

# Agilent 8560 E-Series Spectrum Analyzers and Accessories

## Configuration Guide



- 8560E RF Spectrum Analyzer** (30 Hz to 2.9 GHz)
- 8561E RF Spectrum Analyzer** (30 Hz to 6.5 GHz)
- 8562E RF Spectrum Analyzer** (30 Hz to 13.2 GHz)
- 8563E Microwave Spectrum Analyzer** (9 kHz to 26.5 GHz)
- 8564E Millimeter-wave Spectrum Analyzer** (9 kHz to 40 GHz)
- 8565E Millimeter-wave Spectrum Analyzer** (9 kHz to 50 GHz)
- 8560EL RF Spectrum Analyzer** (30 Hz to 2.9 GHz)
- 8562EL RF Spectrum Analyzer** (30 Hz to 13.2 GHz)



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**Agilent 8560 E-Series Options**

Option	Description	8560E	8561E	8562E	8563E	8564E	8565E	8560EL	8562EL
<input type="checkbox"/> 001	310.7 MHz IF output	✓	✓	✓	✓	✓	✓		
<input type="checkbox"/> 002	Built-in tracking generator <sup>1</sup>	✓						✓	
<input type="checkbox"/> 005	Add alternate sweep output <sup>1</sup>	✓	✓	✓	✓	✓	✓		
<input type="checkbox"/> 006	Frequency coverage down to 30 Hz	Std	Std	Std	✓	✓	✓	Std	Std
<input type="checkbox"/> 007	Digitized fast time domain sweeps	✓	✓	✓	✓	✓	✓		
<input type="checkbox"/> 008	Adds Signal Identification	✓	✓	✓	✓	✓	✓		
<input type="checkbox"/> 026	APC 3.5-mm input connector				✓				
<input type="checkbox"/> 042	Protective soft carrying case/backpack	✓	✓	✓	✓	✓	✓		
<input type="checkbox"/> 0B0	Delete Manual set	✓	✓	✓	✓	✓	✓	✓	✓
<input type="checkbox"/> 0Q8	Factory delivered service training	✓	✓	✓	✓			✓	✓
<input type="checkbox"/> 103	Delete precision frequency reference	✓	✓	✓	✓	✓	✓	Std	Std
<input type="checkbox"/> 104	Delete 85620A Mass Memory Module	✓	✓	✓	✓	✓	✓	Std	Std
<input type="checkbox"/> 1BN	Certificate of calibration for MIL-STD 45662	✓	✓	✓	✓	✓	✓	✓	✓
<input type="checkbox"/> 1BP	Certificate of calibration with test data for MIL-STD 45662	✓	✓	✓	✓	✓	✓	✓	✓
<input type="checkbox"/> 8ZE	Refurbished spectrum analyzer (as available)	Contact an Agilent representative for availability							
<input type="checkbox"/> 908	Rack mount kit without handles	✓	✓	✓	✓	✓	✓	✓	✓
<input type="checkbox"/> 909	Rack mount kit with handles	✓	✓	✓	✓	✓	✓	✓	✓
<input type="checkbox"/> 910	Extra user's guide, calibration guide, mass memory module manual, and quick reference guide (QRG)	✓	✓	✓	✓	✓	✓	✓	✓
<input type="checkbox"/> 915	Service guide and component level information manual	✓	✓	✓	✓	✓	✓		
<input type="checkbox"/> 916	Additional quick reference guide (English)	✓	✓	✓	✓	✓	✓		
<input type="checkbox"/> AB2	Localization Chinese (user's guide)	✓	✓	✓	✓	✓	✓		
<input type="checkbox"/> ABD	Localization German (user's guide and QRG)	✓	✓	✓	✓	✓	✓	✓	✓
<input type="checkbox"/> ABE	Localization Spanish (user's guide and QRG)	✓	✓	✓	✓	✓	✓	✓	✓
<input type="checkbox"/> ABF	Localization French (user's guide and QRG)	✓	✓	✓	✓	✓	✓	✓	✓
<input type="checkbox"/> ABJ	Localization Japanese (user's guide and QRG)	✓	✓	✓	✓	✓	✓	✓	✓
<input type="checkbox"/> ABZ	Localization Italian (user's guide and QRG)	✓	✓	✓	✓	✓	✓	✓	✓
<input type="checkbox"/> J00	Bundles Option UK6 for Japan ONLY	✓	✓	✓	✓				
<input type="checkbox"/> J67	Bundles Option UK6, 006, and 007 for Japan ONLY				✓				
<input type="checkbox"/> J70	Bundles Option UK6 and 007 for Japan ONLY	✓	✓	✓					
<input type="checkbox"/> R07	Digital fast time-domain sweep retrofit kit	✓	✓	✓	✓				
<input type="checkbox"/> R08	Signal identification retrofit kit	✓	✓	✓	✓				
<input type="checkbox"/> UK6	Commercial calibration certificate with test data	✓	✓	✓	✓	✓	✓	✓	✓
<input type="checkbox"/> W30	Two additional years return-to-Agilent service	✓	✓	✓	✓	✓	✓	✓	✓
<input type="checkbox"/> W32	Two additional years return-to-Agilent calibration	✓	✓	✓	✓	✓	✓	✓	✓
<input type="checkbox"/> W34	Two additional years return-to-Agilent calibration MIL-Standard compliant calibration	✓	✓	✓	✓	✓	✓	✓	✓
<input type="checkbox"/> W50	Four additional years return-to-Agilent service	✓	✓	✓	✓	✓	✓	✓	✓
<input type="checkbox"/> W52	Four additional years return-to-Agilent calibration	✓	✓	✓	✓	✓	✓	✓	✓
<input type="checkbox"/> W54	Four additional years return-to-Agilent calibration MIL-Standard compliant calibration	✓	✓	✓	✓	✓	✓	✓	✓

**Agilent 8560 E-Series Application Measurement Cards/Measurement Personalities<sup>2</sup>**

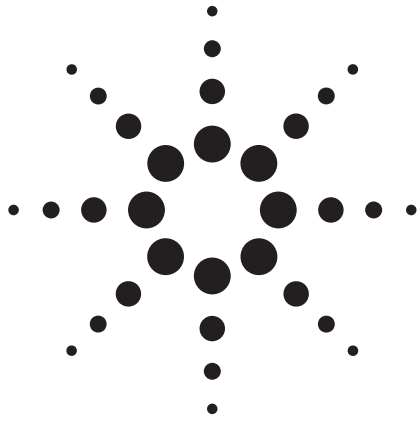
Option	Description	8560E	8561E	8562E	8563E	8564E	8565E	8560EL	8562EL
<input type="checkbox"/> 85710A	Digital Radio Measurements Personality	✓ <sup>7</sup>	✓ <sup>7</sup>	✓	✓	✓	✓		
<input type="checkbox"/> 85671A	Phase Noise Measurements Utility	✓	✓	✓	✓	✓	✓		
<input type="checkbox"/> 85672A	Spurious Response Measurements Utility	✓	✓	✓	✓	✓	✓		

**PC Software**

<input type="checkbox"/> E4444A	Benchlink spectrum analyzer	✓	✓	✓	✓	✓	✓	✓	✓
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✓ = compatible options

✓ = compatible cards/personalities



# Agilent 8560 E-Series Spectrum Analyzers

Data Sheet

**8560E 30 Hz to 2.9 GHz**

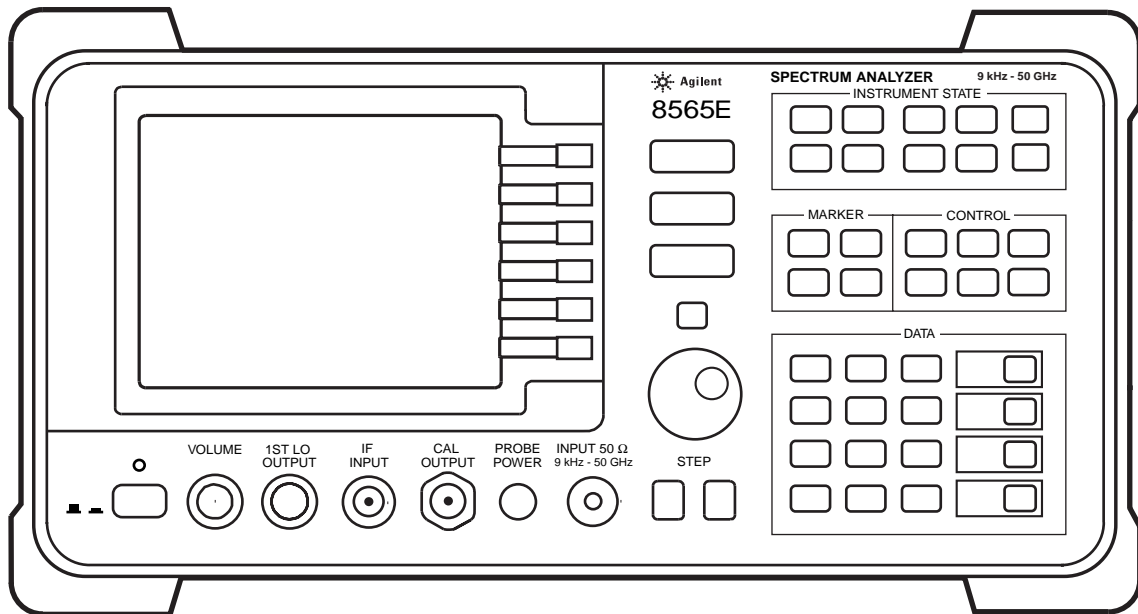
**8561E 30 Hz to 6.5 GHz**

**8562E 30 Hz to 13.2 GHz**

**8563E 30 Hz to 26.5 GHz**

**8564E 30 Hz to 40 GHz**

**8565E 30 Hz to 50 GHz**



Unless noted, all specifications describe the instruments' warranted performance under the following conditions: 5-minute warm-up from ambient conditions, autocoupled controls, digital display, IF ADJ ON, REF LVL CAL adjusted, SECOND IF OUTPUT and 1ST LO OUTPUT terminated in 50  $\Omega$ . After a 30-minute warm-up, and over a temperature range of 20  $^{\circ}\text{C}$  to 30  $^{\circ}\text{C}$ , the preselector does not have to

be peaked at each signal of interest; under these conditions factory preselector peak values are sufficient to meet all specifications. Typical performance is nonwarranted. Supplemental characteristics are denoted by "nominal" and "approximately"; these constitute nonwarranted functional performance information derived during the design process and are not tested on a continuing basis.



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# Frequency specifications, Agilent 8560 E-series

## Frequency range

	8560E	8561E	8562E	8563E	8564E	8565E
<b>Internal mixing</b>	30 Hz <sup>2</sup> to 2.9 GHz	30 Hz <sup>2</sup> to 6.5 GHz	30 Hz <sup>2</sup> to 13.2 GHz	30 Hz <sup>1</sup> to 26.5 GHz	30 Hz <sup>1</sup> to 40 GHz	30 Hz <sup>1</sup> to 50 GHz
<b>External mixing</b>	18 GHz to 325 GHz	18 GHz to 325 GHz	18 GHz to 325 GHz	18 GHz to 325 GHz	18 GHz to 325 GHz	18 GHz to 325 GHz

## Frequency band

30 Hz to 2.9 GHz
2.75 GHz to 6.46 GHz
5.86 GHz to 13.2 GHz
12.4 GHz to 26.8 GHz
26.4 GHz to 31.15 GHz
31.0 GHz to 50 GHz

## Harmonic mixing mode (N)

1
1
2
4
4
8

## Frequency counter accuracy

**Marker count accuracy** (S/N  $\geq 25$  dB)  $\pm(\text{marker freq} \times \text{freq ref accuracy}^6 + 2 \text{ Hz} \times N^5 + 1 \text{ LSD of counter})$

**Accuracy at 1 GHz** (25 °C, 1 yr aging, marker resolution = 1 Hz)  $\pm 225 \text{ Hz (5 minute warm-up)}^7$   
 $\pm 135 \text{ Hz (15 minute warm-up)}^7$   
 $\pm 3003 \text{ Hz (Option 103)}$

**Delta count accuracy** (S/N  $\geq 25$  dB)  $\pm(\text{delta freq} \times \text{freq ref accuracy}^6 + 4 \text{ Hz} \times N^5 + 2 \text{ LSD})$

**Counter resolution** Selectable from 1 Hz to 1 MHz

## Frequency reference

### Temperature stability<sup>3</sup>

$\pm 1 \times 10^{-8}$       **Option 103**  $\pm 1 \times 10^{-6}$

### Aging (per year) (per day nom.)

$\pm 1 \times 10^{-7}$        $\pm 2 \times 10^{-6}$   
 $\pm 5 \times 10^{-10(4)}$

### Initial achievable accuracy

$\pm 2.2 \times 10^{-8}$        $\pm 1 \times 10^{-6}$

### Short-term warm-up accuracy factors (nominal)

5 minute  $\pm 1 \times 10^{-7}$   
 15 minute  $\pm 1 \times 10^{-8}$

## Frequency span

### Range

0, 100 Hz to full span  
 (100 Hz  $\times N^{10}$  when using external mixers)

### Accuracy

Span  $> 2 \text{ MHz} \times N^5$   $\pm 5\%$   
 Span  $\leq 2 \text{ MHz} \times N^5$   $\pm 1\%$

## Frequency readout accuracy

(Start, stop, center, and marker frequency functions)

Span  $> 2 \text{ MHz} \times N^5$   $\pm(\text{freq readout} \times \text{freq ref accuracy}^6 + 5\% \times \text{span} + 15\% \times \text{RBW} + 10 \text{ Hz})$

Span  $\leq 2 \text{ MHz} \times N^5$   $\pm(\text{freq readout} \times \text{freq ref accuracy}^6 + 1\% \times \text{span} + 15\% \times \text{RBW} + 10 \text{ Hz})$

- 8563E, 8564E, 8565E require Option 006 for operation below 9 kHz.
- 8560E, 8561E, 8562E minimum frequency in AC coupled mode is 100 kHz. In DC coupled mode minimum frequency is 30 Hz.
- 10 °C to +55 °C, referenced to 25 °C
- After 7-day warm-up
- N = harmonic mixing mode number
- Frequency reference accuracy = aging  $\times$  time since last adjustment + initial achievable accuracy + temperature stability
- Short term warm-up accuracy factors have been included in this calculation.

# Frequency specifications, continued

## Sweep time

### Range

Span = 0 Hz	50 $\mu$ s to 6000 s
Span $\pm$ 100 Hz	
RBW $\geq$ 300 Hz	50 ms to 2000 s
RBW $\leq$ 100 Hz	50 ms to 100 ks

### Accuracy (Span = 0 Hz)

Sweep time $\geq$ 30 ms	$\pm$ 1% (digitized trace data)
Sweep time <30 ms (non-Option 007)	$\pm$ 10% (analog trace data)
Sweep time <30 ms (Option 007 <sup>1</sup> )	$\pm$ 0.1% (digitized trace data)

### Sweep trigger

delayed, free run, single,  
line, video, external

## Resolution bandwidth

<b>Range</b> (–3 dB)	1 Hz to 1 MHz in a 1, 3, 10 sequence and 2 MHz (3 MHz at –6 dB)	
Option 103	10 Hz to 1 MHz in a 1, 3, 10 sequence and 2 MHz (3 MHz at –6 dB)	
<b>Accuracy</b>	1 Hz to 300 kHz	$\pm$ 10%
	1 MHz	$\pm$ 25%
	2 MHz	+50%, –25%

### Selectivity (–60 dB/–3 dB BW ratio)

RBW $\geq$ 300 Hz	<15:1
RBW $\leq$ 100 Hz	<5:1

**Video bandwidth range** 1 Hz to 3 MHz in a 1, 3, 10 sequence

## Noise sidebands (see figure 1)

Center Frequency  $\leq$ 1 GHz

### Offset

100 Hz	$\leq$ 88 dBc/Hz <sup>2</sup>	<b>Opt. 103</b> $\leq$ 70 dBc/Hz <sup>2</sup>
1 kHz	$\leq$ 97 dBc/Hz <sup>2</sup>	$\leq$ 90 dBc/Hz <sup>2</sup>
10 kHz <sup>6</sup>	$\leq$ 113 dBc/Hz <sup>3</sup>	$\leq$ 113 dBc/Hz <sup>3</sup>
30 kHz <sup>6,8</sup>	$\leq$ 113 dBc/Hz <sup>4</sup>	$\leq$ 113 dBc/Hz <sup>4</sup>
100 kHz <sup>7</sup>	$\leq$ 117 dBc/Hz <sup>5</sup>	$\leq$ 117 dBc/Hz <sup>5</sup>

## Residual FM

(zero span, 10 Hz RBW))	<1 Hz pk-pk x N <sup>9</sup> in 20 ms <0.25 Hz pk-pk x N <sup>9</sup> in 20 ms (typical)
Option 103	<10 Hz pk-pk x N <sup>9</sup> in 20 ms

1. Option 007 extends digitized trace data capability to sweep times <30 ms.  
2. Add  $5.2 \times ((f/1 \text{ GHz}) - 1)$  for  $f > 1 \text{ GHz}$  and  $f \leq 2.9 \text{ GHz}$   
3. Add  $2.5 \times ((f/1 \text{ GHz}) - 1)$  for  $f > 1 \text{ GHz}$  and  $f \leq 2.9 \text{ GHz}$   
4. Add  $3.0 \text{ dB} \times ((f/1 \text{ GHz}) - 1)$  for  $f > 1 \text{ GHz}$  and  $f \leq 2.9 \text{ GHz}$   
5. Add 2 dB for  $f > 1 \text{ GHz}$  and  $f \leq 2.9 \text{ GHz}$   
6. RBW  $\leq$ 1 k or Span  $\leq$ 745 kHz  
7. RBW  $\geq$ 3 k or Span  $>$ 745 kHz  
8. Not specified at 30 kHz offset for 8564E and 8565E  
9. N = harmonic mixing mode number

# Amplitude specifications, Agilent 8560 E-series

**Range**      Displayed average noise level to +30 dBm

## Maximum safe input level

**Average continuous power**      +30 dBm (1 W, input attn  $\geq 10$  dB)

**Peak pulse power**      +50 dBm (100 W, input attn  $\geq 30$  dB)  
 ( $\leq 10 \mu\text{s}$  pulse width,  $< 1\%$  duty cycle)

## Maximum DC input voltage

DC coupled       $\pm 0.2$  Vdc  
 AC coupled       $\pm 50$  Vdc

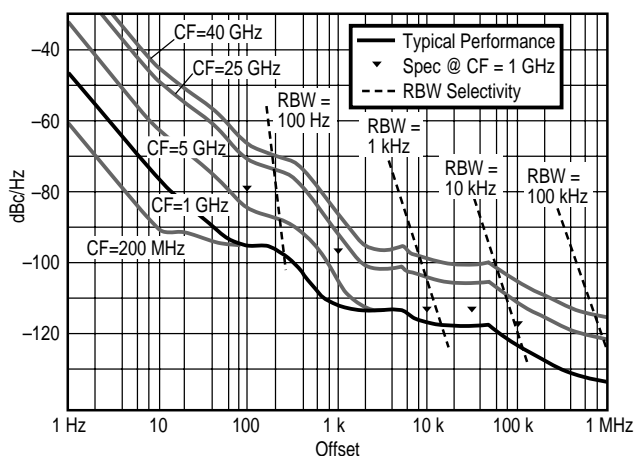
## 1 dB gain compression

Maximum power at mixer =  
 input power (dBm) – input attenuation (dB)

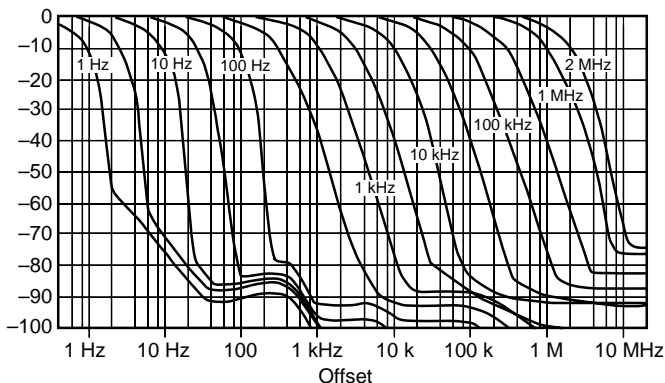
10 MHz to 2.9 GHz	-5 dBm
2.9 GHz to 6.46 GHz	+0 dBm <sup>3</sup>
6.46 GHz to 26.8 GHz	-3 dBm
26.8 GHz to 50 GHz	+0 dBm (nominal)

**Displayed average noise level (DANL)** (see figure 2)  
 (0 dB attenuation, 1 Hz resolution bandwidth<sup>1</sup>)

	8560E	8561E	8562E	8563E	8564E, 8565E
30 Hz <sup>2</sup>	$\leq 90$ dBm	$\leq 90$ dBm	$\leq 90$ dBm	$\leq 90$ dBm	$\leq 90$ dBm
1 kHz <sup>2</sup>	$\leq 105$ dBm	$\leq 105$ dBm	$\leq 105$ dBm	$\leq 105$ dBm	$\leq 105$ dBm
10 kHz	$\leq 120$ dBm	$\leq 120$ dBm	$\leq 120$ dBm	$\leq 120$ dBm	$\leq 120$ dBm
100 kHz	$\leq 120$ dBm	$\leq 120$ dBm	$\leq 120$ dBm	$\leq 120$ dBm	$\leq 120$ dBm
1 MHz to 10 MHz	$\leq 140$ dBm	$\leq 140$ dBm	$\leq 140$ dBm	$\leq 140$ dBm	$\leq 140$ dBm
10 MHz to 2.9 GHz	$\leq 149$ dBm	$\leq 145$ dBm	$\leq 151$ dBm	$\leq 151$ dBm	$\leq 145$ dBm
2.9 GHz to 6.46 GHz		$\leq 145$ dBm	$\leq 148$ dBm	$\leq 148$ dBm	$\leq 147$ dBm
6.46 GHz to 13.2 GHz			$\leq 145$ dBm	$\leq 145$ dBm	$\leq 143$ dBm
13.2 GHz to 22.0 GHz				$\leq 140$ dBm	$\leq 140$ dBm
22.0 GHz to 26.8 GHz				$\leq 139$ dBm	$\leq 136$ dBm
26.8 GHz to 31.15 GHz					$\leq 139$ dBm
31.15 GHz to 40 GHz					$\leq 130$ dBm
40 GHz to 50 GHz					$\leq 127$ dBm



**Figure 1. Noise sidebands normalized to 1 Hz BW versus offset from carrier**



**Figure 2. Typical on-screen dynamic range versus offset from 1 GHz center frequency for all RBWs (mixer level = -10 dBm)**

1. For Option 103, degrade DANL by 10 dB  
 2. 8563E, 8564E, 8565E require Option 006 for operation below 9 kHz.  
 3. 8561E: -3 dBm

# Amplitude specifications, continued

## Dynamic range (see figure 3)

Compression to noise <sup>1</sup>	8560E	8561E	8562E	8563E	8564E, 8565E
10 MHz to 2.9 GHz	>146 dB	>140 dB	>146 dB	>144 dB	>145 dB
2.9 GHz to 6.46 GHz		>142 dB	>148 dB	>148 dB	>147 dB
6.46 GHz to 13.2 GHz			>142 dB	>142 dB	>140 dB
13.2 GHz to 22.0 GHz				>137 dB	>137 dB
22.0 GHz to 26.8 GHz				>136 dB	>133 dB
26.8 GHz to 31.15 GHz					>139 dB
31.15 GHz to 40 GHz					>130 dB
40 GHz to 50 GHz					>127 dB
<b>Signal to distortion</b>					
Harmonic <sup>2</sup>					
20 MHz to 1.45 GHz	>95 dB	>88.5 dB	>95 dB	>94 dB	>92 dB
1.45 GHz to 2 GHz		>98.5 dB	>111.5 dB	>111.5 dB	>111 dB
2 GHz to 3.25 GHz		>119 dB	>119 dB	>119 dB	>113.5 dB
3.25 GHz to 6.6 GHz			>117.5 dB	>117.5 dB	>111.5 dB
6.6 GHz to 11 GHz				>115 dB	>110 dB
11 GHz to 13.4 GHz				>114.5 dB	>108 dB
13.4 GHz to 15.6 GHz					>109.5 dB
15.6 GHz to 20 GHz					>105 dB
20 GHz to 25 GHz					>103.5 dB
Intermodulation <sup>3</sup>					
10 MHz to 2.9 GHz	>108 dB	>103 dB	>108 dB	>107 dB	>104 dB
2.9 GHz to 6.46 GHz		>107 dB	>108.5 dB	>108.5 dB	>108 dB
6.46 GHz to 13.2 GHz			>101.5 dB	>101.5 dB	>100 dB
13.2 GHz to 22.0 GHz				>98 dB	>98 dB
22.0 GHz to 26.8 GHz				>97.5 dB	>95.5 dB
26.8 GHz to 31.15 GHz					>101 dB (nominal)
31.15 GHz to 40 GHz					>95 dB (nominal)
40 GHz to 50 GHz					>93 dB (nominal)

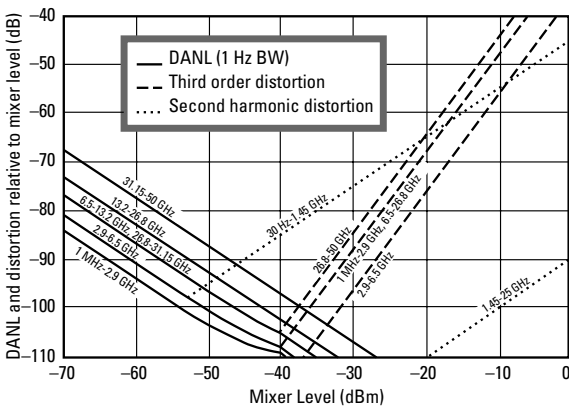


Figure 3. Agilent 8560E family nominal dynamic range

1. (1 dB compression - DANL) For Option 103, degrade compression to noise dynamic range by 10 dB.
2. 0.5 x (SHI - DANL at 2 x input frequency) For Option 103, degrade harmonic (SHI) dynamic range by 5 dB.
3. 0.67 x (TOI - DANL) For Option 103, degrade intermodulation (TOI) dynamic range by 6.67 dB.

# Amplitude specifications, continued

## Spurious responses

### General spurious responses

(Mixer level –40 dBm)  $<(-75 + 20 \times \log N^1)$  dBc

### Second harmonic distortion

input signal	Mixer level	Distortion	SHI
20 MHz to 1.45 GHz	–40 dBm	$\leq 79$ dBc <sup>2</sup>	+39 dBm <sup>2</sup>
1.45 GHz to 2 GHz	–10 dBm <sup>3</sup>	$\leq 85$ dBc <sup>3</sup>	+75 dBm <sup>3</sup>
2 GHz to 13.25 GHz			
8562E, 8563E	–10 dBm	$\leq 100$ dBc	+90 dBm
8564E, 8565E	–10 dBm	$\leq 90$ dBc	+80 dBm
13.25 GHz to 25 GHz	–10 dBm	$\leq 90$ dBc	+80 dBm

### Third order intermodulation distortion

(Two –30 dBm signals,  $\geq 1$  kHz apart)

Mixer level	Distortion	TOI
–30 dBm each	$\leq 82$ dBc <sup>4</sup>	+11 dBm
–30 dBm each	$\leq 90$ dBc	+15 dBm
–30 dBm each	$\leq 75$ dBc	+7.5 dBm
–30 dBm each	$\leq 85$ dBc (nominal)	+12.5 dBm (nominal)

### Image responses

Mixer level	
–10 dBm	–80 dBc
–30 dBm	–60 dBc

### Multiple and out-of-band responses

Mixer level	
–10 dBm	–80 dBc
–30 dBm	–55 dBc

## Residual responses

$\leq 90$  dBm, for the range from 200 kHz to 6.46 GHz, no input signal, 0 dB input attenuation

### Display range

<b>Viewing area</b>	approximately 7 cm (V) x 9 cm (H)
<b>Scale calibration</b>	10 x 10 divisions
<b>Log scale</b>	10, 5, 2, 1 dB per division
<b>Linear scale</b>	10% of reference level per division

## Scale fidelity

### Log range

RBW  $\geq 300$  Hz

RBW  $\leq 100$  Hz

Linear range

### Incremental

0 to –90 dB

$\pm 0.1$  dB/dB

$\pm 0.2$  dB/2dB

$\pm 3\%$  of reference level

### Maximum

0 to –90 dB

$\pm 0.85$  dB

$\pm 0.85$  dB<sup>5</sup>

1. Excluding display related side bands at multiples of 60 Hz
2. 8561E: distortion –72 dBc, SHI +32 dBm
3. 8561E: mixer level –20 dBm, distortion –72 dBc, SHI +52 dBm
4. 8561E –78 dB distortion with two –30 dBm signals, 9 dBm TOI
5. Maximum for 0 to –100 dB is  $\pm 1.5$  dB



# Amplitude specifications, continued

## Reference level range

### Log, adjustable in 0.1 dB steps

30 Hz to 31.15 GHz	-120 to +30 dBm
31.15 GHz to 50 GHz	-115 to +30 dBm

### Linear, adjustable in 1% steps

30 Hz to 31.15 GHz	2.2 $\mu$ V to 7.07 V
31.15 GHz to 50 GHz	3.98 $\mu$ V to 7.07 V

## Frequency response in dB, 10 dB input attenuation, dc coupled relative/typical relative/absolute<sup>2</sup>/typical absolute<sup>3</sup>

	8560E	8561E	8562E	8563E	8564E, 8565E
100 MHz to 2 GHz	0.7/0.7/--/--		0.9/0.8/--/--	1.0/0.8/--/--	0.9/0.8/--/--
30 Hz <sup>1</sup> to 2.9 GHz	1/0.8/1.5/1.0	1.0/0.7/1.75/1.0	1.25/0.8/1.8/1.0	1.25/0.8/1.8/1.0	1.0/0.8/1.5/1.0
2.9 GHz to 6.46 GHz		1.5/1.1/2.5/1.5	1.5/1.1/2.5/1.5	1.5/1.0/2.4/1.5	1.7/1.4/2.6/1.8
6.46 to 13.2 GHz			2.2/1.5/2.9/2.0	2.2/1.5/2.9/2.0	2.6/2.2/3.0/2.8
13.2 to 22 GHz				2.5/1.5/4.0/2.5	2.5/2.5/4.0/3.5
22 to 26.8 GHz				3.3/2.2/4.0/2.5	3.3/2.2/4.5/4.0
26.8 to 31.15 GHz					3.1/2.9/4.0/3.0
31.15 GHz to 40 GHz (8564E)					2.6/2.4/4.0/3.2
31.15 GHz to 50 GHz (8565E)					3.2/3.0/4.0/4.0

## Band switching uncertainty

$\pm 1$  dB (added to relative frequency response for between-band measurements)

## Calibrator output

300 MHz x (1  $\pm$  frequency reference accuracy<sup>4</sup>) at -10 dBm  
 $\pm 0.3$  dB

## Input attenuator

**Switching uncertainty** (referenced to 10 dB attenuation)

30 Hz to 2.9 GHz for 20 to 70 dB settings of input attenuator:  
 $\pm 0.6$  dB/10 dB step, 1.8 dB maximum  
Repeatability  $\pm 0.1$  dB (nominal)

## IF gain uncertainty

$\pm 1$  dB (0 to -80 dBm reference levels with 10 dB input attenuation)

## IF alignment uncertainty

$\pm 0.5$  dB (additional uncertainty only when using 300 Hz RBW)

## Resolution bandwidth switching uncertainty

$\pm 0.5$  dB (relative to 300 kHz RBW)

1. Operation below 9 kHz requires Option 006.
2. Absolute flatness values referenced to 300 MHz CAL OUT
3. Typical values at 25 °C
4. Frequency reference accuracy = aging x time since last adjustment + initial achievable accuracy + temperature stability

# Amplitude specifications, continued

## Pulse digitization uncertainty

(Pulse response mode, PRF >720/sweep time)

	Log	Linear
RBW ≤1 MHz	<1.25 dB pk-pk	<4% of ref level
RBW = 2 MHz	<3 dB pk-pk	<12% of ref level
Standard deviation (RBW <1 MHz)		<0.2 dB (nominal)

## Time-gated spectrum analysis

Gate delay <sup>1</sup>	Edge mode	Level mode
Range	3 μs to 65.535 ms	≤0.5 μs
Resolution	1 μs	
Accuracy	±1 μs	

(From GATE TRIGGER INPUT to positive edge of GATE OUTPUT)

Gate length	
Range	1 μs to 65.535 ms
Resolution	1 μs
Accuracy	±1 μs

(From positive edge to negative edge of GATE OUTPUT)

## Delayed sweep

**Trigger modes** Free run, line, external, video

**Range**  
Non-Option 007<sup>1</sup> +2 μs to +65.535 ms  
Option 007, sweep time <30 ms -9.9 ms to +65.535 ms  
sweep time ≥30 ms +2 μs to +65.535 ms

**Resolution** 1 μs

**Accuracy** ±1 μs

## Demodulation

Spectrum demodulation

Modulation type AM and FM

Audio output Speaker and phone jack with volume control

Marker pause time 100 ms to 60 s (nominal)

1. Up to 1 μs jitter due to 1 μs resolution of gate delay clock

# Inputs/outputs, Agilent 8560 E-series

(All values are nominal)

## Front panel connectors

### RF input

8560E, 8561E, 8562E, 8563E (Option 026, 8563E only)	Type N female, 50 $\Omega$ APC 3.5 mm male, 50 $\Omega$
8564E, 8565E	APC 2.4 mm male, 50 $\Omega$
VSWR ( $\geq 10$ dB atten)	
30 Hz to 2.9 GHz	<1.5:1 dB
2.9 GHz to 50 GHz	<2.3:1 dB
LO emission level (Average with 10 dB atten)	$\leq 80$ dBm

### IF input

Frequency	SMA female, 50 $\Omega$ 310.7 MHz
Full screen level	-30 dBm
Gain compression	-23 dB

### First LO output

Frequency	SMA female, 50 $\Omega$ 3.000 - 6.8107 GHz <sup>1</sup>
Amplitude	+16.5 dBm $\pm 2.0$ dB <sup>1</sup>

### Cal output

<b>Probe power</b>	BNC female, 50 $\Omega$ +15 Vdc, -12.6 Vdc, and Gnd (150 mA max each)
--------------------	---

## Rear panel connectors

### Earphone

Subminiature mono jack,  
0.2 W into 4  $\Omega$

### 10 MHz REF In/Out

Output freq accuracy  
 $\pm(10 \text{ MHz} \times \text{freq ref accuracy})$

Output amplitude

0 dBm

Input amplitude

-2 to +10 dBm

### Video output

BNC, 50  $\Omega$

Amplitude (RBW  $\geq 300$  Hz)

0 to +1 V full scale

### LO sweep frequency analog voltage output

(LO sweep or V/GHz function selectable from the front panel, BNC female, 120  $\Omega$ )

#### LO sweep output

0 to 10 V (no load)

#### Frequency analog voltage output (internal mixer mode)

Output ramp voltage proportional to start and stop frequencies.

Transfer function:

0.5 V/GHz

#### 0.5 V/GHz output (external mixer mode)

Output ramp voltage proportional to LO frequency:

(LO = 3 to 6.8107 GHz)

Transfer function: (1.5 V/GHz  $\times$  LO frequency (GHz)

-0.2054)  $\pm 50$  mV (typ)

### Blanking/gate

#### Output

Shared BNC female, 50  $\Omega$

Blanking mode

During sweep

Low TTL level

During retrace

High TTL level

Gate mode

Gate on

High TTL level

Gate off

Low TTL level

### External/gate

#### Trigger input

Shared BNC female, >10 k $\Omega$   
Settable to high TTL or low TTL

### GPIB

IEEE-488 bus connector

Interface functions

SH1, AH1, T6, L4, LE0, RL1, PP1,  
DC1, DT1, C1, C28, TE0, SR1

Direct printer output

Supports HP 3630A PaintJet  
printer, HP 2225A ThinkJet printer

Direct plotter output

Supports HP 7225A/7440A/  
7470A/7475A/7550A

1. Option 002: 3.9107 to 6.8107 GHz, +14.5 dBm  $\pm 3.0$  dB

# Options

## Option 001 second IF output, Agilent 8560 series

(All values are nominal)

3 dB bandwidth NF conversion gain	8560E	8561E	8562E	8563E	8564E,8565E
30 Hz to 2.9 GHz <sup>1</sup>	>25 MHz 24 dB 1.2 dB	>25 MHz 25 dB -6.5 dB	>25 dB 20 dB -1.2 dB	>25 MHz 25 dB -1.2 dB	>25 MHz 28 dB -1.2 dB
2.9 GHz to 6.5 GHz		>30 MHz 26 dB -1 dB	>30 MHz 22 dB -3 dB	>30 MHz 22 dB -1 dB	>30 MHz 23 dB -1 dB
6.5 GHz to 13.2 GHz			>37 MHz 26 dB -5.7 dB	>37 MHz 26 dB -5.7 dB	>37 MHz 28 dB -5.7 dB
13.2 GHz to 22 GHz				>45 MHz 30 dB -8 dB	>45 MHz 32 dB -8 dB
22 GHz to 26.8 GHz				>45 MHz 32 dB -8 dB	>45 MHz 35 dB -8 dB
26.8 GHz to 31.15 GHz					>25 MHz 28 dB -9 dB
31.15 GHz to 40 GHz					>25 MHz 38 dB -19 dB
40 GHz to 50 GHz					>25 MHz 42 dB -23 dB

## Option 002 built-in tracking generator<sup>2</sup> (8560E only)

### Frequency specifications

<b>Frequency range</b>	300 kHz to 2.9 GHz
<b>Accuracy</b> After peaking	±(frequency reference accuracy x tuned frequency +5% x span + 295 Hz)
<b>Tracking drift</b> (nominal)	Usable in 1 kHz RBW after 5-minute warm-up, usable in 300 Hz RBW after 30-minute warm-up.
<b>Minimum RBW</b>	300 Hz <sup>3</sup>

### Amplitude specifications

Output level (10 dBm to +2.8 dBm typical)	-10 dBm to +1 dBm
Resolution	0.1 dB
<b>Accuracy</b> Vernier	±0.20 dB/dB, ±0.5 dBm max (25 °C ±10 °C)
Absolute	±0.75 dB
Level flatness	±2.0 dB
Effective source match	1.92:1 (nominal)
Total absolute accuracy	±3.25 dB

1. DC coupled for frequencies below 100 kHz. Option 006 required for operation below 9 kHz in 8563E, 8564E, 8565E.

2. Option 002 deletes millimeter external mixer capability (Second IF input is deleted)

3. Tracking generator not usable with resolution bandwidths ≤100 Hz

## Option 002 built-in tracking generator (8560E only), continued

### Spurious output (at +1 dBm output power)

Harmonic spurious	-25 dBc
Non-harmonic spurious	
300 kHz to 2.0 GHz	-27 dBc
2.0 GHz to 2.9 GHz	-23 dBc
LO feedthrough	-16 dBm
	(3.9 GHz to 6.8 GHz)
Residuals (RF-Power-Off)	-78 dBm
	(300 kHz to 2.9 GHz)

### Dynamic range

TG feedthrough <sup>1</sup>	
300 kHz to 1 MHz	-95 dBm
1 MHz to 2.7 GHz	-115 dBm
2.7 GHz to 2.9 GHz	-110 dBm

### Dynamic range<sup>2</sup>

300 kHz to 1 MHz	96 dB
1 MHz to 2.7 GHz	116 dB
2.7 to 2.9 GHz	111 dB
<b>Power sweep</b>	10 dB range, 0.1 dB resolution

### Inputs/outputs

<b>RF output</b> (front panel) (nominal)	Type-N female, 50 Ω
Maximum safe reverse level	+30 dBm, ±30 Vdc

### External ALC input (rear panel)

BNC female, use with negative detector

## Environmental specifications, Agilent 8560 E-series

Per MIL-T-28800, type III, class 3<sup>3</sup>, style C

### Calibration interval

8560E, 8561E, 8562E, 8563E	2 years
8564E, 8565E	1 year

### Warm-up time

5-minutes in ambient conditions

### Temperature

-10 °C to +55 °C (operating); -51 °C to +71 °C (not operating)

### Humidity

95% @ 40 °C for 5 days

### Rain resistance

Drip-proof at 16 liters/hour/sq. ft.

### Altitude

15,000 ft. (operating),  
50,000 ft. (non-operating)

### Pulse shock (half sine)

30 g for 11 ms duration

### Transit drop

8-inch drop on six faces and eight corners

### Electromagnetic compatibility

Conducted and radiated interference in compliance with CISPR Pub. 11 (1990). Meets Mil-STD-461C, part 2, with certain exceptions.

### Power requirements

115 VAC operation:  
90 to 140 V rms,  
3.2 A rms max,  
47 to 440 Hz  
230 VAC operation:  
180 to 250 V rms,  
1.8 A rms max,  
47 to 66 Hz

### Maximum power dissipation

8560E, 8561E, 8562E, 8563E	180 W
8564E, 8565E	260 W

### Audible noise (nominal)

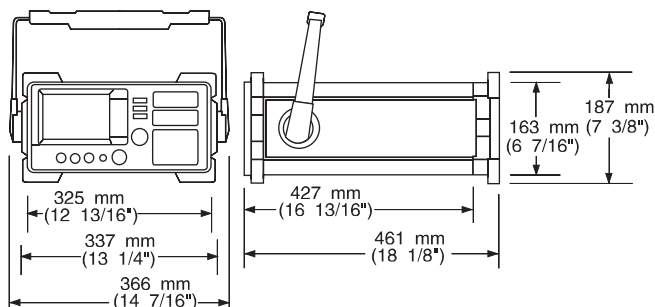
<5.0 Bels power at room temp (ISO DP7779)

### Dimensions (w/o handle, cover)

337 mm W x 187 mm H x 461 mm D

### Weight (nominal)

8560E, 8561E, 8562E, 8563E	20 kg (44 lbs)
8564E, 8565E	21 kg (46 lbs)



1. Leakage measured with maximum power into 50 Ω and with 50 Ω on RF input  
2. Difference between maximum power output and tracking generator feedthrough  
3. 8564E, 8565E: Class 5

## Agilent 8560 E-Series Accessories

### For Scalar Measurements

- 85640A** Tracking generator (300 kHz to 2.9 GHz)
- 8721A** Directional bridge
- 11852B** Option C04 50 to 75 ohm minimum loss pad
- 86205A** 50 ohm bridge (300 kHz to 6 GHz)

### For Extended Frequency Measurements

- 11974A** Preselected mm mixer (26.5 GHz to 40 GHz)<sup>3,6</sup>
- 11974Q** Preselected mm mixer (33 GHz to 50 GHz)<sup>3,6</sup>
- 11974U** Preselected mm mixer (40 GHz to 60 GHz)<sup>3,6</sup>
- 11974V** Preselected mm mixer (50 GHz to 75 GHz)<sup>3,6</sup>
- 11970K** mm harmonic mixer (18 GHz to 26.5 GHz)<sup>3,5</sup>
- 11970A** mm harmonic mixer (26.5 GHz to 40 GHz)<sup>3,5</sup>
- 11970Q** mm harmonic mixer (33 GHz to 50 GHz)<sup>3,5</sup>
- 11970U** mm harmonic mixer (40 GHz to 60 GHz)<sup>3,5</sup>
- 11970V** mm harmonic mixer (50 GHz to 75 GHz)<sup>3,5</sup>
- 11970W** mm harmonic mixer (75 GHz to 110 GHz)<sup>3,5</sup>

### Amplifiers and Preamplifiers

- 8447A** Preamplifier (100 kHz to 400 MHz, 20 dB gain)
- 8447D** Preamplifier (100 kHz to 1.3 GHz, 25 dB gain)
- 8449B** Preamplifier (1 GHz to 26.5 GHz, 30 dB gain)
- 10855A** Broadband preamplifier (2 MHz to 1300 MHz, 22 dB gain)
- 83006A** 10 MHz to 26.5 GHz preamplifier (20 dB gain)
- 83051A** 45 MHz to 50 GHz preamplifier (23 dB gain)

### Printers

Most Hewlett-Packard DeskJet and LaserJet (PCL 3 compatible) printers are compatible with 8590 series spectrum analyzers. Printer compatibility chart is on the internet website at [www.agilent.com/find/pcg/](http://www.agilent.com/find/pcg/)

- ITEL-45 CHVUB** GPIB/Parallel converter (North America, Japan, Korea and Taiwan)
- ITEL-45 CHVEB** GPIB/Parallel converter (Continental Europe, U.K., Australia and South Africa) (requires F1011A AC adapter)
- 10833A** GPIB cable (1 meter)
- C2950A** Parallel printer cable (2 meters)

### Other Accessories

- 85620A** Mass Memory Module (standard on 8560 E-series)
- 85629B** Test and Adjustment Module (limited use on 8562E/64E/65E)
- 85700A** 32-Kbyte RAM memory card<sup>2</sup>
- 85702A** 128-Kbyte RAM memory card<sup>2</sup>
- 85901A** Portable AC power source (for use with 8560E/61E/62E/63E)
- 85902A** Burst Carrier Trigger
- 41800A** Active probe (5 Hz to 500 MHz)
- 85024A** High frequency probe (300 kHz to 3 GHz)
- 11945A** Close-field probes (with Option E51)
- 11742A** High frequency blocking capacitor (3.5 mm (f to m)), 45 MHz to 26.5 GHz, .35 dB IL <12.4 GHz, .7 dB IL <26.5 GHz)
- 5062-4841** Rack mount without handles (centers instrument in rack)<sup>4</sup>
- 5062-4840** Rack mount with handles (centers instrument in rack)<sup>4</sup>
- 5062-8241** Rack mount without handles (mounts instrument left of center)<sup>4</sup>
- 5062-8240** Rack mount with handles (mounts instrument left of center)<sup>4</sup>
- 1494-0060** Rack slide for rack mount
- 1420-0383** Memory card battery (CR 2016)
- 9211-5604** Transit case
- 08562-60021** Service accessory kit
- 1540-1130** Protective soft carrying case/backpack (same as option 042)
- 8120-6164** 50 GHz cable: 1 meter, 2.4 mm (f) and 2.4 mm (m) connectors
- 11693A** Limiter: Type-N (f) to Type-N (m), 0.1 GHz to 12.4 GHz, <2 dB insertion loss

## Agilent 8560 E-Series Manuals

- 08560-90112** 8560 E-Series quick reference guide
- 5961-0435** 8560 E-Series quick reference guide in French<sup>s</sup>
- 5961-0436** 8560 E-Series quick reference guide in German<sup>s</sup>
- 5961-0437** 8560 E-Series quick reference guide in Italian<sup>s</sup>
- 5961-0438** 8560 E-Series quick reference guide in Spanish<sup>s</sup>
- 5961-6800** 8560 E-Series quick reference guide in Chinese<sup>s</sup>
- 08560-90110** 8560 E-Series user's guide
- 5961-6793** 8560 E-Series user's guide in French<sup>s</sup>
- 5961-6794** 8560 E-Series user's guide in German<sup>s</sup>
- 5961-6795** 8560 E-Series user's guide in Italian<sup>s</sup>
- 5961-6796** 8560 E-Series user's guide in Spanish<sup>s</sup>
- 08560-90117** 8560 E-Series user's guide in Japanese<sup>s</sup>
- 5960-6550** 8560 E-Series component level information manual<sup>s</sup>
- 08560-90132** 8560 E-Series calibration guide
- 08560-90111** 8560E service guide
- 08563-90131** 8561/63E service guide
- 08562-90209** 8562E service guide
- 08564-90014** 8564/65E service guide
- 85620-90041** 85620A installation, operation, programming and service manual

## Agilent 8560 E-Series Product Literature

- 5091-3274E** 8560E/61E/63E data sheet
- 5091-3275E** 8560E/61E/63E flyer
- 5091-8182E** 8564E/65E data sheet

For user's training contact your local Agilent representative.

### Notes

1. Options 002 and 005 are mutually exclusive.
2. 85620A required, 85620A includes one 32-Kbyte RAM card
3. Not compatible with Option 002 on the 8560E, not available for the 8560EL and 8562EL
4. Rack height is 8.75 inches.
5. Option 008 on 8560 series recommended
6. Option 005 on 8560 series recommended
7. Not all agency masks can be used with 8560E and 8561E.
8. Not available for the 8562E

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