



# 4 Spec E

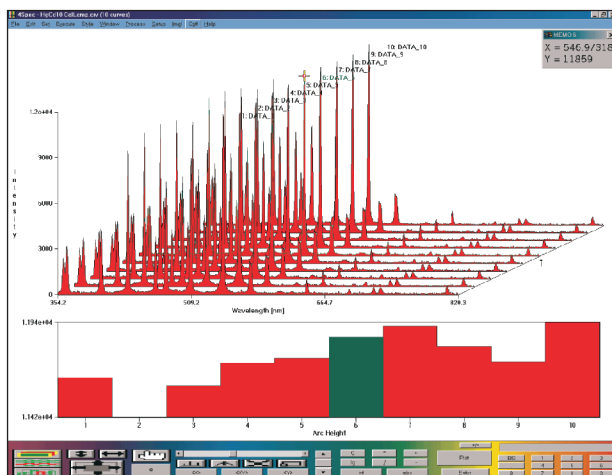
## Spectra Acquisition Software for pulsed and time resolved Spectroscopy

4 Spec E is a software application for the PCs with Pentium or subsequent microprocessor. It is designed for use with a frame grabber and any video camera for video imaging spectroscopy, where image data is grouped into bands that run either parallel or perpendicular to the video scan lines. Intensity data from each band may be plotted as intensity graphs, as pseudo-color or grayscale 16-bit/pixel images, or as a superimposition of image and intensity plots.

4 Spec E is designed to run under Windows 9x, ME or NT/2000/XP or subsequent on the IBM-PC. Analysis of stored curve data high-resolution plots as well as grayscale or full-color images can be printed to any IBM-compatible printer. Graphics can alternatively be achieved to a TIFF file for export to drawing or publishing programs. Data may also be exported as text or binary integers for entry into spreadsheets, image processing software, etc. The Data can also be output as real-time video into the Image Pro Sequence files (\*.SEQ).

4 Spec E also supports Dynamic Data Exchange (DDE) protocol as a DDE server for curve data.

Intensity data from an image may be grouped and summed for plotting into a maximum of 8000 different 16 bit per pixel linear arrays, called *curve memories*. Curve length is



adjustable up to 8000 pixels. 4 Spec E lets you choose the specific image rows to include in each curve, and supports arithmetic processing of curves and images.

4 Spec E offers a full range of camera-control and data-acquisition functions. Data for the full frame grabber image or a grouped image array can be acquired and viewed as grayscale or pseudo-color images, or as curves in a variety of 2D and 3D plot modes. Any type of image or plot can be repetitively scanned in live mode, yielding convenient, *real-time* data presentation. Real-time features include automatic dark-background image subtraction, automatic image flat-fielding, and live display of image pixel position and intensity.

4 Spec E is designed for real-time data acquisition with a PC or compatible computer incorporating a Pentium, or subsequent processor. 4 Spec E communicates with the installed hardware via a MS-Windows software driver which is included on the same disk. These drivers are available for a growing number of frame grabbers and slow scan data acquisition systems. If you wish to use a device which is not yet supported, please let us know. Not only are we continually adding additional drivers, we can also provide special drivers upon



# 4 SPEC

## Specifications

Sensitivity	more than 1 count/photoelectron/pixel. Up to 80 seconds integration time on CCD detector
Image configuration	1 line scan to 582 lines horizontal and vertical binning
Dynamic Range (with cooled detector)	More than <b>21 Bit</b> (2 Mio:1), all lines integrated (binned), dynamic expansion active.
Display options	Stores up to 30,000 curve memories in RAM, 32 Bit/pixel curve memories; 256 level gray scale or 256 level pseudocolor; 2-D and 3-D overlays; peak finder; wave length, wave number, and photon energy calibration image function for laser profile displays.

## Data Acquisition

From an 8-bit per pixel frame grabber image, rows and columns are selected for reading into a 16 bit/pixel computer image having 65.000:1 dynamic range. The exposure sequence is programmed by choosing the number of image frames (from one to many thousands) to be accumulated into 32bit/pixel curve memories for plotting. Any exposure may be externally triggered.

The user can include automatic static- or dynamic background subtraction, flat-field correction, and conversion to logarithmic or absorbance scales.

Depending upon computer speed and image size, up to 15 - 30 frames per second may be captured.

Acquire Real-time series . This command enables the scanning of a series of frames at video rate. All images, images segments, curves, etc. may be automatically saved to disk or RAM disk in real time.

**4Spec - Samples.crv (10 curves)**

File Edit Set Execute Style Window Process Setup Img! Cat! Help

**Import (Image Mode)**

- Raw Data to Image ...
- TIFF File to Image ...
- Text File to Curve(s) ...
- Text File to CAL Curve ...
- Color Palette ...

**Import (Curve/Catalog Mode)**

- Raw Data to Image ...
- TIFF File to Image ...
- Text File to Curve(s) ...
- Text File to CAL Curve ...

**Edit Edit (Curve Mode)**

- Undo Ctrl+U
- Clear
- Clear All
- Delete All Alt+Del
- Smooth Curve Ctrl+J
- Flatten Baseline Ctrl+K
- Convert to Int Ctrl+C
- Convert to Float Ctrl+C
- Paste Curve ...
- Reset Plot Layout

**Edit Edit (Catalog Mode)**

- Cut Shift+Del
- Copy Ctrl+Ins
- Paste Shift+Ins
- Delete Del
- Delete All Alt+Del

**Edit Edit (Image Mode)**

- Clear
- Clear All

**Set**

- General Settings ...
- Axes ... Ctrl+Y
- Auto Background Subtraction
- Auto Flat-Field Correct
- Auto Transform to Absorbance
- Auto Transform to Logarithm
- Auto Image Flip Horizontal
- Set as Background Curve Ctrl+B
- Set as Flat-Field Curve Ctrl+F
- Set as Abs. Blank Curve Ctrl+6

**Execute**

- Run Movie
- Create Overlay Plot ... F3
- Display Catalog Ctrl+M
- Run Scan Sequence Ctrl+R
- Acquire One Exposure Ctrl+E
- Acquire One Background Ctrl+D
- Repeat-Scan Curve(s) Ctrl+Z
- Repeat-Scan Image Ctrl+L
- Acquire Real-time Series ... F2
- Display Active Image Ctrl+A
- Display Background Image
- Display Flat-Field Image

**Process**

- Image -> Curve(s) F5
- Spike-Filter Image Ctrl+0
- Subtract Background Image Ctrl+3
- Flat-Field Correct Image
- Flip Image Horizontal
- Flip Image Vertical

**Style Style (Curve Mode)**

- Line Color ...
- Fill Color ...
- Image Color
- Contour Image
- Zero Y Origin Ctrl+7
- Calibrate Axes
- Title Ctrl+8
- Axes Ctrl+8
- Curve Bands on Image

**Style Style (Image Mode)**

- Line Color ...
- Fill Color ...
- Image Color
- Contour Image
- Zero Y Origin Ctrl+7
- Calibrate Axes
- Title Ctrl+8
- Axes Ctrl+8
- Curve Bands on Image

**Style Style (Image Mode)**

- Positive Ctrl+1
- Negative Ctrl+2
- Pseudocolor Ctrl+3

**Window**

- Controls Ctrl+W
- Information ... Ctrl+I
- Calibration ...
- Integrals ...
- Live Monitor ... Ctrl+V
- Camera Control ...
- HW Interface Setup ...

**Setup**

- Curve Memories ...
- Scan Summary ...
- Image Readout ... Ctrl+H
- Scan Sequence ... Ctrl+G
- Curve Definition ... Ctrl+N
- Memory Mode ...
- Auto Save ...
- Save Options ...
- Load Options ...

**Help**

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**Menu Commands**

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- Window Menu Commands
- Process Menu Commands
- Setup Menu Commands
- Img! Crv! Cat! Commands

**Control Palettes**

- Palette in Curve Mode
- Palette in Image Mode
- Palette in Catalog Mode

**How to ...**

- Use Background Subtraction
- Collect Absorbance Data
- Use Flat-Field Correction
- Make Selections in Catalog
- Change 3D View

**Appendix**

- Hot Keys
- DDE Support Overview

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# 4 Spec E

## Versatile and Adaptable Plotting

Two- and three dimensional overlay plots of curves may be generated with a single mouse click. The 3D plots have handles for dragging to resize the image and change the perspective. In addition, a Channel Profile plot which graphs intensity along a slice parallel to the Z axis may be added. Various plot choices available include line, bar scatter, and cityscape styles, with optional color fill.

## Displays

Images may be shown in real time with 256 levels of gray or in 256 level pseudo color and may be viewed in actual size or resized to fit the display window. The option, contour Image, transforms curve data into patterned, pseudo color image. In addition, 4 Spec E features a live laser-beam profiler display.

## Focusing

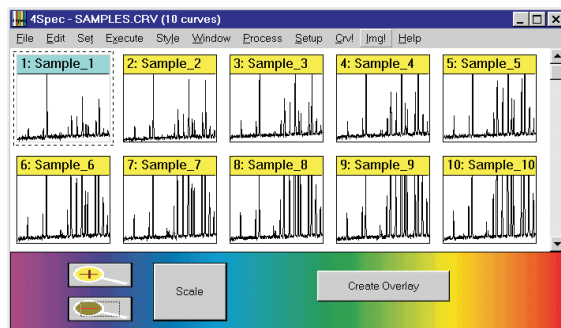
Adjustments to focus are simply done by using live-image or repeat-scan curve plot displays. The user is able to monitor the intensity of any pixel in real time in any image or plot with the moveable cursor. 4 Spec E employs a peak finder feature which can automatically monitor the positions, widths and areas of peaks in a curve during scanning.

## Super Zoom

Super Zoom uses the mouse to zoom and pan the curve plot displays in camera live action (even in 3D). This allows the user to zoom in and out and pan the display while scanning in real-time with the camera.

## Curve Catalog

This feature makes use of Curve Icons to give a single window view of all curve memories. A curve icon may be plotted by double-clicking a curve icon. To erase, drag to 'curve trash' and click. Curve icons may be cut, copied, and pasted to edit memories.



## Automatic Spike Filter

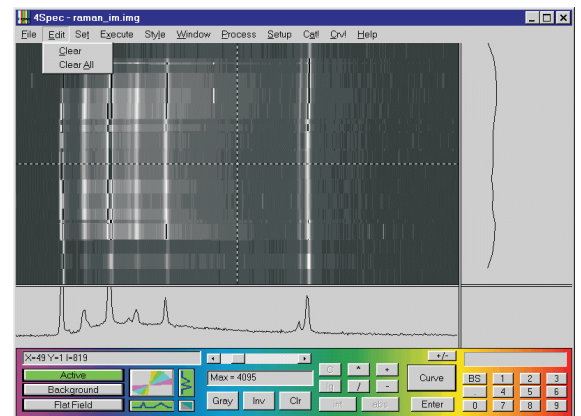
The automatic spike filter removes high energy events (electrical discharges and other interferences) from images acquired during long exposure.

## Export curve data

Export curve data may be in ASCII text format. Images may be exported in 16-bit binary or TIFF formats. Images may be imported from TIFF, or binary-integer-data files.

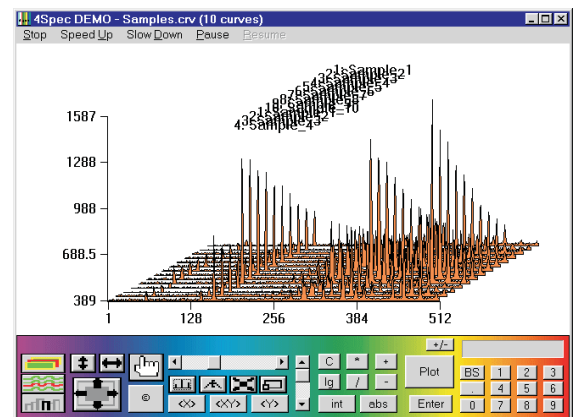
## Calibration

Spectra may be calibrated in wavelength, Raman cm-1 shift or other units with linear or cubic-spline-fits. Peak positions and widths are located with the 'intelligent' peak finder. Spectral sensitivity may be calibrated with a tungsten lamp.



## Movies and live scans

may be run as animated 3D waterfall graphs which dramatically show spatial or time evolution of spectral data.





# 4 Spec E

## Acquire Real-time series

This command enables the scanning of a series of frames at video rate. The frames are stored in the frame grabber buffer. Selected frames can then be transferred into the active image.

Execute	
Run Movie	
Create Overlay Plot ...	F3
Display Catalog	Ctrl+M
Run Scan Sequence	Ctrl+R
Acquire One Exposure	Ctrl+E
Acquire One Background	Ctrl+D
Repeat-Scan Curve(s)	Ctrl+Z
Repeat-Scan Image	Ctrl+L
→ Acquire Real-time Series ...	F2
Display Active Image	Ctrl+A
Display Background Image	
Display Flat-Field Image	

## Plots

Plots may be printed on any PC compatible printer, including color ink-jet printers. Plots may be pasted to the clipboard for copying into other documents.

## Frame grabber

Drivers for the following frame grabbers are available: MV-Gamma (4 Quik E/4 Picos, analog), MV-Titan (XXRapid Frame) and the MV-CL CameraLink for digital ICCD cameras are available.

## USB 2.0

For digital ICCD cameras with USB 2.0 no frame grabber is needed.

## Compatibility

**4 Spec E** works with both 60 Hz (EIA) or 50 Hz (CCIR) and CameraLink frame grabber versions, or with USB 2.0 without frame grabber..

**4 Spec E** also supports Dynamic Data Exchange (DDE) protocol as a DDE server for curve data.

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