



IceFyre®

Component Selection Guide



IceFyre® redefines picosecond micromachining lasers with a patent-pending design to achieve exceptional performance and unprecedented versatility at industry-leading cost performance. Based on Spectra-Physics®' It's in the Box™ design, IceFyre integrates laser and controller into the industry's smallest package.

The laser's unique design exploits fiber laser flexibility and Spectra-Physics' exclusive power amplifier capability to enable TimeShift™ ps programmable burst-mode technology, wide adjustability of repetition rates, very good pulse-to-pulse energy stability and industry smallest pulse separation within a burst. A standard set of waveforms is provided with each laser; an optional TimeShift ps GUI is available for creating custom waveforms. The laser provides pulse-on-demand triggering with the lowest jitter in its class for high quality processing at high scan speeds, e.g. when using a polygon scanner. Picosecond material processing is highly material dependent and IceFyre's processing flexibility leads the industry for best price-performance.

IceFyre is designed, built, and tested to stringent quality standards for reliable continuous operation in demanding 24/7 manufacturing environments. IceFyre lasers' automatic data logging software monitors all key laser performance parameters over the life of the laser, providing a powerful service/preventative maintenance diagnostics feature and product reliability tool. A customer version of this software is also available.

Recommended Optics & Optomechanics

It is critical to choose the right optics and optomechanical components that work best with your IceFyre laser. IceFyre's high IR peak power necessitates optics that have a high damage threshold. MKS Newport offers a wide selection of the highest quality optics and optical components covering the entire spectrum UV, VIS, NIR and IR wavelengths to help you with your most challenging applications. In addition, for more than 30 years, we have manufactured the world's most comprehensive line of optical mounts and mechanics. Our precision optomechanics help our customers stay at the leading edge. MKS also offers LaserClean™ components for low-contamination applications.

Please use the following recommendations to determine which components best serve your needs. If you need help making a selection or have questions about the following tables, please contact us at tech@newport.com.

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Recommended Optics & Optomechanics

Optics				Optomechanics		IceFyre Model
Optics Type	Part Number	LIDT	Description	Mount P/N	Mount Description	1064-50
 Mirrors	10QM20HM.15	45 J/cm ² @ 1064 nm, 10 ns, 20 Hz	1" dia Mirror, 45° AOI	SN100C-F2K	Suprema Clear Edge Mirror Mount, 1.0 in., (2) 127-TPI Locking Hex Key	•
	10Q20HE.1	40 J/cm ² @ 1064 nm, 20 ns, 20 Hz	1" dia Mirror, 45° AOI	9814-6	Stability Top Adjust Mirror Mount, Nickel Plated, 1.0 in., 2 Allen-key	•
 Polarizing Cube Beam Splitters	05BC15PH.9	10 J/cm ² @ 1064 nm, 10 ns, 10 Hz	0.5" Polarizing Cube BS, High Power	9481(-M)	Pint-Sized Prism Mount, 0.25 to 1.00 in., ±3.5°, 8-32 (M4)	•
 Waveplates	05RP02-34	2 J/cm ² @ 1064 nm, 10 ns, 10 Hz	1/2" dia zero order 1/2 waveplate	(M-) MT-RS	Polarizer Rotation Mount, 0.5 in., 5° Grad, 0.5° Sens., 8-32	•
	10RP02-34	2 J/cm ² @ 1064 nm, 10 ns, 10 Hz	1" dia zero order 1/2 waveplate	RSP-1T	360° Continuous Rotation Stage, 1 in Aperture, Coarse & Fine Adj.	•
	05RP04-34	2 J/cm ² @ 1064 nm, 10 ns, 10 Hz	1/2" dia zero order 1/4 waveplate	(M-) MT-RS	Polarizer Rotation Mount, 0.5 in., 5° Grad, 0.5° Sens., 8-32	•
	10RP04-34	2 J/cm ² @ 1064 nm, 10 ns, 10 Hz	1" dia zero order 1/4 waveplate	GM-1RA	Gimbal Tip/Tilt Rotation Mount, Ø1 in., 100 TPI	•
 Lenses (AR.33 for 1064 nm)	SPXxxAR.33	7.5 J/cm ² @ 1064 nm, 10 ns, 20 Hz	Plano-convex lens, fused silica, 25.4 mm	(M-)LH-1A	A-LINE Fixed Lens Mount, Ø 1.0 in., 8-32(M4) Thd.	•
	SBXxxAR.33	7.5 J/cm ² @ 1064 nm, 10 ns, 20 Hz	Bi-convex lens, fused silica, 25.4 mm	LA1V-XY	XY Compact Lens Positioner, Ø 1.0 in.	•
	SPCxxAR.33	7.5 J/cm ² @ 1064 nm, 10 ns, 20 Hz	Plano-concave lens, fused silica, 25.4 mm	LPV-1	XYZ ΘXΘY Compact Lens Positioners, Ø 1.0 in.	•
	SBCxxAR.33	7.5 J/cm ² @ 1064 nm, 10 ns, 20 Hz	Bi-concave lens, fused silica, 25.4 mm	LPV-1	XYZ ΘXΘY Compact Lens Positioners, Ø 1.0 in.	•
 High Energy Plano-Convex Lenses	SPXxxAR.1	15 J/cm ² @ 1064 nm, 20 ns, 10 Hz	Plano-Convex Lens, Fused Silica, 25.4 mm, AR.1 coated	LP-1A	XYZ ΘXΘY Lens Positioner, Ø 1.0 in.	•
 Nano-Texture Surface Lenses	SPXxxRAR.L	35 J/cm ² @ 1064 nm, 10 ms, 10 Hz	Plano-Convex Lens, Nano-Textured Fused Silica, 12.7 mm	LP-05A-XYZ	XYZ Lens Positioner, Ø 0.5-in.	•
	SPCxxRAR.L	35 J/cm ² @ 1064 nm, 10 ms, 10 Hz	Plano-Concave Lens, Nano-Textured Fused Silica, 12.7 mm	LP-05A	XYZ ΘXΘY Lens Positioner, Ø 0.5 in.	•

* Multiple lenses can be mounted with Newport's lens tubes and spacers

** Additional optics types and sizes are available – please go to <http://www.newport.com> or contact your local MKS sales representative

*** The optics listed in this guide will meet the requirements of most customer applications for the IceFyre laser. Not all optics have been tested for all potential IceFyre applications, so compatibility with all applications cannot be guaranteed. When selecting optics, please evaluate suitability for requirements of your application. If you need assistance, please contact your local MKS sales representative

Recommended Laser Measurement Sensor*



For optimal application results, it is critical to ensure that the delivered laser power at the sample is precisely controlled. Laser power sensor is a detector that absorbs a laser beam and outputs a signal proportional to the beam's power. MKS Newport offers a wide selection of power sensors to accurately measure the IceFyre laser power delivered to the sample. The specific type of sensor depends on the details of the laser beam being measured, including power level, spectral region, beam size, etc.

IceFyre Model	Recommended Sensor	Laser Damage Threshold	Aperture	Power/Energy Measurement Range	Spectral Range	Description
IceFyre 1064-50	919P-150-26	12 kW/cm ²	26 mm	50 mW to 150 W; 20 mJ to 100 J	0.19 to 11 μm	<ul style="list-style-type: none"> Spectrally flat broadband coating NIST-traceable calibration included Insensitive to beam position Sensitive with low noise & drift

* Order a 2" optical post holder VPH-2-P, a 1" post SP-1, and a fork PS-F to mount the sensor vertically at beam height

** Additional options from MKS Ophir are available. Please visit www.ophiropt.com or contact your Ophir sales representative for consultation

Recommended Power Meter*

1919-R is one of MKS Newport's most feature rich and technologically advanced power meters. It offers a plug-and-play functionality and is compatible with almost any of the wide range of Newport sensors. 1919-R is also the most precisely calibrated unit on the market thus measuring with the highest accuracy. With its versatility, ease of use, and user-friendly interface, the sensor can be used stand-alone or interfaced with LabVIEW or the user's own software.

Power Meter	Part Number	Description
	1919-R	<ul style="list-style-type: none"> • Compatible with all standard Newport thermal sensors • USB and RS232 interfaces with PMManager PC applications and User Commands document • LabVIEW driver and COM Object Interface • Select between English, Japanese, Russian, and Chinese interfaces

PC Interface (optional)

A PC interface allows you to connect your laser power sensor directly to the PC. The Model 841-PE-USB is a Power Meter with a USB connection to use a computer as the monitor, allowing the user to access the full computing power of the PC.

PC Interface	Part Number	Description
	841-PE-USB	<ul style="list-style-type: none"> • Optical Power and Energy Meter, Virtual, USB • Ideal when equipment space is tight or there is a need to control multiple power meter channels • Has a USB output and 0-1 V analog output. Application installation is simple & takes care of the USB driver installation

* Other Newport display meters are available – please contact your local MKS sales representative

Recommended Beam Profiler & Attenuator*



In addition to the average or instantaneous Watts or Joules of the laser beam, it is critical to understand how the power is spatially distributed in the cross-section of the beam. A beam profiler can help detect laser performance issues such as beam wander, jitter, divergence and astigmatism. MKS is the market leader with the largest installed base of laser beam profilers. With our unmatched accuracy, customizable layout, cutting edge R&D and global support system, we are ready to help our customers solve their most challenging problems.

IceFyre Model	Recommended beam profiler	Recommended Attenuator	Description
IceFyre 1064-50	LBP2-HR-VIS2	LBP2-SAM-NIR2	<ul style="list-style-type: none"> • The LBP2-HR-VIS2 Laser Beam Profiler is a powerful software driven system with comprehensive beam diagnostic measurement features. It features a 1924 x 1448 pixel CCD camera for the wavelength range between 190 and 1100 nm. The easy to use graphical user interface includes all of the accuracy and ISO approved quantitative results • The LBP2-SAM beam sampler operates by reflecting the incoming beam from the front surfaces of a pair of wedges through 90 degrees into the camera. Approximately 99% of the beam is transmitted through the beam sampler with 0.01% passed on to the available filter slides where you can add an additional attenuation up to ND6.

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MKS Instruments is your one-stop-shop partner for all the critical components surrounding your workpiece. Working very closely with customers globally and with diverse applications ranging from PCB, ceramic and glass cutting & drilling to micromachining & solar cell processing, chances are we have already experienced & solved the challenges you may be facing now. That is how we **Solve Together, Succeed Together™**.

Make Light

LASERS & LIGHT SOURCES

Ultrafast, Q-switched DPSS, CW, quasi-CW, high-energy pulsed, tunable and fiber lasers, low power laser diode modules, HeNe lasers, incoherent sources, laser diode instrumentation, laser diode reliability & burn-in test systems, electro-optic modulators & accessories. Includes ILX Lightwave, New Focus, Oriel, and Spectra-Physics products and brands.



Manage Light

MOTION CONTROL

Our motion product portfolio includes high precision XY stages, vertical stages, rotation stages, air bearing stages, custom-made motion systems, XPS high performance universal motion controller/driver and LMS-Pro laser machining software. Over the decades, we have served customers with diverse applications including ablation, ultrafast micromachining, laser additive manufacturing, laser cutting, scribing and drilling.



PRECISION OPTICAL SYSTEMS/ SUBASSEMBLIES

Precision subassemblies and subsystems encompass our knowledge & expertise in optics, lasers, opto-mechanics, motion control, & electro-optics to meet the most demanding customer needs for performance, reliability, value & schedule. Incorporating precision optics fabrication and coating capabilities and components, optical solutions for the DUV, VIS, and NIR spectral ranges are produced from prototype through volume production.



Measure Light

LIGHT ANALYSIS

MKS offers industry leading tools for measuring power or energy of an optical beam, profiling a laser, locating the position of a beam, spectral analysis, or characterizing a laser pulse. In addition to Newport brand optical meters, optical sensors, and beam characterization instrumentation, our Ophir Photonics business offers a diverse selection of these products as well.

