

# EUROPHOTONICS-POESII MASTER COURSE

## PROPOSAL FOR A MASTER THESIS

Dates: April 1<sup>st</sup>, 2016 – September 30<sup>th</sup>, 2016

**Laboratory: Organic Nano-structured Photovoltaics**

**City, Country: Barcelona, Spain**

**Title of the master thesis: Fluorescence quantum yield role on the Perovskite solar cell efficiency**

**Name of the tutor of the master thesis: Jordi Martorell**

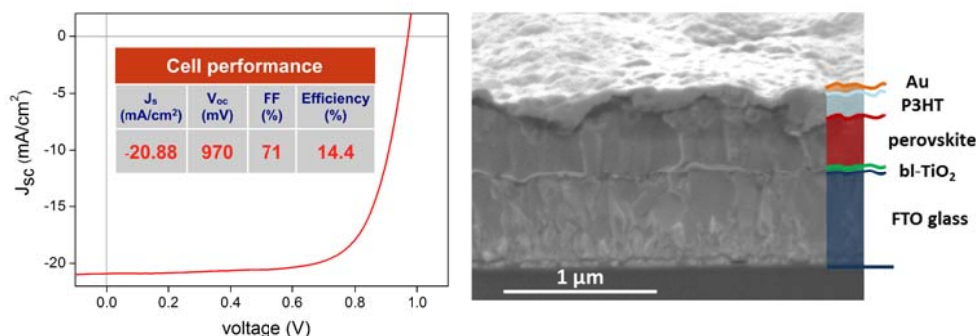
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### **Summary of the subject (maximum 1 page):**

At the moment the use our society makes of the available energy sources is far from optimal. Only a small 5% fraction of the energy used for the electricity production comes from new renewable energy sources. For over several decades, in an attempt to maximize sunlight energy harvesting, researchers in thin film devices have been searching for the optimal materials. Out of the many thin film cell options available one of the most promising is the one based on perovskites. According to the [NREL chart](#) the efficiency of such cells almost doubled in just two years. These attracted a tremendous attention from researchers around the world. The Organic Nano-structured Photovoltaics group at ICFO has already fabricated record performance cells in the configuration shown in Figure 1.



**Figure 1** Perovskite cells fabricated by the research group. Left: J-V curve and cell performance table. Right: SEM image cross section of the cell architecture. The efficiency measured is the highest among all the perovskite cells reported that use P3HT as hole transporting layer

On the other hand, the mix halide methyl-amonia material used in the perovskite crystalline structure exhibits a high degree of crystalline order leading to an efficiency for the solar cell which is to some extent determined by the fluorescence quantum yield. This makes perovskites cells one of the few candidates that can be used to test the thermodynamic limit for solar cell efficiencies that was theoretically established many years ago but has never been reached. In this project, we will investigate the influence that fluorescence quantum yield has on the overall efficiency of the cell and more in particular in the charge recombination. As a basis for the study we will use the perovskite solar cells already developed by the group.

**Keywords: Photovoltaics, Fluorescence quantum yield, Perovskite solar cells**

**Additional information:**

- \* Required skills : A BSc in Physics or Chemistry or an Engineering degree
- \* Miscellaneous :