

# IMA™

## HYPERSPSPECTRAL MICROSCOPE



Upright configuration



Inverted configuration

IMA is a hyperspectral microscope delivering spectral and spatial information in the VIS, NIR, and SWIR range (400 nm - 1620 nm). This system rapidly maps photoluminescence, electroluminescence, fluorescence, reflectance, and transmittance. Based on high throughput global-imaging filters, IMA is faster and more efficient than standard point-by-point or line-scan based systems.

### TECHNICAL SPECIFICATIONS

		VIS - SWIR Model 400 - 1620 nm	
		VIS	SWIR
Spectral range		400-1000 nm	900-1620 nm
Spectral resolution (FWHM)		< 2 nm	< 4 nm
Spectral channels	Continuously tunable		
Spatial resolution	Sub-micron - limited by the microscope objective NA		
Camera	CCD, EMCCD, sCMOS	Photon etc. InGaAs camera (ZepHR™ 1.7 or Alizé™ 1.7)	
Excitation wavelengths (up to 3 lasers)	405, 447, 532, 561, 660, 730, 785, 808 nm (other wavelengths available upon request)		
Microscope	Upright or inverted, scientific grade		
Wavelength absolute accuracy	FWHM/8		
Maximum scanning speed	150 ms per wavelength		
X, Y Travel range	76 mm x 52 mm (with a manual stage)		
Z Stage resolution	100 nm		
White light illumination	Diascopic, episcopic, Hg, halogen		
Illumination options	Epifluorescence module, darkfield module (oil or dry)		
Video mode	Megapixel camera for sample visualization		
Preprocessing	Spatial filtering, statistical tools, spectrum extraction, data normalization, spectral calibration, overlay, central position map, etc.		
Hyperspectral data format	HDF5, FITS		
Software	PC (Windows10 - 64-bits) with PhYSpec™ control and analysis software (computer included)		
Dimensions*	≈ 150 cm x 85 cm x 82 cm		
Weight	≈ 80 kg		
Power requirement	120 VAC / 12A / 60Hz 230 VAC / 12A / 50Hz		

### OPTIONS AND ACCESSORIES

Objectives magnification:	10X, 20X, 40X, 50X, 60X, 100X
Spectral range extension (e.g. UV Option with FWHM=10 nm)	
Motorized stage:	100 mm x 100 mm travel, 22 nm resolution
Filter wheel:	up to 6 band-pass filters
Electroluminescence module	
Second camera port	
Absolute photometric calibration	
High resolution module:	900 - 1620 nm FWHM < 1 nm
<i>*Optical table with passive anti-vibration isolation recommended: 900 x 1800 x 60 mm (36 x 72 x 2.4 inches) or 900 x 900 x 60 mm (36 x 36 x 2.4 inches) next to 900 x 900 mm (36 x 36 inches) standard table</i>	

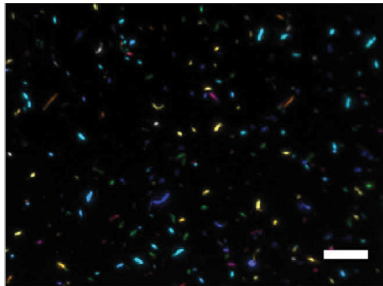
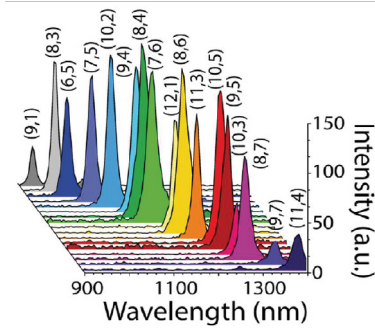
# APPLICATIONS

## 1. MULTIPLEXING

*Spectral and spatial identification of CNT*

False color fluorescence image of SDC-suspended HiPco carbon nanotubes on a glass surface. Each color (17 species) corresponds to a spectrum, as shown below.

REF: Roxbury D. et al. DOI 10.1038/srep14167

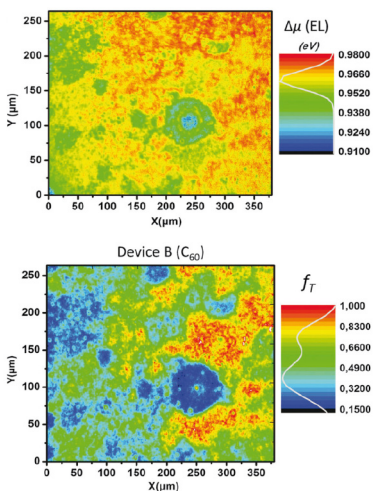


## 2. INHOMOGENEITY – DEFECTS MAPPING

*Luminescence mapping of perovskite devices, absolute calibrated intensity*

The top image represents absolute mapping of the quasi-Fermi level splitting derived from EL, for perovskite cells using  $C_{60}$  as the ETL. The lower image represents mapping of the current transport efficiency  $f_T$ .

REF: El-Hajje G. et al. DOI: 10.1039/c6ee00462h



## KEY POINTS - SPECTRAL AND SPATIAL IMAGING

- » Imaging of multiplexed emitters
- » Study of sample formation, degradation and identification of deficient areas
- » Mapping of spectral heterogeneities
- » Access to the second biological window (900 - 1620 nm)
- » Fast imaging – 1.4 million spectra in minutes
- » Large area – hundreds of  $\mu\text{m}^2$  up to a few  $\text{mm}^2$  with fast stitching

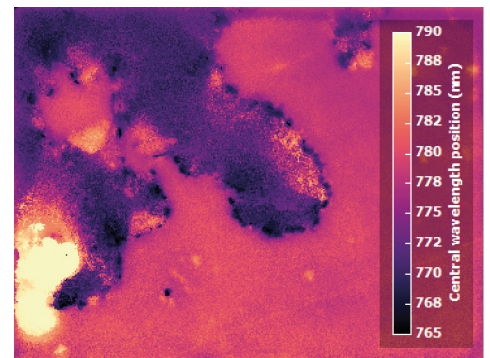
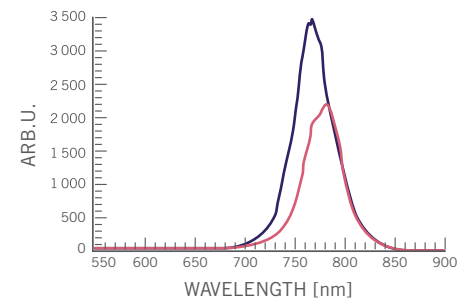
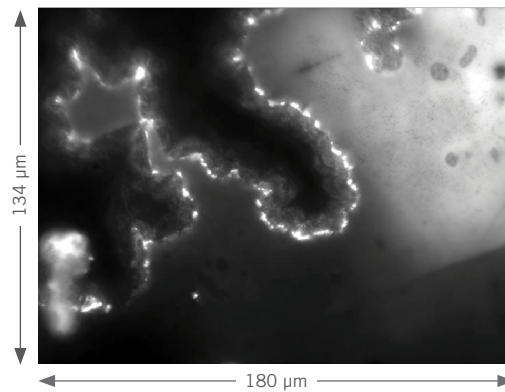
## 3. DEGRADATION - SAMPLE GROWTH

*Photoluminescence mapping of perovskite crystals*

Black and white - PL image extracted at 770 nm, Colored image - false color map of the PL central wavelength,

Side figure - two PL spectra extracted from the hyperspectral data – see corresponding colors.

REF: Samples provided by Mercuri Kanatazidi (Northwestern Univ.) and David Cooke (McGill).



## 4. CELL LABELLING

*Darkfield imaging of gold nanoparticles*

A) Darkfield image of human breast cancer cells tagged with gold nanoparticles (60 nm size), B) monochromatic image at 550 nm. GNPs marked in green after PCA, C) magnification of a breast cancer cell, D) and spectra of GNPs in different areas. Peaks at 550 nm confirm the presence of single 60 nm NPs. The absence of strongly red-shifted peaks confirm the absence of aggregated NPs. The hyperspectral camera did not detect any GNPs in the areas between the cells.

REF: Results kindly provided by: David Rioux, Éric Bergeron and Michel Meunier, at École Polytechnique of Montreal, Quebec, Canada.

