

# Custom mode selective spatial multiplexer

## Features

- › Up to 45 modes
- › Large bandwidth of operation
- › Minimal insertion loss and high selectivity
- › Optimized for standard and custom FMF, MMF and free space output

## Applications

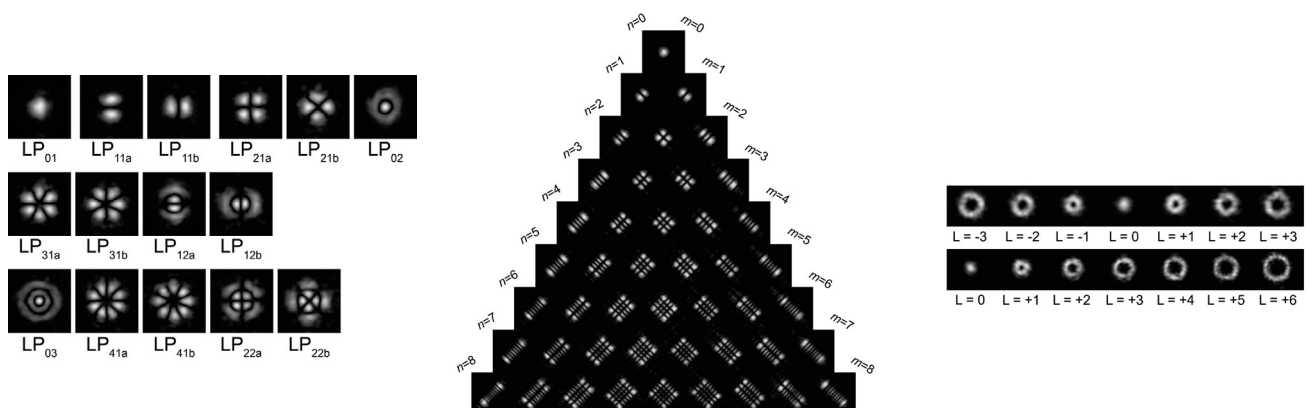
- › Custom spatial mode multiplexer tailored to meet all requirements for SDM, OAM and FSO applications
- › Possible use :
  - Mode-multiplexing for SDM transmission over FMF
  - Pump & signal multiplexing for few-mode EDFA
  - Free-space output with custom beam shape, size and focal point
  - On-demand spatial mode shapes

## Description

Cailabs' PROTEUS-C series is the ideal solution for all mode-multiplexing research & development.

Using the highly flexible technology of **Multi-Plane Light Conversion\***, PROTEUS-C can be customized to **any set of input or output spatial modes**. It can efficiently multiplex **up to 45 modes** into any multi-mode, few-mode fiber or free space output.

Cailabs' **PROTEUS-C** is the best spatial multiplexer on the market that is able to meet all of the requirements for mode division multiplexing research and development, from entry-level to the most advanced applications.



\* U.S. Pat No 9.250.454 - Japanese patent n° 5990544

# General specifications

PROTEUS-C		
PARAMETER	VALUE (AT 20°C)	COMMENTS
Number of modes	Up to 45 modes	
Operating wavelength	C-band, L-band or O-band	Other wavelengths available
Back-to-back insertion loss	Between < 5 dB and < 14 dB	Depending on mode number
Back-to-back cross-talk	Between < -12 dB and < -20dB	Depending on mode number
Signal input fiber type	SMF-28e+ array or FMF or MMF	Custom fiber or input available
Signal output	Standard or custom FMF, MMF or free space	Custom fiber and free space output available
Package size (mm)	140x125x55 (Fiber output) or 153x125x55 (Free Space output)	

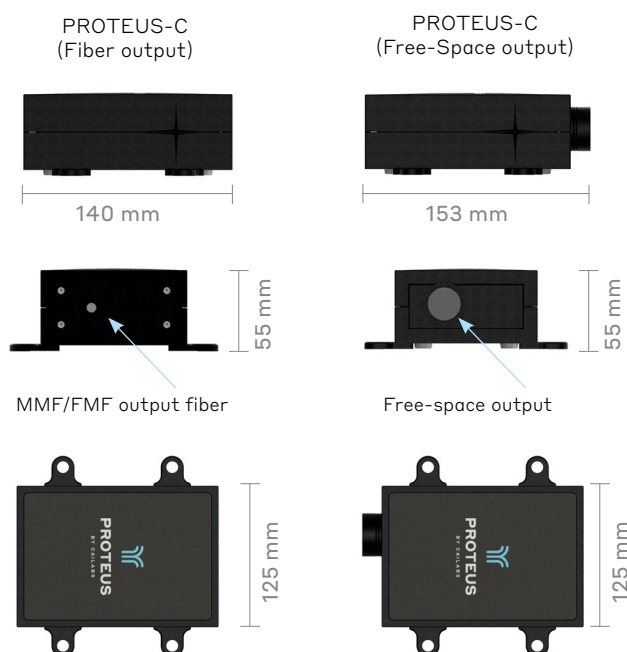
## Output fiber information

### Example of output fibers

- › 4 LP mode step-index fiber by Prysmian
- › 6 LP mode graded-index fiber by Prysmian
- › 9 LP mode graded-index fiber by Prysmian
- › 2 LP mode graded-index fiber by OFS
- › 4 LP mode graded-index fiber by OFS
- › 2 LP mode step-index fiber by OFS
- › 4 LP mode step-index fiber by OFS
- › OM1 : 62.5 um conventional multi-mode fiber
- › OM2/3/4 : 50 um conventional multi-mode fiber
- › OAM modes in free-space

### Other type of fibers

Please contact us with detailed requirements



## Use cases

### Optical fiber communication: (Soma & al. JLT 2018 vol 36, 6)

The PROTEUS-C multiplexer is perfectly designed for SDM applications. It is a key component that has given way to groundbreaking results, including the KDDI's transmission capacity world record.

### Free space communications: (Akirawa & al. ECOC 2017 Tu.2.E5)

The PROTEUS-C multiplexer can be designed for free space output as a way to increase the communication capacity or mitigate atmospheric turbulences. It has already been

successfully combined with drone and low Earth orbit optical systems.

### Orbital Angular Momentum: (Saad & al. ECOC 2017 SC1)

Orbital angular momentum (OAM) is an emerging field in optical communications and quantum optics. The PROTEUS-C multiplexer can generate a high number and high order of OAM.

### Other applications:

Do you have an application in mind and are curious about the feasibility? Please contact us.