

XLA-6433D/F/H/L

Lightwave Component Analyzer

At a Glance

An integrated platform for electrical-to-electrical (E/E), electro-optical (E/O), optical-electrical (O/E) and optical-optical (O/O) measurements, including amplitude-frequency response, phase-frequency response, bandwidth and group delay.

Four models provide model-dependent modulation-frequency coverage up to 67 GHz, with 1 Hz frequency resolution. Internal and external optical-source operation supports lightwave component characterization. Illustrated configuration: XLA-6433F.



Product Overview

The XLA-6433D/F/H/L series characterizes high-speed electro-optical, optical-electrical and optical-optical devices. Frequency range, frequency interval and intermediate-frequency (IF) bandwidth can be set for the measurement; minimum frequency resolution is 1 Hz.

The integrated design combines broadband hardware optimization, a network error model and a calibration algorithm for one-click broadband frequency-sweep testing. Measurements include bandwidth, amplitude-frequency response, phase-frequency response and group delay.

Device examples include electro-optical modulators, directly modulated lasers, optical transmitting components, PIN and APD photodetectors, optical receiving components and passive optical devices such as fiber filters in high-speed optical transmission systems.

Main Features

- **Guided Calibration**

Electrical calibration and optical-path parameter calibration use guided prompts for convenient, rapid calibration.

- **Integrated Measurement Interface**

Switch between E/E, E/O, O/E and O/O modes for S-parameter, impedance and time-domain measurements.

- **Dynamic Range and Trace Noise**

Flat-response internal components and selectable IF bandwidth support a large dynamic range and low trace noise.

- **User Data and Fixture De-Embedding**

User-defined data or fixture de-embedding data can remove probe-related errors for more flexible on-chip measurements.

- **Single-Ended / Balanced Measurements**

Configurations support single-ended-to-single-ended and single-ended-to-balanced transmitting or receiving devices, including differential gain and common-mode rejection parameters.

- **Multi-Functional Toolbox**

Monitor input optical power in real time and select a polarization-maintaining laser-source output in CW mode.

- **Internal and External Light Sources**

Internal wavelengths and external sources extend testing across communication wavelengths for CWDM and DWDM component measurements.

Integrated Measurement Interface

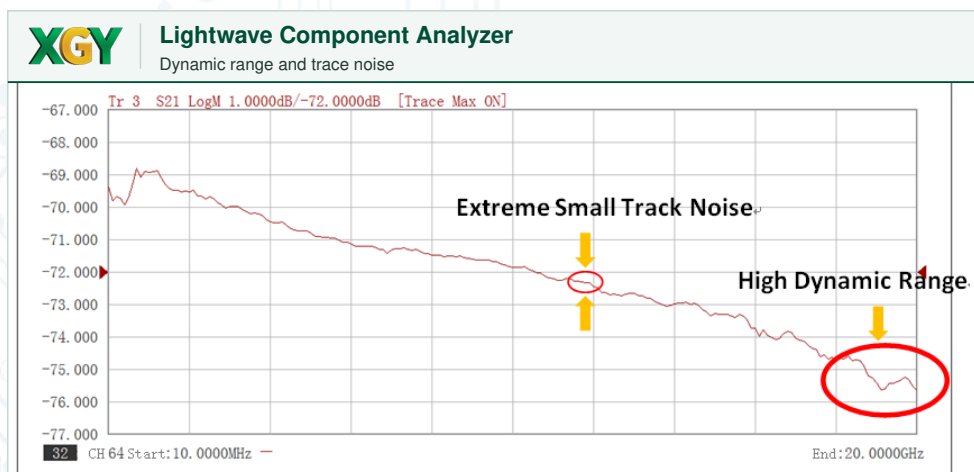
Four measurement modes are available: E/E, E/O, O/E and O/O. The integrated interface brings together source wavelength, optical input-port selection, power settings and measurement controls.

Electrical and optical-path parameter calibration follow guided operational prompts. User-defined de-embedding data can be applied to optical and RF measurement paths.

The screenshot shows the 'Measurement Setup' window of the XGY Lightwave Component Analyzer. It features several tabs: 'EE Measurement', 'EO Measurement', 'OE Measurement' (which is selected), and 'OO Measurement', along with a 'Tools' tab. The 'Measure Mode' is set to 'Single-Ended'. Under 'LCA System Settings', the 'Wave(nm)' is 1550, 'Power(dBm)' is 0.00, 'Optical Input Port' is 'Port 1', 'Optimize Mode' is 'Continuous', and 'Calibration Style' is 'Load'. There are checkboxes for 'Laser On' and 'External Input'. The 'Optical Path Deembedding' section is expanded, showing 'Enable' checked, 'Deembedding Type' set to 'File', and fields for 'Src Length(m)', 'Rcv Length(m)', 'Ref Index', and 'Atte(dB)'. There are also 's2p File' fields for source and receiver. The 'RF Path Deembedding' section is also expanded, showing 'Enable' checked and a '75 Ohm' checkbox. At the bottom, there are 'Select' buttons for each 's2p File' field and a 'Ready' status indicator.

Large Dynamic Range, Low Measurement-Path Noise

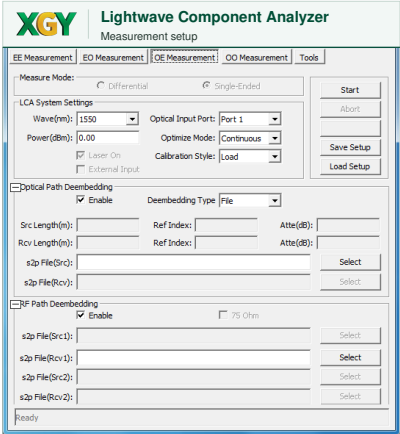
High-precision, flat-response internal components and different IF bandwidth settings provide a large dynamic measurement range and reduced trace noise, allowing more measurement detail to be observed.



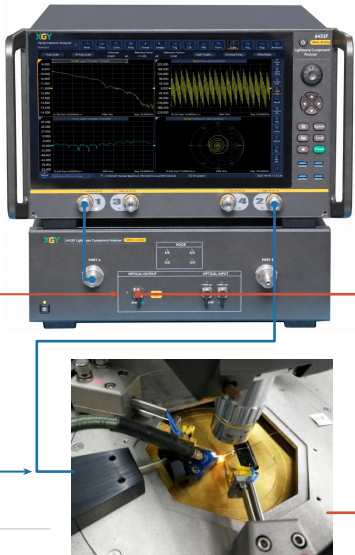
User-Defined Data and Fixture De-Embedding

Measurement accuracy can be improved using user-defined data or fixture de-embedding data. In particular, removal of probe errors supports on-chip testing and more flexible measurement arrangements.

De-embedding controls



Lightwave component analyzer



— Optical de-embed

— RF de-embed

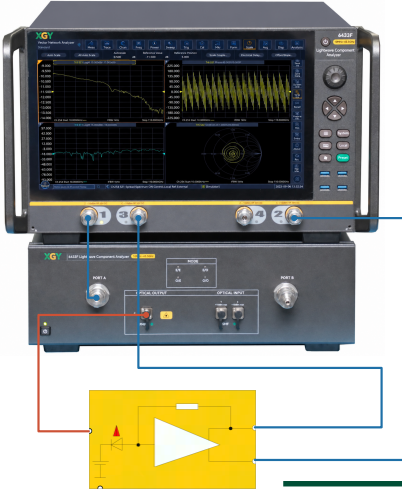
On-chip test fixture



Single-Ended and Balanced Photoelectric Devices

Select configurations for single-ended-to-single-ended or single-ended-to-balanced optical transmitting and receiving devices or components. Measurements include differential gain and common-mode rejection parameters for multi-port optical-fiber communication applications.

Single-ended / balanced measurement



Balanced device

Excitation (input)

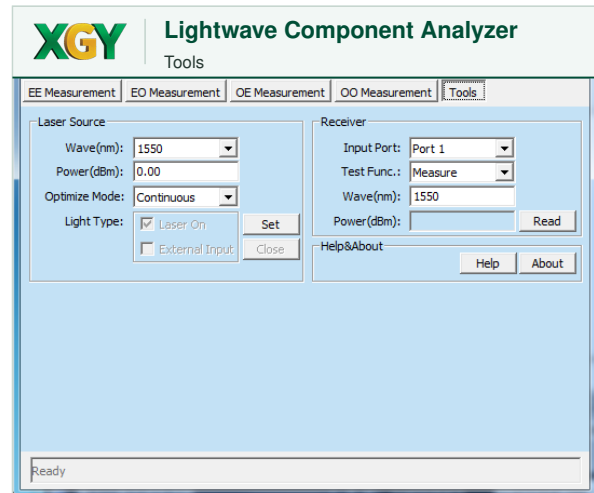
Response	Single-ended (s) Port 1	Differential (d) Port 2	Common (c) Port 2
Single-ended (s), Port 1	S_{ss11}	S_{sd12}	S_{sc12}
Differential (d), Port 2	S_{ds21}	S_{dd22}	S_{dc22}
Common (c), Port 2	S_{cs21}	S_{cd22}	S_{cc22}

E/O: S_{sd12} and S_{sc12}
O/E: S_{ds21} and S_{cs21}

Multi-Functional Toolbox

A built-in optical power meter monitors input optical power in real time. Advanced settings enable polarization-maintaining laser-source output in CW mode, with an extinction ratio greater than 20 dB.

The CW output supplies a polarization-maintaining laser source for an M-Z type LiNiO₃ modulator. The toolbox example shows an optical-power measurement range of -35 dBm to +5 dBm.



Internal and External Wavelength Settings

Testing is not restricted to 1310 nm or 1550 nm. External optical sources from 1260 nm to 1630 nm extend the operating wavelength range for core-component measurements in CWDM and DWDM systems.

Electro-Optical Device Characterization

Multi-window analysis of S11 and S21 provides reflection and transmission characteristics of electro-optical modulators and directly modulated lasers at different frequency points.



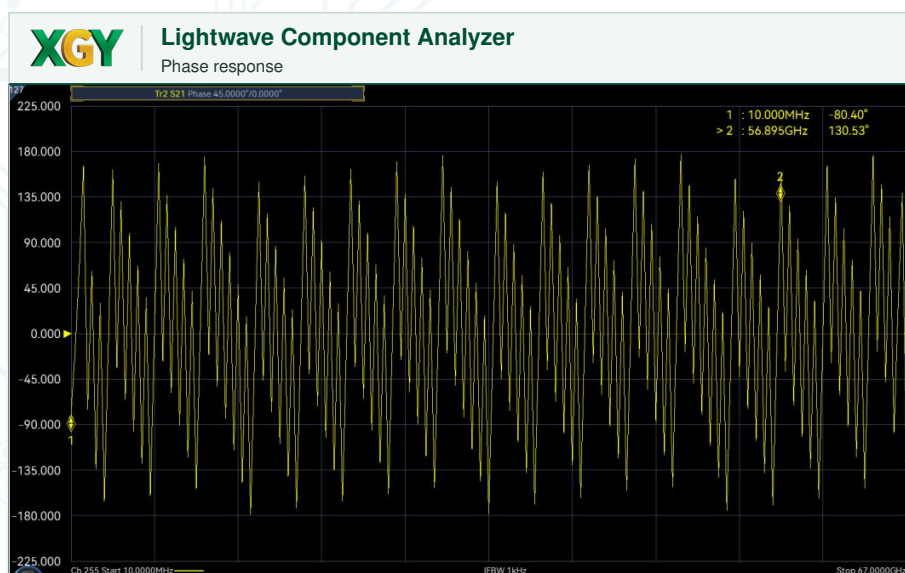
Optoelectronic Device Frequency Response

The series supports frequency-response testing of optoelectronic devices such as photodetectors over model-dependent ranges within 10 MHz to 67 GHz. Rapid 3 dB bandwidth analysis and frequency-response testing support R&D and production-line measurements.



Phase-Frequency Response and Group Delay

Phase-frequency response measurements enable analysis of optoelectronic-device phase and group delay. The figures illustrate the measurement displays; numerical specification limits are listed in the following tables.



Modulation and Optical Specifications

Parameter	XLA-6433D	XLA-6433F	XLA-6433H	XLA-6433L
Modulation Frequency Range (technical specifications)	10 MHz to 26.5 GHz	10 MHz to 43.5 GHz	10 MHz to 50 GHz	10 MHz to 67 GHz
Frequency Accuracy	$\pm 1 \times 10^{-7}$	$\pm 1 \times 10^{-7}$	$\pm 1 \times 10^{-7}$	$\pm 1 \times 10^{-7}$
Frequency Resolution	1 Hz	1 Hz	1 Hz	1 Hz
Working Wavelength	1310 $\pm$ 20 nm; 1550 $\pm$ 20 nm	1310 $\pm$ 20 nm; 1550 $\pm$ 20 nm	1310 $\pm$ 20 nm; 1550 $\pm$ 20 nm	1310 $\pm$ 20 nm; 1550 $\pm$ 20 nm
Average Output Optical Power Range	-2 dBm to +4 dBm	-2 dBm to +4 dBm (1310 nm); -2 dBm to +5 dBm (1550 nm)	-2 dBm to +4 dBm (1310 nm); -2 dBm to +5 dBm (1550 nm)	-2 dBm to +4 dBm (1310 nm); -2 dBm to +5 dBm (1550 nm)
Maximum Safe Average Input Power — Input 1	+7 dBm	+7 dBm	+7 dBm	+7 dBm
Maximum Safe Average Input Power — Input 2	+17 dBm	+17 dBm	+17 dBm	+17 dBm
Average Output Optical Power Accuracy	± 0.5 dB	± 0.5 dB	± 0.5 dB	± 0.5 dB
Average Input Optical Power Measurement Range — Input 1	-35 dBm to +5 dBm	-35 dBm to +5 dBm	-35 dBm to +5 dBm	-35 dBm to +5 dBm
Average Input Optical Power Measurement Range — Input 2	-25 dBm to +15 dBm	-25 dBm to +15 dBm	-25 dBm to +15 dBm	-25 dBm to +15 dBm
Average Input Optical Power Measurement Accuracy	± 0.5 dB	± 0.5 dB	± 0.5 dB	± 0.5 dB

Frequency limits differ between the technical specifications, product overview and primary-instrument ordering descriptions. See Frequency Range Statements before selecting a configuration.

The safe average input-power limits are distinct from the optical-power measurement ranges.

Instrument Item List

Item	Description
Power Cord Assembly	Standard three-core power cord
User Manual	/
Product Certification	Certificate of Conformance
Metrology Level Optical Fiber Patch Cord	/
USB Cable	/

Response and General Specifications

Parameter	XLA-6433D	XLA-6433F	XLA-6433H	XLA-6433L
Minimum Measurable Frequency Response	-	-	-60 dB	-55 dB
Relative Frequency Response Accuracy	±0.7 dB	±1.6 dB	±1.6 dB	±2.2 dB
Absolute Frequency Response Accuracy	±1.8 dB	±2.0 dB	±2.5 dB	±2.7 dB
Frequency Response Repeatability	±0.3 dB	±1.0 dB	±1.7 dB	±1.7 dB
Group Delay Measurement Accuracy	±13 ps	±18 ps	±18 ps	±31 ps
Phase Measurement Accuracy	±3.5°	±4.2°	±4.2°	±6.0°
Maximum Weight	56 kg	60 kg	60 kg	63 kg
Dimensions (W × H × D; excluding feet, hands)	421 × 400 × 600 mm	421 × 400 × 600 mm	421 × 400 × 600 mm	421 × 400 × 600 mm
Maximum Power Consumption	600 W	600 W	600 W	600 W

A dash is retained where no minimum measurable frequency-response value is stated. It is not a zero value. The dimensional exclusion is stated as “excluding feet, hands”. No alternative dimensional definition is provided.

Frequency Range Statements

Parameter	XLA-6433D	XLA-6433F	XLA-6433H	XLA-6433L
Product Overview	10 MHz to 20 GHz	10 MHz to 43.5 GHz	10 MHz to 50 GHz	10 MHz to 67 GHz
Technical Specifications	10 MHz to 26.5 GHz	10 MHz to 43.5 GHz	10 MHz to 50 GHz	10 MHz to 67 GHz
Order Information — Primary Instruments	10 MHz to 26.5 GHz	10 MHz to 26.5 GHz	10 MHz to 26.5 GHz	10 MHz to 26.5 GHz
Frequency-Range Qualification	20 GHz in overview; 26.5 GHz in specifications. Confirm range before ordering.	26.5 GHz in ordering; 43.5 GHz in specifications. Confirm range before ordering.	26.5 GHz in ordering; 50 GHz in specifications. Confirm range before ordering.	26.5 GHz in ordering; 67 GHz in specifications. Confirm range before ordering.

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