Master in Photonics – "PHOTONICS BCN"
Master ERASMUS Mundus "EuroPhotonics"

MASTER THESIS PROPOSAL

Dates: April 2023 – July or September 2023

Laboratory:
Institution: Monocrom S.L.
City, Country: Vilanova i la Geltrú, Spain

Title of the master thesis: Effects of uniaxial stress on filamentation in broad area laser diodes

Name of the master thesis supervisor and co-supervisor: Carles Oriach Font
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Keywords: filamentation, stress, laser diode

Summary of the subject (maximum 1 page):

Filamentation is a well known phenomena occurring in the cavity of broad area laser diodes due to various mechanisms that affect the refractive index of the light guide: gain-saturation-induced changes due to the linewidth-enhancement factor, self-focusing due to heat-induced index changes, and self-defocusing through intensity-dependent index changes in the cladding layer.

Monocrom has a patented mounting technology for laser bars using direct mechanical contact instead of soldering materials. Mounting stress is higher and applied on the opposite directions with respect to the standard soldering techniques. It has been observed that some electrooptical characteristics of the laser bar are affected by such mounting stress, one of them being the slow axis divergence. Affection on the slow axis divergence indicates a change in the cavity confinement, pointing, at its turn, to refractive index changes. As refractive index changes are the main cause of filamentation, it is thought that clamping stress could affect filamentation patterns and intensity.

Moreover, the direct contact between laser diode bar and heatsink implies a certain degree of contact inhomogeneity (at a micrometric level) due to the roughness of laser bars metallization, which can potentially create further local refractive changes.

The student shall develop an experimental setup allowing observation of one single emitter inside the laser bar and analyse the near field pattern variation with clamping force.

Objectives:

The objective of this project is to perform an experimental analysis of the filamentation changes with different clamping forces.

Additional information (if needed):
* Required skills: critical thinking, autonomy, knowledge of optics
* Miscellaneous :