N5264A

PNA-X Measurement Receiver

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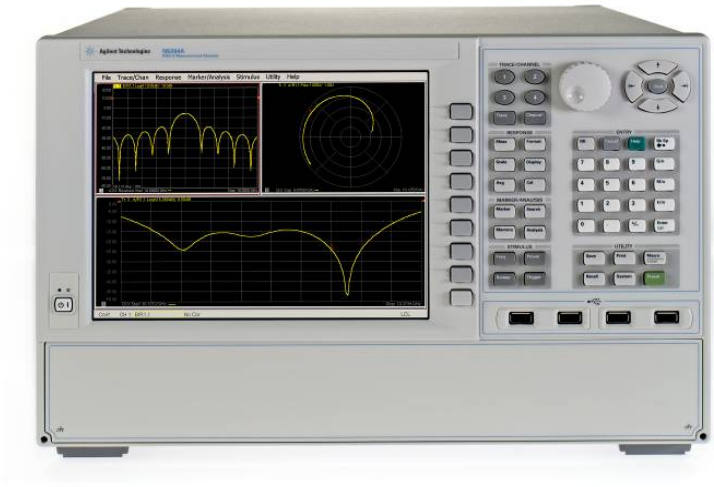
March 2009

N5264A Measurement Receiver

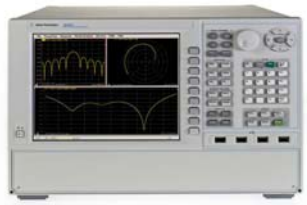


No connectors on front panel

N5264A PNA-X Measurement Receiver

N5264A Description:

- ✓ Measurement Receiver for antenna and system level applications.
- ✓ Five IF inputs are in the rear.
- ✓ Two hardware configurations:
  - ✓ Receiver only (8530 equivalent)
  - ✓ Receiver with LO source
- ✓ Two Software option:
  - ✓ Fast-CW (Circular buffer, FIFO) mode
  - ✓ Time domain (Opt. 010)



Key Aspects:

- ✓ Five IF inputs available (thereby eliminating the PNA-X test set, which is not required for antenna systems)
- ✓ FIFO (enabling infinite measurement durations).
- ✓ Point mode (enabling point averaging).
- ✓ 8530A Drop-in replacement (for equivalent functionality).
- ✓ Hard-drive removal *** for secure environments ***

Key Specifications:

- ✓ Data acquisition time (speed) = 400,000 / Sec (Opt. 118 Fast-CW mode)
- ✓ Input compression point (.1dB)= -10.00 dBm
- ✓ Sensitivity (noise floor) = -145 dBm (worst case @10Hz IFBW, 0 average)
- ✓ Dynamic Range = 135 dB (worst case @10Hz IFBW, 0 averages)
- ✓ Measurement Receiver = 5 with 5 inputs (data taking simultaneously)
- ✓ Data Buffer = 500,000,000 points

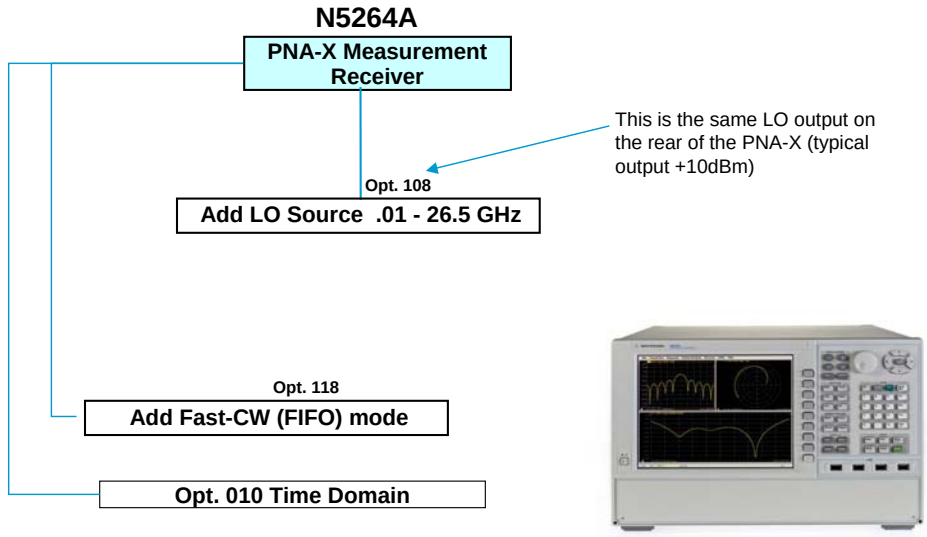
Target Customers:

- ✓ All 8530A antenna end-users
- ✓ All antenna system integrators

Key Applications:

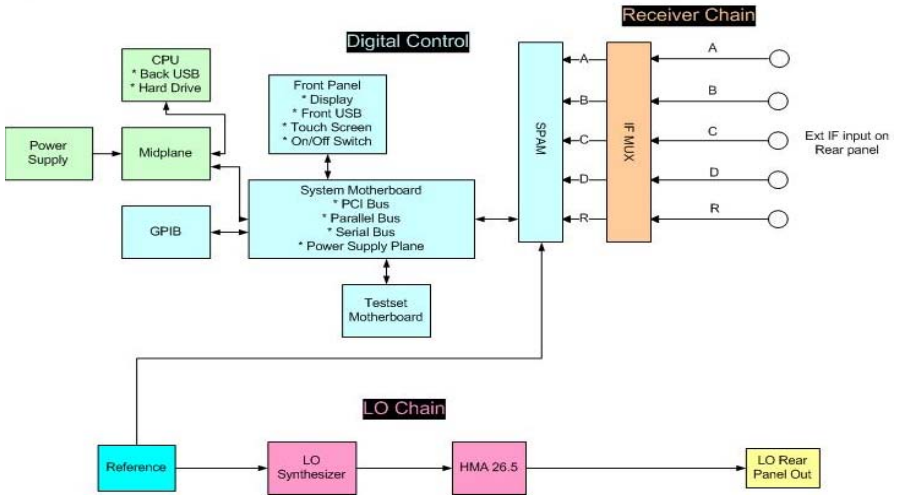
- ✓ Antenna test (A/D and Commercial)
- ✓ Radome tests
- ✓ System Integrator (ATE)

N5264A Model Number Structure



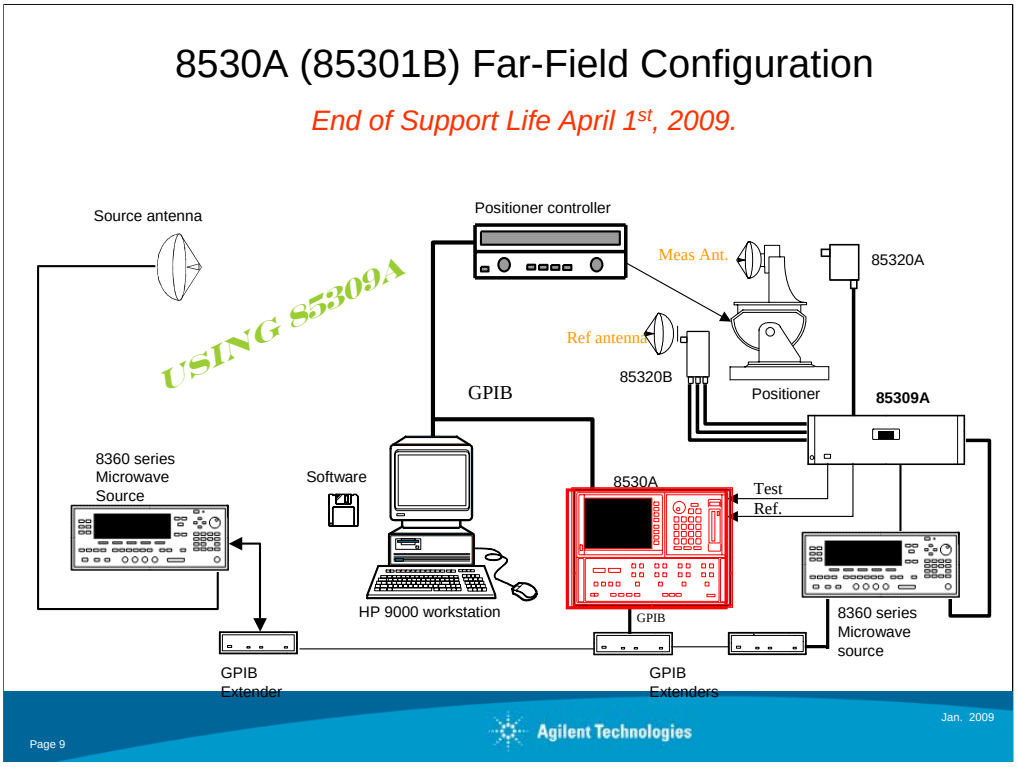
N5264A Block diagram

N5264A opt 108

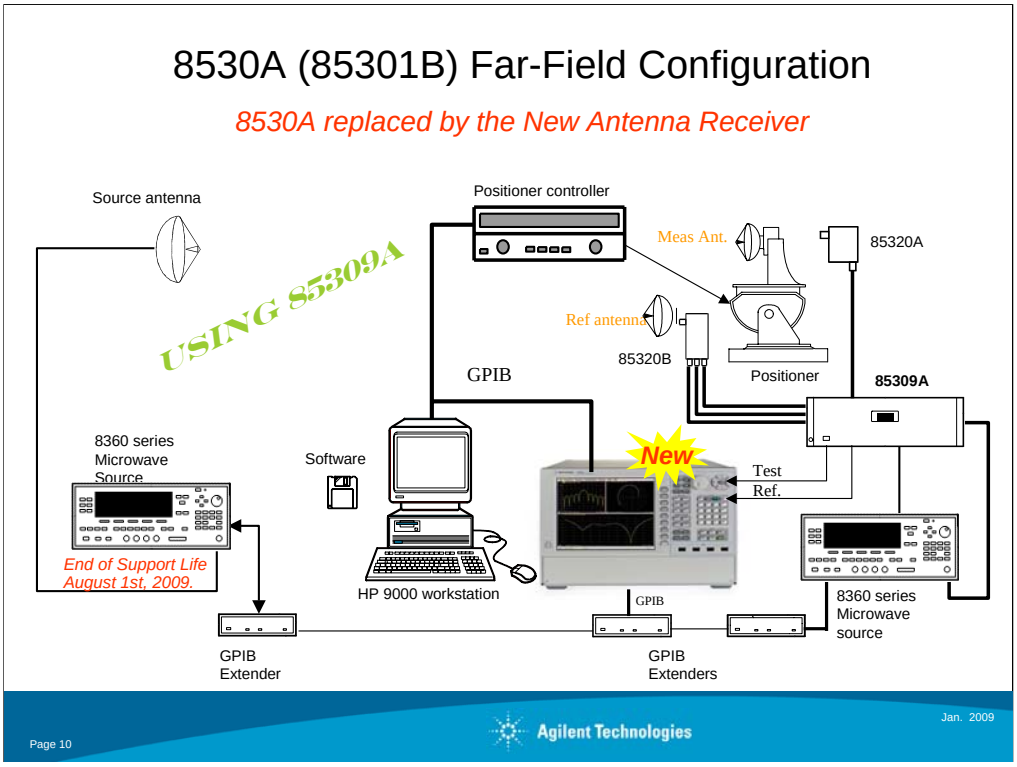


8530A vs New PNA-X Measurement Receiver Performance Summary

Description	Measurement Receiver Only	
	N5264A	**8530A**
Data Acquisition Time (Fast-CW mode)	**400,000 pts/Sec**	5,000 pts/Sec
Noise Floor @ 10KHz	**-115.0 dBm**	-103.0 dBm
Noise Floor @ 10 Hz	**-145.0 dBm**	n/a
Buffer size (FIFO)	**500,000,000 points**	100,000 points
Compression point	**-10.0dBm**	-14.0 dBm
Receiver inputs	**5**	4



First, let's look at previous generation. This is an 85301B system. It based on 8530A as receiver that set industry standard. However, the system support life will end April 1st, 2009.

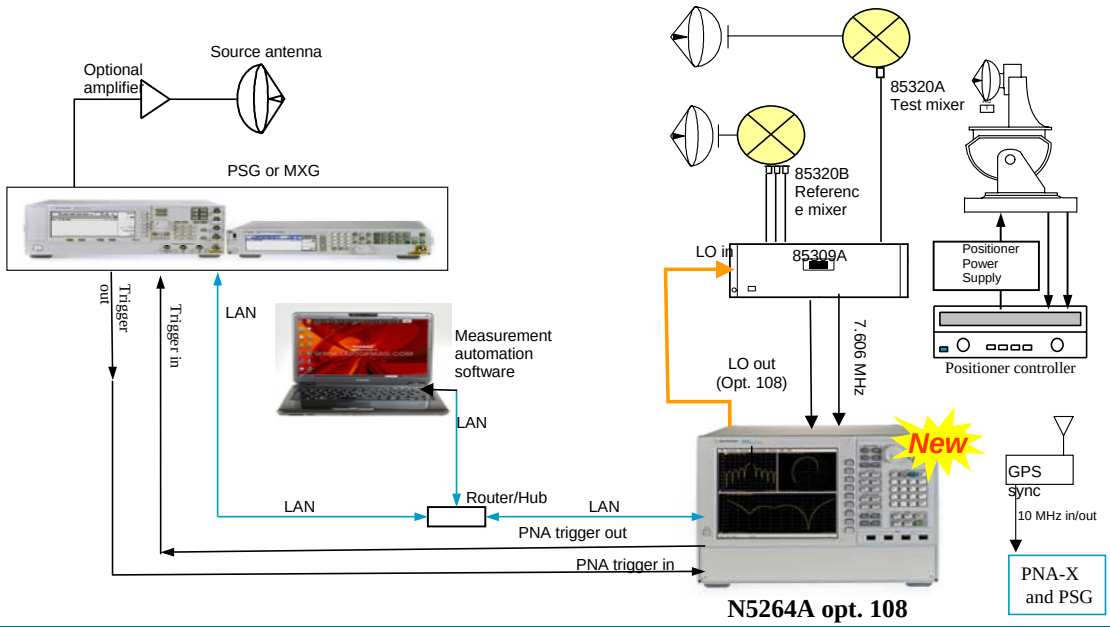


This is the same previous slide but the 8530A replaced by the new antenna receiver. All other system components stayed the same. With the 8530A code emulation, the system should just work.

With this configuration, the support life ends August 1st, 2009 for the 8360 sources.

8530A (85301B) Far-Field Configuration

8530A replaced by the New Antenna Receiver & 8360 source with MXG for faster measurement speed



This configuration replaced 8360 sources with the MXG for transmitting side and Antenna receiver option 108 as LO source to the 85309A. This configuration provides the highest measurement speed for Far-field application, because the MXG source frequency switching time is ten times faster than 8360. Controlling external source via internal antenna receiver firmware. This is same as 8530A operation.

With this configuration, your system is back in the normal support life.

8530A versus New PNA- X Measurement Receiver based System Performance Summary

(with 85309A, 85320A/B mixers)

Frequency	New N5264A with two MXG sources (opt. UNZ) System Sensitivity	8530A based (85301B) with two 8360 sources System Sensitivity	PNA-X N5242A & LO rear output as LO source System Sensitivity
2 - 3GHz	-110.50 dBm	-107.0 dBm	-107.50 dBm
3 - 12.5 GHz	-114.50 dBm	-113.0 dBm	-108.50 dBm
12.5 - 18 GHz	-103.0 dBm	- 96.0 dBm	-101.00 dBm
Sweep Mode	**Speed** (cycle time @10 KHz)	**Speed** (cycle time @10 KHz)	**Speed** (cycle time @10 KHz)
Linear freq., step mode (2-18GHz, 801 pts)	0.730 mSec/pt	12 -15 mSec/pt	.353 mSec/pt
CW or No band crossing (801 pts)	0.185 mSec/pt	12 – 15 mSec/pt	.135 mSec/pt

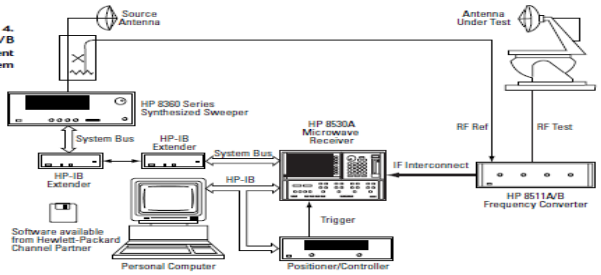
This slide shows the 8530A and new antenna receiver based system performance comparison. The measurement sensitivity improved with MXG as LO source. The measurement speed increase more than ten times.

Note: For compact range, when possible using PNA-X N5242A internal RF for transmitting signal is the fastest measurement speed. PNA-X internal RF sources frequency switching speed even faster than MXG source.

8530A based (85301C) System

End of Support Life April 1st, 2009

Figure 4.
Typical HP 8530A/8511A/B antenna measurement system



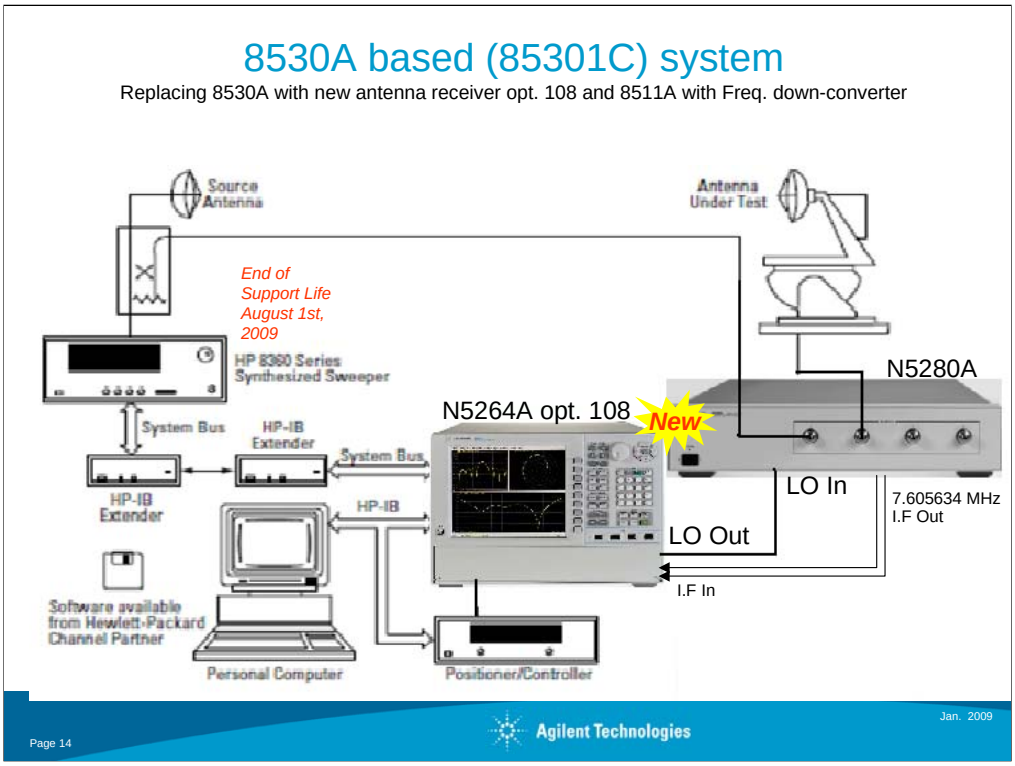
System specifications

Table 2.
HP 8530A/8511A/B system performance specifications

Specification	Frequency (GHz)				
	0.045 to 8	8 to 20	20 to 26.5	26.5 to 40	40 to 50
Max output power (dBm) (HP 83631B)	+10	+10	+3	-	-
Max output power (dBm) (HP 83651B)	+10	+10	+4	+3	0
Frequency converter	HP 8511A/B	HP 8511A/B	HP 8511A/B	HP 8511B	HP 8511B
Sensitivity (dBm) S/N=1;0 averages), HP 8511A (HP 8511B)	–98	–98	–94 [–89]	[–89]	[–87]
Sensitivity (dBm) S/N=1;128 averages), HP 8511A (HP 8511B)	–119	–119	–115 [–110]	[–110]	[–108]
Dynamic range (dB;0 averages), HP 8511A (HP 8511B)	88	88	79 [74]	[74]	[68]
Compression level (dBm at 0.1 dB)	–10	–10	–15	–15	–19
Channel isolation (dB, ref. to test), HP 8511A (HP 8511B)	80 [85]	80 [85]	80 [75]	[75]	[70]
Return loss (dB, RF input)	17	15	9	9	7
Minimum phase-lock power (dBm), HP 8511A (HP 8511B)	–40 [–41]	–38 [–39]	–35 [–32]	[–32]	[–30]

Here is another 8530A based system. This is 85301C system; the last system sold was about ten years ago. The performance was good at that time. Now, there is better performance system available.

•As shown on the table, the measurement sensitivity is only -98 dBm.



Here is new configuration with the antenna receiver option 108. 8530A replaced by new antenna receiver and the frequency down-converter, N5280A replaced 8511A. 8360 source still in placed.

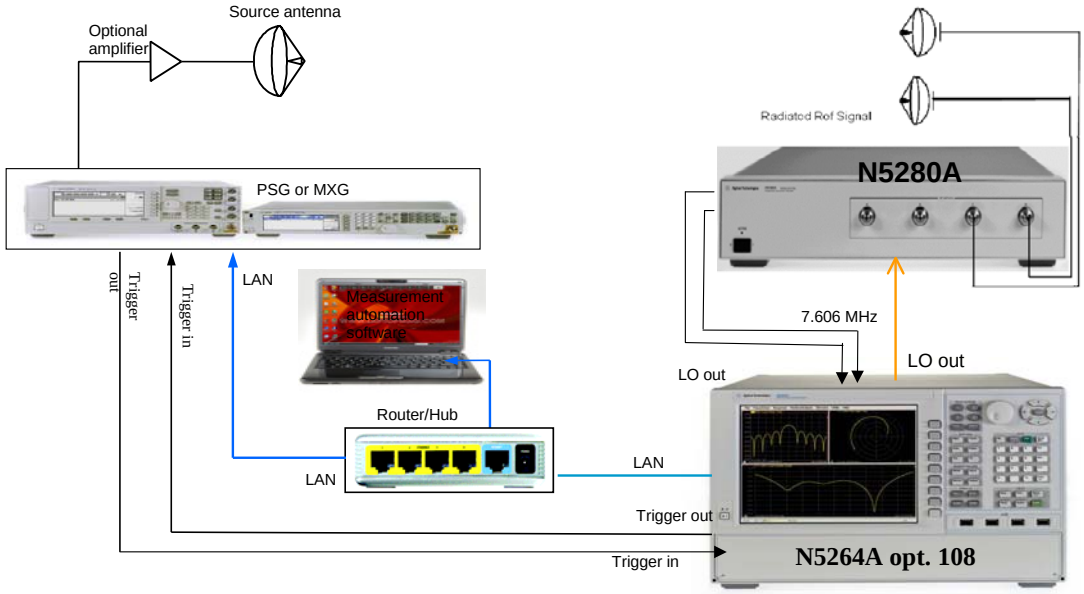
The measurement sensitivity improved by almost 20 dB due to mixer based of the frequency down-converter. More details in the next few slides.

Note: The support life still limited to 8360, which is August 1st, 2009.

8530A based (85301C) system

Replacing:

- 8530A with the new antenna receiver opt. 108
- 8511A with Freq. down-converter
- 8360 source with MXG or PSG

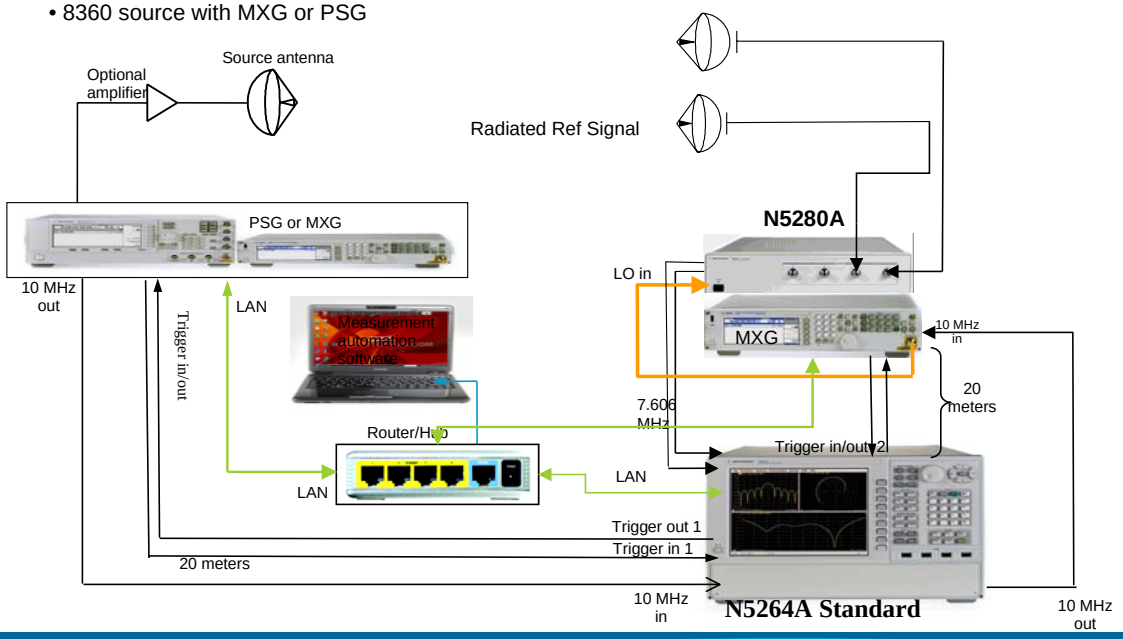


This slide shows the complete replacement. 8360 source replaced by MXG, which provides higher measurement speed. In addition, LAN is used instead of GPIB interface.

8530A based (85301C) system

Replacing:

- 8530A with the new antenna receiver opt. 108
- 8511A with Freq. down-converter
- 8360 source with MXG or PSG



In some antenna ranges, the distance from antenna receiver and antenna itself may be too far. Some of these configurations, the external source must be used for LO input to the frequency down-converter.

Again, the antenna receiver N5264A can control two external sources.

8530A versus New PNA- X Measurement Receiver based System Performance Summary

(with Frequency down-converter, N5280A)

Frequency	N5264A opt. 108 as LO with MXG source	N5264A with MXG two MXG sources (MXG opt. UNZ as LO source)	85301C (8530A+8511A)
0.045 – 8.0GHz	-115.00 dBm	-115.50 dBm	-98.00 dBm
8.0 – 20.0 GHz	-115.00 dBm	-115.40 dBm	-98.00 dBm
20.0 – 26.5 GHz	-115.00	(Opt. 530)	-94.00 dBm
Sweep Mode	**Speed** (cycle time @10 KHz)	**Speed** (cycle time @10 KHz)	**Speed** (cycle time @10 KHz)
Linear freq., step mode (2-18GHz, 801 pts)	0.730 mSec/pt	0.730 mSec/pt	12 -15 mSec/pt
CW or No band crossing (801 pts)	0.185 mSec/pt	0.185 mSec/pt	12 – 15 mSec/pt

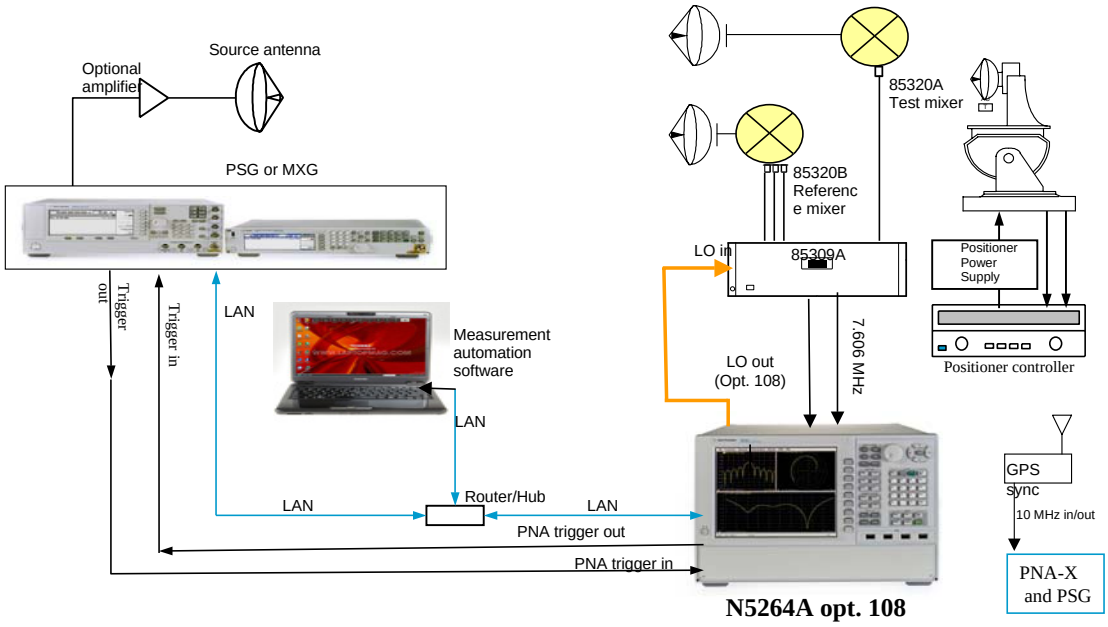
This slide shows the performance comparison between the 8530A with 5811A that is sampler based to the new antenna receiver option 108 as LO source with frequency down-converter.

The measurement sensitivity improved by 17 dB at the same IFBW. The measurement speed improves by over 15 times over 8530A based configurations.

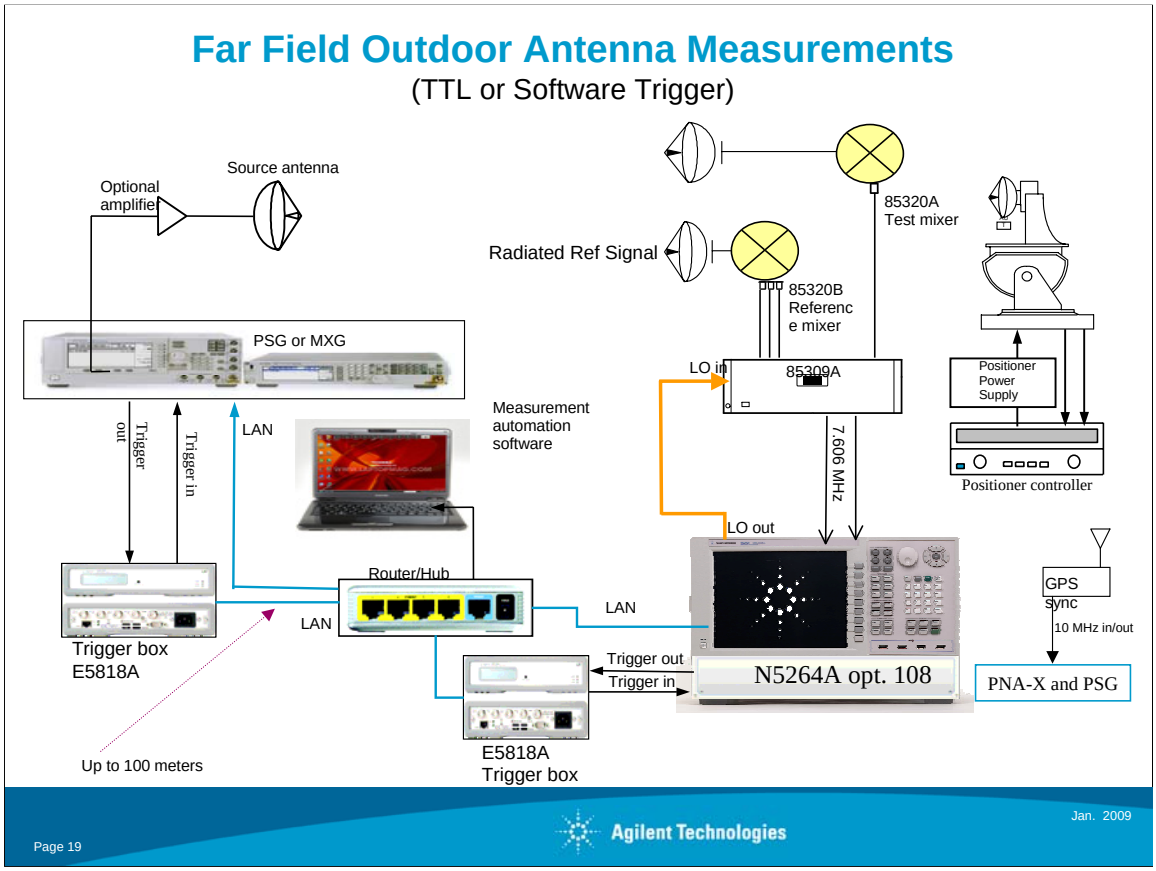
Do you have any questions?

Far Field Outdoor Antenna Measurements

(TTL or Software Trigger)



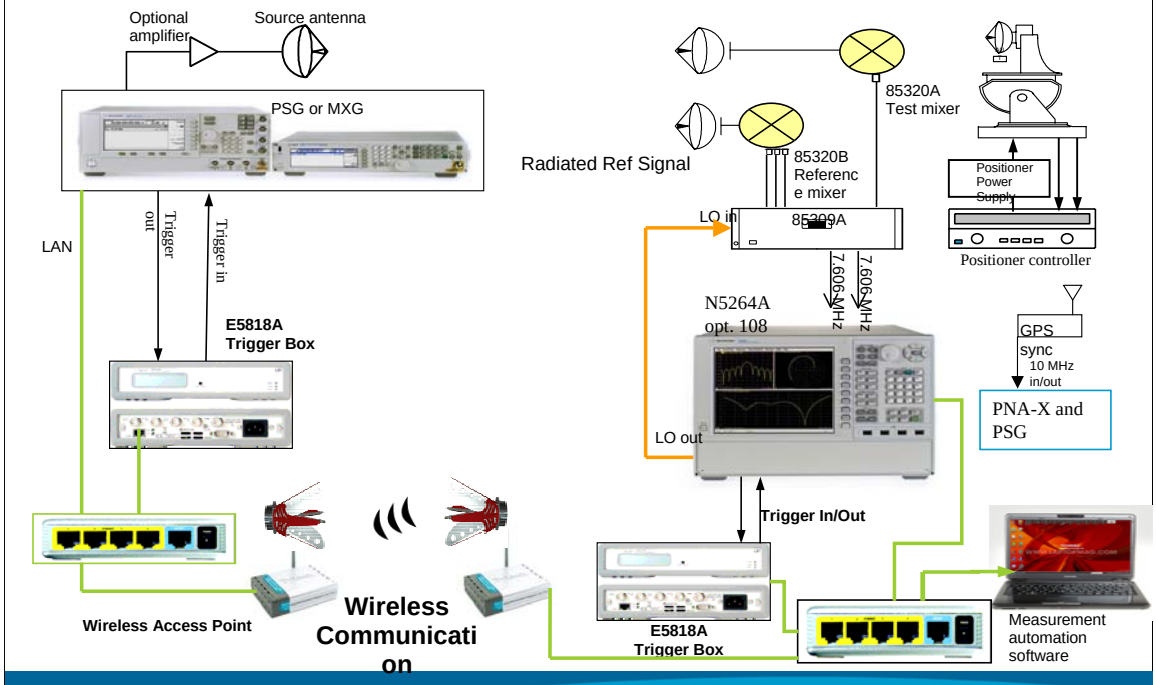
This slide is the same as few slides ago. However, I have not mention using LAN as interface instead of traditional GPIB. LAN is fast and goes longer distance when compared to GPIB.



This slide shows the LAN Hub and Trigger box that extends the distance between receiving and transmitting even farther. For example, this configuration extends 100 meters on side of the LAN Hub.

2-Port PNA-X Far Field Outdoor Antenna Measurements

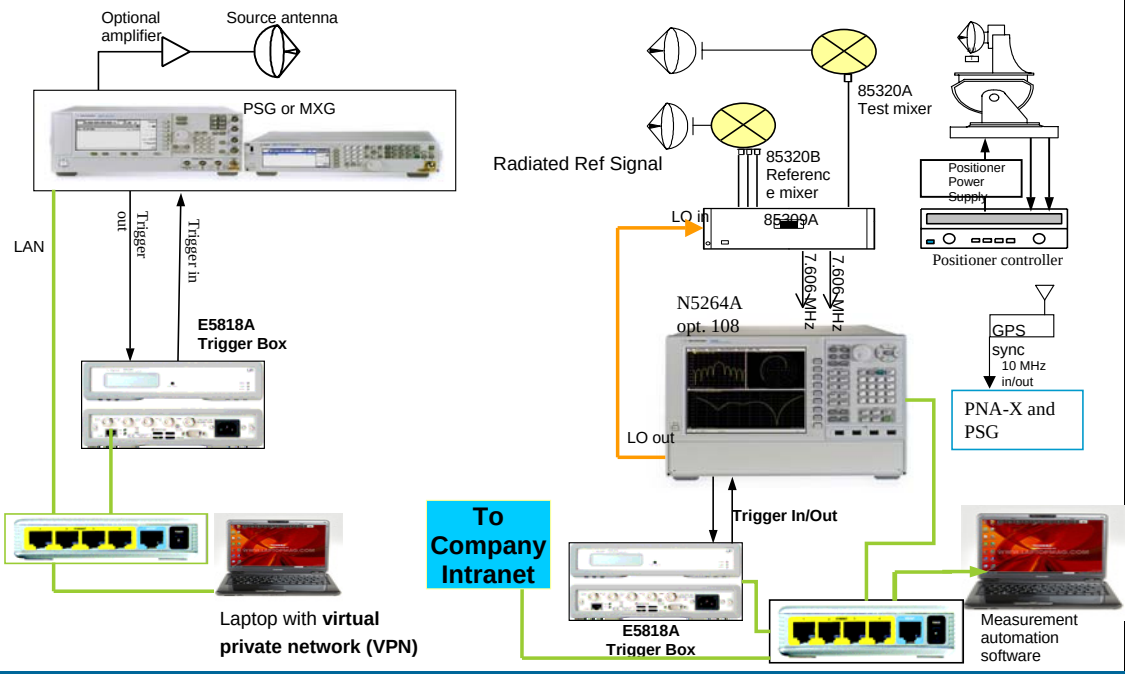
(Hardware, TTL or Software Trigger Wireless trigger)



This slide shows the wireless trigger. Some ranges may require wireless interface. For example, you may not have access to the real state between to two sites.

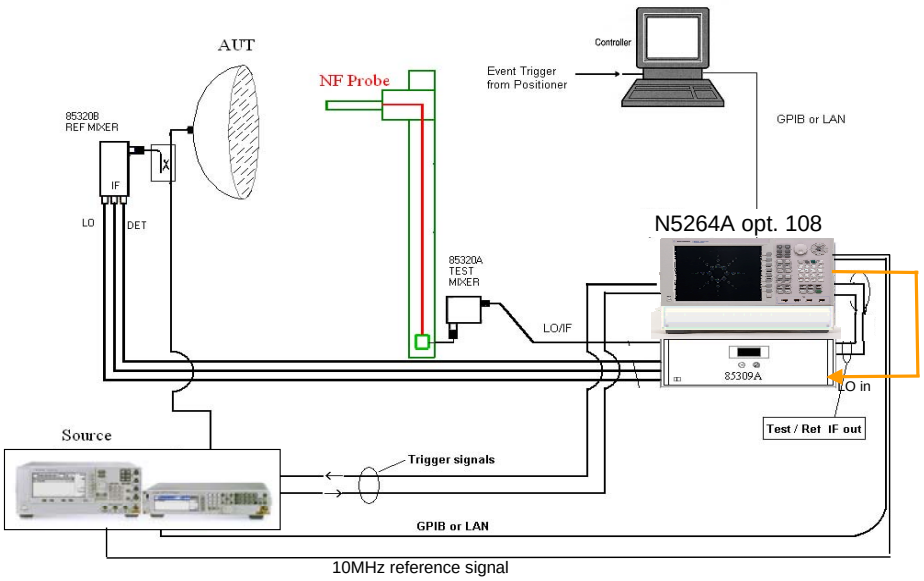
2-Port PNA-X Far Field Outdoor Antenna Measurements

(Hardware, TTL or Software Trigger Wireless trigger)



This slide shows the wireless trigger via virtual private network (VPN).

Large Near Field with Remote Mixing



This slides show the near-field application.

Antenna Receiver Selection

Application	N5264A Mea. Rec.	N5242A PNA-X VNA	***Benefits***
Near-field	Yes (Large near-field system)	Yes	• Fastest measurement throughput (internal sources are faster) • Compact foot print • Use VNA for general components test
Compact Range	Yes	Yes	This will depend on the range dimensions
Far-field	Yes	No	• Lower cost (dedicated receiver only) • Distributed system increases measurement sensitivity by strategically placed system components

Both Antenna Receiver and VNA can be used for antenna receiver. First, you have to decide on the application. As this table shown here.

Complete Antenna Test Solutions

- Agilent is RF components supplier (RF-Subsystem)
- Agilent with Partners provide a complete solution (Turn-Key solution)

Agilent Technologies

http://www.agilent.com/find/antenna

ORBIT/FR

http://www.orbitfr.com/

ETS-LINDGREN
An ESCO Technologies Company

http://www.ets-lindgren.com/

SATIMO
The microwave vision company

http://www.satimo.fr/eng/

NSI
ANTENNA MEASUREMENT SOLUTIONS

http://www.nearfield.com/

SPC

http://www.sysplan.com/

Agilent works with its channel partners to provide a complete antenna test solution. This includes positioner, software, chamber and installation.

Agilent instruments, such as PNA's, ENA's, PSG's and accessories, are sold either directly to the end user or through the channel partners.

Reference Literature

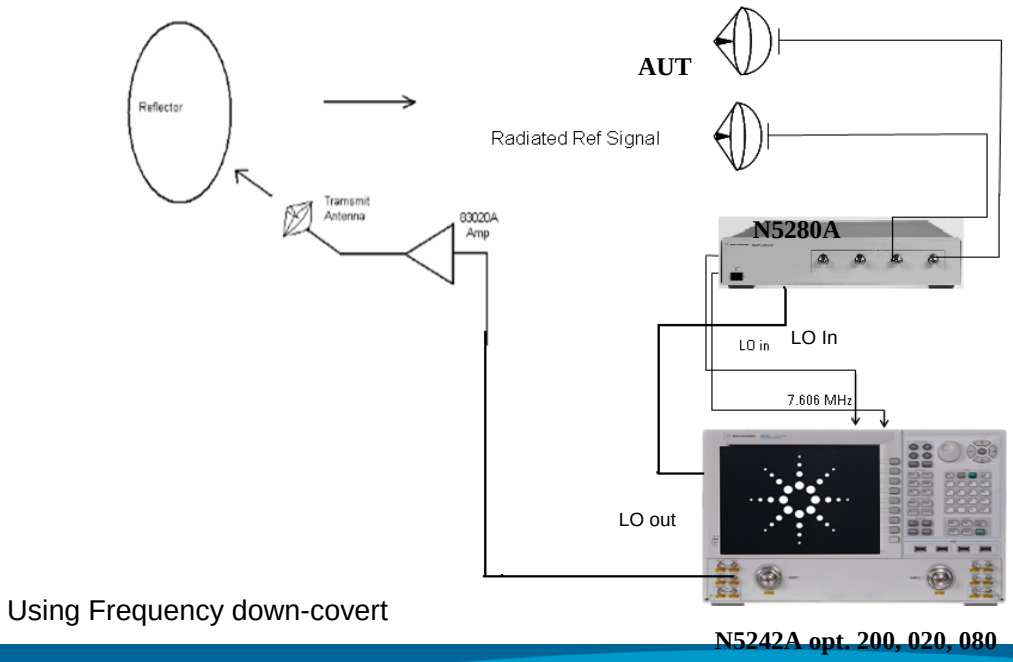
Title	Lit #
Antenna Test Selection Guide	5968-6759E
Pulsed Antenna Measurement Using PNA	5989-0221EN
Application Note 1408-15: Using the PNA in Banded Millimeter-wave Measurements, literature number	5989-4089EN
83000A Series Microwave System Amplifiers	5963-5110E
87415A Technical Overview	5091-1358E
87405A Data Sheet	5091-3661E

Go to www.agilent.com/find/antenna for more information.

Q & A

Back up slides

2-Port PNA-X Compact Range Antenna Measurements



Using Frequency down-covert

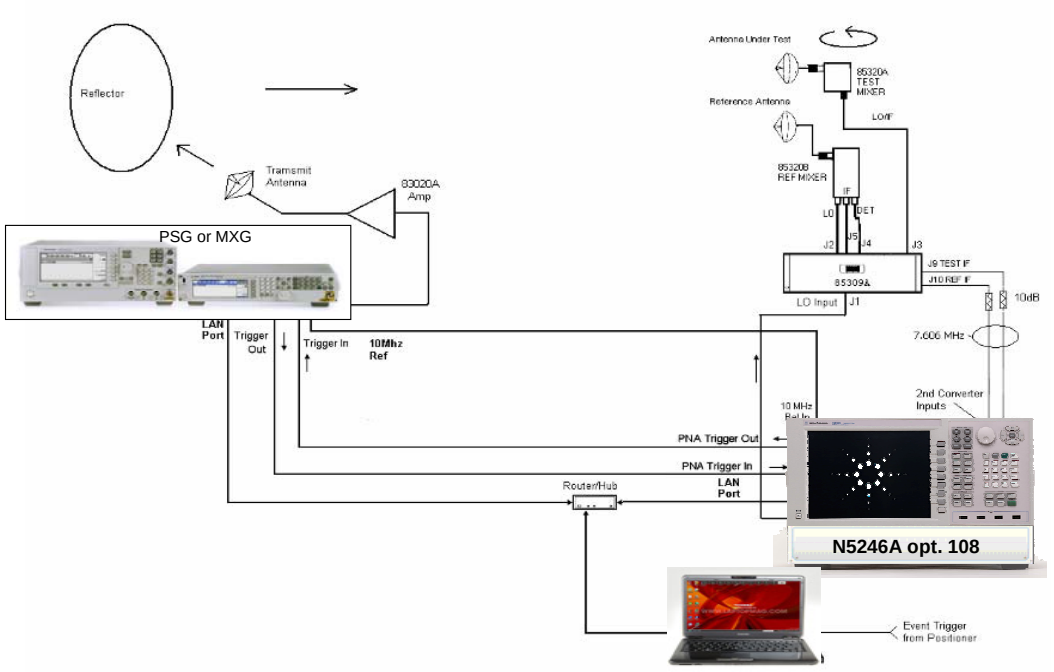
N5242A opt. 200, 020, 080

This slide shows a typical compact range using PNA-X for both transmitting source and rear LO output for LO source.

RF signal from internal source feeds amplifier, if required, then to the antenna. Signal reflected off the reflector that simulates the Far-field wavefront. Signal received by antennas then down-converter it to I.F freq. then feeds input PNA-X rear IF inputs option 020. When possible, vector network analyzer is best choice for complete for transmitting and receiving the signal because the internal source frequency switching time is faster when compared to most external sources.

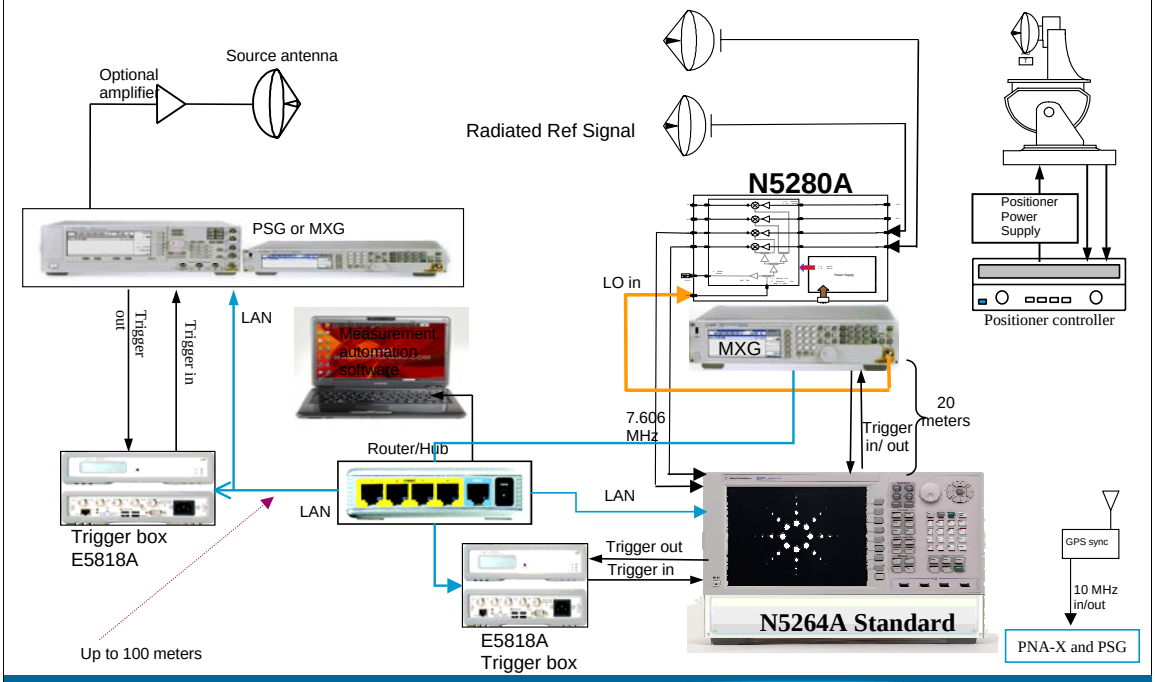
Typical Compact Far-Field Configuration

(TTL or Software Trigger)



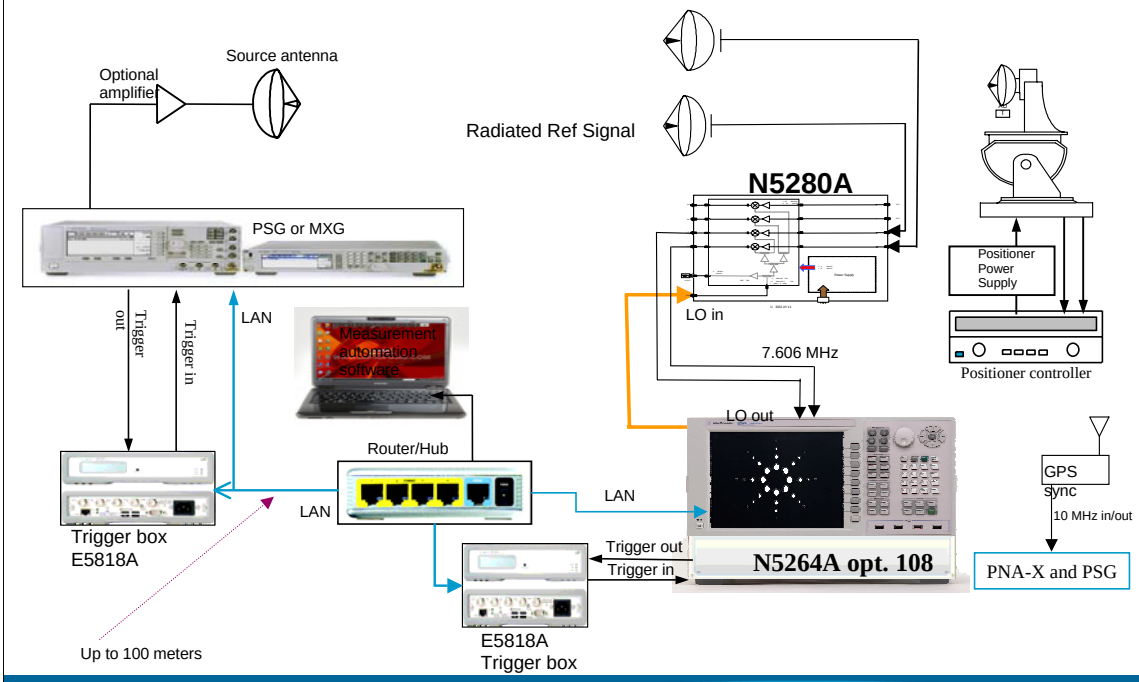
Far Field Outdoor Antenna Measurements

(TTL or Software Trigger)

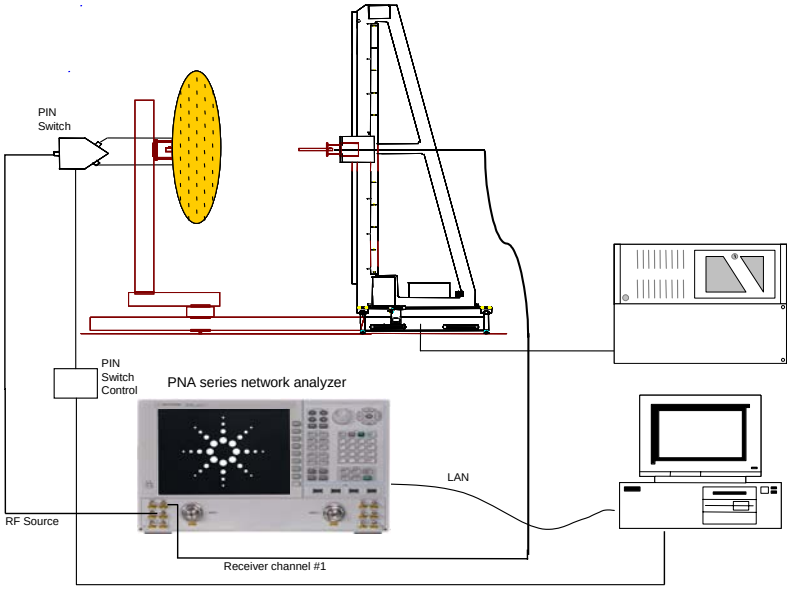


Far Field Outdoor Antenna Measurements

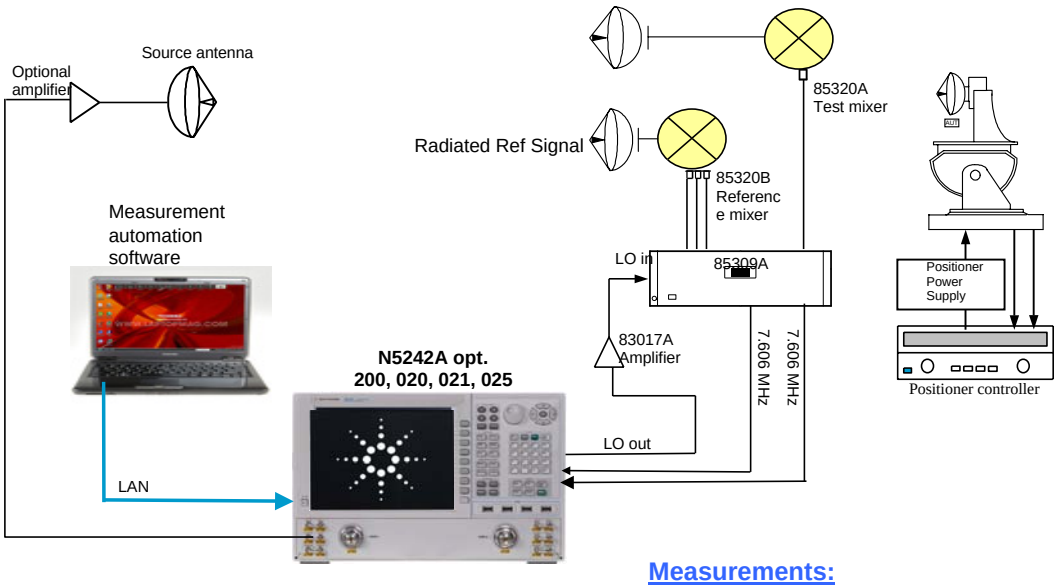
(TTL or Software Trigger)



ypical near-field antenna measurement configuration using a PNA-X



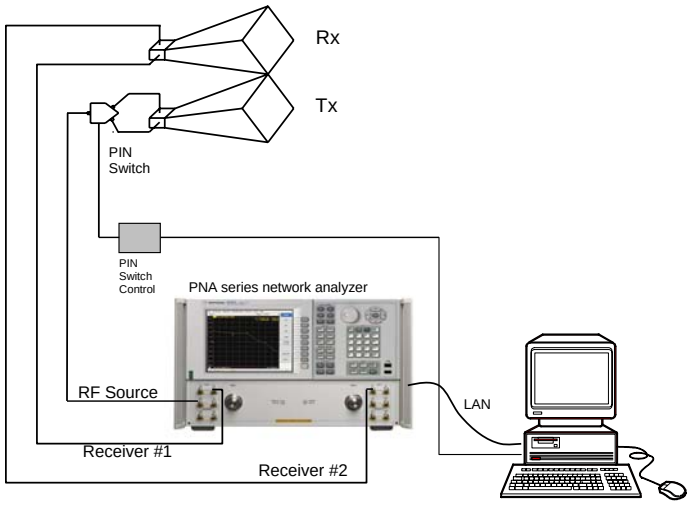
PNA-X Pulsed Antenna Configuration



Measurements:

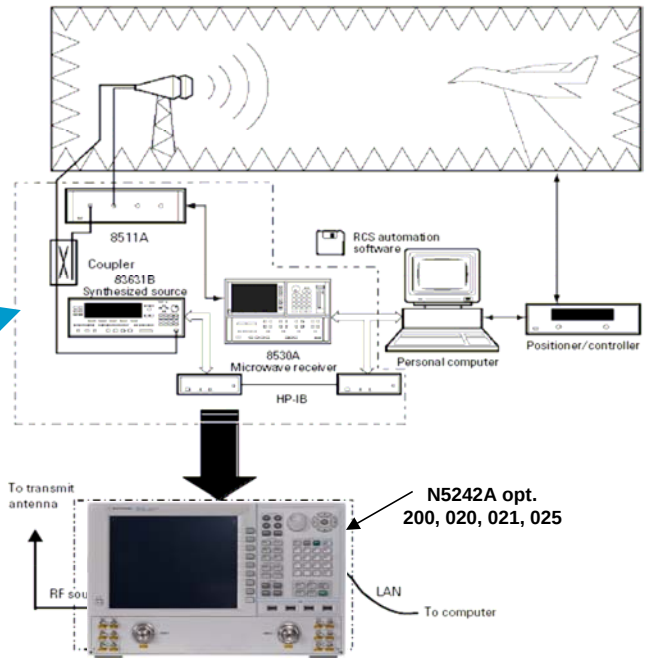
-Average, point-in-pulse, and Pulse profiling

Typical RCS measurement configuration (using a PNA with option 014)



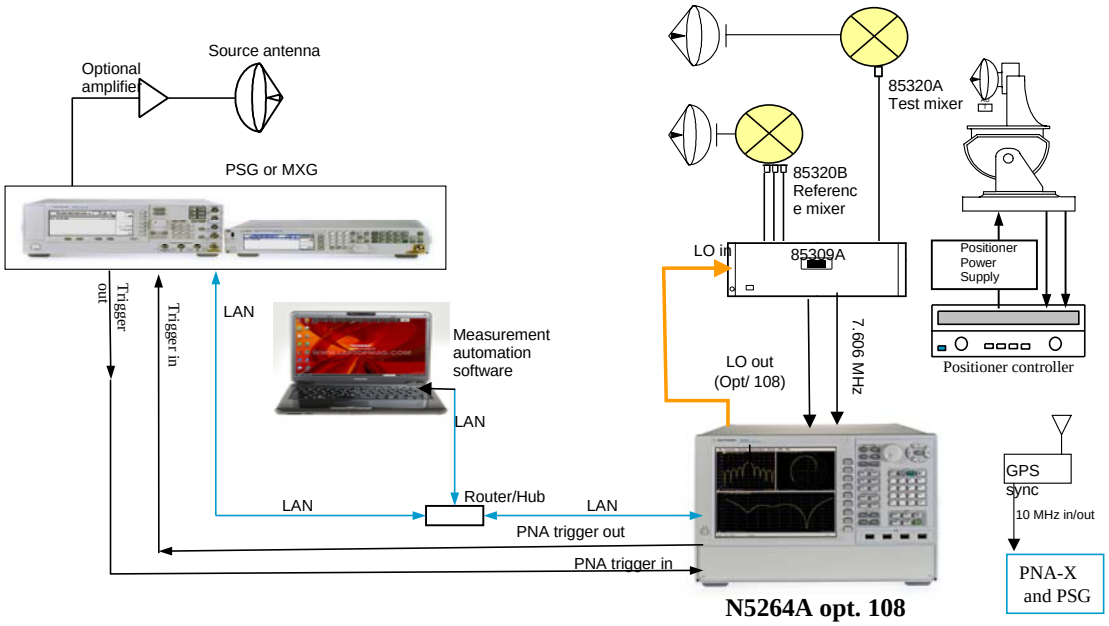
8530A RCS Configuration

Replacing with PNA-X

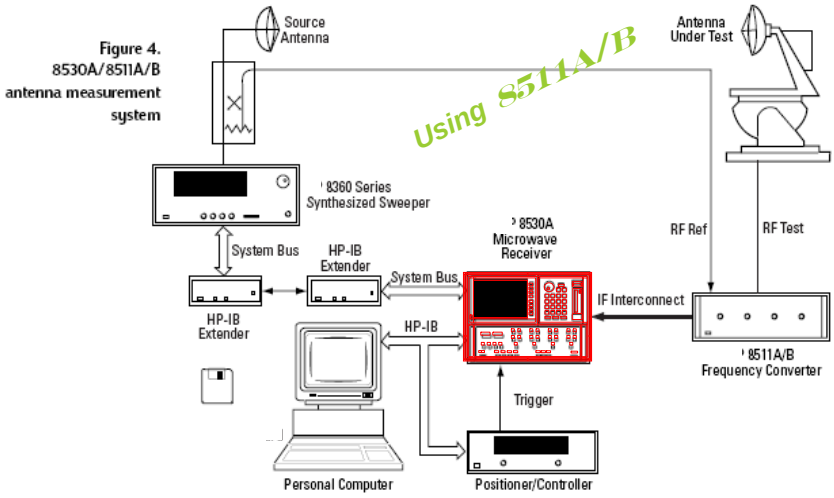


Far Field Outdoor Antenna Measurements

(TTL or Software Trigger)



Typical 8530A (85301C) Far Field Configuration



This configuration is using HPUX worstation to drive 8530A. Customer provided software in HPBASIC to control 8530A and positionner. 8360 series as RF sources driven by 8530 (system GPIB)

Concept here is that signal comming from Antenna (DUT) and ref are downconverted to 20 MHz

2 types of measurements. Swept in frequency and fixed position , CW measurement but antenna is moving

Performance Summary
(with N5280A)

Description	N5264A opt. 108 with MXG	85301C	Comments
The same Measurement Sensitivity - 98 dBm (85301C performance)	0.580 mSec/pt @ 600 KHz	12 – 15 mSec/pt @ 10 KHz	 21 times faster
Freq. .045 to 20GHz, 801 points	yes	yes	
The same speed as 85301C	-135 dBm @ 70Hz	-98 dBm @ 10Kz	**37 dB better**
IFBW	1 Hz to 5 MHz	10 KHz	