USB Type-C RFI System Level Shielding Test Fixture

User Manual

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Product Name	Version	Date	Comments
USB Type-C RFI System Level Shielding Test Fixture	01	Nov.20,2018	Initial release

1. Introduction

During operation of different devices, signal interference can cause device interruptions, system errors, and device shutdowns.

To solve this issue, USB-IF has added RFI (Radio Frequency Interference) as a compliance test item in the USB3.2 specification to detect the signal interference when device is operating.

The test system is built by the equipment as following:

1. Signal Analyzer; 2. Shielding Box; 3. USB Type-C RFI System Level Shielding Test Fixture from Luxshare-ICT.

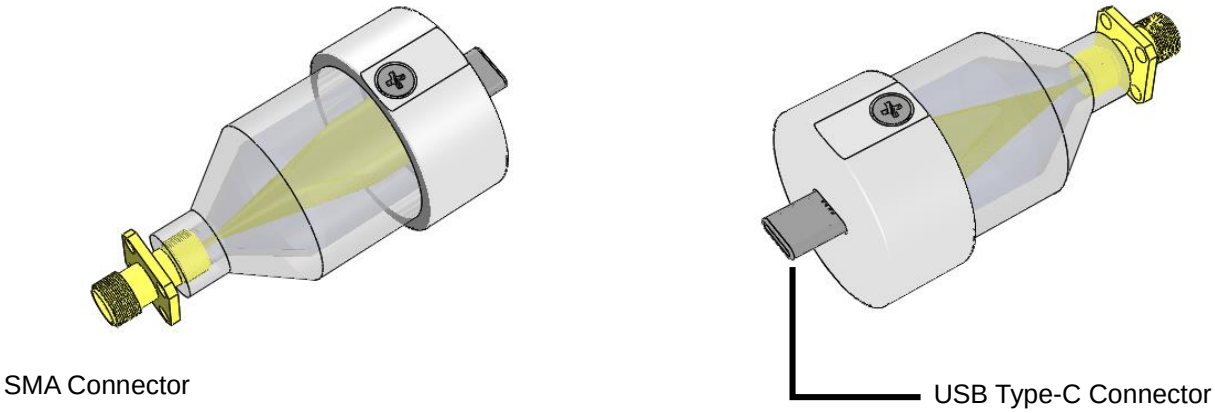

Figure. 1-1 USB Type-C RFI System Level Test Fixture (MEU-27P11-053)

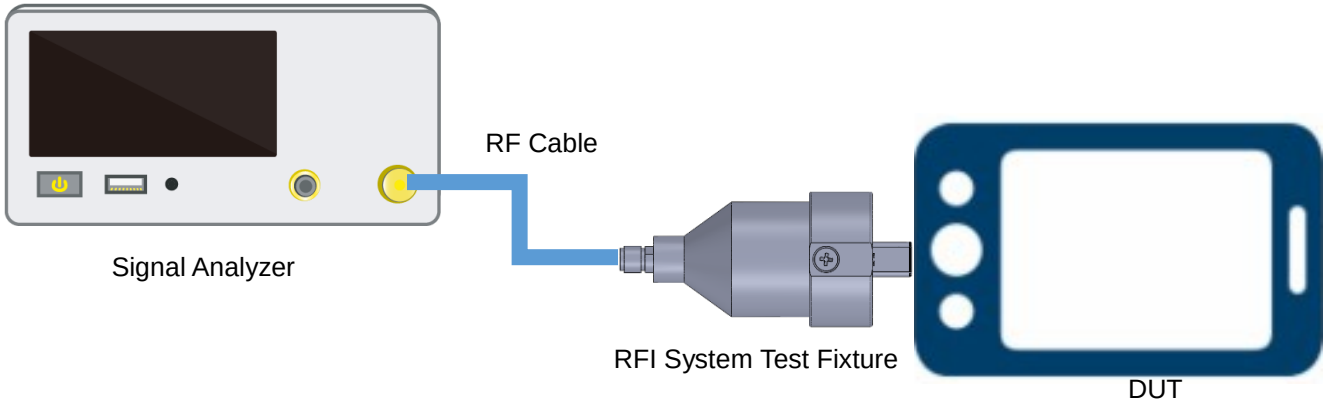

Figure. 1-2 Test Setup

1-1 Test Requirements

Table 1-1 RFI System Level Test –Test Equipment

Item No.	Item Name	SPEC.	Board	Product No.	Note
1	USB Type C RFI System Level Test Fixture	500MHz~6GHz	Luxshare-ICT	MEU-27P11-053	USB-IF standard test fixture
2	Signal Analyzer	500MHz~6GHz	Keysight / Anritsu/R&S	N9000 Series / MS2830A	Or higher equipment
3	Shielding Box	Isolation 97dB +/-2	Micromix	MEB-41A18	
4	RF Cable	500MHz~6GHz	Luxshare-ICT	MEU-28R13-042	

1-1-1 Signal Analyzer Requirements

- Frequency range: 500MHz~6GHz
- RBW: 100KHz
- Average times: 100 times
- Attenuation: 0dB
- Pre-APM function

Figure. 1-3 Keysight – N9000 Series

Figure. 1-4 Anritsu – MS2830A

1-1-2 Shielding Box Requirements

- Isolation: -80 +/-2 dB
- Inside Dimension(Min): 850mm x 550mm x 850mm
- Product No. : MEB-41A18

Figure. 1-5 Shielding Box (MEB-41A18)

1-1-3 RF Components Requirements

- RF Cable: Frequency higher than 6GHz
- Product No. : MEU-28R13-042

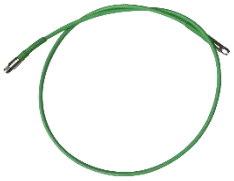

Figure. 1-6 RF Cable (MEU-28R13-042)

2. Precautions

Before making any connections, review the “Precautions” section. Follow these guidelines when making connections:

- Align test fixture carefully
- Make preliminary connection lightly
- To tighten, turn connector nut only
- Do not apply bending force to test fixture
- Do not over-tighten preliminary connections
- Do not twist or screw-in test fixture
- Use an appropriately sized torque wrench (depends on SMA gender), and do not tighten past the “break” point of the torque wrench (normally set to 5 in-lbs.)

⚠ Cleaning method

If necessary, clean the connectors using low-pressure (less than 60 PSI) compressed air or nitrogen with an effective oil-vapor filter and condensation trap. Clean the cable threads, if necessary, using a lint-free swab or cleaning cloth moistened with isopropyl alcohol. Always completely dry a connector before use. Do not use abrasives to clean the connectors. Re-inspect connectors, making sure no particles or residue remains.

⚠ Check SMA connector is connected properly.

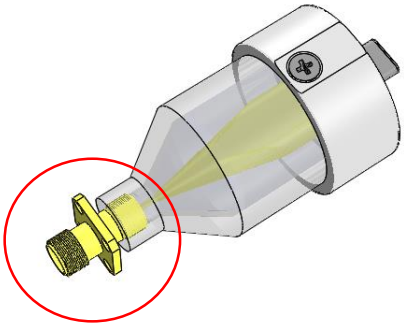

Figure. 2-1 Connected Properly

⚠ A support is necessary on this test system, hold the fixture, prevent fixture hung in the air.

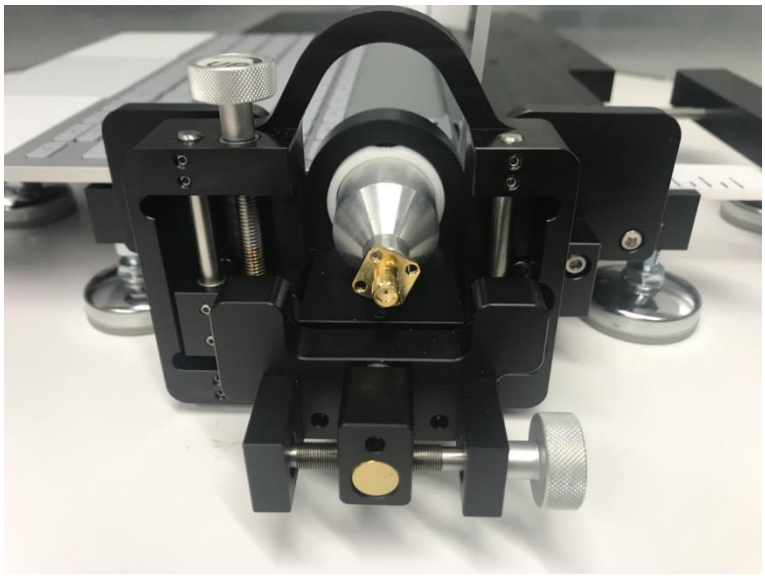

Figure. 2-2 Fixture care (1)

⚠ For the fixture life, fixture connect to device first, then setup RF cable to fixture.

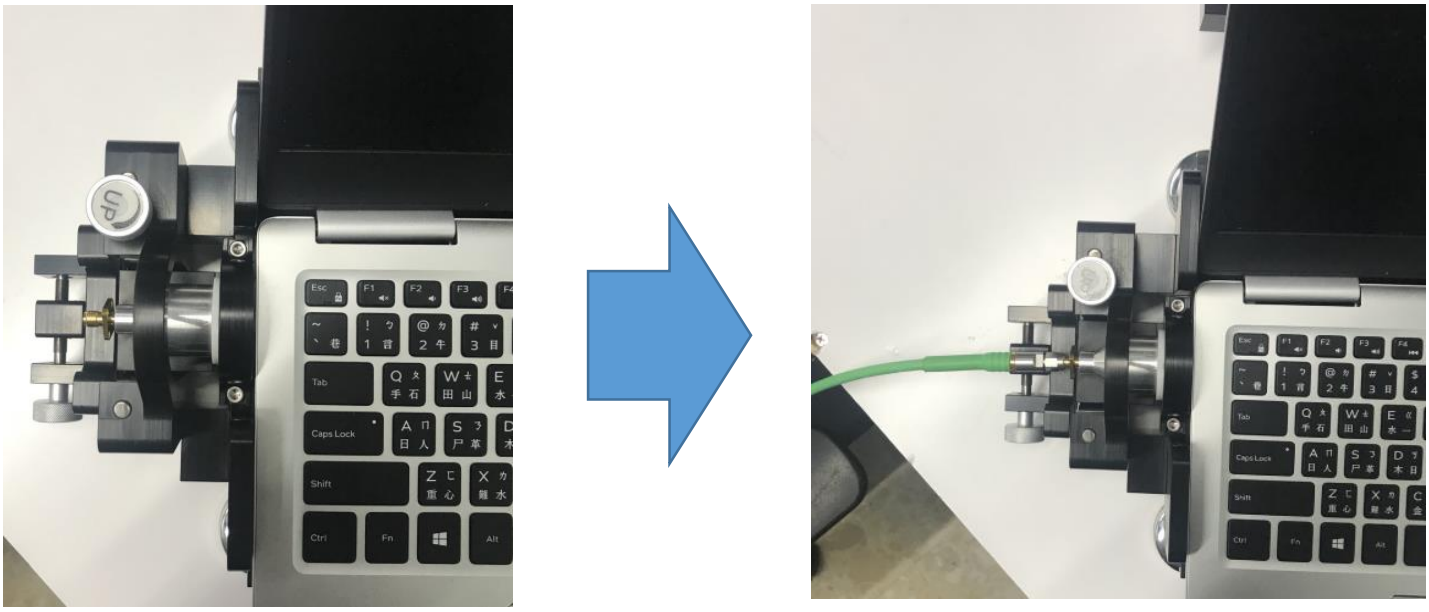

Figure. 2-3 Fixture care (2)

⚠ SMA Connector lock by Torque Wrench (5 in-lbs).

Figure. 2-5 Torque Wrench (5 in-lbs) (Datasheet at 8-2)

3. Structure

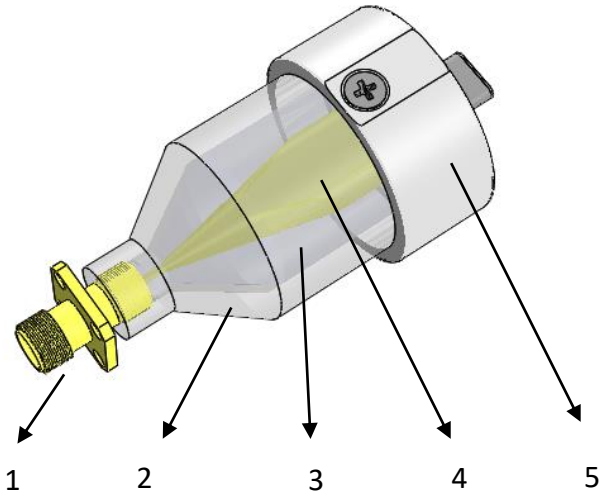

Figure. 3-1 Perspective View

Table 3-1 Perspective Table

Item No.	**Component Name**	**Item function**
1	SMA Thru	Connector for equipment
2	Housing	Protect fixture
3	Prober Cover	Protect probe
4	Probe	Signal collector
5	Fixture Cover	Protect fixture

4. Measure Instruments

4-1. Test Environment Introduction

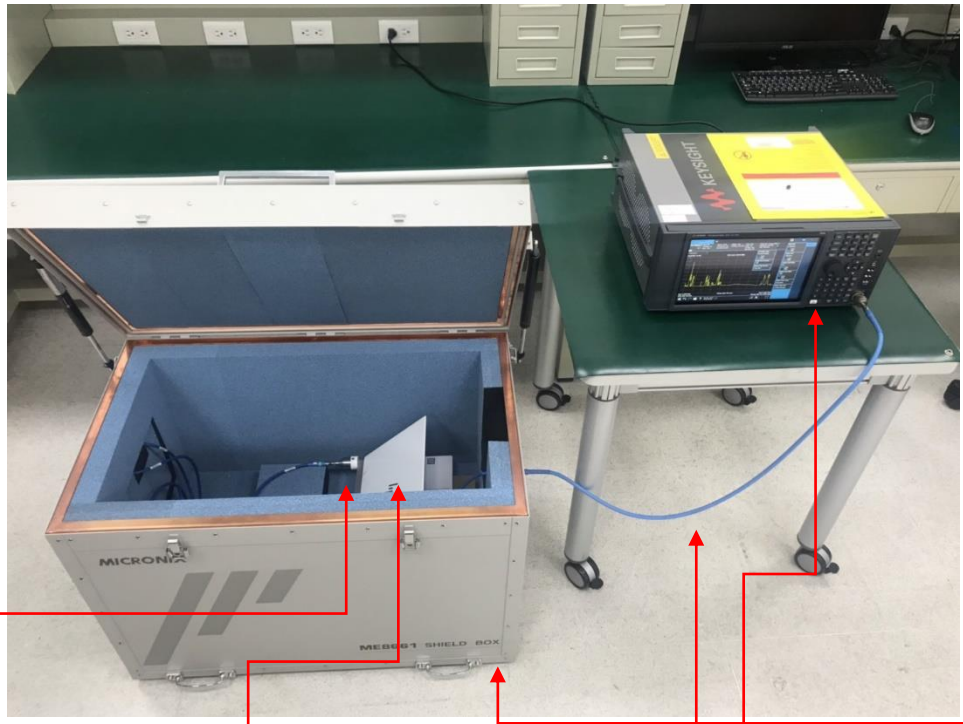

Figure. 4-1 Test Actual Picture

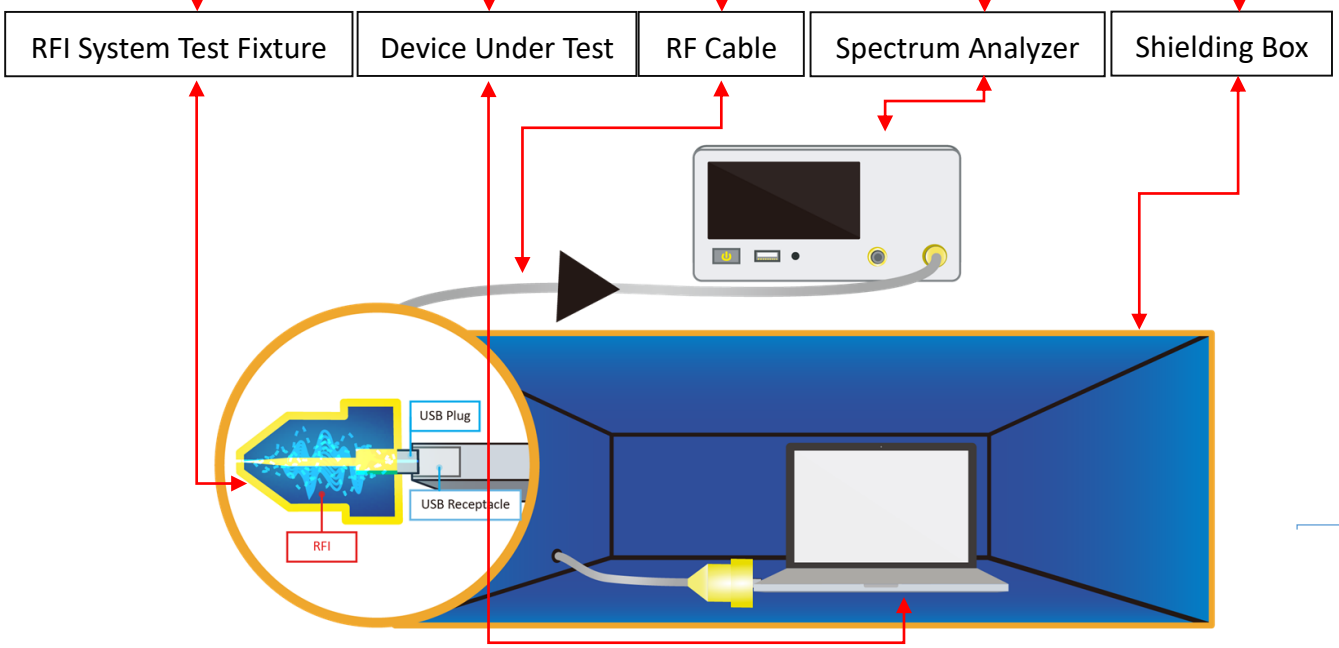

Figure. 4-2 Test Schematic

4-2. Parameters Setting

Table 4-1 Parameters Setting

Setting	ANRITSU	KEYSIGHT
Frequency 500MHz~6GHz	Frequency> Star: 500MHz Stop: 6GHz	Frequency> Star: 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	Average type> Average type:RMS Trace>Detector> Detector:Average(Log/RMS/V)
100 trace averages	Storage count:100	Avg Hold number:100
Attenuation	AMPTD> Attenuation:0dB	AMPTD> Attenuation:0dB
Trace type	Trace> Storage mode: MAX Hold	Trace> Trace type: MAX Hold
Trigger source Free run	Trig: free run(default)	Trig: free run(default)
Preamp on	AMPTD>Signal path> Internal Preamp: Full range(on)	AMPTD>Signal path> Internal Preamp: Full range(on)
Test environment	Shielding room & Shielding Box	Shieding room & Shielding Box

4-3. Limit Line

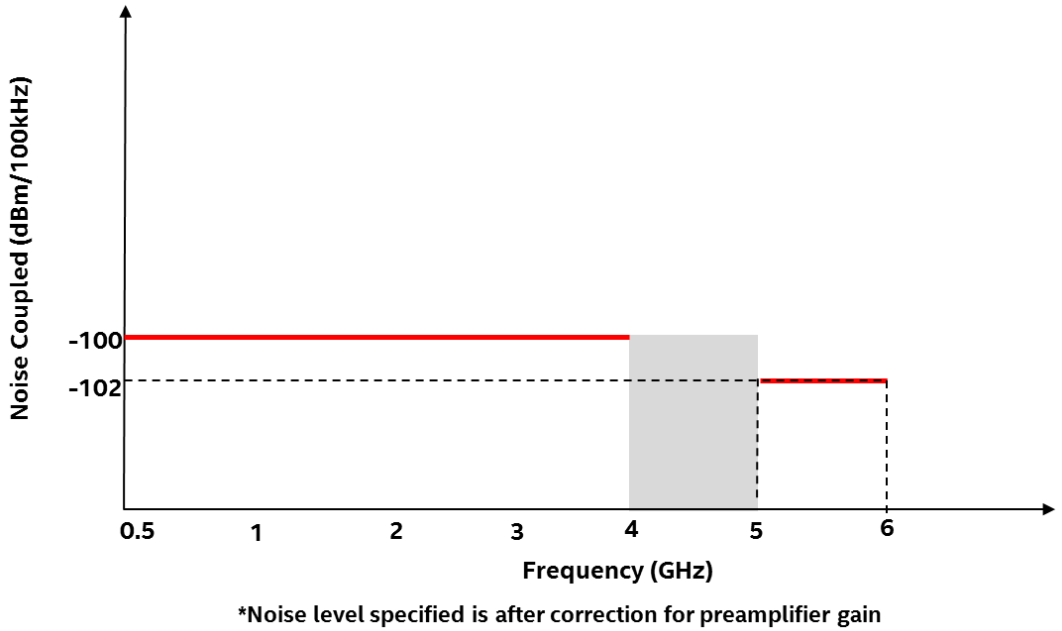

Figure. 4-3 Test Specification

4-4. Test Result

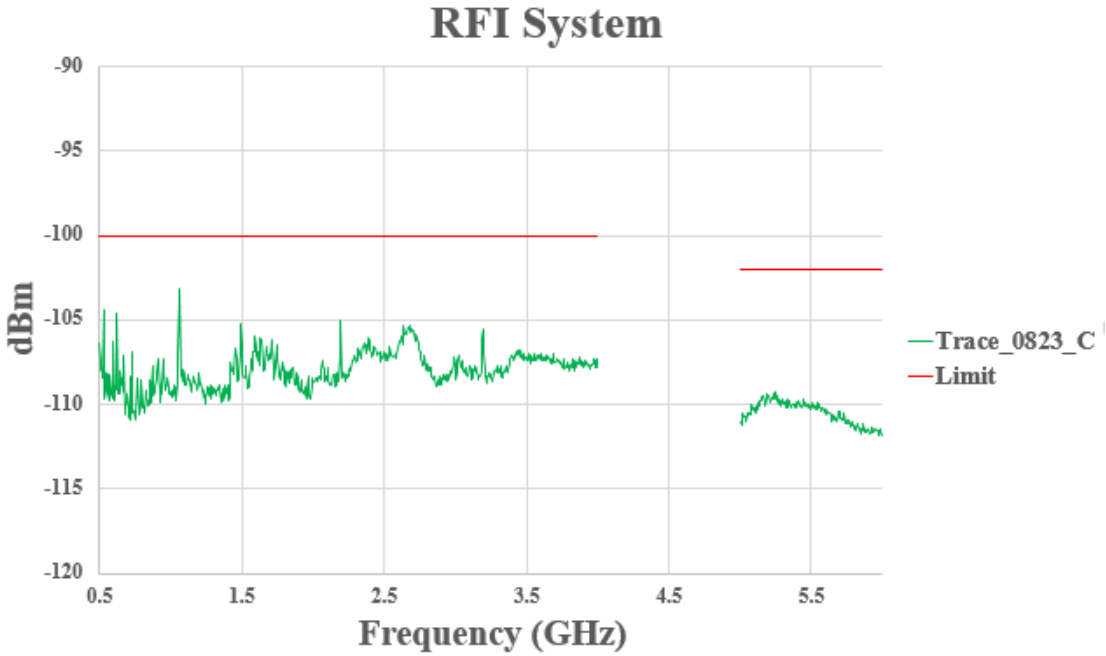

Figure. 4-4 Test Result

5. Drawings

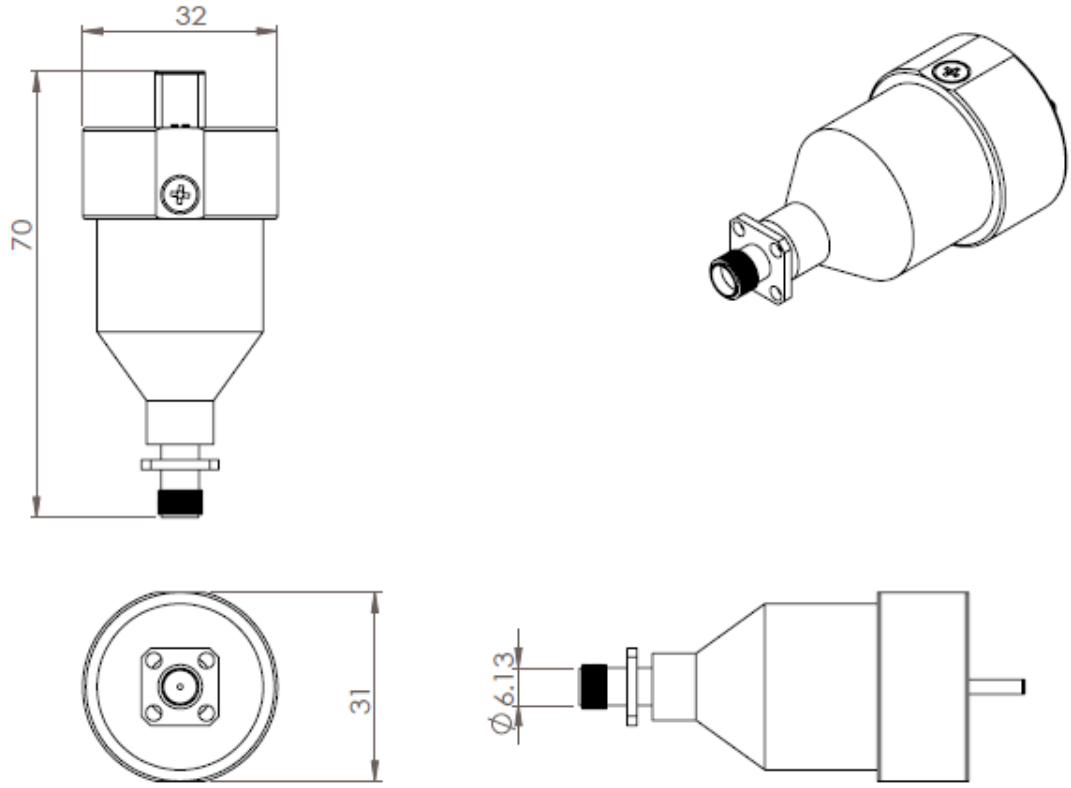

Figure. 5-1 Drawings

6. MOI Download Link

1. TBD

7. References

[1] Universal Serial Bus Type-C Cable and Connector Specification Revision 1.1 April 3, 2015

8. Recommended Optional Accessories

8-1. 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)

8-2. 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

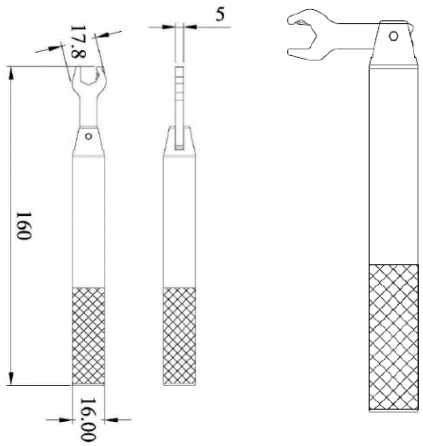

Figure. 8-2 Torque Wrench Drawings (MEW-40A11)

8-3. RF Cable

- Connector type: SMA(F) to SMA(F)
- Length(Min): 1M
- Frequency: Higher than 6GHz
- Product No. : MEU-28R13-042

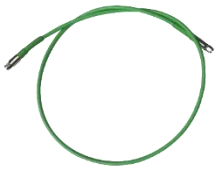

Figure. 8-3 RF Cable (MEU-28R13-042)

USB Type-C RFI System Level Shielding Test Fixture

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Product Name	Version	Date	Comments
USB Type-C RFI System Level Shielding Test Fixture	01	Nov.20,2018	Initial release

1. 產品介紹

當不同裝置運行時訊號的干擾會造成裝置中斷、系統錯誤，甚至於設備關機等問題。

為解決此問題 USB-IF 在 EMI 的檢測項目中制定了 Type-C RFI System Level Shielding Test 規範，此規範主要用來檢測 Device 在運轉時所發出的干擾訊號是否在範圍內。規範定義的測試系統主要由三個設備架構而成：

1. 信號分析儀 2. 遮蔽箱 3. USB Type-C RFI System Level Test Fixture。

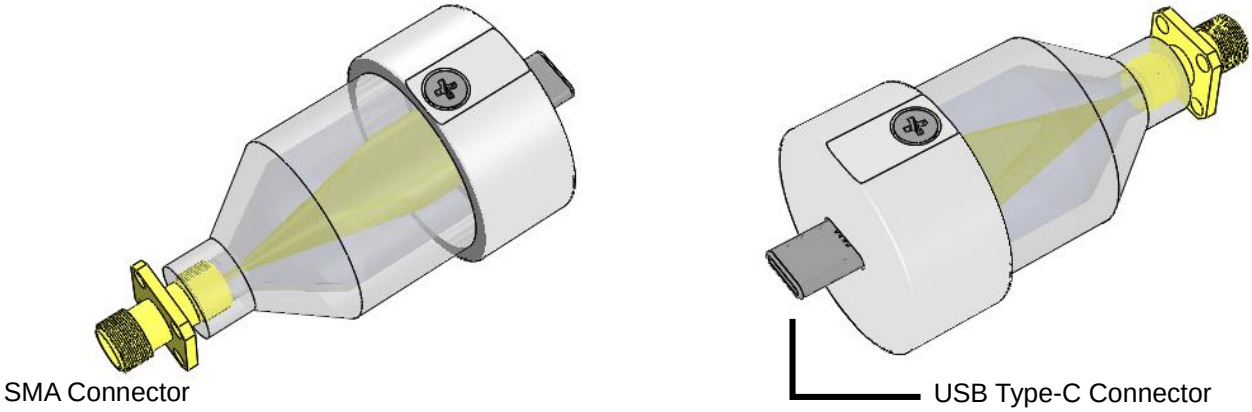

Figure. 1-1 USB Type-C RFI System Level Test Fixture (MEU-27P11-053)

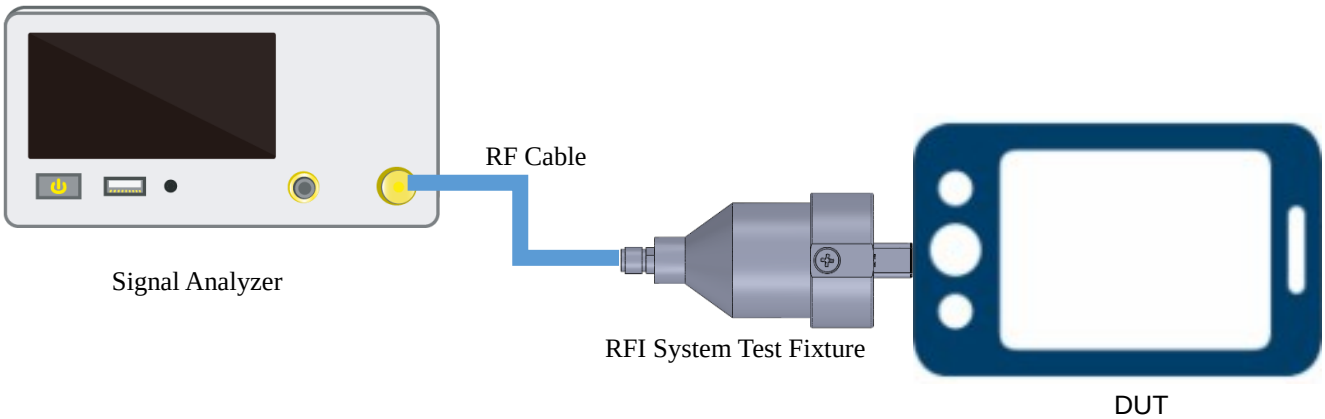

Figure. 1-2 Test Setup

1-1 測試需求

Table 1-1 RFI System Level Test –測試設備

Item No.	Item Name	SPEC.	Board	Product No.	Note
1	USB Type C RFI System Level Test Fixture	500MHz~6GHz	Luxshare-ICT	MEU-27P11-053	USB-IF standard test fixture
2	Signal Analyzer	500MHz~6GHz	Keysight / Anritsu/R&S	N9000 series / MS2830A	
3	Shielding Box	Isolation 97dB +/-2	Micromix	MEB-41A18	
4	RF Cable	500MHz~6GHz	Luxshare-ICT	MEU-28R13-042	

1-1-1 Signal Analyzer

- Frequency range: 500MHz~6GHz
- RBW: 100KHz
- Average times: 100 times
- Attenuation: 0dB
- Pre-APM function

Figure. 1-4 Keysight – N9000 series

Figure. 1-5 Anritsu – MS2830A

1-1-2 Shielding Box

- Isolation: 97+/-2 dB
- Inside Dimension(Min): 850mm x 550mm x 850mm
- Product No. : MEB-41A18

Figure. 1-6 Shielding Box (MEB-41A18)

1-1-3 RF Components

- RF cable: frequency higher than 6GHz
- Product No. : MEU-28R13-042

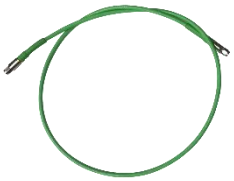

Figure. 1-7 RF Cable (MEU-28R13-042)

2. 注意事項

在進行任何連接之前，請查看“注意事項”部分。連接時請遵循以下準則：

- 仔細對齊測試治具
- 輕微進行初步連接
- 確認 SMA 接頭對鎖狀態
- 不要對測試治具施加彎曲力
- 請勿使用磅數過高之扭力板手(5 in-lbs 以上)
- 測試治具端請勿旋轉或扭動
- 使用適當尺寸的扭矩板手(取決於 SMA 的規格)，並且不要擰過扭矩扳手的“斷開”點（通常設置為 5 in-lbs）

⚠ 清潔方法

如需清潔，請使用低壓（小於 60 PSI）的壓縮空氣或氮氣與有效的油氣過濾器和冷凝器。如有需要清潔內部，使用沾有異丙醇的清潔布清潔測試治具。清潔後請確認連接器是否為乾燥狀態。 請勿使用研磨劑清潔連接器。使用前確保連接器內無殘留物。

⚠ 確認 SMA 鎖緊於機構上

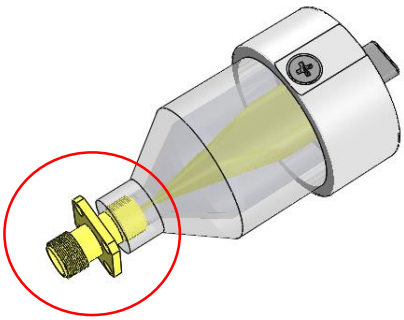

Figure. 2-1 銅針保護

⚠ 連接時請勿將治具懸空進行測試(需有支撐)，或可參考第 8 項配件

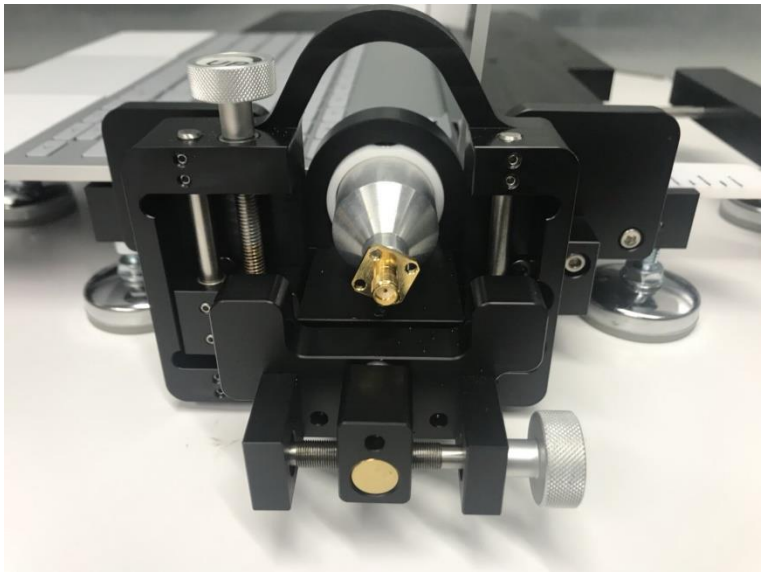

Figure. 2-2 治具保護(1)

⚠ 請先將治具連接於待測物後再接上 RF Cable.

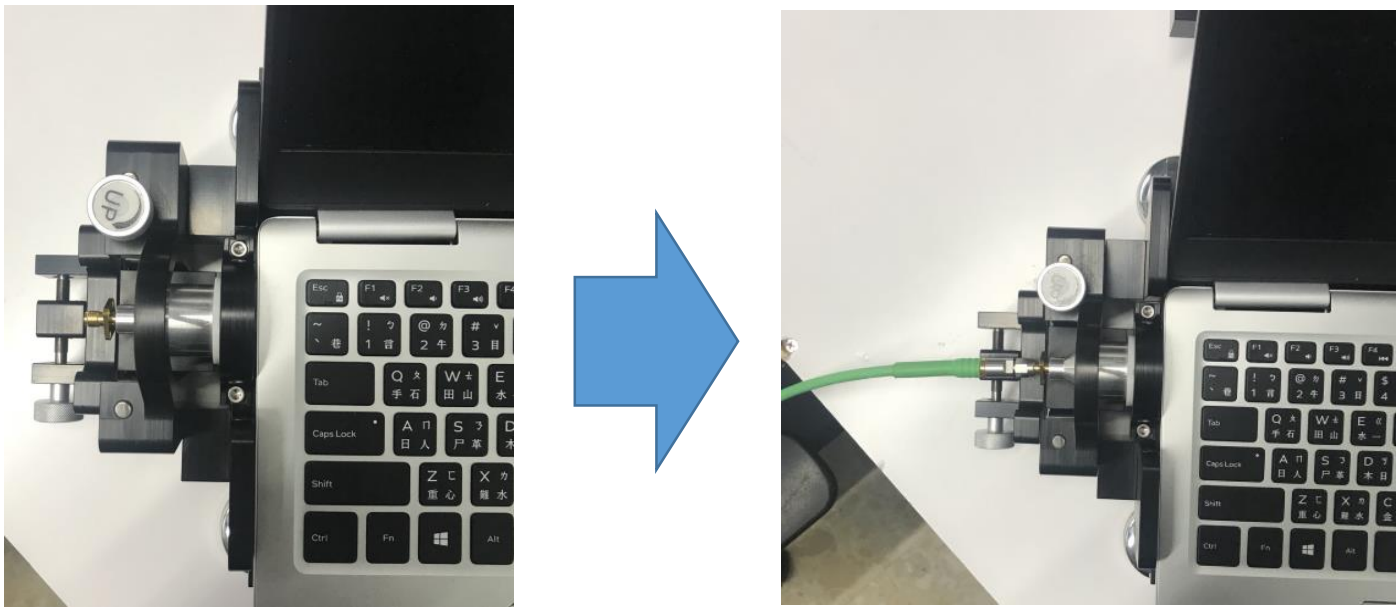

Figure. 2-3 治具保護(2)

⚠ 請使用扭力板手(5 in-lbs)

Figure. 2-5 扭力板手(5 in-lbs)請參考 8-2

3. 結構

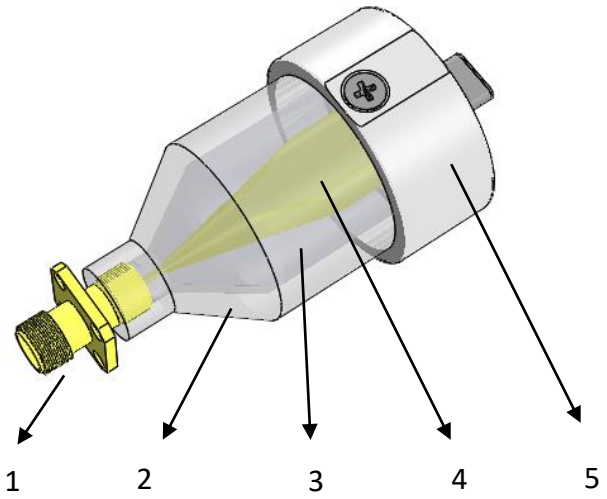

Figure. 3-1 透視圖

Table 3-1 Perspective Table

Item No.	**Component Name**	**Item function**
1	SMA Thru	Connector for equipment
2	Housing	Protect fixture
3	Prober Cover	Protect probe
4	Probe	Signal collector
5	Fixture Cover	Protect fixture

4. 量測設備

4-1. 測試環境介紹

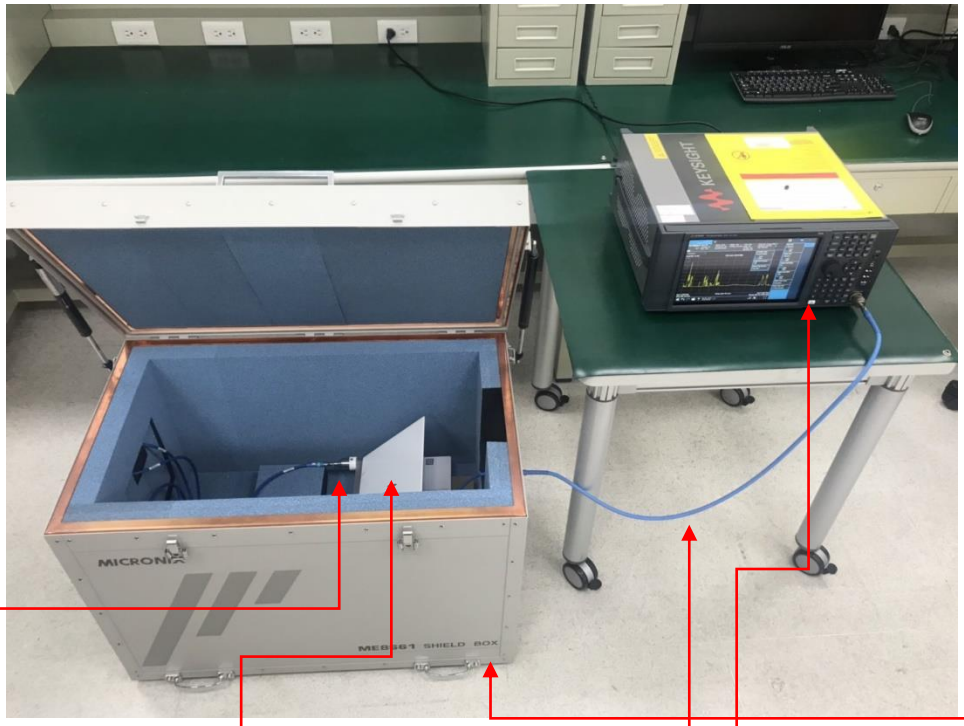

Figure. 4-1 實際測試圖

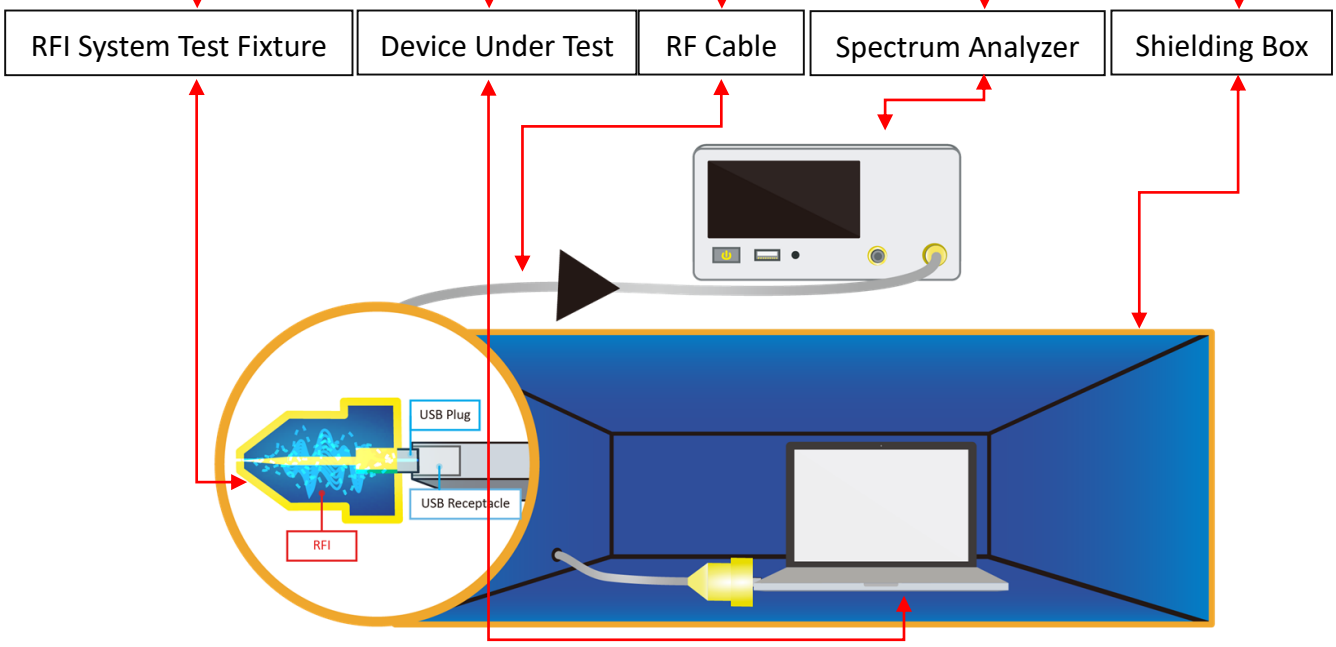

Figure. 4-2 測試原理圖

4-2. 設備參數設定

Table 4-1 設備參數設定

Setting	ANRITSU	KEYSIGHT
Frequency **500MHz~6GHz**	Frequency> Star: 500MHz Stop: 6GHz	Frequency> Star: 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	Average type> Average type:RMS Trace>Detector> Detector:Average(Log/RMS/V)
100 trace averages	Storage count:100	Avg Hold number:100
Attenuation	AMPTD> Attenuation:0dB	AMPTD> Attenuation:0dB
Trace type	Trace> Storage mode: MAX Hold	Trace> Trace type: MAX Hold
Trigger source Free run	Trig: free run(default)	Trig: free run(default)
Preamp on	AMPTD>Signal path> Internal Preamp: Full range(on)	AMPTD>Signal path> Internal Preamp: Full range(on)
Test environment	Shielding room & Shielding Box	Shielding room & Shielding Box

4-3. RFI System 測試規範

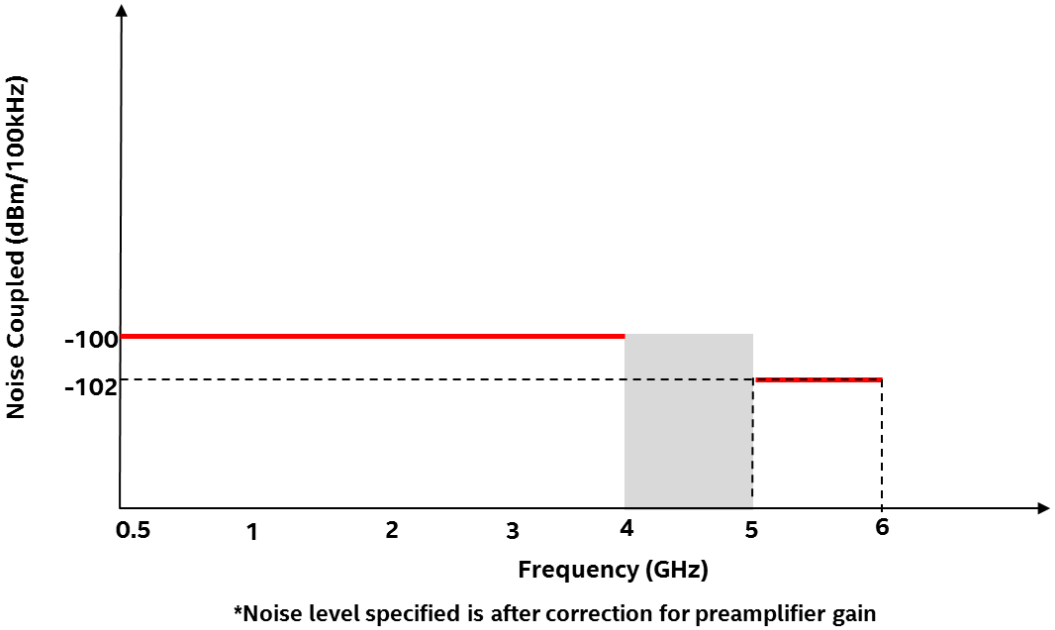

Figure. 4-3 測試規範

4-4. 測試結果參考

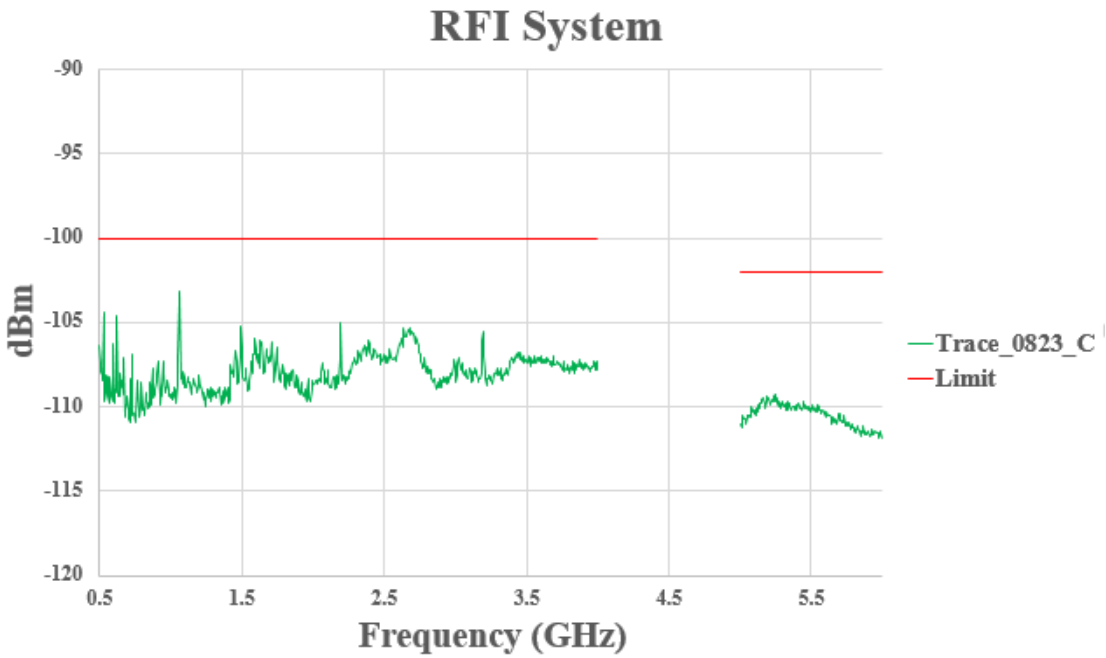

Figure. 4-4 測試結果參考

5. 外觀尺寸圖

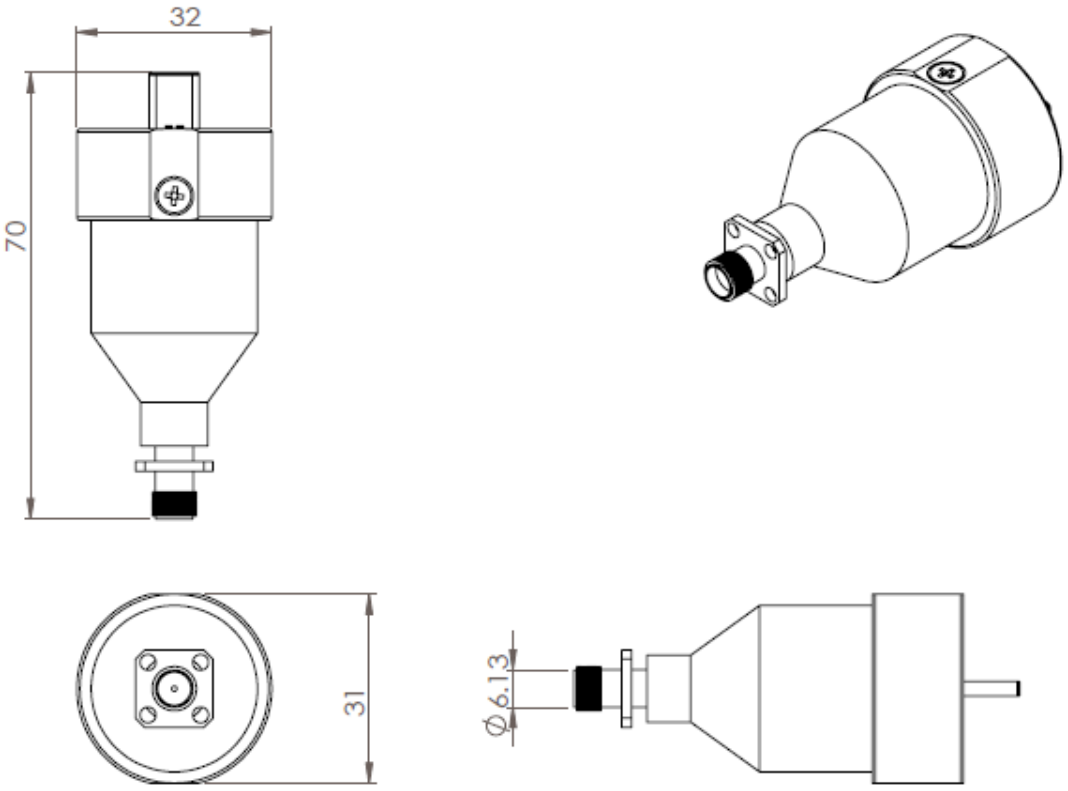

Figure. 5-1 工程圖

6. MOI 下載連結

1. TBD

7. 參考資料

[1] Universal Serial Bus Type-C Cable and Connector Specification Revision 1.1 April 3, 2015

8. 建議選購配件

8-1. RFI System 專用測試平台 (MET-39A17)

- 量測更加穩定
- 可微調待測物位置
- 可放置待測物最大尺寸(Max):46.5 cm
- 雙軸調整(垂直，水平)
- 角度調整(5 度)
- 穩定性高 (底座 10 腳固定)

Figure. 8-1 RFI Table 俯視圖 (MET-39A17)

8-2. 扭力板手 (MEW-40A11)

- 設計概念：棘輪、扭力斷開裝置
- 六角尺寸5/16英寸（8.0mm）
- 扭矩設定：5 in-lbs
- 扭矩精度：±0.4 in-lbs
- 用於連接器類型：SMA
- 總長度：160mm
- 棘輪開口扳手
- 扭力限制，保護SMA接頭

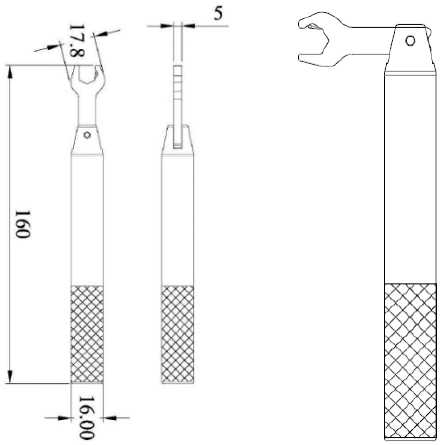

Figure. 8-2 扭力板手工程圖 (MEW-40A11)

8-3. RF Cable (MEU-28R13-042)

- 連接器類型: SMA(F) to SMA(F)
- 長度: 1M
- 頻率: 高於 6GHz

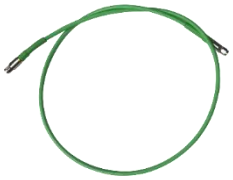

Figure. 8-3 RF Cable (MEU-28R13-042)