Keysight X-Series EMI Receiver

This manual provides documentation for the following models:

MXE EMI Receiver N9038A

KEYSIGHT TECHNOLOGIES

N9038A Functional Tests

Notices

Trademark Acknowledgments

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1 Functional Tests

Functional tests are tests of various instrument parameters that give a high degree of confidence that the analyzer is operating correctly. They are recommended as a check of analyzer operation for incoming inspection or after a repair. Measurement uncertainty analysis is not available for functional tests, and the analyzer is checked against limits that are wider than the published specifications. The functional tests are designed to test an analyzer operating within the temperature range defined by the analyzer specifications using a minimum set of test equipment. If a test does not pass, performance verification tests must be run to determine whether a problem exists.

Functional Test Versus Performance Verification

Functional tests use a minimum set of test equipment to check a much smaller range of parameters (and a limited number of data points for each parameter) than do performance verification tests. Functional tests use limits that are wider than the published specifications; measurement uncertainty analysis is **not** available for functional tests.

NOTE If a functional test does not pass, you must run performance verification tests to determine whether a problem exists.

Performance verification tests span a wide range of instrument parameters and provide the highest level of confidence that the instrument conforms to published specifications. These tests can be time consuming and require extensive test equipment.

Contents of this Document

This chapter includes the following:

- "Before Performing a Functional Test" on page 10 (what to do first).
- "Test Equipment" on page 11 (a list of the equipment required for **all** of the tests).

Subsequent chapters describe the following Functional Tests:

Each functional test includes:

- Test limits (pass/fail criteria)
- A description of the test
- The equipment required for the test
- A figure showing how to connect the equipment
- Step-by-step instructions
- One or more tables in which to record the measurement results

Before Performing a Functional Test

1. Ensure that you have the proper test equipment.
2. Switch on the unit under test (UUT) and let it warm up (in accordance with warm-up requirements in the instrument specifications).
3. Allow sufficient warm-up time for the required test equipment (refer to individual instrument documentation for warm-up specifications).
4. Ensure that the analyzer's frequency reference is set to Internal:
    a. Press the **Input/Output**, More, **Freq Ref In** keys.
    b. If the **Freq Ref In** softkey does **not** show Internal, press the **Freq Ref In** softkey and select Internal.
5. Following instrument warm-up, perform the auto align routine:

    Press **System**, **Alignments**, **Align Now, All**.
6. Run the EMI receiver internal RF preselector alignments by pressing **System**, **Alignments**, **More**, **RF Preselector**, **Align Now**, **20 Hz to 3.6 GHz**.

NOTE Functional test accuracy depends on the precision of the test equipment used. Ensure that all of the test equipment is calibrated before running a functional test.

Test Equipment

The table below summarizes the test equipment needed to perform all of the functional tests. Alternate equipment model numbers are given in case the recommended equipment is not available. If neither the recommended nor the alternative test equipment are available, substitute equipment that meets or exceeds the critical specifications listed.

Table 1-1 Required Test Equipment

Item	Quantity	Critical Specifications	Recommended Model
Adapters			
Adapter BNC (f) to SMA (m)	1	Frequency: 40 MHz to 80 MHz	1250-1200
Adapter Type N (m) to 3.5 mm (m)	1	Frequency: 10 MHz to 18 GHz VSWR: < 1.1:1	1250-1743
Adapter Type N (m) to 3.5 mm (f)	1	Frequency: 10 MHz to 1.51 GHz VSWR: < 1.1:1	1250-1744
Adapter Type N (m) to BNC (f)	1	Frequency: 10 MHz to 80 MHz VSWR: < 1.05:1	1250-1476
Adapter 3.5 mm (f) to 3.5mm (f)	1[a]	Frequency: 10 MHz to 26.5 GHz VSWR: < 1.1:1	83059B
Adapter 2.4 mm (f) to 3.5mm (f)	1[b]	Frequency: 10 MHz to 50 GHz VSWR: < 1.1:1	11901B
Adapter 2.4 mm (f) to 3.5mm (m)	1[b]	Frequency: 10 MHz to 26.5 GHz VSWR: < 1.1:1	11901D
Attenuators			
Attenuator, 10 dB 3.5 mm (m) to 3.5 mm (f))	2	Frequency:50 MHz VSWR: < 1.2:1	8493C Option 010
Attenuator, 10 dB Step 3.5 mm (f) to 3.5 mm (f))	1	Range: 0 to 50 dB Frequency: 50 MHz Accuracy: ±0.25 dB	8495A Option 004
Attenuator, 30 dB Type-N (m) to Type-N (f)	1	Accuracy: < 0.5 dB @ 50 MHz	11708A
Attenuator, 30 dB 3.5 mm (m) to 3.5 mm (f))	1[c]	Accuracy: < 0.5 dB @ 50 MHz	8493C Option 030

Table 1-1 Required Test Equipment

Item	Quantity	Critical Specifications	Recommended Model
Cables			
Cable, 1 meter 2.4 mm (m) to 2.4 mm (m)	1[b]	Frequency:50 MHz to 44 GHz VSWR< 1.55:1	8120-6164
Cable, 1 meter 3.5 mm (m) to 3.5 mm (m)	2	Frequency:10 MHz to 26.5 GHz VSWR< 1.4:1	11500E
Cable, 120 cm BNC (m) to BNC (m)	2	Frequency:10 MHz	10503A
Power Meters/Sensors			
Power Meter	1	Compatible with power sensor	E4418B
Power Sensor	1	Frequency Range: 50 MHz to 26.5 GHz Amplitude Range: –25 dBm to 10 dBm	8485A
Power Sensor	1	Frequency Range: 50 MHz to 26.5 GHz Amplitude Range: –65 to –55 dBm	8485D
Power Sensor	1[b]	Frequency Range: 50 MHz to 44 GHz Amplitude Range: –30 to 20 dBm	8487A
Power Sensor	1[b]	Frequency Range: 50 MHz to 44 GHz Amplitude Range: –65 to –55 dBm	8487D
Power Sensor	1	Frequency Range: 9 kHz to 1 GHz Amplitude Range: –60 to 0 dBm	E9304A
Signal Source			
Signal Generator	1	Frequency: 50 MHz to 26.5 GHz Output Level Accuracy: 0 to –15 dBm: ±1.0 dB Spectral Purity: Better than –20 dBc Typical Temperature Stability: 0.01 dBc/°C	PSG
EMI Calibration Pulse Generator	1	Pulse Area meets CISPR 16-1-1 specification	Schwarzbeck IGUU 2916
Miscellaneous Equipment			
Filter, 50 MHz Low Pass BNC (m) to BNC (f)	1	Cutoff Frequency: 50 MHz Rejection at 65 MHz: > 40 dB Rejection at 75 MHz: > 60 dB	0955-0306
Power Splitter 3.5 mm (f)	1	Frequency Range: 50 MHz to 26.5 GHz Tracking Between Ports: < 0.25 dB	11667B

Table 1-1 Required Test Equipment

Item	Quantity	Critical Specifications	Recommended Model
Power Splitter 2.4 mm (f)	1[b]	Frequency Range: 50 MHz to 44 GHz Tracking Between Ports: < 0.4 dB	11667C
Termination, 50 Ω Type-N (m)	1	Frequency: DC to 18 GHz	909A Option 012
Termination, 50 Ω 3.5 mm (f)	1[c]	Frequency: DC to 26 GHz	909A Option 011
Termination, 50 Ω 2.4 mm (f)	1[b]	Frequency: DC to 50 GHz	85138B

a. Quantity of 2 required for Option C35 (3.5 mm RF Input 1)
b. Required for Option 544 (44 GHz Frequency Range)
c. Only required for Option C35 (3.5 mm RF Input 1)

2 Displayed Average Noise Level (DANL)

Test Limits

See test limits in Table 2-2 and Table 2-3.

Overview

The Displayed Average Noise Level (DANL) of the EMI receiver is measured across a 10 kHz frequency span at several center frequencies. The receiver input is terminated into a 50 Ω load. A test is performed to assure the measurement is not performed in the presence of a residual response. The measurement is then averaged, and the result is normalized to a 1 Hz bandwidth.

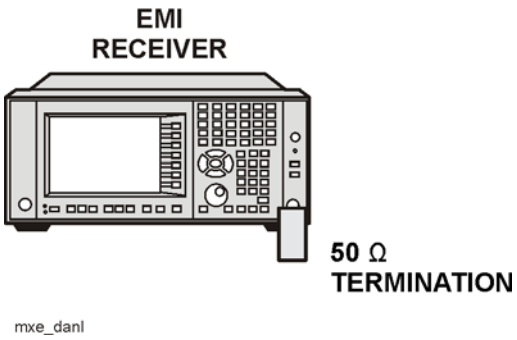
This measurement is performed for both RF inputs.

Table 2-1 Displayed Average Noise Level (DANL) - Required Equipment

Item	Critical Specifications (for this test)	Recommended Model
Termination, 50 Ω Type-N (m)	Frequency: DC to 18 GHz	909A Option 012
Termination, 50 Ω [a] 3.5 mm (f)	Frequency: DC to 26 GHz	909D Option 011
Termination, 50 Ω [b] 2.4 mm (f)	Frequency: DC to 50 GHz	85138B

a. Only required for Option C35 (3.5 mm RF Input 1)
b. Only required for Option 544 (44 GHz Frequency Range)

Figure 2-1 DANL Test Setup



Procedure

1. Configure the equipment as shown in Figure 2-1.
2. Select RF Input 1 on the receiver by pressing **Input/Output**, **RF Input**, **RF Input Port**, **RF Input**.
3. Preset the receiver by pressing **Mode**, **Spectrum Analyzer**, **Mode Preset**.
4. Set up the receiver by pressing:

   Mode Setup, **EMC Standard**, **None**
   FREQ Channel, **Center Freq**, **10**, **MHz**
   Input/Output, RF Input, **RF Coupling DC** (if available)
   SPAN X Scale, **Span**, **10 kHz**
   AMPTD Y Scale, **–70 dBm**
   AMPTD Y Scale, **Attenuation**, **MechAtten**, **0 dB**
   BW, **Res BW**, **1 kHz**
   BW, **Video BW**, **100 Hz**
   Meas Setup, Average/Hold, Number, **20**, **Enter**
   Trace/Detector, **Trace Average**
   Single

5. Perform the following steps for each row listed in Table 2-2 that applies to the frequency range of the instrument being tested:

   a. Set the receiver center frequency to the value listed in the Center Frequency column in Table 2-2 by pressing **FREQ Channel**, **Center Freq**, [Value].

   b. On the receiver, press **Restart**.

   c. Wait for the receiver to finish averaging.

   d. On the receiver, press **View/Display**, **Display**, **Display Line On**.

   e. Rotate the knob and set the display line at the average amplitude of the displayed noise floor by visual inspection.

   f. Confirm that the measurement is performed on the analyzer noise floor and not on a residual response within the displayed 10 kHz span.

NOTE Ignore the residual response if one appears when taking the measurement.

---

   g. Enter the value of the display line as the Measured Average Noise Level in Table 2-2.

h. Normalize the measured value to a 1 Hz BW by adding -30 dB to the measured value.

NOTE

The –30 dB value is added because the formula used to calculate the value of the noise power in a 1 Hz BW when measured with a 1 kHz BW is:

Normalized Noise = 10 Log (BW 2/BW 1) where BW 2 is the 1 kHz BW we measure and BW 1 is 1 Hz BW to which we want to normalize.

Therefore, 10 Log (1000) = 30 dB, so the noise floor will be 30 dB lower in a 1 Hz BW.

i. Enter the Normalized Average Noise Level value in Table 2-2.

j. The value of the normalized displayed average noise should be less than the specification value.

Table 2-2 Displayed Average Noise Level (DANL) Results - RF Input 1

Center Frequency	Measured Average Noise Level (dBm)	Normalized Average Noise Level/ (1 Hz BW) (dBm)	Test Limits (dBm)
10 MHz			–150
2 GHz			–150
6 GHz			–145
13 GHz			–147
20 GHz			–142
26.5 GHz			–135
30 GHz			–141
44 GHz			–135

6. Attach a 50 Ω termination to RF Input 2.

7. Select RF Input 2 on the receiver by pressing **Input/Output**, **RF Input**, **RF Input Port**, **RF Input 2**.

8. Tune the receiver to 10 MHz by pressing **Freq Channel**, **Center Freq**, **10 MHz**.

9. Perform the following steps for each row listed in Table 2-1.

    a. Set the receiver center frequency to the value listed in the Center Frequency column in Table 2-2 by pressing **FREQ Channel**, **Center Freq**, [Value].

    b. On the receiver, press **Restart**.

    c. Wait for the receiver to finish averaging.

    d. On the receiver, press **View/Display**, **Display**, **Display Line On**.

    e. Rotate the knob and set the display line at the average amplitude of the displayed noise floor by visual inspection.

    f. Confirm that the measurement is performed on the analyzer noise floor and not on a residual response within the displayed 10 kHz span.

    g. Enter the value of the display line as the **Measured Average Noise Level** in Table 2-2.

    h. Normalize the measured value to a 1 Hz BW by adding -30 dB to the measured value.

    i. Enter the Normalized Average Noise Level value in Table 2-2.

    j. The value of the normalized displayed average noise should be less than the specification value.

Table 2-3 Displayed Average Noise Level (DANL) Results - RF Input 2

Center Frequency	Measured Average Noise Level (dBm)	Normalized Average Noise Level /(1 Hz BW) (dBm)	Test Limits (dBm)
10 MHz			–139
100 MHz			–140
500 MHz			–142
1 GHz			–140

3 Frequency Readout Accuracy

Test Limits

Frequency Readout Accuracy is equivalent to the following equation:

$$\pm(\mathbf{0.25}\% \times span + \mathbf{5}\% \times RBW + \mathbf{2}\ Hz + \mathbf{0.5} \times horizontal\ resolution)$$

See Table 3-2 for actual limits used.

Overview

The frequency readout accuracy is measured in several spans and center frequencies that allow both internal receiver synthesizer modes and prefilter bandwidths to be tested. Frequency reference error is eliminated by using the same frequency standard for the receiver and signal source.

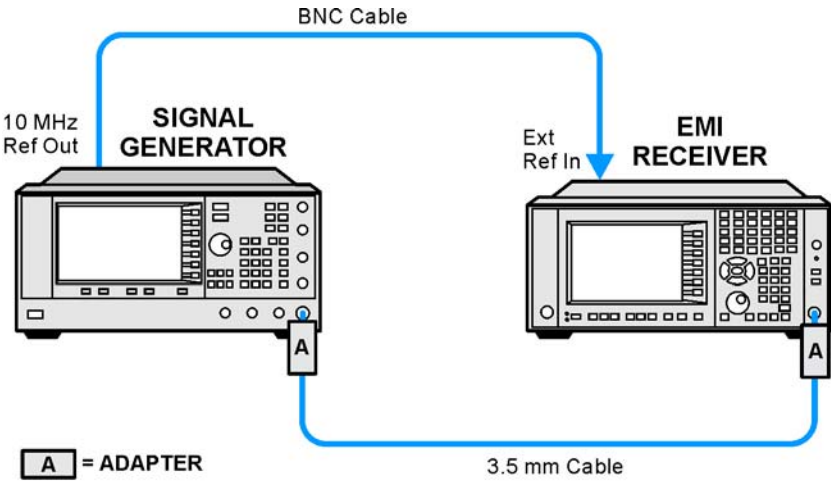
This measurement is performed on RF Input 1 only.

Table 3-1 Frequency Readout Accuracy - Required Equipment

Item	Critical Specification (for this test)	Recommended Model
Adapter Type-N (m) to 3.5 mm (f)	Frequency: 10 MHz to 1.51 GHz VSWR: < 1.1:1	1250-1744
Adapter[a] 3.5 mm (f) to 3.5 mm (f)	Frequency: 10 MHz to 1.51 GHz VSWR: < 1.1:1	83059B
Cable, 1 meter 3.5 mm (m) to 3.5 mm (m)	Frequency: 10 MHz to 1.51 GHz VSWR: < 1.4:1	11500E
Cable, 120 cm BNC (m) to BNC (m)	Frequency: 10 MHz	10503A
Signal Generator	Frequency: 10 MHz to 1.51 GHz	PSG
Adapter[b] 2.4 mm (f) to 3.5 mm (f)	Frequency: 10 MHz to 1.51 GHz VSWR: < 1.4:1	11901B

a. Quantity of 2 required for Option C35 (3.5 mm RF Input 1)
b. Required for Option 544 (44 GHz Frequency Range)

Figure 3-1 Frequency Readout Accuracy Test Setup



Procedure

1. Configure the equipment as shown in Figure 3-1.
2. If the auto alignment for the analyzer has not been performed within the past 24 hours, press **System**, **Alignments**, **Align Now**, **All** to perform the auto alignment routine.
3. On the signal generator, press **PRESET**, then set the controls as follows:

   FREQUENCY, **1505**, **MHz**
   POWER LEVEL, **–10**, **dBm**
   RF, **On**

4. Select RF Input 1 on the receiver by pressing **Input/Output**, **RF Input**, **RF Input Port**, **RF Input**.
5. Preset the receiver by pressing **Mode**, **Spectrum Analyzer**, **Mode Preset.**
6. Set up the receiver by pressing:

   Mode Setup, **EMC Standard**, **None**
   Input/Output, **More**, **Freq Ref In**, **External**
   FREQ Channel, **Center Freq**, **1505**, **MHz**
   SPAN X Scale, **Span**, **2990**, **MHz**
   Trace/Detector, **More**, **Detector**, **Sample**
   Single

7. Perform the following steps for each row listed in Table 3-2:

   a. Set the signal generator frequency to the value listed in the Center Frequency column in Table 3-2.

   b. Set the receiver center frequency to the value listed in the Center Frequency column in Table 3-2 by pressing **FREQ Channel**, **Center Freq**, [Value].

   c. Set the receiver span to the value listed in the Span column of Table 3-2 by pressing **SPAN X Scale**, **Span**, [Value].

   d. On the receiver, press **Restart**.

   e. On the receiver, press **Peak Search**.

   f. Record the marker value in the Marker Frequency Readout column in Table 3-2.

Table 3-2 Frequency Readout Accuracy Results

Center Frequency (MHz)	Span (MHz)	Test Limit Minimum	Marker Frequency Readout	Test Limit Maximum
1505	2990	1495.9 MHz		1514.1 MHz
1505	127.2	1504.56 MHz		1505.44 MHz
1505	54.1	1504.8122 MHz		1505.1878 MHz
1505	7.95	1504.97240 MHz		1505.0276 MHz
1505	0.106	1504.999630 MHz		1505.000370 MHz
517.59	1.98	517.58316 MHz		517.59684 MHz
832.50	1.98	832.49316 MHz		832.50684 MHz

4 Second Harmonic Distortion (SHD)

Test Limits

Table 4-1 Second Harmonic Distortion Test Limits

Applied Frequency	Mixer Level[a]	Distortion
40 MHz	–15 dBm	< –55 dBc

a. Mixer Level = Input Level – RF Attenuation

Overview

This test checks the second harmonic distortion of the EMI receiver by tuning to twice the input frequency and examining the level of the distortion product. A low pass filter is inserted between the source and the receiver to prevent the source second harmonic from artificially raising the second harmonic product displayed on the receiver.

This measurement is performed on RF Input 1 only.

Table 4-2 Second Harmonic Distortion - Required Equipment

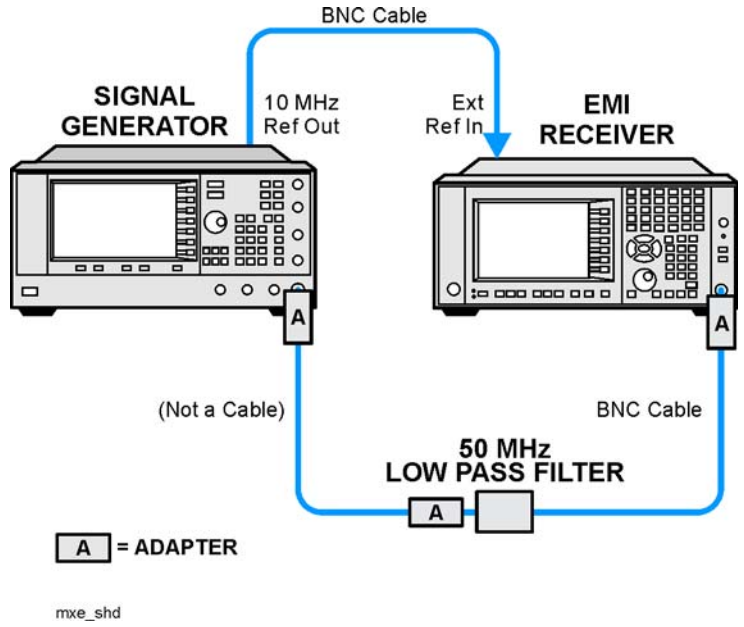
Item	Critical Specifications (for this test)	Recommended Model
Adapter Type-N (m) to BNC (f)	Frequency: 40 to 80 MHz VSWR: < 1.05:1	1250-1476
Adapter[a] BNC (f) to SMA (m)	Frequency: 40 to 80 MHz	1250-1200
Adapter[b] 3.5 mm (f) to 3.5 mm (f)	Frequency: 40 to 80 MHz VSWR: < 1.1:1	83059B
Adapter[c] 2.4 mm (f) to 3.5 mm (f)	Frequency: 40 to 80 MHz VSWR: < 1.1:1	11901B
Cable, 120 cm BNC (m) to BNC (m) (2 required)	Frequency: 10 to 80 MHz	10503A

Table 4-2 Second Harmonic Distortion - Required Equipment

Item	Critical Specifications (for this test)	Recommended Model
Filter, 50 MHz Low Pass	Cutoff Frequency: 50 MHz Rejection at 65 MHz: > 40 dB Rejection at 75 MHz: > 60 dB	0955-0306
Signal Generator	Frequency: 50 MHz Spectral Purity: Better than –30 dBc	PSG

a. Quantity 2 required for Option C35 (3.5 mm RF Input 1) or Option 544 (44 GHz Frequency Range)
b. Quantity 2 required for Option C35 (3.5 mm RF Input 1)
c. Required for Option 544 (44 GHz Frequency Range)

Figure 4-1 Second Harmonic Distortion Test Setup



Procedure

1. Configure the equipment as shown in Figure 4-1.
2. On the signal generator, press **PRESET**, then set the controls as follows:

   Frequency, **40**, **MHz**
   Amplitude, **–5**, **dBm**
   RF, **On**
3. Select RF Input 1 on the receiver by pressing **Input/Output**, **RF Input**, **RF Input Port**, **RF Input**.
4. Preset the receiver by pressing **Mode**, **Spectrum Analyzer**, **Mode Preset**.
5. Set up the receiver by pressing:

   Mode Setup, **EMC Standard**, **None**
   Input/Output, **More**, **Freq Ref In**, **External**
   FREQ Channel, **Center Freq**, **40**, **MHz**
   SPAN X Scale, **Span**, **1**, **MHz**
   AMPTD Y Scale, Attenuation, Mech Atten, **10**, **dB**
6. On the receiver, press **Peak Search**.
7. Adjust the signal generator amplitude for a instrument display of –5 dBm ±0.1 dB.
8. On the receiver, activate the marker delta function by pressing the **Marker** and **Delta** keys.
9. On the receiver, press:

   FREQ Channel, **Center Freq**, **80, MHz**
   Meas Setup, **Average/Hold Number**, **20**, **Enter**
   Trace/Detector, Trace Average
   Single
10. Press **Peak Search**. Enter the displayed value under the Measured Second Harmonic Distortion (dBc) heading in Table 4-3.

Table 4-3 Second Harmonic Distortion Results

Applied Frequency (MHz)	Mixer Level (dBm)	Measured Second Harmonic Distortion (dBc)	Specification (dBc)
40	–15		–55

5 Amplitude Accuracy at 50 MHz

Test Limits

See test limits in the test result Table 5-2 and Table 5-3.

Overview

A signal generator is used as the signal source for the test. The source amplitude is varied using the signal source amplitude control. The attenuation and resolution bandwidth are varied on the EMI receiver. The source amplitude is measured by the power meter and receiver at each setting, and the values compared. The difference between each pair of measurements indicates the amplitude accuracy.

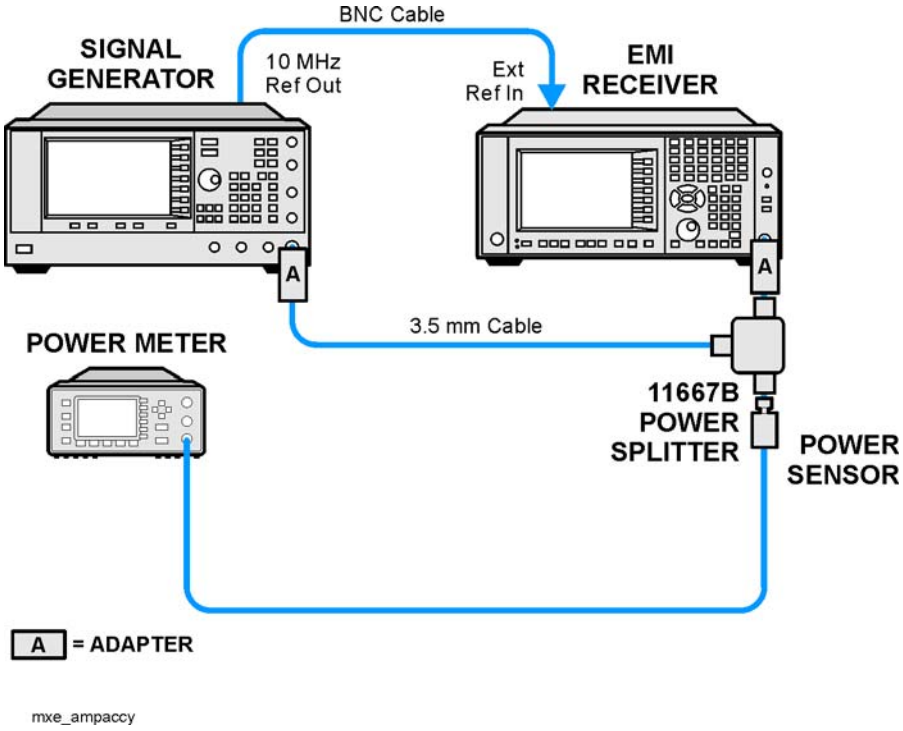
This measurement is performed for both RF inputs.

Table 5-1 Absolute Amplitude Accuracy - Required Equipment

Item	Critical Specifications	Recommended Model
Adapter Type-N (m), to 3.5 mm (m)	Frequency: 10 MHz to 18 GHz VSWR: < 1.1:1	1250-1743
Adapter 3.5 mm (f) to 3.5 mm (f)	Frequency: 10 MHz to 26.5 GHz VSWR: < 1.1:1	83059B
Adapter[a] 2.4 mm (f) to 3.5 mm (m)	Frequency: 10 MHz to 26.5 GHz VSWR: < 1.1:1	11901D
Cable 1 meter 3.5 mm (m) to 3.5 mm (m)	Frequency: 10 MHz to 1.51 GHz VSWR: < 1.4:1	11500E
Cable 120 cm BNC (m) to BNC (m)	Frequency: 10 MHz	10503A
Power Meter	Compatible with power sensor	E4418B
Power Sensor	Frequency Range: 50 MHz Amplitude Range: –25 dBm to 10 dBm	8485A
Power Splitter 3.5 mm (f)	Frequency Range: 50 MHz to 26.5 GHz Tracking between ports: < 0.25 dB	11667B
Signal Generator	Typical Temperature Stability: 0.01 dBc/°C	PSG

a. Required for Option 544 (44 GHz Frequency Range)

Figure 5-1 Absolute Amplitude Accuracy Test Setup



Procedure

1. Zero and calibrate the power meter.
2. Configure equipment as shown in Figure 5-1, with the power splitter connected directly to the receiver RF Input with an adapter when needed.

CAUTION To minimize stress on the test equipment connections, support the power sensor.

RF Input 1

3. If the auto alignment for the receiver has not been performed within the past 24 hours, press **System**, **Alignments**, **Align Now, All** to perform the auto alignment routine.
4. On the signal generator, press **PRESET**, then set the controls as follows:

   FREQUENCY, **50**, **MHz**
   Power Level, **–4**, **dBm**
   RF On

5. Select RF Input 1 on the receiver by pressing **Input/Output**, **RF Input**, **RF Input Port, RF Input**.
6. Preset the receiver by pressing **Mode**, **Spectrum Analyzer**, **Mode Preset**.
7. Set up the receiver by pressing:

   Mode Setup, **EMC Standard**, **None**
   Input/Output, More, Freq Ref In, **External**
   FREQ Channel, **Center Freq**, **50**, **MHz**
   SPAN X Scale, **2**, **MHz**
   AMPTD Y Scale, **Attenuation, Mech Atten, 10, dB**
   Sweep/Control, **Sweep Setup**, **Swp Time Rules**, **SA - Accuracy**
   Meas Setup, **Average/Hold Number**, **20**, **Enter**
   Trace/Detector, **Trace Average**
   Single

8. Perform the following steps for each row listed in Table 5-2:
   a. Set the signal generator amplitude to the value listed in the Nominal Source Amplitude column in Table 5-2.
   b. Set the receiver input attenuator as indicated in the Attenuation column in Table 5-2 by pressing **AMTD Y Scale**, **Attenuation**, **Mech Atten**, [Value].
   c. Set the receiver span as listed in the Span column of Table 5-2 by pressing **SPAN X Scale**, **Span**, [Value].

d. Record the signal generator amplitude, as measured by the power meter, in the Power Meter Amplitude column of Table 5-2.

e. On the receiver, press **Restart**.

f. Wait for the instrument to finish averaging.

g. On the receiver press Peak Search.

h. Record the signal amplitude, as measured by the receiver in the Measured Amplitude column of Table 5-2.

i. Calculate the signal amplitude accuracy error using the following equation, and record the results under the Amplitude Accuracy Error column of Table 5-2:

Amplitude Accuracy Error = Meas_Amp – Power_Meter

Table 5-2 Amplitude Accuracy Results (RF Input 1 - Preamp Off)

Nominal Source Amplitude (dBm)	Attenuation (dB)	Span	Measured Amplitude (dBm) Meas_Amp	Power Meter Amplitude (dBm) Power_Meter	Amplitude Accuracy Error (dB)	Test Limit (dB)
–4	10	2 MHz				±1.13 dB
–9	10	1 MHz				±1.13 dB
–14	10	500 kHz				±1.13 dB
–4	20	100 kHz				±1.13 dB
–14	20	100 kHz				±1.13 dB
–4	30	100 kHz				±1.13 dB
–14	30	100 kHz				±1.13 dB

RF Input 2

9. Move the power splitter from RF Input 1 to RF Input 2.
10. Select RF Input 2 on the receiver by pressing **Input/Output**, **RF Input**, **RF Input Port**, **RF Input 2**.
11. Perform the following steps for each row listed in Table 5-3:
    a. Set the signal generator amplitude to the value listed in the Nominal Source Amplitude column in Table 5-3.
    b. Set the receiver input attenuator as indicated in the Attenuation column in Table 5-3 by pressing **AMTD Y Scale**, **Attenuation**, **Mech Atten**, [Value].
    c. Set the receiver span as listed in the Span column of Table 5-3 by pressing **SPAN X Scale**, **Span**, [Value].
    d. Record the signal generator amplitude, as measured by the power meter, in the Power Meter Amplitude column of Table 5-3.
    e. On the receiver, press **Restart**.
    f. Wait for the instrument to finish averaging.
    g. On the receiver press Peak Search.
    h. Record the signal amplitude, as measured by the receiver in the Measured Amplitude column of Table 5-3.
    i. Calculate the signal amplitude accuracy error using the following equation, and record the results under the Amplitude Accuracy Error column:

$$\text{Amplitude Accuracy Error} = \text{Meas\_Amp} - \text{Power\_Meter}$$

Table 5-3 Amplitude Accuracy Results (RF Input 2 - Preamp Off)

Nominal Source Amplitude (dBm)	Attenuation (dB)	Span	Measured Amplitude (dBm) Meas_amp	Power Meter Amplitude (dBm) Power_meter	Amplitude Accuracy Error (dB)	Test Limit (dB)
–4	10	2 MHz				±1.16 dB
–9	10	1 MHz				±1.16 dB
–14	10	500 kHz				±1.16 dB
–4	20	100 kHz				±1.16 dB
–14	20	100 kHz				±1.16 dB
–4	30	100 kHz				±1.16 dB
–14	30	100 kHz				±1.16 dB

6 Amplitude Accuracy - Preamp On

Test Limits

See test limits in the test result Table 6-2 and Table 6-3.

Overview

A signal generator is used as the signal source for the test. The source amplitude is varied using the signal source amplitude control. The attenuation and resolution bandwidth are varied on the EMI receiver. The source amplitude is measured by the power meter and receiver at each setting, and the values compared. The difference between each pair of measurements indicates the amplitude accuracy.

This measurement is performed for both RF inputs.

Table 6-1 Absolute Amplitude Accuracy - Preamp On - Required Equipment

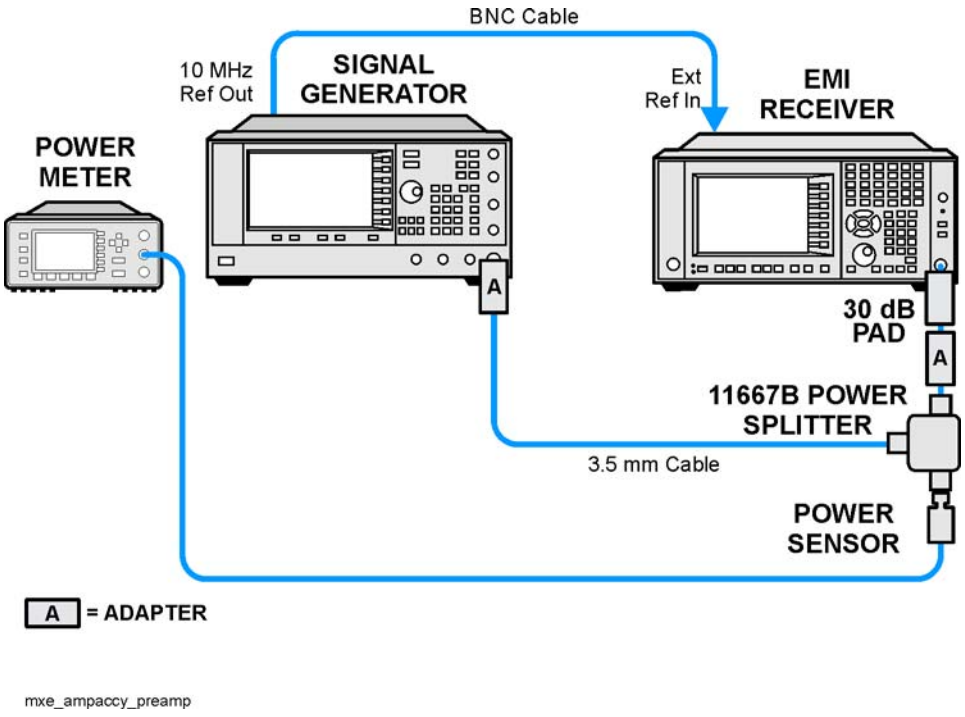
Item	Critical Specifications	Recommended Model
Adapter Type-N (m), to 3.5 mm (m)	Frequency: 10 MHz to 18 GHz VSWR: < 1.1:1	1250-1743
Adapter 3.5 mm (f) to 3.5 mm (f)	Frequency: 10 MHz to 26.5 GHz VSWR: < 1.1:1	83059B
Adapter[a] 2.4 mm (f) to 3.5 mm (m)	Frequency: 10 MHz to 26.5 GHz VSWR: < 1.1:1	11901D
Attenuator, 30 dB Type-N (m) to Type-N (f)	Accuracy: < 0.5 dB at 50 MHz	11708A
Attenuator, 30 dB[b] 3.5 mm (m) to 3.5 mm (f)	Accuracy: < 0.5 dB at 50 MHz	8493C Option 030
Cable 1 meter 3.5 mm (m) to 3.5 mm (m)	Frequency: 10 MHz to 1.515 GHz VSWR: < 1.4:1	11500E
Cable 120 cm BNC (m) to BNC (m)	Frequency: 10 MHz	10503A
Power Meter	Compatible with power sensor	E4418B
Power Sensor	Frequency Range: 50 MHz Amplitude Range: –25 dBm to 10 dBm	8485A

Table 6-1 Absolute Amplitude Accuracy - Preamp On - Required Equipment

Item	Critical Specifications	Recommended Model
Power Splitter 3.5 mm (f)	Frequency Range: 50 MHz to 26.5 GHz Tracking between ports: < 0.25 dB	11667B
Signal Generator	Typical Temperature Stability: 0.01 dBc/°C	PSG

a. Only required for Option 544 (44 GHz Frequency Range)
b. Only required for Option C35 (3.5 mm RF Input 1) or Option 544 (44 GHz Frequency Range)

Figure 6-1 Absolute Amplitude Accuracy - Preamp On Test Setup



Procedure

1. Zero and calibrate the power meter.
2. Configure equipment as shown in Figure 6-1, with the power splitter connected directly to the receiver RF Input with an adapter when needed.

CAUTION To minimize stress on the test equipment connections, support the power sensor.

RF Input 1 - Preamp On

3. If the auto alignment for the receiver has not been performed within the past 24 hours, press **System**, **Alignments**, **Align Now, All** to perform the auto alignment routine.
4. On the signal generator, press **PRESET**, then set the controls as follows:

   FREQUENCY, **50**, **MHz**
   Power Level, **–13**, **dBm**
   RF On

5. Select RF Input 1 on the receiver by pressing **Input/Output**, **RF Input**, **RF Input Port, RF Input**.
6. Preset the receiver by pressing **Mode**, **Spectrum Analyzer**, **Mode Preset**.
7. Set up the receiver by pressing:

   Mode Setup, **EMC Standard**, **None**
   Input/Output, More, Freq Ref In, **External**
   FREQ Channel, **Center Freq**, **50**, **MHz**
   SPAN X Scale, **Span**, **106 kHz**
   AMPTD Y Scale, **More**, **Internal Preamp**, **Low Band**
   AMPTD Y Scale, **Attenuation, Mech Atten, 0 dB**
   Sweep/Control, **Sweep Setup**, **Swp Time Rules**, **SA - Accuracy**
   Meas Setup, **Average/Hold Number**, **20**, **Enter**
   Trace/Detector, **Trace Average**
   Single

8. Record the signal generator amplitude, as measured by the power meter, in the Power Meter Amplitude column of Table 6-2.
9. On the receiver, press **Restart**.
10. Wait for the instrument to finish averaging.
11. On the receiver press Peak Search.

12. Record the signal amplitude, as measured by the receiver in the Measured Amplitude column of Table 6-2.

13. Calculate the signal amplitude accuracy error using the following equation, and record the results under the Amplitude Accuracy Error column:

$$\text{Amplitude Accuracy Error} = \text{Meas\_Amp} + 30\ \text{dB} - \text{Power\_Meter}$$

14. Perform the following steps for each row listed in Table 6-2:

Table 6-2 Amplitude Accuracy Results (RF Input 1 - Preamp Off)

Nominal Source Amplitude (dBm)	Measured Amplitude (dBm) Meas_Amp	Power Meter Amplitude (dBm) Power_Meter	Amplitude Accuracy Error (dB)	Test Limit (dB)
–13				±1.30 dB

RF Input 2 - Preamp On

15. Move the power splitter from RF Input 1 to RF Input 2.

16. Select RF Input 2 on the receiver by pressing **Input/Output**, **RF Input**, **RF Input Port**, **RF Input 2**.

17. Record the signal generator amplitude, as measured by the power meter, in the Power Meter Amplitude column of Table 6-3.

18. On the receiver, press **Restart**.

19. Wait for the instrument to finish averaging.

20. On the receiver press Peak Search.

21. Record the signal amplitude, as measured by the receiver in the Measured Amplitude column of Table 6-3.

22. Calculate the signal amplitude accuracy error using the following equation, and record the results under the Amplitude Accuracy Error column of Table 6-3:

$$\text{Amplitude Accuracy Error} = \text{Meas\_Amp} + 30\ \text{dB} - \text{Power\_Meter}$$

Table 6-3 Amplitude Accuracy Results (RF Input 2 - Preamp Off)

Nominal Source Amplitude (dBm)	Measured Amplitude (dBm) Meas_amp	Power Meter Amplitude (dBm) Power_meter	Amplitude Accuracy Error (dB)	Test Limit (dB)
–13				±1.33 dB

7 Frequency Response (Flatness)

Test Limits

See test limits in the test result Table 7-2 and Table 7-3.

Overview

The frequency response test measures the EMI receiver's amplitude error as a function of the tuned frequency. Measurements are made ranging from 50 MHz to the maximum frequency range of the receiver under test. The signal source amplitude is measured with a power meter to eliminate error due to source flatness. The measured value is normalized to 50 MHz.

This measurement is performed for both RF inputs.

Table 7-1 Frequency Response - Required Equipment

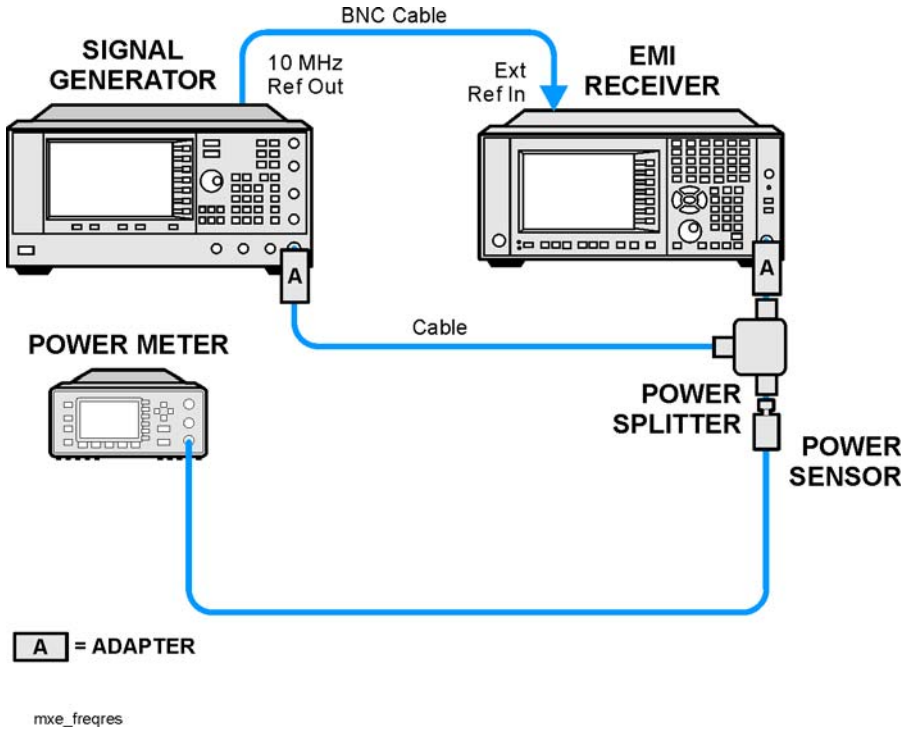
Item	Critical Specifications (for this test)	Recommended Model
Adapter Type N (m) to 3.5 mm (m)	Frequency: 10 MHz to 18 GHz VSWR: < 1.1:1	1250-1743
Adapter, 3.5 mm (f) to 3.5 mm (f)	Frequency: 10 MHz to 26.5 GHz VSWR: < 1.1:1	83059B
Cable, 1 meter[a] 3.5 mm (m) to 3.5 mm (m)	Frequency: 10 MHz to 26.5 GHz VSWR: < 1.4:1	11500E
Cable, 1 meter[b] 2.4 mm (m) to 2.4 mm (m)	Frequency: 50 MHz to 44 GHz VSWR: < 1.55:1	8120-6164
Cable, 120 cm BNC (m) to BNC (m)	Frequency: 10 MHz	10503A
Power Meter	Compatible with power sensor	E4418B
Power Sensor	Frequency Range: 50 MHz to 26.5 GHz Amplitude Range: –25 dBm to 10 dBm	8485A
Power Sensor	Frequency Range: 50 MHz to 44 GHz Amplitude Range: –30 dBm to 20 dBm	8487A

Table 7-1 Frequency Response - Required Equipment

Item	Critical Specifications (for this test)	Recommended Model
Power Splitter[a] 3.5 mm (f)	Frequency Range: 50 MHz to 26.5 GHz Tracking between ports: < 0.25 dB	11667B
Power Splitter[b] 2.4 mm (f)	Frequency Range: 50 MHz to 44 GHz Tracking between ports: < 0.4 dB	11667C
Signal Generator	Frequency Range: 50 MHz to 26 GHz	PSG

a. Required for Option 503, 508, and 526
b. Required for Option 544 (44 GHz Frequency Range)

Figure 7-1 Frequency Response Test Setup



Procedure

1. Zero and calibrate the power meter.
2. Configure the equipment as shown in Figure 7-1.

NOTE

Connect the power splitter to the receiver input directly, with an adapter if needed. Do not use a cable. To minimize stress on the test equipment connections, support the power sensor.

3. If the auto alignment for the receiver has not been performed within the past 24 hours, press **System**, **Alignments**, **Align Now**, **All** to perform the auto alignment routine.
4. On the signal generator, press **PRESET**, then set the controls as follows:

   FREQUENCY, 50, **MHz**
   Power level, **–4**, **dBm**
   RF, **On**

RF Input 1

5. Select RF Input 1 on the receiver by pressing **Input/Output**, **RF Input**, **RF Input Port, RF Input**.
6. Preset the receiver by pressing **Mode**, **Spectrum Analyzer**, **Mode Preset**.
7. Set up the receiver by pressing:

   Mode Setup, **EMC Standard**, **None**
   Input/Output, More, Freq Ref In, **External**
   FREQ Channel, **Center Freq**, **50**, **MHz**
   SPAN X Scale, **Span**, **50**, **kHz**
   AMPTD Y Scale, **Ref Level, 0, dBm**
   Single

8. Perform the following steps for each row listed in Table 7-2 that applies to the frequency range of the instrument being tested:
   a. Tune the receiver center frequency to the value listed in the Center Frequency column of Table 7-2 by pressing **FREQ Channel**, **Center Freq**, [Value].
   b. Tune the signal generator frequency to the value listed in the Center Frequency column of Table 7-2.
   c. Enter the power sensor calibration factor into the power meter for the signal generator frequency.
   d. Adjust the signal generator output power for a power meter reading of –10 dBm ± 0.1 dB.

e. Enter the power meter amplitude value into the Power Meter Amplitude column of Table 7-2.

f. If the Center Frequency is greater than 3.6 GHz center the preselector by pressing **Cont**, **Peak Search**, **AMPTD X Scale**, **Presel Center**, then press **Single** on the receiver.

g. On the receiver, press **Restart**.

h. On the receiver press **Peak Search** to position the marker on the peak of the signal.

i. Enter the receiver marker amplitude value into the Receiver Amplitude column of Table 7-2.

j. Calculate the measurement error using the following equation, and record the results under the Measurement Error column in Table 7-2:

Measurement Error = Meas_Amp – Power_Meter

k. Calculate the frequency response error normalized to 50 MHz using the following equation, and record the results under the Flatness Normalized the 50 MHz column in Table 7-2:

Normalized to 50 MHz = Meas_Error – Meas_Error @ 50 MHz

Table 7-2 Frequency Response Results - RF Input 1

Center Frequency	Receiver Amplitude (dBm) Meas_Amp	Power Meter Amplitude (dBm) Power_Meter	Measurement Error (dB) Meas_Error	Normalized to 50 MHz (dB)	Normalized Test Limit (dB)
50 MHz				0	Ref
1.0 GHz					±1.75 dB
2.0 GHz					±1.75 dB
3.0 GHz					±1.75 dB
4.0 GHz					±2.5 dB
6.0 GHz					±2.5 dB
8.0 GHz					±2.5 dB
9.0 GHz					±2.5 dB
11 GHz					±2.5 dB
13 GHz					±2.5 dB
14 GHz					±2.5 dB
17 GHz					±2.5 dB
20 GHz					±3.0 dB
23 GHz					±3.0 dB
26 GHz					±3.0 dB
29 GHz					±3.5 dB
32 GHz					±3.5 dB
35 GHz					±4.5 dB
38 GHz					±4.5 dB
41 GHz					±4.5 dB
44 GHz					±4.5 dB

RF Input 2

9. Move the power splitter from RF Input 1 to RF Input 2.
10. Select RF Input 2 on the receiver by pressing **Input/Output**, **RF Input**, **RF Input Port**, **RF Input 2**.
11. Tune the receiver to a center frequency of 50 MHz by pressing **FREQ Channel, Center Freq**, **50 MHz**.
12. On the receiver, press **Restart**.
13. Set the signal generator output power to **-4 dBm**.
14. Perform the following steps for each row listed in Table 7-3:
    a. Tune the receiver center frequency to the value listed in the Center Frequency column of Table 7-3 by pressing **FREQ Channel**, **Center Freq**, [Value]
    b. Tune the signal generator frequency to the value listed in the Center Frequency column of Table 7-3.
    c. Enter the power sensor calibration factor into the power meter for the signal generator frequency.
    d. Adjust the signal generator output power for a power meter reading of -10 dBm ±0.1 dB.
    e. Enter the power meter amplitude value into the Power Meter Amplitude column of Table 7-3.
    f. On the receiver, press **Restart**.
    g. On the receiver, press **Peak Search** to position the marker on the peak of the signal.
    h. Enter the receiver marker amplitude value into the Receiver Amplitude column of Table 7-3.
    i. Calculate the measurement error using the following equation, and record the results under the Measurement Error column in Table 7-3:

       Measurement Error = Meas_Amp – Power_Meter

    j. Calculate the frequency response error normalized to 50 MHz using the following equation, and record the results under the Normalized to 50 MHz column in Table 7-3:

       Normalized to 50 MHz = Meas_Error – Meas_Error @ 50 MHz

Table 7-3 Frequency Response Results - RF Input 2

Center Frequency	Receiver Amplitude (dBm) Meas_Amp	Power Meter Amplitude (dBm) Power_Meter	Measurement Error (dB) Meas_Error	Normalized to 50 MHz (dB)	Normalized Test Limit (dB)
50 MHz				0	Ref
300 MHz					±1.75 dB
600 MHz					±1.75 dB
1.0 GHz					±1.75 dB

8 Frequency Response (Flatness) - Preamp On

Test Limits

See test limits in the test result Table 8-2 and Table 8-3.

Overview

The frequency response test measures the EMI receiver's amplitude error as a function of the tuned frequency with the internal preamp turned on. Measurements are made ranging from 50 MHz to the maximum frequency range of the receiver under test. The signal source amplitude is measured with a power meter to eliminate error due to source flatness. The measured value is normalized to 50 MHz.

This measurement is performed for both RF inputs.

Table 8-1 Frequency Response - Preamp On - Required Equipment

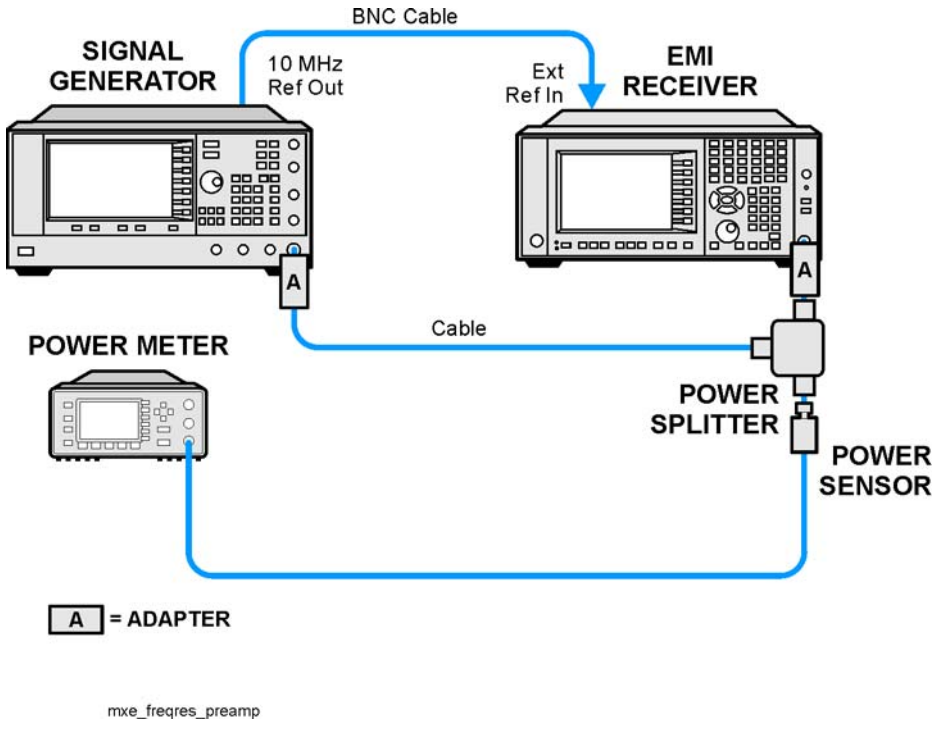
Item	Critical Specifications (for this test)	Recommended Model
Adapter Type N (m) to 3.5 mm (m)	Frequency: 10 MHz to 18 GHz VSWR: < 1.1:1	1250-1743
Adapter, 3.5 mm (f) to 3.5 mm (f)	Frequency: 10 MHz to 26.5 GHz VSWR: < 1.1:1	83059B
Cable, 1 meter[a] 3.5 mm (m) to 3.5 mm (m)	Frequency: 10 MHz to 26.5 GHz VSWR: < 1.4:1	11500E
Cable, 1 meter[b] 2.4 mm (m) to 2.4 mm (m)	Frequency: 50 MHz to 44 GHz VSWR: < 1.55:1	8120-6164
Cable, 120 cm BNC (m) to BNC (m)	Frequency: 10 MHz	10503A
Power Meter	Compatible with power sensor	E4418B
Power Sensor	Frequency Range: 50 MHz to 26.5 GHz Amplitude Range: –65 dBm to –55 dBm	8485D
Power Sensor[b]	Frequency Range: 50 MHz to 44 GHz Amplitude Range: –65 dBm to –55 dBm	8487D

Table 8-1 Frequency Response - Preamp On - Required Equipment

Item	Critical Specifications (for this test)	Recommended Model
Power Splitter[a] 3.5 mm (f)	Frequency Range: 50 MHz to 26.5 GHz Tracking between ports: < 0.25 dB	11667B
Power Splitter[b] 2.4 mm (f)	Frequency Range: 50 MHz to 44 GHz Tracking between ports: < 0.4 dB	11667C
Signal Generator	Frequency Range: 50 MHz to maxiumu frequency of MXE	PSG

a. Required for Option 503, 508, and 526
b. Required for Option 544 (44 GHz Frequency Range)

Figure 8-1 Frequency Response - Preamp On Test Setup



Procedure

1. Zero and calibrate the power meter.
2. Configure the equipment as shown in Figure 8-1.

NOTE Connect the power splitter to the receiver input directly, with an adapter if needed. Do not use a cable. To minimize stress on the test equipment connections, support the power sensor.

3. If the auto alignment for the receiver has not been performed within the past 24 hours, press **System**, **Alignments**, **Align Now**, **All** to perform the auto alignment routine.
4. On the signal generator, press **PRESET**, then set the controls as follows:

   FREQUENCY, 50, **MHz**
   Power level, **–54**, **dBm**
   RF, **On**

RF Input 1

5. Select RF Input 1 on the receiver by pressing **Input/Output**, **RF Input**, **RF Input Port, RF Input**.
6. Preset the receiver by pressing **Mode**, **Spectrum Analyzer**, **Mode Preset**.
7. Set up the receiver by pressing:

   Mode Setup, **EMC Standard**, **None**
   Input/Output, More, Freq Ref In, **External**
   FREQ Channel, **Center Freq**, **50**, **MHz**
   SPAN X Scale, **Span**, **50**, **kHz**
   AMPTD Y Scale, **More**, **Internal Preamp Full Range**
   AMPTD Y Scale, **Attenuation**, **Mech Atten**, **0 dB**
   AMPTD Y Scale, **Ref Level, –55, dBm**

8. Perform the following steps for each row listed in Table 8-2 that applies to the frequency range of the instrument being tested:
   a. Tune the receiver center frequency to the value listed in the Center Frequency column of Table 8-2 by pressing **FREQ Channel**, **Center Freq**, [Value].
   b. Tune the signal generator frequency to the value listed in the Center Frequency column of Table 8-2.
   c. Enter the power sensor calibration factor into the power meter for the signal generator frequency.
   d. Adjust the signal generator output power for a power meter reading of –60 dBm ± 0.1 dB.

e. Enter the power meter amplitude value into the Power Meter Amplitude column of Table 8-2.

f. If the Center Frequency is greater than 3.6 GHz center the preselector by pressing **Peak Search**, **AMPTD X Scale**, **Presel Center**.

g. On the receiver press **Peak Search** to position the marker on the peak of the signal.

h. Enter the receiver marker amplitude value into the Receiver Amplitude column of Table 8-2.

i. Calculate the measurement error using the following equation, and record the results under the Measurement Error column in Table 8-2:

Measurement Error = Meas_Amp – Power_Meter

j. Calculate the frequency response error normalized to 50 MHz using the following equation, and record the results under the Normalized to 50 MHz column in Table 8-2:

Normalized to 50 MHz = Meas_Error – Meas_Error @ 50 MHz

Table 8-2 Frequency Response Results - Preamp On - RF Input 1

Center Frequency	Receiver Amplitude (dBm) Meas_Amp	Power Meter Amplitude (dBm) Power_Meter	Measurement Error (dB) Meas_Error	Normalized to 50 MHz (dB)	Normalized Test Limit (dB)
50 MHz				0	Ref
1.0 GHz					±2.0 dB
2.0 GHz					±2.0 dB
3.0 GHz					±2.0 dB
4.0 GHz					±3.0 dB
6.0 GHz					±3.0 dB
8.0 GHz					±3.0 dB
9.0 GHz					±3.0 dB
11 GHz					±3.0 dB
13 GHz					±3.0 dB
14 GHz					±3.0 dB
17 GHz					±3.0 dB
20 GHz					±3.5 dB
23 GHz					±3.5 dB
26 GHz					±3.5 dB
29 GHz					±4.0 dB
32 GHz					±4.0 dB
35 GHz					±4.0 dB
38 GHz					±5.5 dB
41 GHz					±5.5 dB
44 GHz					±5.5 dB

RF Input 2

9. Move the power splitter from RF Input 1 to RF Input 2.
10. Select RF Input 2 on the receiver by pressing **Input/Output**, **RF Input**, **RF Input Port**, **RF Input 2**.
11. Tune the receiver to a center frequency of 50 MHz by pressing **FREQ Channel, Center Freq**, **50 MHz**.
12. Tune the signal generator to **50 MHz** and set the output power to **–54 dBm**.
13. Perform the following steps for each row listed in Table 8-3:
    a. Tune the receiver center frequency to the value listed in the Center Frequency column of Table 8-3 by pressing **FREQ Channel**, **Center Freq**, [Value]
    b. Tune the signal generator frequency to the value listed in the Center Frequency column of Table 8-3.
    c. Enter the power sensor calibration factor into the power meter for the signal generator frequency.
    d. Adjust the signal generator output power for a power meter reading of –60 dBm ± 0.1 dB.
    e. Enter the power meter amplitude value into the Power Meter Amplitude column of Table 8-3.
    f. On the receiver, press **Peak Search** to position the marker on the peak of the signal.
    g. Enter the receiver marker amplitude value into the Receiver Amplitude column of Table 8-3.
    h. Calculate the measurement error using the following equation, and record the results under the Measurement Error column in Table 8-3:

       Measurement Error = Meas_Amp – Power_Meter

    i. Calculate the frequency response error normalized to 50 MHz using the following equation, and record the results under the Normalized to 50 MHz column in Table 8-3:

       Normalized to 50 MHz = Meas_Error – Meas_Error @ 50 MHz

Table 8-3 Frequency Response Results - RF Input 2

Center Frequency	Receiver Amplitude (dBm) Meas_Amp	Power Meter Amplitude (dBm) Power_Meter	Measurement Error (dB) Meas_Error	Normalized to 50 MHz (dB)	Normalized Test Limit (dB)
50 MHz				0	Ref
300 MHz					±2.0 dB
600 MHz					±2.0 dB
1.0 GHz					±2.0 dB

9 Scale Fidelity

Test Limits

The scale fidelity error test limit is ±1.0 dB.

Overview

This test checks the scale fidelity of the receiver by maintaining a constant reference level and measuring signals of different amplitudes over most of the display range. This test sets the input attenuator to 10 dB and the Reference Level to 0 dBm. The external attenuator is set to 0 dB, and the amplitude of the source is adjusted to set the displayed signal at the reference level.

The receiver's internal marker is used to measure the reference amplitude. The Marker Delta function is activated and the RF input is reduced using the external precision step attenuator. Signal input levels from 0 dBm to –50 dBm are measured.

This measurement is performed on RF Input 1 only.

Table 9-1 Scale Fidelity - Required Equipment

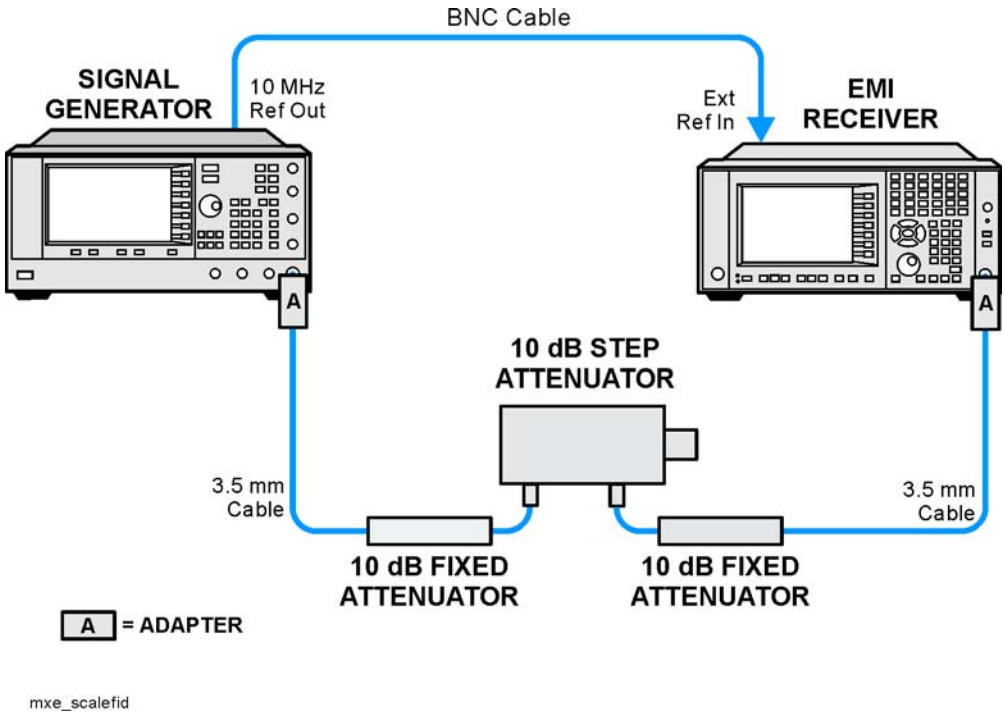
Item	Critical Specifications (for this test)	Recommended Model
Adapter[a] Type-N (m) to 3.5 mm (f)	Frequency: 50 MHz VSWR: < 1.1:1	1250-1744
Adapter[b] 3.5 mm (f) to 3.5 mm (f)	Frequency: 50 MHz VSWR: < 1.1:1	83059B
Adapter[c] 2.4 mm (f) to 3.5 mm (f)	Frequency: 50 MHz VSWR: < 1.1:1	11901B
Attenuator, 10 dB[d] 3.5 mm (m) to 3.5 mm (f)	Frequency: 50 MHz VSWR: < 1.2:1	8493C, Option 010
Attenuator, 10 dB Step 3.5 mm (f) to 3.5 mm (f)	Range: 0-50 dB Frequency: 50 MHz Accuracy: ±0.25 dB	8495A Option 004
Cable, 1 meter[d] 3.5 mm (m) to 3.5 mm (m)	Frequency: 50 MHz VSWR: < 1.4:1	11500E

Table 9-1 Scale Fidelity - Required Equipment

Item	Critical Specifications (for this test)	Recommended Model
Cable, 120 cm BNC (m) to BNC (m)	Frequency: 10 MHz	10503A
Signal Generator	Frequency: 50 MHz Output Level Accuracy: 0 to –15 dBm: ±1.0 dB	PSG

a. Required for Option CNF (Type-N RF Input 1)
b. Quantity of 2 required for Option C35 (3.5 mm RF Input 1)
c. Required for Option 544 (44 GHz Frequency Range)
d. Quantity of 2 required

Figure 9-1 Scale Fidelity Setup



Procedure

1. Configure the equipment as shown in Figure 9-1.
2. If the auto alignment for the analyzer has not been performed within the past 24 hours, press **System**, **Alignments**, **Align Now**, **All** to perform the auto alignment routine.
3. On the signal generator, press **PRESET**, then set the controls as follows:

   Frequency, **50**, **MHz**
   Amplitude, **+5**, **dBm**
   RF, **On**
4. Select RF Input 1 on the receiver by pressing **Input/Output**, **RF Input**, **RF Input Port**, **RF Input**.
5. Preset the receiver by pressing **Mode**, **Spectrum Analyzer, Mode Preset**.
6. Set up the receiver by pressing:

   Mode Setup, **EMC Standard**, **None**
   Input/Output, **More**, **Freq Ref In**, **External**
   FREQ Channel, Center Freq, **50**, **MHz**
   SPAN X Scale, Span, **1, MHz**
   AMPTD Y Scale, Ref Level, **0**, **dBm**
   Meas Setup, Average/Hold Number, 10, **Enter**
   Trace/Detector, Trace Average
   Peak Search
7. Set the external 10 dB step attenuator to 0 dB.
8. Adjust the amplitude on the signal generator until the marker amplitude on the receiver reads –15 dBm ± 0.2 dB.
9. On the receiver, press the **Single**, **Restart** to trigger a 10 sweep average.
10. On the receiver, activate the Marker Delta function by pressing **Peak Search**, **Marker Delta**.

11. Perform the following steps for each attenuator setting listed in the Table 9-2:

    a. Set the external 10 dB step attenuator to the value listed in the External Attenuator Setting column of Table 9-2.

    b. On the receiver, press **Restart**.

    c. Record the delta marker amplitude value into the Marker Delta Value column of Table 9-2.

Table 9-2 Scale Fidelity Results

External Attenuator Setting (dB)	Minimum (dB)	Marker Delta Value (dB)	Maximum (dB)
0	N/A	Reference	N/A
10	–11.0		–9.0
20	–21.0		–19.0
30	–31.0		–29.0
40	–41.0		–39.0
50	–51.0		–49.0

10 CISPR Resolution Bandwidth Shape Accuracy

Test Limits

See the test limits in Table 10-1.

Overview

The CISPR resolution bandwidth shape accuracy is measured for all four of the CISPR specified resolution bandwidths - 200 Hz, 9 kHz, 120 kHz, and 1 MHz. The CISPR 16-1-1 standard provides masks that each of these resolution bandwidths must fall within. This test will verify that the resolution bandwidth shapes fall within the individual frequency offset points in the standard.

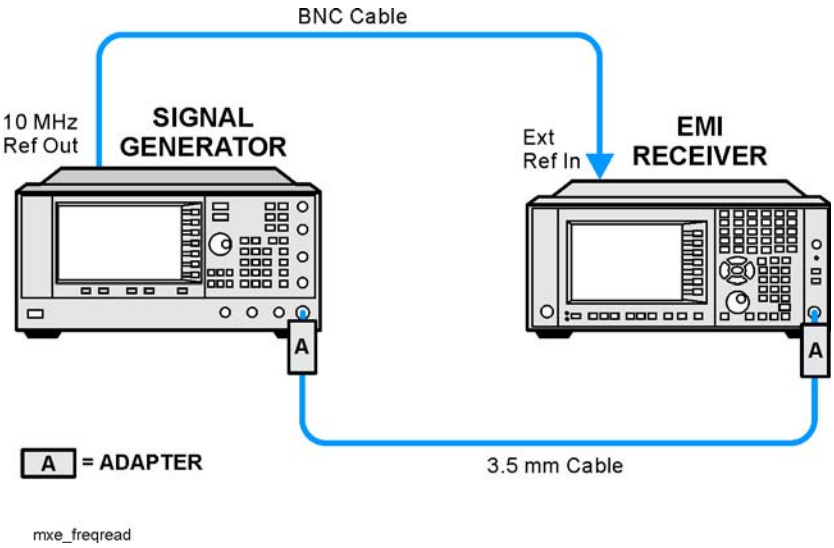
This measurement is performed on RF Input 1 only.

Table 10-1 CISPR Resolution Bandwidth Shape Accuracy - Required Equipment

Item	Critical Specifications (for this test)	Recommended Model
Adapter Type-N (m) to 3.5 mm (f)	Frequency: 10 MHz to 1.51 GHz VSWR: < 1.1:1	1250-1744
Adapter[a] 3.5 mm (f) to 3.5 mm (f)	Frequency: 10 MHz to 1.51 GHz VSWR: < 1.1:1	83059B
Adapter[b] 2.4 mm (f) to 3.5 mm (f)	Frequency: 10 MHz to 1.51 GHz VSWR: < 1.1:1	11901B
Cable, 1 meter 3.5 mm (m) to 3.5 mm (m)	Frequency: 10 MHz to 1.51 GHz VSWR: < 1.4:1	11500E
Cable, 120 cm BNC (m) to BNC (m)	Frequency: 10 MHz	10503A
Signal Generator	Frequency: 10 MHz to 1.51 GHz	PSG

a. Quantity of 2 required for Option C35 (3.5 mm RF Input 1)
b. Required for Option 544 (44 GHz Frequency Range)

Figure 10-1 CISPR Resolution Bandwidth Shape Accuracy



Procedure

1. Configure the equipment as shown in Figure 10-1.
2. If the auto alignment for the analyzer has not been performed within the past 24 hours, press **System**, **Alignments**, **Align Now**, **All** to perform the auto alignment routine.
3. On the signal generator, press **PRESET**, then set the controls as follows:

   FREQUENCY, **100**, **kHz**
   POWER LEVEL, **-10**, **dBm**
   RF, **On**
4. Preset the receiver by pressing **Mode**, **Spectrum Analyzer, Mode Preset**.
5. Set up the receiver by pressing:

   Input/Output, **RF Input**, **RF Input Port**, **RF Input**
   Input/Output, **RF Input**, **RF Coupling**, **DC** (if available)
   Input/Output, **More**, **Freq Ref In**, **External**
   Mode Setup, **EMC Standard**, **CISPR**
   AMPTD Y Scale, Ref Level, **-10**, **dBm**
   AMPTD Y Scale, **Scale/Div**, **3 dB**
   Sweep/Control, **Sweep Setup**, **Swp Time Rules**, **SA-Accuracy**
6. Perform the following steps for each Resolution Bandwidth listed in Table 10-2:
   a. Set the signal generator frequency to the value listed in the Center Frequency column in Table 10-2.
   b. Set the receiver center frequency to the value listed in the Center Frequency column in Table 10-2 by pressing **FREQ Channel**, **Center Freq**, [Value].
   c. Set the receiver span to the value listed in the Span column of Table 10-2 by pressing **SPAN X Scale**, **Span**, [Value].
   d. Adjust the signal generator amplitude as necessary to place the signal in the middle of the top graticule on the receiver display.
   e. Turn on trace averaging by pressing **Trace/Detector**, **Trace Averaging**.
   f. Set the receiver N dB Points to the value listed in the N dB Points column of Table 10-2 by pressing **Meas Setup**, **N dB Points**, [Value].
   g. Record the measured N dB Points value in the Measurement Results column in Table 10-2.
   h. Repeat step f and step g for each N dB Points value in Table 10-2 for the Resolution Bandwidth being measured.
   i. Turn off the N dB Points function by pressing **Marker**, **Off**.
   j. Turn off trace averaging by pressing **Trace/Detector**, **Clear Write**.

Table 10-2 CISPR Resolution Bandwidth Shape Accuracy Results

Resolution Bandwidth	Center Frequency	Span	N dB Points	Test Limit Minimum	Measurement Results	Test Limit Maximum
200 Hz	100 kHz	440 Hz	-1.5 dB	90 Hz		220 Hz
			-6.0 dB	180 Hz		220 Hz
			-20 dB	180 Hz		440 Hz
9 kHz	10 MHz	20 kHz	-1.0 dB	2 kHz		10 kHz
			-1.5 dB	4 kHz		10 kHz
			-6.0 dB	8 kHz		10 kHz
			-20.0 dB	8 kHz		20 kHz
120 kHz	100 MHz	280 kHz	-1.0 dB	20 kHz		140 kHz
			-1.5 dB	40 kHz		140 kHz
			-6.0 dB	100 kHz		140 kHz
			-20 dB	100 kHz		280 kHz
1.0 MHz	1.2 GHz	2.70 MHz	-3.0 dB	500 kHz		1.1 MHz
			-6.0 dB	750 kHz		1.1 MHz
			-9.0 dB	900 kHz		2 MHz
			-20.0 dB	900 kHz		2.7 MHz

11 Quasi-Peak Detector Accuracy

Test Limits

See test limits in test results Table 11-2 through Table 11-12.

Overview

This test will verify the performance of the Quasi-Peak detector of the EMI receiver according to section 4 of the CISPR 16-1-1 :2010 standard. This includes testing for the following subsections:

4.3 Sine-wave voltage accuracy

4.4 Response to pulses

4.4.1 Amplitude relationship (absolute calibration)

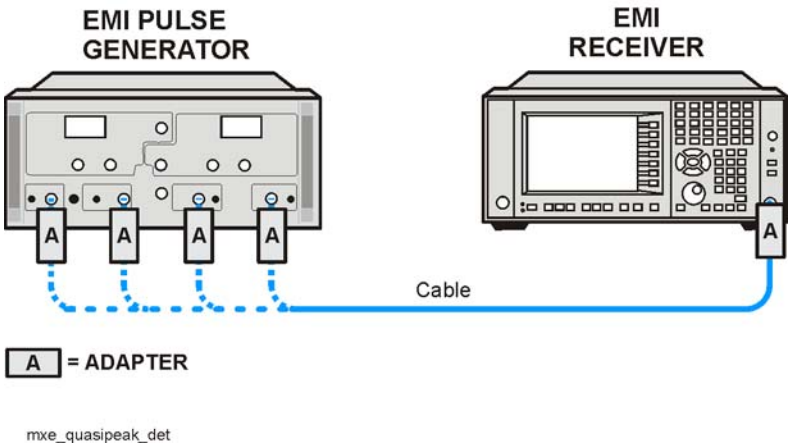
4.4.2 Variation with repetition frequency (relative calibration)

Table 11-1 Quasi-Peak Detector - Required Equipment

Item	Critical Specifications (for this test)	Recommended Model
Adapter[a] Type-N (m) to 3.5 mm (f)	Frequency: 100 kHz to 1.0 GHz VSWR: < 1.1:1	1250-1744
Adapter[b] 3.5 mm (f) to 3.5 mm (f)	Frequency: 100 kHz to 1.0 GHz VSWR: < 1.1:1	83059B
Adapter[c] 2.4 mm (f) to 3.5 mm (f)	Frequency: 100 kHz to 1.0 GHz VSWR: < 1.1:1	11901B
Cable, 1 meter 3.5 mm (m) to 3.5 mm (m)	Frequency: 100 kHz to 1.51 GHz VSWR: < 1.4:1	11500E
EMI Calibration Pulse Generator	CISPR Specified Pulse Area	Schwarzbeck IGUU 2916
Power Meter	Compatible with power sensor	E4418A
Power Sensor	Frequency Range: 100 MHz Amplitude Range: –60 to 0 dBm	E9304A

a. Quantity of 2 required for Option CNF (Type-N RF Input)
b. Only required for Option C35 (3.5 mm RF Input 1)
c. Required for Option 544 (44 GHz Frequency Range)

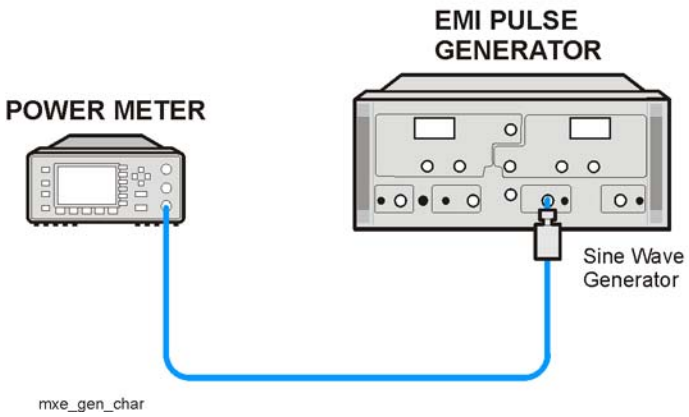
Figure 11-1 Typical Equipment Setup



Sine Wave Generator Characterization

1. Zero and calibrate the power meter.
2. Connect the power meter to the Output Sine Wave Generator of the IGUU 2916 EMI pulse generator as shown in Figure 11-2.

Figure 11-2 Sine Wave Generator Characterization



3. Set the IGUU 2916 EMI pulse generator to output a 100 kHz Sine Wave signal.
4. After allowing the power meter to settle, record the reading in Table 11-2 under the Power Meter column.
5. Set the IGUU 2916 EMI pulse generator to output a 10 MHz Sine Wave signal.
6. After allowing the power meter to settle, record the reading in Table 11-5 under the Power Meter column.
7. Set the IGUU 2916 EMI pulse generator to output a 100 MHz Sine Wave signal.
8. After allowing the power meter to settle, record the reading in Table 11-8 under the Power Meter column.

Initial Setup

1. Setup the equipment as shown in Figure 11-1.
2. Make sure that the EMI receiver is in the spectrum analyzer mode by pressing **Mode**, **Spectrum Analyzer**.
3. Make sure that the auto alignment routine in the EMI receiver is on by pressing **System**, **Alignments**, **Auto Align**, **Normal**.
4. Put the instrument in a known state by pressing **Mode**, **Spectrum Analyzer**, **Mode Setup**, **More**, **Restore Mode Defaults**, **OK**.
5. Set all input / output setting to their default state by pressing **System**, **Restore Defaults**, **Input / Output Settings**, **OK**.

Band A Testing

1. Set the IGUU 2916 EMI pulse generator to output a 100 kHz Sine Wave signal.
2. Connect the IGUU 2916 EMI pulse generator Output Sine Wave Generator to the EMI receiver RF Input.
3. Preset the EMI receiver by pressing **Mode Preset**.
4. Tune the receiver to 100 kHz with a span of 0 Hz by pressing **FREQ Channel**, **Center Freq**, **100 kHz** then **SPAN X Scale**, **Zero Span**.
5. Set the Sweeptime to 2 seconds by pressing **Sweep / Control**, **2 s**.
6. Set the RF Coupling to DC by pressing **Input / Output**, **RF Input**, **RF Coupling DC** (instruments with Option 544 are always DC coupled so this step is skipped for them.)
7. Set the amplitude units to dBµV by pressing **AMPTD Y Scale**, **More**, **Y Axis Unit**, **More**, **dBµV**.
8. Set the reference level to 80 dBµV by pressing **AMPTD Y Scale**, **80 dBµV**.
9. Change the detector used by the EMI receiver to Quasi-Peak by pressing **Trace / Detector**, **More**, **Detector**, **More**, **Quasi Peak**.
10. Turn on the marker by pressing **Marker**.
11. Record the marker value in Table 11-2 as the Measured value for Band A.
12. Calculate the Error with the following formula and enter the value in Table 11-2

    Error = Measured - (Power Meter + 106.99)

Table 11-2 Quasi-Peak Sine-Wave Voltage Accuracy Band A - CISPR 16-1-1: 2010 Section 4.3

Sine Wave Frequency (kHz)	Band A				
	Power Meter (dBm)	Measured (dBµV)	Lower Limit (dB)	Error (dB)	Upper Limit (dB)
100			–2.5		+2.5

13. Set the EMI receiver input attenuator to 20 dB by pressing **AMPTD Y Scale**, **Attenuation**, **20 dB**.
14. Setup the IGUU 2916 EMI pulse generator as follows:
    a. Main Generator: **Band A**
    b. Pulse Frequency: **25 Hz**
    c. Amplitude: **60 dBµV**

15. Connect the IGUU 2916 EMI pulse generator Output Main Generator Band A/B to the EMI receiver RF Input.
16. Put the EMI receiver in single sweep operation by pressing **Single**.
17. Take a single sweep on the EMI receiver by pressing **Restart**.
18. Once the sweep has completed find the peak of the detector output by pressing **Peak Search**.
19. Record the marker value in Table 11-3 as the Measured value for the Band A reference PRF.
20. Calculate the Error with the following formula and enter the value in Table 11-3.

    Error = Measured - 60 dBµV - Error (Table 11-2)

Table 11-3 Quasi-Peak Absolute Calibration Band A - CISPR 16-1-1: 2010 Section 4.4.1

Pulse Frequency (Hz)	Band A			
	Measured (dBµV)	Lower Limit (dB)	Error (dB)	Upper Limit (dB)
25		–2.0		+2.0

21. Put the marker in Delta mode by pressing **Marker**, **Delta**.
22. Turn on the continuous peak function by pressing **Peak Search**, **More**, **Continuous Peak Search On**.
23. Change the Pulse Frequency on the IGUU 2916 EMI pulse generator to **100 Hz**.
24. Take a single sweep on the EMI receiver by pressing **Restart**.
25. Once the sweep on the EMI receiver has completed and the auto peak value is found record the marker delta amplitude value for the pulse frequency being measured in Table 11-4.

26. Without changing any other setting on the EMI receiver or the IGUU 2916 EMI pulse generator change the Pulse Frequency on the pulse generator to the other values in the Table 11-4 and repeat step 24 and step 25 for each.

Table 11-4 Quasi-Peak Relative Response Band A - CISPR 16-1-1: 2010 Section 4.4.2

Pulse Frequency (Hz)	Band A		
	Lower Limit (dB)	Measured (dB)	Upper Limit (dB)
100	2.5		5.5
60	1.5		4.5
25	0	Reference	0
10	–5.5		–2.5
5	–9.0		–6.0
2	–15.5		–10.5
1	–19.5		–14.5
Isolated (0.1 Hz)[a]	–21.5		–16.5

a. Due to the slow pulse rate you may need to take multiple sweeps to capture a complete pulse.

Band B Testing

1. Set the IGUU 2916 EMI pulse generator to output a 10 MHz Sine Wave signal.
2. Connect the IGUU 2916 EMI pulse generator Output Sine Wave Generator to the EMI receiver RF Input.
3. Preset the EMI receiver by pressing **Mode Preset**.
4. Tune the receiver to 10 MHz with a span of 0 Hz by pressing **FREQ Channel**, **Center Freq**, **10 MHz** then **SPAN X Scale**, **Zero Span**.
5. Set the Sweeptime to 2 seconds by pressing **Sweep / Control**, **2 s**.
6. Set the RF Coupling to DC by pressing **Input / Output**, **RF Input**, **RF Coupling DC** (instruments with Option 544 are always DC coupled so this step is skipped for them.)
7. Set the amplitude units to dBµV by pressing **AMPTD Y Scale**, **More**, **Y Axis Unit**, **More**, **dBµV**.
8. Set the reference level to 80 dBµV by pressing **AMPTD Y Scale**, **80 dBµV**.
9. Change the detector used by the EMI receiver to Quasi-Peak by pressing **Trace / Detector**, **More**, **Detector**, **More**, **Quasi Peak**.
10. Turn on the marker by pressing **Marker**.
11. Record the marker value in Table 11-5 as the Measured value for Band B.
12. Calculate the Error with the following formula and enter the value in Table 11-5

    Error = Measured - (Power Meter + 106.99)

Table 11-5 Quasi-Peak Sine-Wave Voltage Accuracy Band B - CISPR 16-1-1: 2010 Section 4.3

Sine Wave Frequency (MHz)	Band B				
	Power Meter (dBm)	Measured (dBµV)	Lower Limit (dB)	Error (dB)	Upper Limit (dB)
10			–2.5		+2.5

13. Set the EMI receiver input attenuator to 18 dB by pressing **AMPTD Y Scale**, **Attenuation**, **18 dB**.
14. Setup the IGUU 2916 EMI pulse generator as follows:
    a. Main Generator: **Band B**
    b. Pulse Frequency: **100 Hz**
    c. Amplitude: **60 dBµV**

15. Connect the IGUU 2916 EMI pulse generator Output Main Generator Band A/B to the EMI receiver RF Input.
16. Put the EMI receiver in single sweep operation by pressing **Single**.
17. Take a single sweep on the EMI receiver by pressing **Restart**.
18. Once the sweep has completed find the peak of the detector output by pressing **Peak Search**.
19. Record the marker value in Table 11-6 as the Measured value for the Band B reference PRF.
20. Calculate the Error with the following formula and enter the value in Table 11-6.

    Error = Measured - 60 dBµV - Error (Table 11-5)

Table 11-6 Quasi-Peak Absolute Calibration Band B - CISPR 16-1-1: 2010 Section 4.4.1

Pulse Frequency (Hz)	Band B			
	Measured (dBµV)	Lower Limit (dB)	Error (dB)	Upper Limit (dB)
100		–2.0		+2.0

21. Put the marker in Delta mode by pressing **Marker**, **Delta**.
22. Turn on the continuous peak function by pressing **Peak Search**, **More**, **Continuous Peak Search On**.
23. Change the Pulse Frequency on the IGUU 2916 EMI pulse generator to **20 Hz**.
24. Take a single sweep on the EMI receiver by pressing **Restart**.
25. Once the sweep on the EMI receiver has completed and the auto peak value is found record the marker delta amplitude value for the pulse frequency being measured in Table 11-7.

26. Without changing any other setting on the EMI receiver or the IGUU 2916 EMI pulse generator change the Pulse Frequency on the pulse generator to the other values in the Table 11-7 (except for 1000 Hz) and repeat step 24 and step 25 for each.

Table 11-7 Quasi-Peak Relative Response Band A - CISPR 16-1-1: 2010 Section 4.4.2

Pulse Frequency (Hz)	Band B		
	Lower Limit (dB)	Measured (dB)	Upper Limit (dB)
1000	3.0		6.0
100	0	Reference	0
20	–8.0		–5.0
10	–12.0		–8.0
2	–23.0		–18.0
1	–25.0		–20.0
Isolated (0.1 Hz)[a]	–26.0		–21.0

a. Due to the slow pulse rate you may need to take multiple sweeps to capture a complete pulse.

27. Setup the IGUU 2916 EMI pulse generator as follows:

- **a.** Aux. Generator: **Band B**
- **b.** Pulse Frequency: **100 Hz**
- **c.** Amplitude: **40 dBµV**

28. Move the cable on the IGUU 2916 EMI pulse generator to Output Auxiliary Generator Band A/B/C/D.

29. Change the EMI receiver input attenuation to 10 dB by pressing **AMPTD Y Scale**, **Attenuation**, **10 dB**.

30. Take a single sweep on the EMI receiver by pressing **Restart**.

31. Reset the delta marker by pressing **Marker**, **Delta**.

32. Change the Pulse Frequency on the IGUU 2916 EMI pulse generator to **1000 Hz**.

33. Take a single sweep on the EMI receiver by pressing **Restart**.

34. Once the sweep on the EMI receiver has completed and the auto peak value is found record the marker delta amplitude value for the pulse frequency of 1000 Hz in Table 11-7.

Band C Testing

1. Set the IGUU 2916 EMI pulse generator to output a 100 MHz Sine Wave signal.
2. Connect the IGUU 2916 EMI pulse generator Output Sine Wave Generator to the EMI receiver RF Input.
3. Preset the EMI receiver by pressing **Mode Preset**.
4. Tune the receiver to 100 MHz with a span of 0 Hz by pressing **FREQ Channel**, **Center Freq**, **100 MHz** then **SPAN X Scale**, **Zero Span**.
5. Set the Sweeptime to 2 seconds by pressing **Sweep / Control**, **2 s**.
6. Set the amplitude units to dBµV by pressing **AMPTD Y Scale**, **More**, **Y Axis Unit**, **More**, **dBµV**.
7. Set the reference level to 80 dBµV by pressing **AMPTD Y Scale**, **80 dBµV**.
8. Change the detector used by the EMI receiver to Quasi-Peak by pressing **Trace / Detector**, **More**, **Detector**, **More**, **Quasi Peak**.
9. Turn on the marker by pressing **Marker**.
10. Record the marker value in Table 11-8 as the Measured value for Band C.
11. Calculate the Error with the following formula and enter the value in Table 11-8

    Error = Measured - (Power Meter + 106.99)

Table 11-8 Quasi-Peak Sine-Wave Voltage Accuracy Band C - CISPR 16-1-1: 2010 Section 4.3

Sine Wave Frequency (MHz)	Band C				
	Power Meter (dBm)	Measured (dBµV)	Lower Limit (dB)	Error (dB)	Upper Limit (dB)
100			–2.5		+2.5

12. Set the EMI receiver input attenuator to 18 dB by pressing **AMPTD Y Scale**, **Attenuation**, **18 dB**.
13. Setup the IGUU 2916 EMI pulse generator as follows:
    a. Main Generator: **Band C/D**
    b. Pulse Frequency: **100 Hz**
    c. Amplitude: **60 dBµV**
14. Connect the IGUU 2916 EMI pulse generator Output Main Generator Band C/D to the EMI receiver RF Input.
15. Put the EMI receiver in single sweep operation by pressing **Single**.

16. Take a single sweep on the EMI receiver by pressing **Restart**.
17. Once the sweep has completed find the peak of the detector output by pressing **Peak Search**.
18. Record the marker value in Table 11-9 as the Measured value for the Band A reference PRF.
19. Calculate the Error with the following formula and enter the value in Table 11-9.

    Error = Measured - 60 dBµV - Error (Table 11-8)

Table 11-9 Quasi-Peak Absolute Calibration Band C - CISPR 16-1-1: 2010 Section 4.4.1

Pulse Frequency (Hz)	Band C			
	Measured (dBµV)	Lower Limit (dB)	Error (dB)	Upper Limit (dB)
100		–2.0		+2.0

20. Put the marker in Delta mode by pressing **Marker**, **Delta**.
21. Turn on the continuous peak function by pressing **Peak Search**, **More**, **Continuous Peak Search On**.
22. Change the Pulse Frequency on the IGUU 2916 EMI pulse generator to **20 Hz**.
23. Take a single sweep on the EMI receiver by pressing **Restart**.
24. Once the sweep on the EMI receiver has completed and the auto peak value is found record the marker delta amplitude value for the pulse frequency being measured in Table 11-10.

25. Without changing any other setting on the EMI receiver or the IGUU 2916 EMI pulse generator change the Pulse Frequency on the pulse generator to the other values in the Table 11-10 (except 1000 Hz and Isolated) and repeat step 23 and step 24 for each.

Table 11-10 Quasi-Peak Relative Response Band C - CISPR 16-1-1: 2010 Section 4.4.2

Pulse Frequency (Hz)	Band C		
	Lower Limit (dB)	Measured (dB)	Upper Limit (dB)
1000	6.5		9.5
100	0	Reference	0
20	–10.5		–7.5
10	–16.0		–12.0
2	–28.5		–23.5
1	–31.0		–26.0
Isolated (0.1 Hz)[a]	–34.0		–29.0

a. Due to the slow pulse rate you may need to take multiple sweeps to capture a complete pulse.

26. Change the Pulse Frequency on the IGUU 2916 EMI pulse generator to **0.1 Hz**.

27. Turn noise floor extension on by pressing **Mode Setup**, **Noise Reduction**, **Noise Floor Extension On**.

28. Take a single sweep on the EMI receiver by pressing **Restart** (due to the slow pulse rate a number of Restarts may be required to capture a complete pulse).

29. Once the sweep on the EMI receiver has completed and the auto peak value is found record the marker delta amplitude value for the pulse frequency of Isolated in Table 11-10.

30. Turn noise floor extension off by pressing **Mode Setup**, **Noise Reduction**, **Noise Floor Extension Off**.

31. Setup the IGUU 2916 EMI pulse generator as follows:

    a. Aux. Generator: **Band C/D**

    b. Pulse Frequency: **100 Hz**

    c. Amplitude: **40 dBµV**

32. Move the cable on the IGUU 2916 EMI pulse generator to Output Auxiliary Generator Band A/B/C/D.

33. Change the EMI receiver input attenuation to 10 dB by pressing **AMPTD Y Scale**, **Attenuation**, **10 dB**.
34. Take a single sweep on the EMI receiver by pressing **Restart**.
35. Reset the delta marker by pressing **Marker**, **Delta**.
36. Change the Pulse Frequency on the IGUU 2916 EMI pulse generator to **1000 Hz**.
37. Take a single sweep on the EMI receiver by pressing **Restart**.
38. Once the sweep on the EMI receiver has completed and the auto peak value is found record the marker delta amplitude value for the pulse frequency of 1000 Hz in Table 11-10.

Band D Testing

1. Set the IGUU 2916 EMI pulse generator as follows:
    a. Main Generator: **Band C/D**
    b. Pulse Frequency: **100 Hz**
    c. Amplitude: **60 dBµV**
2. Connect the IGUU 2916 EMI pulse generator Output Main Generator Band C/D to the EMI receiver RF Input.
3. Preset the EMI receiver by pressing **Mode Preset**.
4. Tune the receiver to 500 MHz with a span of 0 Hz by pressing **FREQ Channel**, **Center Freq**, **500 MHz** then **SPAN X Scale**, **Zero Span**.
5. Set the Sweeptime to 2 seconds by pressing **Sweep / Control**, **2 s**.
6. Set the EMI receiver input attenuator to 18 dB by pressing **AMPTD Y Scale**, **Attenuation**, **18 dB**.
7. Set the amplitude units to dBµV by pressing **AMPTD Y Scale**, **More**, **Y Axis Unit**, **More**, **dBµV**.
8. Set the reference level to 80 dBµV by pressing **AMPTD Y Scale**, **80 dBµV**.
9. Change the detector used by the EMI receiver to Quasi-Peak by pressing **Trace / Detector**, **More**, **Detector**, **More**, **Quasi Peak**.
10. Put the EMI receiver in single sweep operation by pressing **Single**.
11. Take a single sweep on the EMI receiver by pressing **Restart**.
12. Once the sweep has completed find the peak of the detector output by pressing **Peak Search**.
13. Record the marker value in Table 11-11 as the Measured value for the Band D reference PRF.

Table 11-11 Quasi-Peak Sine-Wave Voltage Accuracy Band D - CISPR 16-1-1: 2010 Section 4.3

Pulse Frequency (Hz)	Band D		
	Lower Limit (dBµV)	Measured (dBµV)	Upper Limit (dBµV)
100	58.0		62.0

14. Put the marker in Delta mode by pressing **Marker**, **Delta**.
15. Turn on the continuous peak function by pressing **Peak Search**, **More**, **Continuous Peak Search On**.
16. Change the Pulse Frequency on the IGUU 2916 EMI pulse generator to **20 Hz**.
17. Take a single sweep on the EMI receiver by pressing **Restart**.
18. Once the sweep on the EMI receiver has completed and the auto peak value is found record the marker delta amplitude value for the pulse frequency being measured in Table 11-12.
19. Without changing any other setting on the EMI receiver or the IGUU 2916 EMI pulse generator change the Pulse Frequency on the pulse generator to the other values in the Table 11-12 (except 1000 Hz and Isolated) and repeat step 17 and step 18 for each.

Table 11-12 Quasi-Peak Relative Response Band D - CISPR 16-1-1: 2010 Section 4.4.2

Pulse Frequency (Hz)	Band D		
	Lower Limit (dB)	Measured (dB)	Upper Limit (dB)
1000	6.5		9.5
100	0	Reference	0
20	–10.5		–7.5
10	–16.0		–12.0
2	–28.5[a]		–23.5[a]
1	–31.0[a]		–26.0[a]
Isolated (0.1 Hz)[b]	–34.0[a]		–29.0[a]

a. These measurements are optional and are not required.
b. Due to the slow pulse rate you may need to take multiple sweeps to capture a complete pulse.

20. Change the Pulse Frequency on the IGUU 2916 EMI pulse generator to **0.1 Hz**.
21. Turn noise floor extension on by pressing **Mode Setup**, **Noise Reduction**, **Noise Floor Extension On**.
22. Take a single sweep on the EMI receiver by pressing **Restart** (due to the slow pulse rate a number of Restarts may be required to capture a complete pulse).
23. Once the sweep on the EMI receiver has completed and the auto peak value is found record the marker delta amplitude value for the pulse frequency of Isolated in Table 19.
24. Turn noise floor extension off by pressing **Mode Setup**, **Noise Reduction**, **Noise Floor Extension Off**.
25. Setup the IGUU 2916 EMI pulse generator as follows:
    a. Aux. Generator: **Band C/D**
    b. Pulse Frequency: **100 Hz**
    c. Amplitude: **40 dBµV**
26. Move the cable on the IGUU 2916 EMI pulse generator to Output Auxiliary Generator Band A/B/C/D.
27. Change the EMI receiver input attenuation to 10 dB by pressing **AMPTD Y Scale**, **Attenuation**, **10 dB**.
28. Take a single sweep on the EMI receiver by pressing **Restart**.
29. Reset the delta marker by pressing **Marker**, **Delta**.
30. Change the Pulse Frequency on the IGUU 2916 EMI pulse generator to **1000 Hz**.
31. Take a single sweep on the EMI receiver by pressing **Restart**.
32. Once the sweep on the EMI receiver has completed and the auto peak value is found record the marker delta amplitude value for the pulse frequency of 1000 Hz in Table 11-12.

12 Peak Detector Accuracy

Test Limits

See test limits in test results Table 12-2 through Table 12-8.

Overview

This test will verify the performance of the Peak detector of the EMI receiver according to section 5 of the CISPR 16-1-1 :2010 standard. This includes testing for the following subsections:

5.3 Sine-wave voltage accuracy

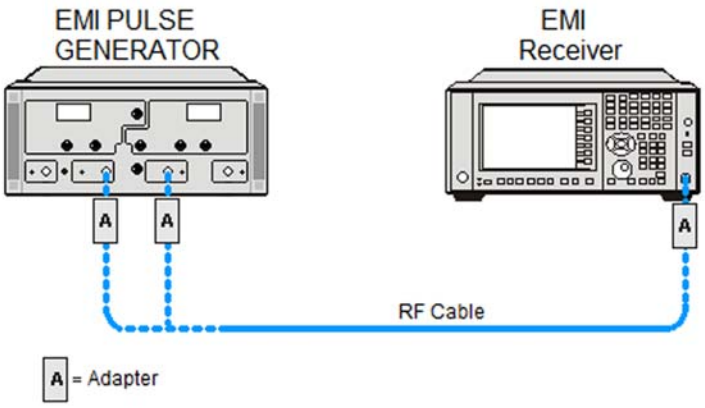
5.4 Response to pulses

Table 12-1 Peak Detector - Required Equipment

Item	Critical Specifications (for this test)	Recommended Model
Adapter[a] Type-N (m) to 3.5 mm (f)	Frequency: 100 kHz to 1.0 GHz VSWR: < 1.1:1	1250-1744
Adapter[b] 3.5 mm (f) to 3.5 mm (f)	Frequency: 100 kHz to 1.0 GHz VSWR: < 1.1:1	83059B
Adapter[c] 2.4 mm (f) to 3.5 mm (f)	Frequency: 100 kHz to 1.0 GHz VSWR: < 1.1:1	11901B
Cable, 1 meter 3.5 mm (m) to 3.5 mm (m)	Frequency: 100 kHz to 1.0 GHz VSWR: < 1.4:1	11500E
EMI Calibration Pulse Generator	CISPR Specified Pulse Area	Schwarzbeck IGUU 2916
Power Meter	Compatible with power sensor	E4418B
Power Sensor	Frequency Range: 100 kHz to 100 MHz Amplitude Range: -60 to 0 dBm	E9304A

a. Quantity 2 required for Option CNF (Type-N RF Input)
b. Only required for Option C35 (3.5 mm RF Input)
c. Only required for Option 544 (44.0 GHz Frequency Range)

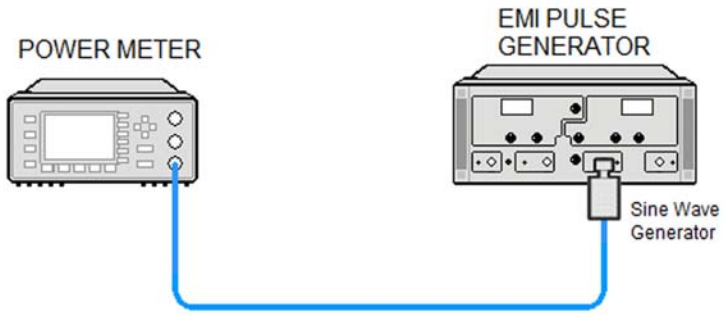
Figure 12-1 Typical Equipment Setup



Sine Wave Generator Characterization

1. Zero and calibrate the power meter.
2. Connect the power meter to the Output Sine Wave Generator of the IGUU 2916 EMI pulse generator as shown in Figure 12-2.

Figure 12-2 Sine Wave Generator Characterization



3. Set the IGUU 2916 EMI pulse generator to output a 100 kHz Sine Wave signal.
4. After allowing the power meter to settle, record the reading in Table 12-2 under the Power Meter column.
5. Set the IGUU 2916 EMI pulse generator to output a 10 MHz Sine Wave signal.
6. After allowing the power meter to settle, record the reading in Table 12-4 under the Power Meter column.
7. Set the IGUU 2916 EMI pulse generator to output a 100 MHz Sine Wave signal.
8. After allowing the power meter to settle, record the reading in Table 12-6 under the Power Meter column.

Initial Setup

1. Setup the equipment as shown in Figure 12-1.
2. Make sure that the EMI receiver is in the spectrum analyzer mode by pressing **Mode, Spectrum Analyzer**.
3. Make sure that the auto alignment routine in the EMI receiver is on by pressing **System, Alignments, Auto Align, Normal**.
4. Put the instrument in a known state by pressing **Mode, Spectrum Analyzer, Mode Setup, More, Restore Mode Defaults, OK**.
5. Set all input / output setting to their default state by pressing **System, Restore Defaults, Input / Output Settings, OK**.

Band A Testing

1. Set the IGUU 2916 EMI pulse generator to output a 100 kHz Sine Wave signal.
2. Connect the IGUU 2916 EMI pulse generator Output Sine Wave Generator to the EMI receiver RF Input.
3. Preset the EMI receiver by pressing **Mode Preset**.
4. Tune the EMI receiver to 100 kHz with a span of 0 Hz by pressing **FREQ Channel, Center Freq, 100 kHz** then **SPAN X Scale, Zero Span**.
5. Set the Sweeptime to 100 milliseconds by pressing **Sweep / Control, 100 ms**.
6. Set the RF Coupling to DC by pressing **Input / Output, RF Input, RF Coupling DC** (instruments with option 544 are always DC coupled so this step is skipped for them).
7. Set the amplitude units to dBµV by pressing **AMPTD Y Scale, More, Y Axis Unit, More, dBµV**.
8. Set the reference level to 80 dBµV by pressing **AMPTD Y Scale, 80 dBµV**.
9. Change the detector used by the EMI receiver to Peak by pressing **Trace / Detector, More, Detector, Peak**.
10. Turn on the marker by pressing **Marker**.
11. Record the marker value in Table 12-2 as the Measured value for Band A.
12. Calculate the Error with the following formula and enter the value in Table 12-2.

    Error = Measured – (Power Meter + 106.99)

Table 12-2 Peak Sine-Wave Voltage Accuracy Band A – CISPR 16-1-1 :2010 Section 5.3

Sine Wave Frequency (kHz)	Band A				
	Power Meter (dBm)	Measured (dBµV)	Lower Limit (dB)	Error (dB)	Upper Limit (dB)
100			-2.5		+2.5

13. Set the EMI receiver input attenuator to 10 dB by pressing **AMPTD Y Scale, Attenuation, 10 dB**.

14. Setup the IGUU 2916 EMI pulse generator as follows:

    a. Aux. Generator: **Band A**

    b. Pulse Frequency: **190 Hz**

    c. Amplitude: **40 dBµV**

15. Connect the IGUU 2916 EMI pulse generator Output Auxiliary Generator Band A/B/C/D to the EMI receiver RF Input.

16. Put the EMI receiver in single sweep operation by pressing **Single**.

17. Turn on the continuous peak function by pressing **Peak Search, More, Continuous Peak Search On**.

18. Take a single sweep on the EMI receiver by pressing **Restart**.

19. Once the sweep on the EMI receiver has completed and the auto peak value is found record the marker amplitude as the Measured value for the pulse frequency being measured in Table 12-3.

20. Without changing any other setting on the EMI receiver or the IGUU 2916 EMI pulse generator change the Pulse Frequency on the pulse generator and the Sweeptime of the EMI receiver to the other values listed in Table 12-3 and repeat steps 18 and 19 for each.

Table 12-3 Peak Response to Pulses Band A – CISPR 16-1-1 :2010 Section 5.4

Pulse Frequency (Hz)	Sweeptime (sec)	Band A			
		Measured (dBµV)	Lower Limit (dB)	Error (dB)	Upper Limit (dB)
190	0.1		-2.0		+2.0
150	0.1		-2.0		+2.0
100	0.1		-2.0		+2.0
50	0.1		-2.0		+2.0
10	2.0		-2.0		+2.0
1	2.0		-2.0		+2.0

21. Calculate the Error for each of the Measured values in Table 12-3 with the following formula and enter the value in Table 12-3.

    Error = Measured – 40 dBµV – 6.61 dB – Error (Table 12-2)

Band B Testing

1. Set the IGUU 2916 EMI pulse generator to output a 10 MHz Sine Wave signal.
2. Connect the IGUU 2916 EMI pulse generator Output Sine Wave Generator to the EMI receiver RF Input.
3. Preset the EMI receiver by pressing **Mode Preset**.
4. Tune the EMI receiver to 10 MHz with a span of 0 Hz by pressing **FREQ Channel, Center Freq, 10 MHz** then **SPAN X Scale, Zero Span**.
5. Set the Sweeptime to 100 milliseconds by pressing **Sweep / Control, 100 ms**.
6. Set the RF Coupling to DC by pressing **Input / Output, RF Input, RF Coupling DC** (instruments with option 544 are always DC coupled so this step is skipped for them).
7. Set the amplitude units to dBµV by pressing **AMPTD Y Scale, More, Y Axis Unit, More, dBµV**.
8. Set the reference level to 80 dBµV by pressing **AMPTD Y Scale, 80 dBµV**.
9. Change the detector used by the EMI receiver to Peak by pressing **Trace / Detector, More, Detector, Peak**.
10. Turn on the marker by pressing **Marker**.
11. Record the marker value in Table 12-4 as the Measured value for Band B.
12. Calculate the Error with the following formula and enter the value in Table 12-4.

    Error = Measured – (Power Meter + 106.99)

Table 12-4 Peak Sine-Wave Voltage Accuracy Band B – CISPR 16-1-1 :2010 Section 5.3

Sine Wave Frequency (MHz)	Band B				
	Power Meter (dBm)	Measured (dBµV)	Lower Limit (dB)	Error (dB)	Upper Limit (dB)
10			-2.5		+2.5

13. Set the EMI receiver input attenuator to 10 dB by pressing **AMPTD Y Scale, Attenuation, 10 dB**.
14. Setup the IGUU 2916 EMI pulse generator as follows:
    a. Aux. Generator: **Band B**
    b. Pulse Frequency: **5000 Hz**
    c. Amplitude: **40 dBµV**

15. Connect the IGUU 2916 EMI pulse generator Output Auxiliary Generator Band A/B/C/D to the EMI receiver RF Input.
16. Set the Sweeptime to 2 milliseconds by pressing **Sweep / Control, 2 ms**.
17. Put the EMI receiver in single sweep operation by pressing **Single**.
18. Turn on the continuous peak function by pressing **Peak Search, More, Continuous Peak Search On**.
19. Take a single sweep on the EMI receiver by pressing **Restart**.
20. Once the sweep on the EMI receiver has completed and the auto peak value is found record the marker amplitude as the Measured value for the pulse frequency being measured in Table 12-5.
21. Without changing any other setting on the EMI receiver or the IGUU 2916 EMI pulse generator change the Pulse Frequency on the pulse generator and the Sweeptime of the EMI receiver to the other values listed in Table 12-5 and repeat steps 19 and 20 for each.

Table 12-5 Peak Response to Pulses Band B – CISPR 16-1-1 :2010 Section 5.4

Pulse Frequency (Hz)	Sweeptime (sec)	Band B			
		Measured (dBµV)	Lower Limit (dB)	Error (dB)	Upper Limit (dB)
5000	0.002		-2.0		+2.0
1000	0.02		-2.0		+2.0
500	0.02		-2.0		+2.0
100	0.1		-2.0		+2.0
50	0.1		-2.0		+2.0
10	2.0		-2.0		+2.0
1	2.0		-2.0		+2.0

22. Calculate the Error for each of the Measured values in Table 12-5 with the following formula and enter the value in Table 12-5.

    Error = Measured – 40 dBµV – 6.33 dB – Error (Table 12-4)

Band C Testing

1. Set the IGUU 2916 EMI pulse generator to output a 100 MHz Sine Wave signal.
2. Connect the IGUU 2916 EMI pulse generator Output Sine Wave Generator to the EMI receiver RF Input.
3. Preset the EMI receiver by pressing **Mode Preset**.
4. Tune the EMI receiver to 100 MHz with a span of 0 Hz by pressing **FREQ Channel, Center Freq, 100 MHz** then **SPAN X Scale, Zero Span**.
5. Set the Sweeptime to 100 milliseconds by pressing **Sweep / Control, 100 ms.**
6. Set the amplitude units to dBµV by pressing **AMPTD Y Scale, More, Y Axis Unit, More, dBµV**.
7. Set the reference level to 80 dBµV by pressing **AMPTD Y Scale, 80 dBµV**.
8. Change the detector used by the EMI receiver to Peak by pressing **Trace / Detector, More, Detector, Peak**.
9. Turn on the marker by pressing **Marker**.
10. Record the marker value in Table 12-6 as the Measured value for Band C.
11. Calculate the Error with the following formula and enter the value in Table 12-6.

    Error = Measured – (Power Meter + 106.99)

Table 12-6 Peak Sine-Wave Voltage Accuracy Band C – CISPR 16-1-1 :2010 Section 5.3

Sine Wave Frequency (MHz)	Band C				
	Power Meter (dBm)	Measured (dBµV)	Lower Limit (dB)	Error (dB)	Upper Limit (dB)
100			-2.5		+2.5

12. Set the EMI receiver input attenuator to 10 dB by pressing **AMPTD Y Scale, Attenuation, 10 dB**.
13. Setup the IGUU 2916 EMI pulse generator as follows:
    a. Aux. Generator: **Band C/D**
    b. Pulse Frequency: **20 kHz**
    c. Amplitude: **40 dBµV**
14. Connect the IGUU 2916 EMI pulse generator Output Auxiliary Generator Band A/B/C/D to the EMI receiver RF Input.
15. Set the Sweeptime to 1 milliseconds by pressing **Sweep / Control, 1 ms**.

16. Put the EMI receiver in single sweep operation by pressing **Single**.
17. Turn on the continuous peak function by pressing **Peak Search, More, Continuous Peak Search On**.
18. Take a single sweep on the EMI receiver by pressing **Restart**.
19. Once the sweep on the EMI receiver has completed and the auto peak value is found record the marker amplitude as the Measured value for the pulse frequency being measured in Table 12-7.
20. Without changing any other setting on the EMI receiver or the IGUU 2916 EMI pulse generator change the Pulse Frequency on the pulse generator and the Sweeptime of the EMI receiver to the other values listed in Table 12-7 and repeat steps 18 and 19 for each.

Table 12-7 Peak Response to Pulses Band C – CISPR 16-1-1 :2010 Section 5.4

Pulse Frequency (Hz)	Sweeptime (sec)	Band C			
		Measured (dBµV)	Lower Limit (dB)	Error (dB)	Upper Limit (dB)
20000	0.001		-2.0		+2.0
10000	0.001		-2.0		+2.0
5000	0.002		-2.0		+2.0
1000	0.02		-2.0		+2.0
500	0.02		-2.0		+2.0
100	0.1		-2.0		+2.0
50	0.1		-2.0		+2.0
10	2.0		-2.0		+2.0
1	2.0		-2.0		+2.0

21. Calculate the Error for each of the Measured values in Table 12-7 with the following formula and enter the value in Table 12-7.

    Error = Measured – 40 dBµV – 12.61 dB – Error (Table 12-6)

Band D Testing

1. Setup the IGUU 2916 EMI pulse generator as follows:
    a. Aux. Generator: **Band C/D**
    b. b.Pulse Frequency: **20 kHz**
    c. Amplitude: **40 dBµV**
2. Connect the IGUU 2916 EMI pulse generator Output Auxiliary Generator Band A/B/C/D to the EMI receiver RF Input.
3. Preset the EMI receiver by pressing **Mode Preset**.
4. Tune the EMI receiver to 500 MHz with a span of 0 Hz by pressing **FREQ Channel, Center Freq, 500 MHz** then **SPAN X Scale, Zero Span**.
5. Set the Sweeptime to 1 milliseconds by pressing **Sweep / Control, 1 ms**.
6. Set the EMI receiver input attenuator to 10 dB by pressing **AMPTD Y Scale, Attenuation, 10 dB**.
7. Set the amplitude units to dBµV by pressing **AMPTD Y Scale, More, Y Axis Unit, More, dBµV**.
8. Set the reference level to 80 dBµV by pressing **AMPTD Y Scale, 80 dBµV**.
9. Change the detector used by the EMI receiver to Peak by pressing **Trace / Detector, More, Detector, Peak**.
10. Put the EMI receiver in single sweep operation by pressing **Single**.
11. Turn on the continuous peak function by pressing **Peak Search, More, Continuous Peak Search On**.
12. Take a single sweep on the EMI receiver by pressing **Restart.**
13. Once the sweep on the EMI receiver has completed and the auto peak value is found record the marker amplitude as the Measured value for the pulse frequency being measured in Table 12-8.

14. Without changing any other setting on the EMI receiver or the IGUU 2916 EMI pulse generator change the Pulse Frequency on the pulse generator and the Sweeptime of the EMI receiver to the other values listed in Table 12-8 and repeat steps 12 and 13 for each.

Table 12-8 Peak Response to Pulses Band D – CISPR 16-1-1 :2010 Section 5.4

Pulse Frequency (Hz)	Sweeptime (sec)	Band D			
		Measured (dBµV)	Lower Limit (dB)	Error (dB)	Upper Limit (dB)
20000	0.001		-2.0		+2.0
10000	0.001		-2.0		+2.0
5000	0.002		-2.0		+2.0
1000	0.02		-2.0		+2.0
500	0.02		-2.0		+2.0
100	0.1		-2.0		+2.0
50	0.1		-2.0		+2.0
10	2.0		-2.0		+2.0
1	2.0		-2.0		+2.0

15. Calculate the Error for each of the Measured values in Table 12-8 with the following formula and enter the value in Table 12-8.

Error = Measured – 40 dBµV – 12.61 dB

13 EMI Average Detector Accuracy

Test Limits

See test limits in test results Table 13-2 through Table 13-12.

Overview

This test will verify the performance of the EMI Average detector of the EMI receiver according to section 6 of the CISPR 16-1-1 :2010 standard. This includes testing for the following subsections:

6.4 Sine-wave voltage accuracy

6.5 Response to pulses

6.5.2 Amplitude relationship

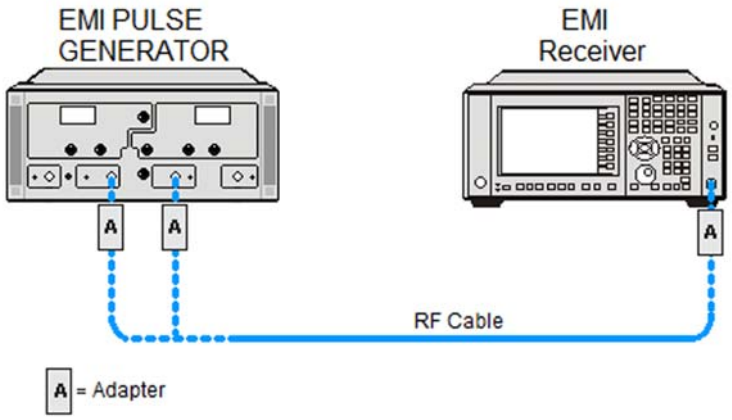
6.5.3 Variation with repetition frequency

Table 13-1 EMI Average - Required Equipment

Item	Critical Specifications (for this test)	Recommended Model
Adapter[a] Type-N (m) to 3.5 mm (f)	Frequency: 100 kHz to 1.0 GHz VSWR: < 1.1:1	1250-1744
Adapter[b] 3.5 mm (f) to 3.5 mm (f)	Frequency: 100 kHz to 1.0 GHz VSWR: < 1.1:1	83059B
Adapter[c] 2.4 mm (f) to 3.5 mm (f)	Frequency: 100 kHz to 1.0 GHz VSWR: < 1.1:1	11901B
Cable, 1 meter 3.5 mm (m) to 3.5 mm (m)	Frequency: 100 kHz to 1.51 GHz VSWR: < 1.4:1	11500E
EMI Calibration Pulse Generator	CISPR Specified Pulse Area	Schwarzbeck IGUU 2916
Power Meter	Compatible with power sensor	E4418B
Power Sensor	Frequency Range: 100 MHz Amplitude Range: -60 to 0 dBm	E9304A

a. Quantity 2 required for Option CNF (Type-N RF Input)
b. Only required for Option C35 (3.5 mm RF Input)
c. Only required for Option 544 (44 GHz RF Frequency Range)

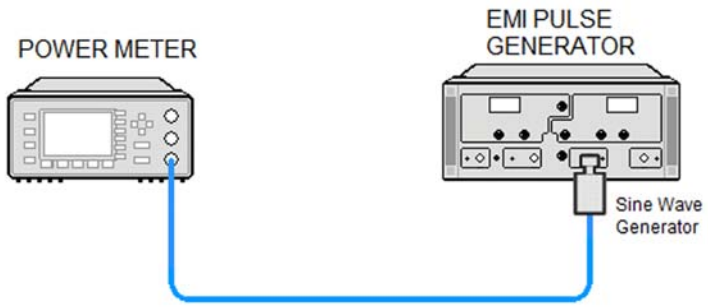
Figure 13-1 Typical Equipment Setup



Sine Wave Generator Characterization

1. Zero and calibrate the power meter.
2. Connect the power meter to the Output Sine Wave Generator of the IGUU 2916 EMI pulse generator as shown in Figure 13-2.

Figure 13-2 Sine Wave Generator Characterization



3. Set the IGUU 2916 EMI pulse generator to output a 100 kHz Sine Wave signal.
4. After allowing the power meter to settle, record the reading in Table 13-2 under the Power Meter column.
5. Set the IGUU 2916 EMI pulse generator to output a 10 MHz Sine Wave signal.
6. After allowing the power meter to settle, record the reading in Table 13-5 under the Power Meter column.
7. Set the IGUU 2916 EMI pulse generator to output a 100 MHz Sine Wave signal.
8. After allowing the power meter to settle, record the reading in Table 13-8 under the Power Meter column.

Initial Setup

1. Setup the equipment as shown in Figure 13-1.
2. Make sure that the EMI receiver is in the spectrum analyzer mode by pressing **Mode, Spectrum Analyzer**.
3. Make sure that the auto alignment routine in the EMI receiver is on by pressing **System, Alignments, Auto Align, Normal**.
4. Put the instrument in a known state by pressing **Mode, Spectrum Analyzer, Mode Setup, More, Restore Mode Defaults, OK**.
5. Set all input / output setting to their default state by pressing **System, Restore Defaults, Input / Output Settings, OK**.

Band A Testing

1. Set the IGUU 2916 EMI pulse generator to output a 100 kHz Sine Wave signal.
2. Connect the IGUU 2916 EMI pulse generator Output Sine Wave Generator to the EMI receiver RF Input.
3. Preset the EMI receiver by pressing **Mode Preset**.
4. Tune the receiver to 100 kHz with a span of 0 Hz by pressing **FREQ Channel, Center Freq, 100 kHz** then **SPAN X Scale, Zero Span**.
5. Set the Sweeptime to 1 second by pressing **Sweep / Control, 1 s**.
6. Set the RF Coupling to DC by pressing **Input / Output, RF Input, RF Coupling DC** (instruments with option 544 are always DC coupled so this step is skipped for them).
7. Set the amplitude units to dBµV by pressing **AMPTD Y Scale, More, Y Axis Unit, More, dBµV**.
8. Set the reference level to 80 dBµV by pressing **AMPTD Y Scale, 80 dBµV**.
9. Change the detector used by the EMI receiver to EMI Average by pressing **Trace / Detector, More, Detector, More, EMI Average**.
10. Turn on the marker by pressing **Marker**.
11. Record the marker value in Table 13-2 as the Measured value for Band A.
12. Calculate the Error with the following formula and enter the value in Table 13-2.

    Error = Measured – (Power Meter + 106.99)

Table 13-2 EMI Average Sine-Wave Voltage Accuracy Band A – CISPR 16-1-1 :2010 Section 6.4

Sine Wave Frequency (kHz)	Band A				
	Power Meter (dBm)	Measured (dBµV)	Lower Limit (dB)	Error (dB)	Upper Limit (dB)
100			-2.5		+2.5

13. Setup the IGUU 2916 EMI pulse generator as follows:
    a. Aux. Generator: **Band A**
    b. Pulse Frequency: **25 Hz**
    c. Amplitude: **40 dBµV**
14. Connect the IGUU 2916 EMI pulse generator Output Auxiliary Generator Band A/B/C/D to the EMI receiver RF Input.

15. Set the EMI receiver input attenuator to 6 dB by pressing **AMPTD Y Scale, Attenuation, 6 dB**.
16. Put the EMI receiver in single sweep operation by pressing **Single**.
17. Take a single sweep on the EMI receiver by pressing **Restart**.
18. Once the sweep has completed find the peak of the detector output by pressing **Peak Search**.
19. Record the marker value in Table 13-3 as the Measured value for the Band A reference PRF.
20. Calculate the Error with the following formula and enter the value in Table 13-3.

    Error = Measured – 40 dBµV + 12.36 dB - Error (Table 13-2)

Table 13-3 EMI Average Amplitude Relationship Band A – CISPR 16-1-1 :2010 Section 6.5.2

Pulse Frequency (Hz)	Band A			
	Measured (dBµV)	Lower Limit (dB)	Error (dB)	Upper Limit (dB)
25		-2.0		+2.0

21. Put the marker in Delta mode by pressing **Marker, Delta**.
22. Turn on the continuous peak function by pressing **Peak Search, More, Continuous Peak Search On**.
23. Change the Pulse Frequency on the IGUU 2916 EMI pulse generator to **100 Hz**.
24. Take a single sweep on the EMI receiver by pressing **Restart**.
25. Once the sweep on the EMI receiver has completed and the auto peak value is found record the marker delta amplitude value for the 100 Hz pulse frequency in Table 13-4.
26. Change the Pulse Frequency on the IGUU 2916 EMI pulse generator to **10 Hz**.
27. Take a single sweep on the EMI receiver by pressing **Restart**.

28. Once the sweep on the EMI receiver has completed and the auto peak value is found record the marker delta amplitude value for the 10 Hz pulse frequency in Table 13-4.

Table 13-4 EMI Average Variation with Repetition Frequency Band A – CISPR 16-1-1 :2010 Section 6.5.3

Pulse Frequency (Hz)	Band A		
	Lower Limit (dB)	Measured (dB)	Upper Limit (dB)
100	15.5		10.5
25	0	Reference	0
10	-9.5		-4.5

Band B Testing

1. Set the IGUU 2916 EMI pulse generator to output a 10 MHz Sine Wave signal.
2. Connect the IGUU 2916 EMI pulse generator Output Sine Wave Generator to the EMI receiver RF Input.
3. Preset the EMI receiver by pressing **Mode Preset**.
4. Tune the receiver to 10 MHz with a span of 0 Hz by pressing **FREQ Channel, Center Freq, 10 MHz then SPAN X Scale, Zero Span**.
5. Set the Sweeptime to 1 second by pressing **Sweep / Control, 1 s**.
6. Set the RF Coupling to DC by pressing **Input / Output, RF Input, RF Coupling DC** (instruments with option 544 are always DC coupled so this step is skipped for them).
7. Set the amplitude units to dBµV by pressing **AMPTD Y Scale, More, Y Axis Unit, More, dBµV**.
8. Set the reference level to 80 dBµV by pressing **AMPTD Y Scale, 80 dBµV**.
9. Change the detector used by the EMI receiver to EMI Average by pressing **Trace / Detector, More, Detector, More, EMI Average**.
10. Turn on the marker by pressing **Marker**.
11. Record the marker value in Table 13-5 as the Measured value for Band B.
12. Calculate the Error with the following formula and enter the value in Table 13-5.

    Error = Measured – (Power Meter + 106.99)

Table 13-5 EMI Average Sine-Wave Voltage Accuracy Band B – CISPR 16-1-1 :2010 Section 6.4

Sine Wave Frequency (MHz)	Band B				
	Power Meter (dBm)	Measured (dBµV)	Lower Limit (dB)	Error (dB)	Upper Limit (dB)
10			-2.5		+2.5

13. Setup the IGUU 2916 EMI pulse generator as follows:
    a. Aux. Generator: **Band B**
    b. Pulse Frequency: **500 Hz**
    c. Amplitude: **40 dBµV**
14. Connect the IGUU 2916 EMI pulse generator Output Auxiliary Generator Band A/B/C/D to the EMI receiver RF Input.

15. Set the EMI receiver input attenuator to 10 dB by pressing **AMPTD Y Scale, Attenuation, 10 dB**.
16. Put the EMI receiver in single sweep operation by pressing **Single**.
17. Take a single sweep on the EMI receiver by pressing **Restart**.
18. Once the sweep has completed find the peak of the detector output by pressing **Peak Search**.
19. Record the marker value in Table 13-6 as the Measured value for the Band B reference PRF.
20. Calculate the Error with the following formula and enter the value in Table 13-6.

    Error = Measured – 40 dBµV + 18.95 dB - Error (Table 13-5)

Table 13-6 EMI Average Amplitude Relationship Band B – CISPR 16-1-1 :2010 Section 6.5.2

Pulse Frequency (Hz)	Band B			
	Measured (dBµV)	Lower Limit (dB)	Error (dB)	Upper Limit (dB)
500		-2.0		+2.0

21. Put the marker in Delta mode by pressing **Marker, Delta**.
22. Turn on the continuous peak function by pressing **Peak Search, More, Continuous Peak Search On**.
23. Change the Pulse Frequency on the IGUU 2916 EMI pulse generator to **1000 Hz**.
24. Take a single sweep on the EMI receiver by pressing **Restart**.
25. Once the sweep on the EMI receiver has completed and the auto peak value is found record the marker delta amplitude value for the 1000 Hz pulse frequency Table 13-7.
26. Change the Pulse Frequency on the IGUU 2916 EMI pulse generator to **100 Hz**.
27. Take a single sweep on the EMI receiver by pressing **Restart**.

28. Once the sweep on the EMI receiver has completed and the auto peak value is found record the marker delta amplitude value for the 100 Hz pulse frequency in Table 13-7.

Table 13-7 EMI Average Variation with Repetition Frequency Band B – CISPR 16-1-1 :2010 Section 6.5.3

Pulse Frequency (Hz)	Band B		
	Lower Limit (dB)	Measured (dB)	Upper Limit (dB)
1000	4.5		9.5
500	0	Reference	0
100	-15.5		-10.5

Band C Testing

1. Set the IGUU 2916 EMI pulse generator to output a 100 MHz Sine Wave signal.
2. Connect the IGUU 2916 EMI pulse generator Output Sine Wave Generator to the EMI receiver RF Input.
3. Preset the EMI receiver by pressing **Mode Preset**.
4. Tune the receiver to 100 MHz with a span of 0 Hz by pressing **FREQ Channel, Center Freq, 100 MHz** then **SPAN X Scale, Zero Span**.
5. Set the Sweeptime to 1 second by pressing **Sweep / Control, 1 s**.
6. Set the amplitude units to dBµV by pressing **AMPTD Y Scale, More, Y Axis Unit, More, dBµV**.
7. Set the reference level to 80 dBµV by pressing **AMPTD Y Scale, 80 dBµV**.
8. Change the detector used by the EMI receiver to EMI Average by pressing **Trace / Detector, More, Detector, More, EMI Average**.
9. Turn on the marker by pressing **Marker**.
10. Record the marker value in Table 13-8 as the Measured value for Band C.
11. Calculate the Error with the following formula and enter the value in Table 13-8.

    Error = Measured – (Power Meter + 106.99)

Table 13-8 EMI Average Sine-Wave Voltage Accuracy Band C – CISPR 16-1-1 :2010 Section 6.4

Sine Wave Frequency (MHz)	Band C				
	Power Meter (dBm)	Measured (dBµV)	Lower Limit (dB)	Error (dB)	Upper Limit (dB)
100			-2.5		+2.5

12. Setup the IGUU 2916 EMI pulse generator as follows:
    a. Aux. Generator: **Band C/D**
    b. Pulse Frequency: **5000 Hz**
    c. Amplitude: **40 dBµV**
13. Connect the IGUU 2916 EMI pulse generator Output Auxiliary Generator Band A/B/C/D to the EMI receiver RF Input.
14. Set the EMI receiver input attenuator to 0 dB by pressing **AMPTD Y Scale, Attenuation, 0 dB**.
15. Put the EMI receiver in single sweep operation by pressing **Single**.

16. Take a single sweep on the EMI receiver by pressing **Restart**.
17. Once the sweep has completed find the peak of the detector output by pressing **Peak Search**.
18. Record the marker value in Table 13-9 as the Measured value for the Band C reference PRF.
19. Calculate the Error with the following formula and enter the value in Table 13-9.

    Error = Measured – 40 dBµV + 16.07 dB - Error (Table 13-8)

Table 13-9 EMI Average Amplitude Relationship Band C – CISPR 16-1-1 :2010 Section 6.5.2

Pulse Frequency (Hz)	Band C			
	Measured (dBµV)	Lower Limit (dB)	Error (dB)	Upper Limit (dB)
5000		-2.0		+2.0

20. Put the marker in Delta mode by pressing **Marker, Delta**.
21. Turn on the continuous peak function by pressing **Peak Search, More, Continuous Peak Search On**.
22. Change the Pulse Frequency on the IGUU 2916 EMI pulse generator to **10000 Hz**.
23. Take a single sweep on the EMI receiver by pressing **Restart**.
24. Once the sweep on the EMI receiver has completed and the auto peak value is found record the marker delta amplitude value for the 10000 Hz pulse frequency in Table 13-10.
25. Change the Pulse Frequency on the IGUU 2916 EMI pulse generator to **1000 Hz**.
26. Take a single sweep on the EMI receiver by pressing **Restart**.

27. Once the sweep on the EMI receiver has completed and the auto peak value is found record the marker delta amplitude value for the 1000 Hz pulse frequency in Table 13-10.

Table 13-10 EMI Average Variation with Repetition Frequency Band C – CISPR 16-1-1 :2010 Section 6.5.3

Pulse Frequency (Hz)	Band C		
	Lower Limit (dB)	Measured (dB)	Upper Limit (dB)
10000	4.5		9.5
5000	0	Reference	0
1000	-15.5		-10.5

Band D Testing

1. Setup the IGUU 2916 EMI pulse generator as follows:
   a. Aux. Generator: **Band C/D**
   b. Pulse Frequency: **5000 Hz**
   c. Amplitude: **40 dBµV**
2. Connect the IGUU 2916 EMI pulse generator Output Auxiliary Generator Band A/B/C/D to the EMI receiver RF Input.
3. Preset the EMI receiver by pressing **Mode Preset**.
4. Tune the receiver to 500 MHz with a span of 0 Hz by pressing **FREQ Channel, Center Freq, 500 MHz** then **SPAN X Scale, Zero Span**.
5. Set the Sweeptime to 1 second by pressing **Sweep / Control, 1 s**.
6. Set the amplitude units to dBµV by pressing **AMPTD Y Scale, More, Y Axis Unit, More, dBµV**.
7. Set the reference level to 80 dBµV by pressing **AMPTD Y Scale, 80 dBµV**.
8. Change the detector used by the EMI receiver to EMI Average by pressing **Trace / Detector, More, Detector, More, EMI Average**.
9. Set the EMI receiver input attenuator to 0 dB by pressing **AMPTD Y Scale, Attenuation, 0 dB**.
10. Put the EMI receiver in single sweep operation by pressing **Single**.
11. Take a single sweep on the EMI receiver by pressing **Restart**.
12. Once the sweep has completed find the peak of the detector output by pressing **Peak Search**.
13. Record the marker value in Table 13-11 as the Measured value for the Band D reference PRF.
14. Calculate the Error with the following formula and enter the value in Table 13-11.

    Error = Measured – 40 dBµV + 16.07 dB

Table 13-11 EMI Average Amplitude Relationship Band D – CISPR 16-1-1 :2010 Section 6.5.2

Pulse Frequency (Hz)	Band D			
	Measured (dBµV)	Lower Limit (dB)	Error (dB)	Upper Limit (dB)
5000		-2.0		+2.0

15. Put the marker in Delta mode by pressing **Marker, Delta**.

16. Turn on the continuous peak function by pressing **Peak Search, More, Continuous Peak Search On**.
17. Change the Pulse Frequency on the IGUU 2916 EMI pulse generator to **10000 Hz**.
18. Take a single sweep on the EMI receiver by pressing **Restart**.
19. Once the sweep on the EMI receiver has completed and the auto peak value is found record the marker delta amplitude value for the 10000 Hz pulse frequency in Table 13-12.
20. Change the Pulse Frequency on the IGUU 2916 EMI pulse generator to **1000 Hz**.
21. Take a single sweep on the EMI receiver by pressing **Restart**.
22. Once the sweep on the EMI receiver has completed and the auto peak value is found record the marker delta amplitude value for the 1000 Hz pulse frequency in Table 13-12.

Table 13-12 EMI Average Variation with Repetition Frequency Band D – CISPR 16-1-1 :2010 Section 6.5.3

Pulse Frequency (Hz)	Band D		
	Lower Limit (dB)	Measured (dB)	Upper Limit (dB)
10000	4.5		9.5
5000	0	Reference	0
1000	-15.5		-10.5

14 RMS Average Detector Accuracy

Test Limits

See test limits in test results Table 14-2 through Table 14-12.

Overview

This test will verify the performance of the RMS Average detector of the EMI receiver according to section 7 of the CISPR 16-1-1 :2010 standard. This includes testing for the following subsections:

7.4 Sine-wave voltage accuracy

7.5 Response to pulses

7.5.2 Amplitude relationship

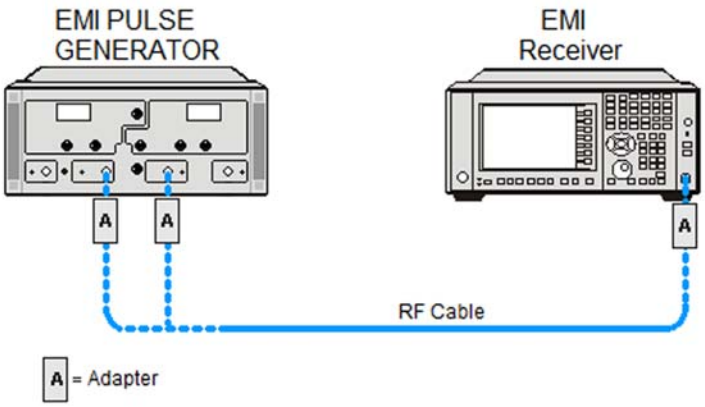
7.5.3 Variation with repetition frequency

Table 14-1 RMS Average Detector- Required Equipment

Item	Critical Specifications (for this test)	Recommended Model
Adapter[a] Type-N (m) to 3.5 mm (f)	Frequency: 10 kHz to 1.0 GHz VSWR: < 1.1:1	1250-1744
Adapter[b] 3.5 mm (f) to 3.5 mm (f)	Frequency: 100 kHz to 1.0 GHz VSWR: < 1.1:1	83059B
Adapter[c] 2.4 mm (f) to 3.5 mm (f)	Frequency: 100 kHz to 1.0 GHz VSWR: < 1.1:1	11901B
Cable, 1 meter 3.5 mm (m) to 3.5 mm (m)	Frequency: 100 kHz to 1.51 GHz VSWR: < 1.4:1	11500E
EMI Calibration Pulse Generator	CISPR Specified Pulse Area	Schwarzbeck IGUU 2916
Power Meter	Compatible with power sensor	E4418B
Power Sensor	Frequency Range: 100 MHz Amplitude Range: -60 to 0 dBm	E9304A

a. Quantity 2 required for Option CNF (Type-N RF Input)
b. Only required for Option C35 (3.5 mm RF Input)
c. Only required for Option 544 (44 GHz Frequency Range)

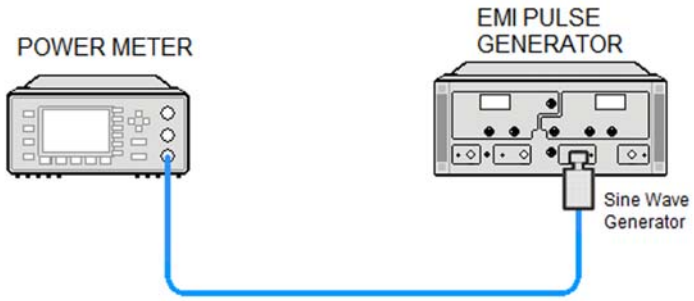
Figure 14-1 Typical Equipment Setup



Sine Wave Generator Characterization

1. Zero and calibrate the power meter.
2. Connect the power meter to the Output Sine Wave Generator of the IGUU 2916 EMI pulse generator as shown in Figure 14-2.

Figure 14-2 Sine Wave Generator Characterization



3. Set the IGUU 2916 EMI pulse generator to output a 100 kHz Sine Wave signal.
4. After allowing the power meter to settle, record the reading in Table 14-2 under the Power Meter column.
5. Set the IGUU 2916 EMI pulse generator to output a 10 MHz Sine Wave signal.
6. After allowing the power meter to settle, record the reading in Table 14-5 under the Power Meter column.
7. Set the IGUU 2916 EMI pulse generator to output a 100 MHz Sine Wave signal.
8. After allowing the power meter to settle, record the reading in Table 14-8 under the Power Meter column.

Initial Setup

1. Setup the equipment as shown in Figure 14-1.
2. Make sure that the EMI receiver is in the spectrum analyzer mode by pressing **Mode, Spectrum Analyzer**.
3. Make sure that the auto alignment routine in the EMI receiver is on by pressing **System, Alignments, Auto Align, Normal**.
4. Put the instrument in a known state by pressing **Mode, Spectrum Analyzer, Mode Setup, More, Restore Mode Defaults, OK**.
5. Set all input / output setting to their default state by pressing **System, Restore Defaults, Input / Output Settings, OK**.

Band A Testing

1. Set the IGUU 2916 EMI pulse generator to output a 100 kHz Sine Wave signal.
2. Connect the IGUU 2916 EMI pulse generator Output Sine Wave Generator to the EMI receiver RF Input.
3. Preset the EMI receiver by pressing **Mode Preset**.
4. Tune the receiver to 100 kHz with a span of 0 Hz by pressing **FREQ Channel, Center Freq, 100 kHz** then **SPAN X Scale, Zero Span**.
5. Set the Sweeptime to 1 second by pressing **Sweep / Control, 1 s**.
6. Set the RF Coupling to DC by pressing **Input / Output, RF Input, RF Coupling DC** (instruments with option 544 are always DC coupled so this step is skipped for them).
7. Set the amplitude units to dBµV by pressing **AMPTD Y Scale, More, Y Axis Unit, More, dBµV**.
8. Set the reference level to 80 dBµV by pressing **AMPTD Y Scale, 80 dBµV**.
9. Change the detector used by the EMI receiver to RMS Average by pressing **Trace / Detector, More, Detector, More, RMS Average**.
10. Put the EMI receiver in single sweep operation by pressing **Single**.
11. Take a single sweep on the EMI receiver by pressing **Restart**.
12. Turn on the marker by pressing **Marker.**
13. Record the marker value in Table 14-2 as the Measured value for Band A.
14. Calculate the Error with the following formula and enter the value in Table 14-2.

    Error = Measured – (Power Meter + 106.99)

Table 14-2 RMS Average Sine-Wave Voltage Accuracy Band A – CISPR 16-1-1 :2010 Section 7.4

Sine Wave Frequency (kHz)	Band A				
	Power Meter (dBm)	Measured (dBµV)	Lower Limit (dB)	Error (dB)	Upper Limit (dB)
100			-2.5		+2.5

15. Setup the IGUU 2916 EMI pulse generator as follows:
    - Aux. Generator: **Band A**
    - Pulse Frequency: **25 Hz**
    - Amplitude: **40 dBµV**

16. Connect the IGUU 2916 EMI pulse generator Output Auxiliary Generator Band A/B/C/D to the EMI receiver RF Input.
17. Set the EMI receiver input attenuator to 6 dB by pressing **AMPTD Y Scale, Attenuation, 6 dB**.
18. Take a single sweep on the EMI receiver by pressing **Restart**.
19. Once the sweep has completed find the peak of the detector output by pressing **Peak Search**.
20. Record the marker value in Table 14-3 as the Measured value for the Band A reference PRF.
21. Calculate the Error with the following formula and enter the value in Table 14-3.

    Error = Measured – 40 dBµV + 5.13 dB - Error (Table 14-2)

Table 14-3 RMS Average Amplitude Relationship Band A – CISPR 16-1-1 :2010 Section 7.5.2

Pulse Frequency (Hz)	Band A			
	Measured (dBµV)	Lower Limit (dB)	Error (dB)	Upper Limit (dB)
25		-2.0		+2.0

22. Put the marker in Delta mode by pressing **Marker, Delta**.
23. Turn on the continuous peak function by pressing **Peak Search, More, Continuous Peak Search On**.
24. Change the Pulse Frequency on the IGUU 2916 EMI pulse generator to **100 Hz**.
25. Take a single sweep on the EMI receiver by pressing **Restart**.
26. Once the sweep on the EMI receiver has completed and the auto peak value is found record the marker delta amplitude value for the 100 Hz pulse frequency in Table 14-4.
27. Change the Pulse Frequency on the IGUU 2916 EMI pulse generator to **10 Hz**.
28. Take a single sweep on the EMI receiver by pressing **Restart**.
29. Once the sweep on the EMI receiver has completed and the auto peak value is found record the marker delta amplitude value for the 10 Hz pulse frequency in Table 14-4.
30. Change the Pulse Frequency on the IGUU 2916 EMI pulse generator to **5 Hz**.
31. Take a single sweep on the EMI receiver by pressing **Restart**.

32. Once the sweep on the EMI receiver has completed and the auto peak value is found record the marker delta amplitude value for the 5 Hz pulse frequency in Table 14-4.

Table 14-4 RMS Average Variation with Repetition Frequency Band A – CISPR 16-1-1 :2010 Section 7.5.3

Pulse Frequency (Hz)	Band A		
	Lower Limit (dB)	Measured (dB)	Upper Limit (dB)
100	4.9		7.1
25	0	Reference	0
10	-4.9		-3.1
5	-10.2		-7.8

Band B Testing

1. Set the IGUU 2916 EMI pulse generator to output a 10 MHz Sine Wave signal.
2. Connect the IGUU 2916 EMI pulse generator Output Sine Wave Generator to the EMI receiver RF Input.
3. Preset the EMI receiver by pressing **Mode Preset**.
4. Tune the receiver to 10 MHz with a span of 0 Hz by pressing **FREQ Channel, Center Freq, 10 MHz** then **SPAN X Scale, Zero Span**.
5. Set the Sweeptime to 1 second by pressing **Sweep / Control, 1 s**.
6. Set the RF Coupling to DC by pressing **Input / Output, RF Input, RF Coupling DC** (instruments with option 544 are always DC coupled so this step is skipped for them).
7. Set the amplitude units to dBµV by pressing **AMPTD Y Scale, More, Y Axis Unit, More, dBµV**.
8. Set the reference level to 80 dBµV by pressing **AMPTD Y Scale, 80 dBµV**.
9. Change the detector used by the EMI receiver to RMS Average by pressing **Trace / Detector, More, Detector, More, RMS Average**.
10. Put the EMI receiver in single sweep operation by pressing **Single**.
11. Take a single sweep on the EMI receiver by pressing **Restart**.
12. Turn on the marker by pressing **Marker**.
13. Record the marker value in Table 14-5 as the Measured value for Band B.
14. Calculate the Error with the following formula and enter the value in Table 14-5.

    Error = Measured – (Power Meter + 106.99)

Table 14-5 RMS Average Sine-Wave Voltage Accuracy Band B – CISPR 16-1-1 :2010 Section 7.4

Sine Wave Frequency (MHz)	Band B				
	Power Meter (dBm)	Measured (dBµV)	Lower Limit (dB)	Error (dB)	Upper Limit (dB)
10			-2.5		+2.5

15. Setup the IGUU 2916 EMI pulse generator as follows:
    a. Aux. Generator: **Band B**
    b. Pulse Frequency: **1000 Hz**
    c. Amplitude: **40 dBµV**

16. Connect the IGUU 2916 EMI pulse generator Output Auxiliary Generator Band A/B/C/D to the EMI receiver RF Input.
17. Set the EMI receiver input attenuator to 10 dB by pressing **AMPTD Y Scale, Attenuation, 10 dB**.
18. Take a single sweep on the EMI receiver by pressing **Restart.**
19. Once the sweep has completed find the peak of the detector output by pressing **Peak Search**.
20. Record the marker value in Table 14-6 as the Measured value for the Band B reference PRF.
21. Calculate the Error with the following formula and enter the value in Table 14-6.

    Error = Measured – 40 dBµV + 4.55 dB - Error (Table 14-5)

Table 14-6 RMS Average Amplitude Relationship Band B – CISPR 16-1-1 :2010 Section 7.5.2

Pulse Frequency (Hz)	Band B			
	Measured (dBµV)	Lower Limit (dB)	Error (dB)	Upper Limit (dB)
1000		-2.0		+2.0

22. Put the marker in Delta mode by pressing **Marker, Delta**.
23. Turn on the continuous peak function by pressing **Peak Search, More, Continuous Peak Search On**.
24. Change the Pulse Frequency on the IGUU 2916 EMI pulse generator to **100 Hz**.
25. Take a single sweep on the EMI receiver by pressing **Restart**.
26. Once the sweep on the EMI receiver has completed and the auto peak value is found record the marker delta amplitude value for the pulse frequency being measured in Table 14-7.

27. Without changing any other setting on the EMI receiver or the IGUU 2916 EMI pulse generator change the Pulse Frequency on the pulse generator to the other values in the Table 14-7 and repeat steps 25 and 26 for each.

Table 14-7 RMS Average Variation with Repetition Frequency Band B – CISPR 16-1-1 :2010 Section 7.5.3

Pulse Frequency (Hz)	Band B		
	Lower Limit (dB)	Measured (dB)	Upper Limit (dB)
1000	0	Reference	0
100	-11.5		-8.5
25	-18.1		-13.9
10	-22.5		-17.5
5	-27.8		-22.2

Band C Testing

1. Set the IGUU 2916 EMI pulse generator to output a 100 MHz Sine Wave signal.
2. Connect the IGUU 2916 EMI pulse generator Output Sine Wave Generator to the EMI receiver RF Input.
3. Preset the EMI receiver by pressing **Mode Preset**.
4. Tune the receiver to 100 MHz with a span of 0 Hz by pressing **FREQ Channel, Center Freq, 100 MHz** then **SPAN X Scale, Zero Span**.
5. Set the Sweeptime to 1 second by pressing **Sweep / Control, 1 s**.
6. Set the amplitude units to dBµV by pressing **AMPTD Y Scale, More, Y Axis Unit, More, dBµV**.
7. Set the reference level to 80 dBµV by pressing **AMPTD Y Scale, 80 dBµV**.
8. Change the detector used by the EMI receiver to RMS Average by pressing **Trace / Detector, More, Detector, More, RMS Average**.
9. Put the EMI receiver in single sweep operation by pressing **Single**.
10. Take a single sweep on the EMI receiver by pressing **Restart**.
11. Turn on the marker by pressing **Marker**.
12. Record the marker value in Table 14-8 as the Measured value for Band C.
13. Calculate the Error with the following formula and enter the value in Table 14-8.

    Error = Measured – (Power Meter + 106.99)

Table 14-8 RMS Average Sine-Wave Voltage Accuracy Band C – CISPR 16-1-1 :2010 Section 7.4

Sine Wave Frequency (MHz)	Band C				
	Power Meter (dBm)	Measured (dBµV)	Lower Limit (dB)	Error (dB)	Upper Limit (dB)
100			-2.5		+2.5

14. Setup the IGUU 2916 EMI pulse generator as follows:
    a. Aux. Generator: **Band C/D**
    b. Pulse Frequency: **1000 Hz**
    c. Amplitude: **40 dBµV**
15. Connect the IGUU 2916 EMI pulse generator Output Auxiliary Generator Band A/B/C/D to the EMI receiver RF Input.

16. Set the EMI receiver input attenuator to 0 dB by pressing **AMPTD Y Scale, Attenuation, 0 dB**.
17. Take a single sweep on the EMI receiver by pressing **Restart**.
18. Once the sweep has completed find the peak of the detector output by pressing **Peak Search**.
19. Record the marker value in Table 14-9 as the Measured value for the Band C reference PRF.
20. Calculate the Error with the following formula and enter the value in Table 14-9.

    Error = Measured – 40 dBµV + 10.41 dB - Error (Table 14-8)

Table 14-9 RMS Average Amplitude Relationship Band C – CISPR 16-1-1 :2010 Section 7.5.2

Pulse Frequency (Hz)	Band C			
	Measured (dBµV)	Lower Limit (dB)	Error (dB)	Upper Limit (dB)
1000		-2.0		+2.0

21. Put the marker in Delta mode by pressing **Marker, Delta**.
22. Turn on the continuous peak function by pressing **Peak Search, More, Continuous Peak Search On**.
23. Change the Pulse Frequency on the IGUU 2916 EMI pulse generator to **10000 Hz**.
24. Take a single sweep on the EMI receiver by pressing **Restart**.
25. Once the sweep on the EMI receiver has completed and the auto peak value is found record the marker delta amplitude value for the 10000 Hz pulse frequency in Table 14-10.
26. Change the Pulse Frequency on the IGUU 2916 EMI pulse generator to **100 Hz**.
27. Take a single sweep on the EMI receiver by pressing **Restart**.

28. Once the sweep on the EMI receiver has completed and the auto peak value is found record the marker delta amplitude value for the 100 Hz pulse frequency in Table 14-10.

Table 14-10 RMS Average Variation with Repetition Frequency Band C – CISPR 16-1-1 :2010 Section 7.5.3

Pulse Frequency (Hz)	Band C		
	Lower Limit (dB)	Measured (dB)	Upper Limit (dB)
10000	8.5		11.5
1000	0	Reference	0
100	-11.5		-8.5

Band D Testing

1. Setup the IGUU 2916 EMI pulse generator as follows:
   a. Aux. Generator: **Band C/D**
   b. Pulse Frequency: **1000 Hz**
   c. Amplitude: **40 dBµV**
2. Connect the IGUU 2916 EMI pulse generator Output Auxiliary Generator Band A/B/C/D to the EMI receiver RF Input.
3. Preset the EMI receiver by pressing **Mode Preset**.
4. Tune the receiver to 500 MHz with a span of 0 Hz by pressing **FREQ Channel, Center Freq, 500 MHz** then **SPAN X Scale, Zero Span**.
5. Set the Sweeptime to 1 second by pressing **Sweep / Control, 1 s**.
6. Set the amplitude units to dBµV by pressing **AMPTD Y Scale, More, Y Axis Unit, More, dBµV**.
7. Set the reference level to 80 dBµV by pressing **AMPTD Y Scale, 80 dBµV**.
8. Change the detector used by the EMI receiver to RMS Average by pressing **Trace / Detector, More, Detector, More, RMS Average**.
9. Set the EMI receiver input attenuator to 0 dB by pressing **AMPTD Y Scale, Attenuation, 0 dB**.
10. Put the EMI receiver in single sweep operation by pressing **Single**.
11. Take a single sweep on the EMI receiver by pressing **Restart**.
12. Once the sweep has completed find the peak of the detector output by pressing **Peak Search**.
13. Record the marker value in Table 14-11 as the Measured value for the Band D reference PRF.
14. Calculate the Error with the following formula and enter the value in Table 14-11.

    Error = Measured – 40 dBµV + 10.41 dB

Table 14-11 RMS Average Amplitude Relationship Band D – CISPR 16-1-1 :2010 Section 7.5.2

Pulse Frequency (Hz)	Band D			
	Measured (dBµV)	Lower Limit (dB)	Error (dB)	Upper Limit (dB)
5000		-2.0		+2.0

15. Put the marker in Delta mode by pressing **Marker, Delta**.

16. Turn on the continuous peak function by pressing **Peak Search, More, Continuous Peak Search On**.
17. Change the Pulse Frequency on the IGUU 2916 EMI pulse generator to **10000 Hz**.
18. Take a single sweep on the EMI receiver by pressing **Restart**.
19. Once the sweep on the EMI receiver has completed and the auto peak value is found record the marker delta amplitude value for the 10000 Hz pulse frequency in Table 14-12.
20. Change the Pulse Frequency on the IGUU 2916 EMI pulse generator to **100 Hz.**
21. Take a single sweep on the EMI receiver by pressing **Restart**.
22. Once the sweep on the EMI receiver has completed and the auto peak value is found record the marker delta amplitude value for the 100 Hz pulse frequency in Table 14-12.

Table 14-12 RMS Average Variation with Repetition Frequency Band D – CISPR 16-1-1 :2010 Section 7.5.3

Pulse Frequency (Hz)	Band D		
	Lower Limit (dB)	Measured (dB)	Upper Limit (dB)
10000	8.5		11.5
1000	0	Reference	0
100	-11.5		-8.5

15 Intermittent, Unsteady, Drifting Disturbances

Test Limits

See test limits in test results Table 15-2 and Table 15-3.

Overview

This test will verify the response of the EMI Average and RMS Average detectors of the EMI receiver according to CISPR 16-1-1 :2010 standard to intermittent, unsteady, and drifting narrowband disturbances. This includes testing for the following subsections:

6.5.4 Response to intermittent, unsteady, and drifting narrowband disturbances

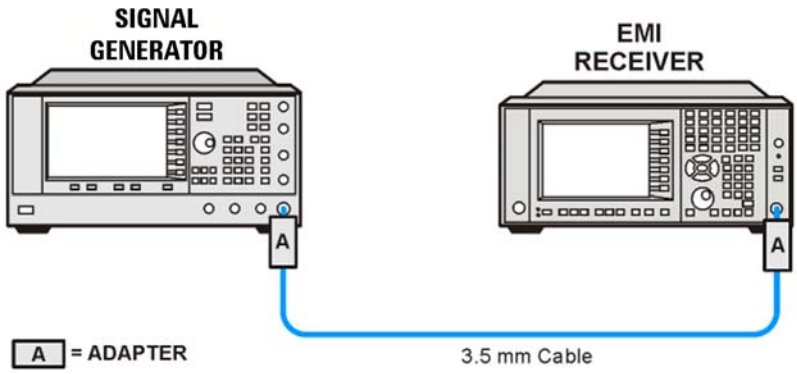
7.5.4 Response to intermittent, unsteady, and drifting narrowband disturbances

Table 15-1 Intermittent, Unsteady, Drifting Disturbances - Required Equipment

Item	Critical Specifications (for this test)	Recommended Model
Adapter[a] Type-N (m) to 3.5 mm (f)	Frequency: 100 kHz to 1.0 GHz VSWR: < 1.1:1	1250-1744
Adapter[b] 3.5 mm (f) to 3.5 mm (f)	Frequency: 100 kHz to 1.0 GHz VSWR: < 1.1:1	83059B
Adapter[c] 2.4 mm (f) to 3.5 mm (f)	Frequency: 100 kHz to 1.0 GHz VSWR: < 1.1:1	11901B
Cable, 1 meter 3.5 mm (m) to 3.5 mm (m)	Frequency: 10 kHz to 1.51 GHz VSWR: < 1.4:1	11500E
Signal Generator	Frequency Range: 100 kHz to 1.5 GHz Amplitude Range: -40 to 0 dBm Narrow Pulse Modulation	PSG w/Option UNW

a. Quantity 2 required for Option CNF (Type-N RF Input)
b. Only required for Option C35 (3.5 mm RF Input)
c. Only required for Option 544 (44 GHz Frequency Range)

Figure 15-1 Equipment Setup



Initial Setup

1. Setup the equipment as shown in Figure 15-1.
2. Make sure that the EMI receiver is in the spectrum analyzer mode by **pressing Mode, Spectrum Analyzer.**
3. Make sure that the auto alignment routine in the EMI receiver is on by pressing **System, Alignments, Auto Align, Normal**.
4. Put the instrument in a known state by pressing **Mode, Spectrum Analyzer, Mode Setup, More, Restore Mode Defaults, OK**.
5. Set all input / output setting to their default state by pressing **System, Restore Defaults, Input / Output Settings, OK**.

EMI Average Detector Testing

1. Preset the Signal Generator by pressing **Preset.**
2. Set the Synthesizer Sweeper as follows:
    a. Output: **Sine Wave**
    b. Frequency: **125 kHz**
    c. Amplitude: **-20 dBm**
    d. Pulse Period: **1.6 seconds**
    e. Pulse Width: **0.16 seconds**
    f. Pulse: **On**
    g. RF Output: **On**
    h. Modulation: **Off**
3. Connect the Signal Generator output to the EMI receiver RF Input.
4. Preset the EMI receiver by pressing **Mode Preset**.
5. Tune the EMI receiver to 125 kHz with a span of 0 Hz by pressing **FREQ Channel, Center Freq, 125 kHz** then **SPAN X Scale, Zero Span**.
6. Set the RF Coupling to DC by pressing **Input / Output, RF Input, RF Coupling DC** (instruments with option 544 are always DC coupled so this step is skipped for them).
7. Set the Sweeptime to 3 seconds by pressing **Sweep / Control, 3 s**.
8. Change the detector used by the EMI receiver to EMI Average by pressing **Trace / Detector, More, Detector, More, EMI Average**.
9. Put the EMI receiver in single sweep operation by pressing **Single**.
10. Turn on the continuous peak function by pressing **Peak Search, More, Continuous Peak Search On**.
11. Take a single sweep on the EMI receiver by pressing **Restart**.
12. Once the sweep on the EMI receiver has completed and the auto peak value is found record the marker amplitude as the Sine Wave Measured value for the frequency being measured in Table 15-2.
13. On the signal generator turn the modulation **On**.
14. Take a single sweep on the EMI receiver by pressing **Restart**.
15. Once the sweep on the EMI receiver has completed and the auto peak value is found record the marker amplitude as the Pulsed RF Measured value for the frequency being measured in Table 15-2.

16. Calculate the Delta between the Sine Wave and Pulsed RF measurements with the following formula and enter the value in Table 15-2 for the frequency being measured.

    Delta = Pulsed RF Measured – Sine Wave Measured

Table 15-2 EMI Average – CISPR 16-1-1 :2010 Section 6.5.4

Frequency (MHz)	Pulse Width (sec)	Sine Wave Measured (dBm)	Pulsed RF Measured (dBm)	Lower Limit (dB)	Delta (dB)	Upper Limit (dB)
0.125	0.16			-10.5		-7.5
10	0.16			-10.5		-7.5
100	0.10			-10.5		-7.5
500	0.10			-10.5		-7.5
1100	0.10			-10.5		-7.5

17. On the signal generator turn the modulation **Off**.

18. Changing the frequency on the EMI receiver and the signal generator to the next value listed in Table 15-2.

19. Change the Pulse Width on the signal generator to the corresponding value for the Frequency being tested listed in Table 15-2.

20. Repeat steps 11 through 19 for the rest of the frequencies in Table 15-2.

RMS Average Detector Testing

1. Preset the signal generator by pressing **Preset**.
2. Set the Synthesizer Sweeper as follows:
    a. Output: **Sine Wave**
    b. Frequency: **125 kHz**
    c. Amplitude: **-20 dBm**
    d. Pulse Period: **1.6 seconds**
    e. Pulse Width: **0.16 seconds**
    f. Pulse: **On**
    g. RF Output: **On**
    h. Modulation: **Off**
3. Connect the signal generator output to the EMI receiver RF Input.
4. Preset the EMI receiver by pressing **Mode Preset.**
5. Tune the EMI receiver to 125 kHz with a span of 0 Hz by pressing **FREQ Channel, Center Freq, 125 kHz** then **SPAN X Scale, Zero Span**.
6. Set the RF Coupling to DC by pressing **Input / Output, RF Input, RF Coupling DC** (instruments with option 544 are always DC coupled so this step is skipped for them).
7. Set the Sweeptime to 3 seconds by pressing **Sweep / Control, 3 s**.
8. Change the detector used by the EMI receiver to RMS Average by pressing **Trace / Detector, More, Detector, More, RMS Average**.
9. Put the EMI receiver in single sweep operation by pressing **Single**.
10. Turn on the continuous peak function by pressing **Peak Search, More, Continuous Peak Search On**.
11. Take a single sweep on the EMI receiver by pressing **Restart**.
12. Once the sweep on the EMI receiver has completed and the auto peak value is found record the marker amplitude as the Sine Wave Measured value for the frequency being measured in Table 15-3.
13. On the signal generator turn the modulation **On**.
14. Take a single sweep on the EMI receiver by pressing **Restart**.
15. Once the sweep on the EMI receiver has completed and the auto peak value is found record the marker amplitude as the Pulsed RF Measured value for the frequency being measured in Table 15-3.

16. Calculate the Delta between the Sine Wave and Pulsed RF measurements with the following formula and enter the value in Table 15-3 for the frequency being measured.

    Delta = Pulsed RF Measured – Sine Wave Measured

Table 15-3 RMS Average – CISPR 16-1-1 :2010 Section 7.5.4

Frequency (MHz)	Pulse Width (sec)	Sine Wave Measured (dBm)	Pulsed RF Measured (dBm)	Lower Limit (dB)	Delta (dB)	Upper Limit (dB)
0.125	0.16			-9.4		-6.4
10	0.16			-9.4		-6.4
100	0.10			-10.5		-7.5
500	0.10			-10.5		-7.5
1100	0.10			-10.5		-7.5

17. On the signal generator turn the modulation **Off**.

18. Changing the frequency on the EMI receiver and the signal generator to the next value listed in Table 15-3.

19. Change the Pulse Width on the signal generator to the corresponding value for the Frequency being tested listed in Table 15-3.

20. Repeat steps 11 through 19 for the rest of the frequencies in Table 15-3.

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