

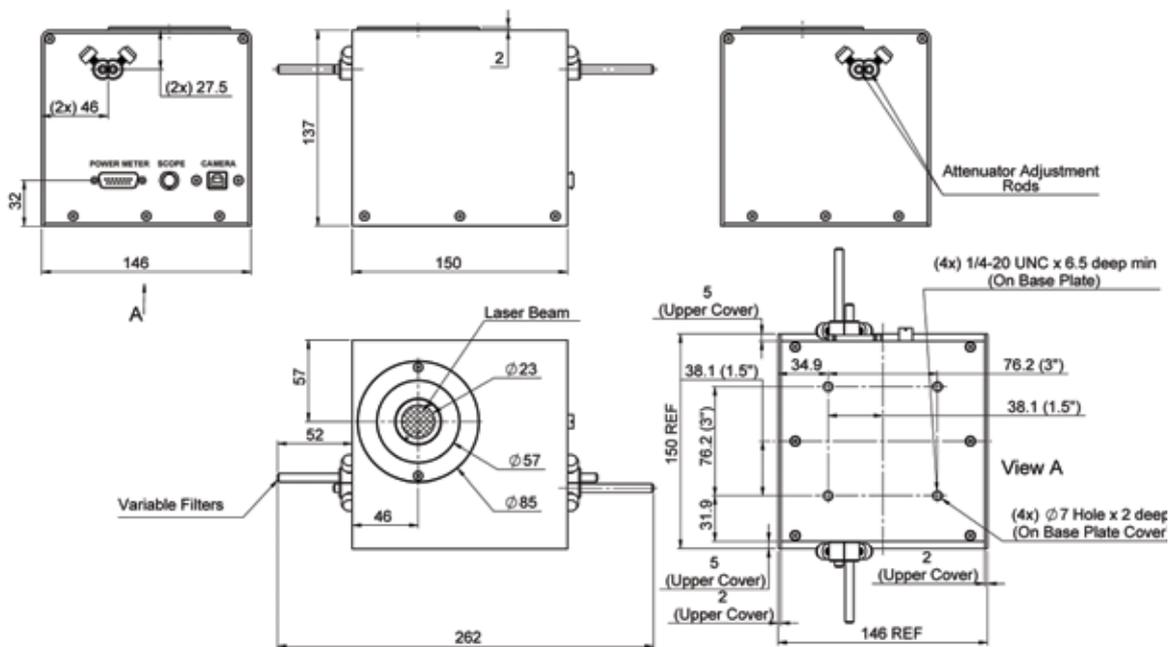
## 3.7 Integrated Laser Performance Measurements

### 3.7.1 Beam Cube - everything in one to verify consistent operation of your laser process; laser beam profile; power, pulse shape and spot size at or near focus

#### Features

- Monitor all important beam parameters to keep tight control over process
- Beam Cube measures beam profile, focal spot position, temporal pulse shape and power, up to 150W
- Portable - can be moved from laser to laser to monitor all lasers in plant
- For measuring at or near focal spot

#### Beam Cube

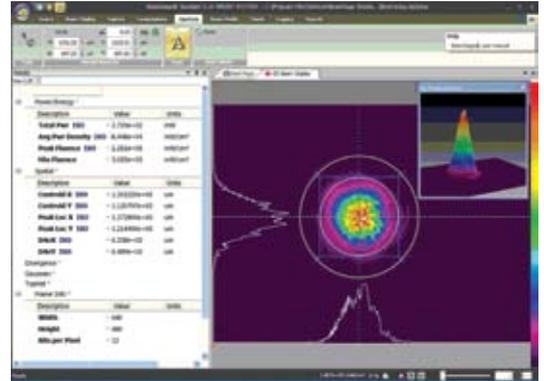


If you are an industrial laser user, you are well aware with the concept that time is money. And when it comes to maintenance on your laser, this principle certainly applies. However, you also know that maintaining your laser is a must if you want to ensure that your process is as efficient and consistent as possible.

Ophir-Spiricon's BeamCube product is about as simple a product as they come. It is a device that has integrated laser power or single-pulse energy measurement, focused spot analysis, and temporal pulse shape measurement all within one black box. The user of a BeamCube can measure the focused spot down to 60  $\mu\text{m}$ , average power up to 150W or 100J per pulse, and pulse widths as short as nanoseconds in duration.

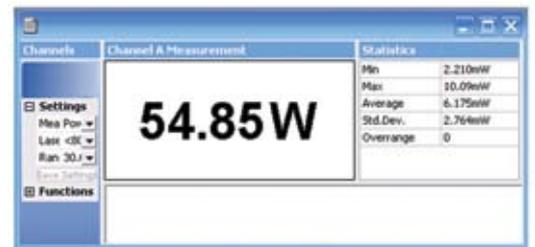
## Spatial Beam Profile

BeamCube comes with BeamGage-Standard, the most popular laser beam profiling software on the market. Accurate measurements of the beams size, shape, uniformity or approximation to the expected power distribution, as well as its divergence and mode content can easily and quickly be made and stored for future reference.



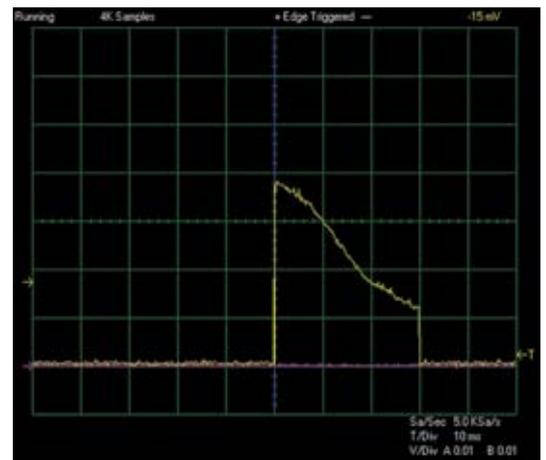
## Average Laser Power

With the built-in thermal power sensor you can measure, collect and store average power measurements within +/-3%, NIST traceable.



## Temporal Pulse Shape

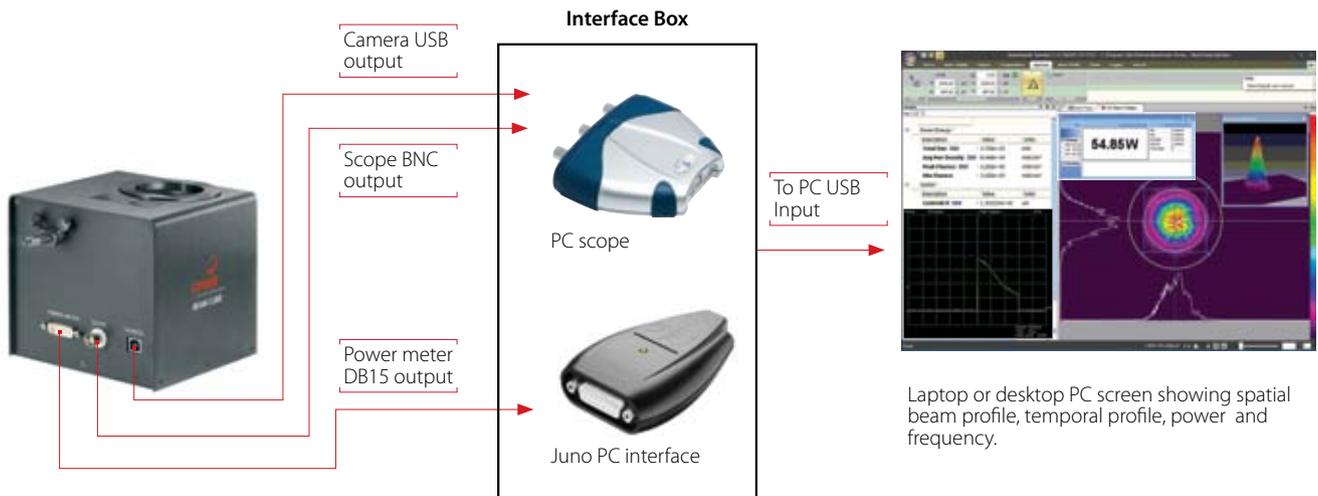
The temporal profile of laser pulses, important in obtaining consistent process results can also be measured using the built-in PC oscilloscope. You can display the pulse shape alone or together with the beam profile on your PC.



## Store and Compare Data and Statistics

Important for consistent laser process verification, measurements and statistics can be stored and later retrieved for comparison to subsequent laser performance.

## Schematic setup of a Beam Cube system

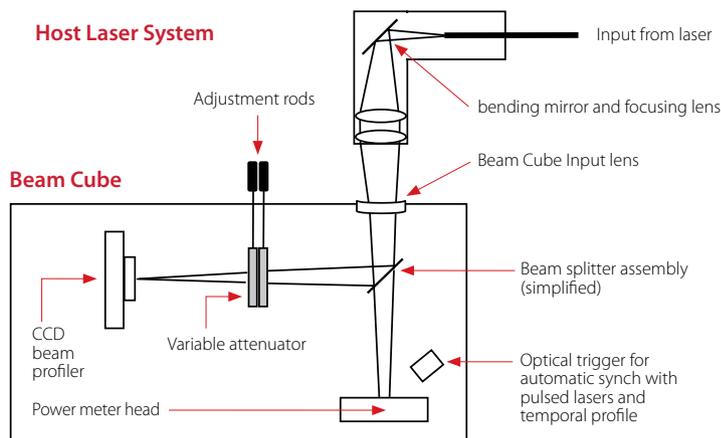


## Beam Cube Interface Box

Beam Cube Interface Box illustrated here that contains the Juno, PC scope and USB hub inside. The output of the box is 1 USB connection to the PC.



## Simplified Schematic of Operation of Beam Cube System



## Specifications

General		Beam Cube
Max and min average power		1W to 100W continuous and to 150W for up to 1 min
Maximum average power density <sup>(a), (c)</sup>		4kW/cm <sup>2</sup> at entrance window
Max and min energy		20mJ <sup>(b)</sup> to 100Joules
Maximum energy density and repetition rate at entrance window vs. pulse width	pulse width	max energy density
	10ms	20J/cm <sup>2</sup>
	2ms	5J/cm <sup>2</sup>
	0.5ms	1.5J/cm <sup>2</sup>
Cooling System		Conduction cooled
Dimensions		22cm L x 16cm W x 14cm H
Spectral Range		400 - 1100nm (calibrated for 1064nm)
<b>Beam profiler unit</b>		
Camera		SP620 1600x1200 pixel camera with 4.4µm spacing
PC interface		USB2
Shutter speeds		Continuously variable 1/frame rate to 1/6,000, manual or automatic
Gain control		0dB to 27dB in ~700 steps (each step is ~0.035dB). Manual or automatic control
Frame rate at 640x480 pixel ROI		20Hz. Auto synch with laser
Software features		Automatic gain and shutter control. Peak and Centroid position tracking. 2D and 3D contour map. Sophisticated noise and background control. Best fit to gaussian or top hat profile 3D display viewable from any angle or elevation. Store and recall screens in single or video fashion. 3 different measures of beam width, of peak, 4 sigma and 90/10 knife edge. Save numerical data files of profiles. Log data with time. Full on line instructions and help. Fully flexible screen format.
Minimum PC system requirements		GHz Pentium, min 2GHz RAM, windows 7 (32/64), Laptop or Desktop
Intensity adjustment		Continuously variable filters actuated from outside the unit.
<b>System optical performance</b>		
Field of view		±6°
Maximum beam size		Ø22mm at entrance for converging beam, Ø7mm for collimated beams
Beam reduction or expansion		Expanded 2-3X . With no lens 1X
Resolution		~5µm
Power / energy / temporal profile unit		
Temporal pulse shape response time into oscilloscope		<5µs Response Time
Software functions when connected to PC or laptop		average power, statistics, graphs
Data logging		Can send unlimited number of points in real time to PC via USB Interface at >1000 point/s. Windows software provided for data analysis.

Notes: (a) The power density limitation applies to any surface that the beam hits. For Beam Cube, since the object plane is outside the instrument, focal spots of much higher power density can be imaged as long as the power density limit on the optical surfaces is not exceeded.

Notes: (b) The Beam Cube will not resolve pulses of energy below 20mJ unless the pulse rate is high. If the energy deposited in 1/50th of a second exceeds 20mJ, then the unit will be able to show the pulses even though the individual energies are below 20mJ.

Notes: (c) If the beam power or energy density on the entrance window exceeds specifications, the window can be removed and not used, assuming that the power and energy density on the first beam splitter is below the damage threshold.

## Ordering Information

Item	Description	Ophir P/N
Beam Cube 620	Beam Cube system for beam profile, average power, and pulse shape. Interface box includes Juno USB interface for transmitting power, oscilloscope interface and USB hub for single USB connection to PC. Uses SP620 beam profiling camera and BeamGage-STD.	SP90323
Optional -50mm lens assembly	Optional -50mm lens assembly for Beam Cube	SP208255
Optional PC interface box	Interface box is included in BeamCube system above. The option is for legacy customers before bundling the interface with the BeamCube system	SP90332