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euro **PHOTONICS**
POESII
International Master in Photonics

MASTER IN PHOTONICS – PHOTONICS BCN EUROPHOTONICS-POESII MASTER COURSE

PROPOSAL FOR A MASTER THESIS

Dates: April - September 2017

Laboratory/Institution: Monocrom S.L.

City, Country: Vilanova i la Geltrú (Barcelona), Spain

Title of the master thesis: Beam combining of edge emitting semiconductor lasers for industrial applications

**Name of the master thesis supervisors: Kestutis Staliunas, UPC / Dr. Joan J. Montiel
Project Leader at Monocrom**

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Summary of the subject (maximum 1 page):

Recent interest in using direct-diode lasers rather than fiber lasers or CO₂ lasers for material processing is justified due to the combination of higher wall-plug efficiency, together with improved reliability and lower cost of manufacturing and maintenance. These properties have made direct-diode lasers to penetrate into the most demanding industrial applications.

The student will participate in a European project named High Power Composites of Edge Emitting Semiconductor Lasers (HIP-Lasers), with partners from three different countries, where Monocrom is acting as a leading partner. The consortium aims at building a compact high power direct-diode laser platform capable of emitting up to 1kW without an amplifier with a good quality output beam. We expect the laser platform to allow Monocrom entering new market areas in the manufacturing and material processing industries with applications such as metal drilling and cutting, marking, laser welding.

The research goals of this project will be: A) Optimization of a semiconductor laser using an external cavity configuration. B) Integration of photonic crystal filters with different properties and characterization of the output beam (see Fig. 1). C) Matching output beam characterization with simulations provided by a research center from Germany (WIAS). The student will be trained in working in a clean room environment.

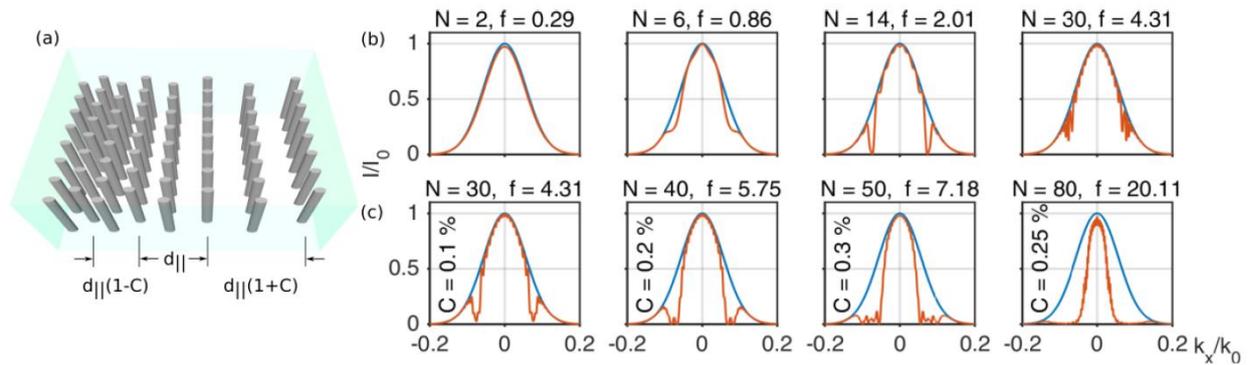


Fig. 1. An illustration of a longitudinally chirped PhC (a) and resulting angular intensity profiles for different parameter combinations of not-chirped (b) and chirped (c) PhCs, where for a larger f through chirping increased filtering line widths is observed.

The student will have the opportunity to gain experience in the laser industry by closely working with other researchers (3 PhD, 2 M.Sc.) in the Optics Laboratory at Monocrom.

Keywords: semiconductor lasers, beam combining, beam characterization, high power laser, fiber coupling, photonic crystal

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.