kestrel™ spectroscopy systems

Catalina Scientific

EMU-65 VIS/NIR

High Resolution
Ultra-High Throughput
Ultra-Low Stray Light
Echelle Spectrograph

The new EMU-65 VIS/NIR is based upon the original broadband EMU-65 echelle spectrograph (190nm - 1100nm). Tall entrance slits are used in this 350nm to 1100nm model for the ultimate in low-light sensitivity, without sacrificing resolution.

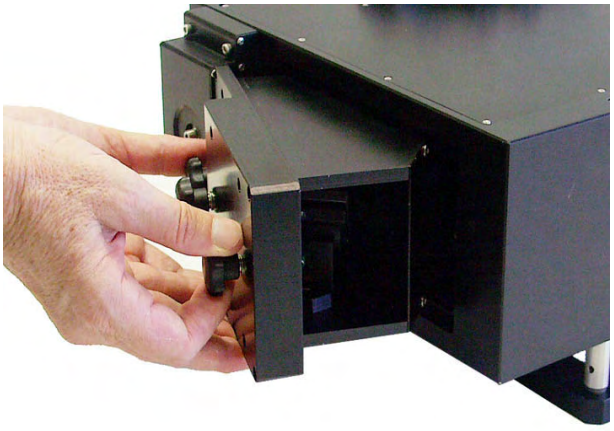
This new VIS/NIR echelle spectrograph, like the original UV/VIS/NIR version, is designed to match N.A.= 0.22 input fibers (F/2.2). The new EMU-65 typically provides 40x to 80x higher throughput than other mirror-based (~F/10) echelle spectrographs using the same width entrance slit. This instrument has much broader wavelength coverage than lens-based echelle or imaging spectrographs and it has comparable or higher throughput.

This VIS/NIR model is ideal for Raman spectroscopy because of the high etendue, high resolving power and exceptionally low stray light. The broad wavelength coverage is especially valuable for applications requiring multiple laser wavelengths to distinguish between background fluorescence and Raman signal. The instrument is superb for other low-light applications such as fluorescence, bioluminescence and VIS/NIR LIBS (laser-induced breakdown spectroscopy).

KestrelSpec™ software is used to calibrate and create spectral data for the EMU-65. The software supports numerous CCD, EMCCD and ICCD cameras. Wavelength calibration is fast and accurate using an Hg/Ar light source.

The EMU-65 VIS/NIR is designed, manufactured and marketed by Catalina Scientific Instruments, LLC. CSI has a patent pending for the EMU-65 spectrograph.

- Very high etendue (numerical aperature x slit area)
- Resolving power up to 12,000 λ/FWHM with HRV series dispersion cassettes
- Can be used with a variety of CCD, CMOS, EMCCD and ICCD cameras
- Covers the entire VIS/NIR range and acquires completely linearized spectra in units of wavelength or Raman cm^{-1} shift
- A variety of interchangeable dispersive cassettes, aperture stops, and entrance slits are adaptable to many user applications.
- Custom collimator optics within the spectrograph can be designed to match the input numerical aperture from the source collection optics.

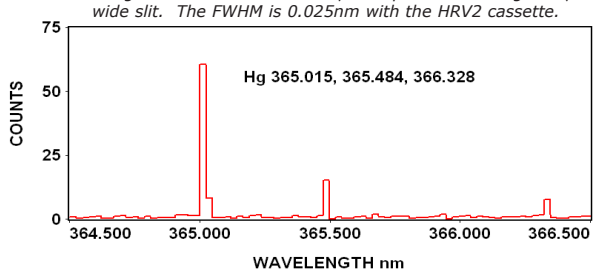


The custom dispersion cassettes for the EMU-65 VIS/NIR are interchangeable.

Resolving Power

The EMU-65 VIS/NIR optical design can yield ***single pixel*** resolving power with high throughput.

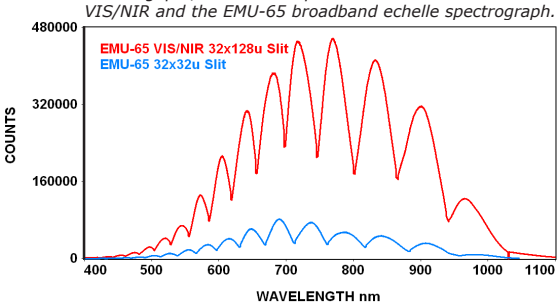
The Hg 365.015nm line is one 8µ CCD pixel wide using an 8µ wide slit. The FWHM is 0.025nm with the HRV2 cassette.



Throughput/Etendue Comparisons

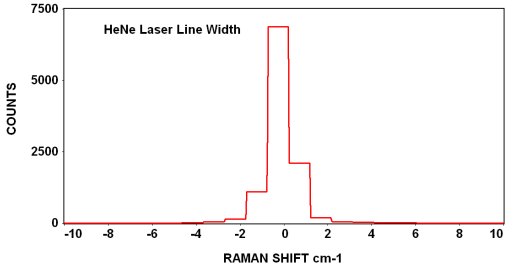
The tungsten spectra below compare the throughput of an EMU-65 VIS/NIR (red) with the EMU-65 broadband (blue). Both systems use the same grating, camera and F/2.2 aperture stop. The resolving power of the two instruments is the same. The high dispersion prism in the EMU-65 VIS/NIR allows adequate order separation for slits 4x taller.

Throughput/Etendue comparison between the EMU-65 VIS/NIR and the EMU-65 broadband echelle spectrograph.

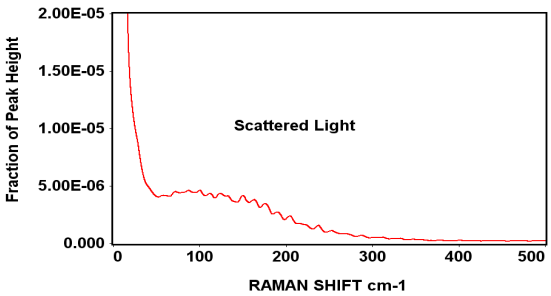


Stray and Scattered Light

The resolution for the HeNe 633nm laser line below is 1 cm^{-1} FWHM using the HRV2 dispersion cassette.



The HeNe laser line below is over-exposed by ~6000x to show the small angle scattering caused primarily by the grating. Scattered light is measured as a fraction of the HeNe peak intensity, and it drops below the CCD dynamic range limit at a fraction of a nm from the peak. The EMU-65 VIS/NIR minimizes stray light beyond the scattering region.



KestrelSpec™ Software

The EMU-65 system is controlled by industry-standard KestrelSpec™ software, with complete real-time camera control and spectral acquisition. Our unique "3-point calibration" is performed quickly and easily with high accuracy. Spectral diffraction orders are automatically linked, linearized and plotted as data is acquired. Image and spectral data can be easily exported as ASCII files. An Element Identification tool with a user-editable reference library can identify the elements in atomic emission spectra for applications such as LIBS.

EMU-65 VIS/NIR Specifications

- Input: F/1.9 to F/3.3 aperture stops
- Focal Length (collimator): 65mm
- Magnification: ~ 1:1
- Wavelength Coverage: 350-1100nm
- Resolving Power* (λ/FWHM)
  - HTV Series Cassettes (at F/3.3)
    - 4700 with 16µ slit
    - 9500 with 8µ slit
  - HRV Series Cassettes (at F/3.3)
    - 6000 with 16µ slit
    - 12,000 with 8µ slit
- Scattered Light: <2.E-05 at 1nm from HeNe 633nm peak using HRV2 cassette
- Stray Light: ~1.E-7
- Unit Volume: 6150 cm^3 (375 cubic inch)
  Fits into a 270 (10.6) x 270 (10.6) x 110 (4.5) mm (inch) box excluding camera and base
- Weight: 6 kg (13 lbs) without camera, adapters and base
- Fiber Optic Input: SMA connector
- Slits: User-interchangeable
- Dispersion Cassettes: User-interchangeable and custom designs

* Resolving power is listed as the average λ/FWHM from 350-1100nm using an 8x8µ pixel detector.

Computer System Requirements

- Windows™ 2000/XP/Vista
- Appropriate driver to interface with the CCD

For more information please contact:

Catalina Scientific Instruments
1870 W. Prince Road, Suite 21
Tucson, AZ 85705 USA

Tel: 520 571 8000
Fax: 520 571 0120
Web: www.catalinasci.com
E-mail: info@catalinasci.com