1435 series
Signal Generator

1435A/B/C/D/F/K/L

(9kHz~3/6/12/20/40, 100kHz~53/67GHz)

Ceyear Technologies Co., Ltd

Product Overview

Based on innovative technologies, the 1435 series signal generator achieves balance in terms of performance, economy and volumetric weight. It also has excellent spectral purity, with a single side band (SSB) phase noise of -136dBc/Hz (when the carrier is 1GHz and the frequency offset is 10kHz) or -116dBc/Hz (when the carrier is 10GHz and the frequency offset is 10kHz). It provides a high-power output and a large dynamic range, with the maximum output power up to 20dBm@20GHz and an output power dynamic range greater than 150dB. It responds fast and switches to another frequency in only 1ms, which shortens the test time and improves test efficiency, meeting the needs of massive data testing; in addition, it also has excellent analog modulation and pulse modulation functions.

By adopting advanced frequency synthesis and RF channel signal processing technologies, it can achieve high performance while reducing the cost. 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. The 1435 series signal generator can meet both the test requirements for high performance in the R&D phase and the test requirements for high efficiency in the production phase.

Main Features

- Wide frequency coverage
- High output power
- Excellent phase noise
- Extremely short frequency switching time
- High performance pulse modulation
- Built-in multi-function function generator
- Small size and light weight
- High-sensitivity LED touch screen

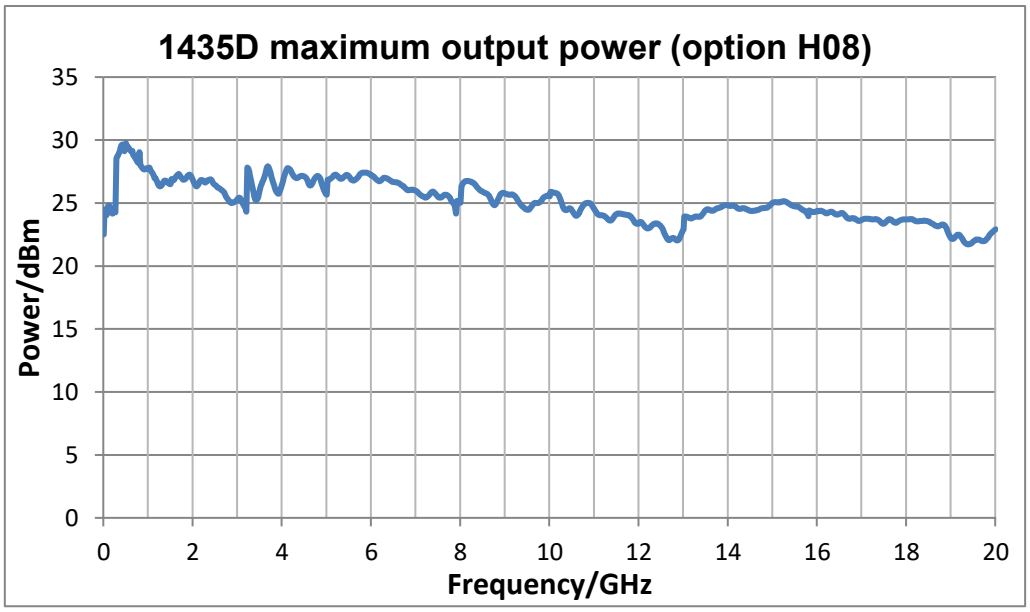
1435 series Signal Generator

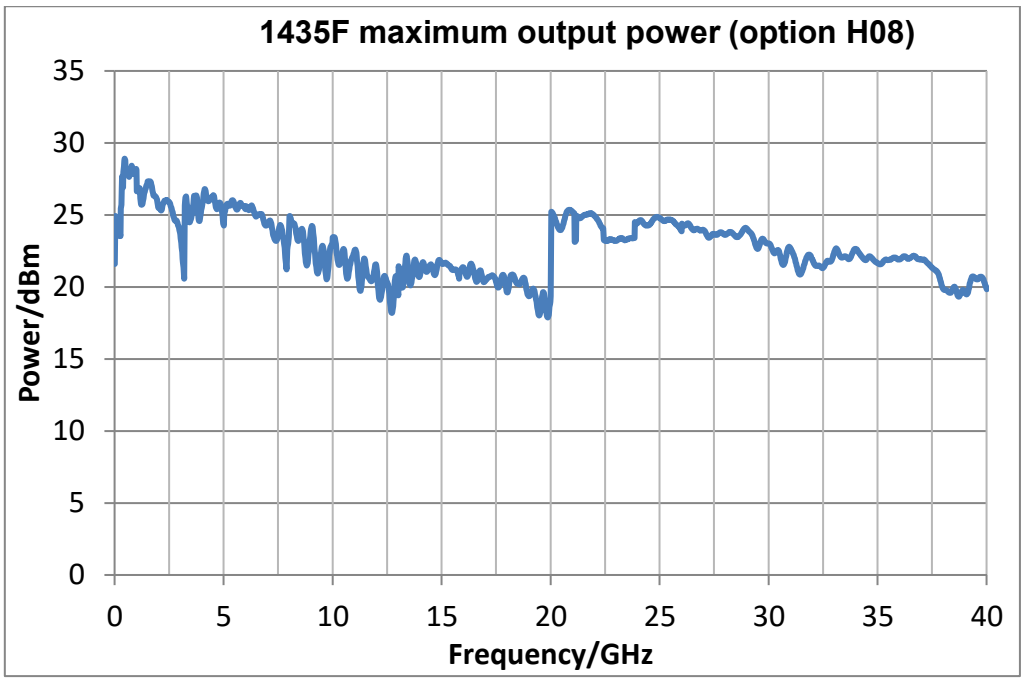
Wide frequency coverage

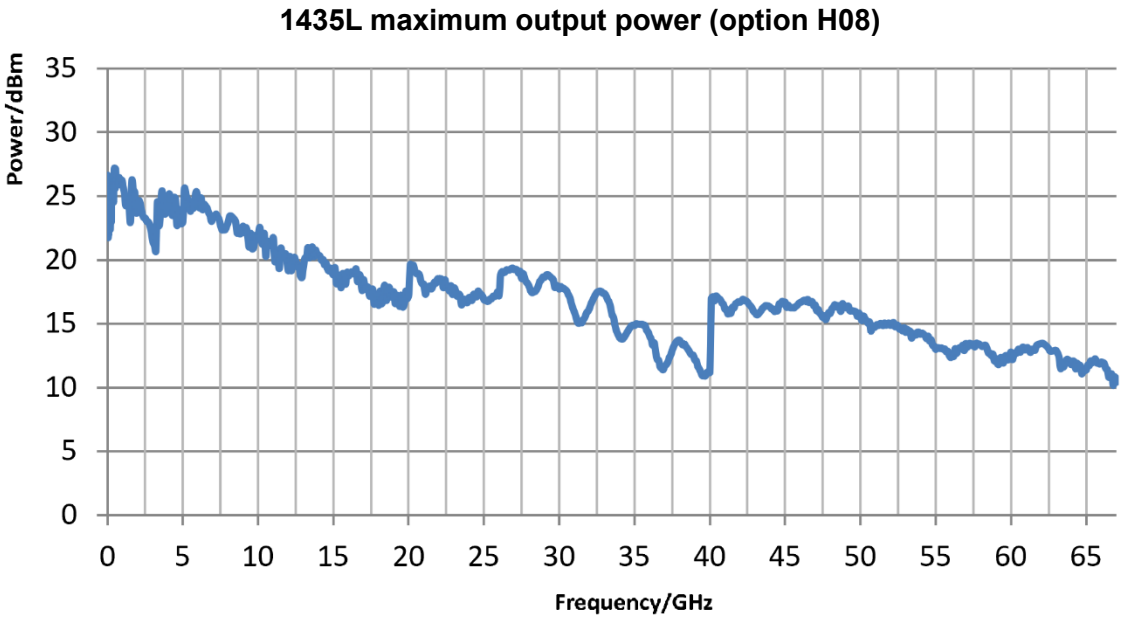
1435A/B/C/D/F/K/L signal generators have a frequency range of 9kHz to 3GHz/6GHz/12GHz/20GHz/40GHz and 100kHz to 53GHz/67GHz. The series has a minimum frequency as low as 9kHz and a maximum frequency as high as 67GHz, which can meet the wide frequency band testing requirements.

High output power

By selecting the H08 high-power output option, the measured power values of the 1435D across the entire frequency band are all above 20dBm, the measured power values of the 1435F across the entire frequency band are above 17dBm, and the measured power values of the 1435K/L across the entire frequency band are above 8dBm. In test applications requiring high-power excitation signals, the 1435 can obtain the required test signals without the need for an external amplifier.

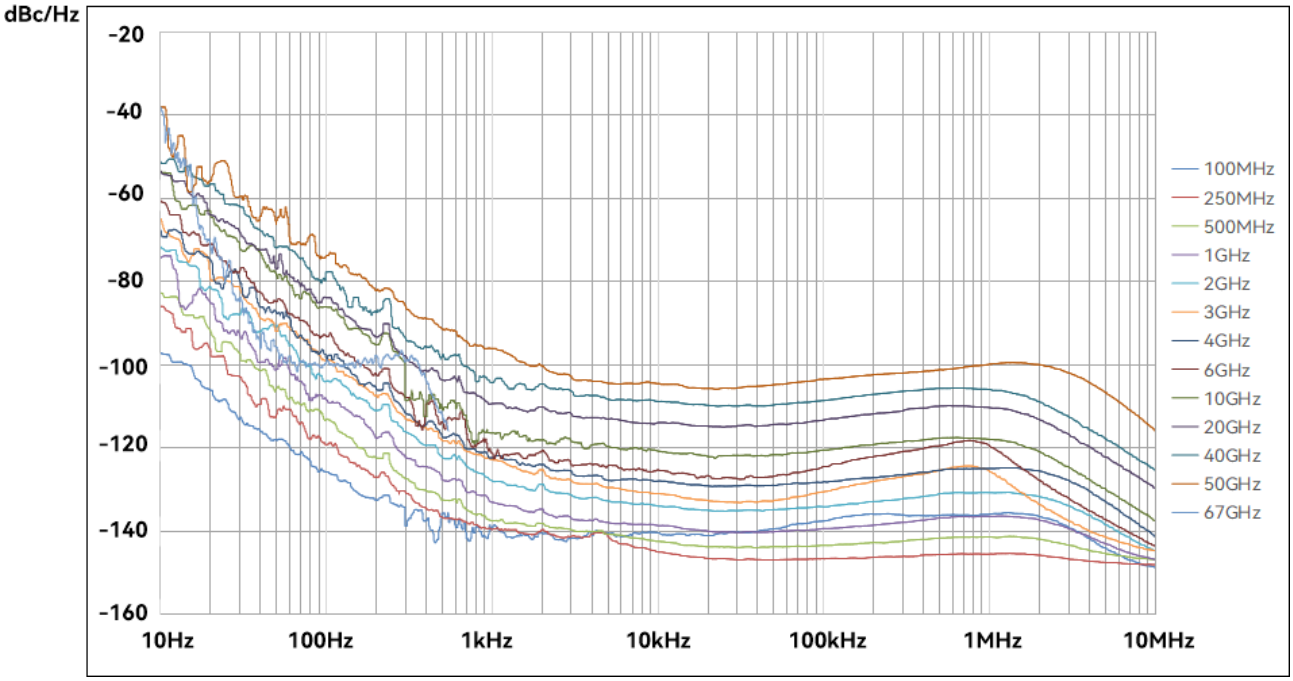






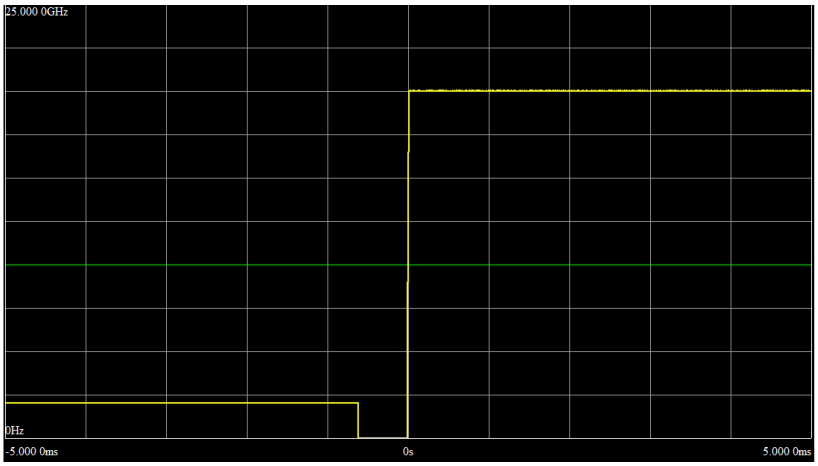
Excellent phase noise

The 1435 series signal generator offers two phase noise levels for users to choose from: a standard single-sideband phase noise of -95dBc/Hz (10GHz@10kHz), and a low-phase-noise option that reduces the single-sideband phase noise to as low as -120dBc/Hz (10GHz@10kHz, measured value). Users can select the appropriate phase noise level based on their specific needs for optimal cost-effectiveness.



Extremely short frequency switching time

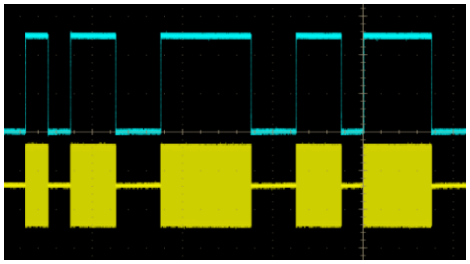
The 1435 series signal generator can realize fast frequency switching in the full frequency band, and the measured frequency switching time is 0.67ms, which can meet the test requirements for high speed.



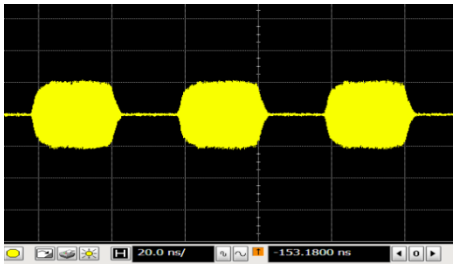
2GHz to 20GHz frequency switching time

High performance pulse modulation

The pulse switch ratio is greater than 80dB, and the rise and fall time is shorter than 10ns. When the narrow pulse option H04 with a minimum pulse width of 20ns, a pulse width range of 20ns to (42s-10ns) and a step of 10ns is selected, it supports various triggering modes such as gating and external triggering. It's also equipped with the pulse string required in radar test.



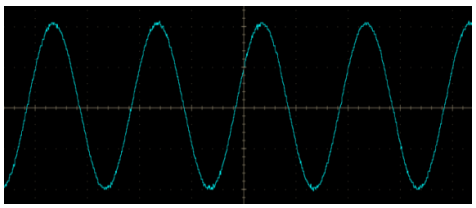
Pulse string (5)



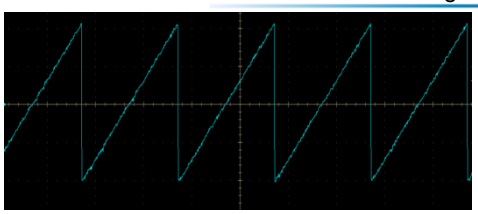
Pulse width: 20ns

Built-in Multi-function function generator

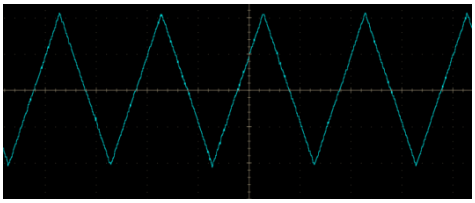
The multi-function function generator consists of seven waveform generators for generating AM/FM/ΦM modulated signals and low-frequency output signals. Two waveform generators can generate a dual-tone modulated signal by internal addition and are used for AM/FM/ΦM. The seven waveform generators include two standard function generators, one double-function generator, one scan function generator, two noise generators, and one DC generator. The DC generator generates DC levels, which can only be used for low frequency output. For the waveform generator, its sine wave frequency range is 0.1Hz~10MHz, and its frequency range of triangle wave, square wave, sawtooth wave and pulse is 0.1Hz~1MHz, and the frequency resolution is 0.1Hz.



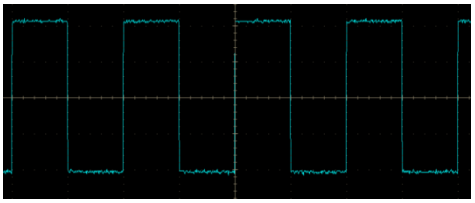
Sine wave



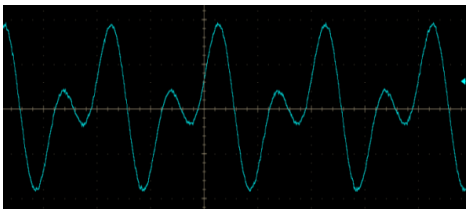
Sawtooth wave



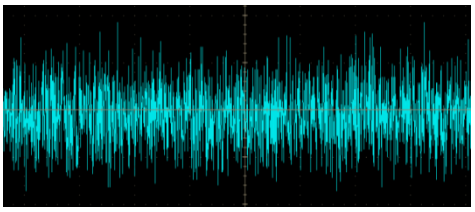
Triangle wave



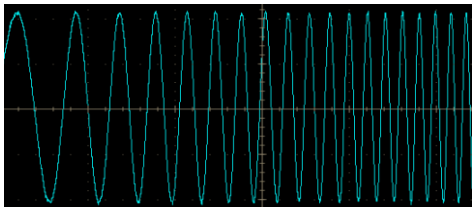
Square wave



Double sine wave



Noise



Frequency sweep sine

Small size and light weight

By adopting the portable 3U-high chassis design, the 1435 series signal generator has its weight and volume greatly reduced (compared to bench instruments). The heaviest model of this series is 10.9kg, and the lightest model is 7.4kg.

High-sensitivity LED touch screen

The 7-inch wide screen 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 1435ABCDF 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 purpose

The 1435 series signal generator provides complete functions and a frequency range of 9kHz~40GHz. It provides AM, FM, ΦM, and PM analog modulation functions and supports step scan and list scan. Also, it has excellent performance. By adopting a design which realizes the balance between performance, economy and volumetric weight, it supports free configuration of various options, which makes it widely available. In respect of cost, it can be used for teaching; in respect of performance, it can be used in laboratory tests.

The 1435 series signal generator supports high-performance pulse modulation, with a pulse-to-modulation switch ratio greater than 80dB, the rise and fall time less than 10ns, and the minimum pulse width of 20ns. It supports various pulse patterns such as pri stagger, prf jittering and pulse string, which is suitable for radar system testing. It has excellent phase noise performance and is available for receiver testing. It has a small size and can be carried along for field testing.

Production line test

The 1435 series signal generator features a 1ms frequency switching time, enabling fast testing, reducing testing time, improving testing efficiency, and meeting the needs of massive data testing. The 1435A/B can be equipped with a high-reliability, long-life electronic attenuator for continuous, uninterrupted measurement. It has high power output, eliminating the need for an external power amplifier, saving space and cost. It supports multiple control interfaces such as LAN and GPIB, and provides IVI-C/COM drivers, facilitating the formation of automated testing systems suitable for production line testing.

Technical Specifications[1]

<table>
<tr><th colspan="4">Frequency Features</th></tr>
<tr><td rowspan="11">Frequency Range</td><td rowspan="11">1435A: 9kHz~3GHz
1435B: 9kHz~6GHz
1435C: 9kHz~12GHz
1435D: 9kHz~20GHz
1435F: 9kHz~40GHz
1435K: 100kHz~53GHz
1435L: 100kHz~67GHz</td><td>Frequency</td><td>N (number of fundamental and harmonic waves)</td></tr>
<tr><td>9kHz≤f＜250MHz</td><td>1/8</td></tr>
<tr><td>250MHz≤f≤375MHz</td><td>1/16</td></tr>
<tr><td>375MHz＜f≤750MHz</td><td>1/8</td></tr>
<tr><td>750MHz＜f≤1.5GHz</td><td>1/4</td></tr>
<tr><td>1.5GHz＜f≤3GHz</td><td>1/2</td></tr>
<tr><td>3GHz＜f≤6GHz</td><td>1</td></tr>
<tr><td>6GHz＜f≤12GHz</td><td>2</td></tr>
<tr><td>12GHz＜f≤24GHz</td><td>4</td></tr>
<tr><td>24GHz＜f≤48GHz</td><td>8</td></tr>
<tr><td>48GHz＜f≤67GHz</td><td>16</td></tr>
<tr><td>Frequency Resolution</td><td colspan="3">0.001Hz</td></tr>
<tr><td>Frequency</td><td colspan="3">≤1ms (typical value [2])</td></tr>
</table>

Switching Time				
Time Base Aging Rate (Typical Value)	Standard: ±5×10^{-7}/year (after continuous switch-on for 30 days) High stability time base option H10: ±5×10^{-8}/year (after continuous switch-on for 30 days), ±5×10^{-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	Model	Standard	Option H01/H01-90/H01-E	
	1435A/B	-15dBm (settable -20dBm)	H01：-110dBm（settable -135dBm） H01-E：-90dBm（settable -110dBm）	
	1435C/D/F	-15dBm (settable -20dBm)	H01：-110dBm（settable -135dBm）	
	1435K/L	-15dBm (settable -20dBm)	H01-90：-90dBm（settable -110dBm）	
Maximum Power (25±10°C)	Frequency range	Standard	High power output option H08	
	1435A/B			
	9kHz≤f≤3GHz	18dBm	22dBm	
	3GHz＜f≤5GHz	16dBm	20dBm	
	5GHz＜f≤6GHz	15dBm	18dBm	
	1435C/D			
	9kHz≤f≤3GHz	16dBm	21dBm	
	3GHz＜f≤20GHz	15dBm	20dBm	
	1435F			
	9kHz≤f≤3GHz	14dBm	20dBm	
	3GHz＜f≤17GHz	13dBm	17dBm	
	17GHz＜f≤40GHz	11dBm	15dBm	
	1435K/L			
	100kHz≤f≤3GHz	14dBm	20dBm	
	3GHz＜f≤30GHz	8dBm	13dBm	
	30GHz＜f≤67GHz	4dBm	8dBm	
Power Accuracy (25±10°C)	Standard			
	Power (dBm) / Frequency	10~maximum power	-10~10	-15~-10
	9kHz≤f≤2GHz	±0.8dB	±0.6dB	±1.5dB
	2GHz < f≤20GHz	±0.9dB	±0.7dB	±1.5dB
	20GHz < f≤40GHz	±0.9dB	±0.8dB	±1.8dB

	40GHz < f≤67GHz	±1.5dB	±1.5dB		±2.0dB
	H01 programmable step attenuator option				
	Power (dBm) / Frequency	10~maximum power	-10~10	-70~-10	-90~-70
	9kHz≤f≤2GHz	±0.8dB	±0.6dB	±0.7dB	±1.4dB
	2GHz＜f≤20GHz	±0.9dB	±0.7dB	±0.7dB	±1.6dB
	20GHz＜f≤40GHz	±0.9dB	±0.8dB	±1.1dB	±2.0dB
	H01-90 programmable step attenuator option				
	Power (dBm) / Frequency	10~maximum power	-10~10	-70~-10	-90~-70
	9kHz≤f≤2GHz	±0.8dB	±0.6dB	±0.7dB	±1.4dB
	2GHz＜f≤20GHz	±0.9dB	±0.7dB	±0.7dB	±1.6dB
	20GHz＜f≤40GHz	±0.9dB	±0.8dB	±1.1dB	±2.0dB
	40GHz＜f≤67GHz	±1.5dB	±1.5dB	±1.8dB	±3.0dB
	H01-Eletronic Attenuator Option				
	Power (dBm) / Frequency	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[3])				
Source Standing Wave Ratio, VSWR (Internal Fixed Amplitude) (Typical Value)	9kHz≤f≤3GHz	＜1.7			
	3GHz＜f≤13GHz	＜1.6			
	13GHz＜f≤20GHz	＜1.8			
	20GHz＜f≤40GHz	＜1.6			
Maximum Reverse Power	0.5W (0V DC) (rated value)				
Spectral Purity [4]					
Harmonic Wave (at +10dBm)	9kHz≤f≤10MHz	＜-23dBc			
	10MHz＜f≤2GHz	＜-30dBc			
	2GHz＜f≤6GHz (1435B)	＜-30dBc			
	2GHz＜f≤20GHz	＜-55dBc			
	20GHz＜f≤40GHz	＜-50dBc (typical value)			
Subharmonic Wave (at +10dBm)	9kHz≤f≤6GHz	None			
	6GHz＜f≤12GHz	＜-60dBc			
	12GHz＜f≤24GHz	＜-55dBc			
	24GHz＜f≤40GHz	＜-50dBc			
Non-Harmonic	Frequency	Standard	Low phase noise option (Measured Value)		

Wave (at 0dBm, 10kHz Frequency Offset)	9kHz≤f≤250MHz	＜-54dBc	＜-58dBc (-65dBm)		
	250MHz＜f≤3GHz	＜-62dBc	＜-77dBc (-86dBm)		
	3GHz＜f≤6GHz	＜-56dBc	＜-71dBc (-80dBm)		
	6GHz＜f≤12GHz	＜-50dBc	＜-65dBc (-74dBm)		
	12GHz＜f≤24GHz	＜-44dBc	＜-59dBc (-68dBm)		
	24GHz＜f≤40GHz	＜-38dBc	＜-53dBc (-62dBm)		
SSB Phase Noise (dBc/Hz at +10dBm)	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		
	10 GHz	-63	-95		
	20 GHz	-57	-89		
	40 GHz	-51	-83		
	Low phase noise option				
	Frequency	100Hz	1kHz	10kHz	100kHz
	100MHz	-83	-122	-135	-131
	250 MHz	-93	-133	-141	-139
	500MHz	-89	-129	-138	-135
	1 GHz	-83	-123	-135	-132
	2 GHz	-77	-117	-131	-126
	3GHz	-74	-114	-125	-121
	4 GHz	-71	-111	-124	-120
	6 GHz	-68	-108	-121	-115
	10 GHz	-63	-103	-117	-113
	20 GHz	-57	-97	-111	-107
	40 GHz	-51	-91	-105	-101
Modulation Features					
Frequency Modulation (Option H02)	Maximum frequency offset: N × 16MHz (N is the number of fundamental harmonic wave) Accuracy (1kHz modulation rate, frequency offset: N × 500kHz): ± (2% × set frequency offset + 20Hz) Modulation rate (3dB bandwidth, frequency offset: N × 500kHz): DC-7MHz Distortion (1kHz rate, frequency offset: N × 500kHz): <0.4%				
Phase Modulation (Option H02)	Maximum phase offset: N × 16rad (N is the number of fundamental harmonic wave) Accuracy (1kHz modulation rate, frequency offset: N × 500kHz): ± (2% × set phase offset + 0.01rad) Modulation rate (3dB bandwidth, phase offset: N × 8rad): DC-1MHz				

	Distortion (1kHz modulation rate, phase offset: N × 8rad): <0.4%	
Amplitude Modulation (Option H02)	Maximum depth: >90% Modulation rate: (1kHz modulation rate, 30% modulation depth): ± (4% × set depth +1%) Modulation rate (bandwidth: 3dB; modulation depth: 30%; frequency test points: 1GHz, 5GHz, 20GHz, 40GHz): DC～100kHz Distortion: (1kHz modulation rate, linear mode, total harmonic distortion, 30% modulation depth): <2%;	
Pulse Modulation [5] (Option H03)	Switching ratio	＞80dB
	Rise and fall time	＜10ns
	Minimum pulse of internal fixed amplitude	1μs
	Minimum pulse of non-fixed amplitude	100ns
Narrow Pulse Modulation [5] (Option H04)	Switching ratio	＞80dB
	Rise and fall time	＜10ns
	Minimum pulse of internal fixed amplitude	1μs
	Minimum pulse of non-fixed amplitude	20ns
Internal Analog Modulation Signal Generator (Option H02)	It provides three independent signals for frequency/phase modulation, amplitude modulation and low frequency output signals Waveform: sine wave, square wave, triangle wave, sawtooth wave Frequency range: sine wave 0.1Hz~10MHz Square wave, triangle wave, sawtooth wave 0.1Hz~1MHz Frequency resolution: 0.1Hz Low frequency output: amplitude 0~5V peak (rated value), to 50Ω load	
Internal Pulse Generator (Option H03 or H04)	H03 Pulse Modulation: Pulse width: 100ns~(42s-10ns) (rated value) Pulse period: 120ns~42s (rated value) H04 Pulse Modulation: Pulse width: 20ns~(42s-10ns) (rated value) Pulse period: 40ns~42s (rated value) Resolution: 10ns	
Multi-Function Function Generator (Option H05)	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 features in the low-frequency output. Waveform: Function generator 1: sine wave, triangle wave, square wave, sawtooth wave, pulse Function generator 2: sine wave, triangle wave, square wave, sawtooth wave, pulse Dual function generator: sine wave, triangle wave, square wave, sawtooth wave, pulse, phase offset and amplitude ratio of audio 2 relative to audio 1; Scan function generator: sine wave, triangle wave, square wave, sawtooth wave; Noise generator 1: uniform, Gaussian; Noise generator 2: uniform, Gaussian; DC: LF output only; Frequency parameters: Sine wave: 0.1Hz to 10MHz; Triangle wave, square wave, sawtooth wave, pulse: 0.1Hz to 1MHz; Resolution: 0.1Hz;	
General Features		
RF Output Port	1435A/B/C: N type (femal), impedance 50Ω	

	1435D: 3.5mm (male) or N type (female) (option H91), impedance 50Ω 1435F: 2.4mm (male), impedance 50Ω
Maximum Dimensions (width × height × depth)	Width × height × depth: 330mm × 147mm × 397mm (excluding the handle) 420mm × 147mm × 445mm (including the handle)
Weight	<12kg (the weight varies with the model and option configuration)
Power Supply	100~120VAC, 50~60Hz; or 200~240VAC, 50~60Hz (self-adaptive)
Power Consumption	Less than 300W
Temperature Range	Operating temperature: 0°C~+50°C; storage temperature: -40°C~+70°C

Note:

1. After 2 hours of storage at ambient temperature, with the frequency set to 1GHz, RF on, and a 30-minute warm-up period, the attenuator will automatically couple (or ALC power greater than -5dBm). Within the given operating range, the 1435 series signal generator will meet all performance specifications.
2. Measured values are actual data from a specific instrument, representative to a certain extent, and for user reference only; they are not for evaluation.
3. Typical values refer to performance information of other products not covered by the product's "guaranteed specifications." Approximately 80% of instruments achieve performance within a temperature range of 20℃ to 30℃. Typical values do not include uncertainties during the measurement process.
4. The optional option to move the RF output to the rear panel (H92) reduces the maximum power of the 1435A/B/C/D/F by 2dB and the 1435K/L by 7dB.
5. Rated values refer to expected performance or describe product performance useful in the product but not included in the product warranty.
6. Spectral purity specifications are for point-frequency unmodulated mode.
7. Frequency modulation, phase modulation, and amplitude modulation specifications are applicable to frequencies greater than 10MHz.
8. Pulse modulation and narrow pulse modulation specifications are applicable to frequencies above 50MHz.

Ordering Information

- **Main unit:**

1435A signal generator: 9kHz~3GHz

1435B signal generator: 9kHz~6GHz

1435C signal generator: 9kHz~12GHz

1435D signal generator: 9kHz~20GHz

1435F signal generator: 9kHz~40GHz

1435K signal generator: 100kHz~53GHz

1435L signal generator: 100kHz~67GHz

- **Standard configuration:**

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

- **Options:**

Code	Name	Function
1435-H01	115dB programmable step attenuator	Expand the output power dynamic range.
1435-H01-90	90dB programmable step attenuator	Expand the output power dynamic range. For 1435K/L
1435-H01-E	Electronic attenuator	Expand the output power dynamic range. For 1435A/B
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 phase noise, 10GHz@10kHz: -113dBc/Hz.
1435-H08	High power output	Increase the maximum output power.
1435-H10	High stability time base option	Internal time base aging rate.
1435-H50	Calibration certificate	Instrument calibration.
1435-H91	N type connector for RF output	N type connector for RF output, applicable to 1435D.
1435-H92	RF output 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.
1435A-EWT1	Extend 1 year warranty	Extend 1 year warranty after 3 years standard warranty. For 1435A
1435B-EWT1	Extend 1 year warranty	Extend 1 year warranty after 3 years standard warranty. For 1435B
1435C-EWT1	Extend 1 year warranty	Extend 1 year warranty after 3 years standard warranty. For 1435C
1435D-EWT1	Extend 1 year warranty	Extend 1 year warranty after 3 years standard warranty. For 1435D
1435F-EWT1	Extend 1 year warranty	Extend 1 year warranty after 3 years standard warranty. For 1435F
1435K-EWT1	Extend 1 year warranty	Extend 1 year warranty after 3 years standard warranty. For 1435K
1435L-EWT1	Extend 1 year warranty	Extend 1 year warranty after 3 years standard warranty. For 1435L
1435A-JL	Metrology Certificate	Metrology Certificate Report. For 1435A
1435B-JL	Metrology Certificate	Metrology Certificate Report. For 1435B
1435C-JL	Metrology Certificate	Metrology Certificate Report. For 1435C
1435D-JL	Metrology Certificate	Metrology Certificate Report. For 1435D
1435F-JL	Metrology Certificate	Metrology Certificate Report. For 1435F
1435K-JL	Metrology Certificate	Metrology Certificate Report. For 1435K
1435L-JL	Metrology Certificate	Metrology Certificate Report. For 1435L

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