



*Lambda
Solutions, Inc.*

Operational Specifications, Standard Configuration

LSI Dimension-P1 Raman Spectrometer;

High efficiency fiber coupled f/1.8, lens-based spectrograph with Princeton Instruments 100F PIXIS: three stage Peletier-TE-cooled (-75C) CCD, 20x20 micron pixels, 100x1340. Spectral coverages in cm^{-1} available from 40/125/200 to 2000(HR)/3000(SR); resolution $1.5\text{cm}^{-1}/\text{pixel}$ (HR), $2.5\text{cm}^{-1}/\text{pixel}$ (SR).

Wavelength calibrated with Hg/Ar & Ne standard lamp, Intensity calibrated with NIST Relative Raman Intensity Standard.

Three gain settings, 1X, 2X & 4X; 100KHz and 2MHz readout speeds- effective data capture to 10 milliseconds, 16 bit processing

System sensitivity: 995 cm^{-1} sodium sulfate peak \Rightarrow 21,000 units at 1X gain setting for 1 second acquisition at 100mW laser excitation.

Signal/noise: based on the ratio of the root mean square of baseline fluctuations at approximate saturation of cyclohexane peak at 801 cm^{-1} = 2782, see attached;

Laser linewidth is equal to or less than 0.18nm. Laser wavelength fluctuation is +/- 0.01nm; stability +/- 1% over 12 hours

Laser lifetime, approximately 10,000 hours. Temperature stability is 0.007nm/ $^{\circ}\text{C}$

L x W x H, 52 cm x 39 cm x 20 cm

Weight, 18.5 kg

LSI RamanSoft: Provides user control of **1)** Laser power from 1mW to 350mW, **2)** CCD integration time, **3)** CCD gain setting (P1), **4)** CCD readout speed, **5)** frame averaging with file merge for easy noise reduction. Complete set of user configurable algorithms for **6)** data normalization, **7)** smoothing and **8)** background removal. **9)** Real time analysis of peak intensity and **10)** peak areas as well as **11)** real time intensity and area ratio calculations. **12)** RealTime Monitoring (RTM) allows for monitoring 5 separate peak intensities or areas (or ratios) as fast as 10 milliseconds and at user defined intervals. GRAMS Spectral ID and GRAMS AI/PLS integration. All algorithms and modules are available for automation and user method development files.

Operational Specifications, Standard Configuration

LSI Dimension-P2 Raman Spectrometer;

High efficiency fiber coupled f/1.8, lens-based spectrograph with Princeton ISB: Peletier-TE-cooled (-19C) CCD, 24x24 micron pixels, 124x1024. Spectral coverages in cm^{-1} available from 40/125/200 to 2000(HR)/3000(SR) resolution $2.0\text{cm}^{-1}/\text{pixel}$ (HR), $3.0\text{cm}^{-1}/\text{pixel}$ (SR).

Wavelength calibrated with Hg/Ar & Ne standard lamp, Intensity calibrated with NIST Relative Raman Intensity Standard.

100KHz readout speeds- effective data capture to 50 milliseconds, 16 bit processing

System sensitivity: 995 cm^{-1} sodium sulfate peak \Rightarrow 18,000 units for 1 second acquisition at 100mW laser excitation.

Signal/noise: based on the ratio of the root mean square of baseline fluctuations at approximate saturation of cyclohexane peak at $801\text{cm}^{-1} = \sim 2000$.

Laser linewidth is equal to or less than 0.18nm. Laser wavelength fluctuation is $\pm 0.01\text{nm}$; stability $\pm 1\%$ over 12 hours; wavenumber stability equal to or better than 1cm^{-1} .

Laser lifetime, approximately 10,000 hours. Temperature stability is $0.007\text{nm}/^\circ\text{C}$

LSI RamanSoft: Provides user control of 1) Laser power from 1mW to 350mW, 2) CCD integration time, 3) CCD gain setting (P1), 4) CCD readout speed, 5) frame averaging with file merge for easy noise reduction. Complete set of user configurable algorithms for 6) data normalization, 7) smoothing and 8) background removal. 9) Real time analysis of peak intensity and 10) peak areas as well as 11) real time intensity and area ratio calculations. 12) RealTime Monitoring (RTM) allows for monitoring 5 separate peak intensities or areas (or ratios) as fast as 10 milliseconds and at user defined intervals. GRAMS Spectral ID and GRAMS AI/PLS integration. All algorithms and modules are available for automation and user method development files.

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| L x W x H | 39 cm x 25 cm x 15 cm |
| Weight | 10kg |