

低功率射頻電機試驗報告

申請者	CRESTRON ELECTRONICS, INC.
申請地址	15 VOLVO DRIVE, ROCKLEIGH, NJ 07647, USA
製造廠商	CRESTRON ELECTRONICS, INC.
產品名稱	WIRELESS PRESENTATION SYSTEM
主型號	M202018001
系列型號	N/A
該產品樣品試驗 依據之試驗標準	低功率射頻電機技術規範 LP0002 109年版
試驗結果	合格

試驗室名稱:倍科檢驗科技有限公司(新北實驗室)

試驗室地址:新北市汐止區大同路二段 169 巷 70 號

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報告編號:RXZ210924001RF02

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報告發行日期:110 年 10 月 28 日

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報告發行紀錄:

版次	案號	報告號碼	發行日期	說明	修訂人員
0.0	RXZ210924001	RXZ210924001RF02	2021.10.28	報告發行	陳菱蓁

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1. 一般描述

產品名稱	WIRELESS PRESENTATION SYSTEM
主 型 號	M202018001
系列型號	N/A
廠 牌	CRESTRON
申 請 者	CRESTRON ELECTRONICS, INC.
地 址	15 VOLVO DRIVE, ROCKLEIGH, NJ 07647, USA
製造廠商	CRESTRON ELECTRONICS, INC.
製造廠址	15 VOLVO DRIVE, ROCKLEIGH, NJ 07647, USA
使用頻率	2402~2480MHz
使用頻道數	40 Channels
傳輸速率	BLE(1M) Mode: 1Mbps BLE(2M) Mode: 2Mbps
調變方式	BLE(1M) Mode: GFSK BLE(2M) Mode: GFSK
EUT供電方式	24V from DC adapter, 48V from POE
備註	無。

2. 測試規範

2.1 符合性聲明

本測試報告之所有項目皆依據國家通訊傳播委員會 LP0002 低功率射頻電機技術規範適用規範及條文。

2.2 適用規範及條文

低功率射頻電機技術規範4.10節(DTS)

項次	測試項目	適用規範	測試結果
1.	電源線傳導干擾	3.3節	符合規範
2.	場強輻射	3.5節& 3.6節	符合規範
3.	天線增益之要求	4.10.1.3節	符合規範
4.	發射頻寬	4.10.1.6節	符合規範
5.	輸出峰值功率	4.10.1.2節	符合規範
6.	開放頻帶邊緣之發射	4.10.1.5節	符合規範
7.	功率密度	4.10.1.6(2)(B)節	符合規範
8.	電波曝露量	6.20.2.2節	符合規範

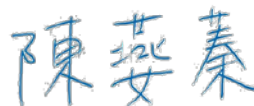
報告簽署人： 徐士珩



測試者： 李宥陞



報告製作員： 陳夔秦



2.3 限制使用之頻帶

根據低功率射頻電機技術規範，任何低功率射頻電機之主波皆不得使用下表所列各頻帶內之頻率；低功率射頻電機落於下表所列頻帶內之混附發射，其電場強度必須符合限制規定。

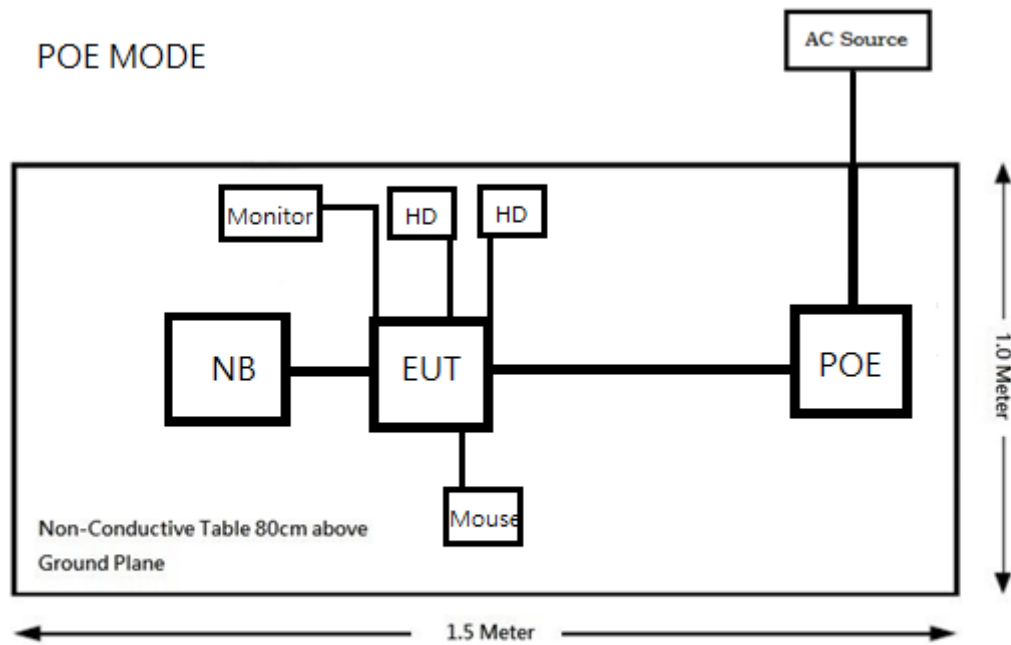
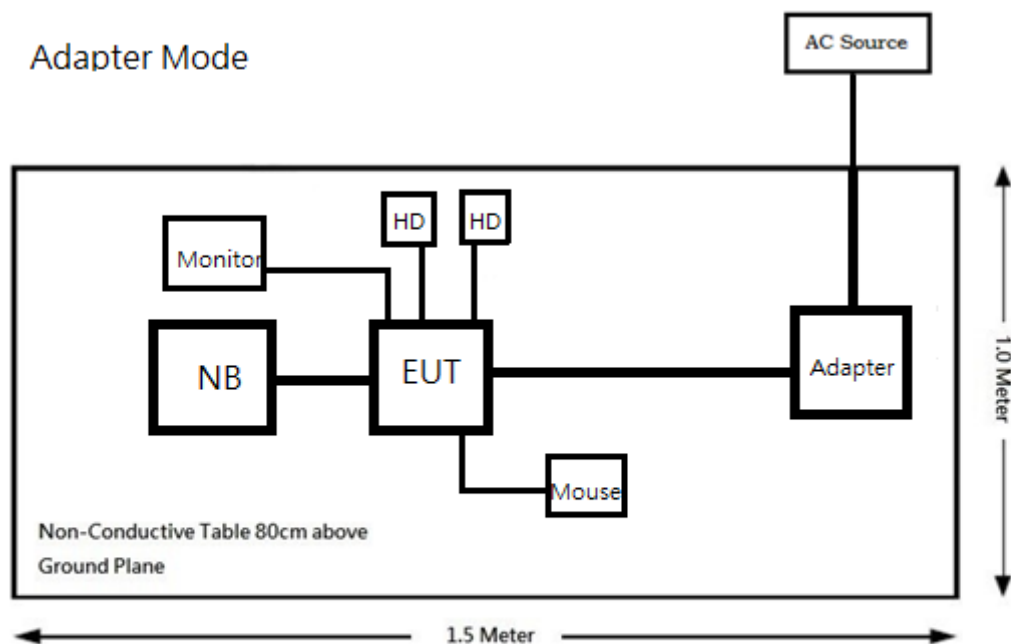
頻率 (MHz)	頻率 (MHz)	頻率 (MHz)
0.090 - 0.110	167.72 - 173.20	3260.0 - 3267.0
0.490 - 0.510	240.00 - 285.00	3332.0 - 3339.0
2.172 - 2.198	322.00 - 335.40	3345.8 - 3358.0
3.013 - 3.033	399.90 - 410.00	3500.0 - 4400.0
4.115 - 4.198	608.00 - 614.00	4500.0 - 5250.0
5.670 - 5.690	703.00 - 748.00	5350.0 - 5460.0
6.200 - 6.300	758.00 - 803.00	7250.0 - 7750.0
8.230 - 8.400	825.00 - 915.00	8025.0 - 8500.0
12.265 - 12.600	930.00 - 1240.0	9000.0 - 9200.0
13.340 - 13.430	1300.0 - 1427.0	9300.0 - 9500.0
14.965 - 15.020	1435.0 - 1626.5	10600 - 12700
16.700 - 16.755	1660.0 - 1785.0	13250 - 13400
19.965 - 20.020	1805.0 - 1880.0	14470 - 14500
25.500 - 25.700	1885.0 - 1900.0	15350 - 16200
37.475 - 38.275	1905.0 - 1985.0	17700 - 21400
73.500 - 75.400	2010.0 - 2025.0	22010 - 23120
108.00 - 138.00	2110.0 - 2170.0	23600 - 24000
149.90 - 150.05	2200.0 - 2300.0	31200 - 31800
156.70 - 156.90	2310.0 - 2390.0	36430 - 36500
162.01 - 167.17	2483.5 - 2900.0	38600 以上

3. 受測裝置之系統說明

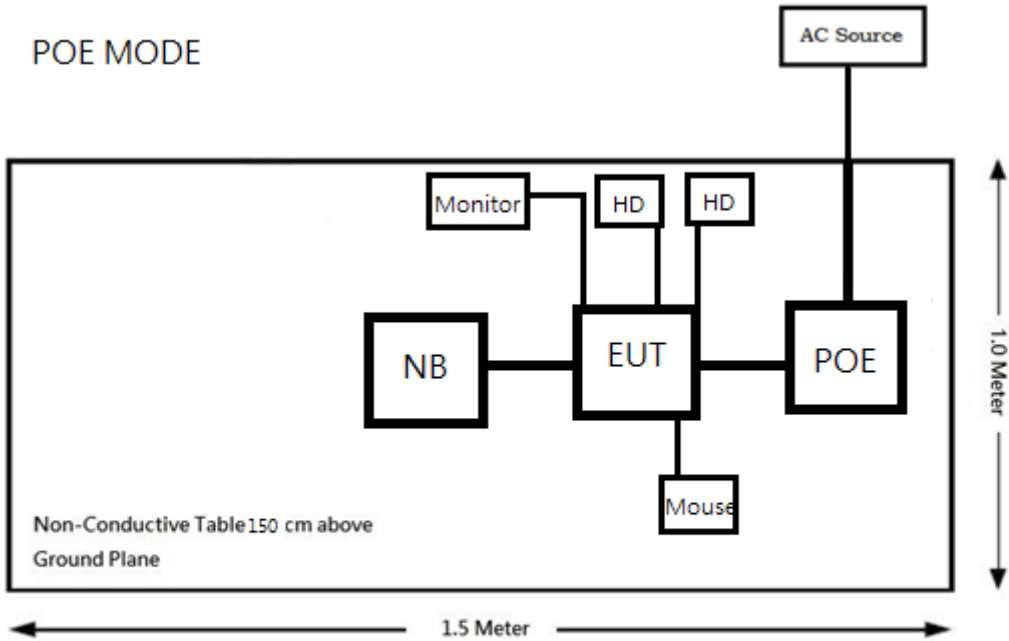
3.1 待測物與測試設備系統圖

Radiation:

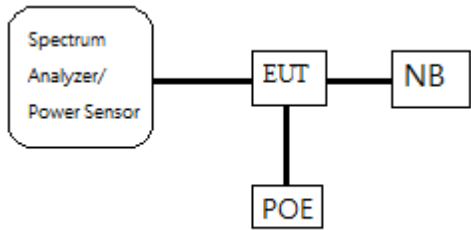
Below 1GHz



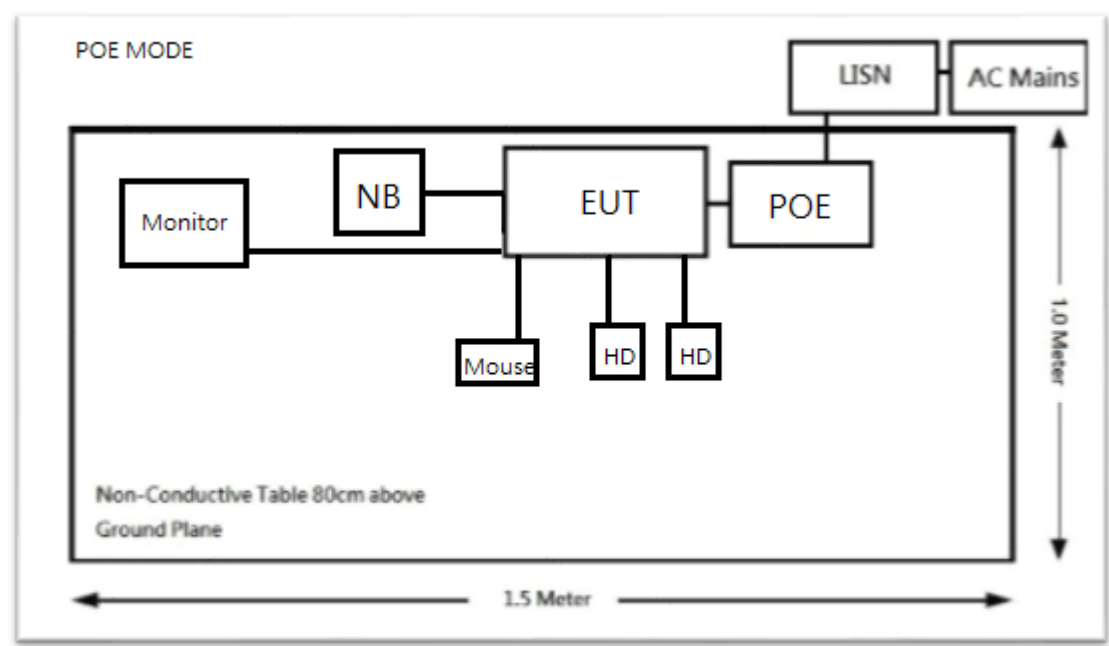
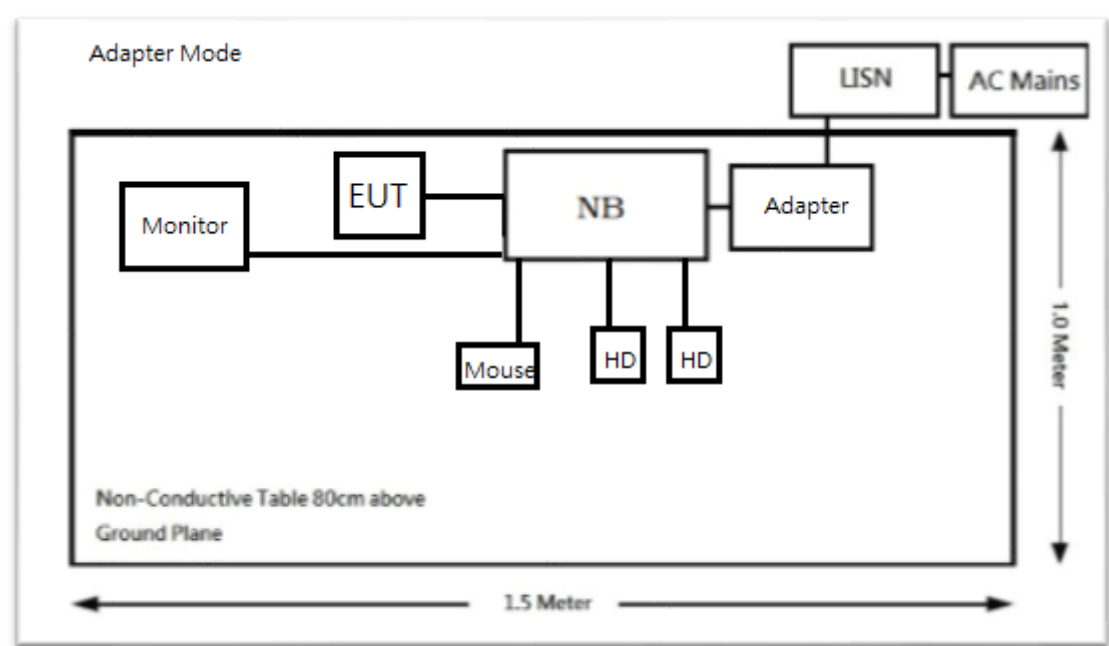
Above 1GHz:



Conducted:



Conduction:



3.2 測試模式

Pre-Scan

Mode 1: Full System (model: M202018001)+POE mode for all test item.

Mode 2: Full System (Adapter mode) for AC Line Conducted Emissions & Radiation below 1G.

Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available.

Final Test

Mode 1: Full System (model: M202018001) for all test item.

The worst case and test report is based on mode 1 to make it.

The system was configured for testing in engineering mode, which was provided by manufacturer.

3.3 測試軟件

The test software was used "Telnet v1.0"

Test Frequency		Low	Mid	High
Power Level Setting	BLE 1M	Default	Default	Default
	BLE 2M	Default	Default	Default

3.4 隨貨附賣週邊設備名稱描述

序號	設備名稱	廠牌	型號
1	N/A	N/A	N/A

3.5 未隨貨附賣，輔助測試週邊設備名稱描述(實驗室或廠商提供)

序號	設備名稱	廠牌	型號
1	POE	SHENZHEN GOSPELL DIGITAL TECHNOLOGY	G0720-480-050
2	LAN Cable	DEHAO	3.6m
3	LAN Cable	DEHAO	3.6m
4	USB Cable	SURE-FIRE	1.8m
5	NB	DELL	E6410
6	Monitor	DELL	SE2216Hf
7	Adapter	ASTEC	SA45-3129
8	HD	WD	NL-2132
9	HD	HP	1TB
10	MICRO SD Card	RIDATA	8GB
11	MOUSE	ASUS	MOBTUOA
12	HDMI Cable	POLYWELL	1.5m

3.6 測試描述

- 1.將 EUT 連接到 POE 在連接到筆電之 LAN Port
- 2.開啟 Telnet 192.168.0.160
- 3.依照對應的頻率與調製下指令

hccmd 03 0c 00

hccmd 1E 20 03 00 25 00

1E:1M, 34:2M 03:00:2402 · 03 13:2440, 03 27:2480

3.7 占空比評估

Duty cycle = Tx on(ms)/(Tx on+off(ms))

Duty factor = 10*log(1/TXon)

	BLE (1M) Mode	BLE (2M) Mode
Duty cycle	0.60	0.31
Duty factor	2.22	5.09

4. 電源線傳導干擾之量測

4.1 適用標準

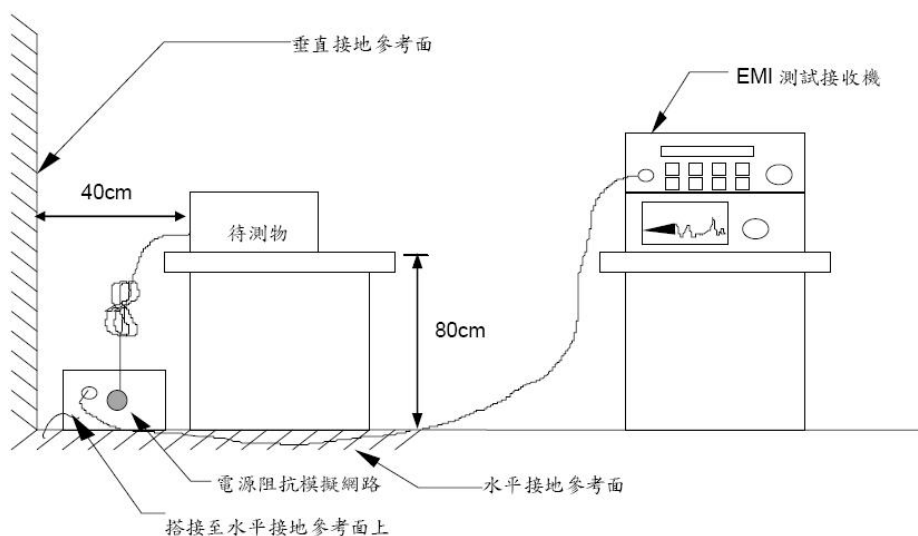
依據國家通訊傳播委員會低功率射頻電機技術規範之3.3節，電源傳導干擾之限制要求如下：

頻率 (MHz)	傳導限制值 (dBμV)	
	準峰值 (Quasi – peak)	平均值(Average)
0.15 – 0.5	66 – 56	56 – 46
0.5 – 5	56	46
5 – 30	60	50

4.2 測試方法

將待測物置於0.8米高的非金屬桌面，使其在工作狀態，待測物電源線接至電源線阻抗穩定網路上，從測試接收機記錄頻率由0.15MHz至30MHz之間之電源線傳導放射強度。

4.3 測試場地配置



4.4 干擾值之計算

電源傳導干擾電壓之計算公式如下

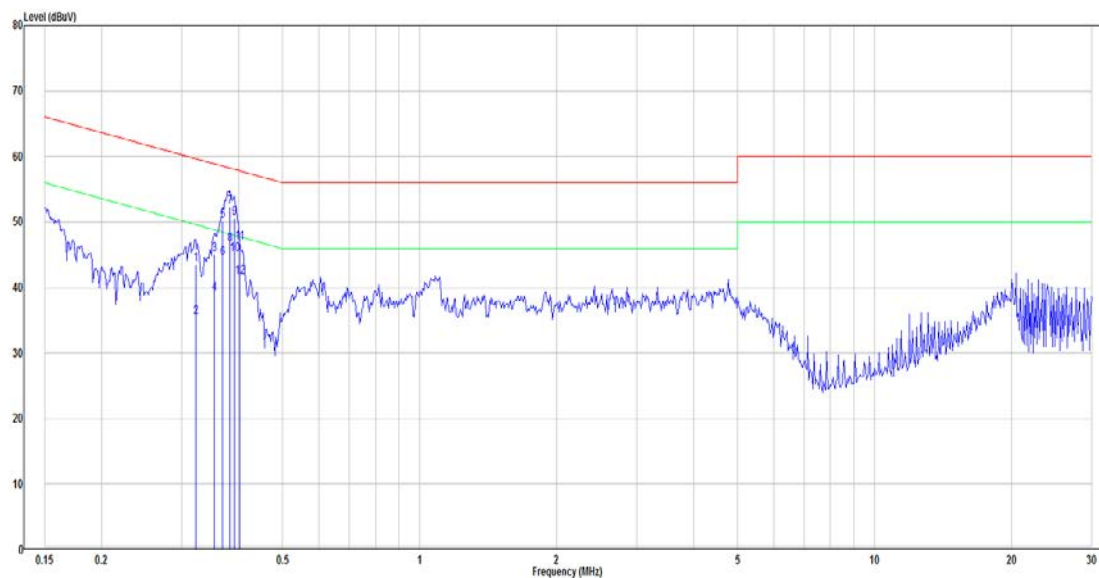
$$\text{干擾值} = \text{讀值} + \text{校正因子}$$

其中校正因子為：饋線損失 + 電源阻抗模擬網路損失

4.5 傳導干擾之量測結果

Job No.:	RXZ210924001	Phase.:	Line
Standard:	limit\RF\NCC LP0002-QP.csv	Power:	AC 110V/60Hz
Test item:	Conduction Test	Test By:	Jason
Temp.(°C)/Hum.(%RH):	26°C/44%		
Description:	BLE(POE)		

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No.	Frequency (MHz)	Reading (dBμV)	Correct Factor(dB)	Result (dBμV)	Limit (dBμV)	Over limit (dB)	Remark
1	0.322	23.97	19.58	43.55	59.66	-16.11	QP
2	0.322	15.84	19.58	35.42	49.66	-14.24	Average
3	0.354	25.39	19.58	44.97	58.87	-13.90	QP
4	0.354	19.38	19.58	38.97	48.87	-9.91	Average
5	0.369	30.50	19.58	50.09	58.52	-8.43	QP
6	0.369	24.79	19.58	44.37	48.52	-4.15	Average
7	0.383	32.60	19.58	52.19	58.21	-6.03	QP
8	0.383	26.91	19.58	46.49	48.21	-1.72	Average
9	0.391	31.06	19.58	50.64	58.03	-7.39	QP
10	0.391	25.42	19.58	45.00	48.03	-3.03	Average
11	0.402	27.21	19.58	46.79	57.81	-11.02	QP
12	0.402	21.93	19.58	41.51	47.81	-6.30	Average

Note:

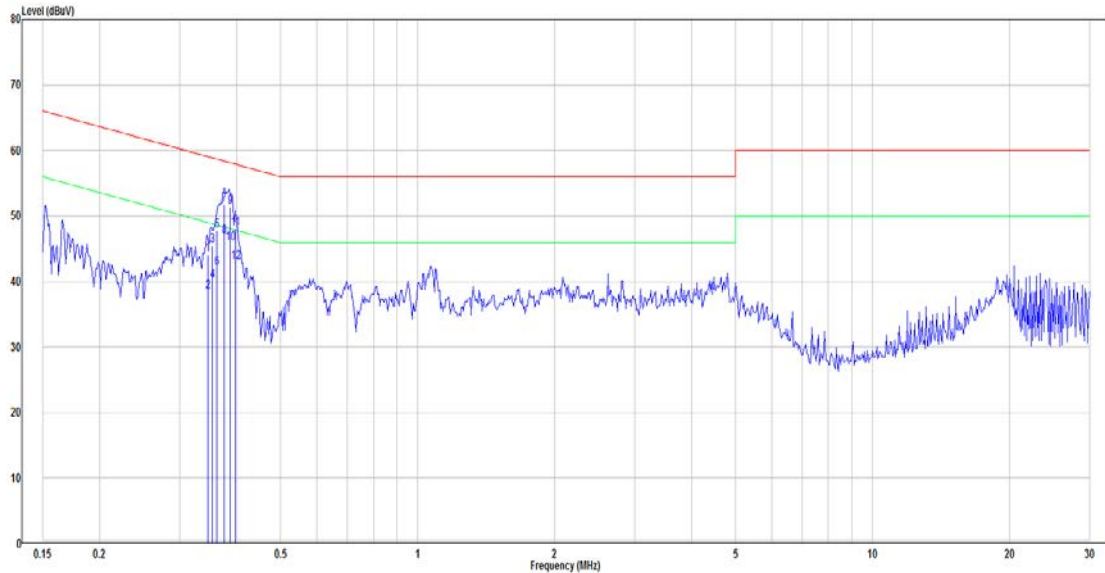
Level = Read Level + Factor

Over Limit = Level – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

Job No.:	RXZ210924001	Phase.:	Neutral
Standard:	limit\RF\NCC LP0002-QP.csv	Power:	AC 110V/60Hz
Test item:	Conduction Test	Test By:	Jason
Temp.(°C)/Hum.(%RH):	26°C/44%		
Description:	BLE(POE)		

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No.	Frequency (MHz)	Reading (dBμV)	Correct Factor(dB)	Result (dBμV)	Limit (dBμV)	Over limit (dB)	Remark
1	0.346	24.49	19.58	44.07	59.05	-14.98	QP
2	0.346	18.91	19.58	38.50	49.05	-10.55	Average
3	0.354	25.94	19.58	45.52	58.87	-13.35	QP
4	0.354	20.46	19.58	40.05	48.87	-8.82	Average
5	0.361	28.13	19.58	47.72	58.69	-10.98	QP
6	0.361	22.43	19.58	42.01	48.69	-6.68	Average
7	0.375	32.23	19.58	51.81	58.39	-6.58	QP
8	0.375	27.28	19.58	46.86	48.39	-1.52	Average
9	0.387	31.74	19.58	51.33	58.12	-6.80	QP
10	0.387	26.18	19.58	45.77	48.12	-2.36	Average
11	0.398	28.41	19.58	47.99	57.90	-9.91	QP
12	0.398	23.39	19.58	42.97	47.90	-4.93	Average

Note:

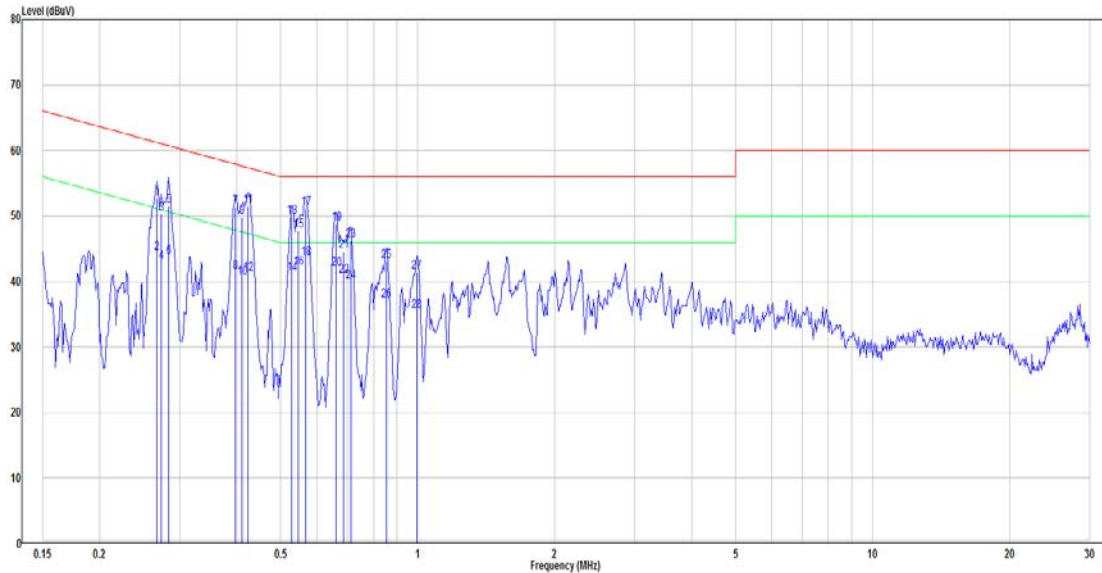
Level = Read Level + Factor

Over Limit = Level – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

Job No.:	RXZ210924001	Phase.:	Line
Standard:	limit\RF\NCC LP0002-QP.csv	Power:	AC 110V/60Hz
Test item:	Conduction Test	Test By:	Jason
Temp.(°C)/Hum.(%RH):	26°C/44%		
Description:	BLE(POWER)		

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No.	Frequency (MHz)	Reading dBuV	Correct Factor(dB)	Result dBuV	Limit dBuV	Over limit (dB)	Remark
1	0.267	33.14	19.58	52.73	61.20	-8.48	QP
2	0.267	24.65	19.58	44.23	51.20	-6.97	Average
3	0.273	30.71	19.58	50.30	61.03	-10.73	QP
4	0.273	23.36	19.58	42.94	51.03	-8.08	Average
5	0.283	31.95	19.58	51.53	60.72	-9.19	QP
6	0.283	24.03	19.58	43.61	50.72	-7.11	Average
7	0.398	31.70	19.58	51.28	57.90	-6.62	QP
8	0.398	21.78	19.58	41.36	47.90	-6.54	Average
9	0.410	30.21	19.58	49.80	57.64	-7.84	QP
10	0.410	20.88	19.58	40.46	47.64	-7.18	Average
11	0.424	31.92	19.59	51.50	57.37	-5.87	QP
12	0.424	21.56	19.59	41.15	47.37	-6.23	Average
13	0.529	30.21	19.59	49.81	56.00	-6.19	QP
14	0.529	21.57	19.59	41.17	46.00	-4.83	Average
15	0.546	28.19	19.59	47.78	56.00	-8.22	QP
16	0.546	22.50	19.59	42.09	46.00	-3.91	Average
17	0.567	31.52	19.59	51.12	56.00	-4.88	QP

18	0.567	23.97	19.59	43.56	46.00	-2.44	Average
19	0.661	29.16	19.60	48.76	56.00	-7.24	QP
20	0.661	22.35	19.60	41.95	46.00	-4.05	Average
21	0.686	25.01	19.60	44.61	56.00	-11.39	QP
22	0.686	21.19	19.60	40.79	46.00	-5.21	Average
23	0.712	26.65	19.60	46.25	56.00	-9.75	QP
24	0.712	20.33	19.60	39.93	46.00	-6.07	Average
25	0.853	23.54	19.60	43.15	56.00	-12.85	QP
26	0.853	17.46	19.60	37.06	46.00	-8.94	Average
27	0.994	21.76	19.61	41.37	56.00	-14.63	QP
28	0.994	15.82	19.61	35.42	46.00	-10.58	Average

Note:

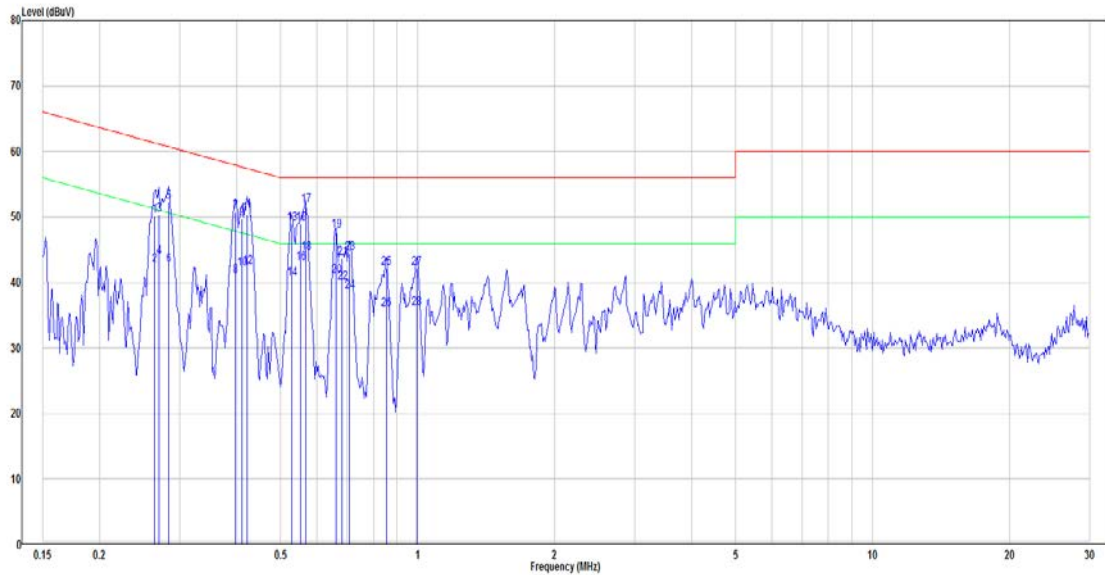
Level = Read Level + Factor

Over Limit = Level – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

Job No.:	RXZ210924001	Phase.:	Neutral
Standard:	limit\RF\NCC LP0002-QP.csv	Power:	AC 110V/60Hz
Test item:	Conduction Test	Test By:	Jason
Temp.(°C)/Hum.(%RH):	26°C/44%		
Description:	BLE(POWER)		

2021-10-04 10:27:27



No.	Frequency (MHz)	Reading dBuV	Correct Factor(dB)	Result dBuV	Limit dBuV	Over limit (dB)	Remark
1	0.264	30.48	19.58	50.06	61.29	-11.23	QP
2	0.264	23.06	19.58	42.64	51.29	-8.65	Average
3	0.270	30.71	19.58	50.29	61.12	-10.82	QP
4	0.270	24.23	19.58	43.81	51.12	-7.31	Average
5	0.283	32.60	19.58	52.18	60.72	-8.54	QP
6	0.283	23.02	19.58	42.60	50.72	-8.12	Average
7	0.398	31.09	19.58	50.67	57.90	-7.23	QP
8	0.398	21.34	19.58	40.92	47.90	-6.98	Average
9	0.410	30.04	19.58	49.62	57.64	-8.02	QP
10	0.410	22.47	19.58	42.05	47.64	-5.59	Average
11	0.421	30.91	19.58	50.50	57.42	-6.92	QP
12	0.421	22.72	19.58	42.31	47.42	-5.11	Average
13	0.529	29.40	19.59	48.99	56.00	-7.01	QP
14	0.529	20.86	19.59	40.45	46.00	-5.55	Average
15	0.552	29.29	19.59	48.88	56.00	-7.12	QP
16	0.552	23.34	19.59	42.93	46.00	-3.07	Average
17	0.567	32.26	19.59	51.85	56.00	-4.15	QP

18	0.567	24.82	19.59	44.41	46.00	-1.59	Average
19	0.661	28.27	19.59	47.86	56.00	-8.14	QP
20	0.661	21.45	19.59	41.04	46.00	-4.96	Average
21	0.683	24.07	19.59	43.67	56.00	-12.33	QP
22	0.683	20.30	19.59	39.89	46.00	-6.11	Average
23	0.708	24.83	19.59	44.42	56.00	-11.58	QP
24	0.708	18.96	19.59	38.56	46.00	-7.44	Average
25	0.853	22.52	19.60	42.12	56.00	-13.88	QP
26	0.853	16.29	19.60	35.89	46.00	-10.11	Average
27	0.994	22.50	19.60	42.10	56.00	-13.90	QP
28	0.994	16.37	19.60	35.97	46.00	-10.03	Average

Note:

Level = Read Level + Factor

Over Limit = Level – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

5. 場強輻射之量測

5.1 適用標準

依據國家通訊傳播委員會低功率射頻電機技術規範3.5之要求，其他開放頻帶外不必要之輻射干擾需符合3.6節之一般限制要求。

頻率 (MHz)	測試距離 (m)	干擾限制 ($\mu\text{V/m}$)	干擾限制 (dB $\mu\text{V/m}$)
0.009 – 0.490 (含)	300	2,400/頻率(千赫)	128.5-93.8(註1)
0.490 (不含) – 1.705 (含)	30	24,000 /頻率(千赫)	73.8-63(註2)
1.705 (不含) – 30 (不含)	30	30	69.5(註3)
30 (含) – 88 (含)	3	100	40.0
88 (不含) – 216 (含)	3	150	43.5
216 (不含) – 960 (含)	3	200	46.0
960 (不含)以上	3	500	54.0

註 1: 其干擾限制值 = $20 \cdot \text{LOG}(2400/F) + 40 \cdot \text{LOG}(300/\text{量測距離})$

註 2: 其干擾限制值 = $20 \cdot \text{LOG}(24000/F) + 40 \cdot \text{LOG}(30/\text{量測距離})$

註 3: 其干擾限制值 = $20 \cdot \text{LOG}(30) + 40 \cdot \text{LOG}(30/\text{量測距離})$

5.2 測試方法

將待測物置於1.5米高的非金屬桌面，使其在工作狀態，接收天線置於3米外相同的高度。待測物分別要垂直或水平放置，而且桌面要360度旋轉，另外接收天線也要從1.0米至4.0米升降變化，以找出最大的輻射電場強度，接收天線置於水平、垂直極向各執行測試一次。若量測頻率低於30兆赫(MHz)時，得於所規定距離以內進行測試，但應盡量避免於近場做測試。當測試距離較規定距離為近時，測試結果應以插補系數換算至規定距離之值：對同一輻射方向最少兩個距離作量測以決定適當的插補系數或線性距離平方反比(40dB/10倍距離)。

5.3 測試擺設圖

圖 1 :量測頻率9kHz~ 30MHz之測試配置

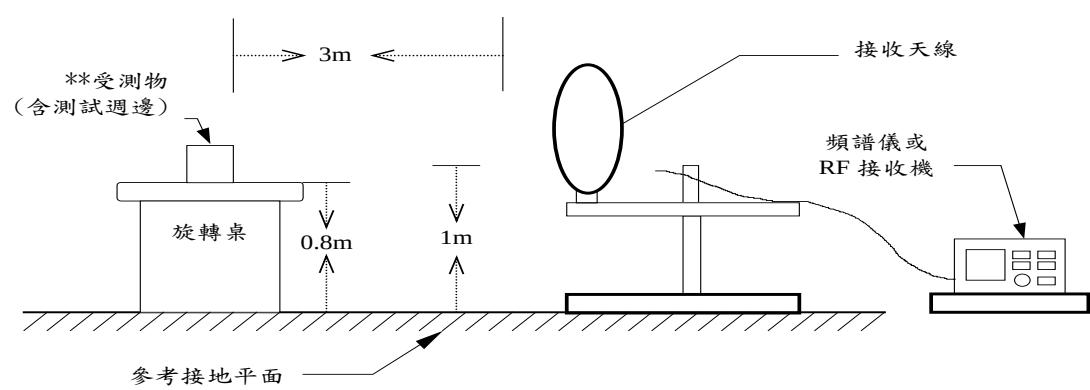


圖 2 :量測頻率30MHz~1GHz之測試配置

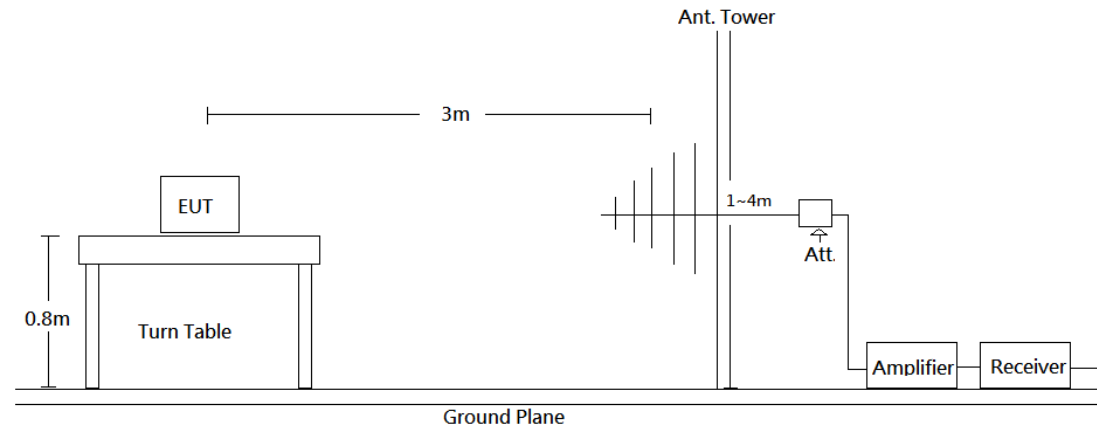
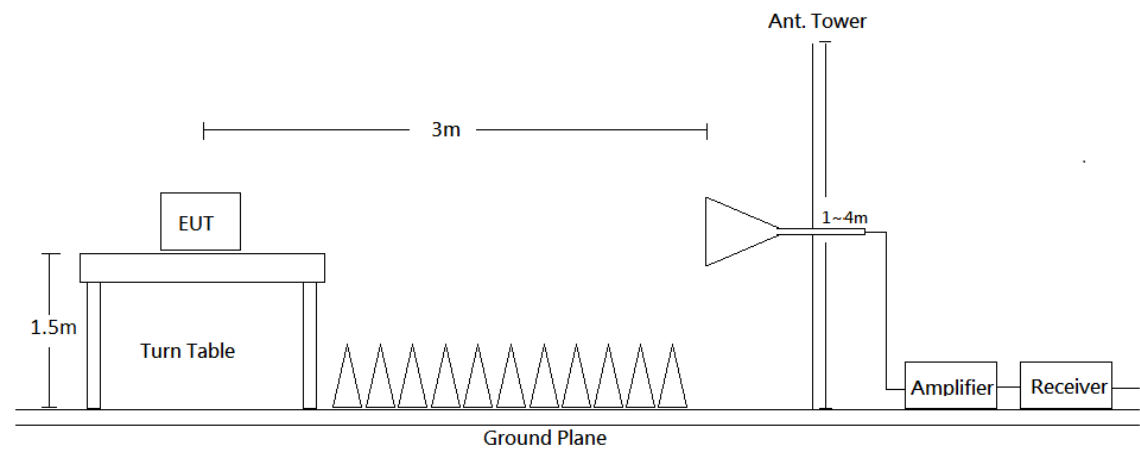


圖 3 : 量測頻率1GHz以上之測試配置



5.4 量測設定

1GHz以下:

頻譜分析儀設定: Quasi-Peak: RBW = VBW: 120kHz

1GHz以上:

頻譜分析儀設定: Peak: RBW: 1MHz; VBW: 1MHz /

Average: RBW: 1MHz; VBW: 10Hz

5.5 場強度之計算

場強之計算公式如

干擾值 = 讀值 + 校正因子

其中校正因子為：

天線因子 + 饋線損失 + 濾波器損失 (若有使用) - 放大器增益 (若有使用)。

5.6 場強輻射之量測結果

發射機 / 接收機 其它不必要之訊號 (9kHz ~ 30MHz)

此頻率之干擾值低於限制值20dB以下，被考量為背景雜訊值並不予記錄。

發射機 / 接收機 其它不必要之訊號 (30MHz ~ 1GHz)

此案件測試模式分別為CH Low、Mid、High，經驗證後最差模式為BLE 2M_2480MHz。

此產品經3軸X、Y、Z，評估X軸為最差。

發射機 其它不必要之訊號 (1GHz ~ 26.5GHz)

此案件測試模式分別為CH Low、Mid、High。此產品經3軸X、Y、Z，評估X軸為最差。

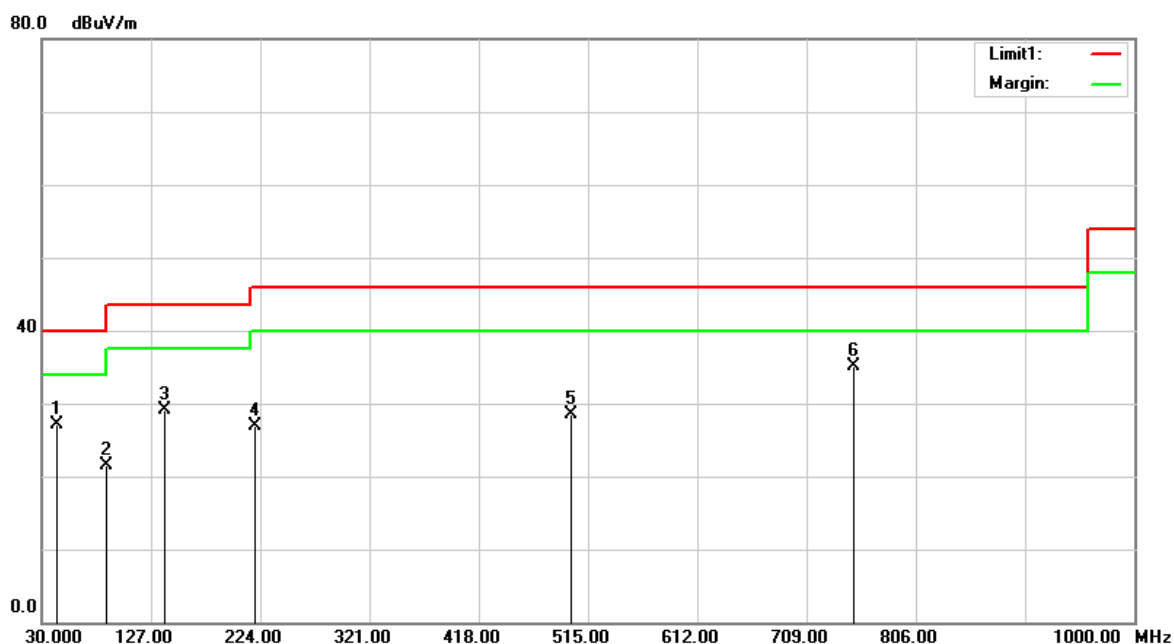
接收機 其它不必要之訊號 (1GHz ~ 26.5GHz)

此案件測試模式分別為CH Low、Mid、High，經驗證後最差模式為BLE 2M_2480MHz。

此產品經3軸X、Y、Z，評估X軸為最差。

場強輻射之量測值 (TX / 1GHz 以下)

Job No.:	RXZ210924001	Ant.Polar.:	Horizontal
Standard:	NCC LP0002 4.10.1 _ 3m	Test Distance:	3m
Test item:	Radiation Test	Power:	AC 110V/60Hz
Temp.(°C)/Hum.(%RH):	24.9(°C)/64%RH	Date:2021/9/27	Time:下午 08:43:26
		Test By:	Ken
Description:	BLE-2M- TX-2480		



Frequency (MHz)	Reading (dBμV)	Correct Factor(dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
43.5800	40.03	-12.98	27.05	40.00	-12.95	100	108	peak
87.2300	38.21	-16.80	21.41	40.00	-18.59	100	251	peak
138.6400	39.89	-10.69	29.20	43.50	-14.30	100	304	peak
219.1500	40.05	-13.09	26.96	46.00	-19.04	100	82	peak
499.4800	34.18	-5.72	28.46	46.00	-17.54	100	68	peak
750.7100	37.30	-2.28	35.02	46.00	-10.98	100	125	peak

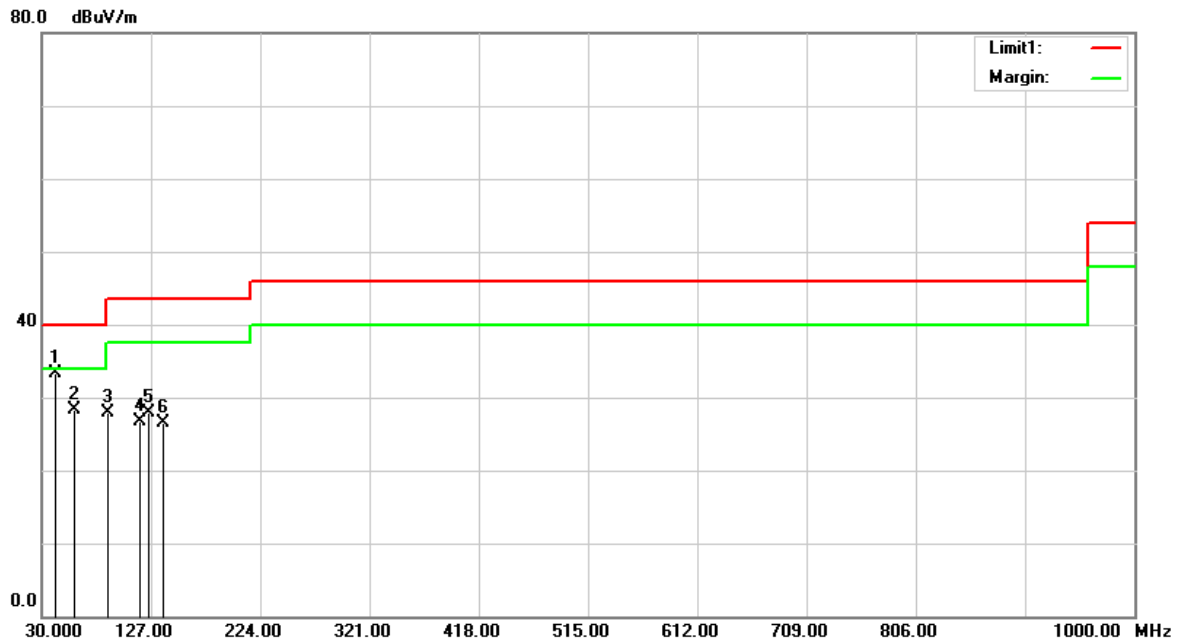
Note:

Result = Reading + Correct Factor

Margin = Result – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Job No.:	RXZ210924001	Ant.Polar.:	Vertical
Standard:	NCC LP0002 4.10.1 _ 3m	Test Distance:	3m
Test item:	Radiation Test	Power:	AC 110V/60Hz
Temp.(°C)/Hum.(%RH):	24.9(°C)/64%RH	Date:2021/9/27	Time:下午 08:45:57
		Test By:	Ken
Description:	BLE-2M- TX-2480		



Frequency (MHz)	Reading (dBμV)	Correct Factor(dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
42.6100	45.42	-12.07	33.35	40.00	-6.65	100	51	QP
59.1000	45.54	-17.29	28.25	40.00	-11.75	100	67	peak
88.2000	44.56	-16.73	27.83	43.50	-15.67	100	207	peak
117.3000	37.41	-10.73	26.68	43.50	-16.82	100	8	peak
125.0600	38.08	-10.17	27.91	43.50	-15.59	100	314	peak
137.6700	37.11	-10.66	26.45	43.50	-17.05	100	145	peak

Note:

Result = Reading + Correct Factor

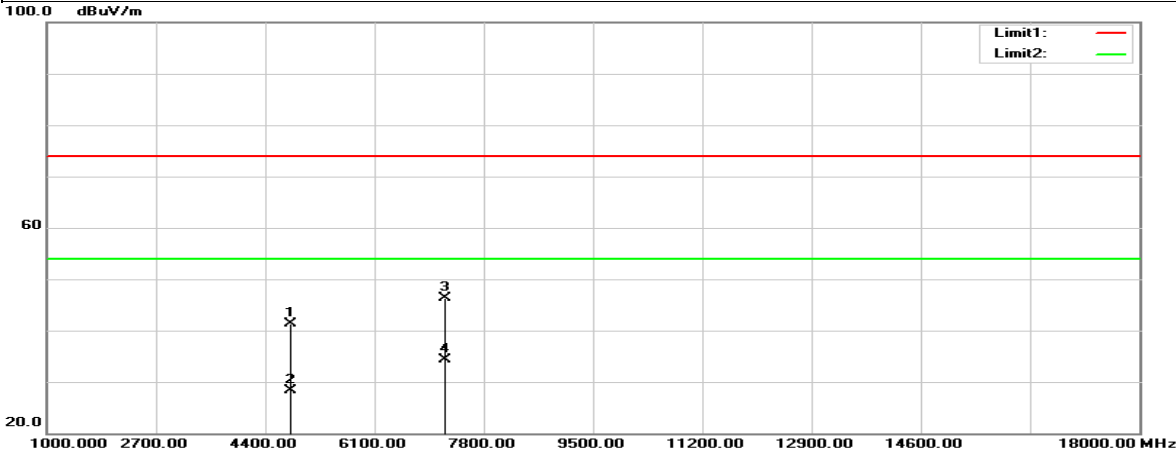
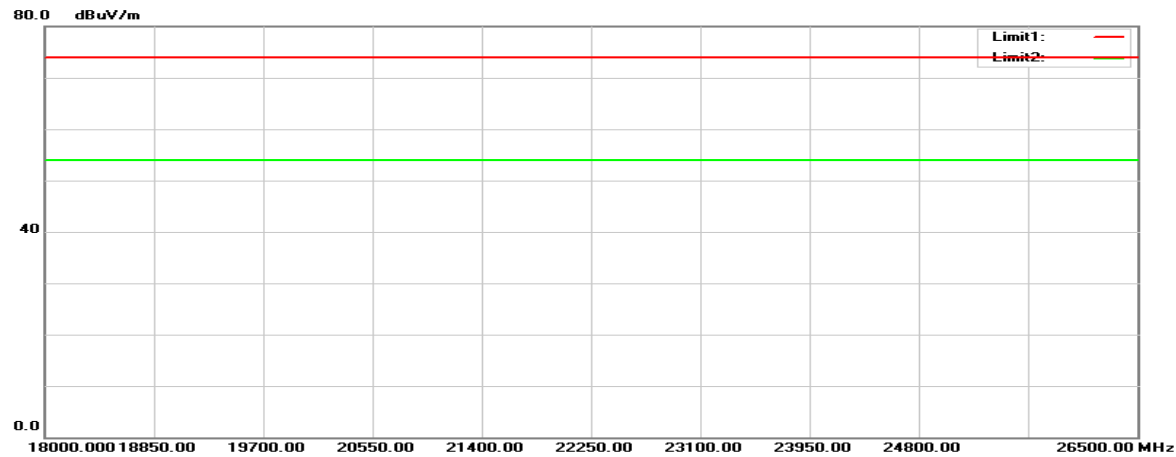
Margin = Result – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

發射機其它不必要之訊號 (TX / 1GHz 以上)

場強輻射之量測值

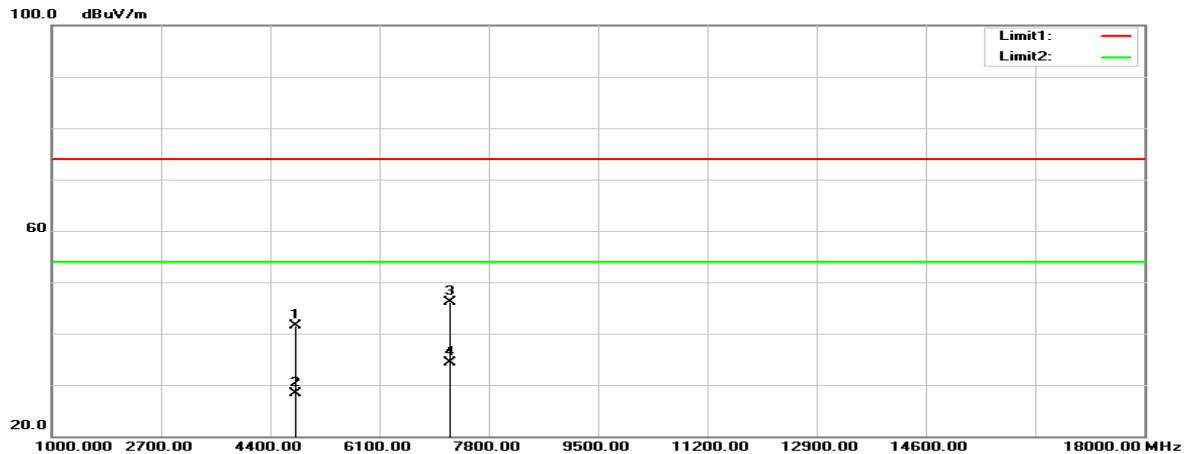
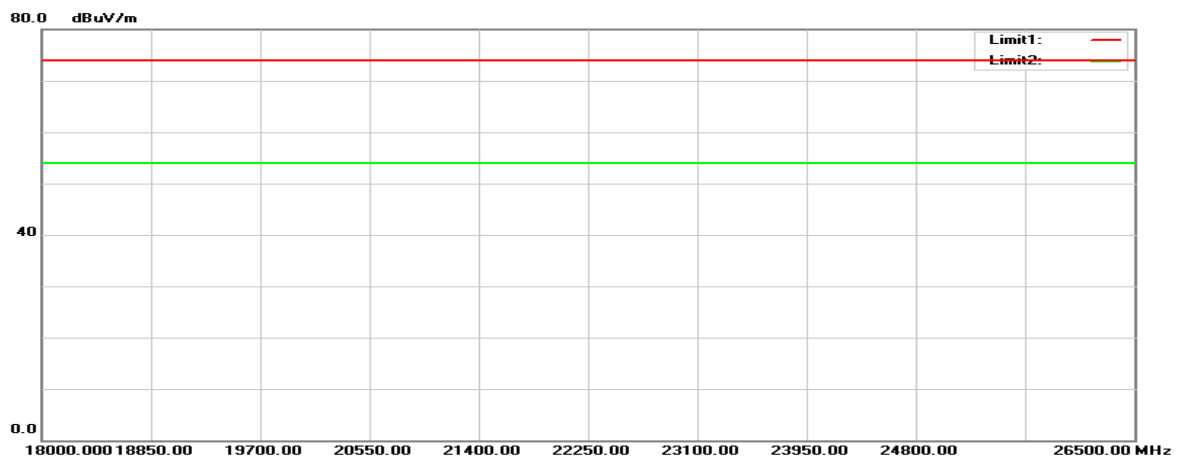
Job No.:	RXZ210924001	Ant.Polar.:	Horizontal
Standard:	NCC LP0002 4.10.1 Peak 3m	Test Distance:	3m
Test item:	Radiation Test	Power:	AC 110V/60Hz
Temp.(°C)/Hum.(%RH):	25.8(°C)/63%RH	Date:2021/9/30	Time:上午 11:47:43
		Test By:	D.L
Description:	BLE-1M-TX-2402-X_Axis		



Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
(MHz)	(dBμV)	Factor(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	(cm)	(°)	
4804.000	44.68	-3.28	41.40	74.00	-32.60	125	220	peak
4804.000	31.50	-3.28	28.22	54.00	-25.78	125	220	AVG
7206.000	43.16	3.10	46.26	74.00	-27.74	111	258	peak
7206.000	31.17	3.10	34.27	54.00	-19.73	111	258	AVG

Note:
Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Other emissions from 18GHz~26.5GHz are 20 dB below the limits. No recording in the test.

Job No.:	RXZ210924001	Ant.Polar.:	Vertical
Standard:	NCC LP0002 4.10.1 Peak 3m	Test Distance:	3m
Test item:	Radiation Test	Power:	AC 110V/60Hz
Temp.(°C)/Hum.(%RH):	25.8(°C)/63%RH	Date:2021/9/30	Time:上午 11:41:26
		Test By:	D.L
Description:	BLE-1M-TX-2402-X_Axis		



Frequency (MHz)	Reading (dBμV)	Correct Factor(dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
4804.000	44.76	-3.28	41.48	74.00	-32.52	128	320	peak
4804.000	31.55	-3.28	28.27	54.00	-25.73	128	320	AVG
7206.000	43.10	3.10	46.20	74.00	-27.80	147	225	peak
7206.000	31.17	3.10	34.27	54.00	-19.73	147	225	AVG

Note:

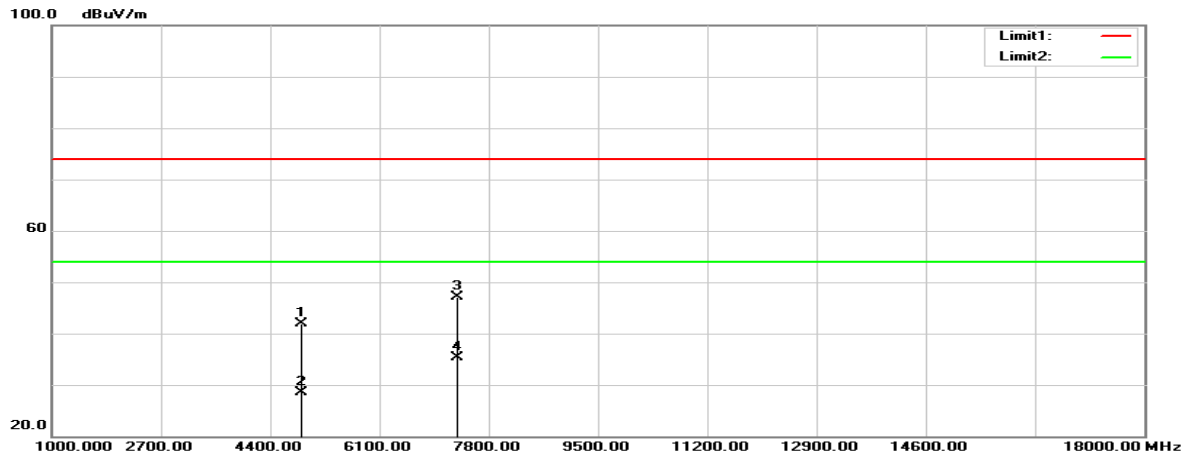
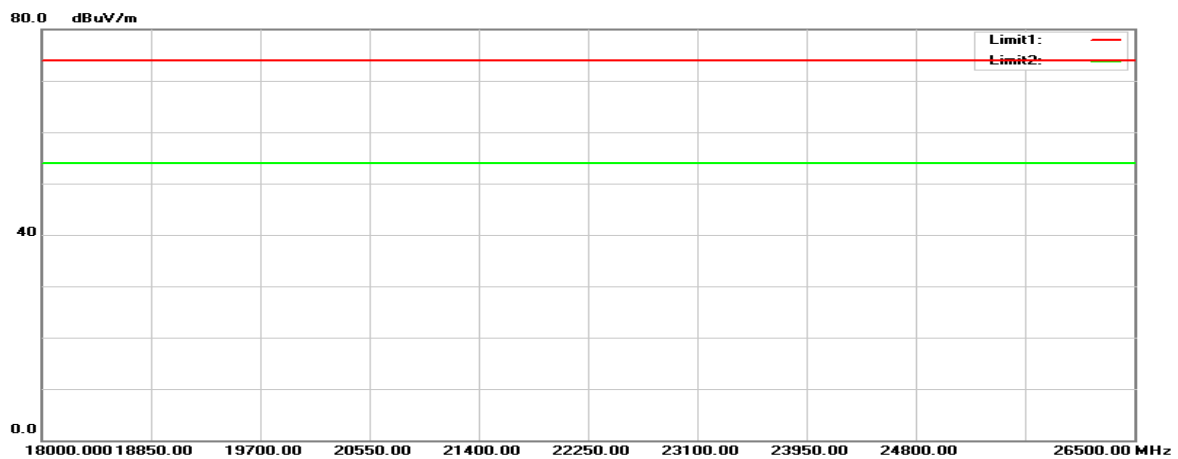
Result = Reading + Correct Factor

Margin = Result – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Other emissions from 18GHz~26.5GHz are 20 dB below the limits. No recording in the test.

Job No.:	RXZ210924001	Ant.Polar.:	Horizontal
Standard:	NCC LP0002 4.10.1 Peak 3m	Test Distance:	3m
Test item:	Radiation Test	Power:	AC 110V/60Hz
Temp.(°C)/Hum.(%RH):	25.8(°C)/63%RH	Date:2021/9/30	Time:上午 11:52:21
		Test By:	D.L
Description:	BLE-1M-TX-2440-X_Axis		



Frequency (MHz)	Reading (dBμV)	Correct Factor(dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
4880.000	44.90	-3.03	41.87	74.00	-32.13	125	258	peak
4880.000	31.49	-3.03	28.46	54.00	-25.54	125	258	AVG
7320.000	43.08	4.07	47.15	74.00	-26.85	105	321	peak
7320.000	31.21	4.07	35.28	54.00	-18.72	105	321	AVG

Note:

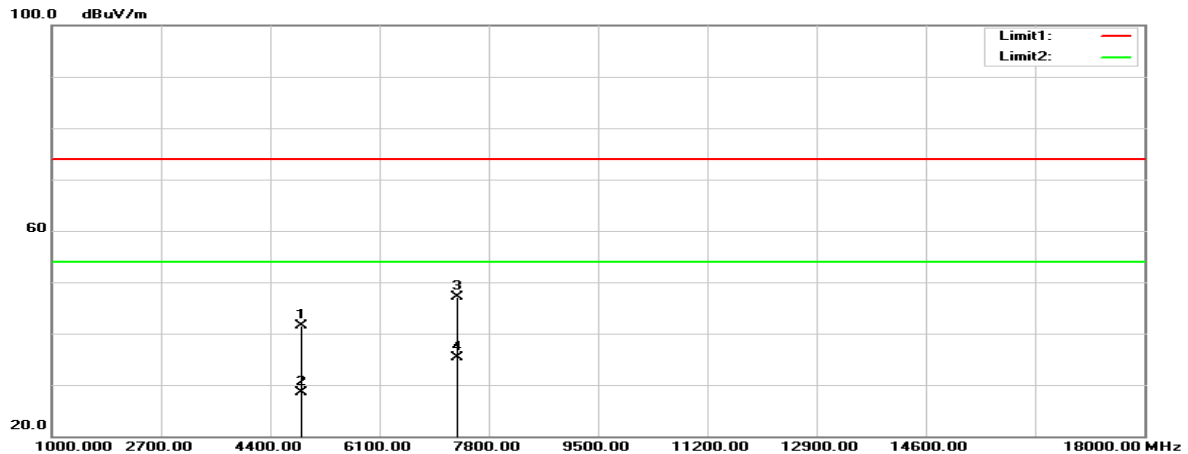
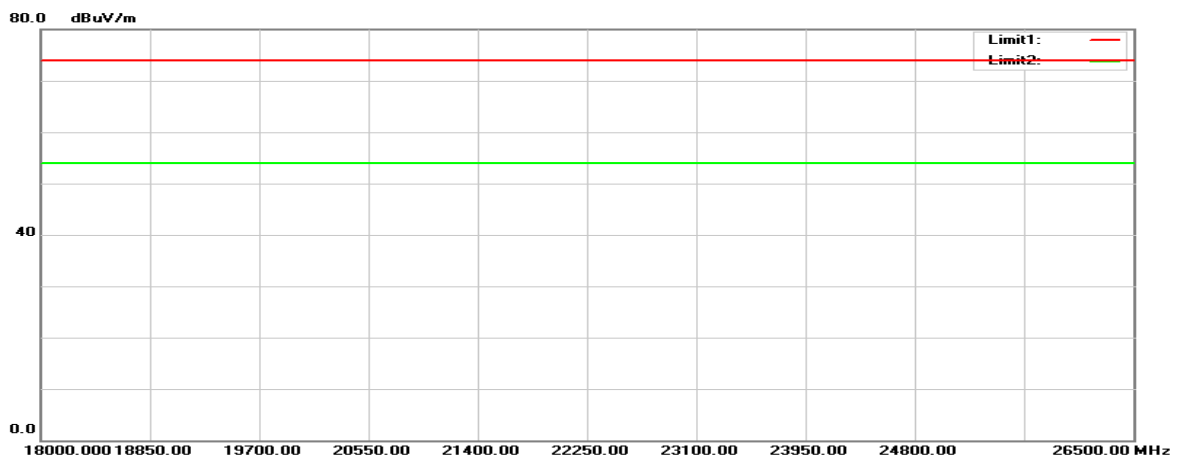
Result = Reading + Correct Factor

Margin = Result – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Other emissions from 18GHz~26.5GHz are 20 dB below the limits. No recording in the test.

Job No.:	RXZ210924001	Ant.Polar.:	Vertical
Standard:	NCC LP0002 4.10.1 Peak 3m	Test Distance:	3m
Test item:	Radiation Test	Power:	AC 110V/60Hz
Temp.(°C)/Hum.(%RH):	25.8(°C)/63%RH	Date:2021/9/30	Time:上午 11:59:22
		Test By:	D.L
Description:	BLE-1M-TX-2440-X_Axis		



Frequency (MHz)	Reading (dBμV)	Correct Factor(dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
4880.000	44.48	-3.03	41.45	74.00	-32.55	127	228	peak
4880.000	31.57	-3.03	28.54	54.00	-25.46	127	228	AVG
7320.000	42.94	4.07	47.01	74.00	-26.99	155	258	peak
7320.000	31.27	4.07	35.34	54.00	-18.66	155	258	AVG

Note:

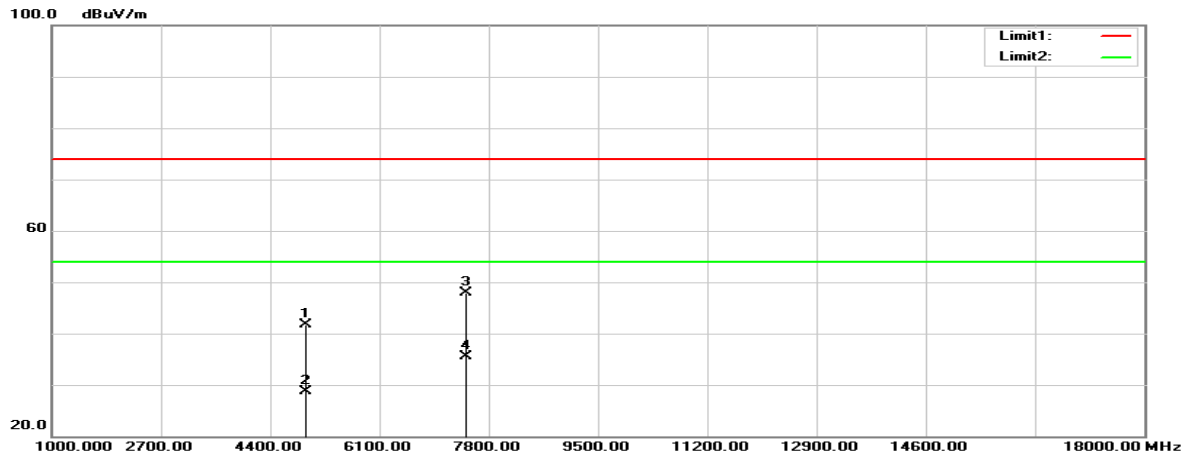
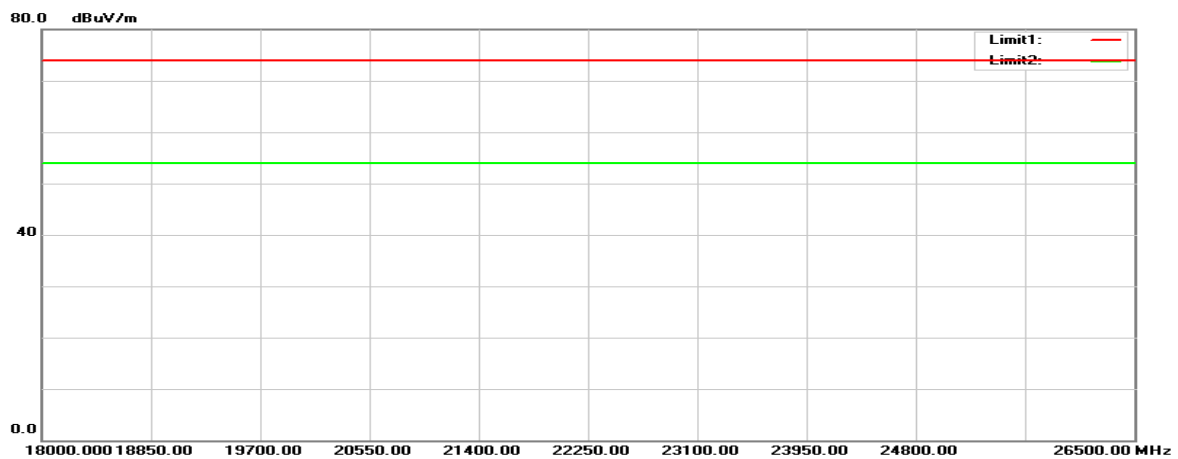
Result = Reading + Correct Factor

Margin = Result – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Other emissions from 18GHz~26.5GHz are 20 dB below the limits. No recording in the test.

Job No.:	RXZ210924001	Ant.Polar.:	Horizontal
Standard:	NCC LP0002 4.10.1 Peak 3m	Test Distance:	3m
Test item:	Radiation Test	Power:	AC 110V/60Hz
Temp.(°C)/Hum.(%RH):	25.8(°C)/63%RH	Date:2021/9/30	Time:下午 12:16:16
		Test By:	D.L
Description:	BLE-1M-TX-2480-X_Axis		



Frequency (MHz)	Reading (dBμV)	Correct Factor(dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
4960.000	44.40	-2.69	41.71	74.00	-32.29	114	259	peak
4960.000	31.40	-2.69	28.71	54.00	-25.29	114	259	AVG
7440.000	43.72	4.25	47.97	74.00	-26.03	147	71	peak
7440.000	31.28	4.25	35.53	54.00	-18.47	147	71	AVG

Note:

Result = Reading + Correct Factor

Margin = Result – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Other emissions from 18GHz~26.5GHz are 20 dB below the limits. No recording in the test.

Job No.:	RXZ210924001	Ant.Polar.:	Vertical
Standard:	NCC LP0002 4.10.1 Peak 3m	Test Distance:	3m
Test item:	Radiation Test	Power:	AC 110V/60Hz
Temp.(°C)/Hum.(%RH):	25.8(°C)/63%RH	Date:2021/9/30	Time:下午 12:01:48
		Test By:	D.L
Description:	BLE-1M-TX-2480-X_Axis		



Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
(MHz)	(dBμV)	Factor(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	(cm)	(°)	
4960.000	45.24	-2.69	42.55	74.00	-31.45	128	77	peak
4960.000	31.49	-2.69	28.80	54.00	-25.20	128	77	AVG
7440.000	42.92	4.25	47.17	74.00	-26.83	117	241	peak
7440.000	31.71	4.25	35.96	54.00	-18.04	117	241	AVG

Note:

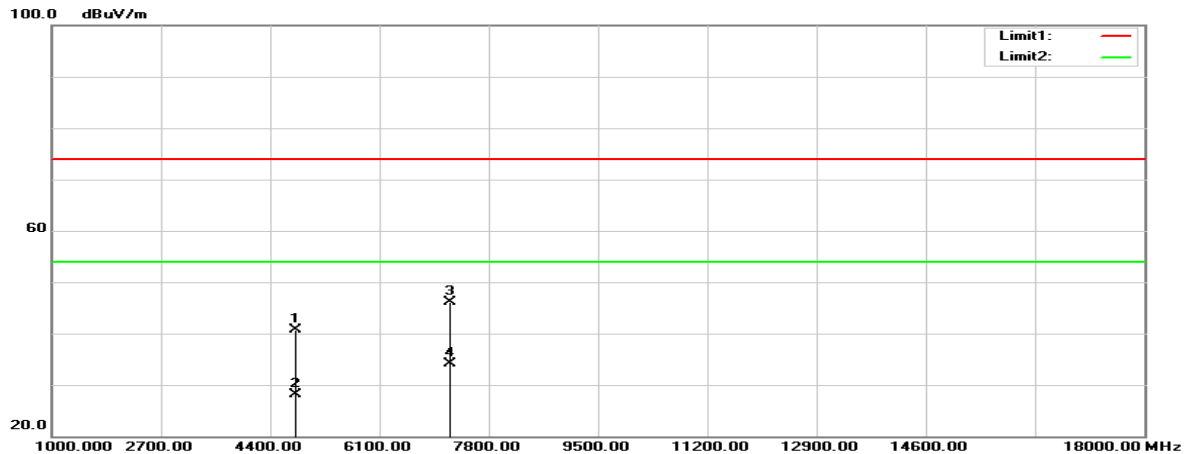
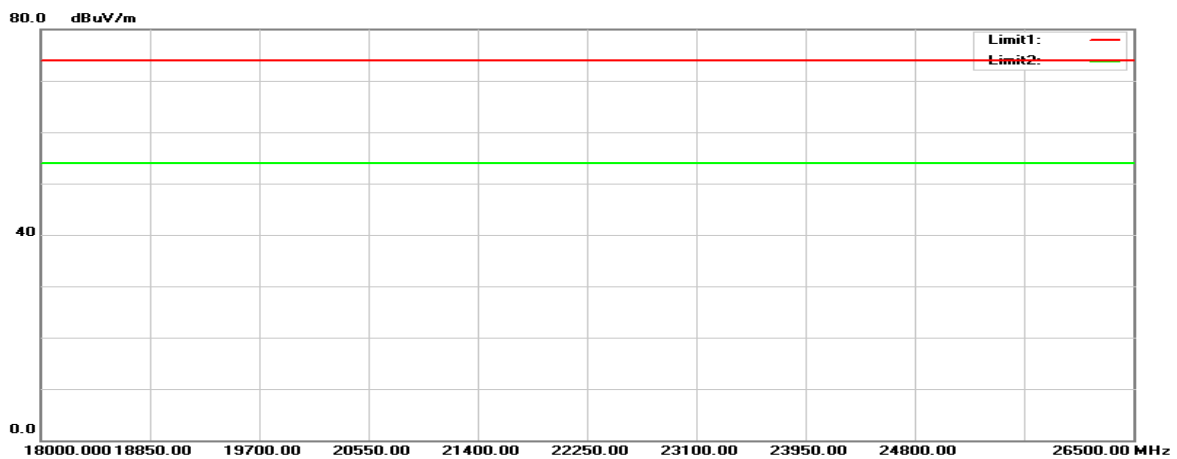
Result = Reading + Correct Factor

Margin = Result – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Other emissions from 18GHz~26.5GHz are 20 dB below the limits. No recording in the test.

Job No.:	RXZ210924001	Ant.Polar.:	Horizontal
Standard:	NCC LP0002 4.10.1 Peak 3m	Test Distance:	3m
Test item:	Radiation Test	Power:	AC 110V/60Hz
Temp.(°C)/Hum.(%RH):	25.8(°C)/63%RH	Date:2021/9/30	Time:上午 11:45:52
		Test By:	D.L
Description:	BLE-2M-TX-2402-X_Axis		



Frequency (MHz)	Reading (dBμV)	Correct Factor(dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
4804.000	43.92	-3.28	40.64	74.00	-33.36	144	199	peak
4804.000	31.44	-3.28	28.16	54.00	-25.84	144	199	AVG
7206.000	43.07	3.10	46.17	74.00	-27.83	158	222	peak
7206.000	31.03	3.10	34.13	54.00	-19.87	158	222	AVG

Note:

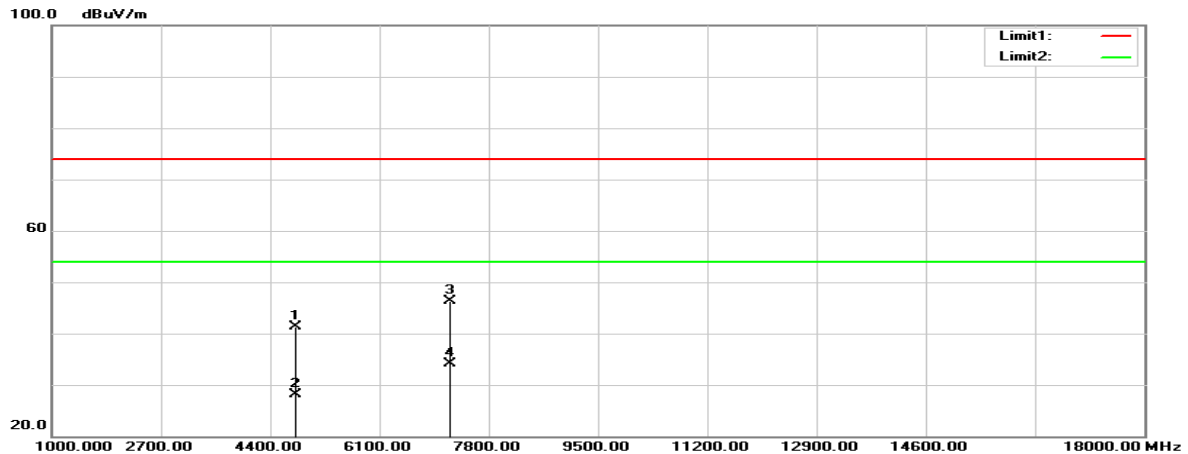
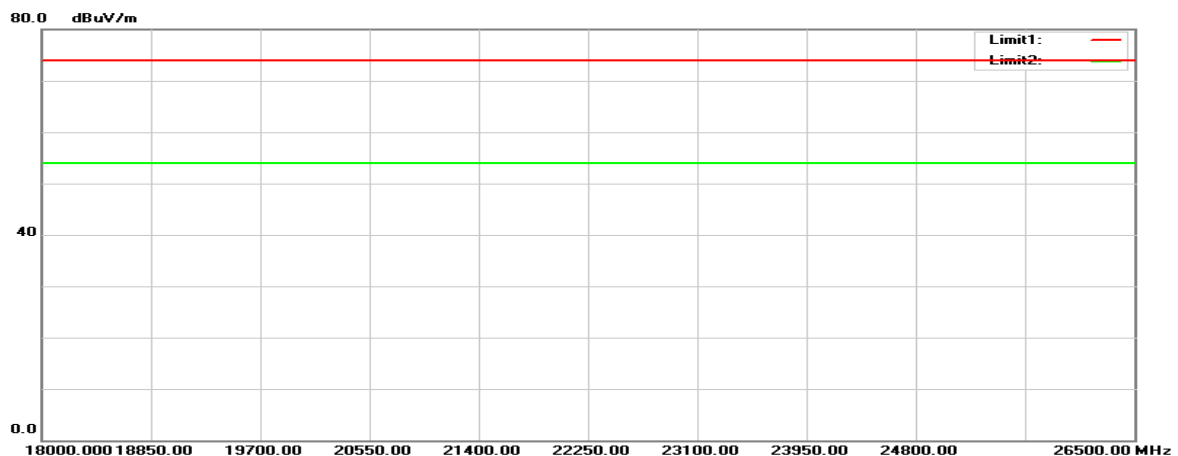
Result = Reading + Correct Factor

Margin = Result – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Other emissions from 18GHz~26.5GHz are 20 dB below the limits. No recording in the test.

Job No.:	RXZ210924001	Ant.Polar.:	Vertical
Standard:	NCC LP0002 4.10.1 Peak 3m	Test Distance:	3m
Test item:	Radiation Test	Power:	AC 110V/60Hz
Temp.(°C)/Hum.(%RH):	25.8(°C)/63%RH	Date:2021/9/30	Time:上午 11:43:56
		Test By:	D.L
Description:	BLE-2M-TX-2402-X_Axis		



Frequency (MHz)	Reading (dBμV)	Correct Factor(dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
4804.000	44.55	-3.28	41.27	74.00	-32.73	151	220	peak
4804.000	31.46	-3.28	28.18	54.00	-25.82	151	220	AVG
7206.000	43.24	3.10	46.34	74.00	-27.66	142	258	peak
7206.000	31.02	3.10	34.12	54.00	-19.88	142	258	AVG

Note:

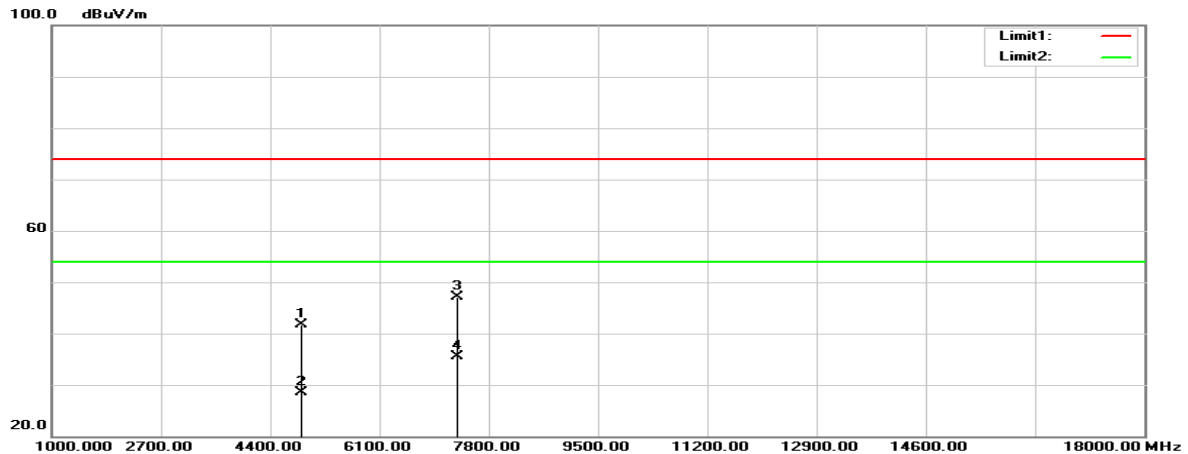
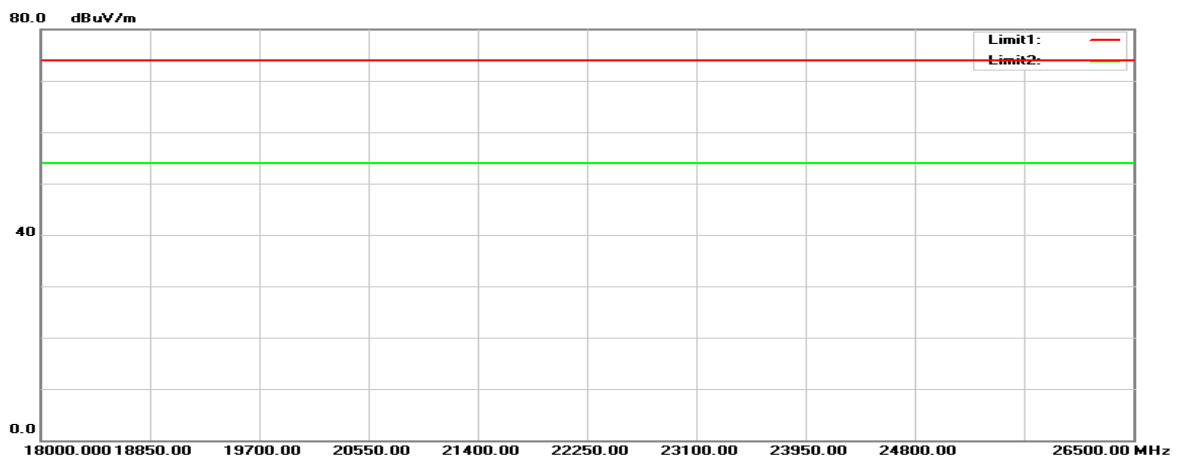
Result = Reading + Correct Factor

Margin = Result – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Other emissions from 18GHz~26.5GHz are 20 dB below the limits. No recording in the test.

Job No.:	RXZ210924001	Ant.Polar.:	Horizontal
Standard:	NCC LP0002 4.10.1 Peak 3m	Test Distance:	3m
Test item:	Radiation Test	Power:	AC 110V/60Hz
Temp.(°C)/Hum.(%RH):	25.8(°C)/63%RH	Date:2021/9/30	Time:上午 11:55:16
		Test By:	D.L
Description:	BLE-2M-TX-2440-X_Axis		



Frequency (MHz)	Reading (dBμV)	Correct Factor(dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
4880.000	44.77	-3.03	41.74	74.00	-32.26	125	320	peak
4880.000	31.52	-3.03	28.49	54.00	-25.51	125	320	AVG
7320.000	43.04	4.07	47.11	74.00	-26.89	140	220	peak
7320.000	31.44	4.07	35.51	54.00	-18.49	140	220	AVG

Note:

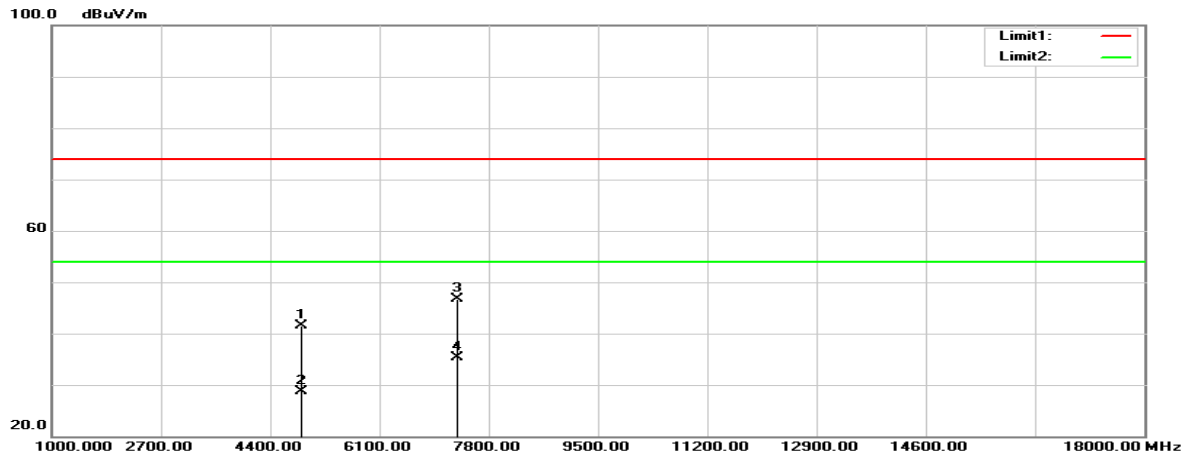
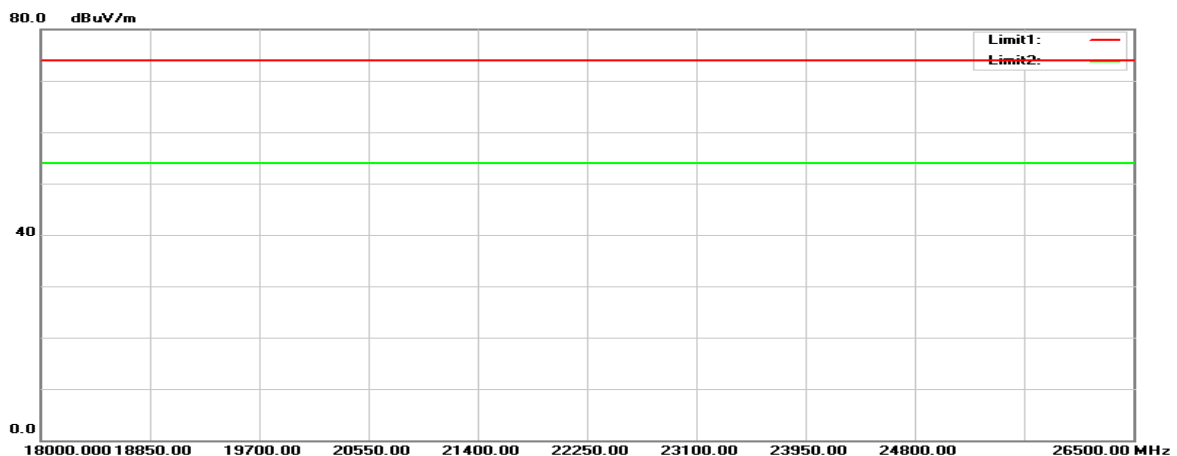
Result = Reading + Correct Factor

Margin = Result – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Other emissions from 18GHz~26.5GHz are 20 dB below the limits. No recording in the test.

Job No.:	RXZ210924001	Ant.Polar.:	Vertical
Standard:	NCC LP0002 4.10.1 Peak 3m	Test Distance:	3m
Test item:	Radiation Test	Power:	AC 110V/60Hz
Temp.(°C)/Hum.(%RH):	25.8(°C)/63%RH	Date:2021/9/30	Time:上午 11:57:14
		Test By:	D.L
Description: BLE-2M-TX-2440-X_Axis			



Frequency (MHz)	Reading (dBμV)	Correct Factor(dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
4880.000	44.45	-3.03	41.42	74.00	-32.58	141	222	peak
4880.000	31.67	-3.03	28.64	54.00	-25.36	141	222	AVG
7320.000	42.56	4.07	46.63	74.00	-27.37	148	321	peak
7320.000	31.17	4.07	35.24	54.00	-18.76	148	321	AVG

Note:

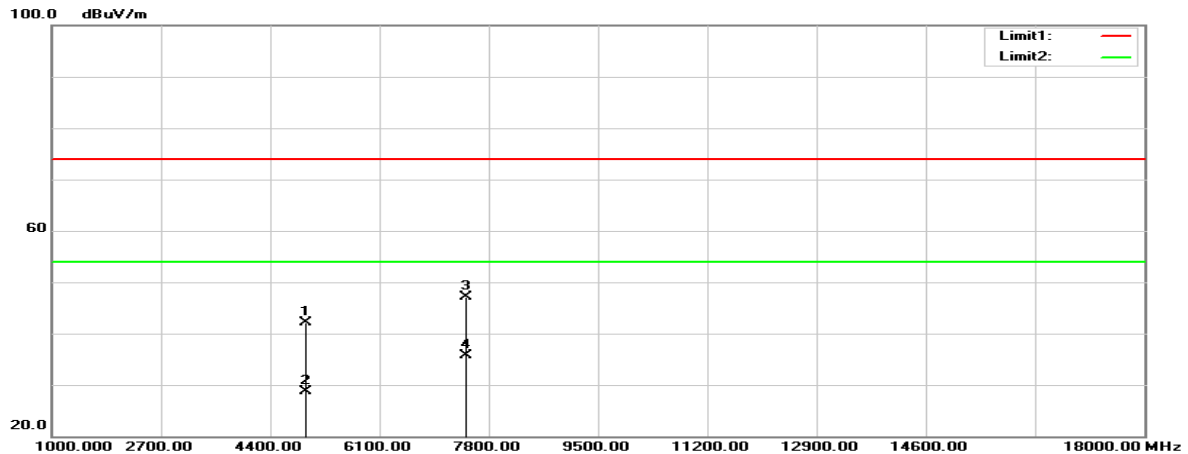
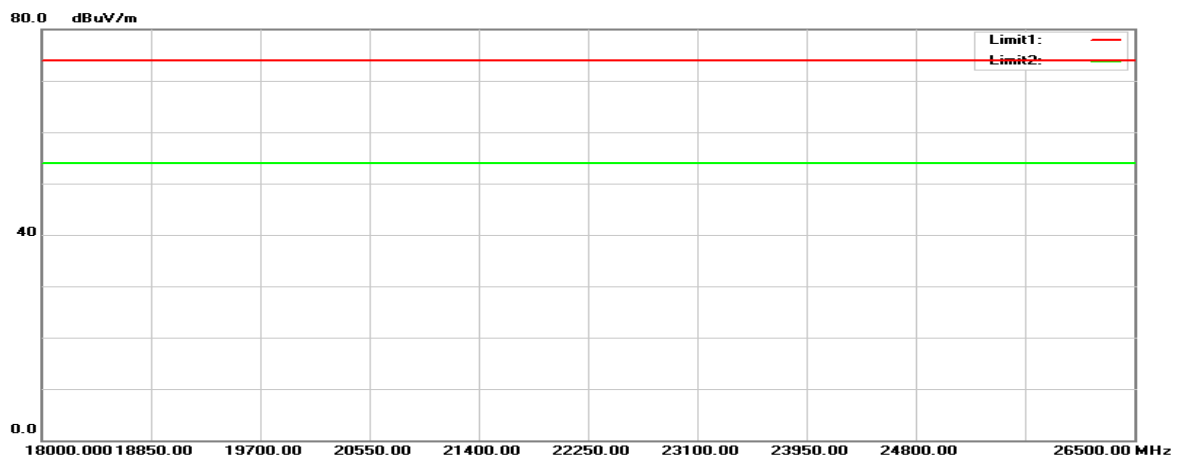
Result = Reading + Correct Factor

Margin = Result – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Other emissions from 18GHz~26.5GHz are 20 dB below the limits. No recording in the test.

Job No.:	RXZ210924001	Ant.Polar.:	Horizontal
Standard:	NCC LP0002 4.10.1 Peak 3m	Test Distance:	3m
Test item:	Radiation Test	Power:	AC 110V/60Hz
Temp.(°C)/Hum.(%RH):	25.8(°C)/63%RH	Date:2021/9/30	Time:下午 12:14:10
		Test By:	D.L
Description:	BLE-2M-TX-2480-X_Axis		



Frequency (MHz)	Reading (dBμV)	Correct Factor(dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
4960.000	44.76	-2.69	42.07	74.00	-31.93	120	320	peak
4960.000	31.42	-2.69	28.73	54.00	-25.27	120	320	AVG
7440.000	42.89	4.25	47.14	74.00	-26.86	147	157	peak
7440.000	31.44	4.25	35.69	54.00	-18.31	147	157	AVG

Note:

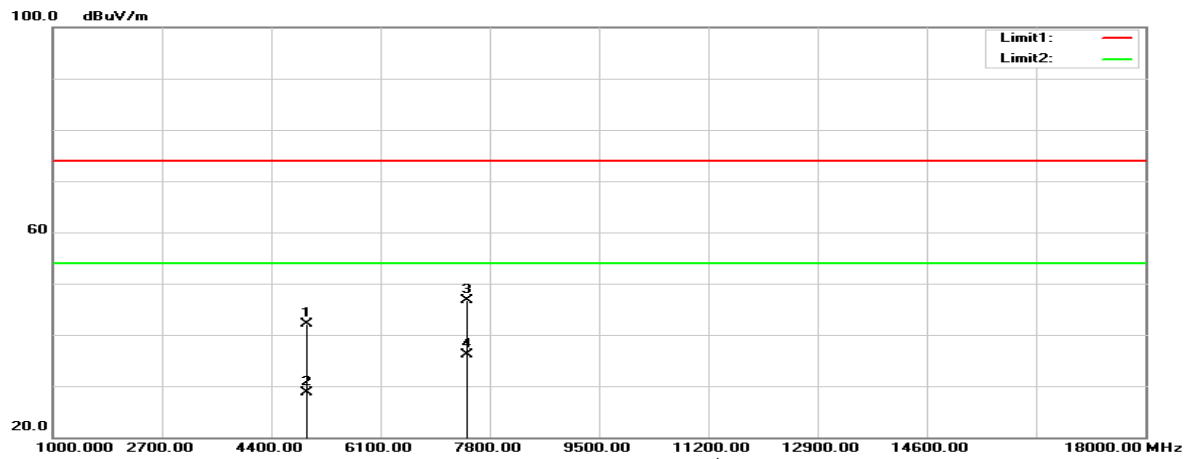
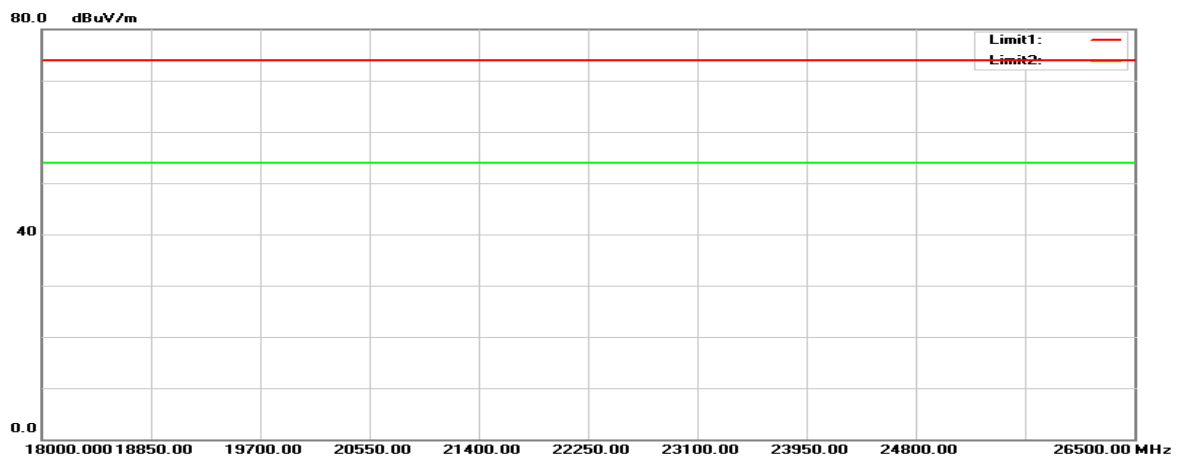
Result = Reading + Correct Factor

Margin = Result – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Other emissions from 18GHz~26.5GHz are 20 dB below the limits. No recording in the test.

Job No.:	RXZ210924001	Ant.Polar.:	Vertical
Standard:	NCC LP0002 4.10.1 Peak 3m	Test Distance:	3m
Test item:	Radiation Test	Power:	AC 110V/60Hz
Temp.(°C)/Hum.(%RH):	25.8(°C)/63%RH	Date:2021/9/30	Time:下午 12:12:06
		Test By:	D.L
Description:	BLE-2M-TX-2480-X_Axis		



Frequency (MHz)	Reading (dBμV)	Correct Factor(dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
4960.000	44.71	-2.69	42.02	74.00	-31.98	124	321	peak
4960.000	31.48	-2.69	28.79	54.00	-25.21	124	321	AVG
7440.000	42.40	4.25	46.65	74.00	-27.35	145	128	peak
7440.000	31.88	4.25	36.13	54.00	-17.87	145	128	AVG

Note:

Result = Reading + Correct Factor

Margin = Result – Limit

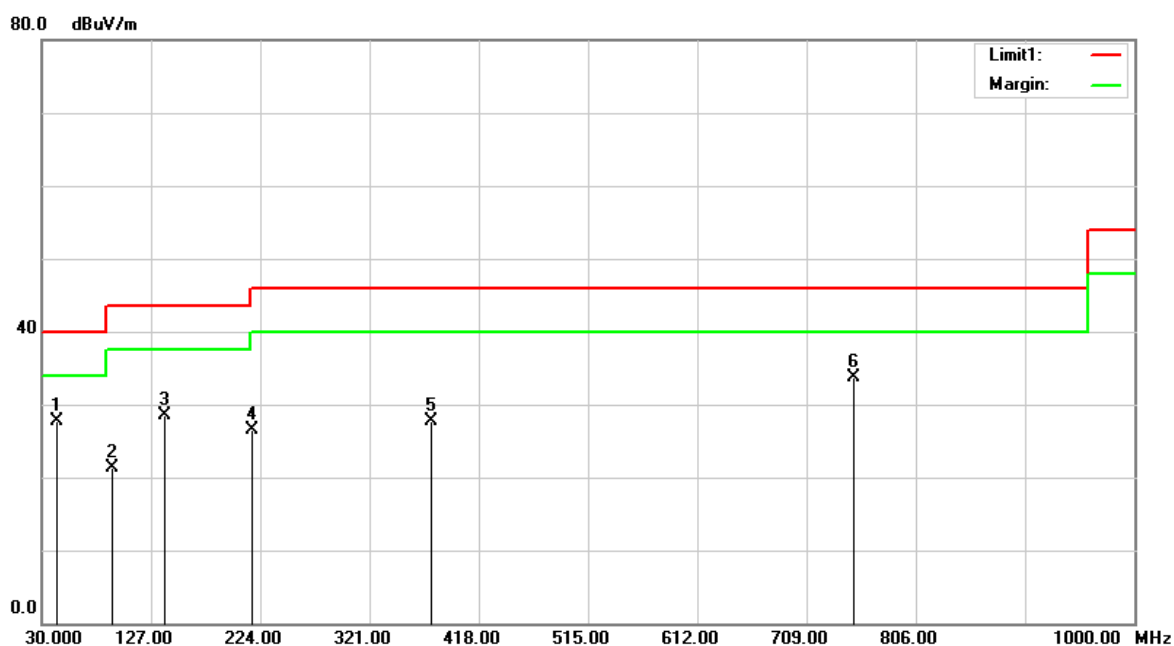
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Other emissions from 18GHz~26.5GHz are 20 dB below the limits. No recording in the test.

接收機其它不必要之訊號 (RX / 1GHz 以下)

場強輻射之量測值

Job No.:	RXZ210924001	Ant.Polar.:	Horizontal
Standard:	NCC LP0002 4.10.1 _ 3m	Test Distance:	3m
Test item:	Radiation Test	Power:	AC 110V/60Hz
Temp.(°C)/Hum.(%RH):	24.9(°C)/64%RH	Date:2021/9/27	Time:下午 08:49:45
		Test By:	Ken
Description:	BLE-2M- RX-2480		



Frequency (MHz)	Reading (dBμV)	Correct Factor(dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
43.5800	40.71	-12.98	27.73	40.00	-12.27	100	115	peak
92.0800	37.62	-16.27	21.35	43.50	-22.15	100	274	peak
138.6400	39.23	-10.69	28.54	43.50	-14.96	100	292	peak
217.2100	39.56	-13.14	26.42	46.00	-19.58	100	56	peak
375.3200	36.21	-8.53	27.68	46.00	-18.32	100	44	peak
750.7100	35.98	-2.28	33.70	46.00	-12.30	100	118	peak

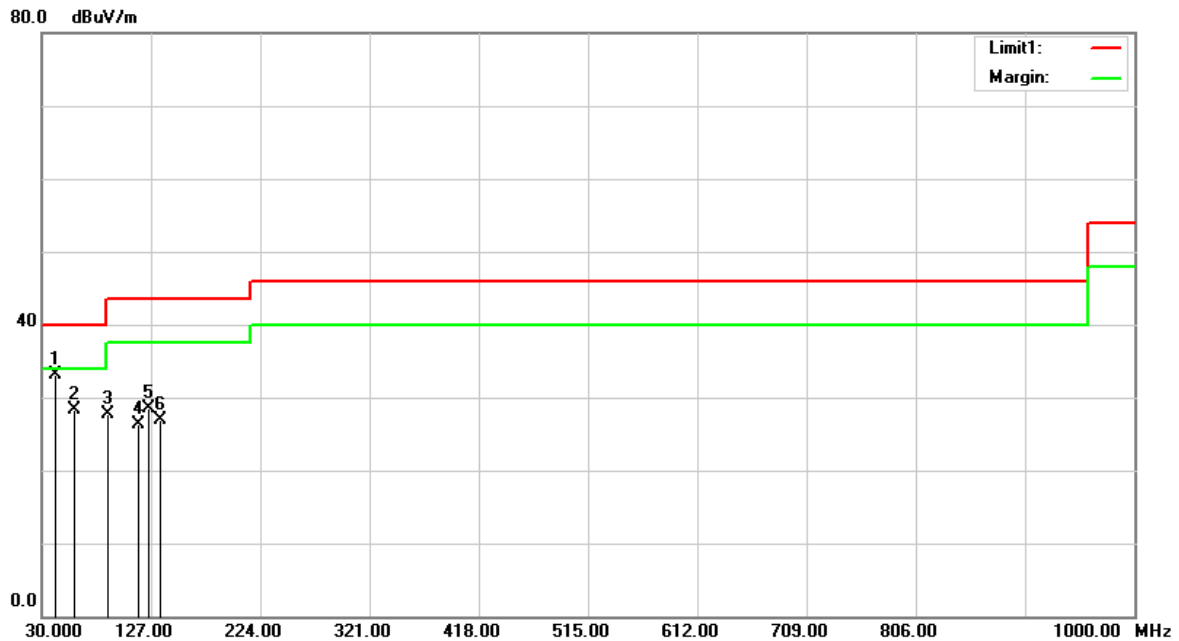
Note:

Result = Reading + Correct Factor

Margin = Result – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Job No.:	RXZ210924001	Ant.Polar.:	Vertical
Standard:	NCC LP0002 4.10.1 _ 3m	Test Distance:	3m
Test item:	Radiation Test	Power:	AC 110V/60Hz
Temp.(°C)/Hum.(%RH):	24.9(°C)/64%RH	Date:2021/9/27	Time:下午 08:51:26
		Test By:	Ken
Description:	BLE-2M- RX-2480		



Frequency (MHz)	Reading (dBμV)	Correct Factor(dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
42.6100	45.08	-12.07	33.01	40.00	-6.99	100	231	QP
59.1000	45.60	-17.29	28.31	40.00	-11.69	100	3	peak
89.1700	44.50	-16.70	27.80	43.50	-15.70	100	231	peak
115.3600	37.14	-10.90	26.24	43.50	-17.26	100	1	peak
125.0600	38.69	-10.17	28.52	43.50	-14.98	100	345	peak
134.7600	37.35	-10.44	26.91	43.50	-16.59	100	63	peak

Note:

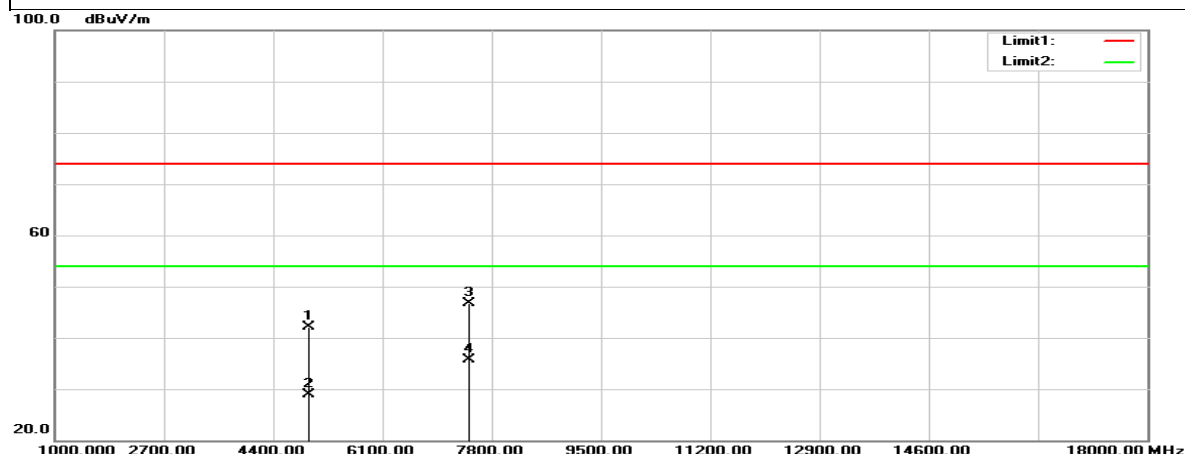
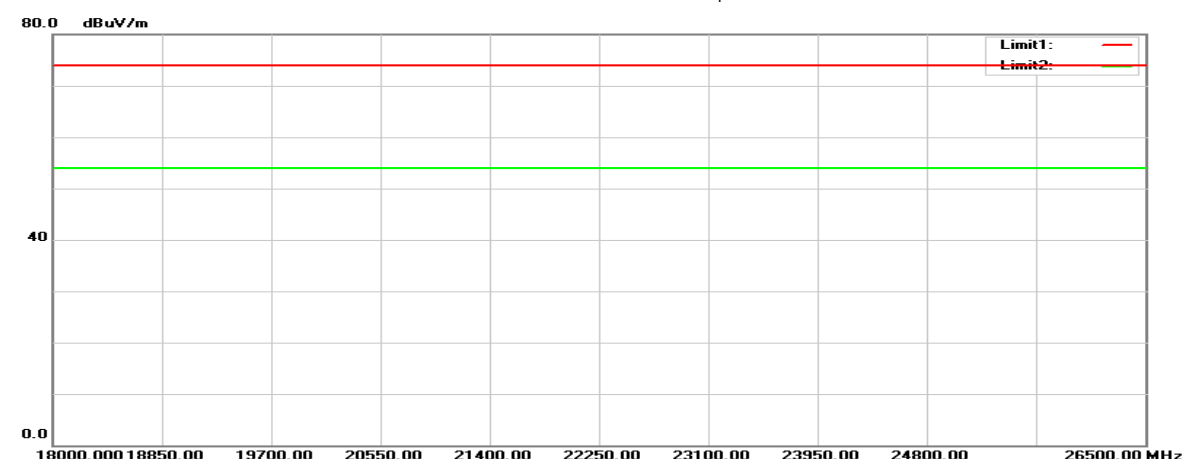
Result = Reading + Correct Factor

Margin = Result – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

場強輻射之量測值 (RX / 1GHz 以上)

Job No.:	RXZ210924001	Ant.Polar.:	Horizontal
Standard:	NCC LP0002 4.10.1 Peak 3m	Test Distance:	3m
Test item:	Radiation Test	Power:	AC 110V/60Hz
Temp.(°C)/Hum.(%RH):	25.8(°C)/63%RH	Date:2021/9/30	Time:下午 12:30:34
		Test By:	D.L
Description:	BLE-2M-RX-2480-X_Axis		



Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
(MHz)	(dBμV)	Factor(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	(cm)	(°)	
4960.000	44.79	-2.69	42.10	74.00	-31.90	147	320	peak
4960.000	31.55	-2.69	28.86	54.00	-25.14	147	320	AVG
7440.000	42.48	4.25	46.73	74.00	-27.27	151	125	peak
7440.000	31.46	4.25	35.71	54.00	-18.29	151	125	AVG

Note:

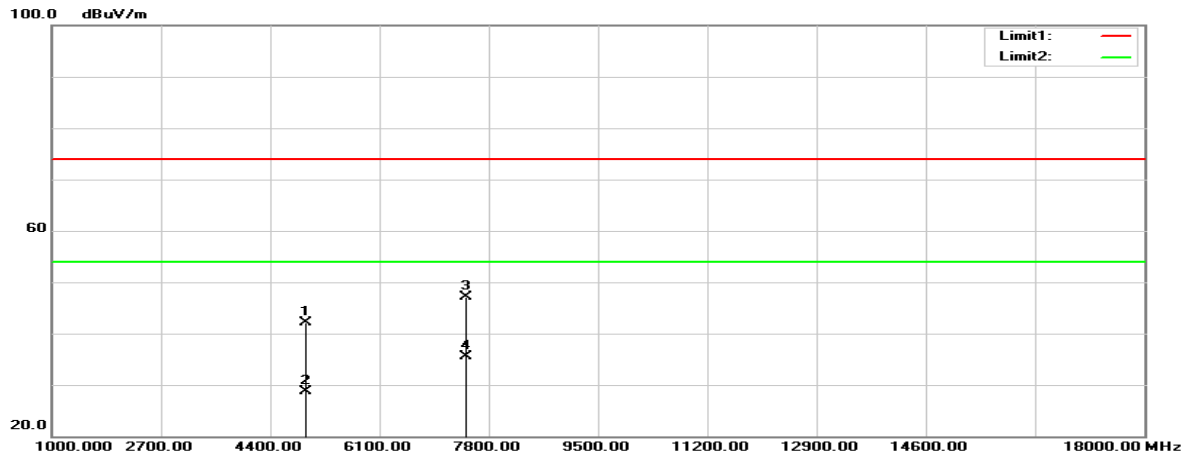
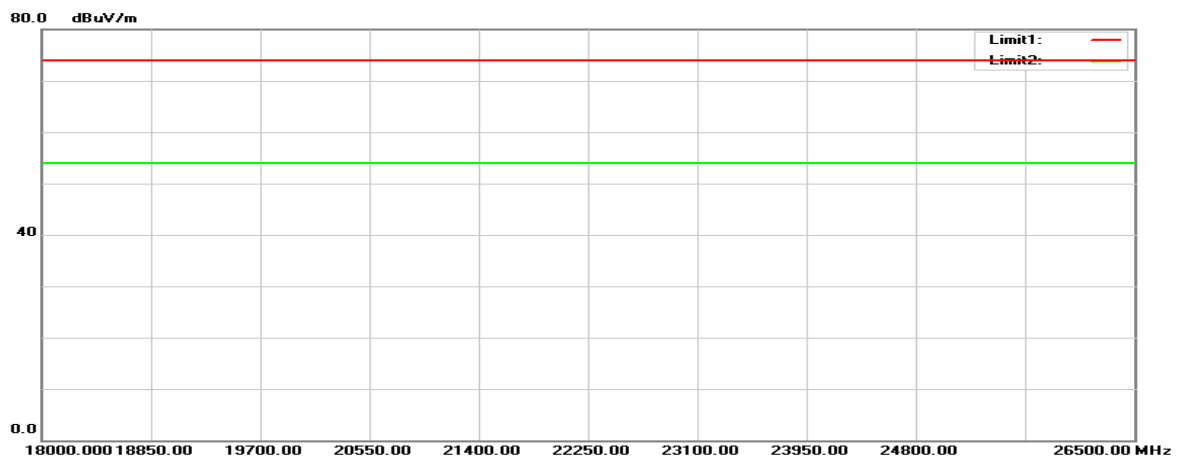
Result = Reading + Correct Factor

Margin = Result – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Other emissions from 18GHz~26.5GHz are 20 dB below the limits. No recording in the test.

Job No.:	RXZ210924001	Ant.Polar.:	Vertical
Standard:	NCC LP0002 4.10.1 Peak 3m	Test Distance:	3m
Test item:	Radiation Test	Power:	AC 110V/60Hz
Temp.(°C)/Hum.(%RH):	25.8(°C)/63%RH	Date:2021/9/30	Time:下午 12:32:58
		Test By:	D.L
Description:	BLE-2M-RX-2480-X_Axis		



Frequency (MHz)	Reading (dBμV)	Correct Factor(dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
4960.000	44.71	-2.69	42.02	74.00	-31.98	152	320	peak
4960.000	31.49	-2.69	28.80	54.00	-25.20	152	320	AVG
7440.000	42.93	4.25	47.18	74.00	-26.82	147	158	peak
7440.000	31.20	4.25	35.45	54.00	-18.55	147	158	AVG

Note:

Result = Reading + Correct Factor

Margin = Result – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

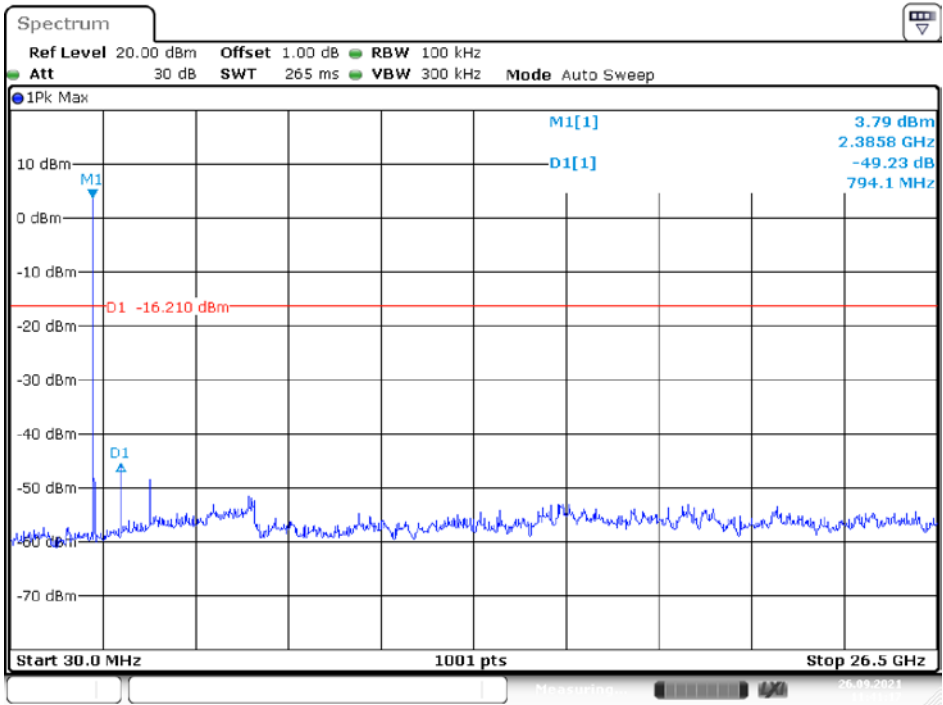
Other emissions from 18GHz~26.5GHz are 20 dB below the limits. No recording in the test.

Conducted Spurious Emissions:

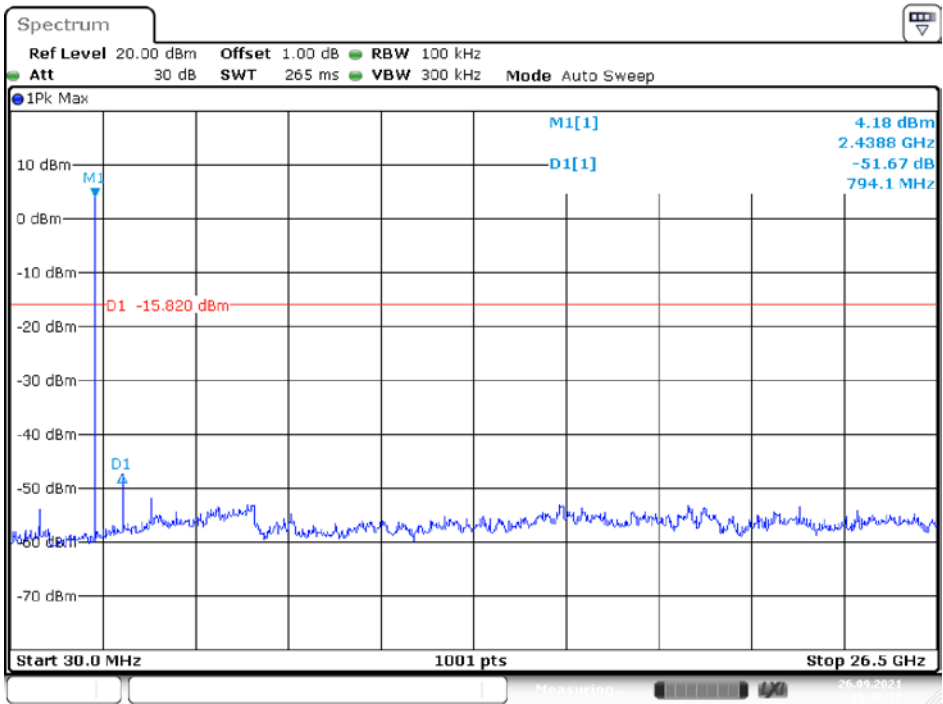
環境溫度	26°C	測試日期	2021-09-26
環境濕度	47%	測試人員	李宥陞

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
BLE(1M) mode				
Low	2402	49.23	≥ 20	PASS
Mid	2440	51.67	≥ 20	PASS
High	2480	54.97	≥ 20	PASS
BLE(2M) mode				
Low	2402	46.81	≥ 20	PASS
Mid	2440	48.84	≥ 20	PASS
High	2480	52.77	≥ 20	PASS

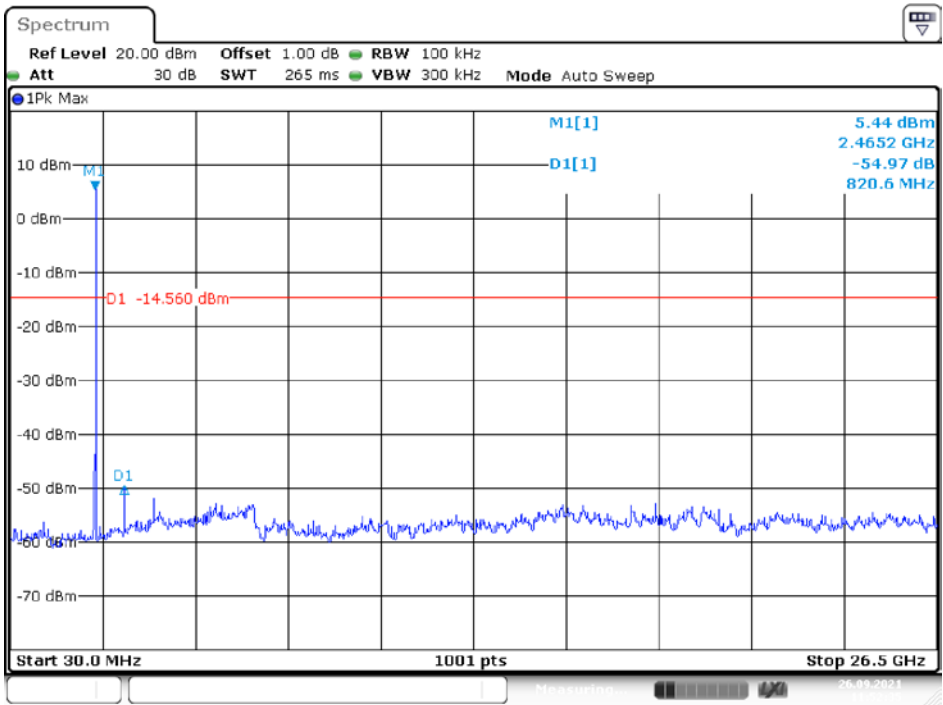
BLE (1M) Mode
Low Channel



Middle Channel

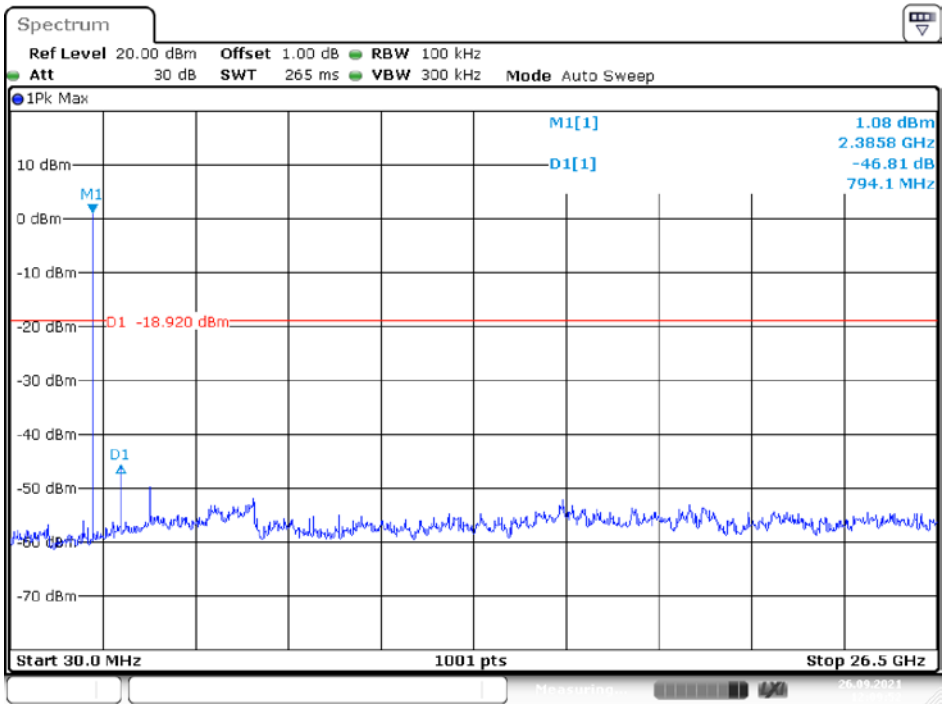


High Channel



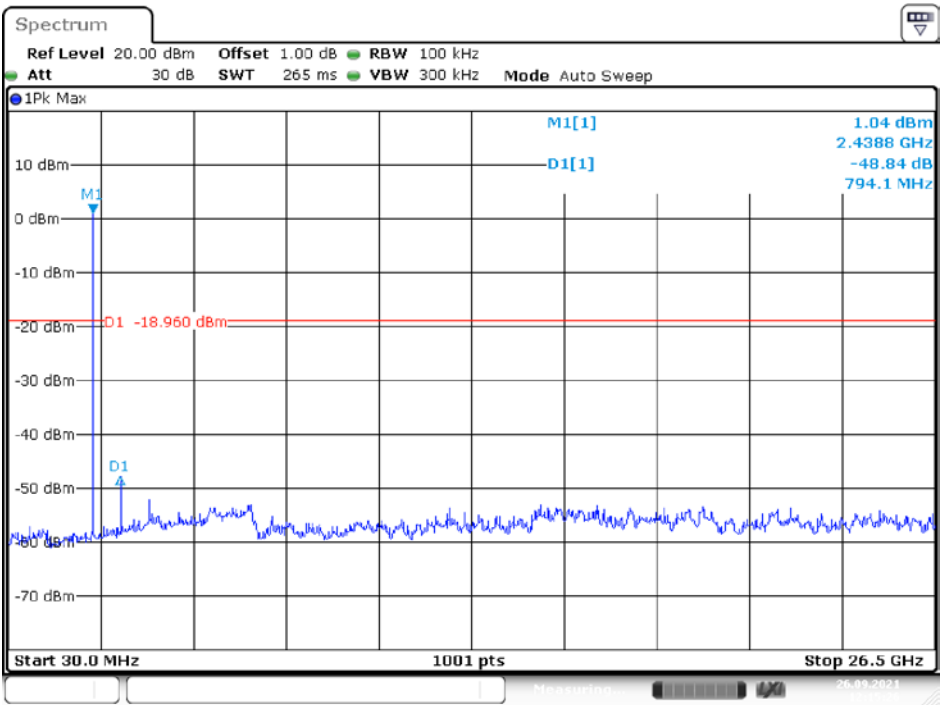
Date: 26.SEP.2021 11:52:36

BLE (2M) Mode
Low Channel



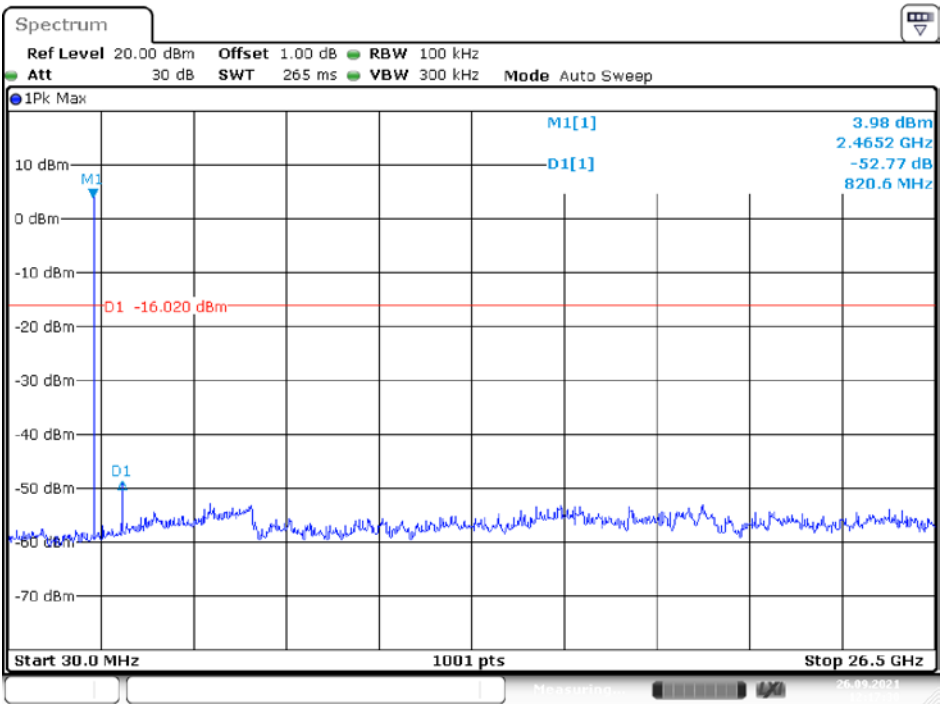
Date: 26.SEP.2021 12:09:52

Middle Channel



Date: 26.SEP.2021 12:15:27

High Channel



Date: 26.SEP.2021 12:17:30

6. 天線增益之要求

6.1 適用標準

依據低功率射頻電機技術規範之規定，應符合下列敘述其中之一：

進行固定式點對點操作時，其發射天線之方向性增益超過6 dBi，每超過3 dBi，最大傳導輸出功率限制值應降低1 dB。

操作頻率為5725 MHz ~ 5850 MHz且進行固定式點對點操作時，其發射天線之方向性增益超過6 dBi，不需降低最大傳導輸出功率。

使用超過6 dBi方向增益之發射天線時，應依超過6 dBi天線方向增益的dBi總量，等量減少最大傳導輸出功率限制值。

6.2 天線增益

此裝置使用的天線明細如下：

2.4GHz 天線型態	廠牌	型號	Gain
Dipole Antenna	ELECTRIC CONNECTOR TECHNOLOGY	81800U610	4.42dBi

** 其詳細規格資料，請參見：天線規格。

判定結果：符合規範

7. 發射頻寬之要求

7.1 適用標準

對使用跳頻系統之低功率發射機依據低功率射頻電機技術規範之規定，跳頻系統之載波頻率頻道間隔應大於或等於25 kHz或跳頻頻道之20 dB頻寬，兩者取較寬者。但操作頻率為2400 MHz ~ 2483.5 MHz頻段且輸出功率應小於或等於125 mW跳頻系統，其載波頻率頻道間隔不得小於25 kHz或跳頻頻道20 dB頻寬之三分之二，兩者取較寬者。系統之跳頻頻道應依虛擬亂數排列，在各頻率之跳頻頻道上跳躍。每一發射機必須均等的使用每一頻率。系統接收機應具有與發射機跳躍頻道頻寬相匹配之輸入頻寬，且應隨所發射之訊號同步偏移接收頻率。

對使用數位調變技術之低功率發射機，依據低功率射頻電機技術規範之規定，6 dB之頻寬至少應有500 kHz。

7.2 測試方法

測量時，頻譜分析儀之解析頻寬為100kHz，視訊頻寬不小於解析頻寬。為求得精確測量，頻率掃描範圍(Span)遠大於解析頻寬。

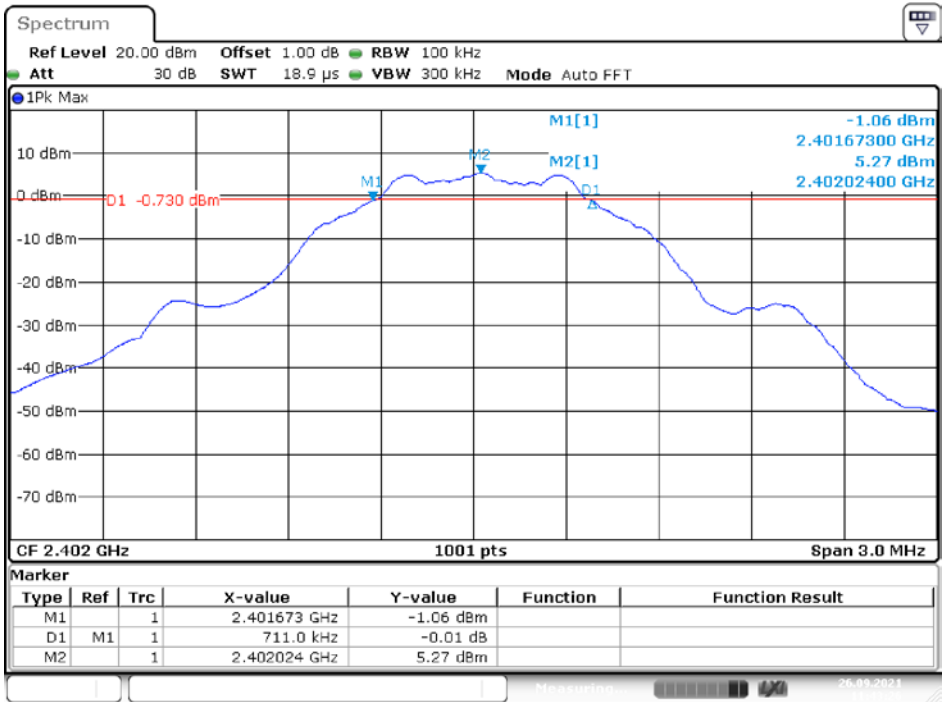
7.3 發射頻寬之量測結果

環境溫度	26°C	測試日期	2021-09-26
環境濕度	47%	測試人員	李宥陞

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (kHz)	Result
BLE(1M) mode				
Low	2402	0.71	> 500	PASS
Mid	2440	0.71		PASS
High	2480	0.72		PASS
BLE(2M) mode				
Low	2402	1.26	> 500	PASS
Mid	2440	1.26		PASS
High	2480	1.26		PASS

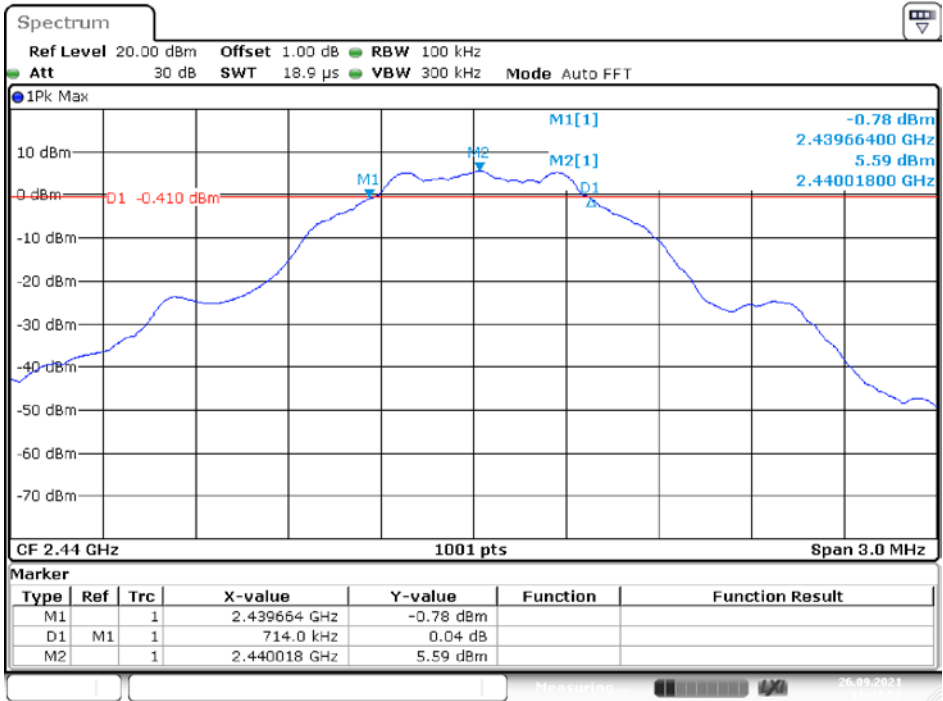
6 dB Emission Bandwidth

BLE(1M) Mode
Low Channel



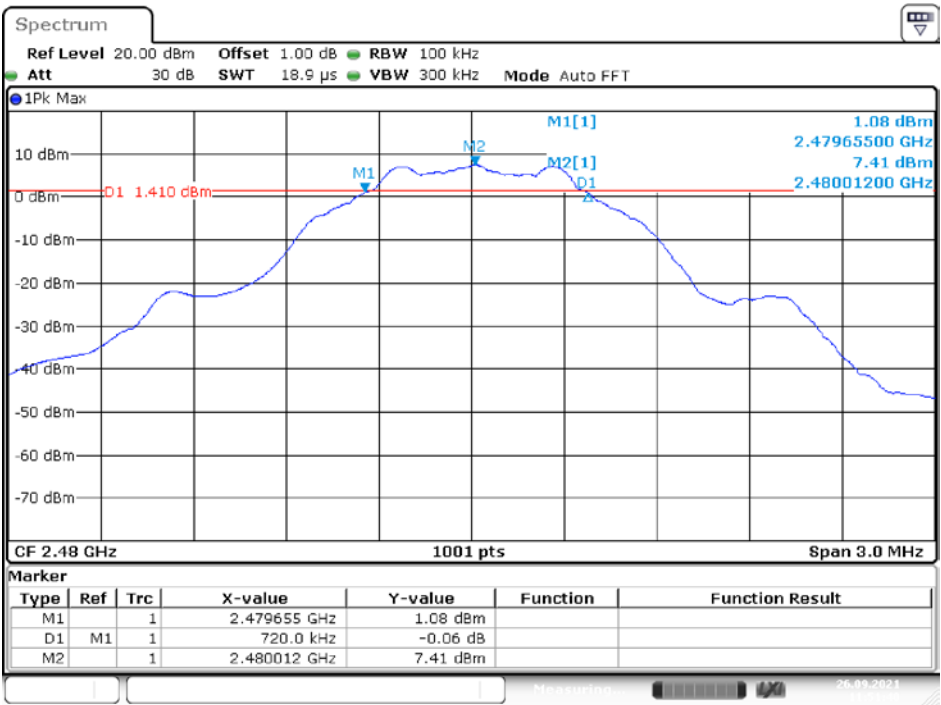
Date: 26.SEP.2021 11:43:26

Middle Channel



Date: 26.SEP.2021 11:47:53

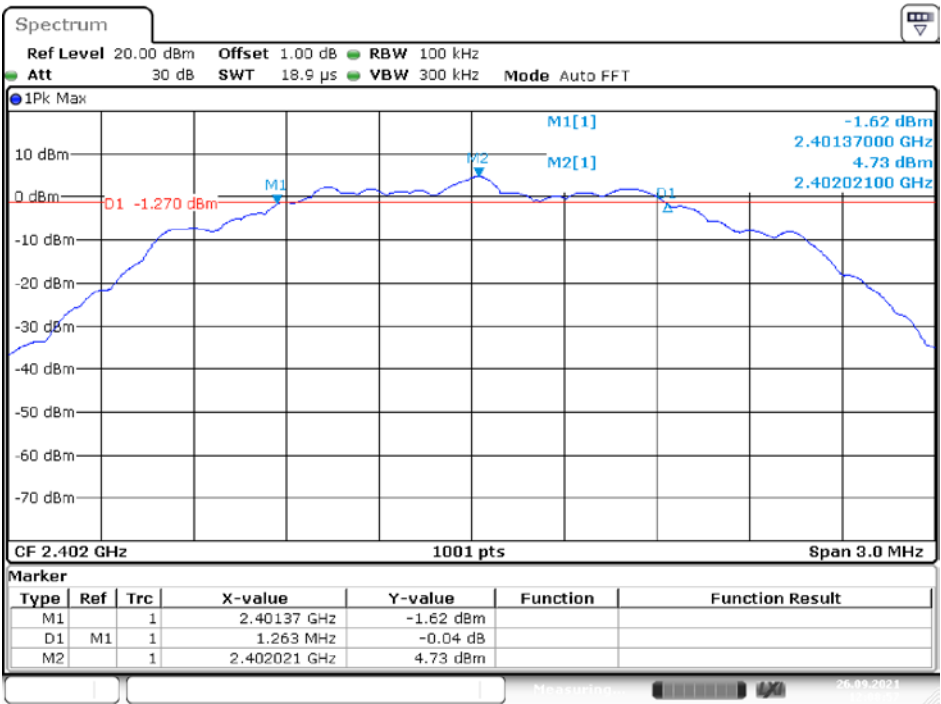
High Channel



Date: 26.SEP.2021 11:51:41

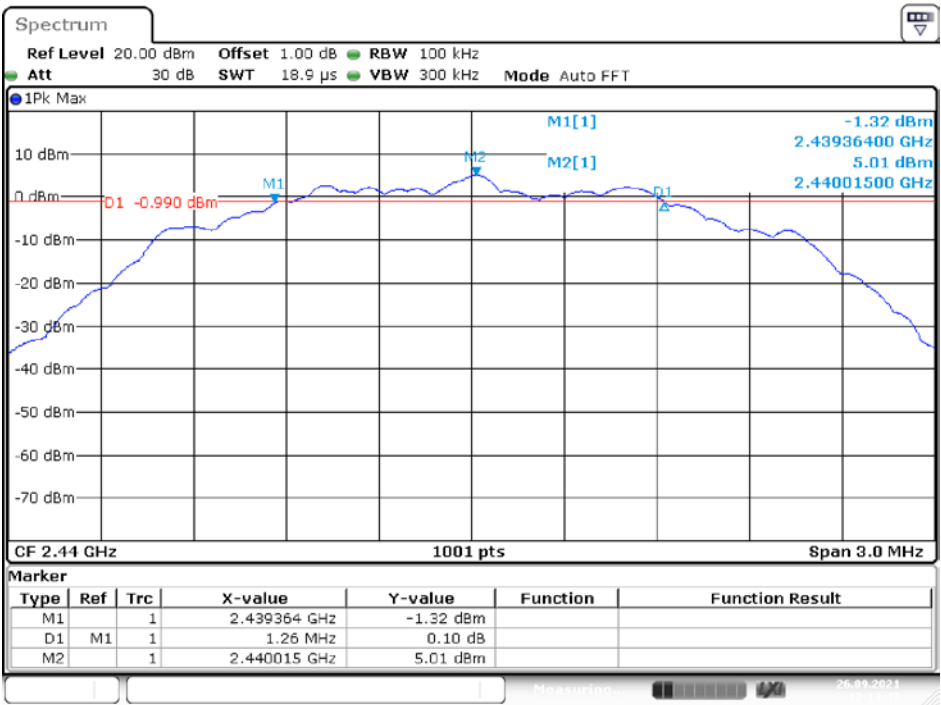
BLE(2M) Mode

Low Channel



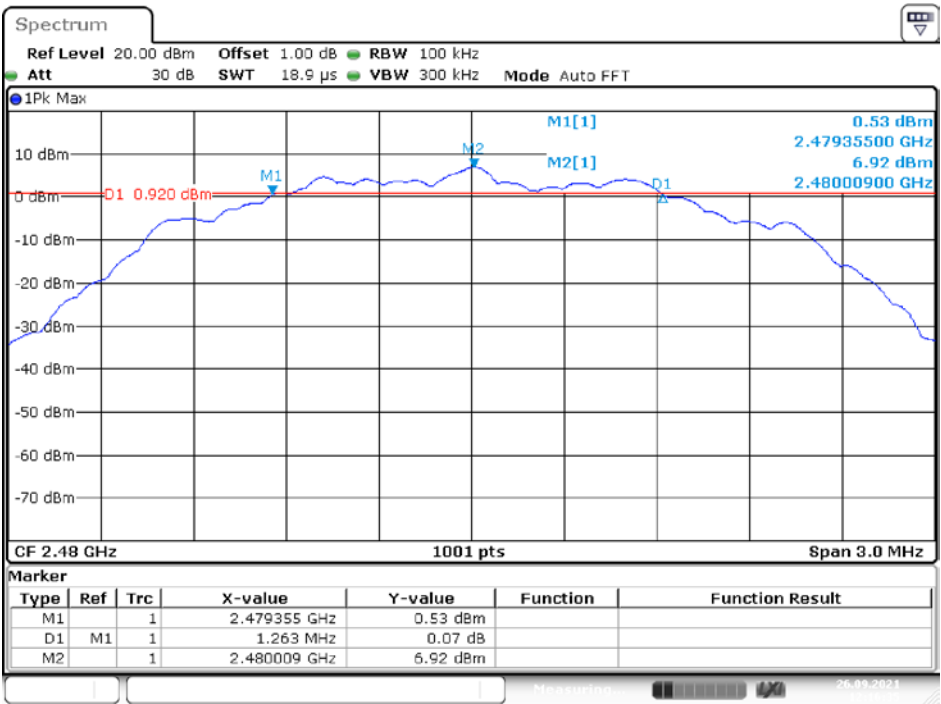
Date: 26.SEP.2021 12:08:57

Middle Channel



Date: 26.SEP.2021 12:14:47

High Channel



Date: 26.SEP.2021 12:16:35

8. 輸出峰值功率之量測

8.1 適用標準

依據低功率射頻電機技術規範之規定，跳頻系統至少使用75個跳頻頻道：1 W(含)以下；跳頻系統依規定操作於2400 MHz ~ 2483.5 MHz之展頻跳頻系統，須使用至少15個無重疊的頻道，在0.4秒乘以跳頻頻道數之週期內，任一頻率占用之平均時間應小於或等於0.4秒，應使用智慧型跳頻技術：0.125 W(含)以下；數位調變技術系統：1 W(含)以下。

8.2 測試方法

1. 將受測物的RF埠經由一條50歐姆纜線連接至功率分析儀。
2. 設定量測頻率為量測頻道。
3. 紀錄最大峰值輸出功率。

上述之測試步驟應注意外接之衰減與纜線損失。

8.3 輸出功率之量測結果

環境溫度	26°C	測試日期	2021-09-26
環境濕度	47%	測試人員	李宥陞

Channel	Frequency (MHz)	Peak Output Power (dBm)	Output Power (W)	Limit (W)	Result
BLE(1M) mode					
Low	2402	6.41	0.004	0.125	PASS
Mid	2440	6.75	0.005		PASS
High	2480	8.36	0.007		PASS
BLE(2M) mode					
Low	2402	6.51	0.004	0.125	PASS
Mid	2440	6.89	0.005		PASS
High	2480	8.51	0.007		PASS

9. 開放頻帶邊緣 100kHz 頻寬內之限制

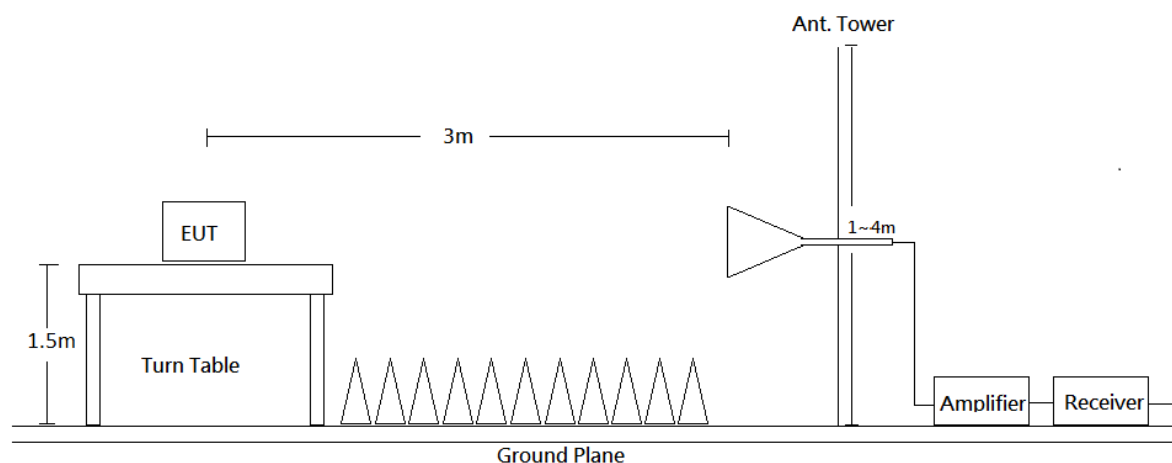
9.1 適用標準

依據低功率射頻電機技術規範之規定，使用頻帶範圍外之任意100 kHz內，發射器所產生的射頻功率相較於使用頻帶範圍中包含最高所需功率之100 kHz內的射頻功率，峰值輸出功率方式測量者須衰減20分貝(dB)，以射頻傳導或輻射方式測量。最大傳導輸出功率測量方式者，至少須衰減30 dB。此外，落於禁用頻段之輻射發射，應符合規定。

9.2 測試方法

1. 頻率掃描範圍足以涵蓋操作在最靠近頻帶邊緣之頻道的發射波峰位準以及任何落於許可頻帶外之調變產物。
2. 解析頻寬大於1%頻率掃描範圍寬度，視訊頻寬不小於解析頻寬。掃描時間為自動，檢波功能為峰值，訊號軌跡為最大保留(Max Hold)。
3. 將標記設定於在頻帶邊緣上的發射，或將標記設定於最大之頻帶外調變產物上若其位準大於頻帶邊緣上的發射。啟動標記差值之功能，利用標記至波峰功能(Marker to Peak)功能以標記頻帶內發射之波峰，所顯示之標記差值必須符合指定之限制值。以上述相同的步驟決定由跳頻功能所產生的任何混附波是否亦符合規定之限制值。

9.3 測試配置



依據 ANSI C63.10:2020 架設

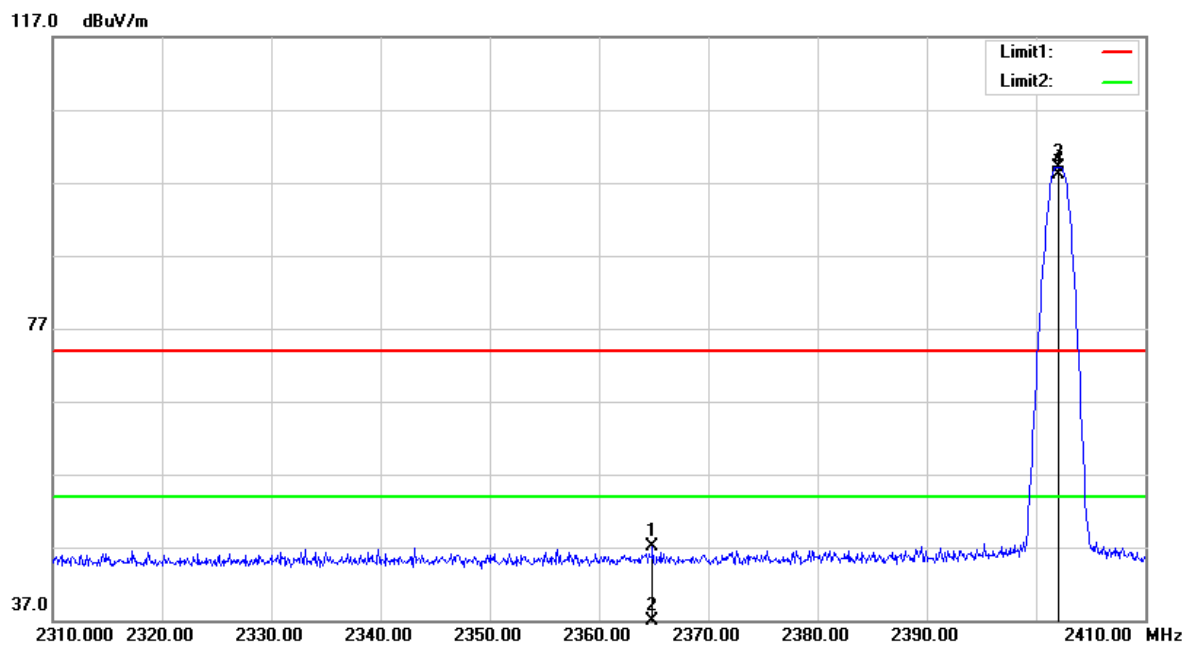
9.4 開放頻帶邊緣之量測結果

請參考附圖

判定結果: 符合規範

發射限制測試 BLE(1M) Mode / CH Low

Job No.:	RXZ210924001	Ant.Polar.:	Horizontal
Standard:	NCC LP0002 4.10.1 Peak 3m	Test Distance:	3m
Test item:	Radiation Test	Power:	AC 110V/60Hz
Temp.(°C)/Hum.(%RH):	24.8(°C)/67%RH	Date:2021/9/29	Time:下午 07:43:19
		Test By:	D.L
Description:	BLE-1M-TX-2402-X_Axis		



Frequency (MHz)	Reading (dBμV)	Correct Factor(dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
2364.900	57.50	-10.43	47.07	74.00	-26.93	142	238	peak
2364.900	43.93	-10.43	33.50	54.00	-20.50	142	238	AVG
2402.000	109.32	-10.14	99.18	N/A	N/A	142	238	peak
2402.000	108.18	-10.14	98.04	N/A	N/A	142	238	AVG

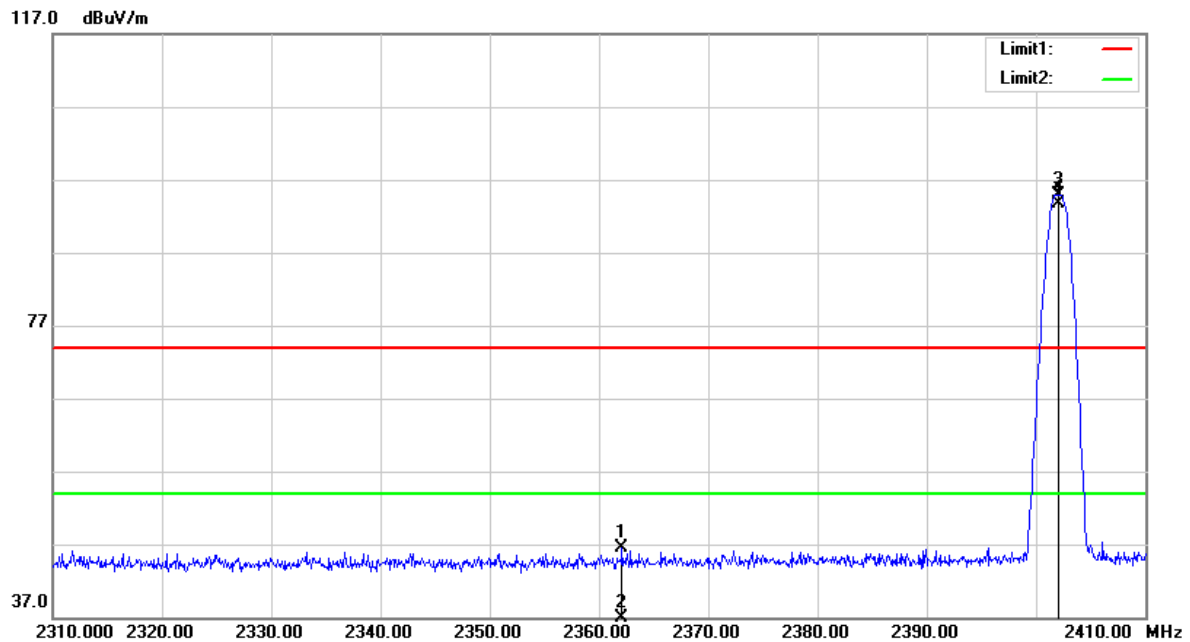
Note:

Result = Reading + Correct Factor

Margin = Result – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Job No.:	RXZ210924001	Ant.Polar.:	Vertical
Standard:	NCC LP0002 4.10.1 Peak 3m	Test Distance:	3m
Test item:	Radiation Test	Power:	AC 110V/60Hz
Temp.(°C)/Hum.(%RH):	24.8(°C)/67%RH	Date:2021/9/29	Time:下午 07:37:39
		Test By:	D.L
Description:	BLE-1M-TX-2402-X_Axis		



Frequency (MHz)	Reading (dBμV)	Correct Factor(dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
2362.100	56.91	-10.45	46.46	74.00	-27.54	144	238	peak
2362.100	43.96	-10.45	33.51	54.00	-20.49	144	238	AVG
2402.000	105.09	-10.14	94.95	N/A	N/A	144	238	peak
2402.000	103.92	-10.14	93.78	N/A	N/A	144	238	AVG

Note:

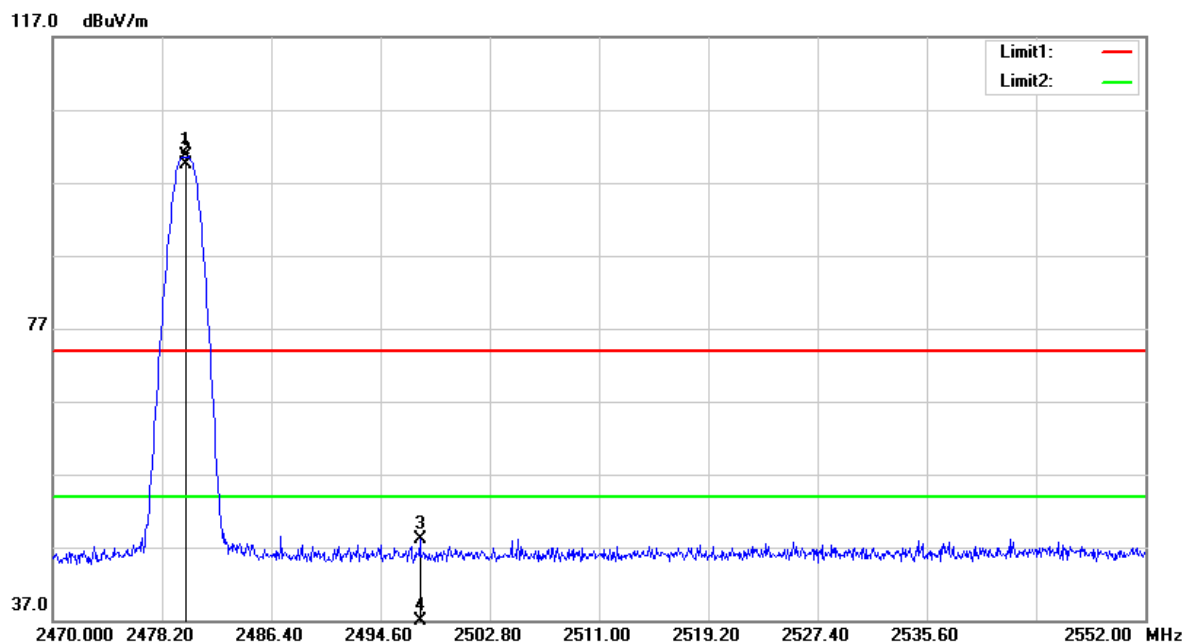
Result = Reading + Correct Factor

Margin = Result – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

發射限制測試 BLE(1M) Mode / CH High

Job No.:	RXZ210924001	Ant.Polar.:	Horizontal
Standard:	NCC LP0002 4.10.1 Peak 3m	Test Distance:	3m
Test item:	Radiation Test	Power:	AC 110V/60Hz
Temp.(°C)/Hum.(%RH):	24.8(°C)/67%RH	Date:2021/9/29	Time:下午 08:03:01
		Test By:	D.L
Description:	BLE-1M-TX-2480-X_Axis		



Frequency (MHz)	Reading (dBμV)	Correct Factor(dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
2480.000	109.92	-9.31	100.61	N/A	N/A	128	223	peak
2480.000	108.72	-9.31	99.41	N/A	N/A	128	223	AVG
2497.552	57.22	-9.06	48.16	74.00	-25.84	128	223	peak
2497.552	44.78	-9.06	35.72	54.00	-18.28	128	223	AVG

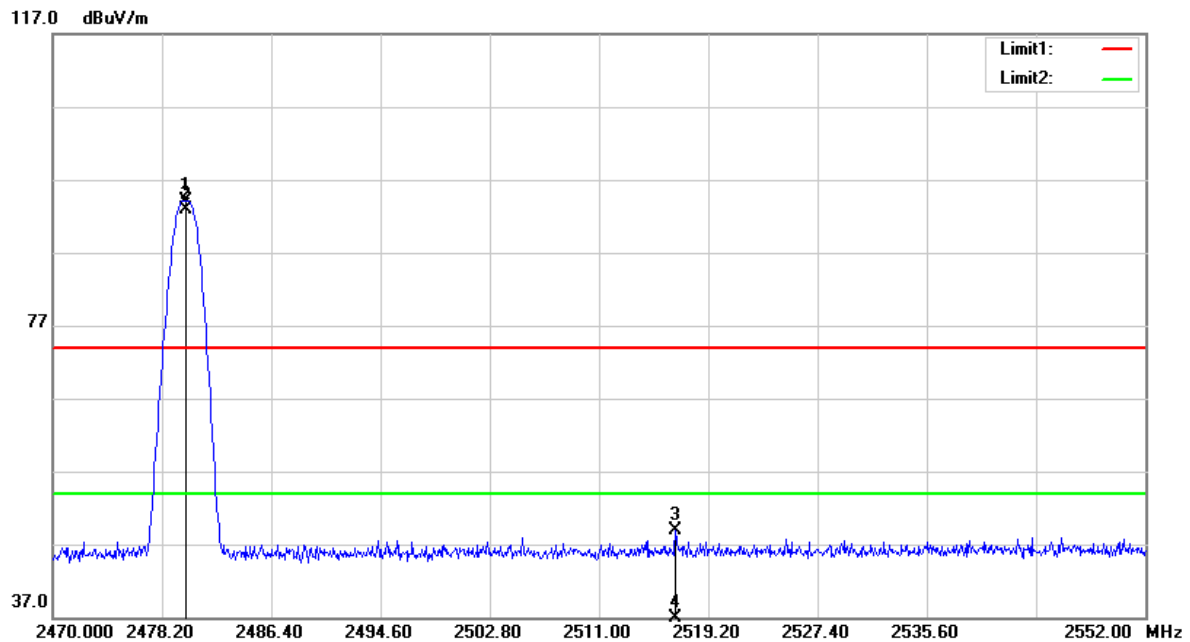
Note:

Result = Reading + Correct Factor

Margin = Result – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Job No.:	RXZ210924001	Ant.Polar.:	Vertical
Standard:	NCC LP0002 4.10.1 Peak 3m	Test Distance:	3m
Test item:	Radiation Test	Power:	AC 110V/60Hz
Temp.(°C)/Hum.(%RH):	24.8(°C)/67%RH	Date:2021/9/29	Time:下午 07:59:16
		Test By:	D.L
Description:	BLE-1M-TX-2480-X_Axis		



Frequency (MHz)	Reading (dBμV)	Correct Factor(dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
2480.000	103.45	-9.31	94.14	N/A	N/A	152	238	peak
2480.000	102.31	-9.31	93.00	N/A	N/A	152	238	AVG
2516.740	57.75	-8.91	48.84	74.00	-25.16	152	238	peak
2516.740	43.99	-8.91	35.08	54.00	-18.92	152	238	AVG

Note:

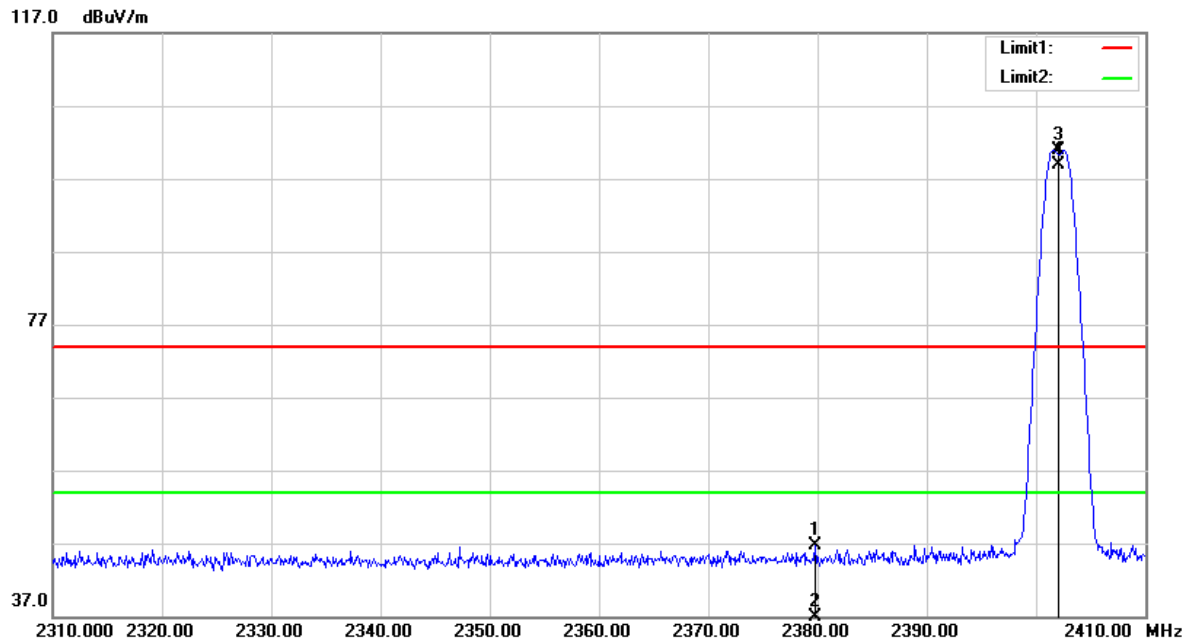
Result = Reading + Correct Factor

Margin = Result – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

發射限制測試 BLE(2M) Mode / CH Low

Job No.:	RXZ210924001	Ant.Polar.:	Horizontal
Standard:	NCC LP0002 4.10.1 Peak 3m	Test Distance:	3m
Test item:	Radiation Test	Power:	AC 110V/60Hz
Temp.(°C)/Hum.(%RH):	25.8(°C)/63%RH	Date:2021/9/30	Time:上午 09:17:20
		Test By:	D.L
Description:	BLE-2M-TX-2402-X_Axis		



Frequency (MHz)	Reading (dBμV)	Correct Factor(dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
2379.800	56.95	-10.31	46.64	74.00	-27.36	137	201	peak
2379.800	45.31	-10.31	35.00	54.00	-19.00	137	201	AVG
2402.000	111.05	-10.14	100.91	N/A	N/A	137	201	peak
2402.000	108.98	-10.14	98.84	N/A	N/A	137	201	AVG

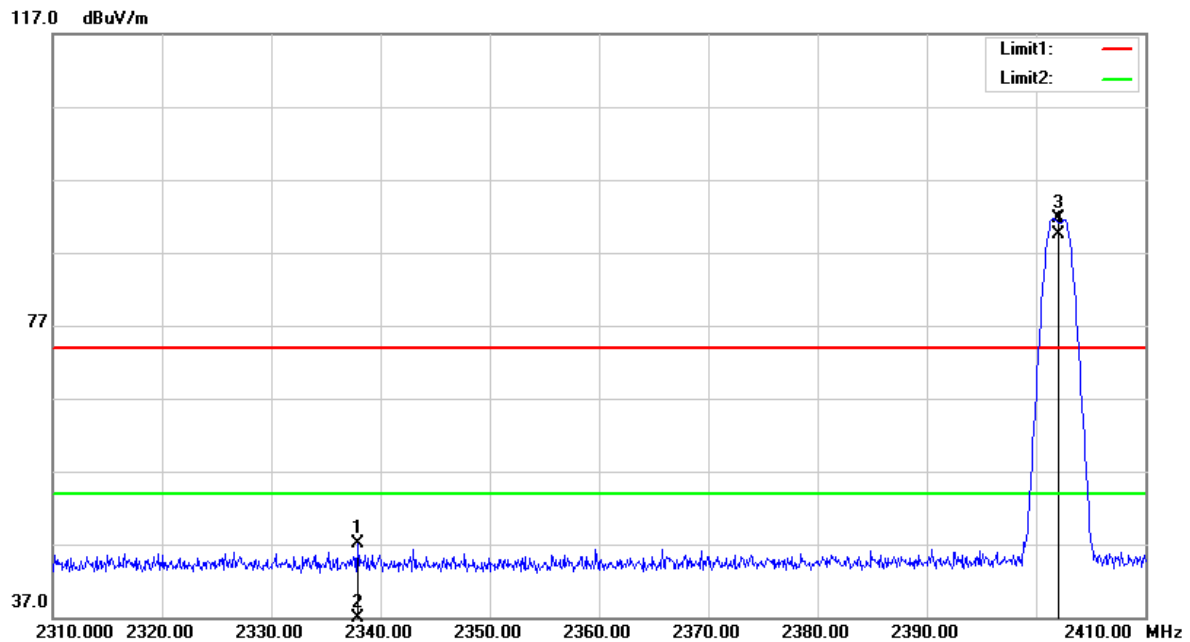
Note:

Result = Reading + Correct Factor

Margin = Result – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Job No.:	RXZ210924001	Ant.Polar.:	Vertical
Standard:	NCC LP0002 4.10.1 Peak 3m	Test Distance:	3m
Test item:	Radiation Test	Power:	AC 110V/60Hz
Temp.(°C)/Hum.(%RH):	25.8(°C)/63%RH	Date:2021/9/30	Time:上午 09:20:15
		Test By:	D.L
Description:	BLE-2M-TX-2402-X_Axis		



Frequency (MHz)	Reading (dBμV)	Correct Factor(dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
2337.900	57.56	-10.55	47.01	74.00	-26.99	145	233	peak
2337.900	45.50	-10.55	34.95	54.00	-19.05	145	233	AVG
2402.000	101.80	-10.14	91.66	N/A	N/A	145	233	peak
2402.000	99.73	-10.14	89.59	N/A	N/A	145	233	AVG

Note:

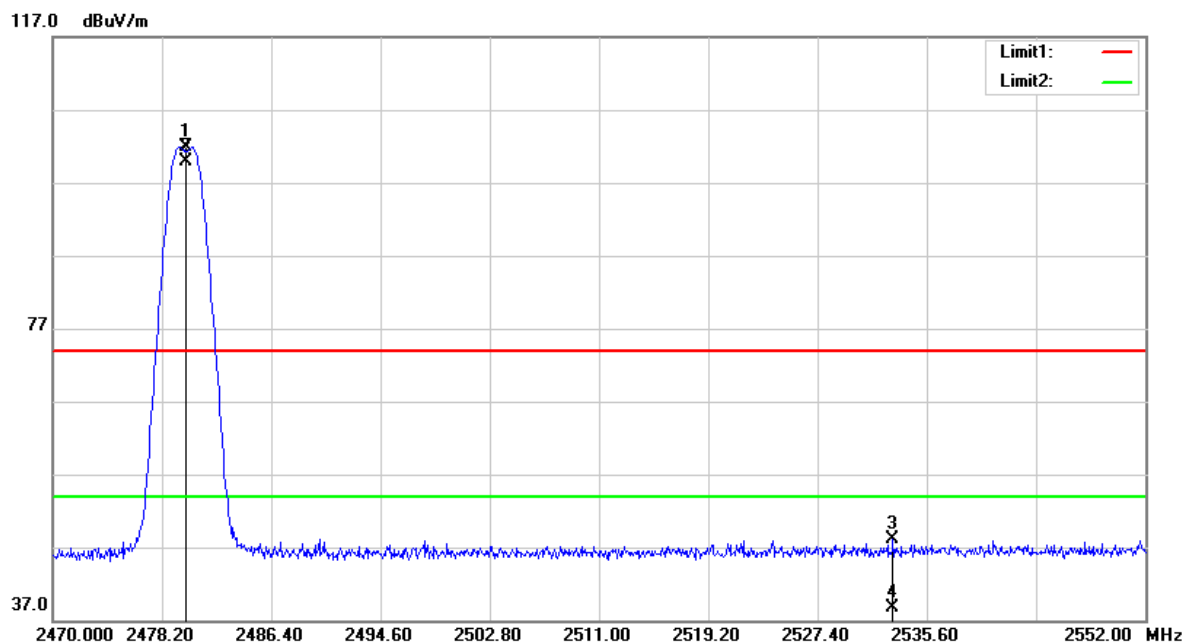
Result = Reading + Correct Factor

Margin = Result – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

發射限制測試 BLE(2M) Mode / CH High

Job No.:	RXZ210924001	Ant.Polar.:	Horizontal
Standard:	NCC LP0002 4.10.1 Peak 3m	Test Distance:	3m
Test item:	Radiation Test	Power:	AC 110V/60Hz
Temp.(°C)/Hum.(%RH):	25.8(°C)/63%RH	Date:2021/9/30	Time:上午 09:31:04
		Test By:	D.L
Description:	BLE-2M-TX-2480-X_Axis		



Frequency (MHz)	Reading (dBμV)	Correct Factor(dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
2480.000	111.21	-9.31	101.90	N/A	N/A	142	208	peak
2480.000	109.18	-9.31	99.87	N/A	N/A	142	208	AVG
2533.058	56.95	-8.80	48.15	74.00	-25.85	142	208	peak
2533.058	47.41	-8.80	38.61	54.00	-15.39	142	208	AVG

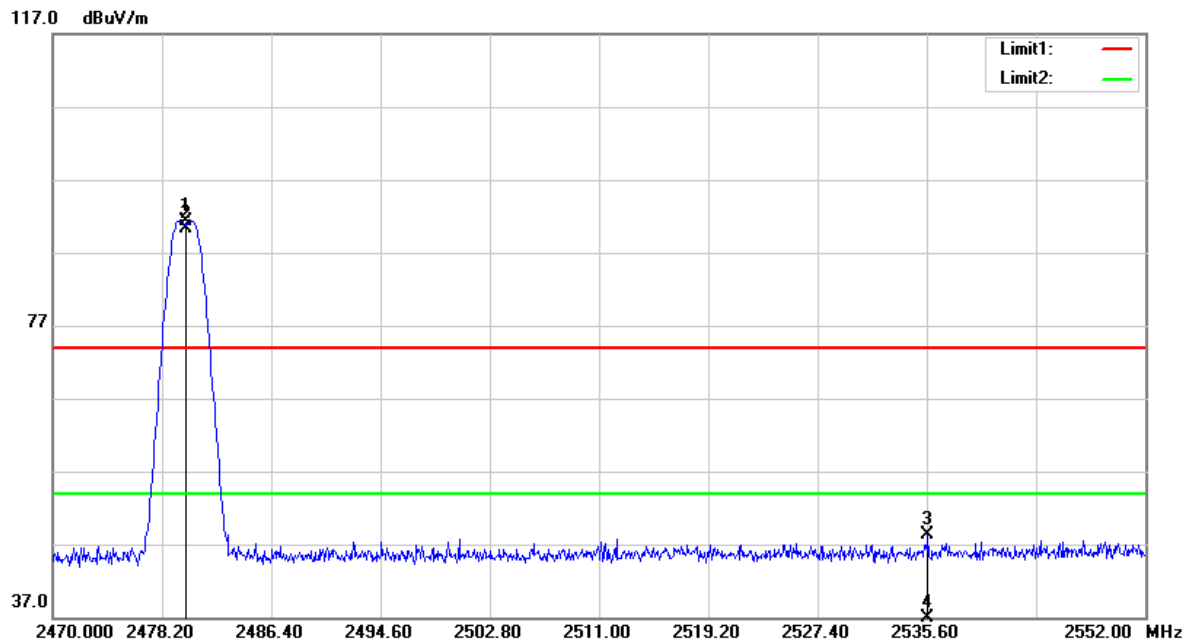
Note:

Result = Reading + Correct Factor

Margin = Result – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Job No.:	RXZ210924001	Ant.Polar.:	Vertical
Standard:	NCC LP0002 4.10.1 Peak 3m	Test Distance:	3m
Test item:	Radiation Test	Power:	AC 110V/60Hz
Temp.(°C)/Hum.(%RH):	25.8(°C)/63%RH	Date:2021/9/30	Time:上午 09:36:56
		Test By:	D.L
Description:	BLE-2M-TX-2480-X_Axis		



Frequency (MHz)	Reading (dBμV)	Correct Factor(dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
2480.000	100.69	-9.31	91.38	N/A	N/A	148	225	peak
2480.000	99.71	-9.31	90.40	N/A	N/A	148	225	AVG
2535.682	56.97	-8.77	48.20	74.00	-25.80	148	225	peak
2535.682	45.59	-8.77	36.82	54.00	-17.18	148	225	AVG

Note:

Result = Reading + Correct Factor

Margin = Result – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

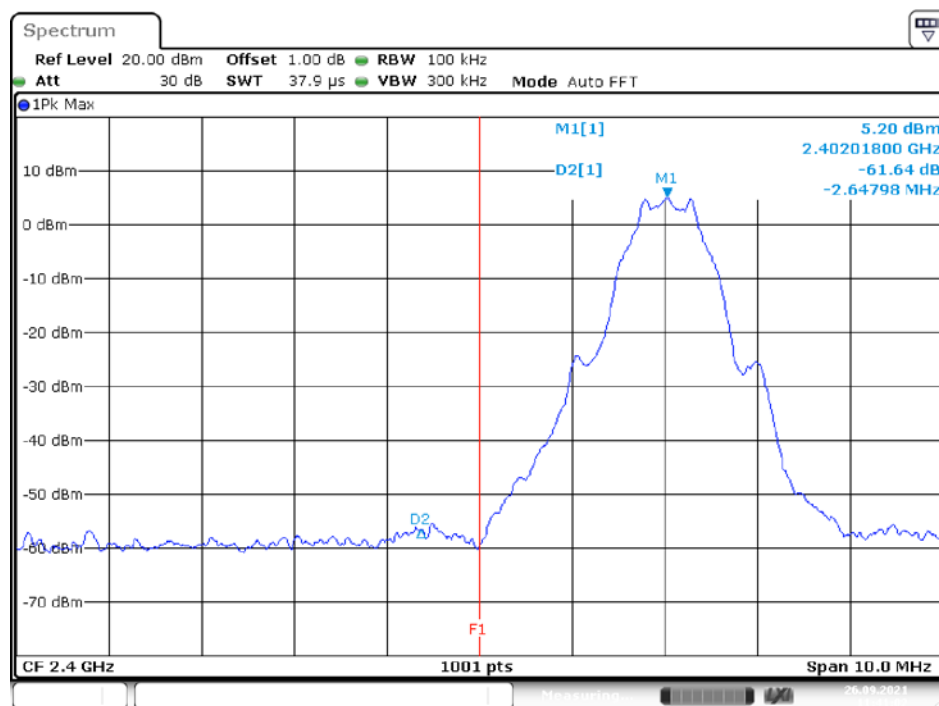
Conducted Bandedge

環境溫度	25℃	測試日期	2021-09-26
環境濕度	55%	測試人員	李宥陞

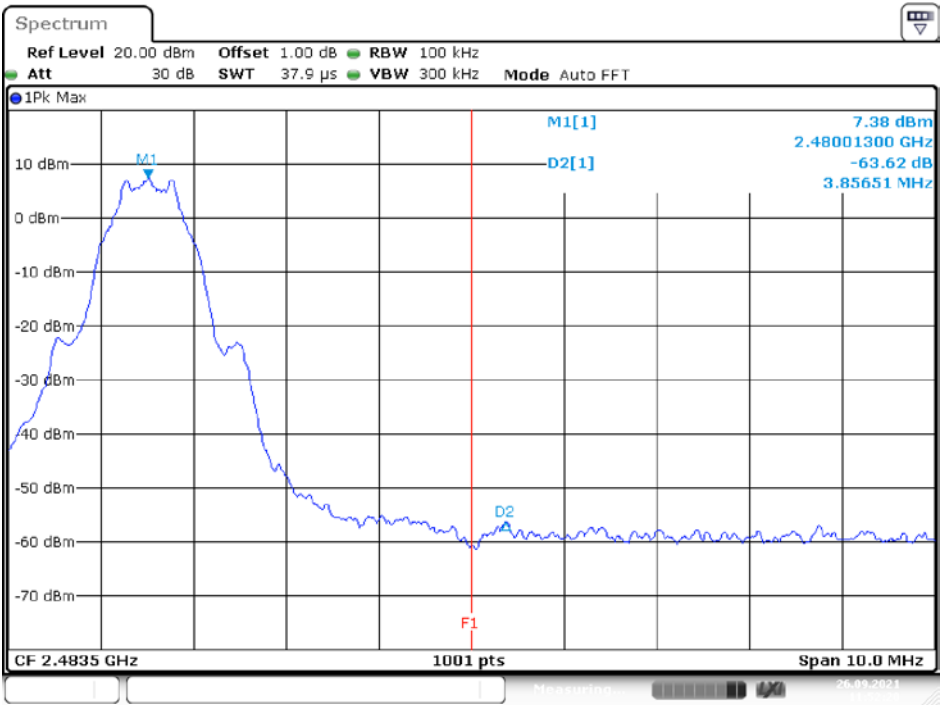
Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
BLE(1M) mode				
Low	2402	61.64	≥ 20	PASS
High	2480	63.62	≥ 20	PASS
BLE(2M) mode				
Low	2402	45.39	≥ 20	PASS
High	2480	63.48	≥ 20	PASS

Conducted Band Edges

BLE(1M) Mode / CH Low

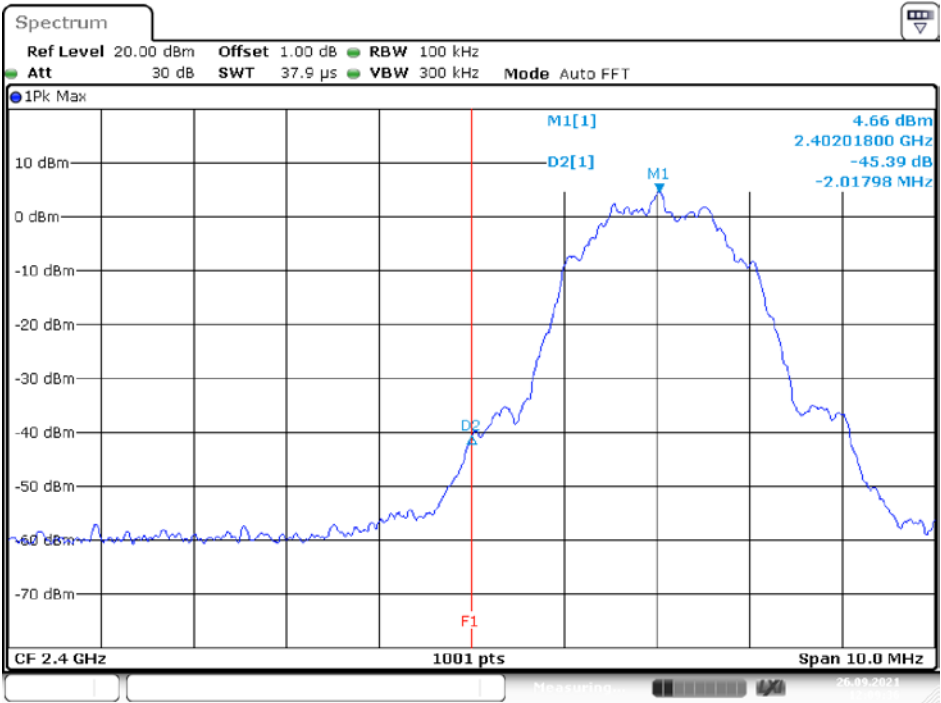


BLE(1M) Mode / CH High



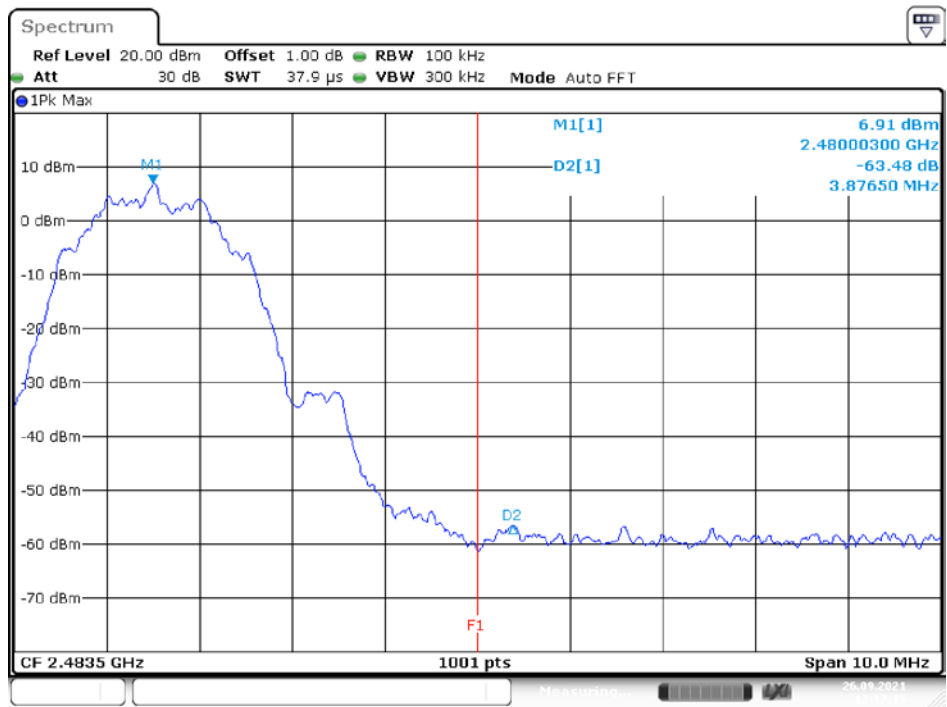
Date: 26.SEP.2021 11:52:21

BLE(2M) Mode / CH Low



Date: 26.SEP.2021 12:09:37

BLE(2M) Mode / CH High



Date: 26.SEP.2021 12:17:15

10. 功率密度之量測

10.1 適用標準

依據低功率射頻電機技術規範規定，在使用頻率範圍之任一3 kHz頻寬內，由發射機傳導至天線之功率頻譜密度在任意傳輸期間內，皆小於或等於8毫分貝(dBm)，且應依規定方式降低功率頻譜密度限制值。

10.2 測試方法

1. 將發射機之天線埠經由適當之衰減直接連至測試儀器。找出發射峰值並擴展於通帶內，設定解析頻寬為3 kHz，視訊頻寬大於解析頻寬，掃描時間為頻率掃描範圍除以3 kHz。所測得之峰值位準必須應小於或等於8dBm。
2. 若受測裝置之頻譜線間隔小於3kHz，測量時應將解析頻寬降低以使頻譜線間隔大於3kHz，所測得之數據再藉加總3kHz頻帶內所有個別頻譜線之功率(即標準化至3kHz)以決定是否符合規定。

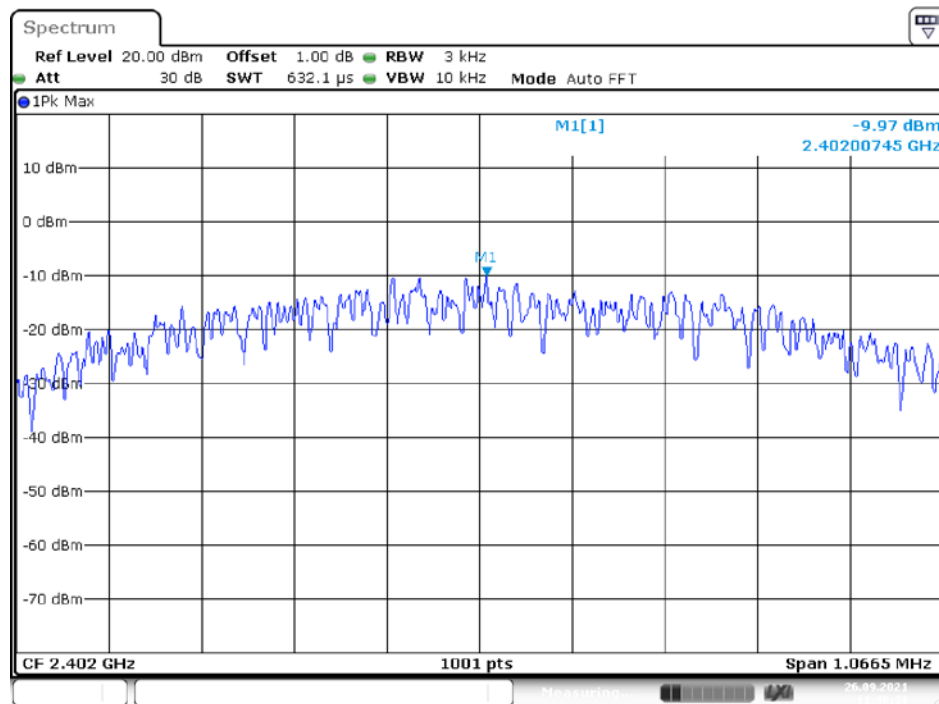
10.3 功率密度之量測結果

環境溫度	26°C	測試日期	2021-09-26
環境濕度	47%	測試人員	李宥陞

Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Result
BLE(1M) mode				
Low	2402	-9.97	8.00	PASS
Mid	2440	-9.56		PASS
High	2480	-7.68		PASS
BLE(2M) mode				
Low	2402	-12.15	8.00	PASS
Mid	2440	-11.86		PASS
High	2480	-9.91		PASS

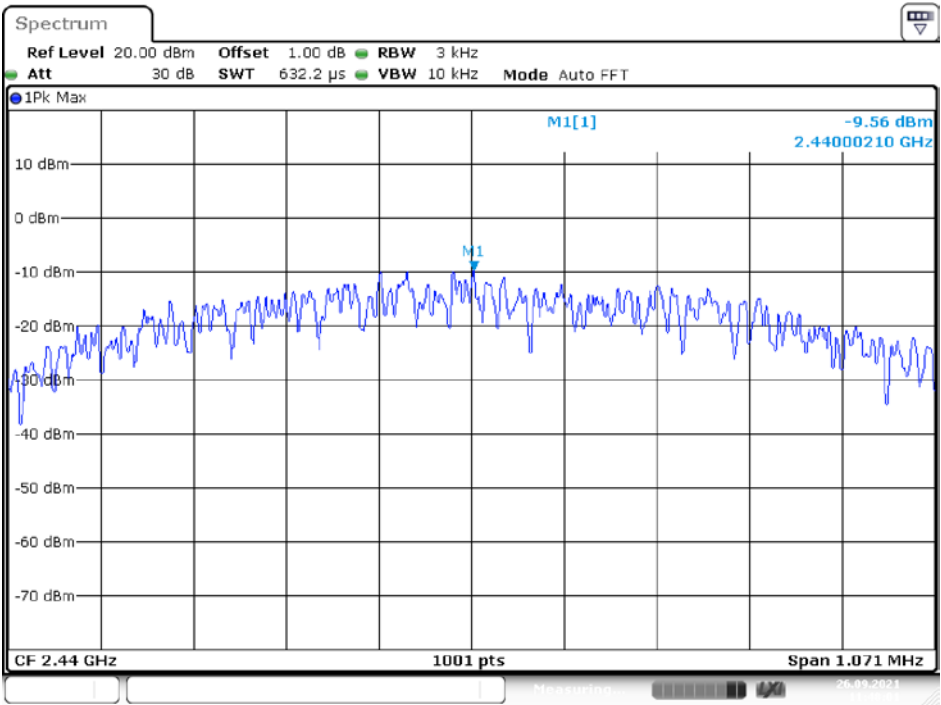
PSD

BLE(1M) Mode Low Channel



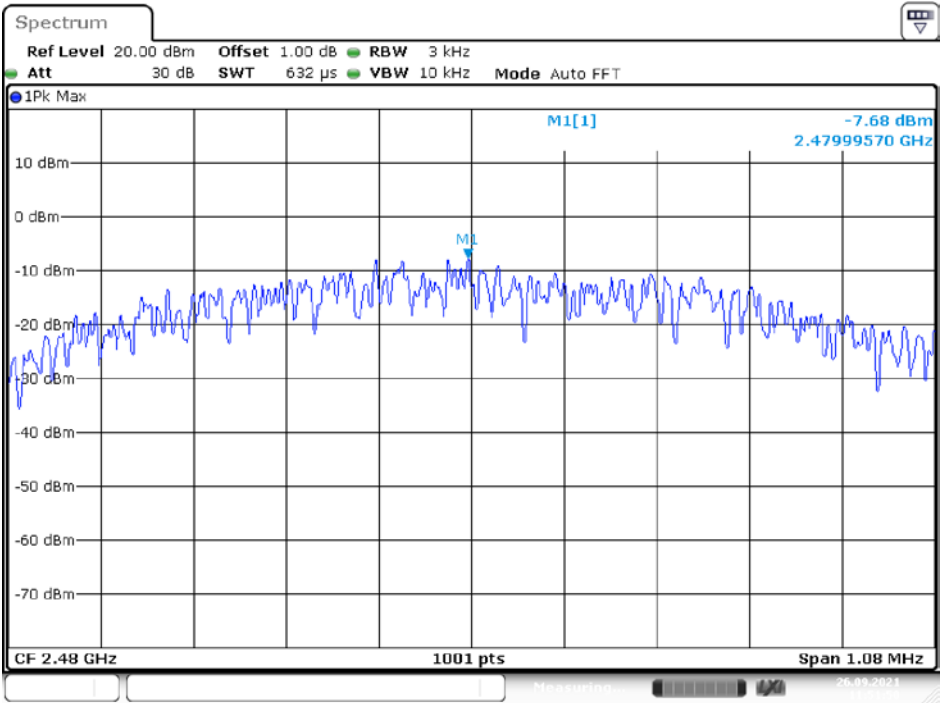
Date: 26.SEP.2021 11:40:31

BLE(1M) Mode Middle Channel



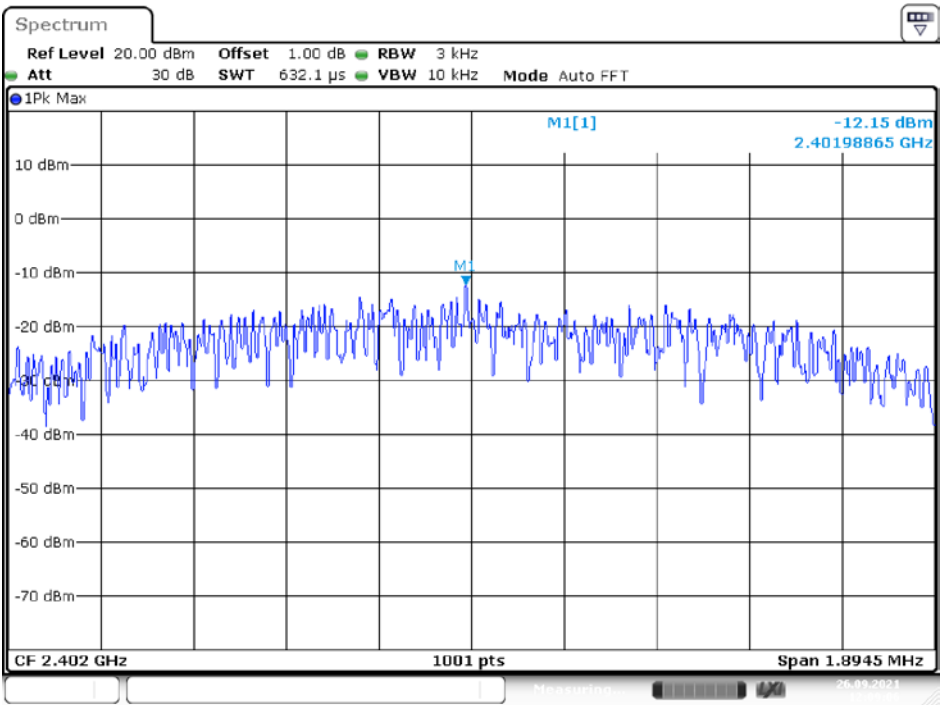
Date: 26.SEP.2021 11:48:01

BLE(1M) Mode High Channel



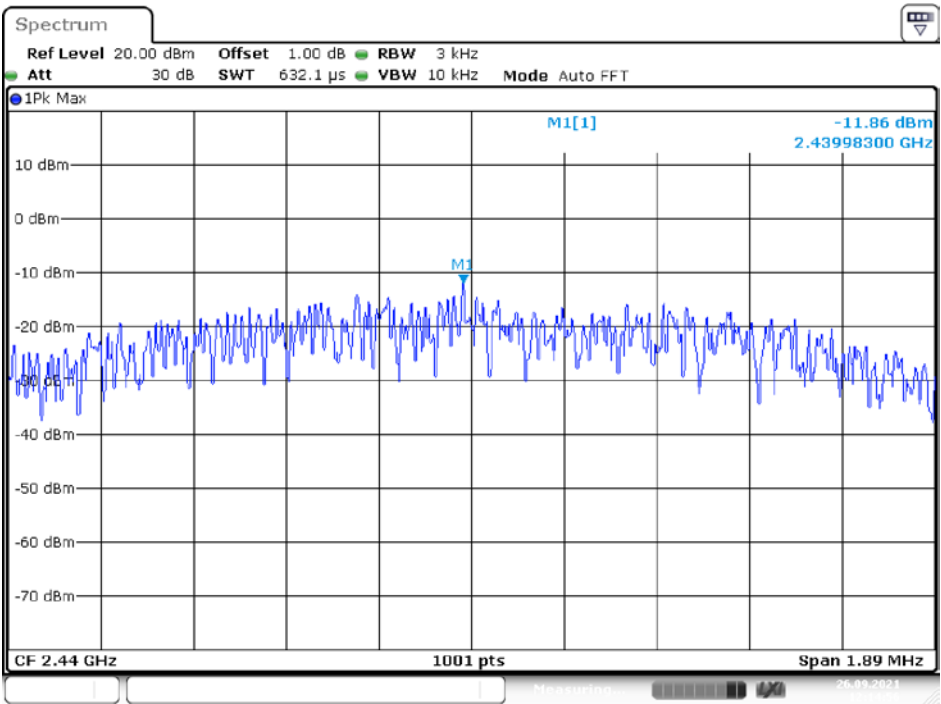
Date: 26.SEP.2021 11:51:50

BLE(2M) Mode Low Channel



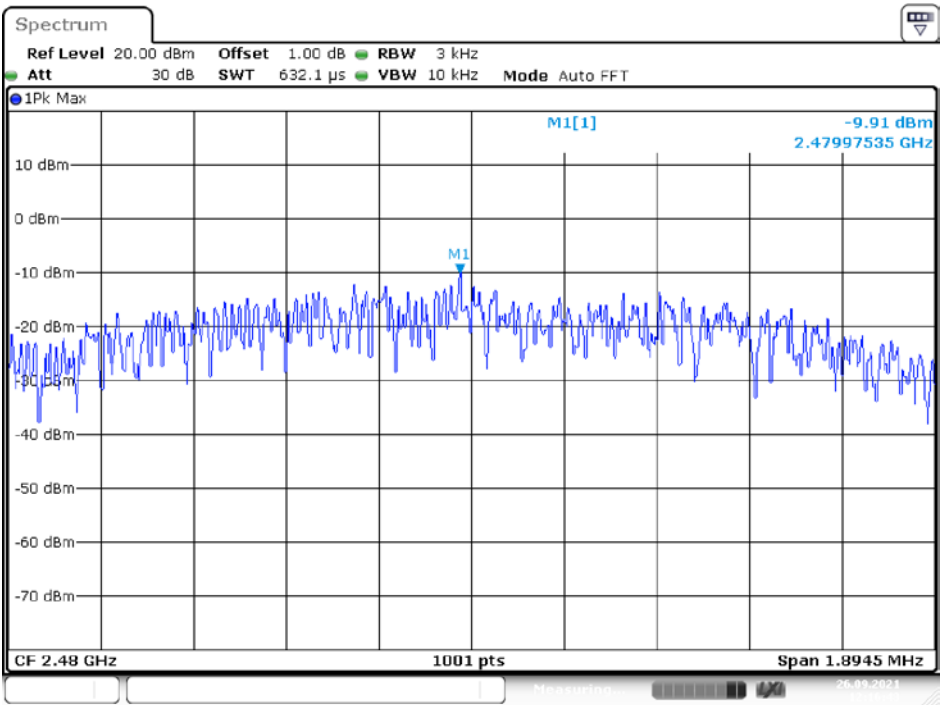
Date: 26.SEP.2021 12:09:06

BLE(2M) Mode Middle Channel



Date: 26.SEP.2021 12:14:56

BLE(2M) Mode High Channel



Date: 26.SEP.2021 12:16:44

11. 電波曝露量之評估

11.1 適用標準

依據低功率射頻電機技術規範之規定，若受測物於正常操作模式下，其發射機距離人體 20 公分以上者，可測試最大曝露允許值(Maximum Permissible Exposure，MPE)以證明其符合電波曝露量之要求。

限制值

5.20.2.2 一般人/不可控制之曝露

頻率範圍 (MHz)	電場強度 (V/m)	磁場強度 (A/m)	功率密度 (mW/cm ²)	平均時間 (分)
0.3~1.34	614	1.63	*100	30
1.34~30	824/f	2.19/f	*180/f ²	30
30~300	27.5	0.073	0.2	30
300~1,500	-	-	f/1500	30
1,500~100,000	-	-	1.0	30

註 1：標記*表平面波等效功率密度。

註 2：f 表測試頻率，單位：MHz。

Calculated Formulary:

Predication of MPE limit at a given distance

$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm²);

P = power input to the antenna (in appropriate units, e.g., mW);

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

11.2 電波曝露量之結果

Test mode: BLE 2M mode

Frequency (MHz)	Power		Antenna Gain		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
	(dBm)	(mW)	(dBi)	(numeric.)			
2402-2480	8.51	7.096	4.42	2.77	20	0.00391	1

電磁波曝露量 MPE 標準值

1mW/cm²，送測產品實測值為： 0.00391 mW/cm²

12. 量測儀器一覽表

儀器名稱	廠商	型號	序號	校驗日期	下次校驗日期
AC Line Conduction Room (CON-A)					
LISN	Rohde & Schwarz	ENV216	101612	2020/12/30	2021/12/29
LISN	Rohde & Schwarz	ENV216	101248	2021/6/8	2022/6/7
LISN	COM-POWER	LI-550A	211726	2020/12/30	2021/12/29
LISN	COM-POWER	LI-550A	211727	2020/12/30	2021/12/29
DC LISN	COM-POWER	LIN-115	241113	2020/11/17	2021/11/16
EMI Test Receiver	Rohde & Schwarz	ESR3	102099	2021/6/9	2022/6/8
Pulse Limiter	Rohde & Schwarz	ESH3Z2	TXZEM104	2021/7/29	2022/7/29
RF Cable	EMEC	EM-CB5D	1	2021/6/11	2022/6/11
Software	AUDIX	E3	V9.150826k	N.C.R	N.C.R
Radiation 3M Room (966-A)					
Active Loop Antenna	ETS-Lindgren	6502	35796	2021/3/16	2022/3/15
Bilog Antenna with 6 dB Attenuator	SUNOL SCIENCES & MINI-CIRCUITS	JB6/UNAT-6+	A050115/155 42_01	2021/1/19	2022/1/18
EMI Test Receiver	Rohde & Schwarz	ESR7	101419	2020/11/12	2021/11/11
Horn Antenna	EMCO	SAS-571	1020	2021/4/23	2022/4/22
Horn Antenna	ETS-Lindgren	3116	62638	2021/8/11	2022/8/10
Preamplifier	Sonoma	310N	130602	2021/6/8	2022/6/7
Preamplifier	A.H. system Inc.	PAM-0118P	466	2020/11/5	2021/11/4
Microwave Preamplifier	EM Electronics Corporation	EM18G40G	60656	2020/12/30	2021/12/29

Spectrum Analyzer	Rohde & Schwarz	FSV40	101435	2021/1/7	2022/1/6
Micro flex Cable	UTIFLEX	UFB197C-1-2362-70U-70U	225757-001	2021/2/1	2022/1/31
Coaxial Cable 同軸電纜	COMMATE	PEWC	8Dr	2020/12/25	2021/12/24
Coaxial Cable 同軸電纜	UTIFLEX	UFB311A-Q-1440-300300	220490-006	2021/2/1	2022/1/31
Coaxial Cable	JUNFLON	J12J102248-00-B-5	AUG-07-15-044	2020/12/25	2021/12/24
Cable	EMC	EMC105-SM-SM-10000	201003	2021/2/3	2022/2/2
Software	Farad	EZ_EMC	BACL-03A1	N.C.R	N.C.R
Conducted Room					
Spectrum Analyzer	Rohde & Schwarz	FSV40	101140	2021/1/7	2022/1/6
Cable	UTIFLEX	UFA210A	9435	2020/10/8	2021/10/7
Power Sensor	KEYSIGHT	U2021XA	MY54080018	2021/1/28	2022/1/27
Attenuator	MINI-CIRCUITS	BW-S10W5+	1419	2021/1/28	2022/1/27

*Statement of Traceability: BACL Corp. attests that all of the calibrations on the equipment items listed above were traceable to the SI System of Units via the R.O.C. Center for Measurement Standards of the Electronics Testing Center, Taiwan (ETC) or to another internationally recognized National Metrology Institute (NMI), and were compliant with the current Taiwan Accreditation Foundation (TAF) requirements.

13. 試驗室之測試不確定度

測試項目	測試場地 / 測試頻率	不確定度
傳導干擾電壓量測	AC Line Conduction	± 3.82 (dB)
輻射干擾場強量測 (測試距離: 3m)	3M Chamber / 30~1000MHz	± 5.46 (dB)
	3M Chamber / 1~6GHz	± 5.24 (dB)
	3M Chamber / 6~18GHz	± 5.62 (dB)
	3M Chamber / 18~40GHz	± 5.86 (dB)
佔用頻寬	Conducted	± 0.35 (MHz)
輸出功率	Conducted	± 0.93 (dB)
直量雜散	Conducted	± 1.69 (dB)
功率密度	Conducted	± 0.93 (dBm/kHz)

- a) 必要為試驗結果作解釋時，依 ISO/IEC 17025 第 7.8.3.1 要求，實驗室得決定是否在測試報告上包含量測不確定度評估結果。
- b) 測試證書/報告中提供量測不確定度資訊時，通常應使用 “ $y \pm U$ (y 和 U 的單位)” 或類似的表述方式；量測結果的數值與其量測不確定度亦可以列表方式表達。視需要，擴充不確定度也可以用相對擴充不確定度 $U / |y|$ 的方式表達，如指數或百分比。應在證書/報告中註明不確定度的涵蓋因子及涵蓋機率(或信賴水準)，可以使用以下文字描述：
- 「本報告的擴充不確定度，係以組合標準不確定度乘以涵蓋因子 k ($k=2$) 來表示，相應之涵蓋機率(或信賴水準)約為 95 %。」

***** END OF REPORT *****