

Optical Complex Spectrum Analyzer



TIME DOMAIN MEASUREMENT

Temporal resolution 7.6fs max., bandwidth >6THz max.

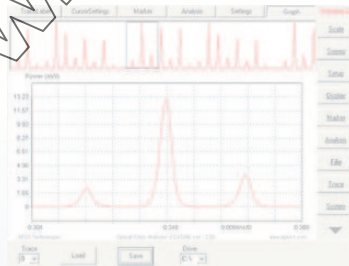
FREQUENCY DOMAIN MEASUREMENT

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

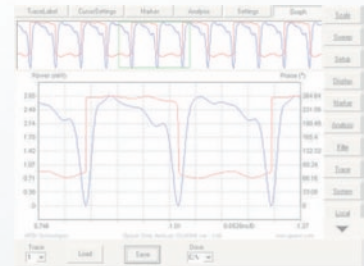
CHIRP & PULSE



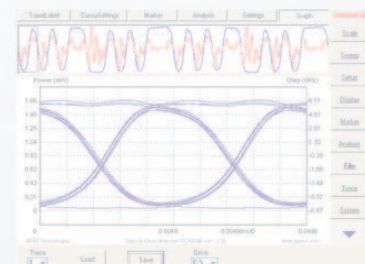
SHORT PULSES



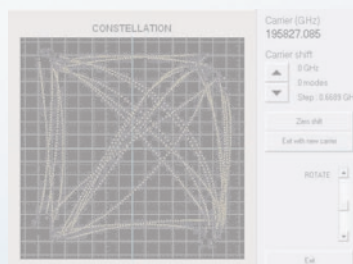
PHASE MODULATION



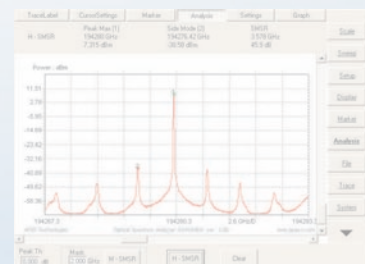
EYE DIAGRAM



CONSTITUTION



ULTRA HIGH RESOLUTION
OPTICAL SPECTRUM ANALYZER



AP2440 series Optical Complex Spectrum Analyzer

To receive a calibration and/or repair quote RMA from R.A.E. Services Inc.
Click here>> www.raeservices.com/services/quote.htm

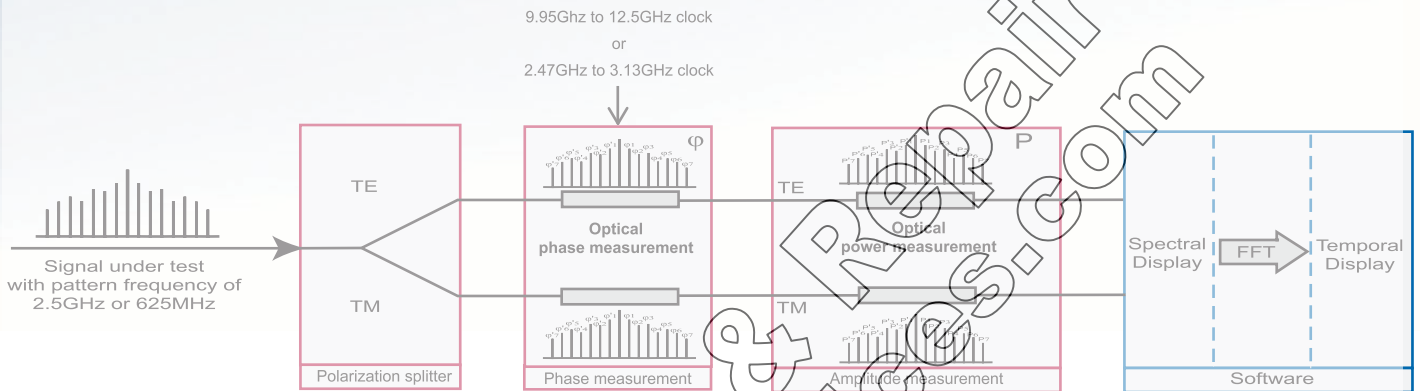
Measurement principle

While optical spectrum analyzer can only measure power of a modulated signals, Apex Technologies complex spectrum analyzer is able to measure also the optical phase.

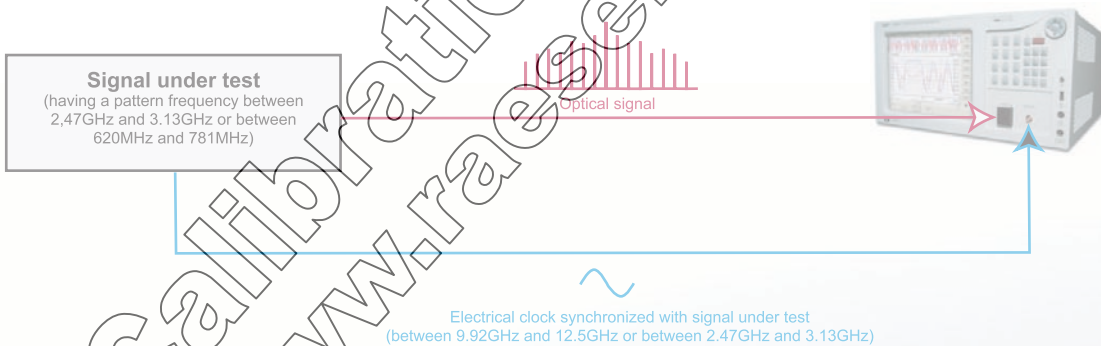
The patented method of the OCA1040 is based upon a spectral analysis of the optical field, of which the amplitude and the phase of each frequency component are analyzed when all components are spaced by a fixed frequency ($F_{r1}=2.5\text{GHz}$ or $F_{r2}=625\text{MHz}$).

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.

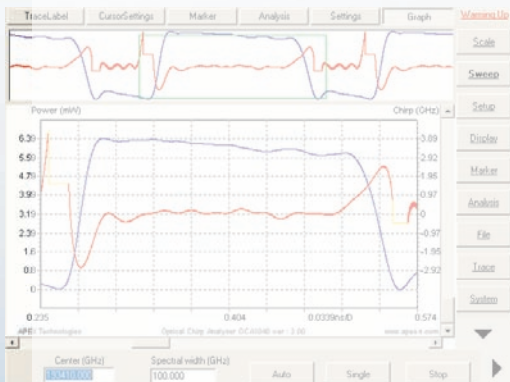
Block diagram :



Measurement configuration



Application examples

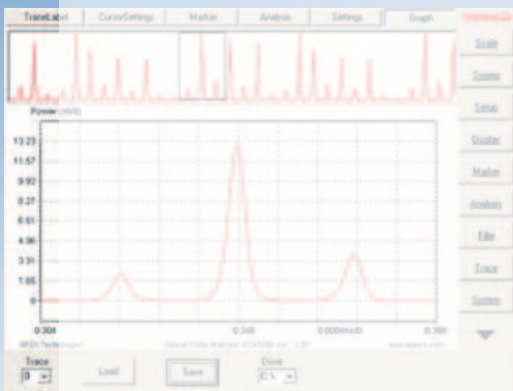


Time resolved chirp measurement :

Time resolved chirp is an important parameter to predict transmitters performances in a transmission system. AP2440 series is the best solution in question of accuracy, repeatability and measurement time, for chirp measurement at high bit rates. Moreover Apex Technologies complex spectrum analyzer can measure the optical pulse shape in the same measurement. For mach-zhender modulator, it is also possible to display the Alfa parameter instead of the chirp.

AP2440 series Optical Complex Spectrum Analyzer

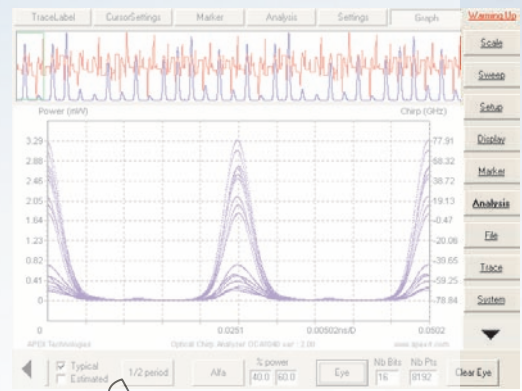
To receive a calibration and/or repair quote RMA from R.A.E. Services Inc.
Click here>> www.raeservices.com/services/quote.htm



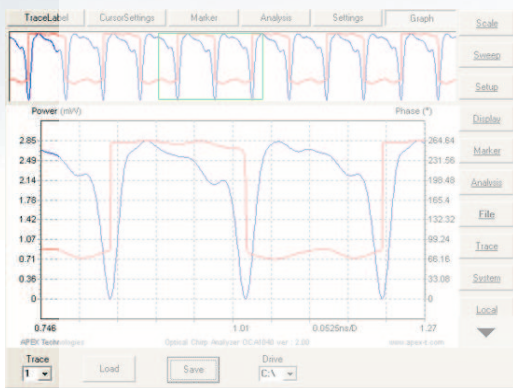
Mode locked fiber laser pulse measurement (4ps pulsewidth)

Short pulses measurement :

Thanks to the complex spectral analysis principle, the bandwidth of AP2440 series is determined by the wavelength range of the instrument. So, the maximum temporal resolution of AP2440A is 150fs, giving the capability to measure ultra short pulses used in high bit rates systems. Compared to a standard oscilloscope having a maximum bandwidth of 80GHz, AP2440 series have a maximum bandwidth >3THz!



Eye diagram analysis of a mode locked fiber laser pulse



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

Optical phase measurement :

A lots of new modulation formats appeared using intensity but also phase modulation in long distance optical transmission. Apex Technologies complex spectrum analyzer is the only instrument able to measure these phase modulations. It is now possible to characterize directly a phase modulation in a DPSK, QPSK, Duobinary... modulation. AP2440 series can also be used as an ultra high resolution OSA to characterize spectral width of modulated signals.



10Gb/s PRBS spectrum

Specifications

Main frame and software specifications

OSA software functionalities	Auto measurement, Zoom function, Zoom to scale, Auto calibration, Peak search, Line width, SMSR, Markers, Horizontal and vertical lines, Peak center, ...
Complex OSA software functionalities	Auto measurement, Zoom function, Averaging function, Auto calibration, Alfa parameter analysis, Eye diagram, Polarization analysis, Accuracy function, Total power measurement...
Trace	Up to 6 traces
Screen	10.4inch, color TFT, 640x480pixels
Front keyboard	Yes
Touch sensitive screen	Yes
USB connector	1x front panel, 2x 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 connector	Yes (PS2 type in front panel)
GPIB	Yes
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 SMF28
Clock input	SMA

AP2440 series Optical Complex Spectrum Analyzer

To receive a calibration and/or repair quote-RMA from R.A.E. Services Inc.
Click here>> www.raeservices.com/services/quote.htm

Optical spectrum analyzer specifications

	AP2440A	AP2441A	AP2443A
Wavelength measurement range	1520nm to 1567nm	1520nm to 1567nm & 1557nm to 1607nm	1520nm to 1630nm
Wavelength span range	1.6pm to 47nm	1.6pm to 87nm	1.6pm to 110nm
Wavelength 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 capabilities			
X scale	Wavelength in nm or Frequency in THz		
Y scale	Power in linear or log		

- a) At 1550nm
b) At 0dBm
c) After wavelength calibration
d) Characteristic
e) Resolution 100MHz

Optical complex spectrum analyzer 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 frequency	Fr1=3.12GHz to 3.12GHz and Fr2=620MHz to 781MHz (see pattern table below)		
Measurement level range ^c	-55dBm to +20dBm		-55dBm to +20dBm
Maximum temporal resolution ^a	150fs	95fs	75fs
Chirp accuracy ^b	+/-60MHz		
Measurement time ^b	5s		7s
Display capabilities			
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) If modulated signal cover the complete wavelength range
b) Maximum chirp deviation measured on a 2.5GHz sinusoidal signal with 30% modulation ratio
c) Power range of complex spectrum components for an accurate analysis

Optical complex spectrum analyzer 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

Specifications are subject to change without notice.