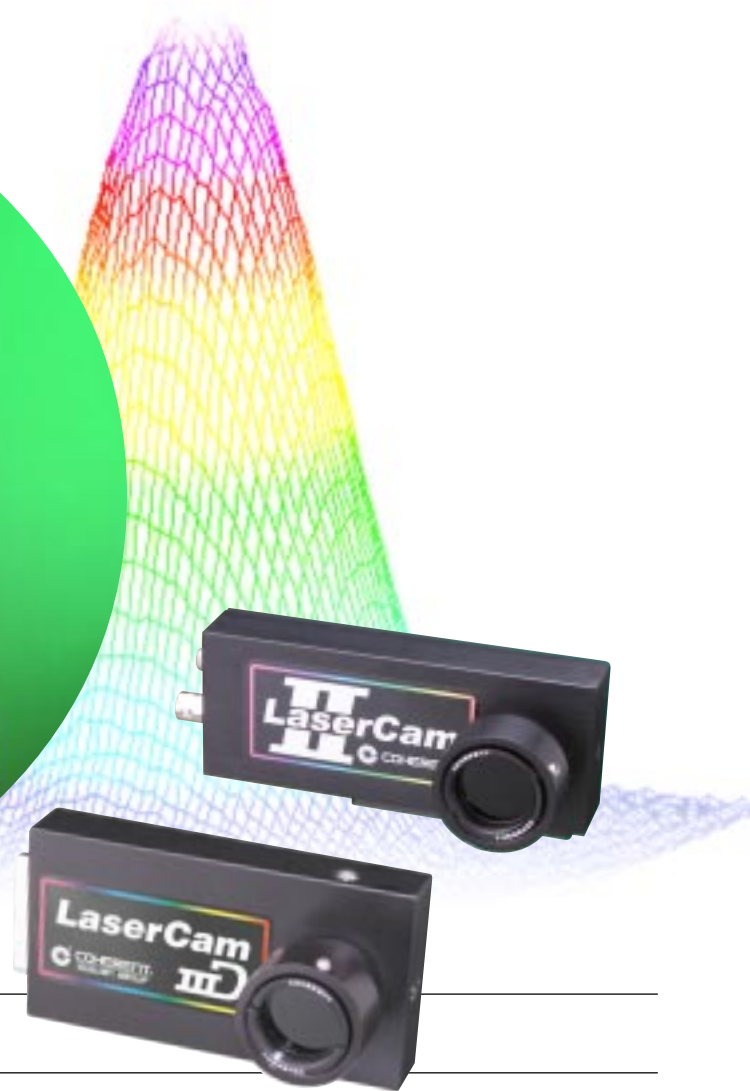
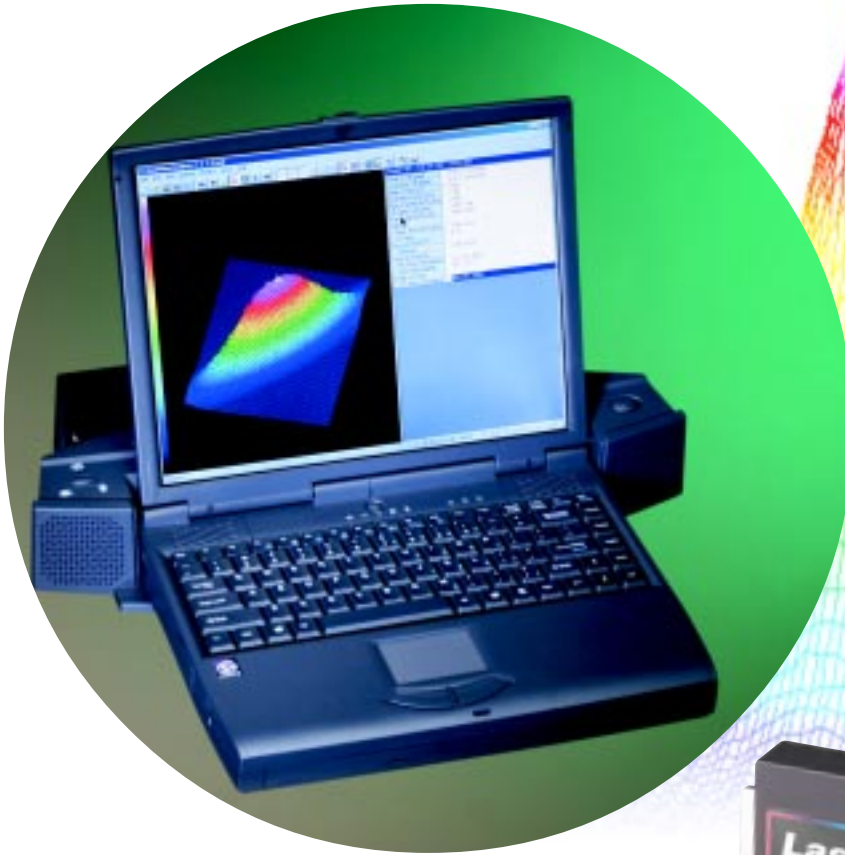




# BeamView™ Analyzer

## Laser Beam Diagnostic Systems



- Digital and Analog Camera Systems
- Refined Windows® software
- Extensive selection of laser beam diagnostic optics
- High speed PCI interface
- Turnkey systems and components

# Digital and Analog BeamView™ Analyzer Systems

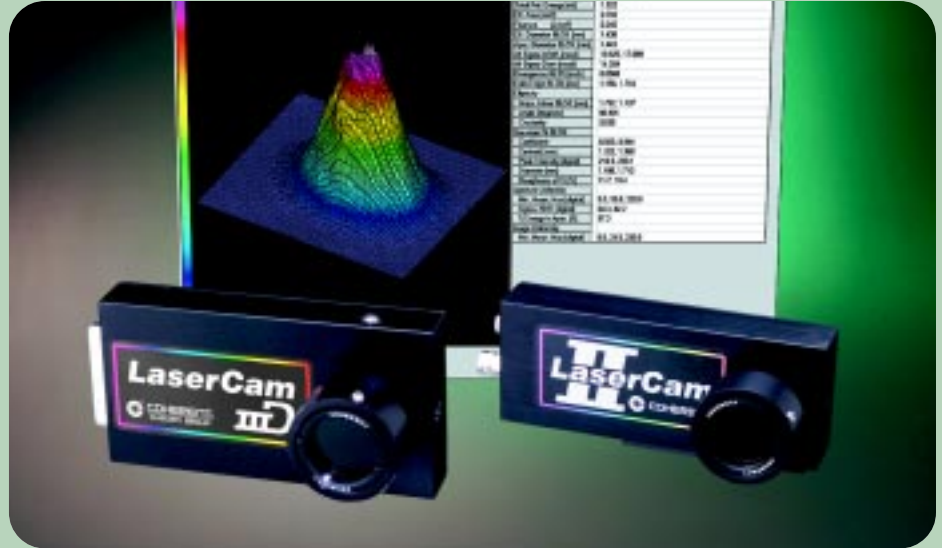
The BeamView™ Analyzer systems have been the recognized leader in software, hardware and optical components for laser beam analysis. Constant product improvement from customer feedback, and innovation from beam analysis experts, has made the BeamView Analyzer products the first choice for laboratory, factory and field measurements.

There are two versions of the BeamView Analyzer, a digital, and an analog camera version. Both versions have the same advanced software interface. Most applications are best handled by the Digital BeamView Analyzer system. In cases where the laser beam is large, from a fiber, raw laser diode, or in wavelengths beyond 1100 nm, the Analog BeamView Analyzer system provides a selection of proven analog laser diagnostic cameras (see back page). For detailed descriptions of the digital and analog cameras, see the **Beam Diagnostic Cameras** brochure.

## Digital BeamView Analyzer

The Digital BeamView Analyzer simplifies the setup and analysis of beams due to the increased optical dynamic range over traditional analog based video camera systems. Higher optical dynamic range means more accurate and consistent results. The Digital BeamView Analyzer utilizes Coherent's refined Windows® software and the 10 bit Digital LaserCam IIID. Coherent has engineered the LaserCam IIID specifically for laser diagnostics with 10 bit digital output and greater than 1200:1 optical dynamic range. The LaserCam IIID is available in 1/4 inch and 1/2 inch sensor format versions that are interchangeable and can be ordered separately as an option if more than one size is required for your needs (see back page for specifications).

The Digital BeamView Analyzer comes as a complete package ready to be incorporated into a PC compatible computer platform. The system includes the LaserCam IIID, Digital BeamView Analyzer for Windows® software,



digital PCI interface card, cables and manual. The BeamView Analyzer can also be ordered as a turnkey diagnostics system in a laptop or desktop computer configuration. Laser diagnostic grade image and attenuation optics are also available, see the **Beam Diagnostic Accessories** brochure.

## Analog BeamView Analyzer

The Analog BeamView Analyzer with PCI framegrabber is for use with RS-170 and CCIR analog video cameras. With six

standard analog diagnostic cameras available off the shelf (see back page), and many more available, almost any beam can be analyzed. Advanced optics, attenuation and customized cameras allow wavelengths from 10-2200 nm, and beams from tens of microns to 30 mm by 40 mm to be quantified. See the **Beam Diagnostic Accessories** brochure.

**For custom BeamView Analyzer Systems that match your exact needs, please call your Coherent representative today.**

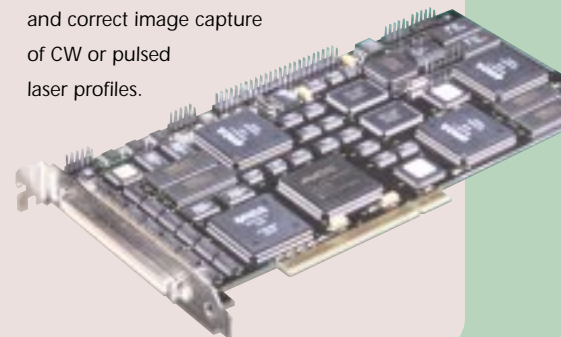
### Digital PCI Interface Card

With LaserCam IIID digital cameras, the "framegrabber" is inside the camera. The interface card is the communication, control and image data storage for the camera. Coherent has developed the LaserCam IIID and interface card specifically for laser beam diagnostics. This system is optimized for high optical dynamic range and saturation levels best suited to laser beam analysis.

### High Speed Framegrabber

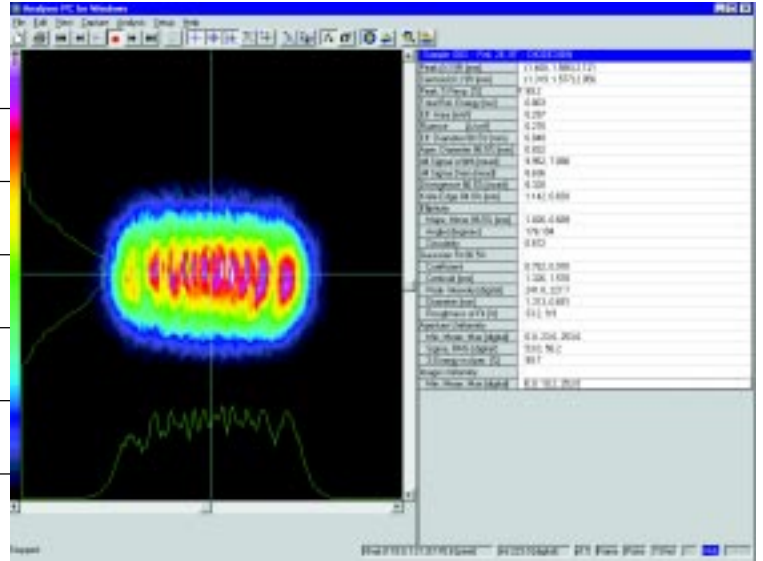
The framegrabber board, for interfacing the chosen analog camera to the controlling computer, has been specifically designed for capturing laser images from RS-170 or CCIR video cameras. The framegrabber can operate with up to four cameras connected.

The software can select any one of the four to be operational. The standard version of the framegrabber board, the Beam Vision Support Module (BVSM), is configured as a 1/2 length, 32 bit PCI bus card for operation with Windows® 95, 98, ME or NT. It contains a 2 Mb Video RAM buffer, temperature stabilization and special synchronization and gate timing electronics for fast, accurate and correct image capture of CW or pulsed laser profiles.



# BeamView™ Analyzer Software

- Over 25 numerical analysis functions
- 28 different profile views
- 13 image import and export formats
- Pass/Fail settings, alarms, configurable setups
- Refined, easy, intuitive interface
- Automatic background subtraction



## Beam Analysis and Statistics

The BeamView Analyzer software can determine the following parameters in a manner that is compatible with the International Standards Organization (ISO) standards for laser beam measurement: peak and centroid position of a beam, the beam ellipticity (and angular position of the ellipse and major/minor axes) and circularity, the  $D_4\sigma$  diameters and widths of the beam (together with slit and knife edge ISO equivalent beamwidth calculations), the Gaussian fit (coefficient, centroid and "roughness of fit"), the aperture fit and uniformity, the total/relative power in a beam, the peak power/energy density and the percentage power within an aperture.

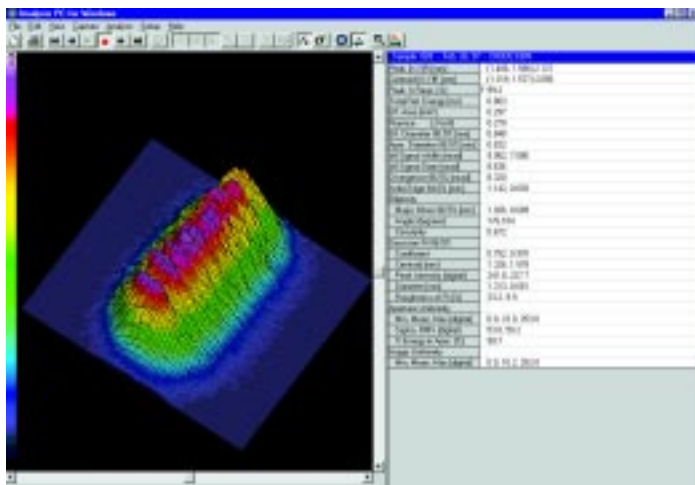
The system is not limited to analysis and display of ISO defined parameters. Many other parameters can be chosen and appropriately displayed in the **Results Area**. There is great flexibility since individual parameters can be selected for display or left out of view, units can be

customized, minimum and maximum alarm limits set and fault actions initiated by the alarms. Statistical analyses, standard profiles, pass/fail tests and QA procedures can be developed. The power and ease of use is best conveyed by our demonstration version of the software. The demonstration software comes with several stored images and can be customized to model anticipated measurement and diagnostic requirements. A free copy is available from your local Coherent representative, or download it from <http://catalog.CoherentInc.com>.

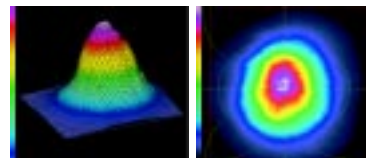
## 2D and 3D Intensity Plots

The Run command switches the BeamView Analyzer from the Stop or Live Video mode to continuous operation with capture, analysis and display of beam image data. In the view area of the computer monitor there is a choice of 2D and 3D images.

The 2D contour maps and the 3D isometric plots display laser beam intensity profiles in a choice of various color and gray-scale styles (fixed and autoscaling to a peak) and sizes (continuous zoom and pan control). The 2D maps can be shown with or without profiles (and Gaussian fit), reference position, variable aperture and rotatable crosshair (with auto peak and auto centroid location). The 3D isometric plots can be displayed with transparent, hidden or solid wires and rotated and viewed from different tilt angles.



BeamView Analyzer display with 3D image and ISO compatible results.

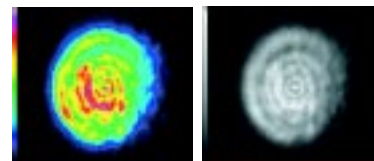


Choice of 3D and 2D images.

## Real Time Laser Monitoring and Alignment

The Live Video mode provides a continuously updated image of the beam (~20-25 Hz, depending on the speed of the Pentium processor in the host computer), displayed in shades of gray or pseudo color. This mode is ideal for monitoring the laser and observing changes in the form and structure of the beam as it is adjusted. It is perfect for real time tuning to achieve optimum beam profile quality and

laser-cavity alignment. While operating in this mode, beam and statistical data is not displayed, but if Run is activated, the image is stored and can be further analyzed.



The Live Video mode.

## Performance Optimization

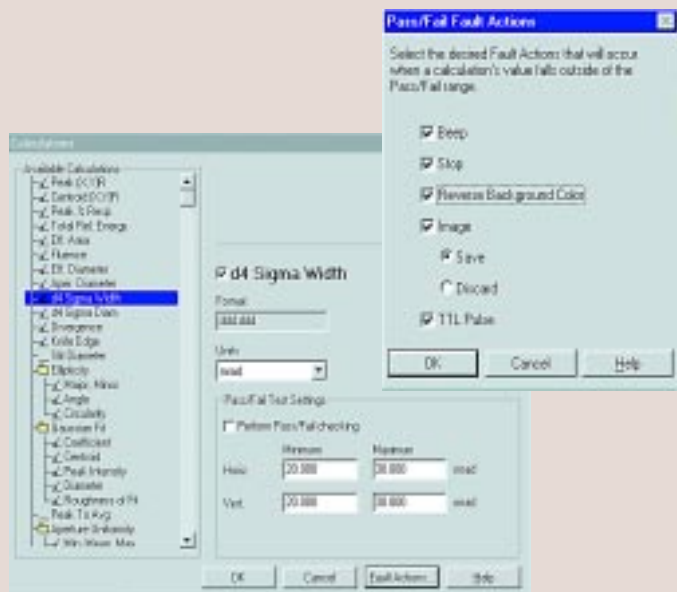
The BeamView Analyzer software provides several functions to insure system performance is optimized to take full advantage of the optical dynamic range available in the camera to achieve maximum measurement accuracy. First, the Automatic A/D Offset and Gain adjust feature (analog systems only) insures the A/D converter on the frame grabber board is properly adjusted to match the maximum video signal and background noise level for the analog camera being used. Second, the Automatic Background subtraction feature measures and stores the background noise "image" and automatically subtracts individual pixel noise levels from all subsequent laser images prior to analysis. Finally, the system can automatically monitor the background noise level to warn of any changes that may effect measurement accuracy.

## Beam Stability

The continuous on-line statistical analysis display shows results of all or a combination of functions and pass/fail parameters for all captured samples and accumulated results. The user may scroll through the analysis results of individual images, and also view the minimum, maximum and sigma (standard deviation) values. This makes the task of comparing individual samples to the time dependent statistical data extremely easy. Thus, the jitter and stability of parameters, such as power, energy, pointing direction, ellipticity and beam size, etc., can be analyzed along with a polar beam wander plot.

### Pass/Fail Analysis

Pass/fail analysis allows simultaneous on-line monitoring of all or any of the analysis results against user specified minimum/maximum (pass/fail) limits. All or a combination of the fault actions can be taken upon test failure: initiate visual alarm, initiate audio alarm, stop data capture, reject/save failed sample and production of a TTL trigger pulse output.



### Characterizing Pulsed Lasers

The BeamView Analyzer can easily capture, display and analyze pulsed laser images with three modes of operation to choose from. In the Auto mode, the capture is triggered by any incoming image with a peak intensity above a pre-selected trigger level. With Synchronous mode, the laser is both synchronously triggered with a TTL pulse from the framegrabber board. With Asynchronous mode, the user provides a TTL pulse to the framegrabber to initiate capture of the laser image. These three triggering modes, when combined with the five capture modes (continuous, time interval, pulse count, on command and single shot), allow for the capture of the image of almost any CW or pulsed laser (up to 10 kHz pulse repetition rate with the appropriate camera).

Sample	Power	Energy	Power	Energy	Power	Energy
1	1.100E+000	1.100E+000	1.100E+000	1.100E+000	1.100E+000	1.100E+000
2	1.100E+000	1.100E+000	1.100E+000	1.100E+000	1.100E+000	1.100E+000
3	1.100E+000	1.100E+000	1.100E+000	1.100E+000	1.100E+000	1.100E+000
4	1.100E+000	1.100E+000	1.100E+000	1.100E+000	1.100E+000	1.100E+000
5	1.100E+000	1.100E+000	1.100E+000	1.100E+000	1.100E+000	1.100E+000
6	1.100E+000	1.100E+000	1.100E+000	1.100E+000	1.100E+000	1.100E+000
7	1.100E+000	1.100E+000	1.100E+000	1.100E+000	1.100E+000	1.100E+000
8	1.100E+000	1.100E+000	1.100E+000	1.100E+000	1.100E+000	1.100E+000
9	1.100E+000	1.100E+000	1.100E+000	1.100E+000	1.100E+000	1.100E+000
10	1.100E+000	1.100E+000	1.100E+000	1.100E+000	1.100E+000	1.100E+000

Continuous on-line statistical analysis display.



# BeamView™ Analyzer Software Features

## Analysis, On-Line Pass/Fail Tests

- Centroid position/wander
- Peak intensity/position
- Peak energy/power density
- Relative energy/power
- Effective area
- Peak-to-average intensity
- Beam diameter/widths (selectable):
  - Second moment (d4Sigma)
  - Knife edge
  - Slit
  - Aperture diameter
  - Effective diameter
- Divergence at % energy/power
- Gaussian fits with:
  - Correlation coefficient
  - Diameter
  - Centroid
  - Peak intensity
  - Fit roughness
- Ellipticity at intensity slice:
  - Major/minor axis diameter
  - Circularity (minor/major)
  - Axis orientation (rotation)
  - Auto align profiles to axis
- Aperture analysis for circular, square, rectangular and elliptical:
  - % energy/power in aperture
  - Uniformity in aperture
  - Aperture/diameter tracking
- Selectable calculation area
- On-line statistical analysis (all results):
  - Minimum, average, maximum
  - Sigma (Std. deviation)
- Pass/Fail test with fault action (all results):
  - Ratio
  - Audio/visual alarms
  - Save/reject images
  - TTL pulse out
  - Stop data capture
- Image Averaging

## Interactive Display Functions

- On-line help
- Control of cursors, profiles, aperture, position, rotation and size
- Run/stop data analysis
- Stored image paging
- Reference profile select
- Reference coordinate set
- Background subtract
- Live video on/off
- Zoom/pan size/position
- Image and profile autoscale modes
- Auto peak/centroid locate
- A/D converter control
- "Hot" function keys

## Standard Graphics Feature

- Contour map with profiles/aperture overlay:
  - 220 color, 17 color, 220 gray shade or 15 colors with 13 shades
- Live video mode
- Profile/peak/centroid position cursor
- On/off axis simultaneous display of:
  - Position cursor
  - Cross section profiles
  - Gaussian fit profiles
  - Reference profiles
  - Aperture overlay for:
    - Beam uniformity
    - % energy/power
- Calculation inclusion area display
- Rotatable color 3D isometric plot
  - 360°, 90° rotate/tilt
  - Hidden/transparent wire
  - Selectable wire density
  - Solid or single color
  - Auto rotate mode
- Graphic zoom and pan
- Auto-scale 2D or profile intensity
- Polar beam wander plot

## Image Capture and Storage

- Pulsed or CW analysis
- 3 trigger modes:
  - Autotrigger to selected level
  - Asynchronous (trigger input)
  - Synchronous (trigger output)
- 3 resolution modes RS-170:
  - Frame (752 x 480 pixels)
  - Full Field (376 x 240 pixels)
  - Half Field (188 x 120 pixels)
- 5 capture modes:
  - Continuous
  - Time interval
  - Pulse count
  - On command
  - Single shot
- High speed sample mode capture
- Image storage to:
  - Frame grabber video memory
  - PC hard drive
  - PC RAM drive
- Profile storage
- Capture area pan
- 4 channel (camera) analog video input
- Configuration storage with password protection
- Image data file formats in bin, img, bmp, eps, jpg, pct, pcx, png, psd, ras, tga, tif, wpg
- Data file compression

## Calibration Functions

- Fully automatic background map correction (pixel-by-pixel) with bias offset
- Automatic background monitor and alert
- Automatic A/D offset/gain set (analog BeamView Analyzer System)
- Optical scale factor (magnification)
- Far field optic focal length
- Camera pixel size (Horz. and Vert.)
- Energy/power calibration factor

# Digital and Analog Camera Selection Chart

For a more detailed description of cameras, see the **Beam Diagnostic Cameras** brochure.

Camera Name	LaserCam IIID 1/2"		LaserCam IIID 1/4"		LaserCam II 1/2"		LaserCam II 1/4"		C-48		C-64		E-7290	
<b>Format***</b>	Digital Interline Transfer CCD 736(H) x 484(V)		Digital Interline Transfer CCD 736(H) x 484(V)		Analog RS-170 Interline Transfer CCD		Analog RS-170 Interline Transfer CCD		2/3" Analog RS-170 Frame Integration CCD		1/2" Analog RS-170 Frame Integration CCD		Analog RS-170 Vidicon	
<b>Wavelength Range</b>	190-1100 nm		190-1100 nm*		190-1100 nm		190-1100 nm*		190-1100 nm		190-1000 nm		400-1800 nm (400-2200 nm Optional)	
<b>Maximum Active Sensor Area (mm)</b>	Horz.	Vert.	Horz.	Vert.	Horz.	Vert.	Horz.	Vert.	Horz.	Vert.	Horz.	Vert.	Horz.	Vert.
	6.4	4.8	3.6	2.7	6.4	4.8	3.6	2.7	8.8	6.6	6.4	4.8	12.5	9.4
<b>Digitized Resolution:</b>														
Frame Mode (µm)	8.5	9.8	4.8	5.5	8.4	9.8	4.8	5.6	11.5	13.5	8.5	9.8	17.3	19.5
Full Field Mode (µm)	17	19.6	9.6	11	16.8	19.2	9.6	11.3	23	27	17	19.6	34.6	39
Half Field Mode (µm)	34.1	39.3	19.2	22	33.6	39.2	19.2	22.6	46	54	34	39.2	69.2	78
Minimum Beam Size (mm)	0.34	0.40	0.19	0.22	0.34	0.40	0.19	0.22	0.46	0.54	0.34	0.40	0.69	0.78
<b>Dynamic Range</b>	>1200:1		>1200:1		250:1		250:1		300:1		250:1		300:1	
<b>CW Saturation</b> (mW/cm <sup>2</sup> at 632.8 nm)	0.5		0.5		0.8		0.8		0.5		0.2		10	
<b>Pulsed Saturation</b> (nJ/cm <sup>2</sup> at 632.8 nm)	9.1		9.1		9.1		9.1		9.1		6.5		1000	
<b>Electronic Shutter (ms)</b>	30, 60-1500 (continuous adjustment)**				16.6 (open shutter), 10, 8, 4, 2, 1, 0.5, 0.25, 0.1				N/A		16.6, 1, 0.5		N/A	
<b>Field Rate (Hz)</b>	60		60		60		60		60		60		60	

\* The 1/4" version can not be used with pulsed beams from 900 to 1100 nm. \*\* CW operation only. \*\*\* CCIR versions of some analog cameras are available. Other camera configurations are available upon request.

The LaserCam IIID Digital Cameras are included with the purchase of the Digital BeamView™ Analyzer System. Additional digital cameras can be ordered as an option.

All Analog Beam Diagnostic Cameras are factory configured for use with the Analog BeamView™ Analyzer System.

### Minimum Computer Requirements

- Windows® 95, 98, ME, or NT 4.0
- 1 free PCI slot for 2/3 length card
- Pentium 166 MHz
- 64 Mb of RAM
- 40 Mb free Hard Disk Space
- SVGA graphics card and display

ISO 9002 Certified

### Digital BeamView Analyzer Beam Diagnostics System

Catalog Number		Description
120 VAC	240 VAC	
33-6990	33-7014	Digital BeamView Analyzer & 1/4" Sensor LaserCam IIID
33-7006	33-7022	Digital BeamView Analyzer & 1/2" Sensor LaserCam IIID

Includes digital camera and interface card, software, manual, and cables. Analog cameras are not compatible with the Digital BeamView Analyzer.

### Analog Beam Diagnostic Cameras

Catalog Number		Description
120 VAC	240 VAC	
33-3120	33-3138	1/2" Sensor LaserCam II and Power Supply
33-2965	33-2973	1/4" Sensor LaserCam II and Power Supply
33-3153	33-6701	C-48 and Power Supply
33-3162	33-6720	C-64 and Power Supply
33-3260	33-3765	E-7290 and Power Supply

### Analog BeamView Analyzer Beam Diagnostics System

Catalog Number	Description
33-2700	Analog BeamView Analyzer System, with PCI Framegrabber/Interface Card

Includes software, framegrabber/interface card, manual and cables. **The user must also choose an appropriate camera.**

11/00



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