

低功率射頻電機試驗報告

申請廠商	Robert Bosch Car Multimedia GmbH Robert-Bosch-Strasse 200, 31139 Hildesheim, Germany
製造廠商	Robert Bosch Car Multimedia GmbH
產品名稱	BMW Dashboard
廠牌	Bosch
型號	ICC6.5in
發射功率	-1.79dBm (Peak)
工作頻率	2402MHz – 2480MHz
調變方式	BT V4.2 BR(GFSK)+EDR($\pi/4$ DQPSK, 8DPSK)
法規	LP0002: 3.10.1節

實驗室資訊

台灣檢驗科技股份有限公司 電子通訊實驗室

新北市新北產業園區五工路134號

認證有效期間：107年06月14日起至110年06月13日止

試驗受理日期 民國106年09月19日

試驗執行日期 民國106年09月19日~民國106年10月31日 (Original test)

試驗執行日期 民國109年02月27日~民國109年03月16日 (Spot check)

報告發行日期 民國109年03月23日

張俊卿

報告簽署人
張俊卿 簽章

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Revision History

Report Number	Revision	Description	Issue Date	Remark
E2/2017/90076	Rev.00	Original.	Oct. 31, 2017	Revised By: Karen Huang
E2/2017/90076-01	Rev.01	Remove HW BCM89200 chip and supporting components and PCB layout	Mar. 23, 2020	Revised By: Yuri Tsai

Note:

此報告為原報告 E2/2017/90076 的加發報告，原報告與此報告的待測物經評估後確認為 硬體結構 和 RF 晶片結構變更，移除 BCM89200 chip 及其部分元件以及 PCB 佈線，產品基本結構相同，因此原報告內的測試結果完全沿用於此報告，僅針對 RSE & Conducted Power spot check。

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測試標準

國家通訊傳播委員會低功率射頻電機技術規範

民國 107 年 1 月 10 日版本

待測裝置已於台灣檢驗科技股份有限公司電子通訊實驗室，依據國家通訊傳播委員會於中華民國一百零七年一月頒佈之低功率射頻電機技術規範測試。

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。

台灣檢驗科技股份有限公司依低功率射頻電機技術規範審驗要點規範製作測試結果報告，測試結果評判為合格。

備註：

1. 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。
2. 此份報告未經本公司同意，不得部份摘錄複製使用。
3. 系列申請，移除 BCM89200 chip 及其部分元件以及 PCB 佈線，產品基本結構相同，詳細請見系列差異說明。

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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 0513, 認可頻率範圍9kHz ~ 40GHz

認證有效期間 : 107年06月14日起至110年06月13日止

測試場地 : 桃園市龜山區(華亞科技園區)科技一路2號

實驗室名稱 : 台灣檢驗科技股份有限公司
電子通訊實驗室

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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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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1 一般資料

1.1 產品特性

產品名稱	BMW Dashboard
型號	ICC6.5in
產品商標	Bosch
Hardware Version	N/A
Software Version	N/A
使用電源	DC12V

發射頻帶	2402MHz – 2480MHz
輸出功率	-1.79dBm (Peak)
調變方式	BT V4.2 BR(GFSK)+EDR($\pi/4$ DQPSK, 8DPSK)
頻道數	79
天線型式/天線增益	Chip Antenna, Antenna Gain: -0.39dBi (Module 1) Model No.: BMW G08, Supplier: BOSCH

本報告針對藍芽(BR/EDR)測試。

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1.2 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電機技術規範(LP0002, 105.8.23 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。

項次	測試項目	適用規範	測試結果	量測設備	備註
1	電源線傳導干擾	低功率射頻電機技術規範 2.3節	請參閱5.5節	請參閱4.1節	合格
2	禁用頻道之輻射發射	低功率射頻電機技術規範 3.10.1節(5)	請參閱6.5節	請參閱4.2節	合格
3	天線增益之要求	低功率射頻電機技術規範 3.10.1節(3)	請參閱7.2節	-----	合格
4	輸出峰值功率	低功率射頻電機技術規範 3.10.1節 (2.1)、(2.2)	請參閱8.3節	請參閱4.3節	合格
5	頻帶邊緣之發射	低功率射頻電機技術規範 3.10.1節(5)	請參閱9.3節	請參閱4.3節	合格
6	發頻頻寬	低功率射頻電機技術規範 3.10.1節(6.1.1)	請參閱10.3節	請參閱4.3節	合格
7	載波頻率間隔	低功率射頻電機技術規範 3.10.1節(6.1.1)	請參閱11.3節	請參閱4.3節	合格
8	載波頻率之佔用週期	低功率射頻電機技術規範 3.10.1節(6.1.2)	請參閱12.3節	請參閱4.3節	合格
9	頻道數量	低功率射頻電機技術規範 3.10.1節(6.1.2)	請參閱13.3節	請參閱4.3節	合格
	以下空白				

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*測試模式

RADIATED EMISSION TEST:

RADIATED EMISSION TEST (BELOW 1 GHz)				
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)
Bluetooth (TX)	0 to 78	0,39,78	GFSK	3DH5
Bluetooth (RX)	0 to 78	0,39,78	GFSK	3DH5
RADIATED EMISSION TEST (ABOVE 1 GHz)				
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)
Bluetooth (TX)	0 to 78	0,39,78	GFSK	3DH5
Bluetooth (RX)	0 to 78	0,39,78	GFSK	3DH5

ANTENNA PORT CONDUCTED MEASUREMENT:

CONDUCTED TEST				
Peak Output Power, 20dB Band Width				
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	PACKET TYPE
Bluetooth	0 to 78	0,39,78	GFSK	DH5
	0 to 78	0,39,78	$\pi/4$ -DQPSK	2DH5
	0 to 78	0,39,78	8-DPSK	3DH5
Band Edge				
Bluetooth	0 to 78	0,78	GFSK	3DH5
Frequency Separation				
Bluetooth	0 to 78	0,1,2	$\pi/4$ -DQPSK	2DH5
Number of hopping frequency				
Bluetooth	0 to 78	0 to 78	GFSK	3DH5
Time of Occupancy (Dwell time)				
Bluetooth	0 to 78	39	GFSK	3DH5

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Spot check:

*測試模式

RADIATED EMISSION TEST:

RADIATED EMISSION TEST (BELOW 1 GHz)				
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)
Bluetooth (TX)	0 to 78	39	GFSK	3DH5
Bluetooth (RX)	0 to 78	39	GFSK	3DH5
RADIATED EMISSION TEST (ABOVE 1 GHz)				
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)
Bluetooth (TX)	0 to 78	39	GFSK	3DH5
Bluetooth (RX)	0 to 78	39	GFSK	3DH5

ANTENNA PORT CONDUCTED MEASUREMENT:

CONDUCTED TEST				
Peak Output Power				
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	PACKET TYPE
Bluetooth	0 to 78	0,39,78	GFSK	DH5
	0 to 78	0,39,78	$\pi/4$ -DQPSK	2DH5
	0 to 78	0,39,78	8-DPSK	3DH5

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2 適用規範

2.1 規範要求 (一般規定)

(1) 傳導之規定

依據NCC低功率射頻電機技術規範之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 150 kHz 至 30MHz 之射頻電壓 (在電源端子每一電源線對接地點) 不得超過下表所列之限值。測量時應經過 50 μ H 及 50 Ω 之電源線阻抗模擬網路 (LISN)。頻率重疊處，以較低限值為準。

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低功率射頻電機技術規範3.10.1節(5)之要求，其他開放頻帶外不必要之輻射需符合2.8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 (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

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(3) 禁用頻帶限制之規定

依據NCC低功率射頻電機技術規範2.7節之要求，任何低功率射頻電機之主波皆不得使用下表所列各頻帶內之頻率；低功率射頻電機落於下表所列頻帶內之混附發射，其電場強度必須符合第2.8節的限制規定。

頻率(兆赫)	頻率(兆赫)	頻率(兆赫)
0.090 - 0.110	162.01 - 167.17	3500.0 - 4400.0
0.490 - 0.510	167.72 - 173.20	4500.0 - 5250.0
2.172 - 2.198	240.00 - 285.00	5350.0 - 5460.0
3.013 - 3.033	322.00 - 335.40	7250.0 - 7750.0
4.115 - 4.198	399.90 - 410.00 (註 1)	8025.0 - 8500.0
5.670 - 5.690	608.00 - 614.00	9000.0 - 9200.0
6.200 - 6.300	825.00 - 915.00	9300.0 - 9500.0
8.230 - 8.400	935.00 - 1240.0	10600 - 12700
12.265 - 12.600	1300.0 - 1427.0	13250 - 13400
13.340 - 13.430	1435.0 - 1626.5	14470 - 14500
14.965 - 15.020	1660.0 - 1755.0	15350 - 16200
16.700 - 16.755	1805.0 - 1850.0	17700 - 21400
19.965 - 20.020	2200.0 - 2300.0	22010 - 23120
25.500 - 25.700	2310.0 - 2390.0	23600 - 24000
37.475 - 38.275	2483.5 - 2500.0	31200 - 31800
73.500 - 75.400	2655.0 - 2900.0	36430 - 36500
108.00 - 138.00	3260.0 - 3267.0	38600 以上 (註 2)
149.90 - 150.05	3332.0 - 3339.0	
156.70 - 156.90	3345.8 - 3358.0	

註 1：402MHz-405MHz MICS 器材（第 4.11 節）除外。

註 2：76GHz-77GHz車輛雷達感測系統器材（第3.13節）除外。

(4) 依據NCC低功率射頻電機技術規範2.11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2.8節之發射規定，且不得接收、解調第2.7節所列之頻率。

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2.2 規範要求 (特殊規定)

依據NCC低功率射頻電機技術規範3.10節 跳頻 (frequency hopping) 之要求，使用頻率為2.4 G至2.4835 GHz 者

(1) 峰值輸出功率之要求：

依據NCC低功率射頻電機技術規範3.10.1節(2.1), (2.2)之規定，操作於2400-2483.5 MHz，並至少使用75個跳頻頻道之跳頻系統，其峰值輸出功率不得大於1 Watt。

(2) 天線增益之要求：

依據NCC低功率射頻電機技術規範3.10.1節(3)之規定，進行固定式點對點操作時，應符合下列情形之一：依據NCC低功率射頻電機技術規範3.10.1節(3)(3.1.1)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低功率射頻電機技術規範3.10.1節(3)(3.1.2)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低功率射頻電機技術規範3.10.1節(3)(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。

(3) 頻帶邊緣之要求：

依據NCC低功率射頻電機技術規範3.10.1節(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2.7節禁用頻段之輻射發射，應符合第2.8節之規定。

(4) 其他限制事項：

依據NCC低功率射頻電機技術規範3.10.1節(6.1)跳頻系統之規定

(6.1.1.) 跳頻系統之載波頻率頻道間隔不得低於25千赫 (kHz)或跳頻頻道之20dB 頻寬，兩者取較寬者。但操作頻率為2400-2483.5兆赫(MHz)頻帶且輸出功率不大於 125毫瓦(mW)跳頻系統，其載波頻率頻道間隔不得小於25千赫 (kHz)或跳頻頻道20dB頻寬之三分之二，兩者取較寬者。系統之跳頻頻道應依虛擬亂數排列，在各頻率之跳頻頻道上跳躍。每一發射機必須均等的使用每一頻率。系統接收機應具有與發射機跳躍頻道頻寬相匹配之輸入頻寬，且應隨所發射之信號同步偏移接收頻率。

(6.1.2.) 操作於2400-2483.5 MHz之展頻跳頻系統，須使用至少15個無重疊的頻道，在0.4秒乘以跳頻頻道數之週期內，任一頻率佔用之平均時間不得超過0.4秒。跳頻頻道數少於75之跳頻系統，可使用智慧型跳頻技術，以避免干擾其他之無線傳輸。

註: 此產品為點對多點操作。

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3 受測裝置之系統說明

裝置名稱	製造者/申請者	型號
* BMW Dashboard	Robert Bosch Car Multimedia GmbH / Robert Bosch Car Multimedia GmbH	ICC6.5in

標記：“*”表欲申請之受測物。

3.1 待測物與測試設備系統圖

3.1.1 量測配置圖

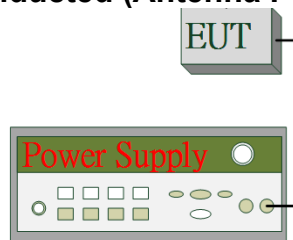
Radiated Emission



Conducted (Antenna Port)



Radiated Emission & Conducted (Antenna Port) (For Spot Check)



3.2 輔助測試週邊設備名稱描述

編號	產品別	商標	型號	序號	信號線線長(米)	電源線線長(米)
1.	Bluetooth Test Software	N/A	N/A	N/A	N/A	N/A
2.	DC Power Supply	Agilent	E3640A	MY53140006	N/A	Unshielded

For Spot Check

編號	產品別	商標	型號	序號	信號線線長(米)	電源線線長(米)
1.	Bluetooth Test Software	N/A	N/A	N/A	N/A	N/A
2.	DC Power Supply	DHA	DPS-3003	9411005787	N/A	Unshielded

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4 量測儀器設備

4.1. 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	100950	12/12/2016	12/11/2017
Coaxial Cables	N/A	N30N30-1042-150cm	N/A	08/30/2017	08/29/2018
LISN	Schwarzbeck	NSLK 8127	8127-648	06/18/2017	06/17/2018
Test Software	Farad	EZ-EMC	Ver. SGS-03A2	N.C.R.	N.C.R.

4.2. 量測場強輻射之量測儀器

SGS SAC-III					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
EMI Test Receiver	R&S	ESU 40	100363	04/18/2017	04/17/2018
Loop Antenna	ETS-Lindgren	6502	00143303	12/23/2016	12/22/2017
Broadband Antenna	TESEQ	CBL 6112D	35240	11/03/2016	11/02/2017
Horn Antenna	ETS-Lindgren	3117	00143272	12/15/2016	12/16/2017
Horn Antenna	Schwarzbeck	BBHA9170	185	08/01/2017	07/31/2018
Pre Amplifier	EMC Instruments	EMC330	980096	12/12/2016	12/11/2017
Pre Amplifier	EMC Instruments	EMC0011830	980199	12/12/2016	12/11/2017
Pre Amplifier	R&S	SCU-18	10204	12/12/2016	12/11/2017
Pre Amplifier	R&S	SCU-26	100780	12/12/2016	12/11/2017
Coaxial Cable	Huber+Suhner	RG 214/U	966Rx 9K-30M	12/12/2016	12/11/2017
Coaxial Cable	Huber+Suhner	RG 214/U SUCOFLEX 104	966Rx 30M-3G	12/12/2016	12/11/2017
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Rx 1G-18G	12/12/2016	12/11/2017
Coaxial Cable	Huber+Suhner	mini 141-12 SUCOFLEX 104	966Rx 18G-40G	12/12/2016	12/11/2017

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Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Tx 30M-18G	12/12/2016	12/11/2017
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	966Tx 18G-40G	12/12/2016	12/11/2017
Attenuator	WOKEN	218FS-10	RF27	12/12/2016	12/11/2017
Site NSA	SGS	966 Chamber C	SAC-C	03/02/2017	03/01/2018
Site VSWR	SGS	966 Chamber C	SAC-C	03/02/2017	03/01/2018
DC Power Supply	HOLA	DP-3003	D7070035	05/04/2017	05/03/2018
Controller	MF	MF-7802	N/A	N.C.R.	N.C.R.
Antenna Master	MF	N/A	N/A	N.C.R.	N.C.R.
Turn Table	MF	N/A	N/A	N.C.R.	N.C.R.
Test Software	World-Pallas	Dr. E	V 3.0 Lite	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。

4.3. 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.
Spectrum Analyzer	KEYSIGHT	N9010A	MY51440113	06/20/2017	06/19/2018
Power Meter	Anritsu	ML2496A	1326001	06/23/2017	06/22/2018
Power Sensor	Anritsu	MA2411B	1315048	06/23/2017	06/22/2018
Power Sensor	Anritsu	MA2411B	1315049	06/23/2017	06/22/2018
Coaxial Cable 30cm	WOKEN	00100A1F1A195C	RF01	12/12/2016	12/11/2017
DC Block	PASTERNAK	PE8210	RF29	12/12/2016	12/11/2017
Splitter	RF-LAMBAD	RFLT2W1G18G	RF35	12/12/2016	12/11/2017
Attenuator	WOKEN	218FS-10	RF23	12/12/2016	12/11/2017
DC Power Supply	Agilent	E3640A	MY53140006	05/02/2017	05/01/2018

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For Spot Check:

4.4. 天線端傳導測試之量測儀器

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010A	MY51440113	07/15/2019	07/14/2020
Power Meter	Anritsu	ML2496A	1804002	03/26/2019	03/25/2020
Power Sensor	Anritsu	MA2411B	1726105	03/26/2019	03/25/2020
DC Power Supply	Agilent	E3640A	MY53140006	05/31/2019	05/30/2020
DC Block	PASTERNAK	PE8210	RF256	11/20/2019	11/19/2020
Attenuator	Marvelous	WATT-218FS-10	RF270	11/20/2019	11/19/2020

4.5. 量測場強輻射之量測儀器

966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Broadband Antenna	TESEQ	CBL 6112D	35240	09/09/2019	09/08/2020
Horn Antenna	Schwarzbeck	BBHA9170	185	08/07/2019	08/06/2020
Horn Antenna	Schwarzbeck	BBHA9120D	1187	01/10/2020	01/09/2021
Loop Antenna	ETS.LINDGREN	6502	143303	04/25/2019	04/24/2020
EMI Test Receiver	R&S	ESU 40	100363	04/15/2019	04/14/2020
Pre-Amplifier	EMC Instruments	EMC330	980096	11/20/2019	11/19/2020
Pre-Amplifier	EMC Instruments	EMC0011830	980199	11/20/2019	11/19/2020
Pre-Amplifier	EMC Instruments	EMC184045B	980135	11/20/2019	11/19/2020
Attenuator	Woken	WATT-218FS-10	RF25	11/20/2019	11/19/2020
Highpass Filter	Micro Tronics	BRM50701-01	G008	11/20/2019	11/19/2020
Coaxial Cable	Huber Suhner	SUCOFLEX 104	MY17388/4	11/20/2019	11/19/2020
Coaxial Cable	Huber Suhner	RG 214/U	W22.03	11/20/2019	11/19/2020

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5 電源線傳導干擾之量測

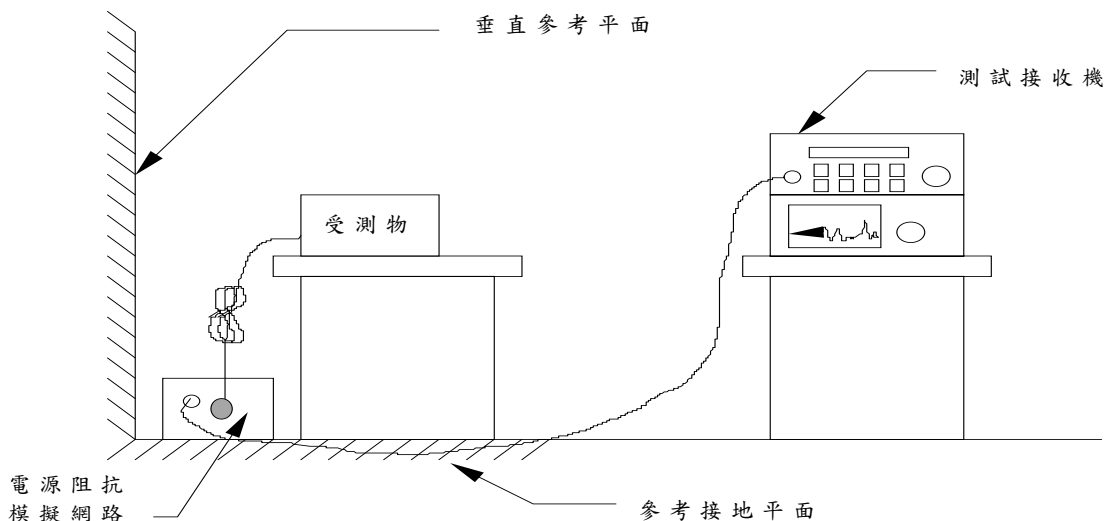
5.1 適用標準

依據NCC低功率射頻電機技術規範2.3節之要求。

5.2 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。

5.3 測試配置



5.4 干擾值之計算

電源傳導干擾電壓之計算公式如下

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

其中校正因子為：

饋線損失 + 電源阻抗模擬網路損失

5.5 傳導干擾之量測結果:

N/A EUT powered from DC12V.

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6 禁用頻帶輻射發射之量測

6.1 適用標準

依據NCC低功率射頻電機技術規範3.10.1節(5)之要求，其他開放頻帶外不必要之輻射干擾需符合2.8節之一般限制要求。

6.2 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:	VULB9168	檢測器:	Quasi-Peak

1GHz 以上測試

量測天線:	3117	檢測器:	Peak, Average
頻譜分析儀設定	Peak: RBW: 1MHz ; VBW: 1MHz , Average: RBW: 1MHz ; VBW: 10Hz		

註: 輻射量測僅放最差模式 (30MHz 以上)。

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6.3 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: 此裝置有 EDR 功能，因比較 BR mode 及 EDR mode 測試值後，附上最差模式 BR mode 數據。

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

Note : $\text{Actual FS(dB}\mu\text{V/m)} = \text{SPA. Reading level(dB}\mu\text{V)} + \text{Factor(dB)}$
 $\text{Factor(dB)} = \text{Antenna Factor(dB}\mu\text{V/m)} + \text{Cable Loss(dB)} - \text{Pre_Amplifier Gain(dB)}$

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.
"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.
"---" : denotes Noise Floor.

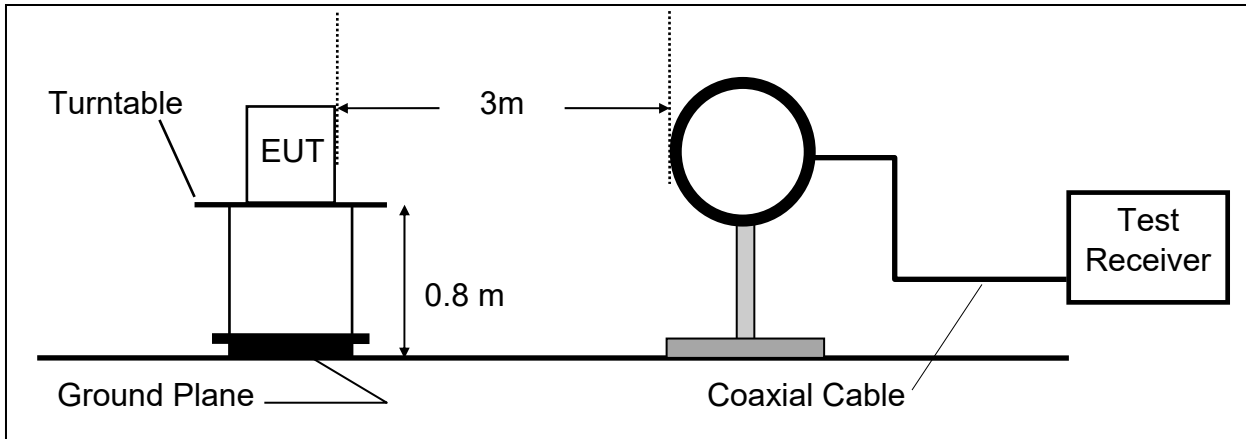
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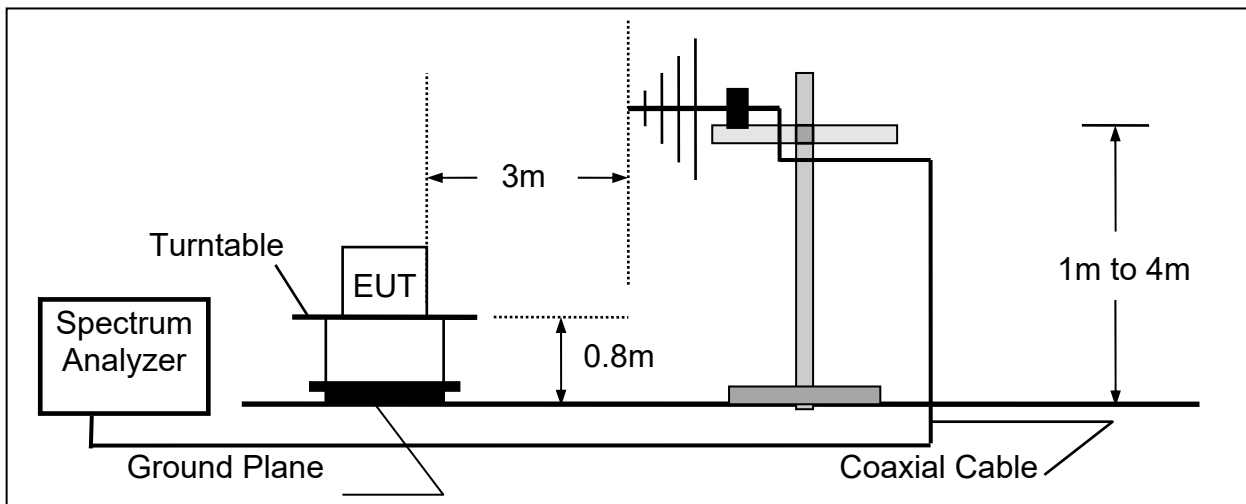
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6.4 輻射之測試配置

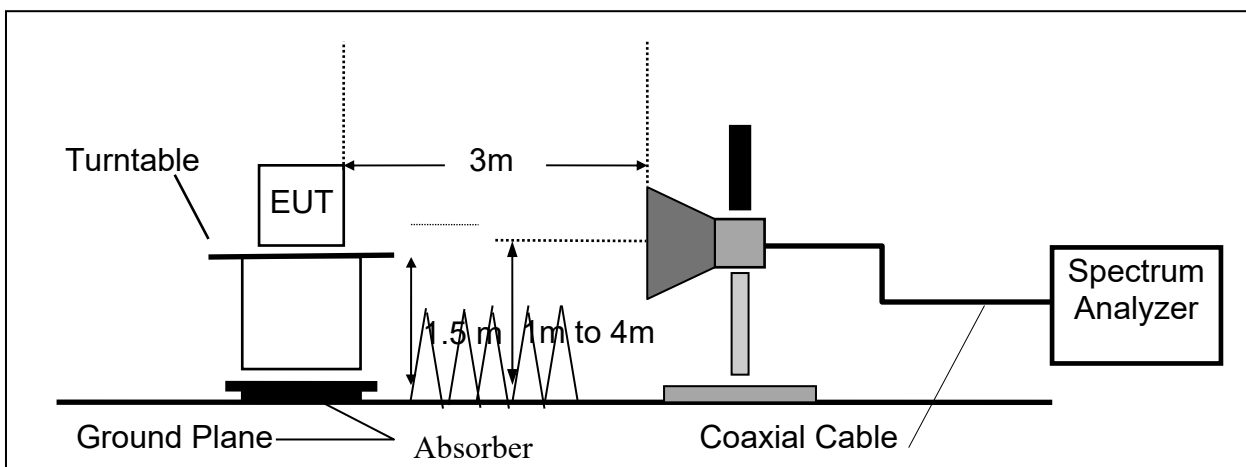
(A) 量測頻率低於 30MHz 以下之測試配置



(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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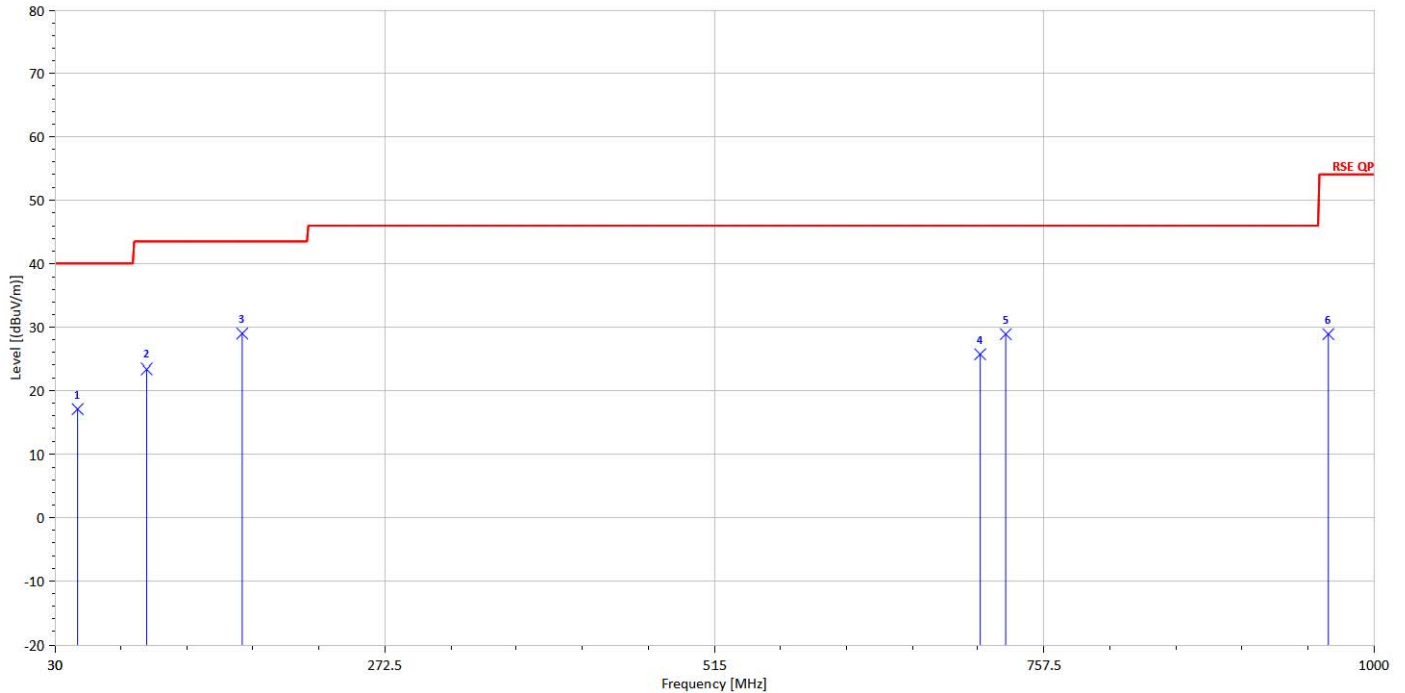
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6.5 場強輻射之量測結果

6.5.1 發射機場強輻射之量測結果(1GHz 以下) (最差模式: EDR Mode)

Module 1

Operation Mode :	BT EDR	Test Date :	2017/10/25
Fundamental Frequency :	2402 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	TX CH LOW	Test Engineer :	Enzo
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical



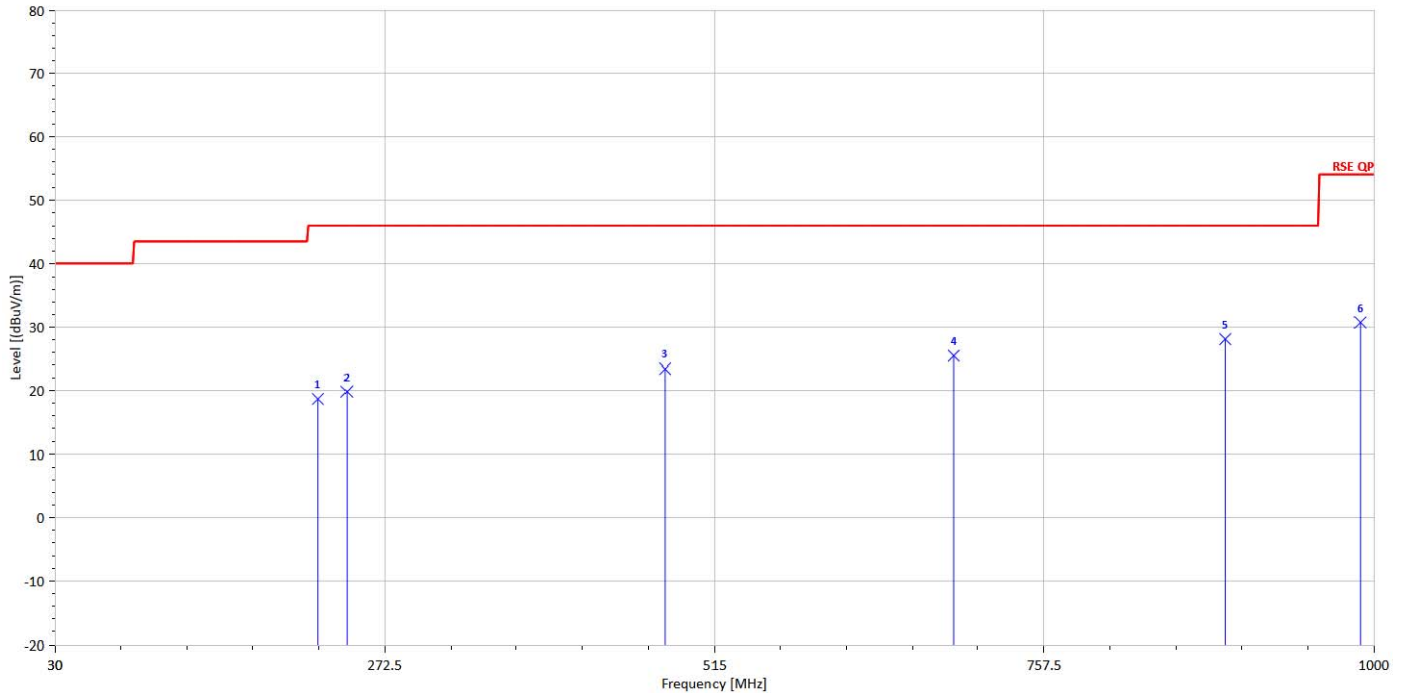
Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
46.18	S	Peak	34.20	-17.09	17.11	40	-22.89
97.53	S	Peak	41.60	-18.17	23.43	43.5	-20.07
167.87	S	Peak	47.07	-18.08	28.99	43.5	-14.51
710.90	S	Peak	31.04	-5.35	25.69	46	-20.31
729.19	S	Peak	33.54	-4.65	28.90	46	-17.10
966.94	S	Peak	30.35	-1.45	28.89	54	-25.11

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Operation Mode : BT EDR Test Date : 2017/10/25
Fundamental Frequency : 2402 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : TX CH LOW Test Engineer : Enzo
EUT Pol. : H Measurement Antenna Pol. : Horizontal



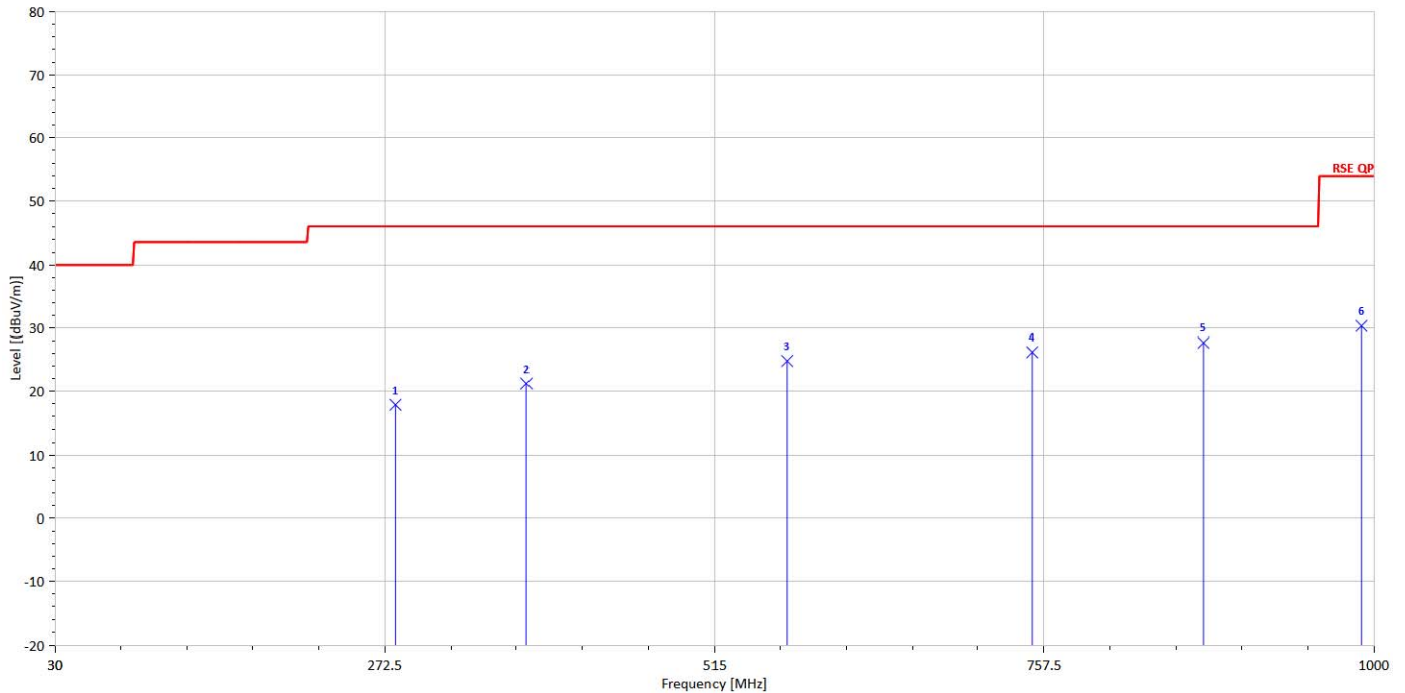
Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
223.44	S	Peak	35.57	-16.85	18.72	46	-27.28
244.54	S	Peak	34.91	-15.03	19.88	46	-26.12
478.77	S	Peak	31.26	-7.80	23.46	46	-22.54
691.20	S	Peak	30.96	-5.48	25.47	46	-20.53
890.97	S	Peak	30.73	-2.62	28.10	46	-17.90
990.15	S	Peak	31.44	-0.69	30.75	54	-23.25

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Operation Mode : BT EDR Test Date : 2017/10/25
Fundamental Frequency : 2441 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : TX CH MID Test Engineer : Enzo
EUT Pol. : H Measurement Antenna Pol. : Vertical



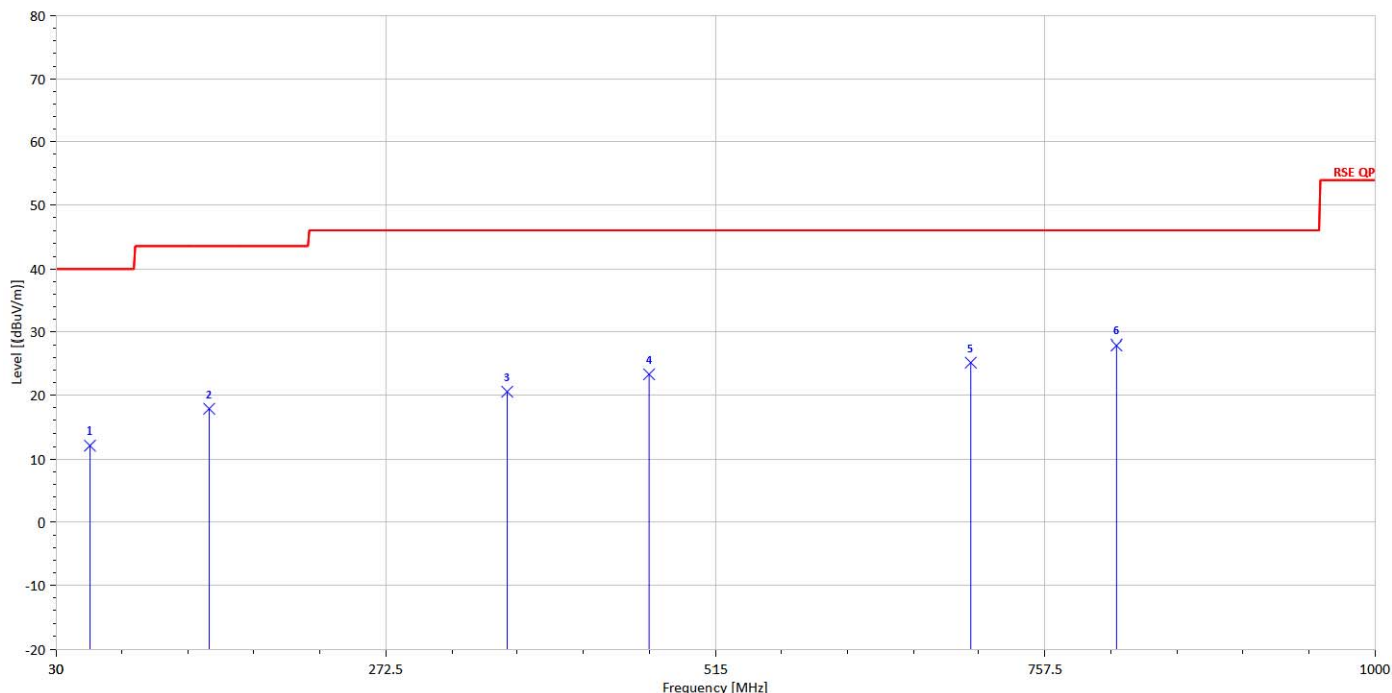
Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
280.41	S	Peak	31.47	-13.60	17.87	46	-28.13
376.78	S	Peak	31.74	-10.49	21.25	46	-24.75
568.81	S	Peak	31.49	-6.65	24.84	46	-21.16
748.88	S	Peak	30.21	-4.00	26.22	46	-19.78
874.79	S	Peak	30.49	-2.77	27.72	46	-18.28
990.86	S	Peak	31.01	-0.68	30.32	54	-23.68

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Operation Mode : BT EDR Test Date : 2017/10/25
Fundamental Frequency : 2441 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : TX CH MID Test Engineer : Enzo
EUT Pol. : H Measurement Antenna Pol. : Horizontal



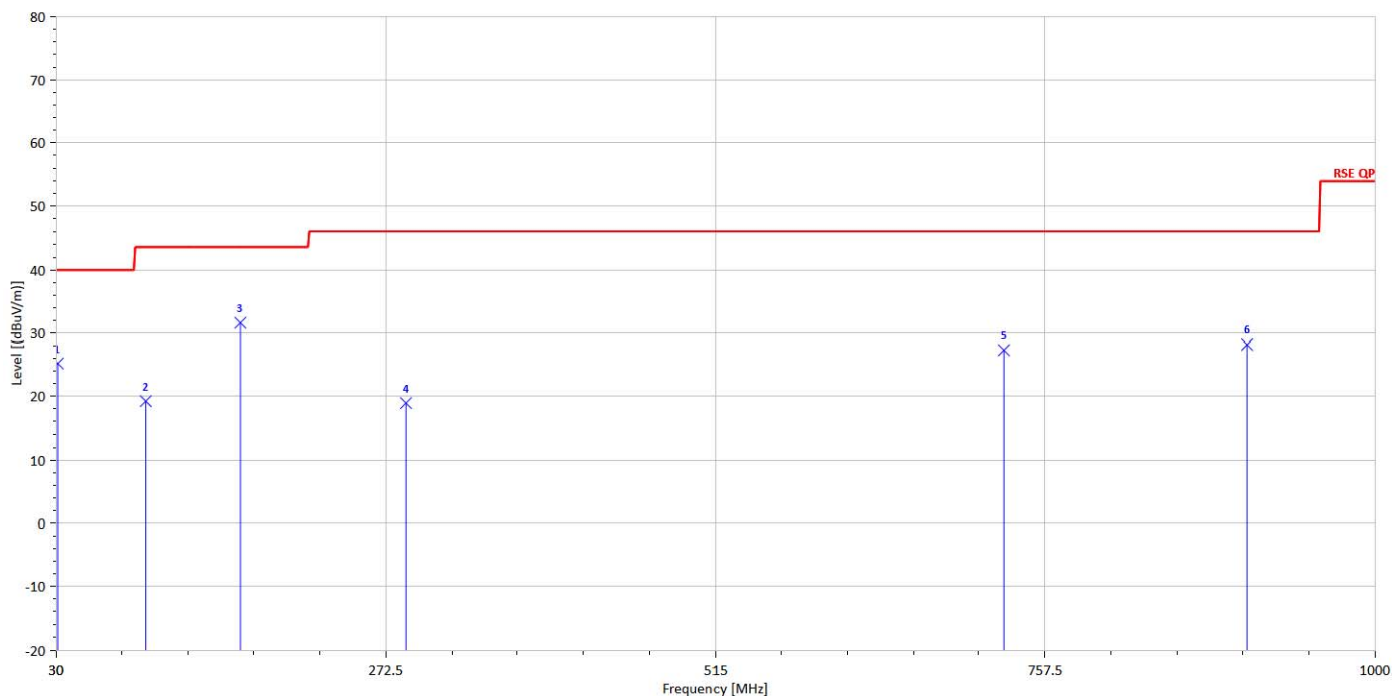
Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
54.62	S	Peak	33.18	-21.04	12.14	40	-27.86
142.55	S	Peak	34.13	-16.26	17.87	43.5	-25.63
362.01	S	Peak	31.65	-11.06	20.59	46	-25.41
466.11	S	Peak	31.34	-7.98	23.36	46	-22.64
703.16	S	Peak	30.50	-5.28	25.22	46	-20.78
810.08	S	Peak	31.09	-3.14	27.95	46	-18.05

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Operation Mode : BT EDR Test Date : 2017/10/25
Fundamental Frequency : 2480 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : TX CH HIGH Test Engineer : Enzo
EUT Pol. : H Measurement Antenna Pol. : Vertical



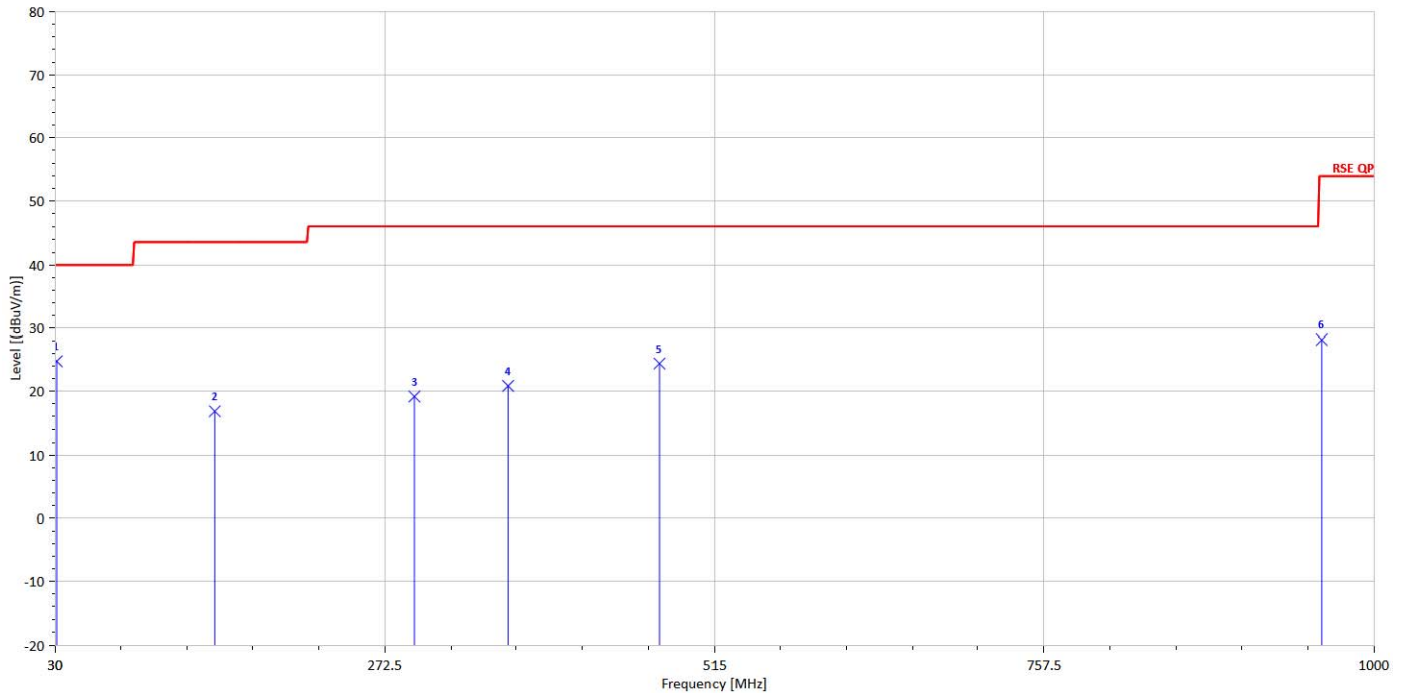
Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
31.41	S	Peak	33.17	-7.94	25.23	40	-14.77
96.12	S	Peak	37.65	-18.41	19.23	43.5	-24.27
165.76	S	Peak	49.52	-17.92	31.61	43.5	-11.89
287.45	S	Peak	32.29	-13.36	18.93	46	-27.07
727.08	S	Peak	32.23	-4.90	27.33	46	-18.67
906.45	S	Peak	29.95	-1.77	28.18	46	-17.82

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Operation Mode : BT EDR Test Date : 2017/10/25
Fundamental Frequency : 2480 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : TX CH HIGH Test Engineer : Enzo
EUT Pol. : H Measurement Antenna Pol. : Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
31.41	S	Peak	32.73	-7.94	24.79	40	-15.21
147.47	S	Peak	33.47	-16.64	16.84	43.5	-26.66
294.48	S	Peak	32.40	-13.21	19.19	46	-26.81
363.42	S	Peak	31.83	-10.96	20.87	46	-25.13
474.55	S	Peak	32.51	-8.08	24.43	46	-21.57
962.02	S	Peak	30.38	-2.20	28.18	54	-25.82

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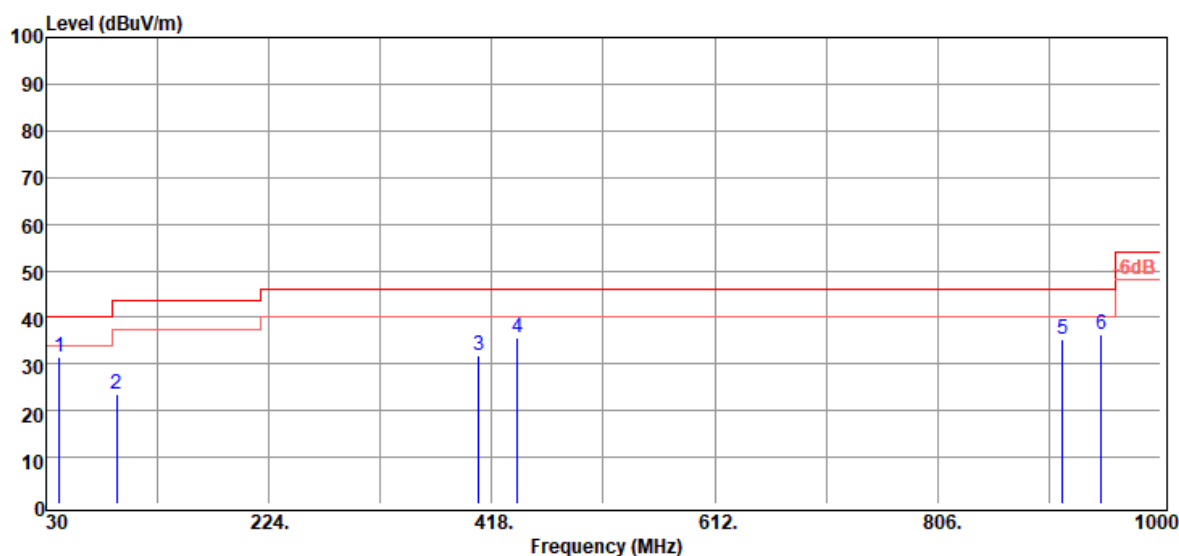
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Spot Check

Report Number :E2/2017/90076-01
 Operation Mode :BT EDR
 Test Frequency :2441 MHz
 Test Mode :TX CH MID
 EUT Pol :H Plan

Test Date :2020-03-11
 Temp./Humi. :25.1/52
 Antenna Pol. :VERTICAL
 Engineer :Enzo



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dB μ V	dB	dB μ V/m	dB μ V/m	dB
41.64	Peak	41.49	-9.84	31.65	40.00	-8.35
91.11	Peak	40.67	-17.22	23.45	43.50	-20.05
406.36	Peak	38.76	-7.07	31.69	46.00	-14.31
440.31	Peak	41.73	-6.11	35.62	46.00	-10.38
914.64	Peak	34.35	1.10	35.45	46.00	-10.55
948.59	Peak	35.05	1.31	36.36	46.00	-9.64

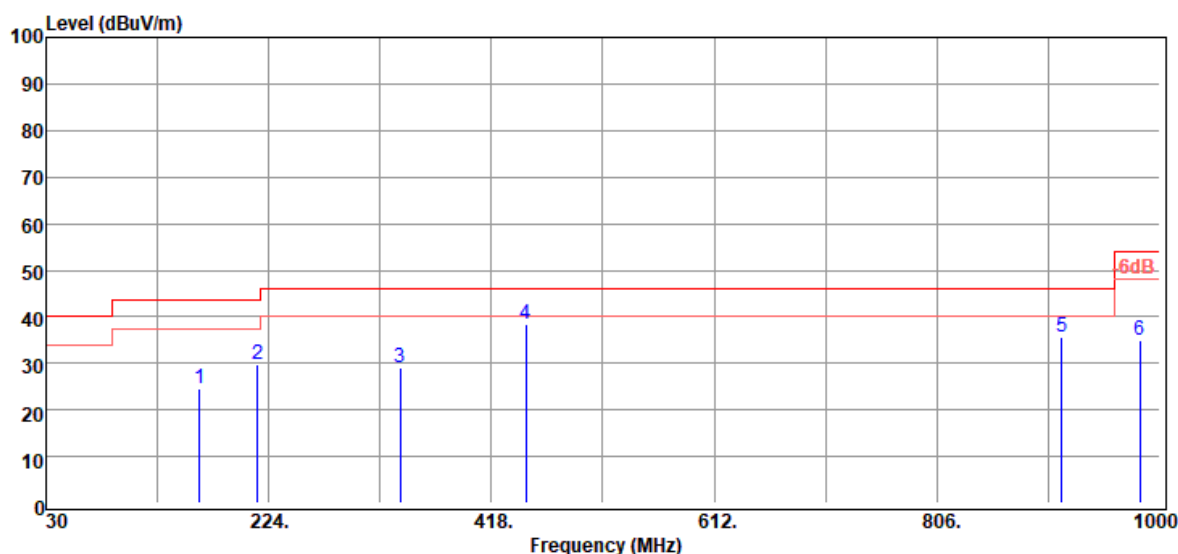
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Report Number :E2/2017/90076-01
Operation Mode :BT EDR
Test Frequency :2441 MHz
Test Mode :TX CH MID
EUT Pol :H Plan

Test Date :2020-03-11
Temp./Humi. :25.1/52
Antenna Pol. :HORIZONTAL
Engineer :Enzo



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
163.86	Peak	39.70	-14.98	24.72	43.50	-18.78
214.30	Peak	45.16	-15.24	29.92	43.50	-13.58
338.46	Peak	38.63	-9.50	29.13	46.00	-16.87
448.07	Peak	44.27	-5.97	38.30	46.00	-7.70
914.64	Peak	34.57	1.10	35.67	46.00	-10.33
982.54	Peak	33.30	1.82	35.12	54.00	-18.88

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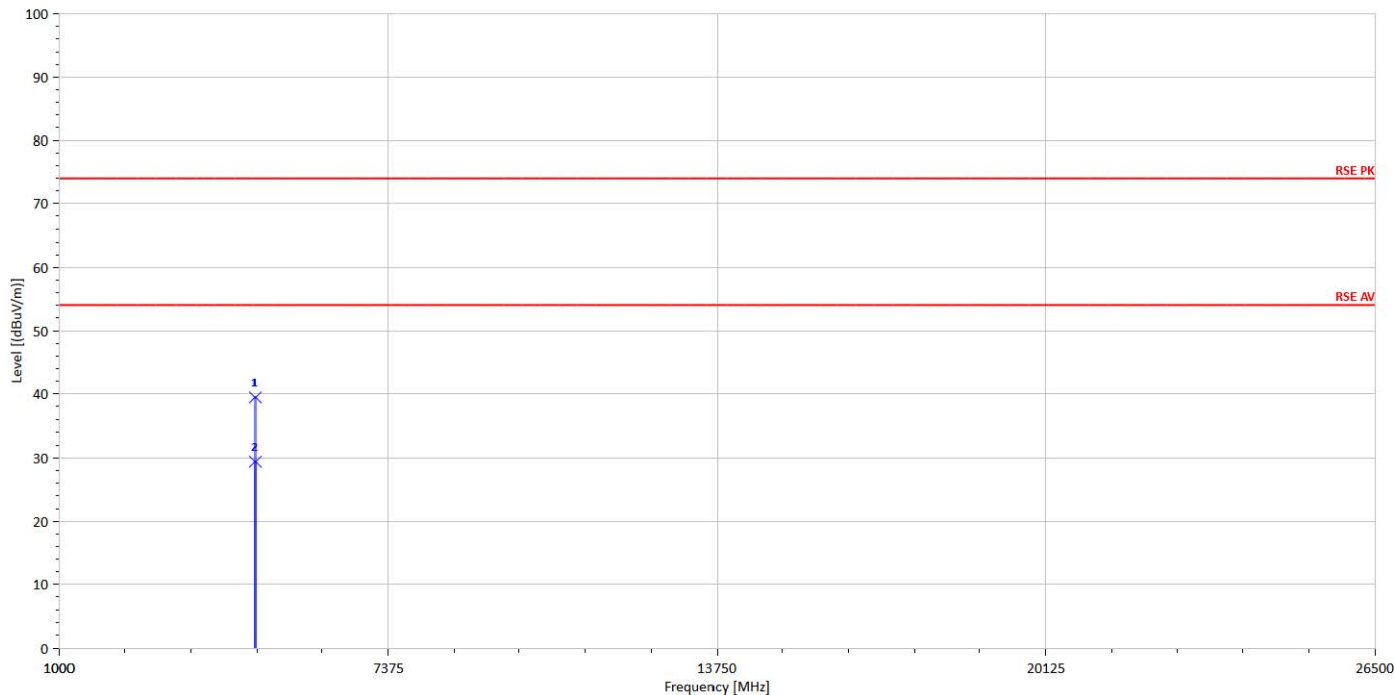
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6.5.2 發射機場強輻射之量測結果(1GHz 以上)

Module 1

Operation Mode :	BT EDR	Test Date :	2017/10/25
Fundamental Frequency :	2402 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	TX CH LOW	Test Engineer :	Enzo
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical



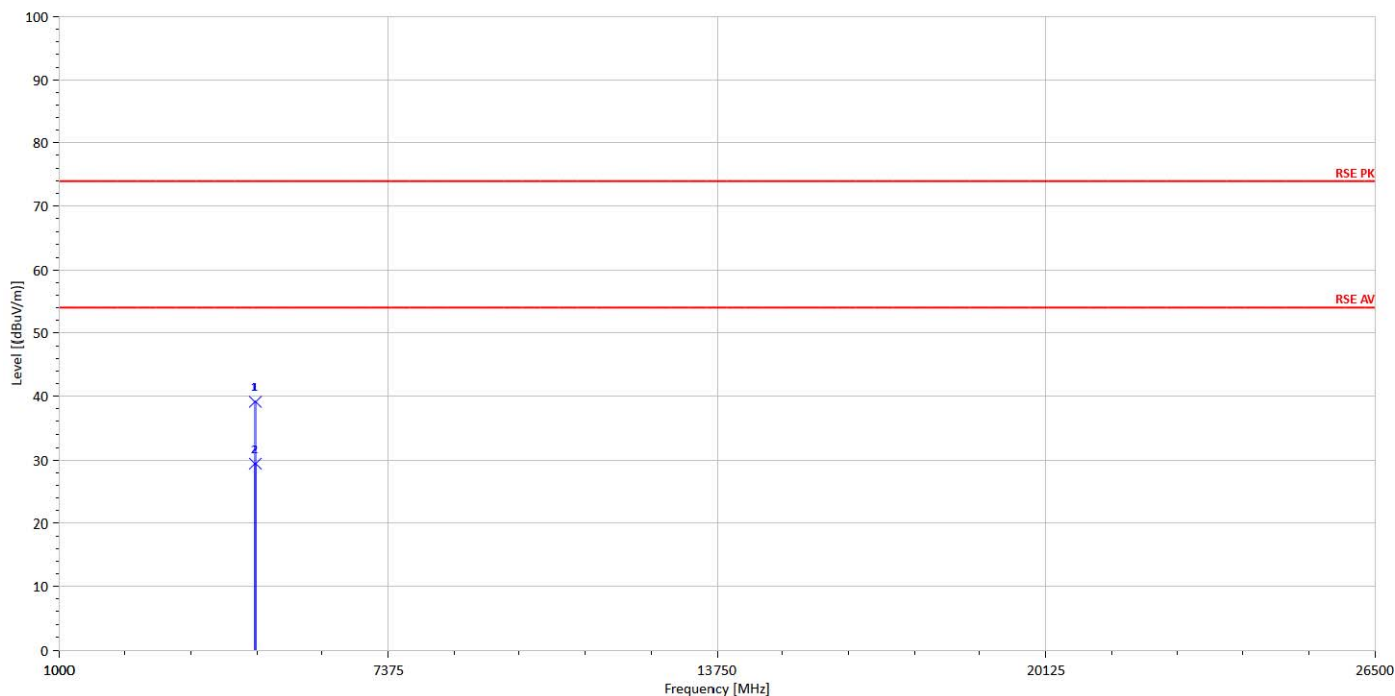
Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4804.00	H	Peak	31.80	7.66	39.46	74	-34.54
4804.00	H	Average	21.71	7.66	29.37	54	-24.63

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Operation Mode :	BT EDR	Test Date :	2017/10/25
Fundamental Frequency :	2402 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	TX CH LOW	Test Engineer :	Enzo
EUT Pol. :	H	Measurement Antenna Pol. :	Horizontal



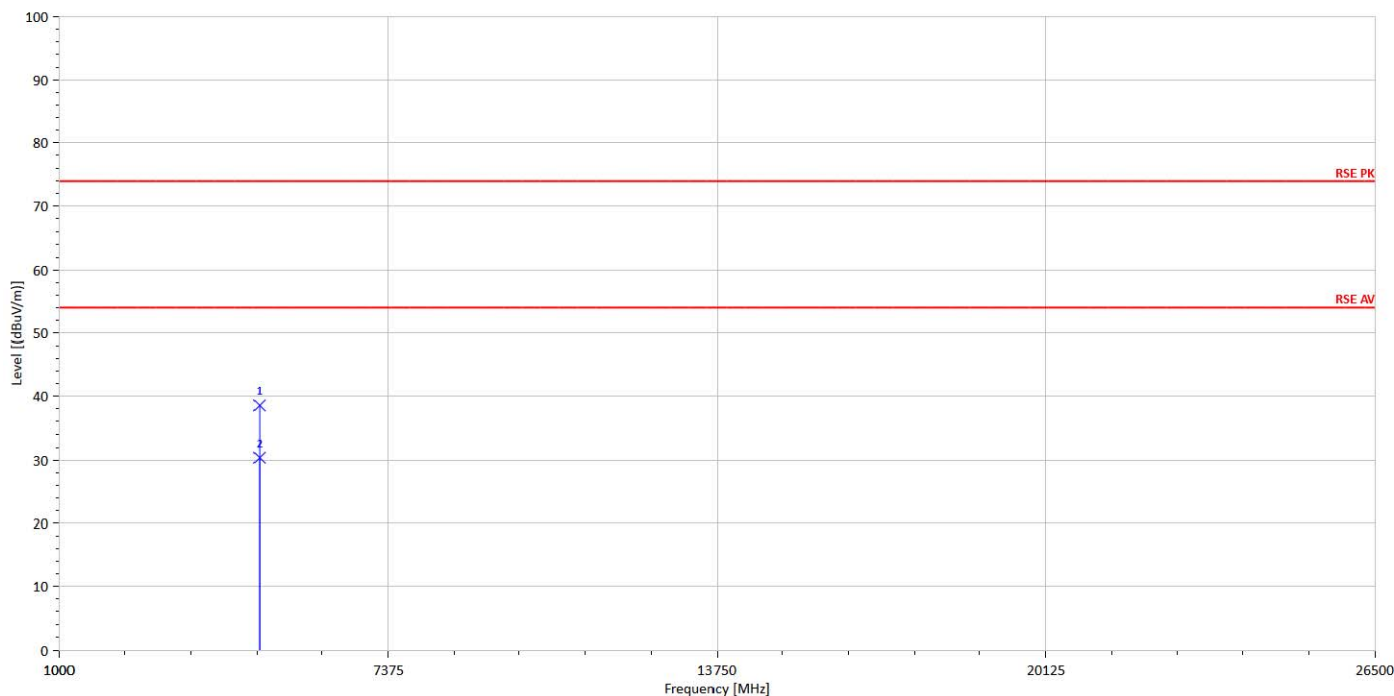
Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4804.00	H	Peak	31.48	7.66	39.14	74	-34.86
4804.00	H	Average	21.77	7.66	29.43	54	-24.57

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Operation Mode : BT EDR Test Date : 2017/10/25
Fundamental Frequency : 2441 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : TX CH MID Test Engineer : Enzo
EUT Pol. : H Measurement Antenna Pol. : Vertical



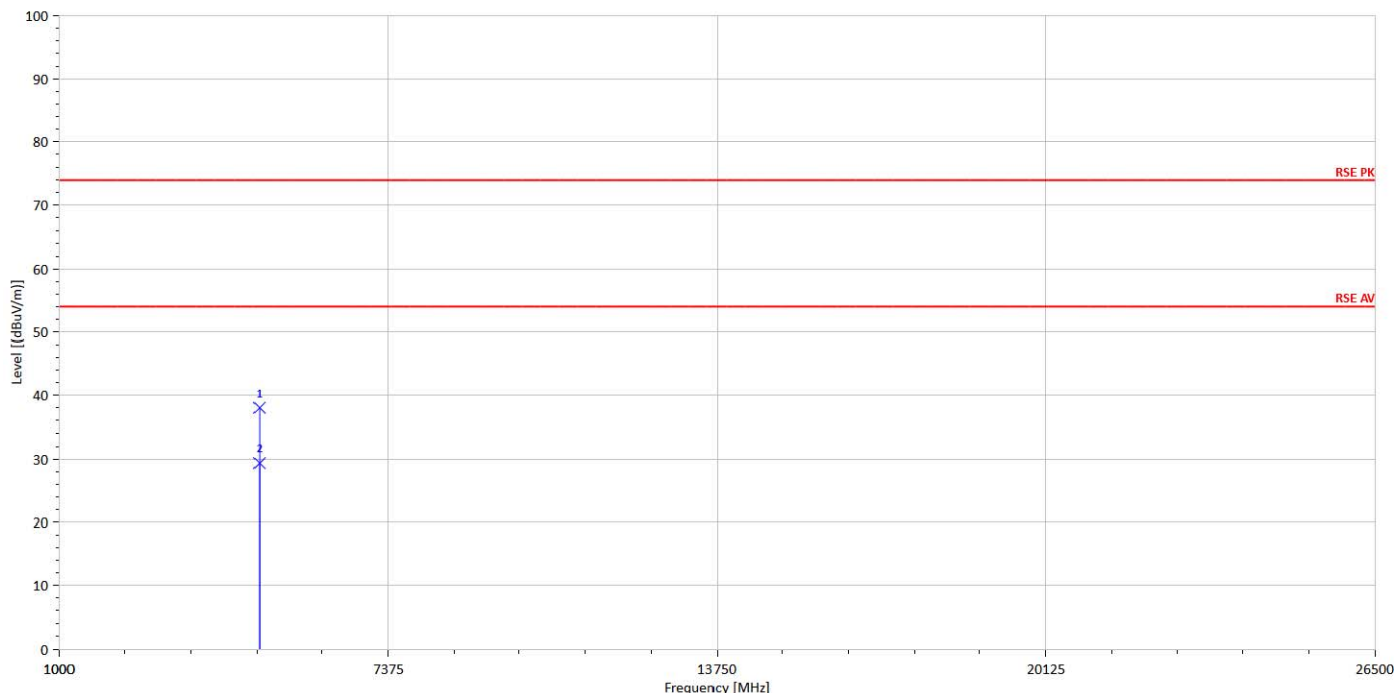
Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4882.00	H	Peak	30.86	7.70	38.56	74	-35.44
4882.00	H	Average	22.67	7.70	30.37	54	-23.63

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Operation Mode : BT EDR Test Date : 2017/10/25
Fundamental Frequency : 2441 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : TX CH MID Test Engineer : Enzo
EUT Pol. : H Measurement Antenna Pol. : Horizontal



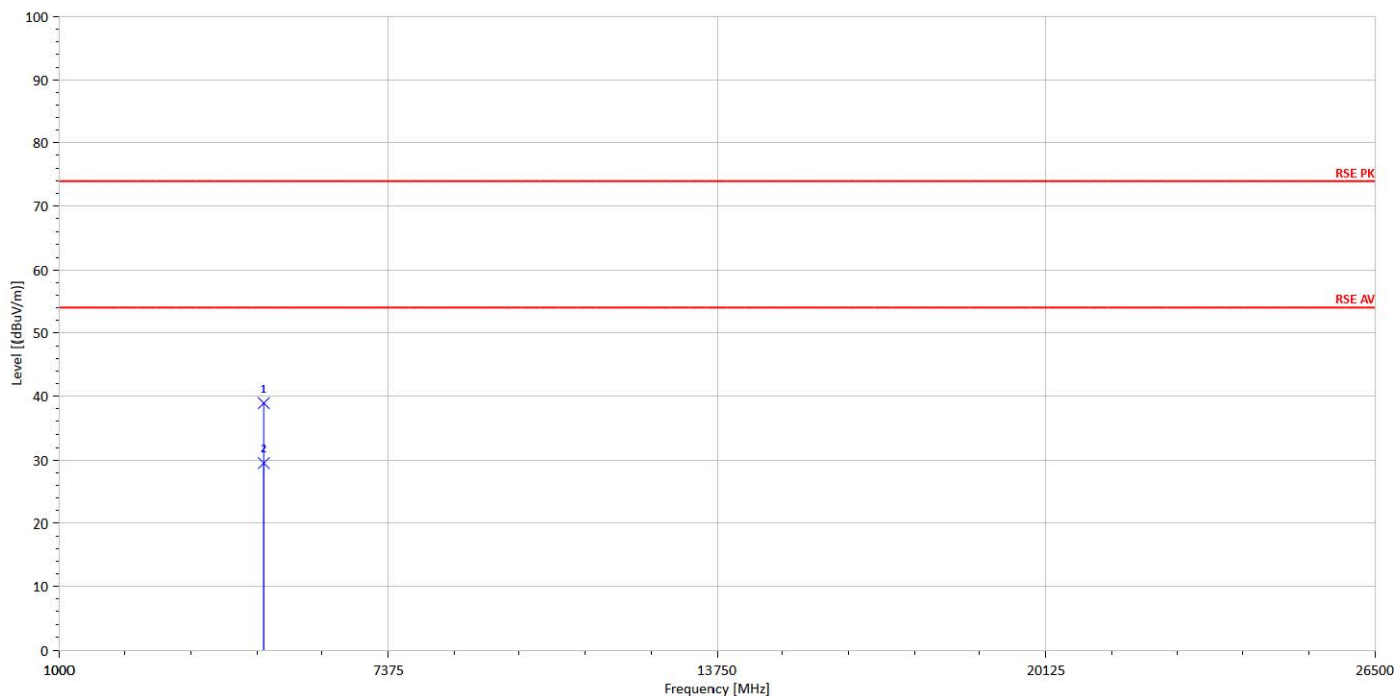
Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4882.00	H	Peak	30.33	7.70	38.03	74	-35.97
4882.00	H	Average	21.65	7.70	29.35	54	-24.65

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Operation Mode : BT EDR Test Date : 2017/10/25
Fundamental Frequency : 2480 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : TX CH HIGH Test Engineer : Enzo
EUT Pol. : H Measurement Antenna Pol. : Vertical



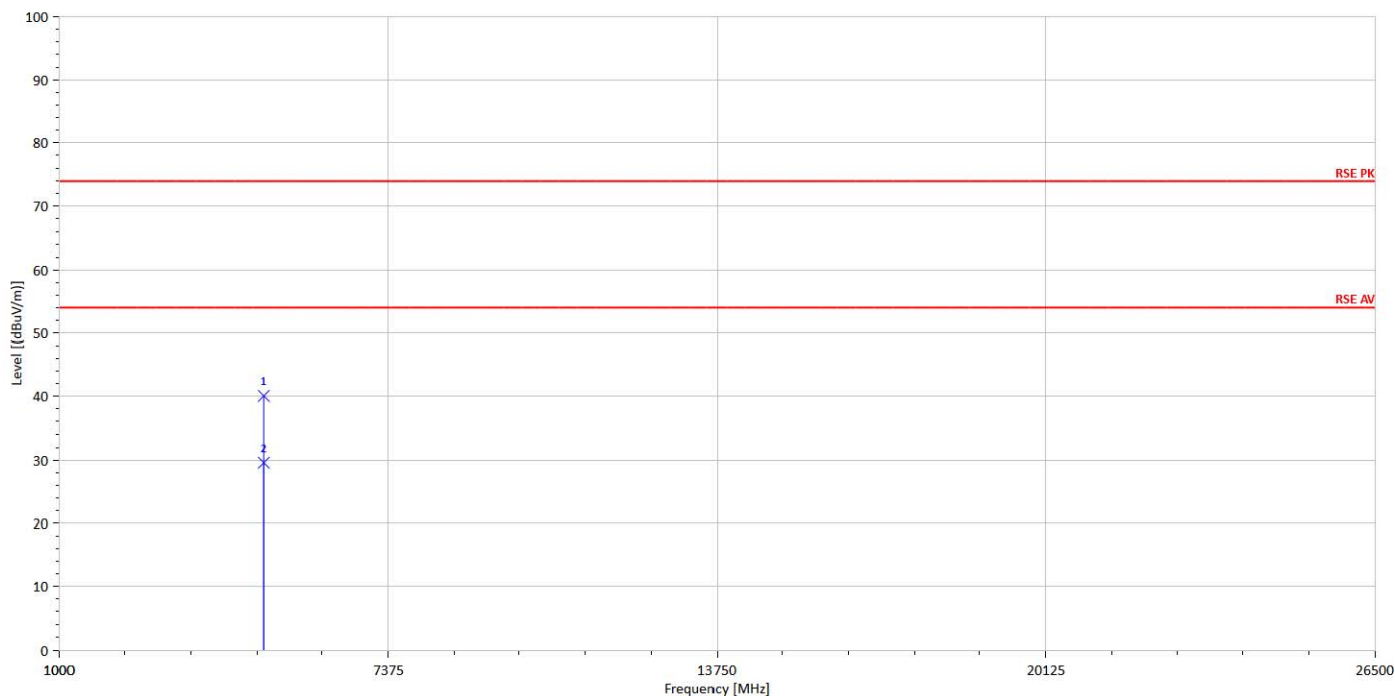
Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBuV	dB	dBuV/m	dBuV/m	dB
4960.00	H	Peak	31.24	7.69	38.92	74	-35.08
4960.00	H	Average	21.83	7.69	29.52	54	-24.48

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Operation Mode : BT EDR Test Date : 2017/10/25
Fundamental Frequency : 2480 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : TX CH HIGH Test Engineer : Enzo
EUT Pol. : H Measurement Antenna Pol. : Horizontal



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBuV	dB	dBuV/m	dBuV/m	dB
4960.00	H	Peak	32.39	7.69	40.08	74	-33.92
4960.00	H	Average	21.89	7.69	29.58	54	-24.42

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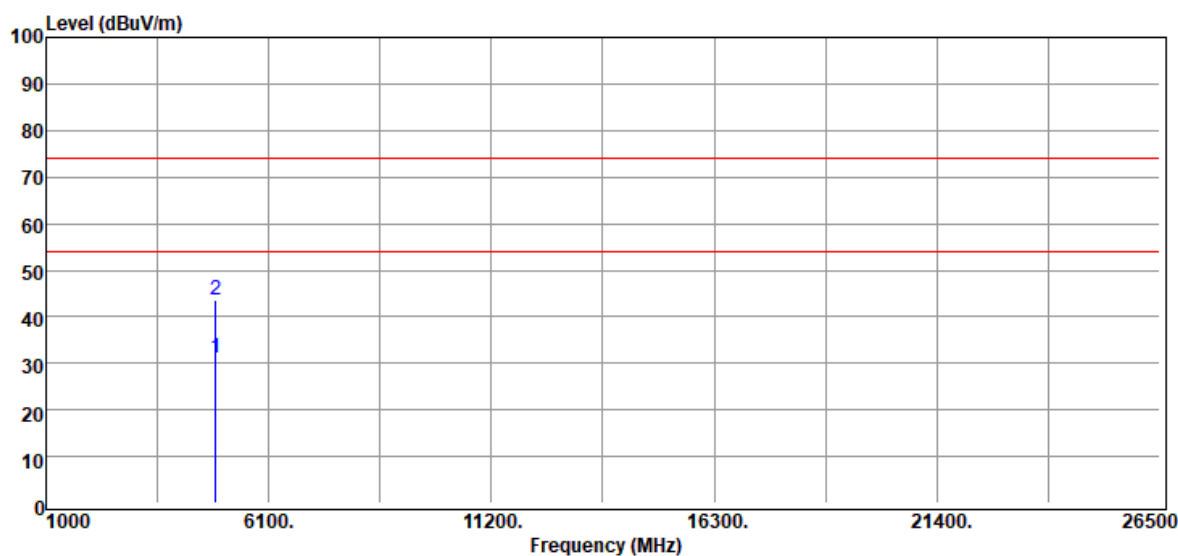
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Spot Check

Report Number :E2/2017/90076-01
 Operation Mode :BT EDR
 Test Frequency :2441 MHz
 Test Mode :TX CH MID
 EUT Pol :H Plan

Test Date :2020-03-11
 Temp./Humi. :25.1/52
 Antenna Pol. :VERTICAL
 Engineer :Enzo



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4882.00	Average	17.00	14.21	31.21	54.00	-22.79
4882.00	Peak	29.40	14.21	43.61	74.00	-30.39

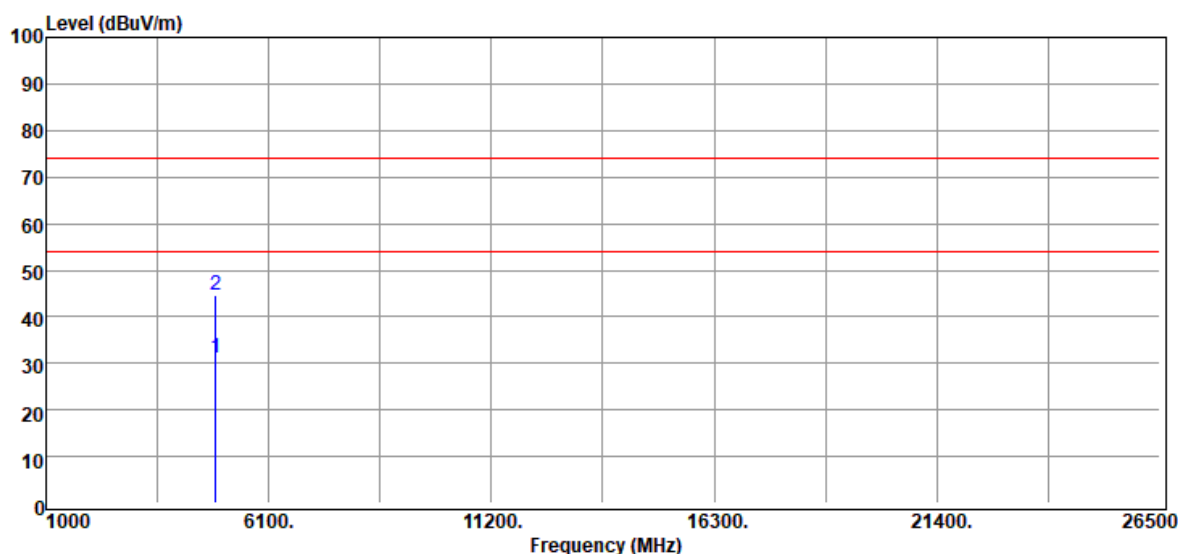
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Report Number :E2/2017/90076-01
Operation Mode :BT EDR
Test Frequency :2441 MHz
Test Mode :TX CH MID
EUT Pol :H Plan

Test Date :2020-03-11
Temp./Humi. :25.1/52
Antenna Pol. :HORIZONTAL
Engineer :Enzo



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4882.00	Average	17.02	14.21	31.23	54.00	-22.77
4882.00	Peak	30.30	14.21	44.51	74.00	-29.49

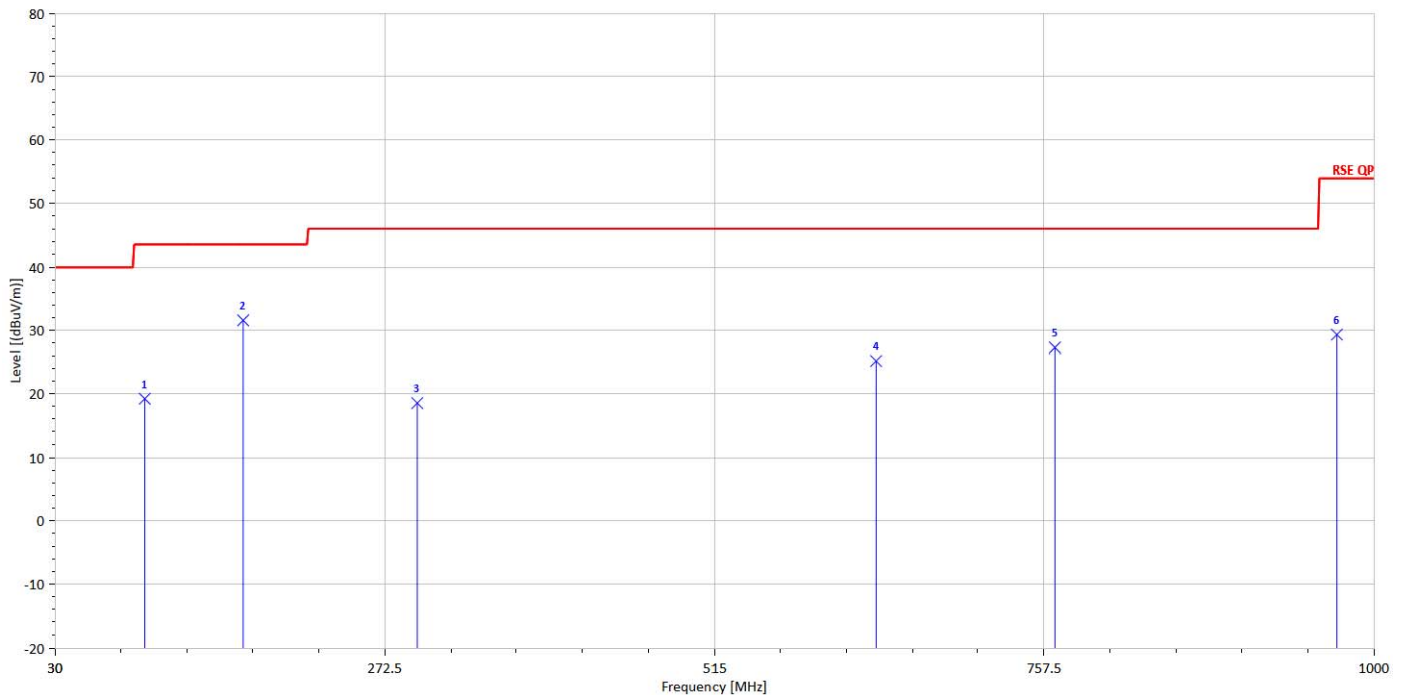
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6.5.3 接收機場強輻射之量測結果(1GHz 以下) (最差模式)**Module 1**

Operation Mode :	BT EDR	Test Date :	2017/10/25
Fundamental Frequency :	2441 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	RX CH MID	Test Engineer :	Enzo
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical



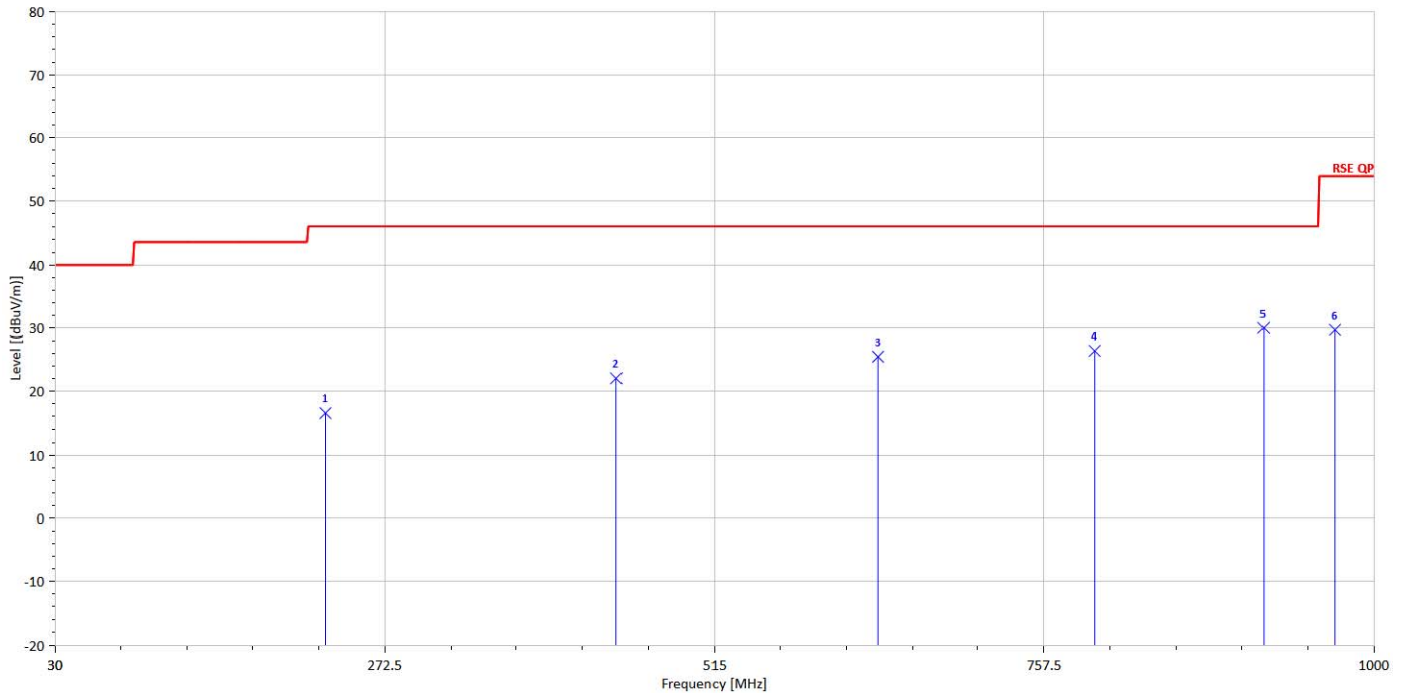
Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
96.12	S	Peak	37.65	-18.41	19.23	43.5	-24.27
168.57	S	Peak	49.80	-18.23	31.57	43.5	-11.93
296.59	S	Peak	31.68	-13.14	18.54	46	-27.46
634.23	S	Peak	30.63	-5.39	25.24	46	-20.76
765.77	S	Peak	31.67	-4.41	27.25	46	-18.75
973.27	S	Peak	30.86	-1.56	29.31	54	-24.69

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Operation Mode : BT EDR Test Date : 2017/10/25
Fundamental Frequency : 2441 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : RX CH MID Test Engineer : Enzo
EUT Pol. : H Measurement Antenna Pol. : Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
229.06	S	Peak	32.85	-16.31	16.54	46	-29.46
442.90	S	Peak	31.52	-9.44	22.08	46	-23.92
635.63	S	Peak	30.79	-5.28	25.51	46	-20.49
794.60	S	Peak	30.65	-4.21	26.44	46	-19.56
919.11	S	Peak	31.80	-1.81	29.99	46	-16.01
971.86	S	Peak	31.33	-1.65	29.68	54	-24.32

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

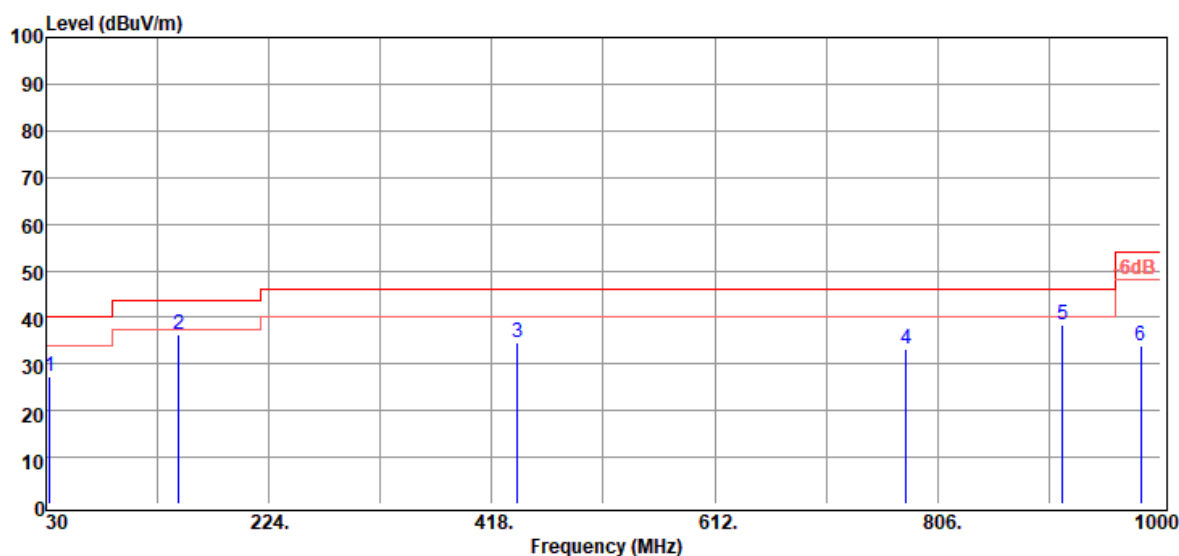
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Spot Check

Report Number :E2/2017/90076-01
 Operation Mode :BT EDR
 Test Frequency :2441 MHz
 Test Mode :RX CH MID
 EUT Pol :H Plan

Test Date :2020-03-12
 Temp./Humi. :24.2/49
 Antenna Pol. :VERTICAL
 Engineer :Ashton



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
32.91	Peak	32.39	-4.98	27.41	40.00	-12.59
145.43	Peak	49.97	-13.48	36.49	43.50	-7.01
440.31	Peak	40.64	-6.11	34.53	46.00	-11.47
778.84	Peak	33.19	0.08	33.27	46.00	-12.73
914.64	Peak	37.32	1.10	38.42	46.00	-7.58
982.54	Peak	32.13	1.82	33.95	54.00	-20.05

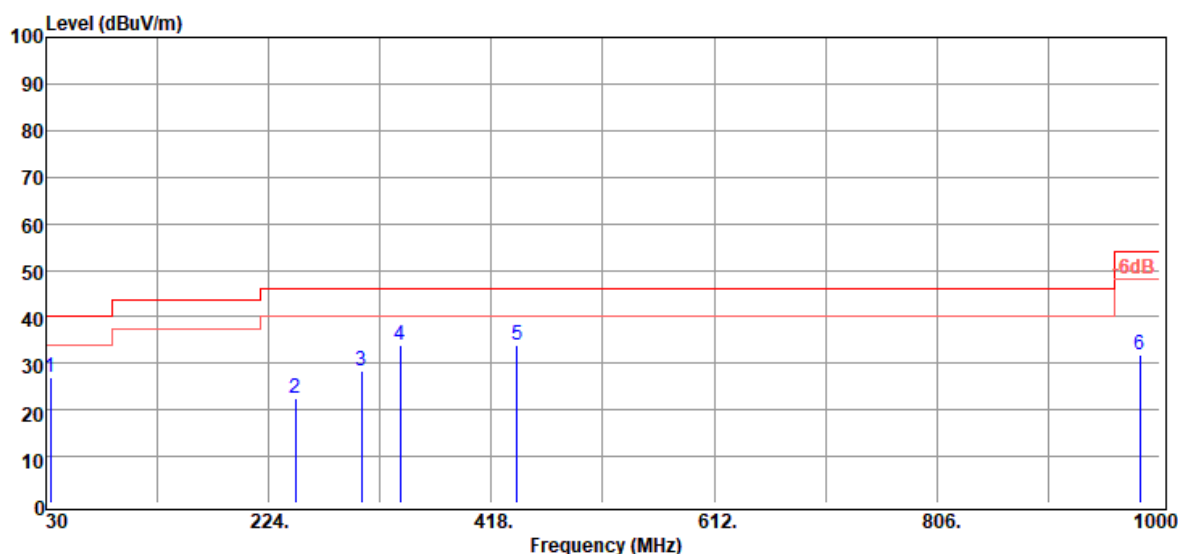
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Report Number :E2/2017/90076-01
Operation Mode :BT EDR
Test Frequency :2441 MHz
Test Mode :RX CH MID
EUT Pol :H Plan

Test Date :2020-03-12
Temp./Humi. :24.2/49
Antenna Pol. :HORIZONTAL
Engineer :Ashton



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
33.88	Peak	32.11	-5.12	26.99	40.00	-13.01
247.28	Peak	34.41	-11.91	22.50	46.00	-23.50
304.51	Peak	38.66	-10.44	28.22	46.00	-17.78
338.46	Peak	43.55	-9.50	34.05	46.00	-11.95
440.31	Peak	39.97	-6.11	33.86	46.00	-12.14
982.54	Peak	29.97	1.82	31.79	54.00	-22.21

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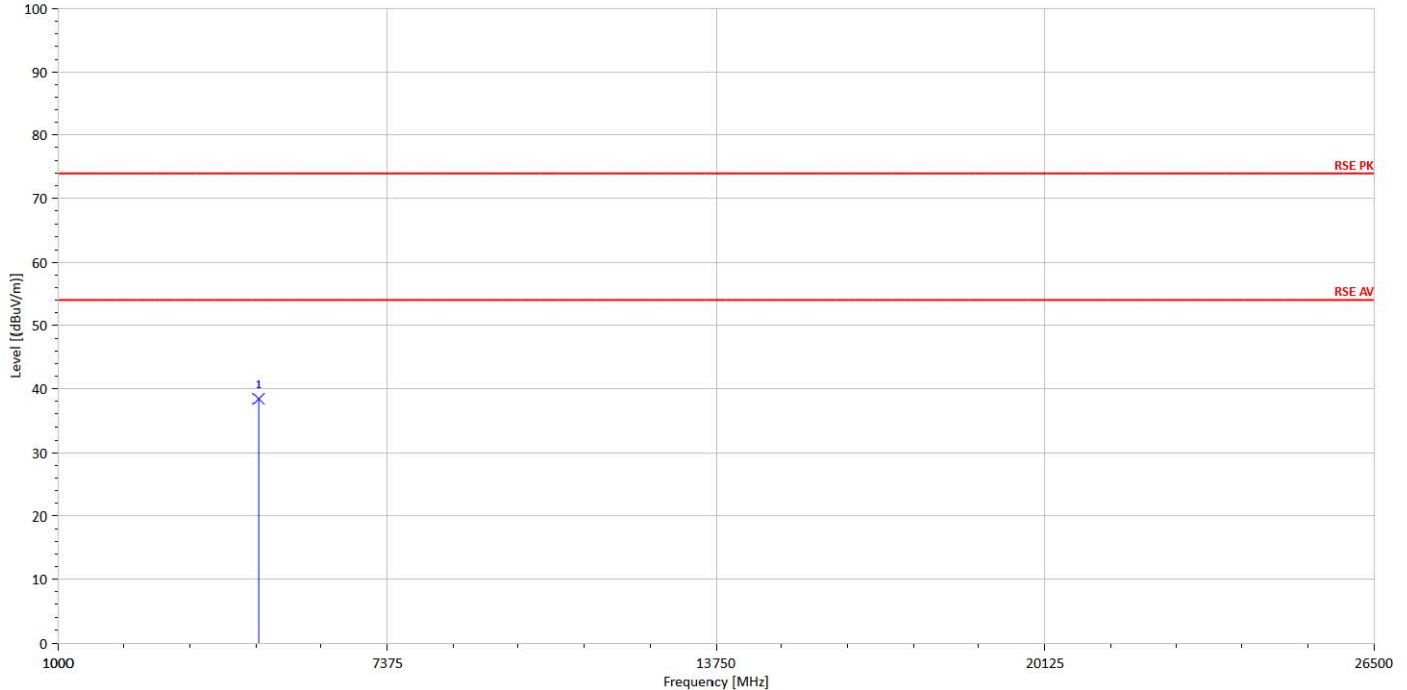
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6.5.4 接收機場強輻射之量測結果(1GHz 以上) (最差模式)

Module 1

Operation Mode :	BT EDR	Test Date :	2017/10/25
Fundamental Frequency :	2441 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	RX CH MID	Test Engineer :	Enzo
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical



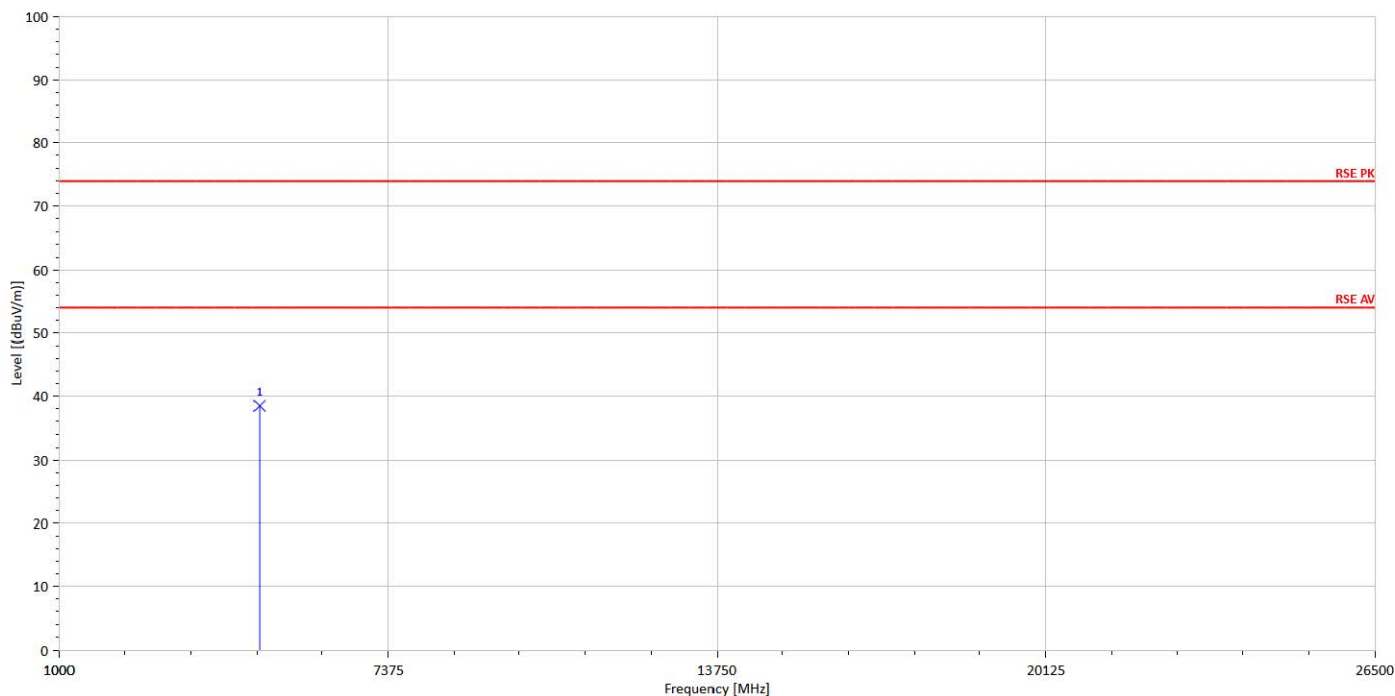
Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4882.00	H	Peak	30.72	7.70	38.42	74	-35.58

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Operation Mode : BT EDR Test Date : 2017/10/25
Fundamental Frequency : 2441 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : RX CH MID Test Engineer : Enzo
EUT Pol. : H Measurement Antenna Pol. : Horizontal



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4882.00	H	Peak	30.79	7.70	38.49	74	-35.51

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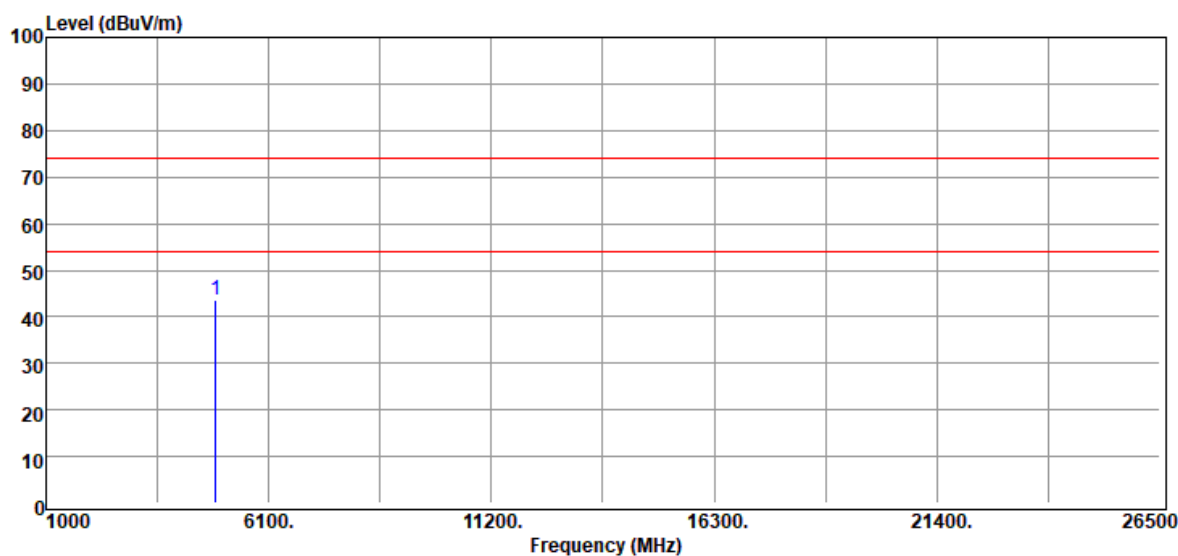
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Spot Check

Report Number :E2/2017/90076A/01
 Operation Mode :BT EDR
 Test Frequency :2441 MHz
 Test Mode :RX CH MID
 EUT Pol :H Plan

Test Date :2020-03-12
 Temp./Humi. :24.7/50
 Antenna Pol. :VERTICAL
 Engineer :Ashton



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4882.00	Peak	29.39	14.21	43.60	74.00	-30.40

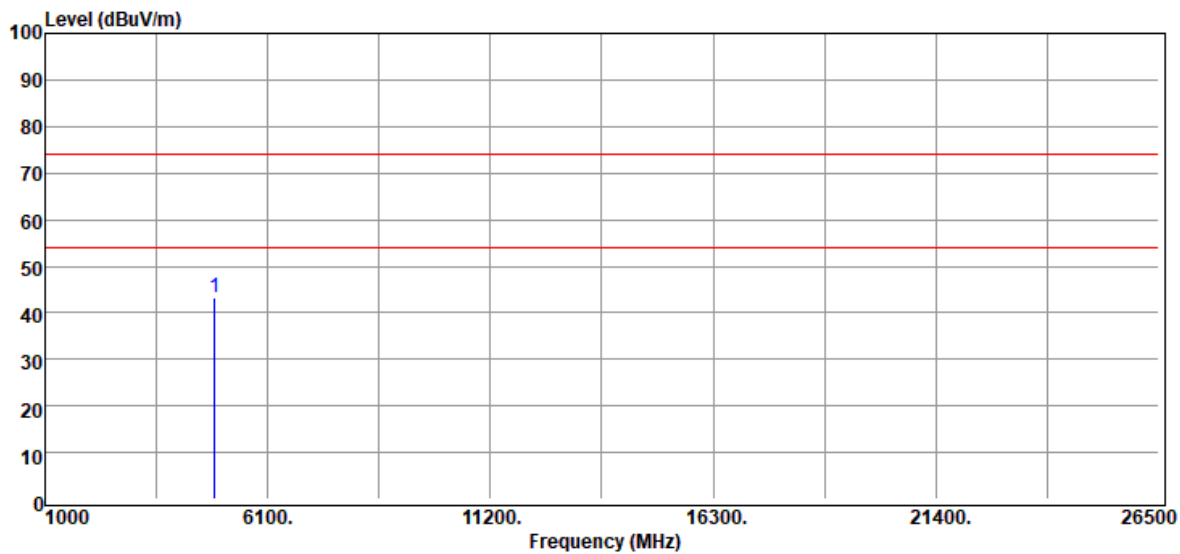
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Report Number :E2/2017/90076A/01
Operation Mode :BT EDR
Test Frequency :2441 MHz
Test Mode :RX CH MID
EUT Pol :H Plan

Test Date :2020-03-12
Temp./Humi. :24.7/50
Antenna Pol. :HORIZONTAL
Engineer :Ashton



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4882.00	Peak	28.95	14.21	43.16	74.00	-30.84

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7 天線增益之要求

7.1 適用標準

依據NCC低功率射頻電機技術規範3.10.1節(3)(3.1.1)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低功率射頻電機技術規範3.10.1節(3)(3.1.2)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低功率射頻電機技術規範3.10.1節(3)(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。

7.2 天線增益

此裝置使用天線如下，詳細規格請參考附件天線規格書。

天線型式/天線增益	Chip Antenna, Antenna Gain: -3.9dBi (Module 1), Model No.: BMW G08, Supplier: BOSCH
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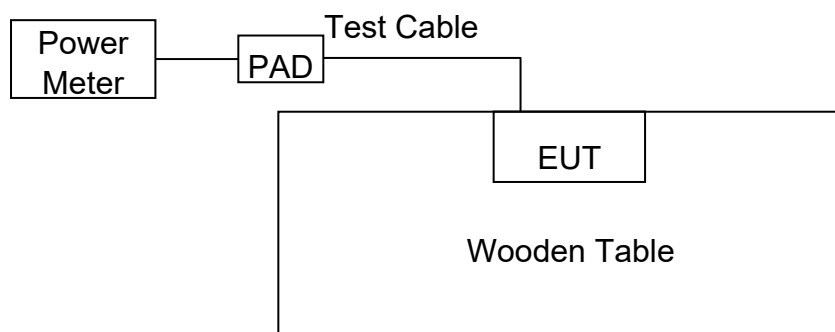
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8 輸出峰值功率之量測

8.1 適用標準

依據 NCC 低功率射頻電機技術規範 3.10.1 節(2.1)之規定，對使用展頻技術之低功率發射機，其輸出峰功率不大於 1 Watt，除前項(2.1) 以外，依 3.10.1 節(6)其他限制事項(6.1.2)，所有操作於 2400-2483.5 兆赫(MHz)之跳頻系統：0.125 瓦(W)(含)以下，且其所使用天線之增益不可大於 6dBi；若使用大於 6dBi 增益之天線，則其輸出峰值功率相對需衰減天線增益所增加之量(單位為 dB)。

8.2 輸出功率之測試配置



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8.3 輸出功率之量測結果

測試設備: BMW Dashboard

環境溫度: 20°C

型號: ICC6.5in

環境濕度: 65%

測試者:

黃凱男

Module 1

1M BR mode (Peak):

Channel	Frequency (MHz)	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
0	2402.00	-5.65	0.272	1000
39	2441.00	-5.19	0.303	1000
78	2480.00	-4.63	0.344	1000

1M BR mode (Average): Tune up tolerance $\pm$ dBm

Channel	Frequency (MHz)	Max. Output include tune up tolerance Power (dBm)	Output Power (mW)	Limit (mW)
0	2402.00	-6.97	0.201	1000
39	2441.00	-6.46	0.226	1000
78	2480.00	-5.93	0.255	1000

2M EDR mode (Peak):

Channel	Frequency (MHz)	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
0	2402.00	-3.23	0.475	125
39	2441.00	-2.77	0.528	125
78	2480.00	-2.12	0.614	125

2M EDR mode (Average): Tune up tolerance $\pm$ dBm

Channel	Frequency (MHz)	Max. Output include tune up tolerance Power (dBm)	Output Power (mW)	Limit (mW)
0	2402.00	-6.95	0.202	125
39	2441.00	-6.41	0.229	125
78	2480.00	-5.76	0.265	125

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3M EDR mode (Peak):

Channel	Frequency (MHz)	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
0	2402.00	-2.92	0.511	125
39	2441.00	-2.45	0.569	125
78	2480.00	-1.79	0.662	125

3M EDR mode (Average): Tune up tolerance $\pm$ dBm

Channel	Frequency (MHz)	Max. Output include tune up tolerance Power (dBm)	Output Power (mW)	Limit (mW)
0	2402.00	-6.91	0.204	125
39	2441.00	-6.39	0.230	125
78	2480.00	-5.70	0.269	125

***offset: 0.5dB**

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Spot Check

1M	Conducted Power
	Average (dBm)
2402	-5.27
2441	-4.74
2480	-4.07

1M	Original Report Power	Toerance
	Average (dBm)	± 2dB
2402	-6.97	1.70
2441	-6.46	1.72
2480	-5.93	1.86

2M	Conducted Power
	Average (dBm)
2402	-5.24
2441	-4.64
2480	-3.88

2M	Original Report Power	Toerance
	Average (dBm)	± 2dB
2402	-6.95	1.71
2441	-6.41	1.77
2480	-5.76	1.88

3M	Conducted Power
	Average (dBm)
2402	-5.13
2441	-4.57
2480	-3.72

3M	Original Report Power	Toerance
	Average (dBm)	± 2dB
2402	-6.91	1.78
2441	-6.39	1.82
2480	-5.7	1.98

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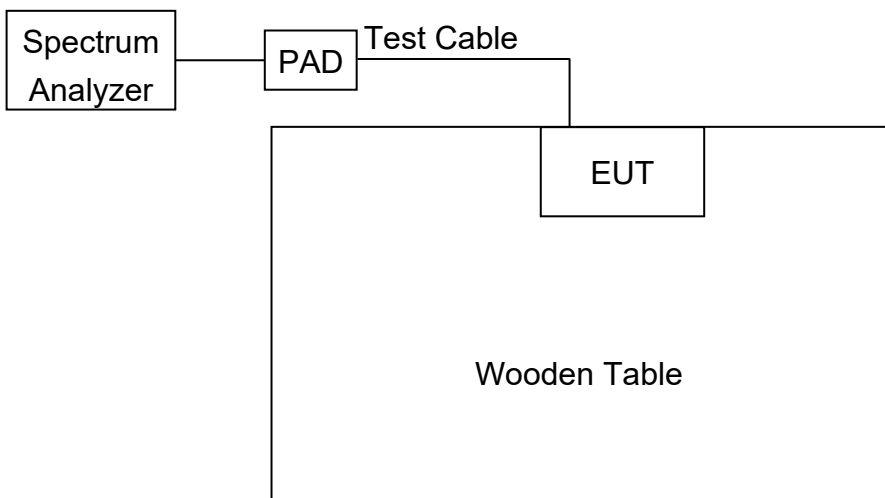
9 開放頻帶邊緣 100kHz 頻寬內之限制

9.1 適用標準

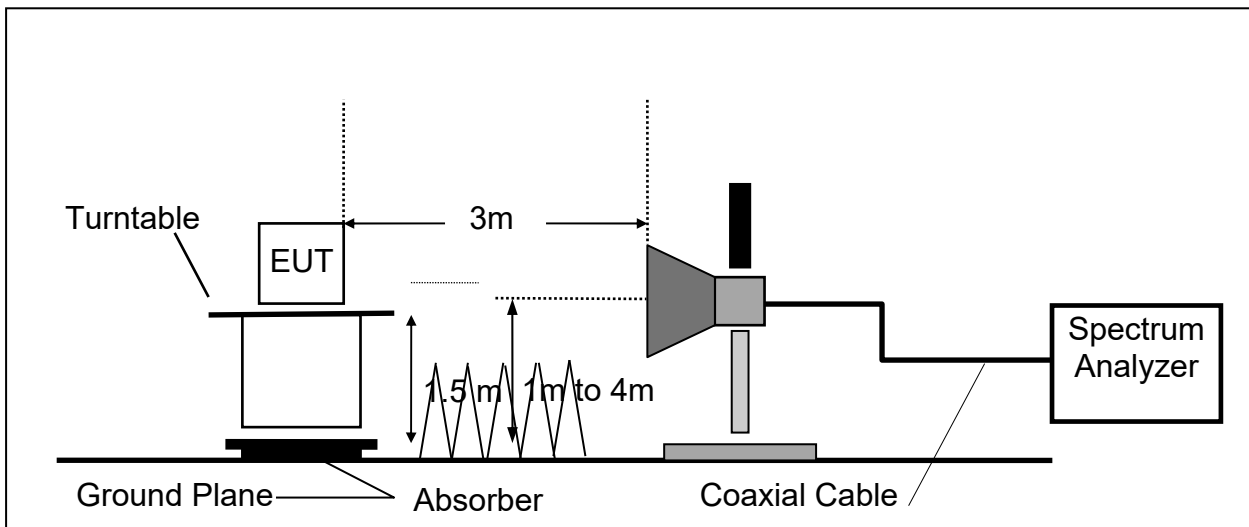
依據 NCC 低功率射頻電機技術規範 3.10.1 節(5)之規定，發射器所產生的射頻功率相較於使用頻帶範圍中包含最高所需功率之 100 千赫內的射頻功率，須衰減 20 分貝(dB)。

9.2 開放頻帶邊緣之測試配置

a. 頻帶外發射傳導量測值



b. 禁用頻帶輻射量測值之測試配置



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9.3 開放頻帶邊緣之量測結果

測試設備: BMW Dashboard

環境溫度: 20°C

解析頻寬: 100kHz

Span: Low: 110MHz / High: 25MHz

型號: ICC6.5in

環境濕度: 65%

視訊頻寬: 300kHz

測試者:

黃凱恩

1. 頻帶外發射傳導量測值

發射限制測試值 CH-1(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-79(上邊緣頻帶): 在 2483.5MHz 之 100kHz 頻寬內最大值皆比主波低 20dB 以上。

請參考附圖。

註: 此裝置有 EDR 功能, 因比較 BR mode 及 EDR mode 測試值後, 附上最差模式 EDR mode 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)

Note: “F”: denotes Fundamental Frequency. ; “H”: denotes Harmonic Frequency.

“E”: denotes Band Edge Frequency. ; “S”: denotes Spurious Frequency.

“---”: denotes Noise Floor.

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Module 1

禁用頻帶及邊際頻帶傳導測試 (Hopping)

CH Low



CH High



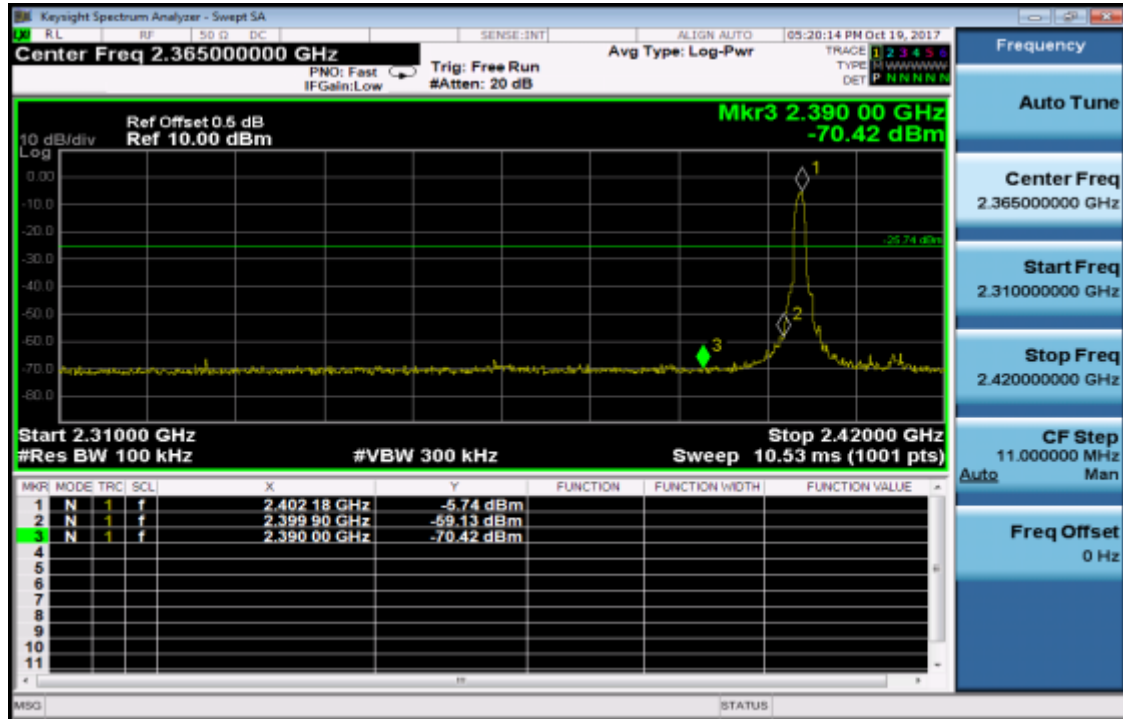
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禁用頻帶及邊際頻帶傳導測試 (Non-Hopping)

CH Low



CH High



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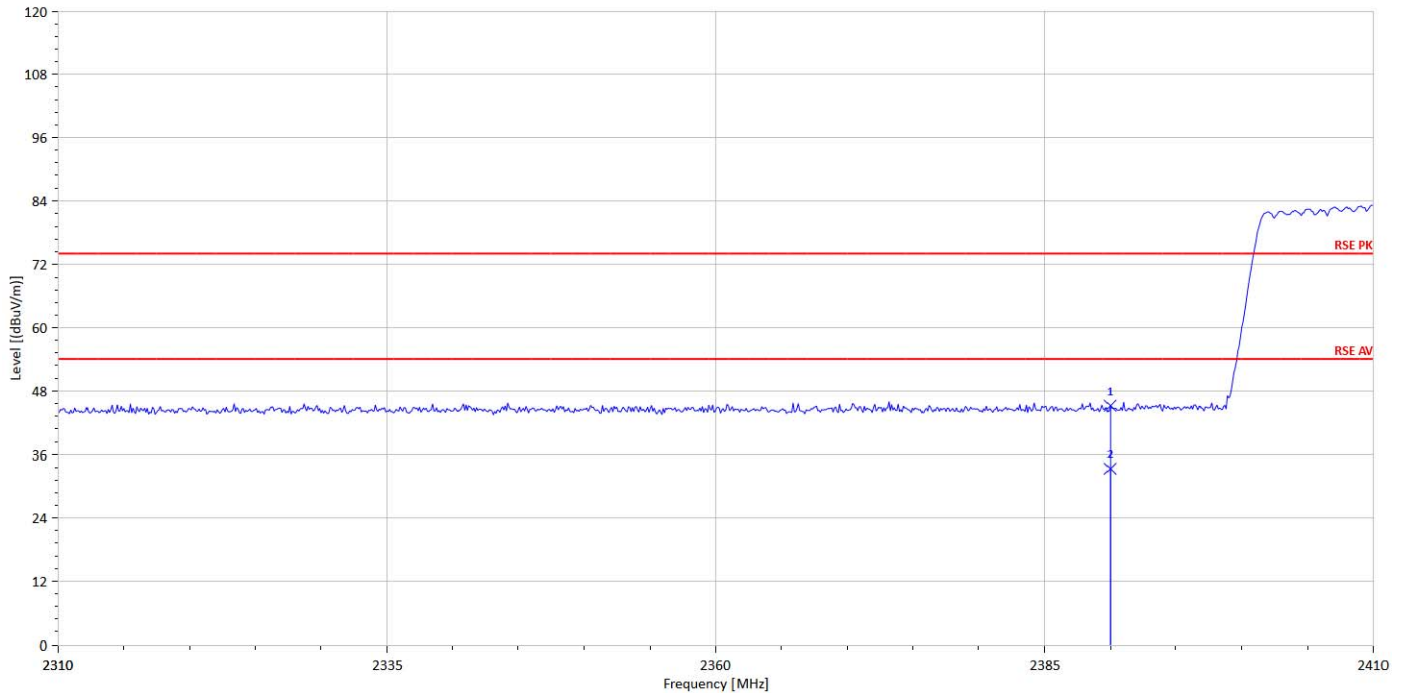
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2. 禁用頻帶輻射量測值

Module 1

Channel Low (Hopping)

Operation Mode :	BT EDR Hopping	Test Date :	2017/10/24
Fundamental Frequency :	2402 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH LOW	Test Engineer :	Enzo
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical



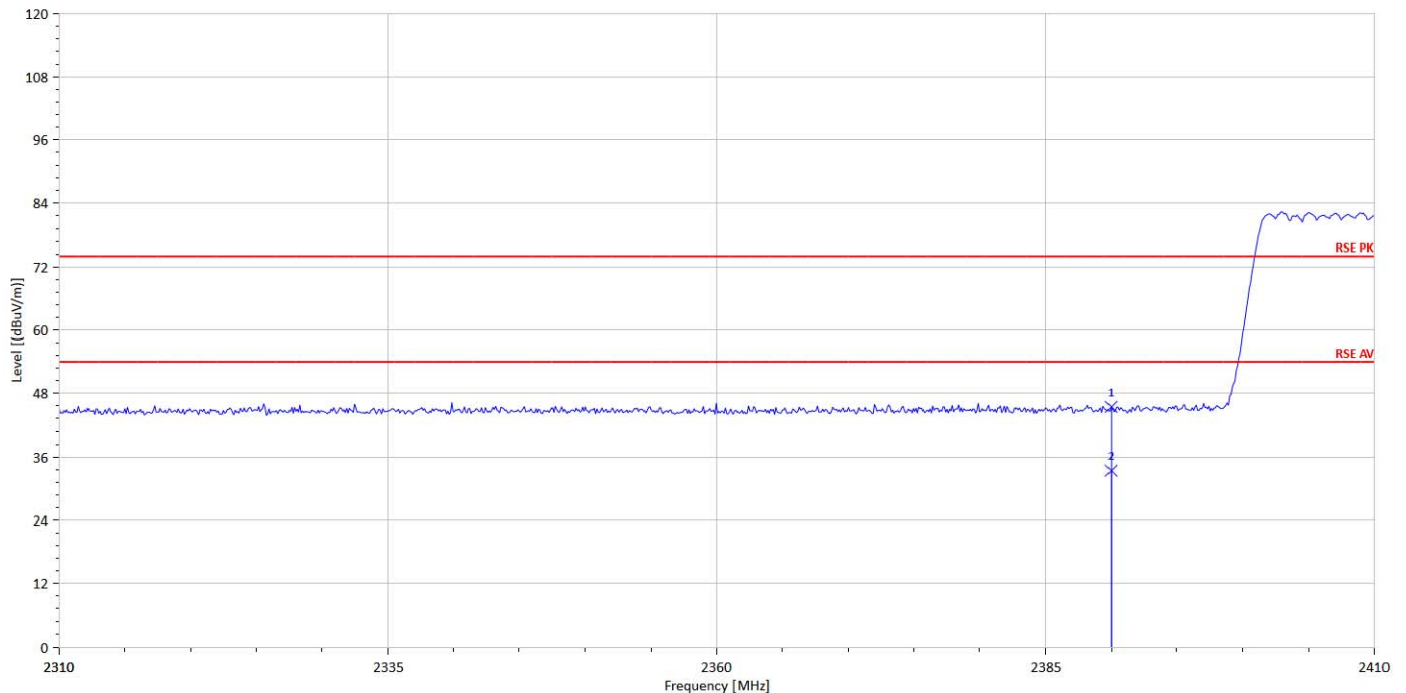
Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
2390.00	E	Peak	44.35	0.92	45.27	74	-28.73
2390.00	E	Average	32.43	0.92	33.35	54	-20.65

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Operation Mode : BT EDR Hopping Test Date : 2017/10/24
Fundamental Frequency : 2402 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : BE CH LOW Test Engineer : Enzo
EUT Pol. : H Measurement Antenna Pol. : Horizontal



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBuV	dB	dBuV/m	dBuV/m	dB
2390.00	E	Peak	44.49	0.92	45.42	74	-28.58
2390.00	E	Average	32.46	0.92	33.38	54	-20.62

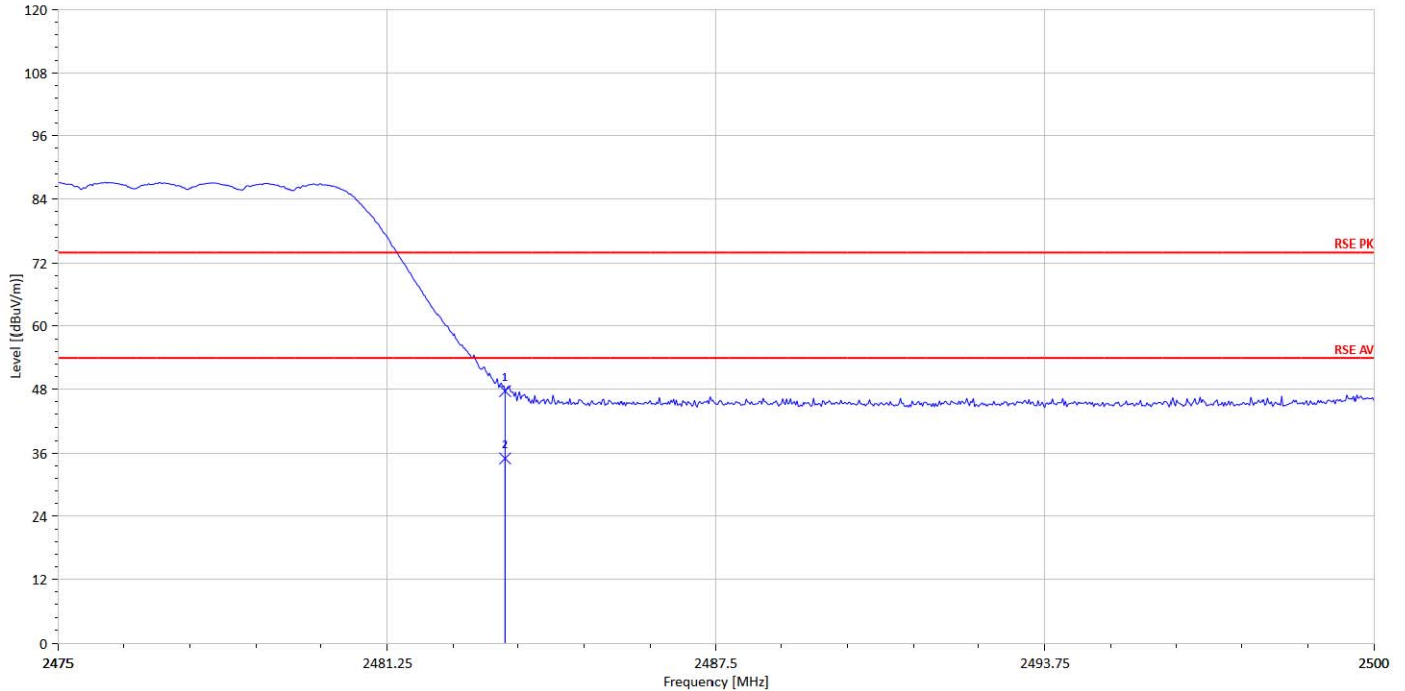
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Channel High

Operation Mode :	BT EDR Hopping	Test Date :	2017/10/24
Fundamental Frequency :	2480 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH HIGH	Test Engineer :	Enzo
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical



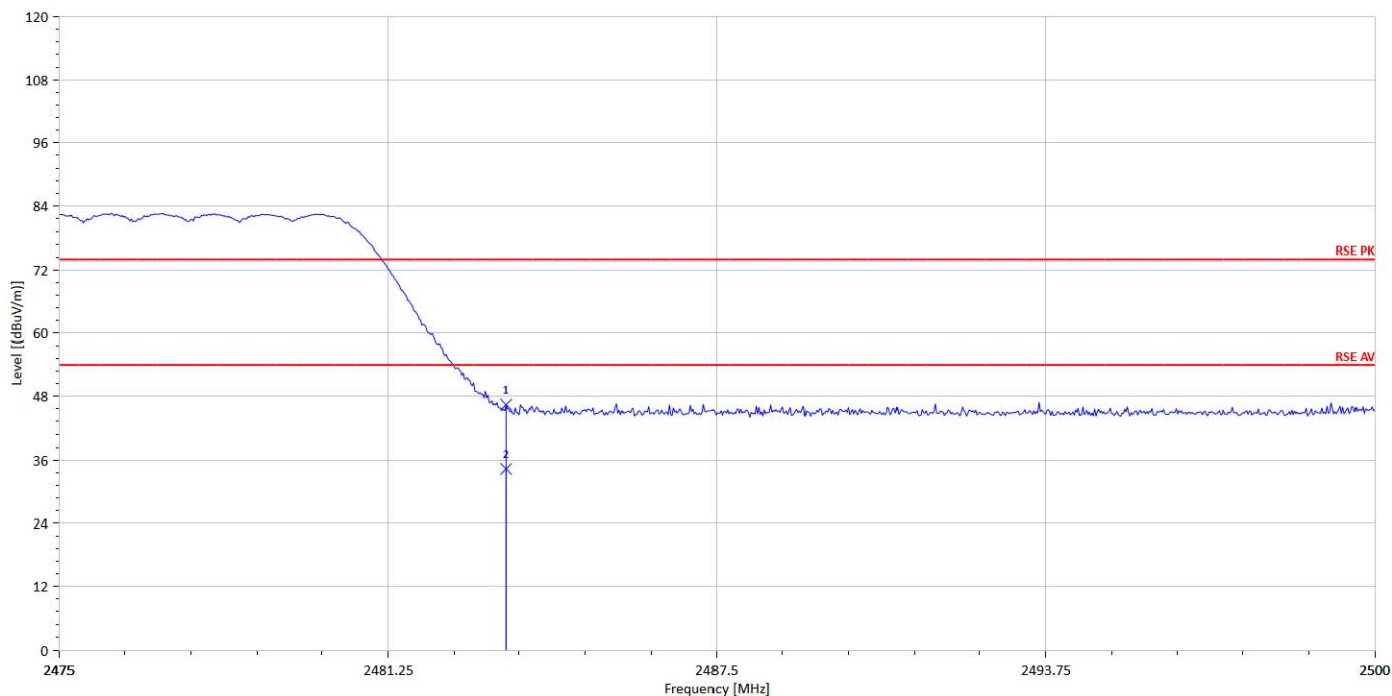
Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Peak	46.51	1.16	47.67	74	-26.33
2483.50	E	Average	33.81	1.16	34.97	54	-19.03

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Operation Mode : BT EDR Hopping Test Date : 2017/10/24
Fundamental Frequency : 2480 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : BE CH HIGH Test Engineer : Enzo
EUT Pol. : H Measurement Antenna Pol. : Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
2483.50	E	Peak	45.25	1.16	46.41	74	-27.59
2483.50	E	Average	33.14	1.16	34.30	54	-19.70

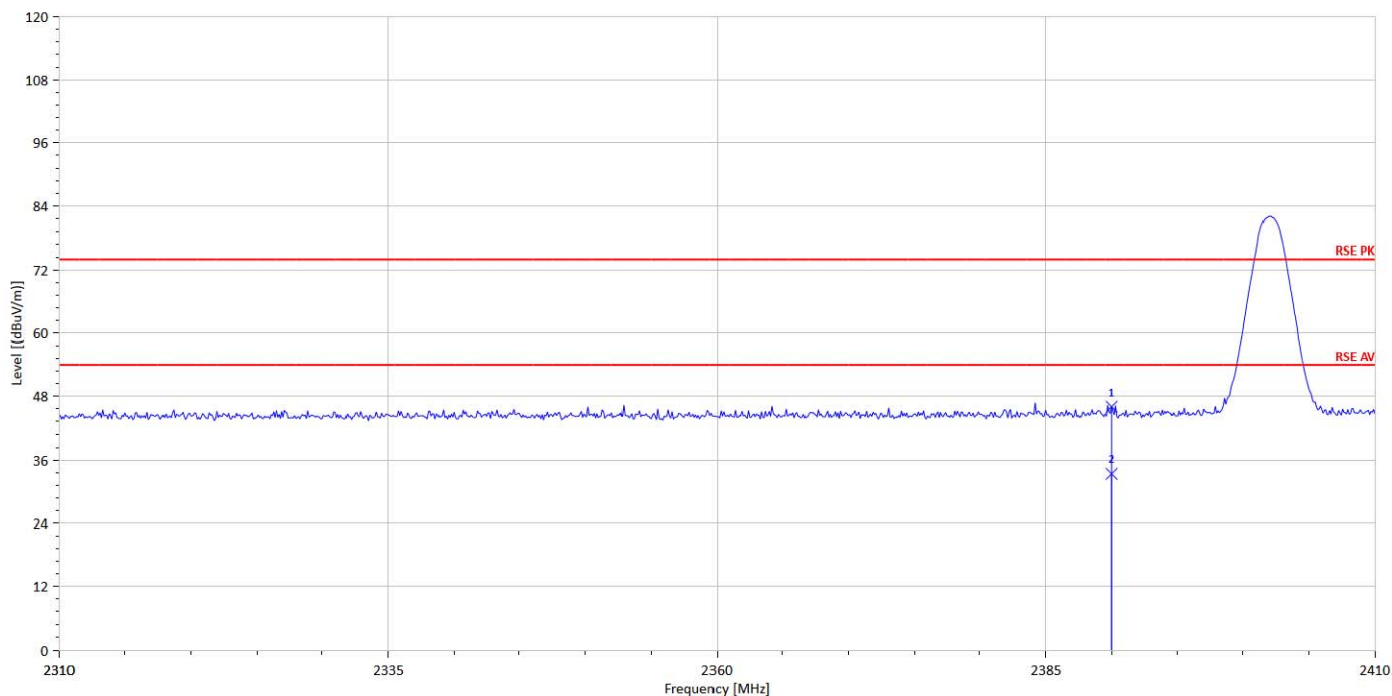
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Channel Low (Non-Hopping)

Operation Mode :	BT EDR	Test Date :	2017/10/24
Fundamental Frequency :	2402 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH LOW	Test Engineer :	Enzo
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical



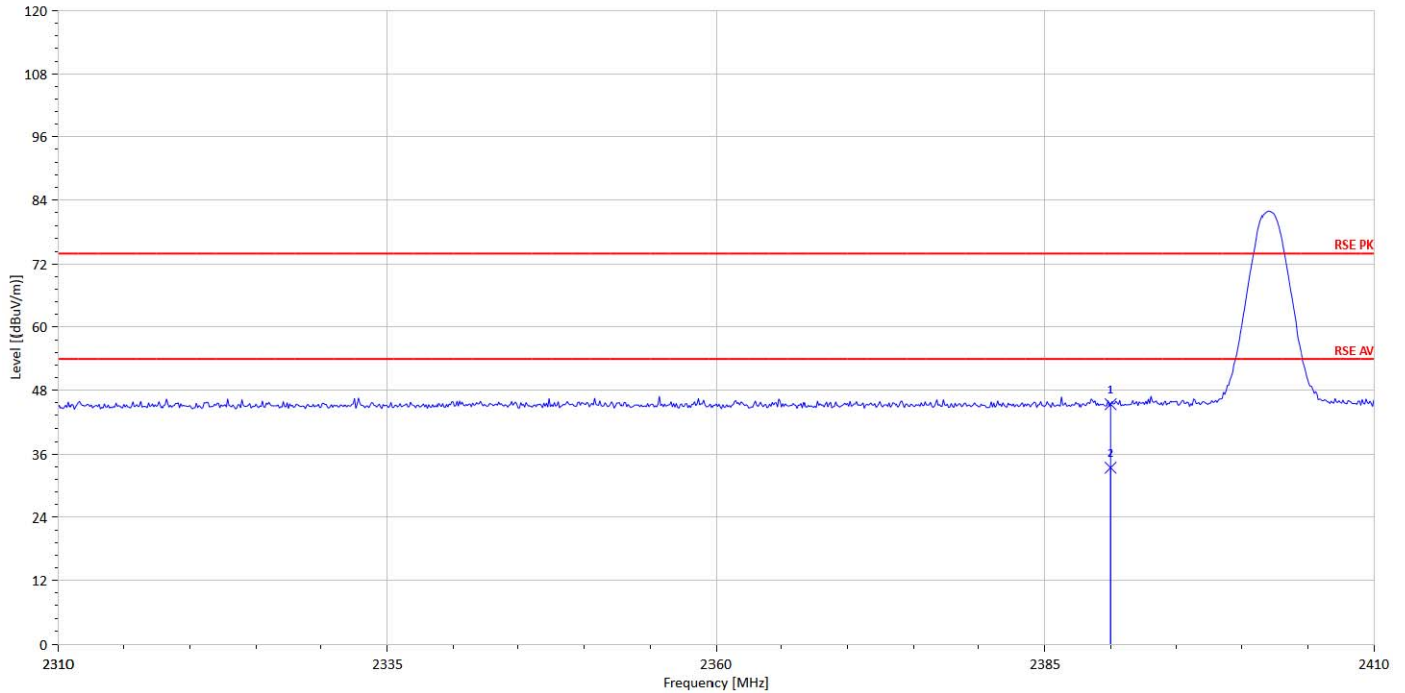
Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBuV	dB	dBuV/m	dBuV/m	dB
2390.00	E	Peak	45.10	0.92	46.02	74	-27.98
2390.00	E	Average	32.44	0.92	33.36	54	-20.64

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Operation Mode : BT EDR Test Date : 2017/10/24
Fundamental Frequency : 2402 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : BE CH LOW Test Engineer : Enzo
EUT Pol. : H Measurement Antenna Pol. : Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2390.00	E	Peak	44.44	0.92	45.36	74	-28.64
2390.00	E	Average	32.47	0.92	33.39	54	-20.61

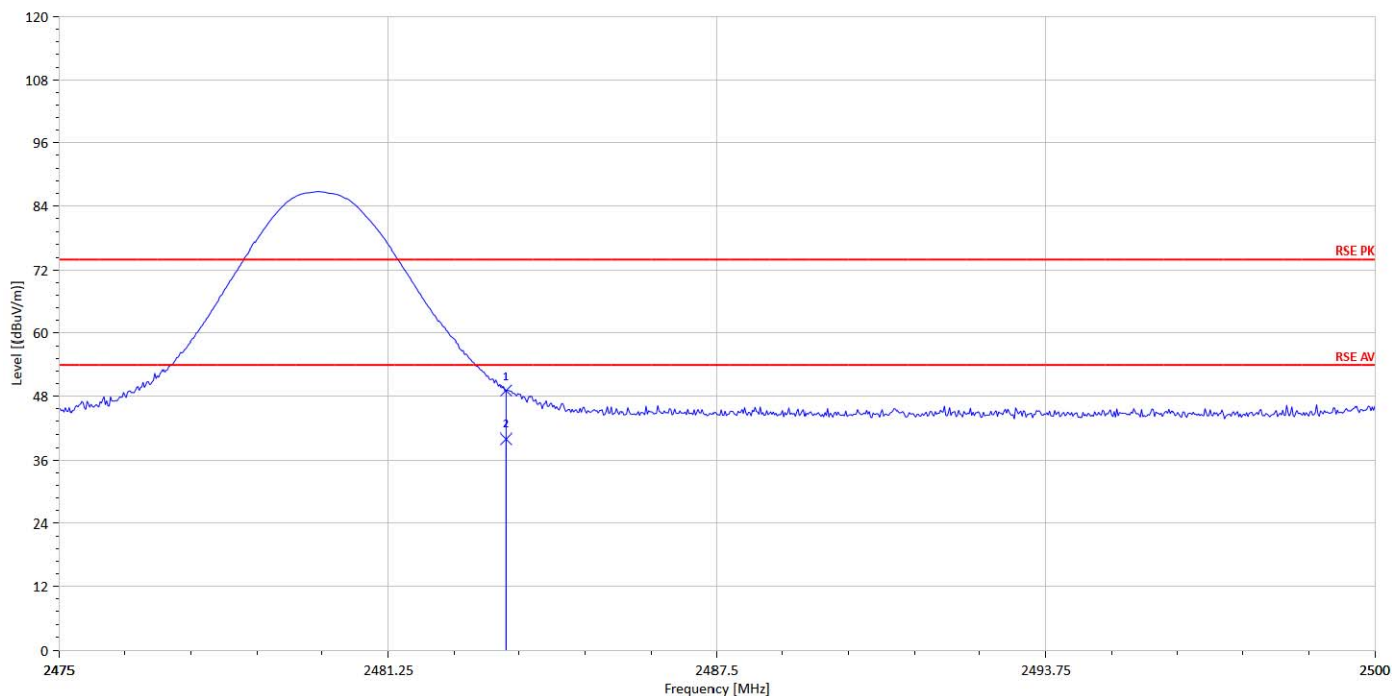
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Channel High

Operation Mode :	BT EDR	Test Date :	2017/10/24
Fundamental Frequency :	2480 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH HIGH	Test Engineer :	Enzo
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical



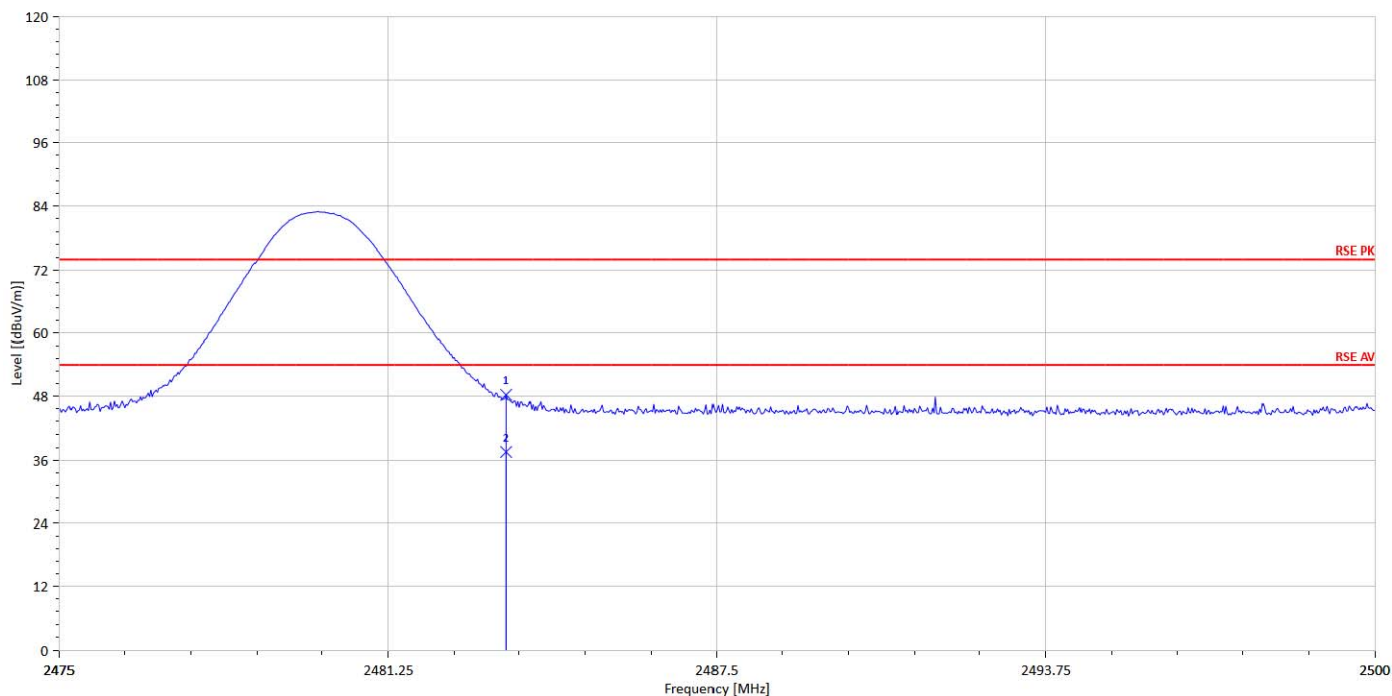
Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Peak	47.97	1.16	49.13	74	-24.87
2483.50	E	Average	38.84	1.16	40.00	54	-14.00

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Operation Mode :	BT EDR	Test Date :	2017/10/24
Fundamental Frequency :	2480 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH HIGH	Test Engineer :	Enzo
EUT Pol. :	H	Measurement Antenna Pol. :	Horizontal



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Peak	47.13	1.16	48.29	74	-25.71
2483.50	E	Average	36.39	1.16	37.55	54	-16.45

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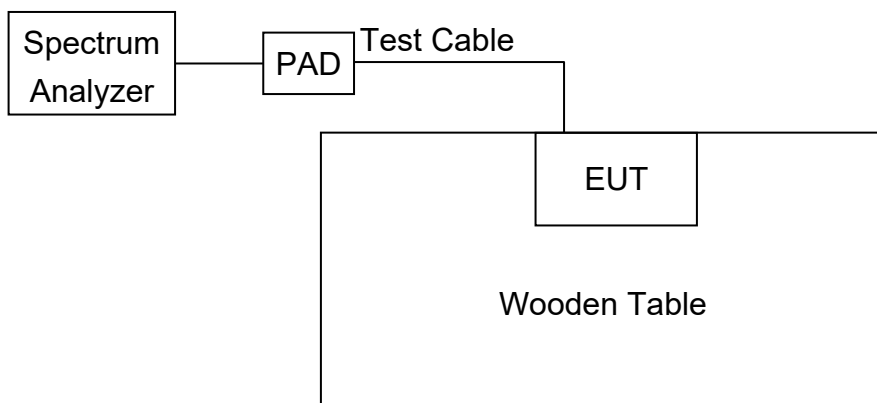
10 20dB 頻寬之要求

10.1 適用標準

NCC 低功率射頻電機技術規範 3.10.1 節(6.1.1) 跳頻系統之載波頻率頻道間隔不得低於 25 千赫 (kHz)或跳頻頻道之 20dB 頻寬，兩者取較寬者。但操作頻率為 2400-2483.5 兆赫(MHz)頻帶且輸出功率不大於 125 毫瓦(mW)跳頻系統，其載波頻率頻道間隔不得小於 25 千赫 (kHz)或跳頻頻道 20dB 頻寬之三分之二，兩者取較寬者。系統之跳頻頻道應依虛擬亂數排列，在各頻率之跳頻頻道上跳躍。每一發射機必須均等的使用每一頻率。系統接收機應具有與發射機跳躍頻道頻寬相匹配之輸入頻寬，且應隨所發射之信號同步偏移接收頻率。

10.2 測試配置

圖 4: 發射頻寬之測試配置



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10.3 量測結果

測試設備: BMW Dashboard
 環境溫度: 20°C
 解析 頻寬: BR:10kHz
 EDR:15kHz
 Span: 3MHz

型號: ICC6.5in
 環境濕度: 65%
 視訊頻寬: BR:30kHz
 EDR:47kHz

測試者:

黃凱恩

Module 1**20dB Bandwidth: BR mode**

CH	(MHz)
Lower	0.92532
Mid	0.92807
Higher	0.92581

20dB Bandwidth: EDR mode ($\pi/4$ -DQPSK)

CH	(MHz)	2/3 Bandwidth (MHz)
Lower	1.3216	0.88
Mid	1.3223	0.88
Higher	1.3227	0.88

20dB Bandwidth: EDR mode (8-DPSK)

CH	(MHz)	2/3 Bandwidth (MHz)
Lower	1.2501	0.83
Mid	1.2505	0.83
Higher	1.2501	0.83

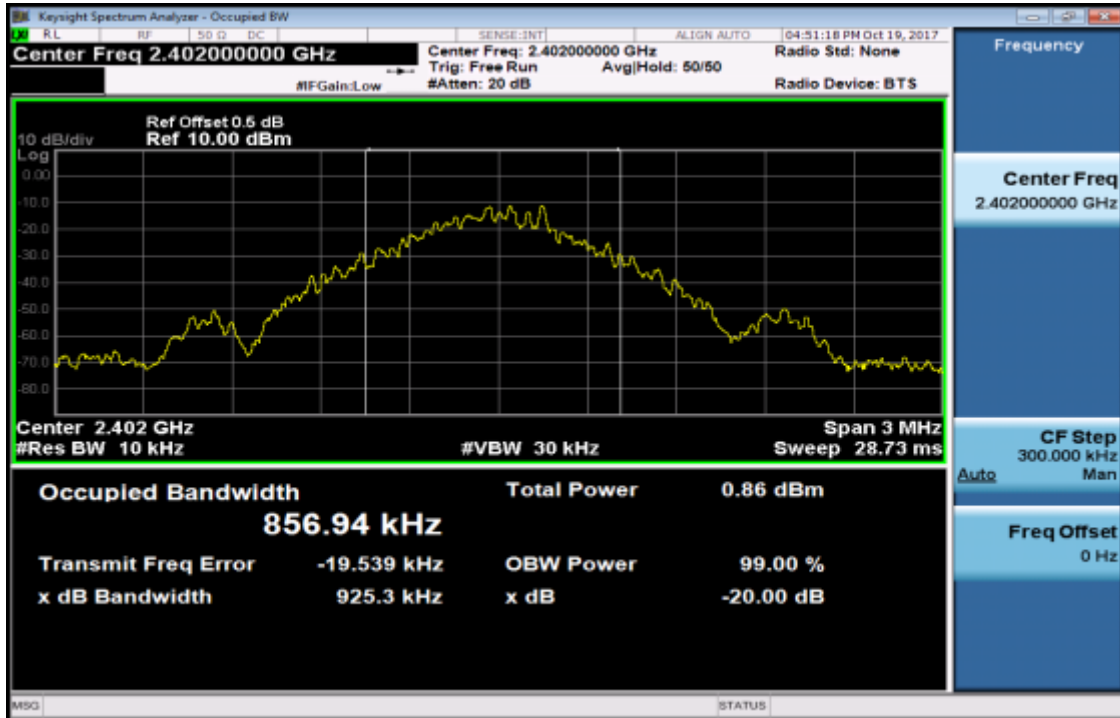
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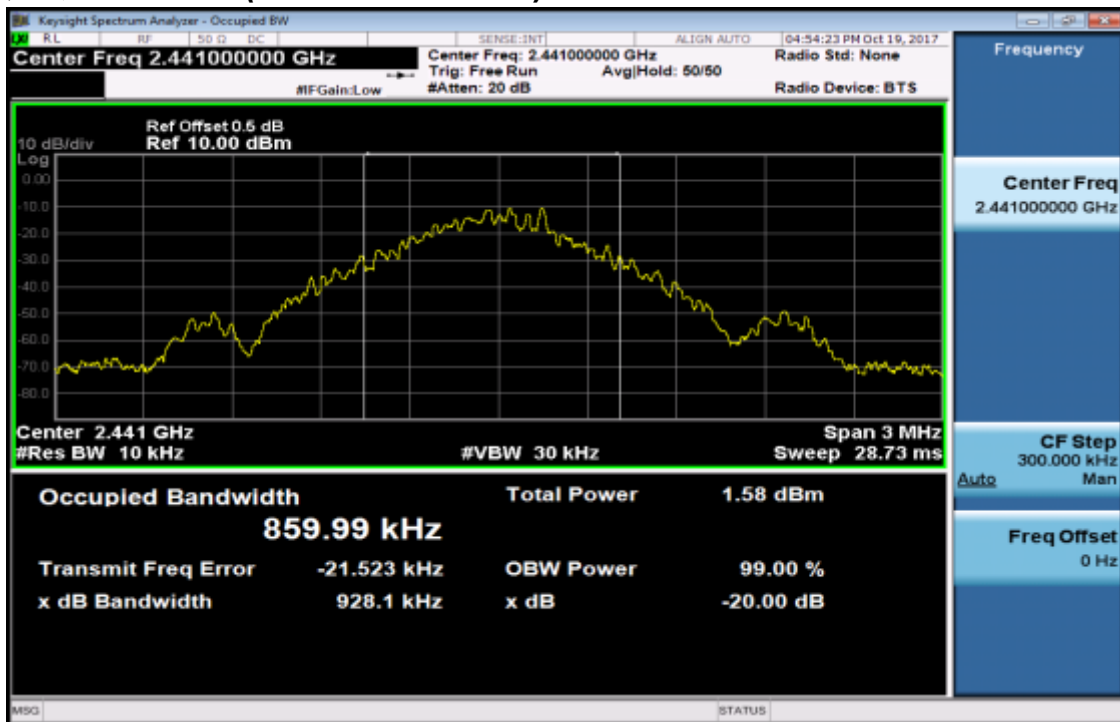
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Module 1

發射頻寬測試值 CH-Low (BR Mode GFSK)



發射頻寬測試值 CH-Mid (BR Mode GFSK)

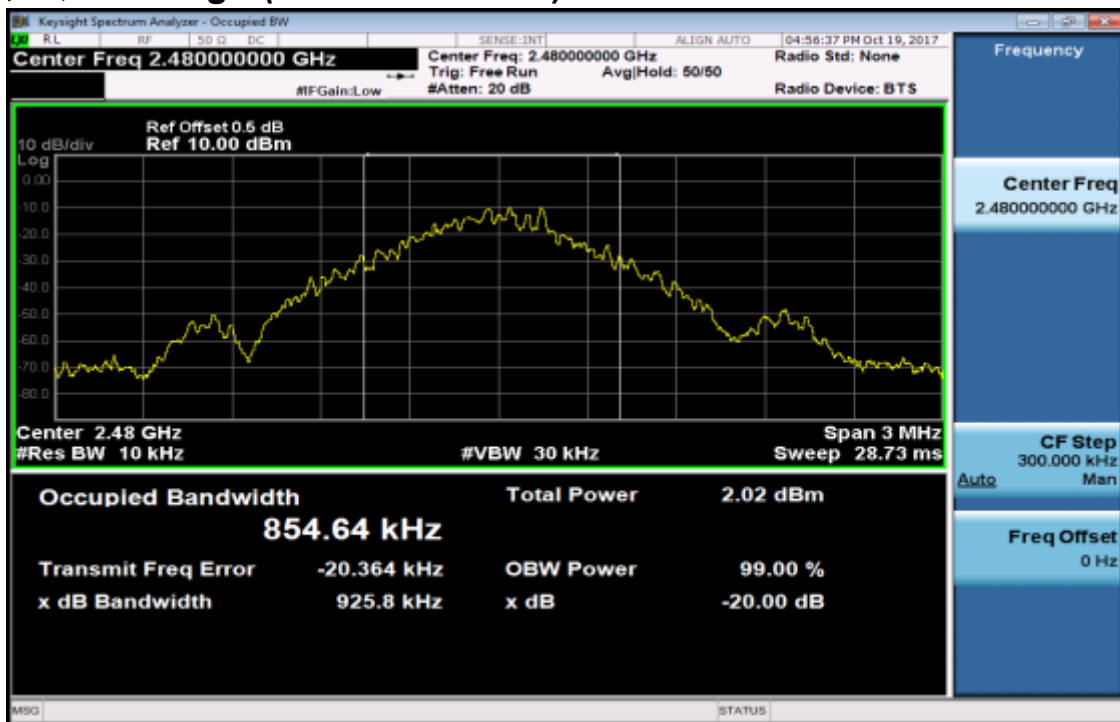


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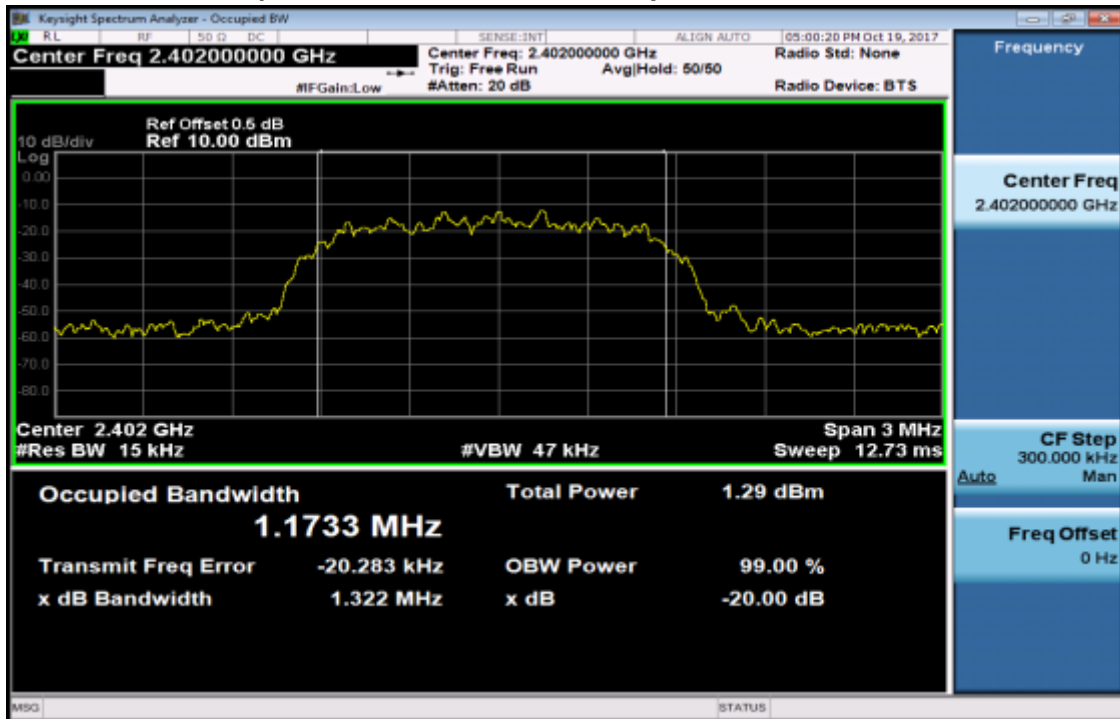
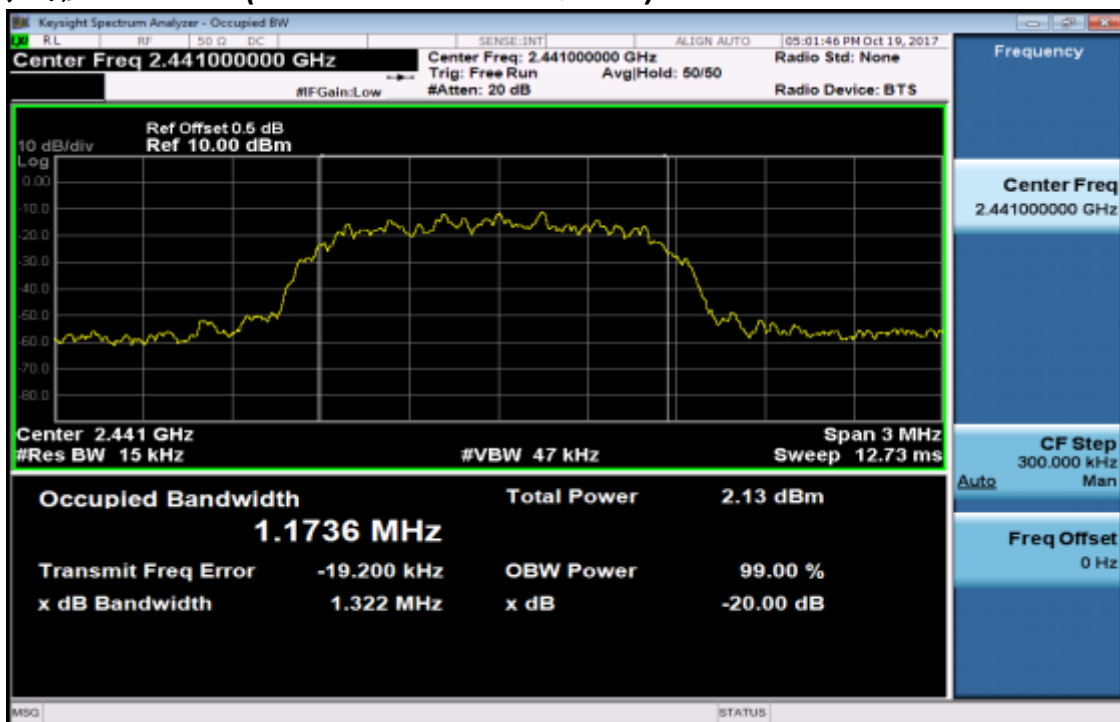
發射頻寬測試值 CH-High (BR Mode GFSK)



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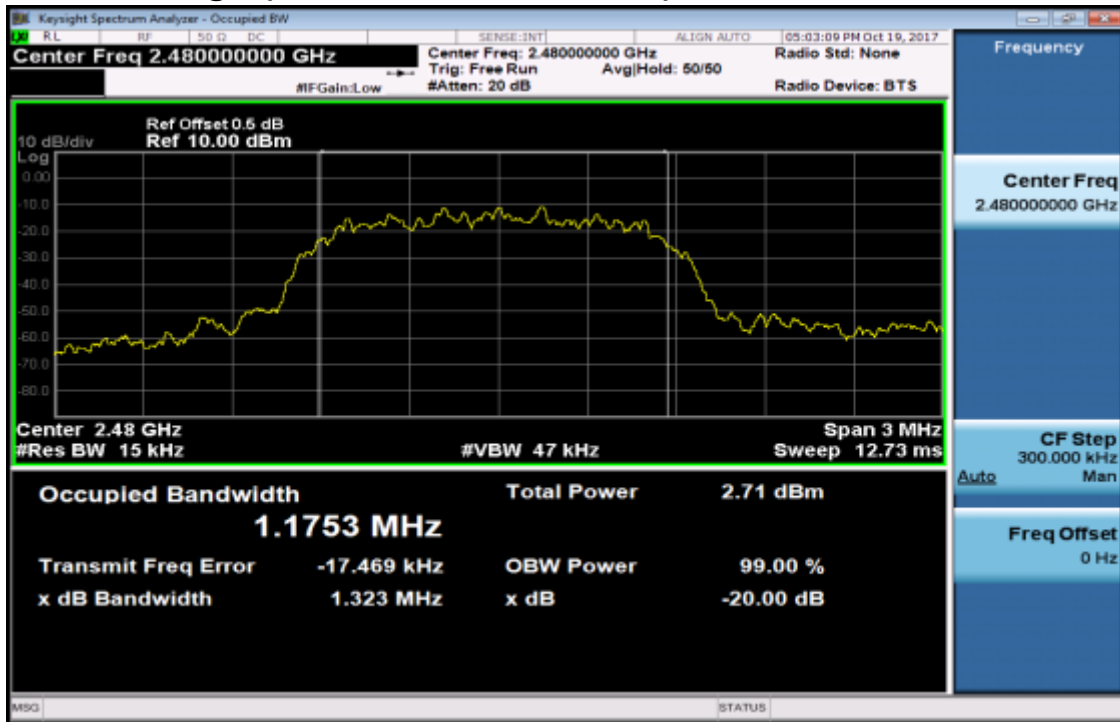
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發射頻寬測試值 CH-Low (EDR Mode $\pi/4$ DQPSK)發射頻寬測試值 CH-Mid (EDR Mode $\pi/4$ DQPSK)

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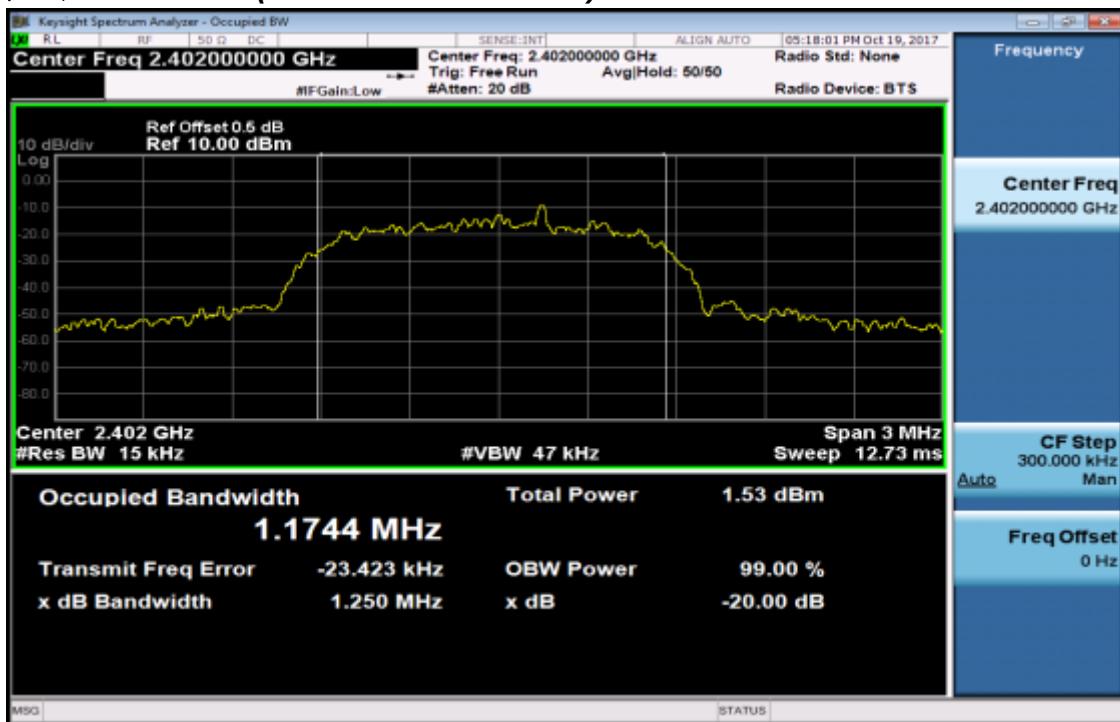
發射頻寬測試值 CH-High (EDR Mode $\pi/4$ DQPSK)

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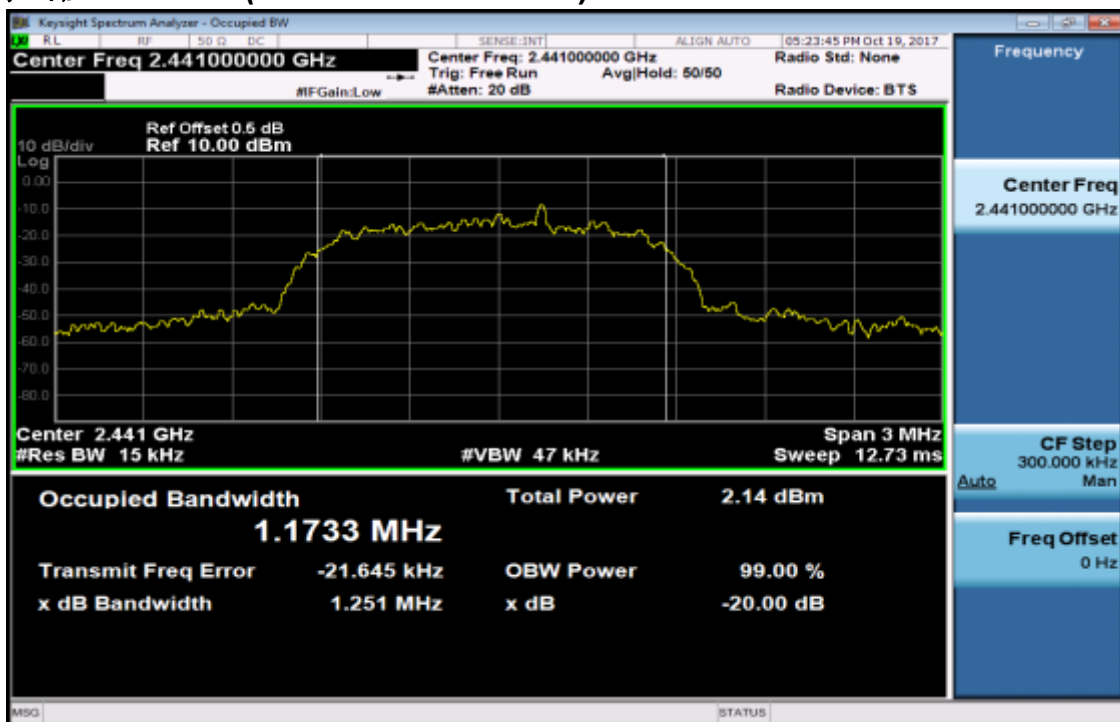
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發射頻寬測試值 CH-Low (EDR Mode 8DPSK)



發射頻寬測試值 CH-Mid (EDR Mode 8DPSK)

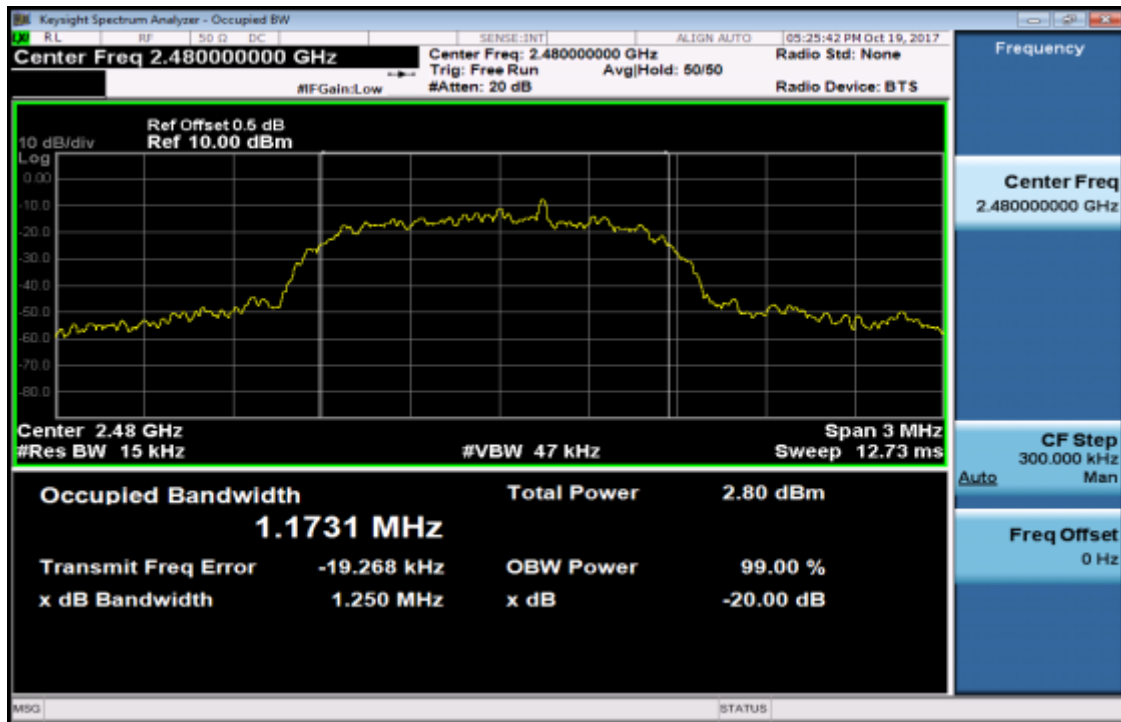


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發射頻寬測試值 CH-High (EDR Mode 8DPSK)



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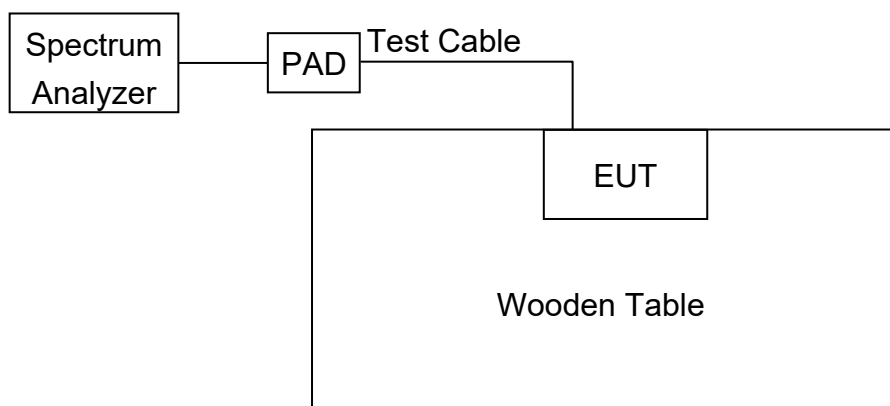
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11 載波頻率間隔之量測

11.1 適用標準

NCC 低功率射頻電機技術規範 3.10.1 節(6.1.1) 跳頻系統之載波頻率頻道間隔不得低於 25 千赫 (kHz)或跳頻頻道之 20dB 頻寬，兩者取較寬者。但操作頻率為 2400-2483.5 兆赫(MHz)頻帶且輸出功率不大於 125 毫瓦(mW)跳頻系統，其載波頻率頻道間隔不得小於 25 千赫 (kHz)或跳頻頻道 20dB 頻寬之三分之二，兩者取較寬者。系統之跳頻頻道應依虛擬亂數排列，在各頻率之跳頻頻道上跳躍。每一發射機必須均等的使用每一頻率。系統接收機應具有與發射機跳躍頻道頻寬相匹配之輸入頻寬，且應隨所發射之信號同步偏移接收頻率。

11.2 量測載波頻率間隔之配置



11.3 載波頻率間隔之量測結果

頻道	載波頻率間隔	最小限制值 (MHz)	依據 NCC 低功率射頻電機技術規範 3.10.1 節(6.1.1)之標準，故取載波頻率間隔之量測值。
CH Low	1MHz	0.88	
CH Mid	1MHz	0.88	
Ch High	1MHz	0.88	

請參考附圖。

註:操作頻率為 2400-2483.5 兆赫(MHz)頻帶且輸出功率不大於 125 毫瓦(mW)跳頻系統，其載波頻率頻道間隔不得小於 25 千赫(kHz)或跳頻頻道 20dB 頻寬之三分之二

註: 此裝置有 EDR 功能，因比較 BR mode 及 EDR mode 測試值後，附上最差模式 EDR Mode ($\pi/4$ DQPSK)) 數據。

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載波頻率間隔測試值

測試設備: BMW Dashboard
環境溫度: 20°C
解析頻寬: 100kHz
Span: 5MHz

型號: ICC6.5in
環境濕度: 65%
視訊頻寬: 100kHz

測試者:

黃凱恩

Module 1



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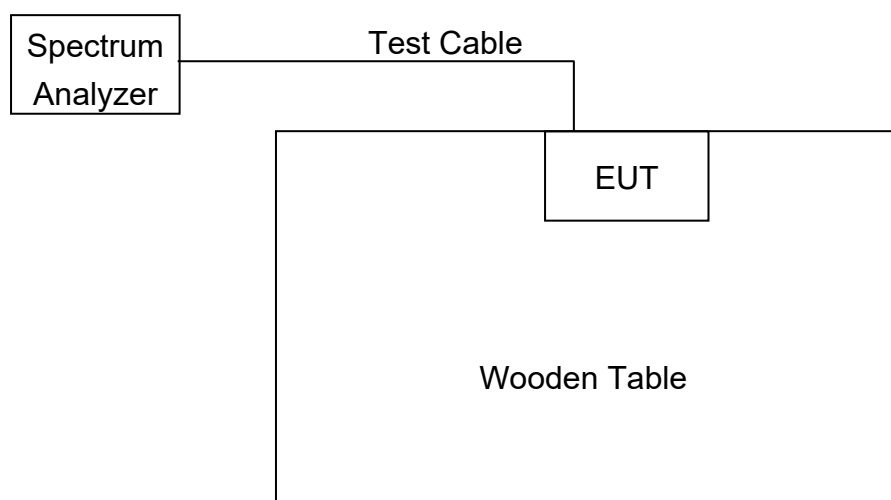
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12 載波頻率佔用週期之量測

12.1 適用標準

NCC 低功率射頻電機技術規範 3.10.1 節(6.1.2) 在 0.4 秒乘以跳頻頻道數之週期內，任一頻率佔用之平均時間不得超過 0.4 秒。

12.2 量測物載波頻率佔用週期之配置



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12.3 開放載波頻率佔用週期之量測結果:

測試設備: BMW Dashboard
環境溫度: 20°C
解析頻寬: 1MHz
Span: 0Hz

型號: ICC6.5in
環境濕度: 65%
視訊頻寬: 3MHz

測試者: 黃凱恩

量測週期 = $0.4 \times 79 = 31.6 \text{ s}$

Module 1**CH Low:**

3DH1 time slot 為1發1 收 Dwell Time
= 0.387 (ms) 每一個脈衝時間 $\times (1600/(2 \times 79))$ 每秒在每一頻道發射次數 $\times 31.6$ 量測週 123.90 (ms)
3DH3 time slot 為1發1 收 Dwell Time
= 1.637 (ms) 每一個脈衝時間 $\times (1600/(4 \times 79))$ 每秒在每一頻道發射次數 $\times 31.6$ 量測週 261.92 (ms)
3DH5 time slot 為1發1 收 Dwell Time
= 2.889 (ms) 每一個脈衝時間 $\times (1600/(6 \times 79))$ 每秒在每一頻道發射次數 $\times 31.6$ 量測週 308.16 (ms)

CH Mid:

3DH1 time slot 為1發1 收 Dwell Time
= 0.389 (ms) 每一個脈衝時間 $\times (1600/(2 \times 79))$ 每秒在每一頻道發射次數 $\times 31.6$ 量測週 124.35 (ms)
3DH3 time slot 為1發1 收 Dwell Time
= 1.633 (ms) 每一個脈衝時間 $\times (1600/(4 \times 79))$ 每秒在每一頻道發射次數 $\times 31.6$ 量測週 261.28 (ms)
3DH5 time slot 為1發1 收 Dwell Time
= 2.889 (ms) 每一個脈衝時間 $\times (1600/(6 \times 79))$ 每秒在每一頻道發射次數 $\times 31.6$ 量測週 308.16 (ms)

CH High:

3DH1 time slot 為1發1 收 Dwell Time
= 0.387 (ms) 每一個脈衝時間 $\times (1600/(2 \times 79))$ 每秒在每一頻道發射次數 $\times 31.6$ 量測週 123.90 (ms)
3DH3 time slot 為1發1 收 Dwell Time
= 1.633 (ms) 每一個脈衝時間 $\times (1600/(4 \times 79))$ 每秒在每一頻道發射次數 $\times 31.6$ 量測週 261.28 (ms)
3DH5 time slot 為1發1 收 Dwell Time
= 2.889 (ms) 每一個脈衝時間 $\times (1600/(6 \times 79))$ 每秒在每一頻道發射次數 $\times 31.6$ 量測週 308.16 (ms)

註: 此裝置有EDR功能, 比較BR mode及EDR mode測試值後, 附上最差模式EDR (8DPSK) mode數據。

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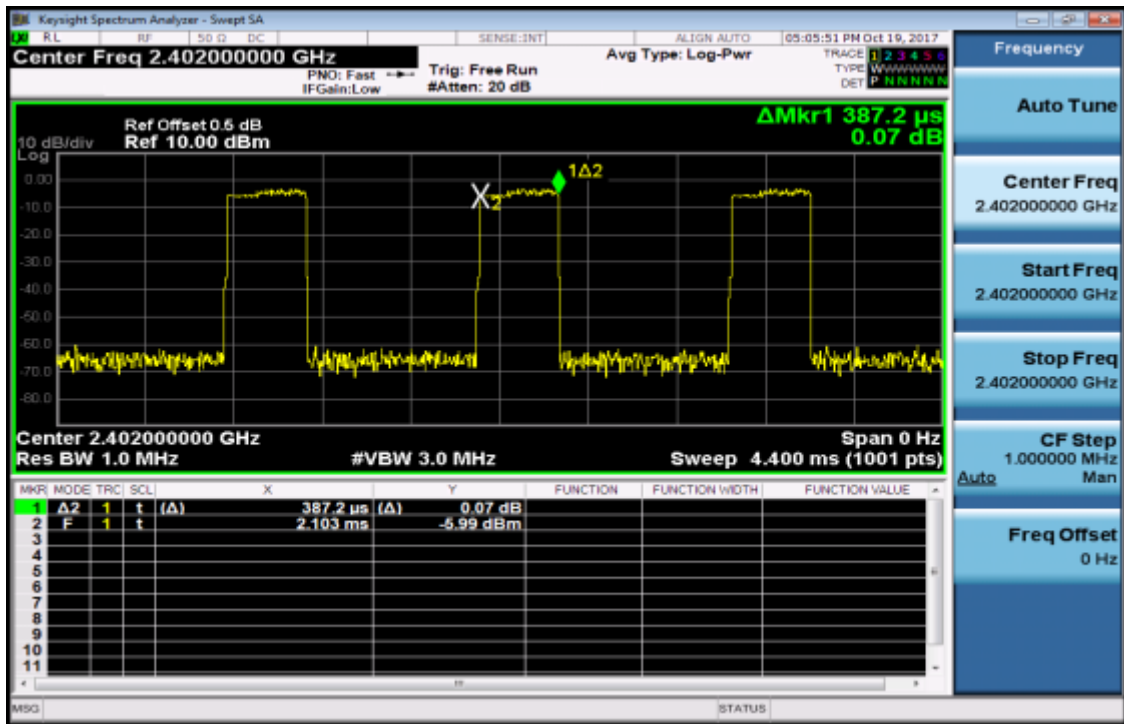
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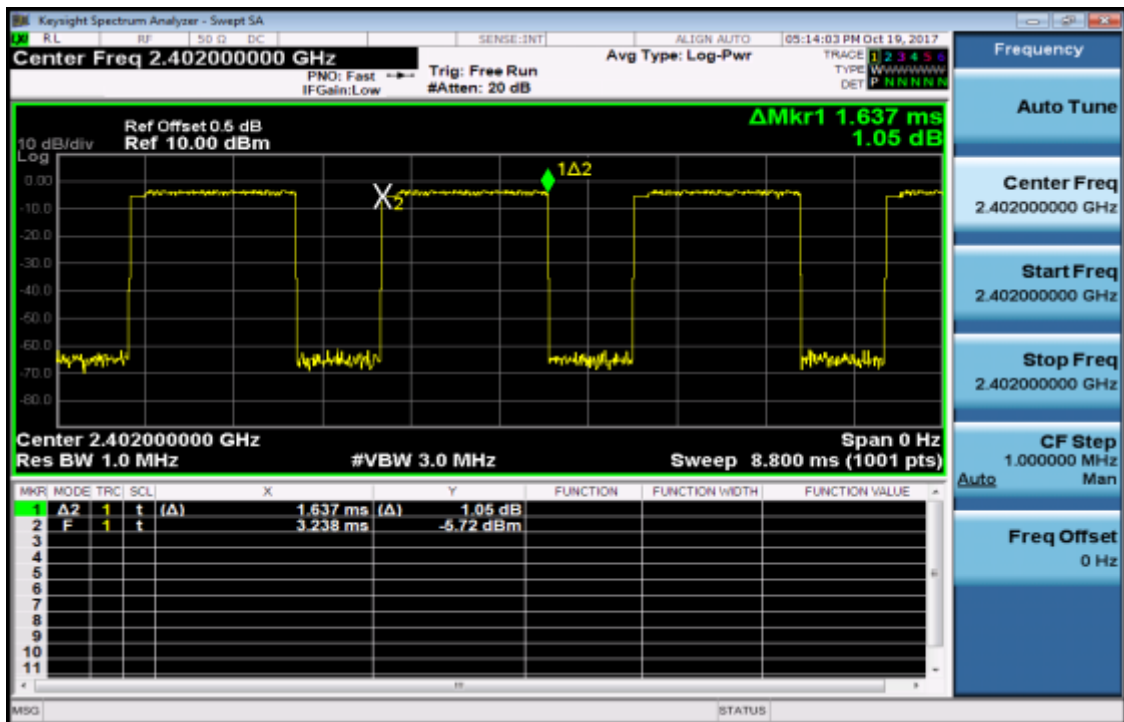
Module 1

載波頻率週期測試值 CH-Low

3DH1



3DH3



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3DH5

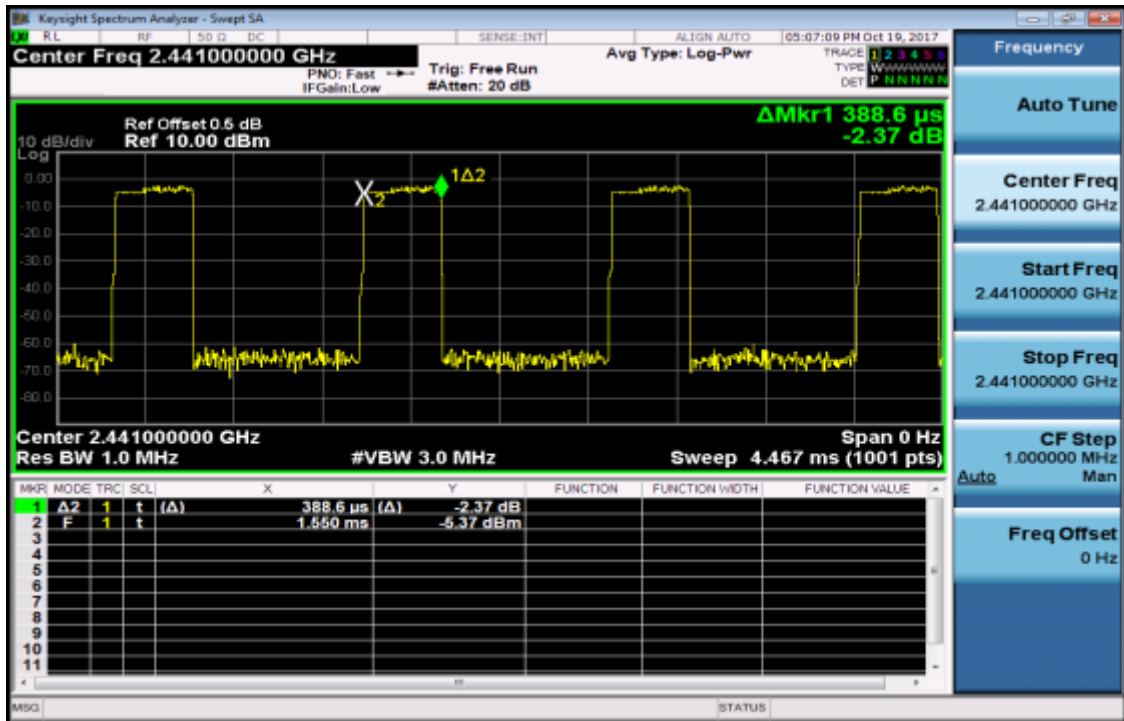


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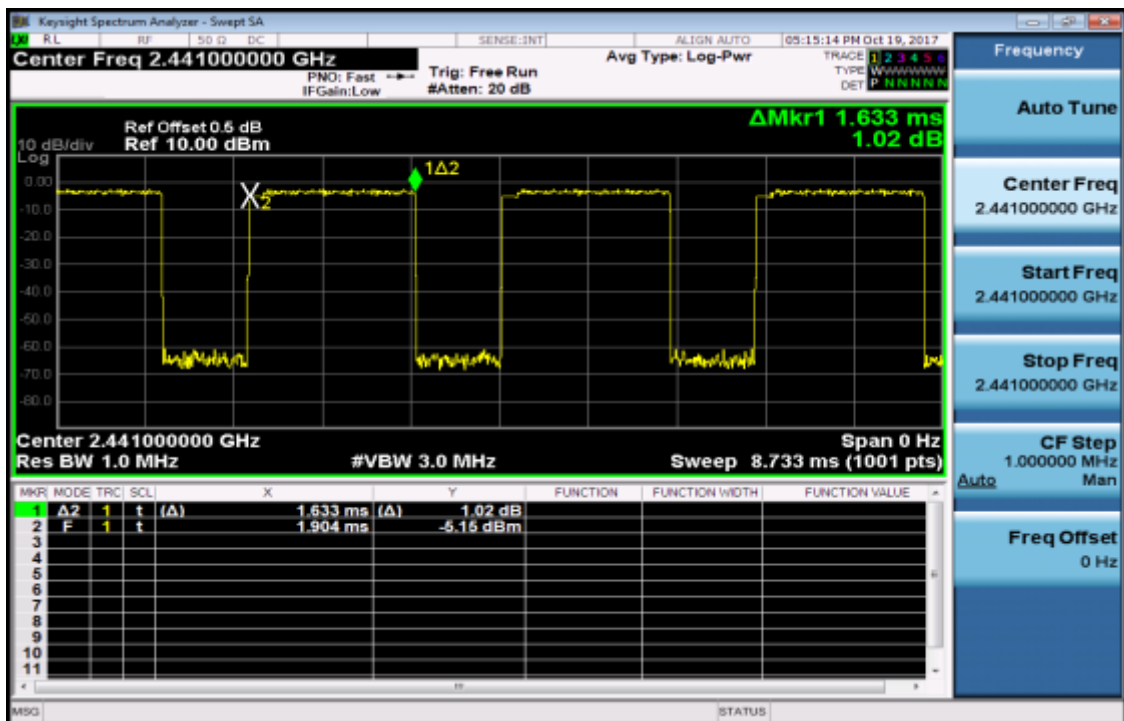
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載波頻率週期測試值 CH-Mid 3DH1



3DH3

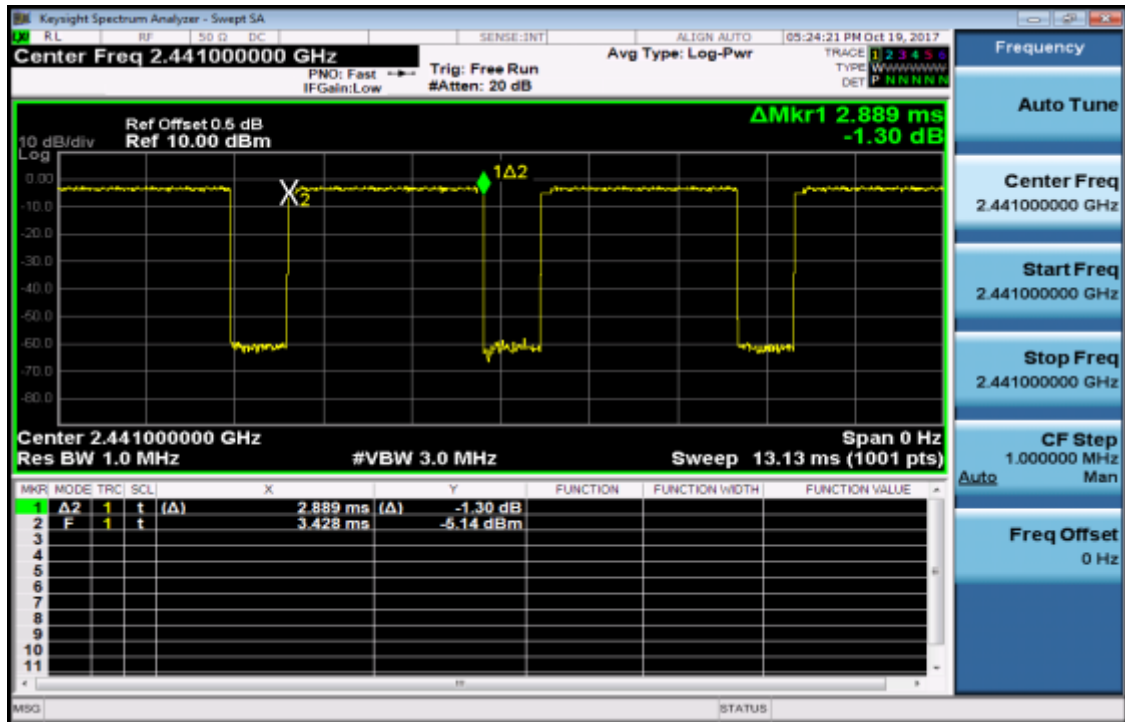


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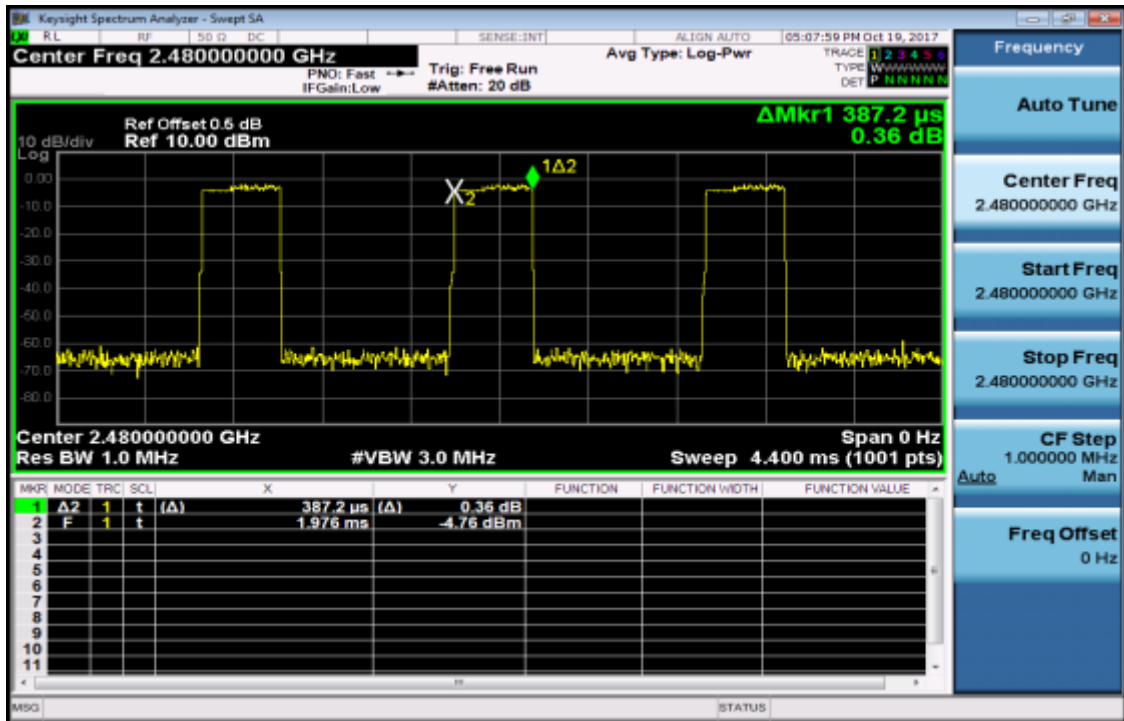
3DH5



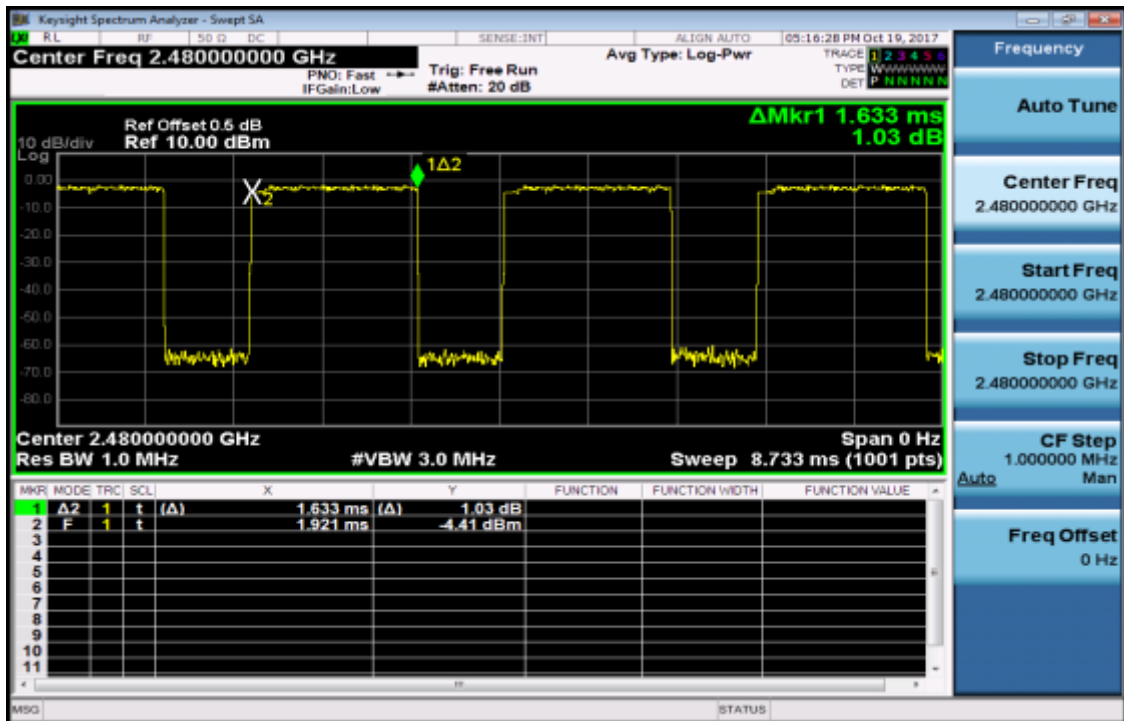
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載波頻率週期測試值 CH-High
3DH1

3DH3



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3DH5



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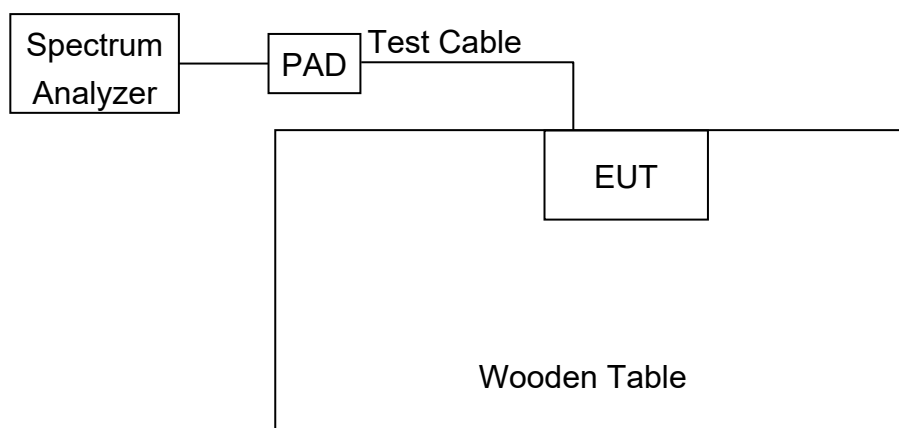
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13 頻道數之量測

13.1 適用標準

依據 NCC 低功率射頻電機技術規範 3.10.1 節之(6.1.2.)條規定，操作於 2400-2483.5 MHz 之展頻跳頻系統，須使用至少 15 個無重疊的頻道，在 0.4 秒乘以跳頻頻道數之週期內，任一頻率佔用之平均時間不得超過 0.4 秒。跳頻頻道數少於 75 之跳頻系統，可使用智慧型跳頻技術，以避免干擾其他之無線傳輸。

13.2 量測頻道數之配置



13.3 頻道數之量測結果

測試設備: BMW Dashboard
環境溫度: 21°C
解析頻寬: 430kHz
Span: 41MHz

型號: ICC6.5in
環境濕度: 63%
視訊頻寬: 1.5MHz

測試者:

黃凱恩

頻道數	限制值 (CH)	量測值 (CH)	結果
	75	79	Pass

註: 此裝置有 EDR 功能，由於 BR mode 及 EDR mode 跳頻數相同，僅以 BR mode、GFSK 調變之數據為代表。

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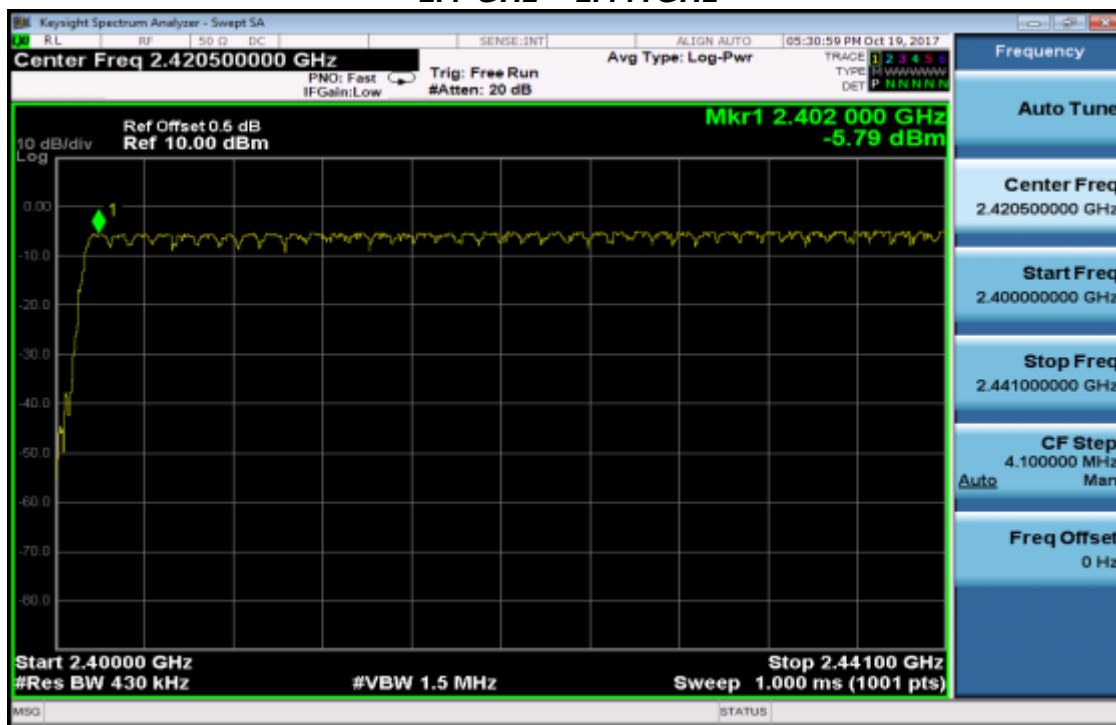
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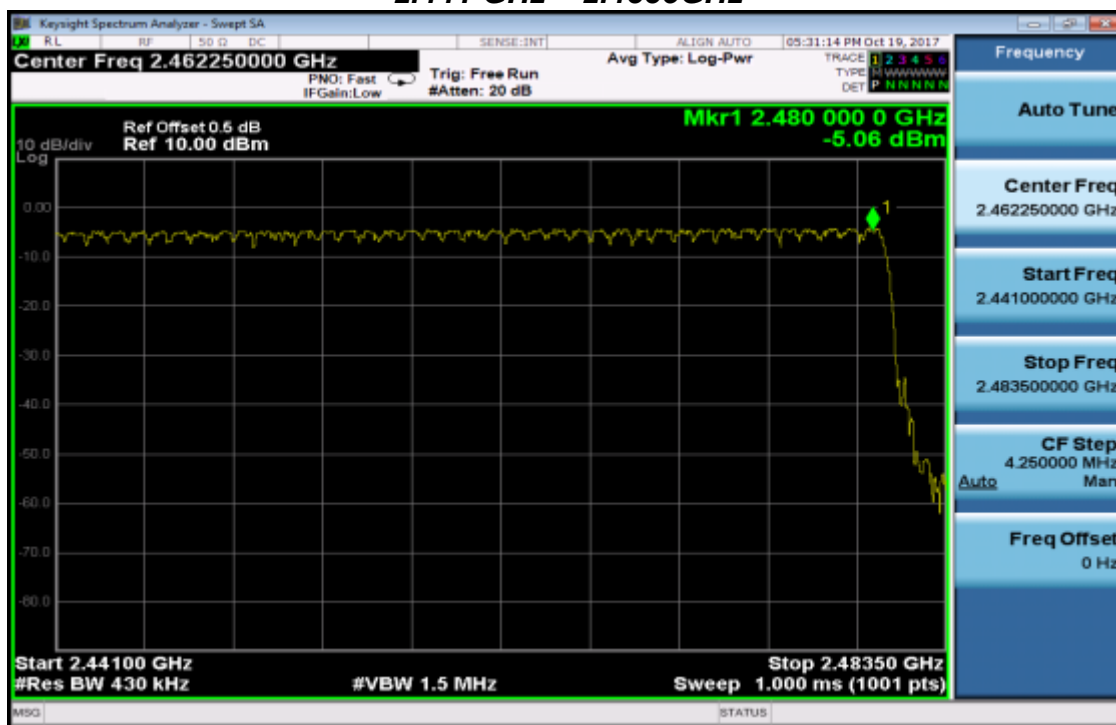
頻道數之量測值

Module 1

2.4 GHz – 2.441GHz



2.441 GHz – 2.4835GHz



~ End of Report ~

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