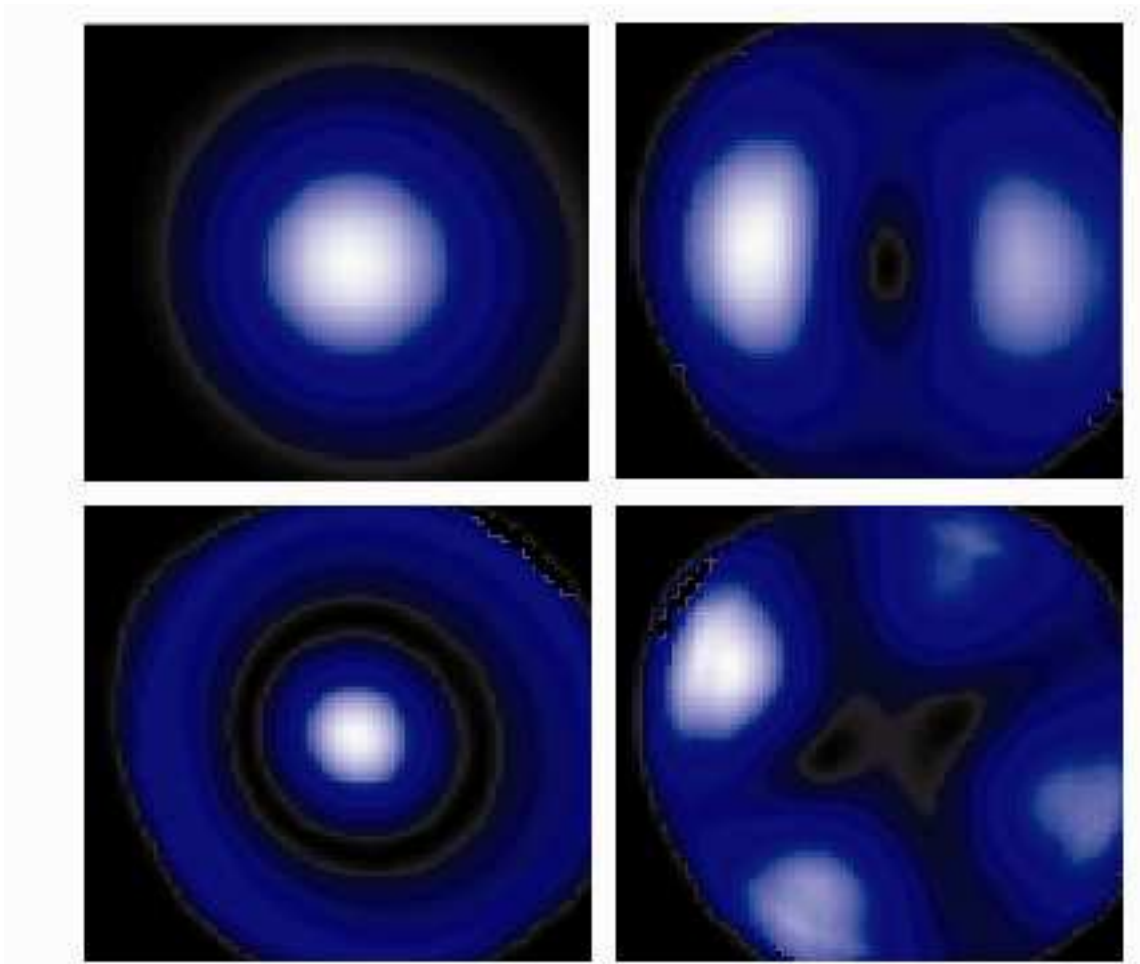


## 1 – Description

The M3 modal mux/demux is a device that enable to inject/recover 3 different signals coming from 3 different fibers in a single Few Mode Fiber (FMF), where each signal is carried on a spatial mode which is orthogonal to the others those modes are called  $LP_{01}$ ,  $LP_{11a}$  and  $LP_{11b}$ . This device allows the use of these FMF in a plug and play way.

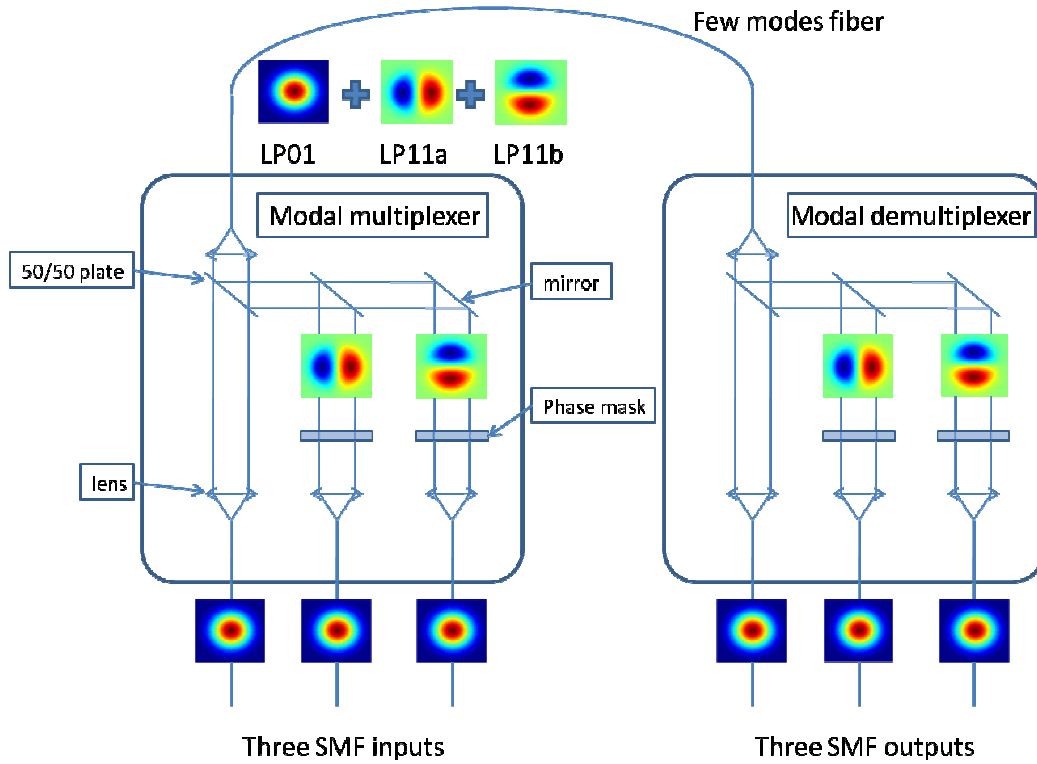
Kylia also offers a M5 modal mux/demux : the 5 carried modes are  $LP_{01}$ ,  $LP_{11a}$ ,  $LP_{11b}$ ,  $LP_{21a}$  and  $LP_{21b}$ .



*intensity profiles of the various modes carried by the few-mode fiber*

## 2 – Block diagram

Example of the use of 2 M3 connected with a FMF. Signals go through Beam Splitters (BS) and through Phase Plates (PP) in order to achieve the functionality.



## 3 – Absolute maximum ratings

Parameter	Symbol	Min	Typ.	Max	Unit	Remarks/Conditions
Maximal optical input power	Opln			+300.0	mW	
Storage temperature range	STR	-10.0		50	°C	
Humidity	RH	5		85	%	non condensing
Fiber bend radius		20			mm	

## 4 – Operating conditions

Parameter	Symbol	Min	Typ.	Max	Unit	Remarks/Conditions
Operating wavelength	OWR	1530		1570	nm	
Operating temperature range	OTR	15		35	°C	

## 5 – Specifications

### M3 specifications

IL (dB)		M3-OUT		
		LP01	LP11A	LP11B
M3-IN	LP01	8.5	32	32
	LP11A	32	22	
	LP11B	32	22	

The insertion losses are measured from input connectors of M3-IN to output connector of M3-OUT. They include the insertions losses of the 50/50 plates:

- 1 for the LP01 mode
- 2 for each LP11 modes

### M5 specifications

IL (dB)		M5-OUT				
		LP01	LP11A	LP11B	LP21A	LP21B
M5-IN	LP01	15	38	38	38	38
	LP11A	38	28		38	38
	LP11B	38	28		38	38
	LP21A	38	38	38	23	
	LP21B	38	38	38	23	

These insertion losses are measured from input connectors of M5-IN to output connector of M5-OUT. They include the insertions losses of the 50/50 plates:

- 2 for the LP01 mode
- 3 for each LP11 modes
- 2 for each LP21 modes

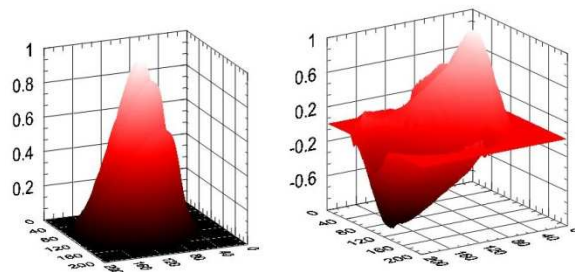
For devices made with custom FMF, the characteristics of the mux/demux may differ.

## 6 – Precaution

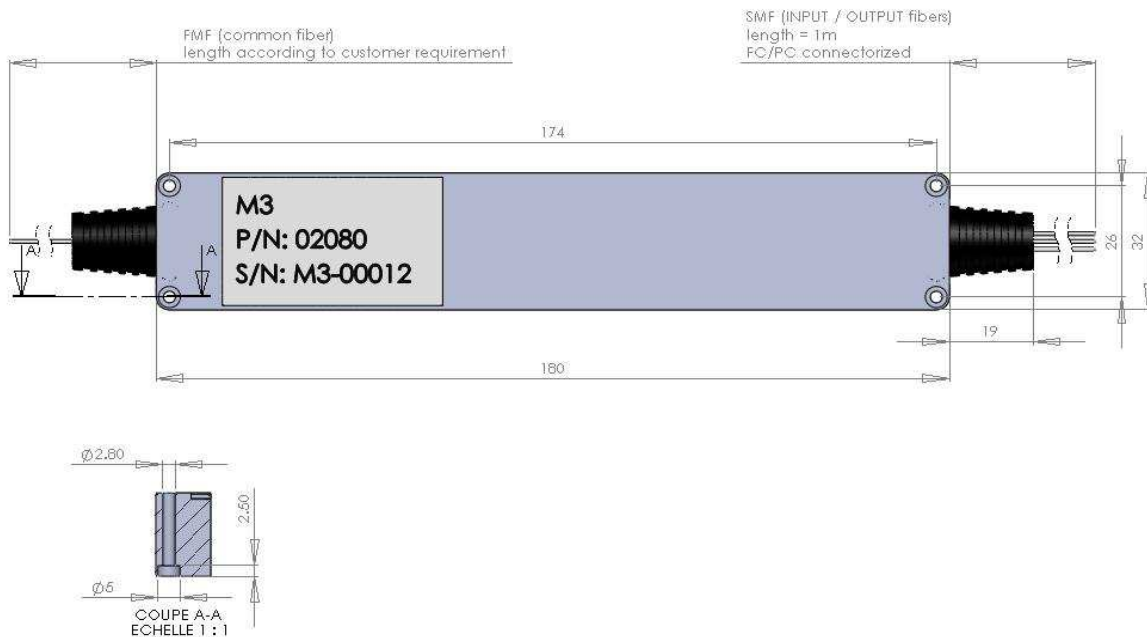
Termination of FMF fibers can be bare or connectorized. Splicing FMF is quite direct forward and should cause only minor performance degradations. However there is not much experience with FMF connectorization. Some degradation can occur when connecting 2 connectorized FMF, especially for the crosstalk, due to core fiber misalignment etc. This is why performances of M3 are given for an unconnectorized device in this specification sheet.

## 7 – FMF

The FMF is supplied either by KyLia or by customer. In latter case, an analysis of the fiber will be conducted in order to check the compatibility of the fiber. This analysis is based on Modes field diameters, cladding dimensions, and then a spectrally and spatially resolved analysis of the modes is performed. This analysis will give the number of modes carried by the fiber, their shape, and their crosstalk. See the example below:



## 8 – Package layout



M3 packaging

## 9 – Revision

<b>date</b>	<b>version</b>	<b>Object</b>
November 14, 2012	M3 v1.0	Creation
December 20, 2012	M3 v1.1	Characteristics single mux or demux and dual mux and demux
February 3 <sup>rd</sup> , 2015	MX v2.0	Added M5 mux/demux