

## Microwave Spectrum Analyzer

### MSA3204

MSA3204 Portable Microwave Spectrum Analyzer is the new generation portable microwave spectrum analyzer developed by using broadband microwave component integration design technology, microwave multilayer PCB design technology, efficient voltage transformation system design technology and multi-band sweep & individual thread processing technology. Compared with the last generation product, its frequency range increases by 5 times, display average noise level decreases by 20dB, single sideband phase noise decreases by 20dB and measuring speed increases by 4 times, featured by broad frequency band, high performance index, small size, light weight, flexible power supply and easy maneuvering, suitable for field service.

Available in the frequency range 1MHz ~ 18GHz, MSA3204 Portable Microwave Spectrum Analyzer can meet the need of measurement from short-wave through to wave band Ku. It uses menu-type operation interfaces and graphical display of measurement result, which operation is simple and result is direct viewing. Portable microwave spectrum analyzer is internally built with a large-capacity FLASH memory and supports USB external memory by which the field measurement curves can be stored for subsequent analysis and processing and filing up for management.

MSA3204 Portable Microwave Spectrum Analyzer is mainly used in the development, repair and maintenance etc. various sectors of radar and communication equipment as well as by the spectrum monitoring and management department for spectrum monitoring and management.

### Main Characteristics

- High measurement speed
- Abundant measurement functions
- Support both linear sweep and list sweep
- Chinese/English menu for easy use
- Available in battery power, convenient for field service
- Built-in large-capacity memory and USB external memory extension supported
- Intelligent battery management function, as long as 4 hours' battery service life
- MSA3204 Portable Microwave Spectrum Analyzer can easily realize fast and efficient signal detection and measurement no matter in laboratory or in field.
- High measurement speed
- The minimum sweep time is only 600ms at 18GHz span.
- Abundant measurement functions
- In addition to spectrum measurement function, it also has the functions of occupied bandwidth measurement, channel power measurement, adjacent channel power measurement, etc.

- Field intensity measurement function
- The field intensity measurement function can position the interference signal by measuring its field intensity; and allows users to edit the antenna factor.
- Support both linear sweep and list sweep
- The list sweep mode can help users easily realize fast measurement of sub-band.
- This instrument is available in menus in Chinese and English versions, the switching between which can be realized by one button conveniently.
- Built-in large-capacity memory and USB external memory extension supported
- MSA3204 Portable Microwave Spectrum Analyzer is internally built with a large-capacity memory and supports USB external memory extension, which can meet the requirements of trace storage in field measurement.
- (Typical Applications) in the case of complex field measurement under special testing environment / MSA3204 Portable Microwave Spectrum Analyzer can realize fast measurement of microwave signals / its features of high measurement speed, high measurement accuracy etc. / allow it to meet the needs of spectrum monitoring and management departments for spectrum monitoring and management and render it a broad application prospect in mobile communication and radio & television, etc. fields.

Technical Specifications

Model	MSA3204
Frequency Range	1MHz ~ 18GHz
Reference Frequency	Nominal frequency: 10MHz Aging rate: $\pm 1 \times 10^{-8}$ /day, $\pm 1 \times 10^{-6}$ /year Temperature stability: $\pm 1 \times 10^{-6}$ (0~50°C, relative to 25°C)
Frequency Readout Accuracy	Frequency readout accuracy = $\pm$ (Frequency readout * Frequency reference error + 5% * Frequency span + 25% * Resolution bandwidth)
Sweep Width	1MHz~18GHz or 0Hz
Resolution Bandwidth	1Hz ~ 3MHz (step by 1, 3, 10)
Video Bandwidth	1Hz ~ 3MHz (step by 1, 3, 10)
Noise Sideband	<-80dBc/Hz (carrier of 18GHz, 1kHz offset) <-89dBc/Hz (carrier of 18GHz, 10kHz, 20kHz, 30kHz offset) <-91dBc/Hz (carrier of 18GHz, 100kHz offset) <-100dBc/Hz (carrier of 18GHz, 1MHz offset)
Residential Response	$\leq -82$ dBm (the preamplifier is off) $\leq -95$ dBm (the preamplifier is on, 10MHz ~ 4GHz)
Display Average Noise Level	$\leq -153$ dBm (10MHz ~ 4GHz, the preamplifier is on) $\leq -133$ dBm (10MHz ~ 7GHz, the preamplifier is off) $\leq -127$ dBm (7GHz ~ 18GHz)
1dB Compression Point	$\geq -5$ dBm
Second-order Harmonic Distortion	$\leq -43$ dBc (50MHz ~ 4GHz) $\leq -58$ dBc (4GHz ~ 18GHz)
Third-order Intermodulation	$\geq 4$ dBm typical (50MHz ~ 4GHz) $\geq 8$ dBm typical (4GHz ~ 18GHz)
Sweep Time	1ms ~ 100s (at zero-span) 100ms ~ 100s (at non zero-span)
Overall-level Uncertainty	$\pm 2.7$ dB (0°C~ 50°C, preheated for 30m)
Input Attenuation Range	0 ~ 30dB, 10dB step
Maximum Safety Input Level	+27dBm
Standing Wave Ratio of Input Port Voltage	$\leq 1.8:1$ (<13GHz, typical) $\leq 2.0:1$ (13GHz~18GHz, typical)
Power Consumption	<28W

Power Supply Mode	DC, rechargeable battery
Battery Service Life	≥2 hours
Input Interface	N-female, 50Ω resistance
Dimension	Length * width * depth=313mm * 211mm * 87mm
Weight	Lighter than 7kg

### Ordering Information

Base Unit: MSA3204 Portable Microwave Spectrum Analyzer

Accessories

- User's Guide
- AC-DC power adapter
- USB communication cable
- PC utility software CD
- Three-wire power cord
- Conformity Certificate

Main Options

- Rechargeable battery
- N (male) – N (male) testing cable
- Instrument shipping case

## Microwave Spectrum Analyzer

### MSA6304

MSA6304 has the advantages of broad bandwidth, high resolution, high dynamic range, high precision, low phase noise and fast measurement speed. It is manufactured with a lot of new technologies, such as all digital IF, auto spectrum detection and real-time calibration and broadband microwave and millimeter wave integration. It has excellent performance and is adaptive to all environments. The modular and standard design on the one hand improves the capacity, debugging, maintenance and reliability dramatically, on the other hand strengthens the connectivity among the modules. The combination of software and hardware modules forms the series products and makes the upgrade and extension more convenient.

MSA6304 can measure the frequency, power, bandwidth and modulation of many type of signals, such as modulated signal, harmonic distortion, stimulus and response, pulsed RF signal and phase noise. It has a wide range of applications as follows: communication, radar, navigation, spectrum management, signal supervision, information security, the research, production test and metrology of electronic devices and components. MSA6304 series spectrum analyzer is a product of independent design and have the full IPR.

### Main Features

- phase noise -108dBc/Hz(typical) carrier1GHz @1kHz offset
- frequency resolution of frequency counter 0.001Hz
- DANL -152dBm (typical)
- 1dB compression point +7dBm
- TOI +17dBm (typical)
- All digital IF design
- flexibility:
- Using the continuous sweep of the digital resolution bandwidth filter or FFT. Optimal test speed and sensibility
- 160 digital resolution bandwidth set-ups to realize the optimal combination of sweep bandwidth and resolution bandwidth and optimize the measurement results.
- 2dB step attenuator
- Interfaces of IF, video, sweep and trigger output.
- embedded and multitask system, flexible for the storage, print and share of the measurement results.
- GPIB, USB, LAN, Serial port, easy to establish auto measurement system
- Serial products, multi- option and configurations.
- User friendly interface:

- Chinese and English operation interface, built-in operation instruction and help menu.
- 8.4-inch LCD, 170 degrees' visual angle
- Adaptability:
  - auto calibration technology, adaptive to all environments
  - power supply adaptive to 110V/220V systems
- Ultra –low DANL:
  - MSA6304 can detect very weak signals with the adoption of integrated microwave devices and digital IF technology.
  - -152dBm average noise level (typical) @1GHz.
  - With preamplifier: better than -160dBm.
  - -155dBm average noise level(typical) @5GHz.
  - -134dBm average noise level(typical) @40GHz.
- High dynamic range
  - New circuit design, using devices with high TOI, very low DANL, minimal 2dB step attenuator, built-in optional low noise preamplifier, 160 precise resolution bandwidth setups(10%step), with the highest dynamic range in the industry to make the tunable measurement.
  - 2dB step attenuator, optimized distortion measurement dynamic range +17dBm TOI(typical)
  - Excellent phase noise
  - Low phase noise synthesized LO technology, the phase noise is improved 10dB than MSA6304 series and the highest in the industry.
- High precision
  - Resolution of frequency counter is 0.001Hz
  - Amplitude precision  $\pm 0.24$ dB
  - Zero error of displayed scale conversion
  - Resolution bandwidth conversion uncertainty  $\pm 0.2$ dB
- Fast measurement speed
  - Fastest sweep time of non-zero span 5ms
  - Fastest sweep time of zero span 1us
  - Refresh rate 30 tracks/s
  - Remote control rate 15times/s
- Two sweep types
  - Continuous sweep based on digital resolution bandwidth filter or step measurement based on FFT filter. The two ways can optimize test speed and sensibility flexibly.
- Breakthrough of LF signal measurement
  - With particular zero frequency compression technology to compress the zero frequency to below -50dBm, good for the measurement of signal below 3Hz.
- Digital detection
  - The detector model is import when measuring CW, noise and quasi-noise signals. MSA6304 provides standard, positive peak, negative peak, sample, average, effective value detections to assure correct results.
- auto calibration

built-in calibration source, auto calibration of the path according to the temperature changes and assured high measurement accuracy in the operation temperature range of 0°C~50°C.

Technical Specifications

Model	MSA6304	MSA6304 A/B/D/E/F/G
Frequency range	3Hz~40GHz	3Hz~4GHz/8GHz/18GHz/26.5GHz/43GHz/50GHz
10MHz Precise frequency reference	Frequency accuracy: $\pm$ (last calibration date xaging rate temperature stability calibration accuracy) Aging rate: $\pm 1 \times 10^{-9}$ /day, $\pm 1 \times 10^{-7}$ /year Temperature stability: $\pm 1 \times 10^{-8}$ (20°C ~ 30°C) $\pm 5 \times 10^{-8}$ (0°C ~ 55°C) Frequency accuracy: $\pm 7 \times 10^{-8}$	
Frequency readout accuracy	$\pm$ (readout xfrequency reference error+0.5%span+5%resolution bandwidth+2Hz+0.5horizontal resolution) Horizontal resolution=span/ (sweep points-1), default point is 751 under adaptive state	
Frequency counting accuracy	Marker accuracy $\pm$ (frequency read out +frequency reference error+0.100) Delta marker accuracy: $\pm$ (delta marker readoutx frequency reference error+0.100) Counter resolution: 0.001Hz	
Span Continuous and step model	Range: 0Hz (zero span) 100Hz ~40GHz Resolution: 0.001Hz Accuracy: $\pm$ (0.2%xspan span/ (sweep point number-1))	
Sweep time	Range: zero span 1us ~ 6000s Span $\geq$ 100Hz 5ms ~ 2000s Accuracy: span $\geq$ 100Hz(continuous) $\pm$ 0.01%(nomination) Span $\geq$ 100Hz(step) $\pm$ 40 %(nomination) Span = 0 Hz $\pm$ 0.01%(nomination)	
trigger	Trigger: free video, power supply, external (front, rear panel) Trigger delay: 1us ~ 500 MS Resolution: 0.1us	
Resolution bandwidth	Range: 1Hz ~ 3MHz (10%step)4MHz,5MHz,6MHz,8MHz Accuracy: 1Hz~3MHz $\pm$ 6% 4MHz~8MHz (< 4GHz) $\pm$ 20% Selectivity: (-60dB/-3dB): $\geq$ 5:1	
Video bandwidth	Range: 1Hz ~ 3MHz (10%step),4MHz,5MHz,6MHz,8MHz Accuracy: 1Hz~3MHz $\pm$ 6% (nomination)	
Sideband noise (20degree ~ 30degree, carrier1GHz)	-91dBc/Hz@100Hz, -103dBc/Hz@1kHz, -114dBc/Hz@10kHz, -117dBc/Hz@100kHz, -145dBc/Hz@1MHz, -154dBc/Hz@6MHz, - 156dBc/Hz@10MHz	

# MICROWAVE SPECTRUM ANALYZER

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Residual FM	<1Hz×N (N is harmonic number)
Amplitude range	Measurement range: DANL~ max safe input signal level Attenuation range: 0 ~ 70dB,2dB step
Max input level	CW (input attenuation ≥ 10dB): +30dBm(nomination) Peak pulse power (pulse width<10us, duty cycle<1%, input attenuation>30dB): +50dBm(100W) (nomination) Current voltage: input<±0.2Vdc
1dB gain Compression point (dual tone, mixer input level)	20MHz~200MHz 0dBm 200MHz~4GHz +3dBm 4GHz~8GHz +3dBm 8GHz~26.5GHz -2dBm 26.5GHz~50GHz 0dBm
DANL (input loaded, sample or average detection, video average, log,20degree~30degree)	10MHz~50MHz -142dBm 50MHz~1GHz -152dBm 1GHz~2GHz -151dBm 2GHz~3GHz -150dBm 3GHz~4GHz -147dBm 4GHz~8GHz -152dBm 8GHz~16GHz -145dBm 16GHz~20GHz -140dBm 20GHz~26.5GHz -138dBm 26.5GHz~40GHz -129dBm 40GHz~50GHz -127dBm
Display	Log scale: 0.1dB~1dB/div 0.1dBstep,1~20/div 1dB step(10divs) Linear scale: 10divs Scale units: dBm, dBmV, dBμV, V, W
Frequency response (10dBattenuation,20degree~30degree, Auto preselection)	3Hz~4GHz ±1.0 dB 4GHz~8GHz ±1.8dB 8GHz~22GHz ±2.8dB 22GHz~26.5GHz ±3.0dB 26.5GHz~50GHz ±3.5dB
Absolute magnitude accuracy	(10dB attenuation,10Hz£ RBW£1MHz, input signal -10~- 50dBm, auto coupling, any reference level, any scale) 300MHz ±0.24dB All frequencies ± (0.24Db+frequency response)
Input VSWR (input attenuation≥8dB)	50MHz~3GHz < 1.5:1 3GHz~18GHz < 1.7:1 18GHz~26.5GHz < 1.9:1 26.5GHz~40GHz < 1.9:1 40GHz~50GHz <2.0:1
Resolution bandwidth Conversion	1Hz~1MHz £ ± 0.2dB 1.1MHz~3MHz £ ± 0.3dB 4 5 6 8MHz £ 1.0dB

# MICROWAVE SPECTRUM ANALYZER

ANWY Technologies

uncertainty	
Reference level range	Log scale -170 dBm ~ +30 dBm, 0.01 dB step Linear scale 707 pV ~ 7.07 V, 0.1% step
Fidelity of display scale	Input mixer level $\leq -20$ dBm $\pm 0.07$ dB $-20$ dBm < input mixer level < $-10$ dBm $\pm 0.13$ dB
Second harmonic distortion	10MHz~2.0GHz (mixer level -40dBm) -82dBc 2.0GHz~4.0GHz (mixer level -10dBm) -94dBc 4.0GHz~13.25GHz (mixer level -10dBm) -96dBc 13.25GHz~25GHz (mixer level -10dBm) -100dBc
TOI distortion ( mixer level -30dBm, dual tone frequency interval > 15kHz, 20~30degree)	10MHz~4.0GHz < -88dBc 4.0GHz~8.0GHz < -92dBc 8.0GHz~50GHz < -84dBc
Trace detection models	Standard, sample, positive peak, negative peak, average, effective value
Temperature range	Operation range 0~+50 degree Storage range -40~+70 degree
Memory capacity	Internal 1GB External USB mobile storage equipment
dimensions	depth x width x height = 500 x 426 x 177 (mm)
weight	Net weight about 22kg Gross weight about 26kg
Input connector	MSA6304A/F/G:2.4mm(male), impedance 50ohm MSA6304A/B/C/D:N type(female), impedance 50ohm

## Ordering Information

- Basic unit: MSA6304 series spectrum analyzer
- options: code, name, instruction

code	name	instruction
1	Phase noise measurement	measuring the phase noise of input signal and gives the curves of phase noise.
2	0 band preamplifier	Range :100kHz~4GHz, gain <sup>3</sup> 25dB, noise figure<7dB, improve the DANL of 100kHz~4GHz, up to 12dB, good at detecting weak signal.
3	70MHz/140MHz IF output	Conducting 70MHz or 140MHz IF to other Equipment for analysis
4	Broadband FM demodulation output	Demodulation of FM signal
5	Tone demodulation	Demodulating AM/FM signals and output through built-in louder speaker.
6	Auxiliary video output	Synchronous video output to other equipment for further analysis
7	21.4MHz IF output	Rear panel output of 21.4MHz IF to other equipment for analysis
8	Aluminum alloy case	Tight and portable aluminum alloy case with handle and rolling wheels, which are convenient for transportation

- MSA6304 series spectrum analyzer (main frame)
- User's manual
- Program instructions
- Certificate of quality
- Power cable