









# Master in Photonics – "PHOTONICS BCN" Master ERASMUS+ "EuroPhotonics"

## MASTER THESIS PROPOSAL

Dates: April 2023 – July or September 2023

Laboratory : OPTICAL COMMUNICATIONS Institution: UPC-ETSETB-TSC-GCO City, Country : BARCELONA

Title of the master thesis: **Simultaneous amplitude and phase modulation of broadband lasers.** 

Name of the master thesis supervisor: Prof. Josep Prat Email address : josep.prat@upc.edu https://josep.prat.tsc.upc.edu Phone number : 934016455 Mail address : UPC Campus Nord D5 Keywords : FIBER, LASER, WDM, FTTH, PON, TRANSMISSION, NETWORKS.

Keywords: optical fiber communications, coherent transmission, digital signal processing,

### Summary of the subject (maximum 1 page) :

The widespread usage of coherent transmission for high capacity optical networks depends on the overall cost and footprint reduction that can be achieved on the transceiver photonic elements. Specifically, to generate high order modulation formats, coherent transmitters employee IQ modulators, which encompass high optical losses and substantial footprint. This represents a severe limitation for its utilization in future access and data center networks that present strict requirements in terms of power budget, cost, and footprint. A much simpler transmitter configuration has been lately developed, based on a dual electro-absorption modulated laser (D-EML); it integrates monolithically a directly modulated distributed feedback (DFB) laser and an electro-absorption modulator (EAM). Its capabilities are greatly enhanced by simultaneously modulating intensity and phase with the EAM and the DFB respectively. With this low footprint device, a differential 8-amplitude-and-phase shift keying (8-APSK) transmitter at 10 Gb/s is obtained.

### **Objectives:**

In this MSc thesis, the D-EML characteristics will be analyzed, tested, modelled and optimized for its operation at higher bit rate and longer distances. Specifically, the static and dynamic behavior of semiconductor lasers and modulators will be studied considering the photon-











electron interactions and the phase chirp, and a proper equalizer will be designed to achieve higher performances.

The student will work in this topic theoretically and experimentally in the Lab of the GCO group and in relation with industry.

### Additional information :

\* Required skills : semiconductor physics, Matlab programming, signal processing, team work ability, laboratory testing.

\* Miscellaneous : A scholarship is available for support of the lab research.