



Spectrum Analyzer Packet Guide



GW INSTEK

Made to Measure Since 1975

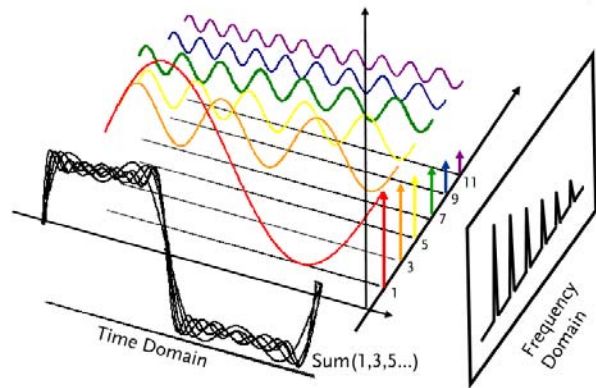
What is a spectrum analyzer?

The spectrum analyzer is basically a device that operates on the principle of relative movement in frequency between the signal and a filter. The important parameter is the relative frequency movement. It doesn't matter whether the signal is stationary and the filter changes or whether the filter is stationary and the signal is made to change the frequency.

Why to proceed in spectrum analysis?

In the typical time-domain analysis, one can easily inspect the event of signal waveform along the time axis as long as using oscilloscope to measure electronic signal event with any time function in terms of instantaneous physical variable. To fully analyze and clarify characteristics of desired signal, in addition to use an oscilloscope to inspect signal in time-domain, one needs to analyze the desired signal from frequency-domain. Usually one can use an oscilloscope to capture a signal without integrity; one can only find the aggregated waveform. For example, the square wave in fact is a kind of signal consists of many signals.

Hence, theoretically any electronic system with proper filter function can enable to decompose the signal waveform into individually separate sinusoidal wave or frequency composition to be analyzed easily.



The difference between time-domain and frequency-domain

The instruments variations of measuring frequency

In terms of the function aspects, the general frequency counter can only measure signal frequency, while power meter can only be used to measure the signal power. And the spectrum analyzer can be considered as the measurement device with the function equipped for frequency counter and power meter.

	Frequency	Intensity	Demodulation(*)	Measurement Item
Power Meter	X	V	X	Total Power Measurement
RF Counter	V	X	X	Maximum Frequency
RF Receiver	V	V	V	Lower frequency, demodulation analysis of modulated signal
Spectrum Analyzer	V	V	V	Measuring frequency and amplitude can acquire the entire signal characteristics
Network Analyzer	V	V	X	Testing analysis of RF device characteristics

High frequency measure instrument of common use (*: Analog demodulation)

The category of spectrum analyzer

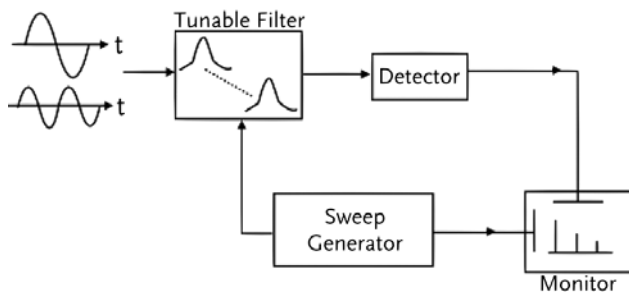
In general, spectrum analyzer can be categorized into two types, sweep tuned spectrum analyzer and real-time spectrum analyzer.

1. Sweep Tuned spectrum analyzer

Among these types of spectrum analyzer, the two types included RF tuning and super heterodyne sweeping method.

A. RF tuning method of the spectrum analyzer

RF tuning type of spectrum analyzer is basically equipped with a band-pass tunable filter which can modulate its pass band width through a sweeper. This can make the related frequency signal to pass and to feed into vertical deflection plate, where the horizontal axis in CRT controlled by synchronous frequency in sweeper can enable the signal with various frequencies to display on horizontal axis.



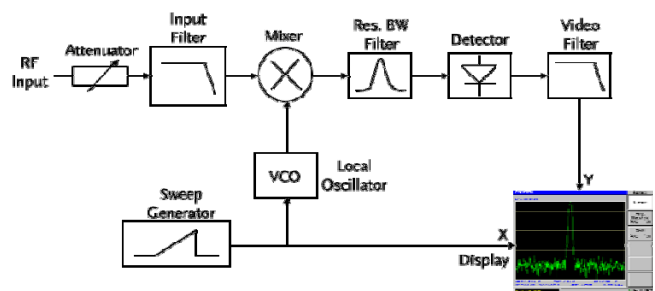
RF tuning type of the spectrum analyzer

Adopting this configuration of spectrum analyzer is simpler and can afford the broader frequency range and cheaper price, but the performance of sensitivity and frequency characteristics behaves more badly. The filter bandwidth is fixed and the frequency resolution is variant. As this tuning type of spectrum analyzer, it became more economic and enable to measure the wider frequency

range, thus there often adopted this kind of the spectrum analyzer for earlier microwave band of spectrum analysis. However, the sweep rate is kept slower to several MHz/s due to that this way is facilitated by sweeper to modulate filter pass band. This will cause the inaccuracy of the desired measurement once the swept results exceed the ratio of filter to its frequency response.

B. Super heterodyne type of the spectrum analyzer

As the sensitivity and accuracy of tuning type of spectrum analyzer is lower, thus the current broadest spectrum analyzer is super heterodyne type of spectrum analyzer. This method is to fix the pass band of the input filter and use a frequency-tunable local oscillator which can generate the linear time variance of oscillating frequency. After mixing this tunable oscillating frequency and input signal, there generate an Intermediate Frequency (IF) which becomes receiver output. At the same time, the signal is fed into vertical deflection plate (horizontal axis) on screen and tooth wave voltage is fed into horizontal deflection plate (vertical axis). The outcomes illustrate there to be the correspondence of the desired signal frequency and amplitude.



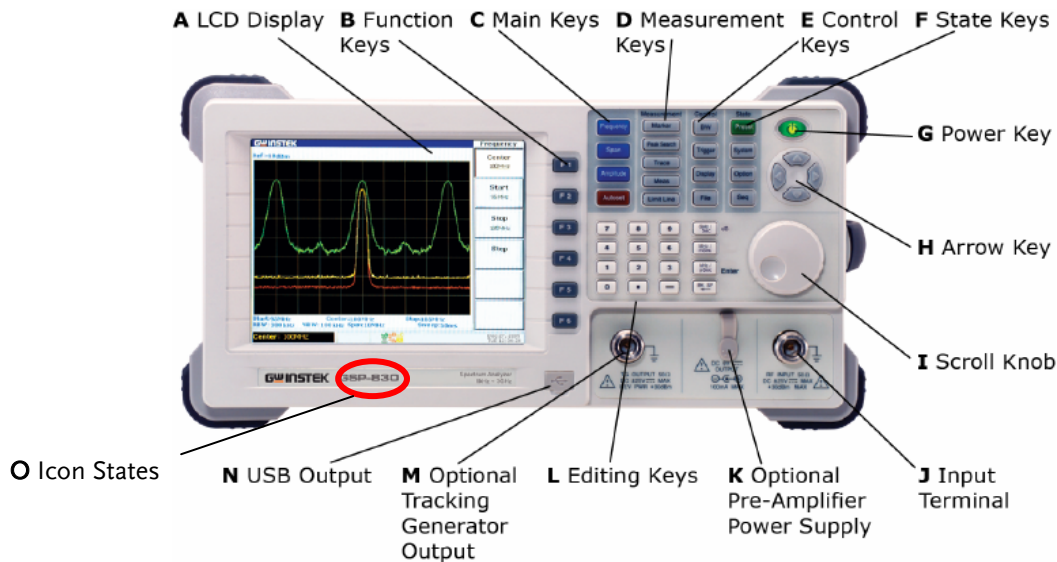
Super heterodyne type of spectrum analyzer


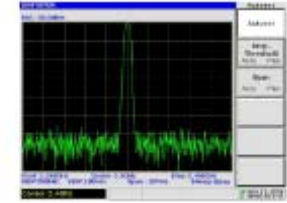
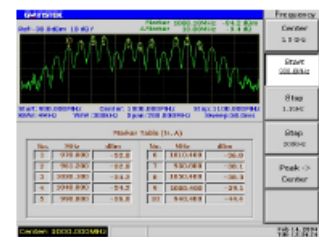
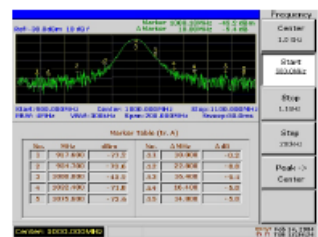
2. Real Time Spectrum Analyzer (RTSA)

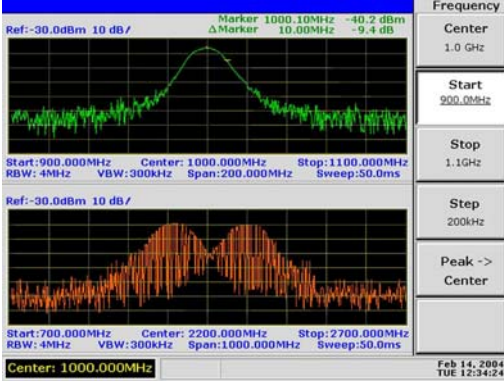
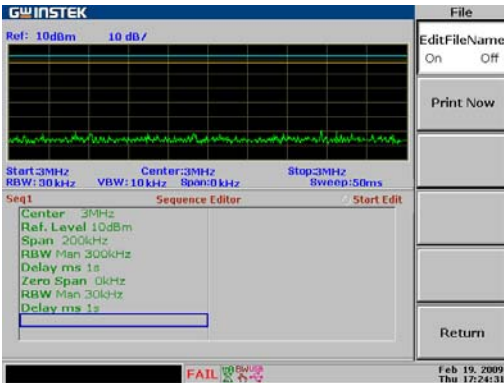
This type of SA is called real-time spectrum analyzer, which can instantly filter out the desired signal. It is

Introduction to the front panel of spectrum analyzer

Spectrum Analyzer Front Panel



A	LCD Display	The display allows you to observe the signal waveforms and exhibit the measurement information.
B	Function Keys	The keys are used to determine the functions associated with the picture.
C	Main Keys	<p>The keys allow you to set the important parameters as Frequency, Span, and Amplitude.</p> <p>Autoset Function: The key allow you to automatically capture the signal and configures the optimal display setting only in one step</p> <div style="display: flex; justify-content: space-around;">   </div>
D	Measurement Keys	<p>The keys determine the functions include Marker, Peak, and Trace to acquire the waveform information.</p> <p>Marker Function: Using 5 pairs of flexible and all-round markers under Marker mode, users can easily find and observe signal peaks and track them or measure delta readings between defined pairs.</p> <div style="display: flex; justify-content: space-around;">   </div>

<p>E</p>	<p>Control Keys</p>	<p>The keys are used to modify some control parameters including bandwidth, trigger, and storage function.</p> <p>Split-window display: This feature enables dual measurements with two displays of a signal under different settings. The advantage is update process is available in real time.</p> 
<p>F</p>	<p>State Keys</p>	<p>The keys can allow you to know about the system status.</p> <p>Auto Sequence: this feature offers a special functionality that allow you free from complex programming so that you may configure ATE test programming without through extra software programming process. After editing the Auto sequence sets as desired, users can easily run different measurements serially or carry out the whole test sequence step by step.</p> 
<p>G</p>	<p>Power Key</p>	<p>The key allow you to enter Standby Mode (Red LED On) or Power -On Mode (Green LED On).</p>
<p>H</p>	<p>Arrow Key</p>	<p>Arrow keys select parameters in various occasions; Up/Right for increasing, Down/Left for decreasing.</p>
<p>I</p>	<p>Scroll Knob</p>	<p>Scroll knob sets or selects parameters in various occasions. In many cases, it works in tandem with the Arrow keys.</p>
<p>J</p>	<p>Input Terminal</p>	<p>The port is used to feed in input signal for DUT. (With the maximum amplitude +30dBm, DC ±25V, and input impedance 50Ω)</p>

K	Pre-Amplifier Power Source	The item provides the option GAP-801/802 with DC 9V power
L	Numerical Keys Unit Keys Enter Key BK SP key	Numerical keys set various parameters. In many cases, they work in tandem with the Arrow keys and Scroll knob.
M	Tracking Generator Output (Optional)	TG output port is used to output TG signal. (The return power is less than +30dBm)
N	USB Output	The output port is used to link USB host, A-Type, and other connectors to store and read the waveform data.
O	Status Information Presented by Icons	Breaking out of the traditional methodology, our spectrum analyzer has adopted status icons to show the current instrument state on the display. The intuitive icons help users grasp the current condition at a glance. Users do not need to remember every previous setting, which may cause measurement fault.

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