

NCC

低功率射頻電機型式試驗報告

產品名稱 : ACCESS POINT
型號 : APINP303
廠牌 :  
申請者 : 慧與科技股份有限公司
申請者地址 : 臺北市南港區經貿二路 66 號 10 樓之 1
測試標準 : LP0002 (107 年版)
參考法規 : ANSI C63.10-2013
測試結果 : 符合
測試日期 : 2018.09.04 ~ 2018.10.19
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測試工程師 : 
(柯文凱)
報告審核人 : 
(陳柏均)
報告簽屬人 : 
(柯承志)



修訂紀錄

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1. 一般資訊

申請者	慧興科技股份有限公司
申請者地址	臺北市南港區經貿二路 66 號 10 樓之 1
製造商	Hewlett Packard Enterprise Company
製造商地址	6280 America Center Drive, San Jose, CA 95002
認證實驗室	台灣曼瑞檢測科技有限公司
實驗室地址	33377 台灣桃園市龜山區復興二路 38 號
測試設備序列號	傳導樣品序列號: CNGHKGX006 輻射樣品序列號: CNGHKGX006
實驗室資訊	1. MRT facility is a FCC registered (Reg. No. 291082) test facility with the site description report on file and is designated by the FCC as an Accredited Test Film. 2. MRT facility is an IC registered (MRT Reg. No. 21723-1) test laboratory with the site description on file at Industry Canada. 3. MRT Lab is accredited to ISO 17025 by the Taiwan Accreditation Foundation (TAF Cert. No. 3261) in EMC, Telecommunications and Radio testing for FCC, Industry Taiwan, EU and TELEC Rules.

2. 產品資訊

2.1. 待測物裝置資料

產品名稱	ACCESS POINT
產品型號	APINP303
天線樣式	Refer to the table "Antenna List"
天線規格	Refer to the table "Antenna List"
待測物額定電壓	POE input or AC adapter input
調變模式	O-QPSK
配件	
電源供應器	Part No.: SDI40-48-U-P7R-C2 Model No.: ATS048T-A480 Input Power: 100 - 240V ~ 50/60Hz, 1.2A Output Power: 48VDC/1A

Note: The applicant provide one POE adapter (Manufacturer: MICROSEMI) for approval testing, it is not for sale.

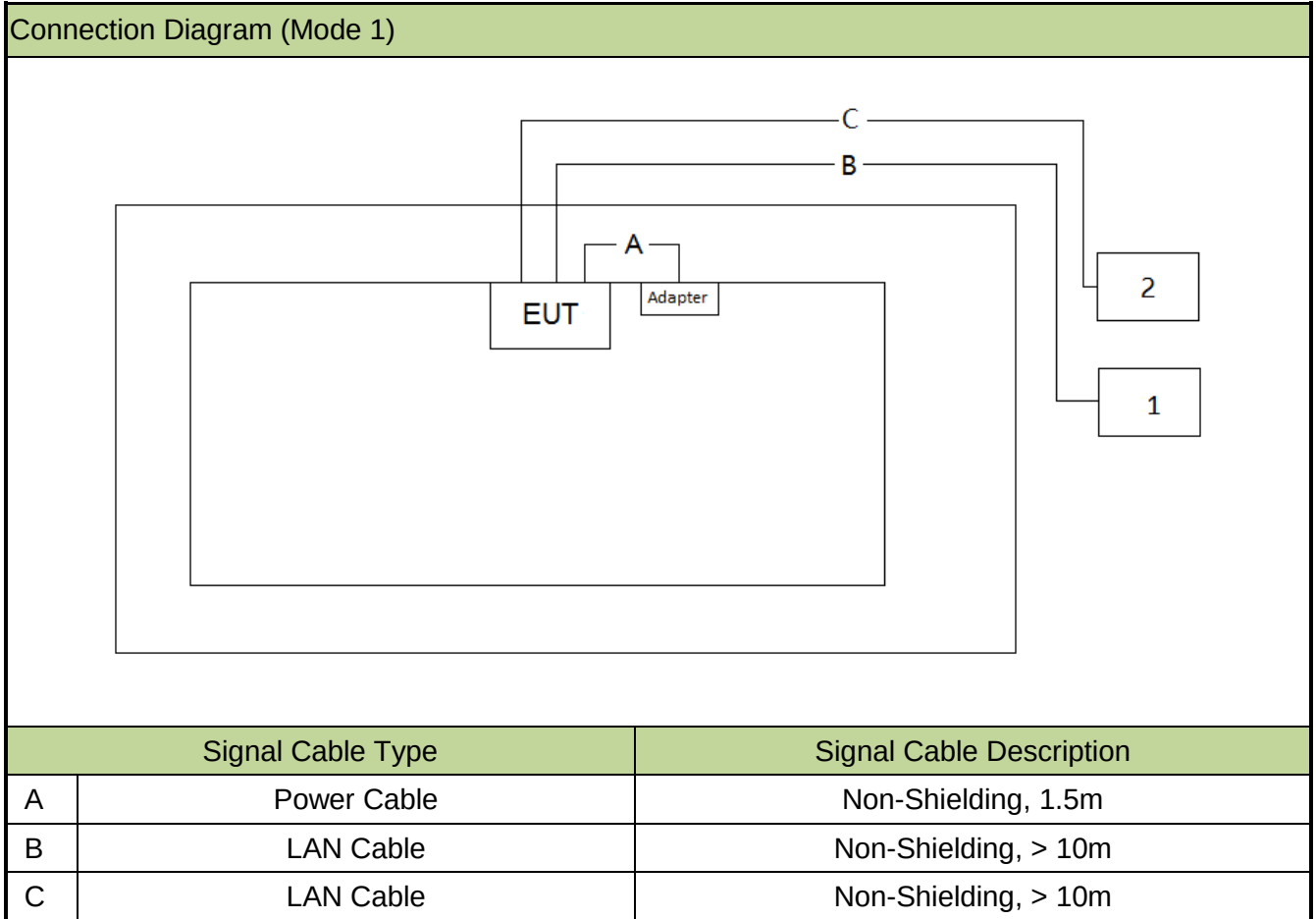
2. 2. 通道清單

Channel	Frequency	Channel	Frequency	Channel	Frequency
11	2405 MHz	12	2410 MHz	13	2415 MHz
14	2420 MHz	15	2425 MHz	16	2430 MHz
17	2435 MHz	18	2440 MHz	19	2445 MHz
20	2450 MHz	21	2455 MHz	22	2460 MHz
23	2465 MHz	24	2470 MHz	25	2475 MHz
26	2480 MHz	--	--	--	--

2. 3. 測試模式

Mode 1: 發射器 ZigBee

2.4. 測試系統組合圖



2.5. 測試周邊

Item	Product	Manufacturer	Model No.	Serial No.	Power Cord
1	Notebook	Lenovo	E430c	N/A	Non-Shielded, 1.8m
2	Notebook	Lenovo	X230i	N/A	Non-Shielded, 1.8m

2.6. 待測裝置測試時之典型操作程式

1.	Setup the EUT and simulators as shown on 2.4
2.	Turn on the power of all equipment.
3.	Execute "Telnet" program, and gave the test order provided by applicant.
4.	Configure the test channel and the data rate.
5.	Start test.

3. 量測不確定度

AC Conducted Emission Measurement - SR2
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 150kHz~30MHz: 3.46dB
Radiated Emission Measurement - AC1
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 9kHz ~ 1GHz: 4.18dB 1GHz ~ 25GHz: 4.76dB
Spurious Emissions, Conducted - SR1
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 0.78dB
Output Power - SR1
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 1.13dB
Power Spectrum Density - SR1
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 1.15dB
Occupied Bandwidth - SR1
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 0.28%

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

4. 測試設備明細

Conducted Emissions

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Two-Line V-Network	R&S	ENV216	MRTTWA00019	1 year	2019/3/20
Two-Line V-Network	R&S	ENV216	MRTTWA00020	1 year	2019/3/20
8-Wire ISN (T8)	R&S	ENY81	MRTTWA00018	1 year	2019/4/24
EMI Test Receiver	R&S	ESR3	MRTTWA00045	1 year	2019/5/14
Temperature/Humidity Meter	TFA	35.1078.10.IT	MRTTWA00033	1 year	2019/06/07

Radiated Emissions

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Active Loop Antenna	SCHWARZBECK	FMZB 1519B	MRTTWA00002	1 year	2019/4/24
Broadband TRILOG Antenna	SCHWARZBECK	VULB 9162	MRTTWA00001	1 year	2019/5/22
Broadband Hornantenna	SCHWARZBECK	BBHA 9120D	MRTTWA00003	1 year	2019/4/24
Breitband Hornantenna	SCHWARZBECK	BBHA 9170	MRTTWA00004	1 year	2019/4/23
Broadband Preamplifier	SCHWARZBECK	BBV 9718	MRTTWA00005	1 year	2019/4/23
Broadband Amplifier	SCHWARZBECK	BBV 9721	MRTTWA00006	1 year	2019/4/23
EMI Test Receiver	R&S	ESR3	MRTTWA00009	1 year	2019/3/19
EXA Signal Analyzer	KEYSIGHT	N9010A	MRTTWA00012	1 year	2019/7/30
Antenna Cable	HUBERSUHNER	SF106	MRTTWE00010	1 year	2019/5/18
Temperature/Humidity Meter	TFA	35.1078.10.IT	MRTTWA00032	1 year	2019/5/21

Conducted Test Equipment

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EXA Signal Analyzer	KEYSIGHT	N9010A	MRTTWA00012	1 year	2019/7/30
X-Series USB Peak and Average Power Sensor	KEYSIGHT	U2021XA	MRTTWA00014	1 year	2019/4/24
Temperature/Humidity Meter	TFA	35.1078.10.IT	MRTTWA00032	1 year	2019/5/21

Software	Version	Function
e3	9.160520a	EMI Test Software

5. 測試結果

產品名稱
型號

ACCESS POINT
APINP303

章節	量測項目	限制值	測試結果	測試數據
2.3	電源傳導	低功率射頻電機技術規範 2.3 節	符合	第 5.1 章節
3.10.1.2	峰值傳導輸出功率	$\leq 30.00\text{dBm}$	符合	第 5.2 章節
3.10.1.3	天線之要求	低功率射頻電機技術規範 3.10.1.3 節	符合	第 5.3 章節
3.10.1.5	帶外發射限制	$\leq 20\text{dBc(Peak)}$	符合	第 5.4 章節
2.7	輻射電場強度	低功率射頻電機技術規範 2.8 節	符合	第 5.5 章節
2.7	頻帶邊緣	$\leq 74\text{dBuV/m(Peak)}$ $\leq 54\text{dBuV/m(Average)}$	符合	第 5.6 章節
3.10.1.6(2)(A)	佔用頻寬	$\geq 500\text{kHz}$	符合	第 5.7 章節
3.10.1.6(2)(B)	功率頻譜密度	$\leq 8\text{dBm}$	符合	第 5.8 章節

5.1. 電源端點干擾測試

5.1.1. 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第 2.3 節，以市電為電源之低功率射頻電機，其傳導回電源線上頻率自 150kHz 至 30MHz 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值。測量時應經過 50 微亨利(μH)及 50 歐姆(Ω)之電源線阻抗模擬網路(LISN)。頻率重疊處，以較低限值為準。

Frequency 頻率範圍 MHz	傳導限制值(dBuV)	
	準尖峰值	平均值
0.15 - 0.50	66-56 ^(註)	56-46 ^(註)
0.50 - 5.0	56	46
5.0 - 30	60	50

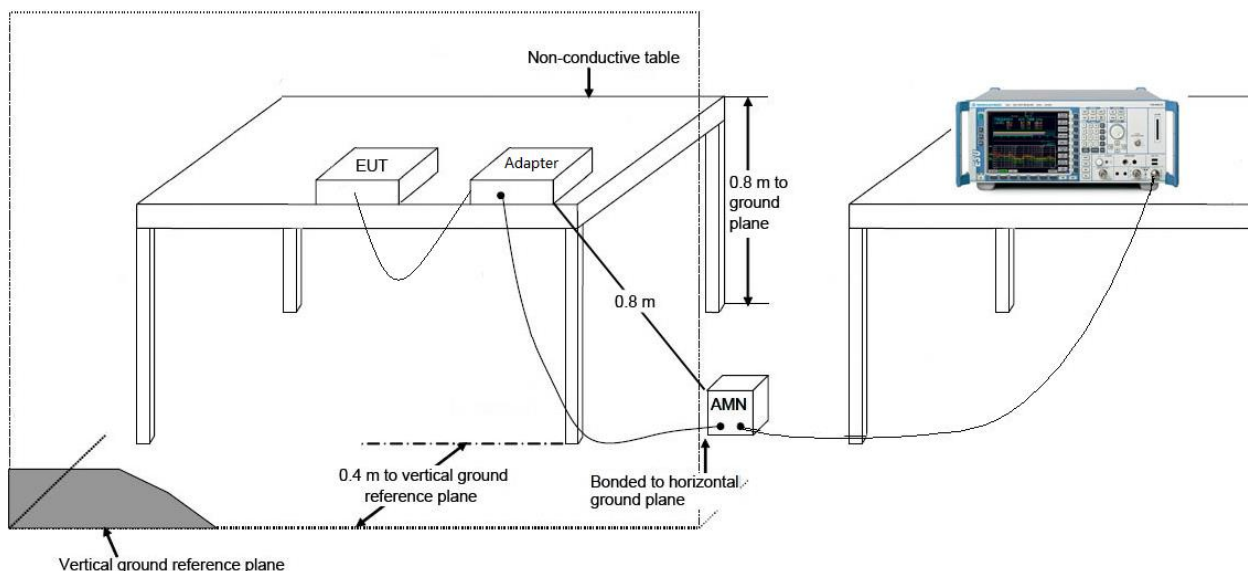
註:隨頻率之對數遞減

5.1.2. 量測方法

待測物置於高 80 公分之非導體桌面（落地型產品置於地上），將待測物之電源線接至電源阻抗網路器(LISN)，同時保持待測物至 LISN 距 80 公分，並將電源線多餘部份以 30 至 40 公分之八字形捆綁於電源線中央並離地 40cm，於在正常工作狀態下，執行待測物之火線(Line)及地線(neutral)各一次量測。電源端點場強之測量範圍由 0.15MHz –30MHz，所量測之讀值皆為準尖峰值(Quasi-Peak Value)及平均值(Average Value)。場強接收機之解析頻寬為 9kHz。

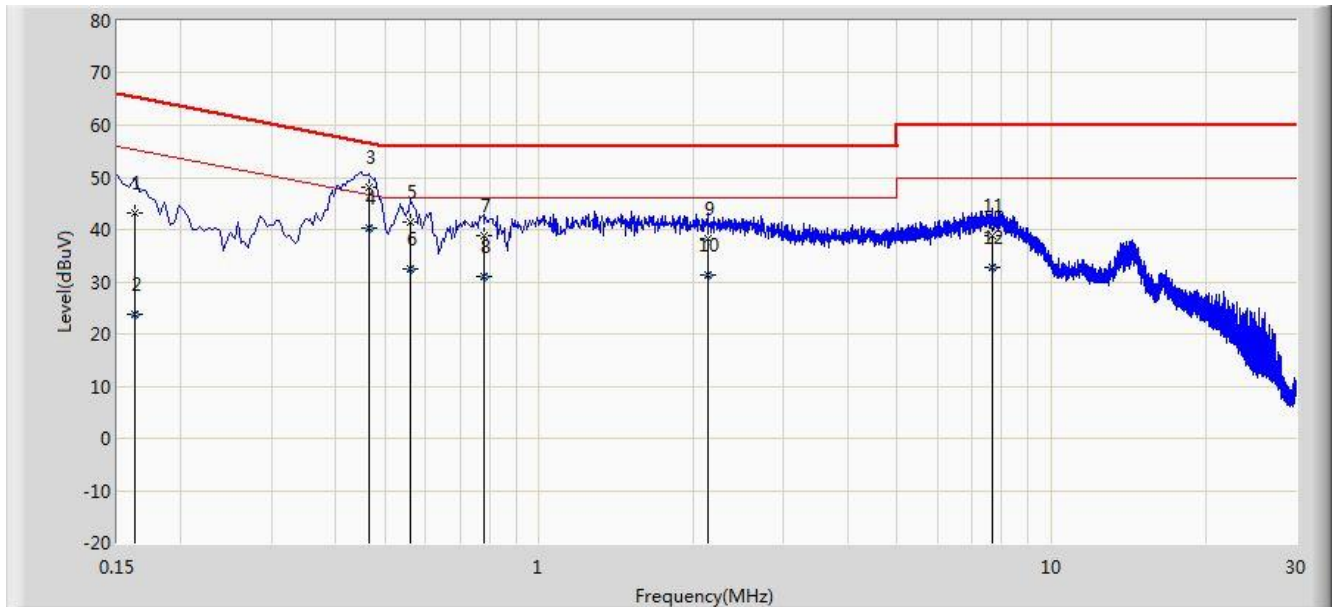
備 註: 經初測驗證過，電源端點干擾測試對測試頻道數並無差異，因此檢附其中一個測試頻道之測試數。

5.1.3. 測試架構圖



5.1.4. 電源端點測試結果

Site: SR2	Time: 2018/09/23 - 12:25
Limit: FCC_Part15.207_CE	Engineer: Kevin Ker
Probe: ENV216_101683_Filter On	Polarity: Line
EUT: ACCESS POINT	Power: AC 110V/60Hz
Worst Case Mode: Transmit by ZigBee at channel 2405MHz	

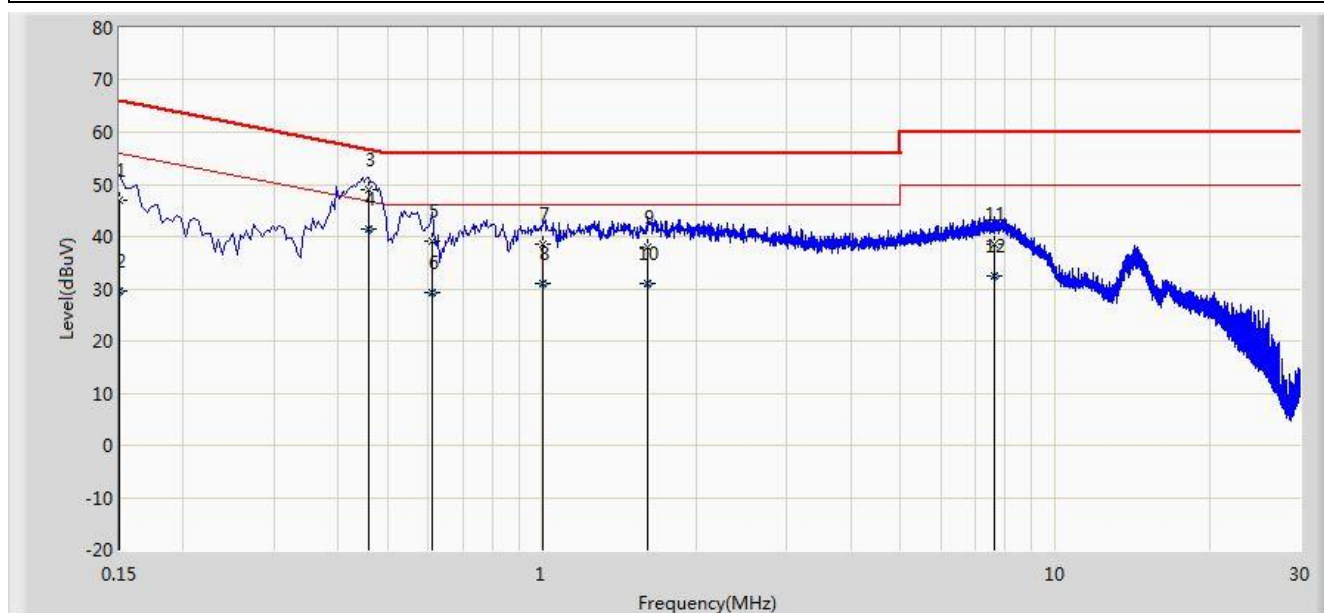


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1			0.162	43.220	33.123	-22.140	65.361	10.097	QP
2			0.162	23.730	13.633	-31.631	55.361	10.097	AV
3			0.466	48.061	37.922	-8.524	56.585	10.139	QP
4		*	0.466	40.290	30.151	-6.295	46.585	10.139	AV
5			0.562	41.558	31.423	-14.442	56.000	10.135	QP
6			0.562	32.531	22.396	-13.469	46.000	10.135	AV
7			0.778	38.827	28.804	-17.173	56.000	10.022	QP
8			0.778	31.085	21.063	-14.915	46.000	10.022	AV
9			2.130	38.150	28.282	-17.850	56.000	9.868	QP
10			2.130	31.384	21.516	-14.616	46.000	9.868	AV
11			7.670	38.882	28.721	-21.118	60.000	10.161	QP
12			7.670	32.853	22.692	-17.147	50.000	10.161	AV

Note: Measure Level (dBμV) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + LISN Factor (dB)

Site: SR2	Time: 2018/09/23 - 12:30
Limit: FCC_Part15.207_CE	Engineer: Kevin Ker
Probe: ENV216_101683_Filter On	Polarity: Neutral
EUT: ACCESS POINT	Power: AC 110V/60Hz
Worst Case Mode: Transmit by ZigBee at channel 2405MHz	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1			0.150	46.822	35.679	-19.178	66.000	11.142	QP
2			0.150	29.579	18.437	-26.421	56.000	11.142	AV
3			0.458	48.980	38.824	-7.749	56.729	10.156	QP
4		*	0.458	41.524	31.369	-5.204	46.729	10.156	AV
5			0.610	39.258	29.132	-16.742	56.000	10.126	QP
6			0.610	29.395	19.269	-16.605	46.000	10.126	AV
7			1.002	38.475	28.566	-17.525	56.000	9.909	QP
8			1.002	30.886	20.978	-15.114	46.000	9.909	AV
9			1.610	37.995	28.109	-18.005	56.000	9.887	QP
10			1.610	31.094	21.207	-14.906	46.000	9.887	AV
11			7.626	38.545	28.368	-21.455	60.000	10.177	QP
12			7.626	32.484	22.306	-17.516	50.000	10.177	AV

Note: Measure Level (dBμV) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + LISN Factor (dB)

5.2. 峰值傳導輸出功率

5.2.1. 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第 3.10.1.2(1)(C)節，操作於 2400-2483.5 MHz 之數位調變的發射器材：1 瓦(W)(含)以下。

依據國家通訊傳播委員會低功率射頻電機技術規範之第 3.10.1.3 節，天線增益限制如下：

(1) 操作於 2400 MHz～2483.5 MHz 頻段：

(A) 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。

(B) 除第(A)節外，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) 天線以多向波束發射方式(含同時發射或循序發射)將訊號導向多個接收機或接收機群組時，應符合下列規定：

(a) 非同時發射多向波束者，所有載波或頻道傳輸至所有天線陣列或陣列群之總和傳導輸出功率應符合 3.10.1.2 之功率限制值。如天線/天線陣列群之方向性增益超過 6 dBi，每超過 3 dBi，總和傳導輸出功率限制值應降低 1 dB。方向性增益值應計算如下：

(i) 方向性增益值= $10\log(\text{天線陣列之單元數目}) + \text{各單元中最高之方向性增益值}$ 。

(ii) 天線陣列間之遮蔽效應或波束干涉損失能充分佐證時，方向性增益得低於(i)計算數值。

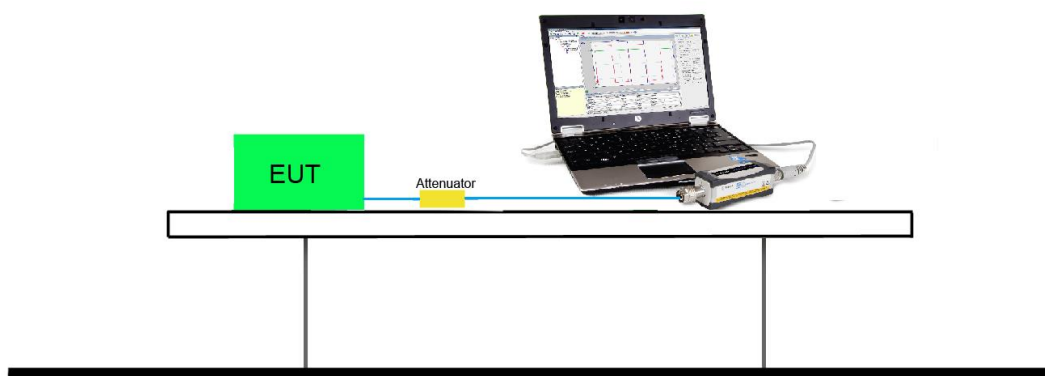
同時發射多向波束於相同或不同頻道者，其每一波束功率應符合(a)之功率限制值。如發射波束有重疊現象，功率應降低，以確保總和傳導輸出功率符合(a)之限制值。同時發射的所有波束總和傳導輸出功率不大於(a) 總和傳導輸出功率限制值加 8 dB。方向性增益值計算同(a)。

(c) 發射機之天線具備單向波束功能者，應符合(1)(A)及(3)後段之規定。

5.2.2. 量測方法

待測物之天線埠經由適當之衰減直接連至頻譜分析儀 RF 輸入端，設定頻譜分析儀之解析度頻寬大於 6dB 發射頻寬或使用峰值功率表。

5.2.3. 測試架構圖



5.2.4. 峰值傳導輸出功率測試結果

Product	ACCESS POINT	Temperature	23°C
Test Engineer	Kevin Ker	Relative Humidity	54%
Test Site	TR3	Test Date	2018/09/04 ~ 2018/10/19

Test Result of Peak Output Power

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Result
802.15.4	O-QPSK	11	2405	7.32	≤ 30.0	Pass
802.15.4	O-QPSK	18	2440	7.44	≤ 30.0	Pass
802.15.4	O-QPSK	26	2480	2.62	≤ 30.0	Pass

Note: E.I.R.P (dBm) = Peak Power (dBm) + Antenna Gain (dBi) = 7.44 dBm + 4.5 dBi = 11.94 dBm.

Test Result of Average Output Power (Reporting Only)

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	Average Power (dBm)	Limit (dBm)	Result
802.15.4	O-QPSK	11	2405	7.11	≤ 30.0	Pass
802.15.4	O-QPSK	18	2440	7.24	≤ 30.0	Pass
802.15.4	O-QPSK	26	2480	2.54	≤ 30.0	Pass

Note: E.I.R.P (dBm) = Peak Power (dBm) + Antenna Gain (dBi) = 7.24 dBm + 4.5 dBi = 11.74 dBm.

5.3. 天線之要求

5.3.1. 適用標準

低功率射頻電機之發射機或收發信機所使用之天線，應為全固定、半固定式或以獨特之耦合(unique coupling)方式連接機體。製造者可設計供使用者因損壞而替換之天線，但不得設計或使用原認證以外之天線或可供引接各類電纜之標準天線插座或電氣連接頭，如：BNC、F type、N type、M type、UG type、RCA、SMA、SMB...等及其他各類工業或通訊標準接頭。

5.3.2. 天線樣式

Antenna Type	Frequency Band (GHz)	TX Paths	Max Peak Gain (dBi)	Beam-Forming Directional Gain (dBi)	CDD Directional Gain (dBi)	
					For Power	For PSD
Wi-Fi Internal Antenna						
PCB	2.4	2	2.1	3.01	2.1	5.11
	5	2	5.9	3.01	5.9	8.91
Bluetooth/ZigBee Internal Antenna						
PCB	2.4	1	4.5	--		

Note:

- The EUT supports Cyclic Delay Diversity (CDD) mode, and CDD signals are correlated.
For CDD transmissions, directional gain is calculated as follows, $N_{ANT} = 2$, $N_{SS} = 1$.
If all antennas have the same gain, G_{ANT} , Directional gain = $G_{ANT} + \text{Array Gain}$, where Array Gain is as follows.
 - For power spectral density (PSD) measurements on all devices,
Array Gain = $10 \log (N_{ANT} / N_{SS})$ dB = 3.01;
 - For power measurements on IEEE 802.11 devices,
Array Gain = 0 dB for $N_{ANT} \leq 4$;
- The EUT also supports Beam Forming mode, and the Beam Forming support 802.11n/ac, not include 802.11a/b/g.

5.4. 輻射干擾測試

5.4.1. 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第 3.10.1.5 節，使用頻帶範圍外之任意 100 千赫 (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 千赫 (kHz) 內的射頻功率，衰減值限制如下：

(1) 輸出功率以低功率射頻電機技術規範附件二之峰值輸出功率方式量測者，至少須衰減 20 dB，可使用射頻傳導或輻射方式測量。

(2) 輸出功率以低功率射頻電機技術規範 3.10.1(2)(2.3) 之最大傳導輸出功率量測方式者，至少須衰減 30 dB。

此外，落於第 2.7 節禁用頻段之輻射發射，應符合第 2.8 節之規定。

依據國家通訊傳播委員會低功率射頻電機技術規範之第 2.8 節，低功率射頻電機，除本規範各章節另有放寬規定者外，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(兆赫)	電場強度(微伏/公尺)	測距(公尺)
0.009 - 0.490(含)	2,400/頻率(千赫)	300
0.490 (不含) – 1.705 (含)	24,000/頻率(千赫)	30
1.705(不含) – 30 (不含)	30	30
30 (含) – 88 (含)	100	3
88 (不含)- 216 (含)	150	3
216 (不含)- 960 (含)	200	3
960 (不含)以上	500	3

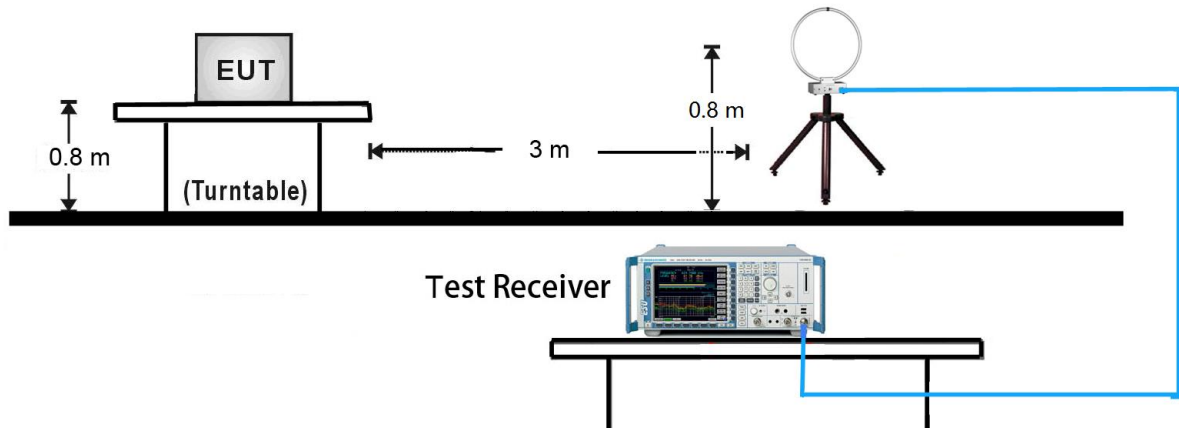
上表規定之電場強度，頻率在 9-90kHz 千赫(kHz)、110-490 千赫(kHz)以及 1000 兆赫(MHz)以上之發射，其量測以平均值檢波器為基準，且須符合第 5.14 節之規定；其他頻率之發射，應以 CISPR 準峰值(quasi-peak) 檢波器測量；非以上表所指定之距離測量時須符合第 5.5 節之規定，而輻射發射之量測頻率範圍須符合第 5.12 節之規定。

5.4.2. 量測方法

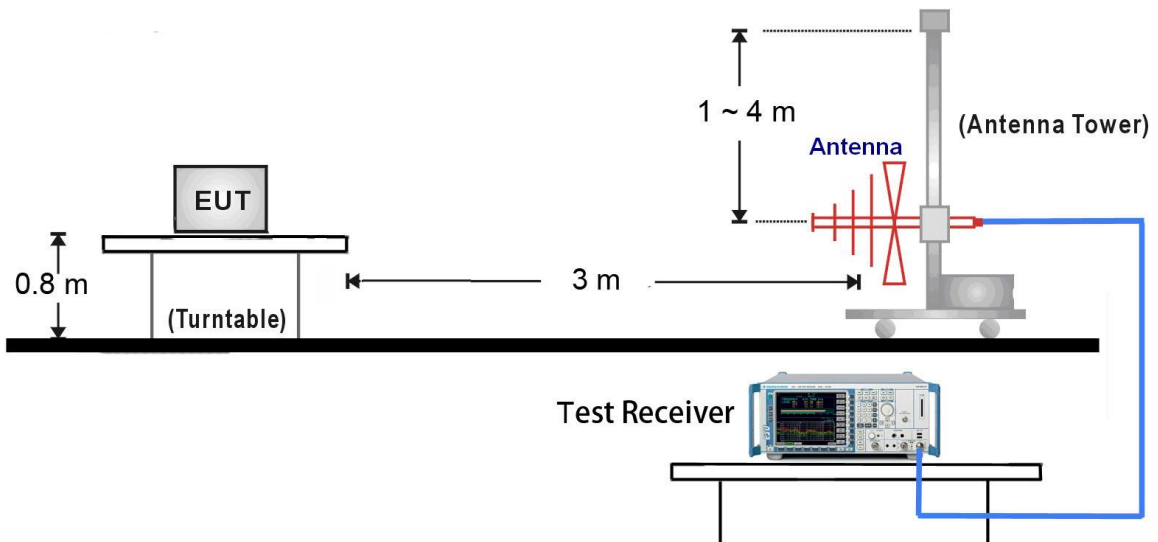
低頻待測物置於高 80 公分之非導體桌面（落地型產品置於地上），高頻待測物置於高 150 公分之非導體桌面，受測物與配件設備之電源線無須束綁，桌面上受測設備的所有電源線由桌子的後緣垂下沿旋轉桌表面接至交流插座。落地型設備的交流電源線可以方便的型態走線。桌面可 360 度旋轉，接收天線置於距待測物 3m 距離，高度可在 1 至 4 公尺間變動，以量測待測物之最大輻射電場強度。接收天線並應於水準及垂直極化方向各量測一次。

5.4.3. 測試架構圖

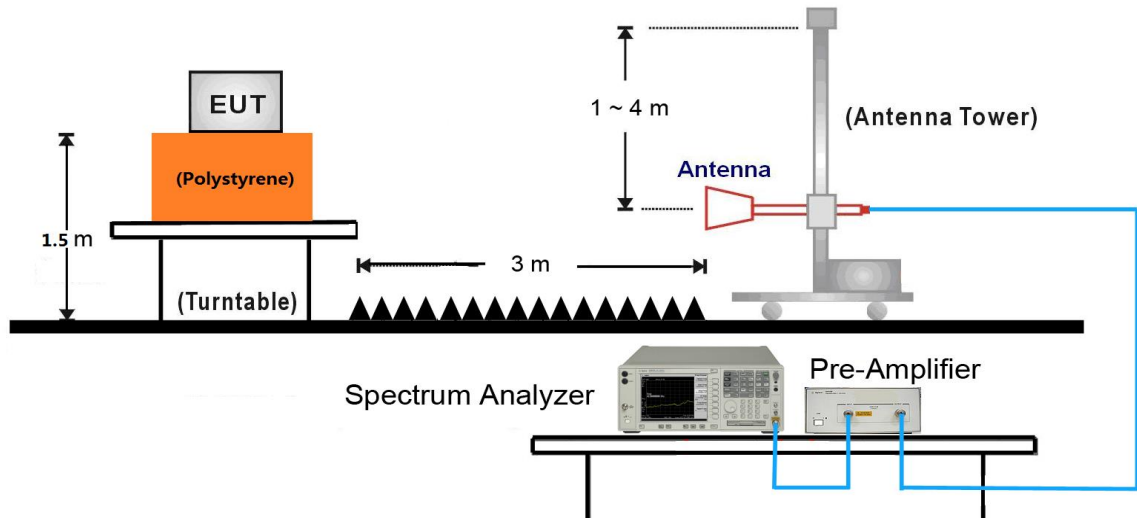
9kHz ~ 30MHz Test Setup:



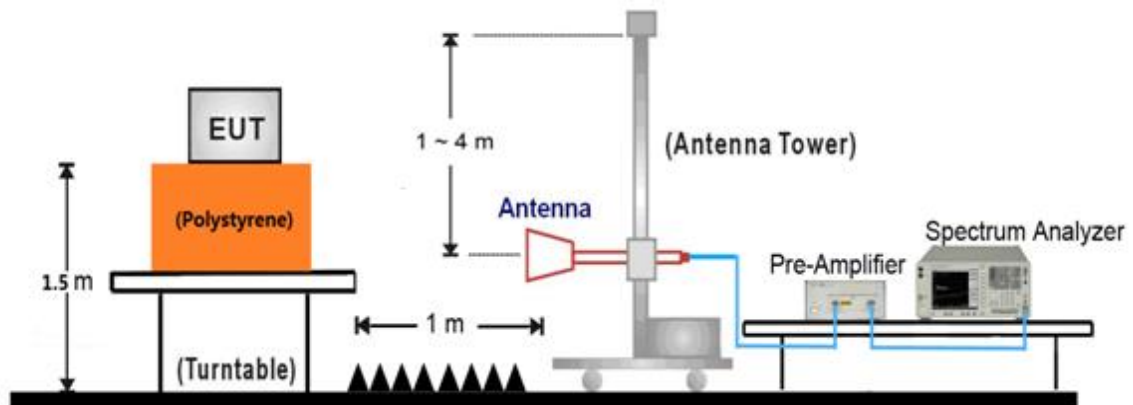
30MHz ~ 1GHz Test Setup:



1GHz ~ 18GHz Test Setup:



18GHz ~ 25GHz Test Setup:



5.4.4. 輻射干擾測試結果

Product	ACCESS POINT	Temperature	25°C
Test Engineer	Kevin Ker	Relative Humidity	58%
Test Site	AC1	Test Date	2018/09/13
Test Mode:	802.15.4	Test Channel:	11
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
*	8735.0	31.2	13.9	45.1	81.7	-36.6	Peak	Horizontal
*	9865.5	31.3	16.0	47.3	81.7	-34.4	Peak	Horizontal
	11123.5	31.2	18.6	49.9	74.0	-24.1	Peak	Horizontal
	15790.0	33.2	20.4	53.6	74.0	-20.4	Peak	Horizontal
*	8769.0	32.6	13.9	46.5	81.7	-35.2	Peak	Vertical
*	9882.5	34.0	15.6	49.7	81.7	-32.0	Peak	Vertical
	10979.0	31.8	18.5	50.2	74.0	-23.8	Peak	Vertical
	15858.0	33.1	20.4	53.5	74.0	-20.5	Peak	Vertical

Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (101.69dBμV/m) or FCC 15.209 which is higher.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

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

Product	ACCESS POINT	Temperature	25°C
Test Engineer	Kevin Ker	Relative Humidity	58%
Test Site	AC1	Test Date	2018/09/13
Test Mode:	802.15.4	Test Channel:	18
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
*	8777.5	31.4	14.9	46.3	82.8	-36.5	Peak	Horizontal
*	9908.0	31.6	17.4	48.9	82.8	-33.9	Peak	Horizontal
	11098.0	29.4	20.0	49.4	74.0	-24.6	Peak	Horizontal
	11948.0	28.8	20.2	49.1	74.0	-24.9	Peak	Horizontal
*	8820.0	31.7	14.9	46.6	82.8	-36.2	Peak	Vertical
*	9695.5	31.3	16.3	47.5	82.8	-35.3	Peak	Vertical
	10911.0	29.9	20.0	49.9	74.0	-24.1	Peak	Vertical
	11727.0	28.6	20.6	49.2	74.0	-24.8	Peak	Vertical

Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (102.78dBμV/m) or FCC 15.209 which is higher.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

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

Product	ACCESS POINT	Temperature	25°C
Test Engineer	Kevin Ker	Relative Humidity	58%
Test Site	AC1	Test Date	2018/10/19
Test Mode:	802.15.4	Test Channel:	26
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	3992.0	38.3	3.2	41.6	74.0	-32.4	Peak	Horizontal
	4825.0	37.8	5.9	43.7	74.0	-30.3	Peak	Horizontal
*	5751.5	37.2	7.4	44.6	75.4	-23.6	Peak	Horizontal
*	6448.5	37.0	9.7	46.7	75.4	-21.5	Peak	Horizontal
	4128.0	37.8	3.8	41.6	74.0	-32.4	Peak	Vertical
	4961.0	38.1	6.1	44.1	74.0	-29.9	Peak	Vertical
*	6015.0	36.4	7.9	44.2	75.4	-24.0	Peak	Vertical
*	6882.0	36.7	10.6	47.3	75.4	-20.9	Peak	Vertical

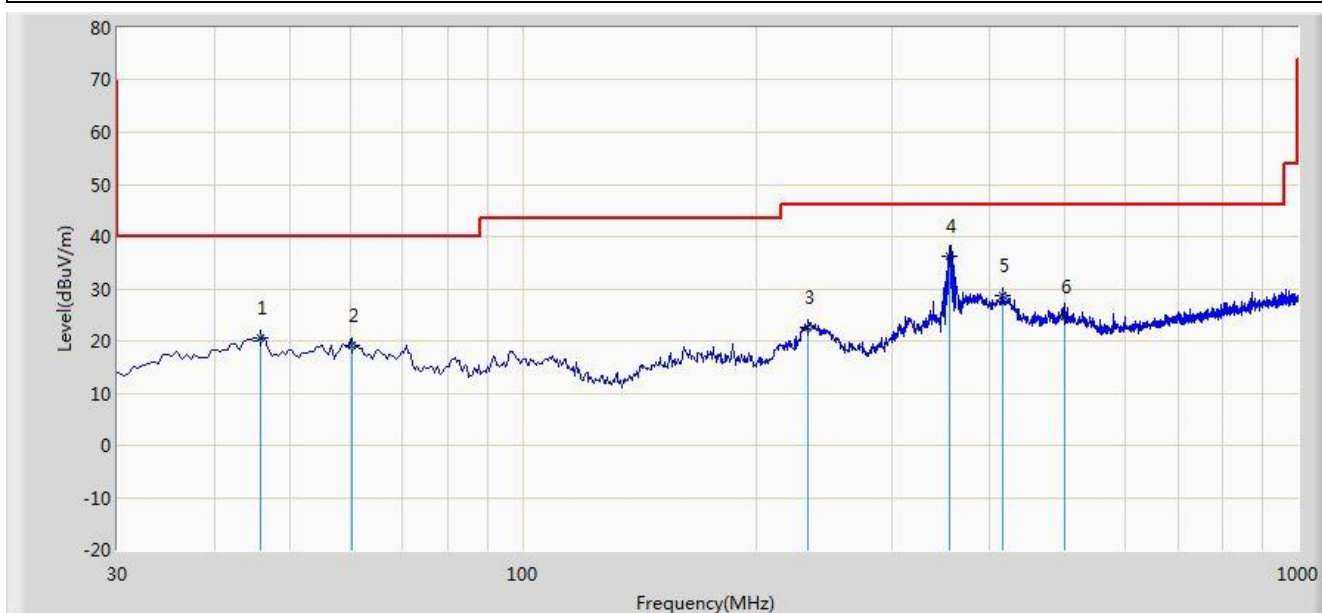
Note 1: “*” is not in restricted band, its limit is 20dBc of the fundamental emission level (95.37dBμV/m) or FCC 15.209 which is higher.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

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

The Worst Case of Radiated Emission below 1GHz:

Site: AC1	Time: 2018/09/21 - 14:47
Limit: FCC_Part15.209_RE(3m)	Engineer: Kevin Ker
Probe: VULB9162_0.03-8GHz	Polarity: Horizontal
EUT: ACCESS POINT	Power: AC 110V/60Hz
Worst Case Mode: Transmit by 802.15.4 at Channel 2405MHz	



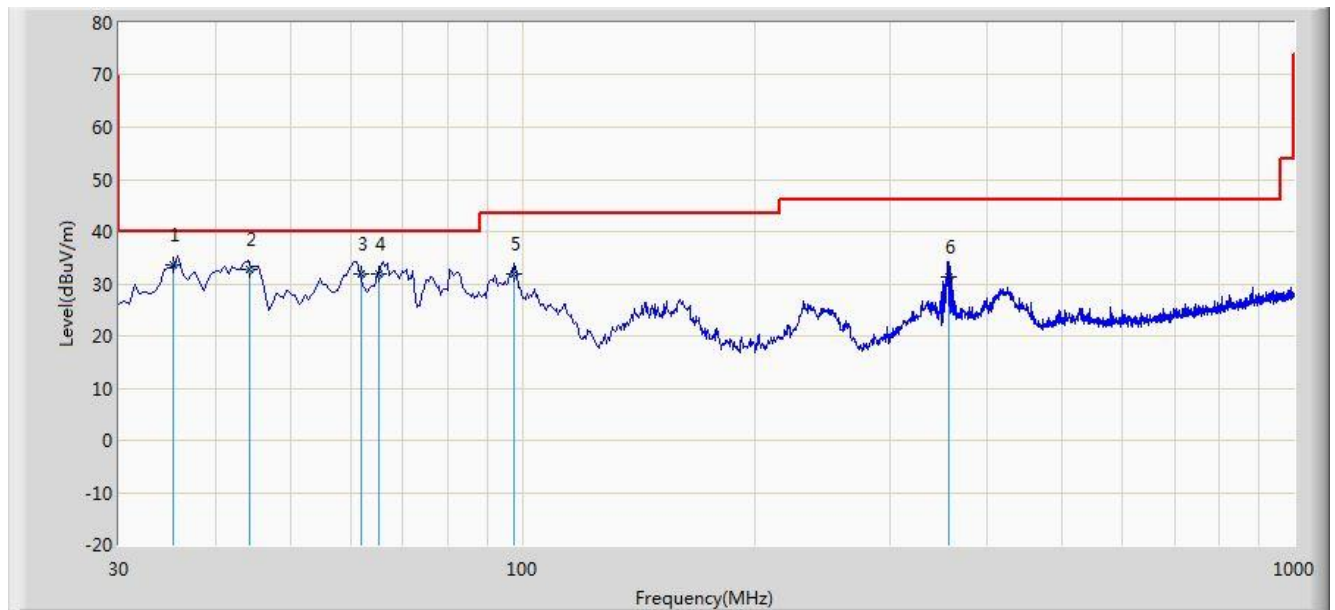
No	Flag	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Over Limit (dB)	Limit (dBμV/m)	Factor (dB)	Type
1			45.960	20.471	5.362	-19.529	40.000	15.109	QP
2			60.145	19.038	5.054	-20.962	40.000	13.983	QP
3			233.085	22.519	9.082	-23.481	46.000	13.438	QP
4		*	355.145	36.376	20.140	-9.624	46.000	16.236	QP
5			416.152	28.772	11.478	-17.228	46.000	17.293	QP
6			500.430	24.716	6.040	-21.284	46.000	18.675	QP

Note 1: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m).

Note 2: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), therefore no data appear in the report.

Site: AC1	Time: 2018/09/21 - 14:49
Limit: FCC_Part15.209_RE(3m)	Engineer: Kevin Ker
Probe: VULB9162_0.03-8GHz	Polarity: Vertical
EUT: ACCESS POINT	Power: AC 110V/60Hz
Worst Case Mode: Transmit by 802.15.4 at Channel 2405MHz	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	35.280	33.678	20.588	-6.322	40.000	13.090	QP
2			44.256	32.758	17.970	-7.242	40.000	14.787	QP
3			61.744	31.806	18.081	-8.194	40.000	13.725	QP
4			65.040	31.751	19.088	-8.249	40.000	12.663	QP
5			97.480	31.893	19.070	-11.607	43.500	12.823	QP
6			356.540	31.433	15.175	-14.567	46.000	16.258	QP

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m).

Note 2: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), therefore no data appear in the report.

5.5. 混附發射之 RF 傳導發射

5.5.1. 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之第 3.10.1.5 節，使用頻帶範圍外之任意 100 千赫 (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 千赫 (kHz) 內的射頻功率，至少須衰減 20 dB，以射頻傳導或輻射方式測量。如發射機以本節 3.10.1(2)(2.3) 之峰值傳導輸出功率量測方式者，至少須衰減 30 dB。此外，落於第 2.7 節禁用頻段之輻射發射，應符合第 2.8 節之規定。

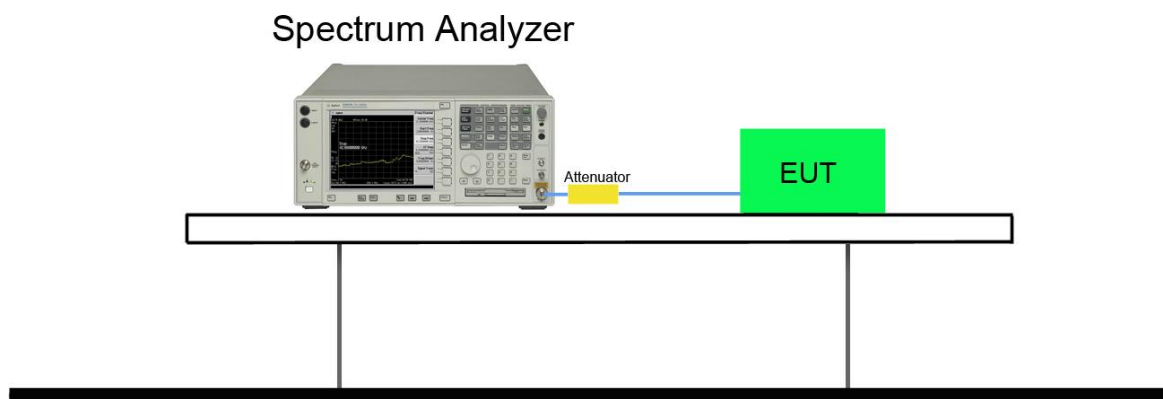
5.5.2. 量測方法

依據國家通訊傳播委員會低功率射頻電機技術規範之附件三，頻率跳頻展頻系統檢測之參考程式七 混附發射之 RF 傳導發射：

(一) 頻譜分析儀設定如下：

1. 頻率掃描範圍足以檢測頻帶內的發射波峰位準以及由受測物產生之最低頻率到第 10 次諧波的所有混附發射，通常需要分幾段以涵蓋全部頻率範圍。
2. 解析頻寬為 100kHz，視訊頻寬不小於解析頻寬。
3. 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)。
4. 將標記設定於任何欲紀錄之波峰上，所顯示之位準值必須符合指定之限制值。

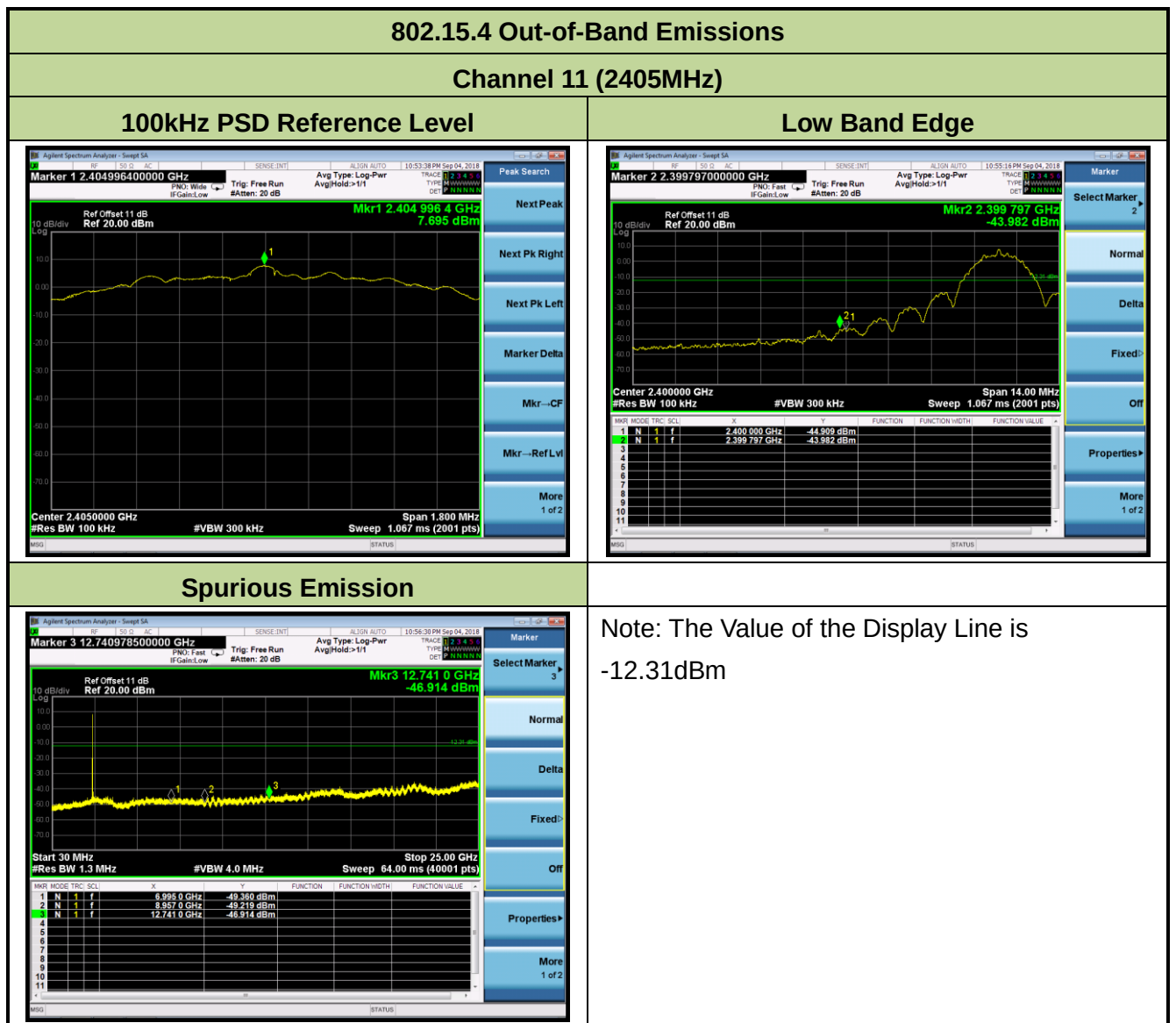
5.5.3. 測試架構圖



5.5.4. 混附發射之 RF 傳導發射測試結果

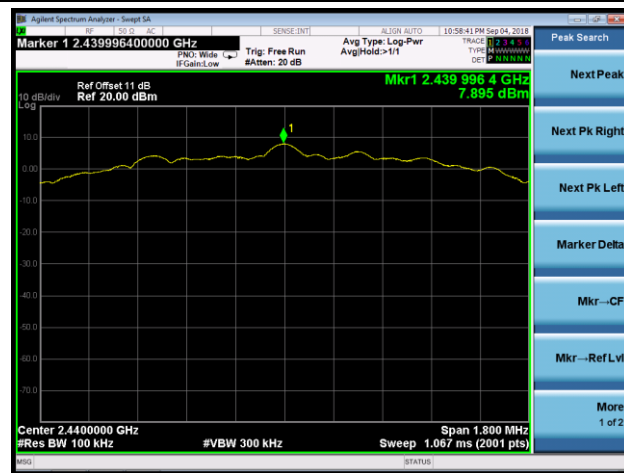
Product	ACCESS POINT	Temperature	24°C
Test Engineer	Kevin Ker	Relative Humidity	60%
Test Site	TR3	Test Date	2018/09/04 ~ 2018/10/19

Test Mode	Data Rate / MCS	Channel No.	Frequency (MHz)	Limit	Result
802.15.4	O-QPSK	11	2405	20dBc	Pass
802.15.4	O-QPSK	18	2440	20dBc	Pass
802.15.4	O-QPSK	26	2480	20dBc	Pass

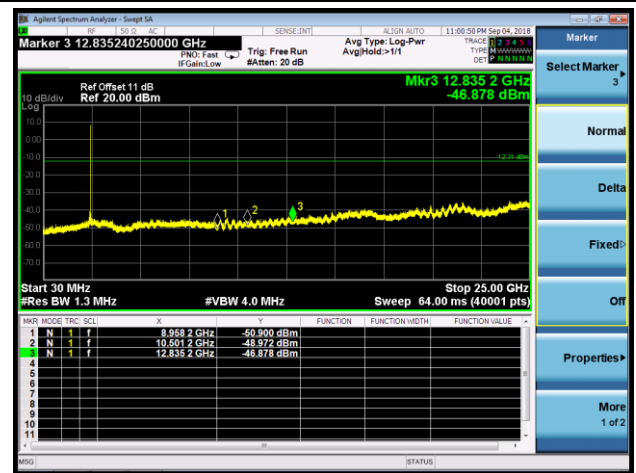


Channel 18 (2440MHz)

100kHz PSD Reference Level



Spurious Emission



Note: The Value of the Display Line is -12.31dBm

Channel 26 (2480MHz)

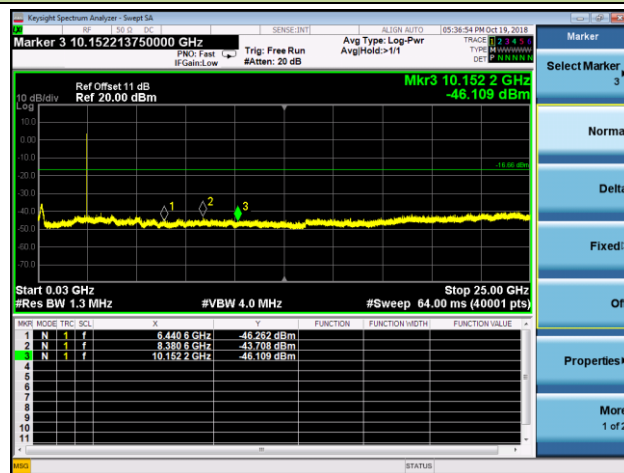
100kHz PSD Reference Level



High Band Edge



Spurious Emission



Note: The Value of the Display Line is -16.66dBm

5.6. 開放頻帶邊緣之不必要幅射要求

5.6.1. 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第 3.10.1.5 節，使用頻帶範圍外之任意 100 千赫 (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 千赫 (kHz) 內的射頻功率，衰減值限制如下：

(1) 輸出功率以低功率射頻電機技術規範附件二之峰值輸出功率方式量測者，至少須衰減 20 dB，可使用射頻傳導或輻射方式測量。

(2) 輸出功率以低功率射頻電機技術規範 3.10.1(2)(2.3) 之最大傳導輸出功率量測方式者，至少須衰減 30 dB。

此外，落於第 2.7 節禁用頻段之輻射發射，應符合第 2.8 節之規定(限制要求如下)：

發射依據國家通訊傳播委員會低功率射頻電機技術規範之第 2.8 節，低功率射頻電機，除本規範各章節另有放寬規定者外，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。

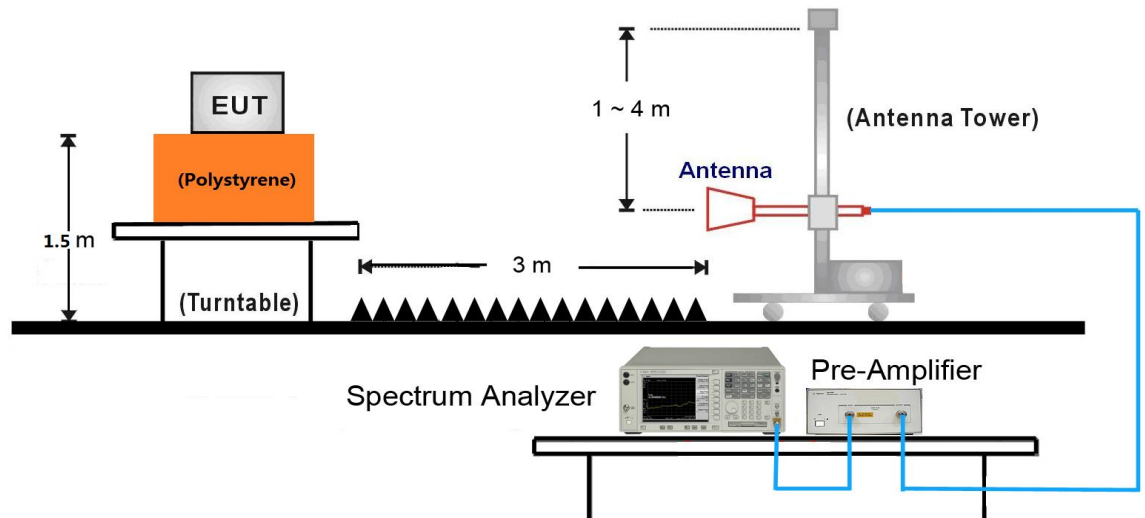
頻 率(兆赫)	電場強度(微伏/公尺)	測距(公尺)
0.009 - 0.490(含)	2,400/頻率(千赫)	300
0.490 (不含) – 1.705 (含)	24,000/頻率(千赫)	30
1.705(不含) – 30 (不含)	30	30
30 (含) – 88 (含)	100	3
88 (不含)- 216 (含)	150	3
216 (不含)- 960 (含)	200	3
960 (不含)以上	500	3

上表規定之電場強度，頻率在 9-90kHz 千赫(kHz)、110-490 千赫(kHz)以及 1000 兆赫(MHz)以上之發射，其量測以平均值檢波器為基準，且須符合第 5.14 節之規定；其他頻率之發射，應以 CISPR 準峰值(quasi-peak) 檢波器測量；非以上表所指定之距離測量時須符合第 5.5 節之規定，而輻射發射之量測頻率範圍須符合第 5.12 節之規定。

5.6.2. 量測方法

待測物置於高 80 公分之非導體桌面（落地型產品置於地上），受測物與配件設備之電源線無須束綁，桌面上受測設備的所有電源線由桌子的後緣垂下沿旋轉桌表面接至交流插座。落地型設備的交流電源線可以方便的型態走線。桌面可 360 度旋轉，接收天線置於距待測物 3m 距離，高度可在 1 至 4 公尺間變動，以量測待測物之最大輻射電場強度。接收天線並應於水準及垂直極化方向各量測一次。

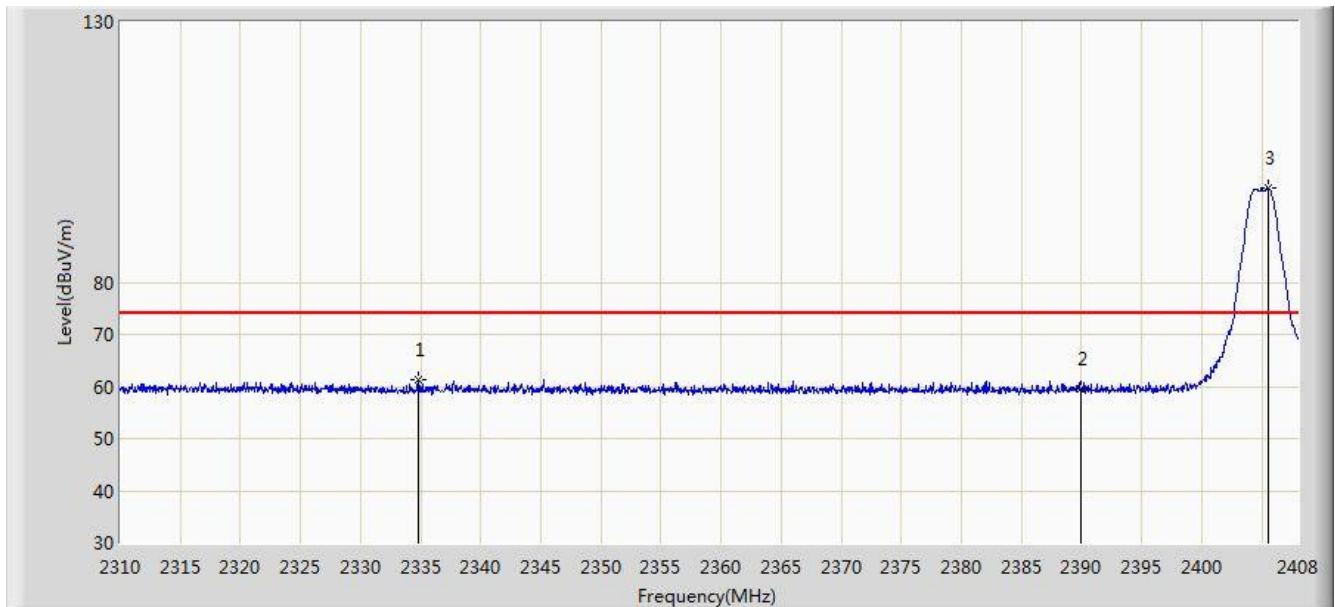
5.6.3. 測試架構圖



備註: 使用頻率範圍外之任意 100 千赫雜訊，使用輻射方式測量，6 dB 頻寬使用 1MHz 遠大於 100kHz 仍可 PASS，檢附其測試數據。

5.6.4. 測試結果

Site: AC1	Time: 2018/09/13 - 06:56
Limit: FCC_Part15.209_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1GHz_18GHz_TW	Polarity: Horizontal
EUT: ACCESS POINT	Power: AC 110V/60Hz
Test Mode: Transmit by ZigBee at channel 2405MHz	

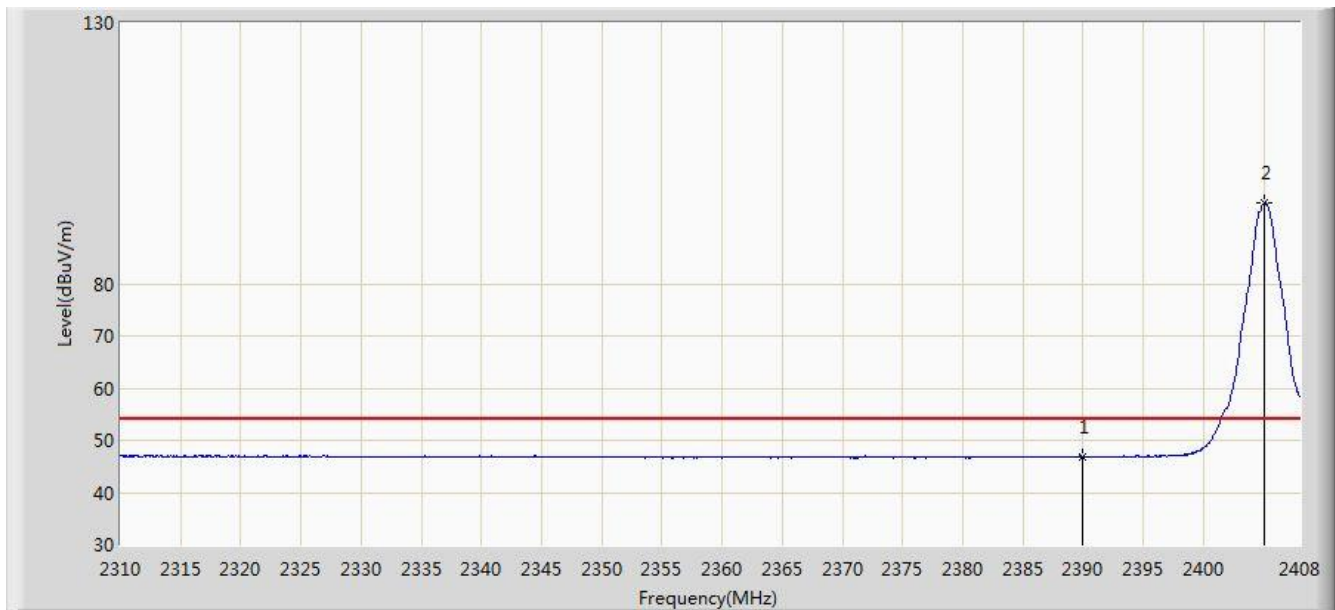


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2334.794	61.277	28.569	-12.723	74.000	32.707	PK
2			2390.000	59.655	27.080	-14.345	74.000	32.575	PK
3		*	2405.501	98.043	65.488	24.043	74.000	32.555	PK

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m).

Site: AC1	Time: 2018/09/13 - 06:57
Limit: FCC_Part15.209_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1GHz_18GHz_TW	Polarity: Horizontal
EUT: ACCESS POINT	Power: AC 110V/60Hz
Test Mode: Transmit by ZigBee at channel 2405MHz	

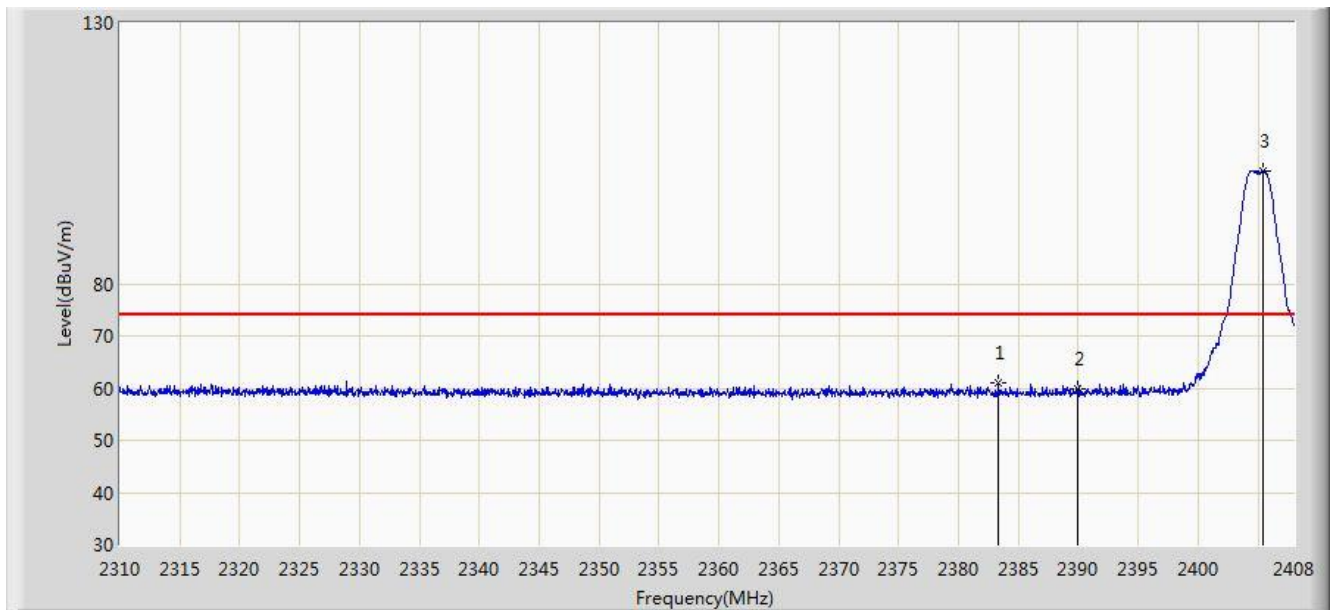


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2390.000	46.871	14.296	-7.129	54.000	32.575	AV
2		*	2405.011	95.396	62.840	41.396	54.000	32.556	AV

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m).

Site: AC1	Time: 2018/09/13 - 06:58
Limit: FCC_Part15.209_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1GHz_18GHz_TW	Polarity: Vertical
EUT: ACCESS POINT	Power: AC 110V/60Hz
Test Mode: Transmit by ZigBee at channel 2405MHz	

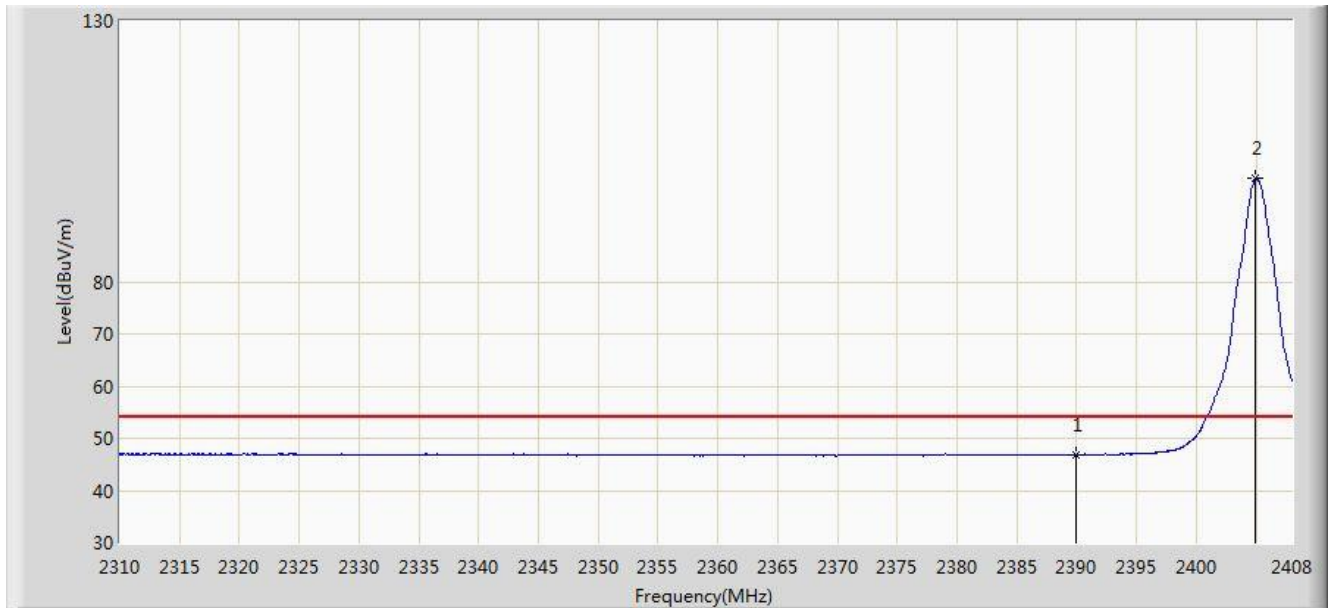


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2383.304	61.092	28.506	-12.908	74.000	32.586	PK
2			2390.000	59.863	27.288	-14.137	74.000	32.575	PK
3		*	2405.452	101.693	69.138	27.693	74.000	32.555	PK

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m).

Site: AC1	Time: 2018/09/13 - 06:59
Limit: FCC_Part15.209_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1GHz_18GHz_TW	Polarity: Vertical
EUT: ACCESS POINT	Power: AC 110V/60Hz
Test Mode: Transmit by ZigBee at channel 2405MHz	

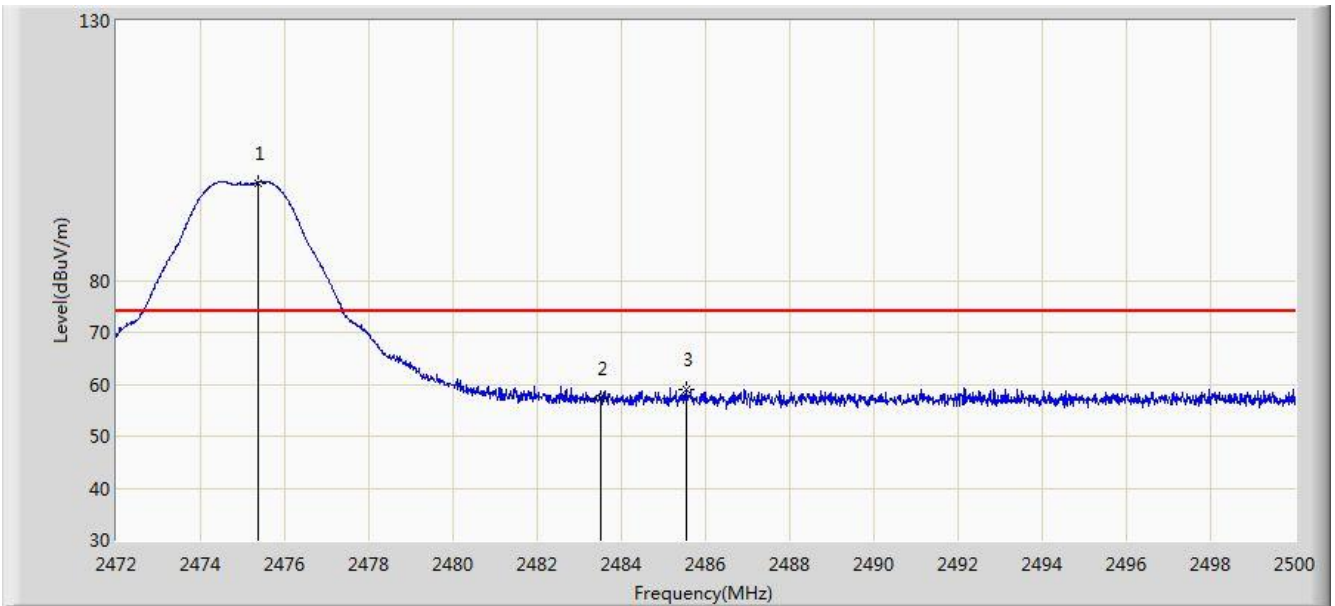


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2390.000	46.790	14.215	-7.210	54.000	32.575	AV
2		*	2404.962	99.764	67.208	45.764	54.000	32.555	AV

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m).

Site: AC1	Time: 2018/09/13 - 09:13
Limit: FCC_Part15.209_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1GHz_18GHz_TW	Polarity: Horizontal
EUT: ACCESS POINT	Power: AC 110V/60Hz
Test Mode: Transmit by ZigBee at channel 2475MHz	

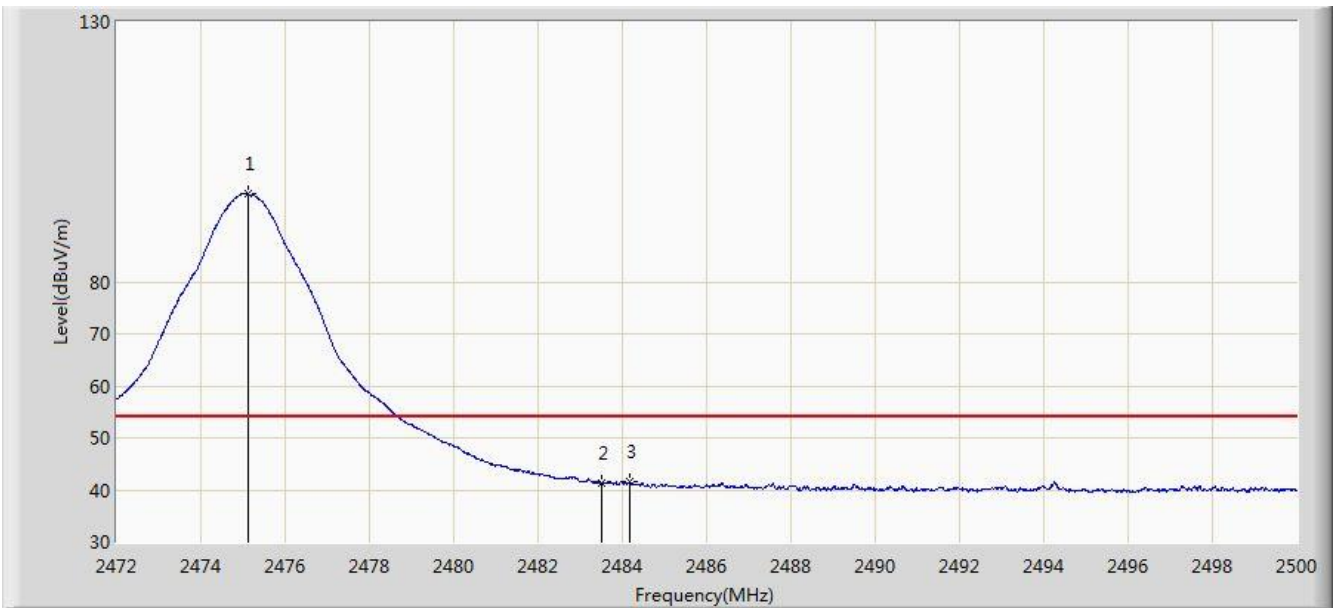


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2475.360	98.793	66.237	24.793	74.000	32.556	PK
2			2483.500	57.145	24.564	-16.855	74.000	32.580	PK
3			2485.552	59.127	26.540	-14.873	74.000	32.587	PK

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2018/09/13 - 09:20
Limit: FCC_Part15.209_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1GHz_18GHz_TW	Polarity: Horizontal
EUT: ACCESS POINT	Power: AC 110V/60Hz
Test Mode: Transmit by ZigBee at channel 2475MHz	

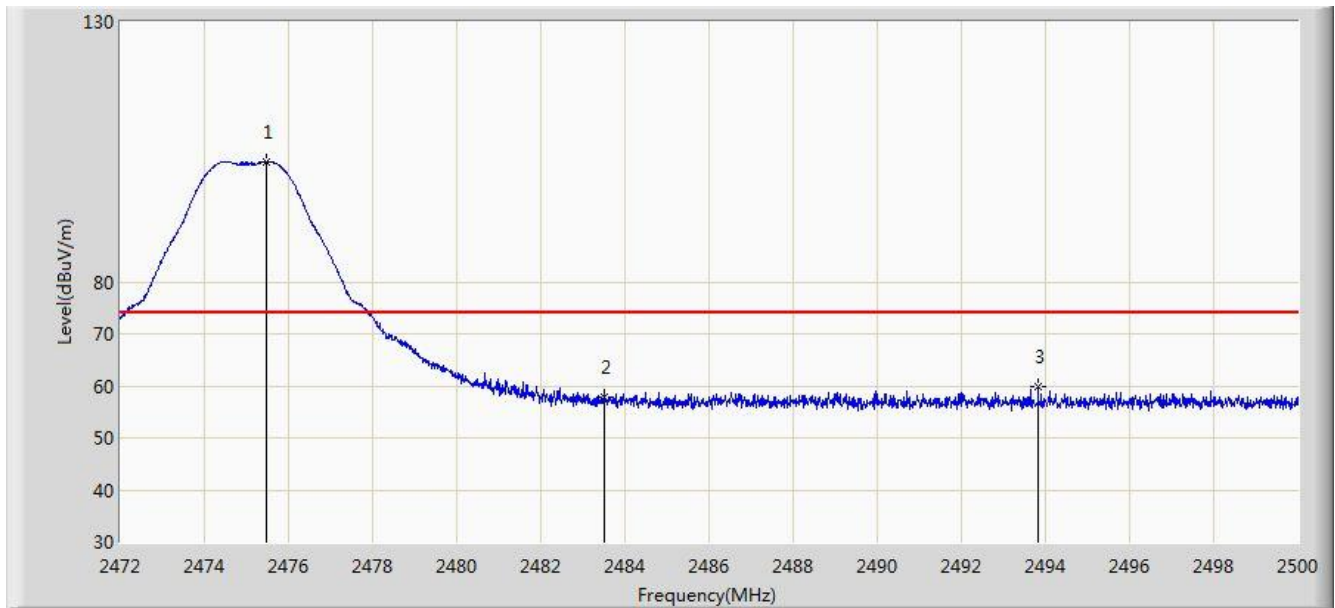


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2475.122	96.948	64.393	42.948	54.000	32.555	AV
2			2483.500	41.290	8.709	-12.710	54.000	32.580	AV
3			2484.180	41.525	8.942	-12.475	54.000	32.582	AV

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2018/09/13 - 09:22
Limit: FCC_Part15.209_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1GHz_18GHz_TW	Polarity: Vertical
EUT: ACCESS POINT	Power: AC 110V/60Hz
Test Mode: Transmit by ZigBee at channel 2475MHz	

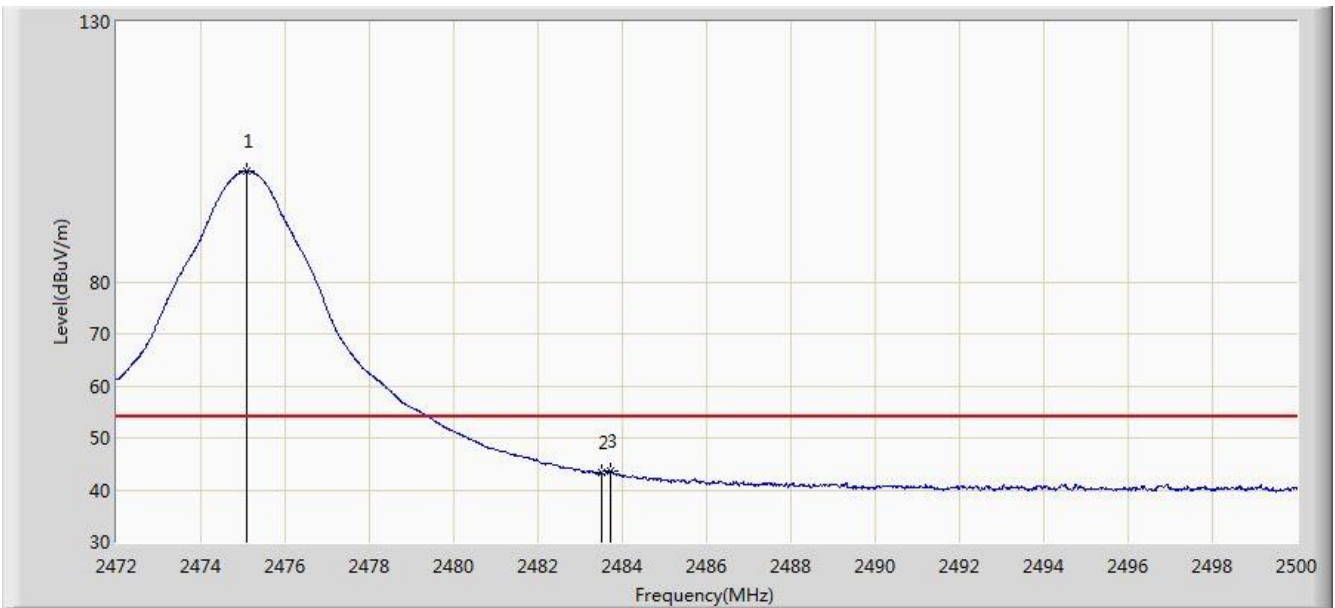


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2475.486	103.129	70.573	29.129	74.000	32.557	PK
2			2483.500	57.869	25.288	-16.131	74.000	32.580	PK
3			2493.826	59.797	27.186	-14.203	74.000	32.611	PK

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2018/09/13 - 09:24
Limit: FCC_Part15.209_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1GHz_18GHz_TW	Polarity: Vertical
EUT: ACCESS POINT	Power: AC 110V/60Hz
Test Mode: Transmit by ZigBee at channel 2475MHz	

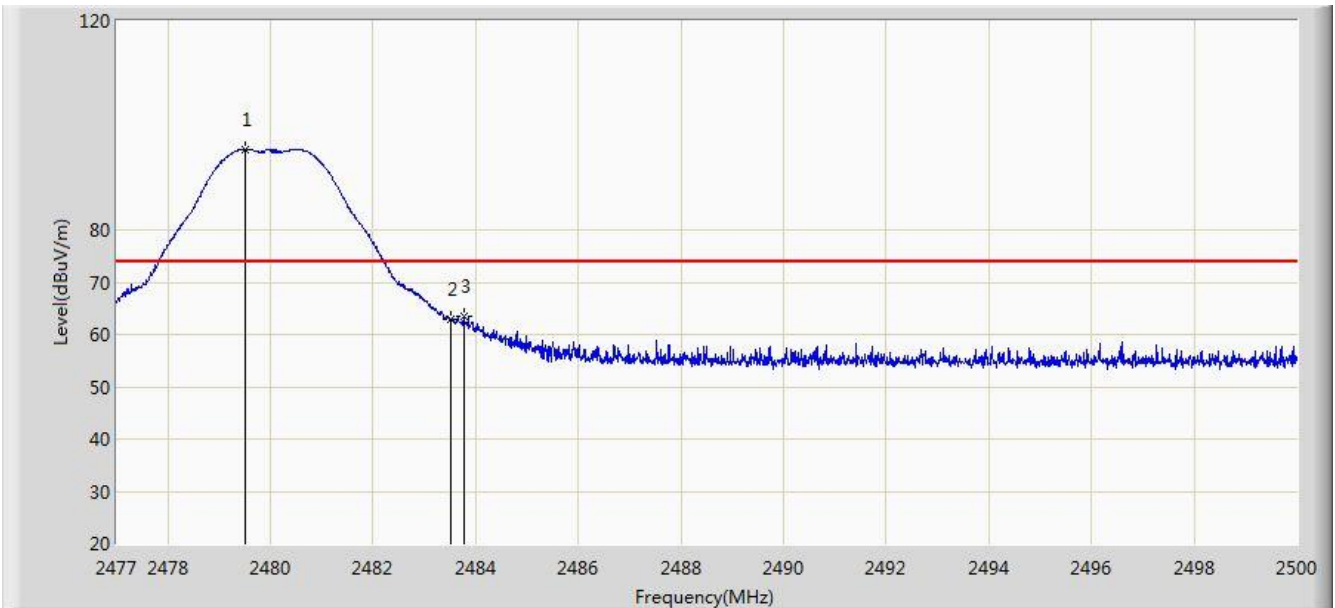


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2475.080	101.287	68.732	47.287	54.000	32.555	AV
2			2483.500	43.224	10.643	-10.776	54.000	32.580	AV
3			2483.704	43.562	10.981	-10.438	54.000	32.582	AV

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m).

Site: AC1	Time: 2018/10/18 - 20:20
Limit: FCC_Part15.209_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1GHz_18GHz_TW	Polarity: Horizontal
EUT: ACCESS POINT	Power: AC 110V/60Hz
Test Mode: Transmit by ZigBee at channel 2480MHz	

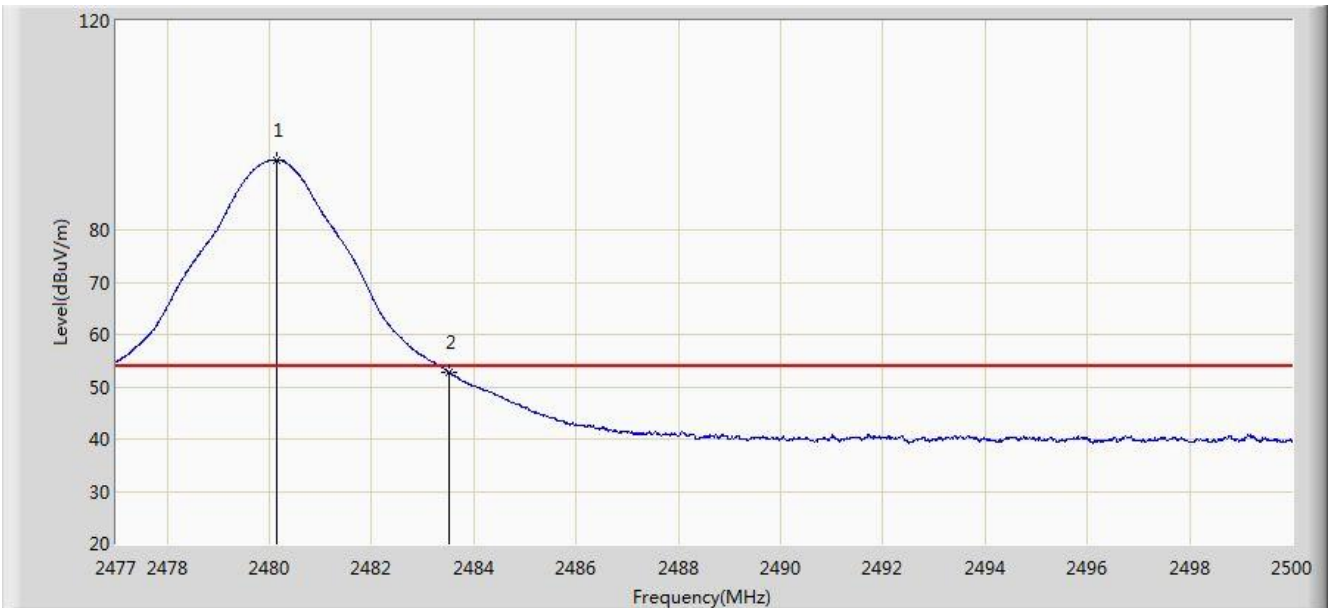


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2479.496	95.374	63.051	21.374	74.000	32.323	PK
2			2483.500	62.978	30.639	-11.022	74.000	32.340	PK
3			2483.762	63.348	31.008	-10.652	74.000	32.340	PK

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m).

Site: AC1	Time: 2018/10/18 - 20:21
Limit: FCC_Part15.209_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1GHz_18GHz_TW	Polarity: Horizontal
EUT: AP303P	Power: AC 110V/60Hz
Test Mode: Transmit by ZigBee at channel 2480MHz	

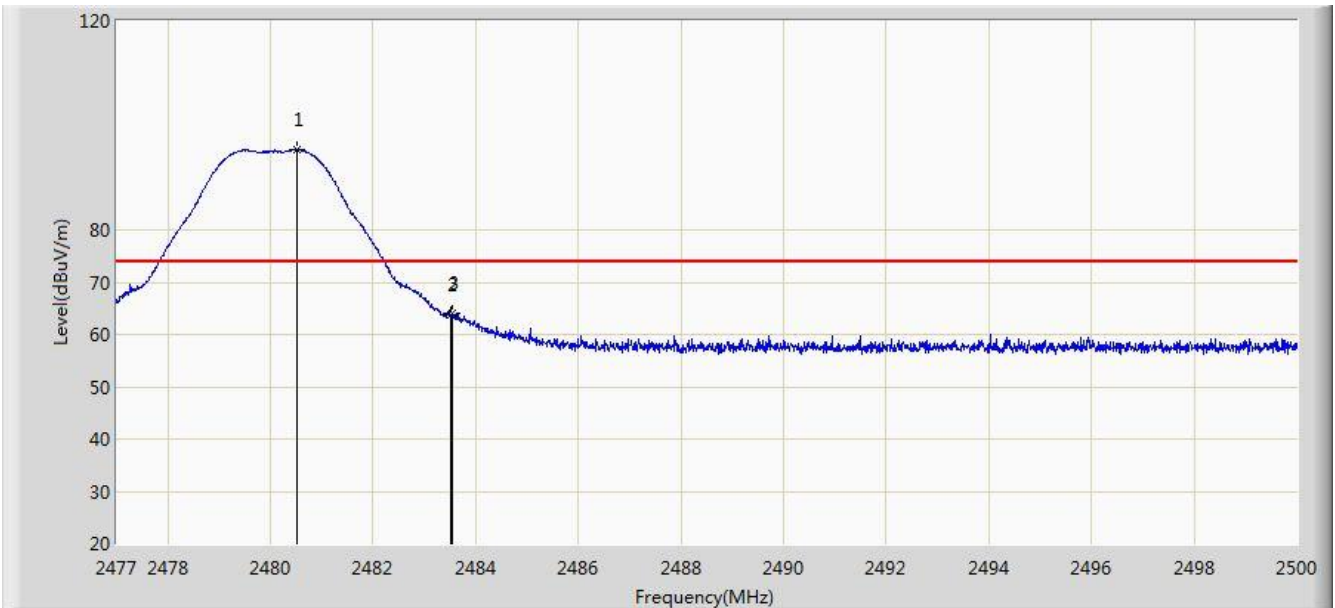


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2480.139	93.378	61.052	39.378	54.000	32.326	AV
2			2483.500	52.818	20.479	-1.182	54.000	32.340	AV

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m).

Site: AC1	Time: 2018/10/18 - 20:21
Limit: FCC_Part15.209_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1GHz_18GHz_TW	Polarity: Vertical
EUT: AP303P	Power: AC 110V/60Hz
Test Mode: Transmit by ZigBee at channel 2480MHz	

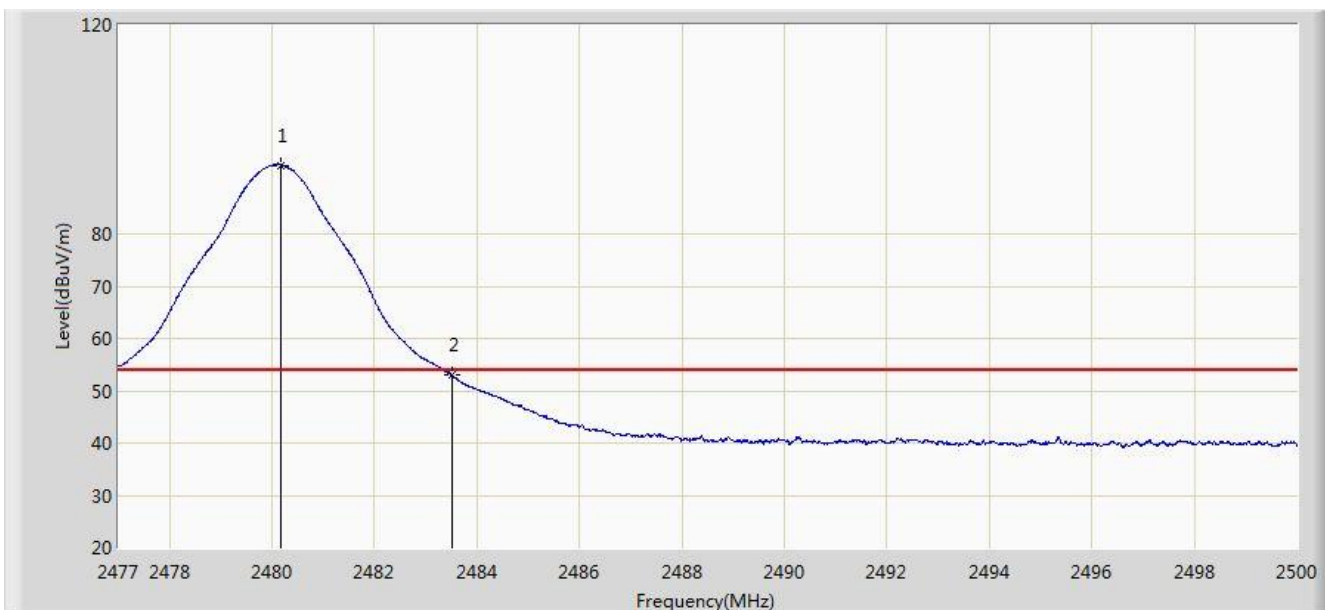


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2480.508	95.318	62.991	21.318	74.000	32.327	PK
2			2483.500	63.695	31.356	-10.305	74.000	32.340	PK
3			2483.543	63.934	31.595	-10.066	74.000	32.340	PK

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m).

Site: AC1	Time: 2018/10/18 - 20:25
Limit: FCC_Part15.209_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1GHz_18GHz_TW	Polarity: Vertical
EUT: AP303P	Power: AC 110V/60Hz
Test Mode: Transmit by ZigBee at channel 2480MHz	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2480.174	93.183	60.857	39.183	54.000	32.326	AV
2			2483.500	52.946	20.607	-1.054	54.000	32.340	AV

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m).

5.7. 佔用頻道寬度

5.7.1. 適用標準

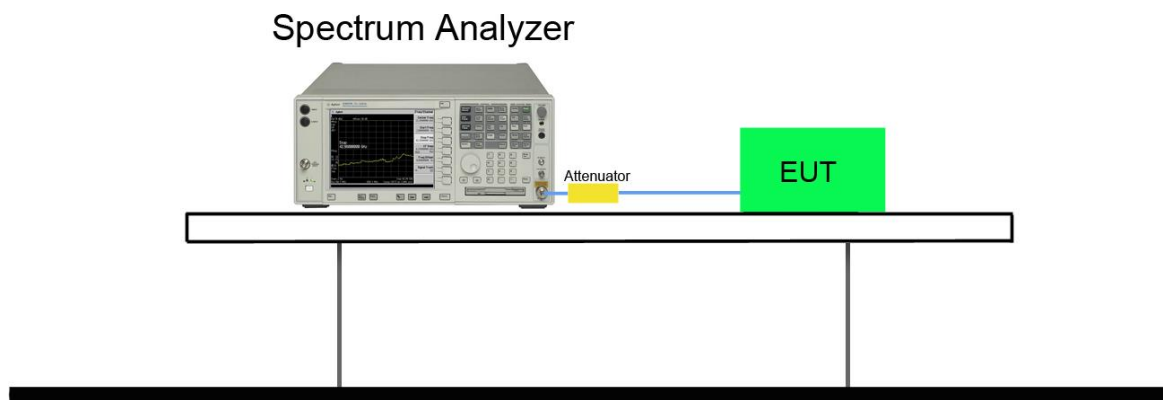
依據國家通訊傳播委員會低功率射頻電機技術規範之第 3.10.1.6(2)(A)節之要求，6dB 頻寬至少應有 500kHz。

5.7.2. 量測方法

待測物之天線埠經由適當之衰減直接連至頻譜分析儀 RF 輸入端，設定頻譜分析儀之解析度頻寬為 100kHz，視訊頻寬不小於解析度頻寬，頻率掃描範圍(SPAN)遠大於解析度頻寬。

待測物應在正常發射狀態下量測。

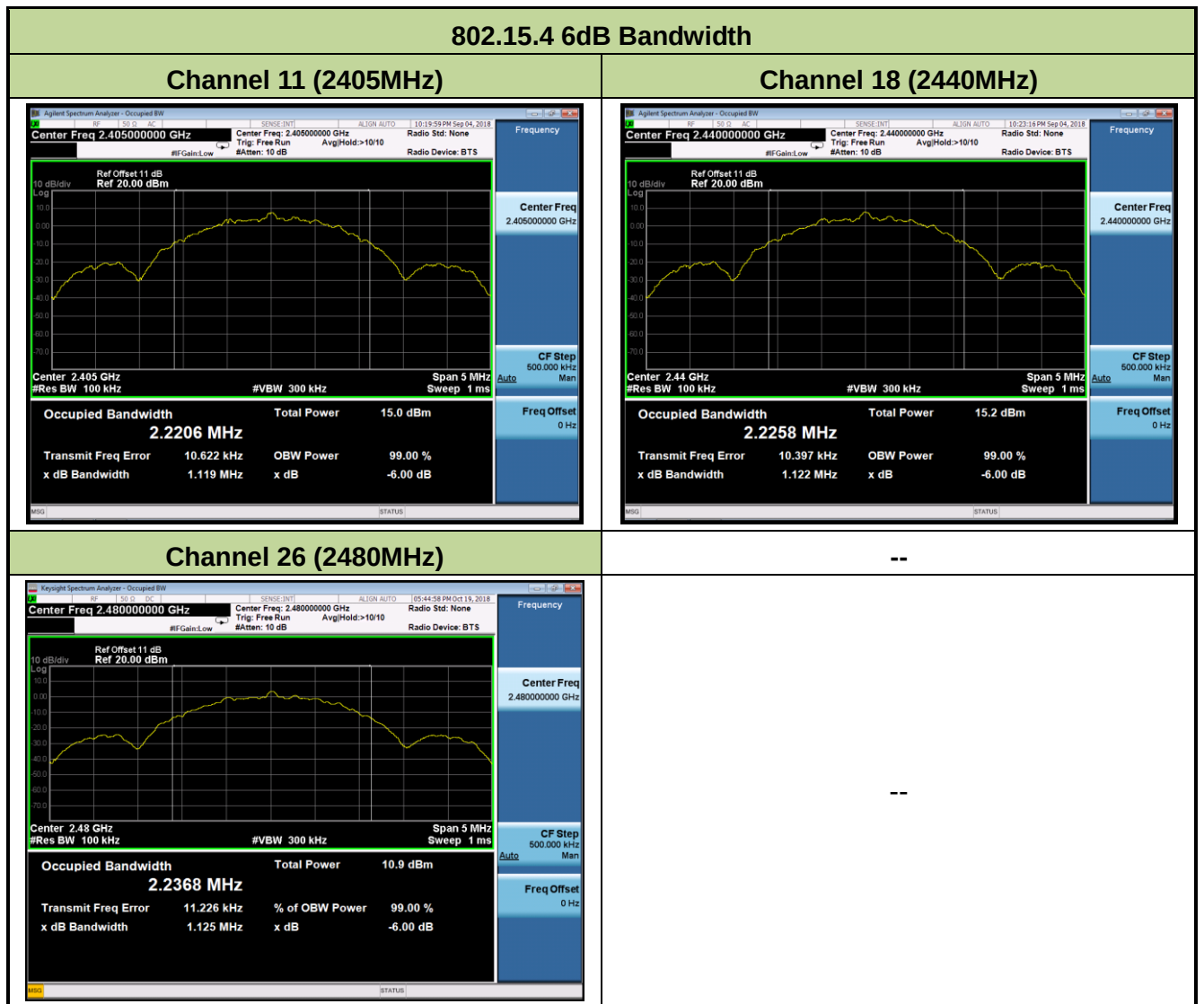
5.7.3. 測試架構圖



5.7.4. 佔用頻帶寬度測試結果

Product	ACCESS POINT	Temperature	24°C
Test Engineer	Kevin Ker	Relative Humidity	60%
Test Site	TR3	Test Date	2018/09/04 ~ 2018/10/19

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
802.15.4	O-QPSK	11	2405	1.12	≥ 0.5	Pass
802.15.4	O-QPSK	18	2440	1.12	≥ 0.5	Pass
802.15.4	O-QPSK	26	2480	1.13	≥ 0.5	Pass



5.8. 發射電功率密度

5.8.1. 適用標準

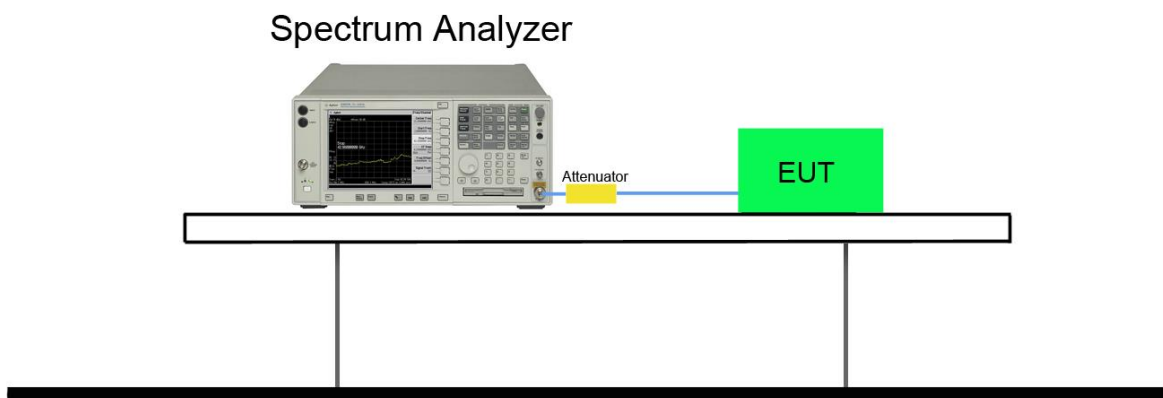
依據國家通訊傳播委員會低功率射頻電機技術規範之第 3.10.1.6(2)(B)節，在使用頻率範圍之任意 3 千赫(kHz)頻寬內，由發射機傳導至天線之峰值發射電功率密度在任意期間內，皆不得大於 8dBm。

5.8.2. 量測方法

待測物之天線埠經由適當之衰減直接連至頻譜分析儀 RF 輸入端。找出發射峰值並擴展於通帶內，設定頻譜分析儀之解析度頻寬為 3kHz，視訊頻寬大於解析度頻寬，掃瞄時間為頻率掃瞄範圍除以 3kHz。
(SWEEP TIME = SPAN/3kHz)。

待測物應在正常發射狀態下量測。

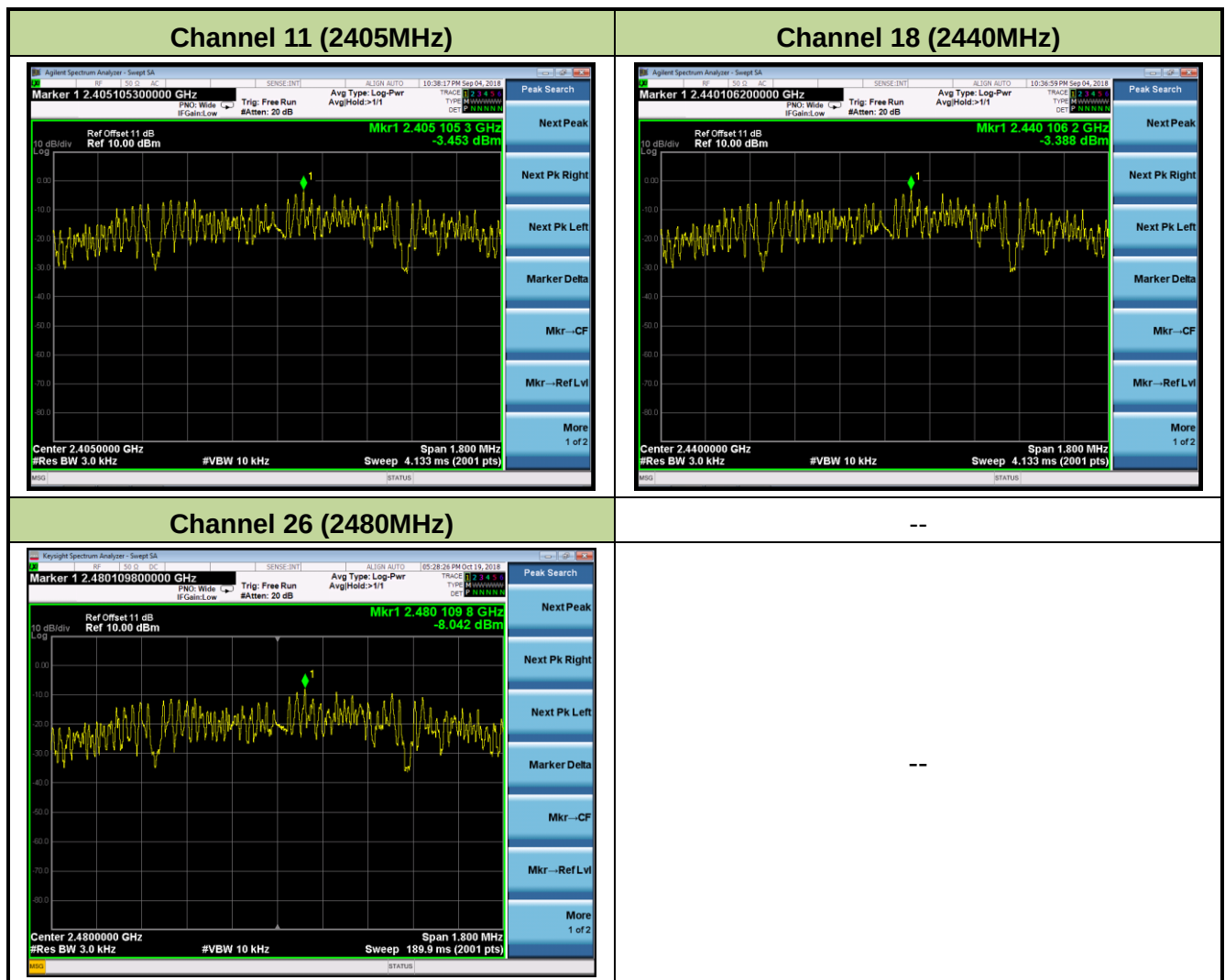
5.8.3. 測試架構圖



5.8.4. 功率密度量測結果

Product	ACCESS POINT	Temperature	24°C
Test Engineer	Kevin Ker	Relative Humidity	60%
Test Site	TR3	Test Date	2018/09/04 ~ 2018/10/19

Test Mode	Modulation Mode	Channel No.	Frequency (MHz)	PK PSD (dBm / 3kHz)	Limit (dBm / 3kHz)	Result
802.15.4	O-QPSK	11	2405	-3.45	≤ 8.00	Pass
802.15.4	O-QPSK	18	2440	-3.39	≤ 8.00	Pass
802.15.4	O-QPSK	26	2480	-8.04	≤ 8.00	Pass



End