

低功率射頻器材技術規範測試報告 (TLPR)

報告編號

RTBCVF-WTW-P20070246 R1

申請者

Siemens AG

產品名稱

Radar sensor for continuous level measurement of liquids

型號

SITRANS LR100, SITRANS LR110

製造廠商

Siemens AG

商標或廠牌

SIEMENS

該產品樣品試驗

國家通訊傳播委員會低功率射頻器材技術規範

依據之試驗標準

109 年 7 月 1 日訂定

試驗結果

合格

香港商立德國際商品試驗有限公司桃園分公司新竹實驗室

日期 110 年 05 月 21 日

報告簽署人簽章:

陳瓊美



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報告發行紀錄

Issue No.	Description	Date Issued
RTBCVF-WTW-P20070246	Original release.	109 年 10 月 21 日
RTBCVF-WTW-P20070246 R1	修改產品名稱，天線廠牌	110 年 05 月 21 日

證 明 書

產 品 名 稱： Radar sensor for continuous level measurement of liquids
商 標： SIEMENS
型 號： SITRANS LR100, SITRANS LR110
申 請 者： Siemens AG
量 測 規 範： 低功率射頻器材技術規範 LP0002 (109 年 7 月 1 日訂定)
ANSI C63.10-2013

香港商立德國際商品試驗有限公司桃園分公司在此證明上述待測設備樣品 (型號：SITRANS LR100, SITRANS LR110)，收件日期 109 年 07 月 13 日，於 109 年 08 月 12 日至 09 月 30 日，已在本公司的標準測試場地完成量測。報告中所描述之測試結果和待測設備的架構組合，均根據樣品實際的量測情況作詳實的記錄。

立德桃園分公司依“低功率射頻器材技術規範”、“電信管制射頻器材審驗管理辦法”製作測試結果報告。

特 此 證 明 ！

報告製作者：



官 君 怡 / 專員

， 日 期：

110 年 05 月 21 日

審 核 者：



陳 瓊 美 / 經理

， 日 期：

110 年 05 月 15 日

香港商立德國際商品試驗有限公司桃園分公司

實驗室地址：300 新竹市科學工業園區力行一路 1 號 E-2

此份報告不得摘錄複製，除全份
複製外，需經實驗室書面同意。



1 低功率射頻器材量測記錄表

申請廠商: Siemens AG

製造廠商: Siemens AG

申請廠商地址: Östliche Rheinbrückenstr. 50 D-76187 Karlsruhe, Germany

廠牌: SIEMENS

產品名稱: Radar sensor for continuous level measurement of liquids

型號: SITRANS LR100, SITRANS LR110

量測單位名稱: 香港商立德國際商品試驗有限公司桃園分公司 新竹實驗室

量測單位地址: 300 新竹市科學工業園區力行一路 1 號 E-2

量測單位認可編號: TAF 2022

量測規範: 低功率射頻器材技術規範 LP0002 (訂定日期: 109 年 7 月 1 日)
ANSI C63.10-2013

項次	量測項目	規 範	量測結果判定
1	主波發射頻寬	低功率射頻器材技術規範 4.15.2.5 節	合格
2	主波發射功率	低功率射頻器材技術規範 4.15.2.6 節	合格
3	輻射混附及帶外發射	低功率射頻器材技術規範 4.15.2.9 節	合格
4	電源線傳導干擾	低功率射頻器材技術規範 3.3 節	見註
5	天線之要求	低功率射頻器材技術規範 3.2 節 低功率射頻器材技術規範 4.15.2.7 節 低功率射頻器材技術規範 4.15.2.8 節	合格

註: 此待測設備只會使用於特殊工業地區且無與個人電腦做任何連接, 故免測傳導干擾測試。

最大暴露允許值(Maximum Permissible Exposure, MPE)

項次	量測項目	規 範	量測結果判定
1	電波暴露量	低功率射頻器材技術規範第 6.20.2 節	合格

備註: 量測結果之判定不考慮量測不確定度的貢獻。

2 一般敘述

2.1 待測設備

產品名稱：	Radar sensor for continuous level measurement of liquids
型號：	SITRANS LR100, SITRANS LR110
額定電源：	12 ~ 35Vdc
調變方式：	FMCW
載波頻率：	77~81GHz
發射功率：	17.97 dBm/8MHz (Peak EIRP)
天線種類：	見註
配件：	NA

註：

1. 此待測設備依銷售需求，其資料如下：

商標	Model	差異說明
SIEMENS	SITRANS LR100	Measurement Rang: 15M Process Connection: Thread 1" and 1 1/2"
SIEMENS	SITRANS LR110	Measurement Rang: 15M Process Connection: Thread 1" and 1 1/2"

此待測設備選擇型號：SITRANS LR100，做為檢測型號，型號：SITRANS LR110 經評估僅需檢測混附發射接收 Below 1GHz 測試。

2. 此裝置為 Radar sensor for continuous level measurement of liquids，其發射頻率落於 77 至 81 GHz，本測報測試頻道的中心頻率如下：

對應頻率 (GHz)
79
Note: FMCW 頻道數目是以在 77GHz - 81GHz 頻率不斷變化的連續波作偵測訊號，因此沒有一定的頻道數目。

3. 此待測設備同時具備 Bluetooth 介面及 TLPR 介面，相關介面對應之測試報告如下：

Function	Report No.
TLPR	RTBCVF-WTW-P20070246
Bluetooth	RTBCVF-WTW-P20070246-1

4. 此待測設備天線規格,詳列如下:

Brand	Model	Antenna Net Gain (dBi)	Frequency Range (GHz)	Antenna Type	Connector Type
SIEMENS	Radar antenna develop by VEGA	23.8	77-81	Metal horn antenna	None

*上述天線的規格資訊由申請者聲明，實驗室不承擔任何責任。

詳細之規格請參考使用說明書，產品的照片請參照 BV 編號: BCVF-WTW-P20070246-2。

2.2 輔助測試之週邊設備描述

待測設備於受測時均接上其所屬的配件或一般用途之相關設備；下列輔助設備或配件測試中所使用的配備，以形成一個代表待測物實際運作的受測系統。

No.	Product	Brand	Model No.	Serial No.	FCC ID	Remark
A	DC Power Supply	GOOD WILL INSTRUMENT CO.	GPC-3030D	E847076	NA	Provided by Lab

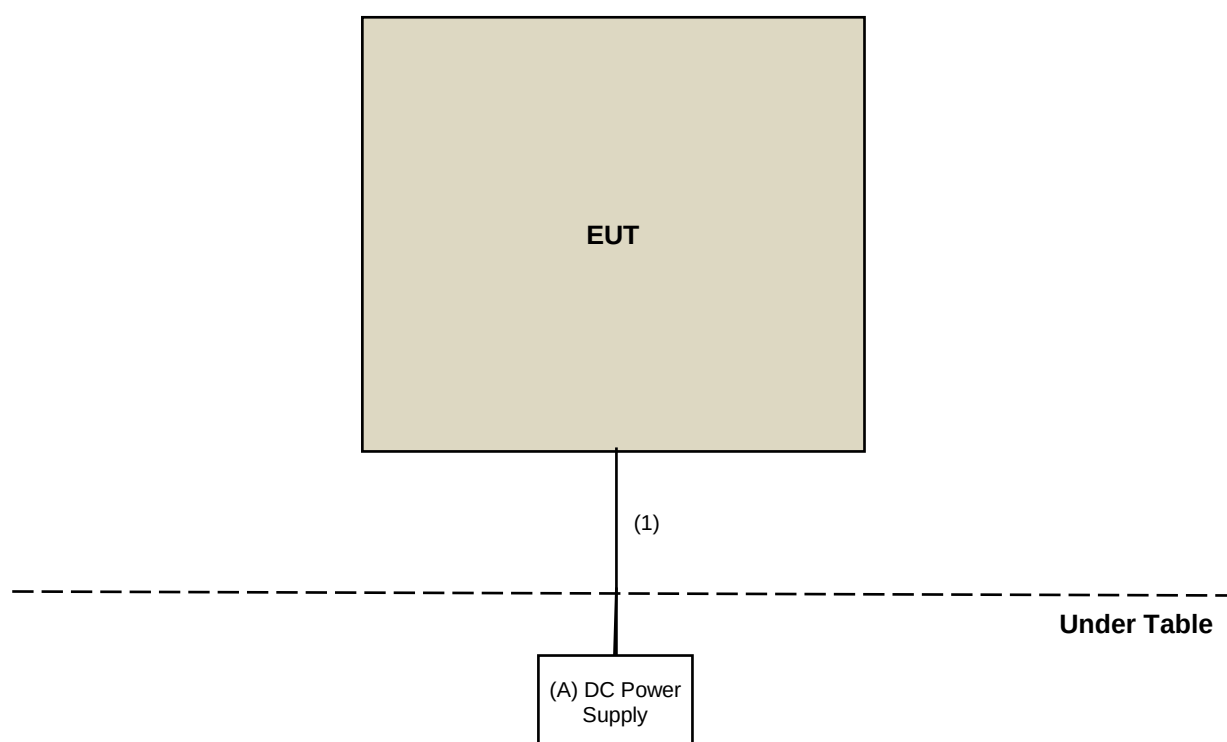
NOTE:

1. All power cords of the above support units are non-shielded (1.8 m).

No.	Cable	Qty.	Length (m)	Shielded (Yes/ No)	Cores (Number)	Remark
1	DC Cable	1	1.8	Yes	0	Supplied by client(Brand:SIEMENS;Model:NA)

NOTE: 本案經申請者切結器材不提供隨貨配件，配件由實驗室(或申請者)提供併同檢驗。

2.3 測試架構圖



3 適用規範

3.1 規範要求

依據國家通訊傳播委員會低功率射頻器材技術規範 4.15.2 節之規定：

工作頻率為 77 GHz~81 GHz 者

器材型式：限用於桶槽位面探測雷達設備(Tank Level Probing Radar，TLPR)。

(1) 主波發射頻寬 (emission bandwidth)：

(a) 主波發射頻寬 ≥ 50 MHz。

(b) 主波發射頻寬須維持在 77 GHz~81 GHz 內。

(c) 主波發射頻寬係量測訊號兩點之間寬度而得，此兩點是載波中心頻率上下兩邊，相對於最高發射功率降低 10 dB 處。

(2) 主波發射功率：

(a) 主波最大發射功率限制值如下：

(1) 在指定的發射頻寬內，任意 1 MHz 範圍以平均值檢波器測量之平均發射功率 EIRP 應小於或等於 -3 dBm。

(2) 以最大平均功率之頻率點為中心，在 50 MHz 範圍內以峰值檢波器測量之峰值發射功率 EIRP 應小於或等於 34 dBm。

(b) 以峰值檢波器測量時，若採用小於 50 MHz 的解析頻寬，則其峰值 EIRP 限制值應加上修正因子 $20\log(\text{RBW}/50)$ dB，其中 RBW 單位為 MHz。

(c) RBW 介於 1 MHz~50 MHz 時，且 VBW 須大於等於 RBW。

(3) 輻射混附及帶外發射：

若能明確指出輻射源於啟動發射機的數位電路，且非經由天線所輻射者，則其輻射值應符合 3.6 之規定，附屬數位設備輻射值亦同。決定 -10 dB 頻寬或最大發射之頻率時，不應計入數位電路產生的輻射。

依據國家通訊傳播委員會低功率射頻器材技術規範之 3.6 節，輻射混附及帶外發射之限制要求如下：

頻率(MHz)	電場強度(微伏特/公尺, uV/m)	測距(公尺)
$0.009 \leq f \leq 0.490$	2,400/f(kHz)	300
$0.490 < f \leq 1.705$	24,000/f(kHz)	30
$1.705 < f < 30$	30	30
$30 \leq f \leq 88$	100	3
$88 < f \leq 216$	150	3
$216 < f \leq 960$	200	3
$960 < f$	500	3

(4) 傳導之規定

依據國家通訊傳播委員會低功率射頻器材技術規範之 3.3 節，電源傳導干擾之限制要求如下：

頻率(MHz)	傳導限制值 (dBuV)	
	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。

(5) 天線之規定

- a. 低功率射頻器材之發射機或收發信機所使用之天線，除本規範章節中另有規定外，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。
- b. 天線波束寬度限制值：天線之-3 dB 波束寬度應 ≤ 8 度。
- c. 天線旁波束增益限制值：主波束離軸角度(off-axis angles)60 度以外的天線旁波束增益應比主波束增益衰減 38 dB 以上。

(6) 電波暴露量之評估

依據國家通訊傳播委員會低功率射頻器材技術規範 6.20.2 節之規定，若受測物於正常操作模式下，其發射機距離人體 20 公分以上者，可測試最大暴露允許值(Maximum Permissible Exposure, MPE)以證明其符合電波暴露量之要求。

限制值如下：

(1) 職業性/可控制之暴露

頻率範圍 (MHz)	電場強度 (V/m)	磁場強度 (A/m)	功率密度 (mW/cm ²)	平均時間 (minutes)
0.3 - 3.0	614	1.63	*100	6
3 - 30	1842/f	4.89/f	*900/f ²	6
30 - 300	61.4	0.163	1.0	6
300 - 1,500	---	---	f/300	6
1,500 - 100,000	---	---	5.0	6

註 1：標記*表平面波等效功率密度。

註 2：f 表測試頻率，單位：MHz。

(2) 一般人/不可控制之暴露

頻率範圍 (MHz)	電場強度 (V/m)	磁場強度 (A/m)	功率密度 (mW/cm ²)	平均時間 (minutes)
0.3 - 3.0	614	1.63	*100	30
3 - 30	1842/f	4.89/f	*180/f ²	30
30 - 300	27.5	0.073	1.0	30
300 - 1,500	---	---	f/1500	30
1,500 - 100,000	---	---	1.0	30

註 1：標記*表平面波等效功率密度。

註 2：f 表測試頻率，單位：MHz。

3.2 限制使用之頻帶

除本規範另有規定外，任何低功率射頻器材之主波皆不得使用下表所列各頻段之頻率；低功率射頻器材落於下表所列頻段之混附發射，其電場強度必須符合 3.6 之限制規定。

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	1660.0~1785.0	14470~14500
19.965~20.020	1805.0~1880.0	15350~16200
25.500~25.700	1885.0~1900.0	17700~21400
37.475~38.275	1905.0~1985.0	22010~23120
73.500~75.400	2010.0~2025.0	23600~24000
108.00~138.00	2110.0~2170.0	31200~31800
149.90~150.05	2200.0~2300.0	36430~36500
156.70~156.90	2310.0~2390.0	38600 以上
162.01~167.17	2483.5~2900.0	
167.72~173.20	3260.0~3267.0	

4 主波發射功率

4.1 適用標準

請見本報告 3.1 節第(2)項的規定。

4.2 量測方法

Frequency Range above 40GHz

- a. Connect the test antenna covering the appropriate frequency range to a spectrum analyzer via an external mixer to the spectrum analyzer.
- b. Set spectrum analyzer RBW = 1 MHz, VBW = 3 MHz, average detector.
- c. Calculate the distance to the far field boundary and determine the maximum measurement distance.
- d. Perform an exploratory search for emissions and determine the approximate direction at which each observed emission emanates from the EUT.
- e. Exploratory measurements be made at a closer distance than the validated maximum measurement distance.
- f. Perform a final measurement; begin with the test antenna at the approximate position where the maximum level occurred during the exploratory scan.
- g. Slowly scan the test antenna around this position, slowly vary the test antenna polarization by rotating through at least 0° to 180°, and slowly vary the orientation of the test antenna to find the final position, polarization, and orientation at which the maximum level of the emission is observed.
- h. Record the measured reading with the test antenna fixed at this maximized position, polarization, and orientation. Record the measurement distance.
- i. Calculate the maximum field strength of the emission at the measurement distance and the adjusted/corrected power at the output of the test antenna.
- j. Calculate the EIRP from the measured field strength and then convert to the linear.
- k. Calculate the power density at the distance specified by the limit from the field strength at the distance specified by the limit.
- l. Repeat the preceding sequence for every emission observed in the frequency band under investigation.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz/3MHz for average detection (AVG) fundamental average power test.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 8 MHz/50MHz for peak detection (PK) fundamental peak power test.

4.3 量測儀器

For above 40GHz test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer Keysight	N9030A	MY55330160	Feb. 07, 2020	Feb. 06, 2021
*Horn Antenna (33~55GHz) OML	M22RH	110215-1	Oct. 17, 2017	Oct. 16, 2020
*Horn Antenna (50~75GHz) OML	M15HWD	110215-1	Oct. 17, 2017	Oct. 16, 2020
*Horn Antenna (75~110GHz) OML	M10RH	110215-1	Oct. 17, 2017	Oct. 16, 2020
*Horn Antenna(110~170GHz) OML	M06HWD	110215-1	Oct. 17, 2017	Oct. 16, 2020
*Horn Antenna (140~220GHz) OML	M05RH	110215-1	Oct. 17, 2017	Oct. 16, 2020
*Horn Antenna (220~325GHz) OML	M03RH	M03RH_140508-1	Oct. 17, 2017	Oct. 16, 2020
**OXE89 Horn Antenna (33~55GHz) QuinStar	QWH-UCRR00	924200002	Jan. 20, 2020	Jan. 19, 2022
**Conical Horn Antenna (50~75GHz) Keysight	WR15CH-Conical	WR15CH_001	Jan. 20, 2020	Jan. 19, 2022
**Conical Horn Antenna (75~110GHz) Keysight	WR10CH-Conical	WR10CH_001	Jan. 20, 2020	Jan. 19, 2022
**Conical Horn Antenna (110~170GHz) Keysight	WR6.5CH-Conical	WR6.5CH_001	Jan. 20, 2020	Jan. 19, 2022
**Conical Horn Antenna (140~220GHz) Keysight	WR5.1CH-Conical	WR5.1CH_001	Dec. 09, 2019	Dec. 08, 2021
**Conical Horn Antenna (220~330GHz) Keysight	WR3.4DH-Diagonal	WR3.4DH_001	Dec. 09, 2019	Dec. 08, 2021
N9029AV15-DC9 - 50-75 GHz VDI Standard Downconverter with 9VDC supply Keysight	SA Extension WR15	SAX 381	CoC	CoC
N9029AV10-DC9 - 75-110 GHz VDI Standard Downconverter with 9VDC supply Keysight	SA Extension WR10	SAX 378	CoC	CoC
N9029AV06-DC9 - 110-170 GHz VDI Standard Downconverter with 9VDC supply Keysight	SA Extension WR6.5	SAX 377	CoC	CoC
**N9029AV05-DC9 - 140-220 GHz VDI Standard Downconverter with 9VDC supply Keysight	SA Extension WR5.1	SAX 375	Dec. 09, 2019	Dec. 08, 2021

**N9029AV03-DC9 - 220-330 GHz VDI Standard Downconverter with 9VDC supply Keysight	SA Extension	SAX 376	Dec. 09, 2019	Dec. 08, 2021
*Millimeter-Wave Signal Generator Frequency Extension Module (50~75 GHz) Keysight	E8257DV15	SGX 050	CoC	CoC
*Millimeter-Wave Signal Generator Frequency Extension Module (75~110 GHz) Keysight	E8257DV10	SGX 069	CoC	CoC
*Millimeter-Wave Signal Generator Frequency Extension Module (110~170 GHz) Keysight	E8257DV06-DC9	SGX 223	CoC	CoC
PSG analog signal generator Keysight	E8257D	MY53401987	June 17, 2020	June 16, 2021
**Power Meter VDI	PM5	431V	Dec. 09, 2019	Dec. 08, 2021
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	NA	NA

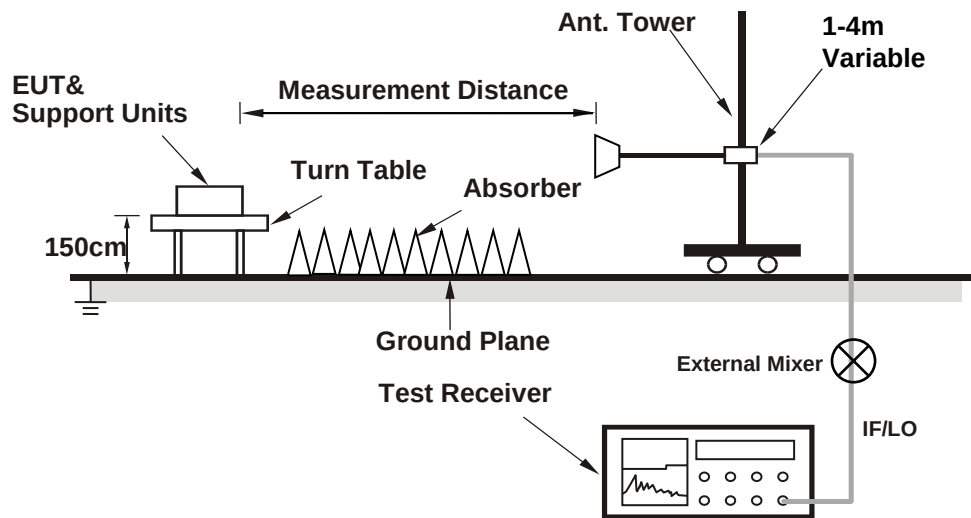
Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. *The calibration interval of the above test instruments is 36 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. **The calibration interval of the above test instruments is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
4. Certificate of Conformance (CoC) which is issued by manufacturer states that the product meets the specification.
5. The test was performed in 966 Chamber No. 6

Measurement	Frequency	Uncertainty
Radiated emissions	40GHz ~ 100GHz	5.4 dB

4.4 測試配置

< Fundamental Frequency >



4.5 量測結果

平均發射功率 EIRP

操作模式	發射	測試日期	109 年 09 月 30 日
量測場地溫度	22°C	測試儀器	(AV) RB=1MHz, VB=3MHz
量測場地濕度	62%RH	測試者	廖偉鈞

Antenna Polarity : Horizontal					
No.	Frequency (GHz)	E _{Meas} (dBμV/m)/MHz	EIRP Level (dBm/MHz)	EIRP Limit (dBm/MHz)	Pass/Fail
1	79.00	94.16	-7.02	-3.00	PASS

Antenna Polarity : Vertical					
No.	Frequency (GHz)	E _{Meas} (dBμV/m)/MHz	EIRP Level (dBm/MHz)	EIRP Limit (dBm/MHz)	Pass/Fail
1	79.00	98.07	-3.11	-3.00	PASS

Remarks:

1. The measured power level is converted to EIRP using the equation:

Follow ANSI 63.10 section 9.5 Equations to calculate EIRP

$$\text{EIRP Level (dBm/MHz)} = E_{\text{Meas}} (\text{dB}\mu\text{V/m}) + 20 \cdot \log(d_{\text{Meas}}) - 104.7$$

E_{meas} is the field strength of the emission at the measurement distance, in dBμV/m

d_{Meas} is the measurement distance, in m

Measurements made at 1.5 meter distance."

2. The far-field boundary is given in ANSI 63.10 as:

$$R \text{ far field} = (2 * L^2) / \lambda$$

L is the Largest Antenna Dimension of either the EUT antenna or measurement antenna, including the reflector

λ is the wavelength

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
79	0.045	0.00380	1.066

峰值發射功率 EIRP

操作模式	發射	測試日期	109 年 09 月 30 日
量測場地溫度	22°C	測試儀器	(PK) RB=8MHz, VB=50MHz
量測場地濕度	62%RH	測試者	廖偉鈞

Antenna Polarity : Horizontal					
No.	Frequency (GHz)	E _{Meas} (dBμV/m)/8MHz	EIRP Level (dBm/8MHz)	EIRP Limit (dBm/8MHz)	Pass/Fail
1	79.00	114.27	13.09	18.08	PASS

Antenna Polarity : Vertical					
No.	Frequency (GHz)	E _{Meas} (dBμV/m)/8MHz	EIRP Level (dBm/8MHz)	EIRP Limit (dBm/8MHz)	Pass/Fail
1	79.00	119.15	17.97	18.08	PASS

Remarks:

1. The measured power level is converted to EIRP using the equation:

Follow ANSI 63.10 section 9.5 Equations to calculate EIRP

$$\text{EIRP Level (dBm/MHz)} = E_{\text{Meas}} (\text{dB}\mu\text{V/m}) + 20 \cdot \log(d_{\text{Meas}}) - 104.7$$

E_{meas} is the field strength of the emission at the measurement distance, in dBμV/m

d_{Meas} is the measurement distance, in m

Measurements made at 1.5 meter distance."

2. The far-field boundary is given in ANSI 63.10 as:

$$R_{\text{far field}} = (2 \cdot L^2) / \lambda$$

L is the Largest Antenna Dimension of either the EUT antenna or measurement antenna, including the reflector

λ is the wavelength

3. RBW=8MHz

$$4. \text{Limit} = 34(\text{dBm}/50\text{MHz}) + 20 \cdot \log(8/50) = 18.08(\text{dBm}/8\text{MHz})$$

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
79	0.045	0.00380	1.066

4.6 量測結果判定

依據測試數據結果，符合低功率射頻器材技術規範之要求。

5 主波發射頻寬

5.1 適用標準

請見本報告 3.1 節第 5 項(1)的規定。

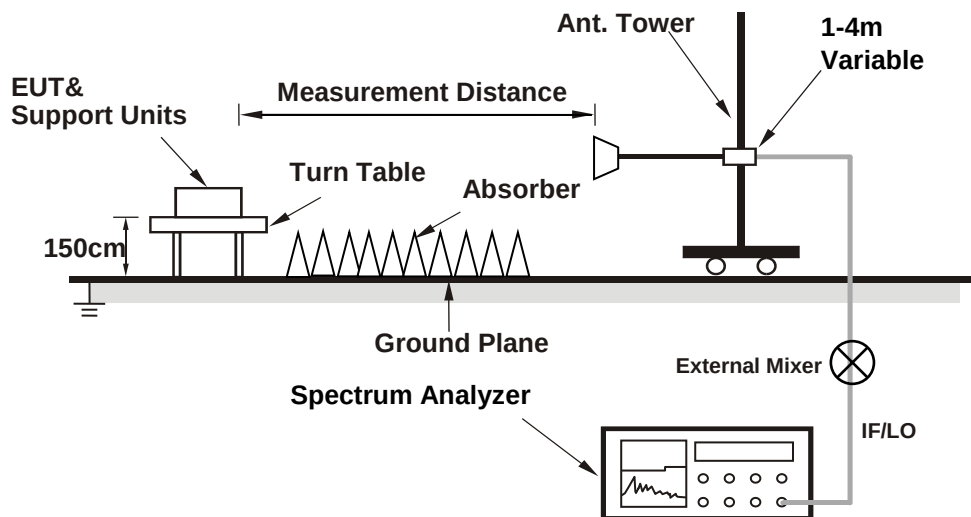
5.2 量測方法

- 將待測物輸出經由衰減器接到頻譜分析儀上。
- 設定待測物處於連續發射狀態。
- 計算最大輸出功率峰值減 10dB 的最大頻率範圍。

5.3 量測儀器

請見本報告 4.3 節

5.4 測試配置



5.5 量測結果

操作模式	發射	測試日期	109 年 09 月 30 日
量測場地溫度	22°C	量測場地濕度	62%RH
測試者	廖偉鈺		

Channel	Frequency (MHz)	10dB Bandwidth (MHz)	Pass / Fail
1	79000	3816.00	Pass

6 輻射混附及帶外發射

6.1 適用標準

請見本報告 3.1 節第(3)項的規定。

6.2 量測方法

Frequency Range below 30MHz

- a. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

Frequency Range 30MHz to 40GHz

- a. The EUT was placed on the top of a rotating table 1.5 meters above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters (30MHz-18GHz) / 1.5 meters (18GHz-40GHz) away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. All modes of operation were investigated and the worst-case emissions are reported.

Frequency Range above 40GHz

- a. Connect the test antenna covering the appropriate frequency range to a spectrum analyzer via an external mixer to the spectrum analyzer.
- b. Set spectrum analyzer RBW = 1 MHz, VBW = 3 MHz, average detector.
- c. Calculate the distance to the far field boundary and determine the maximum measurement distance.
- d. Perform an exploratory search for emissions and determine the approximate direction at which each observed emission emanates from the EUT.
- e. Exploratory measurements be made at a closer distance than the validated maximum measurement distance.
- f. Perform a final measurement; begin with the test antenna at the approximate position where the maximum level occurred during the exploratory scan.
- g. Slowly scan the test antenna around this position, slowly vary the test antenna polarization by rotating through at least 0° to 180°, and slowly vary the orientation of the test antenna to find the final position, polarization, and orientation at which the maximum level of the emission is observed.
- h. Record the measured reading with the test antenna fixed at this maximized position, polarization, and orientation. Record the measurement distance.
- i. Calculate the maximum field strength of the emission at the measurement distance and the adjusted/corrected power at the output of the test antenna.
- j. Calculate the EIRP from the measured field strength and then convert to the linear.
- k. Calculate the power density at the distance specified by the limit from the field strength at the distance specified by the limit.
- l. Repeat the preceding sequence for every emission observed in the frequency band under investigation.

6.3 量測儀器

For below 40GHz test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY51210202	Dec. 13, 2019	Dec. 12, 2020
Pre-Amplifier EMCI	EMC001340	980142	May 25, 2020	May 24, 2021
Loop Antenna Electro-Metrics	EM-6879	264	Feb. 18, 2020	Feb. 17, 2021
RF Cable	NA	LOOPCAB-001	Jan. 08, 2020	Jan. 07, 2021
RF Cable	NA	LOOPCAB-002	Jan. 08, 2020	Jan. 07, 2021
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-01	Oct. 23, 2019	Oct. 22, 2020
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-406	Nov. 11, 2019	Nov. 10, 2020
RF Cable	8D	966-4-1	Mar. 18, 2020	Mar. 17, 2021
RF Cable	8D	966-4-2	Mar. 18, 2020	Mar. 17, 2021
RF Cable	8D	966-4-3	Mar. 18, 2020	Mar. 17, 2021
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-3m-4-01	Sep. 26, 2019	Sep. 25, 2020
Horn_Antenna SCHWARZBECK	BBHA 9120D	9120D-783	Nov. 24, 2019	Nov. 23, 2020
Pre-Amplifier EMCI	EMC 12630 SE	980638	Apr. 08, 2020	Apr. 07, 2021
RF Cable	EMC104-SM-SM-1200	160923	Jan. 15, 2020	Jan. 14, 2021
RF Cable	EMC104-SM-SM-2000	180502	Apr. 29, 2020	Apr. 28, 2021
RF Cable	EMC104-SM-SM-6000	180418	Apr. 29, 2020	Apr. 28, 2021
Pre-Amplifier EMCI	EMC184045SE	980387	Jan. 15, 2020	Jan. 14, 2021
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170519	Nov. 24, 2019	Nov. 23, 2020
RF Cable	EMC102-KM-KM-1200	160924	Jan. 15, 2020	Jan. 14, 2021
RF Cable	EMC-KM-KM-4000	200214	Mar. 11, 2020	Mar. 10, 2021
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	NA	NA

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in 966 Chamber No. 4.
3. The following table is for the measurement uncertainty, which is calculated as per the document CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

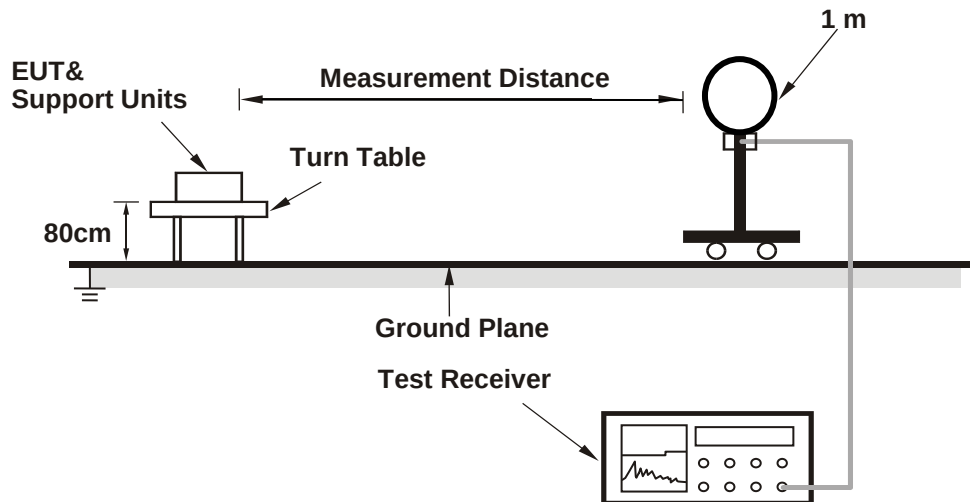
Measurement	Frequency	Expanded Uncertainty ($k=2$) ($\pm$)
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.1 dB
	30MHz ~ 1GHz	5.5 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	5.1 dB
	18GHz ~ 40GHz	5.3 dB

For above 40GHz test:

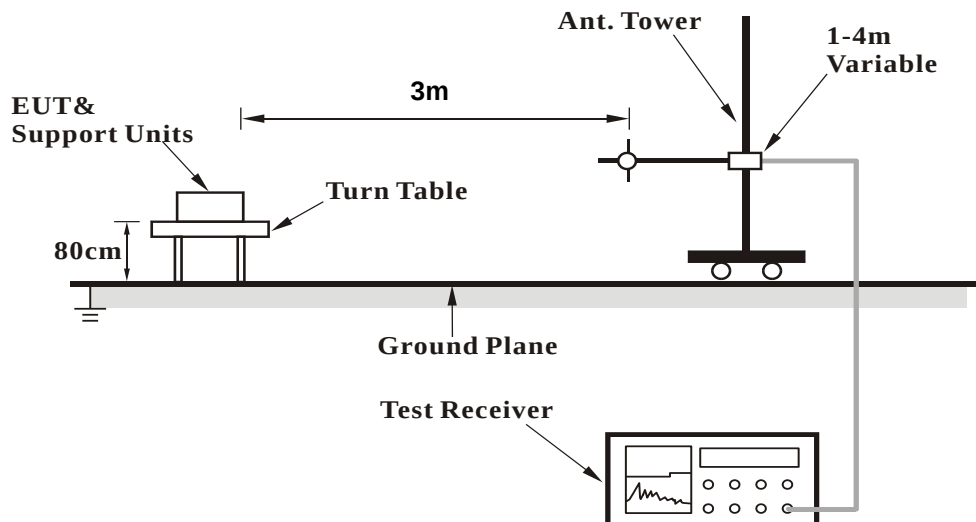
請見本報告 4.3 節

6.4 測試配置

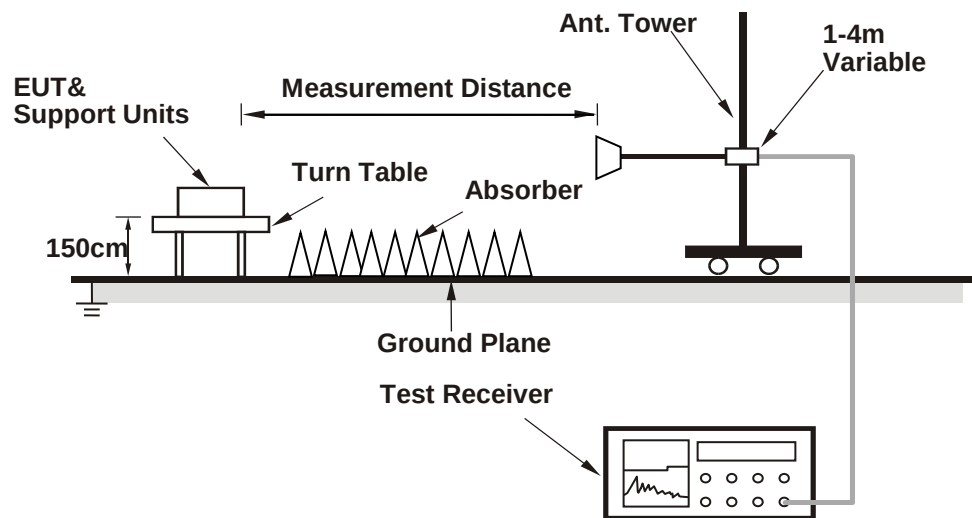
<Frequency Range below 30MHz>



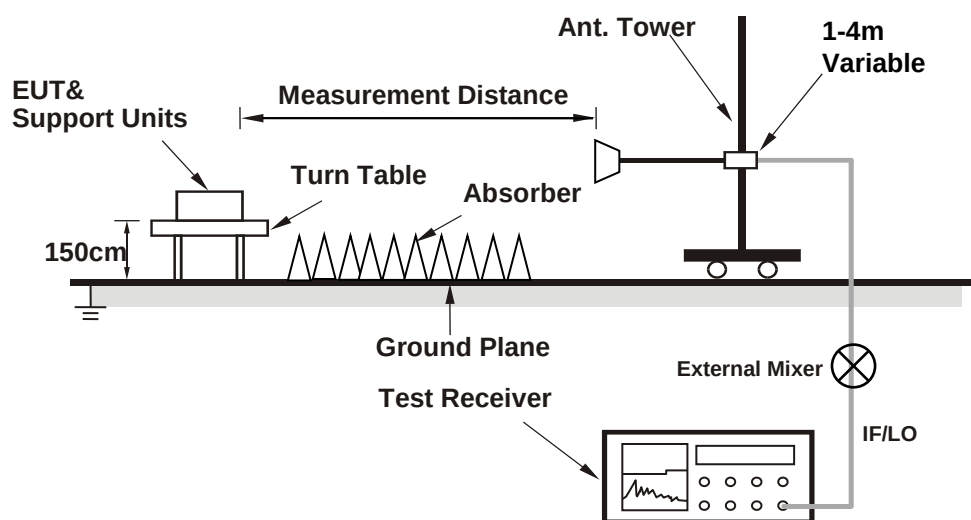
<Frequency Range 30MHz to 1GHz>



<Frequency Range 1GHz to 50GHz>



<Frequency Range above 50GHz>



6.5 配置照片

請參照 Test Setup Photos (BV 編號: BCFV-WTW-P20070246)

6.6 量測結果

6.6.1 混附發射接收 (型號: SITRANS LR100)

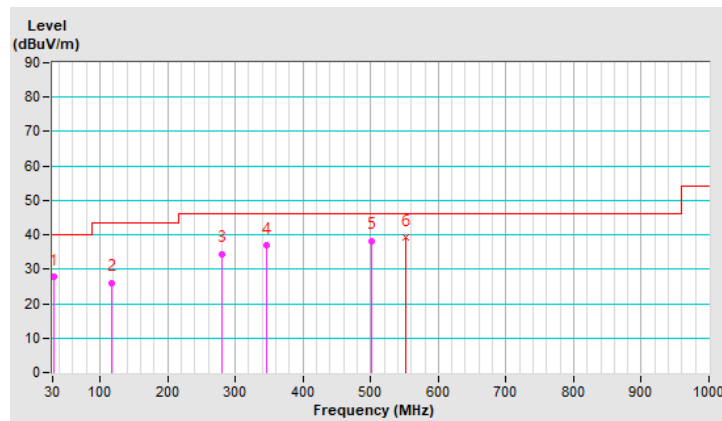
Below 1GHz Data

操作模式：	發射接收	調變技術：	FMCW
基本波頻率：	CH 1：79 GHz	檢測器與頻寬：	(QP) RB=120kHz
量測場地溫度：	23°C	量測場地濕度：	67%RH
測試日期：	109 年 8 月 12 日	測試者：	楊立豪

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	32.52	27.8 QP	40.0	-12.2	1.00 H	349	37.0	-9.2
2	117.49	26.1 QP	43.5	-17.4	1.00 H	180	35.9	-9.8
3	280.67	34.5 QP	46.0	-11.5	1.00 H	217	41.5	-7.0
4	346.12	36.9 QP	46.0	-9.1	1.00 H	222	42.3	-5.4
5	502.15	38.3 QP	46.0	-7.7	2.00 H	146	39.5	-1.2
6	552.82	39.4 QP	46.0	-6.6	1.00 H	127	39.6	-0.2

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

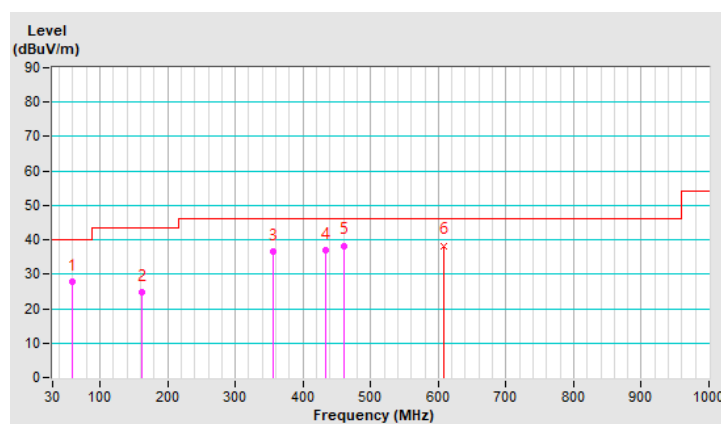


操作模式：	發射接收	調變技術：	FMCW
基本波頻率：	CH 1：79 GHz	檢測器與頻寬：	(QP) RB=120kHz
量測場地溫度：	23°C	量測場地濕度：	67%RH
測試日期：	109 年 8 月 12 日	測試者：	楊立豪

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	60.00	27.9 QP	40.0	-12.1	2.00 V	127	36.3	-8.4
2	160.95	24.7 QP	43.5	-18.8	2.00 V	238	32.2	-7.5
3	356.62	36.5 QP	46.0	-9.5	1.00 V	177	41.6	-5.1
4	432.70	36.8 QP	46.0	-9.2	1.00 V	123	39.4	-2.6
5	460.12	38.3 QP	46.0	-7.7	1.00 V	123	40.2	-1.9
6	607.17	38.3 QP	46.0	-7.7	1.50 V	185	36.5	1.8

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



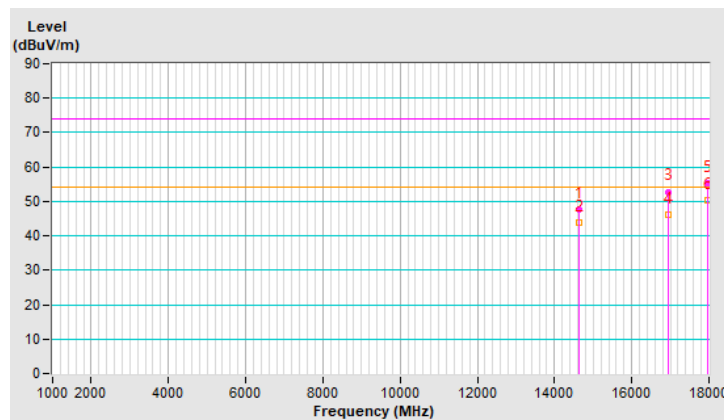
For 1~18GHz

操作模式：	發射	調變技術：	FMCW
基本波頻率：	CH 1：79 GHz	測試儀器：	(PK) RB=1MHz, VB=3MHz (AV) RB=1MHz, VB=3MHz
量測場地溫度：	25°C	量測場地濕度：	75%RH
測試日期：	109 年 8 月 12 日	測試者：	鄧傑仁

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	#14618.07	47.7 PK	74.0	-26.3	1.83 H	172	32.4	15.3
2	#14618.07	44.0 AV	54.0	-10.0	1.83 H	172	28.7	15.3
3	#16956.18	52.8 PK	74.0	-21.2	1.82 H	116	36.3	16.5
4	#16956.18	46.1 AV	54.0	-7.9	1.82 H	116	29.6	16.5
5	17964.37	55.4 PK	74.0	-18.6	2.00 H	141	29.4	26.0
6	17964.37	50.4 AV	54.0	-3.6	2.00 H	141	24.4	26.0

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " # ": The radiated frequency is out of the restricted band.

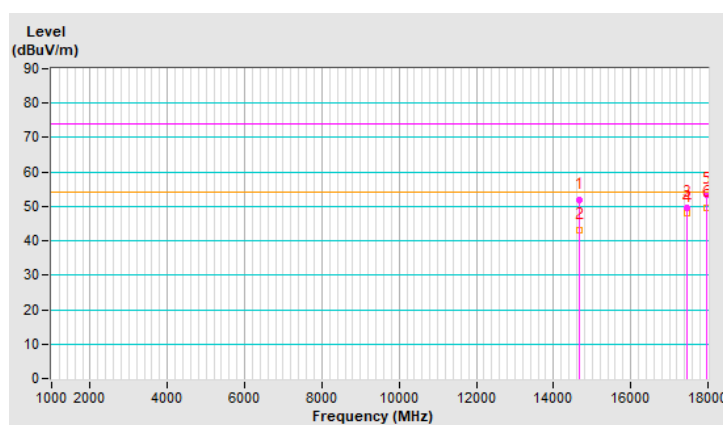


操作模式：	發射	調變技術：	FMCW
基本波頻率：	CH 1：79 GHz	測試儀器：	(PK) RB=1MHz, VB=3MHz (AV) RB=1MHz, VB=3MHz
量測場地溫度：	25°C	量測場地濕度：	75%RH
測試日期：	109 年 8 月 12 日	測試者：	鄧傑仁

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	#14676.90	52.0 PK	74.0	-22.0	1.25 V	218	36.9	15.1
2	#14676.90	43.0 AV	54.0	-11.0	1.25 V	218	27.9	15.1
3	#17455.45	49.7 PK	74.0	-24.3	1.64 V	139	31.6	18.1
4	#17455.45	48.1 AV	54.0	-5.9	1.64 V	139	30.0	18.1
5	17954.31	53.5 PK	74.0	-20.5	1.82 V	222	27.9	25.6
6	17954.31	49.4 AV	54.0	-4.6	1.82 V	222	23.8	25.6

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " # ": The radiated frequency is out of the restricted band.



For 18~40GHz

操作模式：	發射	調變技術：	FMCW
基本波頻率：	CH 1：79 GHz	測試儀器：	(PK) RB=1MHz, VB=3MHz (AV) RB=1MHz, VB=3MHz
量測場地溫度：	25°C	量測場地濕度：	75%RH
測試日期：	109 年 8 月 12 日	測試者：	鄧傑仁

Antenna Polarity : Horizontal at 1 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	19034.20	39.6 PK	74.0	-34.4	1.14 H	24	56.0	-16.4
2	19034.20	34.1 AV	54.0	-19.9	1.14 H	24	50.5	-16.4
3	#28291.95	42.4 PK	74.0	-31.6	2.15 H	64	53.3	-10.9
4	#28291.95	36.9 AV	54.0	-17.1	2.15 H	64	47.8	-10.9
5	38715.12	42.5 PK	74.0	-31.5	1.85 H	206	46.8	-4.3
6	38715.12	37.2 AV	54.0	-16.8	1.85 H	206	41.5	-4.3

Remarks:

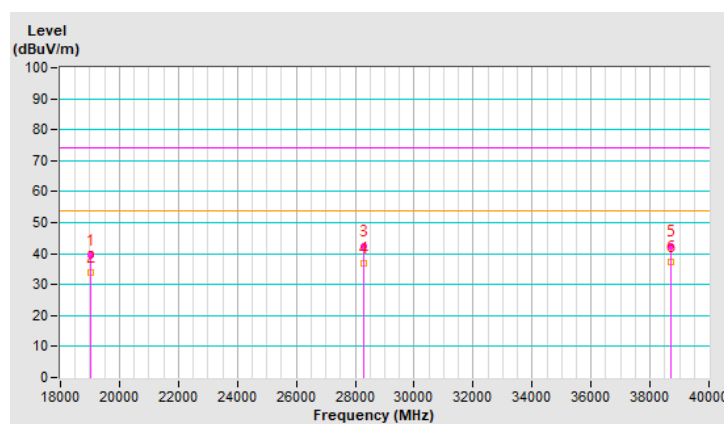
1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. Shorter measurement distances was used to improve the measurement system's noise floor. As standard description is based on the measurement in distance of 3 meters, the data obtained at 1-meter distance was extrapolate results to the 3-m distance:

Test value at 3-meter distance (dBuV)

= Test value at 1 meter distance (dBuV) -20log(3/1)(dB)

= Test value at 1 meter distance (dBuV) -9.5(dB).

*Measurements made at 1 meter distance. Test value converted to account for 3-meter measurement distance.



操作模式：	發射	調變技術：	FMCW
基本波頻率：	CH 1：79 GHz	測試儀器：	(PK) RB=1MHz, VB=3MHz (AV) RB=1MHz, VB=3MHz
量測場地溫度：	25°C	量測場地濕度：	75%RH
測試日期：	109 年 8 月 12 日	測試者：	鄧傑仁

Antenna Polarity : Vertical at 1 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	19378.09	41.2 PK	74.0	-32.8	1.32 V	34	57.5	-16.3
2	19378.09	35.4 AV	54.0	-18.6	1.32 V	34	51.7	-16.3
3	#27995.57	42.7 PK	74.0	-31.3	1.54 V	193	53.5	-10.8
4	#27995.57	37.9 AV	54.0	-16.1	1.54 V	193	48.7	-10.8
5	39788.16	43.6 PK	74.0	-30.4	1.78 V	234	47.1	-3.5
6	39788.16	37.5 AV	54.0	-16.5	1.78 V	234	41.0	-3.5

Remarks:

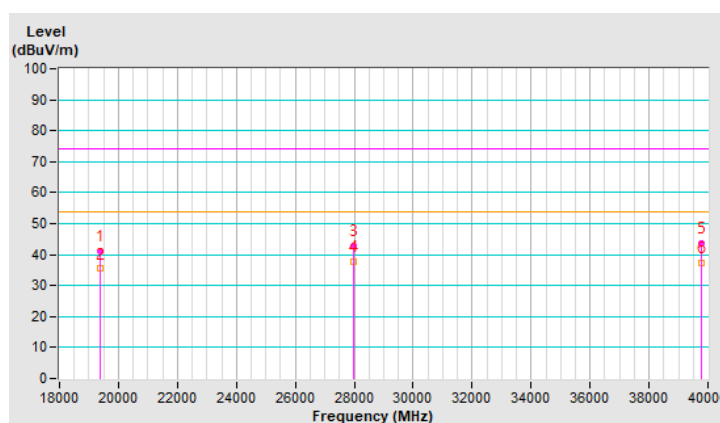
1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. Shorter measurement distances was used to improve the measurement system's noise floor. As standard description is based on the measurement in distance of 3 meters, the data obtained at 1-meter distance was extrapolate results to the 3-m distance:

Test value at 3-meter distance (dBuV)

= Test value at 1 meter distance (dBuV) -20log(3/1)(dB)

= Test value at 1 meter distance (dBuV) -9.5(dB).

*Measurements made at 1 meter distance. Test value converted to account for 3-meter measurement distance.



Above 40GHz

操作模式：	發射	調變技術：	FMCW
基本波頻率：	CH 1：79 GHz	測試儀器：	(PK) RB=1MHz, VB=3MHz (AV) RB=1MHz, VB=3MHz
量測場地溫度：	22℃	量測場地濕度：	62%RH
測試日期：	109 年 09 月 30 日	測試者：	廖偉鈺

Antenna Polarity : Horizontal								
No.	Frequency (GHz)	Factor (dB/m)	Reading (dBuV)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	PASS/FAIL
1	43.06	20.09	33.94	54.03	74	-19.97	Peak	PASS
2	43.06	20.09	15.79	35.88	54	-18.12	Average	PASS
3	71.82	1.50	52.49	53.99	74	-20.01	Peak	PASS
4	71.82	1.50	34.54	36.04	54	-17.96	Average	PASS
5	75.28	19.59	20.20	39.79	74	-34.21	Peak	PASS
6	75.28	19.59	2.71	22.30	54	-31.70	Average	PASS
7	104.29	30.98	8.92	39.90	74	-34.10	Peak	PASS
8	104.29	30.98	-8.66	22.32	54	-31.68	Average	PASS
9	131.41	22.68	17.20	39.88	74	-34.12	Peak	PASS
10	131.41	22.68	-1.15	21.53	54	-32.47	Average	PASS
11	198.13	45.35	-5.80	39.55	74	-34.45	Peak	PASS
12	198.13	45.35	-24.14	21.21	54	-32.79	Average	PASS

Antenna Polarity : Vertical								
No.	Frequency (GHz)	Factor (dB/m)	Reading (dBuV)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	PASS/FAIL
1	42.36	20.09	33.64	53.73	74	-20.27	Peak	PASS
2	42.36	20.09	16.29	36.38	54	-17.62	Average	PASS
3	71.93	1.50	51.79	53.29	74	-20.71	Peak	PASS
4	71.93	1.50	33.28	34.78	54	-19.22	Average	PASS
5	75.04	19.59	19.67	39.26	74	-34.74	Peak	PASS
6	75.04	19.59	2.65	22.24	54	-31.76	Average	PASS
7	104.62	30.98	8.03	39.01	74	-34.99	Peak	PASS
8	104.62	30.98	-9.21	21.77	54	-32.23	Average	PASS
9	131.22	22.68	17.55	40.23	74	-33.77	Peak	PASS
10	131.22	22.68	-1.29	21.39	54	-32.61	Average	PASS
11	197.65	45.35	-6.27	39.08	74	-34.92	Peak	PASS
12	197.65	45.35	-24.69	20.66	54	-33.34	Average	PASS

Note:

1. The measured power level is converted to EIRP using the equation:

Emission = Factor + Reading

where:

Measurements made at 1 meter distance."

2. The far-field boundary is given in ANSI 63.10 as:

$R \text{ far field} = (2 * L^2) / \lambda$

L is the Largest Antenna Dimension of measurement antenna, including the reflector

λ is the wavelength

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
40	0.03	0.0075	0.240
50	0.03	0.0060	0.300

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
50	0.025	0.0060	0.208
75	0.025	0.0040	0.313

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
75	0.018	0.0040	0.162
110	0.018	0.0027	0.238

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
110	0.012	0.0027	0.106
170	0.012	0.0018	0.163

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
170	0.008	0.0018	0.073
260	0.008	0.0012	0.111

6.6.2 混附發射接收 (型號: SITRANS LR110)

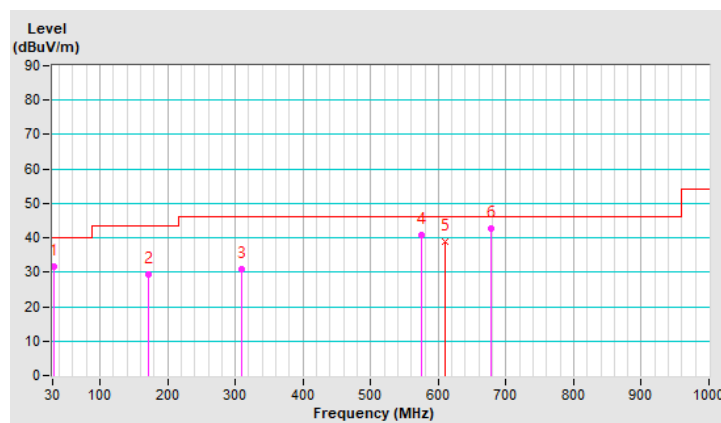
Below 1GHz Data

操作模式：	發射接收	調變技術：	FMCW
基本波頻率：	CH 1 : 79 GHz	檢測器與頻寬：	(QP) RB=120kHz
量測場地溫度：	23°C	量測場地濕度：	67%RH
測試日期：	109 年 8 月 12 日	測試者：	Tom Yang

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	32.30	31.6 QP	40.0	-8.4	1.00 H	360	40.9	-9.3
2	171.79	29.5 QP	43.5	-14.0	2.00 H	246	37.8	-8.3
3	310.16	30.7 QP	46.0	-15.3	1.00 H	8	36.9	-6.2
4	575.96	40.8 QP	46.0	-5.2	1.00 H	336	40.2	0.6
5	609.92	38.8 QP	46.0	-7.2	1.50 H	346	36.9	1.9
6	677.18	42.6 QP	46.0	-3.4	1.00 H	288	40.2	2.4

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

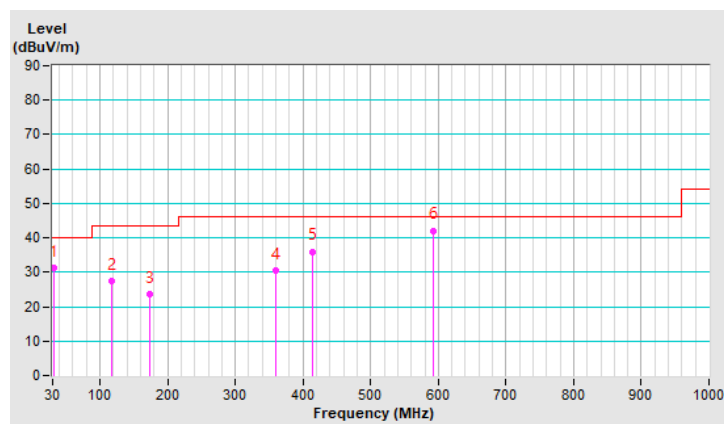


操作模式：	發射接收	調變技術：	FMCW
基本波頻率：	CH 1：79 GHz	檢測器與頻寬：	(QP) RB=120kHz
量測場地溫度：	23°C	量測場地濕度：	67%RH
測試日期：	109 年 8 月 12 日	測試者：	Tom Yang

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	32.64	31.2 QP	40.0	-8.8	1.50 V	0	40.3	-9.1
2	117.52	27.6 QP	43.5	-15.9	1.00 V	278	37.4	-9.8
3	173.92	23.5 QP	43.5	-20.0	3.00 V	90	31.9	-8.4
4	360.60	30.5 QP	46.0	-15.5	1.00 V	22	35.5	-5.0
5	414.53	36.0 QP	46.0	-10.0	2.00 V	44	39.5	-3.5
6	593.25	42.1 QP	46.0	-3.9	1.50 V	352	40.8	1.3

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



6.7 量測結果判定

依據測試數據結果，符合低功率射頻器材技術規範之要求。

6.8 配置照片

請參照 Test Setup Photos (BV 編號: BCVF-WTW-P20070246)

7 天線之要求

7.1 適用標準

請見本報告 3.1 節第(5)項的規定。

7.2 天線規格

- 1) 此待測物搭配 Metal horn antenna，無使用天線接頭。
- 2) 天線波束寬度限制值：天線之-3 dB 波束寬度應 ≤ 8 度。(詳見天線相關資訊)
- 3) 天線旁波束增益限制值：主波束離軸角度(off-axis angles)60 度以外的天線旁波束增益應比主波束增益衰減 38 dB 以上。(詳見天線相關資訊)

7.3 結果判定

符合低功率射頻電機技術規範之要求。

8 電波暴露量之評估

8.1 適用標準

請見本報告 3.1 節第(6)項的規定。

8.2 評估方法

a) 以所測得的最大輸出功率值再加上待測物天線的增益值(Gain)帶入下面公式換算出待測物所輻射的功率密度。

$$b) P_d = (P_{out} * G) / (4 * \pi * r^2)$$

where

P_d = power density in mW/cm^2

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

R = distance between observation point and center of the radiator in cm

8.3 評估結果

Operation Mode	Evaluation Frequency (MHz)	Max Avg. Power (dBm)	Max Avg. Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
Bluetooth	2402-2480	-2.88	0.5152	4.00	20	0.00026	1

Operation Mode	Evaluation Frequency (MHz)	Max EIRP (dBm)	Max EIRP (mW)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
TLPR	77000-81000	17.97	62.661	20	0.01247	1

Conclusion:

The formula of calculated the MPE is:

$$CPD1 / LPD1 + CPD2 / LPD2 + \dots \text{etc.} < 1$$

CPD = Calculation power density

LPD = Limit of power density

$$\text{Bluetooth} + \text{TLPR} = 0.00026 / 1 + 0.01247 / 1 = 0.01273$$

Therefore the maximum calculations of above situations are less than the “1” limit.

9 檢測實驗室基本資料

立德國際商品試驗有限公司桃園分公司提供產業界最佳的檢測以及諮詢服務。
本公司為 ISO/IEC 17025 認可實驗室。

如您有任何問題或建議，請與下列實驗室聯絡：

林口 EMC / RF 實驗室：

Tel: 886-2-26052180

Fax: 886-2-26051924

新竹 EMC / RF 及通訊實驗室：

Tel: 886-3-6668565

Fax: 886-3-6668323

華亞 EMC / RF / Safety 實驗室：

Tel: 886-3-3183232

Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

您也可以我們的網站內找到各實驗室的地圖。

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