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Report No.: 1910TW0109-T1
Report Version: 1.0
Issue Date: 2019-12-10

NCC

低功率射頻電機型式試驗報告

產品名稱 : Wireless Network Control
型號 : 204890
廠牌 : Alliance
商標 : 
申請者 : Alliance Laundry Systems LLC
申請者地址 : 221 Shepard Street PO Box 990 Ripon, WI 54971
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 : 2019/10/14~2019/11/28
接收日期 : 2019/10/09

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(柯承志)



本測試報告僅對實驗室所受測之樣品負責
本測試報告非經本公司同意不可局部複製使用

修訂紀錄

報告編號	版本	描述	發行日期
1910TW0109-T1	1.0	Original Report	2019-12-10

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1. 一般資訊

申請者	Alliance Laundry Systems LLC
申請者地址	221 Shepard Street PO Box 990 Ripon, WI 54971
製造商	Alliance Laundry Systems LLC
製造商地址	221 Shepard Street PO Box 990 Ripon, WI 54971
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
實驗室資訊	1. MRT facility is a FCC registered (Reg. No. 153292) test facility with the site description report on file and is designated by the FCC as an Accredited Test Firm. 2. MRT facility is an IC registered (MRT Reg. No. 21723) 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 (Designation Number: TW3261), Industry Taiwan, EU and TELEC Rules.
實驗室測試環境條件	溫度 (°C) : 20-35 / 濕度 (%RH) : 30-65

2. 產品描述

2.1 產品資訊

產品名稱	Wireless Network Control
產品型號	204890
廠牌	Alliance
商標	
Wi-Fi 規格	802.11b/g/n-20 (1T1R)
頻率範圍	<u>2.4GHz:</u> For 802.11b/g/n-HT20: 2412 ~ 2462 MHz
最大輸出功率	802.11b: 19.67dBm 802.11g: 20.88dBm 802.11n-HT20: 20.41 dBm

2.2 產品規格

Technology	Frequency (MHz)	Modulation	Channel Spacing (MHz)	Data Rate (Mbps)	Number of Channels
802.11b	2412~2462	DSSS (CCK, DQPSK, DBPSK)	5	1 ~11	11
802.11g	2412~2462	OFDM (BPSK, QPSK,16QAM,64QAM)	5	6 ~54	11
802.11n-20M	2412~2462	OFDM (BPSK, QPSK,16QAM,64QAM)	5	7.2-72.2	11

802.11b/g/n-HT20

Channel	Frequency	Channel	Frequency	Channel	Frequency
01	2412 MHz	02	2417 MHz	03	2422 MHz
04	2427 MHz	05	2432 MHz	06	2437 MHz
07	2442 MHz	08	2447 MHz	09	2452 MHz
10	2457 MHz	11	2462 MHz	--	--

Duty Cycle

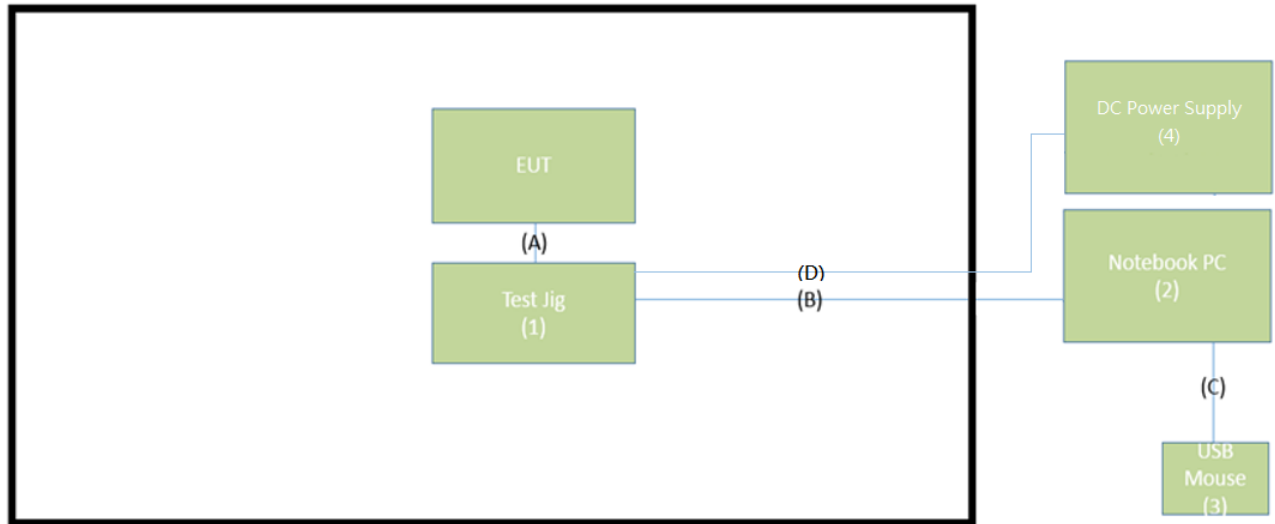
Test Mode	Duty Cycle
802.11b	51.15%
802.11g	33.45%
802.11 n-HT20	33.33%

2.3 測試模式

Test Mode	Mode 1: Transmit by 802.11b (11Mbps)
	Mode 2: Transmit by 802.11g (6Mbps)
	Mode 3: Transmit by 802.11n-HT20 (MCS0)
	Mode 4: Receive by 802.11n-HT20

2.4 測試配置

待測物測試配置圖



Signal Cable Type		Signal Cable Description
A	Signal Cable	Non-Shielded, 0.5m
B	USB Cable	Shielded, 1.5m
C	USB Mouse Cable	Shielded, 1.6m
D	Signal Cable	Non-Shielded, 1.0m

2.5 測試周邊

待測裝置測試時，其搭配系統測試時之週邊裝置包括如下：

No.	周邊名稱	廠牌	型號	序號	檢磁	電源線
1	Test Jig	N/A	N/A	N/A	N/A	N/A
2	Notebook PC	DELL	Latitude E7240	N/A	N/A	Non-shielded, 0.8m
3	USB Mouse	Lenovo	M-U0025-O	HS427HA10UV	N/A	N/A
4	DC Power Supply	GWINSTEK	DPS-3303C	DPS-3303C	N/A	N/A

2.6 操作程序

1.	Turn on the power of all equipment.
2.	Execute "CC3120/CC3220 Radio Tool v1.0.2.0" program
3.	Configure the test channel and the data rate.
4.	Start test.

3. 測試設備明細

傳導干擾 -SR2

儀器名稱	製造商	型號	財產編號	校正週期	校正有效日期
Two-Line V-Network	R&S	ENV216	MRTTWA00019	1 year	2020/3/25
Two-Line V-Network	R&S	ENV216	MRTTWA00020	1 year	2020/4/25
8-Wire ISN (T8)	R&S	ENY81	MRTTWA00018	1 year	2020/4/23
Cable	Rosnol	N1C50-RG400-B1C50 -500CM	MRTTWE00013	1 year	2020/6/18
EMI Test Receiver	R&S	ESR3	MRTTWA00009	1 year	2020/3/25

輻射干擾 - AC1

儀器名稱	製造商	型號	財產編號	校正週期	有效日期
Broadband TRILOG Antenna	SCHWARZBECK	VULB 9162	MRTTWA00001	1 year	2020/6/4
EMI Test Receiver	R&S	ESR3	MRTTWA00009	1 year	2020/3/25
Active Loop Antenna	Schwarzbeck	FMZB 1519B	MRTTWA00002	1 year	2020/4/29
Broadband Horn antenna	SCHWARZBECK	BBHA 9120D	MRTTWA00003	1 year	2020/4/22
Breitband Hornantenna	Schwarzbeck	BBHA 9170	MRTTWA00004	1 year	2020/4/23
Broadband Amplifier	Schwarzbeck	BBV 9721	MRTTWA00006	1 year	2020/4/24
Broadband Preamplifier	SCHWARZBECK	BBV 9718	MRTTWA00005	1 year	2020/4/24
Cable	HUBERSUHNER	SF106	MRTTWE00010	1 year	2020/4/22

傳導量測設備 -SR2

儀器名稱	製造商	型號	財產編號	校正週期	有效日期
EXA Signal Analyzer	KEYSIGHT	N9010B	MRTTWA00074	1 year	2020/7/11
X-Series USB Peak and Average Power Sensor	KEYSIGHT	U2021XA	MRTTWA00015	1 year	2020/3/26

EMI 測試軟體

軟體名稱	製造商	版本
e3	Audix	9.160520a
EMI	Quietek	V3

4. 量測不確定度

電源傳導量測-電源線 (Conducted Emission- Power Line)
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 2.53dB
電源傳導量測-通訊埠 (Conducted Emission- Impedance Stabilization Network Measurement)
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 3.96dB
輻射干擾量測 (Radiated Spurious Emission)
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 3.92dB (Below 30M)
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 4.25dB (30M~1G)
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 4.40dB (1G~18G)
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 4.45dB (18G~40G)
頻率誤差量測 (Frequency Error)
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): $\pm 78.4\text{Hz}$
傳導功率量測 (Conducted Power)
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): $\pm 0.84\text{dB}$
傳導干擾量測 (Conducted Spurious Emission)
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): $\pm 2.65\text{ dB}$
佔用頻寬量測 (Occupied Bandwidth)
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 3.3%
溫度 / 濕度 (Temp. / Humidity)
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): $\pm 0.82^\circ\text{C}$ / $\pm 3\%$
直流電源 (DC Voltage)
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): $\pm 0.3\%$

5. 測試結果

產品名稱 **Wireless Network Control**
型號 **204890**

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	N/A	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)	占用頻寬	$\geq 500\text{KHz}$	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

備註 1：符合性的判定是基於測試結果符合規範的限制值或客戶的宣告要求，測試結果的判定是不考慮測量不確定度的值。

備註 2：此待測物為 DC 12V 供電，因此不需測試電源端點之傳導干擾。

5.1 電源傳導測試

5.1.1 量測方法

待測物放置於1m*2m*0.8m之非導體桌面並離垂直牆面40cm（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。

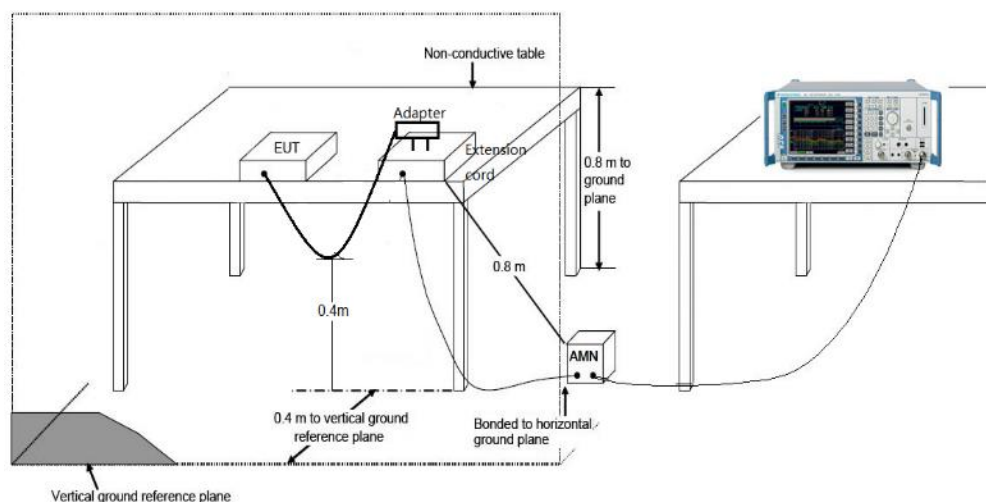
5.1.2 限制要求

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

5.1.3 測試架構圖



5.1.4 電源端點測試結果

備註：此待測物為DC 12V供電，因此不需測試電源端點之傳導干擾。

5.2 峰值傳導輸出功率

5.2.1 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。除使用上述測量方式外，並得使用以最大傳導輸出功率作為測量方式。

5.2.2 限制要求

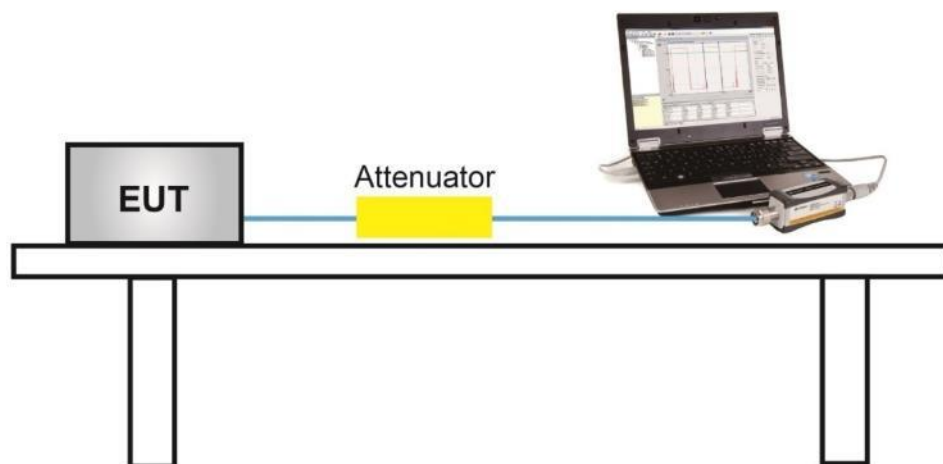
操作於2400-2483.5 MHz之跳頻或數位調變的發射器材與5725-5850 MHz之跳頻發射器材：1W(含)以下，當跳頻系統符合國家通訊傳播委員會低功率射頻電機技術規範之第3.10.1.6(1)(A)(a)節，其限制值為0.125 W(含)以下。

若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(註)操作時，應符合下列情形之一：

(1)操作於2400-2483.5兆赫(MHz)者，其發射天線之方向性增益超過6dBi，應於每超過3dB降低1dB之峰值輸出功率。

(2) 操作於5725-5850兆赫(MHz)者，其發射天線之方向性增益超過6dBi，不需降低峰值輸出功率。

5.2.3 測試架構圖



5.2.4 峰值傳導輸出功率測試結果

Power output test was verified over all data rates of each mode shown as below, and then choose the maximum power output (gray marker) for final test of each channel.

Test Mode	Bandwidth (MHz)	Channel No.	Frequency (MHz)	Data Rate / MCS	Average Power (dBm)
802.11b	20	6	2437	1Mbps	17.28
				5.5Mbps	17.54
				11Mbps	17.72
802.11g	20	6	2437	6Mbps	16.70
				24Mbps	16.31
				54Mbps	16.14
802.11n	20	6	2437	MCS0	15.55
				MCS3	15.24
				MCS7	15.01

Product	Wireless Network Control	Temperature	25°C
Test Engineer	Kevin Ker	Relative Humidity	52%
Test Site	SR1	Test Date	2019/10/24

Test Result of Peak Output Power

Test Mode	Data Rate / MCS	Channel No.	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Result
11b	11Mbps	01	2412	16.89	≤ 30.00	Pass
11b	11Mbps	06	2437	19.67	≤ 30.00	Pass
11b	11Mbps	11	2462	16.60	≤ 30.00	Pass
11g	6Mbps	01	2412	20.03	≤ 30.00	Pass
11g	6Mbps	06	2437	20.88	≤ 30.00	Pass
11g	6Mbps	11	2462	20.13	≤ 30.00	Pass
11n-HT20	MCS0	01	2412	20.09	≤ 30.00	Pass
11n-HT20	MCS0	06	2437	20.41	≤ 30.00	Pass
11n-HT20	MCS0	11	2462	20.31	≤ 30.00	Pass

Test Result of Average Output Power (Reporting Only)

Test Mode	Data Rate / MCS	Channel No.	Frequency (MHz)	Average Power (dBm)	Limit (dBm)	Result
11b	11Mbps	01	2412	14.90	≤ 30.00	Pass
11b	11Mbps	06	2437	17.72	≤ 30.00	Pass
11b	11Mbps	11	2462	14.55	≤ 30.00	Pass
11g	6Mbps	01	2412	12.00	≤ 30.00	Pass
11g	6Mbps	06	2437	16.70	≤ 30.00	Pass
11g	6Mbps	11	2462	12.17	≤ 30.00	Pass
11n-HT20	MCS0	01	2412	11.43	≤ 30.00	Pass
11n-HT20	MCS0	06	2437	15.55	≤ 30.00	Pass
11n-HT20	MCS0	11	2462	12.19	≤ 30.00	Pass

備註： 1. 此項量測係採 Power Meter。

2. 此量測值已含工作週期因子及線材損耗(Cable Loss=1dB)

5.3 天線之要求

5.3.1 限制要求

依據國家通訊傳播委員會低功率射頻電機技術規範之第3.10.1.4節規定，天線之規格可不受下述規定之限制。

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

此 Wireless Network Control 其天線為 Dipole Antenna type，(檢附天線規格書)

Antenna List

No.	Manufacturer	Part No.	Peak Gain
1	Pulse A TECHNITROL COMPANY	W1049B	2dBi

5.4 帶外發射限制

5.4.1 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，

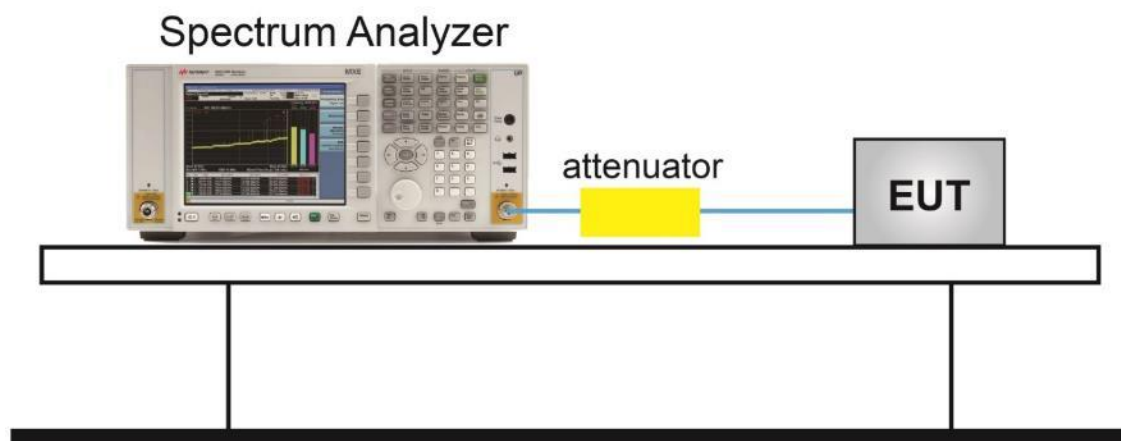
- (1) 頻率掃描範圍足以檢測頻帶內的發射波峰位準以及由受測物產生之最低頻率到第 10 次諧波的所有混附發射，通常需要分幾段以涵蓋全部頻率範圍。
- (2) 解析頻寬為 100 kHz，視訊頻寬不小於解析頻寬。
- (3) 掃描時間為自動，檢波功能為峰值，訊號軌跡為最大保留(Max Hold)
- (4) 將標記設定於任何欲紀錄之波峰上，所顯示之位準值必須符合指定之限制值。

5.4.2 限制要求

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)輸出功率以數位調變技術系統之最大傳導輸出功率量測方式者，至少須衰減 30 dB。
- (3)若落於禁用頻段之輻射發射，應符合低功率射頻電機技術規範第 2.8 節之規定。

5.4.3 測試架構圖



5.4.4 帶外輻射測試結果

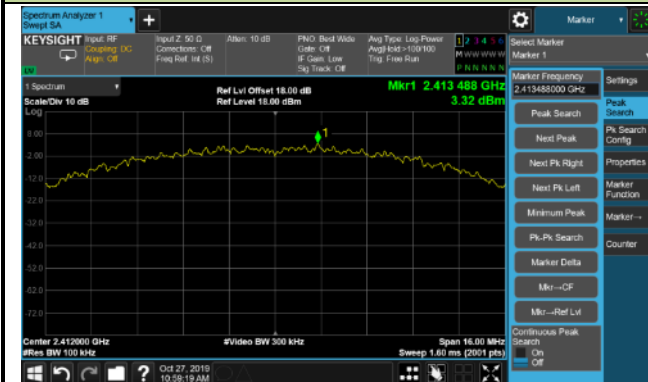
Product	Wireless Network Control	Temperature	25°C
Test Engineer	Kevin Ker	Relative Humidity	52%
Test Site	SR1	Test Date	2019/10/27

Test Mode	Data Rate / MCS	Channel No.	Frequency (MHz)	Limit	Result
802.11b	11Mbps	01	2412	20dBc	Pass
802.11b	11Mbps	06	2437	20dBc	Pass
802.11b	11Mbps	11	2462	20dBc	Pass
802.11g	6Mbps	01	2412	20dBc	Pass
802.11g	6Mbps	06	2437	20dBc	Pass
802.11g	6Mbps	11	2462	20dBc	Pass
802.11n-HT20	MCS0	01	2412	20dBc	Pass
802.11n-HT20	MCS0	06	2437	20dBc	Pass
802.11n-HT20	MCS0	11	2462	20dBc	Pass

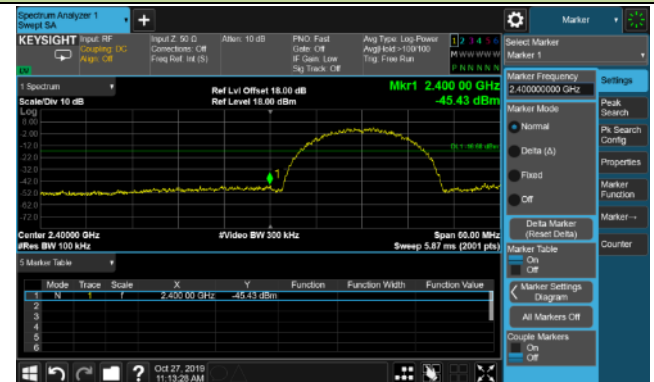
802.11b Out-of-Band Emissions

Channel 01 (2412MHz)

100kHz PSD Reference Level



Low Band Edge



Spurious Emission



Channel 06 (2437MHz)

100kHz PSD Reference Level



Spurious Emission



802.11b Out-of-Band Emissions

Channel 11 (2462MHz)

100kHz PSD Reference Level



High Band Edge



Spurious Emission



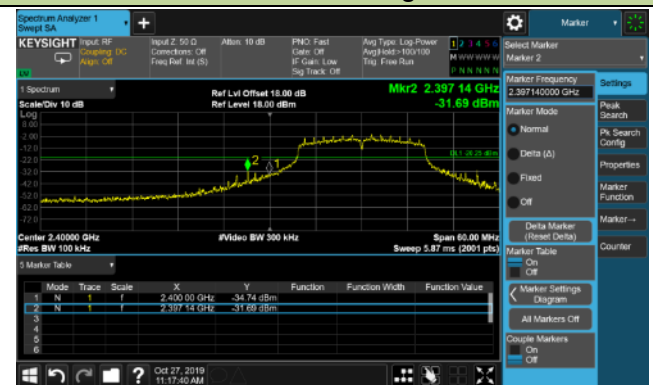
802.11g Out-of-Band Emissions

Channel 01 (2412MHz)

100kHz PSD Reference Level



Low Band Edge



Spurious Emission



Channel 06 (2437MHz)

100kHz PSD Reference Level



Spurious Emission



Channel 11 (2462MHz)

High Band Edge



The screenshot displays the Keysight Spectrum Analyzer 1 interface. The main plot shows a spectrum with three markers labeled 1, 2, and 3. The plot settings are as follows:

- Scale/Div: 10 dB
- Start: 30 MHz
- Stop: 25.00 GHz
- IF Video BW: 4.0 MHz
- Sweep: -46.9 ms (40001 pts)

The markers are positioned at the following frequencies and levels:

- Marker 1: 12.762 GHz, -50.24 dBm
- Marker 2: 12.762 GHz, -50.24 dBm
- Marker 3: 12.762 GHz, -50.24 dBm

The table at the bottom of the interface lists the markers with their frequency, level, and function:

Mode	Trace	Scale	X	Y	Function	Function Width	Function Value
1	N	f	6.350 2 GHz	-49.56 dBm			
2	N	f	9.782 4 GHz	-49.70 dBm			
3	N	f	12.762 4 GHz	-50.24 dBm			

802.11n-HT20 Out-of-Band Emissions

Channel 01 (2412MHz)

100kHz PSD Reference Level



Low Band Edge



Spurious Emission



Channel 06 (2437MHz)

100kHz PSD Reference Level



Spurious Emission



802.11n-HT20 Out-of-Band Emissions

Channel 11 (2462MHz)

100kHz PSD Reference Level



High Band Edge



Spurious Emission



5.5 輻射電場強度

5.5.1 量測方法

待測物置於非導體桌面（落地型產品置於地上），受測物使用交流電源時，將其與任何配件設備之電源線連接至位於旋轉桌的交流電源。受測物使用電池時，測試時應裝置新電池或充電完全的電池。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，接收天線並應於水平及垂直極化方向各量測一次。（待測物擺設方式根據 ANSI C63.10-2014 版本，待測物放置桌中心，1G 以下擺設高度為 80cm/1G 以上擺設高度為 150cm）

- (1) 任一頻率小於或等於 1000 MHz 之訊號,使用 CISPR 準峰值檢波器
- (2) 任一頻率大於 1000 MHz 之訊號，使用平均值檢波器測量(RBW:1MHz,VBW:10Hz)，當規定之發射限制值為平均值時(含 1000 MHz 以下)，受測訊號藉由峰值檢波器(RBW:1MHz,VBW:3MHz)所測量之峰值，亦須符合峰值發射限制值，其峰值發射限制值為最大容許平均值加 20 dB。

5.5.2 限制要求

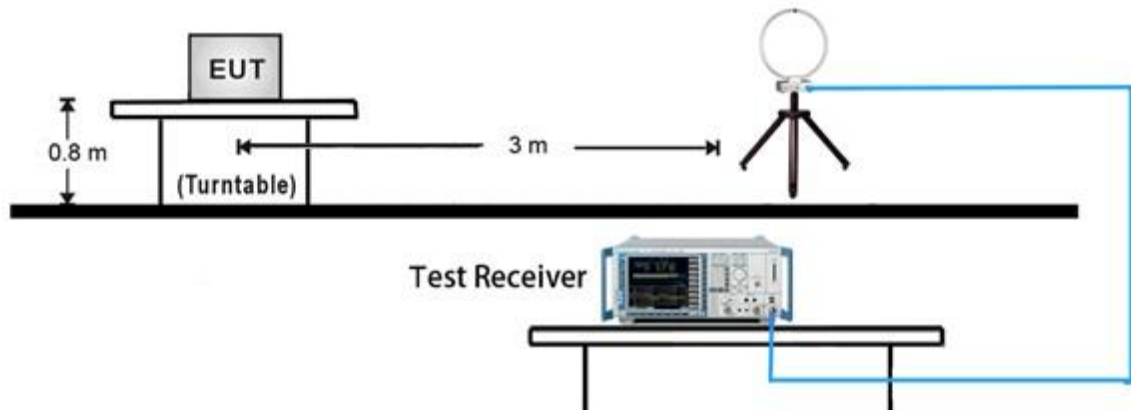
其電場強度不得超過下表之限值，且其不必要之發射皆不得大於主波發射強度。各頻段重疊處，以較嚴格之限制值為準。

頻 率 (MHz)	電場強度(uV/m)	測距(m)
0.009 - 0.490(含)	$2,400/f(\text{KHz})$	300
0.490 (不含) – 1.705 (含)	$24,000/f(\text{KHz})$	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

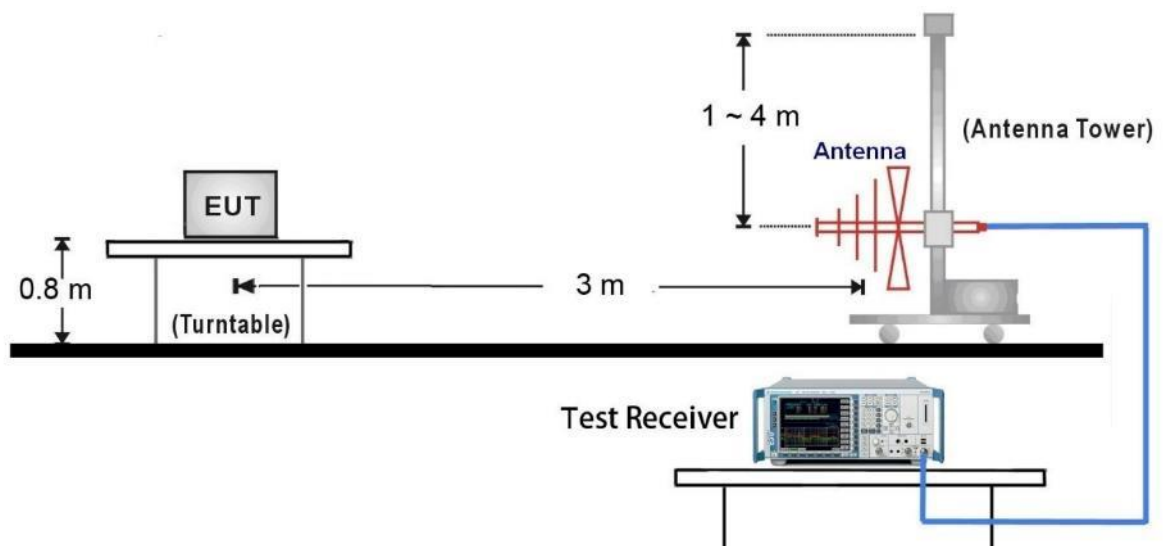
上表規定之電場強度，頻率在 9-90kHz 千赫(kHz)、110-490 千赫(kHz)以及 1000 兆赫(MHz)以上之發射，其量測以平均值檢波器為基準，且須符合低功率射頻電機技術規範第 5.14 節之規定；其他頻率之發射，應以 CISPR 準峰值(quasi-peak) 檢波器測量；非以上表所指定之距離測量時須符合低功率射頻電機技術規範第 5.5 節之規定，而輻射發射之量測頻率範圍須符合低功率射頻電機技術規範第 5.12 節之規定。

5.5.3 測試架構圖

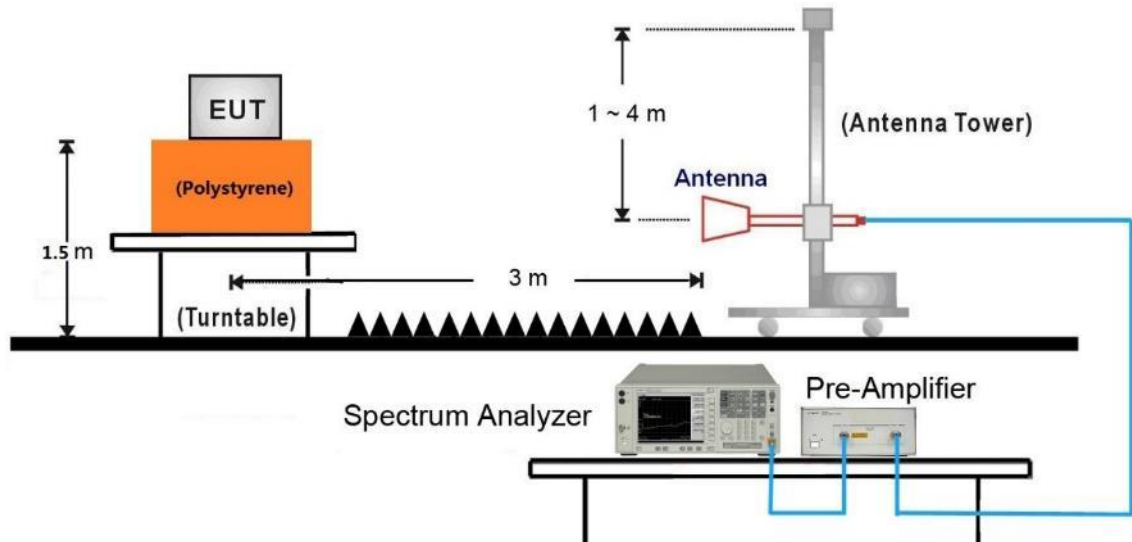
Under 30MHz Test



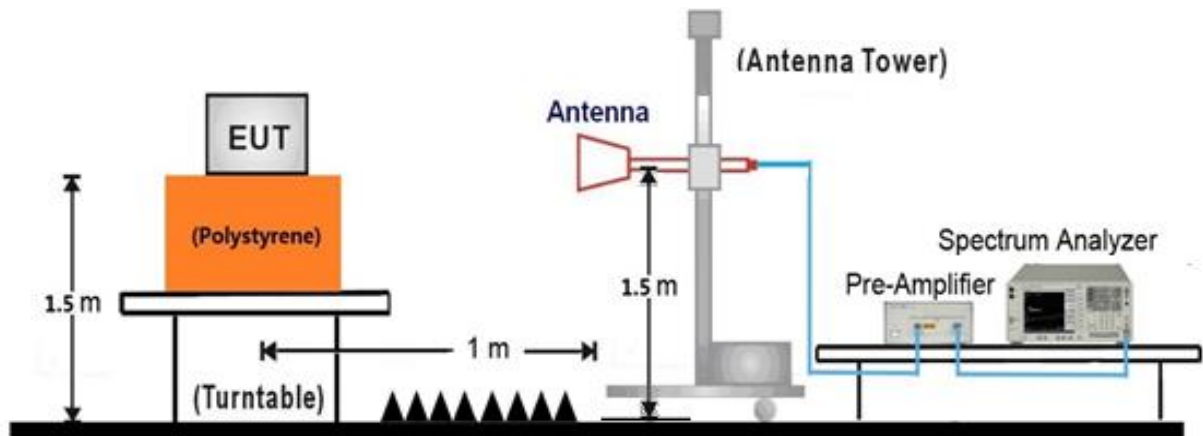
Under 1GHz Test Setup



1GHz ~ 18GHz Test Setup:



18GHz ~ 25GHz Test Setup:



5.5.4 輻射電場強度測試結果

Product	Wireless Network Control	Temperature	25°C
Test Engineer	Kevin Ker	Relative Humidity	54%
Test Site	AC1	Test Date	2019/10/25
Test Mode	802.11b	Test Channel	01
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
	4017.5	51.6	0.2	51.8	74.0	-22.2	Peak	Horizontal
	4910.0	39.4	3.4	42.8	74.0	-31.2	Peak	Horizontal
*	5845.0	37.9	5.2	43.1	88.8	-45.7	Peak	Horizontal
*	6729.0	37.3	9.0	46.3	88.8	-42.5	Peak	Horizontal
	4017.5	52.0	0.2	52.2	74.0	-21.8	Peak	Vertical
	4825.0	42.8	3.2	46.0	74.0	-28.0	Peak	Vertical
*	6431.5	42.5	7.4	49.9	88.8	-38.9	Peak	Vertical
*	6848.0	36.2	9.7	45.9	88.8	-42.9	Peak	Vertical

Note 1: “*” is not in restricted band, its limit is 20dBc of the fundamental emission level (108.8dBμV/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	Wireless Network Control	Temperature	25°C
Test Engineer	Kevin Ker	Relative Humidity	54%
Test Site	AC1	Test Date	2019/10/25
Test Mode	802.11b	Test Channel	06
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
	4060.0	49.7	0.4	50.1	74.0	-23.9	Peak	Horizontal
	4876.0	43.6	3.3	46.9	74.0	-27.1	Peak	Horizontal
*	6499.5	38.8	7.7	46.5	89.4	-42.9	Peak	Horizontal
*	7086.0	36.8	10.8	47.6	89.4	-41.8	Peak	Horizontal
	4060.0	54.5	0.4	54.9	74.0	-19.1	Peak	Vertical
	4063.0	47.6	0.4	48.0	54.0	-6.0	Average	Vertical
	4876.0	45.8	3.3	49.1	74.0	-24.9	Peak	Vertical
*	5887.5	38.9	5.4	44.3	89.4	-45.1	Peak	Vertical
*	6499.5	43.3	7.7	51.0	89.4	-38.4	Peak	Vertical

Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (109.4dBμV/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	Wireless Network Control	Temperature	25°C
Test Engineer	Kevin Ker	Relative Humidity	54%
Test Site	AC1	Test Date	2019/10/25
Test Mode	802.11b	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
	4102.5	47.6	0.6	48.2	74.0	-25.8	Peak	Horizontal
	4952.5	39.4	3.5	42.9	74.0	-31.1	Peak	Horizontal
*	6006.5	38.4	5.8	44.2	88.7	-44.5	Peak	Horizontal
*	6380.5	38.5	7.2	45.7	88.7	-43.0	Peak	Horizontal
	4102.5	50.5	0.6	51.1	74.0	-22.9	Peak	Vertical
	4927.0	40.9	3.4	44.3	74.0	-29.7	Peak	Vertical
*	5989.5	38.3	5.8	44.1	88.7	-44.6	Peak	Vertical
*	6567.5	42.1	8.1	50.2	88.7	-38.5	Peak	Vertical

Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (108.7dBμV/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	Wireless Network Control	Temperature	25°C
Test Engineer	Kevin Ker	Relative Humidity	54%
Test Site	AC1	Test Date	2019/10/25
Test Mode	802.11g	Test Channel	01
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
	4017.5	46.4	0.2	46.6	74.0	-27.4	Peak	Horizontal
	4995.0	39.6	3.5	43.1	74.0	-30.9	Peak	Horizontal
*	5972.5	38.4	5.7	44.1	85.3	-41.2	Peak	Horizontal
*	6397.5	38.3	7.3	45.6	85.3	-39.7	Peak	Horizontal
	4017.5	50.3	0.2	50.5	74.0	-23.5	Peak	Vertical
	5131.0	40.4	3.6	44.0	74.0	-30.0	Peak	Vertical
*	6431.5	41.5	7.4	48.9	85.3	-36.4	Peak	Vertical
*	7103.0	36.3	10.8	47.1	85.3	-38.2	Peak	Vertical

Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (105.3dBμV/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	Wireless Network Control	Temperature	25°C
Test Engineer	Kevin Ker	Relative Humidity	54%
Test Site	AC1	Test Date	2019/10/25
Test Mode	802.11g	Test Channel	06
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
	4060.0	49.3	0.4	49.7	74.0	-24.3	Peak	Horizontal
	4867.5	39.9	3.3	43.2	74.0	-30.8	Peak	Horizontal
*	6006.5	38.2	5.8	44.0	85.7	-41.7	Peak	Horizontal
*	6593.0	37.7	8.2	45.9	85.7	-39.8	Peak	Horizontal
	4060.0	53.4	0.4	53.8	74.0	-20.2	Peak	Vertical
	4060.3	44.8	0.4	45.2	54.0	-8.8	Average	Vertical
	4876.0	44.0	3.3	47.3	74.0	-26.7	Peak	Vertical
*	5683.5	40.9	4.6	45.5	85.7	-40.2	Peak	Vertical
*	6499.5	41.7	7.7	49.4	85.7	-36.3	Peak	Vertical

Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (105.7dBμV/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	Wireless Network Control	Temperature	25°C
Test Engineer	Kevin Ker	Relative Humidity	54%
Test Site	AC1	Test Date	2019/10/25
Test Mode	802.11g	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
	4102.5	46.6	0.6	47.2	74.0	-26.8	Peak	Horizontal
	5063.0	40.5	3.6	44.1	74.0	-29.9	Peak	Horizontal
*	6397.5	38.3	7.3	45.6	86.2	-40.6	Peak	Horizontal
*	7060.5	36.5	10.7	47.2	86.2	-39.0	Peak	Horizontal
	4102.5	49.5	0.6	50.1	74.0	-23.9	Peak	Vertical
	4952.5	39.6	3.5	43.1	74.0	-30.9	Peak	Vertical
*	6567.5	41.0	8.1	49.1	86.2	-37.1	Peak	Vertical
*	7094.5	35.9	10.8	46.7	86.2	-39.5	Peak	Vertical

Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (106.2dBμV/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	Wireless Network Control	Temperature	25°C
Test Engineer	Kevin Ker	Relative Humidity	54%
Test Site	AC1	Test Date	2019/10/25
Test Mode	802.11n-HT20	Test Channel	01
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
	4017.5	46.0	0.2	46.2	74.0	-27.8	Peak	Horizontal
	4986.5	40.1	3.5	43.6	74.0	-30.4	Peak	Horizontal
*	5683.5	39.0	4.6	43.6	85.0	-41.4	Peak	Horizontal
*	6482.5	37.5	7.6	45.1	85.0	-39.9	Peak	Horizontal
	4017.5	49.2	0.2	49.4	74.0	-24.6	Peak	Vertical
	4969.5	39.5	3.5	43.0	74.0	-31.0	Peak	Vertical
*	5862.0	38.9	5.3	44.2	85.0	-40.8	Peak	Vertical
*	6431.5	40.7	7.4	48.1	85.0	-36.9	Peak	Vertical

Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (105.0dBμV/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	Wireless Network Control	Temperature	25°C
Test Engineer	Kevin Ker	Relative Humidity	54%
Test Site	AC1	Test Date	2019/10/25
Test Mode	802.11n-HT20	Test Channel	06
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
	4068.5	47.7	0.4	48.1	74.0	-25.9	Peak	Horizontal
	4876.0	39.9	3.3	43.2	74.0	-30.8	Peak	Horizontal
*	5930.0	37.8	5.5	43.3	85.4	-42.1	Peak	Horizontal
*	6499.5	38.1	7.7	45.8	85.4	-39.6	Peak	Horizontal
	4060.0	49.7	0.4	50.1	74.0	-23.9	Peak	Vertical
	4876.0	42.2	3.3	45.5	74.0	-28.5	Peak	Vertical
*	5913.0	38.3	5.5	43.8	85.4	-41.6	Peak	Vertical
*	6499.5	43.4	7.7	51.1	85.4	-34.3	Peak	Vertical

Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (105.4dBμV/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	Wireless Network Control	Temperature	25°C
Test Engineer	Kevin Ker	Relative Humidity	54%
Test Site	AC1	Test Date	2019/10/25
Test Mode	802.11n-HT20	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
	4102.5	46.7	0.6	47.3	74.0	-26.7	Peak	Horizontal
	4978.0	40.1	3.5	43.6	74.0	-30.4	Peak	Horizontal
*	6465.5	38.5	7.6	46.1	85.7	-39.6	Peak	Horizontal
*	6933.0	36.3	10.2	46.5	85.7	-39.2	Peak	Horizontal
	4102.5	49.0	0.6	49.6	74.0	-24.4	Peak	Vertical
	5063.0	39.4	3.6	43.0	74.0	-31.0	Peak	Vertical
*	5930.0	37.9	5.5	43.4	85.7	-42.3	Peak	Vertical
*	6567.5	40.8	8.1	48.9	85.7	-36.8	Peak	Vertical

Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (105.7dBμV/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	Wireless Network Control	Temperature	25°C
Test Engineer	Kevin Ker	Relative Humidity	54%
Test Site	AC1	Test Date	2019/10/25
Test Mode	802.11n-HT20 (RX)	Test Channel	06
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
	3456.5	40.7	-1.4	39.3	74.0	-34.7	Peak	Horizontal
	4468.0	39.7	2.4	42.1	74.0	-31.9	Peak	Horizontal
	5250.0	38.8	3.7	42.5	74.0	-31.5	Peak	Horizontal
*	6338.0	38.3	7.1	45.4	74.0	-28.6	Peak	Horizontal
	4553.0	37.6	2.7	40.3	74.0	-33.7	Peak	Vertical
	5318.0	36.7	3.8	40.5	74.0	-33.5	Peak	Vertical
	5811.0	36.8	5.1	41.9	74.0	-32.1	Peak	Vertical
	6941.5	34.6	10.3	44.9	74.0	-29.1	Peak	Vertical

Note 1: "*" means this data is the worst emission level.

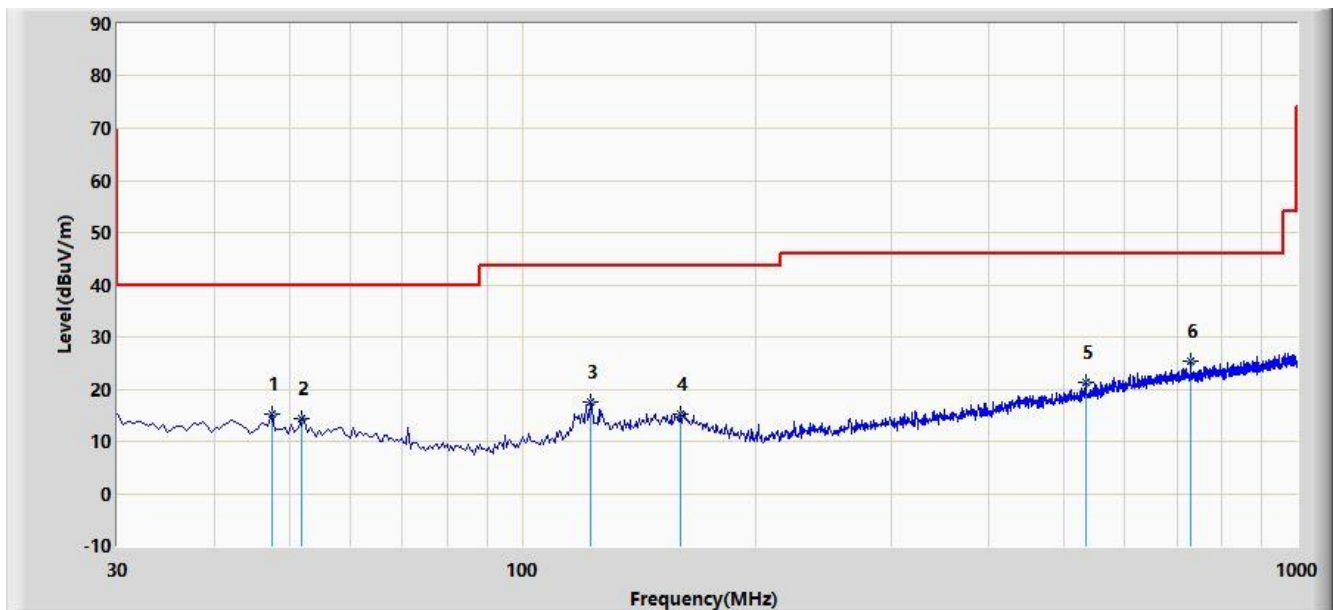
Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

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

Note 3: Average measurement was not performed when the peak level lower than average limit.

The Worst Case of Radiated Emission below 1GHz:

Site: AC1	Time: 2019/10/26 - 07:36
Limit: FCC_Part15.209_RSE(3m)	Engineer: Kevin Ker
Probe: VULB9162_0.03-8GHz	Polarity: Horizontal
EUT: Wireless Network Control	Power: DC 12V
Test Mode: Transmit by 802.11b at Channel 2437MHz	



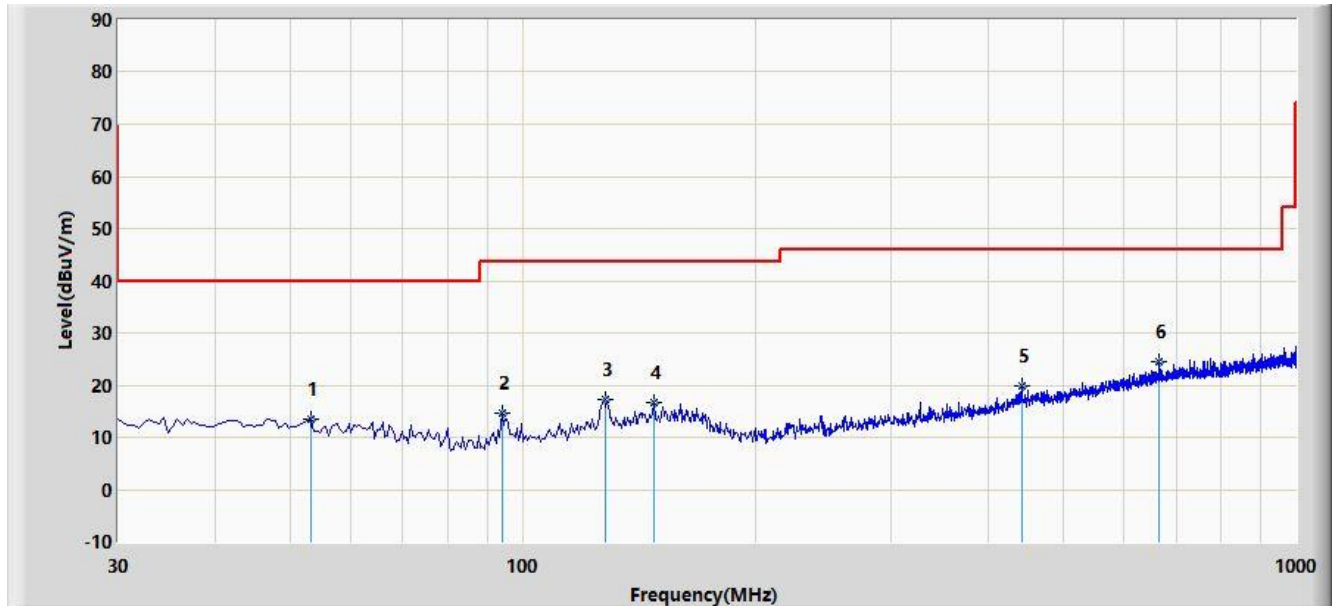
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			47.460	15.284	-6.235	-24.716	40.000	21.519	QP
2			51.825	14.487	-6.877	-25.513	40.000	21.364	QP
3			122.635	17.573	0.881	-25.927	43.500	16.691	QP
4			159.980	15.345	-0.771	-28.155	43.500	16.116	QP
5			533.430	21.436	-4.912	-24.564	46.000	26.348	QP
6		*	729.370	25.402	-4.165	-20.598	46.000	29.567	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: 2019/10/26 - 07:38
Limit: FCC_Part15.209_RSE(3m)	Engineer: Kevin Ker
Probe: VULB9162_0.03-8GHz	Polarity: Vertical
EUT: Wireless Network Control	Power: DC 12V
Test Mode: Transmit by 802.11b at Channel 2437MHz	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			53.280	13.536	-7.607	-26.464	40.000	21.143	QP
2			94.020	14.731	-3.329	-28.769	43.500	18.060	QP
3			127.970	17.323	1.144	-26.177	43.500	16.179	QP
4			147.855	16.671	0.971	-26.829	43.500	15.701	QP
5			441.765	19.800	-4.969	-26.200	46.000	24.769	QP
6		*	664.380	24.508	-4.063	-21.492	46.000	28.571	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.

5.6 頻帶邊緣

5.6.1 量測方法

待測物置於非導體桌面（落地型產品置於地上），受測物使用交流電源時，將其與任何配件設備之電源線連接至位於旋轉桌的交流電源。受測物使用電池時，測試時應裝置新電池或充電完全的電池。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，接收天線並應於水平及垂直極化方向各量測一次。（待測物擺設方式根據 ANSI C63.10-2014版，待測物放置桌中心，1G以下擺設高度為80cm/1G以上擺設高度為150cm）

- (1) 任一頻率小於或等於1000 MHz 之訊號,使用CISPR準峰值檢波器
- (2) 任一頻率大於1000 MHz 之訊號,使用平均值檢波器測量,當規定之發射限制值為平均值時(含1000 MHz 以下),受測訊號藉由峰值檢波器(RBW:1MHz,VBW:3MHz)所測量之峰值,亦須符合峰值發射限制值,其峰值發射限制值為最大容許平均值加20 dB。

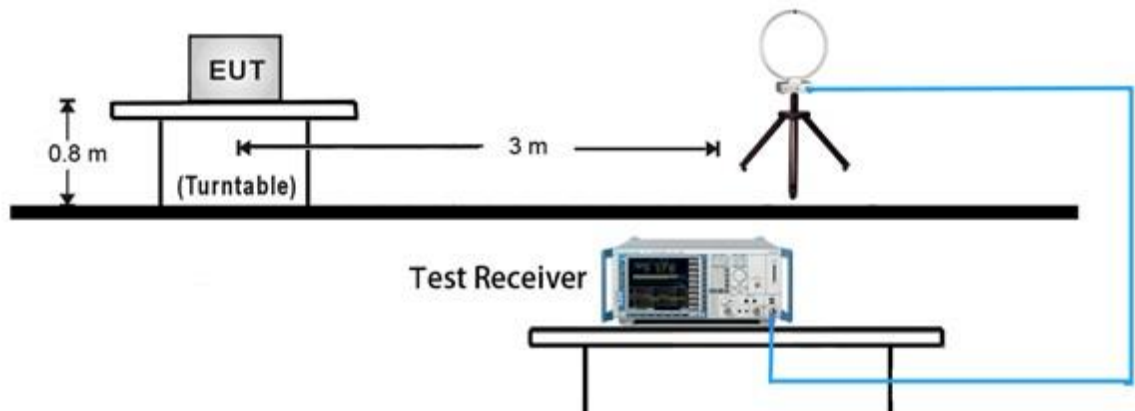
5.6.2 限制要求

除低功率射頻電機技術規範另有規定外,任何低功率射頻電機之主波皆不得使用下表所列各頻段之頻率。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低功率射頻電機技術規範之第2.8節限制規定

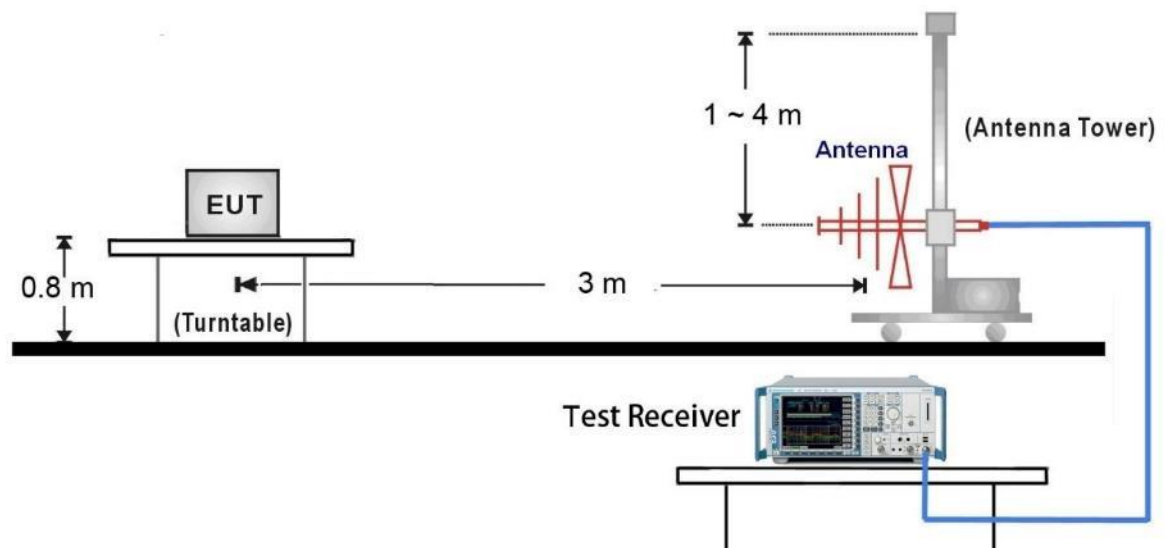
頻 率 (MHz)	頻 率 (MHz)	頻 率 (MHz)	頻 率 (MHz)	頻 率 (MHz)
0.090~0.110	25.500~25.700	703.00~748.00	2310.0~2390.0	13250~13400
0.490~0.510	37.475~38.275	758.00~803.00	2483.5~2900.0	14470~14500
2.172~2.198	73.500~75.400	825.00~915.00	3260.0~3267.0	15350~16200
3.013~3.033	108.00~138.00	930.00~1240.0	3332.0~3339.0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

5.6.3 測試架構圖

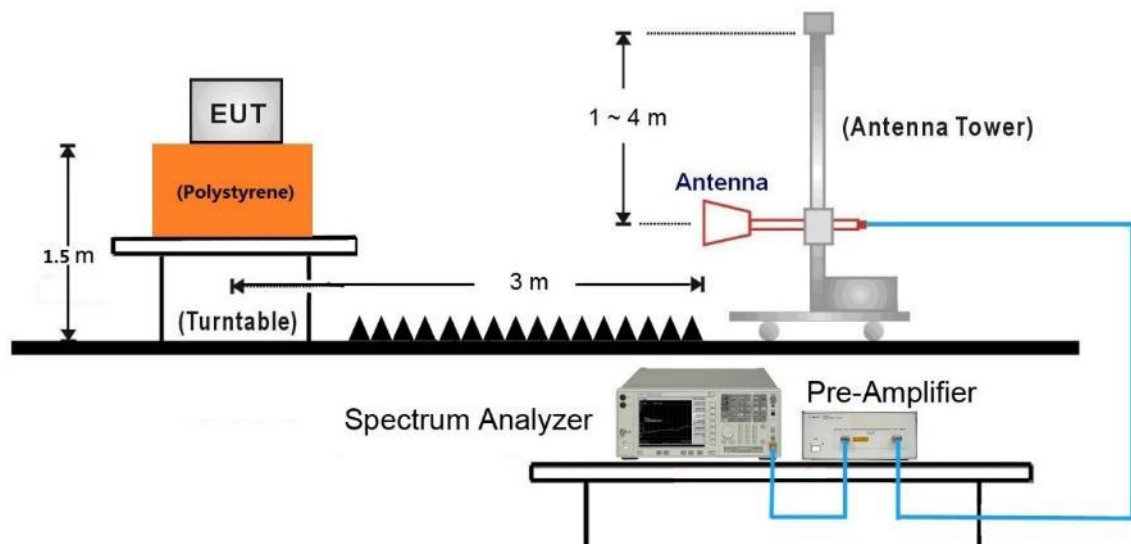
Under 30MHz Test



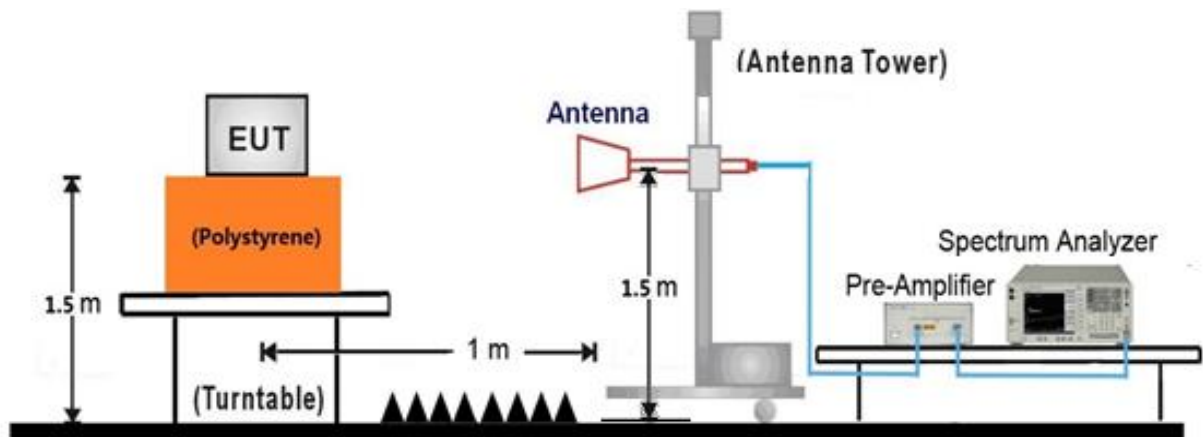
Under 1GHz Test Setup



1GHz ~ 18GHz Test Setup:

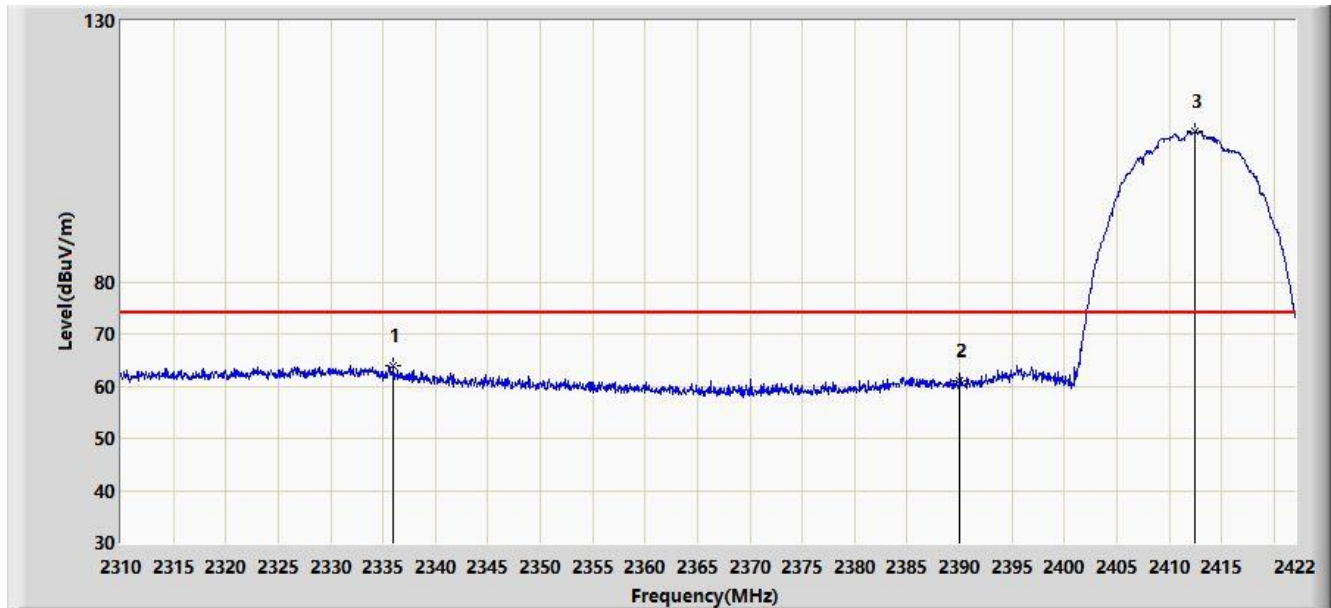


18GHz ~25GHz Test Setup:



5.6.4 頻帶邊緣測試結果

Site: AC1	Time: 2019/10/22 - 17:49
Limit: FCC_Part15.247_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Wireless Network Control	Power: DC 12V
Test Mode: Transmit by 802.11b at channel 2412MHz	

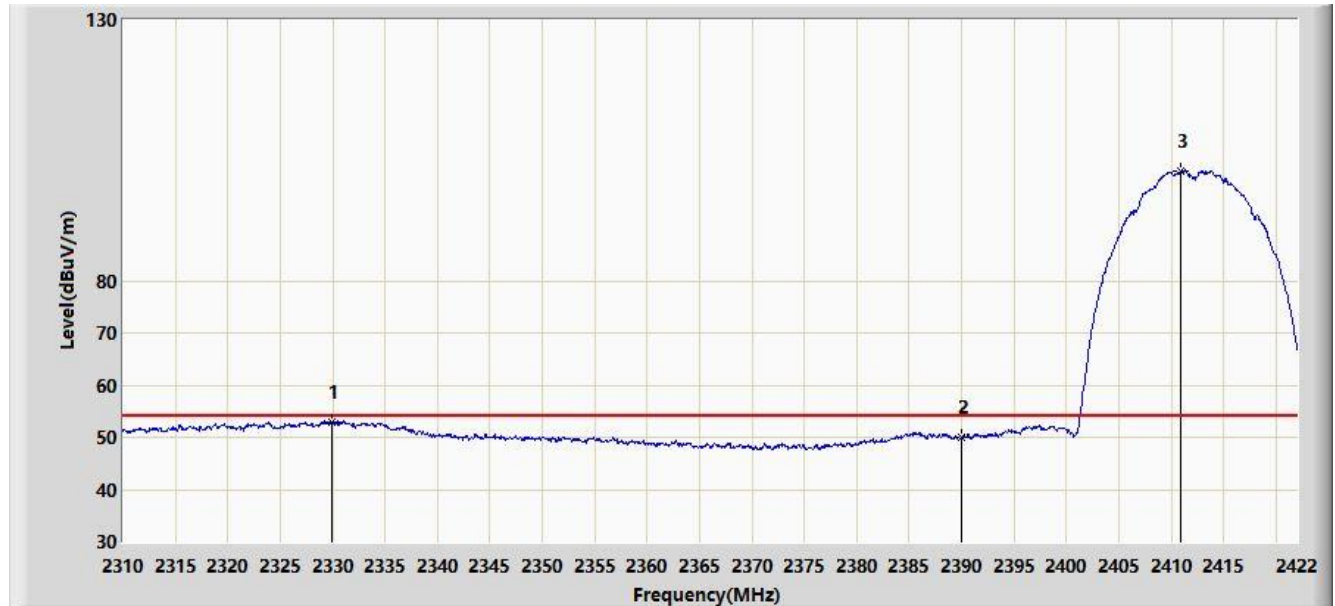


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2335.984	63.912	31.887	-10.088	74.000	32.025	PK
2			2390.000	60.954	28.680	-13.046	74.000	32.274	PK
3		*	2412.424	108.790	76.414	N/A	N/A	32.377	PK

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

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

Site: AC1	Time: 2019/10/22 - 17:47
Limit: FCC_Part15.247_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Wireless Network Control	Power: DC 12V
Test Mode: Transmit by 802.11b at channel 2412MHz	

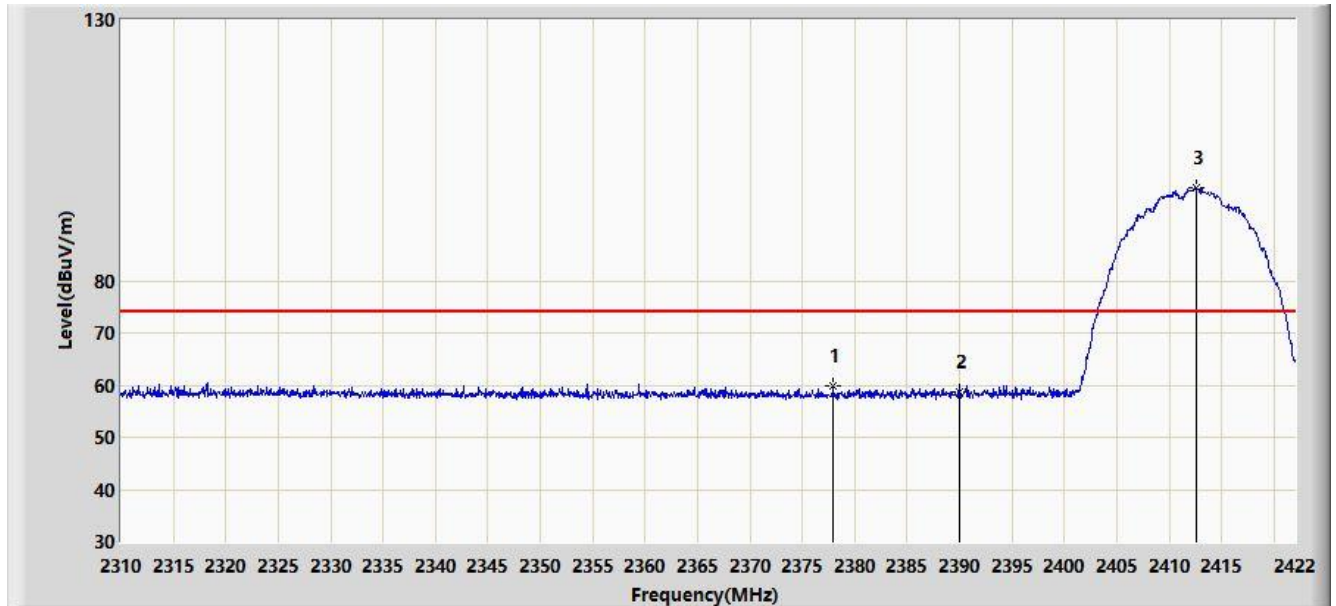


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2329.936	53.007	21.010	-0.993	54.000	31.997	AV
2			2390.000	49.873	17.599	-4.127	54.000	32.274	AV
3		*	2410.968	101.041	68.671	N/A	N/A	32.370	AV

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

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

Site: AC1	Time: 2019/10/22 - 17:51
Limit: FCC_Part15.247_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Wireless Network Control	Power: DC 12V
Test Mode: Transmit by 802.11b at channel 2412MHz	

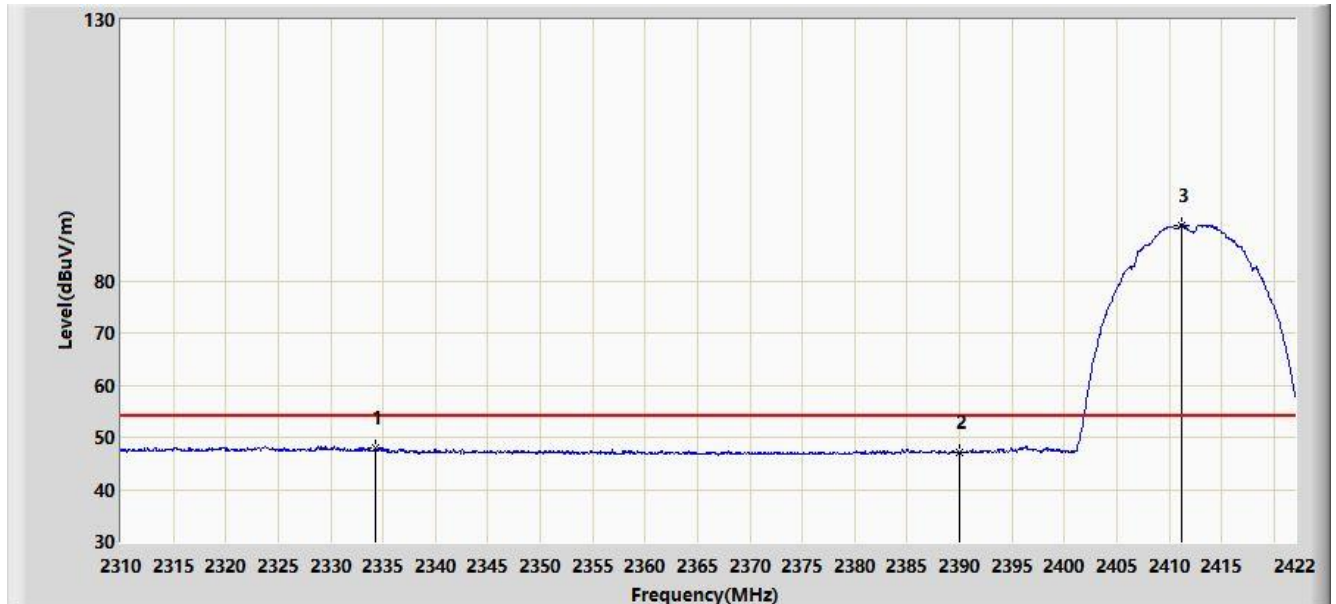


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2377.928	59.867	27.648	-14.133	74.000	32.218	PK
2			2390.000	58.767	26.493	-15.233	74.000	32.274	PK
3		*	2412.592	97.737	65.360	N/A	N/A	32.377	PK

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

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

Site: AC1	Time: 2019/10/22 - 17:53
Limit: FCC_Part15.247_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Wireless Network Control	Power: DC 12V
Test Mode: Transmit by 802.11b at channel 2412MHz	

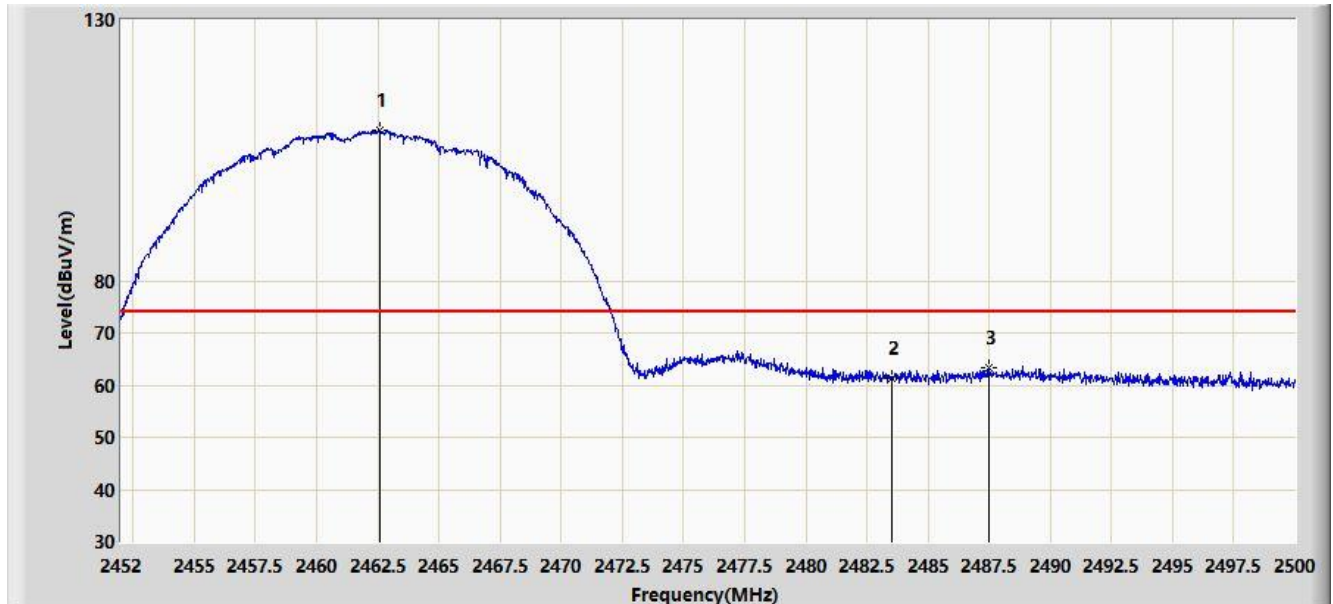


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2334.248	47.967	15.950	-6.033	54.000	32.017	AV
2			2390.000	47.176	14.902	-6.824	54.000	32.274	AV
3		*	2411.192	90.721	58.350	N/A	N/A	32.371	AV

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

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

Site: AC1	Time: 2019/10/22 - 18:00
Limit: FCC_Part15.247_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Wireless Network Control	Power: DC 12V
Test Mode: Transmit by 802.11b at channel 2462MHz	

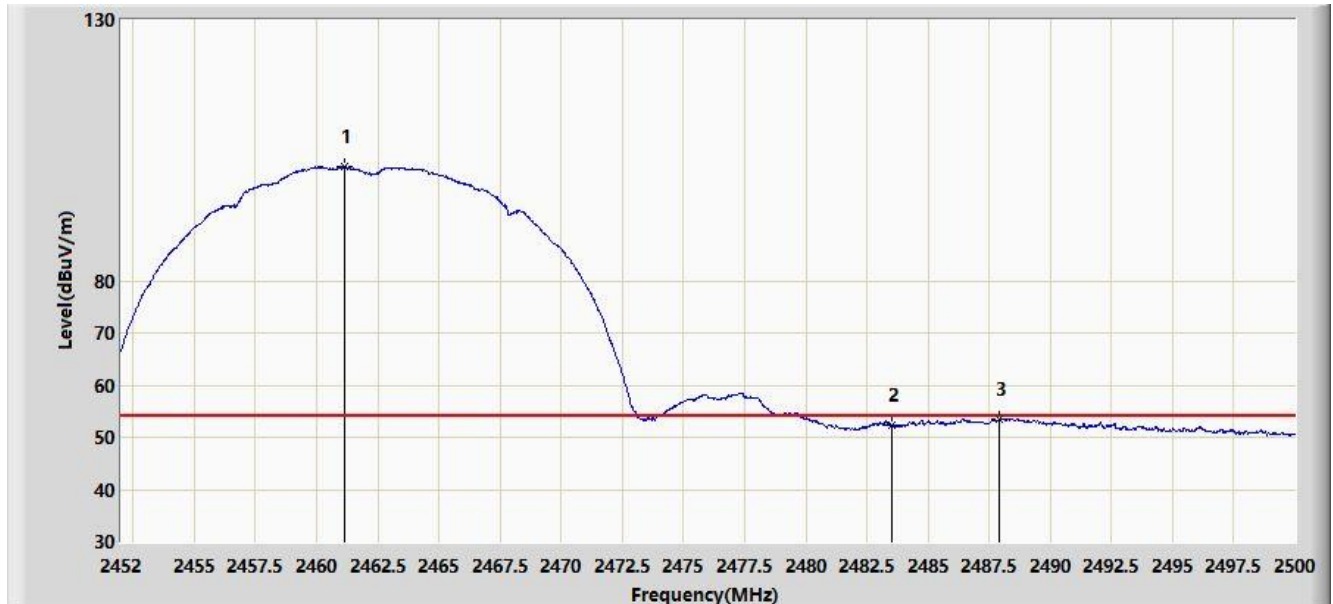


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2462.584	108.732	76.124	N/A	N/A	32.608	PK
2			2483.500	61.189	28.485	-12.811	74.000	32.704	PK
3			2487.496	63.462	30.739	-10.538	74.000	32.722	PK

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

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

Site: AC1	Time: 2019/10/22 - 17:59
Limit: FCC_Part15.247_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Wireless Network Control	Power: DC 12V
Test Mode: Transmit by 802.11b at channel 2462MHz	

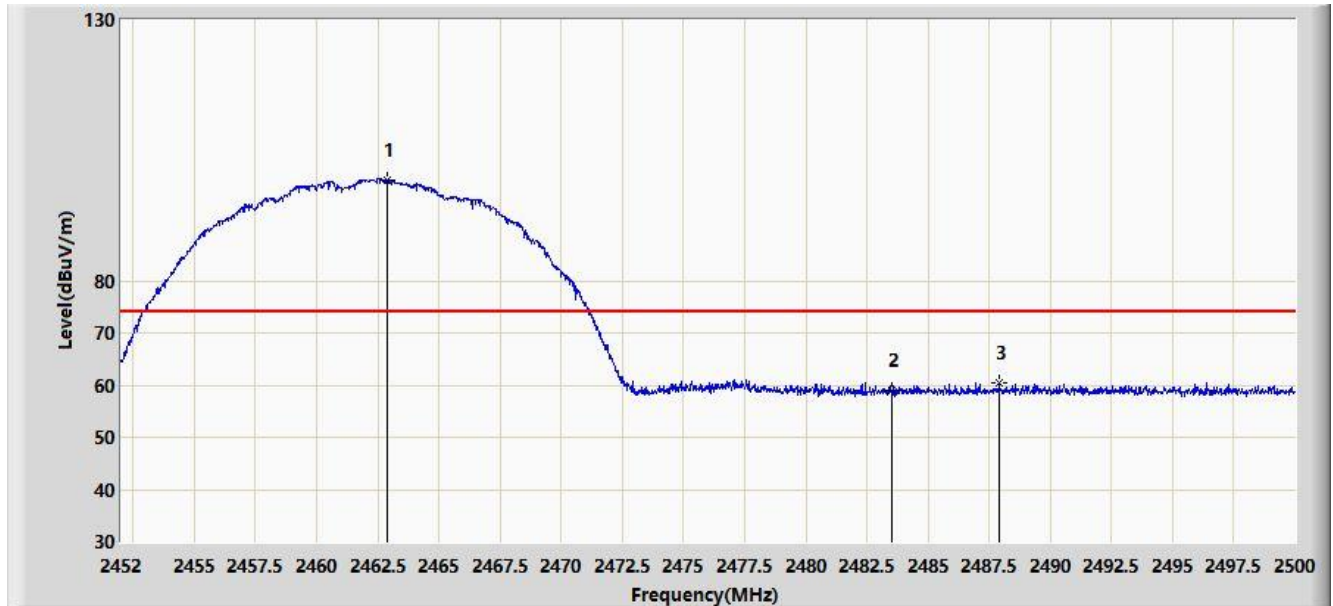


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2461.168	101.906	69.304	N/A	N/A	32.601	AV
2			2483.500	52.388	19.684	-1.612	54.000	32.704	AV
3			2487.928	53.621	20.896	-0.379	54.000	32.725	AV

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

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

Site: AC1	Time: 2019/10/22 - 18:01
Limit: FCC_Part15.247_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Wireless Network Control	Power: DC 12V
Test Mode: Transmit by 802.11b at channel 2462MHz	

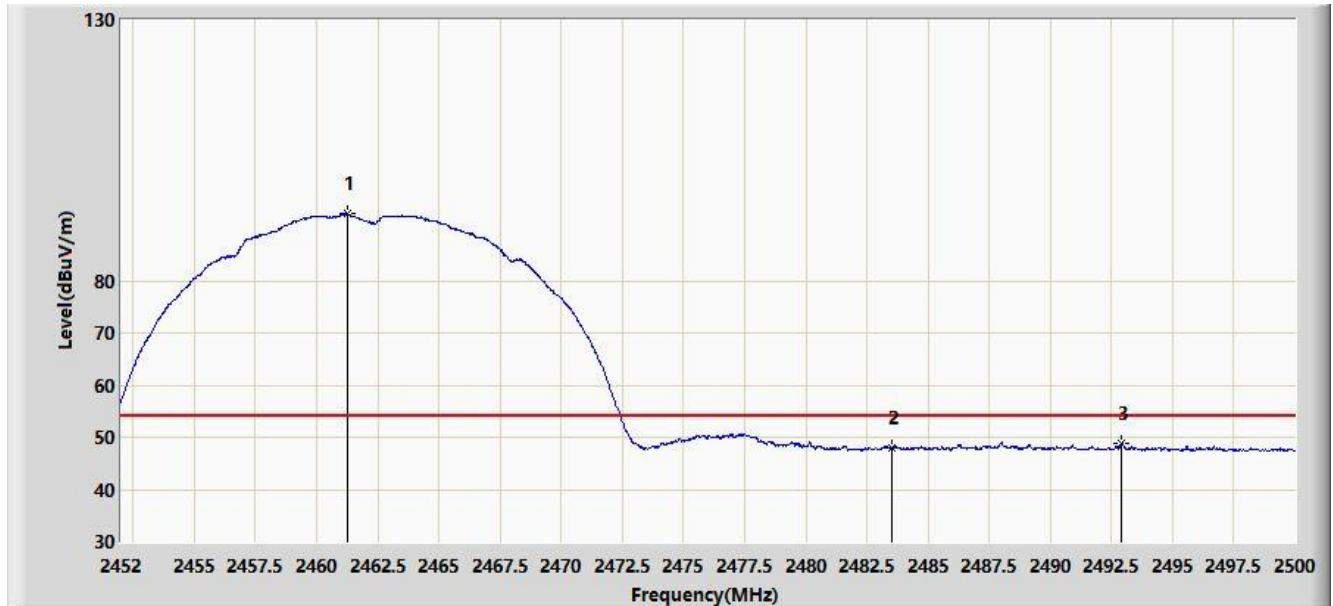


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2462.896	99.415	66.806	N/A	N/A	32.609	PK
2			2483.500	59.005	26.301	-14.995	74.000	32.704	PK
3			2487.904	60.566	27.842	-13.434	74.000	32.725	PK

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

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

Site: AC1	Time: 2019/10/22 - 18:02
Limit: FCC_Part15.247_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Wireless Network Control	Power: DC 12V
Test Mode: Transmit by 802.11b at channel 2462MHz	

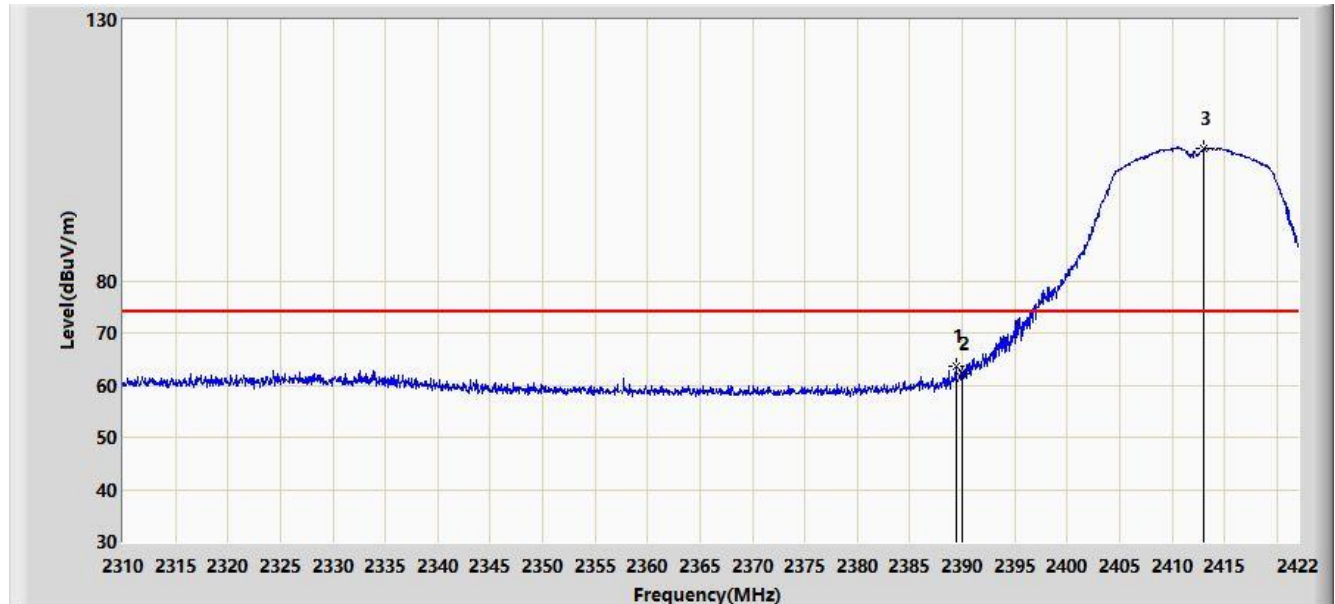


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2461.240	92.806	60.204	N/A	N/A	32.601	AV
2			2483.500	47.950	15.246	-6.050	54.000	32.704	AV
3			2492.920	48.893	16.146	-5.107	54.000	32.747	AV

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

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

Site: AC1	Time: 2019/10/22 - 18:06
Limit: FCC_Part15.247_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Wireless Network Control	Power: DC 12V
Test Mode: Transmit by 802.11g at channel 2412MHz	

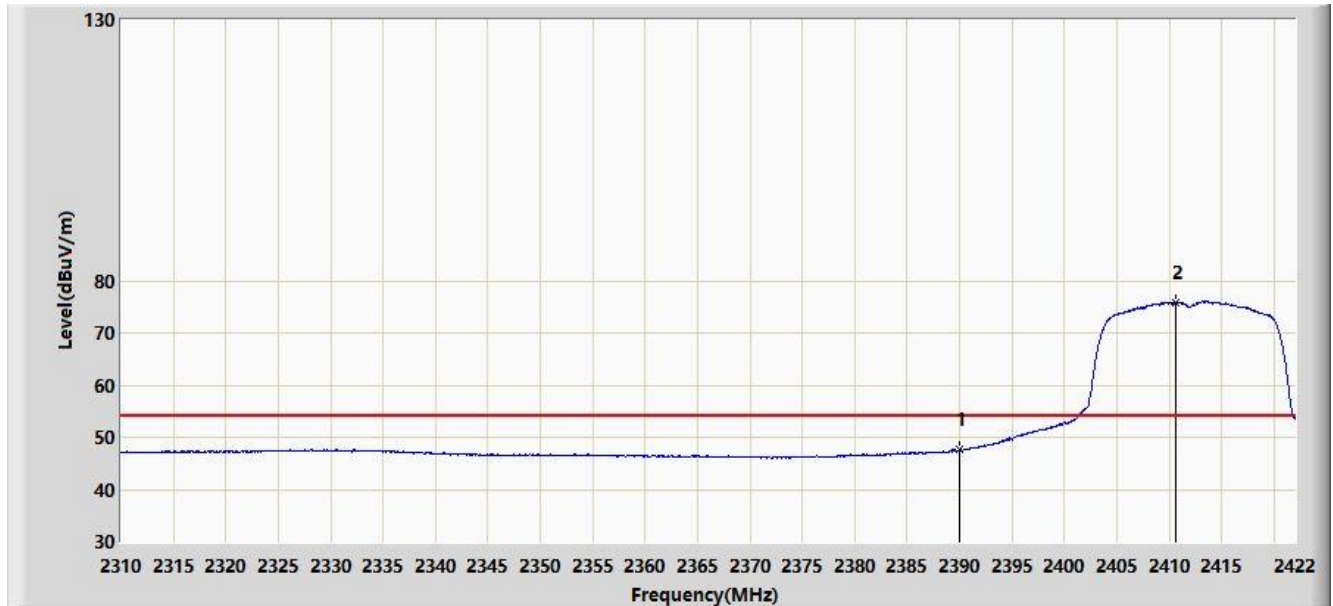


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2389.408	63.486	31.214	-10.514	74.000	32.271	PK
2			2390.000	62.174	29.900	-11.826	74.000	32.274	PK
3		*	2413.040	105.316	72.937	N/A	N/A	32.379	PK

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

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

Site: AC1	Time: 2019/10/22 - 18:11
Limit: FCC_Part15.247_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Wireless Network Control	Power: DC 12V
Test Mode: Transmit by 802.11g at channel 2412MHz	

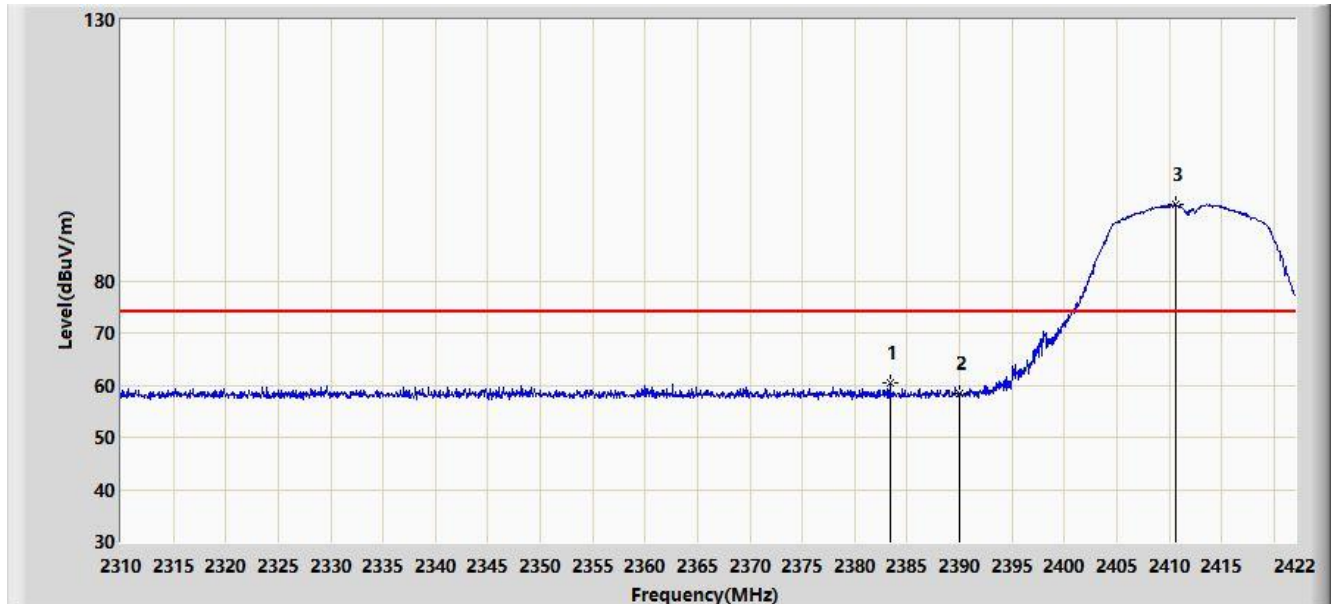


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2390.000	47.582	15.308	-6.418	54.000	32.274	AV
2		*	2410.688	75.826	43.458	N/A	N/A	32.368	AV

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

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

Site: AC1	Time: 2019/10/22 - 18:17
Limit: FCC_Part15.247_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Wireless Network Control	Power: DC 12V
Test Mode: Transmit by 802.11g at channel 2412MHz	

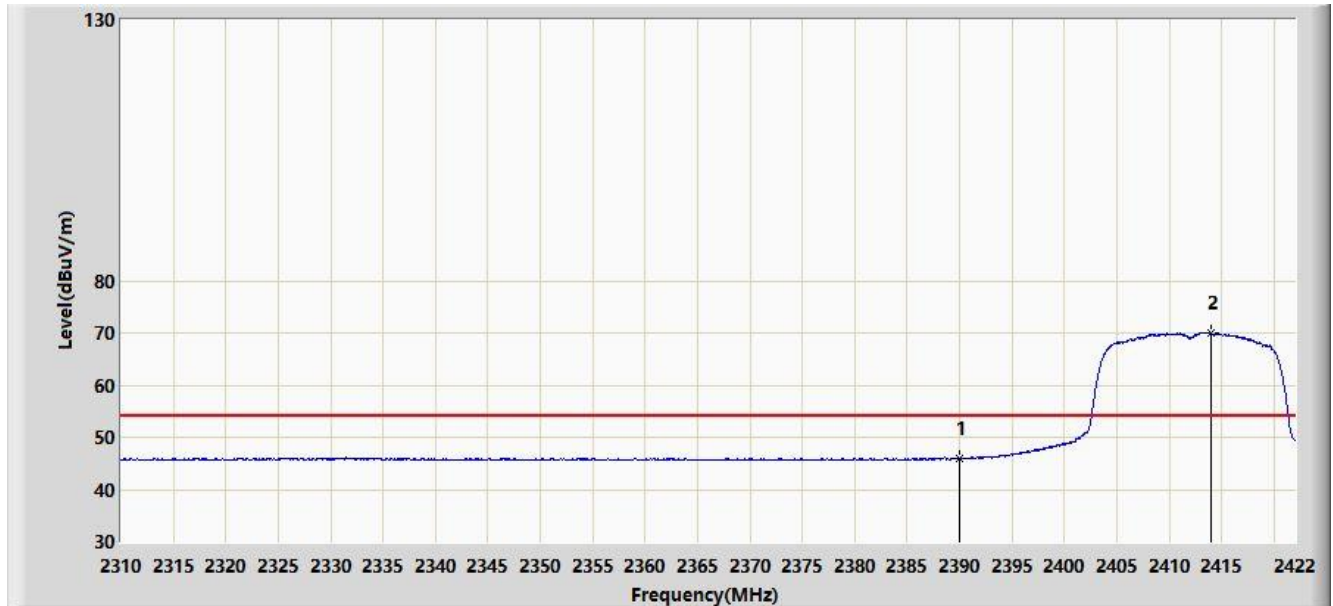


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2383.360	60.357	28.113	-13.643	74.000	32.244	PK
2			2390.000	58.306	26.032	-15.694	74.000	32.274	PK
3		*	2410.576	94.756	62.388	N/A	N/A	32.368	PK

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

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

Site: AC1	Time: 2019/10/22 - 18:19
Limit: FCC_Part15.247_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Wireless Network Control	Power: DC 12V
Test Mode: Transmit by 802.11g at channel 2412MHz	

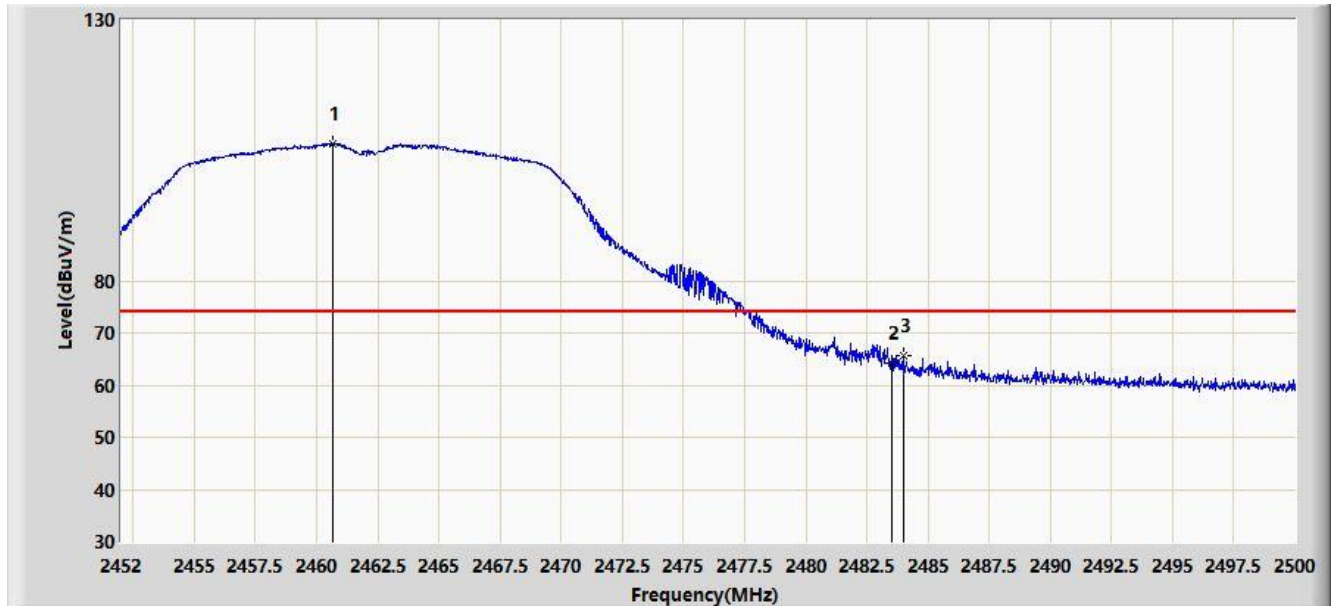


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2390.000	45.892	13.618	-8.108	54.000	32.274	AV
2		*	2414.048	69.924	37.540	N/A	N/A	32.383	AV

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

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

Site: AC1	Time: 2019/10/22 - 18:29
Limit: FCC_Part15.247_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Wireless Network Control	Power: DC 12V
Test Mode: Transmit by 802.11g at channel 2462MHz	

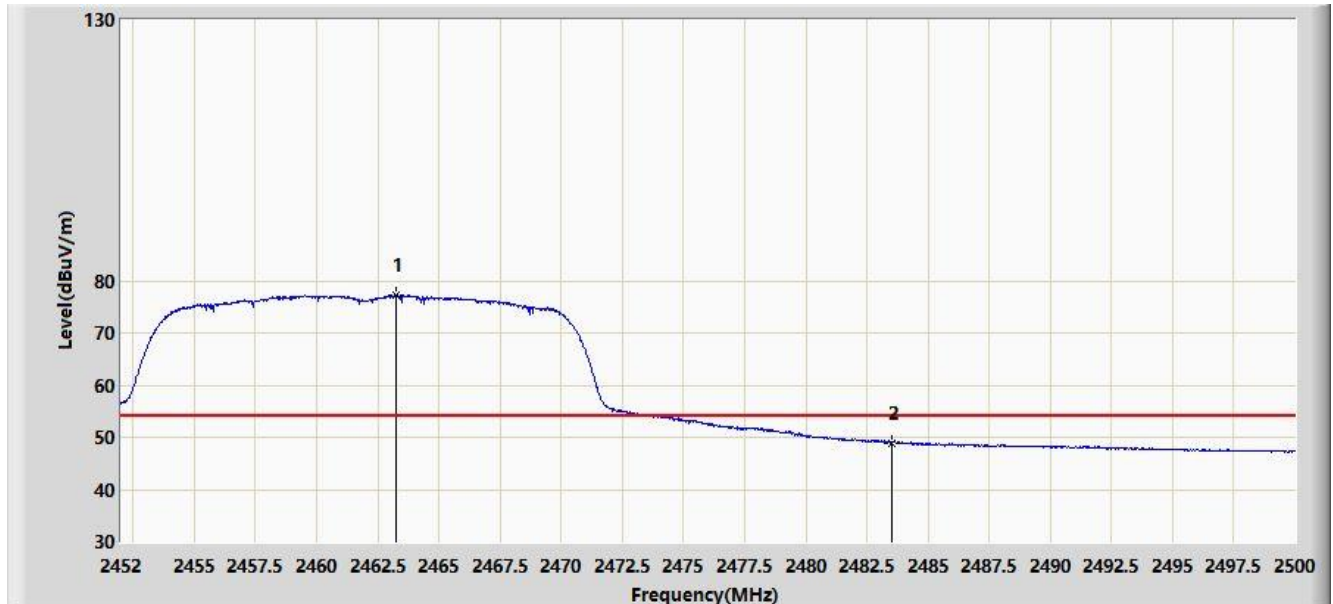


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2460.640	106.243	73.644	N/A	N/A	32.599	PK
2			2483.500	64.235	31.531	-9.765	74.000	32.704	PK
3			2483.992	65.621	32.914	-8.379	74.000	32.707	PK

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

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

Site: AC1	Time: 2019/10/22 - 18:30
Limit: FCC_Part15.247_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Wireless Network Control	Power: DC 12V
Test Mode: Transmit by 802.11g at channel 2462MHz	

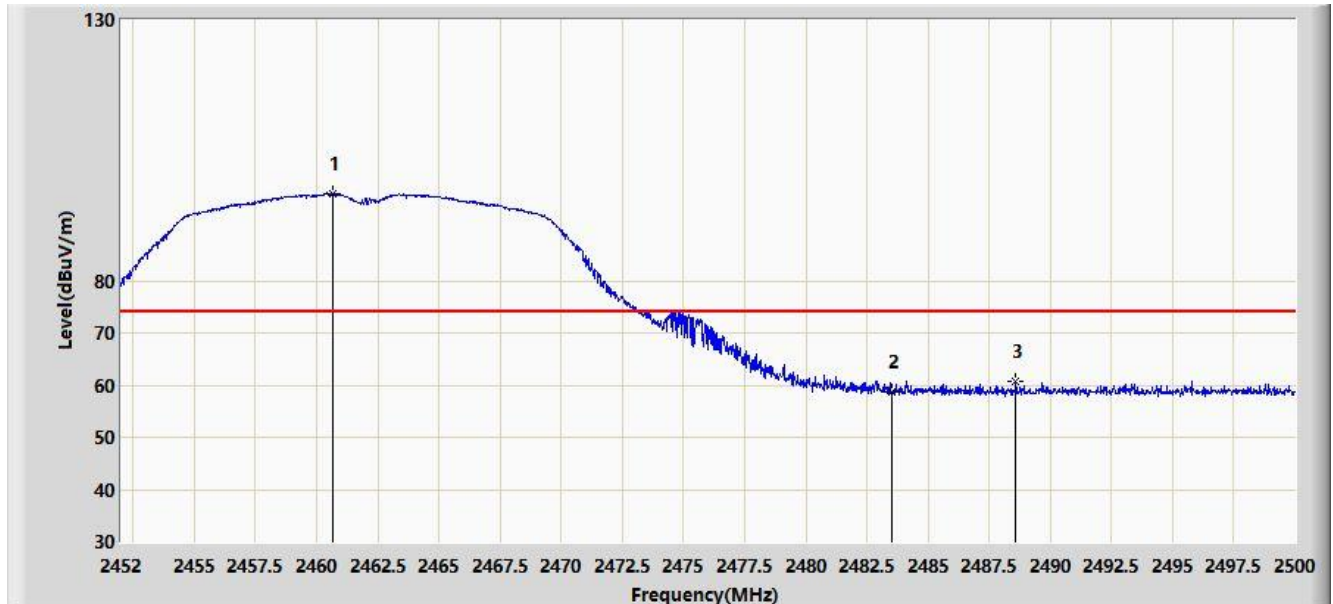


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2463.256	77.161	44.550	N/A	N/A	32.611	AV
2			2483.500	48.952	16.248	-5.048	54.000	32.704	AV

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

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

Site: AC1	Time: 2019/10/22 - 18:31
Limit: FCC_Part15.247_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Wireless Network Control	Power: DC 12V
Test Mode: Transmit by 802.11g at channel 2462MHz	

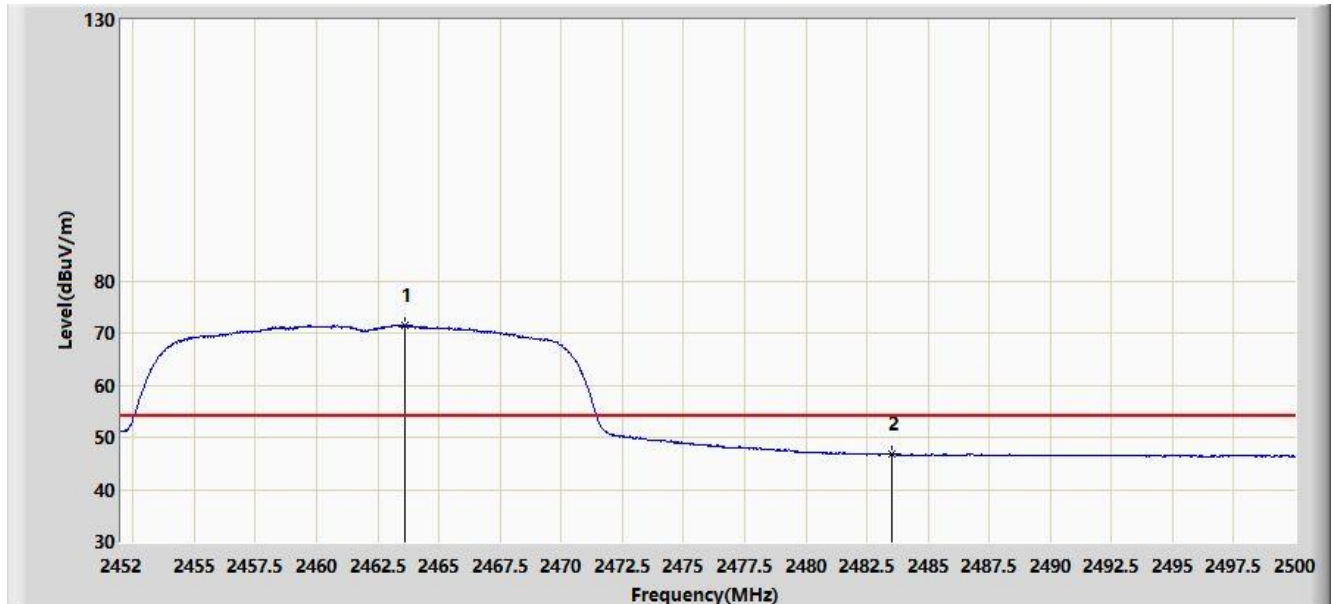


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2460.640	96.617	64.018	N/A	N/A	32.599	PK
2			2483.500	58.676	25.972	-15.324	74.000	32.704	PK
3			2488.600	60.762	28.034	-13.238	74.000	32.727	PK

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

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

Site: AC1	Time: 2019/10/22 - 18:33
Limit: FCC_Part15.247_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Wireless Network Control	Power: DC 12V
Test Mode: Transmit by 802.11g at channel 2462MHz	

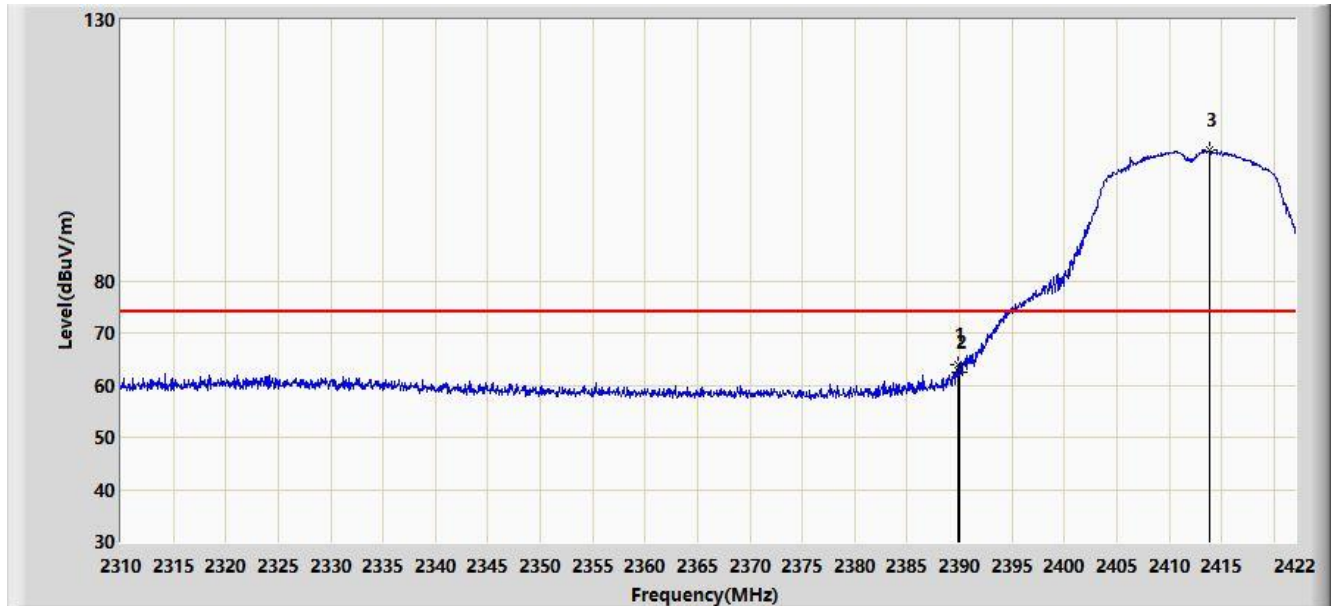


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2463.616	71.473	38.860	N/A	N/A	32.613	AV
2			2483.500	46.690	13.986	-7.310	54.000	32.704	AV

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

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

Site: AC1	Time: 2019/10/22 - 18:33
Limit: FCC_Part15.247_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Wireless Network Control	Power: DC 12V
Test Mode: Transmit by 802.11n-HT20 at channel 2412MHz	

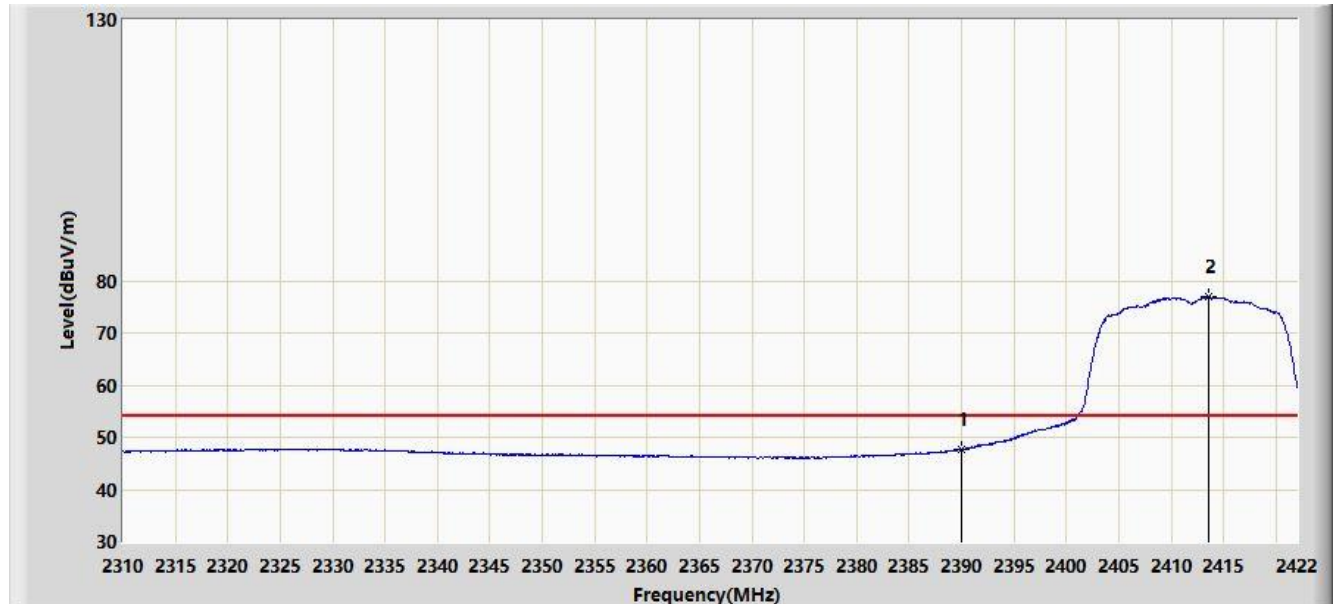


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2389.800	63.987	31.713	-10.013	74.000	32.274	PK
2			2390.000	62.494	30.220	-11.506	74.000	32.274	PK
3		*	2413.824	105.023	72.640	N/A	N/A	32.383	PK

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

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

Site: AC1	Time: 2019/10/22 - 18:36
Limit: FCC_Part15.247_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Wireless Network Control	Power: DC 12V
Test Mode: Transmit by 802.11n-HT20 at channel 2412MHz	

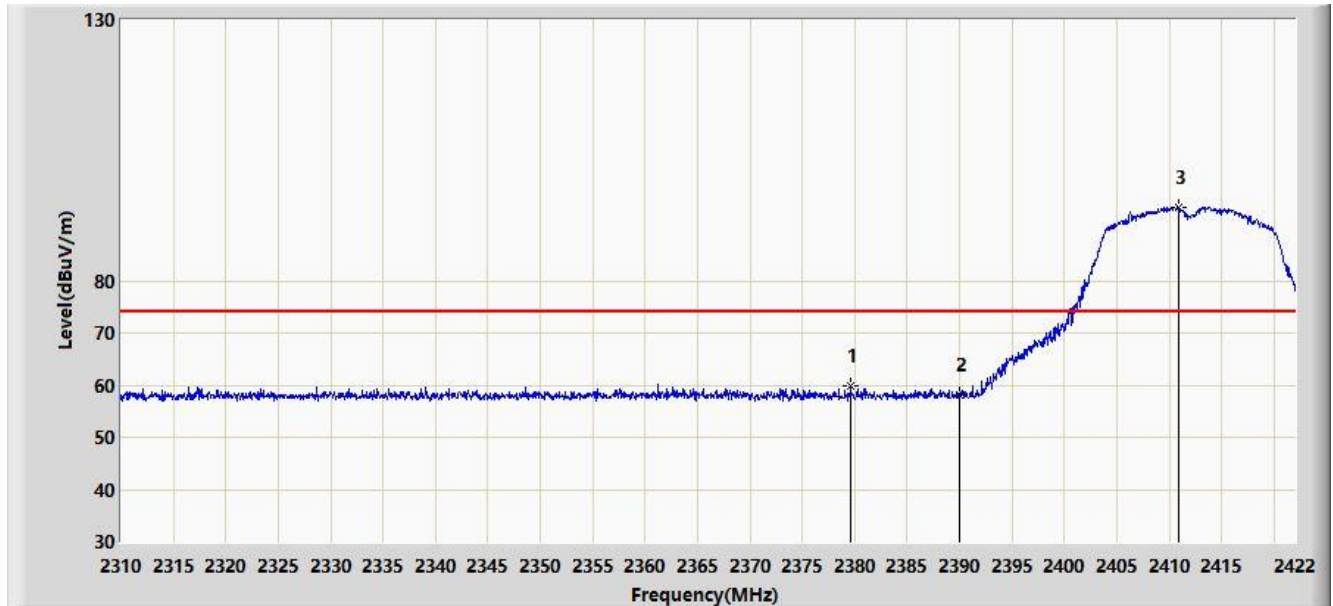


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2390.000	47.716	15.442	-6.284	54.000	32.274	AV
2		*	2413.600	76.826	44.444	N/A	N/A	32.382	AV

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

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

Site: AC1	Time: 2019/10/22 - 18:36
Limit: FCC_Part15.247_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Wireless Network Control	Power: DC 12V
Test Mode: Transmit by 802.11n-HT20 at channel 2412MHz	

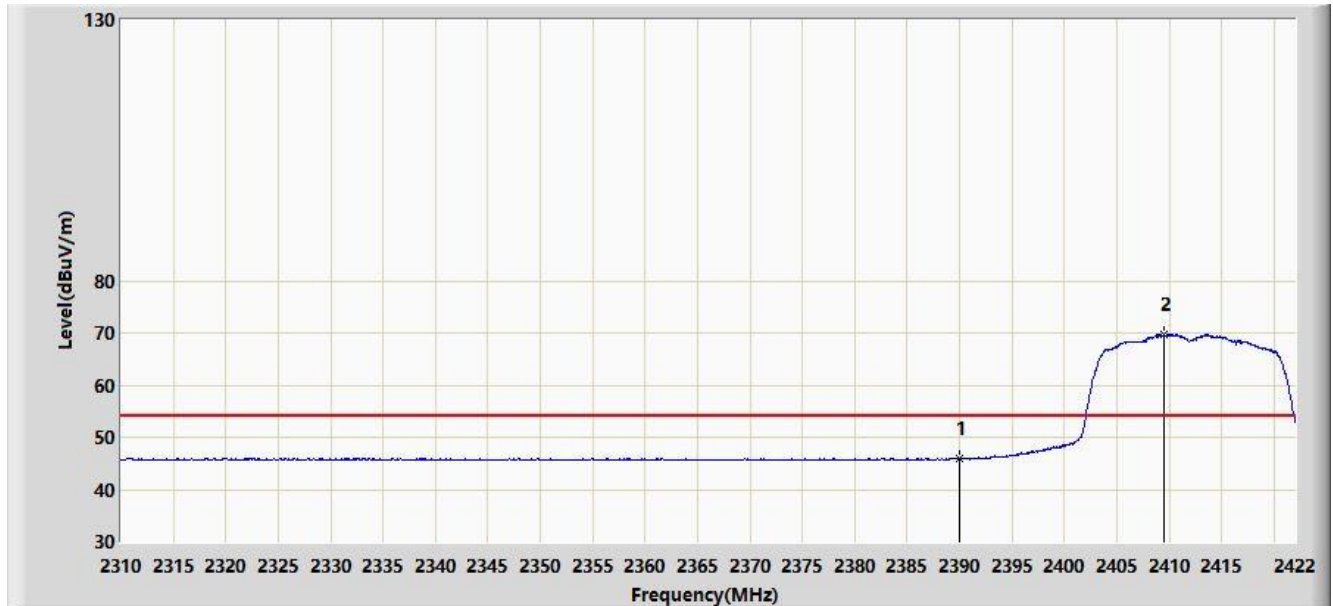


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2379.608	59.947	27.721	-14.053	74.000	32.226	PK
2			2390.000	58.030	25.756	-15.970	74.000	32.274	PK
3		*	2410.856	94.153	61.784	N/A	N/A	32.370	PK

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

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

Site: AC1	Time: 2019/10/22 - 18:38
Limit: FCC_Part15.247_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Wireless Network Control	Power: DC 12V
Test Mode: Transmit by 802.11n-HT20 at channel 2412MHz	

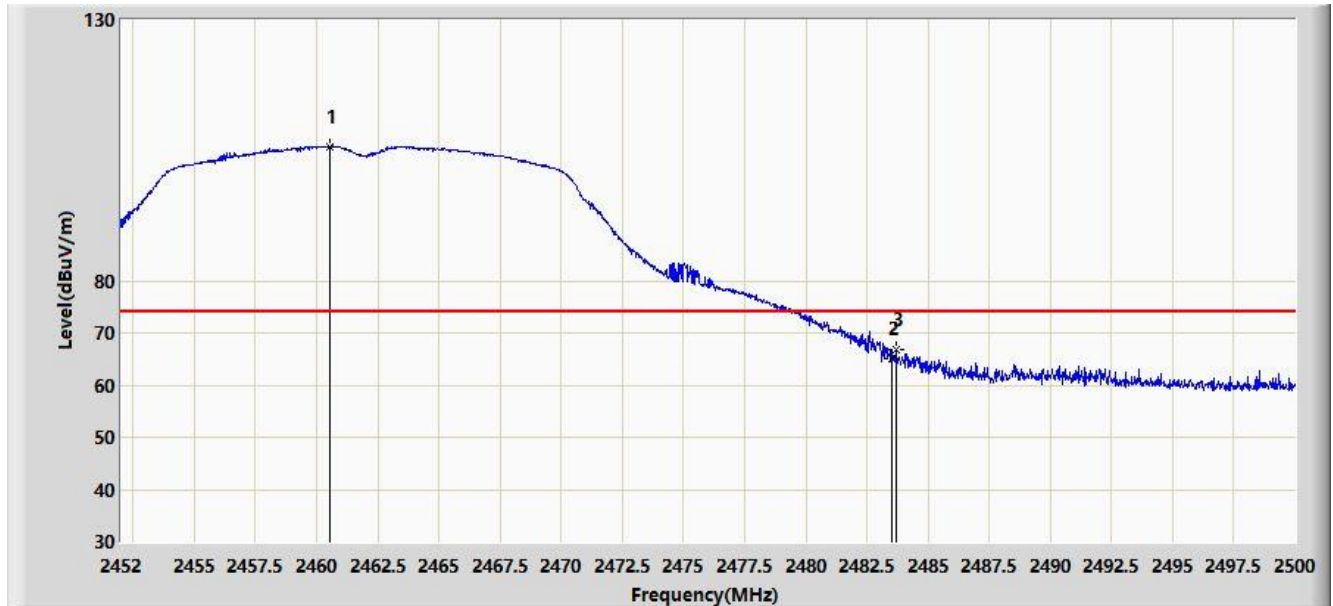


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2390.000	45.933	13.659	-8.067	54.000	32.274	AV
2		*	2409.568	69.614	37.251	N/A	N/A	32.363	AV

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

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

Site: AC1	Time: 2019/10/22 - 18:38
Limit: FCC_Part15.247_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Wireless Network Control	Power: DC 12V
Test Mode: Transmit by 802.11n-HT20 at channel 2462MHz	

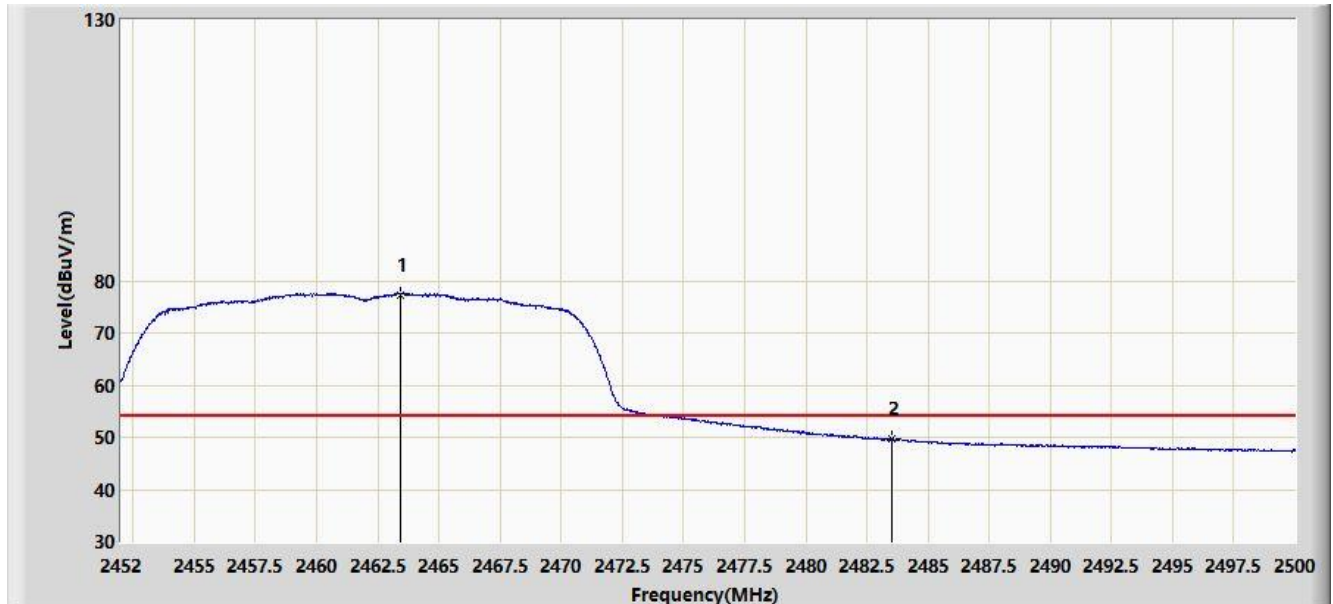


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2460.568	105.712	73.113	N/A	N/A	32.599	PK
2			2483.500	65.161	32.457	-8.839	74.000	32.704	PK
3			2483.680	66.672	33.967	-7.328	74.000	32.706	PK

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

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

Site: AC1	Time: 2019/10/22 - 18:41
Limit: FCC_Part15.247_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Wireless Network Control	Power: DC 12V
Test Mode: Transmit by 802.11n-HT20 at channel 2462MHz	

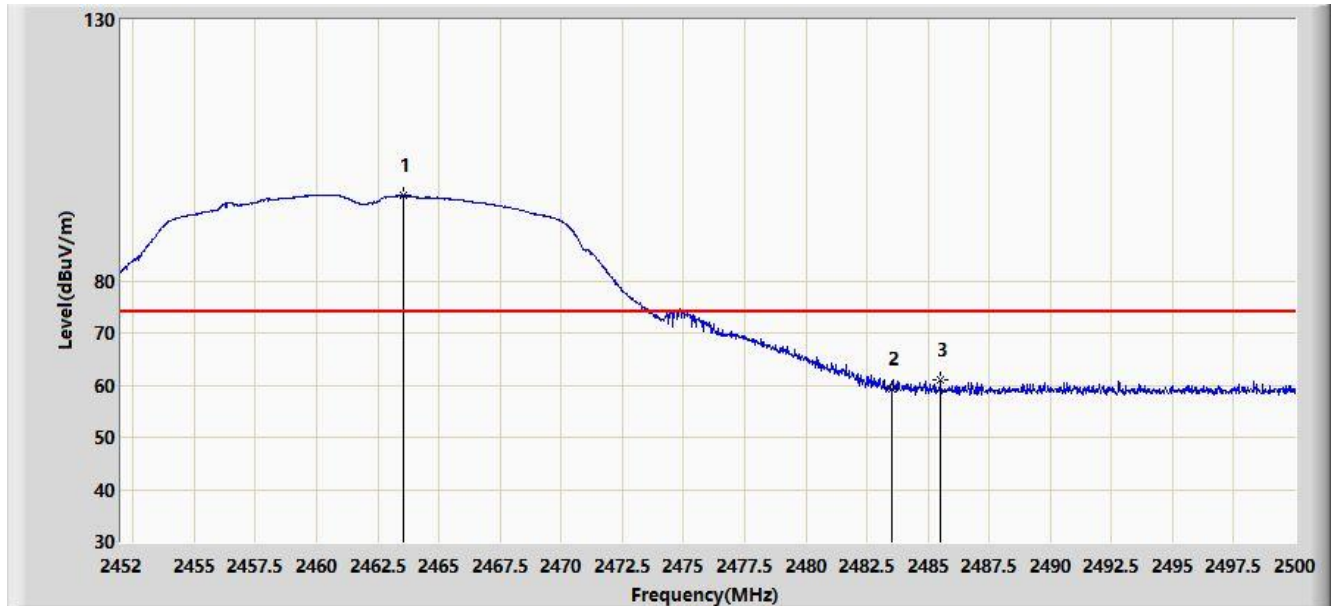


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2463.400	77.381	44.769	N/A	N/A	32.612	AV
2			2483.500	49.569	16.865	-4.431	54.000	32.704	AV

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

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

Site: AC1	Time: 2019/10/22 - 18:41
Limit: FCC_Part15.247_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Wireless Network Control	Power: DC 12V
Test Mode: Transmit by 802.11n-HT20 at channel 2462MHz	

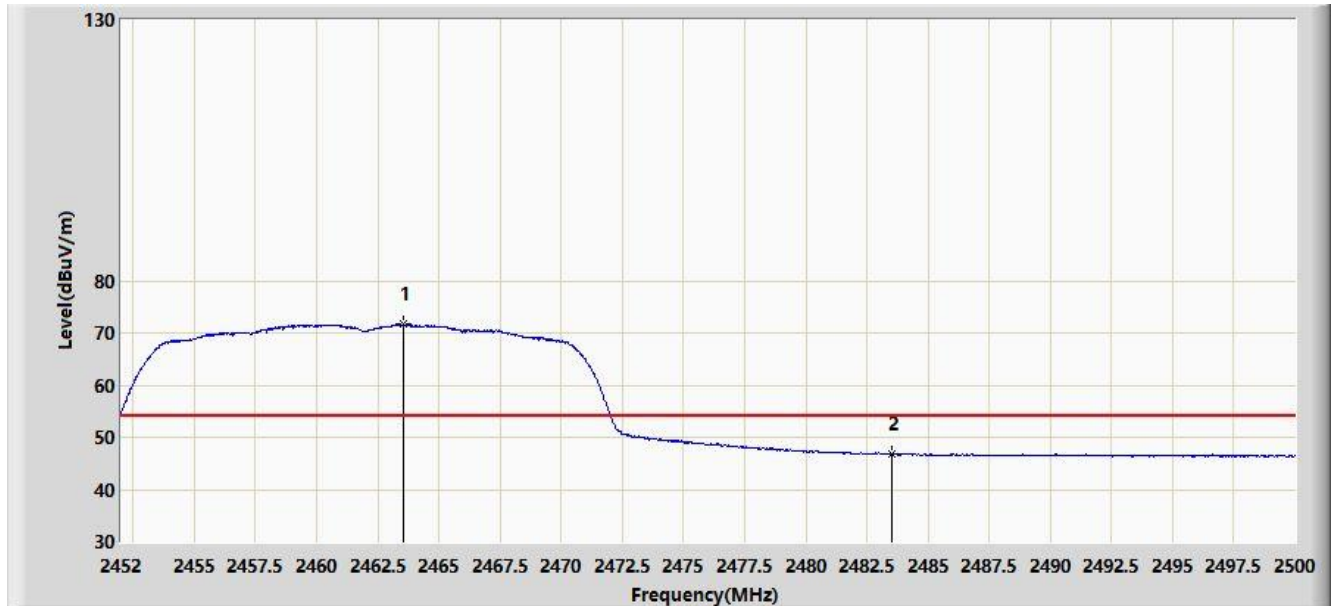


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2463.544	96.317	63.705	N/A	N/A	32.612	PK
2			2483.500	59.312	26.608	-14.688	74.000	32.704	PK
3			2485.504	60.883	28.169	-13.117	74.000	32.714	PK

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

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

Site: AC1	Time: 2019/10/22 - 18:43
Limit: FCC_Part15.247_RE(3m)	Engineer: Kevin Ker
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Wireless Network Control	Power: DC 12V
Test Mode: Transmit by 802.11n-HT20 at channel 2462MHz	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2463.544	71.641	39.029	N/A	N/A	32.612	AV
2			2483.500	46.723	14.019	-7.277	54.000	32.704	AV

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

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

5.7 占用頻寬

5.7.1 量測方法

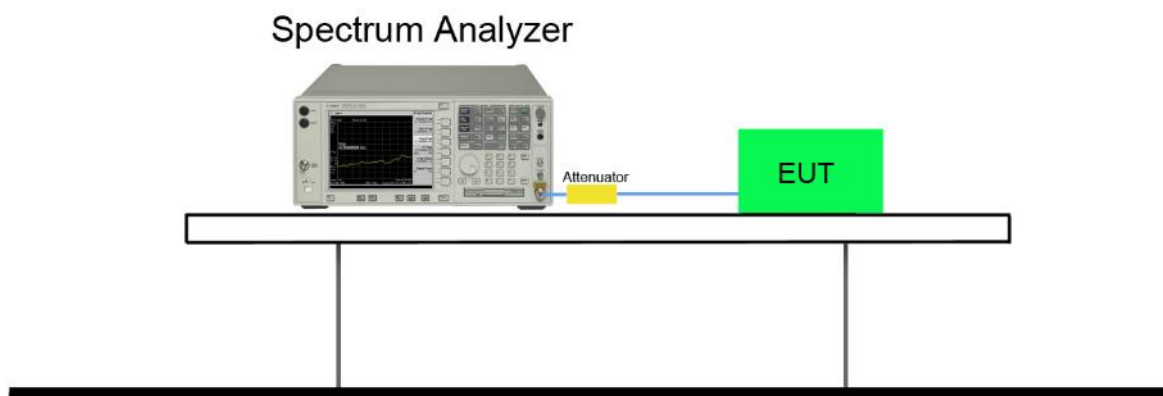
待測物之天線埠經由適當之衰減直接連至頻譜分析儀RF輸入端，頻譜分析儀之設定,參考如下:

- (1) Set RBW = 100 kHz
- (2) VBW $\geq 3 \times$ RBW
- (3) Detector = Peak
- (4) Trace mode = max hold
- (5) Sweep = auto couple

5.7.2 限制要求

6dB頻寬至少應有500kHz。

5.7.3 測試架構圖



5.7.4 占用頻寬測試結果

Product	Wireless Network Control	Temperature	25°C
Test Engineer	Kevin Ker	Relative Humidity	52%
Test Site	SR1	Test Date	2019/10/24

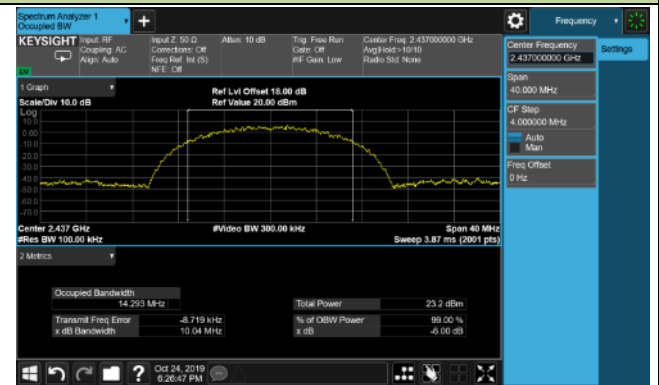
Test Mode	Data Rate / MCS	Channel No.	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
802.11b	11Mbps	01	2412	10.05	≥ 0.5	Pass
802.11b	11Mbps	06	2437	10.04	≥ 0.5	Pass
802.11b	11Mbps	11	2462	10.06	≥ 0.5	Pass
802.11g	6Mbps	01	2412	15.12	≥ 0.5	Pass
802.11g	6Mbps	06	2437	15.14	≥ 0.5	Pass
802.11g	6Mbps	11	2462	15.12	≥ 0.5	Pass
802.11n-HT20	MCS0	01	2412	15.14	≥ 0.5	Pass
802.11n-HT20	MCS0	06	2437	15.15	≥ 0.5	Pass
802.11n-HT20	MCS0	11	2462	15.12	≥ 0.5	Pass

802.11b 6dB Bandwidth

Channel 01 (2412MHz)



Channel 06 (2437MHz)

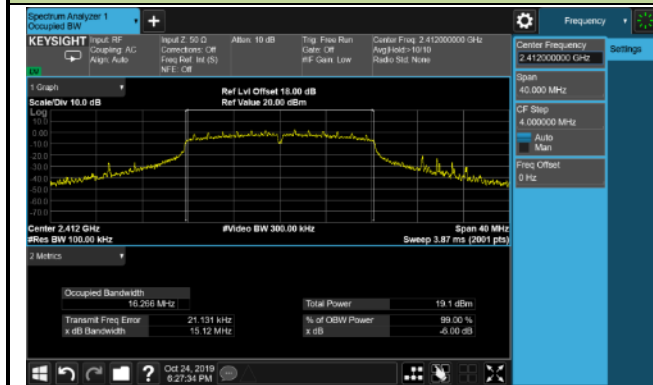


Channel 11 (2462MHz)

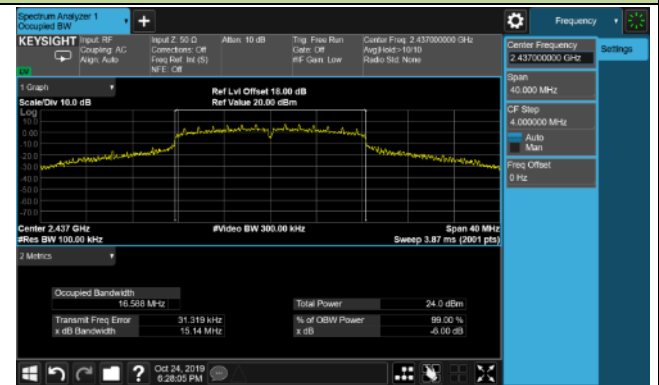


802.11g 6dB Bandwidth

Channel 01 (2412MHz)



Channel 06 (2437MHz)

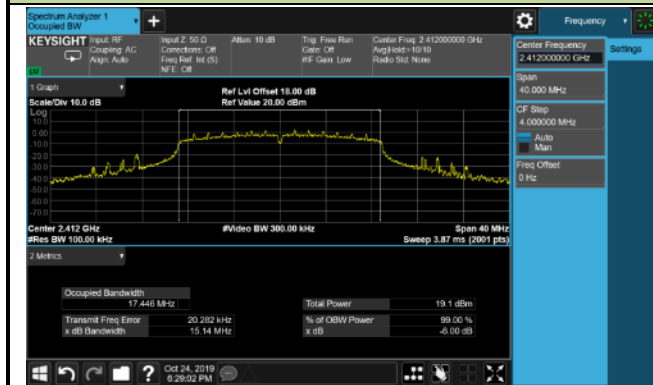


Channel 11 (2462MHz)

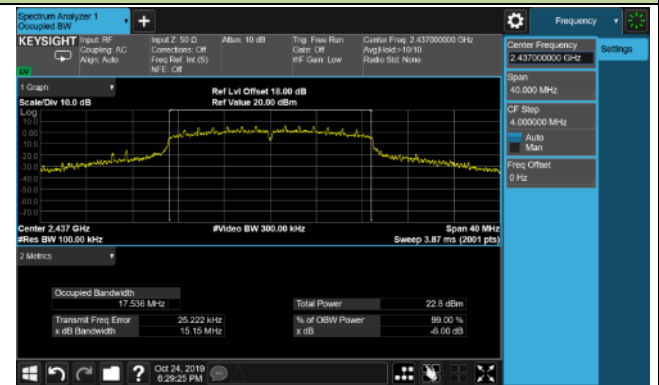


802.11n-HT20 6dB Bandwidth

Channel 01 (2412MHz)



Channel 06 (2437MHz)



Channel 11 (2462MHz)



5.8. 功率頻譜密度

5.8.1 量測方法

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8 dBm。

若受測裝置之頻譜線間隔小於3 kHz，測量時應將解析頻寬降低以使頻譜線間隔大於3 kHz，所測得之數據再藉加總3 kHz 頻帶內所有個別頻譜線之功率(即標準化至3 kHz)以決定是否符合規定。

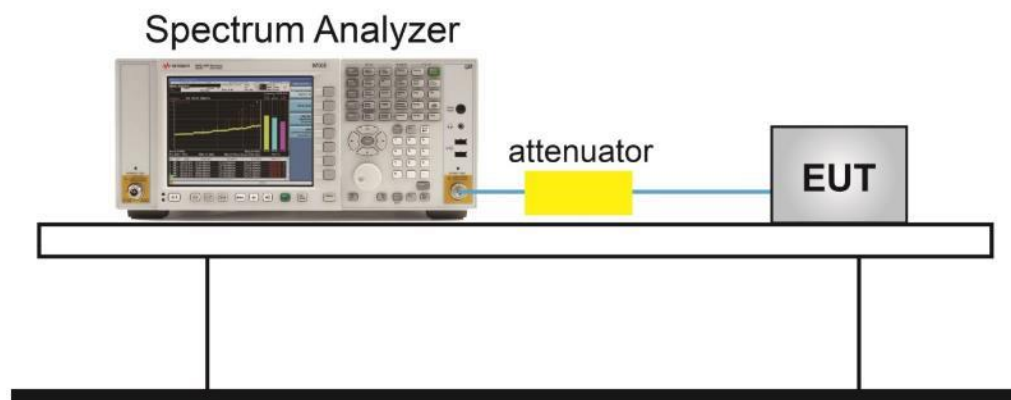
5.8.2 限制要求

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。

若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(註)操作時，應符合下列情形之一：

- (1)操作於2400-2483.5兆赫(MHz)者，其發射天線之方向性增益超過6dBi，應於每超過3dB降低1dB之峰值輸出功率。
- (2) 操作於5725-5850兆赫(MHz)者，其發射天線之方向性增益超過6dBi，不需降低峰值輸出功率。

5.8.3 測試架構圖



5.8.4 功率頻譜密度測試結果

Product	Wireless Network Control	Temperature	25°C
Test Engineer	Kevin Ker	Relative Humidity	52%
Test Site	SR1	Test Date	2019/10/24

Test Mode	Data Rate / MCS	Channel No.	Frequency (MHz)	PK PSD (dBm / 3kHz)	Limit (dBm / 3kHz)	Result
11b	11Mbps	1	2412	-9.92	≤ 8.00	Pass
11b	11Mbps	6	2437	-6.88	≤ 8.00	Pass
11b	11Mbps	11	2462	-8.98	≤ 8.00	Pass
11g	6Mbps	1	2412	-12.45	≤ 8.00	Pass
11g	6Mbps	6	2437	-8.13	≤ 8.00	Pass
11g	6Mbps	11	2462	-13.22	≤ 8.00	Pass
11n-HT20	MCS0	1	2412	-11.54	≤ 8.00	Pass
11n-HT20	MCS0	6	2437	-7.59	≤ 8.00	Pass
11n-HT20	MCS0	11	2462	-12.09	≤ 8.00	Pass

802.11b - PK PSD

Channel 01 (2412MHz)



Channel 06 (2437MHz)

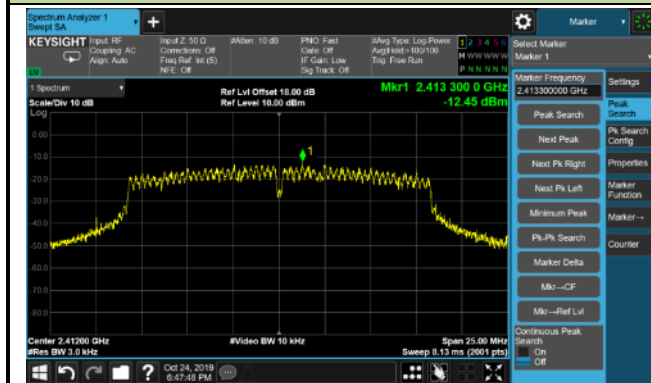


Channel 11 (2462MHz)

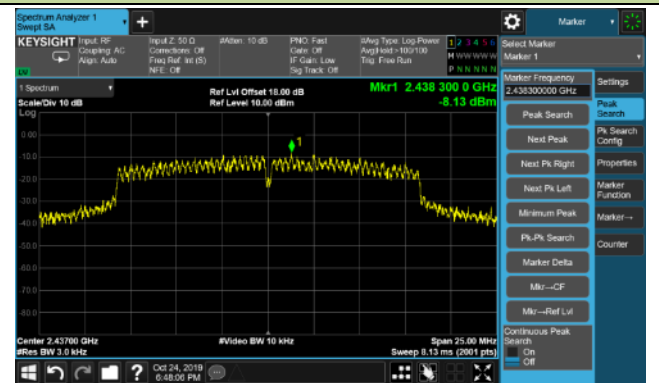


802.11g - PK PSD

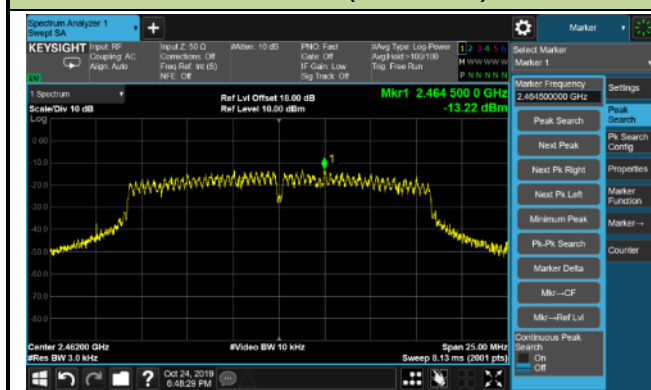
Channel 01 (2412MHz)



Channel 06 (2437MHz)

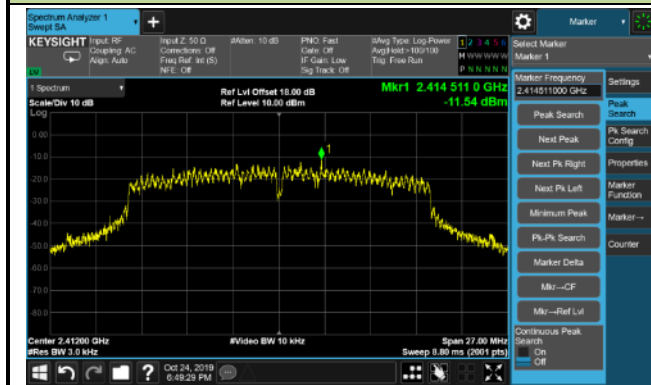


Channel 11 (2462MHz)

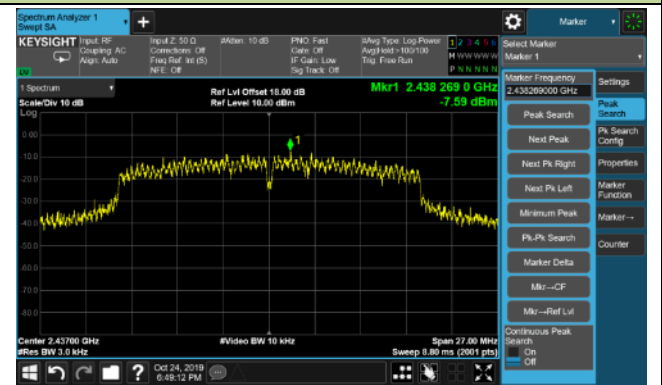


802.11n-HT20 - PK PSD

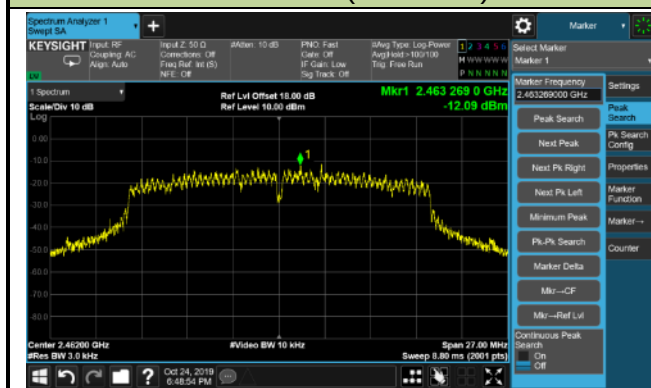
Channel 01 (2412MHz)



Channel 06 (2437MHz)



Channel 11 (2462MHz)



The End