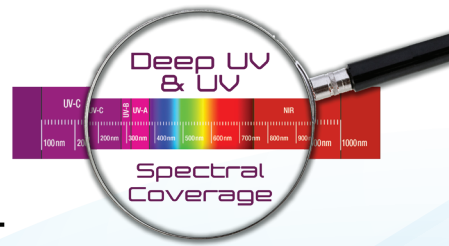
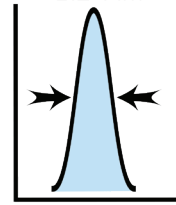


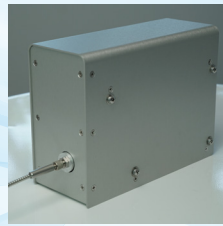
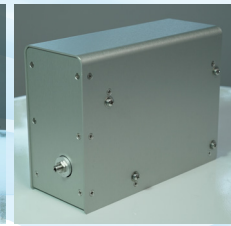
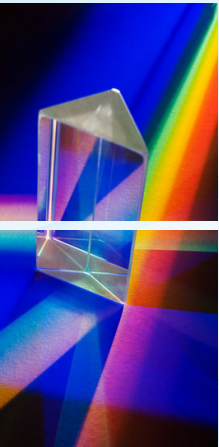
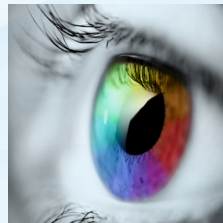
# HORIBA

Minimum resolution:  
0.3 nm



## VU111

Cost-effective, High-performance  
Mini Spectrometer



For OEM  
Industrial Applications

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**HORIBA**

# VU111 Cost-effective, High-performance Mini-Spectrometer

## Overview

VU111 is the latest evolution of the cost-effective, high performance family of mini-spectrometers from HORIBA. This VU111 system for industrial applications uses a miniaturized optical engine which is optimized for the UV spectral range. The VU111 is based on a high-performance aberration-corrected concave grating.

This platform is specially designed to easily adapt to a large variety of detectors and electronic drivers. The optical design is optimized to minimize stray light and maximize optical performance. The VU111 outperforms competitive mini-spectrometers based on front-illuminated CMOS linear sensors, or low-cost back-illuminated CCDs.

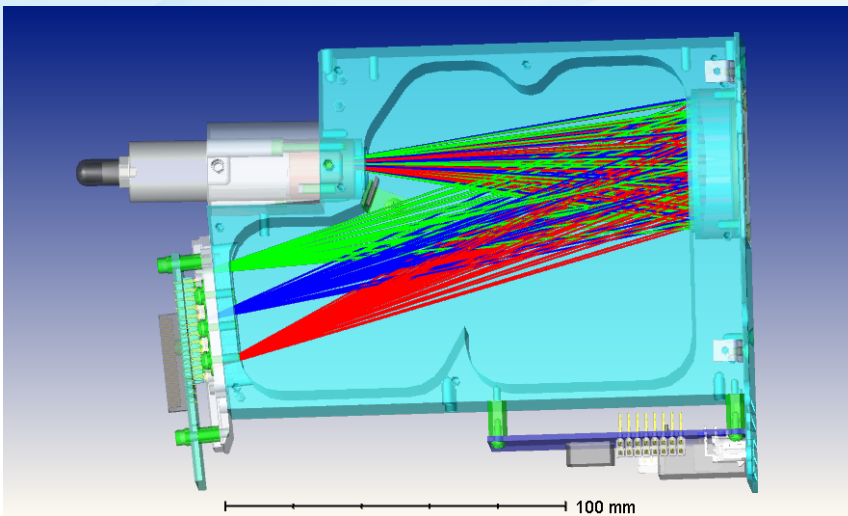
## Applications

- Emission (OES), Absorbance, Reflectance

Examples:

- Semicon (chemical fingerprint by plasma analysis) / UV and high resolution combined for optical emission spectroscopy combustion monitoring)
- Metrology
- HPLC/UPLC (excellent stray light rejection)

## Optical and Mechanical Layout



Concave-grating mini-spectrometer optical mechanical design.

## Features

**High spectral resolution**  
(down to 0.3 nm res at 312 nm or at 223 nm)

**CCD Standard, CMOS/PDA on request**

**Configurable with linear CMOS for affordability, or CCD for highest sensitivity**

**WL Range: Deep UV/UV**

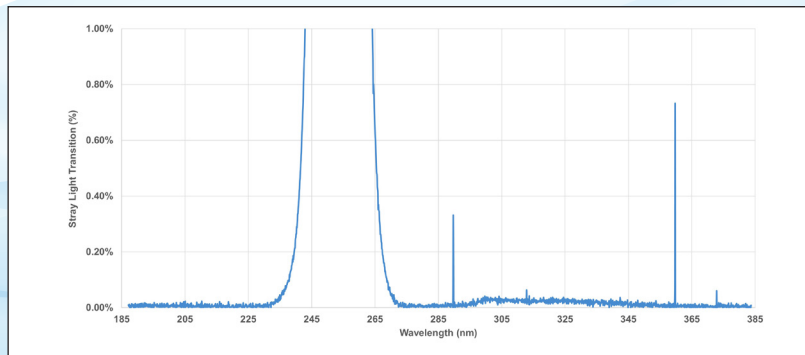
**Ultra low stray light**

**Highly customizable for many applications**

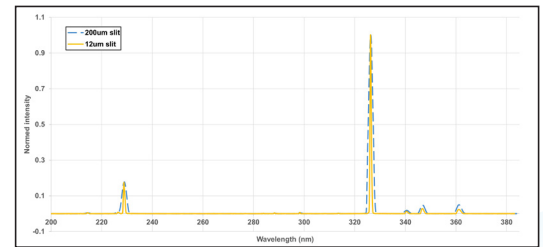
**High volume production capacity**

## General Spectrometer Specifications\*

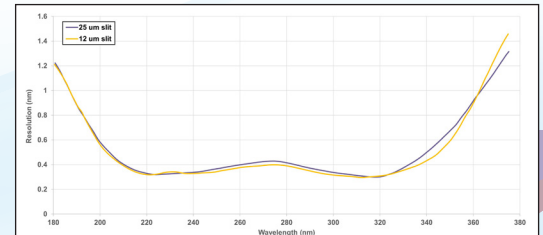
Spectral Coverage	Deep UV & UV
Minimum Resolution	1st optimization: 0.3 nm @ 312 nm 2nd optimization: 0.3 nm @ 223 nm
Average resolution from 220 nm up to 330 nm	1st optimization: from 220 nm up to 330 nm 2nd optimization: up to 240 nm
Working F/#	F/2.7
Stray Light	<0.1% / Ultra low stray light
Options	Slit sizes customizable
Software	LabVIEW™ acquisition software for initial evaluation (DLLs provided for software integration)



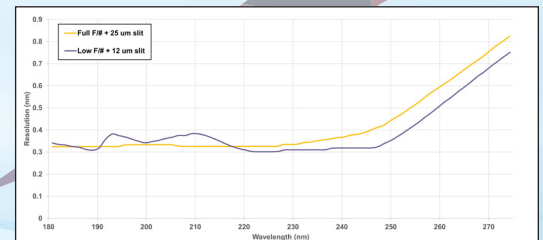
Stray light performance with 254 bandpass filter



A cadmium atomic lamp is used to calibrate the spectrometer in the deep-UV/UV range. Here are experimental resolutions on one unit with different slit sizes.



Resolution in the deep-UV/UV region, first possible optimization



Resolution in the deep-UV/UV region, second possible optimization

## Detector Options and Specifications

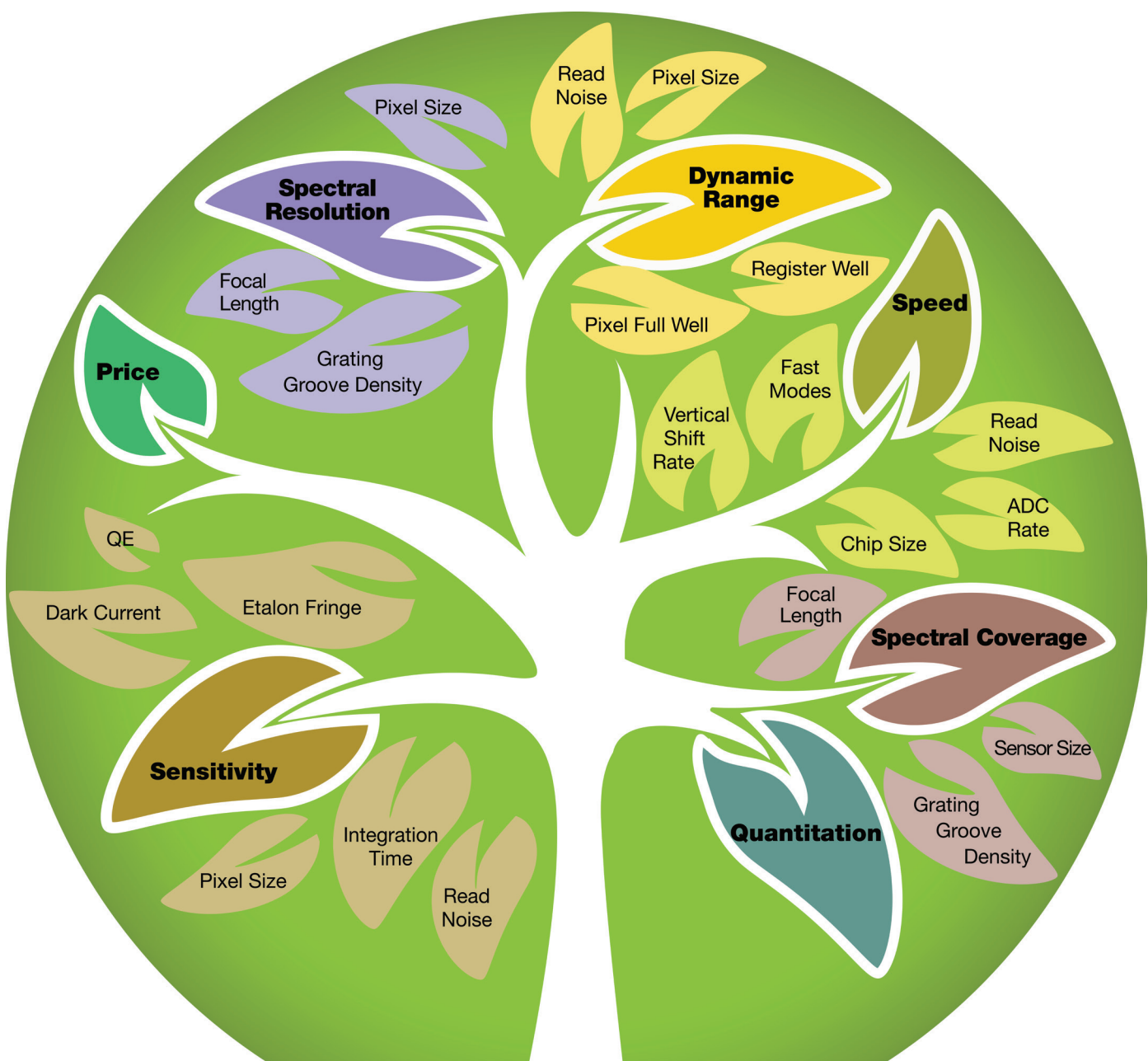
	Linear front-illuminated CMOS sensor with high speed and UV extension	Linear back-illuminated CCD with large active area with high sensitivity	
Sensor Type	Hamamatsu CMOS linear image sensor S11639 with active pixel structure and global e-shutter	Hamamatsu CCD sensor S11071 with high spectral acquisition speed	Hamamatsu CCD sensor S10420 with high dynamic range
Sensor Format	2048 x 1 pixels	2048 x 70 pixels, shorter version available on request	2048 x 70 pixels, shorter version available on request
Active Area	28.7 x 0.2 mm	28.7 x 1 mm	28.7 x 1 mm
Pixel Size	14 x 200 μm	14 x 14 μm	14 x 14 μm
QE		>75% for 450 - 750 nm	
Full Well Capacity	100,000 e <sup>-</sup> (typical) 80,000 e <sup>-</sup> (minimum)	>240,000 e <sup>-</sup> (typical) >175,000 e <sup>-</sup> (minimum)	>375,000 e <sup>-</sup> (high FW mode)
Readout Noise	16 e <sup>-</sup> (typical) 20 e <sup>-</sup> (maximum)	35 e <sup>-</sup> (typical) 45 e <sup>-</sup> (maximum)	50 e <sup>-</sup> (typical) & 75 e <sup>-</sup> maximum in high full well mode
Maximum Spectral Rate	1400 spectra/s and higher	770 spectra/s	223 spectra/s
ADC	16-bit	16-bit	16-bit
Dynamic Range (FW/RN)	6250:1 (typical)	6800:1 (typical)	7500:1 (high FW mode) (typical)
Non-linearity	<0.1% (corrected)	<0.4% (corrected)	<0.4% (corrected)
Dark Current (@25° C)	375 e <sup>-</sup> /pixel/s (typical) 500 e <sup>-</sup> /pixel/s (maximum)	50 e <sup>-</sup> /pixel/s (typical) 500 e <sup>-</sup> /pixel/s (maximum)	50 e <sup>-</sup> /pixel/s (typical) 500 e <sup>-</sup> /pixel/s (maximum)
Communication		USB 2	
Environmental Conditions	Operating temperature +15° C to 45° C ambient Relative humidity <70% (non-condensing); Storage temperature -20° C to 60° C		
Power Requirements	Through USB 2	Y Cable (5 VDC)	

Other detector options, such as CMOS-PDAs with passive pixel structure and full well up to 1Ge<sup>-</sup> available.

### Linear CMOS-PDA Options (other sensors available upon request)

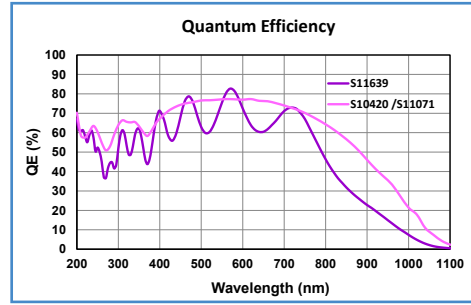
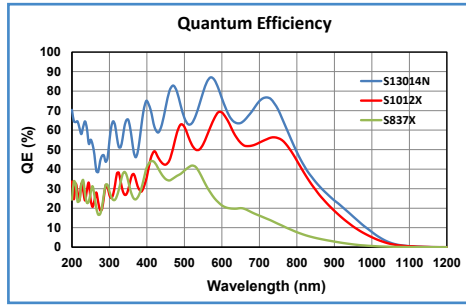
Sensor type	S1012X Series (High Performance)	S837X Series (Low Cost)
Pixel Format	25 or 50 $\mu\text{m}$ pixel pitch; 0.5 or 2.5 mm pixel height; 512 pixels or 1024 pixels	
Detector QE	Refer to graphs on the following page	
Full Well (e-)	From 94 Me <sup>-</sup> to 1 Ge <sup>-</sup> (typical)	From 43 Me <sup>-</sup> to 430 Me <sup>-</sup> (typical)
Readout Noise (e-)	5200 e <sup>-</sup> (typical)	3370 e <sup>-</sup> (typical)
Spectrometer housing will be slightly different depending on CMOS-PDA options		

## CCD Selection Guide

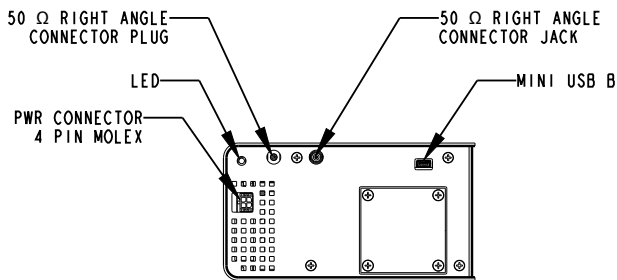
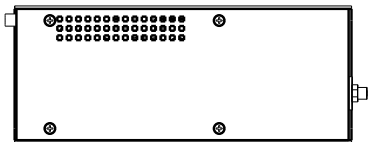
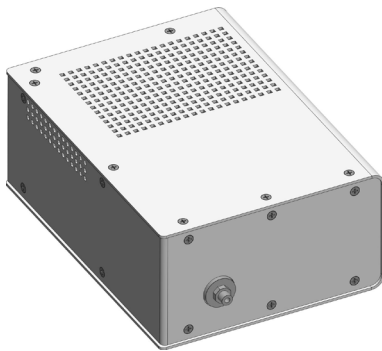


# CCD SELECTION

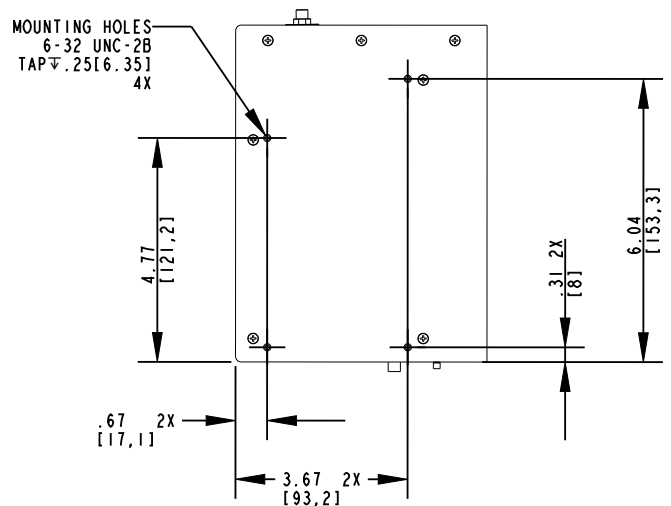
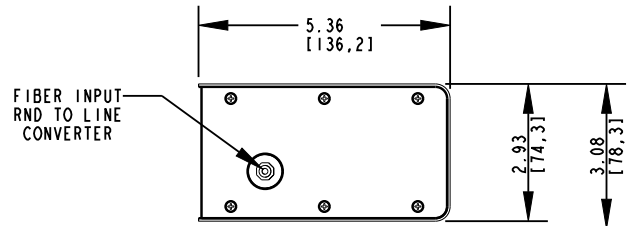
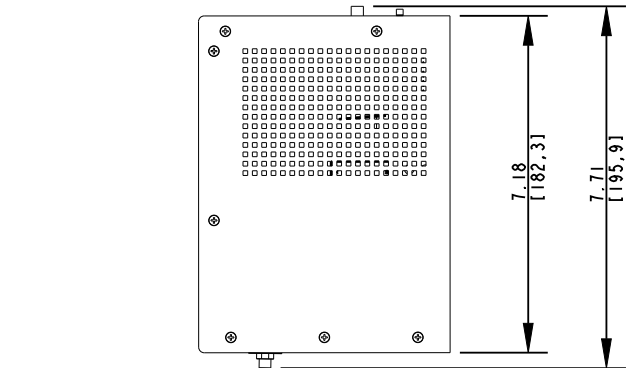
# Quantum Efficiencies



# System Mechanical Drawings



ALL UNITS IN INCHES [MM] UNLESS NOTED



The configuration shown above is for the S10420/S11071 CCDs.

# Best Selling Miniature Spectrometers for OEM Industrial Applications

## Fiber-coupled USB Spectrometers:



### MiniVS20 Spectrometer with Linear UV-VIS CMOS or NIR INGAAS sensor

OEM hand-held spectrometer covering 190 to 1,700 nm for various low stray light applications

- Aberration-corrected concave holographic grating options
- VIS configuration featuring a 1.7" x 1.9" x 2" size combined with full F/2.3 optics for high signal-to-noise
- High throughput, compactness and long term reliability



### MiniVS70 VIS Spectrometer with FI CMOS or BI CCD

NEW miniaturized VS70 configuration

- Based on high performance aberration-corrected concave gratings fitted with a custom order-sorting filter to eliminate higher orders
- Low cost combined with high performance and low stray light
- Long term opto-mechanical stability and choice of front-illuminated linear CMOS or back-illuminated CCD sensors



### VS70 UV-VIS-NIR Spectrometer with uncooled / TE-cooled CCD

Most popular, compact versatile VS70 OEM Spectrometer and OES configurations

- Based on high performance aberration-corrected concave gratings with full F/2.3 aperture
- SINGLE or DUAL fiber channel versions available
- Affordable high throughput, robust and stable
- Electronics drivers ranging from **USB 2 to Ethernet and EtherCAT**



### CiCi-Raman-NIR with scientific camera optimized for 785 nm

Most compact OEM Raman spectrometer with aberration-corrected holographic grating

- Covers 150-3,300 cm<sup>-1</sup>
- High efficiency and low stray light
- Available in F/2.3 and in compact F/5 configurations
- -50° C deep-cooled scientific CCD camera with minimized etaloning and high NIR QE



### PoliSpectra® Quad Spectrometer for simultaneous acquisition of 4 VIS spectra

CCD spectrometer for simultaneous acquisition from 4 fiber inputs (470-730 nm)

- High-speed electronics (as fast as <1.5 msec readout time for 4 spectra)
- QUAD-channel high throughput system (f/2.3) and ultra-low stray light
- Industrial low light applications from low light fluorescence to reflectance



### PoliSpectra® M116 8-32 channel MultiTrack UV-VIS-NIR CMOS spectrometer

Fiber-coupled multi-spectra system with 8 to 32 channel simultaneous measurements

- Concentric optical design with UV extended spectral range provides minimized crosstalk
- High throughput USB 3 system featuring a fast 2D scientific BI CMOS running at 94 to 188 frames per second, acquiring 8, 16 or 32 simultaneous spectra (2048 pixels per spectrum)

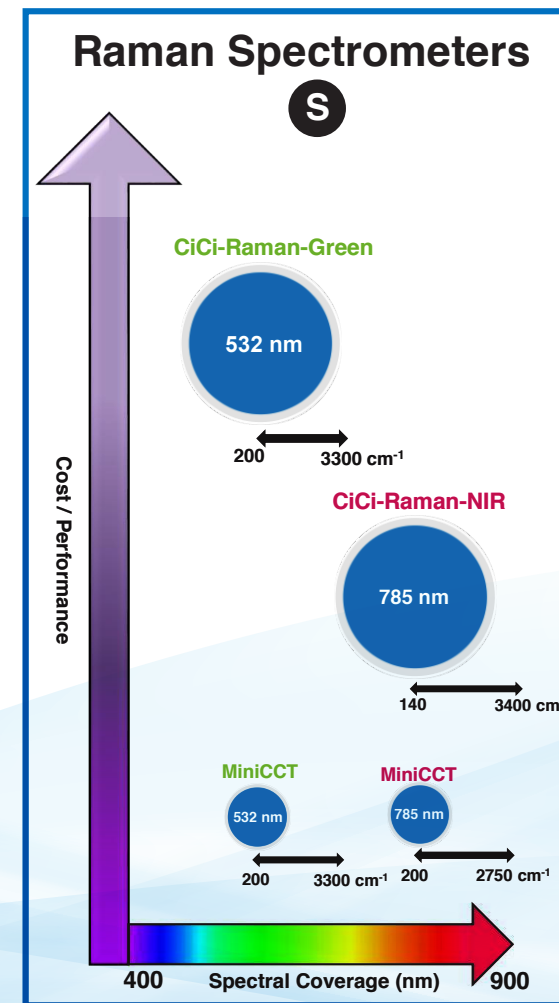
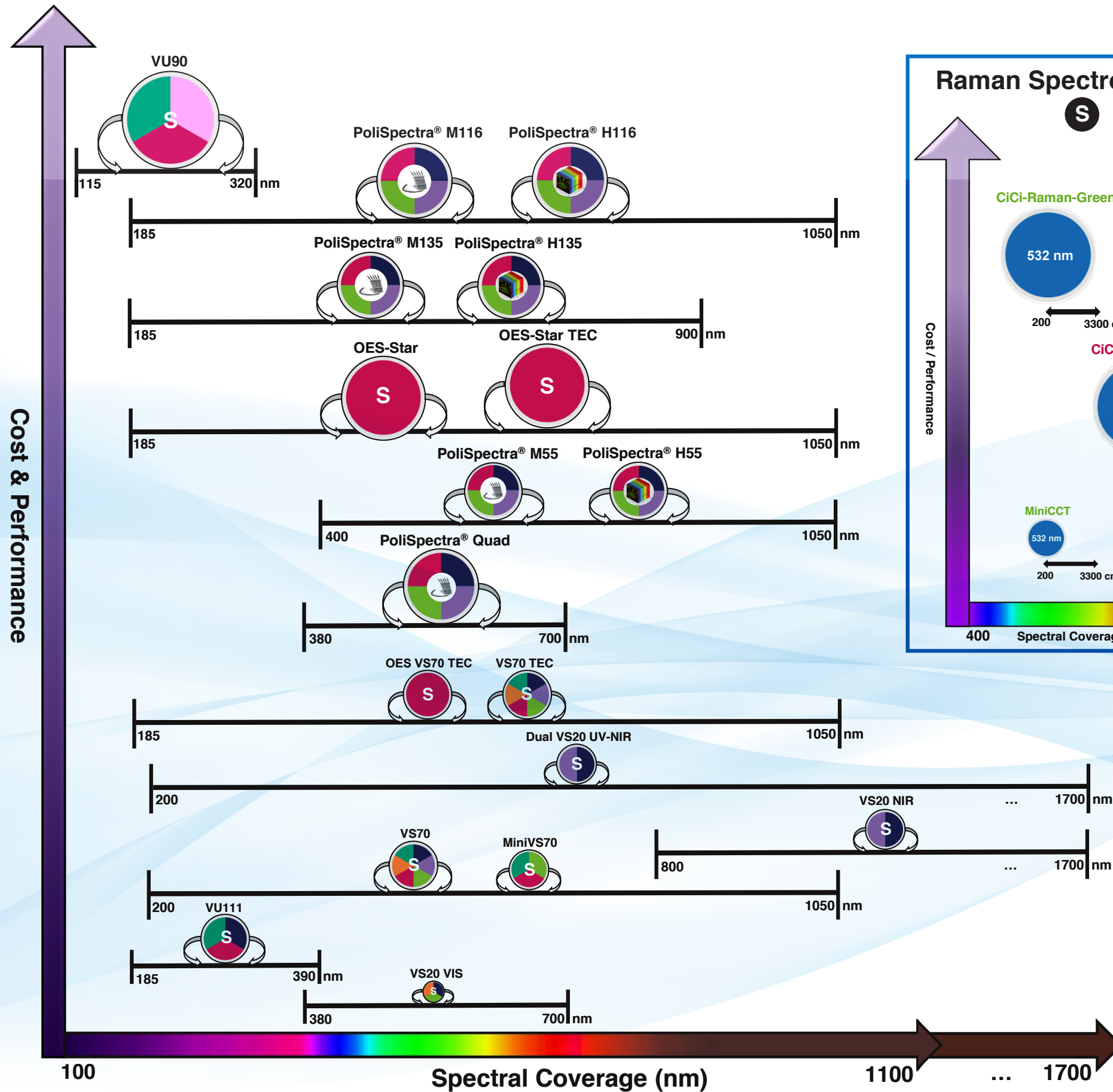


### PoliSpectra® H116 Imaging Spectrometer for hyperspectral work from UV to NIR

Ultra-high performance rugged spectrometer for hyperspectral imaging with a 2D sCMOS Camera

- For line-image scanning, in a push-broom hyperspectral configuration
- High throughput, USB 3 system featuring a fast 2D scientific BI CMOS with rolling shutter, running at 94 (HDR) to 188 (Standard Mode) frames per second (2048 pixels per spectrum)

# OEM Spectrometer Selection Guide



### Legend

**Spectrometer Input Type**

- S** Single-fiber Input
- Multi-fiber Input
- Hyperspectral Imager

**Technique & Application**

- Emission (OES)
- Absorbance
- Fluorescence
- Reflectance
- Raman
- Metrology
- Photoluminescence
- Colorimetry

**Spectrometer Size**

- ≤ 10.5x9x7 inches
- ≤ 8x8x8 inches
- ≤ 7.5x4.5x5 inches
- ≤ 7.5x4.5x3 inches
- ≤ 6x6x7.5 inches
- ≤ 5x5x5 inches
- ≤ 5x5x2 inches
- ≤ 2x2x2 inches

# OEM Philosophy and Mission

## 3 Centers of Excellence Dedicated to OEM Spectroscopy and Camera Solutions in US, EU, and Asia

Our mission is to provide a complete development and manufacturing experience, from optical simulations to opto-mechanical design and prototyping of spectroscopic and camera systems extending to and including electronics, firmware, software design and first articles.

Our products provide superior performance, reliability and stability combined with robust cost reduction. Capable of flexible high volume production capacity in quantities of hundreds to thousands per year, we offer full confidentiality providing "Black Boxes" or private labelling using your logo or graphics.

Unmatched customer service is provided by our exceptionally experienced workforce featuring on-time delivery and flexibility allowing scheduling modifications.

Adhering to Copy Exactly! Processes (CE!) our fully trained staff from engineering to manufacturing form a dedicated OEM engineering force that supports you over the lifetime of the product.

### Scientific Segment - OEM Products and Capabilities:

- Custom master optical diffraction gratings
- Diffraction grating replicas (concave, convex and flat)
- Spectrometers, optical assemblies with pre-aligned sensors (CCD, PDA, CMOS, InGaAs) using either customers' or HORIBA's OEM electronics
- OES spectrometers
- Spectroscopy systems or modular engines such as mini fluorometers and mini Raman systems
- Single and double scanning monochromators
- Imaging spectrographs and spectrometers with CCD or CMOS cameras
- Multispectra spectrometers with multiple fiber input / MultiTrack spectroscopy
- Hyperspectral system with HORIBA camera or customer provided (Push-broom configurations)
- Cameras: Spectroscopic deep-cooled scientific cameras (1D and 2D CCD & InGaAS – FI and BI)
- OEM electronics for optosensors ranging from PD and PDA to CCD and CMOS sensors
- Imaging cameras: Uncooled and cooled with FI and BI high-end scientific CMOS
- VUV/FUV spectrometers and CCD vacuum and N2-purged cameras

## Scientific Deep Cooled CCD and sCMOS cameras

<b>Sincerity®</b>	<b>Sylent Mini</b>	<b>Sylent BLUE</b>	<b>Synapse® EM</b>	<b>VUV Sincerity®</b>
				
Low Cost -50° C Air-cooled OEM Camera	Ultra-compact 4.2 MP Monochrome sCMOS Sensor	TE-cooled to -25° C 4.2 MP sCMOS Sensor	EM CCD Deep-cooled Camera	TE-cooled to -50° C (Vacuum) or -30° C with N2 purge

<b>Contact us in one of our centers of excellence</b>	<b>USA &amp; Canada</b>	<b>Japan</b>	<b>Europe &amp; Asia</b>
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	+1 732 494 8660 Ext. 7733	+81 (75) 313 8121	+33 (0) 1 69 74 72 00