Fiber Coupled Acousto-Optic Modulator/Shifter 40 MHz

1.6 dB, 350 to 2300 nm, SM., PM, MM, Bidirectional

DATASHEET

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The AOMF4 Series Fiber-Optic Acousto-Optic Modulators provide high-performance optical intensity modulation and frequency shifting with DC-15 MHz modulation bandwidth, low insertion loss (~1.2 dB), high extinction ratio (>55 dB), high polarization extinction ratio (>30 dB), and optical power handling up to 10 W — performance unmatched by other vendors. The device operates by driving a side-mounted piezoelectric transducer with a fixed 40 MHz carrier, creating a resonance induced acoustic grating within the TeO2 crystal. The output fiber is aligned to collect the first-order diffracted beam at the Bragg angle. An external driver varies the acoustic amplitude through an SMA control input, modulating the RF intensity thus the optical attenuation. Rise and fall times are determined by the beam diameter, with smaller beams enabling faster response. Available for wavelengths from 1310 to 1620 nm and compatible with all fiber types, including SM, PM, and MM. The AOMF Series offers positive frequency shifting as standard, with negative-shift options available. Its epoxy-free crystal path and precision fiber collimators ensure excellent long-term stability and reliability.

Features

- Low optical Loss
- High Power
- Low Cost
- Stable
- All Fiber Compatible

Applications

- Heterodyne Interferometry & Vibrometry
- Laser Plasma Diagnostics
- Distributed Acoustic and Fiber Optic Sensing
- Laser Mode-Locking and Q-Switching
- Coherent Optical Communications & Testing

RoHS COMPLIANT

Warning: The device needs to be mounted on a heat sink or on a metal frame

Specifications

Parameter	Min	Typical	Max	Unit
Center Wavelength	1310	1550	1620	nm
Wavelength Bandwidth		± 30		nm
Acoustic Frequency (3dB bandwidth)		40		MHz
Modulation Bandwidth	DC		15	MHz
Wavelength Shift	-40		+40	MHz
RF Control Resolution	1			MHz
Carrier RF Power		2.5	3	W
Insertion Loss [1]	0.8	1.4	2.5	dB
Polarization Dependent Loss		0.2	0.5	dB
Extinction Ratio (On/Off) [2]	50	55	65	dB
Rise/Fall Time [3]	25		55	ns
Return Loss [4]	45	50	55	dB
Voltage Standing Wave Ratio		1.2:1		
Polarization Extinction (PM)	18	20	30	dB
Average Optical Power [5]		0.5	5	W
Input Impedance		50		Ω
RF Power		2.5	3.5	W
Electrical Interface		SMA		
Ultrasonic Velocity		4200		m/s
Operating Temperature	-10		65	°C
Storage Temperature	-45		85	°C
Weight		50		g

Notes:

[1]. Without connector. Each connector typically adds 0.2–0.3 dB, RL increase by 5 dB, and ER reduces by 2 dB.

[2]. For Single Mode only, multimode reduces depend on mode filled ratio
ER refers to output power ratio between ON/OFF states

[3]. (10%-90%). The rise/fall and bandwidth are related to the beam size, small beam has higher insertion loss. In another word, fast response with larger bandwidth will add insertion loss

[4]. 50dB is standard for SM, 45dB for 50/125

[5]. @1550nm. For shorter wavelength the power handling is reduced due to smaller core size. Higher power version is available by expand the beam inside the fiber tip.

Note: The specifications provided are for general applications with a cost-effective approach. If you need to narrow or expand the tolerance, coverage, limit, or qualifications, please [click this link]:

Rev 10/16/26

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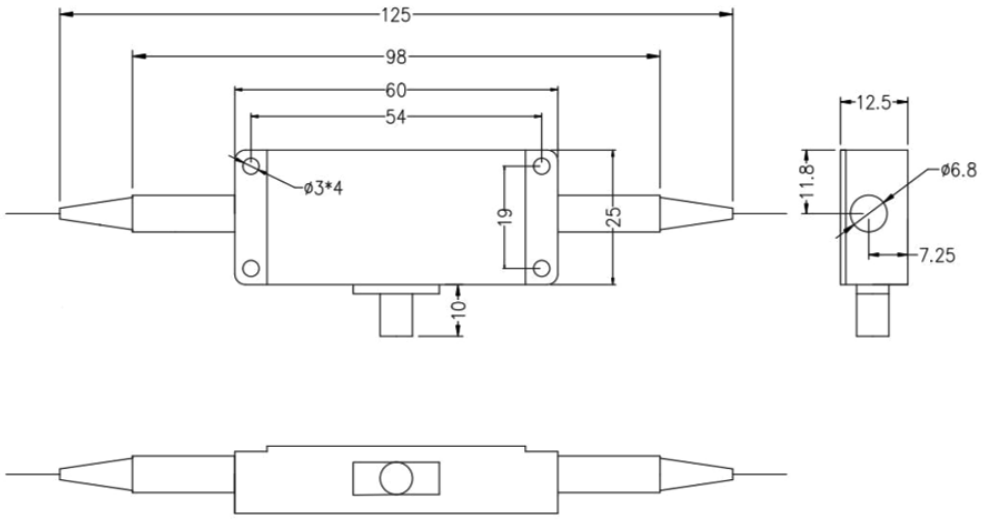
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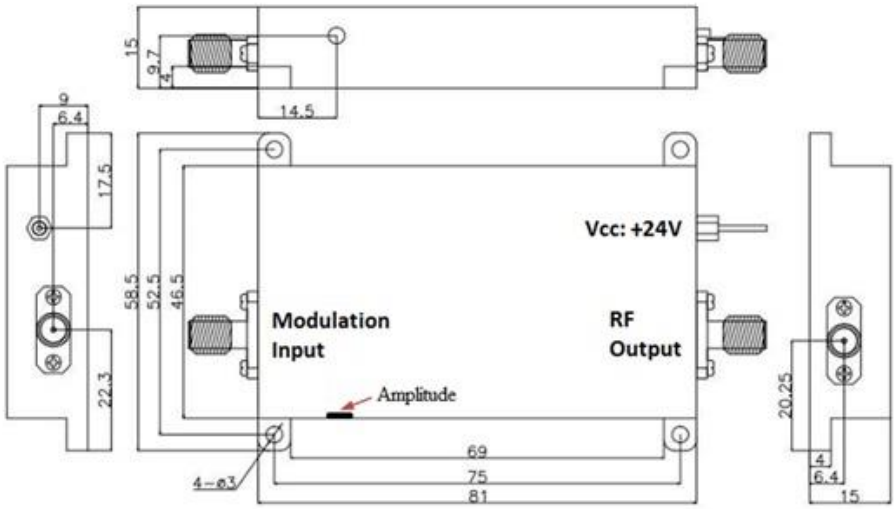
Mechanical Dimensions (mm)

Type A

AOM

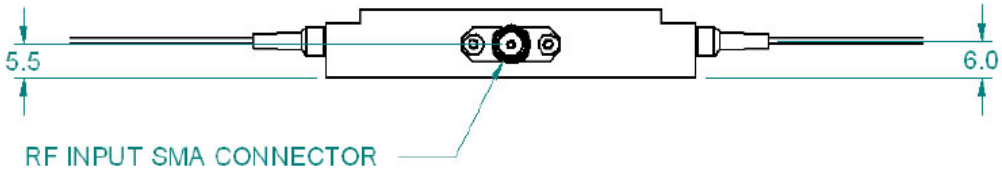


AOM Driver



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Electrical/Computer Connection



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Ordering Information (Part Number)

	4	☐	☐	☐	☐☐	☐	☐	☐	☐	☐	☐	☐
Prefix	**Type**	**Wavelength**	**Insertion [1]**	**Optical Power**	**Fiber Type**	**Fiber Cover**	**Fiber Length**	**Connector [2]**	**PER [3]**	**Wavelength Shift**	**Benchtop [4]**	**Package [5]**
AOM4-	40MHz = 4 Special = 0	1550 nm = 5 1310 nm = 3 1620 nm = E 1060 nm = 1 980 nm = 9 850 nm = 8 780 nm = 7 630 nm = 6 530 nm = A 450 nm = 4 2040 nm = B 1920 nm = C 2300 nm = D Special = 0	2.8dB = 1 3dB = 2	Regular = 1 0.5W = 2 1W = 3 5W = 4	***Select fiber at the table below*** 50/125 = M5 62.5/125 = M6	0.9mm tube = 3 Special = 0	0.25m = 1 0.5m = 2 1.0 m = 3 Special = 0	None = 1 FC/PC = 2 FC/APC = 3 SC/PC = 4 SC/APC = 5 ST/PC = 6 LC/PC = 7 5WFC/PC = H 10WFC/PC = A	Non = 1 18dB = 2 20dB = 3 25dB = 4 29dB = 5	-40MHz = 1 +40MHz = 2	Non = 1 Yes = 2	Regular = 1 Space = S

[1]: Without connector, each connector add 0.3 dB. For 1310-1550 nm. Short wavelength and > 1900 nm, the loss is higher. The default version is optimized for low loss with rise/fall times under 55 ns. Version A is tuned for faster response but with higher loss, while Version B offers moderate rise/fall times with more loss than the default.

[2]: The default connector configuration uses fiber with 0.9 mm buffer protection. The connector cannot be installed directly onto bare fiber because the bare fiber is prone to damage during shipping. However, the connector can be assembled on bare fiber if a 3 cm protective loose tube is added for reinforcement. The customer may remove this protective tube after testing. The optical power handling of a standard connector is less than 0.5 W for SMF-28 fiber and decreases further for smaller-core fibers.

[3]: Polarization extinction ratio only for PM fiber

[4]: The benchtop integrates the modulator, driver, and power supply. Front Panel: SMA 0-5 V electrical control input port for precise modulation. Fiber input and output ports with standard FC/APC connectors. Back Panel: 100-240 VAC power input for global compatibility and a Power switch for easy on/off control.
This all-in-one design simplifies setup and operation

[5]: The space-grade package is manufactured using design and processes with a proven history of compliance with space application requirements.

Fiber Type Selection Table:

01	SMF-28	34	PM1550
02		35	PM1950
03		36	PM1310
04	SM450	37	PM400
05	SM1950	38	PM480
06	SM600	39	PM630
07	780HP	40	PM850
08	SM800	41	PM980
09	SM980	42	PM780
10	Hi1060	43	
11	SM400	44	PM405
12		45	PM460

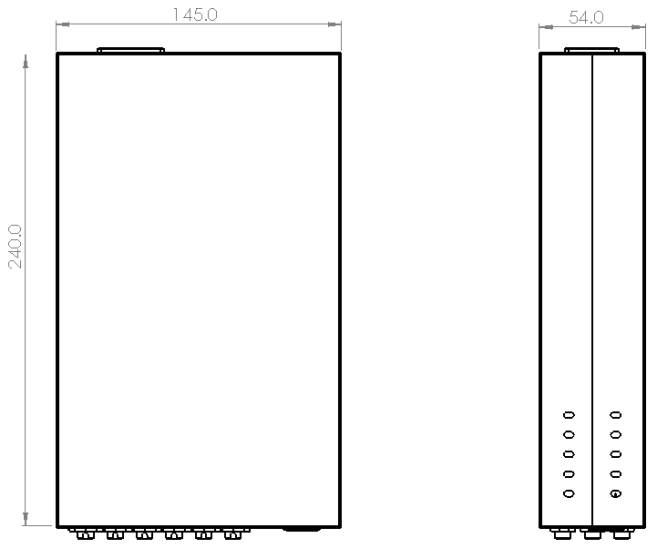
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Benchtop Box Mechanical Dimension





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Setup Instructions

- Connect a laser with a wavelength matched to the specified part number to the fiber input.
- Connect the modulator to the accompanying driver using the provided cable.
- Connect a DC power supply to the driver (refer to the AOM driver datasheet for detailed specifications).
- Connect the control signal to the SMA input port.
- The fiber optical output amplitude and repetition rate will vary according to the electrical control signal.

Application Notes

Fiber Core Alignment
Note that the minimum attenuation for these devices depends on excellent core-to-core alignment when the connectors are mated. This is crucial for shorter wavelengths with smaller fiber core diameters that can increase the loss of many decibels above the specification if they are not perfectly aligned. Different vendors' connectors may not mate well with each other, especially for angled APC.

Fiber Cleanliness
Fibers with smaller core diameters (<5 μm) must be kept extremely clean, contamination at fiber-fiber interfaces, combined with the high optical power density, can lead to significant optical damage. This type of damage usually requires re-polishing or replacement of the connector.

Maximum Optical Input Power
Due to their small fiber core diameters for short wavelength and high photon energies, the damage thresholds for device is substantially reduced than the common 1550nm fiber. To avoid damage to the exposed fiber end faces and internal components, the optical input power should never exceed 20 mW for wavelengths shorter 650nm. We produce a special version to increase the how handling by expanding the core side at the fiber ends.

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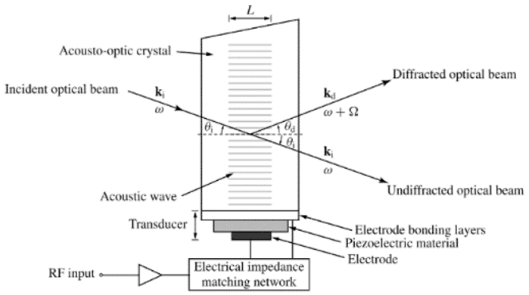
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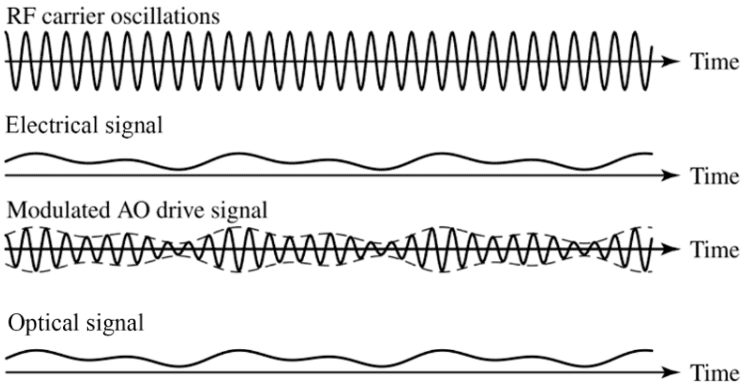
Acoustic Frequency

The operation of an acousto-optic modulator is based on the Bragg diffraction generated by an acoustic wave (traveling refractive grating) inside a crystal, as shown below. The **Acoustic Frequency** is fixed for each device. A RF voltage of the acoustic frequency is applied to the piezoelectric actuator attached to the crystal generating the acoustic wave. The higher the frequency, the higher the cost to make and higher the power consumption.



Modulation Bandwidth

An optical intensity modulator can be achieved by a driving circuity in which the acoustic intensity inside the crystal varies with an input modulation signal. A typical acoustic driver output is shown below: a RF Input electrical signal modulates the intensity profile of the carrier oscillations (acoustic frequency), resulting in a modulated driving signal, which leads to an output optical intensity similar to the RF input. The acoustic frequency intrinsically determines the rise/fall of the optical modulation. The Modulation Bandwidth is proportional to the acoustic frequency. The optical response can be optimized to certain extend via the driving circuit such as digital or analog.



Optical Wavelength Shift

Due to an energy exchange, all acoustic optical devices apply a frequency shift to the diffracted output beams. These optical wavelength shifts are very small and proportional to the acoustic frequency. Depending on the selected Bragg angle, these devices will either up-shift or down-shift the laser light by the frequency of the applied RF signal.

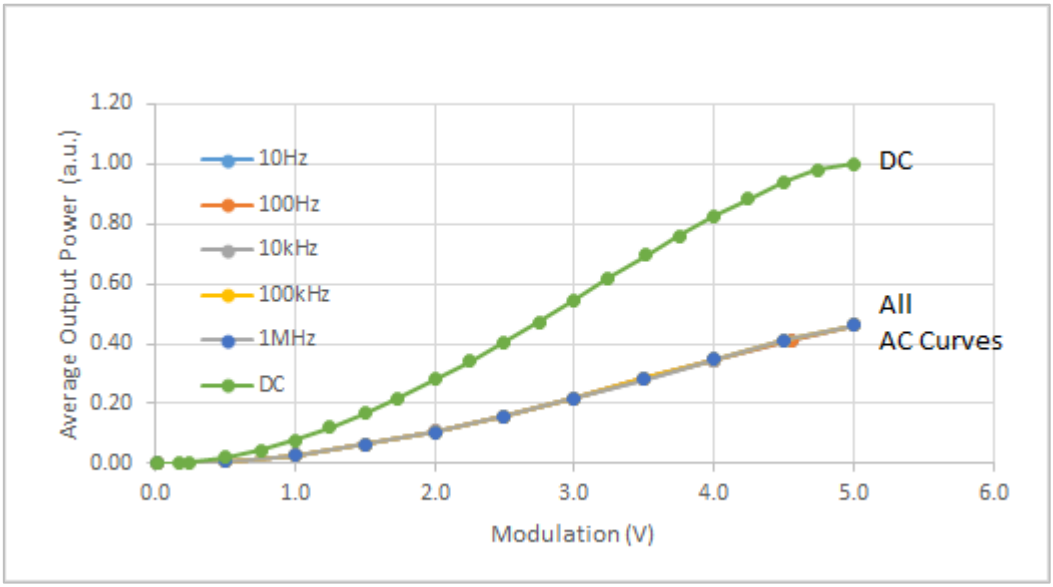
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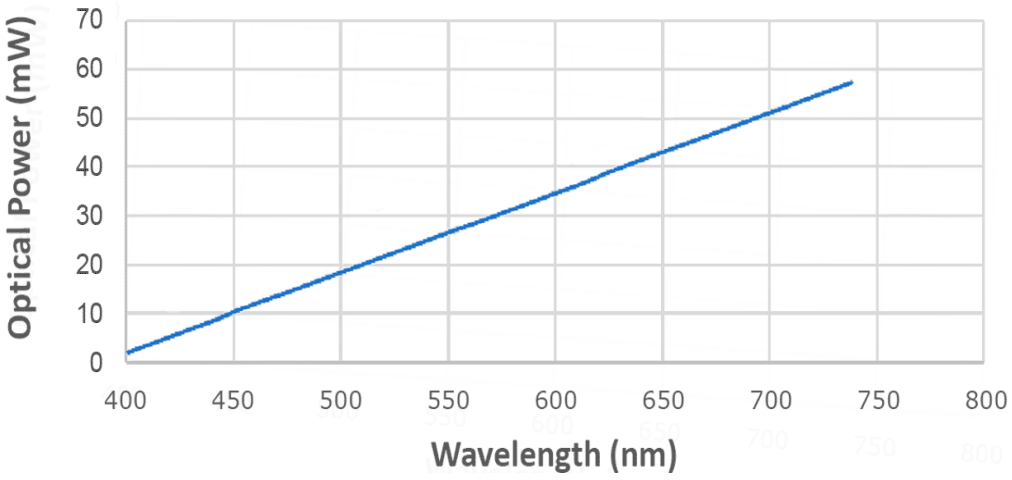
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Typical Attenuation vs Control Signal for 200MHz AOM



Optical Power Handling vs Wavelength for Standard SM Fibers



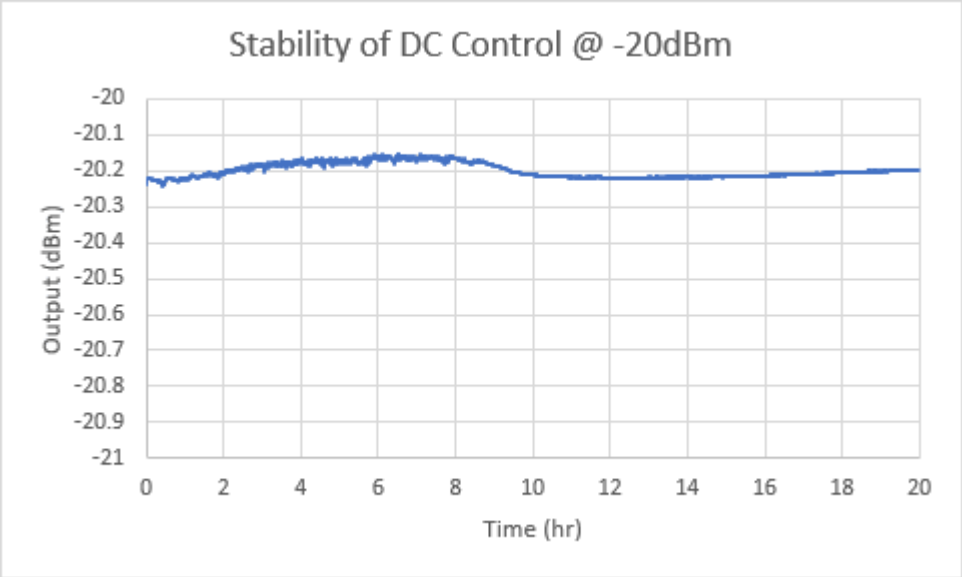
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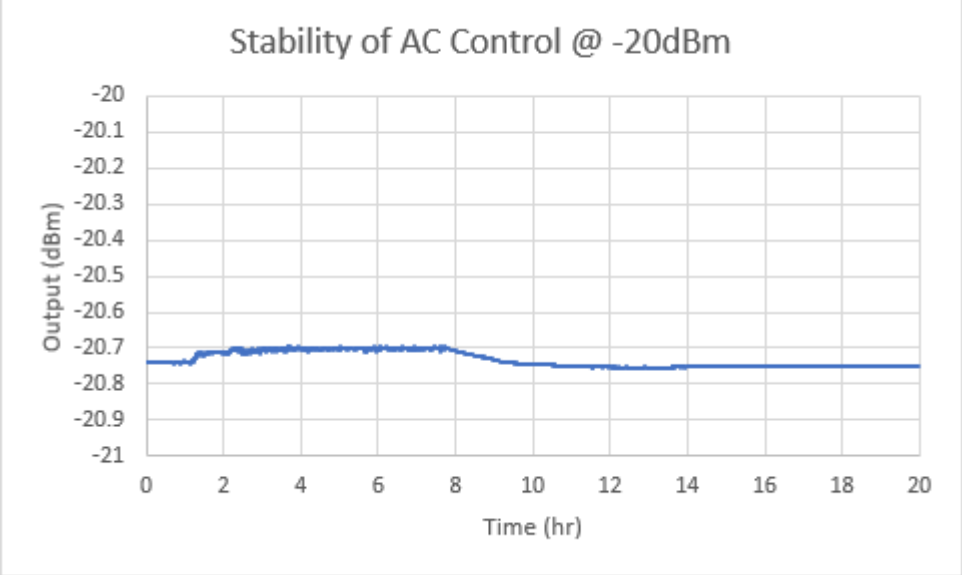
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Typical Stability (@ -20dBm with DC and 1kHz AC control. Fluctuation < 0.1dB)





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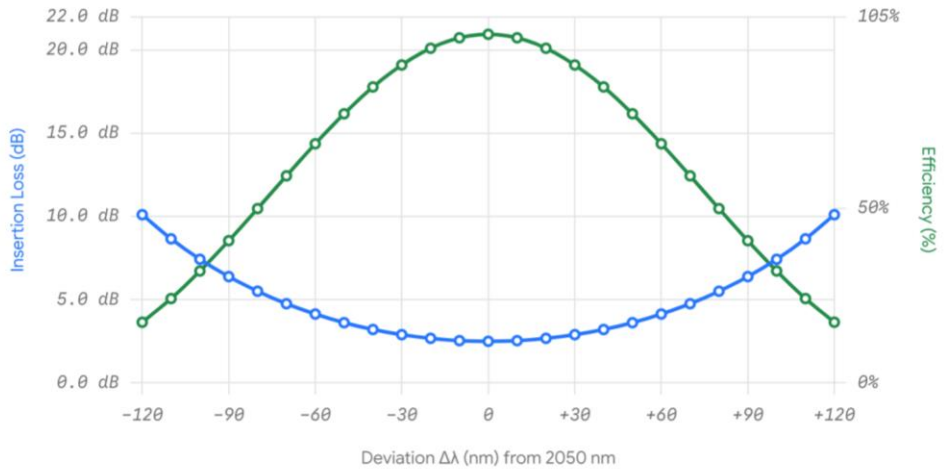
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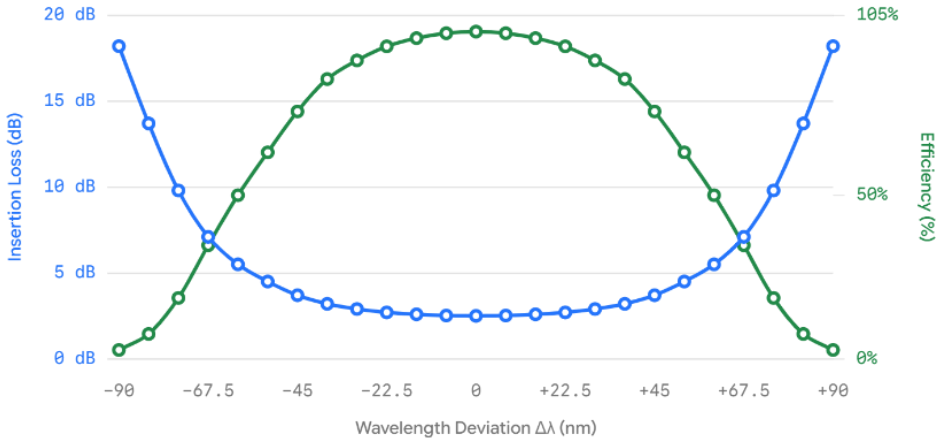
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40 MHz AOM Optical Wavelength Response

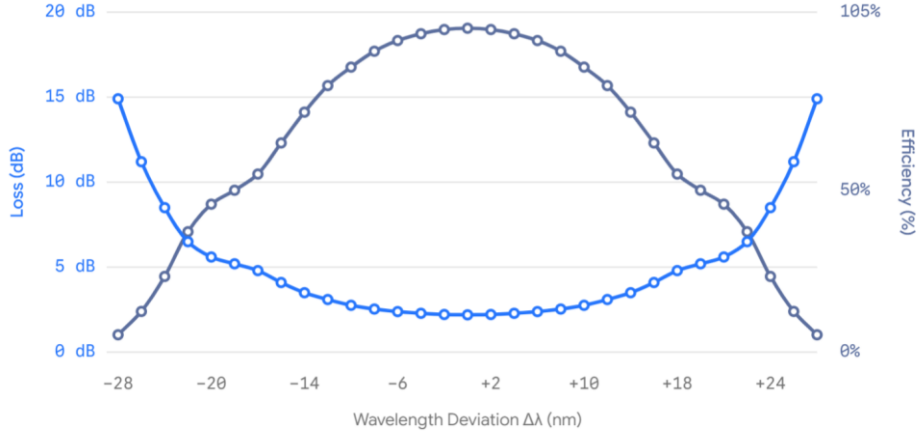
CENTER WAVELENGTH 2050nm (3dBFWHM 80nm)



CENTER WAVELENGTH 1550nm (3dBFWHM 60nm)



CENTER WAVELENGTH 510nm (3dBFWHM 8nm)



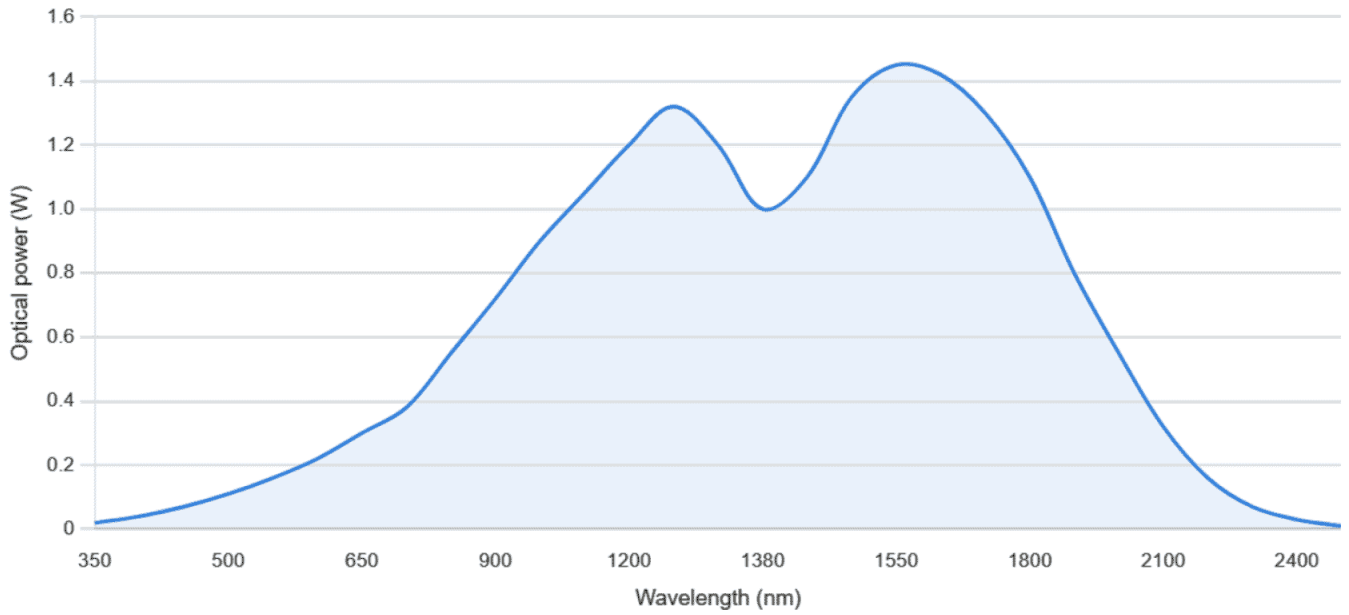
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Regular Single Mode / Polarization Maintaining Fiber Optical Power Handing vs Wavelength



Single mode fiber optical power is limited by nonlinear effects in addition to absorption that increase loss and generate heat. The curve shows the approximate safe CW power envelope for standard single-mode fiber. Actual limits depend on fiber design, core size, length, and laser characteristics. Specialty fibers can significantly increase the power limit.

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