

FCC TEST REPORT

for

AutoMap,LLC

VEHICLE LOCATING SYSTEM

Model Number: BLE 1.3

FCC ID: 2AGOTBLE13

Prepared for : AutoMap,LLC

Address : 275 SE 24th Ave, Hillsboro, OR, 97123, US

Prepared by : Keyway Testing Technology Co., Ltd.

Address : Building 1, Baishun Industrial Zone, Zhangmutou Town,
Dongguan, Guangdong, China

Tel: 86-769-8718 2258

Fax: 86-769-8718 1058

Report No. : 16KWE073942F

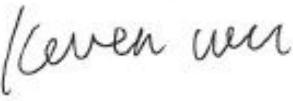
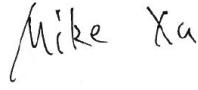
Date of Test : Aug. 15~Aug. 22, 2016

Date of Report : Aug. 23, 2016

TABLE OF CONTENTS

	Page
Test Report Declaration	Page
1. TEST SUMMARY	4
2. GENERAL PRODUCT INFORMATION	5
2.1. Product Function.....	5
2.2. Description of Device (EUT)	5
2.3. Independent Operation Modes.....	6
2.4. TEST SITES.....	6
2.5. List of Test and Measurement Instruments.....	7
3. TEST SET-UP AND OPERATION MODES.....	8
3.1. Principle of Configuration Selection.....	8
3.2. Block Diagram of Test Set-up.....	8
3.3. Test Operation Mode and Test Software.....	8
3.4. Special Accessories and Auxiliary Equipment.....	8
3.5. Countermeasures to Achieve EMC Compliance	8
4. EMISSION TEST RESULTS.....	9
4.1. Conducted Emission at the Mains Terminals Test.....	9
4.2. Radiated Emission Test.....	14
5. BAND EDGE COMPLIANCE TEST.....	26
5.1. Limits	26
5.2. Test setup	26
5.3. TEST Procedure	27
6. 6DB OCCUPY BANDWIDTH	30
6.1. Limits	30
6.2. TEST PROCEDURE	30
7. OUTPUT POWER TEST	33
7.1. Limits	33
7.2. Test setup	33
7.3. Test result	33
8. POWER SPECTRAL DENSITY TEST.....	34
8.1. Limits	34
8.2. Test setup	34
8.3. Test result	34
9. ANTENNA REQUIREMENTS	36
9.1. Limits	36
9.2. Result	36
10.PHOTOGRAPHS OF TEST SET-UP	37
11. PHOTOGRAPHS OF THE EUT	39

Keyway Testing Technology Co., Ltd.

Applicant:	AutoMap,LLC		
Address:	275 SE 24th Ave, Hillsboro, OR, 97123, US		
Manufacturer:	e-BI International supply chain management (ShenZhen) Co.,Ltd		
Address:	Floor 2, Tower A, New Energy Building, Nanhai Road, Nanshan, Shenzhen,Guangdong, China		
E.U.T:	VEHICLE LOCATING SYSTEM		
Model Number:	BLE 1.3		
Serial Model:	N/A		
Trade Name:		Serial No.:	-----
Date of Receipt:	Aug. 13, 2016	Date of Test:	Aug. 15~Aug. 22, 2016
Test Specification:	FCC Part 15, Subpart C Section 15.247: 2015 ANSI C63.10:2013 KDB558074 D01 DTS Meas Guidance v03r05		
Test Result:	The equipment under test was found to be compliance with the requirements of the standards applied.		
Issue Date: Aug.23, 2016			
Tested by:	Reviewed by:	Approved by:	
		 Andy Gao / Supervisor	
Keven Wu / Engineer	Mike Xu / Supervisor		
Other Aspects: None.			
Abbreviations: OK/P=passed fail/F=failed n.a/N=not applicable E.U.T=equipment under tested			
This test report is based on a single evaluation of one sample of above mentioned products. It is not permitted to be duplicated in extracts without written approval of Keyway Testing Technology Co., Ltd.			

1.TEST SUMMARY

Test Items	Test Requirement	Result
Conducted Emissions	15.207	PASS
Radiated Emissions	15.205(a) 15.209 15.247(d)	PASS
6dB&99% Bandwidth	15.247(a)(2)	PASS
Power density	15.247(e)	PASS
Maximum Peak Output Power	15.247(b)(3)	PASS
Emissions from out of band	15.247(d)	PASS
Antenna Requirement	15.203	PASS

2.GENERAL PRODUCT INFORMATION

2.1. Product Function

Refer to Technical Construction Form and User Manual.

2.2. Description of Device (EUT)

Product Name:	VEHICLE LOCATING SYSTEM
Model No.:	BLE 1.3
Serial Model:	N/A
Model Difference	N/A
Operation Frequency:	BT: 2402MHz~2480MHz
Channel numbers:	BT: 40 Channels
Modulation technology:	BT: GFSK
Antenna Type:	PCB
Antenna gain:	1.0dBi
Power supply:	DC 12V from adapter AC 120V/60Hz
Adapter	I/P:AC 100~240V 50/60Hz 0.15A O/P:DC 12V 1A

2.3. Independent Operation Modes

The basic operation modes are:

2.3.1. EUT work BT mode, and Test Mode as below:

Final Test Mode	Description
Mode 1	CH00
Mode 2	CH19
Mode 3	CH39
Mode 4	Link Mode

Remark: According to ANSI C63.10 standards, the test results are both the “worst case” and “worst setup”

2.4. TEST SITES

2.4.1. Test Facilities

Lab Qualifications : Certificated by Industry Canada
Registration No.: 9868A
Date of registration: December 8, 2011

Certificated by FCC, USA
Registration No.: 370994
Date of registration: February 21, 2012

Certificated by CNAS China
Registration No.: CNAS L5783
Date of registration: August 8, 2012

2.5. List of Test and Measurement Instruments

2.5.1. For conducted emission at the mains terminals test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESCI	101156	Apr. 09,16	Apr. 09,17
Artificial Mains Network	Rohde&Schwarz	ENV216	101315	Apr. 09,16	Apr. 09,17
Artificial Mains Network (AUX)	Rohde&Schwarz	ENV216	101314	Apr. 09,16	Apr. 09,17
RF Cable	FUJIKURA	3D-2W	944 Cable	Apr. 09,16	Apr. 09,17

2.5.2. For radiated emission test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESCI	101156	Apr. 09,16	Apr. 09,17
Bilog Antenna	ETS-LINDGREEN	3142D	135452	Apr. 09,16	Apr. 09,17
Spectrum Analyzer	Agilent	E4411B	MY4511304	Apr. 09,16	Apr. 09,17
3m Semi-anechoic Chamber	ETS-LINDGREEN	966	KW01	Apr. 09,16	Apr. 09,17
Signal Amplifier	SONOMA	310	187016	Apr. 09,16	Apr. 09,17
Signal Amplifier	Agilent	8449B	3008A00251	Apr. 09,16	Apr. 09,17
RF Cable	IMRO	IMRO-400	966 Cable 1#	N/A	N/A
MULTI-DEVICE Controller	ETS-LINDGREEN	2090	126913	N/A	N/A
Horn Antenna	SCHWARZBECK	BBHA9170	9170-068	Apr. 09,16	Apr. 09,17
Spectrum Analyzer	Agilent	E4408B	MY44211125	Apr. 09,16	Apr. 09,17
High Pass filter	Micro	HPM50111	324216	Apr. 09,16	Apr. 09,17
Constant temperature and humidity box	GF	GTH-800-40-1P	MAA9906-005	Apr. 09,16	Apr. 09,17
Attenuation	MCE	24-10-34	BN9258	Apr. 02,16	Apr. 02,17
Loop Antenna	ARA	PLA-1030/B	1029	Apr. 02,16	Apr. 02,17
Power Meter	Anritsu	ML2495A	1204003	Apr. 24,16	Apr. 24,17
Power Sensor	Anritsu	MA2411B	1126150	Apr. 24,16	Apr. 24,17

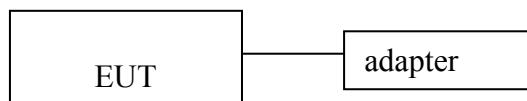
3. TEST SET-UP AND OPERATION MODES

3.1. Principle of Configuration Selection

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the Operating Instructions.

3.2. Block Diagram of Test Set-up

System Diagram of Connections between EUT and Simulators



3.3. Test Operation Mode and Test Software

None.

3.4. Special Accessories and Auxiliary Equipment

Adapter:	Manufacturer:Cenique Infotainment Group Limited I/P:AC 100~240V 50/60Hz 0.15A O/P:DC 12V 1A DC Line:Unshielded,detachable 1.2m
----------	---

3.5. Countermeasures to Achieve EMC Compliance

None.

4. EMISSION TEST RESULTS

4.1. Conducted Emission at the Mains Terminals Test

4.1.1. Limit 15.207 limits

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56	56 to 46
0.5-5	56	46
5-30	60	50

4.1.2. Test Setup

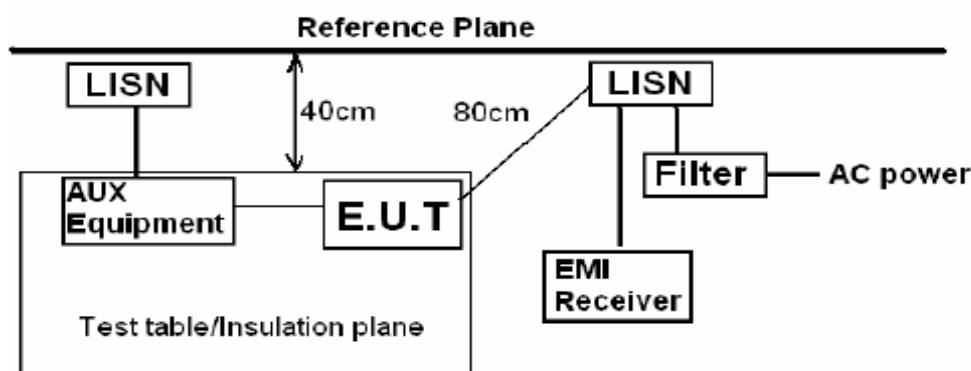
The EUT was put on a wooden table which was 0.8 m high above the ground and connected to the AC mains through the Artificial Mains Network (AMN). Where the mains cable supplied by the manufacture was longer than 0.8 m, the excess was folded back and forth parallel to the cable at the centre so as to form a bundle no longer than 0.4 m.

The EUT was kept 0.4 m from any other earthed conducting surface. Both sides of AC line were checked to find out the maximum conducted emission levels according to the test procedure during the conducted emission test.

The frequency range from 150 kHz to 30 MHz was investigated.

The bandwidth of the test receiver was set at 9 kHz.

Pretest for all mode, The test data of the worst case condition(s) was reported on the following page.



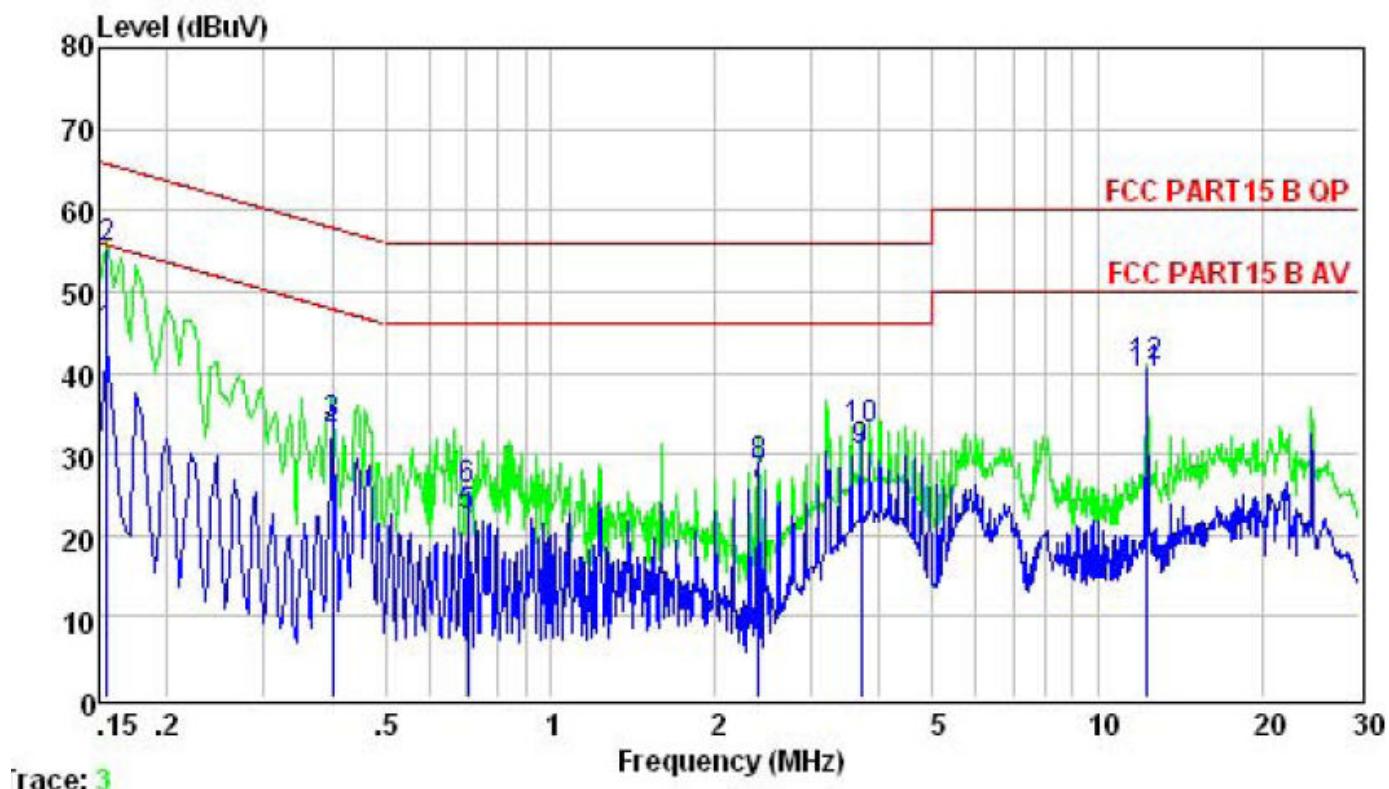
Remark:

E.U.T: Equipment Under Test

LISN: Line Impedance Stabilization Network

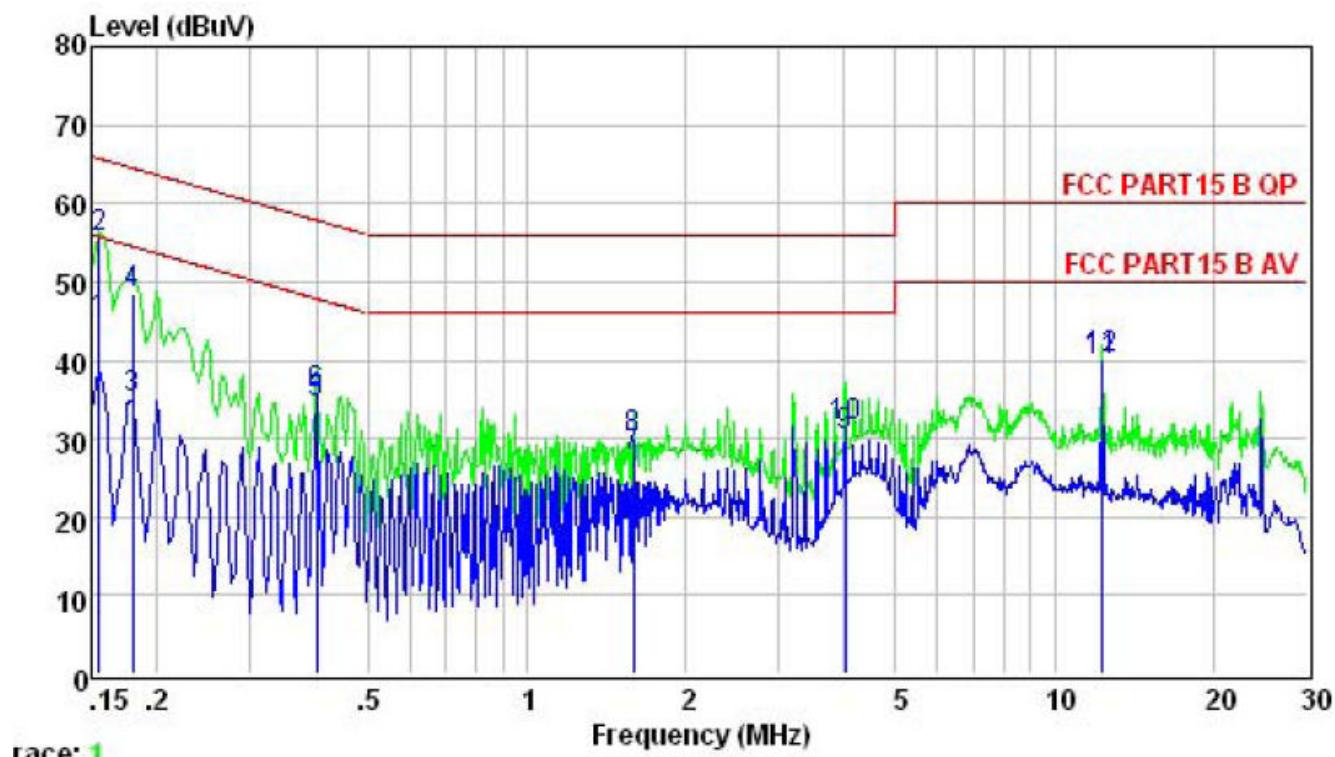
Test table height=0.8m

EUT :	VEHICLE LOCATING SYSTEM	Model Name :	BLE 1.3
Temperature :	26 °C	Relative Humidity :	54%
Pressure :	1010hPa	Phase :	L
Test Voltage :	DC 12.0V form Adapter AC 120V/60Hz	Test Mode :	Mode 4



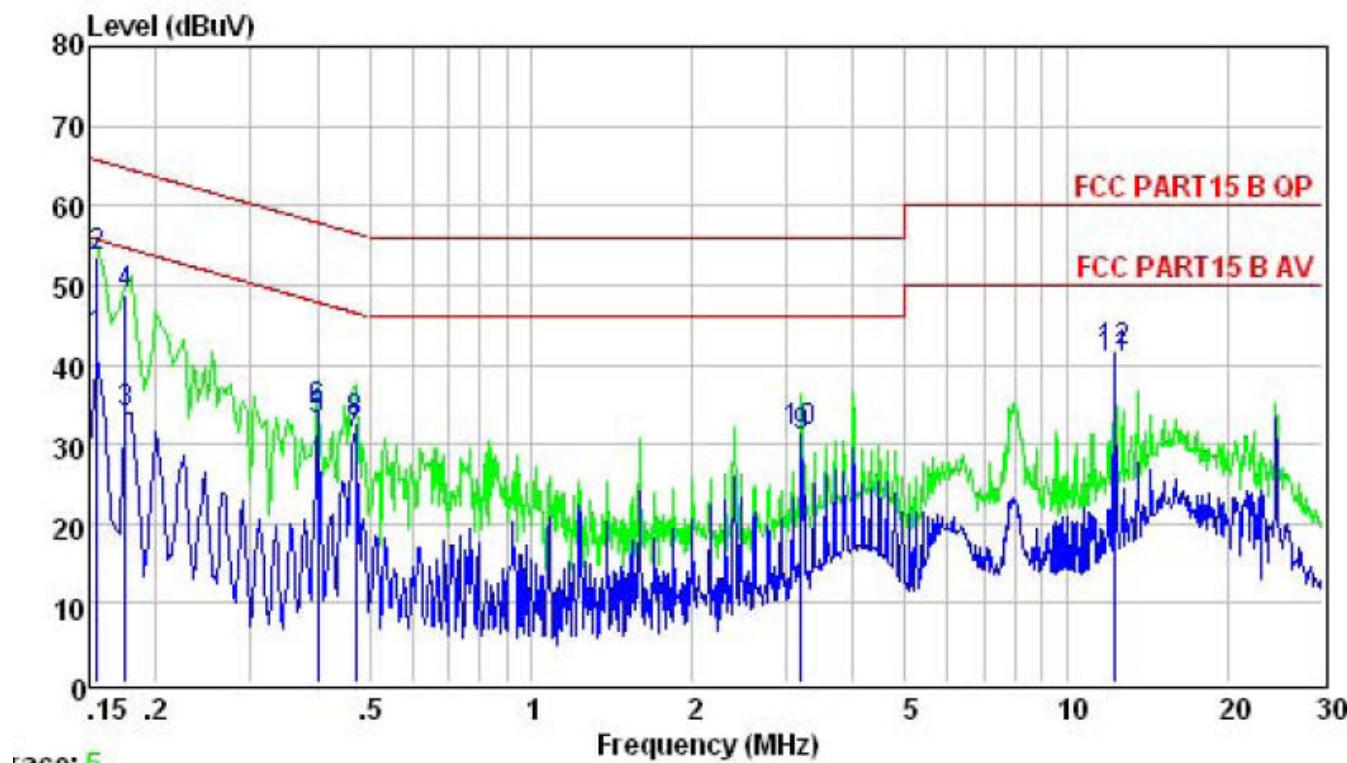
Freq	Level	Limit		Over	Remark
		MHz	dBuV	dBuV	
				dB	
1	0.155	44.80	55.74	-10.94	Average
2	0.155	55.20	65.74	-10.54	QP
3	0.400	33.54	47.86	-14.32	Average
4	0.400	32.56	57.86	-25.30	QP
5	0.708	22.19	46.00	-23.81	Average
6	0.708	25.64	56.00	-30.36	QP
7	2.396	26.16	46.00	-19.84	Average
8	2.396	28.69	56.00	-27.31	QP
9	3.700	30.34	46.00	-15.66	Average
10	3.700	32.89	56.00	-23.11	QP
11	12.318	39.85	50.00	-10.15	Average
12	12.318	40.79	60.00	-19.21	QP

EUT :	VEHICLE LOCATING SYSTEM	Model Name :	BLE 1.3
Temperature :	26 °C	Relative Humidity :	54%
Pressure :	1010hPa	Phase :	N
Test Voltage :	DC 12.0V form Adapter AC 120V/60Hz	Test Mode :	Mode 4



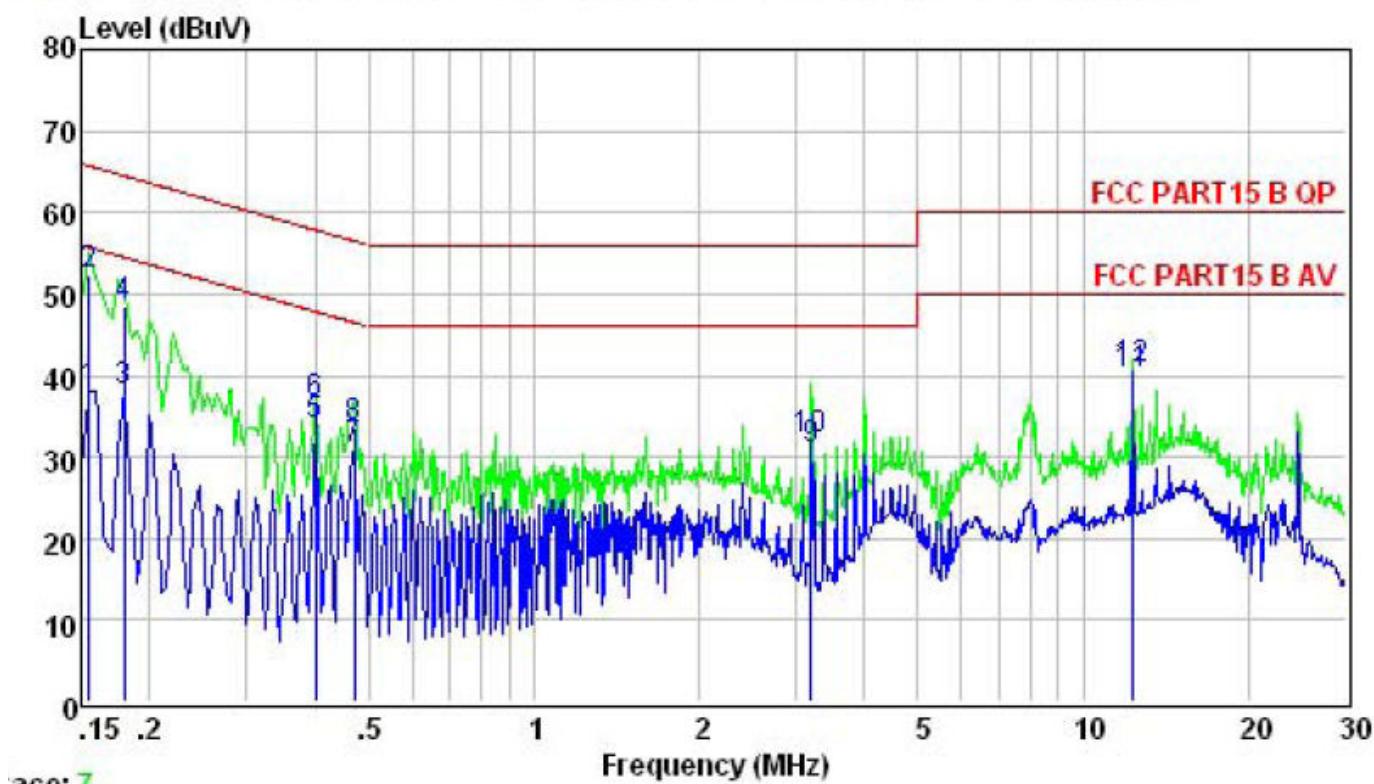
Freq	Level	Limit		Over	Remark
		Line	Limit		
MHz	dBuV	dBuV	dB		
1	0.155	44.80	55.74	-10.94	Average
2	0.155	55.70	65.74	-10.04	QP
3	0.180	35.03	54.50	-19.47	Average
4	0.180	48.56	64.50	-15.94	QP
5	0.400	34.57	47.86	-13.29	Average
6	0.400	35.69	57.86	-22.17	QP
7	1.593	27.67	46.00	-18.33	Average
8	1.593	30.12	56.00	-25.88	QP
9	4.006	30.36	46.00	-15.64	Average
10	4.006	31.59	56.00	-24.41	QP
11	12.318	39.86	50.00	-10.14	Average
12	12.318	40.12	60.00	-19.88	QP

EUT :	VEHICLE LOCATING SYSTEM	Model Name :	BLE 1.3
Temperature :	26 °C	Relative Humidity :	54%
Pressure :	1010hPa	Phase :	L
Test Voltage :	DC 12.0V form Adapter AC 240V/60Hz	Test Mode :	Mode 4



Freq	Limit		Over Line Limit	Remark	
	MHz	dBuV	dBuV	dB	
1	0.155	43.30	55.74	-12.44	Average
2	0.155	53.60	65.74	-12.14	QP
3	0.175	34.03	54.72	-20.69	Average
4	0.175	48.69	64.72	-16.03	QP
5	0.400	32.97	47.86	-14.89	Average
6	0.400	34.21	57.86	-23.65	QP
7	0.471	31.18	46.49	-15.31	Average
8	0.471	32.58	56.49	-23.91	QP
9	3.190	30.93	46.00	-15.07	Average
10	3.190	31.59	56.00	-24.41	QP
11	12.318	40.61	50.00	-9.39	Average
12	12.318	41.52	60.00	-18.48	QP

EUT :	VEHICLE LOCATING SYSTEM	Model Name :	BLE 1.3
Temperature :	26 °C	Relative Humidity :	54%
Pressure :	1010hPa	Phase :	N
Test Voltage :	DC 12.0V form Adapter AC 240V/60Hz	Test Mode :	Mode 4



ace: 7

LAWSON INSTRUMENTS INC.

Freq	Level	Limit	Over	Remark
		Line	Limit	
MHz	dBuV	dBuV	dB	
1	0.155	38.00	55.74	-17.74 Average
2	0.155	52.36	65.74	-13.38 QP
3	0.180	37.97	54.50	-16.53 Average
4	0.180	48.56	64.50	-15.94 QP
5	0.400	33.80	47.86	-14.06 Average
6	0.400	36.60	57.86	-21.26 QP
7	0.471	30.84	46.49	-15.65 Average
8	0.471	33.56	56.49	-22.93 QP
9	3.190	30.78	46.00	-15.22 Average
10	3.190	32.15	56.00	-23.85 QP
11	12.318	40.10	50.00	-9.90 Average
12	12.318	40.89	60.00	-19.11 QP

4.2. Radiated Emission Test

4.2.1. Limit 15.209 limits

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		μV/m	dB(μV)/m
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	74.0 dB(μV)/m (Peak) 54.0 dB(μV)/m (Average)	

4.2.2. Restricted bands of operation

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)

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

4.2.3. Test setup

The EUT was placed on a turn table which was 0.8 m(above 1GHz, the table was 1.5m) above the ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was set 3 m away from the receiving antenna which was mounted on an antenna tower. The measuring antenna moved up and down to find out the maximum emission level. It moved from 1 m to 4 m for both horizontal and vertical polarizations.

The EUT was tested in the Chamber Site. It was pre-scanned with a Peak detector from the spectrum, and all the final readings from the test receiver were measured with the Quasi-Peak detector.

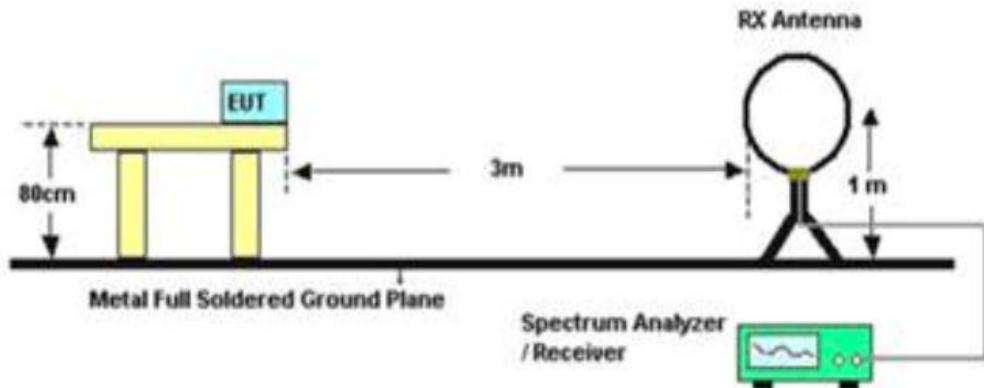
The bandwidth of the EMI test receiver is set at 120kHz for frequency range from 30MHz to 1000 MHz.

The bandwidth of the Spectrum's VBW is set at 3MHz and RBW is set at 1MHz for peak emissions measurement above 1GHz and 1MHz RBW, 10Hz VBW for average emissions measure above 1GHz, Both PK and AV measure, PK detector is used.

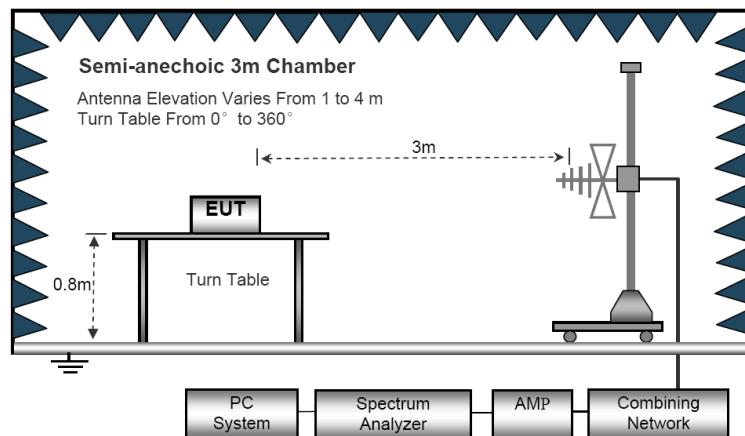
The frequency range from 30MHz to 10th harmonic (25GHz) are checked. and no any emissions were found from 18GHz to 25 GHz, So the radiated emissions from 18GHz to 25GHz were not record.

- Notes:
1. Emission Level = Antenna Factor + Cable Loss + Meter Reading+Preamp Factor.
 2. Measurement Uncertainty: ± 3.2 dB at a level of confidence of 95%.
 3. For emissions above 1GHz, if peak level comply with average limit, then the average level is deemed to comply with average limit.
 4. For emissions below 1GHz, pretest for all mode, The test data of the worst case condition(s) was reported on the following pages.
 5. For Both PK and AV value above 1GHz, PK detector is used.
 6. EUT Pre-scan X/Y/Z orientation, only worst case is presented in the report (Z orientation).

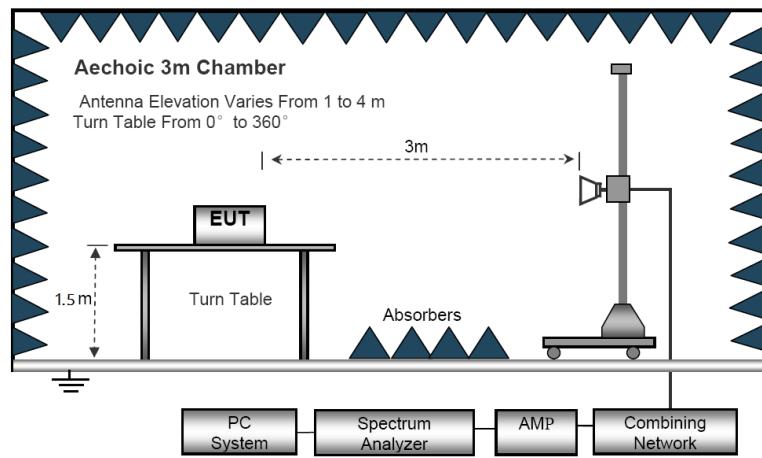
Radiated Emission Test-Up Frequency Below 30MHz



30MHz- 1GHz



Above 1GHz



Below 30MHz

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	P
--	--	--	--	P

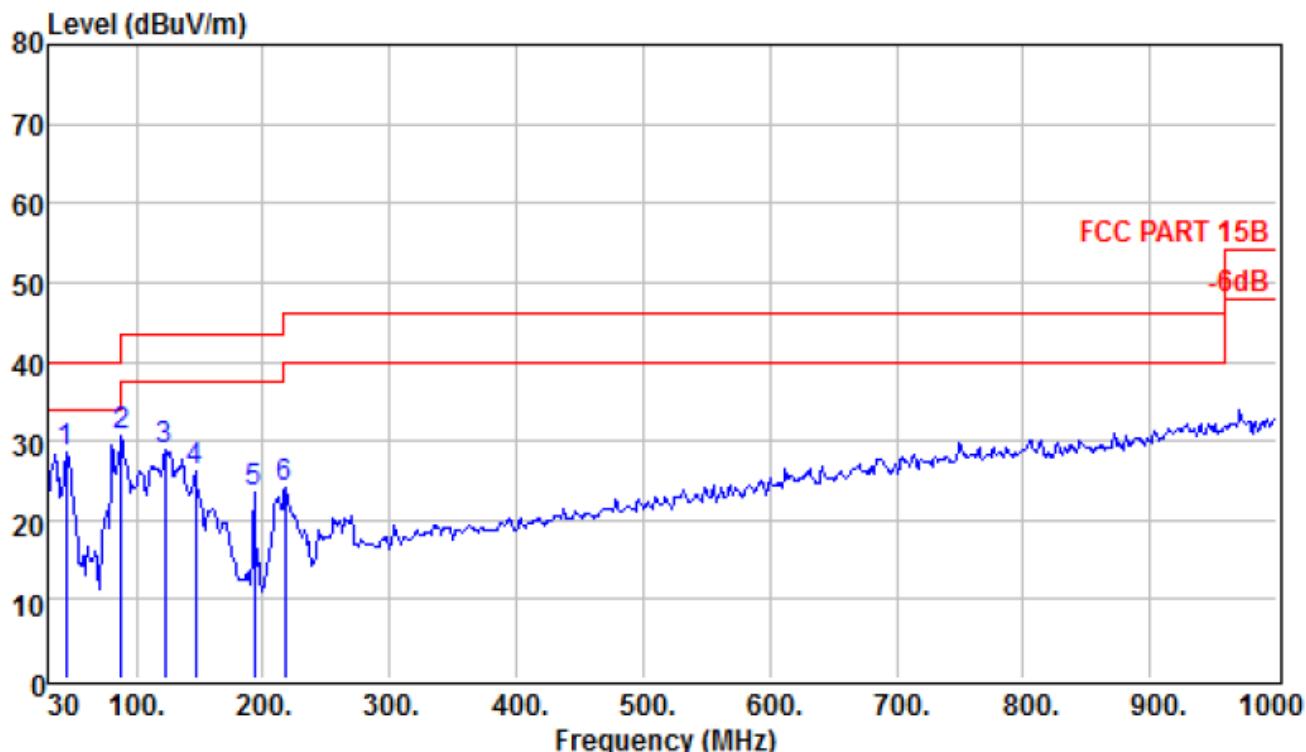
Note:

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

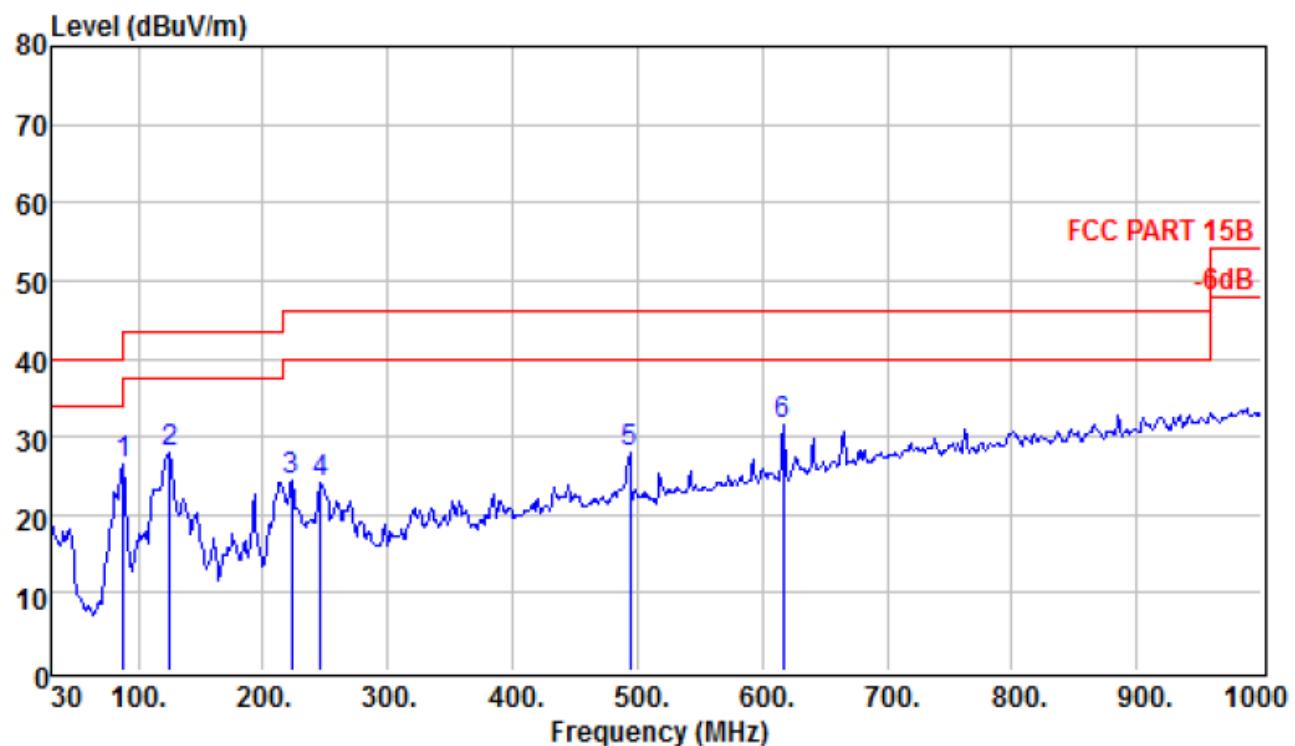
Distance extrapolation factor = $40 \log (\text{specific distance}/\text{test distance})(\text{dB})$;

Limit line = specific limits(dBuV) + distance extrapolation factor.

EUT :	VEHICLE LOCATING SYSTEM	Model Name :	BLE 1.3
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010hPa	Test Mode :	TX
Test Voltage :	DC 12V from adapter		

30-1GHz**Vertical**

Freq	Read		Preamp	Cable		Antenna	Limit Level	Over Line	Over Limit	Remark
	MHz	dBuV	Factor	Loss	Factor	dB/m	dBuV/m	dBuV/m	dB	
1	44.550	48.24	31.40	0.56	11.03	28.43	40.00	-11.57	QP	
2	88.200	52.13	31.35	0.94	8.90	30.62	43.50	-12.88	QP	
3	122.150	50.40	31.23	1.12	8.46	28.75	43.50	-14.75	QP	
4	146.400	47.54	31.23	1.22	8.78	26.31	43.50	-17.19	QP	
5	192.960	42.65	31.12	1.46	10.37	23.36	43.50	-20.14	QP	
6	217.210	41.80	31.01	1.53	11.83	24.15	46.00	-21.85	QP	

Horizontal

Freq	Read	Preamp	CableAntenna		Limit	Over	Remark	
	Level	Factor	Loss	Factor				
	MHz	dBuV	dB	dB	dB/m	dBuV/m	dBuV/m	dB
1	88.200	47.92	31.35	0.94	8.90	26.41	43.50	-17.09 QP
2	125.060	49.58	31.22	1.12	8.40	27.88	43.50	-15.62 QP
3	223.030	41.75	30.96	1.53	12.11	24.43	46.00	-21.57 QP
4	246.310	40.63	30.96	1.70	12.80	24.17	46.00	-21.83 QP
5	493.660	37.23	30.59	2.77	18.60	28.01	46.00	-17.99 QP
6	616.850	37.75	30.64	3.38	21.07	31.56	46.00	-14.44 QP

NOTE:

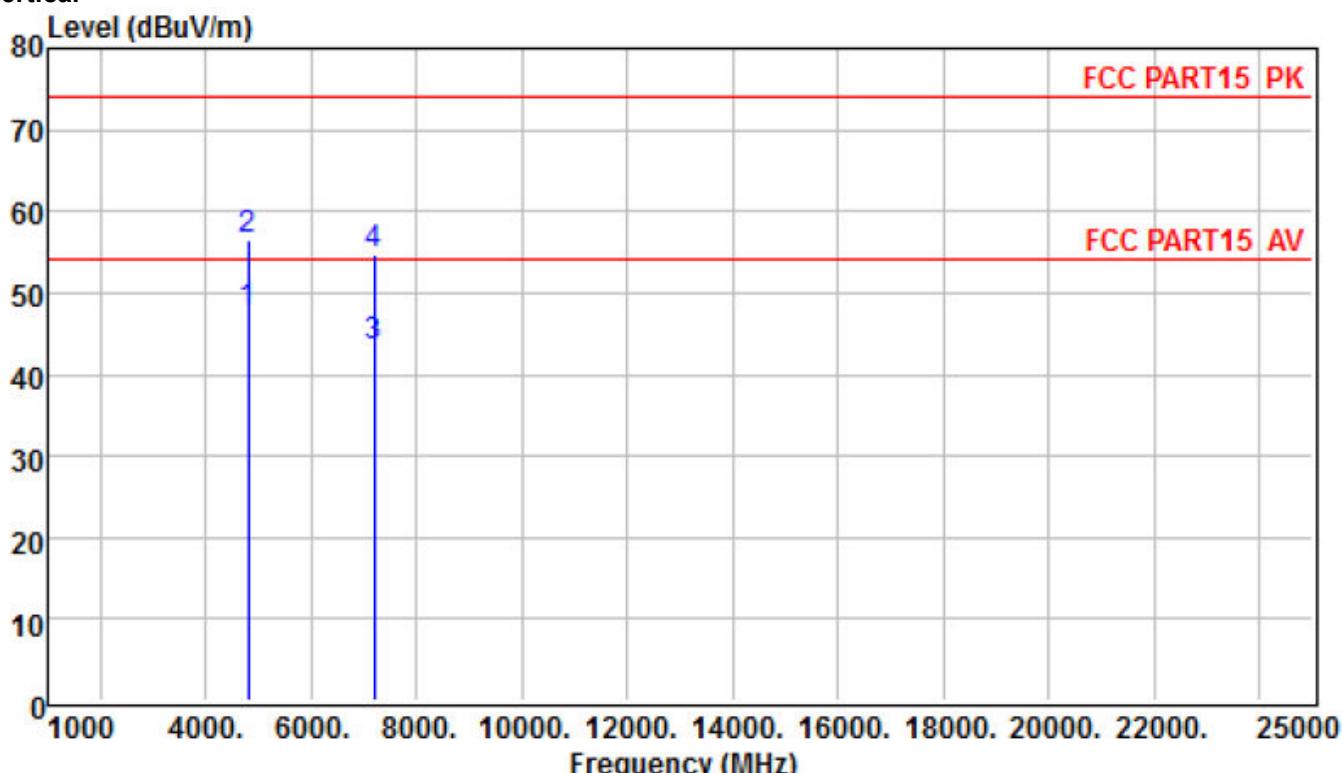
Absolute Level= ReadingLevel+antenna Factor+cable loss-preamp factor,

Over Limit= Absolute Level – Limit

Mode 1 is the worst mode. Only worst case is presented in the report .

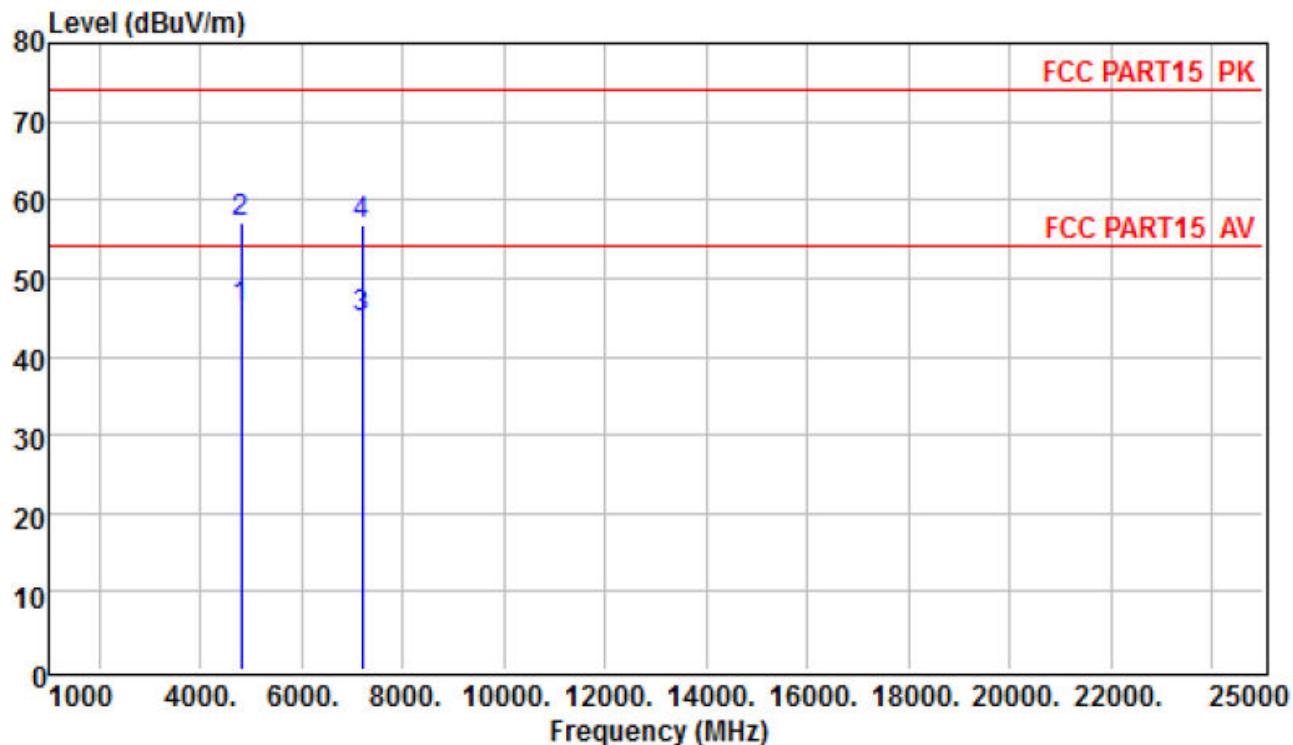
Above 1GHz

EUT :	VEHICLE LOCATING SYSTEM	Model Name :	BLE 1.3
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010hPa	Test Mode :	TX-2402
Test Voltage :	DC 12V from adapter		

Vertical

Freq	Read	Preamp	Cable	Antenna	Limit		Over	Remark
	Level	Factor	Loss	Factor	Level	Line	Limit	
	MHz	dBuV	dB	dB	dB/m	dBuV/m	dBuV/m	dB
1	4804.000	30.08	27.49	11.96	32.94	47.49	54.00	-6.51 Average
2	4804.000	38.97	27.49	11.96	32.94	56.38	74.00	-17.62 Peak
3	7206.000	29.49	27.94	16.61	25.28	43.44	54.00	-10.56 Average
4	7206.000	40.64	27.94	16.61	25.28	54.59	74.00	-19.41 Peak

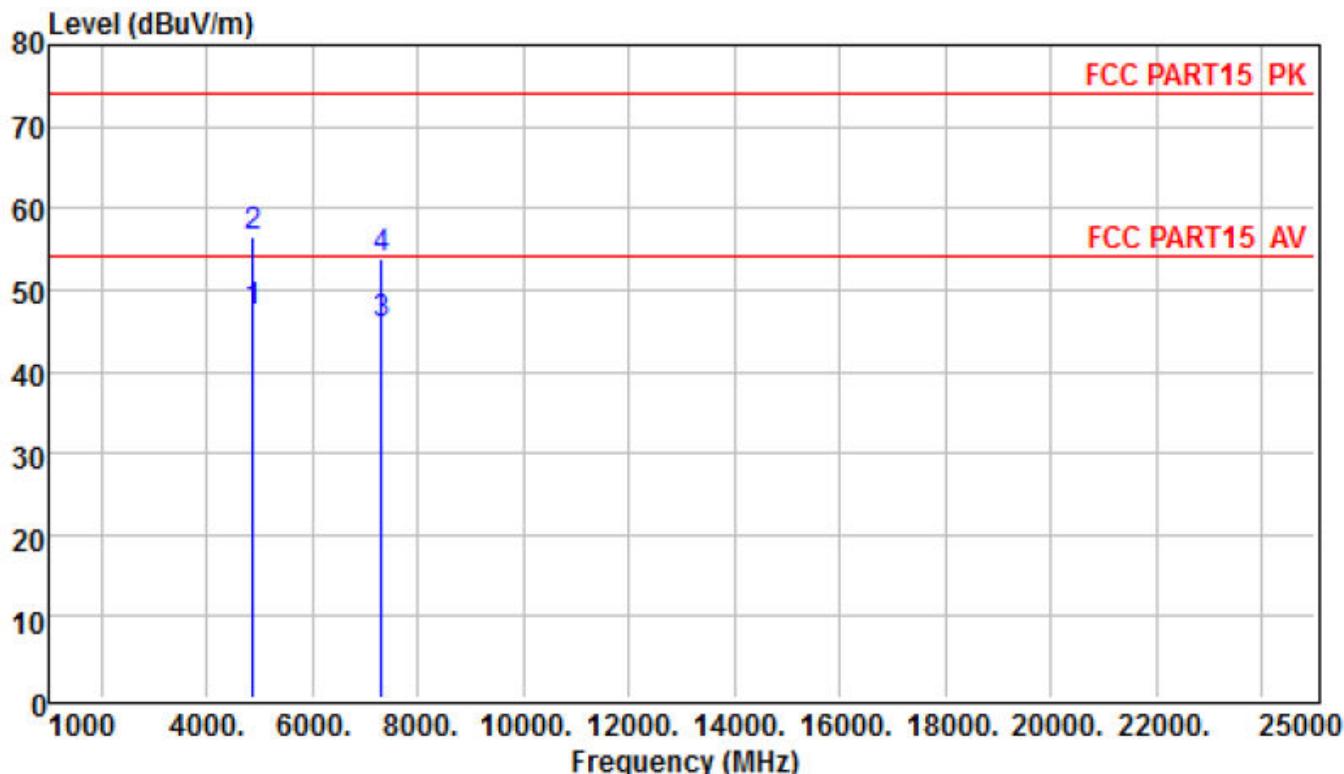
Horizontal



Freq	Read	Preamp	Cable	Antenna	Limit	Over	Limit	Remark
	Level	Factor	Loss	Factor				
	MHz	dBuV	dB	dB	dB/m	dBuV/m	dBuV/m	dB
1	4804.000	28.78	27.49	11.96	32.94	46.19	54.00	-7.81 Average
2	4804.000	39.59	27.49	11.96	32.94	57.00	74.00	-17.00 Peak
3	7206.000	30.96	27.94	16.61	25.28	44.91	54.00	-9.09 Average
4	7206.000	42.94	27.94	16.61	25.28	56.89	74.00	-17.11 Peak

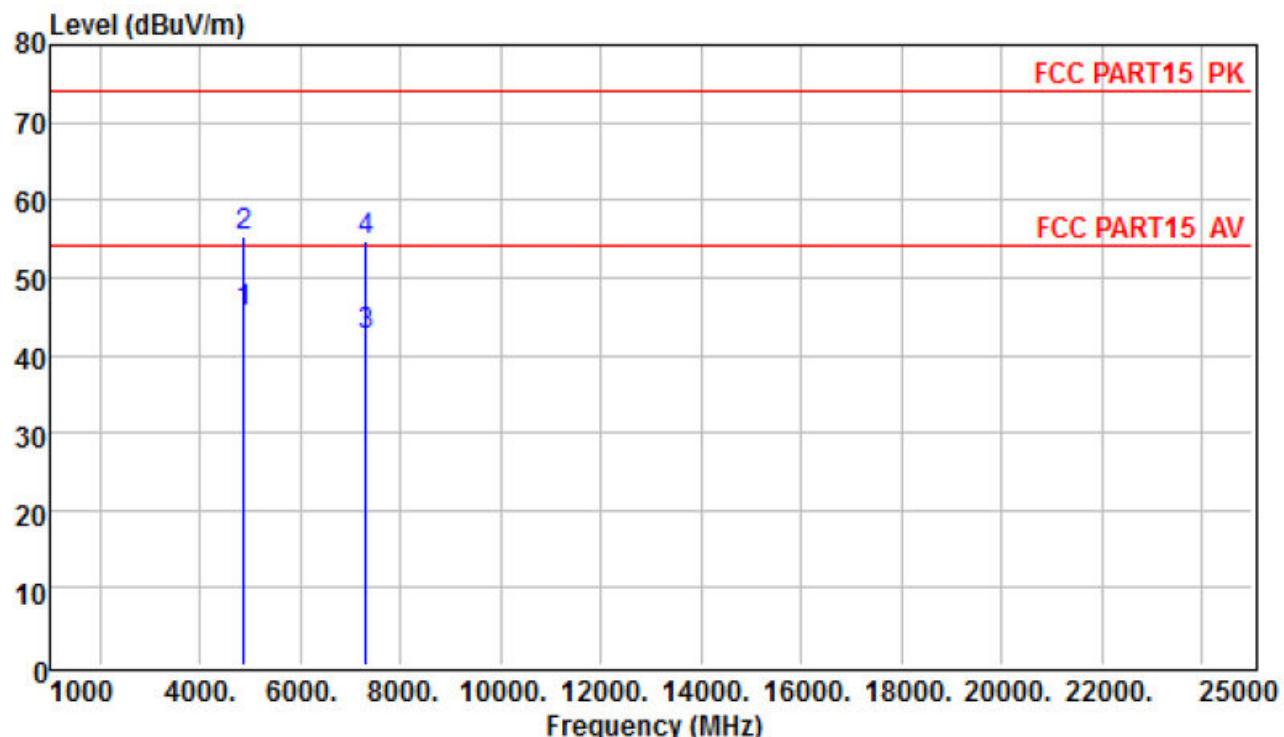
EUT :	VEHICLE LOCATING SYSTEM	Model Name :	BLE 1.3
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010hPa	Test Mode :	TX-2440
Test Voltage :	DC 12V from adapter		

Vertical



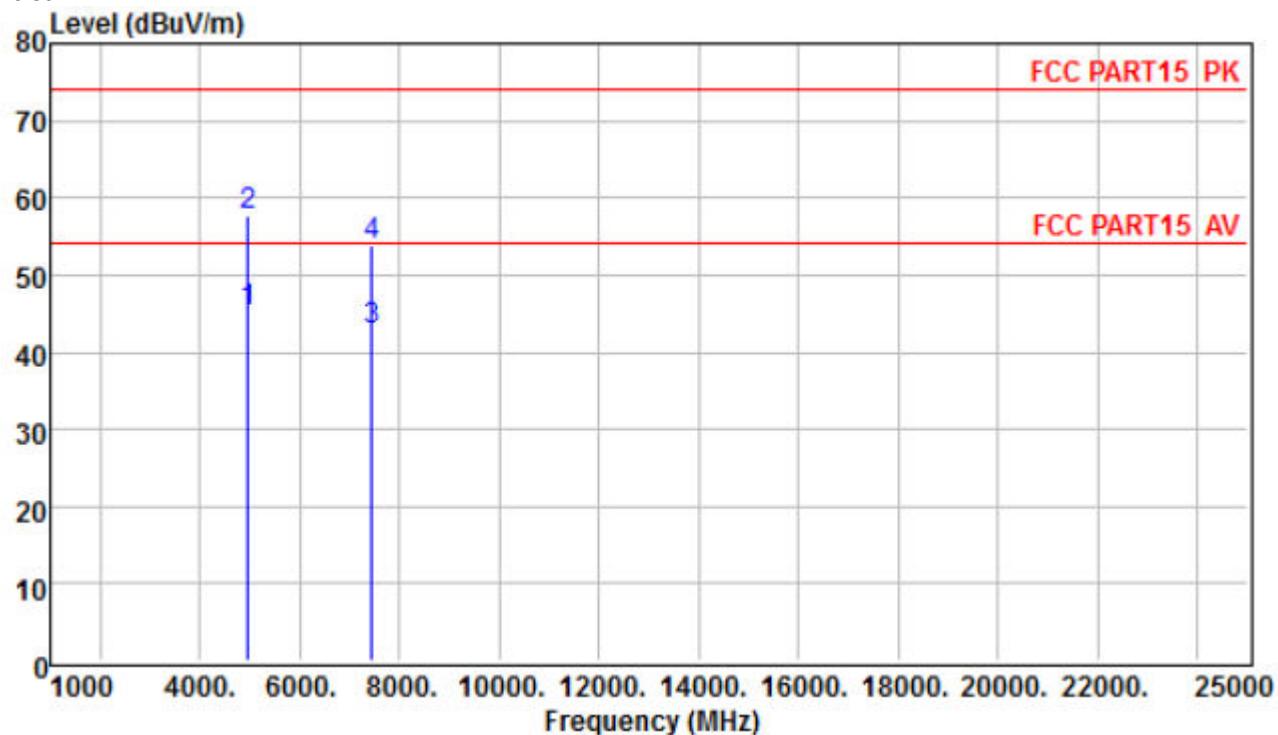
Freq	Read		Preamp	Cable		Antenna	Limit	Over Line	Over Limit	Remark
	MHz	dBuV	Factor	Loss	Factor	Level				
1	4880.000	30.68	27.53	12.14	32.11	47.40	54.00	-6.60	Average	
2	4880.000	39.88	27.53	12.14	32.11	56.60	74.00	-17.40	Peak	
3	7320.000	32.74	27.96	16.62	24.33	45.73	54.00	-8.27	Average	
4	7320.000	40.97	27.96	16.62	24.33	53.96	74.00	-20.04	Peak	

Horizontal

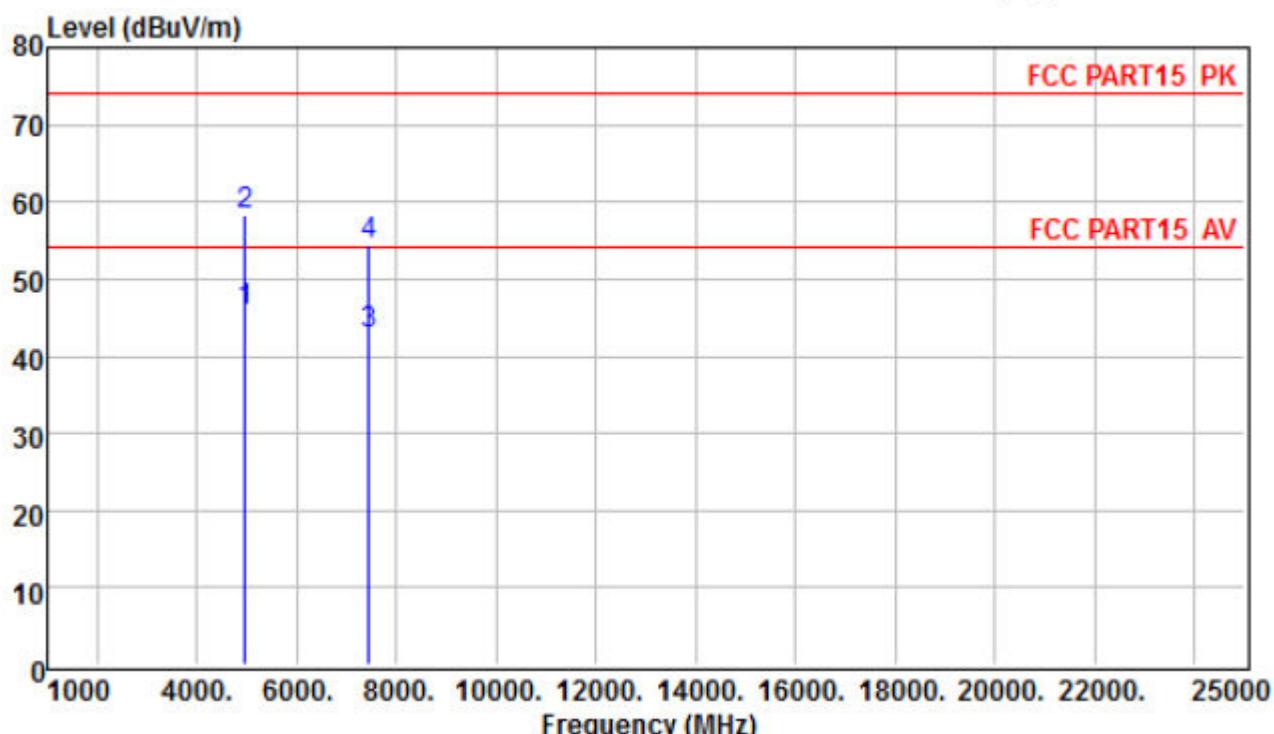


	Read Freq	Preamp Level	Cable Factor	Antenna Loss	Limit Level	Over Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB/m	dBuV/m	dBuV/m	dB
1	4880.000	28.91	27.53	12.14	32.11	45.63	54.00	-8.37 Average
2	4880.000	38.73	27.53	12.14	32.11	55.45	74.00	-18.55 Peak
3	7320.000	29.45	27.96	16.62	24.33	42.44	54.00	-11.56 Average
4	7320.000	41.87	27.96	16.62	24.33	54.86	74.00	-19.14 Peak

EUT :	VEHICLE LOCATING SYSTEM	Model Name :	BLE 1.3
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010hPa	Test Mode :	TX-2480
Test Voltage :	DC 12V from adapter		

Vertical

Freq	Read		Preamp	Cable		Antenna	Limit	Over	Remark
	Level	Factor	Factor	Loss	Factor	Level			
	MHz	dBuV	dB	dB	dB/m	dBuV/m	dBuV/m	dB	
1	4960.000	29.07	27.58	12.36	31.32	45.17	54.00	-8.83	Average
2	4960.000	41.71	27.58	12.36	31.32	57.81	74.00	-16.19	Peak
3	7440.000	29.68	27.99	16.62	24.38	42.69	54.00	-11.31	Average
4	7440.000	40.87	27.99	16.62	24.38	53.88	74.00	-20.12	Peak

Horizontal

Freq	Read	Preamp	Cable	Antenna	Limit	Over	Remark	
	Level	Factor	Loss	Factor				
	MHz	dBuV	dB	dB	dB/m	dBuV/m	dBuV/m	dB
1	4960.000	29.74	27.58	12.36	31.32	45.84	54.00	-8.16 Average
2	4960.000	42.13	27.58	12.36	31.32	58.23	74.00	-15.77 Peak
3	7440.000	29.77	27.99	16.62	24.38	42.78	54.00	-11.22 Average
4	7440.000	41.32	27.99	16.62	24.38	54.33	74.00	-19.67 Peak

NOTE:

Absolute Level= ReadingLevel+antenna Factor+cable loss-preamp factor,

Over Limit= Absolute Level – Limit

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has not to be reported.

5. BAND EDGE COMPLIANCE TEST

5.1. Limits

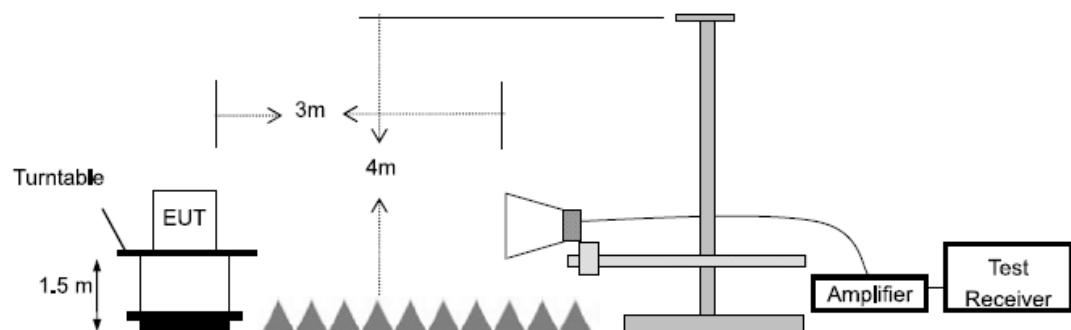
All the lower and upper band-edges emissions appearing within 2310MHz to 2390MHz and 2483.5MHz to 2500MHz restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions outside operation frequency band 2400MHz to 2483.5MHz shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

5.2. Test setup

For Conducted Test



For Radiated emission Test



5.3. TEST Procedure

For Conducted Test

1. The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100KHz. The video bandwidth is set to 300KHz.
2. The spectrum from 30MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

EMI Test Receiver	Setting
Attenuation	Auto
RBW	100KHz
VBW	300KHz
Detector	Peak
Trace	Max hold

For Radiated emission Test

The EUT was placed on a styrofoam table which is 1.5m above ground plane.

The measurement procedure at the band edges was simplified by performing the measurement in just one plot. Both, the in-band-emission and the unwanted emission were encompassed by the span. After trace stabilization, the maximum peak was determined by a peak detector and the value was marked by an appropriate limit line. The second limit line, which is 20dB below the first, marks the limit for the emissions in the unrestricted band. A maximum-peak-detector marks the highest emission in the unrestricted band next to the band edge.

The measurements were performed at the lower end of the 2.4GHz band.

Use the following spectrum analyzer settings:

For Restricted Band, When spectrum scanned above 1GHz setting resolution bandwidth 1MHz, video bandwidth 3MHz:

EMI Test Receiver	Setting
Attenuation	Auto
RBW	1MHz
VBW	3MHz
Detector	Peak
Trace	Max hold

For Non-Restricted Band, When spectrum scanned above 1GHz setting resolution bandwidth 100KHz, video bandwidth 300KHz:

EMI Test Receiver	Setting
Attenuation	Auto
RBW	100KHz
VBW	300KHz
Detector	Peak
Trace	Max hold

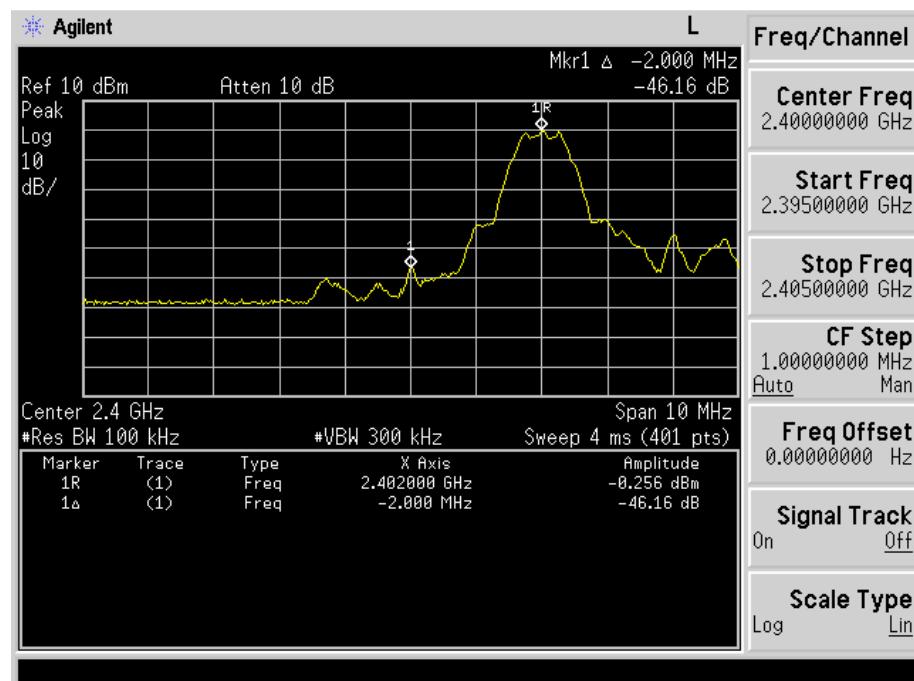
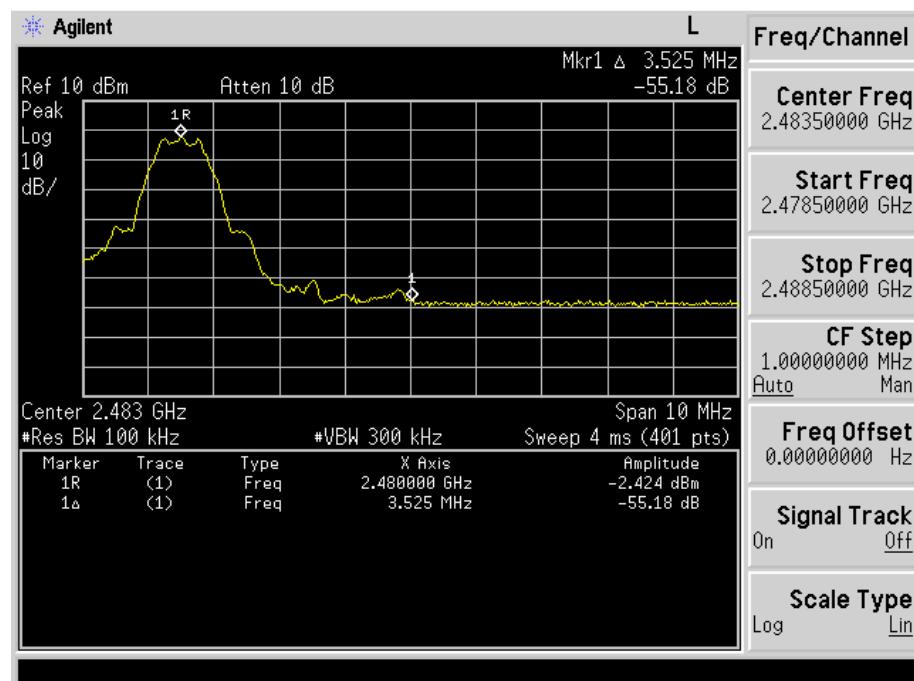
For radiated test as follows:

Frequency (MHz)	Meter Reading (dB μ V)	antenna Factor (dB)	cable loss (dB)	preamp factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type	Comment
2390	37.34	30.44	8.94	26.32	50.4	74	-23.6	peak	Vertical
2390	36.56	30.44	8.94	26.32	49.62	74	-24.38	peak	Horizontal
2483.5	38.12	30.05	9.07	26.34	50.90	74	-23.1	peak	Vertical
2483.5	38.77	30.05	9.07	26.34	51.55	74	-22.45	peak	Horizontal

If the PK measured levels comply with average limit, then the average level were deemed to comply with average limit.

conduction band-edge

Frequency Band	Delta Peak to band emission (dBc)	>Limit (dBc)	Result
Left-band	46.16	20	Pass
Right-band	55.18	20	Pass

Left Side**Right Side**

6. 6DB OCCUPY BANDWIDTH

6.1. Limits

For direct sequence systems, the minimum 6dB bandwidth shall be at least 500kHz

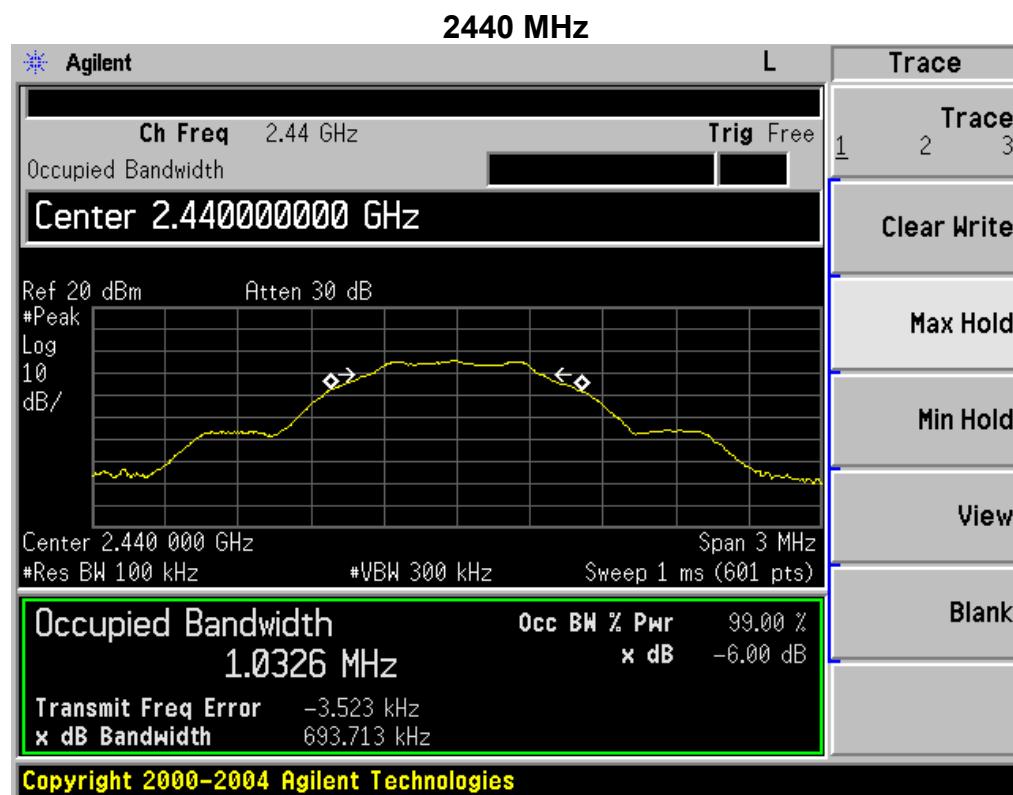
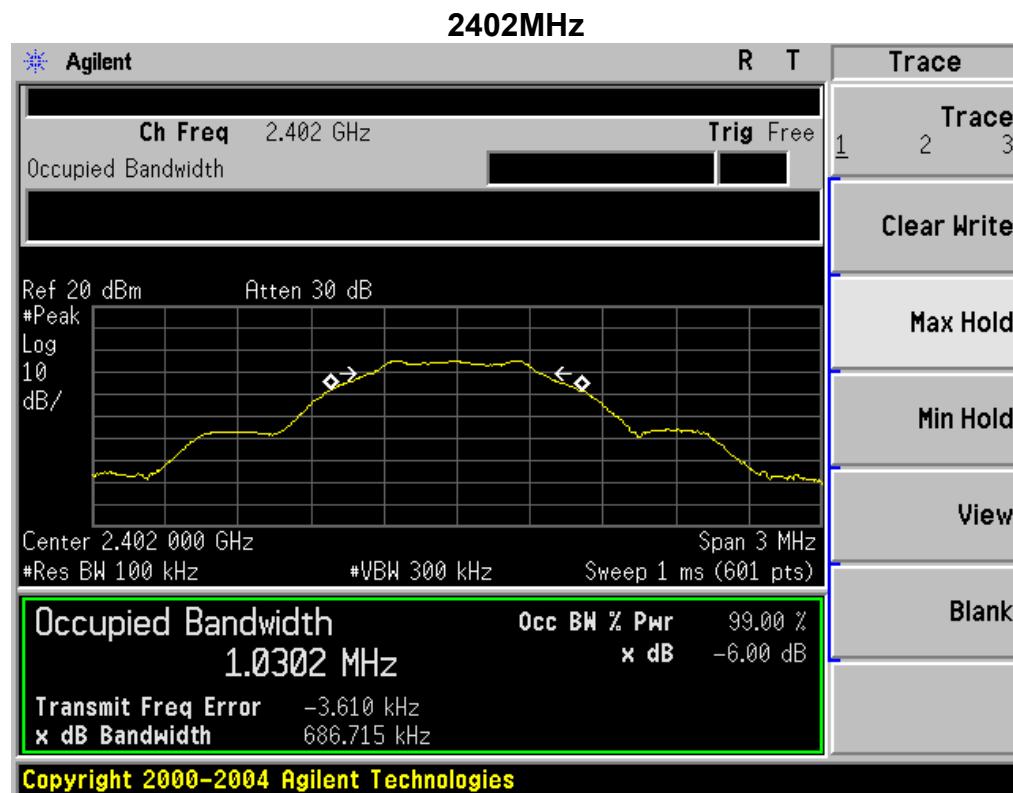
6.2. TEST PROCEDURE

1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

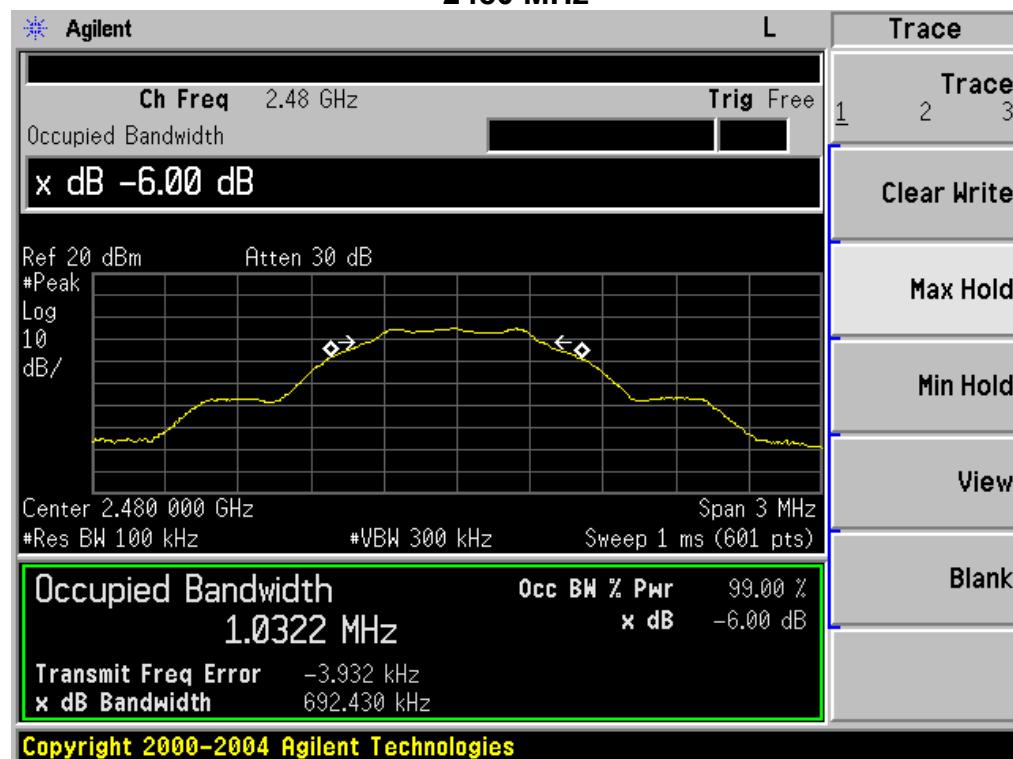
Test data:

Channel Frequency (MHz)	6dB Bandwidth (KHz)	Limit (KHz)	Result
2402	686.715	500	Pass
2440	693.713	500	Pass
2480	692.430	500	Pass

Test plot as follows:



2480 MHz



7. OUTPUT POWER TEST

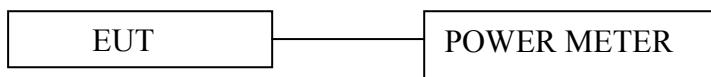
7.1. Limits

For systems using digital modulation in the 2400~2483.5MHz, The output Power shall not exceed 1W (30dBm)

7.2. Test setup

1. The Transmitter output (antenna port) was connected to the power meter.
2. Turn on the EUT and power meter and then record the power value.
3. Repeat above procedures on all channels needed to be tested.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.



7.3. Test result

Frequency (MHz)	Maximum Conducted Output Power (dBm)	Limit (dBm)
2402	1.467	30
2440	1.312	30
2480	1.173	30

8. POWER SPECTRAL DENSITY TEST

8.1. Limits

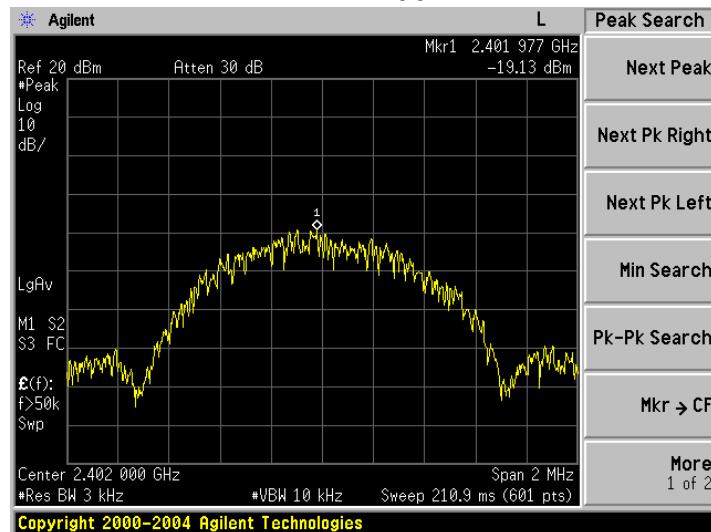
For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

8.2. Test setup

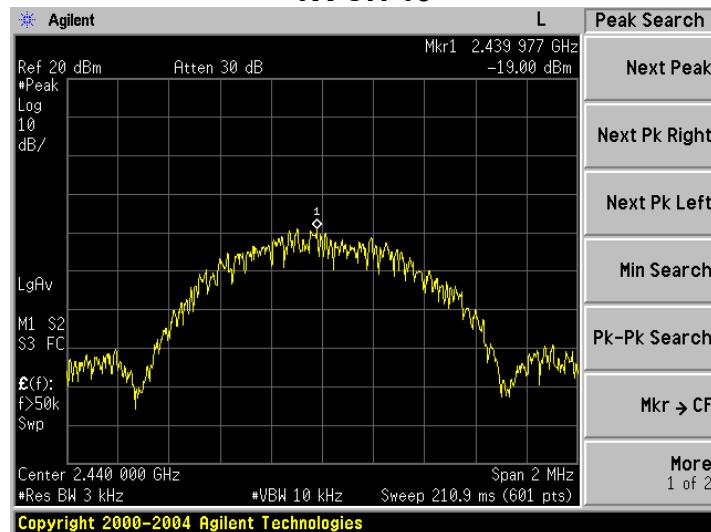
1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
4. Set the VBW $\geq 3 \text{ RBW}$
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

8.3. Test result

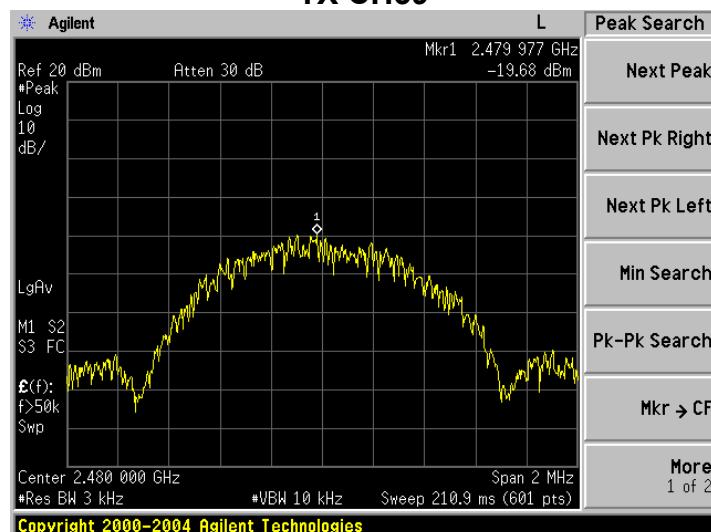
Channel Frequency (MHz)	Power density (dBm/3kHz)	Limit (dBm/3kHz)	Result
2402	-19.13	8	Pass
2440	-19.00	8	Pass
2480	-19.68	8	Pass

TX CH00

Peak Search
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More 1 of 2

TX CH 19

Peak Search
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More 1 of 2

TX CH39

Peak Search
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More 1 of 2

9. ANTENNA REQUIREMENTS

9.1. Limits

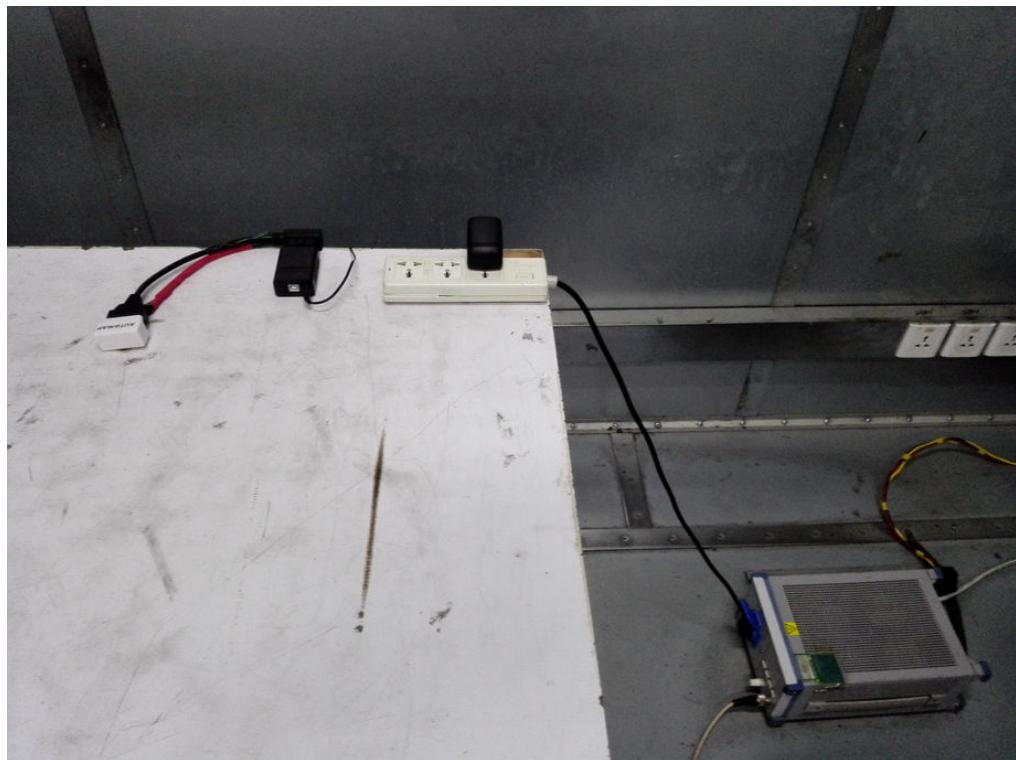
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

9.2. Result

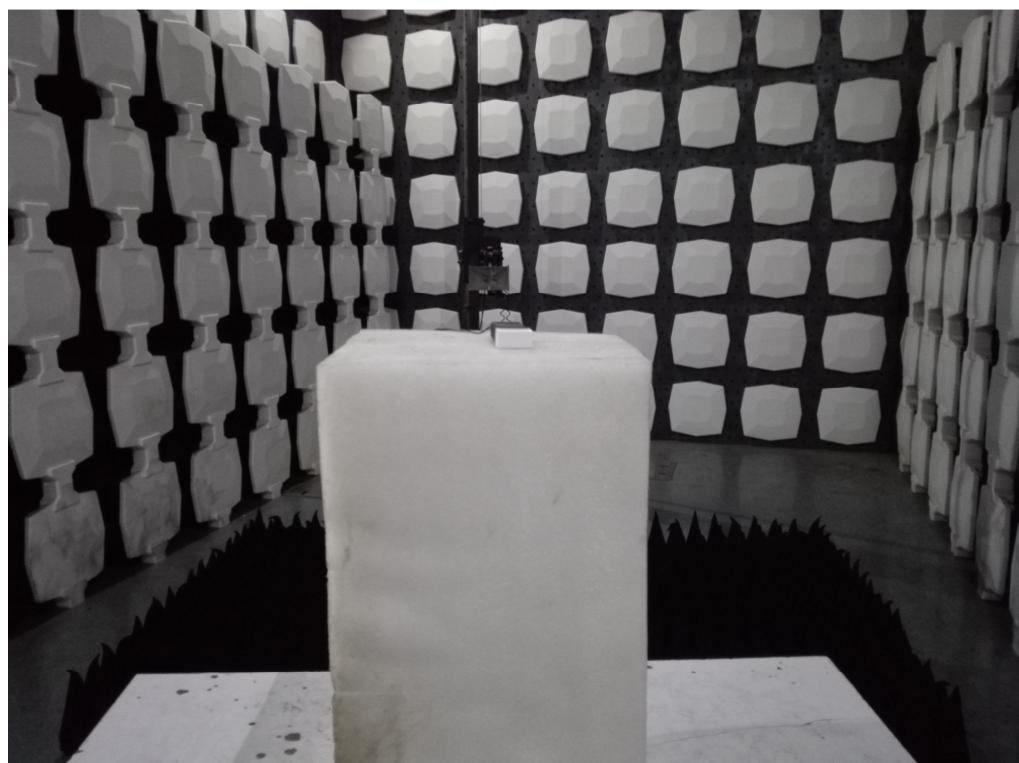
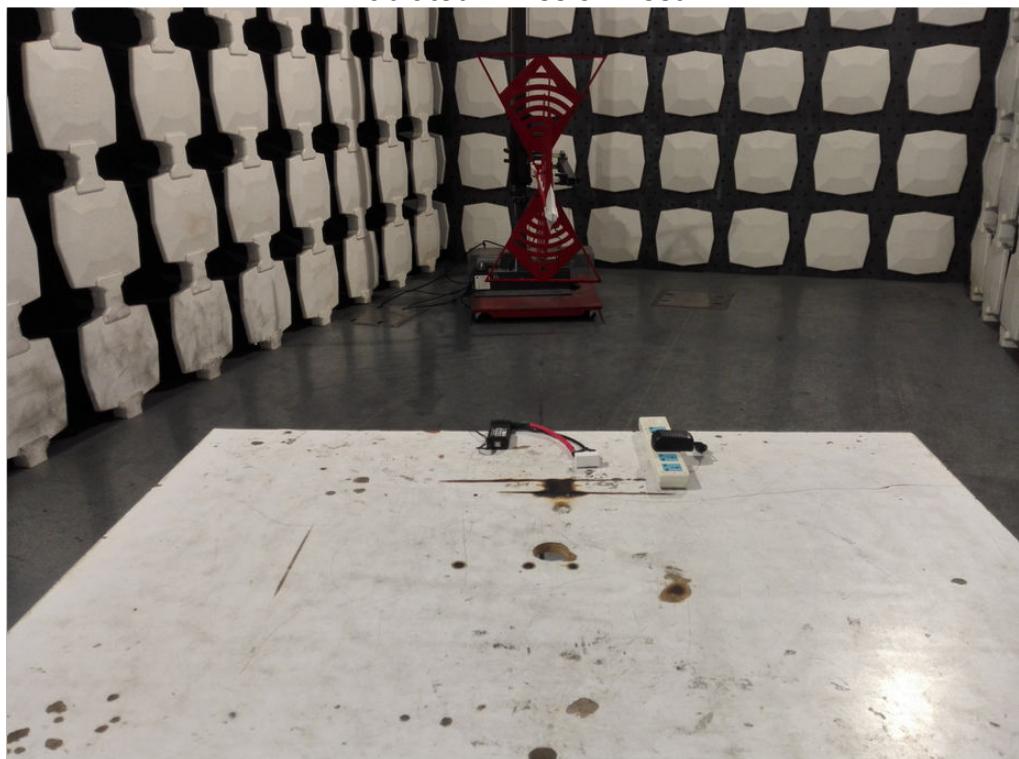
The antennas used for this product are permanent attached antenna and that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is only 1.0dBi.

10.PHOTOGRAPHS OF TEST SET-UP

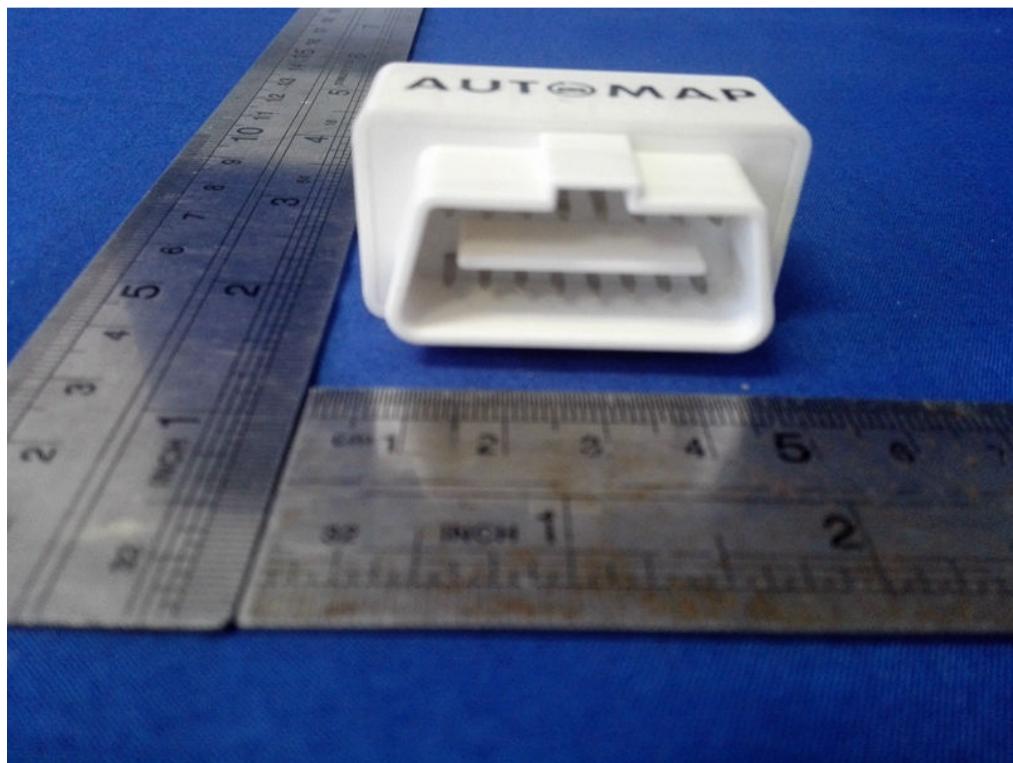
Conducted Emission

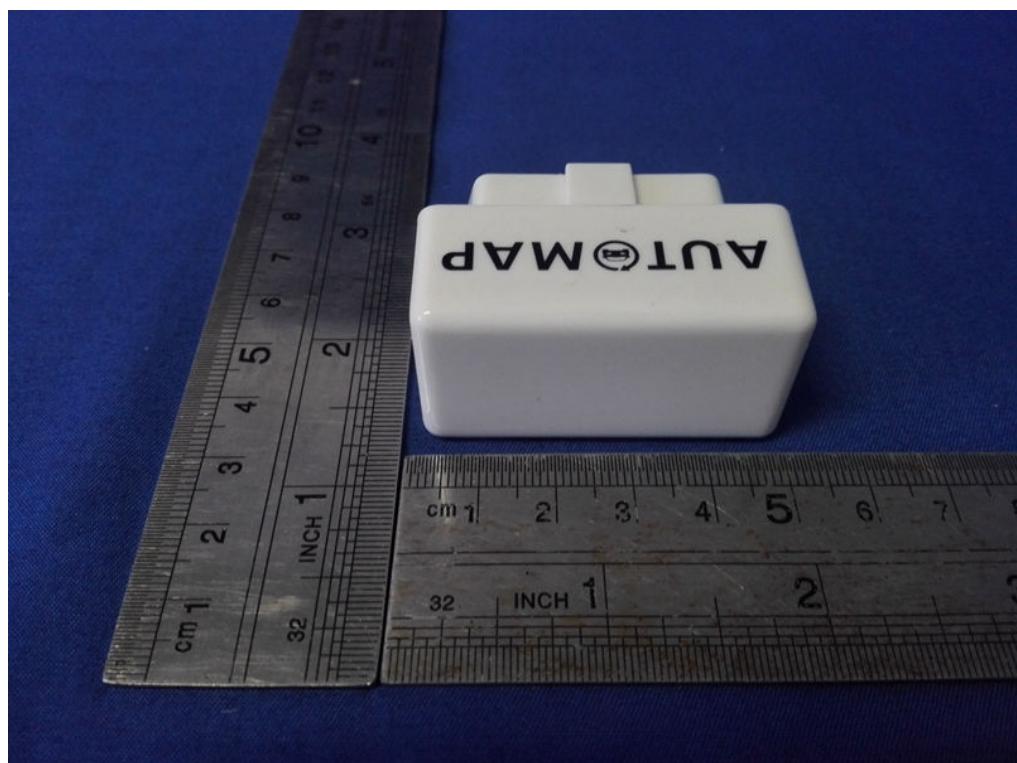
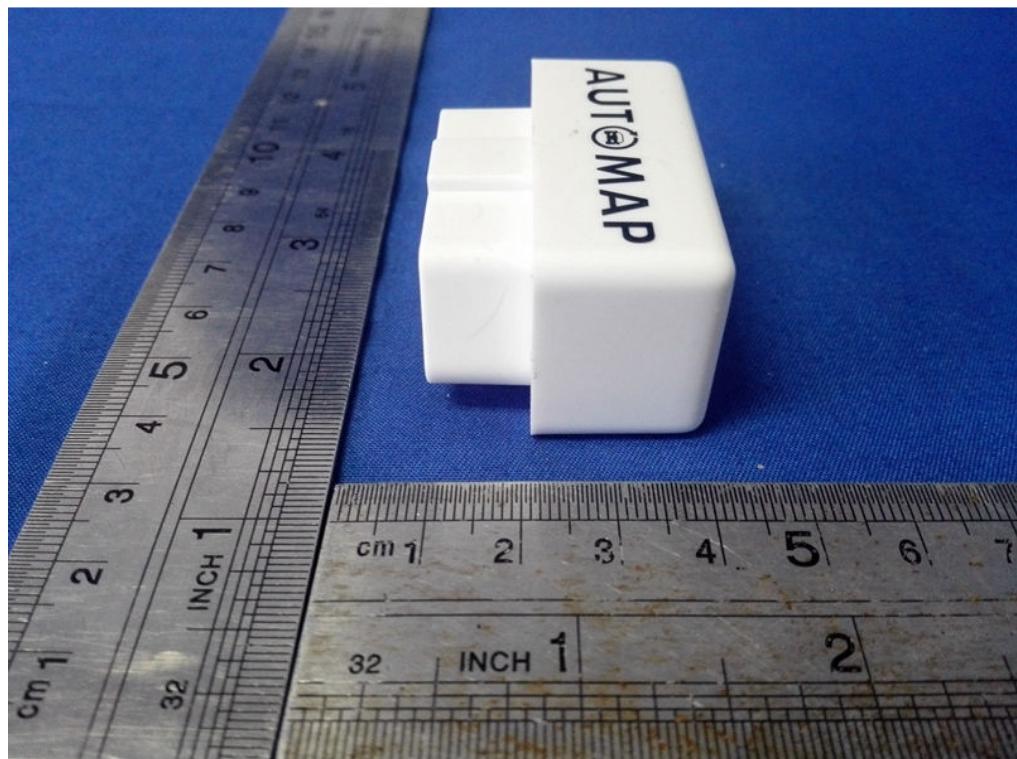


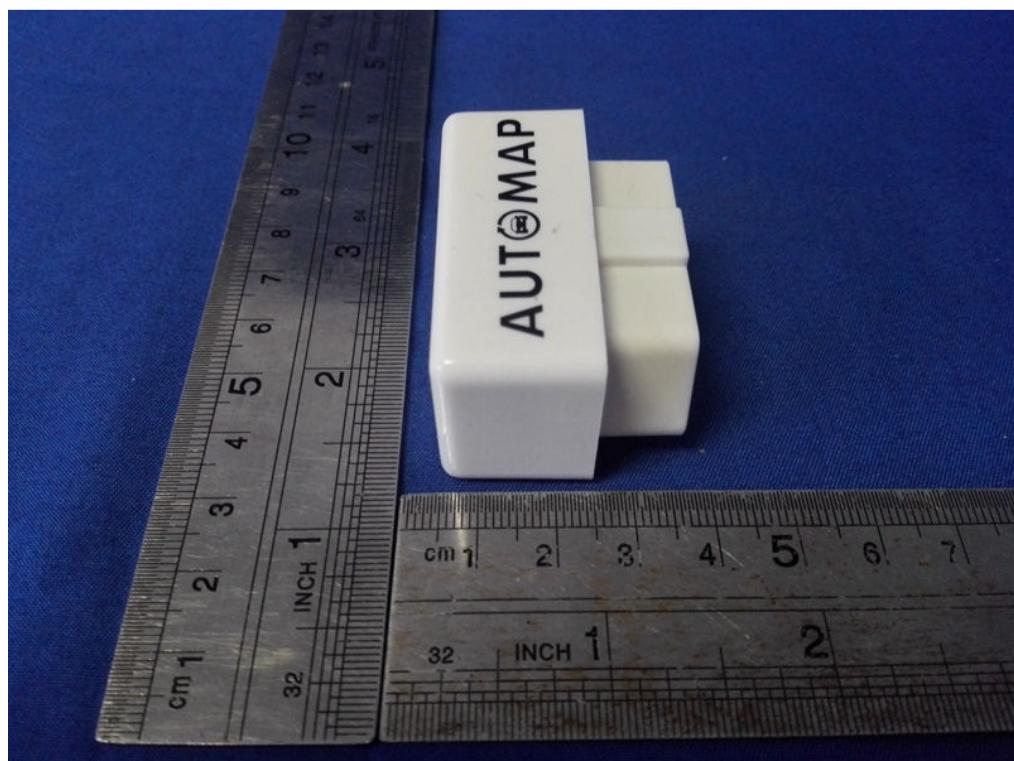
Radiated Emission Test

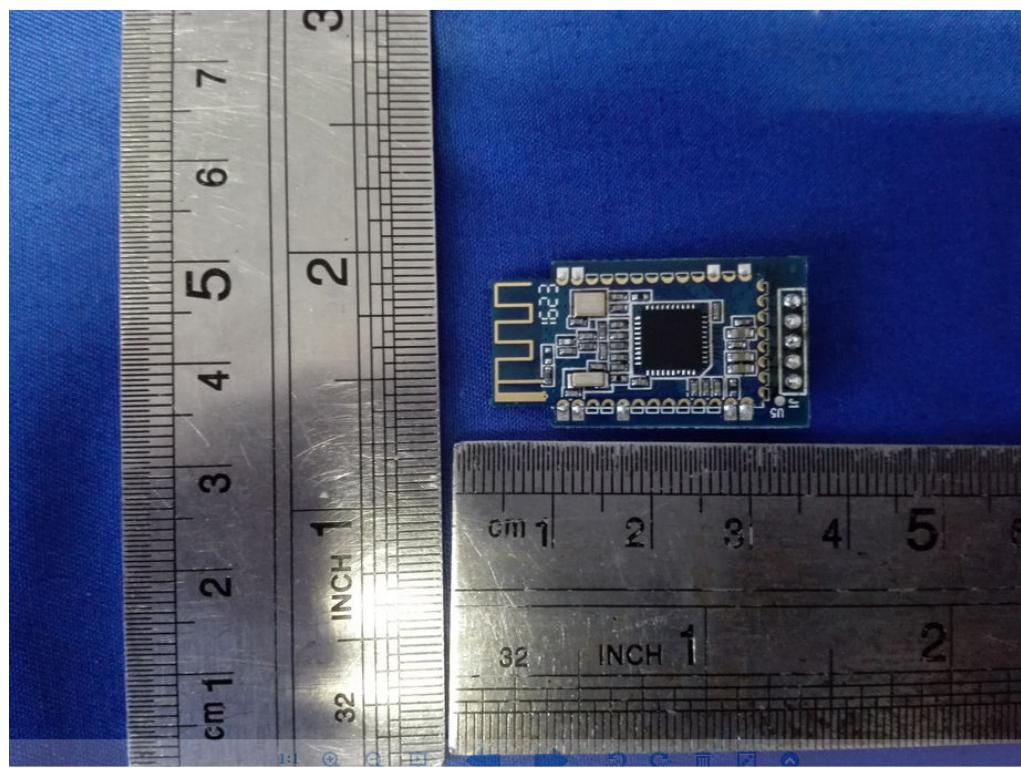
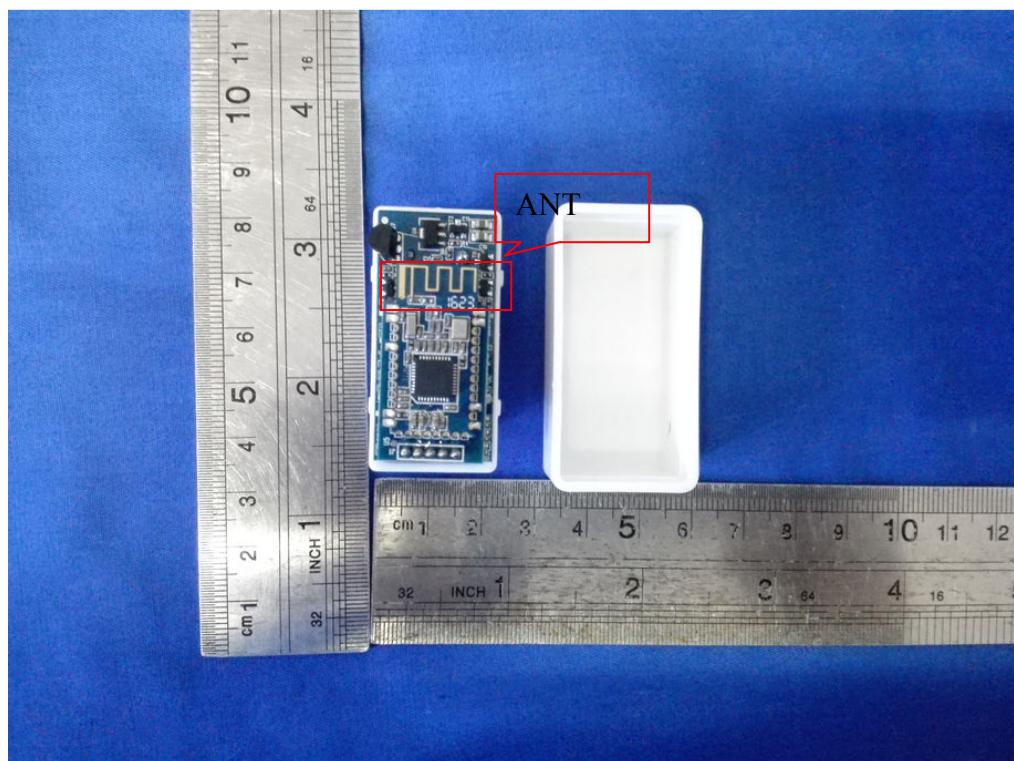


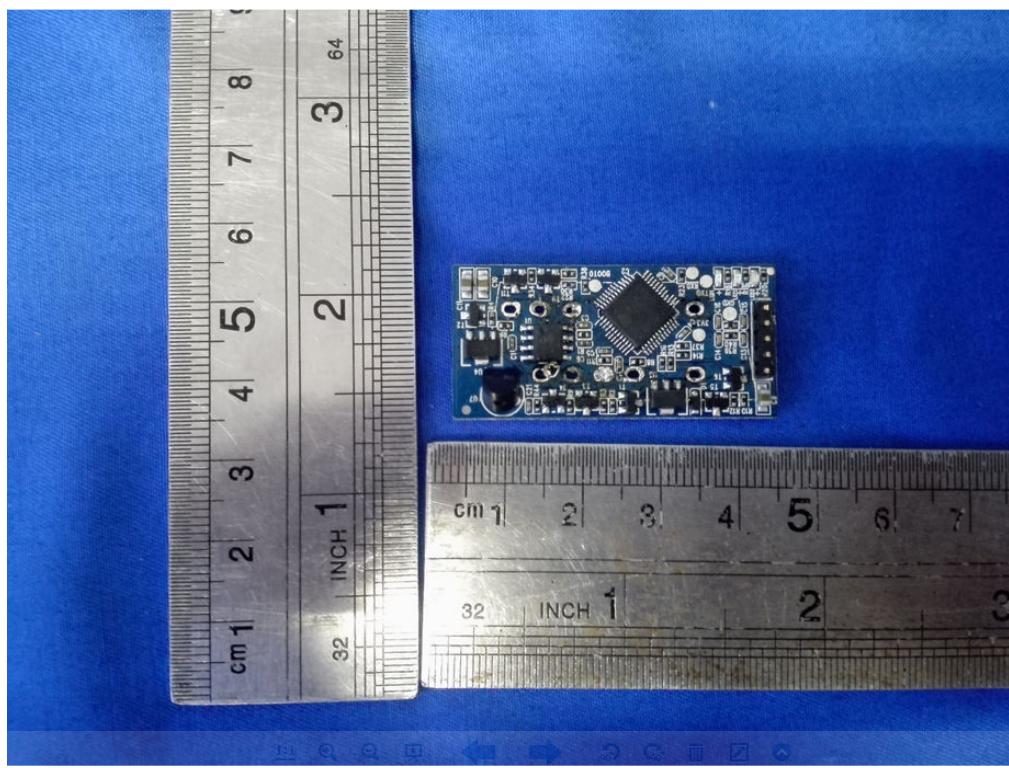
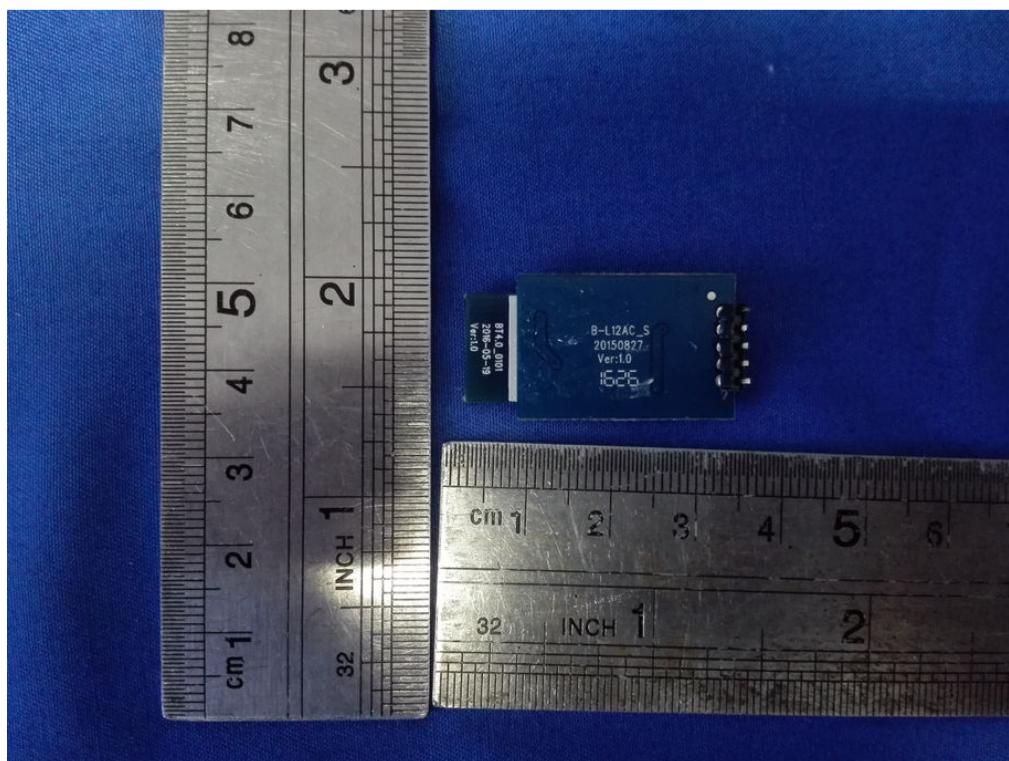
11. PHOTOGRAPHS OF THE EUT

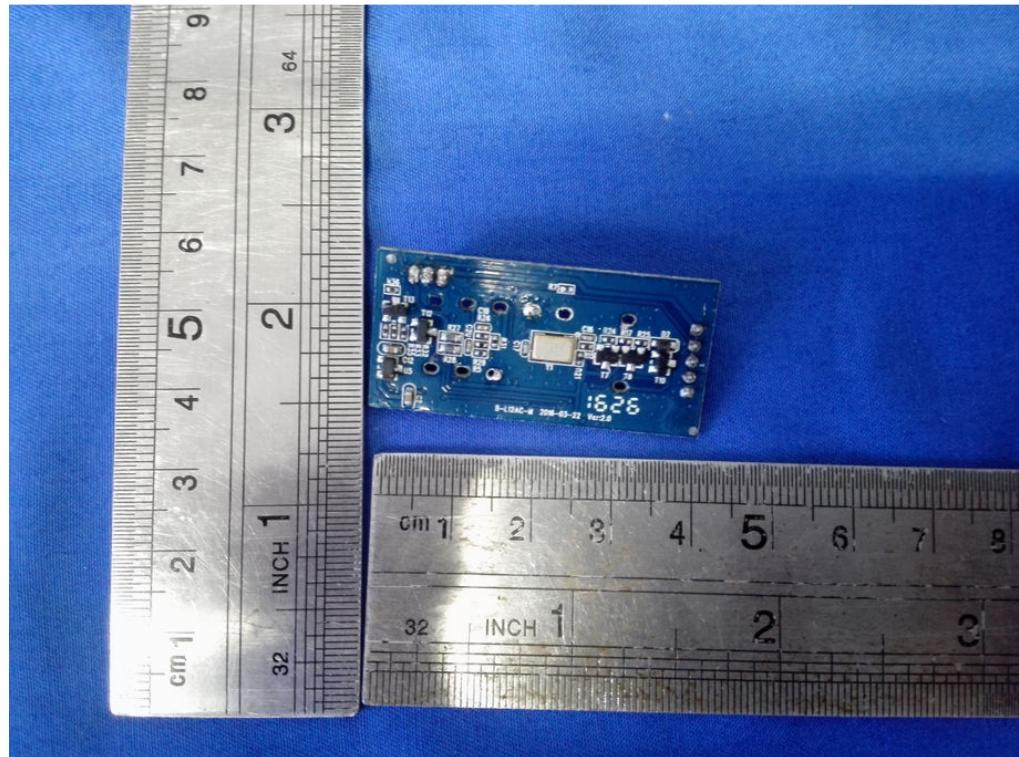












-----END-----