Erbium Doped Fiber Amplifier

1528–1565 nm up to 26 dBm, 1535–1565 nm up to 41 dBm

DATASHEET

Return to the Webpage



Features

- Low Noise
- High Output Up to 41dBm
- High Stability
- High Reliability
- Customizable

Applications

- BOTDR
- OTDR
- LiDAR
- Fiber sensing

Warning: High-power EDFA units are susceptible to damage from strong optical reflections, particularly those caused by improper connector mating.

RoHS COMPLIANT

Agiltron's Erbium-Doped Fiber Amplifier (EDFA) delivers high-performance optical amplification with exceptional reliability and cost efficiency enabled by large-scale manufacturing. The amplifier integrates high-quality semiconductor pump lasers, Wavelength Division Multiplexing (WDM) components, optical isolators, and optimized erbium/ytterbium-doped fiber technology to achieve high output power, high gain, low noise figure, and long operational lifetime. Available in both preamplifier and booster configurations, the EDFA supports a wide range of optical communication and photonic system applications. For output power levels below 25 dBm, the amplifier operates across the 1528–1565 nm C-band, while higher-power versions operate within 1535–1565 nm. For extended wavelength coverage, L-band amplifiers are available. The system supports multiple operating modes including ACC (Automatic Current Control), APC (Automatic Power Control), and CC (Constant Current), providing flexible pump control and stable performance under varying input conditions. Optional configurations include pulse-optimized EDFAs and gain-flattening filters for improved spectral uniformity. The amplifier is engineered for long-term stability exceeding 10 years of continuous operation, supported by advanced thermal management and rigorous reliability testing.

To support diverse applications, the EDFA is offered in several formats, including a turn-key benchtop instrument with USB or RS232 interface and GUI for laboratory environments, compact OEM modules for system integration, and USB-controlled PCB driver boards for rapid evaluation and development. API coding services are available to facilitate integration with custom software platforms. As with all high-gain optical amplifiers, optical back-reflection can damage the device and is not covered under warranty. High-power EDFAs supplied with standard connectors are intended for low-power testing only, as operation at full power may damage connectors and generate harmful reflections.

For narrow-linewidth CW seeds below several MHz, the maximum output power is limited by stimulated Brillouin scattering (SBS). As an example, for linewidths around 500 kHz, SBS limits output powers above a few watts.

Specifications

Parameter		Min	Typical	Max	Unit
Wavelength		1530	1550	1565	nm
Input Power	Booster ≤ 24dBm	-30	0	10	dBm
	Booster > 24dBm	-5		10	dBm
	Pre	-30	-20	5	dBm
Output Power	Booster			41	dBm
	Pre			25	dBm
Optical Gain	Booster			40	dBm
	Pre			40	dBm
Noise Figure			5		dB
Gain Flatness			1		dB
Polarization Dependent Gain				0.3	dB
Polarization Mode Dispersion			0.5		ps
Input/output Isolation		35			dB
Output Stability (8hrs)			0.05	0.1	dB
Adjustable Output Power			Yes with AGC		
Fiber Type		SMF-28e 9/125um NA = 0.13			
Working Temperature [1]		-5	35	40	°C
Storage Temperature		-40		85	°C
Power Consumption				25	W
Power Supply	< 23dBm (MSA)	DC +5			V
	≥ 23dBm	DC +12			V

Notes:

[1]. The regular range is -5 to 40°C, for extended range please see -30 -70°C model

Note: EDFAs are susceptible to damage from strong back-reflections, which internal isolators may not adequately prevent. We offer a special isolator that redirects reflected light to a separate fiber port. **Back-reflection damage is covered under warranty only for EDFAs equipped with this protective isolator.**

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Rev 11/08/26

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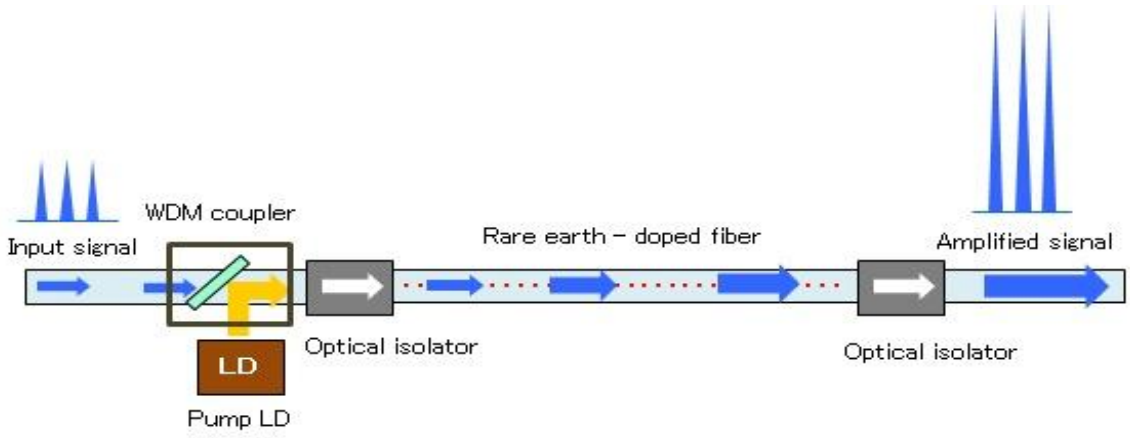
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Function Diagram



Package Choices



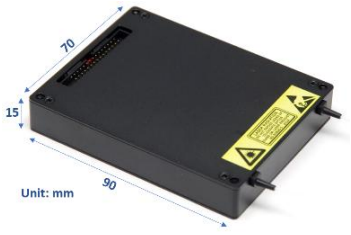
OEM Component



GUI PCB for High-power Component $195



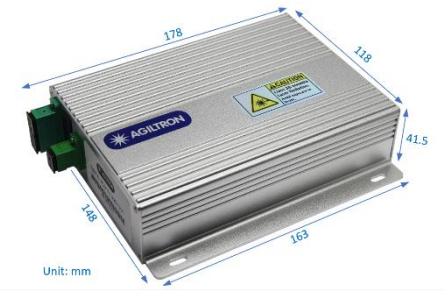
Benchtop- USB/RS232/GUI



MSA



GUI Adapting PCB for MSA $195



Mini benchtop



Net-Control Rack

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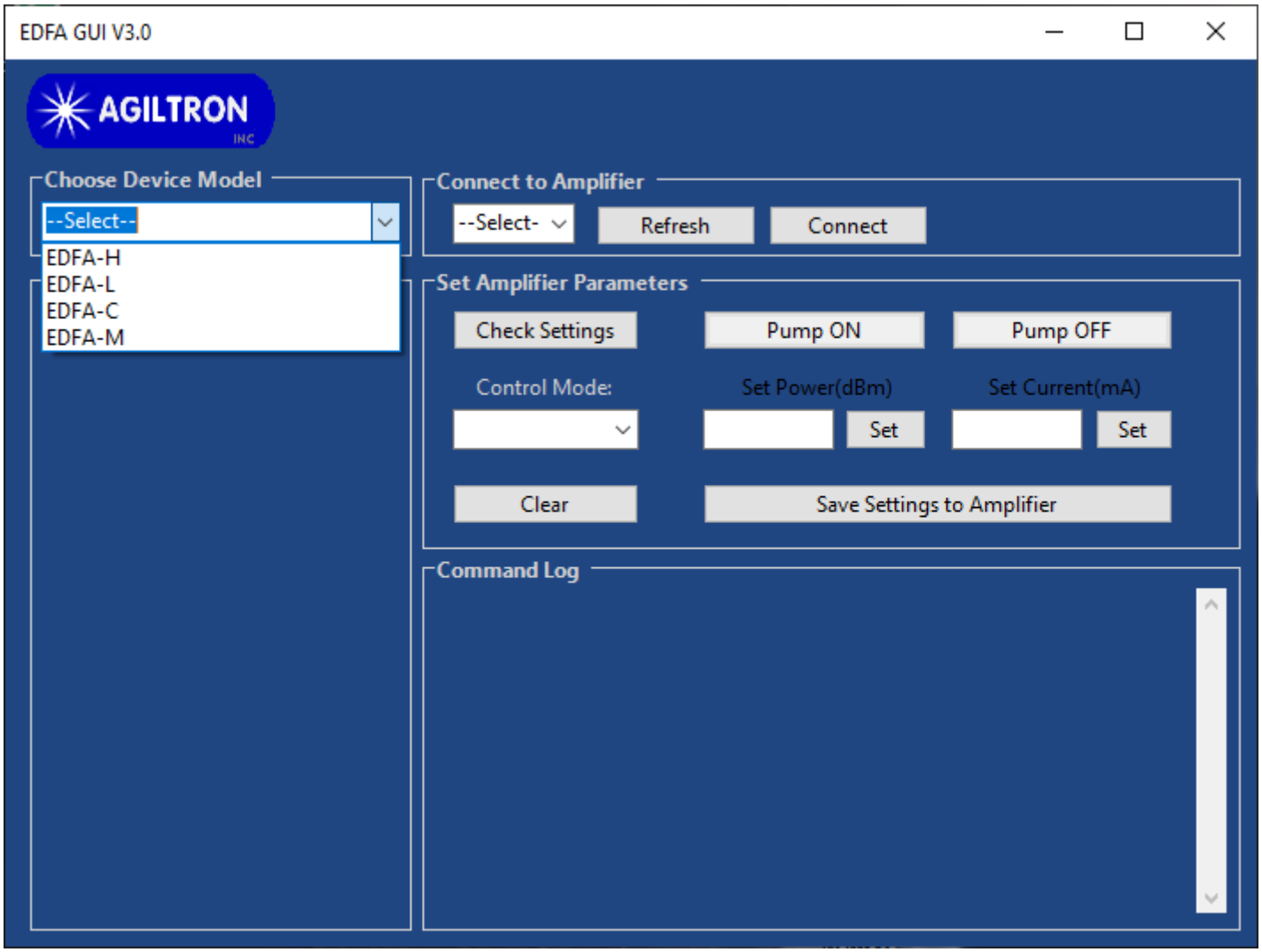
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GUI USB Interface



Operation Instruction

- Load the software, Unzip the folder and Click "setup" to Install the GUI
- Select an amplifier type that matches your PO
- Connect your PC to the Amplifier by first connecting a USB cable and then choosing the necessary port and clicking “Connect“. To change the COM port click "Refresh", choose the necessary port, then click "Connect“
- Obtain the stored settings by clicking "Check Settings“
- To change the setting, first select the control mode
- To set up output power or current, input desired value and click "Set“. There are limits for max output per the model type.
- To turn on the Amplify click "Pump ON“; the green color should appear. To stop click "Pump OFF“; the red color should appear
- To save the setting click "Save Settings to Amplifier”. The Amplifier will store the setting for the next time you turn it on, even without the PC.
- The Amplifier only works if the input optical power level is within the spec.

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Control GUI



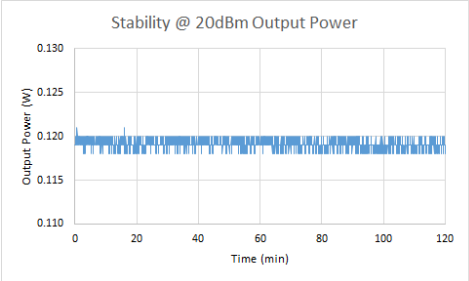
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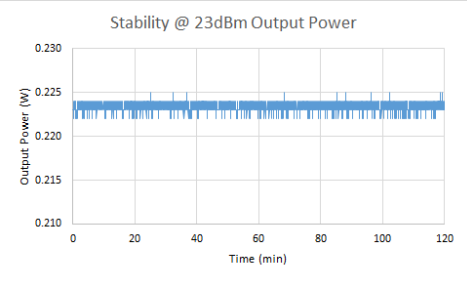
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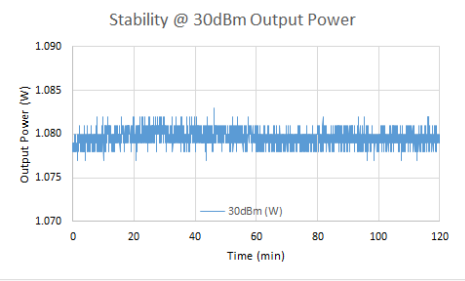
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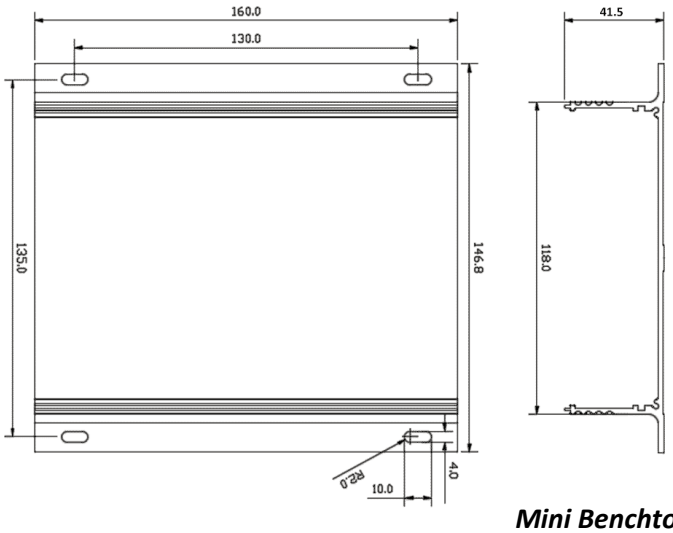
Output Power Stability (33dBm Benchtop)







Mechanical Dimensions (mm)



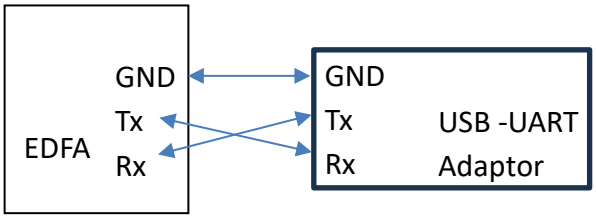
Mini Benchtop: 17/20dBm

*Product dimensions may change without notice. This is sometimes required for non-standard specifications.

USB-UART Wiring

USB-UART Pin	Connects To
TXD	Device RX
RXD	Device TX
GND	Device GND

Note: grounds must be common



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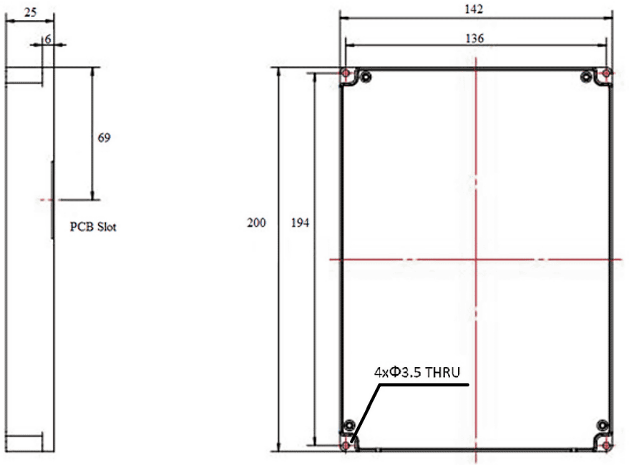
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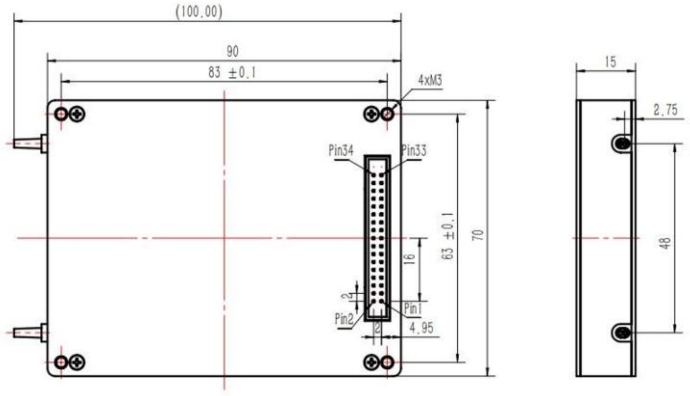
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Mechanical Dimensions (mm)



High-power: >23dBm



MSA package: 20dBm

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Pin Layout

High-power: >23dBm

Power supply（The pin interval is 5mm）

Pin	Description
1	GND
2	+12V

Communication（The pin interval is 2.54mm）

Pin	Description
1	NC
2	GND
3	RX
4	NC
5	NC
6	NC
7	TX
8	NC

MSA package: 20dBm

Pin No.	Name	Pin No.	Name
1	NC	18	NC
2	NC	19	NC
3	+5V	20	NC
4	+5V	21	NC
5	+5V	22	NC
6	+5V	23	GND
7	GND	24	GND
8	GND	25	Serial Port Input (LVTTL)
9	NC	26	Serial Port Output (LVTTL)
10	NC	27	GND
11	GND	28	GND
12	GND	29	+5V
13	NC	30	+5V
14	NC	31	+5V
15	NC	32	+5V
16	NC	33	NC
17	NC	34	NC

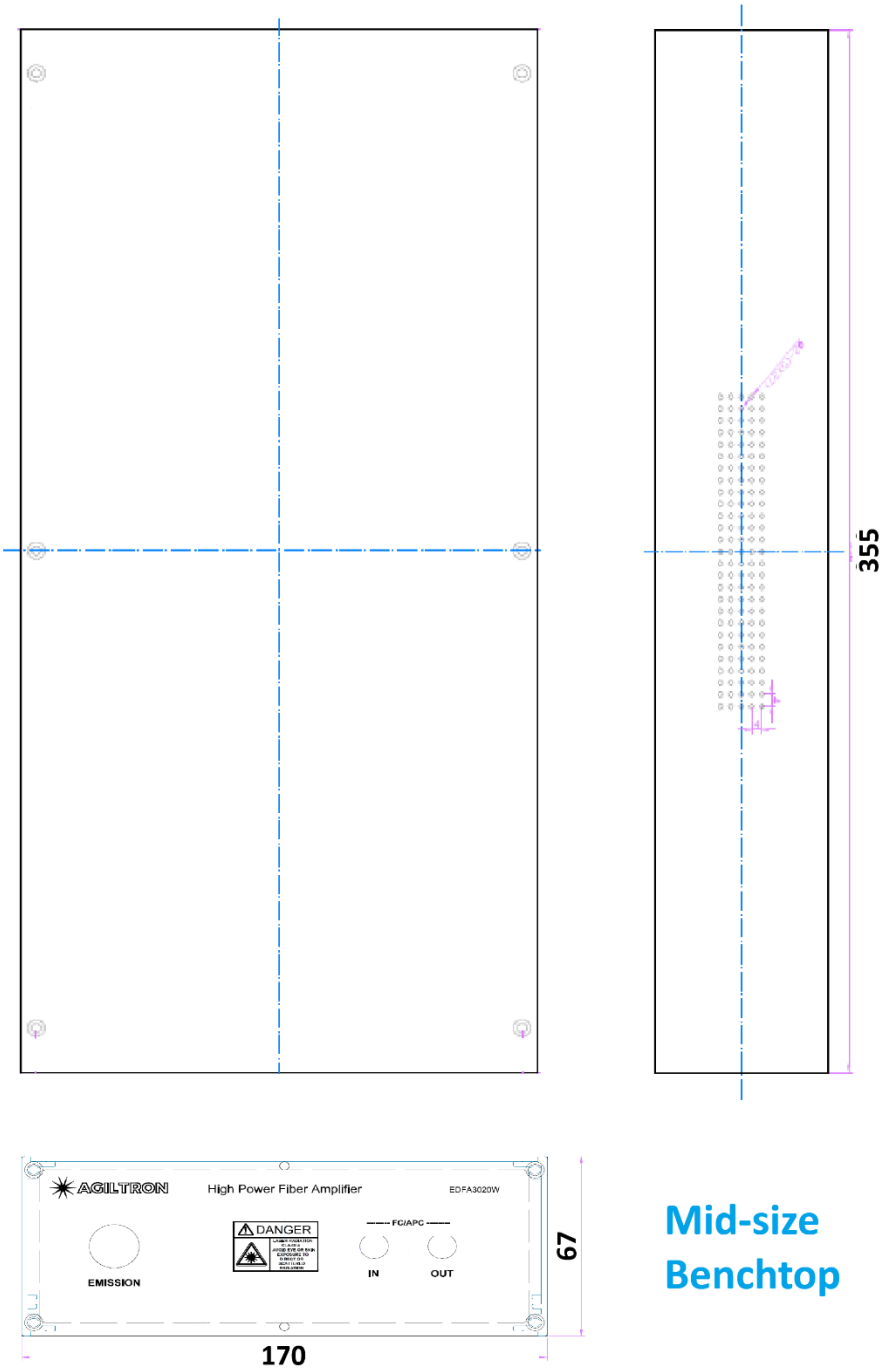
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Mechanical Dimensions (mm)



Mid-size Benchtop

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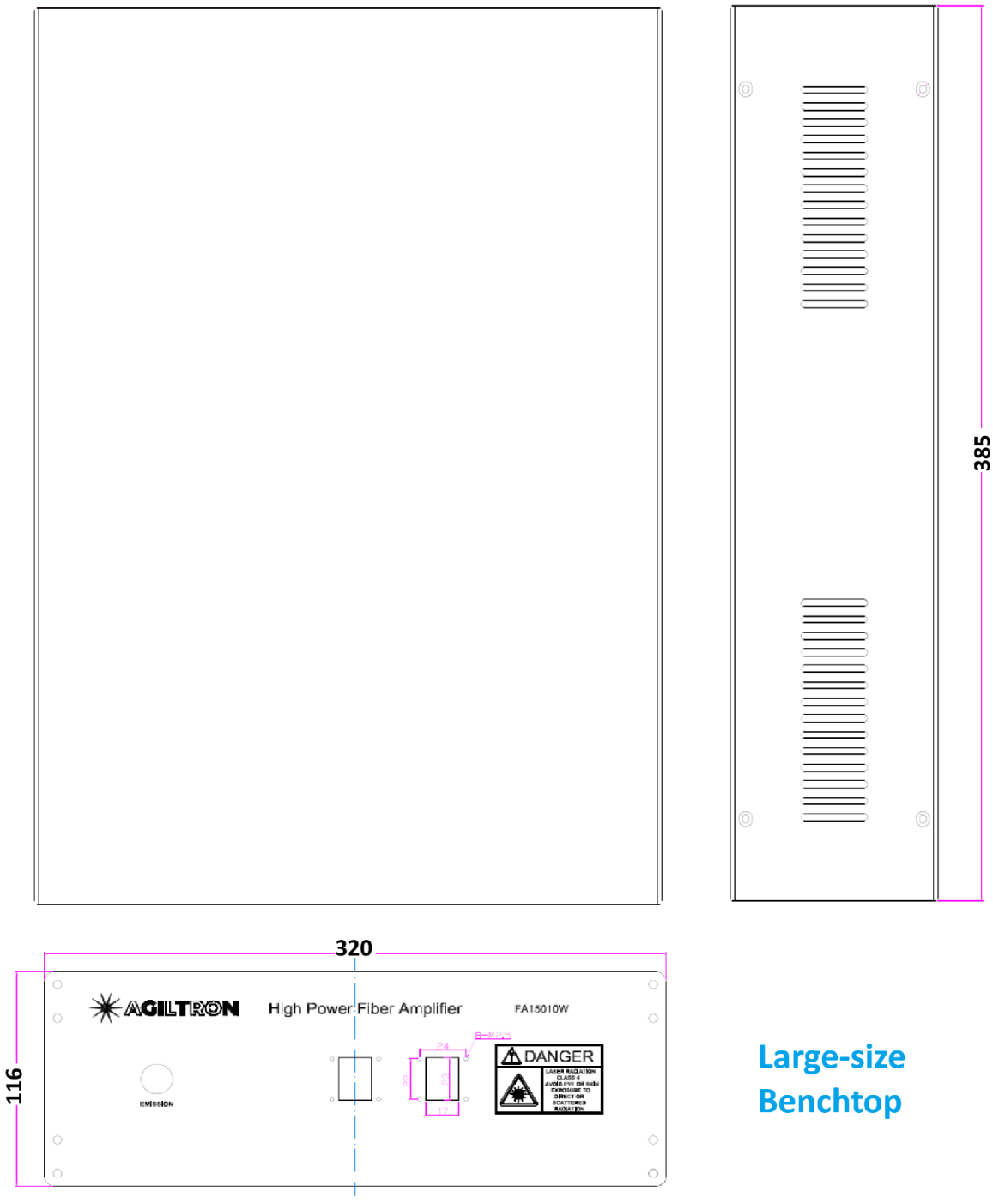
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Mechanical Dimensions (mm)



Large-size Benchtop

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Ordering Information (Part Number)

	☐	1	☐	1	1	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Prefix	**Type**	**Wavelength**	**Power/Gain [1]**	**Output Channel**	**Polarization**	**Package[9]**	**Cable Type**	**Fiber Length [5]**	**Connector [6][8]**	**Low Temperature**	**High Temperature**	**Control Mode**	**Filter [7]**	**Reflection Protector**
EDFA-	Booster =1 Preamp =2	1528-1565nm<26dBm 1535-1565nm>26dBm	17dBm/50mW = 2 20dBm/100mW =3 26dBm/400mW =4 30dBm/1W = 1 33dBm/2W = 5 37dBm/5W = 7 40dBm/10W = 8 41dBm/12W = 9 42dBm/15W = A 43dBm/20W = B	One =1	Random =1	Component (>26dBm) =1 Component/PCB(>26dBm) [3] =G Benchtop = 2 EYA = 3 EYA/PCB [3] = C MSA (<34dBm) = M MSA/PCB(<34dBm)[3] =H Mini Benchtop (17/20dBm)[2] =A Special = 0	0.9mmt =3 Special = 0	0.25m =1 0.5m = 2 1.0m = 3 Special =0	None = 1 FC/PC = 2 FC/APC = 3 SC/PC = 4 SC/APC = 5 LC/PC = 7 LC/APC = A LC/UPC = U High Power FC/PC=H Special = 0	-5°C = 1 -30°C = 2 Special = 0	40°C = 1 70°C = 2 Special = 0	APC = 1 ACC = 2 CC = 3 Special= 0	None = 1 Gain flat= 2 Special = 0	Non = N Yes = Y

[1]. For Booster, maximum output power. For Preamp, maximum amplification gain.

[2]. Mini benchtop only is a low-cost package available for 17/20 dBm without power adjustment function. Please order other packages for fully control functions.

[3]. The PCB control board provides a plug-and-play USB computer interface and includes GUI software along with a power supply. For units ordered without the board, retrofit installation is available for $1,250.

[5]. For >1W modules, the fiber cables extrude out of the front.

[6]. Regular fiber connectors are rated for optical powers up to 0.5 W. Use regular connector for >0.5 W will cause damage to the core, thus no warrantee for this configuration. For outputs above 1 W, only bare fiber or high-power fiber connectors (HPFC) are suitable. We offer a special beam-expanded HPFC connector capable of handling up to 10 W of optical power. The HPFC is used in pairs, with a matching patch cable that has one end terminated with the HPFC connector and the other end left as bare fiber for splicing into the system. The HPFC connector and matching cable are priced at $850.

[7]. Only available for power ≤ 24 dBm.

[8]. 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. The default PM fiber connector is **2.0 mm narrow key, with the fiber slow axis aligned to the key**.

[9]. The component format is designed for OEM integration. For laboratory and university use, only the benchtop protected version has one year warranty.

For PM EDFA please check out https://agiltron.com/dlc/specs/EDFAPM.pdf

Note:

- ❑ Preamplifier output power is limited to 25 dBm

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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Q&A About Fiber Optical Amplifier

Q: What is the polarization state of the output?
A: The erbium-doped fiber core is effectively isotropic, so any input polarization becomes scrambled through propagation and gain interactions. The output's degree of polarization is typically low because the EDFA generates significant ASE, which further washes out any residual polarization.

Q: Why EDFA is limited to amplification above 1530nm?
A: The EDFA gain spectrum is set by the Er^{3+} energy levels in silica glass, and the emission cross-section falls off rapidly as you move toward shorter wavelengths.

Q: Can this amplifier pulsed signals?
A: It has been tested to amplify up to 100GHz digital data. But high power pulse will induce non-linear effects that broaden it.

Q: Can this amplifier WDM signals?
A: It has been tested to amplify signals with DWDM wavelength spacing.

Q: Can this amplifier has a flat wavelength response?
A: Yes, by put flattering gain filters, that is an extra cost.

Q: If one puts a small signal into it, can it be amplified to the maximum output power indicated on the spec?
A: The amplifier is set as an analog mode whose output signal strength is approximately proportional to the input strength. It has a certain gain of about 40dB. There are two types: one is a preamplifier and a booster. One can use a preamplifier before the booster for weak signals, as done in electronic amplifiers.

Q: We have an existing amplifier. Can you duplicate it?
A: Yes, we can produce it with a seamless software interface.

Q: The control mode is selectable in the GUI, does this mean it can be operated in either APC, ACC, or CC mode? (i.e. can you support all 3 control modes in a single system)
A: MSA EDFA: APC, ACC & CC (AGC).
EYDFA (MSA & standard) : APC & ACC

Q: Do the MSA packages work with the Agiltron GUI?
A: Yes

Q: Do you have preamplifier with –35 and –40dBm input power?
A: Yes, available in different package.

Q: Does the Preamplifer come with APC or ACC control mode and which control mode achieves better receive sensitivity?
A: Under ACC mode, EDFA will amplify any input if you choose the always-on pump option.

Q: If we want to control the EDFA without the GUI, do you have a list of the RS232 commands?
A: It comes with each EDFAs.

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Laser Safety

This product meets the appropriate standard in Title 21 of the Code of Federal Regulations (CFR). FDA/CDRH Class 1M laser product. This device has been classified with the FDA/CDRH under accession number 0220191. All versions of this laser are Class 1M laser products, tested according to IEC 60825-1:2007 / EN 60825-1:2007. An additional warning for Class 1M laser products. For diverging beams, this warning shall state that viewing the laser output with certain optical instruments (for example eye loupes, magnifiers, and microscopes) within a distance of 100 mm may pose an eye hazard. For collimated beams, this warning shall state that viewing the laser output with certain instruments designed for use at a distance (for example telescopes and binoculars) may pose an eye hazard.

Wavelength = 1.3/1.5 µm.

Maximum power = 30 mW.



*Caution - Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.
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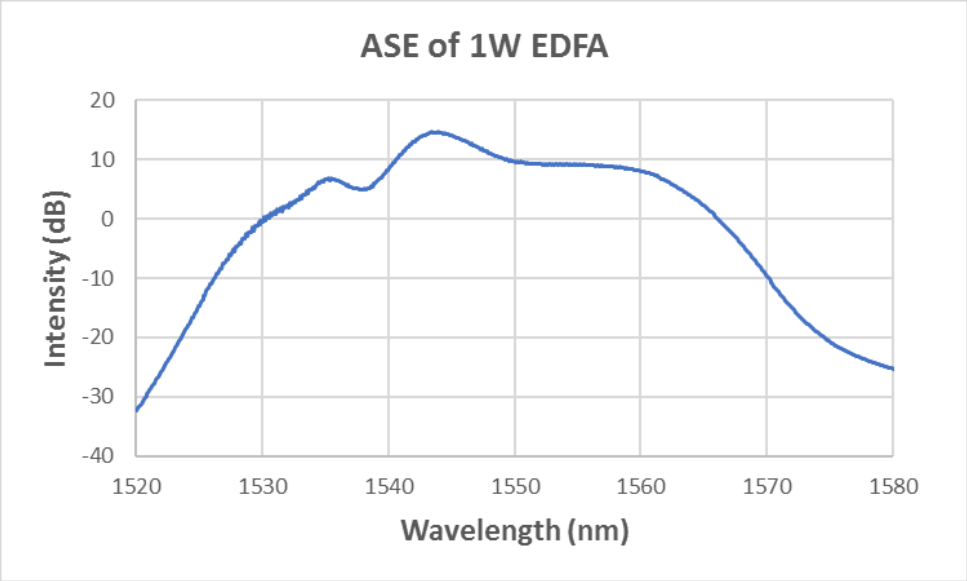
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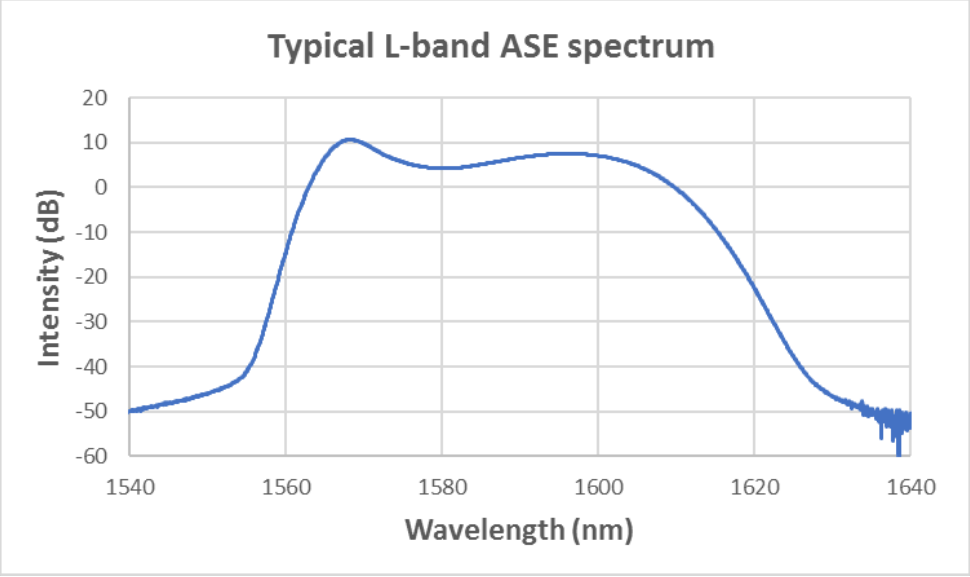
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Modes Description

The EDFAs have both ACC mode - automatic current control or constant current control and APC mode - automatic power control settable via GUI. In the ACC mode, the pump laser's current is set by the user and automatically locked by the EDFA to achieve a constant pumping current. The EDFA's output power is proportional to the input power and has output even though the input signal is weak. In the APC mode, the user sets the output power, and the EDFA automatically maintains the output constant in a feedback laser pump control way. When the input optical power fluctuates, the APC mode minimizes the fluctuation of the output power and is suitable for power type and line type EDFA.

Typical Spectrums





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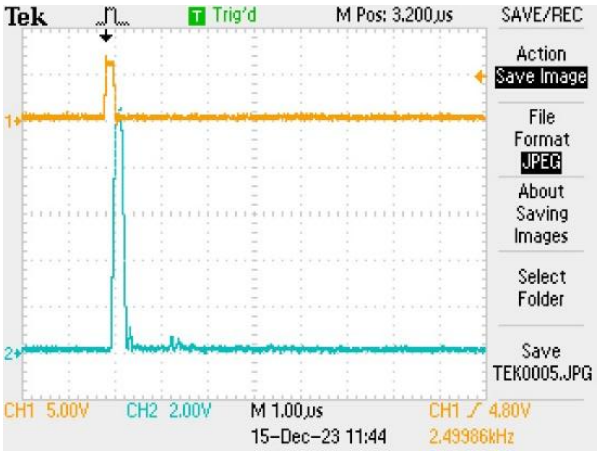
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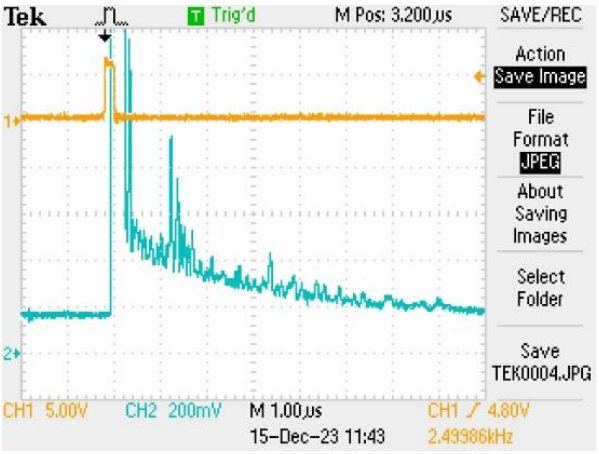
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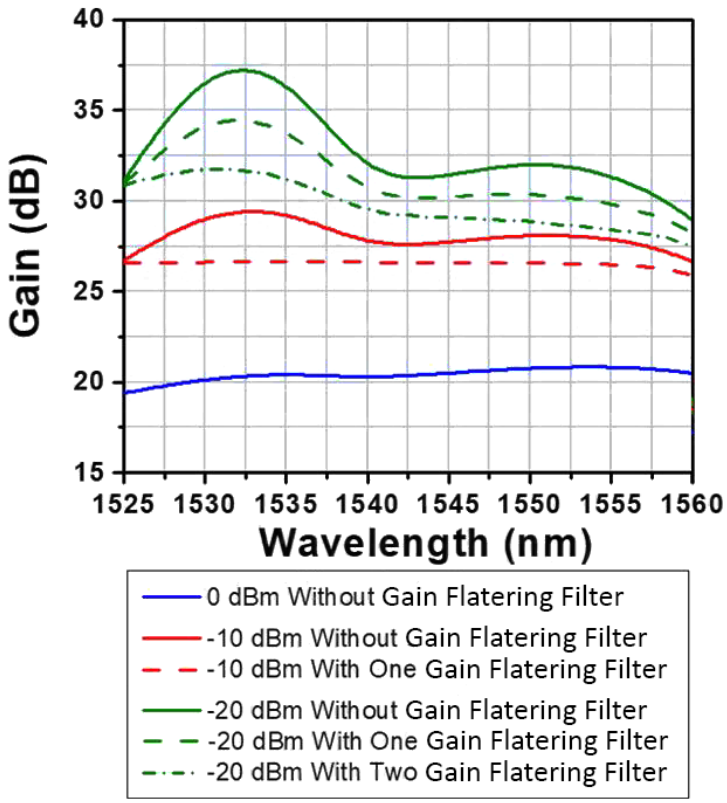
Typical Nanosecond Laser Pulse Amplification

- Source laser: 2.5kHz 200ns pulses with peak power 1.33mW
- Amplified 42dB by 23.5dBm EDFA;
- ASE floor is about 24dB lower than the peak power;



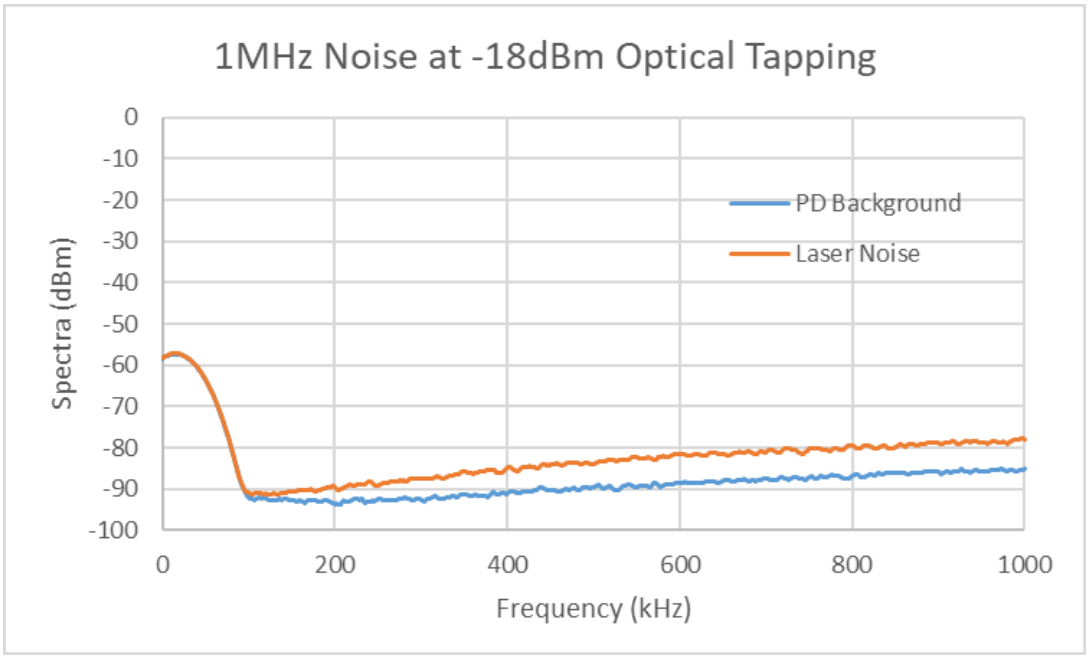


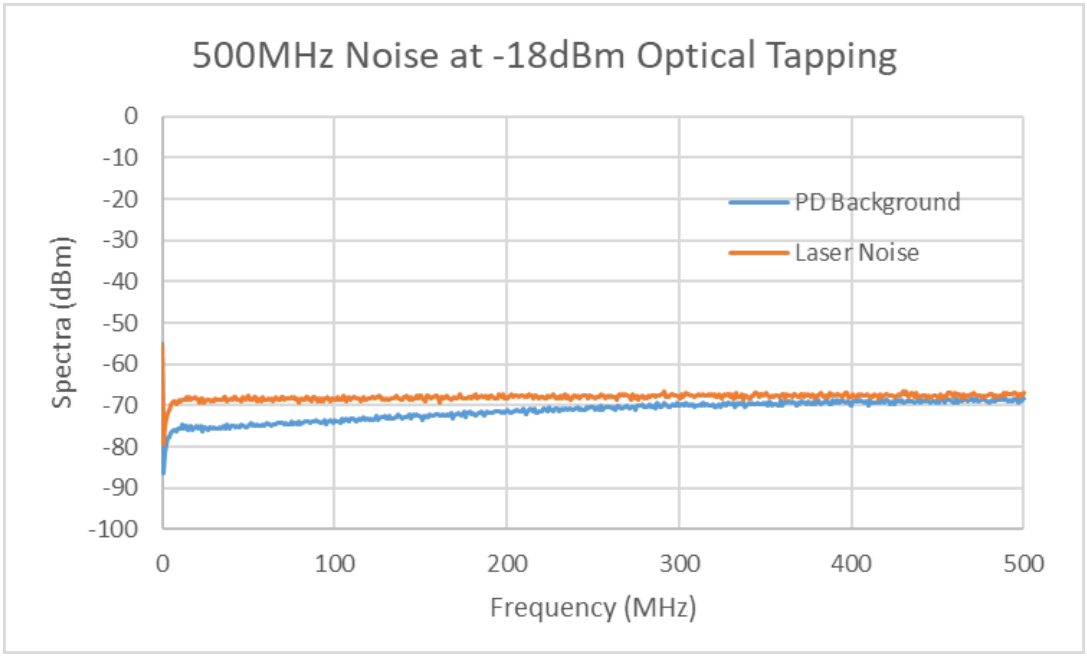
Gain Flattering Filter Effect <25dBm



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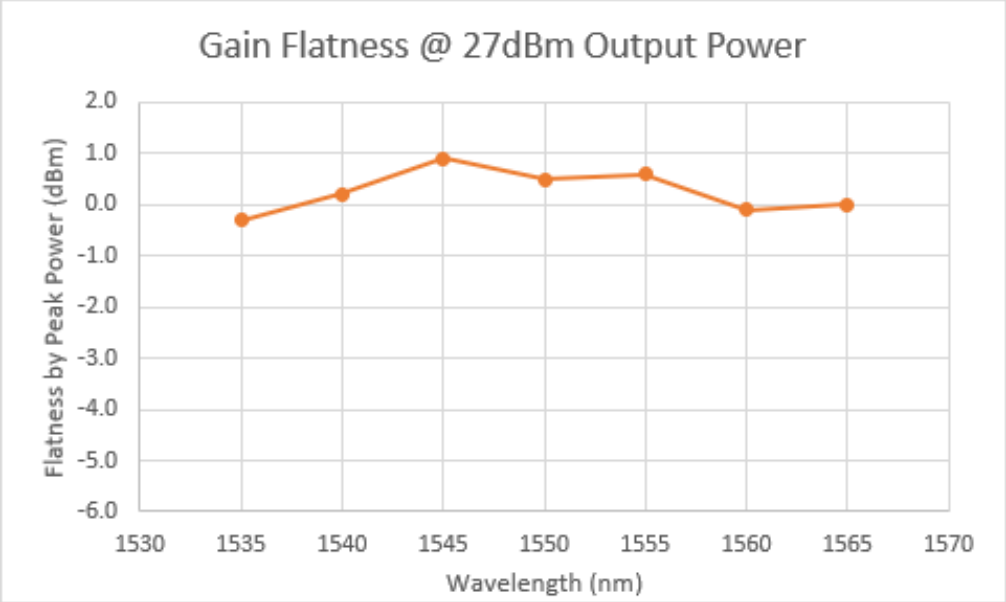
Frequency Noise



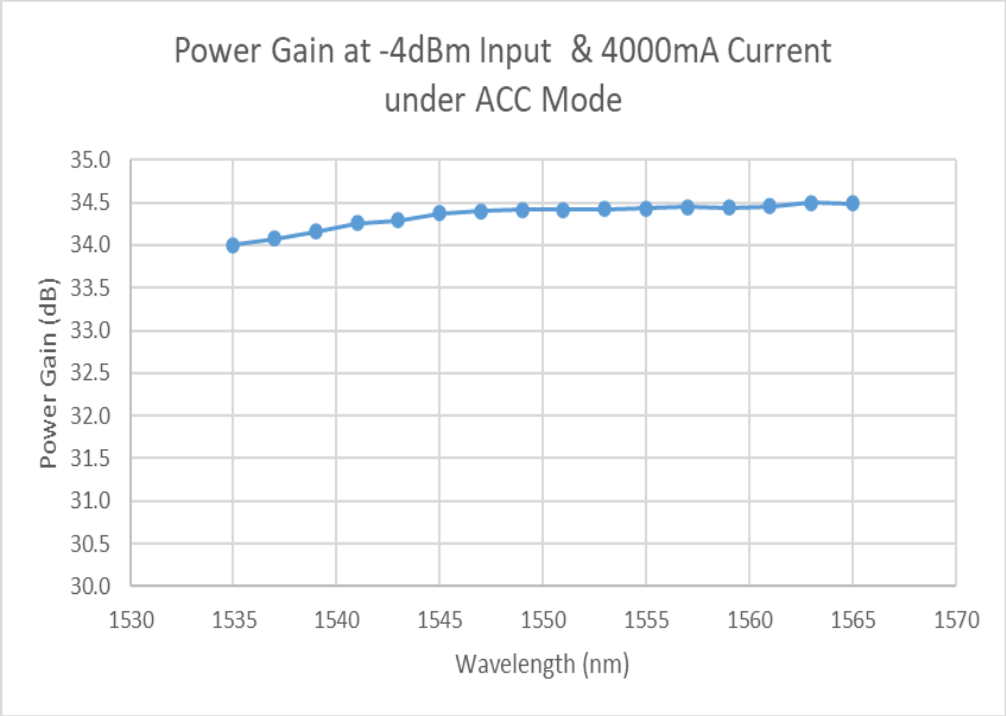


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Frequency Noise



Power Gain



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> 26dBm EDFA: EYDFA M511 protocol (UART Protocol)

1. Port Setting

Baud rate: 115200 bps
Data size: 8 bits
Parity: none
Stop Bits: 1 bit

2. Command (CMD) Packet Format

2.1 Packet sent to device

Description	Frame Head	Frame ID	CMD ID	Data length	data	Checksum
Length (byte)	2	4	1	1	n	1

Frame head 1st byte is 55, 2nd byte is AA, fixed
Frame ID xx xx xx xx, 4 bytes HEX data, device ID/SN
CMD ID 1 byte
Data length 1 byte, max length is 255(DEC). If Data length is zero then it's followed directly by checksum
Data Data to send
Checksum Add all data (except the frame head), subtract it from 0xFF and add 0x01

Data format: big endian, most significant byte (MSB) first.

2.2 Response packet from device

Description	Frame Head	Frame ID	CMD ID	Data length	data	Checksum
Length (byte)	2	4	1	1	n	1

Frame head 1st byte is AA, 2nd byte is 55, fixed
Frame ID xx xx xx xx, 4 bytes HEX data, MSB first
CMD ID 1 byte
Data length 1 byte, max length is 255(DEC).
Data Data to send
Checksum Add all data (except the frame head), subtract it from 0xFF and add 0x01

Data format: big endian, most significant byte (MSB) first.

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> 26dBm EDFA: EYDFA M511 protocol (UART Protocol)

2.3 Parameter Scale

Parameter	Scale	Unit
Input power (get)	x100	dBm
Output power (get)	x100	dBm
Output power (set)	x10	dBm
Pump current	x1	mA
Cooling current (get)	x10	mA
Pump temperature (get)	x10	°C
Module temperature (get)	x10	°C
Pre-amp output power (get)	x100	dBm
Pre-amp current (read)	x10	mA

2.4 Checksum Example

Command 55 AA 24 FF 6F 15 0C 00 (not include checksum)

Checksum 0x24+0xFF+0x6F+0x15+0x0C+0x00=0xB3 (use single-byte to add)

Subtract it from 0xFF, 0xFF – 0xB3=0x4C, then add 0x01,

and the result Checksum is 0x4D.

Complete CMD 55 AA 24 FF 6F 15 0C 00 4D

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> 26dBm EDFA: EYDFA M511 protocol (UART Protocol)

3. Communication Notes

a) EDFA sends data only when command from master is received with correct device address.

b) No response from device to incorrect command.

c) When command is correct, then proceed with one of the following:
For 'Set' commands, execute command, then send out response
For 'Get' commands, send out required data.

d) A command can be sent out only when previous one is completed.

4. Command List

Command	Packet to device	Response packet from device
Get device status	55 AA 00 00 00 6F 2F 00 62	AA 55 00 00 00 6F 2F 18 00 00 01 00 00 4A 00 00 00 00 00 00 00 00 E8 90 E8 90 E8 90 E8 90 00 70 AF
Get settings	55 AA 00 00 00 6F 2E 00 63	AA 55 00 00 00 6F 2E 18 00 01 00 01 00 01 00 00 00 00 00 00 1F 40 1F 40 00 21 00 21 00 00 00 00 48
Get SN	55 AA 00 00 00 6F 1F 00 72	AA 55 00 00 00 6F 1F 20 48 33 30 31 32 39 30 31 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 AA
Get thresholds	55 AA 00 00 00 6F 5F 00 32	AA 55 00 00 00 6F 5F 28 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 0A
Set pump ON	55 AA 00 00 00 6F 20 02 00 00 6F	AA 55 00 00 00 6F 20 02 00 00 6F
Set pump OFF	55 AA 00 00 00 6F 20 02 00 01 6E	AA 55 00 00 00 6F 20 02 00 01 6E
Set 940-1 control mode 00-APC, 01-ACC	55 AA 00 00 00 6F 21 02 00 01 6D	AA 55 00 00 00 6F 21 02 00 01 6D
Set 940-2 control mode 00-APC, 01-ACC	55 AA 00 00 00 6F 29 02 00 01 65	AA 55 00 00 00 6F 29 02 00 01 65
Set 940-1 current in ACC, Max 8000mA	55 AA 00 00 00 6F 23 02 1F 40 0D	AA 55 00 00 00 6F 23 04 1F 40 0D 00 FE
Set 940-2 current in ACC, Max 8000mA	55 AA 00 00 00 6F 24 02 1F 40 0C	AA 55 00 00 00 6F 24 04 1F 40 0C 00 FE
Set 940-1 power in APC, max 33dBm	55 AA 00 00 00 6F 25 02 00 21 49	AA 55 00 00 00 6F 25 02 00 21 49
Set 940-2 power in APC, max 33dBm	55 AA 00 00 00 6F 28 02 00 21 46	AA 55 00 00 00 6F 28 02 00 21 46

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5. Command details

5.1 Get device status

Send

55 AA 00 00 00 6F 2F 00 62

Response

AA 55 00 00 00 6F 2F 18 00 00 01 1A 00 B5 17 6C 03 C0 00 00 10 B6 FF CB 08 34 E8 90 0C E2 00 70 92

-- AA 55 Frame head
-- 00 00 00 6F Frame ID: device serial number in HEX
-- 2F CMD ID
-- 18 Data length
-- 00 00 Spare
-- 01 1A Module temperature (28.2 °C)
-- 00 B5 Pre-amp temperature (18.1 °C)
-- 17 6C Pre-amp current (599.6mA)
-- 03 C0 TEC current (9.60mA)
-- 00 00 Pump-1 current (0.00mA)
-- 10 B6 Pump-2 current (4278mA)
-- FF CB Input optical power (-0.53dBm)
-- 08 34 Pre-amp output power (21.00dBm)
-- E8 90 Output-1 power (-60.00dBm)
-- 0C E2 Output-2 power (32.97dBm)
-- 00 70 Warning 70
-- 92 Checksum

Warning code 00 70

Example 70:

Bit	Value	Meaning	Warning	Normal
7	0	Overall warning status	1	0
6	1	Pump ON/OFF	0 - OFF	1 - ON
5	1	TEC current	0	1
4	1	Pump temperature	0	1
3	0	Pump current	1	0
2	0	Device temperature	1	0
1	0	Input LOS	1	0
0	0	Output LOS	1	0

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> 26dBm EDFA: EYDFA M511 protocol (UART Protocol)

5.2 Get Setting

Send

55 AA 00 00 00 6F 2E 00 63

Response

AA 55 00 00 00 6F 2E 18 00 00 00 01 00 01 00 00 00 00 00 D2 00 00 10 B8 01 4A 01 4A 00 00 00 00 19

-- AA 55	Frame head
-- 00 00 00 6F	Frame ID: device serial number in HEX
-- 2E	CMD ID
-- 18	Data length
-- 00 00	Pump ON
-- 00 01	Pump-1 mode (ACC)
-- 00 01	Pump-1 mode (ACC)
-- 00 00	Pre-amp mode (AP)
-- 00 00	Pre-amp current (0mA)
-- 00 D2	Pre-amp output power (21.0dBm)
-- 00 00	Pump-1 current (0mA)
-- 10 B8	Pump-2 current (4280mA)
-- 01 4A	Pump-1 power (33dBm)
-- 01 4A	Pump-2 power (33dBm)
-- 00 00	spare
-- 00 00	Spare
-- 19	Checksum

5.3 Get Threshold

Command

55 AA 00 00 00 6F 5F 00 32

Response

AA 55 00 00 00 6F 5F 28 00 00 03 E8 00 00 05 14 00 00 03 E8 00 00 05 28 00 00 25 1C 00 00 0F A0 00 00 25 1C 00 00 0F A0 FF FF FF 38 00 00 02 8A 4D

-- AA 55	Frame head
-- 00 00 00 6F	Frame ID: device serial number in HEX
-- 5F	CMD ID
-- 28	Data length
-- 00 00 03 E8	Max pre-pump current (1000mA)
-- 00 00 05 14	Max pre-pump DAC (1300)
-- 00 00 03 E8	Max pre-pump TEC current (1000mA)
-- 00 00 05 28	Max pre-pump TEC DAC (1320)
-- 00 00 25 1C	Max pump-1 current (9500rnA)
-- 00 00 0F A0	Max pump-1 DAC (4000)
-- 00 00 25 1C	Max pump-2 current (9500mA)
-- 00 00 0F A0	Max pump-2 DAC (4000)
-- FF FF FF 38	Input threshold (-20dBm)
-- 00 00 02 8A	Highest temperature pump is allowed to turn on (65°C)
-- 4D	CRC checksum

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< 25dBM MSA EDFA: MSA EDFA protocol

1. Setup of serial port

Baud rate	Data bit	Stop bit	Checksum	Flow control
9600	8 bits	1 bit	None	none

2. Data format

All communications are in Master-slave reply mode. Host computer acts as Master and sends command. EDFA as slave replies it. The data format is HEX and in Big-Endian mode. The format of frame command is as below for detail:

Frame Head	Frame ID	CMD ID	Data length	Data	checksum
2 bytes	4 bytes	1 byte	1 byte	N bytes	1 byte

Frame head: 1st byte is 55, 2nd byte is AA, fixed
Frame ID: xx xxxxxx, 4 bytes HEX data, MSB first
CMD ID: 1 byte
Data length: 1 byte, max length is 255(DEC). If Data length is zero then it's followed directly by checksum
Data: data to send
Checksum: add all data (except the frame head), subtract it from 0xFF and add 0x01

Example:

Master command is: 55 AA 24 FF 6F 15 0C 00 (not include checksum)

Checksum: 0x24+0xFF+0x6F+0x15+0x0C+0x00=0xB3 (use single-byte to add)
Subtract it from 0xFF, 0xFF – 0xB3=0x4C, then add 0x01,
and the result Checksum is 0x4D.

Complete command is: 55 AA 24 FF 6F 15 0C 00 4D

Checksum algorithm is presented as below:

```
U8 FRAME_CreateChkSum(U8 *pucStr, U8 ucLen)
{
     U8   ucSum      = 0x00;
      U8   ucChkSum = 0xFF;
U8   i          = 0;

     /* Check if input string is valid. */ if
     (NULL == pucStr)
     {
          return FALSE;
     }
     /* Create the CheckSum. */
     for (i = 0; i<ucLen; i++)
     {
ucSum += pucStr[i];
     }
ucChkSum = (0xFF - ucSum + 1);
     return ucChkSum;
}
```


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< 25dBM MSA EDFA: MSA EDFA protocol

3. The frame command of slave

Frame Head		Frame ID				CMD ID	Data Length	Data		checksum
2 bytes		4 bytes				1 byte	1 byte	N bytes		1 byte
MSB	LSB	MSB			LSB			MSB	LSB	
AA	55	01	02	03	04	xx	xx	xx ... xx		xx

Note: 'xx' indicates real data, 'NC' indicates that data is not required. All data are HEX format Data decode method: Physical quantity = digital quantity * Scale

Data is in Big-Endian mode.

4. CMD ID

4.1 Module serial number

Frame Head			Frame ID				CMD ID	Data Length	Data		checksum
length	2bytes		4bytes				1byte	1byte	N bytes		1byte
Byte order	MSB	LSB	MSB			LSB			MSB	LSB	
Master	55	AA	01	02	03	04	0A	02	NC		xx
Slave	AA	55	01	02	03	04	0A	02	xx	xx	xx
Data type									Char		

Note: Slave replies 16 bytes, SN is ASCII in HEX.

4.2 All parameter

Frame Head			Frame ID				CMD ID	Data Length	Data		checksum
length	2bytes		4bytes				1byte	1byte	N bytes		1byte
Byte order	MSB	LSB	MSB			LSB			MSB	LSB	
Master	55	AA	01	02	03	04	0C	00	NC		xx
Slave	AA	55	01	02	03	04	0C	14	xx	xx	xx
Data type											

Note: Slave replies 20 bytes, see below for details:
Byte0 ~ 1: unsigned short data type, pump current, MSB first, scale is 0.1, unit is mA. Byte 2 ~ 3: short data type, pump temp, MSB first, scale is 0.1, unit is ℃.
Byte4 ~ 5: short data type, pump TEC current, MSB first, scale is 0.1, unit is mA. Byte6 ~ 7: short data type, pump power, MSB first, scale is 0.01, unit is dBm.
Byte8 ~ 9: short data type, input power, MSB first, scale is 0.01, unit is dBm. If the value is 0xE890, it indicates that the input power is low.
Byte10 ~ 11: short data type, output power, MSB first, scale is 0.01, unit is dBm. If the value is 0xE890, it indicates that the output power is low.
Byte12 ~ 13: short data type, GAIN, MSB first, scale is 0.01, unit is dB. If the value is 0x7FFF, it indicates that the GAIN is
Byte14 ~ 15: short data type, module temperature, MSB first, scale is 0.1, unit is ℃.
Byte16 ~ 17: unsigned short data type, module power voltage, MSB first, scale is 0.01, unit is V. Byte18 ~ 19: unsigned short data type, system alarm, MSB first, MSB type is invalid. The bit field

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of LSB is shown as below:

Bit0: input power LOS alarm

Bit1: output power LOS alarm

Bit2: module temp alarm Bit3:

pump current alarm Bit4: pump

temp alarm

4.3 Get pump state

Frame Head			Frame ID				CMD ID	Data Length	Data		checksum
length	2bytes		4bytes				1byte	1byte	N bytes		1byte
Byte order	MSB	LSB	MSB			LSB			MSB	LSB	
Master	55	AA	01	02	03	04	1B	00	NC		xx
Slave	AA	55	01	02	03	04	1B	02	xx	xx	xx
Data type									unsigned short		

Note: Slave replies 2 bytes. MSB byte is invalid. LSB byte is 0x00 when pump is on, and it is 0x01 when pump is off.

4.4 Set pump state

Frame Head			Frame ID				CMD ID	Data Length	Data		checksum
length	2bytes		4bytes				1byte	1byte	N bytes		1byte
Byte order	MSB	LSB	MSB			LSB			MSB	LSB	
Master	55	AA	01	02	03	04	1A	02	xx	xx	xx
Slave	AA	55	01	02	03	04	1A	02	xx	xx	xx
Data type									unsigned short		

Note: Master sends 2 bytes to slave. MSB byte is invalid. LSB byte is 0x00 when set pump to on and LSB byte is 0x01 when set pump to off.

4.5 Get work mode

Frame Head			Frame ID				CMD ID	Data Length	Data		checksum
length	2bytes		4bytes				1byte	1byte	N bytes		1byte
Byte order	MSB	LSB	MSB			LSB			MSB	LSB	
Master	55	AA	01	02	03	04	41	00	NC		xx
Slave	AA	55	01	02	03	04	41	02	xxxx		xx
Data type									unsigned short		

Note: Slave replies 2 bytes. MSB byte is invalid. LSB byte is as below: 0x00---
-ACC mode, 0x02----APC mode, 0x03---- AGC mode

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< 25dBM MSA EDFA: MSA EDFA protocol

4.6 Set work mode

Frame Head			Frame ID				CMD ID	Data Length	Data		checksum
length	2bytes		4bytes				1byte	1byte	N bytes		1byte
Byte order	MSB	LSB	MSB			LSB			MSB	LSB	
Master	55	AA	01	02	03	04	42	02	xx	xx	xx
Slave	AA	55	01	02	03	04	42	02	xx	xx	xx
Data type									unsigned short		

Note: Master sends 2 bytes to slave. MSB byte is invalid. LSB byte is as below: 0x00----ACC mode, 0x02----APC mode, 0x03---- AGC mode

4.7 Get output power target

Frame Head			Frame ID				CMD ID	Data Length	Data		checksum
length	2bytes		4bytes				1byte	1byte	N bytes		1byte
Byte order	MSB	LSB	MSB			LSB			MSB	LSB	
Master	55	AA	01	02	03	04	44	00	NC		xx
Slave	AA	55	01	02	03	04	44	02	xxxx		xx
Data type									short		

Note: Slave replies 2 bytes. Scale is 0.01. Unit is dBm.

4.8 Set output power target

Frame Head			Frame ID				CMD ID	Data Length	Data		checksum
length	2bytes		4bytes				1byte	1byte	N bytes		1byte
Byte order	MSB	LSB	MSB			LSB			MSB	LSB	
Master	55	AA	01	02	03	04	45	02	xx	xx	xx
Slave	AA	55	01	02	03	04	45	02	xx	xx	xx
Data type									short		

Note: Master sends 2 bytes to slave. Scale is 100. Unit isdBm.

4.9 Get gain

Frame Head			Frame ID				CMD ID	Data Length	Data		checksum
length	2bytes		4bytes				1byte	1byte	N bytes		1byte
Byte order	MSB	LSB	MSB			LSB			MSB	LSB	
Master	55	AA	01	02	03	04	47	00	NC		xx
Slave	AA	55	01	02	03	04	47	02	xxxx		xx
Data type									short		

Note: Slave replies 2 bytes. Scale is 0.01. Unit is dB.

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4.10 Set gain

Frame Head			Frame ID				CMD ID	Data Length	Data		checksum
length	2bytes		4bytes				1byte	1byte	N bytes		1byte
Byte order	MSB	LSB	MSB			LSB			MSB	LSB	
Master	55	AA	01	02	03	04	48	02	xx	xx	xx
Slave	AA	55	01	02	03	04	48	02	xx	xx	xx
Data type									short		

Note: Master sends 2 bytes to slave. Scale is 100. Unit is dB.

4.11 Get threshold of pump current

Frame Head			Frame ID				CMD ID	Data Length	Data		checksum
length	2bytes		4bytes				1byte	1byte	N bytes		1byte
Byte order	MSB	LSB	MSB			LSB			MSB	LSB	
Master	55	AA	01	02	03	04	5F	00	NC		xx
Slave	AA	55	01	02	03	04	5F	02	xxxx		xx
Data type									short		

Note: Slave replies 2 bytes. Scale is 0.1. Unit is mA.

4.12 Set threshold of pump current

Frame Head			Frame ID				CMD ID	Data Length	Data		checksum
length	2bytes		4bytes				1byte	1byte	N bytes		1byte
Byte order	MSB	LSB	MSB			LSB			MSB	LSB	
Master	55	AA	01	02	03	04	50	02	xx	xx	xx
Slave	AA	55	01	02	03	04	50	02	xx	xx	xx
Data type									short		

Note: Master sends 2 bytes to slave. Scale is 10. Unit is mA.

4.13 Get LOS threshold of input power

Frame Head			Frame ID				CMD ID	Data Length	Data		checksum
length	2bytes		4bytes				1byte	1byte	N bytes		1byte
Byte order	MSB	LSB	MSB			LSB			MSB	LSB	
Master	55	AA	01	02	03	04	51	00	NC		xx
Slave	AA	55	01	02	03	04	51	02	xxxx		xx
Data type									short		

Note: Slave replies 2 bytes. Scale is 0.01. Unit is dBm.

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4.14 Set LOS threshold of input power

Frame Head			Frame ID				CMD ID	Data Length	Data		checksum
length	2bytes		4bytes				1byte	1byte	N bytes		1byte
Byte order	MSB	LSB	MSB			LSB			MSB	LSB	
Master	55	AA	01	02	03	04	52	02	xx	xx	xx
Slave	AA	55	01	02	03	04	52	02	xx	xx	xx
Data type									short		

Note: Master sends 2 bytes to slave. Scale is 100. Unit is dBm.

4.15 Get LOS threshold of output power

Frame Head			Frame ID				CMD ID	Data Length	Data		checksum
length	2bytes		4bytes				1byte	1byte	N bytes		1byte
Byte order	MSB	LSB	MSB			LSB			MSB	LSB	
Master	55	AA	01	02	03	04	53	00	NC		xx
Slave	AA	55	01	02	03	04	53	02	xxxx		xx
Data type									short		

Note: Slave replies 2 bytes. Scale is 0.01. Unit is dBm.

4.16 Set LOS threshold of output power

Frame Head			Frame ID				CMD ID	Data Length	Data		checksum
length	2bytes		4bytes				1byte	1byte	N bytes		1byte
Byte order	MSB	LSB	MSB			LSB			MSB	LSB	
Master	55	AA	01	02	03	04	54	02	xx	xx	xx
Slave	AA	55	01	02	03	04	54	02	xx	xx	xx
Data type									short		

Note: Master sends 2 bytes to slave. Scale is 100. Unit is dBm.

4.17 Get threshold of no optical power

Frame Head			Frame ID				CMD ID	Data Length	Data		checksum
length	2bytes		4bytes				1byte	1byte	N bytes		1byte
Byte order	MSB	LSB	MSB			LSB			MSB	LSB	
Master	55	AA	01	02	03	04	55	00	NC		xx
Slave	AA	55	01	02	03	04	55	02	xxxx		xx
Data type									short		

Note: Slave replies 2 bytes. Scale is 0.01. Unit is dBm.

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4.18 Set threshold of no optical power

Frame Head			Frame ID				CMD ID	Data Length	Data		checksum
length	2bytes		4bytes				1byte	1byte	N bytes		1byte
Byte order	MSB	LSB	MSB			LSB			MSB	LSB	
Master	55	AA	01	02	03	04	56	02	xx	xx	xx
Slave	AA	55	01	02	03	04	56	02	xx	xx	xx
Data type									short		

Note: Master sends 2 bytes to slave. Scale is 100. Unit is dBm.

4.19 Get low threshold of module temp

Frame Head			Frame ID				CMD ID	Data Length	Data		checksum
length	2bytes		4bytes				1byte	1byte	N bytes		1byte
Byte order	MSB	LSB	MSB			LSB			MSB	LSB	
Master	55	AA	01	02	03	04	57	00	NC		xx
Slave	AA	55	01	02	03	04	57	02	xxxx		xx
Data type									short		

Note: Slave replies 2 bytes. Scale is 0.1. Unit is ℃.

4.20 Set low threshold of module temp

Frame Head			Frame ID				CMD ID	Data Length	Data		checksum
length	2bytes		4bytes				1byte	1byte	N bytes		1byte
Byte order	MSB	LSB	MSB			LSB			MSB	LSB	
Master	55	AA	01	02	03	04	58	02	xx	xx	xx
Slave	AA	55	01	02	03	04	58	02	xx	xx	xx
Data type									short		

Note: Master sends 2 bytes to slave. Scale is 10. Unit is ℃.

4.21 Get high threshold of module temp

Frame Head			Frame ID				CMD ID	Data Length	Data		checksum
length	2bytes		4bytes				1byte	1byte	N bytes		1byte
Byte order	MSB	LSB	MSB			LSB			MSB	LSB	
Master	55	AA	01	02	03	04	59	00	NC		xx
Slave	AA	55	01	02	03	04	59	02	xxxx		xx
Data type									short		

Note: Slave replies 2 bytes. Scale is 0.1. Unit is℃.

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4.22 Set high threshold of module temp

Frame Head			Frame ID				CMD ID	Data Length	Data		checksum
length	2bytes		4bytes				1byte	1byte	N bytes		1byte
Byte order	MSB	LSB	MSB			LSB			MSB	LSB	
Master	55	AA	01	02	03	04	5A	02	xx	xx	xx
Slave	AA	55	01	02	03	04	5A	02	xx	xx	xx
Data type									short		

Note: Master sends 2 bytes to slave. Scale is 10. Unit is ℃.

4.23 Get low threshold of pump temp

Frame Head			Frame ID				CMD ID	Data Length	Data		checksum
length	2bytes		4bytes				1byte	1byte	N bytes		1byte
Byte order	MSB	LSB	MSB			LSB			MSB	LSB	
Master	55	AA	01	02	03	04	5B	00	NC		xx
Slave	AA	55	01	02	03	04	5B	02	xxxx		xx
Data type									short		

Note: Slave replies 2 bytes. Scale is 0.1. Unit is℃.

4.24 Set low threshold of pump temp

Frame Head			Frame ID				CMD ID	Data Length	Data		checksum
length	2bytes		4bytes				1byte	1byte	N bytes		1byte
Byte order	MSB	LSB	MSB			LSB			MSB	LSB	
Master	55	AA	01	02	03	04	5C	02	xx	xx	xx
Slave	AA	55	01	02	03	04	5C	02	xx	xx	xx
Data type									short		

Note: Master sends 2 bytes to slave. Scale is 10. Unit is ℃.

4.25 Get high threshold of pump temp

Frame Head			Frame ID				CMD ID	Data Length	Data		checksum
length	2bytes		4bytes				1byte	1byte	N bytes		1byte
Byte order	MSB	LSB	MSB			LSB			MSB	LSB	
Master	55	AA	01	02	03	04	5D	00	NC		xx
Slave	AA	55	01	02	03	04	5D	02	xxxx		xx
Data type									short		

Note: Slave replies 2 bytes. Scale is 0.1. Unit is℃.

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4.26 Set high threshold of pump temp

Frame Head			Frame ID				CMD ID	Data Length	Data		checksum
length	2bytes		4bytes				1byte	1byte	N bytes		1byte
Byte order	MSB	LSB	MSB			LSB			MSB	LSB	
Master	55	AA	01	02	03	04	5E	02	xx	xx	xx
Slave	AA	55	01	02	03	04	5E	02	xx	xx	xx
Data type									short		

Note: Master sends 2 bytes to slave. Scale is 10. Unit is ℃.

4.27 Get ACC Pump Current

Frame Head			Frame ID				CMD ID	Data Length	Data		checksum
length	2bytes		4bytes				1byte	1byte	N bytes		1byte
Byte order	MSB	LSB	MSB			LSB			MSB	LSB	
Master	55	AA	01	02	03	04	A7	00	NC		xx
Slave	AA	55	01	02	03	04	A7	02	xxxx		xx
Data type									short		

Note: Slave replies 2 bytes. Scale is 0.1. Unit is mA.

4.28 Set ACC Pump Current

Frame Head			Frame ID				CMD ID	Data Length	Data		checksum
length	2bytes		4bytes				1byte	1byte	N bytes		1byte
Byte order	MSB	LSB	MSB			LSB			MSB	LSB	
Master	55	AA	01	02	03	04	79	02	xx	xx	xx
Slave	AA	55	01	02	03	04	79	02	xx	xx	xx
Data type									short		

Note: Master sends 2 bytes to slave. Scale is 10. Unit is mA.

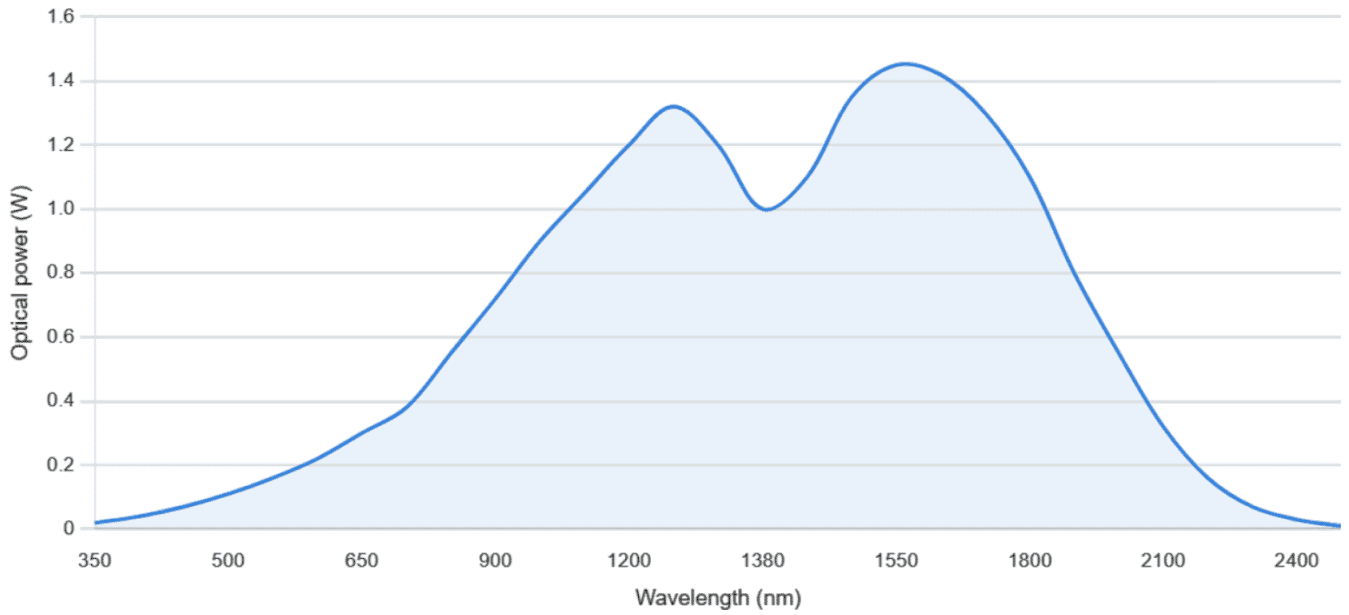
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Erbium Doped Fiber Amplifier

1528–1565 nm up to 26 dBm, 1535–1565 nm up to 41 dBm

DATASHEET

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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