FCC TEST REPORT

FOR

Guangzhou BDE Technology Inc.

BDE Multi-Band & Multi-Protocol Wireless Module with PA

Test Model: BDE-MB1354P101UA32

Additional Model No.: Please Refer to Page 6

Prepared for	:	Guangzhou BDE Technology Inc.
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Prepared by	:	Shenzhen LCS Compliance Testing Laboratory Ltd. 101, 201 Bldg A & 301 Bldg C, Juji Industrial Park
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Date of receipt of test sample	:	May 08, 2024
Number of tested samples	:	2
Sample No.	:	A240508051-1, A240508051-2
Serial number	:	Prototype
Date of Test	:	May 08, 2024 ~ April 01, 2025
Date of Report	:	April 02, 2025

NVLAP® TESTING NVLAP LAB CODE 600167-0

FCC TEST REPORT
FCC CFR 47 PART 15 C (15.247)

Report Reference No.	**:**	**LCSA05074070EC**
Date of Issue.....	:	April 02, 2025
Testing Laboratory Name	**:**	**Shenzhen LCS Compliance Testing Laboratory Ltd.**
Address.....	:	101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Yabianxueziwei, Shajing Street, Baoan District, Shenzhen, 518000, China
Testing Location/ Procedure.....	:	Full application of Harmonised standards ■ Partial application of Harmonised standards □ Other standard testing method □
Applicant's Name.....	**:**	**Guangzhou BDE Technology Inc.**
Address.....	:	B2-403, Chuangyi Building, 162 Science Avenue, Huangpu District, Guangzhou 510663, China
Test Specification		
Standard.....	:	FCC CFR 47 PART 15 C (15.247)
Test Report Form No.	:	TRF-4-E-148 A/0
TRF Originator	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Master TRF	:	Dated 2011-03

Test Item Description.	**:**	**BDE Multi-Band & Multi-Protocol Wireless Module with PA**
Trade Mark.....	:	BDE
Test Model	:	BDE-MB1354P101UA32
Ratings.....	:	Input: DC 3.3V
Result	**:**	**Positive**

Compiled by:	**Supervised by:**	**Approved by:**
Jack Liu/Administrator	Cary Luo/ Technique principal	Gavin Liang/ Manager

FCC -- TEST REPORT

Test Report No. : LCSA05074070EC	April 02, 2025 Date of issue

Test Model.....	: BDE-MB1354P101UA32
EUT.....	: BDE Multi-Band & Multi-Protocol Wireless Module with PA
Applicant.....	**: Guangzhou BDE Technology Inc.**
Address.....	: B2-403, Chuangyi Building, 162 Science Avenue, Huangpu District, Guangzhou 510663, China
Telephone.....	: /
Fax.....	: /
Manufacturer.....	**: Guangzhou BDE Technology Inc.**
Address.....	: B2-403, Chuangyi Building, 162 Science Avenue, Huangpu District, Guangzhou 510663, China
Telephone.....	: /
Fax.....	: /
Factory.....	**: Guangzhou BDE Technology Inc.**
Address.....	: B2-403, Chuangyi Building, 162 Science Avenue, Huangpu District, Guangzhou 510663, China
Telephone.....	: /
Fax.....	: /

Test Result	**Positive**

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Revision History

Report Version	Issue Date	Revision Content	Revised By
000	April 02, 2025	Initial Issue	---

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1. GENERAL INFORMATION

1.1 Description of Device (EUT)

EUT	:	BDE Multi-Band & Multi-Protocol Wireless Module with PA
Test Model	:	BDE-MB1354P101UA32
Additional Model No.	:	See model list
Model Declaration	:	See model list
Ratings	:	Input: DC 3.3V
Hardware Version	:	V1
Software Version	:	7.40.00
Bluetooth	:	
Frequency Range	:	2402MHz~2480MHz
Channel Number	:	40 channels for Bluetooth V5.3 (DTS)
Channel Spacing	:	2MHz for Bluetooth V5.3 (DTS)
Modulation Type	:	GFSK for Bluetooth V5.3 (DTS)
Bluetooth Version	:	V5.3
Antenna Description	:	For PCB Trace Antenna: Integrated PCB trace antenna, 0.8dBi(Max.) For ANT: Whip Antenna, 3.0dBi(Max.) For U.FL Connector: Whip Antenna, 3.0dBi(Max.)
Zigbee	:	
Frequency Range	:	2405MHz-2480MHz
Channel Spacing	:	5MHz
Channel Number	:	16 Channels
Modulation Type	:	O-QPSK
Antenna Description	:	For PCB Trace Antenna: Integrated PCB trace antenna, 0.8dBi(Max.) For ANT Pin: Whip Antenna, 3.0dBi(Max.) For U.FL Connector: Whip Antenna, 3.0dBi(Max.)
915 MHz	:	
Frequency Range	:	50Kbps, 100Kbps: 902.2MHz ~ 927.8MHz 150Kbps, 200Kbps: 902.4MHz ~ 927.6MHz
Equipment Type	:	FHSS
Channel Number	:	129 Channels (50Kbps, 100Kbps) 64 Channels (150Kbps, 200Kbps)
Modulation Type	:	2-GFSK
Antenna Description	:	For U.FL Connector: Whip Antenna, 3.8dBi(Max.) For ANT Pin: Whip Antenna, 3.8dBi(Max.)

Note: For a more detailed antenna description, please refer to the antenna specifications or the antenna report provided by the customer.

Model list:

Model Number	Orderable Part Number	Chipset	Flash (KB)	SRAM (KB)	Antenna on Sub-1G	Antenna on 2.4G	On-Board SPI Nor Flash Support	Operating Temperature
BDE-MB13P1	BDE-MB1354P101UA32	CC1354P10	1024	288	U.FL Connector	PCB Trace Antenna	32Mbit	-40℃ ~ +85℃
	BDE-MB1354P101NA32				ANT Pin	PCB Trace Antenna		
	BDE-MB1354P101UU32				U.FL Connector	U.FL Connector		
	BDE-MB1354P101NU32				ANT Pin	U.FL Connector		
	BDE-MB1354P101UN32				U.FL Connector	ANT Pin		
	BDE-MB1354P101NN32				ANT Pin	ANT Pin		
	BDE-MB1354P101UA0				U.FL Connector	PCB Trace Antenna	Not Included	
	BDE-MB1354P101NA0				ANT Pin	PCB Trace Antenna		
	BDE-MB1354P101UU0				U.FL Connector	U.FL Connector		
	BDE-MB1354P101NU0				ANT Pin	U.FL Connector		
	BDE-MB1354P101UN0				U.FL Connector	ANT Pin		
	BDE-MB1354P101NN0				ANT Pin	ANT Pin		
	BDE-MB1354P101UA32-IN				U.FL Connector	PCB Trace Antenna	32Mbit	-40℃ ~ +105℃
	BDE-MB1354P101NA32-IN				ANT Pin	PCB Trace Antenna		
	BDE-MB1354P101UU32-IN				U.FL Connector	U.FL Connector		
	BDE-MB1354P101NU32-IN				ANT Pin	U.FL Connector		
	BDE-MB1354P101UN32-IN				U.FL Connector	ANT Pin		
	BDE-MB1354P101NN32-IN				ANT Pin	ANT Pin		
	BDE-MB1354P101UA0-IN				U.FL Connector	PCB Trace Antenna	Not Included	
	BDE-MB1354P101NA0-IN				ANT Pin	PCB Trace Antenna		
	BDE-MB1354P101UU0-IN				U.FL Connector	U.FL Connector		
	BDE-MB1354P101NU0-IN				ANT Pin	U.FL Connector		
	BDE-MB1354P101UN0-IN				U.FL Connector	ANT Pin		
	BDE-MB1354P101NN0-IN				ANT Pin	ANT Pin		
BDE-MB13P1	BDE-MB1352P71UA32	CC1352P7	704	144	U.FL Connector	PCB Trace Antenna	32Mbit	-40℃ ~ +85℃
	BDE-MB1352P71NA32				ANT Pin	PCB Trace Antenna		
	BDE-MB1352P71UU32				U.FL Connector	U.FL Connector		
	BDE-MB1352P71NU32				ANT Pin	U.FL Connector		
	BDE-MB1352P71UN32				U.FL Connector	ANT Pin		
	BDE-MB1352P71NN32				ANT Pin	ANT Pin		
	BDE-MB1352P71UA0				U.FL Connector	PCB Trace Antenna	Not Included	
	BDE-MB1352P71NA0				ANT Pin	PCB Trace Antenna		
	BDE-MB1352P71UU0				U.FL Connector	U.FL Connector		
	BDE-MB1352P71NU0				ANT Pin	U.FL Connector		
	BDE-MB1352P71UN0				U.FL Connector	ANT Pin		
	BDE-MB1352P71NN0				ANT Pin	ANT Pin		
	BDE-MB1352P71UA32-IN				U.FL Connector	PCB Trace Antenna	32Mbit	-40℃ ~ +105℃
	BDE-MB1352P71NA32-IN				ANT Pin	PCB Trace Antenna		
	BDE-MB1352P71UU32-IN				U.FL Connector	U.FL Connector		
	BDE-MB1352P71NU32-IN				ANT Pin	U.FL Connector		
	BDE-MB1352P71UN32-IN				U.FL Connector	ANT Pin		
	BDE-MB1352P71NN32-IN				ANT Pin	ANT Pin		
	BDE-MB1352P71UA0-IN				U.FL Connector	PCB Trace Antenna	Not Included	
	BDE-MB1352P71NA0-IN				ANT Pin	PCB Trace Antenna		
	BDE-MB1352P71UU0-IN				U.FL Connector	U.FL Connector		
	BDE-MB1352P71NU0-IN				ANT Pin	U.FL Connector		
	BDE-MB1352P71UN0-IN				U.FL Connector	ANT Pin		
	BDE-MB1352P71NN0-IN				ANT Pin	ANT Pin		
BDE-MB13P1	BDE-MB1352P1UA32	CC1352P	352	80	U.FL Connector	PCB Trace Antenna	32Mbit	-40℃ ~ +85℃
	BDE-MB1352P1NA32				ANT Pin	PCB Trace Antenna		
	BDE-MB1352P1UU32				U.FL Connector	U.FL Connector		
	BDE-MB1352P1NU32				ANT Pin	U.FL Connector		
	BDE-MB1352P1UN32				U.FL Connector	ANT Pin		
	BDE-MB1352P1NN32				ANT Pin	ANT Pin		
	BDE-MB1352P1UA0				U.FL Connector	PCB Trace Antenna	Not Included	
	BDE-MB1352P1NA0				ANT Pin	PCB Trace Antenna		
	BDE-MB1352P1UU0				U.FL Connector	U.FL Connector		
	BDE-MB1352P1NU0				ANT Pin	U.FL Connector		
	BDE-MB1352P1UN0				U.FL Connector	ANT Pin		
	BDE-MB1352P1NN0				ANT Pin	ANT Pin		
	BDE-MB1352P1UA32-IN				U.FL Connector	PCB Trace Antenna	32Mbit	-40℃ ~ +105℃
	BDE-MB1352P1NA32-IN				ANT Pin	PCB Trace Antenna		
	BDE-MB1352P1UU32-IN				U.FL Connector	U.FL Connector		
	BDE-MB1352P1NU32-IN				ANT Pin	U.FL Connector		
	BDE-MB1352P1UN32-IN				U.FL Connector	ANT Pin		
	BDE-MB1352P1NN32-IN				ANT Pin	ANT Pin		
	BDE-MB1352P1UA0-IN				U.FL Connector	PCB Trace Antenna	Not Included	
	BDE-MB1352P1NA0-IN				ANT Pin	PCB Trace Antenna		
	BDE-MB1352P1UU0-IN				U.FL Connector	U.FL Connector		
	BDE-MB1352P1NU0-IN				ANT Pin	U.FL Connector		
	BDE-MB1352P1UN0-IN				U.FL Connector	ANT Pin		
	BDE-MB1352P1NN0-IN				ANT Pin	ANT Pin		

Identities and differences:

The above models have same PCB board and structure, The differences between the above models mainly lie in the main chip model(note: only the Flash and SRAM sizes are different between the main chip models), antenna interface location, antenna type, operating temperature, and whether an external 32Mbit SPI Flash is configured.

With the consideration of the identities and differences list above, BDE-MB1354P101UA32 is fully tested, at radiated emission test item, we choose BDE-MB1354P101NN32 and BDE-MB1354P101UU32 for differences test.

1.2 Support equipment List

Manufacturer	Description	Model	Serial Number	Certificate
Lenovo	ADAPTER for Notebook	ADP-90DD B	36001941	FCC
Lenovo	Notebook	B470	WB05067151	FCC

Note: Auxiliary equipment is provided by the laboratory.

1.3 External I/O Cable

I/O Port Description	Quantity	Cable
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1.4 Description of Test Facility

NVLAP Accreditation Code is 600167-0.
FCC Designation Number is CN5024.
CAB identifier is CN0071.
CNAS Registration Number is L4595.
Test Firm Registration Number: 254912.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.10:2013 and CISPR 16-1-4:2010 SVSWR requirement for radiated emission above 1GHz.

1.5 Statement of the Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements” and is documented in the LCS quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

1.6 Measurement Uncertainty

Test Item		Frequency Range	Uncertainty	Note
Radiation Uncertainty	:	9KHz~30MHz	±3.10dB	(1)
		30MHz~200MHz	±2.96dB	(1)
		200MHz~1000MHz	±3.10dB	(1)
		1GHz~26.5GHz	±3.80dB	(1)
		26.5GHz~40GHz	±3.90dB	(1)
Conduction Uncertainty	:	150kHz~30MHz	±1.63dB	(1)
Power disturbance	:	30MHz~300MHz	±1.60dB	(1)
Output power	:	1GHz-40GHz	±0.57dB	(1)
Power Spectral Density	:	1GHz-40GHz	±1.2dB	(1)
Occupied Channel Bandwidth	:	1GHz-40GHz	±5%	(1)
Conducted RF Spurious Emission	:	9kHz-40GHz	±1.80dB	(1)
Emissions in Restricted Bands	:	1GHz-40GHz	±2.47dB	(1)
Frequency Stability	:	1GHz-40GHz	±25Hz	(1)
Dewll time	:	1GHz-40GHz	2.3%	(1)

(1). This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

1.7 Description of Test Modes

The EUT works in the X-axis, Y-axis, Z-axis. The following operating modes were applied for the related test items. All test modes were tested, only the result of the worst case was recorded in the report.

AC conducted emission pre-test at both at AC 120V/60Hz and AC 240V/50Hz modes, recorded worst case.

AC conducted emission pre-test at both at power adapter and power from PC modes, recorded worst case.

Worst-case mode and channel used for 150 KHz-30 MHz power line conducted emissions was determined to be TX (150Kbps-Low Channel).

Worst-case mode and channel used for 9 KHz-1000 MHz radiated emissions was determined to be TX (150Kbps-Low Channel).

Test configuration parameter:

Mode	Modulation	Power Level Setting	Data Rate	Duty Cycle (%)
50Kbps	2-GFSK	Default	Default	100
100Kbps	2-GFSK	Default	Default	100
150Kbps	2-GFSK	Default	Default	100
200Kbps	2-GFSK	Default	Default	100

Channel list:

Wi-SUN Mode #1b, 50Kbps&Wi-SUN Mode #2a, 100Kbps					
channel number	frequency （MHz）	channel number	frequency （MHz）	channel number	frequency （MHz）
0	**902.2**	43	910.8	86	919.4
1	902.4	44	911	87	919.6
2	902.6	45	911.2	88	919.8
3	902.8	46	911.4	89	920
4	903	47	911.6	90	920.2
5	903.2	48	911.8	91	920.4
6	903.4	49	912	92	920.6
7	903.6	50	912.2	93	920.8
8	903.8	51	912.4	94	921
9	904	52	912.6	95	921.2
10	904.2	53	912.8	96	921.4
11	904.4	54	913	97	921.6
12	904.6	55	913.2	98	921.8
13	904.8	56	913.4	99	922
14	905	57	913.6	100	922.2
15	905.2	58	913.8	101	922.4
16	905.4	59	914	102	922.6
17	905.6	60	914.2	103	922.8
18	905.8	61	914.4	104	923
19	906	62	914.6	105	923.2
20	906.2	63	914.8	106	923.4
21	906.4	64	**915**	107	923.6
22	906.6	65	915.2	108	923.8
23	906.8	66	915.4	109	924
24	907	67	915.6	110	924.2
25	907.2	68	915.8	111	924.4
26	907.4	69	916	112	924.6
27	907.6	70	916.2	113	924.8
28	907.8	71	916.4	114	925
29	908	72	916.6	115	925.2
30	908.2	73	916.8	116	925.4
31	908.4	74	917	117	925.6
32	908.6	75	917.2	118	925.8
33	908.8	76	917.4	119	926
34	909	77	917.6	120	926.2
35	909.2	78	917.8	121	926.4
36	909.4	79	918	122	926.6
37	909.6	80	918.2	123	926.8
38	909.8	81	918.4	124	927
39	910	82	918.6	125	927.2
40	910.2	83	918.8	126	927.4
41	910.4	84	919	127	927.6
42	910.6	85	919.2	128	**927.8**

Note: The black bold channels were selected for 50kbps and 100kbps test.

Wi-SUN Mode #1b, 150Kbps&Wi-SUN Mode #2a, 200Kbps					
channel number	frequency（MHz）	channel number	frequency（MHz）	channel number	frequency（MHz）
0	**902.4**	22	911.2	44	920
1	902.8	23	911.6	45	920.4
2	903.2	24	912	46	920.8
3	903.6	25	912.4	47	921.2
4	904	26	912.8	48	921.6
5	904.4	27	913.2	49	922
6	904.8	28	913.6	50	922.4
7	905.2	29	914	51	922.8
8	905.6	30	914.4	52	923.2
9	906	31	914.8	53	923.6
10	906.4	32	**915.2**	54	924
11	906.8	33	915.6	55	924.4
12	907.2	34	916	56	924.8
13	907.6	35	916.4	57	925.2
14	908	36	916.8	58	925.6
15	908.4	37	917.2	59	926
16	908.8	38	917.6	60	926.4
17	909.2	39	918	61	926.8
18	909.6	40	918.4	62	927.2
19	910	41	918.8	63	**927.6**
20	910.4	42	919.2	/	/
21	910.8	43	919.6	/	/

Note: The black bold channels were selected for 150kbps and 200kbps test.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, FCC CFR PART 15C 15.207, 15.209 and 15.247.

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

The EUT was operated in the normal operating mode for Hopping Numbers and Dwell Time test and a continuous transmits mode for other tests.

According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209, 15.247 under the FCC Rules Part 15 Subpart C.

2.3 General Test Procedures

2.3.1 Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.1.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

2.3.2 Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane below 1GHz and 1.5 m above ground plane above 1GHz. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 6.4 of ANSI C63.10-2013.

2.4. Test Sample

The application provides 2 samples to meet requirement;

Sample Number	Description
Sample 1(A240508051-1)	Engineer sample – continuous transmit
Sample 2(A240508051-2)	Normal sample – Intermittent transmit

3. SYSTEM TEST CONFIGURATION

3.1 Justification

The system was configured for testing in a continuous transmits condition.

3.2 EUT Exercise Software

The system was configured for testing in a continuous transmits condition and change test channels by software provided by applicant.Power Settings Default.

3.3 Special Accessories

N/A

3.4 Block Diagram/Schematics

Please refer to the related document.

3.5 Equipment Modifications

Shenzhen LCS Compliance Testing Laboratory Ltd. has not done any modification on the EUT.

3.6 Test Setup

Please refer to the test setup photo.

4. SUMMARY OF TEST RESULTS

Applied Standard: FCC Part 15 Subpart C				
FCC Rules	Description of Test	Test Sample	Result	Remark
§15.247(a)(1)(i)	20dB Bandwidth	Sample 1	Compliant	Appendix C.1
§15.247(b)(2)	Maximum Peak Conducted Output Power	Sample 1	Compliant	Appendix C.2
§15.247(a)(1)	Frequency Separation	Sample 1	Compliant	Appendix C.3
§15.247(a)(1)(i)	Time Of Occupancy (Dwell Time)	Sample 1	Compliant	Appendix C.4
§15.247(a)(1)(i)	Number Of Hopping Frequency	Sample 1	Compliant	Appendix C.5
§15.209(a)	Radiated Spurious Emissions	Sample 1 Sample 2	Compliant	Note 1
§15.247(d)	Band Edges Measurements and Conducted Spurious Emissions	Sample 1	Compliant	Appendix C.6 Appendix C.7
§15.205	Emissions at Restricted Band	Sample 1	Compliant	Note 1
§15.207(a)	AC Mains Conducted Emissions	Sample 1	Compliant	Note 1
§15.203	Antenna Requirements	Sample 1	Compliant	Note 1
§15.247(i)§1.1310 §15.247(i)§2.1091	RF Exposure	Sample 1	Compliant	Note 2

Remark:
1. Note 1 – Test results inside test report;
2. Note 2 – Test results in other test report (RF Exposure Evaluation);

5. SUMMARY OF TEST EQUIPMENT

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	Power Meter	R&S	NRVS	100444	2023-06-09	2024-06-08
					2024-06-06	2025-06-05
2	Power Sensor	R&S	NRV-Z81	100458	2023-06-09	2024-06-08
					2024-06-06	2025-06-05
3	Power Sensor	R&S	NRV-Z32	10057	2023-06-09	2024-06-08
					2024-06-06	2025-06-05
4	Test Software	Tonscend	JS1120-2	/	N/A	N/A
5	RF Control Unit	Tonscend	JS0806-2	N/A	2023-08-15	2024-08-14
					2024-06-06	2025-06-05
6	MXA Signal Analyzer	Agilent	N9020A	MY50510140	2023-10-18	2024-10-17
					2024-10-08	2025-10-07
7	DC Power Supply	Agilent	E3642A	N/A	2023-10-18	2024-10-17
					2024-10-08	2025-10-07
8	EMI Test Software	AUDIX	E3	/	N/A	N/A
9	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	2023-06-09	2024-06-08
					2024-06-06	2025-06-05
10	Positioning Controller	Max-Full	MF7802BS	MF780208586	N/A	N/A
11	Active Loop Antenna	SCHWARZBECK	FMZB 1519B	00005	2021-08-29	2024-08-28
					2024-07-13	2027-07-12
12	By-log Antenna	SCHWARZBECK	VULB9163	9163-470	2021-09-12	2024-09-11
					2024-08-03	2027-08-02
13	Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1925	2021-09-05	2024-09-04
					2024-07-13	2027-07-12
14	Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	791	2021-08-29	2024-08-28
					2024-07-13	2027-07-12
15	Broadband Preamplifier	SCHWARZBECK	BBV9719	9719-025	2021-08-29	2024-08-28
					2024-07-30	2025-07-29
16	EMI Test Receiver	R&S	ESR 7	101181	2023-08-15	2024-08-14
					2024-06-06	2025-06-05
17	RS SPECTRUM ANALYZER	R&S	FSP40	100503	2023-07-17	2024-07-16
					2024-06-06	2025-06-05
18	Low-frequency amplifier	SchwarzZBECK	BBV9745	00253	2023-10-18	2024-10-17
					2024-10-08	2025-10-07
19	High-frequency amplifier	JS Denki Pte	PA0118-43	JSPA21009	2023-10-18	2024-10-17
					2024-10-08	2025-10-07
20	6dB Attenuator	/	100W/6dB	1172040	2023-06-09	2024-06-08
					2024-06-06	2025-06-05
21	3dB Attenuator	/	2N-3dB	/	2023-10-18	2024-10-17
					2024-10-08	2025-10-07
22	EMI Test Receiver	R&S	ESPI	101940	2023-08-15	2024-08-14
					2024-06-06	2025-06-05
23	Artificial Mains	R&S	ENV216	101288	2023-06-09	2024-06-08
					2024-06-06	2025-06-05
24	10dB Attenuator	SCHWARZBECK	MTS-IMP-136	261115-001-0032	2023-06-09	2024-06-08
					2024-06-06	2025-06-05
25	EMI Test Software	Farad	EZ	/	N/A	N/A
26	Antenna Mast	Max-Full	MFA-515BSN	1308572	N/A	N/A
27	Pulse Limiter	R&S	ESH3-Z2	102750-NB	2023-08-15	2024-08-14
					2024-06-06	2025-06-05

6. MEASUREMENT RESULTS

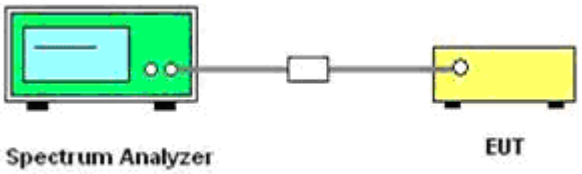
6.1. Frequency Separation and 20 dB Bandwidth

6.1.1 Limit

1. According to §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

2. According to §15.247(a)(1)(i), The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

6.1.2 Block Diagram of Test Setup



6.1.3 Test Procedure

Frequency separation test procedure：

1). Place the EUT on the table and set it in transmitting mode.
2). Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Spectrum Analyzer.
3). Set center frequency of Spectrum Analyzer = middle of hopping channel.
4). Set the Spectrum Analyzer as RBW = 30 kHz, VBW = 100 kHz, Span = wide enough to capture the peaks of two adjacent channels, Sweep = auto.
5). Max hold, mark 2 peaks of hopping channel and record the 2 peaks frequency.

20dB bandwidth test procedure：

1). Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel.
2). RBW ≥1% of the 20 dB bandwidth, VBW ≥RBW.
3). Detector function = peak.
4). Trace = max hold.

6.1.4 Test Results

6.1.4.1 20dB Bandwidth

PASS

Please refer to Appendix C.1

Remark:

1. Test results including cable loss

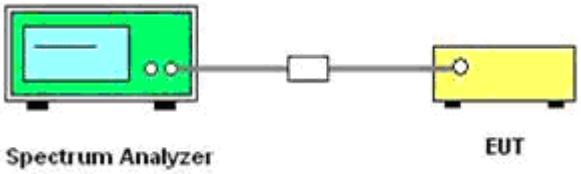
6.1.4.2 Frequency Separation

PASS

Please refer to Appendix C.3

6.2. Maximum Peak Conducted Output Power

6.2.1 Block Diagram of Test Setup



6.2.2 Limit

According to §15.247(b)(2), For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

6.2.3 Test Procedure

The transmitter output is connected to the spectrum.

6.2.4. Test Procedures

1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
2) RBW > 20 dB bandwidth of the emission being measured.
3) VBW ≥ RBW.
4) Sweep: Auto.
5) Detector function: Peak.
6) Trace: Max hold.

6.2.5 Test Results

PASS

Please refer to Appendix C.2

Remark:

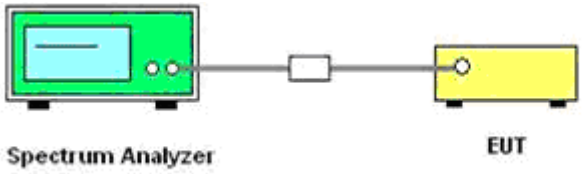
1. *Test results including cable loss*

6.3. Time of Occupancy (Dwell Time)

6.3.1 Limit

According to §15.247(a)(1)(i), For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.

6.3.2 Block Diagram of Test Setup



6.3.3 Test Procedure

1). Place the EUT on the table and set it in transmitting mode.

2). Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Spectrum Analyzer.

3). Set center frequency of Spectrum Analyzer = operating frequency.

4). Set the Spectrum Analyzer as RBW=100kHz, VBW=300kHz, Span = 0Hz, Sweep = auto.

5). Repeat above procedures until all frequency measured was complete.

6.3.4 Test Results

The Dwell Time=Burst Width*Total Hops.

PASS

Please refer to Appendix C.4

Remark:

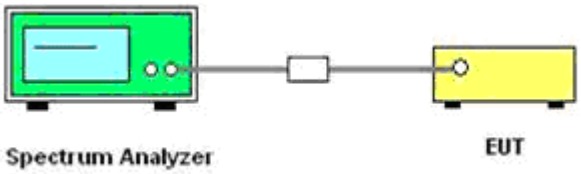
1. Test results including cable loss

6.4. Number of Hopping Frequency

6.4.1 Limit

According to §15.247(a)(1)(i), For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies.

6.4.2 Block Diagram of Test Setup



6.4.3 Test Procedure

1). Place the EUT on the table and set it in transmitting mode.

2). Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Spectrum Analyzer.

3). Set Spectrum Analyzer Start=900MHz, Stop = 930MHz, Sweep = auto.

4). Set the Spectrum Analyzer as RBW=10KHz, VBW=300KHz.

5). Max hold, view and count how many channel in the band.

6.4.4 Test Results

PASS

Please refer to Appendix C.5

Remark:

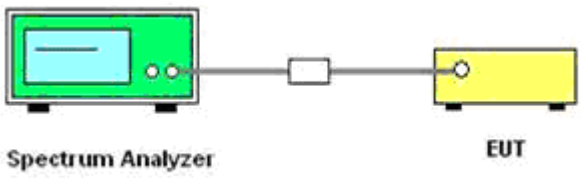
1. Test results including cable loss

6.5. Band Edges Measurements and Conducted Spurious Emissions Test

6.5.1 Limit

According to §15.247(d), In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

6.5.2 Block Diagram of Test Setup



6.5.3 Test Procedure

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 KHz. The video bandwidth is set to 300 KHz.

Measurements are made over the 30 MHz to 10GHz range with the transmitter set to the lowest, middle, and highest channels

6.5.4 Test Results of Conducted Spurious Emissions

No non-compliance noted. Only record the worst test result in this report. The test data refer to the following page.

PASS

Please refer to Appendix C.6 for Band Edges Measurements.

Please refer to Appendix C.7 for Conducted Spurious Emission.

Remark:

1. Test results including cable loss

6.6. Radiated Emission

6.6.1. Standard Applicable

According to §15.247(d), radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

1. For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.

2. For above 1000MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK)

15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
\1\ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293.	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(\2\)
13.36-13.41			

6.6.2. Measuring Instruments and Setting

Please refer to of equipment list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10^{th} carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/T kHz for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/T kHz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB/VB 200Hz/1KHz for QP/AVG
Start ~ Stop Frequency	150kHz~30MHz / RB/VB 9kHz/30KHz for QP/AVG
Start ~ Stop Frequency	30MHz~1000MHz / RB/VB 120kHz/1MHz for QP

6.6.3. Test Procedures

1) Sequence of testing 9 kHz to 30 MHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions.

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna height is 1.0 meter.

--- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement:

--- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will

be stored.

2) Sequence of testing 30 MHz to 1 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 4 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

3) Sequence of testing 1 GHz to 18 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height scan range is 1 meter to 4 meter.

--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.

--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

4) Sequence of testing above 18 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 1 meter.

--- The EUT was set into operation.

Premeasurement:

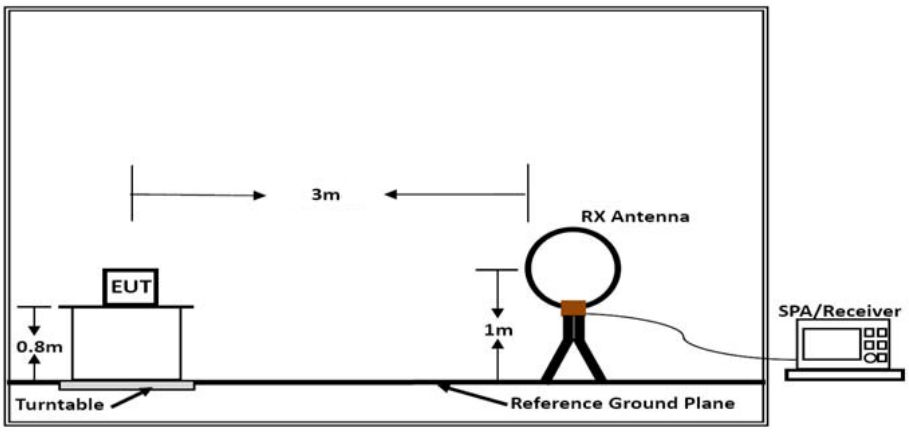
--- The antenna is moved spherical over the EUT in different polarizations of the antenna.

Final measurement:

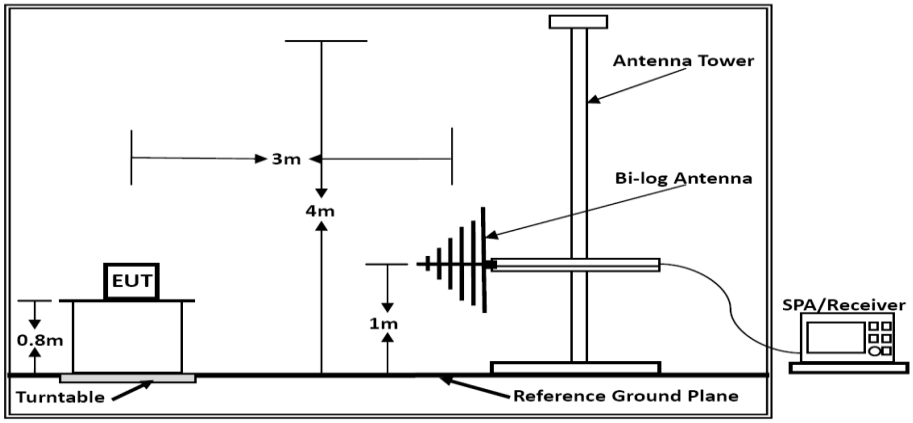
--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

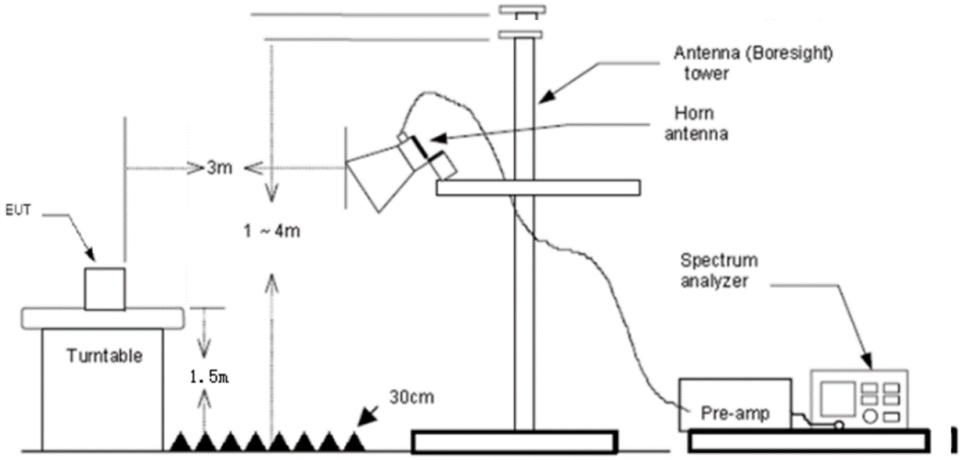
6.6.4. Test Setup Layout



Below 30MHz



Below 1GHz



Above 10 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade form 3m to 1.5m.

6.6.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

6.6.6. Results of Radiated Emissions (9 KHz~30MHz)

Temperature	23.8℃	Humidity	52.1%
Test Engineer	Jose Zhu	Configurations	TX

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Over Limit (dBuV)	Remark
-	-	-	-	See Note

Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

Distance extrapolation factor = 40 log (specific distance / test distance) (dB);
Limit line = specific limits (dBuV) + distance extrapolation factor.

6.6.7. Results of Radiated Emissions (30 MHz~1000 MHz)

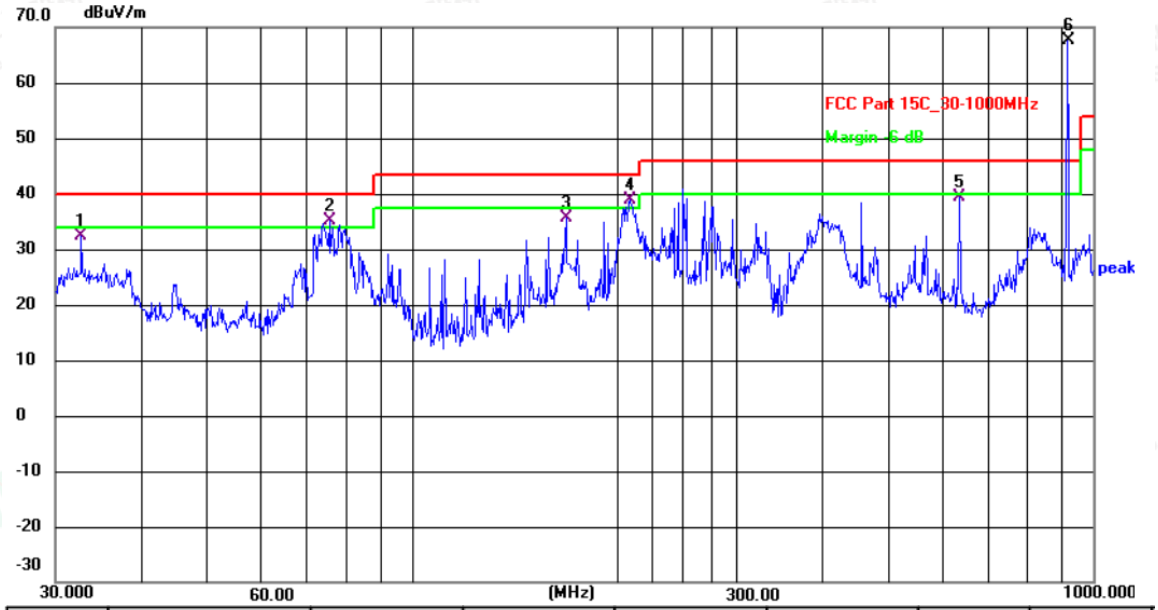
Temperature	23.8℃	Humidity	52.1%
Test Engineer	Jose Zhu	Configurations	TX

PASS.

Only record the worst test result in this report.

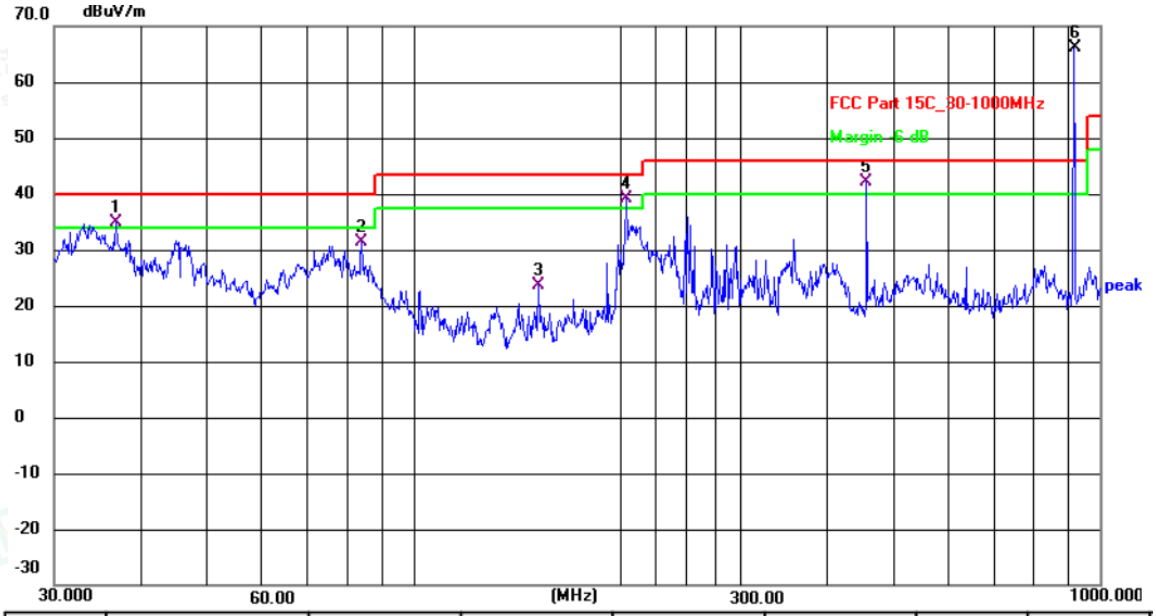
The test data please refer to following page.

Horizontal for model BDE-MB1354P101UA32:



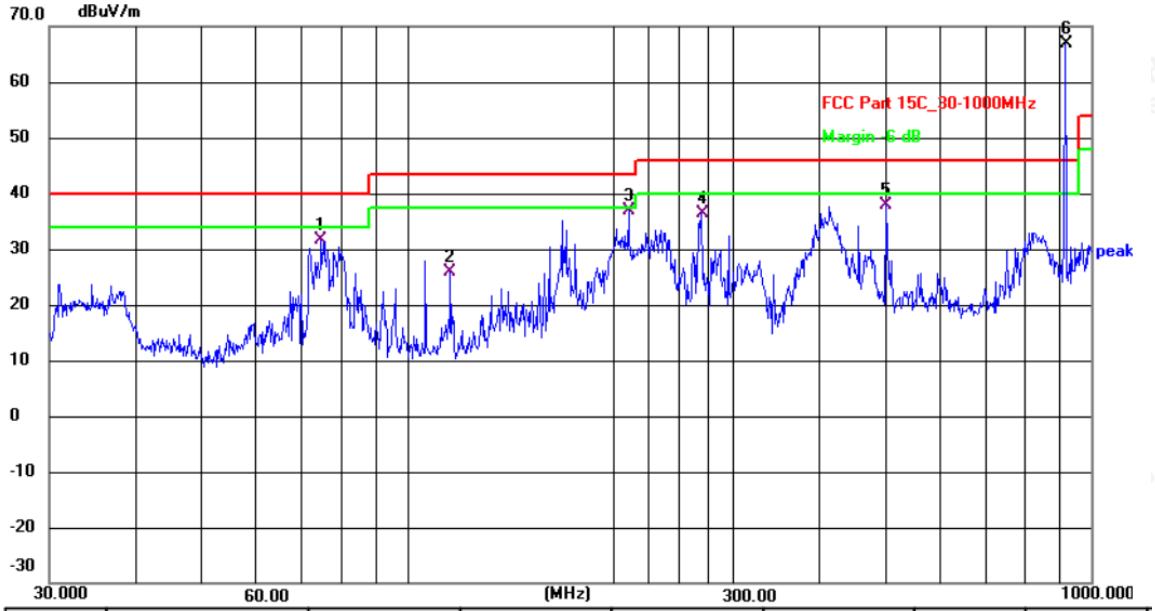
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	32.7486	50.58	-18.14	32.44	40.00	-7.56	QP
2	75.7114	54.73	-19.59	35.14	40.00	-4.86	QP
3	168.4138	55.77	-20.17	35.60	43.50	-7.90	QP
4	209.3129	57.15	-18.25	38.90	43.50	-4.60	QP
5	636.1340	49.75	-10.31	39.44	46.00	-6.56	QP
6	916.0687	75.11	-7.53	67.58	46.00	21.58	peak

Vertical for model BDE-MB1354P101UA32:



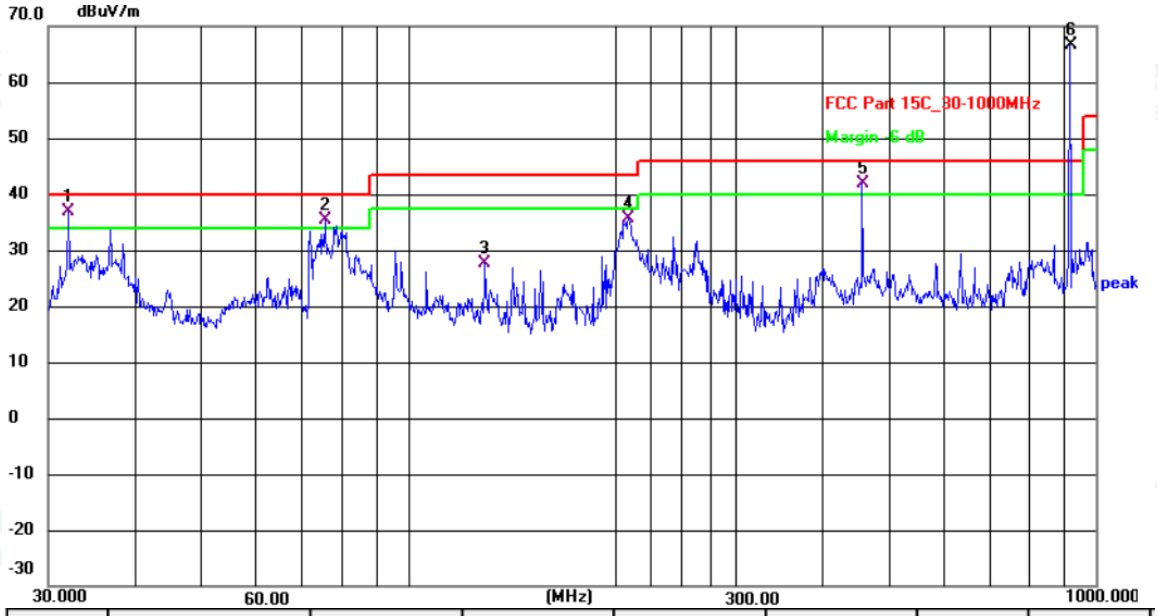
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	36.8953	52.50	-17.69	34.81	40.00	-5.19	QP
2	84.1100	50.78	-19.47	31.31	40.00	-8.69	QP
3	152.1297	43.33	-19.80	23.53	43.50	-19.97	QP
4	204.2377	56.40	-17.29	39.11	43.50	-4.39	QP
5	457.5073	56.65	-14.46	42.19	46.00	-3.81	QP
6	916.0687	74.31	-8.07	66.24	46.00	20.24	peak

Horizontal for model BDE-MB1354P101NN32:



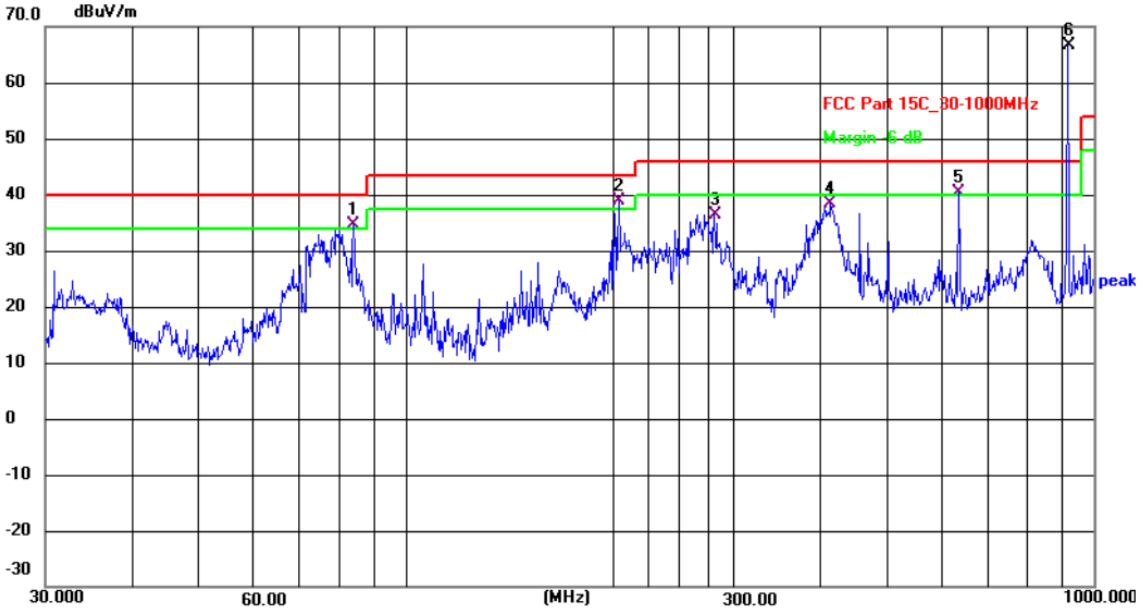
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	74.9191	51.07	-19.51	31.56	40.00	-8.44	QP
2	115.7256	44.31	-18.37	25.94	43.50	-17.56	QP
3	210.7860	55.09	-18.22	36.87	43.50	-6.63	QP
4	269.4284	52.98	-16.50	36.48	46.00	-9.52	QP
5	501.1790	50.81	-12.82	37.99	46.00	-8.01	QP
6	916.0687	74.29	-7.53	66.76	46.00	20.76	peak

Vertical for model BDE-MB1354P101NN32:



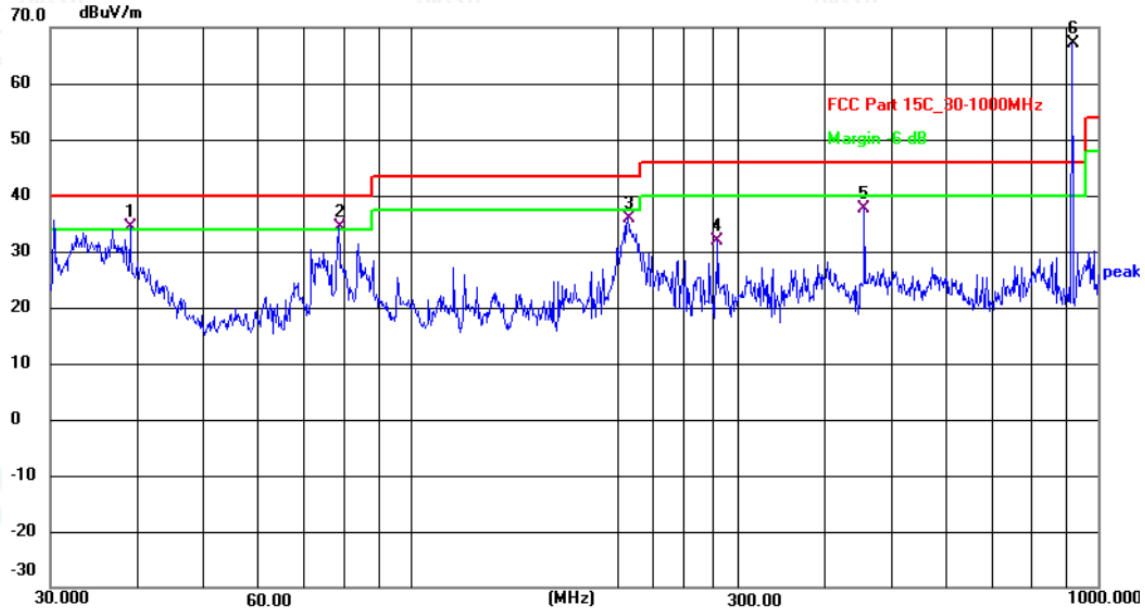
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	32.0667	54.97	-18.17	36.80	40.00	-3.20	QP
2	75.7113	55.20	-19.71	35.49	40.00	-4.51	QP
3	129.4677	48.28	-20.53	27.75	43.50	-15.75	QP
4	209.3129	52.74	-17.15	35.59	43.50	-7.91	QP
5	457.5073	56.35	-14.46	41.89	46.00	-4.11	QP
6	916.0686	74.80	-8.07	66.73	46.00	20.73	peak

Horizontal for model BDE-MB1354P101UU32:



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	84.1100	54.45	-19.82	34.63	40.00	-5.37	QP
2	204.2377	57.34	-18.39	38.95	43.50	-4.55	QP
3	281.0075	52.60	-16.18	36.42	46.00	-9.58	QP
4	414.7223	51.73	-13.31	38.42	46.00	-7.58	QP
5	636.1340	50.72	-10.31	40.41	46.00	-5.59	QP
6	916.0687	74.27	-7.53	66.74	46.00	20.74	peak

Vertical for model BDE-MB1354P101UU32:



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	39.1616	51.95	-17.59	34.36	40.00	-5.64	QP
2	78.6888	54.14	-19.83	34.31	40.00	-5.69	QP
3	207.1226	53.03	-17.21	35.82	43.50	-7.68	QP
4	280.0237	47.41	-15.41	32.00	46.00	-14.00	QP
5	457.5073	52.00	-14.46	37.54	46.00	-8.46	QP
6	916.0687	75.23	-8.07	67.16	46.00	21.16	peak

Note:

1). Pre-scan all modes and recorded the worst case results in this report (150Kbps-Low Channel).

2). Emission level (dBuV/m) = 20 log Emission level (uV/m).

3). Level = Reading + Factor, Margin = Level–Limit, Factor = Antenna Factor + Cable Loss - Preamp Factor.

6.6.8. Results of Radiated Emissions (1 GHz~ 18 GHz)

Note: All the modes have been tested and recorded worst mode in the report.

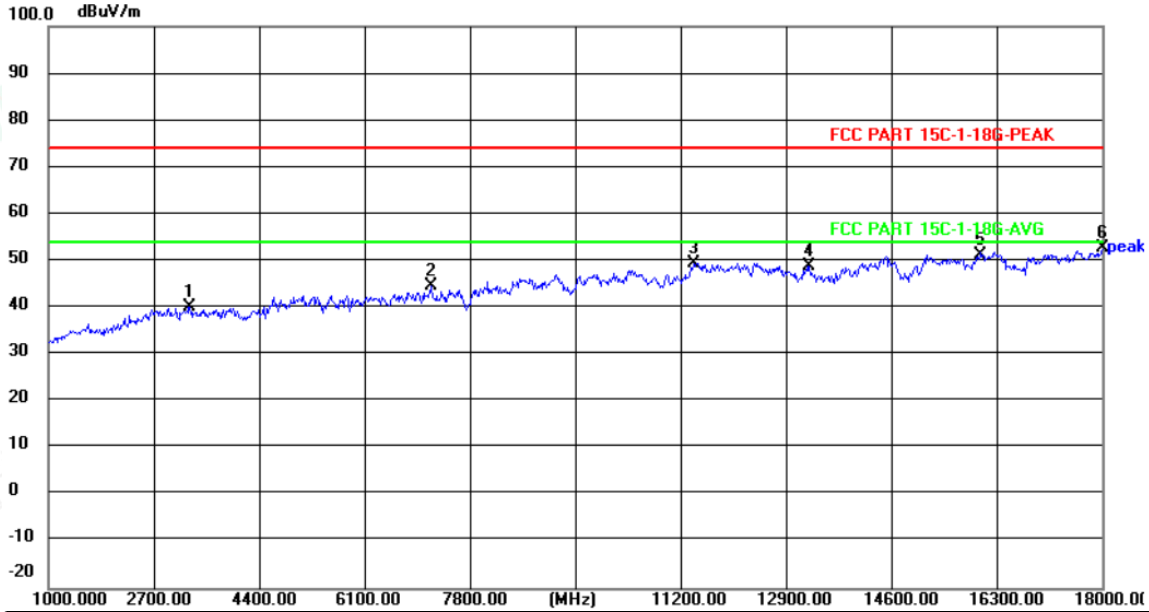
Temperature	23.8℃	Humidity	52.1%
Test Engineer	Jose Zhu	Configurations	TX

PASS.

Only record the worst test result in this report.

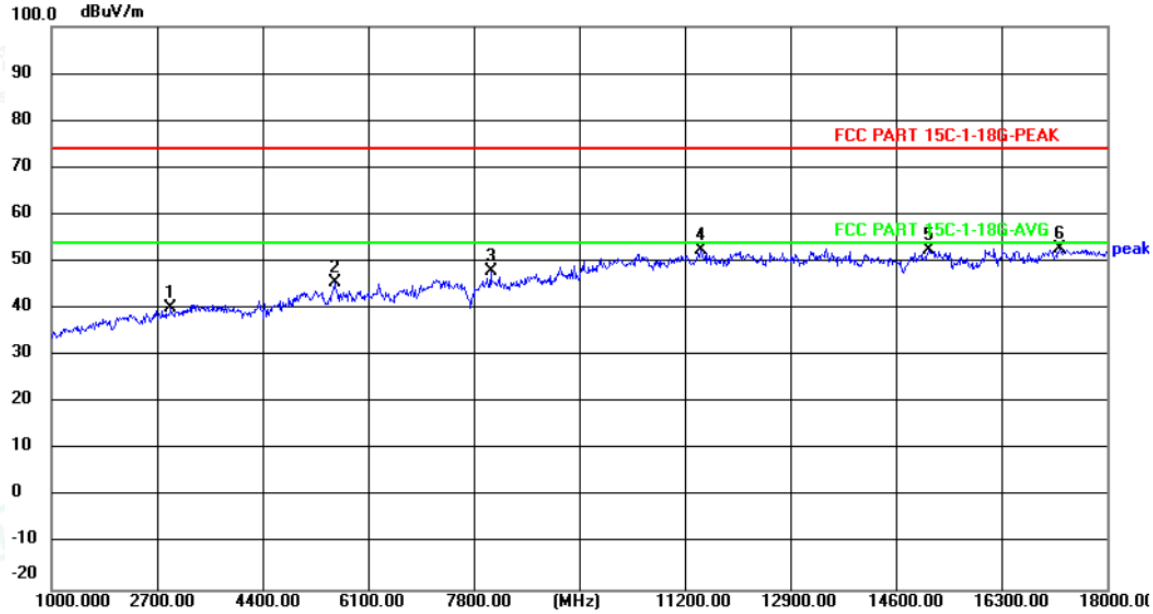
The test data please refer to following page.

Horizontal for model BDE-MB1354P101UA32:



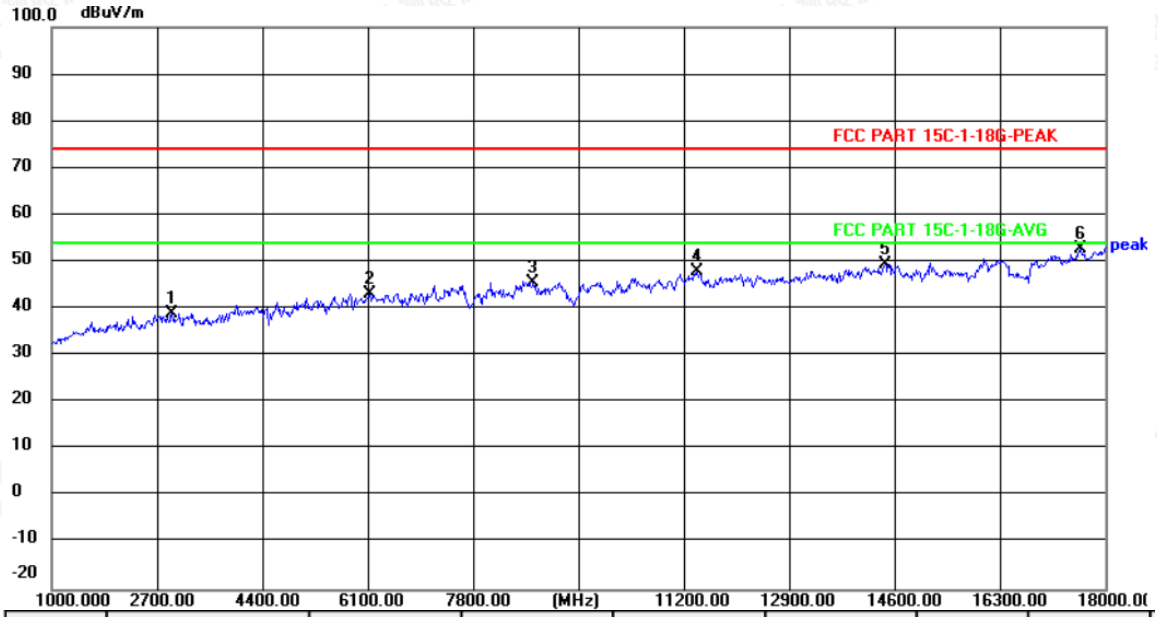
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	3278.000	49.28	-9.18	40.10	74.00	-33.90	peak
2	7171.000	43.71	0.82	44.53	74.00	-29.47	peak
3	11421.000	42.72	6.70	49.42	74.00	-24.58	peak
4	13274.000	40.95	8.01	48.96	74.00	-25.04	peak
5	16028.000	43.31	7.99	51.30	74.00	-22.70	peak
6	18000.000	35.03	17.76	52.79	74.00	-21.21	peak

Vertical for model BDE-MB1354P101UA32



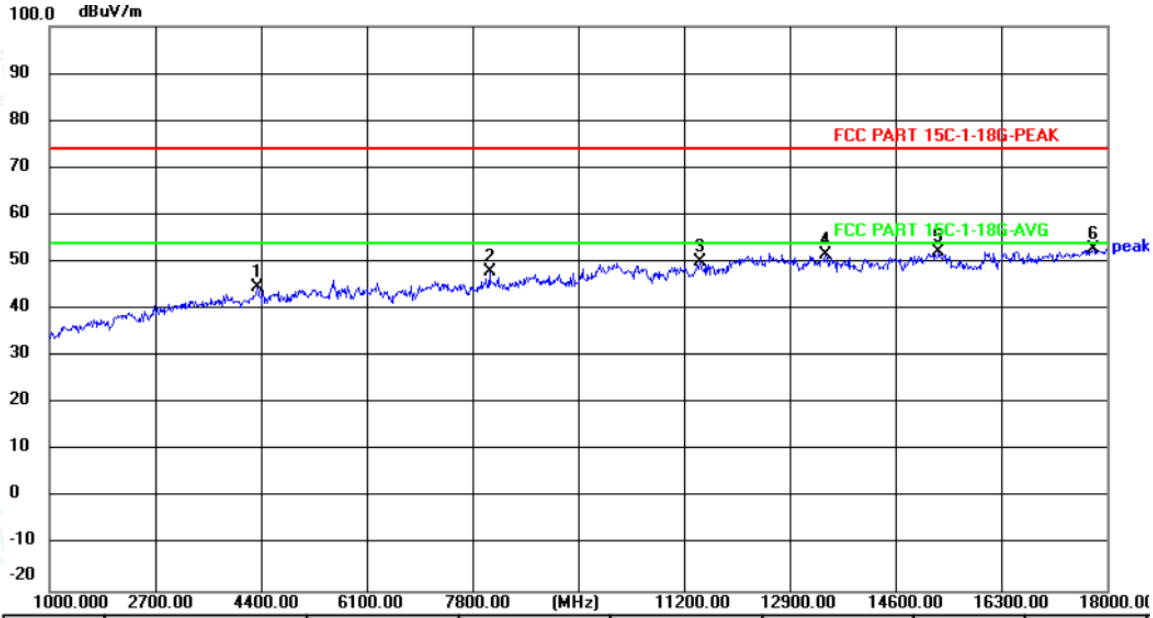
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2921.000	49.90	-9.87	40.03	74.00	-33.97	peak
2	5556.000	48.87	-3.26	45.61	74.00	-28.39	peak
3	8072.000	47.28	0.76	48.04	74.00	-25.96	peak
4	11455.000	46.64	5.95	52.59	74.00	-21.41	peak
5	15127.000	42.77	9.66	52.43	74.00	-21.57	peak
6	17235.000	39.79	12.82	52.61	74.00	-21.39	peak

Horizontal for model BDE-MB1354P101NN32:



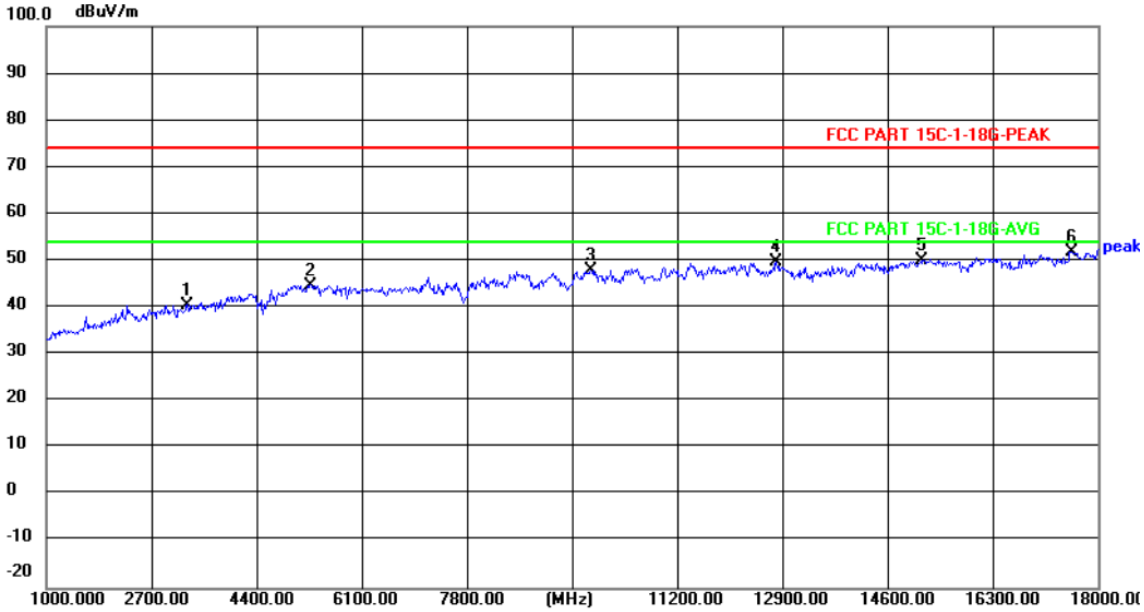
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2938.000	48.79	-9.86	38.93	74.00	-35.07	peak
2	6134.000	45.71	-2.55	43.16	74.00	-30.84	peak
3	8769.000	41.30	4.20	45.50	74.00	-28.50	peak
4	11404.000	41.32	6.62	47.94	74.00	-26.06	peak
5	14447.000	39.38	10.06	49.44	74.00	-24.56	peak
6	17592.000	36.58	16.04	52.62	74.00	-21.38	peak

Vertical for model BDE-MB1354P101NN32:



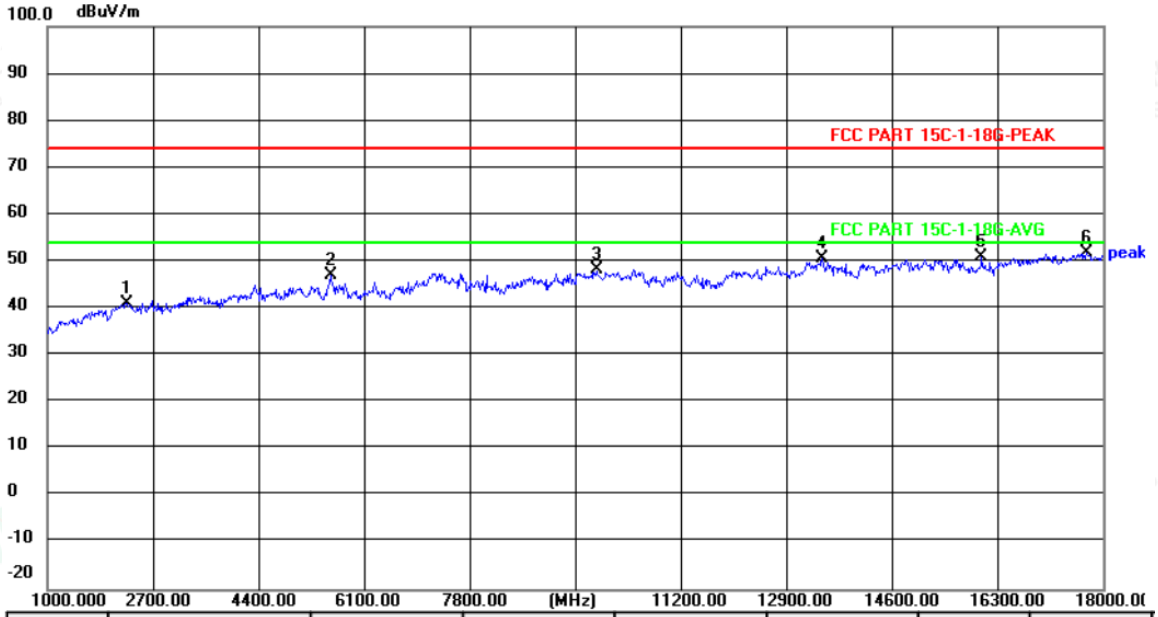
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	4349.000	51.73	-7.18	44.55	74.00	-29.45	peak
2	8072.000	47.28	0.76	48.04	74.00	-25.96	peak
3	11455.000	44.14	5.95	50.09	74.00	-23.91	peak
4	13478.000	44.01	7.64	51.65	74.00	-22.35	peak
5	15297.000	42.82	9.20	52.02	74.00	-21.98	peak
6	17779.000	36.48	16.27	52.75	74.00	-21.25	peak

Horizontal for model BDE-MB1354P101UU32:



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	3278.000	49.78	-9.18	40.60	74.00	-33.40	peak
2	5267.000	47.08	-2.28	44.80	74.00	-29.20	peak
3	9806.000	42.58	5.35	47.93	74.00	-26.07	peak
4	12798.000	43.02	6.71	49.73	74.00	-24.27	peak
5	15161.000	41.37	8.79	50.16	74.00	-23.84	peak
6	17575.000	36.10	15.79	51.89	74.00	-22.11	peak

Vertical for model BDE-MB1354P101UU32:



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2275.000	53.25	-12.14	41.11	74.00	-32.89	peak
2	5556.000	50.37	-3.26	47.11	74.00	-26.89	peak
3	9840.000	44.81	3.29	48.10	74.00	-25.90	peak
4	13478.000	43.01	7.64	50.65	74.00	-23.35	peak
5	16045.000	43.53	7.50	51.03	74.00	-22.97	peak
6	17745.000	35.70	16.04	51.74	74.00	-22.26	peak

Notes:

1). Measuring frequencies from 9 KHz~10th harmonic (ex. 18GHz), at least have 20dB margin found between lowest internal used/generated frequency to 30 MHz.

2). Radiated emissions measured in frequency range from 9 KHz~10th harmonic (ex. 18GHz) were made with an instrument using Peak detector mode.

3). The average measurement was not performed when the peak measured data under the limit of average detection.

4). Measured Level = Reading Level + Factor, Margin = Measured Level – Limit, Factor = Antenna Factor + Cable Loss - Preamp Factor

6.7. AC Power Line Conducted Emissions

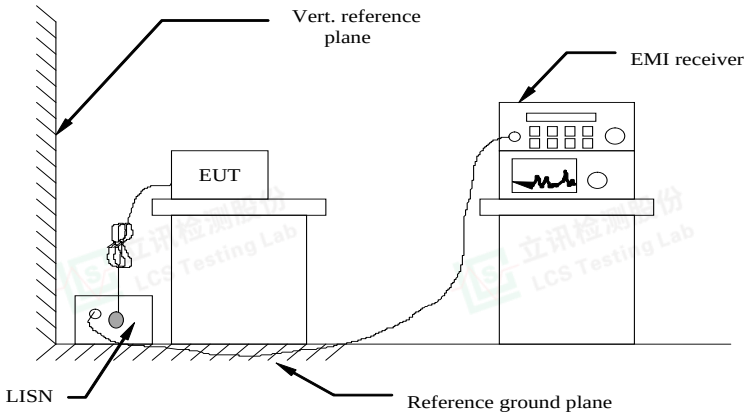
6.7.1 Standard Applicable

According to §15.207 (a): For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

* Decreasing linearly with the logarithm of the frequency

6.7.2 Block Diagram of Test Setup



6.7.3 Disturbance Calculation

The AC mains conducted disturbance is calculated by adding the 10dB Pulse Limiter and Cable Factor and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

CD (dBuV) = RA (dBuV) + PL (dB) + CL (dB)

Where CD = Conducted Disturbance	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	PL = 10 dB Pulse Limiter Factor

6.7.4 Test Results

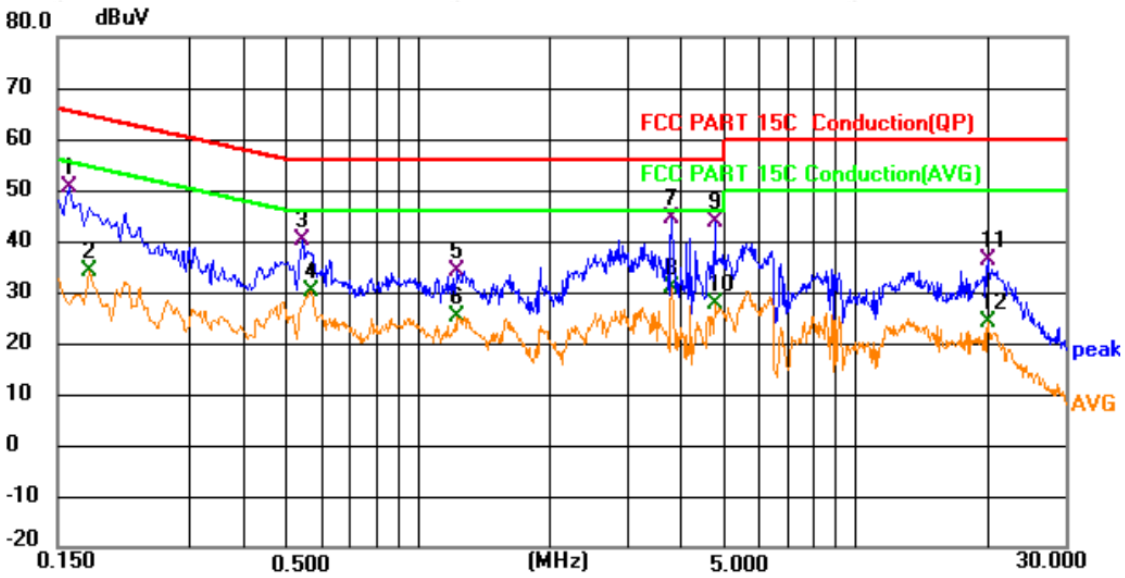
Temperature	22.5℃	Humidity	53.7%
Test Engineer	Jose Zhu	Configurations	TX

PASS.

Only record the worst test result in this report.

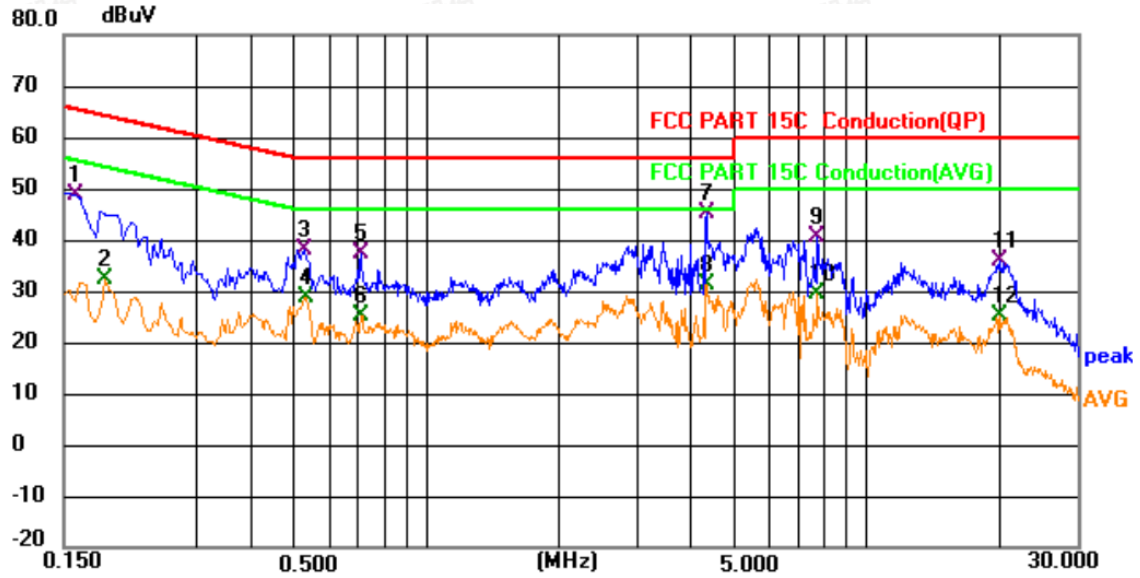
The test data please refer to following page.

Line



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.159	30.61	19.84	50.45	65.52	-15.07	QP	
2		0.177	14.24	19.76	34.00	54.63	-20.63	AVG	
3		0.541	20.59	19.71	40.30	56.00	-15.70	QP	
4		0.569	10.53	19.62	30.15	46.00	-15.85	AVG	
5		1.234	15.11	19.10	34.21	56.00	-21.79	QP	
6		1.234	6.09	19.10	25.19	46.00	-20.81	AVG	
7	*	3.795	25.35	19.18	44.53	56.00	-11.47	QP	
8		3.795	11.59	19.18	30.77	46.00	-15.23	AVG	
9		4.758	24.63	18.99	43.62	56.00	-12.38	QP	
10		4.758	8.86	18.99	27.85	46.00	-18.15	AVG	
11		20.013	17.36	19.06	36.42	60.00	-23.58	QP	
12		20.013	5.05	19.06	24.11	50.00	-25.89	AVG	

Neutral



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.159	29.27	19.62	48.89	65.52	-16.63	QP	
2		0.186	12.62	19.72	32.34	54.21	-21.87	AVG	
3		0.528	18.59	19.40	37.99	56.00	-18.01	QP	
4		0.532	9.28	19.41	28.69	46.00	-17.31	AVG	
5		0.708	17.96	19.49	37.45	56.00	-18.55	QP	
6		0.713	5.73	19.47	25.20	46.00	-20.80	AVG	
7	*	4.322	26.35	18.94	45.29	56.00	-10.71	QP	
8		4.322	12.29	18.94	31.23	46.00	-14.77	AVG	
9		7.710	20.61	19.84	40.45	60.00	-19.55	QP	
10		7.710	9.61	19.84	29.45	50.00	-20.55	AVG	
11		20.063	16.99	19.05	36.04	60.00	-23.96	QP	
12		20.063	6.08	19.05	25.13	50.00	-24.87	AVG	

****Note: 1).Pre-scan all modes and recorded the worst case results in this report (150Kbps-Low Channel)*

2). Measurement = Reading + Correct Factor, Margin = Measurement – Limit,

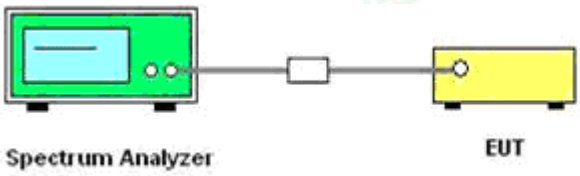
Correct Factor=Lisn Factor+Cable Factor+Insertion loss of Pulse Limiter.

6.8. Emissions in Restricted Bands

6.8.1 Standard Applicable

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

6.8.2. Test Setup Layout



6.8.3. Measuring Instruments and Setting

Please refer to equipment list in this report. The following table is the setting of Spectrum Analyzer.

6.8.4. Test Procedures

According to KDB 412172 section 1.1 Field Strength Approach (linear terms):

$eirp = p_t \times g_t = (E \times d)^2/30$

Where:

p_t = transmitter output power in watts,

g_t = numeric gain of the transmitting antenna (unitless),

E = electric field strength in V/m,

d = measurement distance in meters (m).

$erp = eirp/1.64 = (E \times d)^2/(30 \times 1.64)$

Where all terms are as previously defined.

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Middle Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, for Radiated emissions restricted band RBW=1MHz, VBW=3MHz for peak detector and RBW=1MHz, VBW=1/T for Peak detector.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.
6. Measure the conducted output power (in dBm) using the detector specified by the appropriate regulatory agency for guidance regarding measurement procedures for determining quasi-peak, peak, and average conducted output power, respectively).

7. Add the maximum transmit antenna gain (in dBi) to the measured output power level to determine the EIRP level (see 12.2.5 for guidance on determining the applicable antenna gain)
8. Add the appropriate maximum ground reflection factor to the EIRP level (6 dB for frequencies ≤ 30 MHz, 4.7 dB for frequencies between 30 MHz and 1000 MHz, inclusive and 0 dB for frequencies > 1000 MHz).
9. For devices with multiple antenna-ports, measure the power of each individual chain and sum the EIRP of all chains in linear terms (e.g., Watts, mW).
10. Compare the resultant electric field strength level to the applicable regulatory limit.
11. Perform radiated spurious emission test duress until all measured frequencies were complete.

6.8.5. Test Results

PASS

The adjacent to the restricted frequency band (608-614MHz and 960-1240MHz) is far away the fundamental, it is noise only. Please refer to Section 6.6 for test data.

6.9. Pseudorandom Frequency Hopping Sequence

6.9.1 Standard Applicable

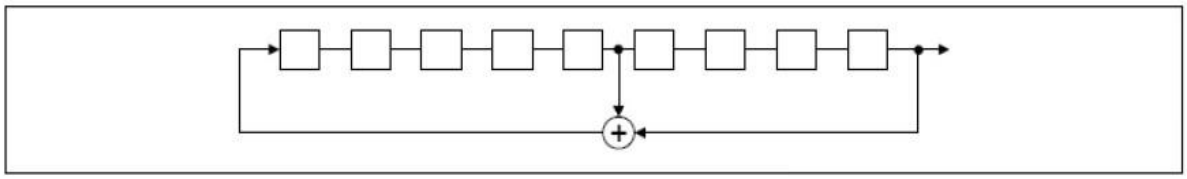
For 47 CFR Part 15C sections 15.247 (a) (1) requirement:

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hop-ping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hop-ping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

6.9.2 EUT Pseudorandom Frequency Hopping Sequence Requirement

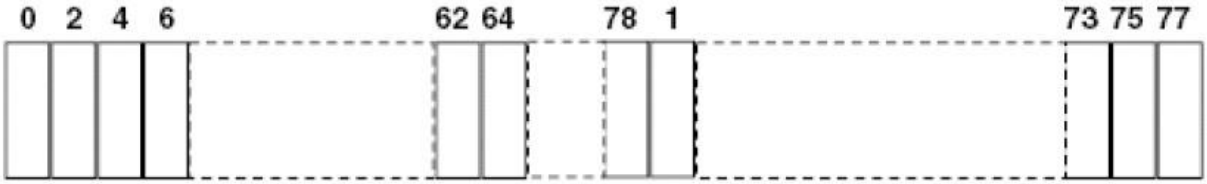
The pseudorandom frequency hopping sequence may be generated in a nice-stage shift register whose 5th first stage. The sequence begins with the first one of 9 consecutive ones, for example: the shift register is initialized with nine ones.

- Number of shift register stages:9
- Length of pseudo-random sequence:29-1=511 bits
- Longest sequence of zeros:8(non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence

An example of pseudorandom frequency hopping sequence as follows:



Each frequency used equally one the average by each transmitter.
The system receiver have input bandwidths that match the hopping channel bandwidths of their corresponding transmitter and shift frequencies in synchronization with the transmitted signals.

6.10. Antenna Requirement

6.10.1 Standard Applicable

According to antenna requirement of §15.203.

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be re-placed by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

And according to §15.247(4)(1), system operating in the 2400-2483.5MHz bands that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

6.10.2 Antenna Connected Construction

6.10.2.1. Standard Applicable

According to § 15.203 & RSS-Gen, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

6.10.2.2. Antenna Connector Construction

The directional gains of antenna used for transmitting is 3.8dBi(Max), and the antenna is an Whip antenna no consideration of replacement. Please see EUT photo for details.

6.10.2.3. Results: Compliance.

7. TEST SETUP PHOTOGRAPHS OF EUT

Please refer to separated files for Test Setup Photos of the EUT.

8. EXTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for External Photos of the EUT.

9. INTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for Internal Photos of the EUT.

----------THE END OF TEST REPORT----------