

embracing a bet



SNAPSHOT RGB+NIR MULTISPECTRAL IMAGING CAMERA

Imec's RGB-NIR multispectral platform demonstrates for the very first time the possibility to integrate together standard RGB organic color filters, NIR-cut filter, NIR narrow band-pass filters and on-chip microlenses technology, down to small pixels a small as 5µm today. First image sensor prototypes are now available, packaged in a ready-to-use CMV2000 image sensor standard format for easy integration and early evaluation into final applications.

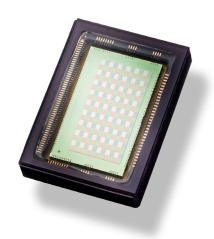
CMOS BASED SPECTRAL FILTERING TECHNOLOGY FROM INDUSTRIAL TO HIGH VOLUME APPLICATIONS

Leveraging CMOS semiconductor factories, equipments and process technology, imec design and manufacture at wafer-level interference based optical filters that are deposited and patterned directly on top of CMOS image sensor pixel arrays. This unique infrastructure provides very clean (class 1 - particle free) optical filter integration with unprecedented size and cost reducation, with potential for high-volume manufacturing.

The integration of per pixel patternable narrow-band NIR imaging filters together with NIR-cut filter for true color rendering based on standard RGB organic color filter and microlenses array technology is a major integration breakthrough. It is today recognized as a key enabling technology for next-generation human-machine 3D imaging and medical diagnosis. But also in automotive and security surveillance applications where various NIR lighting concepts (LED or laser based) are being explored to improve the detection or tracking of useful signals, on purpose not visible to the human eye.

KEY BENEFITS

- Color + narrow band NIR imaging integrated into one single chip for compact, low-cost and integrated optical design solutions
- Tunable NIR band-pass filter design to match filter band (location, FWHM) with your own application requirements, for e.g. with one particular laser or LED wavelength of illumination



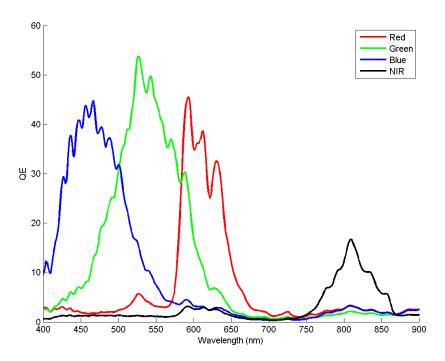
RGB-NIR multispectral imager 2x2 mosaic layout

RGB-NIR MULTISPECTRAL SENSOR & CAMERA SPECIFICATIONS

Acquisition mode snapshot 2x2 mosaic pattern Wavelength range RGB+NIR channels Number of spectral bands 4 channels Spatial resolution 1024x544 pixels (RAW per band) Bandwidth per band (FWHM) see QE plot Imager type CMOS imager, CMOSIS CMV2000 based Imager resolution 2.Mpixels total Frame rate Up to 170fps (limited by USB3.0 camera interface) Pixel pitch 5.5µm Bit depth 8 and 10bit Camera interface USB3.0 Camera dimensions 26.4 x 26.4 x 21.6 mm Camera weight 27g without fore-optics		
Number of spectral bands 4 channels Spatial resolution 1024x544 pixels (RAW per band) Bandwidth per band (FWHM) see QE plot Imager type CMOS imager, CMOSIS CMV2000 based Imager resolution 2.Mpixels total Frame rate Up to 170fps (limited by USB3.0 camera interface) Pixel pitch 5.5µm Bit depth 8 and 10bit Camera interface USB3.0 Camera dimensions 26.4 x 26.4 x 21.6 mm	Acquisition mode	snapshot 2x2 mosaic pattern
Spatial resolution 1024x544 pixels (RAW per band) Bandwidth per band (FWHM) see QE plot Imager type CMOS imager, CMOSIS CMV2000 based Imager resolution 2.Mpixels total Frame rate Up to 170fps (limited by USB3.0 camera interface) Pixel pitch 5.5µm Bit depth 8 and 10bit Camera interface USB3.0 Camera dimensions 26.4 x 26.4 x 21.6 mm	Wavelength range	RGB+NIR channels
Bandwidth per band (FWHM) see QE plot Imager type CMOS imager, CMOSIS CMV2000 based Imager resolution 2.Mpixels total Frame rate Up to 170fps (limited by USB3.0 camera interface) Pixel pitch 5.5µm Bit depth 8 and 10bit Camera interface USB3.0 Camera dimensions 26.4 x 26.4 x 21.6 mm		4 channels
(FWHM) See QE plot Imager type CMOS imager, CMOSIS CMV2000 based Imager resolution 2.Mpixels total Frame rate Up to 170fps (limited by USB3.0 camera interface) Pixel pitch 5.5μm Bit depth 8 and 10bit Camera interface USB3.0 Camera dimensions 26.4 x 26.4 x 21.6 mm	Spatial resolution	1024x544 pixels (RAW per band)
Imager type CMV2000 based Imager resolution 2.Mpixels total Frame rate Up to 170fps (limited by USB3.0 camera interface) Pixel pitch 5.5µm Bit depth 8 and 10bit Camera interface USB3.0 Camera dimensions 26.4 x 26.4 x 21.6 mm		see QE plot
Frame rate Up to 170fps (limited by USB3.0 camera interface) Pixel pitch 5.5µm Bit depth 8 and 10bit Camera interface USB3.0 Camera dimensions 26.4 x 26.4 x 21.6 mm	Imager type	
camera interface) Pixel pitch 5.5µm Bit depth 8 and 10bit Camera interface USB3.0 Camera dimensions 26.4 x 26.4 x 21.6 mm	Imager resolution	2.Mpixels total
Bit depth 8 and 10bit Camera interface USB3.0 Camera dimensions 26.4 x 26.4 x 21.6 mm	Frame rate	
Camera dimensions 26.4 x 26.4 x 21.6 mm	Pixel pitch	5.5µm
Camera dimensions 26.4 x 26.4 x 21.6 mm	Bit depth	8 and 10bit
Edition difficulties 2011 x 2011 x 210 11111	Camera interface	USB3.0
Camera weight 27g without fore-optics	Camera dimensions	26.4 x 26.4 x 21.6 mm
	Camera weight	27g without fore-optics

KEY APPLICATIONS

- Medical imaging using ICG fluorescence
- Human-machine interface for 3D gaming & virtual reality tracking
- Automotive
- Security surveillance
- Industrial inspection
- Food sorting

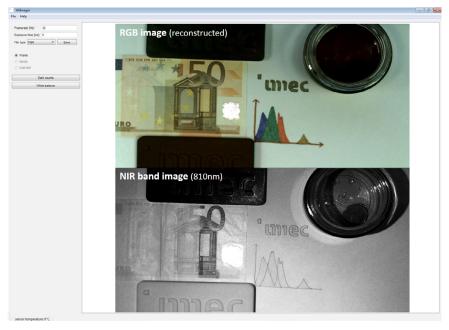


Measured QE responses of RGB+NIR spectral channels (with microlenses array post-processed on top of each filter)



MULTISPECTRAL IMAGER & SOFTWARE

The current RGB+NIR multispectral imager is built on a commercially available CMOS image sensor (CMV2000) designed for the high-speed machine vision market. The imager specifications are listed on the table above. The user interface of imee's in-house software is designed for user-friendly color (RGB) and near-infrared (NIR) imaging operations.



Color RGB and near-infrared NIR images of several objects as captured by imec RGB+NIR hyperspectral imaging camera demo-kit



CONTACT US

hsi.sales@imec.be s

DISCLAIMER - This information is provided 'AS IS', without any representation or warranty. Imec is a registered trademark for the activities of IMEC International (a legal entity set up under Belgian law as a "stichting van openbaar nut"), imec Belgium (IMEC vzw supported by the Flemish Government), imec the Netherlands (Stichting IMEC Nederland, part of Holst Centre which is supported by the Dutch Government), imec Taiwan (IMEC Taiwan Co.) and imec China (IMEC Microelectronics (Shanghai) Co. Ltd.) and imec India (Imec India Private Limited), imec Florida (IMEC USA nanoelectronics design center).