

3.9 Additive Manufacturing Systems

Additive manufacturing (AM) has restructured how prototype, developmental and advanced design mechanical components are made. Direct Laser Melting, Selective Laser Sintering or 3D Metal Printing is quickly becoming the standard for designs that could not be fabricated with traditional metal removing techniques. To create consistent, strong structures using laser-based additive manufacturing processes that meet aviation DOD standards or medical device FDA requirements, the metallurgy must be consistent, and a laser beam of known dimension, power density and focal spot location is required. Quality 3D laser printed processes require a laser delivering the correct amount of power, distributed correctly and focused at the correct location. To insure consistent and structurally sound parts these parameters should be directly measured before and after any critical part is made.

As AM systems have gained in popularity for the mass production of metallic parts, the components produced are becoming larger in size while having finer details. This requires increasing AM chambers, having larger powder platforms and longer laser focal lengths. Simultaneously,



they are equipped with more powerful lasers having smaller focal spots.

Ophir instruments designated for AM systems meet the accuracy requirements of modern AM chambers and lasers, allowing accurate measurement of focal spot size and position, laser profile, and power distribution. They measure how those parameters change with time as well, to assist maintenance of quality and repeatability of the manufactured parts.

Model	BeamPeek™	BeamWatch® AM
Wavelengths (nm)	532, 1030-1080	1060-1080
Maximum power (Watt)	1000	1000
Minimum Focal Spot (µm)	34.5	50
Cooling	Passive	Fan
Analysis		
M² (Caustic)	√	√
Rayleigh length	√	√
Focal Spot location	√	√
Beam Profile	√	√
Power	√	√
Software	BeamPeek Software, BeamGage Pro	BeamWatch
Part Number	SP90609	SP90470

3.9.1 BeamPeek™

Beam Profiling and Power Meter for AM Industry

The BeamPeek laser beam profiler and power meter allows simultaneous beam profiling, focal spot analysis, and power measurement of additive manufacturing (AM) lasers. It integrates both beam profiler, power meter, optical beam sampling system and beam dump. The electronics, beam splitters, and optics, as well as the SP932U CMOS camera and power meter are safely confined in separate chamber. The beam dump is integrated into an easily replaceable tray without the need for active cooling using air or water.

- Focal spot size and position, Laser Beam Profile, and Power
- Multimode and single mode lasers
- Rugged for industrial production environment and metallic powder
- Doesn't require water or air cooling
- Fits AM chambers with 150-800mm focal lengths

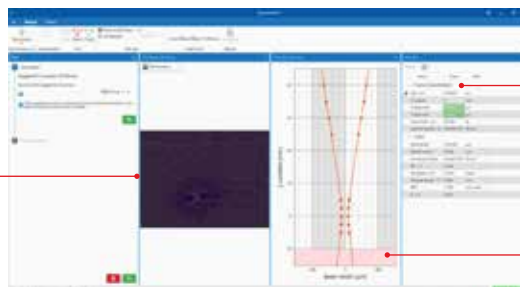
BeamPeek



Software Features

Features	
Measurements	Beam Diameter (ISO) Z locations X Alignment Y Alignment Total Power (ISO) Average Power Density (ISO) Ellipticity (ISO) Waist Diameter (ISO) Waist Location (ISO) Power Density at Waist (ISO) M ² (ISO) K (ISO) Divergence (ISO) Rayleigh Length (ISO) BPP (Beam Parameter Product)
User Interface	Intuitive access and usability as well as the option to hide controls Flexible Display Environments
2D display	Real-time representation of the intensity distribution within the beam Selectable Color Palettes designed to work with variety of safety eyewear
Caustic Display	Displays beam diameter along the propagation Select a point to display frame results from that plane Displays Danger zone for safe operation
3D Beam Display	3D representation of beam constructed from all saved frames
Calculations	Frame Results (Beam Diameter, Z location, X Alignment, Y Alignment, Total Power, Average Power Density, Ellipticity) Laser Results (Waist Diameter, Waist Location, Power Density at Waist, M ² , Divergence, Rayleigh Length, BPP, K) Supported Beam Diameter Calculations <ul style="list-style-type: none"> • D4σ • % Peak (13.5% clip level) • EPSA (86.5% clip level)
Single Page Report	Setup information Results Caustic Display 3D Beam Display

This window displays the 2D or 3D beam profile.



This window displays quantitative measurements of the laser parameters. These include waist width, beam widths, M², K, power density, divergence angles, Rayleigh range, and other parameters shown.

The Caustic Display shows the X and Y beam widths plotted against the Z axis locations.

Specifications

Model	BeamPeek
Beam Profiling, Power Meter and Beam Dump	
Wavelengths	532nm, 1030 - 1080 nm
Spot size (min - max)	34.5µm - 2mm
Maximum power	Multimode: 1000W Single mode: 1000W at 1064nm 700W at 532nm
Minimum power	10W
Measuring rate	24fps
Maximum spot size at entrance	10mm
Maximum incidence angle	0.5°
Operation time	2 min at 1000W
Camera position from bottom plane ⁽¹⁾	Nominal 76.54mm
Accuracy	±3% at 532nm & 1064nm ±5% for 1030nm to 1080nm
Response time	<3s
Cooling	Passive
Software	
	BeamPeek™ Software ⁽²⁾
Calibration Certificates	
Power sensor	NIST traceable
JUNO USB converter	NIST traceable
Camera position from bottom plane ⁽¹⁾	Test Certificate ±100 µm
General	
Communication and power ⁽³⁾	USB 3.0
Storage temperature	-30° C to 65° C
Storage humidity	95% maximum (non-condensing)
Operating temperature	10° C to 40° C
Weight	~9.5 kg
Dimensions	190mm x 190mm x 175mm
Compliance	CE, UKCA, China RoHS
Ordering Information	
Part Number	SP90609

Notes: (1) Nominal value, may differ from item to item due to assembly and camera tolerances; actual value is on COC, calibration sticker, ± 100µm
(2) BeamPeek can also be used with BeamGage Professional, StarLab, and BeamPeek Tools
(3) Comes with 2m cable, 15m active USB 3.0 cable P/N: 7E11214 available on request as accessory

Accessory Ordering Information

Item	Description	P/N
Beam-Dump Cartridge	Replicable beam dump cartridge for BeamPeek	SP98005

BeamPeek Drawing

