

WAVEMAKER® 4000A

Programmable Spectrum Synthesizer

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

An internal amplifier ensures that total power levels of up to 14 dBm can be achieved.

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

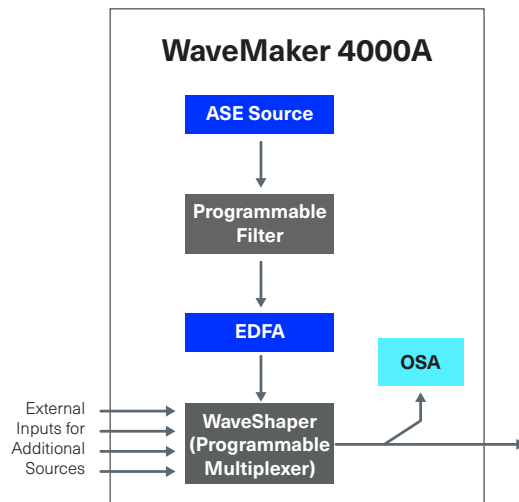
- Generation of Arbitrary Spectra
- Integrated ASE Source
- Internal WaveShaper programmable filter
- Total output power up to 14 dBm
- Detachable panel supports cleaning of internal connectors

APPLICATIONS

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

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 14 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.



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 WaveShaper from other programming environments. Programming examples are available for LabView, Matlab, Python, Octave, Visual Basic and C#.

WaveShaper Operation

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

Additional Resources

Visit <https://ii-vi.com/instruments> for the latest product information, news and software for the WaveShaper, WaveAnalyzer, and WaveMaker product families.

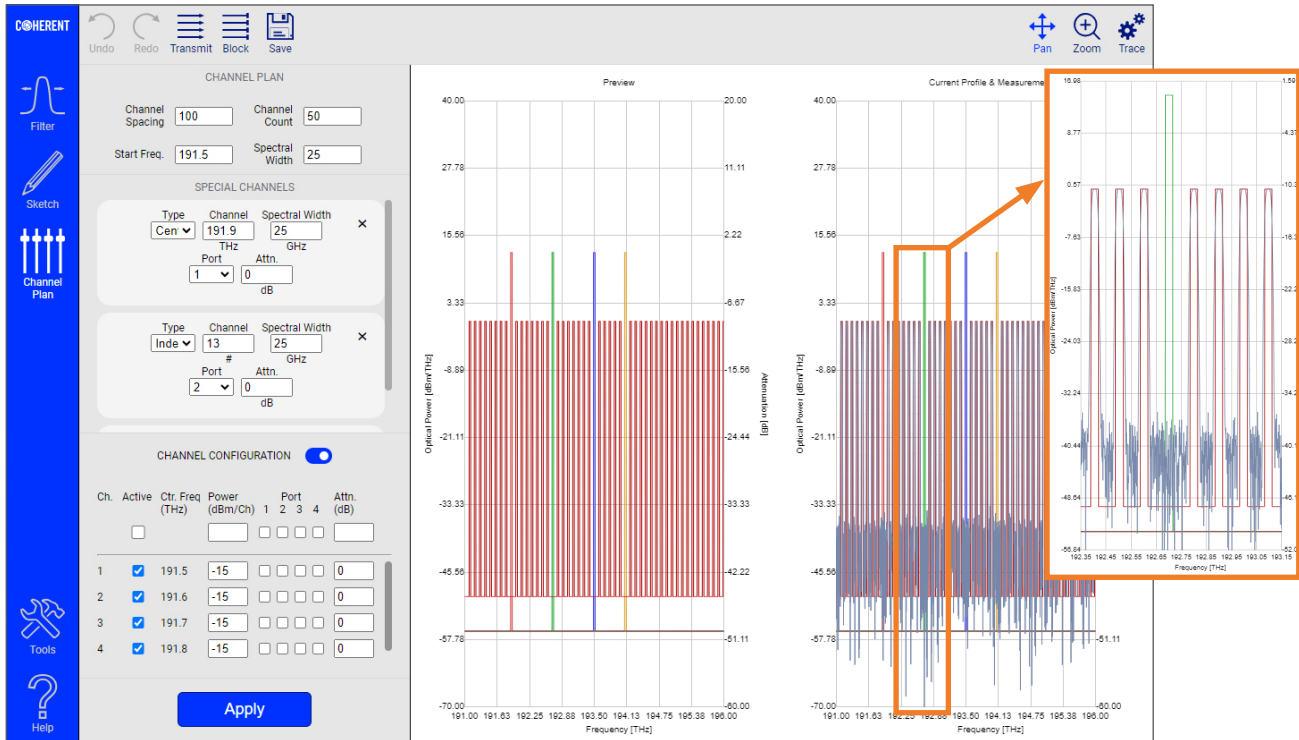
Coherent Knowledgebase

Obtain further application and technical information about the Optical Instrumentation Portfolio including the WaveAnalyzer Family by clicking here: <https://ii-vi.com/waveshaper-and-waveanalyzer-knowledgebase>

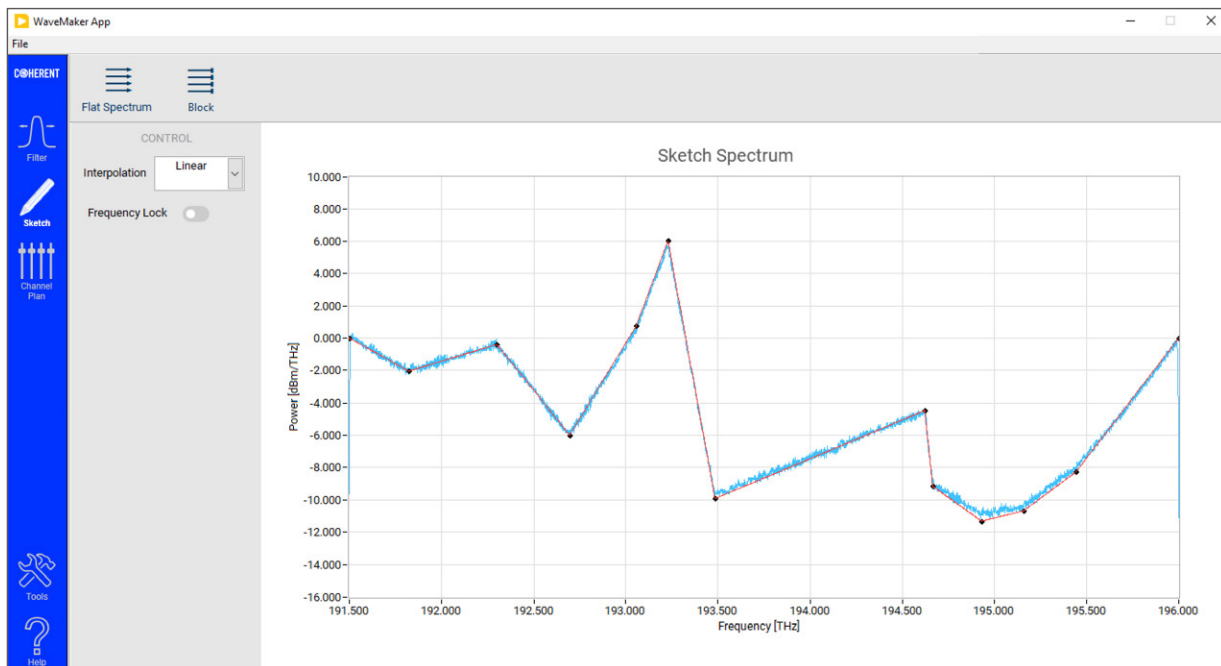
WaveShaper Demonstration on YouTube

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





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.



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.

Specifications (Preliminary)

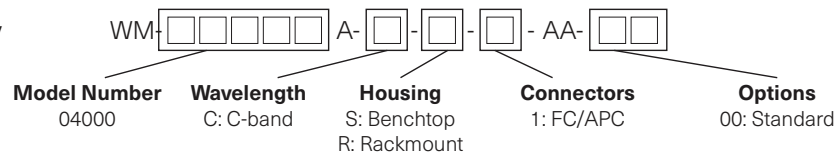
Model		WaveMaker 4000A
Transmission Band		C-band
External Optical Ports ⁽¹⁾	Port Configurations	4 input ports, 1 output port
WaveMaker Control	Technology	Erbium ASE Source plus Erbium Amplifier
	Frequency Range	191.0 THz to 196.225 THz (1527.8 nm to 1569.5 nm)
	Maximum Output Power	>14 dBm
	Maximum Output power density (flat spectrum)	8 dBm / THz
	Maximum Output Power – single 100GHz wide channel	10 dBm
	Blocked Power Level	< -60 dBm / THz
WaveShaper Control	Frequency Range	190.65 THz to 196.65 THz (1524.5 nm to 1572.5 nm)
	Filter Bandwidth	10 GHz to full range
	Filter Shape	Arbitrary Attenuation and Arbitrary Phase
	Frequency Setting Resolution	±0.1 GHz (±0.8 pm)
	Frequency Setting Accuracy	±2.5 GHz (±20 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	±25 ps
	Attenuation Control Range	0 to 40 dB
	Attenuation Setting Resolution	0.01 dB
	Attenuation Setting Accuracy	±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	<6 dB (2)
	Insertion Loss Non-Uniformity	<0.8 dB
	Polarization Dependent Loss (PDL)	<0.6 dB
	Differential Group Delay (DGD)	0.6 ps
	Return Loss	25 dB
	Max Total Input Optical Power	27 dBm
	Max Optical Power per 50 GHz channel	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
	Dimensions, weight	442 mm x 88 mm x 316 mm, 5 kg

Notes:

(1) Inserting optical signals with spectral components below 600 nm must be avoided.

(2) 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.

Order Code Key



Model	Order Code	Description	Wavelength Band	Housing Type	Fiber Type	Connection Type
WaveMaker 4000A	WM-04000A-C-S-1-AA-00	Programmable Spectrum Synthesizer	C	Benchtop	Single-mode	FC/APC
	WM-04000A-C-R-1-AA-00	Programmable Spectrum Synthesizer	C	Rackmount	Single-mode	FC/APC