0. General:

a. These procedures describe impedance and coupling measurements of the LWA Antenna dipoles using the FieldFox N9917A Microwave Analyzer. The FieldFox is equipped with a GPS receiver so its location may be recorded. The measurement frequency range is 5 to 200 MHz.

b. Two measurement configurations are described:

1) Individual antenna measurements including dipole impedance and dipole-dipole coupling. This configuration requires one Antenna Test Fixture and two Test Cables. Refer to Diagram 0.1 and section 2. Measurements for each antenna are:
   S11: Dipole A impedance (reflection coefficient)
   S21: Dipole A to Dipole B coupling (transmission coefficient)
   S12: Dipole B to Dipole A coupling (transmission coefficient)
   S22: Dipole B impedance (reflection coefficient)

2) Antenna measurements including dipole impedance and antenna-antenna coupling. A complete set of measurements for an antenna pair (four dipoles) includes four setups, where X is one antenna with dipoles A and B and Y is another antenna with dipoles A and B. This configuration requires two Antenna Test Fixtures and four Test Cables. Refer to Diagram 0.2 and section 3. Measurements for each antenna pair are:
   S11: Antenna X, Dipole A reflection coefficient
   S21: Antenna X, Dipole A to Antenna Y, Dipole B transmission coefficient
   S12: Antenna Y, Dipole B to Antenna X, Dipole A transmission coefficient
   S22: Antenna Y, Dipole B reflection coefficient

c. All calibrations and measurements use the dual assembly v2 Calibration Fixtures (standards) and Antenna Test Fixtures. In addition to the Open, Short and Load Calibration Fixtures (standards), an Unknown Thru calibration standard is required. The Unknown Thru consists of an Antenna Test Fixture dual assembly, split apart and connected back-to-back through steel spacers with the SMA connectors pointed outward. For the Thru calibrations, the Test Fixture PCBs are connected in-phase (Feedpoint A on one PCB to Feedpoint A on the other PCB).

d. The Calibration and Test Fixtures are mounted using all four studs (feedpoints) in the antenna central hub. For reference, Fixture Side A is the Side facing up and Fixture Side B is the Side facing down when mounted on the antenna.

e. The instrument calibration protocol is as follows: Calibrate at the beginning of each measurement day. Recalibrate if the analyzer internal temperature changes by ≥ 5 °C (10 °F) from the initial calibration. Recalibrate if any of the following are changed after initial calibration: Frequency range; Output Power; IF Bandwidth; or Resolution. Note: These procedures may require changing IF Bandwidth to improve trace and measurement quality.

f. The analyzer should be shaded and kept out of direct sunlight whenever possible, and RF connectors protected from dust at all times with caps or tape. Connectors must be clean of contamination before connecting.

Diagram 0.1 (Dipole Impedance & Dipole-Dipole Coupling)

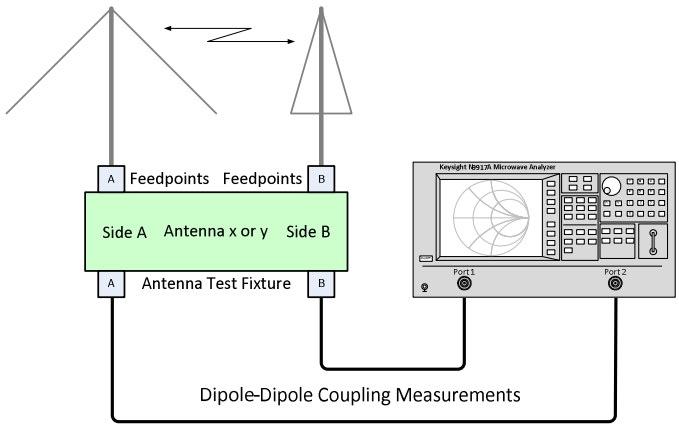
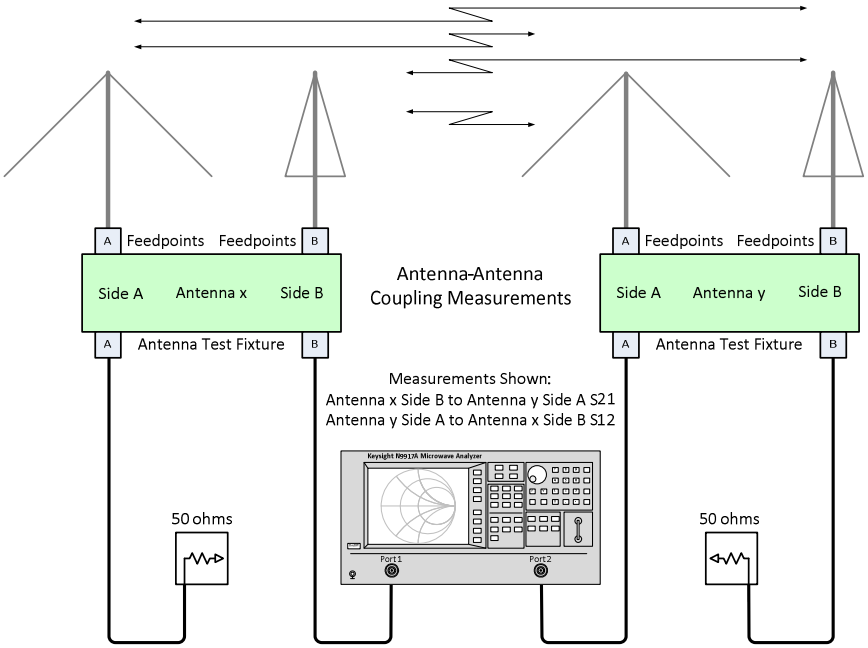


Diagram 0.2 (Antenna-Antenna Coupling)



1.0. Preliminary:

a. Log the antenna stand number (AN) and location of each measured antenna (log will be used as a filename crosscheck).
b. When saving data and screen images, include the stand number in the filename.
c. For all measurements in section 1, S11 is dipole A impedance, S21 is dipole A to B coupling, S12 is dipole B to A coupling, and S22 is dipole B impdedance.
d. When measuring an LWA Antenna, the FieldFox internal GPS receiver may be used for location but the recorded location will be for the GPS antenna and not the LWA Antenna being measured. When using the GPS receiver, watch battery consumption.
e. Test equipment:

1) Vector Network Analyzer: N9917A FieldFox Microwave Analyzer
2) Calibration Fixtures (standards) for Short, Open, Load and Unknown Thru: Version 2, consisting of dual assembly PCBs
3) Antenna Test Fixture: Version 2 consisting of dual assembly PCBs, (2) required
4) Test Cable RED (X): N-M – SMA-M, LMR-240, 37 ft (11 m) long
5) Test Cable GREEN (X): N-M – SMA-M, LMR-240, 37 ft (11 m) long
6) Test Cable RED-RED (Y): N-M – SMA-M, LMR-240, 37 ft (11 m) long
7) Test Cable GREEN-GREEN (Y): N-M – SMA-M, LMR-240, 37 ft (11 m) long
8) 50 ohm termination: N-F, Maury Microwave 2510B1 (alt. N-M, MCL KARN-50+ with coaxial coupler, N-F/N-F, UG-29A/U), (2) required
9) Torque wrench: 5/16 in, 5 in-lb, Fairview Microwave NC-100, ST-SMA5
10) GPS antenna: 3-5 V, 3 m cable, SMA-M connector
11) Test set status as of 16 October 2022:

Mfr	Type	S/N	Cal due
Keysight	N9917A FieldFox, FW A.12.46	MY56071016	23 Dec 2023
Agilent	85033D 3.5 mm Cal Kit	3423A05729	15 Jul 2024
Saluki Tech	SCK0YTL26.5-3.5-F Cal Kit	WBG01482	21 Aug 2023

2.0. Antenna impedance and dipole-dipole coupling measurements:

a. Dipole impedance is measured in terms of dB and angle as reflection coefficients S11 for Dipole A and S22 for Dipole B.
b. Dipole-dipole coupling is measured in terms of dB and angle as transmission coefficients S21 for Dipole A to Dipole B and S12 for Dipole B to Dipole A.
c. Two 37 ft (11 m) Test Cables are used to physically isolate the network analyzer (NA) from the antenna under test. The Test Cables are placed as close as possible in line with the existing antenna cables.
d. It is expected that dipole-dipole coupling will be low, so it will be necessary to use the High Output power setting in the NA. This is typically –2 dBm for the FieldFox at the frequencies of interest.
e. To reduce trace noise on the dipole-dipole coupling measurements, it may be necessary to experiment with IF Bandwidth and Averaging for best S21 and S12 traces. Changing the IF bandwidth requires a new calibration.
f. During calibration and measurements, the near ends of the Test Cables are connected to the NA Port 1 and Port 2. The far ends of the cables are connected to the Calibration Fixtures and Antenna Test Fixture at the Antenna Under Test (AUT).
g. A Full 2-port calibration is used. With the FieldFox, it is necessary to calibrate Port 1 with the Open, Short and Load Calibration Fixtures and then Port 2 with the Open, Short and Load Calibration Fixtures in the specific order shown by the instrument display prompts. An Unknown Thru is used to connect Port 1 to Port 2 in the last calibration step.
h. The *LWA Ideal Cal Kit 200MHz* parameter declarations file (already loaded in the FieldFox) is used for NA calibration with the Calibration Fixtures; this calibration file assumes the Calibration Fixtures are ideal (zero coefficients and zero delay).

2.1. Setup for calibration of dipole impedance and dipole-dipole coupling measurements:

1) Setup Analyzer mode:
   - ☐ Mode ⇢ NA
   - ☐ Mode Preset (factory)

2) Setup Traces:
   - ☐ Trace ⇢ x4
   - ☐ Trace 1 ⇢ Measure ⇢ S11 ⇢ Log Mag
   - ☐ Trace 2 ⇢ Measure ⇢ S21 ⇢ Log Mag
   - ☐ Trace 3 ⇢ Measure ⇢ S12 ⇢ Log Mag
   - ☐ Trace 4 ⇢ Measure ⇢ S22 ⇢ Log Mag

3) Setup Frequency & Amplitude scale:
   - ☐ Freq/Dist ⇢ Start ⇢ 5.0 MHz, Stop ⇢ 200.0 MHz
   - ☐ Scale/Amptd ⇢ Scale ⇢ 5 dB or 10 dB as required
   - ☐ Scale/Amptd ⇢ Ref Level ⇢ 0 dB
   - ☐ Scale/Amptd ⇢ Ref Pos ⇢ 5

4) Check IF bandwidth and averaging:
   - ☐ BW ⇢ IF BW ⇢ 10 kHz (may require adjustment depending on results, recalibration required)
   - ☐ BW ⇢ Average <n> ⇢ 1 ⇢ Enter (may require adjustment depending on results)
   - ☐ BW ⇢ Average Mode ⇢ Sweep
   - ☐ To restart Sweep, go to Sweep ⇢ Restart

5) Measure setup:
   - ☐ Meas Setup ⇢ Output power ⇢ High

6) Setup Sweep:
   - ☐ Sweep ⇢ Resolution ⇢ More ⇢ 1001 ⇢ Enter ⇢ Back (resolution 195.0 kHz)

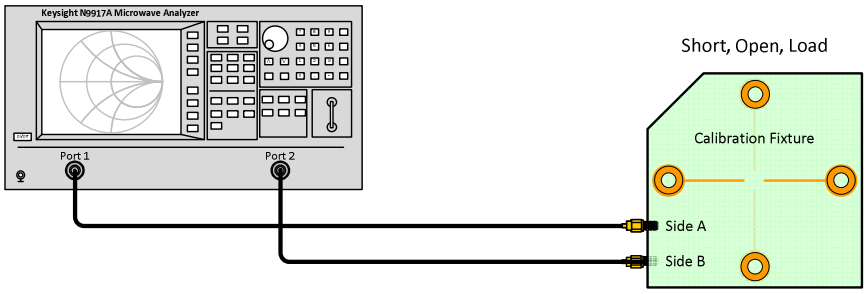
7) Setup Markers:
   - ☐ Mrkr 1 ⇢ Normal ⇢ 5 MHz
   - ☐ Mrkr 2 ⇢ Normal ⇢ 10 MHz
   - ☐ Mrkr 3 ⇢ Normal ⇢ 20 MHz
   - ☐ Mrkr 4 ⇢ Normal ⇢ 40 MHz
   - ☐ Mrkr 5 ⇢ Normal ⇢ 80 MHz
   - ☐ Mrkr 6 ⇢ Normal ⇢ 160 MHz
   - ☐ Mrkr Table: ON

8) Connections for calibration:
   - ☐ Refer to Diagram 2.1 below
   - ☐ Connect Test Cables to Calibration Fixture and install Calibration Fixture on Hub of AUT: Test Cable RED to Side A and Test Cable GREEN to Side B
   - ☐ Connect NA Port 1 to Test Cable A (RED) and NA Port 2 to Test Cable B (GREEN)

9) Calibration:
   - ☐ Cal ⇢ Mechanical Cal ⇢ Change DUT Connectors ⇢ SMA ⇢ Change Gender ⇢ Female ⇢ Next Port 2 ⇢ SMA ⇢ Change Gender ⇢ Female ⇢ Next

- ☐ Select Cal Kit ⇢ LWA Ideal Cal Kit 200 MHz⇢ Next Port 2 ⇢ LWA Ideal Cal Kit 200 MHz ⇢ Finish
- ☐ Start Calibration. Follow prompts to Calibrate NA Port 1 and Port 2. Connect and mount each Calibration Fixture standard (Open, Short, Load) as prompted
- ☐ When the calibration prompts call for connecting Port 1 to Port 2, use an Unknown Thru made from a Test Fixture dual assembly that has been split apart and connected back-to-back in-phase (A-A, B-B) with spacers. Finish the calibration
- ☐ Save/Recall ⇢ Device ⇢ Internal (or USB)
- ☐ Save/Recall ⇢ File Type ⇢ State
- ☐ Save/Recall ⇢ Save ⇢ Cal_5-200MHz_Date.Time ⇢ Done
- ☐ Leave Test Cables connected to NA

Diagram 2.1 (Analyzer Calibration for Dipole-Dipole Measurements)



2.2. Setup for dipole impedance and dipole-dipole coupling measurements:

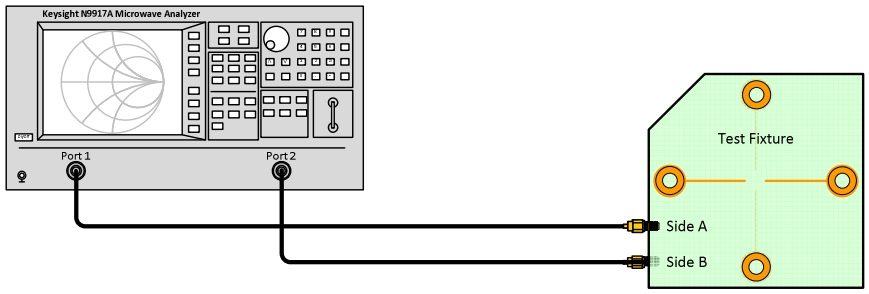
10) If desired enable FieldFox internal GPS receiver:
    - ☐ Connect GPS antenna
    - ☐ System ⇢ GNSS (GPS+)
    - ☐ GNSS ⇢ Internal (set to Off during idle periods to conserve battery)
    - ☐ GNSS Settings ⇢ Display ON ⇢ Back

11) Connect dipoles:
    - ☐ Refer to Diagram 2.2 below
    - ☐ Connect Test Cables to the Antenna Test Fixture and install on Hub of AUT: Test Cable RED to Side A and Test Cable GREEN to Side B
    - ☐ The NA Port 1 already should be connected to Test Cable RED and Port 2 already connected to Test Cable GREEN

12) Measure dipoles and save data:
    - ☐ Save/Recall ⇢ File Type ⇢ Data (s2p)
    - ☐ Save/Recall ⇢ Save ⇢ (AN)_DD.MM.YYYY.s2p ⇢ Done (AN is Antenna Stand Number)
    - ☐ Save/Recall ⇢ File Type ⇢ Picture (PNG)
    - ☐ Save/Recall ⇢ Save ⇢ (AN)_DD.MM.YYYY.png ⇢ Done

13) Repeat steps 8) through 12) for each additional antenna:

Diagram 2.2 (Dipole Impedance & Dipole-Dipole Measurements)



3.0. Antenna-antenna coupling measurements:

a. Antenna-antenna coupling is measured in terms of dB and angle as transmission coefficients S21 and S12.

b. Dipole impedance measurements are incidental to the antenna-antenna coupling measurements. Impedances are measured in terms of dB and angle as reflection coefficients S11 and S22.

c. Four 37 ft (11 m) Test Cables are used to physically isolate the NA from the AUT and also to imitate operational conditions. The cables are placed as close as possible inline with the existing antenna cables.

d. A Full 2-port calibration is used. With the FieldFox, it is necessary to calibrate Port 1 with the Open, Short and Load Calibration Fixtures and then Port 2 with the Open, Short and Load Calibration Fixtures in the specific order shown by the instrument display prompts. An Unknown Thru is used in the last calibration step to connect Port 1 to Port 2.

e. The *LWA Ideal Cal Kit 200MHz* parameter declarations file (already loaded in the FieldFox NA) is used for network analyzer calibration with the Calibration Fixtures; this calibration file assumes the Calibration Fixtures are ideal (zero coefficients and delay).

f. During calibration and measurements, the Test Cables are connected as follows:
   1) One Test Cable is connected between the NA Port 1 and first dipole (A) of the first antenna (X)
   2) One Test Cable is connected between a 50 ohm termination and the second dipole (B) of the first antenna (X)
   3) One Test Cable is connected between the NA Port 2 and the first dipole (A) of the second antenna (Y)
   4) One Test Cable is connected between a 50 ohm termination and the second dipole(B) of the second antenna (Y)
   5) Cable connections to the dipoles are swapped at the antennas to enable measurements of the four antenna-antenna coupling combinations: X-A to Y-A; X-A to Y-B; X-B to Y-A; and X-B to Y-B

3.1. Setup for calibration of antenna-antenna coupling measurements:

1) Setup Analyzer mode:
   - ☐ Mode ⇢ NA

2) Setup Traces:
   - ☐ Trace ⇢ x4
   - ☐ Trace 1 ⇢ Measure ⇢ S11 ⇢ Log Mag
   - ☐ Trace 2 ⇢ Measure ⇢ S21 ⇢ Log Mag

- ☐ Trace 3 ⇢ Measure ⇢ S12 ⇢ Log Mag
- ☐ Trace 4 ⇢ Measure ⇢ S22 ⇢ Log Mag

3) Setup Frequency & display Amplitude:
   - ☐ Freq/Dist ⇢ Start ⇢ 5.0 MHz, Stop ⇢ 200.0 MHz
   - ☐ Scale/Amptd ⇢ Scale ⇢ 5 dB or 10 dB as required
   - ☐ Scale/Amptd ⇢ Ref Level ⇢ 0 dB
   - ☐ Scale/Amptd ⇢ Ref Pos ⇢ 5

4) Check IF bandwidth and averaging:
   - ☐ BW ⇢ IF BW ⇢ 10 kHz (may require adjustment depending on results, recalibration required)
   - ☐ BW ⇢ Average <n> ⇢ 1 ⇢ Enter (may require adjustment depending on results)
   - ☐ BW ⇢ Average Mode ⇢ Sweep
   - ☐ To restart Sweep, go to Sweep ⇢ Restart

5) Measure setup:
   - ☐ Meas Setup ⇢ Output power ⇢ High

6) Setup Sweep:
   - ☐ Sweep ⇢ Resolution ⇢ More ⇢ 1001 ⇢ Enter ⇢ Back (resolution 195.0 kHz)

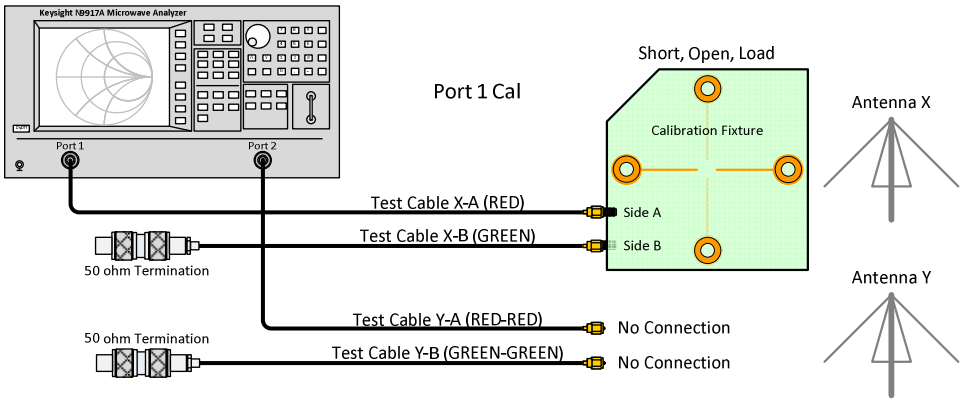
7) Setup Markers:
   - ☐ Mrkr 1 ⇢ Normal ⇢ 5 MHz
   - ☐ Mrkr 2 ⇢ Normal ⇢ 10 MHz
   - ☐ Mrkr 3 ⇢ Normal ⇢ 20 MHz
   - ☐ Mrkr 4 ⇢ Normal ⇢ 40 MHz
   - ☐ Mrkr 5 ⇢ Normal ⇢ 80 MHz
   - ☐ Mrkr 6 ⇢ Normal ⇢ 160 MHz
   - ☐ Mrkr Table: ON

8) Place cables:
   - ☐ Place Test Cables as follows:
     Test Cable X-1 (RED) between NA location and Antenna X
     Test Cable X-B (GREEN) between NA location and Antenna X
     Test Cable Y-A (RED-RED) between NA location and Antenna Y
     Test Cable Y-B (GREEN-GREEN) between NA location and Antenna Y

9) Calibrate NA Port 1:
   - ☐ Refer to Diagram 3.1
   - ☐ Connect Test Cables as follows.
     Test Cable X-1 (RED) between NA Port 1 and Antenna X Calibration Fixture Side A
     Test Cable X-B (GREEN) between 50 ohm termination and Antenna X Calibration Fixture Side B
     Test Cable Y-A (RED-RED) between NA Port 2 and Antenna Y No Connection
     Test Cable Y-B (GREEN-GREEN) between 50 ohm termination and Antenna Y No Connection
   - ☐ Cal ⇢ Mechanical Cal ⇢ Change DUT Connectors ⇢ SMA ⇢ Change Gender ⇢ Female ⇢ Next Port 2 ⇢ SMA ⇢ Change Gender ⇢ Female ⇢ Next
   - ☐ Select Cal Kit ⇢ LWA Ideal Cal Kit 200 MHz⇢ Next Port 2 ⇢ LWA Ideal Cal Kit 200 MHz ⇢ Finish

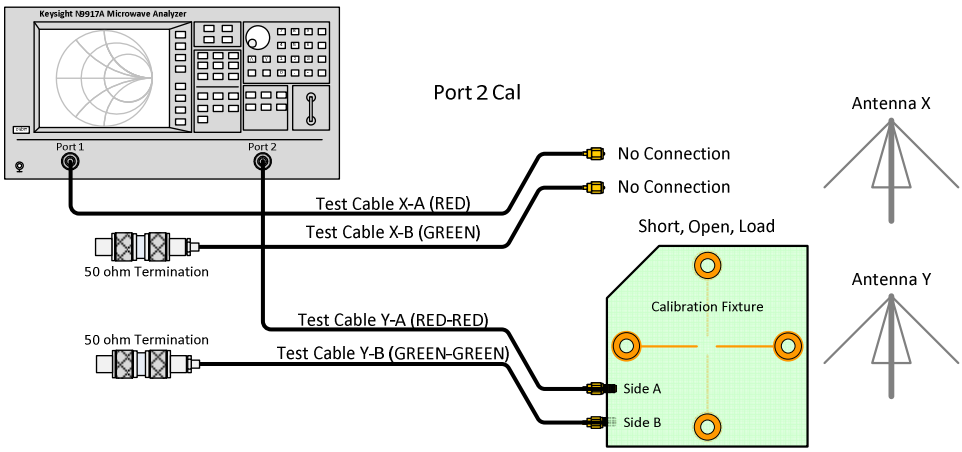
- ☐ Start Calibration and follow prompts to Calibrate NA Port 1. Connect and mount each Calibration Fixture standard (Open, Short, Load) on the antenna Hub in succession as prompted
- ☐ See next step for Port 2 calibration

Diagram 3.1 (Connections for Port 1 Calibration)



10) <u>Calibrate NA Port 2</u>:
- ☐ Refer to Diagram 3.2
- ☐ Connect Test Cables as follows
  Test Cable X-1 (RED) between NA Port 1 and Antenna X No Connection
  Test Cable X-2 (GREEN) between 50 ohm termination and Antenna X No Connection
  Test Cable Y-1 (RED-RED) between NA Port 2 and Antenna Y Calibration Fixture Side A
  Test Cable Y-2 (GREEN-GREEN) between 50 ohm termination and Antenna Y Calibration Fixture Side B
- ☐ Continue Calibration and follow prompts to Calibrate NA Port 2. Connect and mount each Calibration Fixture standard (Open, Short, Load) on the antenna Hub in succession as prompted
- ☐ See next step for Port 1 to Port 2 Thru calibration

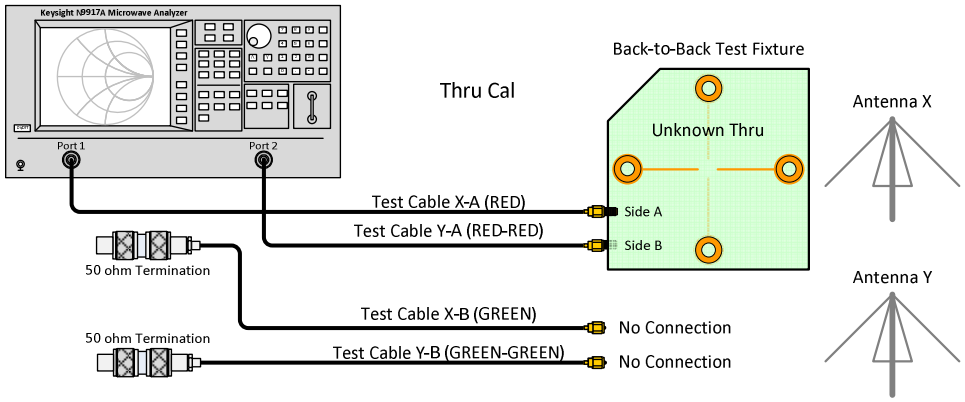
Diagram 3.2 (Connections for Port 2 Calibration)



11) <u>Calibrate NA Port 1 and Port 2 with Unknown Thru</u>:
- ☐ Refer Diagram 3.3

- ☐ When the calibration prompts call for connecting Port 1 to Port 2, connect the Test Cables to an Unknown Thru made from a Test Fixture dual assembly that has been split apart and connected in-phase back-to-back with spacers
- ☐ Move the Test Cables so that the ends of both Test Cables are close together
- ☐ Connect Test Cables as follows:
  Test Cable X-1 (RED) between NA Port 1 and the Unknown Thru Side A
  Test Cable X-2 (GREEN) between 50 ohm termination and Antenna X No Connection
  Test Cable Y-1 (RED-RED) between NA Port 2 and the Unknown Thru Side B
  Test Cable Y-2 (GREEN-GREEN) between 50 ohm termination and Antenna Y No Connection
- ☐ Complete Thru Calibration according to prompts
- ☐ Finish the calibration
- ☐ Return the ends of the Test Cables to their original locations

Diagram 3.3 (Connections for Thru Calibration)



12) Save calibration:
- ☐ Save/Recall ⇢ Device ⇢ Internal (or USB)
- ☐ Save/Recall ⇢ File Type ⇢ State
- ☐ Save/Recall ⇢ Save ⇢ Cal_X-Y_5-200MHz_Date.Time ⇢ Done

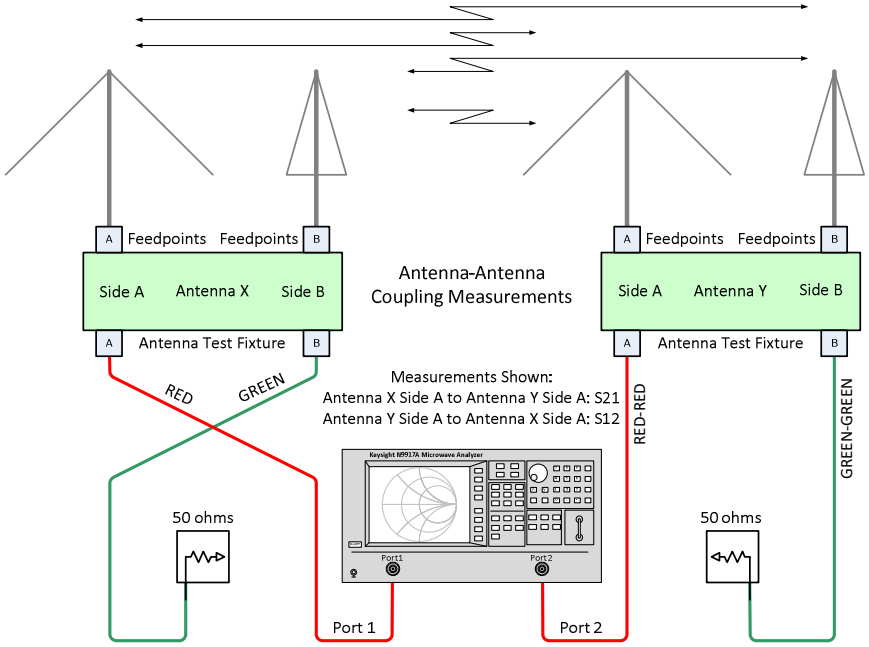
3.2. Setup for antenna-antenna coupling measurements:

13) If desired, enable internal GPS receiver:
- ☐ Connect GPS antenna
- ☐ System ⇢ GNSS (GPS+)
- ☐ GNSS ⇢ Internal (set to Off during idle periods to conserve battery)
- ☐ GNSS Settings ⇢ Display ON ⇢ Back

14) Connections for measurements of Antenna X Side A and Antenna Y Side A:

- ☐ Refer to Diagram 3.4
- ☐ Connect Test Cables as follows.
  Test Cable RED (X) between NA Port 1 and Antenna X Test Fixture Side A
  Test Cable GREEN (X) between 50 ohm termination and Antenna X Test Fixture Side B
  Test Cable RED-RED (Y) between NA Port 2 and Antenna Y Test Fixture Side A
  Test Cable GREEN-GREEN (Y) between 50 ohm termination and Antenna Y Test Fixture Side B
- ☐ At this time, the measurements are as follows:
  S11: Antenna X Side A impedance
  S21: Antenna X Side A to Antenna Y Side A coupling
  S12: Antenna Y Side A to Antenna X Side A coupling
  S22: Antenna Y Side A impedance

Diagram 3.4 (Connections for measurement of X-A to Y-A)

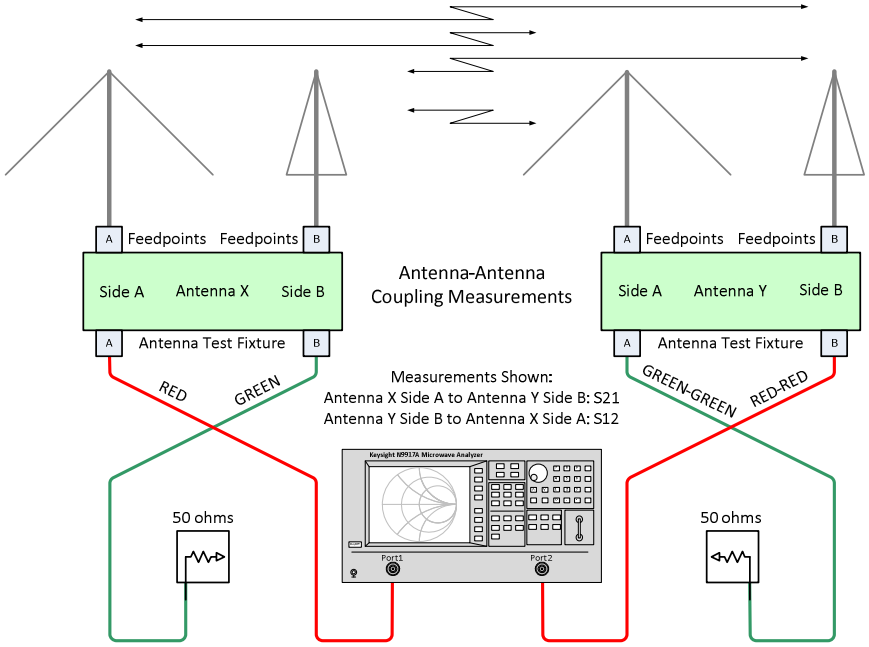


15) Save data for Antenna X Side A and Antenna Y Side A:

- ☐ Save/Recall ⇢ File Type ⇢ Data (s2p)
- ☐ Save/Recall ⇢ Save ⇢ (AN)X-A_(AN)Y-A_DD.MM.YYYY.s2p ⇢ Done (AN is Antenna Stand Number)
- ☐ Save/Recall ⇢ File Type ⇢ Picture (PNG)
- ☐ Save/Recall ⇢ Save ⇢ (AN)X-A_(AN)Y-A_DD.MM.YYYY.png ⇢ Done

16) Connections for measurements of Antenna X Side A and Antenna Y Side B:
- ☐ Refer to Diagram 3.5
- ☐ Connect Test Cables as follows.
  Test Cable RED (X) between NA Port 1 and Antenna X Test Fixture Side A
  Test Cable GREEN (X) between 50 ohm termination and Antenna X Test Fixture Side B
  Test Cable RED-RED (Y) between NA Port 2 and Antenna Y Test Fixture Side B
  Test Cable GREEN-GREEN (Y) between 50 ohm termination and Antenna Y Test Fixture Side A
- ☐ At this time, the measurements are as follows:
  S11: Antenna X Side A impedance
  S21: Antenna X Side A to Antenna Y Side B coupling
  S12: Antenna Y Side B to Antenna X Side A coupling
  S22: Antenna Y Side B impedance

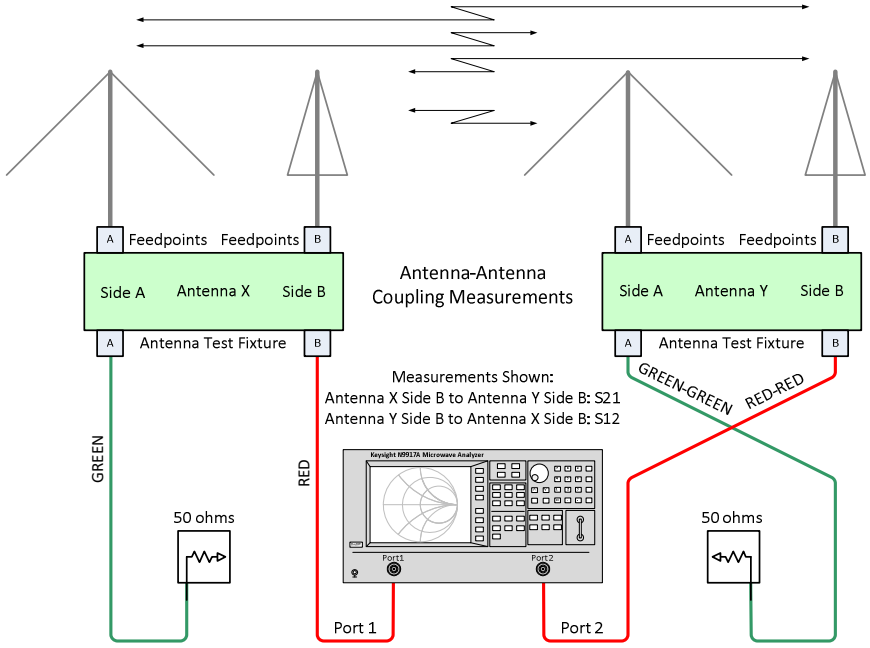
Diagram 3.5 (Connections for measurement of X-A to Y-B)



17) Save data for Antenna X Side A and Antenna Y Side B:
- ☐ Save/Recall ⇢ File Type ⇢ Data (s2p)
- ☐ Save/Recall ⇢ Save ⇢ (AN)X-A_(AN)Y-B_DD.MM.YYYY.s2p ⇢ Done (AN is Antenna Stand Number)
- ☐ Save/Recall ⇢ File Type ⇢ Picture (PNG)
- ☐ Save/Recall ⇢ Save ⇢ (AN)X-A_(AN)Y-B_DD.MM.YYYY.png ⇢ Done

18) Connections for measurements of Antenna X Side B and Antenna Y Side B:
- ☐ Refer to Diagram 3.6
- ☐ Connect Test Cables as follows.
  Test Cable RED (X) between NA Port 1 and Antenna X Test Fixture Side B
  Test Cable GREEN (X) between 50 ohm termination and Antenna X Test Fixture Side A
  Test Cable RED-RED (Y) between NA Port 2 and Antenna Y Test Fixture Side B
  Test Cable GREEN-GREEN (Y) between 50 ohm termination and Antenna Y Test Fixture Side A
- ☐ At this time, the measurements are as follows:
  S11: Antenna X Side B impedance
  S21: Antenna X Side B to Antenna Y Side B coupling
  S12: Antenna Y Side B to Antenna X Side B coupling
  S22: Antenna Y Side B impedance

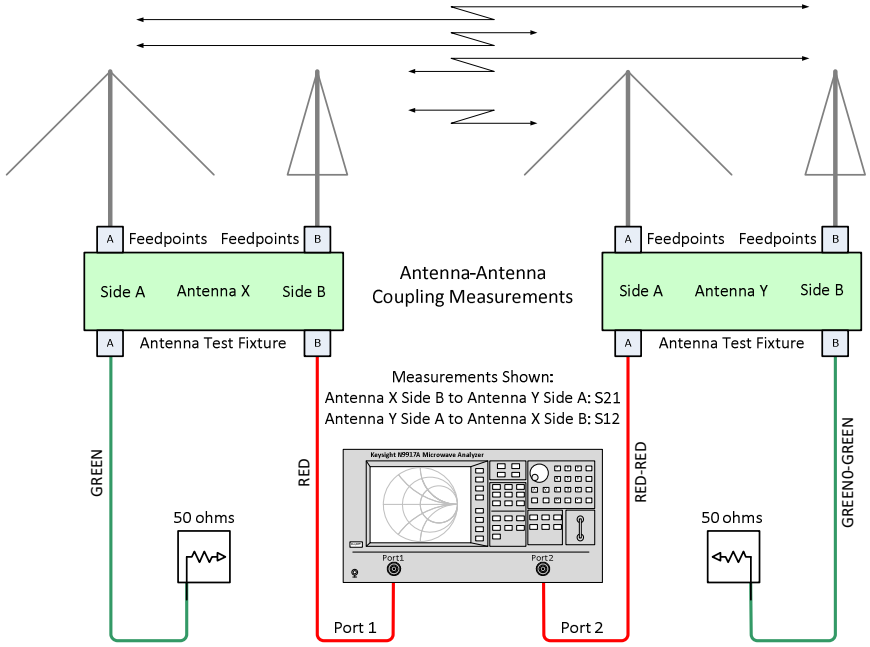
Diagram 3.6 (Connections for measurement of X-B to Y-B)



19) Save data for Antenna X Side B and Antenna Y Side B:
- ☐ Save/Recall ⇢ File Type ⇢ Data (s2p)
- ☐ Save/Recall ⇢ Save ⇢ (AN)X-B_(AN)Y-B_DD.MM.YYYY.s2p ⇢ Done (AN is Antenna Stand Number)
- ☐ Save/Recall ⇢ File Type ⇢ Picture (PNG)
- ☐ Save/Recall ⇢ Save ⇢ (AN)X-B_(AN)Y-B_DD.MM.YYYY.png ⇢ Done

20) Connections for measurements of Antenna X Side B and Antenna Y Side A:
- ☐ Refer to Diagram 3.7
- ☐ Connect Test Cables as follows.
  Test Cable RED (X) between NA Port 1 and Antenna X Test Fixture Side B
  Test Cable GREEN (X) between 50 ohm termination and Antenna X Test Fixture Side A
  Test Cable RED-RED (Y) between NA Port 2 and Antenna Y Test Fixture Side A
  Test Cable GREEN (Y) between 50 ohm termination and Antenna Y Test Fixture Side B
- ☐ At this time, the measurements are as follows:
  S11: Antenna X Side B impedance
  S21: Antenna X Side B to Antenna Y Side A coupling
  S12: Antenna Y Side A to Antenna X Side B coupling
  S22: Antenna Y Side A impedance

Diagram 3.7 (Connections for measurement of X-B to Y-A)



21) Save data for Antenna X Side B and Antenna Y Side A:
- ☐ Save/Recall ⇢ File Type ⇢ Data (s2p)
- ☐ Save/Recall ⇢ Save ⇢ (AN)X-B_(AN)Y-A_DD.MM.YYYY.s2p ⇢ Done (AN is Antenna Stand Number)
- ☐ Save/Recall ⇢ File Type ⇢ Picture (PNG)
- ☐ Save/Recall ⇢ Save ⇢ (AN)X-B_(AN)Y-A_DD.MM.YYYY.png ⇢ Done

22) Repeat steps 8) through 21) for each additional antenna pair

Document Information

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Revisions: 0.0 (Original draft derived from measurements report produced summer 2022, 26 Sep 2022)
0.1 (Completed 1st Draft, 1 Oct 2022)
0.2 (Revised dipole-dipole and antenna-antenna steps, 08 Oct 2022)
0.3 (Added Unknown Thru to calibrations and illustrations, 09 Oct 2022)
0.4 (Completed 2nd Draft, 12 Oct 2022)
0.5 (Revised cable designations, 15 Oct 2022)