# LadyBug Technologies LLC

# Manual PowerSensor+ Field Certification Procedure

**Procedure Applies to Following Power Sensors**

**LB478A, LB479A, LB480A, LB559A, LB579A, LB589A, LB679A, LB680A**

# Contents

# Purpose:

This documents the certification process for LadyBug Technologies LLC (LadyBug) PowerSensor+ line of products. This procedure is a manual procedure and is intended to satisfy the needs of traceable annual recertification. In addition, this procedure is useful for recertifying sensors whose connectors have been replaced with connectors of an identical type (e.g. N-Type male with N-Type male or N-Type male with N-Type female).

This procedure certifies that the existing calibration factors associated with the unit-under-test (UUT) and used properly allows the UUT to make accurate measurements within the procedure's specified uncertainty limits. Since calibration factors for Ladybug sensors include temperature corrections factors and this procedure only measures the UUT at ambient temperature, new calibration factors are NOT generated. Any sensors failing this procedure, or if a sensor's connector is type is changed (e.g. changed from Type-N to SMA) the sensor must be returned to the factory for repair and/or adjustment.

# Products Covered by Procedure:

This procedure applies to the following LadyBug PowerSensor+ products listed below:

LB478A, LB479A, LB480A, LB559A, LB579A, LB589A, LB679A, LB680A

# Overview:

This procedure applies to sensors that are in good working order, fully functional and without mechanical defect or damage. If there is any question about the serviceability or functionality of the sensor, consult the "User's Manual" to ascertain the state of the sensor or contact LadyBug Technologies LLC for advice. This certification procedure consists of six steps:

1. Configure/setup of the certification test system
2. Select the Test Record
3. Physical and functional check of UUT
4. Warm up
5. Absolute level accuracy Test
6. Linearity Test

As with any procedure, it is impractical to verify all conditions and states. This procedure tests a selected set of measurement points. These points are sufficient to ensure a high level of confidence in the sensor's continued performance. As with all calibration procedures, there is great reliance on the experience, knowledge, sound judgment and skill of those doing the work.

Finally, if, during the calibration process, the sensor fails at any point, follow local procedures for recording and resolving the problem before proceeding.

Certification traceability to national standards is accomplished through a locally calibrated SOURCE and factory calibrated CAL_SENSOR and REF_SENSOR.

## Required Equipment:

This section lists the equipment required for the certification procedure. This procedure refers to equipment by “Name” rather than model number. For example, rather than refer to an “HP 8340B” (see Table 1) the calibration procedure refers to “SOURCE”. This term, “SOURCE”, comes from the **Required Equipment** table **Procedure Name** column. In addition, the uncertainties used within the procedure to certify the UUT are based on using “REF_SENSOR” and “CAL_SENSOR” power meters from LadyBug Technologies.

Necessary Equipment (refer to Table 1 for recommended models):

1) **SOURCE**: a stable and repeatable signal generator with sufficient frequency and power range (and resolution) to test the UUT (Unit Under Test) or multiple UUT’s;

2) **SPLITTER**: a 2-resistor uW power splitter that is specified over the necessary frequency range of the UUT’s to be tested. It is recommended that a quality, broadband power splitter that operates from 10 MHz to 26.5 GHz be used;

3) **CAL_SENSOR**: a factory calibrated Ladybug USB power sensor that has the same connector type and sex that is present on the UUT. If there are multiple UUT’s with different RF connector types and sex, multiple CAL_SENSOR’s will be needed;

4) **REF_SENSOR**: a factory calibrated Ladybug USB sensor that is used in the test to ensure that the same power level (at each frequency) is delivered to both the CAL_SENSOR and UUT ;

5) **CAL_ADAPT**: an RF adapter that presents the same RF connector interface between both the UUT_SENSOR and the CAL_SENSOR and the broadband SPLITTER. This approach minimizes mismatch error within the test. If the UUT_SENSOR and CAL_SENSOR RF connector directly connect to the SPLITTER without the use of any adapter, then a CAL_ADAPT is not required.

6) A computer running Windows XP or Windows 7: required to operate the LB Power Meter Application for each sensor connected (REF_SENSOR, CAL_SENSOR, UUT_SENSOR).

7) A USB 2.0 powered hub may be needed to ensure that all of the sensors can be powered and operated at the same time: ensure that the hub can deliver 500 mA of current at each of its ports at the same time.

8) High quality cables and precision adapters to connect the SPLITTER to the SOURCE and to the REF_SENSOR and UUT_SENSOR/CAL_SENSOR. This hardware is not called out in the equipment list.

This procedure applies to several sensors and connectors. Understandably, the equipment requirements vary. However, some of the equipment applies to all sensors. Other equipment varies by the UUT model number and UUT connector type and UUT connector sex. Pay special attention to the type of UUT you are certifying when selecting your equipment.

If you choose to substitute equipment consult the equipment list for information. Also, be aware of the test range for each sensor. These test ranges for each sensor are shown below:

- LB478A: 10 MHz – 8 GHz
- LB479A: 10 MHz – 8 GHz
- LB480A: 50 MHz – 8 GHz (100 MHz – 8 GHz for LB480A serial numbers <117xxx)
- LB559A: 10 MHz – 12.5 GHz
- LB579A: 10 MHz – 18 GHz
- LB589A: 10 MHz – 26.5 GHz
- LB679A: 50 MHz – 18 GHz
- LB680A: 50 MHz – 18 GHz

When selecting your equipment be sure to check the equipment for damage or excessive wear. SWR or match is the single biggest contributor to error and uncertainty in power measurements. So, using worn or damaged connectors during calibration can induce "false failures".

This same advice applies when selecting cables. Use high quality cables during calibration. And ensure they are in good working order. Also, when building the setups, keep cables as short as possible and keep the strain on the cables at a minimum.

Finally, if you choose to substitute any of the passive devices (adapters, attenuators or splitters) pay close attention to specified SWR or match. It is recommended that the SPLITTER and CAL_ADAPT components be of high quality.

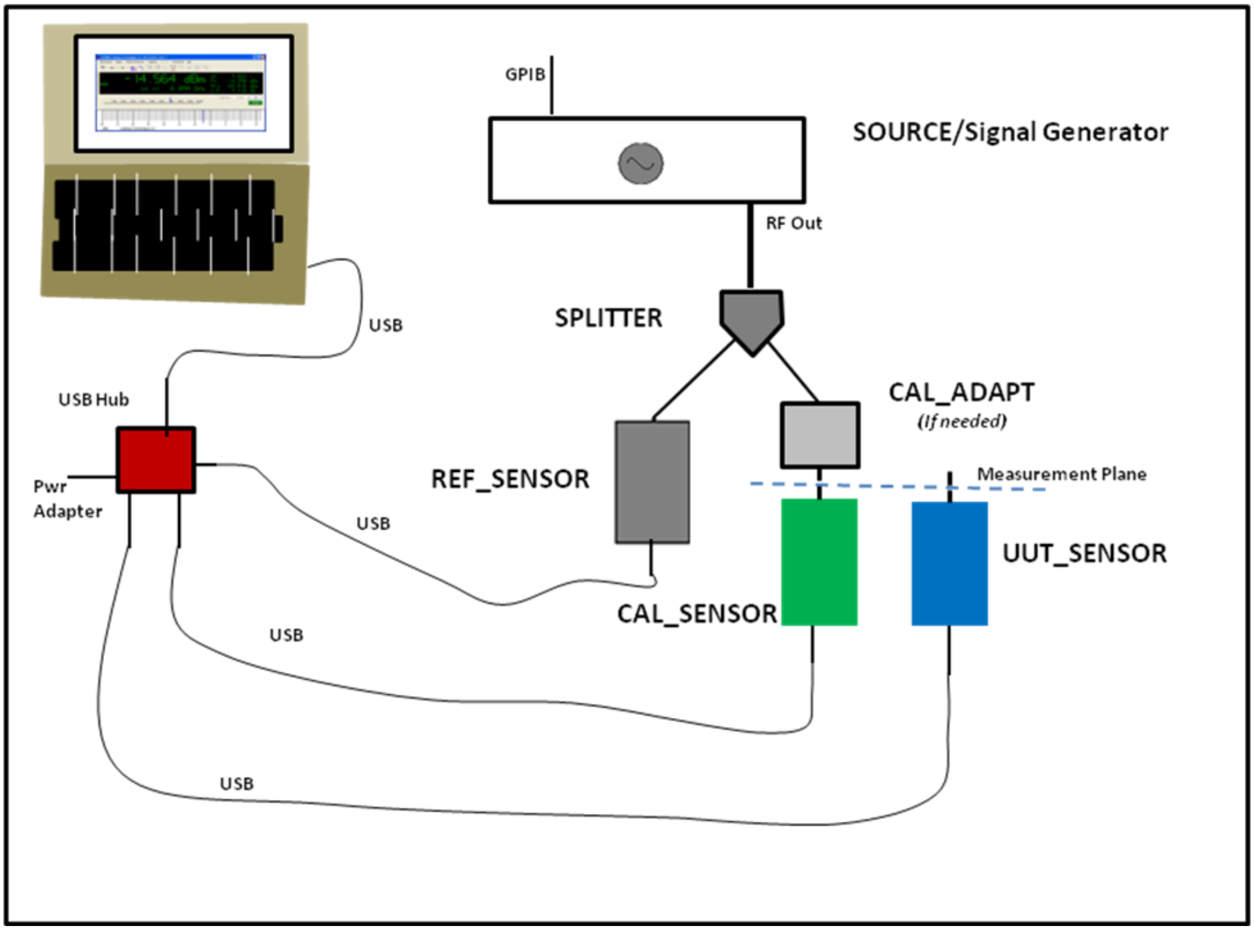
Keep in mind that SWR or port mismatch is the single biggest contributor to error and uncertainty (mismatch at the input to the sensor). As such, selecting components with marginal performance will degrade the quality of the measurements and can easily induce "false failures" during calibration.

| Procedure Name | UUT Connector | | Equipment Model Number | Comments |
|---|---|---|---|---|
| | Sex | Type | | |
| UUT | ALL | ALL | **U**nit **U**nder **T**est | The sensor you wish to calibrate |
| TR | ALL | ALL | **T**est **R**ecord | The test record is selected in step 1 |
| PC | ALL | ALL | PC running Windows XP, Service Pack 3 or Windows 7and up to date | Keyboard, mouse etc as required |
| PM_APP | ALL | ALL | Power meter application. Software available for download from: ***http://www.ladybug-tech.com/*** | Power Meter application is part of standard application installation. |
| SOURCE/Signal Generator | ALL | ALL | Agilent N5183A or equivalent with adapaters and cable necessary to connect to the SPLITTER 3.5 mm female RF input. | Suitable substitutes with equal to or better:<br>Harmonics<br>Power level (-100 dBm to +20 dBm)<br>Frequency range and programmable |
| SPLITTER | F | SMA/3.5 mm | Agilent 11667B , 2 resistor splitter, 26.5 GHz or equivalent | The SPLITTER and CAL_ADAPT in UUT connector |
| USB Hub | | | Powered USB 2.0 Hub | USB 2.0 and capable of delivering 500 mA at each USB port |
| REF_SENSOR | M | SMA | LB589A Opt OSM | Recommended Factory calibrated sensors |
| CAL_SENSOR | M | N-Type | LB579A Opt ONM | Factory calibrated sensors |
| | F | N-Type | LB579A Opt ONF | |
| | M | SMA | LB589A Opt OSM | |
| | F | SMA | LB589A Opt OSF | |
| CAL_ADAPT | M | N-Type | N female to SMA male or N female to 3.5 mm male | If configuring your own splitter with SMA female or 3.5 mm female connectors, and your own CAL_ADAPT, select the cal sensor adapter based on the UUT connector type and UUT connector sex always to 3.5 mm male (for example: N-female to 3.5 mm male for UUT connector type of Type N male) |
| | F | N-Type | N male to SMA male or N male to 3.5 mm male | |
| | M | SMA | No adapter necessary, but if you choose one it must be either a SMA female to SMA male or 3.5 mm female to 3.5 mm male | |
| | F | SMA | SMA male to SMA male or 3.5 mm male to 3.5 mm male | |

**Table 1: Required Equipment**

## Test Procedure:

### 1. Configure the test system




**Configuration Diagram for Field Certification procedure**

Use high quality cables and adapters when making all RF connections.

## 2. Select the TR (Test Record)

Determine the UUT model number, RF connector type and RF connector sex. Select the TR (or test record) at the end of this document that applies to the UUT you have chosen to certify. Copy or print the test record. Record the following on the TR:

a. *Enter Date on TR*
b. *Enter UUT model number on TR*
c. *Enter UUT serial number (rear of UUT, below USB connection) on TR*
d. *Enter UUT connector type on TR*
e. *Enter UUT connector sex on TR*
f. *Enter UUT last calibration date on TR*

Physical and functional check of UUT

g. Inspect the UUT for signs of physical and/or mechanical damage. Enter result on TR.
h. Inspect the UUT connector for signs of wear or damage. *Enter result on TR.*
i. Connect the UUT to the PC.
j. Turn on and preset the SOURCE.
k. Set SOURCE power to off.
l. Connect SOURCE to UUT RF input connector (use adapters as required).
m. Start the PM_APP.
n. After the PM_APP starts, click PM_APP Reset button. The PM_APP switch to CW mode.
o. By exercising the UUT over power and frequency, satisfy yourself that the UUT is functioning properly. Use the outline below.
    i. Set SOURCE power off
    ii. Set SOURCE frequency
    iii. Set the UUT frequency (using the PM_APP)
    iv. Set SOURCE power to less than +20 dBm.
    v. Set SOURCE power on
    vi. Read UUT power.
    vii. As you vary SOURCE power, make readings on the UUT.
    viii. With a high quality SOURCE, UUT power readings should agree within about +-1 dB. You may see larger disagreement with some sources.
    ix. Exercise the UUT over its entire power range.
p. *Enter result of the Functional Test on TR.*

## 3. Warm up

a. For 24 hours prior to and during execution of this test procedure the UUT must be in a stable laboratory environment. In addition, the sensor should be powered for at least 1 hour before starting the test. Stable environmental conditions are defined as:
   - Temperature: 20° C to 30° C (68°F to 86°F)
   - Humidity: 15% to 95% non-condensing
   - Altitude: Sea Level to 3,000 meters (10,000 feet)

b. All equipment requiring power should be connected to mains and warmed up per manufacturers recommendations.

*c. Enter temperature on TR.*

*d. Enter humidity on TR.*

## 4. Absolute Level Accuracy

a. Connect the SOURCE, SPLITTER, PC, REF_SENSOR, CAL_SENSOR. UUT_SENSOR, and CAL_ADPT per the "Configuration Diagram" above.

b. Set the SOURCE mode to CW

c. Set the SOURCE power to Off

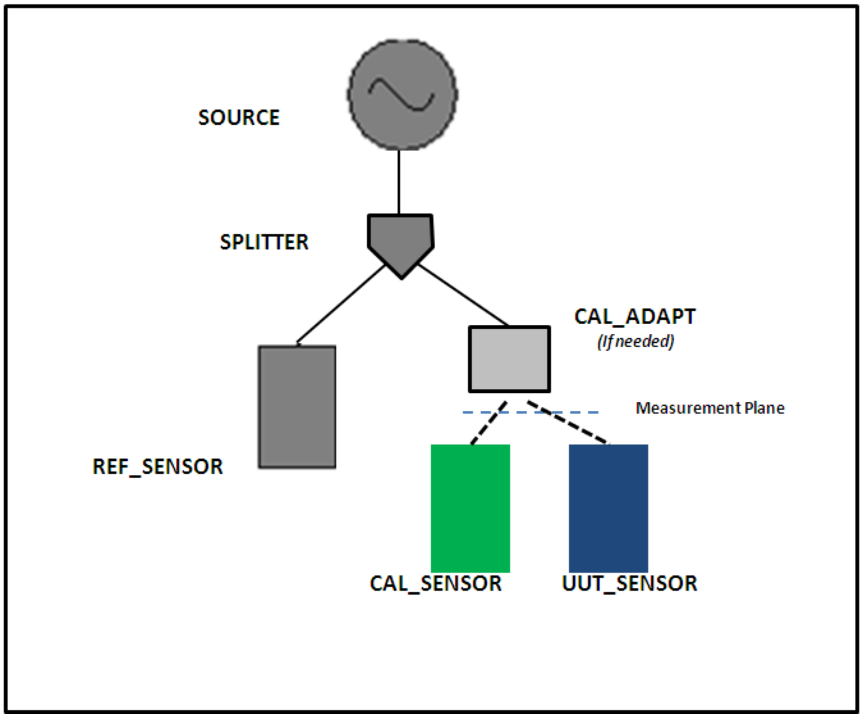
d. Set the SOURCE power level to -120 dBm or lowest power

e. Connect the REF_SENSOR, CAL_SENSOR and UUT_SENSOR to PC via USB cables.

f. Start an instance of the PM_APP for REF_SENSOR, CAL_SENSOR and UUT_SENSOR.

g. Preset each PM_APP.

h. Setup the equipment as depicted in "Absolute Level Accuracy Setup" diagram below. It is recommended that the SPLITTER and CAL_ADAPT components be of high quality. Do not connect CAL_SENSOR or UUT_SENSOR to CAL_ADAPT at this time. The open end of CAL_ADAPT is the measurement plane. Do not connect any additional adapters or cables to the measurement plane.




**Absolute Level Accuracy Setup**

i. If UUT has a female connector you should have a CAL_ADAPT with Type N male in the setup. If UUT has a male connector you should have a CAL_ADAPT with a Type N female in the setup.
j. Ensure CAL_SENSOR and UUT have the same type connector and same sex connector.
k. Ensure the open end of the CAL_ADAPT can mate directly with the CAL_SENSOR and UUT.
l. Preset each PM_APP
m. Set the CAL_SENSOR and UUT_SENSOR PM_APPs as shown below:
    i. Mode = CW
    ii. Averages = 500
    iii. Freq = Same as Source Freq
    iv. Units = dBm
n. Set the REF_SENSOR PM_APP as shown below:
    v. Mode = CW
    vi. Averages = 500
    vii. Freq = Same as Source Freq
    viii. Units = dB (relative dB)
o. Repeat the steps in 4.o for each frequency listed in step 4.n of the TR.
    ix. Carefully connect CAL_SENSOR to measurement plane (open end of ATTEN_20)
    x. Set SOURCE frequency to first or next frequency in step 4.n of the TR and record it on the Worksheet
    xi. Set the all PM_APP frequencies to match SOURCE frequency
    xii. Set SOURCE power On

xiii. Set SOURCE power level so the CAL_SENSOR PM_APP reads within 0.100 dB of IDEAL_CAL_LEVEL indicated in step 4.n.xv of the TR
*xiv. Record CAL_SENSOR PM_APP reading (Worksheet)*
xv. Click the “Set Ref” button on REF_SENSOR PM_APP
xvi. Carefully disconnect CAL_SENSOR from measurement plane.
xvii. Carefully connect UUT_SENSOR to measurement plane.
*xviii. Record the UUT PM_APP reading (Worksheet)*
*xix. Record the REF_SENSOR PM_APP reading (be certain to record the sign of this measurement)(Worksheet)*
xx. Set SOURE power off
xxi. Carefully disconnect UUT from measurement plane.
xxii. Calculate the LVL_ERROR using the following equation and the results from steps 4.o.xiii, 4.o.xviii and 4.o.xix (Worksheet). Be careful not to drop the sign of the REF_SENSOR measurement.

**LVL_ERROR (dB) = UUT _SENSOR (dBm)– CAL_SENSOR (dBm) – REF_SENSOR (dB)**

*xxiii. Record the calculated LVL_ERROR (Worksheet) onto the TR*
*xxiv. Repeat steps above until Level Accy TR is complete*

n. Set the SOURCE power to Off
o. Set the SOURCE power level to -120 dBm or lowest power
p. Close all PM_APPS
q. Tear down “Absolute Level Accuracy Setup.”

## Level Accuracy Worksheet

| Source Freq | Cal Sensor (dBm) | - | UUT Sensor (dBm) | - | Ref Sensor(dB) | = | LVL ERROR (dB) |
|---|---|---|---|---|---|---|---|
| | | - | | - | | = | |
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## 5. Linearity

a. Set the SOURCE mode to CW

b. Set the SOURCE power to Off

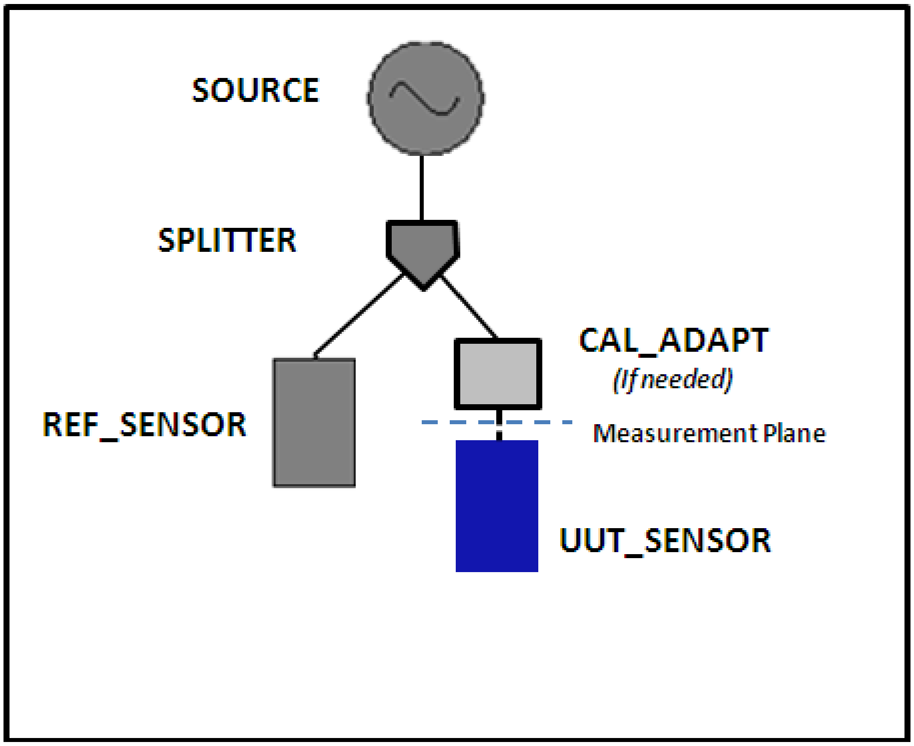
c. Set the SOURCE power level to -120 dBm or lowest power

d. Connect the REF_SENSOR and UUT to PC via USB cables.

e. Start an instance of the PM_APP for REF_SENSOR, CAL_SENSOR and UUT.

f. Preset each PM_APP.

g. Setup the equipment as depicted in the "Linearity Setup" diagram below




**Linearity Setup**

h. Set the REF_SENSOR and UUT PM_APPs as shown below:

i. Mode = CW
ii. Averages = 500
iii. Units = dBm

i. *Set SOURCE frequency equal to IDEAL_SOURCE_FREQ in TR*

j. Set SOURCE power On

k. Set REF_SENSOR and UUT_SENSOR frequency to SOURCE frequency

*l. Set SOURCE level so that REF_SENSOR PM_APP indicates IDEAL_LIN_LEVEL specified in 5.v.v of TR +/- 0.100 dB*

m. Check UUT_SENSOR PM_APP power. UUT_SENSOR PM_APP should indicate within 3.00 dB of REF_SENSOR PM_APP.

n. Change REF_SENSOR PM_APP measurement units to dB Relative

o. Click REF_SENSOR PM_APP Set Ref button

p. Change UUT_SENSOR PM_APP measurement units to dB Relative

q. Click UUT PM_APP Set Ref button

r. Both PM_APPS should indicate 0.000 dB +/- 0.050 dB and should be very stable.
*s. Note the REF_SENSOR PM_APP reading.*
*t. Note the UUT_SENSOR PM_APP reading.*
u. For the remainder of this test you will be asked to read the values indicated on the PM_APPs as a result of changing SOURCE power level. Do not change any other settings on the PM_APPs or SOURCE. Also, take great care not to physically disturb the setup.
v. Repeat the steps in 5.v for each level listed in step 5.v.v of the TR.
    *i. Set SOURCE level to the first or next level in step 5.v of the TR and record on worksheet;*
    *ii. Record REF_SENSOR PM_APP reading on worksheet (dB)*
    *iii. Record UUT_SENSOR PM_APP reading on worksheet (dB)*
    iv. Calculate the LIN_ERROR using the following equation and the values from steps 5.v.ii, 5.v.iii and record on the worksheet. Be careful not to drop the sign of either reading.

**LIN_ERROR = REF_SENSOR PM(dB) – UUT_Sensor PM (dB)**

    *v. Record the calculated LIN_ERROR on the worksheet and onto the TR*
    *vi. Repeat above steps until TR Linearity is complete.*
*w. Set the SOURCE power to Off*
*x. Set the SOURCE power level to -120 dBm or lowest power*
*y. Close all PM_APPS*
*z. Tear down the “Linearity Setup.”*

**Linearity Worksheet**

| Power Level (dBm) | Ref_SENSOR(dB) | - | UUT_Sensor (dB) | = | LIN_ERROR (dB) |
|---|---|---|---|---|---|
| ______ | ______ | - | ______ | = | ______ |
| ______ | ______ | - | ______ | = | ______ |
| ______ | ______ | - | ______ | = | ______ |
| ______ | ______ | - | ______ | = | ______ |
| ______ | ______ | - | ______ | = | ______ |
| ______ | ______ | - | ______ | = | ______ |

# Test Record for LB478A/ LB479A, Type N and Super SMA connectors

Model Number ___________________ SN____________________ Date __________________
Conn Type ___________ Conn Sex _______ Temp _______ °C Humidity______ %

| Step | Measurement or Action | Measurement Range or Point | Lower Limit | Upper Limit | Measured Value | Result |
|---|---|---|---|---|---|---|
| 2.a | UUT Physical Check | Inspection | - | - | - | Pass Fail |
| 2.b | UUT Connector | Inspection | | | | Pass Fail |
| 2.j | Functional Test | | - | - | - | Pass Fail |
| | | | - | - | - | |
| | | | - | | | |
| 4.n.xv | Absolute Level Accuracy | 10 MHz | -0.51 dB | +0.46 dB | ___._____ dB | Pass Fail |
| | **IDEAL_CAL_LEVEL: -20 dBm** | 50 MHz | -0.51 dB | +0.46 dB | ___._____ dB | Pass Fail |
| | | 100 MHz | -0.39 dB | +0.36 dB | ___._____ dB | Pass Fail |
| | | 500 MHz | -0.39 dB | +0.36 dB | ___._____ dB | Pass Fail |
| | | 1 GHz | -0.34 dB | +0.31 dB | ___._____ dB | Pass Fail |
| | | 2 GHz | -0.30 dB | +0.28 dB | ___._____ dB | Pass Fail |
| | | 3 GHz | -0.30 dB | +0.28 dB | ___._____ dB | Pass Fail |
| | | 4 GHz | -0.31 dB | +0.29 dB | ___._____ dB | Pass Fail |
| | | 5 GHz | -0.31 dB | +0.29 dB | ___._____ dB | Pass Fail |
| | | 6 GHz | -0.31 dB | +0.29 dB | ___._____ dB | Pass Fail |
| | | 7 GHz | -0.31 dB | +0.29 dB | ___._____ dB | Pass Fail |
| | | 8 GHz | -0.31 dB | +0.29 dB | ___._____ dB | Pass Fail |
| 5.v.v | Linearity | -25 dBm | -0.22 dB | +0.21 dB | ___._____ dB | Pass Fail |
| | **IDEAL_SOURCE_FREQ: 1 GHz** | -20 dBm | -0.22 dB | +0.21 dB | ___._____ dB | Pass Fail |
| | **IDEAL_LIN_LEVEL: -25 dBm** | -15 dBm | -0.25 dB | +0.23 dB | ___._____ dB | Pass Fail |
| | | -10 dBm | -0.25 dB | +0.23 dB | ___._____ dB | Pass Fail |
| | | -5 dBm | -0.25 dB | +0.23 dB | ___._____ dB | Pass Fail |
| | | 0 dBm | -0.25 dB | +0.23 dB | ___._____ dB | Pass Fail |

# Test Record for LB480A, Type N and Super SMA connectors

Model Number ___________________ SN____________________ Date __________________
Conn Type ___________ Conn Sex ______ Temp ______ °C Humidity______ %

| Step | Measurement or Action | Measurement Range or Point | Lower Limit | Upper Limit | Measured Value | Result |
|---|---|---|---|---|---|---|
| 2.a | UUT Physical Check | Inspection | - | - | - | Pass Fail |
| 2.b | UUT Connector | Inspection | | | | Pass Fail |
| 2.j | Functional Test | | - | - | - | Pass Fail |
| | | | - | - | - | |
| | | | - | | | |
| 4.n.xv | Absolute Level Accuracy | 50 MHz[1] | -0.51 dB | +0.46 dB | ___._____ dB | Pass Fail |
| | **IDEAL_CAL_LEVEL: -20 dBm** | 100 MHz | -0.39 dB | +0.36 dB | ___._____ dB | Pass Fail |
| | | 500 MHz | -0.39 dB | +0.36 dB | ___._____ dB | Pass Fail |
| | | 1 GHz | -0.34 dB | +0.31 dB | ___._____ dB | Pass Fail |
| | | 2 GHz | -0.30 dB | +0.28 dB | ___._____ dB | Pass Fail |
| | | 3 GHz | -0.30 dB | +0.28 dB | ___._____ dB | Pass Fail |
| | | 4 GHz | -0.31 dB | +0.29 dB | ___._____ dB | Pass Fail |
| | | 5 GHz | -0.31 dB | +0.29 dB | ___._____ dB | Pass Fail |
| | | 6 GHz | -0.31 dB | +0.29 dB | ___._____ dB | Pass Fail |
| | | 7 GHz | -0.31 dB | +0.29 dB | ___._____ dB | Pass Fail |
| | | 8 GHz | -0.31 dB | +0.29 dB | ___._____ dB | Pass Fail |
| 5.v.v | Linearity | -25 dBm | -0.22 dB | +0.21 dB | ___._____ dB | Pass Fail |
| | **IDEAL_SOURCE_FREQ: 1 GHz** | -20 dBm | -0.22 dB | +0.21 dB | ___._____ dB | Pass Fail |
| | **IDEAL_LIN_LEVEL: -25 dBm** | -15 dBm | -0.25 dB | +0.23 dB | ___._____ dB | Pass Fail |
| | | -10 dBm | -0.25 dB | +0.23 dB | ___._____ dB | Pass Fail |
| | | -5 dBm | -0.25 dB | +0.23 dB | ___._____ dB | Pass Fail |
| | | 0 dBm | -0.25 dB | +0.23 dB | ___._____ dB | Pass Fail |

1. The 50 MHz calibration frequency is valid only for LB480A's that have a serial number that is > or equal to 117xxx (the xxx can be numbers and/or letters). For units that have a serial number < 117xxx, the minimum frequency to be tested is 100 MHz.

# Test Record for LB559A, Type N and Super SMA connectors

Model Number __________________ SN___________________ Date _________________

Conn Type __________ Conn Sex ______ Temp ______ °C Humidity______ %

| Step | Measurement or Action | Measurement Range or Point | Lower Limit | Upper Limit | Measured Value | Result |
|---|---|---|---|---|---|---|
| 2.a | UUT Physical Check | Inspection | - | - | - | Pass Fail |
| 2.b | UUT Connector | Inspection | | | | Pass Fail |
| 2.j | Functional Test | | - | - | - | Pass Fail |
| | | | - | - | - | |
| | | | - | | | |
| 4.n.xv | Absolute Level Accuracy | 10 MHz | -0.31 dB | +0.29 dB | ___._____ dB | Pass Fail |
| | **IDEAL_CAL_LEVEL: -20 dBm** | 50 MHz | -0.31 dB | +0.29 dB | ___._____ dB | Pass Fail |
| | | 100 MHz | -0.31 dB | +0.29 dB | ___._____ dB | Pass Fail |
| | | 500 MHz | -0.31 dB | +0.29 dB | ___._____ dB | Pass Fail |
| | | 1 GHz | -0.31 dB | +0.29 dB | ___._____ dB | Pass Fail |
| | | 2 GHz | -0.30 dB | +0.28 dB | ___._____ dB | Pass Fail |
| | | 3 GHz | -0.30 dB | +0.28 dB | ___._____ dB | Pass Fail |
| | | 4 GHz | -0.32 dB | +0.30 dB | ___._____ dB | Pass Fail |
| | | 5 GHz | -0.32 dB | +0.30 dB | ___._____ dB | Pass Fail |
| | | 6 GHz | -0.32 dB | +0.30 dB | ___._____ dB | Pass Fail |
| | | 7 GHz | -0.32 dB | +0.30 dB | ___._____ dB | Pass Fail |
| | | 8 GHz | -0.32 dB | +0.30 dB | ___._____ dB | Pass Fail |
| | | 9 GHz | -0.32 dB | +0.30 dB | ___._____ dB | Pass Fail |
| | | 12.5 GHz | -0.35 dB | +0.33 dB | ___._____ dB | Pass Fail |
| 5.v.v | Linearity | -25 dBm | -0.18 dB | +0.17 dB | ___._____ dB | Pass Fail |
| | **IDEAL_SOURCE_FREQ: 1 GHz** | -20 dBm | -0.18 dB | +0.17 dB | ___._____ dB | Pass Fail |
| | **IDEAL_LIN_LEVEL: -25 dBm** | -15 dBm | -0.22 dB | +0.21 dB | ___._____ dB | Pass Fail |
| | | -10 dBm | -0.22 dB | +0.21 dB | ___._____ dB | Pass Fail |
| | | -5 dBm | -0.22 dB | +0.21 dB | ___._____ dB | Pass Fail |
| | | 0 dBm | -0.22 dB | +0.21 dB | ___._____ dB | Pass Fail |

# Test Record for LB579A, Type N and Super SMA connectors

Model Number __________________ SN____________________ Date _________________

Conn Type __________ Conn Sex ______ Temp ______ °C Humidity______ %

| Step | Measurement or Action | Measurement Range or Point | Lower Limit | Upper Limit | Measured Value | Result |
|---|---|---|---|---|---|---|
| 2.a | UUT Physical Check | Inspection | - | - | - | Pass Fail |
| 2.b | UUT Connector | Inspection | | | | Pass Fail |
| 2.j | Functional Test | | - | - | - | Pass Fail |
| | | | - | - | - | |
| 4.f | | | - | | | |
| 4.n.xv | Absolute Level Accuracy | 10 MHz | -0.31 dB | +0.29 dB | ___._____ dB | Pass Fail |
| | **IDEAL_CAL_LEVEL: -20 dBm** | 50 MHz | -0.31 dB | +0.29 dB | ___._____ dB | Pass Fail |
| | | 100 MHz | -0.31 dB | +0.29 dB | ___._____ dB | Pass Fail |
| | | 500 MHz | -0.31 dB | +0.29 dB | ___._____ dB | Pass Fail |
| | | 1 GHz | -0.31 dB | +0.29 dB | ___._____ dB | Pass Fail |
| | | 2 GHz | -0.30 dB | +0.28 dB | ___._____ dB | Pass Fail |
| | | 3 GHz | -0.30 dB | +0.28 dB | ___._____ dB | Pass Fail |
| | | 4 GHz | -0.32 dB | +0.30 dB | ___._____ dB | Pass Fail |
| | | 5 GHz | -0.32 dB | +0.30 dB | ___._____ dB | Pass Fail |
| | | 6 GHz | -0.32 dB | +0.30 dB | ___._____ dB | Pass Fail |
| | | 7 GHz | -0.32 dB | +0.30 dB | ___._____ dB | Pass Fail |
| | | 8 GHz | -0.32 dB | +0.30 dB | ___._____ dB | Pass Fail |
| | | 9 GHz | -0.32 dB | +0.30 dB | ___._____ dB | Pass Fail |
| | | 13 GHz | -0.40 dB | +0.37 dB | ___._____ dB | Pass Fail |
| | | 14 GHz | -0.40 dB | +0.37 dB | ___._____ dB | Pass Fail |
| | | 15 GHz | -0.40 dB | +0.37 dB | ___._____ dB | Pass Fail |
| | | 16 GHz | -0.40 dB | +0.37 dB | ___._____ dB | Pass Fail |
| | | 17 GHz | -0.40 dB | +0.37 dB | ___._____ dB | Pass Fail |
| | | 18 GHz | -0.40 dB | +0.37 dB | ___._____ dB | Pass Fail |
| 5.v.v | Linearity | -25 dBm | -0.18 dB | +0.17 dB | ___._____ dB | Pass Fail |
| | **IDEAL_SOURCE_FREQ: 1 GHz** | -20 dBm | -0.18 dB | +0.17 dB | ___._____ dB | Pass Fail |
| | **IDEAL_LIN_LEVEL: -25 dBm** | -15 dBm | -0.22 dB | +0.21 dB | ___._____ dB | Pass Fail |
| | | -10 dBm | -0.22 dB | +0.21 dB | ___._____ dB | Pass Fail |
| | | -5 dBm | -0.22 dB | +0.21 dB | ___._____ dB | Pass Fail |
| | | 0 dBm | -0.22 dB | +0.21 dB | ___._____ dB | Pass Fail |

# Test Record for LB589A, Super SMA Connectors

Model Number ___________________ SN____________________ Date __________________

Conn Type _Super SMA_____ Conn Sex ______ Temp ______ °C Humidity______ %

| Step | Measurement or Action | Measurement Range or Point | Lower Limit | Upper Limit | Measured Value | Result |
|---|---|---|---|---|---|---|
| 2.a | UUT Physical Check | Inspection | - | - | - | Pass Fail |
| 2.b | UUT Connector | Inspection | | | | Pass Fail |
| 2.j | Functional Test | | - | - | - | Pass Fail |
| | | | - | - | - | |
| | | | - | | | |
| 4.n.xv | Absolute Level Accuracy | 10 MHz | -0.31 dB | +0.29 dB | ___._____ dB | Pass Fail |
| | **IDEAL_CAL_LEVEL: -20 dBm** | 50 MHz | -0.31 dB | +0.29 dB | ___._____ dB | Pass Fail |
| | | 100 MHz | -0.31 dB | +0.29 dB | ___._____ dB | Pass Fail |
| | | 500 MHz | -0.31 dB | +0.29 dB | ___._____ dB | Pass Fail |
| | | 1 GHz | -0.31 dB | +0.29 dB | ___._____ dB | Pass Fail |
| | | 2 GHz | -0.30 dB | +0.28 dB | ___._____ dB | Pass Fail |
| | | 3 GHz | -0.30 dB | +0.28 dB | ___._____ dB | Pass Fail |
| | | 4 GHz | -0.32 dB | +0.30 dB | ___._____ dB | Pass Fail |
| | | 5 GHz | -0. 32 dB | +0. 30 dB | ___._____ dB | Pass Fail |
| | | 6 GHz | -0. 32 dB | +0. 30 dB | ___._____ dB | Pass Fail |
| | | 7 GHz | -0. 32 dB | +0. 30 dB | ___._____ dB | Pass Fail |
| | | 8 GHz | -0. 32 dB | +0. 30 dB | ___._____ dB | Pass Fail |
| | | 9 GHz | -0.32 dB | +0.30 dB | ___._____ dB | Pass Fail |
| | | 13 GHz | -0.40 dB | +0.37 dB | ___._____ dB | Pass Fail |
| | | 14 GHz | -0.40 dB | +0.37 dB | ___._____ dB | Pass Fail |
| | | 15 GHz | -0.40 dB | +0.37 dB | ___._____ dB | Pass Fail |
| | | 16 GHz | -0.40 dB | +0.37 dB | ___._____ dB | Pass Fail |
| | | 17 GHz | -0.40 dB | +0.37 dB | ___._____ dB | Pass Fail |
| | | 18 GHz | -0.40 dB | +0.37 dB | ___._____ dB | Pass Fail |
| | | 19 GHz | -0.46 dB | +0.42 dB | ___._____ dB | Pass Fail |
| | | 20 GHz | -0.46 dB | +0.42 dB | ___._____ dB | Pass Fail |
| | | 21 GHz | -0.46 dB | +0.42 dB | ___._____ dB | Pass Fail |
| | | 22 GHz | -0.46 dB | +0.42 dB | ___._____ dB | Pass Fail |
| | | 23 GHz | -0.46 dB | +0.42 dB | ___._____ dB | Pass Fail |
| | | 24 GHz | -0.46 dB | +0.42 dB | ___._____ dB | Pass Fail |
| | | 25 GHz | -0.46 dB | +0.42 dB | ___._____ dB | Pass Fail |
| | | 26 GHz | -0.46 dB | +0.42 dB | ___._____ dB | Pass Fail |
| | | 26.5 GHz | -0.46 dB | +0.42 dB | ___._____ dB | Pass Fail |
| 5.v.v | Linearity | -25 dBm | -0.18 dB | +0.17 dB | ___._____ dB | Pass Fail |
| | **IDEAL_SOURCE_FREQ: 1 GHz** | -20 dBm | -0.18 dB | +0.17 dB | ___._____ dB | Pass Fail |
| | **IDEAL_LIN_LEVEL: -25 dBm** | -15 dBm | -0.22 dB | +0.21 dB | ___._____ dB | Pass Fail |
| | | -10 dBm | -0.22 dB | +0.21 dB | ___._____ dB | Pass Fail |
| | | -5 dBm | -0.22 dB | +0.21 dB | ___._____ dB | Pass Fail |
| | | 0 dBm | -0.22 dB | +0.21 dB | ___._____ dB | Pass Fail |

# Test Record for LB679A/ LB680A, Type N Connectors

Model Number __________________ SN___________________ Date _________________
Conn Type _N_____ Conn Sex _______ Temp _______ °C Humidity______ %

| Step | Measurement or Action | Measurement Range or Point | Lower Limit | Upper Limit | Measured Value | Result |
|---|---|---|---|---|---|---|
| 2.a | UUT Physical Check | Inspection | - | - | - | Pass Fail |
| 2.b | UUT Connector | Inspection | | | | Pass Fail |
| 2.j | Functional Test | | - | - | - | Pass Fail |
| | | | - | - | - | |
| | | | - | | | |
| 4.n.xv | Absolute Level Accuracy | 50 MHz | -0.50 dB | +0.45 dB | ___._____ dB | Pass Fail |
| | **IDEAL_CAL_LEVEL: -20 dBm** | 100 MHz | -0.44 dB | +0.40 dB | ___._____ dB | Pass Fail |
| | | 500 MHz | -0.44 dB | +0.40 dB | ___._____ dB | Pass Fail |
| | | 1 GHz | -0.38 dB | +0.35 dB | ___._____ dB | Pass Fail |
| | | 2 GHz | -0.35 dB | +0.32 dB | ___._____ dB | Pass Fail |
| | | 3 GHz | -0.35 dB | +0.32 dB | ___._____ dB | Pass Fail |
| | | 4 GHz | -0.36 dB | +0.33 dB | ___._____ dB | Pass Fail |
| | | 5 GHz | -0.36 dB | +0.33 dB | ___._____ dB | Pass Fail |
| | | 6 GHz | -0.36 dB | +0.33 dB | ___._____ dB | Pass Fail |
| | | 7 GHz | -0.36 dB | +0.33 dB | ___._____ dB | Pass Fail |
| | | 8 GHz | -0.36 dB | +0.33 dB | ___._____ dB | Pass Fail |
| | | 9 GHz | -0.36 dB | +0.33 dB | ___._____ dB | Pass Fail |
| | | 10 GHz | -0.36 dB | +0.33 dB | ___._____ dB | Pass Fail |
| | | 14 GHz | -0.44 dB | +0.40 dB | ___._____ dB | Pass Fail |
| | | 15 GHz | -0.44 dB | +0.40 dB | ___._____ dB | Pass Fail |
| | | 16 GHz | -0.44 dB | +0.40 dB | ___._____ dB | Pass Fail |
| | | 17 GHz | -0.44 dB | +0.40 dB | ___._____ dB | Pass Fail |
| | | 18 GHz | -0.44 dB | +0.40 dB | ___._____ dB | Pass Fail |
| 5.v.v | Linearity | 0 dBm | -0.25 dB | +0.23 dB | ___._____ dB | Pass Fail |
| | **IDEAL_SOURCE_FREQ: 1 GHz** | -5 dBm | -0.25 dB | +0.23 dB | ___._____ dB | Pass Fail |
| | **IDEAL_LIN_LEVEL: -0 dBm** | -10 dBm | -0.25 dB | +0.23 dB | ___._____ dB | Pass Fail |
| | | -15 dBm | -0.25 dB | +0.23 dB | ___._____ dB | Pass Fail |
| | | -20 dBm | -0.30 dB | +0.28 dB | ___._____ dB | Pass Fail |
| | | -25 dBm | -0.38 dB | +0.35 dB | ___._____ dB | Pass Fail |

# Test Record for LB679A/ LB680A, Super SMA Connectors

Model Number ___________________ SN____________________ Date __________________

Conn Type __Super SMA____ Conn Sex ______ Temp ______ °C Humidity______ %

| Step | Measurement or Action | Measurement Range or Point | Lower Limit | Upper Limit | Measured Value | Result |
|---|---|---|---|---|---|---|
| 2.a | UUT Physical Check | Inspection | - | - | - | Pass Fail |
| 2.b | UUT Connector | Inspection | | | | Pass Fail |
| 2.j | Functional Test | | - | - | - | Pass Fail |
| | | | - | - | - | |
| | | | - | | | |
| 4.n.xv | Absolute Level Accuracy | 50 MHz | -0.50 dB | +0.45dB | ___._____ dB | Pass Fail |
| | **IDEAL_CAL_LEVEL: -20 dBm** | 100 MHz | -0.44 dB | +0.40 dB | ___._____ dB | Pass Fail |
| | | 500MHz | -0.44 dB | +0.40 dB | ___._____ dB | Pass Fail |
| | | 1 GHz | -0.38 dB | +0.35 dB | ___._____ dB | Pass Fail |
| | | 2 GHz | -0.35 dB | +0.32 dB | ___._____ dB | Pass Fail |
| | | 3 GHz | -0.35 dB | +0.32 dB | ___._____ dB | Pass Fail |
| | | 4 GHz | -0.36 dB | +0.33 dB | ___._____ dB | Pass Fail |
| | | 5 GHz | -0. 36dB | +0.33 dB | ___._____ dB | Pass Fail |
| | | 6 GHz | -0. 36dB | +0.33 dB | ___._____ dB | Pass Fail |
| | | 7 GHz | -0. 36dB | +0.33 dB | ___._____ dB | Pass Fail |
| | | 8 GHz | -0. 36dB | +0.33 dB | ___._____ dB | Pass Fail |
| | | 9 GHz | -0. 36dB | +0.33 dB | ___._____ dB | Pass Fail |
| | | 10 GHz | -0. 36dB | +0.33 dB | ___._____ dB | Pass Fail |
| | | 14 GHz | -0.44 dB | +0.40 dB | ___._____ dB | Pass Fail |
| | | 15 GHz | -0.44 dB | +0.40 dB | ___._____ dB | Pass Fail |
| | | 16 GHz | -0.44 dB | +0.40 dB | ___._____ dB | Pass Fail |
| | | 17 GHz | -0.44 dB | +0.40 dB | ___._____ dB | Pass Fail |
| | | 18 GHz | -0.44 dB | +0.40 dB | ___._____ dB | Pass Fail |
| | | 19 GHz | -0.47 dB | +0.43 dB | ___._____ dB | Pass Fail |
| | | 20 GHz | -0.47 dB | +0.43 dB | ___._____ dB | Pass Fail |
| 5.v.v | Linearity | 0 dBm | -0.25 dB | +0.23 dB | ___._____ dB | Pass Fail |
| | **IDEAL_SOURCE_FREQ: 1 GHz** | -5 dBm | -0.25 dB | +0.23 dB | ___._____ dB | Pass Fail |
| | **IDEAL_LIN_LEVEL: -0 dBm** | -10 dBm | -0.25 dB | +0.23 dB | ___._____ dB | Pass Fail |
| | | -15 dBm | -0.25 dB | +0.23 dB | ___._____ dB | Pass Fail |
| | | -20 dBm | -0.30 dB | +0.28 dB | ___._____ dB | Pass Fail |
| | | -25 dBm | -0.38 dB | +0.35 dB | ___._____ dB | Pass Fail |