GSP-9300

Spectrum Analyzer

GW INSTEK

Simply Reliable

GOOD WILL INSTRUMENT CO., LTD.

Spectrum Analyzer GW Instek GSP-9300

Application Area

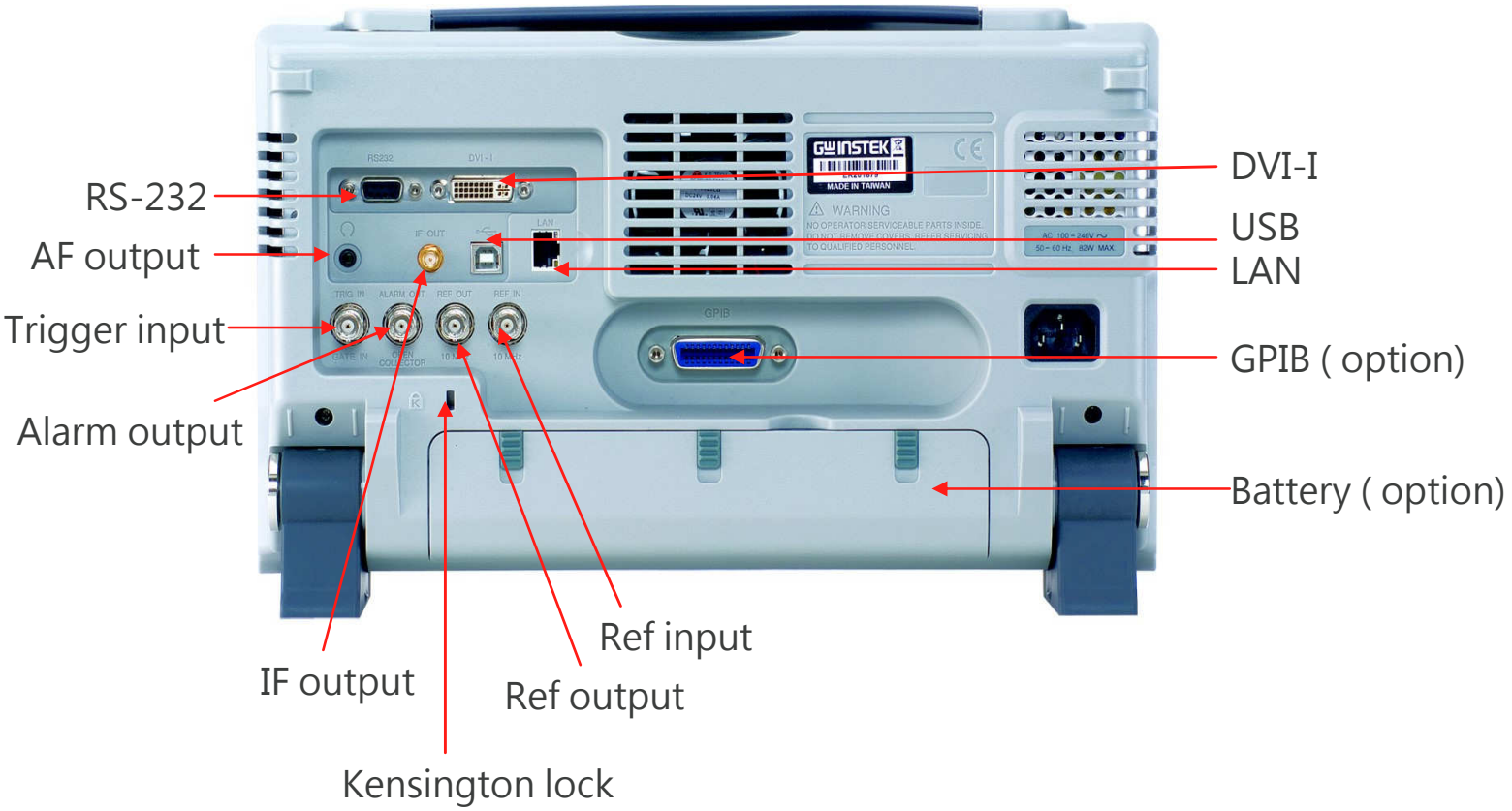
- General Purpose Spectrum Analysis
- EMI Pre-compliance Measurement
- Analyse ASK/FSK/AM/FM signal characteristics
- Satellite Monitoring (SNG)
- Education (University, School)
- Measure the frequency response of attenuator, filter and amplifier
- Electromagnetic Fields (EMF) Measurement

Spectrum Analyzer GW Instek GSP-9300

Front Panel

Spectrum Analyzer GW Instek GSP-9300

Rear Panel



Spectrum Analyzer GW Instek GSP-9300

Brief Specifications

	GSP-9300
Frequency range	9kHz ~ 3GHz, min. resolution 1Hz
Reference frequency stability	±0.025 ppm (0 to 50 °C), ±2 ppm max. (per year)
Resolution Bandwidths	1 Hz to 1 MHz in 1-3-10 sequence , -6dB EMI filter : 200Hz , 9kHz , 120kHz, 1MHz
Phase noise	-88dBc/Hz @1GHz, 10kHz offset
Sweep time	310 us to 1000 s (non-Zero Span) / 50 us to 1000 s (Zero Span)
Displayed average noise level	<-122 dBm nominal, preamp off; <-142dBm + 3*(f/GHz) dBm , preamp on (RBW: 10Hz)
Attenuator	0 to 50 dB, in 1 dB steps
Pre-amplifier	Built-in 18dB Gain
Measurement function	SEM/ACPR/OCBW/ChP/Phase Jitter/ AM,FM,ASK,FSK Analyzer/ TOI/Harmonic/CNR/CSO/CTB /N-dB BW/P1dB/EMC pretest
Trace number	4 Traces
Display mode	Spectrogram ,Topographic, Linear scale Spectrum, Logarithmic scale Spectrum
Display	8.4" Color LCD with SVGA resolution (800 x 600)
Interface	LXI1.4 (HiSLIP), RS-232C, USB Host/Device, DVI-I, Micro SD, GPIB(Opt)

Spectrum Analyzer GW Instek GSP-9300

Excellence RF Performance

- High sensitivity: <–130 dBm (1 Hz), with preamplifier <–152 dBm (1 Hz)
  → for better detection of weak signals like base station & WIFI interferer
- Phase noise: -95 dBc/Hz (100 kHz offset)
  → for better detection of signals close to the carrier
- Low measurement uncertainty (<1.5 dB , 0.5 dB typical)

Support Scalar Network Analyzer

- External VSWR Bridge connection
- Magnitude measurement in forward direction

Outdoor Usage

- Easy exchangeable Li-Ion battery
- Battery operating time up to 2 hours

Multilingual User Interface

- Supported languages: Chinese, Japanese, Russian & English

Spectrum Analyzer GW Instek GSP-9300

USB & micro SD Card Slot

- Easy memory extension via USB & micro SD card (support 32GB Micro SDHC card)
- Storing measurement results and instrument settings
- Easy handling of test results in secure areas
- Easy firmware update via USB & micro SD card

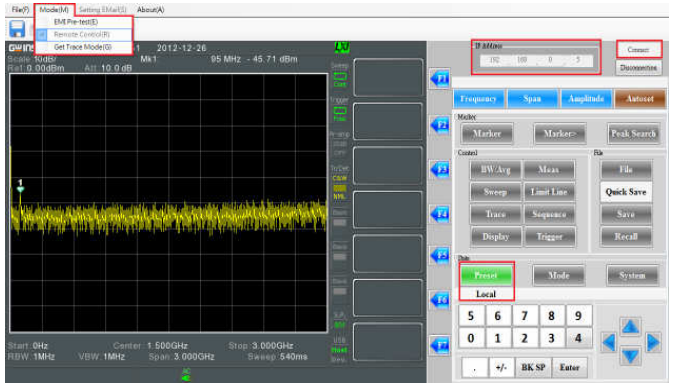
USB/LAN/RS-232/GPIB(option) Interfaces

- Remote control via USB/LAN/RS-232/GPIB
- Easy integration in local area networks

-> remote site operation for long term surveillance

- 8.4 " LCD screen with 800 x 600 SVGA resolution
- Standard weight : 4 kg (basic) , 4.5kg (full option)
- Dimension : 350(W) x 213 (H) x 106 (D) mm

Slim Size

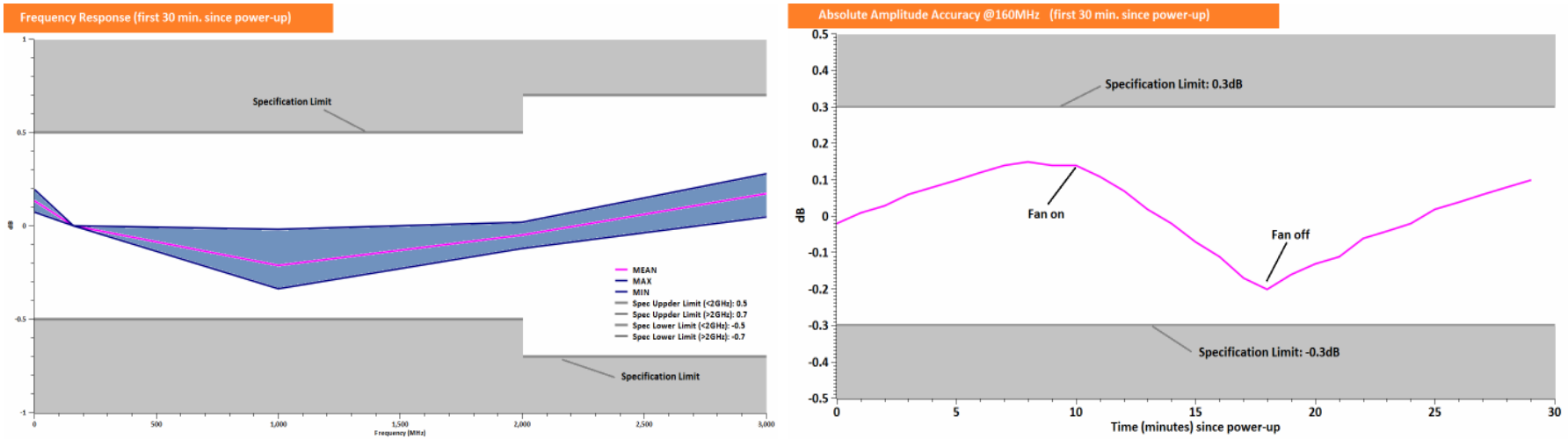


SpectrumShot Software
Remote Control Mode

Spectrum Analyzer GW Instek GSP-9300

Shorten Warm-Up Time

GSP-9300 utilizes the patented design of high efficient heat dissipation and feedback temperature control. After the instrument is turned on, the internal instrument can rapidly maintain a stable temperature so as to provide ±0.3dB amplitude measurement and deliver the frequency measurement with 0.025ppm frequency stability.

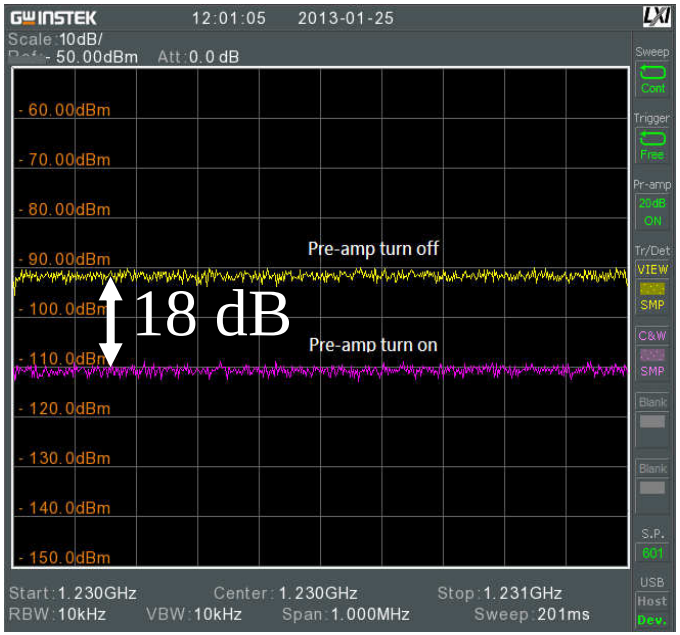


The following diagram shows the typical amplitude variation and frequency response within 30 minutes starting from turning on GSP-9300.

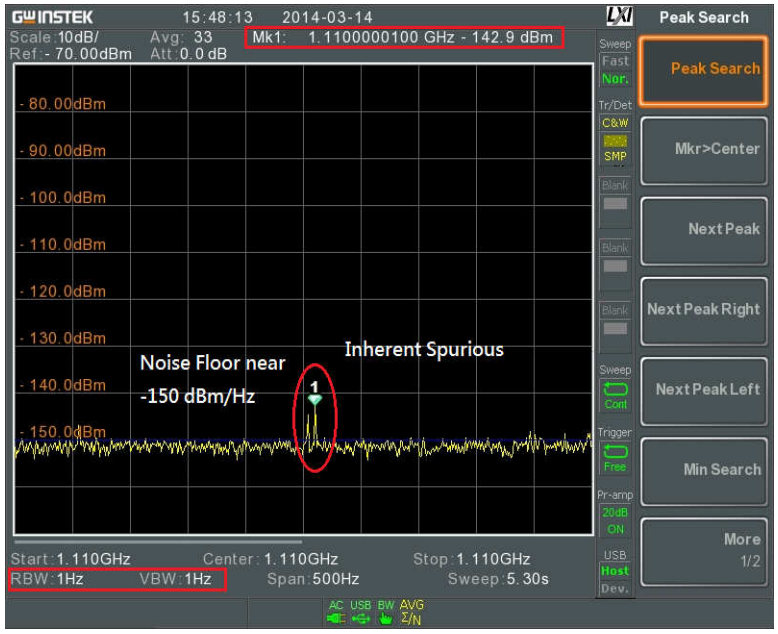
Spectrum Analyzer GW Instek GSP-9300

- Built-in Pre-amplifier function
- Pre-amplifier specification:
- Frequency Range: 1 MHz to 3 GHz / Gain: 18 dB (Nominal)

Amplitude Key→More1/3→Preamp Auto



Built-in Pre-Amp Off/ On



Built-in Pre-Amp On, RBW 1 Hz

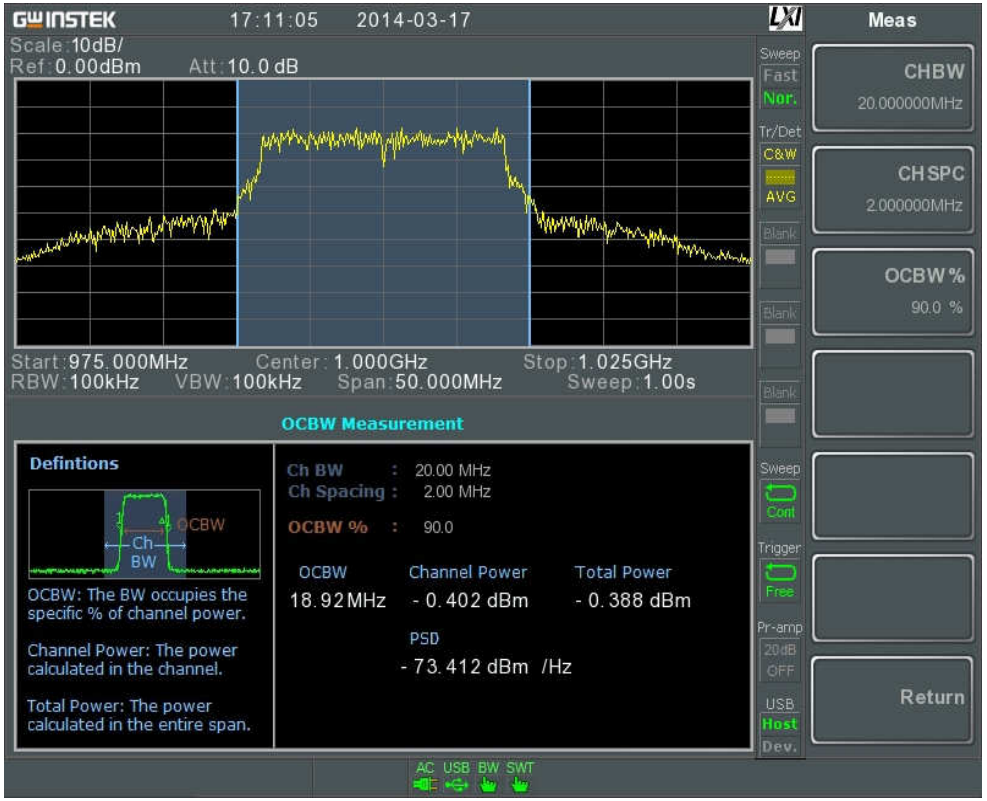
Spectrum Analyzer GW Instek GSP-9300

Standard Functions (1)

- Channel Power (CP)
- Occupied Bandwidth (OCBW)
- Adjacent Channel Power Ratio (ACPR)
- Spectrum Emission Mask (SEM)
- Harmonic Distortion
- Third-Order Intercept Point (TOI)
- Phase Jitter
- Carrier to Noise Ratio (CNR)
- Composite Second Order (CTB)
- Composite Triple Beat (CSO)
- P1dB Compression Point
- N-dB Bandwidth
- AM & FM Demodulation & Analysis
- FSK & ASK Demodulation & Analysis
- 2FSK Analysis

Measure key

Channel Power / Occupied Bandwidth

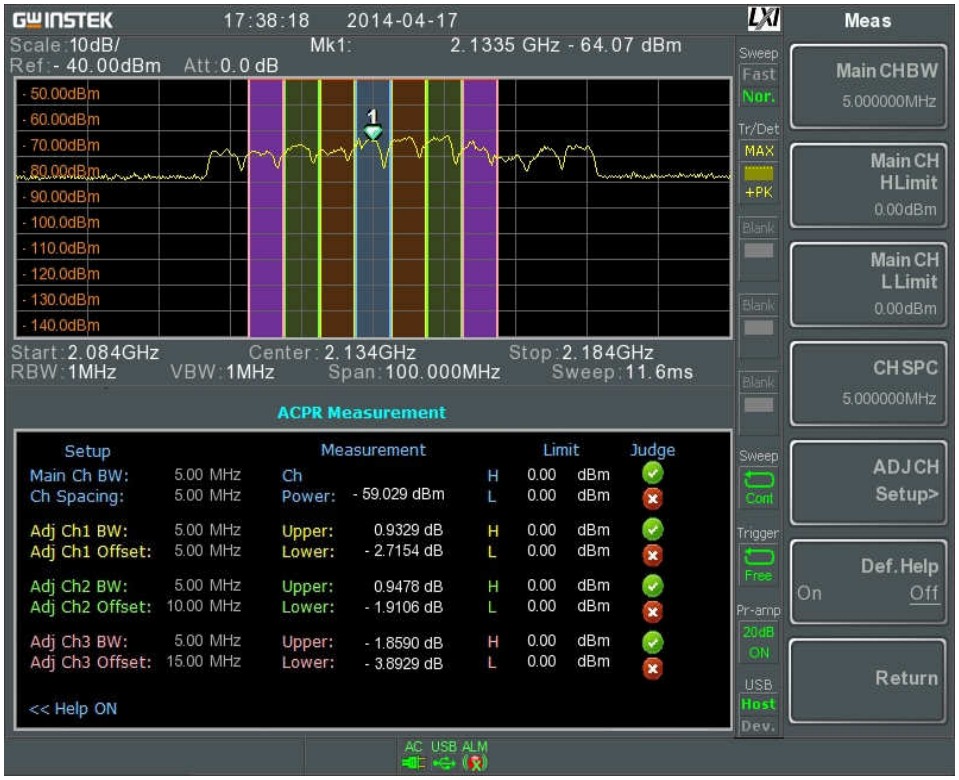


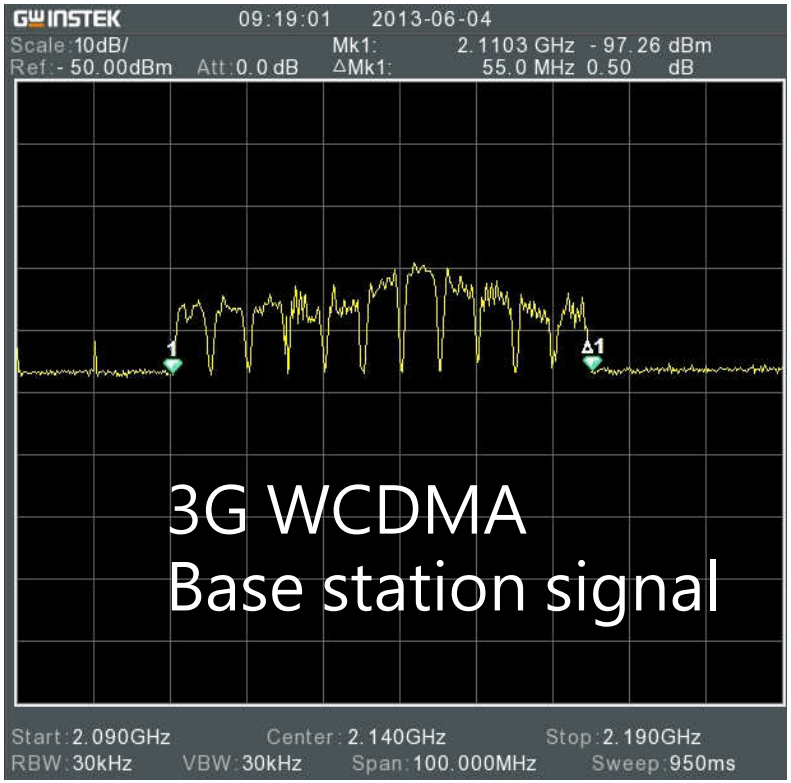
Measure OCBW and CP of a 20MHz ODMA signal under 1 GHz output frequency

An important characteristic of a modulated signal is its occupied bandwidth.

In a radio communications system for instance the occupied bandwidth must be limited to enable distortion-free transmission in adjacent channels.

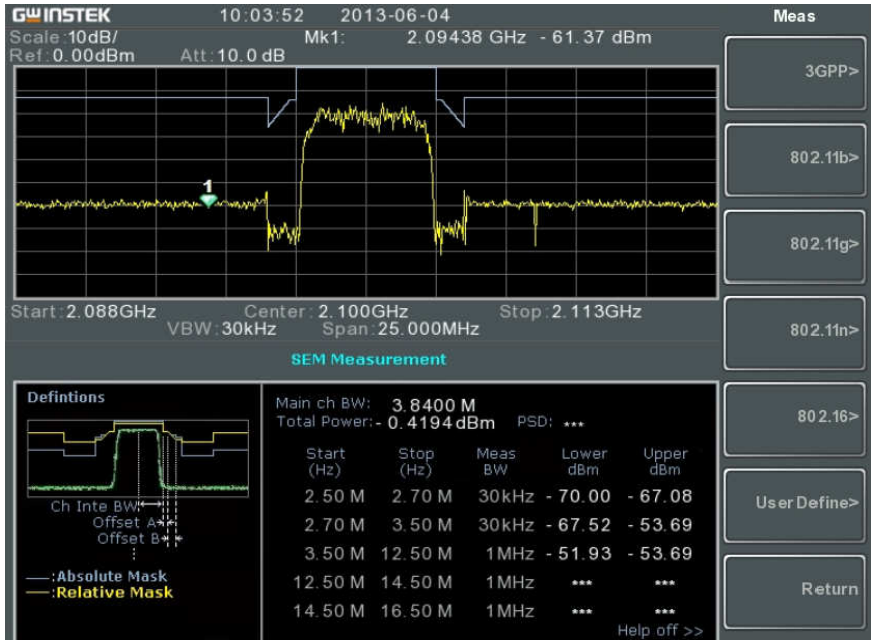
Adjacent Channel Power Ratio (ACPR)



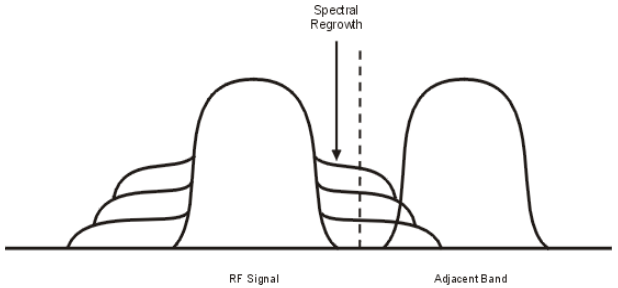


Adjacent Channel Power Ratio (ACPR) is ratio between the total power of adjacent channel (inter-modulation signal) to the main channel's power (useful signal).

Spectrum Emission Mask (SEM)

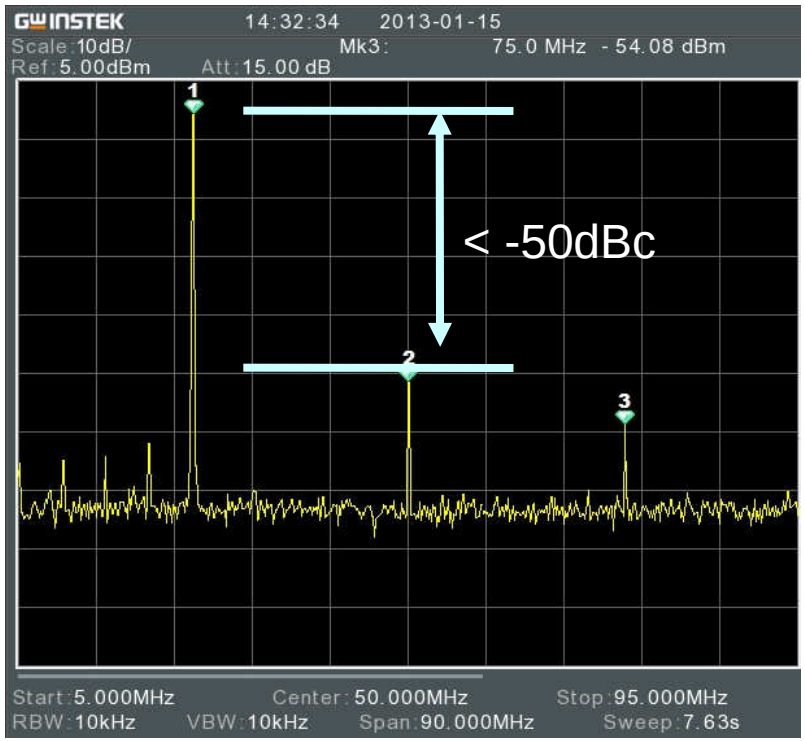


Spectrum Emission Mask
Predefined masks for 3GPP
802.11a/b/g/n / 802.16 /
User Define



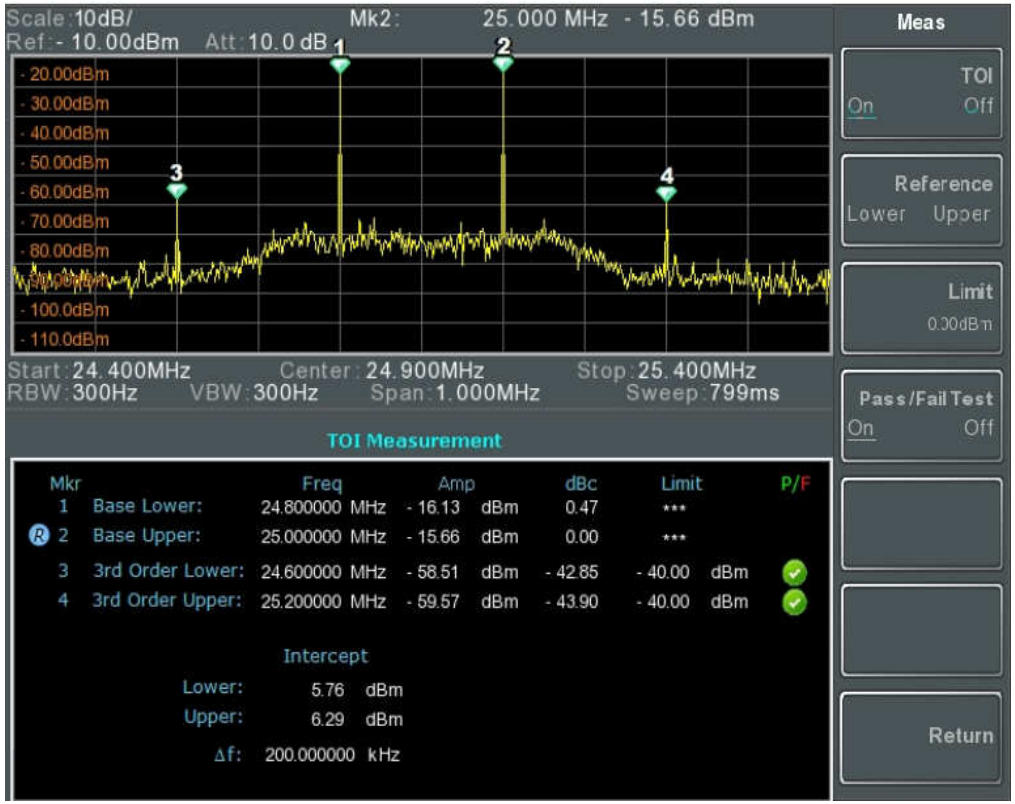
Spectral Re-growth Effect

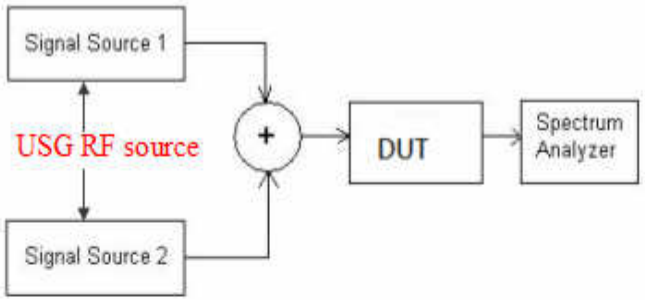
Harmonic Distortion

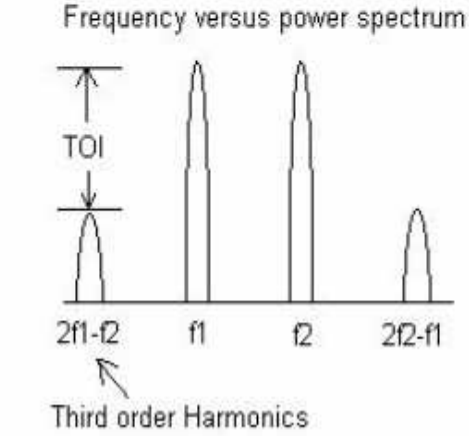


The total harmonic distortion, or THD, of a signal is a measurement of the harmonic distortion present and is defined as the ratio of the sum of the powers of all harmonic components to the power of the fundamental frequency.

Third-Order Intercept (TOI)

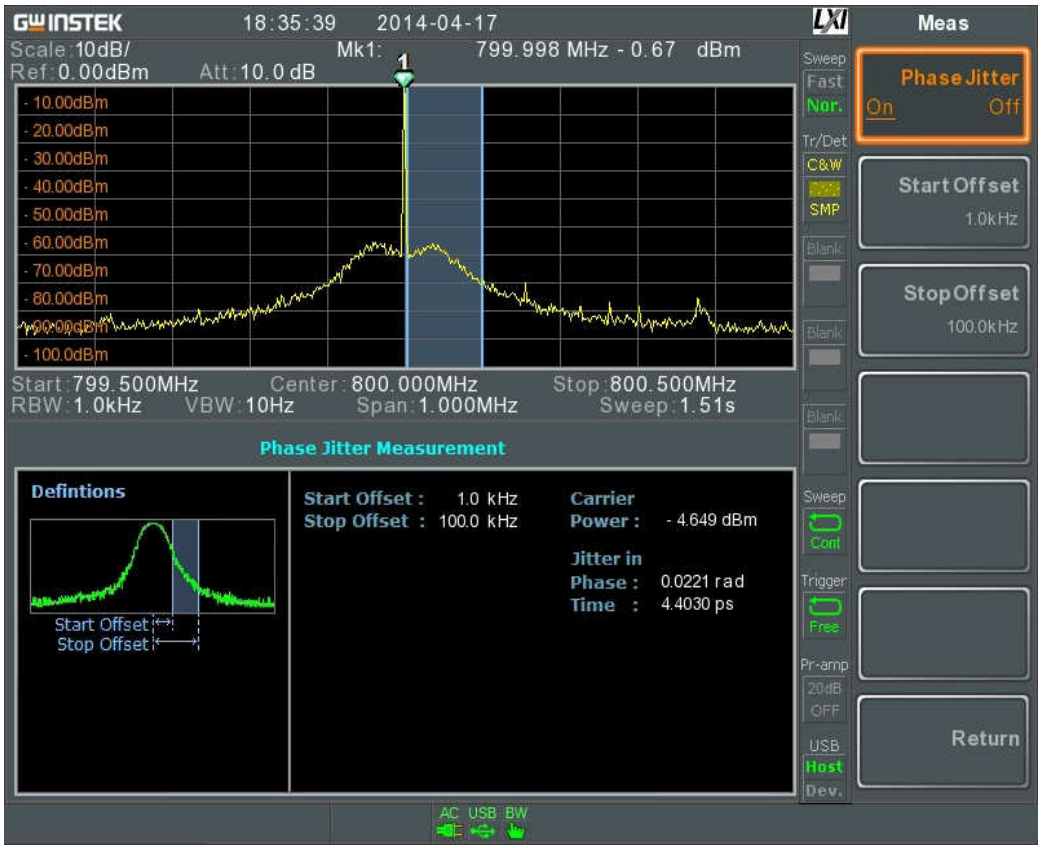






In telecommunications, a third-order intercept point (IP3 or TOI) is a measure for weakly nonlinear systems and devices, for example receivers, linear amplifiers and mixers.

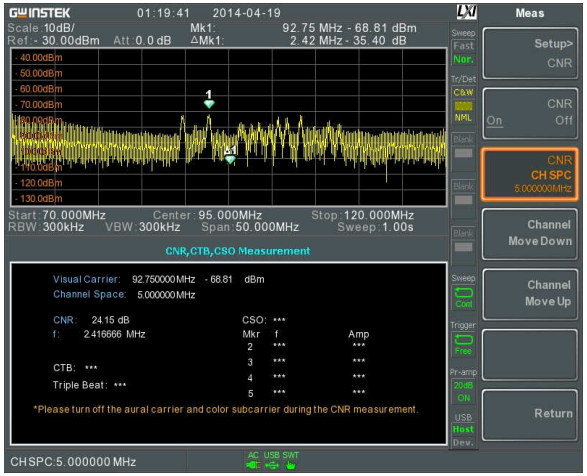
Phase Jitter

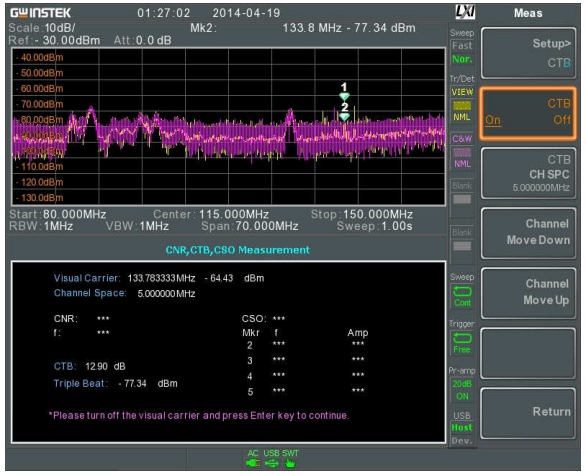


Phase noise is the result of small random fluctuations or uncertainty in the phase of an electronic signal. RF engineers speak of the phase noise of an oscillator, whereas digital system engineers work with the jitter of a clock.

CNR / CSO / CTB

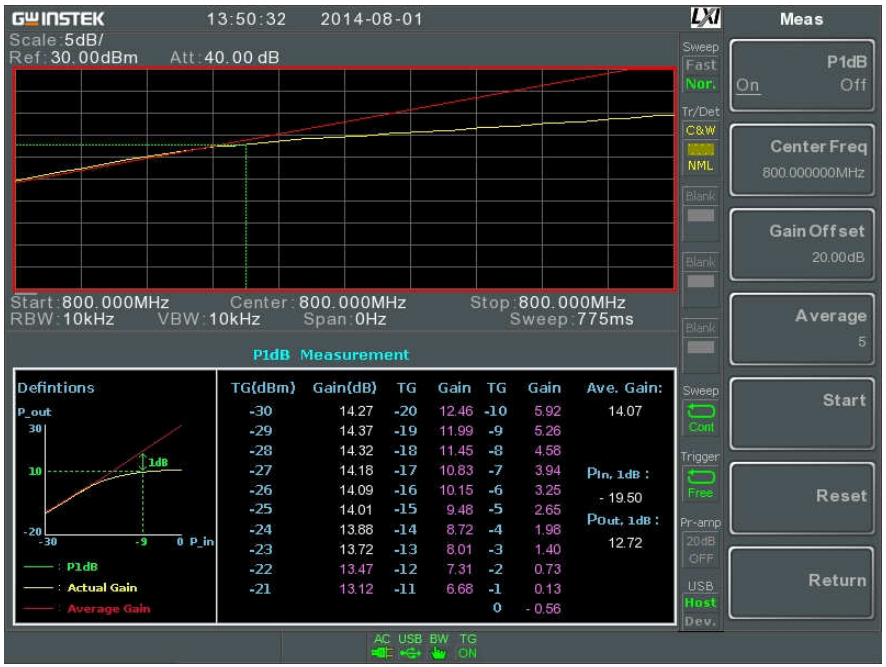
- For CATV amplifier & system testing

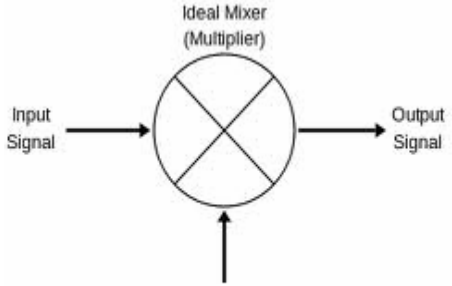




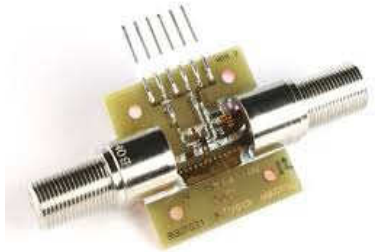
CNR CSO CTB

P1dB Compression Point





Mixer

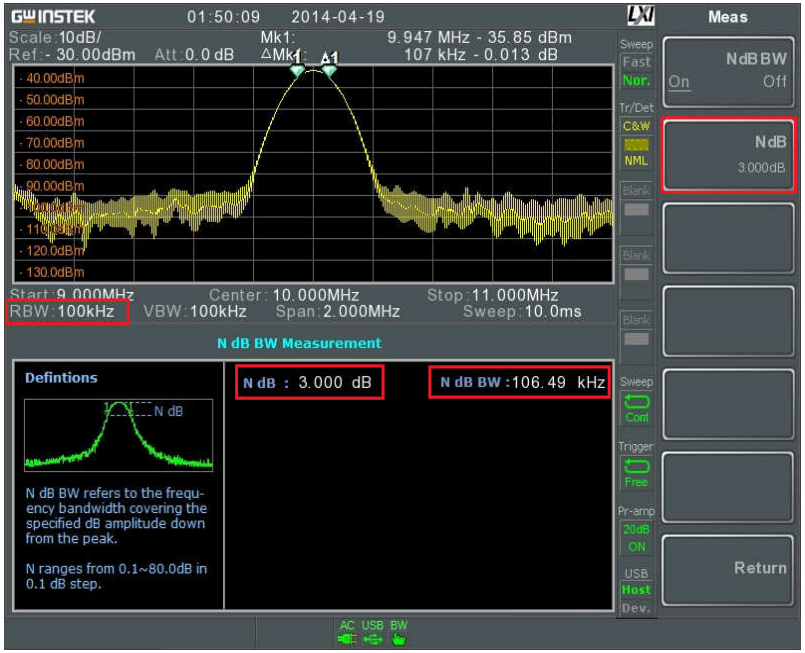


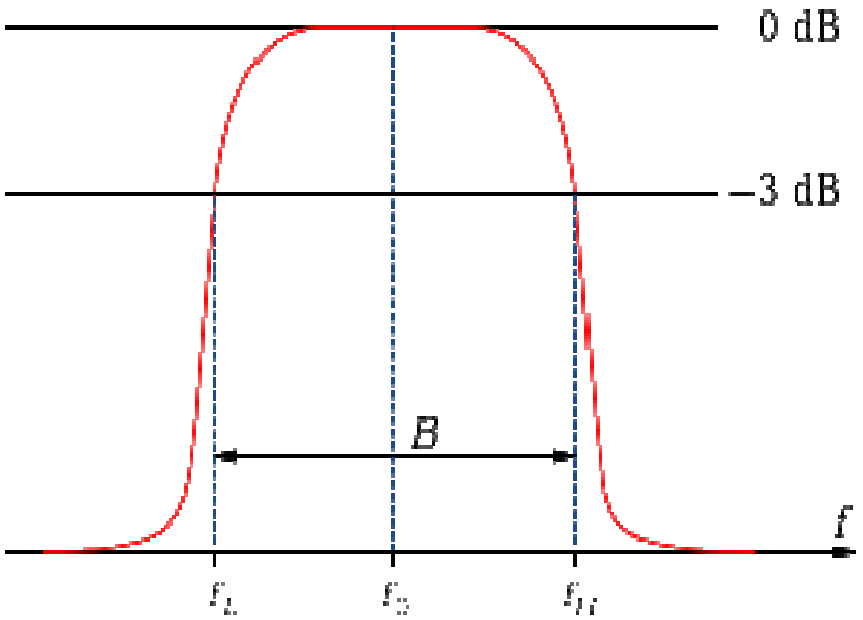
Low noise amplifier

Power amplifier

All active components have linear dynamic range for power output. Once output power reaches the maximum level, active component will enter the non-linear saturated area of P1dB point and cease amplifying signal intensity as well as produce harmonic distortion. It is very useful for P1dB point measurement in active components such as low noise amplifier, mixer and active filter

N-dB Bandwidth

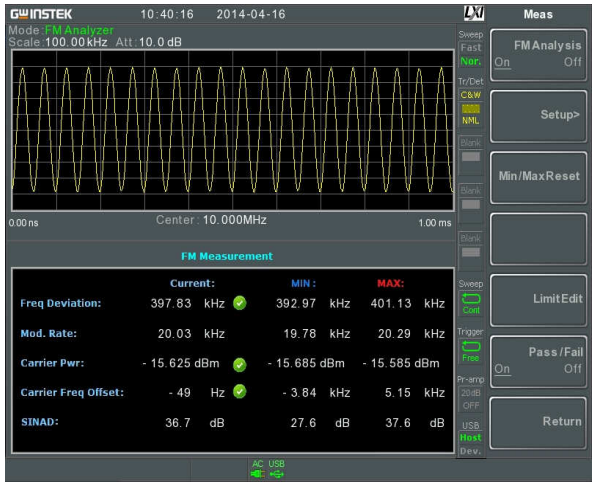


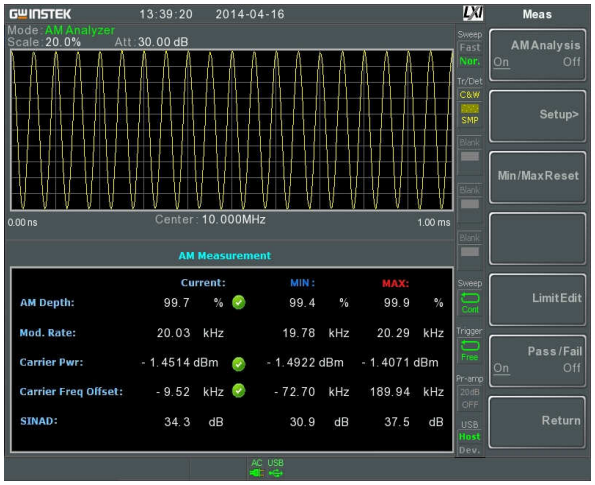


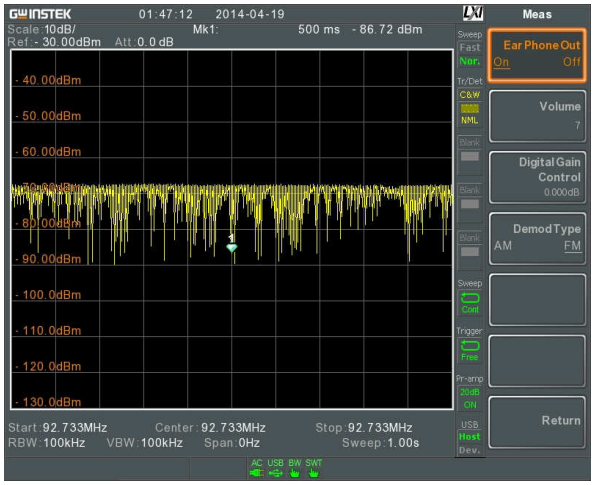
The 3dB point is the point at which the signal has been attenuated by 3dB (in a Bandpass filter). This is generally considered the point for determining the filter's bandwidth.

The bandwidth is defined as the difference between the upper and lower 3dB points.

AM / FM Demodulation & Analysis



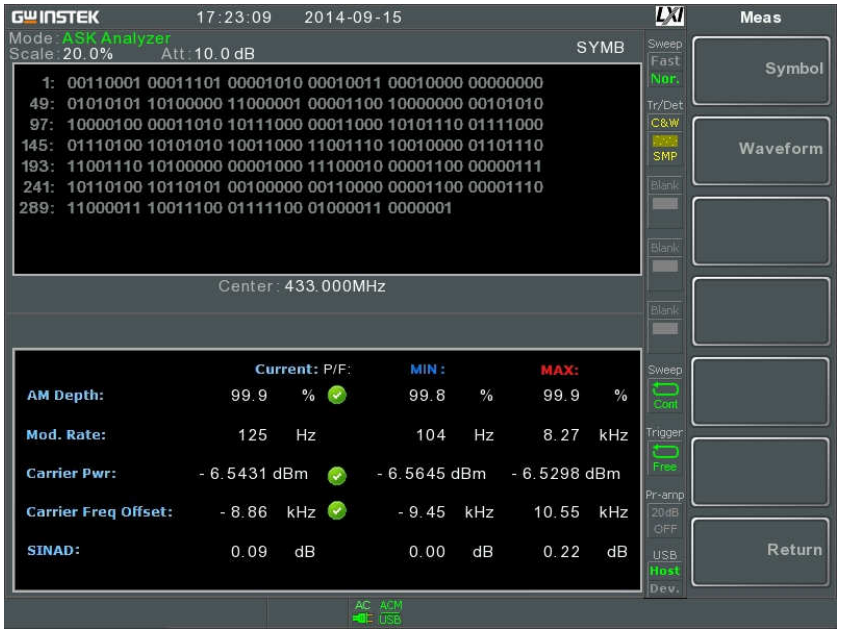




Measure the AM/FM Radio Tuner & Ham Radio Device

AM/FM AF-demodulation with headphone → Useful for interference analysis

ASK / FSK Demodulation & Analysis

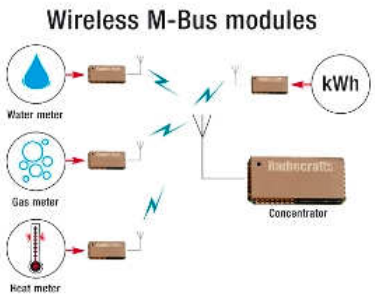


ASK/FSK demodulation and analysis measures parameters including AM depth, frequency deviation, modulation rate, carrier power, carrier frequency offset, SINAD, symbol, and waveform. Users can set AM depth, frequency deviation, carrier power and carrier offset for Pass/Fail testing result.

2FSK Analysis

Measure 2FSK Signal Device :

- Remote keyless entry (RKE)
- Tire pressure monitoring systems (TPMS)
- Wireless medical telemetry
- Railway temperature monitoring
- Wireless peripherals: speakers, headphones, mouse, and keyboards
- Auto vehicle access
- Garage door openers
- Crane control
- More…



Spectrum Analyzer GW Instek GSP-9300

Standard Functions (2)

- Fast Sweep Mode
- EMC Pretest
- Spectrogram
- Topographic
- Limit Line & Pass/Fail Test
- Wake-Up Clock
- Sequence
- Gated Sweep
- Frequency Counter & Marker Noise
- Delete All & Image File Preview
- Icon Symbols & 886MHz IF Output

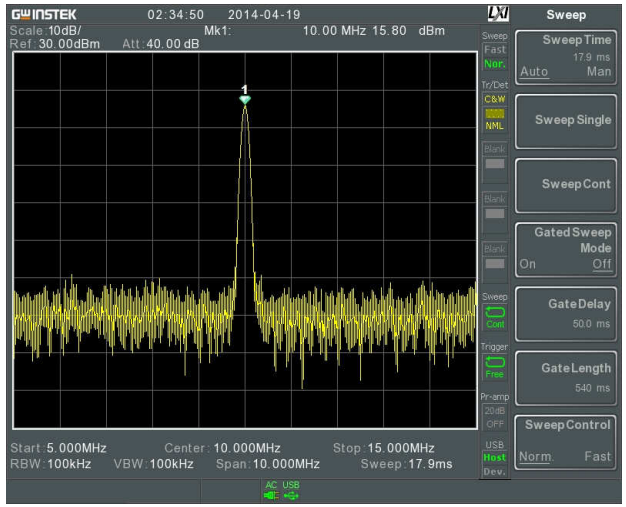
Optional: Tracking Generator, 6.2GHz Power Sensor, Battery Pack , GPIB

Fast Sweep Mode

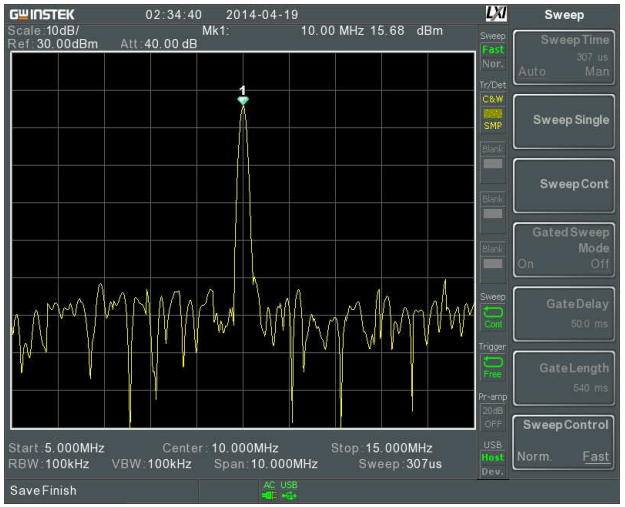
Capture the transient signal like Bluetooth frequency hopping signal, the tuning of VCO, the interfering signal in ISM band and the others.

GSP-9300			
C.F.=1.5GHz		Nor.	Fast
Span(Hz)	RBW(Hz) AUTO		
3G	1M	348ms	175ms
2G	1M	232ms	116ms
1G	1M	116ms	58.4ms
500M	1M	58ms	29.2ms
200M	1M	23.2ms	11.6ms
100M	1M	11.6ms	10ms
50M	300k	18.8ms	727us
20M	100k	35.9ms	593us
10M	100k	17.9ms	307us
5M	30k	42.2ms	655us
2M	10k	127ms	1.96ms
1M	10k	63.8ms	1.31ms
500k	3k	6.88ms	6.88ms
200k	1k	22.9ms	22.9ms

Normal & Fast mode comparison table



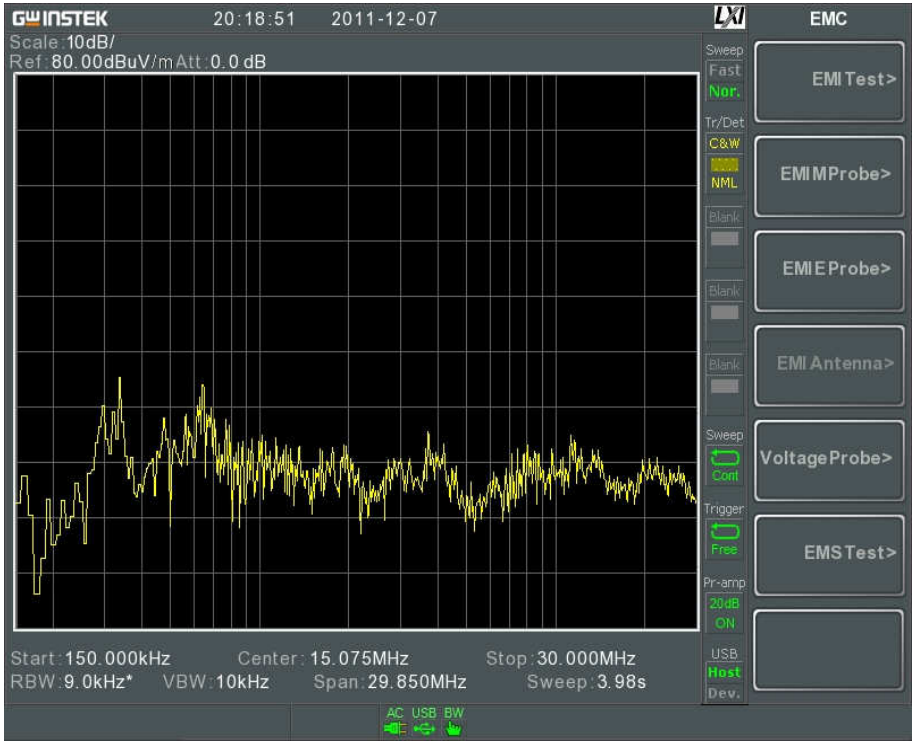
Normal mode sweep time is 17.9 ms



Fast mode sweep time is 307 us

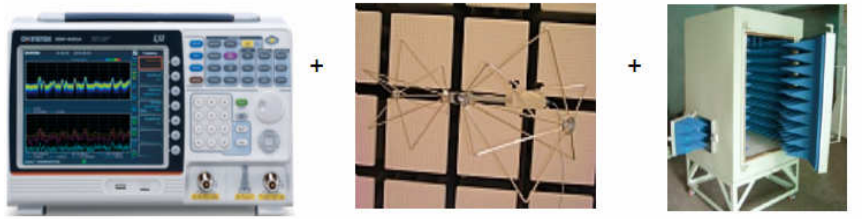
Sweep Mode Key

EMC Pretest



EMC Pretest Key

EMI Radiation Setup

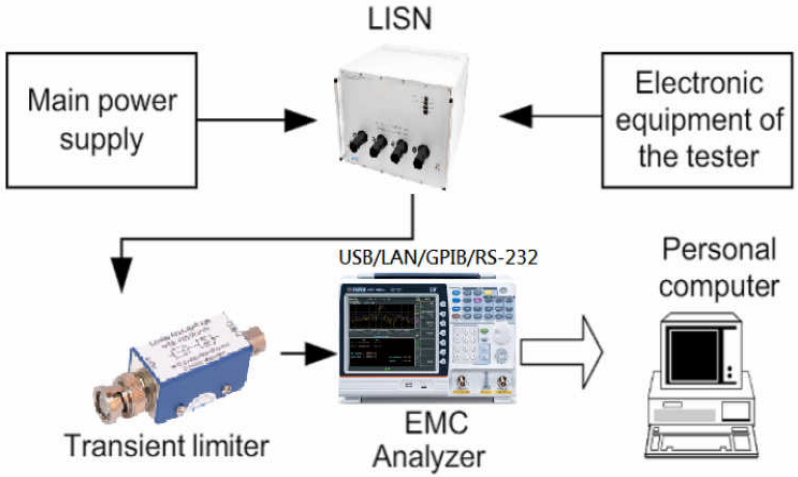


GW Instek GSP-9300
Spectrum Analyzer

ETC Test Lab
Antenna

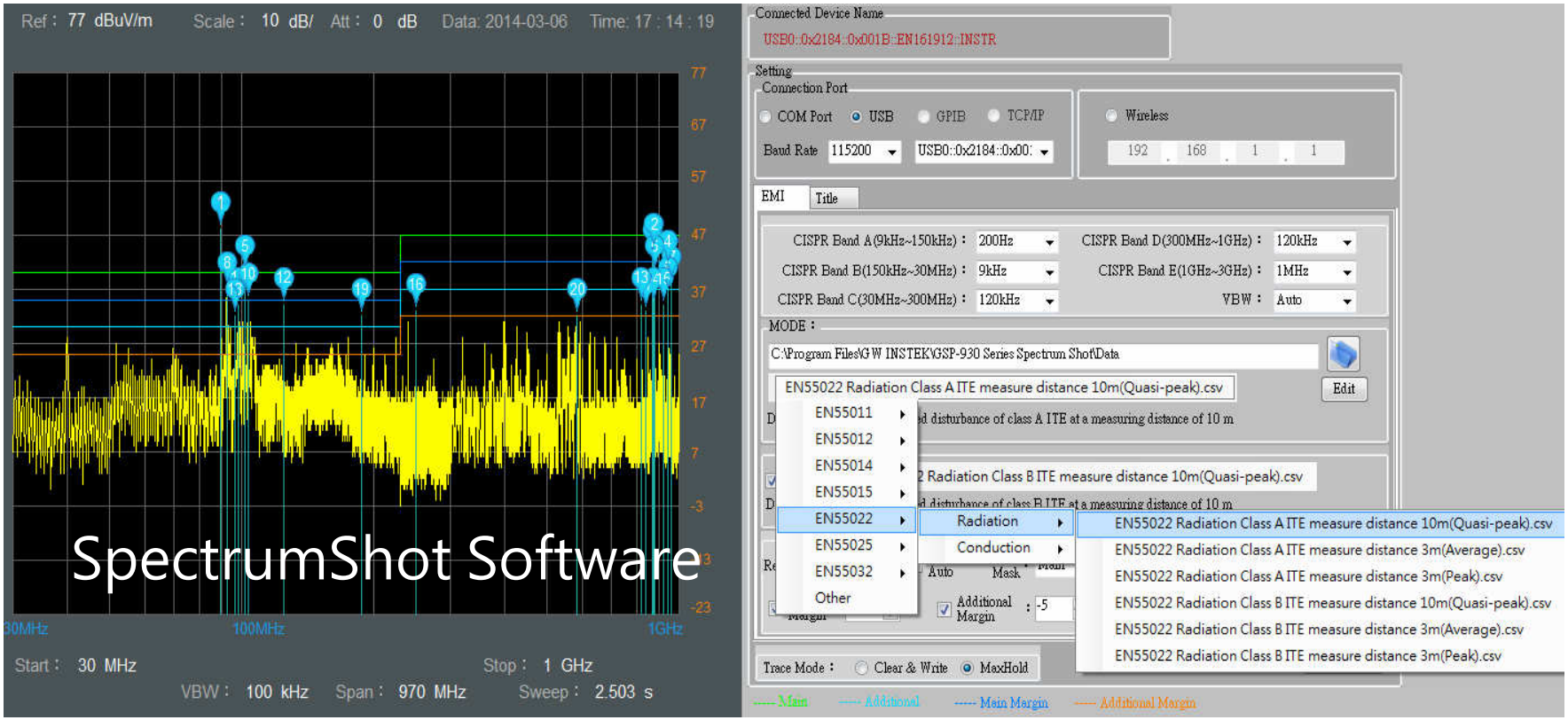
CHANC MOST
Chamber

EMI Conduction Setup



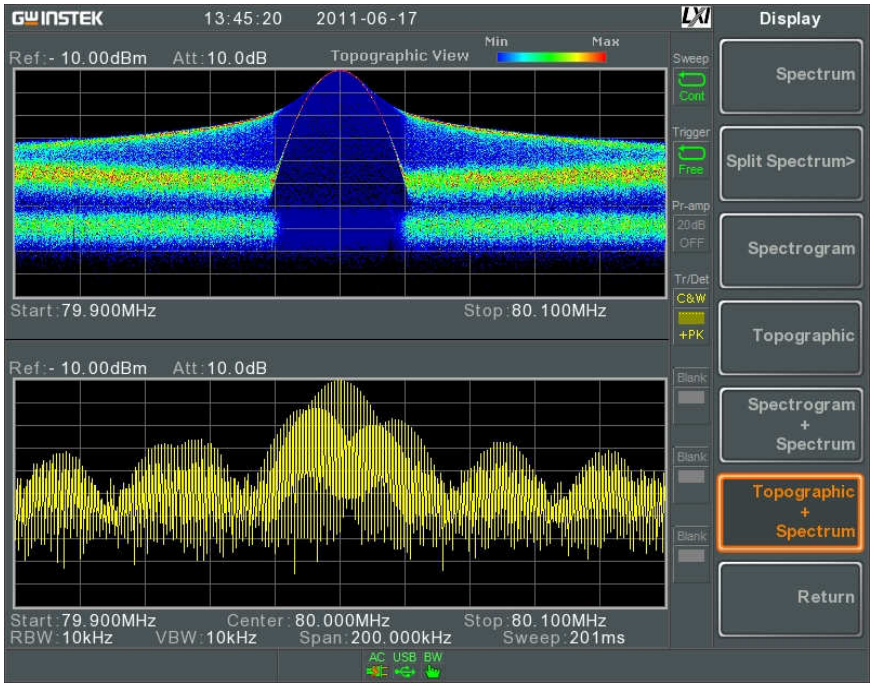
Support the EMC Pre-compliance testing. We cooperate with third party and provide the EMI conduction and radiation testing solution.

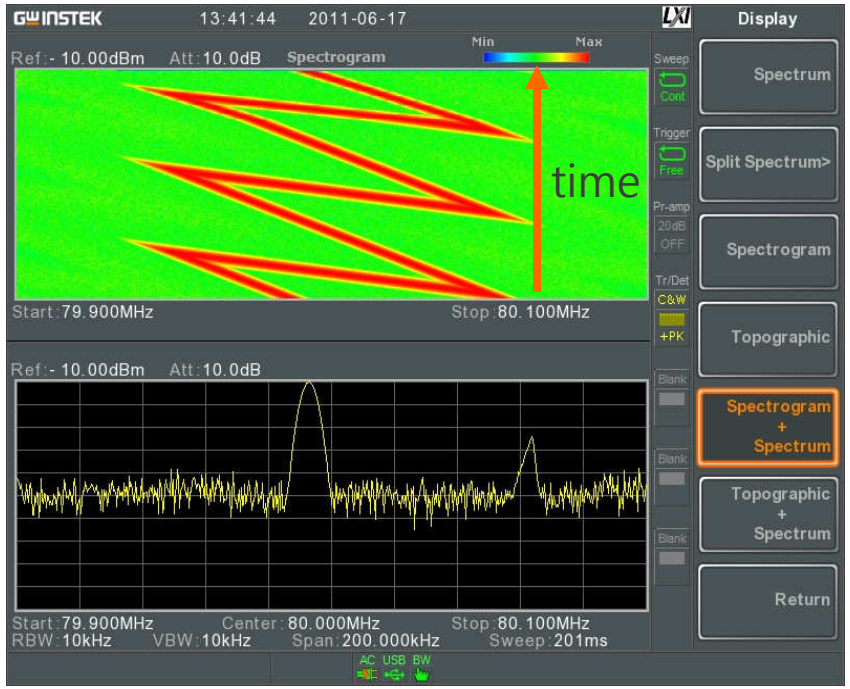
EMI Pre-compliance Software



SpectrumShot software is free of change. Built-in CISPR standard limit line.

Topographic / Spectrogram





Topographic display distinguishes EMI signal overlap on the same frequency range.

Spectrogram display show a frequency sweep signal with time and frequency domain

Display Key →Window Setup

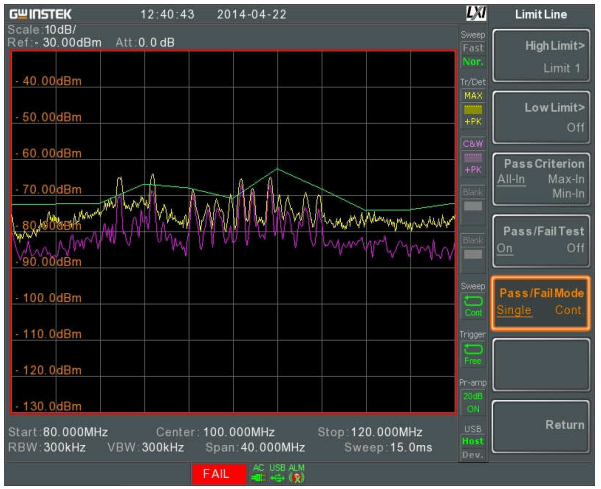
Limit Line & Pass/Fail Test

Pass/Fail Inspection Test performs the test result judgment with inspection criteria pre-defined by user. The procedure is as follows: (a) Create Limit lines to set the inspection zone. (b) Select the Pass Criterion. (c) Execute the Pass/Fail test.

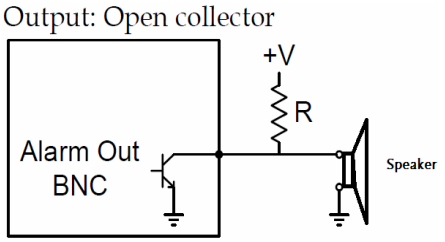
limit line key

In addition to display the judgment result Pass or Fail on the LCD, an open-collector alarm output is available at the rear panel, which allows user to connect an external alarm for sound or other indications of test result.

Create limit line to set the inspection zone



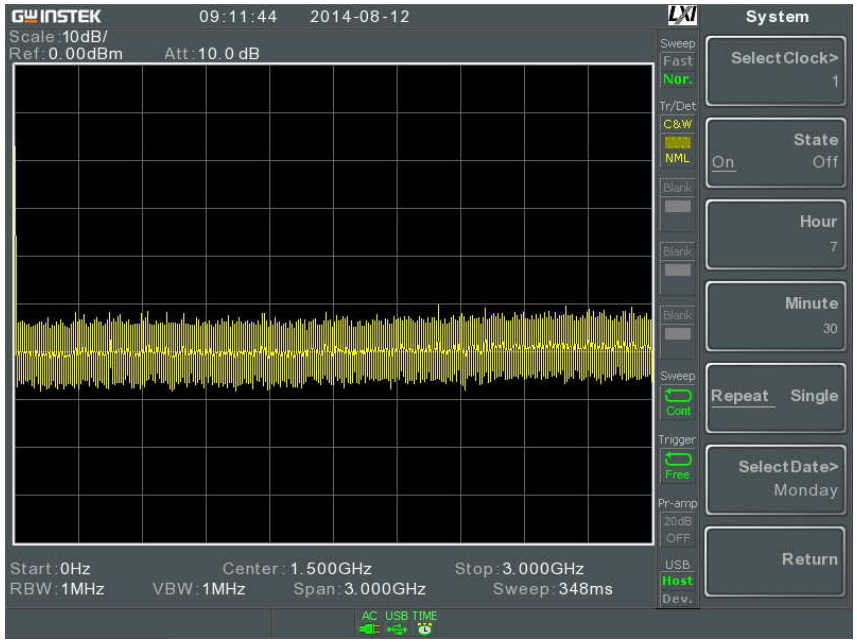
Execute the Pass/ Fail test



Pass/Fail result with external alarm speaker output to maximize throughput

Wake-Up Clock

Wake-Up Clock automatically turns on the power of GSP-9300 spectrum analyzer at user’ s pre-set time, which can be used to warm up the instrument in advance before the measurements are made to ensure the accuracy of measurement results, particularly in the low ambient temperature circumstance.

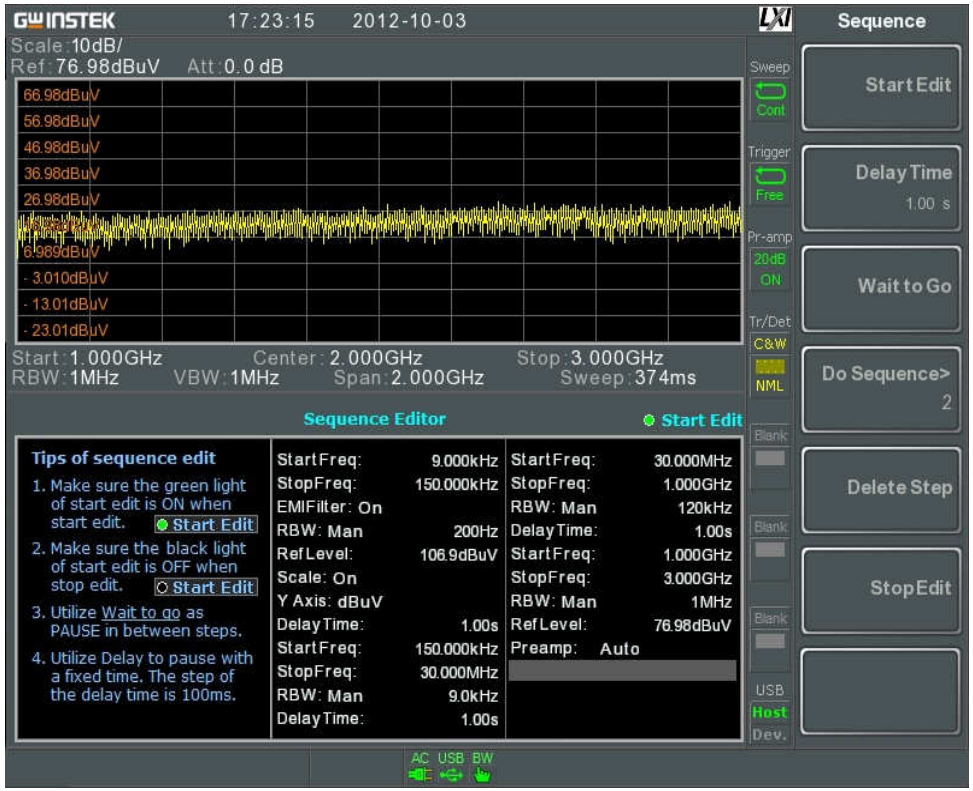


Automatic Turns on GSP-9300 every working day

Time is Money $$$. Saving your time & money

Sequence

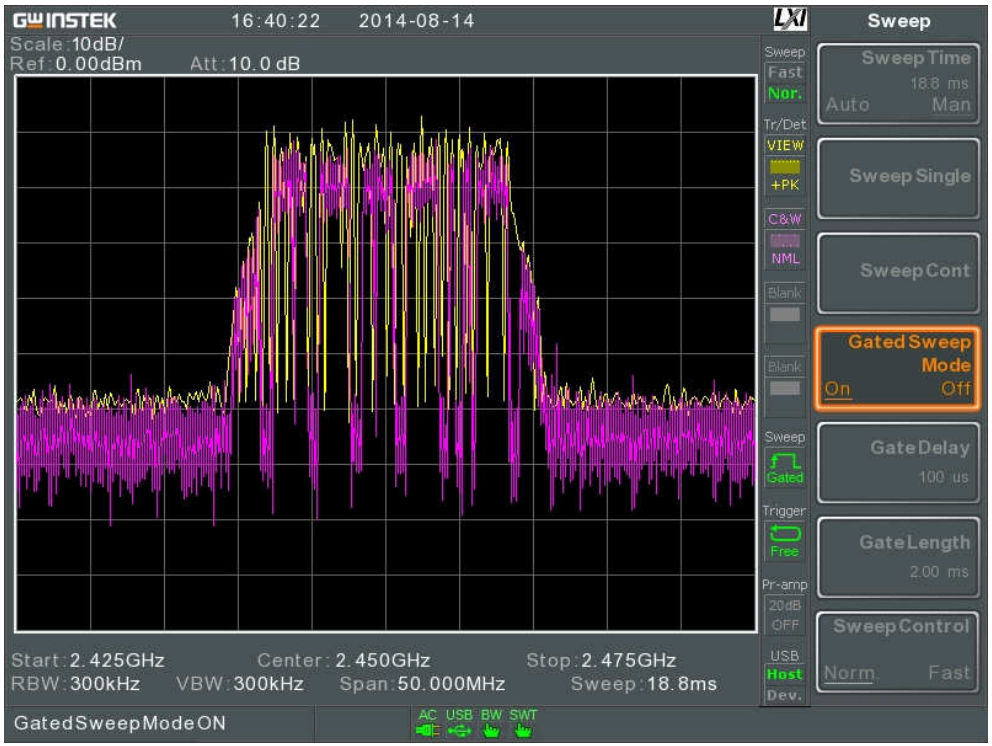
The sequence function allows users to edit a sequence formulated by a series of steps directly from the instrument. This function provides automatic editing without using the PC that is very convenient for assembly lines in which execute routine test procedures.



Sequence Key

Gated Sweep

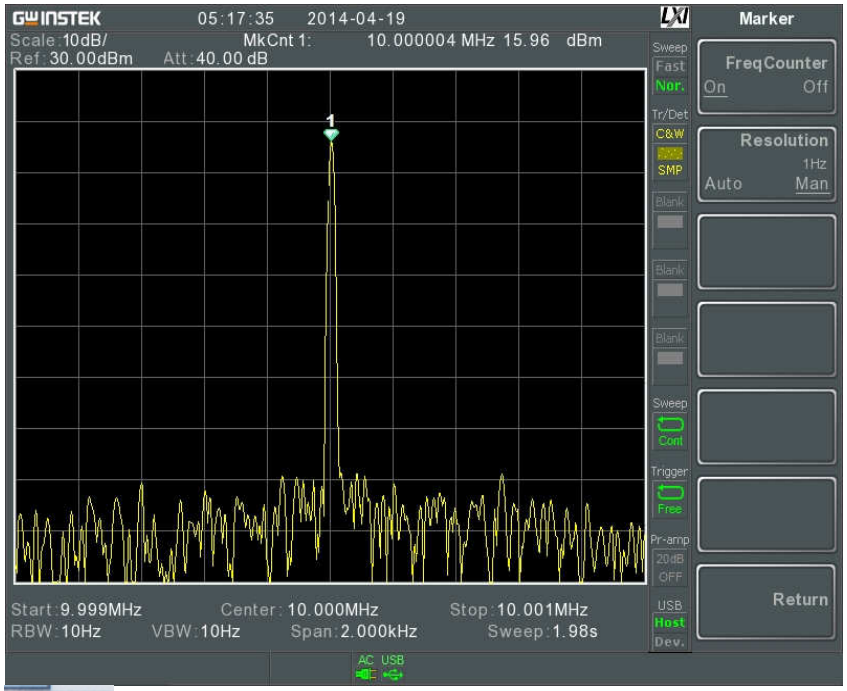
Radar or TDMA communications systems, via intermittently turning on/off output power, control transmission signals. In order to monitor the power spectrum during the transmission process, the Gated Sweep function can initiate measurement only when signals appear. This function is ideal for measuring burst signals such as GSM or WLAN (as shown in the example).



Sweep Key

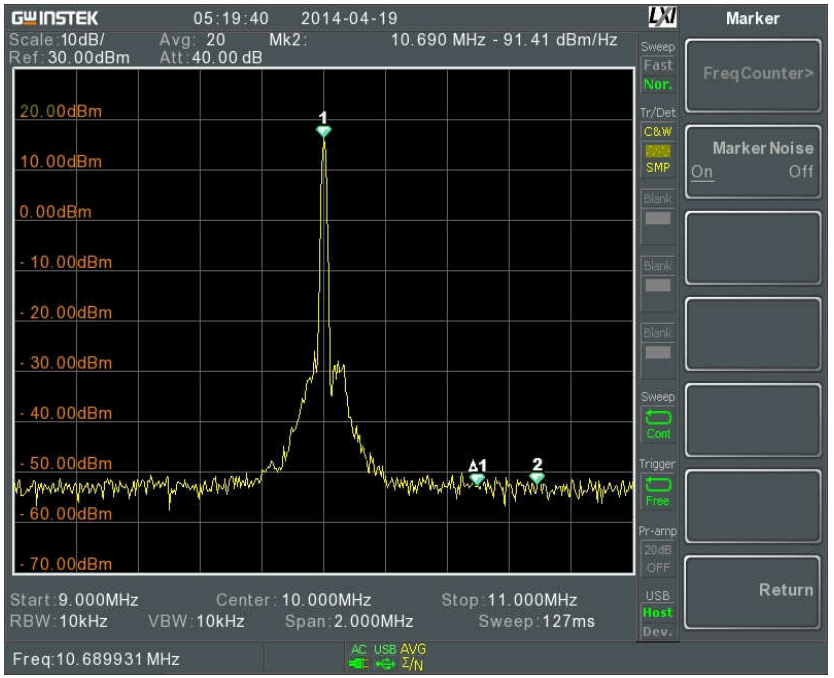
Frequency Counter & Marker Noise

The frequency counter function is used to make accurate frequency measurements up to 1Hz resolution.



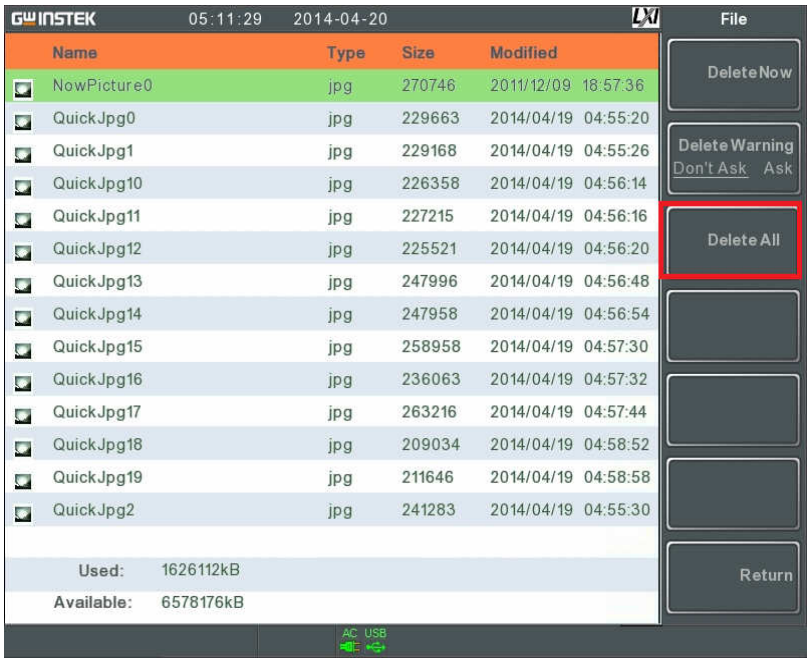
Marker Key → Function>

The marker noise function calculates the average noise level over a bandwidth of 1Hz, referenced from the marker position.



Delete All & Image File Preview

File Key → Delete>



Delete All function allows user to delete all customized files and data in Spectrum Analyzer for security.

File Key → More> Preview

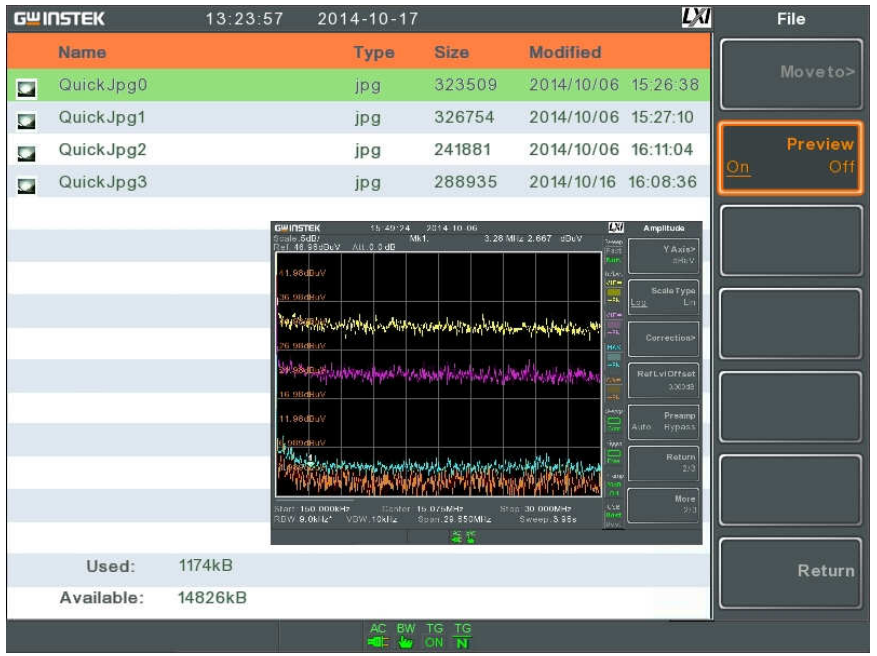
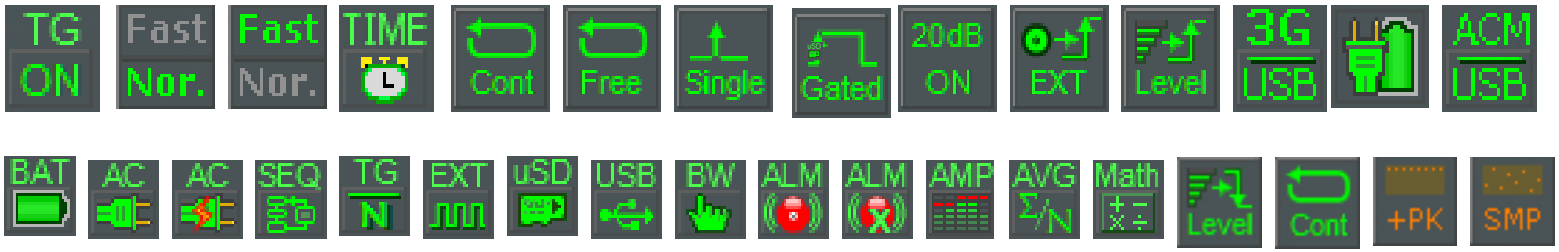


Image files can be previewed on the screen by enabling the preview function.

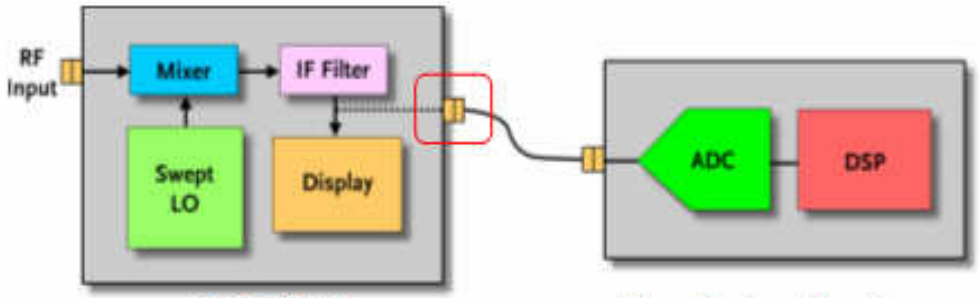
Icon Symbol & IF output

- Status Icons show the interface status, power status, alarm status and etc of GSP-9300. Users can easily understand the setting status and test results of the instrument.



- IF output (886MHz) is provided as the intermediate frequency or the base band of RF input signal for users to develop further applications

IF output

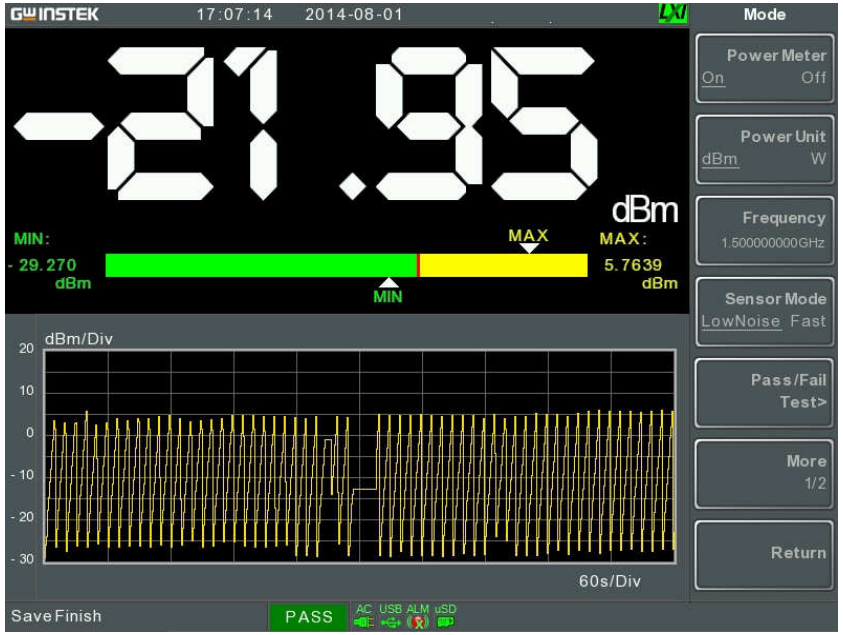


GSP-9300

User's Application

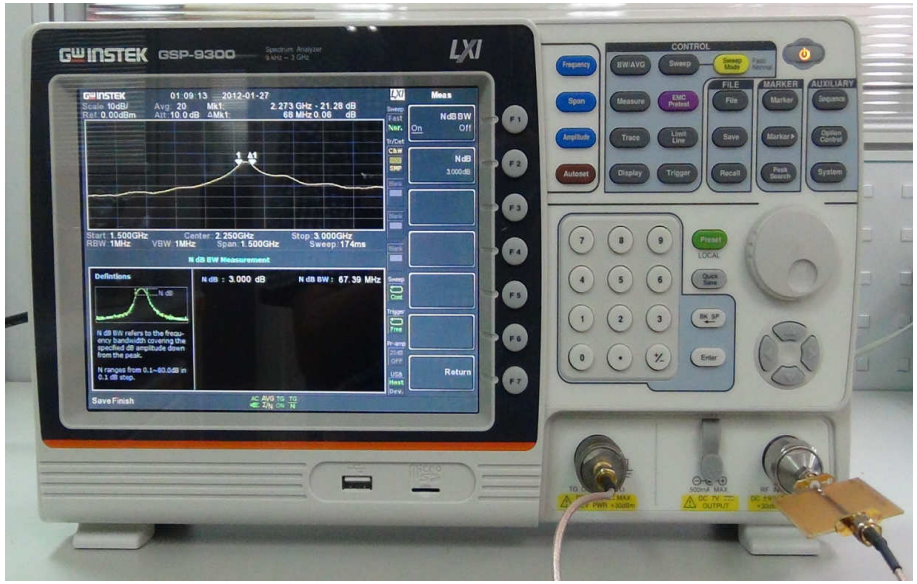
Power Meter

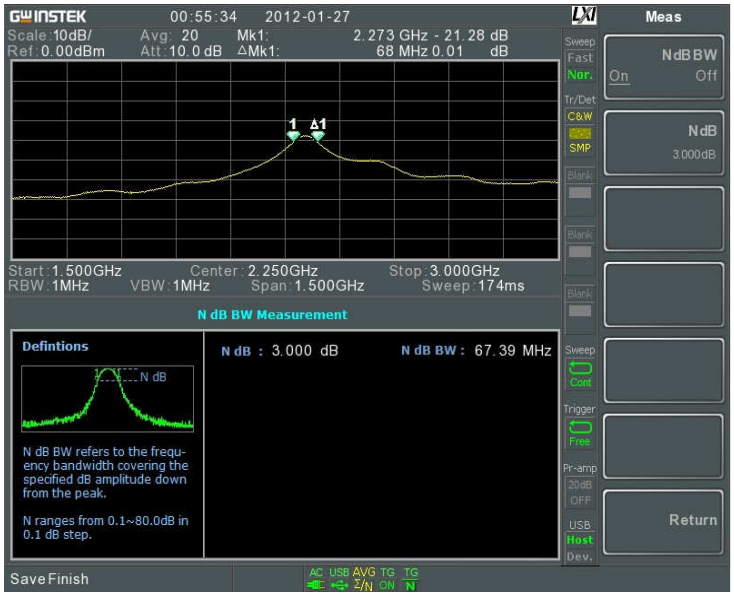
- PWS-06 Power Sensor for GSP-9300 Power Meter function.
- Frequency range : 1MHz to 6.2GHz
- Input power range : -32dBm to 20dBm
- Power measurement uncertainty : ±0.15dB



Scalar Network Analysis

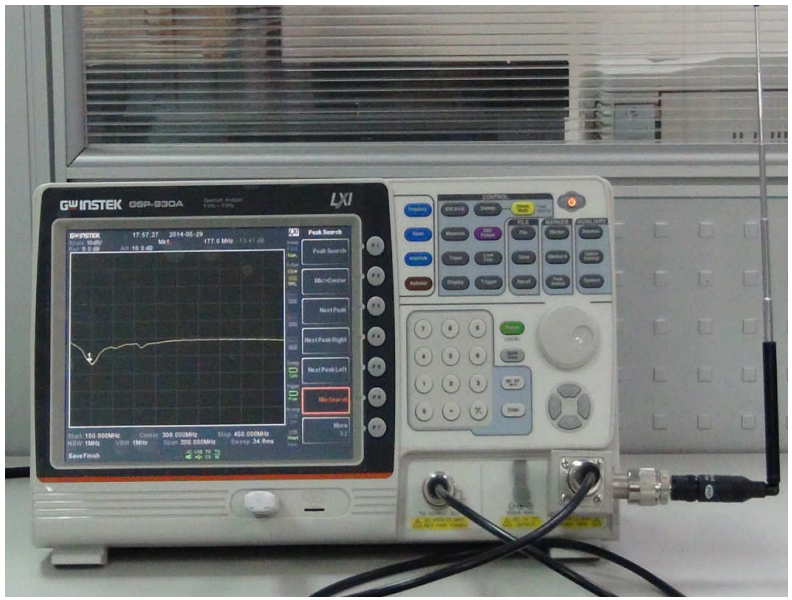
The Tracking Generator is an option of GSP-9300. It can meet the frequency response measurement of RF component.



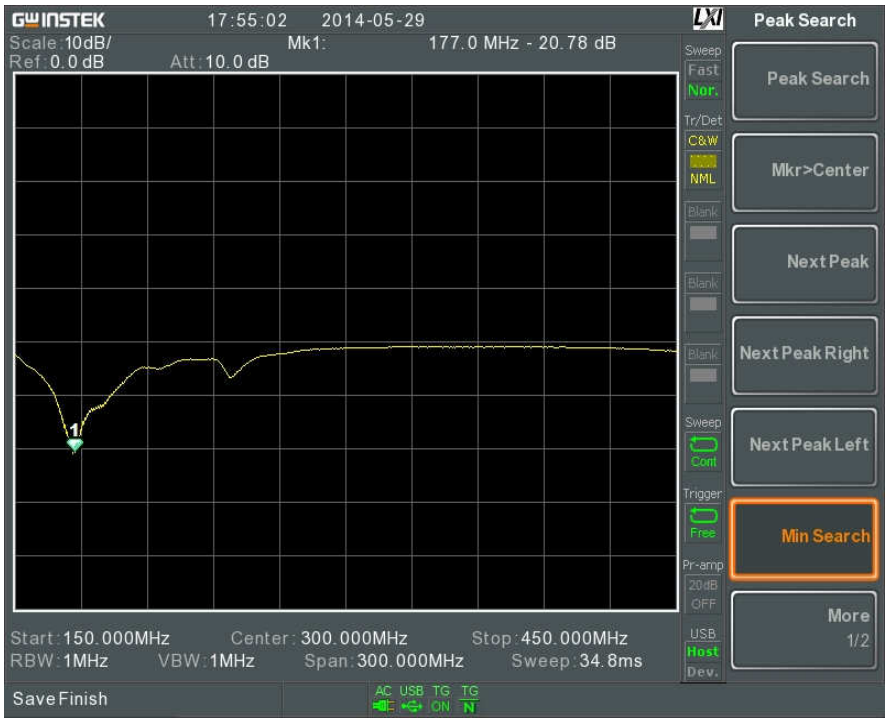


N-dB Bandwidth

Scalar Network Analysis



RLB-001,
10MHz to 1GHz
Return Loss Bridge



Antenna Return Loss Testing

Battery Pack & Carrying Bag

- Compact and light-weighted (4kg) GSP-9300 can be powered by battery making it suitable for outdoor operations.
- Optional battery pack (opt.02) has a battery life of two hours.
- Optional soft carrying case (GSC-009) provides convenience and protection to the instrument.

Option 02, Battery Pack

GSC-009, Soft Carrying Case

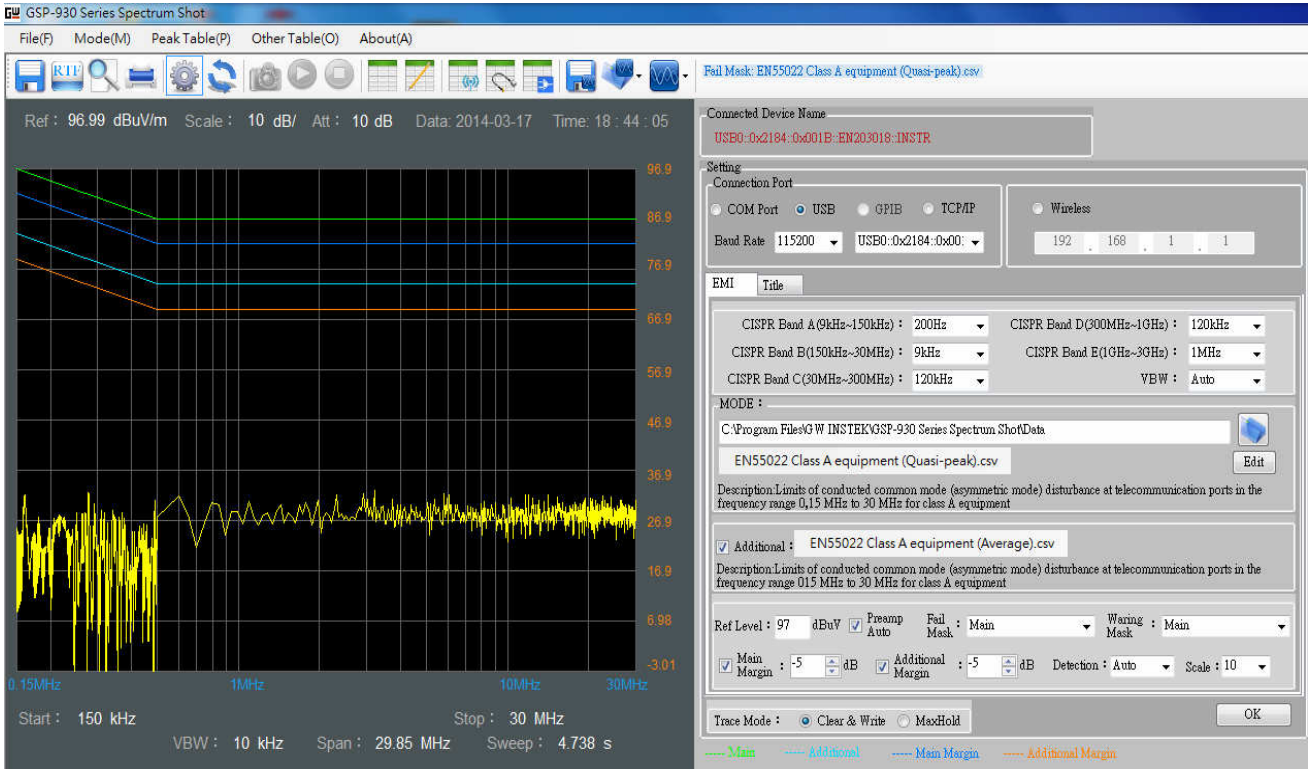
Optional Accessories

- GKT-006A, EMI Probe Kit Set
- RLB-001, Return Loss Bridge
- ADB-002, 50 Ohm BNC DC Block
- ADB-006, 50 Ohm N-type DC Block
- ADB-008, 50 Ohm SMA DC Block
- ADP-001, Adapter BNC (f) to N-type (m)
- ADP-002, Adapter SMA (f) to N-type (m)
- ADP-101, 75 Ohm to 50 Ohm BNC Matching Pad
- ATN-100, 10 dB N-type Attenuator
- GAK-001, 50 Ohm N-type (m) Termination
- GTL-301, 50 Ohm N-type RF Cable (1000mm)
- GTL-302, 50 Ohm N-type RF Cable (300mm)
- GTL-303, 50 Ohm SMA (m) RF Cable
- GRA-415, Rack Adapter Panel

GKT-006A

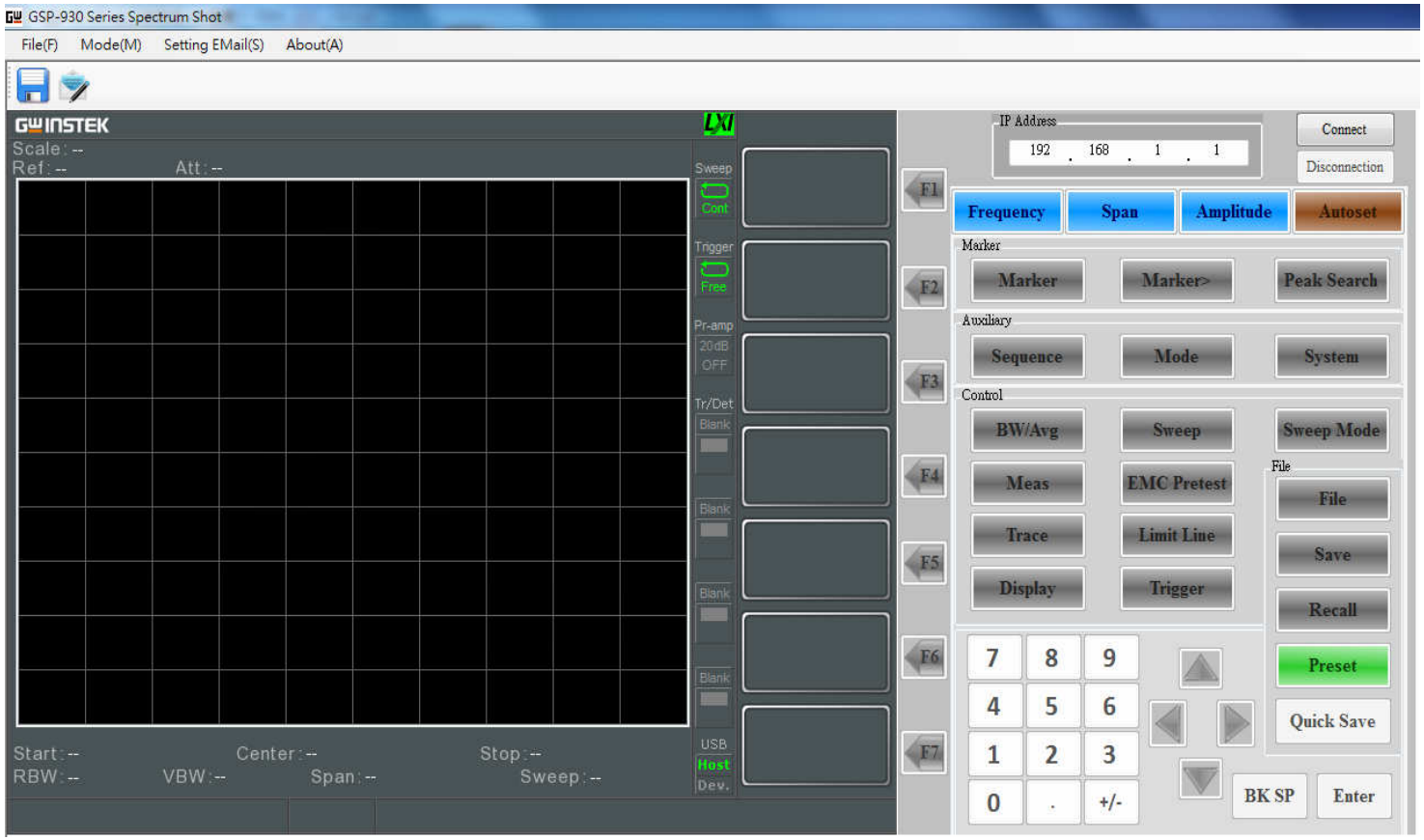
Software and Driver Support

- SpectrumShot software is free of charge.
- Support EMI pre-test, PC remote control & spectrum waveform recording.
- Built-in the CISPR standard limit line for EMI pre-compliance testing.



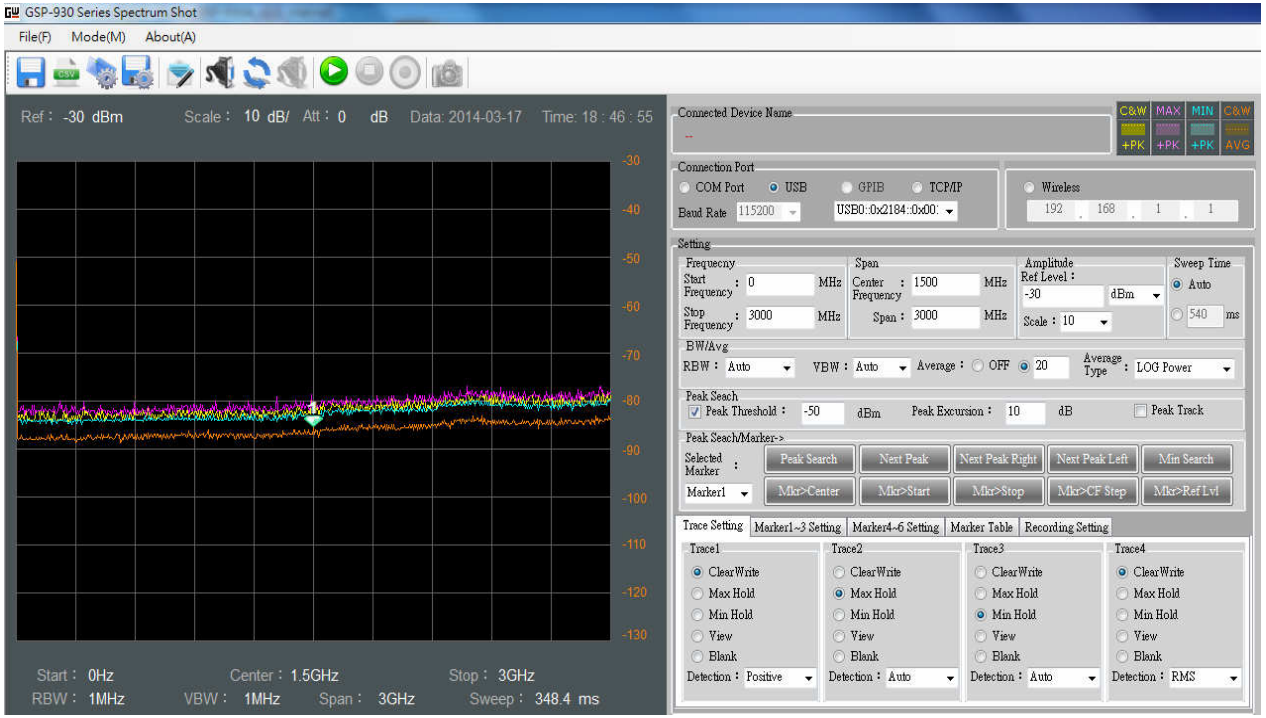
Software and Driver Support

- SpectumShot software supports PC remote control with LAN.



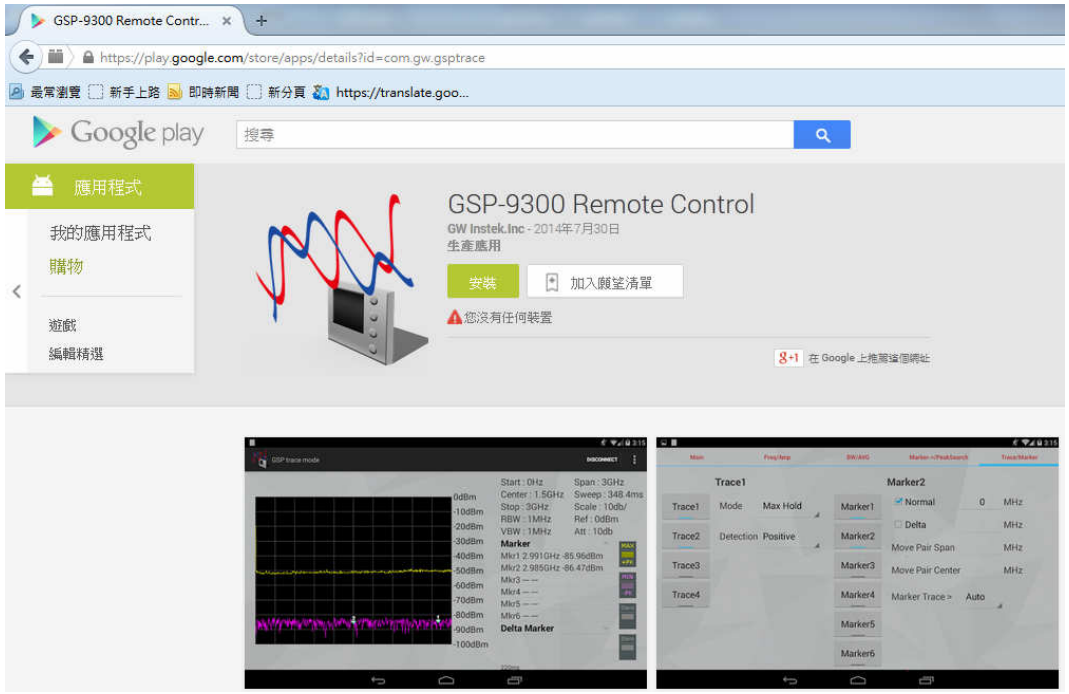
Software and Driver Support

- User can acquire and record trace data with SpectrumShot Software
- Support remote control with LAN & 3G Wireless Dongle for Spectrum Monitoring
- IVI Driver can support LabVIEW/LabWindows/CVI programming.



Software and Driver Support

- Users can install the "**GSP-9300 Remote Control**" **APP** on an Android Smart Phone or Tablet.
- For remote locations, using a 3G modem allows the user to remote control the GSP-9300 Spectrum Analyzer.
- It is available on Google Play Store.



The End
Any Question?