

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°C to 50°C 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°C). 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°C).

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°C).

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

Technical Specifications

Frequency

Frequency		
	DSA705	DSA710
Frequency range	100 kHz to 500 MHz	100 kHz to 1 GHz
Frequency resolution	1 Hz	

Internal Reference Frequency		
	DSA705	DSA710
Reference frequency	10 MHz	
Accuracy	$\pm [(\text{time since last calibration} \times \text{aging rate}) + \text{temperature stability} + \text{calibration accuracy}]$	
Initial calibration accuracy	<1 ppm	
Temperature stability	0°C to 50°C, reference to 25°C	
	<2 ppm	
Aging rate	<2 ppm/year	

Frequency Readout Accuracy	
Marker resolution	span/ (number of sweep points - 1)
Marker uncertainty	$\pm (\text{frequency indication} \times \text{reference frequency accuracy} + 1\% \times \text{span} + 10\% \times \text{resolution bandwidth} + \text{marker resolution})$

Frequency Counter	
Resolution	1 Hz, 10 Hz, 100 Hz, 1 kHz, 10 kHz, 100 kHz
Uncertainty	$\pm (\text{frequency indication} \times \text{reference frequency accuracy} + \text{counter resolution})$

Frequency Span	
Range	0 Hz, 100 Hz to maximum frequency of instrument
Uncertainty	$\pm \text{span} / (\text{number of sweep points} - 1)$

SSB Phase Noise		
		DSA705
		DSA710
		20°C to 30°C, $f_c = 500$ MHz
		20°C to 30°C, $f_c = 1$ GHz
Carrier offset	10 kHz	<-80 dBc/Hz
	100 kHz	<-100 dBc/Hz (typ.)

Residual FM		
		20°C to 30°C, RBW = VBW = 1 kHz
		DSA705
		DSA710
Residual FM		<50 Hz (nom.)

Bandwidths		
		Set "Auto SWT" to "Accy"
		DSA705
		DSA710
Resolution bandwidth (-3 dB)	100 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)

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)			
		DSA705	DSA710
Frequency		attenuation = 0 dB, RBW = VBW = 100 Hz, sample detector, trace average ≥ 50 , 20°C to 30°C, input impedance = 50 Ω	
PA off	100 kHz to 1 MHz	<-90 dBm, <-110 dBm (typ.)	<-90 dBm, <-110 dBm (typ.)
	1 MHz to 500 MHz	<-100 dBm, <-110 dBm (typ.)	<-100 dBm, <-110 dBm (typ.)
	500 MHz to 1 GHz		
PA on	100 kHz to 1 MHz	<-110 dBm, <-130 dBm (typ.)	<-110 dBm, <-130 dBm (typ.)
	1 MHz to 500 MHz	<-120 dBm, <-130 dBm (typ.)	<-120 dBm, <-130 dBm (typ.)
	500 MHz to 1 GHz		

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, dB μ V, nV, μ V, mV, V, nW, μ W, mW, W

Frequency Response			
		DSA705	DSA710
Frequency response		$f_c \geq 100$ kHz, attenuation = 10 dB, relative to 50 MHz, 20°C to 30°C	
PA off	100 kHz to 500 MHz	<0.7 dB	<0.7 dB
	500 MHz to 1 GHz		
		$f_c \geq 1$ MHz, attenuation = 10 dB, relative to 50 MHz, 20°C to 30°C	
PA on	100 kHz to 500 MHz	<1.0 dB	<1.0 dB
	500 MHz to 1 GHz		

Input Attenuation Switching Uncertainty			
		DSA705	DSA710
Setting range		0 dB to 30 dB, in 1 dB step	
Switching uncertainty	$f_c = 50$ MHz, relative to 10 dB, 20°C to 30°C		
	<0.5 dB		

Absolute Amplitude Uncertainty		
	DSA705	DSA710
Uncertainty	$f_c = 50$ MHz, peak detector, preamplifier off, attenuation = 10 dB, input signal level = -10dBm, 20°C to 30°C	
	<0.4 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			
		DSA705 (standard)	DSA710 (standard)
Gain	100 kHz to 500 MHz	20 dB (nom.)	20 dB (nom.)
	500 MHz to 1 GHz		

Level Measurement Uncertainty		
	DSA705	DSA710
	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°C to 30°C	
Level measurement uncertainty		<1.5 dB (nom.)

RF Input VSWR			
		DSA705	DSA710
	attenuation ≥ 10 dB		
VSWR	300 kHz to 500 MHz	<1.5 (nom.)	<1.5 (nom.)
	500 MHz to 1 GHz		

Distortion

Second Harmonic Intercept		
	DSA705	DSA710
Second harmonic intercept (SHI)	$f_c \geq 50$ MHz, input signal level = -20 dBm, attenuation = 10 dB	
	+40 dBm	

Third-order Intercept		
	DSA705	DSA710
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	

1dB Gain Compression		
1dB compression of input mixer (P_{1dB})	$f_c \geq 50$ MHz, attenuation = 0 dB	
	>0 dBm	

Spurious Response		
	DSA705	DSA710
Spurious response, inherent	input terminated 50 Ω , attenuation = 0 dB, 20°C to 30°C	
	< -88dBm (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 = -30 dBm	
	< -60 dBc	

Sweep

Sweep			
		DSA705	DSA710
Sweep time	span \geq 100 Hz	10 ms to 500 s	10 ms to 1000 s
	zero span	20 μ s to 500 s	20 μ s to 1000 s
Sweep time uncertainty	span \geq 100 Hz	5% (nom.)	
	zero span (sweep time setting value > 1 ms)	5% (nom.)	
Sweep mode		continuous, single	

Trigger

Trigger	
Trigger source	free run, video, external
External trigger level	5 V TTL level

SSC-DSA (Option)

Signal Seamless Capture (SSC)	
Measurement bandwidth	1.5 MHz

Input /Output

Front Panel Connectors		
RF input	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 \pm 5 ppm
	input level	0 dBm to +10 dBm
	impedance	50 Ω (nom.)
	connector	BNC female

External Trigger Input		
External trigger input	impedance	1 k Ω (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 (GPIB) bus (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°C to 50°C
	storage temperature range	-20°C to 70°C
Humidity	0°C to 30°C	≤ 95% rel. humidity
	30°C to 40°C	≤ 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 × H × D)	361.6 mm × 178.8 mm × 128 mm (14.2 in × 7.0 in × 5.0 in)

Weight		
	DSA705	DSA710
Standard	4.25 kg (9.4 lb)	

Calibration Interval	
Recommended calibration interval	1 year