

# Agilent 83599A and 83598A

## RF Plug-ins for the Agilent 8350B Sweep Oscillator

Data Sheet

10 MHz to 50 GHz

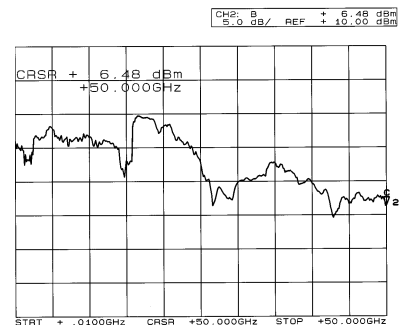


The Agilent Technologies 83599A (10 MHz to 50 GHz) and 83598A (2.4 GHz to 50 GHz) RF plug-ins for the Agilent 8350B sweep oscillator mainframe combine excellent performance and reliability in two broadband coaxial swept frequency sources. These plug-ins feature high output power (+10 dBm to 20 GHz, +3 dBm

to 40, and 0 dBm to 50 GHz), as well as excellent harmonic performance (<-45 dBc from 1.5 to 20 GHz, <-40 dBc to 40 GHz, and <-35 dBc to 50 GHz). For applications requiring additional power to 20 GHz, these plug-ins also provide a switch selectable high power mode which boosts the RF output to +15 dBm from 2.4 to 20 GHz.

### 50 GHz coaxial coverage

The 83599A and 83598A plug-ins incorporate 2.4 mm connectors which make high performance broadband coaxial measurements possible. The superiority of 2.4 mm connectors lies in their ruggedness, repeatable performance, and excellent match over the entire frequency range. 2.4 mm connectors are also incorporated into other Agilent instrumentation and devices so that a complete 10 MHz to 50 GHz coaxial system can be configured.



**Typical output power available from the Agilent 83599A in normal (versus high power) operating mode**



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### Unsurpassed versatility

With these additions, the 8350B sweeper family offers a choice of twenty Agilent 83500 series plug-ins. The 8350B has a straightforward front panel with easy-to-use knob, step, and data entry keyboard controls. Almost all plug-in functions are fully programmable via the Agilent Interface Bus. Numerous features such as power sweep, slope, alternate sweep, save/recall registers, and five independent markers emphasize the 8350B's versatility.

### Outstanding reliability

The 8350B mainframe and all 83500 series plug-ins are backed with a one-year warranty on the instrument and a two-year warranty on microcircuits. These microcircuits are also established on our microcircuit exchange program to further minimize the cost of ownership. Option W30 on the mainframe and plug-ins guarantees a low cost of ownership by providing two additional years of service at a low price.

## Applications

### Scalar network analysis

Testing components up to 50 GHz in a coaxial environment is now possible with the 83599A and 83598A RF plug-ins. A broadband swept scalar measurement system is easy to configure using these 50 GHz sweepers with the Agilent 8757C/E scalar network analyzer and the appropriate 2.4 mm scalar accessories.

Simultaneously measure a device's reflection and transmission characteristics by using the 85027D 10 MHz to 50 GHz 2.4 mm directional bridge to measure the reflected signal and the 85025D 10 MHz to 50 GHz 2.4 mm detector to measure the transmitted signal. Improve measurement accuracy by ratioing. Ratioing can be accomplished by adding an Agilent 11667C 10 MHz to 50 GHz 2.4 mm power splitter and a second 85025D detector to measure the reference signal.

The 8757C/E scalar network analyzer can operate in either AC-detection mode for reliable drift-free measurements or in DC-detection mode for accurate swept power measurements. Scalar measurement dynamic range is maximized by the plug-ins' excellent harmonic performance, making them an ideal choice for scalar network analysis.

### Local oscillator

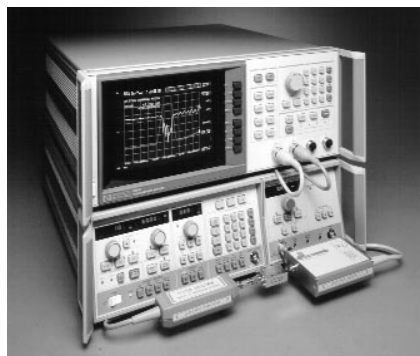
The broadband frequency coverage and high output power of the 83599A and 83598A RF plug-ins make them ideal as local oscillators for downconverting high frequency signals to a lower intermediate frequency. These plug-ins provide the broadest frequency coverage for mixer measurements systems where a 50 GHz coaxial local oscillator is required. Coaxial noise figure measurements up to 50 GHz

are also possible using the Agilent 8970B noise figure meter with an 83599A or 83598A plug-in. In this application, the plug-in is used to downconvert the high frequency signals to the 10 to 1600 MHz range of the noise figure meter.

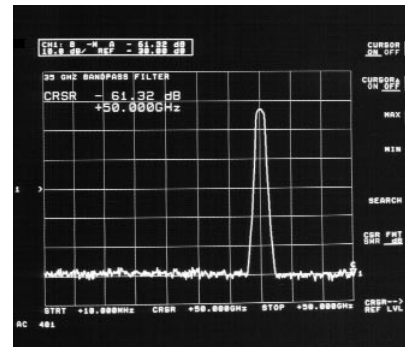
### Stand alone source

The outstanding performance of the 83599A and 83598A RF plug-ins make them especially attractive as stand alone sources for various signal generation and simulation applications. In addition to their broad frequency coverage, these plug-ins provide greater than 45 dBc of harmonic and subharmonic suppression from 1.5 to 20 GHz, greater than 40 dB to 40 GHz, and greater than 35 dB to 50 GHz. They also provide CW frequency accuracies of better than  $\pm 5$  to  $\pm 25$  MHz depending on the frequency of operation.

These plug-ins have very flexible amplitude, frequency, and pulse modulation capabilities. For example,  $\pm 75$  MHz deviations are possible for frequency modulation rates of DC to 100 Hz. An internal pulse modulator provides calibrated leveled pulses with as narrow as 1.5  $\mu$ sec widths and 50 nsec rise/fall times. Finally, both plug-ins provide an optional 60 dB step attenuator which allows output power control from +10 to -72 dBm.



10 MHz to 50 GHz scalar network analyzer system



Transmission response of a 35 GHz band-pass filter

## Specifications

**Specifications** describe the instrument's warranted performance over the temperature range of 0° to 55°C (except where noted). **Supplemental characteristics** are intended to provide information useful in applying the instrument by giving typical but non-warranted performance parameters. These are denoted as “typical,” “nominal,” or “approximate.”

	Band 0	Band 1	Band 2	Band 3	Band 4	Full Band
<b>Frequency Characteristics</b>						
Range						
83599A	0.01 to 2.4 GHz	2.4 to 7.0 GHz	7.0 to 14.0 GHz	14.0 to 26.5 GHz	26.5 to 50.0 GHz	0.01 to 50.0 GHz
83598A		2.4 to 7.0 GHz	7.0 to 14.0 GHz	14.0 to 26.5 GHz	26.5 to 50.0 GHz	2.4 to 50.0 GHz
Accuracy <sup>1</sup>						
CW Mode	±5 MHz	±5 MHz	±10 MHz	±20 MHz	±25 MHz	
All Sweep Modes <sup>2</sup>	±15 MHz	±20 MHz	±25 MHz	±50 MHz	±65 MHz	±100 MHz
Frequency Markers <sup>3</sup>	±15 MHz, ±0.5% of sweep width	±20 MHz, ±0.5% of sweep width	±25 MHz, ±0.5% of sweep width	±50 MHz, ±0.5% of sweep width	±65 MHz, ±0.5% of sweep width	±100 MHz, ±0.5% of sweep width
Linearity: <sup>3</sup> typically	±2 MHz	±2 MHz	±4 MHz	±10 MHz	±12 MHz	±20 MHz
Stability						
With Temperature: typical	±200 kHz/°C	±200 kHz/°C	±400 kHz/°C	±800 kHz/°C	±1.6 MHz/°C	
With 10 dB Power Change	±100 kHz	±100 kHz	±100 kHz	±200 kHz	±250 kHz	
With 3:1 Load SWR	±100 kHz	±100 kHz	±100 kHz	±100 kHz	±200 kHz	
With Time: <sup>4</sup> Typical	±100 kHz	±100 kHz	±200 kHz	±400 kHz	±800 kHz	
Residual FM (peak): <sup>5</sup>	<5 kHz	<5 kHz	<7 kHz	<14 kHz	<24 kHz	
<b>Output Characteristics</b>						
Maximum Leveled Power: <sup>1,6</sup>						
Normal [High Power] <sup>11</sup>	10 mW	10 mW [30 mW]	10 mW [30 mW]	10 mW [30 mW]	2 mW	1 mW
Option 002 <sup>10</sup>	10 mW	7 mW [20 mW]	7 mW [20 mW]	7 mW [20 mW]	1 mW	0.5 mW
Option 004 <sup>10</sup>	10 mW	7 mW [20 mW]	7 mW [20 mW]	7 mW [20 mW]	1 mW	0.5 mW
				20 to 26.5 GHz	40 to 50 GHz	
Option 002 <sup>10</sup>				4 mW	1 mW	
Option 004 <sup>10</sup>				2.5 mW	0.5 mW	
Power Level Accuracy <sup>1,7,8</sup>	±1.5 dB	±1.3 dB	±1.3 dB	±1.4 dB	±2.2 dB	±2.2 dB
Power Variations <sup>1,8</sup>	±0.9 dB	±0.7 dB	±0.7 dB	±0.8 dB	±1.4 dB	±1.5 dB
Spurious Signals <sup>9, 12</sup>						
Harmonics and Subharmonics	0.01 to 1.5 GHz	<-45 dBc	<-45 dBc	14 to 20 GHz	26.5 to 40 GHz	
Normal [High Power] <sup>11</sup>	<-25 dBc	[<-20 dBc typical]	[<-20 dBc typical]	<-45 dBc	<-40 dBc	
	1.5 to 2.4 GHz			[<-20 dBc typical]	40 to 50 GHz	
	<-50 dBc			20 to 26.5 GHz	<-35 dBc	
				-40 dBc		
Non-harmonics	<-25 dBc	<-50 dBc	<-50 dBc	<-50 dBc	<-50 dBc	

1. 25°C ±5°C.

2. For sweep times ≥100 mS.

3. With respect to SWEEP OUT voltage.

4. In 10 minute period after one hour warm-up at selected CW frequency.

5. 10 Hz to 10 kHz bandwidth, CW mode with CW filter on.

6. Typically degrades 0.1 dB/°C above 25°C.

7. Includes power level variations.

8. Degrades typically ±0.05 dB/°C outside the 20°C to 30°C range.

9. At specified maximum leveled power.

10. Option 002 provides an internal 60 dB step attenuator. Option 004 provides the RF output on the rear panel. Options 002 and 004 are not available together.

11. Performance unique to the high power operating mode are in brackets [ ]. High power mode, activated via an internal RF plug-in switch, increases the gain in the plug-in's RF path with the result being increased RF output power from 2.4 to 20 GHz. Harmonics are also degraded in this mode.

12. Spurious signals >50 GHz, <-35 dBc typical.

## Output characteristics

### Output power resolution

Displayed: 0.1 dB

Programmable/settable: 0.01 dB

### Minimum settable power

-12 dBm

-72 dBm with Option 002

### Power variation

Externally leveled (excluding coupler/detector variations), negative crystal detector,<sup>2</sup> or Agilent 432A/B/C, 436A, or 438A power meter<sup>13</sup> ±0.2 dB typical

### Power sweep

Calibrated range:

>20 dB (<20 GHz)

>12 dB (>20 GHz)

Accuracy (including linearity):

±1.5 dB, typical

Resolution (displayed): 0.1 dB

### Power slope

Calibrated range:

up to 5 dB/GHz

up to 15 dB for full sweep

Linearity: 0.2 dB, typical

Resolution (displayed): 0.01 dB/GHz

### Residual AM in 100 kHz bandwidth

-50 dBc, typical

### Source output VSWR

(50 ohms nominal impedance):

<2.0:1 typical

## Modulation characteristics

### External AM

Frequency response: 100 kHz, typical

Maximum input: 15V

Range of amplitude control: 15 dB, typical

Sensitivity: 1 dB/V typical

Input impedance: approximately 25 kohms

### Internal square wave modulation

1 kHz or 27.778 kHz square wave modulation selectable by an internal jumper in 8350B.

The 27.778 kHz modulation ensures operation with all Agilent scalar network analyzers.

On/off ratio: >30 dB

Symmetry: 40/60

### External pulse modulation

Pulse input: TTL compatible

Rise/fall time (neglecting overshoot): <50 nsec typical

Minimum RF pulse width:

Internally leveled: <1.5 µsec, typical

Unleveled: <1 µsec, typical

On/off ratio: >60 dB, typical

## External FM

Maximum deviations for modulation frequencies:

DC to 100 Hz:

±75 MHz (cross-over coupled)

±12 MHz (direct coupled)

100 Hz to 1 MHz: ±7 MHz

1 MHz to 2 MHz: ±5 MHz

2 MHz to 10 MHz: ±1 MHz

Sensitivity (switch selectable):

FM mode: -20 MHz/V, typical

Phase lock Mode: -6 MHz/V, typical

Input impedance: approximately 2 kohms

## General

### Minimum sweep time

30 ms for a single band

75 ms for <20 GHz sweep width

150 ms for >20 GHz sweep width

### Auxiliary output

Rear panel 2.3 to 7.0 GHz fundamental oscillator output, nominally 0 dBm

### Frequency reference output

Switch selectable 0.5 V/GHz (0.01 to

38 GHz) or 0.25 V/GHz (0.01 to 50 GHz)

±25 mV (<2.4 GHz)

±100 mV (>2.4 GHz)

### RF output connector

2.4 mm male

### Weight

Net: 6.5 kg (14.4 lb)

Shipping: 9.5 kg (21 lb)

### Furnished

Operating and service manual

2.4 mm (f) to 2.4 mm (f) adapter,

part number 1250-2188

2.4 mm (f) to K (f) adapter,

part number 1250-2187

## Ordering information

Agilent 83599A

10 MHz to 50 GHz RF plug-in

Agilent 83598A

2.4 GHz to 50 GHz RF plug-in

### Available options

Option 002 60 dB step attenuator

Option 004 Rear panel RF output

Option 910 Extra manual

Option W30 Two additional years return-to-Agilent service

Option 1BN MIL-STD 45662A certificate of calibration

Option 1BP MIL-STD 45662A certificate of calibration with data

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13. For sweep times >10 sec and >2.5 sec/GHz