

EMC TEST REPORT



Report No.: Q190509S003-FCC-E

Supersede Report No: N/A

| | | |
|--|--|---|
| Applicant | TiVo Solutions Inc. d/b/a TiVo Inc | |
| Product Name | REMOTE CONTROL UNIT | |
| Model No. | S6BL | |
| Serial No. | N/A | |
| Test Standard | FCC Part 15 Subpart B Class B, ANSI C63.4: 2014 | |
| Test Date | June 11 to July 31, 2019 | |
| Issue Date | August 06, 2019 | |
| Test Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail | |
| Equipment complied with the specification <input checked="" type="checkbox"/> | | |
| Equipment did not comply with the specification <input type="checkbox"/> | | |
| Evans He | David Huang |  |
| Evans He Test Engineer | David Huang Checked By | |
| This test report may be reproduced in full only Test result presented in this test report is applicable to the tested sample only | | |

Issued by:

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Laboratories Introduction

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Accreditations for Conformity Assessment

| Country/Region | Scope |
|----------------|------------------------------------|
| USA | EMC, RF/Wireless, SAR, Telecom |
| Canada | EMC, RF/Wireless, SAR, Telecom |
| Taiwan | EMC, RF, Telecom, SAR, Safety |
| Hong Kong | RF/Wireless, SAR, Telecom |
| Australia | EMC, RF, Telecom, SAR, Safety |
| Korea | EMI, EMS, RF, SAR, Telecom, Safety |
| Japan | EMI, RF/Wireless, SAR, Telecom |
| Singapore | EMC, RF, SAR, Telecom |
| Europe | EMC, RF, SAR, Telecom, Safety |

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1. Report Revision History

| Report No. | Report Version | Description | Issue Date |
|-------------------|----------------|-------------|-----------------|
| Q190509S003-FCC-E | NONE | Original | August 06, 2019 |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

2. Customer information

| | |
|------------------|---|
| Applicant Name | TiVo Solutions Inc. d/b/a TiVo Inc |
| Applicant Add | 2160 Gold Street San Jose California United States |
| Manufacturer | Remote Solution |
| Manufacturer Add | 92, Chogok-ri, Nammyun, Gimchun city, Kyungsangbukdo, Korea |

3. Test site information

| | |
|--|---|
| Lab performing tests | SIEMIC (Shenzhen-China) LABORATORIES |
| Lab Address | Zone A, Floor 1, Building 2 Wan Ye Long Technology Park South Side of Zhoushi Road, Bao'an District, Shenzhen, Guangdong China 518108 |
| FCC Test Site No. | 535293 |
| IC Test Site No. | 4842E-1 |
| Test Software of Radiated Emission | Radiated Emission Program-To Shenzhen v2.0 |
| Test Software of Conducted Emission | EZ-EMC(ver.lcp-03A1) |

4. Equipment under Test (EUT) Information

Description of EUT: REMOTE CONTROL UNIT

Main Model: S6BL

Serial Model: N/A

Antenna Gain: 0dBi

Antenna Type: Chip Antenna

Equipment Category : JAB

Type of Modulation: GFSK

RF Operating Frequency (ies): 2402-2480 MHz

Number of Channels: 40CH

Input Power: **Battery:**
Spec: DC 3V

Port: Please refer to the user's manual

Trade Name : N/A

FCC ID: TGN-CRB97C

Date EUT received: May 30, 2019

Test Date(s): June 11 to July 31, 2019

5. Test Summary

The product was tested in accordance with the following specifications.

All testing has been performed according to below product classification:

| FCC Rules | Description of Test | Result |
|---------------------------|-----------------------------------|------------|
| §15.107; ANSI C63.4: 2014 | AC Power Line Conducted Emissions | N/A |
| §15.109; ANSI C63.4: 2014 | Radiated Emissions | Compliance |

Measurement Uncertainty

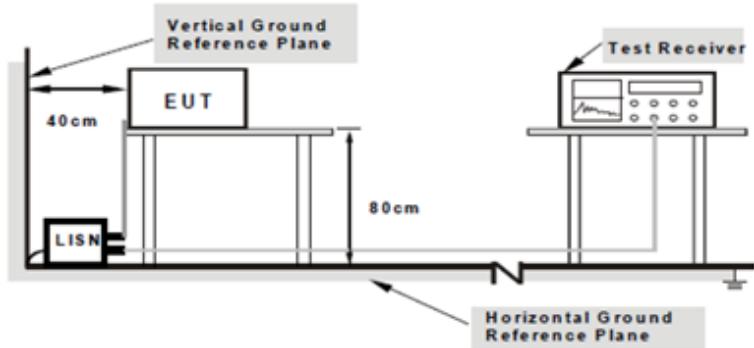
| Parameter | Uncertainty |
|---|-------------|
| AC Power Line Conducted Emissions (150kHz~30MHz) | ±2.70dB |
| Radiated Emission(30MHz~1GHz) | ±3.74dB |
| Radiated Emission(1GHz~6GHz) | ±4.66dB |

6. Measurements, Examination And Derived Results

6.1 AC Power Line Conducted Emissions

| | |
|----------------------|----|
| Temperature | -- |
| Relative Humidity | -- |
| Atmospheric Pressure | -- |
| Test date : | -- |
| Tested By : | -- |

Requirement(s):

| Spec | Item | Requirement | Applicable | | | | | | | | | | | | | | |
|------------------------|---|---|------------------------|--------------------|--|----|---------|------------|---------|---------|---------|----|----|--------|----|----|--------------------------|
| 47CFR§15.107 | a) | <p>For Low-power radio-frequency devices that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 [mu] H/50 ohms line impedance stabilization network (LISN). The lower limit applies at the boundary between the frequencies ranges.</p> <table border="1"> <thead> <tr> <th rowspan="2">Frequency ranges (MHz)</th> <th colspan="2">Limit (dBμV)</th> </tr> <tr> <th>QP</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>0.15 ~ 0.5</td> <td>66 – 56</td> <td>56 – 46</td> </tr> <tr> <td>0.5 ~ 5</td> <td>56</td> <td>46</td> </tr> <tr> <td>5 ~ 30</td> <td>60</td> <td>50</td> </tr> </tbody> </table> | Frequency ranges (MHz) | Limit (dB μ V) | | QP | Average | 0.15 ~ 0.5 | 66 – 56 | 56 – 46 | 0.5 ~ 5 | 56 | 46 | 5 ~ 30 | 60 | 50 | <input type="checkbox"/> |
| Frequency ranges (MHz) | Limit (dB μ V) | | | | | | | | | | | | | | | | |
| | QP | Average | | | | | | | | | | | | | | | |
| 0.15 ~ 0.5 | 66 – 56 | 56 – 46 | | | | | | | | | | | | | | | |
| 0.5 ~ 5 | 56 | 46 | | | | | | | | | | | | | | | |
| 5 ~ 30 | 60 | 50 | | | | | | | | | | | | | | | |
| Test Setup |  <p>The diagram illustrates the test setup for conducted emissions. An EUT (Equipment Under Test) is placed on a table. A LISN (Line Impedance Stabilization Network) is connected between the EUT and the power source. A test receiver is connected to the LISN. The setup is positioned on a horizontal ground reference plane. A vertical ground reference plane is located behind the EUT. The distance between the LISN and the EUT is 40 cm, and the distance between the LISN and the test receiver is 80 cm.</p> <p>Note: 1. Support units were connected to second LISN. 2. Both of LISNs (AMN) are 80cm from EUT and at least 80cm from other units and other metal planes support units.</p> | | | | | | | | | | | | | | | | |
| Procedure | <ol style="list-style-type: none"> The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table. The power supply for the EUT was fed through a 50Ω /50mH EUT LISN, connected to filtered mains. | | | | | | | | | | | | | | | | |

| | |
|--------|--|
| | <ol style="list-style-type: none"> 3. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable. 4. All other supporting equipment were powered separately from another main supply. 5. The EUT was switched on and allowed to warm up to its normal operating condition. 6. A scan was made on the NEUTRAL line (for AC mains) or Earth line (for DC power) over the required frequency range using an EMI test receiver. 7. High peaks, relative to the limit line, The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 10 kHz. 8. Step 7 was then repeated for the LIVE line (for AC mains) or DC line (for DC power). |
| Remark | The EUT was powered by battery. |
| Result | <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input checked="" type="checkbox"/> N/A |

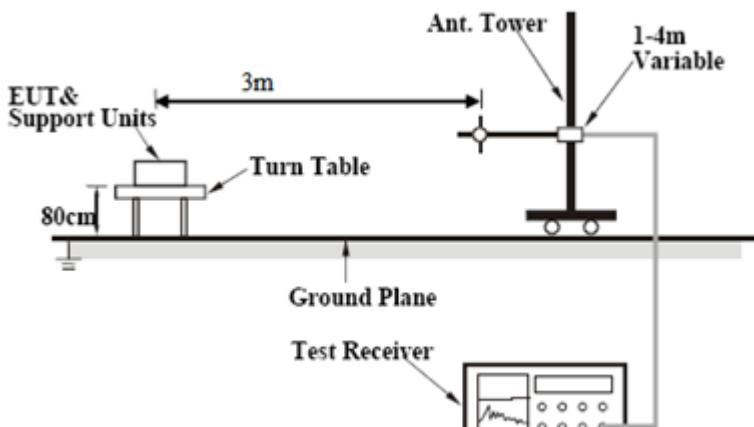
Test Data Yes N/A

Test Plot Yes (See below) N/A

6.2 Radiated Emissions

| | |
|----------------------|---------------|
| Temperature | 25°C |
| Relative Humidity | 57% |
| Atmospheric Pressure | 1014mbar |
| Test date : | Jane 20, 2019 |
| Tested By : | Evans He |

Requirement(s):

| Spec | Item | Requirement | Applicable | | | | | | | | | | |
|-----------------------|-----------------------------|---|-----------------------|-----------------------------|---------|-----|----------|-----|-----------|-----|-----------|-----|-------------------------------------|
| 47CFR§15. 109(d) | a) | <p>Except higher limit as specified elsewhere in other section, the emissions from the low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges</p> <table border="1"> <thead> <tr> <th>Frequency range (MHz)</th> <th>Field Strength (μV/m)</th> </tr> </thead> <tbody> <tr> <td>30 – 88</td> <td>100</td> </tr> <tr> <td>88 – 216</td> <td>150</td> </tr> <tr> <td>216 - 960</td> <td>200</td> </tr> <tr> <td>Above 960</td> <td>500</td> </tr> </tbody> </table> | Frequency range (MHz) | Field Strength (μ V/m) | 30 – 88 | 100 | 88 – 216 | 150 | 216 - 960 | 200 | Above 960 | 500 | <input checked="" type="checkbox"/> |
| Frequency range (MHz) | Field Strength (μ V/m) | | | | | | | | | | | | |
| 30 – 88 | 100 | | | | | | | | | | | | |
| 88 – 216 | 150 | | | | | | | | | | | | |
| 216 - 960 | 200 | | | | | | | | | | | | |
| Above 960 | 500 | | | | | | | | | | | | |
| Test Setup | |  <p>The diagram illustrates the test setup. A 'Turn Table' is positioned on a 'Ground Plane'. An 'EUT & Support Units' is mounted on the turn table at a height of 80cm. A '3m' horizontal distance separates the EUT from an 'Ant. Tower'. The 'Ant. Tower' is mounted on a vertical post and is connected to a 'Test Receiver' which is shown with a waveform display. The 'Ant. Tower' has a '1-4m Variable' height adjustment.</p> | | | | | | | | | | | |
| Procedure | | <ol style="list-style-type: none"> 1. The EUT was switched on and allowed to warm up to its normal operating condition. 2. The test was carried out at the selected frequency points obtained from the EUT characterization. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner: <ol style="list-style-type: none"> a. Vertical or horizontal polarization (whichever gave the higher emission level) | | | | | | | | | | | |

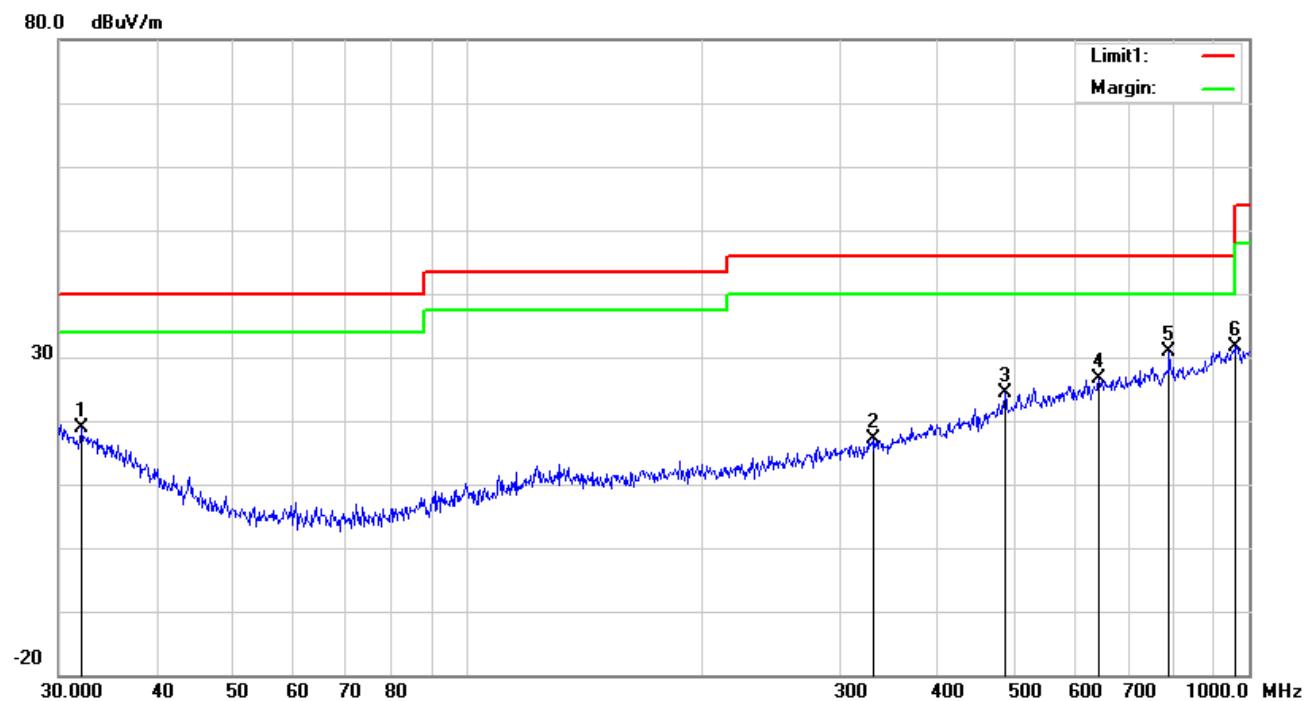
| | |
|--------|---|
| | <p>over a full rotation of the EUT) was chosen.</p> <p>b. The EUT was then rotated to the direction that gave the maximum emission.</p> <p>c. Finally, the antenna height was adjusted to the height that gave the maximum emission.</p> <p>3. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasiy Peak detection at frequency below 1GHz.</p> <p>4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz with Peak detection for Peak measurement at frequency above 1GHz.</p> <p>The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth with Peak detection for Average Measurement as below at frequency above 1GHz.</p> <ul style="list-style-type: none"> ■ 1 kHz (Duty cycle < 98%) <input type="checkbox"/> 10 Hz (Duty cycle > 98%) <p>5. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.</p> |
| Remark | We tested the infrared function with a frequency less than 108MHz |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail |

Test Data Yes N/A

Test Plot Yes (See below) N/A

Test Mode : Normal Working Mode

Below 1GHz

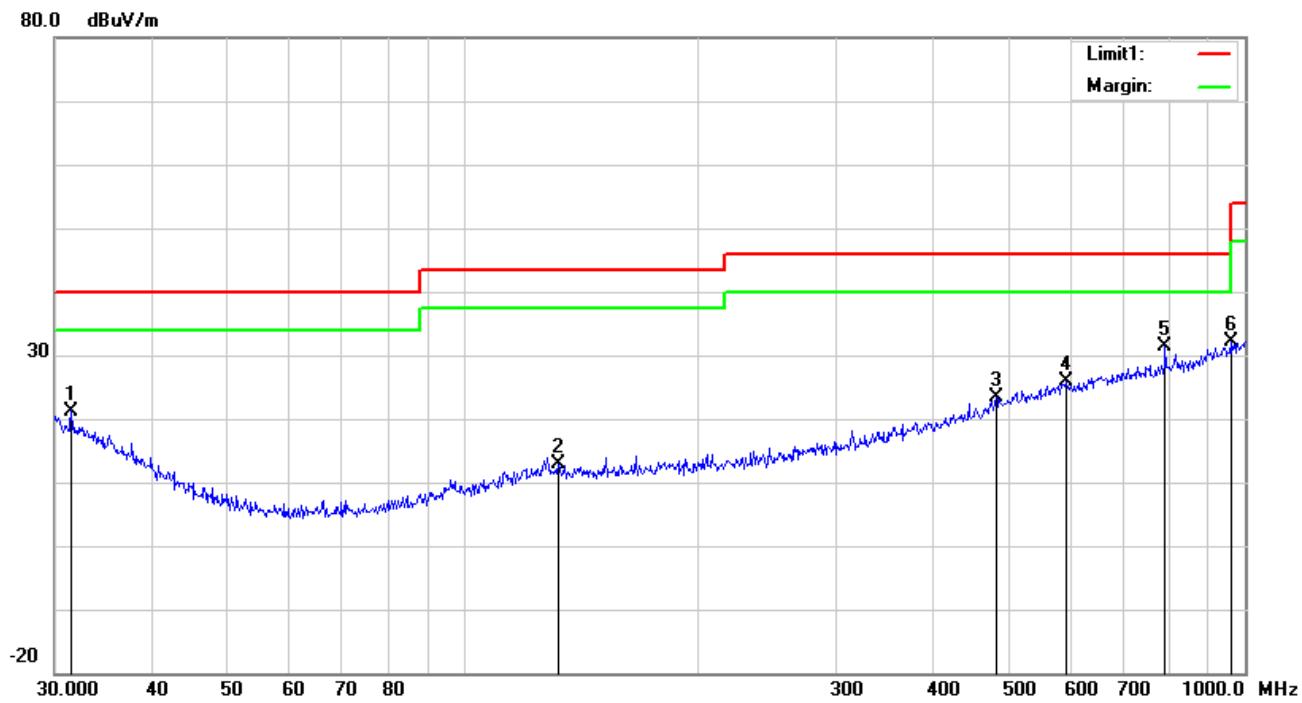


Test Data

Horizontal Polarity Plot @3m

| No. | P/L | Frequency | Reading | Ant_F | PA_G | Cab_L | Result | Limit | Margin | Height | Degree |
|-----|-----|-----------|----------|--------|-------|-------|----------|----------|--------|--------|--------|
| | | (MHz) | (dBuV/m) | (dB/m) | (dB) | (dB) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | (°) |
| 1 | H | 32.0668 | 22.33 | 18.78 | 22.27 | 0.14 | 18.98 | 40.00 | -21.02 | 242 | 292 |
| 2 | H | 330.1949 | 23.20 | 14.30 | 22.21 | 1.80 | 17.09 | 46.00 | -28.91 | 229 | 175 |
| 3 | H | 487.3151 | 25.51 | 18.55 | 21.84 | 2.10 | 24.32 | 46.00 | -21.68 | 227 | 77 |
| 4 | H | 642.8613 | 25.01 | 20.66 | 21.49 | 2.35 | 26.53 | 46.00 | -19.47 | 378 | 319 |
| 5 | H | 790.6188 | 27.29 | 22.11 | 21.17 | 2.54 | 30.77 | 46.00 | -15.23 | 382 | 42 |
| 6 | H | 962.1623 | 25.99 | 23.70 | 20.76 | 2.71 | 31.64 | 54.00 | -22.36 | 359 | 141 |

Below 1GHz



Test Data

Vertical Polarity Plot @3m

| No. | P/L | Frequency | Reading | Ant_F | PA_G | Cab_L | Result | Limit | Margin | Height | Degree |
|-----|-----|-----------|----------|--------|-------|-------|----------|----------|--------|--------|--------|
| | | (MHz) | (dBuV/m) | (dB/m) | (dB) | (dB) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | (°) |
| 1 | V | 31.5095 | 24.25 | 19.13 | 22.27 | 0.14 | 21.25 | 40.00 | -18.75 | 244 | 253 |
| 2 | V | 132.2206 | 22.59 | 11.47 | 22.39 | 1.11 | 12.78 | 43.50 | -30.72 | 326 | 87 |
| 3 | V | 480.5276 | 24.60 | 18.47 | 21.85 | 2.08 | 23.30 | 46.00 | -22.70 | 394 | 285 |
| 4 | V | 590.9737 | 24.97 | 20.23 | 21.60 | 2.30 | 25.90 | 46.00 | -20.10 | 165 | 355 |
| 5 | V | 790.6188 | 28.01 | 22.11 | 21.17 | 2.54 | 31.49 | 46.00 | -14.51 | 246 | 317 |
| 6 | V | 958.7943 | 26.47 | 23.70 | 20.77 | 2.71 | 32.11 | 46.00 | -13.89 | 239 | 121 |

Above 1GHz

| Polarity(H/V) | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | DETECTO R(PK/AV) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENN A HEIGHT (MM) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
|---------------|-------------|-------------------------|------------------|----------------|-------------|----------------------|----------------------|------------------|--------------------------|
| H | 1046.3 | 40.95 | PK | 74 | -33.05 | 100 | 180 | 59.43 | -18.48 |
| H | 1046.3 | 26.16 | AV | 54 | -27.84 | 100 | 99 | 44.64 | -18.48 |
| H | 1157.2 | 41.67 | PK | 74 | -32.33 | 100 | 191 | 58.64 | -16.97 |
| H | 1157.2 | 28.35 | AV | 54 | -25.65 | 100 | 291 | 45.32 | -16.97 |
| H | 1269.8 | 42.77 | PK | 74 | -31.23 | 100 | 188 | 60.52 | -17.75 |
| H | 1269.8 | 28.65 | AV | 54 | -25.35 | 200 | 36 | 46.4 | -17.75 |
| V | 1054.2 | 40.05 | PK | 74 | -33.95 | 100 | 34 | 57.31 | -17.26 |
| V | 1054.2 | 26.59 | AV | 54 | -27.41 | 100 | 145 | 43.85 | -17.26 |
| V | 1244.8 | 41.25 | PK | 74 | -32.75 | 100 | 180 | 58.22 | -16.97 |
| V | 1244.8 | 27.66 | AV | 54 | -26.34 | 100 | 201 | 44.63 | -16.97 |
| V | 1992.3 | 42.99 | PK | 74 | -31.01 | 100 | 135 | 56.74 | -13.75 |
| V | 1992.3 | 28.43 | AV | 54 | -25.57 | 200 | 226 | 42.18 | -13.75 |

Note1: The highest frequency of the EUT is 2480 MHz, so the testing has been conformed to $5*2480MHz=12,400MHz$.

Note2: The frequency that above 3GHz is mainly from the environment noise.

Note3: The AV measurement performed, more than 20dB below limit so AV test data was not presented.

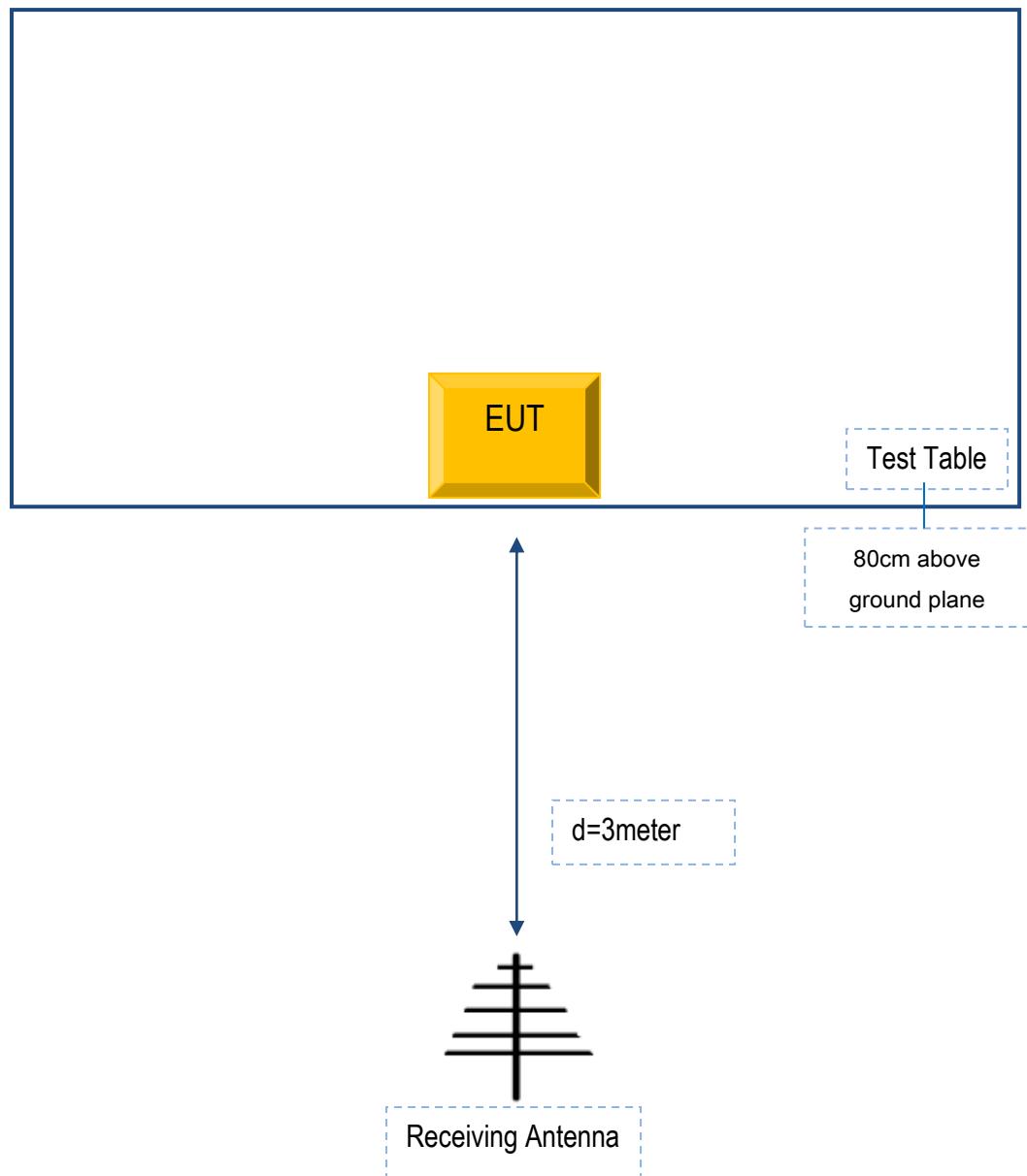
Annex A. TEST INSTRUMENT

| Instrument | Model | Serial # | Cal Date | Cal Due |
|------------------------------------|-----------|------------------------|------------|------------|
| AC Line Conducted Emissions | | | | |
| EMI test receiver | ESCS30 | 8471241027 | 01/04/2019 | 01/03/2020 |
| Artificial Mains Network | 8127 | 8127713 | 01/04/2019 | 01/03/2020 |
| ISN | ISN T800 | 34373 | 01/04/2019 | 01/03/2020 |
| Radiated Emissions | | | | |
| EMI test receiver | ESL6 | 1300.5001K06-100262-eQ | 01/04/2019 | 01/03/2020 |
| Active Antenna | AL-130 | 121031 | 02/07/2019 | 02/06/2020 |
| 3m Semi-anechoic Chamber | 9m*6m*6m | N/A | 10/18/2018 | 10/17/2019 |
| Signal Amplifier | 8447E | 443008 | 01/24/2019 | 01/23/2020 |
| MXA signal analyzer | N9020A | MY49100060 | 01/04/2019 | 01/03/2020 |
| Horn Antenna | HAH-118 | 71259 | 01/25/2019 | 01/24/2020 |
| Horn Antenna | HAH-118 | 71283 | 02/01/2019 | 01/31/2020 |
| AMPLIFIER | EM01G26G | 60613 | 01/24/2019 | 01/23/2020 |
| AMPLIFIER | Emc012645 | 980077 | 01/04/2019 | 01/03/2020 |
| Bilog Antenna (30MHz~6GHz) | JB6 | A110712 | 02/07/2019 | 02/06/2020 |

Annex B. TEST SETUP AND SUPPORTING EQUIPMENT

Annex B.i. TEST SET UP BLOCK

Block Configuration Diagram for Radiated Emissions



Annex C. ii. SUPPORTING EQUIPMENT DESCRIPTION

The following is a description of supporting equipment and details of cables used with the EUT.

Supporting Equipment:

| Manufacturer | Equipment Description | Model | Serial No |
|--------------|-----------------------|-------|-----------|
| - | - | - | - |

Supporting Cable:

| Cable type | Shield Type | Ferrite Core | Length | Serial No |
|------------|-------------|--------------|--------|-----------|
| - | - | - | - | - |

Annex C. User Manual / Block Diagram / Schematics / Partlist

Please see the attachment

Annex D. DECLARATION OF SIMILARITY

Please see attachment