



Report No.SH15080015E02

FCC EMC TEST REPORT

Issued to

Cape Evolution (Shanghai) Co., Ltd.

For

Pivothead Wearable Imaging

Model Name : SMART
Brand name : Pivothead
Trade Name : Pivothead
Standard : 47 CFR Part 15 Subpart B
FCC ID : PB9G2SMART
Test date : Jan.28,2016 - Jan.29,2016
Issue date : Feb.01,2016

Shanghai MORLAB Communication Technology Co., Ltd.



Tested by Fangmin

Approved by Sun Yaping

Review by Zhangjie

CTIA Authorized Test Lab
LAB CODE 20081223-00
IEEE 1725

OFTA
電訊管理局



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Global Certification Forum

Bluetooth
BQTF

FCC
Reg.
No.741109

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Change History

| Issue | Date | Reason for change |
|-------|-------------|-------------------|
| 1.0 | Feb.01,2016 | First edition |
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| | | |
| | | |
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| | | |

1. General Information

1.1 Applicant

Cape Evolution (Shanghai) Co., Ltd.

Room 618 Shatian Mansion, No.587 Changshou Rd, Putuo District, Shanghai, China, 200060

1.2 Manufacturer

Cape Evolution (Shanghai) Co., Ltd.

Room 618 Shatian Mansion, No.587 Changshou Rd, Putuo District, Shanghai, China, 200060

1.3 Description of EUT

EUT Name..... Pivothead Wearable Imaging
Model Name SMART
Brand Name..... Pivothead
Trade Name Pivothead
FCC ID PB9G2SMART
Hardware Version B2
Software Version G20-20151127-002
Modulation Type Bluetooth V4.0:1Mbps(GFSK), FHSS
Frequency Range..... 2.402GHz - 2.480GHz (at interval of 2MHz)
EUT Stage Production Unit
Antenna Type..... Ceramic Antenna
Antenna Gain..... 1.87 dBi
Battery 3.7V Lithium Polymer rechargeable battery

Note 1:

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

Note 2:

EUT testing is used for Certification.

2. Facilities and Accreditations

2.1 Test Facility

Shanghai Morlab Communications Technology Co., Ltd. Morlab Laboratory 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 L6644. A 9*6*6(m) fully anechoic chamber was used for the radiated spurious emissions test.

2.2 Environmental Conditions

Ambient temperature: 15~35°C

Relative humidity: 30~60%

Atmosphere pressure: 86-106kPa

2.3 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: $\pm 1.76\text{dB}$

Uncertainty of Radiated Emission: $\pm 3.16\text{dB}$

2.4 List of Equipments Used

| Description | Manufacturer | Model | Serial No. | Expiry Date | In Use |
|--------------------------|--------------|-----------------|----------------------------|-------------|-------------------------------------|
| Shielding Room | CHENGYU | 5m×4m×3m | CR | 2017.09.13 | <input checked="" type="checkbox"/> |
| EMI Test Receiver | R&S | ESCI7 | 100787 | 2016.02.24 | <input checked="" type="checkbox"/> |
| Artificial Mains Network | TESEQ | NNB 51 | 33285 | 2016.02.24 | <input checked="" type="checkbox"/> |
| 3m Semi-anechoic Chamber | CHENGYU | 9.2×6.25×6.15 m | SAR | 2017.09.13 | <input checked="" type="checkbox"/> |
| Broadband Log Antenna | Schwarzbeck | VULB 9163 | 9163-561 | 2017.07.24 | <input checked="" type="checkbox"/> |
| Broadband Horn Antenna | Schwarzbeck | BBHA 9120 D | 9120D-1033 | 2017.07.24 | <input checked="" type="checkbox"/> |
| Broadband Horn Antenna | Schwarzbeck | BBHA 9120 D | 9120D-1033 | 2017.07.24 | <input checked="" type="checkbox"/> |
| Power Supplier | NF | ES2000S | 9087735 | 2016.09.25 | <input checked="" type="checkbox"/> |
| Laptop | ACER | Aspire 4376ZG | LXPFY0C004 935291221601 | / | <input checked="" type="checkbox"/> |
| Laptop Adapter | LITEON | PA-1650-22 | 9801016502 | / | <input checked="" type="checkbox"/> |

NOTE:

Equipments listed above have been calibrated and are in the period of validation.

2.5 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 | 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 |
| 3 | ANSI C63.4-2014 | Radiated Emission | PASS |

3. Test Conditions Setting

3.1 Test Mode

Mode 1: Transferring and Charging Mode

During the measurement of traffic operating mode, a communication link was established between the EUT and PC, and maintained during the measurement.

NOTE:

All configurations and test modes are performed, only the worst case is recorded in this report.

4. Emission Tests

4.1 Conducted Emission Measurement

4.1.1 Limits of Conducted Emission

| Frequency (MHz) | Quasi-peak (dBuV) | Average (dBuV) |
|--------------------|----------------------|-------------------|
| 0.15 - 0.5 | 66 - 56 | 56 - 46 |
| 0.50 - 5.0 | 56 | 46 |
| 5.0 - 30.0 | 60 | 50 |

NOTE:

(1) The lower limit shall apply at the band edges.

(2) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

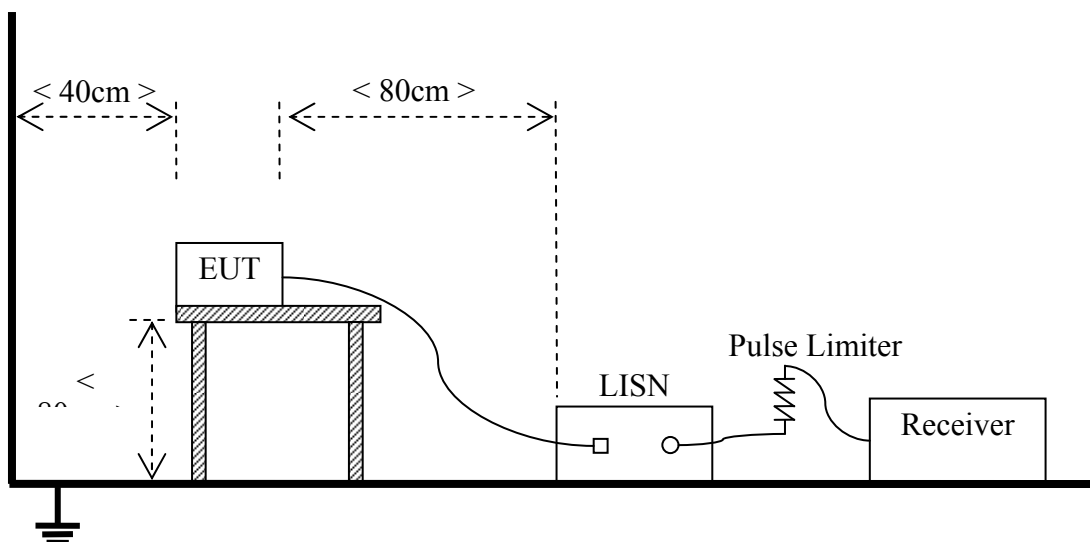
4.1.2 Test Procedure

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 50Ω/50μH of coupling impedance for the measuring instrument.

The test frequency range is from 150kHz to 30MHz. The maximum conducted interference is searched using Peak (PK), Quasi-peak (QP) and Average (AV) detectors; the emission levels that are 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.

Test Setup



4.1.3 Test Result

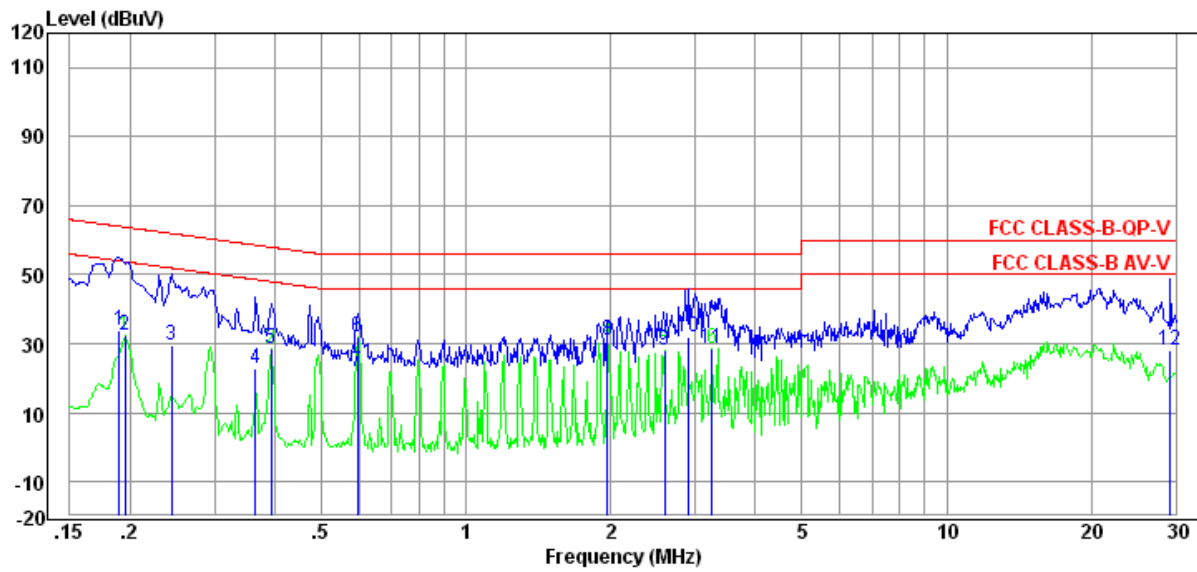
Test Verdict Recorded for Suspicious Points:

Power supplier output setting: 110V/60Hz

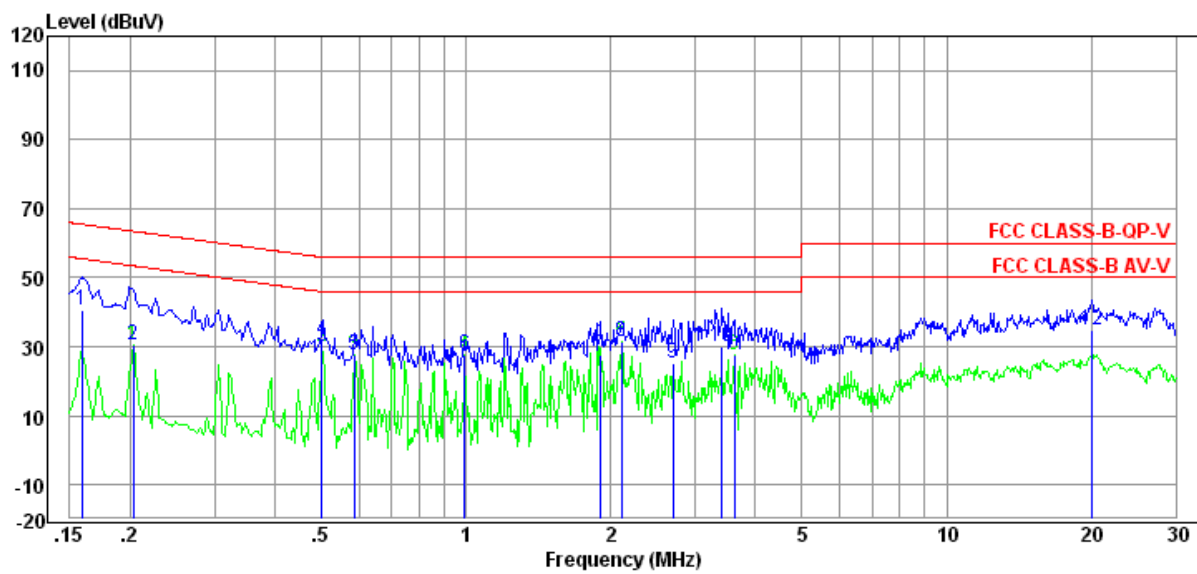
| Line | Freq MHz | Result dBuV | Limit dBuV | Margin dB |
|---------|-------------|----------------|---------------|--------------|
| QP | 0.19 | 34.05 | 64.02 | 29.97 |
| Average | 0.20 | 32.28 | 53.80 | 21.52 |
| QP | 0.24 | 29.77 | 61.95 | 32.18 |
| QP | 0.37 | 22.95 | 58.61 | 35.66 |
| Average | 0.39 | 28.79 | 47.99 | 19.20 |
| Average | 0.59 | 32.15 | 46.00 | 13.85 |
| QP | 0.59 | 22.07 | 56.00 | 33.93 |
| Average | 1.97 | 31.13 | 46.00 | 14.87 |
| Average | 2.59 | 27.94 | 46.00 | 18.06 |
| QP | 2.92 | 31.97 | 56.00 | 24.03 |
| Average | 3.26 | 28.73 | 46.00 | 17.27 |
| QP | 29.22 | 28.18 | 60.00 | 31.82 |

| Neutral | Freq MHz | Result dBuV | Limit dBuV | Margin dB |
|---------|-------------|----------------|---------------|--------------|
| QP | 0.16 | 40.61 | 65.52 | 24.91 |
| Average | 0.20 | 30.44 | 53.45 | 23.01 |
| Average | 0.50 | 30.25 | 46.00 | 15.75 |
| QP | 0.50 | 32.07 | 56.00 | 23.93 |
| Average | 0.59 | 27.80 | 46.00 | 18.20 |
| Average | 0.99 | 27.52 | 46.00 | 18.48 |
| QP | 1.90 | 27.59 | 56.00 | 28.41 |
| Average | 2.11 | 31.64 | 46.00 | 14.36 |
| QP | 2.70 | 25.25 | 56.00 | 30.75 |
| QP | 3.40 | 30.07 | 56.00 | 25.93 |
| Average | 3.62 | 27.86 | 46.00 | 18.14 |
| QP | 20.05 | 34.83 | 60.00 | 25.17 |

Test Plot:



(Plot A: L Phase)



(Plot B: N Phase)

4.2 Radiated Emission Measurement

4.2.1 Limits of Radiated Emission

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

| Frequency (MHz) | Field Strength CLASS B (at 3m) | |
|-----------------|--------------------------------|--------------------------|
| | $\mu\text{V/m}$ | $\text{dB}\mu\text{V/m}$ |
| 30 - 88 | 100 | 40.0 |
| 88 - 216 | 150 | 43.5 |
| 216 - 960 | 200 | 46.0 |
| Above 960 | 500 | 54.0 |

NOTE:

- (1) *Field Strength ($\text{dB}\mu\text{V/m}$) = $20 \cdot \log[\text{Field Strength } (\mu\text{V/m})]$.*
- (2) *In the emission tables above, the tighter limit applies at the band edges.*

Frequency range of radiated measurements (For unintentional radiators)

| Highest frequency generated or used in the device or on which the device operates or tunes (MHz) | Upper frequency of measurement range (MHz) |
|--|--|
| Below 1.705 | 30. |
| 1.705-108 | 1000. |
| 108-500 | 2000. |
| 500-1000 | 5000. |
| Above 1000 | 5th harmonic of the highest frequency or 40 GHz, whichever is lower. |

4.2.2 Test Procedure

The equipment was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden turntable with a height of 0.8 meters is used which is placed on the ground plane. When the EUT is a floor standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.

Support equipment, if needed, was placed as per ANSI C63.4.

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

The EUT received AC power source from the outlet socket under the turntable. All support equipment power received from another socket under the turntable.

The antenna was placed at 3 or 10 meter away from the EUT as stated in ANSI C63.4. The antenna connected to the Spectrum Analyzer via a cable and at times a pre-amplifier would be used.

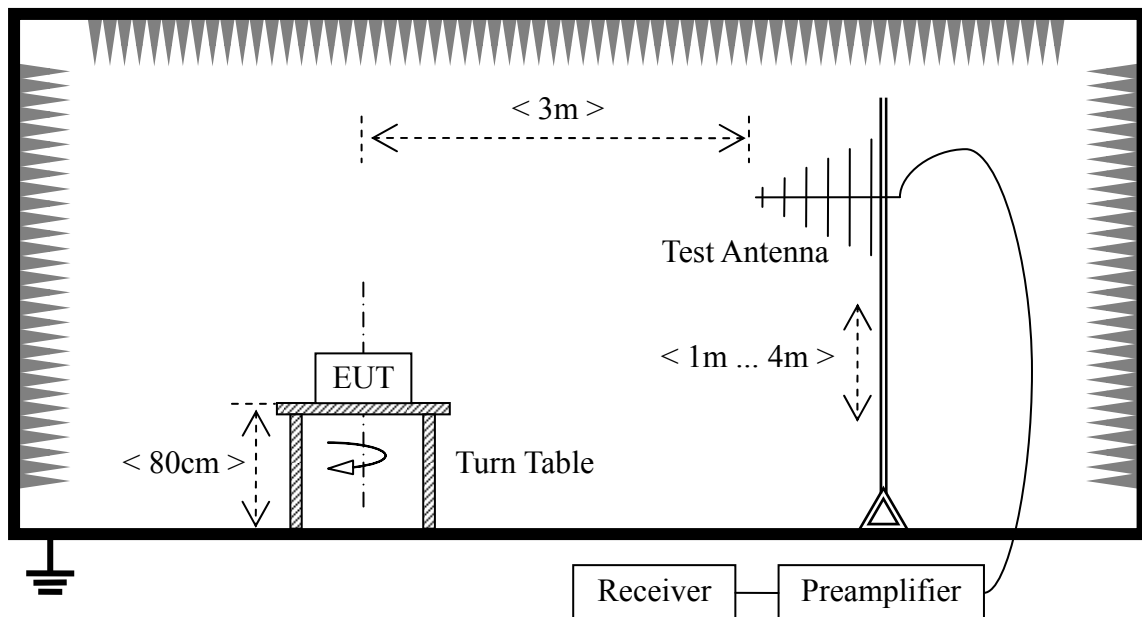
The Analyzer / Receiver quickly scanned from 30MHz to 40GHz. The EUT test program was started. Emissions were scanned and measured rotating the EUT to 360 degrees and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.

The test mode(s) described in Item 3.1 were scanned during the preliminary test:

After the preliminary scan, we found the test mode described in Item 3.1 producing the highest emission level.

The worst configuration of EUT and cable of the above highest emission level were recorded for reference of the final test

4.2.3 Test Setup

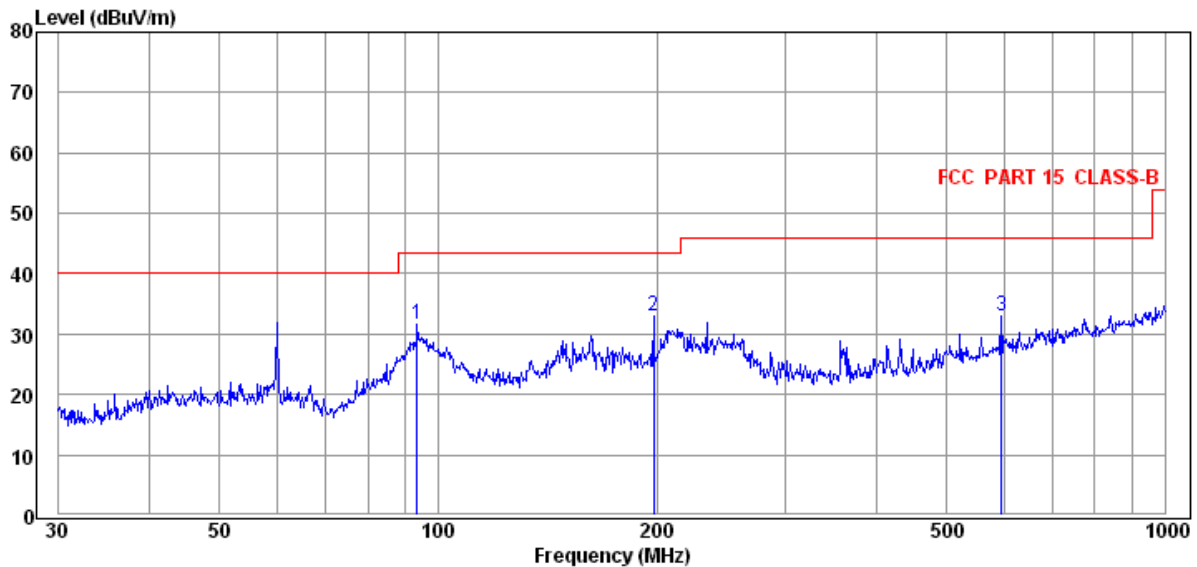


4.2.4 Test Result

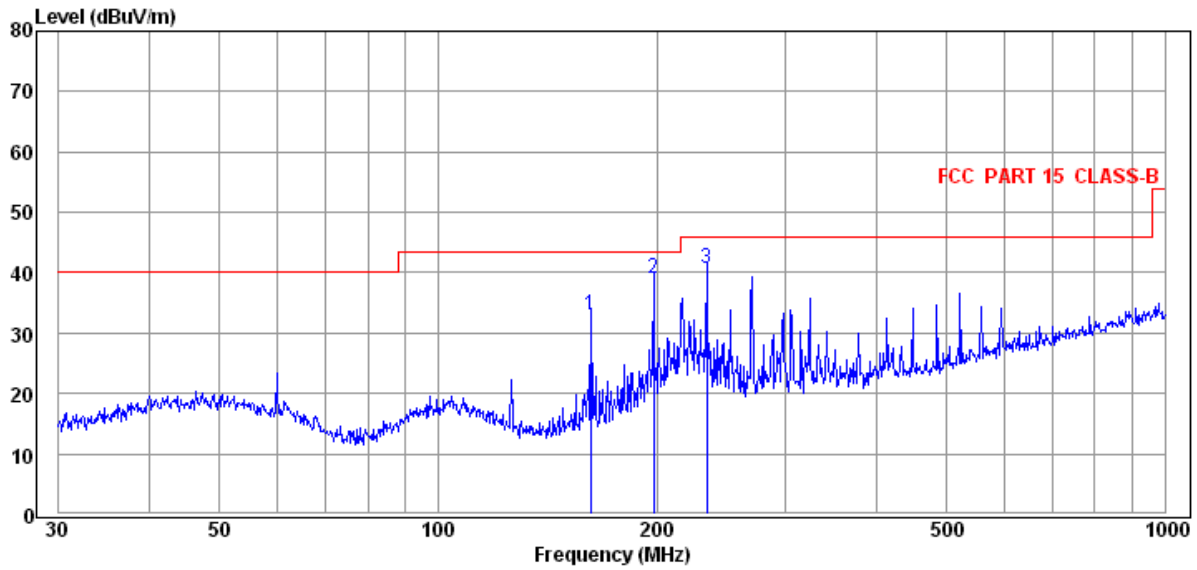
Test Verdict Recorded for Suspicious Points:

| No. | Frequency (MHz) | Emission Level (dB μ V/m) | | Quasi-Peak Limit (dB μ V/m) | Margin (dB μ V/m) | Result |
|-----|-----------------|-------------------------------|----------------------|---------------------------------|-----------------------|--------|
| | | QP (dB μ V/m) | Antenna Polarization | | | |
| 1 | 93.44 | 31.57 | V | 43.50 | 11.93 | PASS |
| 2 | 197.89 | 33.09 | V | 43.50 | 10.41 | PASS |
| 3 | 595.13 | 32.96 | V | 46.00 | 13.04 | PASS |
| 4 | 162.04 | 32.97 | H | 43.50 | 10.53 | PASS |
| 5 | 197.89 | 38.95 | H | 43.50 | 4.55 | PASS |
| 6 | 234.17 | 40.74 | H | 46.00 | 5.26 | PASS |

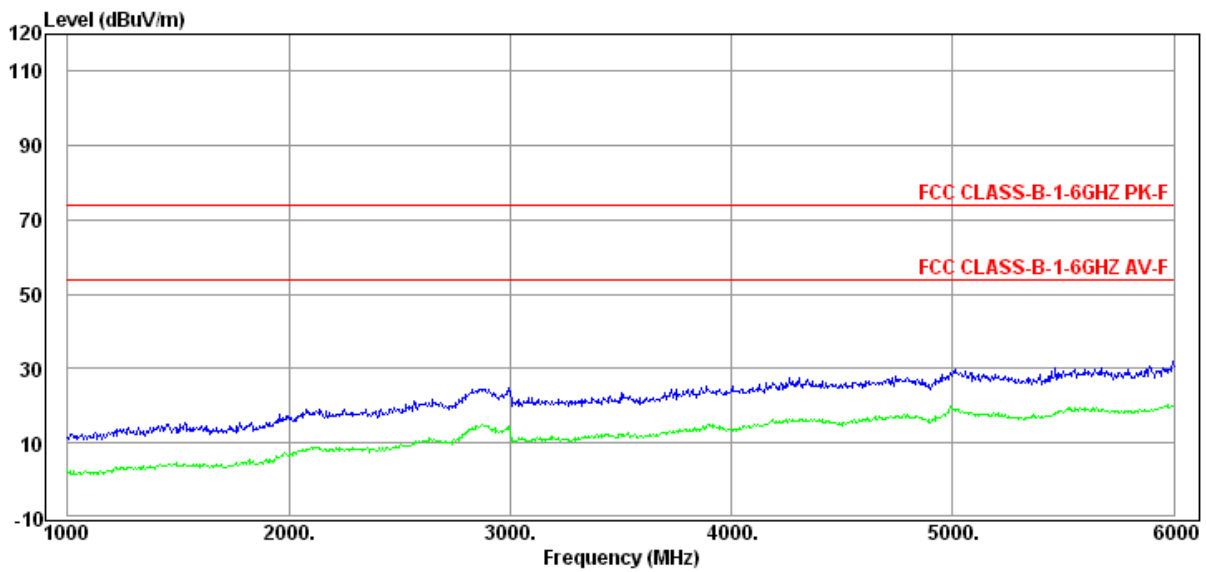
Test Plot:



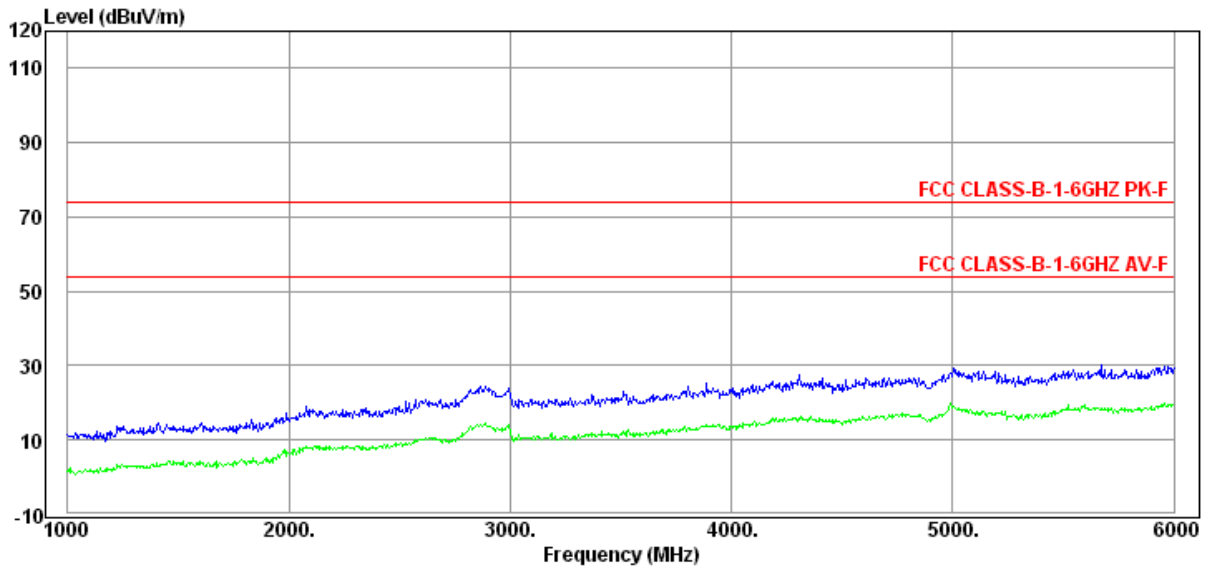
(Plot A: Test Antenna Vertical Frequency from 30MHz to 1GHz)



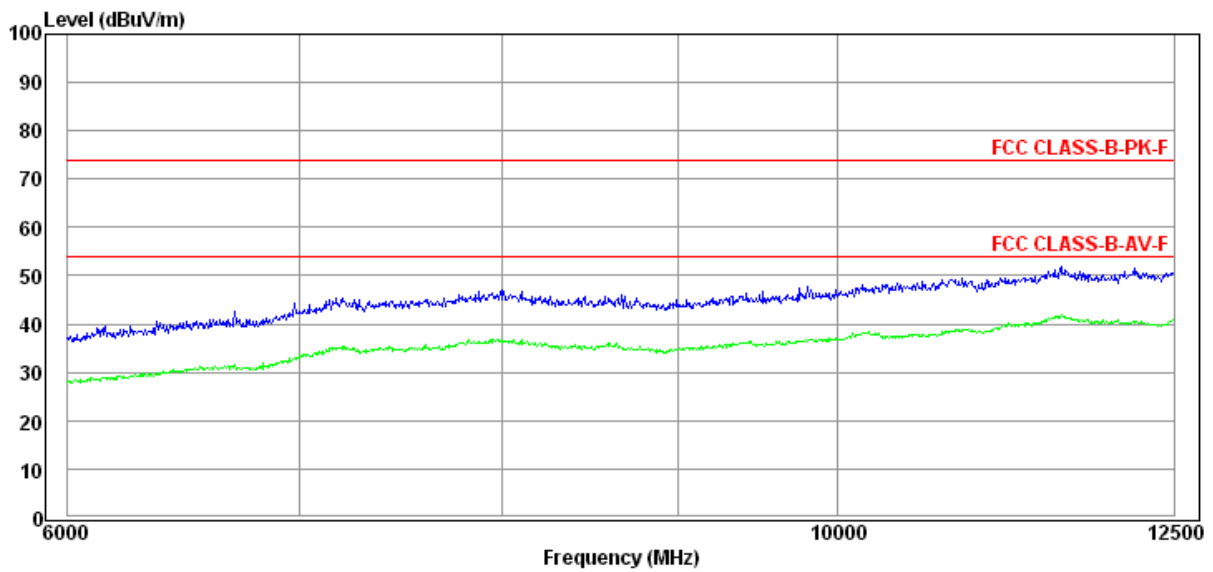
(Plot B: Test Antenna Horizontal Frequency from 30MHz to 1GHz)



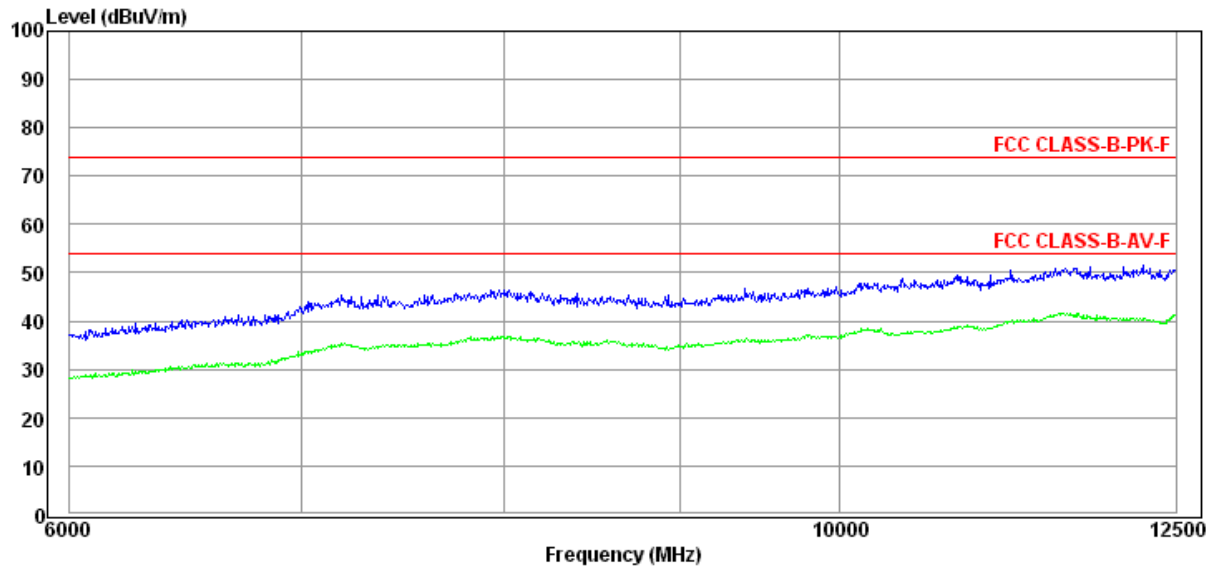
(Plot C: Test Antenna Vertical Frequency from 1GHz to 6GHz)



(Plot D: Test Antenna Horizontal Frequency from 1GHz to 6GHz)



(Plot E: Test Antenna Vertical Frequency from 6GHz to 12.5GHz)



(Plot F: Test Antenna Horizontal Frequency from 6GHz to 12.5GHz)

Annex A Photos of the EUT



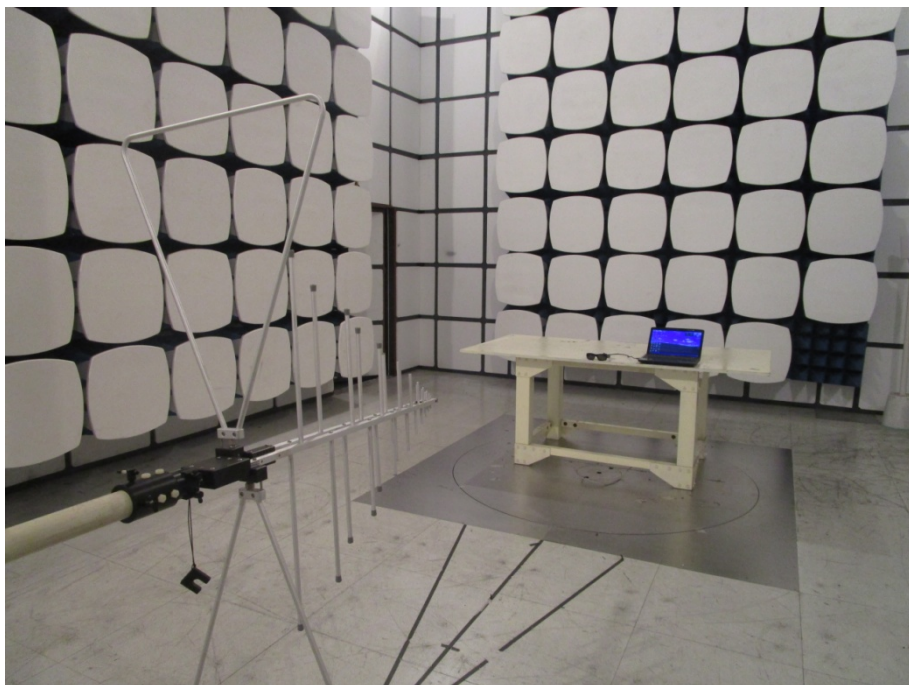


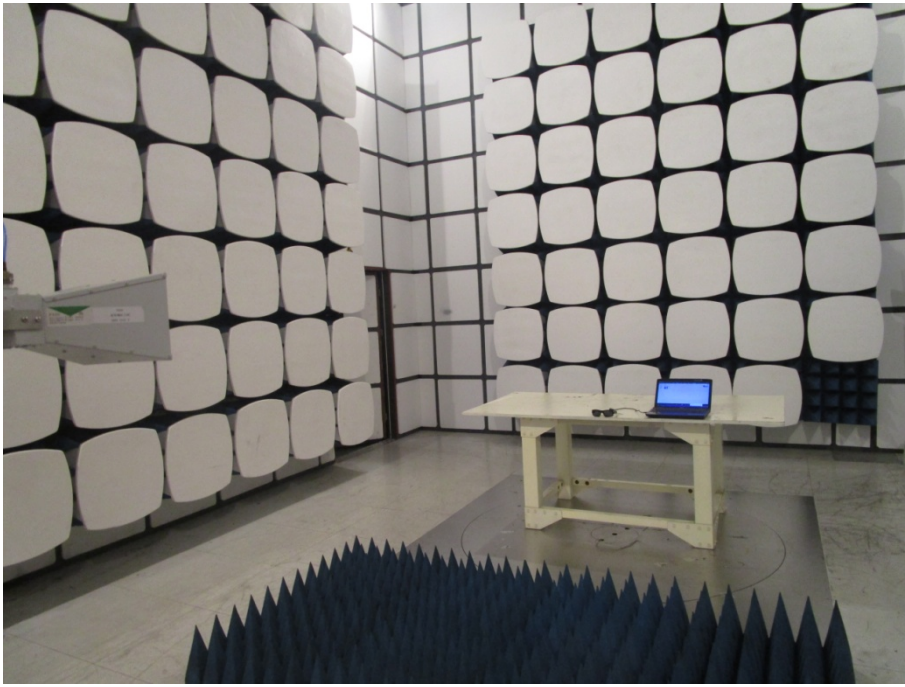
Annex B Photos of Test Setup

1. Conducted Emission



2. Radiated Emission





** END OF REPORT **