# A NEW INSIGHT INTO TRANSIENT AND SPECTRAL LUMINESCENCE OF PHOTOVOLTAIC ABSORBERS BY SINGLE-PIXEL-IMAGING

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The light emitted by semiconductor materials under excitation by an external illumination or voltage depends on both its optical and electronic properties. Therefore imaging this luminescence offers a valuable way of characterizing them. For instance, a hyperspectral measurement in steady states probes material and charge carriers properties as the bandgap and the quasi-Fermi level splitting[1]. Complementarily time-resolved photoluminescence imaging provide an insight into charge carriers dynamic allowing to study their transport[2]. Both approaches have proven to be crucial in the understanding of phenomena induced by light in perovskite absorbers. They allowed the identification of competing change in the absorber as its passivation and phase segregation[3]. However, to probe simultaneously the spectral and temporal evolution of the luminescence becomes more and more necessary to disentangle the different potential causes of performance losses. This can be achieved by using a streak camera, which however cannot provide spatial data.

For a deeper analysis of the PL emission, we built a set-up providing simultaneously a cartography resolved in time and spectrum. This novel set-up relies on single pixel imaging (SPI) technology, an approach that enables the reconstruction of the spatial information recorded from a non-imaging detector by modulating spatially the output signal. In the same vein as raster scanning, applying SPI with a spectrometer as a photodetector allows to build hyperspectral imager.

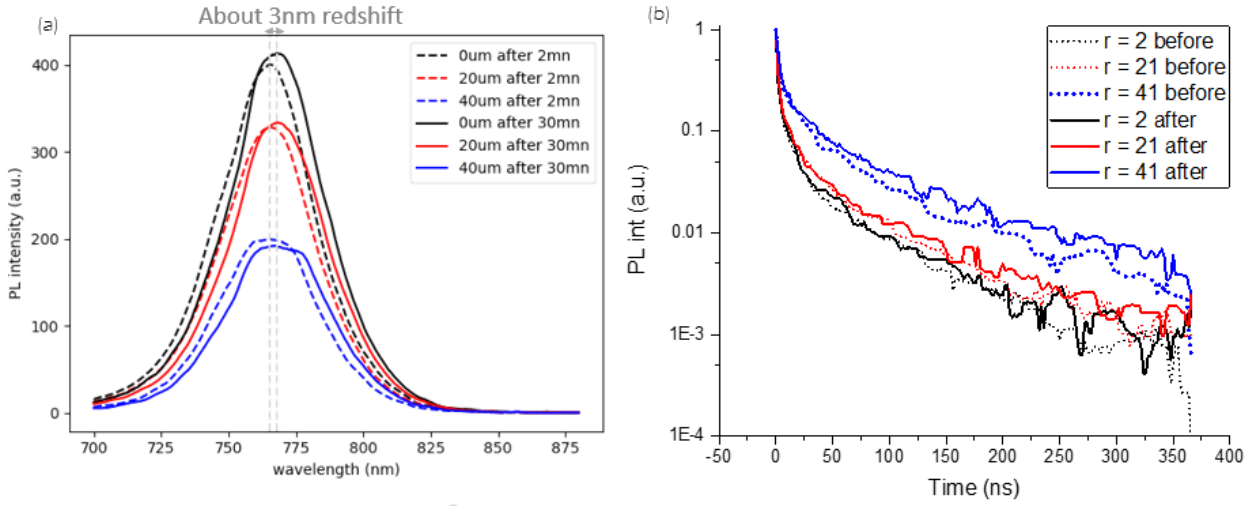


**Figure 1** : (a) PL spectra averaged for different radii from center during punctual illumination at 60 suns (b) normalized PL decays for different radii r from center during punctual illumination (10 pixels = 12 microns)

We demonstrate the use of this setup by monitoring the light-soaking of perovskite samples under punctual illumination. We obtain the PL spectra and decays at different distances from the centre of illumination along the experiment, as diplayed in the figure 1. The different properties of charges carrier recombination and transport are extracted.

References :

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