

Keysight E5063A
ENA Series Network Analyzer
100 kHz to 4.5/8.5/18 GHz

Data Sheet



Definitions

Specification (spec.):

Warranted performance. All specifications apply at 23 °C (± 5 °C), unless otherwise stated, and 90 minutes after the instrument has been turned on. Specifications include guard bands to account for the expected statistical performance distribution, measurement uncertainties, and changes in performance due to environmental conditions.

Typical (typ.):

Expected performance of an average unit which does not include guardbands. It is not covered by the product warranty.

General characteristics:

A general, descriptive term that does not imply a level of performance.

Boundary Conditions

In this data sheet, boundary conditions are given for the specifications. For example, system dynamic range is 68 dB with the following boundary condition.

Frequency: 300 kHz

IF bandwidth: 3 kHz

If the same boundary conditions fall under more than one category in a table, apply the best value.

Calibration Kits and ECal modules

This data sheet also provides technical specifications for the following calibration kits and ECal modules. For models not listed in this data sheet, please download the free uncertainty calculator from www.keysight.com/find/na_calculator to generate the curves for your calibration kit.

- 85032F Calibration kit
- 85033E Calibration kit
- 85052D Calibration kit
- 85092C Electronic calibration (ECal) module
- 85093C Electronic calibration (ECal) module
- N4691B Electronic calibration (ECal) module

Corrected System Performance

The specifications in this section apply to measurements made with the Keysight Technologies, Inc. E5063A network analyzer under the following conditions:

- No averaging applied to data
- Environmental temperature of 23 °C (± 5 °C) with less than 1 °C deviation from the calibration temperature
- Response and isolation calibration performed

System Dynamic Range

Description	Specification	Typical
System dynamic range at test port ¹		
(IF Bandwidth = 3 kHz)		
100 kHz to 300 kHz	63 dB	
300 kHz to 8.5 MHz	68 dB	
8.5 to 100 MHz	91 dB	
100 MHz to 4.34 GHz	92 dB	
4.34 to 8.5 GHz	81 dB	
8.5 to 13 GHz	75 dB	
13 to 16 GHz	65 dB	
16 to 18 GHz	62 dB	
(IF Bandwidth = 10 Hz)		
100 kHz to 300 kHz	88 dB	92 dB
300 kHz to 8.5 MHz	93 dB	97 dB
8.5 to 100 MHz	116 dB	122 dB
100 MHz to 4.34 GHz	117 dB	122 dB
4.34 to 8.5 GHz	106 dB	112 dB
8.5 to 13 GHz	100 dB	106 dB
13 to 16 GHz	90 dB	100 dB
16 to 18 GHz	87 dB	93 dB

1. The test port dynamic range is calculated as the difference between the test port rms noise floor and the source maximum output power. The effective dynamic range must take measurement uncertainty and interfering signals into account.

Corrected system performance with calibration kit

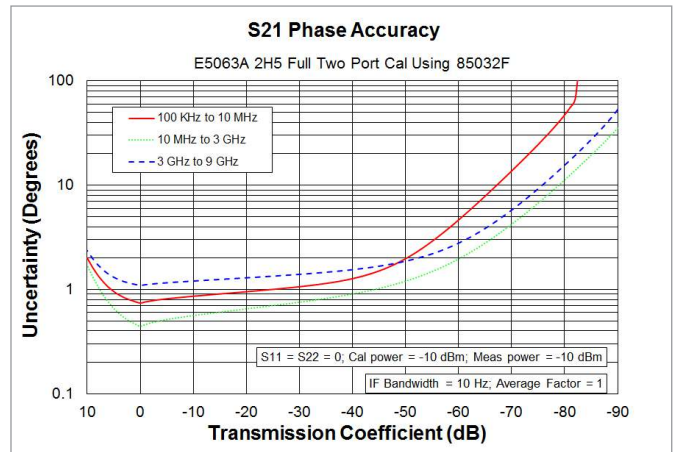
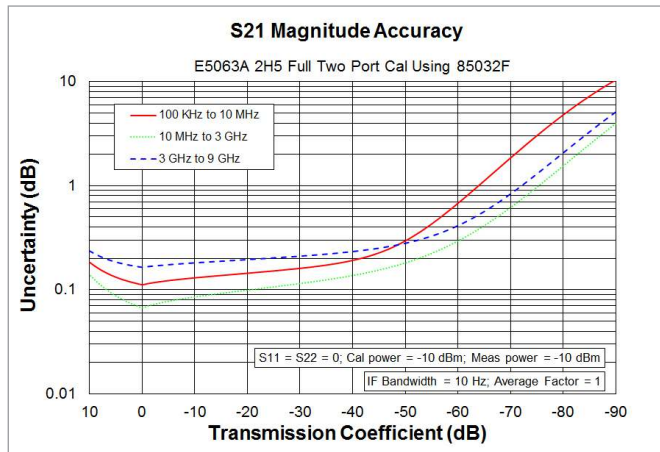
Corrected system performance with type-N device connectors,
85032F calibration kit

Network analyzer : E5063A
Calibration kit : 85032F (Type-N, 50 Ω)
Calibration : Full 2-port

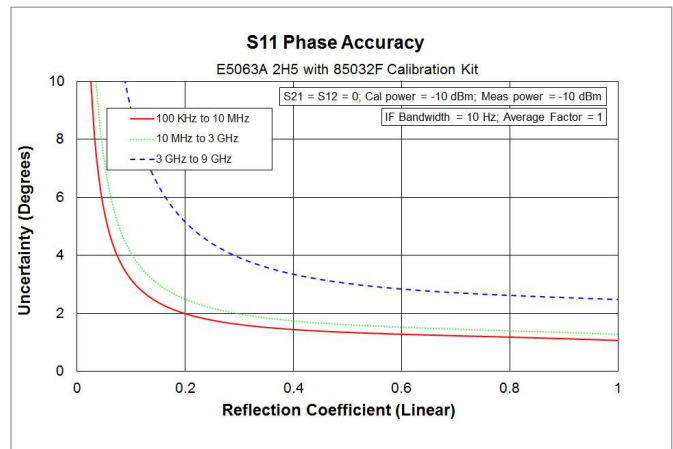
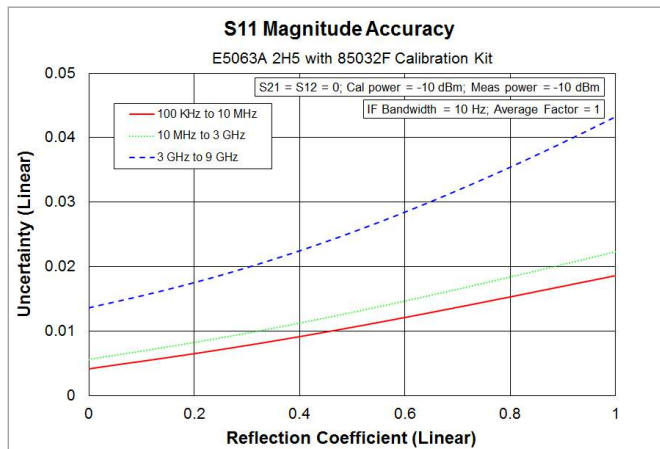
IF bandwidth = 10 Hz, no averaging applied to data, environmental temperature =
23 $^{\circ}\text{C}$ (± 5 $^{\circ}\text{C}$) with < 1 $^{\circ}\text{C}$ deviation from calibration temperature, isolation calibration performed

Description	Specification (dB)		
	100 kHz to 10 MHz	10 MHz to 3 GHz	3 to 9 GHz
Directivity	49	46	38
Source match	41	40	35
Load match	47	46	36
Reflection tracking	± 0.011	± 0.021	± 0.054
Transmission tracking	± 0.082	± 0.037	± 0.128

Transmission uncertainty (specification)



Reflection uncertainty (specification)



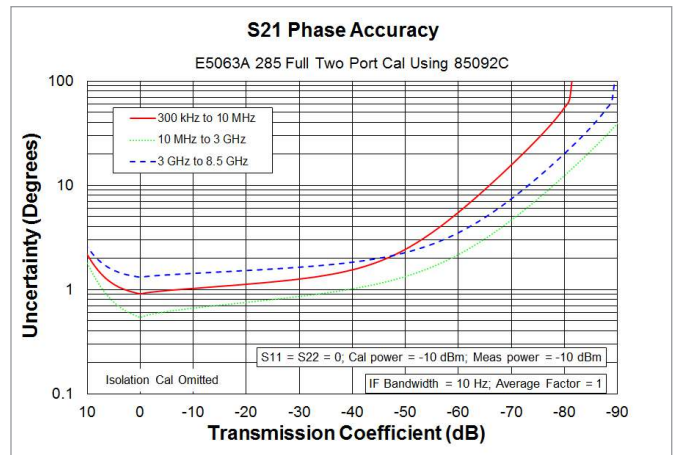
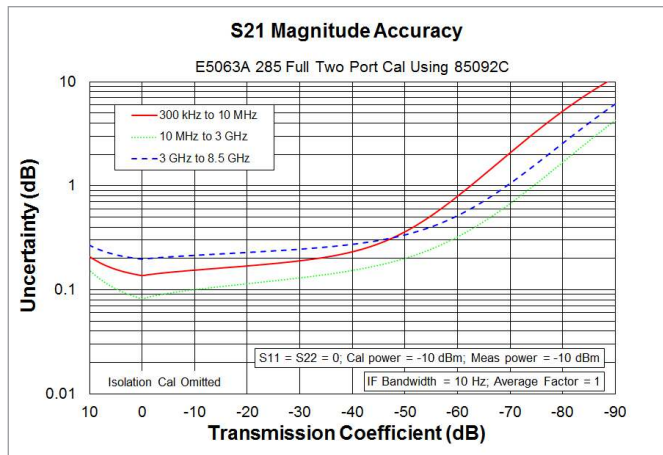
Corrected system performance with type-N device connectors,
85092C electronic calibration (ECal) module

Network analyzer : E5063A
 Calibration kit : 85092C (Type-N, 50 Ω) Electronic calibration (ECal) module
 Calibration : Full 2-port

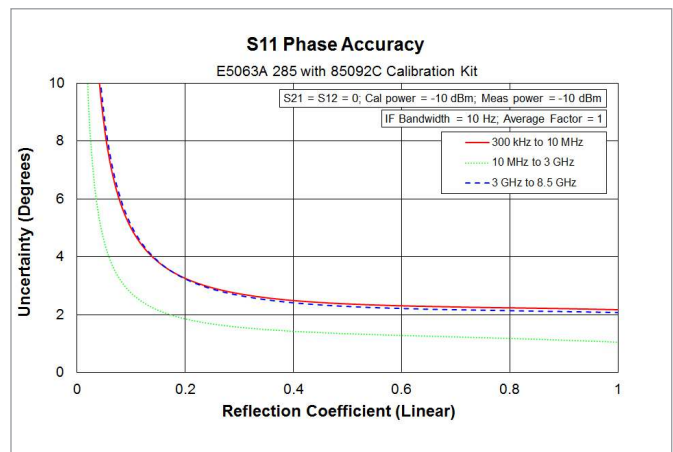
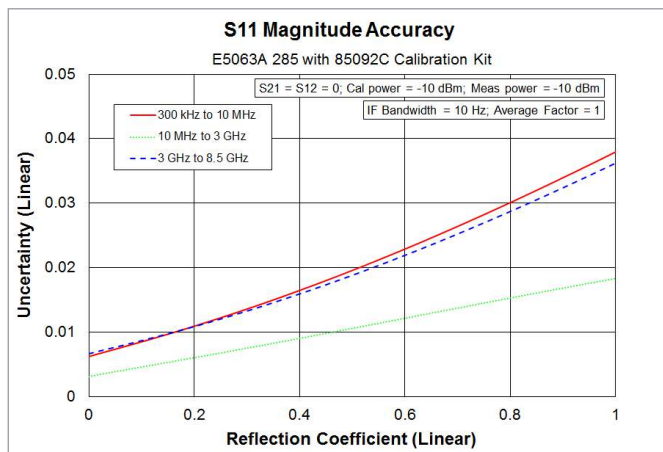
IF bandwidth = 10 Hz, no averaging applied to data, environmental temperature =
 23 °C (± 5 °C) with < 1 °C deviation from calibration temperature, isolation calibration is not performed

Description	Specification (dB)		
	300 kHz to 10 MHz	10 MHz to 3 GHz	3 to 9 GHz
Directivity	45	52	45
Source match	36	44	36
Load match	36	45	38
Reflection tracking	± 0.10	± 0.04	± 0.07
Transmission tracking	± 0.153	± 0.052	± 0.17

Transmission uncertainty (specification)



Reflection uncertainty (specification)



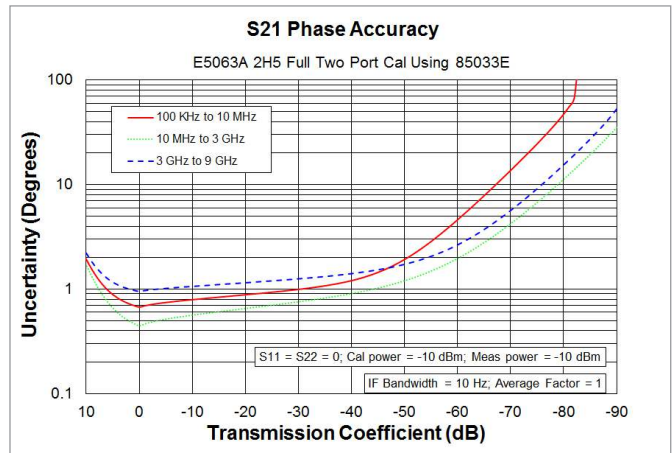
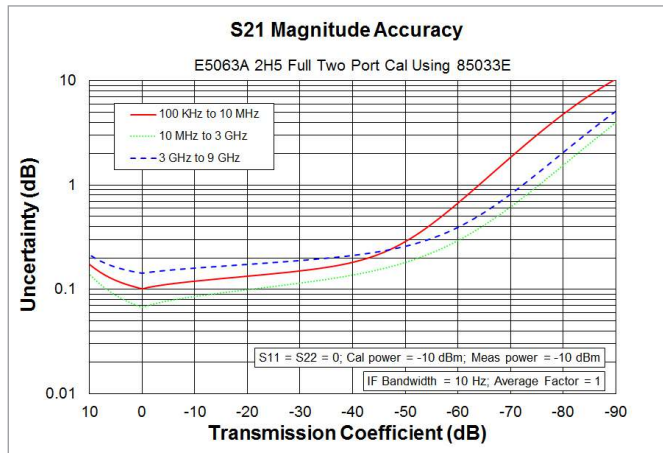
Corrected system performance with 3.5 mm device connector type, 85033E calibration kit

Network analyzer : E5063A
 Calibration kit : 85033E (3.5 mm, 50 Ω)
 Calibration : Full 2-port

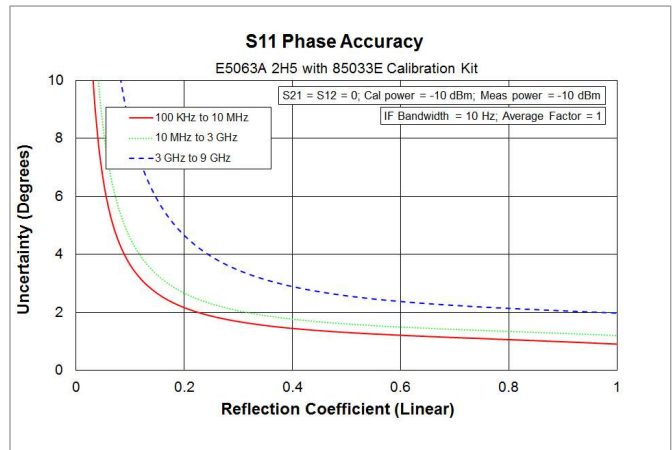
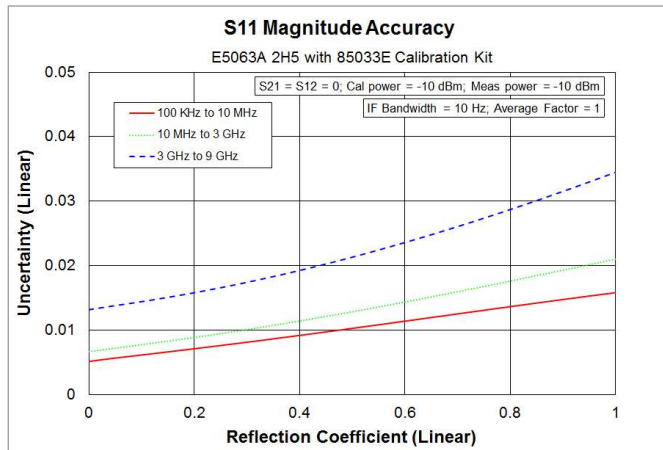
IF bandwidth = 10 Hz, no averaging applied to data, environmental temperature = 23 °C (± 5 °C) with < 1 °C deviation from calibration temperature, isolation calibration performed

Description	Specification (dB)		
	100 kHz to 10 MHz	10 MHz to 3 GHz	3 to 9 GHz
Directivity	46	44	38
Source match	43	40	36
Load match	45	44	38
Reflection tracking	± 0.006	± 0.007	± 0.010
Transmission tracking	± 0.077	± 0.040	± 0.112

Transmission uncertainty (specification)



Reflection uncertainty (specification)



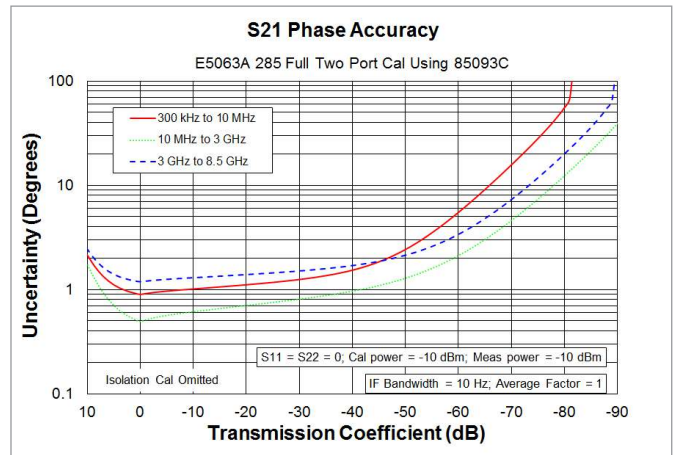
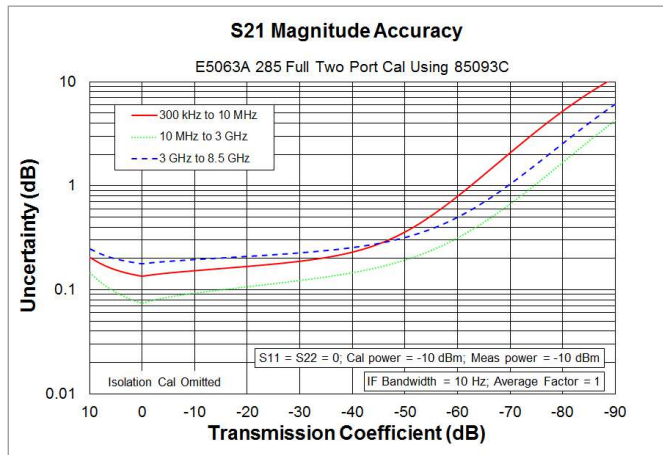
Corrected system performance with 3.5 mm device connector type, 85093C electronic calibration (ECal) module

Network analyzer : E5063A
 Calibration kit : 85093C (3.5 mm, 50 Ω) Electronic calibration (ECal) module
 Calibration : Full 2-port

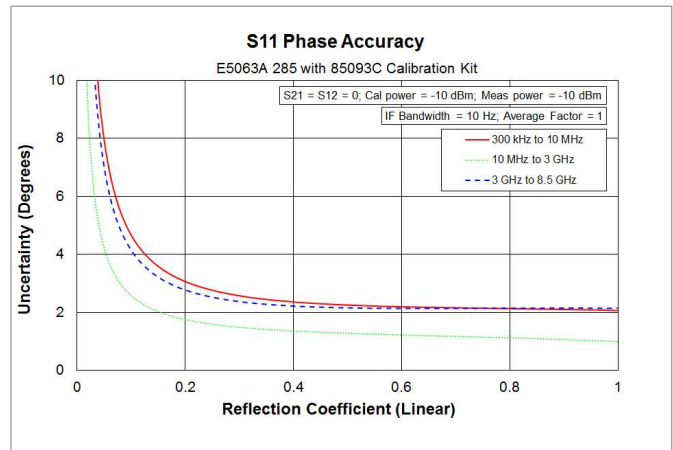
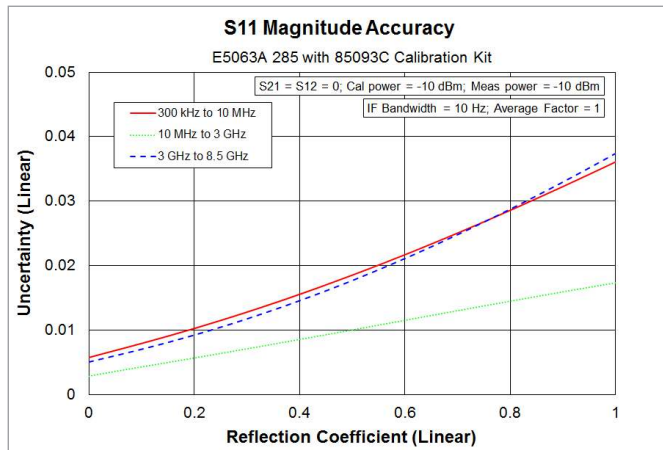
IF bandwidth = 10 Hz, no averaging applied to data, environmental temperature = 23 °C (± 5 °C) with < 1 °C deviation from calibration temperature, isolation calibration is not performed

Description	Specification (dB)		
	300 kHz to 10 MHz	10 MHz to 3 GHz	3 to 9 GHz
Directivity	45	52	47
Source match	36	44	34
Load match	36	45	39
Reflection tracking	± 0.100	± 0.040	± 0.070
Transmission tracking	± 0.156	± 0.047	± 0.155

Transmission uncertainty (specification)



Reflection uncertainty (specification)



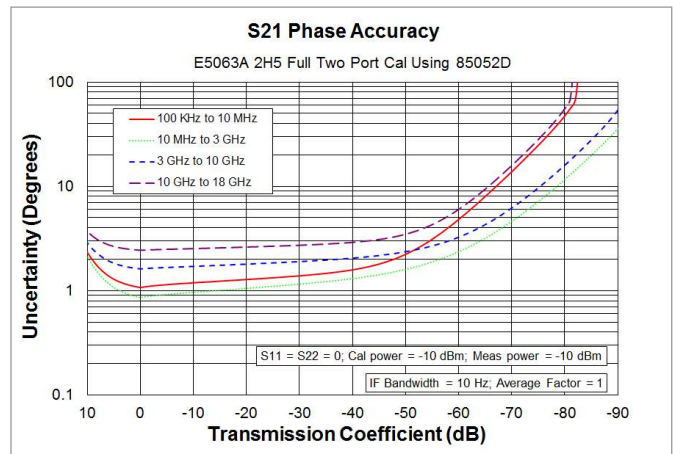
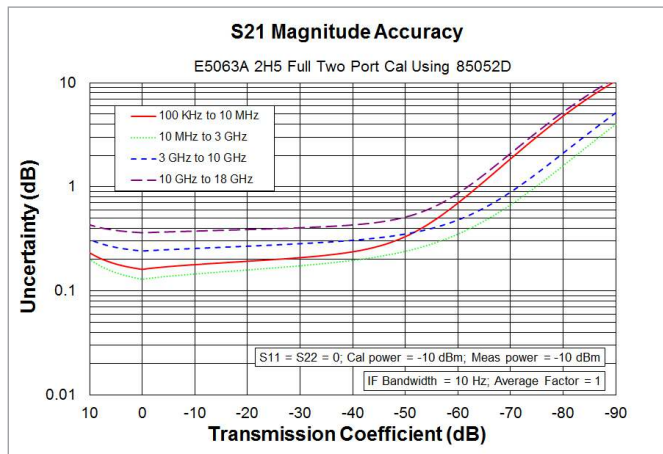
Corrected system performance with 3.5 mm device connector type, 85052D calibration kit

Network analyzer : E5063A
 Calibration kit : 85052D (3.5 mm, 50 Ω)
 Calibration : Full 2-port

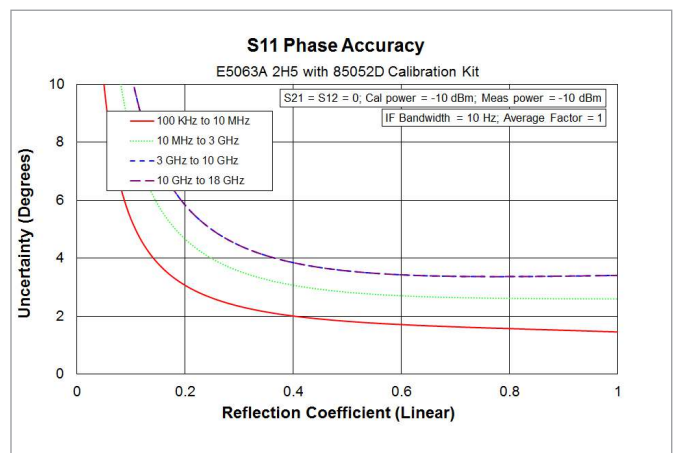
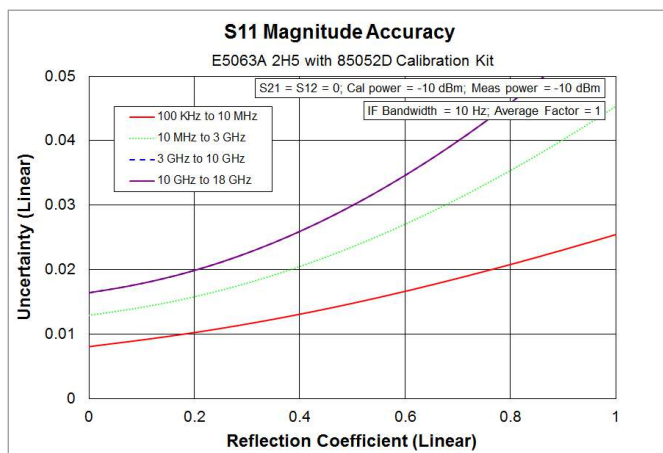
IF bandwidth = 10 Hz, no averaging applied to data, environmental temperature = 23 °C (± 5 °C) with < 1 °C deviation from calibration temperature, isolation calibration performed

Description	Specification (dB)			
	100 kHz to 10 MHz	10 MHz to 3 GHz	3 to 10 GHz	10 to 18 GHz
Directivity	42	38	36	36
Source match	37	31	28	28
Load match	42	38	36	36
Reflection tracking	± 0.003	± 0.004	± 0.008	± 0.008
Transmission tracking	± 0.136	± 0.100	± 0.208	± 0.328

Transmission uncertainty (specification)



Reflection uncertainty (specification)



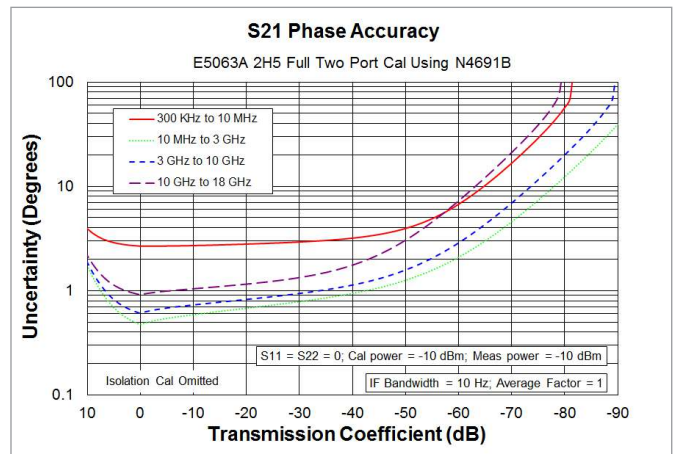
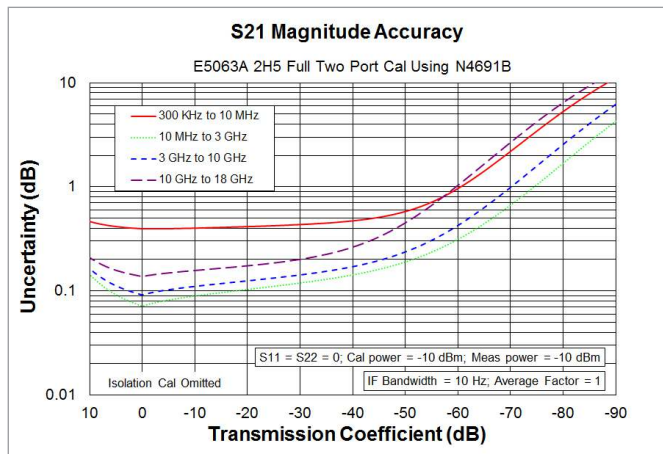
Corrected system performance with 3.5 mm device connector type, N4691B electronic calibration (ECal) module

Network analyzer : E5063A
 Calibration kit : N4691B (3.5 mm, 50 Ω) Electronic calibration (ECal) module
 Calibration : Full 2-port

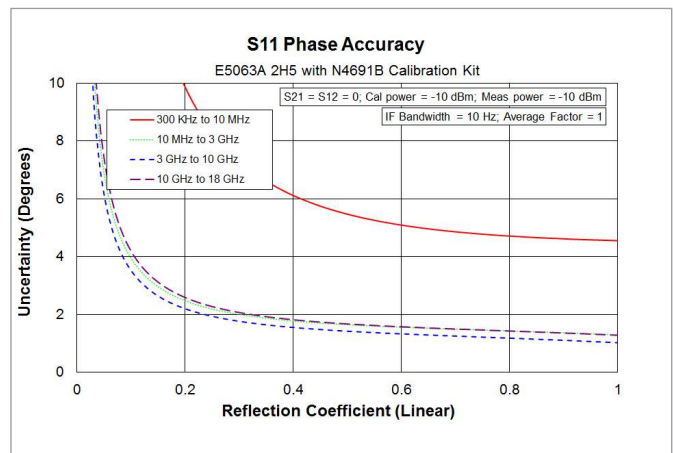
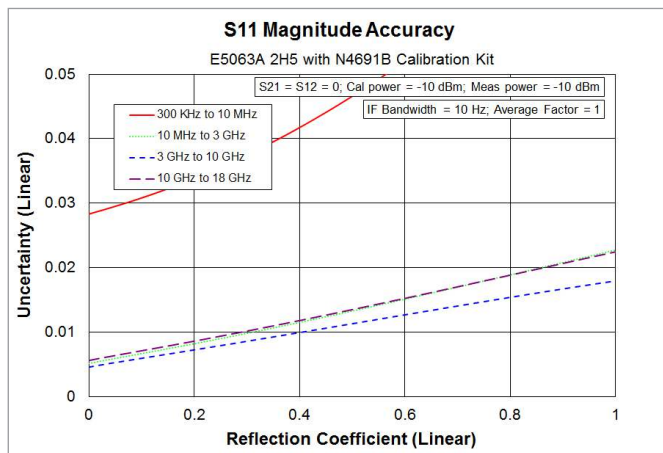
IF bandwidth = 10 Hz, no averaging applied to data, environmental temperature = 23 °C (± 5 °C) with < 1 °C deviation from calibration temperature, isolation calibration is not performed

Description	Specification (dB)			
	300 kHz to 10 MHz	10 MHz to 3 GHz	3 to 10 GHz	10 to 18 GHz
Directivity	31	46	48	46
Source match	29	41	45	42
Load match	27	42	42	39
Reflection tracking	± 0.110	± 0.050	± 0.030	± 0.040
Transmission tracking	± 0.358	± 0.046	± 0.062	± 0.107

Transmission uncertainty (specification)



Reflection uncertainty (specification)



Uncorrected System Performance

User correction: OFF

System error correction: ON

Description	Specification (dB)							
	100 kHz to 300 kHz	300 kHz to 1 MHz	1 to 100 MHz	100 MHz to 3 GHz	3 to 6 GHz	6 to 10 GHz	10 to 13 GHz	13 to 18 GHz
Directivity	10 dB	10 dB	25 dB	25 dB	20 dB	15dB	10 dB	10 dB
Source match	20 dB	20 dB	25 dB	25 dB	20 dB	15dB	15 dB	15 dB
Load match	7 dB (typ.)	11 dB (typ.)	14 dB	11 dB	10 dB	7dB	8 dB (typ.)	6 dB (typ.)
Reflection tracking	± 3.0 dB	± 3.0 dB	± 1.0 dB	± 1.0 dB	± 1.0 dB	± 1.0 dB	± 1.0 dB	± 1.0 dB
Transmission tracking	± 3.0 dB	± 3.0 dB	± 1.0 dB	± 1.0 dB	± 1.0 dB	± 1.0 dB	± 1.0 dB	± 1.0 dB

Test Port Output (Source)

Test port output frequency

Description	Specification	Typical
Frequency range		
Option 245	100 kHz to 4.5 GHz	
Option 285	100 kHz to 8.5 GHz	
Option 2H5	100 kHz to 18 GHz	
Resolution	1 Hz (100 kHz to 6.5 GHz) 2 Hz (6.5 to 13 GHz) 11 Hz (13 to 18 GHz)	
Source stability		± 7 ppm (5 to 40 °C)
CW accuracy	± 7 ppm	

Test port output power

Description	Specification	Typical
Nominal power (preset power)	-5 dBm	
Range		
100 kHz to 300 kHz	-20 to -5 dBm	
300 kHz to 8.5 GHz	-20 to 0 dBm	
8.5 to 18 GHz	-15 to -5 dBm	
Resolution	0.05 dB	
Level accuracy		
At 50 MHz, -5 dBm, absolute		± 0.9 dB
(level flatness) ¹		
100 kHz to 300 kHz		± 3.7 dB
300 kHz to 1 MHz		± 2.0 dB
1 MHz to 4.34 GHz		± 1.0 dB
4.34 to 8.5 GHz		± 1.6 dB
8.5 to 12 GHz		± 3.6 dB
12 to 18 GHz		± 5.8 dB
Level linearity ²		
-10 to -5 dBm, 100 kHz to 300 kHz		± 1.6 dB
-10 to 0 dBm, 300 kHz to 8.5 GHz		± 1.6 dB
-10 to -5 dBm, 8.5 to 18 GHz		± 1.8 dB
-20 to -10 dBm, 100 kHz to 8.5 GHz		± 2.7 dB
-15 to -10 dBm, 8.5 to 18 GHz		± 2.9 dB

1. Level accuracy of other frequencies is taken at -5 dBm, relative to 50 MHz reference unless otherwise stated. Level accuracy includes averaged total (non-)harmonics power. Its transient factor is not included.

2. Level linearity given is relative to -5 dBm unless otherwise stated. Level linearity includes averaged total (non-) harmonics power. The level accuracy needs to be taken into account for test port output power level. Its transient factor is not included.

Test Port Input

Description	Specification	Typical
Test port input level		
Maximum input level	+6 dBm	
Damage level		+26 dBm or ± 35 VDC
Crosstalk		
100 kHz to 300 kHz	-88 dB	
300 kHz to 8.5 MHz	-93 dB	
8.5 MHz to 4.34 GHz	-115 dB	
4.34 to 6 GHz	-105 dB	
6 to 13 GHz	-100 dB	
13 to 16 GHz	-90 dB	
16 to 18 GHz	-85 dB	
Test Port Noise Floor		
100 kHz to 8.5 MHz	-103 dBm/Hz	
8.5 to 100 MHz	-126 dBm/Hz	
100 MHz to 4.34 GHz	-127 dBm/Hz	
4.34 to 8.5 GHz	-116 dBm/Hz	
8.5 to 13 GHz	-115 dBm/Hz	
13 to 16 GHz	-105 dBm/Hz	
16 to 18 GHz	-102 dBm/Hz	
Compression level (at maximum test port input level = +6 dBm)		
Magnitude		
100 kHz to 1 MHz		± 0.2 dB
1 MHz to 4.34 GHz		± 0.2 dB
4.34 to 13 GHz		± 0.2 dB
13 to 18 GHz		± 0.2 dB
Phase		
100 kHz to 1 MHz		± 5 deg.
1 MHz to 4.34 GHz		± 1.5 deg.
4.34 to 13 GHz		± 6 deg.
13 to 18 GHz		± 10 deg.

Trace noise

Description	Specification	Typical
(at maximum output power level of sweep range)		
Magnitude		
Transmission:		
100 kHz to 300 kHz, 3 kHz IFBW	8 mdB rms	5 mdB rms
300 kHz to 8.5 MHz, 3 kHz IFBW	6 mdB rms	3 mdB rms
8.5 MHz to 4.34 GHz, 70 kHz IFBW	5 mdB rms	2 mdB rms
4.34 to 8.5 GHz, 70 kHz IFBW	10 mdB rms	5 mdB rms
8.5 to 13 GHz, 70 kHz IFBW	15 mdB rms	8 mdB rms
13 to 16 GHz, 70 kHz IFBW	25 mdB rms	15 mdB rms
16 to 18 GHz, 70 kHz IFBW	30 mdB rms	20 mdB rms
Reflection:		
100 kHz to 300 kHz, 3 kHz IFBW	16 mdB rms	7 mdB rms
300 kHz to 8.5 MHz, 3 kHz IFBW	10 mdB rms	4 mdB rms
8.5 MHz to 4.34 GHz, 70 kHz IFBW	9 mdB rms	3 mdB rms
4.34 to 8.5 GHz, 70 kHz IFBW	20 mdB rms	10 mdB rms
8.5 to 13 GHz, 70 kHz IFBW	30 mdB rms	18 mdB rms
13 to 16 GHz, 70 kHz IFBW	35 mdB rms	20 mdB rms
16 to 18 GHz, 70 kHz IFBW	45 mdB rms	30 mdB rms
Phase		
Transmission:		
100 kHz to 300 kHz, 3 kHz IFBW	0.05 deg rms	0.03 deg rms
300 kHz to 8.5 MHz, 3 kHz IFBW	0.04 deg rms	0.02 deg rms
8.5 MHz to 4.34 GHz, 70 kHz IFBW	0.035 deg rms	0.015 deg rms
4.34 to 8.5 GHz, 70 kHz IFBW	0.066 deg rms	0.04 deg rms
8.5 to 13 GHz, 70 kHz IFBW	0.1 deg rms	0.06 deg rms
13 to 16 GHz, 70 kHz IFBW	0.17 deg rms	0.1 deg rms
16 to 18 GHz, 70 kHz IFBW	0.2 deg rms	0.13 deg rms
Reflection:		
100 kHz to 300 kHz, 3 kHz IFBW	0.1 deg rms	0.05 deg rms
300 kHz to 8.5 MHz, 3 kHz IFBW	0.066 deg rms	0.03 deg rms
8.5 MHz to 4.34 GHz, 70 kHz IFBW	0.06 deg rms	0.02 deg rms
4.34 to 8.5 GHz, 70 kHz IFBW	0.13 deg rms	0.07 deg rms
8.5 to 13 GHz, 70 kHz IFBW	0.2 deg rms	0.12 deg rms
13 to 16 GHz, 70 kHz IFBW	0.23 deg rms	0.14 deg rms
16 to 18 GHz, 70 kHz IFBW	0.3 deg rms	0.2 deg rms

Stability¹

Description	Specification	Typical
Magnitude		
Transmission:		
100 kHz to 300 kHz		± 0.02 dB/°C
300 kHz to 6 GHz		± 0.01 dB/°C
6 to 12 GHz		± 0.025 dB/°C
12 to 18 GHz		± 0.04 dB/°C
Reflection:		
100 kHz to 300 kHz		± 0.02 dB/°C
300 kHz to 6 GHz		± 0.02 dB/°C
6 to 12 GHz		± 0.035 dB/°C
12 to 18 GHz		± 0.05 dB/°C
Phase		
Transmission:		
100 kHz to 300 kHz		± 0.4 deg/°C
300 kHz to 6 GHz		± 0.2 deg/°C
6 to 12 GHz		± 0.5 deg/°C
12 to 18 GHz		± 0.6 deg/°C
Reflection:		
100 kHz to 300 kHz		± 0.4 deg/°C
300 kHz to 6 GHz		± 0.2 deg/°C
6 to 12 GHz		± 0.5 deg/°C
12 to 18 GHz		± 0.6 deg/°C

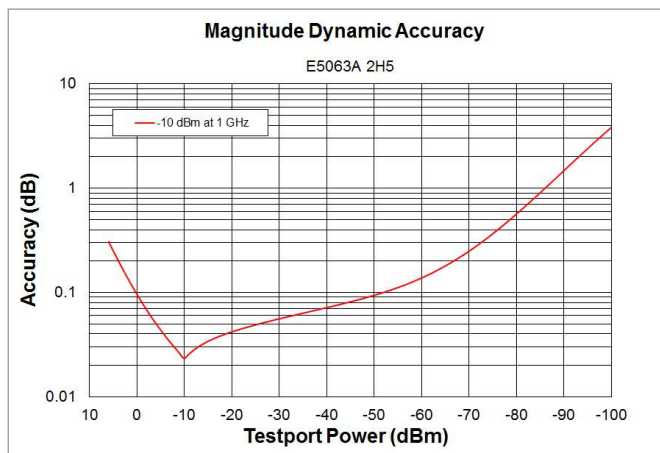
1. Stability is defined as a ratio measurement at the test port.

Dynamic accuracy¹

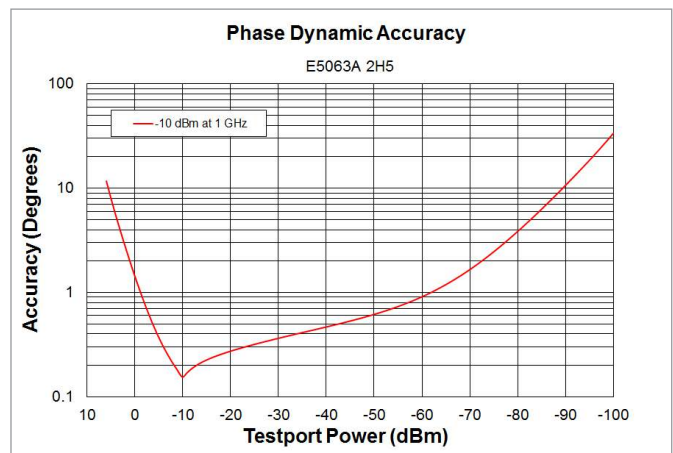
Description	Specification	Typical
Magnitude		
6 dBm	± 0.31 dB	
-30 dBm	± 0.056 dB	
-100 dBm	± 3.83 dB	
-110 dBm		± 5.00 dB
Phase		
6 dBm	± 11.8 deg	
-30 dBm	± 0.37 deg	
-100 dBm	± 33.6 deg	

1. Accuracy of the test port input power reading is relative to -10 dBm reference input power level.

Magnitude



Phase



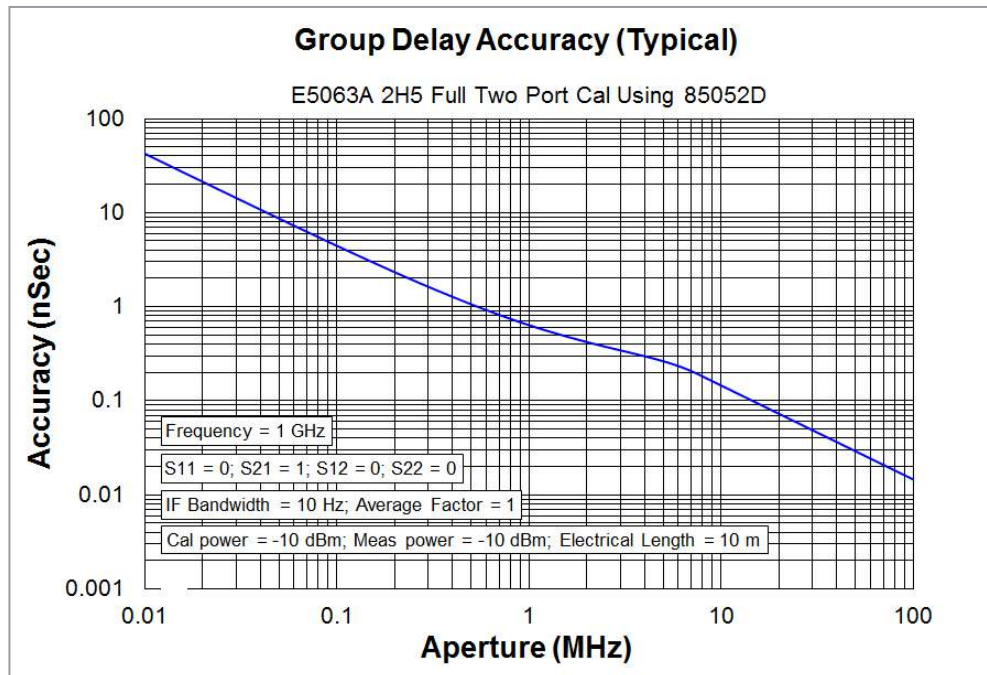
Group delay¹

Description	Specification	Typical
Aperture (selectable)	(frequency span)/(number of points - 1)	
Maximum aperture	25% of frequency span	
Minimum delay		Limited to measuring no more than 180° of phase change within the minimum aperture.
Accuracy		See graph below (typical)

1. Group delay is computed by measuring the phase change within a specified step (determined by the frequency span and the number of points per sweep).

The following graph shows group delay accuracy with 3.5 mm connectors, full 2-port calibration and a 10 Hz IF bandwidth.

- Calibration kit (85052D).
- Insertion loss is assumed to be < 2 dB.



In general, the following formula can be used to determine the accuracy, in seconds, of a specific group delay measurement:
 $\pm \text{phase accuracy (degrees)} / [360 \times \text{aperture (Hz)}]$

General Information

Description	General characteristics
System bandwidth Range	10, 15, 20, 30, 40, 50, 70, 100, 150, 200, 300, 400, 500, 700, 1 kHz, 1.5 kHz, 2 kHz, 3 kHz, 4 kHz, 5 kHz, 7 kHz, 10 kHz, 15 kHz, 20 kHz, 30 kHz, 40 kHz, 50 kHz, 70 kHz, 100 kHz, 150 kHz, 200 kHz, 300 kHz

Front panel

Description	Typical	General characteristics
Test ports		Type-N, female, 50 Ω (nominal)
Display Type Resolution		10.4 inch TFT color LCD with touch screen XGA (1024 x 768) ¹
USB host port		Universal serial bus jack, type A configuration, female; provides connection to mouse, keyboard, printer, ECal module, USB coaxial switch, or USB/GPIB interface

1. Valid pixels are 99.99 % and more. Below 0.01 % (approx. 30 points) of fixed points of black, blue, green or red are not regarded as failure.







Rear panel

Description	Typical	General characteristics
External trigger input connector Type Input level Pulse width Polarity		BNC, female Low threshold voltage: 0.5 V High threshold voltage: 2.1 V Input level range: 0 to + 5 V $\geq 2 \mu\text{sec}$ Positive or negative
External trigger output connector Type Maximum output current Output level Pulse width Polarity		BNC, female 50 mA Low level voltage: 0 V High level voltage: 5 V 1 μsec to 1 sec (adjustable) Positive or negative
External reference signal input connector Type Input frequency Input level	10 MHz \pm 10 ppm 0 dBm to \pm 3 dB	BNC, female
Internal reference signal output connector Type Output frequency Signal type Output level Output impedance	10 MHz \pm 7 ppm Sinewave 0 dBm \pm 3 dB into 50 Ω	BNC, female 50 Ω

Description	Typical	General characteristics
Video output		15-pin mini D-Sub, female; drives VGA compatible monitors
GPIB		24-pin D-Sub (Type D-24), female; compatible with IEEE-488
USB host port		Universal serial bus jack, type A configuration, female; provides connection to mouse, keyboard, printer, ECal module, USB coaxial switch, or USB/GPIB interface
USB (USBTMC ¹) interface port		Universal serial bus jack, type B configuration (4 contacts inline), female; provides connection to an external PC; compatible with USBTMC-USB488 and USB 2.0.LA
LAN		10/100/1000 BaseT Ethernet, 8-pin configuration; auto selects among the three data rates
Handler I/O port		36-pin Centronics, female; provides connection to handler system
Line Power ²		
Frequency		47 to 63 Hz
Voltage		90 to 132 VAC, or 198 to 264 VAC (automatically switched)
VA max		300 VA max
Power consumption ³	120 W	

1. USB Test and Measurement Class (TMC) interface that communicates over USB, complying with the IEEE 488.1 and IEEE 488.2 standards.
2. A third-wire ground is required.
3. At preset condition. No application running other than the E5063A on windows.

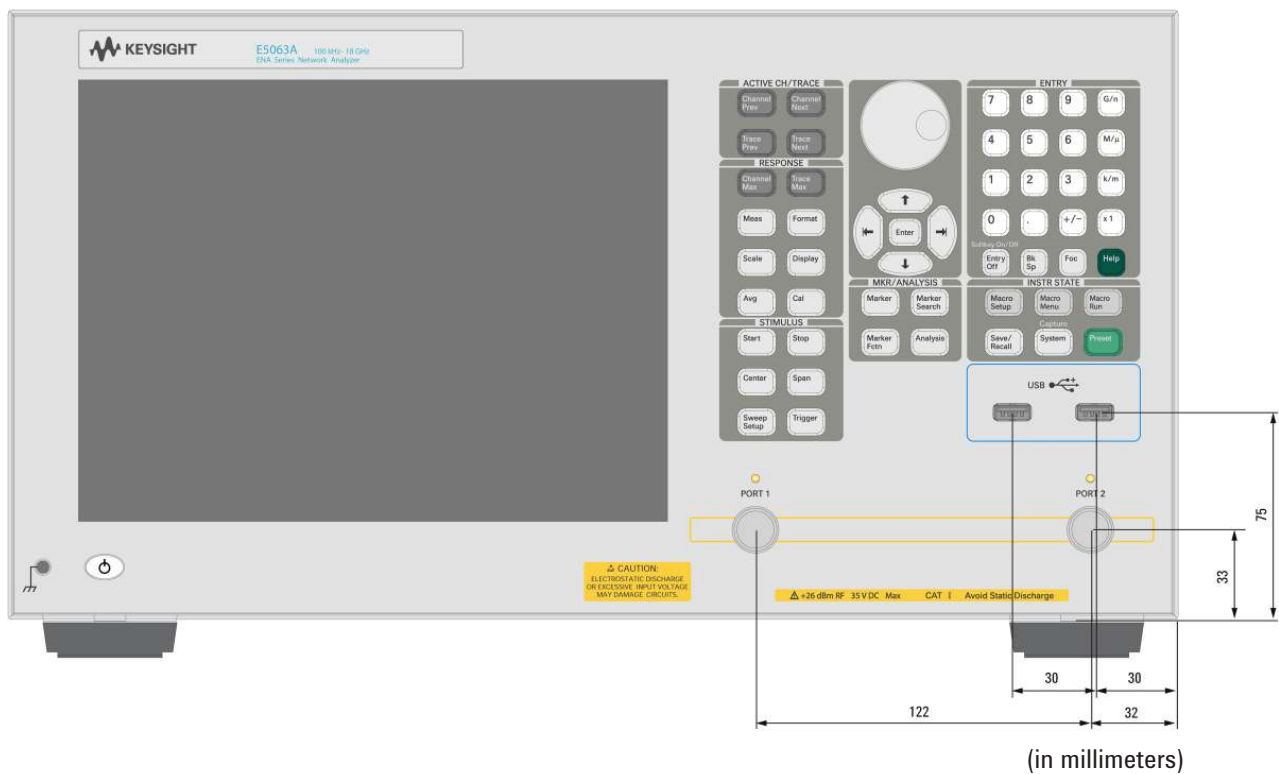
EMC, safety, environment and compliance

Description	General characteristics
EMC	
 ISM 1-A	European Council Directive 2004/108/EC IEC 61326-1:2005 EN 61326-1:2006 CISPR 11:2003+A1:2004 EN 55011:2007 Group 1, Class A IEC 61000-4-2:1995 +A2:2000 EN 61000-4-2:1995 +A2:2001 4 kV CD/8 kV AD IEC 61000-4-3:2006 EN 61000-4-3:2006 1-3 V/m, 80-1000 MHz/1.4 GHz - 2.7 GHz, 80% AM IEC 61000-4-4:2004 EN 61000-4-4:2004 1 kV power lines/0.5 kV signal lines IEC 61000-4-5:2005 EN 61000-4-5:2006 0.5 kV line-line/1 kV line-ground IEC 61000-4-6:2003 + A1:2004+ A2:2006 EN 61000-4-6:2007 3 V, 0.15-80 MHz, 80% AM IEC 61000-4-11:2004 EN 61000-4-11:2004 0.5-300 cycle, 0%/70%
ICES/NMB-001	ICES-001:2006 Group 1, Class A
	AS/NZS CISPR11:2004 Group 1, Class A
Safety	
 ISM 1-A	European Council Directive 2006/95/EC IEC 61010-1:2001/EN 61010-1:2001 Measurement Category I Pollution Degree 2 Indoor Use
	CAN/CSA C22.2 No. 61010-1-12 Measurement Category I Pollution Degree 2 Indoor Use
Environment	
	<p>This product complies with the WEEE Directive (2002/96/EC) marking requirements. The affixed label indicates that you must not discard this electrical/electronic product in domestic household waste.</p> <p>Product Category: With reference to the equipment types in the WEEE Directive Annex I, this product is classed as a "Monitoring and Control instrumentation" product.</p> <p>Do not dispose in domestic household waste. To return unwanted products, contact your local Agilent office, or see http://www.keysight.com/environment/product/ for more information.</p>
Compliance	
	Class C

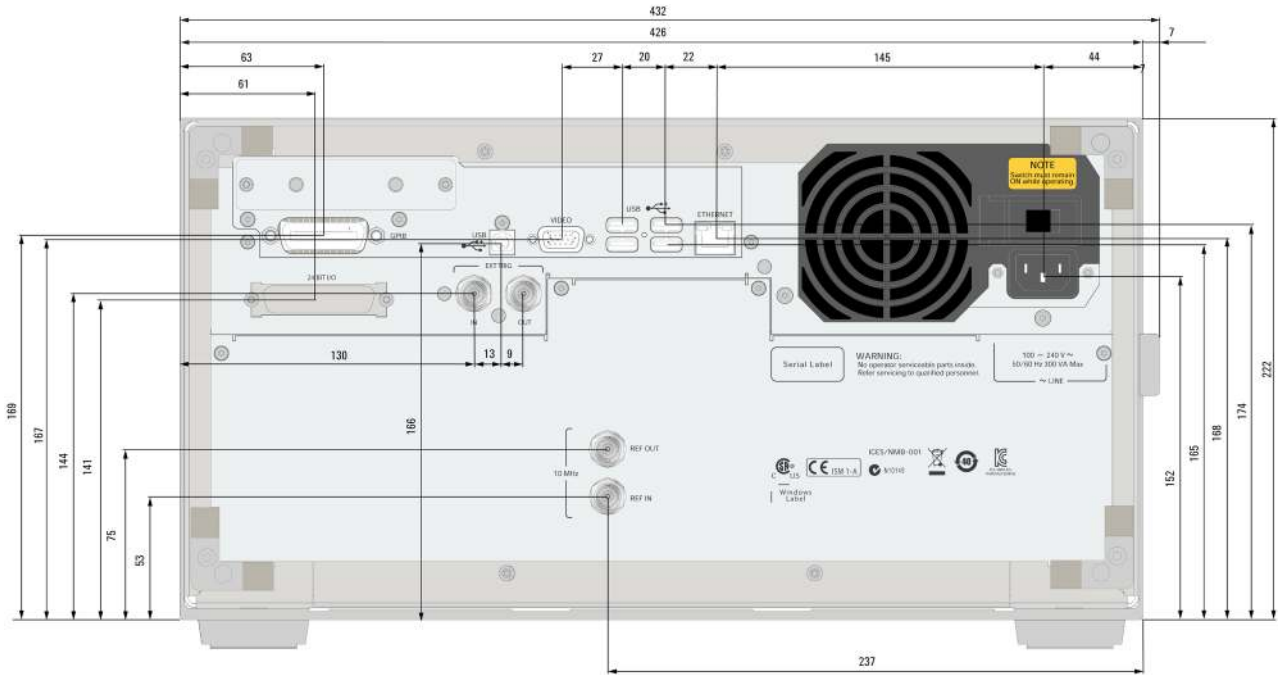
Analyzer environmental specifications and dimensions

Description	General characteristics
Operating environment	
Temperature	+5 °C to +40 °C
Error-corrected temperature range	23 °C (± 5 °C) with < 1 °C deviation from calibration temperature
Humidity	20% to 80% at wet bulb temperature < +29 °C (non-condensation)
Altitude	0 to 2,000 m (0 to 6561 feet)
Vibration	0.21 G maximum, 5 Hz to 500 Hz
Non-operating environment	
Temperature	-10 °C to +60 °C
Humidity	20% to 90% at wet bulb temperature < +40 °C (non-condensation)
Altitude	0 to 4,572 m (0 to 15,000 feet)
Vibration	0.5 G maximum, 5 to 500 Hz
Dimensions	See below
Weight (net)	11 kg

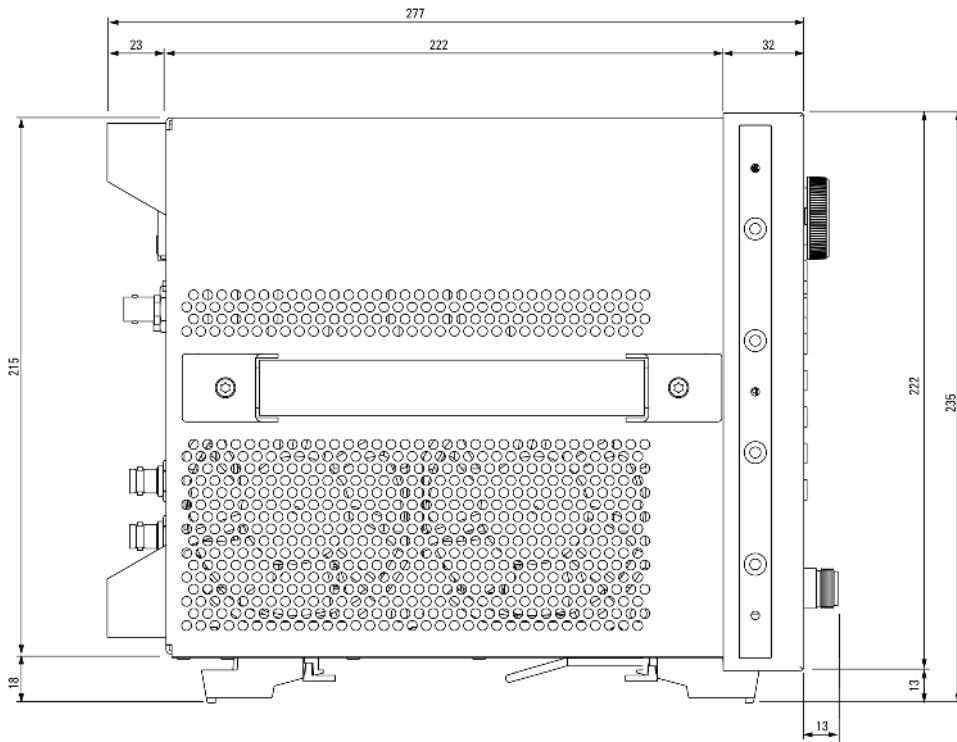
Dimensions (front view)



Dimensions (rear view)



Dimensions (side view)



(in millimeters)

Measurement Throughput Summary

Measurement throughput data is typical performance data. Common condition for the measurement throughput data:

- Analyzer display turned off with: DISP : ENAB OFF
- Number of traces = 1
- firmware version: A.01.0x

Cycle time for measurement completion

Number of Points	300 kHz IF bandwidth				30 kHz IF bandwidth				1 kHz IF bandwidth			
	51	201	401	1601	51	201	401	1601	51	201	401	1601
Start 1 GHz, stop 1.2 GHz												
1-port cal, S11	4	9	14	43	6	15	26	89	53	201	398	1575
Response cal, S21	4	10	16	50	7	21	39	142	102	394	784	3114
2-port cal, S21	8	19	31	99	14	42	78	283	203	788	1566	6226
Start 100 kHz, stop 4.5 GHz												
1-port cal, S11	8	17	26	71	10	23	37	117	57	209	409	1603
Response cal, S21	9	18	27	78	12	29	51	170	106	402	795	3141
2-port cal, S21	16	34	54	154	22	57	101	339	212	804	1589	6282
Start 100 kHz, stop 8.5 GHz												
1-port cal, S11	11	20	28	73	13	26	40	120	60	212	412	1606
Response cal, S21	12	21	30	80	15	32	53	173	109	405	798	3144
2-port cal, S21	23	41	60	159	28	64	106	344	218	810	1595	6287
Start 11 GHz, stop 12 GHz												
1-port cal, S11	4	9	16	47	6	15	27	93	53	202	399	1579
Response cal, S21	5	10	17	53	8	22	40	146	102	395	785	3117
2-port cal, S21	8	20	33	106	14	43	80	291	204	789	1568	6234
Start 8 GHz, stop 18 GHz												
1-port cal, S11	10	17	24	64	12	23	36	111	59	209	408	1596
Response cal, S21	11	18	26	71	14	29	49	163	108	402	793	3135
2-port cal, S21	21	34	51	141	26	58	97	326	216	804	1586	6268
Start 100 kHz, stop 18 GHz												
1-port cal, S11	15	25	34	80	16	30	45	126	64	217	417	1612
Response cal, S21	15	26	35	86	18	37	59	179	113	410	803	3151
2-port cal, S21	29	50	70	172	35	74	116	357	224	820	1605	6300

Unit: ms

Data transfer time^{1, 2}

	Number of Points			
	51	201	401	1601
SCPI over GPIB				
64-bit floating point	4	12	23	88
32-bit floating point	3	7	12	45
ASCII	10	37	73	289
SCPI over 100 Mbps LAN (Socket)				
REAL 64	1	1	1	2
REAL 32	1	1	1	2
ASCII	6	22	42	160
SCPI over 100 Mbps LAN (SICL-LAN)				
REAL 64	4	4	4	5
REAL 32	4	4	4	5
ASCII	4	6	10	30
SCPI over 100 Mbps LAN (SICL-USB)				
REAL 64	2	2	3	3
REAL 32	2	2	3	3
ASCII	3	7	13	50
SCPI over GPIB/USB (82357B)				
REAL 64	9	16	26	86
REAL 32	8	12	17	46
ASCII	75	283	563	2242

1. Transferred complex S11 data, using :CALC:DATA:FDAT?.
2. Data transfer time varies depending on the type of PC and control software.

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