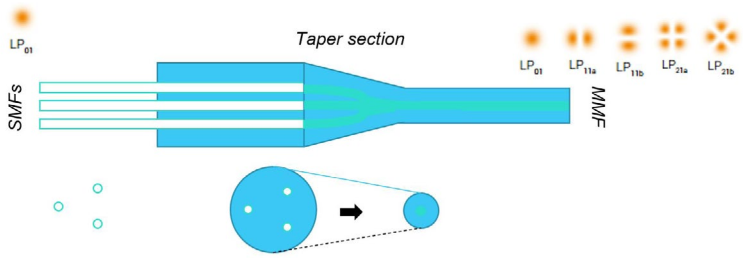
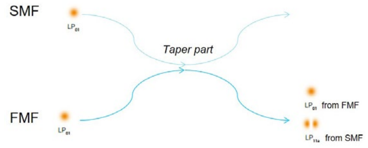
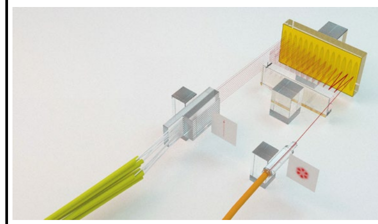
TECHNOLOGY	PHOTONIC LANTERN		EVANESCENT WAVE COUPLING	PHASE PLATE DEVICES	
Subfamily	**Non-mode selective**[1]	**Mode selective**[2]	**Fiber coupler**[3]	**Free space unit converters (Spatial Light Modulator, Binary Phase Plate, Metamaterials, etc.)**[4]	**Multi-Plane Light Conversion**[5]
Component					PROTEUS 
Principle	Technique which merges several single-mode cores into a single multimode core using a conical waveguide, allowing the lower modes of a multimode (MMF) or few-mode (FMF) fiber to be excited. Different manufacturing techniques exist on the market. For example, a photonic lantern can be made from multi-core fibers, from a single-mode fiber bundle or by etching in a glass block.		For this technology, which consists of exploiting an evanescent wave to achieve index matching between two modes in an SMF and an FMF, the fundamental mode of the SMF is converted into the mode with same effective index in the FMF. Using a cascade architecture based on multiple SMFs and a single FMF, it is then possible to build a mode multiplexer.	This category brings together a number of technologies that enable unit conversion from the fundamental mode to a given mode using a phase mask. These multiplexers then need to be coupled into the fiber by means of successive reflections on separator and mirror plates in order to inject all the modes generated into a single optical fiber.	The MPLC simultaneously converts each single-mode input into a given mode in an MMF/FMF using successive reflections on a single phase plate and a mirror at a specific propagation distance.
Potential number of modes					
Crosstalk performance					
Insertion loss performance					
Industrialization capability					
Cailabs' opinion	**Conventional SDM technology that has delivered promising performance, but is now too limited by its zero or partial selectivity.**	**A selective component developed in recent years in the laboratory which allows the modes to be excited separately, but it is still too complex to be manufactured and too fragile to be industrialized.**	**This technique obtains very good performances, especially in terms of crosstalk and 3-way insertion loss, but it has a limited number of modes due to its architecture.**	**Various possibilities, but the configurations are complicated to implement due to the coupling in the fiber, which makes this technology difficult to industrialize.**	**MPLC is now the benchmark for SDM, with the largest number of multiplexed modes in an industrialized product, while offering unmatched insertion loss (IL) and crosstalk (XT) performance.**

1. Bin Huang, Juan Carlos Alvarado Zacarias, Huiyuan Liu, Nicolas K. Fontaine, Haoshuo Chen, Roland Ryf, Francesco Poletti, John R. Hayes, Jose Antonio-Loppez, Jian Zhao, Rodrigo Amezcua Correa, and Guifang Li, «Triple-clad photonic lanterns for mode scaling,» Opt. Express 26, 13390-13396 (2018)

2. Velázquez-Benítez, A.M., Antonio-López, J.E., Alvarado-Zacarías, J.C. et al. Scaling photonic lanterns for space-division multiplexing. Sci Rep 8, 8897 (2018). https://doi.org/10.1038/s41598-018-27072-2

3. Koji Igarashi, Kyung Jun Park, Takahiro Tsuritani, Itsuro Morita, Byoung Yoon Kim, All-fiber-based selective mode multiplexer and demultiplexer for weakly-coupled mode-division multiplexed systems, Optics Communications, Volume 408, 2018, Pages 58-62, ISSN 0030-4018, https://doi.org/10.1016/j.optcom.2017.08.049. (http://www.sciencedirect.com/science/article/pii/S003040181730737X)

4. Philippe Genevaux. Le multiplexage de mode spatial pour augmenter le débit dans les fibres optiques. Optique [physics.optics]. Université Pierre et Marie Curie - Paris VI, 2016.

5. S. Bade et al., «Fabrication and Characterization of a Mode-selective 45-Mode Spatial Multiplexer based on Multi-Plane Light Conversion,» 2018 Optical Fiber Communications Conference and Exposition (OFC), San Diego, CA, 2018, pp. 1-3.