

## FCC CERTIFICATION TEST REPORT

### FOR

|                             |   |                                                                                        |
|-----------------------------|---|----------------------------------------------------------------------------------------|
| <b>Applicant</b>            | : | Dongguan Robstep Robot Co., Ltd.                                                       |
| <b>Address</b>              | : | #6 South Industrial Road, High-tech industrial park,<br>Songshan Lake, Dongguan, China |
| <b>Equipment under Test</b> | : | Robstep                                                                                |
| <b>Model No</b>             | : | M2                                                                                     |
| <b>Trade Mark</b>           | : | Robstep                                                                                |
| <b>FCC ID</b>               | : | ZO4-M2                                                                                 |
| <b>Manufacturer</b>         | : | Dongguan Robstep Robot Co., Ltd.                                                       |
| <b>Address</b>              | : | #6 South Industrial Road, High-tech industrial park,<br>Songshan Lake, Dongguan, China |

**Issued By: Dongguan Dongdian Testing Service Co., Ltd.**

**Add:** No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan City,  
Guangdong Province, China, 523808

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# REPORT

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## TEST REPORT DECLARE

|                             |   |                                                                                     |
|-----------------------------|---|-------------------------------------------------------------------------------------|
| <b>Applicant</b>            | : | Dongguan Robstep Robot Co., Ltd.                                                    |
| <b>Address</b>              | : | #6 South Industrial Road, High-tech industrial park, Songshan Lake, Dongguan, China |
| <b>Equipment under Test</b> | : | Robstep                                                                             |
| <b>Model No</b>             | : | M2                                                                                  |
| <b>Trade Mark</b>           | : | Robstep                                                                             |
| <b>Manufacturer</b>         | : | Dongguan Robstep Robot Co., Ltd.                                                    |
| <b>Address</b>              | : | #6 South Industrial Road, High-tech industrial park, Songshan Lake, Dongguan, China |

**Test Standard Used:**

FCC Rules and Regulations Part 15 Subpart C: 2014

**Test procedure used:**

ANSI C63.10:2013, ANSI C63.4:2014.

**We Declare:**

The equipment described above is tested by Dongguan Dongdian Testing Service Co., Ltd and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and Dongguan Dongdian Testing Service Co., Ltd is assumed of full responsibility for the accuracy and completeness of these tests.

**After test and evaluation, our opinion is that the equipment provided for test compliance with the requirement of the above FCC&IC standards.**

|                      |                           |                        |              |
|----------------------|---------------------------|------------------------|--------------|
| <b>Report No:</b>    | DDT-R15Q0306-2R8          |                        |              |
| <b>Date of Test:</b> | Apr. 2, 2015~Apr. 8, 2015 | <b>Date of Report:</b> | Apr. 8, 2015 |

**Prepared By:**

  
Leo Liu/Engineer

  
Kevin Feng/EMC Manager

Note: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Dongguan Dongdian Testing Service Co., Ltd.

## 1. Summary of test results

| Description of Test Item                         | Standard                                                                              | Results |
|--------------------------------------------------|---------------------------------------------------------------------------------------|---------|
| 20dB Bandwidth                                   | FCC Part 15: 15.215<br>ANSI C63.10 :2013<br>ANSI C63.4:2014                           | PASS    |
| Radiated Emission                                | FCC Part 15: 15.209<br>FCC Part 15: 15.249(d)<br>ANSI C63.10 :2013<br>ANSI C63.4:2014 | PASS    |
| Band Edge Compliance                             | FCC Part 15: 15.249(d)<br>ANSI C63.10 :2013<br>ANSI C63.4:2014                        | PASS    |
| Power Line Conducted Emissions                   | FCC Part 15: 15.207<br>ANSI C63.10 :2013<br>ANSI C63.4:2014                           | N/A     |
| Note: N/A is an abbreviation for Not Applicable. |                                                                                       |         |

## 2. General test information

### 2.1. Description of EUT

|                          |   |                                               |
|--------------------------|---|-----------------------------------------------|
| EUT* Name                | : | Robstep                                       |
| Model Number             | : | M2                                            |
| EUT function description | : | Please reference user manual of this device   |
| Power supply             | : | DC 72V built-in battery                       |
| Operation frequency      | : | 2402MHz -2480MHz                              |
| Modulation               | : | GFSK                                          |
| Data rate                | : | N/A                                           |
| Antenna Type             | : | Integrated PCB antenna, maximum PK gain: 0dBi |
| Date of Receipt          | : | 2015/4/2                                      |
| Sample Type              | : | Series production                             |

Note: EUT is the ab. of equipment under test.

### 2.2. Accessories of EUT

| Description of Accessories | Manufacturer | Model number or Type | Serial No. | Other |
|----------------------------|--------------|----------------------|------------|-------|
| /                          | /            | /                    | /          | /     |

### 2.3. Assistant equipment used for test

| Description of Assistant equipment | Manufacturer | Model number or Type | EMC Compliance | SN |
|------------------------------------|--------------|----------------------|----------------|----|
| /                                  | /            | /                    | /              | /  |

### 2.4. Block diagram of EUT configuration for test



Used to control EUT work in Continuous TX mode by key, and select test channel, wireless mode as blow table.

| Tested mode, information |                 |
|--------------------------|-----------------|
| Mode                     | Frequency (MHz) |
| Tx Mode                  | 2402            |
|                          | 2442            |
|                          | 2480            |

## 2.5. Test environment conditions

During the measurement the environmental conditions were within the listed ranges:

|                    |           |
|--------------------|-----------|
| Temperature range: | 21-25℃    |
| Humidity range:    | 40-75%    |
| Pressure range:    | 86-106kPa |

## 2.6. Test laboratory

Dongguan Dongdian Testing Service Co., Ltd

Add: No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan City, Guangdong

Province, China, 523808 Tel: +86-0769-22891499 <http://www.dgddt.com>

FCC Registration Number: 270092

## 2.7. Measurement uncertainty

| Test Item                                                  | Uncertainty           |
|------------------------------------------------------------|-----------------------|
| Occupied Channel Bandwidth                                 | ±1%                   |
| Temperature                                                | ±0.2℃                 |
| Humidity                                                   | ±1%                   |
| DC and Low frequency voltage                               | ±0.5%                 |
| Uncertainty for Radiation Emission test<br>(30MHz-1GHz)    | 3.14 dB (Polarize: V) |
|                                                            | 3.16 dB (Polarize: H) |
| Uncertainty for Radiation Emission test<br>(1GHz to 25GHz) | 2.08dB(Polarize: V)   |
|                                                            | 2.56dB (Polarize: H)  |
| Uncertainty for Conduction emission test                   | 2.44dB                |
| Uncertainty for Radiation Emission test (150KHz-30MHz)     | 3.21dB                |

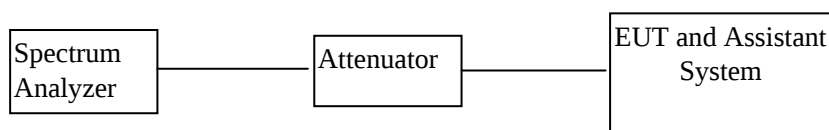
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

### 3. 20dB Bandwidth

#### 3.1. Test equipment

| Item | Equipment         | Manufacturer  | Model No.   | Serial No.   | Last Cal.  | Cal. Interval |
|------|-------------------|---------------|-------------|--------------|------------|---------------|
| 1    | Spectrum analyzer | R&S           | FSU         | 1166.1660.26 | 2014/10/25 | 1 Year        |
| 2    | Attenuator        | Mini-Circuits | BW-S10W2    | 101109       | 2014/10/25 | 1 Year        |
| 3    | RF Cable          | Micable       | C10-01-01-1 | 100309       | 2014/10/25 | 1 Year        |

#### 3.2. Block diagram of test setup



#### 3.3. Limits

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in § 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

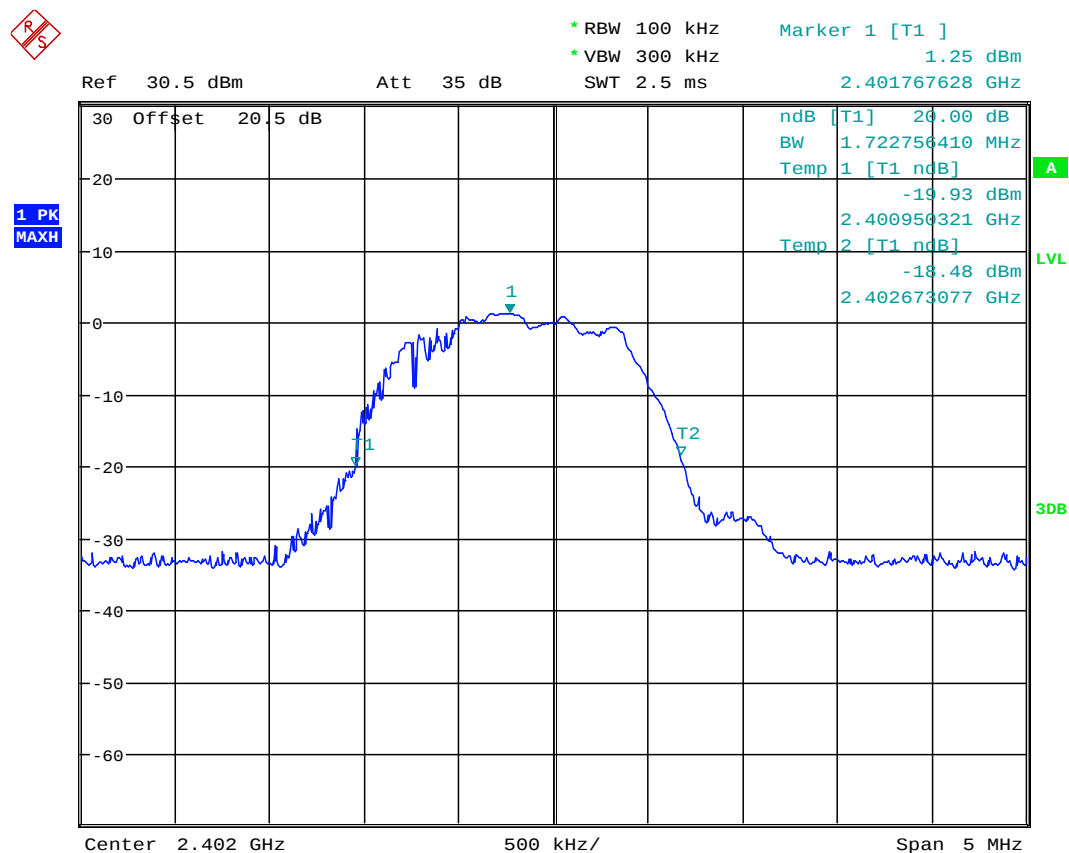
#### 3.4. Test Procedure

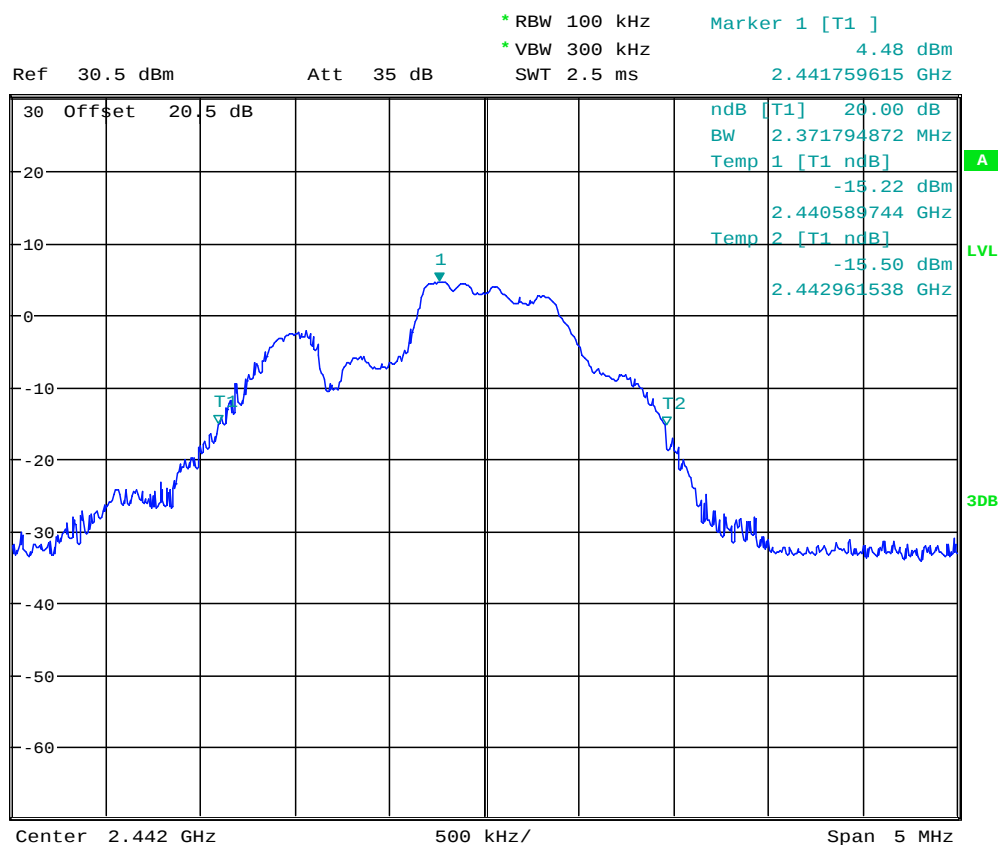
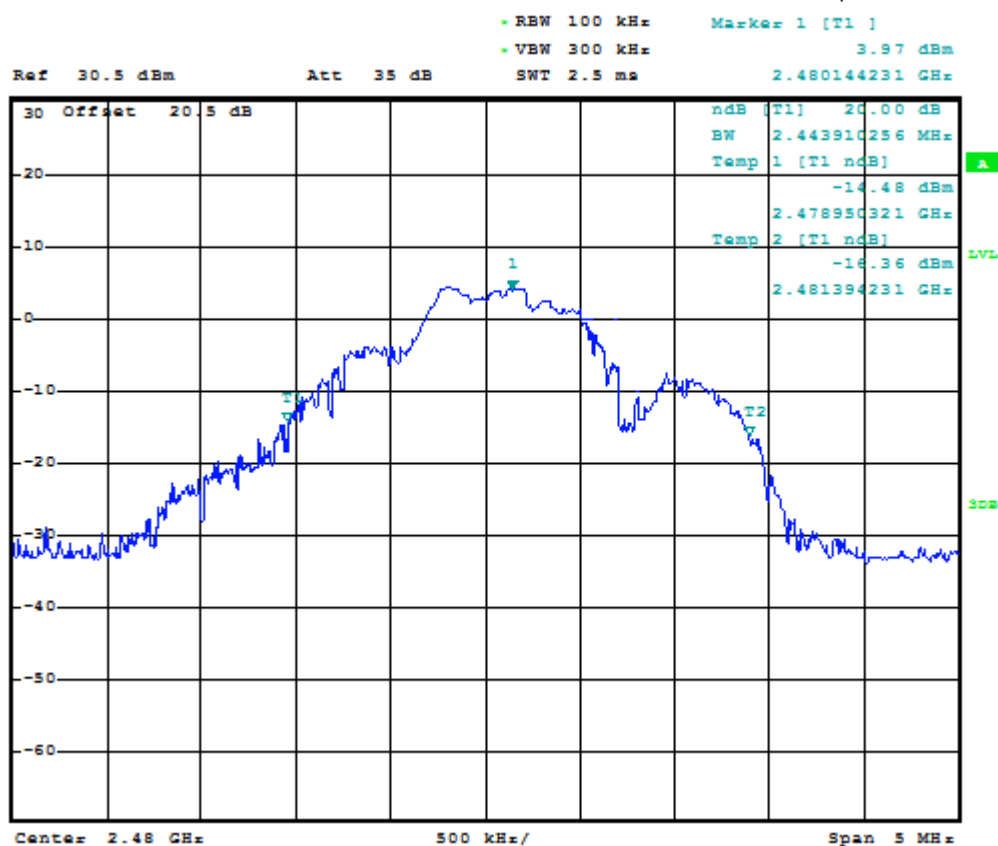
- (1) Configure EUT and assistant system according clause 2.4 and 4.2.
- (2) Connect EUT's antenna output to spectrum analyzer by RF cable.
- (3) Configure EUT work in test mode as stated in clause 2.4.
- (4) The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100 kHz RBW and 300 kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

### 3.5. Test Result

| EUT: Robstep M/N: M2 |            |                             |                            |                    |              |            |
|----------------------|------------|-----------------------------|----------------------------|--------------------|--------------|------------|
| Mode                 | Freq (MHz) | 20dB bandwidth Result (MHz) | 99% bandwidth Result (MHz) | Limit (MHz)        | Margin (MHz) | Conclusion |
| Tx mode              | 2402       | 1.723                       | /                          | /                  | /            | PASS       |
|                      | 2442       | 2.372                       | /                          | /                  | /            | PASS       |
|                      | 2480       | 2.444                       | /                          | /                  | /            | PASS       |
| Test Date : 2015/4/7 |            |                             |                            | Test Engineer: Leo |              |            |

### 3.6. Original test data



1 PK  
MAXH1 PK  
MAXH

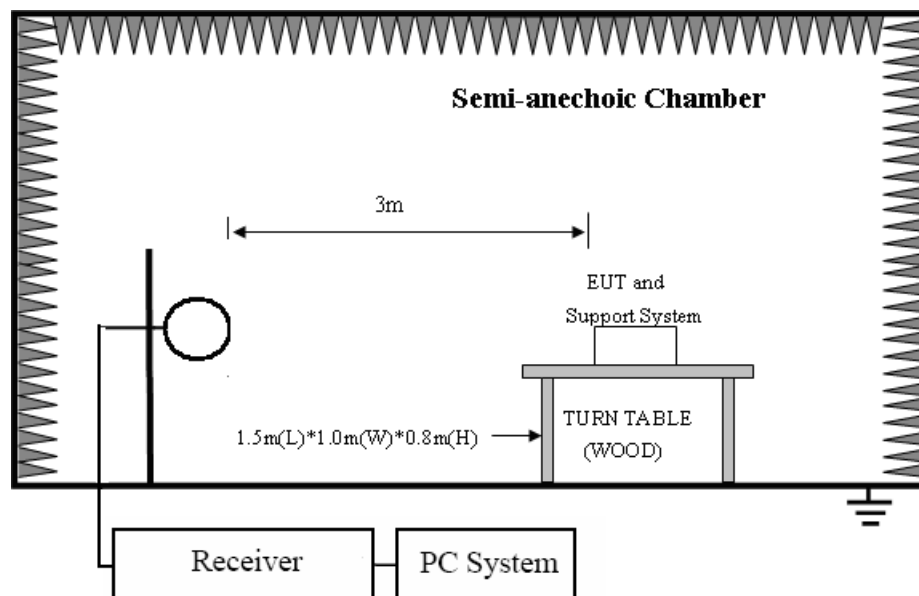
## 4. Radiated emission

### 4.1. Test equipment

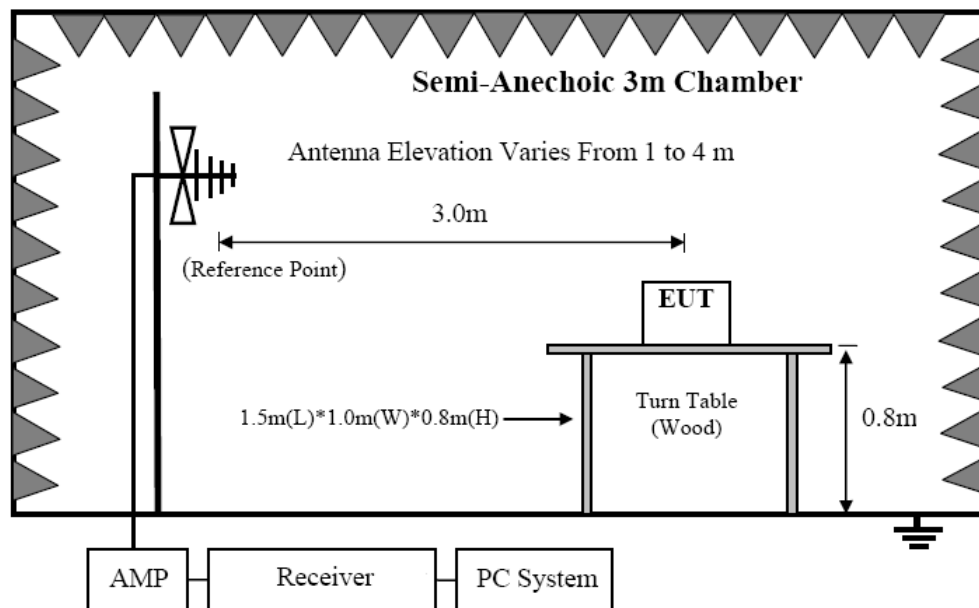
| Item | Equipment                  | Manufacturer | Model No.  | Serial No.   | Last Cal.  | Cal. Interval |
|------|----------------------------|--------------|------------|--------------|------------|---------------|
| 1    | EMI Test Receiver          | R&S          | ESU8       | 100316       | 2014/10/25 | 1 Year        |
| 2    | Spectrum analyzer          | R&S          | FSU        | 1166.1660.26 | 2014/10/25 | 1 Year        |
| 3    | Loop antenna               | TESEQ        | HLA6120    | 20129        | 2014/04/12 | 1 Year        |
| 4    | Trilog Broadband Antenna   | Schwarzbeck  | VULB9163   | 9163-462     | 2014/04/12 | 1 Year        |
| 5    | Double Ridged Horn Antenna | R&S          | HF907      | 100276       | 2014/04/12 | 1 Year        |
| 6    | Horn Antenna               | EMCO         | 3116       | 00060095     | 2014/04/12 | 1 Year        |
| 7    | Pre-amplifier              | A.H.         | PAM-1840VH | 562          | 2014/10/25 | 1 Year        |
| 8    | RF Cable                   | R&S          | R01        | 10403        | 2014/10/25 | 1 Year        |
| 9    | RF Cable                   | R&S          | R02        | 10512        | 2014/10/25 | 1 Year        |
| 10   | Testing software           | Audix        | E3         | 6.111111     | /          | /             |

### 4.2. Block diagram of test setup

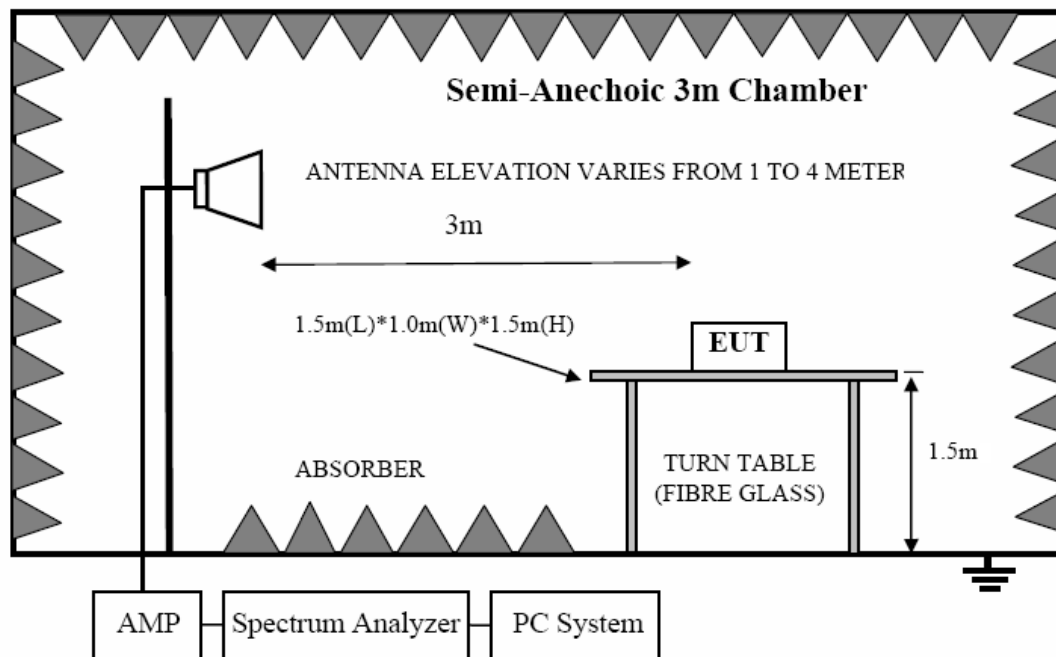
In 3m Anechoic Chamber Test Setup Diagram for 9KHz-30MHz



In 3m Anechoic Chamber Test Setup Diagram for below 1GHz



In 3m Anechoic Chamber Test Setup Diagram for frequency above 1GHz



Note: For harmonic emissions test a appropriate high pass filter was inserted in the input port of AMP.

#### 4.3. Limit

##### 8.3.1 FCC 15.205 Restricted frequency band

| MHz                        | MHz                   | MHz             | GHz              |
|----------------------------|-----------------------|-----------------|------------------|
| 0.090 - 0.110              | 16.42 - 16.423        | 399.9 - 410     | 4.5 - 5.15       |
| <sup>1</sup> 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     | ( <sup>2</sup> ) |

##### 8.3.2 FCC 15.209 Limit.

| FREQUENCY<br>MHz | DISTANCE<br>Meters | FIELD STRENGTHS LIMIT                           |               |
|------------------|--------------------|-------------------------------------------------|---------------|
|                  |                    | μV/m                                            | dB(μV)/m      |
| 0.009 ~ 0.490    | 300                | 2400/F(KHz)                                     | 67.6-20log(F) |
| 0.490 ~ 1.705    | 30                 | 24000/F(KHz)                                    | 87.6-20log(F) |
| 1.705 ~ 30.0     | 30                 | 30                                              | 29.54         |
| 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)<br>54.0 dB(μV)/m (Average) |               |

Note: (1)The emission limits shown in the above table are based on measurements employing a CISPR QP detector except for the frequency bands 9-90KHz, 110-490KHz and above 1000MHz. Radiated emissions limits in these three bands are based on measurements employing an average detector.

(2) At frequencies below 30MHz, measurement may be performed at a distance closer then that specified, and the limit at closer measurement distance can be extrapolated by below formula:

$$\text{Limit}_{3m}(\text{dBuV/m}) = \text{Limit}_{30m}(\text{dBuV/m}) + 40\text{Log}(30m/3m)$$

##### 8.3.3 Limit for this EUT

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.

#### 4.4. Test Procedure

- (1) EUT height should be 0.8m for below 1GHz at a semi - anechoic chamber while EUT height should be 1.5m for above 1GHz at full chamber or semi - anechoic chamber ground with absorbers.
- (2) Setup EUT and assistant system according clause 2.4 and 8.2
- (3) Test antenna was located 1m/3m from the EUT on an adjustable mast, and the antenna used as below table:

| Test frequency range | Test antenna used                      | Test distance |
|----------------------|----------------------------------------|---------------|
| 9KHz-30MHz           | Active Loop antenna                    | 3 m           |
| 30MHz-1GHz           | Trilog Broadband Antenna               | 3 m           |
| 1GHz-18GHz           | Double Ridged Horn Antenna(1GHz-18GHz) | 3 m           |
| 18GHz-40GHz          | Horn Antenna(18GHz-40GHz)              | 1 m           |

According ANSI C63.10:2013 clause 6.4.4.2 and 6.5.3, for measurements below 30 MHz, the loop antenna was positioned with its plane vertical from the EUT and rotated about its vertical axis for maximum response at each azimuth position around the EUT. And the loop antenna also be positioned with its plane horizontal at the specified distance from the EUT. The center of the loop is 1 m above the ground. for measurement above 30MHz, the Trilog Broadband Antenna or Horn Antenna was located 3m from EUT, Measurements were made with the antenna positioned in both the horizontal and vertical planes of Polarization, and the measurement antenna was varied from 1 m to 4 m. in height above the reference ground plane to obtain the maximum signal strength.

- (4) Below pre-scan procedure was first performed in order to find prominent frequency spectrum radiated emissions from 9KHz to 25GHz:

- (a) Scanning the peak frequency spectrum with the antenna specified in step (3), and the EUT was rotated 360 degree, the antenna height was varied from 1m to 4m(Except loop antenna, it's fixed 1m above ground.)

- (b) Change work frequency or channel of device if practicable.

- (c) Change modulation type of device if practicable.

- (d) Change power supply range from 85% to 115% of the rated supply voltage

- (e) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions.

Spectrum frequency from 9KHz to 25GHz (tenth harmonic of fundamental frequency) was investigated, and no any obvious emission were detected from 18GHz to 25GHz, so below final test was performed with frequency range from 9KHz to 18GHz.

- (5) For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to

ANSI C63.10 2013 on Radiated Emission test.

- (6) The emissions from 9KHz to 1GHz were measured based on CISPR QP detector except for the frequency bands 9-90KHz, 110-490KHz, for emissions from 9KHz-90KHz, 110KHz-490KHz and above 1GHz were measured based on average detector, for emissions above 1GHz, peak emissions also be measured and need comply with Peak limit.
- (7) The emissions from 9KHz to 1GHz, QP or average values were measured with EMI receiver with below RBW

| Frequency band | RBW    |
|----------------|--------|
| 9KHz-150KHz    | 200Hz  |
| 150KHz-30MHz   | 9KHz   |
| 30MHz-1GHz     | 120KHz |

- (8) For emissions above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 3MHz, VBW is set at 10MHz for Peak measure; RMS detector RBW 3MHz VBW 10MHz for Average measure (according ANSI C63.10:2013 clause 4.2.3.2.3 procedure for average measure).

#### 4.5. Test result

##### **PASS. (See below detailed test result)**

All the emissions except fundamental emission from 9 KHz to 25GHz were comply with 8.3.2 limit.

Note1: According exploratory test no any obvious emission were detected from 9KHz to 30MHz and 18GHz to 25GHz, so the final test was performed with frequency range from 30MHz to 18GHz and recorded in below.

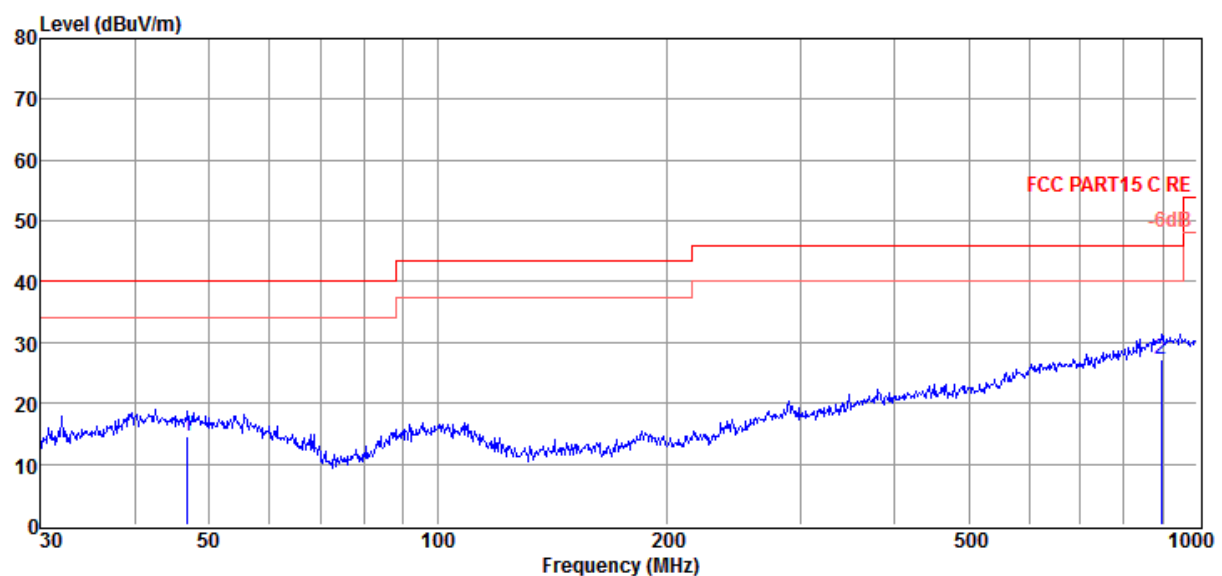
Note2: For emissions below 1GHz, according exploratory explorer test, when change Tx mode and channel, have no distinct influence on emissions level, so for emissions below 1GHz, the final test was only performed with EUT working in GFSK, Tx 2442MHz mode.

Note3: For emissions above 1GHz. If peak results comply with AV limit, AV Result is deemed to comply with AV limit.

## TR-4-E-009 Radiated Emission Test Result

**Test Site** : DDT 3m Chamber **E:\2015 Report Data\15Q0306-2\RE.EM6**  
**Test Date** : 2015/4/7 **Tested By** : Damon  
**EUT** : Robstep **Model Number** : M2  
**Power Supply** : DC 72V from battery **Test Mode** : TX mode  
**Condition** : Temp:24.5'C,Humi:55%,  
 Press:100.1kPa **Antenna/Distance** : 2014 VULB 9163/3m/VERTICAL  
**Memo** :

Data: 53



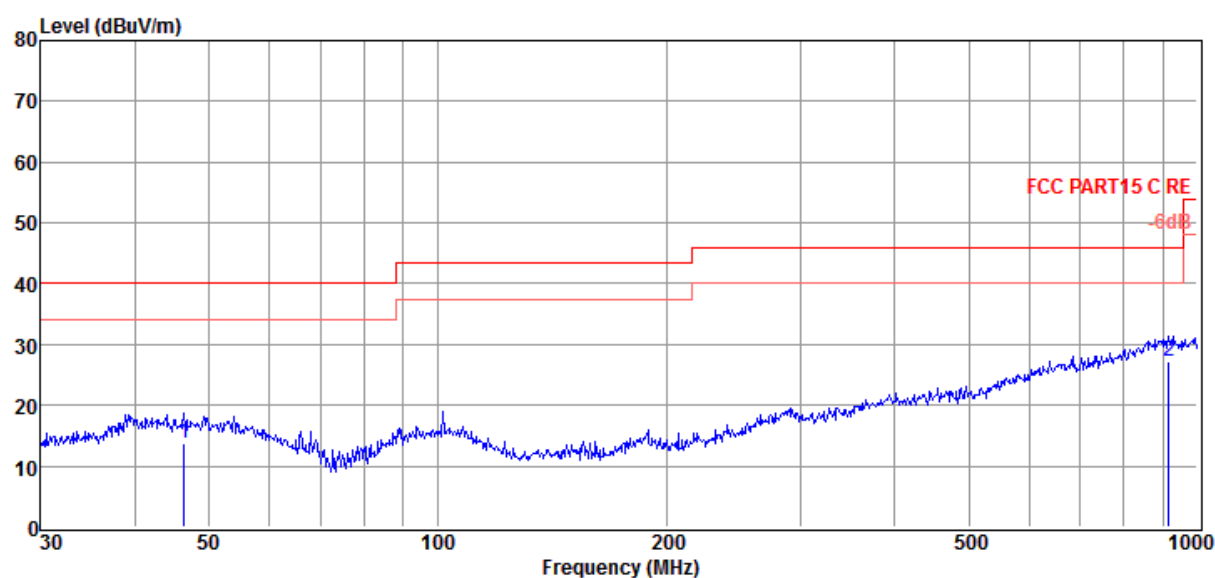
| Item<br>(Mark) | Freq<br>(MHz) | Read<br>Level<br>(dBμV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss<br>dB | Result<br>Level<br>(dBμV/m) | Limit<br>Line<br>(dBμV/m) | Over<br>Limit<br>(dB) | Detector | Polarization |
|----------------|---------------|-------------------------|-----------------------------|---------------------|-----------------------------|---------------------------|-----------------------|----------|--------------|
| 1              | 46.83         | -1.18                   | 14.70                       | 1.05                | 14.57                       | 40.00                     | -25.43                | QP       | VERTICAL     |
| 2              | 897.00        | 0.22                    | 22.07                       | 4.96                | 27.25                       | 46.00                     | -18.75                | QP       | VERTICAL     |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.  
 2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.  
 3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

|                     |                                           |                                                        |
|---------------------|-------------------------------------------|--------------------------------------------------------|
| <b>Test Site</b>    | : DDT 3m Chamber                          | <b>E:\2015 Report Data\15Q0306-2\RE.EM6</b>            |
| <b>Test Date</b>    | : 2015/4/7                                | <b>Tested By</b> : Damon                               |
| <b>EUT</b>          | : Robstep                                 | <b>Model Number</b> : M2                               |
| <b>Power Supply</b> | : DC 72V from battery                     | <b>Test Mode</b> : TX mode                             |
| <b>Condition</b>    | : Temp:24.5'C,Humi:55%,<br>Press:100.1kPa | <b>Antenna/Distance</b> : 2014 VULB 9163/3m/HORIZONTAL |
| <b>Memo</b>         | :                                         |                                                        |

Data: 54



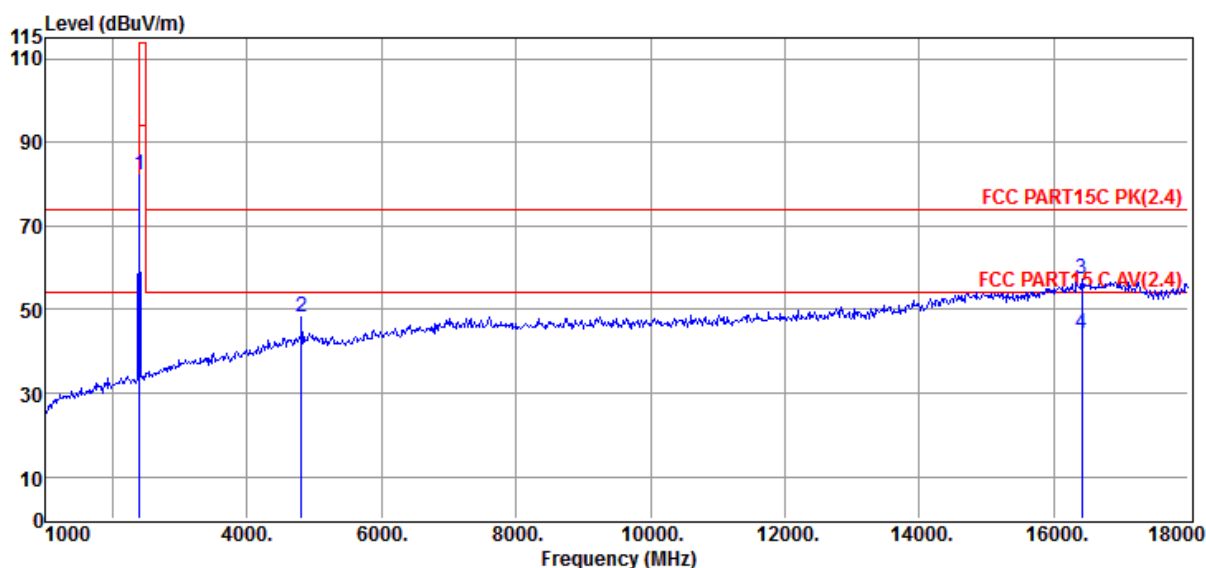
| Item<br>(Mark) | Freq<br>(MHz) | Read<br>Level<br>(dBμV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss<br>dB | Result<br>Level<br>(dBμV/m) | Limit<br>Line<br>(dBμV/m) | Over<br>Limit<br>(dB) | Detector | Polarization |
|----------------|---------------|-------------------------|-----------------------------|---------------------|-----------------------------|---------------------------|-----------------------|----------|--------------|
| 1              | 46.34         | -2.08                   | 14.70                       | 1.04                | 13.66                       | 40.00                     | -26.34                | QP       | HORIZONTAL   |
| 2              | 916.07        | 0.36                    | 21.99                       | 4.97                | 27.32                       | 46.00                     | -18.68                | QP       | HORIZONTAL   |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.  
 2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.  
 3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

**Test Site** : DDT 3m Chamber **E:** \2015 Report Data\15Q0306-2\RF.EM6  
**Test Date** : 2015-04-03 **Tested By** : Damon  
**EUT** : Robstep **Model Number** : M2  
**Power Supply** : DC 72V from battery **Test Mode** : TX 2402MHz  
**Condition** : Temp:24.5'C,Humi:55%,  
 Press:100.1kPa **Antenna/Distance** : 2014 HF907/3m/VERTICAL  
**Memo** :

Data: 41



| Item<br>(Mark) | Freq<br>(MHz) | Read<br>Level<br>(dBuV) | Antenna<br>Factor<br>(dB/m) | PRM<br>Factor<br>dB | Cable<br>Loss<br>dB | Result<br>Level<br>(dBuV/m) | Limit<br>Line<br>(dBuV/m) | Over<br>Limit<br>(dB) | Detector | Polarization |
|----------------|---------------|-------------------------|-----------------------------|---------------------|---------------------|-----------------------------|---------------------------|-----------------------|----------|--------------|
| 1              | 2402.00       | 74.26                   | 29.99                       | 30.21               | 8.35                | 82.39                       | 114.00                    | -31.61                | Peak     | VERTICAL     |
| 2              | 4804.00       | 29.75                   | 35.40                       | 29.13               | 12.07               | 48.09                       | 74.00                     | -25.91                | Peak     | VERTICAL     |
| 3              | 16419.00      | 25.91                   | 43.60                       | 36.62               | 24.30               | 57.19                       | 74.00                     | -16.81                | Peak     | VERTICAL     |
| 4              | 16419.00      | 13.11                   | 43.60                       | 36.62               | 24.30               | 44.39                       | 54.00                     | -9.61                 | Average  | VERTICAL     |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.

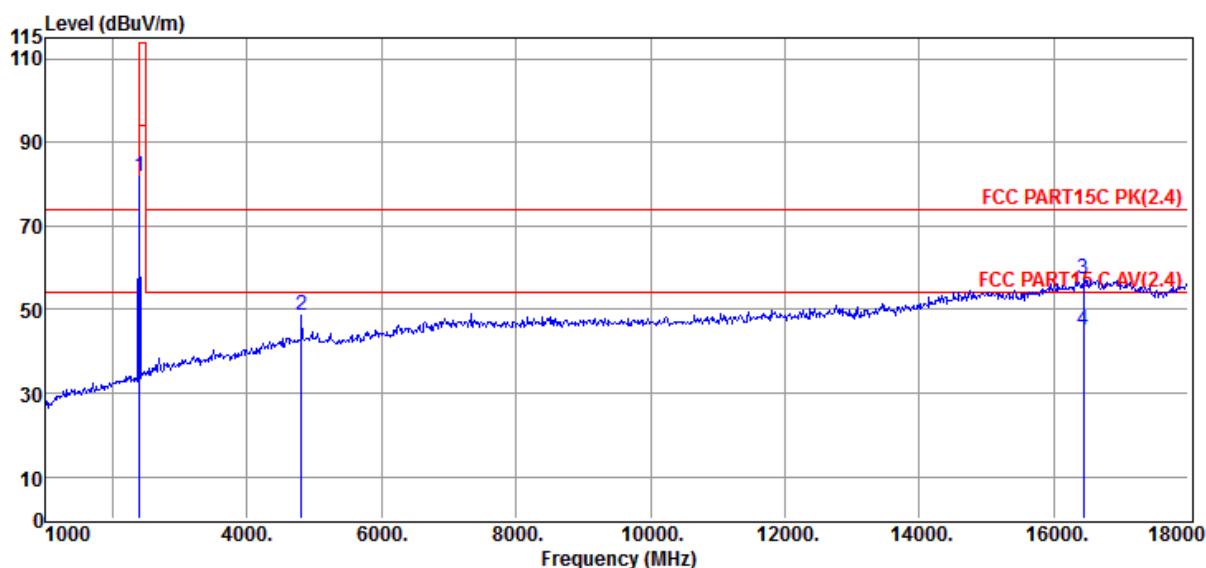
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

**Test Site** : DDT 3m Chamber **E:\2015 Report Data\15Q0306-2\RF.EM6**  
**Test Date** : 2015-04-03 **Tested By** : Damon  
**EUT** : Robstep **Model Number** : M2  
**Power Supply** : DC 72V from battery **Test Mode** : TX 2402MHz  
**Condition** : Temp:24.5'C,Humi:55%,  
 Press:100.1kPa **Antenna/Distance** : 2014 HF907/3m/HORIZONTAL  
**Memo** :

Data: 42



| Item<br>(Mark) | Freq<br>(MHz) | Read<br>Level<br>(dBuV) | Antenna<br>Factor<br>(dB/m) | PRM<br>Factor<br>dB | Cable<br>Loss<br>dB | Result<br>Level<br>(dBuV/m) | Limit<br>Line<br>(dBuV/m) | Over<br>Limit<br>(dB) | Detector | Polarization |
|----------------|---------------|-------------------------|-----------------------------|---------------------|---------------------|-----------------------------|---------------------------|-----------------------|----------|--------------|
| 1              | 2402.00       | 73.57                   | 29.99                       | 30.21               | 8.35                | 81.70                       | 114.00                    | -32.30                | Peak     | HORIZONTAL   |
| 2              | 4804.00       | 30.39                   | 35.40                       | 29.13               | 12.07               | 48.73                       | 74.00                     | -25.27                | Peak     | HORIZONTAL   |
| 3              | 16436.00      | 25.81                   | 43.62                       | 36.62               | 24.40               | 57.21                       | 74.00                     | -16.79                | Peak     | HORIZONTAL   |
| 4              | 16436.00      | 13.52                   | 43.62                       | 36.62               | 24.40               | 44.92                       | 54.00                     | -9.08                 | Average  | HORIZONTAL   |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.

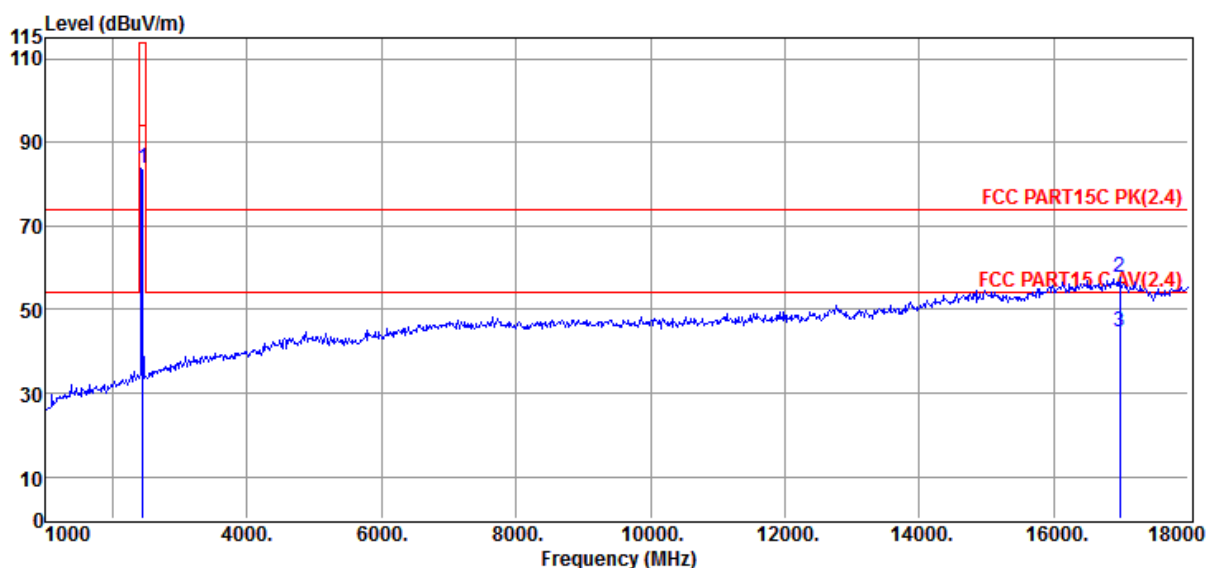
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

**Test Site** : DDT 3m Chamber **E:\2015 Report Data\15Q0306-2\RF.EM6**  
**Test Date** : 2015-04-03 **Tested By** : Damon  
**EUT** : Robstep **Model Number** : M2  
**Power Supply** : DC 72V from battery **Test Mode** : TX 2442MHz  
**Condition** : Temp:24.5'C,Humi:55%,  
 Press:100.1kPa **Antenna/Distance** : 2014 HF907/3m/HORIZONTAL  
**Memo** :

Data: 45



| Item<br>(Mark) | Freq<br>(MHz) | Read<br>Level<br>(dBμV) | Antenna<br>Factor<br>(dB/m) | PRM<br>Factor<br>dB | Cable<br>Loss<br>dB | Result<br>Level<br>(dBμV/m) | Limit<br>Line<br>(dBμV/m) | Over<br>Limit<br>(dB) | Detector | Polarization |
|----------------|---------------|-------------------------|-----------------------------|---------------------|---------------------|-----------------------------|---------------------------|-----------------------|----------|--------------|
| 1              | 2442.00       | 75.51                   | 30.14                       | 30.23               | 8.40                | 83.82                       | 114.00                    | -30.18                | Peak     | HORIZONTAL   |
| 2              | 16980.00      | 25.39                   | 43.60                       | 36.99               | 25.60               | 57.60                       | 74.00                     | -16.40                | Peak     | HORIZONTAL   |
| 3              | 16980.00      | 12.33                   | 43.60                       | 36.99               | 25.60               | 44.54                       | 54.00                     | -9.46                 | Average  | HORIZONTAL   |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.

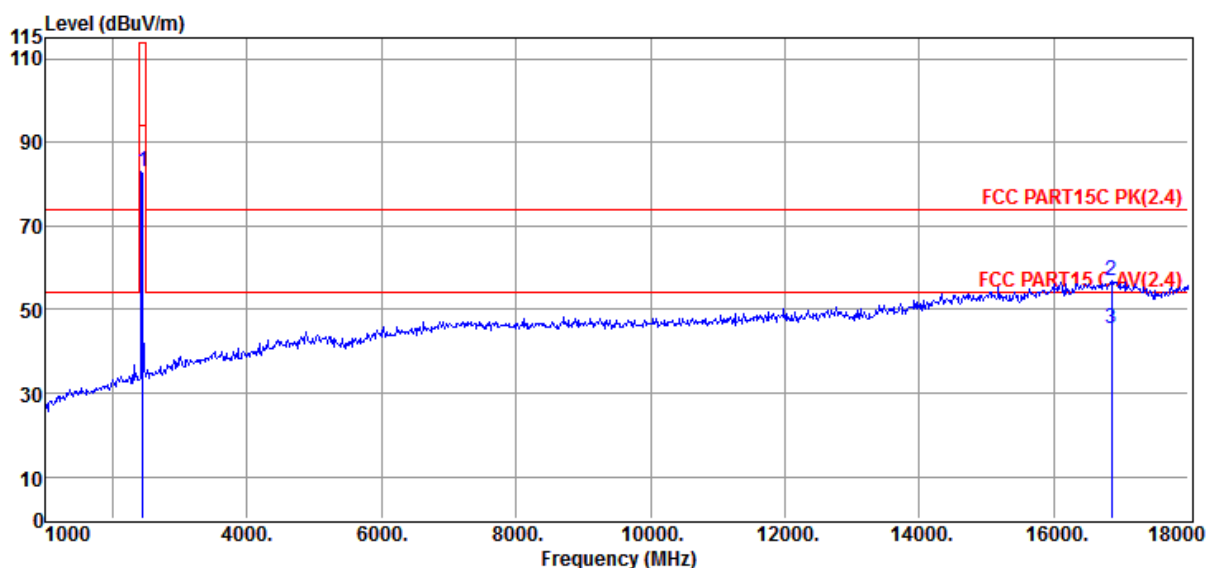
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

**Test Site** : DDT 3m Chamber **E:\2015 Report Data\15Q0306-2\RF.EM6**  
**Test Date** : 2015-04-03 **Tested By** : Damon  
**EUT** : Robstep **Model Number** : M2  
**Power Supply** : DC 72V from battery **Test Mode** : TX 2442MHz  
**Condition** : Temp:24.5'C,Humi:55%,  
 Press:100.1kPa **Antenna/Distance** : 2014 HF907/3m/VERTICAL  
**Memo** :

Data: 46



| Item<br>(Mark) | Freq<br>(MHz) | Read<br>Level<br>(dBuV) | Antenna<br>Factor<br>(dB/m) | PRM<br>Factor<br>dB | Cable<br>Loss<br>dB | Result<br>Level<br>(dBuV/m) | Limit<br>Line<br>(dBuV/m) | Over<br>Limit<br>(dB) | Detector | Polarization |
|----------------|---------------|-------------------------|-----------------------------|---------------------|---------------------|-----------------------------|---------------------------|-----------------------|----------|--------------|
| 1              | 2442.00       | 74.54                   | 30.14                       | 30.23               | 8.40                | 82.85                       | 114.00                    | -31.15                | Peak     | VERTICAL     |
| 2              | 16861.00      | 24.37                   | 43.63                       | 36.88               | 25.60               | 56.72                       | 74.00                     | -17.28                | Peak     | VERTICAL     |
| 3              | 16861.00      | 13.23                   | 43.63                       | 36.88               | 25.60               | 45.58                       | 54.00                     | -8.42                 | Average  | VERTICAL     |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.

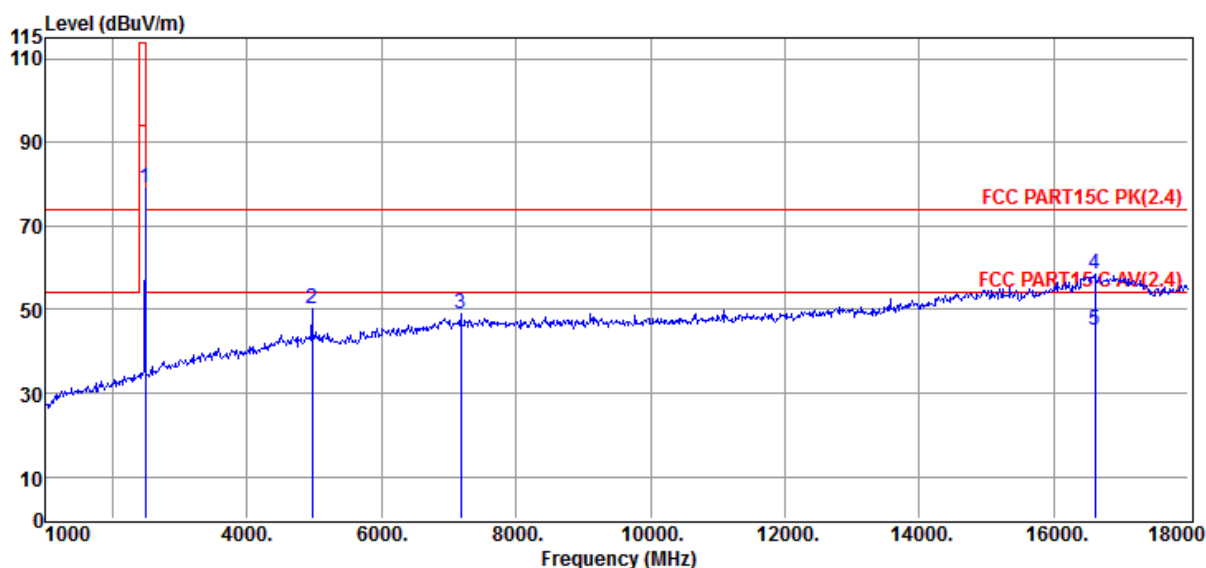
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

**Test Site** : DDT 3m Chamber **E:** \2015 Report Data\15Q0306-2\RF.EM6  
**Test Date** : 2015-04-03 **Tested By** : Damon  
**EUT** : Robstep **Model Number** : M2  
**Power Supply** : DC 72V from battery **Test Mode** : TX 2480MHz  
**Condition** : Temp:24.5'C,Humi:55%,  
 Press:100.1kPa **Antenna/Distance** : 2014 HF907/3m/HORIZONTAL  
**Memo** :

Data: 48



| Item<br>(Mark) | Freq<br>(MHz) | Read<br>Level<br>(dBμV) | Antenna<br>Factor<br>(dB/m) | PRM<br>Factor<br>dB | Cable<br>Loss<br>dB | Result<br>Level<br>(dBμV/m) | Limit<br>Line<br>(dBμV/m) | Over<br>Limit<br>(dB) | Detector | Polarization |
|----------------|---------------|-------------------------|-----------------------------|---------------------|---------------------|-----------------------------|---------------------------|-----------------------|----------|--------------|
| 1              | 2480.00       | 70.59                   | 30.25                       | 30.25               | 8.50                | 79.09                       | 114.00                    | -34.91                | Peak     | HORIZONTAL   |
| 2              | 4960.00       | 31.68                   | 35.64                       | 29.04               | 12.02               | 50.30                       | 74.00                     | -23.70                | Peak     | HORIZONTAL   |
| 3              | 7171.00       | 26.31                   | 37.20                       | 29.62               | 15.18               | 49.07                       | 74.00                     | -24.93                | Peak     | HORIZONTAL   |
| 4              | 16606.00      | 27.00                   | 43.68                       | 36.72               | 24.40               | 58.36                       | 74.00                     | -15.64                | Peak     | HORIZONTAL   |
| 5              | 16606.00      | 13.53                   | 43.68                       | 36.72               | 24.40               | 44.89                       | 54.00                     | -9.11                 | Average  | HORIZONTAL   |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.

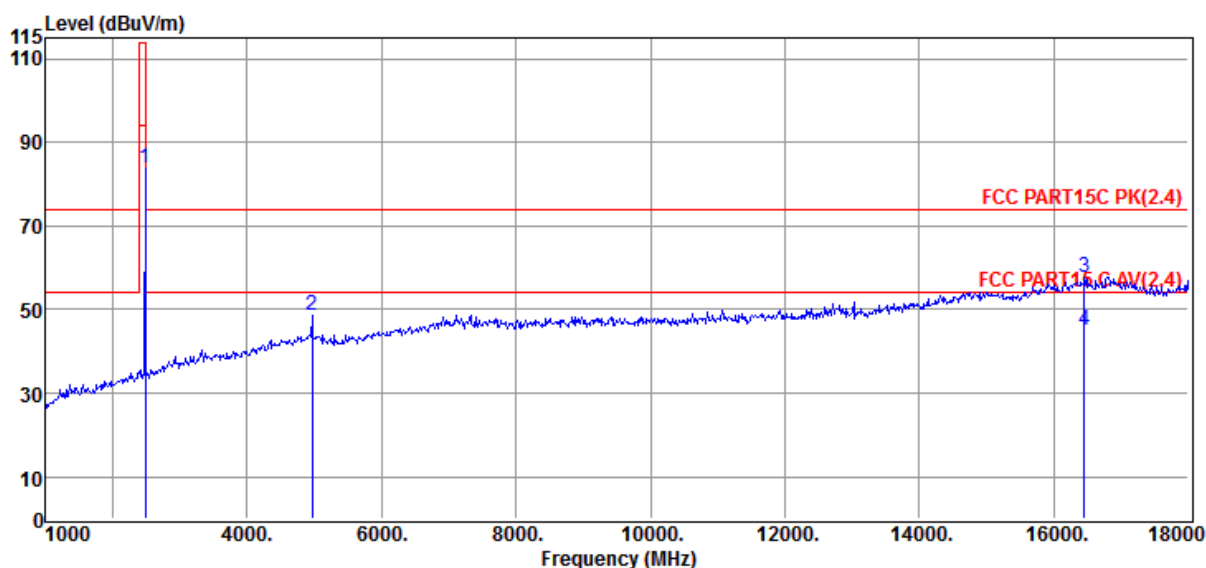
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

**Test Site** : DDT 3m Chamber **E:** \2015 Report Data\15Q0306-2\RF.EM6  
**Test Date** : 2015-04-03 **Tested By** : Damon  
**EUT** : Robstep **Model Number** : M2  
**Power Supply** : DC 72V from battery **Test Mode** : TX 2480MHz  
**Condition** : Temp:24.5'C,Humi:55%,  
 Press:100.1kPa **Antenna/Distance** : 2014 HF907/3m/VERTICAL  
**Memo** :

Data: 49



| Item<br>(Mark) | Freq<br>(MHz) | Read<br>Level<br>(dBuV) | Antenna<br>Factor<br>(dB/m) | PRM<br>Factor<br>dB | Cable<br>Loss<br>dB | Result<br>Level<br>(dBuV/m) | Limit<br>Line<br>(dBuV/m) | Over<br>Limit<br>(dB) | Detector | Polarization |
|----------------|---------------|-------------------------|-----------------------------|---------------------|---------------------|-----------------------------|---------------------------|-----------------------|----------|--------------|
| 1              | 2480.00       | 75.37                   | 30.25                       | 30.25               | 8.50                | 83.87                       | 114.00                    | -30.13                | Peak     | VERTICAL     |
| 2              | 4960.00       | 29.86                   | 35.64                       | 29.04               | 12.02               | 48.48                       | 74.00                     | -25.52                | Peak     | VERTICAL     |
| 3              | 16453.00      | 26.17                   | 43.64                       | 36.63               | 24.40               | 57.58                       | 74.00                     | -16.42                | Peak     | VERTICAL     |
| 4              | 16453.00      | 13.52                   | 43.64                       | 36.63               | 24.40               | 44.93                       | 54.00                     | -9.07                 | Average  | VERTICAL     |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

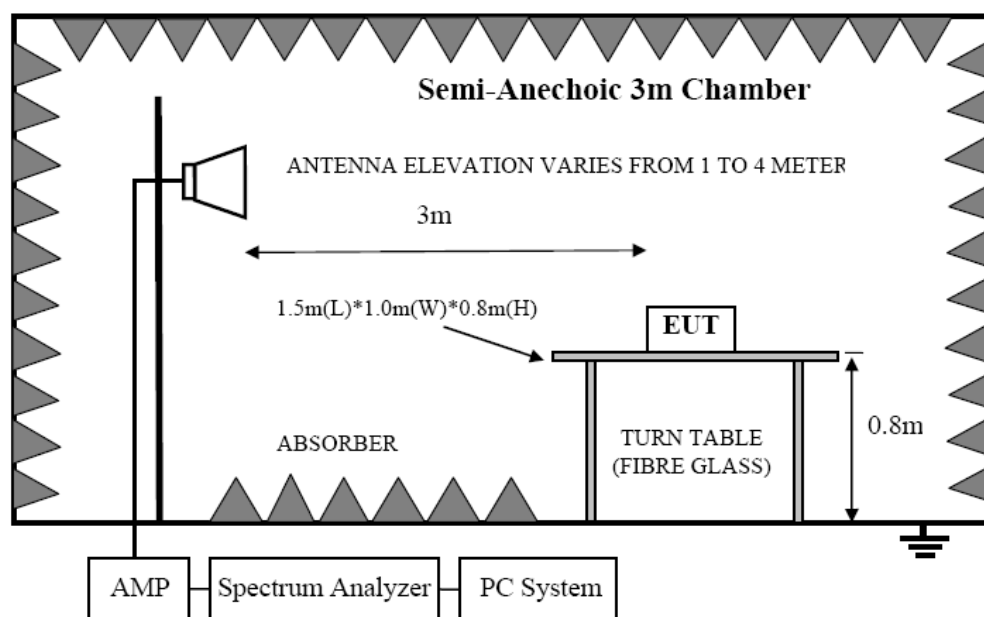
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

## 5. Band Edge Compliance (radiated method)

### 5.1. Test equipment

| Item | Equipment                  | Manufacturer | Model No. | Serial No.   | Last Cal.  | Cal. Interval |
|------|----------------------------|--------------|-----------|--------------|------------|---------------|
| 1    | EMI Test Receiver          | R&S          | ESU8      | 100316       | 2014/10/25 | 1 Year        |
| 2    | Spectrum analyzer          | R&S          | FSU       | 1166.1660.26 | 2014/10/25 | 1 Year        |
| 3    | Trilog Broadband Antenna   | Schwarzbeck  | VULB9163  | 9163-462     | 2014/04/12 | 1 Year        |
| 4    | Double Ridged Horn Antenna | R&S          | HF907     | 100276       | 2014/04/12 | 1 Year        |
| 5    | Pre-amplifier              | A.H.         | PAM0-0118 | 360          | 2014/10/25 | 1 Year        |
| 6    | RF Cable                   | R&S          | R01       | 10403        | 2014/10/25 | 1 Year        |
| 7    | RF Cable                   | R&S          | R02       | 10512        | 2014/10/25 | 1 Year        |
| 8    | Testing software           | Audix        | E3        | 6.111111     | /          | /             |

### 5.2. Block diagram of test setup



### 5.3. Limit

All restriction band should comply with 15.209, other emission should be at least 20dB below the fundamental.

### 5.4. Test Procedure

Same with clause 4.4 except change investigated frequency range from 2310MHz to 2415MHz and 2475MHz to 2500MHz.

Remark: All restriction band have been tested, and only the worse case is shown in report.

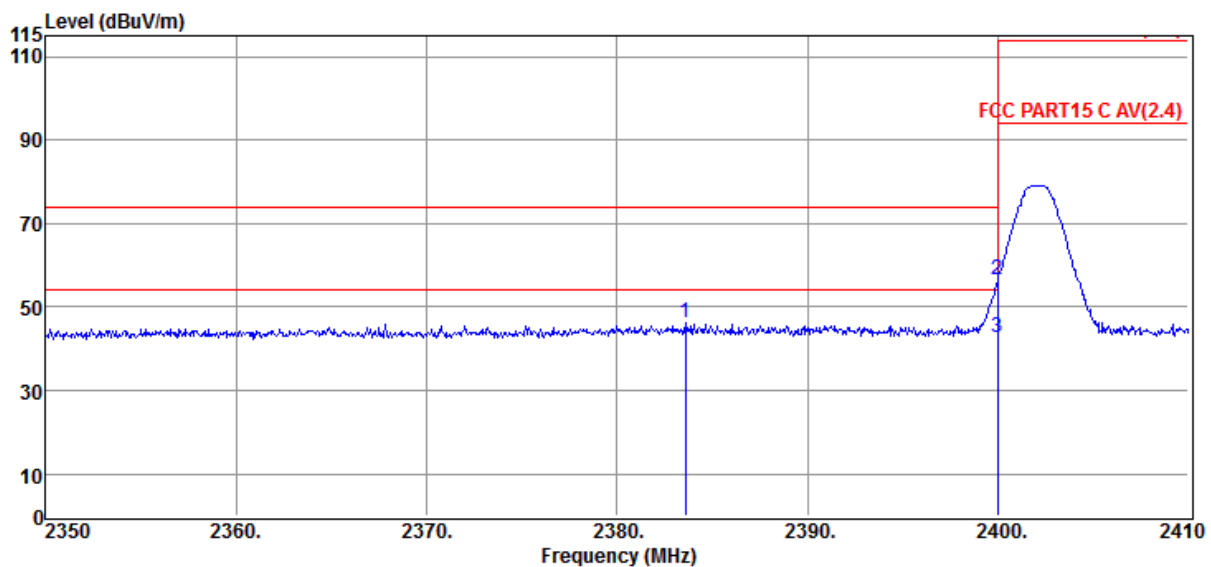
## 5.5. Test result

PASS. (See below detailed test result)

# TR-4-E-009 Radiated Emission Test Result

|                     |                                           |                                                    |
|---------------------|-------------------------------------------|----------------------------------------------------|
| <b>Test Site</b>    | : DDT 3m Chamber                          | <b>E:\2015 Report Data\15Q0306-2\RF.EM6</b>        |
| <b>Test Date</b>    | : 2015-04-03                              | <b>Tested By</b> : Damon                           |
| <b>EUT</b>          | : Robstep                                 | <b>Model Number</b> : M2                           |
| <b>Power Supply</b> | : DC 72V from battery                     | <b>Test Mode</b> : TX 2402MHz                      |
| <b>Condition</b>    | : Temp:24.5'C,Humi:55%,<br>Press:100.1kPa | <b>Antenna/Distance</b> : 2014 HF907/3m/HORIZONTAL |
| <b>Memo</b>         | :                                         |                                                    |

Data: 43



| Item<br>(Mark) | Freq<br>(MHz) | Read<br>Level<br>(dBμV) | Antenna<br>Factor<br>(dB/m) | PRM<br>Factor<br>dB | Cable<br>Loss<br>dB | Result<br>Level<br>(dBμV/m) | Limit<br>Line<br>(dBμV/m) | Over<br>Limit<br>(dB) | Detector | Polarization |
|----------------|---------------|-------------------------|-----------------------------|---------------------|---------------------|-----------------------------|---------------------------|-----------------------|----------|--------------|
| 1              | 2383.60       | 38.11                   | 29.94                       | 30.21               | 8.30                | 46.14                       | 74.00                     | -27.86                | Peak     | HORIZONTAL   |
| 2              | 2400.00       | 48.36                   | 29.99                       | 30.21               | 8.35                | 56.49                       | 74.00                     | -17.51                | Peak     | HORIZONTAL   |
| 3              | 2400.00       | 34.46                   | 29.99                       | 30.21               | 8.35                | 42.59                       | 54.00                     | -11.41                | Average  | HORIZONTAL   |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.

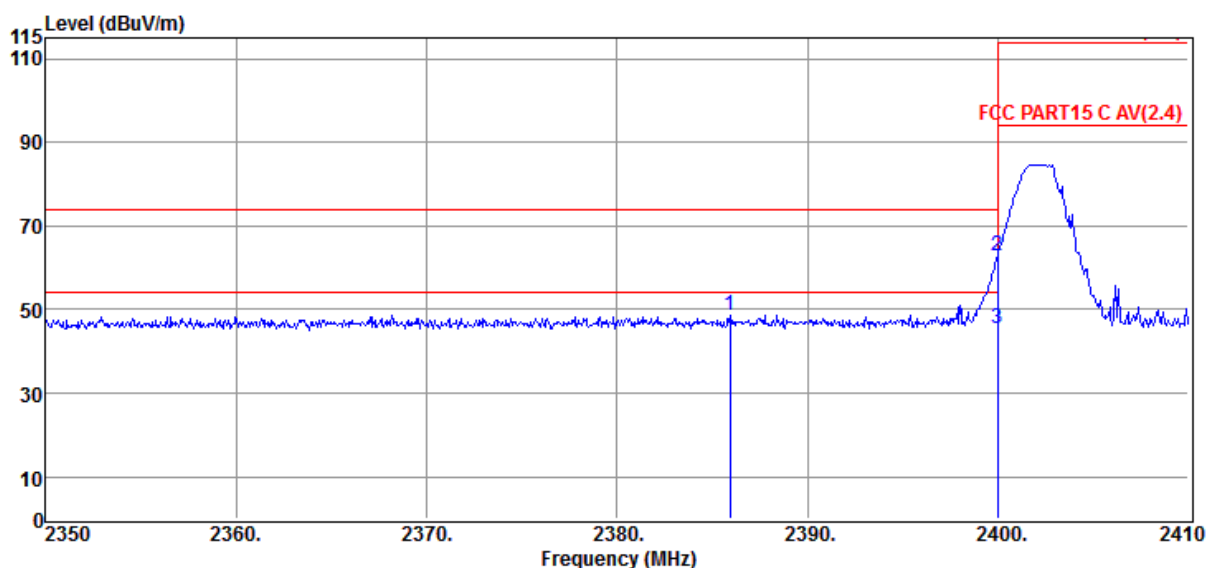
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

**Test Site** : DDT 3m Chamber **E:** \2015 Report Data\15Q0306-2\RF.EM6  
**Test Date** : 2015-04-03 **Tested By** : Damon  
**EUT** : Robstep **Model Number** : M2  
**Power Supply** : DC 72V from battery **Test Mode** : TX 2402MHz  
**Condition** : Temp:24.5'C,Humi:55%,  
 Press:100.1kPa **Antenna/Distance** : 2014 HF907/3m/VERTICAL  
**Memo** :

Data: 44



| Item<br>(Mark) | Freq<br>(MHz) | Read<br>Level<br>(dBμV) | Antenna<br>Factor<br>(dB/m) | PRM<br>Factor<br>dB | Cable<br>Loss<br>dB | Result<br>Level<br>(dBμV/m) | Limit<br>Line<br>(dBμV/m) | Over<br>Limit<br>(dB) | Detector | Polarization |
|----------------|---------------|-------------------------|-----------------------------|---------------------|---------------------|-----------------------------|---------------------------|-----------------------|----------|--------------|
| 1              | 2385.94       | 40.44                   | 29.99                       | 30.21               | 8.30                | 48.52                       | 74.00                     | -25.48                | Peak     | VERTICAL     |
| 2              | 2400.00       | 54.58                   | 29.99                       | 30.21               | 8.35                | 62.71                       | 74.00                     | -11.29                | Peak     | VERTICAL     |
| 3              | 2400.00       | 37.23                   | 29.99                       | 30.21               | 8.35                | 45.36                       | 54.00                     | -8.64                 | Average  | VERTICAL     |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.

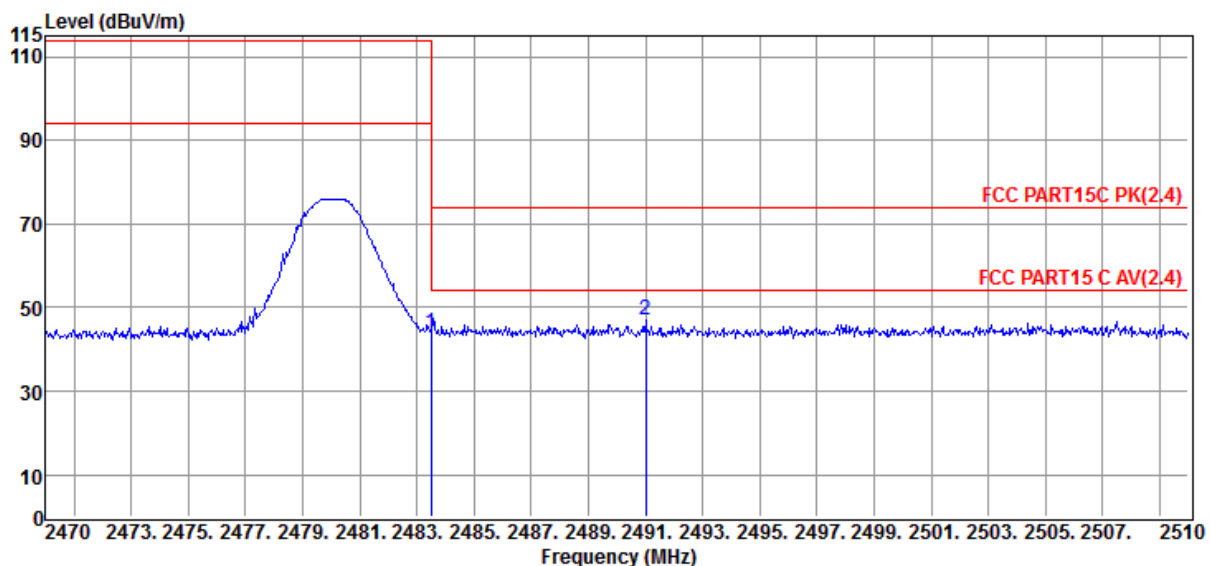
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

**Test Site** : DDT 3m Chamber **E:\2015 Report Data\15Q0306-2\RF.EM6**  
**Test Date** : 2015-04-03 **Tested By** : Damon  
**EUT** : Robstep **Model Number** : M2  
**Power Supply** : DC 72V from battery **Test Mode** : TX 2480MHz  
**Condition** : Temp:24.5'C,Humi:55%,  
 Press:100.1kPa **Antenna/Distance** : 2014 HF907/3m/HORIZONTAL  
**Memo** :

Data: 50



| Item<br>(Mark) | Freq<br>(MHz) | Read<br>Level<br>(dBμV) | Antenna<br>Factor<br>(dB/m) | PRM<br>Factor<br>dB | Cable<br>Loss<br>dB | Result<br>Level<br>(dBμV/m) | Limit<br>Line<br>(dBμV/m) | Over<br>Limit<br>(dB) | Detector | Polarization |
|----------------|---------------|-------------------------|-----------------------------|---------------------|---------------------|-----------------------------|---------------------------|-----------------------|----------|--------------|
| 1              | 2483.50       | 35.32                   | 30.25                       | 30.25               | 8.50                | 43.82                       | 74.00                     | -30.18                | Peak     | HORIZONTAL   |
| 2              | 2491.00       | 38.29                   | 30.30                       | 30.25               | 8.50                | 46.84                       | 74.00                     | -27.16                | Peak     | HORIZONTAL   |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.

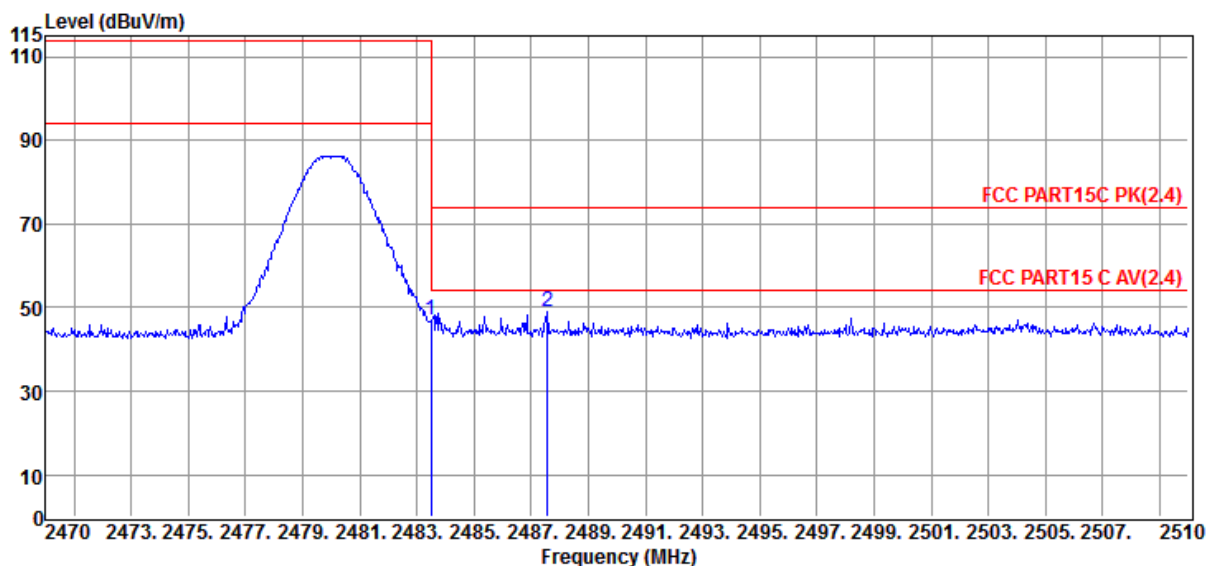
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

**Test Site** : DDT 3m Chamber **E:\2015 Report Data\15Q0306-2\RF.EM6**  
**Test Date** : 2015-04-03 **Tested By** : Damon  
**EUT** : Robstep **Model Number** : M2  
**Power Supply** : DC 72V from battery **Test Mode** : TX 2480MHz  
**Condition** : Temp:24.5'C,Humi:55%,  
 Press:100.1kPa **Antenna/Distance** : 2014 HF907/3m/VERTICAL  
**Memo** :

Data: 51



| Item<br>(Mark) | Freq<br>(MHz) | Read<br>Level<br>(dBμV) | Antenna<br>Factor<br>(dB/m) | PRM<br>Factor<br>dB | Cable<br>Loss<br>dB | Result<br>Level<br>(dBμV/m) | Limit<br>Line<br>(dBμV/m) | Over<br>Limit<br>(dB) | Detector | Polarization |
|----------------|---------------|-------------------------|-----------------------------|---------------------|---------------------|-----------------------------|---------------------------|-----------------------|----------|--------------|
| 1              | 2483.50       | 38.42                   | 30.25                       | 30.25               | 8.50                | 46.92                       | 74.00                     | -27.08                | Peak     | VERTICAL     |
| 2              | 2487.56       | 40.60                   | 30.30                       | 30.25               | 8.50                | 49.15                       | 74.00                     | -24.85                | Peak     | VERTICAL     |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

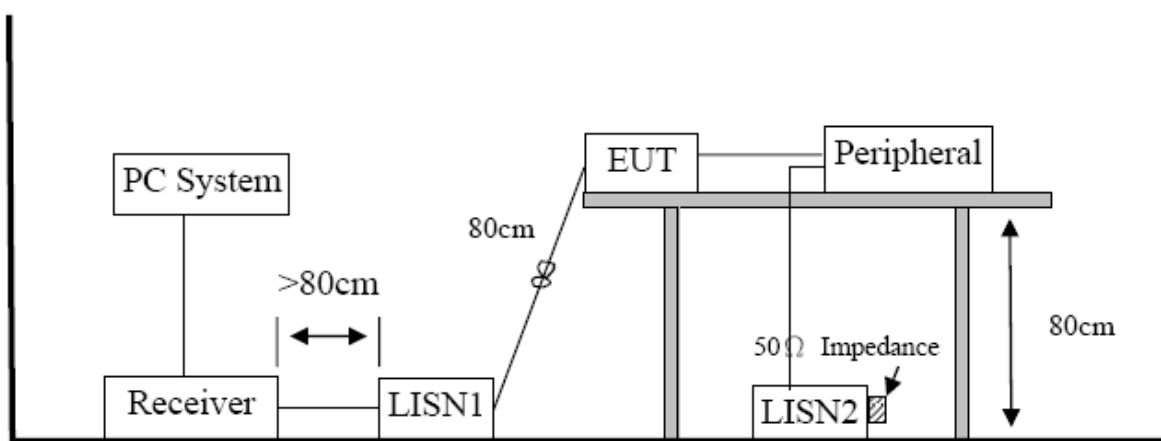
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

## 6. Power Line Conducted Emission

### 6.1. Test equipment

| Item | Equipment     | Manufacturer | Model No. | Serial No. | Last Cal.  | Cal. Interval |
|------|---------------|--------------|-----------|------------|------------|---------------|
| 1    | Test Receiver | R&S          | ESU8      | 100316     | 2014/10/25 | 1 Year        |
| 2    | LISN 1        | R&S          | ENV216    | 101109     | 2014/10/25 | 1 Year        |
| 3    | LISN 2        | R&S          | ESH2-Z5   | 100309     | 2014/10/25 | 1 Year        |
| 4    | Pulse Limiter | R&S          | ESH3-Z2   | 101242     | 2014/10/25 | 1 Year        |

### 6.2. Block diagram of test setup



### 6.3. Power Line Conducted Emission Limits(Class B)

| Frequency       | Quasi-Peak Level<br>dB(μV) | Average Level<br>dB(μV) |
|-----------------|----------------------------|-------------------------|
| 150kHz ~ 500kHz | 66 ~ 56*                   | 56 ~ 46*                |
| 500kHz ~ 5MHz   | 56                         | 46                      |
| 5MHz ~ 30MHz    | 60                         | 50                      |

Note 1: \* Decreasing linearly with logarithm of frequency.

Note 2: The lower limit shall apply at the transition frequencies.

### 6.4. Test Procedure

The EUT and Support equipment, if needed, were put placed on a non-metallic table, 80cm above the ground plane.

Configuration EUT to simulate typical usage as described in clause 2.4 and test equipment as described in clause 10.2 of this report.

All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.

All support equipment power received from a second LISN.

Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.

The Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.

During the above scans, the emissions were maximized by cable manipulation.

The test mode(s) described in clause 2.4 were scanned during the preliminary test.

After the preliminary scan, we found the test mode producing the highest emission level.

The EUT configuration and worse cable configuration of the above highest emission levels were recorded for reference of the final test.

EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test.

A scan was taken on both power lines, Neutral and Line, recording at least the six highest emissions.

Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.

The test data of the worst-case condition(s) was recorded.

The bandwidth of test receiver is set at 9 KHz.

## **6.5. Test Result**

Not Applicable

## **7. Antenna Requirements**

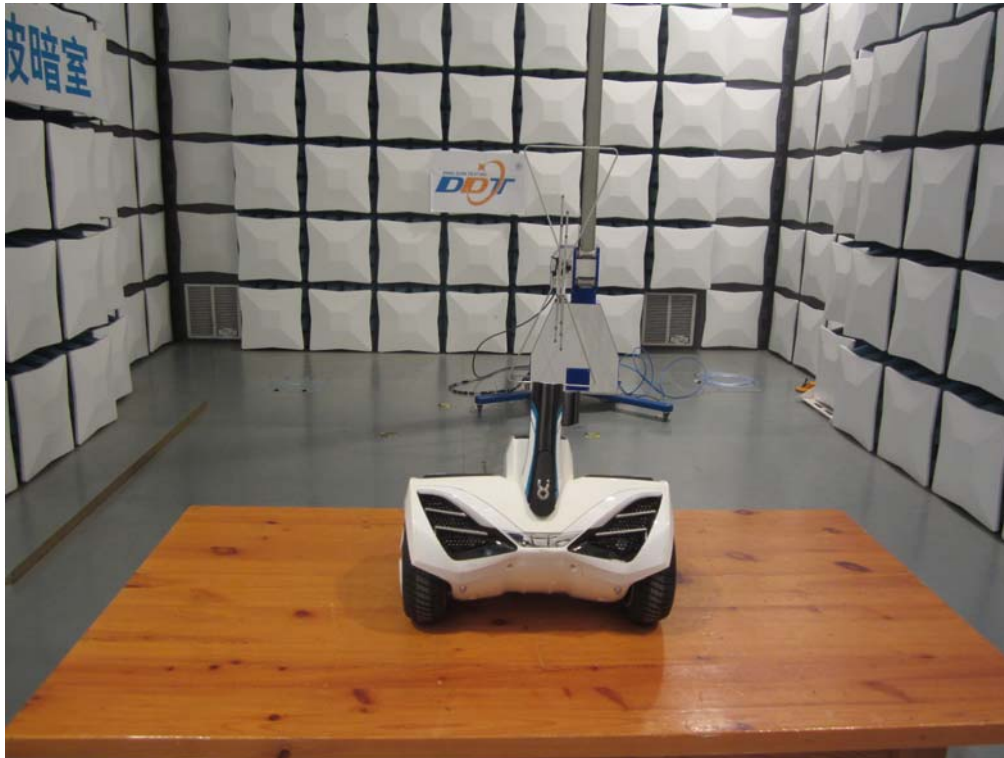
### **7.1. Limit**

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.

### **7.2. Result**

The antennas used for this product are Integrated PCB 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 0dBi.

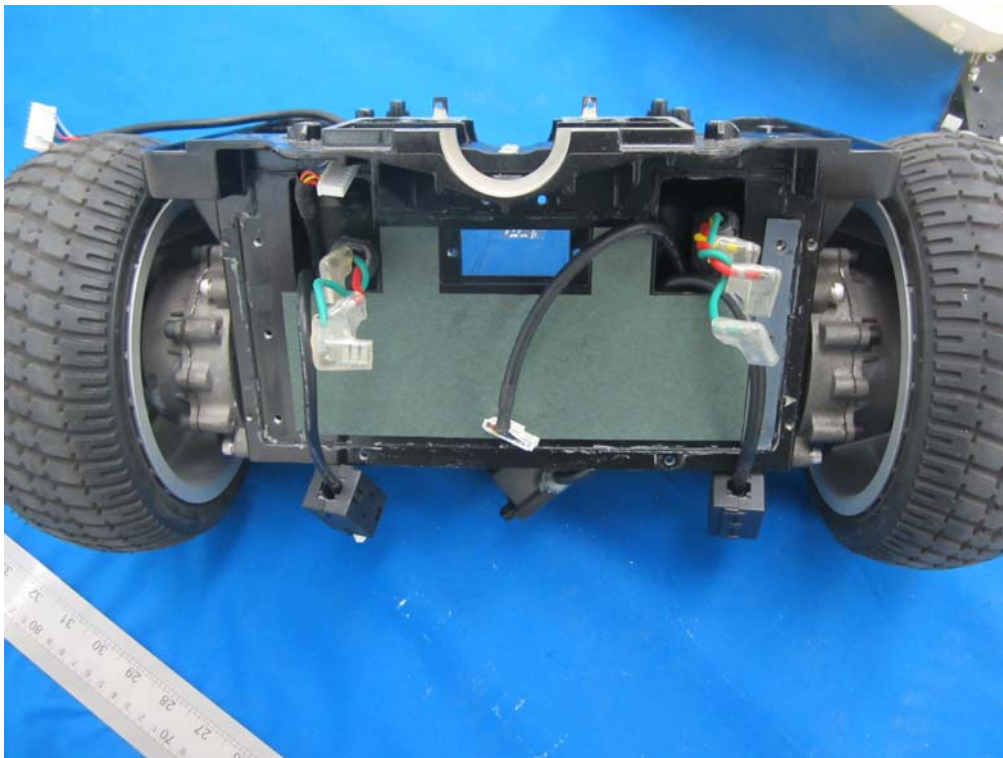
## 8. Test setup photograph

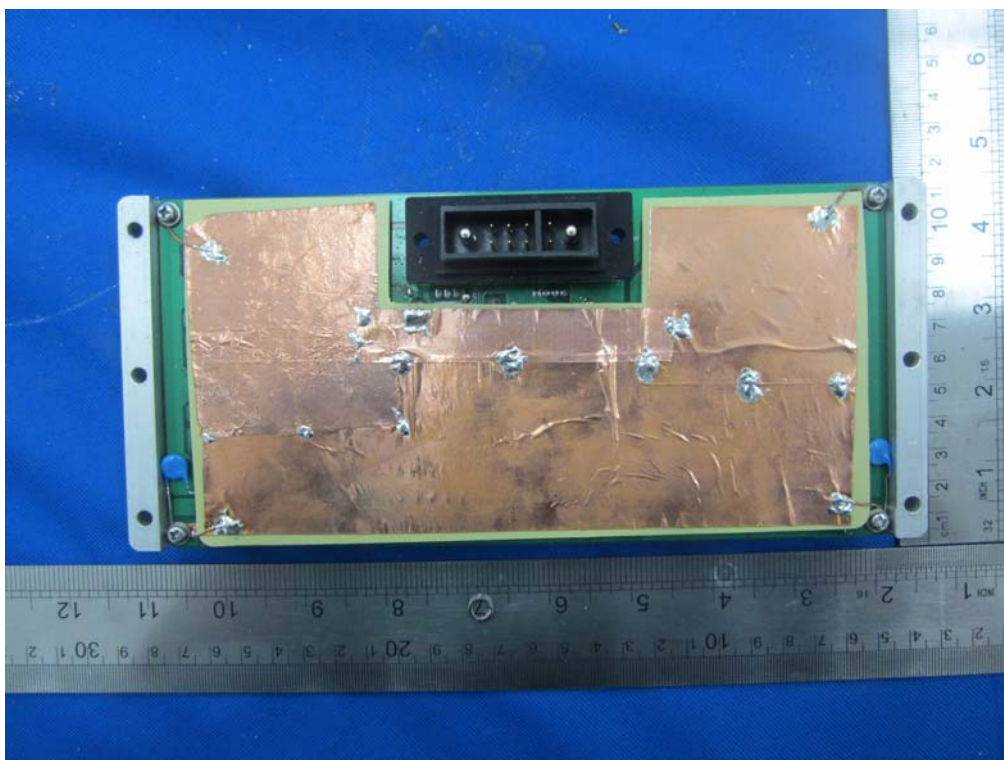
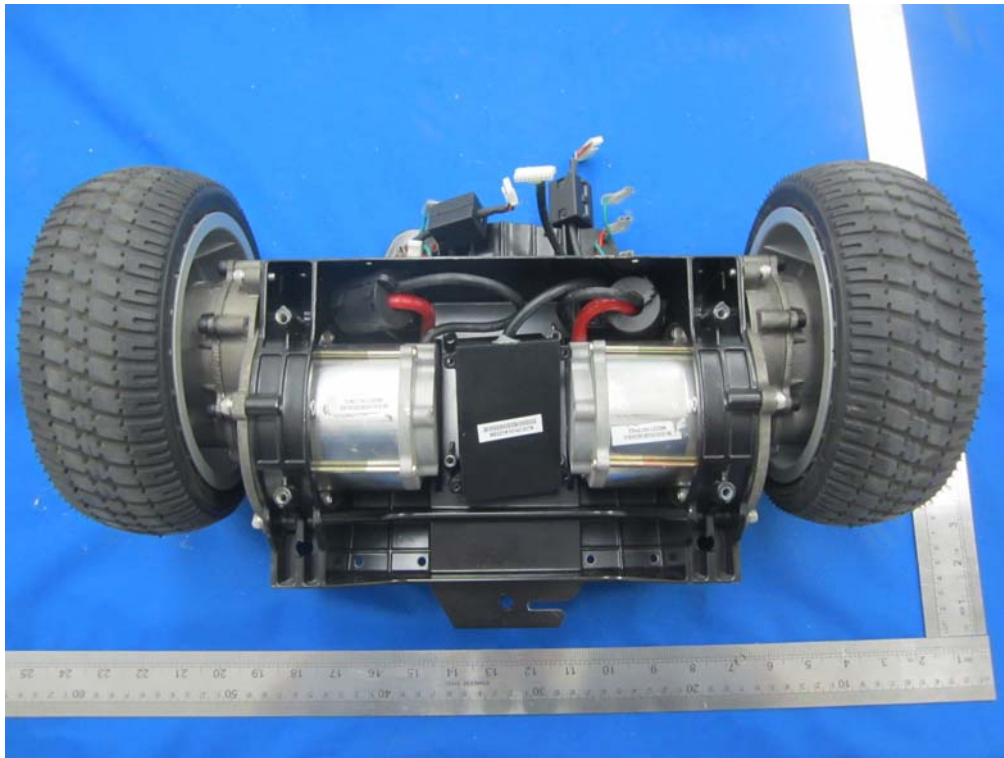


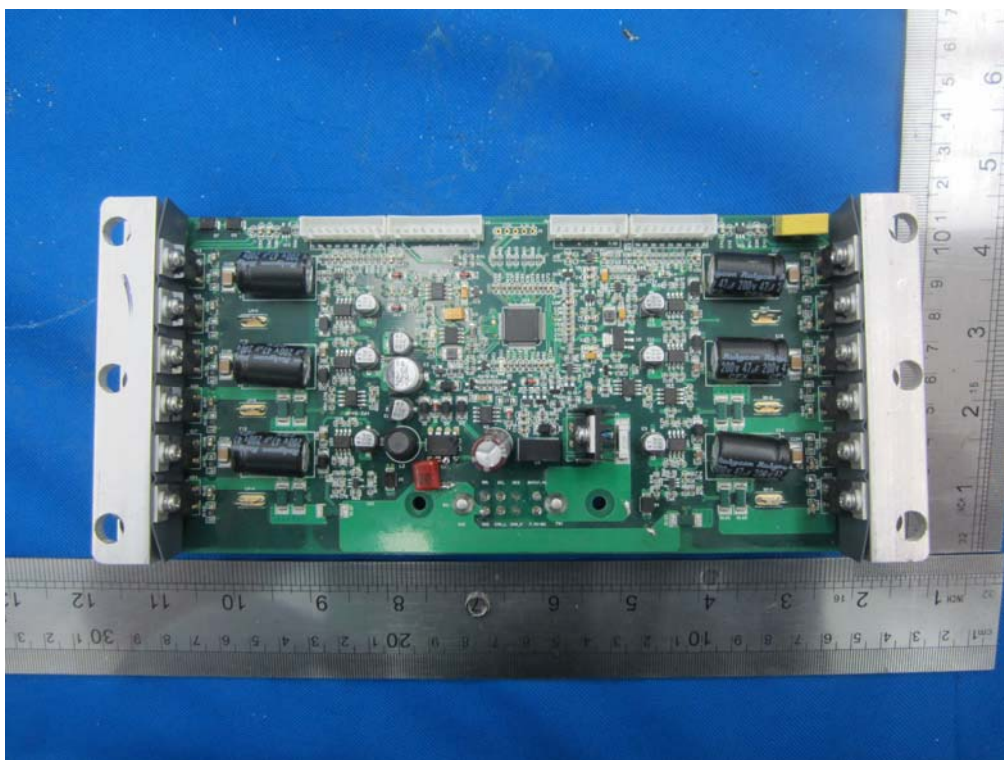
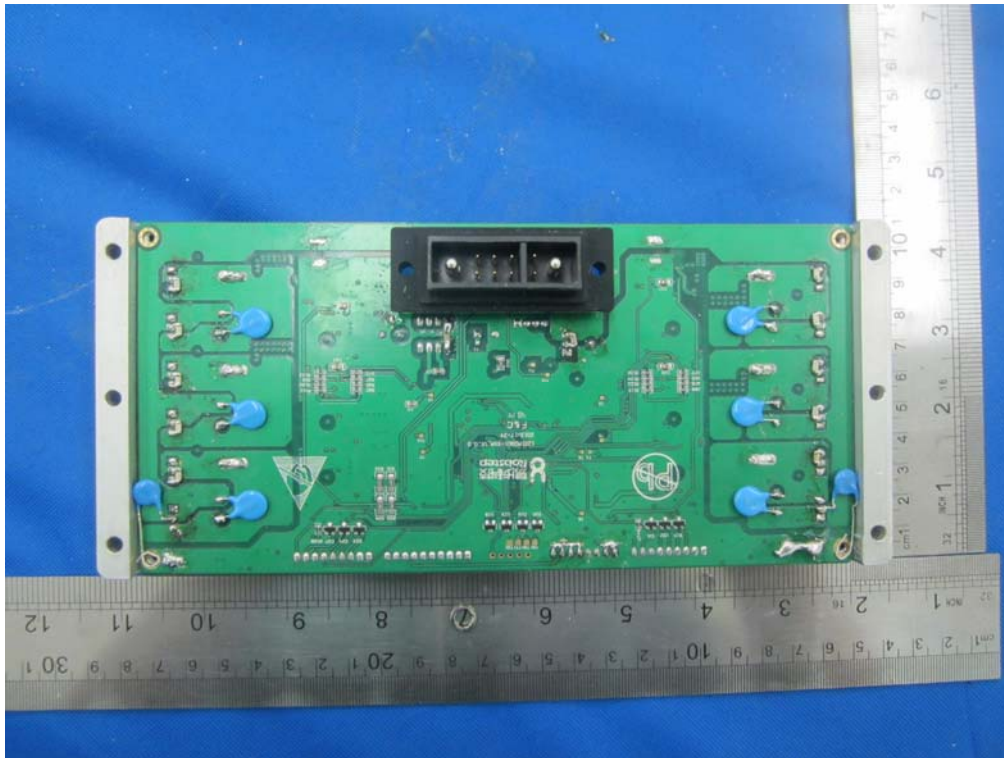
## 9. Photos of the EUT

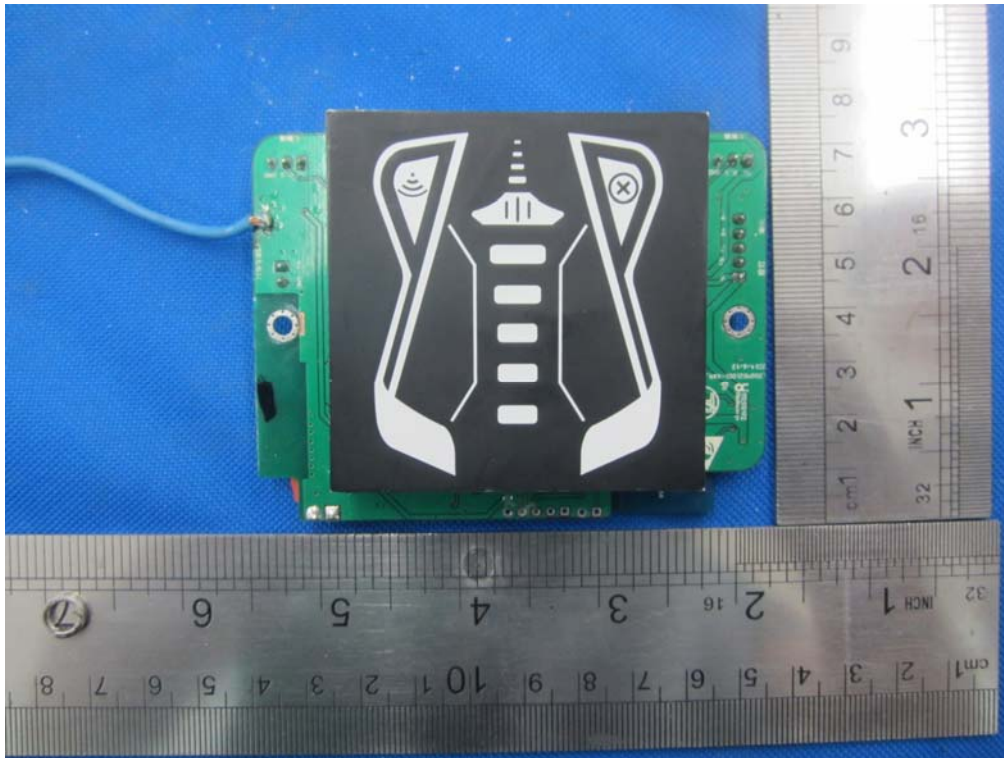


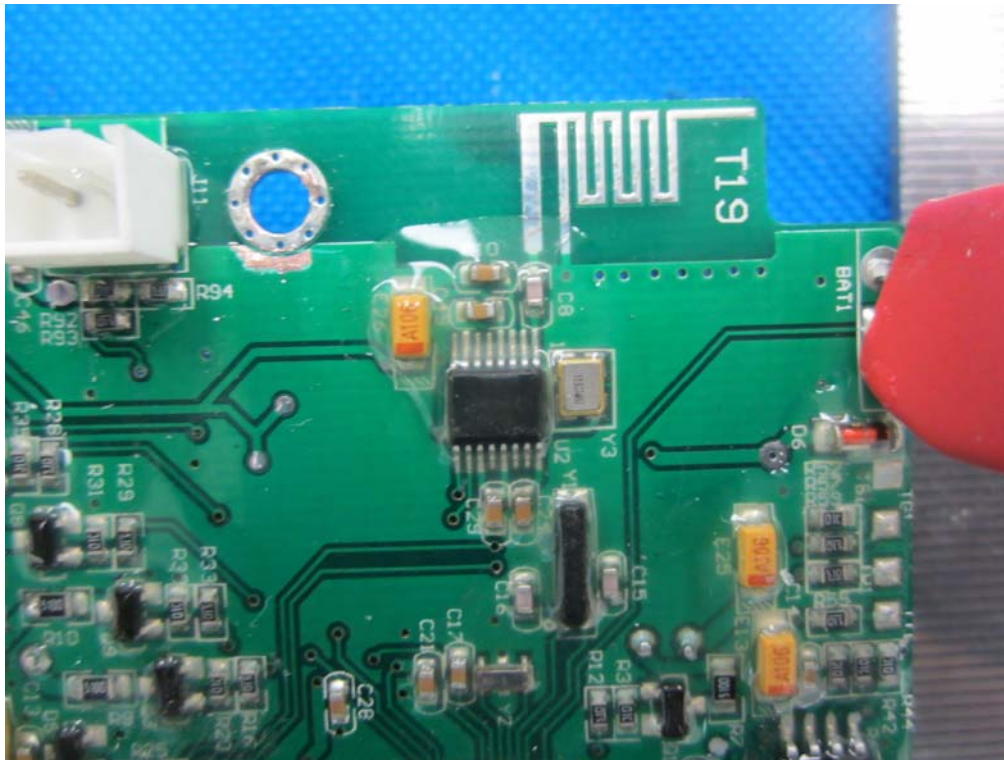












**END OF REPORT**