# TEST REPORT

| | |
|---|---|
| Product Name: | sensert base unit-cellular |
| FCC ID: | 2A52ESST-BCA1HH |
| Trademark: | N/A |
| Model Number: | SST-BCA1HH |
| Prepared For: | Automatic Timing and Controls Diversified Electronics |
| Address: | 8019 Ohio River Blvd PO Box 305 Newell, WV 26050 USA |
| Manufacturer: | Automatic Timing and Controls Diversified Electronics |
| Address: | 8019 Ohio River Blvd PO Box 305 Newell, WV 26050 USA |
| Prepared By: | Shenzhen CTB Testing Technology Co., Ltd. |
| Address: | Floor 1&2, Building A, No. 26 of Xinhe Road, Xinqiao Community, Xinqiao Street, Baoan District, Shenzhen, Guangdong China |
| Sample Received Date: | Sep. 16, 2022 |
| Sample tested Date: | Sep. 16, 2022 to Sep. 23, 2022 |
| Issue Date: | Sep. 23, 2022 |
| Report No.: | CTB220923039RFX |
| Test Standards | FCC Part 2, 24E, 27 |
| Test Results | PASS |
| Remark: | This is LTE radio test report. |

| Compiled by: | Reviewed by: | Approved by: |
|---|---|---|
| Arron Liu | Bin Mei | Rita Xiao / Director |

The test report is effective only with both signature and specialized stamp. This result(s) shown in this report refer only to the sample(s) tested. Without written approval of Shenzhen CTB Testing Technology Co., Ltd. this report can't be reproduced except in full. The tested sample(s) and the sample information are provided by the client.

# TABLE OF CONTENT



*(Note: N/A means not applicable)*

# 1. VERSION

| Report No. | Issue Date | Description | Approved |
|---|---|---|---|
| CTB220923039RFX | Sep. 23, 2022 | Original | Valid |

# 2. TEST SUMMARY

The Product has been tested according to the following specifications:

| Test Item | Test Requirement | Test method | Result |
|---|---|---|---|
| **Conducted output power #** | Part 2.1046(a) | TIA-603-E-2016 & KDB 971168 D01v02r02 | PASS |
| **Effective Radiated Power of Transmitter(EIRP)** | Part24.232(c)/ Part27.50(h)(2) | TIA-603-E-2016 & KDB 971168 D01v02r02 | PASS |
| **peak-to-average ratio #** | Part24.232(d)/Part 27.50(d) | KDB 971168 D01v02r02 | PASS |
| **99% & 26dB Occupied Bandwidth #** | Part 2.1049(h) | KDB 971168 D01v02r02 | PASS |
| **Band Edge at antenna terminals #** | Part 2.1051/ Part 24.238(a) /Part 27.53(m) (4) | KDB 971168 D01v02r02 | PASS |
| **Spurious emissions at antenna terminals #** | Part 2.1051/ Part 24.238(a) /Part 27.53(m) (4) | TIA-603-E-2016 & KDB 971168 D01v02r02 | PASS |
| **Field strength of spurious radiation** | Part 2.1051/ Part 24.238(a) /Part 27.53(m) (4) | TIA-603-E-2016 & KDB 971168 D01v02r02 | PASS |
| **Frequency stability #** | Part 2.1055/Part 27.54 | TIA-603-E-2016 & KDB 971168 D01v02r02 | PASS |

Note: #: Please refer to CTB220527025RF report, FCC ID: 2A52ESST-BCA1HH.

# 3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

| Item | Uncertainty |
|---|---|
| Occupancy bandwidth | 54.3kHz |
| Conducted output power Above 1G | 0.9dB |
| Conducted output power below 1G | 0.9dB |
| Power Spectral Density , Conduction | 0.9dB |
| Conduction spurious emissions | 2.0dB |
| Out of band emission | 2.0dB |
| 3m camber Radiated spurious emission(30MHz-1GHz) | 4.6dB |
| 3m chamber Radiated spurious emission(1GHz-18GHz) | 5.1dB |
| 3m chamber Radiated spurious emission(18GHz-40GHz) | 3.4dB |
| Receiver Reference Sensitivity level | 1.9dB |
| humidity uncertainty | 5.5% |
| Temperature uncertainty | 0.63℃ |
| frequency | 1×10-7 |

# 4. PRODUCT INFORMATION AND TEST SETUP

## 4.1 Product Information

| | |
|---|---|
| Model(s): | SST-BCA1HH |
| Model Description: | N/A |
| Hardware Version: | V1.0 |
| Software Version: | V1.0 |

| | |
|---|---|
| Operation Frequency: | FDD-LTE BAND 2: 1850-1910MHz<br>FDD-LTE BAND 4:1710-1755MHz<br>FDD-LTE BAND 12: 699-716MHz |
| Max. RF output power: | FDD-LTE BAND 2: 20.86 dBm<br>FDD-LTE BAND 4: 20.75 dBm<br>FDD-LTE BAND 12: 22.13 dBm |
| Type of Modulation: | QPSK, 16QAM |
| Antenna installation: | External antenna |
| Antenna Gain: | 4.98dBi |
| Ratings: | Terminal power supply DC9-30V |

## 4.2 Test Setup Configuration

See test photographs attached in EUT TEST SETUP PHOTOGRAPHS for the actual connections between Product and support equipment.

## 4.3 Support Equipment

| No. | Device Type | Brand | Model | Series No. | Note |
|---|---|---|---|---|---|
| | | | | | |

***Notes:***

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

## 4.4 Test Mode

| Test Mode List | | |
|---|---|---|
| Test Mode | Description | Remark |
| TM1 | FDD-LTE BAND 2 | Low, Middle, High Channels |
| TM2 | FDD-LTE BAND 4 | Low, Middle, High Channels |
| TM3 | FDD-LTE BAND 12 | Low, Middle, High Channels |

## 4.5 Test Environment

| | |
|---|---|
| Humidity(%): | 55 |
| Atmospheric Pressure(kPa): | 101.1 |
| Normal Voltage(AC): | 120V |
| Normal Temperature(℃) | 25 |
| Low Temperature(℃) | 0 |
| High Temperature(℃) | 40 |

# 5. TEST FACILITY AND TEST INSTRUMENT USED

## 5.1 Test Facility

All measurement facilities used to collect the measurement data are located at Floor 1&2, Building A, No. 26 of Xinhe Road, Xinqiao Street, Baoan District, Shenzhen China. The site and apparatus are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1-1 other equivalent standards.

## 5.2 Test Instrument Used

| Item | Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
|---|---|---|---|---|---|
| 1 | Spectrum Analyzer | Agilent | N9020A | MY52090073 | 2023.07.19 |
| 2 | Power Sensor | Agilent | U2021XA | MY56120032 | 2023.07.19 |
| 3 | Power Sensor | Agilent | U2021XA | MY56120034 | 2023.07.19 |
| 4 | Communication test set | R&S | CMW500 | 108058 | 2023.07.19 |
| 5 | Spectrum Analyzer | KEYSIGHT | N9020A | MY51289897 | 2023.07.19 |
| 6 | Signal Generator | Agilent | N5181A | MY50140365 | 2023.07.19 |
| 7 | Vector signal generator | Agilent | N5182A | MY47420195 | 2023.07.19 |
| 8 | Communication test set | Agilent | E5515C | MY50102567 | 2023.07.19 |
| 9 | 2.4 GHz Filter | Shenxiang | MSF2400-2483.5MS-1154 | 20181015001 | 2023.07.19 |
| 10 | 5 GHz Filter | Shenxiang | MSF5150-5850 MS-1155 | 20181015001 | 2023.07.19 |
| 11 | Filter | Xingbo | XBLBQ-DZA120 | 190821-1-1 | 2023.07.19 |
| 12 | BT&WI-FI Automatic test software | Micowave | MTS8000 | Ver. 2.0.0.0 | / |
| 13 | Rohde & Schwarz SFU Broadcast Test System | R&S | SFU | 101017 | 2022.10.30 |
| 14 | Temperature humidity chamber | Hongjing | TH-80CH | DG-15174 | 2023.07.19 |
| 15 | 234G Automatic test software | Micowave | MTS8200 | Ver. 2.0.0.0 | / |
| 16 | 966 chamber | C.R.T. | 966 | / | 2024.08.11 |
| 17 | Receiver | R&S | ESPI | 100362 | 2023.07.19 |
| 18 | Amplifier | HP | 8447E | 2945A02747 | 2023.07.19 |
| 19 | Amplifier | Agilent | 8449B | 3008A01838 | 2023.07.19 |
| 20 | TRILOG Broadband Antenna | Schwarzbeck | VULB 9168 | 00869 | 2023.07.22 |
| 21 | Double Ridged Broadband Horn Antenna | Schwarzbeck | BBHA9120D | 01911 | 2023.07.22 |

| | | | | | |
|---|---|---|---|---|---|
| 22 | EMI test software | Fala | EZ-EMC | FA-03A2 RE | / |
| 23 | Loop Antenna | Schwarzbeck | FMZB 1519B | 1519B-224 | 2023.07.23 |
| 24 | loop antenna | ZHINAN | ZN30900A | GTS534 | / |
| 25 | 40G Horn antenna | A/H/System | SAS-574 | 588 | 2024.10.30 |
| 26 | Amplifier | AEROFLEX | Aeroflex | 097 | 2024.10.30 |

# 6. RF EXPOSURE

## 6.1 Standard Applicable

According to §1.1307 and§2.1091,§2.1093, the portable transmitter must comply the RF exposure requirements.

## 6.2 Test Result

This product complied with the requirement of the RF exposure, please see the RF Exposure report.

# 7. RF OUTPUT POWER

## 7.1 Standard Applicable

According to §22.913(a)(2), the ERP of mobile and portable stations transmitters and auxiliary test transmitters must not exceed 7 Watts.

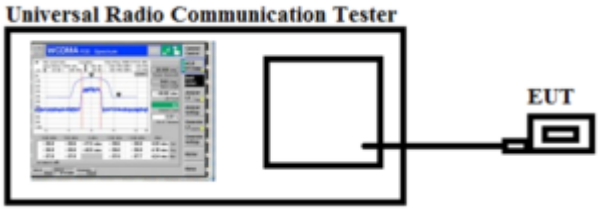
According to §24.232(c), mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

According to §27.50(d)(4), fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP.

According to §27.50(c)(10), portable stations (hand-held devices) in the 698-746 MHz band are limited to 3 watts ERP.

## 7.2 Test Procedure

Conducted output power test method:




Radiated power test method:
1. The setup of EUT is according with per ANSI/TIA Standard 603E and ANSI C63.26 measurement procedure.
2. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.
3. The frequency range up to tenth harmonic of the fundamental frequency was investigated.
4. Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

## 7.3 Summary of Test Results/Plots

Max. Radiated Power:

FDD-LTE Band 2

| Channel Bandwidth: 1.4 MHz | | | | | |
|---|---|---|---|---|---|
| Modulation | Channel | Antenna Polar | ERP [dBm] | Limit (dBm) | Verdict |
| QPSK | LCH | V | 20.45 | <33.00 | PASS |
| | | H | 20.06 | | |
| | MCH | V | 19.57 | | PASS |
| | | H | 19.28 | | |
| | HCH | V | 20.08 | | PASS |
| | | H | 21.00 | | |
| 16QAM | LCH | V | 20.11 | <33.00 | PASS |
| | | H | 19.50 | | |
| | MCH | V | 20.88 | | PASS |
| | | H | 20.66 | | |
| | HCH | V | 20.03 | | PASS |
| | | H | 19.50 | | |
| Channel Bandwidth: 3 MHz | | | | | |
| Modulation | Channel | Antenna Polar | E.i.r.p [dBm] | Limit (dBm) | Verdict |
| QPSK | LCH | V | 20.20 | <33.00 | PASS |
| | | H | 20.07 | | |
| | MCH | V | 20.26 | | PASS |
| | | H | 19.50 | | |
| | HCH | V | 20.18 | | PASS |
| | | H | 20.02 | | |
| 16QAM | LCH | V | 19.75 | <33.00 | PASS |
| | | H | 20.55 | | |
| | MCH | V | 20.24 | | PASS |
| | | H | 19.35 | | |
| | HCH | V | 20.19 | | PASS |
| | | H | 19.21 | | |
| Channel Bandwidth: 5 MHz | | | | | |
| Modulation | Channel | Antenna Polar | E.i.r.p [dBm] | Limit (dBm) | Verdict |
| QPSK | LCH | V | 19.76 | <33.00 | PASS |
| | | H | 21.02 | | |
| | MCH | V | 20.52 | | PASS |

| | | | | | |
|---|---|---|---|---|---|
| | | H | 19.50 | | |
| | HCH | V | 19.31 | | PASS |
| | | H | 20.06 | | |
| 16QAM | LCH | V | 20.96 | <33.00 | PASS |
| | | H | 19.64 | | |
| | MCH | V | 20.47 | | PASS |
| | | H | 20.21 | | |
| | HCH | V | 20.72 | | PASS |
| | | H | 19.98 | | |
| Channel Bandwidth: 10 MHz | | | | | |
| Modulation | Channel | Antenna Polar | E.i.r.p [dBm] | Limit (dBm) | Verdict |
| QPSK | LCH | V | 19.42 | <33.00 | PASS |
| | | H | 20.67 | | |
| | MCH | V | 19.99 | | PASS |
| | | H | 19.59 | | |
| | HCH | V | 19.81 | | PASS |
| | | H | 21.06 | | |
| 16QAM | LCH | V | 21.17 | <33.00 | PASS |
| | | H | 20.83 | | |
| | MCH | V | 21.08 | | PASS |
| | | H | 19.50 | | |
| | HCH | V | 20.31 | | PASS |
| | | H | 21.08 | | |
| Channel Bandwidth: 15 MHz | | | | | |
| Modulation | Channel | Antenna Polar | E.i.r.p [dBm] | Limit (dBm) | Verdict |
| QPSK | LCH | V | 21.05 | <33.00 | PASS |
| | | H | 20.11 | | |
| | MCH | V | 19.69 | | PASS |
| | | H | 19.38 | | |
| | HCH | V | 19.23 | | PASS |
| | | H | 21.12 | | |
| 16QAM | LCH | V | 19.99 | <33.00 | PASS |
| | | H | 21.04 | | |
| | MCH | V | 19.32 | | PASS |
| | | H | 20.53 | | |
| | HCH | V | 19.63 | | PASS |
| | | H | 19.70 | | |
| Channel Bandwidth: 20 MHz | | | | | |

| Modulation | Channel | Antenna Polar | E.i.r.p [dBm] | Limit (dBm) | Verdict |
|---|---|---|---|---|---|
| QPSK | LCH | V | 21.31 | <33.00 | PASS |
| | | H | 19.54 | | |
| | MCH | V | 19.70 | | PASS |
| | | H | 20.84 | | |
| | HCH | V | 20.75 | | PASS |
| | | H | 20.78 | | |
| 16QAM | LCH | V | 19.78 | <33.00 | PASS |
| | | H | 19.81 | | |
| | MCH | V | 21.26 | | PASS |
| | | H | 19.44 | | |
| | HCH | V | 20.99 | | PASS |

FDD-LTE Band 4

| Channel Bandwidth: 1.4 MHz | | | | | |
|---|---|---|---|---|---|
| Modulation | Channel | Antenna Polar | E.i.r.p [dBm] | Limit (dBm) | Verdict |
| QPSK | LCH | V | 18.76 | <30.0 | PASS |
| | | H | 19.01 | | |
| | MCH | V | 18.32 | | PASS |
| | | H | 19.96 | | |
| | HCH | V | 18.44 | | PASS |
| | | H | 18.24 | | |
| 16QAM | LCH | V | 18.67 | <30.0 | PASS |
| | | H | 19.49 | | |
| | MCH | V | 18.67 | | PASS |
| | | H | 19.21 | | |
| | HCH | V | 19.15 | | PASS |
| | | H | 19.69 | | |
| Channel Bandwidth: 3 MHz | | | | | |
| Modulation | Channel | Antenna Polar | E.i.r.p [dBm] | Limit (dBm) | Verdict |
| QPSK | LCH | V | 18.54 | <30.0 | PASS |
| | | H | 19.48 | | |
| | MCH | V | 18.94 | | PASS |
| | | H | 19.51 | | |
| | HCH | V | 19.63 | | PASS |
| | | H | 19.43 | | |
| 16QAM | LCH | V | 18.96 | <30.0 | PASS |
| | | H | 19.13 | | |

| | | | | | |
|---|---|---|---|---|---|
| | MCH | V | 18.48 | | PASS |
| | | H | 19.93 | | |
| | HCH | V | 18.52 | | PASS |
| | | H | 19.75 | | |
| Channel Bandwidth: 5 MHz | | | | | |
| Modulation | Channel | Antenna Polar | E.i.r.p [dBm] | Limit (dBm) | Verdict |
| QPSK | LCH | V | 18.13 | <30.0 | PASS |
| | | H | 18.48 | | |
| | MCH | V | 18.45 | | PASS |
| | | H | 19.91 | | |
| | HCH | V | 18.59 | | PASS |
| | | H | 19.76 | | |
| 16QAM | LCH | V | 18.86 | <30.0 | PASS |
| | | H | 18.37 | | |
| | MCH | V | 18.22 | | PASS |
| | | H | 19.52 | | |
| | HCH | V | 19.20 | | PASS |
| | | H | 19.12 | | |
| Channel Bandwidth: 10 MHz | | | | | |
| Modulation | Channel | Antenna Polar | E.i.r.p [dBm] | Limit (dBm) | Verdict |
| QPSK | LCH | V | 19.27 | <30.0 | PASS |
| | | H | 19.32 | | |
| | MCH | V | 18.84 | | PASS |
| | | H | 18.74 | | |
| | HCH | V | 18.15 | | PASS |
| | | H | 19.49 | | |
| 16QAM | LCH | V | 19.61 | <30.0 | PASS |
| | | H | 18.39 | | |
| | MCH | V | 18.75 | | PASS |
| | | H | 18.03 | | |
| | HCH | V | 19.38 | | PASS |
| | | H | 18.85 | | |
| Channel Bandwidth: 15 MHz | | | | | |
| Modulation | Channel | Antenna Polar | E.i.r.p [dBm] | Limit (dBm) | Verdict |
| QPSK | LCH | V | 18.61 | <30.0 | PASS |
| | | H | 18.37 | | |
| | MCH | V | 19.58 | | PASS |
| | | H | 19.67 | | |

| | | | | | |
|---|---|---|---|---|---|
| | HCH | V | 19.75 | | PASS |
| | | H | 18.99 | | |
| 16QAM | LCH | V | 19.00 | <30.0 | PASS |
| | | H | 18.34 | | |
| | MCH | V | 19.62 | | PASS |
| | | H | 18.75 | | |
| | HCH | V | 19.41 | | PASS |
| | | H | 18.36 | | |
| Channel Bandwidth: 20 MHz | | | | | |
| Modulation | Channel | Antenna Polar | E.i.r.p [dBm] | Limit (dBm) | Verdict |
| QPSK | LCH | V | 19.21 | <30.0 | PASS |
| | | H | 19.55 | | |
| | MCH | V | 20.10 | | PASS |
| | | H | 18.44 | | |
| | HCH | V | 18.56 | | PASS |
| | | H | 18.60 | | |
| 16QAM | LCH | V | 19.99 | <30.0 | PASS |
| | | H | 19.28 | | |
| | MCH | V | 19.79 | | PASS |
| | | H | 19.05 | | |
| | HCH | V | 18.15 | | PASS |
| | | H | 18.82 | | |

FDD-LTE Band 12

| Channel Bandwidth: 1.4 MHz | | | | | |
|---|---|---|---|---|---|
| Modulation | Channel | Antenna Polar | ERP [dBm] | Limit (dBm) | Verdict |
| QPSK | LCH | V | 20.77 | <34.77 | PASS |
| | | H | 20.80 | | |
| | MCH | V | 20.17 | | PASS |
| | | H | 21.57 | | |
| | HCH | V | 20.97 | | PASS |
| | | H | 21.80 | | |
| 16QAM | LCH | V | 20.82 | <34.77 | PASS |
| | | H | 20.84 | | |
| | MCH | V | 21.93 | | PASS |
| | | H | 21.12 | | |
| | HCH | V | 21.25 | | PASS |
| | | H | 21.19 | | |

| Channel Bandwidth: 3 MHz | | | | | |
|---|---|---|---|---|---|
| Modulation | Channel | Antenna Polar | ERP [dBm] | Limit (dBm) | Verdict |
| QPSK | LCH | V | 20.15 | <34.77 | PASS |
| | | H | 21.26 | | |
| | MCH | V | 20.63 | | PASS |
| | | H | 20.01 | | |
| | HCH | V | 21.33 | | PASS |
| | | H | 20.33 | | |
| 16QAM | LCH | V | 21.18 | | PASS |
| | | H | 20.28 | | |
| | MCH | V | 21.97 | | PASS |
| | | H | 21.15 | | |
| | HCH | V | 20.52 | | PASS |
| | | H | 21.11 | | |
| Channel Bandwidth: 5 MHz | | | | | |
| Modulation | Channel | Antenna Polar | ERP [dBm] | Limit (dBm) | Verdict |
| QPSK | LCH | V | 20.77 | <34.77 | PASS |
| | | H | 20.14 | | |
| | MCH | V | 21.42 | | PASS |
| | | H | 21.41 | | |
| | HCH | V | 21.59 | | PASS |
| | | H | 21.21 | | |
| 16QAM | LCH | V | 21.42 | | PASS |
| | | H | 20.23 | | |
| | MCH | V | 20.94 | | PASS |
| | | H | 20.05 | | |
| | HCH | V | 21.30 | | PASS |
| | | H | 20.77 | | |
| Channel Bandwidth: 10 MHz | | | | | |
| Modulation | Channel | Antenna Polar | ERP [dBm] | Limit (dBm) | Verdict |
| QPSK | LCH | V | 20.03 | <34.77 | PASS |
| | | H | 21.75 | | |
| | MCH | V | 20.62 | | PASS |
| | | H | 21.13 | | |
| | HCH | V | 20.36 | | PASS |
| | | H | 21.12 | | |
| 16QAM | LCH | V | 21.99 | <34.77 | PASS |
| | | H | 20.07 | | |

| | | | | | |
|---|---|---|---|---|---|
| | MCH | V | 21.40 | | PASS |
| | | H | 20.51 | | |
| | HCH | V | 21.02 | | PASS |
| | | H | 21.03 | | |

Max. Conducted Output Power
Please refer to Appendix A: Average Power Output Data
Test result: Pass

# 8. PEAK-TO-AVERAGE RATIO (PAR) OF TRANSMITTER

## 8.1 Standard Applicable

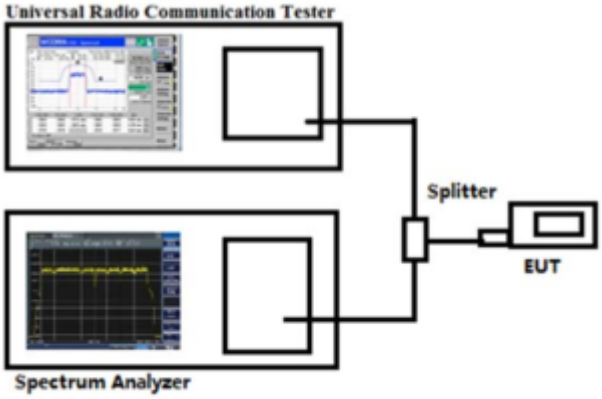
According to §24.232(d), power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of §24.51, in measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

According to §27.50(B), the peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB. The PAPR measurements should be made using either an instrument with complementary cumulative distribution function (CCDF) capabilities to determine that PAPR will not exceed 13 dB for more than 0.1 percent of the time or other Commission approved procedure. The measurement must be performed using a signal corresponding to the highest PAPR expected during periods of continuous transmission.

## 8.2 Test Procedure

According with KDB 971168
1. The signal analyzer’ s CCDF measurement profile is enabled
2. Frequency = carrier center frequency
3. Measurement BW > Emission bandwidth of signal
4. The signal analyzer was set to collect one million samples to generate the CCDF curve
5. The measurement interval was set depending on the type of signal analyzed. For continuous signals (>98% duty cycle), the measurement interval was set to 1ms. For burst transmissions, the spectrum analyzer is set to use an internal “ RF Burst” trigger that is synced with an incoming pulse and the measurement interval is set to less than the duration of the “ on time” of one burst to ensure that energy is only captured during a time in which the transmitter is operating at maximum power

Test Configuration for the emission bandwidth testing:




## 8.3 Summary of Test Results

Please refer to Appendix B: Peak-to-Average Ratio

Test result: Pass

# 9. EMISSION BANDWIDTH

## 9.1 Standard Applicable

According to §22.917(b), the emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

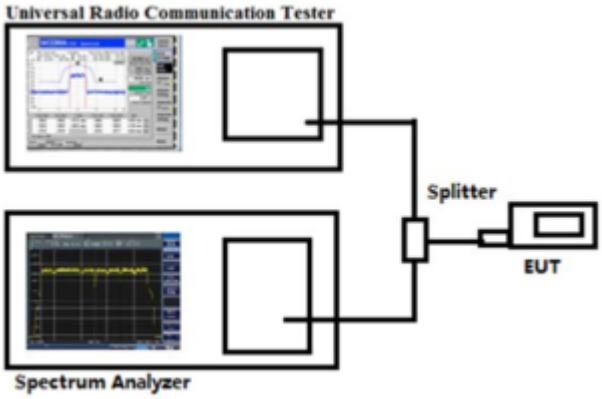
According to §24.238(b), the emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

According to §27.53, the emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

## 9.2 Test Procedure

According to § 22.917(b), the emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

Test Configuration for the emission bandwidth testing:




## 9.3 Summary of Test Results/Plots

Please refer to Appendix C: 26dB Bandwidth and Occupied Bandwidth
Test result: Pass

# 10. OUT OF BAND EMISSIONS AT ANTENNA TERMINAL

## 10.1 Standard Applicable

According to §22.917(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

According to §24.238(a), the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

According to §27.53 (c) For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On any frequency outside the 746-758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(3) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations;

(4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations;

(5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed;

(6) Compliance with the provisions of paragraphs (c)(3) and (c)(4) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

According to §27.53 (f) For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to −70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

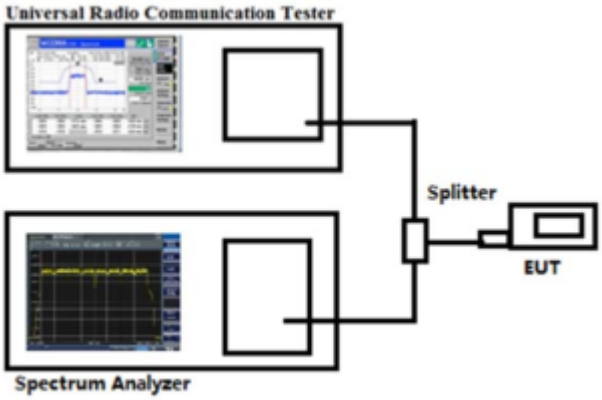
According to §27.53(h), the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log10 (P) dB.
According to §27.53(g), for operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB.

According to §27.53(m)(4), for mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz.

## 10.2 Test Procedure

The RF output terminal of the transmitter was connected to the input of the spectrum analyzer via a suitable attenuation. The RBW of the spectrum analyzer was set to 100kHz and 1MHz for the scan frequency from 30MHz to 1GHz and the scan frequency from 1GHz to up to 10 th harmonic.

Test Configuration for the out of band emissions testing:




## 10.3 Summary of Test Results/Plots

Please refer to Appendix D & E: Band Edge & Conducted Spurious Emission
Test result: Pass

# 11.SPURIOUS RADIATED EMISSIONS

## 11.1 Standard Applicable

According to §22.917(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

According to §24.238(a), the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

According to §27.53 (c) For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On any frequency outside the 746-758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(3) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations;

(4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations;

(5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed;

(6) Compliance with the provisions of paragraphs (c)(3) and (c)(4) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

According to §27.53 (f) For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to −70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

According to §27.53(h), the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log10 (P) dB.

According to §27.53(g) the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB.

## 11.2 Test Procedure

1. The setup of EUT is according with per ANSI/TIA-603-E and ANSI C63.4-2014 measurement procedure.
2. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.
3. The frequency range up to tenth harmonic of the fundamental frequency was investigated.
4. Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.
Spurious attenuation limit in dB =43+10 Log 10 (power out in Watts)

## 11.3 Summary of Test Results/Plots

Note: 1. this EUT was tested in 3 orthogonal positions and the worst case position data was reported.
2. All test modes (different bandwidth and different modulation) are performed, but only the worst case is recorded in this report.

**Test Data:**

**QPSK**

| Band 2 18607 channel/BW 1.4(lowest channel) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Height (cm) | Azimuth (deg) | Spurious Emission Level (dBm) | Limit (dBm) | Over Limit (dB) | Result | Antenna Polaxis. |
| 1275.57 | 146 | 226 | -55.68 | -13 | -42.68 | Pass | H |
| 1627.58 | 140 | 356 | -52.47 | -13 | -39.47 | Pass | H |
| 3967.61 | 155 | 165 | -48.94 | -13 | -35.94 | Pass | H |
| 5774.86 | 159 | 66 | -46.12 | -13 | -33.12 | Pass | H |
| 6408.21 | 152 | 46 | -47.31 | -13 | -34.31 | Pass | H |
| 7946.93 | 151 | 224 | -50.31 | -13 | -37.31 | Pass | H |
| 1161.57 | 153 | 310 | -58.13 | -13 | -45.13 | Pass | V |
| 1341.72 | 148 | 79 | -59.51 | -13 | -46.51 | Pass | V |
| 3534.17 | 150 | 156 | -50.80 | -13 | -37.80 | Pass | V |
| 3753.58 | 153 | 39 | -50.06 | -13 | -37.06 | Pass | V |
| 5741.44 | 155 | 11 | -44.07 | -13 | -31.07 | Pass | V |
| 6635.26 | 150 | 61 | -50.77 | -13 | -37.77 | Pass | V |

| Band 2 18900 channel/BW 1.4 (middle channel) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Height (cm) | Azimuth (deg) | Spurious Emission Level (dBm) | Limit (dBm) | Over Limit (dB) | Result | Antenna Polaxis. |
| 1302.00 | 150 | 126 | -58.98 | -13 | -45.98 | Pass | H |
| 1724.37 | 146 | 292 | -53.82 | -13 | -40.82 | Pass | H |
| 3812.94 | 150 | 93 | -52.15 | -13 | -39.15 | Pass | H |
| 5886.53 | 146 | 128 | -43.56 | -13 | -30.56 | Pass | H |
| 6402.95 | 149 | 295 | -50.30 | -13 | -37.30 | Pass | H |
| 7929.57 | 151 | 88 | -46.72 | -13 | -33.72 | Pass | H |
| 1196.36 | 149 | 174 | -53.93 | -13 | -40.93 | Pass | V |
| 1365.58 | 148 | 34 | -57.29 | -13 | -44.29 | Pass | V |
| 3504.78 | 147 | 186 | -53.29 | -13 | -40.29 | Pass | V |
| 3899.02 | 148 | 260 | -49.94 | -13 | -36.94 | Pass | V |
| 5802.09 | 150 | 224 | -49.72 | -13 | -36.72 | Pass | V |
| 6517.31 | 150 | 53 | -47.69 | -13 | -34.69 | Pass | V |

| Band 2 19193 channel/BW 1.4 (highest channel) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Height (cm) | Azimuth (deg) | Spurious Emission Level (dBm) | Limit (dBm) | Over Limit (dB) | Result | Antenna Polaxis. |
| 1340.71 | 145 | 28 | -56.73 | -13 | -43.73 | Pass | H |
| 1669.90 | 146 | 86 | -52 | -13 | -39 | Pass | H |
| 3845.50 | 148 | 0 | -45.66 | -13 | -32.66 | Pass | H |
| 5906.91 | 151 | 340 | -40.96 | -13 | -27.96 | Pass | H |
| 6531.65 | 154 | 316 | -42.47 | -13 | -29.47 | Pass | H |
| 8000.07 | 152 | 176 | -44.74 | -13 | -31.74 | Pass | H |
| 1257.63 | 153 | 178 | -56.49 | -13 | -43.49 | Pass | V |
| 1403.18 | 154 | 162 | -56.84 | -13 | -43.84 | Pass | V |
| 3525.24 | 152 | 321 | -52.79 | -13 | -39.79 | Pass | V |
| 3912.13 | 147 | 28 | -48.59 | -13 | -35.59 | Pass | V |
| 5788.31 | 154 | 303 | -43.05 | -13 | -30.05 | Pass | V |
| 6576.29 | 155 | 114 | -47.76 | -13 | -34.76 | Pass | V |

**16QAM**

| Band 2 18607 channel/BW 1.4(lowest channel) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Height (cm) | Azimuth (deg) | Spurious Emission Level (dBm) | Limit (dBm) | Over Limit (dB) | Result | Antenna Polaxis. |
| 1408.38 | 148 | 101 | -58.03 | -13 | -45.03 | Pass | H |
| 1617.64 | 151 | 9 | -48.30 | -13 | -35.30 | Pass | H |
| 3923.07 | 145 | 113 | -49.54 | -13 | -36.54 | Pass | H |
| 5894.01 | 149 | 349 | -43.86 | -13 | -30.86 | Pass | H |
| 6656.79 | 151 | 151 | -41.98 | -13 | -28.98 | Pass | H |
| 7967.43 | 148 | 120 | -40.14 | -13 | -27.14 | Pass | H |
| 1261.81 | 146 | 17 | -54.92 | -13 | -41.92 | Pass | V |
| 1372.53 | 146 | 291 | -58.00 | -13 | -45.00 | Pass | V |
| 3543.88 | 149 | 316 | -48.62 | -13 | -35.62 | Pass | V |
| 3952.98 | 148 | 211 | -52.61 | -13 | -39.61 | Pass | V |
| 5952.95 | 150 | 141 | -44.31 | -13 | -31.31 | Pass | V |
| 6496.28 | 147 | 133 | -46.57 | -13 | -33.57 | Pass | V |

| Band 2 18900 channel/BW 1.4 (middle channel) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Height (cm) | Azimuth (deg) | Spurious Emission Level (dBm) | Limit (dBm) | Over Limit (dB) | Result | Antenna Polaxis. |
| 1249.05 | 149 | 58 | -51.66 | -13 | -41.45 | Pass | H |
| 1784.58 | 148 | 111 | -47.96 | -13 | -37.85 | Pass | H |
| 3915.03 | 145 | 10 | -46.64 | -13 | -35.2 | Pass | H |
| 5983.89 | 145 | 194 | -40.37 | -13 | -30.39 | Pass | H |
| 6445.59 | 153 | 50 | -45.18 | -13 | -32.24 | Pass | H |
| 8139.13 | 146 | 72 | -44.07 | -13 | -30.22 | Pass | H |
| 1098.43 | 155 | 253 | -56.10 | -13 | -44.9 | Pass | V |
| 1467.19 | 146 | 345 | -57.22 | -13 | -43.63 | Pass | V |
| 3576.86 | 146 | 10 | -46.99 | -13 | -35.94 | Pass | V |
| 3832.92 | 149 | 174 | -47.67 | -13 | -36.01 | Pass | V |
| 5854.75 | 153 | 156 | -44.58 | -13 | -33.75 | Pass | V |
| 6606.43 | 147 | 133 | -45.65 | -13 | -32.41 | Pass | V |

| Band 2 19193 channel/BW 1.4 (highest channel) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Height (cm) | Azimuth (deg) | Spurious Emission Level (dBm) | Limit (dBm) | Over Limit (dB) | Result | Antenna Polaxis. |
| 1430.02 | 146 | 226 | -56.89 | -13 | -43.89 | Pass | H |
| 1630.46 | 148 | 96 | -47.41 | -13 | -34.41 | Pass | H |
| 3842.51 | 146 | 74 | -43.41 | -13 | -30.41 | Pass | H |
| 5896.31 | 147 | 187 | -39.15 | -13 | -26.15 | Pass | H |
| 6606.63 | 155 | 62 | -40.29 | -13 | -27.29 | Pass | H |
| 8124.81 | 148 | 267 | -42.36 | -13 | -29.36 | Pass | H |
| 1300.02 | 148 | 156 | -53.63 | -13 | -40.63 | Pass | V |
| 1540.45 | 155 | 121 | -59.82 | -13 | -46.82 | Pass | V |
| 3603.08 | 145 | 237 | -46.83 | -13 | -33.83 | Pass | V |
| 3754.75 | 150 | 22 | -50.68 | -13 | -37.68 | Pass | V |
| 5837.10 | 153 | 341 | -47.54 | -13 | -34.54 | Pass | V |
| 6488.24 | 154 | 86 | -44.63 | -13 | -31.63 | Pass | V |

Note:

1)Scan from 9kHz to 25GHz, the disturbance above 13GHz and below 1GHz are attenuated more than 20 dB below the applicable limit and not required to be reported, the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.

2)Tested with all kind of bandwidth,RB Size and RB Offset, Found the 1.4MHz with full RB were the worst case; and then Only the worst case is recorded in the report.

**QPSK**

| Band 4 19957 channel/BW 1.4(lowest channel) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Height (cm) | Azimuth (deg) | Spurious Emission Level (dBm) | Limit (dBm) | Over Limit (dB) | Result | Antenna Polaxis. |
| 1314.73 | 156 | 176 | -55.45 | -13 | -42.45 | Pass | H |
| 1852.68 | 145 | 102 | -53.16 | -13 | -40.16 | Pass | H |
| 3955.13 | 158 | 184 | -48.48 | -13 | -35.48 | Pass | H |
| 5889.58 | 157 | 47 | -44.19 | -13 | -31.19 | Pass | H |
| 6540.63 | 150 | 331 | -45.56 | -13 | -32.56 | Pass | H |
| 7899.21 | 143 | 157 | -48.31 | -13 | -35.31 | Pass | H |
| 1201.39 | 142 | 189 | -54.91 | -13 | -41.91 | Pass | V |
| 1475.10 | 159 | 356 | -58.58 | -13 | -45.58 | Pass | V |
| 3589.54 | 159 | 1 | -55.16 | -13 | -42.16 | Pass | V |
| 3907.70 | 150 | 190 | -50.90 | -13 | -37.90 | Pass | V |
| 5847.62 | 158 | 58 | -46.16 | -13 | -33.16 | Pass | V |
| 6493.21 | 158 | 293 | -46.86 | -13 | -33.86 | Pass | V |

| Band 4 20175 channel/BW 1.4 (middle channel) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Height (cm) | Azimuth (deg) | Spurious Emission Level (dBm) | Limit (dBm) | Over Limit (dB) | Result | Antenna Polaxis. |
| 1237.36 | 150 | 331 | -57.68 | -13 | -44.68 | Pass | H |
| 1811.48 | 146 | 70 | -51.57 | -13 | -38.57 | Pass | H |
| 3834.37 | 150 | 243 | -48.65 | -13 | -35.65 | Pass | H |
| 5773.80 | 146 | 186 | -42.87 | -13 | -29.87 | Pass | H |
| 6520.17 | 149 | 213 | -48.00 | -13 | -35.00 | Pass | H |
| 7977.62 | 151 | 315 | -47.28 | -13 | -34.28 | Pass | H |
| 1277.91 | 149 | 135 | -55.00 | -13 | -42.00 | Pass | V |
| 1453.63 | 148 | 18 | -61.28 | -13 | -48.28 | Pass | V |
| 3543.08 | 147 | 343 | -51.00 | -13 | -38.00 | Pass | V |
| 3833.26 | 148 | 57 | -48.60 | -13 | -35.60 | Pass | V |
| 5911.44 | 150 | 45 | -45.86 | -13 | -32.86 | Pass | V |
| 6482.43 | 150 | 344 | -50.40 | -13 | -37.40 | Pass | V |

| Band 4 20393 channel/BW 1.4 (highest channel) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Height (cm) | Azimuth (deg) | Spurious Emission Level (dBm) | Limit (dBm) | Over Limit (dB) | Result | Antenna Polaxis. |
| 1340.71 | 148 | 358 | -56.73 | -13 | -43.73 | Pass | H |
| 1669.90 | 146 | 209 | -52 | -13 | -39 | Pass | H |
| 3845.50 | 147 | 100 | -45.66 | -13 | -32.66 | Pass | H |
| 5906.91 | 146 | 298 | -40.96 | -13 | -27.96 | Pass | H |
| 6531.65 | 153 | 286 | -42.47 | -13 | -29.47 | Pass | H |
| 8000.07 | 152 | 269 | -44.74 | -13 | -31.74 | Pass | H |
| 1257.63 | 149 | 156 | -56.49 | -13 | -43.49 | Pass | V |
| 1403.18 | 151 | 354 | -56.84 | -13 | -43.84 | Pass | V |
| 3525.24 | 148 | 331 | -52.79 | -13 | -39.79 | Pass | V |
| 3912.13 | 155 | 22 | -48.59 | -13 | -35.59 | Pass | V |
| 5788.31 | 147 | 151 | -43.05 | -13 | -30.05 | Pass | V |
| 6576.29 | 146 | 265 | -47.76 | -13 | -34.76 | Pass | V |

**16QAM**

| Band 4 19957 channel/BW 1.4(lowest channel) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Height (cm) | Azimuth (deg) | Spurious Emission Level (dBm) | Limit (dBm) | Over Limit (dB) | Result | Antenna Polaxis. |
| 1254.79 | 152 | 346 | -57.93 | -13 | -44.93 | Pass | H |
| 1772.48 | 150 | 159 | -48.72 | -13 | -35.72 | Pass | H |
| 3898.25 | 154 | 142 | -51.42 | -13 | -38.42 | Pass | H |
| 5905.57 | 146 | 142 | -45.87 | -13 | -32.87 | Pass | H |
| 6607.14 | 152 | 332 | -45.99 | -13 | -32.99 | Pass | H |
| 8070.29 | 149 | 120 | -43.76 | -13 | -30.76 | Pass | H |
| 1254.37 | 153 | 324 | -52.10 | -13 | -39.10 | Pass | V |
| 1427.09 | 152 | 131 | -55.00 | -13 | -42.00 | Pass | V |
| 3643.18 | 154 | 21 | -54.37 | -13 | -41.37 | Pass | V |
| 3914.75 | 146 | 106 | -48.92 | -13 | -35.92 | Pass | V |
| 5779.70 | 151 | 348 | -45.87 | -13 | -32.87 | Pass | V |
| 6583.48 | 153 | 273 | -46.84 | -13 | -33.84 | Pass | V |

| Band 4 20175 channel/BW 1.4 (middle channel) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Height (cm) | Azimuth (deg) | Spurious Emission Level (dBm) | Limit (dBm) | Over Limit (dB) | Result | Antenna Polaxis. |
| 1387.22 | 150 | 346 | -53.13 | -13 | -41.45 | Pass | H |
| 1692.28 | 146 | 332 | -51.13 | -13 | -37.85 | Pass | H |
| 3777.64 | 146 | 175 | -49.20 | -13 | -35.2 | Pass | H |
| 5889.77 | 154 | 78 | -41.18 | -13 | -30.39 | Pass | H |
| 6425.38 | 148 | 227 | -45.38 | -13 | -32.24 | Pass | H |
| 8003.49 | 145 | 157 | -43.82 | -13 | -30.22 | Pass | H |
| 1164.93 | 151 | 209 | -55.72 | -13 | -44.9 | Pass | V |
| 1308.81 | 152 | 241 | -56.80 | -13 | -43.63 | Pass | V |
| 3574.03 | 151 | 126 | -49.51 | -13 | -35.94 | Pass | V |
| 3853.83 | 150 | 288 | -46.73 | -13 | -36.01 | Pass | V |
| 5869.86 | 148 | 248 | -49.70 | -13 | -33.75 | Pass | V |
| 6492.68 | 148 | 178 | -46.40 | -13 | -32.41 | Pass | V |

| Band 4 20393 channel/BW 1.4 (highest channel) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Height (cm) | Azimuth (deg) | Spurious Emission Level (dBm) | Limit (dBm) | Over Limit (dB) | Result | Antenna Polaxis. |
| 1342.71 | 153 | 300 | -57.01 | -13 | -44.01 | Pass | H |
| 1777.71 | 153 | 67 | -52.17 | -13 | -39.17 | Pass | H |
| 3897.71 | 149 | 118 | -42.56 | -13 | -29.56 | Pass | H |
| 5976.25 | 150 | 335 | -42.11 | -13 | -29.11 | Pass | H |
| 6500.01 | 153 | 254 | -43.72 | -13 | -30.72 | Pass | H |
| 8008.10 | 150 | 278 | -47.18 | -13 | -34.18 | Pass | H |
| 1176.60 | 151 | 86 | -54.89 | -13 | -41.89 | Pass | V |
| 1557.47 | 149 | 42 | -56.65 | -13 | -43.65 | Pass | V |
| 3459.19 | 148 | 323 | -51.70 | -13 | -38.70 | Pass | V |
| 3853.94 | 148 | 208 | -49.24 | -13 | -36.24 | Pass | V |
| 5727.14 | 147 | 333 | -47.47 | -13 | -34.47 | Pass | V |
| 6637.10 | 150 | 281 | -42.88 | -13 | -29.88 | Pass | V |

Note:

1)Scan from 9kHz to 25GHz, the disturbance above 13GHz and below 1GHz are attenuated more than 20 dB below the applicable limit and not required to be reported, the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.

2)Tested with all kind of bandwidth,RB Size and RB Offset, Found the 1.4MHz with full RB were the worst case; and then Only the worst case is recorded in the report.

**QPSK**

| Band 12 23017 channel/BW 1.4(lowest channel) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Height (cm) | Azimuth (deg) | Spurious Emission Level (dBm) | Limit (dBm) | Over Limit (dB) | Result | Antenna Polaxis. |
| 1361.10 | 145 | 111 | -54.30 | -13 | -41.30 | Pass | H |
| 1803.25 | 147 | 171 | -50.11 | -13 | -37.11 | Pass | H |
| 3841.95 | 157 | 235 | -51.46 | -13 | -38.46 | Pass | H |
| 5881.30 | 157 | 60 | -44.90 | -13 | -31.90 | Pass | H |
| 6401.30 | 153 | 328 | -43.09 | -13 | -30.09 | Pass | H |
| 7991.89 | 157 | 49 | -49.53 | -13 | -36.53 | Pass | H |
| 1237.87 | 144 | 343 | -55.74 | -13 | -42.74 | Pass | V |
| 1395.10 | 147 | 120 | -59.17 | -13 | -46.17 | Pass | V |
| 3519.90 | 142 | 256 | -54.68 | -13 | -41.68 | Pass | V |
| 3874.08 | 155 | 194 | -49.67 | -13 | -36.67 | Pass | V |
| 5793.69 | 147 | 174 | -43.88 | -13 | -30.88 | Pass | V |
| 6476.40 | 159 | 79 | -48.08 | -13 | -35.08 | Pass | V |

| Band 12 23095 channel/BW 1.4 (middle channel) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Height (cm) | Azimuth (deg) | Spurious Emission Level (dBm) | Limit (dBm) | Over Limit (dB) | Result | Antenna Polaxis. |
| 1305.02 | 150 | 37 | -56.64 | -13 | -43.64 | Pass | H |
| 1656.98 | 146 | 187 | -51.68 | -13 | -38.68 | Pass | H |
| 3829.96 | 150 | 283 | -52.78 | -13 | -39.78 | Pass | H |
| 5871.86 | 146 | 205 | -45.89 | -13 | -32.89 | Pass | H |
| 6409.32 | 149 | 145 | -50.00 | -13 | -37.00 | Pass | H |
| 8071.57 | 151 | 166 | -49.43 | -13 | -36.43 | Pass | H |
| 1234.94 | 149 | 80 | -55.46 | -13 | -42.46 | Pass | V |
| 1420.92 | 148 | 60 | -60.95 | -13 | -47.95 | Pass | V |
| 3542.31 | 147 | 231 | -52.31 | -13 | -39.31 | Pass | V |
| 3857.50 | 148 | 339 | -51.09 | -13 | -38.09 | Pass | V |
| 5735.29 | 150 | 60 | -51.00 | -13 | -38.00 | Pass | V |
| 6504.72 | 150 | 280 | -50.10 | -13 | -37.10 | Pass | V |

| Band 12 23173 channel/BW 1.4 (highest channel) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Height (cm) | Azimuth (deg) | Spurious Emission Level (dBm) | Limit (dBm) | Over Limit (dB) | Result | Antenna Polaxis. |
| 1340.71 | 150 | 112 | -56.73 | -13 | -43.73 | Pass | H |
| 1669.90 | 146 | 333 | -52 | -13 | -39 | Pass | H |
| 3845.50 | 152 | 308 | -45.66 | -13 | -32.66 | Pass | H |
| 5906.91 | 155 | 255 | -40.96 | -13 | -27.96 | Pass | H |
| 6531.65 | 148 | 14 | -42.47 | -13 | -29.47 | Pass | H |
| 8000.07 | 150 | 295 | -44.74 | -13 | -31.74 | Pass | H |
| 1257.63 | 152 | 264 | -56.49 | -13 | -43.49 | Pass | V |
| 1403.18 | 151 | 101 | -56.84 | -13 | -43.84 | Pass | V |
| 3525.24 | 153 | 75 | -52.79 | -13 | -39.79 | Pass | V |
| 3912.13 | 148 | 311 | -48.59 | -13 | -35.59 | Pass | V |
| 5788.31 | 150 | 341 | -43.05 | -13 | -30.05 | Pass | V |
| 6576.29 | 147 | 189 | -47.76 | -13 | -34.76 | Pass | V |

**16QAM**

| Band 12 23017 channel/BW 1.4(lowest channel) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Height (cm) | Azimuth (deg) | Spurious Emission Level (dBm) | Limit (dBm) | Over Limit (dB) | Result | Antenna Polaxis. |
| 1386.98 | 149 | 117 | -57.28 | -13 | -44.28 | Pass | H |
| 1763.49 | 152 | 157 | -47.55 | -13 | -34.55 | Pass | H |
| 3788.13 | 147 | 141 | -51.69 | -13 | -38.69 | Pass | H |
| 5843.15 | 148 | 334 | -44.05 | -13 | -31.05 | Pass | H |
| 6635.57 | 149 | 44 | -47.10 | -13 | -34.10 | Pass | H |
| 8097.52 | 145 | 356 | -43.86 | -13 | -30.86 | Pass | H |
| 1188.20 | 155 | 342 | -55.34 | -13 | -42.34 | Pass | V |
| 1358.92 | 150 | 312 | -56.98 | -13 | -43.98 | Pass | V |
| 3587.85 | 154 | 290 | -50.18 | -13 | -37.18 | Pass | V |
| 3997.01 | 146 | 27 | -48.85 | -13 | -35.85 | Pass | V |
| 5775.58 | 153 | 254 | -44.30 | -13 | -31.30 | Pass | V |
| 6504.84 | 148 | 73 | -46.54 | -13 | -33.54 | Pass | V |

| Band 12 23095 channel/BW 1.4 (middle channel) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Height (cm) | Azimuth (deg) | Spurious Emission Level (dBm) | Limit (dBm) | Over Limit (dB) | Result | Antenna Polaxis. |
| 1399.68 | 154 | 158 | -53.45 | -13 | -41.45 | Pass | H |
| 1694.54 | 153 | 198 | -50.71 | -13 | -37.85 | Pass | H |
| 3794.77 | 147 | 205 | -44.70 | -13 | -35.2 | Pass | H |
| 5939.31 | 149 | 46 | -44.73 | -13 | -30.39 | Pass | H |
| 6580.36 | 149 | 219 | -41.50 | -13 | -32.24 | Pass | H |
| 8129.37 | 149 | 173 | -40.63 | -13 | -30.22 | Pass | H |
| 1282.06 | 154 | 171 | -55.27 | -13 | -44.9 | Pass | V |
| 1464.57 | 151 | 211 | -59.11 | -13 | -43.63 | Pass | V |
| 3625.38 | 153 | 52 | -49.20 | -13 | -35.94 | Pass | V |
| 3882.81 | 146 | 47 | -51.30 | -13 | -36.01 | Pass | V |
| 5812.12 | 150 | 330 | -48.71 | -13 | -33.75 | Pass | V |
| 6533.74 | 150 | 152 | -43.35 | -13 | -32.41 | Pass | V |

| Band 12 23173 channel/BW 1.4 (highest channel) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Height (cm) | Azimuth (deg) | Spurious Emission Level (dBm) | Limit (dBm) | Over Limit (dB) | Result | Antenna Polaxis. |
| 1428.39 | 149 | 163 | -58.43 | -13 | -45.43 | Pass | H |
| 1714.25 | 153 | 18 | -51.65 | -13 | -38.65 | Pass | H |
| 3917.99 | 153 | 3 | -45.74 | -13 | -32.74 | Pass | H |
| 5791.00 | 153 | 61 | -45.29 | -13 | -32.29 | Pass | H |
| 6535.90 | 152 | 87 | -43.09 | -13 | -30.09 | Pass | H |
| 8114.00 | 155 | 144 | -46.17 | -13 | -33.17 | Pass | H |
| 1294.91 | 146 | 83 | -52.60 | -13 | -39.60 | Pass | V |
| 1508.70 | 149 | 277 | -56.80 | -13 | -43.80 | Pass | V |
| 3535.30 | 145 | 330 | -51.61 | -13 | -38.61 | Pass | V |
| 3837.89 | 149 | 205 | -47.19 | -13 | -34.19 | Pass | V |
| 5874.63 | 153 | 83 | -48.22 | -13 | -35.22 | Pass | V |
| 6632.33 | 146 | 217 | -47.41 | -13 | -34.41 | Pass | V |

Note:

1)Scan from 9kHz to 25GHz, the disturbance above 13GHz and below 1GHz are attenuated more than 20 dB below the applicable limit and not required to be reported, the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.

2)Tested with all kind of bandwidth,RB Size and RB Offset, Found the 1.4MHz with full RB were the worst case; and then Only the worst case is recorded in the report.

# 12. FREQUENCY STABILITY

## 12.1 Standard Applicable

According to §22.355, §24.235, §27.54 the limit is 2.5ppm.

## 12.2 Test Procedure

According to §2.1055, the following test procedure was performed.
The Frequency Stability is measured directly with a Frequency Domain Analyzer. Frequency Deviation in ppm is calculated from the measured peak to peak value.
The Carrier Frequency Stability over Power Supply Voltage and over Temperature is measured with a
Frequency Domain Analyzer in histogram mode

## 12.3 Summary of Test Results/Plots

Note: 1.Normal Voltage NV=DC12.0V; Low Voltage LV=DC10.8V; High Voltage HV=DC13.2V
Please refer to Appendix F: Frequency Stability
Test result: Pass

※※※※※ END OF REPORT ※※※※※