MASTER IN PHOTONICS – "PHOTONICS BCN"
ERASMUS+ "EUROPHOTONICS"

MASTER THESIS PROPOSAL

Dates: April - September 2020

Laboratory/Institution: Monocrom S.L.
City, Country: Vilanova i la Geltrú (Barcelona), Spain

Title of the master thesis: "Optical properties of broad area diode lasers (BAL) – the role of the assembly conditions"

Name of the master thesis supervisors:
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Keywords: semiconductor lasers, beam characterization, high power diode lasers, optical properties

Summary of the subject (maximum 1 page):
Monocrom is a company leader in manufacturing of high-power diode lasers and solid-state lasers. Its unique technology of laser fabrication, based on its patented mounting technique named Clamping^{TM}, offers several advantages with respect to the competing technology (see Fig 1), such as longer lifetime, better cooling efficiency, simplicity and reduced mechanical stresses.

Edge emitting broad area diode lasers (BAL), and arrays of BALs, are the building blocks of high-power diode lasers. The physical properties of these semiconductor lasers are intrinsically related to their structural design and their assembly onto heat sink mounts. This project aims to understand and characterize the optical properties of BALs under different assembly conditions. The student research will combine a great deal of experimental work, designing and setting up an optical setup capable of simultaneously characterize optical power, junction temperature, divergence and polarization of high-power diode lasers. We expect that this research will help boosting up the efficiency of Monocrom's laser devices by allowing to reach higher optical powers at lower p-n junction temperatures. In its turn, an optimization of the laser device

divergence and polarization will improve optical fiber coupling, which is a key technological advance to enable the use of high power diode lasers for industrial applications, such as metal stamping, cutting and welding.

The research goals of this project will be:
A) Understanding the influence of laser bar assembling on the semiconductor lasing properties.
B) Building an opto-mechanical setup for laser characterization
C) Study of the laser bar structural design and influence of the assembling process to the optical parameters.

The student will be trained in working in a clean room environment. In addition to this, the student will have the opportunity to gain experience in the laser industry by closely working with other researchers (3 PhD, 1 M.Sc.) in the Optics Laboratory at Monocrom.

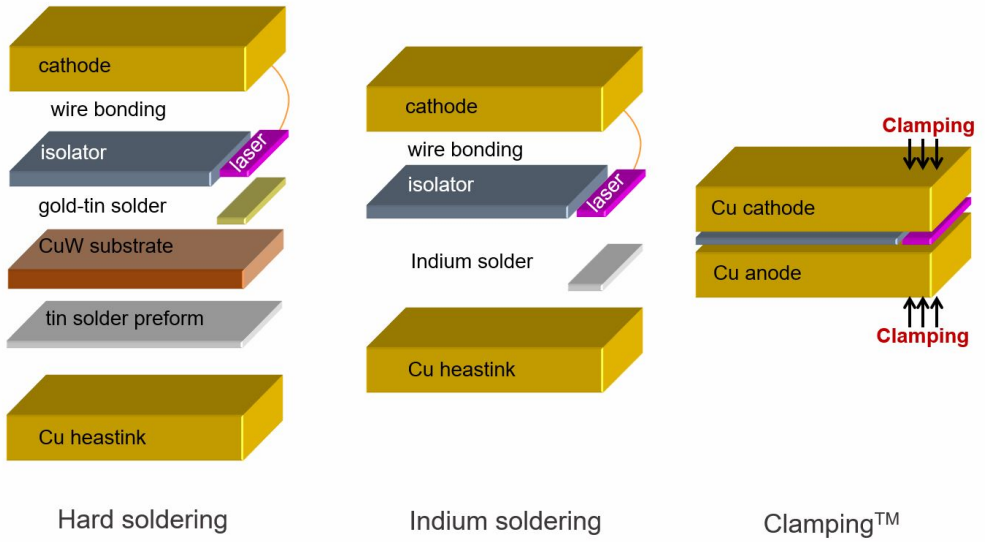

Fig. 1. *An illustration of the existing laser bar mounting processes: (a) hard soldering (using CTE matching materials), (b) Indium soldering (also called soft soldering; using an indium layer), (c) Monocrom's patented mounting technology: Clamping™ (solder free process).*

Additional information:
* Required skills: background in photonics and optics.
* Miscellaneous: This position is particularly suitable for students interested in gaining experience in a photonics industry organization.