Agilent 8510XF Vector Network Analyzer
Single-Connection, Single-Sweep Systems

Product Overview

Discontinued Product Information
— For Support Reference Only —

Information herein, may refer to products/services no longer supported. We regret any inconvenience caused by obsolete information. For the latest information on Agilent's test and measurement products go to:
www.agilent.com/find/products

In the US, call Agilent Technologies at 1-800-829-4444
(any weekday between 8am–5pm in any U.S. time zone)

World-wide Agilent sales office contact information is available at:
www.agilent.com/find/contactus

E7340A, 2 to 85 GHz
E7350A, 2 to 110 GHz

Key features:

- Broad frequency coverage, from 45 MHz to 110 GHz, in a single sweep
- Band switching performed internally by the 8510XF
- Ability to accurately control power at test ports with power control range of greater than 20 dB at 110 GHz
- New test heads designed for convenient on-wafer and coaxial measurements
- Full-frequency calibrations supported on-wafer and in coax using a new 1.0 mm coaxial calibration kit

The Agilent Technologies 8510XF family of systems provides the best overall performance to meet your new design and test challenges in millimeter-wave applications.

The 8510XF systems have been designed to make fully- calibrated, single-sweep measurements of broadband devices to 110 GHz, in 1.0 mm coax. By building on the 8510 network analyzer's capabilities, the 8510XF provides the highest measurement performance in frequency coverage, dynamic range, and measurement accuracy.

Agilent 8510XF vector network analyzer providing new capabilities for broadband measurements, on-wafer or in 1.0 mm coax, microwave and millimeter-wave applications.

With the low-frequency extension (Option 005), the 8510XF extends its low-end frequency from 2 GHz down to 45 MHz, providing frequency coverage from 45 MHz up to 110 GHz in a single sweep. Other models are available to sweep from 45 MHz to 85 GHz and from 2 GHz to 85 GHz.

By adding a wafer probing station with 1.0 mm probes, you can perform fully-calibrated on-wafer measurements to 110 GHz.

Agilent Technologies

On-wafer or in 1.0 mm coax

Convenient on-wafer calibrations and measurements with 1.0 mm probe

The Agilent 8510XF system is designed for convenient on-wafer measurements. The new test heads are designed especially for mounting on top of the probe positioners in a wafer probe configuration. This configuration allows the test heads to move with the probe tips so that there is no relative movement between the two. This prevents RF cable flexing, which improves measurement performance.

Signal conditioning and power amplification to drive the millimeter components have been moved out of the system rack and integrated into the test heads. This allows cable connection of the system rack to the test head without affecting performance and still provides the required signal levels needed to drive the test heads to achieve maximum performance. With the test heads placed closer to the probe tips, RF cable insertion loss is minimized, which results in excellent performance at the probe tips up to 110 GHz.

To complement the 8510XF, wafer probing stations and accessories are available from Cascade Microtech Inc., Beaverton, Oregon, U.S.A.

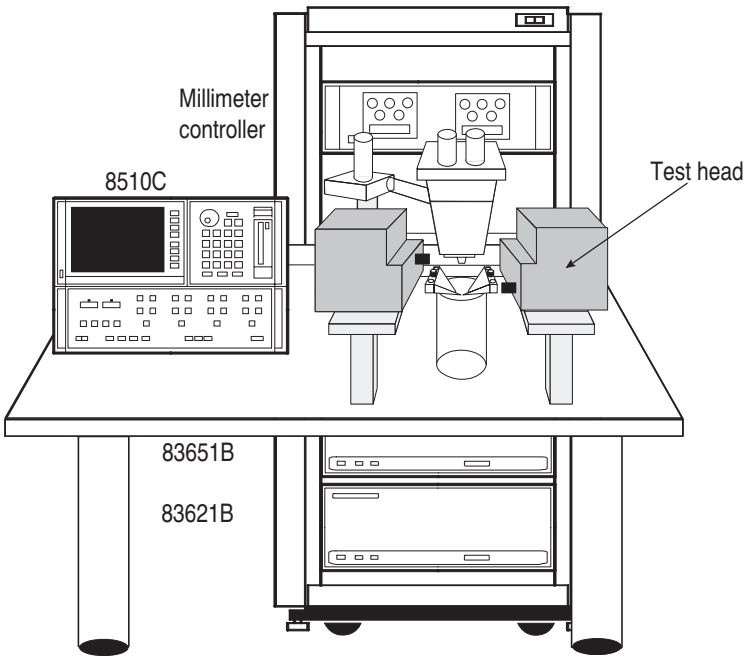


Figure 1. System configuration for wafer probing to 110 GHz using a Cascade Microtech wafer probing station and ACP110 probes

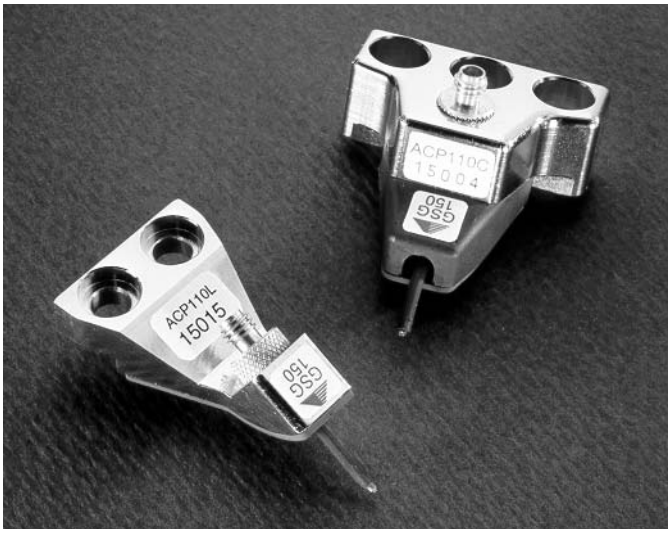


Figure 2. ACP110 probes with a 1.0 mm connector interface from Cascade Microtech enable single touchdown probing from 45 MHz to 110 GHz

Millimeter-wave measurements made in 1.0 mm coax

You can now perform fully error-corrected measurements to 110 GHz in coax with the new 8510XF system and 1.0 mm calibration kit. Making measurements in 1.0 mm coax delivers uncompromised performance with improved productivity over the full-frequency band, compared to making banded waveguide measurements.

Because of the insertion loss of the cables, keeping RF cable length short is extremely critical for achieving high performance up to 110 GHz. To minimize the RF cable length, the 8510XF measurement setup for 1.0 mm coax is configured with the test heads placed closely to the device-under-test (DUT) or test fixture.

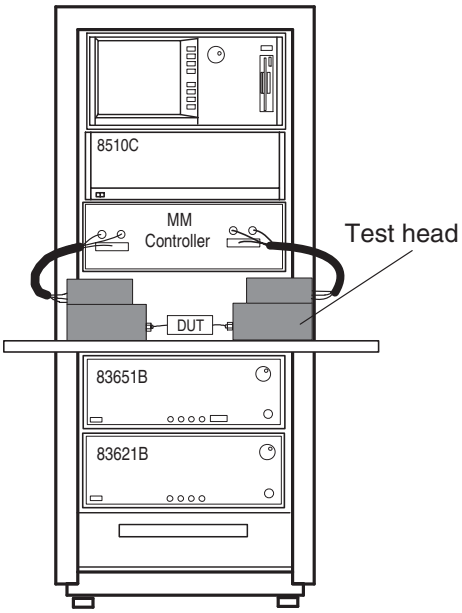


Figure 3. System configuration for measurements to 110 GHz in 1.0 mm coax

Port power control

When performing on-wafer measurements, it is important to control the amount of power delivered to the wafer-under-test to avoid damaging it with excessive input power. Power control in the 8510XF system is achieved through port power leveling. Without leveling, power at the test port can vary up to 15 dB over the full range, subjecting the wafer-under-test to different RF power levels at different frequencies. With leveling in the 8510XF, test port power variation is typically less than 1 dB over the full frequency sweep, with a control range of greater than 20 dB at 110 GHz. This control range can be increased if a smaller portion of the frequency span is used.

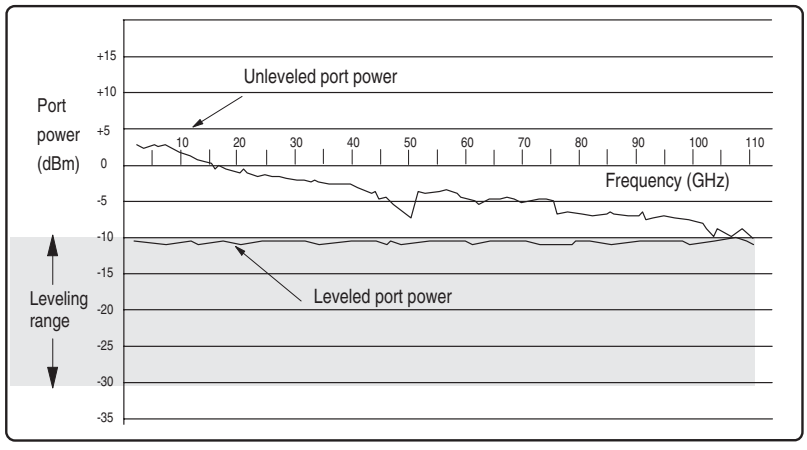


Figure 4. An example of leveled and unleveled port power

Broadband measurements

Broadband coverage in a single sweep

Covering a wide frequency range in millimeter-wave has been limiting due to the frequency bandwith of each waveguide band. Until now, millimeter-wave device measurements were made in narrow bands requiring multiple setups and calibrations.

The recent development by Agilent Technologies of ultra broadband components enables us to offer measurement systems for measuring broadband devices over a wide frequency range, 45 MHz to 110 GHz, with a single connection, in one frequency sweep. These components include the 1.0 mm coaxial coupler and the 1.0 mm coaxial signal combiner. The coaxial couplers are placed directly on the test ports, with the signal combiners positioned before them. This arrangement significantly improved broadband S-parameter measurement accuracy and greatly reduced the effect of insertion loss on the calibrated performance.

All frequency band switching is performed internally by the 8510XF firmware, making it extremely convenient to measure broadband devices.

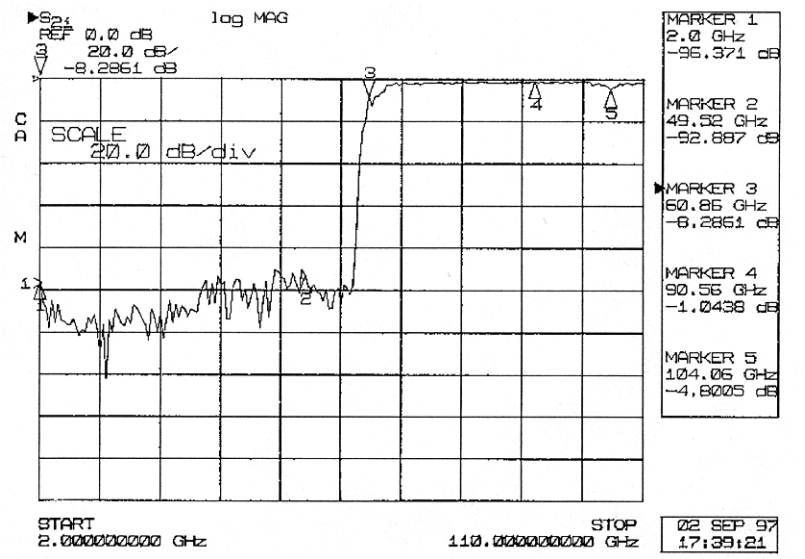


Figure 5. With a single connection, in one frequency sweep, broadband measurement of a high-pass filter was made over the frequency range of 2 to 110 GHz.

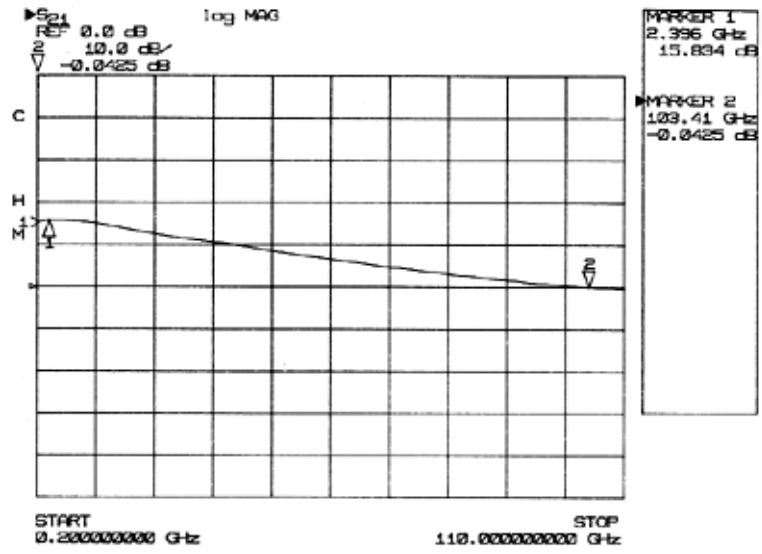


Figure 6. With a single touchdown, an on-wafer discrete InP HEMT (High Electron Mobility Transistor) was measured in a single-sweep, displaying low frequency gain of 15 dB and cutoff frequency above 100 GHz.

Full-frequency calibration reduces setup time

By performing a calibration over the system's full frequency range, 45 MHz to 110 GHz, you are able to perform fully error-corrected measurements on broadband devices with a single setup. Productivity is improved because you no longer need to connect and disconnect banded coaxial test sets or waveguide modules as measurements move from one frequency band to the next. In addition, the system requires minimal training, making it suitable for first-time users as well as experienced users.

Power measurements made simple

Since the 8510XF system already comes with power-leveling calibration, the system is ready for power measurements using port power control. By setting and controlling power level at the test ports, performing power sweeps has never been easier. You no longer need to perform a power flatness calibration each time a power measurement is needed. Simply select power domain (hardkey **DOMAIN**, then softkey ***Power)***; the system is now sweeping in power at a CW frequency.

One of the other key benefits of power leveling of the 8510XF system, is the ability to measure the absolute power and gain compression of amplifiers.

Since the input power level to an amplifier is kept constant, the 1-dB gain compression point is easily identified by simply displaying S21 in power domain, as shown in Figure 7.

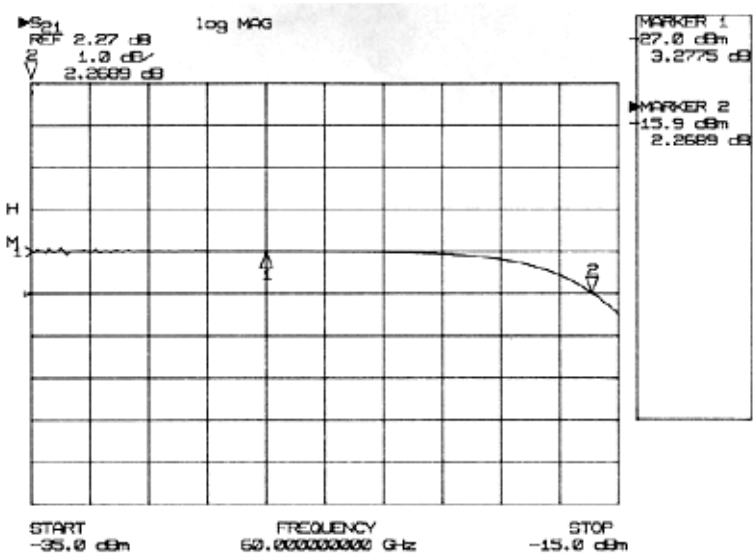


Figure 7

Time domain (Option 010)

With the time domain option, data from transmission or reflection measurements is converted from the frequency domain to the time domain using the inverse Fourier transform and is presented on the CRT display. The time domain response shows the measured parameter value versus time.

Upgrades available to increase your measurement capabilities

Any existing 8510-based system can be upgraded to an 8510XF to meet your new design and test challenges. Preconfigured upgrades are available for standard 8510 systems. These systems include 85107B, 85106C/D and 85109C. Each has upgrade model numbers to convert the system to an 85 GHz or 110 GHz system. All upgrade packages include hardware and firmware upgrades and on-site installation. Customized upgrades are available for other system configurations.

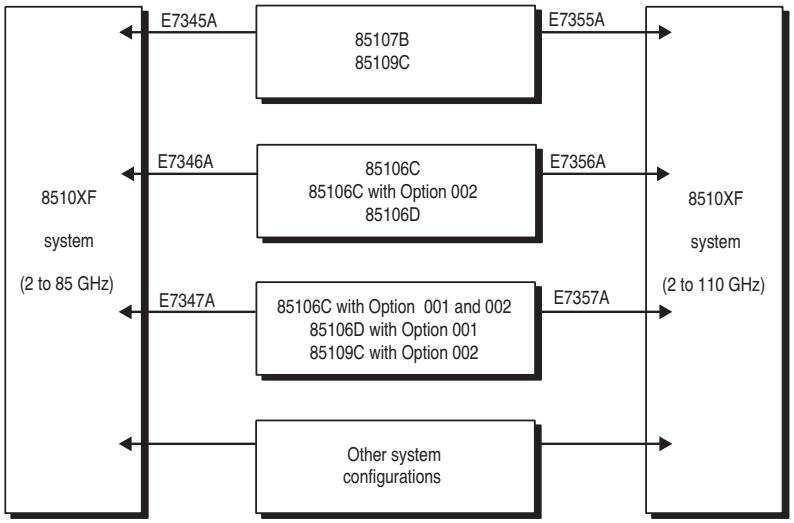


Figure 8. Various upgrades are available to increase measurement capabilities.

1.0 mm accessories

The 1.0 mm connector is an IEEE industry standard connector with a cutoff frequency above 120 GHz. The connector utilizes an air dielectric interface for highest accuracy and repeatability. The coupling diameter and thread size were chosen to maximize strength, increase durability, and provide highly repeatable interconnects.

1.0 mm calibration kits

The Agilent 85059A is a 1.0 mm calibration/ verification kit designed for vector network analyzer systems operating over the frequency range of 45 MHz to 110 GHz. The opens, shorts and loads in this kit were optimized to provide accurate calibrations over the specified frequency range. For best results, the calibration techniques recommended are the open-short-load-thru (OSLT) calibration from 45 MHz to 50 GHz, and the offset-shorts calibration from 50 GHz to 110 GHz, all in one calibration sequence.

1.0 mm cables

The 11500I/J/K/L series of 1.0 mm coaxial cables are available for connecting test ports to devices, fixtures or probe tips with 1.0 mm connectors for frequency coverage from dc to 110 GHz. Performance data of 1.0 mm cables will equal or exceed the following, at frequencies up to 110 GHz:

Figure 9. Agilent 85059A, 1.0 mm calibration/verification kit

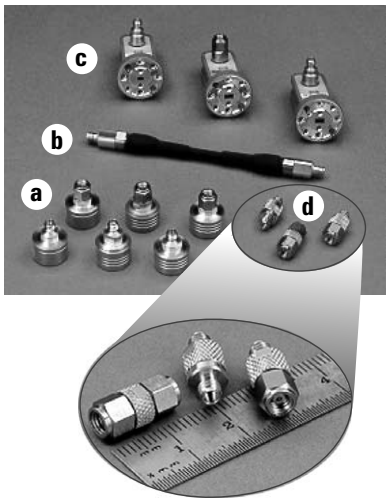


Figure 10. 1.0 mm accessories: (a) opens, shorts; (b) female-to-female test port cable; (c) 1.0 mm coax to V-band or W-band waveguide adapters; (d) 1.0 mm in-series adapters

Cable	Cable length	Return loss	Insertion loss	
11500I (F-F)	8.8 cm/3.45 in	17 dB min.	dc to 50 GHz	1.2 dB max
			50 to 75 GHz	1.4 dB max
			75 to 110 GHz	1.7 dB max
11500J (M-F)	16.0 cm/6.30 in	17 dB min.	dc to 50 GHz	2.25 dB max
			50 to 75 GHz	2.5 dB max
			75 to 110 GHz	3.2 dB max
11500K (M-F)	20.0 cm/7.87 in	16 dB min.	3.5 dB	
11500L (M-F)	24.0 cm/9.45 in	16 dB min.	3.8 dB	

1.0 mm to 1.0 mm or 1.85 mm or 2.4 mm adapters

Three series of 1.0 mm coax adapters are available: 11920A/B/C, 11921A/B/C/D and 11922A/B/C/D. They are the 1.0 mm to 1.0 mm, 1.0 mm to 1.85 mm and 1.0 mm to 2.4 mm series, respectively. Performance data of 1.0 mm coaxial adapters will equal or exceed the following:

Adapters		**Supplemental characteristics**			
	Connector Type	**Frequency (GHz)**	**Return loss better than:**		**Insertion loss better than:**
1.0 mm to 1.0 mm adapters					
11920A	(M) to (M)	dc to 110	dc to 20 GHz,	–24 dB	–0.5 dB
11920B	(F) to (F)		20 to 50 GHz,	–20 dB	
11920C	(M) to (F)		50 to 75 GHz,	–18 dB	
			75 to 110 GHz,	–14 dB	
1.0 mm to 1.85 mm adapters					
11921A	(M) to (M)	dc to 65	–20 dB		–0.5 dB
11921B	(F) to (F)				
11921C	(M) to (F)				
11921D	(F) to (M)				
1.0 mm to 2.4 mm adapters					
11922A	(M) to (M)	dc to 50	–20 dB		–0.7 dB
11922B	(F) to (F)				
11922C	(M) to (F)				
11922D	(F) to (M)				

1.0 mm coax to V-band or W-band adapters

The Agilent V281C/D and W281C/D are 1.0 mm to V-band and 1.0 mm to W-band series waveguide adapters, respectively. These wave guide-to-coaxial adapters are designed for connecting devices, fixtures or probe tips with a waveguide connection to a coaxial measurement system, and vice versa. Performance data of 1.0 mm coax to V-band or W-band waveguide adapters will equal or exceed the following:

Coax-to-waveguide adapters	**Supplemental characteristics:**				
	Waveguide number	**Frequency (GHz)**	**Return loss better than:**	**Insertion loss better than[1]**	**Repeatability [2,3] typically better than:**
V281C, 1.0 mm (F) to V-band	WR-15	50 to 75	–16 dB	–0.8 dB	–45 dB
V281D, 1.0 mm (M) to V-band	WR-15	50 to 75	–16 dB	–0.8 dB	–45 dB
W281C, 1.0 mm (F) to W-band	WR-10	75 to 110	–16 dB	–1 dB	–40 dB
W281D, 1.0 mm (M) to W-band	WR-10	75 to 110	–16 dB	–1 dB	–40 dB

1. Maximum insertion loss for a single adapter.
2. At the coaxial port only.
3. Repeatability = 20 log $|\Delta\Gamma|$ where $|\Delta\Gamma| = |\Gamma m1 - \Gamma m2|$. This is the difference between two measurements Γ m1 and Γ m2 before and after one disconnect/connect cycle at the coax port. Repeatability depends upon proper torque and pin depth.

1.0 mm female connector launch assemblies
The 11923A is a 1.0 mm female connector launch designed to thread into a package or fixture housing to transition a microwave circuit from microstrip to coaxial connector. The 11923A 1.0 mm female connector has an air dielectric interface and center conductor that is supported by a low-loss plastic bead on one end, and a glass-to-metal seal interface on the other end. This interface consists of a 0.162 mm diameter pin that extends inside the package or fixture for connection onto a microwave circuit.

The 11923A is pre-assembled and supplied with a machining detail for mounting the launch and assembly instructions. The user is responsible for making the connection onto the circuit card, machining the package, and installing the connector. If a quasi-hermetic seal is desired, epoxy may be applied to threads of the launch prior to installation. The procedure describing the necessary dimensions for the package and installation is provided with the launch assembly.

Figure 11. A pair of 1.0 mm female connector launch assemblies. Left: 1.0 mm female connector end. Right: package end with 0.162 mm diameter pin.

Connector launch		Supplemental characteristics		
	Coax connector type	Frequency (GHz)	Return loss better than:	Insertion loss better than:
11923A	1.0 mm (F) to circuit launch	dc to 110	–16 dB	–1.0 dB (typical)

Agilent 8510XF system performance

Agilent E7340A Option 005 (45 MHz to 85 GHz)

The following specifications describe the system performance of the 8510XF system in the E7340A Option 005 configuration, from 0.045 GHz to 85 GHz. The following system configuration was used to generate the specifications:

Test set: Millimeter controller and two test heads, 45 MHz to 85 GHz
RF sources: Agilent 83621B and 83651B synthesized sweepers (one each)
Calibration kit: Agilent 85059A 1.0 mm precision calibration/verification kit
Calibration techniques: SOLT to 50 GHz, and offset-shorts from 50 to 85 GHz

Dynamic range (for transmission measurements)

	Frequency range (GHz)						
	0.045 to 2	2 to 18	18 to 40	40 to 50	50 to 65	65 to 75	75 to 85
Maximum power (in) measured at port 2	0 dBm	0 dBm	+10 dBm	+10 dBm	–3 dBm	–3 dBm	–3 dBm
Reference power (out) at port 1 (nominal)	0 dBm	0 dBm	–12 dBm	–12 dBm	–3 dBm	–3 dBm	–10 dBm
Minimum power (in) measured at port 2	–74 dBm	–104 dBm	–84 dBm	–84 dBm	–80 dBm	–80 dBm	–70 dBm
Receiver dynamic range	74 dB	104 dB	94 dB	94 dB	77 dB	77 dB	67 dB
System dynamic range[1]	74 dB	104 dB	72 dB	72 dB	77 dB	77 dB	60 dB

Measurement port characteristics

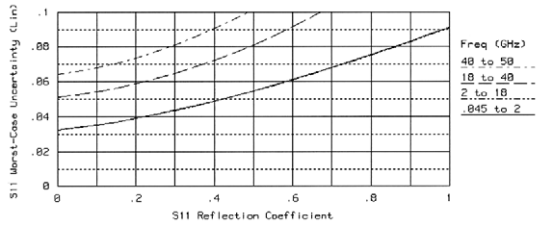
	Frequency range (GHz)						
RESIDUAL	0.045 to 2	2 to 18	18 to 40	40 to 50	50 to 65	65 to 75	75 to 85
Directivity	30 dB	30 dB	26 dB	24 dB	28 dB	28 dB	28 dB
Source match	27 dB	27 dB	23 dB	21 dB	28 dB	28 dB	28 dB
Load match	27 dB	27 dB	23 dB	21 dB	28 dB	28 dB	28 dB
Reflection tracking	±0.10 dB	±0.10 dB	±0.20 dB	±0.25 dB	±0.30 dB	±0.30 dB	±0.30 dB
Transmission tracking	±0.273 dB	±0.273 dB	±0.429 dB	±0.669 dB	±0.322 dB	±0.340 dB	±0.360 dB

	Frequency range (GHz)						
RAW (Typical)	0.045 to 2	2 to 18	18 to 40	40 to 50	50 to 65	65 to 75	75 to 85
Directivity	20 dB	20 dB	15 dB	15 dB	13 dB	10 dB	10 dB
Source match	20 dB	20 dB	15 dB	15 dB	13 dB	12 dB	12 dB
Load match	11 dB	11 dB	10 dB	10 dB	10 dB	10 dB	10 dB

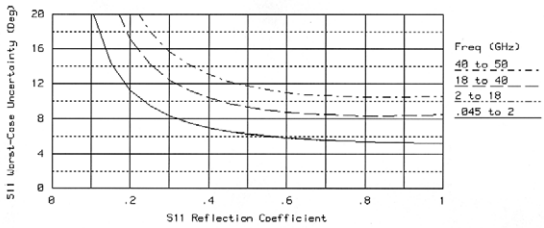
1. System dynamic range = Pref –Pmin, where Pref is the nominal or reference power out of port 1 with maximum power delivered from the source and Pmin is the minimum power into port 2 that can be measured above the peaks of the system's noise floor (10 dB above the average noise floor). Noise floor is measured with full two-port error correction and 1024 averages. System dynamic range is the amount of attenuation that can be measured from a 0 dB reference.

Measurement uncertainty

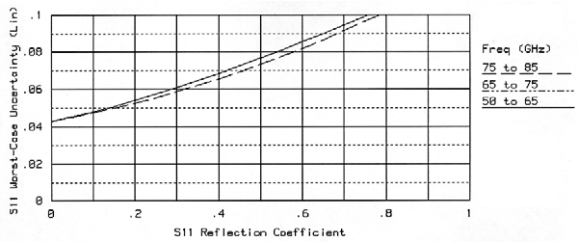
Reflection measurements



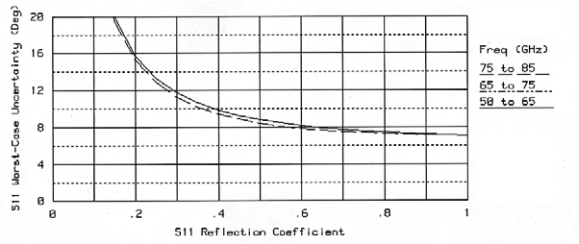
Magnitude



Phase

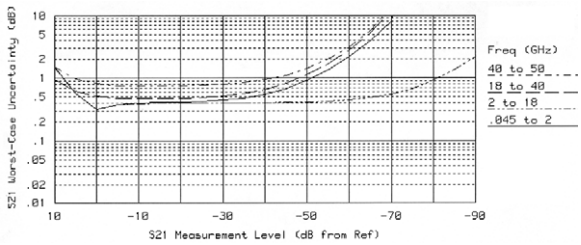


Magnitude

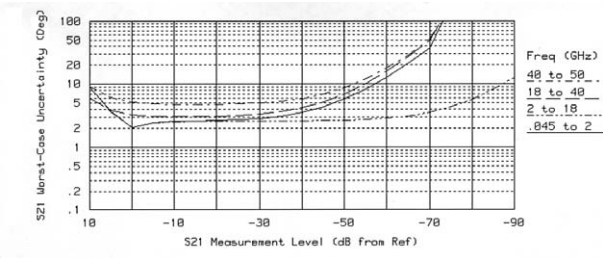


Phase

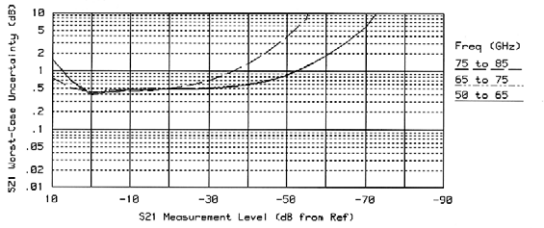
Transmission measurements



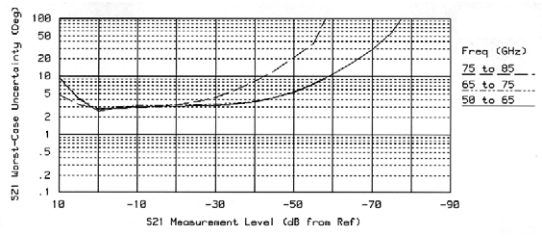
Magnitude



Phase



Magnitude



Phase

Figure 12

Agilent 8510XF system performance

Agilent E7350A Option 005 (45 MHz to 110 GHz)

The following specifications describe the system performance of the 8510XF system in the E7350A Option 005 configuration, from 0.045 GHz to 110 GHz. The following system configuration was used to generate the specifications:

Test set: Millimeter controller and two test heads, 45 MHz to 110 GHz
RF sources: Agilent 83621B and 83651B synthesized sweepers (one each)
Calibration kit: Agilent 85059A 1.0 mm precision calibration/verification kit
Calibration techniques: SOLT to 50 GHz, and offset-shorts from 50 to 110 GHz

Dynamic range (for transmission measurements)

	Frequency range (GHz) 0.045 to 2	2 to 18	18 to 40	40 to 50	50 to 75	75 to 85	85 to 100	100 to 110
Maximum power (in) measured at port 2	0 dBm	0 dBm	+10 dBm	+10 dBm	0 dBm	0 dBm	0 dBm	0 dBm
Reference power (out) at port 1 (nominal)	0 dBm	0 dBm	–12 dBm	–12 dBm	–7 dBm	–12 dBm	–12 dBm	–12 dBm
Minimum power (in) measured at port 2	–74 dBm	–104 dBm	–84 dBm	–84 dBm	–75 dBm	–70 dBm	–70 dBm	–70 dBm
Receiver dynamic range	74 dB	104 dB	94 dB	94 dB	75 dB	70 dB	70 dB	70 dB
System dynamic range[1]	74 dB	104 dB	72 dB	72 dB	68 dB	58 dB	58 dB	58 dB

Measurement port characteristics

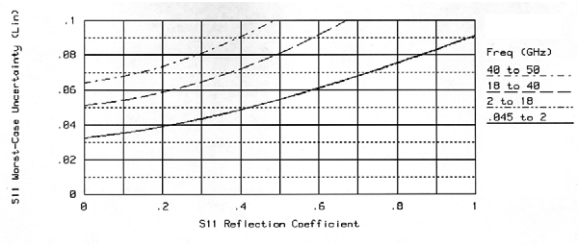
RESIDUAL	Frequency range (GHz) 0.045 to 2	2 to 18	18 to 40	40 to 50	50 to 75	75 to 85	85 to 100	100 to 110
Directivity	30 dB	30 dB	26 dB	24 dB	28 dB	28 dB	26 dB	26 dB
Source match	27 dB	27 dB	23 dB	21 dB	28 dB	28 dB	26 dB	26 dB
Load match	27 dB	27 dB	23 dB	21 dB	28 dB	28 dB	26 dB	26 dB
Reflection tracking	±0.10 dB	±0.10 dB	±0.20 dB	±0.25 dB	±0.30 dB	±0.30 dB	±0.30 dB	±0.30 dB
Transmission tracking	±0.273 dB	±0.273 dB	±0.429 dB	±0.669 dB	±0.322 dB	±0.360 dB	±0.451 dB	±0.451 dB

RAW (Typical)	Frequency range (GHz) 0.045 to 2	2 to 18	18 to 40	40 to 50	50 to 75	75 to 85	85 to 100	100 to 110
Directivity	20 dB	20 dB	15 dB	15 dB	11 dB	11 dB	11 dB	8 dB
Source match	20 dB	20 dB	15 dB	15 dB	11 dB	11 dB	11 dB	10 dB
Load match	11 dB	11 dB	10 dB	10 dB	10 dB	10 dB	9 dB	9 dB

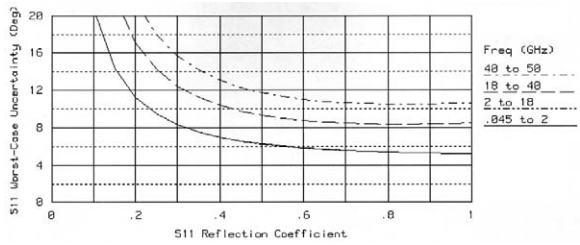
1. System dynamic range = Pref –Pmin, where Pref is the nominal or reference power out of port 1 with maximum power delivered from the source and Pmin is the minimum power into port 2 that can be measured above the peaks of the system's noise floor
(10 dB above the average noise floor). Noise floor is measured with full two-port error correction and 1024 averages.
System dynamic range is the amount of attenuation that can be measured from a 0 dB reference.

Measurement uncertainty

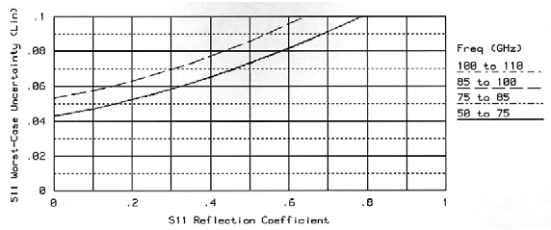
Reflection measurements



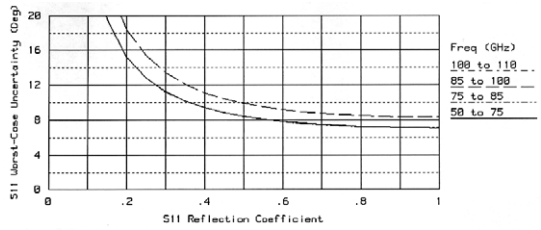
Magnitude



Phase

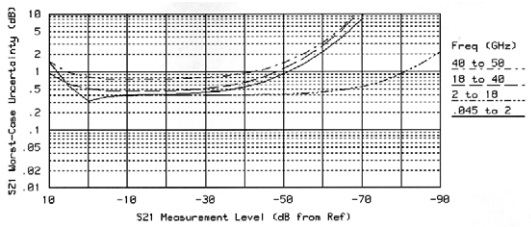


Magnitude

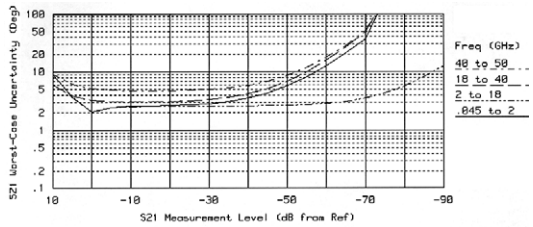


Phase

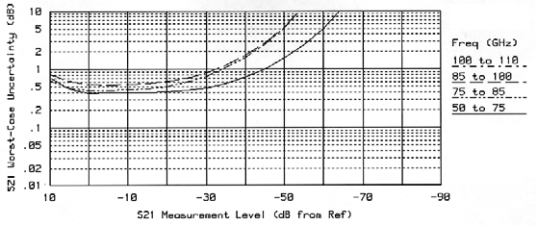
Transmission measurements



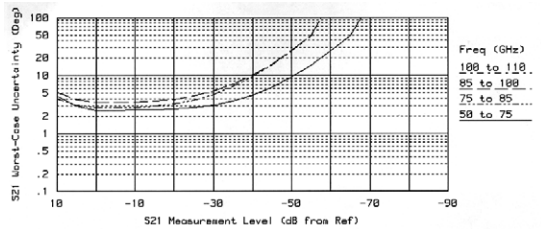
Magnitude



Phase



Magnitude



Phase

Figure 12

Cascade Microtech, Inc.

Probing equipment from Cascade Microtech, Inc.

The Cascade Microtech product line includes millimeter-wave probes, probe stations, autoprobers, calibration standards, measurement software and application support for all Agilent Technologies vector network analyzers. Combining Cascade Microtech probe products with Agilent analyzers provides all the tools needed for complete RF probing solutions through 110 GHz.

A complete on-wafer, S-parameter test system configured for 45 MHz to 110 GHz consists of the new 8510XF coupled directly with wafer probe positioners on a Cascade Microtech prober. Wafer probes and calibration standards to match the test devices specified by the customer round out the equipment accessories. Customer-selected calibration kits or software complete the requirements for accurately corrected S-parameter measurements.

Positioners

For on-wafer measurements, specially-designed X-Y-Z positioners conveniently hold the 8510XF test heads, the 11500J minimum-length cables, and the ACP110 wafer probes, providing micron motion control without measurement-degrading cable strain and losses. Mounting the test heads onto the X-Y-Z positioners allows for 1-micron placement accuracy, and completely eliminates errors caused by cable flexure. This solution provides better than –60 dB connection repeatability up to 110 GHz.

For coaxial measurements, module test stations (MTS) are available to use with the 8510XF system. Depending on your measurement needs, the MTS-1000 series can be configured with either one or both X-Y-Z positioners (a positioner is shown above). Each positioner has a X or Y movement of ±6 inches.

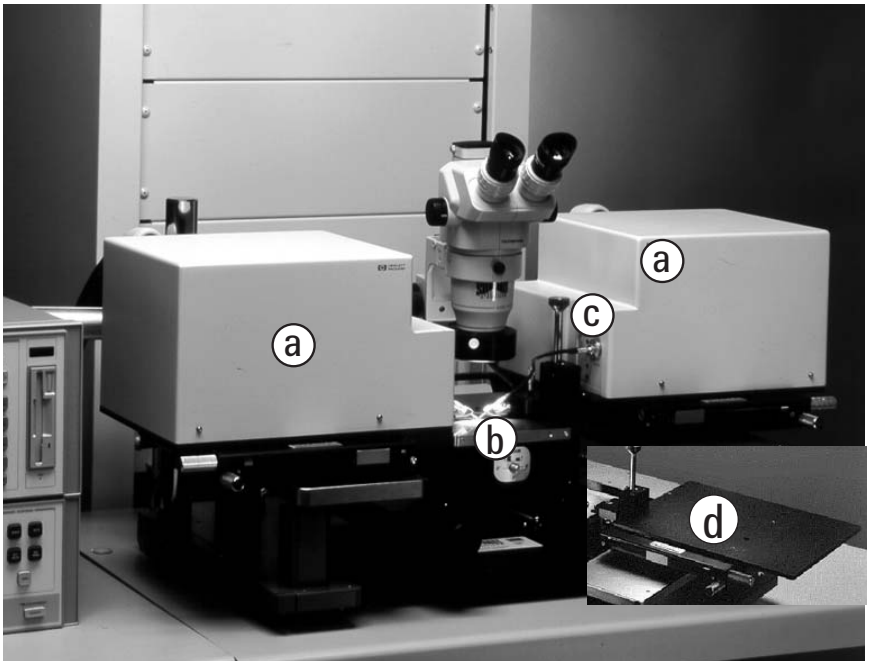


Figure 14. (a) 8510XF test heads; (b) ACP110 wafer probes; (c) 11500J cables; (d) specially designed X-Y-Z positioners to conveniently hold the 8510XF test heads

Cascade Microtech probing systems

A full range of Cascade RF probers is offered to fit all customer needs. All RF probers are designed specifically for thin wafer usage with easy loading stages, and offer patented auxiliary chucks that handle the calibration standards. Probers are classified as manual, semi-automatic, and fully automatic.

- A manual probe station requires the operator to make all position adjustments manually, using a microscope to watch the position of the probe tips.
- Semi-automatic probe stations can be programmed with a wafer map, so that the system automatically locates and measures every device on the wafer. (Or, in "indexing" mode, the system measures the first device, and waits for the operator to push a button before it proceeds to the next device.)
- Fully automatic probe stations are able to load a series of wafers from a cassette, automatically measuring each DUT on each wafer (using a wafer map) before replacing the wafer in the cassette.

In automatic and semi-automatic probe stations, the adjustments in the X, Y, and Z axes are used to put the test probes into the proper positions relative to one another; the chuck then moves the wafer so that the probe tips are brought into contact with each device to be tested.

Cascade RF probers

Model	Style	8510XF application	ACP110-L	ACP110-C	East positioner	West positioner	WinCal software
Summit 9101	Manual	General purpose	•	•	112-960	112-970	VNACAL-WIN-M
Summit 10101	Semi-auto	Modeling	•	•	112-960	112-970	VNACAL-WIN
Summit 11101	Manual	General purpose	•	•	113-120	113-130	VNACAL-WIN-M
Summit 11651	Manual	GP thermal	•	•	113-120	113-130	VNACAL-WIN
Summit 12101	Semi-auto	Characterization	•	•	113-120	113-130	VNACAL-WIN
Summit 12651	Semi-auto	Thermal modeling	•	•	113-120	113-130	VNACAL-WIN
PS21 RF	Automatic	Production	•	•	SQ-113-120-01	SQ-113-130-01	SP-VNACAL-WIN-01

For general characterization work, choose the Summit 9101. The Summit 9101 chuck is designed to hold a wide range of wafer sizes, from single dies as small as 500 microns to 150-mm wafers. Fine-pitch lead screws allow for a manual placement repeatability under 5 microns on a test device.

For metrology-grade semi-automated RF measurements, choose the Summit 12101. Full wafers can be autoprobed with 1-micron repeatability. Fully automatic VNA calibrations repeat to under 0.03 vector magnitude, assuring data integrity.

For extensive temperature-dependent characterization, choose the Summit 12651. The Summit 12651, with patented MicroChamber, yields fast, frost-free measurements from –65° C to +200° C in a light- and EMI/RFI-tight enclosure.

For exhaustive characterization, process monitoring or production device testing, choose the PS21 RF Autoprober. The PS21 offers 75 mm to 200 mm wafer cassette handling, Micro- Chambers with double-wall EMI/RFI shielding, and a full range of built-in temperature options from –55° C to +200° C.

Wafer probes and calibration standards

The ACP110 series wafer probes offers Ground-Signal-Ground (GSG) standard tips with pitches ranging from 50 microns to 150 microns to cover all specific test needs. The ACP110-L, with insertion loss <1.0 dB, is designed specifically for S-parameter, noise parameter and load pull disciplines while the ACP110-C is used for thermal characterization from –65° C to +200° C.

Cascade offers two mode-free impedance standard substrates (ISSs) for full 2-port ACP110 calibration support. Each ISS offers multiple sets of standards, verified to compare favorably with the rigorous NIST multi-line TRL calibration methodology. Calibration reproducibility between ISSs is better than –50 dB due to the uniformity of thin film standards. W-band ISS part number 104-783 covers ACP110 with 75-micron to 150-micron pitches, while the part number 104-909 ISS is used for 50-micron pitch probes. The companion diskette (part number 101-338) provides downloadable 8510 cal kits supporting SOLT, LRM and TRL calibrations.

Computer-aided calibration and system support

Cascade's WinCal PC software utilities enhance your 8510XF on-wafer system performance. WinCal provides tools that can automatically monitor total system drift and check the performance of each probe. Linked to the Summit 12651 or PS21 RF, WinCal provides fully automatic calibrations shown to repeat better than –56 dB using the NIST VERIFY program—extremely useful for over-temperature S-parameters.

Cascade prober upgrade paths

Numerous upgrades are available to enhance your existing Cascade RF prober investments. Depending on your current measurement setup, you may need a standard, preconfigured upgrade or a customized upgrade. Please consult with a Cascade Microtech factory representative for customized system solutions.

For more information contact:
Cascade Microtech, Inc.
2430 NW 206th Ave
Beaverton, OR 97006
(503) 601-1000
www.cmicro.com

Ordering Information

Agilent 8510XF family single-connection, single-sweep systems

Complete measurement systems

- ❑ **E7340A** complete measurement system, 2 to 85 GHz
- ❑ **E7350A** complete measurement system, 2 to 110 GHz

  The following options are available for both systems:
  - ❑ **Option 005** add 45 MHz to 2 GHz low frequency extension
  - ❑ **Option 006** add RF pass thru (provides coupled output of 50 GHz source)1
  - ❑ **Option 010** add time domain
  - ❑ **Option 230** 220/240V line voltage operation
  - ❑ **Option W31** add two years additional on-site service

Each complete rack-mounted system consists of the following:

8510C network analyzer
Millimeter-wave subsystem (85 GHz or 110 GHz)
83621B synthesizer
83651B synthesizer
System rack
(Calibration/verification kit and 1.0 mm test port cables are not included and must be ordered separately.)

Factory integration of the 8510XF system integrates all the main system instruments in the system cabinet and fully tests the system. On-site installation is included, and the entire system carries a full one-year, on-site warranty.

For on-wafer applications, Cascade Microtech provides complete probing systems using the 8510XF. These include both new probing systems and upgrades to existing Cascade Microtech products. Cascade can also provide on-wafer verification and probing system training. Once the 8510XF system is verified in coax, Cascade Microtech will verify the system through its wafer probes.

1.0 mm accessories

The following accessories are available for use with the 8510XF system, but are not included in the system.

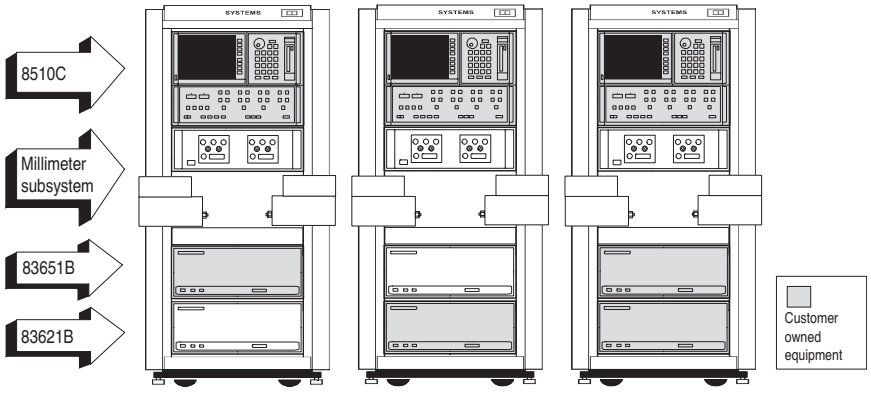
- ❑ **11500I** 1.0 mm (f-f) test port cable (8.8 cm)
- ❑ **11500J** 1.0 mm (m-f) test port cable (16.0 cm)[2]
- ❑ **11500K** 1.0 mm (m-f) test port cable (20.0 cm)[2]
- ❑ **11500L** 1.0 mm (m-f) test port cable (24.0 cm)[2]
- ❑ **85059A** DC to 110 GHz precision calibration/verification kit
- ❑ **V281C** 1.0 mm (f) to V-band waveguide adapter
- ❑ **V281D** 1.0 mm (m) to V-band waveguide adapter
- ❑ **W281C** 1.0 mm (f) to W-band waveguide adapter
- ❑ **W281D** 1.0 mm (m) to W-band waveguide adapter
- ❑ **11920A** 1.0 mm (m) to 1.0 mm (m) adapter
- ❑ **11920B** 1.0 mm (f) to 1.0 mm (f) adapter
- ❑ **11920C** 1.0 mm (m) to 1.0 mm (f) adapter
- ❑ **11921A** 1.0 mm (m) to 1.85 mm (m) adapter
- ❑ **11921B** 1.0 mm (f) to 1.85 mm (f) adapter
- ❑ **11921C** 1.0 mm (m) to 1.85 mm (f) adapter
- ❑ **11921D** 1.0 mm (f) to 1.85 mm (m) adapter
- ❑ **11922A** 1.0 mm (m) to 2.4 mm (m) adapter
- ❑ **11922B** 1.0 mm (f) to 2.4 mm (f) adapter
- ❑ **11922C** 1.0 mm (m) to 2.4 mm (f) adapter
- ❑ **11922D** 1.0 mm (f) to 2.4 mm (m) adapter
- ❑ **11923A** 1.0 mm (f) connector launch assembly

1. Option 006 is needed for multiple test sets configuration. Additional test set(s) must have Option 001 installed. *See Agilent 8510 Multiple Test Sets,* product note, (literature number 5967-5886E) for additional information.
2. For on-wafer applications, two 11500J/K/L cables are required. One cable for each test port.

System upgrades

Upgrades available for existing 8510 systems to 8510XF single-sweep systems

Upgrades from…	85107B 85109C	85106C 85106C w/Option 002 85106D	85106C w/ Option 001 and 002 85106D w/ Option 001 85109C w/ Option 002
… to 85 GHz	E7345A	E7346A	E7347A
…to 110 GHz	E7355A	E7356A	E7357A



Upgrades for

85107B

85109C

Upgrade consists of two test heads, a millimeter test set controller, an 83621B for LO source, and rack. It does not include calibration kits or test port cables.

- ❑ **E7345A** upgrade to an 8510XF 85 GHz system
- ❑ **E7355A** upgrade to an 8510XF 110 GHz system

The following options are available for both upgrades:

- ❑ **Option 005** add 45 MHz to 2 GHz low frequency extension
- ❑ **Option 006** add RF pass thru (provides coupled output of 50 GHz source for additional test sets. Additional test set(s) must have Option 001 installed.)

Upgrades for

85106C

85106C with Option 002 (replaced 8350B/83540A with 83621A/B)

85106D

Upgrade consists of two test heads, a millimeter test set controller and an 83651B for RF source. It does not include calibration kits, test port cables or rack.

- ❑ **E7346A** upgrade to an 8510XF 85 GHz system
- ❑ **E7356A** upgrade to an 8510XF 110 GHz system

The following options are available for both upgrades:

- ❑ **Option 005** add 45 MHz to 2 GHz low frequency extension
- ❑ **Option 006** add RF pass thru (provides coupled output of 50 GHz source for additional test sets. Additional test set(s) must have Option 001 installed.)

Upgrades for

85106C with Options 001 and 002 (added 8517B, replaced 83621A/B with 83651A/B, and replaced 8350B/83540A with 83621A/B)

85106D with Option 001 (added 8517B and replaced 83621B with 83651B)

85109C with Option 002 (replaced 8350B/83540A with 83621A/B)

Upgrade consists of two test heads and a millimeter test set. It does not include calibration kits, test port cables or rack.

- ❑ **E7347A** upgrade to an 8510XF 85 GHz system
- ❑ **E7357A** upgrade to an 8510XF 110 GHz system

The following options are available for both upgrades:

- ❑ **Option 005** add 45 MHz to 2 GHz low frequency extension
- ❑ **Option 006** add RF pass thru (provides coupled output of 50 GHz source for additional test sets. Additional test set(s) must have Option 001 installed.)

Related literature	**Pub. number**
Agilent 8510C Family Network Analyzer, Configuration Guide	5091-8967E
Agilent 8510C Family Network Analyzer, Data Specifications	5091-8484E
Agilent 8510 System Solutions, Color Brochure	5965-8837E
Agilent 8510 Multiple Test Sets, Product Note	5967-5886E
Agilent 11923A 1.0 mm Connector Launch, Product Overview	5968-4315E
Agilent 11920/1/2 A, B, C, D Series 1.0 mm Coaxial Adapters, Product Overview	5968-4318E
Agilent V/W 281C, D Series Waveguide-to-1.0 mm Coaxial Adapters, Product Overview	5966-2007E

Agilent Email Updates

www.agilent.com/find/emailupdates
Get the latest information on the products and applications you select.

Agilent Direct

www.agilent.com/find/agilentdirect
Quickly choose and use your test equipment solutions with confidence.

Agilent Open 

www.agilent.com/find/open
Agilent Open simplifies the process of connecting and programming test systems to help engineers design, validate and manufacture electronic products. Agilent offers open connectivity for a broad range of system-ready instruments, open industry software, PC-standard I/O and global support, which are combined to more easily integrate test system development.

Agilent Technologies' Test and Measurement Support, Services, and Assistance
Agilent Technologies aims to maximize the value you receive, while minimizing your risk and problems. We strive to ensure that you get the test and measurement capabilities you paid for and obtain the support you need. Our extensive support resources and services can help you choose the right Agilent products for your applications and apply them successfully. Every instrument and system we sell has a global warranty. Two concepts underlie Agilent's overall support policy: "Our Promise" and "Your Advantage."

Our Promise
Our Promise means your Agilent test and measurement equipment will meet its advertised performance and functionality. When you are choosing new equipment, we will help you with product information, including realistic performance specifications and practical recommendations from experienced test engineers. When you receive your new Agilent equipment, we can help verify that it works properly and help with initial product operation.

Your Advantage
Your Advantage means that Agilent offers a wide range of additional expert test and measurement services, which you can purchase according to your unique technical and business needs. Solve problems efficiently and gain a competitive edge by contracting with us for calibration, extra-cost upgrades, out-of-warranty repairs, and onsite education and training, as well as design, system integration, project management, and other professional engineering services. Experienced Agilent engineers and technicians worldwide can help you maximize your productivity, optimize the return on investment of your Agilent instruments and systems, and obtain dependable measurement accuracy for the life of those products.

www.agilent.com

For more information on Agilent Technologies' products, applications or services, please contact your local Agilent office. The complete list is available at:

www.agilent.com/find/contactus

Phone or Fax

United States:
(tel) 800 829 4444
(fax) 800 829 4433

Canada:
(tel) 877 894 4414
(fax) 800 746 4866

China:
(tel) 800 810 0189
(fax) 800 820 2816

Europe:
(tel) 31 20 547 2111

Japan:
(tel) (81) 426 56 7832
(fax) (81) 426 56 7840

Korea:
(tel) (080) 769 0800
(fax) (080) 769 0900

Latin America:
(tel) (305) 269 7500

Taiwan:
(tel) 0800 047 866
(fax) 0800 286 331

Other Asia Pacific Countries:
(tel) (65) 6375 8100
(fax) (65) 6755 0042
Email: tm_ap@agilent.com
Contacts revised: 09/26/05

Product specifications and descriptions in this document subject to change without notice.

Printed in USA, July 13, 2006
5965-9888E

Agilent Technologies