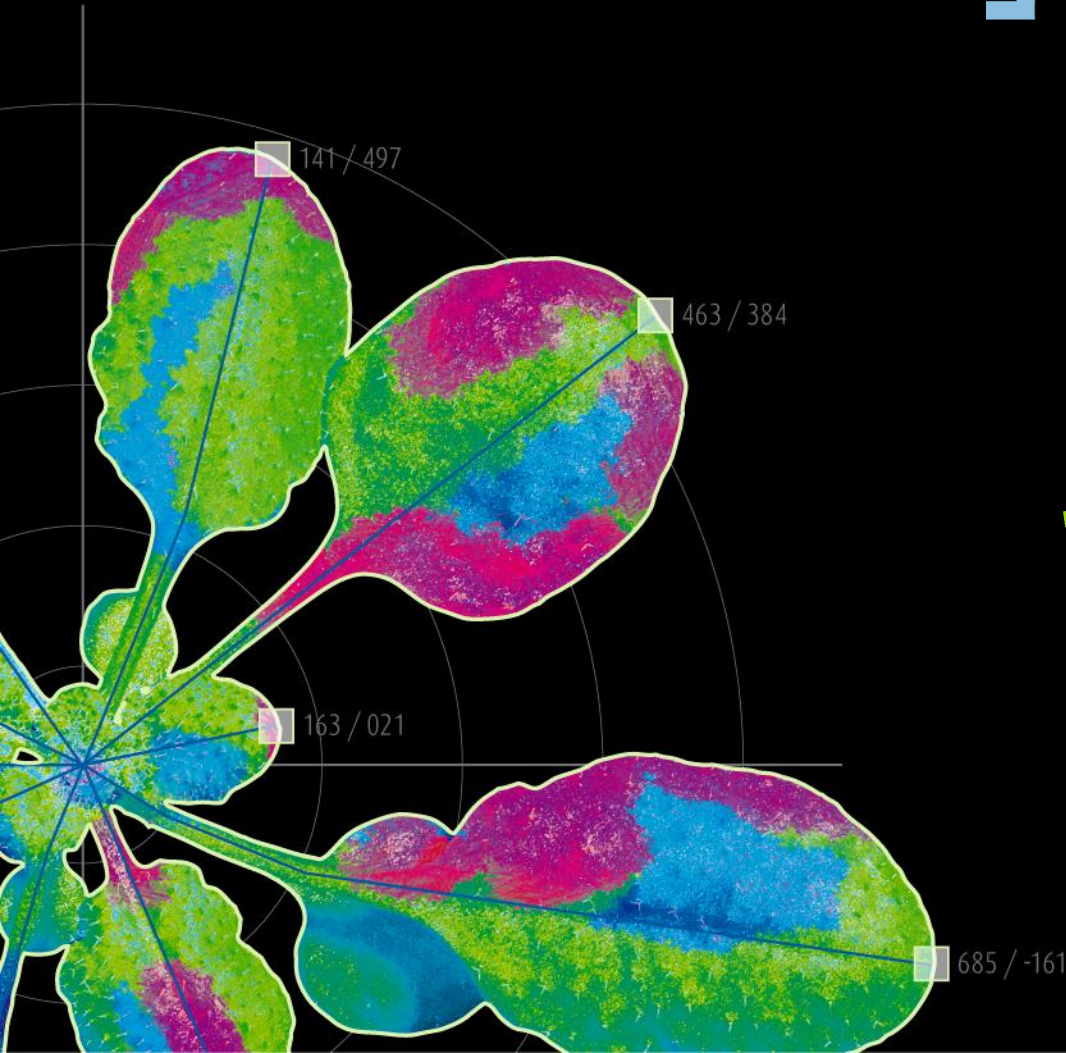




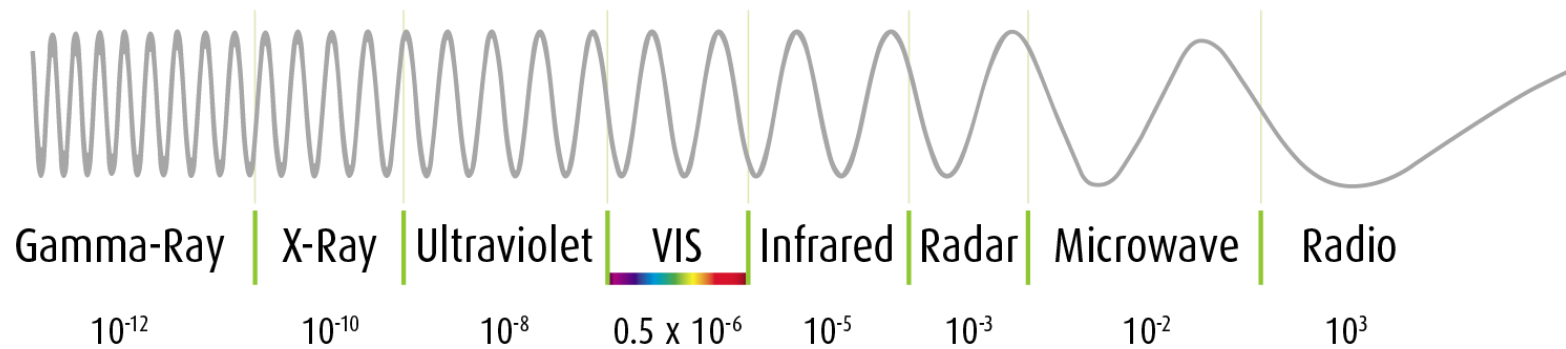
Hyperspectral Imaging for scanner Systems

NEW!

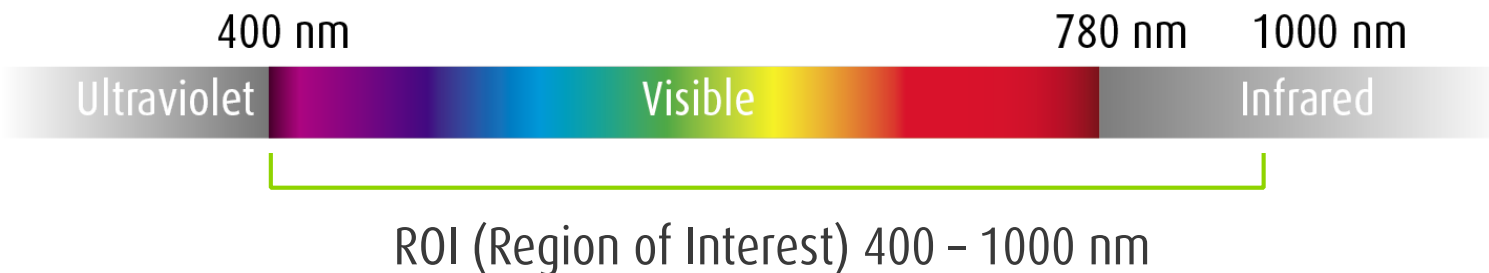


Spectral Region

Radiation Type and Wavelength [m]

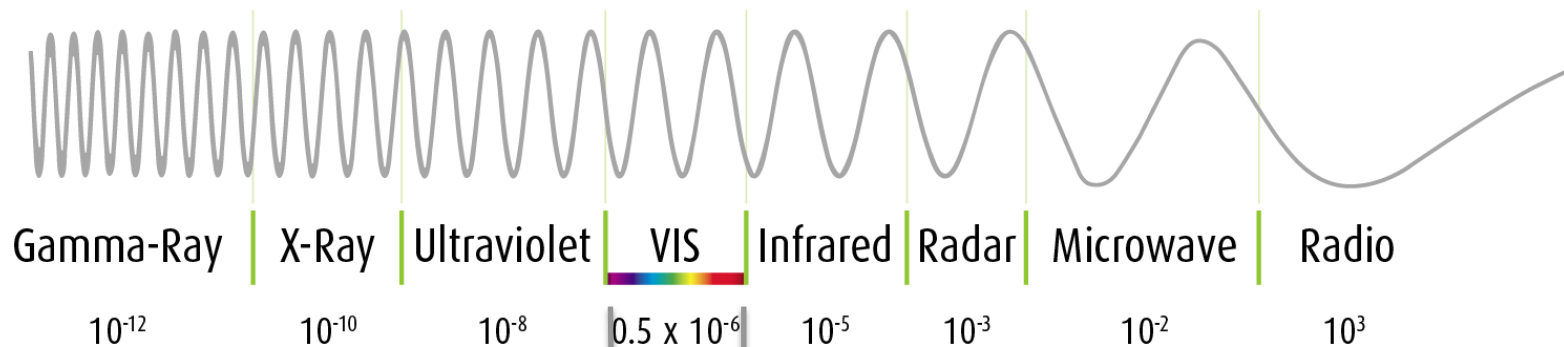


Spectral Range of Hyperspec Cam: VNIR 400 – 1000 nm



Spectral Region

Radiation Type and Wavelength [m]



Spectral Range of Hyperspec Cam: VNIR 400 – 1000 nm

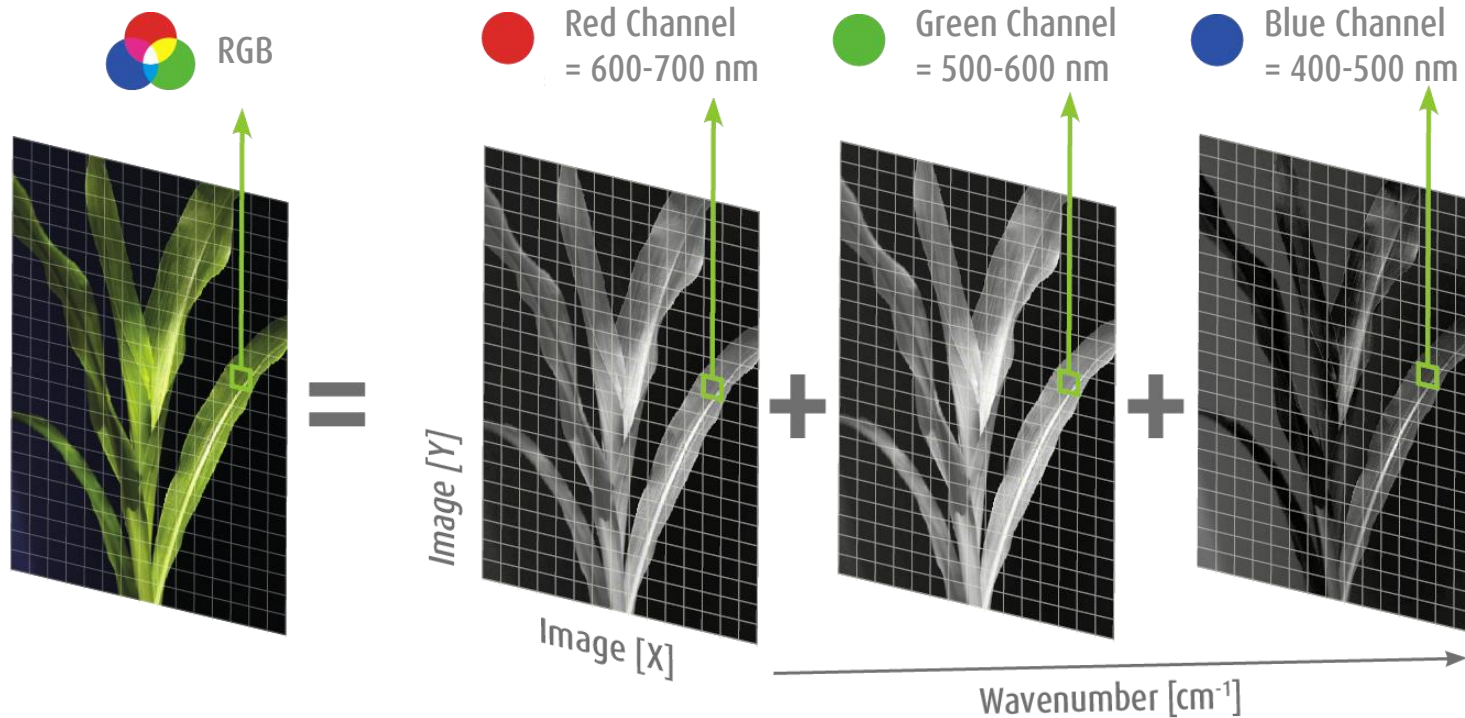


ROI (Region of Interest) 400 – 1000 nm

3 Wavelengths of RGB

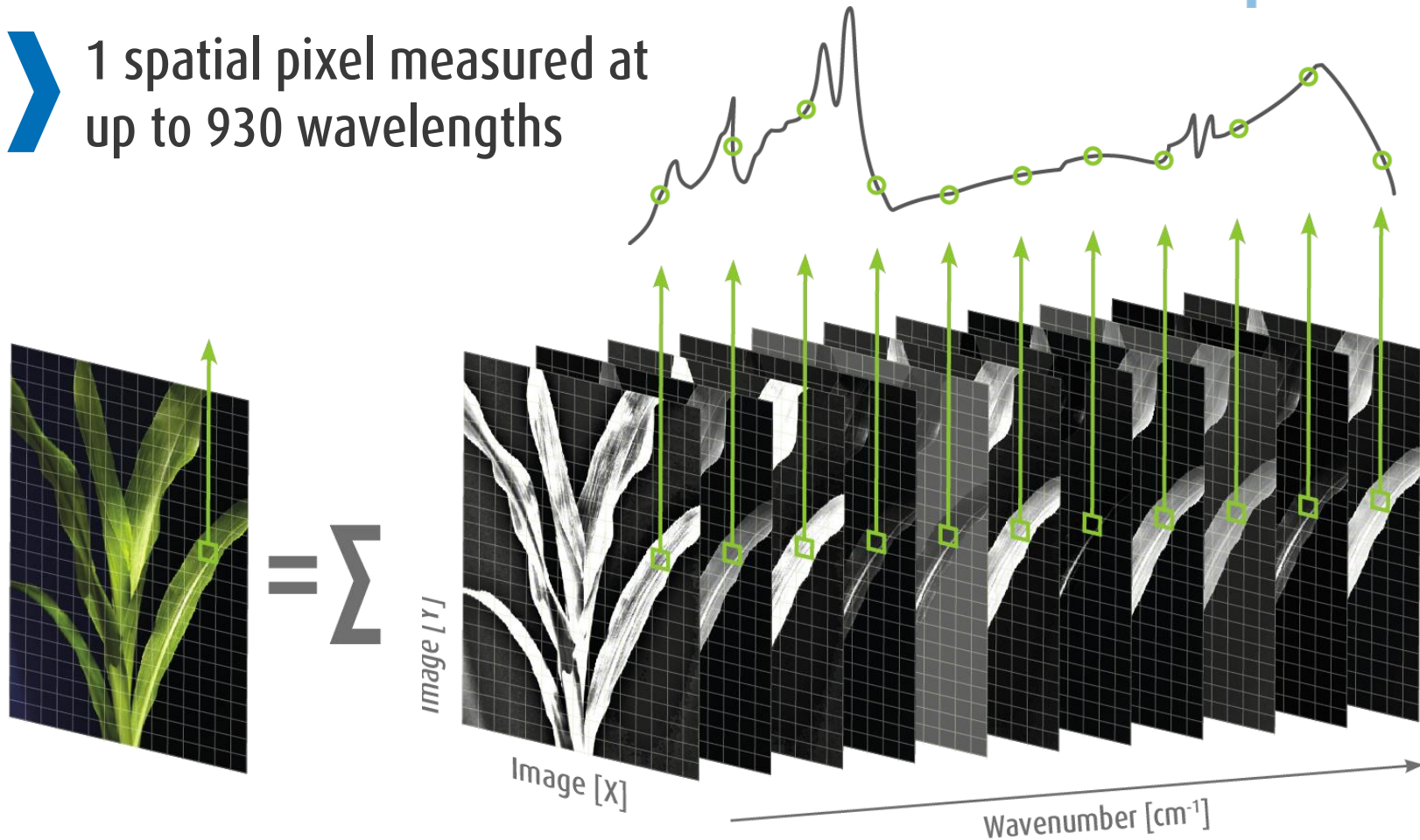
- 1 Pixel measured at 3 wavelength bands
- All images span the same area
- All images are taken simultaneously

Classifications attributed to broad spectral bands



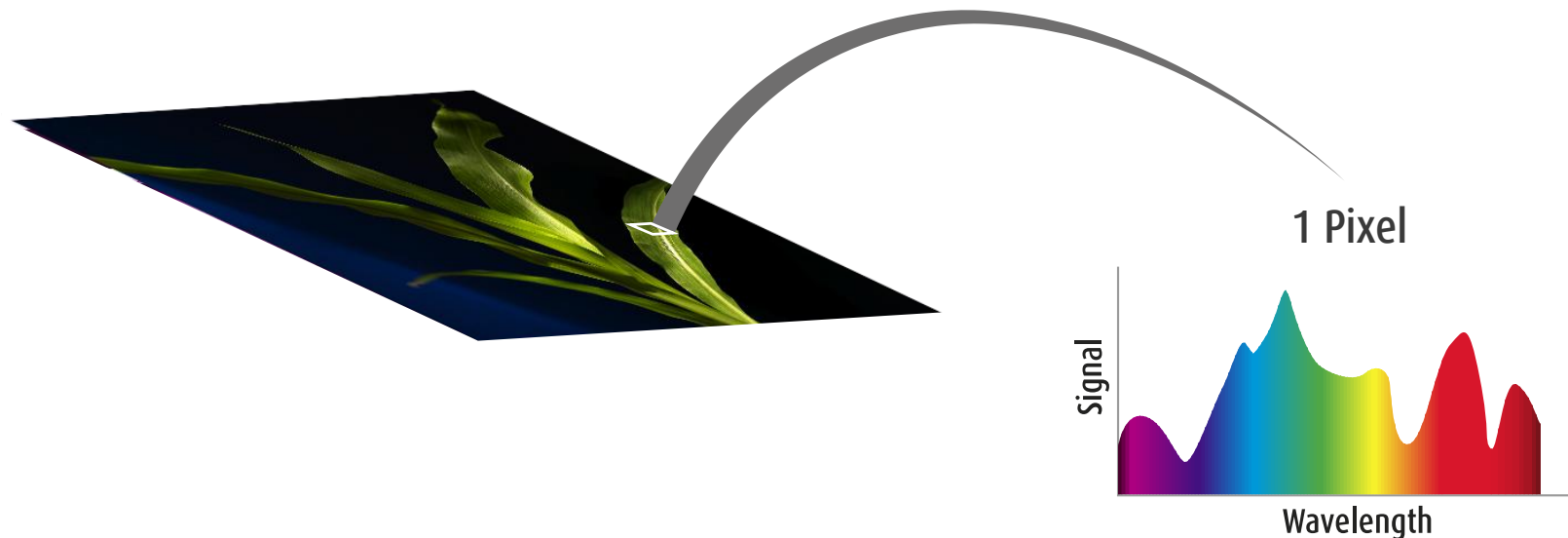
Hyperspec = High Spectral Resolution

1 spatial pixel measured at up to 930 wavelengths



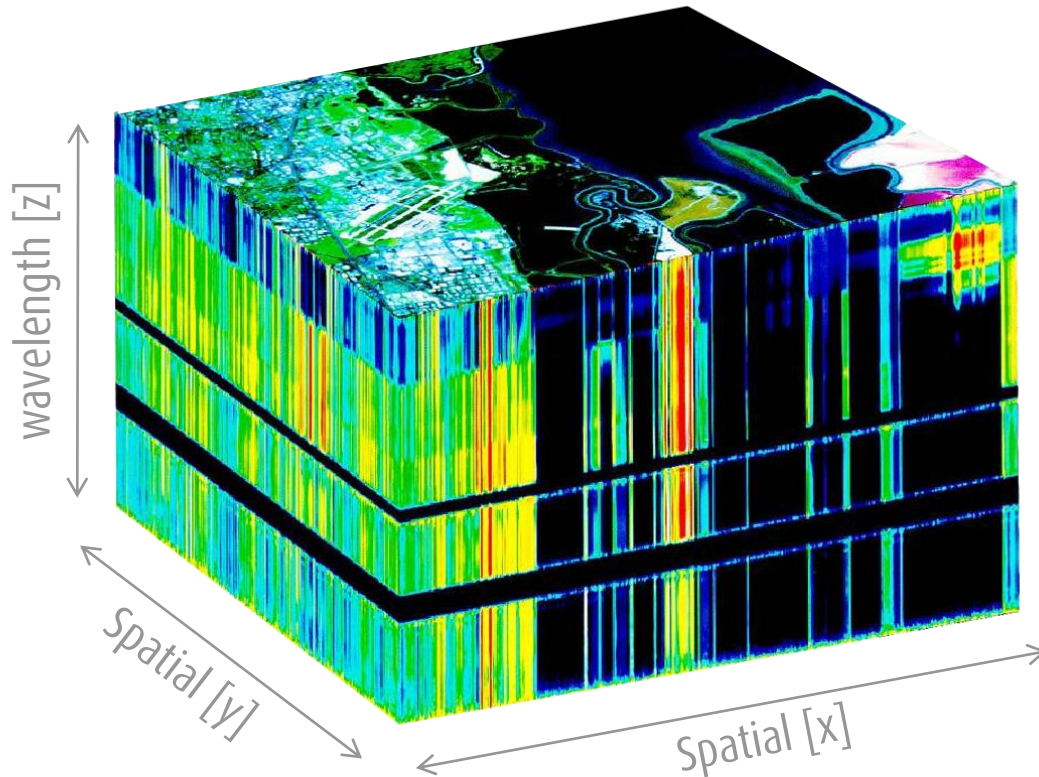
Hyperspectral Imaging Concept

- Each Pixel contains a continuous spectrum that is used to identify the condition of the plant or fruit



- E.g.: Optimised spectral detail in Chlorophyll red band for more accurate classifications

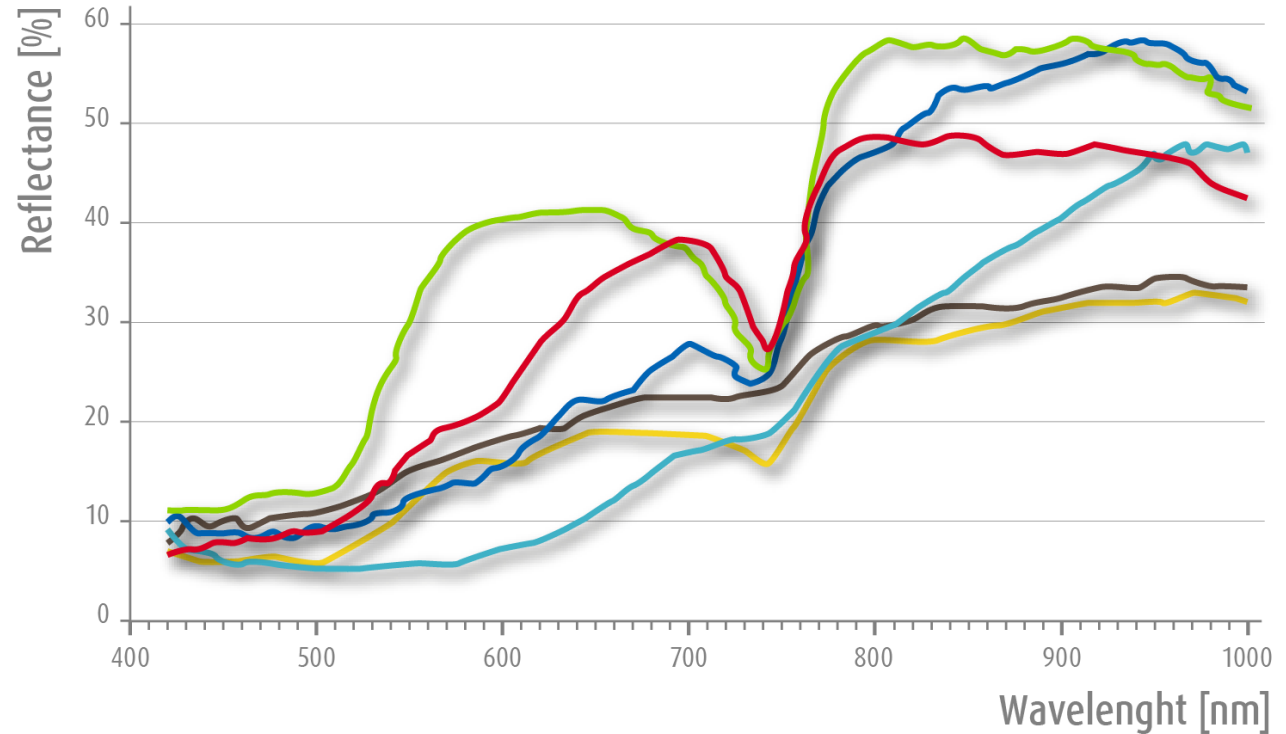
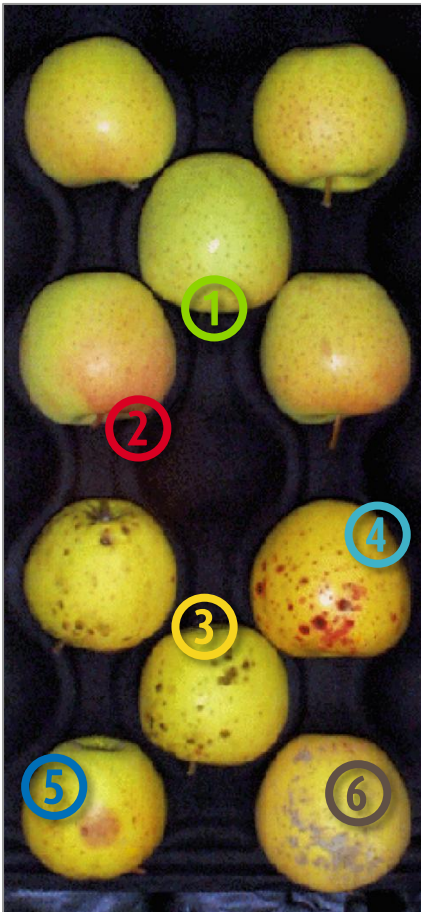
Hyperspectral Imaging Cube



- One graphic example of a Hyperspectral Datacube

AVIRIS image of Moffet Field, CA (courtesy R Green, JPL)

Example: Fruit Quality



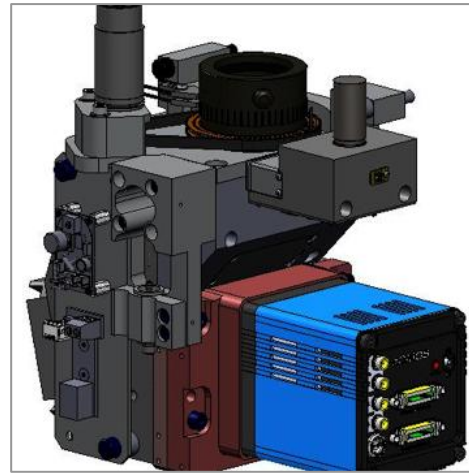
- 1 Greenish Skin
- 2 Reddish Skin
- 3 Fungal (Sooty Blotch)
- 4 Diseased (Black Pox)
- 5 Bruised
- 6 Soil Contaminated

Author of picture and data: USDA

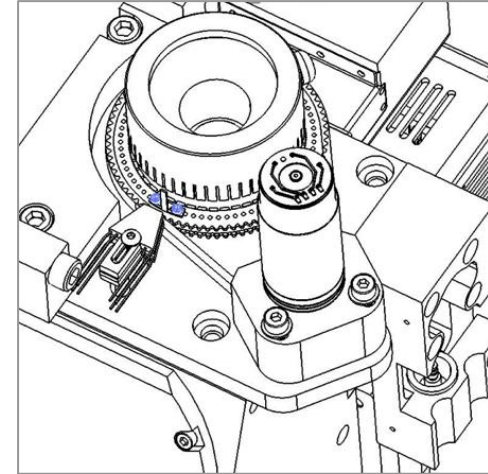
Hyperspec[®] Inspector E-Series



Hyperspec Inspector[®]



Hyperspec[®] Imaging Module



Lens Focus

- State of the art camera
- Retrofit to all existing **scanalyzer 3D** and **HTS** possible
- Optimized for VNIR (400-1000 nm)

Detector Specifications



Detector Material	sCMOS
Firmware	Proprietary
Detector geometry	2560 x 2160
Frame speed	> 100 fps
Pixel well depth	30,000 e-
Read Noise	1.4-2.0 e- @ 285 MHz

Scan Specifications



Category	Description	Specification
Acquisition Parameters	FOV _S (Scan direction, $\Delta\theta_M$ - max scan range of mirror)	30°
	IFOV _S	1.47 mrad
	FOV _{CS} (cross-scan direction)	26.6°
Point-And-Stare Angular Specs.	Angular Accuracy	± 0.04 mrad
	Angular Reproducibility (scan to scan)	± 0.04 mrad

Focus Specifications



Focus Type

Electronic Controlled

Focus Control

Microstepper Controller

Focus Motion

Faulhaber Servo

Positioning Feedback

Optical Positioning detector

Aperture Module



Aperture Type

Electronic Controlled

Lens Type

- Aperture Controlled Lens.
- Transmission optimized and chromatically corrected for full wavelength band.

Aperture Range

8000 Counts (Full Open) to
-8000 Counts (Full Close)

Wavelength and Radiometric Calibration



Wavelength Calibration

- Integrating Sphere and fore-optic
- Atomic Emission Lines

Wavelength Calibrator accuracy

+/- 0.005 nm

Radiometric Standard (secondary)

Continuum, Tungsten-Krypton



Thank you for
your attention!

Visit our website www.lemnatec.com