



## **MASTER IN PHOTONICS – “PHOTONICS BCN” ERASMUS+ “EUROPHOTONICS-POESII”**

### **MASTER THESIS PROPOSAL**

**Dates: April - September 2018**

**Laboratory : Nano-optoelectronics**  
**Institution: ICFO – The institute of photonic sciences**  
**City, Country : Barcelona (Castelldefels)**

**Title of the master thesis:**  
**Chip-integrated spectrometer with graphene-based photodetectors**

**Name of the master thesis supervisor: Prof. Frank Koppens**  
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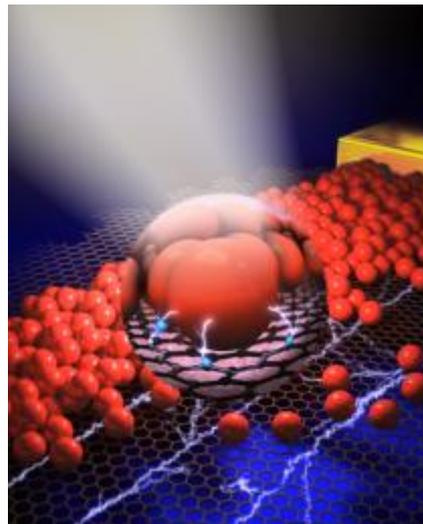
**Keywords :** optics, beam propagation, graphene, photodetectors, spectrometer

## Summary of the subject:

Optical Spectrometry is a powerful non-destructive, high throughput technique used extensively for a huge number of applications including threat and hazardous substance detection, food inspection, process and environmental monitoring, quality control etc. We aim to revolutionize the spectrometer technology by introducing graphene photodetectors [1,2], which can detect visible and infrared light at the same time. See this video for a future impression of this technology:

<https://youtu.be/szL-ejdpNgU>

The goal of this masters project is to design, build and evaluate an on-chip spectrometer where color-separation and photodetection are integrated on the chip itself. The student will work inside a multi-disciplinary team of about 10 people, with a strong international network and reputation. Tasks include the design of the spectrometer, building the device (in collaboration with other team members) and evaluation of the functionality. The students will perform simulations, work in the optics labs and perform data analysis. A unique and novel approach is being implemented, where know-how of complex optical beam propagation is beneficial for the project.



### References

- [1] Hybrid graphene-quantum dot phototransistors with ultrahigh gain. G. Konstantatos et al., Nature Nanotechnology 7, 363-368 (2012)
- [2] Broadband image sensor array based on graphene-CMOS integration. Goossens et al., Nature Photonics, 11(6), 366-371. (2017)

### **Additional information :**

- \* Required skills : knowledge in optics and condensed matter physics, computational skills
- \* Miscellaneous :