales Director and Head of the Application Systems Special Task Force



Mr. Dirk Walter Bogs

President of Laser Optics BU

- Over 25 years' experience in ultra-precision tooling, optic manufacturing, engineering & project management
- More than 20 years' experience in operational management
- Very deep knowledge of technology development and optimization
- Experienced and familiar in international cooperation



Mr. Yong Tian (York)

VP of Laser Optics BU

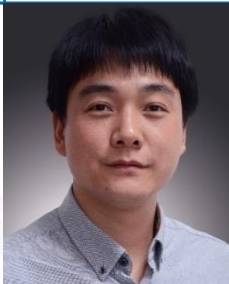
- 20+ years of operation & R&D management
- Very deep knowledge with organic optical materials and optical coating technology, published SCI articles and owns patented technologies
- Experienced in Lean Manufacturing & Industry 4.0



Mr. Yong Li (Leon)

VP of Automotive BU

- Outstanding leadership in previous roles: Overseas Sales Manager, Product Line Manager, and Head of the Automotive LiDAR Strategic Project
- Led the team to the successful automotive-grade SOP of the world's first all-solid-state LiDAR transmitter module
- Experienced in international cooperation and strategic planning



Mr. Ye Dai (Robert)

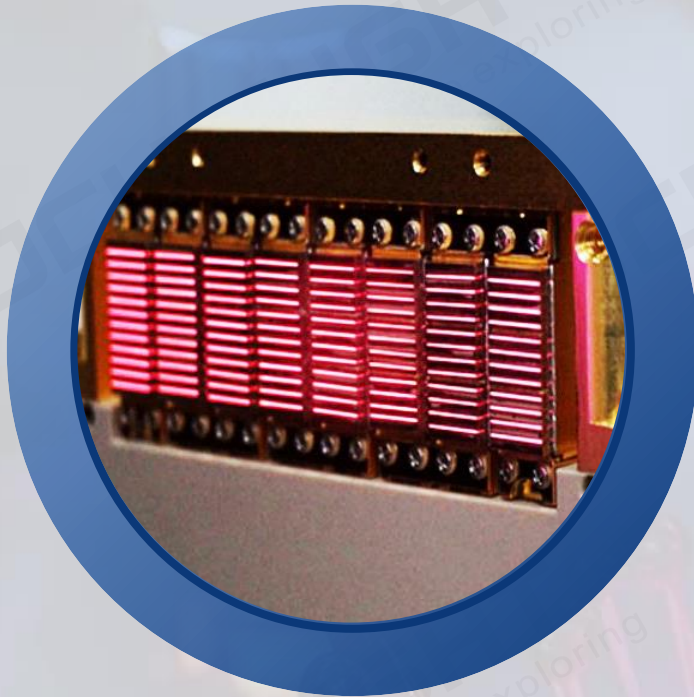
President of Pan-Semiconductor Solutions BU

- Excellent track record in worldwide sales & product line management leadership roles
- 20+ patents granted

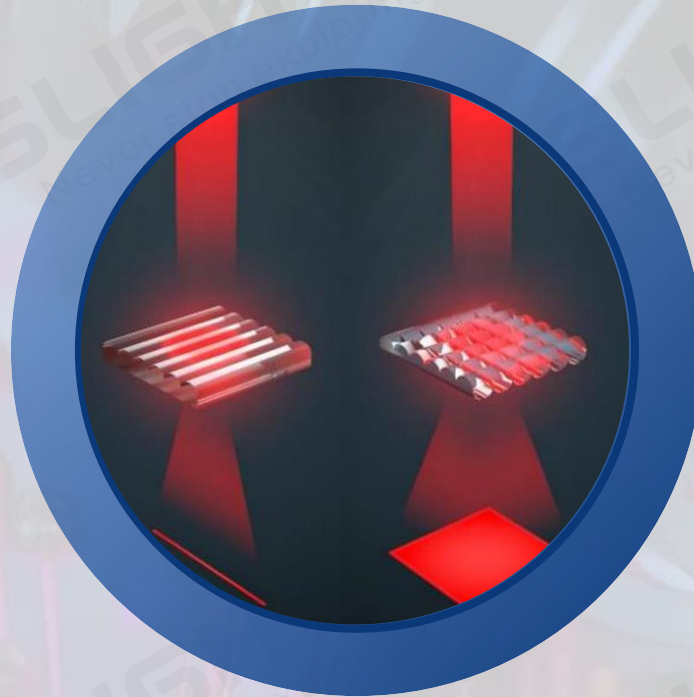


Products and Businesses

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**Photon
Generation**



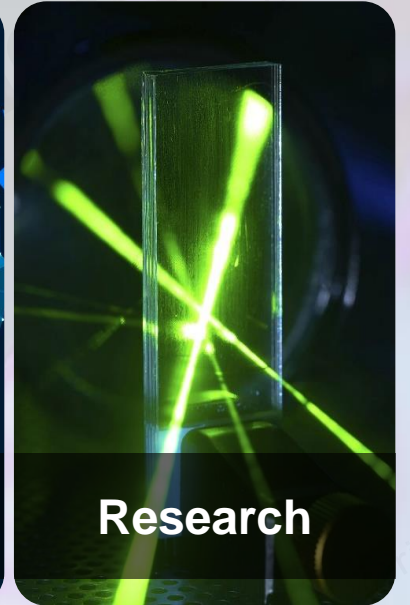
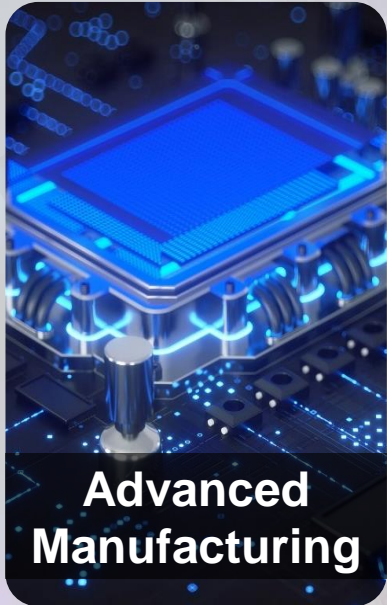
**Photon
Control**



**Photonics
Application
Solutions**

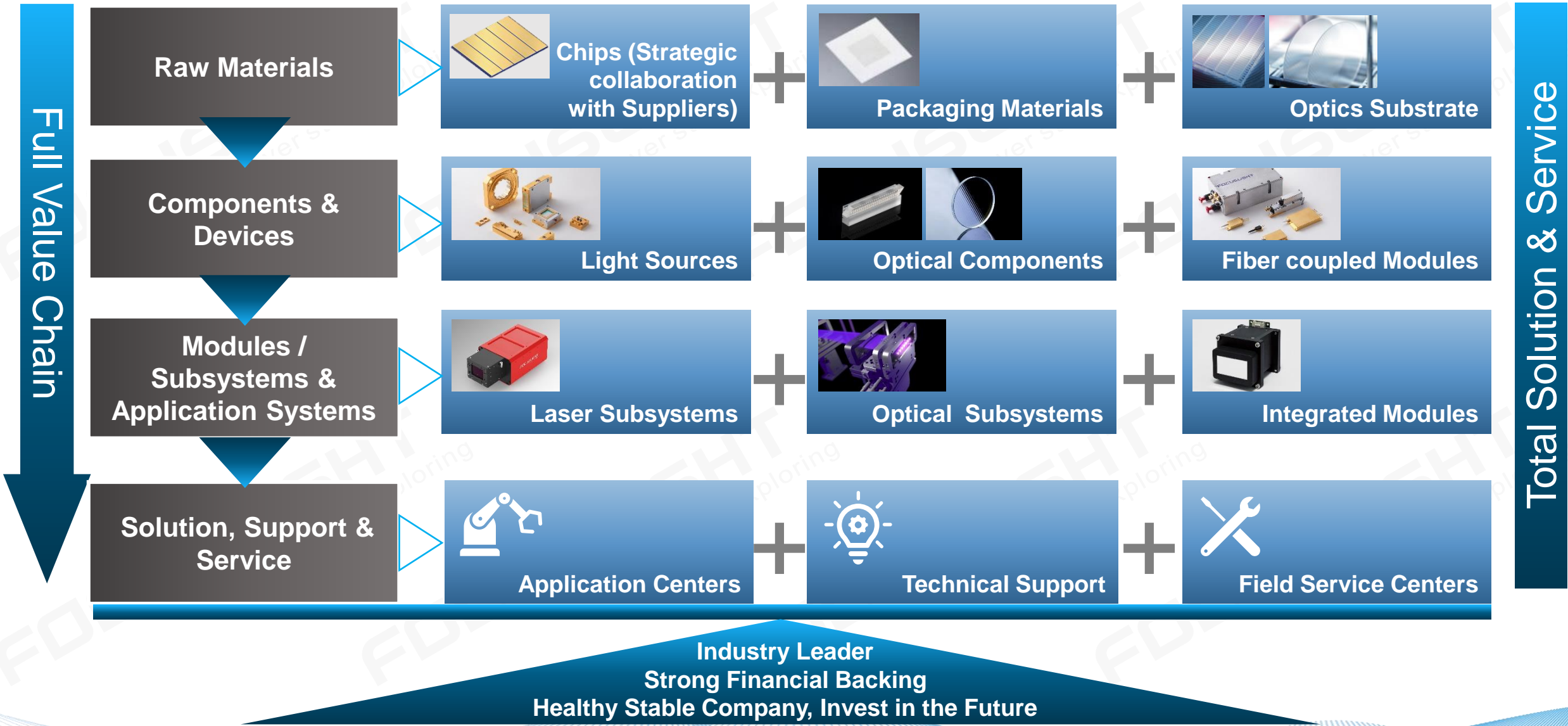
Markets

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**Be the global trusted photonics solution provider
through innovation, manufacturing excellence and fast response**

Value Proposition



Value Proposition



- ◆ **Quality First** philosophy



- ◆ Strong **IP position**



- ◆ Customer **commitment** and willing to **invest**



- ◆ Advanced **technical strengths** and “**know-how**”



- ◆ Extensive **engineering** capability and high-volume **manufacturing**



- ◆ **Low-cost production** ensured by high yield, low RMA & high productivity



- ◆ Comprehensive **quality assurance system including IATF 16949 Automotive QMS standards**



- ◆ **Full range of product portfolio** from components to modules or subassembly



- ◆ Application support and **total solutions**



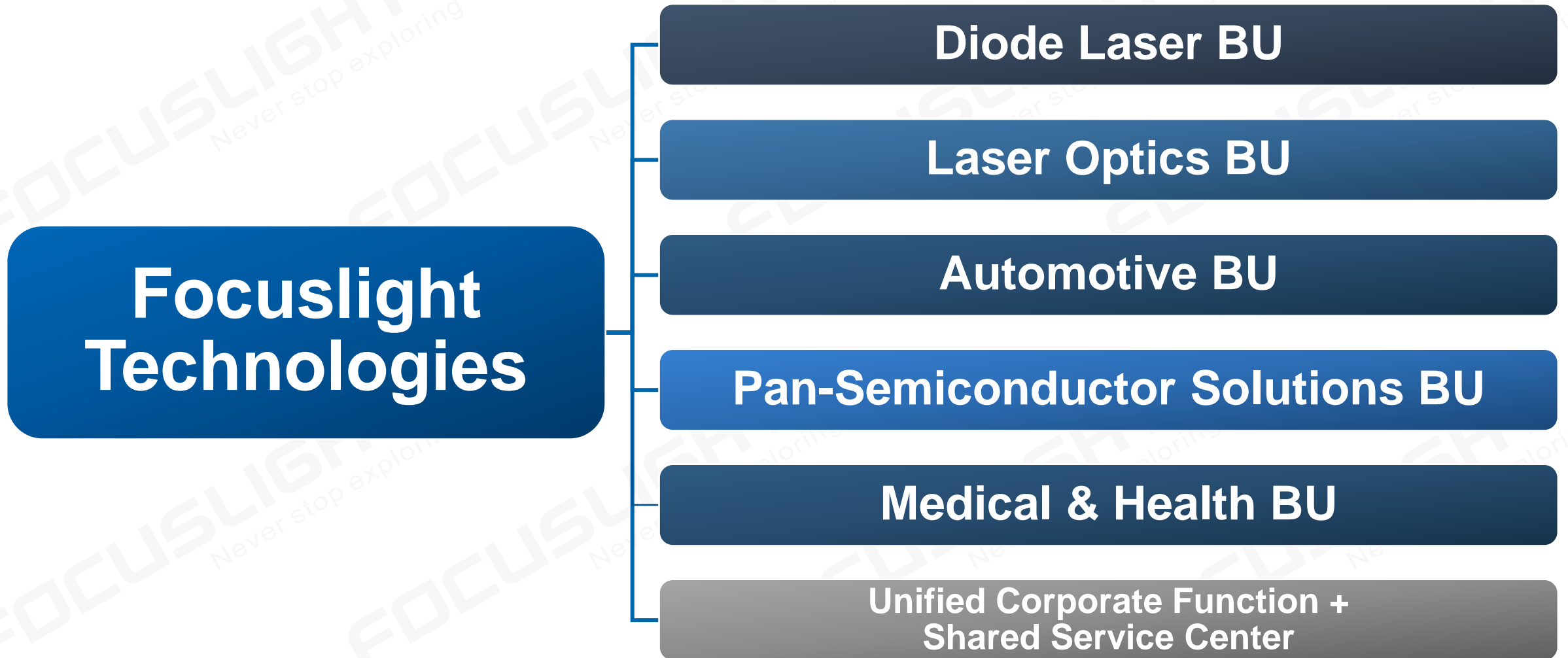
- ◆ Versatile **customization service**

Vision

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**To unlock the potential
of photonics to enhance
and enrich people's life**

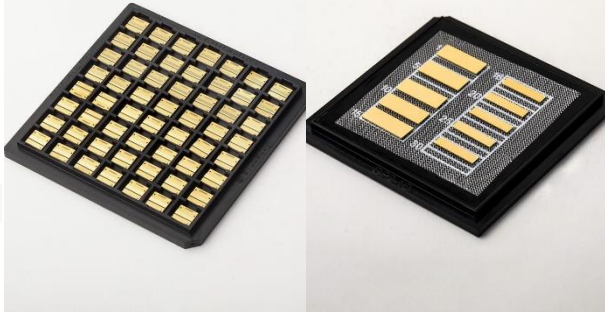
Company Organization



* BU: Business Unit

Products – Diode Laser Components and Materials

Advanced Materials



- AuSn Pre-Deposited AlN Ceramic Substrates
- AuSn Pre-Deposited CuW Substrates
- Thin Film Metallization Service

Active Devices



- Single Emitter Components
- Single Bar Components
- Micro-Channel Cooled Stacks
- Conduction Cooled Stacks
- Pumped Modules

Fiber Coupled Modules & Passive Components



- Emitter-Based FCM
- Bar-Based FCM
- Patch Cords

Professional Medical Application Components

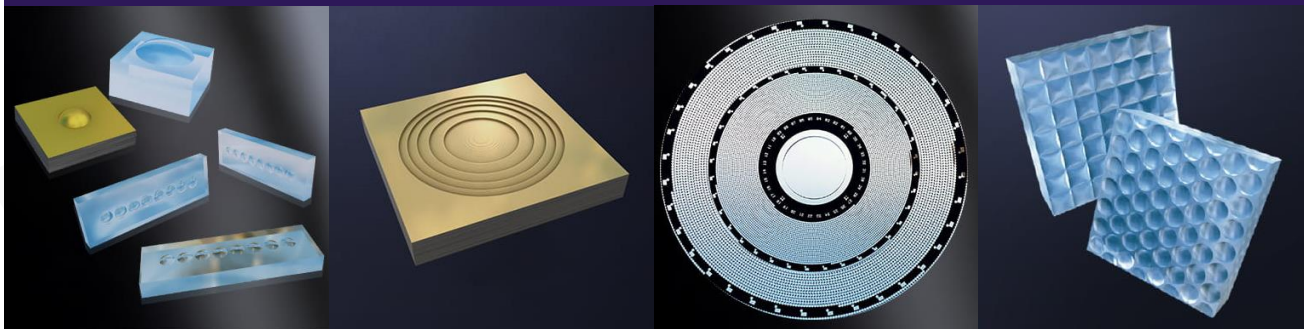


- Laser Hair Removal Modules
- Medical Lasers

- Focuslight offers our customers a variety of products.
- Focuslight is committed to providing our customers with reliable, high-performance laser products and superior services

Products – Laser Optics Components

Etched Micro-Optics (EMO)



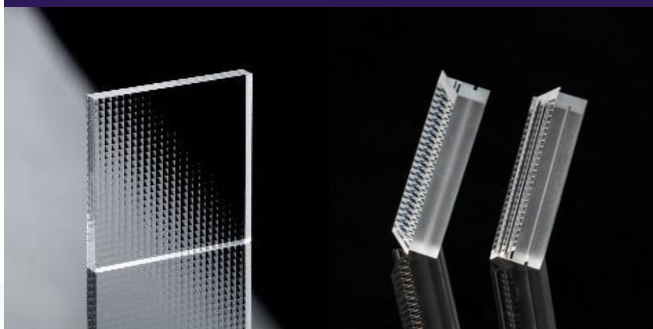
Single (A)cylindrical Lenses (SCL)



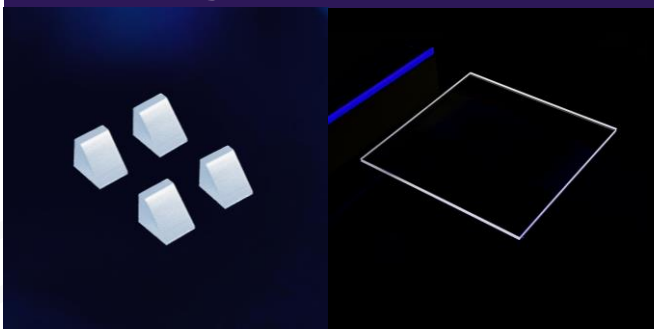
Imprinted Micro-Optics



Microlens Arrays (MLA)



High-Damage-Threshold Coating and Optics (HCO)



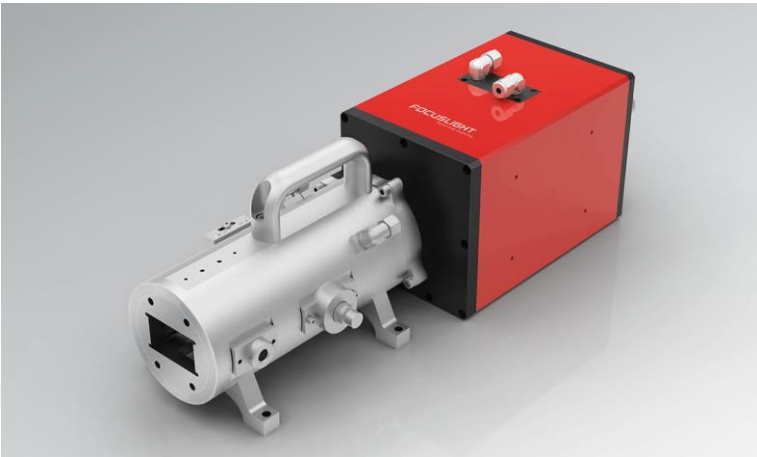
Precision Molded Optics (PMO)



Products – Automotive Application Solutions

Flash LiDAR Transmitter Modules			Line Beam Transmitter Modules	
AL01 (Mass Production)	AT02 / AT02 Pro (Engineering Sample)	AX02 Pro (Engineering Sample)	LE02 Pro (Engineering Sample)	LX02 (Engineering Sample)
				
Auto-grade DPSSL Flash Tx	Auto-grade VCSEL module for DMS (Driver Monitoring System)	VCSEL Flash Tx 700W	905nm 700W EEL Line Beam Tx	VCSEL Line Tx 1000W
Optical Components and Assemblies for Automotive				
EEL FAC Collimators	Auto-grade Diffusers and Homogenizers	Optics for Automotive Projected Lighting and Headlight		Customized Optical Assemblies
				

Products – Pan-Semiconductor Application Solutions



IC Wafer Annealing System



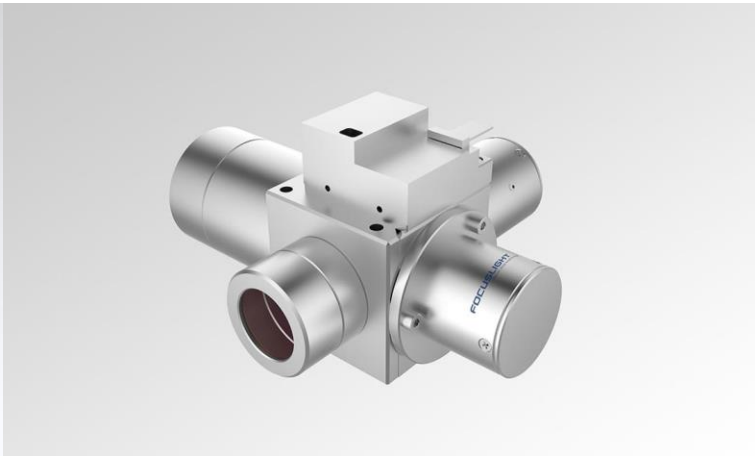
Variable Beam Laser System



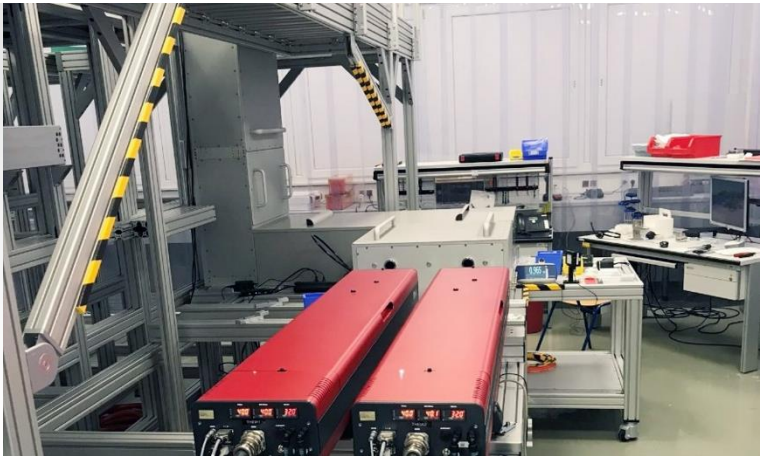
Solid-State Laser Lift-Off (LLO) System



IR Line System



Industrial Laser Modules



Solid-State Laser Annealing (SLA) System

Products – Medical and Health Application Solutions

Professional Medical & Health Modules

Laser Hair Removal
Module



Laser Body Sculpting
Module

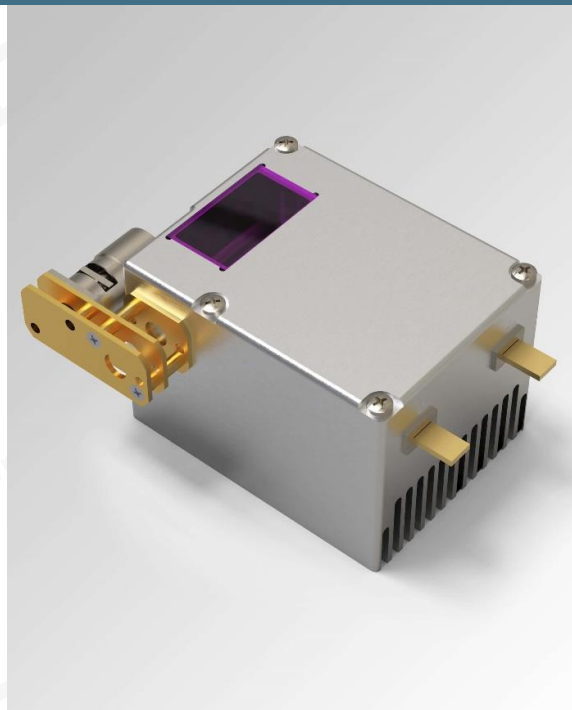


Consumer Medical and Health Modules

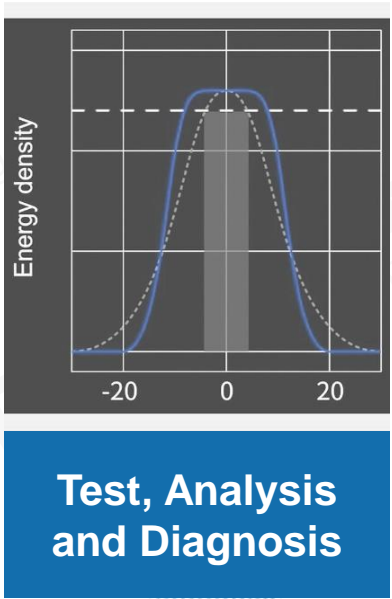
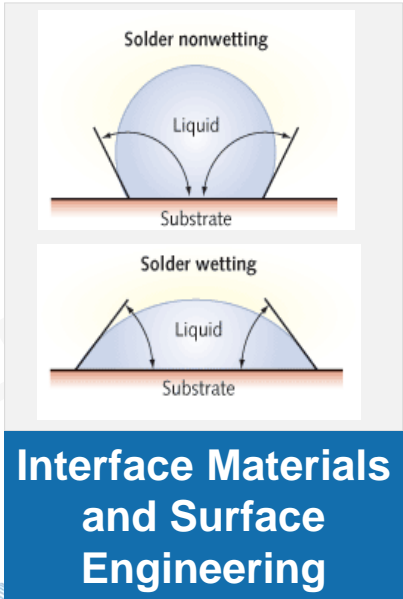
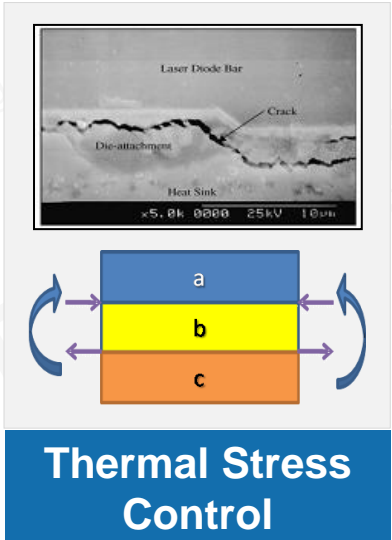
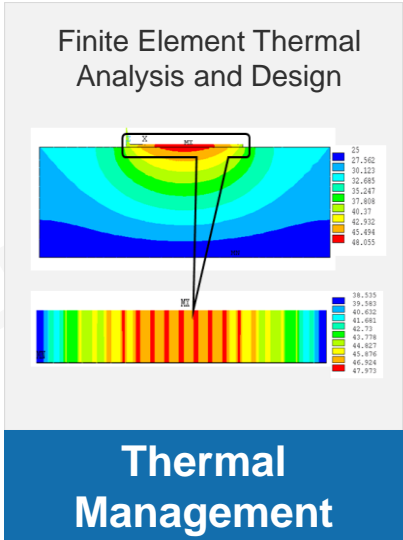
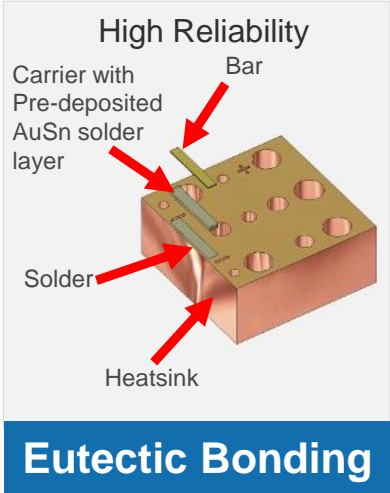
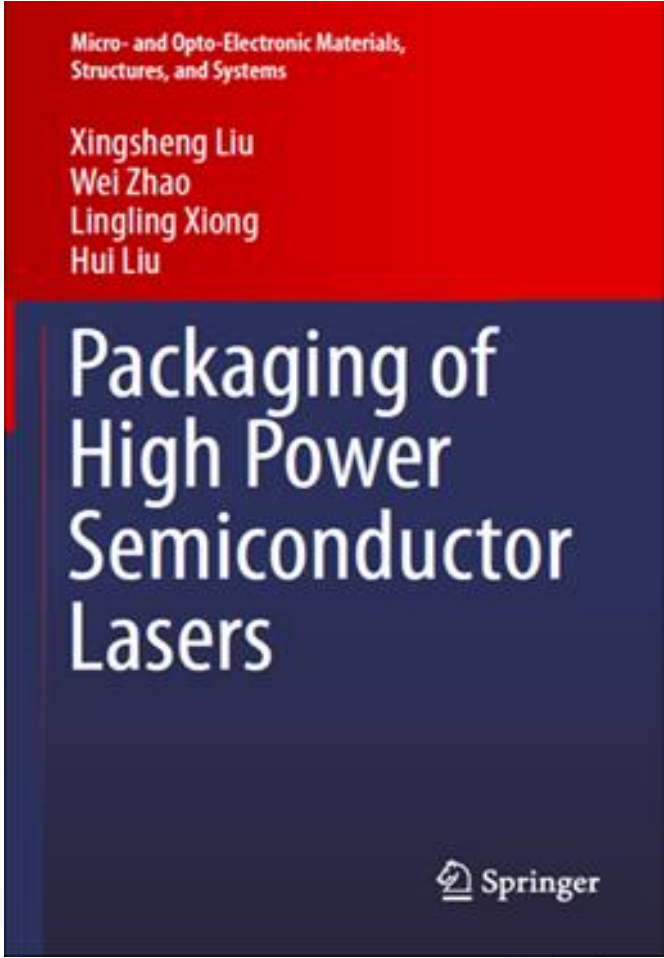
Home-use Skin
Rejuvenation Module



Home-use Laser Hair
Removal Module



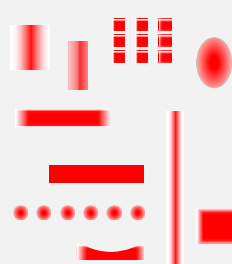
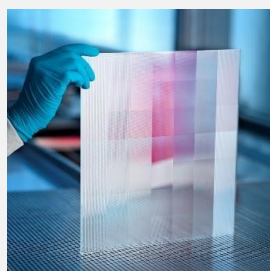
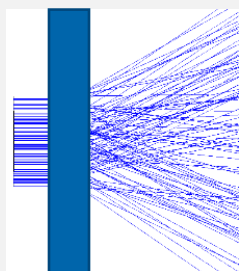
Core Competence – Diode Laser



Core Competence – Beam Shaping

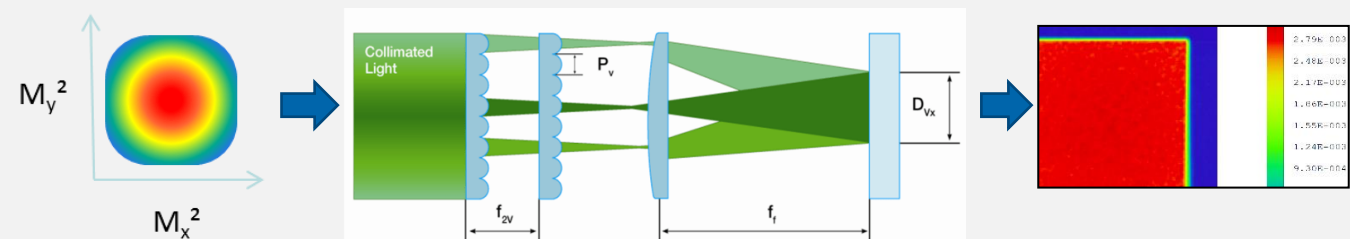
Micro Optics Design and Simulation

Acylindrical free-form micro-optics / arrays /
diffusers / DOE splitters / beam shaping systems



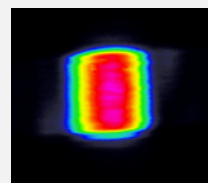
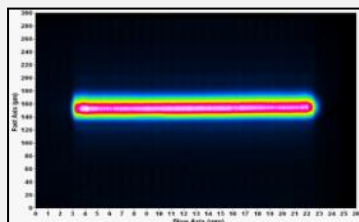
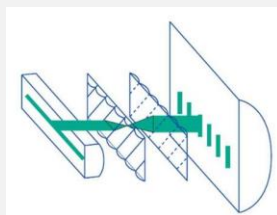
Homogenization

Uniform and homogeneous illumination in any desired shape

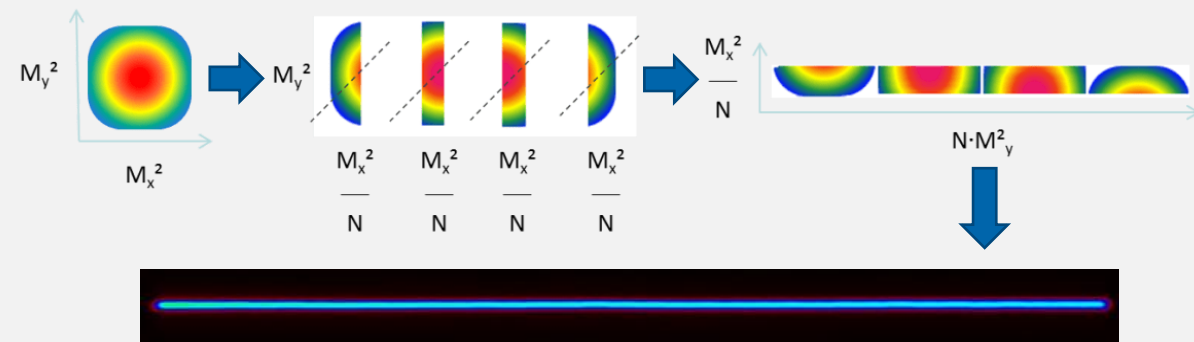


Beam Transformation

Asymmetrical → Symmetrical beam

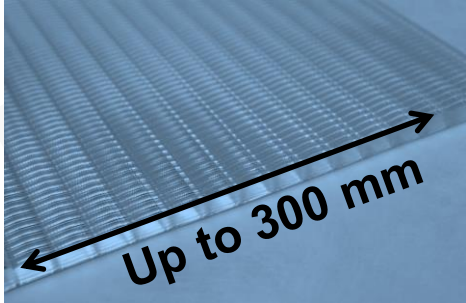
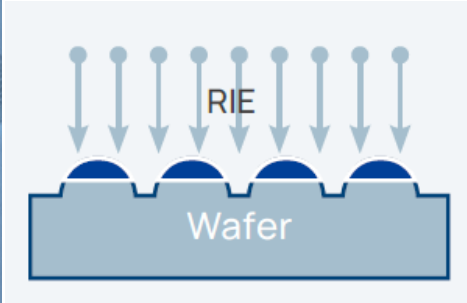

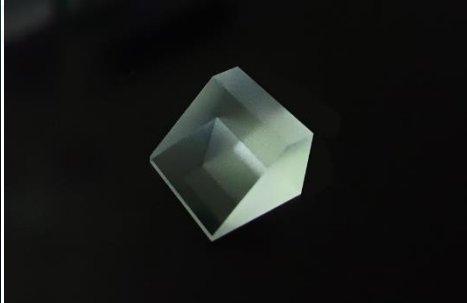
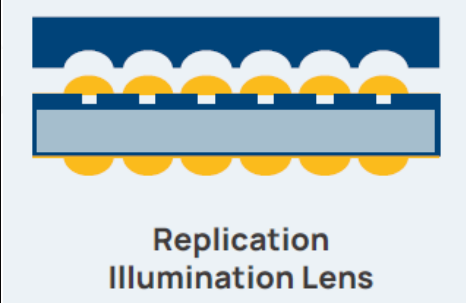
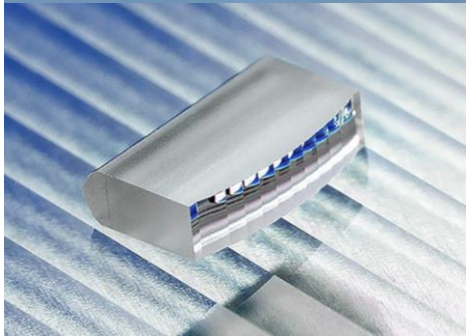
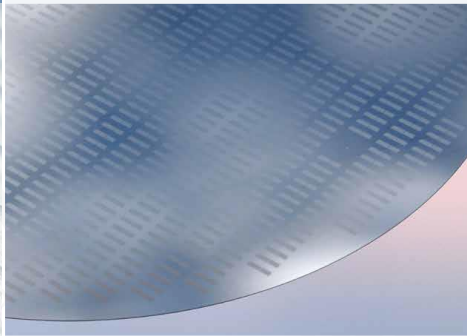
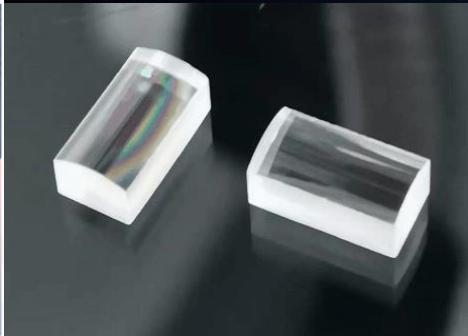
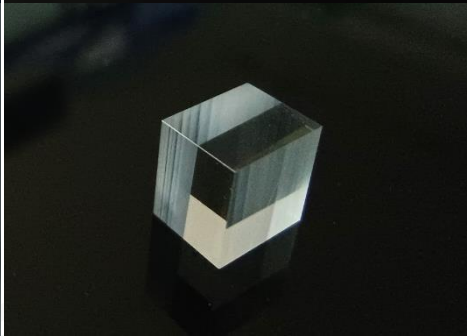
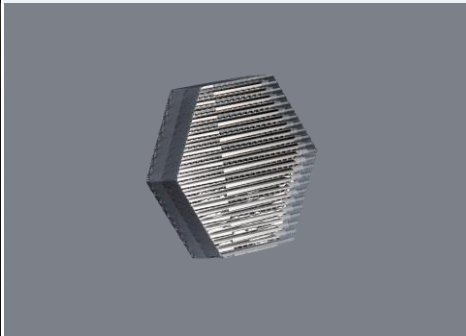


Symmetrical beam → High density line beam

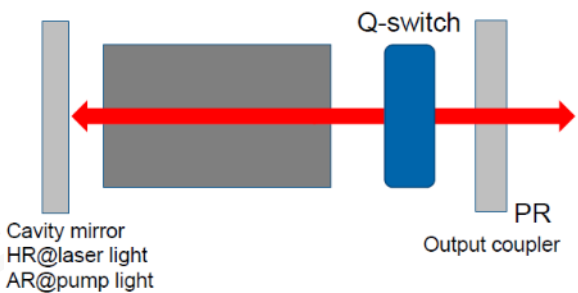


The right photon at the right place and time!

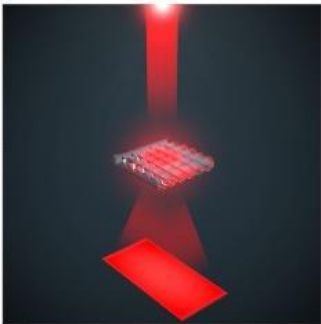
Core Competence – Optics Manufacturing

Wafer Level Simultaneous Structuring	Wafer Level Photolithography-RIE (reactive ion etching)	Precision Glass Molding	Cold Processing	Imprint
				
				
With inorganic materials: Glass, Fused Silica, Silicon, CaF ₂				With polymer on glass
High LIDT Optical Coating: Anti-reflection, high-reflection, beam splitter, band filter, and various customization (UV, VIS, IR)				

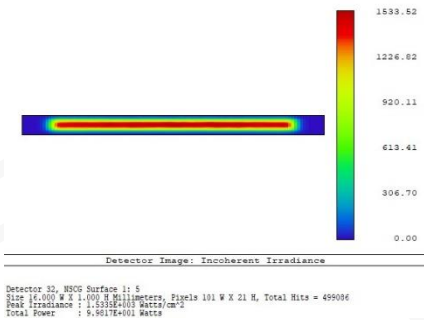
Core Competence – Automotive



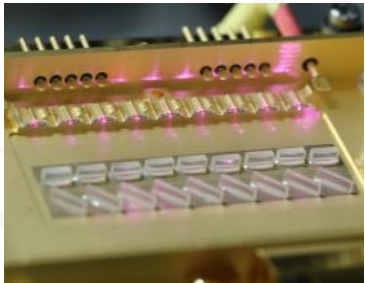
Q-switch DPSS Laser
Transmitter Design



Advanced ROE Beam
Shaping Optics Design



Design and Simulation



High Power Diode Laser
Design and Assembling



Automotive Grade Laser
Design and Qualification



Optical Assembly
Automation



Laser Testing and
Characterization



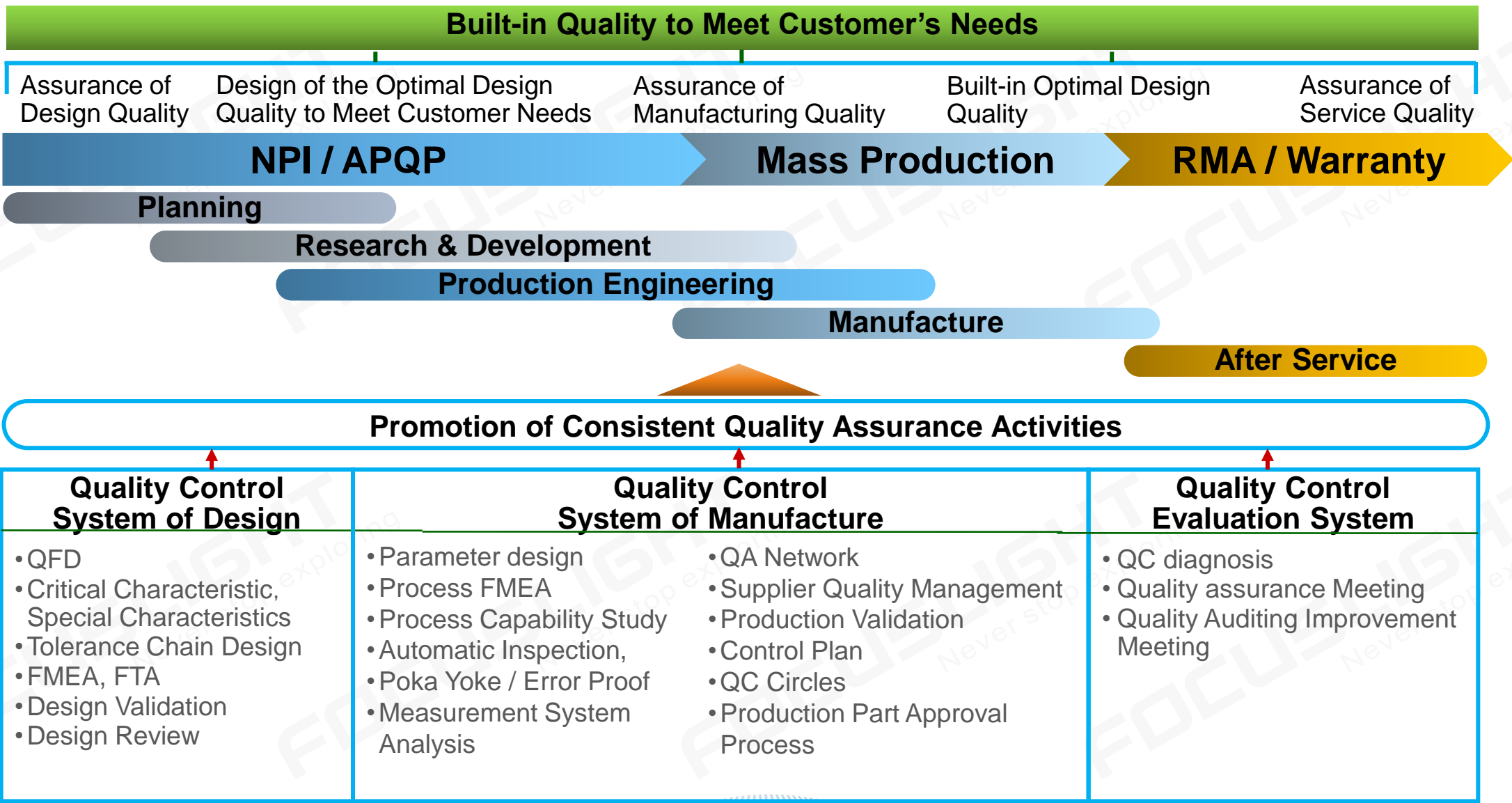
Laser Assembly
Automation

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Control Plan (CP)

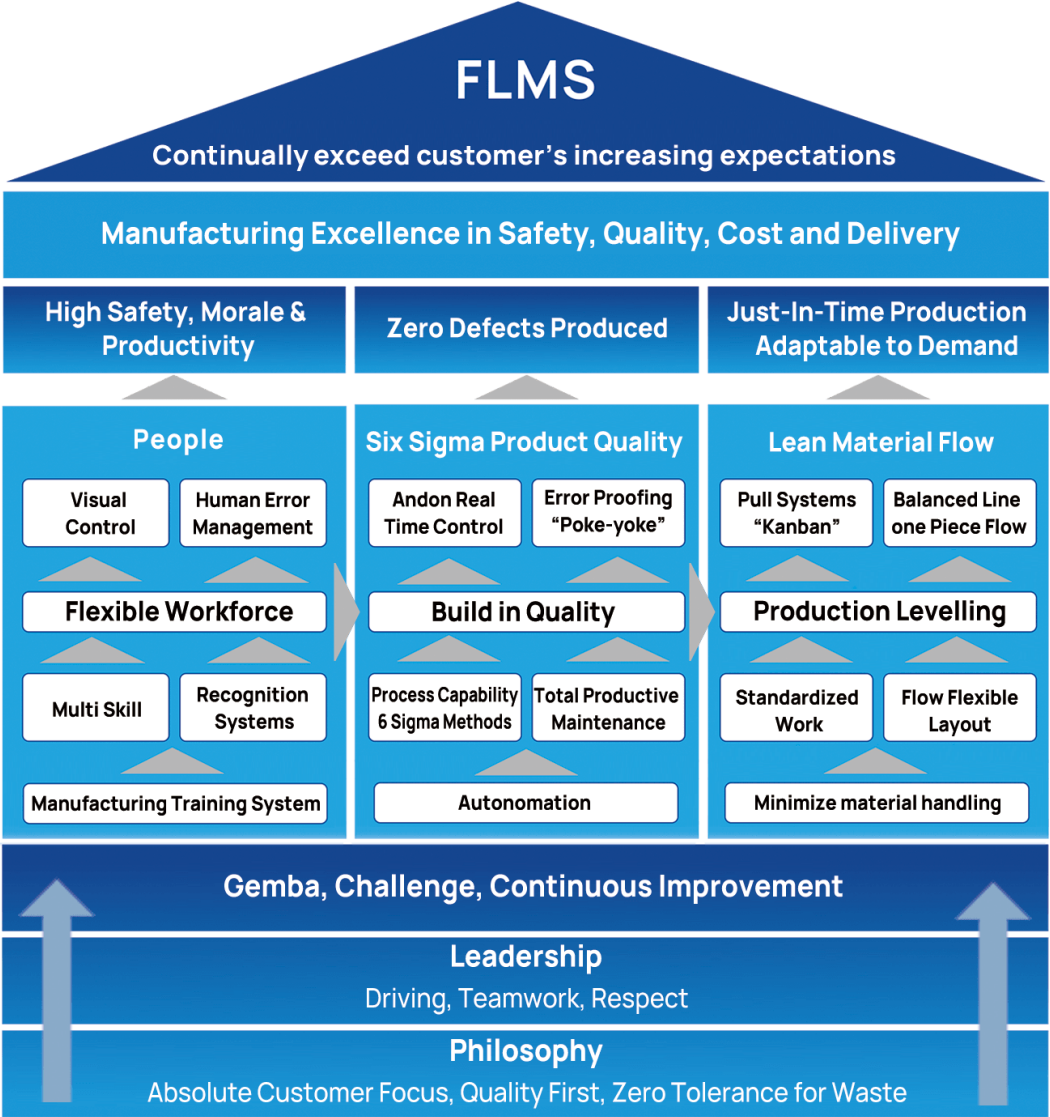


Quality Assurance System



Focuslight Manufacturing System (FLMS)

Focuslight Manufacturing System (FLMS)



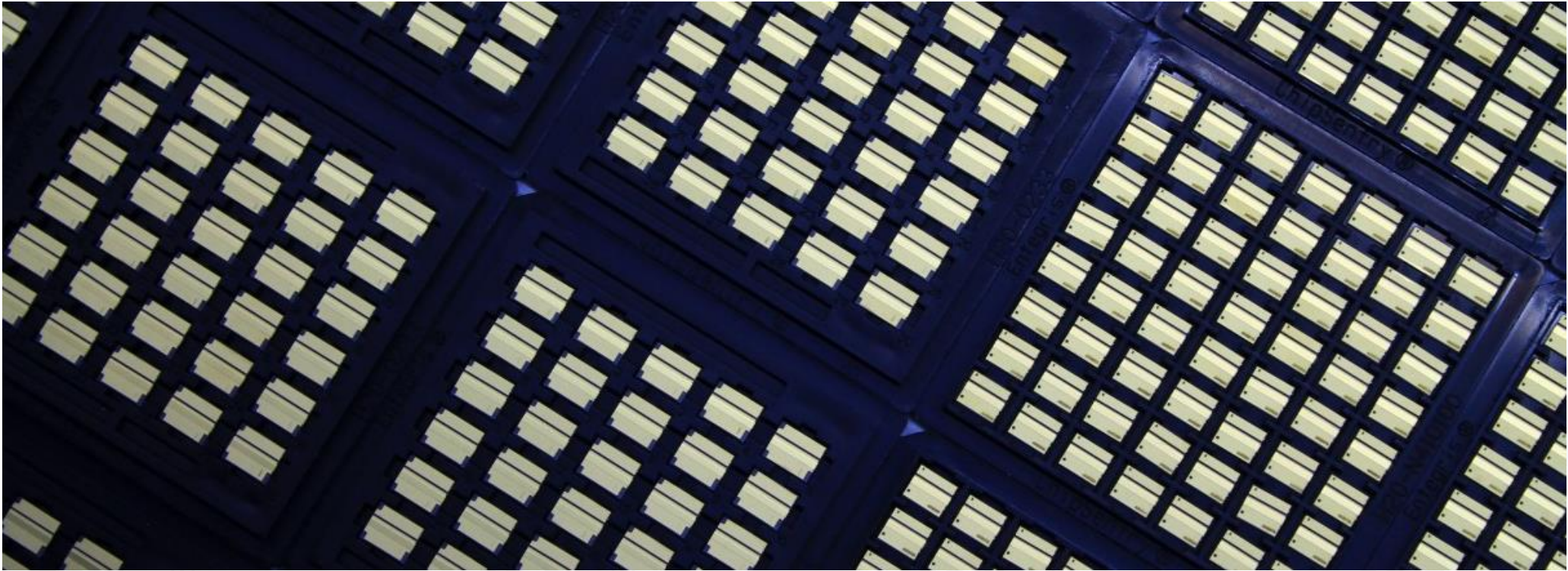
Manufacturing Excellence

- Apply the **lean manufacturing practices** to all production lines, including automotive, diode laser ones and laser optics business
- **Absolute customer focus, zero tolerance of waste, and continuous improvement** philosophy
- **Significantly reduced** cycle time, improved manufacturing efficiency, and lowered RMA yield and manufacturing cost.
- Adopting **automation and advanced production management system**
- **SOP** of the first LiDAR transmitter project with an international automotive tier 1 customer
- IATF 16949 certified and VDA 6.3 audited



Manufacturing Capacity – Advanced Materials

10+ years high-volume manufacturing experiences + self-owned core technologies



Monthly Advanced Materials Manufacturing Capacity > 2M pcs

Manufacturing Capacity – Diode Laser Components

Packaging & Assembling



Optical Assembling



Testing & Measurement



Quality Inspection

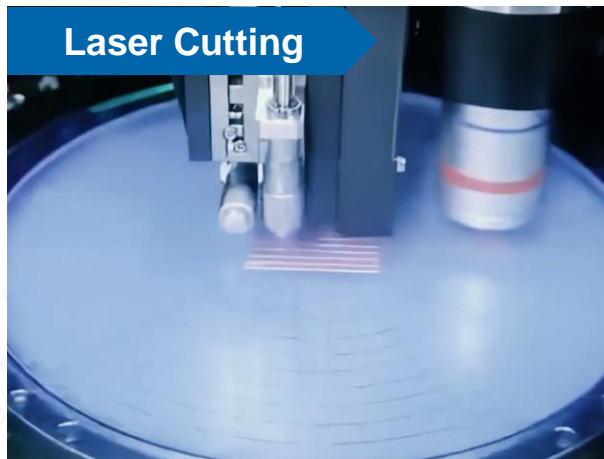
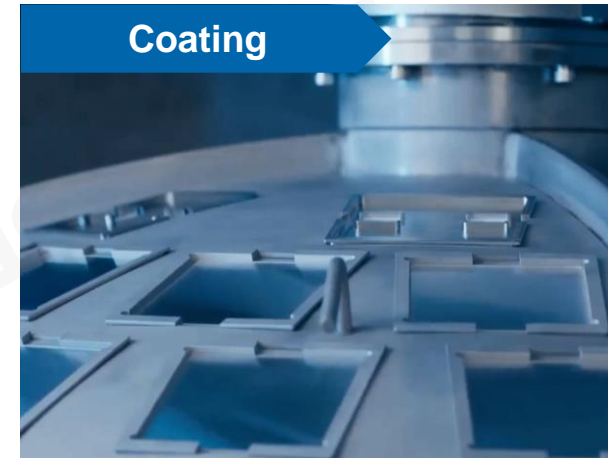
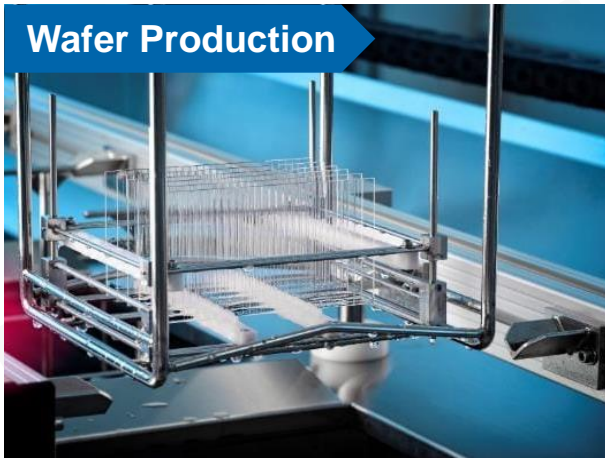


Burn-in & Lifetime Test



Yearly Diode Laser Manufacturing Capacity > 500K pcs
Burn-in Capacity 600K pcs/year

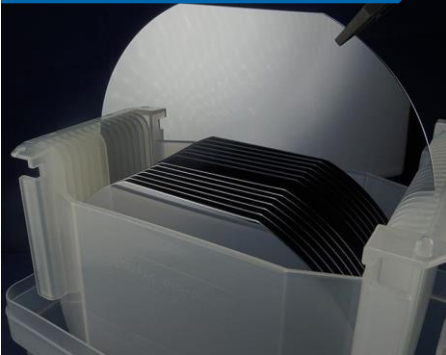
Manufacturing Capacity – Laser Optics Components



**Wafer-Level Simultaneous Structuring Processing:
Monthly Manufacturing Capacity > 2K wafers or > 3.5M pcs lenses**

Manufacturing Capacity – Laser Optics Components

Wafer Raw Materials



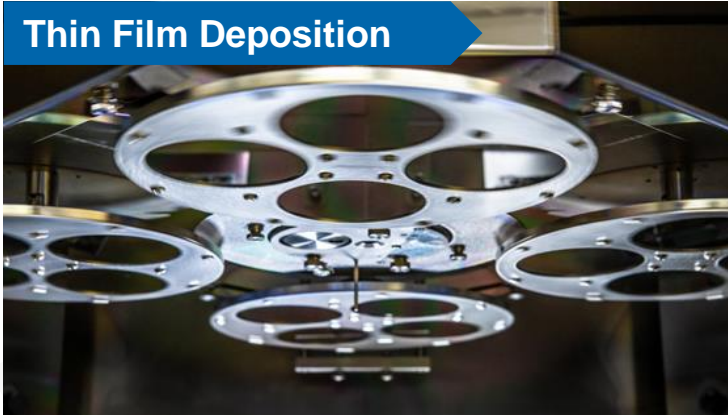
Photolithography



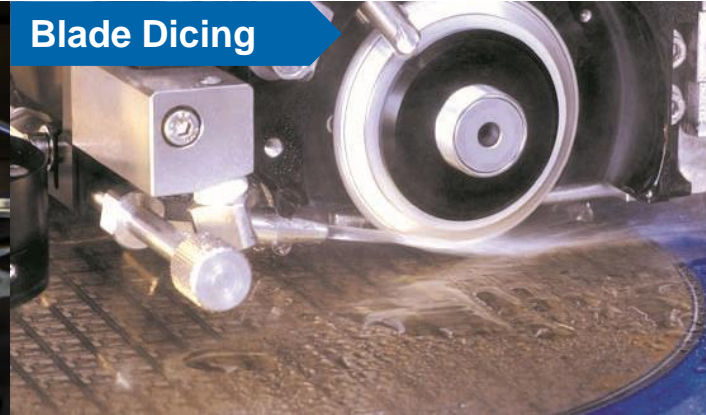
Dry Etching



Thin Film Deposition



Blade Dicing



Pick & Place

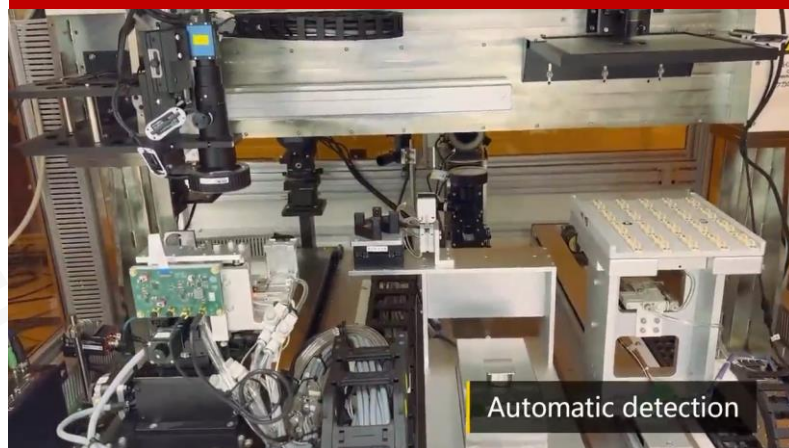


**Photolithography-Reactive-Ion-Etching Processing:
Monthly Manufacturing Capacity > 300 wafers**

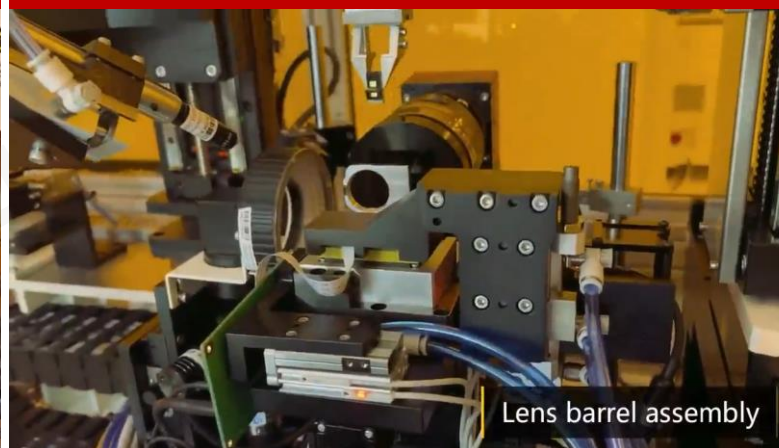
Automation Powered Manufacturing Excellence

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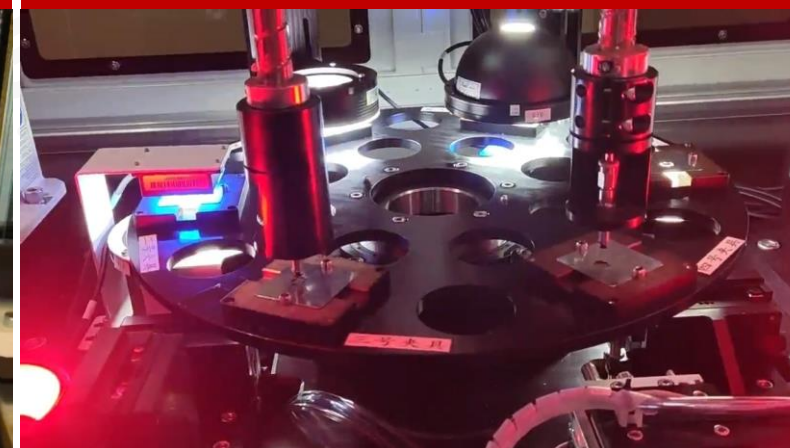
Automatic Optical Alignment



Automatic Assembly



Automated Optical Inspection



Laser Optics Production Line



LiDAR Transmitter Production Line



Video Link: <https://www.focuslight.com/news-events/newslist/focuslight-autonotation-powered-manufacturing-excellence/>

Global Facility/Capacity Expansion - China



Focuslight HQ, Xi'an, China

13787m² facility with 3710m² clean room space for **diode laser components & automotive LiDAR Tx module** production lines



Hefei, China

A new facility of ~25,000 m² focused on **pan-semiconductor application solutions** will be constructed.



Shaoguan, China

A new facility of ~15,000 m² focused on **medical and health application solutions** is being constructed



Dongguan, China

Total 65,000m² of building to be constructed. #1 and #3 buildings with ~6000 m² of clean room space has started operating in September 2022. Monthly **micro-optics** manufacturing capacity > 3 million pcs



Haining, China
UV-LLO and UV-SLA systems being fully deliverable from here

Global Facility/Capacity Expansion – Europe & USA



Dortmund, Germany

13000m² facility with 2870m² production area
Extension of **high-volume micro-optics wafer** production line (FAC /SAC) with manufacturing space increased by 150%
Expansion of UV laboratory finished

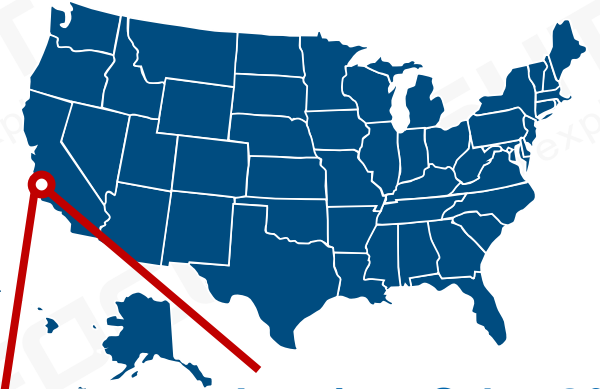


Neuchâtel, Switzerland

1,150m² of cleanroom area in two facilities – specially for **wafer-level production of industrial and automotive optics**



EMEA Sales Office
being an important part
of our global presence



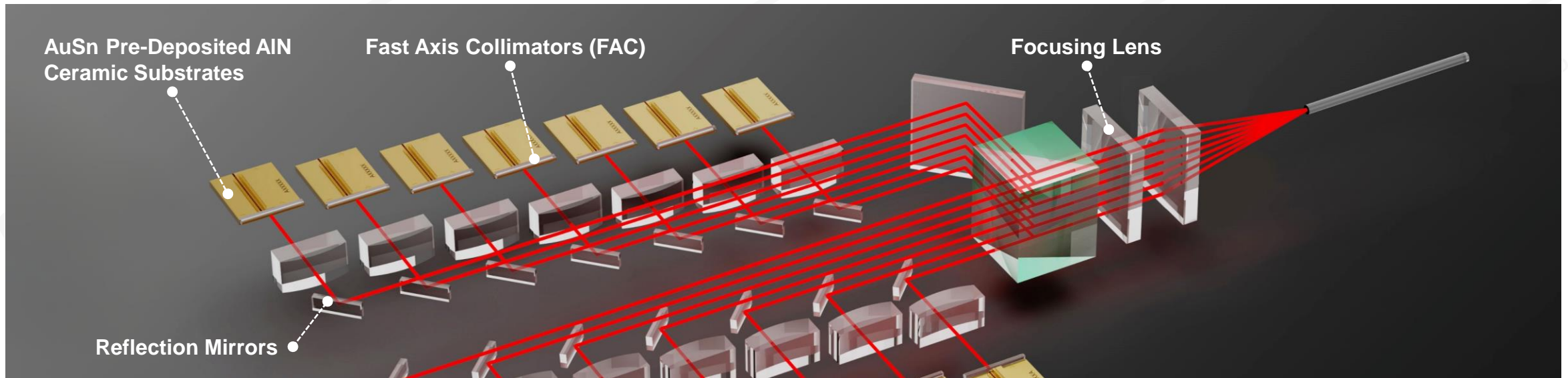
Americas Sales Office
being an important part
of our global presence



Silicon Valley, USA

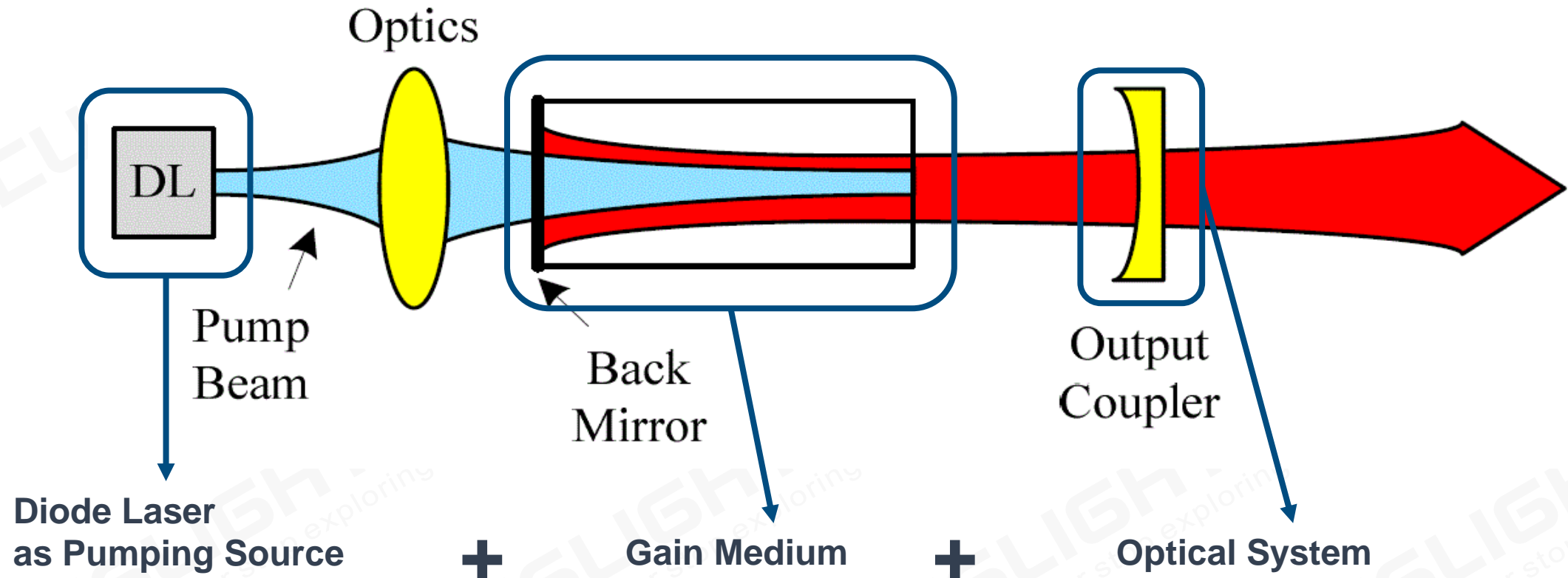
The **new innovation lab** has been set up with our Chief Scientist working here

Applications – Fiber Laser Pumping



- **AuSn pre-deposited ceramic substrates** – stable and reliable thanks to the high thermal conductivity and suitable thermal expansion coefficient;
- **Fast axis collimators (FAC)** – fundamental and efficient solutions for shaping the beam emitted by the pumping sources;
- **Reflection mirrors** – highly accurate and efficient in reflection, reducing optical signal losses;
- **Focusing lenses** – coupling the collimated laser beam precisely into the output fiber;

Applications – Solid State Laser Pumping



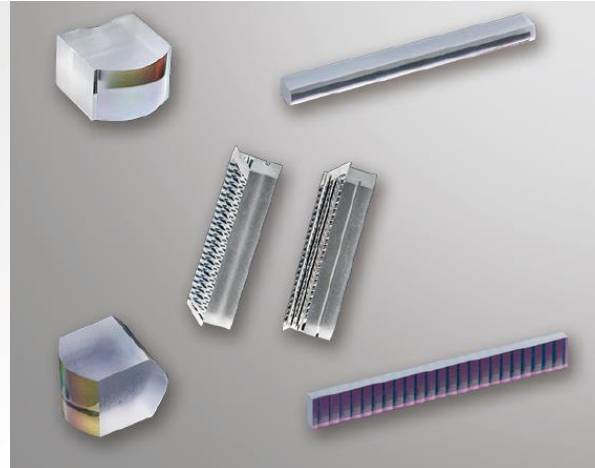
Diode Laser: ↓ Footprint ↑ Reliability ↑ Efficiency ↓ Cost

Applications – Blue Laser



AuSn Pre-Deposited Substrates

For optical cooling of the blue diode laser



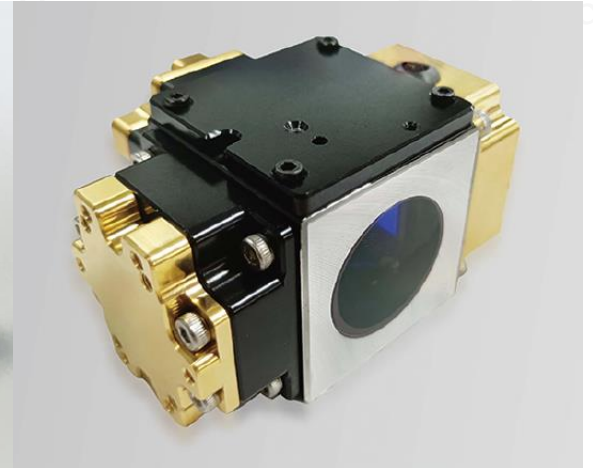
Beam-Shaping Optics

For highly efficient use of the photons



Laser Engraving Modules

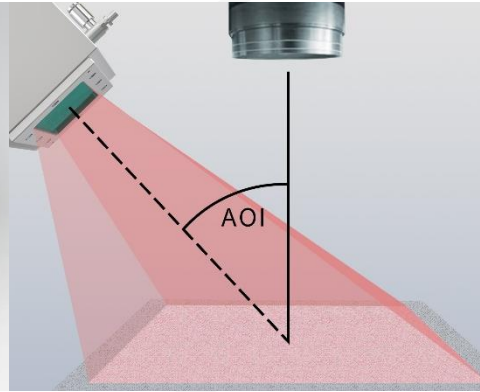
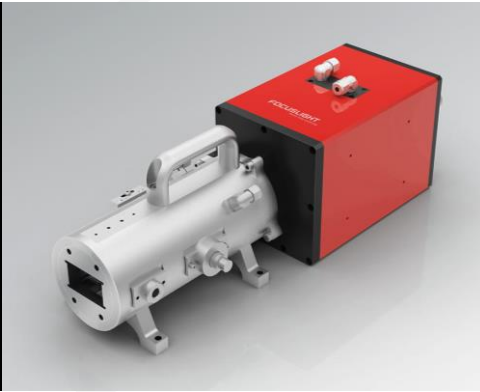
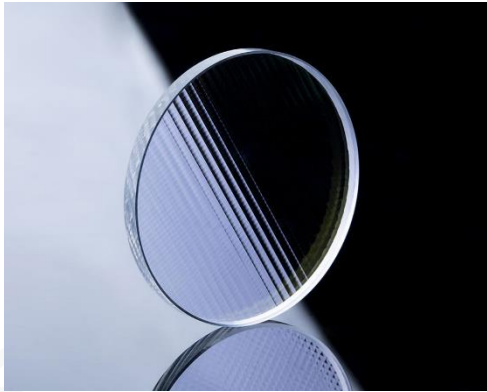
With 20W output (typ.)
in 10 x 5 x 5 cm
dimensions



Lighting Modules

With 8,000 lm output
(typ.) in 7.5 x 6.5 x 4.5
cm dimensions

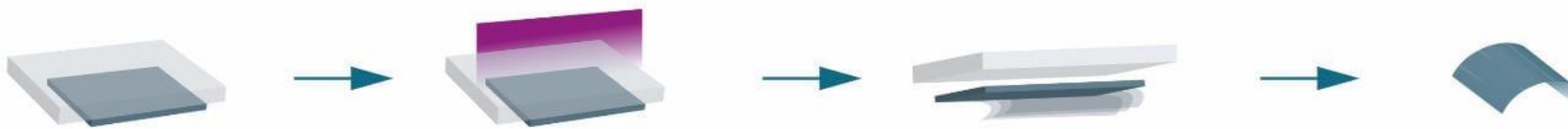
Application – Semiconductor



- Beam homogenization technology powers **lithography** illumination system – key optical component in steppers
- > 15 years supply to the major manufacturer of semiconductor lithography tools
- Laser system solutions with high power density and different beam profiles, designed for various **laser-based wafer annealing processes** including IGBT backside annealing and SiC annealing
- Off-axis beam shaping technology powers laser surface treatment as well as surface inspection
- Typically used in **solar cell industry**
- Beam shaping on UV solid-state laser, 30000:1 aspect ratio is achievable
- Up to 1000 mm long UV Line generation system enabling **OLED laser lift-off** process
- Next-gen LTPS **solid-state laser annealing** process.
- Based on 976nm diode laser with adjustable beam output and >97% homogenization in energy distribution
- Ideal for **Mini / Micro LED manufacturing processing**, e.g. laser mass transfer, laser mass soldering, and laser chip repair

Applications – Display

- Several tens of beam shapers (plasma display pixel structuring)
- Several green 100 mm line beam systems (laser lift-off)
- > 600 mm UV line beam production system (laser lift-off)



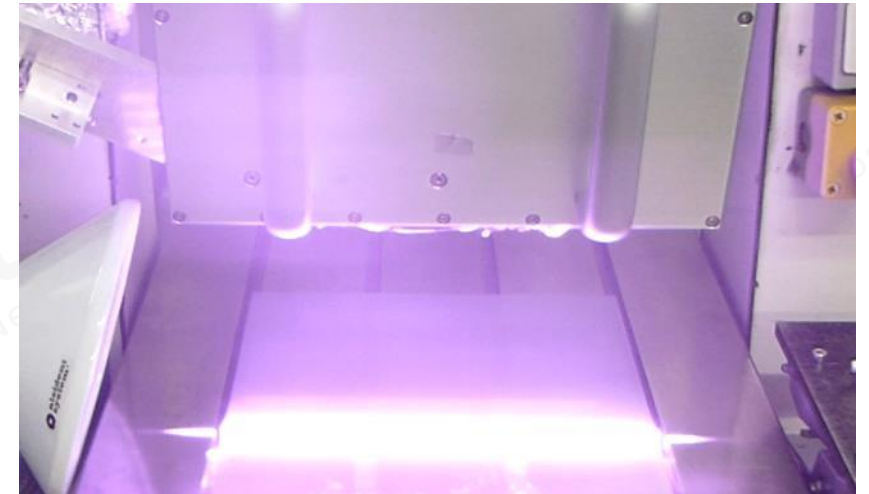
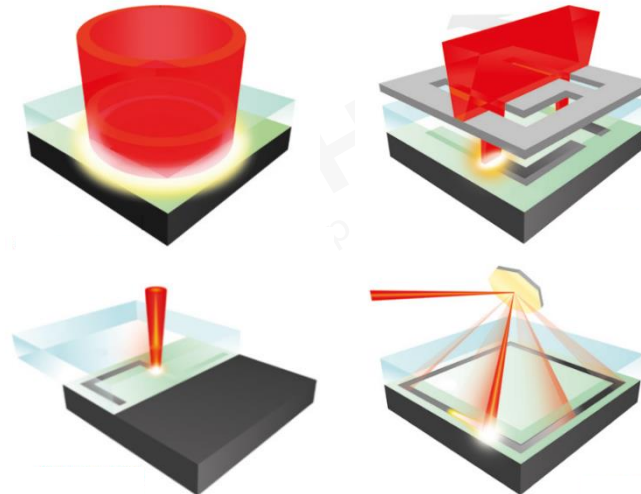
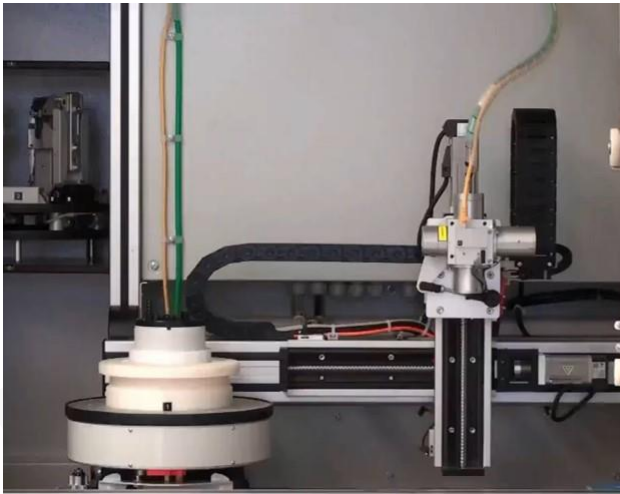
This graphic shows the laser lift off process.

Pre-production stage:

- Laser-induced thermal imaging process (LITI) with IR diode lasers
- Thermal optimization of TCO layers with Focuslight Line Beam Technology
- Low-temperature polysilicon annealing (LTPS) for AMOLED and high-resolution LCDs

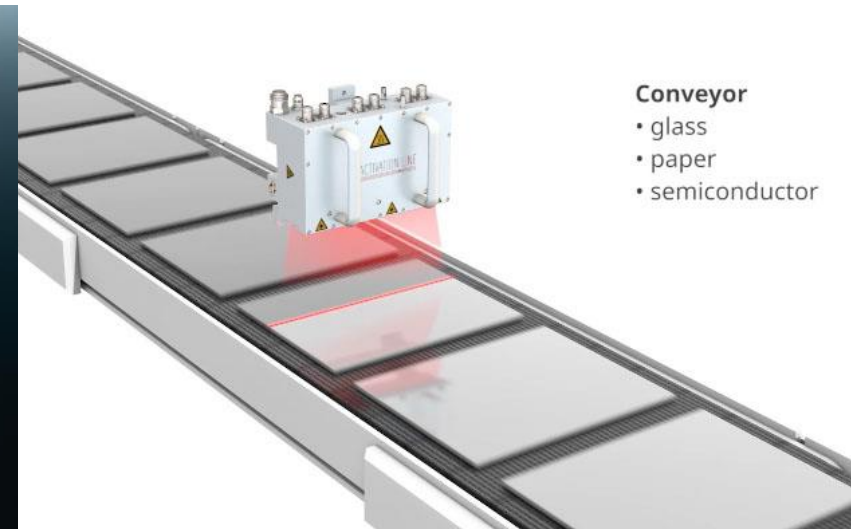
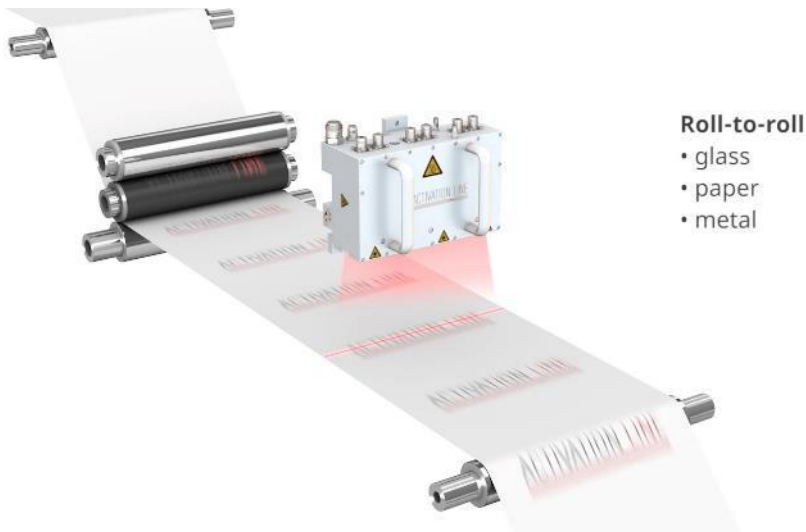
Applications – Welding

- Laser transmission welding of thermoplastics in the wavelength range 808nm-980nm
- Simultaneous welding of thermoplastics with Focuslight Line Beam Technology
- Cutting, welding and soldering of metals
- Metal surface finishing with Focuslight Line Beam Technology
- Corrosion- and abrasion-resistant hard metal coatings on steel



Applications – Coating

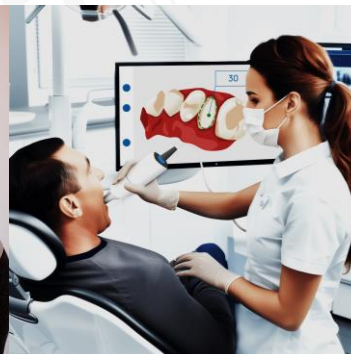
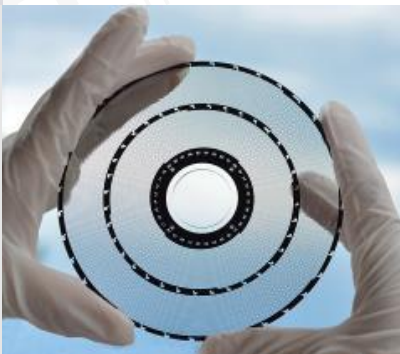
- vRTP (very Rapid Thermal Processing) of functional coatings with Focuslight Line Beam Technology:
- Large-scale, energy-efficient and precisely controlled processing
- ... for a large variety of substrate materials (metal, glass, polymer, paper etc.)
- ... for a large variety of processes (annealing, crystallization, drying, sintering etc.)
- ... for a large variety of coating materials (semiconductors, metals, TCOs etc.)



Applications – Medical and Health



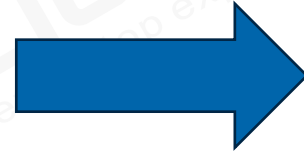
- **Direct diode laser solutions, fiber coupled laser solutions, and optical components** for medical and aesthetic uses including laser hair removal, laser body sculpting, dental, surgery, laser fluorescein angiography (LFA), etc.
- Strong positioning in **professional hair removal** industry worldwide
- Fast growth in **consumer health solution** and **body sculpting** laser modules, massive production project awarded from world-class home-use aesthetic equipment manufacturer
- Imprinted polymer lens, diffractive elements (DOEs), square lenses arrays for various applications such as **wavefront sensing, 3D intraoral scanning, health monitoring**
- **Nipkow discs** for **confocal microscopy**



Applications – Optical Communication

Refractive Optics

- Focusing / collimating microlens
- Prism integrated MLA
- Microlens arrays
- Si refractive microlens arrays



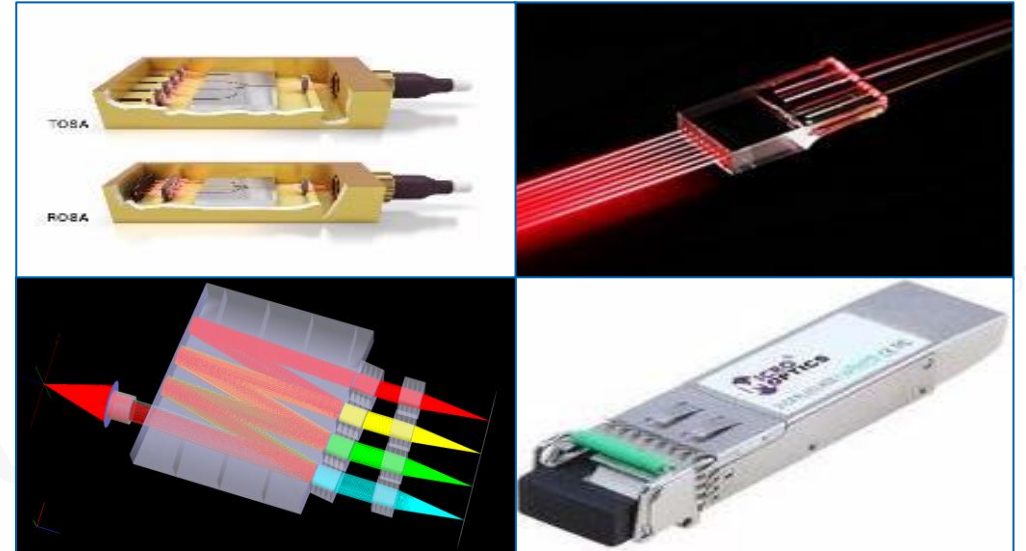
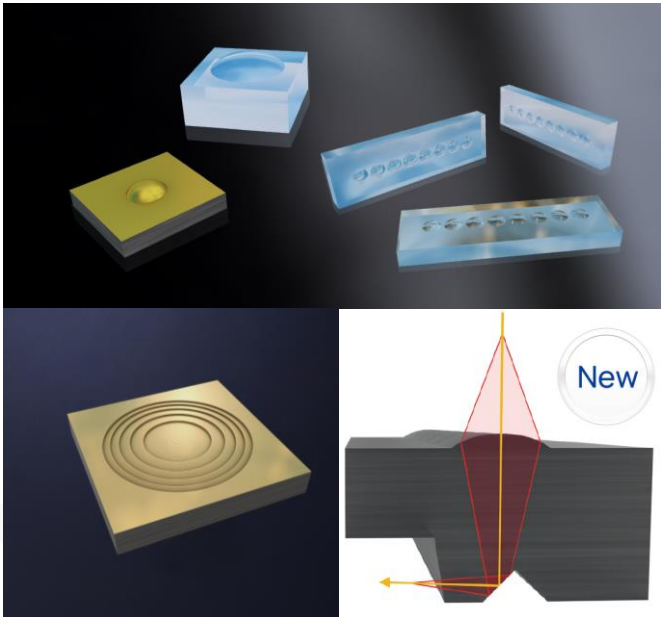
*Transceiver (TROSA, ROSA, TOSA *)*

Fiber couplers for PICs

Co-packaged optics

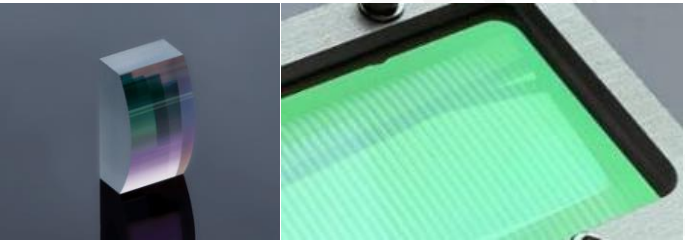
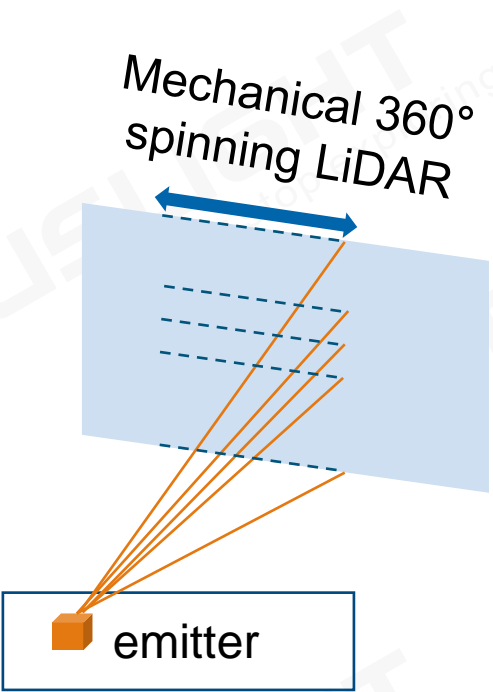
Wavelength selective switches

Extended beam connectors

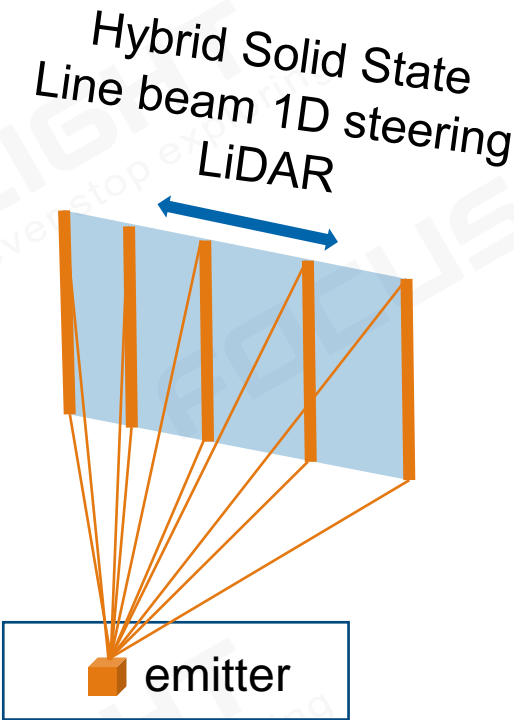


* TROSA = Transmit & Receive Optical Sub Assembly, ROSA = Receiver Optical Sub Assembly, TOSA = Transmitter Optical Sub Assembly

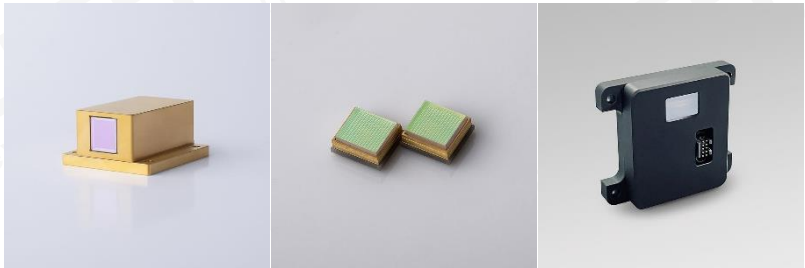
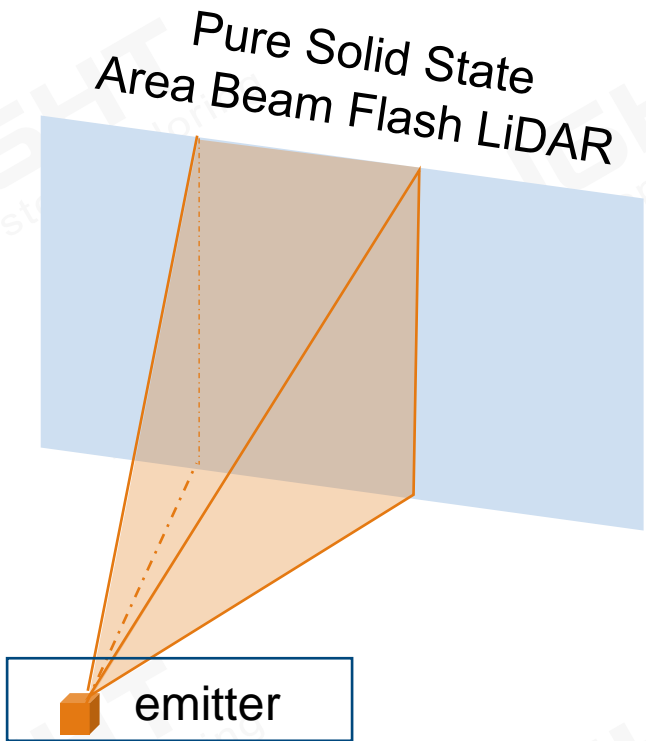
Application – Automotive LiDAR



Automotive-grade optics
and subassembly



Line Beam Transmitter Modules



Flash Transmitter Modules

Application – Automotive Lighting

Refractive and Diffractive Optics

- Microlens arrays
- Diffractive elements
- Spatial filter arrays
- Hexagonal / round / cylindrical / square lens arrays



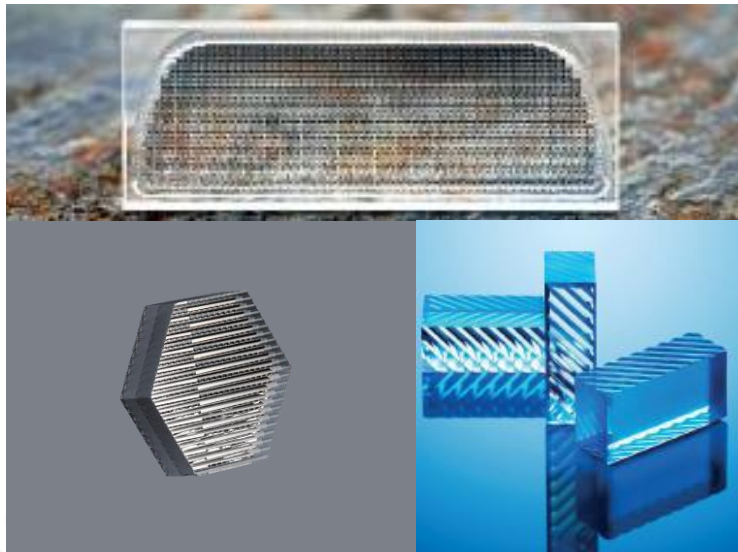
Headlight

Exterior projections

Interior projections

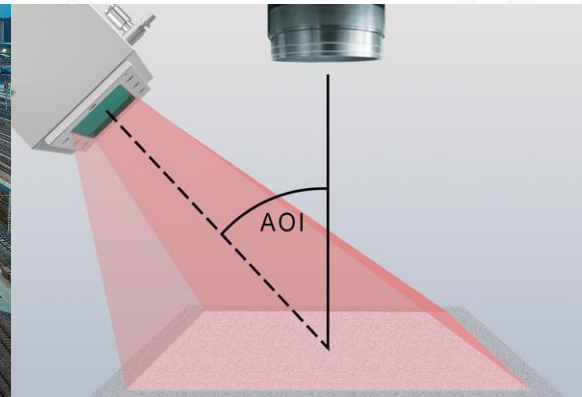
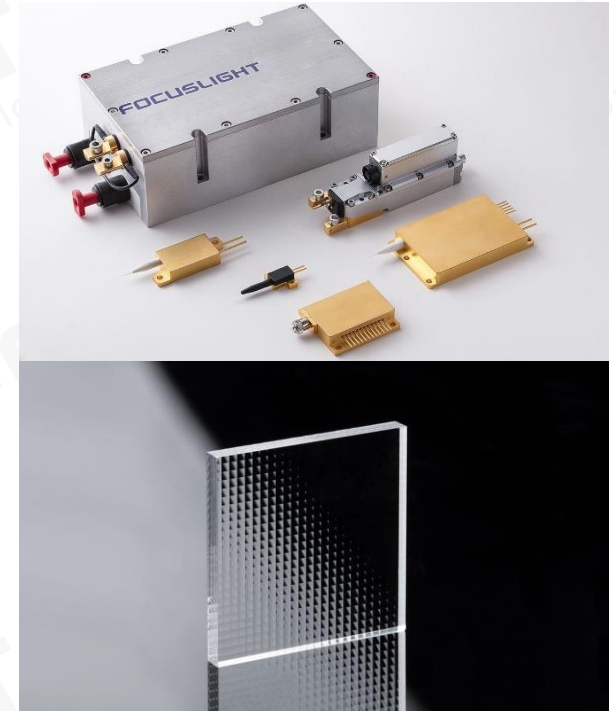
LiDAR Receiver

LiDAR Transmitter



Applications – Illumination and Machine Vision

- **Diode laser sources** with different power and wavelength ranges, **Fiber coupling modules (FCM)** products and **micro-optic components** for the **illumination** application.
- **Homogenizers, diffusers, and beam shaper modules** can disperse laser light in one direction up to a full illumination angle ranging from a few mrad to over 160°, which illuminates the target area precisely and uniformly (95%), providing high uniformity and high-resolution illumination system for **CCD/CMOS imaging and surface inspection system**, for instance, **for rail transit and bridges**, and in various **industrial application fields**.



Sales Network



- Worldwide established distributors
- Direct sales offices in China, Switzerland and US
- Manufacturing site in Xi'an, Dortmund, Dongguan, Haining, and Neuchâtel

Summary



- Diode laser light source leader and beam shaping expert
- One stop source from active devices to passive optics, from components to modules to application subassemblies
- Total solution, versatile customization service and field service provider
- Strong RDE capability, high volume production capacity and low-cost manufacturing
- Strong IP position in diode lasers and laser optics
- Financially healthy and strong financial backing from investors for long term growth



- **Your committed and reliable long-term partner in diode lasers and laser optics**

THANK YOU



FOCUSLIGHT
Never stop exploring