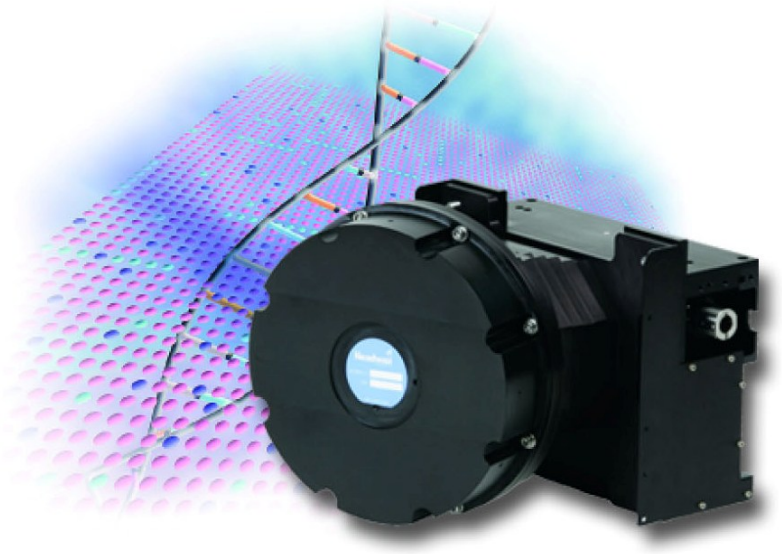


Raman Explorer 785

Raman Explorer 632

Raman Explorer 532

Raman Explorer 532/658
Dual Laser

Raman Explorer™ Imaging Spectrographs

Spectral Imaging For Demanding Raman Applications

High performance imaging spectrographs
The Raman Explorer™ family of multi-channel, multi-spectrum spectrographs is based on Headwall's patented, aberration-corrected, retro-reflective concentric design – an innovative, high reciprocal dispersion instrument which is optimized for high signal throughput of weak Raman spectra with reduced measurement integration time. The unique design supports the ability to disperse multiple spectral ranges over a single CCD with superior resolution, photometric accuracy, and spectral bandwidth.

At the heart of every Raman Explorer™ imaging spectrograph is Headwall's proprietary resonance domain, high efficiency diffraction grating. Unlike gratings that produce many diffracted orders, these "one order" gratings produce only a single diffracted order which propagates the wavelength region of interest. Spectrometers produced using these Headwall proprietary gratings exhibit very high efficiencies with 100% of the diffracted light contained within this single dispersed order. By eliminating several common sources of stray light, the Raman Explorer™ provides excellent dynamic range.

Performance Advantages

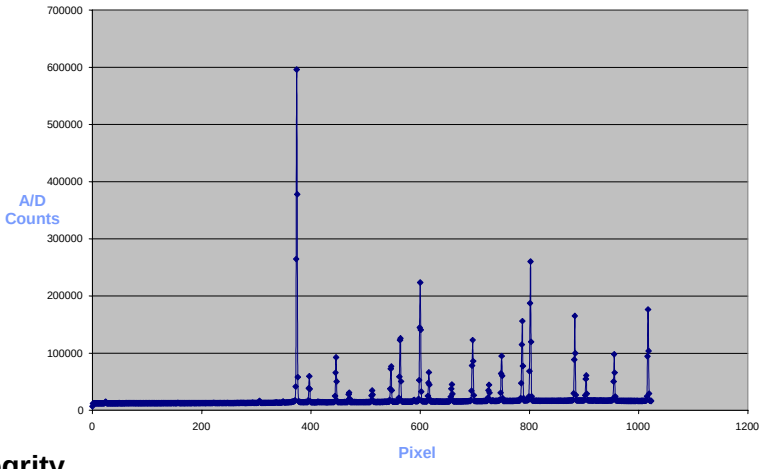
- Signal collection optimized
- Measurement accuracy
- Signal integrity
- Process reliability
- Measurement reliability/repeatability
- Ease of implementation

Features

High throughput f/2.4 optical design
Exceptional spectral & spatial resolution
No chromatic aberration or stray light
Environmental durability of design
No moving parts
No compensation needed for curved or tilted entrance slits

Headwall Photonics Raman Explorer™

Superior Spectral Resolution:
A linear array of nineteen adjacent 50µm core (70µm total diameter) fibers were illuminated with a neon light source and installed without a slit at the entrance aperture of a Raman Explorer 532. The CCD pixel size was 26µm square. As the chart shows, two pixel FWHM spectral imaging is achievable.



Neon Illumination, 19 Linear 50µ Fibers, No Slit

Large Area Image Capture—Enhanced Signal Integrity

The Raman Explorer™ accepts a wide range of single fiber, multiple fiber, multiple channel, and free optic signal input options.

Raman Explorer™ with one optical entrance aperture: Provides imaging capability with up to 7mm of entrance aperture height available. For example, 116 optical fibers can be stacked linearly (50µm core fibers with 10µm cladding). Features within the entrance aperture are spectrally re-imaged1:1 across the back focal plane at the corresponding spatial height of the CCD. Individual fibers may be used for calibration and illumination references.

Raman Explorer™ with two separate optical entrance apertures: Each optical entrance aperture disperses a unique spectral bandwidth across the back focal plane. Used separately, up to 7mm of spatial height can be entered into either entrance aperture, which will be spectrally re-imaged 1:1 across the back focal plane at the corresponding available spatial height of the CCD being used. Used simultaneously, one entrance aperture may provide the "fingerprint" region across the top half of the CCD while the other aperture provides the "C-H stretch" region across the bottom half of the CCD.

Small instrument size enables analysis in harsh application environments
The Raman Explorer™ is comprised of a rugged design with no moving parts. The design places both the input and detection regions on the same side of the instrument allowing for a more compact design without sacrificing optical performance and spectral resolution. The design innovation allows for significant reduction in size and weight enabling spectroscopic analysis in harsh field environments.

Raman Explorer		Raman Explorer 532	Raman Explorer 785		Raman Explorer 532/658	
Parameter	**Units**	**Ch1**	**Ch1**	**Ch2**	**Ch1**	**Ch2**
Laser stimulation wavelength	**nm**	532	**785**	**785**	**532**	**658**
Camera pixel pitch (µm)	µm	24	24	24	24	24
# of pixels (spectral dimension)	N.A.	1024	1024	1024	1024	1024
Stokes Shift Detected on Pixel 1	cm^{-1}	300	-98	2257	300	79
	nm	541	779	954	541	661
Stokes Shift Detected on Pixel 1024	cm^{-1}	3671	2419	3998	3671	2409
	nm	661	969	1144	661	782
Minimum cm^{-1} Detected on Pixel 1	cm^{-1}	18497	12837	10482	18497	15119
Maximum cm^{-1} Detected on Pixel 1024	cm^{-1}	15126	10320	8741	15126	12789
Total Spectral bandwidth	cm^{-1}	3371	2517	1740	3371	2330
	nm	120	190	190	120	120
Avg. Reciprocal Linear Dispersion	cm^{-1}/ pixel	3.3	2.4	1.6	3.3	2.3
Avg. Spectral resolution (50% MTF)	cm^{-1}	6.6	4.7	3.3	6.6	4.6
Avg. Spectral resolution (50% MTF)	nm	0.24	0.36	0.36	0.24	0.24
All values are for nominal guideline reference and are based on 50 micron fiber image						

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