



FCC 47 CFR PART 15 SUBPART C

for

Pano Computer

Model: TPB-C01

Brand: TOPEAK

Test Report Number:

C140327Z03-RP1

Issued for

Topeak, Inc.

8F-4, No.20, Dalong Road, Taichung, Taiwan (40310)

Issued by:

COMPLIANCE CERTIFICATION SERVICES (SHENZHEN) INC.

**No.10-1, Mingkeda Logistics Park, No.18, Huanguan South Rd.,
Guan Lan Town, Baoan District, Shenzhen, China**

TEL: 86-755-28055000

FAX: 86-755-28055221

Issued Date: April 9, 2014



Note: This report shall not be reproduced except in full, without the written approval of Compliance Certification Services Inc. This document may be altered or revised by Compliance Certification Services Inc. personnel only, and shall be noted in the revision section of the document. The client should not use it to claim product endorsement by TAF, A2LA, NVLAP, NIST or any government agencies. The test result of this report relate only to the tested sample identified in this report.



Revision History

| Rev. | Issue No. | Revisions | Effect Page | Revised By |
|------|----------------|---------------|-------------|--------------|
| 00 | C140327Z03-RP1 | Initial Issue | ALL | Sabrina Wang |
| | | | | |
| | | | | |
| | | | | |



TABLE OF CONTENTS

| | | |
|----------|---|-----------|
| 1 | TEST CERTIFICATION | 4 |
| 2 | EUT DESCRIPTION..... | 5 |
| 3 | TEST METHODOLOGY..... | 6 |
| 3.1. | DESCRIPTION OF TEST MODES..... | 6 |
| 4 | TEST METHODOLOGY..... | 7 |
| 4.1. | EUT EXERCISE | 7 |
| 4.2. | FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS..... | 7 |
| 5 | INSTRUMENT CALIBRATION | 8 |
| 6 | SETUP OF EQUIPMENT UNDER TEST | 8 |
| 6.1. | DESCRIPTION OF SUPPORT UNITS | 8 |
| 6.2. | CONFIGURATION OF SYSTEM UNDER TEST..... | 8 |
| 7 | FACILITIES AND ACCREDITATIONS | 9 |
| 7.1. | FACILITIES | 9 |
| 7.2. | ACCREDITATIONS..... | 9 |
| 7.3. | MEASUREMENT UNCERTAINTY | 9 |
| 8 | FCC PART 15.249 REQUIREMENTS | 10 |
| 8.1. | BAND EDGES MEASUREMENT | 10 |
| 8.2. | POWER LINE CONDUCTED EMISSIONS MEASUREMENT | 13 |
| 8.3. | SPURIOUS EMISSIONS MEASUREMENT | 20 |



1 TEST CERTIFICATION

| | |
|---------------------|--|
| Product | Pano Computer |
| Model | TPB-C01 |
| Brand | TOPEAK |
| Tested | March 27~April 8, 2014 |
| Applicant | Topeak, Inc. 8F-4, No.20, Dalong Road, Taichung, Taiwan (40310) |
| Manufacturer | Maxwell Guider Technology Rm., 4E07, No.5, Hsin Yi Rd.,Sec.5, Hsin Yi Dist.,Taipei City,Taiwan |

| APPLICABLE STANDARDS | |
|------------------------------------|-------------------------|
| STANDARD | TEST RESULT |
| FCC 47 CFR Part 15 Subpart C | No non-compliance noted |
| DEVIATION FROM APPLICABLE STANDARD | |
| None | |

We hereby certify that:

The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4:2009 and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 15.207, 15.209, 15.249.

The test results of this report relate only to the tested sample EUT identified in this report.

Approved by:

Sunday Hu
Supervisor of EMC Dept.
Compliance Certification Service Inc.

Reviewed by:

Ruby Zhang
Supervisor of Report Dept.
Compliance Certification Service Inc.



2 EUT DESCRIPTION

| | |
|------------------------------|---|
| Product | Pano Computer |
| Model | TPB-C01 |
| Brand | TOPEAK |
| Model Discrepancy | N/A |
| Identify Number | C140327Z03-RP1 |
| Power Supply | DC3V supplied by the battery |
| Frequency Range | 2402-2480 MHz |
| Transmit Power | Peak: 89.49dBuV/m (Max.) Average: 91.06dBuV/m (Max.) |
| Modulation Technique | GFSK |
| Number of Channels | 40 Channels |
| Antenna Specification | PCB Antenna with 0dBi gain(MAX) |
| Temperature Range | 0°C ~ +40°C |

Note: 1. The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.

2. This submittal(s) (test report) is intended for FCC ID: R3STPB-C01 filing to comply with Section 15.207, 15.209 and 15.249 of the FCC Part 15, Subpart C Rules.



3 TEST METHODOLOGY

3.1. DESCRIPTION OF TEST MODES

The EUT had been tested under operating condition.

Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

The following test mode(s) were scanned during the preliminary test below 1G:

| Test Item | Test mode | Worse mode |
|--------------------|---|-------------------------------------|
| Conducted Emission | Not applicable since the EUT supplied by the battery. | <input type="checkbox"/> |
| Radiated Emission | Mode 1: TX | <input checked="" type="checkbox"/> |

After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz, which worst case was in normal link mode only.

Channel Low (2402MHz), Channel Mid (2440MHz) and Channel High (2480MHz) were chosen for the final testing.

The field strength of spurious radiation emission was measured in the following position: EUT stand-up position (Y mode) and lie-down position (X, Z mode) The following data show only the worst case setup.

The worst case (X axis) was reported.



4 TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4:2009 and FCC CFR 15.209 and 15.249.

4.1. EUT EXERCISE

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to its specifications, the EUT must comply with the requirements of the Section 15.209,15.249 under the FCC Rules Part 15 Subpart C.

4.2. FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

| 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 - | 2483.5 - 2500 | 17.7 - 21.4 |
| 8.37625 - 8.38675 | 156.52525 | 2655 - 2900 | 22.01 - 23.12 |
| 8.41425 - 8.41475 | 156.7 - 156.9 | 3260 - 3267 | 23.6 - 24.0 |
| 12.29 - 12.293 | 162.0125 - 167.17 | 3332 - 3339 | 31.2 - 31.8 |
| 12.51975 - 12.52025 | 167.72 - 173.2 | 3345.8 - 3358 | 36.43 - 36.5 |
| 12.57675 - 12.57725 | 240 - 285 | 3600 - 4400 | (²) |
| 13.36 - 13.41 | 322 - 335.4 | | |

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.



5 INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

6 SETUP OF EQUIPMENT UNDER TEST

6.1. DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

| No. | Equipment | Model No. | Serial No. | FCC ID | Brand | Data Cable | Power Cord |
|-----|-----------|-----------|------------|--------|-------|------------|------------|
| 1 | N/A | | | | | | |

Note:

- 1) Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

6.2. CONFIGURATION OF SYSTEM UNDER TEST

See test photographs attached in Appendix II for the actual connections between EUT and support equipment.



7 FACILITIES AND ACCREDITATIONS

7.1. FACILITIES

All measurement facilities used to collect the measurement data are located at **No.10-1, Mingkeda Logistics Park, No.18, Huanguan South Rd., Guan Lan Town, Baoan District, Shenzhen, China**

The sites are constructed in conformance with the requirements of ANSI C63.4:2009, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

7.2. ACCREDITATIONS

Our laboratories are accredited and approved by the following accreditation body according to ISO/IEC 17025.

| | |
|--------------|-------------|
| USA | A2LA |
| China | CNAS |

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

| | |
|---------------|---|
| USA | FCC |
| Japan | VCCI(C-3478, R-3135, T-652, G-624) |
| Canada | INDUSTRY CANADA |
| Taiwan | BSMI |

Copies of granted accreditation certificates are available for downloading from our web site, <http://www.ccsrf.com>

7.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

| Parameter | Uncertainty |
|--|--------------------|
| Radiated Emission, 30 to 200 MHz Test Site : 966(2) | +/-3.6880dB |
| Radiated Emission, 200 to 1000 MHz Test Site : 966(2) | +/-3.6695dB |
| Radiated Emission, 1 to 8 GHz | +/-5.1782dB |
| Radiated Emission, 8 to 18 GHz | +/-5.2173dB |
| Conducted Emissions | +/-3.6836dB |
| Band Width | 178kHz |
| Peak Output Power MU | +/-1.906dB |
| Band Edge MU | +/-0.182dB |
| Channel Separation MU | 416.178Hz |
| Duty Cycle MU | 0.054ms |
| Frequency Stability MU | 226Hz |

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

The measured result is above (below) the specification limit by a margin less than the measurement uncertainty; it is therefore not possible to state compliance based on the 95% level of confidence. However, the result indicates that compliance (non-compliance) is more probable than non-compliance) with the specification limit.



8 FCC PART 15.249 REQUIREMENTS

8.1. BAND EDGES MEASUREMENT

LIMIT

1. In the above emission table, the tighter limit applies at the band edges.

| Frequency (Hz) | Field Strength ($\mu\text{V/m}$ at 3-meter) | Field Strength (dB $\mu\text{V/m}$ at 3-meter) |
|----------------|---|---|
| 30-88 | 100 | 40 |
| 88-216 | 150 | 43.5 |
| 216-960 | 200 | 46 |
| Above 960 | 500 | 54 |

2. As shown in Section 15.35(b), for frequencies above 1000 MHz, the above field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth.
3. As shown in Section 15.249(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

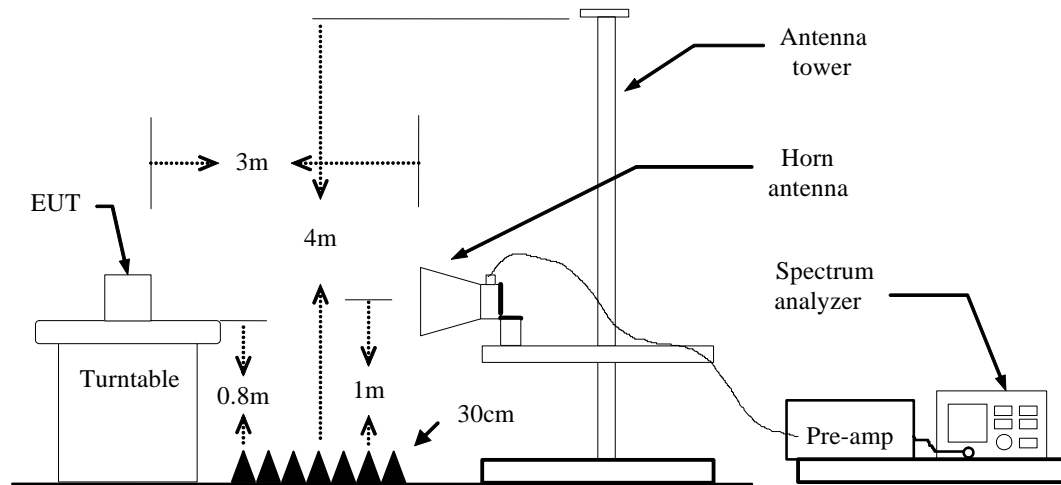
**MEASUREMENT EQUIPMENT USED**

| Radiated Emission Test Site 966 (2) | | | | | |
|--|---------------------|---------------------|----------------------|-------------------------|------------------------|
| Name of Equipment | Manufacturer | Model Number | Serial Number | Last Calibration | Due Calibration |
| PSA Series Spectrum Analyzer | Agilent | E4446A | US44300399 | 03/01/2014 | 03/01/2015 |
| EMI TEST RECEIVER | ROHDE&SCHWARZ | ESCI | 100783 | 03/09/2014 | 03/08/2015 |
| Amplifier | MITEQ | AM-1604-3000 | 1123808 | 03/18/2015 | 03/18/2015 |
| High Noise Amplifier | Agilent | 8449B | 3008A01838 | 03/18/2015 | 03/18/2015 |
| Board-Band Horn Antenna | Schwarzbeck | BBHA 9170 | 9170-497 | 07/10/2013 | 07/09/2014 |
| Bilog Antenna | SCHAFFNER | CBL6143 | 5082 | 03/01/2014 | 03/01/2015 |
| Horn Antenna | SCHWARZBECK | BBHA9120 | D286 | 03/01/2014 | 03/01/2015 |
| Loop Antenna | COM-POWER | AL-130 | 121044 | 09/27/2013 | 09/26/2014 |
| Turn Table | N/A | N/A | N/A | N.C.R | N.C.R |
| Controller | Sunol Sciences | SC104V | 022310-1 | N.C.R | N.C.R |
| Controller | CT | N/A | N/A | N.C.R | N.C.R |
| Temp. / Humidity Meter | Anymetre | JR913 | N/A | 02/28/2014 | 02/28/2015 |
| Antenna Tower | SUNOL | TLT2 | N/A | N.C.R | N.C.R |
| Test S/W | FARAD | LZ-RF / CCS-SZ-3A2 | | | |

Remark: Each piece of equipment is scheduled for calibration once a year.



Test Configuration



TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8m above the ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
 - (a) PEAK: RBW=VBW=1MHz / Sweep=AUTO
 - (b) AVERAGE: RBW=1MHz / VBW=10kHz / Sweep=AUTO
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

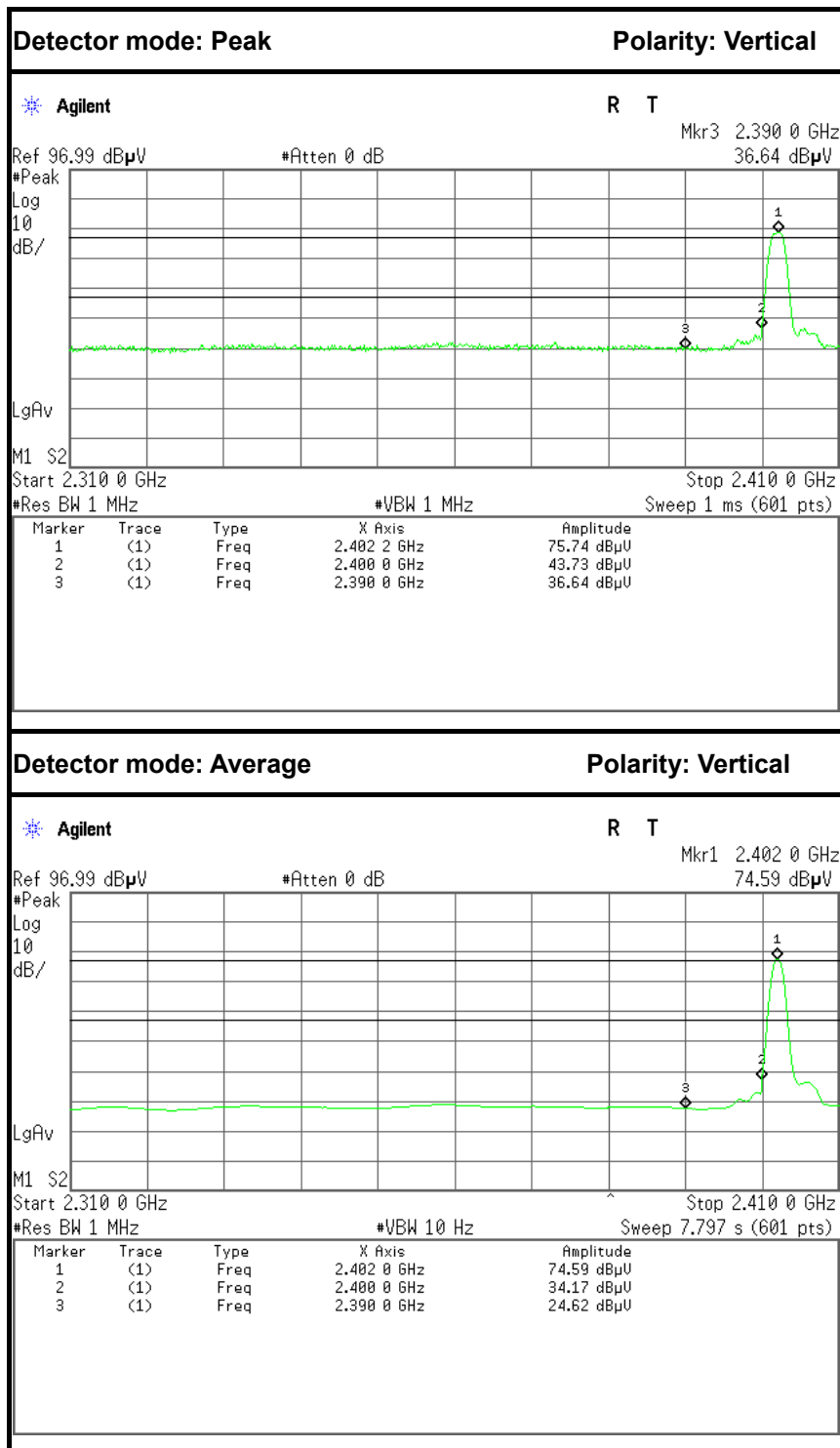
TEST RESULTS

Refer to attach spectrum analyzer data chart.

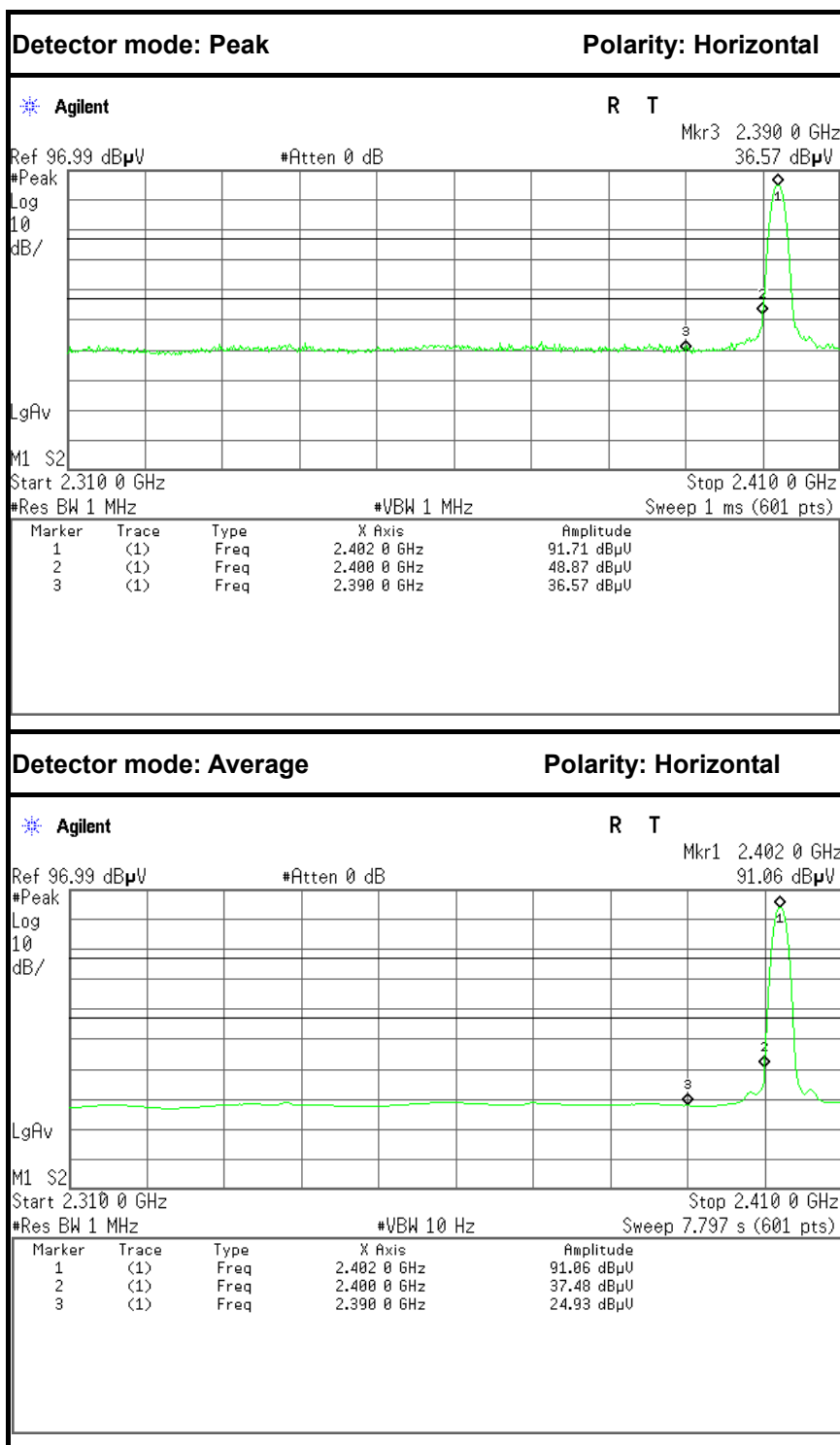


Test Data

Band Edges (CH-Low)



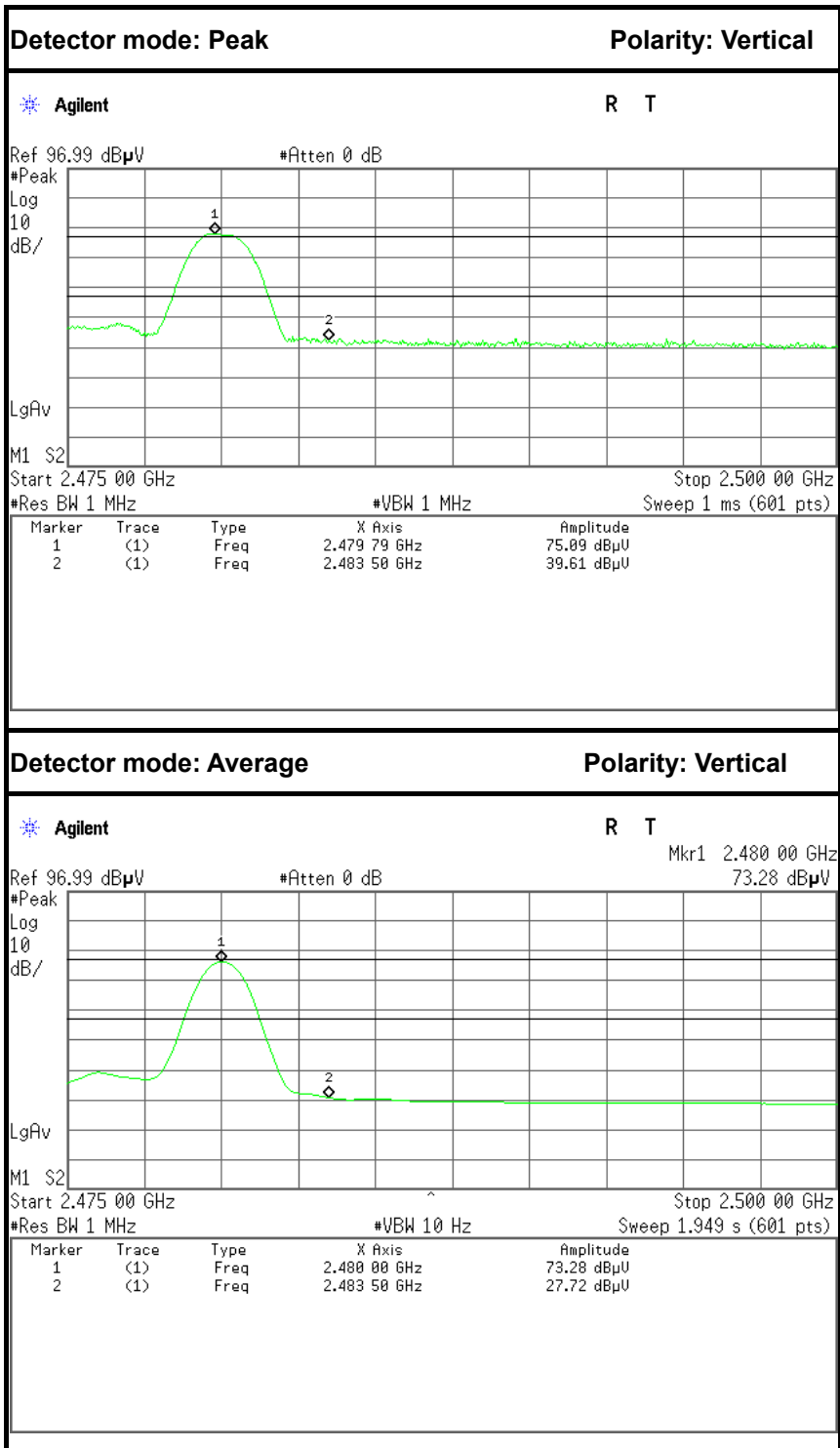
| No. | Frequency (MHz) | Reading (dBuV) | Corrected (dB) | Result (dBuV) | Limit (dBuV) | Margin (dB) | Detector | Antenna Pole |
|-----|-----------------|----------------|----------------|---------------|--------------|-------------|----------|--------------|
| 1 | 2390.0000 | 30.04 | -6.60 | 36.64 | 74.00 | -37.36 | Peak | Vertical |
| 2 | 2390.0000 | 18.02 | -6.60 | 24.62 | 54.00 | -29.38 | Average | Vertical |



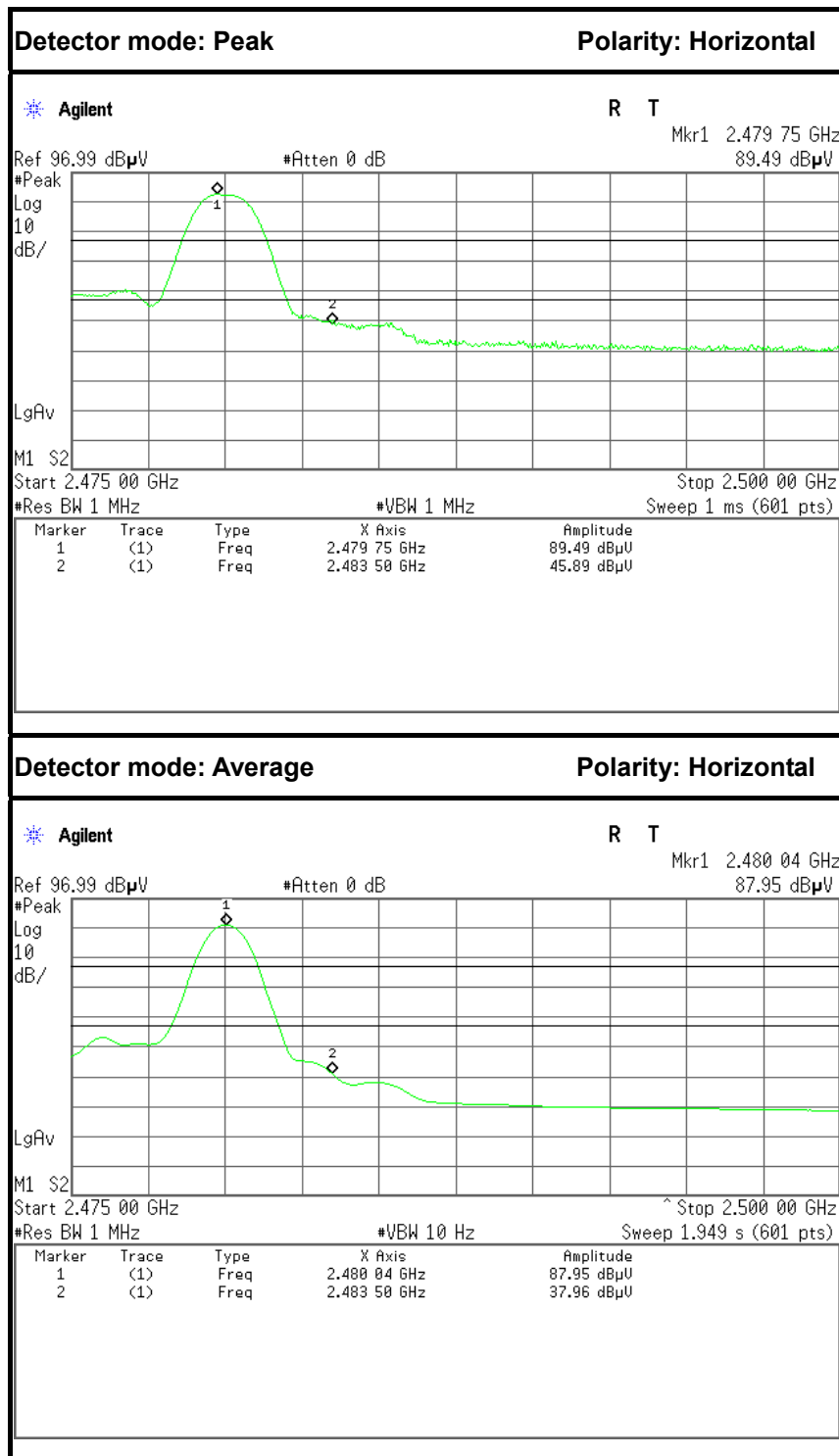
| No. | Frequency (MHz) | Reading (dBuV) | Corrected (dB) | Result (dBuV) | Limit (dBuV) | Margin (dB) | Detector | Antenna Pole |
|-----|-----------------|----------------|----------------|---------------|--------------|-------------|----------|--------------|
| 1 | 2390.0000 | 29.97 | -6.60 | 36.57 | 74.00 | -37.43 | Peak | Vertical |
| 2 | 2390.0000 | 18.33 | -6.60 | 24.93 | 54.00 | -29.07 | Average | Vertical |



Band Edges (CH-High)



| No. | Frequency (MHz) | Reading (dBuV) | Corrected (dB) | Result (dBuV) | Limit (dBuV) | Margin (dB) | Detector | Antenna Pole |
|-----|-----------------|----------------|----------------|---------------|--------------|-------------|----------|--------------|
| 1 | 2483.5000 | 33.01 | -6.60 | 39.61 | 74.00 | -34.39 | Peak | Vertical |
| 2 | 2483.5000 | 21.12 | -6.60 | 27.72 | 54.00 | -26.28 | Average | Vertical |



| No. | Frequency (MHz) | Reading (dBuV) | Corrected (dB) | Result (dBuV) | Limit (dBuV) | Margin (dB) | Detector | Antenna Pole |
|-----|-----------------|----------------|----------------|---------------|--------------|-------------|----------|--------------|
| 1 | 2483.5000 | 39.29 | -6.60 | 45.89 | 74.00 | -28.11 | Peak | Vertical |
| 2 | 2483.5000 | 31.36 | -6.60 | 37.96 | 54.00 | -16.04 | Average | Vertical |



8.2. POWER LINE CONDUCTED EMISSIONS MEASUREMENT

8.2.1. LIMITS OF CONDUCTED EMISSIONS MEASUREMENT

According to §15.207(a), except as shown in paragraphs (b) and (c) of this section, for an intentional radiator 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 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

| Frequency Range (MHz) | Limits (dB μ V) | |
|-----------------------|---------------------|-----------|
| | Quasi-peak | Average |
| 0.15 to 0.50 | 66 to 56* | 56 to 46* |
| 0.50 to 5 | 56 | 46 |
| 5 to 30 | 60 | 50 |

NOTE:

- (1) The lower limit shall apply at the transition frequencies.
- (2) The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.
- (3) All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

8.2.2. TEST INSTRUMENTS

| Conducted Emission Test Site | | | | | |
|------------------------------|---------------|--------------------|---------------|------------------|-----------------|
| Name of Equipment | Manufacturer | Model Number | Serial Number | Last Calibration | Due Calibration |
| EMI TEST RECEIVER | ROHDE&SCHWARZ | ESCI | 100783 | 03/09/2014 | 03/08/2015 |
| LISN(EUT) | ROHDE&SCHWARZ | ENV216 | 101543-WX | 04/20/2013 | 04/19/2014 |
| LISN | EMCO | 3825/2 | 8901-1459 | 03/09/2014 | 03/08/2015 |
| Temp. / Humidity Meter | VICTOR | HTC-1 | N/A | 03/17/2014 | 03/17/2015 |
| Test S/W | FARAD | EZ-EMC/ CCS-3A1-CE | | | |

- NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R = No Calibration Request.

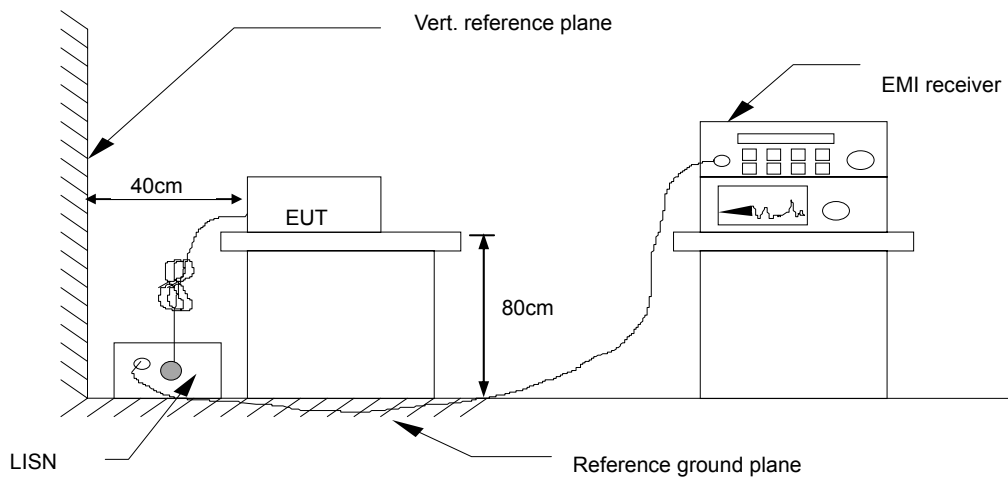


8.2.3. TEST PROCEDURES (please refer to measurement standard)

- The EUT and Support equipment, if needed, was placed on a non-conducted table, which is 0.8m above the ground plane and 0.4m away from the conducted wall.
- The test equipment EUT installed received AC main power, through a Line Impedance Stabilization Network (LISN), which supplied power source and was grounded to the ground plane. All support equipment power received from a second LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- The EUT test program was started. Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.
- The frequency range from 150 kHz to 30 MHz was searched. The test data of the worst-case condition(s) was recorded. Emission levels under limit 20dB were not recorded.



8.2.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

8.2.5. DATA SAMPLE

| Frequency (MHz) | QuasiPeak Reading (dBuV) | Average Reading (dBuV) | Correction Factor (dB) | QuasiPeak Result (dBuV) | Average Result (dBuV) | QuasiPeak Limit (dBuV) | Average Limit (dBuV) | QuasiPeak Margin (dB) | Average Margin (dB) | Remark (Pass/Fail) |
|-----------------|--------------------------|------------------------|------------------------|-------------------------|-----------------------|------------------------|----------------------|-----------------------|---------------------|--------------------|
| X.XXXX | 32.69 | 25.65 | 11.52 | 44.21 | 37.17 | 65.78 | 55.79 | -21.57 | -18.62 | Pass |

Factor = Insertion loss of LISN + Cable Loss
Result = Quasi-peak Reading/ Average Reading + Factor
Limit = Limit stated in standard
Margin = Result (dBuV) – Limit (dBuV)

8.2.6. TEST RESULTS

Not applicable, since the EUT supplied by the battery.



8.3. SPURIOUS EMISSIONS MEASUREMENT

8.3.1. LIMITS OF RADIATED EMISSIONS MEASUREMENT

1. In the section 15.249(a):

Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

| Fundamental Frequency | Field Strength of Fundamental Field Strength (mV/m) | Field Strength of Harmonics (μV/m) |
|-----------------------|---|------------------------------------|
| 902-928 MHz | 50 | 500 |
| 2400 - 2483.5 MHz | 50 | 500 |
| 5725 - 5875 MHz | 50 | 500 |
| 24.0 - 24.25 GHz | 250 | 2500 |

2. Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency (MHz) | Field Strength (μV/m) | Measurement Distance (m) |
|-----------------|-----------------------|--------------------------|
| 0.009-0.490 | 2400/F(kHz) | 300 |
| 0.490-1.705 | 24000/F(kHz) | 30 |
| 1.705-30.0 | 30 | 30 |
| 30-88 | 100* | 3 |
| 88-216 | 150* | 3 |
| 216-960 | 200* | 3 |
| Above 960 | 500 | 3 |

Remark: Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

3. In the above emission table, the tighter limit applies at the band edges.

| Frequency (Hz) | Field Strength (μV/m at 3-meter) | Field Strength (dBμV/m at 3-meter) |
|----------------|----------------------------------|------------------------------------|
| 30-88 | 100 | 40 |
| 88-216 | 150 | 43.5 |
| 216-960 | 200 | 46 |
| Above 960 | 500 | 54 |

**8.3.2. TEST INSTRUMENTS**

| Radiated Emission Test Site 966 (2) | | | | | |
|--|---------------------|---------------------|----------------------|-------------------------|------------------------|
| Name of Equipment | Manufacturer | Model Number | Serial Number | Last Calibration | Due Calibration |
| PSA Series Spectrum Analyzer | Agilent | E4446A | US44300399 | 03/01/2014 | 03/01/2015 |
| EMI TEST RECEIVER | ROHDE&SCHWARZ | ESCI | 100783 | 03/09/2014 | 03/08/2015 |
| Amplifier | MITEQ | AM-1604-3000 | 1123808 | 03/18/2015 | 03/18/2015 |
| High Noise Amplifier | Agilent | 8449B | 3008A01838 | 03/18/2015 | 03/18/2015 |
| Board-Band Horn Antenna | Schwarzbeck | BBHA 9170 | 9170-497 | 07/10/2013 | 07/09/2014 |
| Bilog Antenna | SCHAFFNER | CBL6143 | 5082 | 03/01/2014 | 03/01/2015 |
| Horn Antenna | SCHWARZBECK | BBHA9120 | D286 | 03/01/2014 | 03/01/2015 |
| Loop Antenna | COM-POWER | AL-130 | 121044 | 09/27/2013 | 09/26/2014 |
| Turn Table | N/A | N/A | N/A | N.C.R | N.C.R |
| Controller | Sunol Sciences | SC104V | 022310-1 | N.C.R | N.C.R |
| Controller | CT | N/A | N/A | N.C.R | N.C.R |
| Temp. / Humidity Meter | Anymetre | JR913 | N/A | 02/28/2014 | 02/28/2015 |
| Antenna Tower | SUNOL | TLT2 | N/A | N.C.R | N.C.R |
| Test S/W | FARAD | LZ-RF / CCS-SZ-3A2 | | | |

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The FCC Site Registration number is 101879.
3. N.C.R = No Calibration Required.



8.3.3 TEST PROCEDURE (please refer to measurement standard)

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Set the spectrum analyzer in the following setting as:

Below 1GHz:

RBW=100kHz / VBW=300kHz / Sweep=AUTO

Above 1GHz:

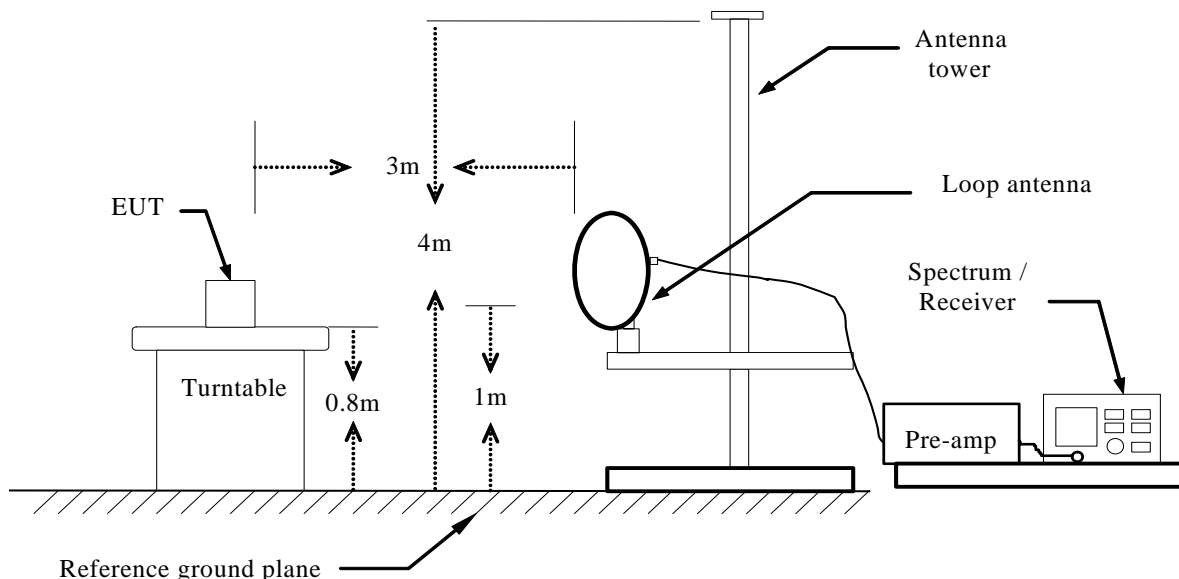
(a) PEAK: RBW=VBW=1MHz / Sweep=AUTO

(b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO

7. Repeat above procedures until the measurements for all frequencies are complete.

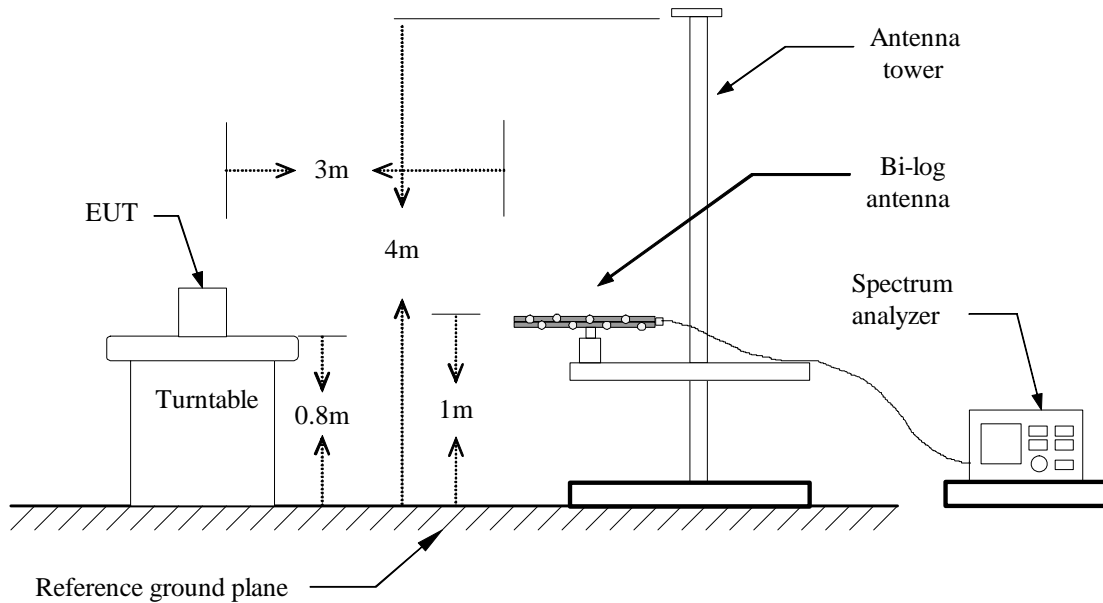
8.3.2.1. TEST SETUP

Below 30MHz

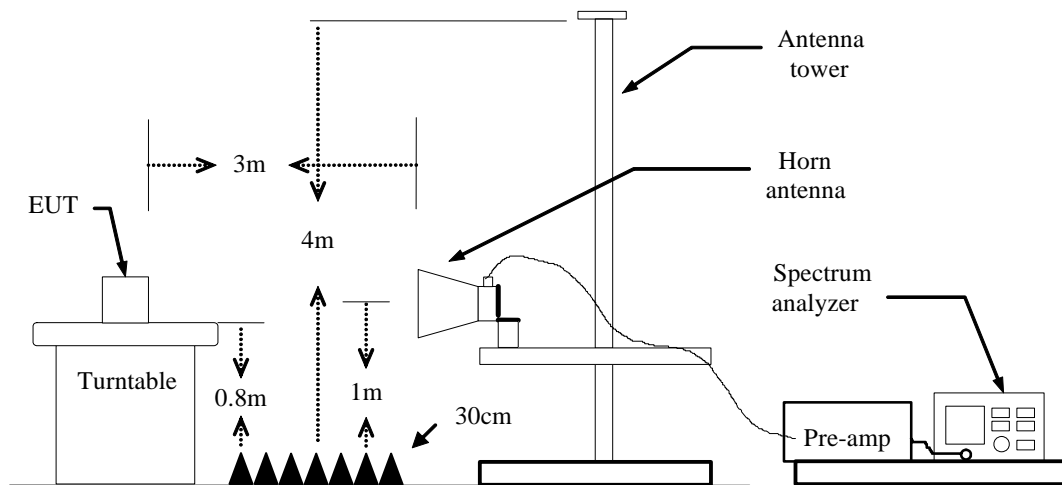




Below 1 GHz



Above 1 GHz



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

**8.3.2.2. DATA SAMPLE****Below 1GHz**

| Frequency (MHz) | Reading (dBuV) | Correction Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Pole (V/H) | Remark |
|-----------------|----------------|--------------------------|-----------------|----------------|-------------|--------------------|--------|
| XXX.XXXX | 37.47 | -16.41 | 21.06 | 40.00 | -18.94 | V | QP |

Above 1GHz

| Frequency (MHz) | Reading (dBuV) | Correction Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Pole (V/H) | Remark |
|-----------------|----------------|--------------------------|-----------------|----------------|-------------|--------------------|--------|
| XXXX.XXXX | 55.54 | 4.56 | 60.10 | 74.00 | -13.90 | V | Peak |
| XXXX.XXXX | 29.66 | 4.56 | 34.22 | 54.00 | -19.78 | V | AVG |

Frequency (MHz)

= Emission frequency in MHz

Reading (dBuV)

= Uncorrected Analyzer / Receiver reading

Correction Factor (dB/m)

= Antenna factor + Cable loss – Amplifier gain

Result (dBuV/m)

= Reading (dBuV) + Corr. Factor (dB/m)

Limit (dBuV/m)

= Limit stated in standard

Margin (dB)

= Result (dBuV/m) – Limit (dBuV/m)

Q.P.

= Quasi-peak Reading

Peak

= Peak Reading

AVG

= Average Reading

**8.3.2.3. TEST RESULTS****Below 1 GHz****Operation Mode:** TX / CH Low**Test Date:** April 8, 2014**Temperature:** 24°C**Tested by:** Jimmy Zheng**Humidity:** 52% RH**Polarity:** Ver. / Hor.

| Frequency (MHz) | Reading (dBμV) | Correction Factor (dB/m) | Result (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Antenna Pole (V/H) | Remark |
|-----------------|----------------|--------------------------|-----------------|----------------|-------------|--------------------|--------|
| 34.8500 | 37.97 | -13.13 | 24.84 | 40.00 | -15.16 | V | QP |
| 227.2333 | 35.28 | -18.07 | 17.21 | 46.00 | -28.79 | V | QP |
| 246.6333 | 34.46 | -17.43 | 17.03 | 46.00 | -28.97 | V | QP |
| 329.0833 | 36.12 | -17.48 | 18.64 | 46.00 | -27.36 | V | QP |
| 351.7167 | 36.71 | -16.69 | 20.02 | 46.00 | -25.98 | V | QP |
| 440.6333 | 37.01 | -15.07 | 21.94 | 46.00 | -24.06 | V | QP |
| | | | | | | | |
| 33.2333 | 42.62 | -12.99 | 29.63 | 40.00 | -10.37 | H | QP |
| 70.4167 | 45.03 | -23.33 | 21.70 | 40.00 | -18.30 | H | QP |
| 172.2667 | 45.17 | -18.71 | 26.46 | 43.50 | -17.04 | H | QP |
| 256.3333 | 34.71 | -17.84 | 16.87 | 46.00 | -29.13 | H | QP |
| 440.6333 | 32.46 | -15.07 | 17.39 | 46.00 | -28.61 | H | QP |
| 479.4333 | 31.77 | -14.40 | 17.37 | 46.00 | -28.63 | H | QP |

Remark: No emission found between lowest internal used/generated frequency to 30MHz.**Notes:**

1. Measuring frequencies from 9kHz to the 1GHz.
2. Radiated emissions measured in frequency range from 30MHz to 1GHz were made with an instrument using Peak/Quasi-peak detector mode.
3. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz.

**Operation Mode:** TX / CH Mid**Test Date:** April 8, 2014**Temperature:** 24°C**Tested by:** Jimmy Zheng**Humidity:** 52% RH**Polarity:** Ver. / Hor.

| Frequency (MHz) | Reading (dBμV) | Correction Factor (dB/m) | Result (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Antenna Pole (V/H) | Remark |
|-----------------|----------------|--------------------------|-----------------|----------------|-------------|--------------------|--------|
| 33.2333 | 39.95 | -12.99 | 26.96 | 40.00 | -13.04 | V | QP |
| 70.4167 | 40.13 | -23.33 | 16.80 | 40.00 | -23.20 | V | QP |
| 227.2333 | 34.92 | -18.07 | 16.85 | 46.00 | -29.15 | V | QP |
| 246.6333 | 34.61 | -17.43 | 17.18 | 46.00 | -28.82 | V | QP |
| 375.9667 | 32.55 | -16.81 | 15.74 | 46.00 | -30.26 | V | QP |
| 477.8167 | 31.33 | -14.47 | 16.86 | 46.00 | -29.14 | V | QP |
| | | | | | | | |
| 34.8500 | 38.56 | -13.13 | 25.43 | 40.00 | -14.57 | H | QP |
| 70.4167 | 44.29 | -23.33 | 20.96 | 40.00 | -19.04 | H | QP |
| 178.7332 | 42.90 | -18.74 | 24.16 | 43.50 | -19.34 | H | QP |
| 256.3333 | 34.06 | -17.84 | 16.22 | 46.00 | -29.78 | H | QP |
| 479.4333 | 32.83 | -14.40 | 18.43 | 46.00 | -27.57 | H | QP |
| 620.0833 | 31.99 | -12.65 | 19.34 | 46.00 | -26.66 | H | QP |

Remark: No emission found between lowest internal used/generated frequency to 30MHz.**Notes:**

1. Measuring frequencies from 9kHz to the 1GHz.
2. Radiated emissions measured in frequency range from 30MHz to 1GHz were made with an instrument using Peak/Quasi-peak detector mode.
3. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz.

**Operation Mode:** TX / CH High**Test Date:** April 8, 2014**Temperature:** 24°C**Tested by:** Jimmy Zheng**Humidity:** 52% RH**Polarity:** Ver. / Hor.

| Frequency (MHz) | Reading (dBμV) | Correction Factor (dB/m) | Result (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Antenna Pole (V/H) | Remark |
|-----------------|----------------|--------------------------|-----------------|----------------|-------------|--------------------|--------|
| 39.7000 | 39.33 | -14.46 | 24.87 | 40.00 | -15.13 | V | QP |
| 118.9167 | 33.54 | -20.30 | 13.24 | 43.50 | -30.26 | V | QP |
| 227.2333 | 34.41 | -18.07 | 16.34 | 46.00 | -29.66 | V | QP |
| 246.6333 | 34.44 | -17.43 | 17.01 | 46.00 | -28.99 | V | QP |
| 377.5833 | 31.80 | -16.85 | 14.95 | 46.00 | -31.05 | V | QP |
| 576.4333 | 32.01 | -13.33 | 18.68 | 46.00 | -27.32 | V | QP |
| | | | | | | | |
| 36.4667 | 34.20 | -13.55 | 20.65 | 40.00 | -19.35 | H | QP |
| 128.6167 | 32.91 | -19.34 | 13.57 | 43.50 | -29.93 | H | QP |
| 144.7833 | 34.37 | -19.12 | 15.25 | 43.50 | -28.25 | H | QP |
| 191.6667 | 33.97 | -18.73 | 15.24 | 43.50 | -28.26 | H | QP |
| 256.3333 | 34.30 | -17.84 | 16.46 | 46.00 | -29.54 | H | QP |
| 426.0833 | 31.65 | -14.92 | 16.73 | 46.00 | -29.27 | H | QP |

Remark: No emission found between lowest internal used/generated frequency to 30MHz.**Notes:**

1. Measuring frequencies from 9kHz to the 1GHz.
2. Radiated emissions measured in frequency range from 30MHz to 1GHz were made with an instrument using Peak/Quasi-peak detector mode.
3. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz.

**Above 1 GHz****Operation Mode:** TX / CH Low**Test Date:** April 8, 2014**Temperature:** 24°C**Tested by:** Jimmy Zheng**Humidity:** 52% RH**Polarity:** Ver. / Hor.*Fundamental*

| Frequency (MHz) | Reading (dBuV) | Correction Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Pole (V/H) | Remark |
|-----------------|----------------|--------------------------|-----------------|----------------|-------------|--------------------|--------|
| 2402.0000 | 46.36 | -9.72 | 36.64 | 114.00 | -77.36 | V | Peak |
| 2402.0000 | 84.31 | -9.72 | 74.59 | 94.00 | -19.41 | V | AVG |
| 2402.0000 | 46.29 | -9.72 | 36.57 | 114.00 | -77.43 | H | Peak |
| 2402.0000 | 100.78 | -9.72 | 91.06 | 94.00 | -2.94 | H | AVG |

| Frequency (MHz) | Reading (dBuV) | Correction Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Pole (V/H) | Remark |
|-----------------|----------------|--------------------------|-----------------|----------------|-------------|--------------------|--------|
| 1340.0000 | 45.40 | -8.10 | 37.30 | 74.00 | -36.70 | V | Peak |
| 2530.0000 | 45.04 | -6.08 | 38.96 | 74.00 | -35.04 | V | Peak |
| 2870.0000 | 43.58 | -4.76 | 38.82 | 74.00 | -35.18 | V | Peak |
| 3833.3330 | 41.93 | -2.50 | 39.43 | 74.00 | -34.57 | V | Peak |
| 4315.0000 | 39.78 | -1.14 | 38.64 | 74.00 | -35.36 | V | Peak |
| 4711.6670 | 40.55 | 0.03 | 40.58 | 74.00 | -33.42 | V | Peak |
| 1368.3330 | 46.30 | -7.97 | 38.33 | 74.00 | -35.67 | H | Peak |
| 2501.6670 | 45.27 | -6.18 | 39.09 | 74.00 | -34.91 | H | Peak |
| 2813.3330 | 44.28 | -4.99 | 39.29 | 74.00 | -34.71 | H | Peak |
| 4343.3330 | 41.86 | -1.04 | 40.82 | 74.00 | -33.18 | H | Peak |
| 5618.3330 | 41.50 | 2.01 | 43.51 | 74.00 | -30.49 | H | Peak |
| 7205.0000 | 39.86 | 7.38 | 47.24 | 74.00 | -26.76 | H | Peak |

REMARKS:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**Operation Mode:** TX / CH Mid**Test Date:** April 8, 2014**Temperature:** 24°C**Tested by:** Jimmy Zheng**Humidity:** 52% RH**Polarity:** Ver. / Hor.***Fundamental***

| Frequency (MHz) | Reading (dBuV) | Correction Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Pole (V/H) | Remark |
|-----------------|----------------|--------------------------|-----------------|----------------|-------------|--------------------|--------|
| 2440.0000 | 83.38 | -9.77 | 73.61 | 114.00 | -40.39 | V | Peak |
| 2440.0000 | 82.35 | -9.77 | 72.58 | 94.00 | -21.42 | V | AVG |
| 2440.0000 | 98.67 | -9.77 | 88.90 | 114.00 | -25.10 | H | Peak |
| 2440.0000 | 97.89 | -9.77 | 88.12 | 94.00 | -5.88 | H | AVG |

| Frequency (MHz) | Reading (dBuV) | Correction Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Pole (V/H) | Remark |
|-----------------|----------------|--------------------------|-----------------|----------------|-------------|--------------------|--------|
| 1311.6670 | 46.68 | -8.23 | 38.45 | 74.00 | -35.55 | V | Peak |
| 1623.3330 | 45.70 | -8.77 | 36.93 | 74.00 | -37.07 | V | Peak |
| 2190.0000 | 44.35 | -8.13 | 36.22 | 74.00 | -37.78 | V | Peak |
| 2501.6670 | 45.45 | -6.18 | 39.27 | 74.00 | -34.73 | V | Peak |
| 2785.0000 | 45.27 | -5.10 | 40.17 | 74.00 | -33.83 | V | Peak |
| 3210.0000 | 43.42 | -4.09 | 39.33 | 74.00 | -34.67 | V | Peak |
| 1481.6670 | 46.44 | -8.18 | 38.26 | 74.00 | -35.74 | H | Peak |
| 2246.6670 | 44.46 | -7.63 | 36.83 | 74.00 | -37.17 | H | Peak |
| 2501.6670 | 45.73 | -6.18 | 39.55 | 74.00 | -34.45 | H | Peak |
| 3266.6670 | 44.86 | -4.06 | 40.80 | 74.00 | -33.20 | H | Peak |
| 3720.0000 | 42.70 | -2.70 | 40.00 | 74.00 | -34.00 | H | Peak |
| 4796.6670 | 45.37 | 0.40 | 45.77 | 74.00 | -28.23 | H | Peak |

REMARKS:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**Operation Mode:** TX / CH High**Temperature:** 24°C**Humidity:** 52% RH**Test Date:** April 8, 2014**Tested by:** Jimmy Zheng**Polarity:** Ver. / Hor.***Fundamental***

| Frequency (MHz) | Reading (dBuV) | Correction Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Pole (V/H) | Remark |
|-----------------|----------------|--------------------------|-----------------|----------------|-------------|--------------------|--------|
| 2480.0000 | 84.87 | -9.78 | 75.09 | 114.00 | -38.91 | V | Peak |
| 2480.0000 | 83.06 | -9.78 | 73.28 | 94.00 | -20.72 | V | AVG |
| 2480.0000 | 99.27 | -9.78 | 89.49 | 114.00 | -24.51 | H | Peak |
| 2480.0000 | 97.73 | -9.78 | 87.95 | 94.00 | -6.05 | H | AVG |

| Frequency (MHz) | Reading (dBuV) | Correction Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Pole (V/H) | Remark |
|-----------------|----------------|--------------------------|-----------------|----------------|-------------|--------------------|--------|
| 1396.6670 | 46.15 | -7.84 | 38.31 | 74.00 | -35.69 | V | Peak |
| 2246.6670 | 44.85 | -7.63 | 37.22 | 74.00 | -36.78 | V | Peak |
| 2501.6670 | 45.15 | -6.18 | 38.97 | 74.00 | -35.03 | V | Peak |
| 2785.0000 | 44.16 | -5.10 | 39.06 | 74.00 | -34.94 | V | Peak |
| 3295.0000 | 44.64 | -4.05 | 40.59 | 74.00 | -33.41 | V | Peak |
| 3720.0000 | 42.70 | -2.70 | 40.00 | 74.00 | -34.00 | V | Peak |
| | | | | | | | |
| 1311.6670 | 46.74 | -8.23 | 38.51 | 74.00 | -35.49 | H | Peak |
| 1510.0000 | 46.81 | -8.30 | 38.51 | 74.00 | -35.49 | H | Peak |
| 2105.0000 | 46.19 | -9.55 | 36.64 | 74.00 | -37.36 | H | Peak |
| 2558.3330 | 45.62 | -5.98 | 39.64 | 74.00 | -34.36 | H | Peak |
| 2841.6670 | 44.26 | -4.87 | 39.39 | 74.00 | -34.61 | H | Peak |
| 4881.6670 | 44.72 | 0.78 | 45.50 | 74.00 | -28.50 | H | Peak |

REMARKS:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).