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The Institute
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Master in Photonics – “PHOTONICS BCN” Master ERASMUS Mundus “EuroPhotonics”

MASTER THESIS PROPOSAL

**Starting full time from April 2024
Presentation at the end of July or beginning of September 2024**

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):

Monocrom has a patented mounting technology for laser bars using direct mechanical contact instead of soldering materials. This mounting technique involves uniaxial stress in the direction orthogonal to the p-n junction plane, resulting in tensile strain on it. It has been observed that some electrooptical characteristics of laser bars are affected by this mounting technique, with some experiments pointing to local changes on refractive index.

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.

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 :