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TC1204A Hand-held Spectrum Analyzer

TC1204A handheld spectrum analyzer   adapts high resolution of large 6.5 -inch screen with an impressive and delicate performance; The unit   is small and light-weight which is easy to carry, with a 6000 mAH large-capacity rechargeable battery, it   can continuously work up to 4 hours, and equipped with man-machine interface of a similar desktop spectrum analyzer,   it possesses much advanced technical index which is superior   to those from mainstream portable spectrum analyzer for applications of indoor and outdoor tests.

It can also be connected to PC, by which it can display test images by controlling remotely. Universal USB and LAN communication interface make it more convenient to user-friendly measurement, with the standard complete SCPI command set, which can build and upgrade the integrated test system quickly.

Features:
- Provided most handheld spectrum analyzer test function with superior technical index
- Frequency range: 9kHz~3.6GHz
- Optimum sensitivity: -148dBm
- Resolution bandwidth: 10Hz~3MHz

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- AM/FM demodulation, frequency count
- 100kHz~1.5GHz tracking generator
- 6.5 inch highlight TFT color LCD
- 6000mAH li-ion battery, up to 4 hours durable used.
- Structure Size: 288x182x142mm
- PC control software easy to save and manage test data.
- Weight: less than 3kg

Technical index

Frequency range	9kHz~3.6GHz	
Frequency resolution	1Hz	
Frequency readout accuracy	±（frequency marker count×frequency benchmark precision+1%×sweep width+10%×RBW+0.5×[sweep width/（sweep point-1）]+1Hz）	
Internal standard （10MHz）	Aging rate	<1ppm/year
	Temperature stability	<0.5ppm　（15℃~35℃）

Resolution bandwidth		
Range		10Hz~500kHz（from 1 to 10 serial stepping）， 1MHz，3MHz
Selectivity (60dB/3dB)	RBW≤500kHz	<5：1 typical value
accuracy		<5%　 typical value
Video bandwidth （VBW）		10Hz~3MHz

Displayed average noise level		
(10Hz Resolution bandwidth, radio-frequency attenuator 0dB）		
frequency	Pre-amplifier off	Pre-amplifier pen
100kHz	-90dBm	-110dBm
1MHz	-120dBm	-140dBm
100MHz	-125dBm	-145dBm
500MHz	-125dBm	-145dBm
1000MHz	-122dBm	-140dBm
1.4GHz	-120dBm	-138dBm
1.8GHz	-123dBm	-140dBm
2.2GHz	-121dBm	-138dBm

2.5GHz	-121dBm	-138dBm
3.0GHz	-120dBm	-137dBm
3.5GHz	-120dBm	-137dBm

Phase noise		
		Frequency offset 10kHz -80dBc/Hz
		Frequency offset 30kHz -90dBc/Hz
		Frequency offset 1MHz -115dBc/Hz

Sweep time		
Sweep width 100Hz≤SPAN≤3.6GHz		10ms~3000s
0 sweep width		1ms~3000s
Sweep mode		Serial, single

Frequency counter		
resolution		1Hz、10Hz、100Hz、1kHz
Uncertainly angle		Frequency count×frequency benchmark accuracy +counter resolution

Range frequency（20℃~30℃）		
Synthetical range frequency（90%）	Input single range 0dBm~-50dBm	±1.5dB

Range		
Maximum permissible input	average continuous power	+27dBm
Maximum input direct current voltage		50Vdc
Input attenuator range		0~39dB，3dBstepping
1dBpoint of compression		+7dBm

Stray and residual response		
TOI（CTB）	>30MHz	+13dBm
SHI（cos)		+30dBm
Input related stray		<-60dBc

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single		
residual response		<-85dBm

Tracing source		
Frequency range		100kHz~1.5GHz
Output power		-30dBm ~ 0dBm 1dBstepping
Output flatness		±3dB
Common parameter		
Radio frequency input/output		SMA female（50Ω）
USB		USB 1.1（equipment side）
LAN		10/100 Base-T，RJ-45connector
AM/FM modulation		
Benchmark input/output	10MHz，BNC female	Input power 0dBm~+10dBm
		output 0dBm±2dB
Maximum size		288×182×142mm
weight		Less than 3kg
Operating temperature		0℃~40℃
Storage temperature		-40℃~+70℃
power	battery	7.4V 6000mAh
	adapter input	100V~240V 50/60Hz 1.5A
	adapter output	9V 4000mA
Power consumption		13W
Inside data storage		128MB
Upper computer software	USB、LAN	Pc display test

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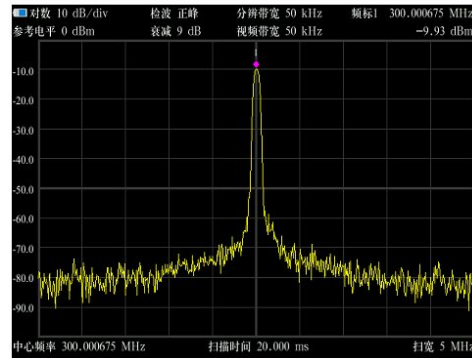Add.: 2159 SE 55th Ave.Hillsboro OR 97123 U.S.A
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Some Power Measurements

Here we can see some test results according to different examples, Firstly we can input Frequency 300MHz, Amplitude -10dBm as a test, TC1204A spectrum analyzer measurements.

A. Continuous Wave Signal Measurement

One of the most common measurement tasks about spectrum analyzer is to measure the frequency and amplitude of the signal. In the following example, we use a generator (E4421B 300MHz, -10dBm) to output Continuous wave signal as the measuring signal. Here is the chart about the result of inputting 300MHz, -9.44dBm,
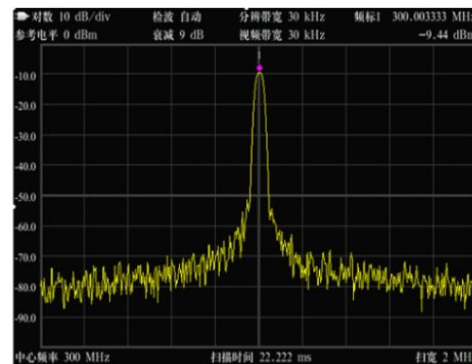
Measurement of Sine Signal

B. Application of the Resolution Bandwidth to Distinguish Closely Spaced Signals

Resolution bandwidth Description: Signal resolution is determined by the bandwidth of the IF filter, namely, the resolution bandwidth. When there is a signal through the IF filter, spectrum instrument scans out of the shape of IF filter bandpass. Thus, when the frequency of two equal amplitude signals comes in close proximity, which will lead to the top of any one of the signal waveforms scanning a bandpass that covers almost all the other signals, which looks like a signal. If the two signals range, but with close frequency, the small signal may be overwhelmed by the large signal response. Appropriate resolution bandwidth function is used to measure Intermediate frequency bandwidth, we take the 3 db bandwidth of the filter as its resolution bandwidth to describe how to select the suitable one.

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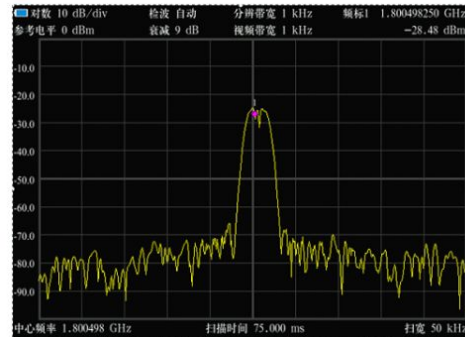## Distinguish Between Two Equal Amplitude Signals

Typically, to distinguish between the two signals of equal amplitude, the bandwidth must be less than or equal to two signal frequency interval. For example, to distinguish two 1 KHZ continuous signal,1 KHZ or smaller resolution bandwidth should be selected. Here is the chart about the result of inputting 1800.5MHz

If now the resolution band width(RBW) has been reduced to 100HZ,there will appear two signals, if you continue to reduce RBW, they will be more clearly shown on the screen. like this.

(IF),50KHZ(Sweepwidth),1KHZ(Resolution bandwidth)

1KHZ Resolution Bandwidth Measurement

100HZ Resolution Bandwidth Measurement

Distinguish Between Two Unequal Amplitude Signals

In this case, to distinguish two unequal amplitude signals with a frequency deviation of 50kHz and the magnitude gap of 40dB. To distinguish between the two unequal amplitude signals, resolution bandwidth must be less than the frequency interval of the two signals (the same as the resolution of two equal amplitude signals),however, the maximum frequency resolution bandwidth of two unequal amplitude

signals is mainly decided by the rectangular coefficient of IF filter, rather than 3dB bandwidth. It is defined as the bandwidth ratio of 60dB and 3dB bandwidth of the IF filter.
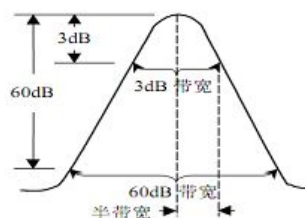

Coefficient Between Bandwidth and Rectangular

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Here is the chart about the result of inputting 1800.025MHz(IF), 500KHZ(Sweep width), 30KHZ(Resolution bandwidth). In addition, rectangular coefficient of TC1204A spectrum analyzer of resolution bandwidth of the filter is about 5 to 1, If the resolution bandwidth is for 30 kHz, 60 db point is 115 kHz, half the bandwidth is 57.5 kHz, which is more than 50 kHz

frequency interval, but the two input signals can't be distinguished.
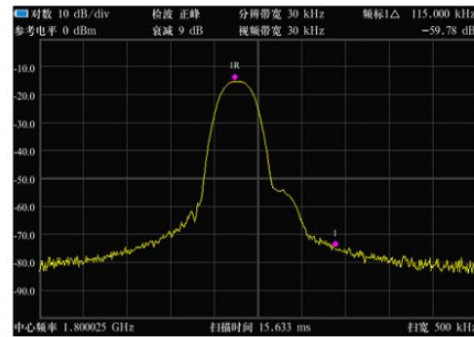
30KHZ Resolution Bandwidth Measurement

If the resolution bandwidth has been reduced to 1KHZ, small signal overwhelmed can be shown .and the frequency and the amplitude difference of unequal amplitude signals included.
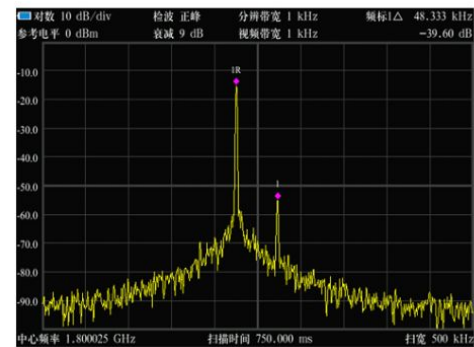
1KHZ Resolution Bandwidth Measurement

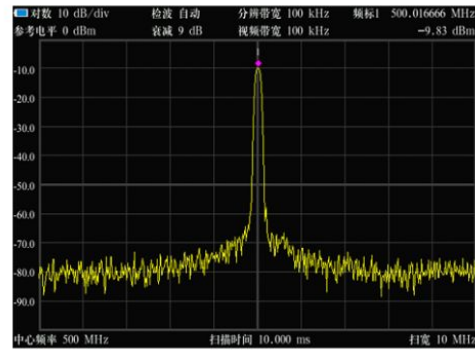## C. Frequency Counter Measurement

In order to measure the signal frequency more accurately, TC1204A hand-held spectrum analyzer provides a frequency counter function, compared to cursor measurement, it can measure the signal frequency

more accurately. In the following example, we use the signal generator (Agilent E4421B) with output 500MHz,-10dBm as a continuous wave signal of the signal. We input 500MHZ (IF),10MHZ(Sweep width), there are 1HZ, 10HZ, 100HZ, 1KHZ can been chosen by users. Here shows
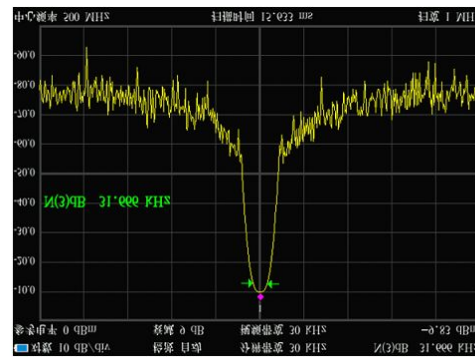
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frequency 500.016666 MHz measured (accurate to 1 HZ).

Frequency Counter Measurement

D. N dB Bandwidth Measurement

Here is the chart about the result of inputting 500MHz(IF), 1MHZ(Sweep width), 30KHZ(Resolution bandwidth).NdB is open, then the default is 3 N, if needed, press [NdB] key to change, The measurement result is displayed in the active area, If the current cursor dropped 3dB bandwidth is 31.666kHz;

N-dB Measurement

E. Adjacent Power Measurement

We use a generator (E4421B 500MHz, -10dBm) to output Continuous wave signal as the measured signal. Here is the figure about the result of inputting 500MHz(IF) as a reference.

The main channel power is 9.22 dBm

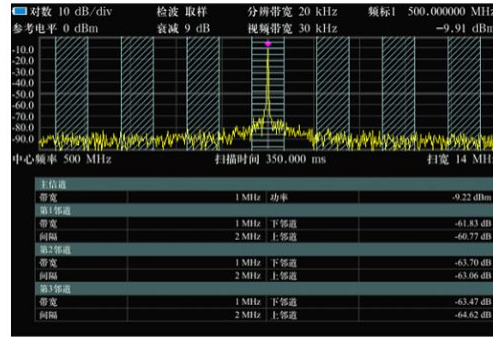Under the first adjacent channel, channel power is -61.83dBm;

For the first adjacent lanes adjacent, channel power-60.77dBm;

Under the second adjacent channel, channel power is -63.70dBm;

For the second adjacent lanes, channel power is -63.06dBm;

Under the third adjacent channel, channel power is -63.47dBm;

For third adjacent lanes adjacent, channel power is -64.62dBm.

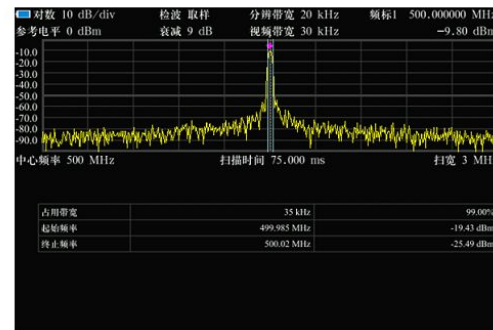**Adjacent Power Measurement**

F. Channel Power Measurement

We use a generator (E4421B 500MHz, -10dBm) to output Continuous wave signal as the measured signal. Here is the chart about the result of inputting 500MHz(IF) as a reference .The measured results shows in the upper right corner of the display screen. Power channel is -9.81dBm.
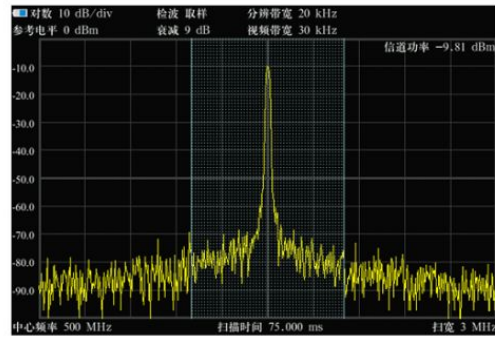
Channel Power Measurement

G. Bandwidth Measurement

We use a generator (E4421B 500MHz, -10dBm) to output Continuous wave signal as the measured signal. Here is the chart about the result of inputting 500MHz(IF) as a reference .The measurement results display in the split screen window of the second half window and the bandwidth is 35KHZ.


Bandwidth Measurement

H. Using Preamplifier for Small Signal Measuring

We use a generator (E4421B 500MHz, -80dBm) to output Continuous wave

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signal as the measured signal. Here is the chart about the result of inputting 500MHz(IF), 10MHZ(Sweep width), -20dBm(Reference level) as a reference.
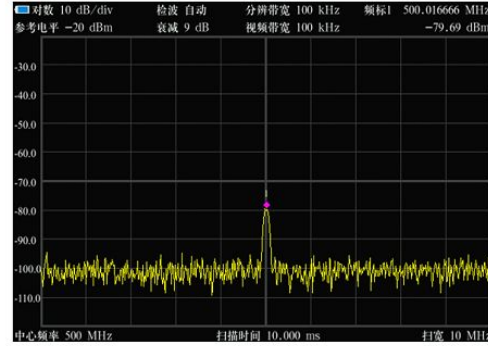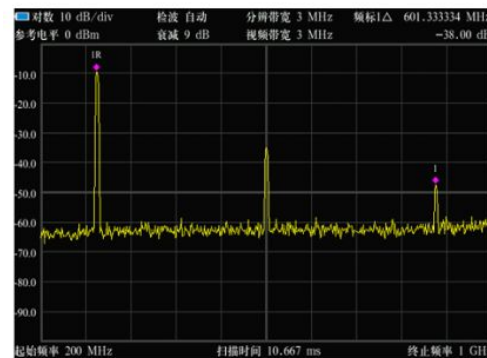

Using Preamplifier for Small Signal Measuring

I. Harmonic Distortion Measurement

We use a generator (E4421B 300MHz, -10dBm) to output Continuous wave signal as the measured signal. Input 200MHZ as its starting frequency, and1GHZ as its ending frequency, the fundamental, then the second harmonic signal and the three can be displayed clearly on the screen. you can also select Peak and Marker as a test. Press Peak button, then it marks fundamental frequency of 300MHZ, amplitude of -10DBM. On the second harmonic, you can read the measurement result : frequency offset is 300MHz, the magnitude of the

difference is-26.55dB. On the third harmonic, you can read the measurement result. frequency offset is 601.333334GHz, the magnitude of the difference is-38.00dB.Then Here formed the testing output of graphics of the Fundamental and harmonic signal of spectrum analyzer.

Harmonic Distortion Measurement

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J. The Third Order Distortion Measurement

In the following example, We use a generator (E4421B 500MHz, -10dBm) and another generator (E4422B 501MHz, -10dBm) to output Continuous wave signal as the measured signal. The two signals through a combiner are connected to RF input end of the spectrum instrument front panel. Then we set the parameter, input 500MHZ(IF),5MHZ(Sweepwidth),1KHZ(Resolution Bandwidth). The measured frequency and amplitude difference will display in the cursor area of screen. Here is the result.
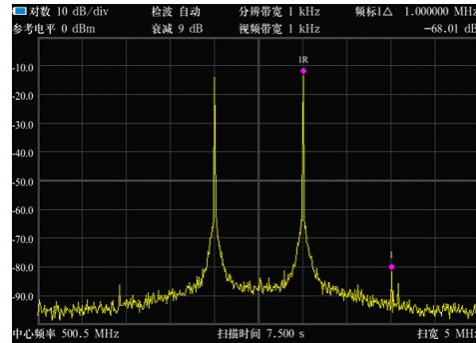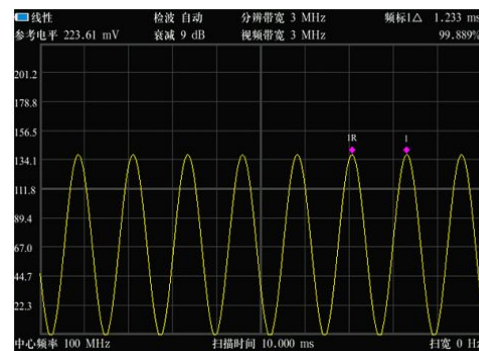

The Third Order Distortion Measurement

K. AM Modulation Signal Measurement

Demodulation functions of spectrum analyzer can demodulate AM modulated signal from the carrier signal out and displayed on the screen. In the following example, we use signal generator (Agilent E4421B) which outputs a AM modulation signal as the measured signal: carrier is 100 MHZ, and 10 DBM continuous wave signal, modulation frequency of 1 KHZ, modulation depth of 100%. We also input 100MHZ(IF),O(Sweepwidth),and 10ms sweep time as a reference. The measured period of the modulation signal is 1.233ms.here shows below.


AM Modulation Measurement

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Customers can control remotely TC1204A Hand-held Spectrum Analyzer by the standard SCPI（Standard Commands for Programmable Instruments）and USB. Connect the spectrum analyzer with USB interface automatically equipped to the PC correctly and turn on. Update wizard dialog box of PC hardware will pop up, please follow the wizard prompted to install driver USBDEVICE.

Resources searched will appear in the "NI-VISA USB Devices" directory, as well as USB interface information, as shown below:
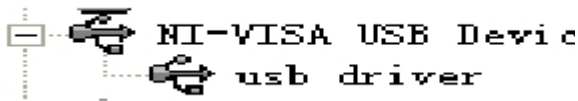
TC1204A can be used to communication test. Double-click to open USB control side of the remote control of PC software. SARemoteControl. Through the "view -> SCPI command", open the remote command control panel, you can send commands and read data through the panel. As shown in the figure below:

As well as to be controlled via LAN. Double-click to open LAN control side of the remote control of PC software SARemoteControl, open the remote command control panel, you can send commands and read data through the panel. In addition, excellent guidance to troubleshooting and maintenance, fault diagnosis and troubleshooting and repair of TC1204A can be offered according to customers'requirement.

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Ordering Information:

Standard Configuration		
TC1204A Hand-held Spectrum Analyzer	Spectrum analyzer Host	9kHz to 3.6GHz
	CD-ROM User's Manual	Programming Manual
	AC / DC adapter AC input	+9 V output
	power cord	220V/110V AC

Options	
TC1204A -TG	100 KHZ to 1.5 GHz tracking signal source
TC1204A -RBW	1 HZ resolution bandwidth
TC1204A -AMA	Audio demodulation, AM measurement, FM measurements, high-fidelity headphones
PC Spectrum	PC, PC software, LAN and USB connection cable
TC1204A -BAG	Portable Soft package
TC1204A -BAT	Battery backup

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