# FCC Test Report

| | | |
|---|---|---|
| **Equipment** | **:** | **Wireless Controller** |
| **Brand Name** | **:** | **Wacom** |
| **Model No.** | **:** | **EKR-100** |
| **FCC ID** | **:** | **HV4EKR100-1** |
| **Standard** | **:** | **47 CFR FCC Part 15.249** |
| **Operating Band** | **:** | **2400 MHz – 2483.5 MHz** |
| **FCC Classification** | **:** | **DXX** |
| **Applicant**<br>**Manufacturer** | **:** | **Wacom Co., Ltd.**<br>2-510-1 Toyonodai, Kazo-shi,<br>Saitama 349-1148, Japan |

**The product sample received on Oct. 16, 2014 and completely tested on Feb. 06, 2015. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013 and shown compliance with the applicable technical standards.**

**The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.**

**Reviewed by:**

Vic Hsiao / Supervisor

Testing Laboratory
1190

# Table of Contents

# Summary of Test Result

| Conformance Test Specifications | | | | | |
|---|---|---|---|---|---|
| **Report Clause** | **Ref. Std. Clause** | **Description** | **Measured** | **Limit** | **Result** |
| 1.1.2 | 15.203 | Antenna Requirement | Antenna connector mechanism complied | FCC 15.203 | Complied |
| 3.1 | 15.207 | AC Power-line Conducted Emissions | [dBuV]: 17.290MHz<br>42.46 (Margin 17.54dB) - QP<br>36.99 (Margin 13.01dB) - AV | FCC 15.207 | Complied |
| 3.2 | 15.215(c) | Emission Bandwidth | 2.1708 MHz; fall in band | Information only | Complied |
| 3.3 | 15.249(a) | Fundamental Emissions | [dBuV/m at 3m]:<br>77.62 (Margin 16.38dB) average | [dBuV/m at 3m]:<br>average: 94 | Complied |
| 3.4 | 15.249(a)/(d) | Transmitter Radiated Unwanted Emissions | [dBuV/m at 3m]:134.760 MHz<br>39.77 (Margin 3.73 dB) - PK | Harmonics:<br>54 dBuV/m@3m<br>Other band:<br>50 dB or<br>FCC 15.209, whichever is the lesser attenuation. | Complied |

# Revision History

| Report No. | Version | Description | Issued Date |
|---|---|---|---|
| FR4O0730 | Rev. 01 | Initial issue of report | Dec. 16, 2014 |
| FR4O0730-01 | Rev. 01 | Product modification Refer to 1.1.4 | Feb. 26, 2015 |
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# 1 General Description

## 1.1 Information

### 1.1.1 RF General Information

| RF General Information | | | | |
|---|---|---|---|---|
| **Frequency Range (MHz)** | **Modulation** | **Ch. Frequency (MHz)** | **Channel Number** | **Fundamental Field Strength (dBuV/m)** |
| 2400-2483.5 | GFSK | 2402~2478 | 77 | 77.62 |
| Note 1: Field strength performed average level at 3m. | | | | |

### 1.1.2 Antenna Information

| Antenna Category | |
|---|---|
| ☒ | Integral antenna (antenna permanently attached) |
| ☐ | External antenna (dedicated antennas) ; Unique antenna connector |

### 1.1.3 Type of EUT

| Identify EUT | |
|---|---|
| EUT Serial Number | N/A |
| Presentation of Equipment | ☐ Production ; ☒ Pre-Production ; ☐ Prototype |
| **Type of EUT** | |
| ☒ | Stand-alone |
| ☐ | Combined (EUT where the radio part is fully integrated within another device)<br>Combined Equipment - Brand Name / Model No.: |
| ☐ | Plug-in radio (EUT intended for a variety of host systems)<br>Host System - Brand Name / Model No.: |
| ☐ | Other: |

### 1.1.4 Miscellaneous changes

| Product Modifications | |
|---|---|
| **No.** | **Description** |
| 1 | Change an antenna |
| 2 | Add a SMD (0.33Ω) and a 1/2w resistor |
| 3 | Change of C31 & C32 location |
| 4 | Change of U3 location from SOT-23-5 LN2054 to SOP-8 XT2055 |
| 5 | Change of Q3(NPN Transistor), SMD 0603 R61，SMD 0603 R32 location |
| 6 | Removed D1 & D2 (LED) |

### 1.1.5 Test Signal Duty Cycle

| Operated Mode for Worst Duty Cycle | |
|---|---|
| ☐ Operated normally mode for worst duty cycle | |
| ☒ Operated test mode for worst duty cycle | |
| **Test Signal Duty Cycle (x)** | **Duty Cycle Correction Factor [dB] = (20 log x)** |
| ☒ 45.94% | 6.76 |
| If worst duty < 100%, average emission = peak emission + 20 log x | |

### 1.1.6 EUT Operational Condition

| | | | |
|---|---|---|---|
| **Supply Voltage** | ☐ AC mains | ☒ DC | - - |
| **Type of DC Source** | ☐ Internal DC supply | ☐ External DC adapter | ☒ Battery or System |

## 1.2 Accessories and Support Equipment

| Accessories Information | | | | |
|---|---|---|---|---|
| Li-ion Battery | Brand Name | Shenzhen Highest Electronic | Model Name | 274462P |
| | Power Rating | 3.7V⎓ 780mAh | | |
| USB Cable | Brand Name | Wacom | Model Name | STJ-A347 |
| | Signal Line | 0.3 meter, non-shielded cable | | |

Reminder: Regarding to more detail and other information, please refer to user manual.

| Support Equipment - AC Conduction and Radiated Emission | | | |
|---|---|---|---|
| **Equipment** | **Brand Name** | **Model Name** | **FCC ID** |
| Notebook | DELL | E5530 | DoC |

## 1.3 Testing Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR FCC Part 15
- ANSI C63.10-2013

## 1.4 Testing Location Information

| Testing Location | | | | | | | |
|---|---|---|---|---|---|---|---|
| ☒ | HWA YA | ADD | : | No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C. | | | |
| | | TEL | : | 886-3-327-3456 | FAX | : | 886-3-327-0973 |
| **Test Site Registration Number: FCC 636805** | | | | | | | |
| **Test Condition** | **Test Site No.** | **Test Engineer** | **Test Environment** | | | | |
| AC Conduction | CO04-HY | Zeus | 22°C / 43% | | | | |
| RF Conducted | TH01-HY | Ian | 23.4°C / 62% | | | | |
| Radiated Emission | 03CH03-HY | Daniel | 22°C / 54% | | | | |

## 1.5 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)

| Measurement Uncertainty | | | |
|---|---|---|---|
| **Test Item** | | **Uncertainty** | **Limit** |
| AC power-line conducted emissions | | ±2.2 dB | N/A |
| Emission bandwidth, | | ±1.4 % | N/A |
| Unwanted emissions, conducted | 30 – 1000 MHz | ±0.5 dB | N/A |
| | 1 – 18 GHz | ±0.6 dB | N/A |
| | 18 – 40 GHz | ±0.8 dB | N/A |
| | 40 – 200 GHz | N/A | N/A |
| All emissions, radiated | 30 – 1000 MHz | ±2.5 dB | N/A |
| | 1 – 18 GHz | ±3.5 dB | N/A |
| | 18 – 40 GHz | ±3.8 dB | N/A |
| | 40 – 200 GHz | N/A | N/A |
| Temperature | | ±0.8 °C | N/A |
| Humidity | | ±3 % | N/A |
| DC and low frequency voltages | | ±3 % | N/A |
| Time | | ±1.4 % | N/A |
| Duty Cycle | | ±1.4 % | N/A |

# 2 Test Configuration of EUT

## 2.1 The Worst Case Modulation Configuration

| Modulation Used for Conformance Testing | |
|---|---|
| **Test Mode** | **Field Strength (dBuV/m at 3 m)** |
| GFSK-Transmit | 77.62 |

## 2.2 Test Channel Frequencies Configuration

| Test Channel Frequencies Configuration | |
|---|---|
| **Test Mode** | **Test Channel Frequencies (MHz)** |
| GFSK-Transmit | 2402, 2445, 2478 |

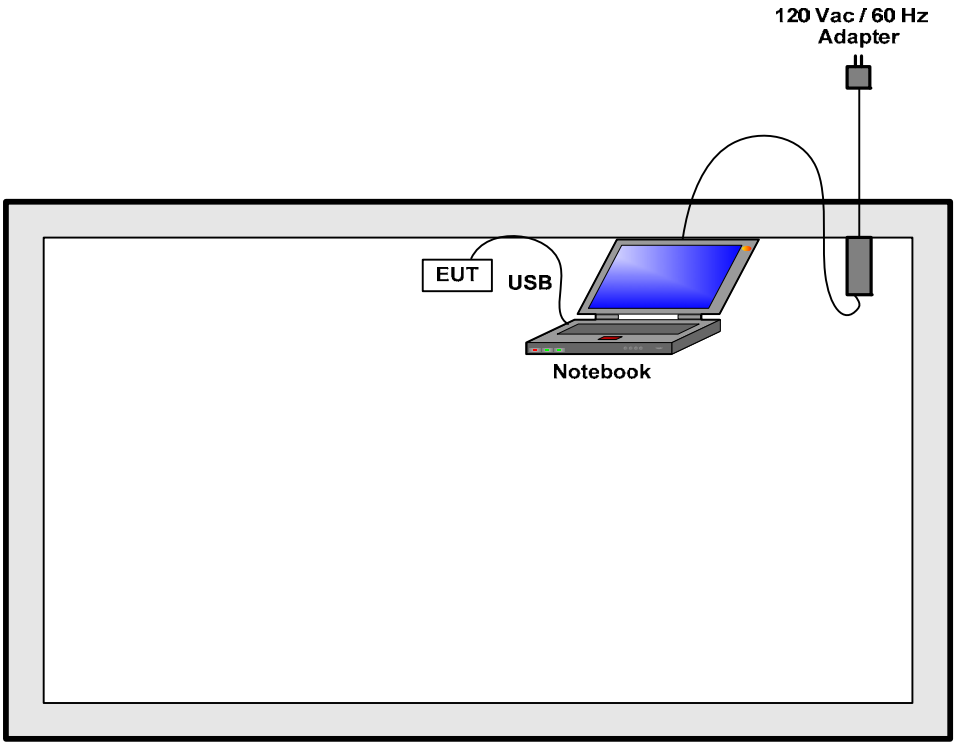
## 2.3 The Worst Case Measurement Configuration

| The Worst Case Mode for Following Conformance Tests | |
|---|---|
| **Tests Item** | AC power-line conducted emissions |
| **Condition** | AC power-line conducted measurement for line and neutral<br>Test Voltage: 120Vac / 60Hz |
| **Operating Mode** | Operating Mode Description |
| 1 | Power from Host & Radio link |

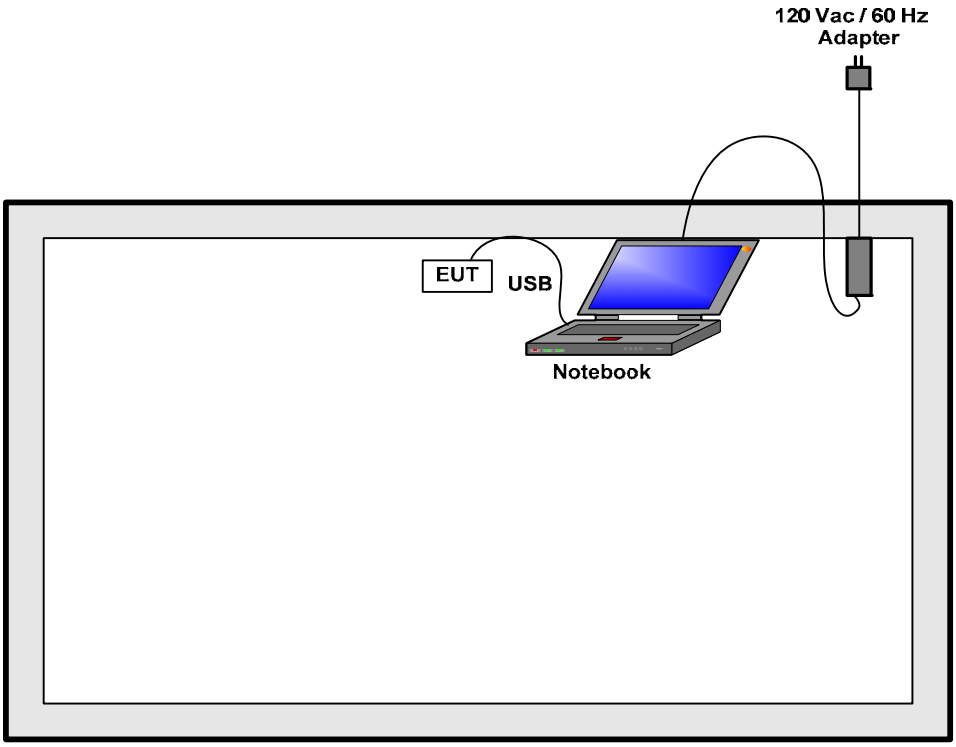
| The Worst Case Mode for Following Conformance Tests | | | |
|---|---|---|---|
| **Tests Item** | | | Emission Bandwidth, Fundamental Emissions, Radiated Unwanted Emissions |
| **Test Condition** | | | Radiated measurement |
| **User Position** | | | ☐ EUT will be placed in fixed position. |
| **X Plane** | **Y Plane** | **Z Plane** | ☐ EUT will be placed in mobile position and operating multiple positions. |
|  |  |  | ☒ EUT will be a hand-held or body-worn battery-powered devices and operating multiple positions. EUT shall be performed three orthogonal planes. The worst planes is Y. |
| **Operating Mode** | | | Operating Mode Description |
| | | | Transmitter Mode |
| **Modulation Mode** | | | GFSK-Transmit |

## 2.4 Test Setup Diagram

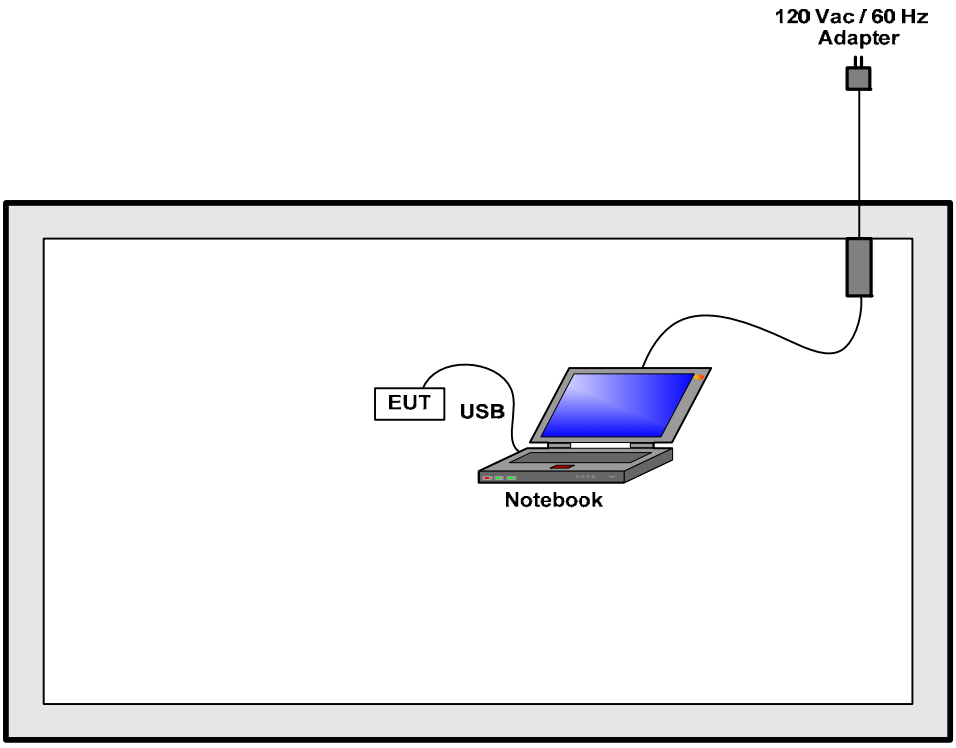
**Test Setup Diagram - AC Line Conducted Emission Test**



## Test Setup Diagram - Radiated Below 1GHz Test




## Test Setup Diagram - Radiated Above 1GHz Test



# 3 Transmitter Test Result

## 3.1 AC Power-line Conducted Emissions

### 3.1.1 AC Power-line Conducted Emissions Limit

| AC Power-line Conducted Emissions Limit | | |
|---|---|---|
| **Frequency Emission (MHz)** | **Quasi-Peak** | **Average** |
| 0.15-0.5 | 66 - 56 * | 56 - 46 * |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |
| Note 1: * Decreases with the logarithm of the frequency. | | |

### 3.1.2 Measuring Instruments

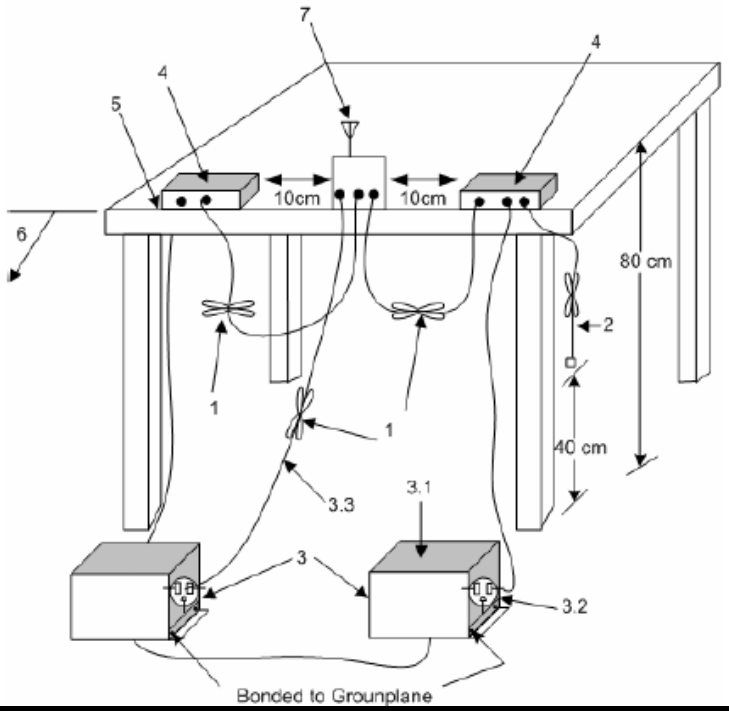
Refer a test equipment and calibration data table in this test report.

### 3.1.3 Test Procedures

| Test Method |
|---|
| ☒ Refer as ANSI C63.10-2013, clause 6.2 for AC power-line conducted emissions. |

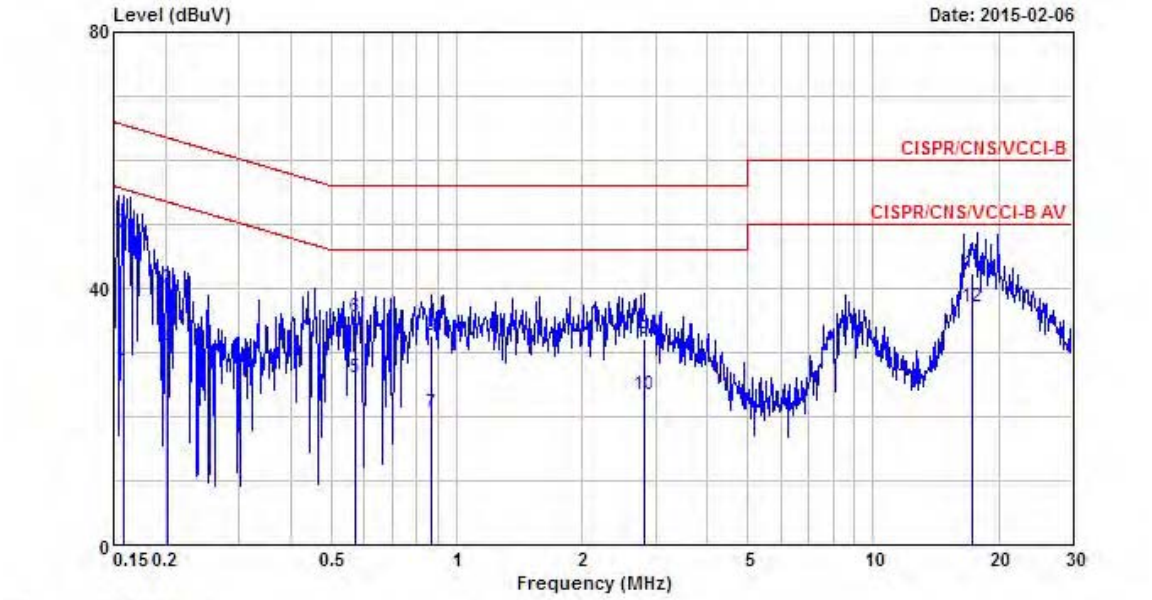
### 3.1.4 Test Setup

**AC Power-line Conducted Emissions**



### 3.1.5 Test Result of AC Power-line Conducted Emissions

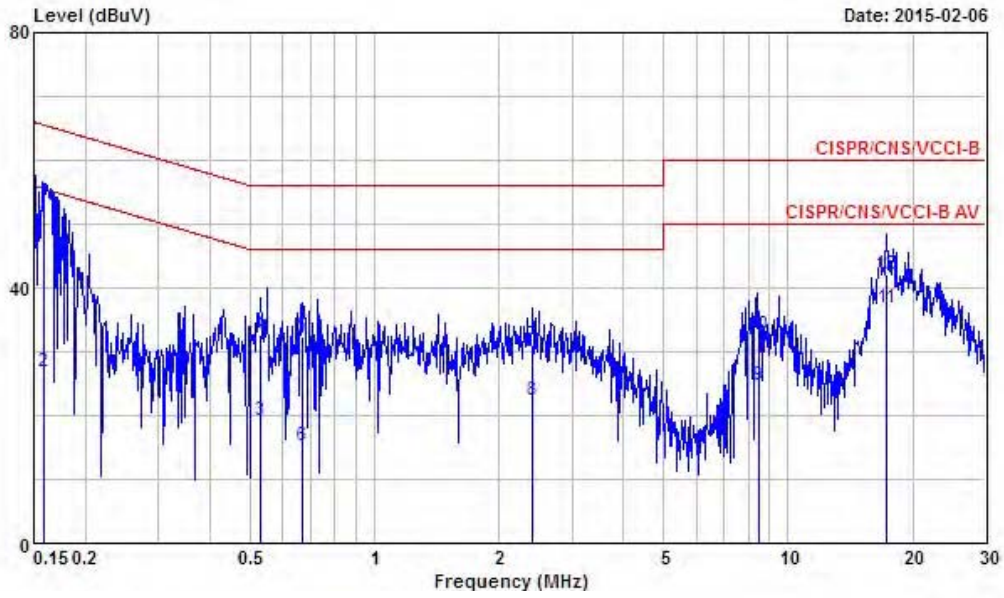
| AC Power-line Conducted Emissions Result | | | |
|---|---|---|---|
| **Operating Mode** | 1 | **Power Phase** | Neutral |
| **Operating Function** | Power from Host & Radio link | | |




| | Freq | Level | Over Limit | Limit Line | Read Level | LISN Factor | Cable Loss | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dBuV | dBuV | dB | dB | |
| 1 | 0.1590020 | 27.08 | -28.44 | 55.52 | 26.64 | 0.07 | 0.37 | Average |
| 2 | 0.1590020 | 48.71 | -16.81 | 65.52 | 48.27 | 0.07 | 0.37 | QP |
| 3 | 0.2028850 | 39.88 | -23.61 | 63.49 | 39.31 | 0.07 | 0.50 | QP |
| 4 | 0.2028850 | 30.61 | -22.88 | 53.49 | 30.04 | 0.07 | 0.50 | Average |
| 5 | 0.5701000 | 26.04 | -19.96 | 46.00 | 25.28 | 0.08 | 0.68 | Average |
| 6 | 0.5701000 | 35.45 | -20.55 | 56.00 | 34.69 | 0.08 | 0.68 | QP |
| 7 | 0.8710300 | 20.61 | -25.39 | 46.00 | 19.75 | 0.09 | 0.77 | Average |
| 8 | 0.8710300 | 32.54 | -23.46 | 56.00 | 31.68 | 0.09 | 0.77 | QP |
| 9 | 2.820 | 32.19 | -23.81 | 56.00 | 31.33 | 0.11 | 0.75 | QP |
| 10 | 2.820 | 23.50 | -22.50 | 46.00 | 22.64 | 0.11 | 0.75 | Average |
| 11 | 17.290 | 42.46 | -17.54 | 60.00 | 41.34 | 0.37 | 0.75 | QP |
| 12 @ | 17.290 | 36.99 | -13.01 | 50.00 | 35.87 | 0.37 | 0.75 | Average |

Note 1: “>20dB” means emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: “N/F” means Nothing Found emissions (No emissions were detected.)

| AC Power-line Conducted Emissions Result | | | |
|---|---|---|---|
| **Operating Mode** | 1 | **Power Phase** | Line |
| **Operating Function** | Power from Host & Radio link | | |




| | Freq | Level | Over Limit | Limit Line | Read Level | LISN Factor | Cable Loss | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dBuV | dBuV | dB | dB | |
| 1 | 0.1590020 | 50.24 | -15.28 | 65.52 | 49.82 | 0.05 | 0.37 | QP |
| 2 | 0.1590020 | 26.79 | -28.73 | 55.52 | 26.37 | 0.05 | 0.37 | Average |
| 3 | 0.5293420 | 19.27 | -26.73 | 46.00 | 18.54 | 0.07 | 0.66 | Average |
| 4 | 0.5293420 | 32.52 | -23.48 | 56.00 | 31.79 | 0.07 | 0.66 | QP |
| 5 | 0.6718660 | 32.40 | -23.60 | 56.00 | 31.61 | 0.08 | 0.71 | QP |
| 6 | 0.6718660 | 15.30 | -30.70 | 46.00 | 14.51 | 0.08 | 0.71 | Average |
| 7 | 2.410 | 31.04 | -24.96 | 56.00 | 30.16 | 0.11 | 0.77 | QP |
| 8 | 2.410 | 22.41 | -23.59 | 46.00 | 21.53 | 0.11 | 0.77 | Average |
| 9 | 8.460 | 24.76 | -25.24 | 50.00 | 23.77 | 0.21 | 0.78 | Average |
| 10 | 8.460 | 32.70 | -27.30 | 60.00 | 31.71 | 0.21 | 0.78 | QP |
| 11 | 17.290 | 36.81 | -13.19 | 50.00 | 35.73 | 0.33 | 0.75 | Average |
| 12 | 17.290 | 42.12 | -17.88 | 60.00 | 41.04 | 0.33 | 0.75 | QP |

Note 1: “>20dB” means emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: “N/F” means Nothing Found emissions (No emissions were detected.)

# 3.2 Emission Bandwidth

## 3.2.1 Emission Bandwidth Limit

| Emission Bandwidth Limit |
|---|
| ☒ Emission bandwidth falls completely within authorized band. |

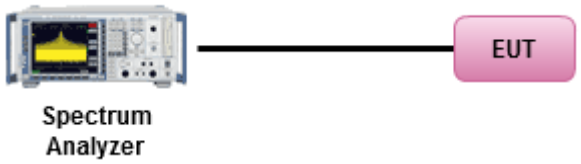
## 3.2.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

## 3.2.3 Test Procedures

| Test Method |
|---|
| ☒ Refer as ANSI C63.10, clause 6.9.2 for 20 dB emission bandwidth and 99% occupied bandwidth measurement. |

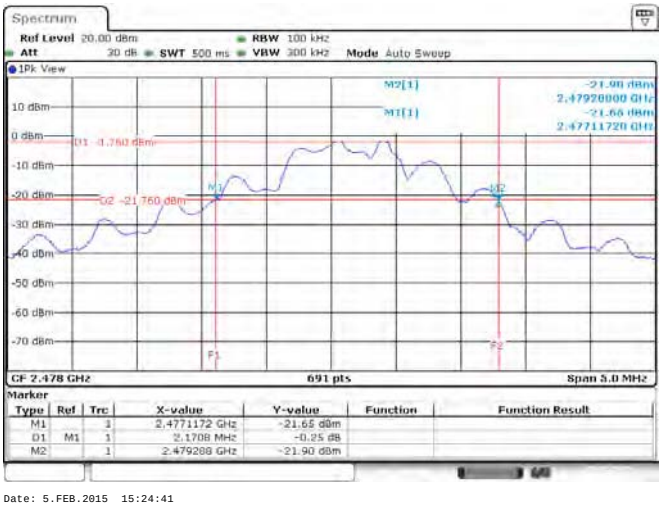
## 3.2.4 Test Setup

| Emission Bandwidth |
|---|
|   |

### 3.2.5 Test Result of Emission Bandwidth

| Emission Bandwidth Result | | | | | |
|---|---|---|---|---|---|
| **Modulation Mode** | **Frequency (MHz)** | **20dB BW (MHz)** | **99% Bandwidth (MHz)** | **$F_L$ at 20dB BW (MHz)** | **$F_H$ at 20dB BW (MHz)** |
| GFSK-Transmit | 2402 | 1.8958 | 1.7366 | 2401.0955 | - |
| GFSK-Transmit | 2445 | 2.1563 | 2.0767 | - | - |
| GFSK-Transmit | 2478 | 2.1708 | 2.1635 | - | 2479.2880 |
| **Limit** | | **N/A** | **N/A** | **2400** | **2483.5** |
| **Result** | | **Complied** | | | |

**Worst Emission Bandwidth Plots**



# 3.3 Fundamental Emissions

## 3.3.1 Fundamental Emissions Limit

| Fundamental Emissions E-Field Strength Limit (3m) | |
|---|---|
| ☐ | 902-928 MHz Band: 94 dBuV/m (quasi peak) |
| ☒ | 2400-2483.5 MHz Band: 94 dBuV/m (average) |
| ☐ | 5725-5785 MHz Band: 94 dBuV/m (average) |

## 3.3.2 Measuring Instruments

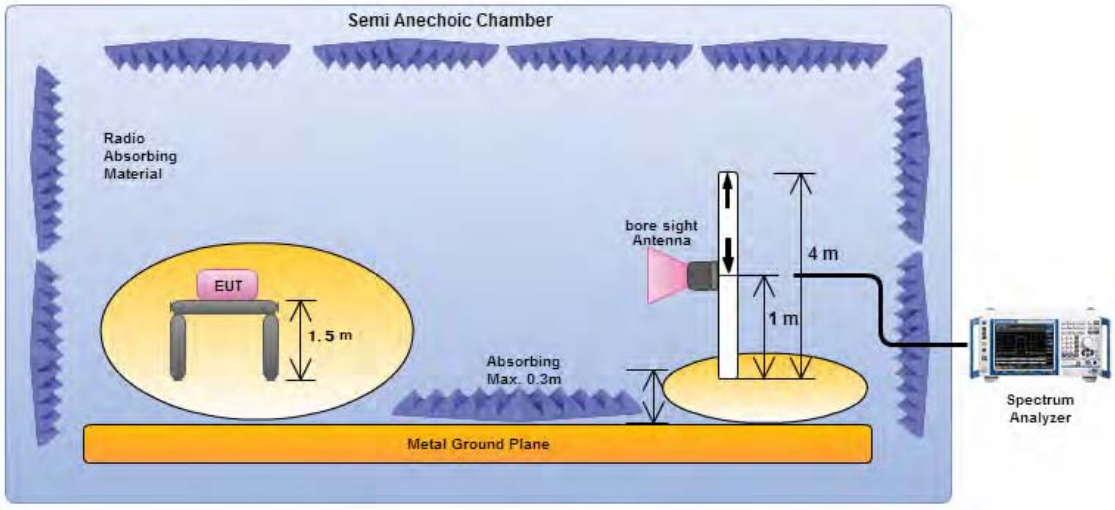
Refer a test equipment and calibration data table in this test report.

## 3.3.3 Test Procedures

| | | |
|---|---|---|
| ☒ | The average emission levels shall be measured in [duty cycle ≤ 100 or by duty cycle correction factor]. | |
| ☒ | For the transmitter emissions shall be measured using following options below: | |
| | ☐ | Refer as ANSI C63.10, clause 4.1.2.3 (Reduced VBW) – Duty cycle ≥ 100%. |
| | ☒ | Refer as ANSI C63.10, clause 4.1.4.2.4 average value of pulsed emissions. Adjusted by a “duty cycle correction factor”, derived from 20log (dwell time/100 ms). Average emission = peak emission + 20 log (duty cycle). |
| | ☒ | Refer as ANSI C63.10, clause 4.1.4.2.2 measurement procedure peak limit. |
| ☒ | For radiated measurement, refer as ANSI C63.10, clause 6.6 for radiated emissions | |

## 3.3.4 Test Setup

**Fundamental Emissions**



### 3.3.5 Test Result of Fundamental Emissions

| Field Strength of Fundamental Emissions Result | | | | | |
|---|---|---|---|---|---|
| **Modulation Mode** | **Frequency (MHz)** | **Fundamental (dBuV/m)@3m** | **Margin (dB)** | **Limit (dBuV/m)@3m** | **Type** |
| GFSK-Transmit | 2402 | 84.38 | 29.62 | 114 | peak |
| GFSK-Transmit | 2402 | 77.62 | 16.38 | 94 | average |
| GFSK-Transmit | 2445 | 83.44 | 83.44 | 114 | peak |
| GFSK-Transmit | 2445 | 76.68 | 17.32 | 94 | average |
| GFSK-Transmit | 2478 | 82.01 | 31.99 | 114 | peak |
| GFSK-Transmit | 2478 | 75.25 | 18.75 | 94 | average |
| **Result** | | **Complied** | | | |

Note 1: Measurement worst emissions of receive antenna polarization: Vertical.
Note 2: If duty cycle < 100%, average emission = peak emission + 20 log (duty cycle).

# 3.4 Transmitter Radiated Unwanted Emissions

## 3.4.1 Transmitter Radiated Unwanted Emissions Limit

| Transmitter Radiated Unwanted Emissions Limit |
|---|
| **Harmonics:** |
| ☒ 54 dBuV/m (average) |
| **Other Unwanted Emissions:** |
| ☒ 50 dB below the level of the fundamental or FCC 15.209, whichever is the lesser attenuation. |

## 3.4.2 Measuring Instruments

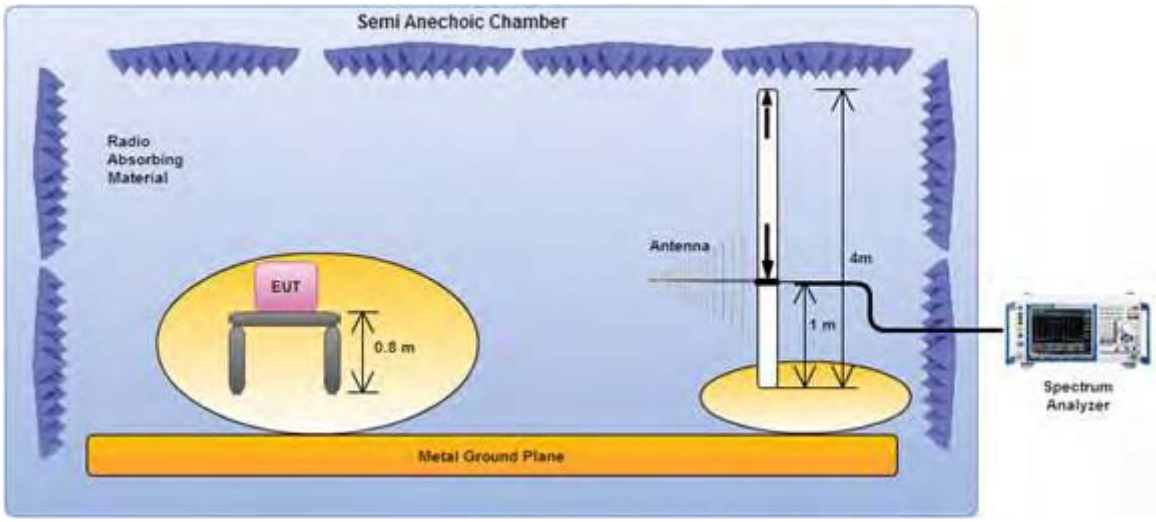
Refer a test equipment and calibration data table in this test report.

## 3.4.3 Test Procedures

| Test Method – General Information | |
|---|---|
| ☒ | Measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements). |
| ☒ | The average emission levels shall be measured in [duty cycle ≥ 98 or duty factor]. |
| ☒ | Refer as ANSI C63.10, clause 6.10.3 bandedge testing shall be performed at the lowest frequency channel and highest frequency channel within the allowed operating band. |
| ☒ | For the transmitter unwanted emissions shall be measured using following options below: |
| ☐ | Refer as ANSI C63.10, clause 4.1.2.3 (Reduced VBW) – Duty cycle ≥ 100%. |
| ☒ | Refer as ANSI C63.10, clause 4.1.4.2.4 average value of pulsed emissions. Adjusted by a “duty cycle correction factor”, derived from 20log (dwell time/100 ms). Average emission = peak emission + 20 log (duty cycle). |
| ☒ | Refer as ANSI C63.10, clause 4.1.4.2.2 measurement procedure peak limit. |
| ☒ | For the transmitter bandedge emissions shall be measured using following options below: |
| ☒ | Refer as ANSI C63.10, clause 6.10 for band-edge testing. |
| ☐ | Refer as ANSI C63.10, clause 6.10.6 for marker-delta method for band-edge measurements. |
| ☒ | For radiated measurement. |
| ☒ | Refer as ANSI C63.10, clause 6.4 for radiated emissions from below 30 MHz. |
| ☒ | Refer as ANSI C63.10, clause 6.5 for radiated emissions from 30 MHz to 1000 MHz. |
| ☒ | Refer as ANSI C63.10, clause 6.6 for radiated emissions from above 1 GHz. |

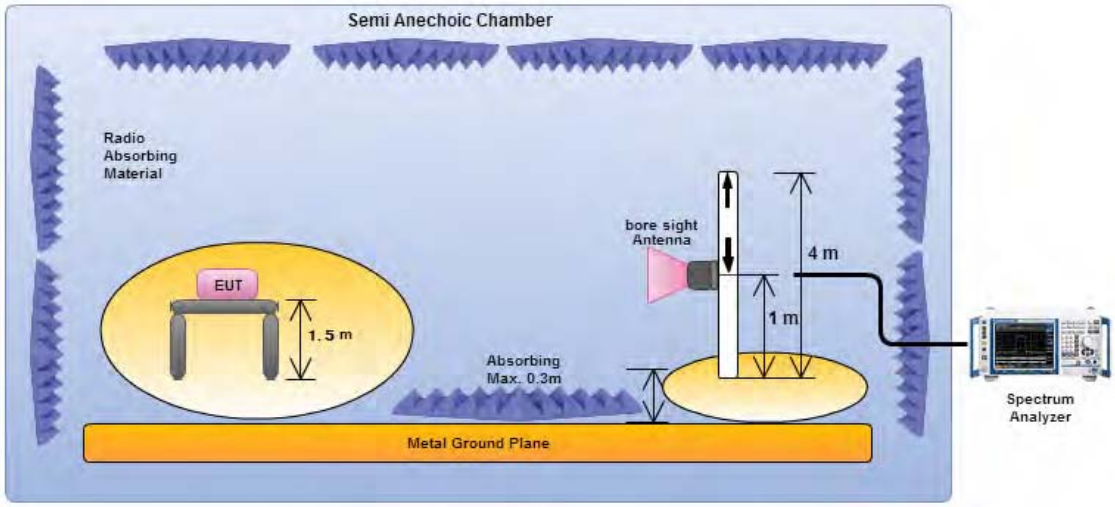
### 3.4.4 Test Setup

**Transmitter Radiated Unwanted Emissions (below 1GHz)**




Magnetic field tests shall be performed in the frequency range of 9 kHz to 30 MHz using a calibrated loop antenna. Electric field tests shall be performed in the frequency range of 30 MHz to 1000 MHz using a calibrated bi-log antenna.

**Transmitter Radiated Unwanted Emissions (Above 1GHz)**



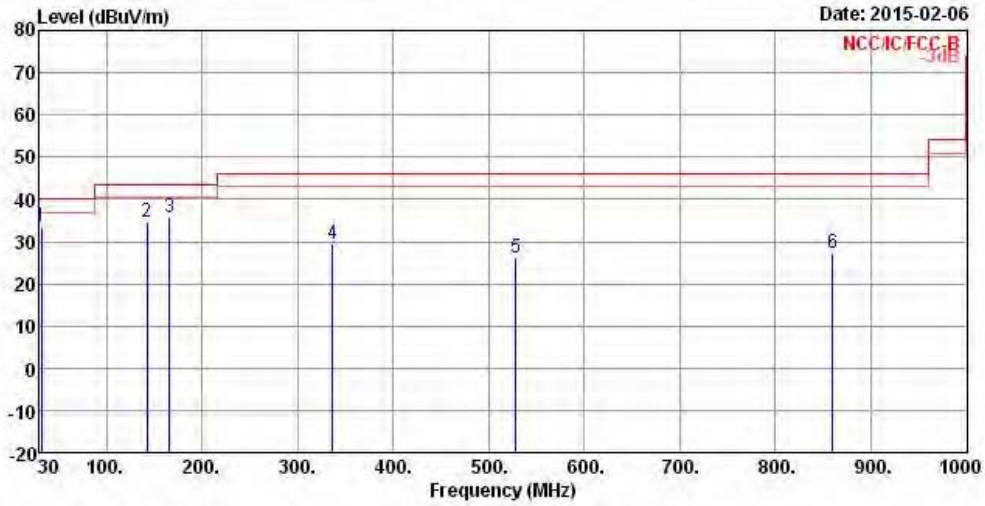

Electric field tests shall be performed in the frequency range of 1 GHz to 10th harmonic of highest fundamental frequency or 40 GHz using a calibrated horn antenna.

### 3.4.5 Transmitter Radiated Unwanted Emissions (Below 30MHz)

All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

## 3.4.6 Transmitter Radiated Unwanted Emissions (Below 1GHz)

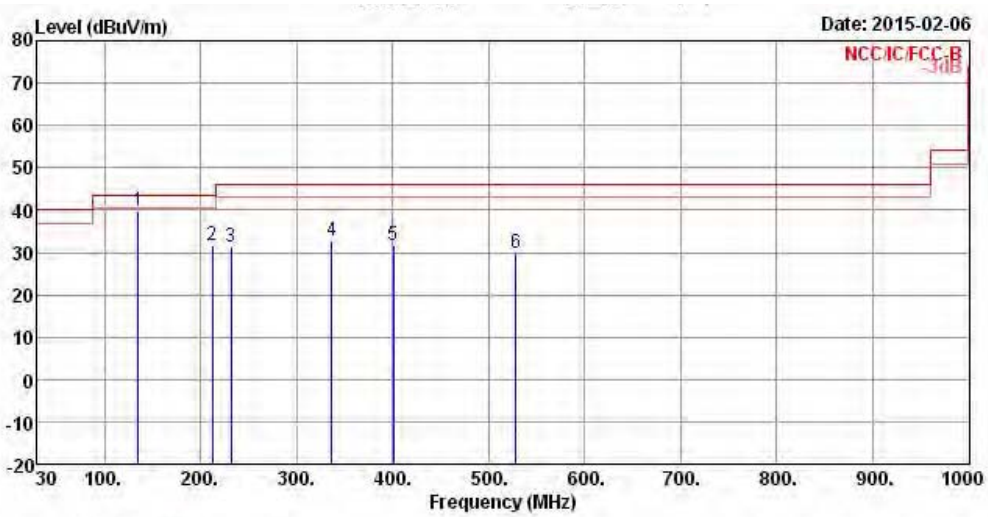
| Transmitter Radiated Unwanted Emissions (Below 1GHz) | | | |
|---|---|---|---|
| **Operating Mode** | 1 | **Polarization** | V |
| **Operating Function** | Transmitter Mode | | |




| | Freq | Level | Over Limit | Limit Line | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Remark | A/Pos | T/Pos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV | dB/m | dB | dB | | cm | deg |
| 1 | 31.940 | 33.65 | -6.35 | 40.00 | 43.23 | 16.90 | 0.87 | 27.35 | Peak | --- | --- |
| 2 | 142.520 | 34.79 | -8.71 | 43.50 | 49.15 | 10.82 | 1.98 | 27.16 | Peak | --- | --- |
| 3 | 165.800 | 35.61 | -7.89 | 43.50 | 51.13 | 9.51 | 2.12 | 27.15 | Peak | --- | --- |
| 4 | 336.520 | 29.39 | -16.61 | 46.00 | 39.75 | 13.49 | 3.06 | 26.91 | Peak | --- | --- |
| 5 | 528.580 | 26.18 | -19.82 | 46.00 | 32.75 | 17.48 | 3.86 | 27.91 | Peak | --- | --- |
| 6 | 860.320 | 27.40 | -18.60 | 46.00 | 29.82 | 20.02 | 4.98 | 27.42 | Peak | --- | --- |

Note 1: “>20dB” means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: “N/F” means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

| Transmitter Radiated Unwanted Emissions (Below 1GHz) | | | |
|---|---|---|---|
| **Operating Mode** | 1 | **Polarization** | H |
| **Operating Function** | Transmitter Mode | | |

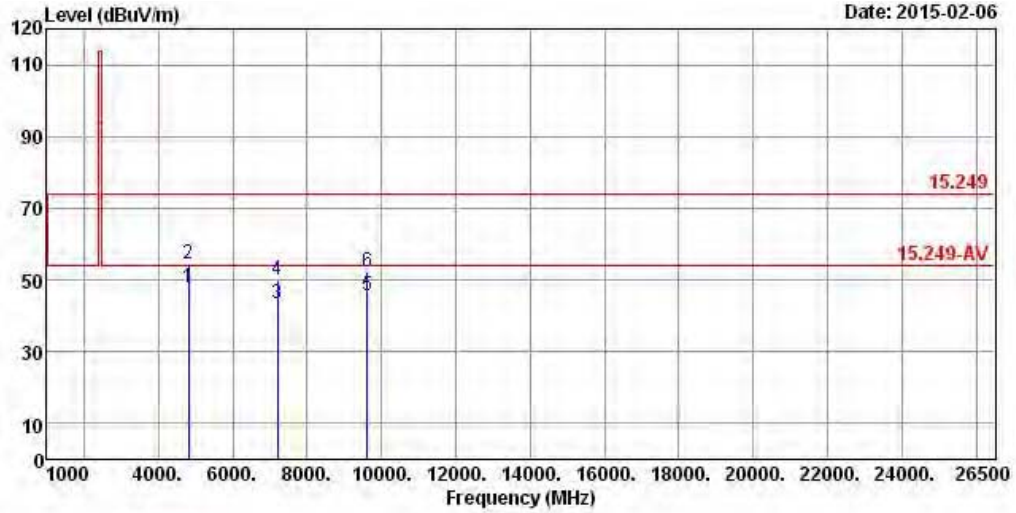



| | Freq | Level | Over Limit | Limit Line | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Remark | A/Pos | T/Pos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV | dB/m | dB | dB | | cm | deg |
| 1 | 134.760 | 39.77 | -3.73 | 43.50 | 53.43 | 11.59 | 1.92 | 27.17 | Peak | --- | --- |
| 2 | 212.360 | 31.54 | -11.96 | 43.50 | 47.40 | 8.82 | 2.40 | 27.08 | Peak | --- | --- |
| 3 | 231.760 | 31.24 | -14.76 | 46.00 | 45.67 | 10.05 | 2.51 | 26.99 | Peak | --- | --- |
| 4 | 336.520 | 32.60 | -13.40 | 46.00 | 42.96 | 13.49 | 3.06 | 26.91 | Peak | --- | --- |
| 5 | 400.540 | 31.58 | -14.42 | 46.00 | 40.24 | 15.32 | 3.34 | 27.32 | Peak | --- | --- |
| 6 | 528.580 | 29.78 | -16.22 | 46.00 | 36.35 | 17.48 | 3.86 | 27.91 | Peak | --- | --- |

Note 1: “>20dB” means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: “N/F” means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

### 3.4.7 Transmitter Radiated Unwanted Emissions (Above 1GHz)

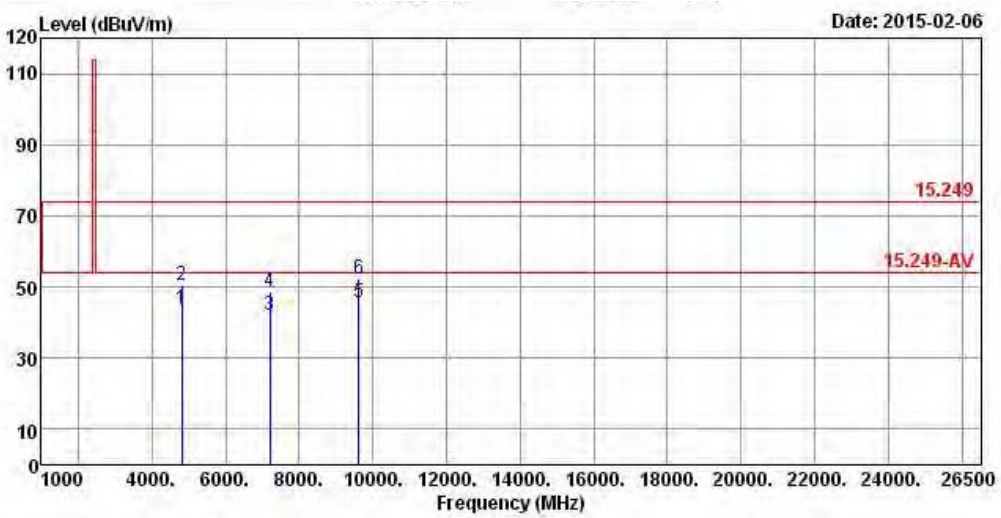
| Transmitter Radiated Unwanted Emissions (Above 1GHz) | | | |
|---|---|---|---|
| **Modulation Mode** | GFSK-Transmit | **Test Freq. (MHz)** | 2402 |
| **Operating Function** | Transmit | **Polarization** | V |




| | Freq | Level | Over Limit | Limit Line | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Remark | A/Pos | T/Pos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV | dB/m | dB | dB | | cm | deg |
| 1 | 4804.000 | 47.76 | -6.24 | 54.00 | 42.54 | 33.20 | 4.49 | 32.47 | Average | --- | --- |
| 2 | 4804.000 | 54.51 | -19.49 | 74.00 | 49.29 | 33.20 | 4.49 | 32.47 | Peak | --- | --- |
| 3 | 7206.000 | 43.19 | -10.81 | 54.00 | 34.27 | 35.84 | 5.71 | 32.63 | Average | --- | --- |
| 4 | 7206.000 | 49.94 | -24.06 | 74.00 | 41.02 | 35.84 | 5.71 | 32.63 | Peak | --- | --- |
| 5 | 9608.000 | 45.61 | -8.39 | 54.00 | 33.72 | 38.37 | 6.66 | 33.14 | Average | --- | --- |
| 6 | 9608.000 | 52.36 | -21.64 | 74.00 | 40.47 | 38.37 | 6.66 | 33.14 | Peak | --- | --- |

Note 1: “>20dB” means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
Note 3: For the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.
Note 4: If duty cycle < 100%, average emission = peak emission + 20 log (duty cycle).

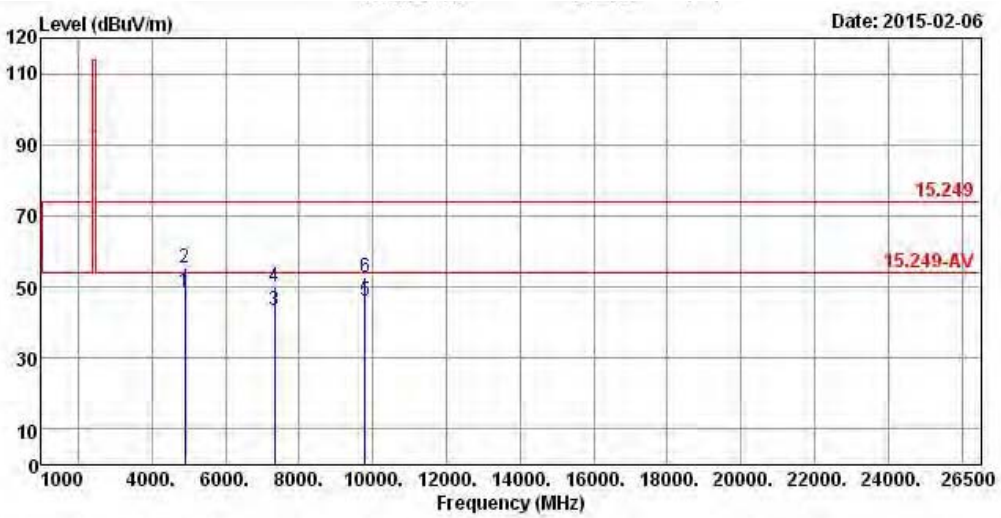
| Transmitter Radiated Unwanted Emissions (Above 1GHz) | | | |
|---|---|---|---|
| **Modulation Mode** | GFSK-Transmit | **Test Freq. (MHz)** | 2402 |
| **Operating Function** | Transmit | **Polarization** | H |




| | Freq | Level | Over Limit | Limit Line | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Remark | A/Pos | T/Pos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV | dB/m | dB | dB | | cm | deg |
| 1 | 4804.000 | 43.77 | -10.23 | 54.00 | 38.55 | 33.20 | 4.49 | 32.47 | Average | --- | --- |
| 2 | 4804.000 | 50.52 | -23.48 | 74.00 | 45.30 | 33.20 | 4.49 | 32.47 | Peak | --- | --- |
| 3 | 7206.000 | 42.07 | -11.93 | 54.00 | 33.15 | 35.84 | 5.71 | 32.63 | Average | --- | --- |
| 4 | 7206.000 | 48.82 | -25.18 | 74.00 | 39.90 | 35.84 | 5.71 | 32.63 | Peak | --- | --- |
| 5 | 9608.000 | 45.62 | -8.38 | 54.00 | 33.73 | 38.37 | 6.66 | 33.14 | Average | --- | --- |
| 6 | 9608.000 | 52.37 | -21.63 | 74.00 | 40.48 | 38.37 | 6.66 | 33.14 | Peak | --- | --- |

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
Note 3: For the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.
Note 4: If duty cycle < 100%, average emission = peak emission + 20 log (duty cycle).

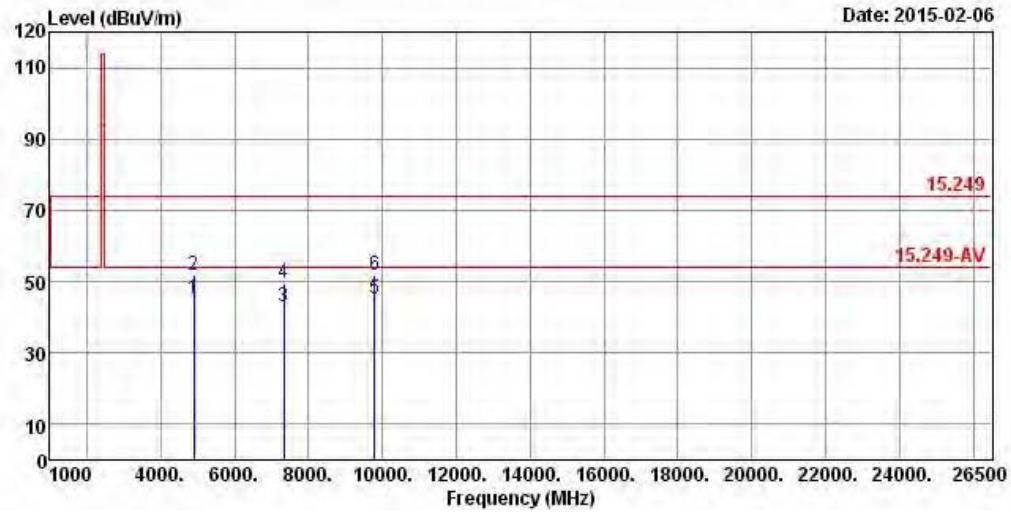
| Transmitter Radiated Unwanted Emissions (Above 1GHz) | | | |
|---|---|---|---|
| **Modulation Mode** | GFSK-Transmit | **Test Freq. (MHz)** | 2445 |
| **Operating Function** | Transmit | **Polarization** | V |




| | Freq | Level | Over Limit | Limit Line | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Remark | A/Pos | T/Pos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV | dB/m | dB | dB | | cm | deg |
| 1 | 4890.000 | 48.74 | -5.26 | 54.00 | 43.33 | 33.33 | 4.53 | 32.45 | Average | --- | --- |
| 2 | 4890.000 | 55.49 | -18.51 | 74.00 | 50.08 | 33.33 | 4.53 | 32.45 | Peak | --- | --- |
| 3 | 7335.000 | 43.29 | -10.71 | 54.00 | 34.02 | 36.20 | 5.75 | 32.68 | Average | --- | --- |
| 4 | 7335.000 | 50.04 | -23.96 | 74.00 | 40.77 | 36.20 | 5.75 | 32.68 | Peak | --- | --- |
| 5 | 9780.000 | 46.08 | -7.92 | 54.00 | 33.84 | 38.64 | 6.73 | 33.13 | Average | --- | --- |
| 6 | 9780.000 | 52.83 | -21.17 | 74.00 | 40.59 | 38.64 | 6.73 | 33.13 | Peak | --- | --- |

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
Note 3: For the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.
Note 4: If duty cycle < 100%, average emission = peak emission + 20 log (duty cycle).

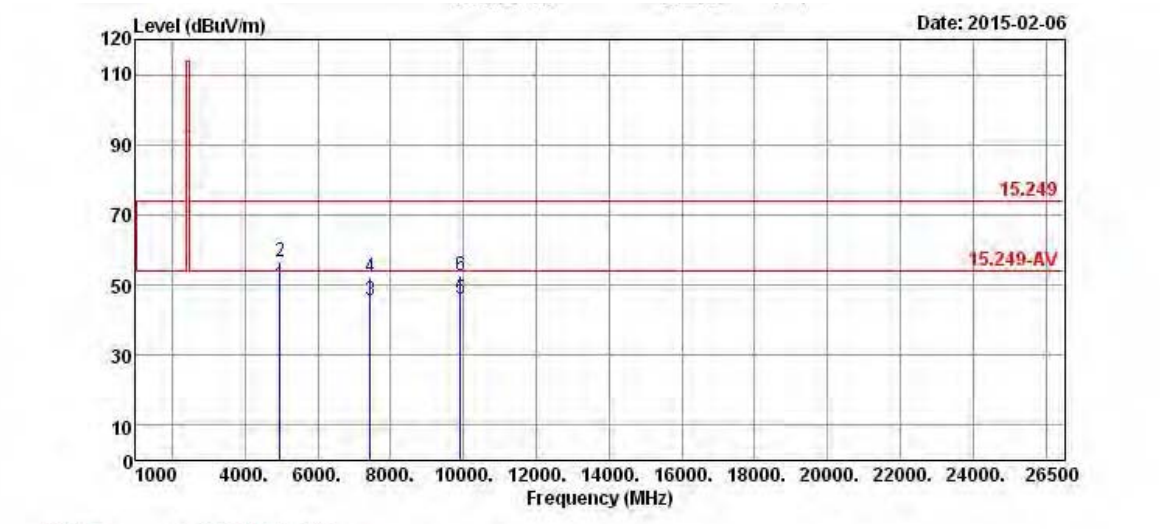
| Transmitter Radiated Unwanted Emissions (Above 1GHz) | | | |
|---|---|---|---|
| **Modulation Mode** | GFSK-Transmit | **Test Freq. (MHz)** | 2445 |
| **Operating Function** | Transmit | **Polarization** | H |




| | Freq | Level | Over Limit | Limit Line | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Remark | A/Pos | T/Pos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV | dB/m | dB | dB | | cm | deg |
| 1 | 4890.000 | 45.23 | -8.77 | 54.00 | 39.82 | 33.33 | 4.53 | 32.45 | Average | --- | --- |
| 2 | 4890.000 | 51.98 | -22.02 | 74.00 | 46.57 | 33.33 | 4.53 | 32.45 | Peak | --- | --- |
| 3 | 7335.000 | 42.78 | -11.22 | 54.00 | 33.51 | 36.20 | 5.75 | 32.68 | Average | --- | --- |
| 4 | 7335.000 | 49.53 | -24.47 | 74.00 | 40.26 | 36.20 | 5.75 | 32.68 | Peak | --- | --- |
| 5 | 9780.000 | 45.27 | -8.73 | 54.00 | 33.03 | 38.64 | 6.73 | 33.13 | Average | --- | --- |
| 6 | 9780.000 | 52.02 | -21.98 | 74.00 | 39.78 | 38.64 | 6.73 | 33.13 | Peak | --- | --- |

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
Note 3: For the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.
Note 4: If duty cycle < 100%, average emission = peak emission + 20 log (duty cycle).

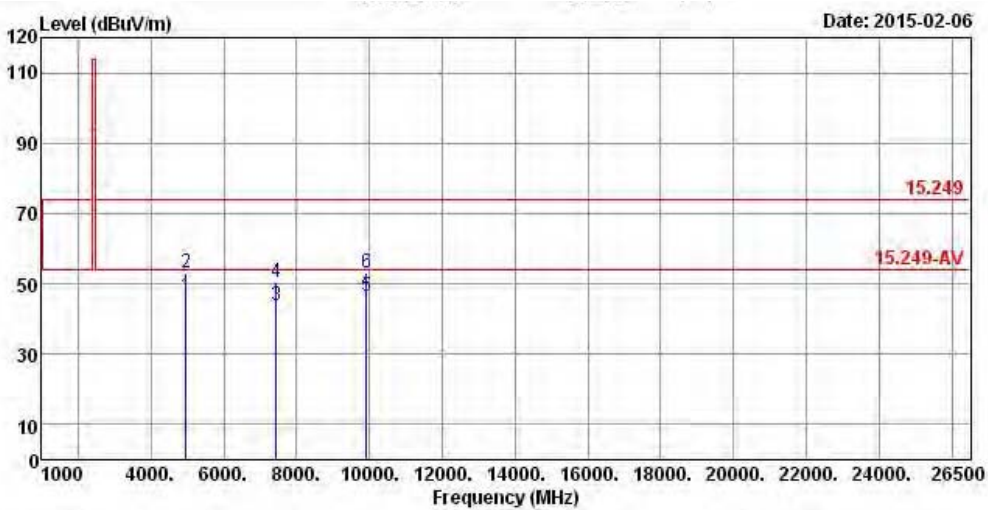
| Transmitter Radiated Unwanted Emissions (Above 1GHz) | | | |
|---|---|---|---|
| **Modulation Mode** | GFSK-Transmit | **Test Freq. (MHz)** | 2478 |
| **Operating Function** | Transmit | **Polarization** | V |




| | Freq | Level | Over Limit | Limit Line | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Remark | A/Pos | T/Pos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV | dB/m | dB | dB | | cm | deg |
| 1 | 4956.000 | 49.92 | -4.08 | 54.00 | 44.37 | 33.44 | 4.55 | 32.44 | Average | --- | --- |
| 2 | 4956.000 | 56.67 | -17.33 | 74.00 | 51.12 | 33.44 | 4.55 | 32.44 | Peak | --- | --- |
| 3 | 7434.000 | 45.63 | -8.37 | 54.00 | 36.14 | 36.42 | 5.79 | 32.72 | Average | --- | --- |
| 4 | 7434.000 | 52.38 | -21.62 | 74.00 | 42.89 | 36.42 | 5.79 | 32.72 | Peak | --- | --- |
| 5 | 9912.000 | 46.05 | -7.95 | 54.00 | 33.52 | 38.86 | 6.80 | 33.13 | Average | --- | --- |
| 6 | 9912.000 | 52.80 | -21.20 | 74.00 | 40.27 | 38.86 | 6.80 | 33.13 | Peak | --- | --- |

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
Note 3: For the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.
Note 4: If duty cycle < 100%, average emission = peak emission + 20 log (duty cycle).

| Transmitter Radiated Unwanted Emissions (Above 1GHz) | | | |
|---|---|---|---|
| **Modulation Mode** | GFSK-Transmit | **Test Freq. (MHz)** | 2478 |
| **Operating Function** | Transmit | **Polarization** | H |




| | Freq | Level | Over Limit | Limit Line | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Remark | A/Pos | T/Pos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV | dB/m | dB | dB | | cm | deg |
| 1 | 4956.000 | 46.36 | -7.64 | 54.00 | 40.81 | 33.44 | 4.55 | 32.44 | Average | --- | --- |
| 2 | 4956.000 | 53.11 | -20.89 | 74.00 | 47.56 | 33.44 | 4.55 | 32.44 | Peak | --- | --- |
| 3 | 7434.000 | 43.69 | -10.31 | 54.00 | 34.20 | 36.42 | 5.79 | 32.72 | Average | --- | --- |
| 4 | 7434.000 | 50.44 | -23.56 | 74.00 | 40.95 | 36.42 | 5.79 | 32.72 | Peak | --- | --- |
| 5 | 9912.000 | 46.54 | -7.46 | 54.00 | 34.01 | 38.86 | 6.80 | 33.13 | Average | --- | --- |
| 6 | 9912.000 | 53.29 | -20.71 | 74.00 | 40.76 | 38.86 | 6.80 | 33.13 | Peak | --- | --- |

Note 1: “>20dB” means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
Note 3: For the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.
Note 4: If duty cycle < 100%, average emission = peak emission + 20 log (duty cycle).

# 4 Test Equipment and Calibration Data

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Remark |
|---|---|---|---|---|---|---|
| EMC Receiver | R&S | ESCS 30 | 100174 | 9kHz ~ 2.75GHz | Apr. 14, 2014 | AC Conduction |
| LISN | SCHWARZBECK MESS-ELEKTRONIK | NSLK 8127 | 8127-477 | 9kHz ~ 30MHz | Jan. 22, 2015 | AC Conduction |
| RF Cable-CON | HUBER+SUHNER | RG213/U | 07611832020001 | 9kHz ~ 30MHz | Oct. 31, 2014 | AC Conduction |
| EMI Filter | LINDGREN | LRE-2030 | 2651 | < 450 Hz | N/A | AC Conduction |

Note: Calibration Interval of instruments listed above is one year.

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Remark |
|---|---|---|---|---|---|---|
| Spectrum Analyzer | R&S | FSV 40 | 101514 | 9kHz ~ 40GHz | Jun. 13, 2014 | RF Conducted |
| Signal Generator | R&S | SMR40 | 100116 | 10MHz ~ 40GHz | Jul. 31, 2014 | RF Conducted |

Note: Calibration Interval of instruments listed above is one year.

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Remark |
|---|---|---|---|---|---|---|
| 3m Semi Anechoic Chamber | SIDT FRANKONIA | SAC-3M | 03CH03-HY | 30MHz ~ 1GHz 3m | Nov. 29, 2014 | Radiation |
| Amplifier | HP | 8447D | 2944A08033 | 10kHz ~ 1.3GHz | May 05, 2014 | Radiation |
| Amplifier | Agilent | 8449B | 3008A02120 | 1GHz ~ 26.5GHz | Sep. 01, 2014 | Radiation |
| Spectrum | R&S | FSP40 | 100004 | 9kHz ~ 40GHz | Mar. 27, 2014 | Radiation |
| Bilog Antenna | SCHAFFNER | CBL 6112D | 22237 | 30MHz ~ 1GHz | Sep. 20, 2014 | Radiation |
| Horn Antenna | ETS・LINDGREN | 3115 | 6741 | 1GHz ~ 18GHz | Jul. 11, 2014 | Radiation |
| Horn Antenna | SCHWARZBECK | BBHA9170 | BBHA9170154 | 18GHz ~ 40GHz | Jan. 27, 2015 | Radiation |
| RF Cable-R03m | Jye Bao | RG142 | CB021 | 9kHz ~ 1GHz | Nov. 15, 2014 | Radiation |
| RF Cable-high | SUHNER | SUCOFLEX 106 | 03CH03-HY | 1GHz ~ 40GHz | Dec. 12, 2014 | Radiation |
| Turn Table | EM Electronics | EM Electronics | 060615 | 0 ~ 360 degree | N/A | Radiation |
| Antenna Mast | MF | MF-7802 | MF780208179 | 1 ~ 4 m | N/A | Radiation |

Note: Calibration Interval of instruments listed above is one year.

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Remark |
|---|---|---|---|---|---|---|
| Loop Antenna | Rohde & Schwarz | HFH2-Z2 | 100315 | 9kHz ~ 30MHz | Jul. 28, 2014 | Radiation |

Note: Calibration Interval of instruments listed above is two years.