IDF INNOV

From invention to innovation

# OPTICAL FIBER COUPLING STRUCTURE

A polymeric structure with an optimal geometry makes it easier to couple an optical fiber with a laser or a photodiode

VCSEL ▪ Monomode fiber ▪ Multimode fiber ▪ Photodetector ▪ Coupling efficiency ▪ Photonics ▪ Optoelectronics

## APPLICATIONS

- VCSEL to fiber coupling
- Photodetector to fiber coupling

## DEVELOPMENT PHASE

Prototypes of coupler for VCSEL and photodetectors, with multimode and single-mode fibers

Numerical simulations

## PUBLICATIONS

"Technological development and system integration of VCSELs and SiGe HPT receivers for 60 GHz low cost Radio-over-Fiber applications", Carlos Araujo Viana

## INTELLECTUAL PROPERTY

Patent applications : WO2015118131

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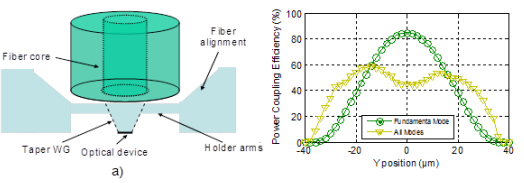
## PRESENTATION

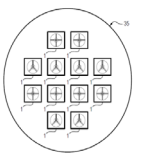
Connecting a light source or a receiver to an optical fiber requires to align precisely the formers to the latter. This is currently done with what is called an active coupling method, consisting in turning on the laser, using a ball lens and slowly aligning the fiber with the laser or the photodetector.

Our technology consists in placing a passive structure between the optical fiber and the laser or the photodiode. This method takes only seconds to carry out as it does not require turning on the optical source. Thanks to an optimized geometry, the passive structure has a good tolerance to misalignment and reaches a 60%-80% coupling efficiency with a 10-micrometer misalignment (where traditional methods have a steep decrease in coupling efficiency, reaching 50% with a 1micrometer misalignment).

The invention allows to realize a collective substrate with collective coupling truncated elements between the optical fiber and the laser or the photodiode, the coupling elements having some forms tuned by the method of the invention.




Coupling efficiency, with optical fiber fundamental mode (green) or with a uniform energy distribution representing worst case (yellow) © Jean-Luc Polleux



Collective matrice of the invention

## COMPETITIVE ADVANTAGES

- 60-80% coupling efficiency with a large alignment tolerance (10 microns vs 2 microns with a ball lens)
- Cost effective production with passive alignment
- Wafer scale production
- Potentially adaptable to multimode and single-mode fibers
- High coupling efficiency with high speed photodetector (9 microns diameter)
- Production potentially done on the same wafer as emitter/receiver