

USB 3.2 RFI System-Level Test Procedure

Rev1.1

November 24, 2020

Test Applicability

This test is only applicable to systems with Type C Connector and support data speeds 5Gbps and above

- USB 3.2 Hosts End Product (This includes embedded hosts)
- USB 3.2 Hubs End Product
- DRD

Equipment List

No	Equipment Name	Vendor	P/N
1	Signal/Spectrum Analyzer	Anritsu/Keysight	MS2830A /N9000B
2	RFI System Level Test Fixture	Luxshare-ICT	MEU-58P1F
3	RF Cable 1m	Junkosha	MWX121-01000DMSDMS
4	RF Cable 0.5m	Junkosha	MWX121-00500DMSDMS
5	Shielding Box	Lab105	SHD6001A
6	Test Table (Recommended Optional)	Luxshare-ICT	MEU-39P1F
7	5 in-lbs. torque wrench (Recommended Optional)	Luxshare-ICT	MEW-40A11

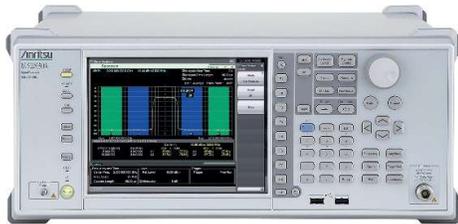
Table 1

Please contact Od.Liao@luxshare-ict.com for Luxshare and Lab105 parts and contact respective Test Equipment Vendors listed for the Signal/Spectrum Analyzer and refer [Table 2](#) for configuration.

Signals Analyzer Test Configuration

It is highly recommended to have the built-in preamplifier function for the signal analyzer.

Anritsu MS2830A



Keysight N9000B



Setting	ANRITSU	KEYSIGHT
Frequency Range 500MHz to 6GHz	Frequency> Start: 500MHz Stop: 6GHz	Frequency> Start: 500MHz Stop: 6GHz
RBW: 100KHz, VBW: 100KHz	BW> RBW: 100KHz VBW: 100KHz	BW> RBW: 100KHz VBW: 100KHz
Average Detector	Average type> Trace> Detector> Detector: RMS	Trace> Detector> Detector: Average (log/RMS/V)
Average times: 100	Storage count: 100	Avg. Hold number: 100
Attenuation	AMPTD> Attenuation: 0dB	AMPTD> Attenuation: 0dB
Trace type	Trace> Storage mode: Average	Trace> Trace type: Average
Trigger source	Trig: Free run (default)	Trig: Free run (default)
Pre-AMP	AMPTD> Signal path> Internal Premap: Full range (on)	AMPTD> Signal path> Internal Premap: Full range (on)
Test environment	Shielding room or Shielding box	Shielding room or Shielding box

Table 2

*Test environment can be in an unshielded room as long as the Shielding Box is utilized properly.

Tools and Equipment Drawings and Specifications

USB RFI System Level Test Fixture

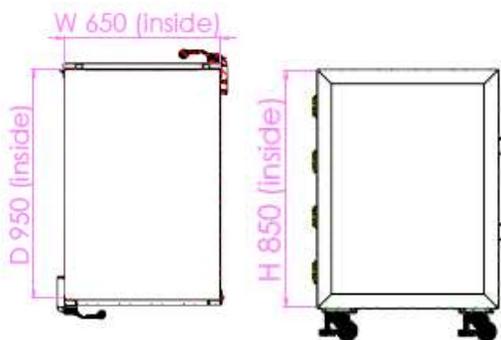


RF Cable Requirement

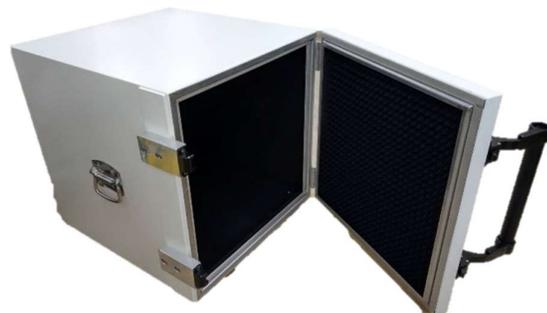
- RF Cable: 1m and 0.5m SMA M-M for 6 GHz or higher

Shielding Box Requirement

The shielding box isolation level must be lower than -80dB for full test frequency range (500MHz to 6GHz) and inside dimensions must be large enough for a desktop computer. Below is recommend shielding box dimension.



Lab105 Shielding box dimension



Lab105 Shielding box

Optional Tools and Accessories

Vendor – Luxshare-ICT

RFI System Table (MET-39A17)

- Make measure more stable
- Adjust DUT position
- DUT dimension (Max) : 46.5 cm
- Two axis adjust (vertical, horizontal)
- Rotation adjust (5 degrees)
- Ten feet fix table to be stable



Figure. 8-1 RFI Table Top View (MET-39A17)

Torque Wrench (MEW-40A11)

- Design Type: Ratchet, Break-over
- Hex Size: 5/16 inch(8.0)mm
- Torque Setting: 5 in-lbs
- Torque Accuracy: ± 0.4 in-lbs
- Use for connector type: SMA Connectors
- Length: 160mm
- Ratchet open-end wrench head.
- Break-Over design to make sure the torque will not be exceeded

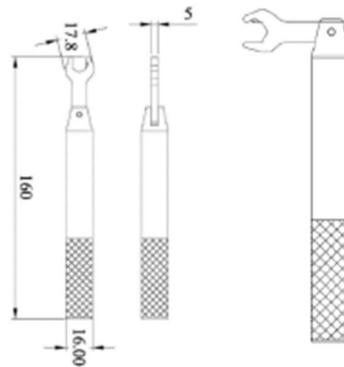
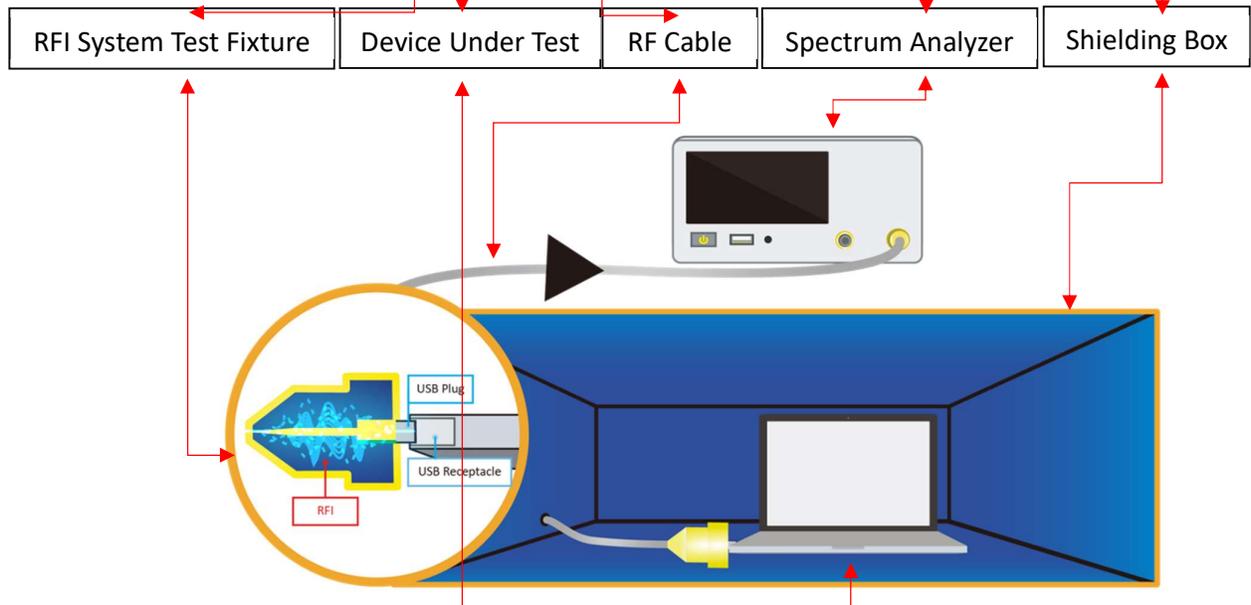
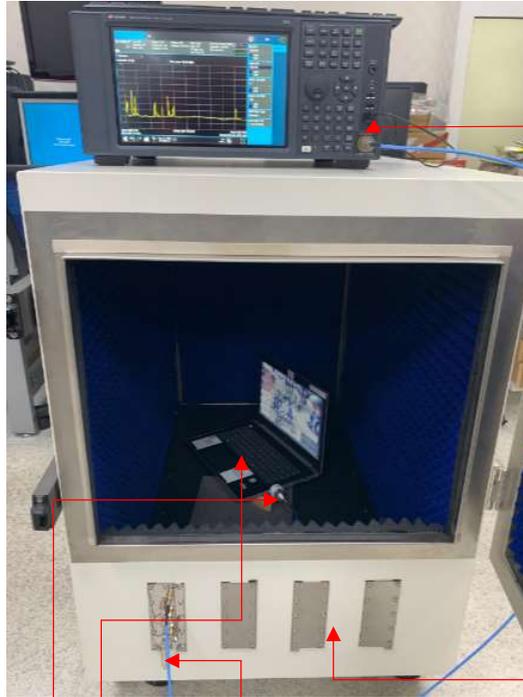


Figure. 8-2 Torque Wrench Drawings (MEW-40A11)

Test Setup



Test Procedure (Windows OS based systems)

Note: The fixture is designed to activate compliance test patterns CP0 running at 5 Gbps when the fixture is plugged in. CP0 transmission is forced by the termination in the fixture. Based on that, the specification is designed to meet the RFI requirement when the data rate is 10 Gbps. XHSETT tool is used to make sure the port stays in compliance mode for Windows OS environment.

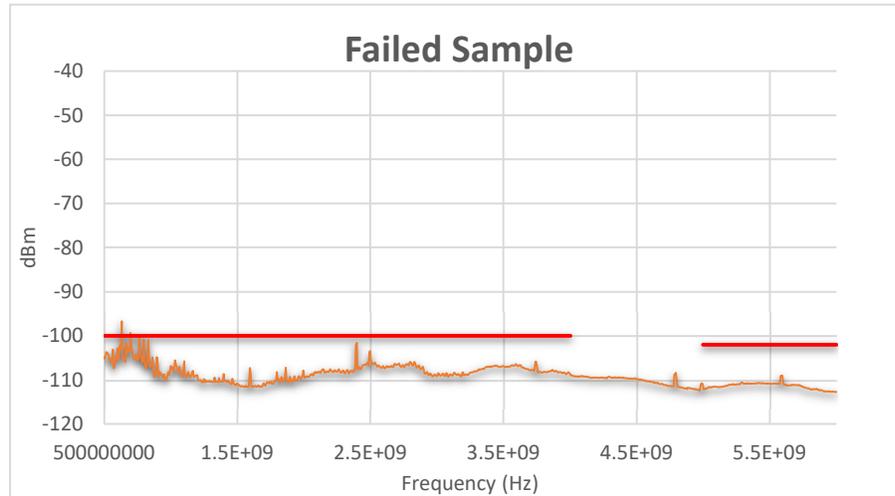
1. Please make sure you have performed the [Test Setup](#) first before proceeding.
2. Find out the port assignments for the exposed USB Type C ports of the DUT. This can be done by asking the customer about the port assignments or by utilizing USBView and plugging in a USB 3.2 device/hub with a Type C connector. Take note of what port number it is enumerated under this is important information for using XHSETT tool for generating CP0 and recording compliance test results.

USBView (<https://docs.microsoft.com/en-us/windows-hardware/drivers/debugger/usbview>)

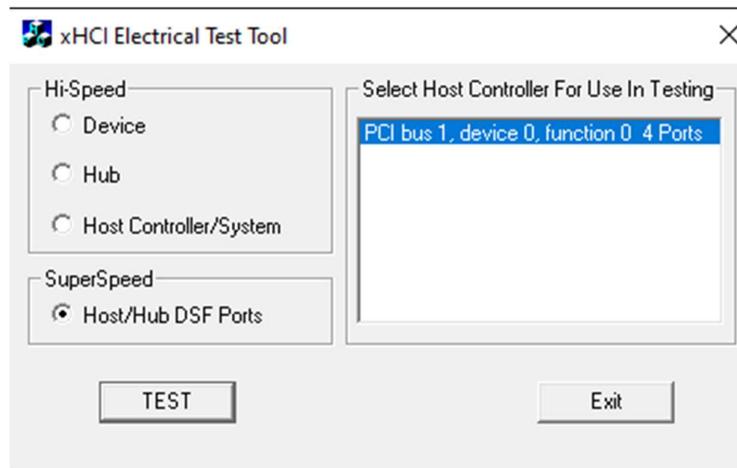
3. Configure the Signal Analyzer by referring to the parameters in (Signal Analyzer Test Configuration Section) then check the noise floor of the analyzer by leaving the RF input of the analyzer open. Noise floor should be less than or equal to -105dBm. Refer to the test setup shown (Test Setup Section) to setup the connection and make sure to tighten the connections using a 5 in-lbs. torque wrench where applicable.
4. Set limit lines in the Analyzer for the compliance test for pass/fail, 500MHz to 4GHz >- 100 dBm, 5GHz to 6GHz >-102 dBm

An alternative way is to export the measured signal from the analyzer as .csv and use a spreadsheet program to convert the values to a table. Please refer to the table below.

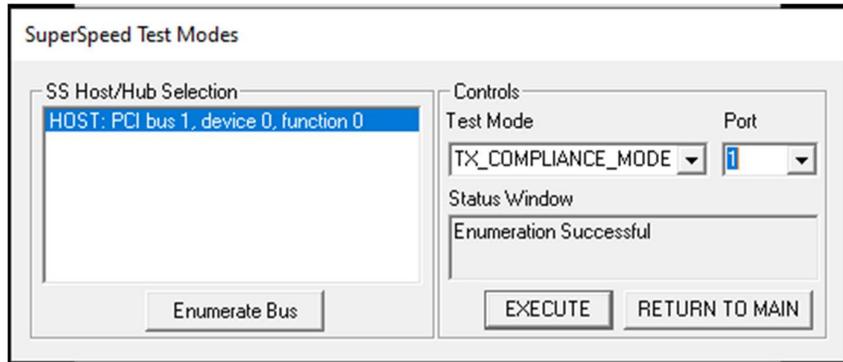
Example



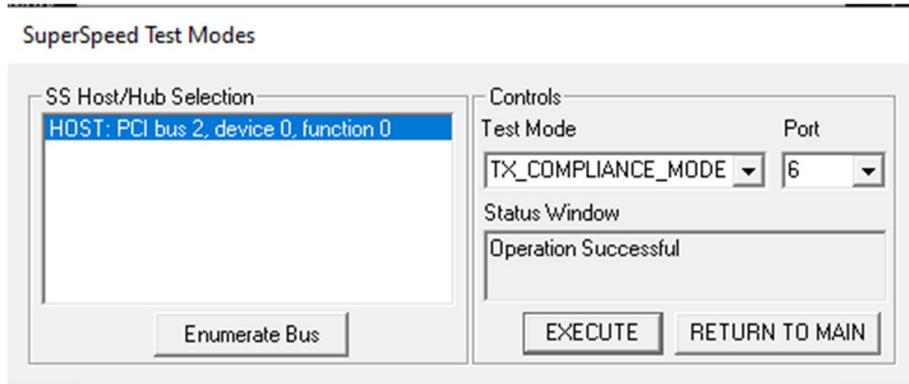
5. Launch XHSETT. The tool can be downloaded from:
<https://usb.org/document-library/xhsett-x64; for 64-bit OS>
<https://usb.org/document-library/xhsett-x32; for 32-bit OS>
6. Select Host/Hub DSF Ports under the SuperSpeed section then select host controller for use in testing.



7. Enumerate Bus and Select Host.



8. In the Controls section, select TX_COMPLIANCE_MODE from the drop-down menu under Test Mode. Choose the port number for the PUT then click execute and make sure status window shows "Operation Successful".



9. Plug in RFI system level test fixture to PUT and make sure the platform for testing is stable (i.e. no wobbling, no vibrations and etc.) then close the shielding box door. Start sweep (make sure it counts 100 average and save the waveform when done and proceed to the next port (if DUT has more than 1 Type C port).

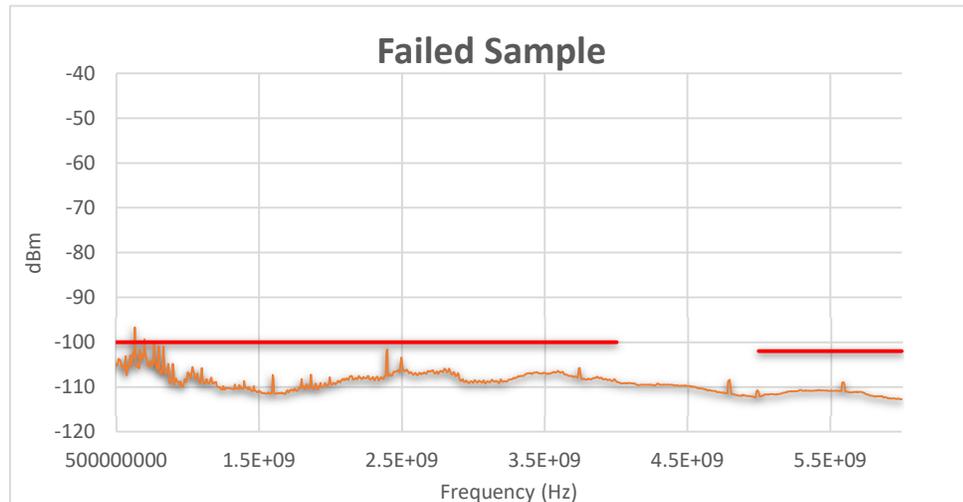
Test Procedure (non-Windows based Operating Systems)

Note: The fixture is designed to activate compliance test patterns CP0 running at 5 Gbps when the fixture is plugged in. CP0 transmission is forced by the termination in the fixture. Based on that, the specification is designed to meet the RFI requirement when the data rate is 10 Gbps.

1. Find out the port assignments for the exposed USB Type C ports of the DUT. The most convenient way is by asking the customer about the port assignments or please use whatever tool is available.
2. Configure the Signal Analyzer by referring to the parameters in (Signal Analyzer Test Configuration Section) then check the noise floor of the analyzer by leaving the RF input of the analyzer open. Noise floor should be less than or equal to -105dBm. Refer to the test setup shown (Test Setup Section) to setup the connection and make sure to tighten the connections using a 5 in-lbs. torque wrench where applicable.
3. Set limit lines in the Analyzer for the compliance test for pass/fail, 500MHz to 4GHz >- 100 dBm, 5GHz to 6GHz >-102 dBm

An alternative way is to export the measured signal from the analyzer as .csv and use a spreadsheet program to convert the values to a table. Please refer to the table below.

Example



4. Use any method/tool to make sure DUT goes and stays into compliance mode generating CPO
5. Plug in RFI system level test fixture to PUT and make sure the platform for testing is stable (i.e. no wobbling, no vibrations and etc.). Start sweep (make sure it counts 100 average and save the waveform when done and proceed to the next port (if DUT has more than 1 Type C port).

Test Pass/Fail Criteria

PUT generated CPO signal shall have noise emissions below the specified noise levels within the specified range.

- PUT shall have noise levels less than -100 dBm in the 500 MHz to 4 GHz range
- PUT shall have noise levels less than -102 dBm in the 5 GHz to 6 GHz range

Revision History

Revision	Date	Description	Author
1.0	8/21/2020	Initial Release	Joshua Talactac
1.1	11/19/2020	Improved Clarity, Fixed Formatting and added sections "Optional Tools and Accessories", Pass/Fail Criteria and "Test Procedure for non-Windows based Operating Systems" and updated equipment P/N.	Joshua Talactac

For questions, please feel free to contact techadmin@usb.org for more information.