



低功率射頻電機測試報告

申請廠商	: 德鋁企業股份有限公司
地址	: 台北市內湖區行善路 417 巷 30 號
製造廠商	: 自然聲電子（深圳）有限公司
地址	: 深圳市龍崗區龍城街道龍西社區玉湖村 1 號
產品名稱	: 無線藍牙耳機
產品型號	: GEAR
廠牌	: NOBD+
受理日期	: 108 年 08 月 23 日
完成日期	: 108 年 12 月 23 日

實驗室名稱：世騰電子科技股份有限公司測試實驗室

實驗室地址：桃園市蘆竹區聯福街 2 巷 10 號

實驗室認可證書有效期限：109 年 07 月 08 日

實驗室認可編號及範圍：1439 (9 kHz to 40 GHz)

實驗室認證資格





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修訂記錄

報告號碼.	發行日期	描述
TENQ1908207	Dec. 23, 2019	Original



證 明 書

申請廠商	:	德鋁企業股份有限公司
地址	:	台北市內湖區行善路 417 巷 30 號
製造廠商	:	自然聲電子（深圳）有限公司
地址	:	深圳市龍崗區龍城街道龍西社區玉湖村 1 號
產品名稱	:	無線藍牙耳機
產品型號	:	GEAR
廠牌	:	NOBD+
該產品樣品試驗 依據之試驗標準	:	國家通訊傳播委員會低功率射頻電機技術規範(LP0002)。 規範修訂日期 107 年 1 月 10 日。
發射功率 (電場強度)	:	7.39 dBm

茲在此鄭重聲明：

本試驗報告所列之待測設備樣品已於民國 108 年 12 月 17 日在本公司的標準測試場地完成詳細及完整之量測。本試驗報告所列之量測皆依據低功率射頻電機技術規範之規定來執行。並判斷此待測設備樣品確實符合低功率射頻電機技術規範規定。

備註：本測試報告僅對受測之樣品負責。非經本公司同意，測試報告不得摘錄複印使用。(全部複製除外)。

項次	測試項目	低功率射頻電機技術 規範	量測設備	測試結果	結果判定
1	天線增益之要求	3.10.1.3 節	---	請參閱 2.2 節	---
2	電源線傳導干擾之要求	2.3 節	請參閱 2 章	請參閱 4.4 節	合格
3	場強輻射之要求	3.10.1.5 節	請參閱 2 章	請參閱 5.4 節 及 5.5 節	合格
4	發射頻寬之要求	3.10.1.6 節(2).(A)	請參閱 2 章	請參閱 6.4 節	合格
5	峰值輸出功率之要求	3.10.1.2 節(1)(C)	請參閱 2 章	請參閱 7.4 節	合格
6	混附波發射限制之要求	3.10.1.5 節	請參閱 2 章	請參閱 8.4 節	合格
7	功率密度之要求	3.10.1.6 節(2)(B)	請參閱 2 章	請參閱 9.4 節	合格

本實驗室依據 ISO-IEC 17025，已將儀器、環境、人員等不確定影響因素降低，故當量測結果符合標準要求時，即判定合格，不評估與量測結果有相關的不確定度

報告簽署人：



1. 一般描述

1.1. 產品規格

Frequency Range	2400-2483.5MHz
Modulation Type	BT: GFSK, $\pi/4$ -DQPSK, 8DPSK BLE: GFSK
Modulation Technology	FHSS, DTS
Data Rate	BT: GFSK: 1Mbps, $\pi/4$ -DQPSK: 2Mbps, 8DPSK: 3Mbps BLE: GFSK: 1Mbps
Antenna Type	Chip Antenna
Antenna Gain	2.28dBi
充電盒	廠牌: 自然聲電子(深圳) 型號: HB12

Note:

*For more details, please refer to the User's manual of the EUT.

*左耳藍牙耳機、右耳藍牙耳機之電路設計/佈線相同時，左耳藍牙耳機、右耳藍牙耳機屬同一發射機無須驗證 2dB，僅以右耳藍牙耳機為測試之判定。

1.2. 差異說明

無。

1.3. 無線界面規格及頻道對應頻率

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
*00	2402	14	2430	28	2458
01	2404	15	2432	29	2460
02	2406	16	2434	30	2462
03	2408	17	2436	31	2464
04	2410	18	2438	32	2466
05	2412	*19	2440	33	2468
06	2414	20	2442	34	2470
07	2416	21	2444	35	2472
08	2418	22	2446	36	2474
09	2420	23	2448	37	2476
10	2422	24	2450	38	2478
11	2424	25	2452	*39	2480
12	2426	26	2454	--	--
13	2428	27	2456	--	--

*為量測之頻率



1.4. 測試模式之描述

- 電源傳導及輻射測試之測試軟體如下:
 1. 將量測系統之全部電源打開。
 2. 於測試進行的同時，在 Windows OS system 作業系統下，待測物執行” AWRDLab ver. R_1_0_6_220” 傳送及接收訊號。
- 執行以下測試模式如下：

Conducted Emissions from the AC mains power ports	
Test Mode	Operating Description
1	Charger Mode
caused “Test Mode 1” generated the worst case, it was reported as the final data.	
Radiation Emissions (30MHz ~ 1GHz)	
Test Mode	Operating Description
1	GFSK (1Mbps), Transmitter
2	GFSK (1Mbps) , Receiver
3	Charger Mode
caused “Test Mode 1, 2, 3” generated the worst case, they were reported as the final data.	
Radiation Emissions (1GHz ~ 25GHz)	
Test Mode	Operating Description
1	GFSK (1Mbps), Transmitter
2	GFSK (1Mbps) , Receiver
caused “Test Mode 1, 2” generated the worst case, they were reported as the final data.	

1.5. 受測裝置之系統說明

「本案經申請者切結器材不提供隨貨配件，配件由實驗室提供併同檢驗」，及其廠牌型號資訊如下：

RF Conducted				
Equipment	Brand	Model	Length/Type	Power cord/Length/Type
Notebook	ASUS	P2430U	N/A	Adapter / 1.8m / NS
Radiated Emissions				
Equipment	Brand	Model	Length/Type	Power cord/Length/Type
USB TYPE-C	SAMSUNG	EP-DG950CBE	1.2m / NS	N/A
Adapter	SAMSUNG	EP-TA20JBS	N/A	N/A
AC Power Line Conducted Emission				
Equipment	Brand	Model	Length/Type	Power cord/Length/Type
USB TYPE-C	SAMSUNG	EP-DG950CBE	1.2m / NS	N/A
Adapter	SAMSUNG	EP-TA20JBS	N/A	N/A



1.6. 測試場地

測試場地：	世騰電子科技股份有限公司測試實驗室 338 桃園市蘆竹區聯福街 2 巷 10 號
測試電壓：	AC 110V / 60Hz
適用規範：	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以及參考 ANSI、FCC/47CFR/2.1046、2.1047、2.1049、2.1051、2.1053 及 2.1055 之檢驗法。
測試頻率：	電源傳導：從 150 kHz 到 30 MHz。 場強輻射：從 30 MHz 到 25000 MHz。
測試天線的距離：	場強輻射之測試距離為 3 M。

Test Item	Test Site	Finish Date	Environmental Conditions	Tested By
RF Conducted	RFCON01-NK	2019/12/16	22°C / 61%	Nick Guan
Radiated Emissions	3M02-NK	2019/12/17	24°C / 46%	Vic Yeh
AC Power Line Conducted Emission	CON02-NK	2019/12/04	24°C / 57%	Dian Chen

1.7. 量測不確定度

Measurement Item	Uncertainty
AC Power Line Conduction(150K~30MHz)	±1.60dB
Radiated Spurious Emission(9KHz~30MHz)	±3.405dB
Radiated Spurious Emission(30MHz~1GHz)	±5.326dB
Radiated Spurious Emission(1GHz~25GHz)	±5.918dB
Conducted Spurious Emission	±2.156dB
6dB Bandwidth	±4.401%
20dB Bandwidth	±4.40%
Occupied Bandwidth	±4.41%
Peak Output Power(Conducted Power Meter)	±1.31dB
Dwell Time	±0.11%
Power Spectral Density	±2.146dB
Duty Cycle	±0.17%



2. 測試儀器

Test Item	Radiated Emissions				
Test Site	Semi Anechoic Room(3M02-NK)				
Instrument	Manufacturer	Model No	Serial No	Calibration Date	Valid Date
Bilog Antenna	Schwarzbeck	VULB9168	275	2019/09/24	2020/09/23
Bilog Antenna	Schwarzbeck	VULB9168	369	2019/03/29	2020/03/28
Active Loop Antenna	EMCO	6507	40855	2019/05/24	2020/05/23
Horn Antenna	EMCO	3115	31589	2019/04/01	2020/03/31
Horn Antenna	EMCO	3116	31974	2019/09/17	2020/09/16
EMI Receiver	ROHDE & SCHWARZ	ESCI	101423	2019/05/14	2020/05/13
Spectrum Analyzer	ROHDE & SCHWARZ	FSP 40	100047	2019/03/28	2020/03/27
Spectrum Analyzer	ROHDE & SCHWARZ	FSV 40-N	102151	2019/08/02	2020/08/01
Preamplifier	EM Electronics corp.	EM330	60660	2019/03/11	2020/03/10
Preamplifier	EMC INSTRUMENTS	EMC051845SE	980333	2019/09/20	2020/09/19
Preamplifier	Agilent	8449B	3008A01954	2019/03/11	2020/03/10
Preamplifier	EMC INSTRUMENTS	EMC184045	980065	2019/11/07	2020/11/06
Bluetooth Tester	ROHDE & SCHWARZ	CBT	101133	2019/04/07	2020/04/06
Cable-3in1(30M-1G)	HARBOUR INDUSTRIES	LL142	CCE1315	2019/04/09	2020/04/08
Cable-3in1(30M-1G)	HARBOUR INDUSTRIES	LL142	CCE1316	2019/09/20	2020/09/19
Cable-0.5m(1G-40G)	HUBER SUHNER	SUCOFLEX 100	805443/4	2019/05/20	2020/05/19
Cable-3m(1G-40G)	HUBER SUHNER	SUCOFLEX 100	805796/4	2019/05/20	2020/05/19
Cable-8m(1G-40G)	HUBER SUHNER	SUCOFLEX 100	805795/4	2019/05/20	2020/05/19
E3	AUDIX	v8.2014-8-6	RK-000529	NA	NA

Test Item	RF Conducted				
Test Site	RFCON01-NK				
Instrument	Manufacturer	Model No	Serial No	Calibration Date	Valid Date
Spectrum Analyzer	ROHDE & SCHWARZ	FSP 40	100047	2019/03/28	2020/03/27
Spectrum Analyzer	ROHDE & SCHWARZ	FSV 40-N	102151	2019/08/02	2020/08/01
Bluetooth Tester	ROHDE & SCHWARZ	CBT	101133	2019/04/07	2020/04/06
Attenuator	KEYSIGHT	8491B	MY39250703	2019/09/12	2020/09/11
TEMP & HUMI CHAMBER	T-MACHINE	TMJ-9712	T-12-040111	2019/08/28	2020/08/27
Power Meter	Anritsu	ML2495A	1224005	2019/04/11	2020/04/10
Power Sensor	Anritsu	MA2411B	1207295	2019/04/09	2020/04/08



Test Item	AC Power Line Conducted Emission				
Test Site	CON02-NK				
Instrument	Manufacturer	Model No	Serial No	Calibration Date	Valid Date
EMI Receiver	ROHDE & SCHWARZ	ESCI	100821	2019/09/16	2020/09/15
Line Impedance Stabilization Network	Schwarzbeck	NSLK 8127	8127-516	2019/09/19	2020/09/18
TWO-LINE V-NETWORK	ROHDE & SCHWARZ	ENV216	102185	2019/07/05	2020/07/04
Cable-6m(9k~300M)	NA	EMC5D-BM-BM-6	130606	2019/03/14	2020/03/13
E3	AUDIX	v8.2014-8-6	RK-000536	NA	NA



3. 天線增益之要求

天線規格不受國家通訊傳播委員會低功率射頻電機技術規範(2.2)節規定之限制，其發射天線之方向性增益超過 6dBi 時，應依其所超過之 dB 數等量降低峰值輸出功率。如用於固定式點對點操作時，應符合下列情形之一：

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。

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。

3.1. 天線型式及其增益

1.1 Brand :	ONEWAVE
1.2 Model :	WAN3216F245M08
1.3 Antenna type :	Chip Antenna
1.4 Frequency Rang :	2402-2480MHz
1.5 Gain(peak) :	2.28 dBi
(參照天線規格資料)	

3.2. 結果判定

其發射天線之方向性增益低於 6dBi，因此無需降低峰值輸出功率。



4.1. 適用標準

頻率範圍(MHz)	傳導限制值 (dB μ V)	
	準峰值(Quasi-peak)	平均值(Average)
0.15 ~ 0.5	66-56 (註)	56-46 (註)
0.5 ~ 5	56	46
5 ~ 30	60	50

註：隨頻率之對數遞減

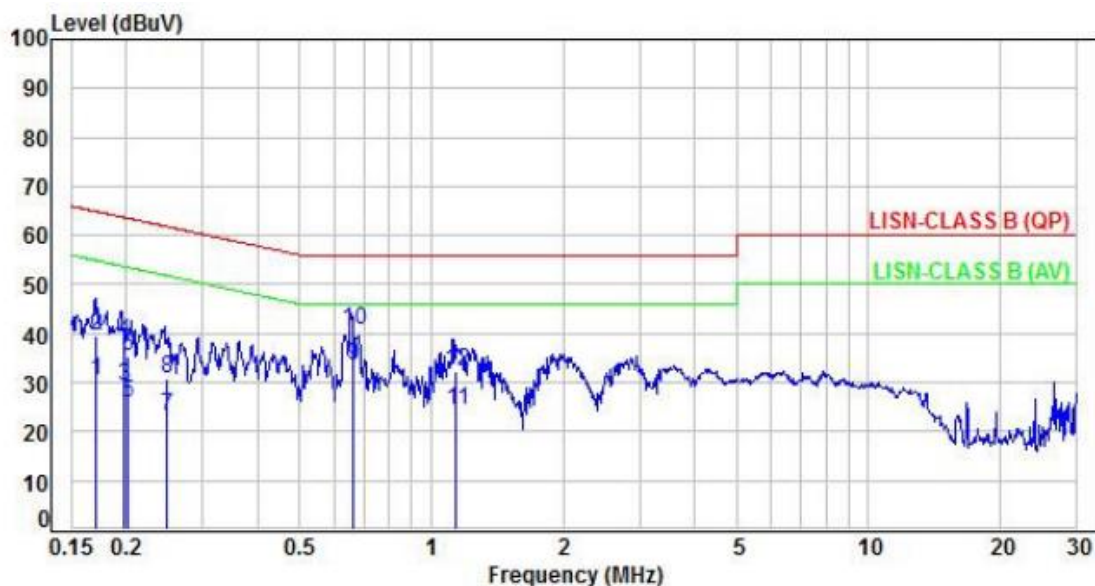
將待測物置於 0.8 米高的非金屬桌面，使其在工作狀態，待測物電源線接至電源線接至電源阻抗穩定網路上，從測試接收機記錄頻率由 0.15MHz 至 30MHz 之間之電源線導放射強度。

[illegible]



4.4. 傳導干擾之測試結果及數據

Power	: AC 110V / 60Hz	Pol/Phase	: LINE
Test Mode	: Mode 1		



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.17	9.64	20.86	30.50	54.94	-24.44	Average	P
2	0.17	9.64	30.08	39.72	64.94	-25.22	QP	P
3	0.20	9.64	19.68	29.32	53.68	-24.36	Average	P
4	0.20	9.64	28.80	38.44	63.68	-25.24	QP	P
5	0.20	9.64	16.09	25.73	53.57	-27.84	Average	P
6	0.20	9.64	25.68	35.32	63.57	-28.25	QP	P
7	0.25	9.64	13.54	23.18	51.81	-28.63	Average	P
8	0.25	9.64	21.24	30.88	61.81	-30.93	QP	P
9	0.66	9.65	23.85	33.50	46.00	-12.50	Average	P
10	0.66	9.65	31.04	40.69	56.00	-15.31	QP	P
11	1.14	9.68	14.54	24.22	46.00	-21.78	Average	P
12	1.14	9.68	22.62	32.30	56.00	-23.70	QP	P

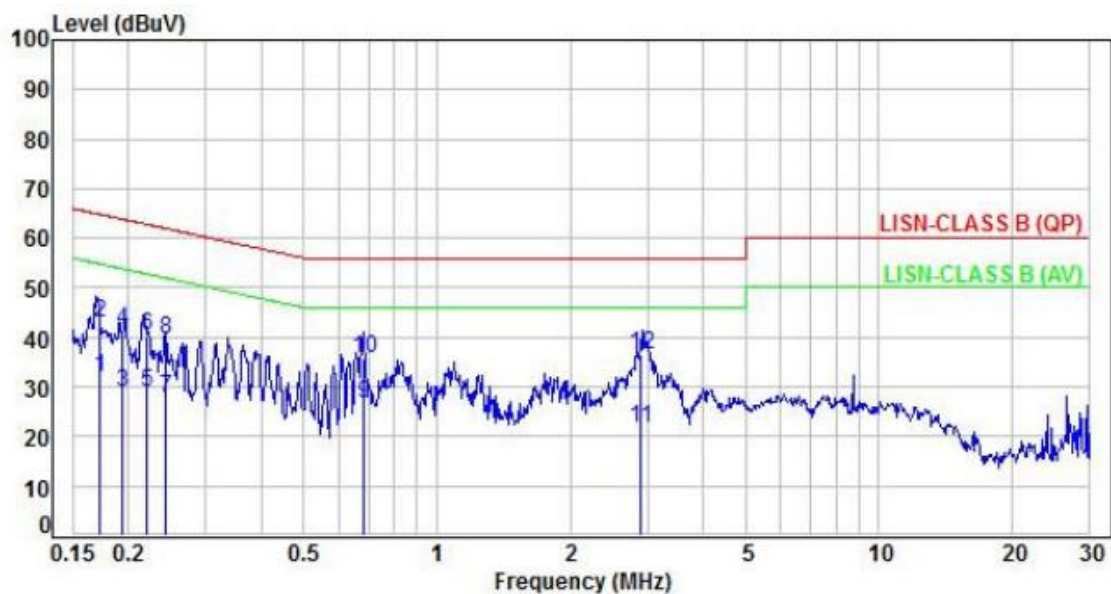
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=(LISN or ISN or Current Probe)Factor + Cable Loss



Power	: AC 110V / 60Hz	Pol/Phase	: NEUTRAL
Test Mode	: Mode 1		



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.17	9.64	22.24	31.88	54.86	-22.98	Average	P
2	0.17	9.64	33.45	43.09	64.86	-21.77	QP	P
3	0.19	9.63	19.27	28.90	53.85	-24.95	Average	P
4	0.19	9.63	31.74	41.37	63.85	-22.48	QP	P
5	0.22	9.63	19.37	29.00	52.80	-23.80	Average	P
6	0.22	9.63	30.49	40.12	62.80	-22.68	QP	P
7	0.24	9.63	18.20	27.83	51.97	-24.14	Average	P
8	0.24	9.63	29.96	39.59	61.97	-22.38	QP	P
9	0.68	9.65	17.11	26.76	46.00	-19.24	Average	P
10	0.68	9.65	26.04	35.69	56.00	-20.31	QP	P
11	2.89	9.75	11.75	21.50	46.00	-24.50	Average	P
12	2.89	9.75	26.85	36.60	56.00	-19.40	QP	P

Note: Level=Reading+Factor

Margin=Level-Limit

Factor=(LISN or ISN or Current Probe)Factor + Cable Loss



5. 輻射之量測規定

5.1. 適用標準

依據國家通訊傳播委員會低功率射頻電機技術規範 3.10.1.5 節之要求，落於 2.7 節禁用頻段之輻射干擾需符合 2.8 節之一般限制要求：

頻率(MHz)	測試距離(m)	限制值(dB μ V)	限制值(μ V/m)
0.009 – 0.490 (含)	300	67.6 / f(kHz)	2400 / f(kHz)
0.490 (不含) – 1.705 (含)	30	87.6 / f(kHz)	24000 / f(kHz)
1.705(不含) – 30(不含)	30	29.5	30
30 (含) – 88 (含)	3	40.0	100
88(不含) – 216 (含)	3	43.5	150
216(不含) – 960 (含)	3	46.0	200
960(不含)以上	3	54.0	500

5.2. 測試方法

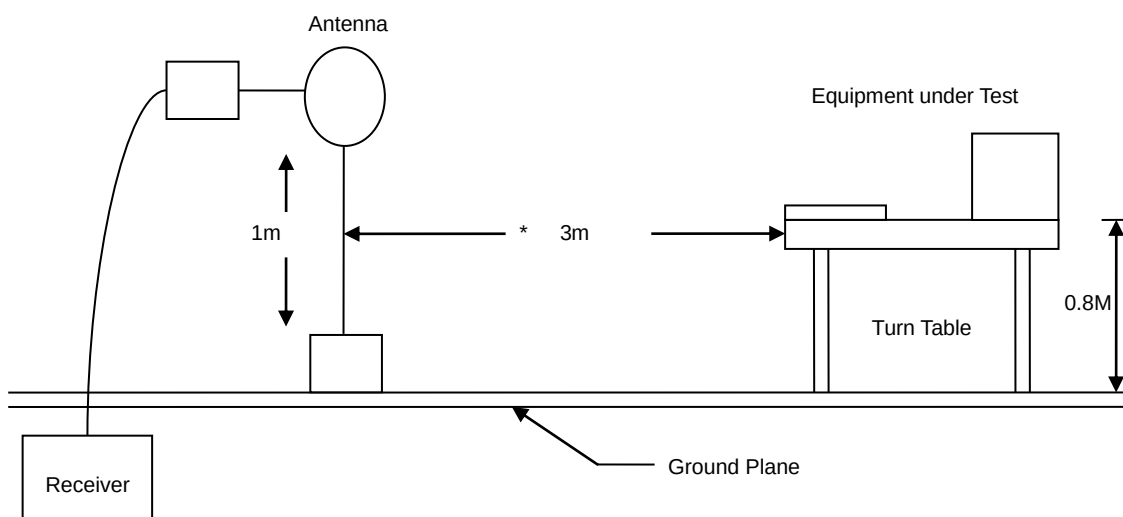
將待測物置於 0.8 米(Below 1G) & 1.5 米(Above 1G)高的非金屬桌面，使其在測試模式狀態，且設定為高、中、低各頻道產生最高峰值輸出功率的傳輸速率，接收天線置於 3 米外，且桌面要 360 度旋轉，另外接收天線也要從 1 米至 4 米升降變化，接收天線置於水平、垂直極向各執行測試一次。待測物若為手持式則分別要以三軸相放置，並分別測試以找出最大輻射電場強度。

備註：

For Below 1G 若待測物之輻射峰值低於限制值 3dB 以上，則將終止測試，並以峰值之讀值作為報告之記錄；反之，若無 3dB 餘裕範圍之輻射，則每一訊號皆以準峰值之測試方法量測，並記錄於報告之中

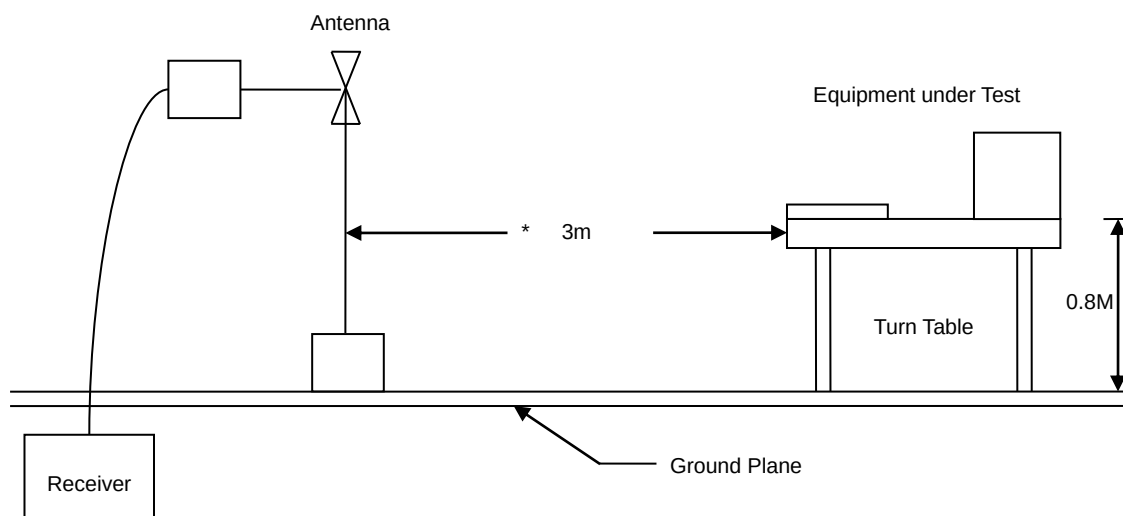
5.3. 輻射場地之擺設

Below 30MHz test setup

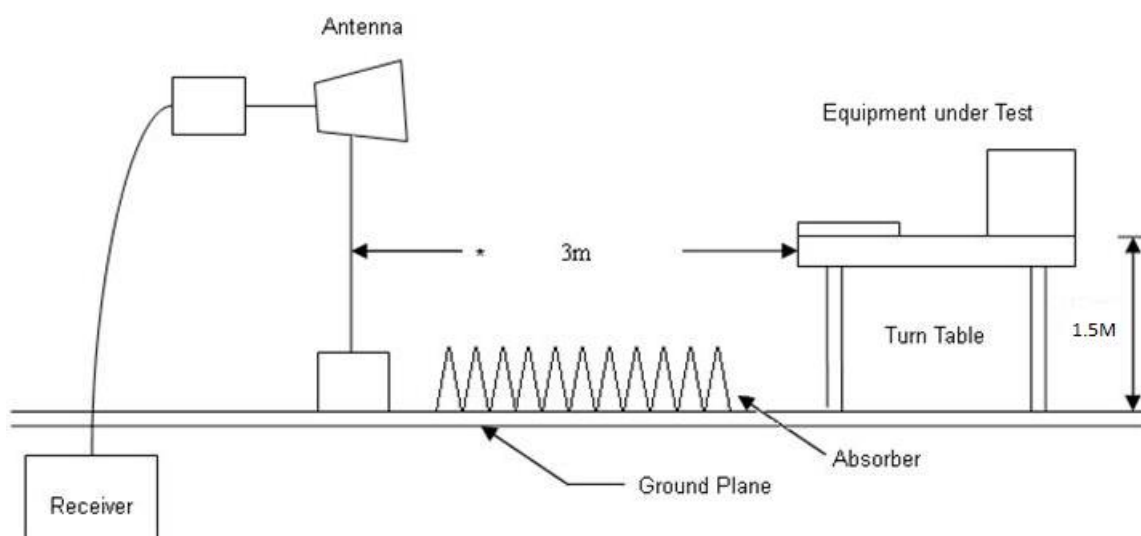




30MHz- 1GHz Test Setup



Above 1GHz Test Setup



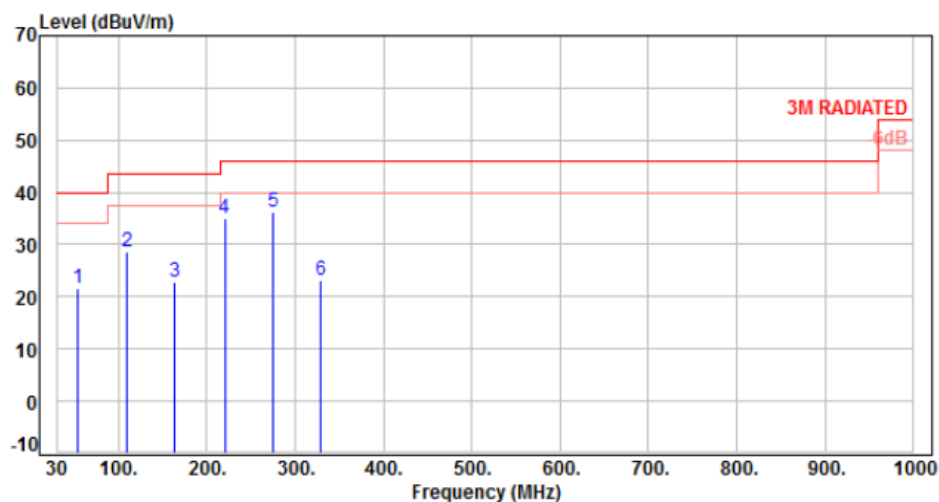


5.4. 輻射之測試結果及數據 (9kHz ~ 30MHz)

The 9kHz - 30MHz spurious emission is under limit 20dB more.

5.5. 輻射之測試結果及數據 (30MHz ~ 1GHz)

Power	: AC 110V / 60Hz	Pol/Phase	: VERTICAL
Test Mode	: Mode 1, CH39		



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	53.28	-9.38	31.13	21.75	40.00	-18.25	Peak	100	0	P
2	109.54	-12.50	41.14	28.64	43.50	-14.86	Peak	100	0	P
3	163.86	-9.50	32.28	22.78	43.50	-20.72	Peak	100	0	P
4	220.12	-11.93	46.98	35.05	46.00	-10.95	Peak	100	0	P
5	274.44	-9.21	45.38	36.17	46.00	-9.83	Peak	100	0	P
6	328.76	-7.53	30.71	23.18	46.00	-22.82	Peak	100	0	P

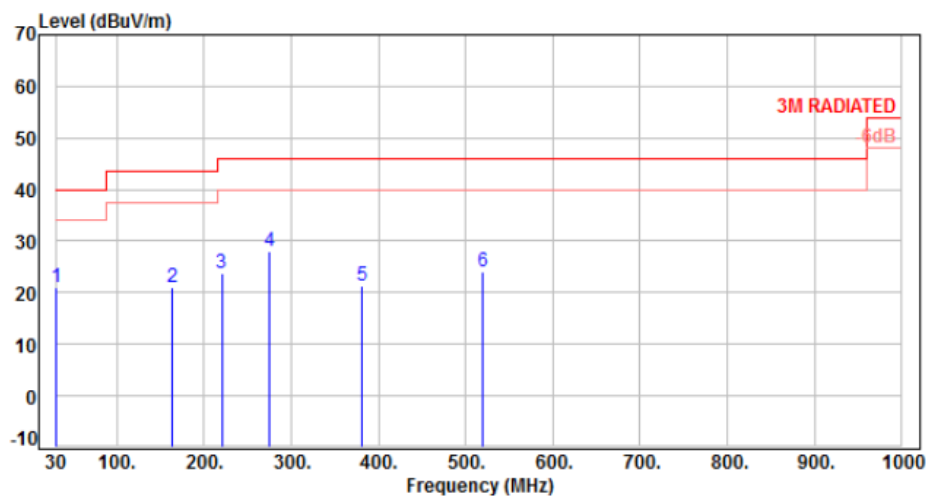
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 110V / 60Hz	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1, CH39		



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	30.00	-10.17	31.22	21.05	40.00	-18.95	Peak	100	0	P
2	163.86	-9.50	30.48	20.98	43.50	-22.52	Peak	100	0	P
3	220.12	-11.93	35.76	23.83	46.00	-22.17	Peak	100	0	P
4	274.44	-9.21	37.15	27.94	46.00	-18.06	Peak	100	0	P
5	381.14	-6.17	27.38	21.21	46.00	-24.79	Peak	100	0	P
6	518.88	-3.10	27.19	24.09	46.00	-21.91	Peak	100	0	P

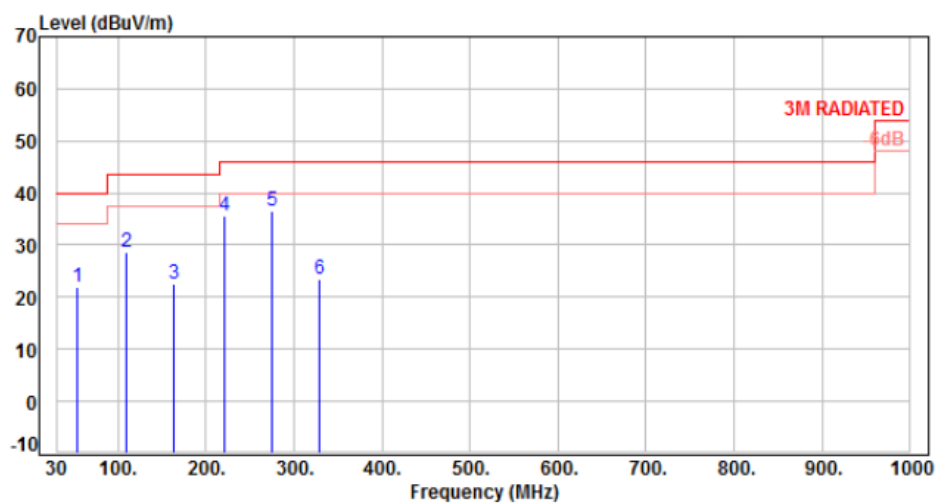
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 110V / 60Hz	Pol/Phase	: VERTICAL
Test Mode	: Mode 2, CH39		



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	53.62	-9.37	31.41	22.04	40.00	-17.96	Peak	100	0	P
2	109.25	-12.52	41.06	28.54	43.50	-14.96	Peak	100	0	P
3	163.77	-9.49	32.02	22.53	43.50	-20.97	Peak	100	0	P
4	220.58	-11.93	47.46	35.53	46.00	-10.47	Peak	100	0	P
5	274.83	-9.20	45.77	36.57	46.00	-9.43	Peak	100	0	P
6	328.54	-7.54	31.00	23.46	46.00	-22.54	Peak	100	0	P

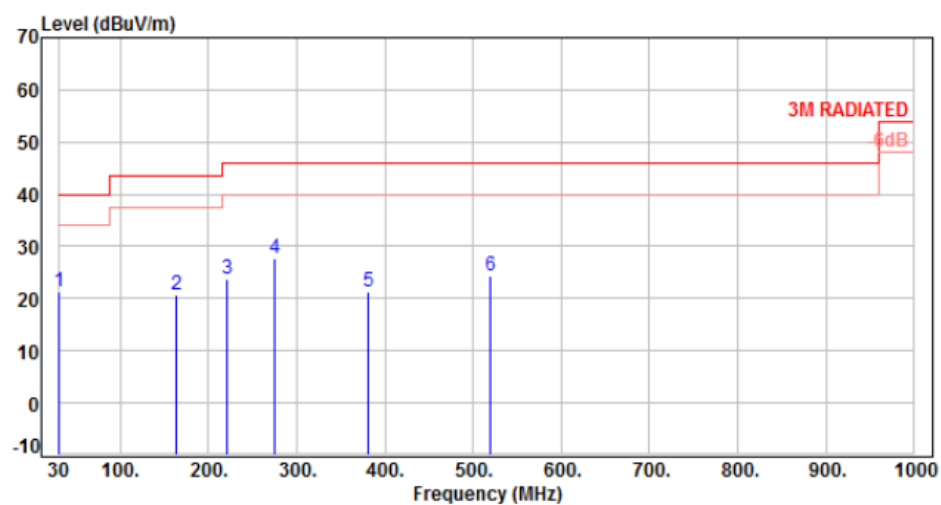
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 110V / 60Hz	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 2, CH39		



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	30.00	-10.17	31.43	21.26	40.00	-18.74	Peak	100	0	P
2	163.77	-9.49	30.26	20.77	43.50	-22.73	Peak	100	0	P
3	220.35	-11.93	35.64	23.71	46.00	-22.29	Peak	100	0	P
4	274.23	-9.22	36.94	27.72	46.00	-18.28	Peak	100	0	P
5	381.36	-6.16	27.64	21.48	46.00	-24.52	Peak	100	0	P
6	518.71	-3.10	27.35	24.25	46.00	-21.75	Peak	100	0	P

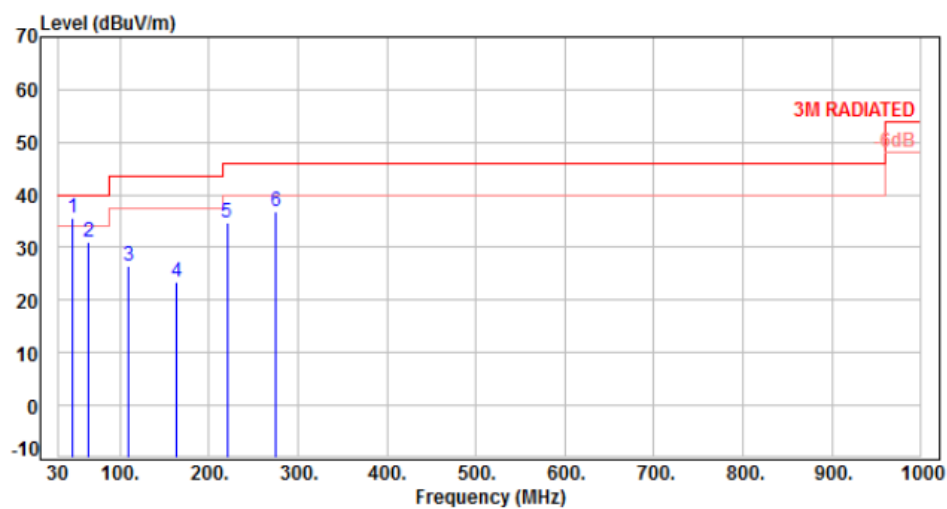
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 110V / 60Hz	Pol/Phase	: VERTICAL
Test Mode	: Mode 3		



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	47.46	-9.30	44.90	35.60	40.00	-4.40	Peak	100	0	P
2	64.92	-10.68	41.60	30.92	40.00	-9.08	Peak	100	0	P
3	109.54	-12.50	39.11	26.61	43.50	-16.89	Peak	100	0	P
4	163.86	-9.50	33.01	23.51	43.50	-19.99	Peak	100	0	P
5	220.12	-11.93	46.79	34.86	46.00	-11.14	Peak	100	0	P
6	274.44	-9.21	46.08	36.87	46.00	-9.13	Peak	100	0	P

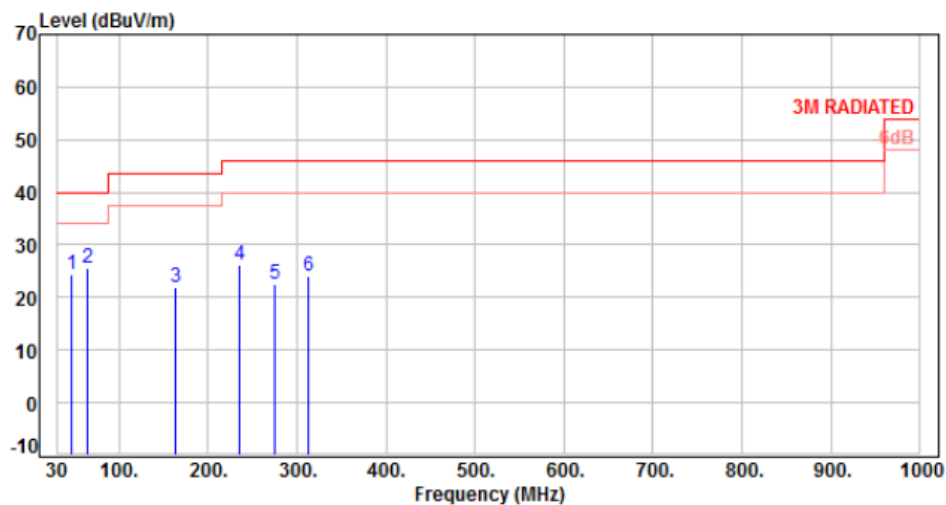
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 110V / 60Hz	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 3		



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	47.46	-9.30	33.68	24.38	40.00	-15.62	Peak	100	0	P
2	64.92	-10.68	36.23	25.55	40.00	-14.45	Peak	100	0	P
3	163.86	-9.50	31.36	21.86	43.50	-21.64	Peak	100	0	P
4	235.64	-10.78	36.93	26.15	46.00	-19.85	Peak	100	0	P
5	274.44	-9.21	31.67	22.46	46.00	-23.54	Peak	100	0	P
6	313.24	-8.11	32.23	24.12	46.00	-21.88	Peak	100	0	P

Note: Level=Reading+Factor

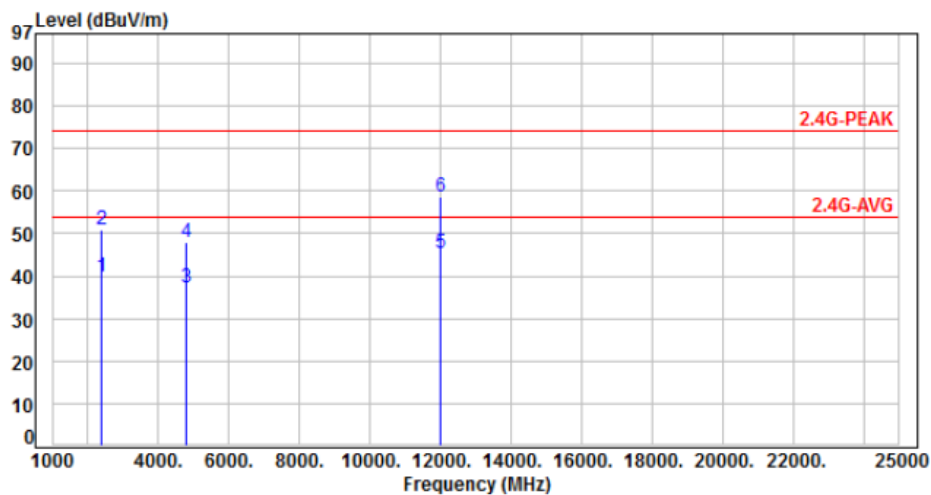
Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



5.6. 輻射之測試結果及數據 (1GHz ~ 25GHz)

Power	: AC 110V / 60Hz	Pol/Phase	: VERTICAL
Test Mode	: Mode 1, CH00		



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-3.64	43.36	39.72	54.00	-14.28	Average	100	200	P
2	2390.00	-3.64	54.45	50.81	74.00	-23.19	Peak	100	200	P
3	4804.00	3.65	33.45	37.10	54.00	-16.90	Average	100	220	P
4	4804.00	3.65	44.23	47.88	74.00	-26.12	Peak	100	220	P
5	12010.00	13.50	32.02	45.52	54.00	-8.48	Average	100	112	P
6	12010.00	13.50	45.00	58.50	74.00	-15.50	Peak	100	112	P

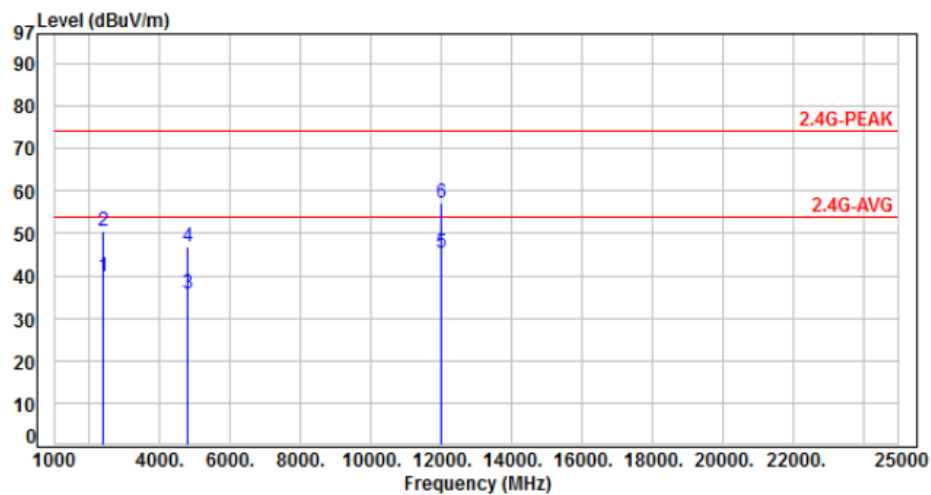
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 110V / 60Hz	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1, CH00		



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-3.64	43.40	39.76	54.00	-14.24	Average	100	115	P
2	2390.00	-3.64	54.26	50.62	74.00	-23.38	Peak	100	115	P
3	4804.00	3.65	32.12	35.77	54.00	-18.23	Average	100	258	P
4	4804.00	3.65	43.18	46.83	74.00	-27.17	Peak	100	258	P
5	12010.00	13.50	31.92	45.42	54.00	-8.58	Average	100	305	P
6	12010.00	13.50	43.65	57.15	74.00	-16.85	Peak	100	305	P

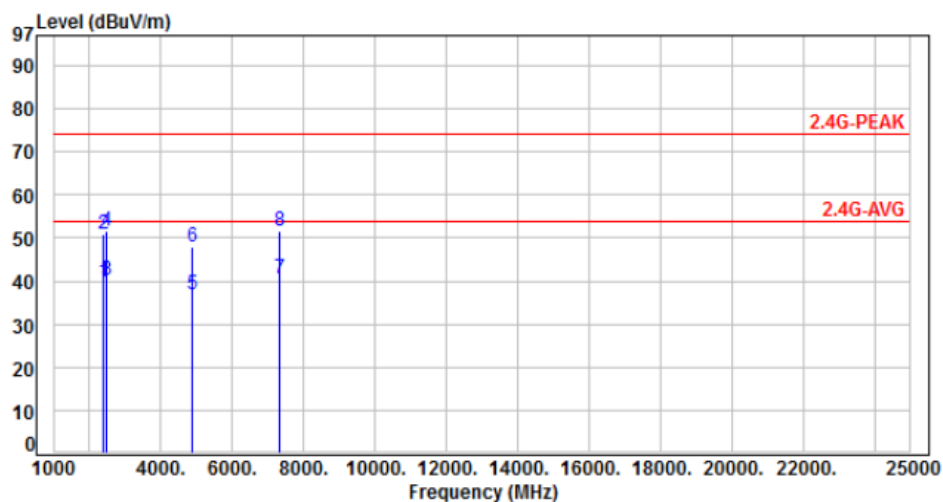
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 110V / 60Hz	Pol/Phase	: VERTICAL
Test Mode	: Mode 1, CH19		



No.	Frequency (MHz)	Factor (dB)	Reading (dBUV)	Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-3.64	43.33	39.69	54.00	-14.31	Average	100	211	P
2	2390.00	-3.64	54.35	50.71	74.00	-23.29	Peak	100	211	P
3	2483.50	-3.30	43.35	40.05	54.00	-13.95	Average	100	211	P
4	2483.50	-3.30	54.86	51.56	74.00	-22.44	Peak	100	211	P
5	4880.00	3.97	32.79	36.76	54.00	-17.24	Average	100	262	P
6	4880.00	3.97	43.80	47.77	74.00	-26.23	Peak	100	262	P
7	7320.00	8.83	31.87	40.70	54.00	-13.30	Average	100	355	P
8	7320.00	8.83	42.99	51.82	74.00	-22.18	Peak	100	355	P

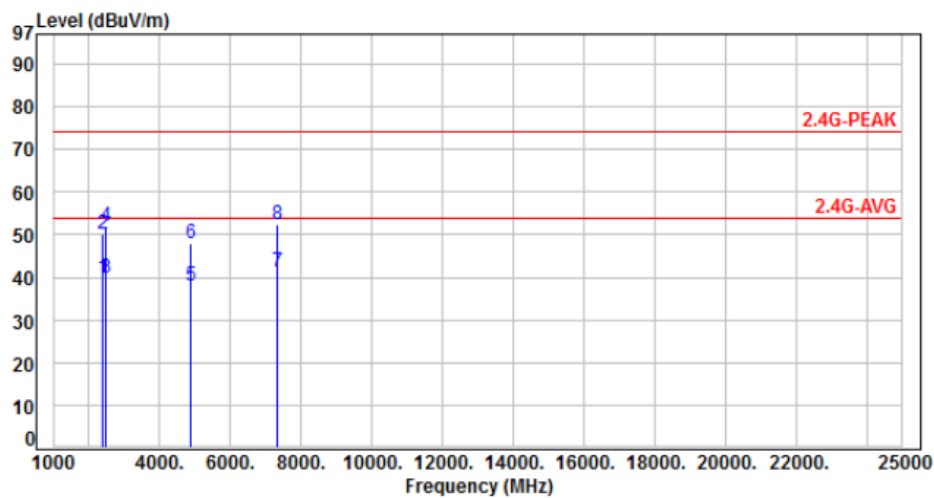
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 110V / 60Hz	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1, CH19		



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-3.64	43.55	39.91	54.00	-14.09	Average	100	126	P
2	2390.00	-3.64	53.97	50.33	74.00	-23.67	Peak	100	126	P
3	2483.50	-3.30	43.21	39.91	54.00	-14.09	Average	100	126	P
4	2483.50	-3.30	55.45	52.15	74.00	-21.85	Peak	100	126	P
5	4880.00	3.97	33.85	37.82	54.00	-16.18	Average	100	213	P
6	4880.00	3.97	43.80	47.77	74.00	-26.23	Peak	100	213	P
7	7320.00	8.83	32.48	41.31	54.00	-12.69	Average	100	0	P
8	7320.00	8.83	43.66	52.49	74.00	-21.51	Peak	100	0	P

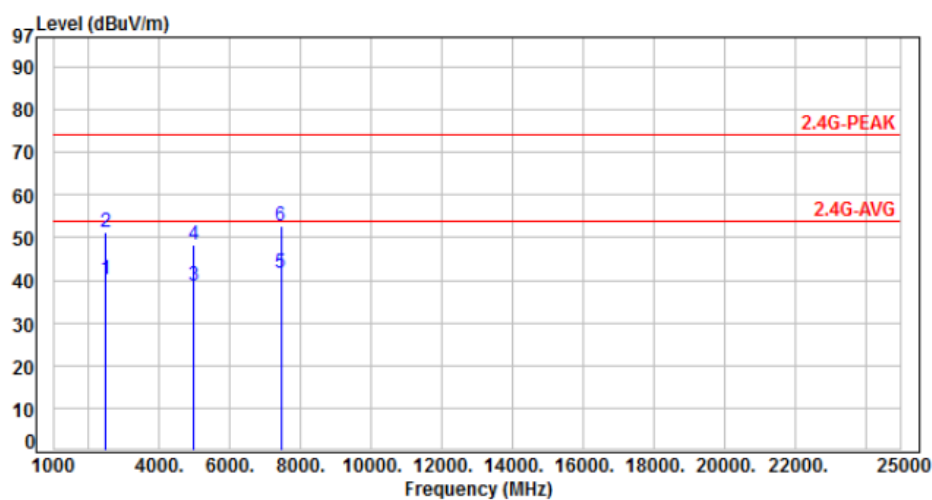
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 110V / 60Hz	Pol/Phase	: VERTICAL
Test Mode	: Mode 1, CH39		



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2483.50	-3.30	43.32	40.02	54.00	-13.98	Average	100	197	P
2	2483.50	-3.30	54.64	51.34	74.00	-22.66	Peak	100	197	P
3	4960.00	4.21	34.45	38.66	54.00	-15.34	Average	100	260	P
4	4960.00	4.21	44.20	48.41	74.00	-25.59	Peak	100	260	P
5	7440.00	8.98	32.74	41.72	54.00	-12.28	Average	100	352	P
6	7440.00	8.98	43.89	52.87	74.00	-21.13	Peak	100	352	P

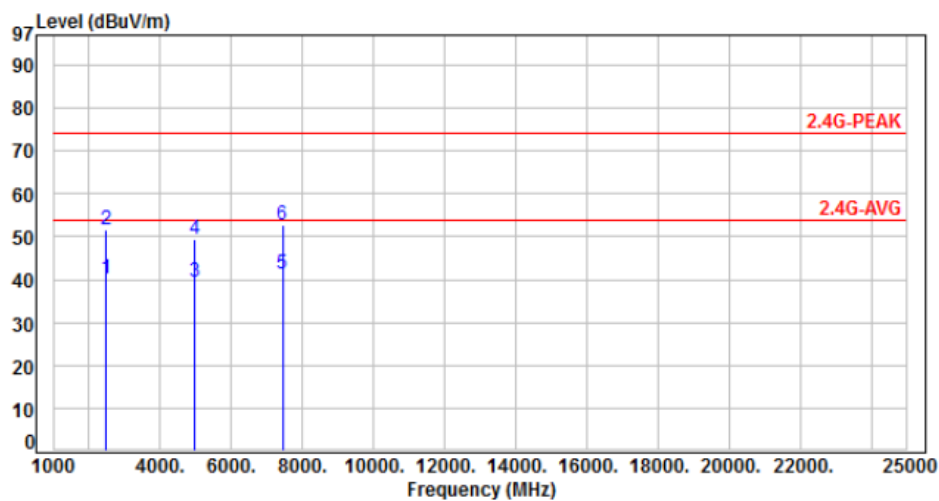
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 110V / 60Hz	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1, CH39		



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2483.50	-3.30	43.35	40.05	54.00	-13.95	Average	100	141	P
2	2483.50	-3.30	54.91	51.61	74.00	-22.39	Peak	100	141	P
3	4960.00	4.21	35.25	39.46	54.00	-14.54	Average	100	214	P
4	4960.00	4.21	45.28	49.49	74.00	-24.51	Peak	100	214	P
5	7440.00	8.98	32.51	41.49	54.00	-12.51	Average	100	2	P
6	7440.00	8.98	43.81	52.79	74.00	-21.21	Peak	100	2	P

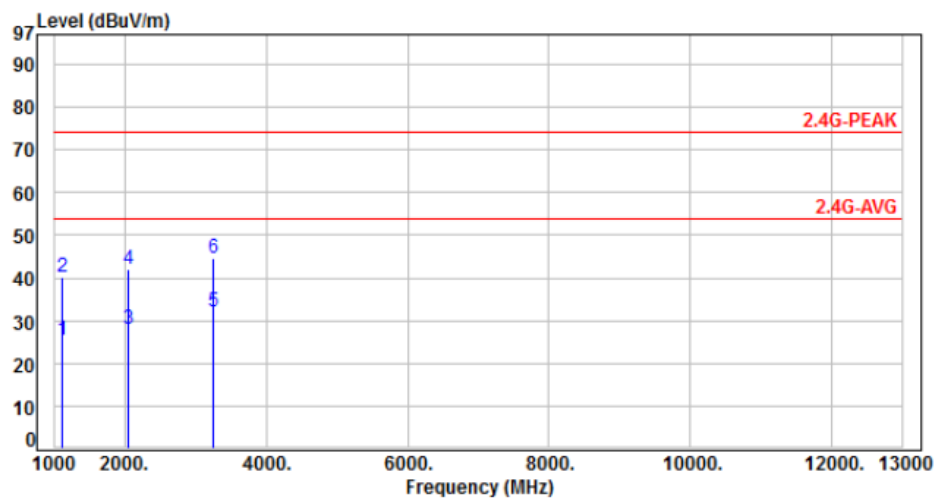
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 110V / 60Hz	Pol/Phase	: VERTICAL
Test Mode	: Mode 2, CH00		



No.	Frequency (MHz)	Factor (dB)	Reading (dBUV)	Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	1107.00	-10.05	35.38	25.33	54.00	-28.67	Average	100	26	P
2	1107.00	-10.05	50.40	40.35	74.00	-33.65	Peak	100	26	P
3	2050.00	-4.66	32.75	28.09	54.00	-25.91	Average	100	336	P
4	2050.00	-4.66	46.70	42.04	74.00	-31.96	Peak	100	336	P
5	3252.00	0.12	31.98	32.10	54.00	-21.90	Average	100	58	P
6	3252.00	0.12	44.40	44.52	74.00	-29.48	Peak	100	58	P

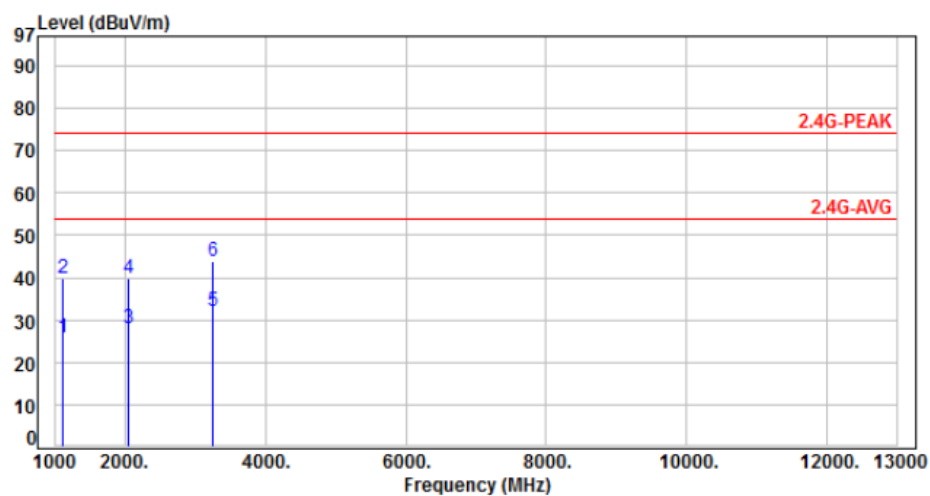
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 110V / 60Hz	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 2, CH00		



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	1107.00	-10.05	35.78	25.73	54.00	-28.27	Average	112	156	P
2	1107.00	-10.05	49.80	39.75	74.00	-34.25	Peak	112	156	P
3	2050.00	-4.66	32.60	27.94	54.00	-26.06	Average	100	347	P
4	2050.00	-4.66	44.66	40.00	74.00	-34.00	Peak	100	347	P
5	3252.00	0.12	31.92	32.04	54.00	-21.96	Average	100	116	P
6	3252.00	0.12	43.60	43.72	74.00	-30.28	Peak	100	116	P

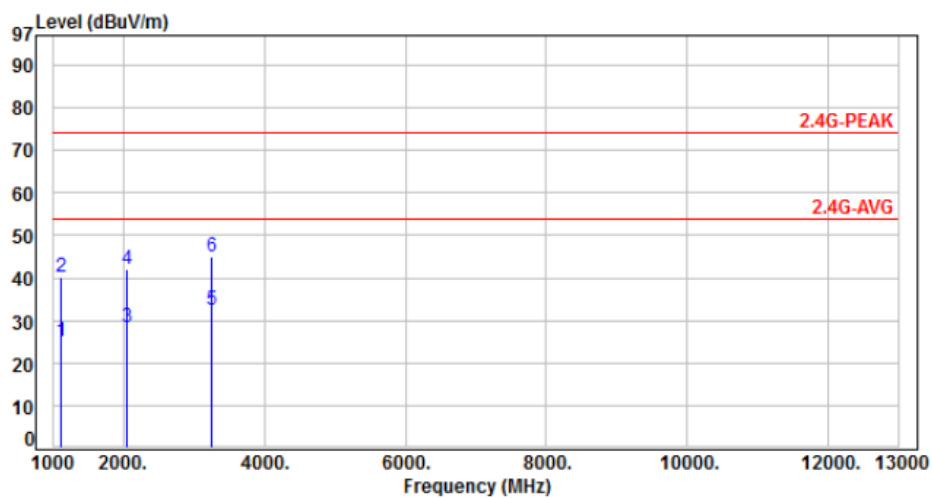
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 110V / 60Hz	Pol/Phase	: VERTICAL
Test Mode	: Mode 2, CH19		



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	1107.00	-10.05	35.26	25.21	54.00	-28.79	Average	100	22	P
2	1107.00	-10.05	50.17	40.12	74.00	-33.88	Peak	100	22	P
3	2050.00	-4.66	33.05	28.39	54.00	-25.61	Average	100	340	P
4	2050.00	-4.66	46.70	42.04	74.00	-31.96	Peak	100	340	P
5	3252.00	0.12	32.52	32.64	54.00	-21.36	Average	100	65	P
6	3252.00	0.12	44.79	44.91	74.00	-29.09	Peak	100	65	P

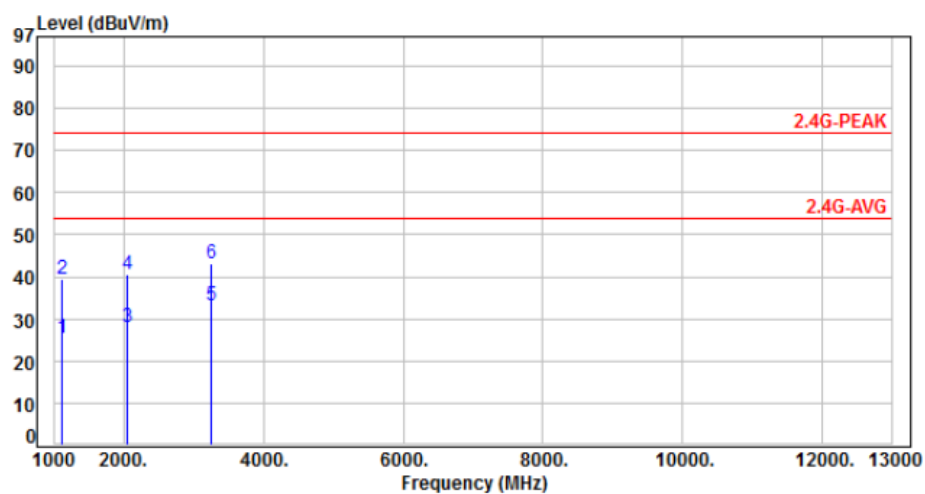
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 110V / 60Hz	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 2, CH19		



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	1107.00	-10.05	35.36	25.31	54.00	-28.69	Average	112	158	P
2	1107.00	-10.05	49.37	39.32	74.00	-34.68	Peak	112	158	P
3	2050.00	-4.66	32.57	27.91	54.00	-26.09	Average	100	333	P
4	2050.00	-4.66	45.08	40.42	74.00	-33.58	Peak	100	333	P
5	3252.00	0.12	33.21	33.33	54.00	-20.67	Average	100	112	P
6	3252.00	0.12	42.93	43.05	74.00	-30.95	Peak	100	112	P

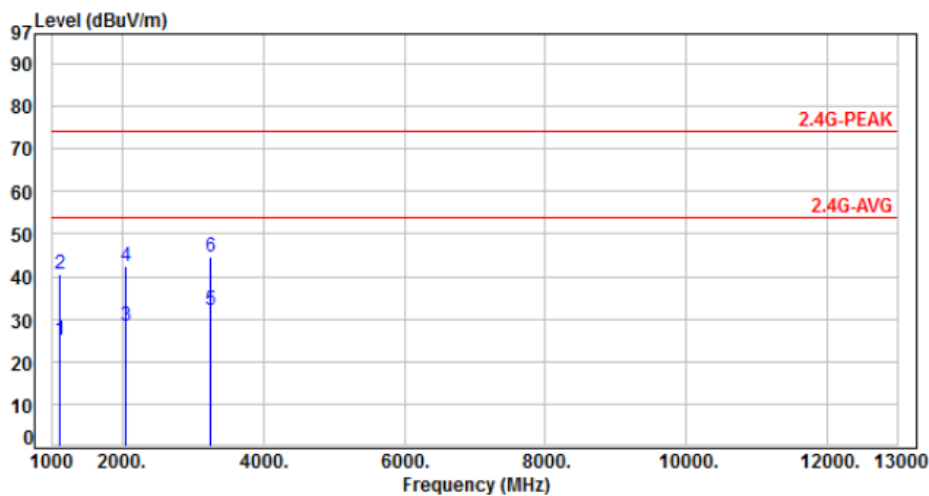
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 110V / 60Hz	Pol/Phase	: VERTICAL
Test Mode	: Mode 2, CH39		



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	1107.00	-10.05	35.27	25.22	54.00	-28.78	Average	100	32	P
2	1107.00	-10.05	50.64	40.59	74.00	-33.41	Peak	100	32	P
3	2050.00	-4.66	33.14	28.48	54.00	-25.52	Average	100	330	P
4	2050.00	-4.66	47.17	42.51	74.00	-31.49	Peak	100	330	P
5	3252.00	0.12	31.98	32.10	54.00	-21.90	Average	100	58	P
6	3252.00	0.12	44.40	44.52	74.00	-29.48	Peak	100	58	P

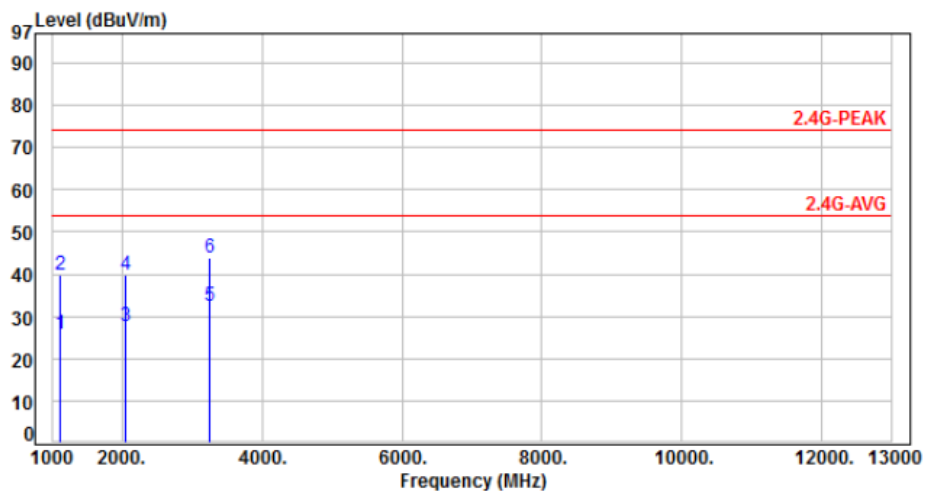
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 110V / 60Hz	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 2, CH39		



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	1107.00	-10.05	35.91	25.86	54.00	-28.14	Average	112	160	P
2	1107.00	-10.05	49.91	39.86	74.00	-34.14	Peak	112	160	P
3	2050.00	-4.66	32.47	27.81	54.00	-26.19	Average	100	340	P
4	2050.00	-4.66	44.52	39.86	74.00	-34.14	Peak	100	340	P
5	3252.00	0.12	32.43	32.55	54.00	-21.45	Average	100	110	P
6	3252.00	0.12	43.79	43.91	74.00	-30.09	Peak	100	110	P

Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



6. On Time, Duty Cycle and Measurement methods

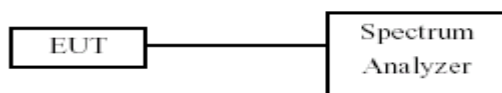
6.1. 適用標準

None; for reporting purposes only.

6.2. 測試方法

ANSI 63.10 第11.6節 Duty cycle zero-span mode Method.

6.3. 測試配置



6.4. 測試結果及數據

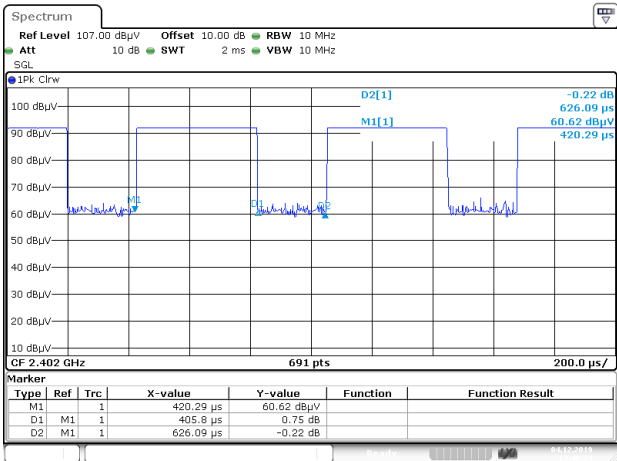
Modulation Type	On Time (ms)	Period Time (ms)	Duty Cycle (%)
GFSK	0.41	0.63	64.81%

備註：繪圖資料請參考下頁。



Modulation Type: GFSK

)





7. 6dB 頻寬之規定

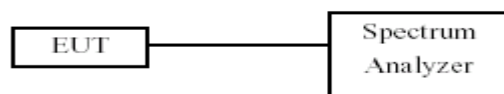
7.1. 適用標準

對使用數位調變技術之低功率發射機，依據國家通訊傳播委員會低功率射頻電機技術規範 3.10.1.6 節之(2)(A)規定，6dB 頻寬至少應有 500 kHz。

7.2. 測試方法

- 將待測物和儀器相連接。
- 設定儀器解析頻寬 100KHz 和視訊頻寬為 300KHz。
- 量測峰值減去 6 dB 之頻寬並記錄於報告中。

7.3. 測試配置



7.4. 6dB 頻寬之測試結果及數據

Modulation Type	Channel	Frequency (MHz)	6dB Bandwidth (KHz)	Limit (KHz)
GFSK(1Mbps)	0	2402	666.00	500
	19	2440	678.00	500
	39	2480	672.00	500

備註：繪圖資料請參考下頁。

7.5. 結果判定

高、中、低頻段的 6dB 頻寬皆大於 500 KHz，合乎標準規定。



8. 峰值輸出功率之規定

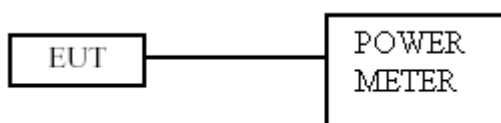
8.1. 適用標準

依據國家通訊傳播委員會低功率射頻電機技術規範 3.10.1.2 節(1)(C)之規定，對使用數位調變技術之低功率發射機，其輸出峰值功率不得大於 1 Watt，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)。放寬之條件請參考天線增益之要求。

8.2. 測試方法

- 將待測物和儀器相連接。
- 量測輸出功率並記錄於報告中。

8.3. 測試配置



8.4. 峰值輸出功率之測試結果及數據

(1M bps)

Power Set	Modulation Type	Channel	Frequency (MHz)	Power Output (dBm)		Power Output (mW)	
				Peak	Average	Peak	Average
0x04	GFSK	0	2402	7.31	7.36	5.383	5.445
0x04		19	2440	7.34	7.41	5.420	5.508
0x04		39	2480	7.39	7.45	5.483	5.559

*Average power is for reference only.

8.5. 結果判定

高、中、低頻段的峰值輸出功率皆低於 30 dBm，合乎標準規定。



9. 混附波發射限制之規定

9.1. 適用方法

依據國家通訊傳播委員會低功率射頻電機技術規範 3.10.1.5 節之規定，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，其衰減值限制如下：

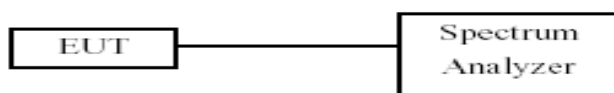
- (1) 輸出功率以峰值輸出功率方式量測者，至少需衰減 20dB，可使用射頻傳導或輻射方式測量。
- (2) 輸出功率以 3.10.1.2(1)(C)之最大傳導輸出功率測量方式者，至少需衰減 30dB，可使用射頻傳導或輻射方式測量。

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。

9.2. 測試方法

1. 將待測物和儀器相連接。
2. 設定儀器解析頻寬為 100 kHz 和視訊頻寬為 300 kHz。
3. 將頻寬展開至 100 MHz。
4. 量測並記錄於報告中。

9.3. 測試配置

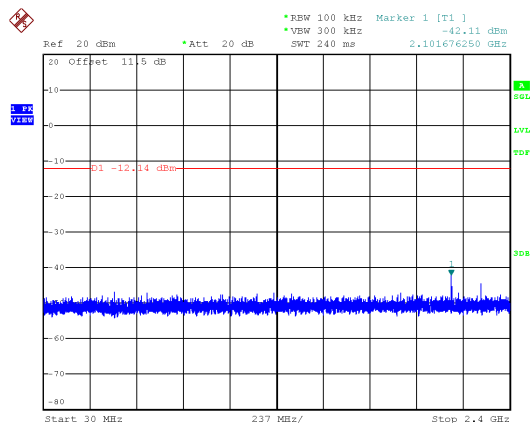
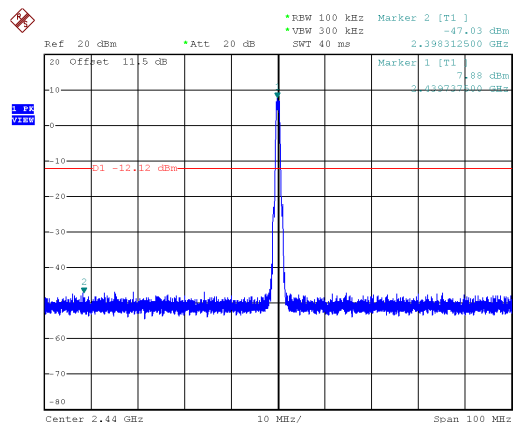
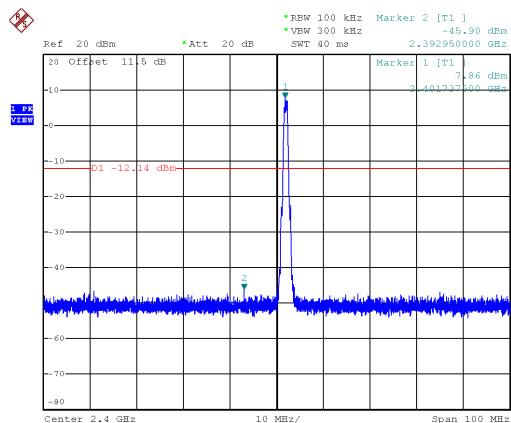
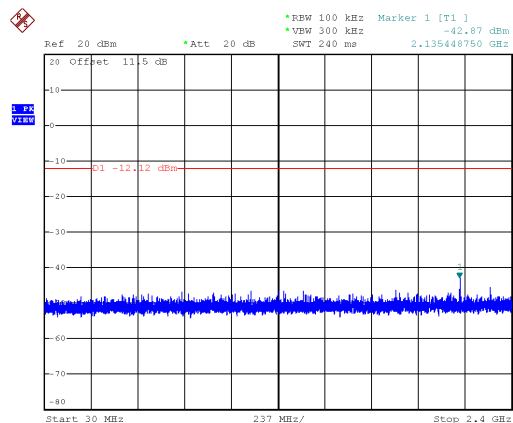


9.4. 結果判定

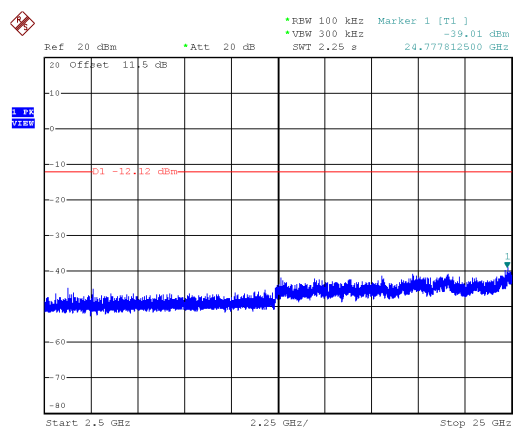
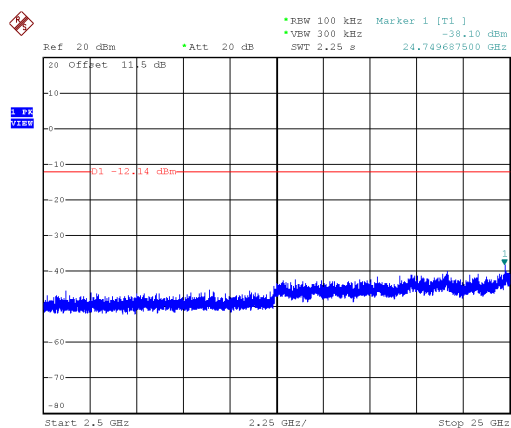
7.6.1 下邊緣頻帶：距下頻帶邊緣 40MHz 內最大混附波比主波低 20dB 以上，合乎標準規定。

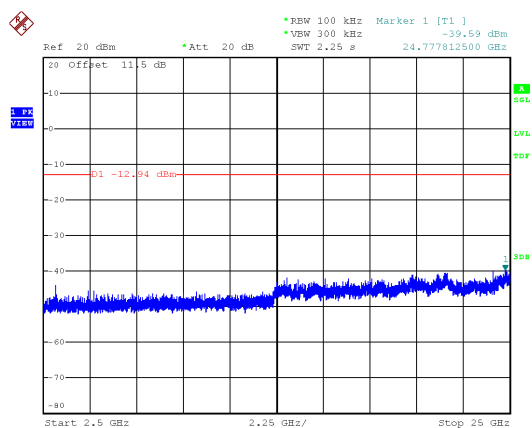
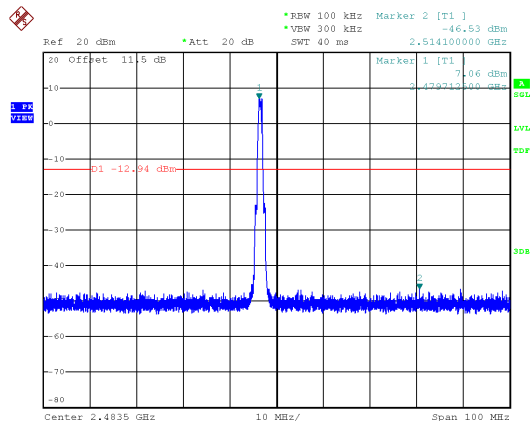
7.6.2 上邊緣頻帶：距上頻帶邊緣 40MHz 內最大混附波比主波低 20dB 以上，合乎標準規定。

備註：繪圖資料請參考下頁。

Modulation Type: GFSK
CH00Modulation Type: GFSK
CH19

D.







10. 功率密度之規定

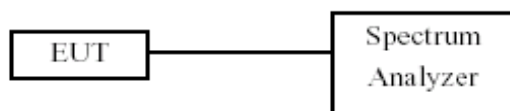
10.1. 適用標準

依據國家通訊傳播委員會低功率射頻電機技術規範 3.10.1.6 節之(2)(B)規定，對數位調變技術系統，在使用任意 3 kHz 之頻寬內，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，且應依 3.10.1.3 之方式降低功率頻譜密度限制值。

10.2. 測試方法

1. 將待測物和儀器相連接。
2. 設定儀器解析頻寬為 3kHz、視訊頻寬為 10 kHz。
3. 量測並記錄於報告中。

10.3. 測試配置



10.4. 功率密度之量測結果及數據

Modulation Type	Channel	Frequency (MHz)	Maximum Power Density of 3KHz Bandwidth(dBm)	Limit
GFSK(1Mbps)	0	2402	-7.01	8.00
	19	2440	-7.01	8.00
	39	2480	-7.12	8.00

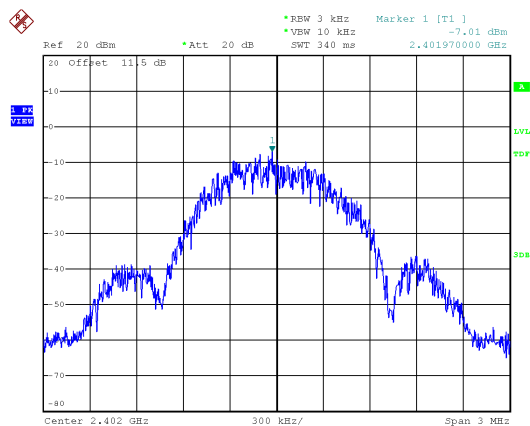
備註：繪圖資料請參考下頁。

10.5. 結果判定

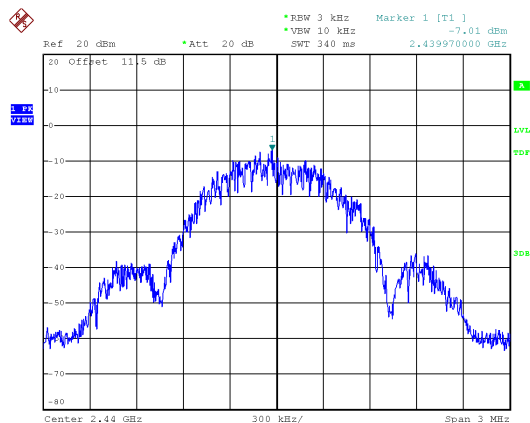
高、中、低頻段的3 kHz功率密度皆低於 8 dBm，合乎標準規定。



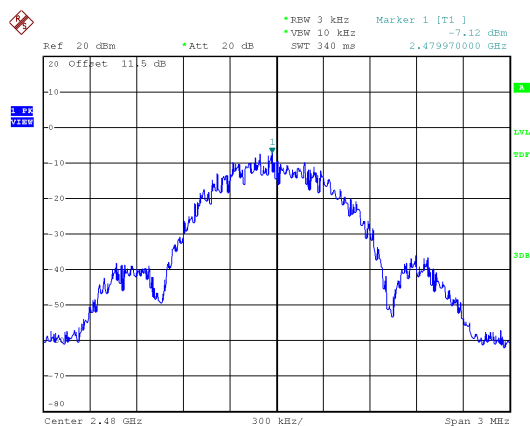
Modulation Type: GFSK CH00



Modulation Type: GFSK (1Mbps) CH19



Modulation Type: GFSK (1Mbps) CH39





11. 電波暴露量之評估

11.1. Applicable Standards

The measurements shown in this test report were made in accordance with the procedures given in FCC Part 2 (Section 2.1093)

LIMIT

KDB 447498 D01 § 4.3(a)

For 100 MHz to 6 GHz and test separation distances ≤ 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$ for 1-g SAR, and ≤ 7.5 for 10-g extremity SAR, where

*f(GHz) is the RF channel transmit frequency in GHz

* Power and distance are rounded to the nearest mW and mm before calculation

*The result is rounded to one decimal place for comparison

*The values 3.0 and 7.5 are referred to as numeric thresholds in step b) below

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm, and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to 4.1 f) is applied to determine SAR test exclusion

11.2.EUT Specification

Frequency band (Operating)	☐ WLAN: 2412MHz ~ 2462MHz ☒ Bluetooth: 2402MHz ~ 2480MHz
Device category	☒ Portable (<20cm separation) ☐ Mobile (>20cm separation)
Exposure classification	☐ Occupational/Controlled exposure ☒ General Population/Uncontrolled exposure
Antenna diversity	☒ Single antenna ☐ Multiple antennas ☐ Tx diversity ☐ Rx diversity ☐ Tx/Rx diversity
Evaluation applied	☐ MPE Evaluation* ☒ SAR Evaluation ☐ N/A

Remark:

1. The maximum output power is 7.39 dBm (5.483mW) at 2480MHz (with 2.28dBi antenna gain.)
2. DTS device is not subject to routine RF evaluation; MPE estimate is used to justify the compliance.
3. For mobile or fixed location transmitters, no SAR consideration applied.

*Note: Simultaneous transmission is not applicable for this EUT.



TEST RESULTS

According to the KDB447498:

The SAR test exclusion thresholds Level:

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] * \text{sqrt}(\text{freq. in GHz}) < 3$$

Calculation

Channel Frequency (MHz)	Max. Conducted output power (dBm)	Max. Tune up power (dBm)	Max. Tune up power (mW)	Distance (mm)	SAR test exclusion thresholds (mW)
2402-2480	7.39	8.39	6.90	5	10.00

Since the source-based time-averaging conducted output power is well below the SAR low threshold level, so the EUT is considered to comply with SAR requirement without testing



12. 限制使用之頻帶

Only spurious emissions are permitted in any of the frequency bands listed below:

頻率(兆赫)	頻率(兆赫)	頻率(兆赫)
0.090 - 0.110	240.00 - 285.00	3332.0 - 3339.0
0.490 - 0.510	322.00 - 335.40	3345.8 - 3358.0
2.172 - 2.198	399.90 - 410.00	3500.0 - 4400.0
3.013 - 3.033	485.00 - 510.00	4500.0 - 5250.0
4.115 - 4.198	608.00 - 614.00	5350.0 - 5460.0
5.670 - 5.690	703.00 - 748.00	7250.0 - 7750.0
6.200 - 6.300	758.00 - 803.00	8025.0 - 8500.0
8.230 - 8.400	825.00 - 915.00	9000.0 - 9200.0
12.265 - 12.600	930.00 - 1240.0	9300.0 - 9500.0
13.340 - 13.430	1300.0 - 1427.0	10600 - 12700
14.965 - 15.020	1435.0 - 1626.5	13250 - 13400
16.700 - 16.755	1660.0 - 1770.0	14470 - 14500
19.965 - 20.020	1805.0 - 1865.0	15350 - 16200
25.500 - 25.700	1885.0 - 1900.0	17700 - 21400
37.475 - 38.275	1905.0 - 1985.0	22010 - 23120
73.500 - 75.400	2015.0 - 2025.0	23600 - 24000
108.00 - 138.00	2125.0 - 2165.0	31200 - 31800
149.90 - 150.05	2200.0 - 2300.0	36430 - 36500
156.70 - 156.90	2310.0 - 2390.0	38600 以上
162.01 - 167.17	2483.5 - 2900.0	
167.72 - 173.20	3260.0 - 3267.0	