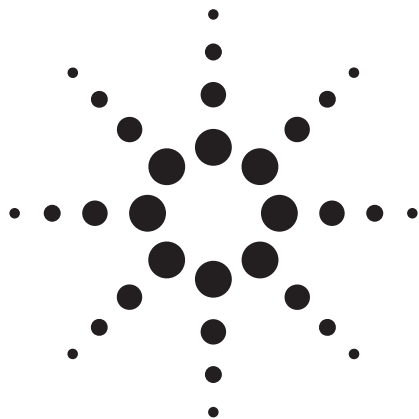




## Agilent 8753ET/ES

### 8753ET and 8753ES Network Analyzers, 30 kHz to 3 or 6 GHz

Data Sheet

**This document describes the performance and features of the following products:**

- Agilent 8753ES S-parameter vector network analyzer
- Agilent 8753ES Option 011 vector network analyzer without test set
- Agilent 8753ET Transmission/reflection vector network analyzer

For more information about these analyzers, please see the following documents:

|                                                                        | <b>Pub. Number</b> |
|------------------------------------------------------------------------|--------------------|
| <i>Agilent 8753ET and 8753ES Network Analyzers Overview</i>            | 5968-5159E         |
| <i>Agilent 8753ET and 8753ES Network Analyzers Configuration Guide</i> | 5968-5158E         |



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# Definitions and Test Conditions

Specifications describe the instrument's warranted performance after a half-hour warm-up and over the temperature range of  $25^{\circ} \pm 5^{\circ} \text{ C}$ , unless otherwise stated. Specifications for frequencies above 3 GHz do not apply to instruments with Option 075 (75-ohm impedance).

Supplemental characteristics are typical but non-warranted performance parameters. These are denoted as "typical," "nominal," or "approximate."

The measurement uncertainty curves and measurement port characteristics given for Agilent Technologies 8753ES systems also apply to the 8753ES with Options 006 and 011 and the 85047A test set (50-ohm), or the 8753ES Option 011 with an 85046B test set (75-ohm).

## Dynamic Range

System dynamic range is calculated as the difference between the receiver noise floor and the lesser of either the source maximum output or the receiver maximum input level. System dynamic range applies to transmission measurements only, since reflection measurements are limited by directivity.

Noise floor is specified as the mean of the noise trace over frequency. Noise floor is measured with the test ports terminated in loads, full two-port error correction for the 8753ES and enhanced-response error correction for the 8753ET (with 16 averages used during isolation), 10 Hz IF bandwidth (BW), maximum test port power, and no averaging during the measurement.

## Measurement Uncertainty

Measurement uncertainty curves utilize a Root Sum Square (RSS) model for the contribution of random errors such as noise, typical connector repeatabilities, and test set switching; this is combined with a worst-case model for the contributions of dynamic accuracy and residual systematic errors.

Curves show the worst-case magnitude and phase uncertainty for reflection and transmission measurements, after a full two-port error correction for the 8753ES and enhanced-response error correction for the 8753ET (including isolation with an averaging factor of 16) using the specified cal kit, with 10 Hz IF bandwidth (BW) and no averaging.

## Measurement Port Characteristics

Characteristics show the residual system uncertainties for uncorrected performance and after accuracy enhancement using full two-port error correction for the 8753ES and enhanced-response error correction for the 8753ET. These characteristics apply for an environmental temperature of  $25^{\circ} \pm 5^{\circ} \text{ C}$ , with less than  $1^{\circ} \text{ C}$  deviation from the calibration temperature. Agilent 8753ET Option 004 may degrade transmission source match as much as 2 dB, resulting in up to 0.05 dB additional uncertainty in transmission tracking.

Corrected performance indicates residual error after calibration. It is determined by the quality of calibration standards, system repeatability, stability, and noise.

Uncorrected performance indicates intrinsic errors without calibration correction applied. This is related to the ultimate stability of a calibration.

# System Performance Summaries

## Agilent 8753ES (50-ohm systems)

7-mm test ports

### Configuration

|                  |        |
|------------------|--------|
| Network analyzer | 8753ES |
| Calibration kit  | 85031B |
| Test-port cables | 11857D |

### System dynamic range

|                   |                    |
|-------------------|--------------------|
| 30 kHz to 50 kHz  | 70 dB <sup>1</sup> |
| 50 kHz to 300 kHz | 90 dB <sup>1</sup> |
| 300 kHz to 16 MHz | 100 dB             |
| 16 MHz to 3 GHz   | 110 dB             |
| Option 014        | 108 dB             |
| 3 GHz to 6 GHz    | 105 dB             |
| Option 014        | 103 dB             |

## Measurement Port Characteristics

### Frequency Range

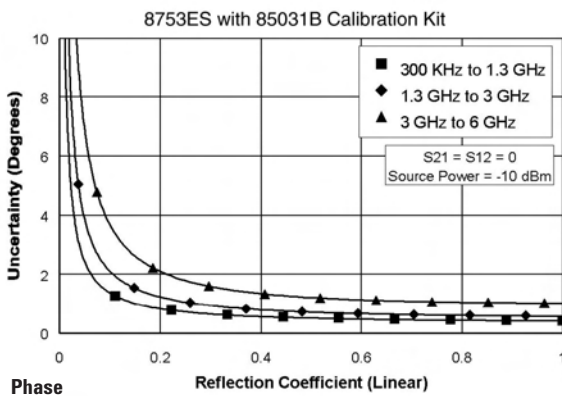
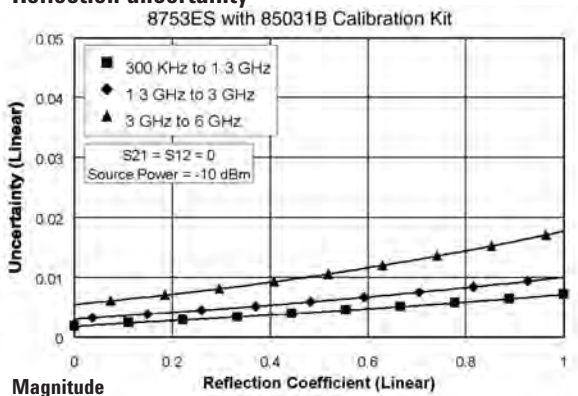
| Corrected                    | 30 kHz–<br>300 kHz <sup>2</sup> | 300 kHz–<br>1.3 GHz        | 1.3 GHz–<br>3 GHz          | 3 GHz–<br>6 GHz            |
|------------------------------|---------------------------------|----------------------------|----------------------------|----------------------------|
| <b>Directivity</b>           | 55 dB                           | 55 dB                      | 51 dB                      | 46 dB                      |
| <b>Source match</b>          | 55 dB                           | 51 dB                      | 49 dB                      | 43 dB                      |
| <b>Load match</b>            | 55 dB                           | 55 dB                      | 51 dB                      | 46 dB                      |
| <b>Reflection tracking</b>   | ±(0.001 dB<br>+0.02 dB/°C)      | ±(0.001 dB<br>+0.01 dB/°C) | ±(0.005 dB<br>+0.02 dB/°C) | ±(0.020 dB<br>+0.03 dB/°C) |
| <b>Transmission tracking</b> | ±(0.008 dB<br>+0.02 dB/°C)      | ±(0.006 dB<br>+0.01 dB/°C) | ±(0.009 dB<br>+0.02 dB/°C) | ±(0.021 dB<br>+0.03 dB/°C) |

### Uncorrected

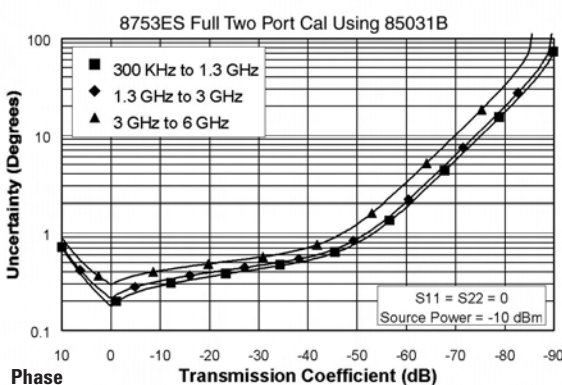
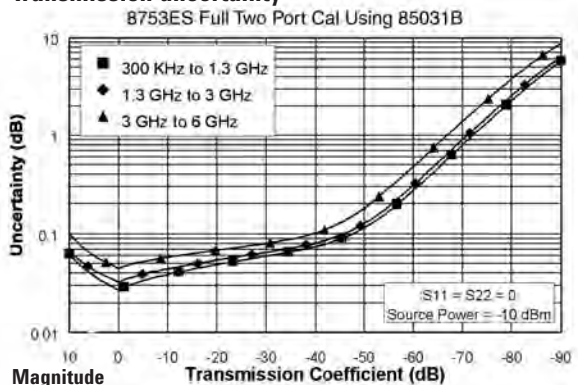
|                              |          |        |        |         |
|------------------------------|----------|--------|--------|---------|
| <b>Directivity</b>           | 20 dB*   | 35 dB  | 30 dB  | 25 dB   |
| <b>Source match</b>          | 18 dB**  | 16 dB  | 16 dB  | 14 dB   |
| <b>Load match</b>            | 18 dB**  | 18 dB  | 16 dB  | 14 dB   |
| <b>Reflection tracking</b>   | ±2.5 dB  | ±1 dB  | ±1 dB  | ±1.5 dB |
| <b>Transmission tracking</b> | ±2.5 dB  | ±1 dB  | ±1 dB  | ±1.5 dB |
| <b>Crosstalk</b>             | 90 dB*** | 100 dB | 100 dB | 90 dB   |

\*15 dB, 30 kHz to 50 kHz    \*\*10 dB, 30 kHz to 50 kHz    \*\*\*60 dB, 30 kHz to 50 kHz

### Reflection uncertainty



### Transmission uncertainty



1. Typical below 300 kHz.
2. Typical performance.

## Agilent 8753ES (50-ohm systems)

Type-N test ports

### Configuration

|                  |                         |
|------------------|-------------------------|
| Network analyzer | 8753ES                  |
|                  | Standard and Option 006 |
| Calibration kit  | 85032B                  |
| Test-port cables | 11857D                  |

### System dynamic range

|                   |                    |
|-------------------|--------------------|
| 30 kHz to 50 kHz  | 70 dB <sup>1</sup> |
| 50 kHz to 300 kHz | 90 dB <sup>1</sup> |
| 300 kHz to 16 MHz | 100 dB             |
| 16 MHz to 3 GHz   | 110 dB             |
| Option 014        | 108 dB             |
| 3 GHz to 6 GHz    | 105 dB             |
| Option 014        | 103 dB             |

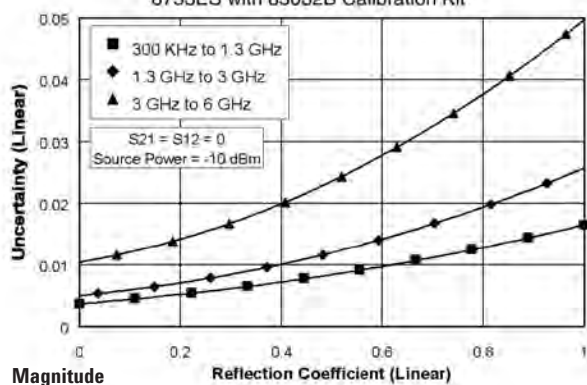
## Measurement Port Characteristics

### Frequency Range

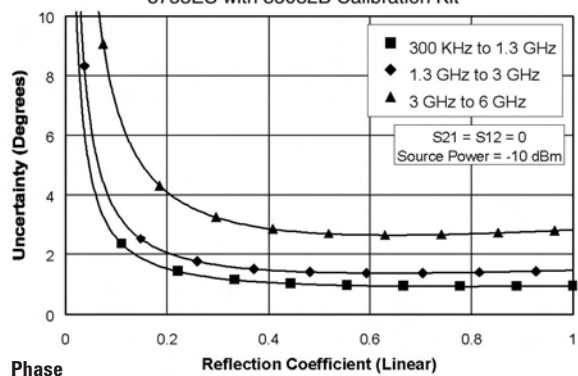
| Corrected                    | 30 kHz–<br>300 kHz <sup>2</sup> | 300 kHz–<br>1.3 GHz        | 1.3 GHz–<br>3 GHz          | 3 GHz–<br>6 GHz            |
|------------------------------|---------------------------------|----------------------------|----------------------------|----------------------------|
| <b>Directivity</b>           | 50 dB                           | 50 dB                      | 47 dB                      | 40 dB                      |
| <b>Source match</b>          | 49 dB                           | 42 dB                      | 36 dB                      | 31 dB                      |
| <b>Load match</b>            | 50 dB                           | 50 dB                      | 47 dB                      | 40 dB                      |
| <b>Reflection tracking</b>   | ±(0.005 dB<br>+0.02 dB/°C)      | ±(0.009 dB<br>+0.01 dB/°C) | ±(0.019 dB<br>+0.02 dB/°C) | ±(0.070 dB<br>+0.03 dB/°C) |
| <b>Transmission tracking</b> | ±(0.014 dB<br>+0.02 dB/°C)      | ±(0.013 dB<br>+0.01 dB/°C) | ±(0.026 dB<br>+0.02 dB/°C) | ±(0.065 dB<br>+0.03 dB/°C) |

### Reflection uncertainty

8753ES with 85032B Calibration Kit

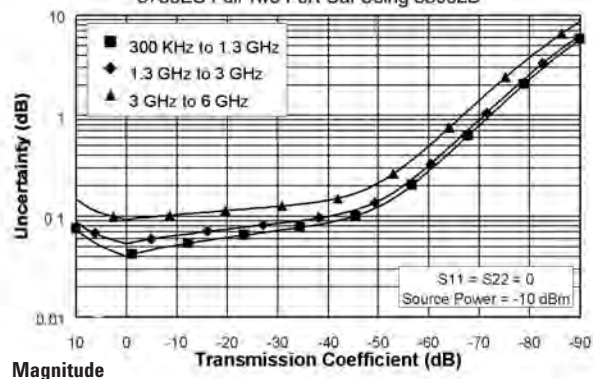


8753ES with 85032B Calibration Kit

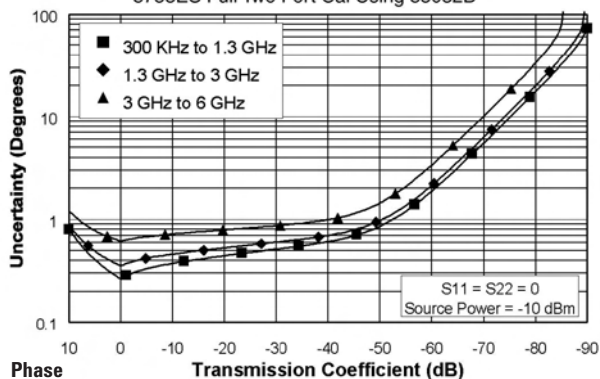


### Transmission uncertainty

8753ES Full Two Port Cal Using 85032B



8753ES Full Two Port Cal Using 85032B



1. Typical below 300 kHz.
2. Typical performance.

# System Performance Summaries

## Agilent 8753ES (50-ohm systems)

3.5-mm test ports

### Configuration

|                  |                         |
|------------------|-------------------------|
| Network analyzer | 8753ES                  |
|                  | Standard and Option 006 |
| Calibration kit  | 85033D                  |
| Test-port cables | 11857D                  |

### System dynamic range

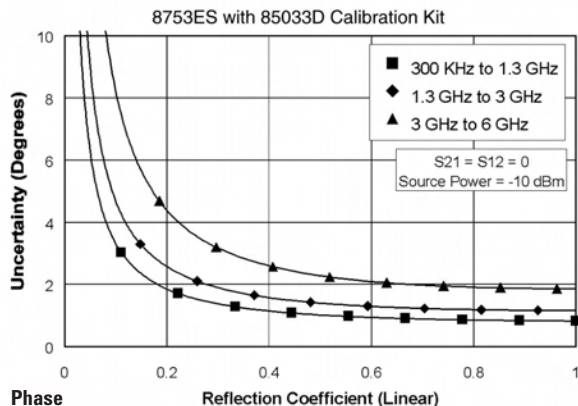
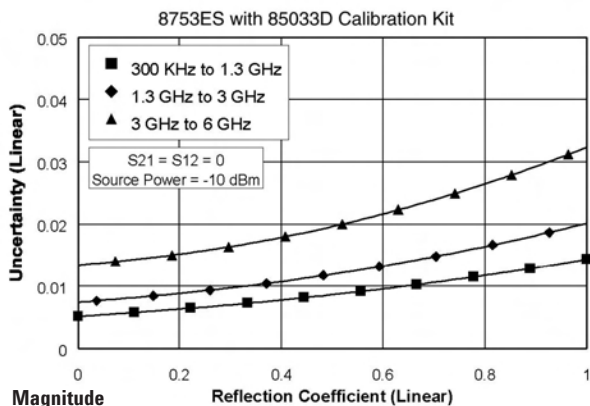
|                   |                    |
|-------------------|--------------------|
| 30 kHz to 50 kHz  | 70 dB <sup>1</sup> |
| 50 kHz to 300 kHz | 90 dB <sup>1</sup> |
| 300 kHz to 16 MHz | 100 dB             |
| 16 MHz to 3 GHz   | 110 dB             |
| Option 014        | 108 dB             |
| 3 GHz to 6 GHz    | 105 dB             |
| Option 014        | 103 dB             |

## Measurement Port Characteristics

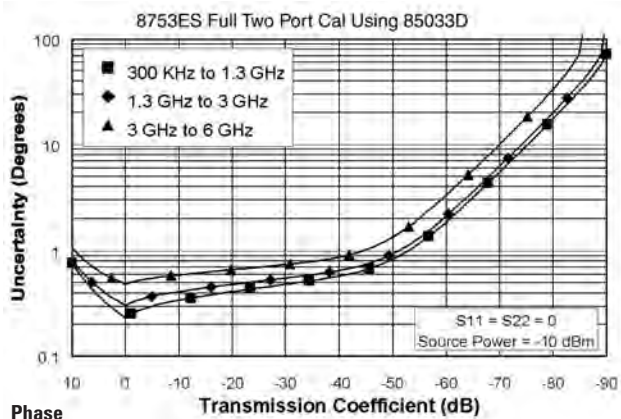
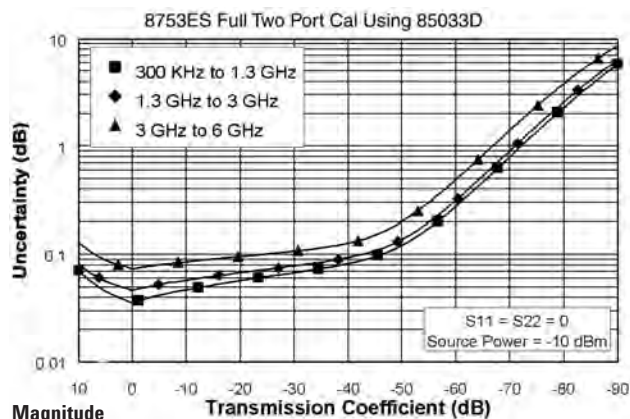
### Frequency Range

| Corrected                    | 30 kHz–<br>300 kHz <sup>2</sup> | 300 kHz–<br>1.3 GHz     | 1.3 GHz–<br>3 GHz       | 3 GHz–<br>6 GHz         |
|------------------------------|---------------------------------|-------------------------|-------------------------|-------------------------|
| <b>Directivity</b>           | 49 dB                           | 46 dB                   | 44 dB                   | 38 dB                   |
| <b>Source match</b>          | 49 dB                           | 44 dB                   | 41 dB                   | 37 dB                   |
| <b>Load match</b>            | 49 dB                           | 46 dB                   | 44 dB                   | 38 dB                   |
| <b>Reflection tracking</b>   | ±(0.010 dB<br>+0.02/°C)         | ±(0.005 dB<br>+0.01/°C) | ±(0.007 dB<br>+0.02/°C) | ±(0.009 dB<br>+0.03/°C) |
| <b>Transmission tracking</b> | ±(0.016 dB<br>+0.02/°C)         | ±(0.014 dB<br>+0.01/°C) | ±(0.022 dB<br>+0.02/°C) | ±(0.048 dB<br>+0.03/°C) |

### Reflection uncertainty



### Transmission uncertainty



1. Typical below 300 kHz.
2. Typical performance.



## Agilent 8753ES (75-Ohm Systems)

Type-N test ports

### Configuration

|                  |                   |
|------------------|-------------------|
| Network analyzer | 8753ES Option 075 |
| Calibration kit  | 85036B            |
| Test-port cables | 11857B            |

### System Dynamic Range

|                   |                    |
|-------------------|--------------------|
| 30 kHz to 50 kHz  | 68 dB <sup>1</sup> |
| 50 kHz to 300 kHz | 90 dB <sup>1</sup> |
| 300 kHz to 16 MHz | 96 dB              |
| 16 MHz to 3 GHz   | 106 dB             |

## Measurement Port Characteristics

### Frequency Range

| Corrected                    | 30 kHz–300 kHz <sup>2</sup> | 300 kHz–1.3 GHz            | 1.3 GHz–3 GHz              |
|------------------------------|-----------------------------|----------------------------|----------------------------|
| <b>Directivity</b>           | 48 dB                       | 48 dB                      | 43 dB                      |
| <b>Source match</b>          | 47 dB                       | 41 dB                      | 35 dB                      |
| <b>Load match</b>            | 48 dB                       | 48 dB                      | 43 dB                      |
| <b>Reflection tracking</b>   | ±(0.004 dB<br>+0.02 dB/°C)  | ±(0.010 dB<br>+0.01 dB/°C) | ±(0.019 dB<br>+0.02 dB/°C) |
| <b>Transmission tracking</b> | ±(0.018 dB<br>+0.02 dB/°C)  | ±(0.016 dB<br>+0.01 dB/°C) | ±(0.033 dB<br>+0.02 dB/°C) |

### Uncorrected<sup>2</sup>

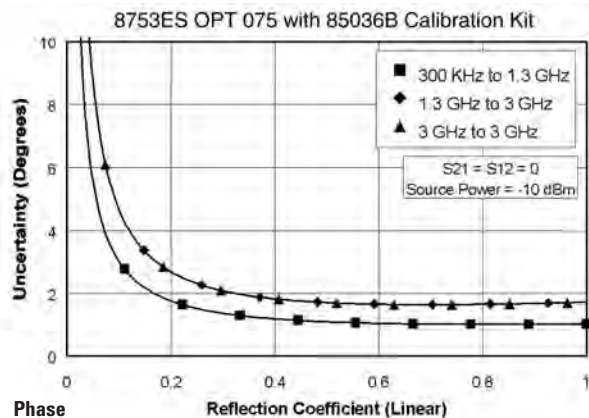
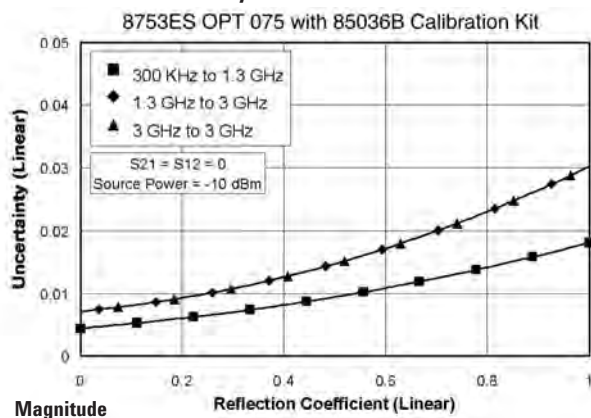
|                              |          |        |        |
|------------------------------|----------|--------|--------|
| <b>Directivity</b>           | 20 dB*   | 35 dB  | 30 dB  |
| <b>Source match</b>          | 16 dB**  | 16 dB  | 16 dB  |
| <b>Load match</b>            | 15 dB**  | 18 dB  | 16 dB  |
| <b>Reflection tracking</b>   | ±2.5 dB  | ±1 dB  | ±1 dB  |
| <b>Transmission tracking</b> | ±2.5 dB  | ±1 dB  | ±1 dB  |
| <b>Crosstalk</b>             | 90 dB*** | 100 dB | 100 dB |

\*15 dB, 30 to 50 kHz

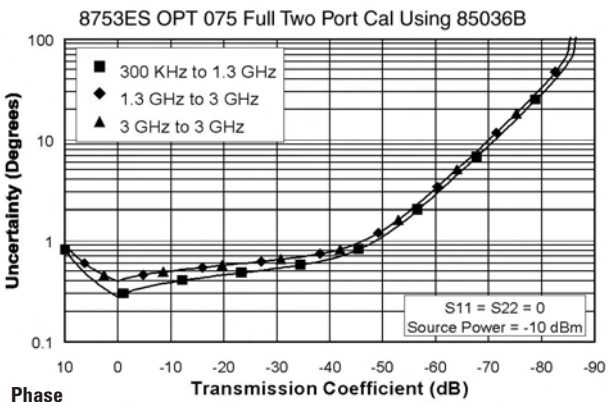
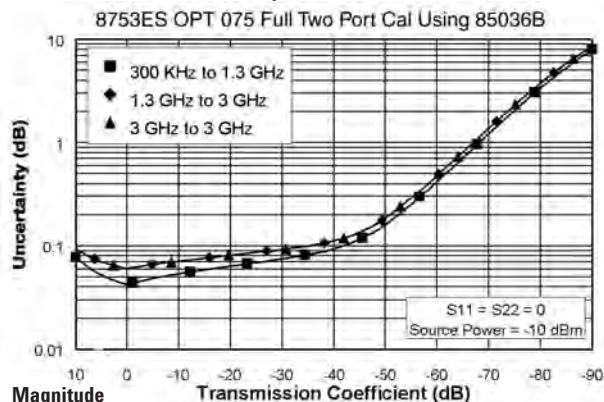
\*\*10 dB, 30 to 50 kHz

\*\*\*60 dB, 30 to 50 kHz

### Reflection uncertainty



### Transmission uncertainty



1. Typical below 300 kHz.

2. Typical performance.

# System Performance Summaries

## Agilent 8753ES (75-ohm systems)

Type-F test ports

### Configuration

|                  |                  |
|------------------|------------------|
| Network analyzer | 8753E Option 075 |
| Calibration kit  | 85039B           |
| Test-port cables | 11857B           |

### System dynamic range

|                   |                    |
|-------------------|--------------------|
| 30 kHz to 50 kHz  | 68 dB <sup>1</sup> |
| 50 kHz to 300 kHz | 90 dB <sup>1</sup> |
| 300 kHz to 16 MHz | 96 dB              |
| 16 MHz to 3 GHz   | 106 dB             |

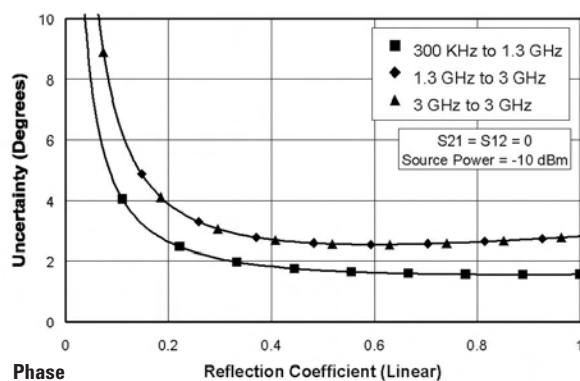
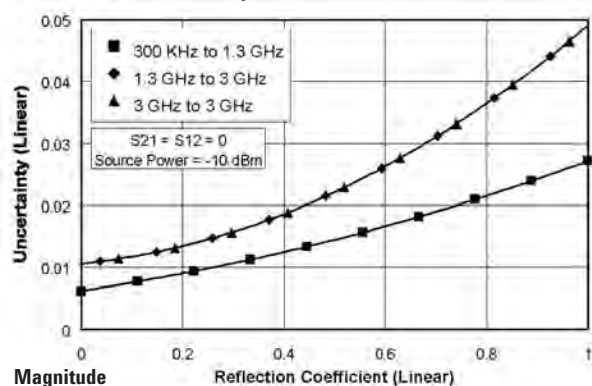
## Measurement Port Characteristics

Data is shown for a Type-F female reflection port and a Type-F male transmission port.

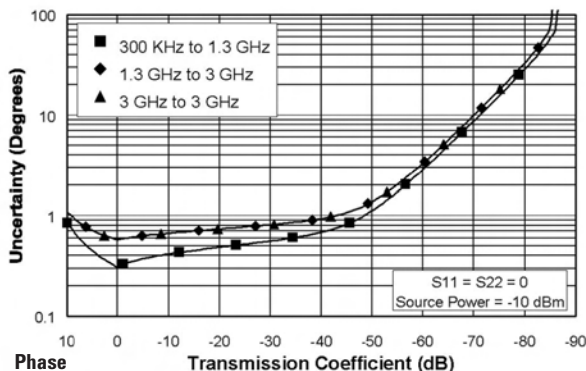
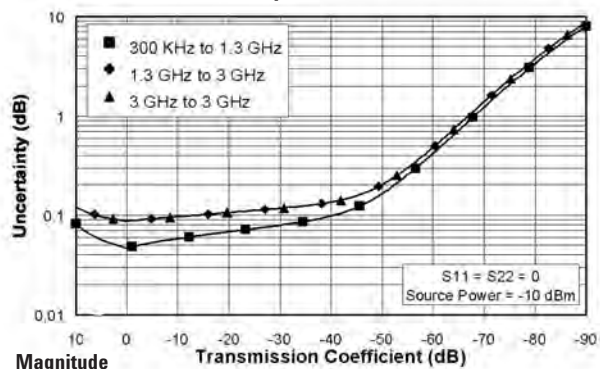
### Frequency Range

| Corrected <sup>2</sup>       | 30 kHz–300 kHz             | 300 kHz–1.3 GHz            | 1.3 GHz–3 GHz              |
|------------------------------|----------------------------|----------------------------|----------------------------|
| <b>Directivity</b>           | 45 dB                      | 45 dB                      | 40 dB                      |
| <b>Source match</b>          | 40 dB                      | 40 dB                      | 30 dB                      |
| <b>Load match</b>            | 45 dB                      | 45 dB                      | 40 dB                      |
| <b>Reflection tracking</b>   | ±(0.060 dB<br>+0.02 dB/°C) | ±(0.060 dB<br>+0.01 dB/°C) | ±(0.024 dB<br>+0.02 dB/°C) |
| <b>Transmission tracking</b> | ±(0.033 dB<br>+0.02 dB/°C) | ±(0.019 dB<br>+0.01 dB/°C) | ±(0.057 dB<br>+0.02 dB/°C) |

### Reflection uncertainty



### Transmission uncertainty



1. Typical below 300 kHz.
2. Typical performance.



## Agilent 8753ET (50-ohm systems)

Type-N test ports

### Configuration

|                  |                                               |
|------------------|-----------------------------------------------|
| Network analyzer | 8753ET Standard,<br>Option 006, or Option 004 |
| Calibration kit  | 85032B                                        |
| Test port cable  | Part number 8120-4781                         |

### System dynamic range

|                   |        |
|-------------------|--------|
| 300 kHz to 16 MHz | 100 dB |
| 16 MHz to 3 GHz   | 110 dB |
| 3 GHz to 6 GHz    | 105 dB |

### Measurement Port Characteristics

#### Frequency Range

| Uncorrected                     | 300 kHz–1.3 GHz | 1.3 GHz–3.0 GHz | 3.0 GHz–6.0 GHz |
|---------------------------------|-----------------|-----------------|-----------------|
| <b>Directivity</b>              | 30 dB           | 24 dB           | 19 dB           |
| <b>Source match<sup>4</sup></b> | 25 dB           | 20 dB           | 14 dB           |
| <b>Load match</b>               | 24 dB           | 19 dB           | 16 dB           |
| <b>Reflection tracking</b>      | ±1.0 dB         | ±1.0 dB         | ±2.0 dB         |
| <b>Transmission tracking</b>    | ±1.5 dB         | ±1.5 dB         | ±2.5 dB         |
| <b>Crosstalk</b>                | 100 dB          | 100 dB          | 90 dB           |

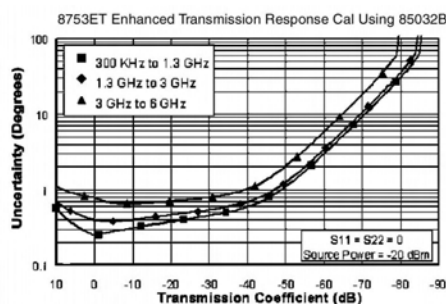
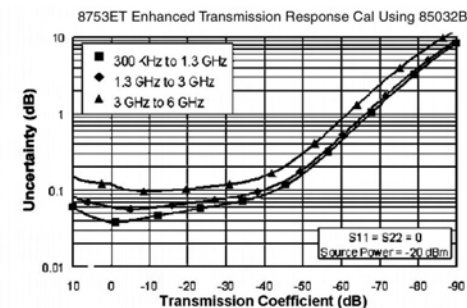
### Measurement Port Characteristics (continued)

#### Corrected

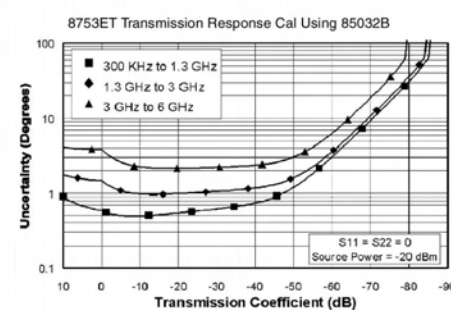
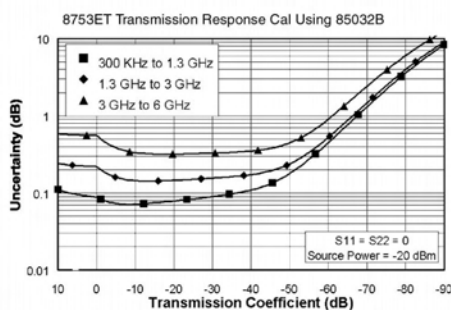
| Reflection measurements <sup>1</sup> | 300 kHz–1.3 GHz            | 1.3 GHz–3.0 GHz            | 3.0 GHz–6.0 GHz           |
|--------------------------------------|----------------------------|----------------------------|---------------------------|
| <b>Directivity</b>                   | 50 dB                      | 47 dB                      | 40 dB                     |
| <b>Source match</b>                  | 42 dB                      | 36 dB                      | 31 dB                     |
| <b>Load match</b>                    |                            |                            |                           |
| One-port cal                         | 24 dB                      | 19 dB                      | 16 dB                     |
| Enhanced-reflection cal              | 24 dB                      | 19 dB                      | 16 dB                     |
| <b>Reflection tracking</b>           | ±(0.009 dB<br>+0.01 dB/°C) | ±(0.019 dB<br>+0.02 dB/°C) | ±(0.07 dB<br>+0.03 dB/°C) |

#### Transmission measurements<sup>2</sup>

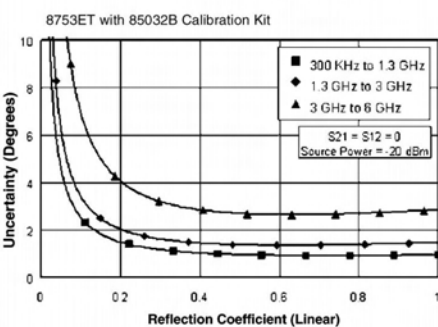
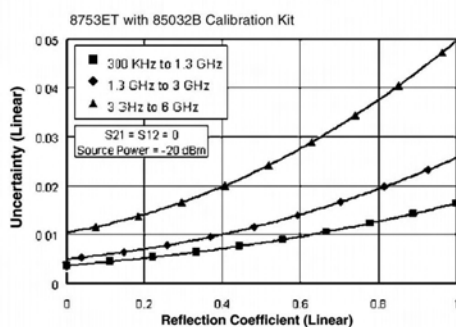
|                                |                            |                            |                            |
|--------------------------------|----------------------------|----------------------------|----------------------------|
| <b>Source match</b>            |                            |                            |                            |
| Enhanced-response cal          | 42 dB                      | 36 dB                      | 31 dB                      |
| Response-only cal <sup>3</sup> | 25 dB                      | 20 dB                      | 14 dB                      |
| <b>Transmission tracking</b>   |                            |                            |                            |
| Enhanced-response cal          | ±(0.006 dB<br>+0.01 dB/°C) | ±(0.018 dB<br>+0.02 dB/°C) | ±(0.054 dB<br>+0.03 dB/°C) |
| Response-only cal              | ±(0.033 dB<br>+0.01 dB/°C) | ±(0.1 dB<br>+0.02 dB/°C)   | ±(0.27 dB<br>+0.03 dB/°C)  |



Transmission uncertainty  
(enhanced-response calibration)



Transmission uncertainty  
(response calibration)



Reflection uncertainty  
(one-port calibration)

1. One-port or enhanced-response calibration.
2. Enhanced-response or response-only calibration.
3. 2 dB less with Option 004.
4. Option 004 may degrade uncorrected source match as much as 2 dB.

# Agilent 8753ES Specifications

## Test-Port Output Characteristics<sup>7</sup>

### Frequency characteristics

|                        |                                           |
|------------------------|-------------------------------------------|
| Range                  | 30 kHz to 3 GHz                           |
| Option 006             | 30 kHz to 6 GHz                           |
| Resolution             | 1 Hz                                      |
| Stability <sup>9</sup> | ±7.5 ppm (0° to 55° C)<br>±3 ppm/year     |
| Option 1D5             | ±0.05 ppm (0° to 55° C),<br>±0.5 ppm/year |
| Accuracy               | ±10 ppm at 25° ±5° C                      |

|                                |                |
|--------------------------------|----------------|
| <b>Power range<sup>2</sup></b> | -85 to +10 dBm |
| Option 075/014                 | -85 to +8 dBm  |

|                                        |                                                                   |
|----------------------------------------|-------------------------------------------------------------------|
| <b>Power sweep range</b>               | 25 dB (typically 31 dB)                                           |
| <b>Resolution</b>                      | 0.01 dB                                                           |
| <b>Level accuracy<sup>1,2,5</sup></b>  | ±1.0 dB                                                           |
| <b>Level linearity<sup>1,2,5</sup></b> | -15 dBm to +5 dBm ±0.2 dB<br>5 dBm to 10 dBm <sup>6</sup> ±0.5 dB |
| <b>Impedance<sup>9</sup></b>           | 50 Ω (nominal)                                                    |
| 30 kHz to 3 GHz                        | >16 dB RL (<1.38 SWR)                                             |
| 3 GHz to 6 GHz                         | >14 dB RL (<1.50 SWR)                                             |
| Option 075                             | 75 Ω (nominal)                                                    |
| 30 kHz to 3 GHz                        | >16 dB RL (<1.38 SWR)                                             |

### Spectral purity

|                                         |                                                                    |
|-----------------------------------------|--------------------------------------------------------------------|
| 2nd harmonic <sup>3</sup>               | <-40 dBc at 0 dBm <sup>9</sup><br><-50 dBc at -10 dBm <sup>9</sup> |
| Option 002                              | <-25 dBc at 10 dBm <sup>6</sup>                                    |
| 3rd harmonic <sup>4</sup>               | <-40 dBc at 0 dBm <sup>9</sup><br><-50 dBc at -10 dBm <sup>9</sup> |
| Option 002                              | <-25 dBc at 10 dBm <sup>6</sup>                                    |
| <b>Nonharmonic spurious<sup>9</sup></b> |                                                                    |
| Mixer related                           | <-30 dBc at 10 dBm <sup>6</sup><br><-55 dBc at -10 dBm             |

## Test-Port Input Characteristics

|                                                    |                                                                                          |
|----------------------------------------------------|------------------------------------------------------------------------------------------|
| <b>Frequency range</b>                             | 30 kHz to 3 GHz                                                                          |
| Option 006                                         | 30 kHz to 6 GHz                                                                          |
| <b>Average noise level<sup>1,2,8</sup></b>         |                                                                                          |
| <3 GHz                                             | <-82 dBm (3 kHz BW)                                                                      |
| <3 GHz                                             | <-102 dBm (10 Hz BW)                                                                     |
| <3 GHz                                             | <-110 dBm (10 Hz BW) typical                                                             |
| 3 to 6 GHz                                         | <-77 dBm (3 kHz BW)                                                                      |
| 3 to 6 GHz                                         | <-97 dBm (10 Hz BW)                                                                      |
| 3 to 6 GHz                                         | <-105 dBm (10 Hz BW) typical                                                             |
| <b>Maximum input level</b>                         | 10 dBm                                                                                   |
| <b>Damage level</b>                                | 26 dBm or 35 VDC                                                                         |
| <b>Impedance</b>                                   | 50 Ω (nominal)                                                                           |
| Option 075                                         | 75 Ω (nominal)                                                                           |
| <b>Frequency response<sup>2,5</sup></b>            |                                                                                          |
| 300 kHz to 3 GHz                                   | ±1.0 dB                                                                                  |
| 3 GHz to 6 GHz                                     | ±2.0 dB                                                                                  |
| <b>Internally generated harmonics (Option 002)</b> |                                                                                          |
| 2nd harmonic <sup>3</sup>                          | <-15 dBc at +8 dBm<br><-30 dBc at 0 dBm <sup>9</sup><br><-45 dBc at -15 dBm <sup>9</sup> |
| 3rd harmonic <sup>4</sup>                          | <-30 dBc at +8 dBm<br><-50 dBc at 0 dBm <sup>9</sup><br><-50 dBc at -15 dBm <sup>9</sup> |
| <b>Harmonic measurement accuracy<sup>10</sup></b>  |                                                                                          |
| 300 kHz to 3 GHz                                   | ±1.5 dB                                                                                  |
| 3 GHz to 6 GHz                                     | ±3 dB (Option 006)                                                                       |
| <b>Harmonic measurement dynamic range</b>          | -40 dBc (output = -10 dBm, input = <-15 dBm) <sup>9</sup>                                |
| <b>Frequency offset mode<sup>11</sup></b>          |                                                                                          |
| Frequency range                                    | 300 kHz to 3 GHz                                                                         |
| Option 006                                         | 300 kHz to 6 GHz                                                                         |
| <b>R-channel input requirements</b>                |                                                                                          |
| Power level                                        |                                                                                          |
| 300 kHz to 3 GHz                                   | 0 to -35 dBm                                                                             |
| 3 GHz to 6 GHz                                     | 0 to -30 dBm                                                                             |
| <b>LO spectral purity (typical)</b>                |                                                                                          |
| Maximum spurious input                             | <-25 dBc                                                                                 |
| Residual FM                                        | <20 kHz                                                                                  |
| <b>LO frequency accuracy<sup>9</sup></b>           | ±1 MHz at nominal frequency                                                              |

1. Relative to 0 dBm output power.

2. Typical below 300 kHz.

3. 16 MHz to 3 GHz.

4. 16 MHz to 2 GHz.

5. Typical from 2 to 3 GHz for instruments with Option 075.

6. +8 dBm maximum with Option 075, or Option 014.

7. Test performed on port 1 only.

8. Instruments with Option 075 are degraded 2 dB.

9. Typical performance.

10. 25° ±5° C.

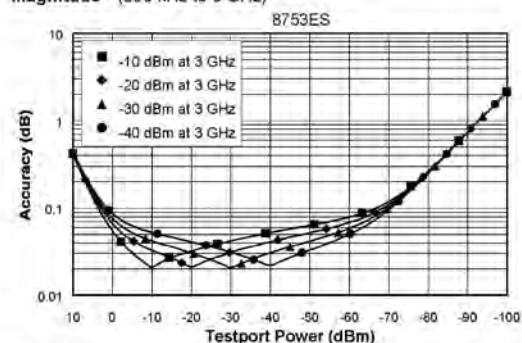
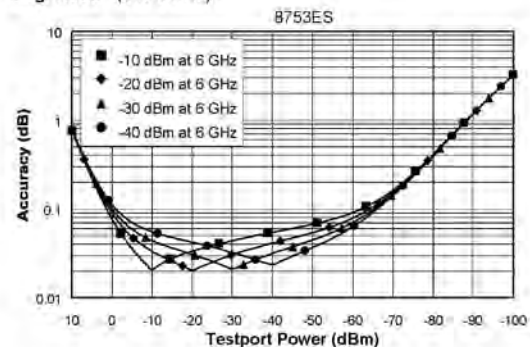
11. The Agilent 8753ES source characteristics and measurement accuracy in this mode are dependent on the stability of the external LO source. The RF source tracks the LO to maintain a stable IF signal at the R-channel receiver input. Degradation in accuracy is negligible when using an Agilent 8642A/B, 8656B, or E4432B RF signal generator as the LO source.

**External source mode<sup>1</sup>** (CW time sweep only)

|                                                   |                                           |
|---------------------------------------------------|-------------------------------------------|
| Frequency range                                   | 300 kHz to 6 GHz                          |
| R-channel input requirements (typical)            |                                           |
| Power level                                       | 0 to -25 dBm                              |
| Spectral purity                                   |                                           |
| Maximum                                           | <-30 dBc                                  |
| spurious input                                    |                                           |
| Residual FM                                       | <20 kHz                                   |
| Typical settling time                             | 500 ms (automatic)<br>50 ms (manual)      |
| Frequency readout accuracy                        | 0.1% (automatic)                          |
| Input frequency accuracy requirement <sup>2</sup> |                                           |
| Manual                                            | -0.5 to 5 MHz                             |
| Accuracy                                          | (see magnitude and phase characteristics) |

**Magnitude Characteristics**

Dynamic accuracy (10 Hz IF BW)

**Magnitude** (300 kHz to 3 GHz)**Magnitude** (3 to 6 GHz)

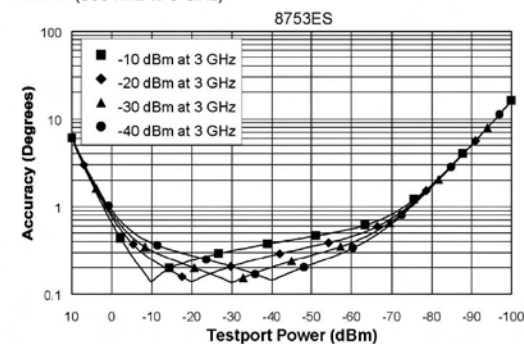
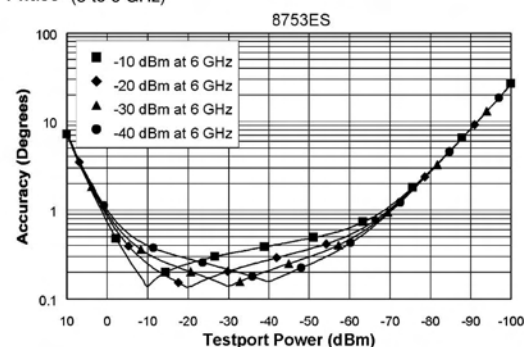
|                                                    |                   |
|----------------------------------------------------|-------------------|
| Display resolution                                 | 0.001 dB/division |
| Marker resolution <sup>3</sup>                     | 0.001 dB          |
| Trace noise                                        |                   |
| (+5 dBm at test-port, ratio measurement, 3 kHz BW) |                   |
| 300 kHz to 3 GHz                                   | <0.006 dB rms     |
| 3 GHz to 6 GHz                                     | <0.010 dB rms     |

## Reference level

|                        |             |
|------------------------|-------------|
| Range                  | ±500 dB     |
| Resolution             | 0.001 dB    |
| Stability <sup>2</sup> |             |
| 30 kHz to 3 GHz        | 0.02 dB/° C |
| 3 GHz to 6 GHz         | 0.04 dB/° C |

**Phase Characteristics**

|                  |               |
|------------------|---------------|
| Dynamic accuracy | (10 Hz IF BW) |
| Range            | ±180°         |

**Phase** (300 kHz to 3 GHz)**Phase** (3 to 6 GHz)

|                                                    |                |
|----------------------------------------------------|----------------|
| Display resolution                                 | 0.01°/division |
| Marker resolution <sup>3</sup>                     | 0.01°          |
| Trace noise                                        |                |
| (+5 dBm at test-port, ratio measurement, 3 kHz BW) |                |
| 300 kHz to 3 GHz                                   | <0.038° rms    |
| 3 GHz to 6 GHz                                     | <0.070° rms    |

## Reference level

|                       |                                                    |
|-----------------------|----------------------------------------------------|
| Range                 | -180° to +180°                                     |
| Resolution            | 0.01°                                              |
| Stability             |                                                    |
| 30 kHz to 3 GHz       | 0.05°/° C                                          |
| 3 GHz to 6 GHz        | 0.20°/° C                                          |
| Polar characteristics |                                                    |
| Range                 | 10 x 10 <sup>-12</sup> to 1000 units<br>full scale |
| Reference             | ±500 units                                         |

1. See the Agilent 8753ES descriptions and options for a functional description. Measurement accuracy is dependent on the stability of the input signal.
2. Typical performance.
3. Marker resolution for magnitude; phase and delay is dependent upon measured value. Resolution is limited to five digits.

# Agilent 8753ES Option 011 Specifications

## Test Port Output Characteristics

### Frequency characteristics

|            |                                                                                        |
|------------|----------------------------------------------------------------------------------------|
| Range      | 300 kHz to 3 GHz                                                                       |
| Option 006 | 30 kHz to 6 GHz                                                                        |
| Resolution | 1 Hz                                                                                   |
| Stability  | typically $\pm 7.5$ ppm $0^{\circ}$ to $55^{\circ}$ C<br>typically $\pm 3$ ppm/year    |
| Option 1D5 | typically $\pm 0.05$ ppm $0^{\circ}$ to $55^{\circ}$ C<br>typically $\pm 0.5$ ppm/year |

Accuracy  $\pm 10$  ppm at  $25^{\circ} \pm 5^{\circ}$  C

**Power range** -5 to +20 dBm

Option 006 -5 to +18 dBm

**Resolution** 0.01 dB

**Level accuracy**<sup>1,2</sup>  $\pm 1.0$  dB

**Level linearity**<sup>1,2,5</sup>  $\pm 0.25$  dB, -5 to +15 dBm  
 $\pm 0.5$  dB, +15 to +20 dBm

**Impedance** 50  $\Omega$  nominal

300 kHz to 3 GHz<sup>2</sup> >16 dB RL (<1.38 SWR)

300 kHz to 6 GHz >14 dB RL (<1.50 SWR)

### Spectral purity

|                           |                                                                    |
|---------------------------|--------------------------------------------------------------------|
| 2nd harmonic <sup>3</sup> | <-40 dBc at +10 dBm <sup>6</sup><br><-50 dBc at 0 dBm <sup>6</sup> |
| Option 002                | <-25 dBc at max power                                              |

|                           |                                                                    |
|---------------------------|--------------------------------------------------------------------|
| 3rd harmonic <sup>4</sup> | <-40 dBc at +10 dBm <sup>6</sup><br><-50 dBc at 0 dBm <sup>6</sup> |
|---------------------------|--------------------------------------------------------------------|

Option 002 <-25 dBc at max power

### Nonharmonic spurious<sup>6</sup>

|               |                                              |
|---------------|----------------------------------------------|
| Mixer related | <-30 dBc at max power<br><-55 dBc at -10 dBm |
|---------------|----------------------------------------------|

## Test Port Input Characteristics Option 011

**Frequency range** 300 kHz to 3 GHz

Option 006 30 kHz to 6 GHz

### Average noise level<sup>2</sup>

|                 |                              |
|-----------------|------------------------------|
| 50 kHz to 3 GHz | <-90 dBm (3 kHz BW)          |
| 50 kHz to 3 GHz | <-110 dBm (10 Hz BW)         |
| 50 kHz to 3 GHz | <-120 dBm (10 Hz BW) typical |
| 3 to 6 GHz      | <-85 dBm (3 kHz BW)          |
| 3 to 6 GHz      | <-105 dBm (10 Hz BW)         |
| 3 to 6 GHz      | <-115 dBm (10 Hz BW) typical |

**Maximum input level** 0 dBm

**Damage level** 20 dBm or 25 VDC

**Impedance** 50 ohms nominal

300 kHz to 2 MHz  $\geq 20$  dB RL

2 MHz to 1.3 GHz  $\geq 24$  dB RL

1.3 GHz to 3 GHz  $\geq 19$  dB RL

Option 006

3 GHz to 6 GHz  $\geq 15$  dB RL<sup>6</sup>

### Frequency response

300 kHz to 3 GHz  $\pm 1.0$  dB

3 GHz to 6 GHz  $\pm 2.0$  dB

### Harmonics (Option 002)

|                           |                                                                                           |
|---------------------------|-------------------------------------------------------------------------------------------|
| 2nd harmonic <sup>3</sup> | <-15 dBc at 0 dBm<br><-30 dBc at -10 dBm <sup>6</sup><br><-45 dBc at -30 dBm <sup>6</sup> |
| 3rd harmonic <sup>4</sup> | <-30 dBc at 0 dBm<br><-50 dBc at -10 dBm <sup>6</sup><br><-50 dBc at -30 dBm <sup>6</sup> |

### Harmonic measurement accuracy

16 MHz to 3 GHz  $\pm 1.5$  dB

3 GHz to 6 GHz Option 006  $\pm 3$  dB

### Harmonic measurement dynamic range

-40 dBc<sup>6</sup> (output = -10 dBm, input <-15 dBm)

1. +10 dBm output power for Agilent 8753ES Option 011.

2. Typical below 300 kHz.

3. 16 MHz to 3 GHz.

4. 16 MHz to 2 GHz.

5. For Agilent 8753ES Option 011 and Option 006, linearity is specified for the ranges of -5 to +13 dBm and +13 to +18 dBm.

6. Typical performance.

**Frequency offset mode<sup>3</sup>**

|                 |                  |
|-----------------|------------------|
| Frequency range | 300 kHz to 3 GHz |
| Option 006      | 300 kHz to 6 GHz |

**R-channel input requirements**

|                  |              |
|------------------|--------------|
| Power level      |              |
| 300 kHz to 3 GHz | 0 to -35 dBm |
| 3 GHz to 6 GHz   | 0 to -30 dBm |

**LO spectral purity**

|                        |          |
|------------------------|----------|
| Maximum spurious input | <-25 dBc |
| Residual FM            | <20 kHz  |

**LO frequency accuracy**

±1 MHz at nominal frequency  
(CW time sweep only)

**External source mode<sup>4</sup>**

|                 |                  |
|-----------------|------------------|
| Frequency range | 300 kHz to 6 GHz |
|-----------------|------------------|

**R-channel input requirements<sup>1</sup>**

|                        |              |
|------------------------|--------------|
| Power level            | 0 to -25 dBm |
| Spectral purity        |              |
| Maximum spurious input | <-30 dBc     |
| Residual FM            | <20 kHz      |

|                                    |                                      |
|------------------------------------|--------------------------------------|
| Typical settling time <sup>1</sup> | 500 ms (automatic)<br>50 ms (manual) |
|------------------------------------|--------------------------------------|

**Input frequency accuracy requirement<sup>1</sup>**

|        |               |
|--------|---------------|
| Manual | -0.5 to 5 MHz |
|--------|---------------|

|                    |                   |
|--------------------|-------------------|
| Display resolution | 0.001 dB/division |
|--------------------|-------------------|

|                                |          |
|--------------------------------|----------|
| Marker resolution <sup>5</sup> | 0.001 dB |
|--------------------------------|----------|

**Trace noise**

(+5 dBm at test-port, ratio measurement, 3 kHz BW)

**Magnitude**

|                  |               |
|------------------|---------------|
| 300 kHz to 3 GHz | <0.006 dB rms |
| 3 GHz to 6 GHz   | <0.010 dB rms |

**Phase**

|                  |             |
|------------------|-------------|
| 300 kHz to 3 GHz | <0.038° rms |
| 3 GHz to 6 GHz   | <0.070° rms |

**Reference level**

|            |          |
|------------|----------|
| Range      | ±500 dB  |
| Resolution | 0.001 dB |

**Stability<sup>2</sup>**

|                 |             |
|-----------------|-------------|
| 30 kHz to 3 GHz | 0.02 dB/° C |
| 3 GHz to 6 GHz  | 0.04 dB/° C |

**Range**

|                                |                |
|--------------------------------|----------------|
| Display resolution             | 0.01°/division |
| Marker resolution <sup>5</sup> | 0.01°          |

**Trace noise<sup>2</sup>**

|                 |                                                    |
|-----------------|----------------------------------------------------|
| 30 kHz to 3 GHz | <0.038° rms                                        |
| 3 GHz to 6 GHz  | <0.070° rms                                        |
|                 | (+5 dBm at test port, ratio measurement, 3 kHz BW) |

**Reference level**

|            |                |
|------------|----------------|
| Range      | -180° to +180° |
| Resolution | 0.01°          |

**Stability**

|                 |           |
|-----------------|-----------|
| 30 kHz to 3 GHz | 0.05°/° C |
| 3 GHz to 6 GHz  | 0.20°/° C |

**Polar characteristics**

|           |                                                 |
|-----------|-------------------------------------------------|
| Range     | 10 x 10 <sup>-12</sup> to 1000 units full scale |
| Reference | ±500 units                                      |

1. Typical performance.

2. Typical below 300 kHz.

3. The Agilent 8753ES source characteristics and measurement accuracy in this mode are dependent on the stability of the external LO source. The RF source tracks the LO to maintain a stable IF signal at the R-channel receiver input. Degradation in accuracy is negligible when using an Agilent 8642A/B, 8656B, or E4432B RF signal generator as the LO source.

4. See the Agilent 8753ES descriptions and options for a functional description. Measurement accuracy is dependent on the stability of the input signal.

5. Marker resolution for magnitude, phase and delay is dependent upon measured value. Resolution is limited to five digits.

# Agilent 8753ET Specifications

## Test-Port Output Characteristics

### Frequency characteristics

|                        |                                          |
|------------------------|------------------------------------------|
| Range                  | 300 kHz to 3 GHz                         |
| Option 006             | 300 kHz to 6 GHz                         |
| Resolution             | 1 Hz                                     |
| Stability <sup>4</sup> | ±7.5 ppm (0° to 55° C)<br>±3 ppm/year    |
| Option 1D5             | ±0.05 ppm (0° to 55° C)<br>±0.5 ppm/year |

|          |                      |
|----------|----------------------|
| Accuracy | ±10 ppm at 25° ±5° C |
|----------|----------------------|

### Power range

|                                     |
|-------------------------------------|
| -20 to +5 dBm                       |
| -85 to +10 dBm<br>(with Option 004) |

### Resolution

|         |
|---------|
| 0.01 dB |
|---------|

### Level accuracy<sup>1</sup>

|         |
|---------|
| ±1.0 dB |
|---------|

### Level linearity<sup>1</sup>

#### Standard

|                |         |
|----------------|---------|
| -20 to -15 dBm | ±0.5 dB |
| -15 to 0 dBm   | ±0.2 dB |
| 0 to +5 dBm    | ±0.5 dB |

#### Option 004

|               |         |
|---------------|---------|
| -15 to +5 dBm | ±0.2 dB |
| +5 to +10 dBm | ±0.5 dB |

### Impedance

|                |
|----------------|
| 50 Ω (nominal) |
|----------------|

|                  |
|------------------|
| 300 kHz to 3 GHz |
|------------------|

|                        |
|------------------------|
| >18 dB RL (< 1.28 SWR) |
|------------------------|

|                |
|----------------|
| 3 GHz to 6 GHz |
|----------------|

|                       |
|-----------------------|
| >14 dB RL (<1.50 SWR) |
|-----------------------|

### Spectral purity

#### 2nd harmonic<sup>2</sup>

|                                  |
|----------------------------------|
| <-40 dBc at 0 dBm <sup>4</sup>   |
| <-50 dBc at -10 dBm <sup>4</sup> |

#### Option 002

|                                  |
|----------------------------------|
| <-25 dBc at maximum output power |
|----------------------------------|

#### 3rd harmonic<sup>3</sup>

|                     |
|---------------------|
| <-40 dBc at 0 dBm   |
| <-50 dBc at -10 dBm |

#### Option 002

|                                  |
|----------------------------------|
| <-25 dBc at maximum output power |
|----------------------------------|

### Nonharmonic spurious

#### Mixer related

|                     |
|---------------------|
| <-30 dBc at +10 dBm |
| <-55 dBc at -10 dBm |

## Test Port Input Characteristics

### Frequency range

|                  |
|------------------|
| 300 kHz to 3 GHz |
|------------------|

#### Option 006

|                  |
|------------------|
| 300 kHz to 6 GHz |
|------------------|

### Average noise level

|                  |                                 |
|------------------|---------------------------------|
| 300 kHz to 3 GHz | <-90 dBm (3 kHz BW)             |
| 300 kHz to 3 GHz | <-110 dBm (10 Hz BW)            |
| 300 kHz to 3 GHz | <-120 dBm (10 Hz BW)<br>typical |

|                |
|----------------|
| 3 GHz to 6 GHz |
|----------------|

|                     |
|---------------------|
| <-85 dBm (3 kHz BW) |
|---------------------|

|                |
|----------------|
| 3 GHz to 6 GHz |
|----------------|

|                      |
|----------------------|
| <-105 dBm (10 Hz BW) |
|----------------------|

|                |
|----------------|
| 3 GHz to 6 GHz |
|----------------|

|                                 |
|---------------------------------|
| <-114 dBm (10 Hz BW)<br>typical |
|---------------------------------|

### Maximum input level

|                         |
|-------------------------|
| +10 dBm reflection port |
| 0 dBm transmission port |

### Damage level

|                    |
|--------------------|
| >+26 dBm or 35 VDC |
|--------------------|

### Impedance

|                |
|----------------|
| 50 Ω (nominal) |
|----------------|

### Frequency response<sup>5</sup>

|                  |         |
|------------------|---------|
| 300 kHz to 3 GHz | ±1.0 dB |
| 3 GHz to 6 GHz   | ±2.0 dB |

### Harmonics (Option 002)

|                           |                                                                                          |
|---------------------------|------------------------------------------------------------------------------------------|
| 2nd harmonic <sup>2</sup> | <-15 dBc at +8 dBm<br><-30 dBc at 0 dBm <sup>4</sup><br><-45 dBc at -15 dBm <sup>4</sup> |
| 3rd harmonic <sup>3</sup> | <-30 dBc at +8 dBm<br><-50 dBc at 0 dBm <sup>4</sup><br><-50 dBc at -15 dBm <sup>4</sup> |

### Harmonic measurement accuracy<sup>5</sup>

|                  |                    |
|------------------|--------------------|
| 300 kHz to 3 GHz | ±1.5 dB            |
| 3 GHz to 6 GHz   | ±3 dB (Option 006) |

### Harmonic measurement dynamic range<sup>4</sup>

|                                              |
|----------------------------------------------|
| -40 dBc (output = -10 dBm, input = <-15 dBm) |
|----------------------------------------------|

### Frequency offset mode<sup>6</sup>

|                 |                  |
|-----------------|------------------|
| Frequency range | 300 kHz to 3 GHz |
| Option 006      | 300 kHz to 6 GHz |

### R-channel input requirements

#### Power level

|                  |              |
|------------------|--------------|
| 300 kHz to 3 GHz | 0 to -35 dBm |
| 3 GHz to 6 GHz   | 0 to -30 dBm |

### LO Spectral purity

|                        |          |
|------------------------|----------|
| Maximum spurious input | <-25 dBc |
|------------------------|----------|

|             |         |
|-------------|---------|
| Residual FM | <20 kHz |
|-------------|---------|

|                                    |                             |
|------------------------------------|-----------------------------|
| LO frequency accuracy <sup>6</sup> | ±1 MHz at nominal frequency |
|------------------------------------|-----------------------------|

1. Relative to -5 dBm output power for the Agilent 8753ET; -10 dBm output power for 8753ET with Option 004.

2. 16 MHz to 3 GHz.

3. 16 MHz to 2 GHz.

4. Typical performance.

5. 25° C ± 5° C.

6. The Agilent 8753ET source characteristics and measurement accuracy in this mode are dependent on the stability of the external LO source. The RF source tracks the LO to maintain a stable IF signal at the R-channel receiver input. Degradation in accuracy is negligible when using an Agilent 8642A/B, 8656B, or E4432B RF signal generator as the LO source.



**External source mode<sup>1</sup>** (CW time sweep only)

Frequency range 300 kHz to 6 GHz

**R-channel input requirements<sup>2</sup>**

Power level 0 to -25 dBm

Spectral purity

Maximum spurious input &lt;-30 dBc

Residual FM &lt;20 kHz

Typical settling time 500 ms (automatic)

50 ms (manual)

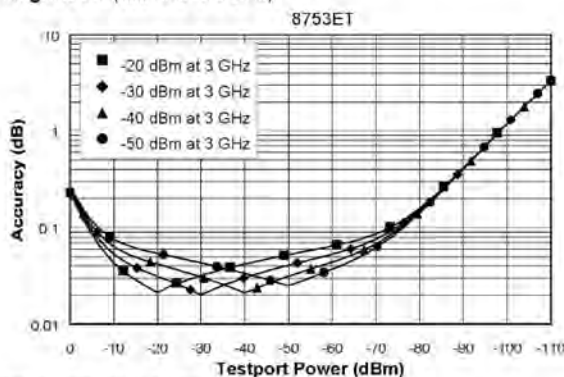
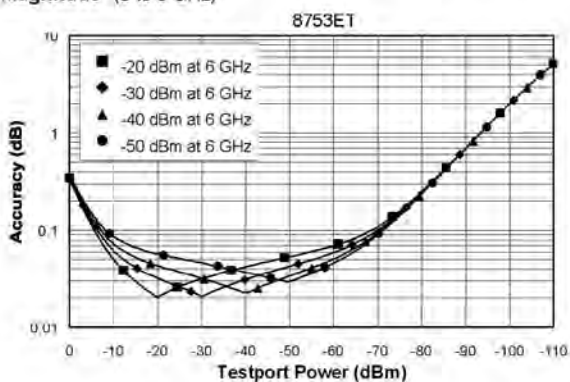
Frequency readout accuracy<sup>2</sup> 0.1% (automatic)**Input frequency accuracy requirement<sup>2</sup>**

Manual -0.5 to 5 MHz

Accuracy (See magnitude and phase characteristics)

**Magnitude characteristics**

Dynamic accuracy (10 Hz IF BW)

**Magnitude (300 kHz to 3 GHz)****Magnitude (3 to 6 GHz)****Display resolution** 0.001 dB/division**Marker resolution<sup>3</sup>** 0.001 dB**Trace noise**

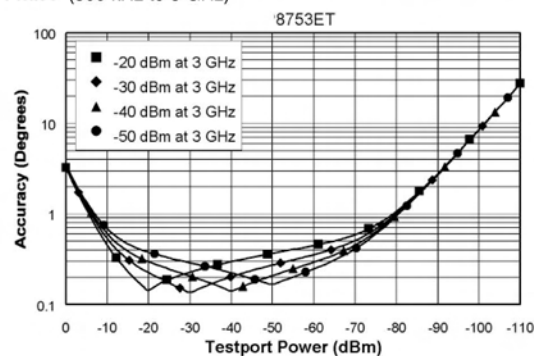
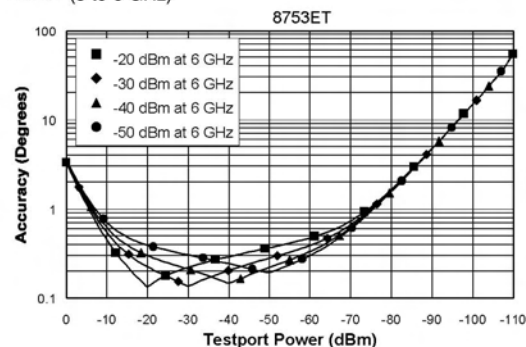
(0 dBm at transmission port or +5 dBm at reflection port, ratio measurement, 3 kHz BW)

300 kHz to 3 GHz &lt;0.006 dB rms

3 GHz to 6 GHz &lt;0.010 dB rms

**Reference level**Range  $\pm 500$  dB

Resolution 0.001 dB

**Phase (300 kHz to 3 GHz)****Phase (3 to 6 GHz)****Stability<sup>2</sup>**

300 kHz to 3 GHz 0.02 dB/1° C

3 GHz to 6 GHz 0.04 dB/1° C

**Phase Characteristics**

Dynamic accuracy (10 Hz IF BW)

Range  $\pm 180^\circ$ 

Display resolution 0.01°/division

Marker resolution<sup>3</sup> 0.01°

Trace noise

(0 dBm at transmission port or +5 dBm at reflection port, ratio measurement, 3 kHz BW)

300 kHz to 3 GHz &lt;0.038° rms

3 GHz to 6 GHz &lt;0.070° rms

**Reference level**

Range -180° to +180°

Resolution 0.01°

**Stability**

30 kHz to 3 GHz 0.05°/° C

3 GHz to 6 GHz 0.20°/° C

**Polar characteristics**Range  $10 \times 10^{-12}$  to 1000 units full scaleReference  $\pm 500$  units

1. See the Agilent 8753ET/ES descriptions and options for a functional description. Measurement accuracy is dependent on the stability of the input signal.

2. Typical performance.

3. Marker resolution for magnitude, phase and delay is dependent upon measured value. Resolution is limited to five digits.

# Agilent 8753ET/ES Supplemental Characteristics

## Measurement

### Number of display channels

Four display channels available.

### Number of measurement channels

Two primary and two auxiliary measurement channels available.

### Measurement parameters

8753ET: Reflection, transmission, A, B, R, A/R, B/R, A/B. Conversion to impedance or admittance.  
8753ES: S11, S21, S12, S22, A, B, R, A/R, B/R, A/B. Conversion to impedance or admittance.

### Formats

Cartesian: log/linear magnitude, phase, group delay, SWR, real and imaginary.

Smith chart: with log/linear amplitude and phase, R + jX, G + jB, or real/imaginary markers.

Polar: with linear/log amplitude, phase, or real and imaginary markers.

### Data markers

Each display channel has five independent markers that can be displayed simultaneously. Twenty independent markers can be displayed in 4-channel display mode when markers are uncoupled.

### Marker functions

Markers can be used in various functions: Marker search (Mkr to max, Mkr to min, Mkr to target), Mkr bandwidth with user-defined target values, Mkr to start, Mkr to stop, Mkr to center, Mkr to span, Mkr to reference, Mkr to delay, and trace statistics (average value, standard deviation, and peak-to-peak deviation of the data trace between two markers). The tracking function enables continuous update of marker search values on each sweep.

## Group Delay Characteristics

### Aperture: selectable

Maximum aperture: 20% of frequency span

Minimum aperture: (freq. span) / (number of points + 1)

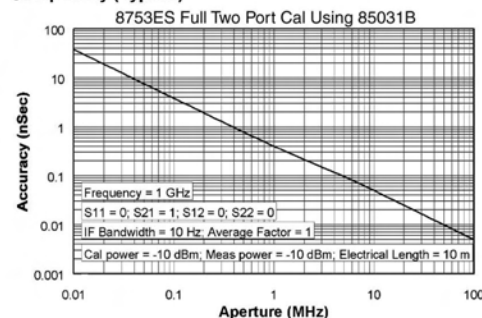
### Range

The maximum delay is limited to measuring no more than 180° of phase change within the minimum aperture. Range =  $1/(2 \times \text{minimum aperture})$

## Accuracy

The following graph shows group-delay accuracy at 1.3 GHz with type-N full two-port calibration and 10-Hz IF bandwidth. Insertion loss is assumed to be <2 dB and electrical length to be ten meters.

### Group Delay (Typical)



## Source Control

### Sweep limits

Set start/stop or center/span of the stimulus parameter (frequency, power, time) directly through the source control keys and the control knob, the step keys or the data entry keyboard.

### Sweep type

Set a linear or logarithmic sweep, an arbitrarily defined frequency list, a power sweep or a CW (single frequency) type of sweep.

### Measured number of points per sweep

Linear frequency: choose 3, 11, 26, 51, 101, 201, 401, 801, or 1601 points.

### Fast swept list

Define up to 30 different sub-sweep frequency ranges in any combination of CW, center/span, or start-stop sweep modes. Set test-port power levels and IF bandwidth independently for each segment.

### Sweep modes

Set a coupled channel sweep (same stimulus conditions on both channels) or an uncoupled channel sweep.

### Chop/alternate

Select whether to alternately or simultaneously (chop) measure channels when in dual-channel mode. Chop mode is faster, while alternate mode optimizes dynamic range.

### Sweep time

Set sweep time in seconds, minutes, or hours.

### Automatic sweep time

Select auto sweep time by entering zero seconds sweep time. The analyzer will sweep at the minimum sweep time for any subsequently selected stimulus conditions. Auto sweep time is the default condition.

### **Sweep trigger**

Set to either continuous, single, group sweep, or external trigger. Set external trigger to take a complete sweep or to measure individual points in a frequency, power or list sweep.

### **Power**

Set source power from -20 to +5 dBm for the 8753ET<sup>1</sup> or from -85 to +10 dBm for the 8753ES<sup>2</sup>. Power slope can be set in dBm/GHz.

### **Power Meter Calibration**

Select continuous leveling or use a correction table to modify source power. The correction table is created with an initial single sweep. Make single or multiple power meter readings at each frequency.

## **Data Accuracy Enhancement**

### **Measurement calibration**

Measurement calibration significantly reduces measurement uncertainty due to errors caused by system directivity, source and load match, tracking, and crosstalk. Full two-port calibration removes all the systematic errors to obtain the most accurate measurements.

### **Calibration types available**

- **Frequency response**  
Simultaneous magnitude and phase correction of frequency response errors for either reflection or transmission measurements.
- **Response and isolation**  
Compensates for frequency response and directivity (reflection) or frequency response and crosstalk errors.
- **Enhanced response calibration**  
Corrects for frequency response and source match for transmission measurements, and provides one-port calibration for reflection measurements.
- **One-port calibration**  
Uses test set port 1 or port 2 to correct for directivity, frequency response and source match errors.
- **Two-port calibration**  
Compensates for directivity, source match, reflection frequency response, load match, transmission frequency response and crosstalk for an S-parameter test set. Crosstalk calibration can be omitted. Available on 8753ES analyzers.
- **TRL\*/LRM\* calibration**  
Compensates for directivity, reflection and transmission frequency response, and crosstalk in both the forward and reverse directions.

Especially suitable for calibrating non-coaxial environments, such as in test fixtures. TRL\*/LRM\* is a special implementation of TRL/LRM calibration, modified for the three-sampler receiver in the 8753ES. Available on Agilent 8753ES analyzers.

### **Interpolated error correction**

With any type of accuracy enhancement applied, interpolated mode recalculates the error coefficients when the test frequencies are changed. The number of points can be increased or decreased and the start/stop frequencies can be changed, but the resulting frequency span must be a subset of the original calibration frequency span. System performance is not specified for measurements with interpolated error correction applied.

### **Velocity factor**

Enters the velocity factor to calculate equivalent electrical length.

### **Reference plane extension**

Redefine the plane-of-measurement reference to other than port 1 or port 2 of the 8753ET and 8753ES.

### **Select default calibration kit**

Select from a list of standard calibration kits or choose a user-defined kit.

## **Data Averaging**

### **IF bandwidth**

The IF bandwidth is selectable from 6 kHz to 10 Hz.

### **Weighted sweep-to-sweep averaging**

Averages vector data on each successive sweep.

### **Trace smoothing**

Computes the moving average of adjacent data points. Smoothing aperture defines the trace width (number of points) to be averaged, and ranges from 0.25% to 20% of the trace width.

## **Display Control**

### **Display formats**

Single-channel, dual-channel overlay (both traces on one graticule), dual-channel split (each trace on separate graticules), three-channel split (each trace on separate graticules), three-channel overlay (three traces on one graticule), quad-channel overlay (four traces on one graticule), quad-channel split (each trace on separate graticules).

1. -85 to +5 dBm with Option 004.
2. +8 dBm maximum with Option 075 or 014.

# Agilent 8753ET/ES Supplemental Characteristics (continued)

## Trace Functions

### Display data

Display current measurement data, memory data, or current measurement with measurement and memory data simultaneously.

### Trace math

Vector division or subtraction of current linear measurement values and memory data.

### Display annotations

Start/stop, center/span, or CW frequency, source level, scale/div, reference level, marker data, softkey functions, warning and caution messages, trace identification, and pass/fail indication.

### Autoscale

Automatically selects scale resolution and reference value to center the trace.

### Electrical delay

Offset measured phase or group delay by a defined amount of electrical delay, in seconds.

### Frequency blanking

Blank out all frequency information on the display. Requires an instrument preset to re-enable frequency information on the display.

### Title

Add custom titles (49 characters maximum) to the display.

### Adjust display

Customize the color and brightness of the data traces, memory traces, reference lines, graticules, text, and warning messages. Default colors can be recalled along with one set of user-defined display values.

## Storage

### Instrument state

Up to 31 instrument states can be stored internally or recalled via the SAVE/RECALL menu. Instrument states include all control settings, active limit lines, active list frequency tables, memory trace data, active calibration coefficients, and custom display titles. Storage is in nonvolatile memory.

### Test sequences

Six measurement sequences can be stored or recalled via the sequencing menu. Sequences may also be recalled from Preset menu. Sequence register 6 is part of nonvolatile storage and is not erased during a power cycle. If sequence 6 is titled AUTO, it will be executed when power is turned on.

## Disk drive

Data, instrument states, user graphics, data plots and test sequences can be stored on internal floppy disk in MS-DOS® or Agilent's standard LIF formats.

## Data Hardcopy

### Data plotting

Hardcopy plots are automatically produced with HP-GL compatible digital plotters. The 8753ET/ES provides Centronics, RS-232C, and GPIB interfaces.

### Data listings

Printouts of instrument data are directly produced with a printer such as the HP DeskJet or LaserJet. Select black & white or color print. For a list of compatible printers, consult our printer compatibility guide Web page at [www.agilent.com/find/pcg](http://www.agilent.com/find/pcg)

### Configure plots

Configure plots completely from the network analyzer by defining pen color and line type for data, text markers, graticules, and memory traces.

## Functions

Plot trace(s), graticule(s), marker(s), or text including operating and system parameters.

### Quadrants

Plot entire display in one of four different quadrants of the plotter paper.

## System Capabilities

### Limit lines

Define test limit lines that appear on the display for go/no go testing. Lines may be any combination of horizontal, sloping lines, or discrete data points. Limit-test TTL output available for external control or indication.

### External source mode

The receiver (input R) detects and phase-locks to any externally generated CW signal. Receiver inputs A and B will measure this same frequency for comparison or tracking measurements.

Automatic: The input signal frequency is counted and displayed.

Manual: Measures the input signal closest to the frequency specified by the user (within +0.5 to +5 MHz).

### Tuned receiver

Tunes the receiver for a synthesized CW input signal at a precisely specified frequency. The time bases of the external RF source or sources must be tied to the external reference input (rear panel BNC). The built-in RF source is not used.



### Frequency offset on/off

Sets the RF source to be swept at a fixed offset frequency above the receiver as required in a swept RF/IF, fixed LO, mixer test.

### Service menu

Select the desired service test, service diagnostic, service or verification mode.

## Test Sequences

### Description

Create, edit, save, or recall a series of front-panel key-strokes to automate a measurement. Test sequences may contain basic stimulus and measurement functions (frequency, power, parameter, format, scale) advanced operations (time domain, limit testing, display marker values) and basic logical branching (IF limit test fails DO sequence 5 or GOSUB).

### Storage

Test sequences can be stored internally to a disk drive and can be loaded from a computer over the GPIB interface. Sequence 6 is saved in nonvolatile storage and can be used as an autostart routine when titled AUTO.

### General purpose input/output

Read or write bits to the output port to control external devices such as part handlers. Eight output and five input TTL lines are available on the parallel port.

### Other functions

PAUSE/continue, wait, title sequence, print sequence, duplicate sequence, pause, and select.

## Time-domain (Option 010)

With the time-domain option, data from transmission or reflection measurements in the frequency domain are converted to the time domain using a Fourier transformation technique (chirp Z) and presented on the display. The time-domain response shows the measured parameter value versus time. Markers may also be displayed in electrical length (or physical length if the relative propagation velocity is entered).

### Time stimulus modes

Two types of time excitation stimulus waveforms can be simulated during the transformations, a step and an impulse.

- **Low-pass step**

This stimulus, similar to a traditional time-domain reflectometer (TDR) stimulus waveform, is used to measure low-pass devices. The frequency-domain data should extend from DC (extrapolated value) to a higher value.

- **Low-pass impulse**

This stimulus is also used to measure low-pass devices.

- **Bandpass impulse**

The bandpass impulse stimulates a pulsed RF signal (with an impulse envelope) and is used to measure the time-domain response of band-limited devices.

### Windows

The windowing function can be used to modify (filter) the frequency-domain data and thereby reduce overshoot and ringing in the time-domain response. Three types of windows are available: minimum, normal, and maximum.

### Gating

The gating function can be used to selectively remove reflection or transmission time-domain responses. In converting back to the frequency-domain the effects of the responses outside the gate are removed.

## Remote Programming

### Interface

GPIB interface operates to IEEE 488-1978 and IEC 625 standards and IEEE 728-1982 recommended practices.

### Addressing

The GPIB address can be verified or set from the front panel via the local menu and can range from 0 to 30 decimal (factory set at 16).

### Pass control

Allows the 8753ET/ES to request control of the GPIB (when an active controller is present) whenever it needs to output to a plotter or printer.

### System controller

Lets an 8753ET/ES become a controller on the GPIB to directly control a plotter or a printer.

### Talker/listener

Lets the 8753ET/ES become a GPIB talker/listener when an external controller is present.

### Transfer formats

Binary (internal 48-bit floating-point complex format) ASCII 32- or 64-bit IEEE 754 floating-point format.

### User-accessible graphics

Using a subset of HP Graphics Language (HP-GL), vector or text graphics may be written on the 8753ET/ES via GPIB. Up to 5 kbytes of data can be stored at one time (4 bytes per vector, 2 bytes per character).

### Interface function codes

SH1, AH1, T6, TE0, L4, LE0, SR1, RL1, PP0, DC1, DT0, C1, C2, C3, C10, E2

# General Characteristics

## Front Panel Connectors

### 8753ES test ports (without Option 011)

|                |                   |
|----------------|-------------------|
| Connector type | 7 mm, precision   |
| Impedance      | 50 ohms (nominal) |

### 8753ES Option 011 test ports

|                |                   |
|----------------|-------------------|
| Connector type | Type-N female     |
| Impedance      | 50 ohms (nominal) |

### 8753ES Option 075 test ports

|                |                   |
|----------------|-------------------|
| Connector type | Type-N female     |
| Impedance      | 75 ohms (nominal) |

### 8753ET test ports

|                |                   |
|----------------|-------------------|
| Connector type | Type-N female     |
| Impedance      | 50 ohms (nominal) |

### Probe power

|                                            |
|--------------------------------------------|
| +15V $\pm 2\%$ 400 mA                      |
| (combined load for both probe connections) |
| -12.6V $\pm 5.5\%$ 300 mA                  |
| (combined load for both probe connections) |

## Rear-Panel Connectors

### External reference frequency input (EXT REF INPUT)

|           |                                                  |
|-----------|--------------------------------------------------|
| Frequency | 1, 2, 5, and 10 MHz<br>( $\pm 200$ Hz at 10 MHz) |
| Level     | -10 dBm to +20 dBm, typical                      |
| Impedance | 50 ohms                                          |
| Connector | BNC (f)                                          |

### High-stability frequency reference output (Option 1D5)

|                          |                                              |
|--------------------------|----------------------------------------------|
| Frequency                | 10.0000 MHz                                  |
| Frequency stability      | $\pm 0.05$ ppm<br>(0° to 55° C)              |
| Daily aging rate         | $< 3 \times 10^{-9}$ /day<br>(after 30 days) |
| Yearly aging rate        | 0.5 ppm/year                                 |
| Output                   | 0 dBm minimum                                |
| Nominal output impedance | 50 $\Omega$ Connector BNC (f)                |

### External auxiliary input (AUX INPUT)

|                      |              |
|----------------------|--------------|
| Input voltage limits | -10V to +10V |
|----------------------|--------------|

### External AM input (EXT AM)

$\pm 1$  volt into a 5 k  $\Omega$  resistor, 1 kHz maximum, resulting in approximately 8 dB/volt amplitude modulation. BNC (f) connector.

### External trigger (EXT TRIGGER)

Triggers on a negative TTL transition or contact closure to ground. BNC (f) connector.

### Test sequence output (TEST SEQ)

By default, this connector outputs a TTL end-of-sweep signal. It can also be programmed by the user in a test sequence to output a user-defined TTL signal. BNC (f) connector.

### Limit test output (LIMIT TEST)

This connector outputs a TTL signal of the limit test results. Pass: TTL high. Fail: TTL low. BNC (f) connector.

### Test-port bias input (BIAS CONNECT) (8753ES only)

|                              |              |
|------------------------------|--------------|
| Maximum voltage              | +30 VDC      |
| Maximum current              | $\pm 200$ mA |
| (no degradation in RF specs) |              |
| Maximum current              | $\pm 1$ A    |
| Connector                    | BNC (f)      |

### VGA video output (EXT MON)

This connector drives external VGA monitors.

### GPIO

This connector allows communications with compatible devices including external controllers, printers, plotters, disk drives, and power meters.

### Parallel port

This 25-pin female connector is used with parallel peripherals. It can also be used as a general purpose I/O port.

### RS-232C

This 9-pin male connector is used with serial peripherals.

### DIN keyboard

This mini-DIN connector is used for adding an IBM PC-AT compatible keyboard.

### Test set interconnect

This connector is used to connect an 8753ES Option 011 to the 85046A/B or 85047A test set. 8753ES analyzers without Option 011 can use signal levels on this connector for sequencing or general purpose I/O applications.

### Internal memory

|                                                      |                          |
|------------------------------------------------------|--------------------------|
| Typical data retention time with 3V, 1.2 Ah battery: |                          |
| At 25° C                                             | 11,904 days (32.6 years) |
| At 40° C                                             | 1244 days (3.4 years)    |
| At 70° C                                             | 250 days (0.68 year)     |

### Line power

48 Hz to 66 Hz  
115V nominal (90V to 132V) or 230V nominal (198V to 264V).  
280 VA max.



## Environmental Characteristics

### General Conditions

RFI and EMI susceptibility: defined by VDE 0730, CISPR Publication 11, and FCC Class B Standards.

ESD (electrostatic discharge): must be eliminated by use of static-safe work procedures and an anti-static bench mat. The flexible rubber keypad protects key contacts from dust, but the environment should be as dust-free as possible for optimal reliability.

### Operating conditions

|                          |                                        |
|--------------------------|----------------------------------------|
| Temperature              | 0° to 55° C                            |
| (unless otherwise noted) |                                        |
| Humidity                 | 5% to 95% at 40° C<br>(non-condensing) |
| Altitude                 | 0 to 4500 meters<br>(15,000 feet)      |

### Non-operating storage conditions

|             |                                                 |
|-------------|-------------------------------------------------|
| Temperature | -40° C to +70° C                                |
| Humidity    | 0 to 90% relative at +65° C<br>(non-condensing) |
| Altitude    | 0 to 15,240 meters<br>(50,000 feet)             |

### Weight (8753ET/ES)

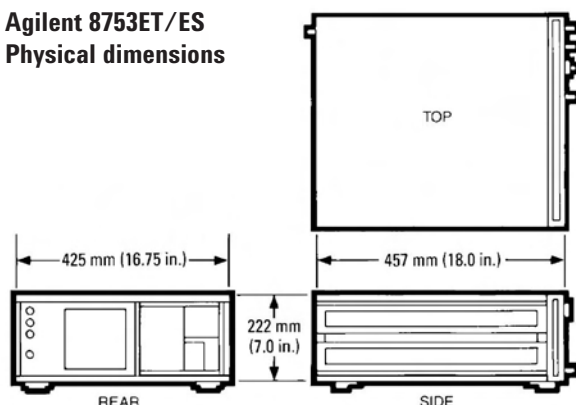
|          |               |
|----------|---------------|
| Net      | 21 kg (46 lb) |
| Shipping | 35 kg (77 lb) |

### Cabinet Dimensions (8753ET/ES)

(These dimensions exclude front and rear panel protrusions.)

222 mm H x 425 mm W x 457 mm D  
(8.75 in x 16.75 in x 18.0 in)

### Agilent 8753ET/ES Physical dimensions



1. One-port calibration, with a 6 kHz IF bandwidth. Includes system retrace time, but does not include bandwidth time. Time-domain gating is assumed off.
2. Same as footnote 1, but for an S21 measurement with full two-port calibration. Includes RF switching time.
3. Option 010 only, gating off.
4. Measured with an Omnibook 7100 266 MHz Pentium® II computer.
5. Does not include error from the 8753T/ES source and receiver harmonics.

## Measurement Throughput Summary

The following table shows typical measurement times in milliseconds.

### Typical Time for Completion (msec)

| Measurement                                                               | Number of Points |     |     |      |
|---------------------------------------------------------------------------|------------------|-----|-----|------|
|                                                                           | 51               | 201 | 401 | 1601 |
| Start=1 GHz, Span=10 MHz, IFBW=6 kHz                                      |                  |     |     |      |
| Uncorrected, 1-port calibration <sup>1</sup>                              | 32               | 70  | 121 | 423  |
| Two-port calibration <sup>2</sup>                                         | 62               | 139 | 240 | 848  |
| Start=30 kHz, Stop=3 GHz, IFBW=6 kHz                                      |                  |     |     |      |
| Uncorrected, 1-port calibration <sup>1</sup>                              | 202              | 270 | 304 | 615  |
| Two-port calibration <sup>2</sup>                                         | 402              | 540 | 607 | 1237 |
| Start=30 kHz, Stop=6 GHz, IFBW=6 kHz                                      |                  |     |     |      |
| Uncorrected, 1-port calibration <sup>1</sup>                              | 310              | 380 | 415 | 658  |
| Two-port calibration <sup>2</sup>                                         | 618              | 757 | 829 | 1315 |
| <b>Time domain<br/>(increase over uncorrected sweep time)<sup>3</sup></b> |                  |     |     |      |
| Conversion                                                                | 12               | 42  | 86  | 378  |
| Gating                                                                    | 14               | 40  | 80  | 349  |
| <b>GPIO data transfer<sup>4</sup></b>                                     |                  |     |     |      |
| Internal binary                                                           | 10               | 16  | 21  | 58   |
| ASCII                                                                     | 35               | 112 | 214 | 831  |
| IEEE 754 floating point format                                            |                  |     |     |      |
| 32-bit                                                                    | 11               | 19  | 28  | 83   |
| 64-bit                                                                    | 13               | 26  | 42  | 141  |

## Options

### Harmonic measurements (Option 002)

Measures amplifier 2nd and 3rd harmonics on a swept-frequency basis for fundamental signals above 16 MHz.

Dynamic Range (source at +10 dBm, receiver <+30 dBm)  
+40 dBc (minimum)

Accuracy<sup>5</sup> ±1 dB (<6 GHz)

### Step attenuator (Option 004)

Provides source output power range from -85 to +10 dBm for 8753ET model.

### 6 GHz operation (Option 006)

With Option 006, performance is extended to 6 GHz. When external source, tuned receiver or harmonic mode is used, the receiver is capable of measuring signals up to 6 GHz.

### Time domain (Option 010)

Transforms data from the frequency domain to the time domain using a Fourier transformation technique.

### High-stability frequency reference (Option 1D5)

This option adds an ovenized 10-MHz frequency reference output. It is connected to the external reference input on the rear panel. See the "General Characteristics" section for below specifications.

# Test Set Specifications for Option 011

## Agilent 85046A/B S-Parameter Test Sets

The 85046A/B S-parameter test sets provide the capability to measure reflection and transmission characteristics (including S-parameters) of two-port devices in either direction with a single connection. The test sets are controlled from the 8753ES Option 011 and include a programmable step attenuator. The frequency range of the 85046A 50-ohm test set is 300 kHz to 3 GHz. The 85046A has precision 7-mm connectors. The frequency range of the 85046B 75-ohm test set is 300 kHz to 2 GHz. The 85046B has 75-ohm type-N(f) connectors. Both connectors can be adapted to other interfaces with the appropriate precision adapters.

## Agilent 85046A/B Specifications

*Note: Specifications that apply only to the 85046B are indicated in parentheses.*

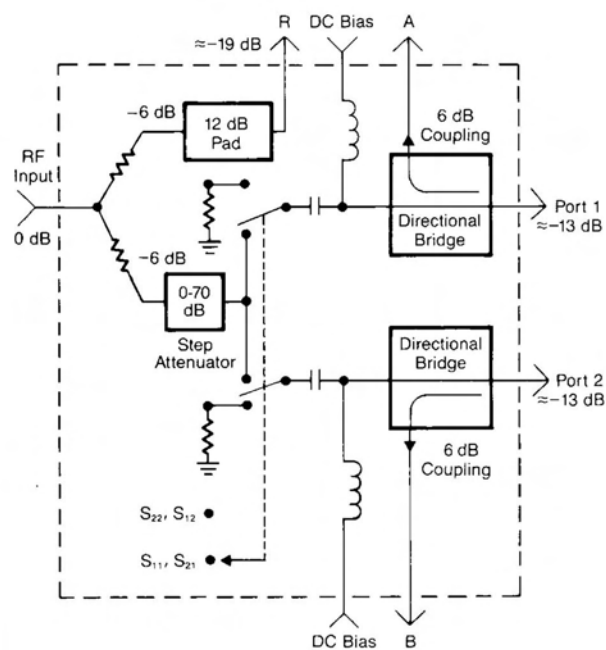
|                                            |                                             |
|--------------------------------------------|---------------------------------------------|
| <b>Impedance</b>                           | 50 ohm (75 ohm)                             |
| <b>Frequency range</b>                     | 300 kHz to 3 GHz<br>(300 kHz to 2 GHz)      |
| <b>Directivity</b>                         | 35 dB to 1.3 GHz<br>30 dB to $F_{\max}^1$   |
| <b>Typical tracking</b>                    |                                             |
| Transmission magnitude, phase <sup>2</sup> |                                             |
| 0.3 MHz to 2.0 MHz                         | $\pm 1.5$ dB, $\pm 20^\circ$                |
| 2.0 MHz to $F_{\max}$                      | $\pm 1.5$ dB, $\pm 10^\circ$                |
| Reflection magnitude, phase <sup>2</sup>   |                                             |
| 0.3 MHz to 2.0 MHz                         | $\pm 1.5$ dB, $\pm 25^\circ$                |
| 2.0 MHz to $F_{\max}$                      | $\pm 1.5$ dB, $\pm 10^\circ$                |
| Effective source match                     |                                             |
| 0.3 MHz to 2.0 MHz                         | 14 dB                                       |
| 2.0 MHz to 1.3 GHz                         | 20 dB (17 dB)                               |
| 1.3 GHz to $F_{\max}$                      | 16 dB                                       |
| <b>Nominal insertion loss</b>              |                                             |
| Input to test port                         | 14 dB + 0.5 dB/GHz<br>(19.5 dB + 1 dB/GHz)  |
| Input to incident                          | 18 dB + 1.5 dB/GHz<br>(18 dB + 1.5 dB/GHz)  |
| Port 1, 2 to A, B                          | 6.5 dB + 1.0 dB/GHz<br>(12 dB + 0.5 dB/GHz) |

## Test set switch/repeatability

|                             |                                                                     |
|-----------------------------|---------------------------------------------------------------------|
|                             | $\pm 0.03$ dB; $\pm 0.01$ dB <sup>3</sup>                           |
| <b>Max. operating level</b> | +20 dBm                                                             |
| <b>Damage level</b>         | +30 dBm                                                             |
| <b>RF attenuator range</b>  | 70 dB, 10 dB steps                                                  |
| <b>DC bias range</b>        | $\pm 30$ VDC, 200 mA <sup>4</sup><br>500 mA max                     |
| <b>DC bias connectors</b>   | 50 ohm BNC (f)                                                      |
| <b>Includes</b>             | four 190 mm (7.5 in) type-N cables and test set interconnect cable. |
| <b>Dimensions</b>           | 90 mm H x 432 mm W<br>x 553 mm D                                    |
| <b>Weight</b>               | 9.1 kg (20 lb)                                                      |

A standard 85046A/B test set contains a solid-state transfer switch, which allows continuous switching of power from port 1 to port 2 for full two-port error correction.

## Agilent 85046A Schematic



- $F_{\max}$  is the upper frequency limit of the associated test set.
- Degrees, specified as deviation from linear phase.
- Typical performance.
- Some degradation of RF specifications may occur.

## Agilent 85047A S-Parameter Test Set

The 85047A S-parameter test set provides the capability to simultaneously measure the reflection and transmission characteristics of two-port devices in either direction with a single connection. This test set includes a frequency doubler that can be switched in by an 8753B/C Option 006 to measure 3 MHz to 6 GHz in a single sweep or switched out to measure 300 kHz to 3 GHz in a single sweep. The 8753ES Option 011 does not use the frequency doubler, so the full 300 kHz to 6 GHz range is available. This test set exhibits <5 dB insertion loss between the RF input and the test ports for as high as 15 dBm at the test port, and also includes a programmable step attenuator. There are two rear panel BNC outputs. One provides a TTL signal which indicates the result of a limit test. The second TTL output is controlled from the 8753ES test sequence function.

## Specifications

|                        |                                                                                                   |
|------------------------|---------------------------------------------------------------------------------------------------|
| <b>Impedance</b>       | 50 ohms                                                                                           |
| <b>Frequency range</b> | 300 kHz to 3 GHz and<br>3 GHz to 6 GHz<br>(8753B/C);<br>300 kHz to 6 GHz<br>(8753D/E/ES Opt. 006) |

|                                |                    |
|--------------------------------|--------------------|
| <b>Directivity<sup>1</sup></b> |                    |
| 300 kHz to 1.3 GHz             | 35 dB <sup>2</sup> |
| 1.3 GHz to 3 GHz               | 30 dB              |
| 3 GHz to 6 GHz                 | 25 dB              |

### Typical tracking<sup>1</sup>

|                                                  |                                    |
|--------------------------------------------------|------------------------------------|
| <b>Transmission magnitude, phase<sup>3</sup></b> |                                    |
| 300 kHz to 3 GHz                                 | $\pm 1.5$ dB, $\pm 10^\circ$       |
| 3 GHz to 6 GHz                                   | $+0.5$ , $-2.5$ dB, $\pm 20^\circ$ |

|                                                |                              |
|------------------------------------------------|------------------------------|
| <b>Reflection magnitude, phase<sup>3</sup></b> |                              |
| 300 kHz to 3 GHz                               | $\pm 1.5$ dB, $\pm 10^\circ$ |
| 3 GHz to 6 GHz                                 | $\pm 1.5$ dB, $\pm 20^\circ$ |

|                                 |       |
|---------------------------------|-------|
| <b>Source match<sup>1</sup></b> |       |
| 300 kHz to 1.3 GHz              | 20 dB |
| 1.3 GHz to 3 GHz                | 16 dB |
| 3 GHz to 6 GHz                  | 14 dB |

### Normal insertion loss

|                   |                     |
|-------------------|---------------------|
| Input to port 1,2 |                     |
| 300 kHz to 3 GHz  | 4.0 dB +0.8 dB/GHz  |
| 3 GHz to 6 GHz    | 17.5 dB +0.8 dB/GHz |

|                  |                   |
|------------------|-------------------|
| Input to R       |                   |
| 300 kHz to 3 GHz | 19 dB +0.5 dB/GHz |
| 3 GHz to 6 GHz   | 34 dB +0.5 dB/GHz |

|                 |       |
|-----------------|-------|
| Port 1,2 to A,B | 16 dB |
|-----------------|-------|

### Typical isolation<sup>4</sup>

|                  |        |
|------------------|--------|
| 300 kHz to 3 GHz | 100 dB |
| 3 GHz to 6 GHz   | 90 dB  |

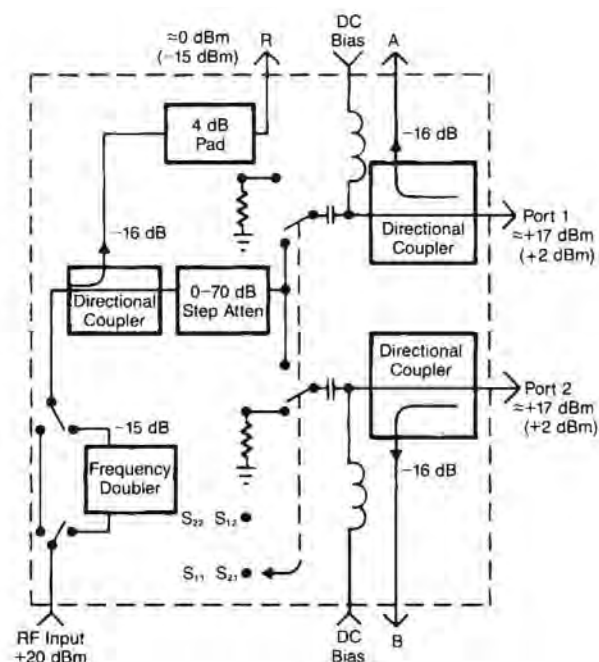
|                                       |                                                                 |
|---------------------------------------|-----------------------------------------------------------------|
| <b>Test port switch repeatability</b> | $\pm 0.03$ dB; $\pm 0.01$ dB4                                   |
| <b>Maximum operating level</b>        | +20 dBm                                                         |
| <b>Damage level</b>                   | +30 dBm                                                         |
| <b>RF attenuator range</b>            | 70 dB (10 dB steps)                                             |
| <b>DC bias range</b>                  | $\pm 30$ VDC, 200 mA,<br>no degradation in RF specs,<br>1A max. |

### RF connectors

|                   |                                  |
|-------------------|----------------------------------|
| Port 1,2          | 7 mm precision                   |
| All others        | 50 ohm type-N(f)                 |
| <b>Dimensions</b> | 90 mm H x 432 mm W x<br>553 mm D |
| <b>Weight</b>     | 10 kg (22 lb)                    |

A standard 85047A test set contains a solid-state transfer switch, which allows continuous switching of power from port 1 to port 2 for full two-port error correction.

## Agilent 85047A Schematic



1. This can be greatly improved with accuracy enhancement.
2. Some degradation at environmental extremes below 600 kHz.
3. Degrees, specified as deviation from linear phase.
4. Typical performance.

# Accessories

## Calibration Kits

Vector accuracy enhancement procedures require that the systematic errors of the measurement system be characterized by measuring known devices (standards) on the system over the frequency range of interest. Return loss specifications or typical values are provided where available for the terminations and adapters.

### 85031B 7-mm calibration kit

Contains precision 7-mm standards used to calibrate the 8753ES for measurement of devices with precision 7-mm connectors.

| Includes                                | Part number |
|-----------------------------------------|-------------|
| 7 mm short/open circuit                 | 85031-60001 |
| 7 mm 50-ohm terminations:<br>(two each) | 00909-60008 |
| Specifications for terminations         |             |
| DC to 5 GHz                             | RL ≥ 52 dB  |
| 5 to 6 GHz                              | RL ≥ 46 dB  |

### 85032B 50-ohm type-N calibration kit

Contains precision 50-ohm type-N standards used to calibrate the 8753ET/ES and 50-ohm test sets for measurement of devices with 50-ohm type-N connectors. Precision phase-matched 7-mm to type-N adapters are included for accurate measurements of non-insertable devices. Option 001 deletes the 7-mm to type-N adapters, which are not needed with the 8753ET.

| Includes                               | Part number |
|----------------------------------------|-------------|
| N-male 50-ohm termination              | 00909-60009 |
| N-female 50-ohm termination            | 00909-60010 |
| N-male short circuit                   | 85032-60008 |
| N-female short circuit                 | 85032-60009 |
| N-female open circuit                  | 85032-60012 |
| N-male open circuit                    | 85032-60007 |
| 7-mm to N-male adapter<br>(two each)   | 85054-60009 |
| 7-mm to N-female adapter<br>(two each) | 85054-60001 |
| Specifications for terminations:       |             |
| DC to 3 GHz                            | RL ≥ 49 dB  |
| 2 to 3 GHz                             | RL ≥ 46 dB  |
| 3 to 6 GHz                             | RL ≥ 40 dB  |
| Typical adapter characteristics:       |             |
| DC to 6 GHz                            | RL ≥ 30 dB  |

### 85033D 3.5-mm calibration kit

Contains a set of precision 3.5-mm standards to calibrate the 8753ES and 50-ohm test sets for the measurement of devices with precision 3.5-mm and SMA connectors. Precision phase-matched 7-mm to 3.5-mm adapters are included for accurate measurements of non-insertable devices. Option 001 deletes the 7-mm to type-N adapters.

| Includes                               | Part number |
|----------------------------------------|-------------|
| 3.5-mm-male 50-ohm termination         | 85033-60009 |
| 3.5-mm-female 50-ohm termination       | 85033-60010 |
| 3.5-mm-female short                    | 85033-60014 |
| 3.5-mm-male short                      | 85033-60013 |
| 3.5-mm-female open                     | 85033-60012 |
| 3.5-mm-male open                       | 85033-60011 |
| 7-mm to 3.5-mm female adapter<br>(two) | 1250-1747   |
| 7-mm to 3.5-mm male adapter<br>(two)   | 1250-1746   |
| Specifications for terminations:       |             |
| DC to 1.3 GHz                          | RL ≥ 46 dB  |
| 1.3 to 3 GHz                           | RL ≥ 44 dB  |
| 3 to 6 GHz                             | RL ≥ 38 dB  |
| Typical adapter characteristics:       |             |
| DC to 6 GHz                            | RL ≥ 34 dB  |

### 85036B 75-ohm type-N calibration kit

Contains a set of precision 75-ohm type-N standards to calibrate the 8753ES with a 75-ohm test set for measurement of devices with 75-ohm type-N connectors. Precision phased-matched adapters are included for accurate measurements of non-insertable devices.

| Includes                               | Part number |
|----------------------------------------|-------------|
| N-male 75-ohm termination              | 00909-60019 |
| N-female 75-ohm termination            | 00909-60020 |
| N-female 75-ohm short                  | 85036-60011 |
| N-male 75-ohm short                    | 85036-60012 |
| N-female open                          | 85032-20001 |
| N-male open                            | 85032-60007 |
| N-male to N-male 75-ohm adapter        | 85036-60013 |
| N-female to N-female 75-ohm<br>adapter | 85036-60014 |
| N-male to N-female 75-ohm<br>adapter   | 85036-60015 |
| Specifications for terminations:       |             |
| DC to 2 GHz                            | RL ≥ 46 dB  |
| 2 to 3 GHz                             | RL ≥ 40 dB  |

## Agilent 85038 Family of Calibration Kits

The 85038A calibration kit contains open circuits, short circuits, and terminations with both male and female 7-16 connectors. More economical versions of this kit are available: the 85038M contains only male devices, and the 85038F provides only female devices (see following table). Each kit contains a floppy disk with the calibration kit definition for use with 8712, 8714, 8753, 8719, 8720, 8722, and 8510C network analyzers.

### Contents of 7-16 Calibration Kits

| Description                    | Part Number | 85038A | 85038M | 85038F |
|--------------------------------|-------------|--------|--------|--------|
| Open circuit, female           | 85038-80002 | X      |        | X      |
| Open circuit, male             | 85038-80003 | X      | X      |        |
| Short circuit, female          | 85038-80004 | X      |        | X      |
| Short circuit, male            | 85038-80005 | X      | X      |        |
| Termination, female            | 85038-80006 | X      |        | X      |
| Termination, male              | 85038-80007 | X      | X      |        |
| 7-16 adapter, female-to-female | 11906-80016 |        |        | X      |
| 7-16 adapter, male-to-male     | 11906-80015 |        | X      |        |
| Calibration kit data disk      | 85038-10001 | X      | X      | X      |
| Torque wrench                  | 8710-2175   | X      |        |        |
| Open-end wrench                | 8710-2174   | X      |        |        |

### Specifications

|                                |                                            |
|--------------------------------|--------------------------------------------|
| <b>Frequency coverage</b>      | dc to 7.5 GHz<br>(usable to 8 GHz)         |
| <b>Nominal impedance</b>       | 50 ohms                                    |
| <b>Open circuits</b>           | Reflection phase<br>±1 degree from nominal |
| <b>Short circuits</b>          | Reflection phase<br>±1 degree from nominal |
| <b>Terminations</b>            | Return loss >40 dB                         |
| 7-16 to 7-16 adapters          | Return loss >40 dB<br>(VSWR <1.02)         |
| 7-16 to 50 ohm type-N adapters | Return loss >36 dB<br>(VSWR <1.03)         |
| 7-16 to 7-mm adapters          | Return loss >38 dB<br>(VSWR <1.025)        |
| 7-16 to 3.5-mm adapters        | Return loss >34 dB<br>(VSWR <1.04)         |

## Agilent 11906 Family of Adapter Kits

The 11906 family consists of four adapter kits:

### 11906A 7-16 to 7-16 adapter kit

| Description                   | Quantity | Part number |
|-------------------------------|----------|-------------|
| 7-16 male-to-male adapter     | 1        | 11906-80015 |
| 7-16 female-to-female adapter | 1        | 11906-80016 |
| 7-16 male-to-female adapter   | 2        | 11906-80017 |

### 11906B 7-16 to 50-ohm type-N adapter kit

| Description                          | Quantity | Part number |
|--------------------------------------|----------|-------------|
| Type-N male to 7-16 male adapter     | 1        | 11906-80007 |
| Type-N female to 7-16 female adapter | 1        | 11906-80008 |
| Type-N female to 7-16 male adapter   | 1        | 11906-80009 |
| Type-N male to 7-16 female adapter   | 1        | 11906-80010 |

### 11906C 7-16 to 7-mm adapter kit

| Description                 | Quantity | Part number |
|-----------------------------|----------|-------------|
| 7-mm to 7-16 male adapter   | 2        | 11906-80012 |
| 7-mm to 7-16 female adapter | 2        | 11906-80013 |

### 11906D 7-16 to 3.5-mm adapter kit

| Description                          | Quantity | Part number |
|--------------------------------------|----------|-------------|
| 3.5-mm male to 7-16 male adapter     | 1        | 11906-80002 |
| 3.5-mm male to 7-16 female adapter   | 1        | 11906-80005 |
| 3.5-mm female to 7-16 male adapter   | 1        | 11906-80004 |
| 3.5-mm female to 7-16 female adapter | 1        | 11906-80003 |

### 85039B type-F calibration kit

Contains a set of 75-ohm type-F standards to calibrate the 8753ES with a 75-ohm test set for the measurement of devices with type-F connectors.

| Description                                       | Part number |
|---------------------------------------------------|-------------|
| F-male 75-ohm termination                         | 85039-60007 |
| F-female 75-ohm termination                       | 85039-60004 |
| Specifications for termination:                   |             |
| DC to 1 GHz                                       | RL ≥ 45 dB  |
| 1 to 3 GHz                                        | RL ≥ 38 dB  |
| F-male 75-ohm short                               | 85039-60008 |
| F-female 75-ohm short                             | 85039-60003 |
| F-male 75-ohm open                                | 85039-60009 |
| F-female 75-ohm open                              | 85039-60005 |
| F-female to F-female 75-ohm adapter               | 85039-60002 |
| F-male to F-male 75-ohm adapter                   | 85039-60006 |
| Typical type-F adapter characteristics:           |             |
| DC to 1 GHz                                       | RL ≥ 40 dB  |
| 1 to 3 GHz                                        | RL ≥ 32 dB  |
| F-female to N-male 75-ohm adapter                 | 85039-60013 |
| F-male to N-female 75-ohm adapter                 | 85039-60011 |
| Typical type-F to type-N adapter characteristics: |             |
| DC to 1 GHz                                       | RL ≥ 38 dB  |
| 1 to 3 GHz                                        | RL ≥ 32 dB  |



# Accessories

## Verification Kits

Measuring known devices other than the standards used in calibration is an easy way to verify the proper operation of an 8753ES measurement system. Agilent offers verification kits which include devices, with data, for verifying the error-corrected measurements of an 8753ES and 50-ohm test sets.

### 85029B 7-mm verification kit

Contains a set of precision 7-mm devices, with data traceable to NIST\* for verifying the calibrated performance of an 8753E measurement system. The 85031B 7-mm calibration kit is required for complete verification.

## Test-Port Return Cables

Agilent offers high-quality RF cables to connect the 8753ET/ES and test sets to devices under test. These cables offer excellent RF shielding for high-dynamic-range measurements.

### 11851B 50-ohm type-N RF cable kit

Recommended for use with the 11850C/D three-way power splitters. Kit includes three phase-matched 610-mm (24-in.) cables and one 860-mm (34-in.) cable.

|                |                          |
|----------------|--------------------------|
| Return loss    | >24 dB to 3 GHz          |
| Phase tracking | $\pm 4^\circ$ at 1.3 GHz |

### 8120-5639 50-ohm type-N RF cable

A 50-ohm type-N test-port cable (both connectors are type-N male).

|             |                |
|-------------|----------------|
| Return loss | >30dB to 6 GHz |
|-------------|----------------|

### 11857B 75-ohm type-N test-port return cables

A pair of 610-mm (24-in.) test-port return cables for use with the 8753ES or 85046B 75-ohm S-parameter test set.

|                |                          |
|----------------|--------------------------|
| Return loss    | >24 dB to 2 GHz          |
| Phase tracking | $\pm 2^\circ$ at 1.3 GHz |

### 11857D 7-mm test-port return cables

A pair of 610-mm (24-in.) test-port return cables for use with the 8753ES with the 85046A and 85047A S-parameter test sets. These cables can be used with connector types other than 7-mm with the appropriate precision adapters.

|                |                          |
|----------------|--------------------------|
| Return loss    | >24 dB to 3 GHz          |
|                | >20 dB to 6 GHz          |
| Phase tracking | $\pm 2^\circ$ at 1.3 GHz |

### 11857F type-F test-port return cables

Type-F test-port cable set (75-ohm). Includes one cable with type-N(male) to type-F(male) connectors and one cable with type-N(male) to type-F(female) connectors.

## 11850C/D three-way power splitters

|                         | 11850C                                       | 11850D                      |
|-------------------------|----------------------------------------------|-----------------------------|
| Impedance               | 50 ohms                                      | 75 ohms                     |
| Frequency range         | DC to 3 GHz                                  | DC to 2 GHz                 |
| Tracking                | $\pm 25$ dB, $\pm 3^\circ$                   | $\pm 2$ dB, $\pm 2.5^\circ$ |
| Equivalent source match | 30 dB at 1.3 GHz                             | 30 dB at 1.3 GHz            |
| (ratio or leveling)     | 20 dB at 3 GHz                               | 20 dB at 2 GHz              |
| Nominal insertion loss  | 9.5 dB + 1 dB/GHz                            | 7.8 dB                      |
| Input port match        |                                              |                             |
| DC to 1.3 GHz           | 20 dB                                        | 20 dB                       |
| 1.3 GHz to $F_{\max}$   | 10 dB                                        | 10 dB                       |
| Maximum operating level | +20 dB                                       | +20 dB                      |
| Damage level            | +30 dB                                       | +30 dB                      |
| RF connectors           |                                              |                             |
| RF input                | 50-ohm type-N (f)                            | 50-ohm type-N(f)            |
| All others              | 50-ohm type-N (f)                            | 75-ohm type-N(f)            |
| Includes                | Three 11852B 50- to 75-ohm minimum-loss pads |                             |
| Recommended accessories | 11851B RF cable kit                          |                             |

### 11667A 50-ohm power splitter

|                                |                                                  |
|--------------------------------|--------------------------------------------------|
| Frequency range                | DC to 18 GHz                                     |
| Typical insertion loss         | 6 dB                                             |
| Equivalent source match        |                                                  |
| DC to 4 GHz                    | 26 dB                                            |
| 4 GHz to 8 GHz                 | 21 dB                                            |
| 8 GHz to 18 GHz                | 17 dB                                            |
| Tracking (between output arms) |                                                  |
| DC to 4 GHz                    | $\pm 15$ dB                                      |
| 4 GHz to 8 GHz                 | $\pm 2$ dB                                       |
| 8 GHz to 18 GHz                | $\pm 25$ dB                                      |
| Maximum operating level        | $\pm 27$ dBm                                     |
| Connectors                     | 50-ohm type-N (f)                                |
| Option 001                     |                                                  |
| RF input                       | type-N (m)                                       |
| Outputs                        | type-N (f)                                       |
| Option 002                     |                                                  |
| RF input                       | type-N (f) on RF                                 |
| Outputs                        | precision 7-mm                                   |
| Dimensions                     | 46 mm H x 52 mm W x 19 mm D (1.8 x 2.0 x 0.7 in) |
| Recommended accessories        | 11851B RF cable kit                              |

### 11852B 50-ohm to 75-ohm minimum loss pad

|                        |                  |
|------------------------|------------------|
| Frequency range        | DC to 3.0 GHz    |
| Nominal insertion loss | 5.7 dB           |
| Return loss            |                  |
| 300 kHz to 2 GHz       | 32 dB            |
| 2 GHz to 3 GHz         | 27 dB            |
| Maximum input power    | 250 mW (+24 dBm) |

|            |                                                                                                                |
|------------|----------------------------------------------------------------------------------------------------------------|
| Connectors | 50-ohm type-N (f) to<br>75-ohm type-N (m)<br>standard Option 004,<br>50-ohm type-N (m) to<br>75-ohm type-N (f) |
| Dimensions | 14-mm D x 70-mm L<br>(0.56 in x 2.75 in)                                                                       |
| Weight     | Net 0.1 kg (0.316 lb)                                                                                          |

### 50-Ohm Accessory Kits

The 11853A 50-ohm type-N and the 11854A 50-ohm BNC accessory kits provide the RF components generally required when using either the 85046A, 85047A, or 11850C with the 8753ES Option 011 when measuring devices having 50-ohm type-N or BNC connectors. These kits are supplied with a storage case.

#### 11853A 50-ohm type-N accessory kit

| Includes                    | Part number |
|-----------------------------|-------------|
| Type-N (f) short            | HP 11511A   |
| Type-N (m) short            | HP 11512A   |
| Type-N (m) to N (m) adapter | 1250-1475   |
| Type-N (f) to N (f) adapter | 1250-1472   |

#### 11854A 50-ohm BNC accessory kit

| Includes                         | Part number |
|----------------------------------|-------------|
| Type-N (m) to BNC female adapter | 1250-1476   |
| Type-N (m) to BNC male adapter   | 1250-1473   |
| Type-N (f) to BNC male adapter   | 1250-1477   |
| Type-N (f) to BNC female adapter | 1250-1474   |
| BNC (m) short                    | 1250-0929   |

### 75-Ohm Accessory Kits

The 11855A 75-ohm type-N and the 11856A 75-ohm BNC accessory kits provide the RF components generally required when using either the 85046B or the 11850D power splitter with the 8753ES Option 011 when measuring devices having 75-ohm type-N or BNC connectors. These kits are supplied with a storage case.

#### 11855A 75-ohm type-N accessory kit

| Includes                    | Part number |
|-----------------------------|-------------|
| Type-N (f) short            | 1250-1531   |
| Type-N (m) short            | 1250-1530   |
| Type-N (m) to N (m) adapter | 1250-1528   |
| Type-N (f) to N (f) adapter | 1250-1529   |
| Type-N (m) termination      | 1250-1532   |

#### 11856A 75-ohm BNC accessory kit

| Includes                      | Part number |
|-------------------------------|-------------|
| Type-N (m) to BNC (f) adapter | 1250-1535   |
| Type-N (m) to BNC (m) adapter | 1250-1533   |
| Type-N (f) to BNC (m) adapter | 1250-1534   |
| Type-N (f) to BNC (f) adapter | 1250-1536   |
| BNC (m) short                 | 1250-0929   |
| BNC (m) termination           | 11652-60010 |

### RF Limiter

Externally attaches to one or both ports of the analyzer. Provides protection against potential high-power transients from external devices.

#### Specifications

##### 11930A 7-mm RF limiter

|                        |             |
|------------------------|-------------|
| Frequency range        | DC to 6 GHz |
| Nominal insertion loss |             |
| DC to 3 GHz            | 1.0 dB      |
| 3 GHz to 6 GHz         | 1.5 dB      |

|                |       |
|----------------|-------|
| Return loss    |       |
| DC to 3 GHz    | 22 dB |
| 3 GHz to 6 GHz | 20 dB |

|                     |              |
|---------------------|--------------|
| Maximum input power | 3 W          |
| Maximum DC          | 30 V, 350 mA |

##### 11930B 50-ohm type-N RF limiter<sup>2</sup>

|                        |                     |
|------------------------|---------------------|
| Frequency range        | 5 MHz to 6 GHz      |
| Nominal insertion loss |                     |
| 5 MHz to 3 GHz         | 1.0 dB <sup>1</sup> |
| 3 GHz to 6 GHz         | 1.5 dB              |
| Return loss            |                     |
| 5 MHz to 3 GHz         | 21 dB <sup>1</sup>  |
| 3 GHz to 6 GHz         | 17 dB               |
| Maximum input power    | 3W                  |

### 85024A High-Frequency Probe

Two probes may be powered directly from the front panel of the 8753ET/ES. Refer to technical specifications, Agilent literature #5954-8393, for more information.

#### Specifications

|                            |                    |
|----------------------------|--------------------|
| Input capacitance          | <0.7 pF (nominal)  |
| (at 500 MHz)               |                    |
| Input resistance           | 1 Megohm (nominal) |
| Bandwidth                  | 300 kHz to 3 GHz   |
| Gain (at 500 MHz)          | 0 dB $\pm$ 1 dB    |
| Frequency response         |                    |
| 300 kHz to 1 GHz           | $\pm$ 1 dB         |
| 1 GHz to 3 GHz             | +2, -3 dB          |
| Input voltage for          |                    |
| <1 dB compression          | 0.3 V              |
| Supplement characteristics |                    |
| Noise figure               |                    |
| <100 MHz                   | <50 dB             |
| 100 MHz to 3 GHz           | <25 dB             |

| Includes             | Part/model number |
|----------------------|-------------------|
| Type-N (m) adapter   | 11880A            |
| 10:1 divider         | 11881A            |
| Spare 12 mil probes  | 85024-20012       |
| 2.5-inch ground lead | 01223-61302       |
| Hook tip             | 10229             |
| Spanner tip          | 5060-0549         |
| Probe tip nut driver | 8710-1806         |

1. Return loss and insertion loss limited below 16 MHz by series capacitor.  
2. Internal bias tees cannot be used with this limiter.

# Accessories

## Agilent 8347A RF Amplifier

The 8347A RF amplifier delivers increased power across a 300 kHz to 3 GHz frequency range. The 8347A provides leveled output power without using an external coupler and detector, since these parts are built-in. The external ALC can be directly connected to the external AM input on the 8753ET/ES. This capability is especially useful for achieving high dynamic range measurements at faster sweep rates.

### Specifications

|                        |                                                                  |
|------------------------|------------------------------------------------------------------|
| Frequency              | 100 kHz to 3 GHz                                                 |
| Gain                   | 25 dB minimum                                                    |
| Output power (leveled) | +5 dBm to +20 dBm<br>(adjustable)                                |
| Maximum output power   | 24 dBm typical                                                   |
| Leveled power flatness | ±1.5 dB                                                          |
| Impedance              | 50 ohms nominal                                                  |
| SWR                    |                                                                  |
| Input                  | 2.2:1 max                                                        |
| Output                 | 1.6:1 (ALC on)                                                   |
| Spectral purity        |                                                                  |
| Harmonics              | -20 dBc at dBm                                                   |
| Third-order intercept  | +30 dBm (nominal)                                                |
| Typical noise figure   |                                                                  |
| 100 MHz to 3 GHz       | 13.5 dB                                                          |
| RF connectors          | Type-N female                                                    |
| Dimensions             | 102-mm H x 213-mm<br>W x 297-mm D<br>(4.0 in x 8.4 in x 11.7 in) |
| Weight                 | net 3.5 kg (7.7 lb)                                              |

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