Chapter 5 Specifications

Specifications are valid under the following conditions: the instrument is within the calibration period, is stored for at least two hours at 0℃ to 50℃ temperature and is warmed up for 40 minutes. Unless otherwise noted, the specifications in the manual include the measurement uncertainty.

Typical (typ.): characteristic performance, which 80 percent of the measurement results will meet at room temperature (approximately 25℃). This data is not warranted and does not include the measurement uncertainty.

Nominal (nom.): the expected mean or average performance or a designed attribute (such as the 50Ω connector). This data is not warranted and is measured at room temperature (approximately 25℃).

Measured (meas.): an attribute measured during the design phase which can be compared to the expected performance, such as the amplitude drift variation with time. This data is not warranted and is measured at room temperature (approximately 25℃).

Note: All charts in this manual are the measurement results of multiple instruments at room temperature unless otherwise noted.

Technical Specifications*

Frequency

Frequency			
	DSA815	DSA832	DSA875
Frequency Range	9 kHz to 1.5 GHz	9 kHz to 3.2 GHz	9 kHz to 7.5 GHz
Frequency Resolution	1 Hz		

Internal Reference Frequency			
	DSA815	DSA832	DSA875
Reference Frequency	10 MHz		
Accuracy	±[(time since last calibration × aging rate) + temperature stability + calibration accuracy]		
Initial Calibration Accuracy	<1 ppm		
Temperature Stability	0℃ to 50℃, reference to 25℃		
	<2 ppm	<0.5 ppm	
Aging Rate	<2 ppm/year	<1 ppm/year	

Frequency Readout Accuracy	
Marker Resolution	span/ (number of sweep points - 1)
Marker Uncertainty	±(frequency indication × reference frequency accuracy + 1% × span + 10% × resolution bandwidth + marker resolution)

Frequency Counter	
Resolution	1 Hz, 10 Hz, 100 Hz, 1 kHz, 10 kHz, 100 kHz
Uncertainty	±(frequency indication × reference frequency accuracy + counter resolution)

Note: *The specifications (except the TG specifications) listed in this manual are those when the tracking generator is off.

Frequency Span	
Range	0 Hz, 100 Hz to maximum frequency of instrument
Uncertainty	±span/ (number of sweep points - 1)

SSB Phase Noise			
	20℃ to 30℃, f_c = 1 GHz		
Carrier Offset	DSA815	DSA832	DSA875
10 kHz	<-80 dBc/Hz	<-98 dBc/Hz	
100 kHz	<-100 dBc/Hz (typ.)	<-100 dBc/Hz (typ.)	

Residual FM			
	20℃ to 30℃, RBW = VBW = 1 kHz		
	DSA815	DSA832	DSA875
Residual FM	<50 Hz (nom.)	<20 Hz (nom.)	

Bandwidths			
	DSA815	DSA832	DSA875
Resolution Bandwidth (-3 dB)	100 Hz to 1 MHz, in 1-3-10 sequence	10 Hz to 1 MHz, in 1-3-10 sequence	
RBW Uncertainty	<5% (nom.)		
Resolution Filter Shape Factor (60 dB : 3 dB)	<5 (nom.)		
Video Bandwidth (-3 dB)	1 Hz to 3 MHz, in 1-3-10 sequence		
Resolution Bandwidth (-6 dB) (EMI-DSA800 option)	200 Hz, 9 kHz, 120 kHz		

Amplitude

Measurement Range	
Range	$f_c \geq 10$ MHz
	DANL to +20 dBm

Maximum Input Level	
DC Voltage	50 V
CW RF Power	Attenuation = 30 dB
	+20 dBm (100 mW)
Max. Damage Level*	+30 dBm (1 W)

Displayed Average Noise Level (DANL)		
		DSA815
Frequency		Attenuation = 0 dB, RBW = VBW = 100 Hz, Sample Detector, Trace Average ≥ 50, Tracking Generator off, 20℃ to 30℃, Input Impendence = 50 Ω
PA Off	100 kHz to 1 MHz	<-90 dBm, <-110 dBm (typ.)
	1 MHz to 1.5 GHz	<-110 dBm+6×(f/1 GHz) dB, <-115 dBm (typ.)
PA On	100 kHz to 1 MHz	<-110 dBm, <-130 dBm (typ.)
	1 MHz to 1.5 GHz	<-130 dBm+6×(f/1 GHz) dB, <-135 dBm (typ.)

Note: *When $f_c \geq 10$ MHz, input level > +25 dBm and PA is Off, the protection switch will be on.

Displayed Average Noise Level (DANL)			
		DSA832	DSA875
Frequency		Attenuation = 0 dB, RBW = VBW = 10 Hz, Sample Detector, Trace Average ≥ 50, Tracking Generator off, 20℃ to 30℃, Input Impendence = 50 Ω	
PA Off	9 kHz to 100 kHz	<-110 dBm (typ.)	<-110 dBm (typ.)
	100 kHz to 5 MHz	<-125 dBm, <-128 dBm (typ.)	<-125 dBm, <-128 dBm (typ.)
	5 MHz to 3.2 GHz	<-130 dBm, <-134 dBm (typ.)	<-130 dBm, <-134 dBm (typ.)
	3.2 GHz to 6 GHz		<-126 dBm, <-130 dBm (typ.)
	6 GHz to 7.5 GHz		<-121 dBm, <-125 dBm (typ.)
PA On	100 kHz to 5 MHz	<-142 dBm, <-145 dBm (typ.)	<-142 dBm, <-145 dBm (typ.)
	5 MHz to 3.2 GHz	<-147 dBm, <-151 dBm (typ.)	<-147 dBm, <-151 dBm (typ.)
	3.2 GHz to 6 GHz		<-143 dBm, <-147 dBm (typ.)
	6 GHz to 7.5 GHz		<-138 dBm, <-142 dBm (typ.)

Displayed Average Noise Level (DANL) (Normalized to 1Hz)				
		DSA815	DSA832	DSA875
Frequency		Attenuation = 0 dB, RBW = VBW = 100 Hz, Sample Detector, Trace Average ≥ 50, Tracking Generator off, Normalized to 1Hz, 20℃ to 30℃, Input Impendence = 50 Ω		
PA Off	9 kHz to 100 kHz		<-120 dBm (typ.)	<-120 dBm (typ.)
	100 kHz to 1 MHz	<-110 dBm, <-130 dBm (typ.)	<-135 dBm, <-138 dBm (typ.)	<-135 dBm, <-138 dBm (typ.)
	1 MHz to 5 MHz	<-130 dBm+6× (f/1 GHz) dB, <-135 dBm (typ.)		
	5 MHz to 1.5 GHz		<-140 dBm, <-144 dBm (typ.)	<-140 dBm, <-144 dBm (typ.)
	1.5 GHz to 3.2 GHz			
	3.2 GHz to 6 GHz			<-136 dBm, <-140 dBm (typ.)
	6 GHz to 7.5 GHz			<-131 dBm, <-135 dBm (typ.)
PA On	100 kHz to 1 MHz	<-130 dBm, <-150 dBm (typ.)	<-152 dBm, <-155 dBm (typ.)	<-152 dBm, <-155 dBm (typ.)
	1 MHz to 5 MHz	<-150 dBm+6× (f/1 GHz) dB, <-155 dBm (typ.)		
	5 MHz to 1.5 GHz		<-157 dBm, <-161 dBm (typ.)	<-157 dBm, <-161 dBm (typ.)
	1.5 GHz to 3.2 GHz			
	3.2 GHz to 6 GHz			<-153 dBm, <-157 dBm (typ.)
	6 GHz to 7.5 GHz			<-148 dBm, <-152 dBm (typ.)

Level Display	
Logarithmic Level Axis	1 dB to 200 dB
Linear Level Axis	0 to Reference Level
Number of Display Points	601
Number of Traces	3 + Math Trace
Trace Detectors	Normal, Positive-peak, Negative-peak, Sample, RMS, Voltage Average
	Quasi-peak (with EMI-DSA800 option)
Trace Functions	Clear Write, Max Hold, Min Hold, Average, View, Blank
Units of Level Axis	dBm, dBmV, dBμV, nV, μV, mV, V, nW, μW, mW, W

Frequency Response				
		DSA815	DSA832	DSA875
Frequency Response		$f_c \geq$ 100 kHz, Attenuation = 10 dB, Relative to 50 MHz, 20℃ to 30℃		
PA Off	100 kHz to 1.5 GHz	<0.7 dB	<0.5 dB, <0.3 dB (typ.)	
	1.5 GHz to 3.2 GHz			
	3.2 GHz to 7.5 GHz		<0.7 dB, <0.3 dB (typ.)	
		$f_c \geq$ 1MHz, Attenuation = 10 dB, Relative to 50 MHz, 20℃ to 30℃		
PA On	100 kHz to 1.5 GHz	<1.0 dB	<0.7 dB, <0.3 dB (typ.)	
	1.5 GHz to 3.2 GHz			
	3.2 GHz to 7.5 GHz		<0.9 dB, <0.3 dB (typ.)	

Input Attenuation Switching Uncertainty			
	DSA815	DSA832	DSA875
Setting Range	0 dB to 30 dB, in 1 dB step		
Switching Uncertainty	f_c = 50 MHz, Relative to 10 dB, 20℃ to 30℃		
	<0.5 dB	<0.3 dB	

Absolute Amplitude Uncertainty			
	DSA815	DSA832	DSA875
Uncertainty	f_c = 50 MHz, Peak Detector, Preamplifier Off, Attenuation = 10 dB, Input Signal Level = -10dBm, 20℃ to 30℃		
	<0.4 dB	<0.3 dB	

RBW Switching Uncertainty	
Uncertainty	Relative to 1 kHz RBW
	<0.1 dB

Reference Level		
Range		-100 dBm to +20 dBm, in 1 dB step
Resolution	Log Scale	0.01 dB
	Linear Scale	4 digits

Preamplifier				
		DSA815 (standard)	PA-DSA832 (option)	PA-DSA875 (option)
Gain	100 kHz to 1.5 GHz	20 dB (nom.)	17 dB (nom.)	17 dB (nom.)
	1.5 GHz to 3.2 GHz			
	3.2 GHz to 7.5 GHz			

Level Measurement Uncertainty			
	DSA815	DSA832	DSA875
	95% Confidence Level, S/N > 20 dB, RBW = VBW = 1 kHz, Preamplifier Off, Attenuation = 10 dB, -50 dBm < Input Level ≤ 0 dBm, f_c > 10 MHz, 20℃ to 30℃		
Level Measurement Uncertainty	<1.5 dB (nom.)	<0.8 dB (nom.)	

RF Input VSWR				
		DSA815	DSA832	DSA875
		Attenuation ≥ 10 dB		
VSWR	300 kHz to 1.5 GHz	<1.5 (nom.)	<1.5 (nom.)	<1.5 (nom.)
	1.5 GHz to 3.2 GHz			
	3.2 GHz to 7.5 GHz			<1.8 (nom.)

Second Harmonic Intercept			
	DSA815	DSA832	DSA875
Second Harmonic Intercept (SHI)	$f_c \geq 50$ MHz, Input Signal Level = -20 dBm, Attenuation = 10 dB		
	+40 dBm	+45 dBm	

Third-order Intercept			
	DSA815	DSA832	DSA875
Third-order Intercept (TOI)	$f_c \geq 50$ MHz, Two -20 dBm Tones at Input Mixer Spaced by 200 kHz, Attenuation = 10 dB		
	+10 dBm	+12 dBm, +15 dBm (typ.)	

1dB Gain Compression	
1dB Compression of Input Mixer (P_{1dB})	$f_c \geq 50$ MHz, Attenuation = 0 dB
	>0 dBm

Spurious Response			
Spurious Response, Inherent	DSA815	DSA832	DSA875
	Input Terminated 50 Ω, Attenuation = 0 dB, 20℃ to 30℃		
	<-88dBm (typ.)	<-90dBm, <-100dBm (typ.)	
Intermediate Frequency	<-60 dBc		
System Related Sidebands	Referenced to Local Oscillators, Referenced to A/D Conversion, Referenced to Subharmonic of First LO, Referenced to Harmonic of First LO		
	<-60 dBc		
Input Related Spurious	Mixer Level = -30dBm		
	<-60 dBc		

Sweep

Sweep				
		DSA815	DSA832	DSA875
Sweep Time	Span ≥ 100 Hz	10 ms to 1500 s	1 ms to 3200 s	1 ms to 7500 s
	Zero Span	20 μs to 1500 s	20 μs to 3200 s	20 μs to 7500 s
Sweep Time Uncertainty	Span ≥ 100 Hz	5% (nom.)		
	Zero Span (Sweep Time Setting Value > 1 ms)	5% (nom.)		
Sweep Mode		Continuous, Single		

Tracking Generator (Option)

TG Output			
	DSA815	DSA832	DSA875
Frequency Range	100 kHz to 1.5 GHz	100 kHz to 3.2 GHz	100 kHz to 7.5 GHz
Output Level Range	-20 dBm to 0 dBm	-40 dBm to 0 dBm	
Output Level Resolution	1 dB		
Output Flatness	Relative to 50 MHz		
	±3 dB (nom.)		

Trigger

Trigger	
Trigger Source	Free run, Video, External
External Trigger Level	5 V TTL level

Input /Output

Front Panel Connectors		
RF Input	Impedance	50 Ω (nom.)
	Connector	N female
Tracking Generator Output	Impedance	50 Ω (nom.)
	Connector	N female

Internal/ External Reference		
Internal Reference	Frequency	10 MHz
	Output level	+3 dBm to +10 dBm, +8 dBm (typ.)
	Impedance	50 Ω (nom.)
	Connector	BNC female
External Reference	Frequency	10 MHz ± 5 ppm
	Input level	0 dBm to +10 dBm
	Impedance	50 Ω (nom.)
	Connector	BNC female

External Trigger Input		
External Trigger Input	Impedance	1 kΩ (nom.)
	Connector	BNC female

Communication Interface		
USB Host	Connector	A plug
	Protocol	Version2.0
USB Device	Connector	B plug
	Protocol	Version2.0
LAN	LXI Core 2011 Device	10/100Base, RJ-45
IEC/IEEE Bus (GPIB)		With USB-GPIB option
		IEEE488.2

General Specifications

Display	
Type	TFT LCD
Resolution	800 x 480 pixels
Size	8 inch
Colors	64k

Printer Supported	
Protocol	PictBridge

Mass Memory	
Mass Memory	Flash Disk (internal), USB Storage Device (not supplied)

Power Supply	
Input Voltage Range, AC	100 V to 240 V (nom.)
AC Supply Frequency	45 Hz to 440 Hz
Power Consumption	35 W (typ.), Max. 50 W with all options.

Environmental		
Temperature	Operating Temperature Range	0℃ to 50℃
	Storage Temperature Range	-20℃ to 70℃
Humidity	0℃ to 30℃	≤ 95% rel. humidity
	30℃ to 40℃	≤ 75% rel. humidity
Altitude	Operating Height	Up to 3,000m

Electromagnetic Compatibility and Safety		
EMC	In line with EN61326-1:2006	
	IEC 61000-4-2:2001	±4.0 kV (contact discharge), ±4.0 kV (air discharge)
	IEC 61000-4-3:2002	3 V/m (80 MHz to 1 GHz) 3 V/m (1.4 GHz to 2 GHz) 1 V/m (2.0 GHz to 2.7 GHz)
	IEC 61000-4-4:2004	1 kV power lines
	IEC 61000-4-5:2001	0.5 kV (Phase to Neutral) 0.5 kV (Phase to PE) 1 kV (Neutral to PE)
	IEC 61000-4-6:2003	3 V, 0.15 to 80 MHz
	IEC 61000-4-11:2004	Voltage dip: 0% UT during half cycle 0% UT during 1 cycle 70% UT during 25 cycles Short interruption: 0% UT during 250 cycles
Electrical Safety		In line with UL 61010-1:2012 CAN/CSA-C22.2 No. 61010-1-12 EN 61010-1:2010

Dimensions	
(W x H x D)	361.6 mm × 178.8 mm × 128 mm (14.2 in × 7.0 in × 5.0 in)

Weight			
	DSA815	DSA832	DSA875
Standard	4.25 kg (9.4 lb)	4.55 kg (10.0 lb)	
With tracking generator		5.15 kg (11.4 lb)	