

# WAVEMAKER® 500A/4000A

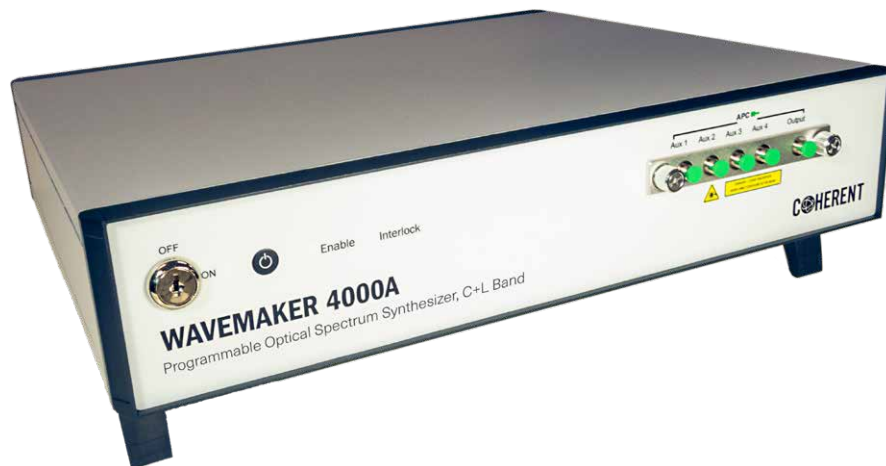
## 500A Programmable Optical Spectrum Generator 4000A Programmable Optical Spectrum Synthesizer

The WaveMaker family allows creating test signals especially suited for D-WDM system test applications.

The WaveMaker 500A is a programmable ASE source covering the Super-C band and showing power levels of up to 20 dBm.

The WaveMaker 4000A is a programmable spectrum synthesizer allowing generation of arbitrary spectral shapes in the Super C-Band or in the C+L band. Shapes with widths (FWHM) as narrow as 10 GHz and slopes as steep as 600 dB/nm can be generated. With the WaveMaker 4000A units extinction ratios exceeding 60 dB can be achieved. Also, adding signals (like modulated channels) from external sources is supported.

Programming of the spectrum can be done manually via the GUI, by upload of a spectrum definition file and also automated through an Application Programming Interface (API).



### FEATURES

- Generation of Arbitrary Spectra
- Coverage of Super-C and C+L Band
- Integrated ASE Source
- Internal WaveShaper programmable filter
- Total output power up to 20 dBm
- Detachable panel supports cleaning of internal connectors

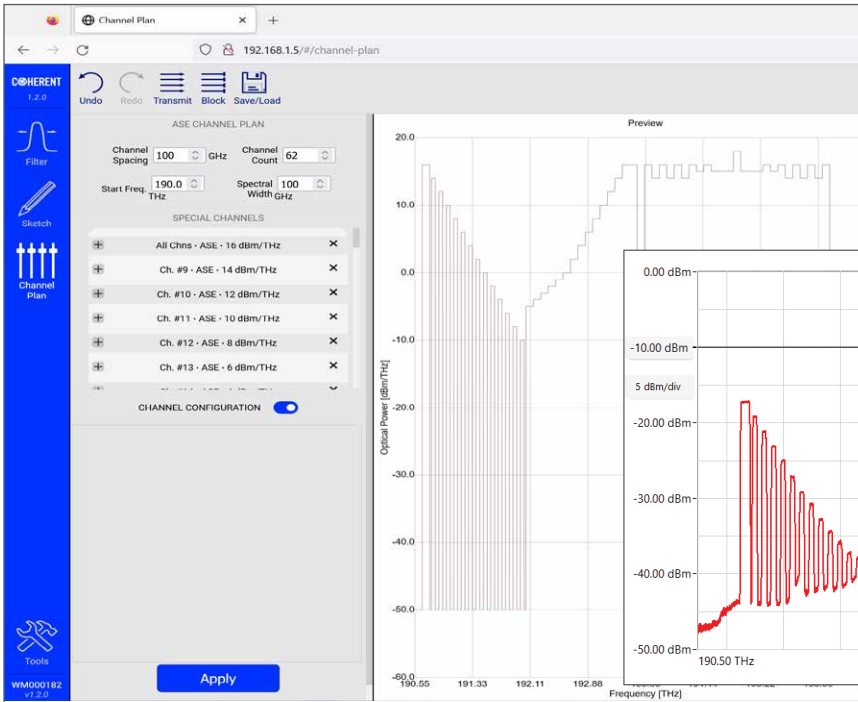
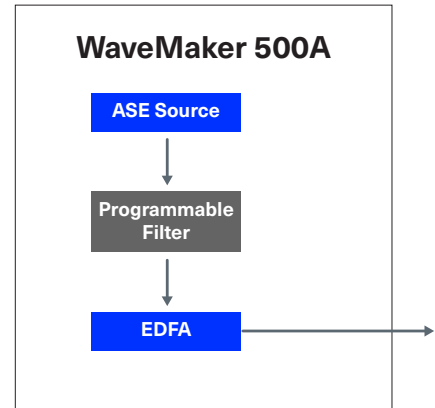
### APPLICATIONS

- System Test lab
- DWDM Test signal generation
- Transceiver test
- Amplifier test

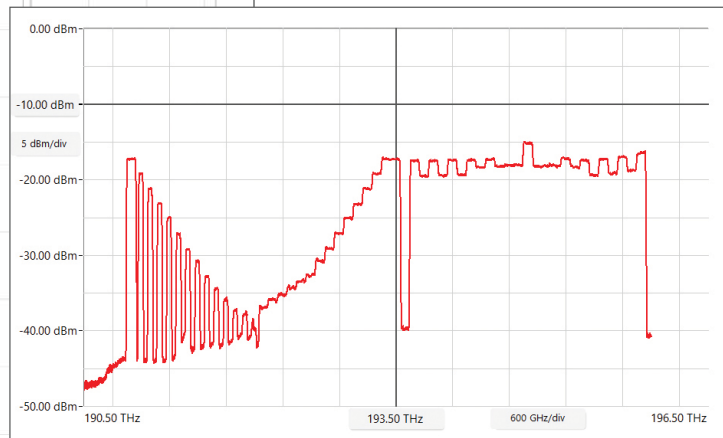
### WaveMaker 500A – Setup

The WaveMaker 500A Programmable Optical Spectrum Generator supports generating spectra across the SuperC band with a total power of more than 20 dBm.

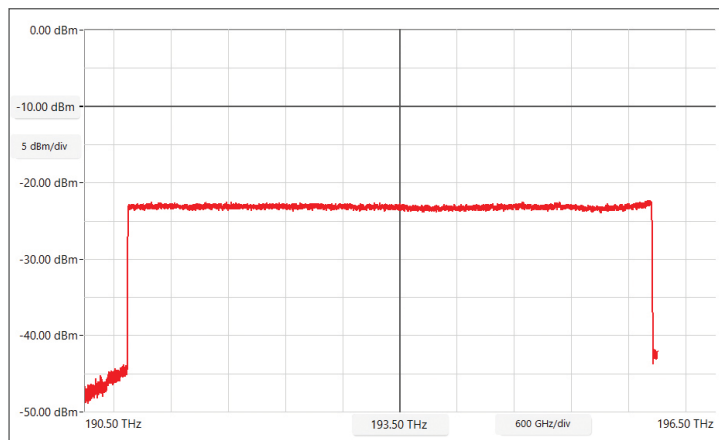
The spectral shape of the output signal is programmable; it can be set to be flat, channelized or completely arbitrary.



Programming of the WaveMaker 500A with the desired ASE shape



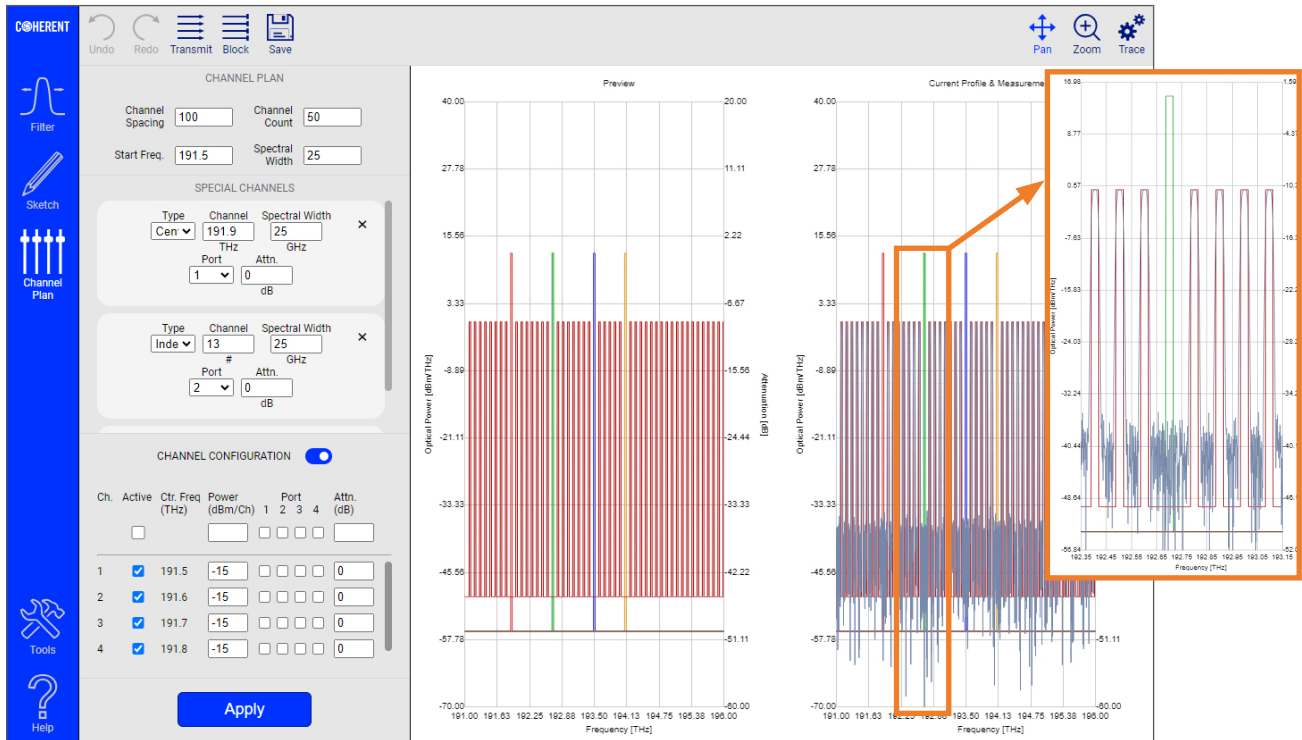
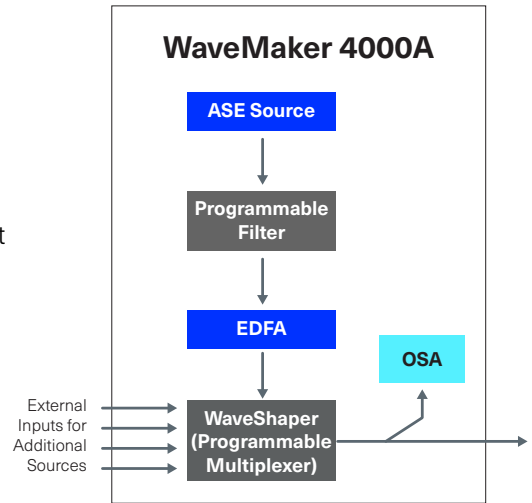
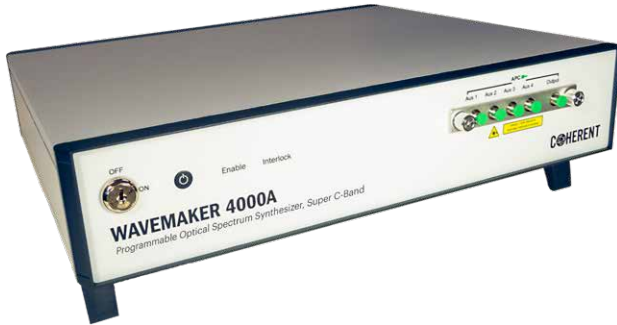
Output spectrum of the WaveMaker 500A, measurement taken with a WaveAnalyzer 400A.



Flattened output spectrum

### WaveMaker 4000A - Setup

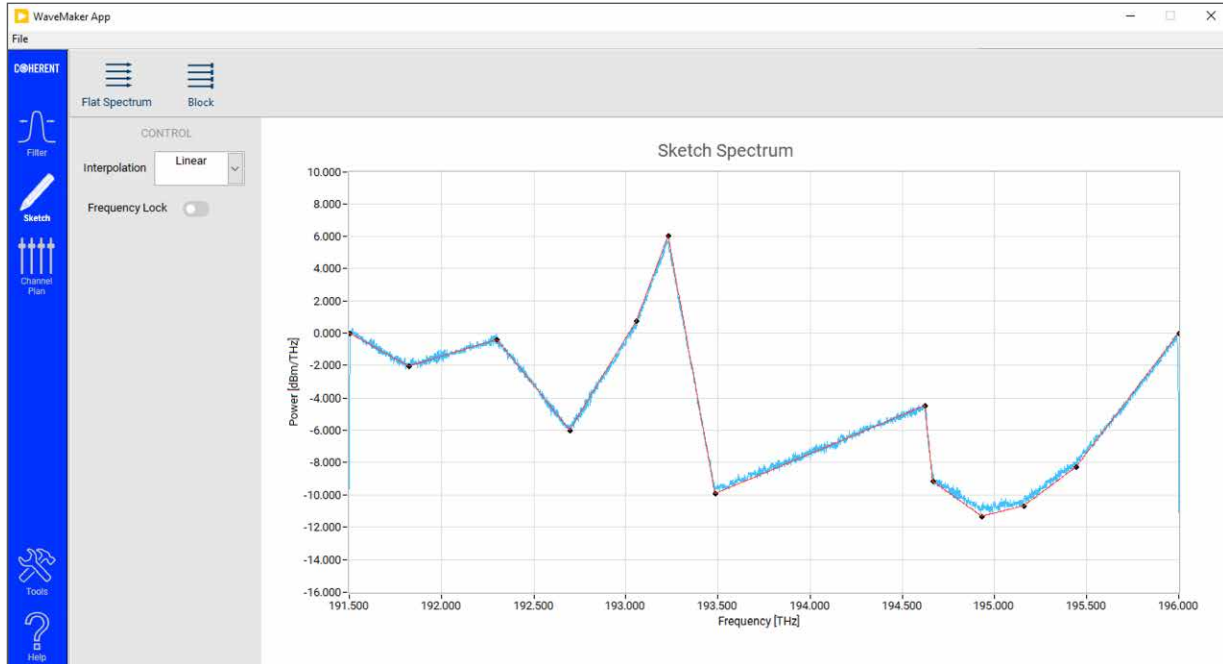
The WaveMaker 4000A includes an ASE Source plus a programmable filter for shaping the ASE – typically carving out the desired channels. An EDFA ensures that an output power level of up to 17 dBm is available. The programmable Multiplexer removes remaining ASE (for example between channels) and also supports multiplexing additional channels from external sources into the signal. As a last step the output signal is measured with an internal Optical Spectrum Analyzer module.



A channel plan can be defined using the WaveMaker Graphical User Interface. ASE channels are generated from the Erbium broadband source by shaping with the internal programming filter. In addition true modulated channels can be multiplexed from external sources into the signal, as shown in the “Preview” window. In this example a number of 50 GHz wide, 100 GHz spaced ASE channels have been created and multiplexed with four real channels. The output signal is shown in the “Current Profile & Measurement” window. This includes a real measurement with the internal Optical Spectrum Analyzer module. The noise floor visible in the measured spectrum is actually the noise floor of the OSA module. The real noise floor exiting the WaveMaker is well below this level.

All WaveMaker instruments support the Sketch function in which a desired arbitrary ASE spectral shape can be designed with the mouse in a drag-and-drop fashion. The created shape – shown as red curve in the screenshot below – will immediately be uploaded to the WaveMaker.

In case of the WaveMaker 4000A the spectrum of the output signal is measured with the internal Optical Spectrum Analyzer module and shown with the blue trace.



A signal with an arbitrary spectral shape can be defined by drag-and-drop using the mouse of the PC, as shown with the red curve in the screenshot above. The created shape will immediately be uploaded to the WaveMaker. The output spectrum, measured with the internal Optical Spectrum Analyzer module, is shown with the blue trace.

- All WaveMaker instruments come with a detachable sub-front panel which allow easy cleaning of the internal optical connector.
- The WaveMaker instruments include an interlock, so that they can be integrated in the safety concepts of automated system environments.



**Specifications (Preliminary)**

Model	WaveMaker 500A	WaveMaker 4000A/C	WaveMaker 4000A/X	
Transmission Band	Super C-Band	Super C-Band	C+L-band	
External Optical Ports	Port Configurations	1 output port	4 input ports (2), 1 output port	
WaveMaker Control	Technology	Erbium ASE Source plus Erbium Amplifier		
	Frequency Range	190.55 THz to 196.775 THz (1523.53 nm to 1573.301 nm)	190.65 THz to 196.65 THz (1524.5 nm to 1572.5 nm)	186.20 THz to 196.20 THz (1528.0 nm to 1610.0 nm)
	Maximum Output Power	>20 dBm	14 dBm	17 dBm (1)
	Maximum Output power density (flat spectrum)	>13 dBm / THz	8 dBm / THz	
	Maximum Output Power – single 100GHz wide channel	17 dBm	10 dBm	
	Blocked Power Density Level	up to 30 dB (4)	< -60 dBm / THz	
WaveShaper / Programmable Filter Control	Frequency Range (2)	190.55 THz to 196.775 THz (1523.53 nm to 1573.301 nm)	190.65 THz to 196.65 THz (1524.5 nm to 1572.5 nm)	185.90 THz to 196.20 THz (1528.0 nm to 1612.65 nm)
	Filter Bandwidth	10 GHz to full range		
	Filter Shape	Arbitrary Attenuation	Arbitrary Attenuation and Arbitrary Phase	
	Frequency Setting Resolution	±0.1 GHz (±0.8 pm)		
	Frequency Setting Accuracy	±2.5 GHz (±20 pm)		±1.5 GHz (±12 pm)
	Bandwidth Setting Resolution	±0.1 GHz (±0.8 pm)		
	Bandwidth Setting Accuracy	±5 GHz (±40 pm)		
	Bandwidth Setting Repeatability	±2.5 GHz (±20 pm)		
	Group Delay Control Range	n/a	±25 ps	
	Attenuation Control Range	n/a	0 to 30 dB	
	Attenuation Setting Resolution	n/a	0.01 dB	
	Attenuation Setting Accuracy	n/a	±1 dB for 0.01 to 10 dB ±10% for 10.01 to 25 dB ±15% dB for 25.01 to 30 dB	
	Settling Time (Filter update rate)	<0.1 s (>10 Hz)		
	Insertion Loss	n/a	<6 dB (3)	
	Insertion Loss Non-Uniformity	n/a	<0.8 dB	
	Polarization Dependent Loss (PDL)	n/a	<0.6 dB	
	Differential Group Delay (DGD)	n/a	0.6 ps	
	Return Loss	n/a	25 dB	
	Max Total Input Optical Power	n/a	27 dBm	
Max Optical Power per 50 GHz channel	n/a	13 dBm		
Environment	Operating Temperature	15°C to 35°C		
	Operating Humidity	10% to 85%, non condensing		
Electrical	Communications Interface	USB 2.0, Ethernet (GbE)		
	Voltage	100-240 V (AC)		
	Power Consumption	<60 VA		
Mechanical	Connector Interface	FC/APC, LC/UPC		
	Dimensions, weight	442 mm x 88 mm x 316 mm, 5 kg		

Notes:

- (1) In case signal stretches across C+L band. In case signal covers only Super-C or L band, max power is 14 dBm.
- (2) Inserting optical signals with spectral components below 600 nm must be avoided.
- (3) Valid for Filter Bandwidth settings of 15 GHz and larger. For Filter Bandwidth settings below 15 GHz an additional loss of up to 2 dB may apply.
- (4) Difference of power density levels of a blocked spectral region compared to power density levels in a channel.

## Control and Programming

The WaveMaker can be controlled in a number of ways:

- From a Win 10 / Win 11 system using the WaveMaker App Graphical User Interface (GUI) package.
- From a Web-Browser using the WaveMaker-internal Web-Server. This Web-Server provides full control without installing software on the user computers. Control from any platform (Windows, Linux, Android, iOS etc) is provided.
- A RESTful http based Application Programming Interface (API) provides control of the WaveMaker from other programming environments. Programming examples are available for LabView, Matlab, Python, Octave, Visual Basic and C#.

## WaveShaper Operation

The WaveMaker 4000A includes a WaveShaper engine which can be operated like an independent WaveShaper with a 1 x 4 port count. Filtering with arbitrary attenuation and phase shape is supported.

## Optical Spectrum Analyzer (OSA) Operation

The WaveMaker 4000A includes an Optical Spectrum Analyzer engine which can also be used as an independent instrument.

## Additional Resources

Visit <https://www.coherent.com/networking/optical-instrumentation> for the latest product information, news and software for the WaveShaper, WaveAnalyzer, and WaveMaker product families.

## Coherent Knowledgebase

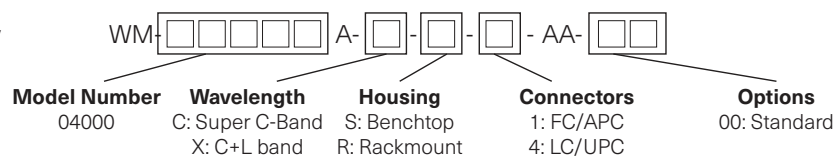
Obtain further application and technical information about the Optical Instrumentation Portfolio including the WaveAnalyzer Family by clicking here: <https://www.coherent.com/networking/optical-instrumentation/knowledgebase>

## WaveShaper Demonstration on YouTube

Watch product demo at: <https://www.youtube.com/@CoherentCorp>



### Order Code Key



Model	Order Code	Description	Wavelength Band	Housing Type	Fiber Type	Connection Type
WaveMaker 500A	WM-00500A-C-S-1-AA-00	Programmable Spectrum Generator	Super-C	Benchtop	Single-mode	FC/APC
	WM-00500A-C-R-1-AA-00	Programmable Spectrum Generator	Super-C	Rackmount	Single-mode	FC/APC
WaveMaker 4000A/C	WM-04000A-C-S-1-AA-00	Programmable Spectrum Synthesizer	Super-C	Benchtop	Single-mode	FC/APC
	WM-04000A-C-R-1-AA-00	Programmable Spectrum Synthesizer	Super-C	Rackmount	Single-mode	FC/APC
	WM-04000A-C-R-4-AA-00	Programmable Spectrum Synthesizer	Super-C	Rackmount	Single-mode	LC/UPC
WaveMaker 4000A/X	WM-04000A-X-S-1-AA-00	Programmable Spectrum Synthesizer	C+L	Benchtop	Single-mode	FC/APC
	WM-04000A-X-R-1-AA-00	Programmable Spectrum Synthesizer	C+L	Rackmount	Single-mode	FC/APC