APEX TECHNOLOGIES

AP2440A series
Optical Complex Spectrum Analyzer

AP2440A Series : Optical Complex Spectrum Analyzer

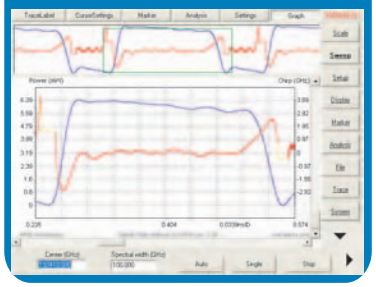
TIME DOMAIN MEASUREMENT

Temporal resolution 75fs max., bandwidth >6THz max.

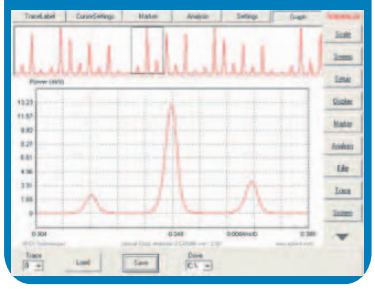
FREQUENCY DOMAIN MEASUREMENT

Resolution 20MHz (0.16pm), C and L band

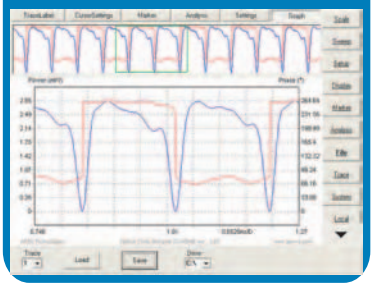
CHIRP & PULSE



SHORT PULSES

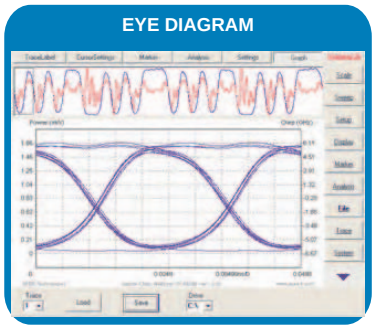


PHASE MODULATION

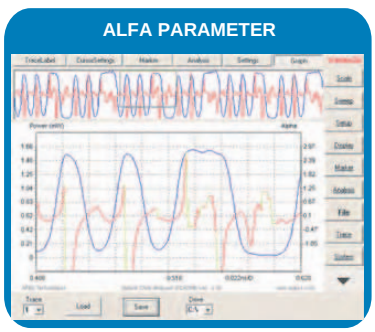




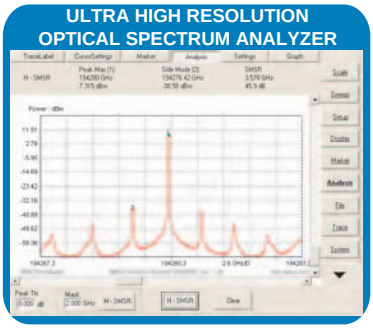
EYE DIAGRAM



ALFA PARAMETER



ULTRA HIGH RESOLUTION OPTICAL SPECTRUM ANALYZER



Specifications are subject to change without notice.

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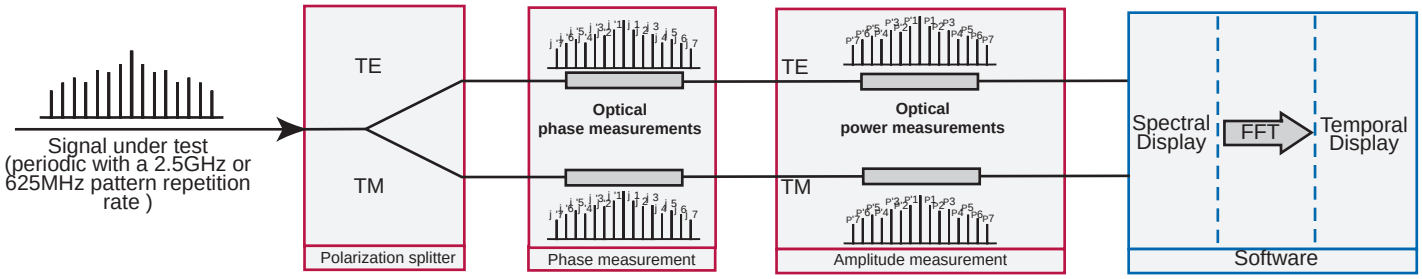
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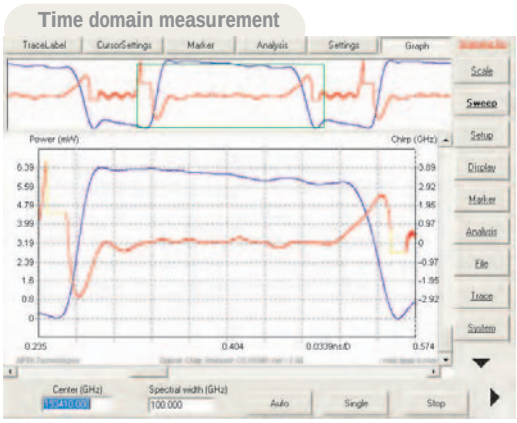
Measurement principle

While optical spectrum analyzers can only measure power and wavelengths of modulated signals, Apex Technologies complex spectrum analyzer is able to measure the optical phase as well.
The patented method is based upon a spectral analysis of the optical field, of which the amplitude and the phase of each frequency component are analyzed when all components are spaced by a fixed frequency (Fr1=2.5GHz or Fr2= 625MHz).
By knowing the amplitude and the phase of each spectral component, the temporal variations of the amplitude and the phase are calculated by the Fourier transform, providing the intensity and the chirp or phase as a function of time.

Block diagram :

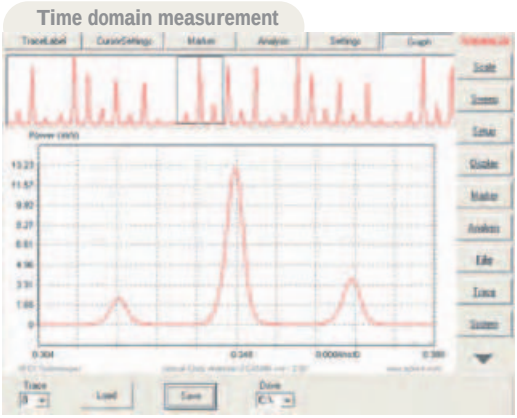


Application examples



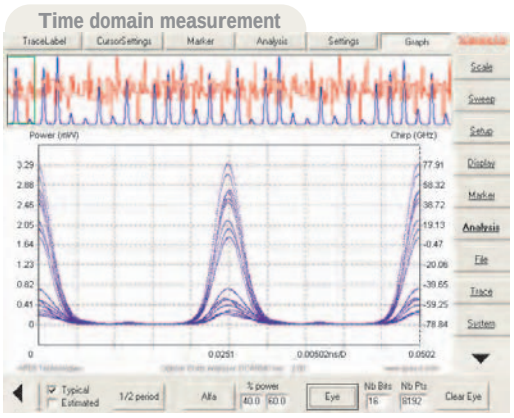
10Gb/s NRZ modulation (LD+Mach-zhender modulator)
Blue trace : Optical pulse in mW Red trace : Chirp in GHz

Time resolved chirp measurements :
Time resolved chirp is an important parameter to predict the performance of transmitters in network systems.
Especially for chirp measurements at high bit rates, the AP2440A is the best solution in regard to accuracy, repeatability and measurement speed, in addition it measures the optical pulse shape at the same time.
For mach-zhender modulator measurements, the AP2440A converts the measured chirp into the Alfa parameter without any additional interaction.



Mode locked fiber laser pulse measurement (4ps pulsewidth)

Short pulse measurements :
Due to its unique complex spectral analysis principle, the only bandwidth limitation the AP2440A faces is its own wavelength range.
The 75fs maximum temporal resolution makes the AP2443A the perfect tool to measure ultra short pulses in high bit rate systems. Comparing this with a standard 80GHz oscilloscope, the AP2443A has a maximum bandwidth >6THz which is more than 75 times higher!



Eye diagram analysis of a mode locked fiber laser pulse

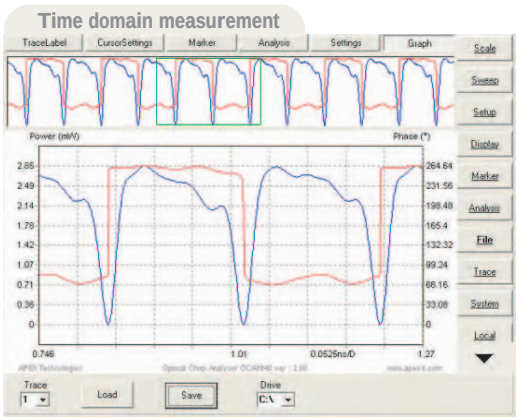
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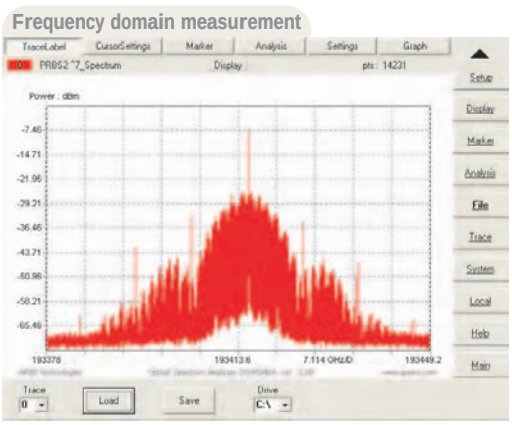
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AP2440A series Optical Complex Spectrum Analyzer



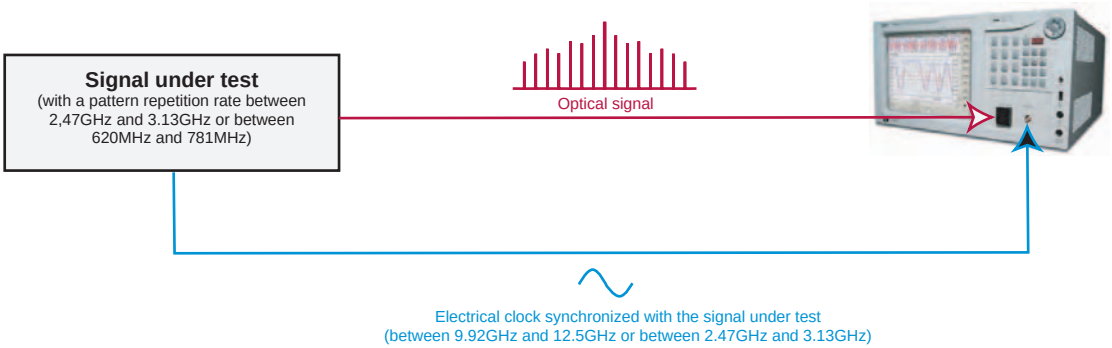
10Gb/s DPSK modulation (phase in red and intensity in blue)

Optical phase measurements :
Several new modulation formats use intensity but also phase modulation in long distance optical transmission. Currently Apex Technologies' AP2440A complex spectrum analyzer is the only instrument able to measure these phase modulations, which means it is finally possible to characterize directly phase modulation in a DPSK, QPSK, Duo-binary... modulation. All based on the measured spectrum of an optical signal, the AP2440A can be used as an ultra high resolution OSA like its brother, the AP2040A series.



10Gb/s PRBS signal spectrum

Measurement configuration



Specifications

Mainframe and software

OSA software features	Auto measurement, Zoom function, Zoom to scale, Auto calibration, Peak search, Line width, SMSR, Markers, Horizontal and vertical lines, Peak center, and more
Complex OSA software features	Auto measurement, Zoom function, Averaging function, Auto calibration, Alfa parameter analysis, Eye diagram, Polarization analysis, Accuracy function, Total power measurement and more
Trace	Up to 6 traces at the time
Screen	10.4inch, color TFT, 640x480pixels
Fron keyboard	Yes
Touch sensitive screen	Yes
USB connector	1x on front panel, 2x on back panel
Internal memory	More than 1,000 traces
File format	Trace file (.dat, .txt), Setup file, Screen copy (.bmp), Marker table
Mouse and keyboard connection	Yes (PS2 type on front panel)
GPIB	IEEE-488
Ethernet	Yes (10/100 base T)
Operating temperature	+10°C to +35°C
Power requirement	AC 100 to 120V / 200 to 250V, 50/60Hz
Accessories	Touch sensitive pen
Optical input	FC/PC SMF-28
Clock input	SMA

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AP2440A series Optical Complex Spectrum Analyzer

Optical spectrum analyzer (OSA) specifications

	AP2440A	AP2441A	AP2443A
Wavelength measurement range	1520nm to 1567nm	1520nm to 1567nm & 1557nm to 1607nm	1520nm to 1630nm
Wavelength span range	80pm [f] to 47nm	80pm [f] to 87nm	80pm [f] to 110nm
Measurement sampling interval [g]	0.5MHz (0.004pm) Max. (Span (80pm) / Number of measured and displayed points (20,000pts))		
Wavelenght absolute accuracy [a b c]	+/-3pm		
Wavelength resolution (@3db) [d]	20MHz (0.16pm) and 100MHz (0.8pm)		
Measurement level range [a e]	-67dBm to +20dBm		-64dBm to +20dBm
Absolute level accuracy [a b e]	+/-0.3dB		
Level repeatability [a b d e]	+/-0.2dB		
Close-in dynamic range [a b e]	>40dB @ +/-2pm 60dB @ +/-10pm		60dB @ +/-1.7pm
Spurious free dynamic [d]	>60dB		>45dB
Sweep time [d e]	5s for 55nm		8s for 110nm
Tunable laser output	>-5dBm		>-7dBm
Internal absolute WL calibrator	Yes		
Display			
X scale	Wavelength in nm or Frequency in THz		
Y scale	Power in linear or logaritmic mode		

a) At 1550nm
b) At 0dBm
c) After wavelength calibration
d) Typical
e) Resolution 100MHz
f) Minimum span for 20,000pts. Zoom down this value is possible.
g) Resolution 20MHz

Optical complex spectrum analyzer (OCSA) specifications

	AP2440A	AP2441A	AP2443A
Wavelength measurement range	1520nm to 1567nm	1520nm to 1567nm & 1557nm to 1607nm	1520nm to 1630nm
Clock frequency	Fclk1 = 9.92GHz to 12.5GHz or Fclk2=2.47GHz to 3.13GHz		
Clock power	0 to +10dBm		
Pattern repetition rate	Fr1=2.48GHz to 3.12GHz and Fr2=620MHz to 781MHz (see pattern table below)		
Measurement level range	-55dBm to +20dBm		-55dBm to +20dBm
Maximum temporal resolution[a]	150fs	95fs	75fs
Chirp accuracy [b]	+/-60MHz		
Measurement time [b]	5s		7s
Display			
X scale	Time in ps, or Wavelength in nm, or Frequency in THz		
Y scale	Intensity in mW or dBm, chirp in GHz, Phase in degree, Alfa parameter		

a) Based on a modulated signal covering the entire wavelength range
b) Maximum chirp deviation measured on a 2.5GHz sinusoidal signal with a 30% modulation ratio

Optical complex spectrum analyzer (OCSA) pattern length

Bit rate	2.48Gb/s to 3.12Gb/s	9.92Gb/s to 12.5Gb/s	39.68Gb/s to 50Gb/s	79.36Gb/s to 100Gb/s	158.72Gb/s to 200Gb/s	317.44Gb/s to 400Gb/s	634.88Gb/s to 800Gb/s
Pattern length for Fr1	1bit	4bits	16bits	32bits	64bits	128bits	256bits
Pattern length for Fr2	4bits	16bits	64bits	128bits	256bits	512bits	1024bits

Ordering informations

AP2440A : C band (1520nm to 1567nm) optical complex spectrum analyzer

AP2441A : C (1520nm to 1567nm) and L band (1557nm to 1607nm) optical complex spectrum analyzer

AP2443A : C+L band (1520nm to 1630nm) optical complex spectrum analyzer

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