



EMC TEST REPORT

Report No.: SET2014-01709

Product Name: Toughshield

FCC ID: OHV-R750

Model No. : R750

Applicant: Toughshield devices Ltd.

Address: 2nd Floor, Belgravia House, 34-44 Circular Road, Douglas,
Isle of Man. IM1 1AE

Received Date: 2014-02-21

Tested Date: 2014-02-21—2014-03-07

Issued by: CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd.

Lab Location: Electronic Testing Building, Shahe Road, Xili, Nanshan District,
Shenzhen, 518055, P. R. China

Tel: 86 755 26627338 **Fax:** 86 755 26627238

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Test Report

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Applicant : Toughshield devices Ltd.

Applicant Address : 2nd Floor, Belgravia House, 34-44 Circular Road,
Douglas, Isle of Man. IM1 1AE

Manufacturer : Toughshield devices Ltd.

Manufacturer Address : 2nd Floor, Belgravia House, 34-44 Circular Road,
Douglas, Isle of Man. IM1 1AE

Test Standards : 47 CFR Part 15 Subpart B: Radio Frequency Devices

Test Result : PASS

Tested by :

Xiaolong Zhang

2014.03.07

Xiaolong Zhang, Test Engineer

Reviewed by :

Shuangwen Zhang

2014.03.07

Shuangwen Zhang, Senior Engineer

Approved by :

Wu Li'an

2014.03.07

Wu Li'an, Manager

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| Change History | | |
|----------------|------------|-------------------|
| Issue | Date | Reason for change |
| 1.0 | 2014.03.07 | First edition |
| | | |
| | | |

1. GENERAL INFORMATION

1.1 EUT Description

EUT Name : Toughshield
Serial No. : (n.a, marked #1 by test site)v
FCC ID : OHV-R750
Hardware Version : S097M001P110
Software Version : R750_VER_2.0_01035_20131114
Power Supply : Battery
Brand Name: /
Model No.: /
Serial No.: (n.a. marked #1 by test site)
Capacitance: 2000mAh
Rated Voltage: 3.7V
Charge Limit: 4.2V
Ancillary Equipment 1 : AC Adapter (Charger for Battery)
Brand Name: /
Model No.: DSA-5CAA-05050100
Serial No.: (n.a. marked #1 by test site)
Rated Input: 100-240V, 0.2A, 50/60Hz
Rated Output: 5V=1A
Ancillary Equipment 2 : PC
Brand Name: ThinkPad
Model Name: E420
Serial No.: 1141AH6

Note 1: The EUT is a GSM/WCDMA MOBILE PHONE, it supports the following operating mode and frequency band: NFC(13.56MHz), GSM850/PCS1900/WCDMA850WCDMA1900 and 802.11b, 802.11g, 802.11n/20M and Bluetooth 3.0

Note 2: The EUT is equipped with a T-Flash card slot; equipped with a USB port which can be connected to the ancillary equipments supplied by the manufacturer e.g. the AC Adapter and the USB Cable.

Note 3: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

1.2 Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart B:

| No. | Identity | Document Title |
|-----|----------------------------------|-------------------------|
| 1 | 47 CFR Part 15 Subpart B 2012 | Radio Frequency Devices |

Test detailed items/section required by FCC rules and results are as below:

| No. | Section | Description | Result |
|-----|---------|--------------------|--------|
| 1 | 15.107 | Conducted Emission | PASS |
| 2 | 15.109 | Radiated Emission | PASS |

NOTE: The EUT has been tested according to 47 CFR Part 15 Subpart B, Class B. The test procedure is according to ANSI C63.4:2009 and CISPR 22:2008. The test results are as following:



1.3 Facilities and Accreditations

1.3.1 Facilities

CNAS-Lab Code: L1659

CCIC-SET Southern Electronic Product Testing (Shenzhen) Co., Ltd. CCIC is a third party testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L1659. A 12.8*6.8*6.4 (m) fully anechoic chamber was used for the radiated spurious emissions test.

FCC-Registration No.: 406086

CCIC-SET Southern Electronic Product Testing (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Registration 406086, Renewal date Nov. 19, 2011, valid time is until Nov. 18, 2014.

1.3.2 Test Environment Conditions

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

| | |
|-----------------------------|---------------|
| Temperature (°C): | 15 °C - 35 °C |
| Relative Humidity (%): | 30% -60% |
| Atmospheric Pressure (kPa): | 86KPa-106KPa |

1.3.3 Measurement Uncertainty

The uncertainty is calculated using the methods suggested in the "Guide to the Expression of Uncertainty in Measurement" (GUM) published by ISO.

| | |
|------------------------------------|-------------------------------|
| Uncertainty of Conducted Emission: | U _c = 3.6 dB (k=2) |
| Uncertainty of Radiated Emission: | U _c = 4.5 dB (k=2) |

2. TEST CONDITIONS SETTING

2.1 Test Mode

(1) The test mode (USB)

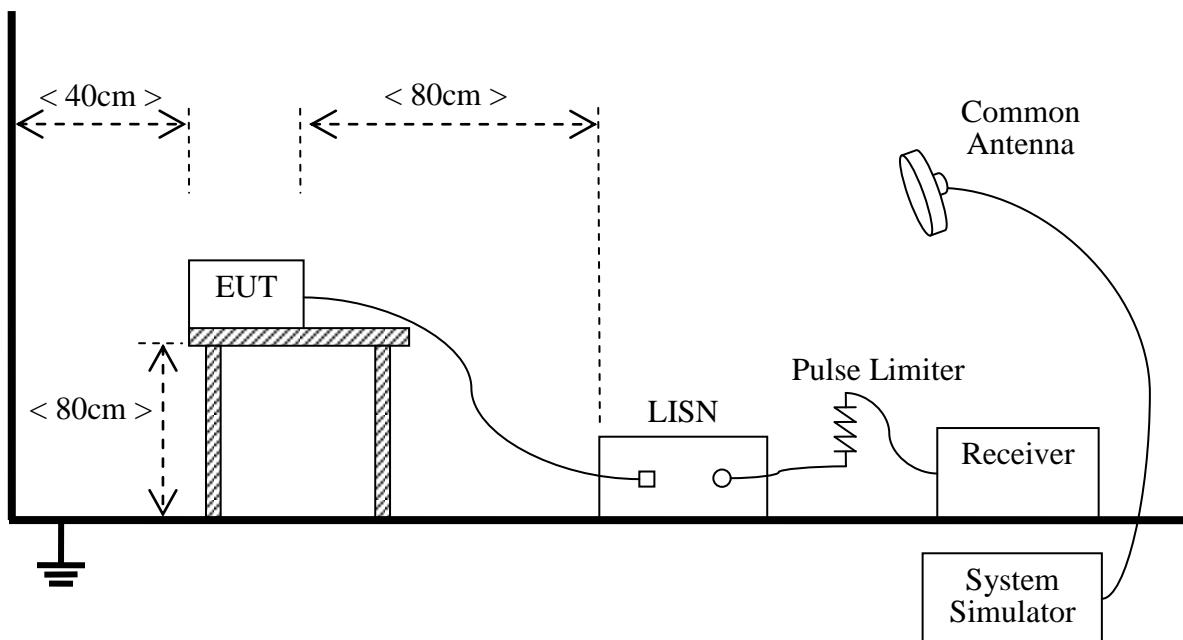
The EUT configuration of the emission tests is TransFlash Card + EUT + Battery + PC.

In this test mode, the EUT with a TransFlash Card embedded is connected with a PC via a USB cable supplied by applicant. During the measurement, the data is transmitting between the PC and the TransFlash Card of the EUT.

2.2 Test Setup and Equipments List

2.2.1 Conducted Emission

A. Test Setup:



The EUT is placed on a 0.8m high insulating table, which stands on the grounded conducting floor, and keeps 0.4m away from the grounded conducting wall. The EUT is connected to the power mains through a LISN which provides $50\Omega/50\mu\text{H}$ of coupling impedance for the measuring instrument. The Common Antenna is used for the call between the EUT and the System Simulator (SS). A Pulse Limiter is used to protect the measuring instrument. The factors of the whole test system are calibrated to correct the reading.

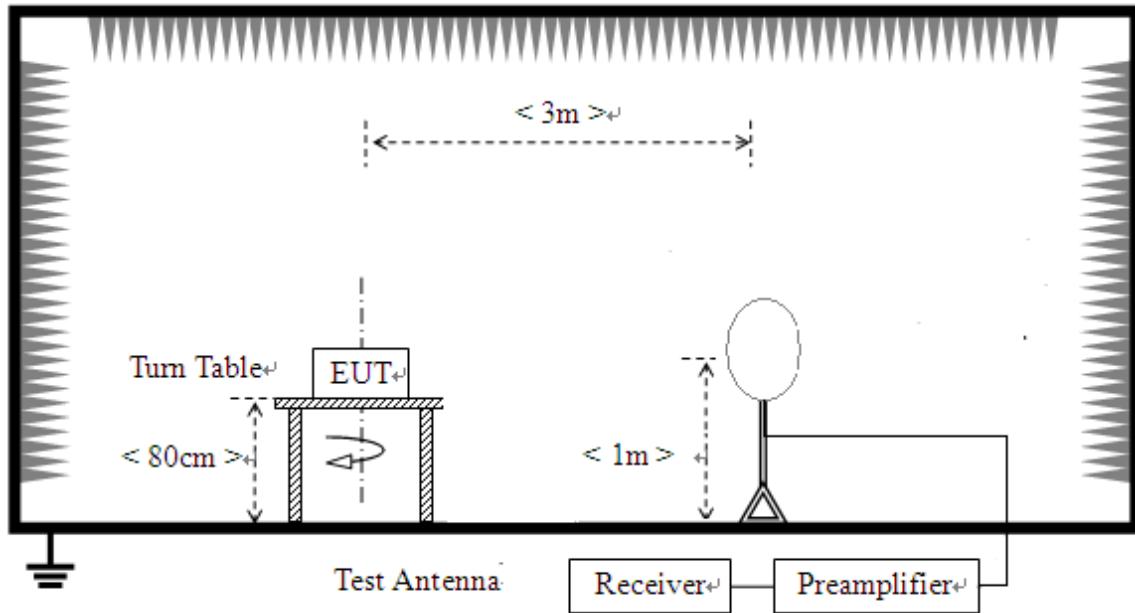
B. Equipments List:

| Description | Manufacturer | Model | Serial No. | Calibration Due. Date |
|---------------|---------------|-------|------------|-----------------------|
| Test Receiver | ROHDE&SCHWARZ | ESCI | A130901475 | 2014.09.09 |
| LISN | Schaffner | NNB41 | A0304245 | 2014.09.11 |

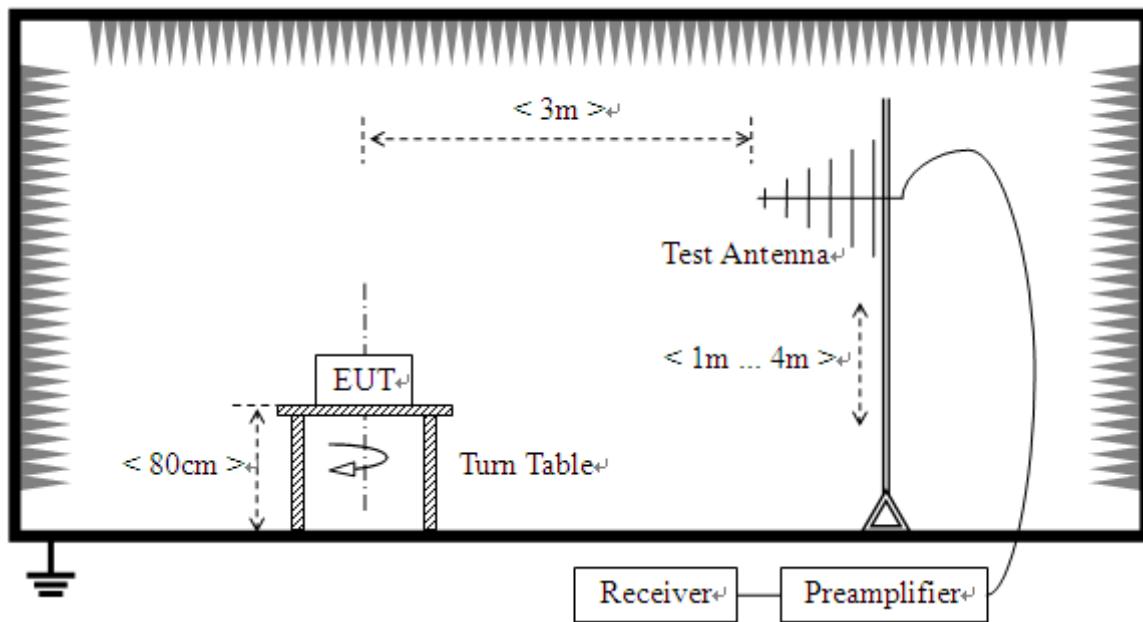
2.2.2 Radiated Emission

A. Test Setup:

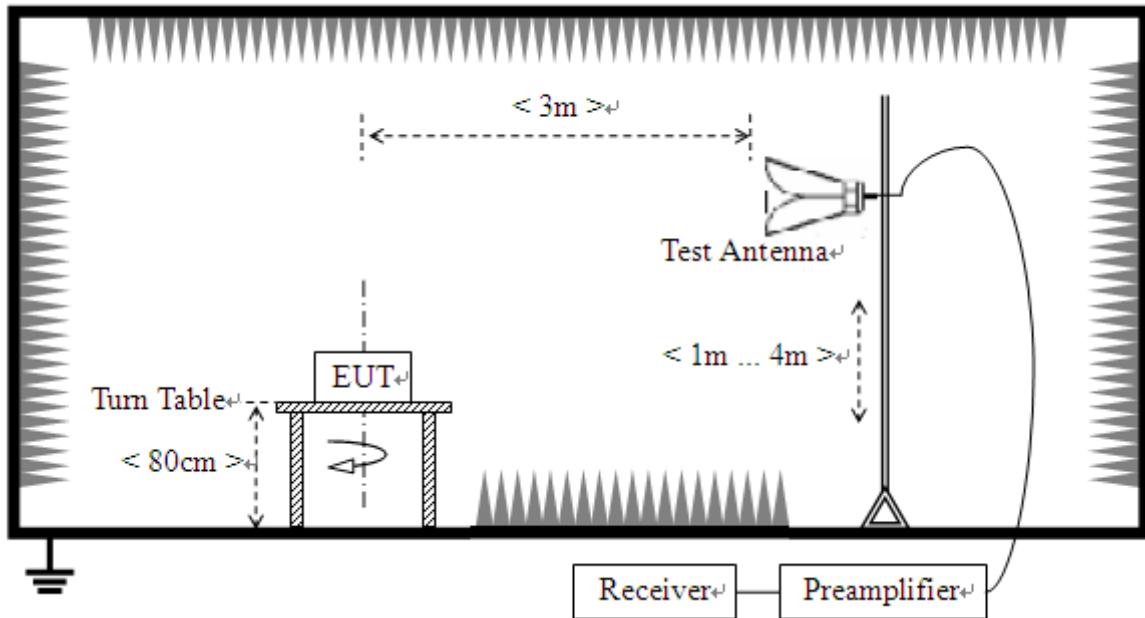
- 1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to 1GHz



3) For radiated emissions above 1GHz



B. Test Procedure

The test is performed in a 3m Semi-Anechoic Chamber; the antenna factor, cable loss and so on of the site (factors) is calculated to correct the reading. The EUT is placed on a 0.8m high insulating Turn Table, and keeps 3m away from the Test Antenna, which is mounted on a variable-height antenna master tower.

For the test Antenna:

- 1) In the frequency range of 9KHz to 30MHz, magnetic field is measured with Loop Test Antenna. The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
- 2) In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) and Horn Test Antenna (above 1GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength. The emission levels at both horizontal and vertical polarizations should be tested.

C. Equipments List:



| Description | Manufacturer | Model | Serial No. | Calibration Due Date |
|-----------------------|-----------------------------|--------------------------------|------------|----------------------|
| Test Receiver | ROHDE&SCHWARZ | ESIB7 | A0501375 | 2014.06.10 |
| Test Receiver | ROHDE&SCHWARZ | ESIB26 | A0304218 | 2014.06.10 |
| Semi-Anechoic Chamber | Albatross | 9m*6m*6m | A0412372 | 2015.01.04 |
| Test Antenna Bi-Log | HP | CBL6111A | A9704202 | 2014.06.10 |
| Test Antenna Horn | ROHDE&SCHWARZ | HF906 | A0304225 | 2014.06.10 |
| System Simulator | ROHDE&SCHWARZ | CMU200 | A0304212 | 2014.06.10 |
| Anechoic Chamber | Albatross | SAC-5MAC 12.8x6.8x6.4 m | A0304210 | 2015.03.09 |
| Amplifier 1G~18GHz | ROHDE&SCHWARZ | MITEQ AFS42-0010 1800 | A0509366 | 2014.06.10 |
| amplifier 20M~3GHz | Compliance Direction System | PAP-0203H | A0509377 | 2014.06.10 |
| loop antenna | HFH2-Z2 | R&S | A0304220 | 2016.06.28 |
| Anechoic Chamber | Albatross | SAC-5MAC 19.6x11.8x8. 5m | A0304210 | 2015.03.09 |
| EMI Test Receiver | R&S | ESCI | A0902601 | 2014.09.09 |

3. 47 CFR PART 15B REQUIREMENTS

3.1 Conducted Emission

3.1.1 Requirement

According to FCC section 15.107, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 Ω line impedance stabilization network (LISN).

| Frequency range (MHz) | Conducted Limit (dB μ V) | |
|-----------------------|------------------------------|----------|
| | Quasi-peak | Average |
| 0.15 - 0.50 | 66 to 56 | 56 to 46 |
| 0.50 - 5 | 56 | 46 |
| 5 - 30 | 60 | 50 |

NOTE:

- The limit subjects to the Class B digital device.
- The lower limit shall apply at the band edges.
- The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

3.1.2 Test Description

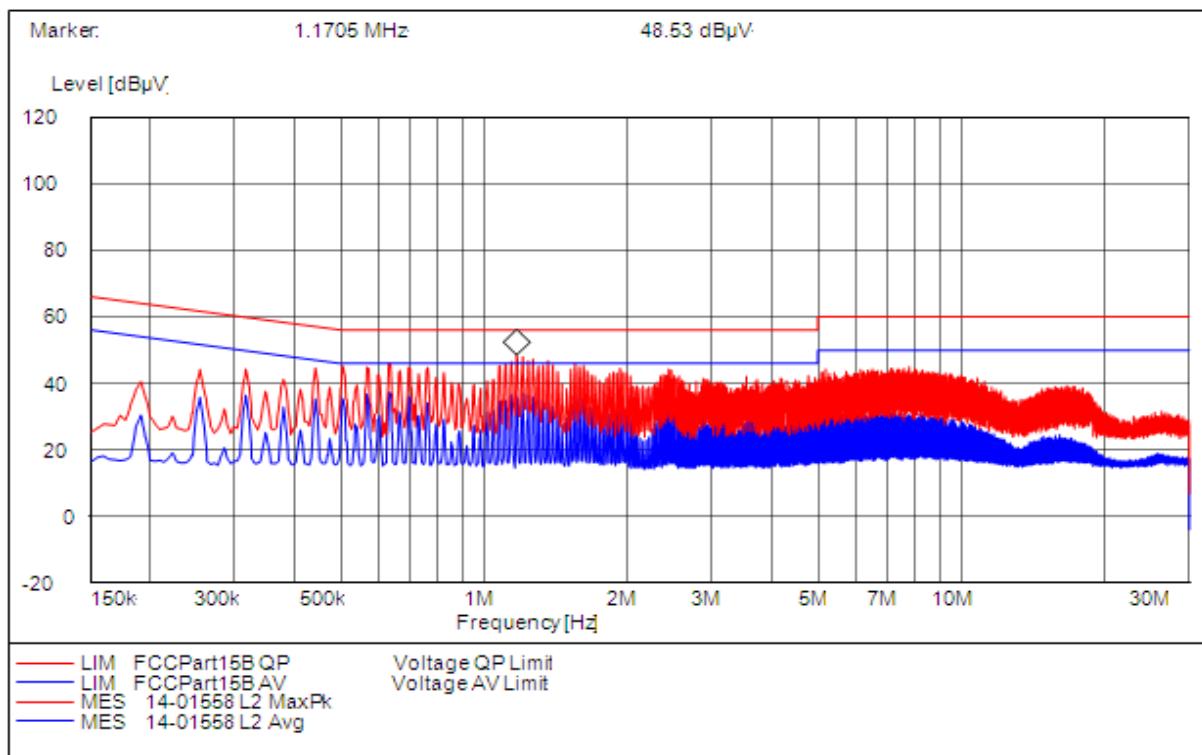
See section 2.2.1 of this report.

3.1.3 Test Result

The maximum conducted interference is searched using Peak (PK), Quasi-peak (QP) and Average (AV) detectors; the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. All test modes are considered, refer to recorded points and plots below.

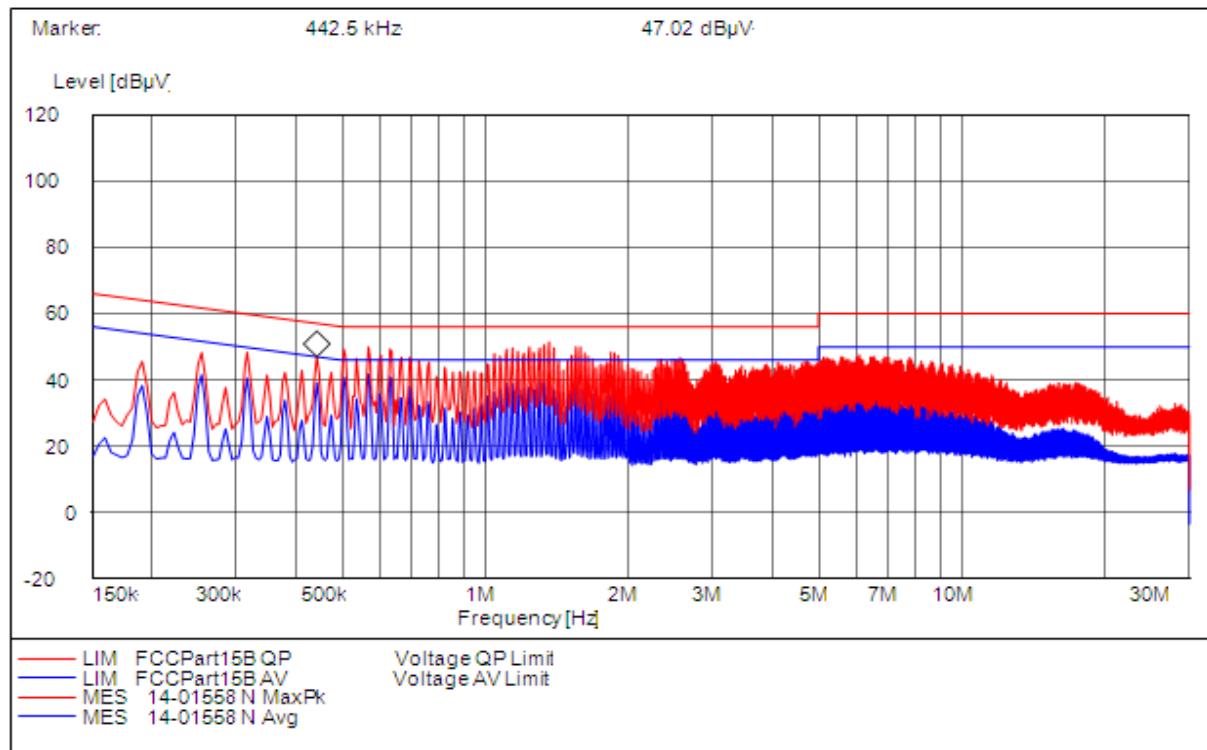
3.1.3.1 Test Mode

A. Test Plot and Suspicious Points:



| Conducted Disturbance at Mains Terminals | | | | | | | |
|--|---------------------|--------------------------------|-------------|-----------------|---------------------|--------------------------------|-------------|
| L Test Data | | | | | | | |
| QP | | | | AV | | | |
| Frequency (MHz) | Limits (dB μ V) | Measurement Value (dB μ V) | Margin (dB) | Frequency (MHz) | Limits (dB μ V) | Measurement Value (dB μ V) | Margin (dB) |
| 0.4425 | 57 | 44.70 | 12.30 | 0.4425 | 47 | 35.47 | 11.53 |
| 0.6305 | 56 | 45.98 | 10.02 | 0.6305 | 46 | 37.44 | 8.56 |
| 1.1075 | 56 | 47.86 | 8.14 | 1.1075 | 46 | 36.05 | 19.95 |
| L Test Curve | | | | | | | |

(Plot A: L Phase)



| Conducted Disturbance at Mains Terminals | | | | | | | |
|--|---------------------|--------------------------------|-------------|-----------------|---------------------|--------------------------------|-------------|
| N Test Data | | | | | | | |
| QP | | | | AV | | | |
| Frequency (MHz) | Limits (dB μ V) | Measurement Value (dB μ V) | Margin (dB) | Frequency (MHz) | Limits (dB μ V) | Measurement Value (dB μ V) | Margin (dB) |
| 0.4425 | 57 | 47.33 | 9.67 | 0.4425 | 47 | 39.31 | 7.69 |
| 0.5675 | 56 | 48.97 | 7.03 | 0.5675 | 46 | 41.90 | 4.10 |
| 1.3280 | 56 | 50.64 | 5.36 | 1.3280 | 46 | 39.59 | 6.41 |
| N Test Curve | | | | | | | |

(Plot B: N Phase)

Test Result: PASS

3.2 Radiated Emission

3.2.1 Requirement

According to FCC section 15.109, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

| Frequency range (MHz) | Field Strength | | Field Strength Limitation at 3m Measurement Dist | |
|-----------------------|-----------------|------|--|------------------------|
| | $\mu\text{V/m}$ | Dist | ($\mu\text{V/m}$) | (dBuV/m) |
| 0.009 - 0.490 | 2400/F(kHz) | 300m | 10000* 2400/F(KHz) | 20log 2400/F(kHz) + 80 |
| 0.490 - 1.705 | 2400/F(kHz) | 30m | 100* 2400/F(KHz) | 20log 2400/F(kHz) + 40 |
| 1.705 - 30.00 | 30 | 30m | 100*30 | 20log 30 + 40 |
| 30.0 - 88.0 | 100 | 3m | 100 | 20log 100 |
| 88.0 - 216.0 | 150 | 3m | 150 | 20log 150 |
| 216.0 - 960.0 | 200 | 3m | 200 | 20log 200 |
| Above 960.0 | 500 | 3m | 500 | 20log 500 |

- a) As shown in FCC section 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector. When average radiated emission measurements are specified in this part, including emission measurements below 1000MHz, there also is a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit for the frequency being investigated unless a different peak emission limit is otherwise specified in the rules.
- b) Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength.
- c) For below 1G :QP detector RBW 120kHz ,VBW 300kHz.
- d) For Above 1G: PK detector RBW 1MHz,VBW 3MHz for PK value ;PK detector RBW 1MHz, VBW 10Hz for AV value.

Note:

- 1) The tighter limit shall apply at the boundary between two frequency range.
- 2) Limitation expressed in dBuV/m is calculated by 20log Emission Level($\mu\text{V/m}$).
- 3) If measurement is made at 3m distance, then F.S Limitation at 3m distance is adjusted by using the formula of $Ld1 = Ld2 * (d2/d1)^2$.

Example:

F.S Limit at 30m distance is 30uV/m, then F.S Limitation at 3m distance is adjusted as $Ld1 = Ld2 * (10)^2 = 100 * 30u\text{V/m}$.

3.2.2 Test Description

See section 2.2.2 of this report.

3.2.3 Test Result

The maximum radiated emission is searched using PK, QP and AV detectors; the emission levels more than the limits, and that have narrow margins from the limits will be re-measured with AV and QP detectors. Both the vertical and the horizontal polarizations of the Test Antenna are considered to perform the tests. All test modes are considered, refer to recorded points and plots below.

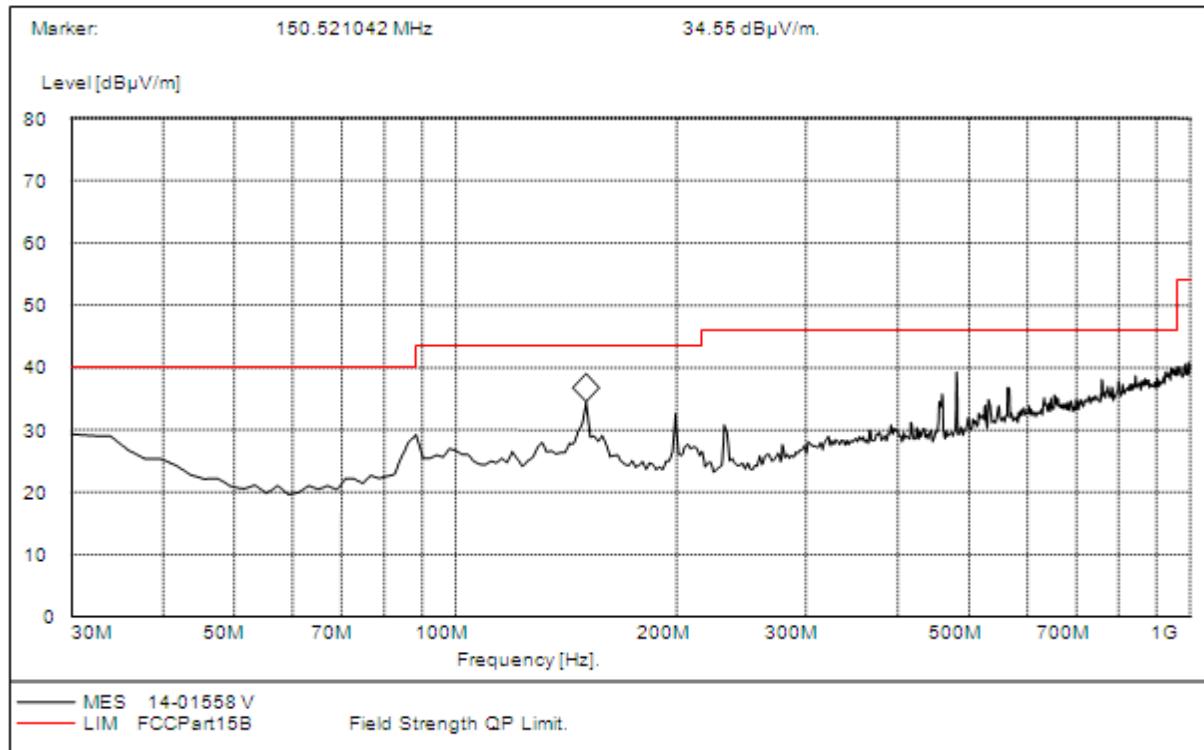
The amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.

Note: All radiated emission tests were performed in X, Y, Z axis direction, and only the worst axis test condition was recorded in this test report.

A. Test Plots and Suspicious Points:

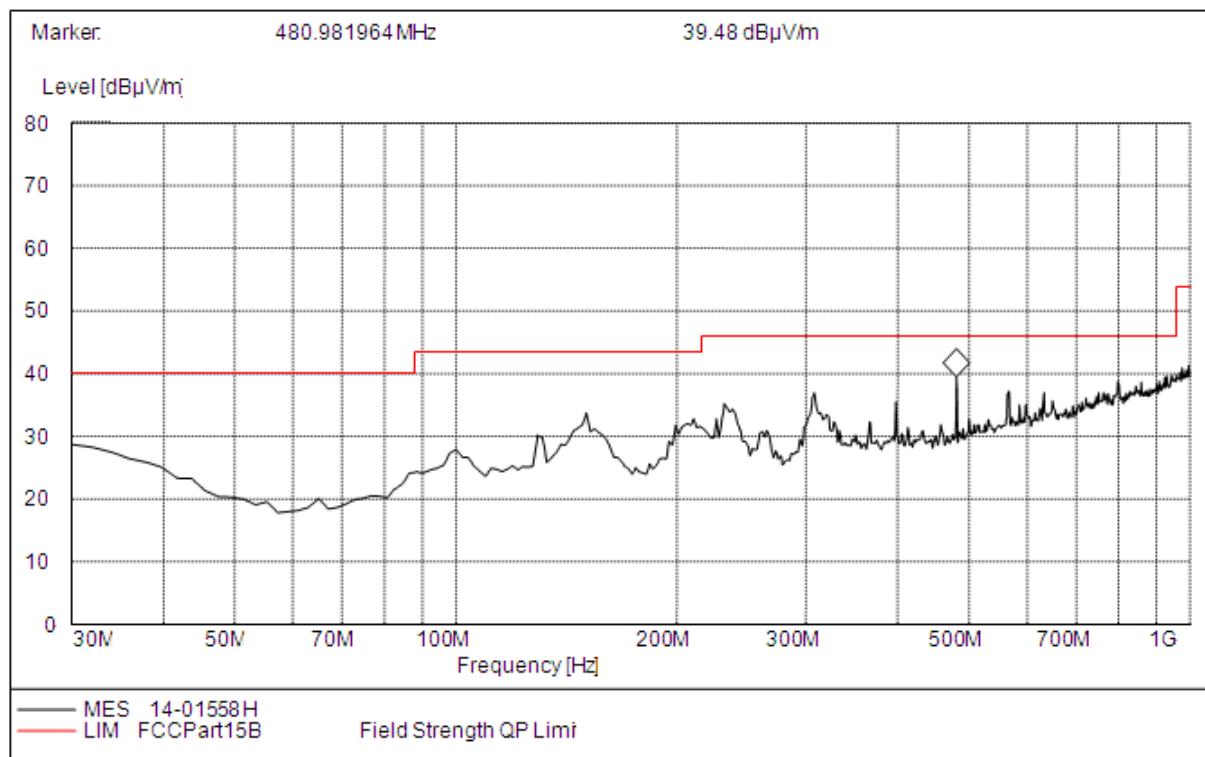


(Plot A: 9K – 30M)



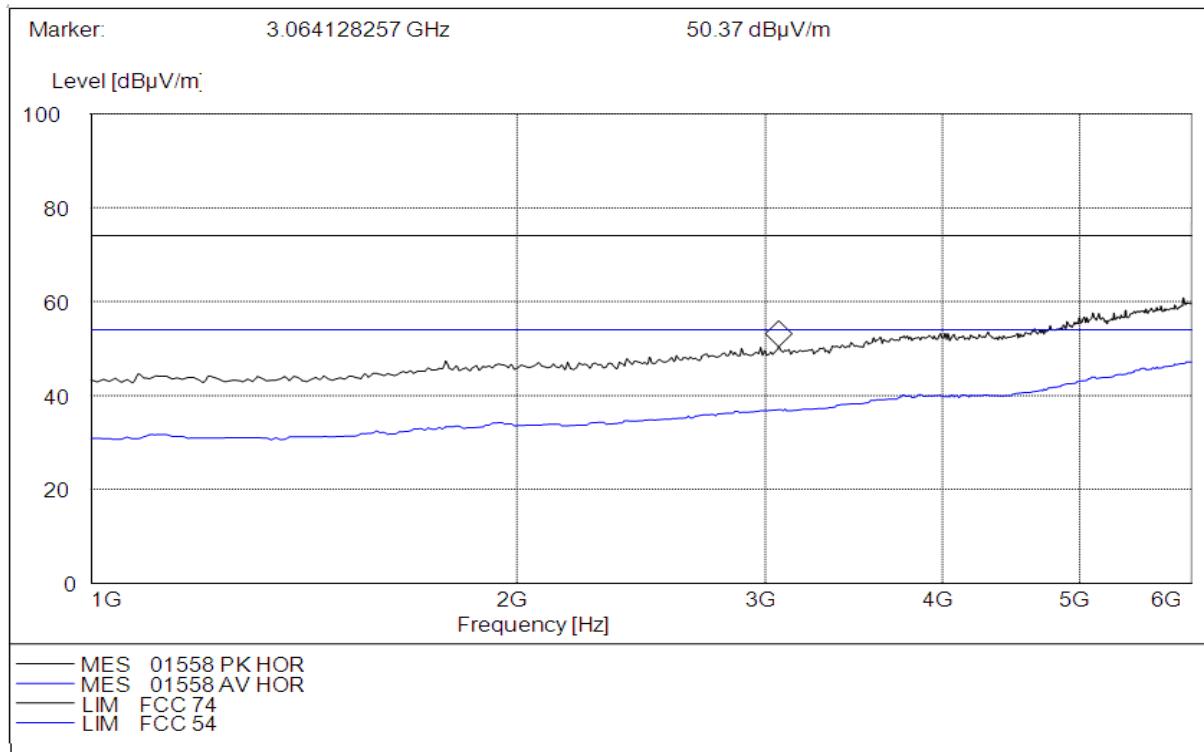
(Plot B: Test Antenna Vertical 30M - 1G)

| Frequency (MHz) | QuasiPeak (dB μ V/m) | Bandwidth (kHz) | Antenna height (cm) | Limit (dB μ V/m) | Margin (dB) | Antenna | Verdict |
|-----------------|--------------------------|-----------------|---------------------|----------------------|-------------|----------|---------|
| 30.000000 | 29.30 | 120.000 | 100.0 | 40.00 | 10.70 | Vertical | Pass |
| 150.521000 | 34.55 | 120.000 | 100.0 | 43.50 | 8.95 | Vertical | Pass |
| 307.975000 | 36.98 | 120.000 | 100.0 | 46.00 | 9.02 | Vertical | Pass |



(Plot C: Test Antenna Horizontal 30M - 1G)

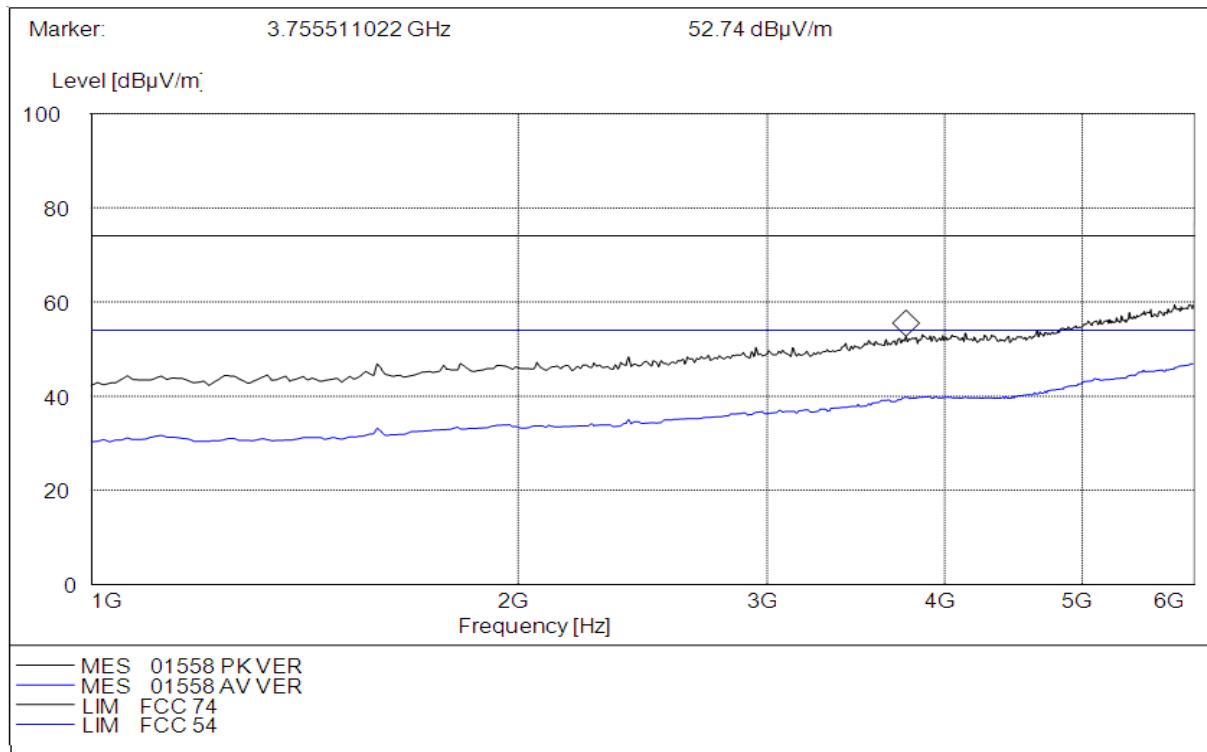
| Frequency (MHz) | QuasiPeak (dB μ V/m) | Bandwidth (kHz) | Antenna height (cm) | Limit (dB μ V/m) | Margin (dB) | Antenna | Verdict |
|-----------------|--------------------------|-----------------|---------------------|----------------------|-------------|------------|---------|
| 30.000000 | 28.90 | 120.000 | 100.0 | 40.00 | 11.10 | Horizontal | Pass |
| 150.521000 | 33.75 | 120.000 | 100.0 | 43.50 | 9.75 | Horizontal | Pass |
| 480.981964 | 39.48 | 120.000 | 100.0 | 46.00 | 6.52 | Horizontal | Pass |
| | | | | | | | |



(Plot D: Test Antenna Horizontal 1G – 6G)

| Frequency (MHz) | AV (dB μ V/m) | Bandwidth (kHz) | Antenna height (cm) | Limit (dB μ V/m) | Margin (dB) | Antenna | Verdict |
|-----------------|-------------------|-----------------|---------------------|----------------------|-------------|------------|---------|
| 1081.16030 | 30.81 | 1000.000 | 100.0 | 54.00 | 23.19 | Horizontal | Pass |
| 1782.56312 | 33.31 | 1000.000 | 150.0 | 54.00 | 20.69 | Horizontal | Pass |
| 2884.76750 | 36.41 | 1000.000 | 150.0 | 54.00 | 17.59 | Horizontal | Pass |
| 3756.51102 | 40.11 | 1000.000 | 100.0 | 54.00 | 13.89 | Horizontal | Pass |
| 4908.81563 | 42.51 | 1000.000 | 100.0 | 54.00 | 11.49 | Horizontal | Pass |
| 5920.83967 | 46.81 | 1000.000 | 150.0 | 54.00 | 7.19 | Horizontal | Pass |
| | | | | | | | |

| Frequency (MHz) | PK (dB μ V/m) | Bandwidth (kHz) | Antenna height (cm) | Limit (dB μ V/m) | Margin (dB) | Antenna | Verdict |
|-----------------|-------------------|-----------------|---------------------|----------------------|-------------|------------|---------|
| 1081.16030 | 44.69 | 1000.000 | 150.0 | 74.00 | 29.31 | Horizontal | Pass |
| 1782.56312 | 47.40 | 1000.000 | 150.0 | 74.00 | 26.60 | Horizontal | Pass |
| 2884.76750 | 50.04 | 1000.000 | 150.0 | 74.00 | 23.93 | Horizontal | Pass |
| 3756.51102 | 52.75 | 1000.000 | 100.0 | 74.00 | 21.25 | Horizontal | Pass |
| 4908.81563 | 55.33 | 1000.000 | 180.0 | 74.00 | 18.67 | Horizontal | Pass |
| 5920.83967 | 60.79 | 1000.000 | 150.0 | 74.00 | 13.21 | Horizontal | Pass |
| | | | | | | | |



(Plot E: Test Antenna Vertical 1G – 6G)



| Frequency (MHz) | AV (dB μ V/m) | Bandwidth (kHz) | Antenna height (cm) | Limit (dB μ V/m) | Margin (dB) | Antenna | Verdict |
|-----------------|-------------------|-----------------|---------------------|----------------------|-------------|----------|---------|
| 1591.18230 | 33.21 | 1000.000 | 100.0 | 54.00 | 10.79 | Vertical | Pass |
| 2392.78550 | 35.01 | 1000.000 | 150.0 | 54.00 | 18.99 | Vertical | Pass |
| 2943.88770 | 36.51 | 1000.000 | 150.0 | 54.00 | 17.49 | Vertical | Pass |
| 3855.71140 | 39.81 | 1000.000 | 100.0 | 54.00 | 14.19 | Vertical | Pass |
| 4887.77750 | 42.11 | 1000.000 | 150.0 | 54.00 | 11.89 | Vertical | Pass |
| 5589.17835 | 45.31 | 1000.000 | 100.0 | 54.00 | 8.69 | Vertical | Pass |
| | | | | | | | |

| Frequency (MHz) | PK (dB μ V/m) | Bandwidth (kHz) | Antenna height (cm) | Limit (dB μ V/m) | Margin (dB) | Antenna | Verdict |
|-----------------|-------------------|-----------------|---------------------|----------------------|-------------|----------|---------|
| 1592.18230 | 46.89 | 1000.000 | 150.0 | 74.00 | 27.11 | Vertical | Pass |
| 2393.78550 | 48.34 | 1000.000 | 150.0 | 74.00 | 25.66 | Vertical | Pass |
| 2944.88770 | 50.35 | 1000.000 | 150.0 | 74.00 | 23.65 | Vertical | Pass |
| 3856.71140 | 53.04 | 1000.000 | 180.0 | 74.00 | 20.93 | Vertical | Pass |
| 4888.77750 | 54.74 | 1000.000 | 150.0 | 74.00 | 19.26 | Vertical | Pass |
| 5589.87835 | 58.45 | 1000.000 | 100.0 | 74.00 | 15.55 | Vertical | Pass |
| | | | | | | | |

Test Result: PASS

4. PHOTOGRAPHS OF THE EUT



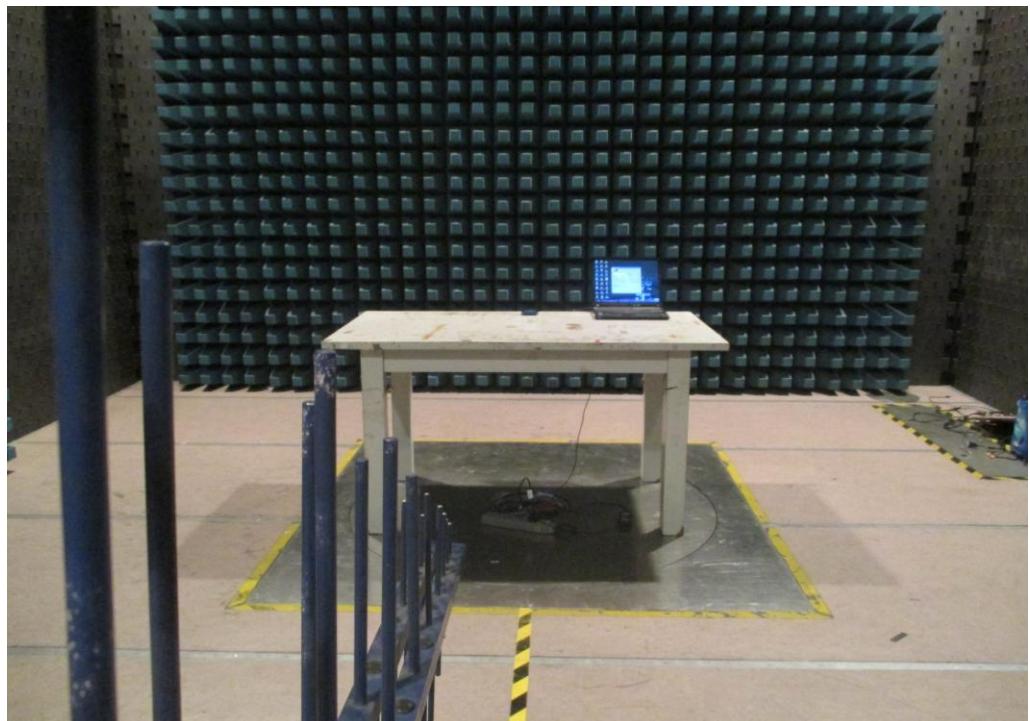
5. PHOTOGRAPHS OF THE TEST SET-UP



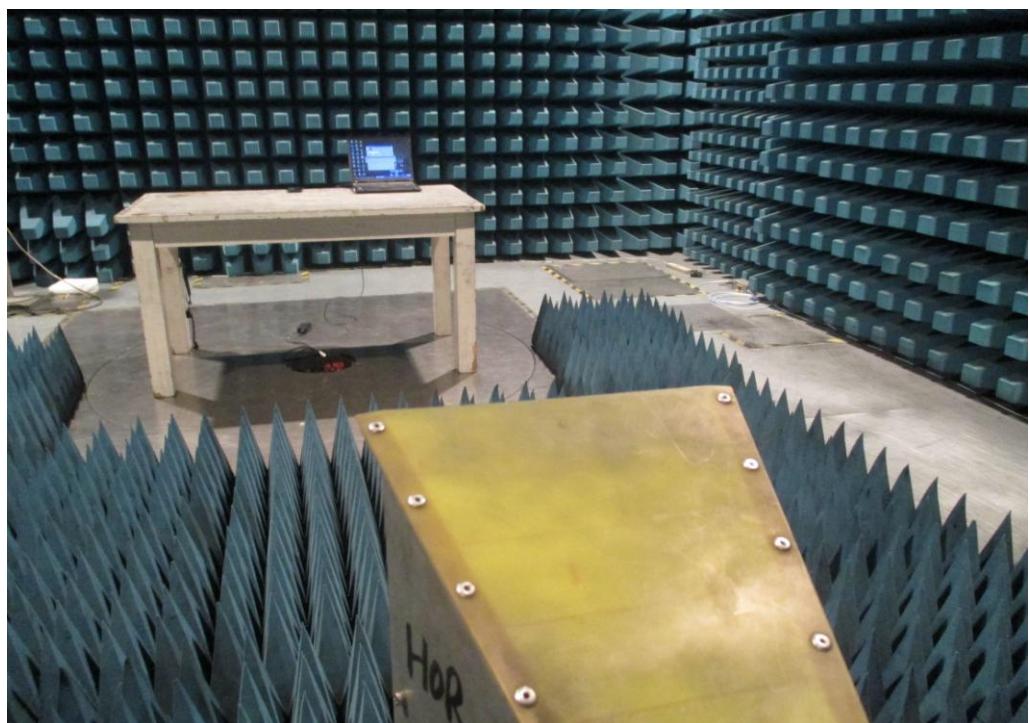
Conducted Emission



Radiated Emission of 9k-30M



Radiated Emission of 30M-1G



Radiated Emission of 1-6G

** END OF REPORT **