

# RESONANCE<sup>LTD</sup>

Optical Solutions & Technologies



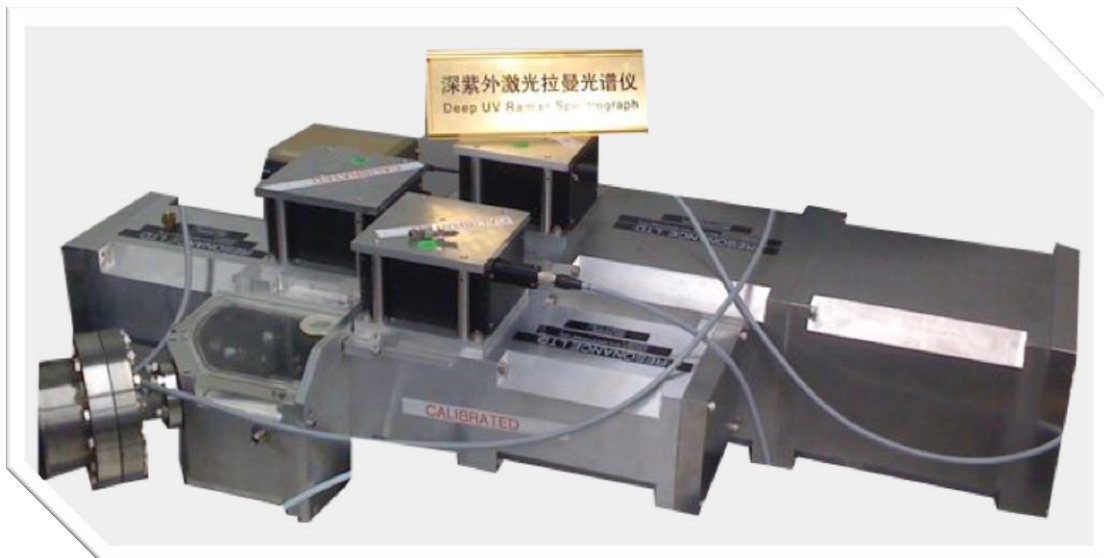
## RamSPEC-VUV-0.3-0.6

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### Data Sheet

REV 1.0

7/29/2014



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## Description

RamSPEC-VUV is the first commercial Raman spectrometer available for the VUV region of the spectrum and the first instrument to measure Raman scattering signal in the VUV range of 177 -190nm.

The system has been designed to allow interchangeability between various grating arrangements for optimum configuration. Its relatively small size and standard connections also makes it an obvious choice for almost for almost any system.

### Spectrometer Features

- Two spectrometer Rayleigh filter
- CCD spectrograph
- 0.01nm resolution
- Low VUV scattered light
- High optical efficiency
- 140 to 550nm with standard grating
- Motorized wavelength selection
- Labview based software with control and DAS PC

### Sample Chamber Features

- Focuses laser light with Confocal optics
- Collects Raman signal with Ellipsoid relay
- Self-aligning sample holder
- Interchangeable sample holders
- Purge Nitrogen sample cooling and VUV Trans
- Purge allows rapid sample interchange
- Allows custom optics and sample holder

### CCD Features

- Back thinned CCD; response VUV to NIR
- QE>60% at 180nm
- Detector format 1024 x 256
- Binning to reduce read-out noise
- Long integration times available
- No UV absorbing window required
- Liquid cooled 3 stage TEC CCD
- Temperatures lower than -70°C
- USB interface

### Pump Station

- Turbo plus diaphragm station'
- 15 to 30 minute pump out
- Includes PC and A to D plus control electronic

## Specifications

### Electrical/Optical

Focal Length	First and second stages 305mm, third stage 610mm
Slits Location	Interface plate between stages
Entrance Slit	0 - 4mm, 0 - 6mm high
Slits Subtractive Intermediate	0 – 10mm wide, 0 – 10mm high
Slits Spectrograph	0 – 4mm wide
F/No	f/6.2 with 3600 grating; f/7.9 with 4200 grating
Spectrograph Dispersion at 185nm	0.445 nm/mm with 3600 G/mm
Spectrograph Dispersion at 185nm	0.375 nm/mm with 4200 G/mm
Resolution	0.028nm with 3600 G/mm grating; 0.015nm with 4200 G/mm spectrograph grating with 25mic slits
Resolution in WN with 3600 G/mm gtg/25 micron slits	177nm 9cm <sup>-1</sup> , 254nm 4.15cm <sup>-1</sup> and 405nm: 1.33cm <sup>-1</sup>
Resolution in WN with 4200 G/mm gtg/25 micron slits	177nm 5cm <sup>-1</sup> , 254nm 2cm <sup>-1</sup> and 405nm: 0.6cm <sup>-1</sup>
Grating Size	90 x 80mm for 3600 G/mm; 85 x 60 for 4200 G/mm gtgs
Drive Mechanism	Computer controlled Sine bar with linear translation stage stabilization
Step Size	0.004nm at 177nm 0.002nm at 405nm
Wavelength accuracy/reproducibility	0.05nm / 0.03nm respectively
Detector Quantum Efficiency	180nm > 60% at 177nm
Focal Plane	Third stage CCD 7mm h x 30mm W, max 40mm square
Spatial Resolution Perpendicular to Slit	0.06mm with 0.015mm high laser spot
Wavelength Range	140 to 550nm with 3600 G/mm gtg; 140 to 420 with 4200 g/mm grating
Dimensions	1.1m x 0.25m x 0.7m
Telemetry Channels	CCD temperature pressure
CCD	Back-thinned 28mm 1044 pixels -45°C 16 bit A to D
Vacuum Compatible	<10 – 6torr 15 to 30 minute pump out dry pump
Purge	N2 purge sample chamber
Software	LabView CCD 2-D display and scan control

# Reference

**Raman Spectrum with 224.3 and 177.2 nm Lasers at DICP Sept 11 and 12, 2009 - Teflon Target with Resonance Ltd. RamSpec VUV**

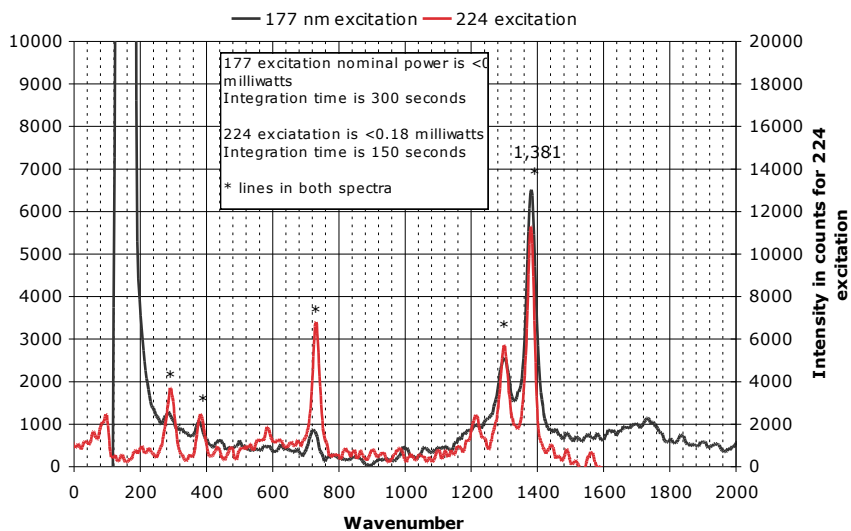


Figure 1: First 177 nm Raman Spectrum with RamSPEC compared to Raman spectrum with same grating of 224 laser.

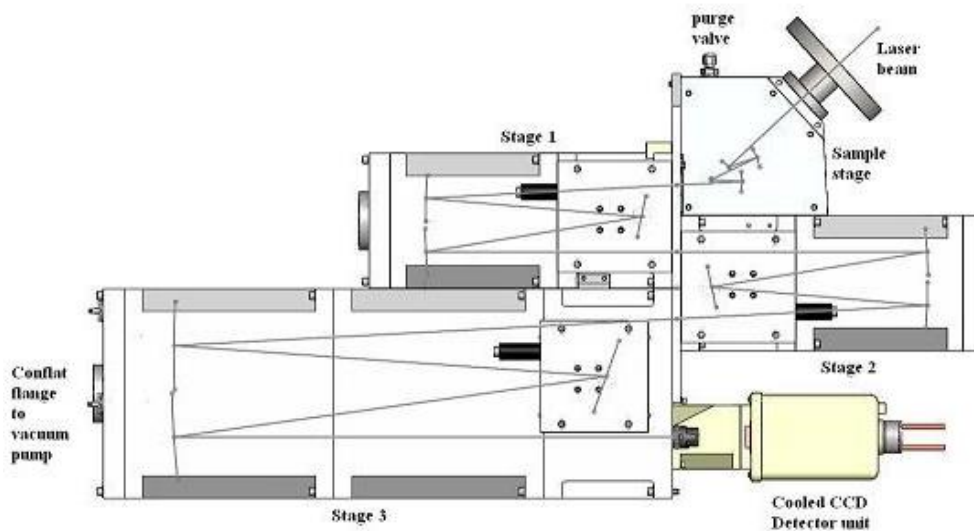


Fig: 2. The Resonance RamSPEC triple Raman spectrometer is illustrated above. The Laser beam enters from the top right and is focused onto a target in the Sample Stage

## Reference

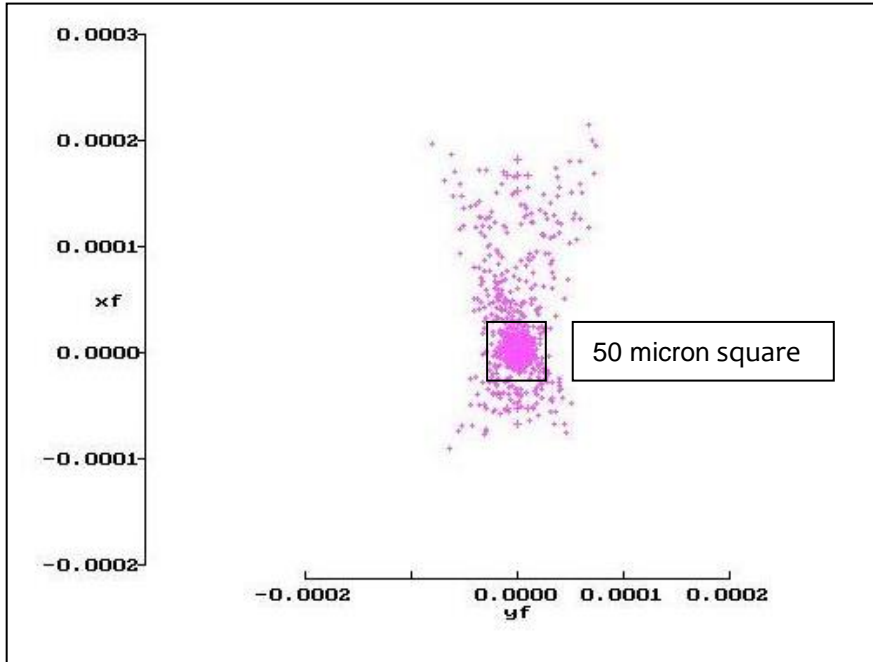


Figure 3: the output spot diagram of the Hyperspectral RamSPEC showing an image less than 50 microns in X and Y for a 25 micron input image.

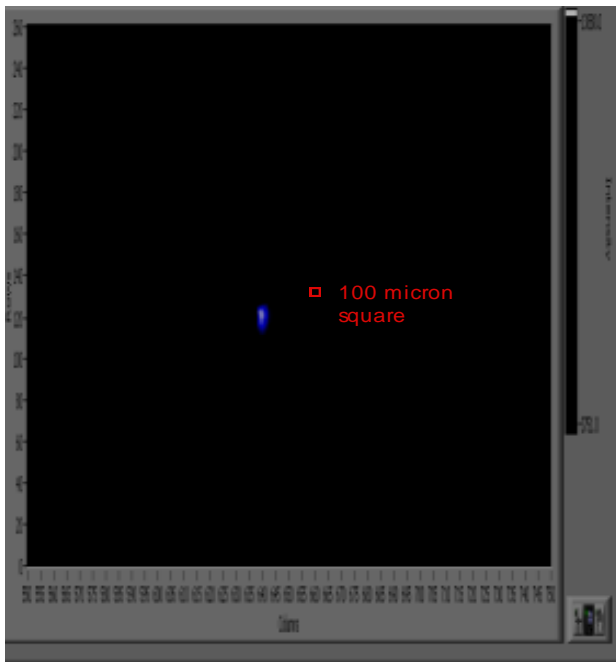


Figure 4: Hyper spectral Rayleigh image of 224 nm laser spot that is estimated at 200 microns at Teflon target. Entrance Slit aperture is 80 microns by 6000 microns.

The Rayleigh image is about 100 microns wide by 250 microns high at half power points

This image was acquired at room temperature with Laser power reduced to about 10 microwatts with a short integration time.

## Reference

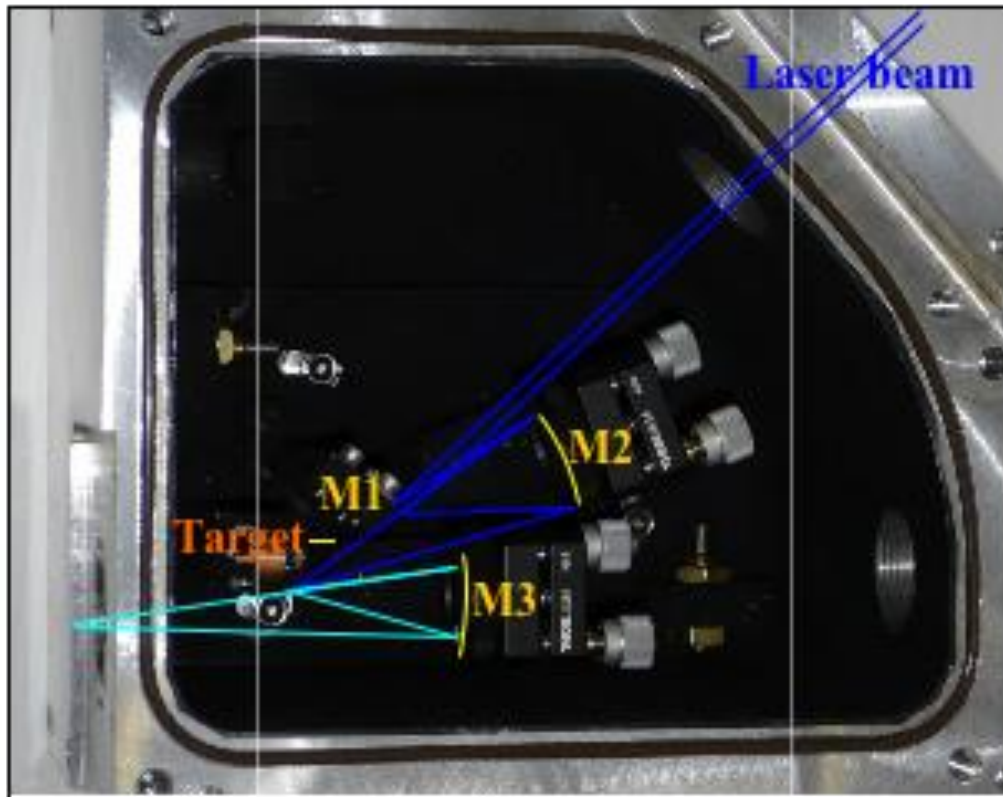


Figure 5

M1 and M2 are confocal and focus the laser beam onto the targets which are held in a Copper Block. The purge pipe (not shown) directs the purge gas onto the target holder and cools the samples directly. The concave mirror M3 collects Raman light from the sample and focuses it onto the entrance slit. All the components of this sample holder are mounted to an optical bench to allow rapid reconfiguring for other types of samples