# FCC RADIO TEST REPORT

| | | |
|---|---|---|
| FCC ID | : | SWX-UBB |
| Equipment | : | UniFi Building Bridge |
| Brand Name | : | UBIQUITI |
| Model Name | : | UBB |
| Applicant | : | Ubiquiti Inc.<br>685 Third Avenue, New York, New York 10017 USA |
| Manufacturer | : | Ubiquiti Inc.<br>685 Third Avenue, New York, New York 10017 USA |
| Standard | : | 47 CFR FCC Part 15.255 |

The product was received on Nov. 20, 2019, and testing was started from Nov. 22, 2019 and completed on Dec. 04, 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 and Millimeter Wave Test Procedures, FCC KDB 414788 D01 v01r01 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 variant 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.)*

# Table of Contents

# History of this test report

| Report No. | Version | Description | Issued Date |
|---|---|---|---|
| FR951623-09 | 01 | Initial issue of report | Dec. 19, 2019 |
| FR951623-09 | 02 | Revising the Table for Class II Change | Dec. 23, 2019 |
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# Summary of Test Result

| Report Clause | Ref Std. Clause | Test Items | Result (PASS/FAIL) | Remark |
|---|---|---|---|---|
| 3.1 | FCC 15.255(e) | Occupied Bandwidth | PASS | - |
| 3.2 | FCC 15.255(c) | EIRP Power | PASS | - |
| 3.3 | FCC 15.255(c) | Peak Conducted Power | PASS | - |
| 3.4 | FCC 15.255(d) | Transmitter Spurious Emissions | PASS | - |
| 3.5 | FCC 15.255(f) | Frequency Stability | PASS | - |
| 3.6 | 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: Cliff Chang**

**Report Producer: Vicky Huang**

# 1 General Description

## 1.1 Information

### 1.1.1 RF General Information

| RF General Information | |
|---|---|
| **Frequency Range** | 57-71 GHz |
| **The Channel Plan(s)** | Bandwidth: 2.16 GHz<br>Channel 1: 58.32 GHz<br>Channel 2: 60.48 GHz<br>Channel 3: 62.64 GHz<br>Channel 4: 64.80 GHz<br>Channel 4.5: 65.88 GHz<br><br>Bandwidth: 1.08 GHz<br>Channel 1: 58.32 GHz<br>Channel 2: 59.40 GHz<br>Channel 3: 60.48 GHz<br>Channel 4: 61.56 GHz<br>Channel 5: 62.64 GHz<br>Channel 6: 63.72 GHz<br>Channel 7: 64.80 GHz<br>Channel 8: 65.88 GHz |
| **Modulation** | $\pi$/2-BPSK, π/2-QPSK, π/2-16QAM |

### 1.1.2 Antenna Information

| Ant. | Brand | Model Name | Antenna Type | Connector | Gain (dBi) |
|---|---|---|---|---|---|
| 1 | N/A | PRA710-B2 | Integral | N/A | 17.2 |

Note: The above information was declared by manufacturer.

### 1.1.3 Modulation

**IEEE 802.11ad Modulation Scheme**

| MCS Index | Modulation | Code rate | Data rate (Mbit/s) |
|---|---|---|---|
| 0 | π/-2BPSK | 1/2 | 27.5 |
| 1 | π/-2BPSK | 1/2 | 385 |
| 2 | π/-2BPSK | 1/2 | 770 |
| 3 | π/-2BPSK | 5/8 | 962.5 |
| 4 | π/-2BPSK | 3/4 | 1155 |
| 5 | π/-2BPSK | 13/16 | 1251.25 |
| 6 | π/-2QPSK | 1/2 | 1540 |
| 7 | π/-2QPSK | 5/8 | 1925 |
| 8 | π/-2QPSK | 3/4 | 2310 |
| 9 | π/-2QPSK | 13/16 | 2502.5 |
| 10 | π/2-16QAM | 1/2 | 3080 |
| 11 | π/2-16QAM | 5/8 | 3850 |
| 12 | π/2-16QAM | 3/4 | 4620 |
| 12.1 | π/2-16QAM | 13/16 | 5005 |
| Can the transmitter operate un-modulated: | ☒ Yes | ☐ No | |

### 1.1.4 Operating Conditions

| Operating Conditions | | | | |
|---|---|---|---|---|
| ☒ -40 °C to +70 °C | | | | |
| ☐ 0 °C to +40 °C | | | | |
| ☐ Other: | | | | |
| EUT Power Type | From PoE | | | |
| Supply Voltage | ☐ AC | State AC voltage | | V |
| Supply Voltage | ☒ DC | State DC voltage | 48 | V |

### 1.1.5 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 |

### 1.1.6 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.

### 1.1.7 Duty Cycle

| Duty Cycle | | Duty Cycle Factor |
|---|---|---|
| The transmitter is intended for | 100 % | 10 |

### 1.1.8 Table for Class II Change

This product is an extension of original one reported under Sporton project number: FR951623-06

Below is the table for the change of the product with respect to the original one.

| Modifications | Performance Checking |
|---|---|
| Adding Channel 4.5 (65.88 GHz) for bandwidth 2.16GHz.<br>(Please refer to section 1.1.1 for detail channel list.) | 1. Occupied Bandwidth<br>2. EIRP Power<br>3. Peak Conducted Power<br>4. Transmitter Spurious Emissions<br>5. Frequency Stability |

## 1.2 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”

## 1.3 Testing Location

| Testing Location | | | |
|---|---|---|---|
| ☐ | HWA YA | ADD : | No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) |
| | | 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. |
| | | TEL : | 886-3-656-9065 FAX : 886-3-656-9085 |

| Test Condition | Test Site No. | Test Engineer | Test Environment | Test Date |
|---|---|---|---|---|
| Radiated | 03CH06-CB | Stim Sung | 24.5~25.1°C / 51~58% | Nov. 22, 2019~Dec. 04, 2019 |
| RF Conducted | TH03-CB | Lucas Huang | 24.5~25.1°C / 51~58% | Nov. 22, 2019 |

Test site Designation No. TW0006 with FCC.

Test site registered number IC 4086D with Industry Canada.

# 2 Test Configuration of Equipment under Test

## 2.1 Test Channel Frequencies

| Test Channel Frequencies Configuration | |
|---|---|
| **Channel 4.5 (GHz)** | 65.88 |

## 2.2 Conformance Tests and Related Test Frequencies

| Test Item | Test Frequencies (GHz) |
|---|---|
| Occupied Bandwidth | 65.88 |
| EIRP Power | 65.88 |
| Peak Conducted Power | 65.88 |
| Transmitter Spurious Emissions (below 1 GHz) | 65.88 |
| Transmitter Spurious Emissions (1 GHz-40 GHz) | 65.88 |
| Transmitter Spurious Emissions (above 40 GHz) | 65.88 |
| Frequency Stability | 65.88 |

The following test modes were performed for all tests:

**For Transmitter Spurious Emissions (below 1 GHz) test:**

The EUT was performed at Y axis and Z axis position for Transmitter Spurious Emissions (above 1 GHz) test, and the worst case was found at Y axis. So the measurement will follow this same test configuration.

**For Transmitter Spurious Emissions (above 1 GHz) test:**

The EUT was performed at Y axis and Z axis position, and the worst case was found at Y axis. So the measurement will follow this same test configuration.

## 2.3 EUT Operation during Test

During the test, “Telnet (v6.1.7600)” under WIN 7 was executed the test program to control the EUT continuously transmit RF signal.

## 2.4 Accessories

| Accessories | | | |
|---|---|---|---|
| **Equipment Name** | **Brand Name** | **Model Name** | **Rating** |
| PoE | UBIQUITI | GP-V480-032G | INPUT: 100-240V ~ 50/60MHz, Max 0.5A<br>OUTPUT: 48V, 0.32A |

## 2.5 Support Equipment

| Support Equipment | | | | |
|---|---|---|---|---|
| **No.** | **Equipment** | **Brand Name** | **Model Name** | **FCC ID** |
| A | NB | DELL | E4300 | N/A |

## 2.6 Far Field Boundary Calculations

The far-field boundary is given as:

far field = (2 * L^2) /**λ**

where:

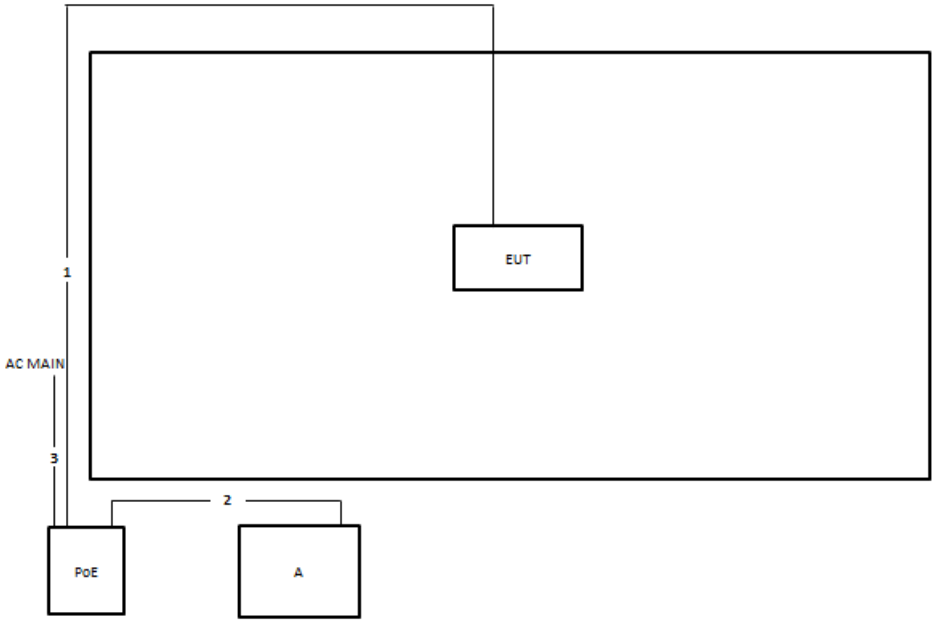
L = Largest Antenna Dimension, including the reflector, in meters

**λ**= wavelength in meters

| Far Field (m) | | | | |
|---|---|---|---|---|
| **Frequency (GHz)** | **L (m)** | **Lambda (m)** | **d(Far Field) (m)** | **d(Far Field) (cm)** |
| 65.88 | 0.02 | 0.0045537 | 0.176 | 17.57 |

## 2.7 Test Setup Diagram

**Test Setup Diagram - Transmitter Spurious Emissions**




| Item | Connection | Shielded | Length |
|---|---|---|---|
| 1 | RJ-45 cable | No | 10m |
| 2 | RJ-45 cable | No | 1.5m |
| 3 | Power cable | No | 1.8m |

# 3 Transmitter Test Result

## 3.1 Occupied Bandwidth

### 3.1.1 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.

### 3.1.2 Measuring Instruments

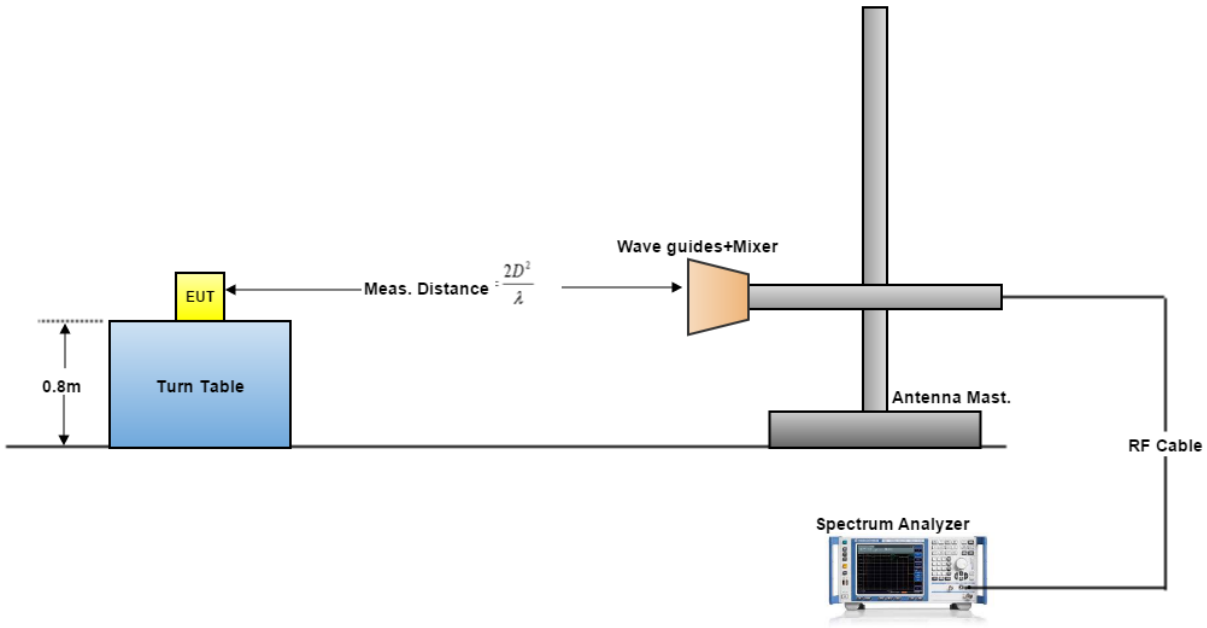
Refer a measuring instruments list in this test report.

### 3.1.3 Test Procedures

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

### 3.1.4 Test Setup

**Occupied Channel Bandwidth**



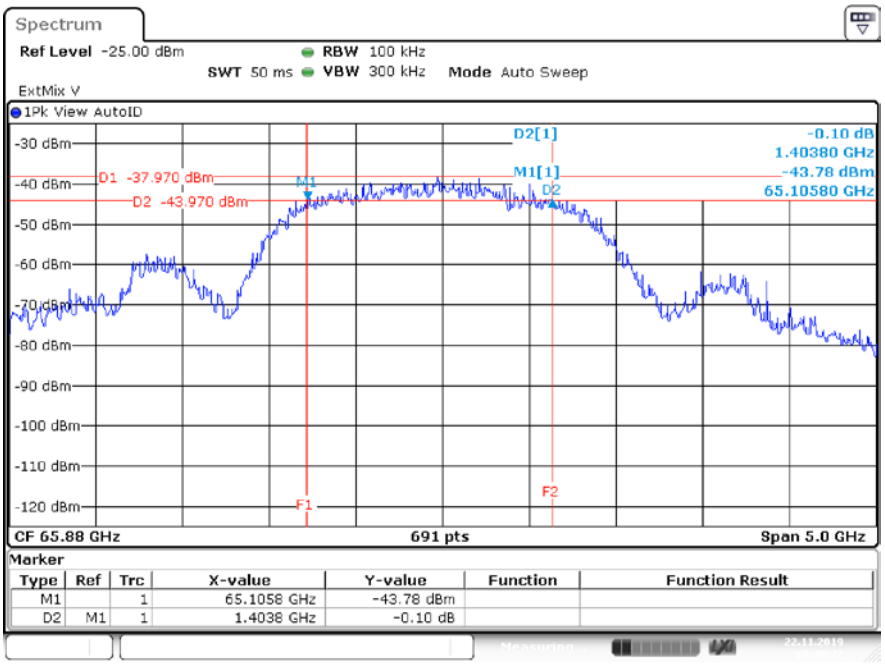
### 3.1.5 Test Result of Occupied Bandwidth

| | |
|---|---|
| **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. | |

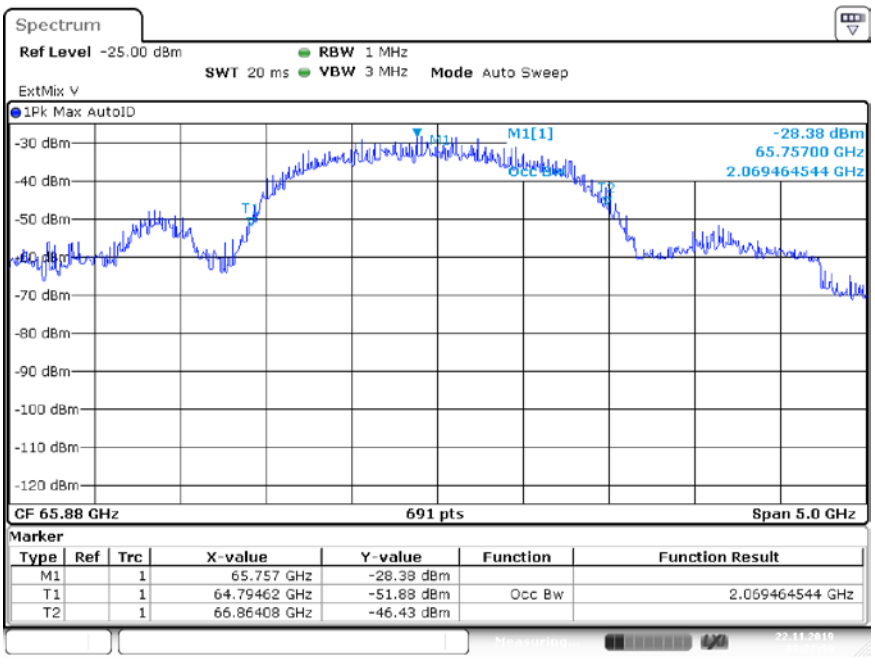
| **Test Results** | | | |
|---|---|---|---|
| **Test Freq. (GHz)** | **6 dBc Bandwidth (MHz)** | **99% Occupied Bandwidth (MHz)** | **Limit (MHz)** |
| 65.88 | 1403.8000 | 2069.4645 | N/A |

## 3.1.5.1 Bandwidth Plots

| Test Frequency: 65.88 GHz |
|---|
| **6 dBc Bandwidth** |




| Occupied Bandwidth&26 dBc Bandwidth |
|---|



## 3.2 EIRP Power

### 3.2.1 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)

### 3.2.2 Measuring Instruments

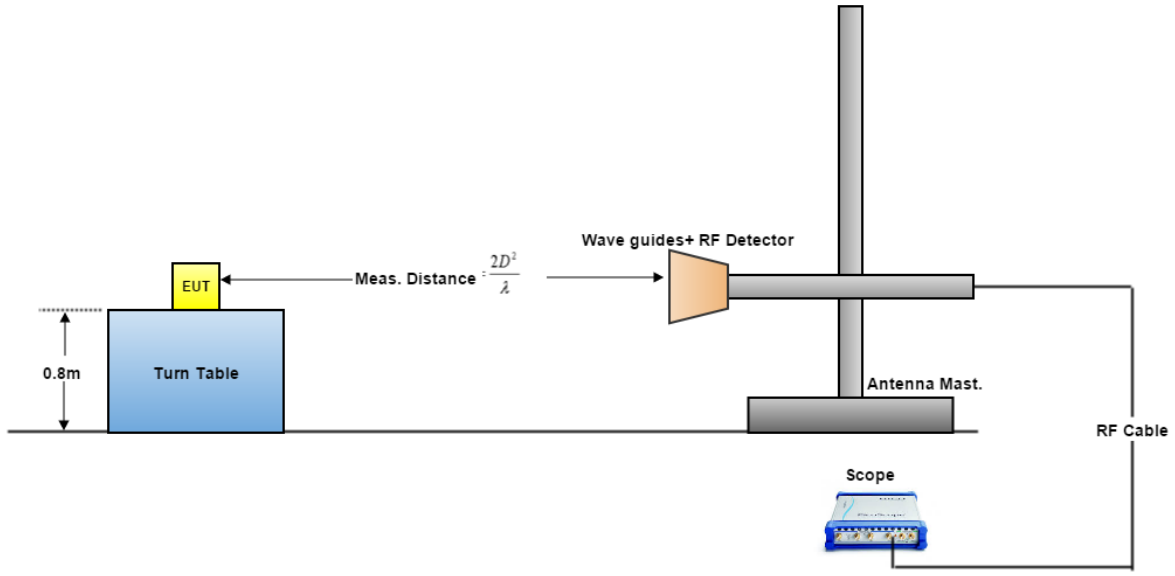
Refer a measuring instruments list in this test report.

### 3.2.3 Test Procedures

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

### 3.2.4 Test Setup

**EIPR Power**




### 3.2.5 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.

### 3.2.5.1 Test Result of EIRP Power

| Test Distance | | 0.5 m | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 |
| 65.88 | 23.6 | 344.31 | 56.70 | -6.99 | -16.73 | 143.04 | 133.30 | 32.22 | 22.58 | 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)”.

# 3.3 Peak Conducted Power

## 3.3.1 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) | |

## 3.3.2 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 9.5

## 3.3.4 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. | |

### 3.3.4.1 Peak Conducted Power

| 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)** |
| 65.88 | 32.22 | 17.2 | 15.02 | 31.784 | 1403.80 | 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 3.1.5.

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.

# 3.4 Transmitter Spurious Emissions

## 3.4.1 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. | |

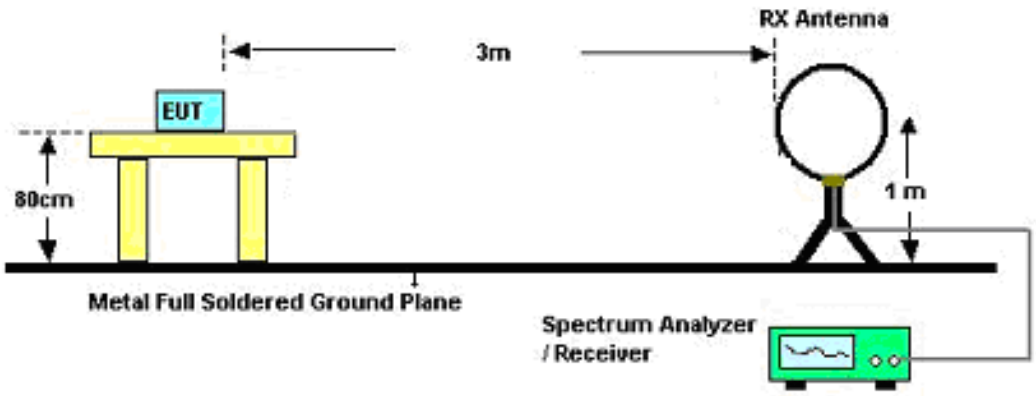
## 3.4.2 Test Procedures

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

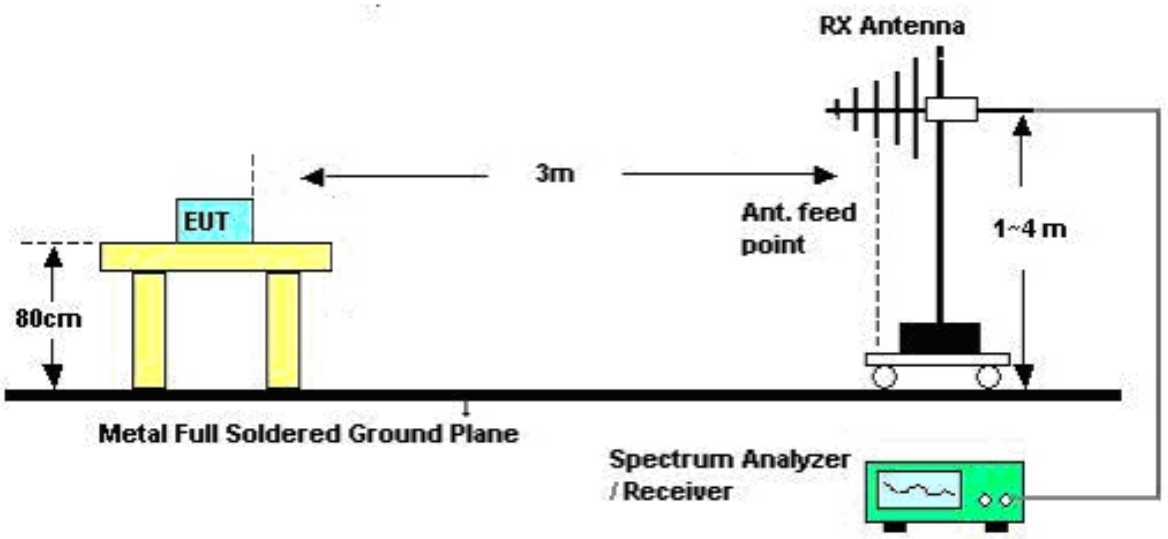
### 3.4.3 Test Setup

**Transmitter Spurious Emissions**

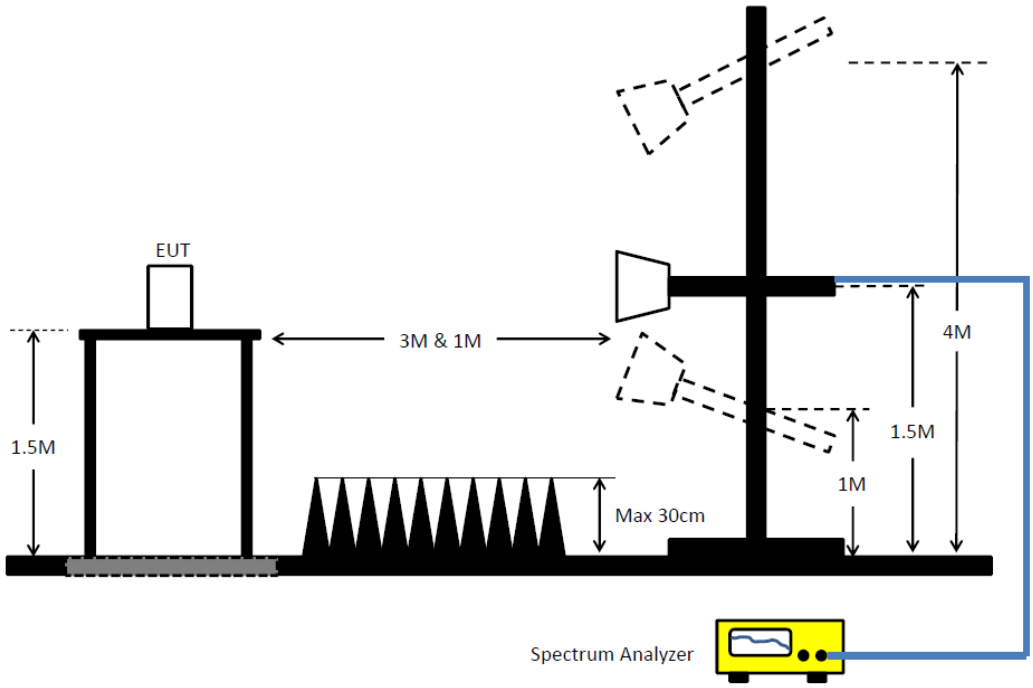
**9kHz ~30MHz**

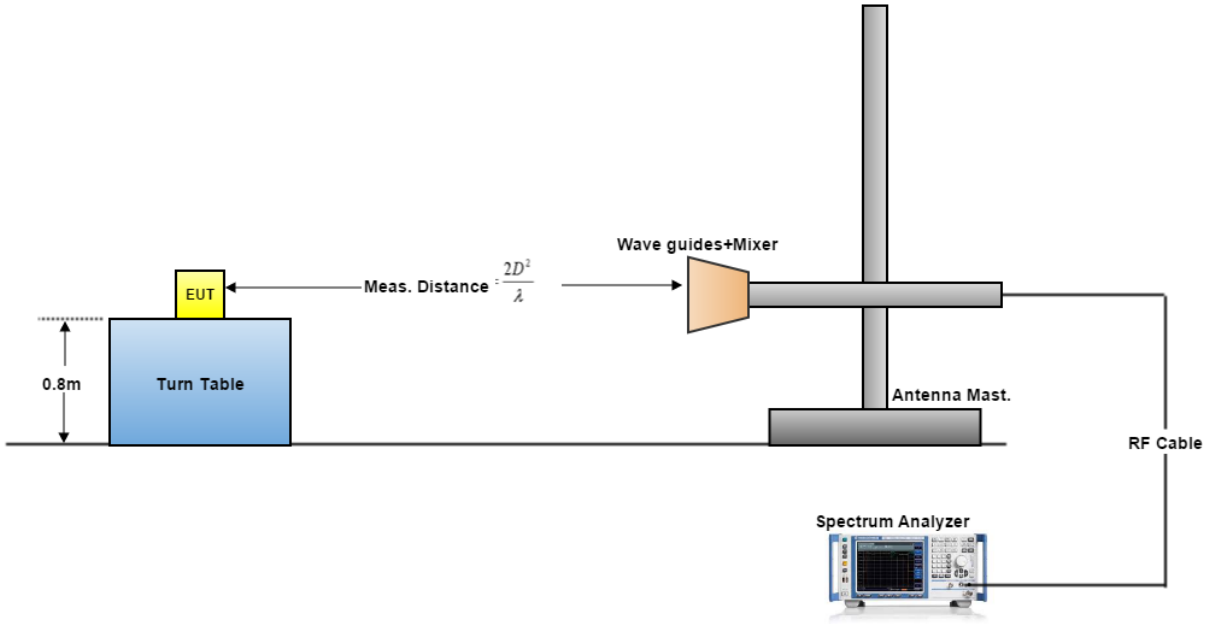



**30MHz~1GHz**



**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.

### 3.4.4 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. | |

### 3.4.5 Measurement Results Calculation

The measured Level is calculated using:

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

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

There is a comparison data of both open-field test site and alternative test site - semi-Anechoic chamber according to KDB414788 Radiated Test Site, and the result came out very similar.

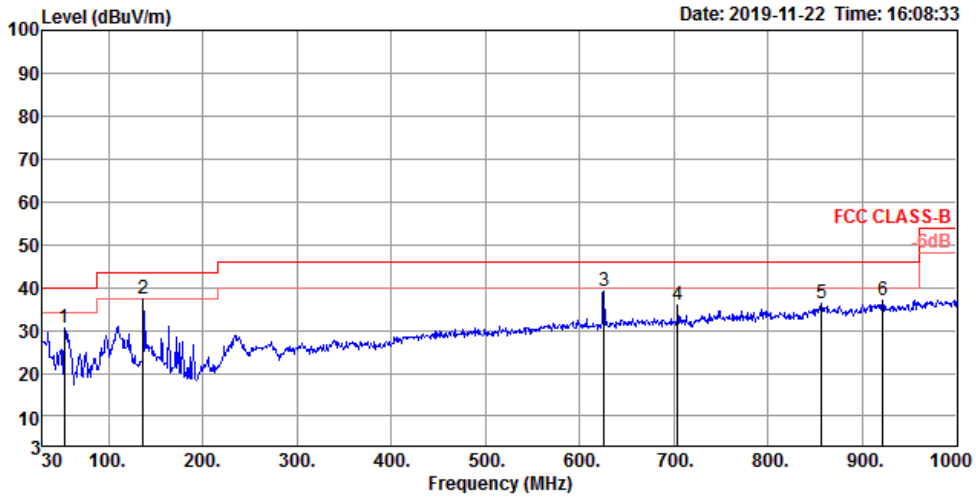
All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

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.

### 3.4.5.2 Test Result of Transmitter Spurious Emissions

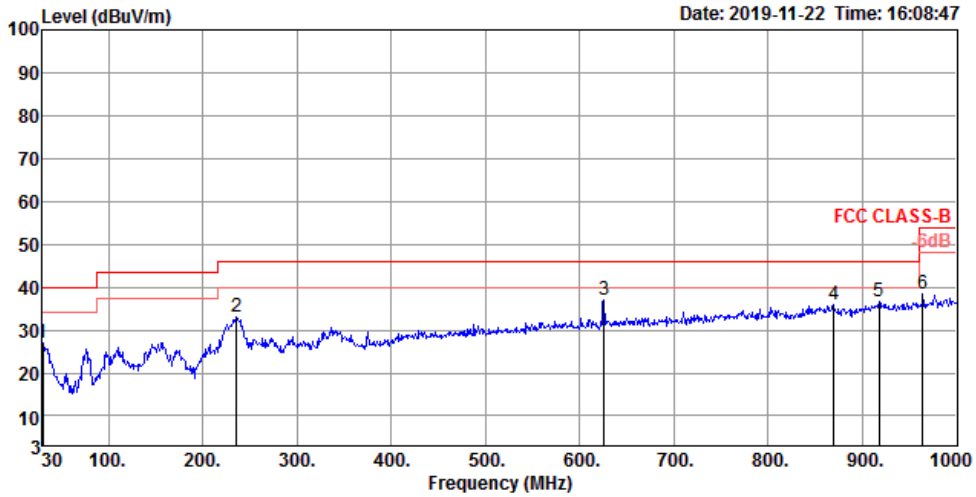
| Test Range | 30 MHz – 1000 MHz | Test Distance | 3 m |
|---|---|---|---|
| Test Configuration | CTX | | |

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 | 53.28 | 30.52 | 40.00 | -9.48 | 48.83 | 1.36 | 13.00 | 32.67 | 150 | 360 | Peak | VERTICAL |
| 2 | 136.70 | 37.20 | 43.50 | -6.30 | 50.10 | 2.20 | 17.34 | 32.44 | 100 | 80 | Peak | VERTICAL |
| 3 | 625.58 | 39.25 | 46.00 | -6.75 | 42.12 | 4.96 | 24.55 | 32.38 | 100 | 183 | Peak | VERTICAL |
| 4 | 704.15 | 35.96 | 46.00 | -10.04 | 38.31 | 5.29 | 24.74 | 32.38 | 200 | 262 | Peak | VERTICAL |
| 5 | 856.44 | 36.39 | 46.00 | -9.61 | 36.20 | 5.87 | 26.04 | 31.72 | 125 | 111 | Peak | VERTICAL |
| 6 | 921.43 | 36.98 | 46.00 | -9.02 | 36.15 | 6.12 | 26.30 | 31.59 | 150 | 62 | Peak | VERTICAL |

Horizontal

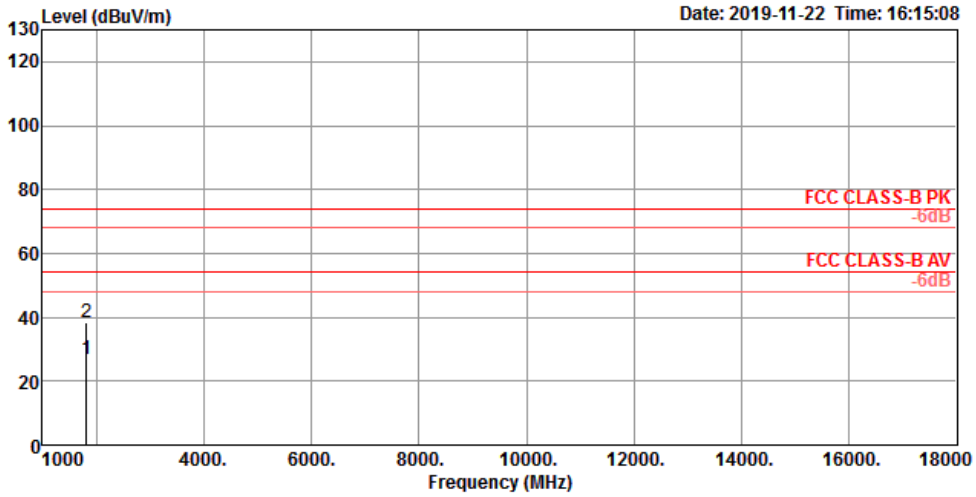



| | Freq | Level | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark | Pol/Phase |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB/m | dB | cm | deg | | |
| 1 | 30.00 | 27.11 | 40.00 | -12.89 | 34.22 | 1.01 | 24.23 | 32.35 | 150 | 358 | Peak | HORIZONTAL |
| 2 | 235.64 | 33.03 | 46.00 | -12.97 | 45.85 | 2.91 | 16.64 | 32.37 | 150 | 103 | Peak | HORIZONTAL |
| 3 | 625.58 | 37.17 | 46.00 | -8.83 | 40.04 | 4.96 | 24.55 | 32.38 | 125 | 144 | Peak | HORIZONTAL |
| 4 | 870.02 | 35.97 | 46.00 | -10.03 | 35.68 | 5.91 | 26.11 | 31.73 | 200 | 93 | Peak | HORIZONTAL |
| 5 | 917.55 | 36.66 | 46.00 | -9.34 | 35.90 | 6.10 | 26.29 | 31.63 | 200 | 132 | Peak | HORIZONTAL |
| 6 | 964.11 | 38.38 | 54.00 | -15.62 | 36.66 | 6.32 | 26.61 | 31.21 | 150 | 250 | Peak | HORIZONTAL |

Note: Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

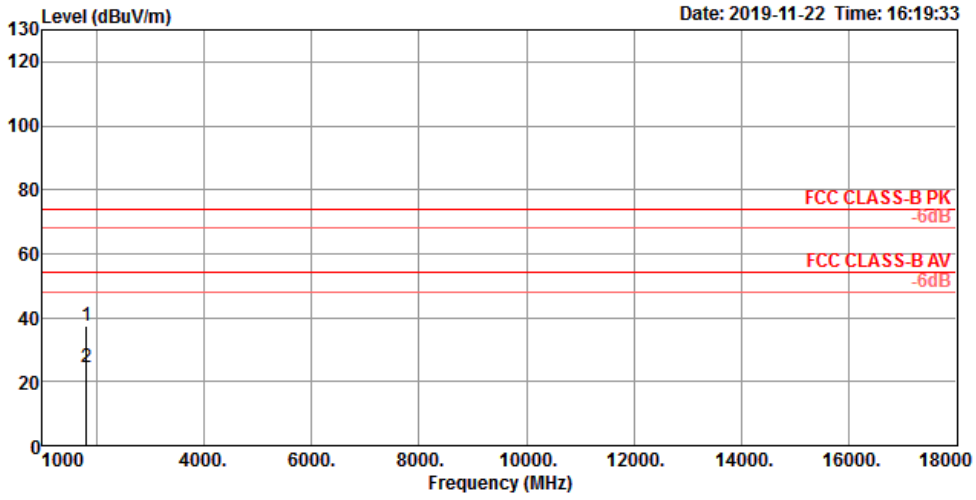
| Test Range | 1 GHz – 18 GHz | Test Distance | 3 m |
|---|---|---|---|

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 | 1812.28 | 26.90 | 54.00 | -27.10 | 32.50 | 2.94 | 25.23 | 33.77 | 100 | 129 | Average | VERTICAL |
| 2 | 1812.76 | 38.50 | 74.00 | -35.50 | 44.10 | 2.94 | 25.23 | 33.77 | 100 | 129 | Peak | VERTICAL |

Horizontal

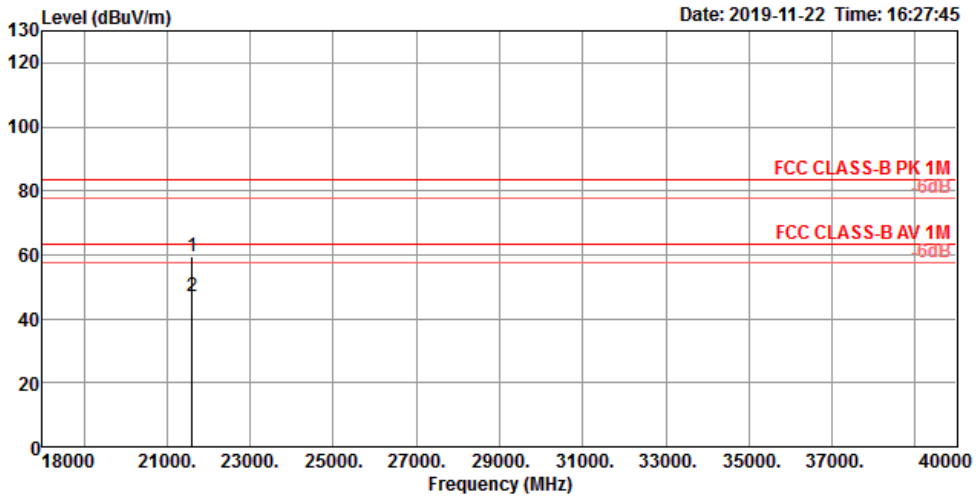



| | Freq | Level | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark | Pol/Phase |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB/m | dB | cm | deg | | |
| 1 | 1811.96 | 37.41 | 74.00 | -36.59 | 43.01 | 2.94 | 25.23 | 33.77 | 100 | 155 | Peak | HORIZONTAL |
| 2 | 1812.21 | 24.31 | 54.00 | -29.69 | 29.91 | 2.94 | 25.23 | 33.77 | 100 | 155 | Average | HORIZONTAL |

Note: Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

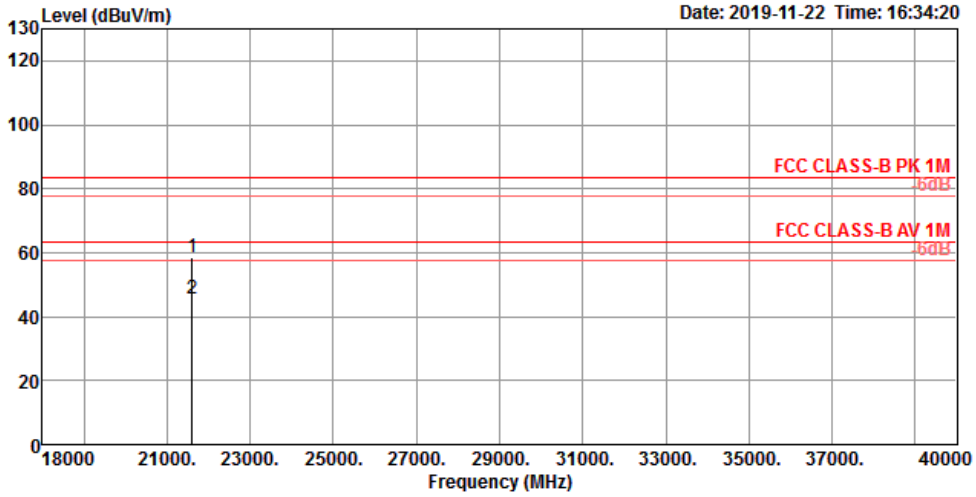
| Test Range | 18 GHz – 40 GHz | Test Distance | 1 m |
|---|---|---|---|

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 | 21596.94 | 59.46 | 83.54 | -24.08 | 56.32 | 15.15 | 37.64 | 49.65 | 150 | 65 | Peak | VERTICAL |
| 2 | 21597.30 | 47.02 | 63.54 | -16.52 | 43.88 | 15.15 | 37.64 | 49.65 | 150 | 65 | 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 | 21591.69 | 58.60 | 83.54 | -24.94 | 55.46 | 15.15 | 37.64 | 49.65 | 150 | 130 | Peak | HORIZONTAL |
| 2 | 21599.46 | 45.57 | 63.54 | -17.97 | 42.43 | 15.15 | 37.64 | 49.65 | 150 | 130 | Average | HORIZONTAL |

Note: Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

| Test Range | 40GHz – 200GHz |
|---|---|

| Test Frequency (GHz) | Rx Antenna Gain (dBi) | Measurement Distance (m) | Read Worse Frequency (GHz) | Read Level (dBm) |
|---|---|---|---|---|
| 65.88 | 23.6 | 0.50 | 71.66 | -60.61 |
| **EIRP (dBm)** | **Specification Distance (m)** | **Power Density (pW/cm^2)** | **Limit (pW/cm^2)** | **Test Result** |
| -20.68 | 3 | 7.5553 | 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

# 3.5 Frequency Stability

## 3.5.1 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. | |

## 3.5.2 Measuring Instruments

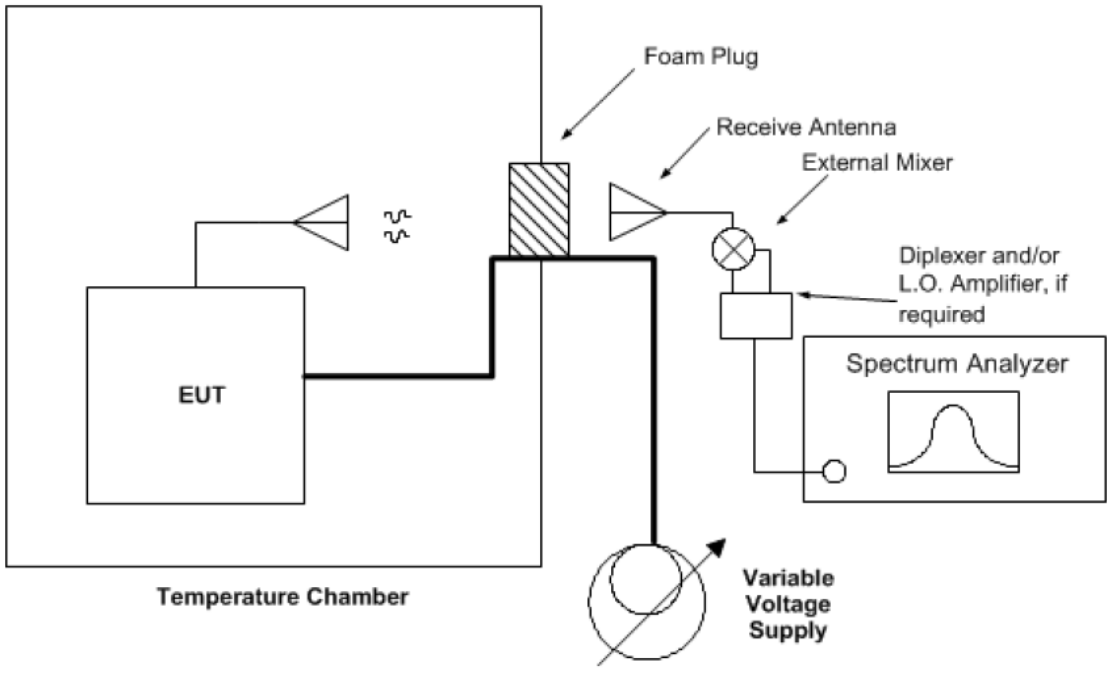
Refer a measuring instruments list in this test report.

## 3.5.3 Test Procedures

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

## 3.5.4 Test Setup

**Frequency Stability**



### 3.5.5 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. | |

### 3.5.5.1 Frequency Stability with Respect to Ambient Temperature

| Frequency Stability with Respect to Ambient Temperature | | | |
|---|---|---|---|
| **Test Results** | | | |
| **Test Temp.erature (°C)** | **Measured Frequency (MHz)** | **Delta Frequency (kHz)** | **Limit (±kHz)** |
| -40 | 65880.5544 | 13.30 | within band |
| -30 | 65880.5741 | 33.00 | within band |
| -20 | 65880.7574 | 216.30 | within band |
| -10 | 65880.7561 | 215.00 | within band |
| 0 | 65880.7855 | 244.40 | within band |
| 10 | 65880.5761 | 35.00 | within band |
| 20 | 65880.5411 | Reference | within band |
| 30 | 65880.5477 | 6.60 | within band |
| 40 | 65880.6974 | 156.30 | within band |
| 50 | 65880.5874 | 46.30 | within band |
| 60 | 65880.58922 | 48.12 | within band |
| 70 | 65880.5151 | -26.00 | within band |
| NOTE: The manufacturer's specified temperature range of -40 to 70°C. | | | |

### 3.5.5.2 Frequency Stability When Varying Supply Voltage

| Frequency Stability When Varying Supply Voltage | | | |
|---|---|---|---|
| Test Results | | | |
| Test Voltage: (Vdc) | Measured Frequency (MHz) | Delta Frequency (kHz) | Limit (±kHz) |
| 40.8 | 65880.5744 | 3.00 | within band |
| 48 | 65880.5714 | Reference | within band |
| 55.2 | 65880.5544 | -17.00 | within band |
| NOTE: For the applicable limit, see FCC 15.255(f). | | | |

## 3.6 Operation Restriction and Group Installation

### 3.6.1 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)) |

### 3.6.2 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. EUT is a wireless video area network (WVAN) for the connection of consumer electronic (CE) audio and video devices.

### 3.6.3 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 |
|---|---|---|---|---|---|---|---|
| Bilog Antenna with 6 dB attenuator | TESEQ & EMCI | CBL6112D & N-6-06 | 37878 & AT-N0606 | 20MHz ~ 2GHz | Aug. 03, 2019 | Aug. 02, 2020 | Radiation (03CH06-CB) |
| Horn Antenna | SCHWARZBECK | BBHA9120D | 9120D-1292 | 1GHz~18GHz | Jul. 17, 2019 | Jul. 16, 2020 | Radiation (03CH06-CB) |
| Horn Antenna | SCHWARZBECK | BBHA 9170 | BBHA9170507 | 15GHz ~ 40GHz | Jun. 12, 2019 | Jun. 11, 2020 | Radiation (03CH06-CB) |
| Pre-Amplifier | Agilent | 310N | 187290 | 0.1MHz ~ 1GHz | May 07, 2019 | May 06, 2020 | Radiation (03CH06-CB) |
| Pre-Amplifier | Agilent | 83017A | MY53270064 | 0.5GHz ~ 26.5GHz | May 08, 2019 | May 07, 2020 | Radiation (03CH06-CB) |
| Pre-Amplifier | MITEQ | TTA1840-35-HG | 1864479 | 18GHz ~ 40GHz | Jul. 03, 2019 | Jul. 02, 2020 | Radiation (03CH06-CB) |
| Spectrum analyzer | R&S | FSP40 | 100080 | 9kHz~40GHz | Oct. 21, 2019 | Oct. 20, 2020 | Radiation (03CH06-CB) |
| EMI Test Receiver | R&S | ESCS | 826547/017 | 9kHz ~ 2.75GHz | May 15, 2019 | May 14, 2020 | Radiation (03CH06-CB) |
| RF Cable-low | HUBER+SUHNER | RG402 | Low Cable-05+24 | 30MHz~1GHz | Oct. 07, 2019 | Oct. 06, 2020 | Radiation (03CH06-CB) |
| RF Cable-high | HUBER+SUHNER | RG402 | High Cable-05 | 1GHz~18GHz | Oct. 07, 2019 | Oct. 06, 2020 | Radiation (03CH06-CB) |
| RF Cable-high | HUBER+SUHNER | RG402 | High Cable-05+24 | 1GHz~18GHz | Oct. 07, 2019 | Oct. 06, 2020 | Radiation (03CH06-CB) |
| RF Cable-high | Woken | RG402 | High Cable-40G#1 | 18GHz ~ 40 GHz | Jul. 24, 2019 | Jul. 23, 2020 | Radiation (03CH06-CB) |
| RF Cable-high | Woken | RG402 | High Cable-40G#2 | 18GHz ~ 40 GHz | Jul. 24, 2019 | Jul. 23, 2020 | Radiation (03CH06-CB) |
| Loop Antenna | Teseq | HLA 6120 | 24155 | 9kHz - 30 MHz | Mar. 29, 2019 | Mar. 28, 2020 | Radiation (03CH06-CB) |
| Mixer | OML | M19HWA | U91113-1 | 40 ~ 60 GHz | Apr. 04, 2019 | Apr. 03, 2020 | Radiation (03CH06-CB) |
| Mixer | OML | M15HWA | V91113-1 | 50 ~ 75 GHz | Apr. 04, 2019 | Apr. 03, 2020 | Radiation (03CH06-CB) |
| Mixer | OML | M12HWA | E91113-1 | 60 ~ 90 GHz | Apr. 04, 2019 | Apr. 03, 2020 | Radiation (03CH06-CB) |
| Mixer | OML | M08HWA | F91113-1 | 90 ~ 140 GHz | Apr. 04, 2019 | Apr. 03, 2020 | Radiation (03CH06-CB) |

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Calibration Due Date | Remark |
|---|---|---|---|---|---|---|---|
| Mixer | OML | M05HW/A | G91113-1 | 140 ~ 220 GHz | Apr. 04, 2019 | Apr. 03, 2020 | Radiation (03CH06-CB) |
| Detector | Millitech | DET-15-RPFW0 | #A18185(074) | 50 ~ 75 GHz | Jan. 29, 2018* | Jan. 29, 2020 | Radiation (03CH06-CB) |
| Pico Scope | Pico | Pico Scope 6402C | CX372/002 | N/A | Jul. 07, 2019 | Jul. 06, 2020 | Radiation (03CH06-CB) |
| Standard Horn Antenna | Custom Microwave | M19RH | U91113-A | 40 ~ 60 GHz | N.C.R | N.C.R | Radiation (03CH06-CB) |
| Standard Horn Antenna | Custom Microwave | M15RH | V91113-A | 50 ~ 75 GHz | N.C.R | N.C.R | Radiation (03CH06-CB) |
| Standard Horn Antenna | Custom Microwave | M12RH | E91113-A | 60 ~ 90 GHz | N.C.R | N.C.R | Radiation (03CH06-CB) |
| Standard Horn Antenna | Custom Microwave | M08RH | F91113-A | 90 ~ 140 GHz | N.C.R | N.C.R | Radiation (03CH06-CB) |
| Standard Horn Antenna | Custom Microwave | M05RH | G91113-A | 140 ~ 220 GHz | N.C.R | N.C.R | Radiation (03CH06-CB) |
| Temp. and Humidity Chamber | Gaint Force | GTH-408-40-CP-AR | MAA1410-011 | -40~100 degree | Sep. 12, 2019 | Sep. 11, 2020 | Conducted (TH03-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 |
|---|---|---|
| Radiated Emission (30MHz ~ 1,000MHz) | 4.3 dB | Confidence levels of 95% |
| Radiated Emission (1GHz ~ 18GHz) | 4.3 dB | Confidence levels of 95% |
| Radiated Emission (18GHz ~ 40GHz) | 5.1 dB | Confidence levels of 95% |
| Radiated Emission (40GHz ~ 60GHz) | 4.6 dB | Confidence levels of 95% |
| Radiated Emission (60GHz ~ 90GHz) | 5.1 dB | Confidence levels of 95% |
| Radiated Emission (90GHz ~ 200GHz) | 5.6 dB | Confidence levels of 95% |
| Temperature | 1°C | Confidence levels of 95% |