Testing Laboratory 1190

# FCC RADIO TEST REPORT

| | | |
|---|---|---|
| FCC ID | : | 2AMP5K60I |
| Equipment | : | 60 GHz Indoor Distribution System |
| Brand Name | : | Kwikbit |
| Model Name | : | K60i |
| Applicant | : | Kwikbit Inc.<br>7801 E. Bush Lake Rd Suite 300 Minneapolis<br>Minnesota United States 55439 |
| Manufacturer | : | Kwikbit Inc.<br>7801 E. Bush Lake Rd Suite 300 Minneapolis<br>Minnesota United States 55439 |
| Standard | : | 47 CFR FCC Part 15.255 |

The product was received on Apr. 24, 2019, and testing was started from May 06, 2019 and completed on May 21, 2019. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013, 47 CFR FCC Part 15.255, Millimeter Wave Test Procedures and shown compliance with the applicable technical standards.

The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

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

Approved by: Sam Chen

*SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory*
*No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)*

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**Appendix A. Test Photos**

**Photographs of EUT v01**

# History of this test report

| Report No. | Version | Description | Issued Date |
|---|---|---|---|
| FR942349 | 01 | Initial issue of report | Jun. 04, 2019 |
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# Summary of Test Result

| Report Clause | Ref Std. Clause | Test Items | Result (PASS/FAIL) | Remark |
|---|---|---|---|---|
| 3.1 | FCC 15.207 | AC Power Conducted Emissions | PASS | - |
| 0 | FCC 15.255(e) | Occupied Bandwidth | PASS | - |
| 3.3 | FCC 15.255(c) | EIRP Power | PASS | - |
| 3.4 | FCC 15.255(c) | Peak Conducted Power | PASS | - |
| 3.5 | FCC 15.255(d) | Transmitter Spurious Emissions | PASS | - |
| 3.6 | FCC 15.255(f) | Frequency Stability | PASS | - |
| 3.7 | FCC 15.255(a), (h) | Operation Restriction and Group Installation | PASS | - |

| **Declaration of Conformity:** |
|---|
| The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers. |
| **Comments and Explanations:** |
| The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification. |

**Reviewed by: Sam Chen**

**Report Producer: Viola Huang**

# 1 General Description

## 1.1 Information

### 1.1.1 The Channel Plan(s)

| | |
|---|---|
| **Frequency Range** | 57-71 GHz |
| **The Channel Plan(s)** | 58.32GHz<br>60.48GHz<br>62.64GHz |

### 1.1.2 Modulation

**IEEE 802.11ad Modulation Scheme**

| MCS Index | Modulation | Code rate | Data rate (Mbit/s) |
|---|---|---|---|
| 0 | π/2-BPSK | 1/2 | 27.5 |
| 1 | π/2-BPSK | 1/2 | 385 |
| 2 | π/2-BPSK | 1/2 | 770 |
| 3 | π/2-BPSK | 5/8 | 962.5 |
| 4 | π/2-BPSK | 3/4 | 1155 |
| 5 | π/2-BPSK | 13/16 | 1251.25 |
| 6 | π/2-QPSK | 1/2 | 1540 |
| 7 | π/2-QPSK | 5/8 | 1925 |
| 8 | π/2-QPSK | 3/4 | 2310 |
| Can the transmitter operate un-modulated: | | | ☒ Yes ☐ No |

### 1.1.3 Antenna Information

| Ant. | Brand | Model Name | Antenna Type | Connector | Gain (dBi) |
|---|---|---|---|---|---|
| 1 | WNC | XEAG-V01 | Integrated beamforming antenna | Murata | 21.9 |

Note: The above information was declared by manufacturer.

### 1.1.4 Power Levels

| Applicable power levels | ☐ Conducted ☒ EIRP | |
|---|---|---|
| Frequency (GHz) | setting: (dBm) | |
| | AV Power | Peak Power |
| 60.48 | 31.54 | 40.45 |

### 1.1.5 Operating Conditions

| Operating Conditions | | | | |
|---|---|---|---|---|
| ☐ -20 °C to +50 °C | | | | |
| ☐ 0 °C to +40 °C | | | | |
| ☒ Other: 0 °C to +50 °C | | | | |
| EUT Power Type | From adapter | | | |
| Supply Voltage | ☒ AC | State AC voltage | 120 | V |
| Supply Voltage | ☐ DC | State DC voltage | | V |

### 1.1.6 Equipment Use Condition

| Equipment Use Condition |
|---|
| ☐ Fixed field disturbance sensors at 61-61.5GHz |
| ☐ Except fixed field disturbance sensors at 61-61.5GHz |
| ☒ Except fixed field disturbance sensors |

### 1.1.7 User Condition

| Intended Operation |
|---|
| ☒ Indoor |
| ☐ Outdoor (except outdoor fixed Point to Point) |
| ☐ Outdoor fixed Point to Point |

Note: The above information was declared by manufacturer.

### 1.1.8 Duty Cycle

| Duty Cycle | Duty Cycle Factor |
|---|---|
| 100 | 0 |

## 1.2 Accessories

| Accessories | | | | |
|---|---|---|---|---|
| **Equipment Name** | **Brand Name** | **Model Name** | **Rating** | **Remark** |
| Adapter | MW | OWA-60U-48 | INPUT: 100-240V ~,1.2A, 50/60Hz<br>OUTPUT: +48V, 1.25A | AC power cable, non-shielded, 1.5m<br>DC power cable, non-shielded, 0.3m |
| **Other** | | | | |
| DC power cable*1, non-shielded, 1.8m | | | | |
| Wall-mounted rack *1 | | | | |

## 1.3 Support Equipment

**For AC power conducted emissions test:**

| Support Equipment | | | | |
|---|---|---|---|---|
| **No.** | **Equipment** | **Brand Name** | **Model Name** | **FCC ID** |
| A | LAN1 NB | DELL | E6430 | N/A |
| B | LAN2 NB | DELL | E6430 | N/A |
| C | LAN3 NB | DELL | E6430 | N/A |
| D | LAN4 NB | DELL | E6430 | N/A |
| E | PoE fixture | N/A | N/A | N/A |
| F | PoE fixture | N/A | N/A | N/A |
| G | Device | Kwikbit | K60i | 2AMP5K60I |
| H | 30W resistance | N/A | N/A | N/A |
| I | 15W resistance | N/A | N/A | N/A |

**For Transmitter Spurious Emissions below 1 GHz:**

| Support Equipment | | | | |
|---|---|---|---|---|
| **No.** | **Equipment** | **Brand Name** | **Model Name** | **FCC ID** |
| A | NB | DELL | E4300 | N/A |
| B | NB | DELL | E4300 | N/A |
| C | NB | DELL | E4300 | N/A |
| D | PoE fixture | N/A | N/A | N/A |
| E | 15W resistance | N/A | N/A | N/A |
| F | PoE fixture | N/A | N/A | N/A |
| G | 30W resistance | N/A | N/A | N/A |
| H | Device | Kwikbit | K60i | 2AMP5K60I |

**For Transmitter Spurious Emissions above 1 GHz and other tests:**

| Support Equipment | | | | |
|---|---|---|---|---|
| **No.** | **Equipment** | **Brand Name** | **Model Name** | **FCC ID** |
| A | NB | DELL | E6430 | N/A |

## 1.4 EUT Operation during Test

For CTX Mode:

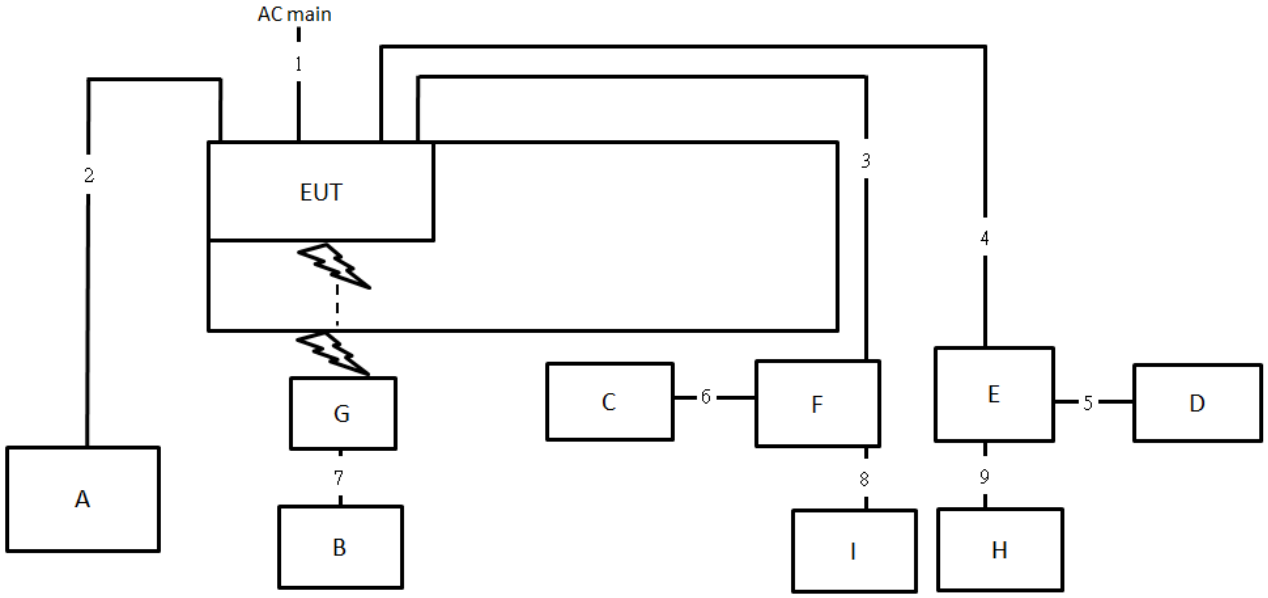
The EUT was programmed to be in continuously transmitting mode.

For Normal Link:

During the test, the EUT operation to normal function.

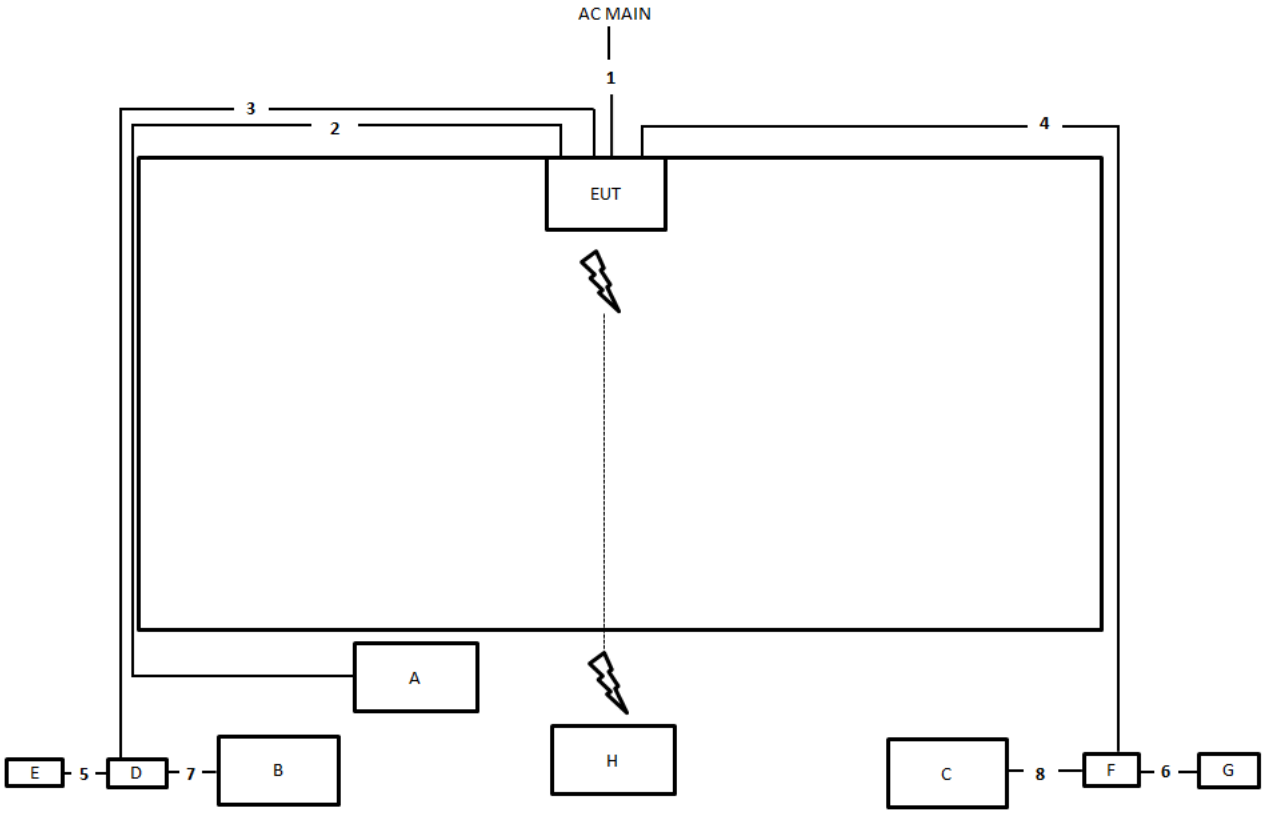
## 1.5 Test Setup Diagram

**Test Setup Diagram - AC Power Conducted Emissions**



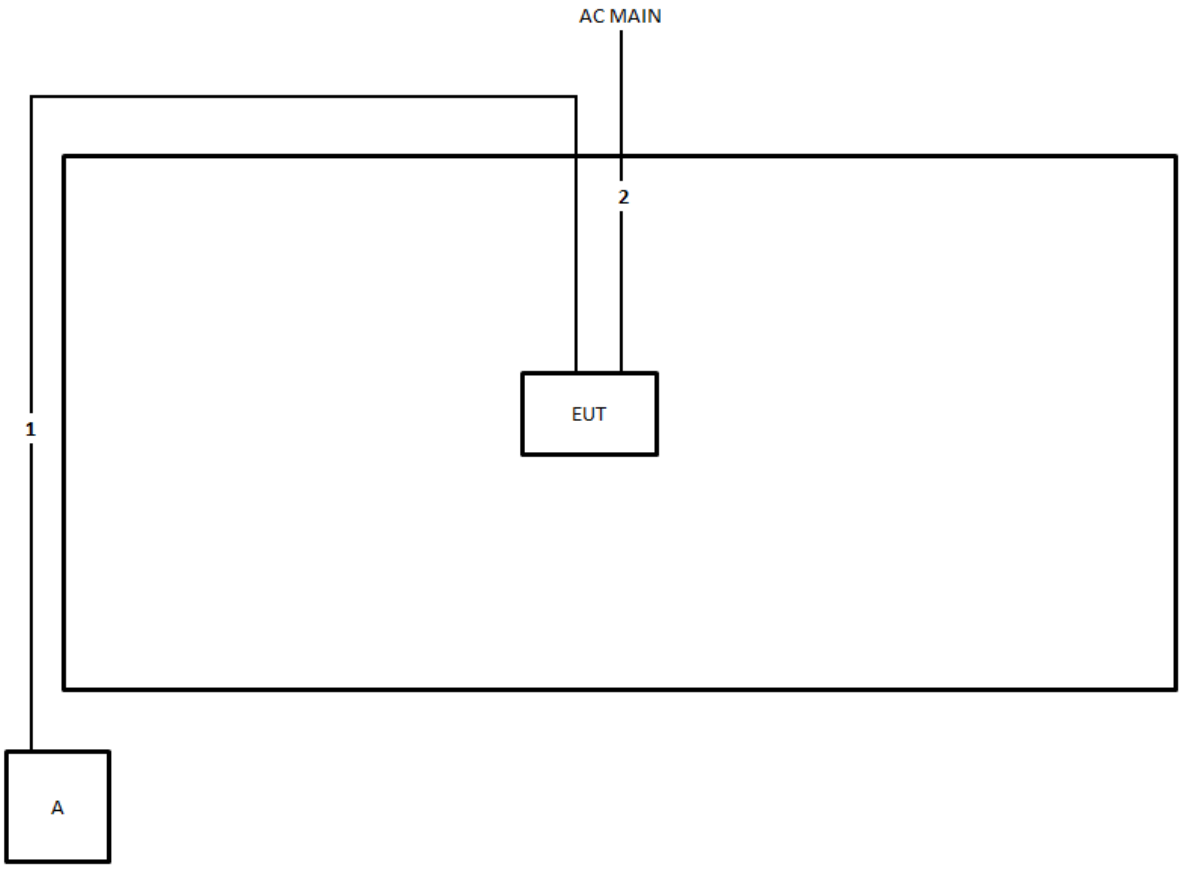

| Item | Connection | Shielded | Length |
|---|---|---|---|
| 1 | Power cable | No | 3.8m |
| 2 | RJ-45 cable | No | 10m |
| 3 | RJ-45 cable | No | 10m |
| 4 | RJ-45 cable | No | 10m |
| 5 | RJ-45 cable | No | 3m |
| 6 | RJ-45 cable | No | 3m |
| 7 | RJ-45 cable | No | 3m |
| 8 | RJ-45 cable | No | 3m |
| 9 | RJ-45 cable | No | 3m |

## Test Setup Diagram - Transmitter Spurious Emissions below 1 GHz




| Item | Connection | Shielded | Length |
|---|---|---|---|
| 1 | Power cable | No | 3.8m |
| 2 | RJ-45 cable | No | 10m |
| 3 | RJ-45 cable | No | 10m |
| 4 | RJ-45 cable | No | 10m |
| 5 | Line cable | No | 0.4m |
| 6 | Line cable | No | 0.4m |
| 7 | RJ-45 cable | No | 1.5m |
| 8 | RJ-45 cable | No | 1.5m |

**Test Setup Diagram - Transmitter Spurious Emissions above 1 GHz**




| Item | Connection | Shielded | Length |
|---|---|---|---|
| 1 | RJ-45 cable | No | 10m |
| 2 | Power cable | No | 3.8m |

## 1.6 Applicable Standards

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

- 47 CFR FCC Part 15.255
- ANSI C63.10-2013 Section 9. “Procedures for testing millimeter-wave systems”

## 1.7 Testing Location

| Testing Location | | | |
|---|---|---|---|
| ☐ | HWA YA | ADD : No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)<br>TEL : 886-3-327-3456 FAX : 886-3-327-0973 | |
| ☒ | JHUBEI | ADD : No.8, Lane 724, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C.<br>TEL : 886-3-656-9065 FAX : 886-3-656-9085 | |
| **Test Site No.** | | | |
| CO02-CB | | 03CH01-CB | TH01-CB |

Test site Designation No. TW0006 with FCC.

Test site registered number IC 4086B with Industry Canada.

# 2 Test Configuration of Equipment under Test

## 2.1 Test Channel Frequencies

| Test Channel Frequencies Configuration | |
|---|---|
| **Low Channel (GHz)** | 58.32 |
| **Middle Channel (GHz)** | 60.48 |
| **High Channel (GHz)** | 62.64 |

## 2.2 Conformance Tests and Related Test Frequencies

| Test Item | Test Frequencies (GHz) |
|---|---|
| AC Power Conducted Emissions | Random Frequency |
| Occupied Bandwidth | 58.32, 60.48, 62.64 |
| EIRP Power | 58.32, 60.48, 62.64 |
| Peak Conducted Power | 58.32, 60.48, 62.64 |
| Transmitter Spurious Emissions (below 1 GHz) | Random Frequency |
| Transmitter Spurious Emissions (1 GHz-40 GHz) | 58.32, 60.48, 62.64 |
| Transmitter Spurious Emissions (above 40 GHz) | 58.32, 60.48, 62.64 |
| Frequency Stability | 60.48 |

The following table is a list of the test modes shown in this test report.

| AC power conducted emissions tes and Transmitter Spurious Emissions below 1 GHz | |
|---|---|
| **Test Mode** | **Description** |
| 1 | Normal Link - EUT + Power adapter + DC power cable |

Note: The EUT only uses in Y axis.

## 2.3 Far Field Boundary Calculations

The far-field boundary is given as:

far field = (2 * L^2) /**λ**

where:

L = Largest Antenna Dimension, including the reflector, in meters

**λ**= wavelength in meters

| Far Field (m) | | | | |
|---|---|---|---|---|
| **Frequency (GHz)** | **L (m)** | **Lambda (m)** | **d(Far Field) (m)** | **d(Far Field) (cm)** |
| 58.32 | 0.03 | 0.0051440 | 0.350 | 34.99 |
| 60.48 | 0.03 | 0.0049603 | 0.363 | 36.29 |
| 62.64 | 0.03 | 0.0047893 | 0.376 | 37.58 |

# 3 Transmitter Test Result

## 3.1 AC Power Conducted Emissions

### 3.1.1 Limit of AC Power Conducted Emissions

| AC Power 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: * Decreases with the logarithm of the frequency. | | |

### 3.1.2 Measuring Instruments

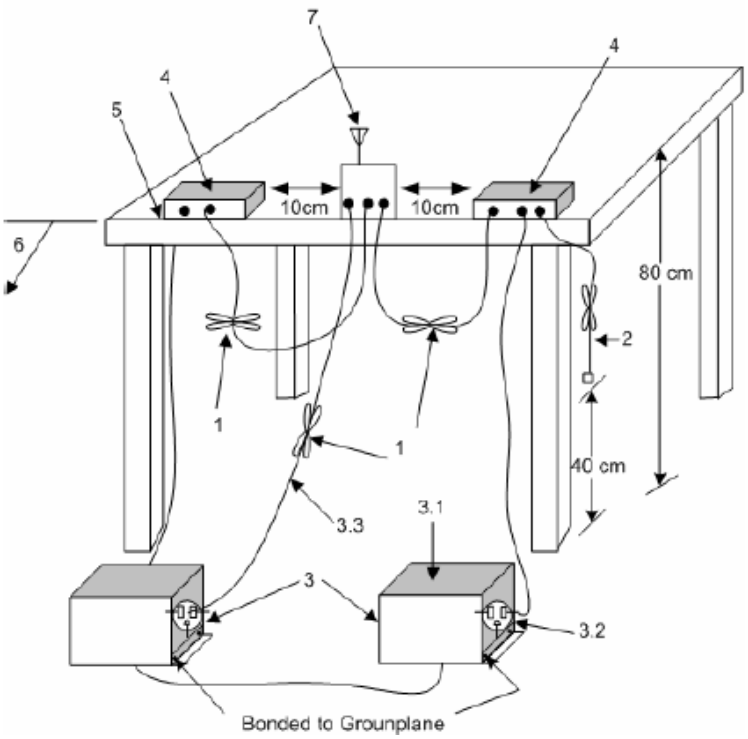
Refer a measuring instruments list in this test report.

### 3.1.3 Test Procedures

Method of measurement: Refer as ANSI C63.10-2013, clause 6.2.

### 3.1.4 Test Setup

**AC Power Conducted Emissions**




1—Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 cm to 40 cm long.

2—The I/O cables that are not connected to an accessory shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

3—EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50 Ω loads. LISN may be placed on top of, or immediately beneath, reference ground plane.

3.1—All other equipment powered from additional LISN(s).

3.2—A multiple-outlet strip may be used for multiple power cords of non-EUT equipment.

3.3—LISN at least 80 cm from nearest part of EUT chassis.

4—Non-EUT components of EUT system being tested.

5—Rear of EUT, including peripherals, shall all be aligned and flush with edge of tabletop.

6—Edge of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.

7—Antenna can be integral or detachable. If detachable, then the antenna shall be attached for this test.

### 3.1.5 Test Result of AC Power Conducted Emissions

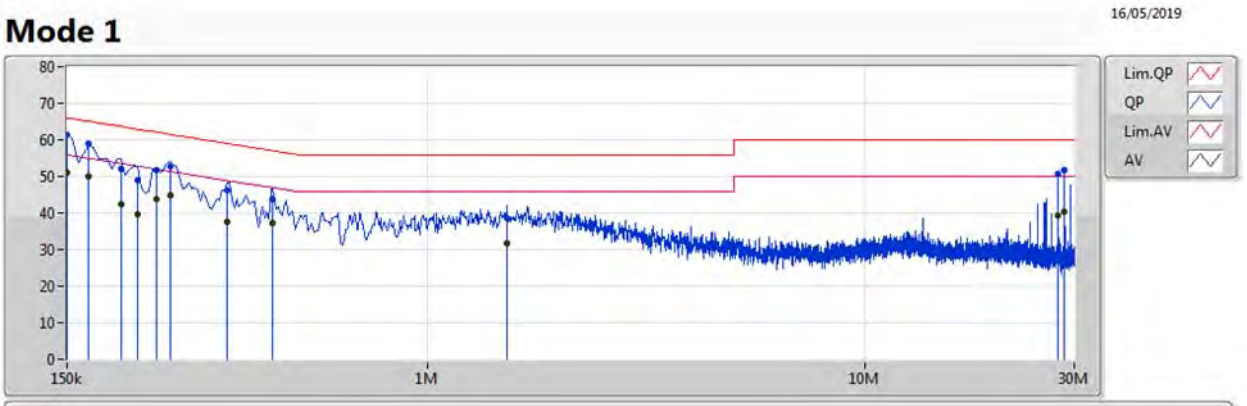
| | |
|---|---|
| **Test Conditions** | see ANSI C63.10, clause 5.11 |
| **Test Setup** | see ANSI C63.10, clause 6.2.3 |

NOTE 1: If equipment having different channel plan and nominal channel bandwidth modes (see test report clause 1.1.1), the measurements are uninfluenced by different channel plan and nominal channel bandwidth modes, may not need to be repeated for all modes. If equipment having different transmit operating modes (see test report clause 1.1.2), the measurements are uninfluenced by different transmit operating modes, may not need to be repeated for all the operating modes. Similar, if the equipment supports different modulations and/or data rates, the measurements described in ANSI C63.10, clause 5.12 may not need to be repeated for all these modulations and data rates. Simple comparison of engineering test across all operating modes, modulations and data rates may need to be performed to define the worse case combination to be used for the conformance testing.

NOTE 2: “>20dB” means the tables in this clause should only list values of spurious emissions that exceed the level of 20 dB below the applicable limit, see ANSI C63.4, clause 10.1.8.1.

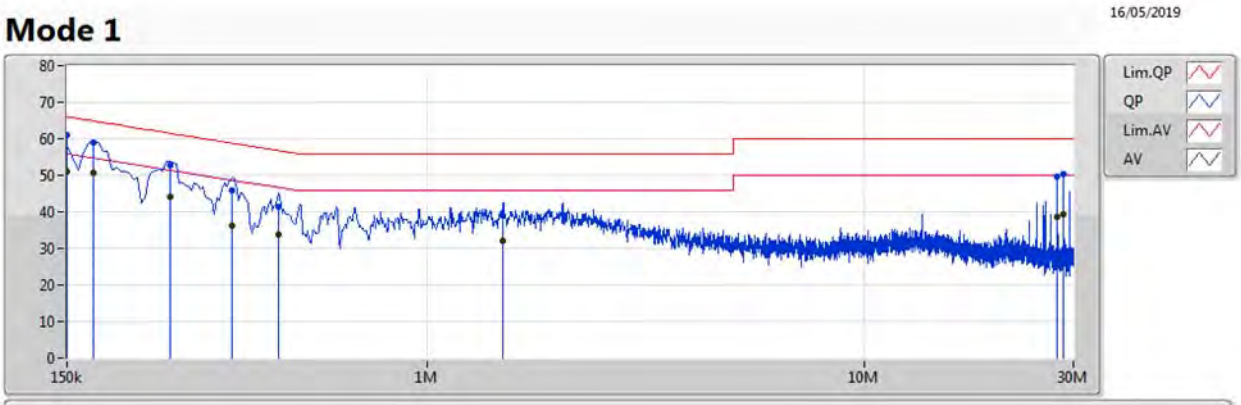
| Temp | 25.6~26.1°C | Humidity | 45.3~45.6% |
|---|---|---|---|
| Test Engineer | Rick Yeh | Phase | Line |
| Configuration | Normal Link | | |

**Mode 1**




| Type | Freq | Level | Limit | Margin | Factor | Condition | Comment | Raw | AF | CL | AT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | (Hz) | (dBuV) | (dBuV) | (dB) | (dB) | | | (dBuV) | (dB) | (dB) | (dB) |
| QP | 150k | 61.34 | 66.00 | -4.66 | 10.17 | Line | "Worst" | 51.17 | 0.05 | 0.02 | 10.10 |
| AV | 150k | 51.13 | 56.00 | -4.87 | 10.17 | Line | - | 40.96 | 0.05 | 0.02 | 10.10 |
| QP | 168k | 58.91 | 65.06 | -6.15 | 10.17 | Line | - | 48.74 | 0.05 | 0.02 | 10.10 |
| AV | 168k | 50.07 | 55.06 | -4.99 | 10.17 | Line | - | 39.90 | 0.05 | 0.02 | 10.10 |
| QP | 199.5k | 52.21 | 63.63 | -11.42 | 10.17 | Line | - | 42.04 | 0.05 | 0.02 | 10.10 |
| AV | 199.5k | 42.32 | 53.63 | -11.31 | 10.17 | Line | - | 32.15 | 0.05 | 0.02 | 10.10 |
| QP | 217.5k | 48.98 | 62.92 | -13.94 | 10.17 | Line | - | 38.81 | 0.05 | 0.02 | 10.10 |
| AV | 217.5k | 39.79 | 52.92 | -13.13 | 10.17 | Line | - | 29.62 | 0.05 | 0.02 | 10.10 |
| QP | 240k | 51.65 | 62.10 | -10.45 | 10.17 | Line | - | 41.48 | 0.05 | 0.02 | 10.10 |
| AV | 240k | 43.80 | 52.10 | -8.30 | 10.17 | Line | - | 33.63 | 0.05 | 0.02 | 10.10 |
| QP | 258k | 52.91 | 61.49 | -8.58 | 10.17 | Line | - | 42.74 | 0.05 | 0.02 | 10.10 |
| AV | 258k | 44.75 | 51.49 | -6.74 | 10.17 | Line | - | 34.58 | 0.05 | 0.02 | 10.10 |
| QP | 348k | 46.04 | 59.00 | -12.96 | 10.18 | Line | - | 35.86 | 0.06 | 0.02 | 10.10 |
| AV | 348k | 37.73 | 49.00 | -11.27 | 10.18 | Line | - | 27.55 | 0.06 | 0.02 | 10.10 |
| QP | 442.5k | 43.85 | 57.01 | -13.16 | 10.18 | Line | - | 33.67 | 0.06 | 0.02 | 10.10 |
| AV | 442.5k | 37.31 | 47.01 | -9.70 | 10.18 | Line | - | 27.13 | 0.06 | 0.02 | 10.10 |
| QP | 1.518M | 38.54 | 56.00 | -17.46 | 10.22 | Line | - | 28.32 | 0.08 | 0.04 | 10.10 |
| AV | 1.518M | 31.64 | 46.00 | -14.36 | 10.22 | Line | - | 21.42 | 0.08 | 0.04 | 10.10 |
| QP | 27.565M | 50.61 | 60.00 | -9.39 | 10.71 | Line | - | 39.90 | 0.36 | 0.22 | 10.10 |
| AV | 27.565M | 39.31 | 50.00 | -10.69 | 10.71 | Line | - | 28.60 | 0.36 | 0.22 | 10.10 |
| QP | 28.516M | 51.88 | 60.00 | -8.12 | 10.73 | Line | - | 41.15 | 0.37 | 0.23 | 10.10 |
| AV | 28.516M | 40.40 | 50.00 | -9.60 | 10.73 | Line | - | 29.67 | 0.37 | 0.23 | 10.10 |

| Temp | 25.6~26.1°C | Humidity | 45.3~45.6% |
|---|---|---|---|
| Test Engineer | Rick Yeh | Phase | Neutral |
| Configuration | Normal Link | | |




NO : R8
EUT : K60i
Power : 120V
Mode : normal link adapter供電 + DC cable延長線
Memo : LISN 201811-NEUTRAL

| Type | Freq | Level | Limit | Margin | Factor | Condition | Comment | Raw | AF | CL | AT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | (Hz) | (dBuV) | (dBuV) | (dB) | (dB) | | | (dBuV) | (dB) | (dB) | (dB) |
| QP | 150k | 61.06 | 66.00 | -4.94 | 10.15 | Neutral | - | 50.91 | 0.03 | 0.02 | 10.10 |
| AV | 150k | 51.06 | 56.00 | -4.94 | 10.15 | Neutral | - | 40.91 | 0.03 | 0.02 | 10.10 |
| QP | 172.5k | 58.87 | 64.83 | -5.96 | 10.15 | Neutral | - | 48.72 | 0.03 | 0.02 | 10.10 |
| AV | 172.5k | 50.66 | 54.83 | -4.17 | 10.15 | Neutral | "Worst" | 40.51 | 0.03 | 0.02 | 10.10 |
| QP | 258k | 52.59 | 61.49 | -8.90 | 10.15 | Neutral | - | 42.44 | 0.03 | 0.02 | 10.10 |
| AV | 258k | 44.28 | 51.49 | -7.21 | 10.15 | Neutral | - | 34.13 | 0.03 | 0.02 | 10.10 |
| QP | 357k | 45.94 | 58.79 | -12.85 | 10.16 | Neutral | - | 35.78 | 0.04 | 0.02 | 10.10 |
| AV | 357k | 36.37 | 48.79 | -12.42 | 10.16 | Neutral | - | 26.21 | 0.04 | 0.02 | 10.10 |
| QP | 456k | 41.24 | 56.76 | -15.52 | 10.16 | Neutral | - | 31.08 | 0.04 | 0.02 | 10.10 |
| AV | 456k | 33.71 | 46.76 | -13.05 | 10.16 | Neutral | - | 23.55 | 0.04 | 0.02 | 10.10 |
| QP | 1.491M | 38.80 | 56.00 | -17.20 | 10.19 | Neutral | - | 28.61 | 0.05 | 0.04 | 10.10 |
| AV | 1.491M | 31.98 | 46.00 | -14.02 | 10.19 | Neutral | - | 21.79 | 0.05 | 0.04 | 10.10 |
| QP | 27.563M | 49.68 | 60.00 | -10.32 | 10.65 | Neutral | - | 39.03 | 0.30 | 0.22 | 10.10 |
| AV | 27.563M | 38.47 | 50.00 | -11.53 | 10.65 | Neutral | - | 27.82 | 0.30 | 0.22 | 10.10 |
| QP | 28.514M | 50.34 | 60.00 | -9.66 | 10.67 | Neutral | - | 39.67 | 0.31 | 0.23 | 10.10 |
| AV | 28.514M | 39.40 | 50.00 | -10.60 | 10.67 | Neutral | - | 28.73 | 0.31 | 0.23 | 10.10 |

## 3.2 Occupied Bandwidth

### 3.2.1 Limit of Occupied Bandwidth

| | |
|---|---|
| **6dBc Bandwidth** (see Note 1) | None |
| **99% Occupied Bandwidth** (see Note 2) | None |

NOTE 1: The 6dBc bandwidth is the frequency bandwidth of the signal power at the -6 dBc points when measured with a 100 kHz resolution bandwidth. These measurements shall also be performed at normal test conditions.

NOTE 2: The 99% occupied bandwidth is the frequency bandwidth of the signal power at the 99% channel power of occupied bandwidth when resolution bandwidth should be approximately 1 % to 5 % of the occupied bandwidth (OBW). These measurements shall also be performed at normal test conditions.

### 3.2.2 Measuring Instruments

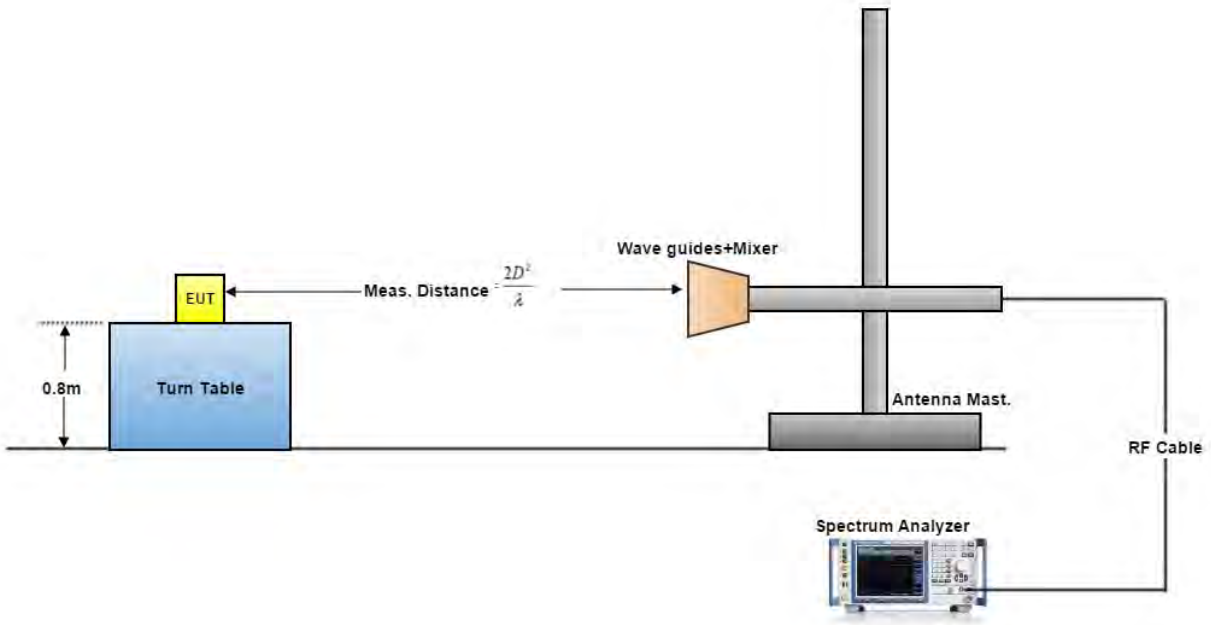
Refer a measuring instruments list in this test report.

### 3.2.3 Test Procedures

Method of measurement: Refer as ANSI C63.10-2013, clauses 6.9.2.

### 3.2.4 Test Setup

**Occupied Channel Bandwidth**



### 3.2.5 Test Result of Occupied Bandwidth

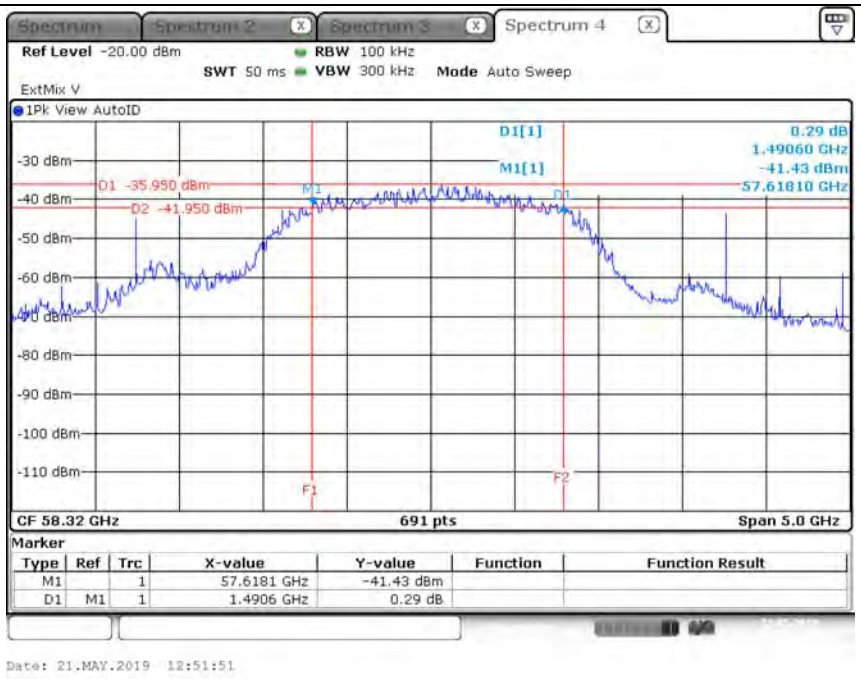
| | |
|---|---|
| **Test Conditions** | see ANSI C63.10, clause 5.11 |
| **Test Setup** | see ANSI C63.10, clause 6.9.2 |
| NOTE: If equipment having different transmit operating modes (see test report clause 1.1.2), the measurements are uninfluenced by different transmit operating modes, may not need to be repeated for all the operating modes. Similar, if the equipment supports different modulations and/or data rates, the measurements described in ANSI C63.10, clause 5.11 may not need to be repeated for all these modulations and data rates. Simple comparison of engineering test across all operating modes, modulations and data rates may need to be performed to define the worse case combination to be used for the conformance testing. Refer as ANSI C63.10, clause 15, observe and record with plotted graphs or photographs the worst-case (i.e., widest) occupied bandwidth produced by these different modulation sources. | |

| | | | |
|---|---|---|---|
| **Temp** | 22~24℃ | **Humidity** | 50~60% |
| **Test Engineer** | KJ Chang | | |
| **Test Results** | | | |
| **Test Freq. (GHz)** | **6 dBc Bandwidth (MHz)** | **99% Occupied Bandwidth (MHz)** | **Limit (MHz)** |
| 58.32 | 1490.6 | 2626.628 | N/A |
| 60.48 | 1526.8 | 2735.166 | N/A |
| 62.64 | 1512.3 | 3327.213 | N/A |

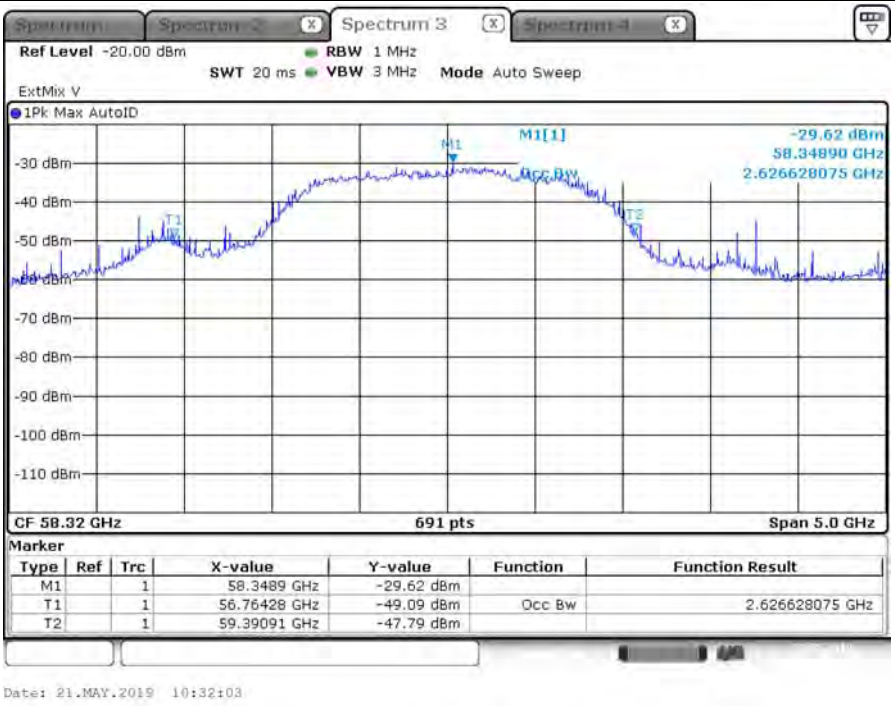
## 3.2.5.1 Bandwidth Plots

**Test Frequency: 58.32 GHz**

**6 dBc Bandwidth**

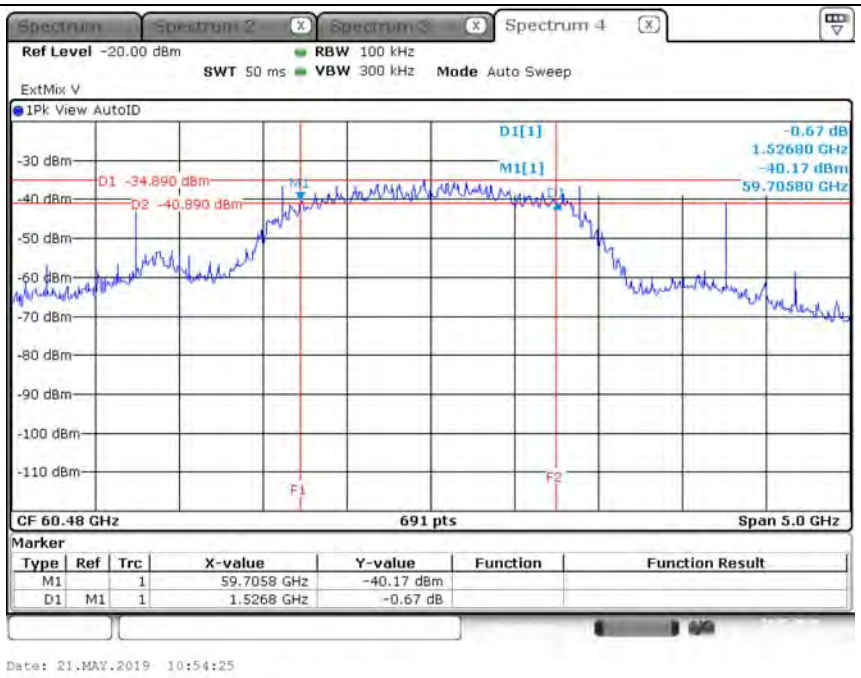



**Occupied Bandwidth&26 dBc Bandwidth**

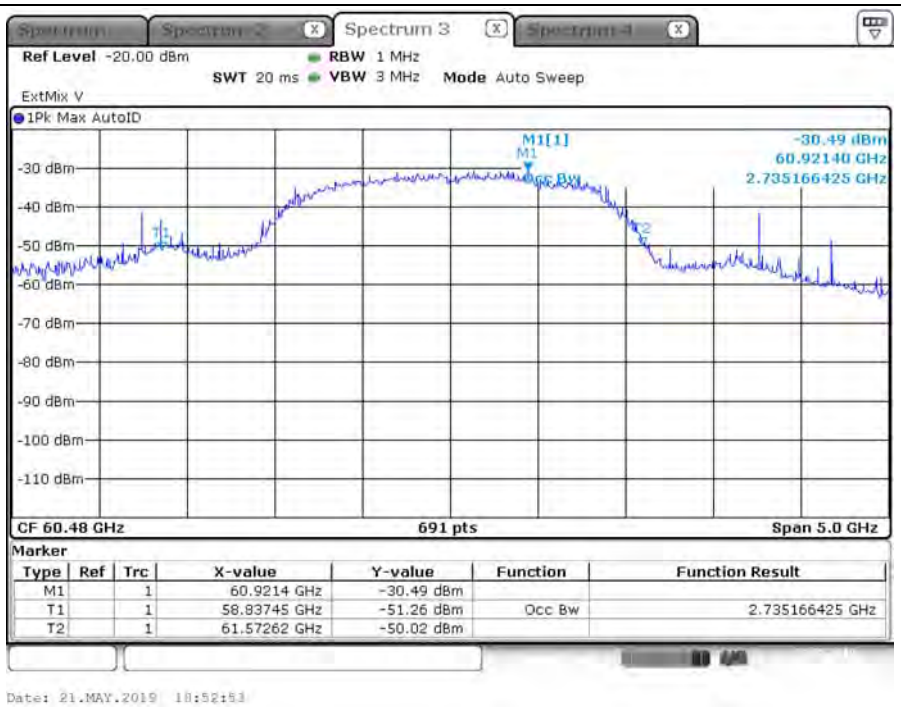


**Test Frequency: 60.48 GHz**

**6 dBc Bandwidth**

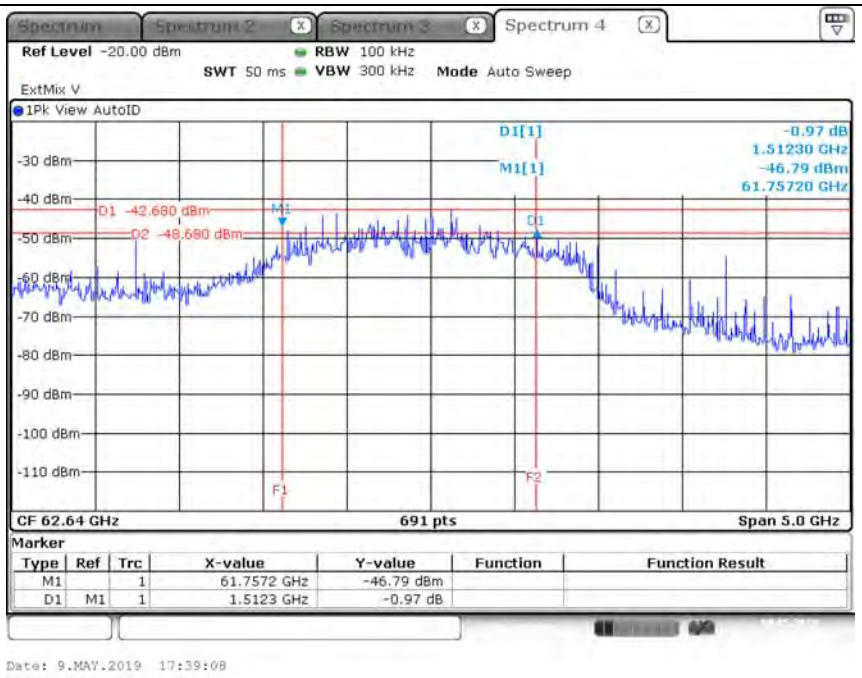



**Occupied Bandwidth&26 dBc Bandwidth**

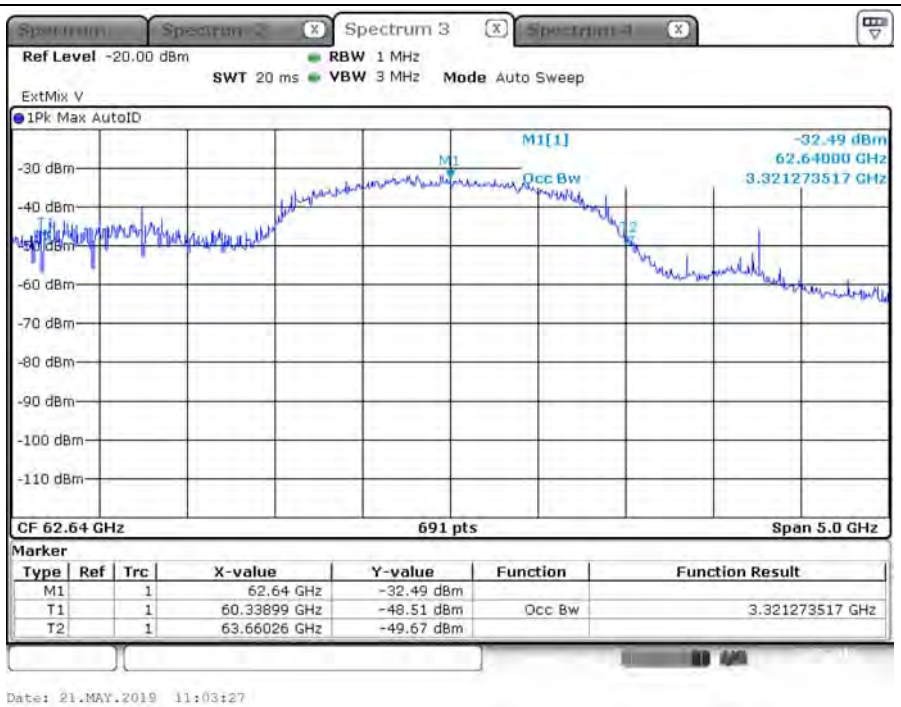


**Test Frequency: 62.64 GHz**

**6 dBc Bandwidth**




**Occupied Bandwidth&26 dBc Bandwidth**



# 3.3 EIRP Power

## 3.3.1 Limit of EIRP Power

| EIRP Power Limit | | |
|---|---|---|
| **Use Condition** | **EIRP Average Power** | **EIRP Peak Power** |
| Fixed field disturbance sensors at within the frequency band 61-61.5GHz | 40 dBm | 43 dBm |
| Fixed field disturbance sensors at outside of the band 61-61.5GHz | 10 dBm | 13 dBm |
| Except fixed field disturbance sensors at 61-61.5GHz | N/A | 10 dBm |
| Except outdoor fixed Point to Point | 40 dBm | 43 dBm |
| Outdoor fixed Point to Point | 82 dBm | 85 dBm |
| Note: For fixed point-to-point transmitters located outdoors, the average power of any emission shall not exceed 82 dBm, and shall be reduced by 2 dB for every dB that the antenna gain is less than 51 dBi. The peak power of any emission shall not exceed 85 dBm, and shall be reduced by 2 dB for every dB that the antenna gain is less than 51 dBi. | | |

NOTE: For the applicable limit, see FCC 15.255 (c)

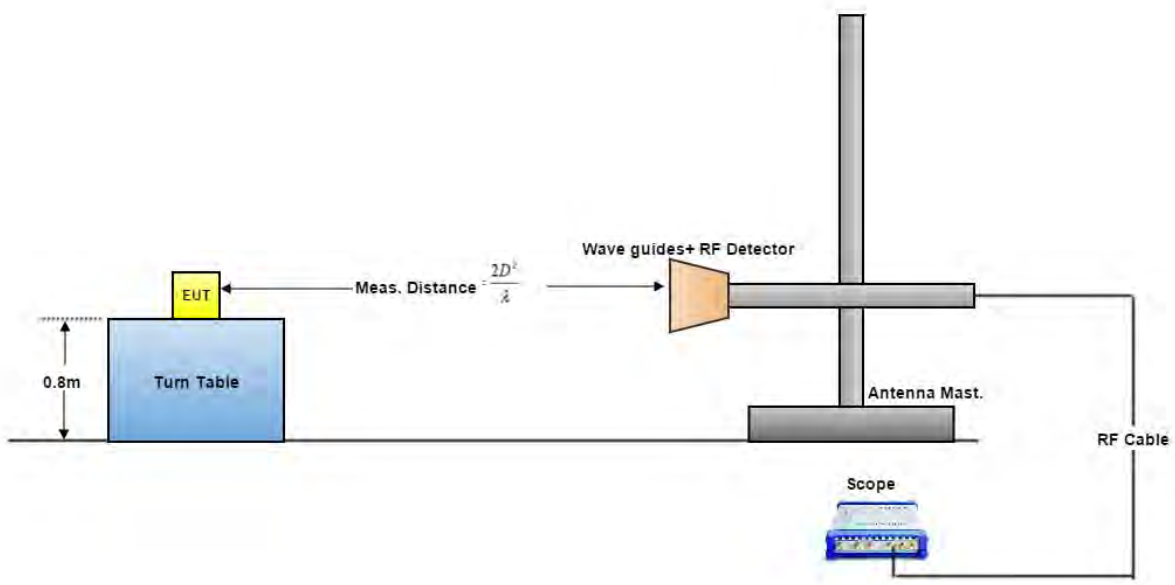
## 3.3.2 Measuring Instruments

Refer a measuring instruments list in this test report.

## 3.3.3 Test Procedures

Method of measurement: Refer as ANSI C63.10-2013 clause 9.3 & 9.5.

### 3.3.4 Test Setup

| EIPR Power |
|---|
|  |



### 3.3.5 Test Result of EIRP Power

| | |
|---|---|
| **Test Conditions** | see ANSI C63.10, clause 5.11 & clause 9 |
| **Test Setup** | see ANSI C63.10, clause 9.11 |
| NOTE: If the equipment supports different modulations and/or data rates, the measurements described in ANSI C63.10, clause 5.11 may not need to be repeated for all these modulations and data rates. Simple comparison of engineering test across all operating modes, modulations and data rates may need to be performed to define the worst case combination to be used for the conformance testing. | |

### 3.3.5.1 Test Result of EIRP Power

| Temp | 22~24℃ | | | | Humidity | | 50~60% | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Test Engineer | KJ Chang | | | | Test Distance | | 0.5 m | | | |
| Test Date | May 09, 2019 ~ May 21, 2019 | | | | | | | | | |
| Test Results | | | | | | | | | | |
| Test Freq. (GHz) | Rx Gain (dBi) | DSO (mV) | | Power Measured (dBm) | | $E_{Meas}$ (dBuV/m) | | EIRP (dBm) | | EIRP Limit (dBm) (note 1) | |
| | | Peak | AV | Peak | AV | Peak | AV | Peak | AV | Peak | AV |
| 58.32 | 23.6 | 578.14 | 174.54 | 1.61 | -7.39 | 150.58 | 141.58 | 39.76 | 30.76 | 43 | 40 |
| 60.48 | 23.6 | 596.16 | 186.92 | 1.98 | -6.93 | 151.27 | 142.36 | 40.45 | 31.54 | 43 | 40 |
| 62.64 | 23.6 | 508.12 | 144.75 | 0.60 | -8.92 | 150.19 | 140.67 | 39.37 | 29.85 | 43 | 40 |

The measured power level is converted to EIRP using the Friis equation:

For radiated emissions, calculate the field strength (E) in dBμV/meter.

$E = 126.8 – 20\log(\lambda) + P - G$

where:

E : is the field strength of the emission at the measurement distance, in dBμV/m

P : is the power measured at the output of the test antenna, in dBm

**λ**: is the wavelength of the emission under investigation [300/fMHz], in m

G : is the gain of the test antenna, in dBi For radiated emissions, calculate the EIRP (dBm). If the measurement was performed in the far field, calculate the EIRP.

EIRP = E-meas +20log(d-meas)-104.7

where:

EIRP : is the equivalent isotopically radiated power, in dBm

E-meas. : is the field strength of the emission at the measurement distance, in dBμV/m

d-meas. : is the measurement distance, in m

NOTE 1: For the applicable limit, see FCC 15.255 (c)

NOTE 2: The comparison method which replaces EUT with a signal generator is used to find the correct conversion factor between “DSO(mV)” & “Power Measured(dBm)”.

# 3.4 Peak Conducted Power

## 3.4.1 Limit of Peak Conducted Power

| Peak Conducted Power Limit | |
|---|---|
| **6dBc Bandwidth** | **Peak Conducted Power (note 1)** |
| > 100MHz | 500mW |
| ≤ 100MHz | 500mW x (BW/100) (see note 2) |
| NOTE 1: For the applicable limit, see FCC 15.255(c)<br>NOTE 2: BW= 6dB bandwidth (measured at RBW 100kHz) | |

## 3.4.2 Measuring Instruments

Refer a measuring instruments list in this test report.

## 3.4.3 Test Procedures

Method of measurement: Refer as ANSI C63.10-2013, clause 9.5

## 3.4.4 Test Result of Peak Conducted Power

| | |
|---|---|
| **Test Conditions** | see ANSI C63.10, clause 5.11 & clause 9 |
| **Test Setup** | see ANSI C63.10, clause 9.11 |
| NOTE: If the equipment supports different modulations and/or data rates, the measurements described in ANSI C63.10, clause 5.11 may not need to be repeated for all these modulations and data rates. Simple comparison of engineering test across all operating modes, modulations and data rates may need to be performed to define the worst case combination to be used for the conformance testing. | |

### 3.4.4.1 Peak Conducted Power

| Temp | 22~24℃ | Humidity | 50~60% |
|---|---|---|---|
| Test Engineer | KJ Chang | | |
| Test Date | May 09, 2019 ~ May 21, 2019 | | |

**Test Results**

| Test Freq. (GHz) | EIRP (dBm) | Max. Ant. Gain (dBi) | Peak Power (dBm) (note1) | Peak Power (mW) | 6dBc BW (MHz) (note2) | Peak Power Limit (mW) (note3) |
|---|---|---|---|---|---|---|
| 58.32 | 39.76 | 21.9 | 17.86 | 61.141 | 1490.60 | 500.00 |
| 60.48 | 40.45 | 21.9 | 18.55 | 71.601 | 1526.80 | 500.00 |
| 62.64 | 39.37 | 21.9 | 17.47 | 55.899 | 1512.30 | 500.00 |

NOTE 1: Because EUT used for the integral antenna without temporary RF connector provided. Therefore peak conducted power is equal to EIRP power subtract the antenna gain.

NOTE 2: For the 6dBc bandwidth, see test report clause 3.2.5.

NOTE 3: For the applicable limit, see FCC 15.255(c)

NOTE 4: For radiated emission measurements, calculate conducted transmitter output power P(cond)(dBm)

P(cond) = EIRP - G(dBi)

where:

G(dBi) is gain of EUT antenna.

# 3.5 Transmitter Spurious Emissions

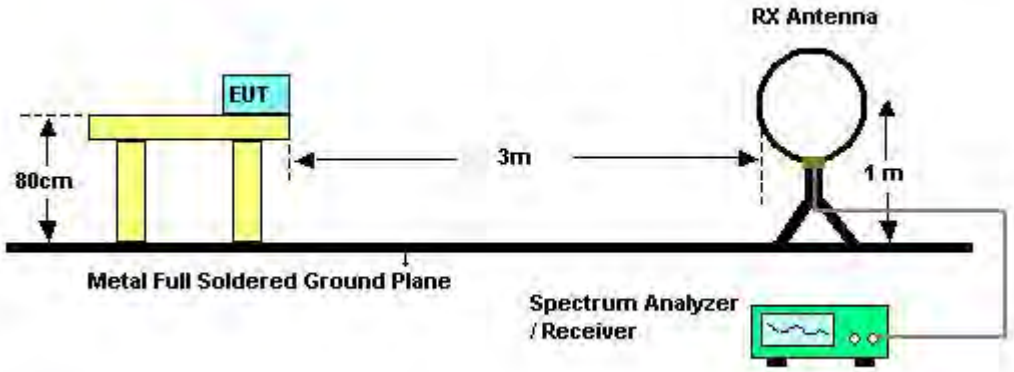
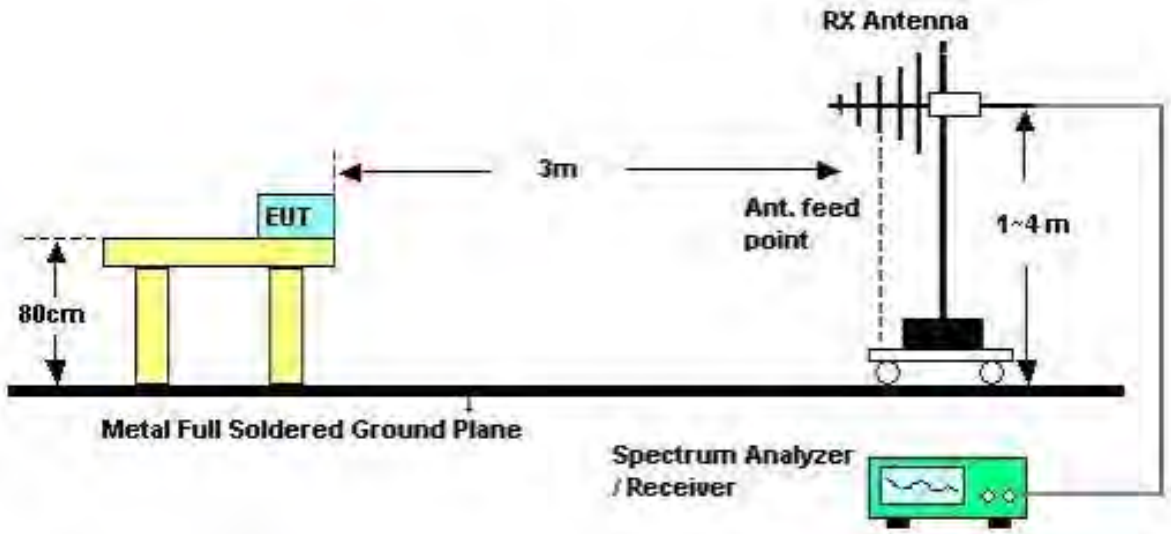
## 3.5.1 Limit of Transmitter Spurious Emissions

| Frequency Range | Limit |
|---|---|
| Radiated emissions below 40 GHz | FCC 15.209 |
| Radiated emissions above 40 GHz – 200GHz | 90 pW/cm$^2$ @ 3 m (Equivalent EIRP 102 μW, -9.91dBm) |
| NOTE 1: For the applicable limit, see FCC 15.255(d) | |
| NOTE 2: Spurious emissions shall not exceed the level of the fundamental emission. | |

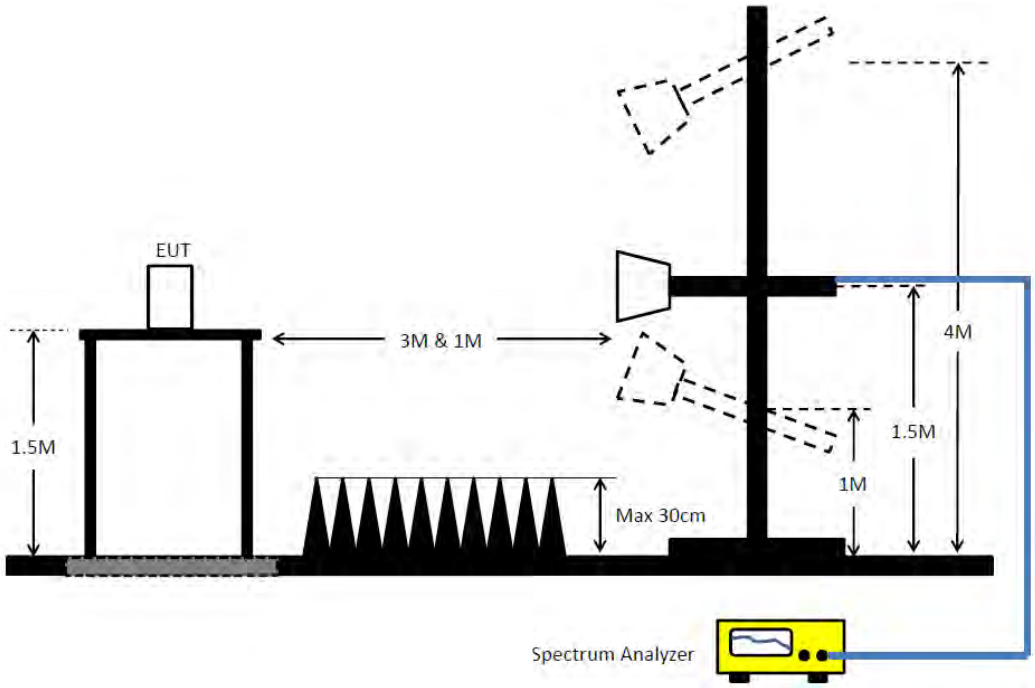
## 3.5.2 Test Procedures

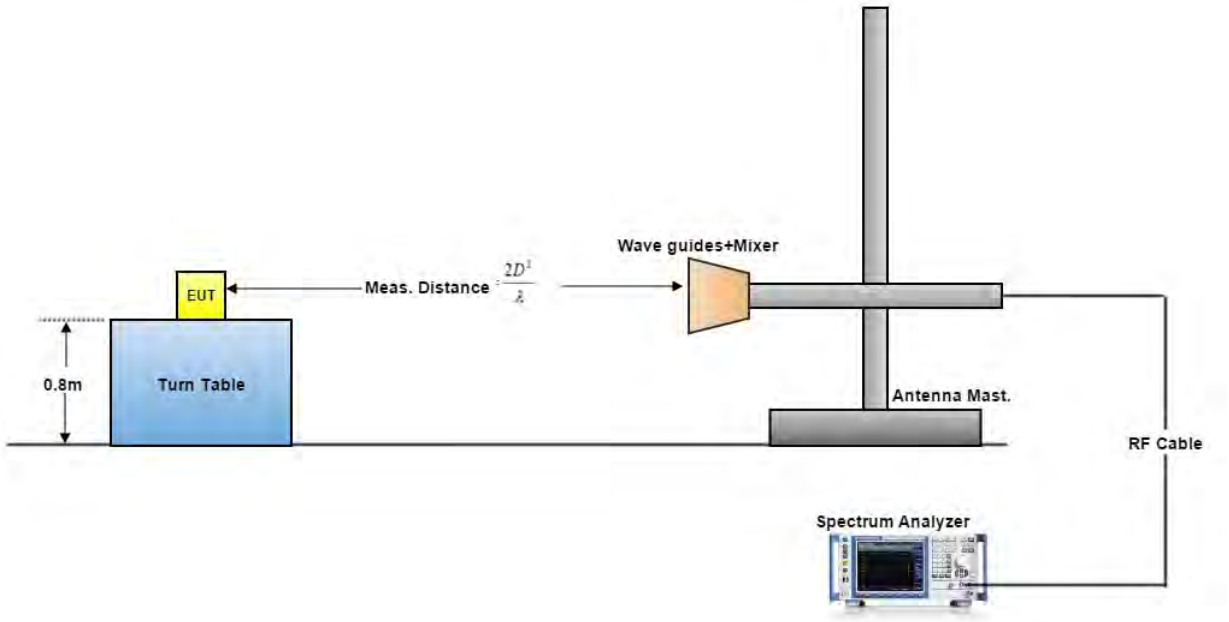
Method of measurement: Refer as ANSI C63.10-2013, clause 9.12

### 3.5.3 Test Setup

| Transmitter Spurious Emissions |
|---|
| 9kHz ~30MHz |
|  |
| 30MHz~1GHz |
|  |

**1GHz ~40GHz**



| Above 40GHz |
|---|
|  |



A measuring distance of at 3 m shall be used for measurements at frequencies up to 15 GHz. For frequencies above 15 GHz, any suitable measuring distance may be used. The measurement distance is chosen up to far field distance, depending on the test system noise floor for detecting spurious emission signals. Then above 15 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from spec. distance (3 m) to measurement distance. Distance extrapolation factor = 20 log (spec. distance [3 m] / measurement distance [N m]) (dB) .The measurements described in ANSI C63.10, clause 7.8.6. If the emission cannot be detected at 1 m, reduce the RBW to increase system sensitivity. Note the value. If the emission still cannot be detected, move the horn closer to the EUT, noting the distance at which a measurement is made.

### 3.5.4 Test Result of Transmitter Spurious Emissions

| | |
|---|---|
| **Test Conditions** | see ANSI C63.10, clause 5.11 & clause 9 |
| **Test Setup** | see ANSI C63.10, clause 9.12 、9.13 |
| NOTE: If equipment having different channel plan and nominal channel bandwidth modes (see test report clause 1.1.1), the measurements are uninfluenced by different channel plan and nominal channel bandwidth modes, may not need to be repeated for all modes. | |

### 3.5.4.1 Test Result of Transmitter Spurious Emissions (Below 30MHz)

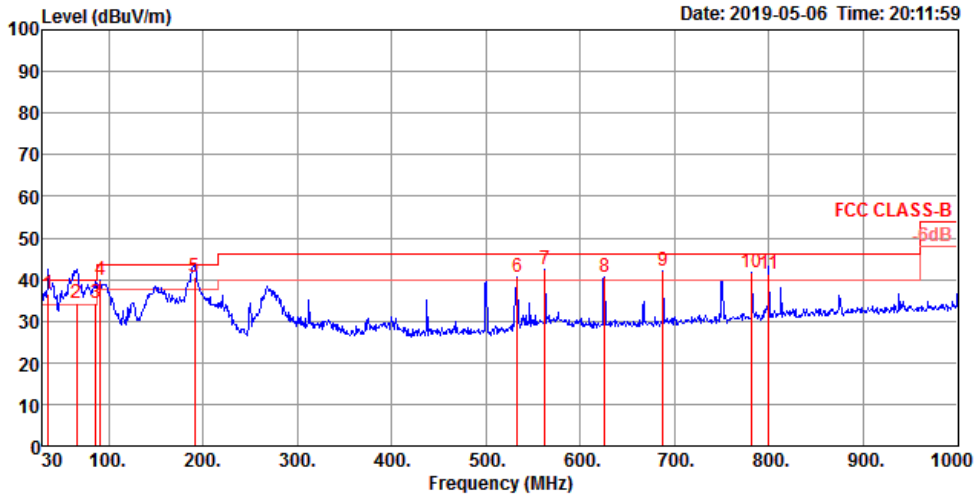
All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

The radiated emissions were investigated from 9 kHz or the lowest frequency generated within the device, up to the 10 harmonic or 40 GHz, whichever is appropriate.

### 3.5.4.2 Test Result of Transmitter Spurious Emissions

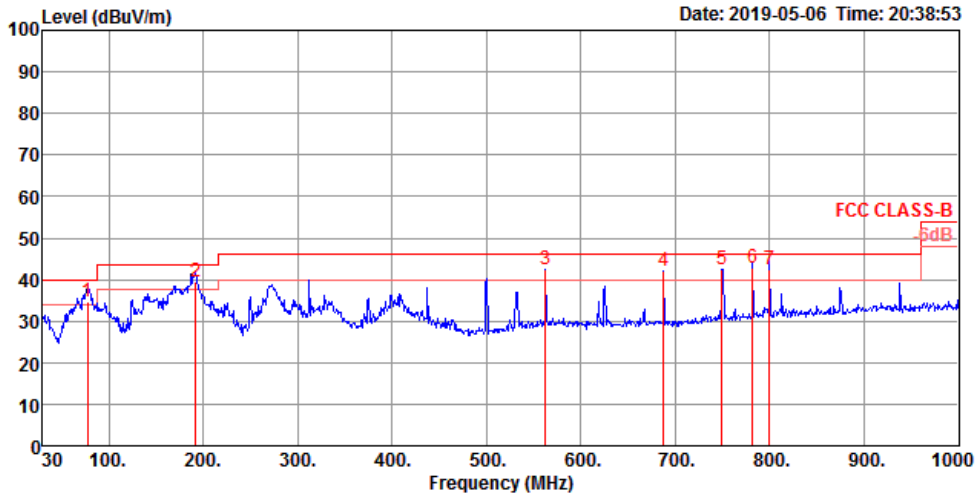
| | | | |
|---|---|---|---|
| **Temp** | 22~24°C | **Humidity** | 50~60% |
| **Test Engineer** | Mason Chen | **Test Distance** | 3 m |
| **Test Range** | 30 MHz – 1000 MHz | **Test Configuration** | Normal Link |

Vertical




| | Freq | Level | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark | Pol/Phase |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB/m | dB | cm | deg | | |
| 1 | 35.82 | 36.63 | 40.00 | -3.37 | 45.20 | 0.77 | 22.25 | 31.59 | 100 | 334 | QP | VERTICAL |
| 2 | 65.89 | 34.48 | 40.00 | -5.52 | 52.71 | 1.00 | 12.60 | 31.83 | 200 | 258 | QP | VERTICAL |
| 3 | 86.26 | 34.33 | 40.00 | -5.67 | 50.51 | 1.16 | 14.51 | 31.85 | 125 | 139 | QP | VERTICAL |
| 4 | 91.11 | 39.87 | 43.50 | -3.63 | 55.03 | 1.24 | 15.45 | 31.85 | 150 | 122 | Peak | VERTICAL |
| 5 | 191.02 | 40.41 | 43.50 | -3.09 | 55.02 | 1.73 | 15.59 | 31.93 | 100 | 358 | QP | VERTICAL |
| 6 | 533.43 | 40.77 | 46.00 | -5.23 | 45.70 | 3.05 | 24.34 | 32.32 | 100 | 207 | Peak | VERTICAL |
| 7 | 562.53 | 42.25 | 46.00 | -3.75 | 46.80 | 3.15 | 24.67 | 32.37 | 100 | 212 | Peak | VERTICAL |
| 8 | 625.58 | 40.73 | 46.00 | -5.27 | 44.68 | 3.28 | 25.21 | 32.44 | 100 | 193 | Peak | VERTICAL |
| 9 | 687.66 | 42.06 | 46.00 | -3.94 | 45.56 | 3.41 | 25.58 | 32.49 | 100 | 220 | Peak | VERTICAL |
| 10 | 781.75 | 41.81 | 46.00 | -4.19 | 44.10 | 3.69 | 26.53 | 32.51 | 100 | 133 | Peak | VERTICAL |
| 11 | 800.18 | 41.23 | 46.00 | -4.77 | 43.32 | 3.71 | 26.70 | 32.50 | 100 | 360 | QP | VERTICAL |

Horizontal




| | Freq | Level | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark | Pol/Phase |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB/m | dB | cm | deg | | |
| 1 | 77.53 | 34.84 | 40.00 | -5.16 | 52.43 | 1.14 | 13.13 | 31.86 | 300 | 185 | QP | HORIZONTAL |
| 2 | 191.99 | 39.65 | 43.50 | -3.85 | 54.21 | 1.73 | 15.64 | 31.93 | 200 | 192 | QP | HORIZONTAL |
| 3 | 562.53 | 42.45 | 46.00 | -3.55 | 47.00 | 3.15 | 24.67 | 32.37 | 150 | 241 | Peak | HORIZONTAL |
| 4 | 687.66 | 42.00 | 46.00 | -4.00 | 45.50 | 3.41 | 25.58 | 32.49 | 100 | 264 | Peak | HORIZONTAL |
| 5 | 749.74 | 42.47 | 46.00 | -3.53 | 45.16 | 3.64 | 26.20 | 32.53 | 150 | 222 | Peak | HORIZONTAL |
| 6 | 781.75 | 42.76 | 46.00 | -3.24 | 45.05 | 3.69 | 26.53 | 32.51 | 125 | 64 | QP | HORIZONTAL |
| 7 | 800.18 | 42.61 | 46.00 | -3.39 | 44.70 | 3.71 | 26.70 | 32.50 | 125 | 175 | QP | HORIZONTAL |

| Temp | 22~24°C | Humidity | 50~60% |
|---|---|---|---|
| Test Engineer | KJ Chang | Test Distance | 3 m |
| Test Range | 1 GHz – 18 GHz | Test Freq. (GHz) | 58.32 |
| Test Date | May 21, 2019 | | |

Vertical

| | Freq | Level | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark | Pol/Phase |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB/m | dB | cm | deg | | |
| 1 | 7289.97 | 49.32 | 74.00 | -24.68 | 41.70 | 6.46 | 36.47 | 35.31 | 132 | 40 | Peak | VERTICAL |
| 2 | 7290.03 | 42.76 | 54.00 | -11.24 | 35.14 | 6.46 | 36.47 | 35.31 | 132 | 40 | Average | VERTICAL |

Horizontal

| | Freq | Level | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark | Pol/Phase |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB/m | dB | cm | deg | | |
| 1 | 7289.94 | 48.77 | 74.00 | -25.23 | 41.15 | 6.46 | 36.47 | 35.31 | 117 | 288 | Peak | HORIZONTAL |
| 2 | 7290.03 | 42.32 | 54.00 | -11.68 | 34.70 | 6.46 | 36.47 | 35.31 | 117 | 288 | Average | HORIZONTAL |

| Temp | 22~24°C | Humidity | 50~60% |
|---|---|---|---|
| Test Engineer | KJ Chang | Test Distance | 1 m |
| Test Range | 18 GHz – 40 GHz | Test Freq. (GHz) | 58.32 |
| Test Date | May 21, 2019 | | |

Vertical

| | Freq | Level | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark | Pol/Phase |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB/m | dB | cm | deg | | |
| 1 | 19987.94 | 56.93 | 83.54 | -26.61 | 56.16 | 13.06 | 37.50 | 49.79 | 150 | 309 | Peak | VERTICAL |
| 2 | 19989.13 | 47.31 | 63.54 | -16.23 | 46.54 | 13.06 | 37.50 | 49.79 | 150 | 309 | Average | VERTICAL |

Horizontal

| | Freq | Level | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark | Pol/Phase |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB/m | dB | cm | deg | | |
| 1 | 19988.68 | 43.74 | 63.54 | -19.80 | 42.97 | 13.06 | 37.50 | 49.79 | 150 | 64 | Average | HORIZONTAL |
| 2 | 19992.24 | 54.78 | 83.54 | -28.76 | 54.01 | 13.06 | 37.50 | 49.79 | 150 | 64 | Peak | HORIZONTAL |

| Temp | 22~24°C | Humidity | 50~60% |
|---|---|---|---|
| Test Engineer | Mason Chen | Test Distance | 3 m |
| Test Range | 1 GHz – 18 GHz | Test Freq. (GHz) | 60.48 |
| Test Date | May 21, 2019 | | |

Vertical

| | Freq | Level | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark | Pol/Phase |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB/m | dB | cm | deg | | |
| 1 | 7559.98 | 52.50 | 74.00 | -21.50 | 44.89 | 6.51 | 36.33 | 35.23 | 100 | 40 | Peak | VERTICAL |
| 2 | 7560.02 | 46.31 | 54.00 | -7.69 | 38.70 | 6.51 | 36.33 | 35.23 | 100 | 40 | Average | VERTICAL |

Horizontal

| | Freq | Level | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark | Pol/Phase |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB/m | dB | cm | deg | | |
| 1 | 7559.97 | 53.12 | 74.00 | -20.88 | 45.51 | 6.51 | 36.33 | 35.23 | 100 | 295 | Peak | HORIZONTAL |
| 2 | 7560.02 | 48.34 | 54.00 | -5.66 | 40.73 | 6.51 | 36.33 | 35.23 | 100 | 295 | Average | HORIZONTAL |

| Temp | 22~24°C | Humidity | 50~60% |
|---|---|---|---|
| Test Engineer | Mason Chen | Test Distance | 1 m |
| Test Range | 18 GHz – 40 GHz | Test Freq. (GHz) | 60.48 |
| Test Date | May 21, 2019 | | |

Vertical

| | Freq | Level | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark | Pol/Phase |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB/m | dB | cm | deg | | |
| 1 | 19988.73 | 43.58 | 63.54 | -19.96 | 42.81 | 13.06 | 37.50 | 49.79 | 150 | 230 | Average | VERTICAL |
| 2 | 19988.84 | 55.77 | 83.54 | -27.77 | 55.00 | 13.06 | 37.50 | 49.79 | 150 | 230 | Peak | VERTICAL |

Horizontal

| | Freq | Level | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark | Pol/Phase |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB/m | dB | cm | deg | | |
| 1 | 19987.81 | 43.60 | 63.54 | -19.94 | 42.83 | 13.06 | 37.50 | 49.79 | 150 | 338 | Average | HORIZONTAL |
| 2 | 19987.97 | 55.91 | 83.54 | -27.63 | 55.14 | 13.06 | 37.50 | 49.79 | 150 | 338 | Peak | HORIZONTAL |

| Temp | 22~24°C | Humidity | 50~60% |
|---|---|---|---|
| Test Engineer | Mason Chen | Test Distance | 3 m |
| Test Range | 1 GHz – 18 GHz | Test Freq. (GHz) | 62.64 |
| Test Date | May 21, 2019 | | |

Vertical

| | Freq | Level | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark | Pol/Phase |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB/m | dB | cm | deg | | |
| 1 | 7829.91 | 52.04 | 74.00 | -21.96 | 43.76 | 7.07 | 36.45 | 35.24 | 100 | 336 | Peak | VERTICAL |
| 2 | 7830.02 | 43.41 | 54.00 | -10.59 | 35.13 | 7.07 | 36.45 | 35.24 | 100 | 336 | Average | VERTICAL |

Horizontal

| | Freq | Level | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark | Pol/Phase |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB/m | dB | cm | deg | | |
| 1 | 7829.99 | 51.96 | 74.00 | -22.04 | 43.68 | 7.07 | 36.45 | 35.24 | 237 | 325 | Peak | HORIZONTAL |
| 2 | 7830.02 | 45.26 | 54.00 | -8.74 | 36.98 | 7.07 | 36.45 | 35.24 | 237 | 325 | Average | HORIZONTAL |

| Temp | 22~24°C | Humidity | 50~60% |
|---|---|---|---|
| Test Engineer | Mason Chen | Test Distance | 1 m |
| Test Range | 18 GHz – 40 GHz | Test Freq. (GHz) | 62.64 |
| Test Date | May 21, 2019 | | |

Vertical

| | Freq | Level | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark | Pol/Phase |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB/m | dB | cm | deg | | |
| 1 | 19988.47 | 44.52 | 63.54 | -19.02 | 43.75 | 13.06 | 37.50 | 49.79 | 150 | 26 | Average | VERTICAL |
| 2 | 19989.81 | 55.75 | 83.54 | -27.79 | 54.98 | 13.06 | 37.50 | 49.79 | 150 | 26 | Peak | VERTICAL |

Horizontal

| | Freq | Level | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark | Pol/Phase |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB/m | dB | cm | deg | | |
| 1 | 19987.81 | 55.40 | 83.54 | -28.14 | 54.63 | 13.06 | 37.50 | 49.79 | 150 | 152 | Peak | HORIZONTAL |
| 2 | 19988.60 | 43.60 | 63.54 | -19.94 | 42.83 | 13.06 | 37.50 | 49.79 | 150 | 152 | Average | HORIZONTAL |

| Temp | 22~24°C | Humidity | 50~60% |
|---|---|---|---|
| Test Engineer | KJ Chang | Test Date | May 09, 2019 ~ May 21, 2019 |
| Test Range | 40GHz – 200GHz | | |

| Test Frequency (GHz) | Rx Antenna Gain (dBi) | Measurement Distance (m) | Read Worse Frequency (GHz) | Read Level (dBm) |
|---|---|---|---|---|
| 58.32 | 23.6 | 0.50 | 56.56 | -53.35 |
| **EIRP (dBm)** | **Specification Distance (m)** | **Power Density (pW/cm^2)** | **Limit (pW/cm^2)** | **Test Result** |
| -15.48 | 3 | 25.0419 | 90.00 | PASS |

| Test Frequency (GHz) | Rx Antenna Gain (dBi) | Measurement Distance (m) | Read Worse Frequency (GHz) | Read Level (dBm) |
|---|---|---|---|---|
| 60.48 | 23.6 | 0.50 | 55.84 | -60.92 |
| **EIRP (dBm)** | **Specification Distance (m)** | **Power Density (pW/cm^2)** | **Limit (pW/cm^2)** | **Test Result** |
| -23.16 | 3 | 4.2713 | 90.00 | PASS |

| Test Frequency (GHz) | Rx Antenna Gain (dBi) | Measurement Distance (m) | Read Worse Frequency (GHz) | Read Level (dBm) |
|---|---|---|---|---|
| 62.64 | 23.6 | 0.50 | 56.86 | -64.67 |
| **EIRP (dBm)** | **Specification Distance (m)** | **Power Density (pW/cm^2)** | **Limit (pW/cm^2)** | **Test Result** |
| -26.75 | 3 | 1.8676 | 90.00 | PASS |

Note:
EIRP = Prx – Grx + Free Space Path Loss = Prx – Grx + 20Log(4πd/ λ)2
Which
Prx = Read Level.
Grx = Rx Antenna Gain.
A distance factor is offset and the formula is 20LOG(D1/D2)
Which
D1 = Specification Distance
D2 = Measurement Distance

# 3.6 Frequency Stability

## 3.6.1 Limit of Frequency Stability

| Frequency Stability | Limit |
|---|---|
| Refer as FCC 15.255(f) and<br>ANSI C63.10-2013, clause 9.14 | within the frequency bands |
| Note: These measurements shall also be performed at normal and extreme test conditions. | |

## 3.6.2 Measuring Instruments

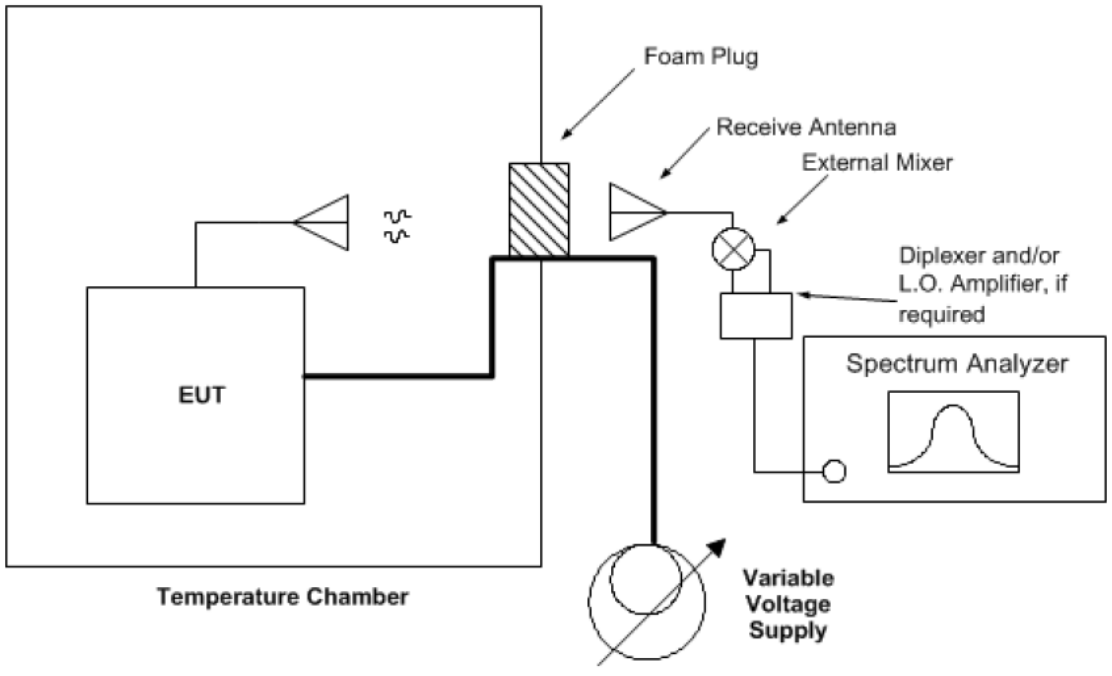
Refer a measuring instruments list in this test report.

## 3.6.3 Test Procedures

Method of measurement: Refer as ANSI C63.10-2013, clauses 9.14.

## 3.6.4 Test Setup

**Frequency Stability**



### 3.6.5 Test Result of Frequency Stability

| | |
|---|---|
| **Test Conditions** | see ANSI C63.10, clause 5.11 & clause 9 |
| **Test Setup** | see ANSI C63.10, clause 9.14 |
| NOTE: If equipment having different channel plan and nominal channel bandwidth modes (see test report clause 1.1.1), the measurements are uninfluenced by different channel plan and nominal channel bandwidth modes, may not need to be repeated for all modes. | |

### 3.6.5.1 Frequency Stability with Respect to Ambient Temperature

| **Frequency Stability with Respect to Ambient Temperature** | | | |
|---|---|---|---|
| **Temp** | 22~24°C | **Humidity** | 50~60% |
| **Test Engineer** | KJ Chang | **Test Date** | May 09, 2019 ~ May 21, 2019 |
| **Test Results** | | | |
| **Test Temperature (°C)** | **Measured Frequency (MHz)** | **Delta Frequency (kHz)** | **Limit (±kHz)** |
| 0 | 60480.546 | -31 | Within band |
| 10 | 60480.546 | -31 | Within band |
| 20 | 60480.577 | Reference | Within band |
| 30 | 60480.643 | 66 | Within band |
| 40 | 60480.684 | 107 | Within band |
| 50 | 60480.684 | 107 | Within band |
| NOTE: The manufacturer's specified temperature range of 0 to 50°C. | | | |

### 3.6.5.2 Frequency Stability When Varying Supply Voltage

| Frequency Stability When Varying Supply Voltage | | | |
|---|---|---|---|
| **Temp** | 22~24°C | **Humidity** | 50~60% |
| **Test Engineer** | KJ Chang | **Test Date** | May 09, 2019 ~ May 21, 2019 |
| **Test Results** | | | |
| **Test Voltage: (Vdc)** | **Measured Frequency (MHz)** | **Delta Frequency (kHz)** | **Limit (±kHz)** |
| 40.8 | 60480.699 | 122 | within band |
| 48 | 60480.577 | Reference | within band |
| 55.2 | 60480.532 | -45 | within band |

# 3.7 Operation Restriction and Group Installation

## 3.7.1 Limit of Operation Restriction and Group Installation

| Item | Limit |
|---|---|
| Operation Restriction | Operation is not permitted for the following products:<br>♦ Equipment used on aircraft or satellites. (Refer as FCC 15.255 (a))<br>♦ Field disturbance sensors, including vehicle radar systems, unless the field disturbance sensors are employed for fixed operation. (Refer as FCC 15.255 (a)) |
| Group Installation | Operation is not permitted for the following products:<br>♦ External phase-locking (Refer as FCC 15.255 (h)) |

## 3.7.2 Result of Operation Restriction

Manufacturer declares that EUT will not been used on aircraft or satellites. Then user manual will include a statement to caution EUT is not permitted for used on aircraft or satellites.

## 3.7.3 Result of Group Installation

The frequency, amplitude and phase of the transmit signal are set within the EUT. There are no external phase-locking inputs or any other means of combining two or more units together to realize a beam-forming array.

# 4 Test Equipment and Calibration Data

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Calibration Due Date | Remark |
|---|---|---|---|---|---|---|---|
| LISN | Schwarzbeck | NSLK 8127 | 8127650 | 9kHz ~ 30MHz | Nov. 21, 2018 | Nov. 20, 2019 | Conduction (CO02-CB) |
| LISN | Schwarzbeck | NSLK 8127 | 8127478 | 9kHz ~ 30MHz | Nov. 05, 2018 | Nov. 04, 2019 | Conduction (CO02-CB) |
| EMI Receiver | Agilent | N9038A | MY52260140 | 9kHz ~ 8.4GHz | Jan. 16, 2019 | Jan. 15, 2020 | Conduction (CO02-CB) |
| COND Cable | Woken | Cable | 2 | 0.15MHz ~ 30MHz | Nov. 06, 2018 | Nov. 05, 2019 | Conduction (CO02-CB) |
| Software | Audix | E3 | 6.120210n | - | N.C.R. | N.C.R. | Conduction (CO02-CB) |
| BILOG ANTENNA with 6dB Attenuator | TESEQ & EMCI | CBL6112D & N-6-06 | 37880 & AT-N0609 | 20MHz ~ 2GHz | Aug. 27, 2018 | Aug. 26, 2019 | Radiation (03CH01-CB) |
| Loop Antenna | Teseq | HLA 6120 | 24155 | 9kHz - 30 MHz | Mar. 29, 2019 | Mar. 28, 2020 | Radiation (03CH01-CB) |
| Horn Antenna | EMCO | 3115 | 00075790 | 750MHz ~ 18GHz | Nov. 13, 2018 | Nov. 12, 2019 | Radiation (03CH01-CB) |
| Horn Antenna | Schwarzbeck | BBHA 9170 | BBHA9170252 | 15GHz ~ 40GHz | Jun. 28, 2018 | Jun. 27, 2019 | Radiation (03CH01-CB) |
| Pre-Amplifier | EMCI | EMC330N | 980332 | 20MHz ~ 3GHz | May 01, 2019 | Apr. 30, 2020 | Radiation (03CH01-CB) |
| Pre-Amplifier | Agilent | 8449B | 3008A02310 | 1GHz ~ 26.5GHz | Jan. 08, 2019 | Jan. 07, 2020 | Radiation (03CH01-CB) |
| Pre-Amplifier | MITEQ | TTA1840-35-HG | 1864479 | 18GHz ~ 40GHz | Jul. 04, 2018 | Jul. 03, 2019 | Radiation (03CH01-CB) |
| Spectrum Analyzer | R&S | FSP40 | 100056 | 9kHz ~ 40GHz | Jan. 31, 2019 | Jan. 30, 2020 | Radiation (03CH01-CB) |
| EMI Test Receiver | R&S | ESCS | 100359 | 9kHz ~ 2.75GHz | Jul. 03, 2018 | Jul. 02, 2019 | Radiation (03CH01-CB) |
| RF Cable-low | Woken | Low Cable-16+17 | N/A | 30 MHz ~ 1 GHz | Oct. 08, 2018 | Oct. 07, 2019 | Radiation (03CH01-CB) |
| RF Cable-high | Woken | High Cable-16 | N/A | 1 GHz ~ 18 GHz | Oct. 08, 2018 | Oct. 07, 2019 | Radiation (03CH01-CB) |
| RF Cable-high | Woken | High Cable-16+17 | N/A | 1 GHz ~ 18 GHz | Oct. 08, 2018 | Oct. 07, 2019 | Radiation (03CH01-CB) |
| RF Cable-high | Woken | High Cable-40G#1 | N/A | 18GHz ~ 40 GHz | Jul. 27, 2018 | Jul. 26, 2019 | Radiation (03CH01-CB) |

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Calibration Due Date | Remark |
|---|---|---|---|---|---|---|---|
| RF Cable-high | Woken | High Cable-40G#2 | N/A | 18GHz ~ 40 GHz | Jul. 27, 2018 | Jul. 26, 2019 | Radiation (03CH01-CB) |
| Mixer | OML | M19HW/A | U91113-1 | 40 ~ 60 GHz | Oct. 12, 2017* | Oct. 11, 2019* | Radiation (03CH01-CB) |
| Mixer | OML | M15HW/A | V91113-1 | 50 ~ 75 GHz | Oct. 12, 2017* | Oct. 11, 2019* | Radiation (03CH01-CB) |
| Mixer | OML | M12HW/A | E91113-1 | 60 ~ 90 GHz | Oct. 12, 2017* | Oct. 11, 2019* | Radiation (03CH01-CB) |
| Mixer | OML | M08HW/A | F91113-1 | 90 ~ 140 GHz | Oct. 12, 2017* | Oct. 11, 2019* | Radiation (03CH01-CB) |
| Mixer | OML | M05HW/A | G91113-1 | 140 ~ 220 GHz | Oct. 12, 2017* | Oct. 11, 2019* | Radiation (03CH01-CB) |
| Standard Horn Antenna | Custom Microwave | M19RH | U91113-A | 40 ~ 60 GHz | N.C.R. | N.C.R. | Radiation (03CH01-CB) |
| Standard Horn Antenna | Custom Microwave | M15RH | V91113-A | 50 ~ 75 GHz | N.C.R. | N.C.R. | Radiation (03CH01-CB) |
| Standard Horn Antenna | Custom Microwave | M12RH | E91113-A | 60 ~ 90 GHz | N.C.R. | N.C.R. | Radiation (03CH01-CB) |
| Standard Horn Antenna | Custom Microwave | M08RH | F91113-A | 90 ~ 140 GHz | N.C.R. | N.C.R. | Radiation (03CH01-CB) |
| Standard Horn Antenna | Custom Microwave | M05RH | G91113-A | 140 ~ 220 GHz | N.C.R. | N.C.R. | Radiation (03CH01-CB) |
| Detector | Millitech | DET-15-RPFW0 | #A18185(074) | 50 ~ 75 GHz | Jan. 29, 2018* | Jan. 29, 2020* | Radiation (03CH01-CB) |
| Pico Scope | Pico | Pico Scope 6402C | CX372/002 | N/A | Jul. 13, 2018 | Jul. 12, 2019 | Radiation (03CH01-CB) |
| Temp. and Humidity Chamber | Ten Billion | TTH-C2SP | TBN-1010206 | -20~150 degree | Mar. 04. 2019 | Mar. 03. 2020 | Conducted (TH01-CB) |

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

"*" Calibration Interval of instruments listed above is two years.

N.C.R. means Non-Calibration required.

# 5 Measurement Uncertainty

| Test Items | Uncertainty | Remark |
|---|---|---|
| Conducted Emission (150kHz ~ 30MHz) | 2.0 dB | Confidence levels of 95% |
| Radiated Emission (30MHz ~ 1,000MHz) | 3.6 dB | Confidence levels of 95% |
| Radiated Emission (1GHz ~ 18GHz) | 3.7 dB | Confidence levels of 95% |
| Radiated Emission (18GHz ~ 40GHz) | 3.5 dB | Confidence levels of 95% |
| Radiated Emission (40GHz ~ 220GHz) | 4.7 dB | Confidence levels of 95% |
| Temperature | 0.7°C | Confidence levels of 95% |