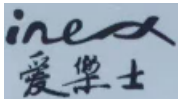


TEST REPORT

Product Name : Vehicle Terminal

Brand Mark : 

Model No. : 5213

Extension model : 6201、6202、6203、6207、6208、6209、
6210、6211、6213、6215、6217、6218、
6219、6223、6225、6227、6229、6231、
6233、6236、6239、6243、6245、6251、
6253、6256、6257、6258、6261、6263、
6267、6268、6271、6273、6278、6283、
6288、6293、6502、6503、6509、6513、
6538、6810、6833、6858、6868、5208、
5209、5211、5215、5217、5218、5219、
5224、5225、5227、5231、5236、5239、
5243、5245、5251、5256、5257、5258、
5261、5263、5267、5268、5271、5273、
5278、5288、5293、5509、5513、5523、
5538、5807、5810、5833、5858、5868

FCC ID : 2AZHT-AL-XXXX

Report Number : BLA-EMC-202103-A12302

Date of Sample Receipt : 2021/3/29

Date of Test : 2021/3/29 to 2021/5/7

Date of Issue : 2021/5/7

Test Standard : 47 CFR Part 15, Subpart C 15.247

Test Result : Pass



Prepared for:

Shenzhen ALEX Electronics Co., Ltd.**A & B Block, building 1, Jinshun Industrial Park, No.29, Anju Road, Anliang Community,
Henggang Subdistrict, Longgang District, Shenzhen(No.6, 5F, A Block), China**

Prepared by:

BlueAsia of Technical Services(Shenzhen) Co.,Ltd.**Building C, No. 107, Shihuan Road, Shiyan Sub-District, Baoan District,
Shenzhen, Guangdong Province, China****TEL: +86-755-23059481**

Compiled by:

Jason

Approved by:

Jamen Li

Review by:

Sweet. Liang

Date:

2021/5/7



REPORT REVISE RECORD

Version No.	Date	Description
00	2021/5/7	Original

BlueAsia

TABLE OF CONTENTS

1 TEST SUMMARY	7
2 GENERAL INFORMATION	8
3 GENERAL DESCRIPTION OF E.U.T.....	8
4 TEST ENVIRONMENT	9
5 TEST MODE.....	9
6 MEASUREMENT UNCERTAINTY	9
7 DESCRIPTION OF SUPPORT UNIT	10
8 LABORATORY LOCATION	10
9 TEST INSTRUMENTS LIST.....	11
1 ANTENNA REQUIREMENT.....	15
1.1 CONCLUSION	15
2 CONDUCTED SPURIOUS EMISSIONS.....	16
2.1 LIMITS.....	16
2.2 BLOCK DIAGRAM OF TEST SETUP	16
2.3 TEST DATA	17
3 RADIATED SPURIOUS EMISSIONS	18
3.1 LIMITS.....	18
3.2 BLOCK DIAGRAM OF TEST SETUP	19
3.3 PROCEDURE.....	19
3.4 TEST DATA	21
4 RADIATED EMISSIONS WHICH FALL IN THE RESTRICTED BANDS	29
4.1 LIMITS.....	29
4.2 BLOCK DIAGRAM OF TEST SETUP	30
4.3 PROCEDURE.....	30
4.4 TEST DATA	32
5 CONDUCTED BAND EDGES MEASUREMENT	36
5.1 LIMITS.....	36
5.2 BLOCK DIAGRAM OF TEST SETUP	36
5.3 TEST DATA	37

6 DWELL TIME.....	38
6.1 LIMITS	38
6.2 BLOCK DIAGRAM OF TEST SETUP	38
6.3 EST DATA	38
7 HOPPING CHANNEL NUMBER.....	39
7.1 LIMITS	39
7.2 BLOCK DIAGRAM OF TEST SETUP	39
7.3 TEST DATA	39
8 CARRIER FREQUENCIES SEPARATION	40
8.1 LIMITS	40
8.2 BLOCK DIAGRAM OF TEST SETUP	40
8.3 TEST DATA	40
9 20DB BANDWIDTH	41
9.1 BLOCK DIAGRAM OF TEST SETUP	41
9.2 TEST DATA	41
10 CONDUCTED PEAK OUTPUT POWER	42
10.1 LIMITS	42
10.2 BLOCK DIAGRAM OF TEST SETUP	42
10.3 EST DATA	43
10 APPENDIX.....	44
10.1 : 20dB EMISSION BANDWIDTH	44
<i>Test Result</i>	44
<i>Test Graphs</i>	45
10.2 : MAXIMUM CONDUCTED OUTPUT POWER	50
<i>Test Result</i>	50
<i>Test Graphs</i>	51
10.3 APPENDIX D: CARRIER FREQUENCY SEPARATION	56
<i>Test Result</i>	56
<i>Test Graphs</i>	57
10.4 : TIME OF OCCUPANCY	59
<i>Test Result</i>	59
<i>Test Graphs</i>	60
10.5 : NUMBER OF HOPPING CHANNELS.....	63

Test Result.....	63
Test Graphs.....	64
10.6 : BAND EDGE MEASUREMENTS	66
Test Result.....	66
Test Graphs.....	67
10.7 : CONDUCTED SPURIOUS EMISSION	73
Test Result.....	73
Test Graphs.....	74
APPENDIX A: PHOTOGRAPHS OF TEST SETUP	88
APPENDIX B: PHOTOGRAPHS OF EUT	89

1 TEST SUMMARY

Test item	Test Requirement	Test Method	Class/Severity	Result
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(c)	Pass
Conducted Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.6 & Section 11.11	47 CFR Part 15, Subpart C 15.247(d)	Pass
Radiated Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.4,6.5,6.6	47 CFR Part 15, Subpart C 15.209 & 15.247(d)	Pass
Radiated Emissions which fall in the restricted bands	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.209 & 15.247(d)	Pass
Conducted Band Edges Measurement	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.8 & Section 11.13.3.2	47 CFR Part 15, Subpart C 15.247(d)	Pass
Dwell Time	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.4	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass
Hopping Channel Number	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.3	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass
Carrier Frequencies Separation	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.2	47 CFR Part 15, Subpart C 15.247a(1)	Pass
20dB Bandwidth	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.7	47 CFR Part 15, Subpart C 15.247(a)(1)	Pass
Conducted Peak Output Power	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.5	47 CFR Part 15, Subpart C 15.247(b)(3)	Pass

2 GENERAL INFORMATION

Applicant	Shenzhen ALEX Electronics Co., Ltd.
Address	A & B Block, building 1, Jinshun Industrial Park, No.29, Anju Road, Anliang Community, Henggang Subdistrict, Longgang District, Shenzhen(No.6, 5F, A Block), China
Manufacturer	Shenzhen ALEX Electronics Co., Ltd.
Address	A & B Block, building 1, Jinshun Industrial Park, No.29, Anju Road, Anliang Community, Henggang Subdistrict, Longgang District, Shenzhen(No.6, 5F, A Block), China
Factory	Shenzhen ALEX Electronics Co., Ltd.
Address	A & B Block, building 1, Jinshun Industrial Park, No.29, Anju Road, Anliang Community, Henggang Subdistrict, Longgang District, Shenzhen(No.6, 5F, A Block), China
Product Name	Vehicle Terminal
Test Model No.	5213

3 GENERAL DESCRIPTION OF E.U.T.

Hardware Version	10-8953EA-1
Software Version	KSW-Q-Userdebug_OS_v2.7.4
Operation Frequency:	2402MHz-2480MHz
Modulation Type:	GFSK, p/4DQPSK, 8DPSK
Channel Spacing:	1MHz
Number of Channels:	79
Antenna Type:	Internal Antenna
Antenna Gain:	NA dBi

4 TEST ENVIRONMENT

Environment	Temperature	Voltage
Normal	25°C	DC12V

5 TEST MODE

TEST MODE	TEST MODE DESCRIPTION
Transmitting mode	Keep the EUT in continuously transmitting mode with modulation. (hopping and non hopping mode all have been tested, non hopping mode is worse case for RE)
Remark: Full battery is used during all test except ac conducted emission, DH1,DH3, DH5 all have been tested, during the test, GFSK, Pi/4QPSK, 8-DPSK modulation were all pre-scanned Only the 8-DPSK, of the worst mode would be recorded in this report.	

6 MEASUREMENT UNCERTAINTY

Parameter	Expanded Uncertainty (Confidence of 95%)
Radiated Emission(9kHz-30MHz)	±4.34dB
Radiated Emission(30Mz-1000MHz)	±4.24dB
Radiated Emission(1GHz-18GHz)	±4.68dB
AC Power Line Conducted Emission(150kHz-30MHz)	±3.45dB

7 DESCRIPTION OF SUPPORT UNIT

Device Type	Manufacturer	Model Name	Serial No.	Remark
PC	HASEE	K610D	N/A	N/A

8 LABORATORY LOCATION

All tests were performed at:
BlueAsia of Technical Services(Shenzhen) Co., Ltd.
Building C, No. 107, Shihuan Road, Shiyan Sub-District, Baoan District, Shenzhen, Guangdong Province, China
Telephone: TEL: +86-755-28682673 FAX: +86-755-28682673
No tests were sub-contracted.

9 TEST INSTRUMENTS LIST

Test Equipment Of Conducted Spurious Emissions					
Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Spectrum	R&S	FSP40	100817	2020/10/12	2021/10/11
Spectrum	Agilent	N9020A	MY49100060	2020/10/12	2021/10/11
Signal Generator	Agilent	N5182A	MY49060650	2020/10/12	2021/10/11
Signal Generator	Agilent	E8257D	MY44320250	2020/10/12	2021/10/11

Test Equipment Of Radiated Spurious Emissions					
Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Chamber	SKET	966	N/A	2020/11/10	2023/11/9
Spectrum	R&S	FSP40	100817	2020/10/12	2021/10/11
Receiver	R&S	ESR7	101199	2020/10/12	2021/10/11
broadband Antenna	Schwarzbeck	VULB9168	00836 P:00227	2020/9/26	2022/9/25
Horn Antenna	Schwarzbeck	9120D	01892 P:00331	2020/9/26	2022/9/25
Amplifier	SKET	PA-000318G-45	N/A	2020/10/16	2021/10/15
EMI software	EZ	EZ-EMC	EEMC-3A1	N/A	N/A
Loop antenna	SCHNARZBECK	FMZB1519B	00102	2020/9/26	2022/9/25
Controller	SKET	N/A	N/A	N/A	N/A
Coaxial Cable	BlueAsia	BLA-XC-02	N/A	N/A	N/A
Coaxial Cable	BlueAsia	BLA-XC-03	N/A	N/A	N/A
Coaxial Cable	BlueAsia	BLA-XC-01	N/A	N/A	N/A

Test Equipment Of Radiated Emissions which fall in the restricted bands

Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Chamber	SKET	966	N/A	2020/11/10	2023/11/9
Spectrum	R&S	FSP40	100817	2020/10/12	2021/10/11
Receiver	R&S	ESR7	101199	2020/10/12	2021/10/11
broadband Antenna	Schwarzbeck	VULB9168	00836 P:00227	2020/9/26	2022/9/25
Horn Antenna	Schwarzbeck	9120D	01892 P:00331	2020/9/26	2022/9/25
Amplifier	SKET	PA-000318G-45	N/A	2020/10/16	2021/10/15
EMI software	EZ	EZ-EMC	EEMC-3A1	N/A	N/A
Loop antenna	SCHNARZBECK	FMZB1519B	00102	2020/9/26	2022/9/25
Controller	SKET	N/A	N/A	N/A	N/A
Coaxial Cable	BlueAsia	BLA-XC-02	N/A	N/A	N/A
Coaxial Cable	BlueAsia	BLA-XC-03	N/A	N/A	N/A
Coaxial Cable	BlueAsia	BLA-XC-01	N/A	N/A	N/A

Test Equipment Of Conducted Band Edges Measurement

Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Spectrum	R&S	FSP40	100817	2020/10/12	2021/10/11
Spectrum	Agilent	N9020A	MY49100060	2020/10/12	2021/10/11
Signal Generator	Agilent	N5182A	MY49060650	2020/10/12	2021/10/11
Signal Generator	Agilent	E8257D	MY44320250	2020/10/12	2021/10/11

Test Equipment Of Dwell Time

Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Spectrum	R&S	FSP40	100817	2020/10/12	2021/10/11

Spectrum	Agilent	N9020A	MY49100060	2020/10/12	2021/10/11
Signal Generator	Agilent	N5182A	MY49060650	2020/10/12	2021/10/11
Signal Generator	Agilent	E8257D	MY44320250	2020/10/12	2021/10/11

Test Equipment Of Hopping Channel Number

Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Spectrum	R&S	FSP40	100817	2020/10/12	2021/10/11
Spectrum	Agilent	N9020A	MY49100060	2020/10/12	2021/10/11
Signal Generator	Agilent	N5182A	MY49060650	2020/10/12	2021/10/11
Signal Generator	Agilent	E8257D	MY44320250	2020/10/12	2021/10/11

Test Equipment Of Carrier Frequencies Separation

Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Spectrum	R&S	FSP40	100817	2020/10/12	2021/10/11
Spectrum	Agilent	N9020A	MY49100060	2020/10/12	2021/10/11
Signal Generator	Agilent	N5182A	MY49060650	2020/10/12	2021/10/11
Signal Generator	Agilent	E8257D	MY44320250	2020/10/12	2021/10/11

Test Equipment Of 20dB Bandwidth

Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Spectrum	R&S	FSP40	100817	2020/10/12	2021/10/11
Spectrum	Agilent	N9020A	MY49100060	2020/10/12	2021/10/11
Signal Generator	Agilent	N5182A	MY49060650	2020/10/12	2021/10/11
Signal Generator	Agilent	E8257D	MY44320250	2020/10/12	2021/10/11

Test Equipment Of Conducted Peak Output Power					
Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Spectrum	R&S	FSP40	100817	2020/10/12	2021/10/11
Spectrum	Agilent	N9020A	MY49100060	2020/10/12	2021/10/11
Signal Generator	Agilent	N5182A	MY49060650	2020/10/12	2021/10/11
Signal Generator	Agilent	E8257D	MY44320250	2020/10/12	2021/10/11

1 ANTENNA REQUIREMENT

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	N/A

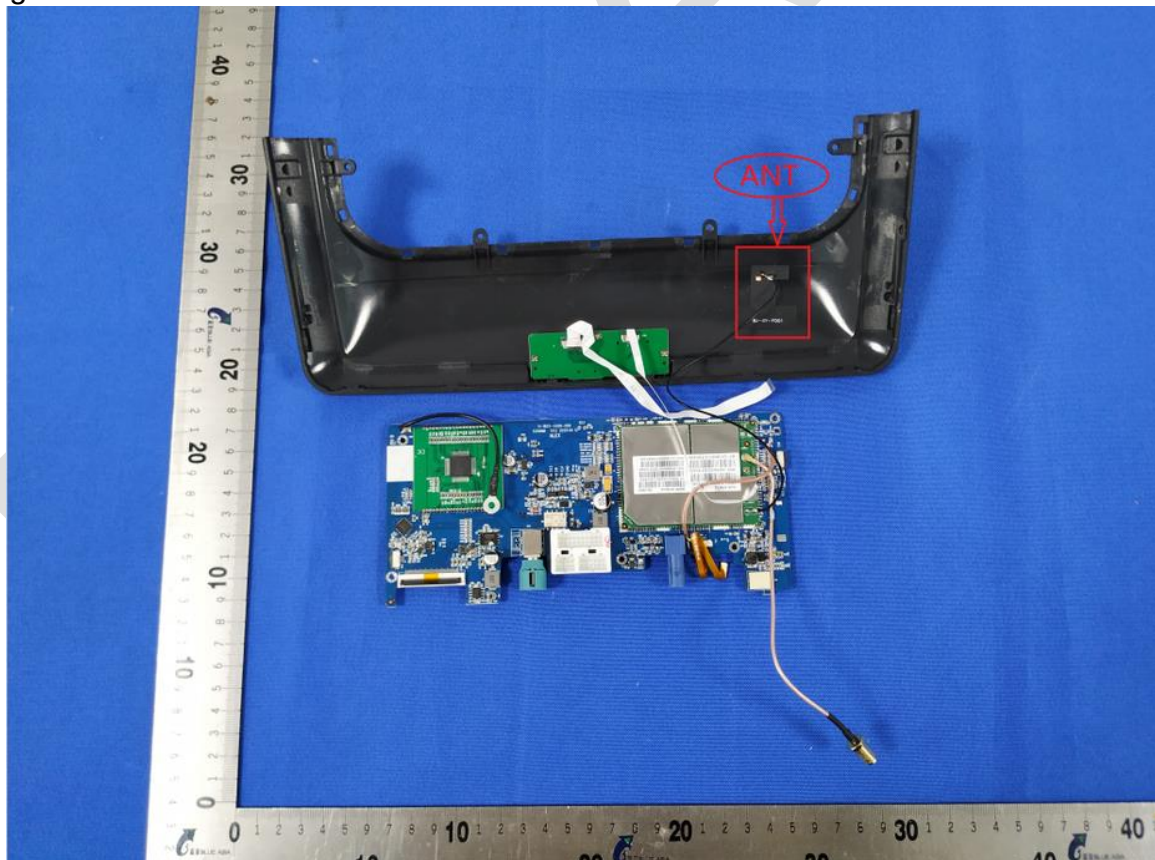
1.1 CONCLUSION

Standard Requirement:

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 an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit permanently attached antenna or of an so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is XXdBi.



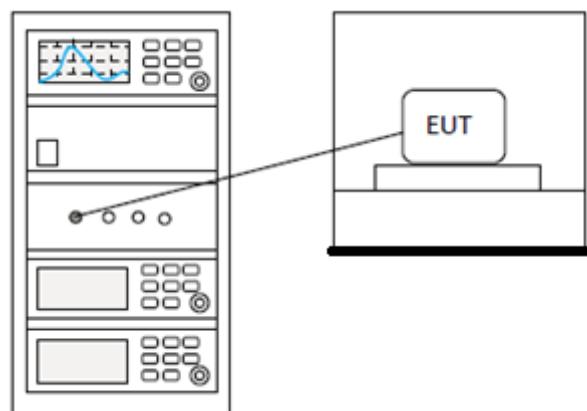
2 CONDUCTED SPURIOUS EMISSIONS

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.6 & Section 11.11
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Eason
Temperature	25°C
Humidity	52%

2.1 LIMITS

Limit:	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)).
---------------	--

2.2 BLOCK DIAGRAM OF TEST SETUP



2.3 TEST DATA

Pass: Please Refer To Appendix: For Details

BlueAsia

3 RADIATED SPURIOUS EMISSIONS

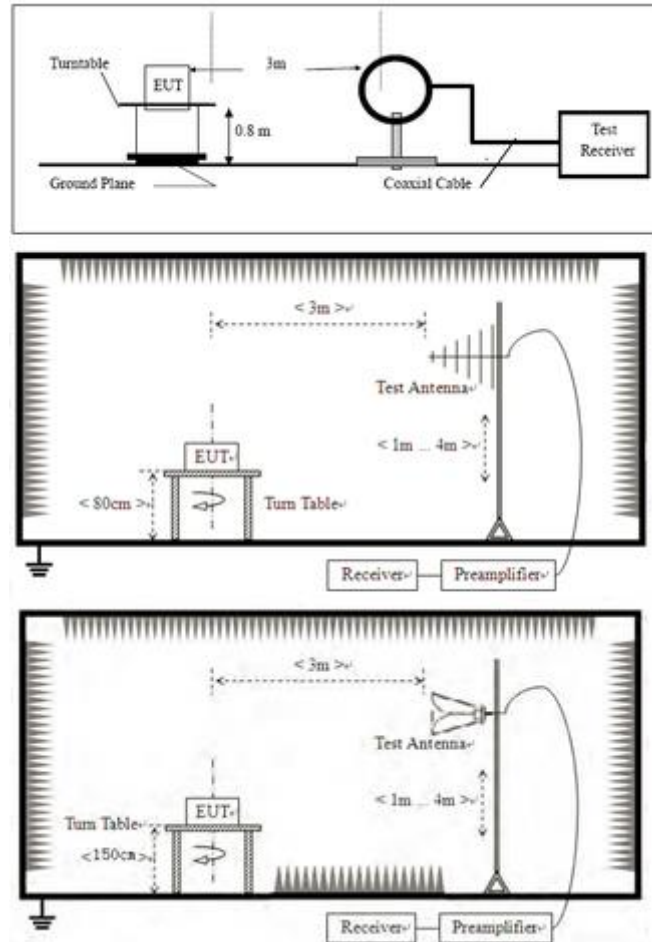
Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 6.4,6.5,6.6
Test Mode (Pre-Scan)	TX;TX middle channel;TX Low channel;TX high channel
Test Mode (Final Test)	TX;TX middle channel;TX Low channel;TX high channel
Tester	Eason
Temperature	25℃
Humidity	52%

3.1 LIMITS

Frequency(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

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

3.2 BLOCK DIAGRAM OF TEST SETUP



3.3 PROCEDURE

- For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

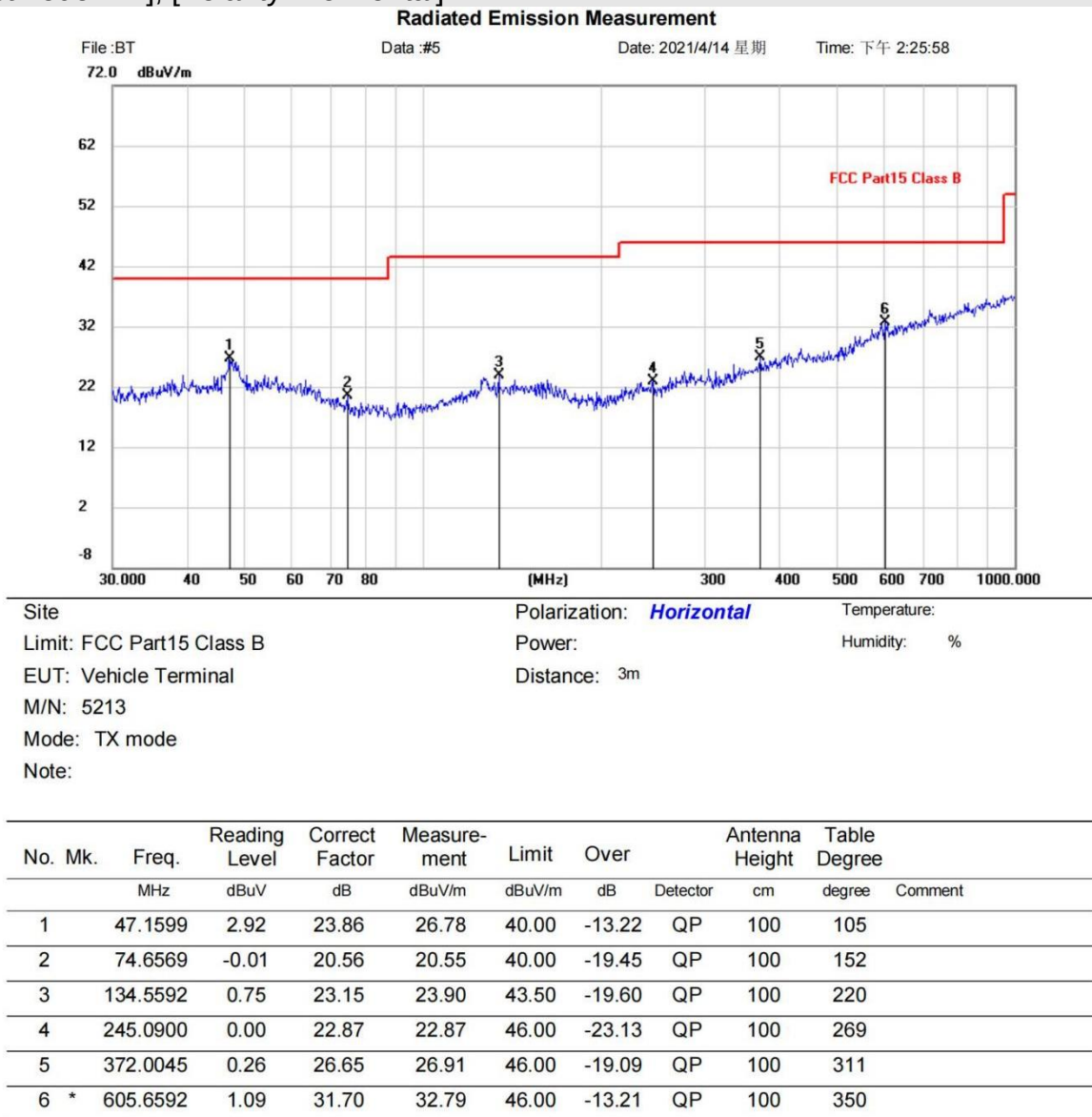
- h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.

Remark:

- 1) For emission below 1GHz, through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.
- 2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Final Test Level = Receiver Reading + Antenna Factor + Cable Factor - Preamplifier Factor
- 3) Scan from 9kHz to 25GHz, the disturbance above 12.75GHz and below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported. Fundamental frequency is blocked by filter, and only spurious emission is shown.
- 4) For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

3.4 TEST DATA

[TestMode: TX]; [Polarity: Horizontal]



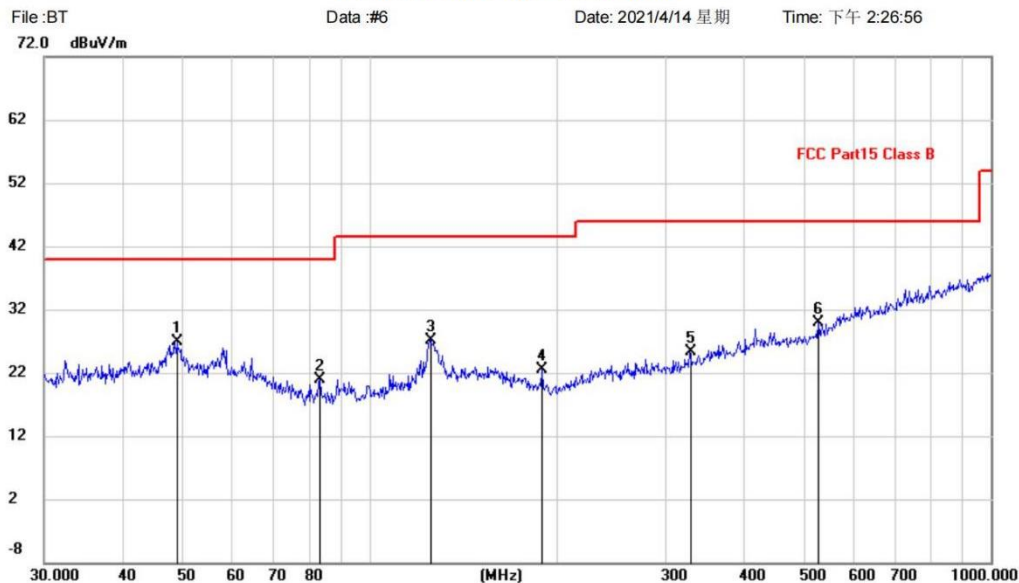
*:Maximum data x:Over limit !:over margin

<Reference Only

Test Result: Pass

[TestMode: TX]; [Polarity: Vertical]

Radiated Emission Measurement



Site
Limit: FCC Part15 Class B
EUT: Vehicle Terminal
M/N: 5213
Mode: TX mode
Note:

Polarization: **Vertical**
Power:
Distance: 3m

Temperature:
Humidity: %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1	*	49.0145	3.06	23.81	26.87	40.00	-13.13	QP	100	95
2		83.2298	1.37	19.52	20.89	40.00	-19.11	QP	100	136
3		125.0066	4.40	22.77	27.17	43.50	-16.33	QP	100	189
4		189.7385	1.45	21.07	22.52	43.50	-20.98	QP	100	208
5		327.8873	0.34	25.00	25.34	46.00	-20.66	QP	100	269
6		528.2458	0.55	29.26	29.81	46.00	-16.19	QP	100	310

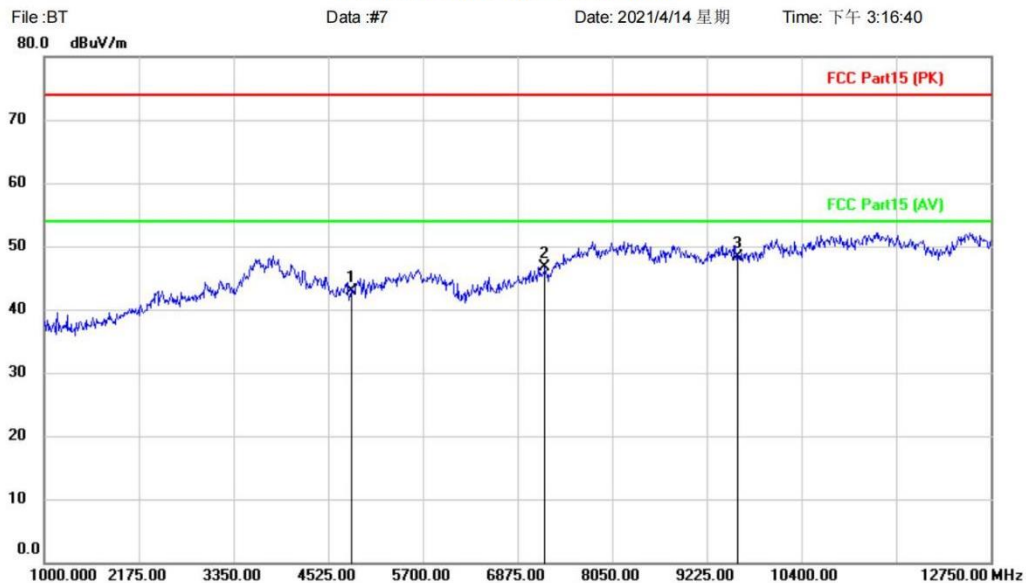
*:Maximum data x:Over limit !:over margin

<Reference Only

Test Result: Pass

[TestMode: TX Low channel]; [Polarity: Horizontal]

Radiated Emission Measurement



Site: Limit: FCC Part15 (PK) Polarization: **Horizontal** Temperature:
EUT: Vehicle Terminal Power: Humidity: %
M/N: 5213 Distance: 3m
Mode: TX-L
Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree	Comment
1		4804.000	50.22	-7.27	42.95	74.00	-31.05	peak	150	156
2		7206.000	51.17	-4.42	46.75	74.00	-27.25	peak	150	205
3	*	9608.000	48.53	-0.29	48.24	74.00	-25.76	peak	150	322

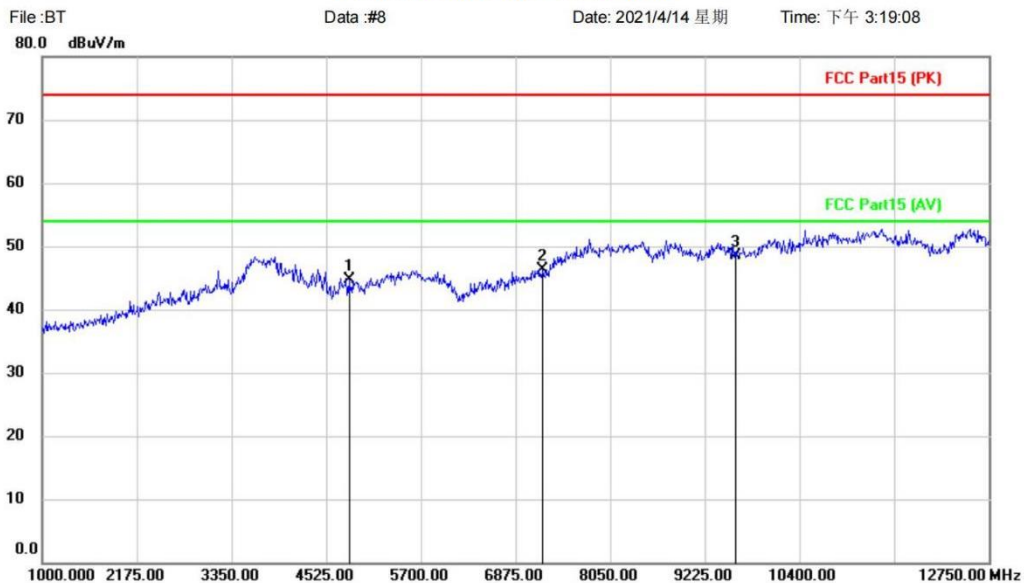
*:Maximum data x:Over limit !:over margin

<Reference Only

Test Result: Pass

[TestMode: TX Low channel]; [Polarity: Vertical]

Radiated Emission Measurement



Site: Polarization: **Vertical** Temperature:
Limit: FCC Part15 (PK) Power: Humidity: %
EUT: Vehicle Terminal Distance: 3m
M/N: 5213
Mode: TX-L
Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree	Comment
1		4804.000	51.93	-7.27	44.66	74.00	-29.34	peak	150	126	
2		7206.000	50.63	-4.42	46.21	74.00	-27.79	peak	150	238	
3	*	9608.000	48.78	-0.29	48.49	74.00	-25.51	peak	150	319	

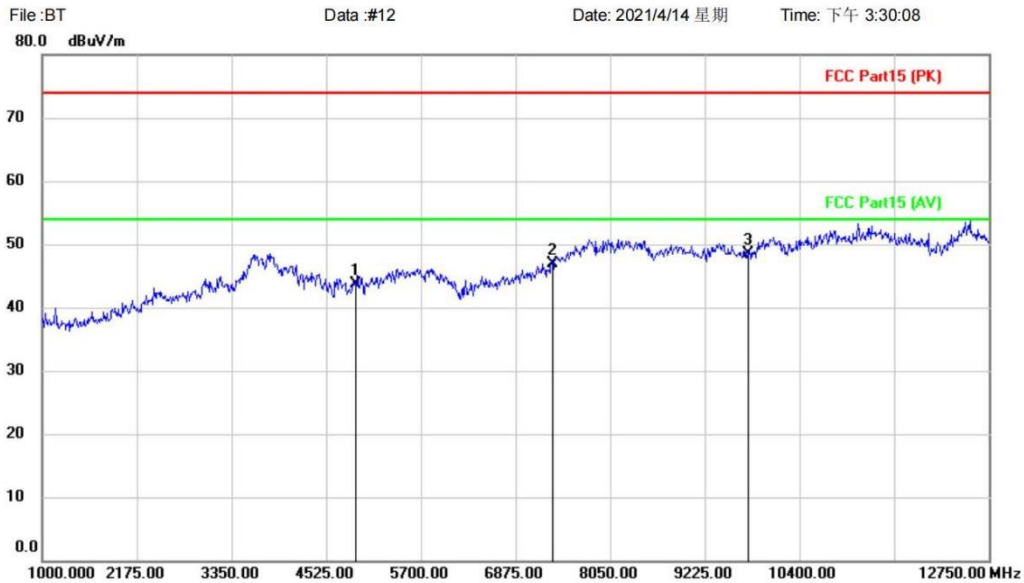
*:Maximum data x:Over limit !:over margin

<Reference Only

Test Result: Pass

[TestMode: TX middle channel]; [Polarity: Horizontal]

Radiated Emission Measurement



Site Limit: FCC Part15 (PK) Polarization: **Horizontal** Temperature:
EUT: Vehicle Terminal Power: Humidity: %
M/N: 5213 Distance: 3m
Mode: TX-M
Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree	Comment
1		4882.000	51.14	-7.51	43.63	74.00	-30.37	peak	150	136	
2		7323.000	50.21	-3.35	46.86	74.00	-27.14	peak	150	242	
3	*	9764.000	48.03	0.56	48.59	74.00	-25.41	peak	150	338	

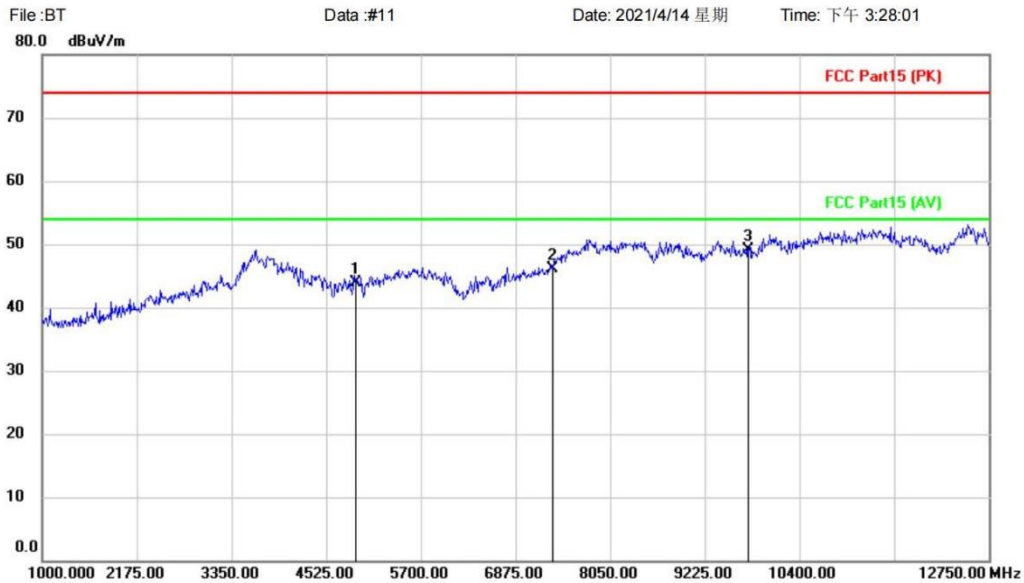
*:Maximum data x:Over limit !:over margin

〈Reference Only

Test Result: Pass

[TestMode: TX middle channel]; [Polarity: Vertical]

Radiated Emission Measurement



Site: Polarization: **Vertical** Temperature:
Limit: FCC Part15 (PK) Power: Humidity: %
EUT: Vehicle Terminal Distance: 3m
M/N: 5213
Mode: TX-M
Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree	Comment
1		4882.000	51.49	-7.51	43.98	74.00	-30.02	peak	150	118
2		7323.000	49.53	-3.35	46.18	74.00	-27.82	peak	150	239
3	*	9764.000	48.47	0.56	49.03	74.00	-24.97	peak	150	348

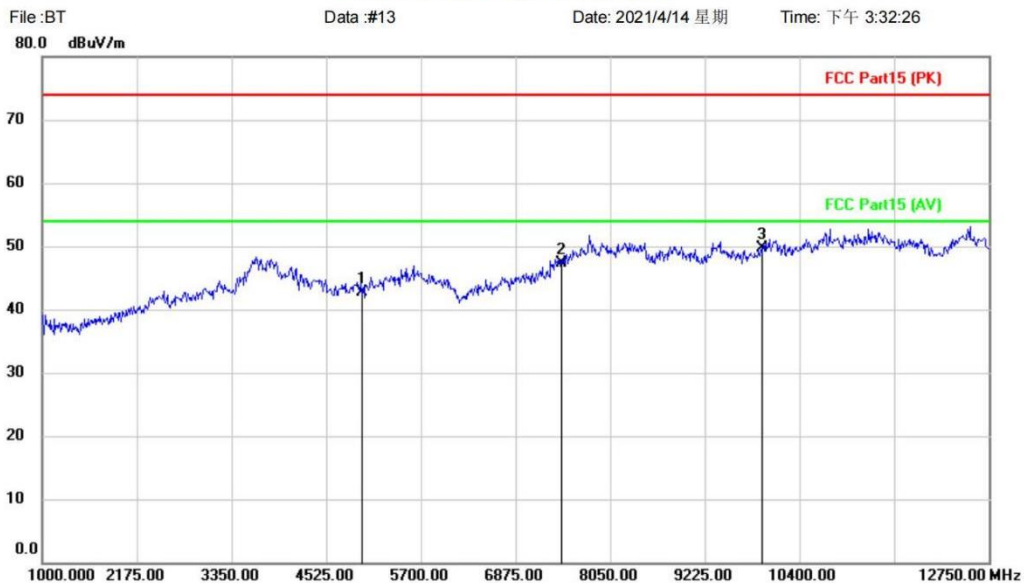
*:Maximum data x:Over limit !:over margin

<Reference Only

Test Result: Pass

[TestMode: TX high channel]; [Polarity: Horizontal]

Radiated Emission Measurement



Site: Limit: FCC Part15 (PK) Polarization: **Horizontal** Temperature:
EUT: Vehicle Terminal Power: Humidity: %
M/N: 5213 Distance: 3m
Mode: TX-H
Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree	Comment
1		4960.000	49.69	-6.99	42.70	74.00	-31.30	peak	150	128	
2		7440.000	49.65	-2.43	47.22	74.00	-26.78	peak	150	206	
3	*	9920.000	48.05	1.63	49.68	74.00	-24.32	peak	150	293	

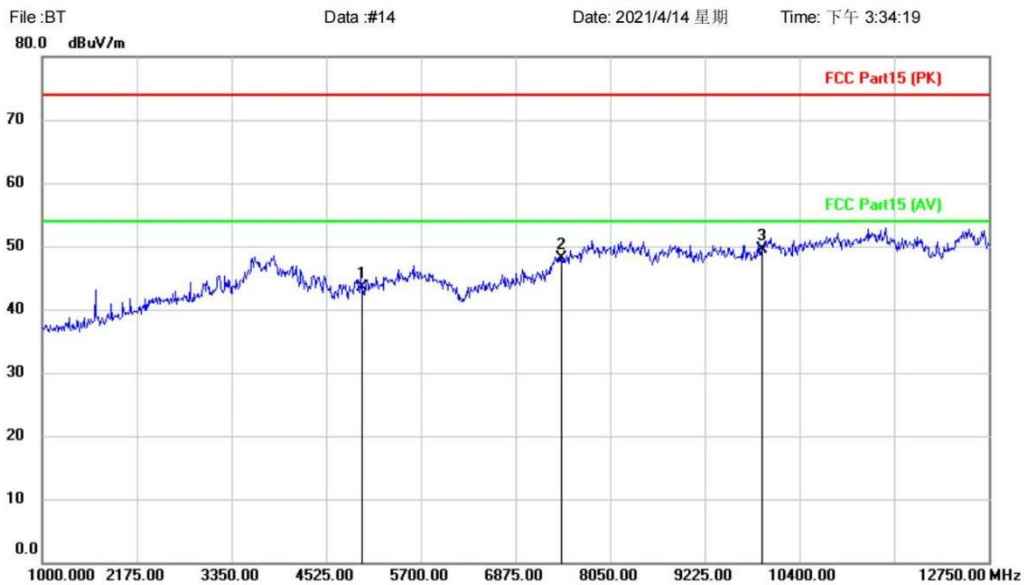
*:Maximum data x:Over limit !:over margin

<Reference Only

Test Result: Pass

[TestMode: TX high channel]; [Polarity: Vertical]

Radiated Emission Measurement



Site Limit: FCC Part15 (PK) Polarization: **Vertical** Temperature:
EUT: Vehicle Terminal Power: Humidity: %
M/N: 5213 Distance: 3m
Mode: TX-H
Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree	Comment
1		4960.000	50.46	-6.99	43.47	74.00	-30.53	peak	150	178	
2		7440.000	50.47	-2.43	48.04	74.00	-25.96	peak	150	209	
3	*	9920.000	47.95	1.63	49.58	74.00	-24.42	peak	150	318	

*:Maximum data x:Over limit !:over margin

<Reference Only

Test Result: Pass

4 RADIATED EMISSIONS WHICH FALL IN THE RESTRICTED BANDS

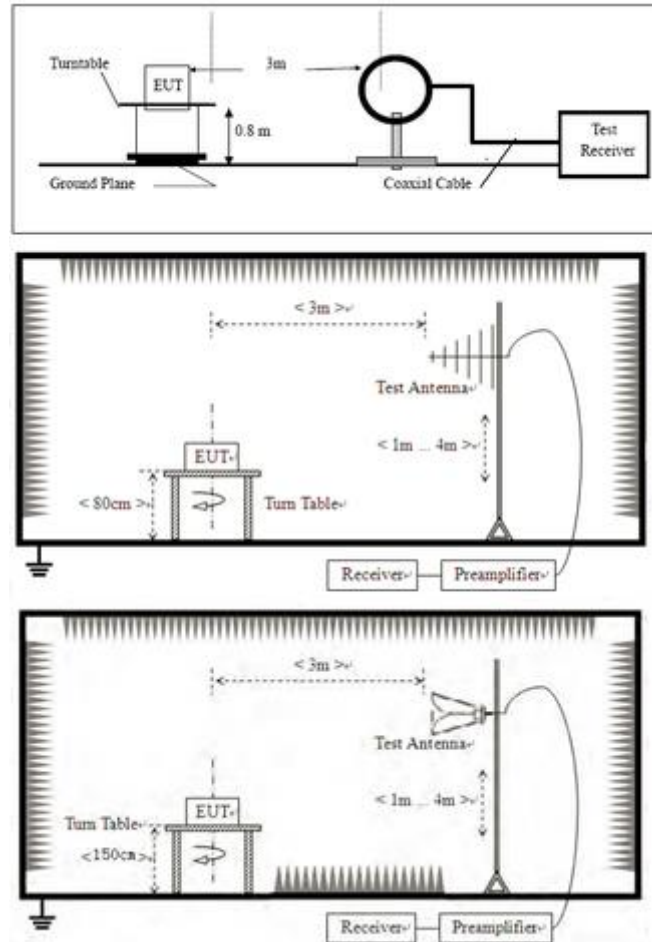
Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 6.10.5
Test Mode (Pre-Scan)	TX Low channel;TX high channel
Test Mode (Final Test)	TX Low channel;TX high channel
Tester	Eason
Temperature	25℃
Humidity	52%

4.1 LIMITS

Frequency(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

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

4.2 BLOCK DIAGRAM OF TEST SETUP



4.3 PROCEDURE

- For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

- h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.

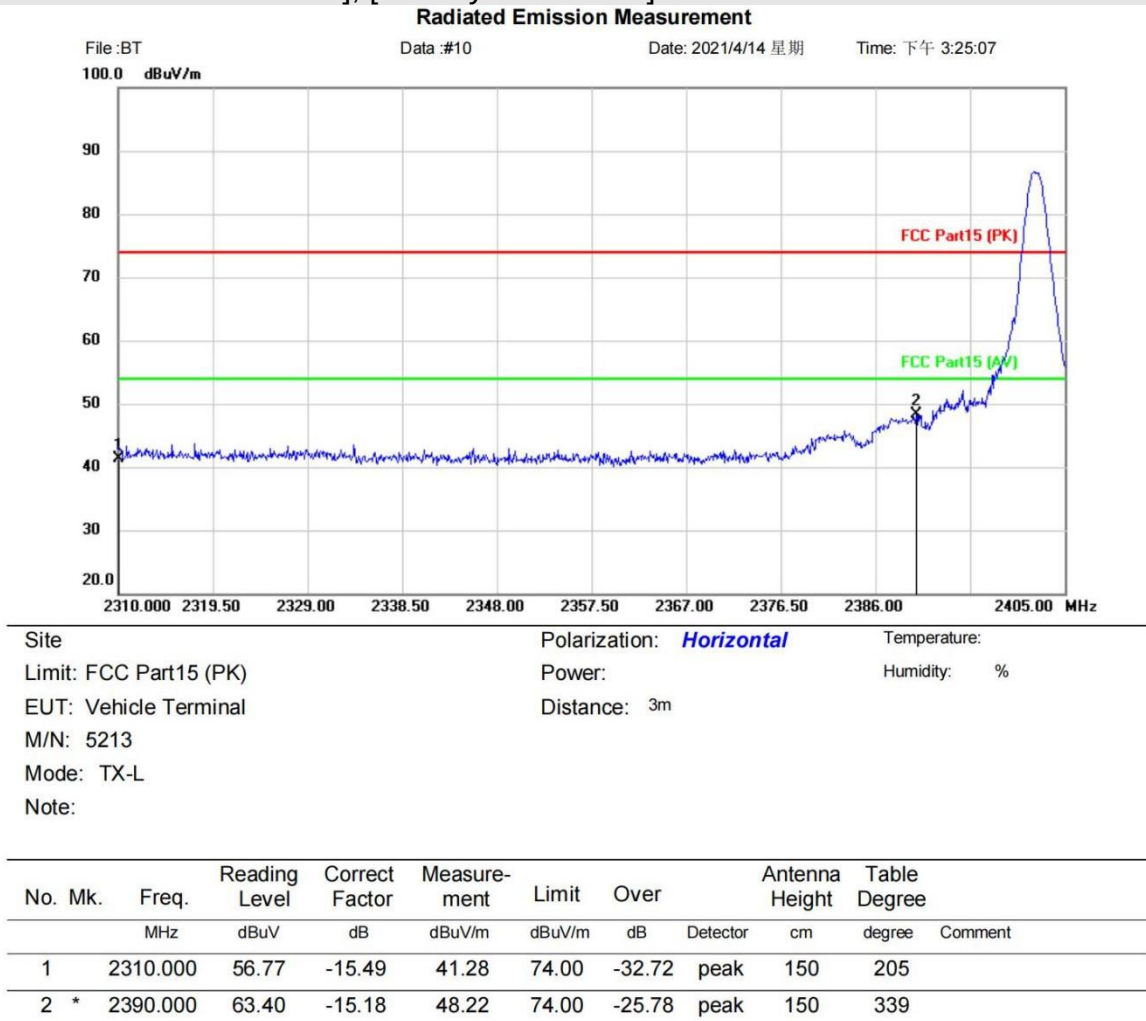
Remark 1: $\text{Level} = \text{Read Level} + \text{Cable Loss} + \text{Antenna Factor} - \text{Preamplifier Factor}$

Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

BlueAsia

4.4 TEST DATA

[TestMode: TX Low channel]; [Polarity: Horizontal]



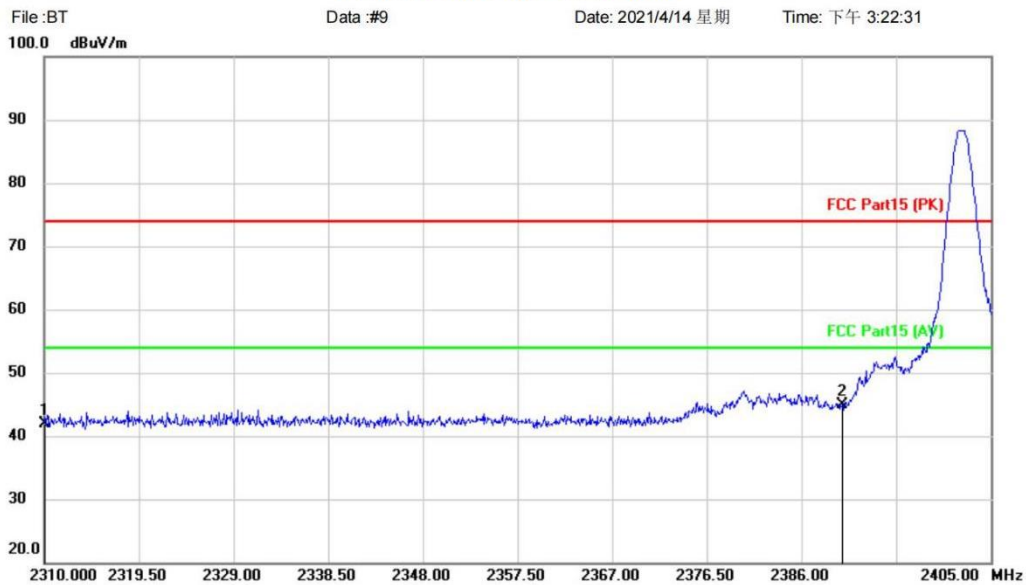
*:Maximum data x:Over limit !:over margin

<Reference Only

Test Result: Pass

[TestMode: TX Low channel]; [Polarity: Vertical]

Radiated Emission Measurement



Site: Limit: FCC Part15 (PK) EUT: Vehicle Terminal M/N: 5213 Mode: TX-L Note:

Polarization: **Vertical** Temperature: Humidity: % Distance: 3m

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree	Comment
1		2310.000	57.40	-15.49	41.91	74.00	-32.09	peak	150	189
2	*	2390.000	60.02	-15.18	44.84	74.00	-29.16	peak	150	305

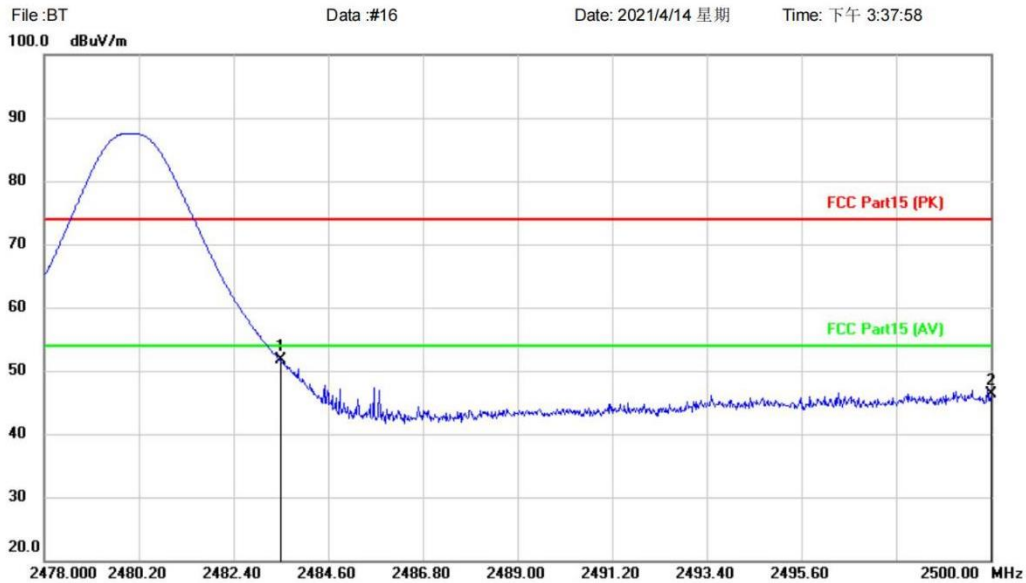
*:Maximum data x:Over limit !:over margin

<Reference Only

Test Result: Pass

[TestMode: TX high channel]; [Polarity: Horizontal]

Radiated Emission Measurement



Site Limit: FCC Part15 (PK) Polarization: **Horizontal** Temperature:
EUT: Vehicle Terminal Power: Humidity: %
M/N: 5213 Distance: 3m
Mode: TX-H
Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree	Comment
1	*	2483.500	66.40	-14.79	51.61	74.00	-22.39	peak	150	208	
2		2500.000	61.12	-14.72	46.40	74.00	-27.60	peak	150	337	

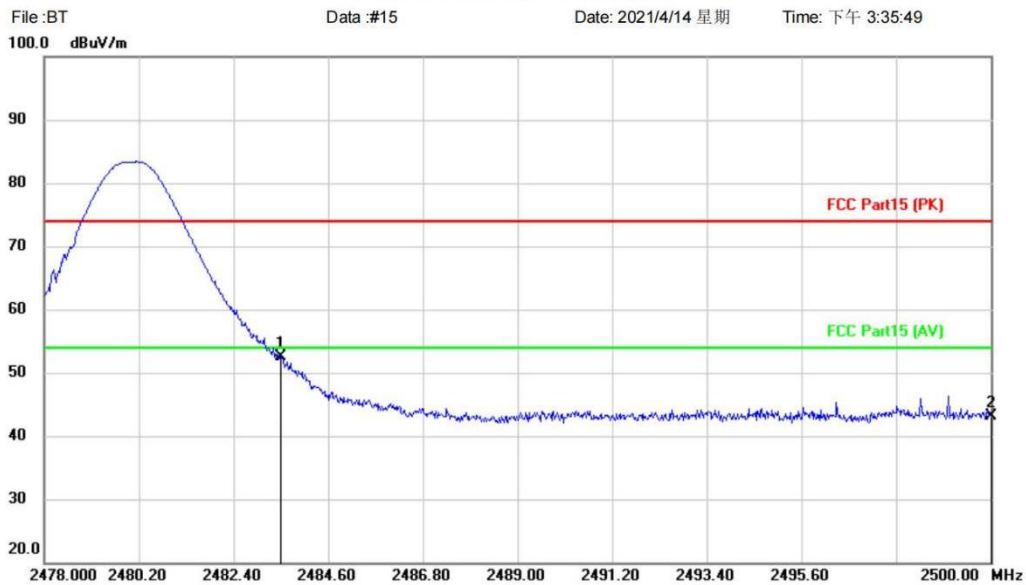
*:Maximum data x:Over limit !:over margin

〈Reference Only

Test Result: Pass

[TestMode: TX high channel]; [Polarity: Vertical]

Radiated Emission Measurement



Site Limit: FCC Part15 (PK) Polarization: **Vertical** Temperature:
EUT: Vehicle Terminal Power: Humidity: %
M/N: 5213 Distance: 3m
Mode: TX-H
Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree	Comment
1	*	2483.500	67.28	-14.79	52.49	74.00	-21.51	peak	150	198
2		2500.000	57.87	-14.72	43.15	74.00	-30.85	peak	150	305

*:Maximum data x:Over limit !:over margin

〈Reference Only

Test Result: Pass

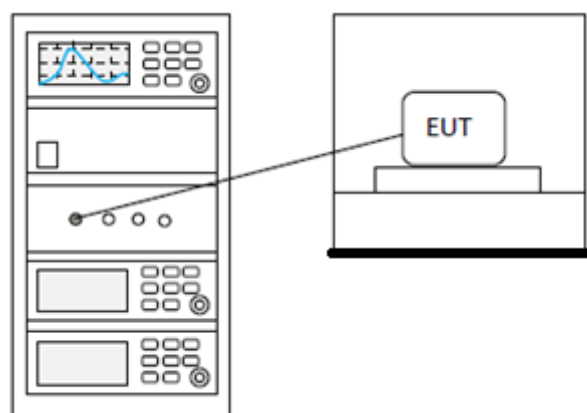
5 CONDUCTED BAND EDGES MEASUREMENT

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.8 & Section 11.13.3.2
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Eason
Temperature	25°C
Humidity	52%

5.1 LIMITS

Limit:	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)).
---------------	--

5.2 BLOCK DIAGRAM OF TEST SETUP



5.3 TEST DATA

Pass: Please Refer To Appendix: For Details

BlueAsia

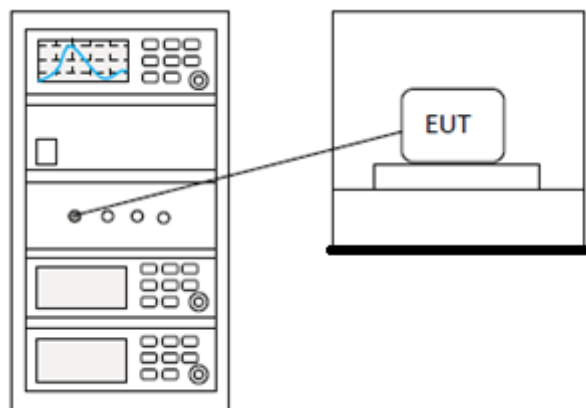
6 DWELL TIME

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.4
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Eason
Temperature	25℃
Humidity	52%

6.1 LIMITS

Frequency(MHz)	Limit
902-928	0.4S within a 20S period(20dB bandwidth<250kHz)
	0.4S within a 10S period(20dB bandwidth≥250kHz)
2400-2483.5	0.4S within a period of 0.4S multiplied by the number of hopping channels
5725-5850	0.4S within a 30S period

6.2 BLOCK DIAGRAM OF TEST SETUP



6.3 EST DATA

Pass: Please Refer To Appendix: For Details

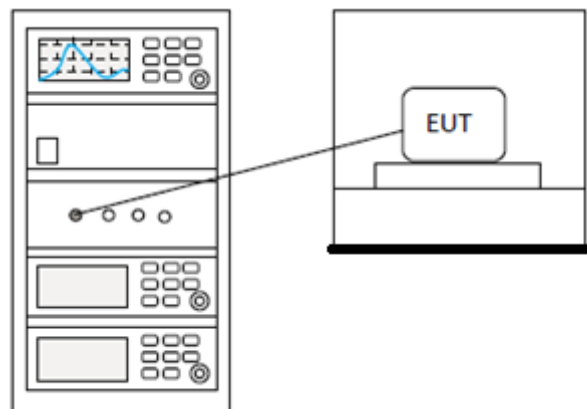
7 HOPPING CHANNEL NUMBER

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.3
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Eason
Temperature	25℃
Humidity	52%

7.1 LIMITS

Frequency range(MHz)	Number of hopping channels (minimum)
902-928	50 for 20dB bandwidth <250kHz
	25 for 20dB bandwidth ≥250kHz
2400-2483.5	15
5725-5850	75

7.2 BLOCK DIAGRAM OF TEST SETUP



7.3 TEST DATA

Pass: Please Refer To Appendix: For Details

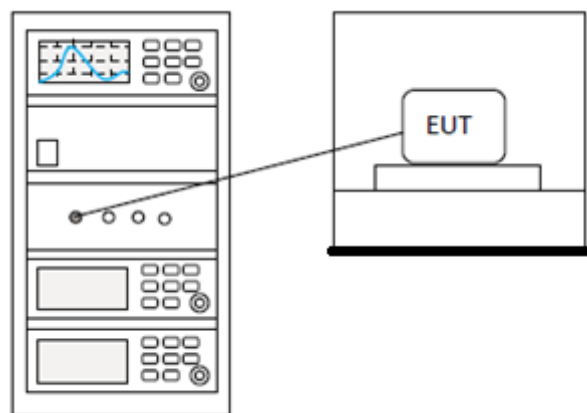
8 CARRIER FREQUENCIES SEPARATION

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.2
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Eason
Temperature	25°C
Humidity	52%

8.1 LIMITS

Limit:	2/3 of the 20dB bandwidth base on the transmission power is less than 0.125W
---------------	--

8.2 BLOCK DIAGRAM OF TEST SETUP



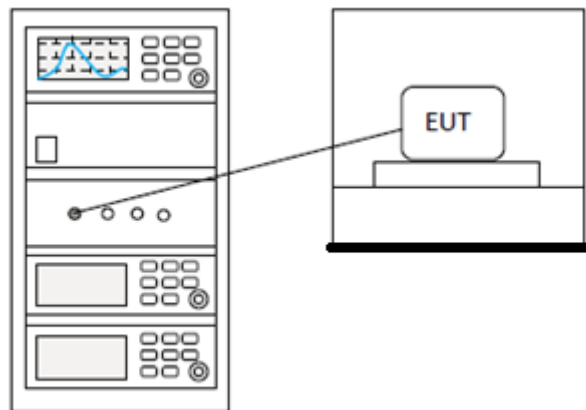
8.3 TEST DATA

Pass: Please Refer To Appendix: For Details

9 20DB BANDWIDTH

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.7
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Eason
Temperature	25℃
Humidity	52%

9.1 BLOCK DIAGRAM OF TEST SETUP



9.2 TEST DATA

Pass: Please Refer To Appendix: For Details

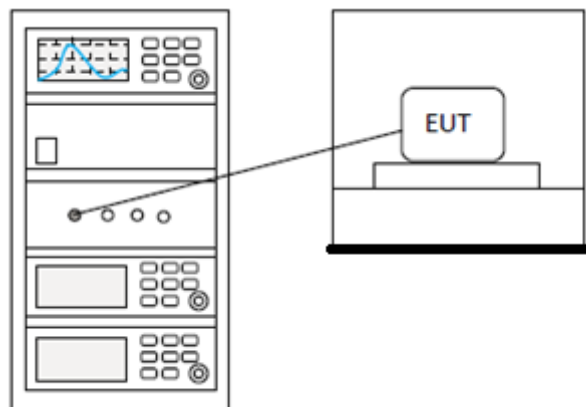
10 CONDUCTED PEAK OUTPUT POWER

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.5
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Eason
Temperature	25°C
Humidity	52%

10.1 LIMITS

Frequency range(MHz)	Output power of the intentional radiator(watt)
902-928	1 for ≥ 50 hopping channels
	0.25 for $25 \leq \text{hopping channels} < 50$
	1 for digital modulation
2400-2483.5	1 for ≥ 75 non-overlapping hopping channels
	0.125 for all other frequency hopping systems
	1 for digital modulation
5725-5850	1 for frequency hopping systems and digital modulation

10.2 BLOCK DIAGRAM OF TEST SETUP



10.3 EST DATA

Pass: Please Refer To Appendix: For Details

BlueAsia

10 APPENDIX

10.1: 20DB EMISSION BANDWIDTH

Test Result

TestMode	Antenna	Channel	20db EBW[MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH1	Ant1	2402	1.110	2401.436	2402.546	---	PASS
		2441	1.110	2440.436	2441.546	---	PASS
		2480	1.107	2479.436	2480.543	---	PASS
2DH1	Ant1	2402	1.374	2401.298	2402.672	---	PASS
		2441	1.380	2440.298	2441.678	---	PASS
		2480	1.383	2479.295	2480.678	---	PASS
3DH1	Ant1	2402	1.356	2401.310	2402.666	---	PASS
		2441	1.353	2440.313	2441.666	---	PASS
		2480	1.356	2479.310	2480.666	---	PASS

Test Graphs

