

# Ceyear

## 1435A/B-V Signal Generator (9kHz~3GHz/6GHz)



Ceyear Technologies Co., Ltd

## Product Overview

Based on innovative technologies, the 1435-V series signal generator achieves balance in terms of performance, economy and volumetric weight. It supports arbitrary modulation of wave data downloaded in 5 formats, and enables users to edit, download, and configure the waveforms as required to complete various signal simulations and meet the testing requirements of various complex signals. Its baseband signal generator is easy to set up and has excellent performance. It supports real-time occurrence of general digital modulation signals in more than 20 formats such as PSK, QAM, FSK and MSK. It also has excellent spectral purity, with a single side band (SSB) phase noise of  $-136\text{dBc/Hz}$  (when the carrier is 1GHz and the frequency offset is 10kHz) or  $-120\text{dBc/Hz}$  (when the carrier is 6GHz and the frequency offset is 10kHz). It provides a high power output and a large dynamic range, with the maximum output power up to  $22\text{dBm}@3\text{GHz}$  and an output power dynamic range greater than  $150\text{dB}$ . Besides, it is equipped with a 7-inch high-sensitivity LED touch screen, and supports operation by touch screen, panel buttons, rotary knobs, external mouse and keyboard, etc., which fully upgrades the users' operation experience. It adopts portable 3U chassis structure and is featured by small size and light weight, and thus is easy to carry. It can achieve exceptional performance even in a compact space, which meets both the test requirements for high performance in the equipment development phase and the test requirements for high efficiency in the production phase.

## Main Features

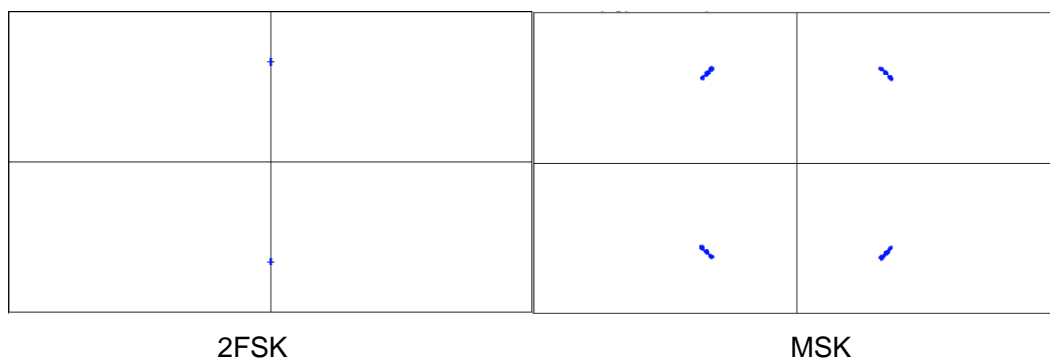
- High compatibility, downloading of arbitrary wave data in various formats
- Complete universal digital modulation modes
- Excellent SSB phase noise
- High output power
- Small size and light weight
- High-sensitivity LED touch screen

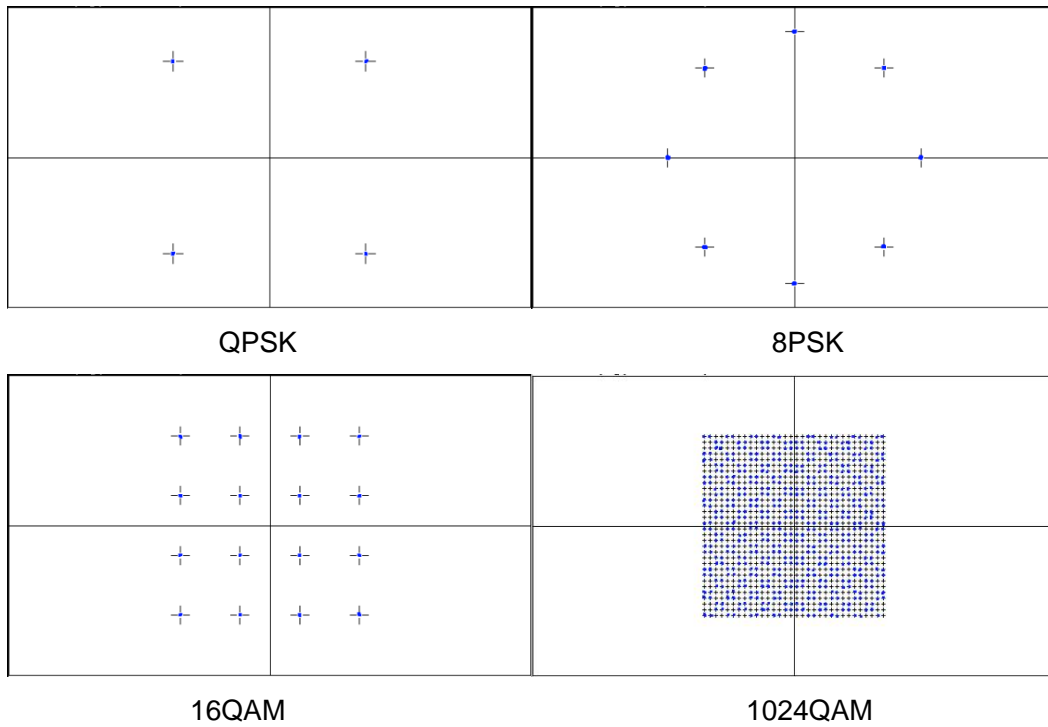
### High compatibility, downloading of wave data in arbitrary format

The 1435-V series signal generator supports direct downloading and playing of arbitrary wave data in five formats: Mat-File 5, ASCII, Binary, cap and csv, and provides a storage depth of 2G sampling points.

### Complete universal digital modulation modes

The 1435-V series signal generator supports real-time occurrence of universal digital modulation signals in more than 20 formats, including PSK, QAM, FSK and MSK.

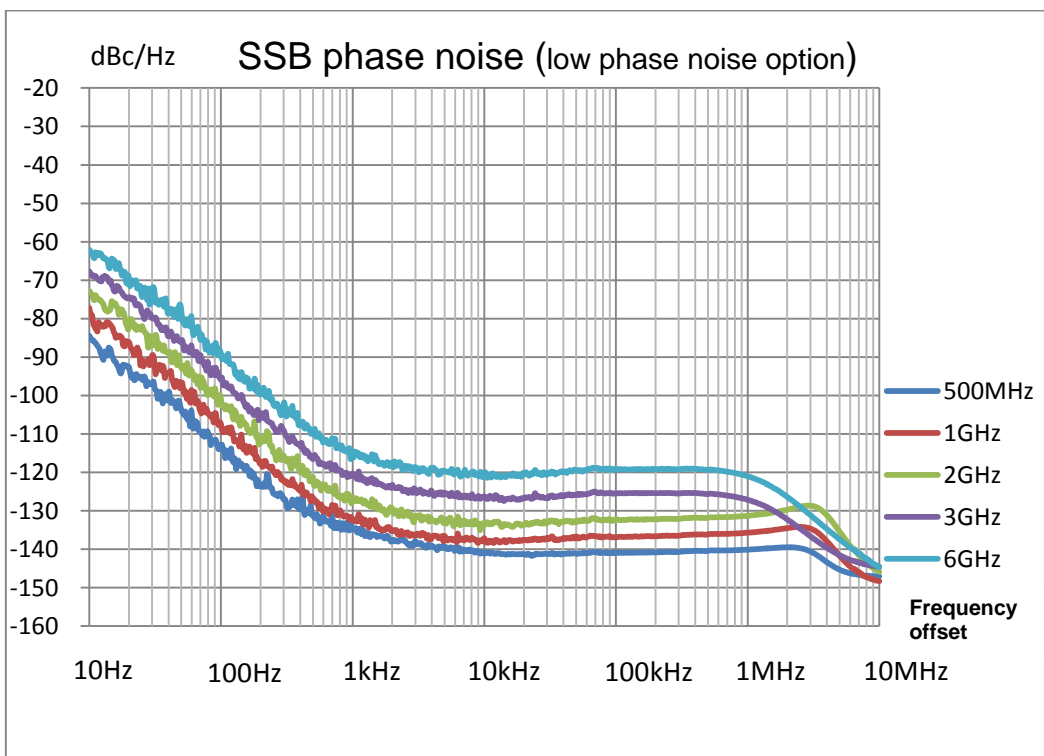




**Excellent SSB phase noise**

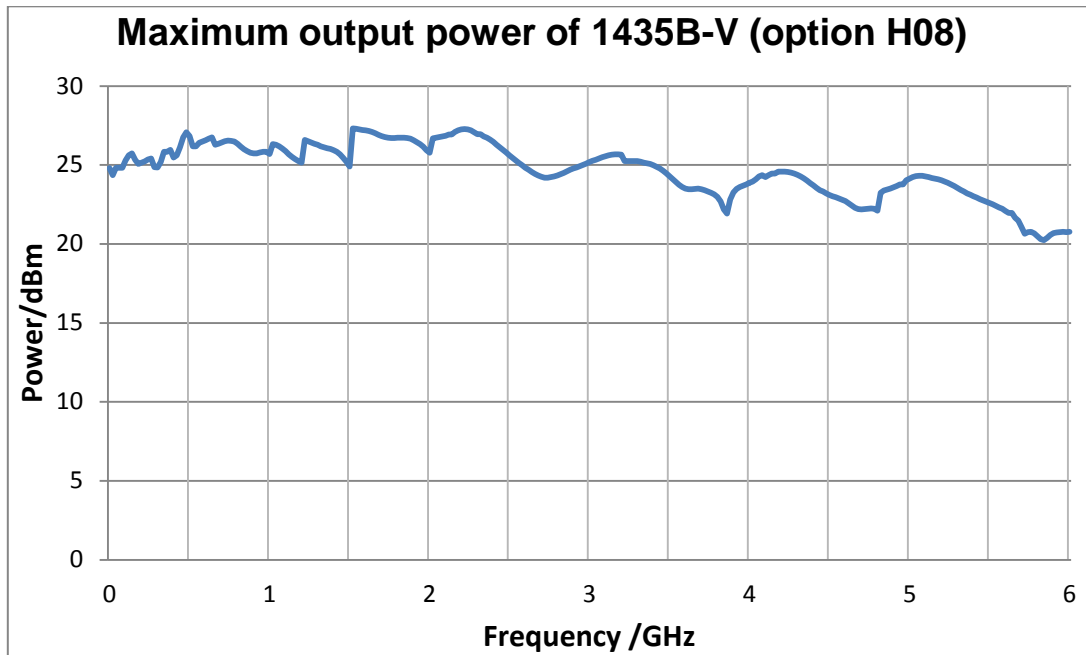
The 1435-V series signal generator provides two steps of SSB phase noise for users. The standard SSB phase noise is measured at -104dBc/Hz (6GHz@10kHz), and the SSB phase noise can be as low as -120dBc/Hz (6GHz@10kHz) when the low phase noise option is selected. Users can select the phase noise as required to achieve the optimal cost performance.

It covers a frequency range of 9kHz to 6GHz.



## High output power

When the H08 high-power output option is selected, the measured value of the full-band output power of the 1435-V series signal generator can be above 20dBm. In the test where high-power excitation signals are required, the 1435-V series signal generator can be used to obtain the required test signal without an external amplifier.



## Small size and light weight

By adopting the portable 3U-high chassis design, the 1435-V series signal generator has its weight and volume greatly reduced (compared to bench instruments). The heaviest model of this series is 9.4kg, and the lightest model is 7.8kg.

## High-sensitivity LED touch screen

The 7-inch wide LED display which supports a resolution of 800 × 480 pixels clearly shows the instrument status information. The combination of the capacitive screen and the tailored window interface enables the 1435-V series signal generator to respond sensitively and accurately to users' touch operations. In addition to the touch screen, the user can also operate the instrument by the panel buttons, the rotary knobs (with the Enter function), and the external keyboard and mouse conveniently and quickly.



## Typical Applications

### General test

The 1435-V series signal generator has complete functions, and supports both digital modulation and AM, FM,  $\Phi$ M and PM analog modulation functions, which can be widely used in the field of RF testing.

### Test of communication systems

The 1435-V series signal generator provides excellent digital modulation performance, complete digital modulation modes, and supports real-time occurrence of universal digital modulation signals and user-defined modulation signals in more than 20 formats such as PSK, QAM, FSK, MSK, etc., which is suitable for various indicator tests, for example, the bit error rate of a communication system.

### Test of navigation systems

The 1435-V series signal generator is highly compatible and supports arbitrary wave data in various formats, which enables it to conveniently play user-defined navigation data files. In addition, it has a power dynamic range up to 150dB. Thus, it is suitable for such indicator tests as the sensitivity and signal-to-noise ratio of a navigation receiving devices.

## Technical Specifications <sup>1</sup>

Frequency Features			
Frequency Range	1435A-V:9kHz~3GHz 1435B-V:9kHz~6GHz	Frequency	N (number of internal harmonic waves)
		9kHz≤f<250MHz	1/8
		250MHz≤f≤375MHz	1/16
		375MHz<f≤750MHz	1/8
		750MHz<f≤1.5GHz	1/4
		1.5GHz<f≤3GHz	1/2
		3GHz<f≤6GHz	1
Frequency Resolution	0.001Hz		
Frequency Switching Time	≤1ms (typical value <sup>2</sup> )		
Time Base Aging (Typical Value)	Standard: $\pm 5 \times 10^{-7}$ /year(after continuous switch-on for 30 days) High stability time base option H10: $\pm 5 \times 10^{-8}$ /year (after continuous switch-on for 30 days) $\pm 5 \times 10^{-10}$ /day (after continuous switch-on for 30 days)		
Reference Output	Frequency	10MHz	
	Power	>+4dBm, to 50Ω load	
Reference Input	Frequency	1MHz~50MHz, step 1Hz	
	Power	0dBm~+7dBm, impedance 50Ω	
Scanning Features			
Scanning Mode	Step scan, list scan		
Scan Dwell Time	100μs~100s		

Power Features						
Minimum Power	Standard	Option H01				
	-15dBm (can be set -20dBm)	-110dBm (can be set -135dBm)				
Maximum Power (25±10°C)	Frequency range	Standard	High power output option H08			
	9kHz≤f≤3GHz	18dBm	22dBm			
	3GHz<f≤5GHz	16dBm	20dBm			
	5GHz<f≤6GHz	15dBm	18dBm			
Power Accuracy (25±10°C)	Standard					
	Frequency	Power (dBm)	10~maximum power	-10~10	-15~-10	
	9kHz≤f≤2GHz		±0.8dB	±0.6dB	±1.5dB	
	2GHz<f≤6GHz		±0.9dB	±0.7dB	±1.5dB	
	H01 programmable step attenuator option					
	Frequency	Power (dBm)	10~maximum power	-10~10	-70~-10	-90~-70
	9kHz≤f≤2GHz		±0.8dB	±0.6dB	±0.7dB	±1.4dB
2GHz<f≤6GHz		±0.9dB	±0.7dB	±0.7dB	±1.6dB	
Power Resolution	0.01dB					
Output Impedance	50Ω (rated value <sup>3</sup> )					
Source Standing Wave Ratio, VSWR (Internal Fixed Amplitude) (Typical Value)	9kHz≤f≤3GHz		<1.7			
	3GHz<f≤6GHz		<1.6			
Maximum Reverse Power	0.5W (0V DC) (rated value <sup>3</sup> )					
Spectral Purity <sup>4</sup>						
Harmonic Wave (at +10dBm)	Frequency		Standard			
	9kHz≤f≤10MHz		<-23dBc			
	10MHz<f≤2GHz		<-30dBc			
	2GHz<f≤3GHz (1435A-V)		<-55dBc			
	2GHz<f≤6GHz (1435B-V)		<-30dBc			
Subharmonic Wave (at +10dBm)	9kHz≤f≤6GHz		None			

<b>Non-harmonic Wave (at 0dBm, 10kHz Frequency Offset)</b>	Frequency	Standard	Low phase noise option		
	9kHz≤f≤250MHz	<-54dBc	<-60dBc		
	250MHz<f≤3GHz	<-62dBc	<-77dBc		
	3GHz<f≤6GHz	<-56dBc	<-71dBc		
<b>SSB Phase Noise (dBc/Hz at +10dBm)</b>	Standard				
	Frequency	100Hz	10kHz		
	100MHz	-83	-115		
	250 MHz	-93	-127		
	500MHz	-89	-121		
	1 GHz	-83	-115		
	2 GHz	-77	-109		
	3GHz	-74	-105		
	4 GHz	-71	-103		
	6 GHz	-68	-99		
	Low phase noise option H06				
	Frequency	100Hz	1kHz	10kHz	100kHz
	100MHz	-83	-112	-131	-131
	250MHz	-93	-123	-139	-139
	500MHz	-89	-119	-135	-135
	1GHz	-83	-113	-132	-132
	2GHz	-77	-107	-126	-126
	3GHz	-74	-104	-121	-121
	4GHz	-71	-101	-120	-120
6GHz	-68	-98	-115	-115	
<b>Modulation Features</b>					
<b>Frequency Modulation<sup>5</sup> (Option H02)</b>	<p>Maximum frequency offset: N × 16MHz (N is the number of fundamental harmonic wave)</p> <p>Accuracy (1kHz modulation rate, frequency offset: N × 500kHz): ± (2% × set frequency offset + 20Hz)</p> <p>Modulation rate (3dB bandwidth, frequency offset: N × 500kHz): DC-7MHz</p> <p>Distortion (1 kHz rate, frequency offset: N × 500kHz): &lt;0.4%</p>				
<b>Phase Modulation<sup>5</sup> (Option H02)</b>	<p>Maximum phase offset: N × 16rad (N is the number of fundamental harmonic wave)</p> <p>Accuracy (1kHz modulation rate, frequency offset: N × 500kHz): ± (2% × set phase offset + 0.01rad)</p> <p>Modulation rate (3dB bandwidth, phase offset: N × 8rad): DC-1MHz</p> <p>Distortion (1kHz modulation rate, phase offset: N × 8rad): &lt;0.4%</p>				
<b>Amplitude Modulation<sup>5</sup> (Option H02)</b>	<p>Maximum depth: &gt;90%</p> <p>Amplitude modulation accuracy: (1 kHz modulation rate, 30% modulation depth): ± (4% × set depth + 1%)</p> <p>Amplitude modulation distortion: (1kHz modulation rate, linear mode, total harmonic distortion, 30% modulation depth): &lt;2%;</p> <p>Amplitude modulation bandwidth (3dB bandwidth, 30% modulation depth, frequency test point: 1GHz, 5GHz): DC~100kHz.</p>				
<b>Pulse</b>	Switching ratio	> 80dB			

<b>Modulation<sup>6</sup> (Option H03)</b>	Rise and fall time	< 10ns		
	Minimum pulse of internal fixed amplitude	1μs		
	Minimum pulse of non-fixed amplitude	100ns		
<b>Narrow Pulse Modulation<sup>6</sup> (Option H04)</b>	Switching ratio	> 80dB		
	Rise and fall time	< 10ns		
	Minimum pulse of internal fixed amplitude	1μs		
	Minimum pulse of non-fixed amplitude	20ns		
<b>Internal Analog Modulation Signal Generator (Option H02)</b>	<p>It provides three independent signals for frequency/phase modulation, amplitude modulation and low frequency output signals</p> <p>Waveform: sine wave, square wave, triangle wave, sawtooth wave</p> <p>Frequency range: sine wave 0.1Hz~10MHz</p> <p>Square wave, triangle wave, sawtooth wave 0.1Hz~1MHz</p> <p>Frequency resolution: 0.1Hz</p> <p>Low frequency output: amplitude 0~5V peak (rated value), to 50Ω load</p>			
<b>Internal Pulse Generator (Option H03)</b>	<p>Pulse width: 20ns~(42s-10ns) (rated value)</p> <p>Pulse period: 40ns~42s (rated value)</p> <p>Resolution: 10ns</p>			
<b>Multi-function Function Generator (Option H05)</b>	<p>The Multi-function generator consists of 7 waveform generators. The generator can be set separately or five generators can be set simultaneously by using the AM, FM/ΦM and the composite modulation characteristics in the low-frequency output.</p> <p>Waveform:</p> <p>Function generator 1: sine wave, triangle wave, square wave, sawtooth wave, pulse</p> <p>Function generator 2: sine wave, triangle wave, square wave, sawtooth wave, pulse</p> <p>Dual function generator: sine wave, triangle wave, square wave, sawtooth wave, pulse, phase offset and amplitude ratio of audio 2 relative to audio 1;</p> <p>Scan function generator: sine wave, triangle wave, square wave, sawtooth wave;</p> <p>Noise generator 1: uniform, Gaussian;</p> <p>Noise generator 2: uniform, Gaussian;</p> <p>DC: LF output only;</p> <p>Frequency parameters:</p> <p>Sine wave: 0.1Hz to 10MHz;</p> <p>Triangle wave, square wave, sawtooth wave, pulse: 0.1Hz to 1MHz;</p> <p>Resolution: 0.1Hz;</p>			
<b>Vector Modulation Accuracy (25°C ± 10°C After Calibration) (Symbol Rate: 4Msps, Root Nyquist Filter, A=0.3, QPSK Format,</b>	1435A/B-V	50MHz~3GHz	EVM (RMS%) <1.4%	
		3GHz~6GHz	Standard	EVM (RMS%) <1.8%
			Low phase noise option	EVM (RMS%) <1.4%



<b>0dBm)</b>				
<b>Internal Modulation Bandwidth</b>	(Carrier 900MHz, 1.8GHz, 2.4GHz, 6GHz) Standard: 120MHz (multi-tone, number of tones: 51, frequency interval: 2.4MHz, $\pm 3$ dB bandwidth); H09 large modulation bandwidth option: 200MHz (multi-tone, number of tones: 51, frequency interval: 4MHz, $\pm 3$ dB bandwidth).			
<b>External Modulation Bandwidth</b>	(Carrier 900MHz, 1.8GHz, 2.4GHz, 6GHz) 200MHz (open loop of fixed amplitude, input 100mVrms sine wave through I channel, $\pm 4$ dB bandwidth)			
<b>Internal Baseband Signal Generator</b>	Number of channels: 2 (I and Q) Maximum symbol rate: Standard: 75Msps Option 09: 125Msps Baseband waveform memory: Standard: 1G sampling point Option H32: 2G sampling point Real-time baseband mode: Modulation format: PSK: BPSK, QPSK, OQPSK, $\pi/4$ DQPSK, D8PSK, 16PSK QAM: 4, 16, 32, 64, 128, 256, 512, 1024 FSK: 2, 4, 8, 16 ASK, MSK, arbitrary wave modulation EVM: <1.0% (typical value) (RMS%, symbol rate: 4Msps, root Nyquist filter, $\alpha=0.3$ , QPSK format) Maximum frequency interval in dual tone mode: 200MHz Arbitrary wave mode: Data format: Mat-File 5, ASCII, Binary, cap, csv. Trigger: Trigger type: continuous, single, gating, advanced waveform segments; Trigger source: trigger key, external, remote (GPIB, LAN); Trigger mode: auto play, trigger play, trigger reset, single auto, single trigger buffer, single reset, gated (high, low), waveform segment-single, waveform segment-continuous;			
<b>AWGN (option S03)</b>	Types: Pure noise, Continuous wave jamming, Additive noise Noise bandwidth: 120/200MHz Setting range: 0 to 40dB			
<b>General Features</b>				
<b>RF Output Port</b>	N type (negative), impedance 50 $\Omega$			
<b>Maximum Dimensions</b>	Width $\times$ height $\times$ depth: 330mm $\times$ 147mm $\times$ 397mm (excluding the handle) 420mm $\times$ 147mm $\times$ 445mm (including the handle)			
<b>Weight</b>	<12kg (the weight varies with the model and option configuration)			
<b>Power Supply</b>	100~120VAC, 50~60Hz; or 200~240VAC, 50~60Hz (self-adaptive)			
<b>Power Consumption</b>	Less than 300W			
<b>Temperature Range</b>	Operating temperature: 0 $^{\circ}$ C~+50 $^{\circ}$ C; storage temperature: -40 $^{\circ}$ C~+70 $^{\circ}$ C			

Note: 1. The 1435-V series signal generator can be stored at ambient temperature for 2 hours. After preheating for 30 minutes, the attenuator is automatically coupled (or ALC power is greater than -5dBm) to meet the performance of each indicator within a given working range.

2. The typical value is a supplementary feature given based on the stereotype value, which is only for user reference, and will not be assessed.

3. The rated value refers to the expected performance, or describes the product performance that is useful in the product but is not included in the product warranty.

4. The spectral purity indicates that the point frequency has no modulation mode.

5. The technical specifications of frequency modulation, phase modulation and amplitude modulation are applicable to frequencies above 10MHz.

6. The technical specifications of pulse modulation and narrow pulse modulation are applicable to frequencies above 50MHz.

## Order Information

- Main unit:

1435A-V signal generator 9kHz~3GHz

1435B-V signal generator 9kHz~6GHz

- Standard:

No.	Designation	Description
1	Power cord assembly	Standard three-core power cord
2	User manual	-
3	Programming manual	-
4	Product certificate	-

- Option:

Code	Designation	Function
1435-H01-A	115dB programmable step attenuator	Expand the output power dynamic range.
1435-H02	Analog modulation	Increase analog modulation functions, including AM, FM, ΦM and low frequency output.
1435-H03	Pulse modulation	Increase the pulse modulation function with a minimum pulse width of 100ns.
1435-H04	Narrow pulse modulation	Increase the pulse modulation function with a minimum pulse width of 20ns.
1435-H05	Multi-function function generator	Add a richer analog modulation signal format. (Note: The H05 option is available after the H02 analog modulation option is selected.)
1435-H06	Low phase noise	Optimize SSB phase noise, 6GHz@10kHz: -115dBc/Hz.
1435-H08	High power output	Increase the maximum output power.
1435-H09	Large modulation bandwidth	The internal modulation bandwidth is extended to 200MHz, suitable for the -V series.
1435-H10	High stability time base option	Internal time base aging rate.
1435-H32	Large-capacity memory of	Built-in baseband memory is expanded to 8GB, suitable

	built-in baseband	for the -V series.
1435-H50	Calibration certificate	Instrument calibration.
1435-H92	RF output moved to the rear panel	RF output on rear panel.
1435-H93	Portable handle	3U handle.
1435-H94	Rack mount kit	Mounting kit for the upper cabinet.
1435-H95	Aluminum alloy transport case	High-strength lightweight aluminum alloy transport case with handle and universal roller for easy transportation.
1435-H98	English kit	English panel, English manual, English operation interface and English operating system.
1435-S01	Arbitrary waveform mode	Support arbitrary wave data download and playback, generation of baseband signal or signal playback
1435-S02	Linear Frequency Modulation (LFM)	Supported intra-pulse linear frequency modulation function
1435-S03	Gaussian White Noise	Supported pure noise generation, additive noise generation and continuous wave jamming generation



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