Antenna Measurements with the Network Analyzer

Presented by
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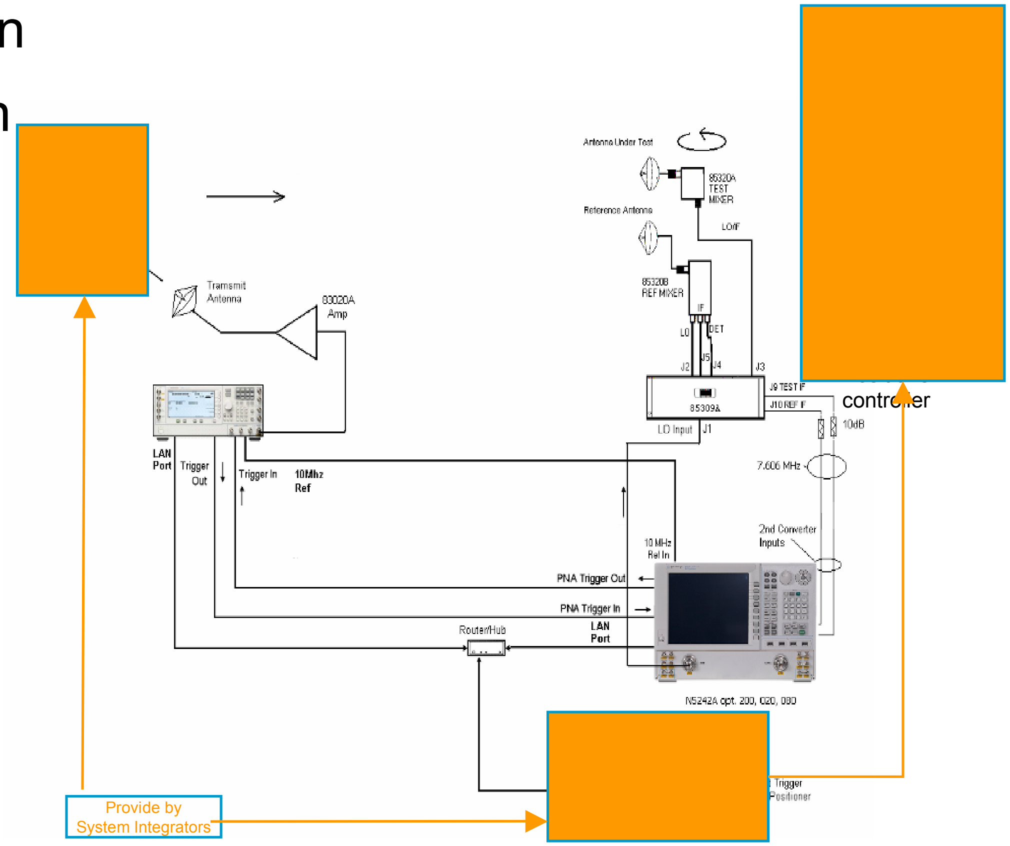
Purpose

During this presentation you will:

- ✓ Learn about interface requirements between components.
- ✓ Learn about issues related to selecting the equipment required to make antenna measurements.
- ✓ Learn how instruments can be integrated into your configuration.
- ✓ Learn about New PNA-X Measurement Receiver and Frequency Converter.

Agenda

- ➢Overview of antenna applications
- ➢Antenna Measurement Design Considerations
  - ➢Transmit Site Configuration
  - ➢Receive Site Configuration
  - ➢Receiver Speed
- ➢Summary



Key features for Antenna Measurements

- High sensitivity.
  - Reduces measurement uncertainty (increase accuracy).
    - Enable the best device specifications.
- Increased Speed.
  - Decrease test time and cost.
- Flexibility.
  - Upgradable for future requirements
- Security.
  - Enable multiple users to share test site

Near-Field Vs Far-Field

Near-Field:

The near-field test system measures the energy in the radiating near-field region and converts those measurements by a Fourier transform into the far-field result.

Far-Field:

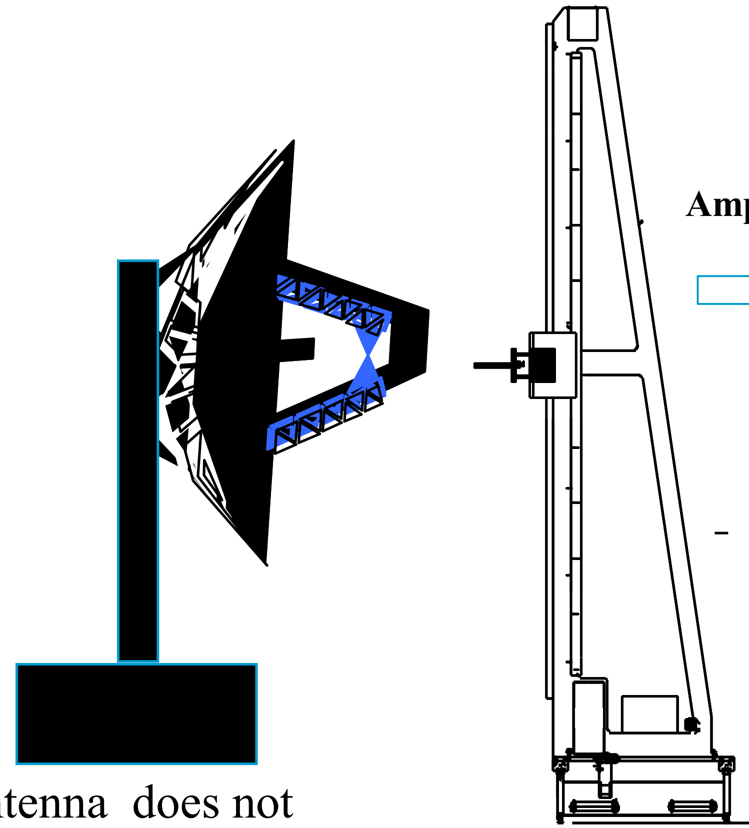
On a traditional far-field antenna range the transmit and receive antennas are typically separated by enough distance to simulate the intended operating environment. The AUT is illuminated by a source antenna at a distance far enough to create a near-planar phase front over the electrical aperture of the AUT.

Near-field Measurements

Basic Concept:

•Record amplitude and phase over a surface in the radiating near-field (~3 wavelengths)

•Process with an FFT to produce far-field data.



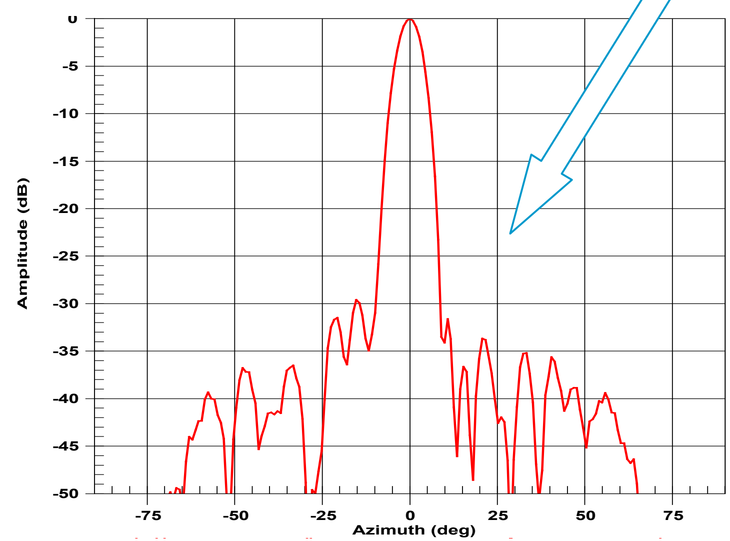
Antenna does not move (planar case)

Amplitude and Phase

FFT Processing

+

Probe Compensation



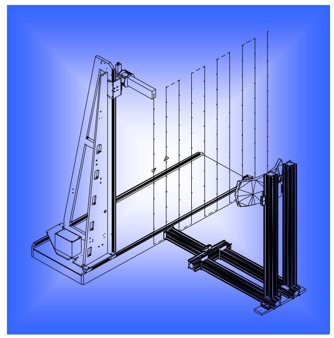
Near-Field

Near-Field:

There are three scan types

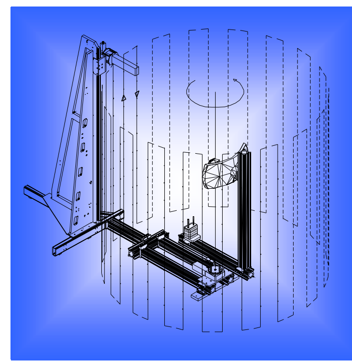
1. **Planar near-field**
   - Directional antennas
   - Gain > 15 dBi
   - Max angle < ± 70 º

Planar



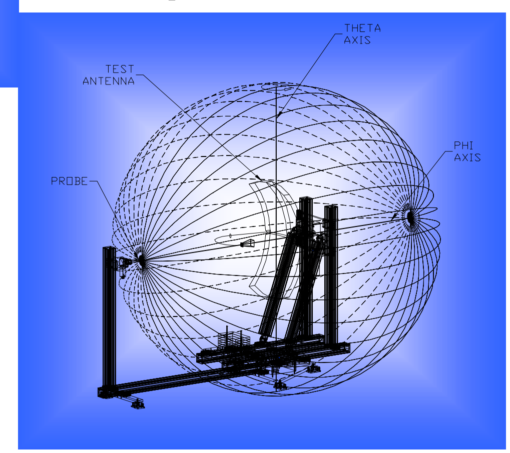
2. **Cylindrical near-field**
   - Fan beam antennas
   - Wide side or back lobes

Cylindrical



3. **Spherical near-field**
   - Low gain antennas
   - Wide or omni-directional patterns on any antennas

Spherical



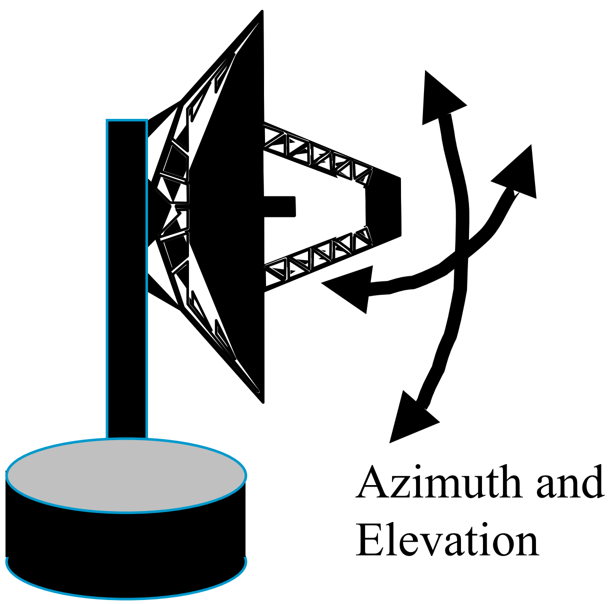
Near-field Antenna Measurement Scan Summary

ANTENNA TYPE/PARAMETER	PLANAR	CYLINDRICAL	SPHERICAL
High-gain Antennas	excellent	good	good
Low-gain Antennas	poor	good	excellent
Stationary AUT	yes	possible	possible
Zero-gravity Simulation	excellent	poor	variable
Alignment Ease	simple	difficult	difficult
Speed	fast	medium	slow

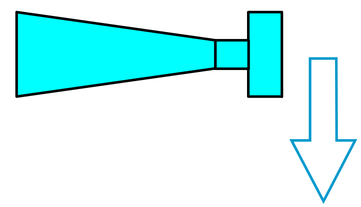
Far-field Measurements

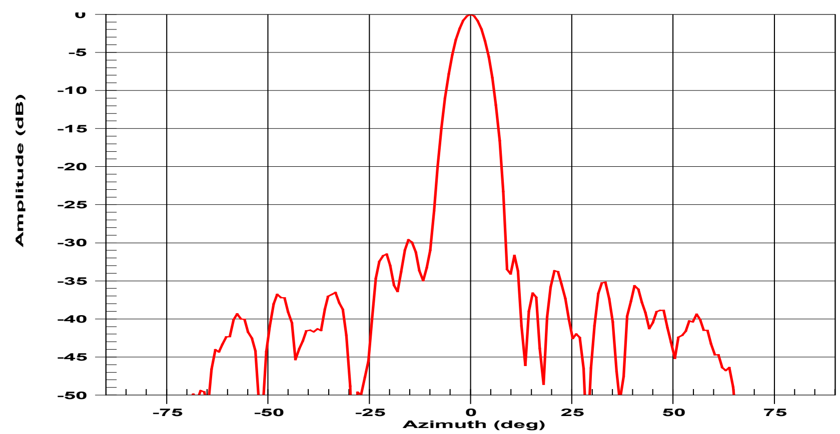
Basic Concept:

- Rotate antenna under test in azimuth and elevation coordinates
- Record far-field data on plotter or computer



Receive antenna measures far-field amplitude and or phase as test antenna rotates





Near-Field Vs Far-Field

	NEAR-FIELD			FAR-FIELD		
	PLANAR	CYLINDRICAL	SPHERICAL	OUTDOOR RANGE	ANECHOIC CHAMBER	COMPACT RANGE
High gain antenna	Excellent	Good	Good	Adequate	Adequate	Excellent
Low gain antenna	Poor	Good	Good	Adequate	Good	Excellent
High frequency	Excellent	Excellent	Excellent	Good	Poor	Excellent
Low frequency	Poor	Poor	Good	Good	Fair	Poor
Gain measurement	Excellent	Good	Good	Excellent	Good	Excellent
Close sidelobes	Excellent	Excellent	Excellent	Good	Poor	Excellent
Far sidelobes	Adequate	Excellent	Excellent	Good	Poor	Good
Low sidelobes	Excellent	Excellent	Excellent	Variable	Poor	Good
Axial ratio	Excellent	Excellent	Excellent	Good	Poor	Good
Zero G effects	Excellent (horizontal mode)	Poor	Good (horizontal mode)	Poor	Poor	Poor
Multipath	Good	Good	Good	Adequate	Adequate	Good
Weather	Excellent	Excellent	Excellent	Poor	Excellent	Excellent
Security	Excellent	Excellent	Excellent	Poor	Excellent	Excellent
Facility cost	Low	Moderate	Moderate	High (land value)	Moderate	Very high
Operating cost	Moderate	Moderate	Moderate	High (remote)	Moderate	Moderate
Speed (complete measurements)	Excellent	Good	Fair	Fair	Fair	Fair
Speed (simple cuts)	Good	Fair	Fair	Excellent	Excellent	Excellent
Complexity	Moderate	Moderate	High	Moderate	Low	High
Mechanical surface measurements	Excellent	No	No	No	No	No
Antenna access	Excellent	Excellent	Excellent	Good	Good	Fair
Antenna alignment	Easy	Moderate	Difficult	Moderate	Moderate	Difficult

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➢Antenna Measurement Design Considerations

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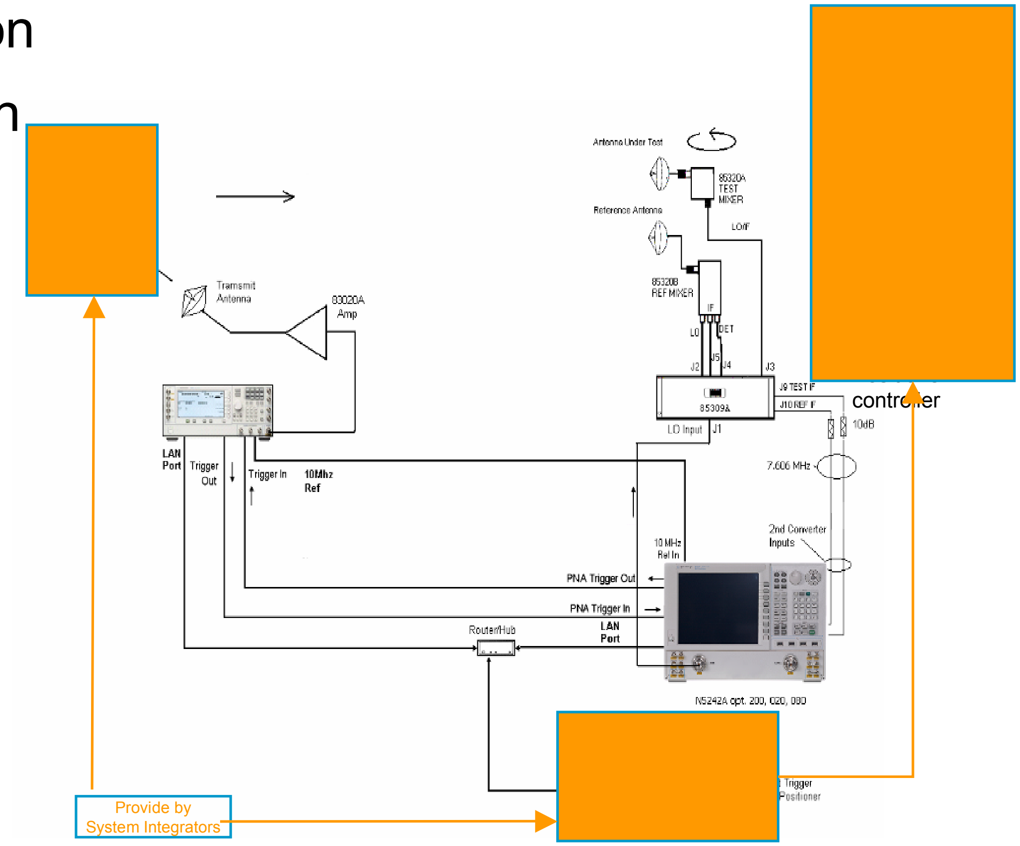


Antenna Characterization System Solution

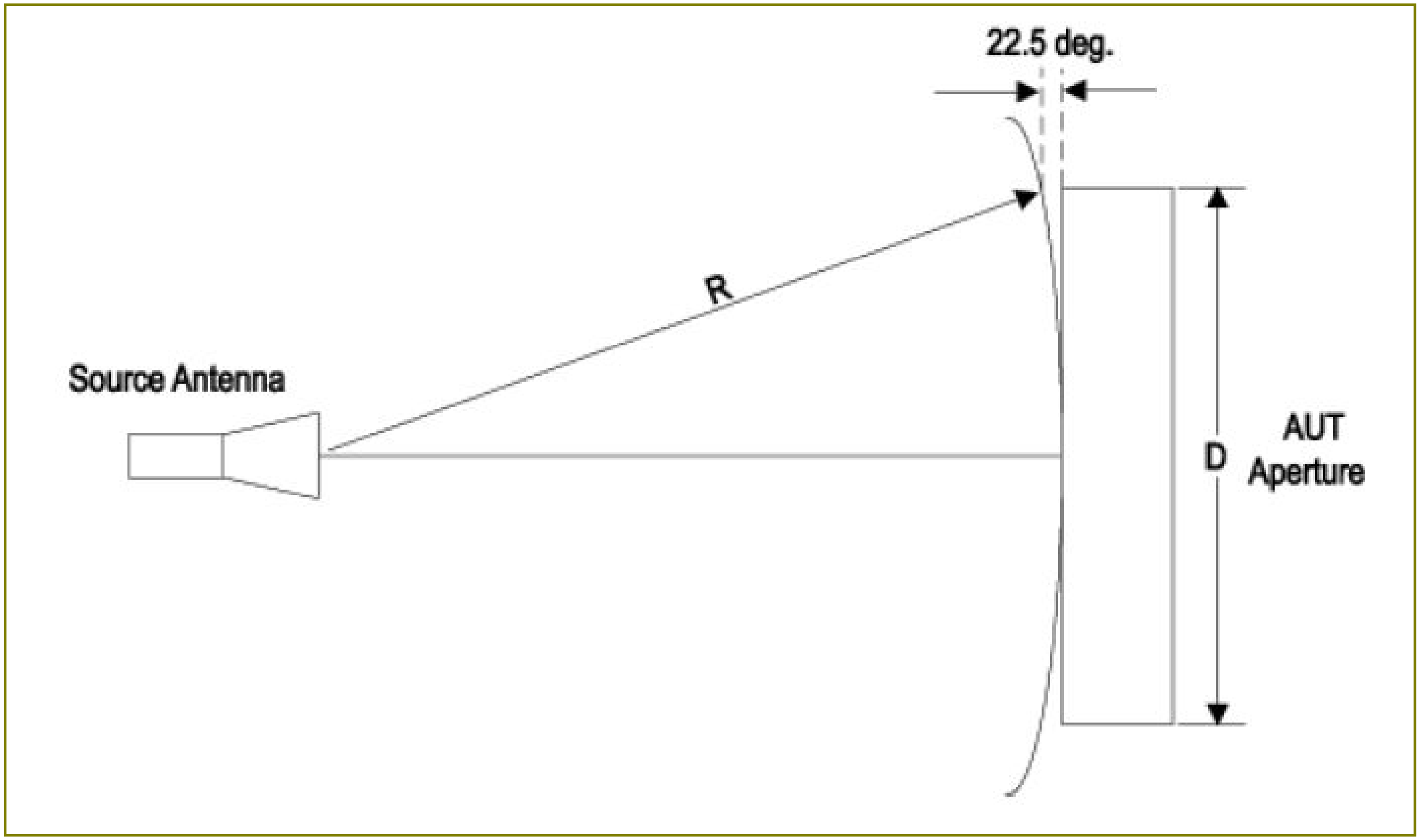
Overview:

Antenna Characterization System Consists:

1. RF Subsystem – Receiver, Sources and Convertor/Mixers
2. Mechanical Subsystem – Positioner, Anechoic Chamber and Absorber Material
3. Measurement & Data Analysis Software

Agilent primary provides RF Subsystem only.

Far-Field Distance determination



The mathematical expression for determining the minimum separation distance is: $R < \frac{2D^2}{\lambda}$

Where:
R = Range length (separation distance between transmit and receive antennas)
D = Aperture of antenna under test
λ = Measurement wavelength (shortest of the ones tested)

Design Considerations

Designing an antenna system is an iterative process:

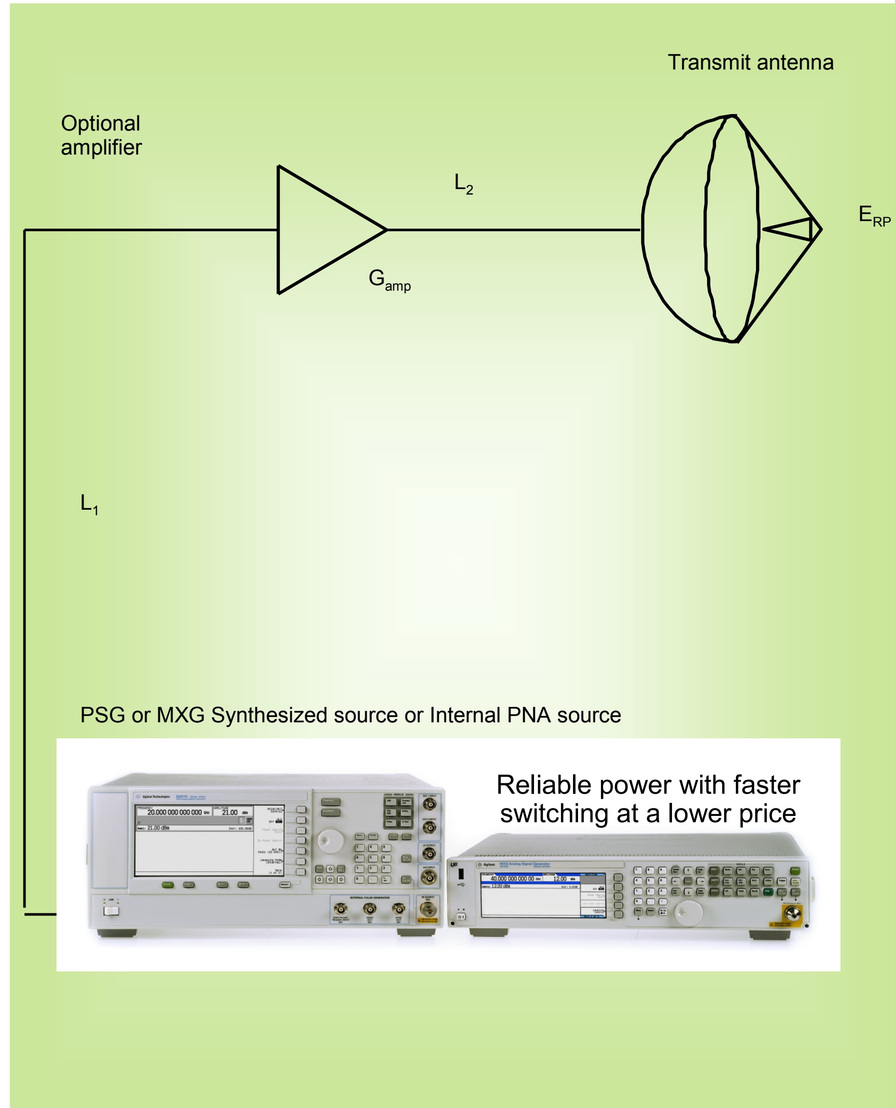
- First design the transmit site
- Next design the receive site
- Then, return to the transmit site to make equipment adjustments required by the receive site
- Finally, confirm power levels are adequate for entire system

Transmit Site Configuration

Typical transmit site configuration.

Considerations in selecting a transmit source:

- Frequency range of AUT
- Distance to transmit antenna
- Source power
  - PNA/PNA-X internal source typically used for near-field and compact ranges.
  - External sources typically required for large outdoor ranges.
- Speed requirements



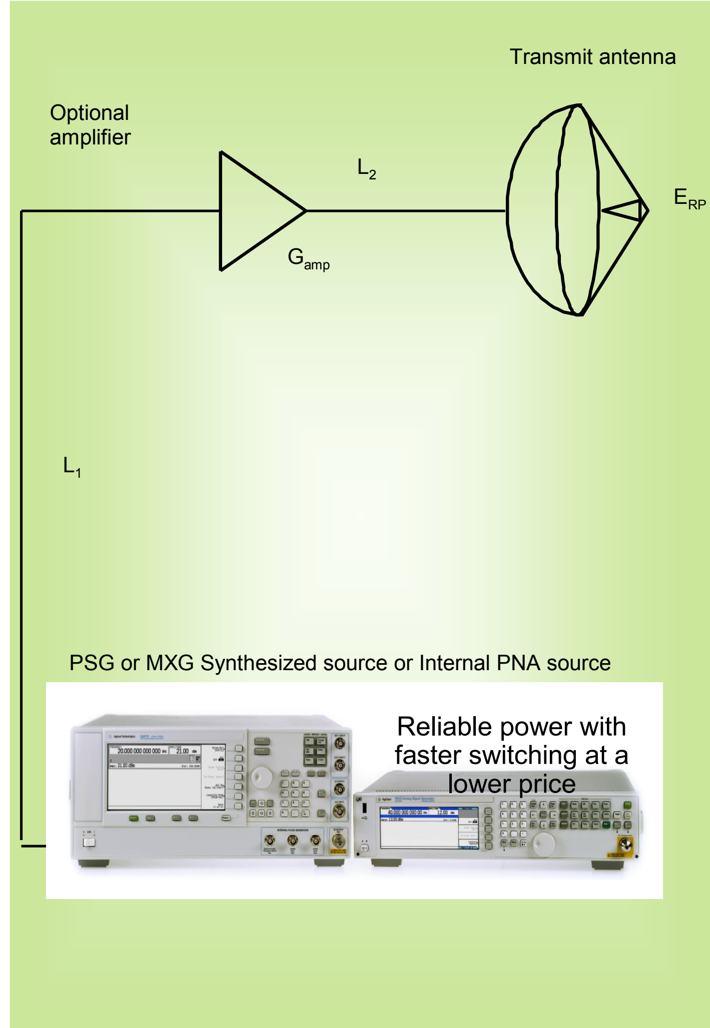
Calculate the effective radiated power

Effective Radiated Power (E_{RP}): Power level at the output of the transmit antenna.

$$E_{RP} = P_{source} - (L_1 + L_2) + G_{amp} + G_t$$

Where:

P_{source}	= Power out of the source (dBm)
L_1 & L_2	= Loss from cable(s) between source and antenna (dB)
G_{amp}	= Gain of the amplifier (if used) (dBi)
G_t	= Gain of transmit antenna (dBi)



• Make power calculations first without an amplifier, add one only if required to achieve the desired transmit power

Calculate the free-space loss (power dissipation)

Free-space loss (power dissipation, P_D): difference in power levels between the output of the transmit antenna and the output of an isotropic (0dBi) antenna located at the receive site.

P_D = 32.45 + 20*log(R) + 20*log(F)

Where: R = Range length (meters)

F = Test frequency (GHz)

This equation does not account for atmospheric attenuation, which can be a significant factor in certain millimeter-wave frequency ranges.

A calculator which will derive this number for you can be found at:
http://na.tm.agilent.com/pna/antenna

Calculate the maximum power level at the output of the AUT

P(AUT): power level present at the output of the antenna-under-test (AUT).

$$P(AUT) = E_{RP} - P_D + G(AUT)$$

Where: E_{RP} = Effective Radiated Power (dBm)

P_D = Free-space loss (dB, at the maximum test frequency)

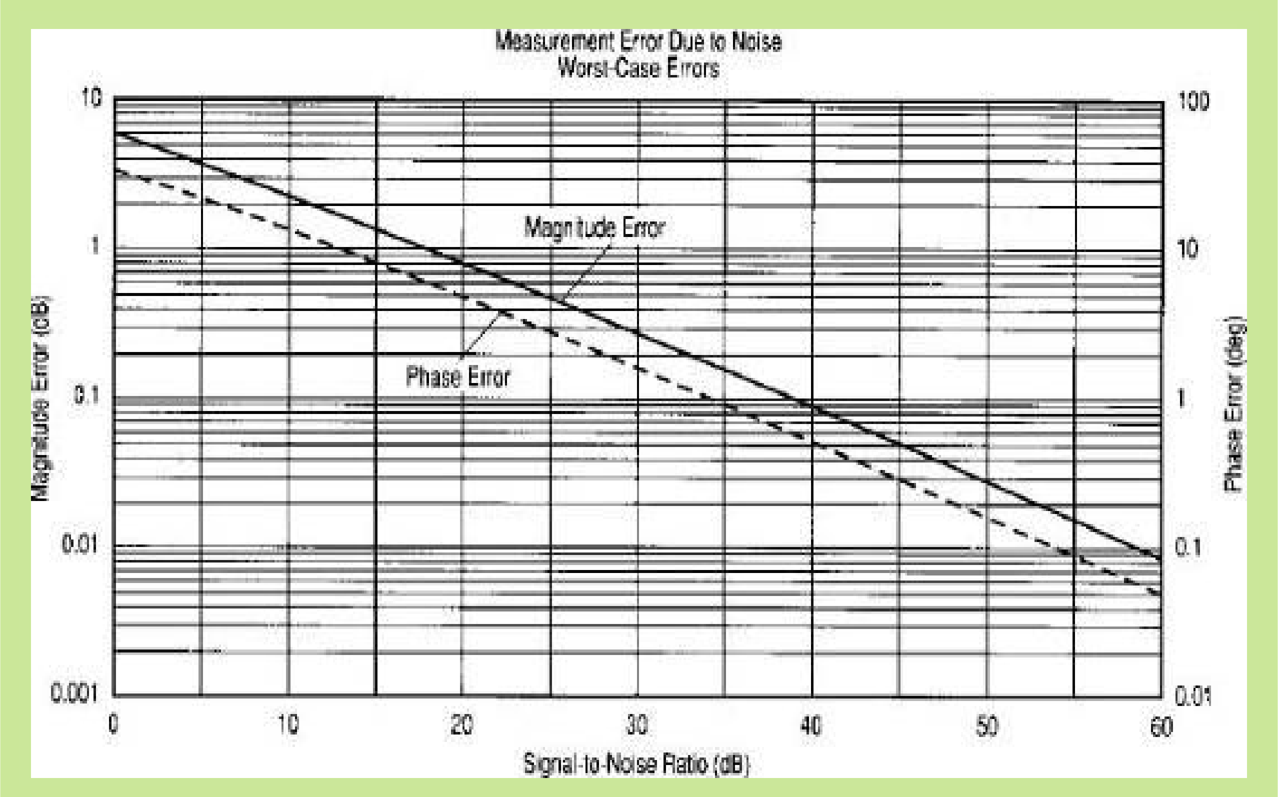
G(AUT) = Expected maximum gain of AUT (dBi)

Dynamic Range, Accuracy & Signal-to-Noise Ratio

Required dynamic range is the difference between maximum bore site level and minimum AUT level that must be measured.

Examples of measurements made are: Side-lobe levels, null depth and cross-polarization levels.

Measurement accuracy is directly affected by the signal-to-noise ratio as shown in this figure.



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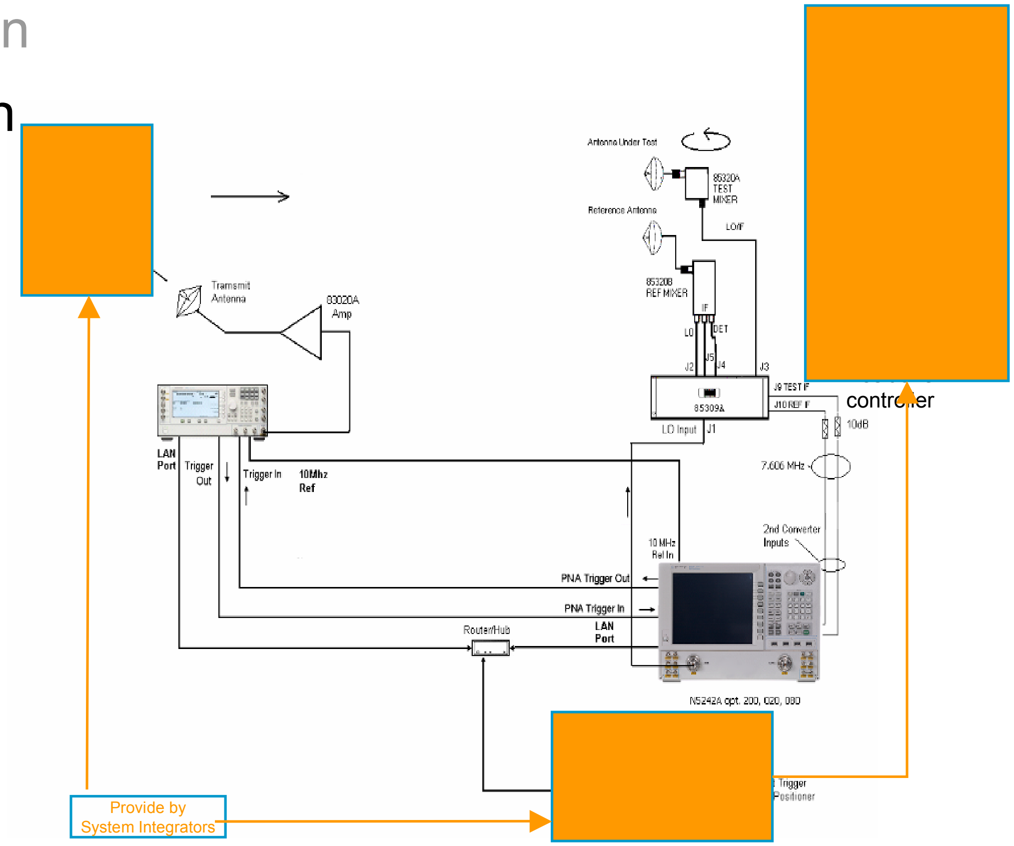


Calculate the Sensitivity for a Receive Site without External mixing

Sensitivity = P(AUT) – DR – S/N – L

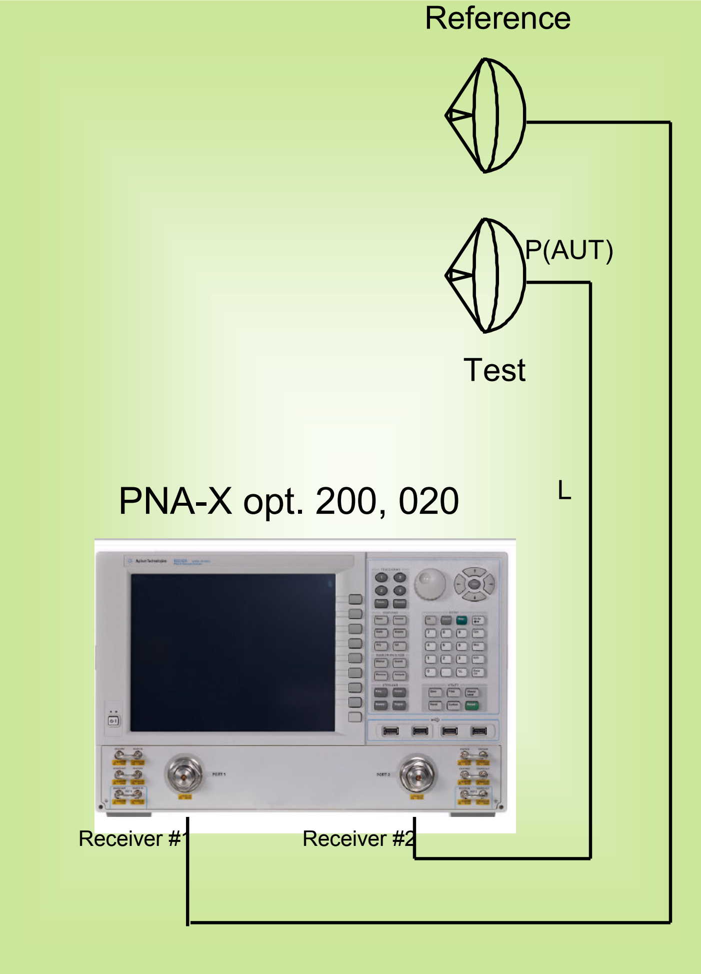
Where: P(AUT) (dBm) = Power at the output of the AUT

DR = Required dynamic range (dB)

S/N = Signal-to-noise ratio (dB)

L = Cable loss (dB) from AUT to PNA input

Example:
P(AUT) = 0dBm, DR = 60dB, S/N = 30dB and L = 5dB
Sensitivity = 95dBm



Choosing an analyzer

Agilent has developed options for the PNA series specifically for antenna measurements. However, the PNA-L and ENA analyzers can also be used in less complex applications.

Family	Model/Option	Frequency range	Frequency stepping speed (10 MHz/pt at max IFBW with no band crossings	Sensitivity at test port with 1 kHz IFBW @ Fmax	Sensitivity at direct receiver input with 1 kHz IFBW (with Opt. 014) @ Fmax	Power out @ Fmax
ENA	E5070B	300 kHz to 3 GHz	Data not available	< -92 dBm	Option not available	+10 dBm
	E5071B	300 kHz to 8.5 GHz	Data not available	< -80 dBm	Option not available	+5 dBm
PNA-L	N5230A Opt. 020/025	300 kHz to 6 GHz	100 us	< -99 dBm	< -108 dBm	+10 dBm
	N5230A Opt. 120/125	300 kHz to 13.5 GHz	110 us	< -94 dBm	< -108 dBm	+2 dBm
	N5230A Opt. 220/225	10 MHz to 20 GHz	160 us	< -85 dBm	< -97 dBm	+10 dBm
	N5230A Opt. 420/425	10 MHz to 40 GHz	160 us	< -75 dBm	< -86 dBm	-5 dBm
	N5230A Opt. 520/525	10 MHz to 50 GHz	160 us	< -70 dBm	< -78 dBm	-9 dBm
PNA	E8362B	10 MHz to 20 GHz	278 us	< -100 dBm	< -114 dBm	+3 dBm
	E8363B	10 MHz to 40 GHz	278 us	< -94 dBm	< -105 dBm	-4 dBm
	E8364B	10 MHz to 50 GHz	278 us	< -94 dBm	< -103 dBm	-10 dBm
	E8361A	10 MHz to 67 GHz	278 us	< -79 dBm	< -88 dBm	-5 dBm
PNA-X	N5242A	10 MHz to 26.5 GHz	100 uS	< -100 dBm	< -115 dBm	+11 dBm

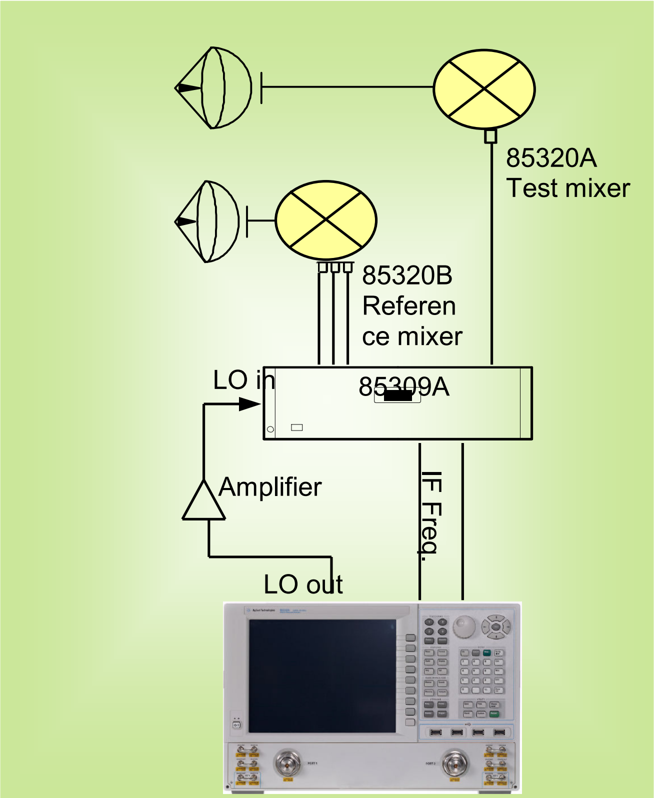
Calculate the Sensitivity for a Receive Site with External mixing

When do you need external mixing?

When the AUT is located far from the analyzer which requires long cables. The long cables reduce accuracy and dynamic range often to unacceptable levels.

Benefit of remote mixers

- Down converts signal to an IF signal
- Reduces RF cable losses
  - Maximizes accuracy and dynamic range



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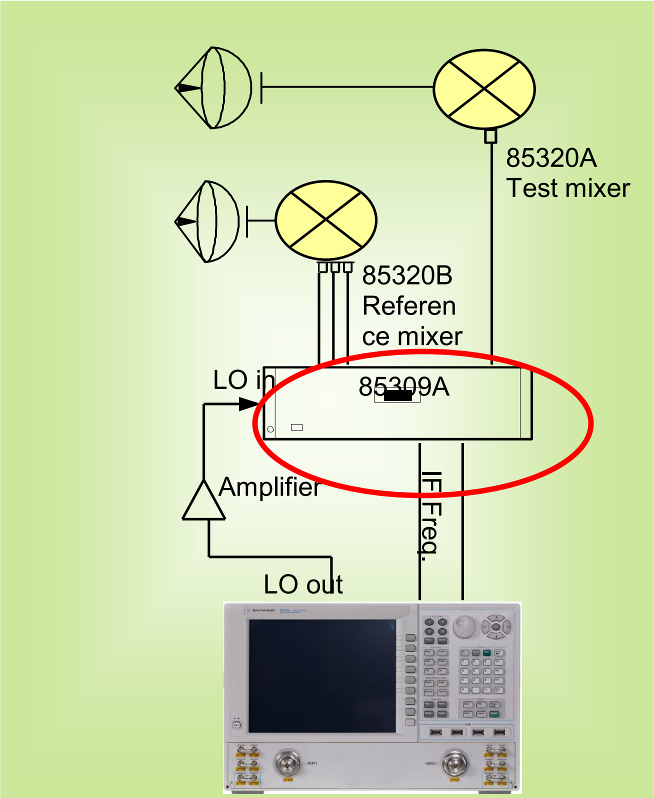
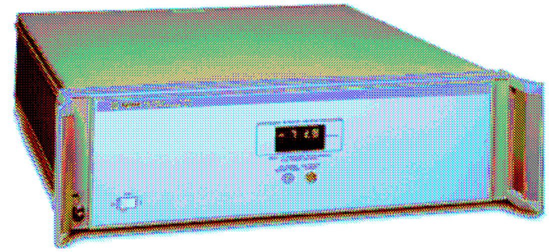
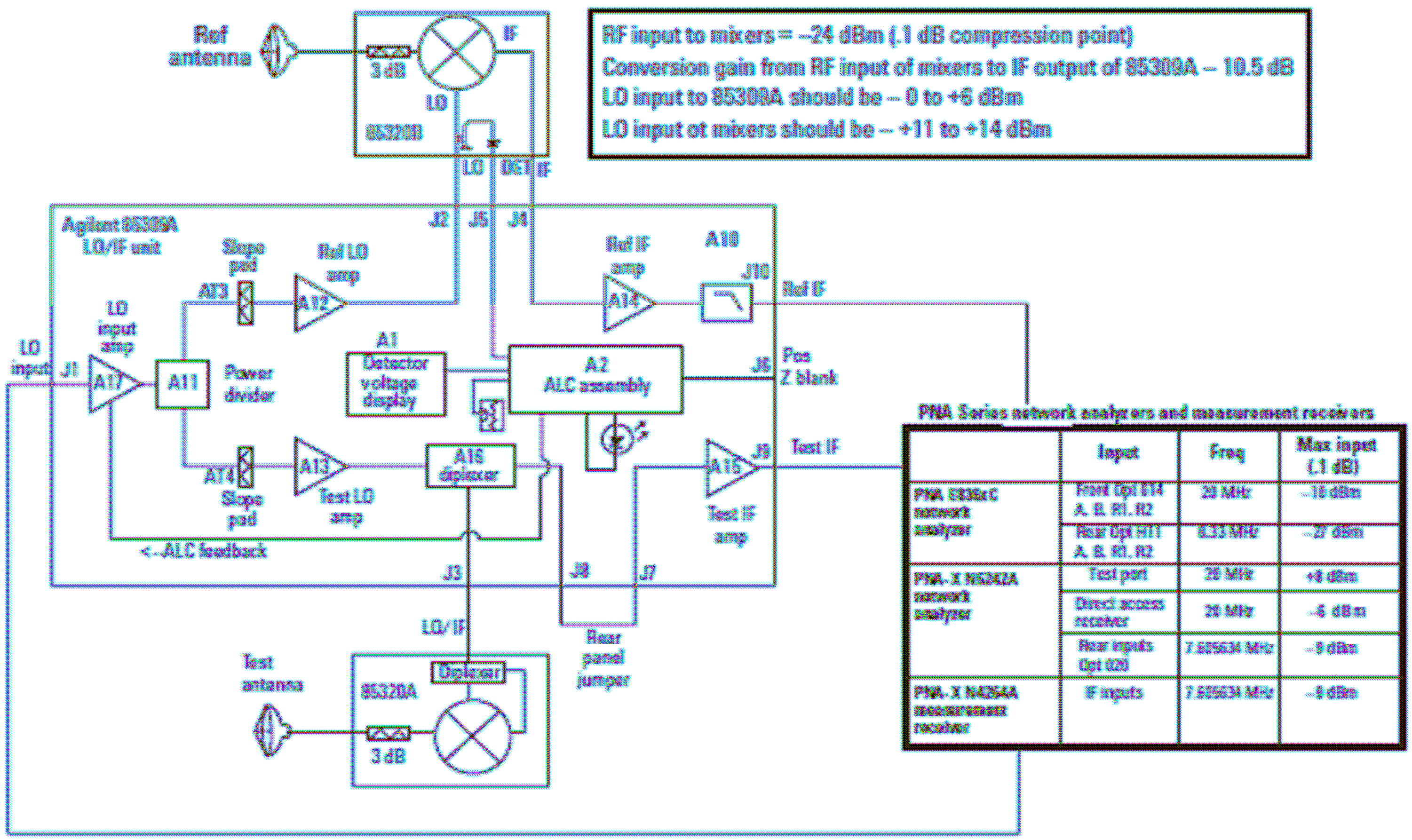


85309A Simplify Diagram

2 to 18 GHz





	Input	Freq	Max input (.1 dB)
PNA E836xC network analyzer	Front Opt 014 A, B, R1, R2	20 MHz	–10 dBm
	Rear Opt H11 A, B, R1, R2	8.33 MHz	–27 dBm
PNA-X N5242A network analyzer	Test port	20 MHz	+8 dBm
	Direct access receiver	20 MHz	–6 dBm
	Rear inputs Opt 020	7.605634 MHz	–9 dBm
PNA-X N5264A measurement receiver	IF inputs	7.605634 MHz	–9 dBm

85309A

⊟ Key Specifications

- Allows mixers to be located at the antenna under test
- Allows fundamental mixing to 18 GHz for best sensitivity
- Provides best rejection of unwanted spurious signals
- Channel-to-channel isolation of 100 dB

⊟ Description

The Agilent 85309A LO/IF distribution unit, together with the 85320A/B mixers, downconvert a microwave signal to an IF signal.

- Allows mixers to be located at the antenna under test
- Allows fundamental mixing to 18 GHz for best sensitivity
- Provides best rejection of unwanted spurious signals
- Channel-to-channel isolation of 100 dB

Calculate the Sensitivity for a Receive Site with External mixing

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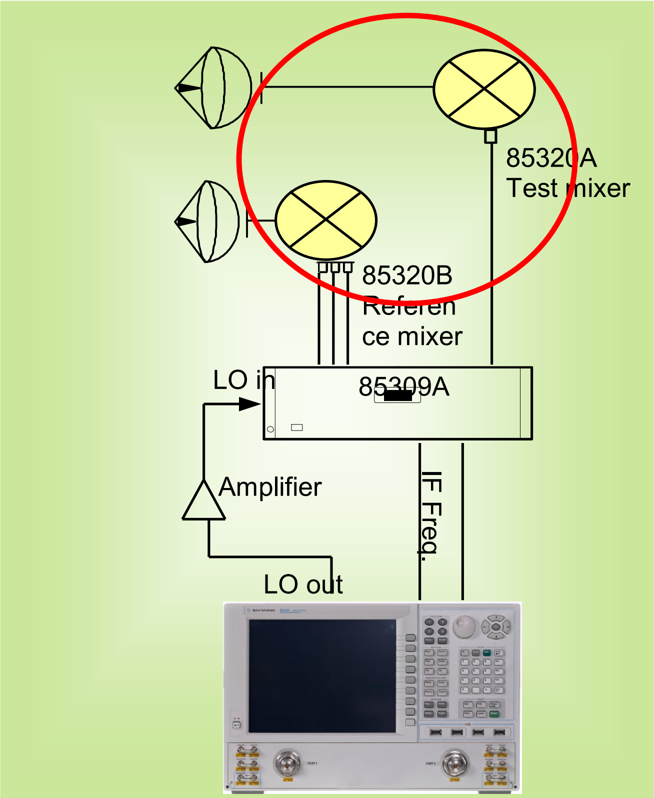
When the AUT is located far from the analyzer which requires long cables. The long cables reduce accuracy and dynamic range often to unacceptable levels.



Benefit of remote mixers

- Down converts signal to an IF signal
- Reduces RF cable losses
  - Maximizes accuracy and dynamic range

85320A

Key Specifications

- Broadband operating from 300 MHz to 3 GHz, 1 to 26.5 GHz, or 2 to 50 GHz
- Operate in fundamental mode from 2 to 18 GHz for best sensitivity and lowest conversion loss
- Diplexer combines LO input and IF output onto a single coaxial connector

Description

The Agilent 85320A test mixer modules are designed for use with the 85309A LO/IF distribution unit to downconvert microwave signals to IF signals.

- Broadband operating from 300 MHz to 3 GHz, 1 to 26.5 GHz, or 2 to 50 GHz
- Operate in fundamental mode from 2 to 18 GHz for best sensitivity and lowest conversion loss
- Diplexer combines LO input and IF output onto a single coaxial connector

85320B

⊟ Key Specifications

- Broadband operating from 300 MHz to 3 GHz, 1 to 26.5 GHz, or 2 to 50 GHz
- Operate in fundamental mode from 2 to 18 GHz for best sensitivity and lowest conversion loss
- Leveling coupler/detector provides leveling signal to 85309A, ensuring leveled LO drive power to the mixer

⊟ Description

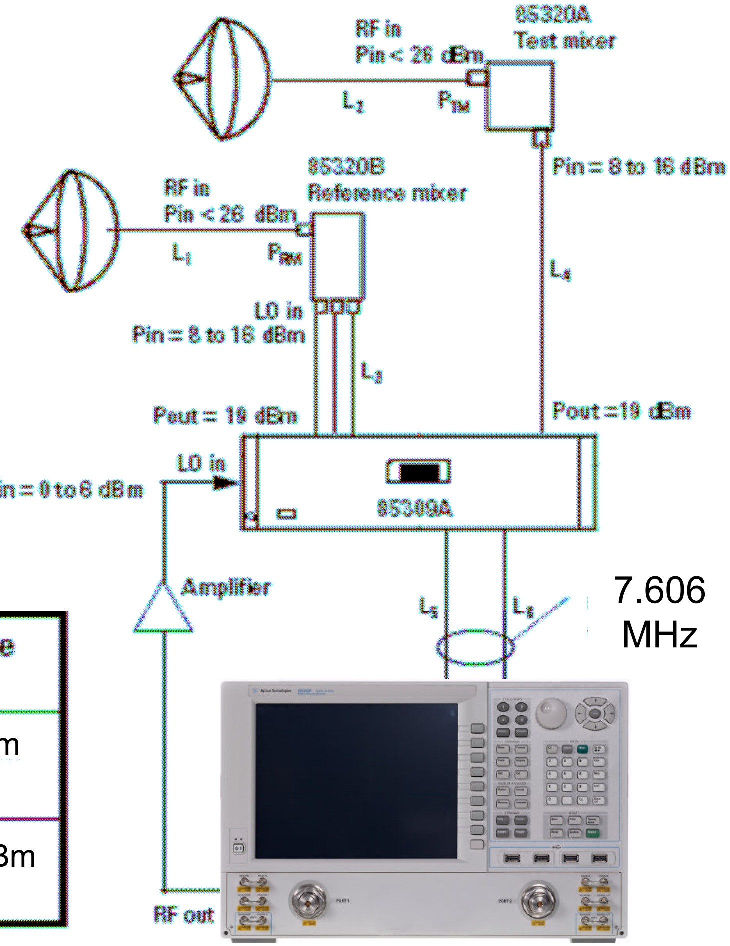
The Agilent 85320B reference mixer modules are designed for use with the 85309A LO/IF distribution unit to downconvert microwave signals to IF signals.

- Broadband operating from 300 MHz to 3 GHz, 1 to 26.5 GHz, or 2 to 50 GHz
- Operate in fundamental mode from 2 to 18 GHz for best sensitivity and lowest conversion loss
- Leveling coupler/detector provides leveling signal to 85309A, ensuring leveled LO drive power to the mixer

Receive Site Configuration

This figure shows a typical receive site configuration.

The following slides show how to calculate the various levels indicated.



Input	Freq	Max input (.1 dB)	Damage level
From Test port A,B,R1,R2	20 MHz	+8 dBm	+30 dBm
Rear Opt 020 A,B,R1,R2	7.606 MHz	-10 dBm	+10 dBm

Select the LO Source

Frequency Range Required:

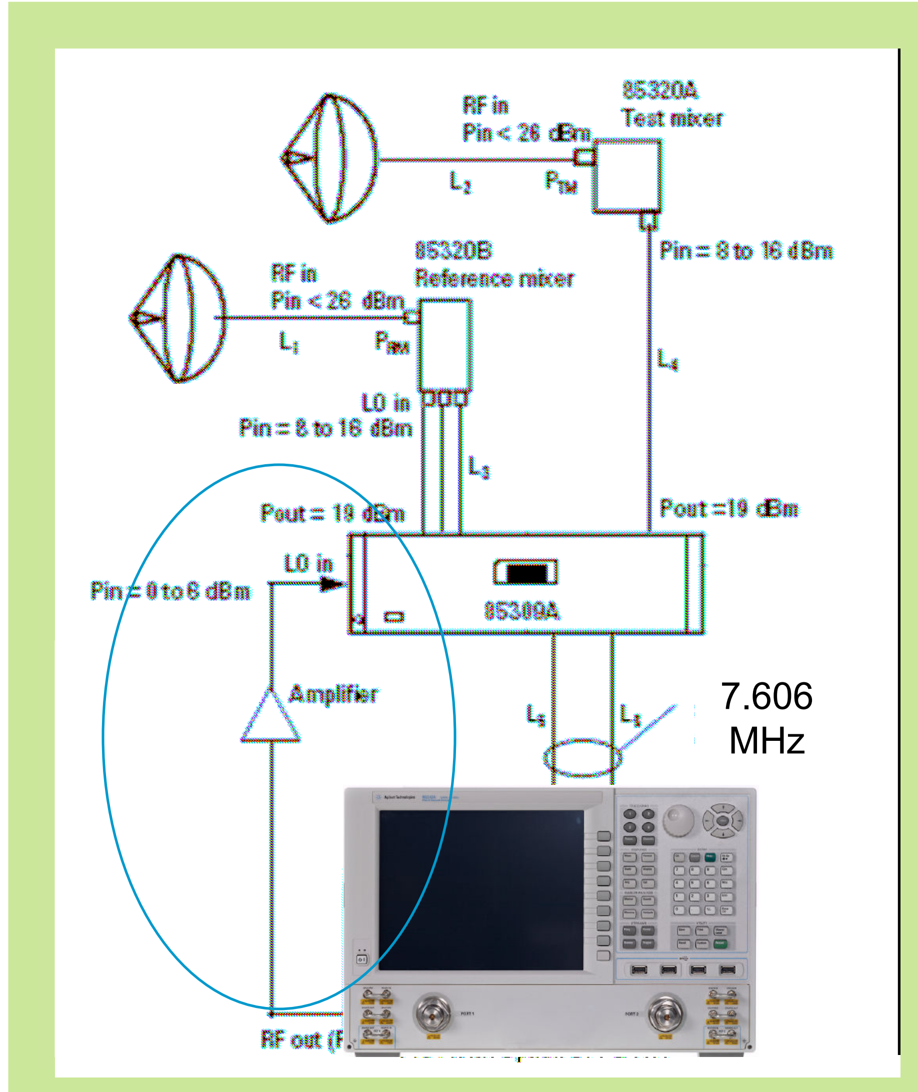
- 0.3 to 18 GHz

Power Required at 85309A LO Input:

- 0-6 dBm

Sources Available:

- PSG/ESG/MXG
- Internal LO Source of PNA-X (or PNA opt. H11 with amplifier)



Determine 85309A to LO source distance:

P_s = Cable length (meters) X cable loss (dB/meter) + P_{in}

Where P_s = Power out of the LO source

P_{in} = Required power into 85309A (0 to 6 dBm)

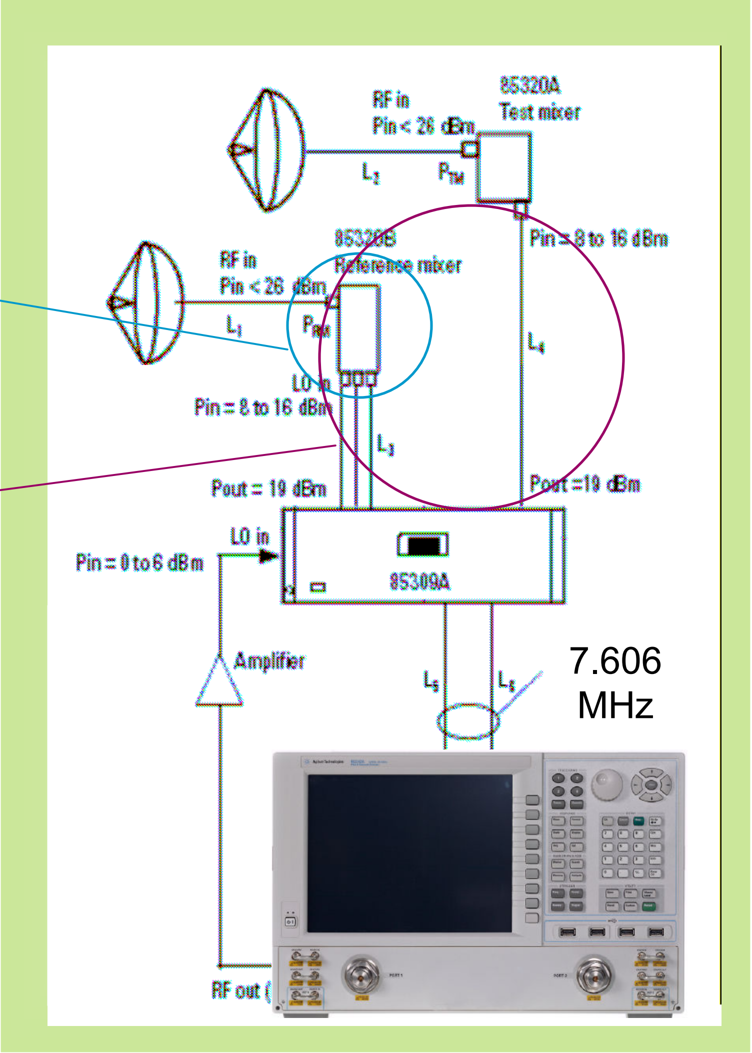
Reference Signal Level & Cable length 85309A to Mixers

Requirement:

- Signal must be high enough to achieve the desire accuracy

Reference mixer provides:

- A phase reference & a reference signal for a ratioed measurement (test/reference)
- Ratios out any variations in signal levels from system



Cable length must be calculated to assure adequate power from the 85309A

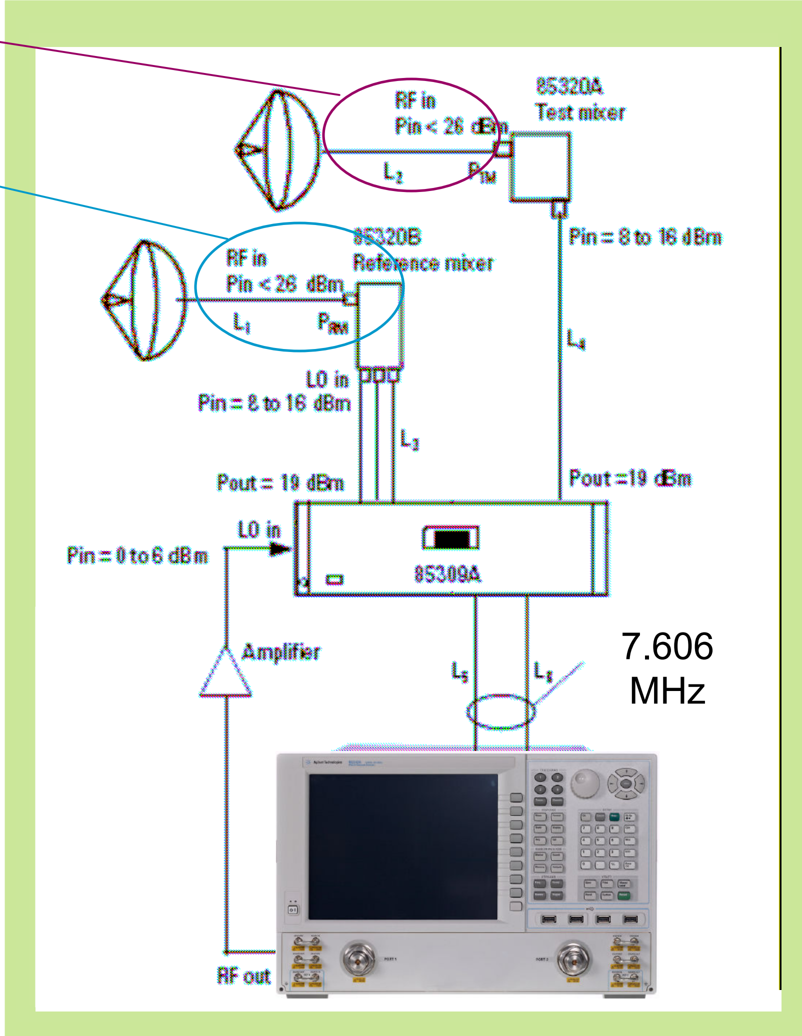
Cable length (meters) = (P_{out}(85309A) – P_{in}(mixer)) / (cable loss/meter@frequency)

✓ High quality, low loss, phase stable cables are recommended

Power at Reference/Test Mixer

$$P_{TM} = E_{RP} - P_D + G(TEST) - L2$$

$$P_{RM} = E_{RP} - P_D + G(REF) - L1$$



Where: P_{RM} = Power level at the reference mixer (dBm)

P_{TM} = Power level at the reference mixer (dBm)

E_{RP} = Effective radiated power (dBm)

P_D = Free space loss (power dissipation) (dB)

G(REF) = Gain of reference antenna (dBi)

G(REF) = Gain of reference antenna (dBi)

L1 or L2= cable loss between ref. or Test antenna and ref. mixer (dB)

Power at the Analyzer Inputs and Receiver Sensitivity

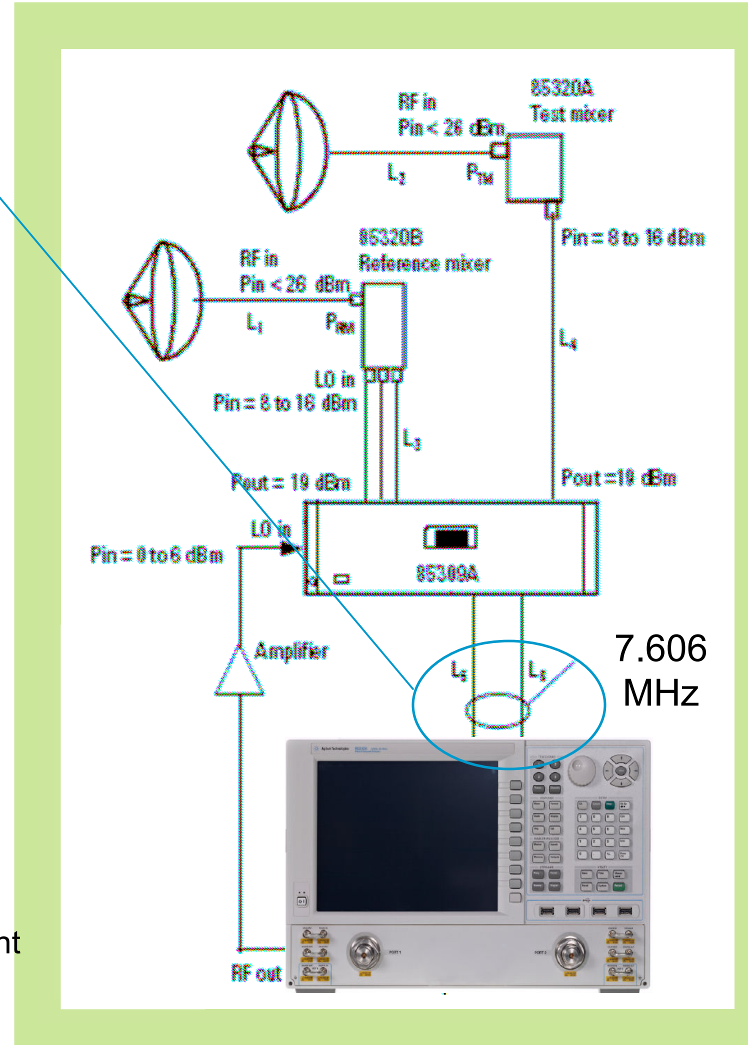
IF power level at the receiver can be calculated by the following:

➢ P_{REF} = P_{RM} – conversion loss of mixers + conversion gain of 85309A – (L_3+L_5)

➢ P_{TEST} = P_{TM} – conversion loss of mixers + conversion gain of 85309A – (L_4+L_6)

Where L = Cable losses as shown in the figure.

Conversion gain of 85309A = 23 dB (typical).



Sensitivity required of the PNA can be calculated by the following:

$$\text{Sensitivity} = P_{REF} - DR - S/N$$

Where

- DR = Required dynamic range
- S/N = Signal-to-noise ratio determined earlier as required of measurement uncertainty

✓ Now, with this sensitivity number, select an analyzer

Choosing an analyzer for External Mixers

Agilent has developed options for the PNA series specifically for antenna measurements.

Family	Model/Option	Frequency range	Frequency stepping speed (10 MHz/pt at max IFBW with no band crossings	Sensitivity at test port with 1 kHz IFBW @ Fmax	Sensitivity at direct receiver input with 1 kHz IFBW (with Opt. 014) @ Fmax	Power out @ Fmax
PNA-X	N5242A	10 MHz to 26.5 GHz	100 uS	< -100 dBm	< -115 dBm	+11 dBm

PNA opt. H11 and PNA-X opt 020, IF input

Family	Model/Option	Frequency range	Sensitivity 1 kHz IFBW	Sensitivity with 10 Hz IFBW	.1 dB compression
PNA	E8362B opt. H11	10 MHz to 20 GHz	< -114 dBm	< -134 dBm	-27 dBm
PNA-X	N5242A opt. 020	10 MHz to 26.5 GHz	< -115 dBm	< -135 dBm	-10 dBm

PNA opt. H11 and PNA-X opt 020, Speed @Max IFBW, CW time

PNA	E8362B opt. H11	10 MHz to 20 GHz	24 uS/pt (data acquisition)	4 IF inputs	IF = 8.33 MHz
PNA-X	N5242A opt. 020	10 MHz to 26.5 GHz	2.4 uS/pt (data acquisition)	5 IF inputs	IF= 7.606 MHz

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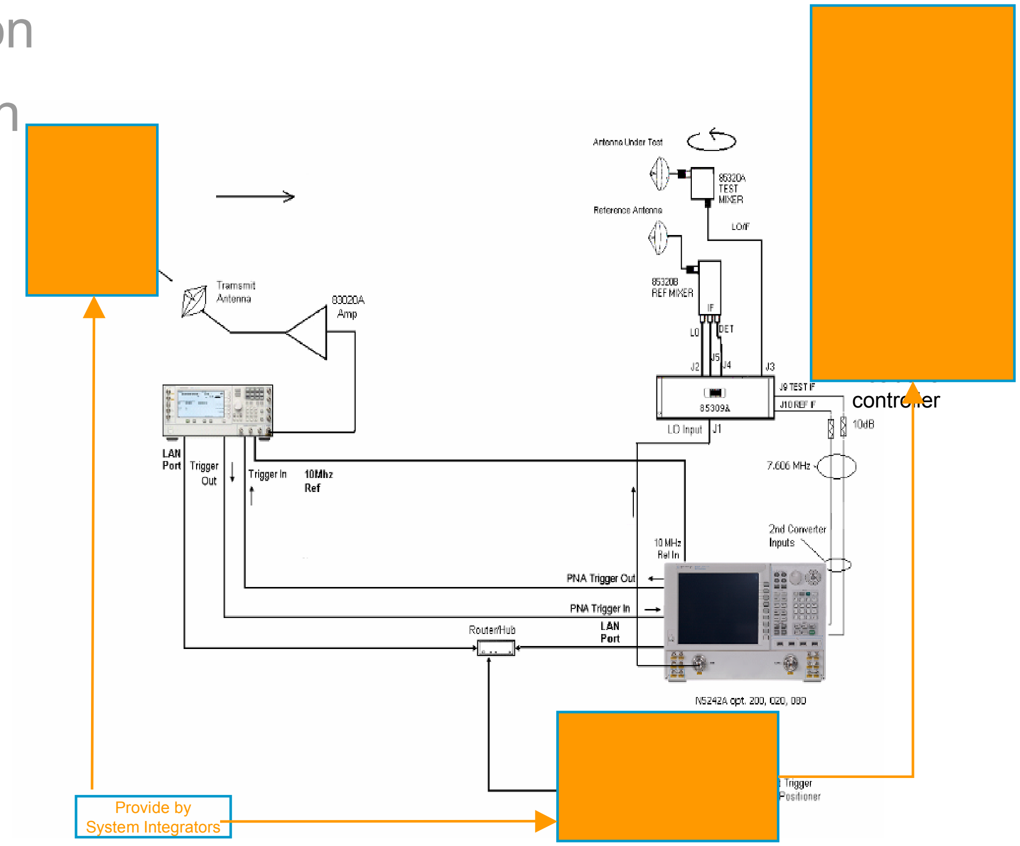


Measurement Speed

Measurement speed is made up of many components.

- The speed displayed on the analyzer is only one part of the actual speed.
- Total measurement speed you can either measure it directly, or get an estimate from an equation.

Calculating Approximate Speed

The approximate speed of the PNA can be calculated:

Total Measurement time = data taking + pre-sweep time + band crossing + retrace

Where: Data taking ~ 1/IFBW (PNA IFBW) +

Description	PNA	PNA-L	PNA-X
Pre-sweep (swept mode)	~ 222 uS	~ 56 uS	~ 30 uS
Band crossings	~ 4 – 8 mS	~ 2 mS	~ 800 uS
Retrace	~ 10 – 15 mS (display on), 5 - 8 mS (display off)		

Measurement Speed Example

Configuration: PNA with 201 points, 1 GHz span, 10 kHz BW sweep

1. Determine if step or swept. (IF BW <= 1kHz or time/point > 1 mS, then stepped otherwise swept.)
2. Data taking: 1/IFBW=1/10 kHz = 100 uS (Swept mode)

   So 201 points * 100 uS/point = 20.1 mS
3. Pre-sweep time: 222 uS
4. Band crossings: None
5. Retrace time: 10 to 15 mS

Total measurement time = 20.1 mS + 222 uS + 10 to 15 mS

= **30 to 35 mS (NOMINAL)**

Agenda

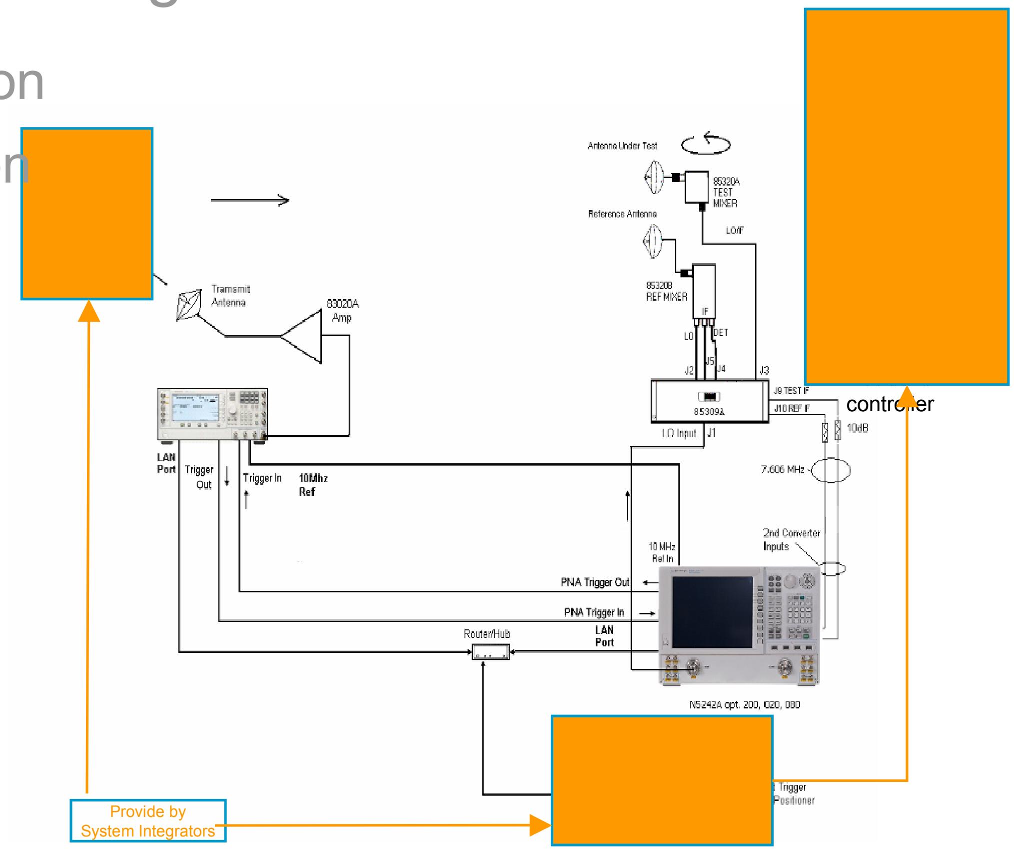
✓Overview of antenna applications

✓Antenna Measurement Design Considerations

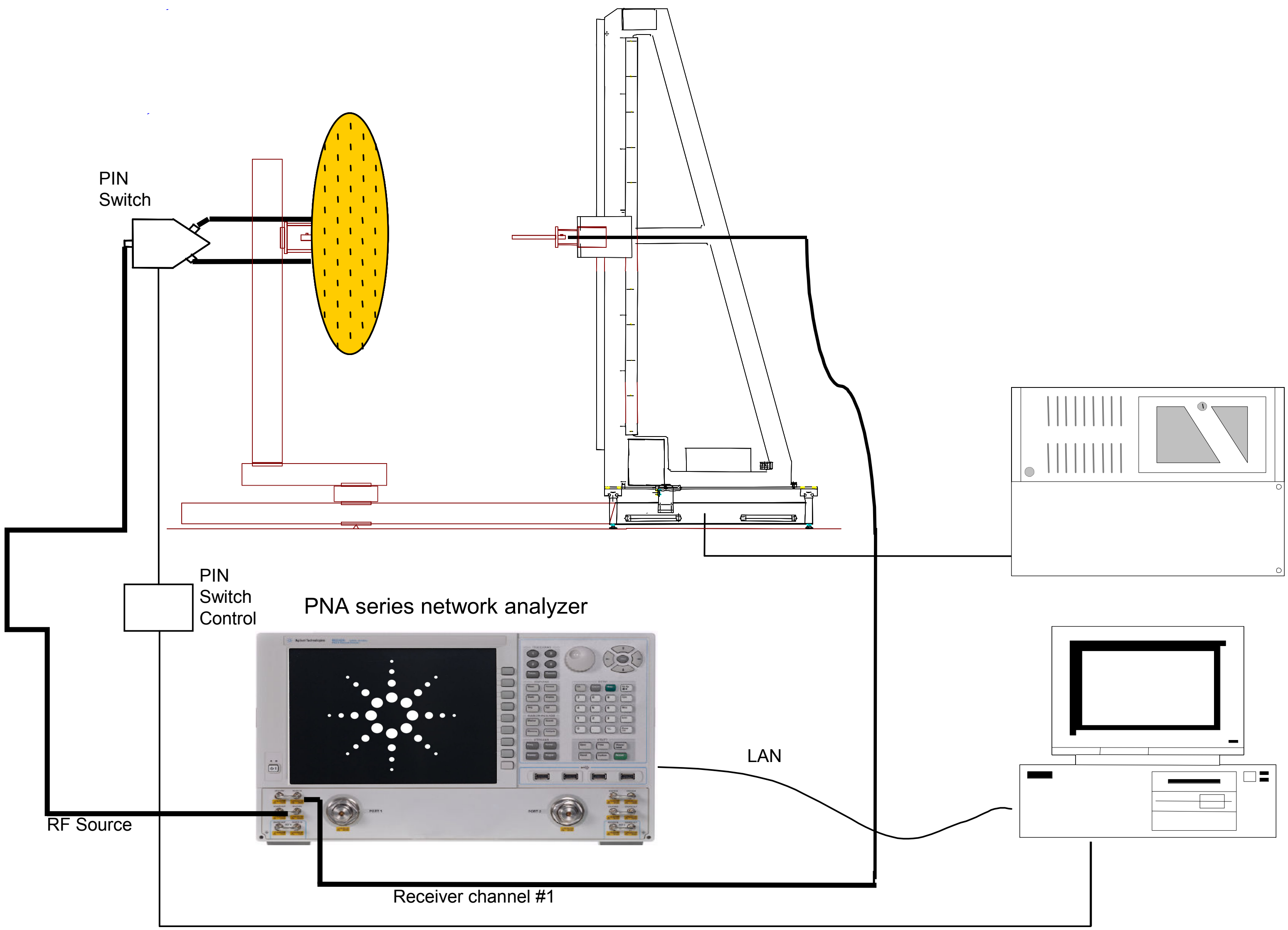
- ✓Transmit Site Configuration
- ✓Receive Site Configuration
- ✓Receiver Speed

➢ Summary

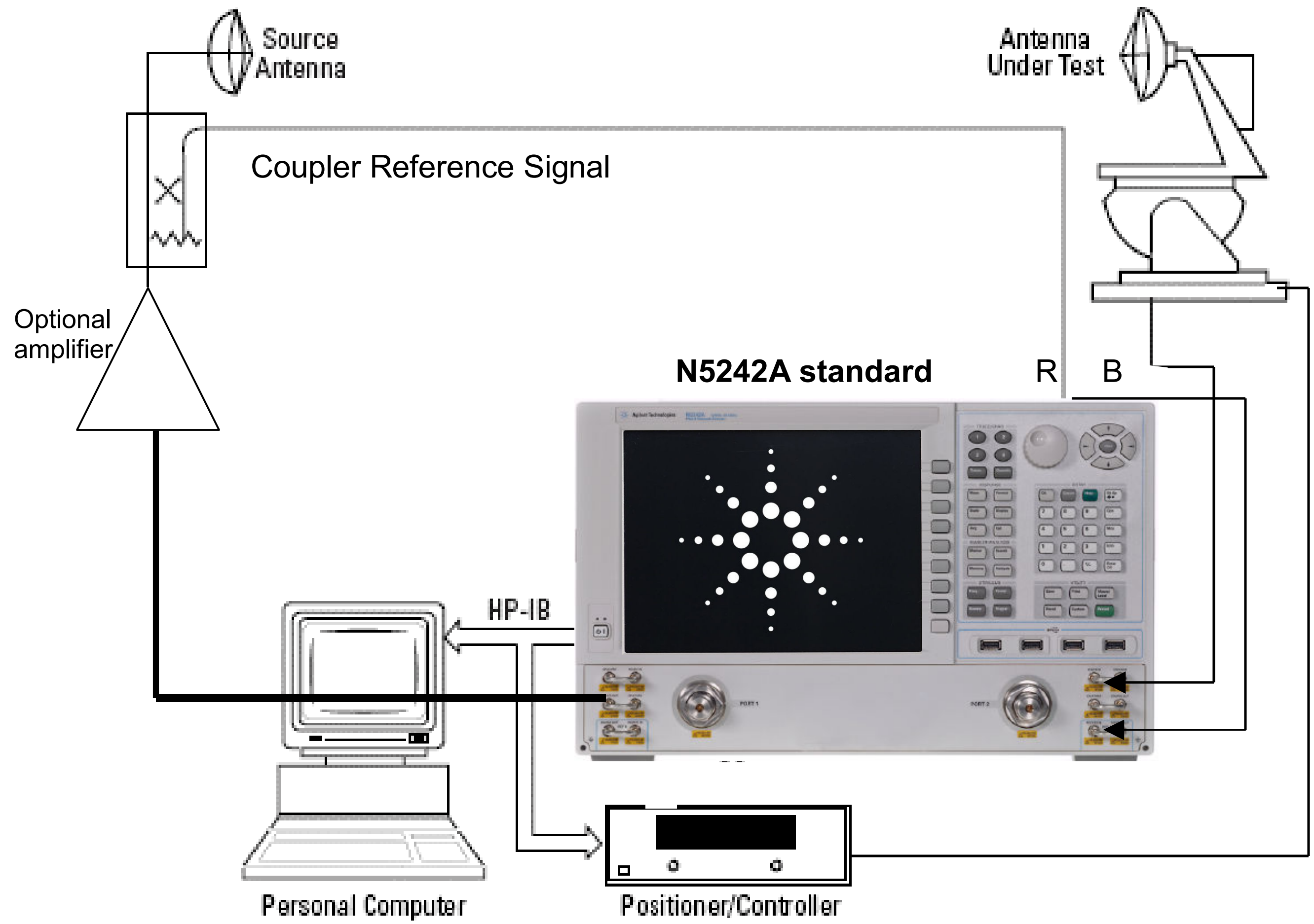
- ➢ Typical Solutions
- ➢ New Solutions



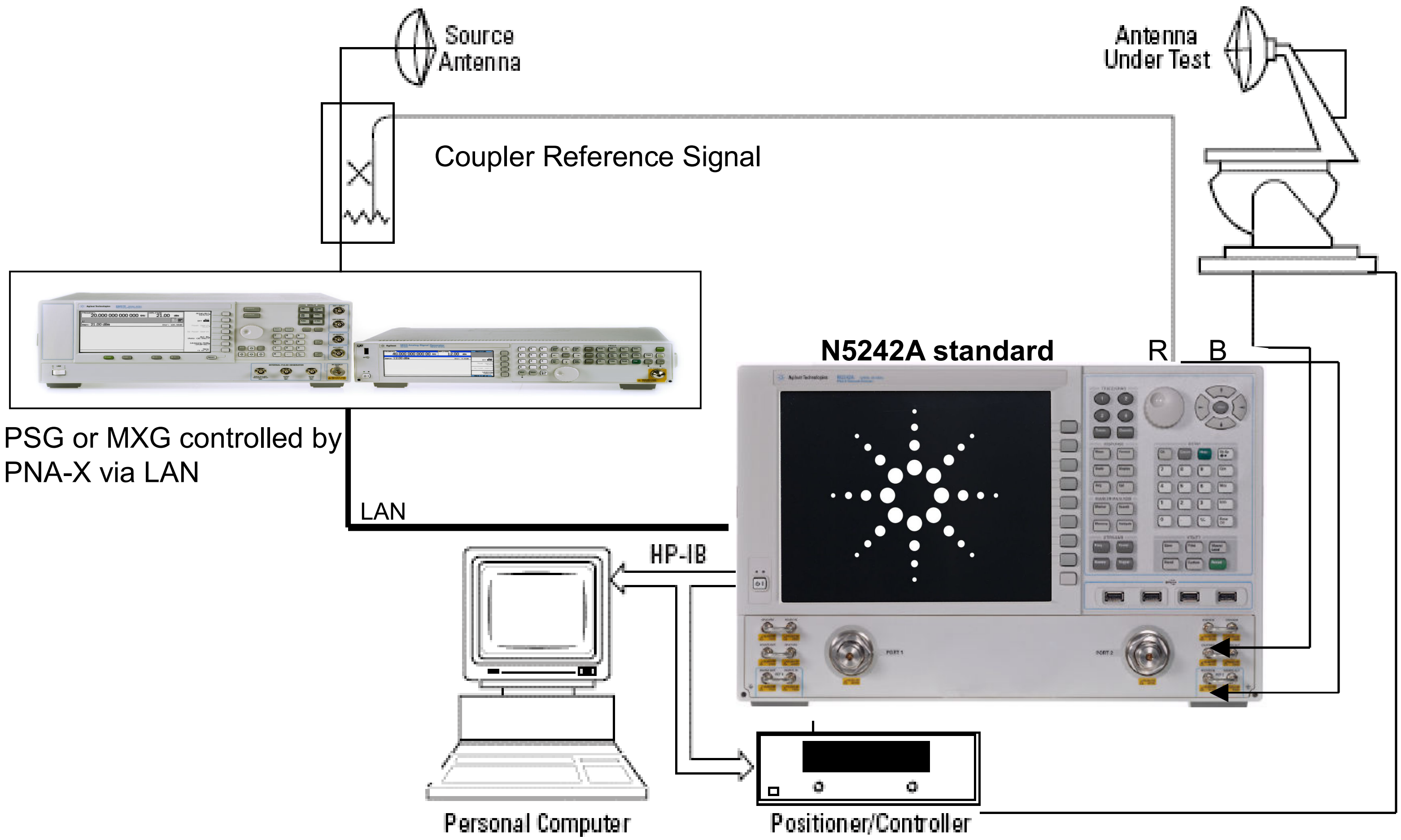
ypical near-field antenna measurement configuration using a PNA-X



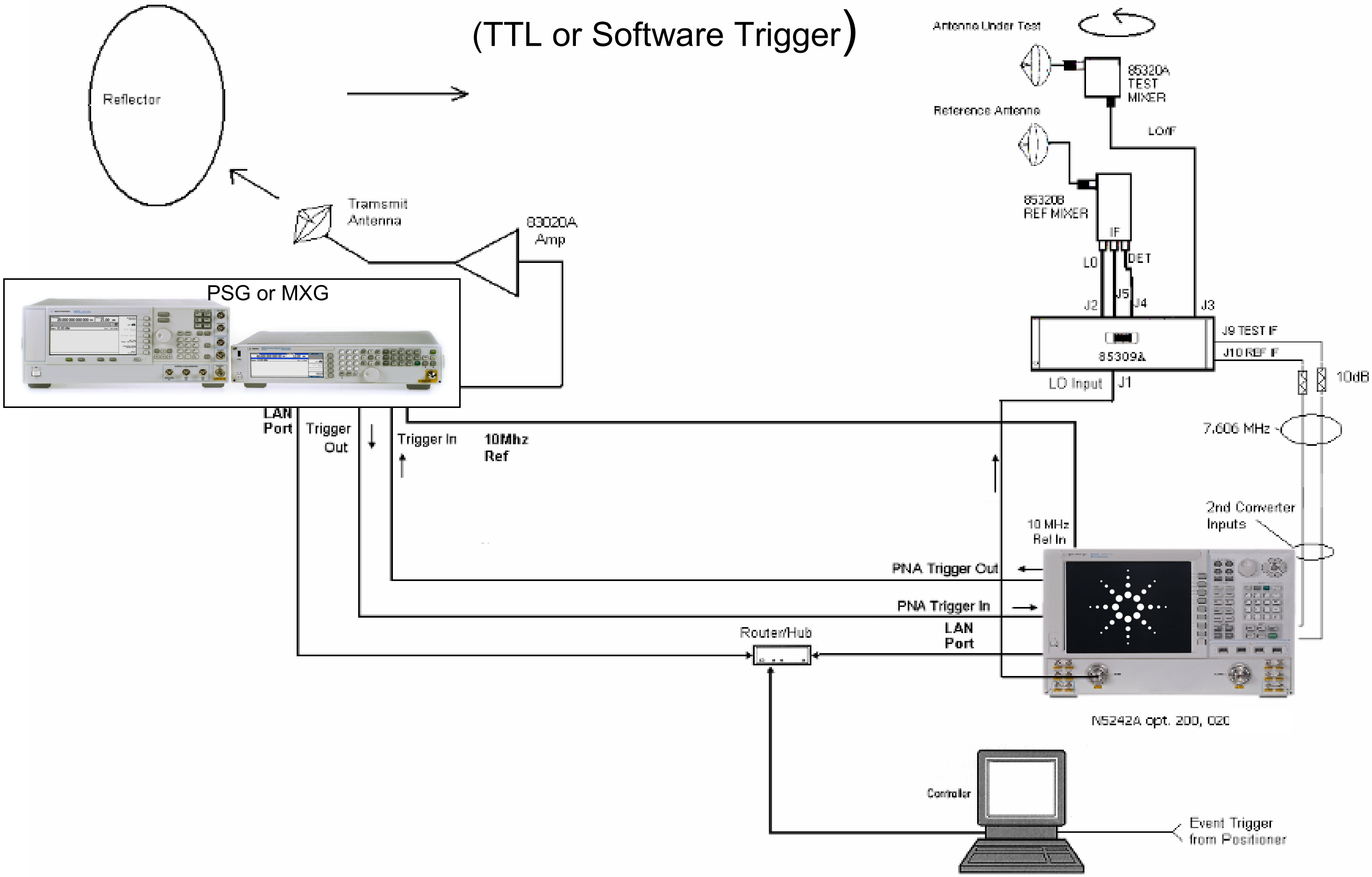
Typical PNA-X Far Field Configuration



Typical PNA-X Far Field Large Range Configuration

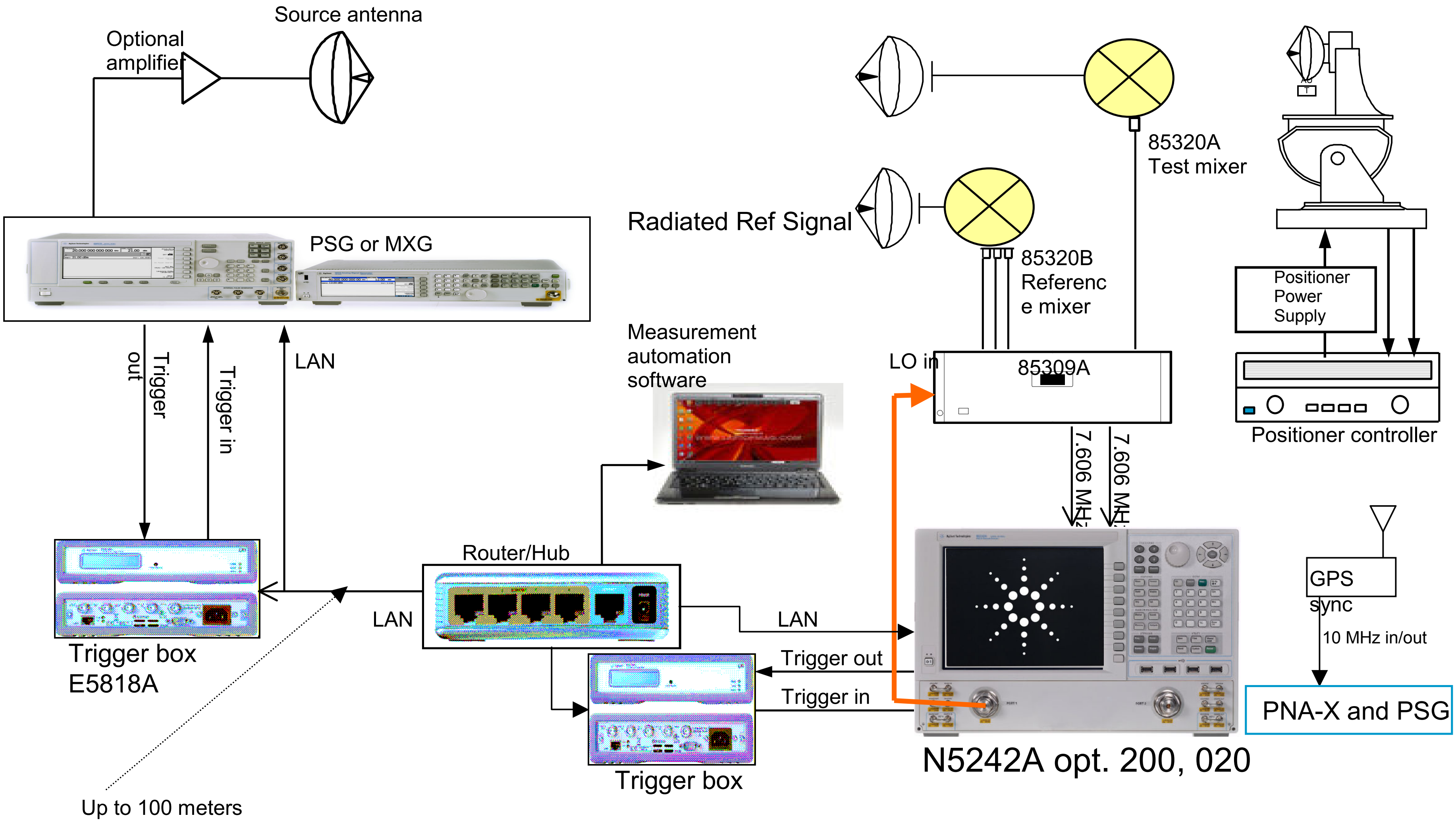


Typical PNA-X for Compact Far-Field Configuration



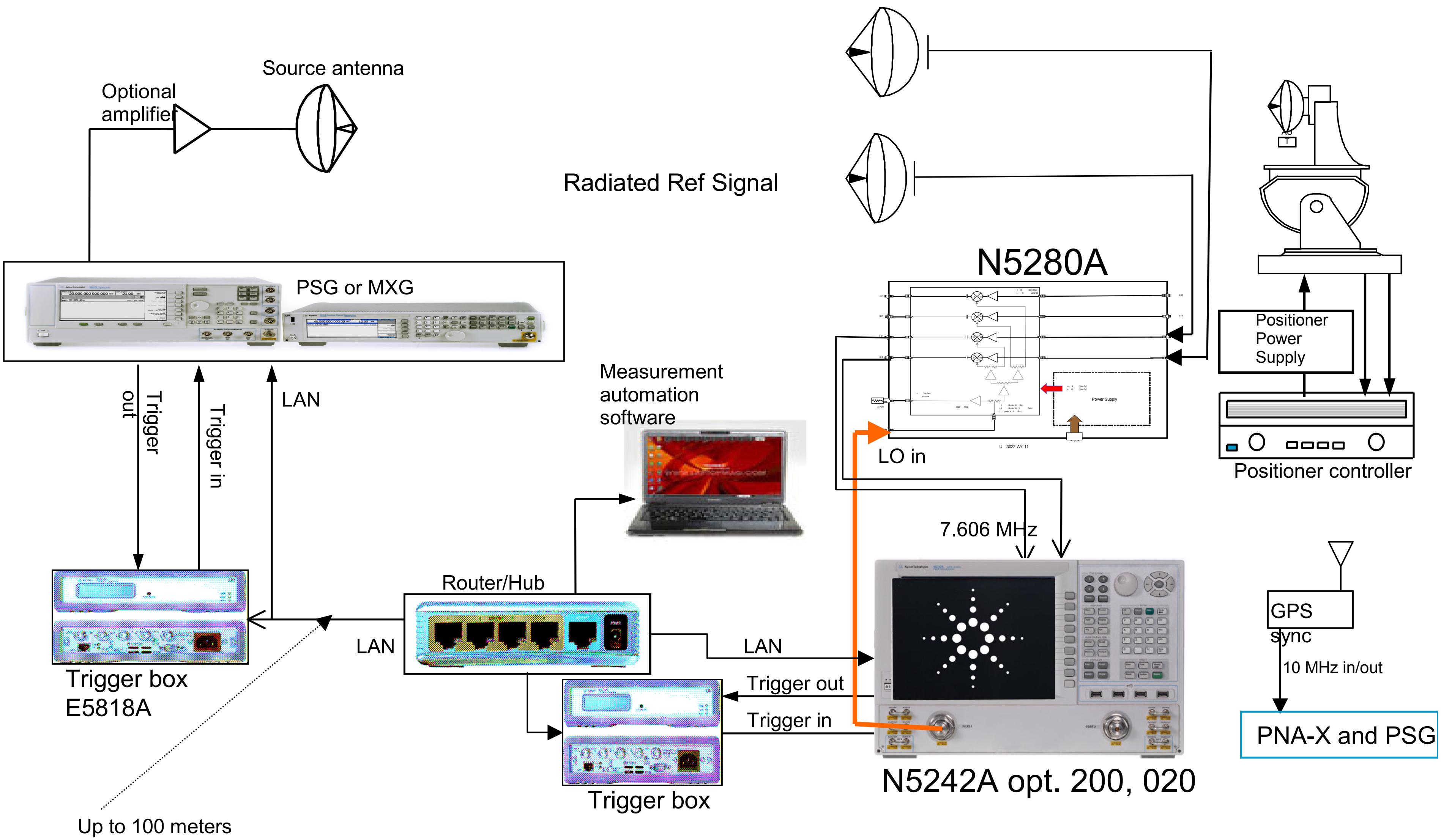
2-Port PNA-X Far Field Outdoor Antenna Measurements

(TTL or Software Trigger)



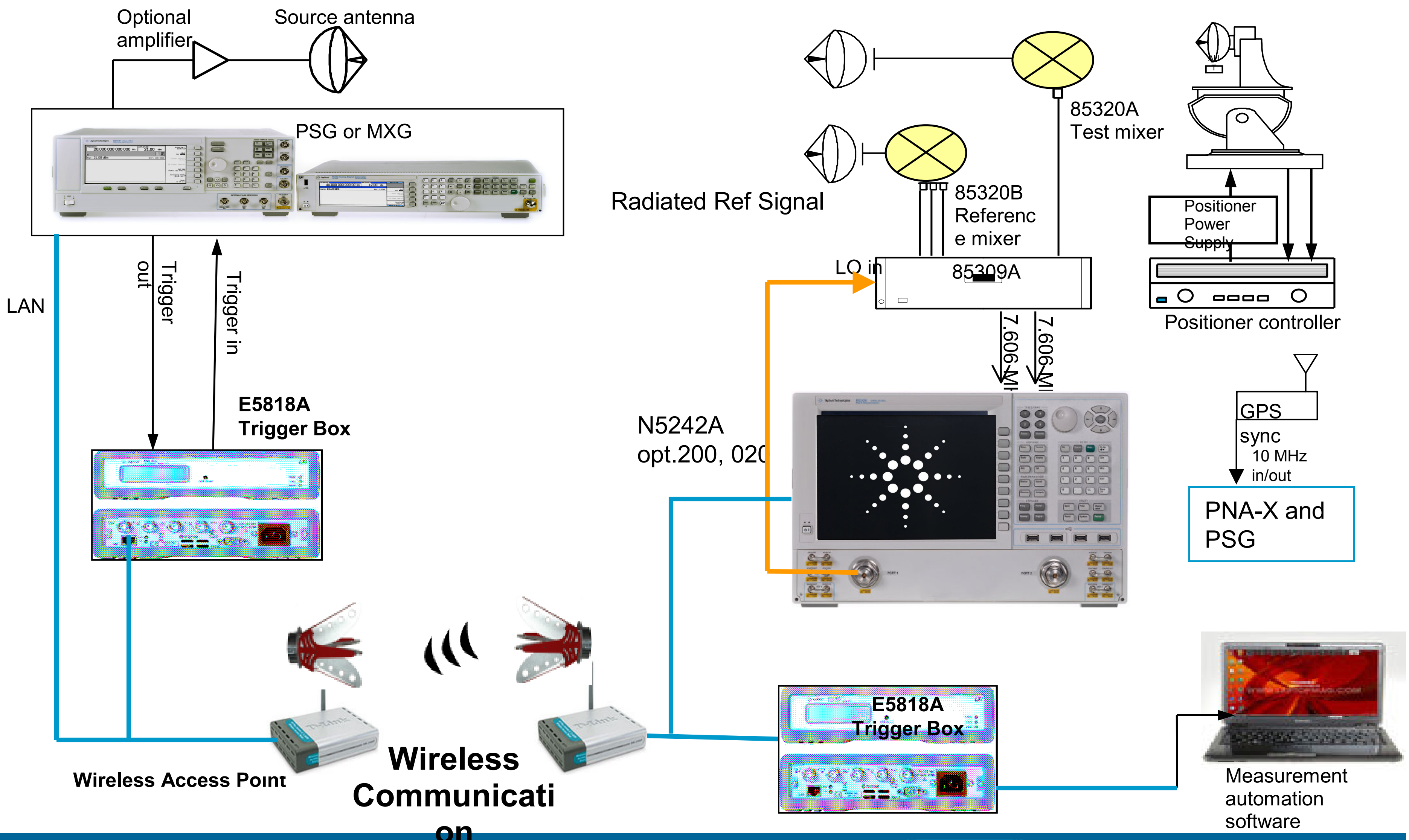
2-Port PNA-X Far Field Outdoor Antenna Measurements

(TTL or Software Trigger)



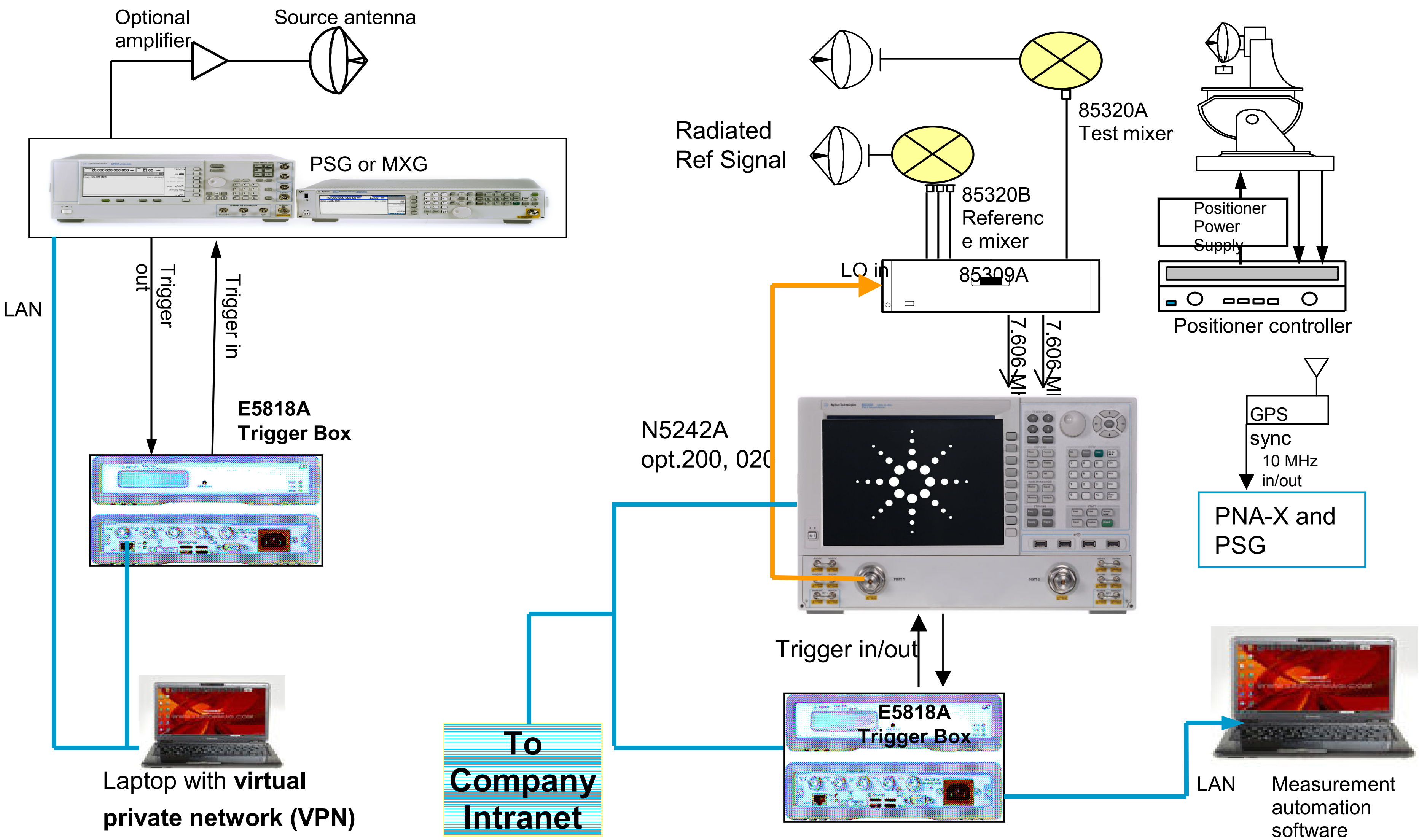
2-Port PNA-X Far Field Outdoor Antenna Measurements

(Hardware, TTL or Software Trigger Wireless trigger)

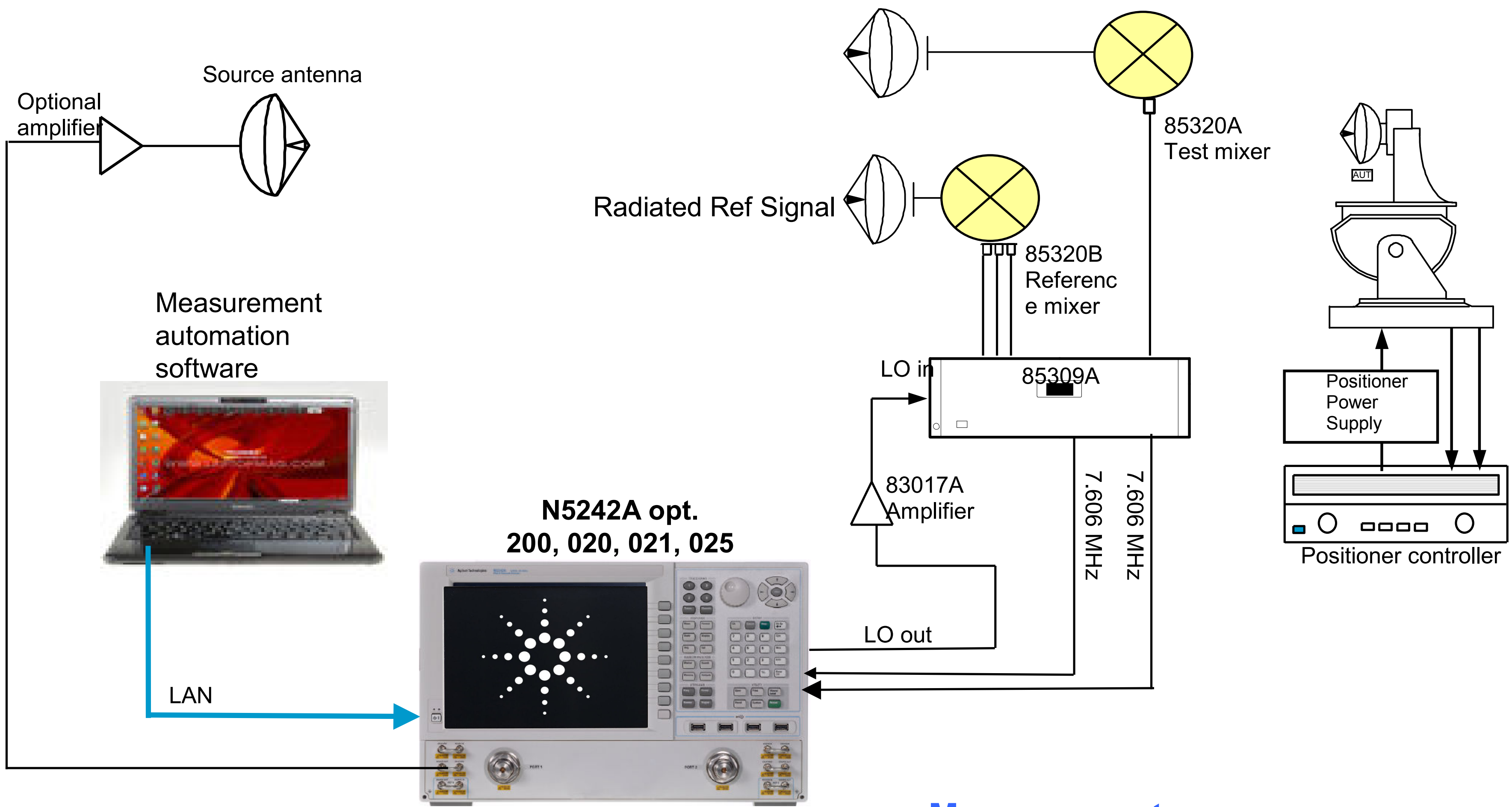


2-Port PNA-X Far Field Outdoor Antenna Measurements

(Hardware, TTL or Software Trigger Wireless trigger)



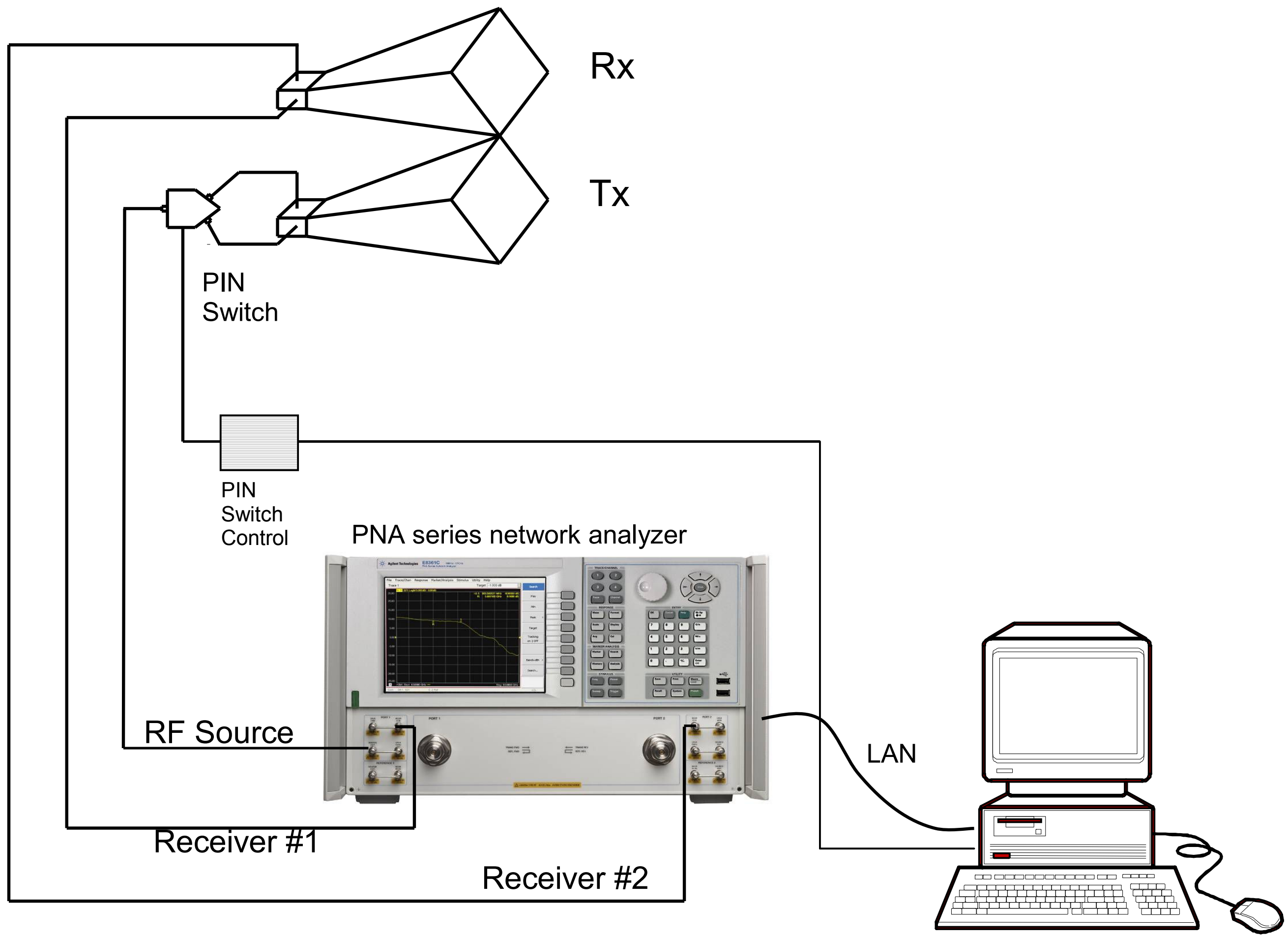
PNA-X Pulsed Antenna Configuration



Measurements:

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

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



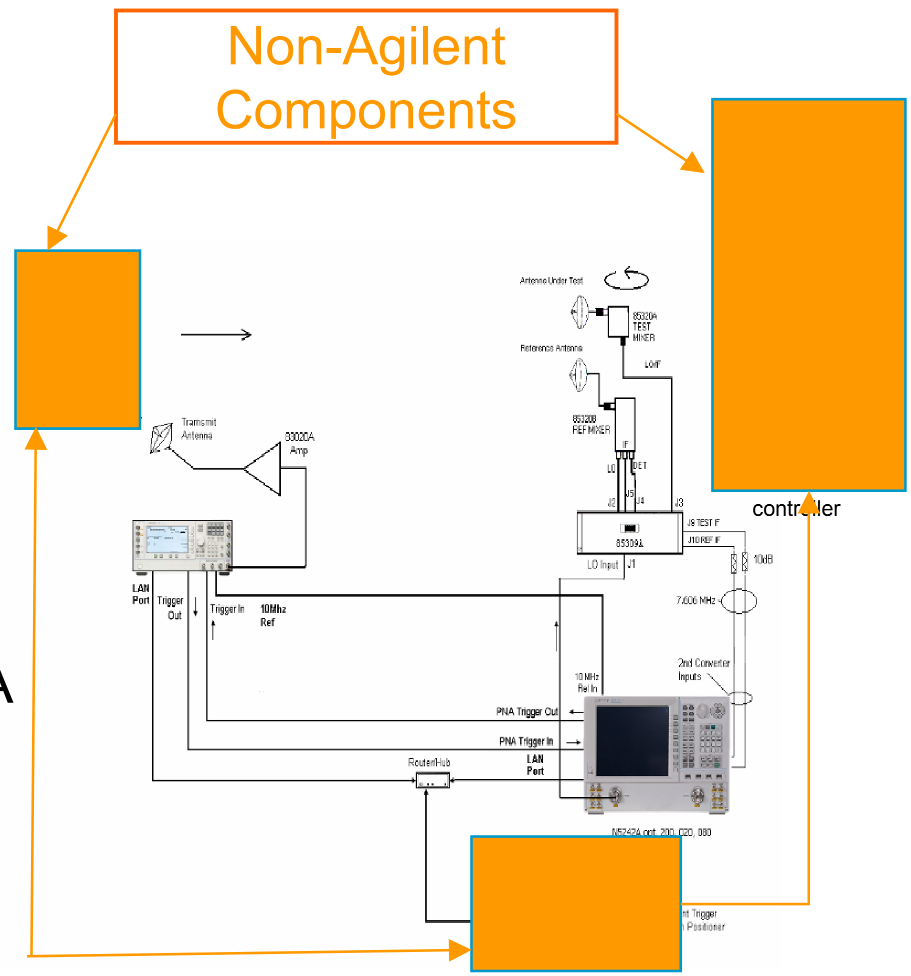
PNA-X Features and Benefits for Antenna Test

PNA-X Replaces 8530A for Antenna Measurements

Antenna Test Requirements	***Features***	***Benefits***
	Mixer-based architecture	Improve sensitivity
	Selectable IFBW	Trade off sensitivity for speed
Sensitivity	Options 020, IF input	Increase sensitivity
Speed	Fast data transfers with COM/DCOM	Up to 10 times faster than using GPBI interface (8530A)
	LAN connectivity	Built-in 10/100 Mbs LAN interface
Flexibility & Accuracy	Five simultaneous test receivers	Five Independent receivers path (simultaneous Co-Pol/Cross-Pol)
Pulsed Measurements	Option H08, Spectrum Nulling Technique	- Internal hardware gates - Average, Point-in-pulse, and Pulsed profile testing
Security	Removable hard drive Memory clearing & sanitization Frequency blanking	No security compromise when taking PNA of out secured environment

Agilent's RF Subsystem components

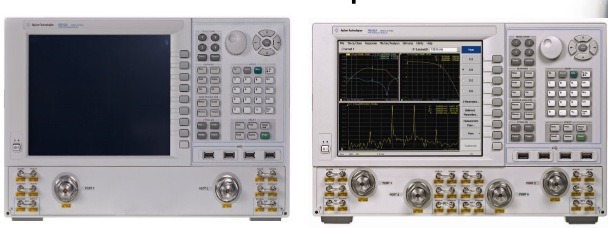
Model #	Description
85309A	LO/IF distribution unit
85310A	Distributed frequency converter
85320A	Test mixer module
85320B	Reference mixer module
85331B	SP2T absorptive PIN switch, 0.045-50 GHz
85332B	SP4T absorptive PIN switch, 0.045-50 GHz



RF sources (ESG, PSG or MXG)

PNA

PNA-X 2 or 4-port

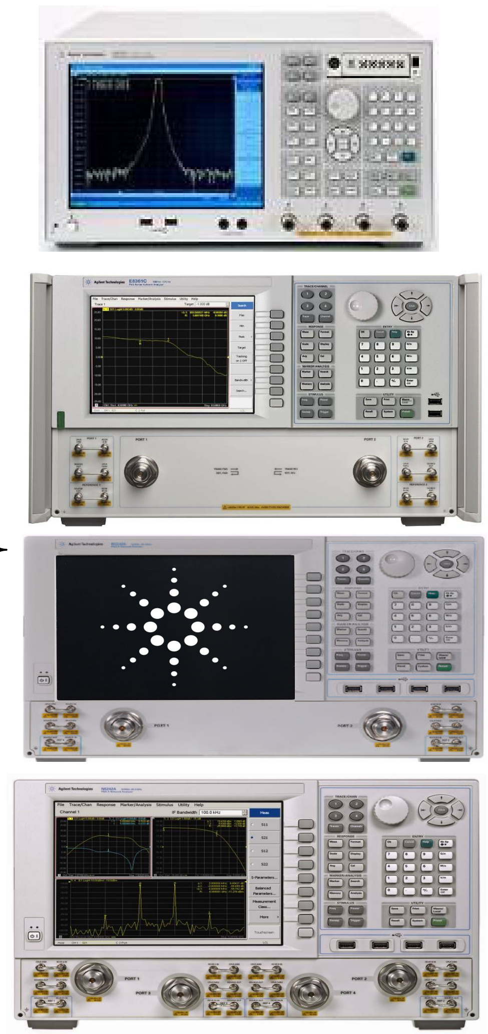


Agilent's RF Subsystem components

(continuing to improve antenna RF components)

Today's choice:

Agilent's VNA is excellent choice Antenna Receiver



Future's choice:

Distributed or Dedicated hardware RF components with more points, faster speed and higher sensitivity.

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/

NSI
ANTENNA MEASUREMENT SOLUTIONS

http://www.nearfield.com/

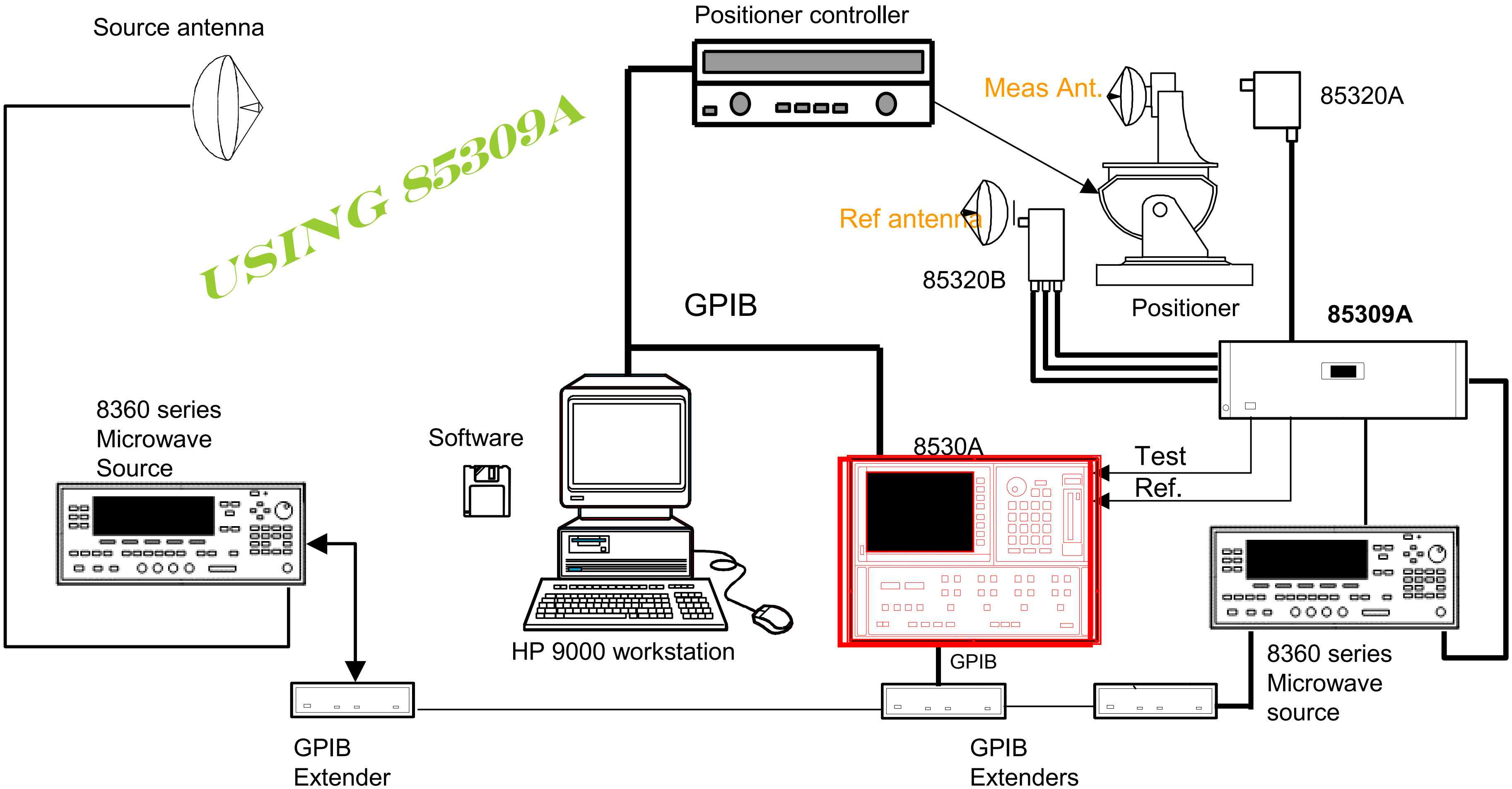
SATIMO
The microwave vision company

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

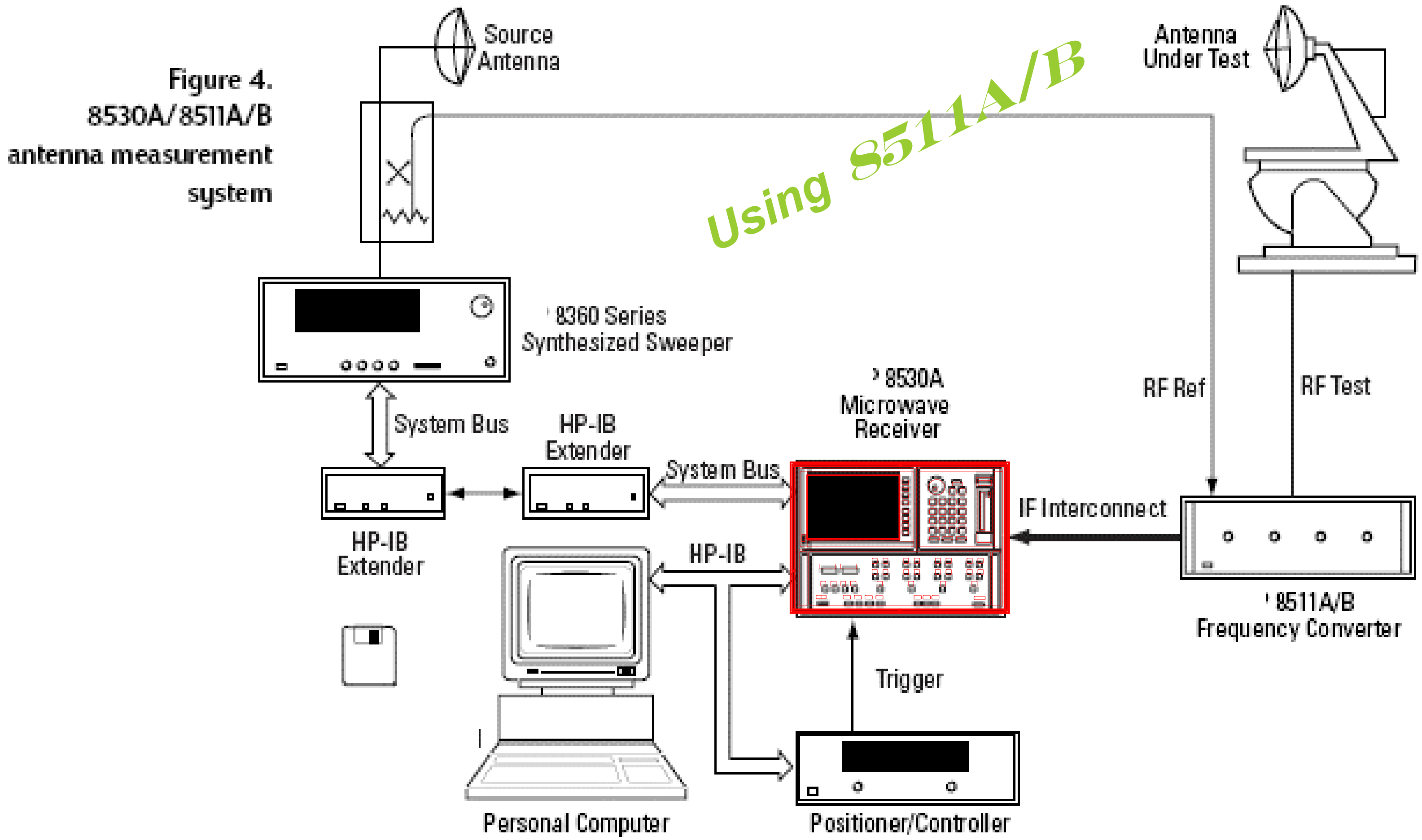
SPC

http://www.sysplan.com/

8530A (85301B) Far-Field Configuration



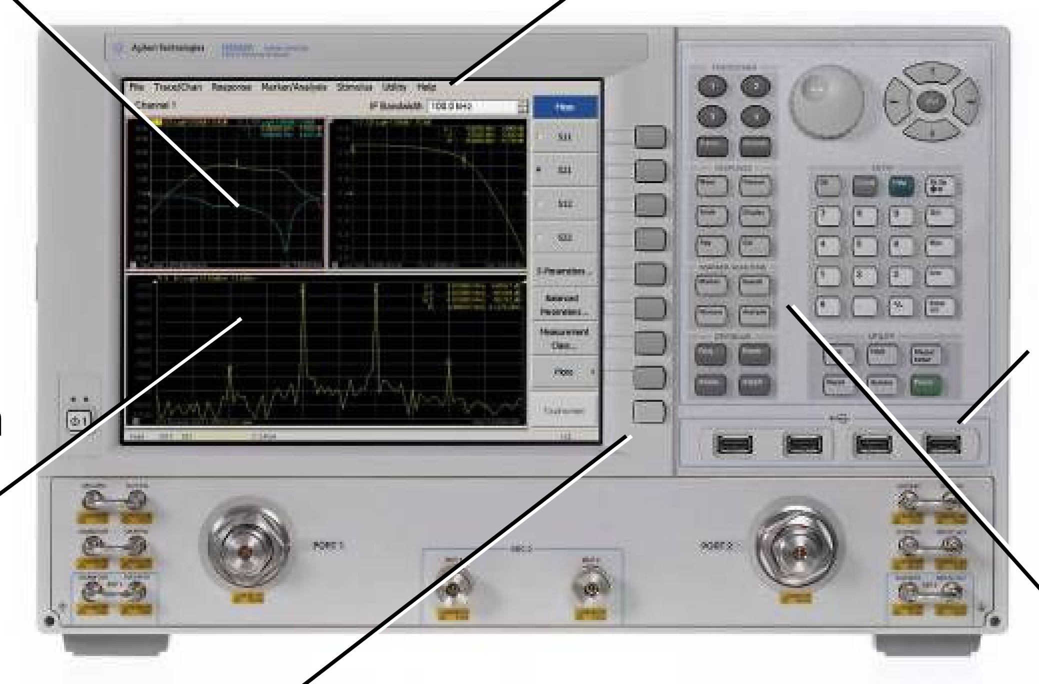
Typical 8530A (85301C) Far Field Configuration



Product Features – User Interface

Crisp viewing of data with 10.4” standard touch-screen, high-resolution display

Quick and easy operation using hard/soft keys or pull-down menus



Mouse zoom plus “click and drag” markers

Convenient access to USB ports for ECal, flash drives, mouse, etc.

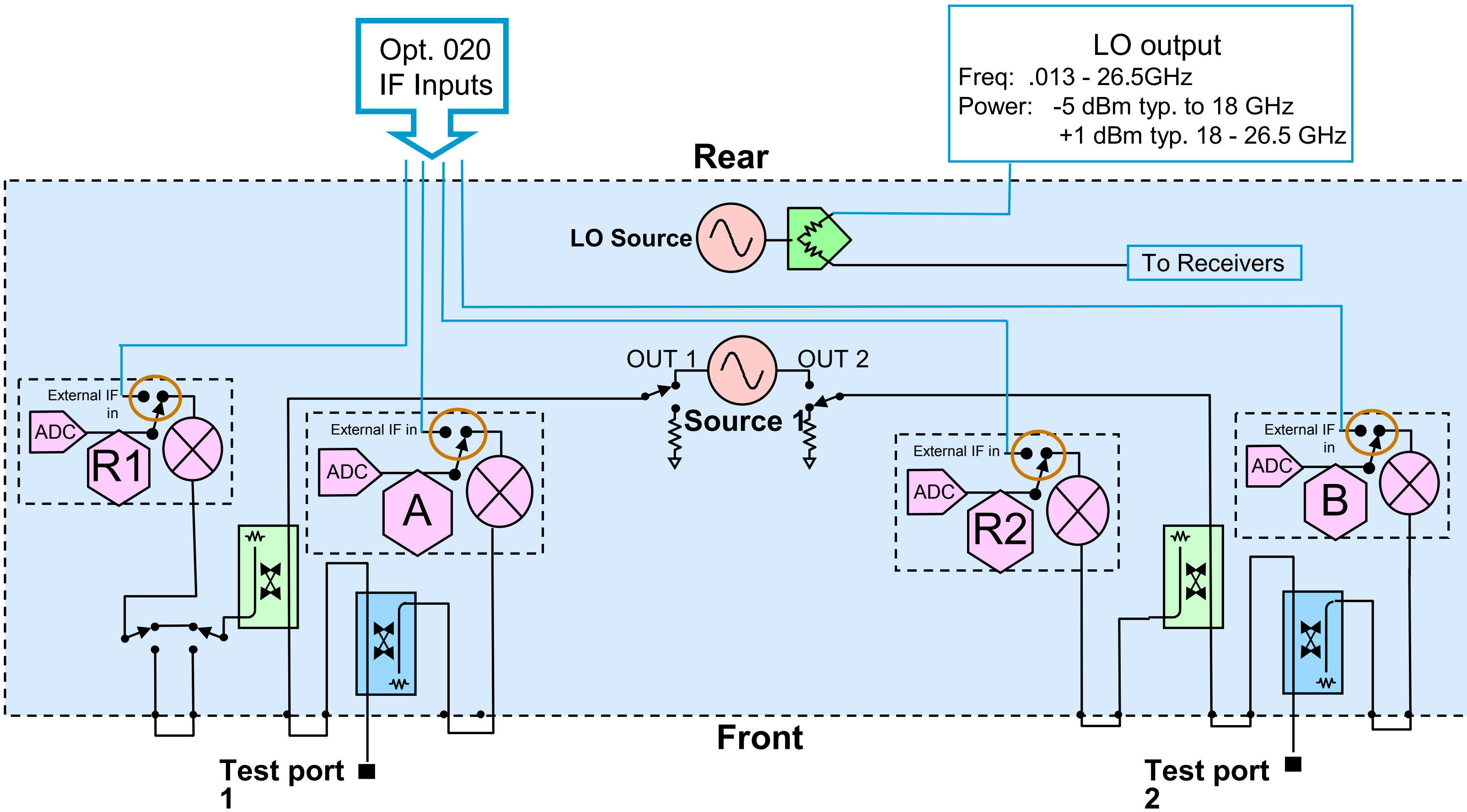
Eight soft keys plus “user key” for your favorite functions

Simplified set of hard keys (similar to 8753/8720/ENA)

PNA-X: Rear Panel

N1966A
Pulse I/O
Adapter

2-Port PNA-X Option 020



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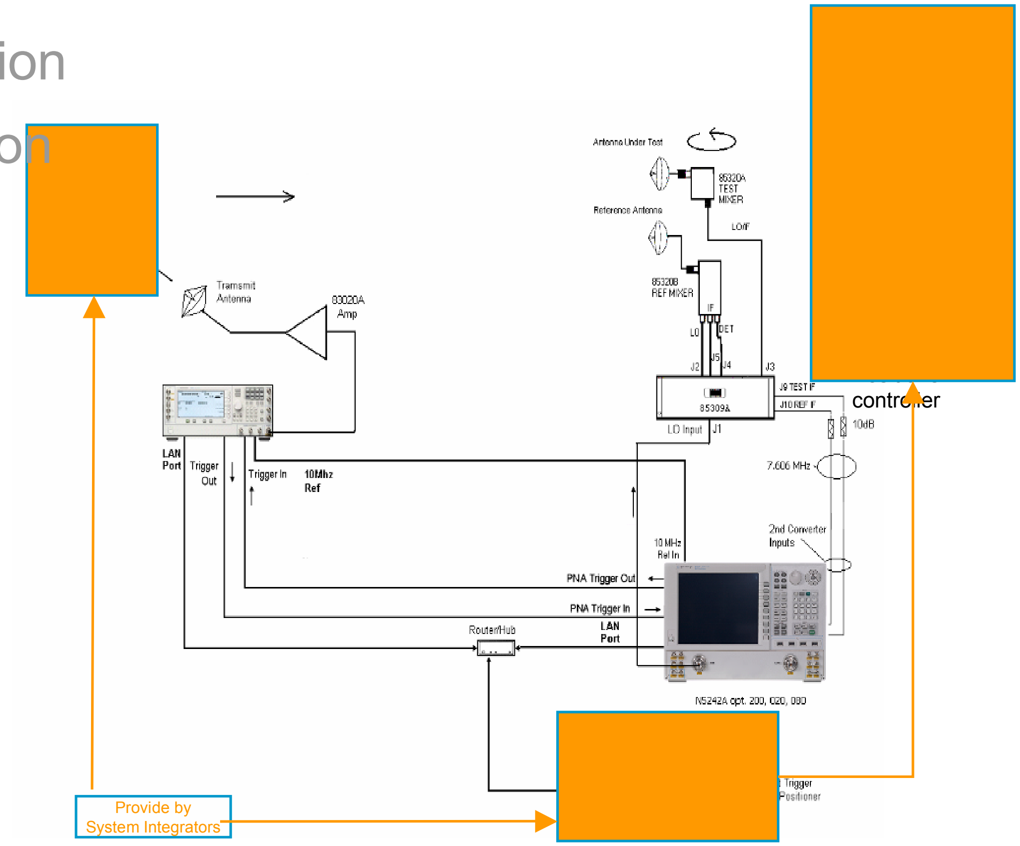
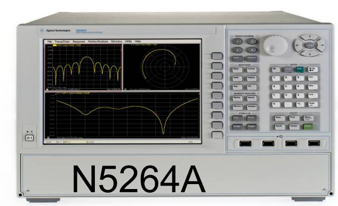
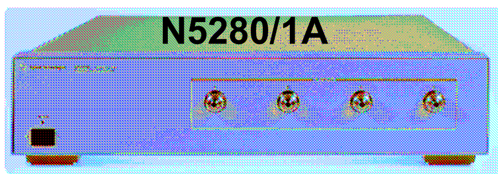


Agilent's RF Subsystem components

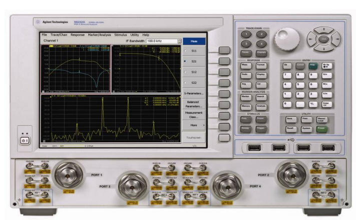
Model #	Description
N526A	PNA-Measurement receiver
N5280/1A	Frequency converter
85309A	LO/IF distribution unit
85310A	Distributed frequency converter
85320A	Test mixer module
85320B	Reference mixer module
85331B	SP2T absorptive PIN switch, 0.045-50 GHz
85332B	SP4T absorptive PIN switch, 0.045-50 GHz





RF sources (ESG, PSG or MXG)

PNA-X 2 or 4-port



PNA

Agilent's RF Subsystem components

Model #	Description
N526A	PNA-Measurement receiver
N5280/1A	Frequency converter
85309A	LO/IF distribution unit
85310A	Distributed frequency converter
85320A	Test mixer module
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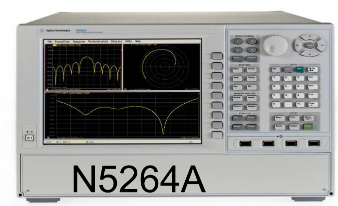
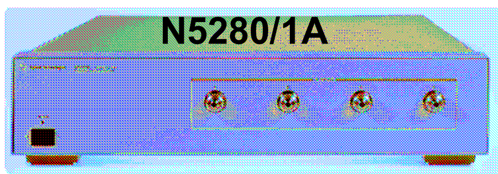
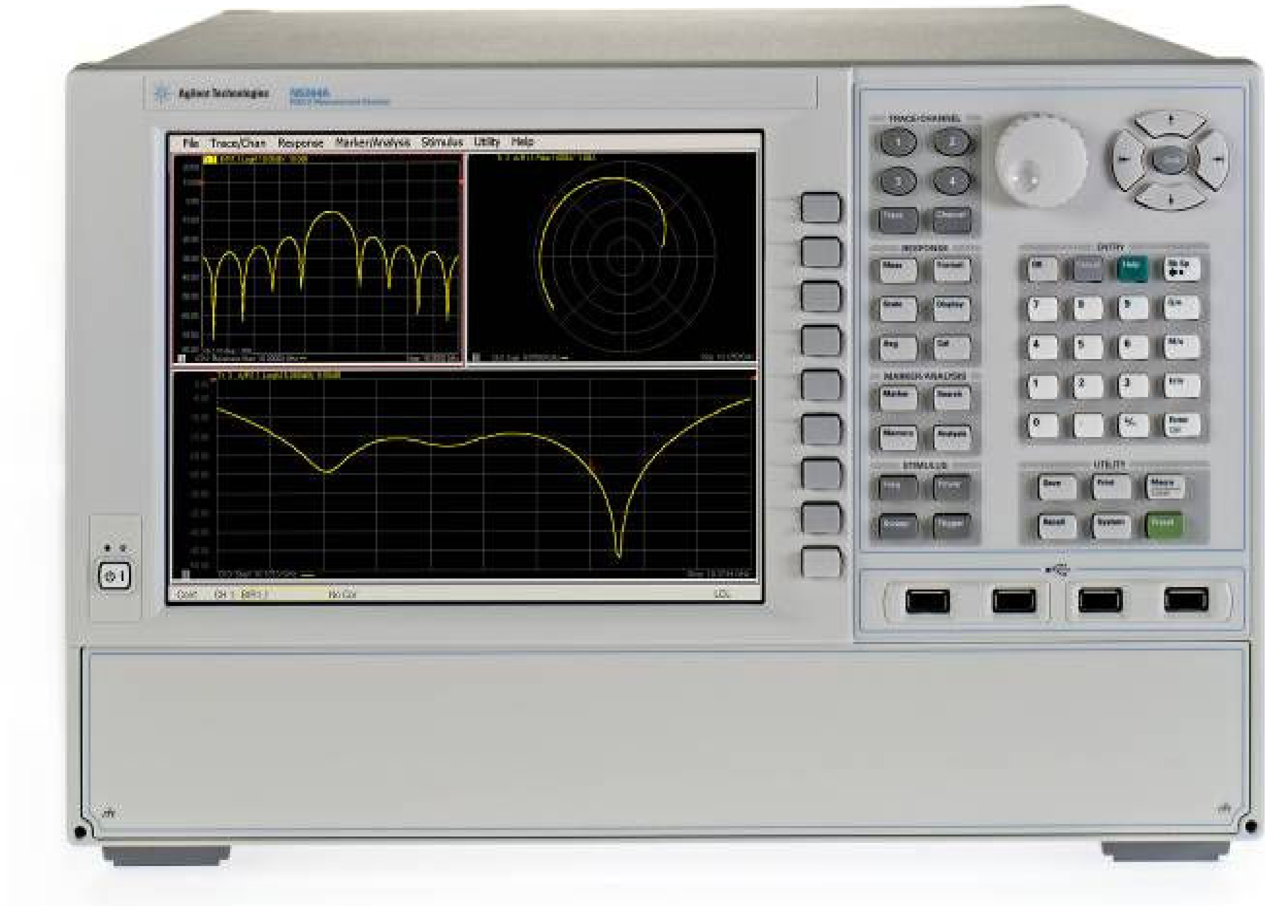




PNA

N5264A Measurement Receiver



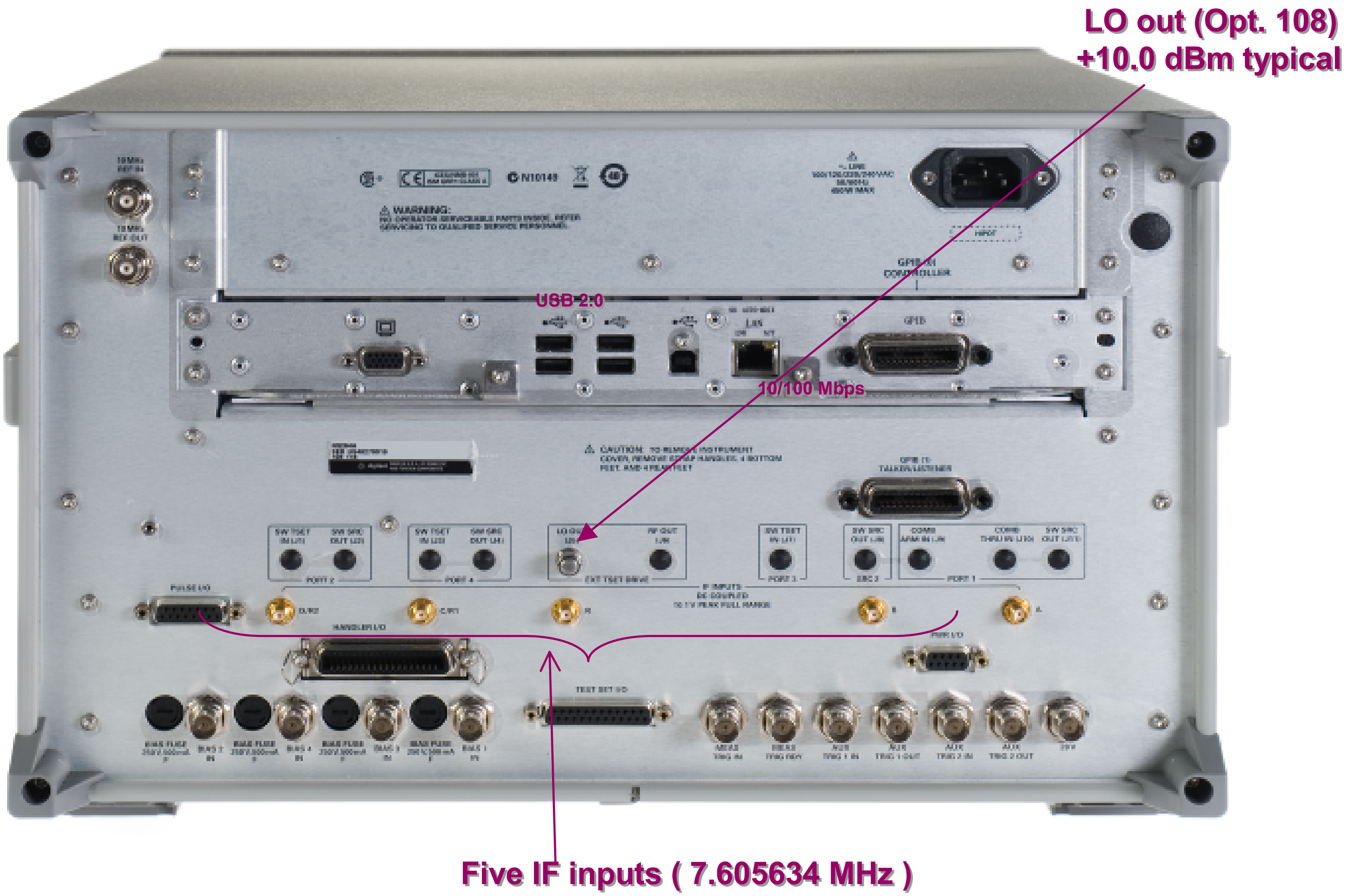
No connectors on front panel

What Is N5264A PNA-X Measurement Receiver?

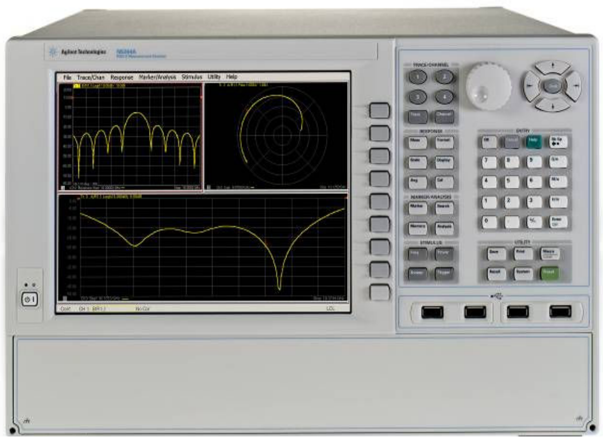
N5264A is:

- Dedicated IF receivers for antenna test
- Built on well established PNA-X N5242A VNA.
- PNA-X without sources, mixers, couplers and test ports
- 8530A replacement

N5264A PNA-X Measurement Receiver



Product Briefing:
N5264A PNA-X Measurement Receiver



Product Description:

N5264A is Measurement Receiver for antenna and system level applications. This product built on well established PNA-X N5242A VNA.

Hardware configurations:

- N5264A Receiver only (8530A equivalent) = $50,323.00 US
- N5264A opt. 108 adds LO source = $20,540.00 US

Software options:

- 118 Fast-CW mode (400,000 pts/Sec) = $10,290.00 US
- 010 Time domain = $9,570.00 US

Key Features:

- ✓ Five IF inputs available for simultaneous measurements.
- ✓ Built-in 26.5 GHz source as optional option (option 108)
- ✓ Fast-CW mode, opt. 118 (enabling infinite measurement durations).
- ✓ Point mode (enabling point averaging).
- ✓ 8530A Drop-in replacement.
- ✓ Built-in 8530A code emulation.

Key Specifications:

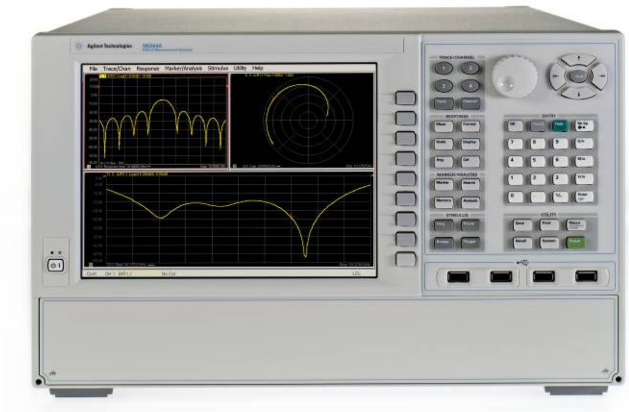
- ✓ Data acquisition time (speed) = 400,000 / Sec (Opt. 118 Fast-CW mode)
- ✓ Input compression point (.1dB)= -10.00 dBm
- ✓ Sensitivity (noise floor) = -145 dBm (worst case @10Hz IFBW, 0 average)
- ✓ Dynamic Range = 135 dB (worst case @10Hz IFBW, 0 averages)
- ✓ Measurement Receiver = 5 with 5 inputs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

Target Users:

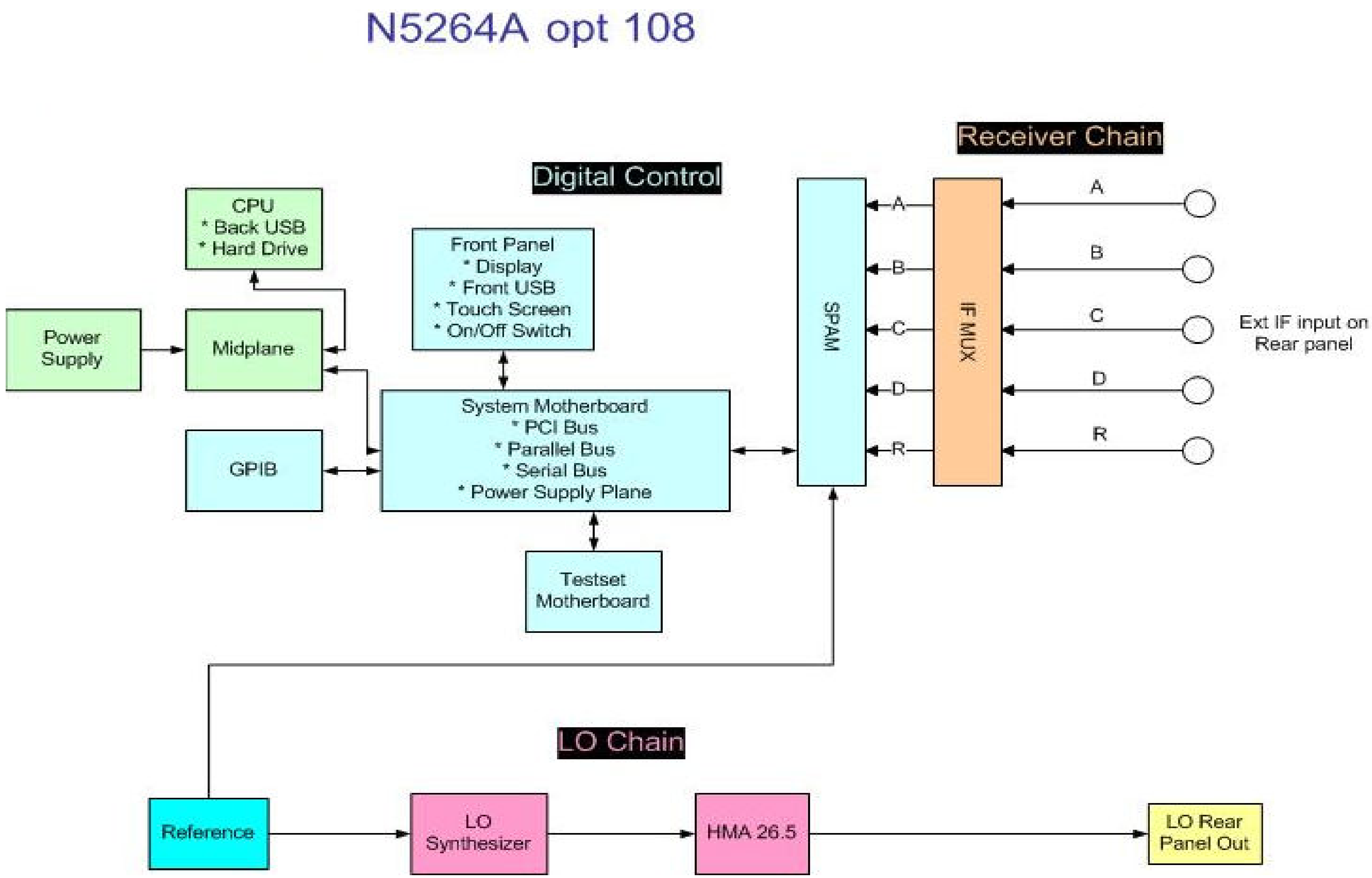
- ✓ All 8530A antenna end-users
- ✓ All antenna system integrators

Key Applications:

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



N5264A Block diagram



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

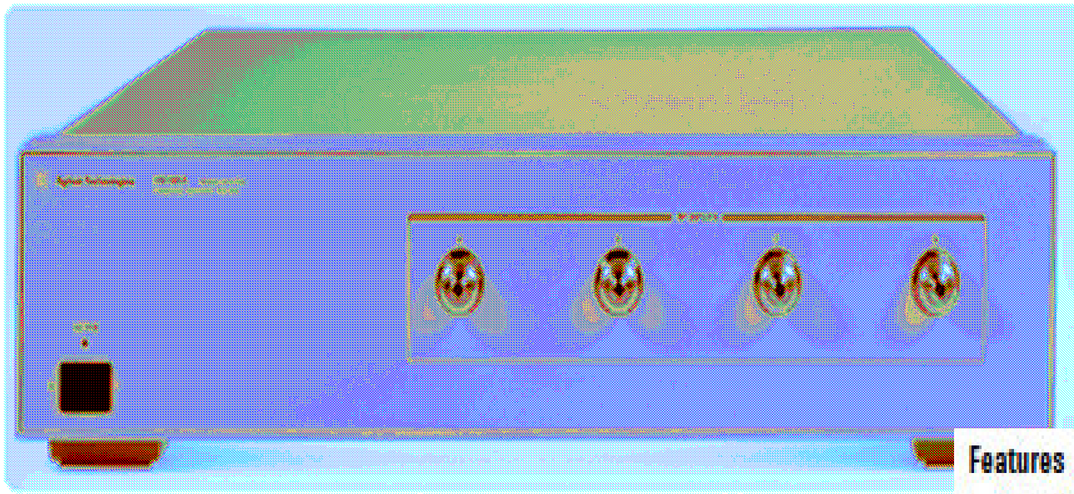
N5280/1A Frequency converter

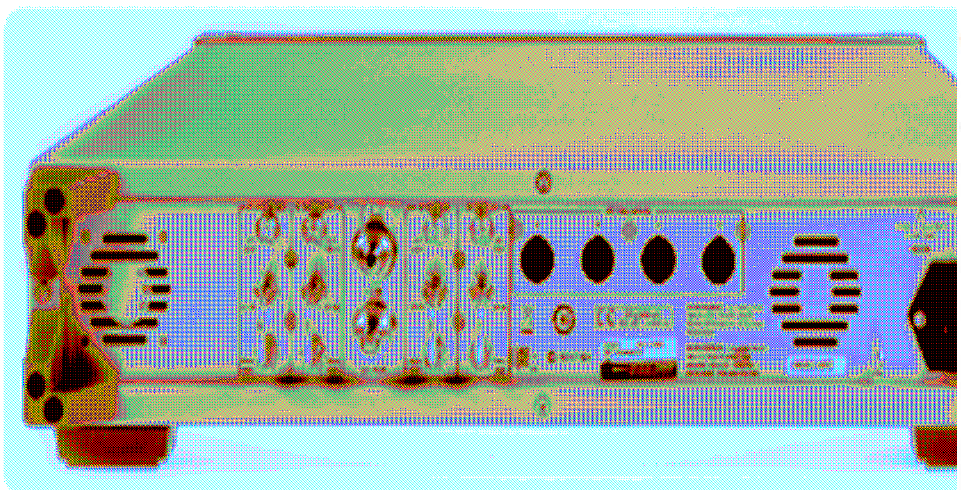
N5280A replaces 8511A/B

Freq. = .010 to 26.5 GHz

LO input = + 5 dBm

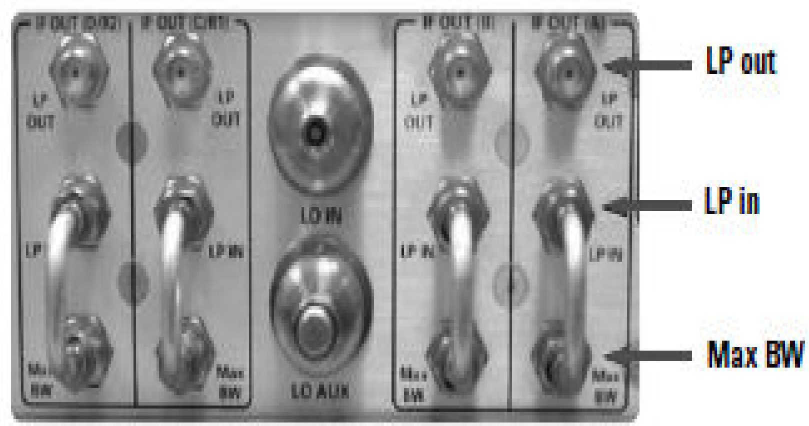
IF out = .007 to 1.5 GHz





Features

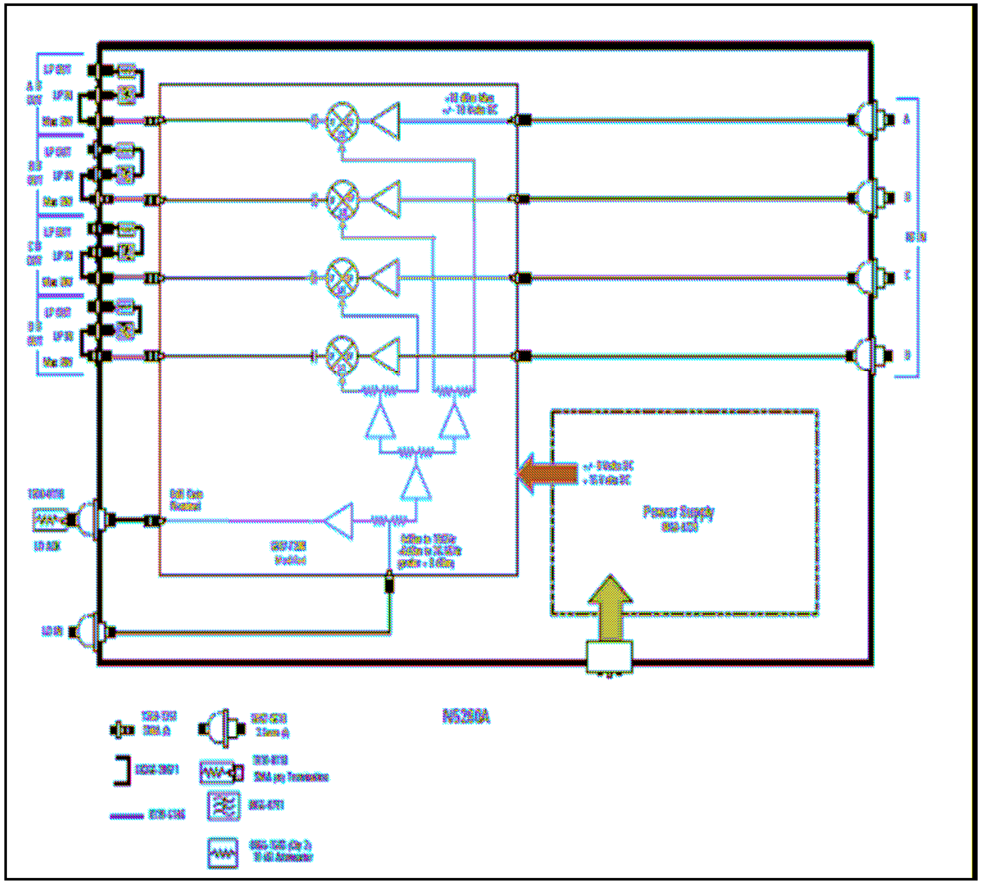
- Four measurement inputs
- Exceptional low noise floor with fundamental mixing
- Wide IF frequency, 0.007 to 20 MHz (with jumper) or 0.007 to 1.5 GHz (without jumper)



N5280A Simplify Diagram

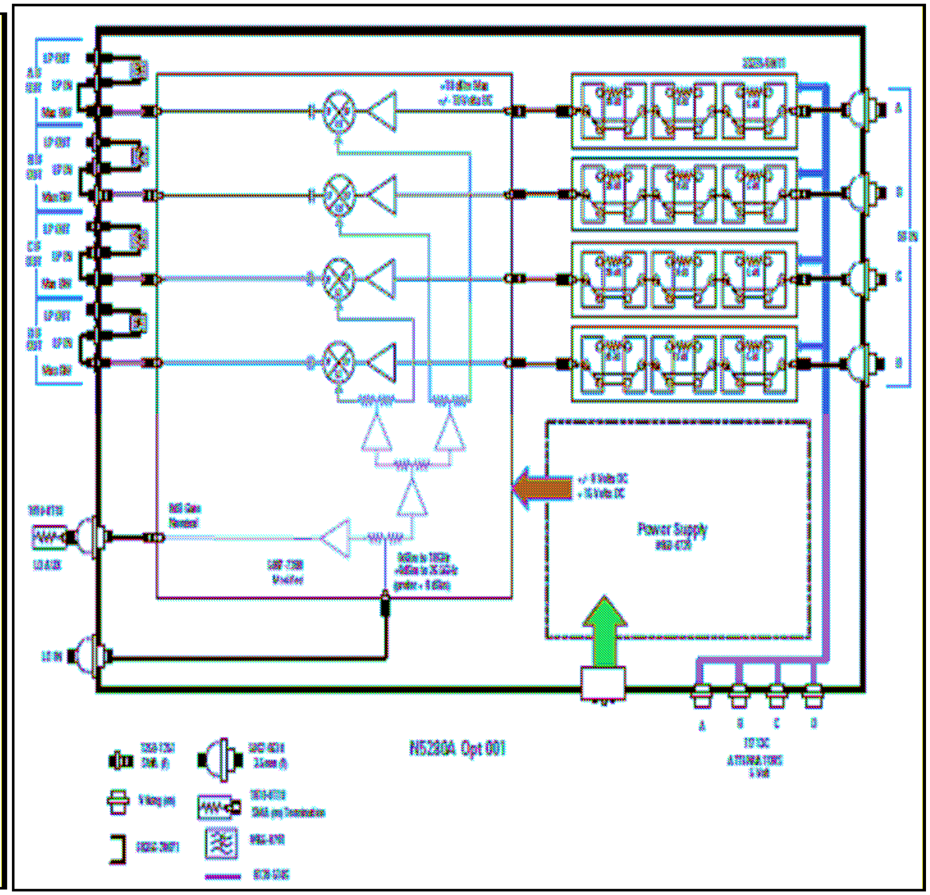
.010 to 26.5 GHz

Standard



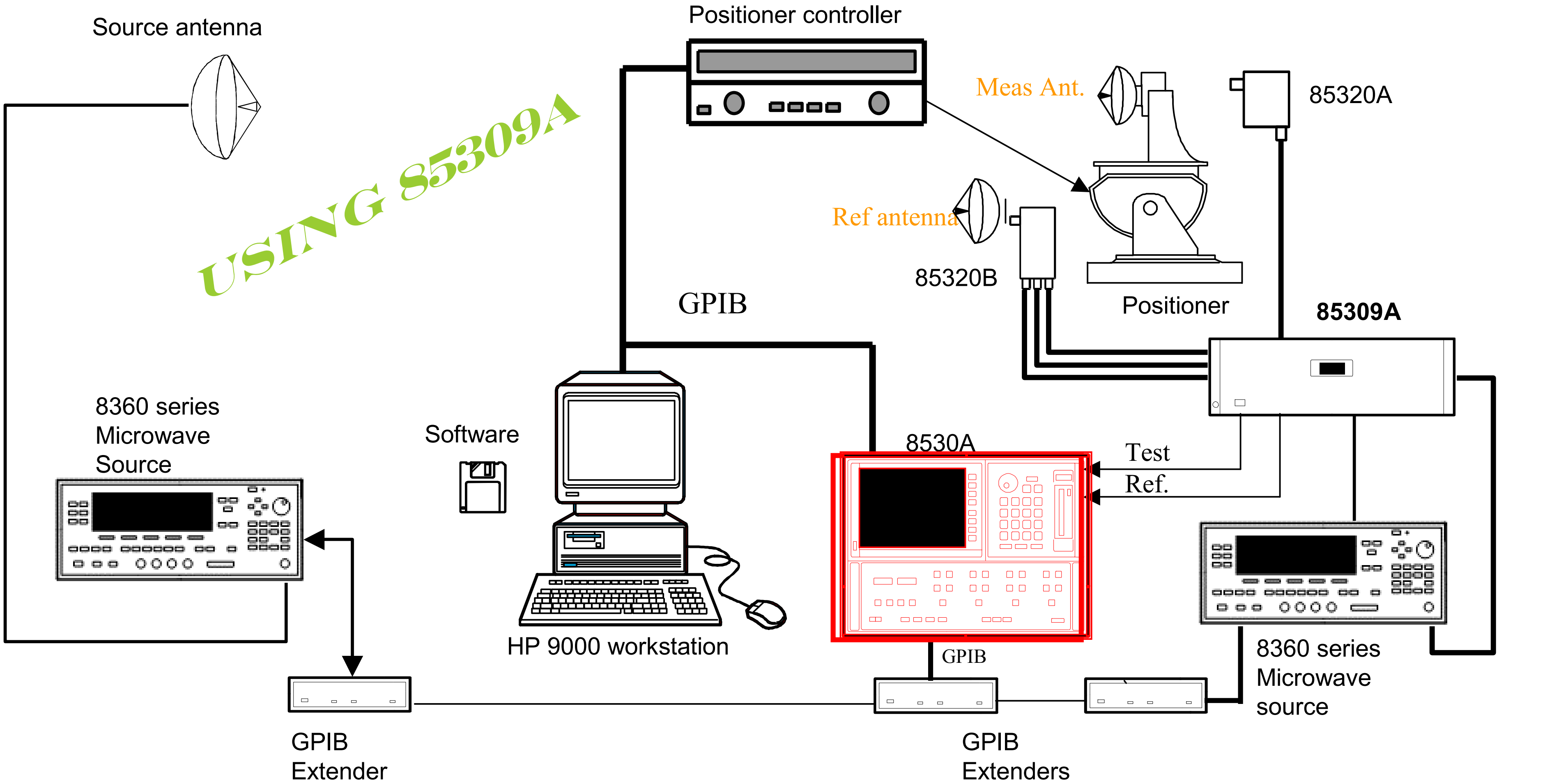
Option 001

Required 11713C Attenuator (order separately)



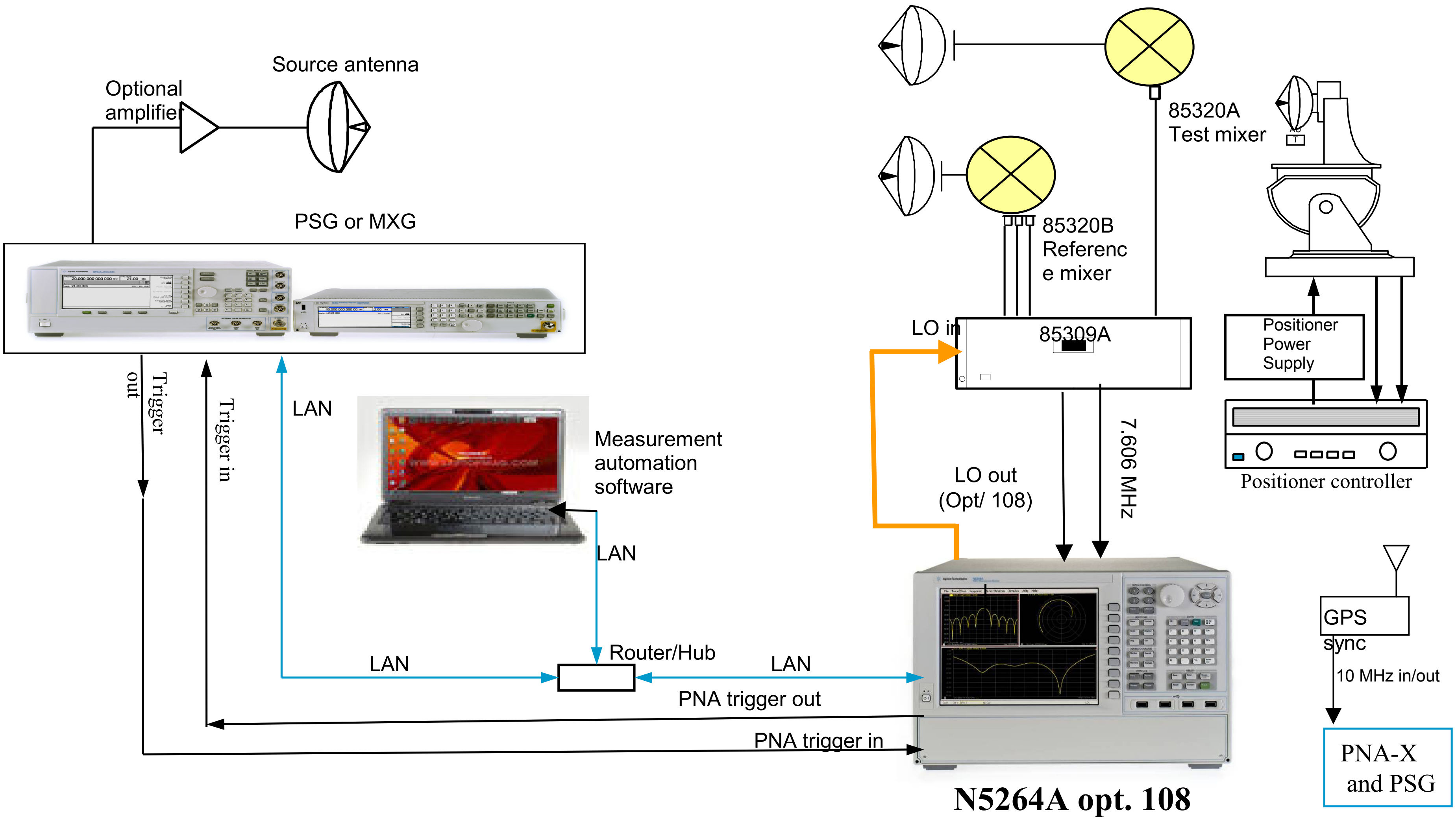
8530A (85301B) Far-Field Configuration

End of Support Life April 1st, 2009.



Far Field Outdoor Antenna Measurements

(TTL or Software Trigger)

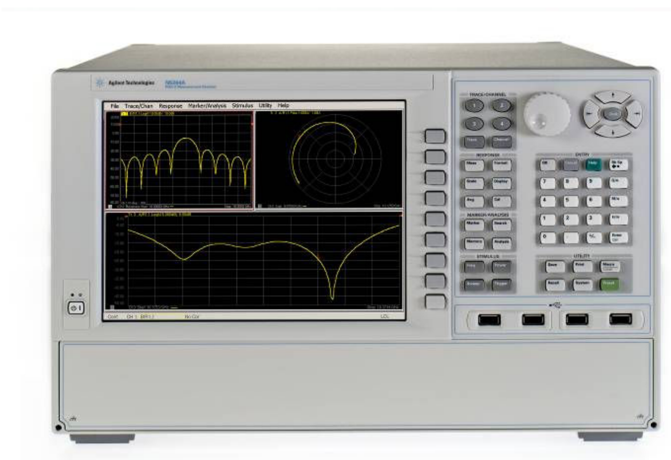


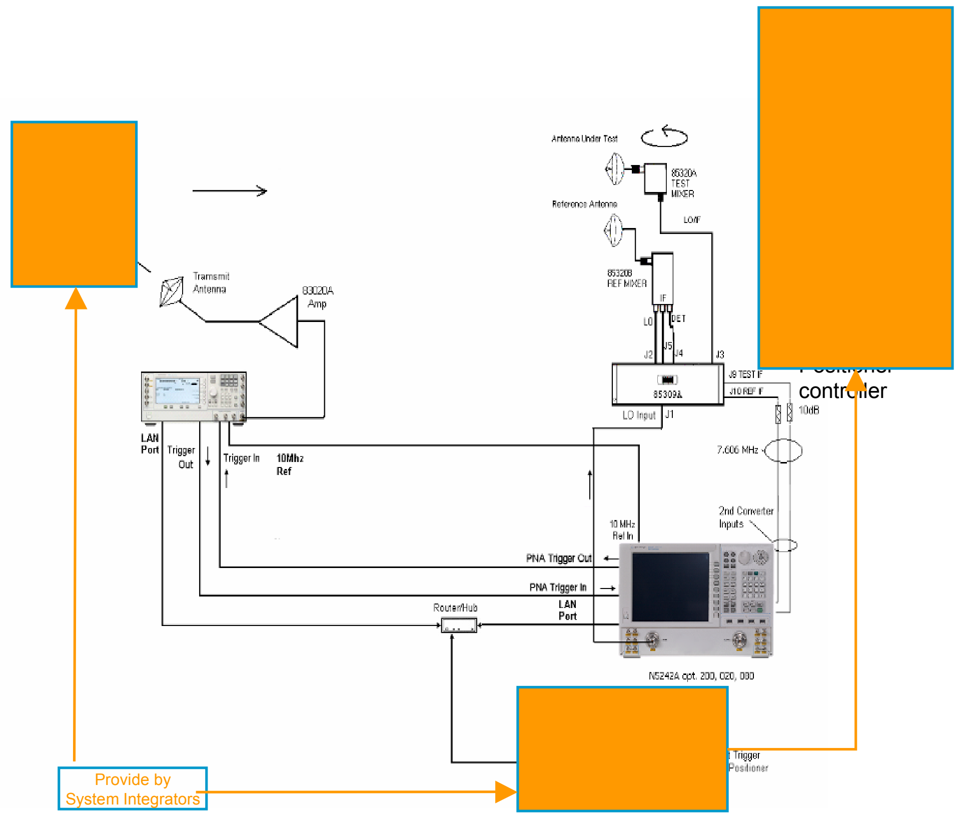
Agenda

- ✓Overview of antenna applications
- ✓Antenna Measurement Design Considerations
- ✓Migrating from 8510/8530 to PNA
- ✓Agilent's Solutions
- ➢Real Summary

Summary

- Designing Antenna Measurement Systems requires attention to many details
- Select instrument components to meet your antenna measurement needs
- Test equipment suppliers and channel partners can provide a complete antenna test solution





Reference Literature

Title	Lit #
❖Antenna Test Selection Guide	5968-6759E
❖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.