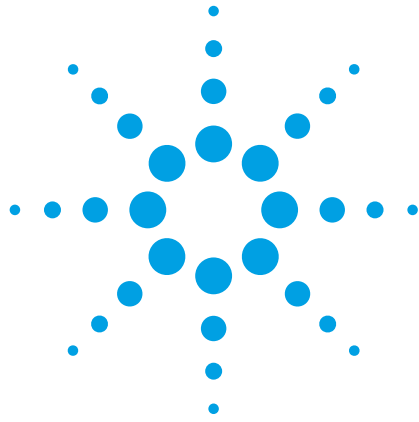


[ Obsolete product ]

Agilent has a new name

Keysight Technologies.

Keysight Technologies Inc. is the world's leading electronic measurement company, transforming today's measurement experience through innovations in wireless, modular, and software solutions. With its HP and Agilent legacy, Keysight delivers solutions in wireless communications, aerospace and defense and semiconductor markets with world-class platforms, software and consistent measurement science.



## Agilent E5071C ENA Network Analyzer

- 9 kHz to 4.5/6.5/8.5 GHz
- 100 kHz to 4.5/6.5/8.5 GHz (with bias tees)
- 300 kHz to 14/20 GHz (with bias tees)

## E5091A Multiport Test Set

## E5092A Configurable Multiport Test Set

Data Sheet



**Agilent Technologies**

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## Options

This document provides technical specifications for the E5071C ENA network analyzer and the E5091A multiport test set.

|            |                                                                  |
|------------|------------------------------------------------------------------|
| E5071C-230 | 2-port test set, 9 kHz to 3 GHz without bias tees (Discontinued) |
| E5071C-235 | 2-port test set, 100 kHz to 3 GHz with bias tees (Discontinued)  |
| E5071C-240 | 2-port test set, 9 kHz to 4.5 GHz without bias tees              |
| E5071C-245 | 2-port test set, 100 kHz to 4.5 GHz with bias tees               |
| E5071C-260 | 2-port test set, 9 kHz to 6.5 GHz without bias tees              |
| E5071C-265 | 2-port test set, 100 kHz to 6.5 GHz with bias tees               |
| E5071C-280 | 2-port test set, 9 kHz to 8.5 GHz without bias tees              |
| E5071C-285 | 2-port test set, 100 kHz to 8.5 GHz with bias tees               |
| E5071C-430 | 4-port test set, 9 kHz to 3 GHz without bias tees (Discontinued) |
| E5071C-435 | 4-port test set, 100 kHz to 3 GHz with bias tees (Discontinued)  |
| E5071C-440 | 4-port test set, 9 kHz to 4.5 GHz without bias tees              |
| E5071C-445 | 4-port test set, 100 kHz to 4.5 GHz with bias tees               |
| E5071C-460 | 4-port test set, 9 kHz to 6.5 GHz without bias tees              |
| E5071C-465 | 4-port test set, 100 kHz to 6.5 GHz with bias tees               |
| E5071C-480 | 4-port test set, 9 kHz to 8.5 GHz without bias tees              |
| E5071C-485 | 4-port test set, 100 kHz to 8.5 GHz with bias tees               |
| E5071C-2D5 | 2-port test set, 300 kHz to 14 GHz with bias tees                |
| E5071C-4D5 | 4-port test set, 300 kHz to 14 GHz with bias tees                |
| E5071C-2K5 | 2-port test set, 300 kHz to 20 GHz with bias tees                |
| E5071C-4K5 | 4-port test set, 300 kHz to 20 GHz with bias tees                |
| E5091A     | Multiport test set                                               |
| E5092A     | Configurable multiport test set                                  |

## Calibration kits and ECal modules

This E5071C 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.agilent.com/find/na\\_calculator](http://www.agilent.com/find/na_calculator) to generate the curves for your calibration kit and enable ENA setup.

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

## Definitions

### Specification (spec.):

Warranted performance. All specifications apply at 23 °C ( $\pm 5$  °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.

---

Supplemental information is intended to provide information that is helpful for using the instrument but that is not guaranteed by the product warranty.

### Typical (typ.):

Describes performance that will be met by a minimum of 80% of all products. It is not guaranteed by the product warranty.

### Supplemental performance data (SPD):

Supplemental performance data represents the value of a parameter that is most likely to occur; the expected mean or average. It is not guaranteed 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 98 dB with the following boundary conditions.

**Option:** 485

**Frequency:** 10 MHz

**IF bandwidth:** 3 kHz

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

## Corrected System Performance

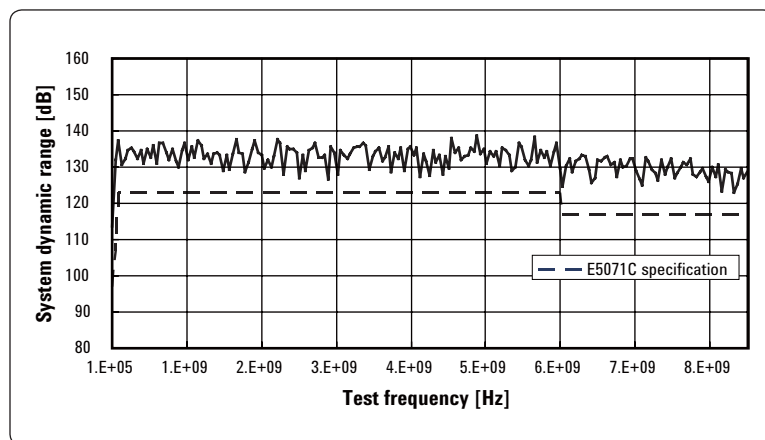
The specifications in this section apply to measurements made with the Agilent E5071C network analyzer under the following conditions:

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

### System dynamic range

**Table 1.** Option 230/235/240/245/260/265/280/285/430/435/440/445/460/465/480/485

| Description                                | Specification        | SPD    |
|--------------------------------------------|----------------------|--------|
| <b>System dynamic range<sup>1, 2</sup></b> |                      |        |
| 9 kHz to 300 kHz                           | IF bandwidth = 3 kHz |        |
| 300 kHz to 10 MHz                          |                      |        |
| 10 MHz to 6 GHz                            |                      |        |
| 6 GHz to 8.5 GHz                           |                      |        |
| 9 kHz to 300 kHz                           | IF bandwidth = 10 Hz | 115 dB |
| 300 kHz to 10 MHz                          |                      | 115 dB |
| 10 MHz to 6 GHz                            |                      | 130 dB |
| 6 GHz to 7 GHz                             |                      | 128 dB |
| 7 GHz to 8 GHz                             |                      | 126 dB |
| 8 GHz to 8.5 GHz                           |                      | 124 dB |



**Figure 1.** System dynamic range (specification and actual measurement data example, IF bandwidth 10 Hz)

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.
2. The specification might not be met at 5 MHz or 50 MHz.

System dynamic range (continued)

Table 2. Option 2D5/2K5/4D5/4K5

| Description                          |                      | Specification | SPD    |
|--------------------------------------|----------------------|---------------|--------|
| System dynamic range <sup>1, 2</sup> |                      |               |        |
| 300 kHz to 1 MHz                     | IF bandwidth = 3 kHz | 70 dB         |        |
| 1 MHz to 10 MHz                      |                      | 82 dB         |        |
| 10 MHz to 100 MHz                    |                      | 95 dB         |        |
| 100 MHz to 6 GHz                     |                      | 98 dB         |        |
| 6 GHz to 8.5 GHz                     |                      | 92 dB         |        |
| 8.5 GHz to 10.5 GHz                  |                      | 80 dB         |        |
| 10.5 GHz to 15 GHz                   |                      | 75 dB         |        |
| 15 GHz to 20 GHz                     |                      | 71 dB         |        |
| 300 kHz to 1 MHz                     | IF bandwidth = 10 Hz | 95 dB         | 105 dB |
| 1 MHz to 10 MHz                      |                      | 107 dB        | 115 dB |
| 10 MHz to 100 MHz                    |                      | 120 dB        | 129 dB |
| 100 MHz to 6 GHz                     |                      | 123 dB        | 130 dB |
| 6 GHz to 8 GHz                       |                      | 117 dB        | 129 dB |
| 8 GHz to 8.5 GHz                     |                      | 117 dB        | 127 dB |
| 8.5 GHz to 10.5 GHz                  |                      | 105 dB        | 115 dB |
| 10.5 GHz to 15 GHz                   |                      | 100 dB        | 111 dB |
| 15 GHz to 20 GHz                     |                      | 96 dB         | 105 dB |

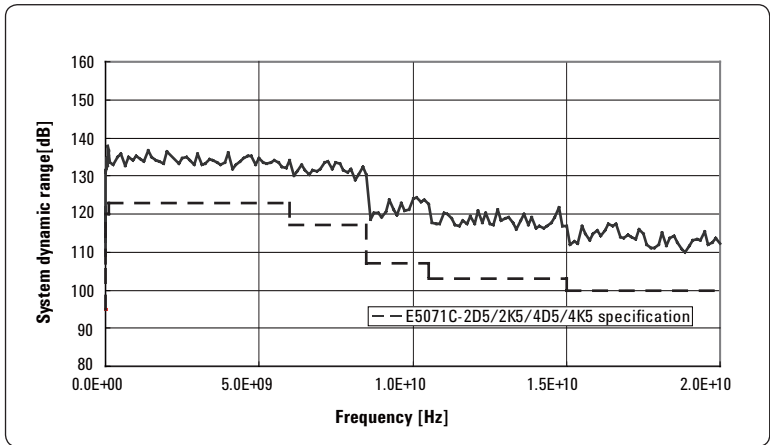


Figure 2. System dynamic range (specification and actual measurement data example, IF bandwidth 10 Hz)

1. The test port dynamic range is calculated as the difference between the test port's rms noise floor and the source's maximum output power. Effective dynamic range must take measurement uncertainty and interfering signals into account.
2. The specification might not be met at 5 MHz or 50 MHz.

## Corrected system performance with calibration kit

Option 230/235/240/245/260/265/280/285/430/435/440/445/460/465/480/485

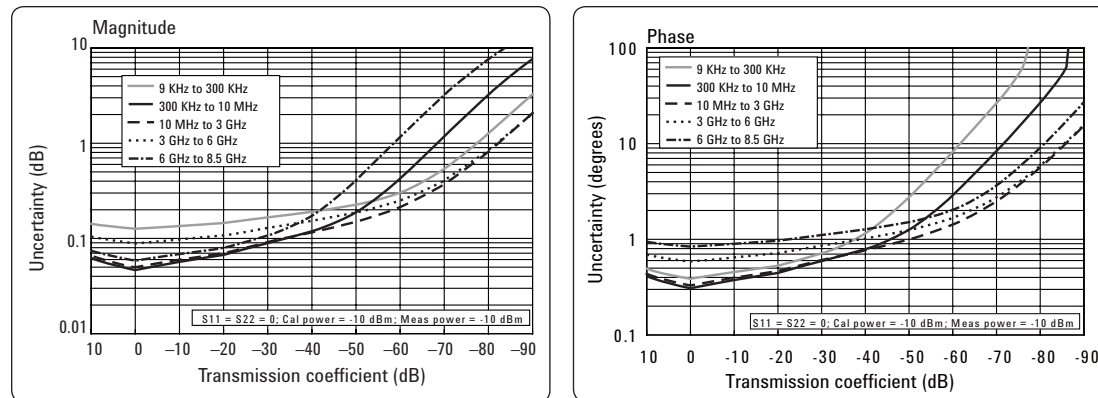
**Table 3.** Corrected system performance with type-N device connectors, 85032F calibration kit

Network analyzer: E5071C  
Calibration kit: 85032F (Type-N, 50  $\Omega$ )  
Calibration: full 2-port

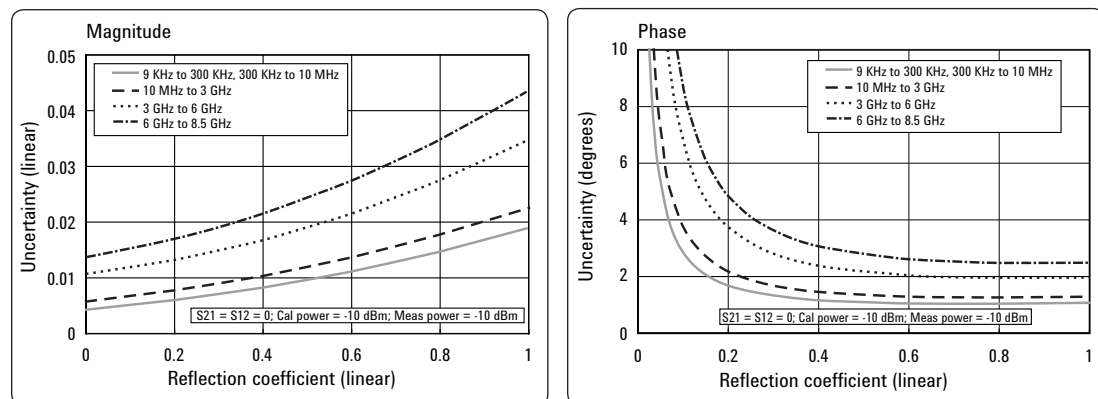
IF bandwidth = 10 Hz, no averaging applied to data, environmental temperature = 23 °C  
( $\pm 5$  °C) with < 1 °C deviation from calibration temperature, isolation calibration performed

| Description           | Specification (dB) |                   |                 |                |                  |
|-----------------------|--------------------|-------------------|-----------------|----------------|------------------|
|                       | 9 kHz to 300 kHz   | 300 kHz to 10 MHz | 10 MHz to 3 GHz | 3 GHz to 6 GHz | 6 GHz to 8.5 GHz |
| Directivity           | 49                 | 49                | 46              | 40             | 38               |
| Source match          | 41                 | 41                | 40              | 36             | 35               |
| Load match            | 49                 | 49                | 46              | 40             | 37               |
| Reflection tracking   | $\pm 0.011$        | $\pm 0.011$       | $\pm 0.021$     | $\pm 0.032$    | $\pm 0.054$      |
| Transmission tracking | $\pm 0.027$        | $\pm 0.015$       | $\pm 0.018$     | $\pm 0.056$    | $\pm 0.088$      |

### Transmission uncertainty (specification)



### Reflection uncertainty (specification)



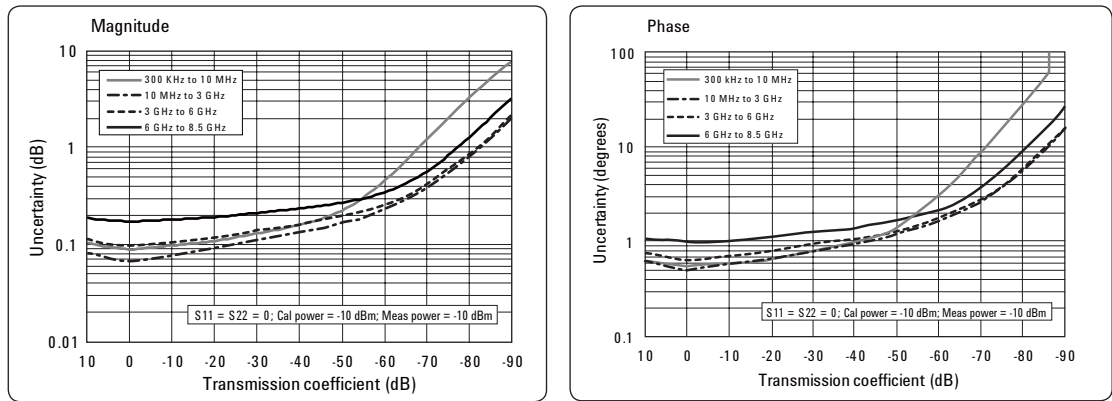
**Table 4.** Corrected system performance with type-N device connectors, 85092C electronic calibration (ECal) module

Network analyzer: E5071C  
Calibration module: 85092C (Type-N, 50 Ω) Electronic calibration (ECal) module  
Calibration: full 2-port

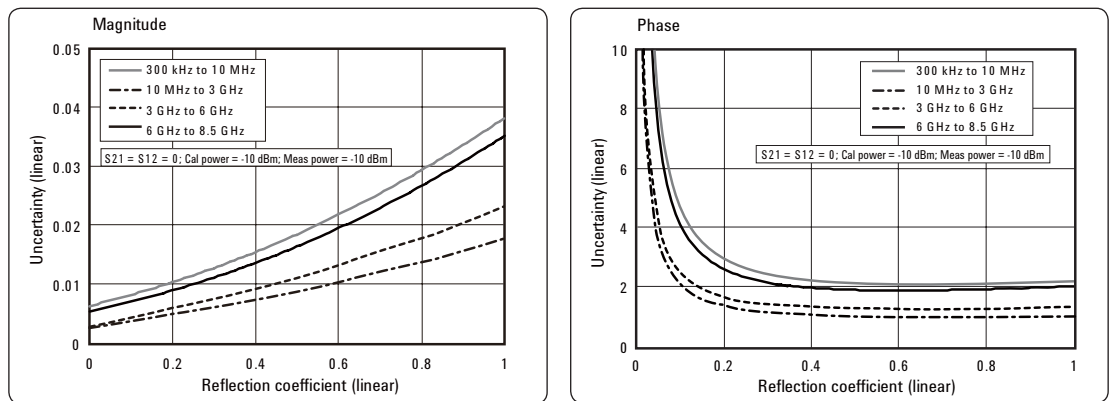
IF bandwidth = 10 Hz, no averaging applied to data, environmental temperature = 23 °C (±5 °C ) with < 1 °C deviation from calibration temperature, isolation calibration performed

| Description           | Specification (dB) |                 |                |                  |
|-----------------------|--------------------|-----------------|----------------|------------------|
|                       | 300 kHz to 10 MHz  | 10 MHz to 3 GHz | 3 GHz to 6 GHz | 6 GHz to 8.5 GHz |
| Directivity           | 45                 | 52              | 52             | 47               |
| Source match          | 36                 | 44              | 41             | 36               |
| Load match            | 41                 | 47              | 44             | 39               |
| Reflection tracking   | ±0.100             | ±0.040          | ±0.060         | ±0.070           |
| Transmission tracking | ±0.055             | ±0.039          | ±0.068         | ±0.136           |

Transmission uncertainty (specification)



Reflection uncertainty (specification)



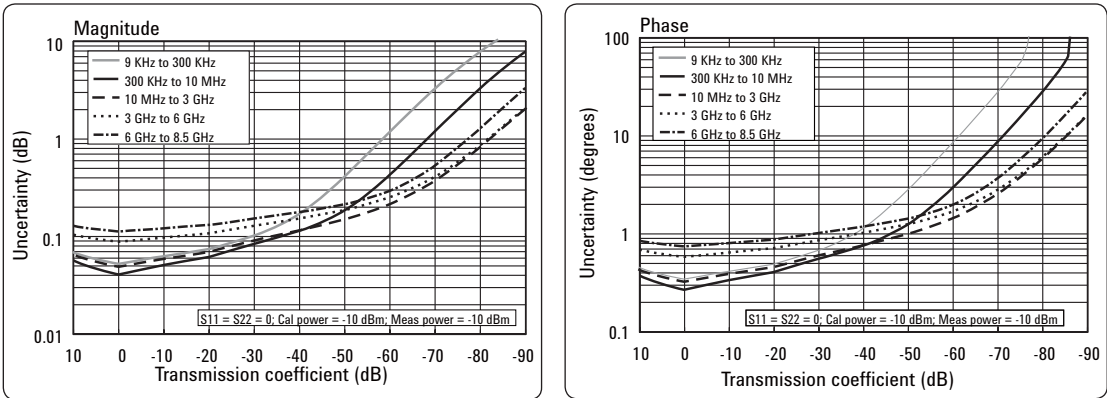
**Table 5.** Corrected system performance with 3.5 mm device connector type, 85033E calibration kit

Network analyzer: E5071C  
Calibration kit: 85033E (3.5 mm, 50 Ω)  
Calibration: full 2-port

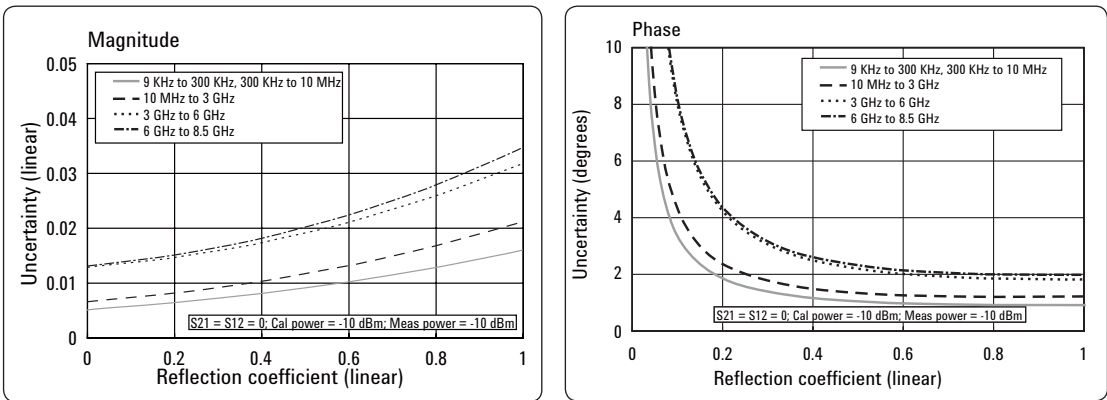
IF bandwidth = 10 Hz, no averaging applied to data, environmental temperature = 23 °C (±5 °C ) with < 1 °C deviation from calibration temperature, isolation calibration performed

| Description           | Specification (dB) |                   |                 |                |                  |
|-----------------------|--------------------|-------------------|-----------------|----------------|------------------|
|                       | 9 kHz to 300 kHz   | 300 kHz to 10 MHz | 10 MHz to 3 GHz | 3 GHz to 6 GHz | 6 GHz to 8.5 GHz |
| Directivity           | 46                 | 46                | 44              | 38             | 38               |
| Source match          | 43                 | 43                | 40              | 37             | 36               |
| Load match            | 46                 | 46                | 44              | 38             | 38               |
| Reflection tracking   | ±0.006             | ±0.006            | ±0.007          | ±0.009         | ±0.010           |
| Transmission tracking | ±0.026             | ±0.015            | ±0.020          | ±0.058         | ±0.079           |

Transmission uncertainty (specification)



Reflection uncertainty (specification)



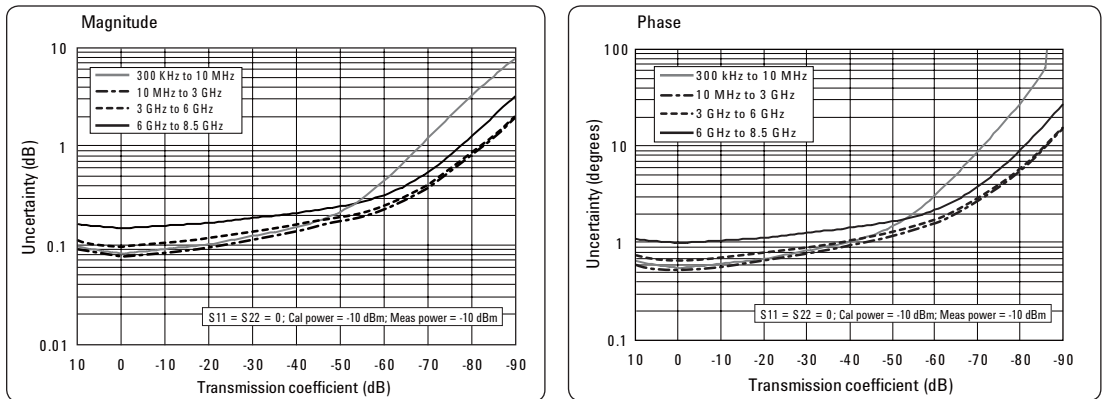
**Table 6.** Corrected system performance with 3.5 mm device connector type, 85093C electronic calibration (ECal) module

Network analyzer: E5071C  
Calibration module: 85093C (3.5 mm, 50 Ω) electronic calibration (ECal) module  
Calibration: full 2-port

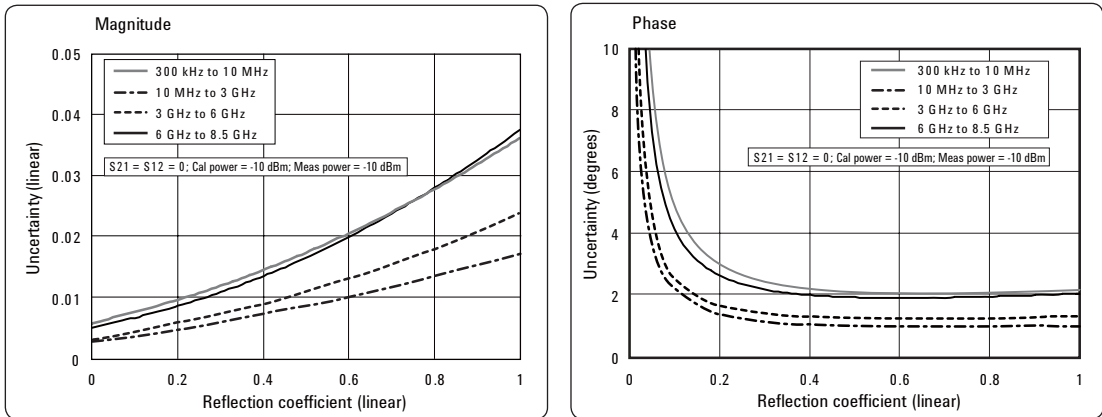
IF bandwidth = 10 Hz, no averaging applied to data, environmental temperature = 23 °C (±5 °C ) with < 1 °C deviation from calibration temperature, isolation calibration performed

| Description           | Specification (dB) |                 |                |                  |
|-----------------------|--------------------|-----------------|----------------|------------------|
|                       | 300 kHz to 10 MHz  | 10 MHz to 3 GHz | 3 GHz to 6 GHz | 6 GHz to 8.5 GHz |
| Directivity           | 45                 | 52              | 51             | 47               |
| Source match          | 36                 | 44              | 39             | 34               |
| Load match            | 41                 | 47              | 44             | 40               |
| Reflection tracking   | ±0.100             | ±0.040          | ±0.050         | ±0.070           |
| Transmission tracking | ±0.055             | ±0.049          | ±0.068         | ±0.117           |

Transmission uncertainty (specification)



Reflection uncertainty (specification)



Option 2D5/2K5/4D5/4K5

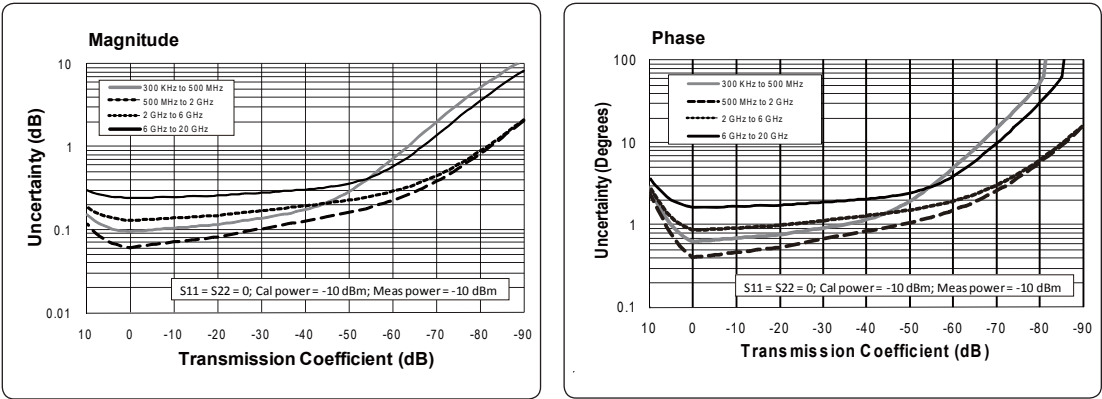
Table 7. Corrected system performance with 3.5 mm device connectors, 85052D calibration kit

Network analyzer: E5071C  
Calibration kit: 85052D (3.5 mm, 50 Ω)  
Calibration: full 2-port

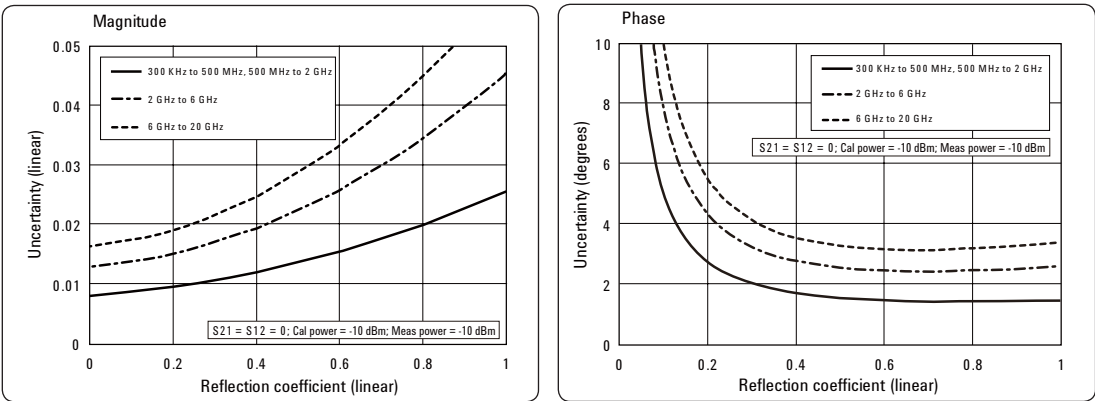
IF bandwidth = 10 Hz, no averaging applied to data, environmental temperature = 23 °C (±5 °C ) with < 1 °C deviation from calibration temperature, isolation calibration performed

| Description           | Specification (dB) |                  |                |                 |
|-----------------------|--------------------|------------------|----------------|-----------------|
|                       | 300 kHz to 500 MHz | 500 MHz to 2 GHz | 2 GHz to 6 GHz | 6 GHz to 20 GHz |
| Directivity           | 42                 | 42               | 38             | 36              |
| Source match          | 37                 | 37               | 31             | 28              |
| Load match            | 42                 | 42               | 38             | 36              |
| Reflection tracking   | ±0.003             | ±0.003           | ±0.004         | ±0.008          |
| Transmission tracking | ±0.068             | ±0.034           | ±0.100         | ±0.208          |

Transmission uncertainty (specification)



Reflection uncertainty (specification)



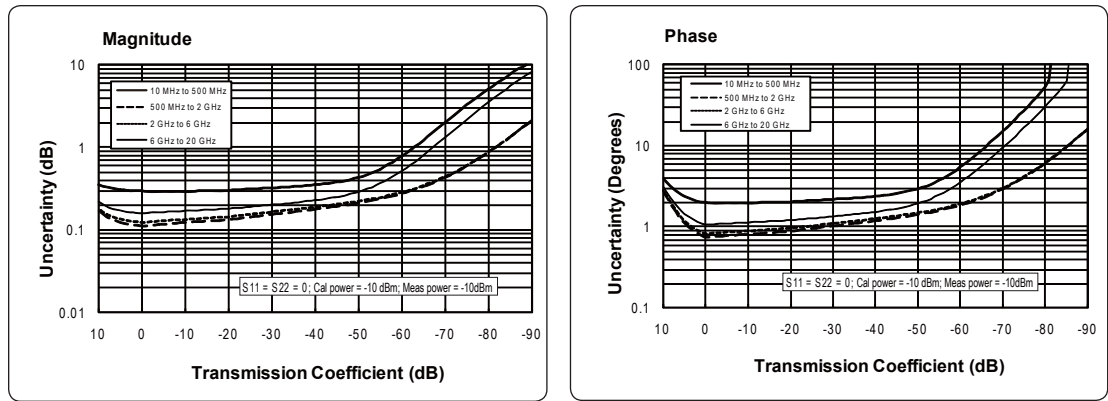
**Table 8.** Corrected system performance with 3.5 mm device connectors, N4691B electronic calibration (ECal) module

Network analyzer: E5071C  
Calibration module: N4691B (3.5 mm, 50 Ω) electronic calibration (ECal) module  
Calibration: full 2-port

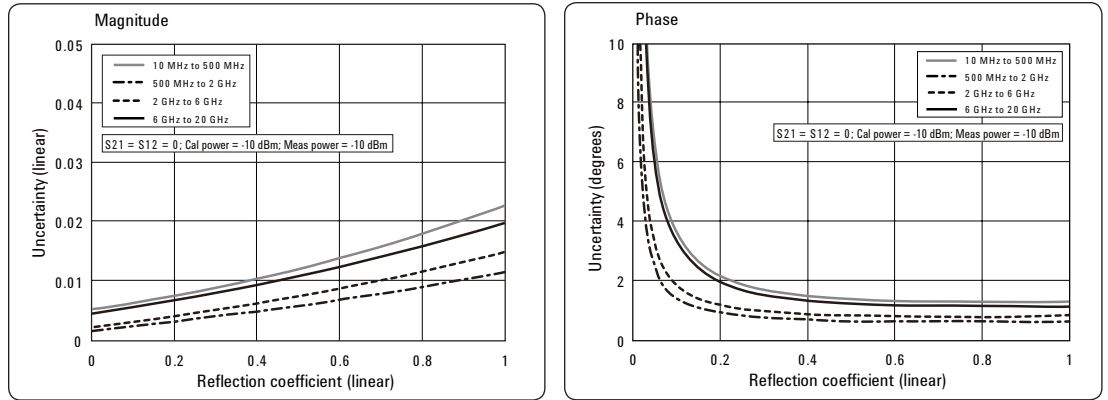
IF bandwidth = 10 Hz, no averaging applied to data, environmental temperature = 23 °C (±5 °C ) with < 1 °C deviation from calibration temperature, isolation calibration performed

| Description           | Specification (dB) |                  |                |                 |
|-----------------------|--------------------|------------------|----------------|-----------------|
|                       | 10 MHz to 500 MHz  | 500 MHz to 2 GHz | 2 GHz to 6 GHz | 6 GHz to 20 GHz |
| Directivity           | 46                 | 56               | 54             | 48              |
| Source match          | 41                 | 47               | 45             | 44              |
| Load match            | 38                 | 41               | 39             | 36              |
| Reflection tracking   | ±0.050             | ±0.020           | ±0.030         | ±0.040          |
| Transmission tracking | ±0.087             | ±0.086           | ±0.097         | ±0.130          |

Transmission uncertainty (specification)



Reflection uncertainty (specification)



## Uncorrected System Performance

**Table 9.** Option 230/235/240/245/260/265/280/285/430/435/440/445/460/465/480/485

User correction: OFF, system correction: ON

| Description           | Specification (dB) |                  |                |                  |
|-----------------------|--------------------|------------------|----------------|------------------|
|                       | 9 kHz to 300 kHz   | 300 kHz to 3 GHz | 3 GHz to 6 GHz | 6 GHz to 8.5 GHz |
| Directivity           | 20 dB              | 25 dB            | 20 dB          | 15 dB            |
| Source match          | 20 dB              | 25 dB            | 20 dB          | 15 dB            |
| Load match            | 12 dB              | 17 dB            | 12 dB          | 10 dB            |
| Transmission tracking | ±1.5 dB            | ±1.0 dB          | ±1.0 dB        | ±1.0 dB          |
| Reflection tracking   | ±1.5 dB            | ±1.0 dB          | ±1.0 dB        | ±1.0 dB          |

**Table 10.** Option 2D5/2K5/4D5/4K5

User correction: OFF, system correction: ON

| Description           | Specification (dB) |                |                |                |                  |                   |                  |
|-----------------------|--------------------|----------------|----------------|----------------|------------------|-------------------|------------------|
|                       | 300 kHz to 1 MHz   | 1 MHz to 1 GHz | 1 GHz to 3 GHz | 3 GHz to 6 GHz | 6 GHz to 8.5 GHz | 8.5 GHz to 11 GHz | 11 GHz to 20 GHz |
| Directivity           | 20 dB              | 25 dB          | 25 dB          | 20 dB          | 15 dB            | 15 dB             | 15 dB            |
| Source match          | 20 dB              | 25 dB          | 25 dB          | 20 dB          | 15 dB            | 15 dB             | 15 dB            |
| Load match            | 9 dB               | 17 dB          | 15 dB          | 11 dB          | 9 dB             | 8 dB              | 7 dB             |
| Transmission tracking | ±1.0 dB            | ±1.0 dB        | ±1.0 dB        | ±1.0 dB        | ±1.0 dB          | ±1.0 dB           | ±1.0 dB          |
| Reflection tracking   | ±1.0 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

**Table 11.** Option 230/235/240/245/260/265/280/285/430/435/440/445/460/465/480/485/2D5/2K5/4D5/4K5

| Description      | Specification      | Typical                                  |
|------------------|--------------------|------------------------------------------|
| Frequency range  |                    |                                          |
| Option 230/430   | 9 kHz to 3 GHz     |                                          |
| Option 240/440   | 9 kHz to 4.5 GHz   |                                          |
| Option 260/460   | 9 kHz to 6.5 GHz   |                                          |
| Option 280/480   | 9 kHz to 8.5 GHz   |                                          |
| Option 235/435   | 100 kHz to 3 GHz   |                                          |
| Option 245/445   | 100 kHz to 4.5 GHz |                                          |
| Option 265/465   | 100 kHz to 6.5 GHz |                                          |
| Option 285/485   | 100 kHz to 8.5 GHz |                                          |
| Option 2D5/4D5   | 300 kHz to 14 GHz  |                                          |
| Option 2K5/4K5   | 300 kHz to 20 GHz  |                                          |
| Resolution       | 1 Hz               |                                          |
| Source stability |                    |                                          |
| standard         |                    | ±5 ppm (5 to 40 °C)                      |
| Option 1E5       |                    | ±0.05 ppm (5 to 40 °C),<br>±0.5 ppm/year |
| CW accuracy      |                    |                                          |
| standard         | ±5 ppm             |                                          |
| Option 1E5       | ±1 ppm             |                                          |

## Test port output power<sup>1</sup>

**Table 12.** Option 230/235/240/245/260/265/280/285/430/435/440/445/460/465/480/485

| Description                                                                       | Specification                                       | Typical                    |
|-----------------------------------------------------------------------------------|-----------------------------------------------------|----------------------------|
| Nominal power<br>(preset power)                                                   | 0 dBm                                               |                            |
| Level accuracy <sup>2, 6</sup><br>(stepped sweep mode)                            | ±0.650 dB (at 0 dBm,<br>50 MHz absolute)<br>±1.0 dB |                            |
| Level accuracy <sup>2</sup><br>(swept sweep mode)                                 |                                                     | ±2.5 dB                    |
| Level linearity <sup>3, 5, 6</sup><br>(stepped sweep mode)                        |                                                     |                            |
| 9 kHz to 5 GHz                                                                    | ±0.75 dB (–20 to 10 dBm)                            |                            |
| 5 GHz to 6 GHz                                                                    | ±0.75 dB (–20 to 9 dBm )                            |                            |
| 6 GHz to 7 GHz                                                                    | ±0.75 dB (–20 to 8 dBm )                            |                            |
| 7 GHz to 8.5 GHz                                                                  | ±0.75 dB (–20 to 7 dBm )                            |                            |
| Level linearity <sup>5</sup><br>(swept sweep mode) <sup>4</sup>                   |                                                     |                            |
| 9 kHz to 5 GHz                                                                    |                                                     | ±1.5 dB (at –20 to 10 dBm) |
| 5 GHz to 6 GHz                                                                    |                                                     | ±1.5 dB (at –20 to 9 dBm)  |
| 6 GHz to 7 GHz                                                                    |                                                     | ±1.5 dB (at –20 to 8 dBm)  |
| 7 GHz to 8.5 GHz                                                                  |                                                     | ±1.5 dB (at –20 to 7 dBm)  |
| Range <sup>5, 6</sup>                                                             |                                                     |                            |
| 9 kHz to 5 GHz                                                                    | –55 to 10 dBm                                       |                            |
| 5 GHz to 6 GHz                                                                    | –55 to 9 dBm                                        |                            |
| 6 GHz to 7 GHz                                                                    | –55 to 8 dBm                                        |                            |
| 7 GHz to 8.5 GHz                                                                  | –55 to 7 dBm                                        |                            |
| Sweep range <sup>5, 6</sup>                                                       |                                                     |                            |
| 9 kHz to 5 GHz                                                                    | –55 to 10 dBm                                       |                            |
| 5 GHz to 6 GHz                                                                    | –55 to 9 dBm                                        |                            |
| 6 GHz to 7 GHz                                                                    | –55 to 8 dBm                                        |                            |
| 7 GHz to 8.5 GHz                                                                  | –55 to 7 dBm                                        |                            |
| Level resolution                                                                  | 0.05 dB                                             |                            |
| Description                                                                       | Specification                                       | SPD                        |
| Max leveled power <sup>5, 6</sup><br>(Option 230/235/240/245/260/<br>265/280/285) |                                                     |                            |
| 9 kHz to 8.5 GHz                                                                  |                                                     | 10 dBm                     |
| (Option 430/435/440/445/460/<br>465/480/485)                                      |                                                     |                            |
| 9 kHz to 6 GHz                                                                    |                                                     | 10 dBm                     |
| 6 GHz to 7 GHz                                                                    |                                                     | 9 dBm                      |
| 7 GHz to 8.5 GHz                                                                  |                                                     | 8 dBm                      |

1. Source output performance on port 1 only. Other port output performance is typical.
2. Level accuracy is taken at 0 dBm, relative to 50 MHz reference unless otherwise stated.
3. Level linearity given is relative to 0 dBm.
4. The specification might not be met at 5 MHz or 50 MHz.
5. The level accuracy specification needs to be taken into account for test port output power level.
6. Power calibration using an external power meter improves level accuracy of the test port output power. Proper power meters/sensors, and the 82357B USB-GPIB interface are required to conduct power calibration.

## Test port output power<sup>7</sup> (continued)

**Table 13. Option 2D5/2K5/4D5/4K5**

| Description                                                          | Specification            | Typical                 |
|----------------------------------------------------------------------|--------------------------|-------------------------|
| Nominal power (preset power)                                         | –5 dBm                   |                         |
| Level accuracy <sup>6</sup><br>(stepped sweep mode) <sup>1</sup>     | ±0.650 dB                |                         |
| 300 kHz to 1 MHz                                                     | +2.0 dB, –6.0 dB         |                         |
| 1 MHz to 5 MHz                                                       | ±2.0 dB                  |                         |
| 5 MHz to 8.5 GHz                                                     | ±1.0 dB                  |                         |
| 8.5 GHz to 20 GHz                                                    | ±2.5 dB                  |                         |
| Level accuracy<br>(swept sweep mode) <sup>2</sup>                    |                          |                         |
| 300 kHz to 1 GHz                                                     |                          | ±5.0 dB                 |
| 1 GHz to 8.5 GHz                                                     |                          | ±2.5 dB                 |
| 8.5 GHz to 20 GHz                                                    |                          | +5.0 dB, –7.0 dB        |
| Level linearity <sup>5, 6</sup><br>(stepped sweep mode) <sup>3</sup> |                          |                         |
| 300 kHz to 1 MHz                                                     | ±0.75 dB (–25 to 8 dBm)  |                         |
| 1 MHz to 6 GHz                                                       | ±0.75 dB (–25 to 10 dBm) |                         |
| 6 GHz to 8 GHz                                                       | ±0.75 dB (–25 to 9 dBm ) |                         |
| 8 GHz to 10.5 GHz                                                    | ±0.75 dB (–25 to 7 dBm ) |                         |
| 10.5 GHz to 15 GHz                                                   | ±0.75 dB (–25 to 3 dBm ) |                         |
| 15 GHz to 20 GHz                                                     | ±0.75 dB (–25 to 0 dBm ) |                         |
| Level linearity <sup>5</sup><br>(swept sweep mode) <sup>3</sup>      |                          |                         |
| 300 kHz to 1 MHz                                                     |                          | ±1.5 dB (–25 to 8 dBm)  |
| 1 MHz to 6 GHz                                                       |                          | ±1.5 dB (–25 to 10 dBm) |
| 6 GHz to 8 GHz                                                       |                          | ±1.5 dB (–25 to 9 dBm ) |
| 8 GHz to 10.5 GHz                                                    |                          | ±1.5 dB (–25 to 7 dBm ) |
| 10.5 GHz to 15 GHz                                                   |                          | ±1.5 dB (–25 to 3 dBm ) |
| 15 GHz to 20 GHz                                                     |                          | ±1.5 dB (–25 to 0 dBm ) |
| Range <sup>5, 6</sup>                                                |                          |                         |
| 300 kHz to 1 MHz                                                     | –85 to 8 dBm             |                         |
| 1 MHz to 6 GHz                                                       | –85 to 10 dBm            |                         |
| 6 GHz to 8 GHz                                                       | –85 to 9 dBm             |                         |
| 8 GHz to 10.5 GHz                                                    | –85 to 7 dBm             |                         |
| 10.5 GHz to 15 GHz                                                   | –85 to 3 dBm             |                         |
| 15 GHz to 20 GHz                                                     | –85 to 0 dBm             |                         |
| Sweep range <sup>4, 5, 6</sup>                                       |                          |                         |
| 300 kHz to 1 MHz                                                     | –25 to 8 dBm             |                         |
| 1 MHz to 6 GHz                                                       | –25 to 10 dBm            |                         |
| 6 GHz to 8 GHz                                                       | –25 to 9 dBm             |                         |
| 8 GHz to 10.5 GHz                                                    | –25 to 7 dBm             |                         |
| 10.5 GHz to 15 GHz                                                   | –25 to 3 dBm             |                         |
| 15 GHz to 20 GHz                                                     | –25 to 0 dBm             |                         |
| (Source attenuator = 0 dB)                                           |                          |                         |
| Level resolution                                                     | 0.05 dB                  |                         |

1. Level accuracy is taken at –5 dBm, relative to 50 MHz reference unless otherwise stated.
2. Level accuracy is taken at –5 dBm, relative to 50 MHz reference.
3. Level linearity given is relative to –5 dBm.
4. The sweep range shifts based on the selected source attenuator value (0 dB to 60 dB, 10 dB step).
5. The level accuracy specification needs to be taken into account for test port output power level.
6. Power calibration using an external power meter improves level accuracy of the test port output power.  
Proper power meters/sensors, and the 82357B USB-GPIB interface are required to conduct power calibration.
7. Source output performance on port 1 only. Other port output performance is typical.

## Test port output power<sup>6</sup> (continued)

**Table 13.** Option 2D5/2K5/4D5/4K5

| Description                       | Specification | SPD    |
|-----------------------------------|---------------|--------|
| Max leveled power <sup>3, 4</sup> |               |        |
| 300 kHz to 1 MHz                  |               | 9 dBm  |
| 1 MHz to 10 GHz                   |               | 10 dBm |
| 10 GHz to 13 GHz                  |               | 9 dBm  |
| 13 GHz to 15 GHz                  |               | 7 dBm  |
| 15 GHz to 18 GHz                  |               | 5 dBm  |
| 18 GHz to 20 GHz                  |               | 4 dBm  |

## Test port output signal purity

**Table 14.** Option 230/235/240/245/260/265/280/285/430/435/440/445/460/465/480/485

| Description            | Specification | Typical              |
|------------------------|---------------|----------------------|
| Harmonics (2nd or 3rd) |               |                      |
| 9 kHz to 2 GHz         |               | < -25 dBc (at 5 dBm) |
| 2 GHz to 8.5 GHz       |               | < -20 dBc (at 5 dBm) |
| Non-harmonic spurious  |               |                      |
| 9 kHz to 8.5 GHz       |               | < -30 dBc (at 5 dBm) |

**Table 15.** Option 2D5/2K5/4D5/4K5

| Description                         | Specification | Typical                                          |
|-------------------------------------|---------------|--------------------------------------------------|
| Harmonics (2nd to 5th) <sup>1</sup> |               |                                                  |
| 300 kHz to 1 GHz                    |               | < -12 dBc (at maximum output power) <sup>5</sup> |
| 1 GHz to 20 GHz                     |               | < -15 dBc (at maximum output power) <sup>5</sup> |
| Non-harmonic spurious <sup>2</sup>  |               |                                                  |
| 300 kHz to 20 GHz                   |               | < -30 dBc (at -5 dBm)                            |

1. This includes 6th and 7th harmonics when the test frequency is from 1 MHz to 1 GHz.
2. The carrier  $\pm 1/8$ th spurious is excluded from 8.76 GHz to 17.52 GHz.
3. The level accuracy specification needs to be taken into account for test port output power level.
4. Power calibration using an external power meter improves level accuracy of the test port output power. Proper power meters/sensors, and the 82357B USB-GPIB interface are required to conduct power calibration.
5. Maximum output power is the maximum power of "Range" in Table 13 Test port output power.
6. Source output performance on port 1 only. Other port output performance is typical.

## Test Port Input

### Test port input levels

**Table 16.** Option 230/235/240/245/260/265/280/285/430/435/440/445/460/465/480/485

| Description                          | Specification | Typical            |
|--------------------------------------|---------------|--------------------|
| <b>Maximum test port input level</b> |               |                    |
| 9 kHz to 5 GHz                       | +10 dBm       |                    |
| 5 GHz to 6 GHz                       | +9 dBm        |                    |
| 6 GHz to 7 GHz                       | +8 dBm        |                    |
| 7 GHz to 8.5 GHz                     | +7 dBm        |                    |
| <b>Damage level</b>                  |               |                    |
| 9 kHz to 8.5 GHz                     |               | +26 dBm<br>±35 VDC |
| <b>Crosstalk<sup>1</sup></b>         |               |                    |
| 9 kHz to 300 kHz                     | −100 dB       |                    |
| 300 kHz to 10 MHz                    | −110 dB       |                    |
| 10 MHz to 3 GHz                      | −120 dB       |                    |
| 3 GHz to 6 GHz                       | −110 dB       |                    |
| 6 GHz to 8.5 GHz                     | −100 dB       |                    |
| Description                          | Specification | SPD                |
| <b>Test port noise floor</b>         |               |                    |
| 9 kHz to 10 MHz                      |               | −115 dBm/Hz        |
| 10 MHz to 5 GHz                      |               | −130 dBm/Hz        |
| 5 GHz to 6 GHz                       |               | −131 dBm/Hz        |
| 6 GHz to 7 GHz                       |               | −130 dBm/Hz        |
| 7 GHz to 8 GHz                       |               | −129 dBm/Hz        |
| 8 GHz to 8.5 GHz                     |               | −127 dBm/Hz        |

1. The specification might not be met at 5 MHz or 50 MHz.

## Test port input levels *(continued)*

**Table 17.** Option 2D5/2K5/4D5/4K5

| Description                          | Specification | Typical                    |
|--------------------------------------|---------------|----------------------------|
| <b>Maximum test port input level</b> |               |                            |
| 300 kHz to 20 GHz                    | +10 dBm       |                            |
| <b>Damage level</b>                  |               |                            |
| 300 kHz to 20 GHz                    |               | +26 dBm<br>or $\pm 35$ VDC |
| <b>Crosstalk<sup>1</sup></b>         |               |                            |
| 300 kHz to 1 MHz                     | −68 dB        |                            |
| 1 MHz to 5 MHz                       | −70 dB        |                            |
| 5 MHz to 10 MHz                      | −100 dB       |                            |
| 10 MHz to 45 MHz                     | −110 dB       |                            |
| 45 MHz to 4 GHz                      | −118 dB       |                            |
| 4 GHz to 6 GHz                       | −123 dB       |                            |
| 6 GHz to 8.5 GHz                     | −120 dB       |                            |
| 8.5 GHz to 15 GHz                    | −112 dB       |                            |
| 15 GHz to 20 GHz                     | −106 dB       |                            |
| Description                          | Specification | SPD                        |
| <b>Test port noise floor</b>         |               |                            |
| 300 kHz to 1 MHz                     |               | −110 dBm/Hz                |
| 1 MHz to 10 MHz                      |               | −115 dBm/Hz                |
| 10 MHz to 100 MHz                    |               | −129 dBm/Hz                |
| 100 MHz to 8.5 GHz                   |               | −130 dBm/Hz                |
| 8.5 GHz to 15 GHz                    |               | −118 dBm/Hz                |
| 15 GHz to 20 GHz                     |               | −115 dBm/Hz                |

1. The specification might not be met at 5 MHz or 50 MHz.

## Test port input (trace noise)

**Table 18.** Option 230/235/240/245/260/265/280/285/430/435/440/445/460/465/480/485

| Description                                                                     | Specification | SPD         |
|---------------------------------------------------------------------------------|---------------|-------------|
| <b>Compression level</b>                                                        |               |             |
| Magnitude                                                                       |               |             |
| 9 kHz to 5 GHz                                                                  |               | 0.08 dB     |
| 5 GHz to 8.5 GHz                                                                |               | 0.1 dB      |
| (maximum test port input level = +10 dBm)                                       |               |             |
| Phase                                                                           |               |             |
| 9 kHz to 3 GHz                                                                  |               | 0.3 deg     |
| 3 GHz to 5 GHz                                                                  |               | 0.6 deg     |
| 5 GHz to 8.5 GHz                                                                |               | 1.0 deg     |
| (maximum test port input level = +10 dBm)                                       |               |             |
| <b>Trace noise magnitude<sup>1</sup></b>                                        |               |             |
| 9 kHz to 30 kHz (IFBW = 3 kHz)<br>(maximum test port input level = +10 dBm)     | 0.004 dBrms   | 0.001 dBm   |
| 30 kHz to 100 kHz (IFBW = 3 kHz)<br>(maximum test port input level = +10 dBm)   | 0.003 dBm     | 0.001 dBm   |
| 100 kHz to 10 MHz (IFBW = 3 kHz)<br>(maximum test port input level = +10 dBm)   | 0.003 dBrms   | 0.0005 dBm  |
| 10 MHz to 4.38 GHz (IFBW = 70 kHz)<br>(maximum test port input level = +10 dBm) | 0.004 dBrms   | 0.001 dBrms |
| 4.38 GHz to 5 GHz (IFBW = 70 kHz)<br>(maximum test port input level = +10 dBm)  | 0.006 dBrms   | 0.0012 dBm  |
| 5 GHz to 6 GHz (IFBW = 70 kHz)<br>(maximum test port input level = +9 dBm)      | 0.006 dBrms   | 0.0012 dBm  |
| 6 GHz to 7 GHz (IFBW = 70 kHz)<br>(maximum test port input level = +8 dBm)      | 0.006 dBrms   | 0.0012 dBm  |
| 7 GHz to 8.5 GHz (IFBW = 70 kHz)<br>(maximum test port input level = +7 dBm)    | 0.006 dBrms   | 0.0012 dBm  |
| <b>Trace noise phase<sup>2</sup></b>                                            |               |             |
| 9 kHz to 30 kHz (IFBW = 3 kHz)<br>(maximum test port input level = +10 dBm)     | 0.035 deg rms |             |
| 30 kHz to 10 MHz (IFBW = 3 kHz)<br>(maximum test port input level = +10 dBm)    | 0.020 deg rms |             |
| 10 MHz to 4.38 GHz (IFBW = 70 kHz)<br>(maximum test port input level = +10 dBm) | 0.035 deg rms |             |
| 4.38 GHz to 5 GHz (IFBW = 70 kHz)<br>(maximum test port input level = +10 dBm)  | 0.050 deg rms |             |
| 5 GHz to 6 GHz (IFBW = 70 kHz)<br>(maximum test port input level = +9 dBm)      | 0.050 deg rms |             |
| 6 GHz to 7 GHz (IFBW = 70 kHz)<br>(maximum test port input level = +8 dBm)      | 0.050 deg rms |             |
| 7 GHz to 8.5 GHz (IFBW = 70 kHz)<br>(maximum test port input level = +7 dBm)    | 0.050 deg rms |             |

1. The specification might not be met at the following frequencies: 333.333 kHz, 406.25 kHz, 857.143 kHz, 928.571 kHz, 1.3 MHz, 2.4 MHz and 4.333333 MHz.

2. The specification might not be met at 5 MHz or 50 MHz.

## Test port input (trace noise) *(continued)*

**Table 19.** Option 2D5/2K5/4D5/4K5

| Description                                    | Specification | SPD            |
|------------------------------------------------|---------------|----------------|
| <b>Compression level</b>                       |               |                |
| Magnitude                                      |               |                |
| 300 kHz to 10 MHz                              |               | 0.3 dB         |
| 10 MHz to 10 GHz                               |               | 0.182 dB       |
| 10 GHz to 15 GHz                               |               | 0.712 dB       |
| 15 GHz to 20 GHz                               |               | 1.87 dB        |
| (maximum test port input level = +10 dBm)      |               |                |
| Phase                                          |               |                |
| 300 kHz to 5 GHz                               |               | 2.3 deg        |
| 5 GHz to 10 GHz                                |               | 4.3 deg        |
| 10 GHz to 15 GHz                               |               | 17.3 deg       |
| 15 GHz to 20 GHz                               |               | 20.3 deg       |
| (maximum test port input level = +10 dBm)      |               |                |
| <b>Trace noise magnitude<sup>1, 3</sup></b>    |               |                |
| 300 kHz to 1 MHz (IFBW = 3 kHz)                | 0.006 dBrms   | 0.0009 dBrms   |
| 1 MHz to 10 MHz (IFBW = 3 kHz)                 | 0.003 dBrms   | 0.0005 dBrms   |
| 10 MHz to 4.38 GHz (IFBW = 70 kHz)             | 0.004 dBrms   | 0.0010 dBrms   |
| 4.38 GHz to 8.5 GHz (IFBW = 70 kHz)            | 0.006 dBrms   | 0.0012 dBrms   |
| 8.5 GHz to 13.137 GHz (IFBW = 70 kHz)          | 0.009 dBrms   | 0.0024 dBrms   |
| 13.137 GHz to 17 GHz (IFBW = 70 kHz)           | 0.013 dBrms   | 0.0040 dBrms   |
| 17 GHz to 20 GHz (IFBW = 70 kHz)               | 0.023 dBrms   | 0.0065 dBrms   |
| (at maximum output power level of sweep range) |               |                |
| <b>Trace noise phase<sup>2, 3</sup></b>        |               |                |
| 300 kHz to 1 MHz (IFBW = 3 kHz)                | 0.040 deg rms | 0.0120 deg rms |
| 1 MHz to 10 MHz (IFBW = 3 kHz)                 | 0.020 deg rms | 0.0025 deg rms |
| 10 MHz to 4.38 GHz (IFBW = 70 kHz)             | 0.035 deg rms | 0.0075 deg rms |
| 4.38 GHz to 8.5 GHz (IFBW = 70 kHz)            | 0.050 deg rms | 0.0150 deg rms |
| 8.5 GHz to 13.137 GHz (IFBW = 70 kHz)          | 0.064 deg rms | 0.0250 deg rms |
| 13.137 GHz to 17 GHz (IFBW = 70 kHz)           | 0.095 deg rms | 0.0320 deg rms |
| 17 GHz to 20 GHz (IFBW = 70 kHz)               | 0.165 deg rms | 0.0520 deg rms |
| (at maximum output power level of sweep range) |               |                |

1. The specification might not be met at the following frequencies: 406.25 kHz, 666.667 kHz, 722.222 kHz, 857.143 kHz, 928.571 kHz, 1.444444 MHz, 1.714286 MHz, 1.8 MHz, 1.857143 MHz, 1.95 MHz, 2.4375 MHz, 2.571429 MHz, 3.714286 MHz, 4.8 MHz, 5 MHz, 5.416667 MHz, 7.583333 MHz, 10 MHz, 10.833333 MHz, 12.5 MHz.

2. The specification might not be met at 5 MHz or 50 MHz.

3. Trace noise SPD is defined with transmission measurements only.

## Test port input (stability)<sup>1</sup>

**Table 20.** Option 230/235/240/245/260/265/280/285/430/435/440/445/460/465/480/485

| Description                | Specification | Typical      |
|----------------------------|---------------|--------------|
| <b>Stability magnitude</b> |               |              |
| 9 kHz to 3 GHz             |               | ±0.005 dB/°C |
| 3 GHz to 6 GHz             |               | ±0.01 dB/°C  |
| 6 GHz to 8.5 GHz           |               | ±0.04 dB/°C  |
| <b>Stability phase</b>     |               |              |
| 9 kHz to 3 GHz             |               | ±0.1 deg/°C  |
| 3 GHz to 6 GHz             |               | ±0.2 deg/°C  |
| 6 GHz to 8.5 GHz           |               | ±0.8 deg/°C  |

**Table 21.** Option 2D5/2K5/4D5/4K5

| Description                | Specification | Typical      |
|----------------------------|---------------|--------------|
| <b>Stability magnitude</b> |               |              |
| 300 kHz to 3 GHz           |               | ±0.005 dB/°C |
| 3 GHz to 6 GHz             |               | ±0.01 dB/°C  |
| 6 GHz to 20 GHz            |               | ±0.04 dB/°C  |
| <b>Stability phase</b>     |               |              |
| 300 kHz to 3 GHz           |               | ±0.1 deg/°C  |
| 3 GHz to 6 GHz             |               | ±0.2 deg/°C  |
| 6 GHz to 20 GHz            |               | ±0.8 deg/°C  |

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

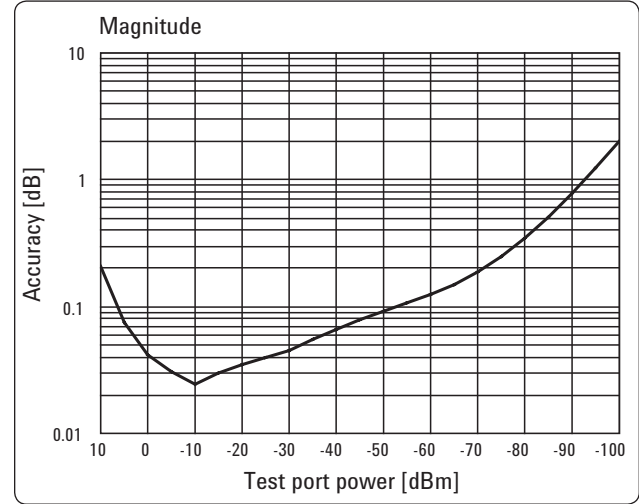
Test port input (dynamic accuracy)

Table 22. Option 230/235/240/245/260/265/280/285/430/435/440/445/460/465/480/485

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

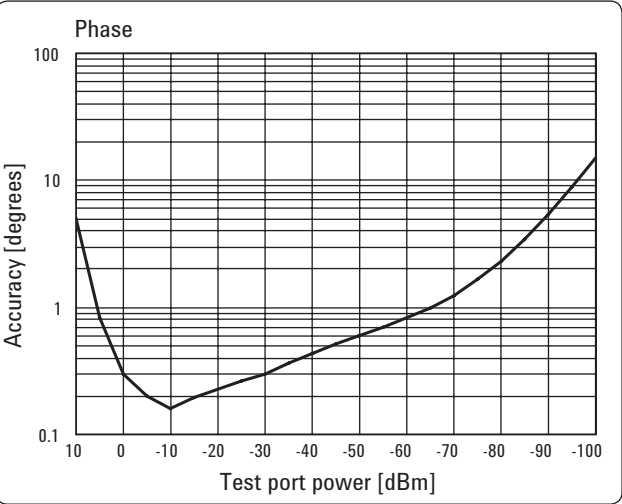
| Description                | Specification | Typical        |
|----------------------------|---------------|----------------|
| Dynamic accuracy magnitude |               |                |
| 10 dBm                     | $\pm 0.21$ dB |                |
| $-30$ dBm                  | $\pm 0.05$ dB |                |
| $-100$ dBm                 | $\pm 2.01$ dB |                |
| Dynamic accuracy phase     |               |                |
| 10 dBm                     |               | $\pm 5$ deg    |
| $-30$ dBm                  |               | $\pm 0.3$ deg  |
| $-100$ dBm                 |               | $\pm 15.1$ deg |

Specification



$\pm 3.0$  dB (at  $-110$  dBm, Ref. =  $-10$  dBm, typical)

Typical



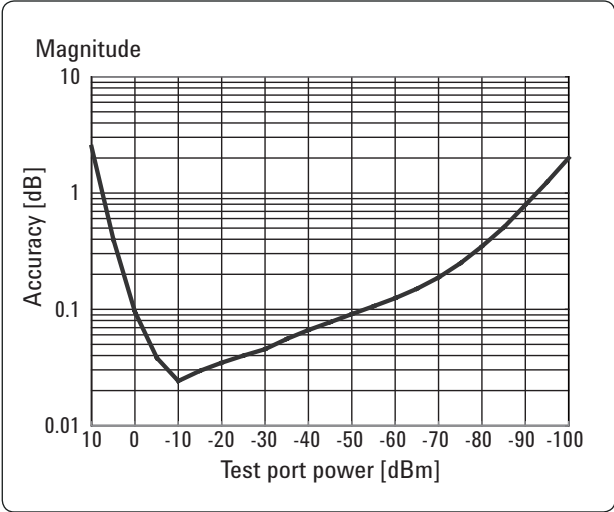
Test port input (dynamic accuracy) (continued)

Table 23. Option 2D5/2K5/4D5/4K5

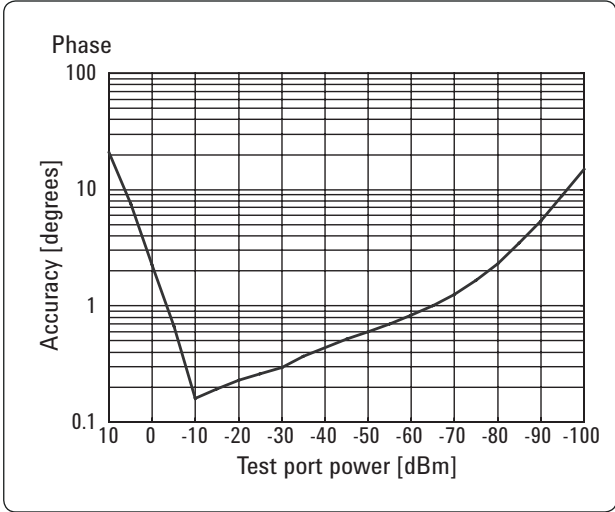
Accuracy of the test port input power reading is relative to  $-10$  dBm reference input power level.

| Description                | Specification   | Typical         |
|----------------------------|-----------------|-----------------|
| Dynamic accuracy magnitude |                 |                 |
| 10 dBm                     | $\pm 2.4972$ dB |                 |
| $-30$ dBm                  | $\pm 0.05$ dB   |                 |
| $-100$ dBm                 | $\pm 2.01$ dB   |                 |
| Dynamic accuracy phase     |                 |                 |
| 10 dBm                     |                 | $\pm 20.66$ deg |
| $-30$ dBm                  |                 | $\pm 0.3$ deg   |
| $-100$ dBm                 |                 | $\pm 15.1$ deg  |

Specification



Typical



$\pm 3.0$  dB (at  $-110$  dBm, Ref. =  $-10$  dBm, typical)

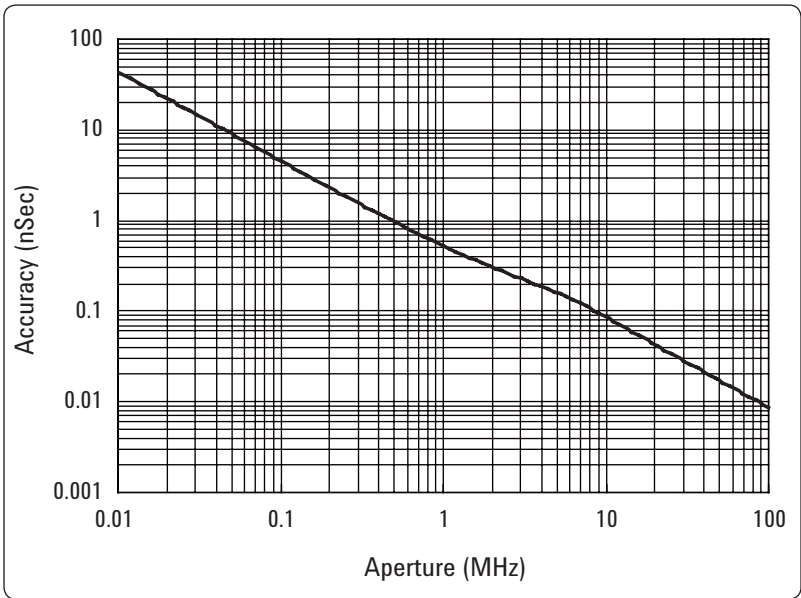
Test port input (group delay)<sup>1</sup>

Table 24. Option 230/235/240/245/260/265/280/285/430/435/440/445/460/465/480/485

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

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

Calibration kit (85032F). 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:

$\pm \text{phase accuracy (degrees)} / [360 \times \text{aperture (Hz)}]$

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).

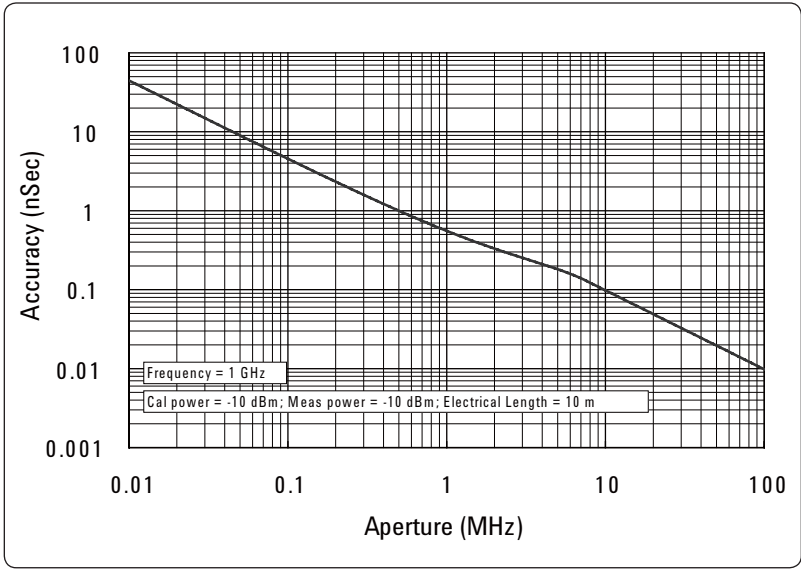
Test port input (group delay)<sup>1</sup> (continued)

Table 25. Option 2D5/2K5/4D5/4K5

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

The following graph shows group delay accuracy with 3.5 mm (male) 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:

$$\pm \text{phase accuracy (degrees)} / [360 \times \text{aperture (Hz)}]$$

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).

## General Information

**Table 26. System bandwidth**

| Description           | General characteristics                                                                                                                                                                                                                     |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IF bandwidth settings |                                                                                                                                                                                                                                             |
| Range                 | 10 Hz to 500 kHz<br>Nominal settings are:<br>10, 15, 20, 30, 40, 50, 70, 100, 150, 200, 300, 400, 500, 700, 1 k,<br>1.5 k, 2 k, 3 k, 4 k, 5 k, 7 k, 10 k, 15 k, 20 k, 30 k, 40 k, 50 k, 70 k,<br>100 k, 150 k, 200 k, 300 k, 400 k, 500 kHz |

**Table 27. Front panel information**

| Description                                                                        | Typical                                                                                               | General characteristics                    |
|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|--------------------------------------------|
| <b>RF connectors</b>                                                               |                                                                                                       |                                            |
| Option 230/235/240/<br>245/260/265/280/285/<br>430/435/440/445/460/<br>465/480/485 |                                                                                                       | Type-N, female, 50 $\Omega$                |
| Option 2D5/2K5/4D5/4K5                                                             |                                                                                                       | 3.5 mm (male), 50 $\Omega$ nominal         |
| <b>Probe power</b>                                                                 |                                                                                                       |                                            |
| Connector                                                                          |                                                                                                       | 3 terminal connector x 2                   |
| Voltage & maximum<br>current                                                       | +15 V $\pm$ 2% (400 mA)<br>–12.6 V $\pm$ 5% (300 mA)<br>(Combined load for both<br>probe connections) |                                            |
| <b>Display</b>                                                                     |                                                                                                       |                                            |
| Type                                                                               |                                                                                                       | 10.4 in TFT color LCD<br>with touch screen |
| Resolution                                                                         |                                                                                                       | XGA (1024 x 768) <sup>1</sup>              |

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.

**Table 28. Rear panel information**

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

**Table 28. Rear panel information** *(continued)*

| Description                                                                | Typical                                                                                                                                                                               | General characteristics                                    |
|----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
| <b>Bias tee input connector</b>                                            |                                                                                                                                                                                       |                                                            |
| Type                                                                       |                                                                                                                                                                                       | BNC, female (for each port)                                |
| Maximum voltage                                                            |                                                                                                                                                                                       | ±35 VDC                                                    |
| <b>Maximum current (no degradation in RF specifications)</b>               |                                                                                                                                                                                       |                                                            |
| Option 230/235/240/245/260/265/280/<br>285/430/435/440/445/460/465/480/485 |                                                                                                                                                                                       | ±50 mA (1 MHz < test frequency < 500 MHz)                  |
|                                                                            |                                                                                                                                                                                       | ±200 mA (test frequency ≤ 1 MHz, ≥ 500 MHz)                |
| Option 2D5/2K5/4D5/4K5                                                     |                                                                                                                                                                                       | ±200 mA                                                    |
| <b>Maximum current (damage level)</b>                                      |                                                                                                                                                                                       | ±500 mA                                                    |
| <b>Fuse</b>                                                                |                                                                                                                                                                                       | 500 mA, bi-pin style                                       |
| <b>Video output</b>                                                        |                                                                                                                                                                                       | 15-pin mini D-Sub; female; drives XGA compatible monitors  |
| <b>GPIB</b>                                                                |                                                                                                                                                                                       | 24-pin D-Sub (Type D-24), female; compatible with IEEE-488 |
| <b>USB-host port</b>                                                       |                                                                                                                                                                                       |                                                            |
|                                                                            | Universal serial bus jack, Type A configuration (4 contacts inline, contact 1 on left); female; provides connection to printer, ECal module, USB/GPIB interface or multiport test set |                                                            |
| Contact 1                                                                  |                                                                                                                                                                                       | Vcc: 4.75 to 5.25 VDC, 500 mA, maximum                     |
| Contact 2                                                                  |                                                                                                                                                                                       | – Data                                                     |
| Contact 3                                                                  |                                                                                                                                                                                       | + Data                                                     |
| Contact 4                                                                  |                                                                                                                                                                                       | Ground                                                     |

**Table 28. Rear panel information** *(continued)*

| Description                                    | Typical | General characteristics                                                                                                                                        |
|------------------------------------------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>USB (USBTMC<sup>1</sup>) interface port</b> |         | 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. |
| <b>LAN</b>                                     |         | 10/100BaseT Ethernet, 8-pin configuration; auto selects between the two data rates                                                                             |
| <b>Handler I/O port</b>                        |         | 36-pin centronics, female; provides connection to handler system                                                                                               |
| <b>Line power<sup>2</sup></b>                  |         |                                                                                                                                                                |
| Frequency                                      |         | 47 Hz to 63 Hz                                                                                                                                                 |
| Voltage                                        |         | 90 to 132 VAC, or 198 to 264 VAC (automatically switched)                                                                                                      |
| VA max                                         |         | 350 VA max.                                                                                                                                                    |

| Description                | Specification                                            | General characteristics  |
|----------------------------|----------------------------------------------------------|--------------------------|
| <b>AUX input connector</b> |                                                          |                          |
| Type                       |                                                          | BNC, female x 2          |
| Input range                |                                                          | ±1 V or ±10 V selectable |
| Accuracy                   | 1 % + 1 mV for ±1 V input<br>1 % + 10 mV for ±10 V input |                          |

**Table 29. LXI compliance**

| Description                                                                         | General characteristics                                                                  |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|  | Class C (only applies to units that are shipped with firmware revision A.08.00 or later) |

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.

**Table 30. EMC, safety and environment**

| Description                                                                                         | General characteristics                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>EMC</b>                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                    | <p>European Council Directive 2004/108/EC<br/> IEC 61326-1:2005<br/> EN 61326-1:2006<br/> CISPR 11:2003+A1:2004<br/> EN 55011:2007<br/> Group 1, Class A<br/> IEC 61000-4-2:1995 +A2:2000<br/> EN 61000-4-2:1995 +A2:2001<br/> 4 kV CD / 8 kV AD<br/> IEC 61000-4-3:2006<br/> EN 61000-4-3:2006<br/> 1-3 V/m, 80-1000 MHz / 1.4 GHz - 2.7 GHz, 80% AM<br/> IEC 61000-4-4:2004<br/> EN 61000-4-4:2004<br/> 1 kV power lines / 0.5 kV signal lines<br/> IEC 61000-4-5:2005<br/> EN 61000-4-5:2006<br/> 0.5 kV line-line / 1 kV line-ground<br/> IEC 61000-4-6:2003 + A1:2004+ A2:2006<br/> EN 61000-4-6:2007<br/> 3 V, 0.15-80 MHz, 80% AM<br/> IEC 61000-4-11:2004<br/> EN 61000-4-11:2004<br/> 0.5-300 cycle, 0% / 70%</p> |
| <b>ICES/NMB-001</b>                                                                                 | ICES-001:2006 Group 1, Class A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|  <b>N10149</b>   | <p>AS/NZS CISPR11:2004<br/> Group 1, Class A</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Safety</b>                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                  | <p>European Council Directive 2006/95/EC<br/> IEC 61010-1:2001 / EN 61010-1:2001<br/> Measurement Category I<br/> Pollution Degree 2<br/> Indoor Use</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|  <b>LR95111C</b> | <p>CAN/CSA C22.2 No. 61010-1-04<br/> Measurement Category I<br/> Pollution Degree 2<br/> Indoor Use</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Environment</b>                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                  | <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.</p> <p>To return unwanted products, contact your local Agilent office, or see <a href="http://www.agilent.com/environment/product/">www.agilent.com/environment/product/</a> for more information.</p>                                                                           |

**Table 31. Analyzer environmental specifications and dimensions**

| <b>Description</b>                       | <b>General characteristics</b>                                         |
|------------------------------------------|------------------------------------------------------------------------|
| <b>Operating environment</b>             |                                                                        |
| Temperature                              | +5 °C to +40 °C                                                        |
| Error-corrected temperature range        | 23 °C ( $\pm 5$ °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                                         |
| <b>Non-Operating storage environment</b> |                                                                        |
| Temperature                              | -10 °C to +60 °C                                                       |
| Humidity                                 | 20% to 90% at wet bulb temperature < +40 °C (non-condensation)         |
| Altitude                                 | 0 to 4572 m (0 to 15,000 feet)                                         |
| Vibration                                | 0.5 G maximum, 5 Hz to 500 Hz                                          |
| <b>Dimensions</b>                        | See next page.                                                         |
| <b>Weight (net)</b>                      |                                                                        |
| Option 230/240/260/280 (2-port)          | 18.2 kg                                                                |
| Option 235/245/265/285 (2-port)          | 18.3 kg                                                                |
| Option 430/480/440/460 (4-port)          | 19.9 kg                                                                |
| Option 435/445/465/485 (4-port)          | 20.0 kg                                                                |
| Option 2D5/2K5 (2-port)                  | 19.8 kg                                                                |
| Option 4D5/4K5 (4-port)                  | 21.8 kg                                                                |

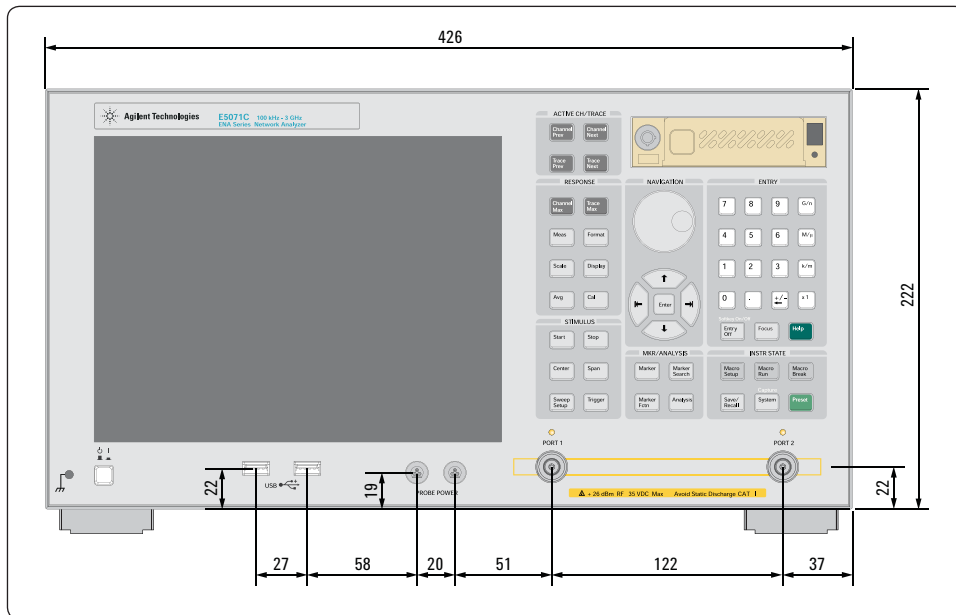


Figure 3. Dimensions (front view, E5071C with Option 230/235/240/245/260/265/280/285, in millimeters)

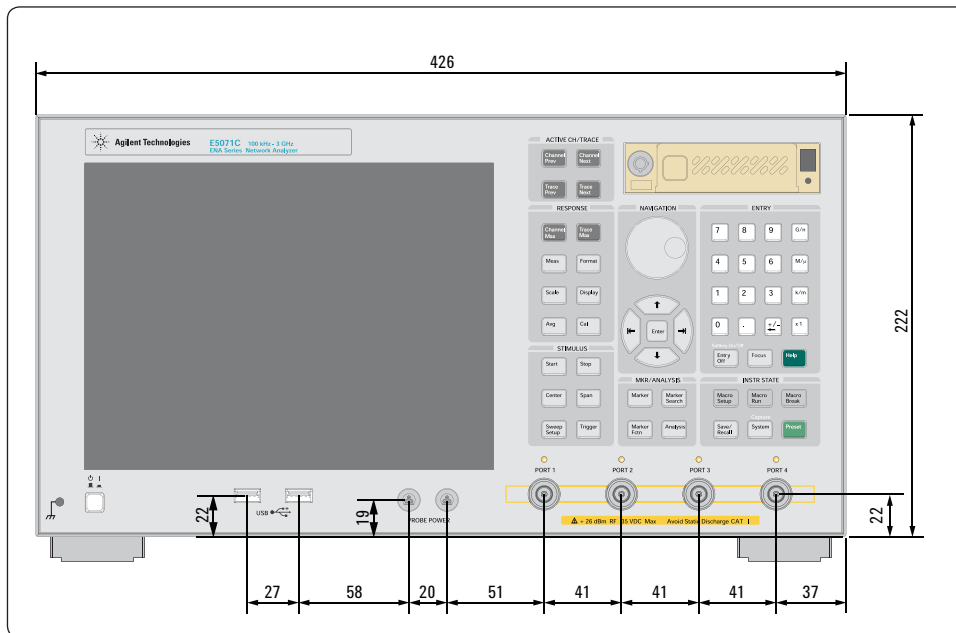


Figure 4. Dimensions (front view, E5071C with Option 430/435/440/445/460/465/480/485, in millimeters)

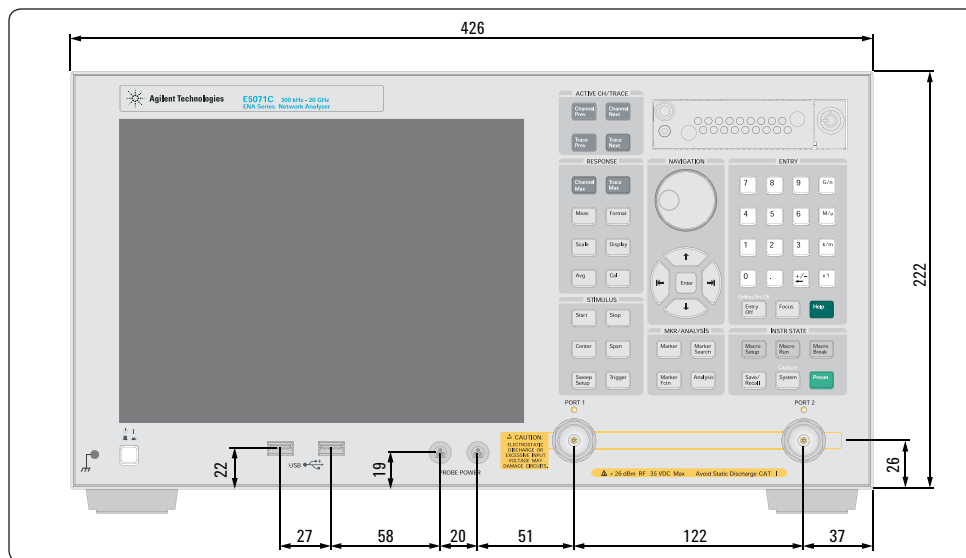


Figure 5. Dimensions (front view, E5071C with Option 2D5/2K5, in millimeters)

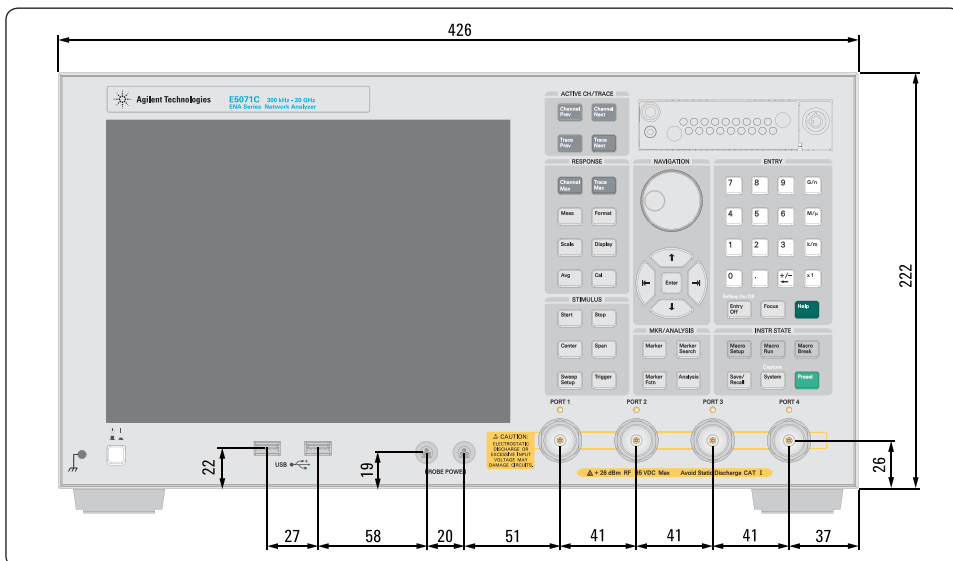


Figure 6. Dimensions (front view, E5071C with Option 4D5/4K5, in millimeters)

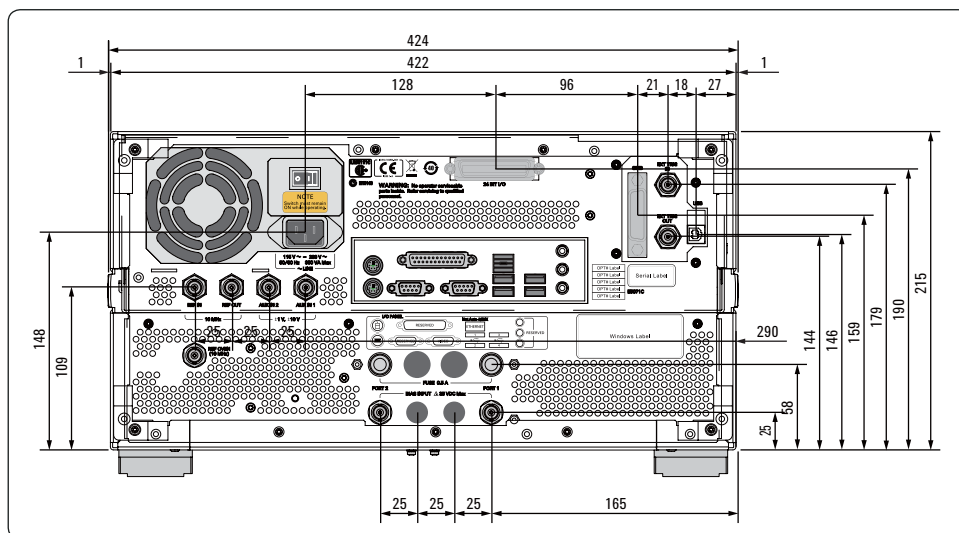


Figure 7. Dimensions (rear view with Option 1E5, in millimeters)

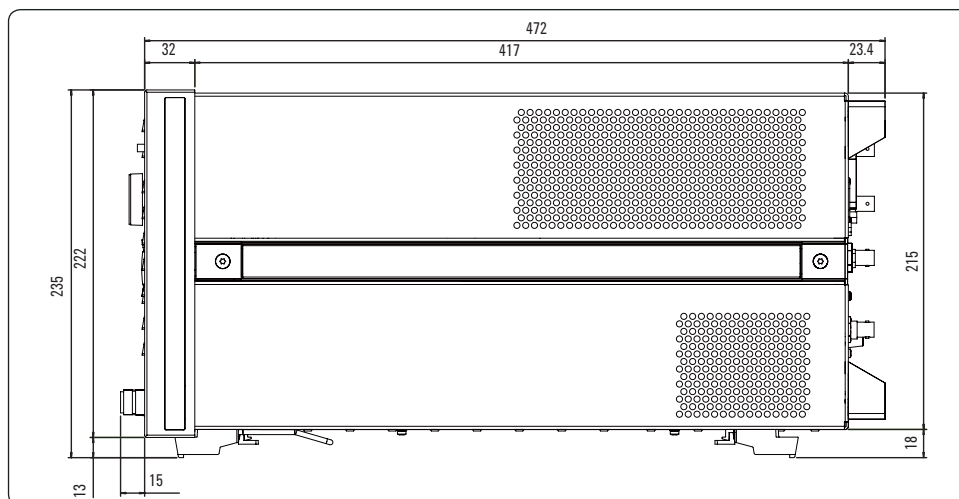


Figure 8. Dimensions (side view, E5071C Option 230/235/240/245/260/265/280/285/430/435/440/445/460/465/480/485, in millimeters)

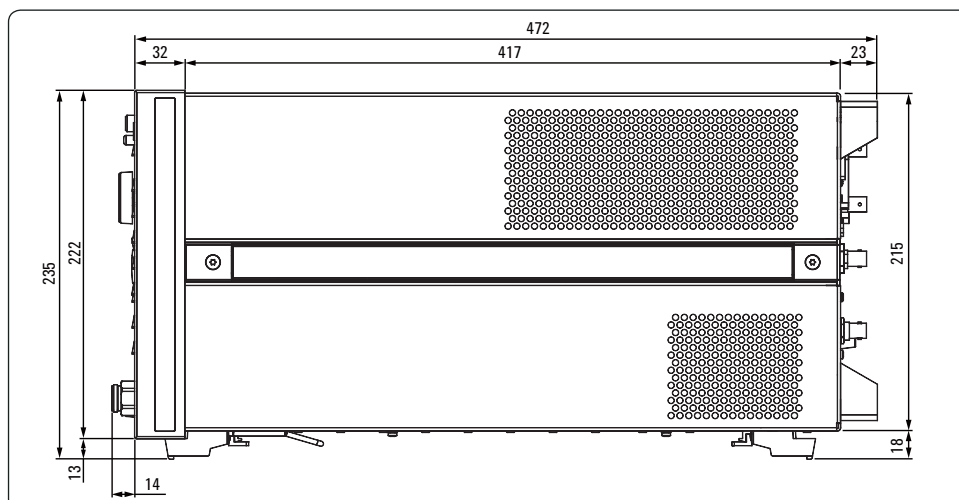


Figure 9. Dimensions (side view, E5071C with Option 2D5/2K5/4D5/4K5, in millimeters)

## Measurement Throughput Summary

### Cycle time for measurement completion<sup>1, 2</sup> (ms)

**Table 32.** Option 230/235/240/245/260/265/280/285/430/435/440/445/460/465/480/485

Sweep mode: Swept, analyzer display turned off with: DISP:ENAB OFF,  
number of traces = 1, system error correction: OFF

|                                                        | Number of points |     |      |      |
|--------------------------------------------------------|------------------|-----|------|------|
|                                                        | 51               | 201 | 401  | 1601 |
| <b>Start 1 GHz, stop 1.2 GHz, 500 kHz IF bandwidth</b> |                  |     |      |      |
| Uncorrected                                            | 3.4              | 4.9 | 7.1  | 20   |
| 2-port cal                                             | 6.3              | 9.3 | 14   | 41   |
| 4-port cal                                             | 13               | 19  | 28   | 92   |
| <b>Start 1 GHz, stop 1.2 GHz, 100 kHz IF bandwidth</b> |                  |     |      |      |
| Uncorrected                                            | 3.7              | 5.2 | 7.3  | 20   |
| 2-port cal                                             | 6.6              | 10  | 15   | 42   |
| 4-port cal                                             | 13               | 21  | 32   | 94   |
| <b>Start 1 GHz, stop 1.2 GHz, 1 kHz IF bandwidth</b>   |                  |     |      |      |
| Uncorrected                                            | 54               | 202 | 397  | 1563 |
| 2-port cal                                             | 107              | 401 | 792  | 3125 |
| 4-port cal                                             | 213              | 800 | 1581 | 6247 |
| <b>Start 100 kHz, stop 3 GHz, 500 kHz IF bandwidth</b> |                  |     |      |      |
| Uncorrected                                            | 8.7              | 11  | 12   | 25   |
| 2-port cal                                             | 17               | 21  | 24   | 48   |
| 4-port cal                                             | 34               | 42  | 49   | 102  |
| <b>Start 100 kHz, stop 3 GHz, 100 kHz IF bandwidth</b> |                  |     |      |      |
| Uncorrected                                            | 8.8              | 11  | 13   | 26   |
| 2-port cal                                             | 17               | 22  | 24   | 54   |
| 4-port cal                                             | 34               | 42  | 49   | 118  |
| <b>Start 100 kHz, stop 3 GHz, 1 kHz IF bandwidth</b>   |                  |     |      |      |
| Uncorrected                                            | 56               | 206 | 404  | 1583 |
| 2-port cal                                             | 112              | 410 | 805  | 3163 |
| 4-port cal                                             | 222              | 818 | 1608 | 6324 |

1. Supplemental performance data.

2. Measured with firmware version A.09.30.

**Table 32.** Option 230/235/240/245/260/265/280/285/430/435/440/445/  
460/465/480/485 *(continued)*

|                                                          | Number of points |     |      |      |
|----------------------------------------------------------|------------------|-----|------|------|
|                                                          | 51               | 201 | 401  | 1601 |
| <b>Start 100 kHz, stop 8.5 GHz, 500 kHz IF bandwidth</b> |                  |     |      |      |
| Uncorrected                                              | 15               | 18  | 19   | 24   |
| 2-port cal                                               | 28               | 35  | 38   | 48   |
| 4-port cal                                               | 55               | 69  | 74   | 104  |
| <b>Start 100 kHz, stop 8.5 GHz, 100 kHz IF bandwidth</b> |                  |     |      |      |
| Uncorrected                                              | 15               | 18  | 20   | 26   |
| 2-port cal                                               | 28               | 36  | 38   | 52   |
| 4-port cal                                               | 56               | 70  | 75   | 117  |
| <b>Start 100 kHz, stop 8.5 GHz, 1 kHz IF bandwidth</b>   |                  |     |      |      |
| Uncorrected                                              | 57               | 207 | 404  | 1583 |
| 2-port cal                                               | 114              | 412 | 806  | 3163 |
| 4-port cal                                               | 225              | 821 | 1611 | 6324 |

## Cycle time for measurement completion<sup>1, 2</sup> (ms)

**Table 33.** Option 230/235/240/245/260/265/280/285/430/435/440/445/460/465/480/485

**Sweep mode:** Swept, analyzer display turned off with: DISP:ENAB OFF,  
**number of traces = 1, system error correction: ON**

|                                                        | Number of Points |     |      |      |
|--------------------------------------------------------|------------------|-----|------|------|
|                                                        | 51               | 201 | 401  | 1601 |
| <b>Start 1 GHz, stop 1.2 GHz, 500 kHz IF bandwidth</b> |                  |     |      |      |
| Uncorrected                                            | 3.5              | 5.5 | 8.0  | 24   |
| 2-port cal                                             | 6.4              | 9.8 | 15   | 49   |
| 4-port cal                                             | 13               | 20  | 29   | 108  |
| <b>Start 1 GHz, stop 1.2 GHz, 100 kHz IF bandwidth</b> |                  |     |      |      |
| Uncorrected                                            | 3.6              | 5.4 | 8.0  | 23   |
| 2-port cal                                             | 6.6              | 11  | 16   | 48   |
| 4-port cal                                             | 13               | 22  | 33   | 107  |
| <b>Start 1 GHz, stop 1.2 GHz, 1 kHz IF bandwidth</b>   |                  |     |      |      |
| Uncorrected                                            | 54               | 202 | 397  | 1563 |
| 2-port cal                                             | 107              | 401 | 792  | 3125 |
| 4-port cal                                             | 213              | 800 | 1581 | 6247 |
| <b>Start 100 kHz, stop 3 GHz, 500 kHz IF bandwidth</b> |                  |     |      |      |
| Uncorrected                                            | 8.7              | 11  | 13   | 28   |
| 2-port cal                                             | 18               | 21  | 24   | 53   |
| 4-port cal                                             | 34               | 42  | 49   | 112  |
| <b>Start 100 kHz, stop 3 GHz, 100 kHz IF bandwidth</b> |                  |     |      |      |
| Uncorrected                                            | 8.8              | 11  | 13   | 28   |
| 2-port cal                                             | 17               | 22  | 25   | 57   |
| 4-port cal                                             | 34               | 42  | 50   | 122  |
| <b>Start 100 kHz, stop 3 GHz, 1 kHz IF bandwidth</b>   |                  |     |      |      |
| Uncorrected                                            | 56               | 206 | 404  | 1583 |
| 2-port cal                                             | 112              | 410 | 805  | 3163 |
| 4-port cal                                             | 222              | 818 | 1608 | 6324 |

1. Supplemental performance data.

2. Measured with firmware version A.09.30.

**Table 33.** Option 230/235/240/245/260/265/280/285/430/435/440/445/  
460/465/480/485 *(continued)*

|                                                          | Number of points |     |      |      |
|----------------------------------------------------------|------------------|-----|------|------|
|                                                          | 51               | 201 | 401  | 1601 |
| <b>Start 100 kHz, stop 8.5 GHz, 500 kHz IF bandwidth</b> |                  |     |      |      |
| Uncorrected                                              | 15               | 18  | 20   | 27   |
| 2-port cal                                               | 28               | 35  | 38   | 52   |
| 4-port cal                                               | 55               | 69  | 74   | 111  |
| <b>Start 100 kHz, stop 8.5 GHz, 100 kHz IF bandwidth</b> |                  |     |      |      |
| Uncorrected                                              | 15               | 18  | 20   | 27   |
| 2-port cal                                               | 28               | 36  | 38   | 56   |
| 4-port cal                                               | 56               | 70  | 75   | 120  |
| <b>Start 100 kHz, stop 8.5 GHz, 1 kHz IF bandwidth</b>   |                  |     |      |      |
| Uncorrected                                              | 57               | 207 | 404  | 1583 |
| 2-port cal                                               | 114              | 412 | 806  | 3163 |
| 4-port cal                                               | 225              | 821 | 1611 | 6324 |

## Cycle time for measurement completion<sup>1, 2</sup> (ms)

**Table 34.** Option 230/235/240/245/260/265/280/285/430/435/440/445/460/465/480/485

Sweep mode: Stepped, analyzer display turned off with: DISP:ENAB OFF,  
number of traces = 1, system error correction: ON

|                                                        | Number of Points |     |      |      |
|--------------------------------------------------------|------------------|-----|------|------|
|                                                        | 51               | 201 | 401  | 1601 |
| <b>Start 1 GHz, stop 1.2 GHz, 500 kHz IF bandwidth</b> |                  |     |      |      |
| Uncorrected                                            | 4.4              | 7.7 | 12   | 29   |
| 2-port cal                                             | 8.2              | 15  | 22   | 56   |
| 4-port cal                                             | 16               | 29  | 45   | 126  |
| <b>Start 1 GHz, stop 1.2 GHz, 100 kHz IF bandwidth</b> |                  |     |      |      |
| Uncorrected                                            | 4.8              | 9.2 | 15   | 41   |
| 2-port cal                                             | 9.0              | 18  | 28   | 80   |
| 4-port cal                                             | 18               | 35  | 56   | 163  |
| <b>Start 1 GHz, stop 1.2 GHz, 1 kHz IF bandwidth</b>   |                  |     |      |      |
| Uncorrected                                            | 54               | 202 | 397  | 1563 |
| 2-port cal                                             | 107              | 401 | 792  | 3125 |
| 4-port cal                                             | 213              | 800 | 1581 | 6247 |
| <b>Start 100 kHz, stop 3 GHz, 500 kHz IF bandwidth</b> |                  |     |      |      |
| Uncorrected                                            | 6.7              | 13  | 18   | 48   |
| 2-port cal                                             | 13               | 24  | 36   | 94   |
| 4-port cal                                             | 26               | 47  | 70   | 190  |
| <b>Start 100 kHz, stop 3 GHz, 100 kHz IF bandwidth</b> |                  |     |      |      |
| Uncorrected                                            | 7.1              | 14  | 22   | 60   |
| 2-port cal                                             | 14               | 27  | 42   | 119  |
| 4-port cal                                             | 27               | 53  | 82   | 237  |
| <b>Start 100 kHz, stop 3 GHz, 1 kHz IF bandwidth</b>   |                  |     |      |      |
| Uncorrected                                            | 56               | 206 | 404  | 1583 |
| 2-port cal                                             | 112              | 410 | 805  | 3163 |
| 4-port cal                                             | 222              | 818 | 1608 | 6324 |

1. Supplemental performance data.

2. Measured with firmware version A.09.30.

**Table 34.** Option 230/235/240/245/260/265/280/285/430/435/440/445/  
460/465/480/485 *(continued)*

|                                                          | Number of points |     |      |      |
|----------------------------------------------------------|------------------|-----|------|------|
|                                                          | 51               | 201 | 401  | 1601 |
| <b>Start 100 kHz, stop 8.5 GHz, 500 kHz IF bandwidth</b> |                  |     |      |      |
| Uncorrected                                              | 7.5              | 13  | 19   | 48   |
| 2-port cal                                               | 15               | 26  | 37   | 94   |
| 4-port cal                                               | 29               | 50  | 73   | 189  |
| <b>Start 100 kHz, stop 8.5 GHz, 100 kHz IF bandwidth</b> |                  |     |      |      |
| Uncorrected                                              | 7.9              | 15  | 22   | 60   |
| 2-port cal                                               | 16               | 29  | 43   | 120  |
| 4-port cal                                               | 30               | 56  | 85   | 237  |
| <b>Start 100 kHz, stop 8.5 GHz, 1 kHz IF bandwidth</b>   |                  |     |      |      |
| Uncorrected                                              | 57               | 207 | 404  | 1583 |
| 2-port cal                                               | 114              | 412 | 806  | 3163 |
| 4-port cal                                               | 225              | 821 | 1611 | 6324 |

## Cycle time for measurement completion<sup>1, 2</sup> (ms)

**Table 35.** Option 2D5/2K5/4D5/4K5

**Sweep mode:** Swept, analyzer display turned off with: DISP:ENAB OFF,  
**number of traces = 1, system error correction: OFF**

|                                                         | Number of points |     |      |      |
|---------------------------------------------------------|------------------|-----|------|------|
|                                                         | 51               | 201 | 401  | 1601 |
| <b>Start 300 kHz, stop 20 GHz, 500 kHz IF bandwidth</b> |                  |     |      |      |
| Uncorrected                                             | 23               | 36  | 39   | 43   |
| 2-port cal                                              | 45               | 71  | 77   | 85   |
| 4-port cal                                              | 88               | 142 | 155  | 169  |
| <b>Start 300 kHz, stop 20 GHz, 100 kHz IF bandwidth</b> |                  |     |      |      |
| Uncorrected                                             | 23               | 37  | 40   | 43   |
| 2-port cal                                              | 45               | 72  | 78   | 86   |
| 4-port cal                                              | 89               | 144 | 156  | 171  |
| <b>Start 300 kHz, stop 20 GHz, 1 kHz IF bandwidth</b>   |                  |     |      |      |
| Uncorrected                                             | 60               | 212 | 410  | 1591 |
| 2-port cal                                              | 120              | 421 | 817  | 3180 |
| 4-port cal                                              | 237              | 840 | 1632 | 6358 |
| <b>Start 8 GHz, stop 18 GHz, 500 kHz IF bandwidth</b>   |                  |     |      |      |
| Uncorrected                                             | 17               | 22  | 22   | 23   |
| 2-port cal                                              | 34               | 42  | 44   | 45   |
| 4-port cal                                              | 67               | 83  | 86   | 102  |
| <b>Start 8 GHz, stop 18 GHz, 100 kHz IF bandwidth</b>   |                  |     |      |      |
| Uncorrected                                             | 18               | 22  | 23   | 24   |
| 2-port cal                                              | 34               | 42  | 44   | 47   |
| 4-port cal                                              | 67               | 84  | 87   | 106  |
| <b>Start 8 GHz, stop 18 GHz, 1 kHz IF bandwidth</b>     |                  |     |      |      |
| Uncorrected                                             | 58               | 207 | 405  | 1583 |
| 2-port cal                                              | 115              | 413 | 807  | 3163 |
| 4-port cal                                              | 229              | 823 | 1612 | 6324 |

1. Supplemental performance data.

2. Measured with firmware version A.09.30.

**Table 35. Option 2D5/2K5/4D5/4K5** *(continued)*

|                                                        | Number of points |     |      |      |
|--------------------------------------------------------|------------------|-----|------|------|
|                                                        | 51               | 201 | 401  | 1601 |
| <b>Start 11 GHz, stop 12 GHz, 500 kHz IF bandwidth</b> |                  |     |      |      |
| Uncorrected                                            | 3.0              | 3.2 | 4.9  | 17   |
| 2-port cal                                             | 5.6              | 6.1 | 9.9  | 37   |
| 4-port cal                                             | 11               | 14  | 23   | 84   |
| <b>Start 11 GHz, stop 12 GHz, 100 kHz IF bandwidth</b> |                  |     |      |      |
| Uncorrected                                            | 3.0              | 3.4 | 5.5  | 18   |
| 2-port cal                                             | 5.6              | 6.4 | 11   | 38   |
| 4-port cal                                             | 11               | 14  | 24   | 85   |
| <b>Start 11 GHz, stop 12 GHz, 1 kHz IF bandwidth</b>   |                  |     |      |      |
| Uncorrected                                            | 52               | 200 | 396  | 1566 |
| 2-port cal                                             | 104              | 399 | 790  | 3130 |
| 4-port cal                                             | 206              | 795 | 1578 | 6258 |

## Cycle time for measurement completion<sup>1, 2</sup> (ms)

**Table 36.** Option 2D5/2K5/4D5/4K5

Sweep mode: Swept, analyzer display turned off with: DISP:ENAB OFF,  
number of traces = 1, system error correction: ON

|                                                         | Number of points |     |      |      |
|---------------------------------------------------------|------------------|-----|------|------|
|                                                         | 51               | 201 | 401  | 1601 |
| <b>Start 300 kHz, stop 20 GHz, 500 kHz IF bandwidth</b> |                  |     |      |      |
| Uncorrected                                             | 23               | 36  | 39   | 43   |
| 2-port cal                                              | 45               | 71  | 77   | 85   |
| 4-port cal                                              | 88               | 142 | 155  | 170  |
| <b>Start 300 kHz, stop 20 GHz, 100 kHz IF bandwidth</b> |                  |     |      |      |
| Uncorrected                                             | 23               | 37  | 40   | 43   |
| 2-port cal                                              | 45               | 72  | 78   | 86   |
| 4-port cal                                              | 89               | 144 | 156  | 171  |
| <b>Start 300 kHz, stop 20 GHz, 1 kHz IF bandwidth</b>   |                  |     |      |      |
| Uncorrected                                             | 60               | 212 | 410  | 1591 |
| 2-port cal                                              | 120              | 421 | 817  | 3180 |
| 4-port cal                                              | 237              | 840 | 1632 | 6358 |
| <b>Start 8 GHz, stop 18 GHz, 500 kHz IF bandwidth</b>   |                  |     |      |      |
| Uncorrected                                             | 17               | 22  | 22   | 23   |
| 2-port cal                                              | 34               | 42  | 44   | 48   |
| 4-port cal                                              | 67               | 83  | 86   | 107  |
| <b>Start 8 GHz, stop 18 GHz, 100 kHz IF bandwidth</b>   |                  |     |      |      |
| Uncorrected                                             | 18               | 22  | 23   | 24   |
| 2-port cal                                              | 34               | 42  | 44   | 49   |
| 4-port cal                                              | 67               | 83  | 87   | 110  |
| <b>Start 8 GHz, stop 18 GHz, 1 kHz IF bandwidth</b>     |                  |     |      |      |
| Uncorrected                                             | 58               | 207 | 405  | 1583 |
| 2-port cal                                              | 115              | 413 | 807  | 3163 |
| 4-port cal                                              | 229              | 823 | 1612 | 6324 |

1. Supplemental performance data.

2. Measured with firmware version A.09.30.

**Table 36. Option 2D5/2K5/4D5/4K5** *(continued)*

|                                                        | Number of points |     |      |      |
|--------------------------------------------------------|------------------|-----|------|------|
|                                                        | 51               | 201 | 401  | 1601 |
| <b>Start 11 GHz, stop 12 GHz, 500 kHz IF bandwidth</b> |                  |     |      |      |
| Uncorrected                                            | 3.0              | 3.4 | 5.9  | 20   |
| 2-port cal                                             | 5.6              | 6.6 | 12   | 43   |
| 4-port cal                                             | 11               | 14  | 26   | 98   |
| <b>Start 11 GHz, stop 12 GHz, 100 kHz IF bandwidth</b> |                  |     |      |      |
| Uncorrected                                            | 3.0              | 3.5 | 5.8  | 20   |
| 2-port cal                                             | 5.6              | 6.8 | 12   | 43   |
| 4-port cal                                             | 11               | 15  | 26   | 98   |
| <b>Start 11 GHz, stop 12 GHz, 1 kHz IF bandwidth</b>   |                  |     |      |      |
| Uncorrected                                            | 52               | 200 | 396  | 1566 |
| 2-port cal                                             | 104              | 399 | 790  | 3130 |
| 4-port cal                                             | 206              | 795 | 1578 | 6258 |

## Cycle time for measurement completion<sup>1, 2</sup> (ms)

**Table 37. Option 2D5/2K5/4D5/4K5**

**Sweep mode: Stepped, analyzer display turned off with: DISP:ENAB OFF,  
number of traces = 1, system error correction: ON**

|                                                         | Number of points |     |      |      |
|---------------------------------------------------------|------------------|-----|------|------|
|                                                         | 51               | 201 | 401  | 1601 |
| <b>Start 300 kHz, stop 20 GHz, 500 kHz IF bandwidth</b> |                  |     |      |      |
| Uncorrected                                             | 11               | 18  | 24   | 56   |
| 2-port cal                                              | 21               | 35  | 48   | 112  |
| 4-port cal                                              | 41               | 69  | 94   | 222  |
| <b>Start 300 kHz, stop 20 GHz, 100 kHz IF bandwidth</b> |                  |     |      |      |
| Uncorrected                                             | 11               | 20  | 28   | 69   |
| 2-port cal                                              | 22               | 38  | 54   | 137  |
| 4-port cal                                              | 42               | 75  | 107  | 272  |
| <b>Start 300 kHz, stop 20 GHz, 1 kHz IF bandwidth</b>   |                  |     |      |      |
| Uncorrected                                             | 60               | 212 | 410  | 1591 |
| 2-port cal                                              | 120              | 421 | 817  | 3180 |
| 4-port cal                                              | 237              | 840 | 1632 | 6358 |
| <b>Start 8 GHz, stop 18 GHz, 500 kHz IF bandwidth</b>   |                  |     |      |      |
| Uncorrected                                             | 8.4              | 14  | 19   | 48   |
| 2-port cal                                              | 17               | 27  | 38   | 94   |
| 4-port cal                                              | 32               | 52  | 74   | 188  |
| <b>Start 8 GHz, stop 18 GHz, 100 kHz IF bandwidth</b>   |                  |     |      |      |
| Uncorrected                                             | 8.8              | 15  | 22   | 60   |
| 2-port cal                                              | 17               | 30  | 44   | 120  |
| 4-port cal                                              | 34               | 58  | 86   | 237  |
| <b>Start 8 GHz, stop 18 GHz, 1 kHz IF bandwidth</b>     |                  |     |      |      |
| Uncorrected                                             | 58               | 207 | 405  | 1583 |
| 2-port cal                                              | 115              | 413 | 807  | 3163 |
| 4-port cal                                              | 229              | 823 | 1612 | 6324 |

1. Supplemental performance data.

2. Measured with firmware version A.09.30.

**Table 37. Option 2D5/2K5/4D5/4K5** *(continued)*

|                                                        | Number of points |     |      |      |
|--------------------------------------------------------|------------------|-----|------|------|
|                                                        | 51               | 201 | 401  | 1601 |
| <b>Start 11 GHz, stop 12 GHz, 500 kHz IF bandwidth</b> |                  |     |      |      |
| Uncorrected                                            | 2.8              | 6.4 | 11   | 31   |
| 2-port cal                                             | 5.1              | 13  | 21   | 61   |
| 4-port cal                                             | 9.6              | 24  | 41   | 131  |
| <b>Start 11 GHz, stop 12 GHz, 100 kHz IF bandwidth</b> |                  |     |      |      |
| Uncorrected                                            | 3.4              | 8.0 | 14   | 43   |
| 2-port cal                                             | 5.9              | 16  | 27   | 86   |
| 4-port cal                                             | 12               | 30  | 53   | 171  |
| <b>Start 11 GHz, stop 12 GHz, 1 kHz IF bandwidth</b>   |                  |     |      |      |
| Uncorrected                                            | 52               | 200 | 396  | 1566 |
| 2-port cal                                             | 104              | 399 | 790  | 3130 |
| 4-port cal                                             | 206              | 795 | 1578 | 6258 |

## Cycle time (ms)<sup>1, 2</sup> vs. number of points

**Table 38.** Option 230/235/240/245/260/265/280/285/430/435/440/445/460/465/480/485

Start 1 GHz, stop 1.2 GHz, 500 kHz IF bandwidth, error correction: OFF,  
display update: OFF, number of traces = 1

| Number of points | Sweep mode:<br>Fast swept,<br>system error<br>correction: OFF | Sweep mode:<br>Fast swept,<br>system error<br>correction: ON | Sweep mode:<br>Std stepped,<br>system error<br>correction: ON |
|------------------|---------------------------------------------------------------|--------------------------------------------------------------|---------------------------------------------------------------|
| 3                | 3.1                                                           | 3.1                                                          | 3.4                                                           |
| 11               | 3.3                                                           | 3.3                                                          | 3.3                                                           |
| 51               | 3.5                                                           | 3.5                                                          | 4.4                                                           |
| 101              | 3.9                                                           | 4.1                                                          | 5.6                                                           |
| 201              | 4.9                                                           | 5.5                                                          | 7.7                                                           |
| 401              | 7.1                                                           | 8.0                                                          | 12                                                            |
| 801              | 12                                                            | 14                                                           | 18                                                            |
| 1601             | 20                                                            | 24                                                           | 29                                                            |

## Cycle time (ms)<sup>1, 2</sup> vs. number of points

**Table 39.** Option 2D5/2K5/4D5/4K5

Start 11 GHz, stop 12 GHz, 500 kHz IF bandwidth, error correction: OFF,  
display update: OFF, number of traces = 1

| Number of points | Sweep mode:<br>Fast swept,<br>system error<br>correction: OFF | Sweep mode:<br>Fast swept,<br>system error<br>correction: ON | Sweep mode:<br>Std stepped,<br>system error<br>correction: ON |
|------------------|---------------------------------------------------------------|--------------------------------------------------------------|---------------------------------------------------------------|
| 51               | 3.0                                                           | 3.0                                                          | 2.8                                                           |
| 201              | 3.2                                                           | 3.4                                                          | 6.5                                                           |
| 401              | 4.9                                                           | 5.9                                                          | 11                                                            |
| 1601             | 17                                                            | 20                                                           | 31                                                            |

1. Supplemental performance data.

2. Measured with firmware version A.09.30.

## Cycle time (ms)<sup>1, 2</sup> vs. IF bandwidth

**Table 40. All options**

Sweep mode: Swept, analyzer display turned off with: DISP:ENAB OFF,  
number of traces = 1, system error correction: OFF, NOP = 201

| Option 230/235/240/245/260/265/280/<br>285/430/435/440/445/460/465/480/485 |              |                    | Option 2D5/2K5/4D5/4K5 |              |                    |
|----------------------------------------------------------------------------|--------------|--------------------|------------------------|--------------|--------------------|
| Frequency<br>[Hz]                                                          | IFBW<br>[Hz] | Cycle time<br>[ms] | Frequency<br>[Hz]      | IFBW<br>[Hz] | Cycle time<br>[ms] |
| 4 G                                                                        | 500000       | 5.0                | 10 G                   | 500000       | 2.8                |
| 4 G                                                                        | 400000       | 5.0                | 10 G                   | 400000       | 2.8                |
| 4 G                                                                        | 300000       | 4.9                | 10 G                   | 300000       | 2.8                |
| 4 G                                                                        | 200000       | 4.9                | 10 G                   | 200000       | 2.8                |
| 4 G                                                                        | 150000       | 4.9                | 10 G                   | 150000       | 2.8                |
| 4 G                                                                        | 100000       | 5.0                | 10 G                   | 100000       | 3.0                |
| 4 G                                                                        | 70000        | 5.7                | 10 G                   | 70000        | 3.8                |
| 4 G                                                                        | 50000        | 6.9                | 10 G                   | 50000        | 4.9                |
| 4 G                                                                        | 40000        | 7.8                | 10 G                   | 40000        | 5.9                |
| 4 G                                                                        | 30000        | 9.4                | 10 G                   | 30000        | 7.5                |
| 4 G                                                                        | 20000        | 13                 | 10 G                   | 20000        | 11                 |
| 4 G                                                                        | 15000        | 16                 | 10 G                   | 15000        | 14                 |
| 4 G                                                                        | 10000        | 23                 | 10 G                   | 10000        | 21                 |
| 4 G                                                                        | 7000         | 31                 | 10 G                   | 7000         | 29                 |
| 4 G                                                                        | 5000         | 42                 | 10 G                   | 5000         | 40                 |
| 4 G                                                                        | 4000         | 52                 | 10 G                   | 4000         | 50                 |
| 4 G                                                                        | 3000         | 68                 | 10 G                   | 3000         | 66                 |
| 4 G                                                                        | 2000         | 100                | 10 G                   | 2000         | 98                 |
| 4 G                                                                        | 1500         | 133                | 10 G                   | 1500         | 132                |
| 4 G                                                                        | 1000         | 198                | 10 G                   | 1000         | 196                |
| 4 G                                                                        | 700          | 278                | 10 G                   | 700          | 276                |
| 4 G                                                                        | 500          | 391                | 10 G                   | 500          | 389                |
| 4 G                                                                        | 400          | 487                | 10 G                   | 400          | 485                |
| 4 G                                                                        | 300          | 648                | 10 G                   | 300          | 646                |
| 4 G                                                                        | 200          | 970                | 10 G                   | 200          | 968                |
| 4 G                                                                        | 150          | 1291               | 10 G                   | 150          | 1289               |
| 4 G                                                                        | 100          | 1935               | 10 G                   | 100          | 1933               |
| 4 G                                                                        | 70           | 2739               | 10 G                   | 70           | 2739               |
| 4 G                                                                        | 50           | 3864               | 10 G                   | 50           | 3869               |
| 4 G                                                                        | 40           | 4829               | 10 G                   | 40           | 4837               |
| 4 G                                                                        | 30           | 6437               | 10 G                   | 30           | 6449               |
| 4 G                                                                        | 20           | 9653               | 10 G                   | 20           | 9671               |
| 4 G                                                                        | 15           | 12870              | 10 G                   | 15           | 12892              |
| 4 G                                                                        | 10           | 19302              | 10 G                   | 10           | 19330              |

1. Supplemental performance data.

2. Measured with firmware version A.09.30.

## Data transfer time<sup>1, 2</sup> (ms)

**Table 41.** All options

|                                                      | Number of points |     |     |      |
|------------------------------------------------------|------------------|-----|-----|------|
|                                                      | 51               | 201 | 401 | 1601 |
| <b>SCPI over GPIB<sup>3</sup></b>                    |                  |     |     |      |
| 64-bit floating point                                | 4                | 12  | 25  | 88   |
| 32-bit floating point                                | 3                | 7   | 13  | 45   |
| ASCII                                                | 30               | 108 | 223 | 841  |
| <b>SCPI over 100 Mbps LAN (Telnet)<sup>3</sup></b>   |                  |     |     |      |
| REAL 64                                              | 1                | 1   | 2   | 4    |
| REAL 32                                              | 1                | 1   | 1   | 2    |
| ASCII                                                | 15               | 59  | 117 | 457  |
| <b>SCPI over 100 Mbps LAN (SICL-LAN)<sup>3</sup></b> |                  |     |     |      |
| REAL 64                                              | 3                | 3   | 4   | 6    |
| REAL 32                                              | 3                | 3   | 3   | 5    |
| ASCII                                                | 4                | 8   | 14  | 47   |
| <b>SCPI over USB (SICL-USB)<sup>3</sup></b>          |                  |     |     |      |
| REAL 64                                              | 2                | 2   | 2   | 3    |
| REAL 32                                              | 2                | 2   | 2   | 3    |
| ASCII                                                | 4                | 13  | 24  | 91   |
| <b>SCPI over GPIB/USB (82357B)</b>                   |                  |     |     |      |
| REAL 64                                              | 8                | 15  | 21  | 68   |
| REAL 32                                              | 7                | 10  | 13  | 37   |
| ASCII                                                | 75               | 290 | 579 | 2313 |
| <b>COM<sup>4</sup></b>                               |                  |     |     |      |
| Variant type                                         | 1                | 1   | 1   | 1    |

1. Supplemental performance data.

2. Measured with firmware version A.09.30.

3. Measured using a VEE Pro 7.0 program running on a 3.2 GHz Pentium 4 DELL Precision 370, Transferred complex  $S_{11}$  data, using :CALC{1-36}:DATA:FDAT?.

4. Measured using an E5071C VBA macro running inside the analyzer. Transferred complex  $S_{11}$  data.

## E5091A Multiport Test Set

The section provides port performance of test set without calibration.

**Table 42.** Test set input/output performance

| Description  | Specification     | Typical                        |
|--------------|-------------------|--------------------------------|
| Range        | 50 MHz to 8.5 GHz |                                |
| Damage level |                   | 20 dBm, $\pm 25$ VDC (typical) |

**Table 43.** Option E5091A-009 port performance

| Description                 | Specification     |                    |                  |                |                  |
|-----------------------------|-------------------|--------------------|------------------|----------------|------------------|
|                             | 50 MHz to 300 MHz | 300 MHz to 1.3 GHz | 1.3 GHz to 3 GHz | 3 GHz to 6 GHz | 6 GHz to 8.5 GHz |
| <b>Load match</b>           |                   |                    |                  |                |                  |
| Test port selected          |                   |                    |                  |                |                  |
| A, T2, R1+, R1–             | 19 dB             | 20 dB              | 18 dB            | 12 dB          | 10 dB            |
| T1, R2+, R2–, R3+, R3–      | 15 dB             | 17 dB              | 15 dB            | 11 dB          | 8 dB             |
| Test port unselected        |                   |                    |                  |                |                  |
| A, T2, R1+, R1–, R3+, R3–   | 23 dB             | 25 dB              | 19 dB            | 12 dB          | 11 dB            |
| T1, R2+, R2–                | 18 dB             | 20 dB              | 16 dB            | 12 dB          | 9 dB             |
| Interconnect port, typical  |                   |                    |                  |                |                  |
| P1, P2, P3, P4              | 19 dB             | 19 dB              | 17 dB            | 13 dB          | 9 dB             |
| <b>Insertion loss</b>       |                   |                    |                  |                |                  |
| Test port                   |                   |                    |                  |                |                  |
| A, T2, R1+, R1–             | 3 dB              | 3 dB               | 4 dB             | 5 dB           | 6 dB             |
| T1, R2+, R2–, R3+, R3–      | 5 dB              | 5 dB               | 7 dB             | 8 dB           | 9.5 dB           |
| Stability, typical          | 0.005 dB/° C      | 0.005 dB/° C       | 0.005 dB/° C     | 0.01 dB/° C    | 0.015 dB/° C     |
| <b>Isolation</b>            |                   |                    |                  |                |                  |
| Over arbitrarily test ports | –100 dB           | –100 dB            | –100 dB          | –100 dB        | –90 dB           |

**Table 44. Option E5091A-016 port performance**

| Description                                                               | Specification     |                    |                  |                |                  |
|---------------------------------------------------------------------------|-------------------|--------------------|------------------|----------------|------------------|
|                                                                           | 50 MHz to 300 MHz | 300 MHz to 1.3 GHz | 1.3 GHz to 3 GHz | 3 GHz to 6 GHz | 6 GHz to 8.5 GHz |
| <b>Load match</b>                                                         |                   |                    |                  |                |                  |
| Test port selected<br>A, T4, R1+, R1–, R2+, R2–, R3+, R3–, R4+, R4–       | 15 dB             | 17 dB              | 15 dB            | 9 dB           | 8 dB             |
| T1, T2, T3                                                                | 12 dB             | 14 dB              | 14 dB            | 8 dB           | 6 dB             |
| Test port unselected<br>A, T4, T2, R1+, R1–, R2+, R2–, R3+, R3–, R4+, R4– | 18 dB             | 20 dB              | 16 dB            | 10 dB          | 9 dB             |
| T1, T2, T3                                                                | 13 dB             | 15 dB              | 14 dB            | 8 dB           | 6 dB             |
| Interconnect port, typical<br>P1, P2, P3, P4                              | 12 dB             | 12 dB              | 12 dB            | 9 dB           | 7 dB             |
| <b>Insertion loss</b>                                                     |                   |                    |                  |                |                  |
| Test port<br>A, T4, R1+, R1–, R2+, R2–, R3+, R3–, R4+, R4–                | 6 dB              | 6 dB               | 7 dB             | 8 dB           | 9.5 dB           |
| T1, T2, T3                                                                | 6 dB              | 9 dB               | 10.5 dB          | 12 dB          | 14.5 dB          |
| Stability per switch, typical                                             | 0.005 dB/° C      | 0.005 dB/° C       | 0.005 dB/° C     | 0.01 dB/° C    | 0.015 dB/° C     |
| <b>Isolation</b>                                                          |                   |                    |                  |                |                  |
| Over arbitrarily test ports                                               | –100 dB           | –100 dB            | –100 dB          | –100 dB        | –80 dB           |

**Table 45. Front panel information**

| Description                    | General characteristics                                                                       |
|--------------------------------|-----------------------------------------------------------------------------------------------|
| <b>RF connectors</b>           |                                                                                               |
| Interconnect ports             | Type-N, female, 50 Ω, nominal<br>Number of ports 4 ports                                      |
| Test ports (Option E5091A-009) | Type-N, female, 50 Ω, nominal<br>Number of ports 9 ports                                      |
| Test ports (Option E5091A-016) | SMA, female, 50 Ω, nominal<br>Number of ports 25 ports<br>(includes configurable switch port) |
| Control line                   | 15 pin D-sub, female                                                                          |

**Table 46. Rear panel information**

| Description                    | General characteristics                                      |
|--------------------------------|--------------------------------------------------------------|
| USB port                       | Type B-receptacle, provide connection to the E5071C          |
| <b>Line power <sup>1</sup></b> |                                                              |
| Frequency                      | 47 to 63 Hz                                                  |
| Voltage                        | 90 to 132 VAC, or 198 to 264 VAC<br>(automatically switched) |
| VA max                         | 150 VA max.                                                  |

1. A third-wire ground is required.

Table 47. Test set dimensions and block diagram

| Description           | General characteristics   |
|-----------------------|---------------------------|
| <b>Dimensions</b>     |                           |
| Option E5091A-009     | See Figure 10, 12, and 13 |
| Option E5091A-016     | See Figure 11, 12, and 15 |
| <b>Weight</b>         |                           |
| Option E5091A-009     | 6 kg                      |
| Option E5091A-016     | 7 kg                      |
| <b>Block diagram</b>  |                           |
| Option E5091A-009/016 | See Figure 15             |

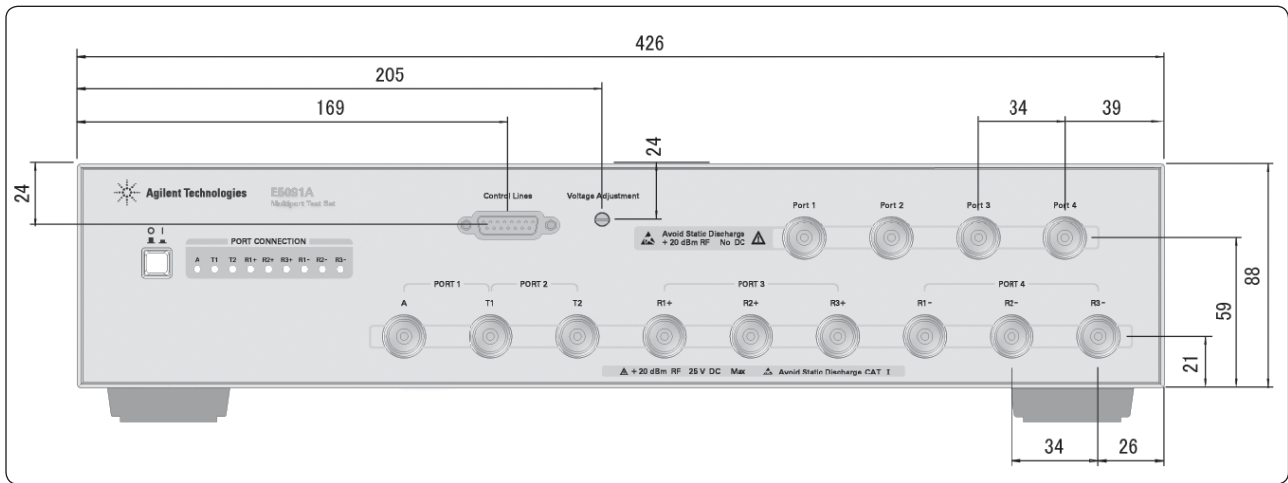


Figure 10. Dimensions (front view, with Option E5091A-009, in millimeters, nominal)

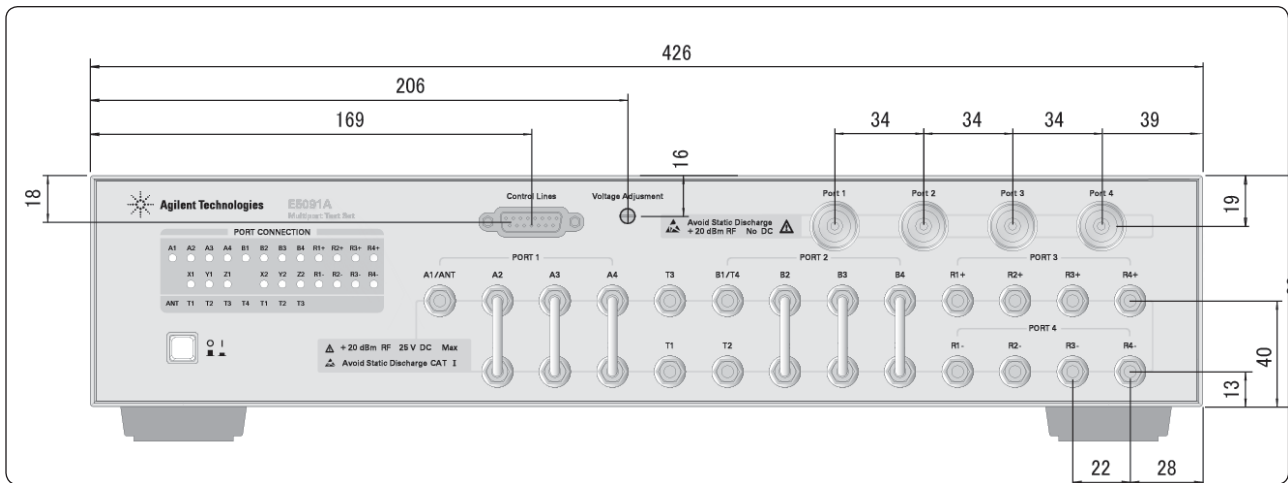


Figure 11. Dimensions (front view, with Option E5091A-016, in millimeters, nominal)

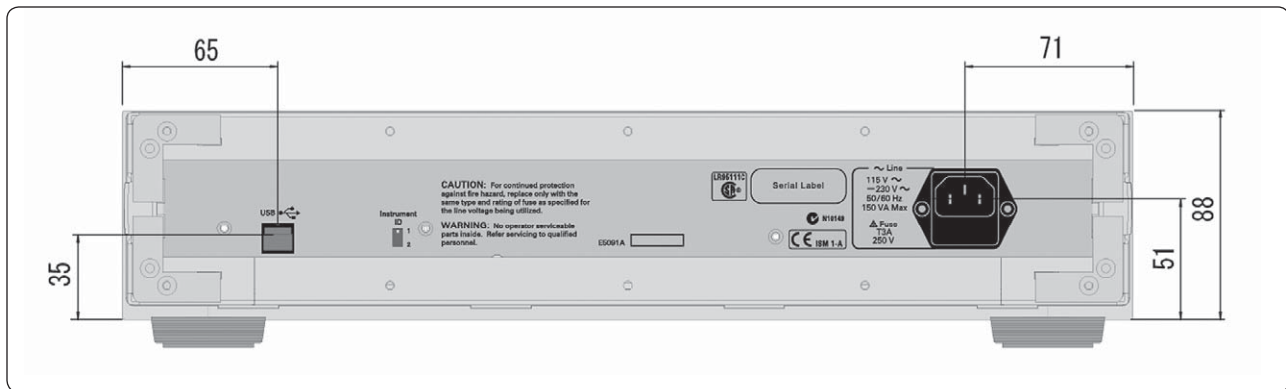


Figure 12. Dimensions (rear view, in millimeters, nominal)

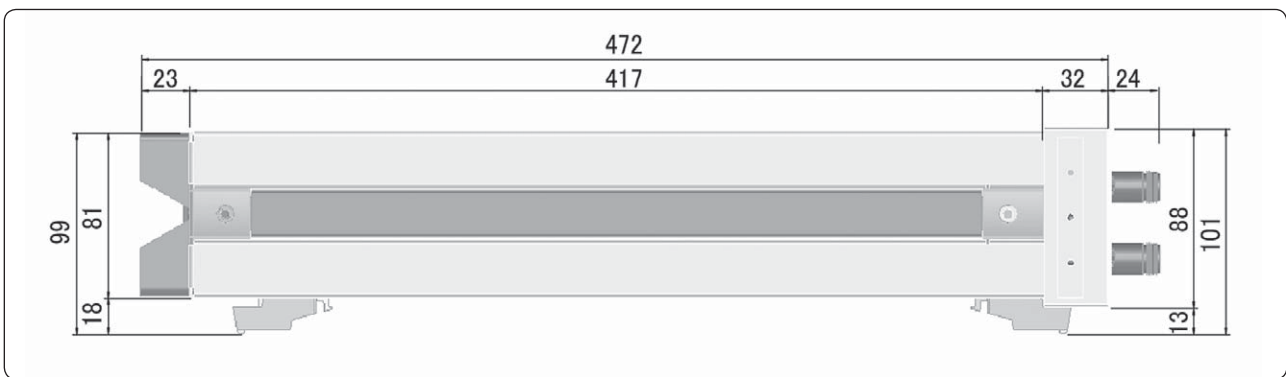


Figure 13 Dimensions (side view, with Option E5091A-009, in millimeters, nominal)

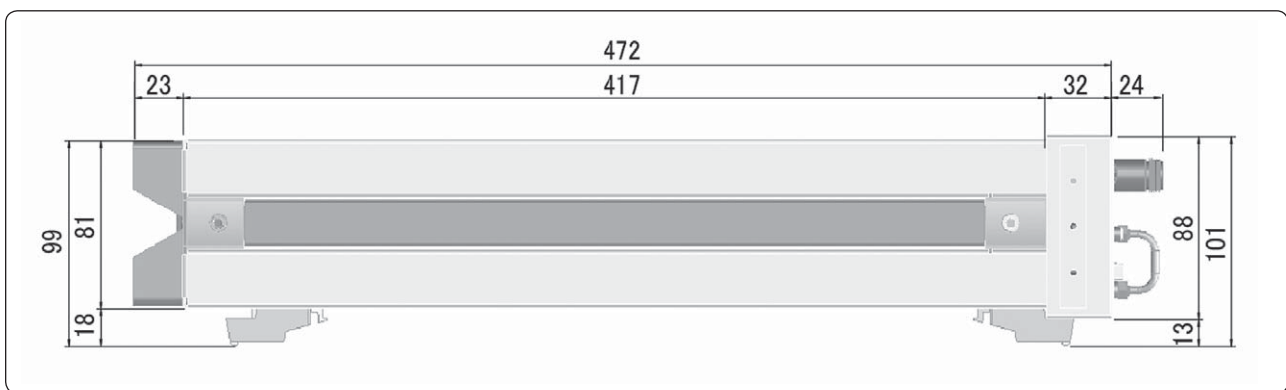


Figure 14. Dimensions (side view, with Option E5091A-016, in millimeters, nominal)

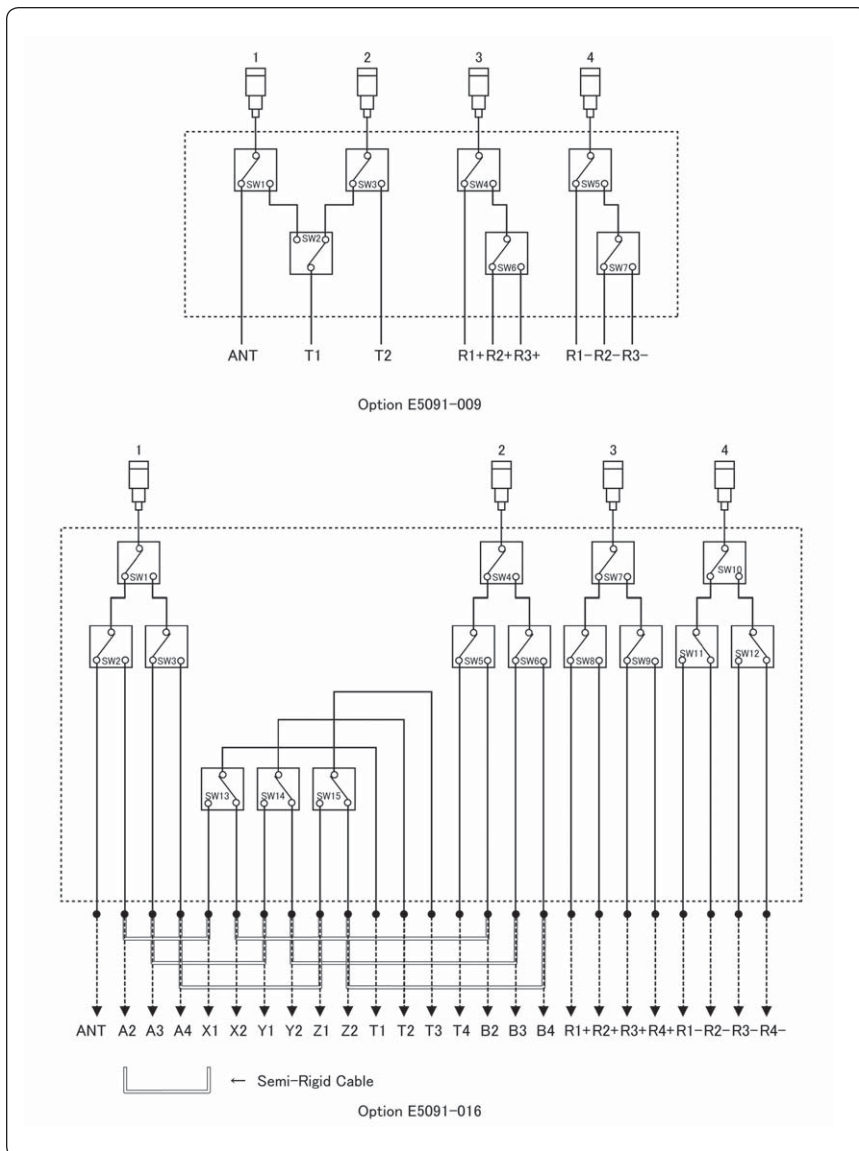


Figure 15. Block diagram

## E5092A Configurable multiport test set

The section provides test input/output performance without calibration by the E5071C.

**Table 48. Test set input/output performance**

| Description     | Specification    | Typical              |
|-----------------|------------------|----------------------|
| Frequency range | 50 MHz to 20 GHz |                      |
| Damage level    |                  | 20 dBm, $\pm 35$ VDC |

**Table 49. Option E5092A-020 port performance**

| Description                         | Specification | Typical |
|-------------------------------------|---------------|---------|
| <b>Load match (selected port)</b>   |               |         |
| <b>SPDT switch<sup>1</sup></b>      |               |         |
| 50 MHz to 2 GHz                     | 17 dB         |         |
| 2 GHz to 4 GHz                      | 11 dB         |         |
| 4 GHz to 8 GHz                      | 8 dB          |         |
| 8 GHz to 10 GHz                     | 7 dB          |         |
| 10 GHz to 18 GHz                    | 4 dB          |         |
| 18 GHz to 20 GHz                    | 4 dB          |         |
| <b>SP4T switch<sup>2</sup></b>      |               |         |
| 50 MHz to 2 GHz                     | 17 dB         |         |
| 2 GHz to 3 GHz                      | 11 dB         |         |
| 3 GHz to 8 GHz                      | 8 dB          |         |
| 8 GHz to 10 GHz                     | 7 dB          |         |
| 10 GHz to 18 GHz                    | 4 dB          |         |
| 18 GHz to 20 GHz                    | 4 dB          |         |
| <b>Load match (unselected port)</b> |               |         |
| <b>SPDT switch<sup>1</sup></b>      |               |         |
| 50 MHz to 3 GHz                     | 17 dB         |         |
| 3 GHz to 10 GHz                     | 11 dB         |         |
| 10 GHz to 16 GHz                    | 8 dB          |         |
| 16 GHz to 18 GHz                    | 6 dB          |         |
| 18 GHz to 20 GHz                    | 4 dB          |         |
| <b>SP4T switch<sup>2</sup></b>      |               |         |
| 50 MHz to 3 GHz                     | 17 dB         |         |
| 3 GHz to 10 GHz                     | 11 dB         |         |
| 10 GHz to 16 GHz                    | 8 dB          |         |
| 16 GHz to 18 GHz                    | 6 dB          |         |
| 18 GHz to 20 GHz                    | 4 dB          |         |

1. SPDT: Single-pole-double-throw switches. Applies to SW5, SW6, SW7, SW8, SW9 and SW10 in the E5092A. (See Figure 20.)

2. SP4T: Single-pole-four-throw switches. Applies to SW1, SW2, SW3 and SW4 in the E5092A. (See Figure 20.)

**Table 49. Option E5092A-020 port performance** *(continued)*

| Description                     | Specification                 | Typical                |
|---------------------------------|-------------------------------|------------------------|
| <b>Load match (common port)</b> |                               |                        |
| <b>SPDT switch<sup>1</sup></b>  |                               |                        |
| 50 MHz to 2 GHz                 | 16 dB                         |                        |
| 2 GHz to 4 GHz                  | 11 dB                         |                        |
| 4 GHz to 8 GHz                  | 8 dB                          |                        |
| 8 GHz to 10 GHz                 | 7 dB                          |                        |
| 10 GHz to 20 GHz                | 4 dB                          |                        |
| <b>SP4T switch<sup>2</sup></b>  |                               |                        |
| 50 MHz to 1.3 GHz               | 16 dB                         |                        |
| 1.3 GHz to 4 GHz                | 11 dB                         |                        |
| 4 GHz to 8 GHz                  | 8 dB                          |                        |
| 8 GHz to 10 GHz                 | 7 dB                          |                        |
| 10 GHz to 20 GHz                | 4 dB                          |                        |
| <b>Insertion loss</b>           |                               |                        |
| <b>SPDT switch<sup>1</sup></b>  |                               |                        |
| 50 MHz to 100 MHz               | 4 dB                          |                        |
| 100 MHz to 2 GHz                | 3.5 dB                        |                        |
| 2 GHz to 3 GHz                  | 4.5 dB                        |                        |
| 3 GHz to 4 GHz                  | 5 dB                          |                        |
| 4 GHz to 6 GHz                  | 5.5 dB                        |                        |
| 6 GHz to 8 GHz                  | 7 dB                          |                        |
| 8 GHz to 10 GHz                 | 8 dB                          |                        |
| 10 GHz to 14 GHz                | 8.5 dB                        |                        |
| 14 GHz to 18 GHz                | 10 dB                         |                        |
| 18 GHz to 20 GHz                | 11.5 dB                       |                        |
| <b>SP4T switch<sup>2</sup></b>  |                               |                        |
| 50 to 100 MHz                   | 4 dB                          |                        |
| 100 MHz to 2 GHz                | 3.5 dB                        |                        |
| 2 GHz to 3 GHz                  | 4.5 dB                        |                        |
| 3 GHz to 4 GHz                  | 5.5 dB                        |                        |
| 4 GHz to 6 GHz                  | 6 dB                          |                        |
| 6 GHz to 8 GHz                  | 7.5 dB                        |                        |
| 8 GHz to 10 GHz                 | 8.5 dB                        |                        |
| 10 GHz to 14 GHz                | 9.5 dB                        |                        |
| 14 GHz to 18 GHz                | 10.5 dB                       |                        |
| 18 GHz to 20 GHz                | 12 dB                         |                        |
| <b>Stability</b>                |                               |                        |
| 50 MHz to 6 GHz                 |                               | 0.003 dB/°C            |
| 6 GHz to 20 GHz                 |                               | 0.01 dB/°C             |
|                                 |                               | (Stability per switch) |
| <b>Isolation<sup>3</sup></b>    |                               |                        |
| 50 MHz to 500 MHz               | 65 dB                         |                        |
| 500 MHz to 1 GHz                | 80 dB                         |                        |
| 1 GHz to 2 GHz                  | 85 dB                         |                        |
| 2 GHz to 6 GHz                  | 90 dB                         |                        |
| 6 GHz to 10 GHz                 | 85 dB                         |                        |
| 10 GHz to 18 GHz                | 75 dB                         |                        |
| 18 GHz to 20 GHz                | 65 dB                         |                        |
|                                 | (Over arbitrarily test ports) |                        |

1. SPDT: Single-pole-double-throw switches. Applies to SW5, SW6, SW7, SW8, SW9 and SW10 in the E5092A. (See Figure 20.)

2. SP4T: Single-pole-four-throw switches. Applies to SW1, SW2, SW3 and SW4 in the E5092A. (See Figure 20.)

3. This specification is defined when all ports are terminated with a 50 ohm load.

**Table 50. Control line**

| Description                      | Specification                                                                         | Typical                                       |
|----------------------------------|---------------------------------------------------------------------------------------|-----------------------------------------------|
| Number of groups                 | 4<br>Group A: 8 bits<br>Group B,C,D: 4 bits                                           |                                               |
| Input voltage range <sup>1</sup> | 0 V to +5 V (positive input)<br>–5 V to 0 V (negative input)                          |                                               |
| Maximum current                  | Group A, B: 50 mA in total of each group<br>Group C, D: 500 uA in total of each group |                                               |
| Impedance                        |                                                                                       | Group A, B: < 10 ohm<br>Group C, D: < 200 ohm |

**Table 51. DC source**

| Description             | Specification                                               | Typical                              |
|-------------------------|-------------------------------------------------------------|--------------------------------------|
| Number of sources       | 4                                                           |                                      |
| Output voltage range    |                                                             | 0 V to +5.2 V (nominal) <sup>2</sup> |
| Output voltage accuracy | ±3 % of setting (+1 V to +5 V) at<br>1 M ohm load impedance |                                      |
| Voltage resolution      |                                                             | 10 mV (nominal) <sup>3</sup>         |
| Maximum current         | 150 mA for each source                                      |                                      |
| Output impedance        |                                                             | < 5 ohm                              |

**Table 52. Operating storage environment**

| Description | General characteristics                                        |
|-------------|----------------------------------------------------------------|
| Temperature | +5 °C to +40 °C                                                |
| Humidity    | 20 to 80% at wet bulb temperature<br>< +29 °C (non-condensing) |
| Altitude    | 0 to 2,000m (0 to 6,561 feet)                                  |
| Vibration   | 0.21 G max., 5 to 500 Hz                                       |

**Table 53. Non-operating storage environment**

| Description | General characteristics                                         |
|-------------|-----------------------------------------------------------------|
| Temperature | –10 °C to +60 °C                                                |
| Humidity    | 20 to 90 % at wet bulb temperature<br>< +40 °C (non-condensing) |
| Altitude    | 0 to 4,572 m (0 to 15,000 feet)                                 |
| Vibration   | 0.5 G max., 5 Hz to 500 Hz                                      |

1. Input voltage will be clipped at about ±5.2 V when over this range.
2. The output voltage can be set in this range.
3. The output voltage resolution becomes effective between 0 V to 5.2 V.

Table 54. Front panel information

| Description   | General characteristics                      |
|---------------|----------------------------------------------|
| RF connectors | SMA                                          |
| Test ports    | 38 ports                                     |
| Control line  | 15-pin D-sub, female<br>25-pin D-sub, female |

Table 55. Rear panel information

| Description             | General characteristics                             |
|-------------------------|-----------------------------------------------------|
| USB port                | Type B-receptacle, provide connection to the E5071C |
| Line power <sup>1</sup> |                                                     |
| Frequency               | 47 to 63 Hz                                         |
| Voltage                 | 90 to 132 VAC, or 198 to 264 VAC                    |
| VA max                  | (automatically switched)<br>300 VA max.             |

Table 56. Test set dimensions and block diagram

| Description                            | General characteristics       |
|----------------------------------------|-------------------------------|
| <b>Dimensions</b><br>E5092A Option 020 | See Figures 16, 17, 18 and 19 |
| <b>Weight</b><br>E5092A Option 020     | 9 kg                          |

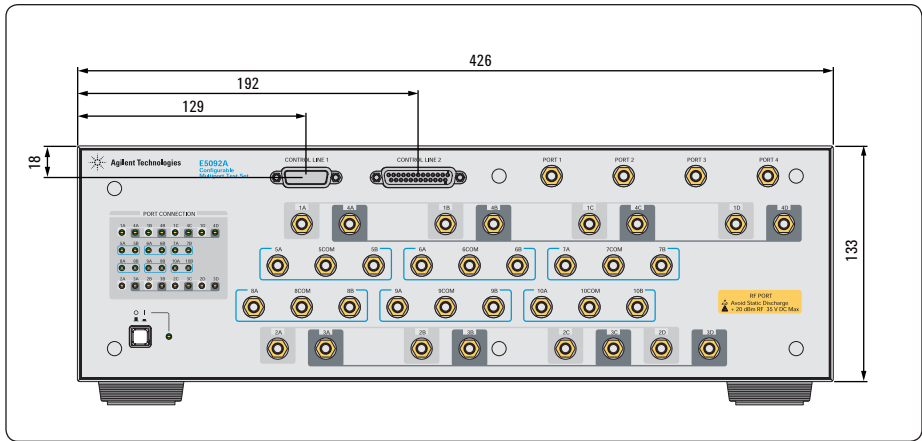
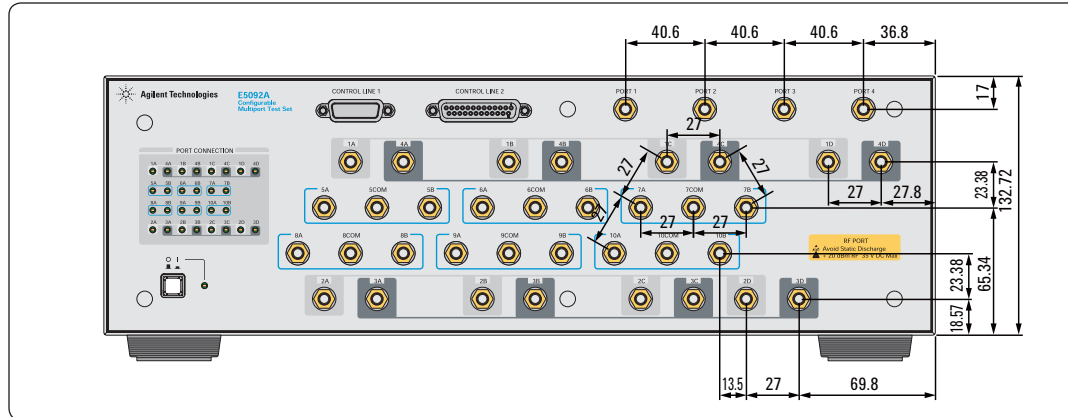


Figure 16. Dimensions (front view, with Option E5092A-020, in millimeters, nominal)

1. 1A third-wire ground is required.



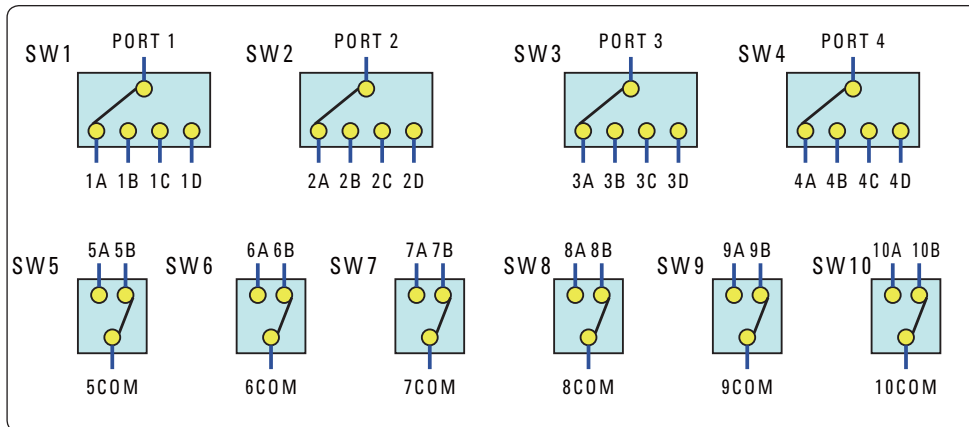


Figure 20. Switch configuration (E5092A-020)

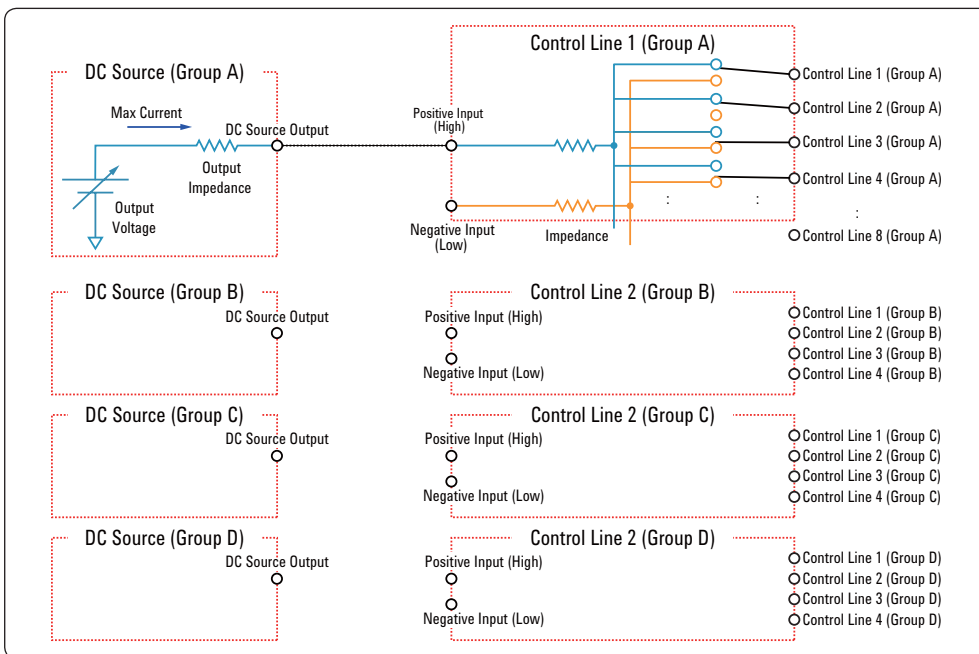
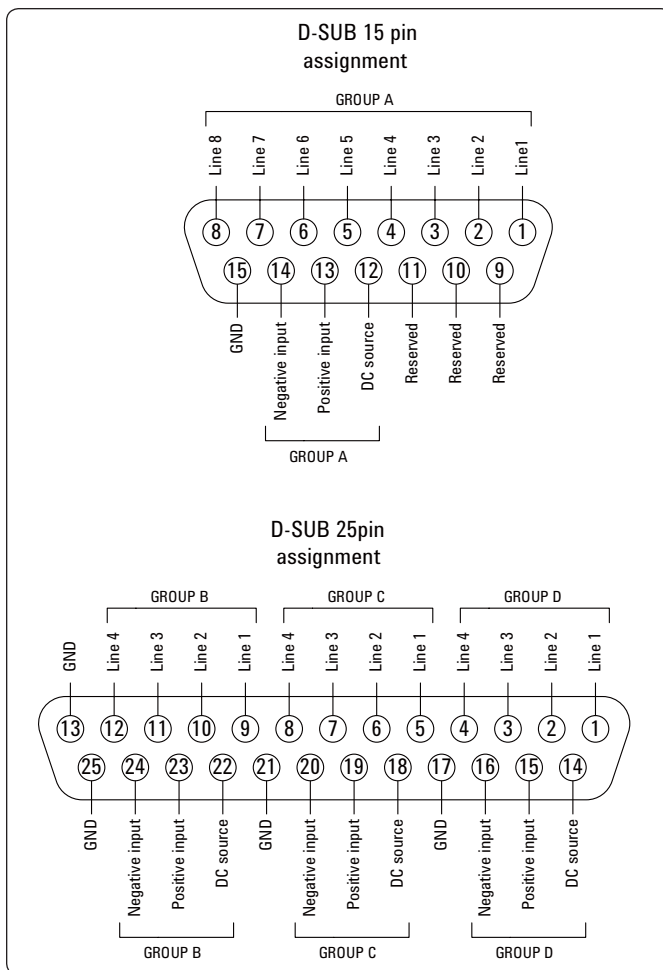


Figure 21. DC control line (E5092A-020)



**Figure 22. Control line pin assignment (E5092A-020)**

# Corrected System Performance for 75 $\Omega$ Measurements with 11852B 50 to 75 $\Omega$ Minimum-Loss Pads (Supplemental Information)

Option 230/235/240/245/260/265/280/285/430/435/440/445/  
460/465/480/485

**Table 55.** Corrected system performance with type-N 75  $\Omega$  device connectors,  
85036E calibration kit

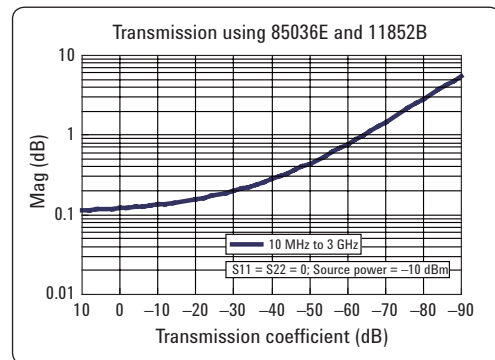
Network analyzer: E5071C  
calibration kit: 85036E (type-N 75  $\Omega$ )  
50 to 75  $\Omega$  adapters: 11852B  
calibration: full 2-port

IF bandwidth = 10 Hz, no averaging applied to data, environmental temperature = 23° C  
 $\pm 5^\circ$  C with  $< 1^\circ$  C deviation from calibration temperature, isolation calibration performed

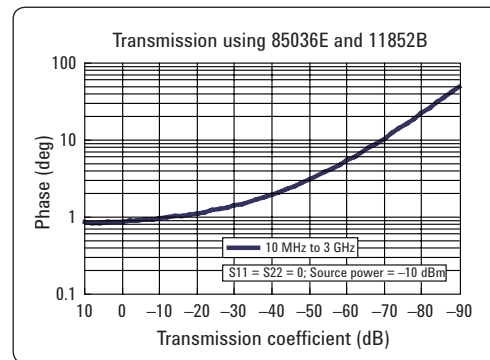
| Description           | Typical (dB)    |
|-----------------------|-----------------|
|                       | 10 MHz to 3 GHz |
| Directivity           | 37              |
| Source match          | 33              |
| Load match            | 39              |
| Reflection tracking   | $\pm 0.015$     |
| Transmission tracking | $\pm 0.019$     |

Transmission uncertainty 10 MHz to 3 GHz (typical)

**Magnitude**

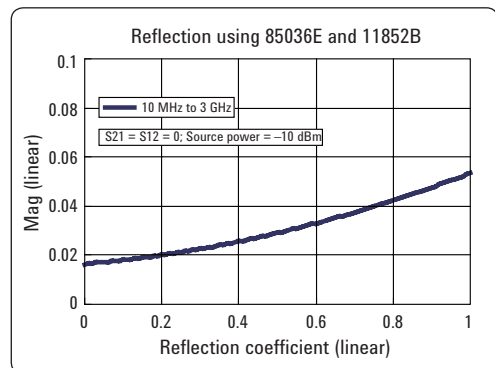


**Phase**

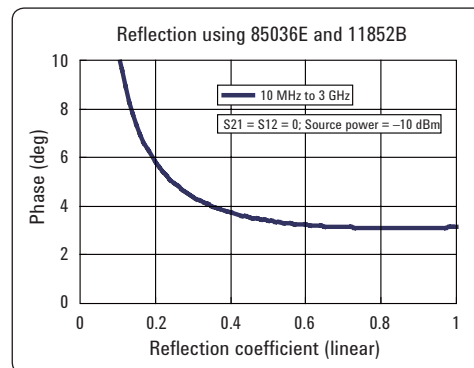


Reflection uncertainty 10 MHz to 3 GHz (typical)

**Magnitude**



**Phase**





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