

Certificate

Issue Date: December 20, 2021

Ref. Report No. ISL-21LR289CT

Product Name : BLG840F/X BLE/802.15.4 to LTE Gateways
Model(s) : BRX840XE; BRX840E; BRX840F; BR840XE; BR840E; BR840F;
M262X840XE; M262X840E; M262X840F; M262840XE; M262840E;
M262840F
Responsible Party : Fanstel Corporation, Taipei
Address : 10F-10, No. 79, Sec. 1, Hsin Tai Wu Rd.,
Hsi-Chih, New Taipei City 221 Taiwan

We, **International Standards Laboratory Corp.**, hereby certify that:

The device bearing the trade name and model specified above has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in the EMI part of RCM Mark. And Our laboratories is the accredited laboratories and are approved according to ISO/IEC 17025. The device was passed the test performed according to :



Standards:

AS/NZS CISPR 32:2015+A1:2020: Class B: Electromagnetic compatibility of multimedia equipment- Emission requirements

I attest to the accuracy of data and all measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

The determination of the test results is determined by customer agreement, regulations or standard document specifications.

The Laboratory evaluates measurement inaccuracies based on regulatory or standard document specifications and is listed in the report for reference. The quantitative project part judges the conformity of the test results based on the evaluation results of the standard cited uncertainty, and the qualitative project does not temporarily evaluate the measurement uncertainty.

Angus Chu

Angus Chu / Sr. Manager

International Standards Laboratory Corp. LT Lab.

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No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist., Tao Yuan City 325, Taiwan

TEST REPORT

of
RCM Class B

Product : **BLG840F/X BLE/802.15.4 to LTE Gateways**
Model(s): **BRX840XE; BRX840E; BRX840F; BR840XE;
BR840E; BR840F; M262X840XE; M262X840E;
M262X840F; M262840XE; M262840E; M262840F**
Brand: **Fanstel**
Applicant: **Fanstel Corporation, Taipei**
Address: **10F-10, No. 79, Sec. 1, Hsin Tai Wu Rd.,
Hsi-Chih, New Taipei City 221 Taiwan**

Test Performed by:

International Standards Laboratory Corp. LT Lab.



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No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist., Tao Yuan City
325, Taiwan

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Test results given in this report apply only to the specific sample(s) tested and are traceable to national or international standard through calibration of the equipment and evaluating measurement uncertainty herein. The uncertainty of the measurement does not include in consideration of the test result unless the customer required the determination of uncertainty via the agreement, regulation or standard document specification.

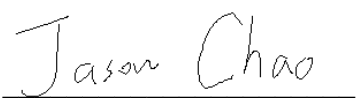
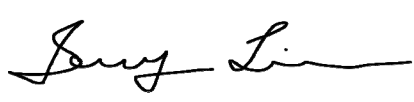
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1. General

1.1 Certification of Accuracy of Test Data

Standards:	AS/NZS CISPR 32:2015+A1:2020: Class B: Electromagnetic compatibility of multimedia equipment- Emission requirements
Equipment Tested:	BLG840F/X BLE/802.15.4 to LTE Gateways
Model(s):	BRX840XE; BRX840E; BRX840F; BR840XE; BR840E; BR840F; M262X840XE; M262X840E; M262X840F; M262840XE; M262840E; M262840F
Brand:	Fanstel
Applicant:	Fanstel Corporation, Taipei
Sample received Date:	December 7, 2021
Final test Date:	refer to the date of test data
Test Site:	Chamber 02; Chamber 19; Conduction 03; Immunity02
Test Distance:	10m; 3m (above 1GHz)
Temperature:	refer to each site test data
Humidity:	refer to each site test data
Atmospheric Pressure:	86 kPa to 106 kPa
Input power:	Conduction input power: AC 230 V / 50 Hz Radiation input power: AC 230 V / 50 Hz
Test Result:	PASS
Report Engineer:	Gigi Yeh
Test Engineer:	 Jason Chao
Approved By:	 Jerry Liu / Assistant Manager

1.2 Summary of Test Result

Performed Item	Test Performed	Deviation	Result
Conducted emissions from the AC mains power ports	Yes	No	PASS
Telecommunication Port Conducted Emissions (asymmetric mode)	Yes	No	N/A
Radiated emissions at frequencies below 1 GHz	Yes	No	PASS
Radiated emissions at frequencies above 1 GHz	Yes	No	PASS
Radiated emissions from FM receivers	N/A	N/A	N/A
Voltage Disturbance Emissions at Antenna Terminals	N/A	N/A	N/A
Differential voltage emissions	N/A	N/A	N/A
Outdoor units of home satellite receiving systems	N/A	N/A	N/A

1.3 Description of EUT

EUT

General:

Product Name	BLG840F/X BLE/802.15.4 to LTE Gateways
Brand Name	Fanstel
Model Name	BRX840XE; BRX840E; BRX840F; BR840XE; BR840E; BR840F; M262X840XE; M262X840E; M262X840F; M262840XE; M262840E; M262840F
Power adaptor (Plug type I)	Model: GA-0501000 AC Input: 100-240V~ 0.6A,50-60Hz DC Output: 5V, 1000mA
Power adaptor (Plug type C)	Model: GA-0501000V AC Input: 100-240V~ 0.6A,50-60Hz DC Output: 5V, 1000mA
Micro USB port	One provided
Antenna port	Two provided

Model Summaries:

LoRa to BLE Gateway		
BRX840XE	M262X840XE	BT840XE, LR62XE
BRX840E	M262X840E	BT840E, LR62XE
BRX840F	M262X840F	BT840F, LR62XE
BR840XE	M262840XE	BT840XE, LR62E
BR840E	M262840E	BT840E, LR62E
BR840F	M262840F	BT840F, LR62E

Applicable standard		AS/NZS CISPR 32		
Test Configuration		Config 1	Config 2	Config 3
		EUT(Master) + Smart mobile phone+EUT(Slave)	EUT(Master) + Smart mobile phone+EUT(Slave)	EUT(Master) + Smart mobile phone+EUT(Slave)
Operation mode		LoRa and BLE link(BLRX840XE)	LoRa and BLE link(BLRX840E)	LoRa and BLE link(BLRX840F)
No.	Description			
1	Radiated emission(30M~1GHz)(above 1GHz)	Pretest	Measured	Pretest
3	Conducted emission (AC Power)	N/A	Measured	N/A

Applicable standard		AS/NZS CISPR 32		
Test Configuration		Config 4	Config 5	Config 6
		EUT(Master) + Smart mobile phone+EUT(Slave)	EUT(Master) + Smart mobile phone+EUT(Slave)	EUT(Master) + Smart mobile phone+EUT(Slave)
Operation mode		LoRa and BLE link(BLR840XE)	LoRa and BLE link(BLR840E)	LoRa and BLE link(BLR840F)
No.	Description			
1	Radiated emission(30M~1GHz)(above 1GHz)	Pretest	Pretest	Pretest
3	Conducted emission (AC Power)	N/A	N/A	N/A

1.4 Description of Support Equipment

Fig. 1-1 Configuration

Config 2

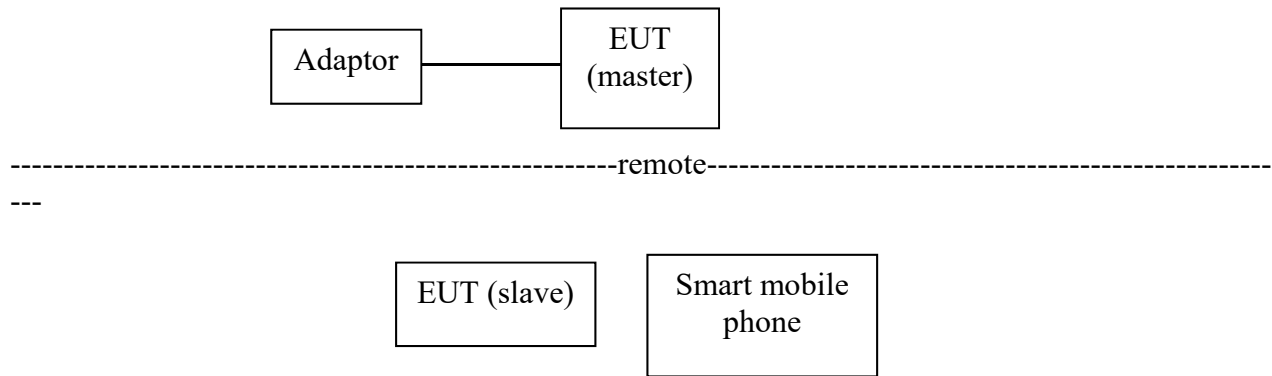


Table 1-1 Support Equipment Used in Tested System

Item	Equipment	Mrf/Brand	Model name	Series No	Data Cable	Power Cable
1	Smart mobile phone	hTC	PL99110	N/A	N/A	N/A

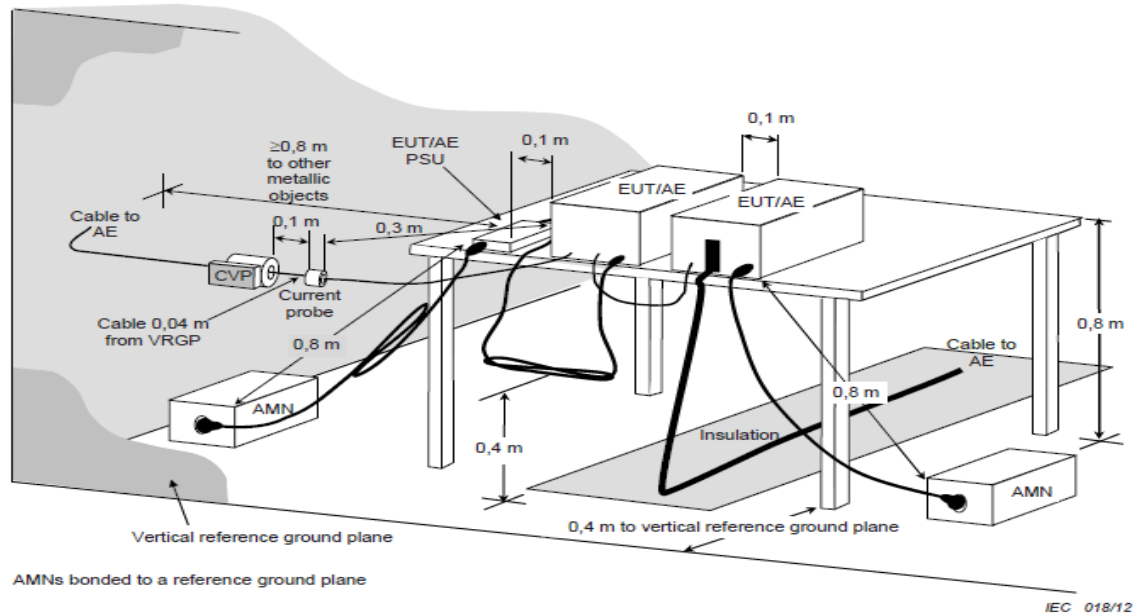
I/O Cable Condition of EUT and Support Units

Description	Path	Cable Length	Cable Type	Connector Type
USB power cable	Adaptor USB port to EUT micro USB port	2m	Shielded	Metal

Note: All the above equipment/cables were placed in worse case positions to maximize emission signals during emission test.

Grounding: Grounding was in accordance with the manufacturer's requirements and conditions for the intended use.

2.1.1 Test Setup



Frequency Range: 150kHz--30MHz
 Detector Function: Quasi-Peak / Average Mode
 Resolution Bandwidth: 9kHz

2.1.4 Limit

Conducted emissions from the AC mains power ports of Class A equipment:

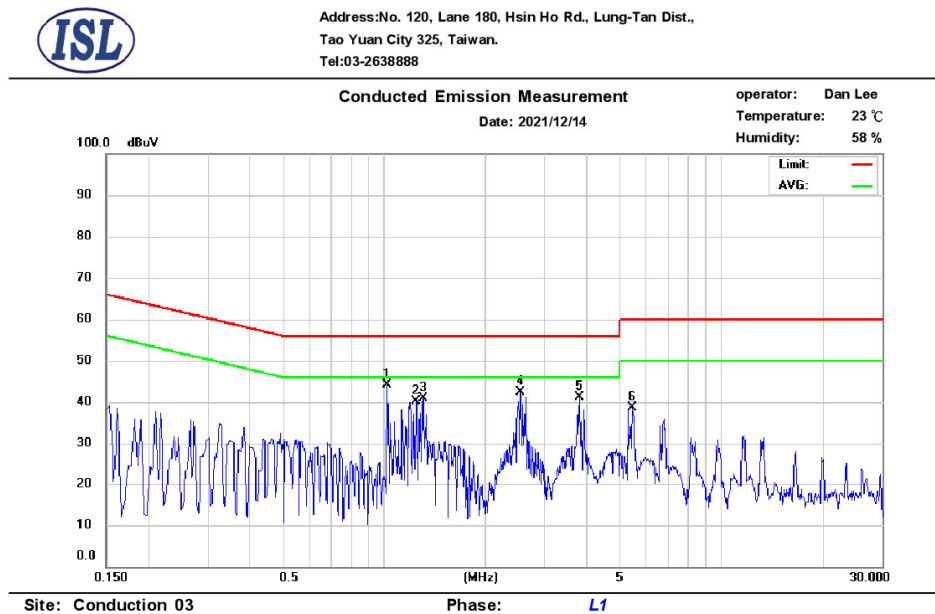
Frequency	QP	AV
MHz	dB(μ V)	dB(μ V)
0.15-0.50	79	66
0.50-30	73	60
Note: The lower limit shall apply at the transition frequencies		

Conducted emissions from the AC mains power ports of Class B equipment:

Frequency	QP	AV
MHz	dB(μ V)	dB(μ V)
0.15-0.50	66-56	56-46
0.50-5.0	56	46
5.0-30	60	50
Note: The lower limit shall apply at the transition frequencies		

2.2 Conduction Test Data: Configuration 2

-Line



No.	Frequency (MHz)	QP_R (dBuV)	AVG_R (dBuV)	Correct Factor (dB)	QP Emission (dBuV)	QP Limit (dBuV)	QP Margin (dB)	AVG Emission (dBuV)	AVG Limit (dBuV)	AVG Margin (dB)
1	1.022	16.14	4.80	9.68	25.82	56.00	-30.18	14.48	46.00	-31.52
2	1.246	20.62	8.50	9.69	30.31	56.00	-25.69	18.19	46.00	-27.81
3	1.306	22.02	8.90	9.69	31.71	56.00	-24.29	18.59	46.00	-27.41
4	2.546	22.31	9.82	9.73	32.04	56.00	-23.96	19.55	46.00	-26.45
5	3.814	21.42	7.51	9.76	31.18	56.00	-24.82	17.27	46.00	-28.73
6	5.474	18.44	1.24	9.79	28.23	60.00	-31.77	11.03	50.00	-38.97

Note:

Margin = QP/AVG Emission - Limit

QP/AVG Emission = QP_R/AVG_R + Correct Factor

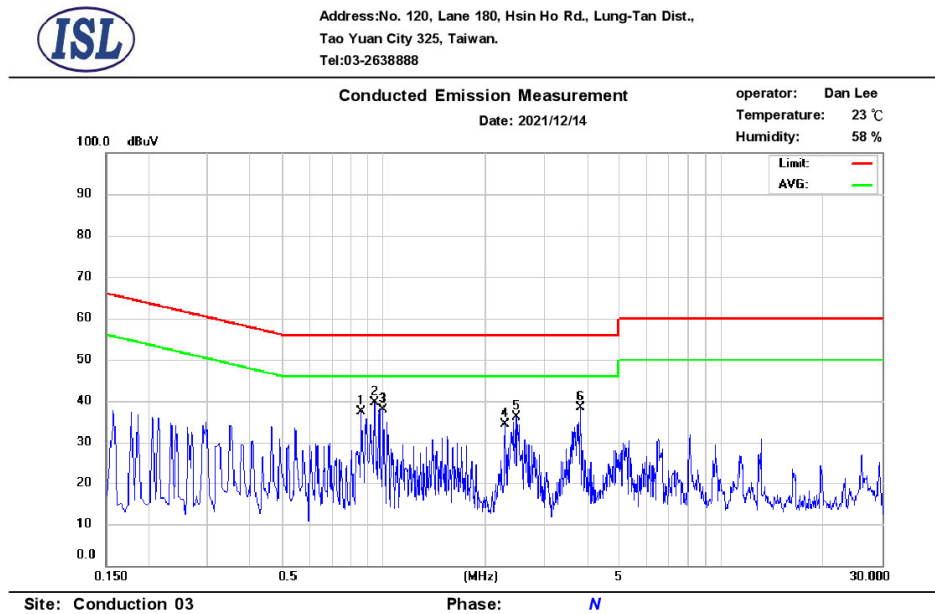
Correct Factor = LISN Loss + Cable Loss

A margin of -8dB means that the emission is 8dB below the limit

The frequency spectrum graph is for final peak graph, and the attached table is for QP/AVG test result.

If peak data can pass, it will be shown in "QP/AVG Correct" column, if not, QP/AVG data will instead.

- Neutral



No.	Frequency (MHz)	QP_R (dBuV)	AVG_R (dBuV)	Correct Factor (dB)	QP Emission (dBuV)	QP Limit (dBuV)	QP Margin (dB)	AVG Emission (dBuV)	AVG Limit (dBuV)	AVG Margin (dB)
1	0.858	18.72	3.97	9.69	28.41	56.00	-27.59	13.66	46.00	-32.34
2	0.942	17.42	1.98	9.69	27.11	56.00	-28.89	11.67	46.00	-34.33
3	0.998	19.41	1.10	9.69	29.10	56.00	-26.90	10.79	46.00	-35.21
4	2.294	12.22	1.67	9.74	21.96	56.00	-34.04	11.41	46.00	-34.59
5	2.478	15.05	4.50	9.74	24.79	56.00	-31.21	14.24	46.00	-31.76
6	3.838	17.37	2.71	9.78	27.15	56.00	-28.85	12.49	46.00	-33.51

Note:

Margin = QP/AVG Emission - Limit

QP/AVG Emission = QP_R/AVG_R + Correct Factor

Correct Factor = LISN Loss + Cable Loss

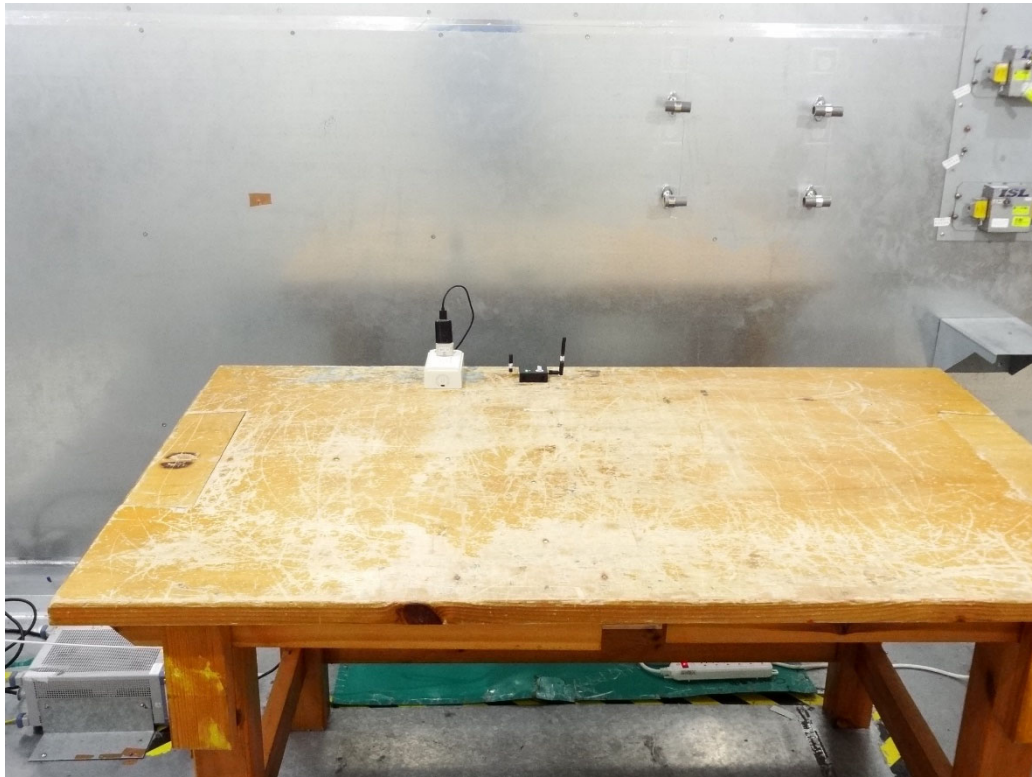
A margin of -8dB means that the emission is 8dB below the limit

The frequency spectrum graph is for final peak graph, and the attached table is for QP/AVG test result.

If peak data can pass, it will be shown in "QP/AVG Correct" column, if not, QP/AVG data will instead.

2.3 Test Setup Photo

Front View



Back View



3.1 Test Setup and Procedure

[illegible]

Frequency Range: 150kHz--30MHz
 Detector Function: Quasi-Peak / Average Mode
 Resolution Bandwidth: 9kHz

3.1.4 Limit

Asymmetric mode conducted emissions from Class_A equipment:

Applicable to

1. wired network ports.
2. optical fibre ports with metallic shield or tension members.
3. antenna ports.

Frequency range MHz	Coupling device	Detector type / bandwidth	Class_A voltage limits dB(μV)	Class_A current limits dB(μA)
0.15-0.5	AAN	Quasi Peak / 9 kHz	97-87	n/a
0.5-30			87	
0.15-0.5	AAN	Average / 9 kHz	84-74	
0.5-30			74	
0.15-0.5	CVP and current probe	Quasi Peak / 9 kHz	97-87	53-43
0.5-30			87	43
0.15-0.5	CVP and current probe	Average / 9 kHz	84-74	40-30
0.5-30			74	30
0.15-0.5	Current Probe	Quasi Peak / 9 kHz	n/a	53-43
0.5-30				43
0.15-0.5	Current Probe	Average / 9 kHz		40-30
0.5-30				30

Asymmetric mode conducted emissions from Class_B equipment:

Applicable to:

1. wired network ports.
2. optical fibre ports with metallic shield or tension members.
3. broadcast receiver tuner ports.
4. antenna ports.

Frequency range MHz	Coupling device	Detector type / bandwidth	Class B voltage limits dB(μV)	Class B current limits dB(μA)
0.15-0.5	AAN	Quasi Peak / 9 kHz	84-74	n/a
0.5-30			74	
0.15-0.5	AAN	Average / 9 kHz	74-64	
0.5-30			64	
0.15-0.5	CVP and current probe	Quasi Peak / 9 kHz	84-74	40-30
0.5-30			74	30
0.15-0.5	CVP and current probe	Average / 9 kHz	74-64	30-20
0.5-30			64	20
0.15-0.5	Current Probe	Quasi Peak / 9 kHz	n/a	40-30
0.5-30				30
0.15-0.5	Current Probe	Average / 9 kHz		30-20
0.5-30				20

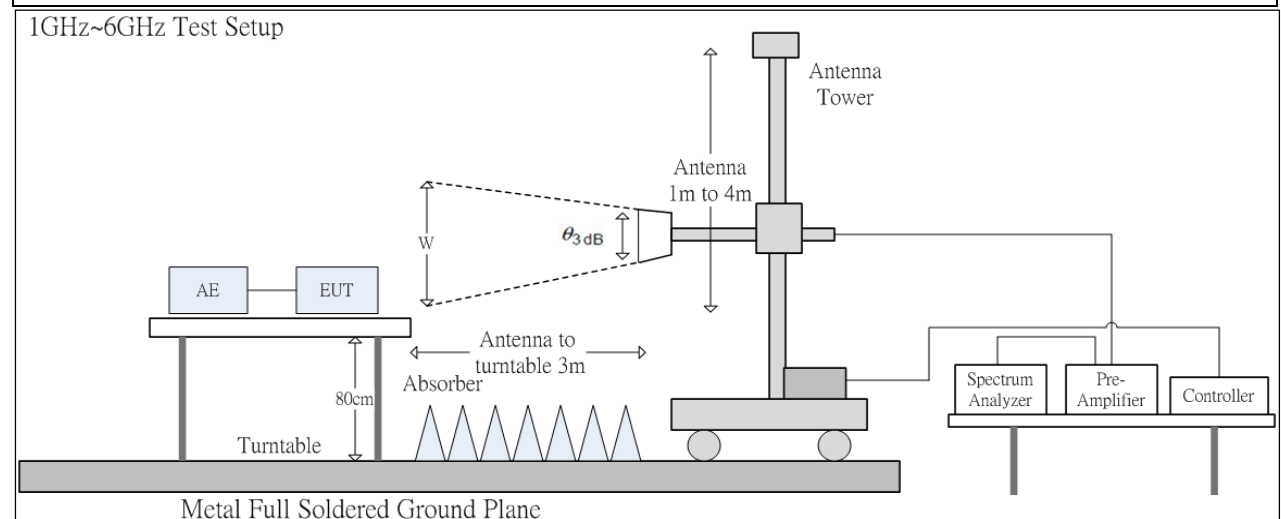
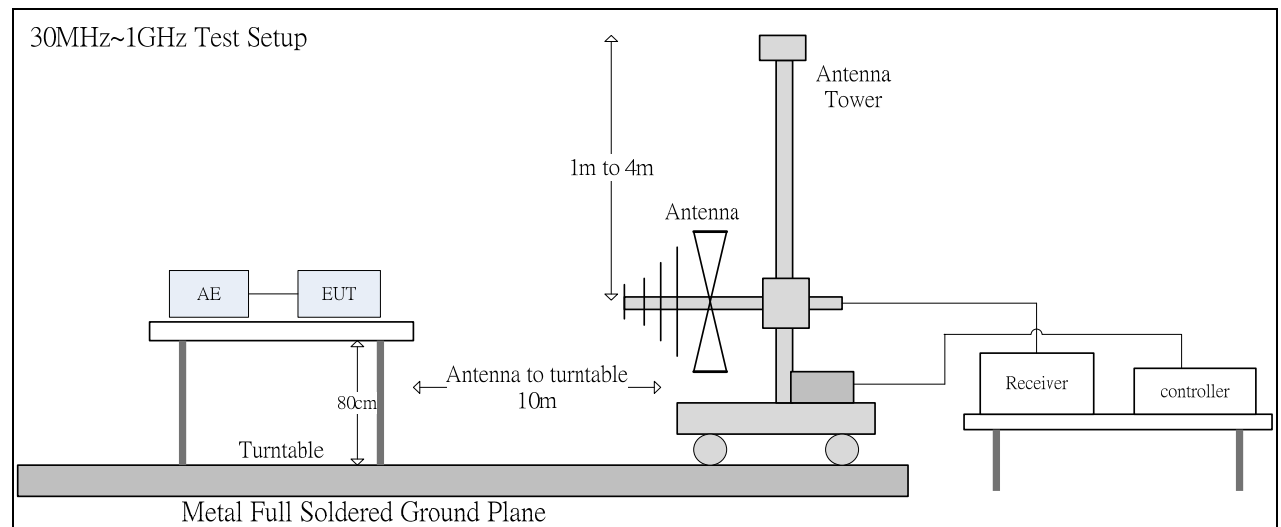
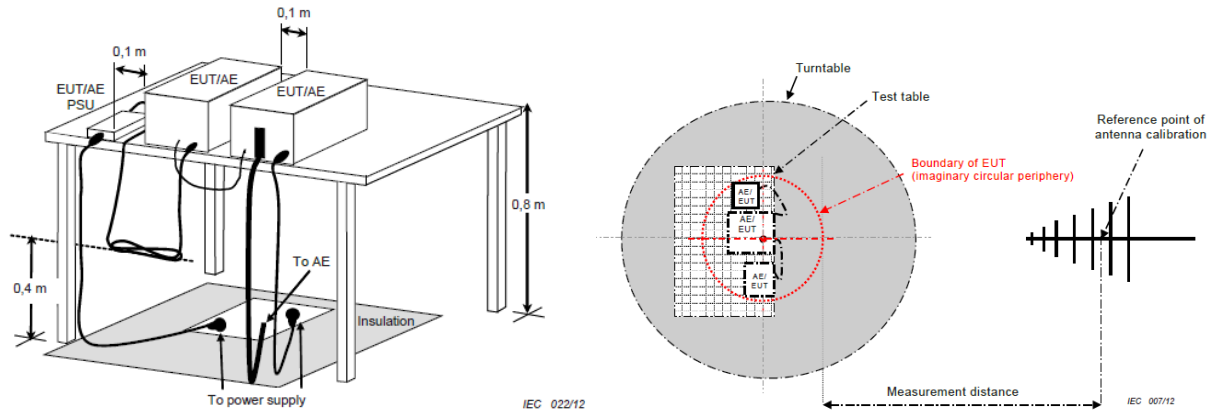
3.2 Test Result

****Remarks: It is not necessary to be tested on this item.**

4. Radiated Disturbance Emissions

4.1 Test Setup and Procedure

4.1.1 Test Setup



The 3dB beam width of the horn antenna used for the test is as shown in the table below.

Frequency (GHz)	E-plane	H-plane	$\theta_{3dB}(\text{min})$	d= 3 m
				w (m)
1	88°	147°	88°	5.79
2	68°	119°	68°	4.04
3	73°	92°	73°	4.44
4	70°	89°	70°	4.20
5	55°	60°	55°	3.12
6	63°	62°	62°	3.60

4.1.2 Test Procedure

The radiated emissions test will then be repeated on the chamber to measure the amplitudes accurately and without the multiple reflections existing in the shielded room. The EUT and support equipment are set up on the turntable of one of 10 meter chamber. Desktop EUT are set up on a FRP stand 0.8 meter above the ground or floor-standing arrangement shall be placed on the horizontal ground reference plane.

For the initial measurements, the receiving antenna is varied from 1-4 meter height and is changed in the vertical plane from vertical to horizontal polarization at each frequency. The highest emissions between 30 MHz to 1000 MHz were analyzed in details by operating the spectrum analyzer and/or EMI receiver in quasi-peak mode to determine the precise amplitude of the emissions. The highest emissions between 1 GHz to 6 GHz were analyzed in details by operating the spectrum analyzer in peak and average mode to determine the precise amplitude of the emissions. The test volume for a height of up to 30 cm may be obstructed by absorber placed on the ground plane.

At the highest amplitudes observed, the EUT is rotated in the horizontal plane while changing the antenna polarization in the vertical plane to maximize the reading. The interconnecting cables were arranged and moved to get the maximum measurement. Once the maximum reading is obtained, the antenna elevation and polarization will be varied between specified limits to maximize the readings. All of the interface cables were manipulated according to EN 55032 & AS/NZS CISPR 32 requirements.

The highest internal source of an EUT is defined as the highest frequency generated or used within the EUT or on which the EUT operates or tunes.

If the highest frequency of the internal sources of the EUT is less than 108 MHz, the measurement shall only be made up to 1 GHz.

If the highest frequency of the internal sources of the EUT is between 108 MHz and 500 MHz, the measurement shall only be made up to 2 GHz.

If the highest frequency of the internal sources of the EUT is between 500 MHz and 1 GHz, the measurement shall only be made up to 5 GHz.

If the highest frequency of the internal sources of the EUT is above 1 GHz, the measurement shall be made up to 5 times the highest frequency or 6 GHz, whichever is less.

4.1.3 Spectrum Analyzer Configuration (for the frequencies tested)

Frequency Range: 30MHz--1000MHz
Detector Function: Quasi-Peak Mode
Resolution Bandwidth: 120kHz

Frequency Range: Above 1 GHz to 6 GHz
Detector Function: Peak/Average Mode
Resolution Bandwidth: 1MHz

4.2 Limit

Radiated emissions at frequencies up to 1 GHz for Class _A equipment:

Frequency range MHz	Measurement		Class_A limits dB(μV/m)
	Distance m	Detector type / bandwidth	OATS/SAC
30-230	10	Quasi Peak / 120 kHz	40
230-1000			47
30-230	3		50
230-1000			57

Radiated emissions at frequencies above 1 GHz for Class _A equipment:

Frequency range MHz	Measurement		Class _A limits dB(μ V/m)
	Distance m	Detector type / bandwidth	FSOATS
1000-3000	3	Average / 1MHz	56
3000-6000			60
1000-3000		Peak / 1MHz	76
3000-6000			80

Radiated emissions at frequencies up to 1 GHz for Class _B equipment:

Frequency range MHz	Measurement		Class_B limits dB(μV/m)
	Distance m	Detector type / bandwidth	OATS/SAC
30-230	10	Quasi Peak / 120 kHz	30
230-1000			37
30-230	3		40
230-1000			47

Radiated emissions at frequencies above 1 GHz for Class_B equipment:

Frequency range MHz	Measurement		Class_B limits dB(μ V/m)
	Distance m	Detector type / bandwidth	FSOATS
1000-3000	3	Average / 1MHz	50
3000-6000			54
1000-3000		Peak / 1MHz	70
3000-6000			74

Radiated emissions from FM receivers:

Frequency range MHz	Measurement		Class_B limits dB(μV/m)	
	Distance m	Detector type / bandwidth	Fundamental	Harmonics
			OATS/SAC	OATS/SAC
30-230	10	Quasi Peak / 120 kHz	50	42
230-300				42
300-1000				46
30-230	3		60	52
230-300				52
300-1000				56

4.3 Radiation Test Data: Configuration 2 - Radiated Emissions (Horizontal)



Address: No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist.,
Tao Yuan City 325, Taiwan.
Tel: 03-2638888

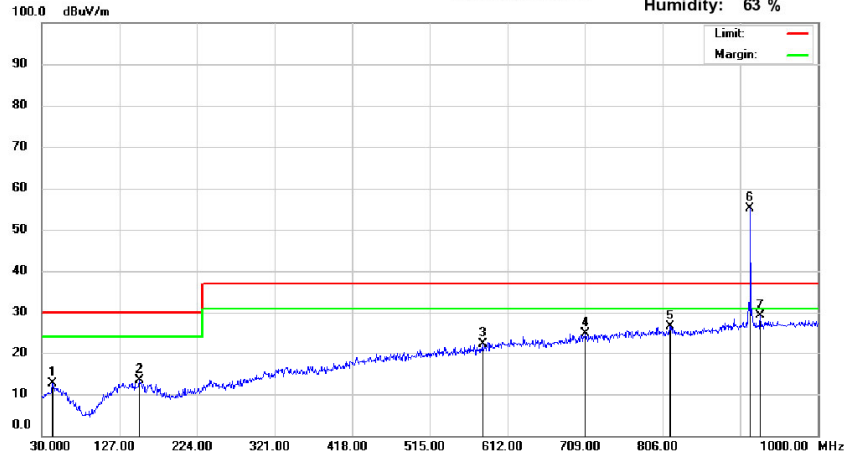
Radiated Emission Measurement

Date: 2021/12/16

Operator: Dan Lee

Temperature: 23 °C

Humidity: 63 %



Site : Chamber 02

Polarization: Horizontal

Mk.	Frequency (MHz)	RX_R (dBuV)	Correct Factor (dB/m)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant.Pos (cm)	Tab.Pos (deg.)	Detector
1	43.58	29.73	-17.04	12.69	30.00	-17.31	200	229	peak
2	152.22	28.86	-15.55	13.31	30.00	-16.69	100	227	peak
3	580.96	29.40	-7.26	22.14	37.00	-14.86	300	11	peak
4	709.97	29.67	-5.00	24.67	37.00	-12.33	300	359	peak
5	815.70	29.62	-3.28	26.34	37.00	-10.66	100	184	peak
6	915.61	57.25	-2.02	55.23	37.00	18.23	100	327	peak
7	928.22	30.85	-1.72	29.13	37.00	-7.87	100	203	peak



Address: No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist.,
Tao Yuan City 325, Taiwan.
Tel: 03-2638888

Radiated Emission Measurement

Date: 2021/12/16

Operator: Dan Lee

Temperature: 23 °C

Humidity: 63 %

Site : Chamber 02

Polarization: *Horizontal*

EUT :

Model Name : BLRX840E

Mode :

Note :

Frequency (MHz)	Emission (dBuV/m)	Margin (dB)	Note
915.6100	55.23	18.23	fundamental frequency

* Note:

Margin = Emission – Limit

Emission = Radiated Amplitude + Correct Factor

Correct Factor = Antenna Correction Factor + Cable Loss – Pre-Amplifier Gain

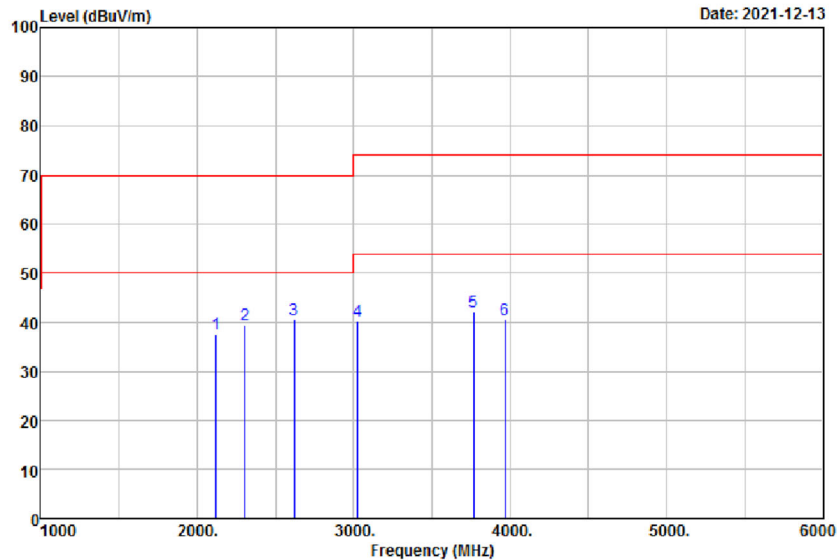
A margin of -8dB means that the emission is 8dB below the limit

Antenna Distance: 10 meters

Below 1GHz test, if the peak measured value meets the QP limit, it is unnecessary to perform the QP measurement.



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Web: www.isl.com.tw



Condition: 55032 CLASS B PK 3m HORIZONTAL
Site : Chamber 19

Operator : Jason

	Freq	Read		Limit	Over		
	MHz	Level	Factor	Level	Line	Limit	Remark
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Pol/Phase
1	2120.00	50.44	-12.84	37.60	70.00	-32.40	Peak HORIZONTAL
2	2305.00	51.62	-12.26	39.36	70.00	-30.64	Peak HORIZONTAL
3	2620.00	51.91	-11.30	40.61	70.00	-29.39	Peak HORIZONTAL
4	3025.00	50.96	-10.64	40.32	74.00	-33.68	Peak HORIZONTAL
5	3765.00	51.40	-9.28	42.12	74.00	-31.88	Peak HORIZONTAL
6	3965.00	49.51	-8.99	40.52	74.00	-33.48	Peak HORIZONTAL

- 1 -

* Note:

Margin = Emission - Limit

Emission = Radiated Amplitude + Correct Factor

Correct Factor = Antenna Correction Factor + Cable Loss - Pre-Amplifier Gain

A margin of -8dB means that the emission is 8dB below the limit

Antenna Distance: 3 meters

Above 1GHz test, if the peak measured value meets the average limit, it is unnecessary to perform the average measurement.

-Radiated Emissions (Vertical)



Address: No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist.,
Tao Yuan City 325, Taiwan.
Tel: 03-2638888

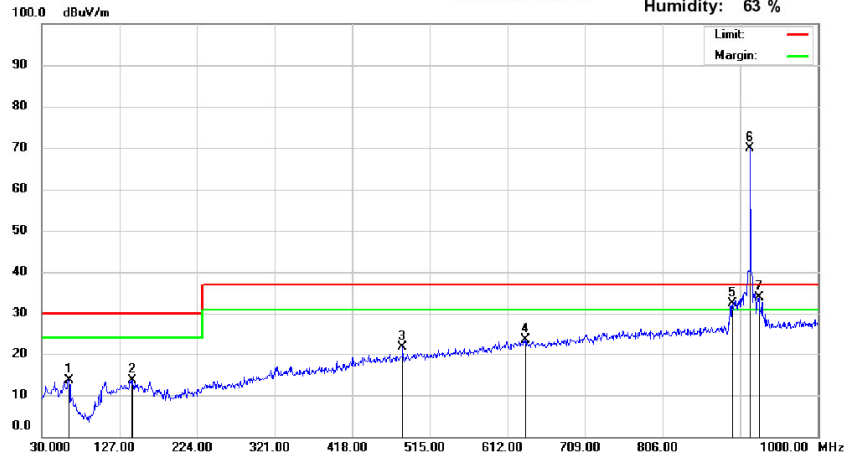
Radiated Emission Measurement

Date: 2021/12/16

Operator: Dan Lee

Temperature: 23 °C

Humidity: 63 %



Site : Chamber 02

Polarization: Vertical

Mk.	Frequency (MHz)	RX_R (dBuV)	Correct Factor (dB/m)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant.Pos (cm)	Tab.Pos (deg.)	Detector
1	63.95	31.30	-17.62	13.68	30.00	-16.32	200	359	peak
2	142.52	29.82	-16.15	13.67	30.00	-16.33	100	171	peak
3	481.05	30.97	-9.35	21.62	37.00	-15.38	199	360	peak
4	634.31	29.24	-5.95	23.29	37.00	-13.71	300	0	peak
5	893.30	34.78	-2.38	32.40	37.00	-4.60	200	5	peak
6	915.61	71.93	-2.02	69.91	37.00	32.91	152	360	peak
7	926.28	35.70	-1.81	33.89	37.00	-3.11	152	360	peak



Address: No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist.,
Tao Yuan City 325, Taiwan.
Tel: 03-2638888

Radiated Emission Measurement

Date: 2021/12/16

Operator: Dan Lee

Temperature: 23 °C

Humidity: 63 %

Site : Chamber 02

Polarization: *Vertical*

EUT :

Model Name : BLRX840E

Mode :

Note :

Frequency (MHz)	Emission (dBuV/m)	Margin (dB)	Note
915.6100	69.91	32.91	fundamental frequency

* Note:

Margin = Emission – Limit

Emission = Radiated Amplitude + Correct Factor

Correct Factor = Antenna Correction Factor + Cable Loss – Pre-Amplifier Gain

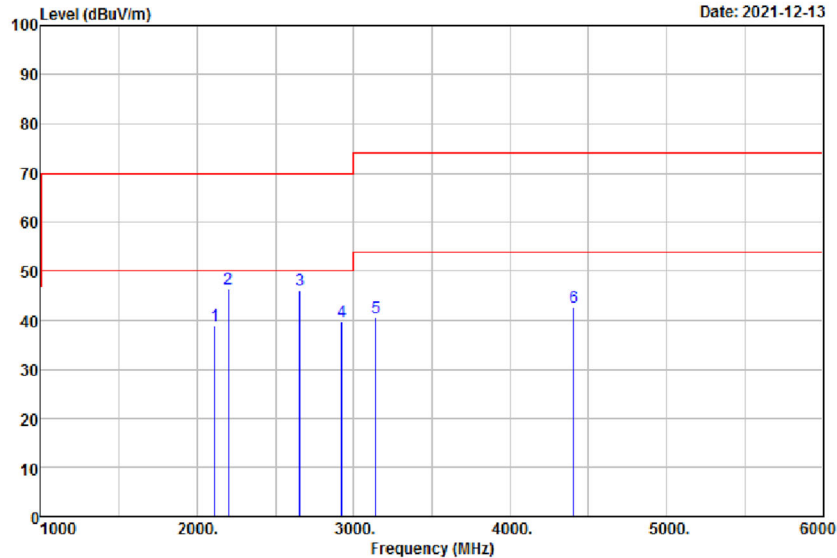
A margin of -8dB means that the emission is 8dB below the limit

Antenna Distance: 10 meters

Below 1GHz test, if the peak measured value meets the QP limit, it is unnecessary to perform the QP measurement.



International Standard Laboratory Corp.
Company Address: No. 120, Lane 180, Hsin Ho Rd.
Lung-Tan Dist., Tao Yuan City 325, Taiwan
Tel: (03) 4071718 ; Fax: (03) 4071738
Web: www.isl.com.tw



Condition: 55032 CLASS B PK 3m VERTICAL
Site : Chamber 19

Operator : Jason

	Freq	Read	Factor	Level	Limit	Over	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1	2110.00	51.70	-12.82	38.88	70.00	-31.12	Peak	VERTICAL
2	2200.00	59.30	-12.84	46.46	70.00	-23.54	Peak	VERTICAL
3	2655.00	57.42	-11.17	46.25	70.00	-23.75	Peak	VERTICAL
4	2925.00	50.88	-11.23	39.65	70.00	-30.35	Peak	VERTICAL
5	3140.00	50.98	-10.32	40.66	74.00	-33.34	Peak	VERTICAL
6	4405.00	50.39	-7.85	42.54	74.00	-31.46	Peak	VERTICAL

- 1 -

* Note:

Margin = Emission - Limit

Emission = Radiated Amplitude + Correct Factor

Correct Factor = Antenna Correction Factor + Cable Loss - Pre-Amplifier Gain

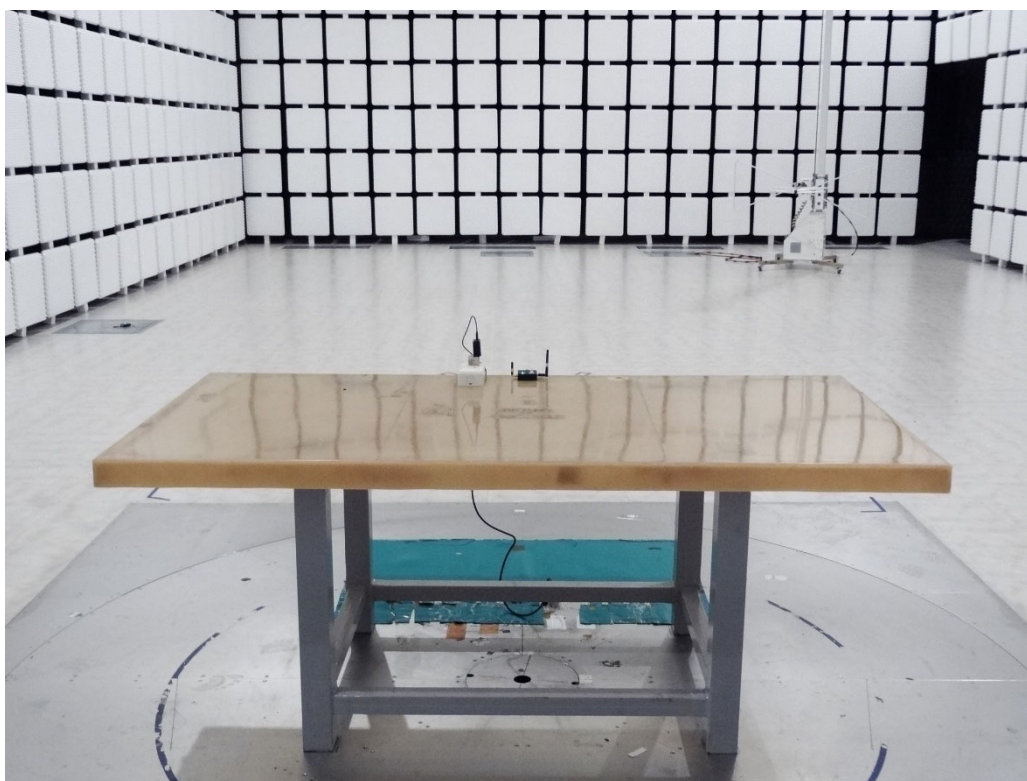
A margin of -8dB means that the emission is 8dB below the limit

Antenna Distance: 3 meters

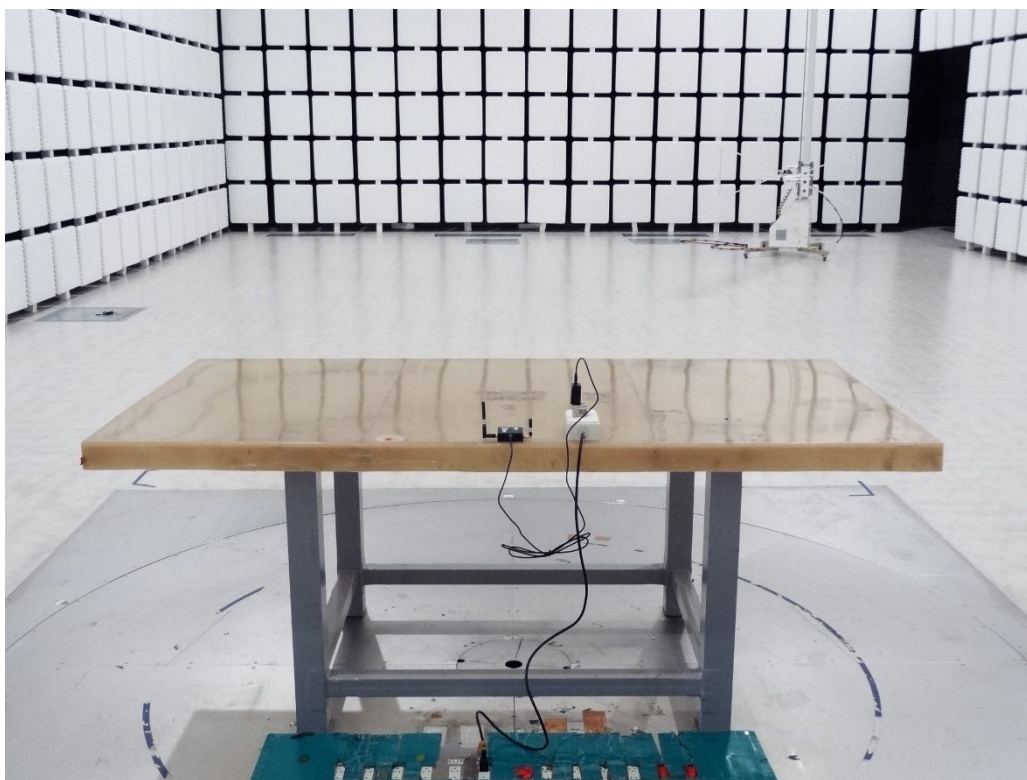
Above 1GHz test, if the peak measured value meets the average limit, it is unnecessary to perform the average measurement.

4.4 Test Setup Photo

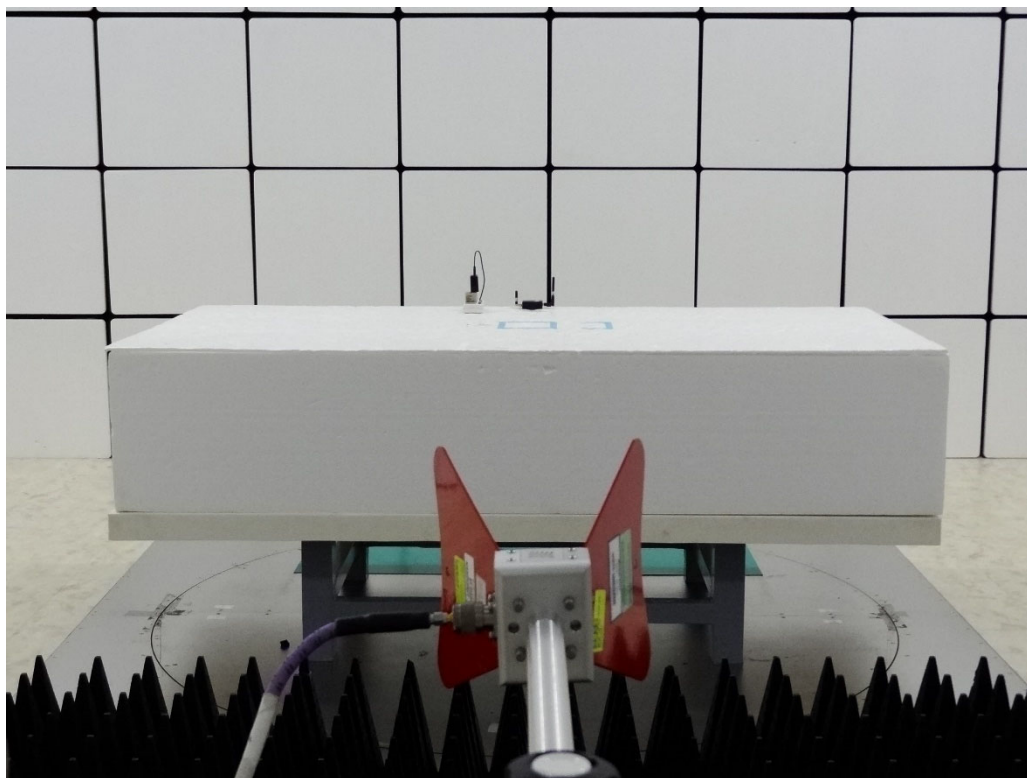
Front View (30MHz~1GHz)



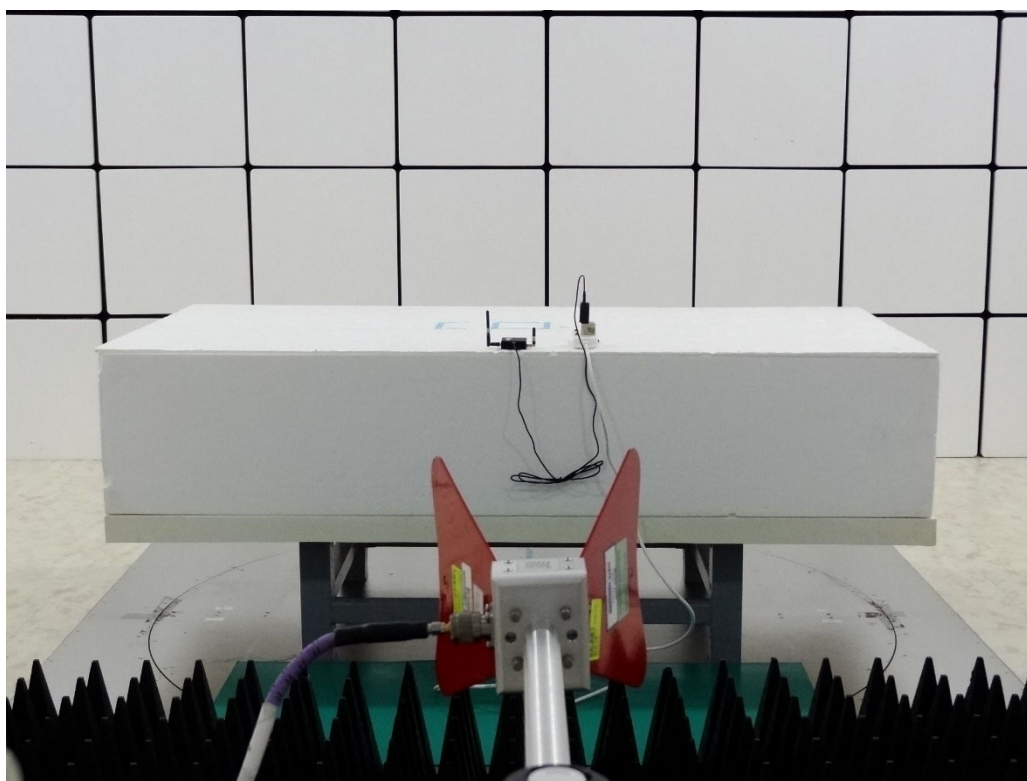
Back View (30MHz~1GHz)



Front View (above 1GHz)



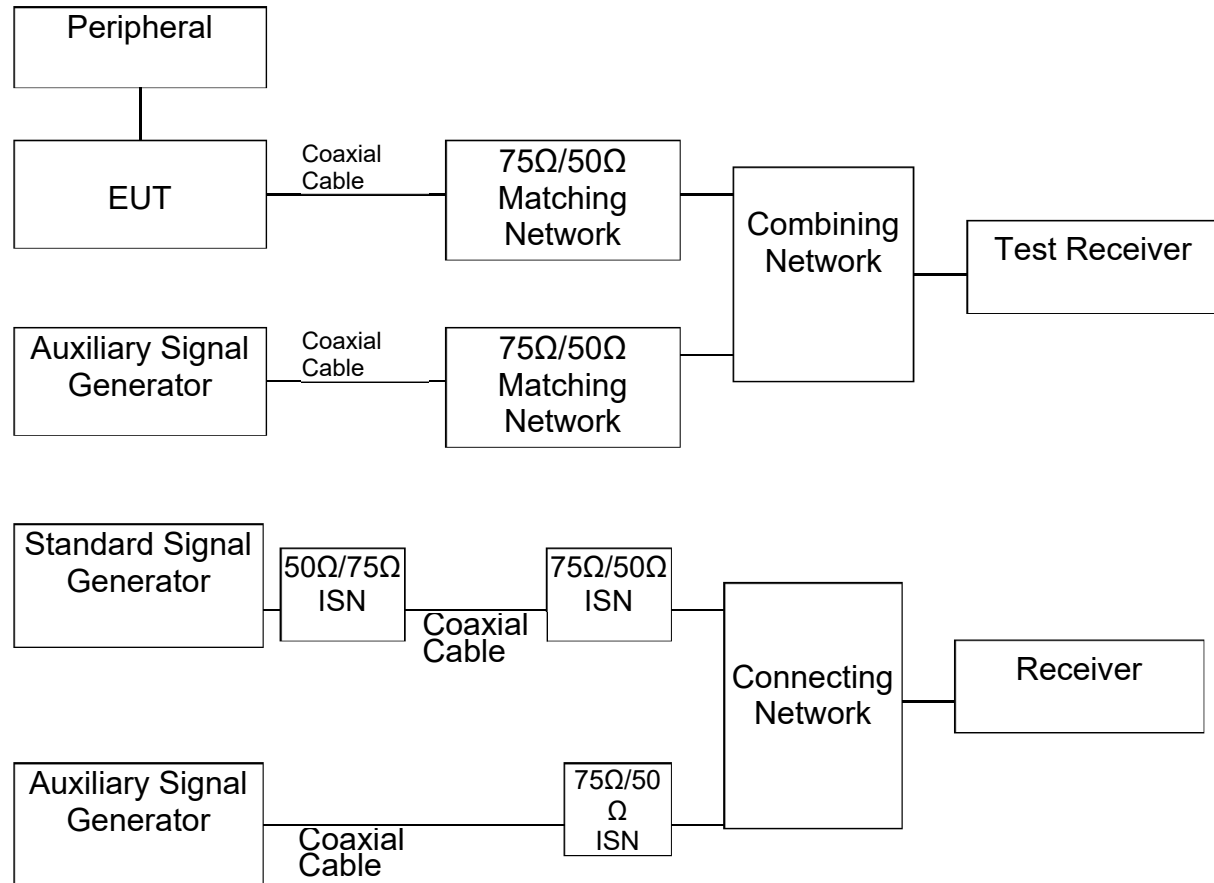
Back View (above 1GHz)



5. Voltage Disturbance Emissions at Antenna Terminals

5.1 Test Setup and Procedure

5.1.1 Test Setup



5.1.2 Test Procedure

The output level of the auxiliary signal generator was set to 70dBuV at the EUT antenna terminal with 75 ohms impedance with an un-modulated carrier.

The highest emissions were analyzed in details by operating the spectrum analyzer and/or EMI receiver in quasi-peak mode to determine the precise amplitude of the emissions. The power of EUT was switched off to make sure the emission was not contributed by the auxiliary signal generator. While doing so, the interconnecting cables and major parts of the system were moved around to maximize the emission.

5.1.3 EMI Receiver Configuration (for the frequencies tested)

Frequency Range:	30MHz-2150MHz
Detector Function:	Quasi-Peak Mode
Resolution Bandwidth:	120kHz

5.1.4 Limit

Applicable to:

1. TV broadcast receiver tuner ports with an accessible connector.
2. RF modulator output ports.
3. FM broadcast receiver tuner ports with an accessible connector.

Table clause	Frequency range MHz	Detector type/ bandwidth	Class B limits dB(μV) 75 Ω			Applicability
			Other	Local Oscillator Fundamental	Local Oscillator Harmonics	
A12.1	30 – 950	For frequencies ≤1 GHz	46	46	46	See a)
	950 – 2 150		46	54	54	
A12.2	950 – 2 150	Quasi Peak/ 120 kHz	46	54	54	See b)
A12.3	30 – 300		46	54	50	See c)
	300 – 1 000				52	
A12.4	30 – 300	For frequencies ≥1 GHz	46	66	59	See d)
	300 – 1 000				52	
A12.5	30 – 950	Peak/ 1 MHz	46	76	46	See e)
	950 – 2 150			n/a	54	

a) Television receivers (analogue or digital), video recorders and PC TV broadcast receiver tuner cards working in channels between 30 MHz and 1 GHz, and digital audio receivers.

b) Tuner units (not the LNB) for satellite signal reception.

c) Frequency modulation audio receivers and PC tuner cards.

d) Frequency modulation car radios.

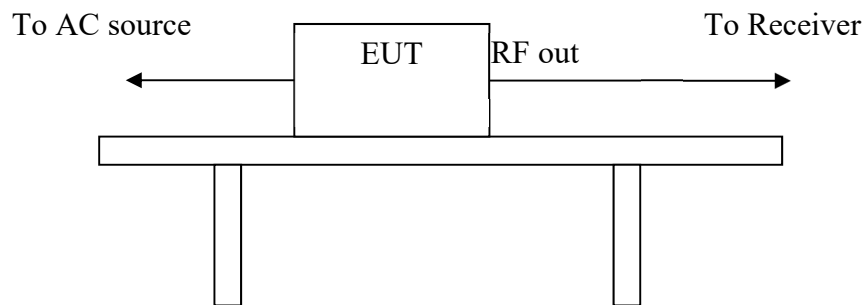
e) Applicable to EUTs with RF modulator output ports (for example DVD equipment, video recorders, camcorders and decoders etc.) designed to connect to TV broadcast receiver tuner ports.

****Remarks: It is not necessary to be tested on this item.**

6. Differential Voltage Emissions

6.1 Test Setup and Procedure

6.1.1 Test Setup



6.1.2 Test Procedure

The output level of the auxiliary signal generator was set to 70dBuV at the EUT antenna terminal with 75 ohms impedance with an un-modulated carrier.

The highest emissions were analyzed in details by operating the spectrum analyzer and/or EMI receiver in quasi-peak mode to determine the precise amplitude of the emissions. The power of EUT was switched off to make sure the emission was not contributed by the auxiliary signal generator. While doing so, the interconnecting cables and major parts of the system were moved around to maximize the emission.

6.1.3 EMI Receiver Configuration (for the frequencies tested)

Frequency Range:	30MHz-2150MHz
Detector Function:	Quasi-Peak Mode
Resolution Bandwidth:	120kHz

6.1.4 Limit

Applicable to:

1. TV broadcast receiver tuner ports with an accessible connector.
2. RF modulator output ports.
3. FM broadcast receiver tuner ports with an accessible connector.

Table clause	Frequency range MHz	Detector type/ bandwidth	Class B limits dB(μV) 75 Ω			Applicability
			Other	Local Oscillator Fundamental	Local Oscillator Harmonics	
A12.1	30 – 950	For frequencies ≤1 GHz	46	46	46	See a)
	950 – 2 150		46	54	54	
A12.2	950 – 2 150	Quasi Peak/ 120 kHz	46	54	54	See b)
A12.3	30 – 300		46	54	50	See c)
	300 – 1 000				52	
A12.4	30 – 300	For frequencies ≥1 GHz	46	66	59	See d)
	300 – 1 000				52	
A12.5	30 – 950	Peak/ 1 MHz	46	76	46	See e)
	950 – 2 150			n/a	54	

a) Television receivers (analogue or digital), video recorders and PC TV broadcast receiver tuner cards working in channels between 30 MHz and 1 GHz, and digital audio receivers.

b) Tuner units (not the LNB) for satellite signal reception.

c) Frequency modulation audio receivers and PC tuner cards.

d) Frequency modulation car radios.

e) Applicable to EUTs with RF modulator output ports (for example DVD equipment, video recorders, camcorders and decoders etc.) designed to connect to TV broadcast receiver tuner ports.

****Remarks: It is not necessary to be tested on this item.**

7. Appendix

7.1 Appendix A: Test Equipment

7.1.1 Test Equipment List

Location	Equipment Name	Brand	Model	S/N	Last Cal. Date	Next Cal. Date
Conduction 03	EMI Receiver 15	ROHDE & SCHWARZ	ESCI	101166	07/07/2021	07/07/2022
Conduction 03	Chamber05 -1 Cable	WOKEN	CFD 300-NL	Chamber05 -1 Cable	08/30/2021	08/30/2022
Conduction 03	LISN 19	R&S	ENV216	101425	11/11/2021	11/11/2022
Conduction 03	LISN 22	R&S	ENV216	101478	10/28/2021	10/28/2022
Conduction 03	LISN 24	SCHWARZBECK	NNLK 8121	8121-829	07/26/2021	07/26/2022
Conduction 03	ISN T4 09	Teseq GmbH	ISN T400A	49914	08/02/2021	08/02/2022
Conduction 03	ISN T8 09	Teseq GmbH	ISN T800	36190	09/30/2021	09/30/2022
Conduction 03	ISN T8 CAT6A 01	SCHWARZBECK	NTFM 8158	8158 0123	01/17/2021	01/17/2022
Conduction 03	CDN ISN ST08A 1	Teseq GmbH	CDN ISN ST08A	43352	10/07/2021	10/07/2022
Conduction 03	Capacitive Voltage Probe 01	SCHAFFNER	CVP 2200A	18711	08/05/2021	08/05/2022
Conduction 03	Current Probe	SCHAFFNER	SMZ 11	18030	03/04/2021	03/04/2022

Location Chamber02	Equipment Name	Brand	Model	S/N	Last Cal. Date	Next Cal. Date
Radiation	BILOG Antenna 17 (30MHz~1GHz)	Schwarzbeck	Schwarzbeck VULB 9168+EMCI-N-6-05	645	04/13/2021	04/13/2022
Radiation	Preamplifier 25	EMCI	EMC9135	980295	04/03/2021	04/03/2022
Radiation	Coaxial Cable Chmb 02-10M-02	EMC	RG214U	Chmb 02-10M-02	10/13/2021	10/13/2022
Radiation	EMI Receiver 12	ROHDE & SCHWARZ	ESCI	100804	08/04/2021	08/04/2022

Location Conducted	Equipment Name	Brand	Model	S/N	Last Cal. Date	Next Cal. Date
Chamber 19	Spectrum analyzer	R&S	FSV40	101919	08/18/2021	08/18/2022
Chamber 19	EMI Receiver	R&S	ESR3	102461	05/05/2021	05/05/2022
Chamber 19	Loop Antenna	EM	EM-6879	271	09/29/2021	09/29/2022
Chamber 19	Bilog Antenna (30MHz-1GHz)	Schwarzbeck	VULB9168 w 6dB Att.	9168-736	02/22/2021	02/22/2022
Chamber 19	Horn antenna (1GHz-18GHz)	ETS	3117	00218718	10/12/2021	10/12/2022
Chamber 19	Horn antenna (18GHz-26GHz)	Com-power	AH-826	081001	11/30/2021	11/30/2022
Chamber 19	Horn antenna (26GHz-40GHz)	Com-power	AH-640	100A	03/11/2021	03/11/2022
Chamber 19	Preamplifier (9kHz-1GHz)	HP	8447F	3113A04621	06/22/2021	06/22/2022
Chamber 19	Preamplifier (1GHz-26GHz)	EM	EM01M26G	060681	05/07/2021	05/07/2022
Chamber 19	Preamplifier (26GHz-40GHz)	MITEQ	JS4-26004000-27-5A	818471	05/07/2021	05/07/2022
Chamber 19	RF Cable (9kHz-18GHz)	HUBER SUHNER	Sucoflex 104A & 18GHz SMA(M)-SMA(M)-10M	MY817/4A & 20200525	12/25/2020	12/25/2021
Chamber 19	RF Cable (18GHz-40GHz)	HUBER SUHNER	Sucoflex 102	27963/2&3742 1/2	11/17/2021	11/17/2022
Chamber 19	Signal Generator	Anritsu	MG3692A	20311	01/03/2021	01/03/2022
Chamber 19	Test Software	Audix	E3 Ver:6.12023	N/A	N/A	N/A

7.1.2 Software for Controlling Spectrum/Receiver and Calculating Test Data

Site	Filename	Version
Conduction/Radiation	EZ EMC	ISL-03A2

7.2 Appendix B: Uncertainty of Measurement

The laboratory measurement uncertainty accordance with refers to CISPR 16-4-2. If U_{lab} is less than or equal to U_{cisp} in Table 1, then the test report may either state the value of U_{lab} or state that U_{lab} is less than U_{cisp} .

The coverage factor $k = 2$ yields approximately a 95 % level of confidence.

<Conduction 03>

AMN: $\pm 2.90\text{dB}$

ISN T4: $\pm 3.05\text{dB}$

ISN T8: $\pm 3.05\text{dB}$

CVP: $\pm 3.62\text{dB}$

CP: $\pm 2.88\text{dB}$

<Chamber 02 (10m)>

Horizontal

30MHz~200MHz: $\pm 4.52\text{dB}$

200MHz~1000MHz: $\pm 4.42\text{dB}$

Vertical

30MHz~200MHz: $\pm 4.51\text{dB}$

200MHz~1000MHz: $\pm 4.70\text{dB}$

<Chamber 19 (3M)>

30MHz~1000MHz: $\pm 4.22\text{ dB}$

1GHz~40GHz: $\pm 4.08\text{ dB}$

--- END ---