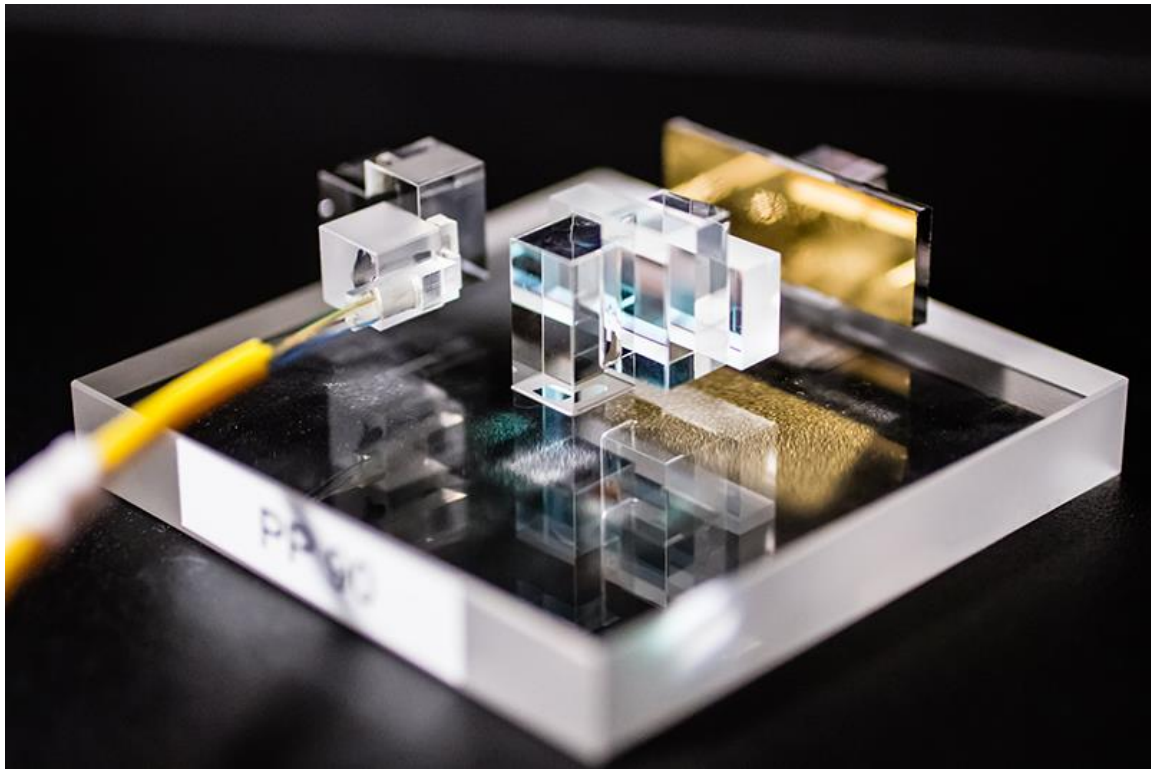

cailabs
SHAPING THE LIGHT

cailabs

SHAPING THE LIGHT

Cailabs's overview

March 2021



Cailabs, a deep-tech company

Develop, manufacture & sell innovative optical components

cailabs

Unique technology (MPLC)
and **expertise** in beam shaping

19
patent families

70%
export

50+ employees
(**20** PhDs)

16.6 M€
raised

20+ sales partners
worldwide

References:

SAFRAN

DLR

PRECITEC

Rexel

NEC

Amplitude

DGA

tellabs

Location

Headquarters:

Rennes, France

Placing Cailabs
Tailored beam shaping is photonics' next disruption enabler

Beyond the usual properties …

Power

Wavelength

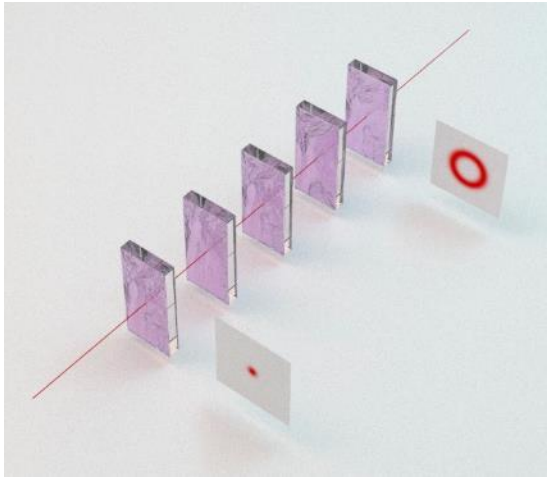
Polarization

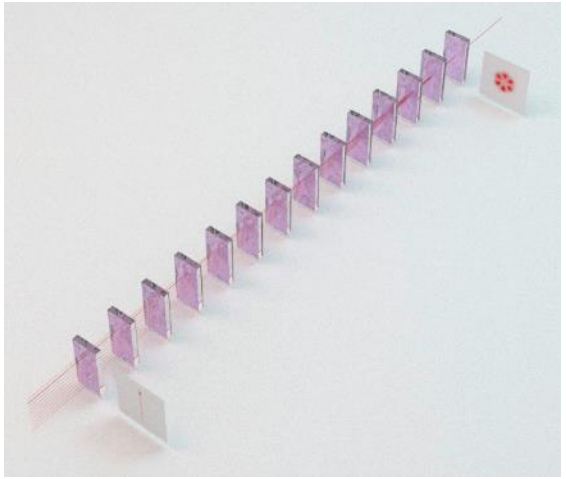
Phase

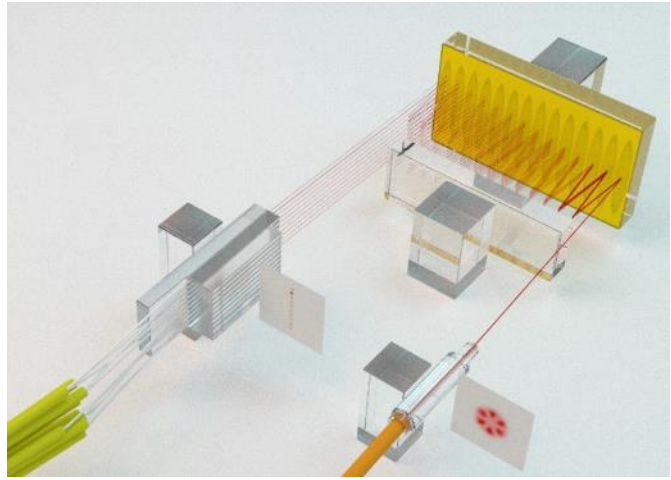
… we control the shape of the light

Multi-Plane Light Conversion (MPLC)
Take-home message

- Derived from quantum optics at French Kastler Brossel Lab
- Complex beam shaping through a succession of spatial phase profiles
- Passive optical beam shaping with no intrinsic loss and no moving parts



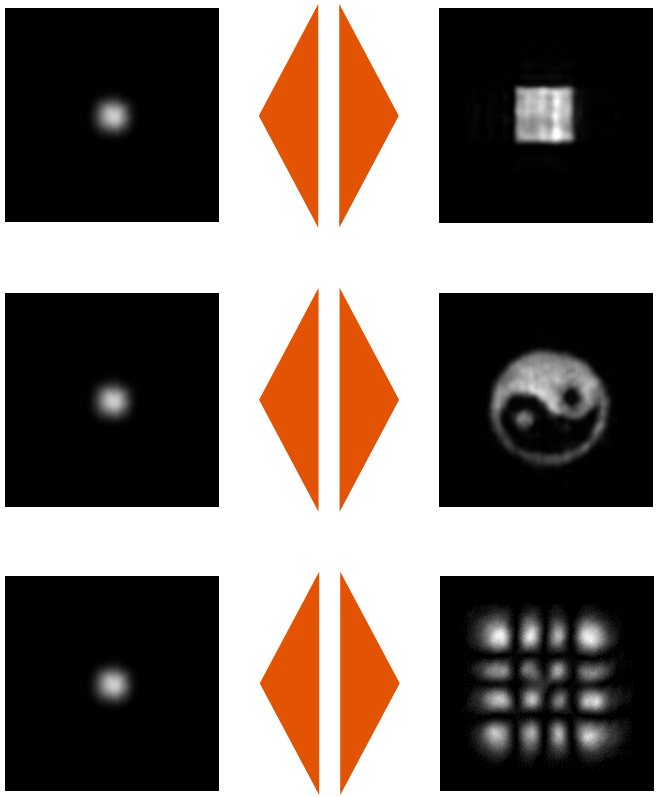




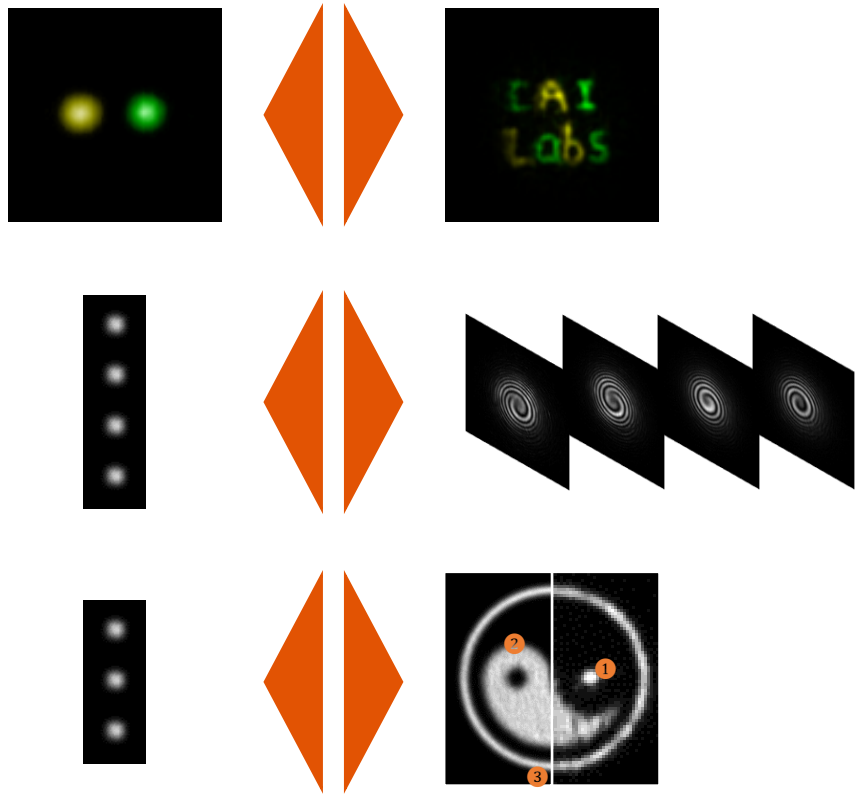
Multi-Plane Light Conversion
Flexible and versatile beam shaping

cailabs

Mono-mode transform



Multi-mode transform



Cailabs product ranges

cailabs

MPLC technology

Improve laser material processing	Future-proof fiber infrastructure of LANs	Invent the optical networks of the future	Ensure the reliability of lasercom	Enable tailored optical solutions
				
CANUNDA BY CAILABS	AROONA BY CAILABS	PROTEUS BY CAILABS	TILBA BY CAILABS	CUSTOM

AROONA
BY CAILABS

AROONA product line

Future-proof the multimode fiber infrastructure of LANs

What is AROONA?
Transform multimode fibers into single-mode fibers without recabling

AROONA BY CAILABS

AROONA: a simple box to increase network bandwidth without replacing existing cabling infrastructure

5-YEAR warranty

Efficient and effective solution : increased transmission capacity

- From 1 to 100 Gb/s over multimode fibers up to 10 km

ENVIRONMENTALLY FRIENDLY: **RECYCLING OF CABLING INFRASTRUCTURE**

Reduced cost

- 2x to 10x **less expensive than conventional fiber rollout**
- **No** additional cost of consumption, cooling, monitoring

AS USED BY FRENCH ARMED FORCES

Quick and easy to install

- Compatible with standard fibers and transceivers
- **Any type of multi-mode fiber 62.5/125 µm or 50/125 µm** (OM1 to OM5)
- Installation takes only a few hours; **operationnal after a simple fiber splice**

Why AROONA?
Ever-increasing demand for higher bandwidth in LANs

AROONA BY CAILABS

Today, most equipments and services requires 10+ Gb/s.

Examples of bandwidth consuming services:

- 5G networks with Consumer/Industrial IoT
- CCTV, smart building, smart factory, smart city, etc.
- Audio/Video streaming, real-time apps, etc.

A major issue for:

- Industrial sites
- Military bases
- Hospitals
- Local authorities
- University campuses
- Etc.

Just a few steps
to transform multimode fibers into single-mode fibers

AROONA
BY CAILABS

ISSUE

Limited bandwidth
over multimode fiber

1

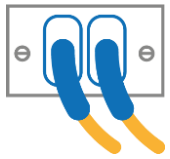
INSTALL
the AROONA-STAR box
in the existing network rack

3

CHECK
the link performance

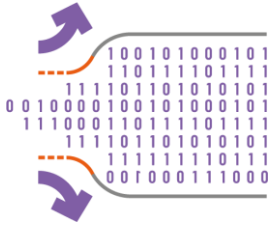
2

SPLICE
the multimode fibers to be upgraded
to the AROONA-STAR fibers



4

CONNECT
the AROONA-STAR to the single-mode active layer
via single-mode optical patchcords



RESULT

High throughput over MMF
= future-proof infrastructure

The AROONA product line
A broad range to cover all types of networks

AROONA BY CAILABS

AROONA STAR

10 Gb/s or more over multiple pairs of MMFs

AROONA-STAR upgrades up to 24 MMFs simultaneously to SMF capacity, with a single component

- 10 Gb/s over all branches of a LAN (instead of 100 Mb/s or 1 Gb/s)
- Up to 12 MMF of 800 m
- Available in 2/4/8/12/24 fibers
- 40-100 Gb/s compatible

AROONA POL

The Passive Optical LAN architecture over existing MMF infrastructure

AROONA-POL facilitates the upgrade of conventional Ethernet LAN to POLAN

- AROONA-POL facilitates the transition to Passive Optical LAN on existing cabling infrastructure
- Adapts MMFs to SMFs by simple replacement of an optical splitter
- GPON and XGPON over MMF

CANUNDA
BY CAILABS

CANUNDA product line

Improve laser machining processes

What is CANUNDA?

High-power CW or pulsed beam shaping to boost laser machining processes

CANUNDA BY CAILABS

CANUNDA: a module enabling laser beam shaping

Optimum beam shape

High-quality complex beam shaping

High power or high energy resistance

Operation with high power lasers or with lasers at high peak powers

Simplified machine integration

Robust and compact design, compatible with industrial machines

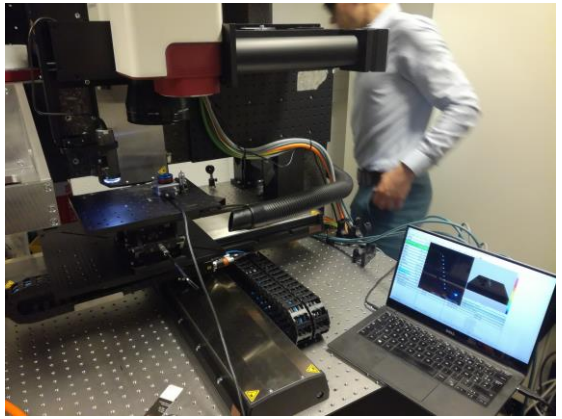
Why CANUNDA?
Answering the laser material processing challenges

CANUNDA BY CAILABS

Optimal Beam shaping has proved its efficiency to **increase** laser material processing **yield** but is still facing technical **challenges**.

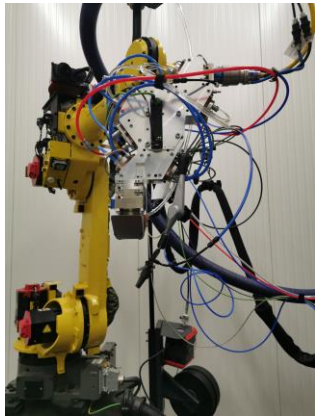
- **CANUNDA: compatible with industrial applications**

Rough environment, compact design, compatible with scanner, etc.



- **CANUNDA can stabilize the laser input**

Tilt, shift, and energy homogeneity



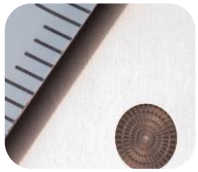
- **CANUNDA: the highest depth of field in the market**

CANUNDA: what for?
From USP laser to multi-kW laser processing applications

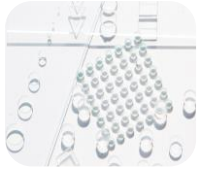
CANUNDA BY CAILABS

USP laser material processing

For medical devices, watch industry & jewellery, automotive, aerospace, glass industry, electronic industry

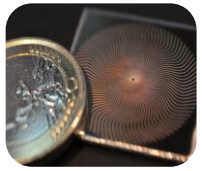

Laser engraving


Laser cutting


Laser drilling


Laser welding


Laser thin film removal


Laser structuring & texturing

Multi-kW laser material processing

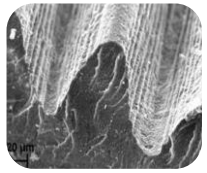
For automotive, aerospace, naval and machines for industry


Laser cutting / drilling


Laser welding


Additive manufacturing

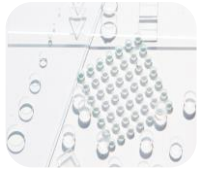

Composite heating


Laser texturing / cleaning

Glass processing

For medical devices, automotive, aerospace, glass industry, electronic industry


Laser cutting

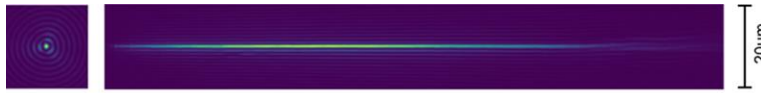

Laser drilling

CANUNDA product line
A broad range for various laser types

CANUNDA BY CAILABS

CANUNDA AXICON

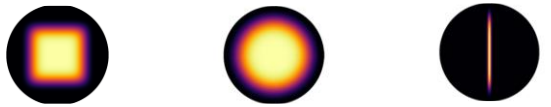
The most reliable solution to generate high quality Bessel beam



CANUNDA PULSE

The perfect product for ultra-fast laser stabilization & top-hat beam shaping

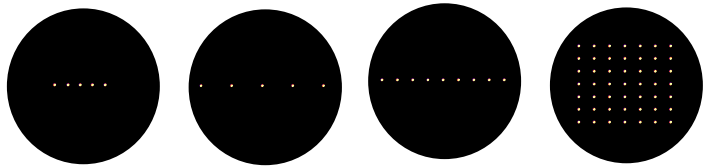
Ultra-short pulse laser beam shape examples:



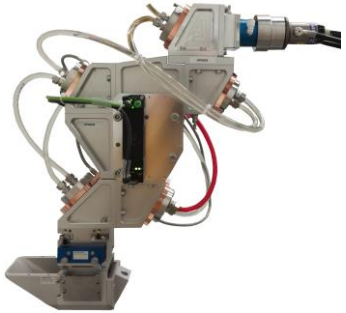
Square top-hat Round top-hat Line top-hat

CANUNDA SPLIT

The new laser beam splitting for micromachining efficiency for ultra-fast laser

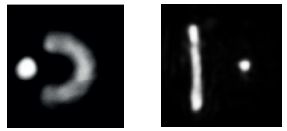


CANUNDA HP



The beam shaping system dedicated to high power continuous laser

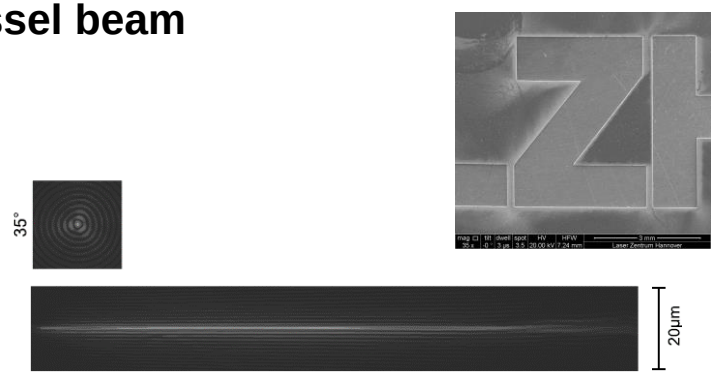
CW beam shape examples:



What do we do for laser material procesing?
Beam shaping for high quality and high yield processes

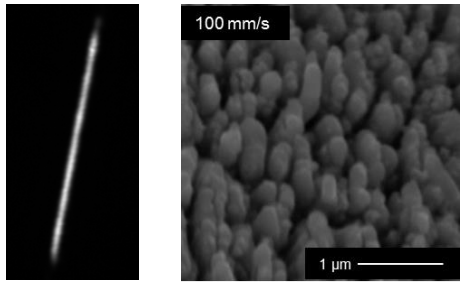
CANUNDA BY CAILABS

CANUNDA-AXICON Glass cutting
Bessel beam



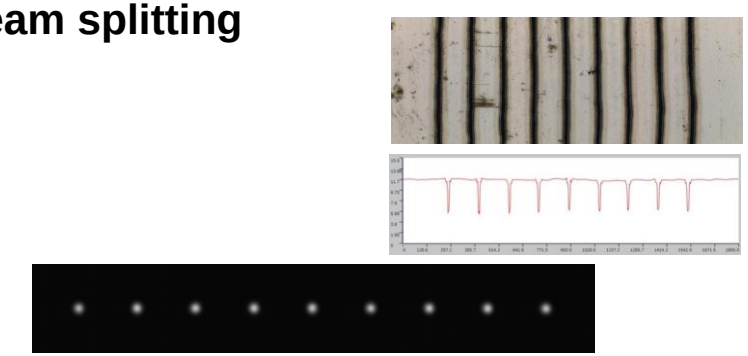
LZH LASER ZENTRUM HANNOVER e.V.

CANUNDA-PULSE Surface texturing
Line top-hat



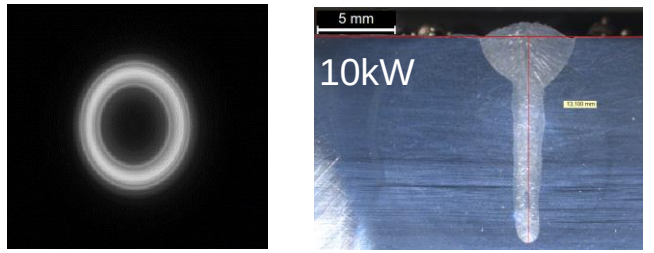
ALPhA NOV

CANUNDA-SPLIT Engraving
Beam splitting



lasea PRECISION LASER SOLUTIONS

CANUNDA-HP Laser beam welding
Donut shape



INSTITUT MAUPERTUIS TECHNOLOGIES INDUSTRIELLES INNOVANTES

TILBA
BY CAILABS

TILBA product line

Bringing solutions to each end of LaserCom links

What is TILBA?
Bringing solutions to each end of LaserCom links

TILBA BY CAILABS

TILBA: a module to improve the reliability of laser communications

More reliable laser communications

Increases the range and robustness of optical links in free space

Passive optical system

A mechanicaly passive system compatible with embedded applications

Compatible with standard telecommunications components

Inputs/outputs over standard single-mode optical fibers compatible with detectors, amplifiers, etc.

Why TILBA?
Networks of the future rely on laser communication

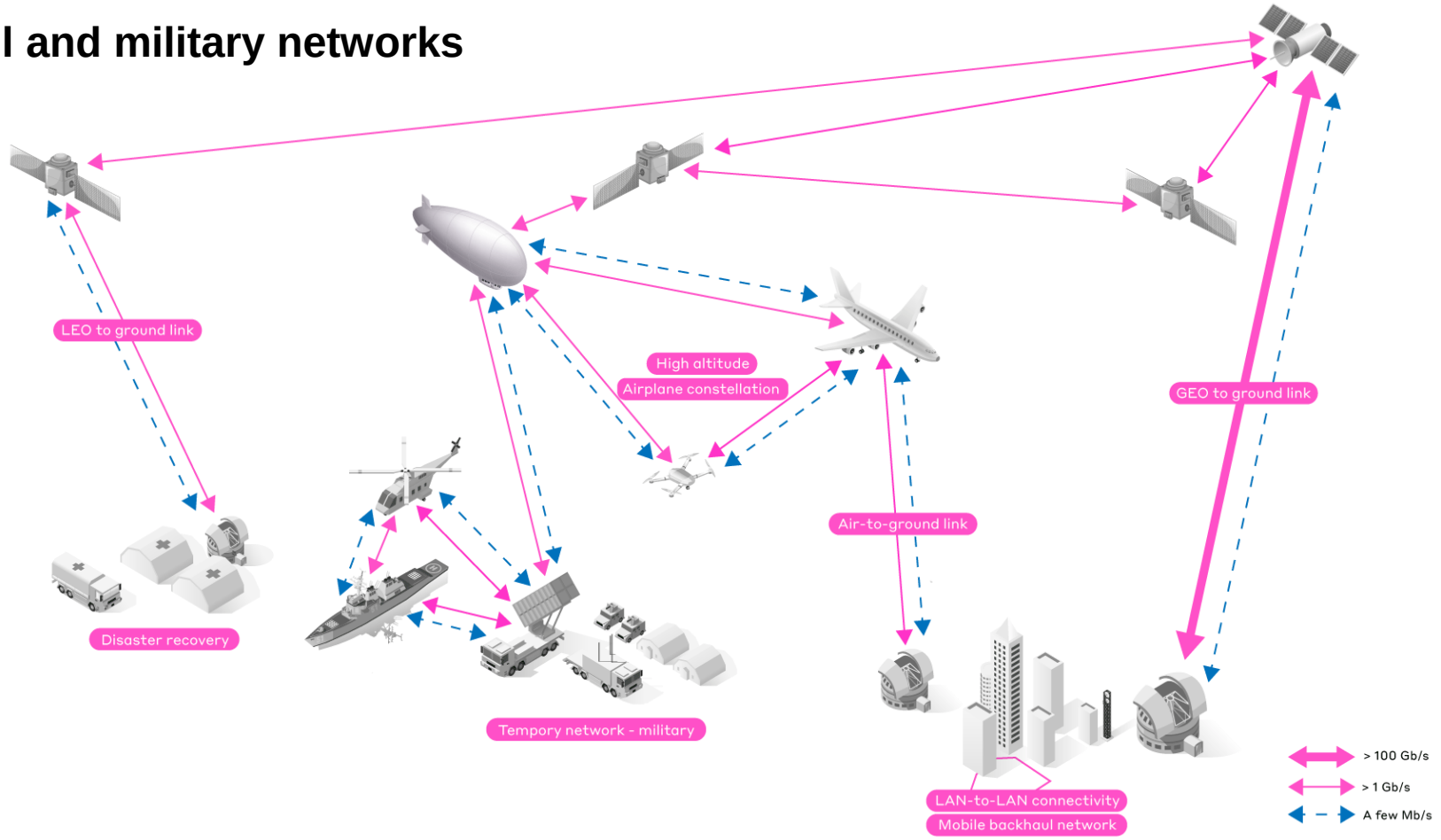
TILBA
BY CAILABS

Reshaping architecture for civil and military networks

- Very high throughput
- High security
- Better SWaP

(Size, Weight and Power)

- Unlicensed spectrum



TILBA: what for?
From space to aeronautics applications

TILBA
BY CAILABS

Earth-space laser communication

Naval communication bubbles

Laser communication with aircraft

… And any other laser communication link

The TILBA product line
Designed to solve challenges at each end of the link

TILBA BY CAILABS

TILBA ATMO

Turbulence mitigation

- With no moving parts
- Standard, plug and play component
- Easy to integrate

TILBA EMIT

Beam combining

- Optimum beam combining
- High power handling (kW)
- Large number of sources (>10)

PROTEUS
BY CAILABS

PROTEUS product line

Inventing tomorrow’s optical networks

What is PROTEUS?

Fulfill all telecommunications shaping and multiplexing requirements

PROTEUS BY CAILABS

PROTEUS: a robust spatial mode multiplexer for use in Space Division Multiplexing (SDM)

Record number of space division modes

Up to 45 spatial modes selectively multiplexed and excited

Unparalleled optical performance

Low optical losses and record modal selectivity

Simplified machine integration

Compatible with a wide range of wavelengths

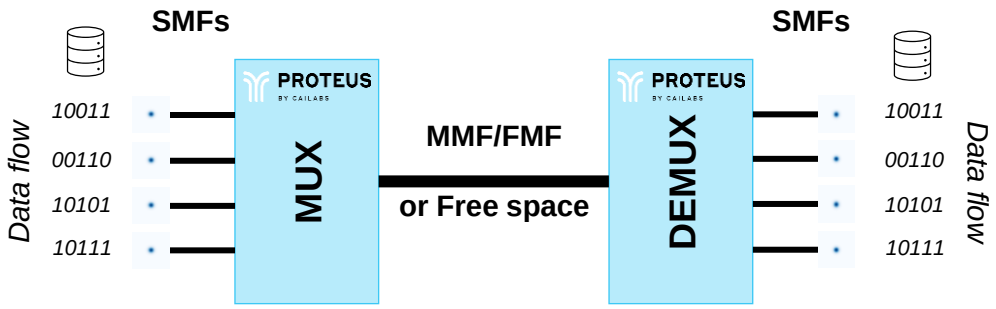
Compatible with all types of input and output (free space or fiber, all mode types, etc.)

Why PROTEUS?
Best SDM (Space Division Multiplexing) solution on the market

PROTEUS BY CAILABS

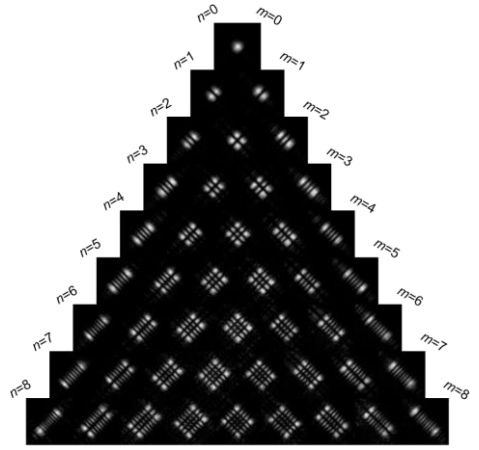
Why

- By using several shapes of light simultaneously in an optical link, **Space Division Multiplexing (SDM)** increases the bandwidth of optical telecommunications.



How

- A **MUX** to encode the information in only one guide (MMF, FMF or FSO) and a **DEMUX** to decode it.



Use case

- PROTEUS helps achieve **fiber-capacity world record**! (10 Pb/s!)

PROTEUS: what for?

For telecom applications & to invent the optical networks of the future

PROTEUS
BY CAILABS

Applications

- Fiber optics network
- 5G backbone
- Satellite communication
- Point-to-point free space communication

The PROTEUS product line
Ideal for R&D teams inventing tomorrow's optical networks

PROTEUS BY CAILABS

PROTEUS C

Turbulence mitigation

- Record number of space division modes
- Unparalleled optical performance
- High flexibility for all applications

PROTEUS S

A standard spatial multiplexer for research

- Optimized for commercial fibers
- Unparalleled optical performance
- A 6 to 10 mode multiplexer available at an affordable price

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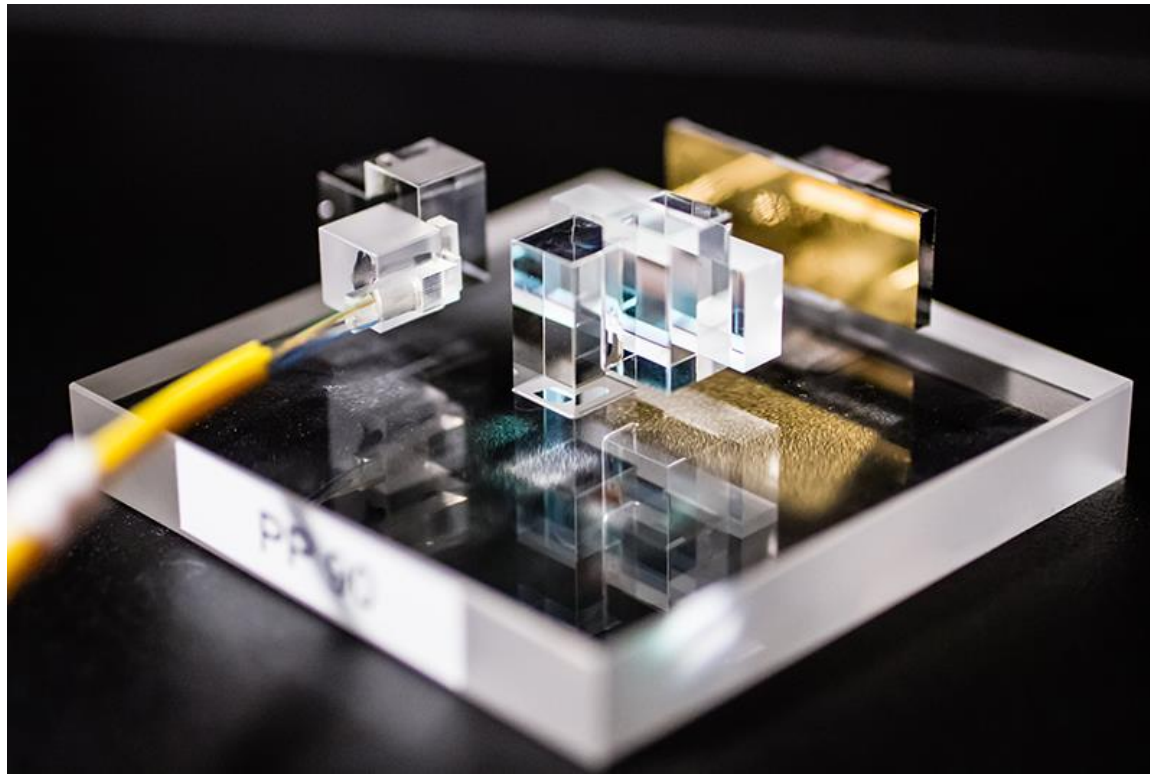
SHAPING THE LIGHT

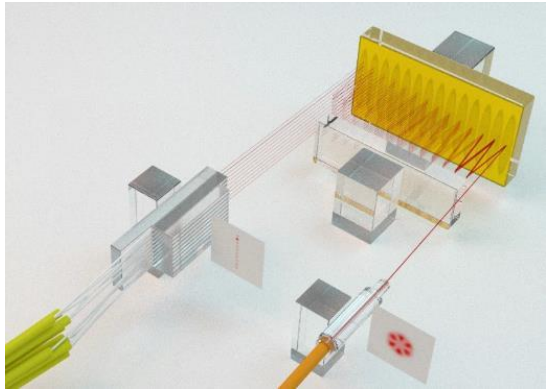
Tailored optical solutions

For emerging applications



Cailabs' tailored optical solutions
Light shaping at all levels

Cailabs MPLC* technology



Combine lasers
into optimized output

Change the spatial shape
of the output laser beam

Optimize laser beam reception

Cailabs develops **tailored solutions** for its customers in promising markets and for emerging applications.

*Multi-Plane Light Conversion

Scope of the Cailabs solutions
From existing to emerging applications

Defense

- DEW
- DIRCM
- LiDAR
- Fiber Optical Rotary Joint

Telecom & Datacom

- Cybersecurity
- Submarine optical communication
- Aircraft network

Aeronautics & Space

- Optical remote power sypply
- LaserCom
- Fiber sensor network

Others

- Medical
- Robotics
- Microscopy