

FCC TEST REPORT

for

AutoMap,LLC

VEHICLE LOCATING SYSTEM

Model Number: BLE 12

FCC ID: 2AGOTBLE12

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

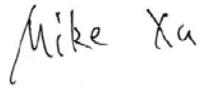
Tel: 86-769-8718 2258
Fax: 86-769-8718 1058

Report No. : 15KWE113278R
Date of Test : Nov. 13~24, 2015
Date of Report : Nov. 25, 2015

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 12 | | |
| Trade Name: |  | Serial No.: | ----- |
| Date of Receipt: | Nov. 12, 2015 | Date of Test: | Nov.13~24, 2015 |
| Test Specification: | FCC Part 15, Subpart C Section 15.247: 2014 ANSI C63.10:2013 KDB558074 D01 DTS Meas Guidance v03r02 | | |
| Test Result: | The equipment under test was found to be compliance with the requirements of the standards applied. | | |
| Issue Date: Nov. 25, 2015 | | | |
| Tested by: | Reviewed by: | Approved by: | |
|  |  |  | |
| Daisy Chen / Engineer | Mike Xu / Supervisor | Andy Gao / Supervisor | |
| Other Aspects: | None. | | |
| Abbreviations: OK/P=passed fail/F=failed n.a/N=not applicable E.U.T=equipment under tested | | | |
| <i>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.</i> | | | |

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 12 |
| 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 |
| Adapter | N/A |

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. 27,15 | Apr. 27,16 |
| Artificial Mains Network | Rohde&Schwarz | ENV216 | 101315 | Apr. 27,15 | Apr. 27,16 |
| Artificial Mains Network (AUX) | Rohde&Schwarz | ENV216 | 101314 | Apr. 27,15 | Apr. 27,16 |
| RF Cable | FUJIKURA | 3D-2W | 944 Cable | Apr. 27,15 | Apr. 27,16 |

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. 27,15 | Apr. 27,16 |
| System Simulator | Agilent | E5515C | GB43130245 | Apr. 27,15 | Apr. 27,16 |
| Power Splitter | Weinschel | 1506A | NW425 | Apr. 27,15 | Apr. 27,16 |
| Bilog Antenna | ETS-LINDGREEN | 3142D | 135452 | Apr. 27,15 | Apr. 27,16 |
| Spectrum Analyzer | Agilent | E4411B | MY4511304 | Apr. 27,15 | Apr. 27,16 |
| Spectrum Analyzer | R&S | FSV40 | 132.1.3008K39-100967 | Apr. 27,15 | Apr. 27,16 |
| 3m Semi-anechoic Chamber | ETS-LINDGREEN | 966 | KW01 | Apr. 27,15 | Apr. 27,16 |
| Signal Amplifier | SONOMA | 310 | 187016 | Apr. 27,15 | Apr. 27,16 |
| Signal Amplifier | Agilent | 8449B | 3008A00251 | Apr. 27,15 | Apr. 27,16 |
| 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 | DAZE | ZN30701 | 11003 | Apr. 27,15 | Apr. 27,16 |
| Horn Antenna | SCHWARZBECK | BBHA9170 | 9170-068 | Apr. 27,15 | Apr. 27,16 |
| Spectrum Analyzer | Agilent | 8593E | 3911A04271 | Apr. 27,15 | Apr. 27,16 |
| Spectrum Analyzer | Agilent | E4408B | MY44211125 | Apr. 27,15 | Apr. 27,16 |
| Signal Amplifier | DAZE | ZN3380C | 11001 | Apr. 27,15 | Apr. 27,16 |
| High Pass filter | Micro | HPM50111 | 324216 | Apr. 27,15 | Apr. 27,16 |
| Filter | COM-MW | ZBSF-C836.5-25-X | KW032 | Apr. 27,15 | Apr. 27,16 |
| Filter | COM-MW | ZBSF-C1747.5-75-X2 | KW035 | Apr. 27,15 | Apr. 27,16 |
| Filter | COM-MW | ZBSF-C1880-60-X2 | KW037 | Apr. 27,15 | Apr. 27,16 |
| DC Power Supply | LongWei | PS-305D | 010964729 | Apr. 27,15 | Apr. 27,16 |
| Constant temperature and humidity box | GF | GTH-800-40-1P | MAA9906-005 | Apr. 27,15 | Apr. 27,16 |
| Universal radio communication tester | Rohde&Schwarz | CMU200 | 3215420 | Apr. 27,15 | Apr. 27,16 |
| Splitter | Agilent | 11636B | 0025164 | Apr. 27,15 | Apr. 27,16 |
| Loop Antenna | ARA | PLA-1030/B | 1029 | Apr. 22,15 | Apr. 22,16 |
| Power Meter | R&S | NRVS | 100696 | Apr. 24,15 | Apr. 24,16 |
| Power Sensor | R&S | URV5-Z4 | 395.1619.05 | Apr. 24,15 | Apr. 24,16 |

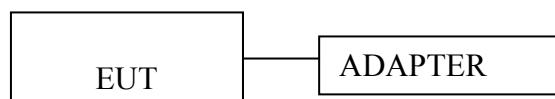
3. TEST SET-UP AND OPERATION MODES

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

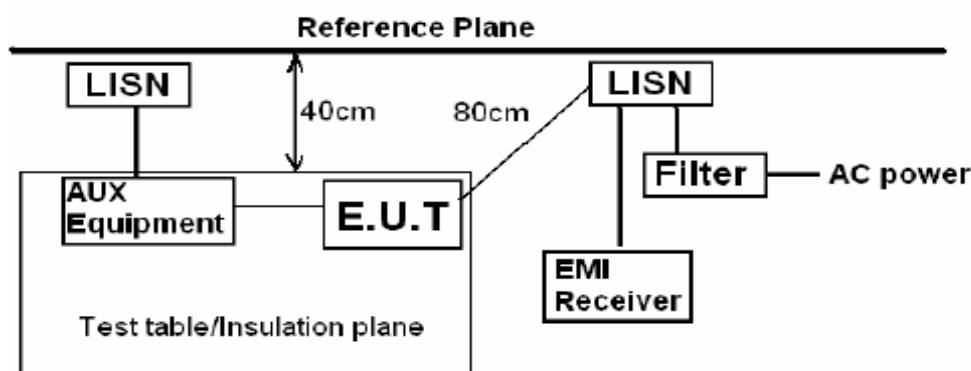
The EUT was put on a wooden table which was 0.8 m high above the ground and connected to the AC mains through the Artificial Mains Network (AMN). Where the mains cable supplied by the manufacture was longer than 0.8 m, the excess was folded back and forth parallel to the cable at the centre so as to 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.



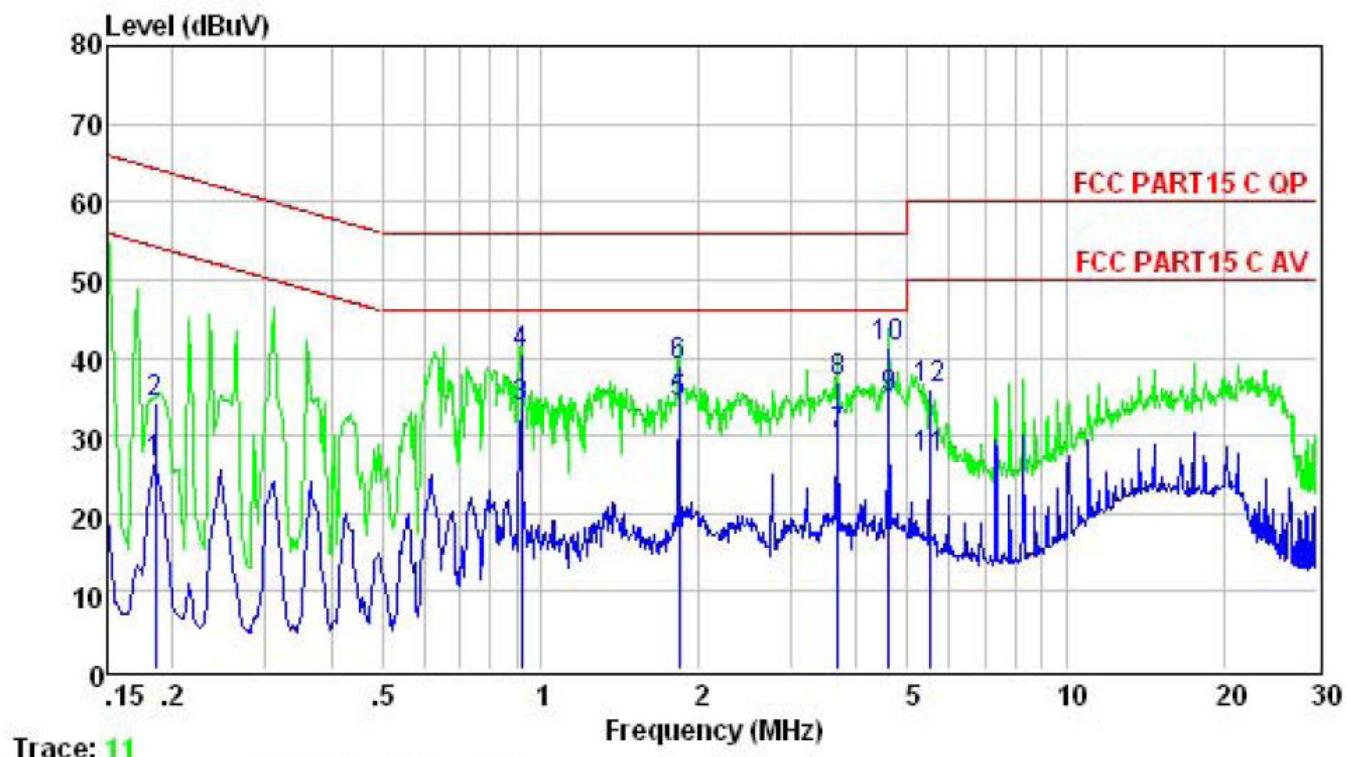
Remark:

E.U.T: Equipment Under Test

LISN: Line Impedance Stabilization Network

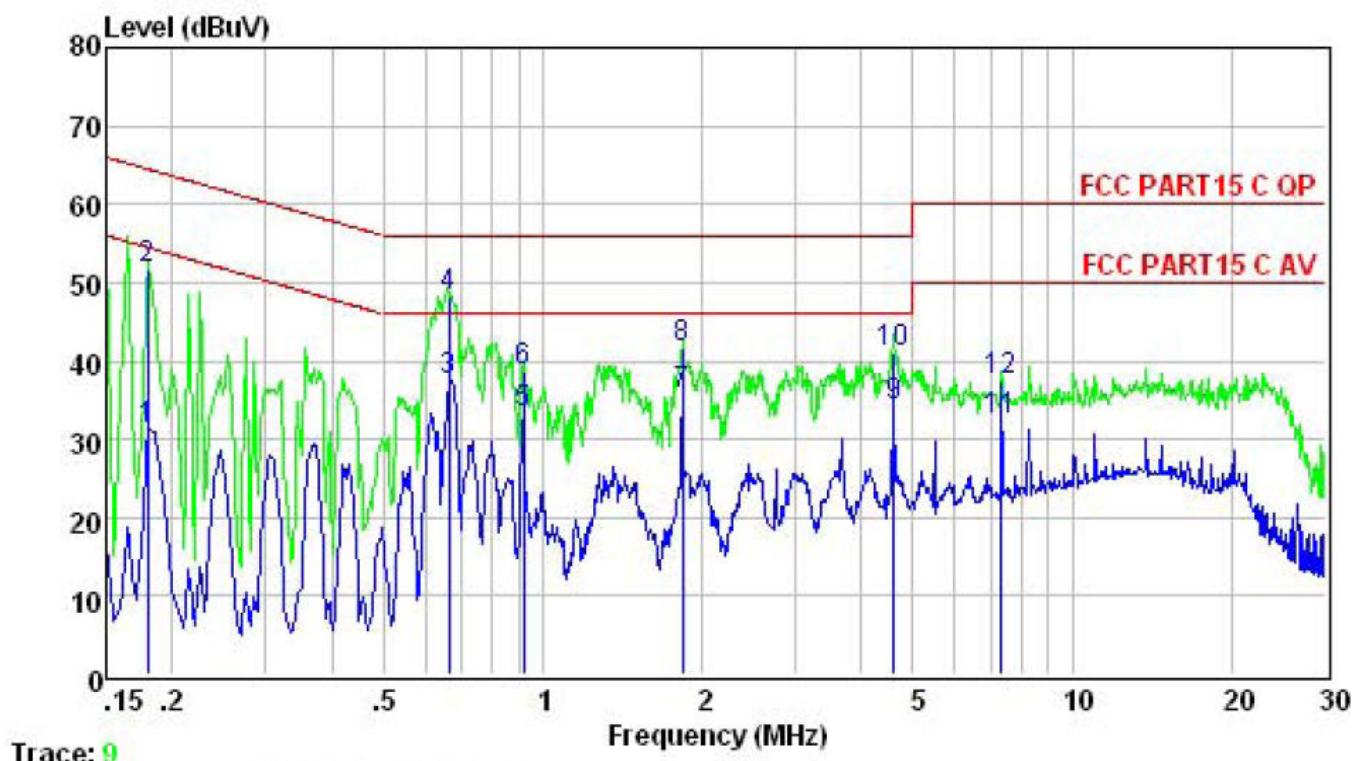
Test table height=0.8m

| | | | |
|----------------|---------------------------------------|---------------------|--------|
| EUT : | VEHICLE LOCATING SYSTEM | Model Name : | BLE 12 |
| Temperature : | 26 °C | Relative Humidity : | 54% |
| Pressure : | 1010hPa | Phase : | L |
| Test Voltage : | DC 12.0V form Adapter AC 120V/60Hz | Test Mode : | Mode 4 |



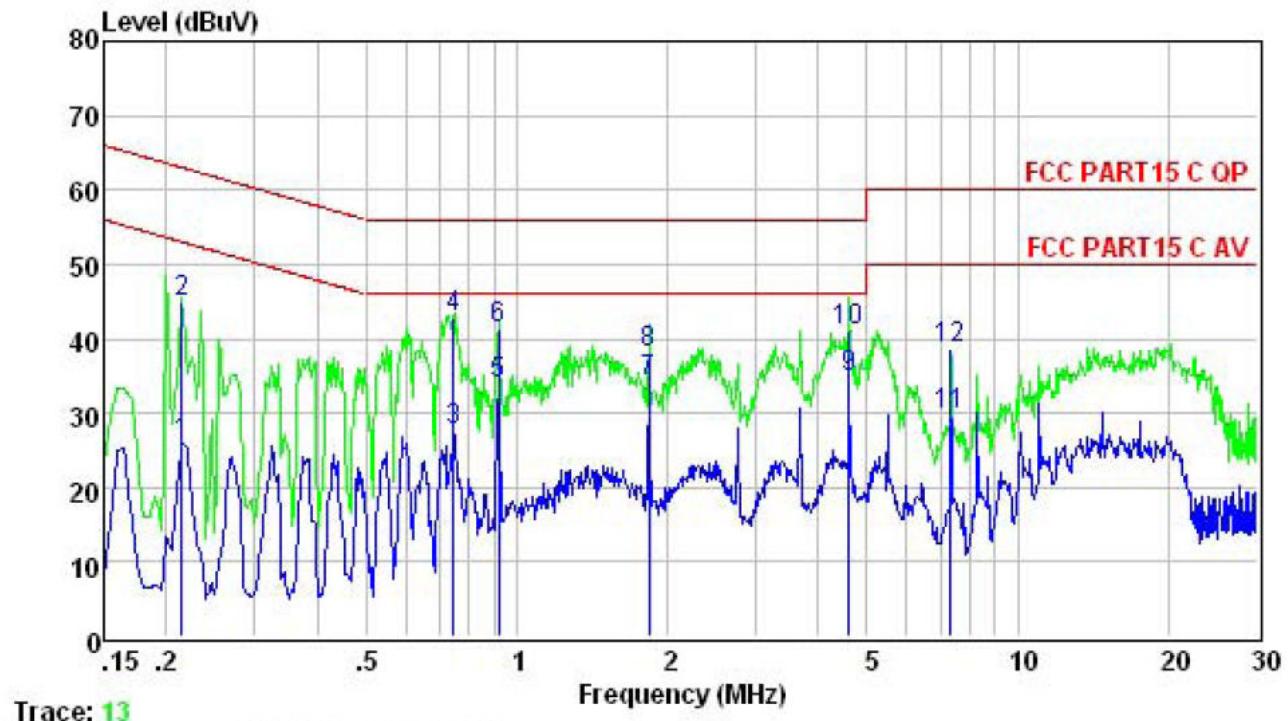
| Freq | Level | Limit | | Over Line Limit | Remark |
|------|-------|-------|-------|-----------------|---------|
| | | MHz | dBuV | | |
| 1 | 0.185 | 26.52 | 64.24 | -37.72 | Average |
| 2 | 0.185 | 34.26 | 64.24 | -29.98 | QP |
| 3 | 0.918 | 33.65 | 56.00 | -22.35 | Average |
| 4 | 0.918 | 40.59 | 56.00 | -15.41 | QP |
| 5 | 1.839 | 34.14 | 56.00 | -21.86 | Average |
| 6 | 1.839 | 38.92 | 56.00 | -17.08 | QP |
| 7 | 3.681 | 30.11 | 56.00 | -25.89 | Average |
| 8 | 3.681 | 36.78 | 56.00 | -19.22 | QP |
| 9 | 4.598 | 34.71 | 56.00 | -21.29 | Average |
| 10 | 4.598 | 41.36 | 56.00 | -14.64 | QP |
| 11 | 5.505 | 27.20 | 60.00 | -32.80 | Average |
| 12 | 5.505 | 35.96 | 60.00 | -24.04 | QP |

| | | | |
|----------------|---------------------------------------|---------------------|--------|
| EUT : | VEHICLE LOCATING SYSTEM | Model Name : | BLE 12 |
| Temperature : | 26 °C | Relative Humidity : | 54% |
| Pressure : | 1010hPa | Phase : | N |
| Test Voltage : | DC 12.0V form Adapter AC 120V/60Hz | Test Mode : | Mode 4 |



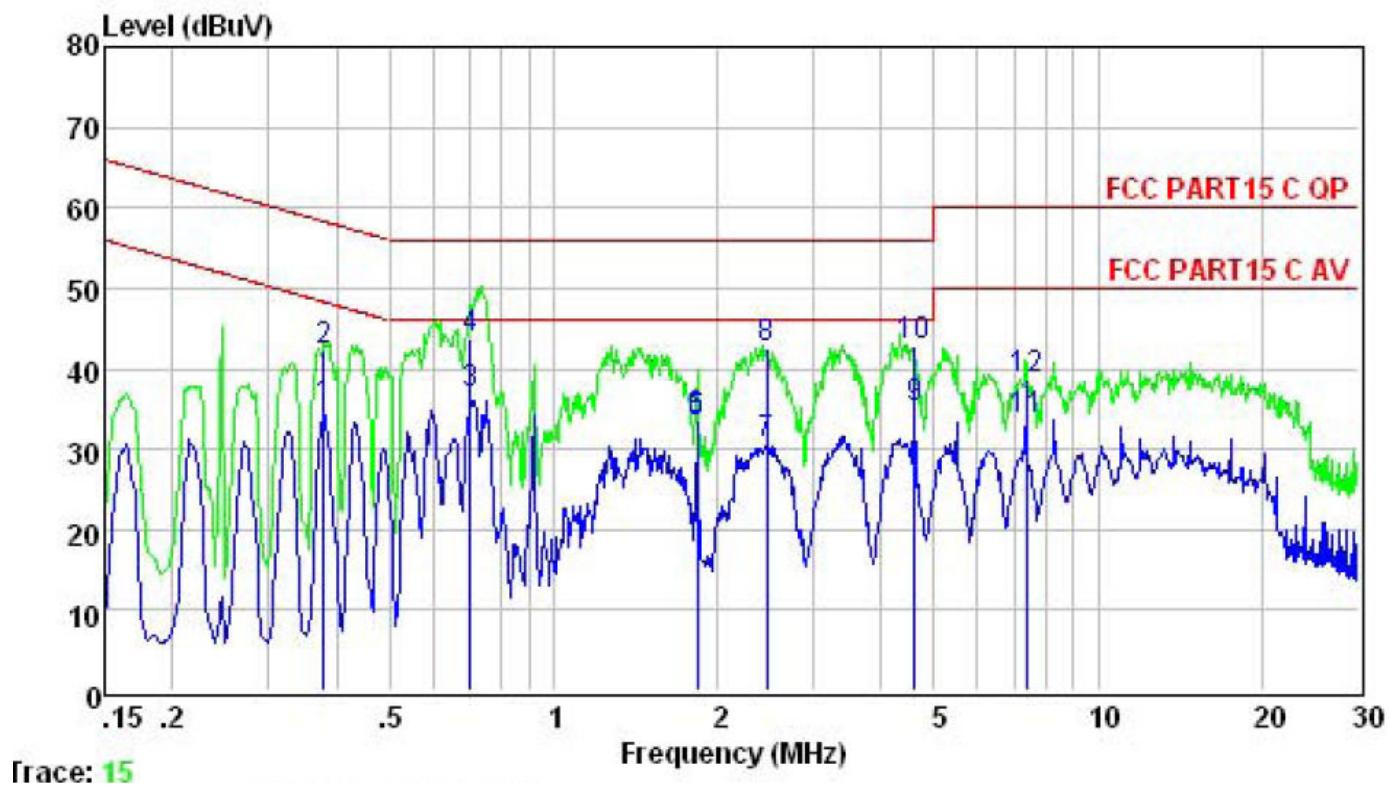
| Freq | Level | Limit | | Over | Remark |
|------|-------|-------|-------|--------|---------|
| | | Line | dBuV | dB | |
| 1 | 0.180 | 31.09 | 64.50 | -33.41 | Average |
| 2 | 0.180 | 51.76 | 64.50 | -12.74 | QP |
| 3 | 0.665 | 37.49 | 56.00 | -18.51 | Average |
| 4 | 0.665 | 48.25 | 56.00 | -7.75 | QP |
| 5 | 0.918 | 33.42 | 56.00 | -22.58 | Average |
| 6 | 0.918 | 38.69 | 56.00 | -17.31 | QP |
| 7 | 1.839 | 35.62 | 56.00 | -20.38 | Average |
| 8 | 1.839 | 41.56 | 56.00 | -14.44 | QP |
| 9 | 4.598 | 34.19 | 56.00 | -21.81 | Average |
| 10 | 4.598 | 41.06 | 56.00 | -14.94 | QP |
| 11 | 7.329 | 32.49 | 60.00 | -27.51 | Average |
| 12 | 7.329 | 37.59 | 60.00 | -22.41 | QP |

| | | | |
|----------------|---------------------------------------|---------------------|--------|
| EUT : | VEHICLE LOCATING SYSTEM | Model Name : | BLE 12 |
| 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 | Level | Limit | | Over Line Limit | Remark |
|------|-------|-------|-------|-----------------|---------|
| | | MHz | dBuV | | |
| 1 | 0.215 | 25.88 | 63.01 | -37.13 | Average |
| 2 | 0.215 | 45.02 | 63.01 | -17.99 | QP |
| 3 | 0.747 | 27.52 | 56.00 | -28.48 | Average |
| 4 | 0.747 | 42.96 | 56.00 | -13.04 | QP |
| 5 | 0.918 | 33.88 | 56.00 | -22.12 | Average |
| 6 | 0.918 | 41.29 | 56.00 | -14.71 | QP |
| 7 | 1.839 | 34.12 | 56.00 | -21.88 | Average |
| 8 | 1.839 | 38.03 | 56.00 | -17.97 | QP |
| 9 | 4.598 | 34.82 | 56.00 | -21.18 | Average |
| 10 | 4.598 | 41.09 | 56.00 | -14.91 | QP |
| 11 | 7.329 | 29.60 | 60.00 | -30.40 | Average |
| 12 | 7.329 | 38.56 | 60.00 | -21.44 | QP |

| | | | |
|----------------|---------------------------------------|---------------------|--------|
| EUT : | VEHICLE LOCATING SYSTEM | Model Name : | BLE 12 |
| Temperature : | 26 °C | Relative Humidity : | 54% |
| Pressure : | 1010hPa | Phase : | N |
| Test Voltage : | DC 12.0V form Adapter AC 240V/60Hz | Test Mode : | Mode 4 |



| Freq | Level | Limit | | Over Limit | Remark |
|------|-------|-------|-------|------------|---------|
| | | Line | dB | | |
| MHz | dBuV | dBuV | dB | | |
| 1 | 0.379 | 35.04 | 58.30 | -23.26 | Average |
| 2 | 0.379 | 42.36 | 58.30 | -15.94 | QP |
| 3 | 0.705 | 36.90 | 56.00 | -19.10 | Average |
| 4 | 0.705 | 43.69 | 56.00 | -12.31 | QP |
| 5 | 1.839 | 33.44 | 56.00 | -22.56 | Average |
| 6 | 1.839 | 33.69 | 56.00 | -22.31 | QP |
| 7 | 2.461 | 30.59 | 56.00 | -25.41 | Average |
| 8 | 2.461 | 42.38 | 56.00 | -13.62 | QP |
| 9 | 4.598 | 35.02 | 56.00 | -20.98 | Average |
| 10 | 4.598 | 42.78 | 56.00 | -13.22 | QP |
| 11 | 7.368 | 33.74 | 60.00 | -26.26 | Average |
| 12 | 7.368 | 38.76 | 60.00 | -21.24 | 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.

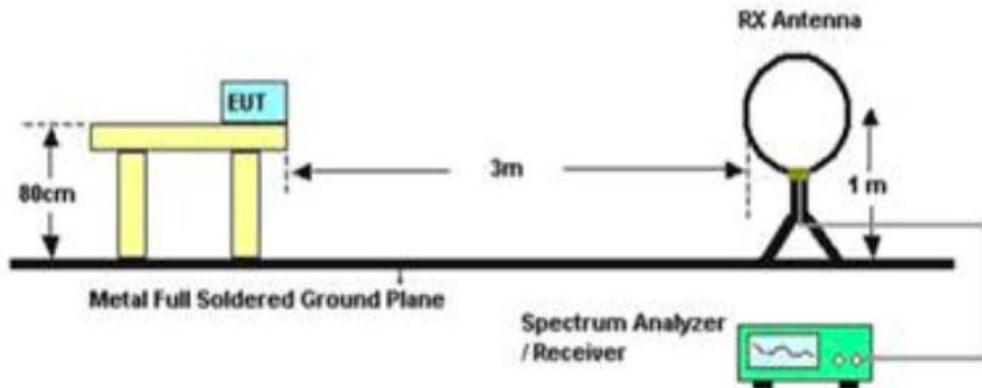
The bandwidth of the EMI test receiver is set at 120kHz for frequency range from 30MHz to 1000 MHz.

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.

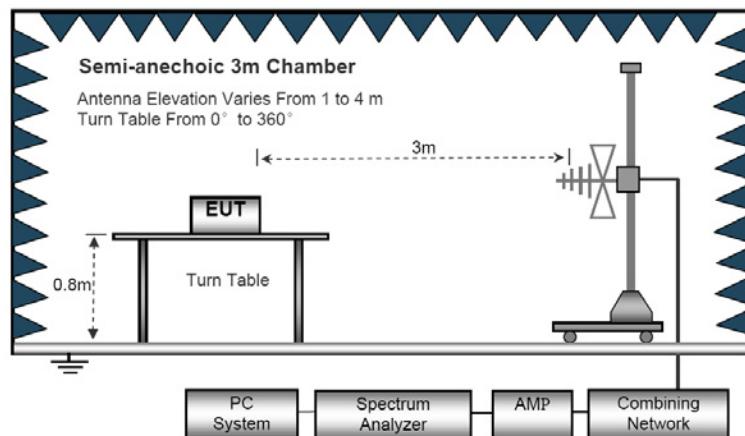
The frequency range from 30MHz to 10th harmonic (25GHz) are checked. and no any emissions were found from 18GHz to 25 GHz, So the radiated emissions from 18GHz to 25GHz were not record.

- 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. Note: EUT Pre-scan X/Y/Z orientation, only worst case is presented in the report (Z orientation).

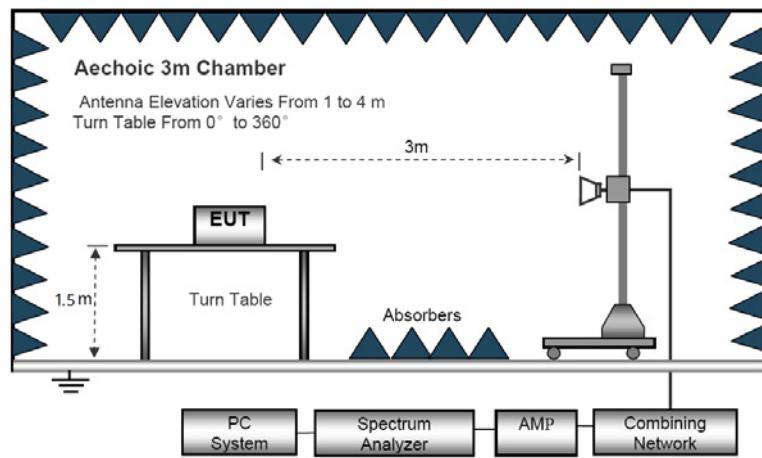
Radiated Emission Test-Up Frequency Below 30MHz



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.

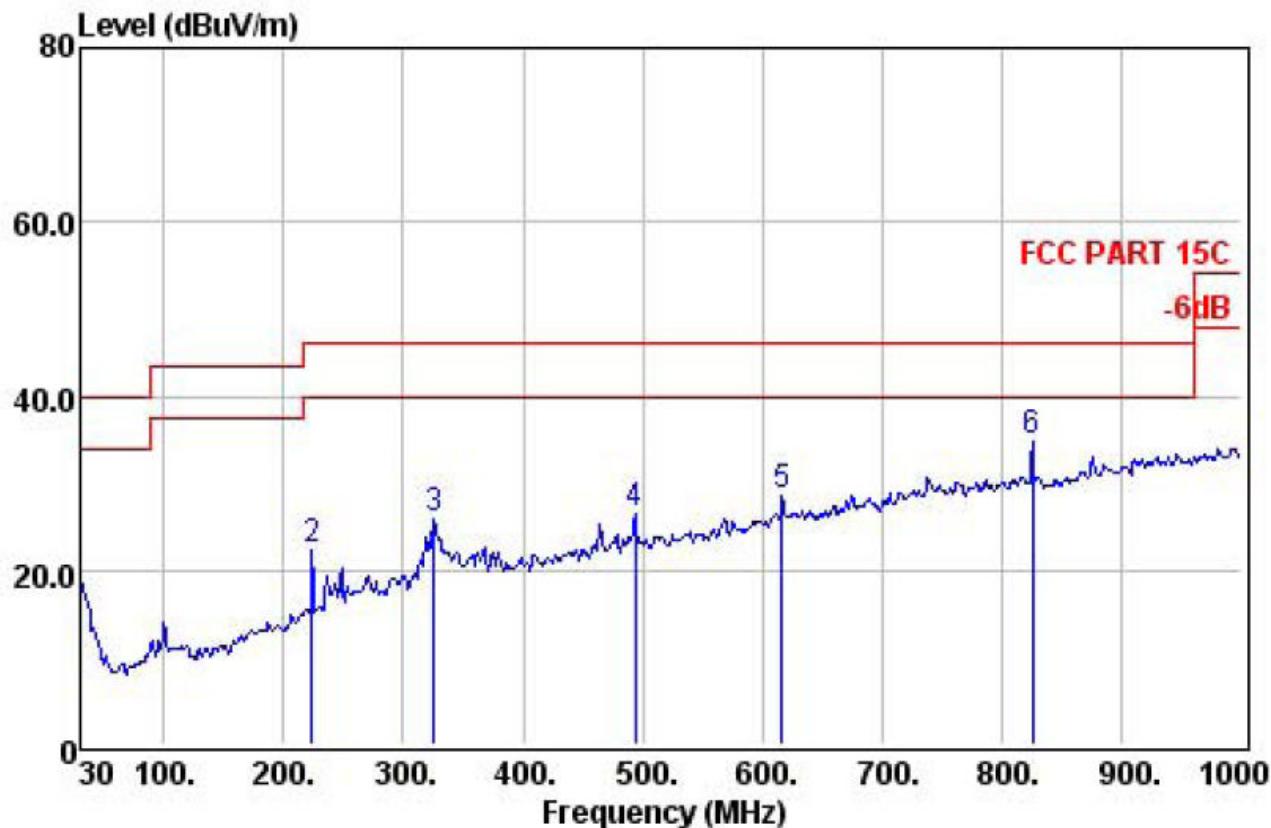
Distance extrapolation factor = $20 \log (\text{specific distance}/\text{test distance})(\text{dB})$;

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

| | | | |
|----------------|-----------------------------------|---------------------|--------|
| EUT : | VEHICLE LOCATING SYSTEM | Model Name : | BLE 12 |
| Temperature : | 20 °C | Relative Humidity : | 48% |
| Pressure : | 1010hPa | Test Mode : | TX |
| Test Voltage : | DC 12.0V form Adapter AC120V/60Hz | | |

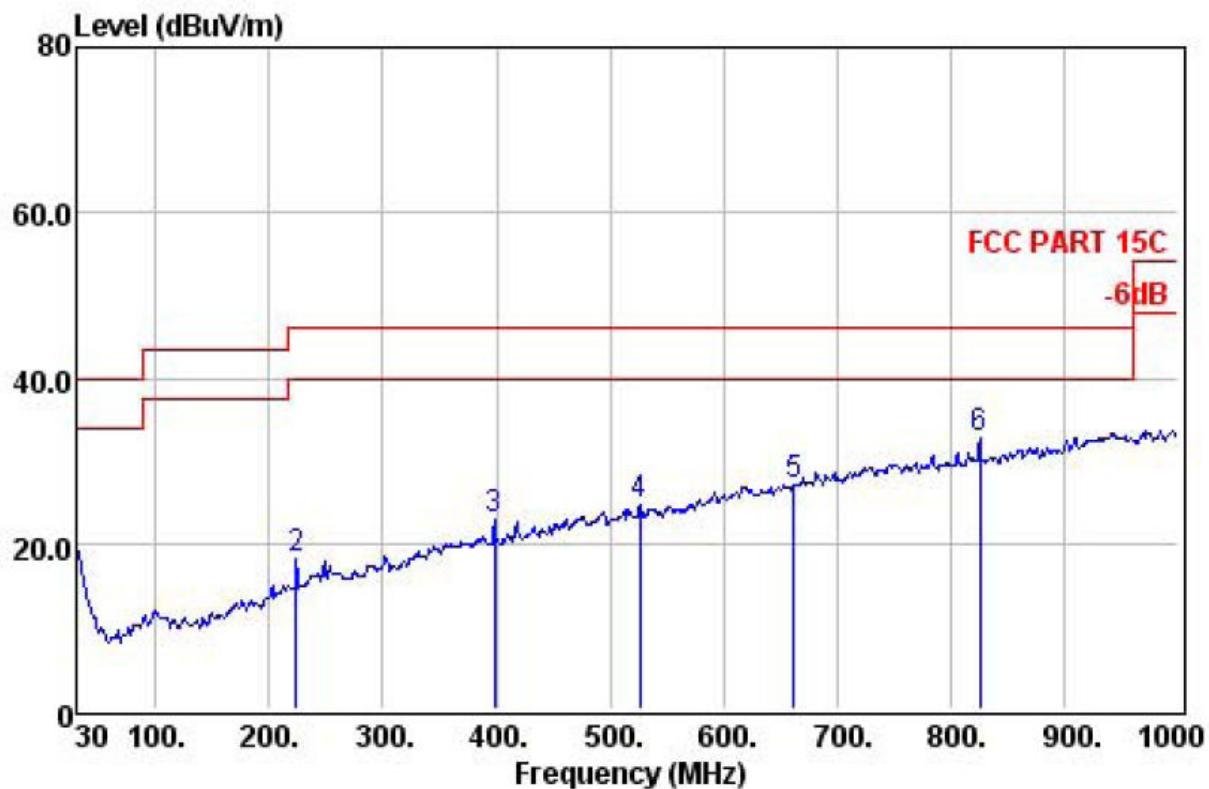
30-1GHz

Horizontal



| Freq | Preamp Factor | Read Level | Cable Loss | | Limit Line | Over Limit | Remark | |
|------|---------------|------------|------------|------|------------|------------|--------|--------|
| | | | MHz | dB | dBuV | dB | dBuV/m | dBuV/m |
| 1 | 30.00 | 31.41 | 32.99 | 0.56 | 20.94 | 40.00 | -19.06 | QP |
| 2 | 224.00 | 30.95 | 39.50 | 1.53 | 22.23 | 46.00 | -23.77 | QP |
| 3 | 325.85 | 30.81 | 40.24 | 2.02 | 25.98 | 46.00 | -20.02 | QP |
| 4 | 493.66 | 30.59 | 35.68 | 2.77 | 26.46 | 46.00 | -19.54 | QP |
| 5 | 616.85 | 30.64 | 34.74 | 3.38 | 28.55 | 46.00 | -17.45 | QP |
| 6 | 825.40 | 30.47 | 37.64 | 4.49 | 34.76 | 46.00 | -11.24 | QP |

Vertical



| Preamp Freq | Factor | Read | Cable | Limit Line | Over Limit | Remark | |
|----------------|--------|-------|-------|---------------|---------------|--------|-----------|
| | | Level | Loss | | | | |
| MHz | | dB | dBuV | dB | dBuV/m | dBuV/m | dB |
| 1 | 30.00 | 31.41 | 32.17 | 0.56 | 20.12 | 40.00 | -19.88 QP |
| 2 | 224.00 | 30.95 | 35.36 | 1.53 | 18.09 | 46.00 | -27.91 QP |
| 3 | 398.60 | 30.63 | 34.73 | 2.37 | 22.76 | 46.00 | -23.24 QP |
| 4 | 526.64 | 30.72 | 33.26 | 2.94 | 24.70 | 46.00 | -21.30 QP |
| 5 | 662.44 | 30.81 | 32.53 | 3.69 | 27.11 | 46.00 | -18.89 QP |
| 6 | 825.40 | 30.47 | 35.56 | 4.49 | 32.68 | 46.00 | -13.32 QP |

NOTE:

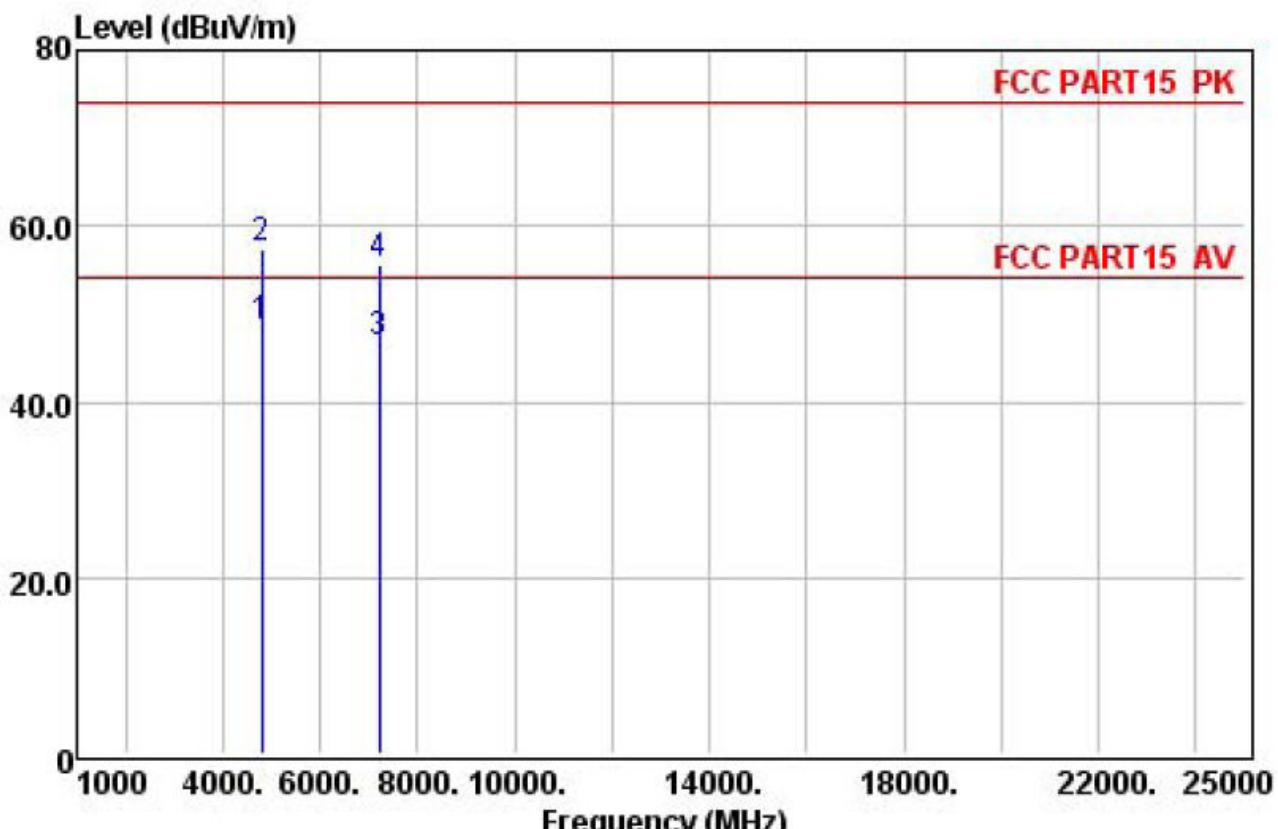
Absolute Level= ReadingLevel+antenna Factor+cable loss-preamp factor,

Over Limit= Absolute Level – Limit

Mode 1 is the worst mode.

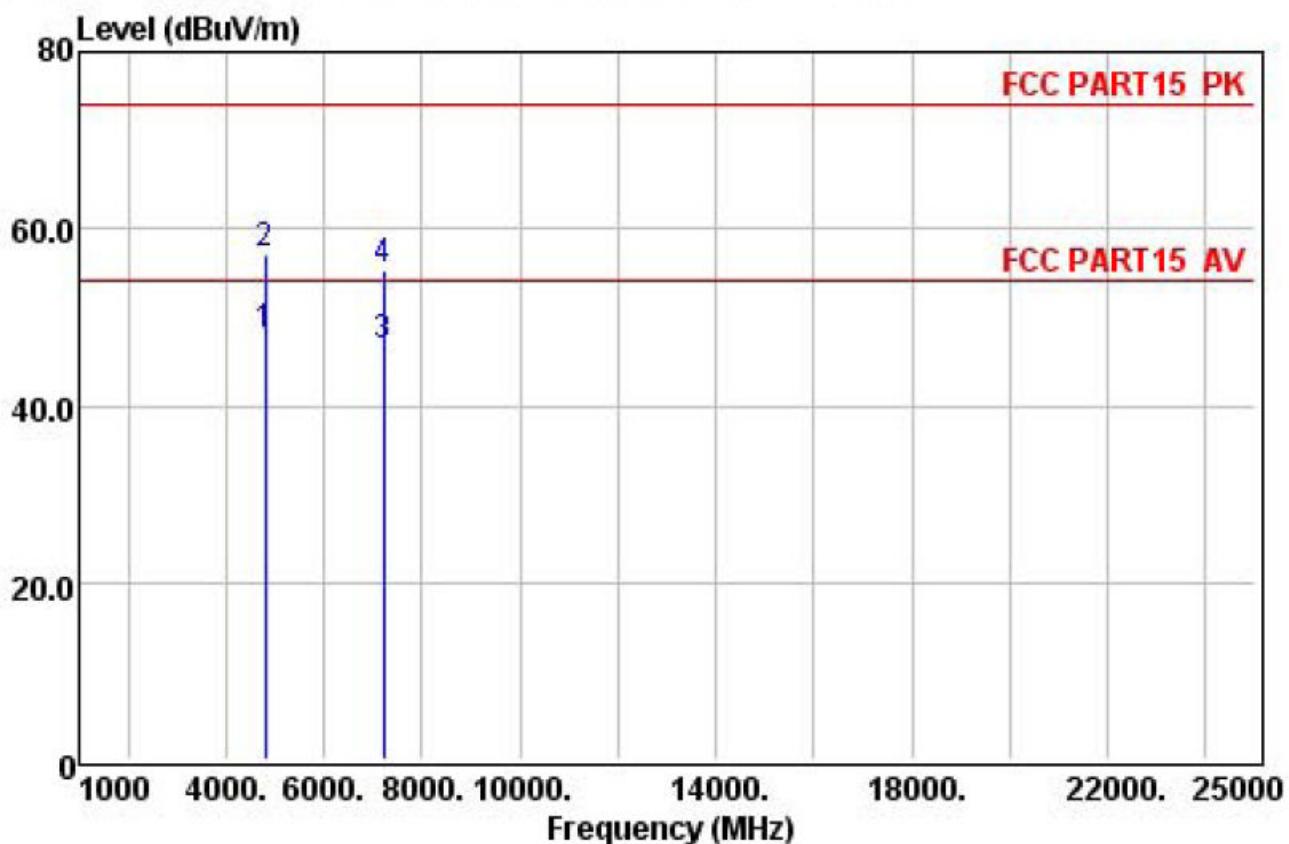
Above 1GHz

| | | | |
|----------------|-----------------------------------|---------------------|---------|
| EUT : | VEHICLE LOCATING SYSTEM | Model Name : | BLE 12 |
| Temperature : | 20 °C | Relative Humidity : | 48% |
| Pressure : | 1010hPa | Test Mode : | TX-2402 |
| Test Voltage : | DC 12.0V form Adapter AC120V/60Hz | | |

Vertical

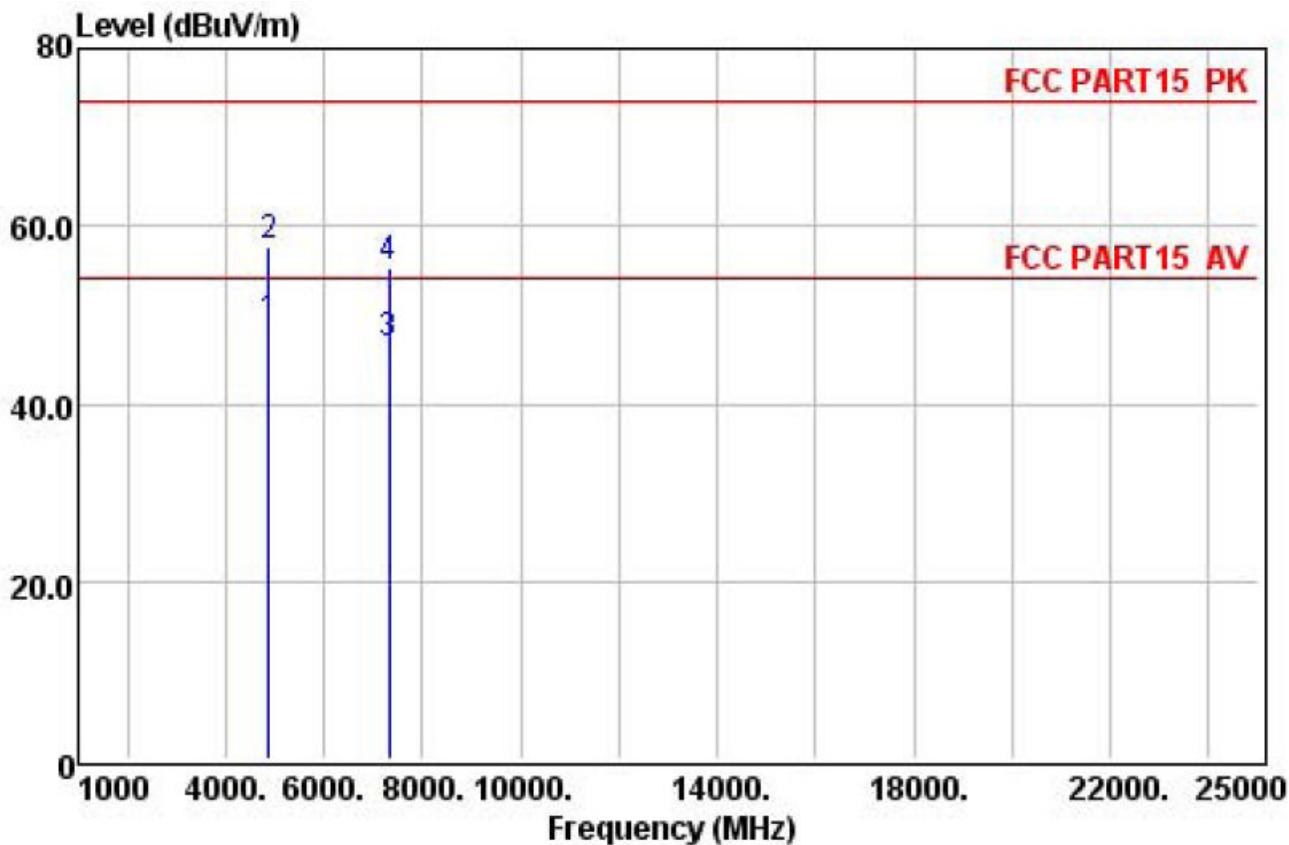
| | Preamp Factor | Read Level (dBuV) | Cable Loss (dB) | Limit Level (dBuV/m) | Over Line (dBuV/m) | Over Limit (dB) | Remark |
|---|---------------|-------------------|-----------------|----------------------|--------------------|-----------------|--------|
| | MHz | dB | dBuV | dB | dBuV/m | dBuV/m | dB |
| 1 | 4804.00 | 27.49 | 31.12 | 11.96 | 48.53 | 54.00 | -5.47 |
| 2 | 4804.00 | 27.49 | 40.01 | 11.96 | 57.42 | 74.00 | -16.58 |
| 3 | 7206.00 | 27.94 | 32.68 | 16.61 | 46.63 | 54.00 | -7.37 |
| 4 | 7206.00 | 27.94 | 41.69 | 16.61 | 55.64 | 74.00 | -18.36 |

Horizontal



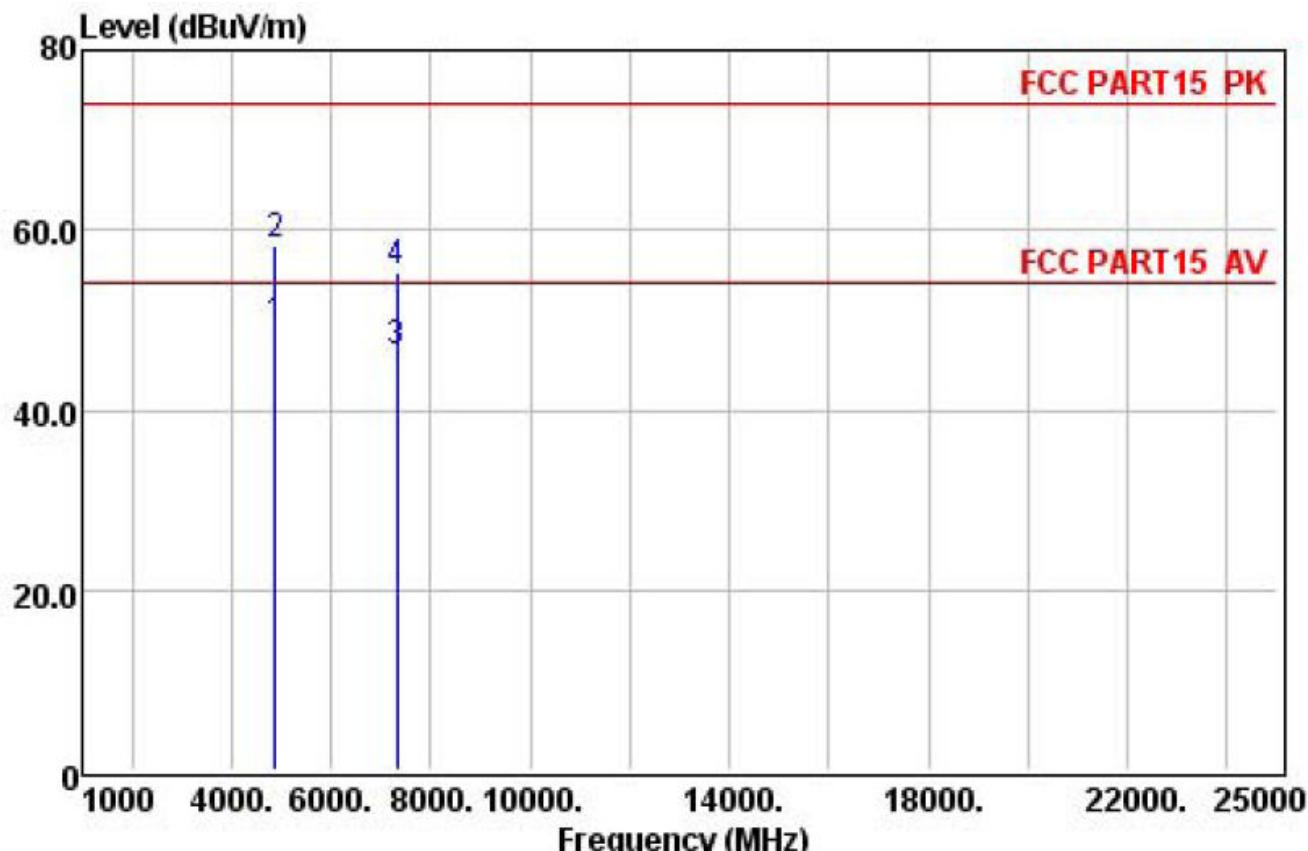
| | | Preamp Freq | Read Factor | Cable Level | Cable Loss | Limit Level | Line Level | Over Limit | Remark |
|---|--|----------------|----------------|----------------|---------------|----------------|---------------|---------------|---------|
| | | MHz | | dB | dBuV | dB | dBuV/m | dBuV/m | dB |
| 1 | | 4804.00 | 27.49 | 30.60 | 11.96 | 48.01 | 54.00 | -5.99 | Average |
| 2 | | 4804.00 | 27.49 | 39.74 | 11.96 | 57.15 | 74.00 | -16.85 | Peak |
| 3 | | 7206.00 | 27.94 | 32.63 | 16.61 | 46.58 | 54.00 | -7.42 | Average |
| 4 | | 7206.00 | 27.94 | 41.35 | 16.61 | 55.30 | 74.00 | -18.70 | Peak |

| | | | |
|----------------|-----------------------------------|---------------------|---------|
| EUT : | VEHICLE LOCATING SYSTEM | Model Name : | BLE 12 |
| Temperature : | 20 °C | Relative Humidity : | 48% |
| Pressure : | 1010hPa | Test Mode : | TX-2440 |
| Test Voltage : | DC 12.0V form Adapter AC120V/60Hz | | |

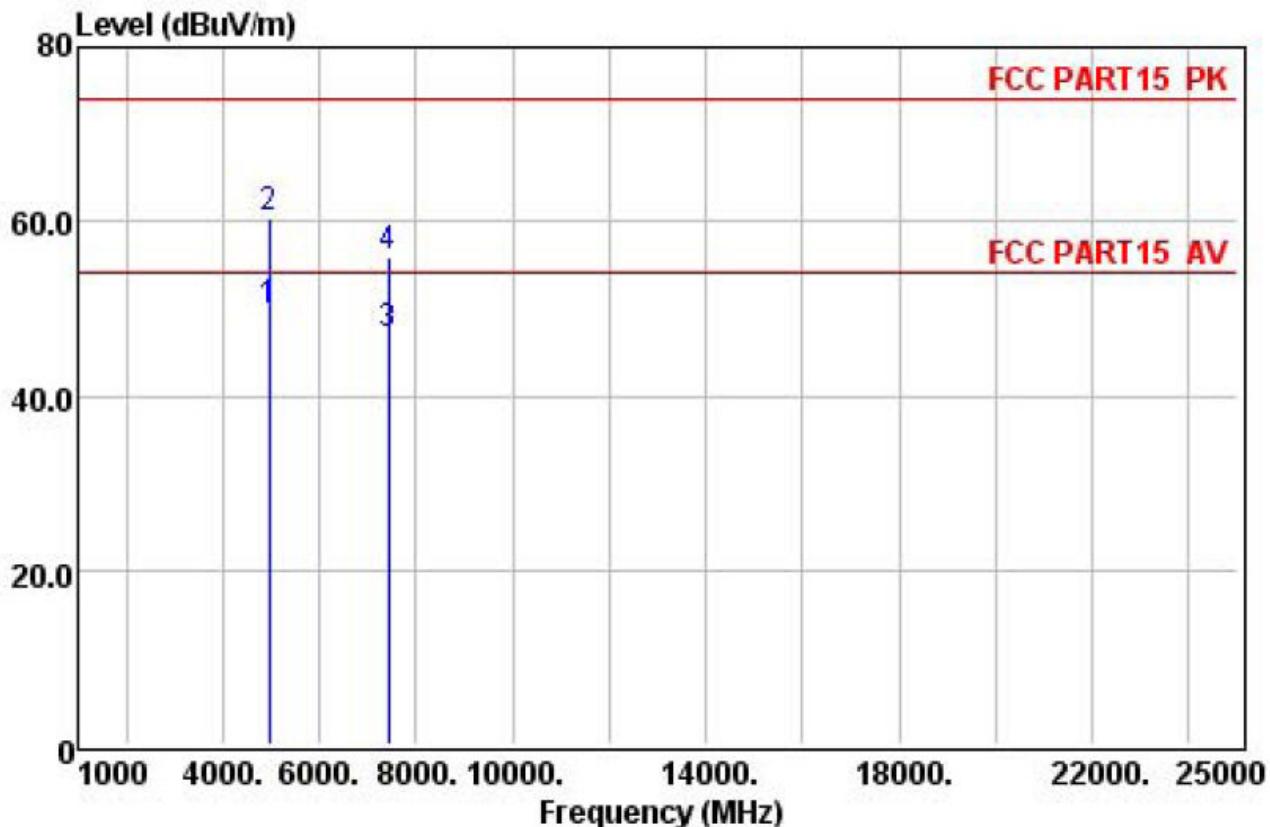
Vertical

| Freq | Preamp Factor | Read | Cable | Limit Line | Over Limit | Remark | |
|------|---------------|-------|-------|------------|------------|--------|---------------|
| | | Level | Loss | | | | |
| | MHz | dB | dBuV | dB | dBuV/m | dBuV/m | dB |
| 1 | 4880.00 | 27.53 | 32.03 | 12.14 | 48.75 | 54.00 | -5.25 Average |
| 2 | 4880.00 | 27.53 | 41.09 | 12.14 | 57.81 | 74.00 | -16.19 Peak |
| 3 | 7320.00 | 27.96 | 33.57 | 16.62 | 46.56 | 54.00 | -7.44 Average |
| 4 | 7320.00 | 27.96 | 42.37 | 16.62 | 55.36 | 74.00 | -18.64 Peak |

Horizontal

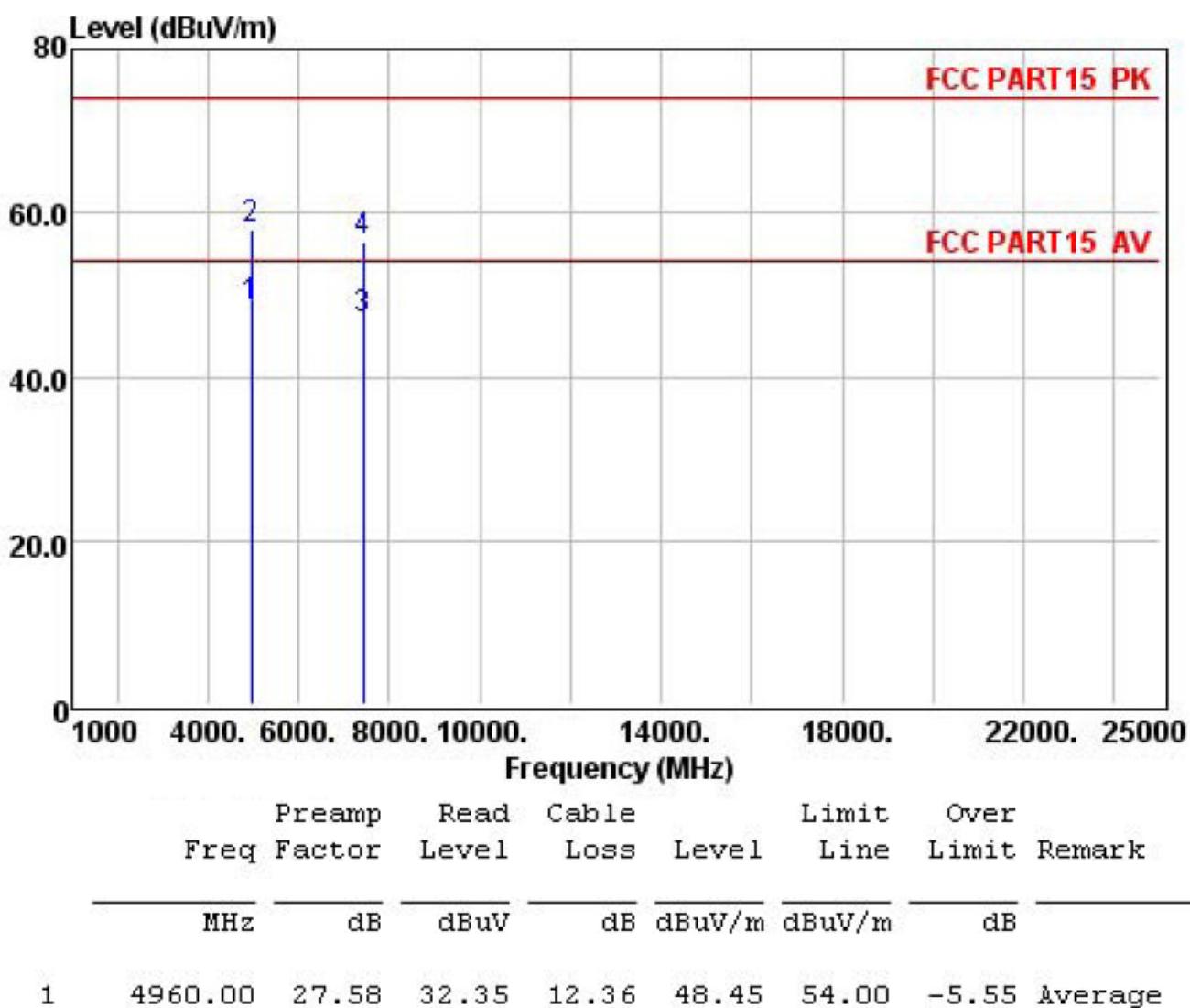


| | | | |
|----------------|-----------------------------------|---------------------|---------|
| EUT : | VEHICLE LOCATING SYSTEM | Model Name : | BLE 12 |
| Temperature : | 20 °C | Relative Humidity : | 48% |
| Pressure : | 1010hPa | Test Mode : | TX-2480 |
| Test Voltage : | DC 12.0V form Adapter AC120V/60Hz | | |

Vertical

| | Preamp Freq | Read Factor | Cable Level | Cable Loss | Limit Level | Limit Line | Over Limit | Remark |
|---|----------------|----------------|----------------|---------------|----------------|---------------|---------------|---------|
| | MHz | dB | dBuV | dB | dBuV/m | dBuV/m | dB | |
| 1 | 4960.00 | 27.58 | 33.59 | 12.36 | 49.69 | 54.00 | -4.31 | Average |
| 2 | 4960.00 | 27.58 | 44.32 | 12.36 | 60.42 | 74.00 | -13.58 | Peak |
| 3 | 7440.00 | 27.99 | 33.89 | 16.62 | 46.90 | 54.00 | -7.10 | Average |
| 4 | 7440.00 | 27.99 | 42.88 | 16.62 | 55.89 | 74.00 | -18.11 | Peak |

Horizontal

**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

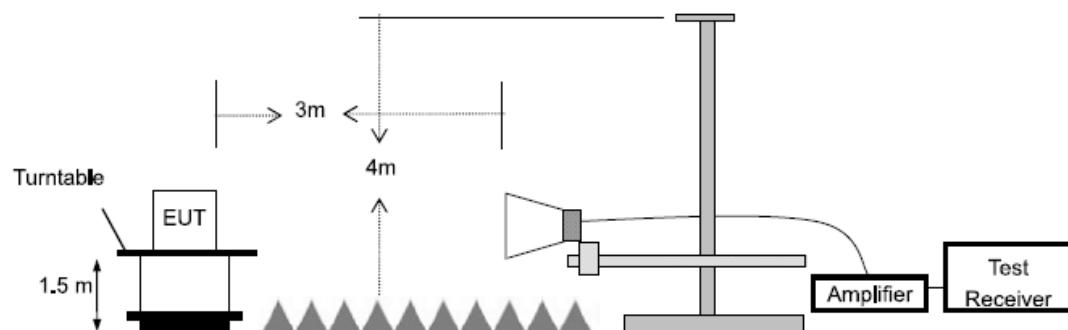
All the lower and upper band-edges emissions appearing within 2310MHz to 2390MHz and 2483.5MHz to 2500MHz restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions outside operation frequency band 2400MHz to 2483.5MHz shall be at least 30dB below the fundamental 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 |

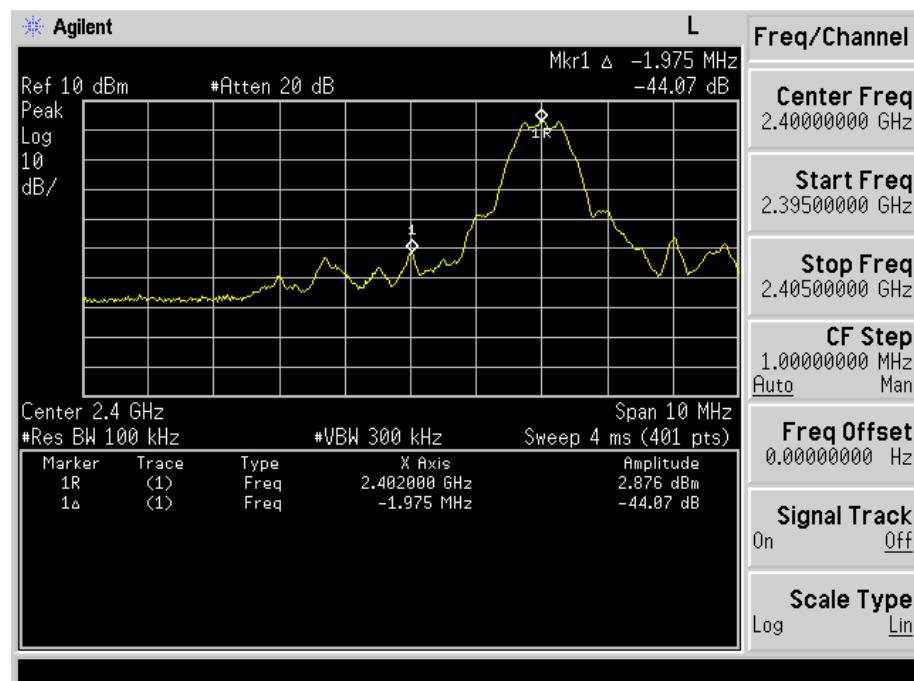
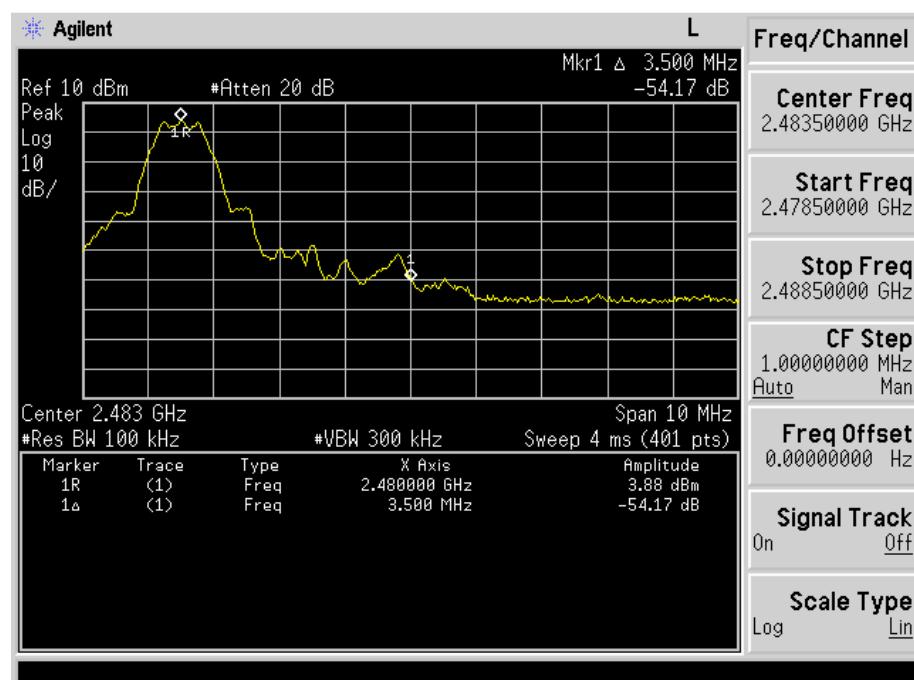
For radiated test as follows:

| Frequency (MHz) | Meter Reading (dB μ V) | Factor (dB) | Emission Level (dB μ V/m) | Limits (dB μ V/m) | Margin (dB) | Detector Type | Comment |
|--------------------|-------------------------------|----------------|----------------------------------|--------------------------|----------------|---------------|------------|
| 2390 | 38.97 | 13.06 | 52.03 | 74.00 | -21.97 | peak | Vertical |
| 2390 | 38.64 | 13.06 | 51.7 | 74.00 | -22.3 | peak | Horizontal |
| 2483.5 | 37.88 | 12.78 | 50.66 | 74.00 | -23.34 | peak | Vertical |
| 2483.5 | 38.61 | 12.78 | 51.39 | 74.00 | -22.61 | 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 | 44.07 | 20 | Pass |
| Right-band | 54.17 | 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

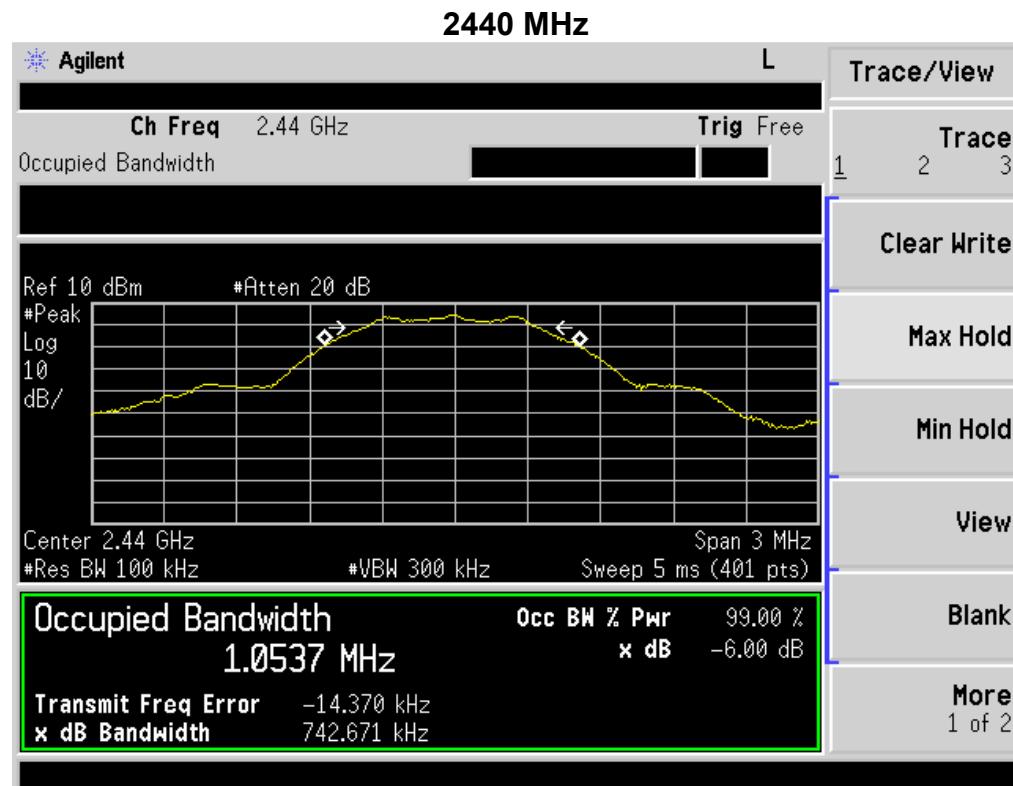
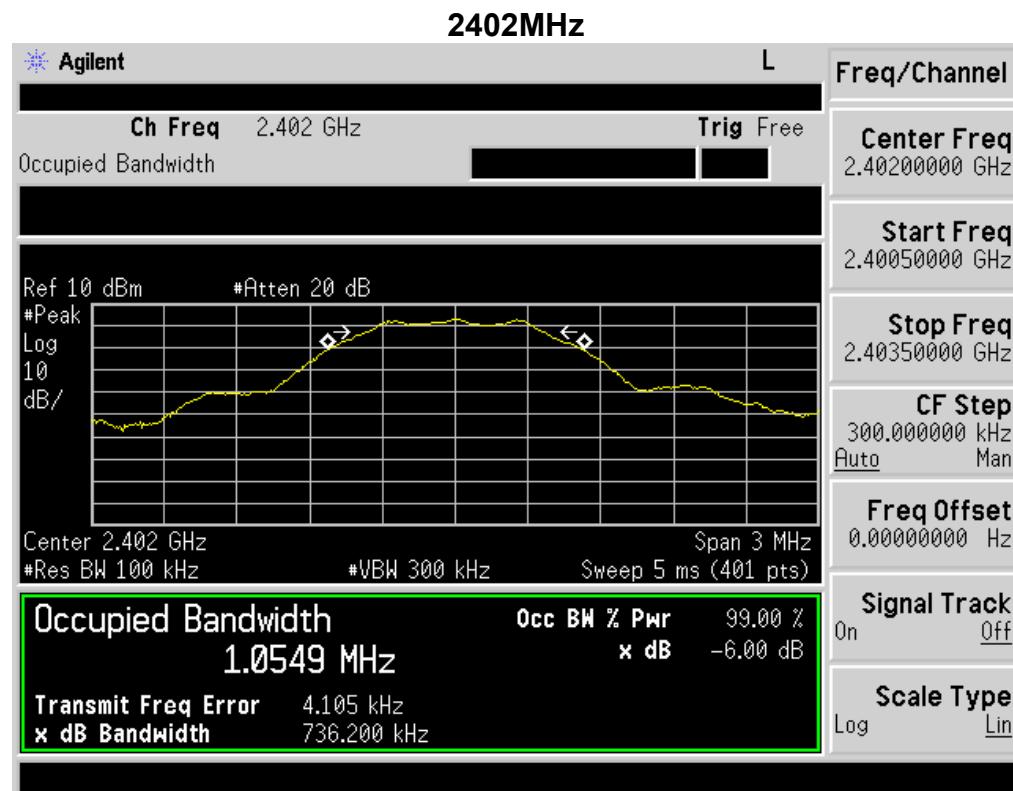
6.2. TEST PROCEDURE

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.

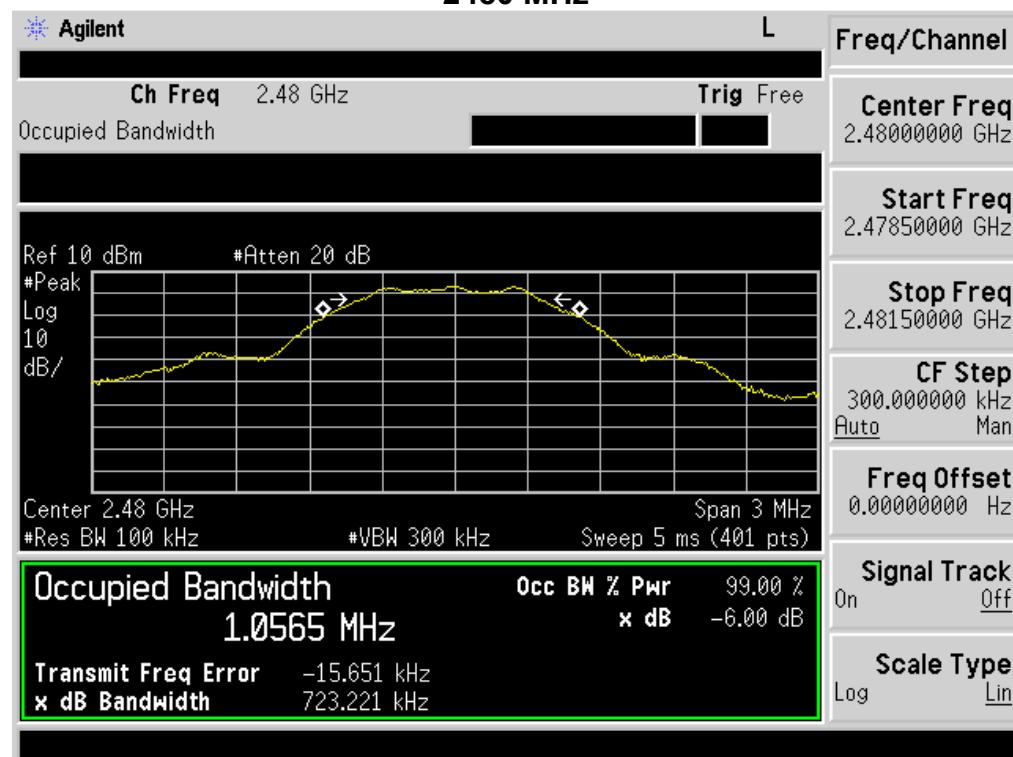
Test data:

| Channel Frequency (MHz) | 6dB Bandwidth (KHz) | Limit (KHz) | Result |
|-------------------------|---------------------|-------------|--------|
| 2402 | 736.200 | 500 | Pass |
| 2440 | 742.671 | 500 | Pass |
| 2480 | 723.221 | 500 | Pass |

Test plot as follows:



2480 MHz



7. OUTPUT POWER TEST

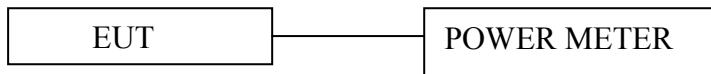
7.1. Limits

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 | 2.124 | 30 |
| 2440 | 2.353 | 30 |
| 2480 | 2.445 | 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.

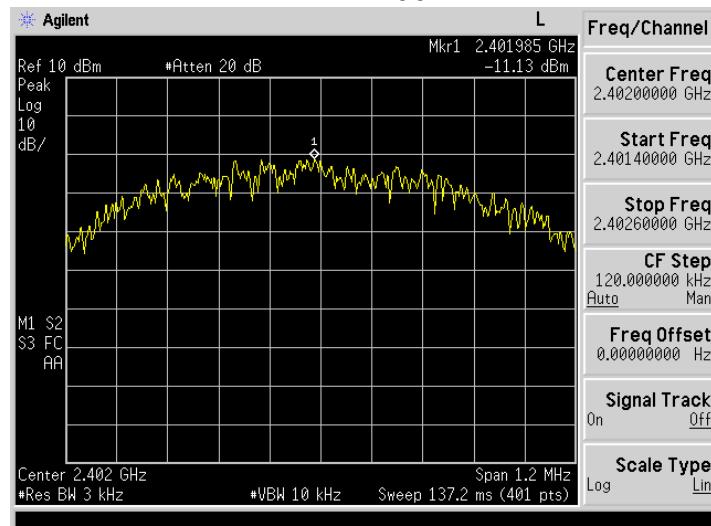
8.2. Test setup

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.

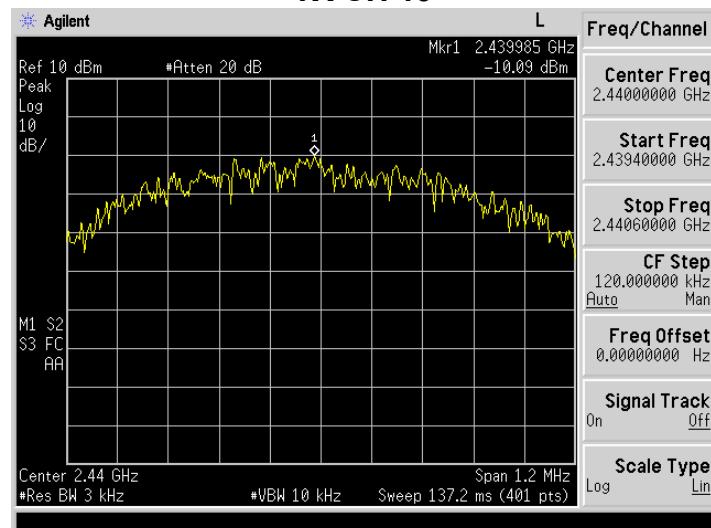
8.3. Test result

| Channel Frequency (MHz) | Power density (dBm/3kHz) | Limit (dBm/3kHz) | Result |
|-------------------------|--------------------------|------------------|--------|
| 2402 | -11.13 | 8 | Pass |
| 2440 | -10.09 | 8 | Pass |
| 2480 | -10.70 | 8 | Pass |

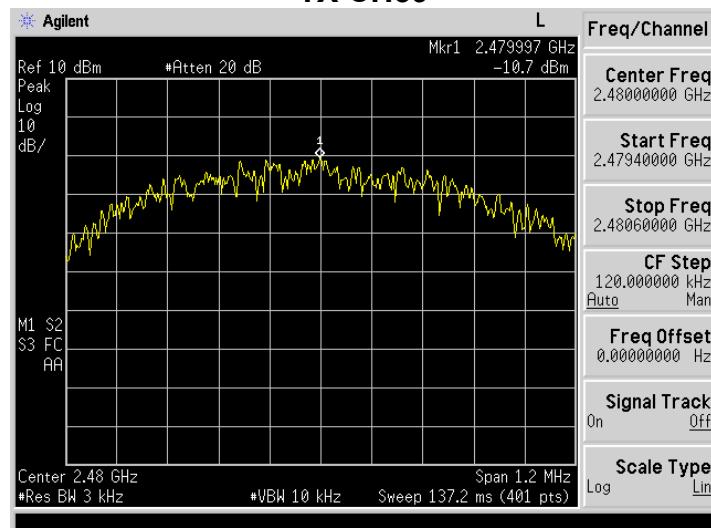
TX CH00



TX CH 19



TX CH39



9. ANTENNA REQUIREMENTS

9.1. Limits

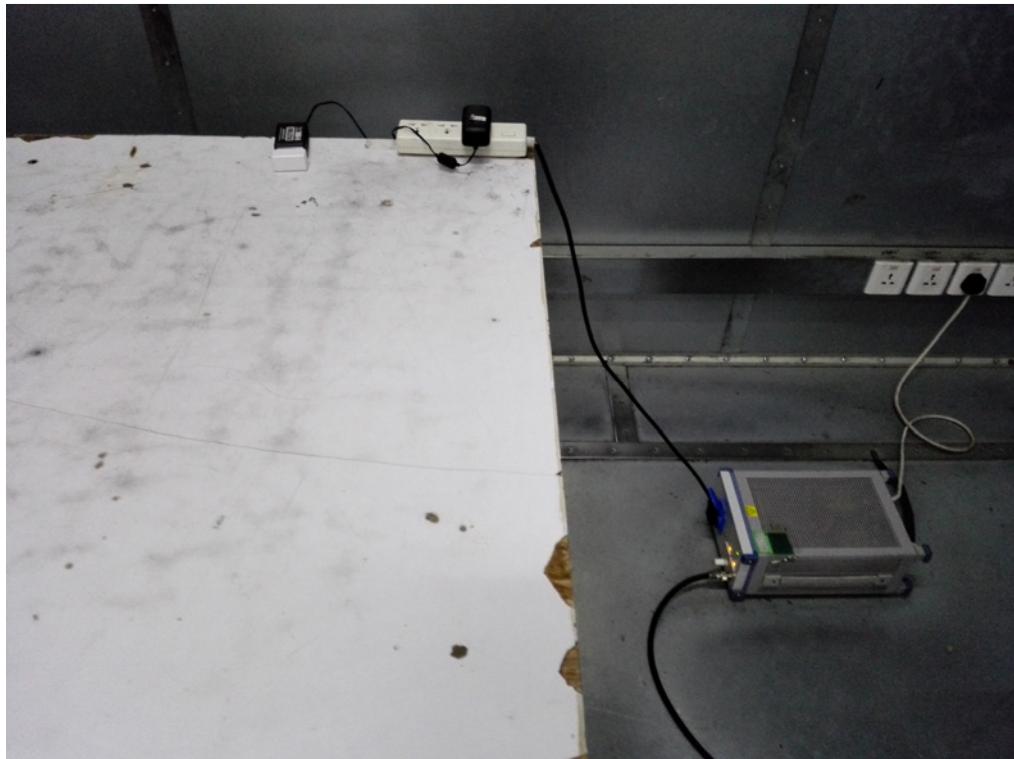
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional 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

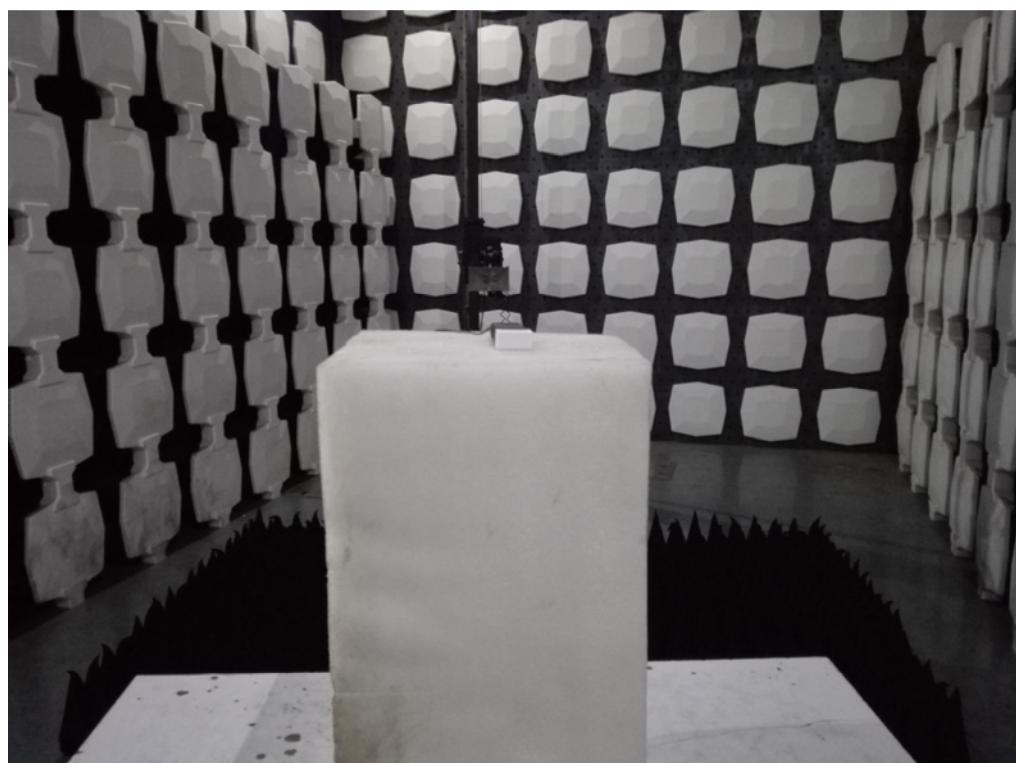
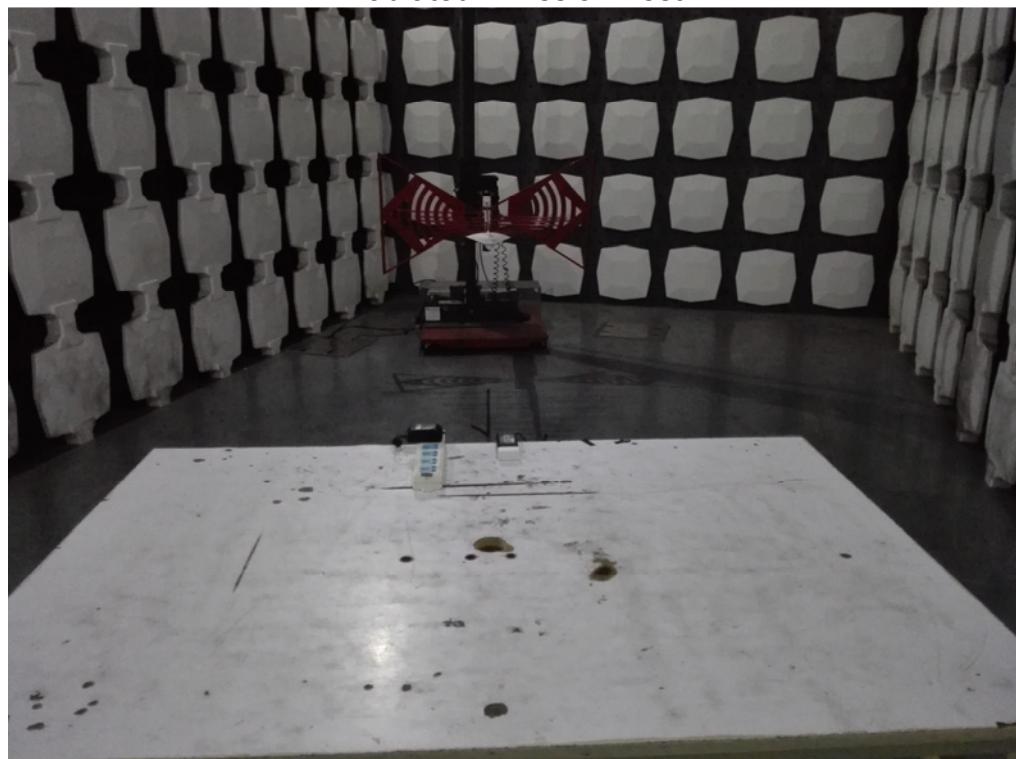
The antennas used for this product are permanent attached antenna and that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is only 1.0dBi.

10.PHOTOGRAPHS OF TEST SET-UP

Conducted Emission

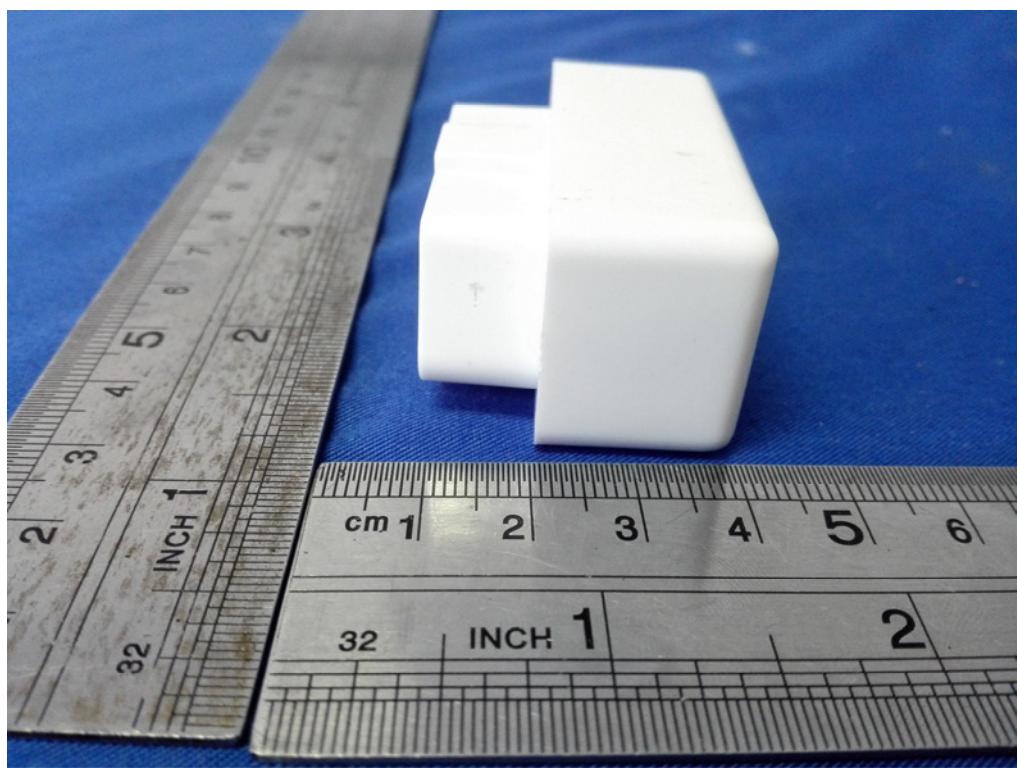
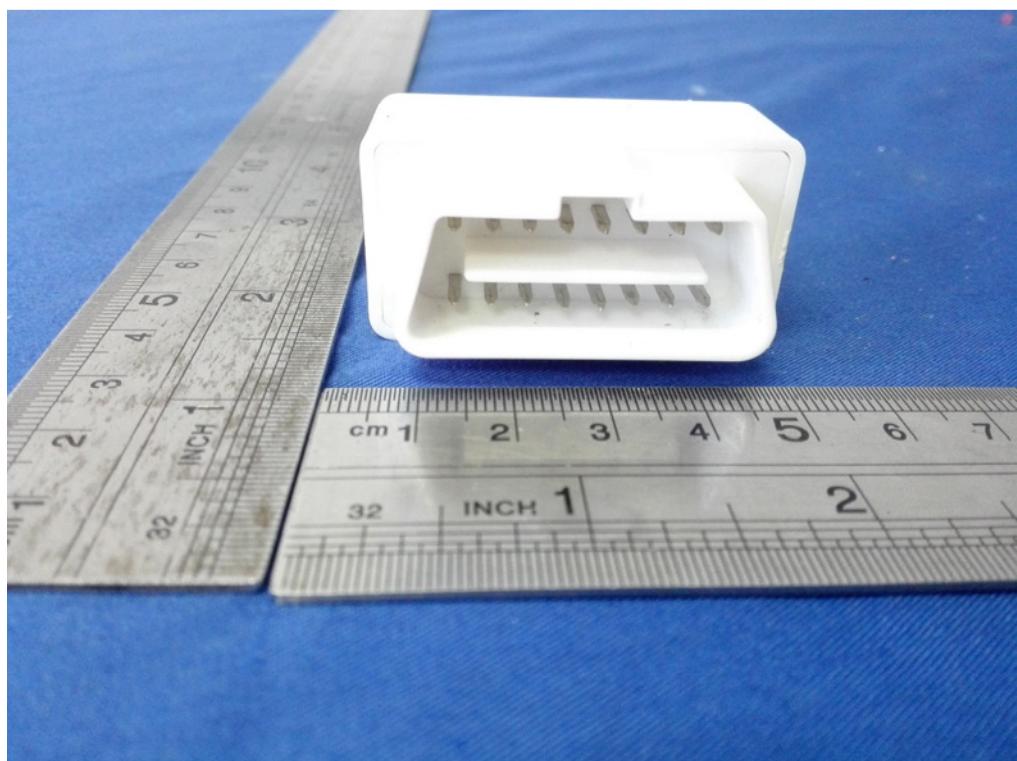


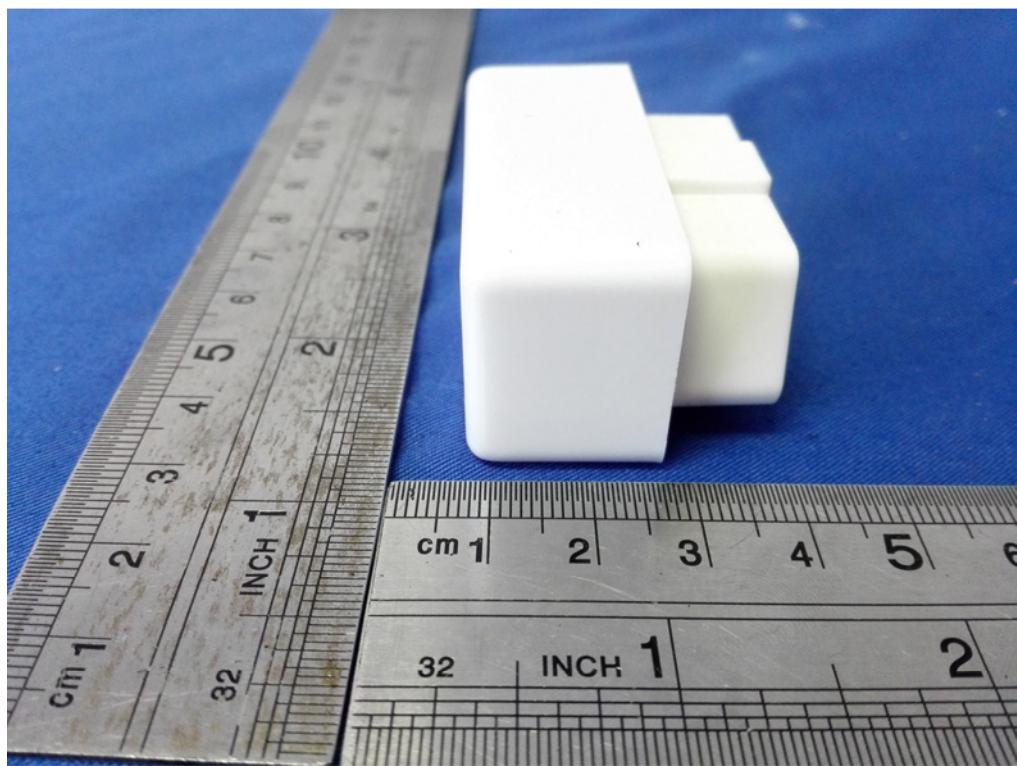
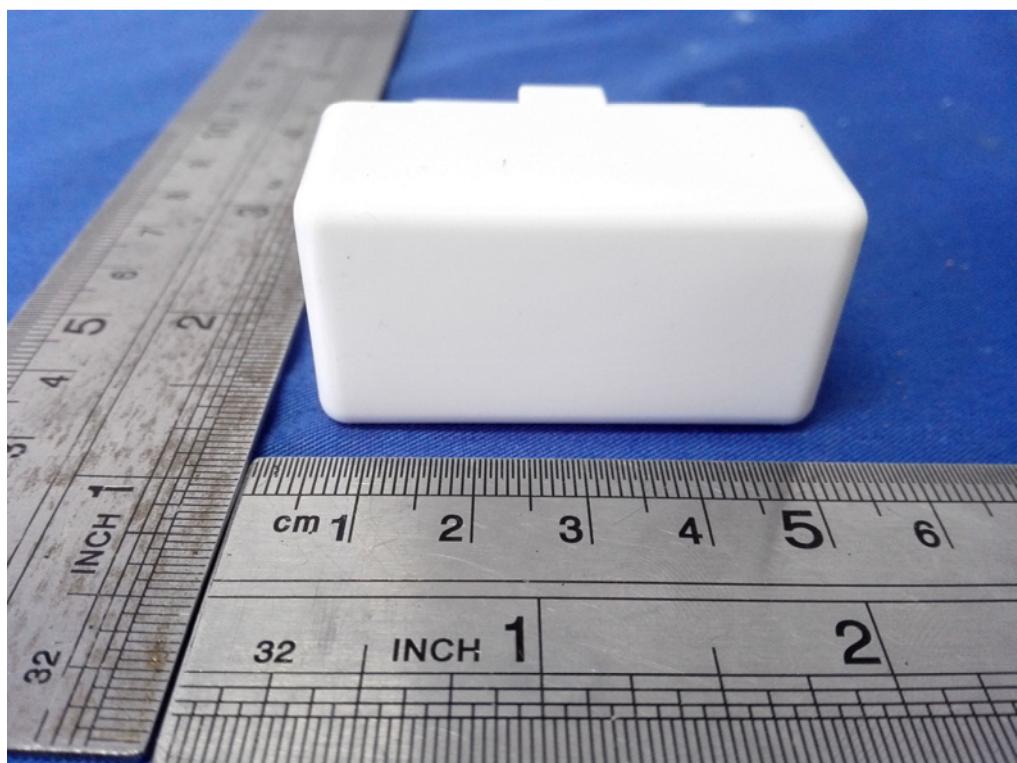
Radiated Emission Test

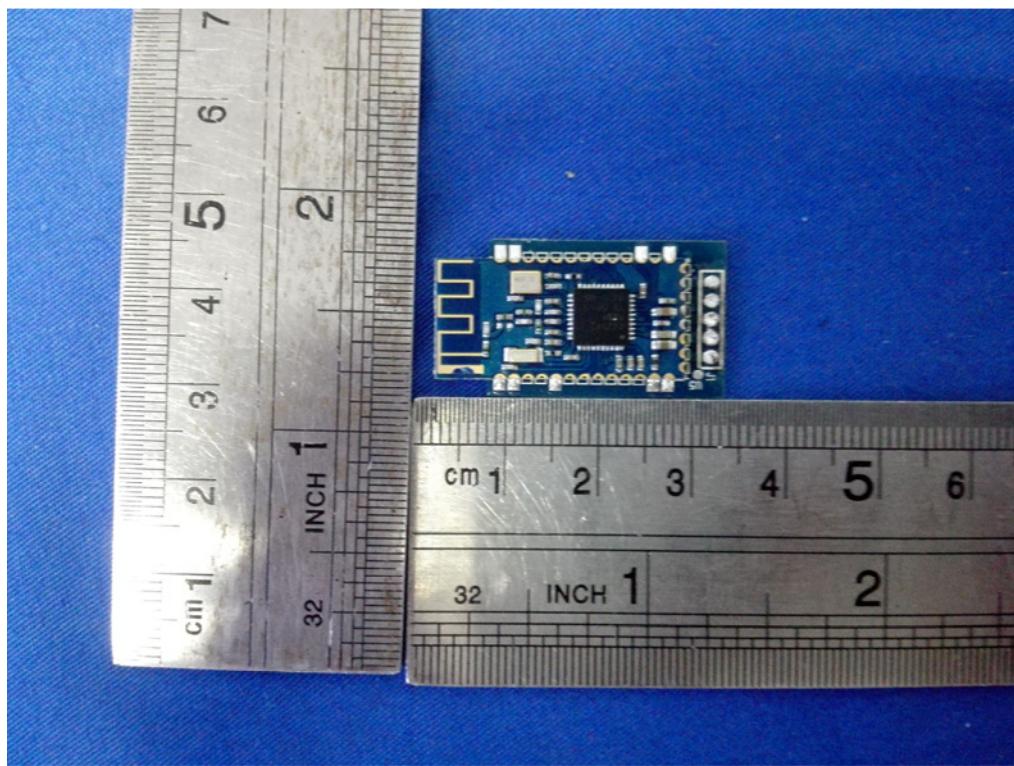
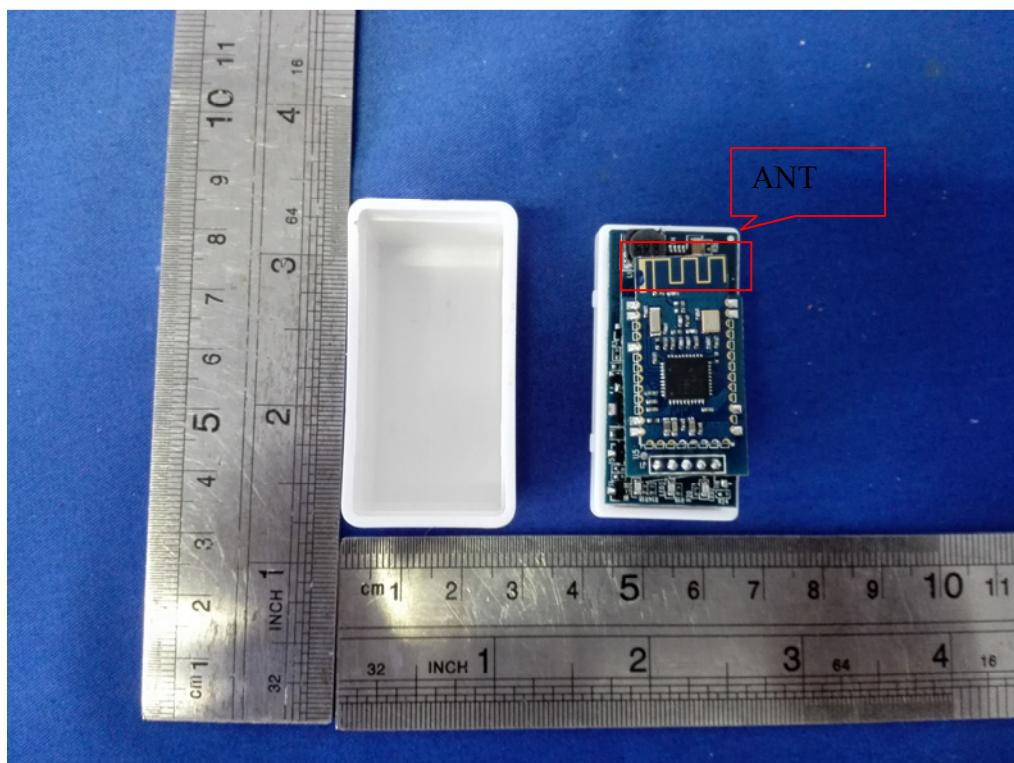


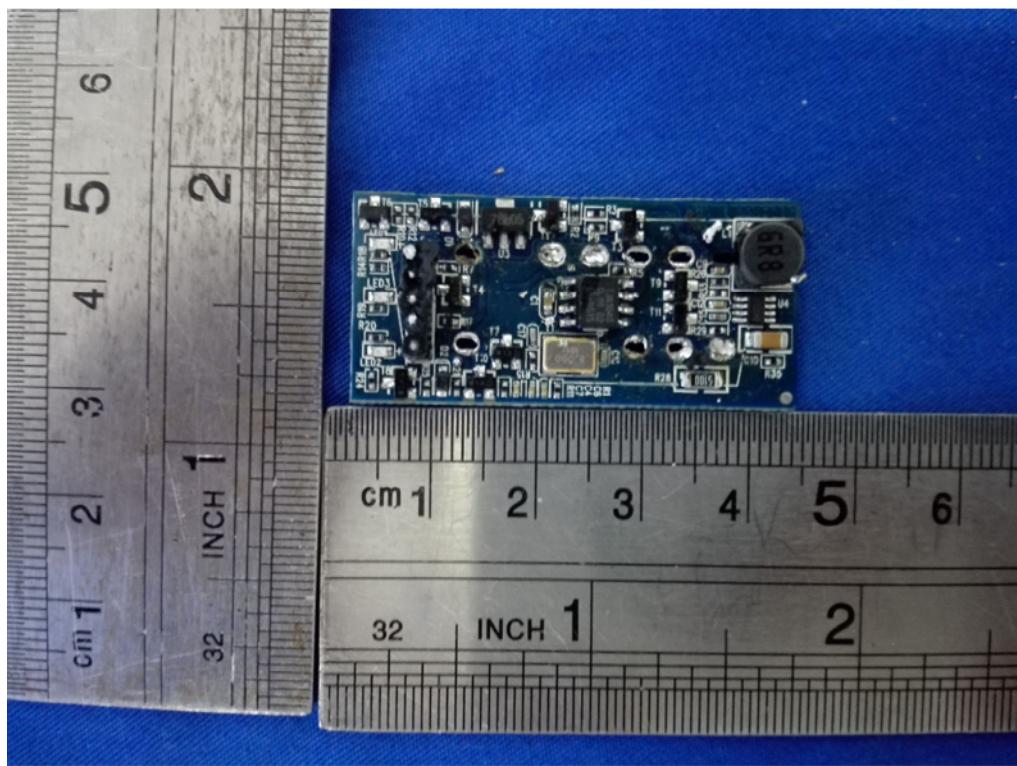
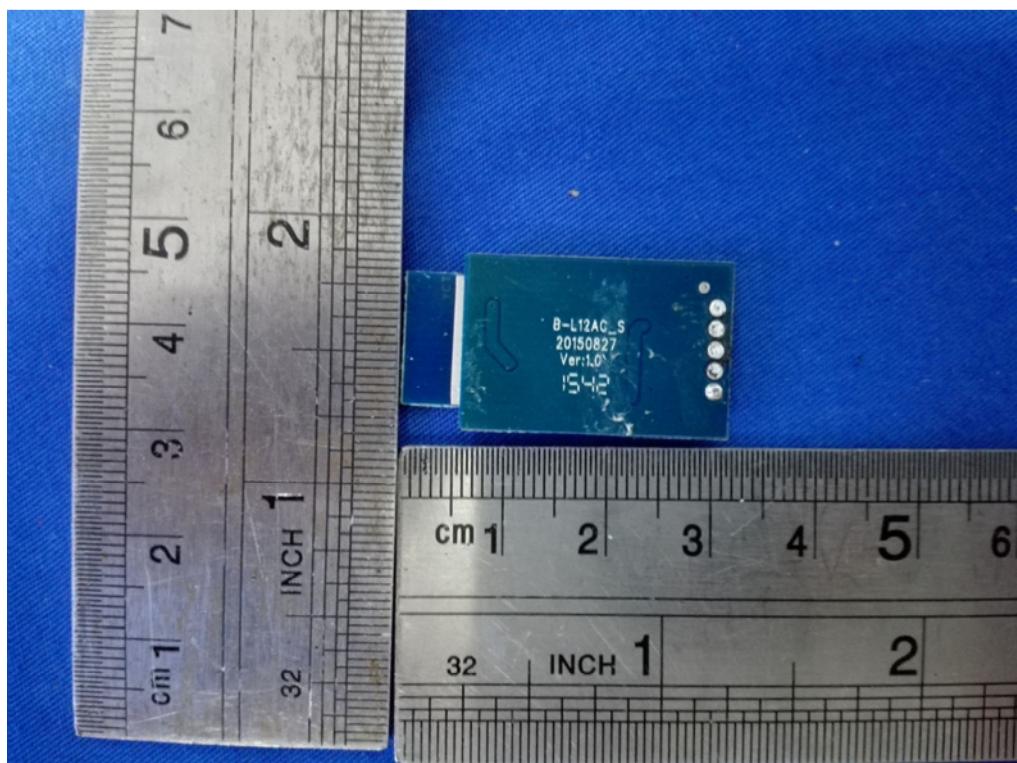
11. PHOTOGRAPHS OF THE EUT

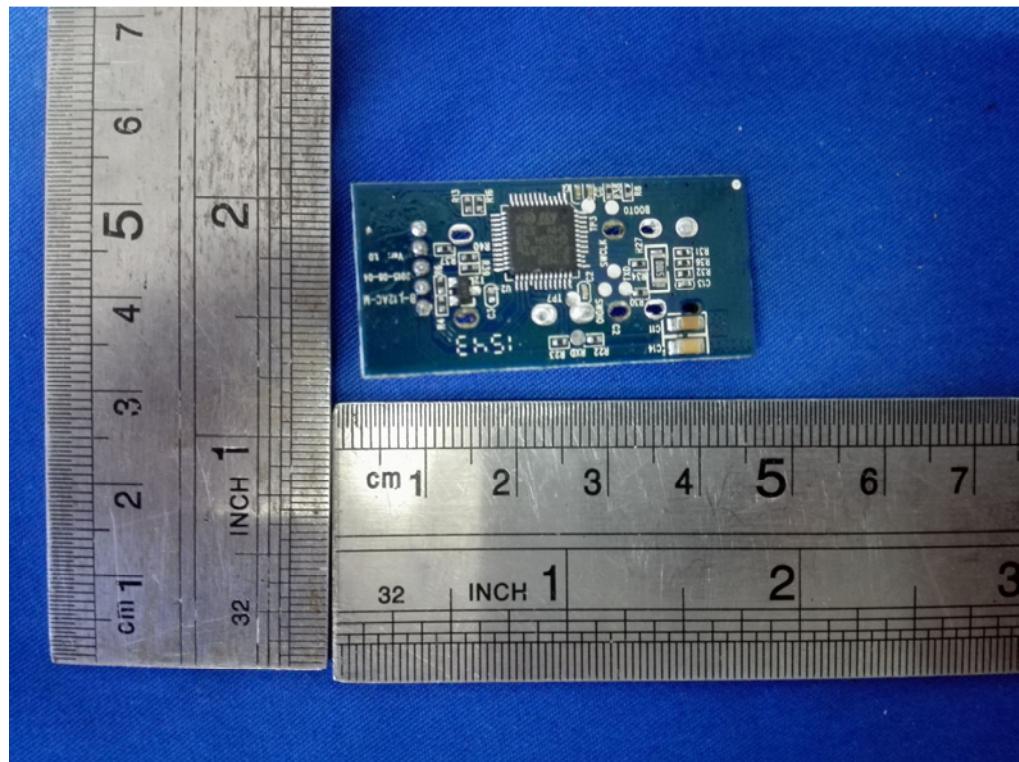












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