

低功率射頻器材試驗報告

申請廠商 HMD Global Oy
製造廠商 Bertel Jungin aukio 9,02600 ESPOO. FINLAND
產品名稱 HMD Global Oy
廠牌 4G無線藍牙手持式行動電話機
型號 NOKIA
技術標準 TA-1337
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民國110年1月7日

待測裝置已於台灣檢驗科技股份有限公司射頻實驗中心，依據國家通訊傳播委員會於中華民國一百零九年七月頒佈之低功率射頻器材技術規範測試。

台灣檢驗科技股份有限公司根據此條文規範項目測試，測試各項數據皆能符合此規範規定之限度值。

報告中所描述之測試結果和待測設備的架構組合，均根據實際量測情況作詳實的記錄，且本測試報告僅對上述待測設備樣品負責。

Approved By:

楊景嵐

楊景嵐



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Revision History

Report Number	Revision	Description	Issue Date	Remark
ER/2020/A0090	00	Original.	Jan. 07, 2021	Revised By: Yuri Tsai

Note:

1、Disclaimer

Antenna information is provided by the applicant, the test results of this report are applicable to the sample EUT received.

2、測試報告 ER/2020/A0088 之電源線傳導干擾及 Fully system 場強輻射測試數據，沿用於此報告中。

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1 測試實驗室資料:

實驗室認可登錄 : 中華民國實驗室認證體系

認可編號 : TAF 3702, 認可頻率範圍9kHz ~ 200GHz

認證有效期間 : 109年01月30日起至110年06月13日止

測試場地 : 新北市新北產業園區五工路134號

實驗室名稱 : 台灣檢驗科技股份有限公司
射頻實驗中心

實驗室地址 : 新北市新北產業園區五工路134號

電話 : 886-2-22993939

傳真 : 886-2-22982698

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2 實驗室之量測不確定度

量測項目	量測不確定度 (擴充不確定度)		
傳導干擾量測	電源線	0.15-30MHz	2.586 dB
輻射干擾量測 (3m測距)	水平極化	9kHz - 30MHz	2.3dB
		30-167MHz	4.22dB
		167-500MHz	3.44dB
		0.5-1GHz	3.39dB
		1-18GHz	4.08dB
		18-40GHz	4.08dB
	垂直極化	9kHz - 30MHz	2.3dB
		30-180MHz	3.37dB
		180-417MHz	3.19dB
		0.417-1GHz	3.19dB
		1-18GHz	4.04dB
		18-40GHz	4.04dB
頻率誤差量測	範例一	2.4 GHz	290 Hz
	範例二	5 GHz	724.3 Hz
輸出功率	傳導方式	2.4 GHz	1.3 dB
		5 GHz	1.55 dB
有效輻射功率 (輻射方式)	水平極化	2.4GHz	4.21 dB
		5 GHz	4.62 dB
	垂直極化	2.4 GHz	4.42 dB
		5 GHz	4.74 dB
功率頻譜密度	傳導方式	2.4GHz	1.3dB
		5GHz	1.67dB
鄰頻道功率量測 (輻射方式)	水平極化	30-167MHz	4.22dB
		167-500MHz	3.44dB
		0.5-1GHz	3.39dB
	垂直極化	30-180MHz	3.37dB
		180-417MHz	3.19dB
		0.417-1GHz	3.19dB

附註: 1. K=2 即代表測試結果具有95%的量測可信度。

2. 本報告中的符合性判定僅依據試驗結果，不考慮其試驗結果的量測不確定度。

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3 一般資料

3.1 產品描述

產品名稱	4G無線藍牙手持式行動電話機	
型號	TA-1337	
產品商標	NOKIA	
USB Cable	1. Model No: SHQ-A069A, Brand: Saibao 2. Model No: L56B-052000100, Brand: Liqi	
Headset	Model No: NLD-EM300M-07SF, Brand: NEW Leader	
使用電源	3.8 Vdc from Rechargeable Li-polymer Battery or 5 Vdc from AC/DC Adapter	
	Battery:	1. Model No: HQ430, Brand: NOKIA 2. Model No: HQ430, Brand: NOKIA
	Adapter:	Model No: CH-21U, Brand: NOKIA

3.2 射頻特性

發射頻帶	2402MHz – 2480MHz
輸出功率	0.66dBm (Peak)
調變方式	BT Dual mode LE (GFSK)
頻道數	40
天線型式/天線增益	PIFA Antenna, Gain: 0.4dBi Model No.: ANT3; Supplier: Nokia

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4 測試方法之依據

本測試報告之所有項目皆依據國家通訊傳播委員會低功率射頻器材技術規範(LP0002, 109.7.1 版本) 如無國家標準可適用者, 得依美國 EIA、IEEE ANSI 檢驗法檢驗, 及美國 FCC 47 CFR Part 2 有關檢驗之規定及參考 ANSI 63.10:2013、FCC CFR 47 15.247 之檢驗法。

低功率射頻器材技術規範4.10節

項次	測試項目	適用規範	測試結果
1	場強輻射	低功率射頻器材技術規範 4.10.1.5節	合格
2	電源線傳導干擾	低功率射頻器材技術規範 3.3節	合格
3	天線增益之要求	低功率射頻器材技術規範 4.10.1.3 (1) 節	合格
4	發頻頻寬	低功率射頻器材技術規範 4.10.1.6(2) (A) 節	合格
5	輸出峰值功率	低功率射頻器材技術規範 4.10.1.2(1) (C) 節	合格
6	開放頻帶邊緣之發射	低功率射頻器材技術規範 4.10.1.5節	合格
7	功率密度	低功率射頻器材技術規範 4.10.1.6(2) (B) 節	合格

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5 測試模式

RADIATED EMISSION TEST:

RADIATED EMISSION TEST (BELOW 1 GHz)				
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)
Bluetooth LE	0 to 39	20	GFSK	1
Fully system				
RADIATED EMISSION TEST (ABOVE 1 GHz)				
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)
Bluetooth LE (TX)	0 to 39	0,20,39	GFSK	1
Bluetooth LE (RX)	0 to 39	20	GFSK	1

ANTENNA PORT CONDUCTED MEASUREMENT:

CONDUCTED TEST				
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)
Bluetooth LE	0 to 39	0,20,39	GFSK	1

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6 適用規範

6.1 規範要求 (一般規定)

(1) 傳導之規定

依據NCC低功率射頻器材技術規範之3.3節，以市電為電源之低功率射頻器材，其傳導回電源線上頻率自150 kHz~30 百萬赫(MHz) 之射頻電壓(在電源端子每一電源線對接地點)應小於或等於下表所列之限制值。測量時應經過50 微亨利(uH)及50 歐姆(Ω)之電源線阻抗穩定網路(Line Impedance Stabilization Network；LISN)。頻率重疊處，以較低限制值為準。

頻率(MHz)	傳導限制值 (dBuV)	
	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

(2) 輻射之規定

依據NCC低功率射頻器材技術規範3.5之要求，其他開放頻帶外不必要之輻射需符合3.6節之一般限制要求，其電場強度不得超過下表之限值，且其不必要之發射皆不得大於主波發射強度。各頻段重疊處，以較嚴格之限制值為準。

頻率 MHz	測試距離 m	其他發射之限制值	
		dB μ V/m	μ V/m
0.009 – 0.490 (含)	300	128.5-93.8	2,400 / 頻率 (千赫)
0.490 (不含) – 1.705 (含)	30	73.8-62.9	24,000 / 頻率 (千赫)
1.705 (不含) – 30 (含)	30		30
30 - 88	3	40.0	100
88 - 216	3	43.5	150
216 - 960	3	46.0	200
960以上	3	54.0	500

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(3) 禁用頻帶限制之規定

依據NCC低功率射頻器材技術規範3.5節之要求，任何低功率射頻器材之主波皆不得使用下表所列各頻帶內之頻率；低功率射頻器材落於下表所列頻帶內之混附發射，其電場強度必須符合第3.6節的限制規定。

頻率 (MHz)	頻率 (MHz)	頻率 (MHz)
0.090~0.110	240.00~285.00	3332.0~3339.0
0.490~0.510	322.00~335.40	3345.8~3358.0
2.172~2.198	399.90~410.00	3500.0~4400.0
3.013~3.033	485.00~510.00	4500.0~5250.0
4.115~4.198	608.00~614.00	5350.0~5460.0
5.670~5.690	703.00~748.00	7250.0~7750.0
6.200~6.300	758.00~803.00	8025.0~8500.0
8.230~8.400	825.00~915.00	9000.0~9200.0
12.265~12.600	930.00~1240.0	9300.0~9500.0
13.340~13.430	1300.0~1427.0	10600~12700
14.965~15.020	1435.0~1626.5	13250~13400
16.700~16.755	1660.0~1785.0	14470~14500
19.965~20.020	1805.0~1880.0	15350~16200
25.500~25.700	1885.0~1900.0	17700~21400
37.475~38.275	1905.0~1985.0	22010~23120
73.500~75.400	2010.0~2025.0	23600~24000
108.00~138.00	2110.0~2170.0	31200~31800
149.90~150.05	2200.0~2300.0	36430~36500
156.70~156.90	2310.0~2390.0	38600 以上
162.01~167.17	2483.5~2900.0	
167.72~173.20	3260.0~3267.0	

(4) 依據NCC低功率射頻器材技術規範3.9節之要求，收、發信機為成套銷售者，收、發信機應一併送審或提供經型式認證合格之對應收、發信機之送審資料；送信機之輻射電場強度不得超過第3.6節之發射規定，且不得接收、解調第3.5節所列之頻率。

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6.2 規範要求

依據NCC低功率射頻器材技術規範4.10節 數位調變 (Digitally Modulated) 之要求，使用頻率為2400 MHz至2483.5 MHz 及 5725 MHz 至5850 MHz

(A) 峰值輸出功率之要求

依據 NCC 低功率射頻器材技術規範 4.10.1.2(1)(C)之規定，操作於 2400-2483.5 兆赫(MHz)與 5725-5850 兆赫(MHz)之所有數位調變技術系統：1 瓦(W)以下。

除使用附件二之峰值輸出功率量測方式外，並得使用以最大傳導輸出功率(Maximum Conducted Output Power)作為量測方式。

最大傳導輸出功率，定義為發射器操作在最大功率時，輸出至所有天線及天線單元 (antenna elements) 之總發射功率對信號集 (signaling alphabet) 所有符號 (symbol) 之平均值。此平均值不含發射器停止或已降低發射功率位準之任何時間區段。器材可操作於不同調變模式等多種模式時，最大傳導輸出功率為各模式之總發射功率其中最高者。

(B) 天線增益之要求

依據NCC低功率射頻器材技術規範4.10.1.3之規定，進行固定式點對點操作時，應符合下列情現之一：依據NCC低功率射頻器材技術規範4.10.1.3 (1)之規定，操作頻率為2400-2483.5兆赫(MHz)者，其發射天線之方向性增益超過6dBi，每超過3dB應降低1dB之最大傳導輸出功率。

依據NCC低功率射頻器材技術規範4.10.1.3 (2)之規定，操作頻率為5725-5850兆赫(MHz)者，其發射天線之方向性增益超過6dBi，不需降低最大傳導輸出功率。

依據NCC低功率射頻器材技術規範4.10.1.3 (3)之規定，用於點對多點操作時，如其發射天線之方向性增益超過 6dBi，應依所超過之dB數等量降低最大傳導輸出功率。

(C) 發射限制之要求

依據NCC低功率射頻器材技術規範4.10.1.5之規定，帶外發射限制：操作頻帶範圍外之任意100 kHz 內，發射機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，其衰減值限制如下：

(1) 輸出功率以附件二之峰值輸出功率方式測量者，至少須衰減20 dB，可使用射頻傳導或輻射方式測量。

(2) 輸出功率以4.10.1.2(1)(C)之最大傳導輸出功率測量方式者，至少須衰減30 dB。

此外，落於3.5 禁用頻段之輻射發射，應符合3.6 之規定。

(D) 頻寬之要求

依據NCC低功率射頻器材技術規範4.10.1.6(2) (A)規定，6dB之頻寬至少應500kHz。

(E) 功率密度之要求

依據NCC低功率射頻器材技術規範4.10.1.6(2) (B)規定，在使用頻率範圍之任意3千赫(kHz)頻寬內，由發射機傳導至天線之峰值發射電功率密度在任意期間內，皆不得大於8dBm。

註: 此產品為點對多點操作。

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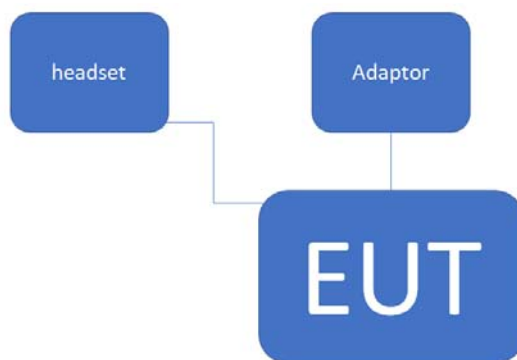
7 測試配置

7.1 待測物與測試週邊配置圖

Conducted (Antenna Port) & Radiated Emission



Conduction (AC power line) & Fully System



7.2 測試週邊描述

編號	產品別	商標	版本	型號	序號
1.	QRCT4	N/A	4.0.00138.0	N/A	N/A
2.	Adapter	Nokia	N/A	CH-21U	N/A
3.	Headset	NEW Leader	N/A	NLD-EM300M-07SF	N/A
4.	Notebook	Lenovo	N/A	L430	PK-126TN

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8 量測儀器設備

8.1 AC 電源端傳導干擾之量測儀器

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCI 7	100759	07/13/2020	07/12/2021
LISN	SCHWARZBECK	NSLK 8127	8127-465	04/09/2020	04/08/2021
Coaxial Cables	N/A	Coaxial Cable	161207	12/07/2019	12/06/2020
Test Software	audix	e3	Ver. 6.11-20180413	N.C.R	N.C.R

註: 以上部份設備跟量測值沒有影響, 且沒有直接關聯, 因此不需要進行校正。

8.2 天線端傳導測試之量測儀器

SGS Conducted Room					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Meter	Anritsu	ML2496A	1804001	02/20/2020	02/19/2021
Power Sensor	Anritsu	MA2411B	1726104	02/20/2020	02/19/2021
Power Sensor	Anritsu	MA2411B	1726107	02/20/2020	02/19/2021
EXM Spectrum Analyzer	KEYSIGHT	N9010B	MY59071571	06/27/2020	06/26/2021
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2020	01/01/2021

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8.3 量測場強輻射之量測儀器 & Fully System

966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Horn Antenna	Schwarzbeck	BBHA9170	184	12/25/2019	12/24/2020
Horn Antenna	Schwarzbeck	BBHA9120D	D803	12/20/2019	12/19/2020
Bi-log Antenna	TESEO	CBL 6112D	35242 & AT-N0555	01/13/2020	01/12/2021
Loop Antenna	ETS.LINDGREN	6502	148045	10/19/2020	10/18/2021
Spectrum Analyzer	Agilent	E4446A	MY51100003	10/29/2020	10/28/2021
EMI Test Receiver	R&S	ESCI 7	100759	07/13/2020	07/12/2021
Pre-Amplifier	EMC Instruments	EMC184045B	980135	01/02/2020	01/01/2021
Pre-Amplifier	EMC Instruments	EMC051825	980152	01/02/2020	01/01/2021
Pre-Amplifier	HP	8447D	2944A09469	01/02/2020	01/01/2021
Attenuator	Mini-Circuit	BW-S10W2+	4	01/02/2020	01/01/2021
Filter 2400-2483.5 MHz	EWT	EWT-14-0166	M1	01/02/2020	01/01/2021
High Pass Filter	WI	WHKX4.0/18G-10SS	22	01/02/2020	01/01/2021
Coaxial Cable	Huber Suhner	succoflex 102	MY2622/2	01/02/2020	01/01/2021
Coaxial Cable	Huber Suhner	succoflex 104A	800086/4a	01/02/2020	01/01/2021
Coaxial Cable	Huber Suhner	EMC 104-SM-SM-2000	160123	01/02/2020	01/01/2021

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9 電源線傳導干擾之量測

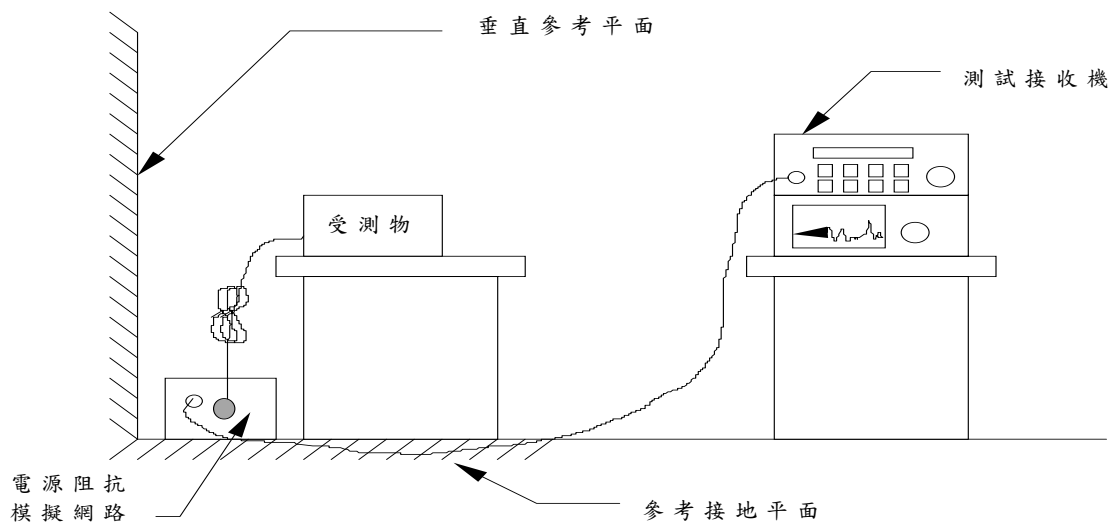
9.1 適用標準

依據NCC低功率射頻器材技術規範3.3節之要求。

9.2 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的峰值量側(Peak)並提供掃描圖，Mark 最大的六個頻率點進行準峰值量測(QP),如果準峰值QP結果值已低於AV限制值時將不再進行AV值的量測。

9.3 測試配置



9.4 干擾值之計算

電源傳導干擾電壓之計算公式如下

$$\text{結果值} = \text{儀器讀值}(QP/AV) + \text{校正因子}$$

其中校正因子為：

$$\text{饋線損失} + \text{電源阻抗模擬網路損失}$$

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9.5 傳導干擾之量測結果:

Report Number :ER-2020-A0088

Test Site :Conduction 6F

Test Mode :Operation

Test Date :2020-12-01

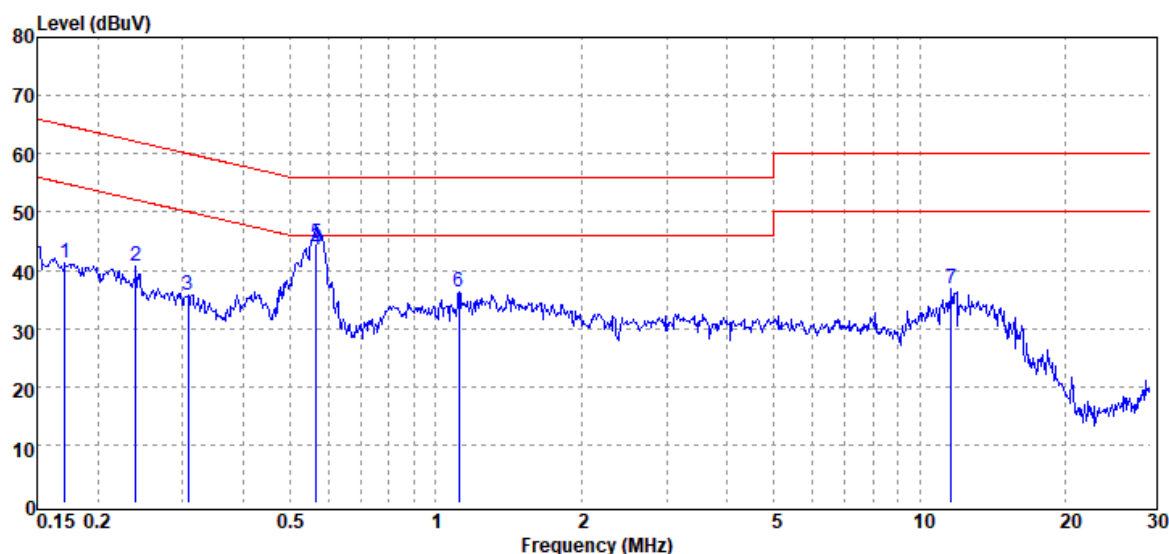
Power :AC 110V/60Hz

Temp./Humi. :25.0/61

Probe :L

Engineer :Neo

Note :



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV	Limit dBμV	Margin dB
0.17	Peak	38.98	2.14	41.12	64.90	-23.78
0.24	Peak	38.49	2.14	40.63	62.08	-21.45
0.31	Peak	33.68	2.15	35.83	60.02	-24.19
0.57	Average	41.23	2.16	43.39	46.00	-2.61
0.57	QP	42.44	2.16	44.60	56.00	-11.40
1.12	Peak	34.08	2.19	36.27	56.00	-19.73
11.62	Peak	33.91	2.88	36.79	60.00	-23.21

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Report Number :ER-2020-A0088

Test Site :Conduction 6F

Test Mode :Operation

Test Date :2020-12-01

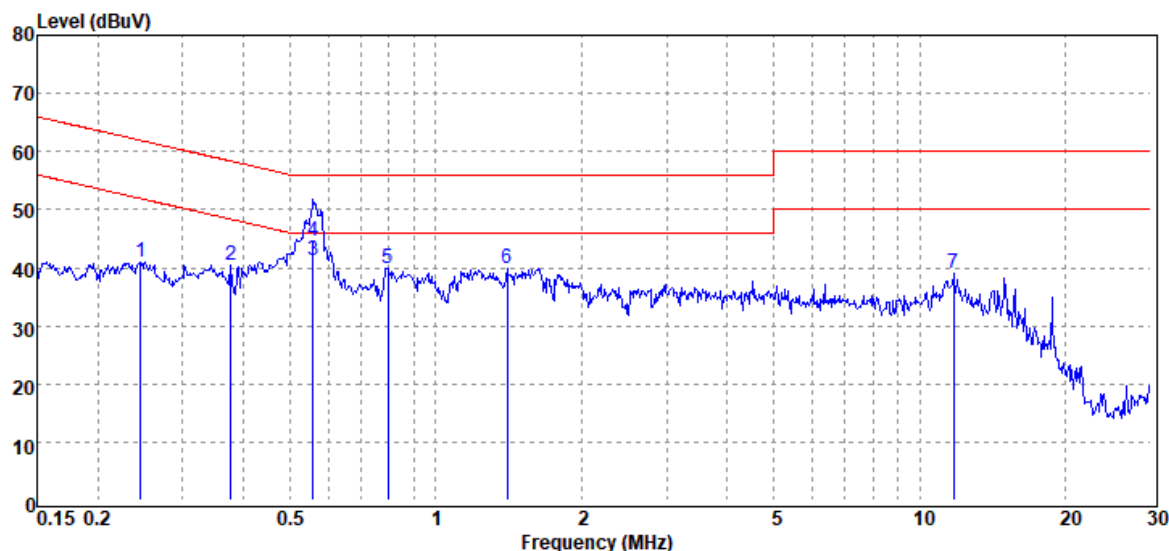
Power :AC 110V/60Hz

Temp./Humi. :25.0/61

Probe :N

Engineer :Neo

Note: :



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV	Limit dBμV	Margin dB
0.25	Peak	38.67	2.21	40.88	61.91	-21.03
0.38	Peak	38.22	2.21	40.43	58.34	-17.91
0.56	Average	38.89	2.22	41.11	46.00	-4.89
0.56	QP	42.46	2.22	44.68	56.00	-11.32
0.80	Peak	37.63	2.24	39.87	56.00	-16.13
1.40	Peak	37.65	2.27	39.92	56.00	-16.08
11.75	Peak	36.29	2.79	39.08	60.00	-20.92

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10 場強輻射之量測

10.1 適用標準

依據NCC低功率射頻器材技術規範4.10.1.5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。

10.2 量測方法

將待測物置於非金屬桌面，測試頻率1GHz以下時，使用桌高0.8 米，1GHz以上時，使用桌高1.5米，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。

1GHz 以下先進行Peak 值量測，若Peak 以低於QP 限制值將不在進行QP 量測，否則，則進行QP 值量測，1GHz 以上先進行Peak 值量測，若Peak 以低於AV 限制值將不在進行AV值量測，否則，則進行AV 值量測。

9kHz~150kHz 測試

解析頻寬:	300Hz	視訊頻寬:	300Hz
量測天線:	6502	檢測器:	Quasi-Peak

150kHz~30MHz 測試

解析頻寬:	10kHz	視訊頻寬:	10kHz
量測天線:	6502	檢測器:	Quasi-Peak

1GHz 以下測試

解析頻寬:	100kHz	視訊頻寬:	100kHz
量測天線:	CBL 6112D	檢測器:	Quasi-Peak

1GHz 以上測試

量測天線:	BBHA9170 BBHA9120D	檢測器:	Peak, Average
頻譜分析儀設定	Peak: RBW: 1MHz ; VBW: 1MHz , Average: RBW: 1MHz ; VBW: 10Hz		

註: 9 kHz ~ 30MHz 之輻射量測皆低於限制值 20dB 以上，依據LP0002 6.13規定混附發射毋需記錄。

輻射量測僅放最差模式 (30MHz 以上)。

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10.3 場強度之計算

場強之計算公式如

$$\text{結果值} = \text{讀值} + \text{校正因子}$$

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）
量測結果請見下頁。

註1: 比較 H Plane、E1 Plane 和 E2 Plane 測試值後，附上最差模式 H Plane 數據。

註2: Fully System 附上最差模式 E1 Plane 數據。

Note: Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

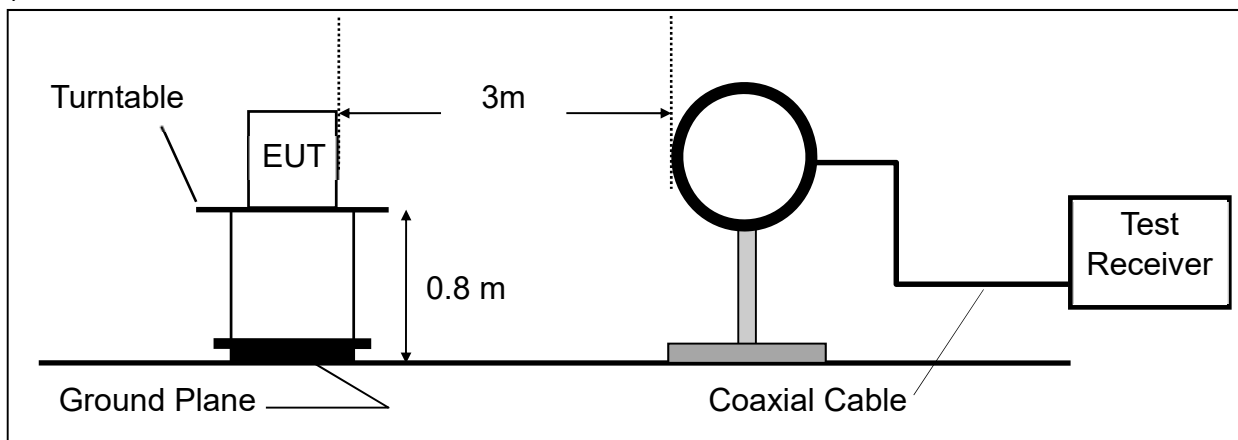
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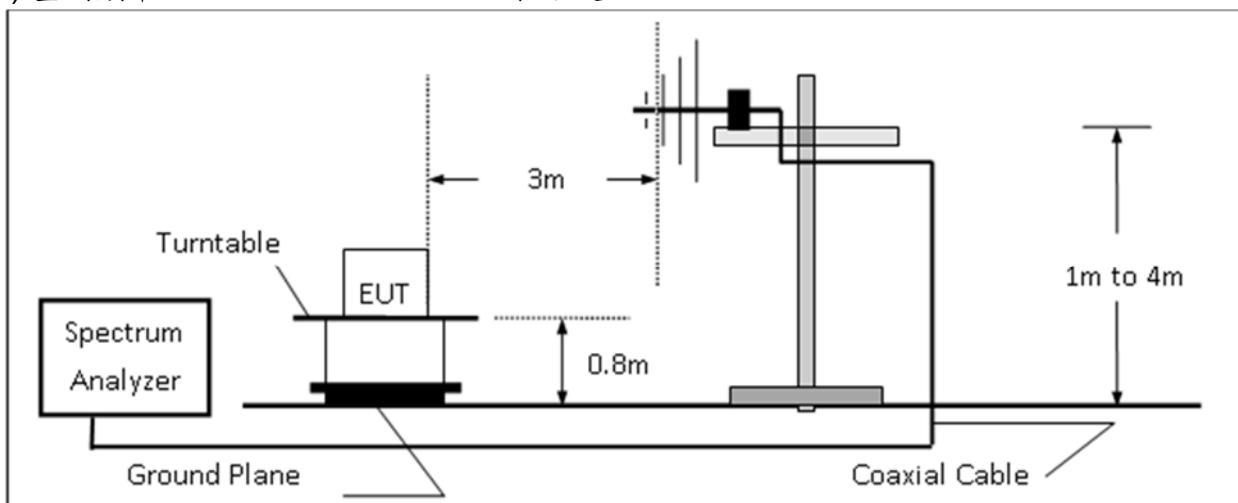
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10.4 輻射之測試配置

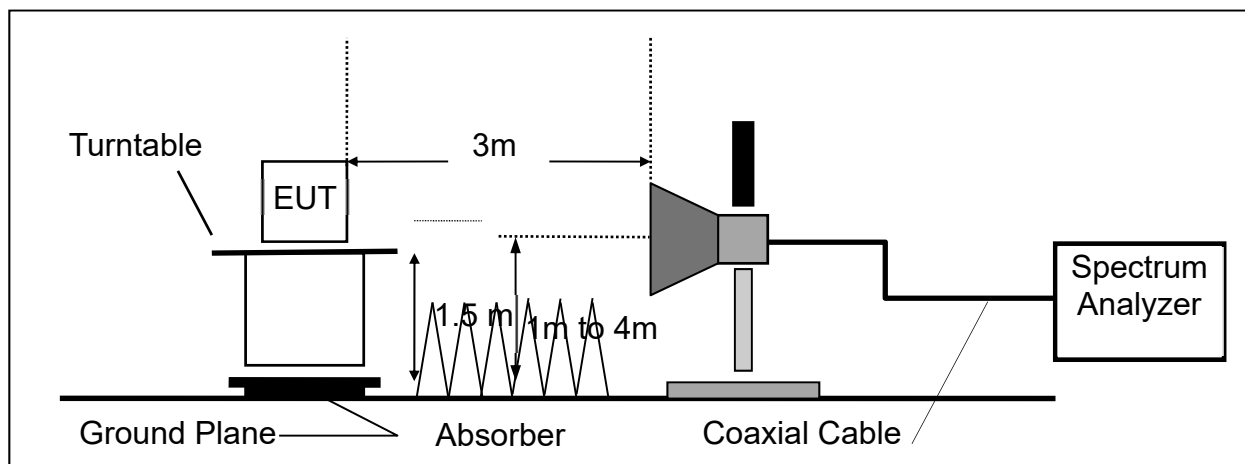
(A) 量測頻率低於 30MHz 以下之測試配置



(B) 量測頻率 30MHz 至 1000MHz 之測試配置



(C) 量測頻率 1000MHz 以上之測試配置



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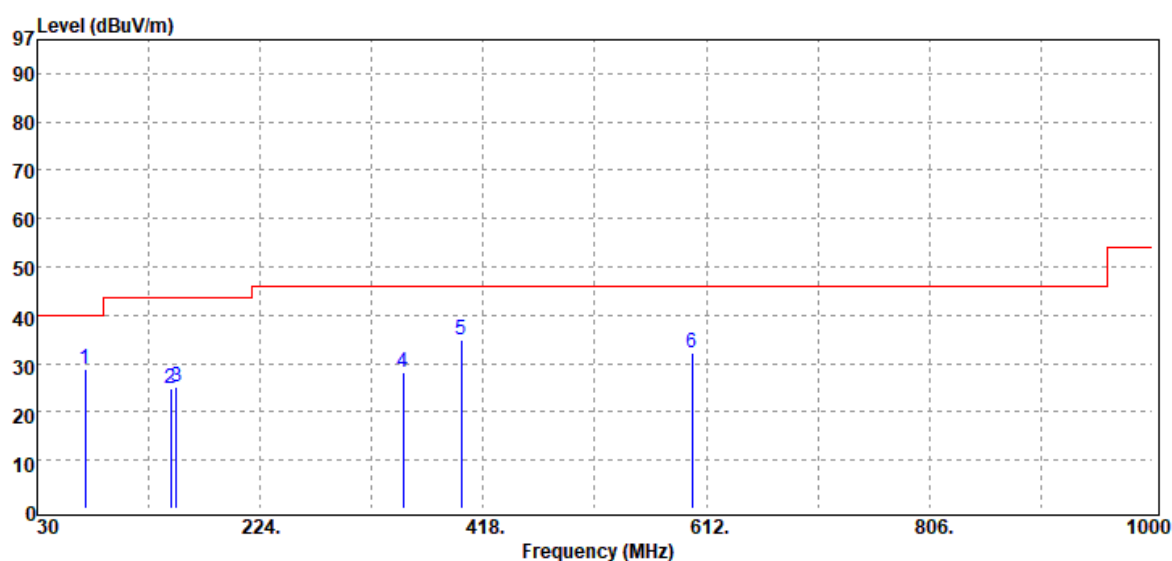
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10.5 場強輻射之量測結果

10.5.1 發射機場強輻射之量測結果(1GHz 以下)

Report Number :ER/2020/A0090
 Operation Mode :BLE(1M)
 Test Frequency :2442 MHz
 Test Mode :Tx CH Mid
 EUT Pol :H Plane

Test Site :SAC I Chamber
 Test Date :2020-12-01
 Temp./Humi. :23.8/61
 Antenna Pol. :VERTICAL
 Engineer :Neo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
71.71	Peak	45.82	-17.04	28.78	40.00	-11.22
146.40	Peak	36.83	-11.92	24.91	43.50	-18.59
151.25	Peak	37.08	-12.05	25.03	43.50	-18.47
348.16	Peak	35.75	-7.47	28.28	46.00	-17.72
398.60	Peak	41.05	-6.12	34.93	46.00	-11.07
599.39	Peak	35.60	-3.42	32.18	46.00	-13.82

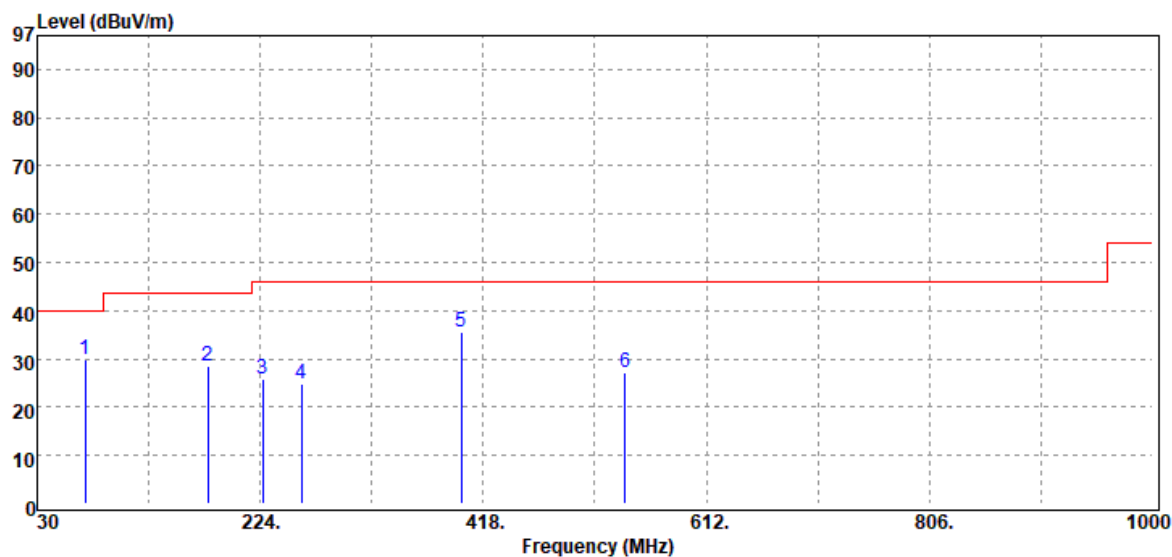
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Report Number :ER/2020/A0090
 Operation Mode :BLE(1M)
 Test Frequency :2442 MHz
 Test Mode :Tx CH Mid
 EUT Pol :H Plane

Test Site :SAC I Chamber
 Test Date :2020-12-01
 Temp./Humi. :23.8/61
 Antenna Pol. :HORIZONTAL
 Engineer :Neo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
71.71	Peak	46.90	-17.04	29.86	40.00	-10.14
178.41	Peak	41.68	-13.28	28.40	43.50	-15.10
225.94	Peak	37.10	-11.42	25.68	46.00	-20.32
259.89	Peak	32.91	-8.21	24.70	46.00	-21.30
398.60	Peak	41.67	-6.12	35.55	46.00	-10.45
541.19	Peak	31.42	-4.35	27.07	46.00	-18.93

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Fully System

Report Number :ER/2020/A0088

Operation Mode :System

Test Frequency :System

Test Mode :System

EUT Pol :E1 Plane

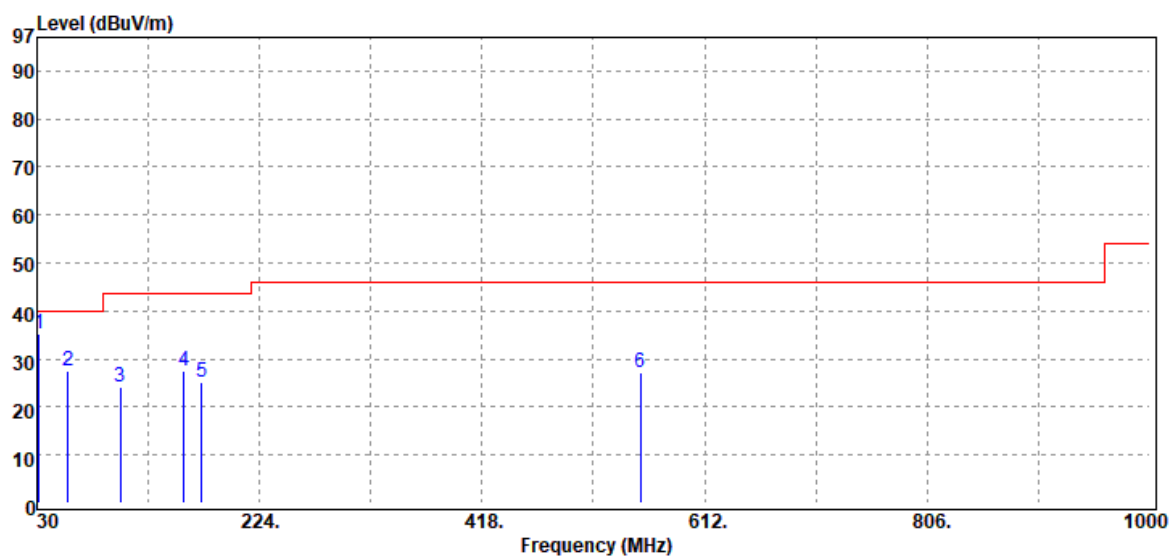
Test Site :SAC I Chamber

Test Date :2020-12-01

Temp./Humi. :23.8/61

Antenna Pol. :VERTICAL

Engineer :Neo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
31.94	QP	40.61	-5.32	35.29	40.00	-4.71
57.16	Peak	44.29	-16.69	27.60	40.00	-12.40
102.75	Peak	36.36	-12.24	24.12	43.50	-19.38
158.04	Peak	39.70	-12.20	27.50	43.50	-16.00
173.56	Peak	38.11	-13.09	25.02	43.50	-18.48
555.74	Peak	31.26	-4.19	27.07	46.00	-18.93

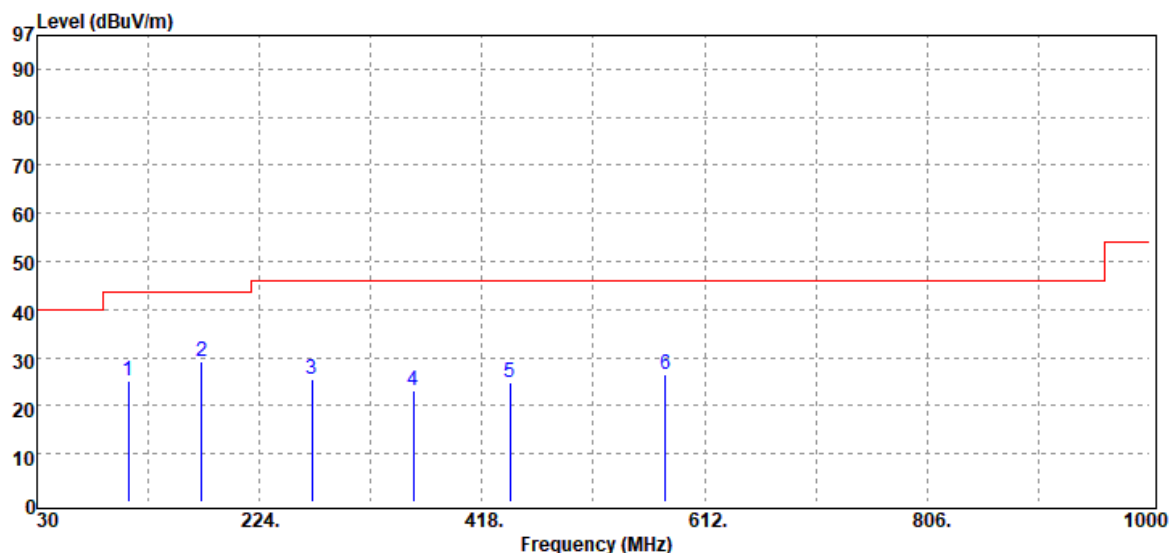
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Report Number :ER/2020/A0088
Operation Mode :System
Test Frequency :System
Test Mode :System
EUT Pol :E1 Plane

Test Site :SAC I Chamber
Test Date :2020-12-01
Temp./Humi. :23.8/61
Antenna Pol. :HORIZONTAL
Engineer :Neo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
109.54	Peak	36.84	-11.73	25.11	43.50	-18.39
173.56	Peak	42.18	-13.09	29.09	43.50	-14.41
269.59	Peak	34.27	-8.75	25.52	46.00	-20.48
357.86	Peak	30.01	-6.92	23.09	46.00	-22.91
442.25	Peak	30.88	-6.08	24.80	46.00	-21.20
578.05	Peak	30.81	-4.32	26.49	46.00	-19.51

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10.5.2 發射機強輻射之量測結果(1GHz 以上)

Report Number :ER/2020/A0090

Operation Mode :BLE(1M)

Test Frequency :2402 MHz

Test Mode :Tx CH Low

EUT Pol :H Plane

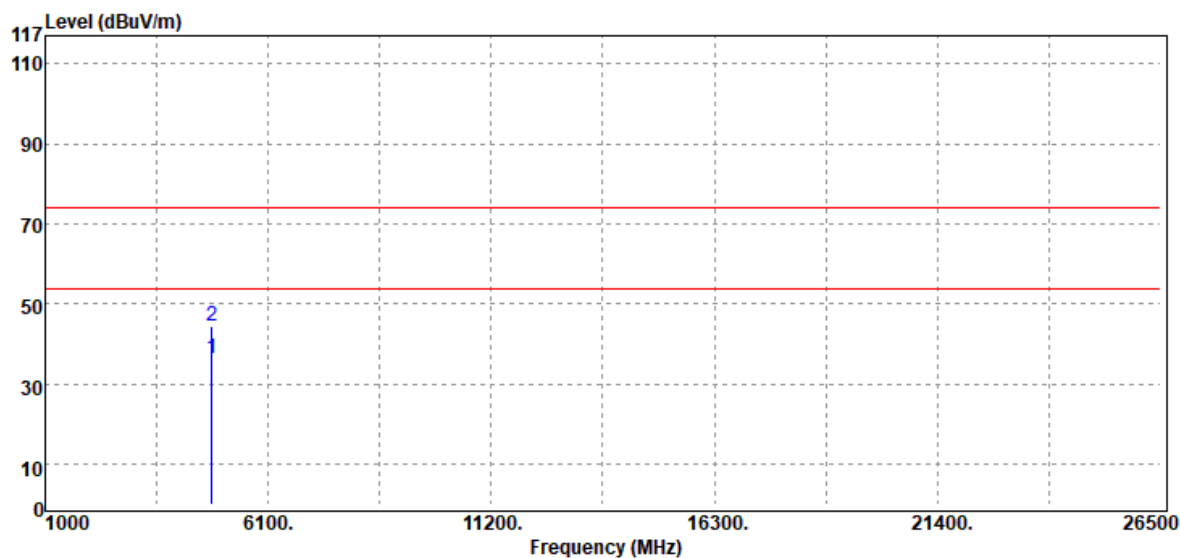
Test Site :SAC I Chamber

Test Date :2020-11-30

Temp./Humi. :24.6/61

Antenna Pol. :VERTICAL

Engineer :Neo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
4804.00	Average	22.06	14.54	36.60	54.00	-17.40
4804.00	Peak	30.13	14.54	44.67	74.00	-29.33

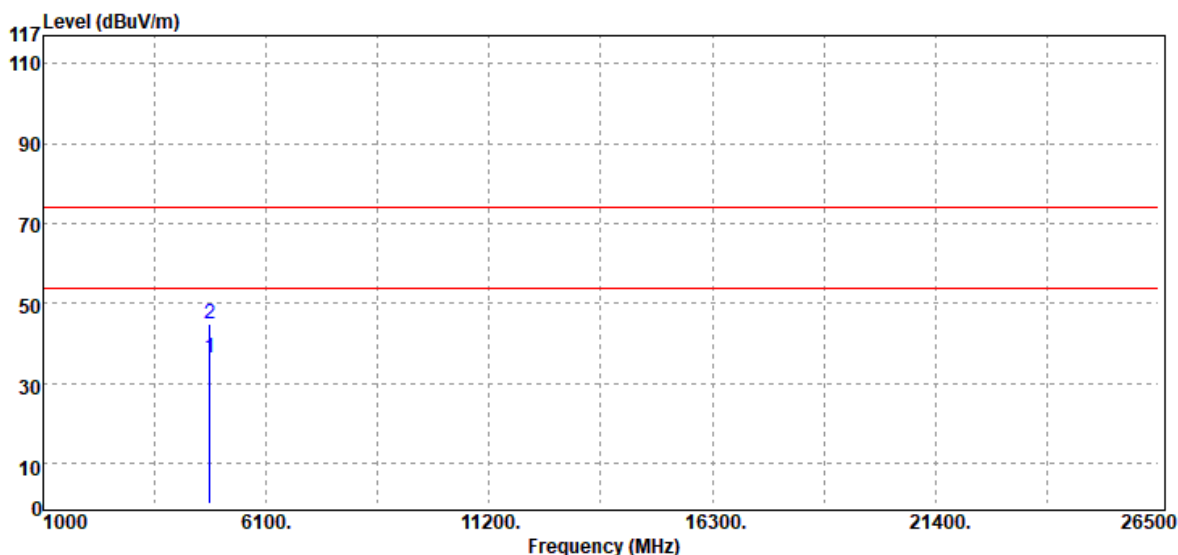
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Report Number :ER/2020/A0090
 Operation Mode :BLE(1M)
 Test Frequency :2402 MHz
 Test Mode :Tx CH Low
 EUT Pol :H Plane

Test Site :SAC I Chamber
 Test Date :2020-11-30
 Temp./Humi. :24.6/61
 Antenna Pol. :HORIZONTAL
 Engineer :Neo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4804.00	Average	22.05	14.54	36.59	54.00	-17.41
4804.00	Peak	30.55	14.54	45.09	74.00	-28.91

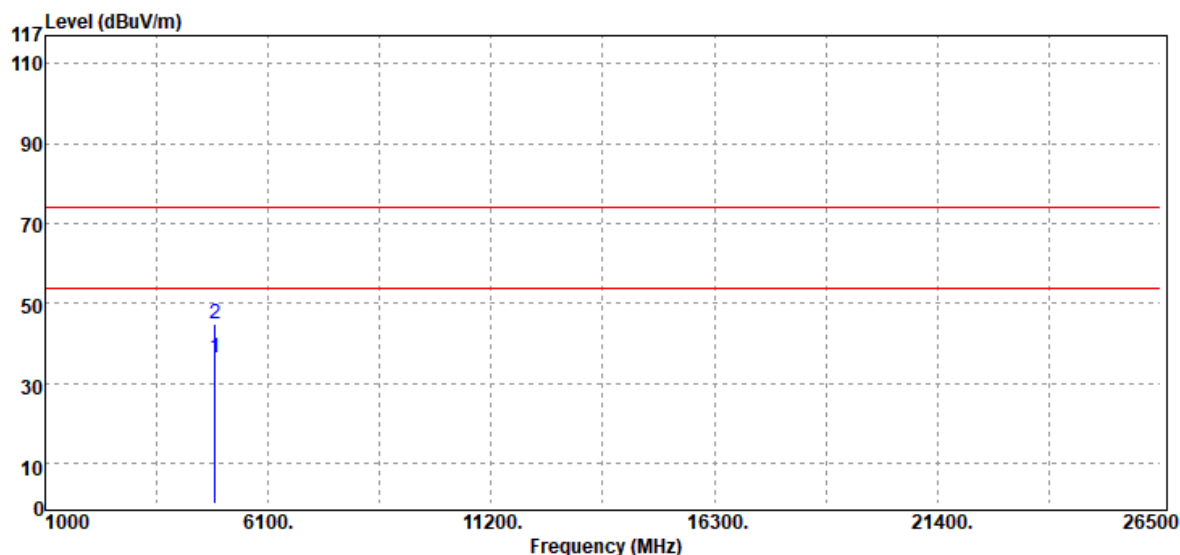
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Report Number :ER/2020/A0090
Operation Mode :BLE(1M)
Test Frequency :2442 MHz
Test Mode :Tx CH Mid
EUT Pol :H Plane

Test Site :SAC I Chamber
Test Date :2020-11-30
Temp./Humi. :24.6/61
Antenna Pol. :VERTICAL
Engineer :Neo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4884.00	Average	21.57	14.97	36.54	54.00	-17.46
4884.00	Peak	29.98	14.97	44.95	74.00	-29.05

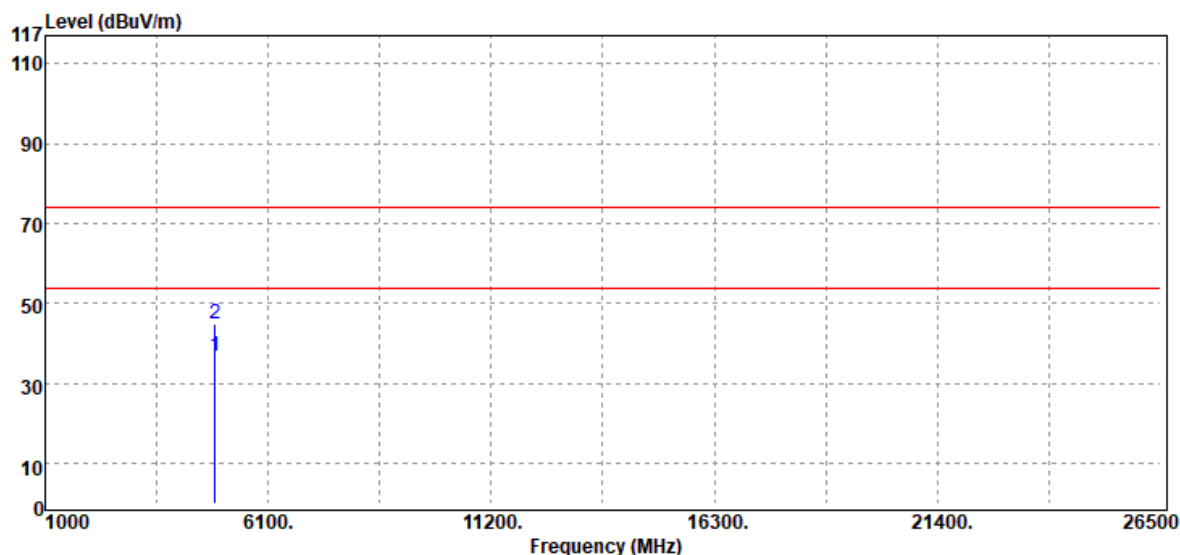
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Report Number :ER/2020/A0090
 Operation Mode :BLE(1M)
 Test Frequency :2442 MHz
 Test Mode :Tx CH Mid
 EUT Pol :H Plane

Test Site :SAC I Chamber
 Test Date :2020-11-30
 Temp./Humi. :24.6/61
 Antenna Pol. :HORIZONTAL
 Engineer :Neo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4884.00	Average	21.74	14.97	36.71	54.00	-17.29
4884.00	Peak	29.97	14.97	44.94	74.00	-29.06

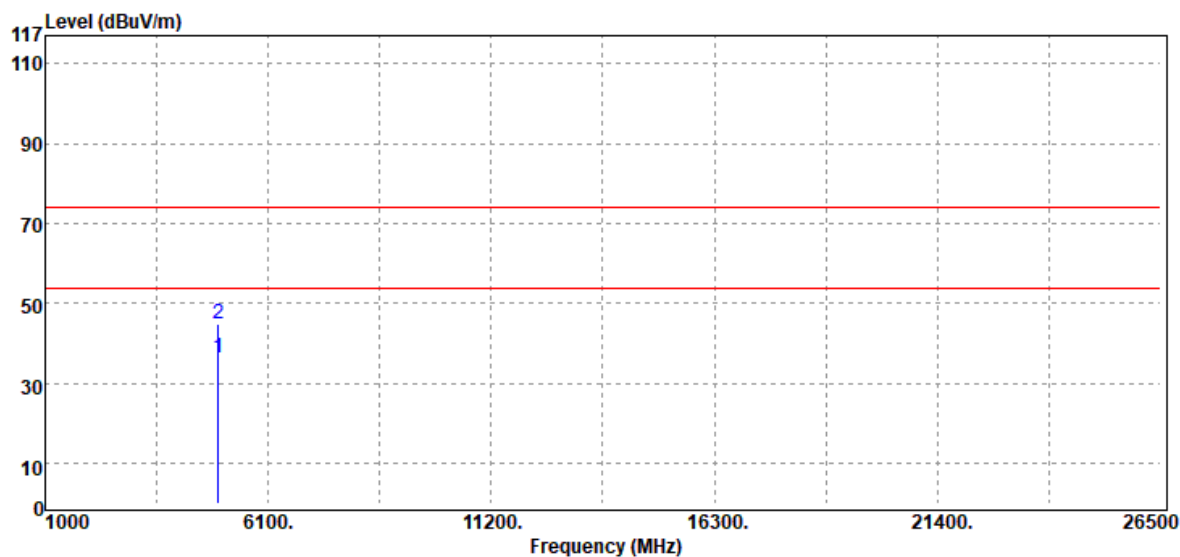
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Report Number :ER/2020/A0090
Operation Mode :BLE(1M)
Test Frequency :2480 MHz
Test Mode :Tx CH High
EUT Pol :H Plane

Test Site :SAC I Chamber
Test Date :2020-11-30
Temp./Humi. :24.6/61
Antenna Pol. :VERTICAL
Engineer :Neo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4960.00	Average	21.59	14.75	36.34	54.00	-17.66
4960.00	Peak	30.31	14.75	45.06	74.00	-28.94

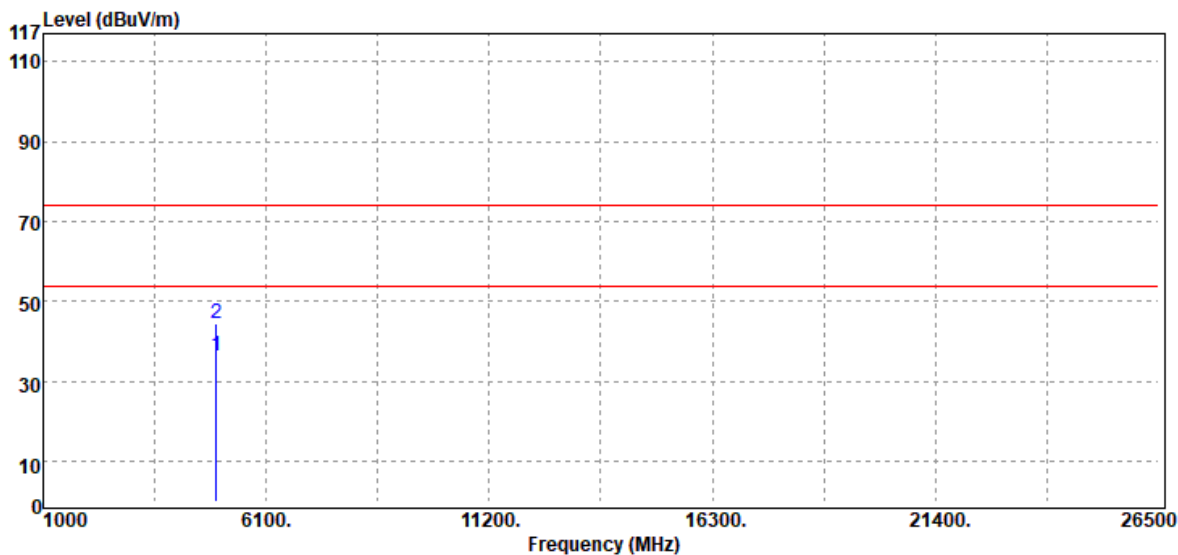
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Report Number :ER/2020/A0090
 Operation Mode :BLE(1M)
 Test Frequency :2480 MHz
 Test Mode :Tx CH High
 EUT Pol :H Plane

Test Site :SAC I Chamber
 Test Date :2020-11-30
 Temp./Humi. :24.6/61
 Antenna Pol. :HORIZONTAL
 Engineer :Neo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4960.00	Average	21.62	14.75	36.37	54.00	-17.63
4960.00	Peak	29.68	14.75	44.43	74.00	-29.57

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10.5.3 接收機場強輻射之量測結果(1GHz 以下) (最差模式)

Report Number :ER/2020/A0090

Operation Mode :BLE(1M)

Test Frequency :2442 MHz

Test Mode :Rx CH Mid

EUT Pol :H Plane

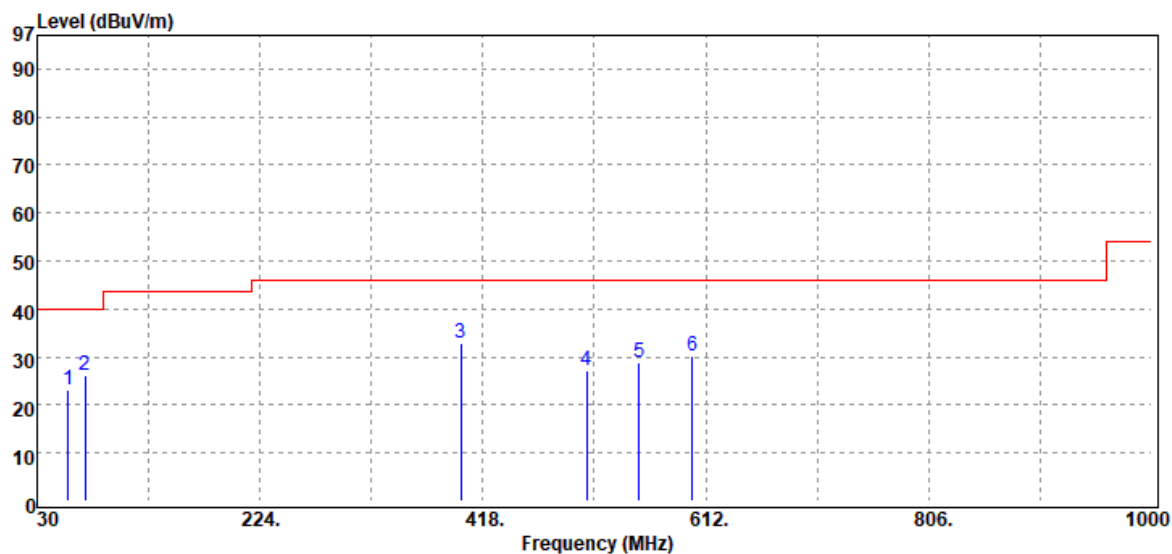
Test Site :SAC I Chamber

Test Date :2020-12-01

Temp./Humi. :23.8/61

Antenna Pol. :VERTICAL

Engineer :Neo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
57.16	Peak	39.88	-16.69	23.19	40.00	-16.81
71.71	Peak	43.38	-17.04	26.34	40.00	-13.66
398.60	Peak	39.12	-6.12	33.00	46.00	-13.00
508.21	Peak	32.04	-4.72	27.32	46.00	-18.68
553.80	Peak	33.03	-4.19	28.84	46.00	-17.16
600.36	Peak	33.63	-3.40	30.23	46.00	-15.77

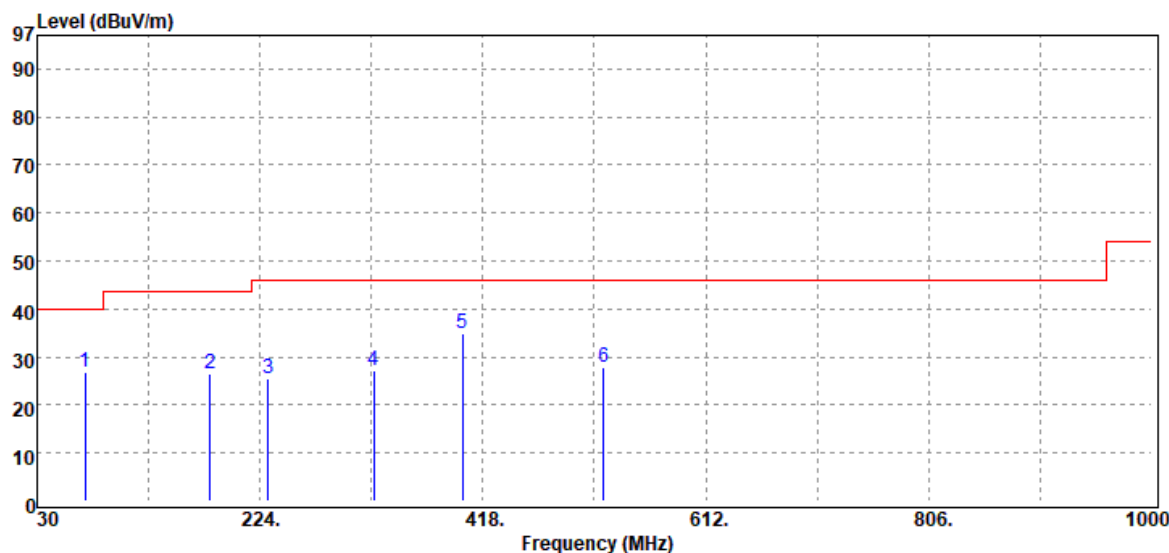
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Report Number :ER/2020/A0090
Operation Mode :BLE(1M)
Test Frequency :2442 MHz
Test Mode :Rx CH Mid
EUT Pol :H Plane

Test Site :SAC I Chamber
Test Date :2020-12-01
Temp./Humi. :23.8/61
Antenna Pol. :HORIZONTAL
Engineer :Neo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
71.71	Peak	43.76	-17.04	26.72	40.00	-13.28
180.35	Peak	39.82	-13.27	26.55	43.50	-16.95
230.79	Peak	36.26	-10.92	25.34	46.00	-20.66
322.94	Peak	34.95	-7.75	27.20	46.00	-18.80
400.54	Peak	40.98	-6.02	34.96	46.00	-11.04
522.76	Peak	32.48	-4.75	27.73	46.00	-18.27

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10.5.4 接收模式場強輻射之量測結果(1GHz 以上) (最差模式)

Report Number :ER/2020/A0090

Operation Mode :BLE(1M)

Test Frequency :2442 MHz

Test Mode :Rx CH Mid

EUT Pol :H Plane

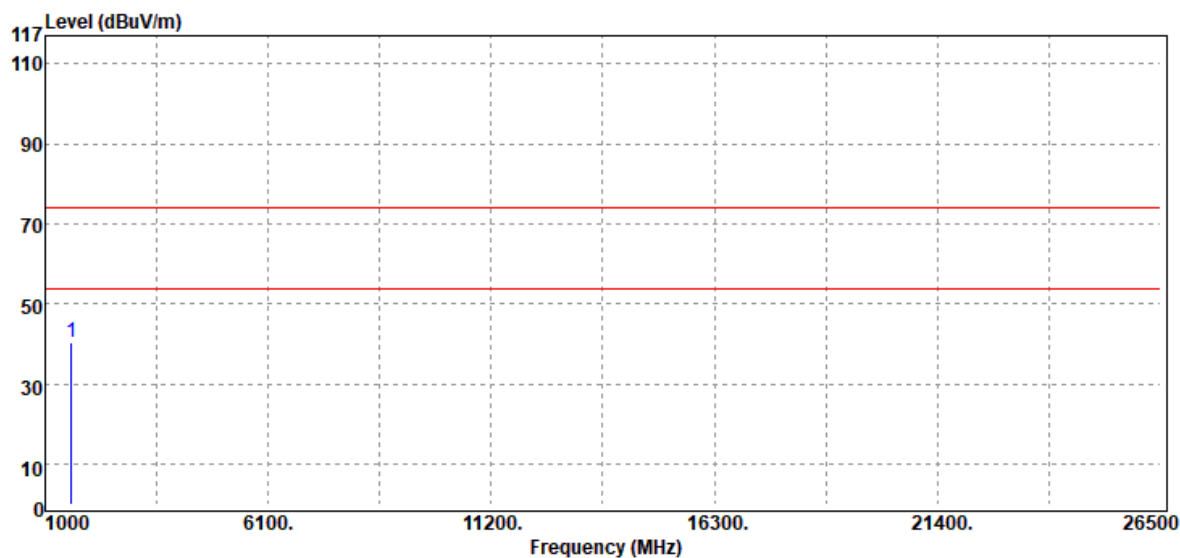
Test Site :SAC I Chamber

Test Date :2020-11-30

Temp./Humi. :24.6/61

Antenna Pol. :VERTICAL

Engineer :Neo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
1602.00	Peak	37.30	3.27	40.57	74.00	-33.43

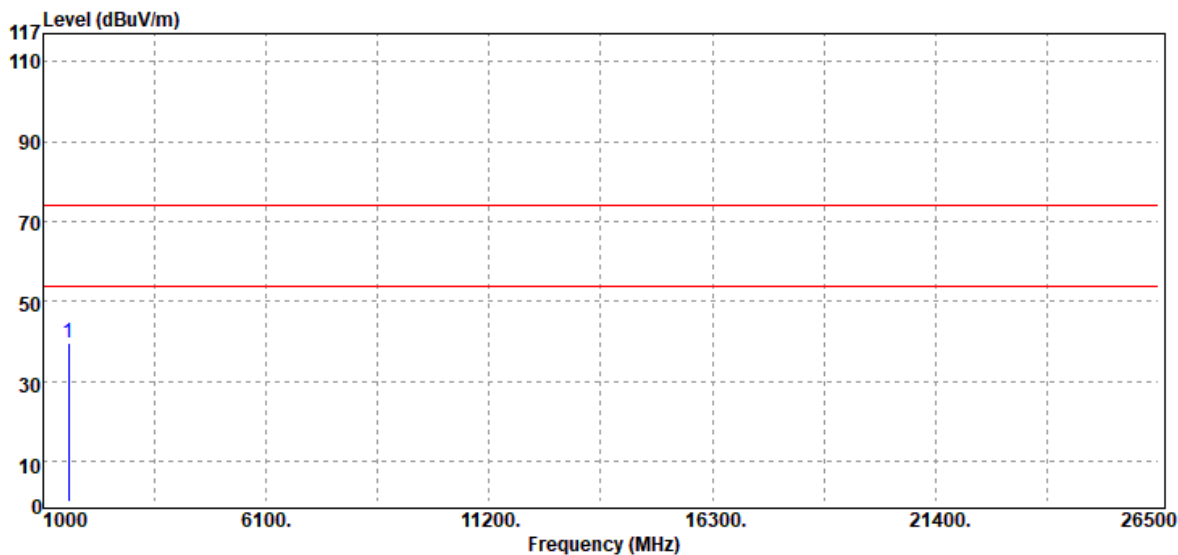
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Report Number :ER/2020/A0090
 Operation Mode :BLE(1M)
 Test Frequency :2442 MHz
 Test Mode :Rx CH Mid
 EUT Pol :H Plane

Test Site :SAC I Chamber
 Test Date :2020-11-30
 Temp./Humi. :24.6/61
 Antenna Pol. :HORIZONTAL
 Engineer :Neo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
1588.00	Peak	36.42	3.29	39.71	74.00	-34.29

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11 天線增益之要求

11.1 適用標準

依據NCC低功率射頻器材技術規範4.10.1.3 (1)之規定，操作於2400-2483.5MHz 者，僅用於固定式點對點操作，其發射天線之方向性增益超過 6dBi，每超過3dB應降低1dB之峰值輸出功率。

依據NCC低功率射頻器材技術規範4.10.1.3 (2)之規定，操作於5725-5850MHz 者，其發射天線之方向性增益超過 6dBi，無須降低峰值輸出功率。

依據NCC低功率射頻器材技術規範4.10.1.3 (2)之規定，用於點對多點操作時，如其發射天線之方向性增益超過 6dBi，應依所超過之dB數等量降低最大傳導輸出功率。

註：固定式點對點操作使用方式，並不包括使用點對多點之系統、全向性之應用以及發射相同資訊之共同安裝的多重發射機。展頻或數位調變之發射器需要專業安裝，該設備操作者或安裝者有責任確認該系統是限用於固定式、點對點之操作，隨機所附之使用手冊必須包含此訊息以告知使用者或安裝者須負之責任。

11.2 天線增益

此裝置使用天線如下：

天線型式/天線增益	PIFA Antenna, Gain: 0.4dBi Model No.: ANT3; Supplier: Nokia
-----------	--

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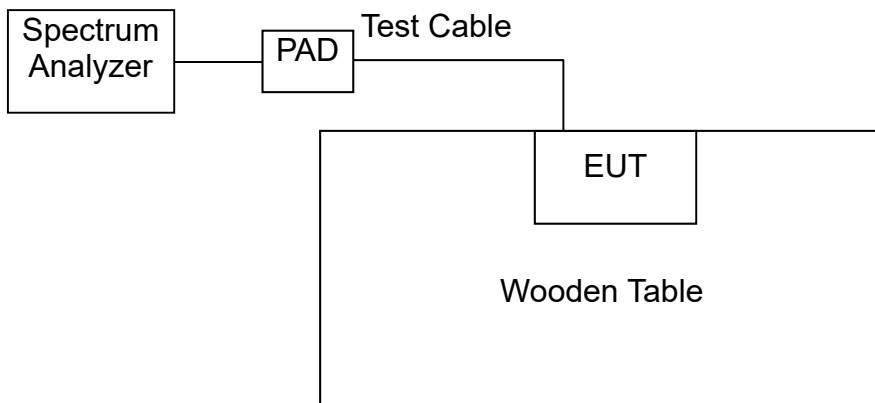
12 發射頻寬之要求

12.1 適用標準

對使用數位調變技術之低功率發射機，依據NCC低功率射頻器材技術規範4.10.1.6(2) (A)之規定，6dB之頻寬至少應有500kHz。

12.2 測試配置

圖 4: 發射頻寬之測試配置



12.3 量測結果

BLE mode

頻率 (MHz)	頻寬讀值 (kHz)	限制值 (kHz)	結果
2402	673.1	> 500	PASS
2442	671	> 500	PASS
2480	670.7	> 500	PASS

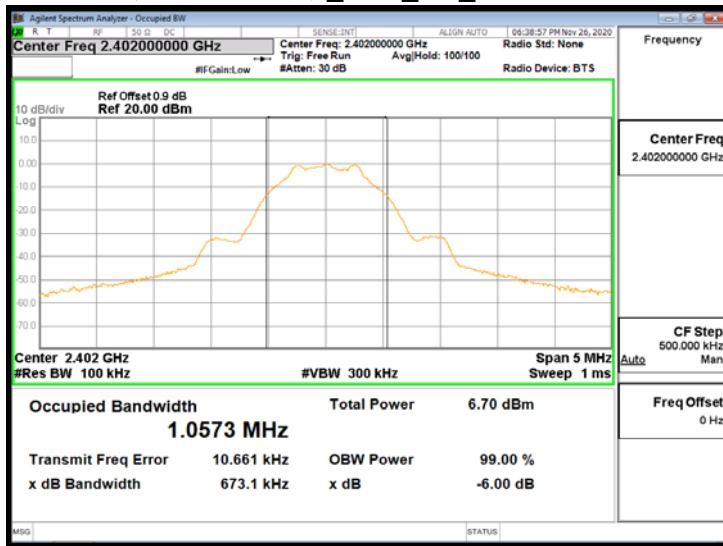
Refer next page for test plots

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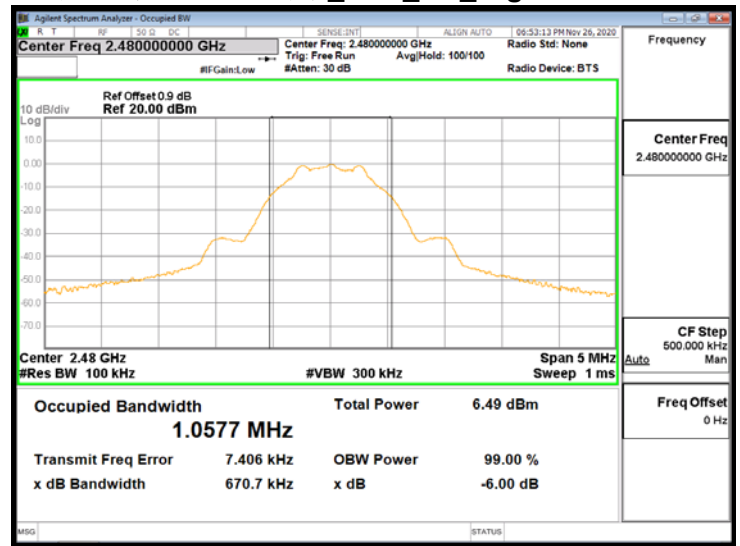
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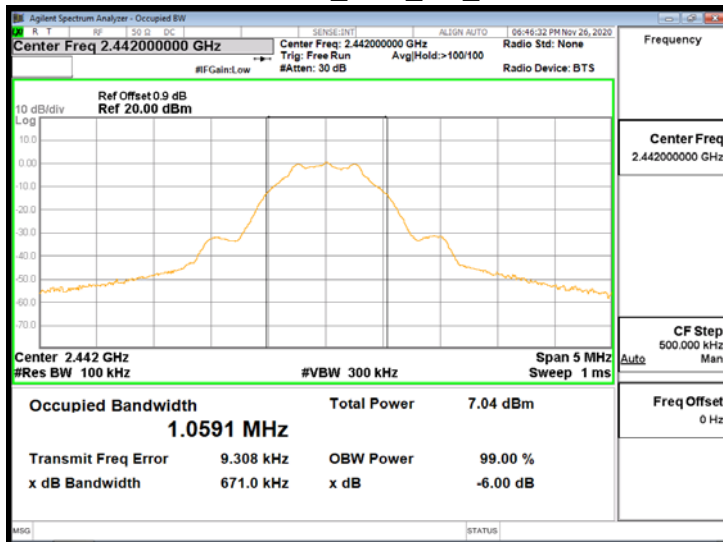
發射頻寬 6dB 之要求_BLE_1M_LowCH00-2402



發射頻寬 6dB 之要求_BLE_1M_HighCH39-2480



發射頻寬 6dB 之要求_BLE_1M_MidCH20-2442



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13 輸出峰值功率之量測

13.1 適用標準

依據 NCC 低功率射頻器材技術規範 4.10.1.2(1)(C)之規定，操作於 2400-2483.5MHz 與 5725-5850MHz 之所有數位調變技術系統：1 Watt(含)以下。

依據NCC低功率射頻器材技術規範4.10.1.3之規定，用於非固定式點對點操作時，若其發射天線之方向性增益超過6dBi，應依所超過之dB數等量降低峰值輸出功率。如用於固定式點對點操作時，應符合下列情現之一：

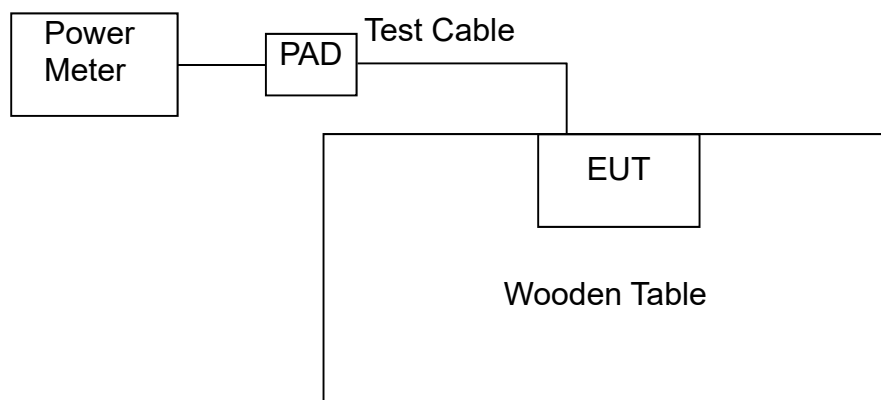
依據NCC低功率射頻器材技術規範4.10.1.3 (1)之規定，操作於2400-2483.5MHz 者，僅用於固定式點對點操作，其發射天線之方向性增益超過 6dBi，每超過3dB應降低1dB之峰值輸出功率。

依據NCC低功率射頻器材技術規範4.10.1.3 (2)之規定，操作於5725-5850MHz 者，其發射天線之方向性增益超過 6dBi，無須降低峰值輸出功率。

依據NCC低功率射頻器材技術規範4.10.1.3 (3)之規定，用於點對多點操作時，如其發射天線之方向性增益超過 6dBi，應依所超過之dB數等量降低最大傳導輸出功率。

註：固定式點對點操作使用方式，並不包括使用點對多點之系統、全向性之應用以及發射相同資訊之共同安裝的多重發射機。展頻或數位調變之發射器需要專業安裝，該設備操作者或安裝者有責任確認該系統是限用於固定式、點對點之操作，隨機所附之使用手冊必須包含此訊息以告知使用者或安裝者須負之責任。

13.2 輸出功率之測試配置



*註: 此產品為點對多點操作

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13.3 輸出功率之量測結果

BLE

Frequency (MHz)	Power set	Reading Power (dBm)	Output Power (W)	Limit (W)
2402	default	0.35	0.00108	1
2442	default	0.66	0.00116	1
2480	default	0.45	0.00111	1
Cable loss	0.9 dB			

***Note:** 由 Power Meter 量測。

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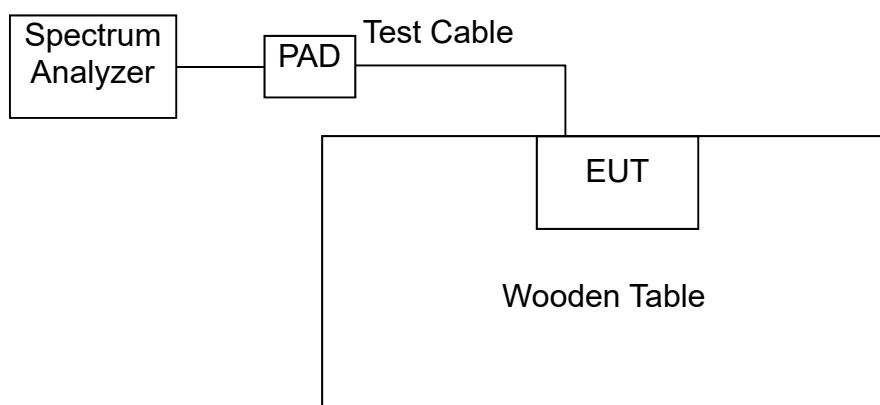
14 開放頻帶邊緣 100KHZ 頻寬內之限制

14.1 適用標準

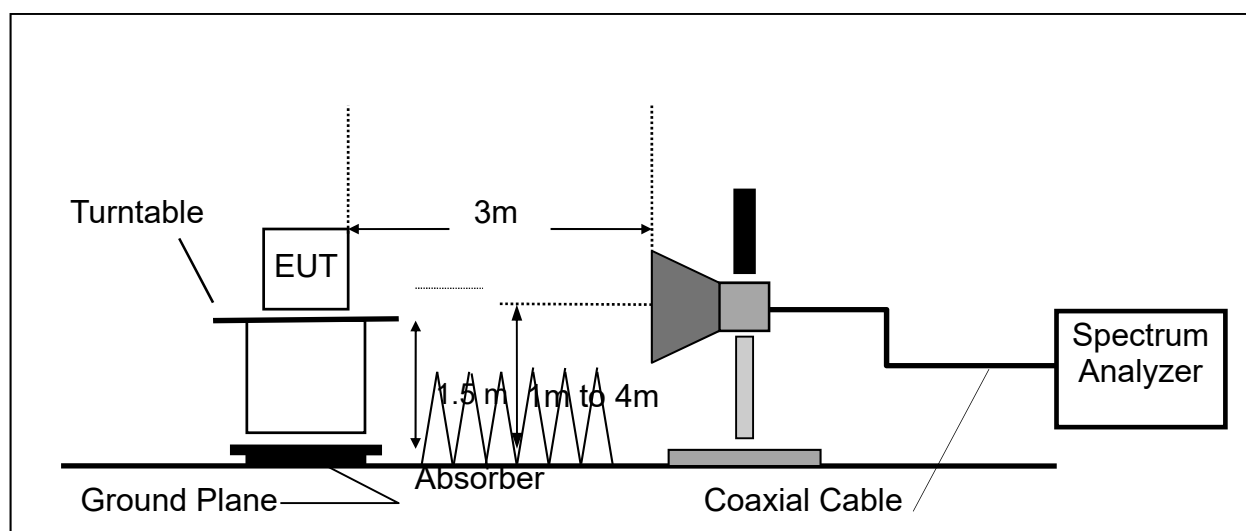
依據 NCC 低功率射頻器材技術規範 4.10.1.5 之規定，使用頻帶範圍外之任意 100kHz 內，發射器所產生的射頻功率相較於使用頻帶範圍中包含最高所需功率之 100kHz 內的射頻功率，須衰減 20 分貝 (dB)，以射頻傳導或輻射方式測量。此外，落於第 3.5 節禁用頻段之輻射發射，應符合第 3.6 節之規定。

14.2 開放頻帶邊緣之測試配置

(a) 傳導量測配置圖：



(b) 輻射量測配置圖：



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14.3 開放頻帶邊緣之量測結果

發射限制測試值 CH Low (下邊緣頻帶): 在 2400.00MHz 之 100kHz 頻寬內最大值皆比主波低 20dB 以上。

發射限制測試值 CH High(上邊緣頻帶): 在 2483.50MHz 之 100kHz 頻寬內最大值皆比主波低 20dB 以上。

$Actual\ FS(dB\mu V/m) = SPA.\ Reading\ level(dB\mu V) + Factor(dB)$

$Factor(dB) = Antenna\ Factor(dB\mu V/m) + Cable\ Loss(dB) - Pre_Amplifier\ Gain(dB)$

Band Edge Limit

Frequency (MHz)	RF Power Density (dBm)	Bandedge Limit = PSD - 20dB
2402	-0.06	-20.06
2442	0.27	-19.73
2480	-0.22	-20.22

NOTE: cable loss as 0.9dB that offsets in the spectrum

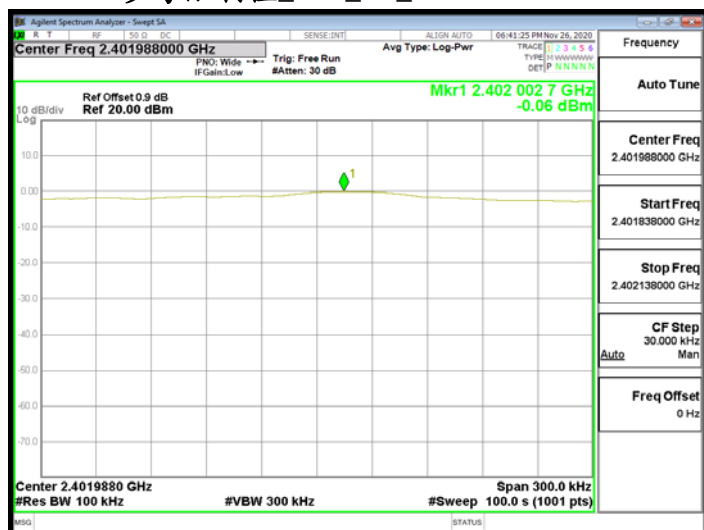
Refer next page for test plots

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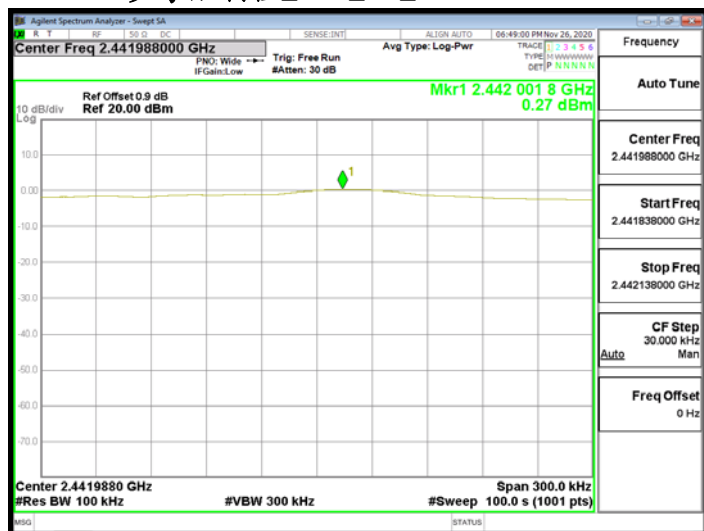
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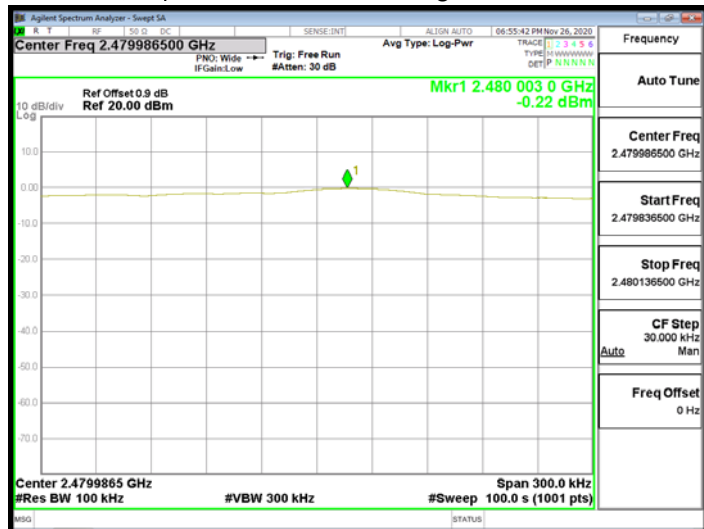
參考限制值_BLE_1M_LowCH00-2402



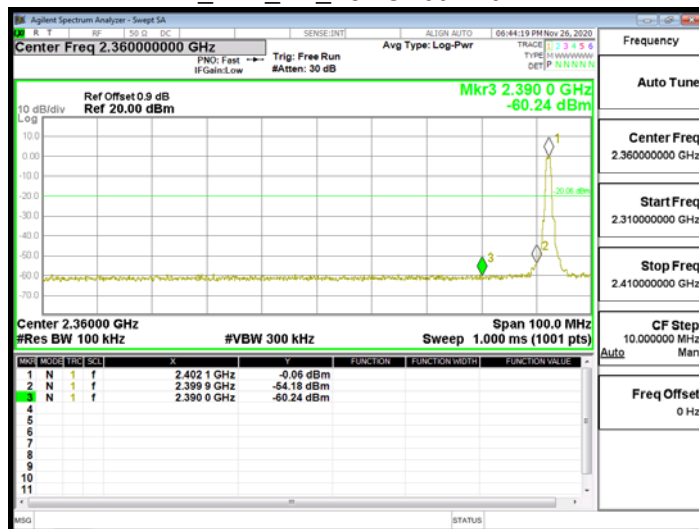
參考限制值_BLE_1M_MidCH20-2442



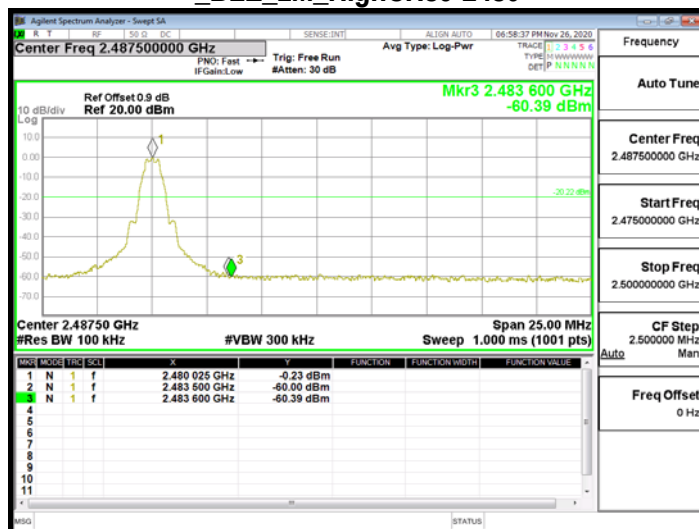
參考限制值_BLE_1M_HighCH39-2480



開放頻帶邊緣 100KHz 頻寬內之限制_BLE_1M_LowCH00-2402



開放頻帶邊緣 100KHz 頻寬內之限制_BLE_1M_HighCH39-2480



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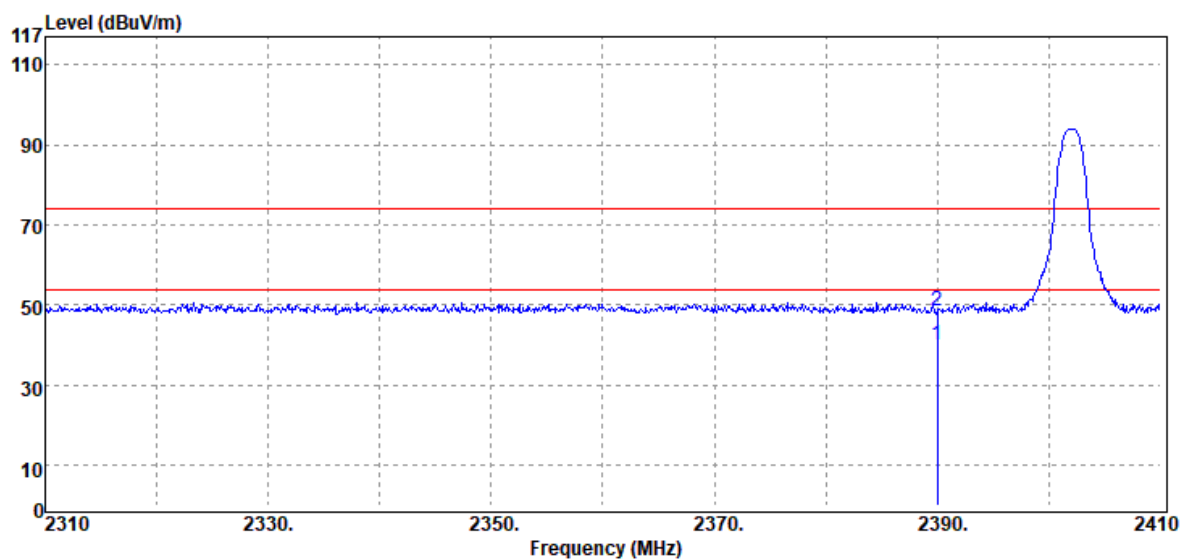
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14.3.1 禁用頻帶輻射量測值

Report Number :ER/2020/A0090
 Operation Mode :BLE(1M)
 Test Frequency :2402 MHz
 Test Mode :Bandedge CH Low
 EUT Pol :H Plane

Test Site :SAC I Chamber
 Test Date :2020-11-30
 Temp./Humi. :24.6/61
 Antenna Pol. :VERTICAL
 Engineer :Neo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
2390.00	Average	32.66	7.46	40.12	54.00	-13.88
2390.00	Peak	40.93	7.46	48.39	74.00	-25.61

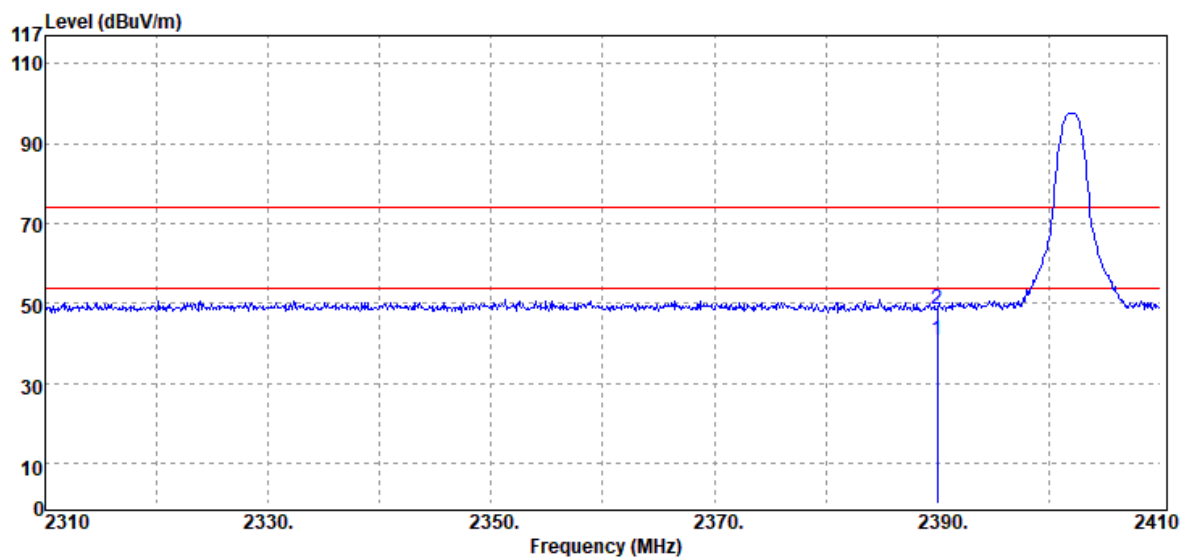
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Report Number :ER/2020/A0090
 Operation Mode :BLE(1M)
 Test Frequency :2402 MHz
 Test Mode :Bandedge CH Low
 EUT Pol :H Plane

Test Site :SAC I Chamber
 Test Date :2020-11-30
 Temp./Humi. :24.6/61
 Antenna Pol. :HORIZONTAL
 Engineer :Neo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2390.00	Average	33.24	7.46	40.70	54.00	-13.30
2390.00	Peak	41.32	7.46	48.78	74.00	-25.22

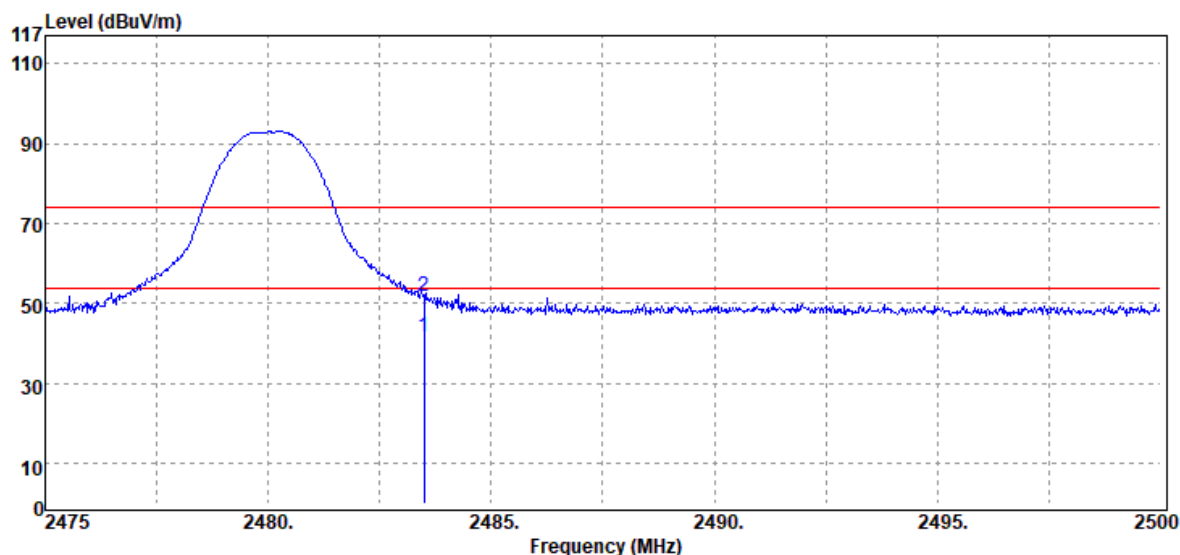
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Report Number :ER/2020/A0090
 Operation Mode :BLE(1M)
 Test Frequency :2480 MHz
 Test Mode :Bandedge CH High
 EUT Pol :H Plane

Test Site :SAC I Chamber
 Test Date :2020-11-30
 Temp./Humi. :24.6/61
 Antenna Pol. :VERTICAL
 Engineer :Neo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2483.50	Average	34.12	7.46	41.58	54.00	-12.42
2483.50	Peak	44.42	7.46	51.88	74.00	-22.12

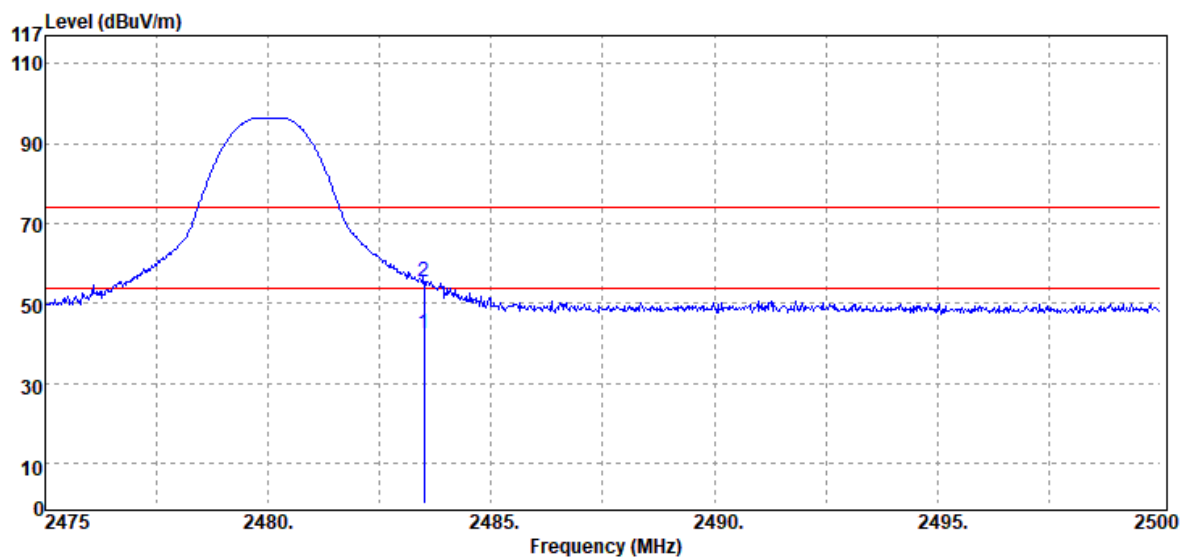
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Report Number :ER/2020/A0090
 Operation Mode :BLE(1M)
 Test Frequency :2480 MHz
 Test Mode :Bandedge CH High
 EUT Pol :H Plane

Test Site :SAC I Chamber
 Test Date :2020-11-30
 Temp./Humi. :24.6/61
 Antenna Pol. :HORIZONTAL
 Engineer :Neo



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2483.50	Average	35.11	7.46	42.57	54.00	-11.43
2483.50	Peak	48.09	7.46	55.55	74.00	-18.45

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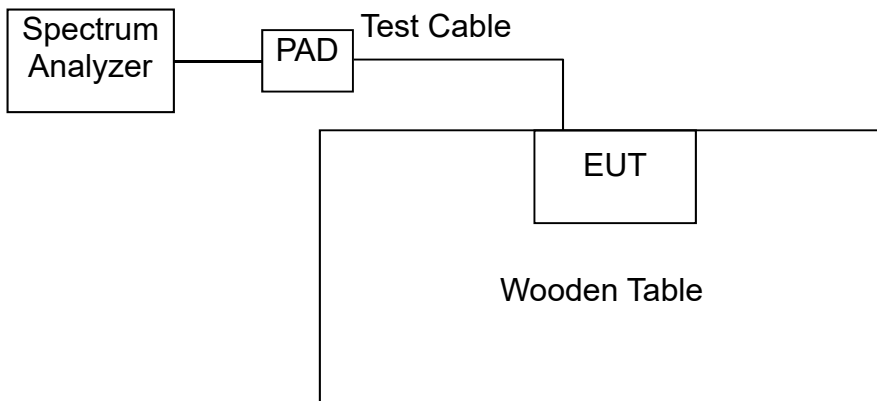
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15 功率密度之量測

15.1 適用標準

依據 NCC 低功率射頻器材技術規範 4.10.1.6(2) (B)規定，對數位調變之展頻系統，在使用頻率範圍之任意 3kHz 頻寬內，由發射機傳導至天線之峰值發射電功率密度在任意期間內，皆不得大於 8dBm。

15.2 功率密度之測試配置



15.3 功率密度量測結果

BLE mode

Frequency (MHz)	RF Power Density (dBm/3kHz)	Maximum Limit (dBm/3kHz)
2402	-14.72	8
2442	-14.39	8
2480	-14.89	8

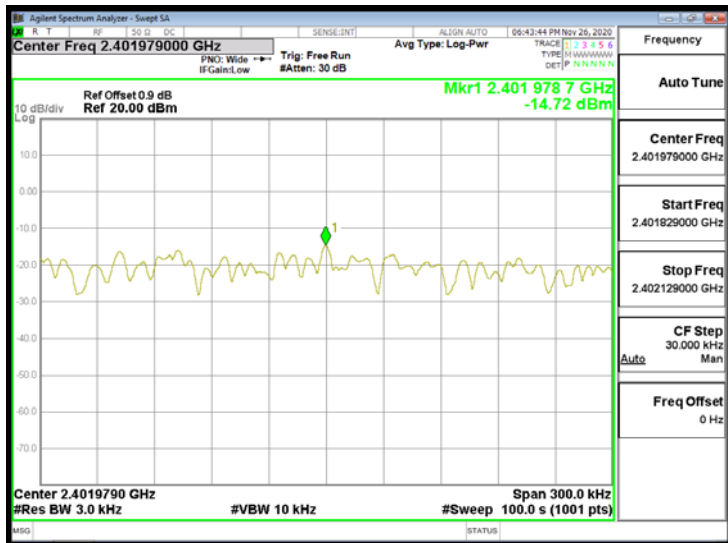
* offset 0.9 dB

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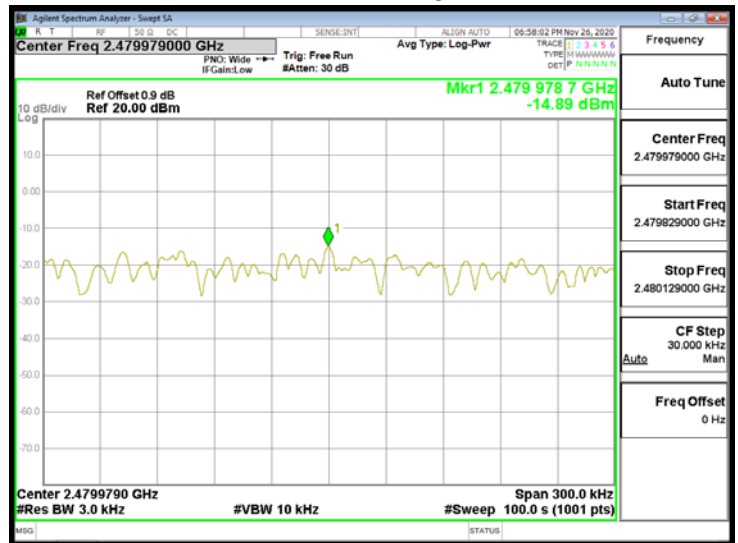
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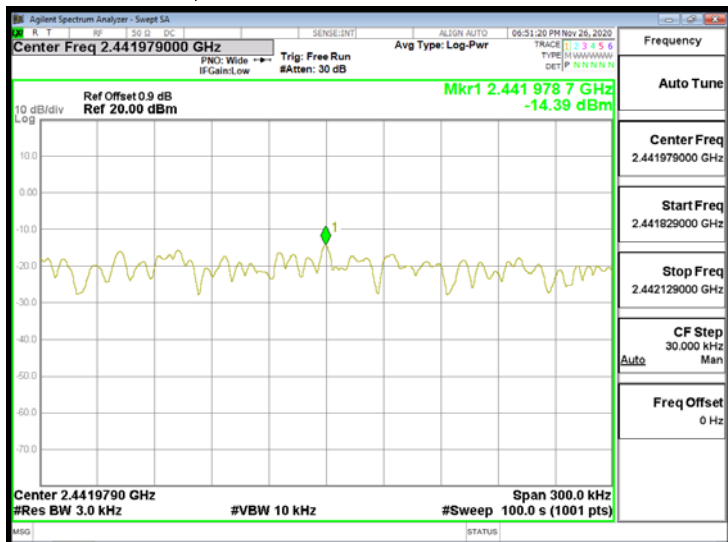
功率密度_BLE_1M_LowCH00-2402



功率密度_BLE_1M_HighCH39-2480



功率密度_BLE_1M_MidCH20-2442



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~ End of Report ~

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