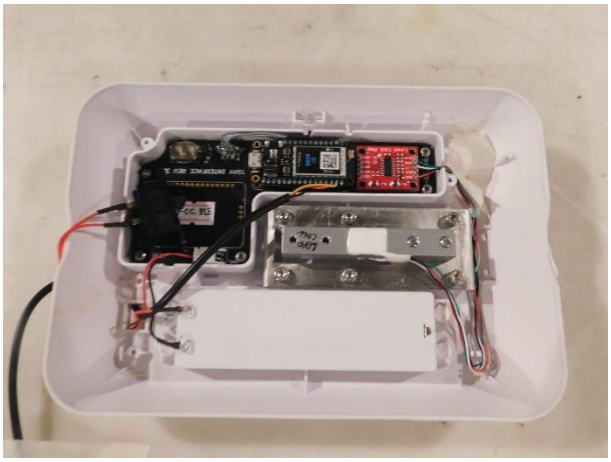
| | | | | |
|---|---|---|---|---|
| **Prüfbericht-Nr.:** *Test report no.:* | ULR-TC568821300000030F | **Auftrags-Nr.:** *Order no.*: | 166542461 0010 | Seite 1 von 38 *Page 1 of 38* |
| **Kunden-Referenz-Nr.:** *Client reference no.:* | NA | **Auftragsdatum:** *Order date:* | 2021-03-31 | |
| **Auftraggeber:** *Client:* | The Procter & Gamble Company<br>1 P&G Plaza Cincinnati, OH 45202 | | | |
| **Prüfgegenstand:** *Test item:* | Tide Smart Tray | | | |
| **Bezeichnung .:** *Identification .:* | 3995 | **Serien -Nr.:** *Serial no.:* | 104 | |
| **Auftrags-Inhalt:** *Order content*: | Testing & Issue of Grant Certificate | | | |
| **Prüfgrundlage:** *Test specification:* | FCC Part 2, Part 22H, Part 24E, Part 27 | | | |
| **Wareneingangsdatum:** *Date of sample receipt:* | 2021-04-16 | | | |
| **Prüfmuster-Nr.:** *Test sample no:* | A003035526-001 | | | |
| **Prüfzeitraum:** *Testing period:* | 2021-04-24 - 2021-05-03 | | | |
| **Ort der Prüfung:** *Place of testing:* | Wireless Test Laboratory | | | |
| **Prüflaboratorium:** *Testing laboratory:* | TÜV Rheinland (India) Pvt. Ltd,<br>#27/B, 2nd Cross Road,<br>Electronic City Phase-1,<br>Bengaluru-560100, India.<br>FCC Test site registration number: 496599 | | | |
| **Prüfergebnis*:** *Test result*:* | Pass | | | |



| | | | |
|---|---|---|---|
| **geprüft von:** *tested by:* | | **genehmigt von:** *authorized by:* | |
| **Datum:** *Date:* 2021-04-19 | | **Ausstellatum:** *Issue date:* 2021-06-17 | |
| **Stellung** / *Position:* | M.V.Naveen Kumar<br>Engineer | **Stellung** / *Position:* | Mahammadgouse Kaladagi<br>Assistant Manager |
| **Sonstiges** / *Other:* | FCC ID: 2AG9A921101 | | |

**Zustand des Prüfgegenstandes bei Anlieferung:** **Prüfmuster vollständig und unbeschädigt**
*Condition of the test item at delivery:* ***Test item complete and undamaged***

| | | | | | |
|---|---|---|---|---|---|
| * Legende: | 1 = sehr gut | 2 = gut | 3 = befriedigend | 4 = ausreichend | 5 = mangelhaft |
| | P(ass) = entspricht o.g. Prüfgrundlage(n) | | F(ail) = entspricht nicht o.g. Prüfgrundlage(n) | N/A = nicht anwendbar | N/T = nicht getestet |
| ** Legend:* | *1 = very good* | *2 = good* | *3 = satisfactory* | *4 = sufficient* | *5 = poor* |
| | *P(ass) = passed a.m. test specification(s)* | | *F(ail) = failed a.m. test specification(s)* | *N/A = not applicable* | *N/T = not tested* |

# TEST SUMMARY

| Test Item | FCC Clause | Results |
|---|---|---|
| Conducted Output Average Power and Peak to Average Power Ratio | § 2.1046<br>§ 24.232<br>§ 27.50 | Pass |
| Equivalent Isotropic Radaiated power (EIRP) / Effective Radaited Power(dBm) | § 22.913<br>§ 24.232<br>§ 27.50 | Pass |
| Field strength of spurious radiation | § 2.1053<br>§ 22.917<br>§ 24.238<br>§ 27.53 | Pass |
| Frequency Stability | § 2.1055<br>§ 22.355<br>§ 24.235<br>§ 27.54 | N/T |
| Emission Babwidth and Occupied Bandwidth | § 2.1049 | N/T |
| Band Edge | § 22.917<br>§ 24.238<br>§ 27.53 | N/T |
| Conducted Spurious Emissions | § 2.1051<br>§ 22.917<br>§ 24.238<br>§ 27.53 | N/T |
| Conducted Emission | § 15.207 | N/A |

**Note**:

1. N/T: Not Tested
2. N/A: Not Applicable
3. The product **Tide Smart Tray** uses pre-certified RF module with FCC ID: 2AEMI-BRN402; hence the above mentioned test cases are excluded and which can be found in the module test report of respective FCC Id

Product Category: Electronics Testing
Test Discipline: EMC Test Facility

# REVISION HISTORY OF THIS REPORT

| Report Number | Version | Description | Issue date |
|---|---|---|---|
| ULR-TC568821300000030F | 01 | Issue of test report | 2021-06-11 |
| ULR-TC568821300000030F | 02 | Updated Reviewer Comments | 2021-06-17 |

# Table of Contents

# 1 GENERAL REMARKS

## 1.1 Attachments

All attachments are part of this test report and are issued in separate document

**1:** TEST SETUP PHOTOS

**2:** EUT EXTERNAL PHOTOS

**3:** EUT INTERNAL PHOTOS

**4:** FCC LABEL AND LABEL LOCATION

**5:** BLOCK DIAGRAM

**6:** SPECIFICATION OF EUT

**7**: SCHEMATIC DIAGRAM

**8**: BILL OF MATERIAL

**9**: USER MANUAL

**10**: MAXIMUM PERMISSIBLE EXPOSURE INFORMATION

# 2 TEST SITES

## 2.1 Testing Facilities

1. TÜV Rheinland (India) Pvt.Ltd.,
   27/B, 2nd Cross,
   ElectronicCityPhase1
   Bangalore – 560 100,
   India

   Radiated Measurement site type :
   Fully anechoic chamber (used for above 1 GHz measurements)

2. TUV Rheinland (India) Pvt.Ltd.,
   108 , Beside ISBR Business School,
   Electronic city Phase I
   Bangalore - 560 100.
   India

   Radiated Measurement site type :
   Semi anechoic chamber (used for below 1 GHz measurements)

## 2.2 List of Test and Measurement Instruments

**Table 1: List of test and measurement instruments**

| Equipment | Manufacturer | Model Name | Serial Number | Firmware Versions | Calibration Due Date | Periodicity | Test Facility |
|---|---|---|---|---|---|---|---|
| EMI Receiver | Rohde & Schwarz | ESU 40 | 100288 | 4.43 SP3 | 09.06.2021 | Yearly | Radiated measurements |
| EMI Receiver | Rohde & Schwarz | ESW 44 | 101773 | 1.72.SP1 | 27.01.2022 | Yearly | |
| Active loop antenna | Frankonia | LAX-10 | LAX-10-800 | - | 27.02.2022 | Yearly | |
| Baloon and Biconical Antenna | Schwarzbeck mess-elektronik | VHBB-9124 / BBA-9106 | 01028 | - | 02.09.2021 | Yearly | |
| Log Periodic Antenna | Schwarzbeck mess-elektronik | VUSLP-9111B | 9111B-111 | - | 31.08.2021 | Yearly | |
| Horn Antenna | Frankonia | HAX-18 | 802 | - | 01.03.2022 | Yearly | |
| Horn Antenna | ETS | 116706 | 00107323 | - | 02.03.2022 | Yearly | |
| Semi Anechoic Chamber | Frankonia | - | - | - | - | - | |
| Fully Anechoic Chamber | Albatross | - | - | - | - | - | |
| Power Splitter | Mini Circuits | ZN4PD1-63HP-S+ | SF015301638 | - | 01.10.2021 | Yearly | Antenna - Port Measurements |
| 30dB Attenuator | Mini Circuits | BW-N30W5+ | | - | 01.10.2021 | Yearly | |
| USB Wideband Power Sensor | Boonton | 55006 | 10231 | - | 09.01.2022 | Yearly | |
| Wideband Radio Communication Tester | Rohde & Schwarz | CMW500 | 158345 | - | 04.07.2021 | Yearly | |

**Table 2: Instrument application Software versions**

| SL. No. | Test Type | Application software | Version |
|---|---|---|---|
| 1 | Radiated spurious emission measurement in SAC | EMC 32 | 10.60.00 |
| 2 | Radiated spurious emission measurement in FAC | EMC 32 | 10.60.00 |

# 3 GENERAL PRODUCT INFORMATION

## 3.1 Product Function and Intended Use

Proxime Smart Tray is a battery powered, single product auto-replenishment tray, which can connect to internet via cellular. It has Bluetooth capability which is used for calibration.

User experience: User puts a bottle of Tide on the tray. As the bottle is used, the weight reduces. When it gets to a critical level, it automatically triggers an e-Commerce purchase, which ships a replacement bottle to the consumer

## 3.2 Ratings and System Details of Equipment under Test

**Table 3: Ratings and System Details as declared by Client***

| | | | |
|---|---|---|---|
| **Operating Radio Protocol** | **LTE CAT M1** | | |
| **Operating Frequency Bands** | Band | UL Frequency (MHz) | DL Frequency (MHz) |
| | 2 | UL 1850MHz to 1910MHz | 1930.7MHz to 1989.3MHz |
| | 4 | UL 1710MHz to 1755MHz | 2110.7MHz to 2154.3MHz |
| | 5 | UL 824MHz to 849MHz | 869.7MHz to 893.3MHz |
| | 12 | UL 699MHz to 716MHz | 729MHz to 746MHz |
| **Cellular Bandwidth** | 1.4 MHz | | |
| **Modulation** | QPSK & 16QAM | | |
| **Power class** | Power Class 3: 23 dBm | | |
| **Number of antennas** | 1 | | |
| **Antenna gain & antenna type** | PCB Antenna (Taoglas) 698 to 3000 MHz, Gain: 5.00 | | |
| **Operating voltage range** | 4.8 to 6.4 Volts DC | | |
| **Environmental conditions** | Storage | | -30°C to 75° C |
| | Operating | | 10°C to 40° C |
| **Dimensions (LxWxH)** | 228.6 mm x 160 mm x 49.4 mm | | |

***Disclaimer:**
The information/data is supplied by the client and the same is considered to arrive at the final value.
Any changes made apart from the specified specification, can directly impact on the tests results. Refer the products user manual for more details.

## 3.3 Measurement Uncertainty:

Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of *k* = 2

**Table 4: Measurement Uncertainty**

| Parameter | Uncertainty |
|---|---|
| RF output power, conducted | ±0.51 dB |
| Power Spectral Density, conducted | ±0.85 dB |
| Unwanted Emissions, conducted | ±2.58 dB |
| SAC, radiated measurement | ±3.67 dB |
| FAC, radiated measurement | ±4.95 dB |
| Temperature | ±3 ℃ |
| Supply Voltages | ±3 % |
| Time | ±5 % |

**Note:** The Listed Measurement Uncertainties are the worst-case uncertainty, for the respective test cases. Above Table is for reporting purpose only and not used in determining Final Pass/Fail verdict.

# 4 TEST SET-UP AND OPERATION MODE

## 4.1 Principle of Configuration Selection

Transmission was enabled with the help of CMW 500 on low, middle & high channels for LTE as mentioned in below table 6

## 4.2 Operation and Software of the EUT

| | | |
|---|---|---|
| EUT Firmware name (FVIN) | : | Cellular_logs.bin |
| EUT Firmware version | : | NA |
| Hardware Name(HVIN) | : | TRAY INTERFACE |
| Hardware Version | : | REV 3.0 |

## 4.3 Test modes – data rates and modulations

- None

## 4.4 Special Accessories and Auxiliary Equipment

- None

## 4.5 Countermeasures to achieve EMC Compliance

- None

## 4.6 Report Reference

**Note:** Product Tide Smart Tray has supports multiple protocols. All the supported wireless protocols and their respective test results are issued in separate test reports.

| SL No: | RF Protocol | Report Name |
|---|---|---|
| **1** | **LTE** | **ULR-TC568821300000030F** |
| 2 | BLE | ULR-TC568821300000029F |

## 4.7 Simultaneous Operation

Product does not supports the simultaneous operation which means either one of the radio will work

**Table 5: TUV Sample identification details**

| **Samples used for Testing** | **S/N Number** |
|---|---|
| Antenna port measurement | A003035526-001 |
| Radiated mode test | |

**Table 6: Mode of Operation**

| LTE CAT M1 Band 2 | | | LTE CAT M1Band 4 | | |
|---|---|---|---|---|---|
| Channel Bandwidth | 1.4MHz | | Channel Bandwidth | 1.4MHz | |
| | Channel | Frequency (MHz) | | Channel | Frequency (MHz) |
| Low Channel | 18607 | 1850.7 | Low Channel | 19957 | 1710.7 |
| Mid Channel | 18900 | 1880.0 | Mid Channel | 20175 | 1732.5 |
| High Channel | 19913 | 1909.2 | High Channel | 20393 | 1754.2 |

| LTE CAT M1 Band 5 | | | LTE CAT M1Band 12 | | |
|---|---|---|---|---|---|
| Channel Bandwidth | 1.4MHz | | Channel Bandwidth | 1.4MHz | |
| | Channel | Frequency (MHz) | | Channel | Frequency (MHz) |
| Low Channel | 20407 | 824.7 | Low Channel | 23017 | 699.7 |
| Mid Channel | 20528 | 836.8 | Mid Channel | 23095 | 707.5 |
| High Channel | 20642 | 848.2 | High Channel | 23173 | 715.2 |

Note: As the device Tide Smart Tray does not support Band 13, hence it's not been tested; customer has declared that LTE Band 13 is disabled with Software, which was originally supported by LTE module;

# 5 Operational Description of the product

Tide Smart Tray is a battery powered, single product auto-replenishment tray, which can connect to internet via cellular. It is calibrated using Bluetooth before being sent to consumer.

Tide Smart Tray can be made ON using a Power Switch at the bottom. After Power On Consumer puts a bottle of Tide on the Tray. For the first two hours, Tray records/stores the Tide bottle weight every 30 mins and after two hours it records/stores Tide bottle weight every one hour. After every 12 hours, it connects to internet using Cellular and transfer 12 hour weight measurement data to cloud. As the bottle is used, the weight reduces. When it gets to a critical level, it automatically triggers an e-commerce purchase, which ships a replacement bottle to the consumer.

# 6 Block Diagram of the product

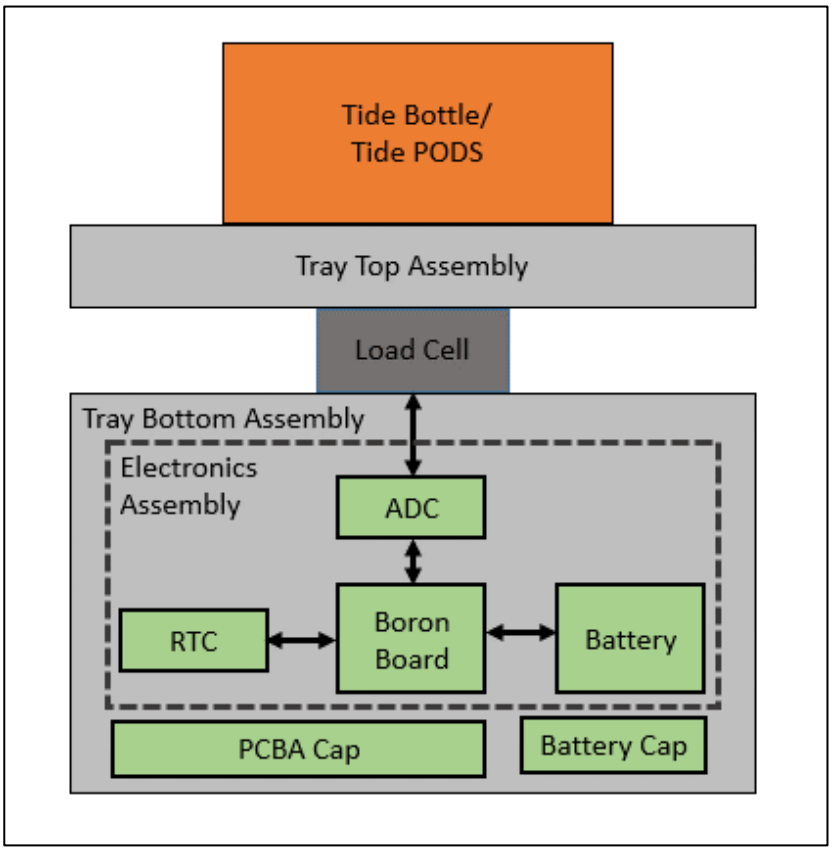
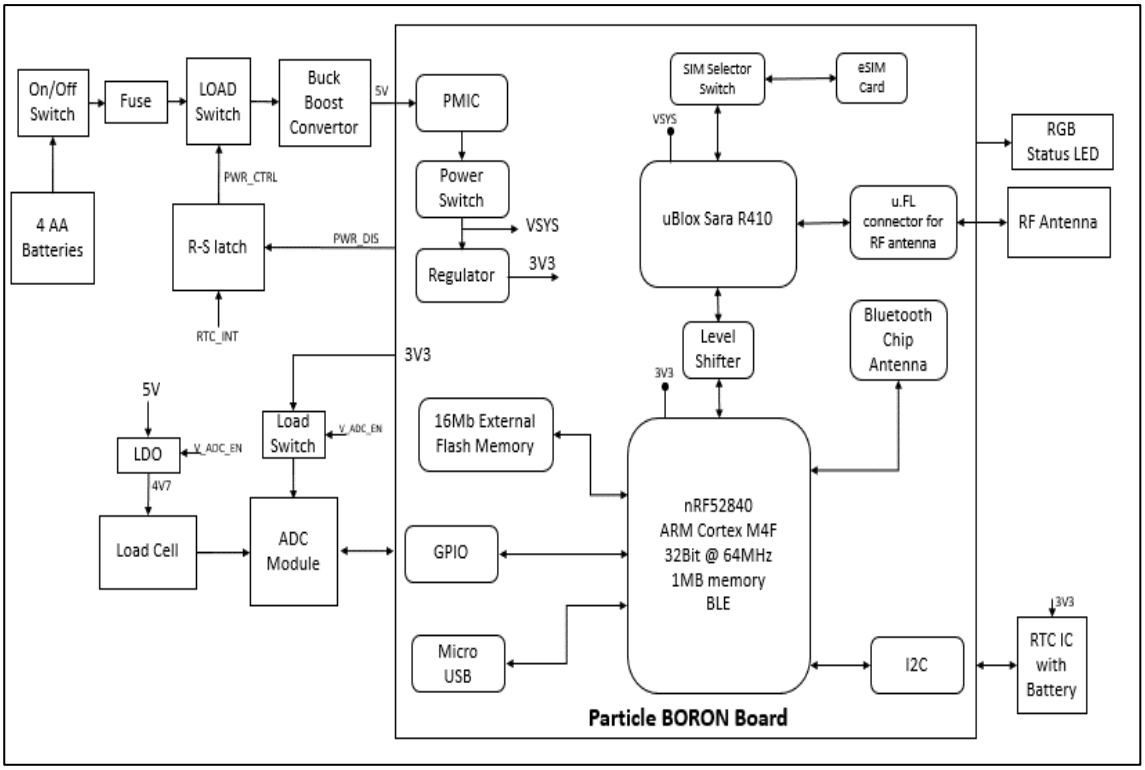



Figure 1: System Architecture


On/Off Switch
Fuse
LOAD Switch
Buck Boost Convertor
5V
PMIC
SIM Selector Switch
eSIM Card
RGB Status LED
VSYS
4 AA Batteries
PWR_CTRL
R-S latch
PWR_DIS
Power Switch
VSYS
Regulator
3V3
uBlox Sara R410
u.FL connector for RF antenna
RF Antenna
RTC_INT
3V3
Level Shifter
Bluetooth Chip Antenna
5V
LDO
V_ADC_EN
Load Switch
V_ADC_EN
16Mb External Flash Memory
3V3
4V7
Load Cell
ADC Module
GPIO
nRF52840
ARM Cortex M4F
32Bit @ 64MHz
1MB memory
BLE
Micro USB
I2C
3V3
RTC IC with Battery
Particle BORON Board

# 7 TEST METHODOLOGY

## 7.1 Radiated Emission Test

**Frequency Range 9 kHz - 30 MHz**

**Test performed as per ANSI C63.4-2014 section 8.3**

The loop Antenna was placed at 1m above the ground plane & EUT is 3 meters far from the measuring antenna. With 3m measurement distance, correction data were applied to the measured results. The test arrangement, measuring antenna guidelines and operational configurations in 8.2.1 and 8.2.2, shall be followed. The measurement antenna shall be positioned with its plane perpendicular to the ground at the Specified distance, when perpendicular to the ground plane, the lowest height of the magnetic antenna shall be 1 m above the ground and shall be positioned at the specified distance from the EUT. EUT & its associates are placed on non-conducting table of 0.8m height which is placed on the turn table, For each measurement antenna alignment, the EUT shall be rotated through 0° to 360° on a turntable. The report shall list worst case emission results, for each of the parallel & perpendicular orientations.

### 7.1.1 Test Setup Configuration

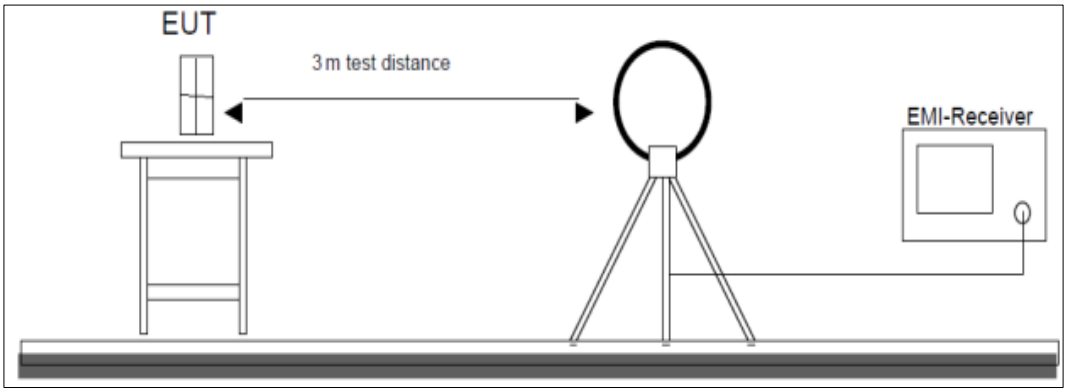



**Figure 1: Frequency Range 9 kHz- 30 MHz**

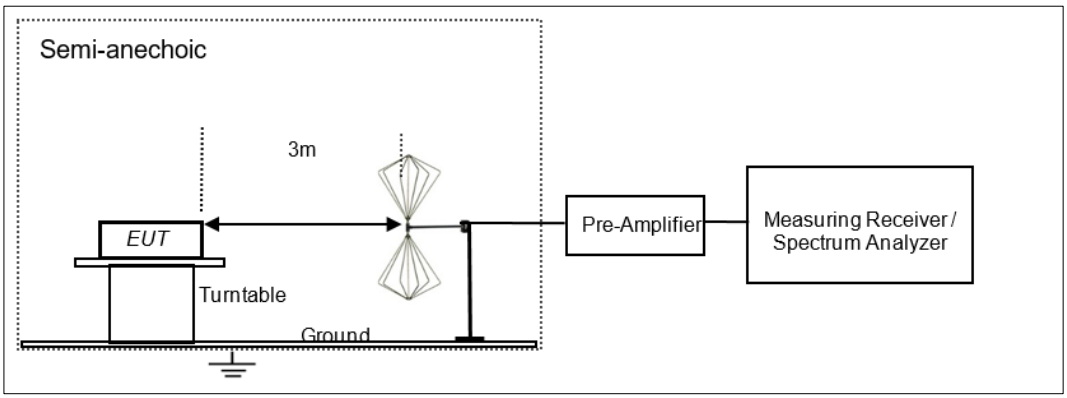



**Figure 2: Frequency Range 30 MHz – 200 MHz**

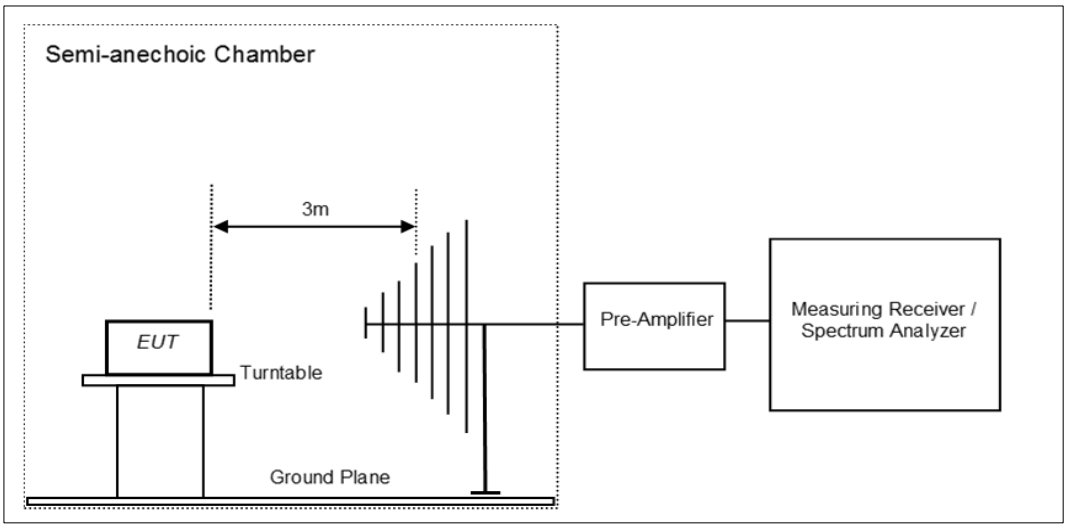



**Figure 3: Frequency Range 200 MHz - 1GHz**

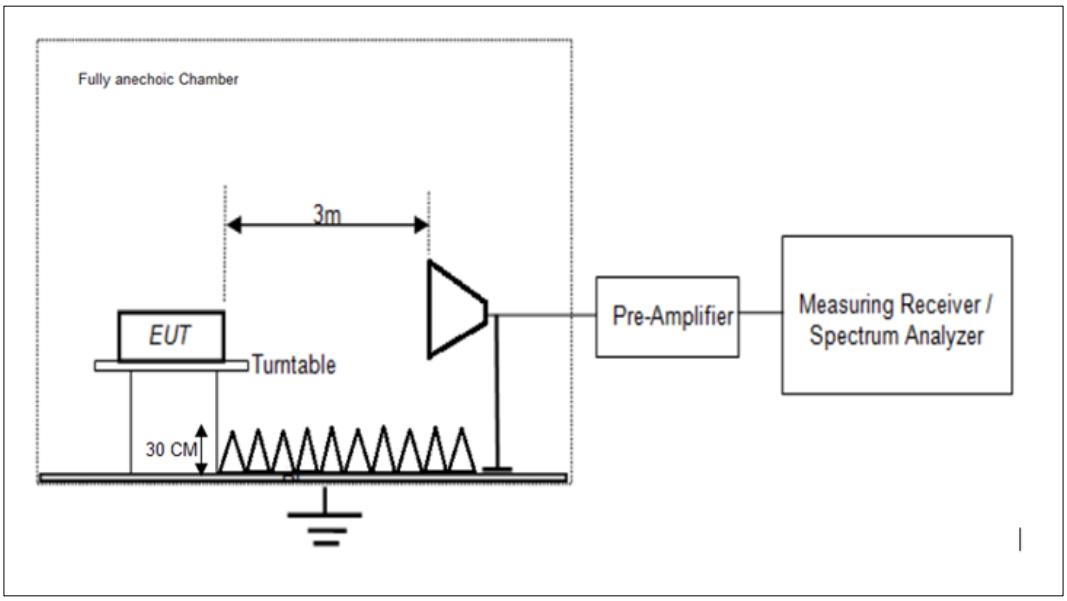



**Figure 4: Frequency Range above 1 GHz**

## Frequency Range 30MHz to 10th harmonics of the highest fundamental frequency

**Test performed as per ANSI C63.26-2015**

ERP/EIRP Radiated Power & Radiated spurious emission test are performed as below.

All the radiated emission measurements are performed in accordance with common requirement specified in 5.5.2 and Pre-test site path loss correction factors are used to adjust the EUT emission data in place of two step substitution method (as defined in Annex B of ANSI C63.26-2015).

The equipment under test is placed on non-conductive table at 3m away from the receive antenna in accordance with above mentioned standard. Turn table is rotated through 360 degree, and receiver antenna height is varied in order to determine the level of maximum emission. The maximum emission level and position of the maximized emission is recorded with use of spectrum analyzer.

**Using pre-test site path loss to determine EUT emission power:**

1) EUT emission powers are calculated using the following equation:

**Emission Power = $EUT_{Prec}$ [dBm EIRP] + $P_L$ [dB]**

where

$EUT_{Prec}$ = power of the emission measured at the test receiver during EUT measurements.

$P_L$ = path loss determined on the frequency of the EUT emission or calculated using linear interpolation between site characterization frequencies.

2) This is the level to be compared against the regulatory limit as it is the emission power referenced back to the EUT on the test site.

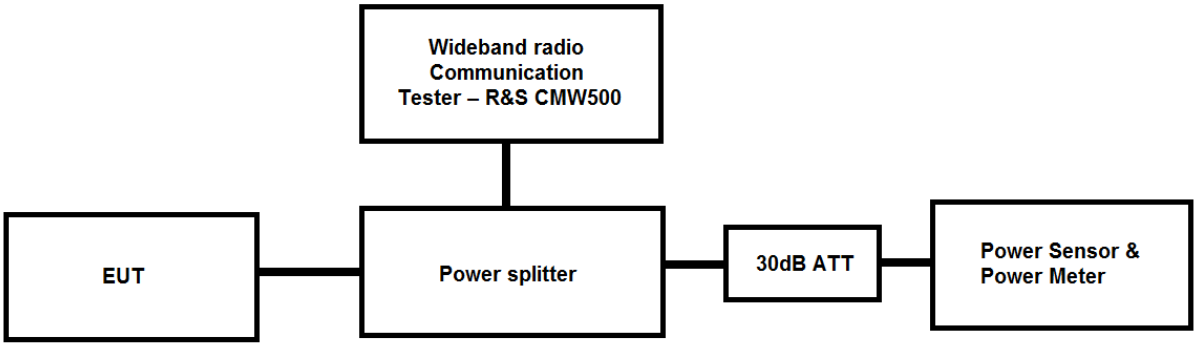
# 8 TEST RESULTS

## 8.1 Conducted Output Average Power

***Result*** ***Pass***

| | |
|---|---|
| Test Specification | FCC Part §2.1046 , §24.232, §27.50 |
| Test Method / Procedure | ANSI C63.26-2015<br>971168 D01 Power Meas License Digital Systems v03r01 |
| Measurement Bandwidth(RBW) | ≥ OBW |
| Detector function | Peak / Average |
| Requirement | NA |

**Test Setup:**




**Environmental conditions:**

Temperature (Norm) = + 22.3 °C Voltage = 6 Volts DC (4 AA Batteries - 1.5 Volts each)

Relative humidity = 62 %

**KDB Guidelines applied:**

Measurements were made as per section 5.1.3 section 5.2.4 and section 5.7.3 in KDB 971168 D01 Power Meas License Digital Systems v03r01.

**Test results:**

**Note:**

1. All the losses are included during measurement and final values are mentioned in the test report.
2. Total Average Output power (dBm) = Measured Average power (dBm) + Attenuator factor (30dB) + Power Splitter (6 dB) + Cable loss (1dB)
3. ERP,EIRP = $P_T$(Total Average Output power in dBm) + $G_T$(Gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP))
4. $G_T$ (dBd) = $G_T$ (dBi)− dB

**Table 7: Conducted Power Results**

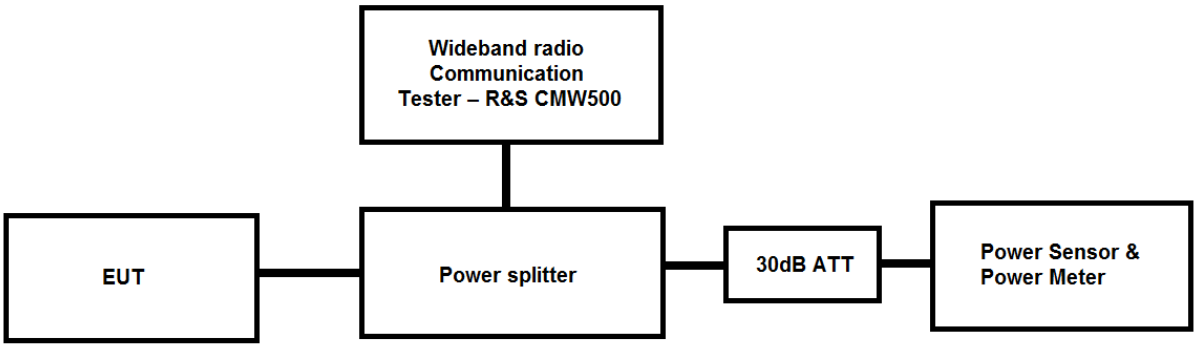
| Band | Modulation | Bandwidth (MHz) | RB Size / RB Offset | Channel No | Channel Frequency (MHz) | Measured Peak Power (dBm) | Measured Average Power (dBm) |
|---|---|---|---|---|---|---|---|
| 2 | QPSK | 1.4 | 6/0 | 18607 | 1850.7 | **23.2** | 17.64 |
| | | | | 18900 | 1880 | 23.2 | 17.73 |
| | | | | 19193 | 1909.2 | 22.91 | 17.1 |
| | 16QAM | | | 18607 | 1850.7 | 23.5 | 17.62 |
| | | | | 18900 | 1880 | 23.74 | 17.67 |
| | | | | 19193 | 1909.2 | **23.76** | 17.03 |
| 4 | QPSK | 1.4 | | 19957 | 1710.7 | 23.34 | 17.93 |
| | | | | 20175 | 1732.5 | **23.54** | 18.04 |
| | | | | 20393 | 1754.3 | 22.66 | 17.78 |
| | 16QAM | | | 19957 | 1710.7 | **24.12** | 17.99 |
| | | | | 20175 | 1732.5 | 23.95 | 18.02 |
| | | | | 20393 | 1754.3 | 23.43 | 17.84 |
| 5 | QPSK | 1.4 | | 20407 | 824.7 | 25.31 | 18.93 |
| | | | | 20528 | 836.8 | **25.61** | 19.08 |
| | | | | 20642 | 848.2 | 25.54 | 19.08 |
| | 16QAM | | | 20407 | 824.7 | 25.35 | 18.97 |
| | | | | 20528 | 836.8 | **25.5** | 19.13 |
| | | | | 20642 | 848.2 | 25.5 | 19.06 |
| 12 | QPSK | 1.4 | | 23017 | 699.7 | 25.95 | 19.6 |
| | | | | 23095 | 707.5 | **26.21** | 19.5 |
| | | | | 23173 | 715.3 | 26.06 | 19.59 |
| | 16QAM | | | 23017 | 699.7 | 25.88 | 19.65 |
| | | | | 23095 | 707.5 | **26.09** | 19.63 |
| | | | | 23173 | 715.2 | 26.03 | 19.58 |

## 8.2 Peak to Average Power Ratio (PAPR)

***Result*** ***Pass***

| | |
|---|---|
| Test Specification | FCC Part §2.1046 , §24.232, §27.50 |
| Test Method / Procedure | ANSI C63.26-2015<br>971168 D01 Power Meas License Digital Systems v03r01 |
| Measurement Bandwidth(RBW) | ≥ OBW |
| Detector function | Peak / Average |
| Requirement | PAPR ≤ 13dB |

**Test Setup:**




**Environmental conditions:**

Temperature (Norm) = + 22.3 °C Voltage = 6 Volts DC (4 AA Batteries - 1.5 Volts each)

Relative humidity = 62 %

**KDB Guidelines applied:**

Measurements were made as per section 5.1.3 in KDB 971168 D01 Power Meas License Digital Systems v03r01.

**Test results:**

**Note:**

1. All the losses are included during measurement and final values are mentioned in the test report.
2. Total Average Output power (dBm) = Measured Average power (dBm) + Attenuator factor (30dB) + Power Splitter (6 dB) + Cable loss (1dB)
3. PAPR (dB) = Measured Peak Power(dBm) – Measured Average Power(dBm)
4. Added a Duty correction factor to a measured average value
5. Duty correction factor(dB) = 10*log(1/D) where D is duty cycle, this factor is added to the measured results and final readings are reported in the below table

**Table 8: PAPR of test Results**

| Band | Modulation | Bandwidth (MHz) | RB Size / RB Offset | Channel No | Channel Frequency (MHz) | Measured Peak Power (dBm) | Measured Averge power (dBm) | PAPR |
|---|---|---|---|---|---|---|---|---|
| 2 | QPSK | 1.4 | 6/0 | 18607 | 1850.7 | 23.2 | 17.64 | 5.56 |
| | | | | 18900 | 1880.0 | 23.2 | 17.73 | 5.47 |
| | | | | 19193 | 1909.2 | 22.91 | 17.1 | 5.81 |
| | 16QAM | | | 18607 | 1850.7 | 23.5 | 17.62 | 5.88 |
| | | | | 18900 | 1880.0 | 23.74 | 17.67 | 6.07 |
| | | | | 19193 | 1909.2 | 23.76 | 17.03 | 6.73 |
| 4 | QPSK | 1.4 | 6/0 | 19957 | 1710.7 | 23.34 | 17.93 | 5.41 |
| | | | | 20175 | 1732.5 | 23.54 | 18.04 | 5.5 |
| | | | | 20393 | 1754.3 | 22.66 | 17.78 | 4.88 |
| | 16QAM | | | 19957 | 1710.7 | 24.12 | 17.99 | 6.13 |
| | | | | 20175 | 1732.5 | 23.95 | 18.02 | 5.93 |
| | | | | 20393 | 1754.3 | 23.43 | 17.84 | 5.59 |
| 5 | QPSK | 1.4 | 6/0 | 20407 | 824.7 | 25.31 | 18.93 | 6.38 |
| | | | | 20528 | 836.8 | 25.61 | 19.08 | 6.53 |
| | | | | 20642 | 848.2 | 25.54 | 19.08 | 6.46 |
| | 16QAM | | | 20407 | 824.7 | 25.35 | 18.97 | 6.38 |
| | | | | 20528 | 836.8 | 25.5 | 19.13 | 6.37 |
| | | | | 20642 | 848.2 | 25.5 | 19.06 | 6.44 |
| 12 | QPSK | 1.4 | 6/0 | 23017 | 699.7 | 25.95 | 19.6 | 6.35 |
| | | | | 23095 | 707.5 | 26.21 | 19.5 | 6.71 |
| | | | | 23173 | 715.3 | 26.06 | 19.59 | 6.47 |
| | 16QAM | | | 23017 | 699.7 | 25.88 | 19.65 | 6.23 |
| | | | | 23095 | 707.5 | 26.09 | 19.63 | 6.46 |
| | | | | 23173 | 715.2 | 26.03 | 19.58 | 6.45 |

## 8.3 Equivalent Isotropic Radiated Power (EIRP) / Effective Radiated Power (ERP)

***Result*** ***Pass***

| | |
|---|---|
| Test Specification | FCC Part §22.913 , §24.232, §27.50 |
| Test Method / Procedure | ANSI C63.26-2015<br>971168 D01 Power Meas License Digital Systems v03r01 |
| Measurement Bandwidth(RBW) | 100 kHz for Frequency range of < 1GHz<br>1 MHz for Frequency range of > 1GHz |
| Detector function | Peak |
| Measurement Distance | 3m |
| Requirement | As per the limits mensioned in the below table |
| Test Setup | Refer TEST METHODOLOGY |

| **FCC Clause** | **Requirements** |
|---|---|
| FCC Part 27 | The EIRP of mobile transmitter and auxiliary test transmitters must not exceed 1 Watts |
| FCC Part 27.50(b)(9) | Control station and mobile stations transmitting in the 746-757 MHz, and 776-788 MHz bands are limited to 30 watts ERP |
| FCC Part 27.50(c)(9) | Control station and mobile stations in the 698-746MHz band are limited to 30 watts ERP |
| FCC Part 27.50(c)(10) | Portable stations in the 698-746MHz band are limited to 3 watts ERP |
| FCC Part 22.913(a)(2) | The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts |
| FCC 24.232(b) | The EIRP of mobile transmitters and auxiliary test transmitters must not exceed 2 watts |

**Environmental conditions:**

Temperature (Norm) = + 24 °C Voltage = 6 Volts DC (4 AA Batteries - 1.5 Volts each)

Relative humidity = 62 %

**KDB Guidelines applied :**

All the radiated emission measurements are performed in accordance with common requirement specified in 5.5.2 and Pre-test site path loss correction factors are used to adjust the EUT emission data in place of two step substitution method as defined in Annex B of ANSI C63.26-2015

## Test results:

Note: All the losses are included during measurement and final values are mentioned in the test report. Refer TEST METHODOLOGY for more details

This product only support full RB at 1.4 MHz and does not support reduced RBs and RB positions, also does not support other bandwidths hence measurement is performed for 1.4MHz BW (full RB)

**Table 9: ERP/EIRP Test results**

| **LTE Band 2** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Modulation** | **Bandwidth** | **Frequency (MHz)** | **Channel** | **RB Size / RB Offset** | **Polarization** | **EIRP (dBm)** | **Limit (dBm)** |
| QPSK | 1.4 | 1850.7 | 18607 | 6/0 | Vertical | 17.76 | 33 |
| | | | | | Horizontal | 20.97 | 33 |
| | | 1880 | 18900 | 6/0 | Vertical | 16.42 | 33 |
| | | | | | Horizontal | 21.9 | 33 |
| | | 1909.2 | 19192 | 6/0 | Vertical | 15.19 | 33 |
| | | | | | Horizontal | 24.43 | 33 |
| 16QAM | 1.4 | 1850.7 | 18607 | 6/0 | Vertical | 14.75 | 33 |
| | | | | | Horizontal | 18.12 | 33 |
| | | 1880 | 18900 | 6/0 | Vertical | 13.13 | 33 |
| | | | | | Horizontal | 19.23 | 33 |
| | | 1909.2 | 19192 | 6/0 | Vertical | 14.32 | 33 |
| | | | | | Horizontal | 21.22 | 33 |

| **LTE Band 4** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Modulation** | **Bandwidth** | **Frequency (MHz)** | **Channel** | **RB Size / RB Offset** | **Polarization** | **EIRP (dBm)** | **Limit (dBm)** |
| QPSK | 1.4 | 1710.7 | 19957 | 6/0 | Vertical | 17.11 | 30 |
| | | | | | Horizontal | 20.5 | 30 |
| | | 1732.5 | 20175 | 6/0 | Vertical | 18.45 | 30 |
| | | | | | Horizontal | 20.84 | 30 |
| | | 1754.2 | 20392 | 6/0 | Vertical | 18.8 | 30 |
| | | | | | Horizontal | 20.73 | 30 |
| 16QAM | 1.4 | 1710.7 | 19957 | 6/0 | Vertical | 14.22 | 30 |
| | | | | | Horizontal | 18.21 | 30 |
| | | 1732.5 | 20175 | 6/0 | Vertical | 17.19 | 30 |
| | | | | | Horizontal | 18.23 | 30 |
| | | 1754.2 | 20392 | 6/0 | Vertical | 18.21 | 30 |
| | | | | | Horizontal | 19.27 | 30 |

| **LTE Band 5** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Modulation** | **Bandwidth** | **Frequency (MHz)** | **Channel** | **RB Size / RB Offset** | **Polarization** | **ERP (dBm)** | **Limit (dBm)** |
| QPSK | 1.4 | 824.7 | 20407 | 6/0 | Vertical | 15.45 | 38.45 |
| | | | | | Horizontal | 22.11 | 38.45 |
| | | 836.8 | 20528 | 6/0 | Vertical | 16.84 | 38.45 |
| | | | | | Horizontal | 22.22 | 38.45 |
| | | 848.2 | 20642 | 6/0 | Vertical | 17.4 | 38.45 |
| | | | | | Horizontal | 23.49 | 38.45 |
| 16QAM | 1.4 | 824.7 | 20407 | 6/0 | Vertical | 14.21 | 38.45 |
| | | | | | Horizontal | 21.45 | 38.45 |
| | | 836.8 | 20528 | 6/0 | Vertical | 15.23 | 38.45 |
| | | | | | Horizontal | 22.1 | 38.45 |
| | | 848.2 | 20642 | 6/0 | Vertical | 17.1 | 38.45 |
| | | | | | Horizontal | 20.98 | 38.45 |

| **Modulation** | **Bandwidth** | **Frequency (MHz)** | **Channel** | **RB Size / RB Offset** | **Polarization** | **ERP (dBm)** | **Limit (dBm)** |
|---|---|---|---|---|---|---|---|
| QPSK | 1.4 MHz | 699.7 | 23017 | 6/0 | Vertical | 12.2 | 44.77 |
| | | | | | Horizontal | 22.67 | 44.77 |
| | | 707.8 | 23098 | 6/0 | Vertical | 12.81 | 44.77 |
| | | | | | Horizontal | 19.54 | 44.77 |
| | | 715.2 | 23172 | 6/0 | Vertical | 13.63 | 44.77 |
| | | | | | Horizontal | 23.19 | 44.77 |
| QPSK | 1.4 MHz | 699.7 | 23017 | 6/0 | Vertical | 11.98 | 44.77 |
| | | | | | Horizontal | 21.56 | 44.77 |
| | | 707.8 | 23098 | 6/0 | Vertical | 11.19 | 44.77 |
| | | | | | Horizontal | 20.25 | 44.77 |
| | | 715.2 | 23172 | 6/0 | Vertical | 12.76 | 44.77 |
| | | | | | Horizontal | 21.22 | 44.77 |

## 8.4 Field Strength of Spurious Radiation

| ***Result*** | ***Pass*** |
|---|---|
| Specification | FCC Part §2.1053, §22.917 (a), §24.238(a)(b), §27.53 (g) |
| Test Method / Procedure | ANSI C63.26-2015 |
| Measurement Bandwidth (RBW) | 100 kHz for frequency range < 1GHz<br>1 MHz for Frequency range >1GHz |
| Detector Function | Peak |
| Measuring Distance | 3 m |
| Requirement | The power of any emission outside the authorized frequency range must be attenuated below the transmitting power (P) by a factor of atleast 43+10log(P) dB |
| Test setup | Refer TEST METHODOLOGY |

**Environmental conditions:**

Temperature (Norm) = + 24 °C  Voltage = 6 Volts DC (4 AA Batteries - 1.5 Volts each)

Relative humidity = 62 %

**KDB Guidelines applied :**

All the radiated emission measurements are performed in accordance with common requirement specified in 7 971168 D01 Power Meas License Digital Systems v03r01 and Pre-test site path loss correction factors are used to adjust the EUT emission data in place of two step substitution method (as defined in Annex B of ANSI C63.26-2015)

## Test results:

Note: All the losses are included during measurement and final values are mentioned in the test report. Refer TEST METHODOLOGY for more details

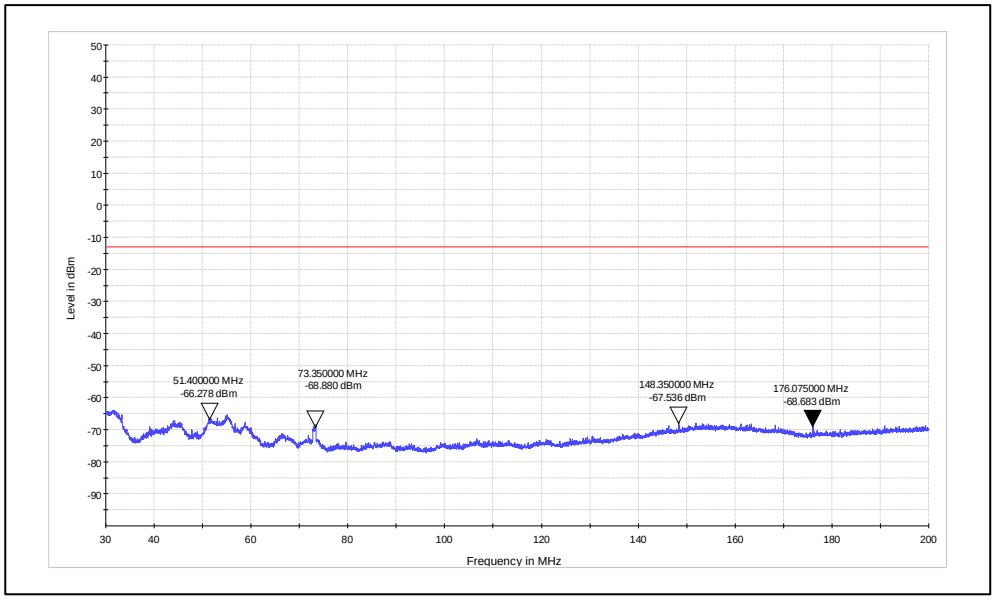
**Test Result:**

**Frequency range 9KHz to 30MHz**

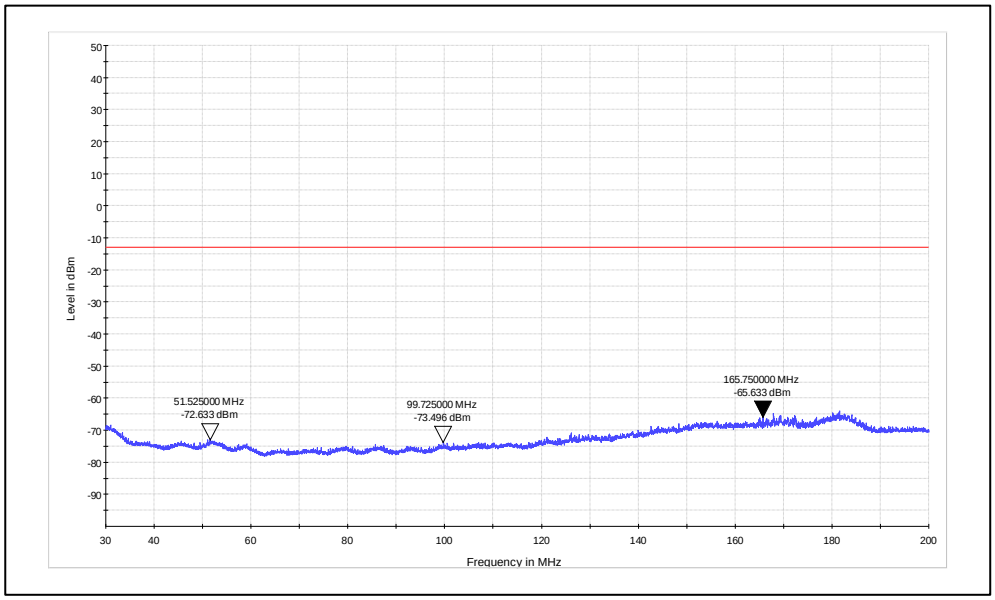
NA

**Frequency range 30MHz to 200MHz**

| Frequency range (MHz) | Antenna Polarization | Measured Frequency (MHz) | Measured e.i.r.p Value (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|
| 30-200MHz | Vertical | 51.4 | -66.27 | -13 | -53.27 |
| | | 73.35 | -68.88 | -13 | -55.88 |
| | | 148.35 | -67.53 | -13 | -54.53 |
| | | 176.07 | -68.68 | -13 | -55.68 |
| | Horizontal | 51.52 | -72.63 | -13 | -59.63 |
| | | 99.72 | -73.49 | -13 | -60.49 |
| | | 165.75 | -65.63 | -13 | -52.63 |

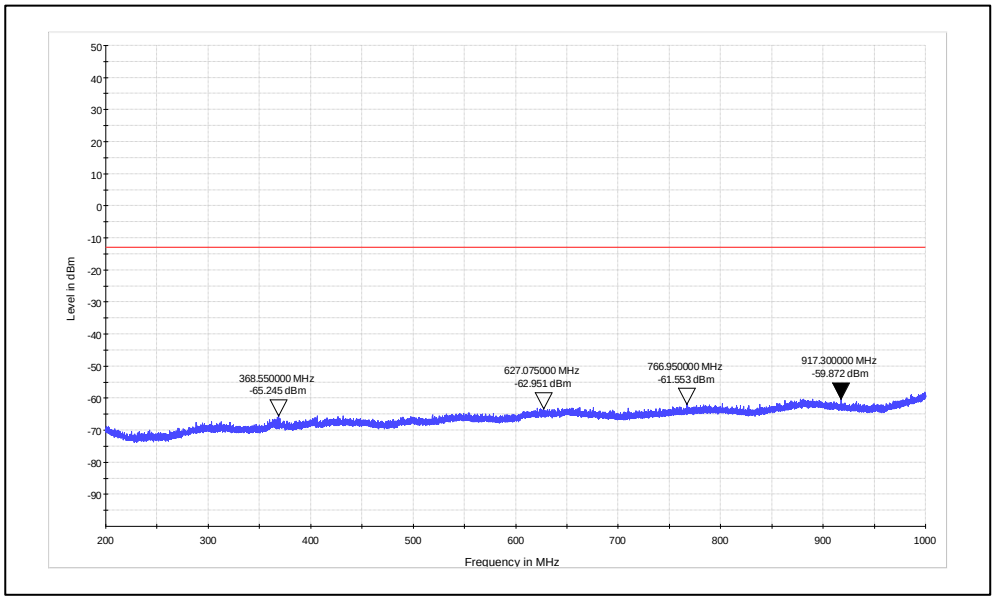



Vertical Polarization Frequency range: 30MHz-200MHz

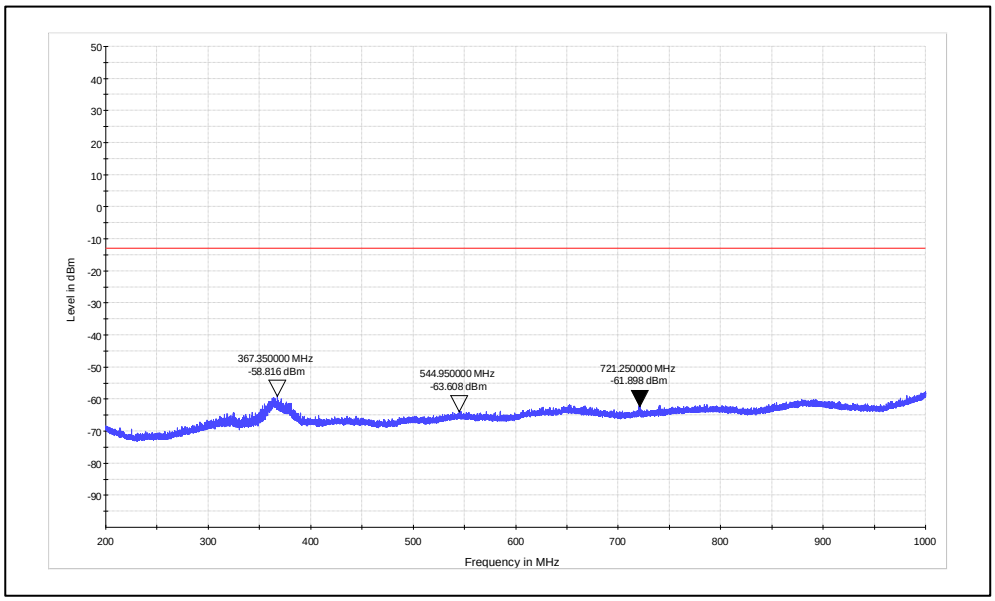



Horizontal Polarization Frequency range: 30MHz-200MHz

| Frequency range (MHz) | Antenna Polarization | Measured Frequency (MHz) | Measured e.i.r.p Value (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|
| 200-1GHz | Vertical | 365.55 | -65.24 | -13.00 | -52.24 |
| | | 627.07 | -62.95 | -13.00 | -49.95 |
| | | 766.95 | -61.55 | -13.00 | -48.55 |
| | | 917.3 | -59.87 | -13.00 | -46.87 |
| | Horizontal | 367.35 | -58.81 | -13.00 | -45.81 |
| | | 544.95 | -63.6 | -13.00 | -50.6 |
| | | 721.25 | -61.89 | -13.00 | -48.89 |




Vertical Polarization Frequency range: 200MHz-1GHz




Horizontal Polarization Frequency range: 200MHz-1GHz

**Test Results: above 1GHz**

| Band | Modulation | Cell Bandwidth (MHz) | Antenna Polarization | Channel Frequency MHz) | Measured Frequency (MHz) | Measured Spurious (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| 2 | QPSK | 1.4 | Vertical | 1850.7 | 3701.4 | -42.29 | -13 | -29.29 |
| | | | | | 5552.1 | -45.78 | -13 | -32.78 |
| | | | | | 7402.8 | -48.84 | -13 | -35.84 |
| | | | Horizontal | | 3701.4 | -42.26 | -13 | -29.26 |
| | | | | | 5552.1 | No Harmonics | | |
| | | | | | 7402.8 | | | |
| | | | Vertical | 1880 | 3760 | -44.03 | -13 | -31.03 |
| | | | | | 5640 | -37.36 | -13 | -24.36 |
| | | | | | 7520 | -45.97 | -13 | -32.97 |
| | | | Horizontal | | 3760 | -47.71 | -13 | -34.71 |
| | | | | | 5640 | -41.43 | -13 | -28.43 |
| | | | | | 7520 | No Harmonics | | |
| | | | Vertical | 1909.3 | 3818.6 | -49.34 | -13 | -36.34 |
| | | | | | 5727.9 | -45.08 | -13 | -32.08 |
| | | | | | 7637.2 | -47.44 | -13 | -34.44 |
| | | | Horizontal | | 3818.6 | -43.7 | -13 | -30.7 |
| | | | | | 5727.9 | -42.34 | -13 | -29.34 |
| | | | | | 7637.2 | No Harmonics | | |

| Band | Modulation | Cell Bandwidth (MHz) | Antenna Polarization | Channel Frequency (MHz) | Measured Frequency (MHz) | Measured Spurious (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| 4 | QPSK | 1.4 | Vertical | 1710.7 | 3421.4 | -45.49 | -13 | -32.49 |
| | | | | | 5132.1 | -47.57 | -13 | -34.57 |
| | | | | | 6842.8 | No Harmonics | | |
| | | | Horizontal | | 3421.4 | -42.64 | -13 | -29.64 |
| | | | | | 5132.1 | -48.69 | -13 | -35.69 |
| | | | | | 6842.8 | No Harmonics | | |
| | | | Vertical | 1732.5 | 3465 | -43.79 | -13 | -30.79 |
| | | | | | 5197.5 | No Harmonics | | |
| | | | | | 6930 | | | |
| | | | Horizontal | | 3465 | -42.61 | -13 | -29.61 |
| | | | | | 5197.5 | No Harmonics | | |
| | | | | | 6930 | | | |
| | | | Vertical | 1754.2 | 3508.4 | -41.22 | -13 | -28.22 |
| | | | | | 5262.6 | -45.77 | -13 | -32.77 |
| | | | | | 7016.8 | No Harmonics | | |
| | | | Horizontal | | 3508.4 | -43.31 | -13 | -30.31 |
| | | | | | 5262.6 | No Harmonics | | |
| | | | | | 7016.8 | | | |

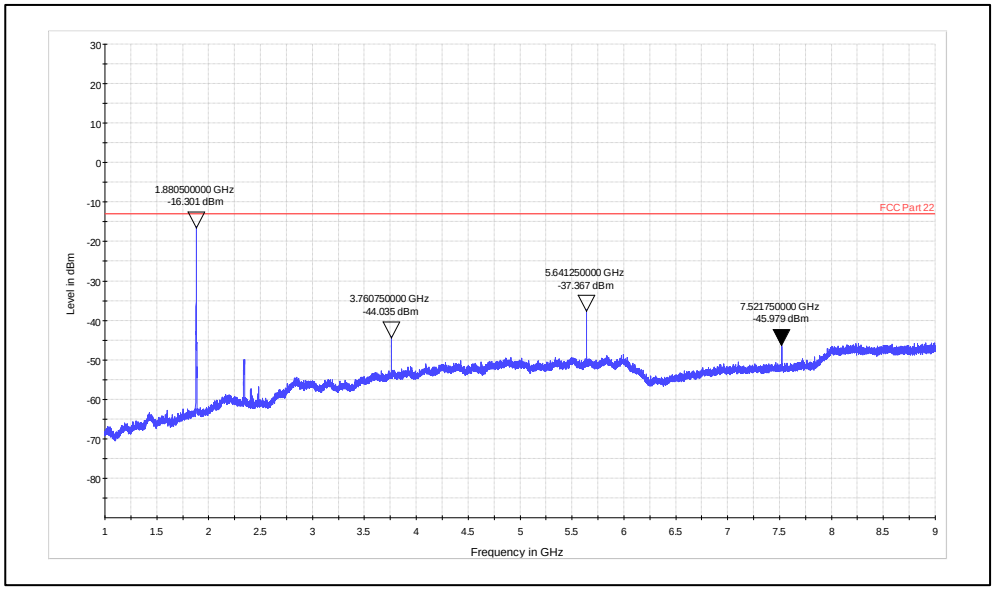
| Band | Modulation | Cell Bandwidth (MHz) | Antenna Polarization | Channel Frequency (MHz) | Measured Frequency (MHz) | Measured Spurious (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| 5 | QPSK | 1.4 | Vertical | 824.7 | 1649.4 | -43.7 | -13 | -30.7 |
| | | | | | 2474.1 | -44.75 | -13 | -31.75 |
| | | | | | 3298.8 | -53.78 | -13 | -40.78 |
| | | | Horizontal | | 1649.4 | -44.03 | -13 | -31.03 |
| | | | | | 2474.1 | -34.93 | -13 | -21.93 |
| | | | | | 3298.8 | -48.9 | -13 | -35.9 |
| | | | Vertical | 836.8 | 1673.6 | -38.29 | -13 | -25.29 |
| | | | | | 2510.4 | -39.75 | -13 | -26.75 |
| | | | | | 3347.2 | -53.71 | -13 | -40.71 |
| | | | | | 4184.7 | -45.63 | -13 | -32.63 |
| | | | Horizontal | | 1673.6 | -37 | -13 | -24 |
| | | | | | 2510.4 | -36.37 | -13 | -23.37 |
| | | | | | 3347.2 | -53.31 | -13 | -40.31 |
| | | | | | 4184.7 | -45.5 | -13 | -32.5 |
| | | | Vertical | 848.2 | 1696.4 | -35.5 | -13 | -22.5 |
| | | | | | 2544.6 | -35.36 | -13 | -22.36 |
| | | | | | 3392.8 | -47.02 | -13 | -34.02 |
| | | | | | 4241 | -42.38 | -13 | -29.38 |
| | | | Horizontal | | 1696.4 | -31.33 | -13 | -18.33 |
| | | | | | 2544.6 | -37.08 | -13 | -24.08 |
| | | | | | 3392.8 | -46.18 | -13 | -33.18 |
| | | | | | 4241 | -45.81 | -13 | -32.81 |

| Band | Modulation | Cell Bandwidth (MHz) | Antenna Polarization | Channel Frequency (MHz) | Measured Frequency (MHz) | Measured Spurious (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| 12 | QPSK | 1.4 | Vertical | 699.7 | 1399.4 | -41.49 | -13 | -28.49 |
| | | | | | 2099.1 | -33.38 | -13 | -20.38 |
| | | | | | 2798.8 | -42.3 | -13 | -29.3 |
| | | | | | 3498.5 | -34.31 | -13 | -21.31 |
| | | | | | 4198.2 | -46.05 | -13 | -33.05 |
| | | | Horizontal | | 1399.4 | -30.07 | -13 | -17.07 |
| | | | | | 2099.1 | -35.99 | -13 | -22.99 |
| | | | | | 2798.8 | -42.66 | -13 | -29.66 |
| | | | | | 3498.5 | -36.27 | -13 | -23.27 |
| | | | | | 4198.2 | -42.11 | -13 | -29.11 |
| | | | Vertical | 707.5 | 1415 | -37.96 | -13 | -24.96 |
| | | | | | 2122.5 | -31.15 | -13 | -18.15 |
| | | | | | 2830 | -42.89 | -13 | -29.89 |
| | | | | | 3537.5 | -37.81 | -13 | -24.81 |
| | | | | | 4245 | -43.49 | -13 | -30.49 |
| | | | Horizontal | | 1415 | -29.45 | -13 | -16.45 |
| | | | | | 2122.5 | -33.78 | -13 | -20.78 |
| | | | | | 2830 | -44.24 | -13 | -31.24 |
| | | | | | 3537.5 | -36.7 | -13 | -23.7 |
| | | | | | 4245 | -43.41 | -13 | -30.41 |
| | | | Vertical | 715.2 | 1430.4 | -35.43 | -13 | -22.43 |
| | | | | | 2145.6 | -30.73 | -13 | -17.73 |
| | | | | | 2860.8 | -44.27 | -13 | -31.27 |
| | | | | | 3576 | -36.01 | -13 | -23.01 |
| | | | | | 4291.2 | -42.03 | -13 | -29.03 |
| | | | Horizontal | | 1430.4 | -25.96 | -13 | -12.96 |
| | | | | | 2145.6 | -33.6 | -13 | -20.6 |
| | | | | | 2860.8 | -43.54 | -13 | -30.54 |
| | | | | | 3576 | -38.31 | -13 | -25.31 |
| | | | | | 4291.2 | -41.02 | -13 | -28.02 |

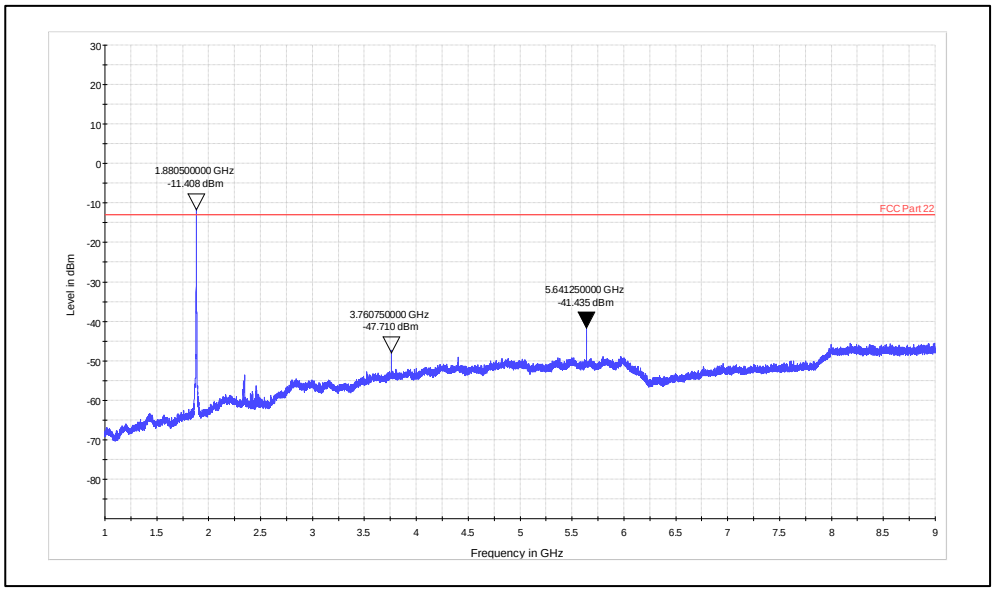
Note: Only worst case as reported

**Band 2:**

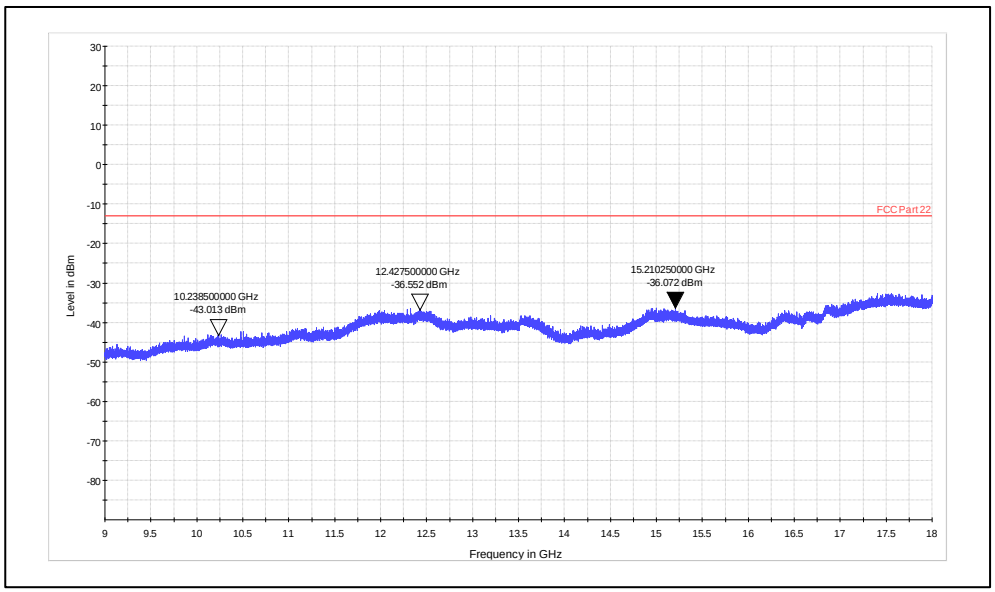
**Channel Fequency: 1880MHz**



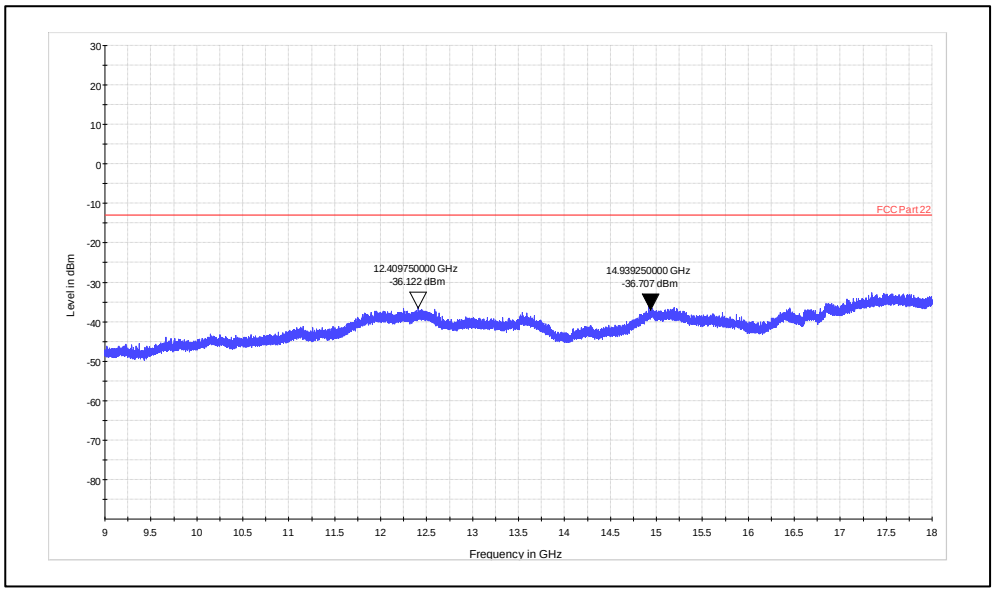

Frequency range: 1GHz-9GHz Polarization: Vertical




Frequency range: 1GHz-9GHz Polarization: Horizontal



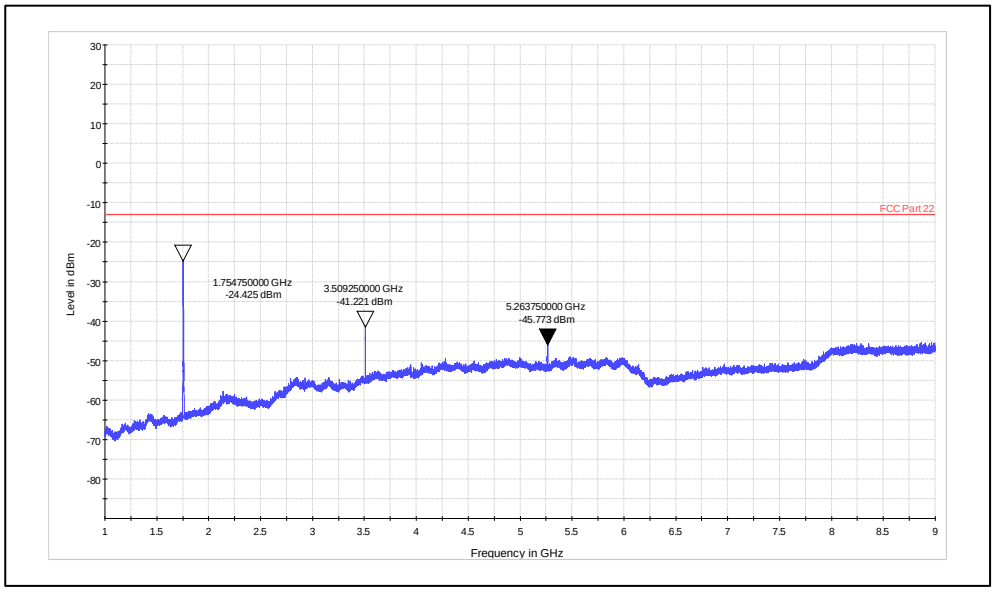

Frequency range: 9GHz-18GHz Polarization: Vertical



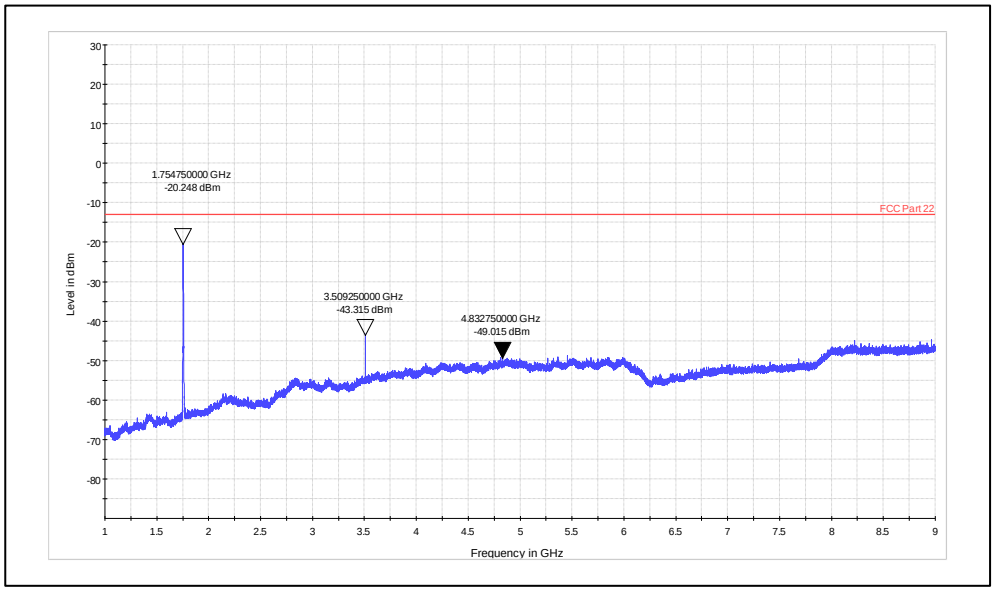

Frequency range: 9GHz-18GHz Polarization: Horizontal

**Band 4:**

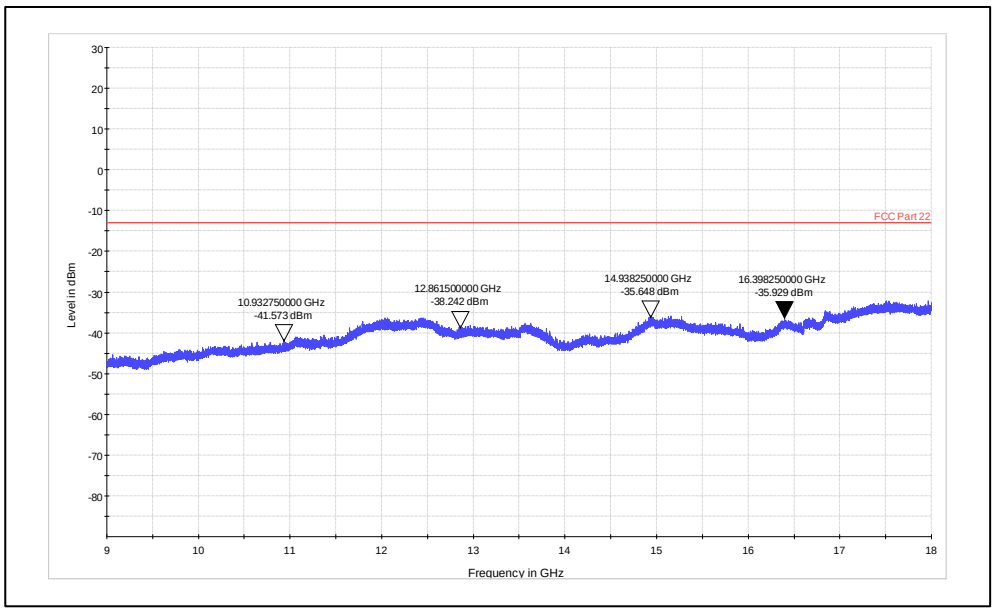
**Channel Frequency: 1754.2MHz**



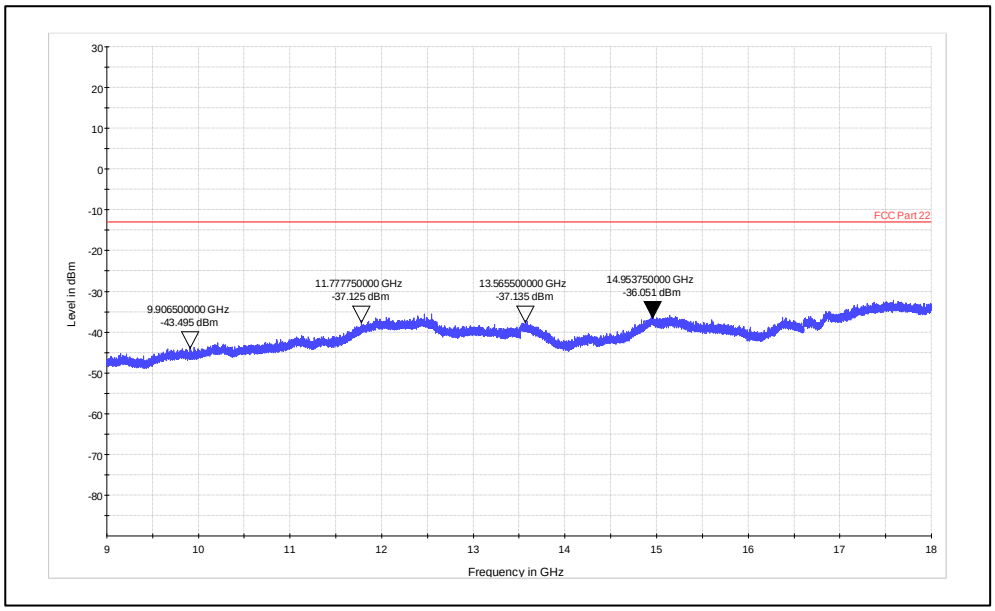

Frequency range: 1GHz-9GHz Polarization: Vertical




Frequency range: 1GHz-9GHz Polarization: Horizontal



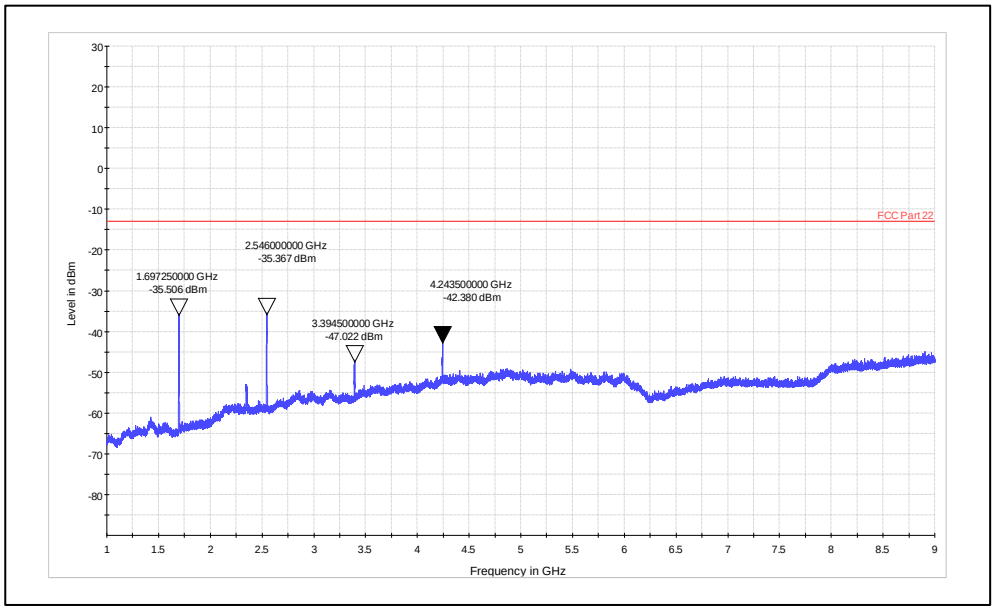

Frequency range: 9GHz-18GHz Polarization: Vertical



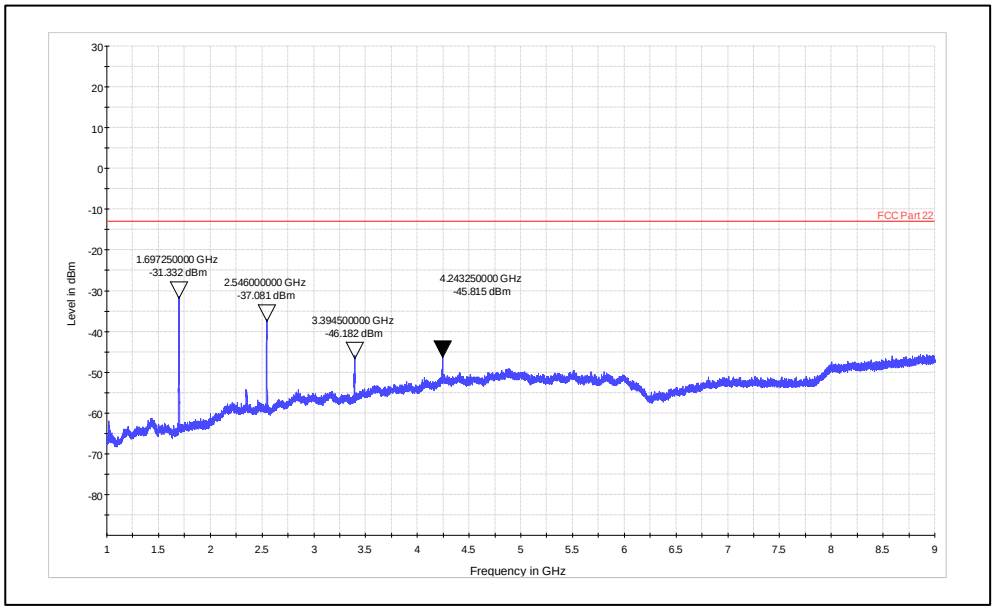

Frequency range: 9GHz-18GHz Polarization: Horizontal

**Band: 5**

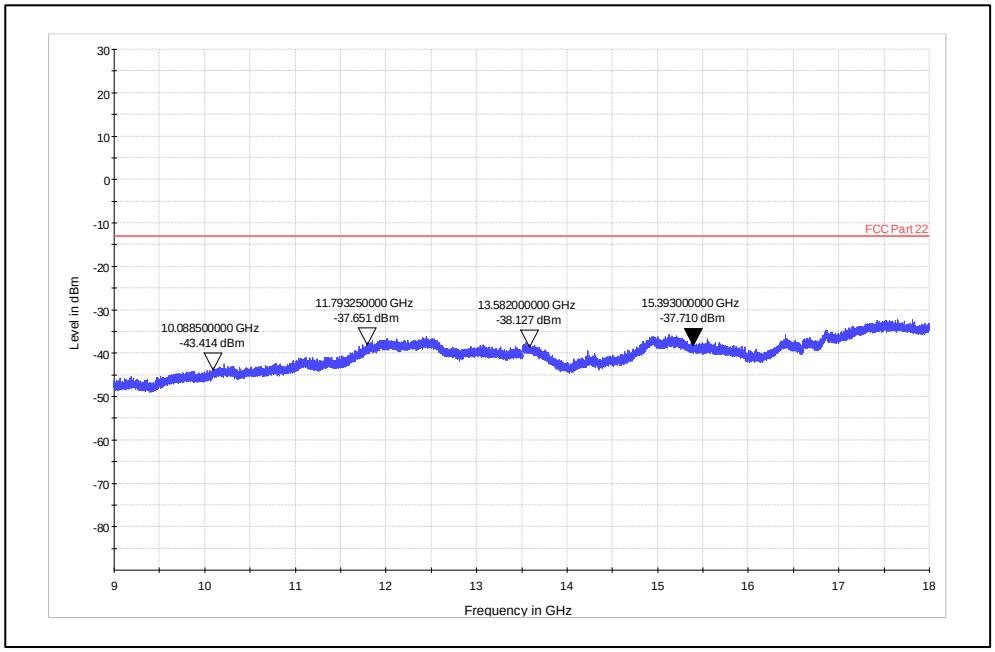
**Channel Frequency: 848.2MHz**



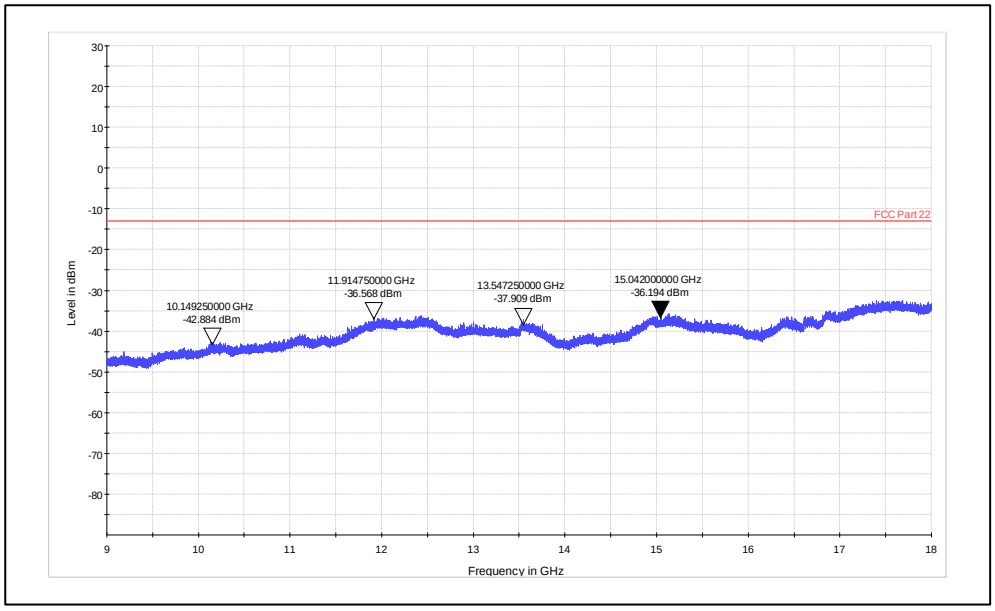

Frequency range: 1GHz-9GHz Polarization: Vertical




Frequency range: 1GHz-9GHz Polarization: Horizontal



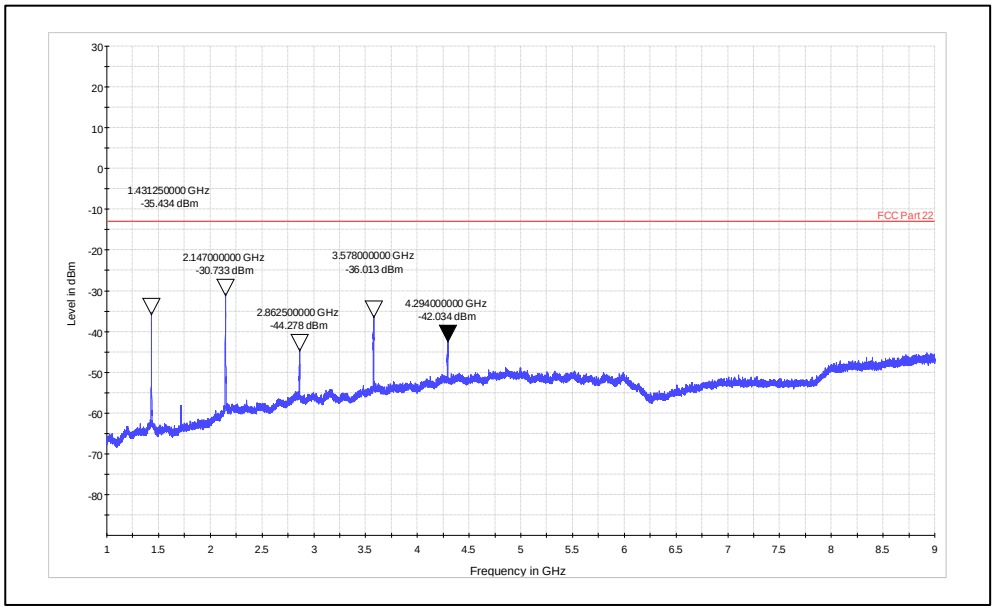

Frequency range: 9GHz-18GHz Polarization: Vertical



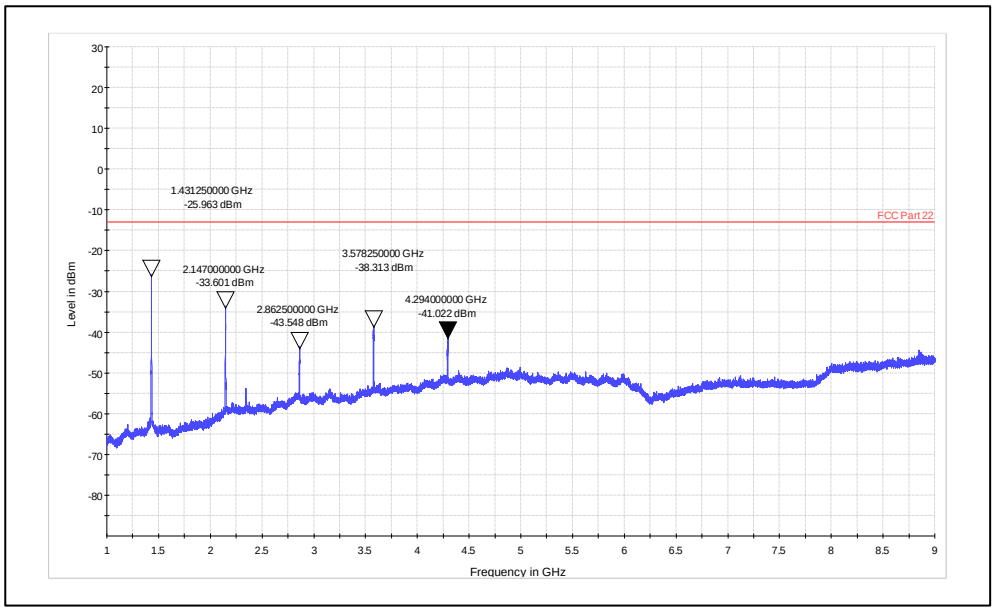

Frequency range: 9GHz-18GHz Polarization: Horizontal

**Band 12:**

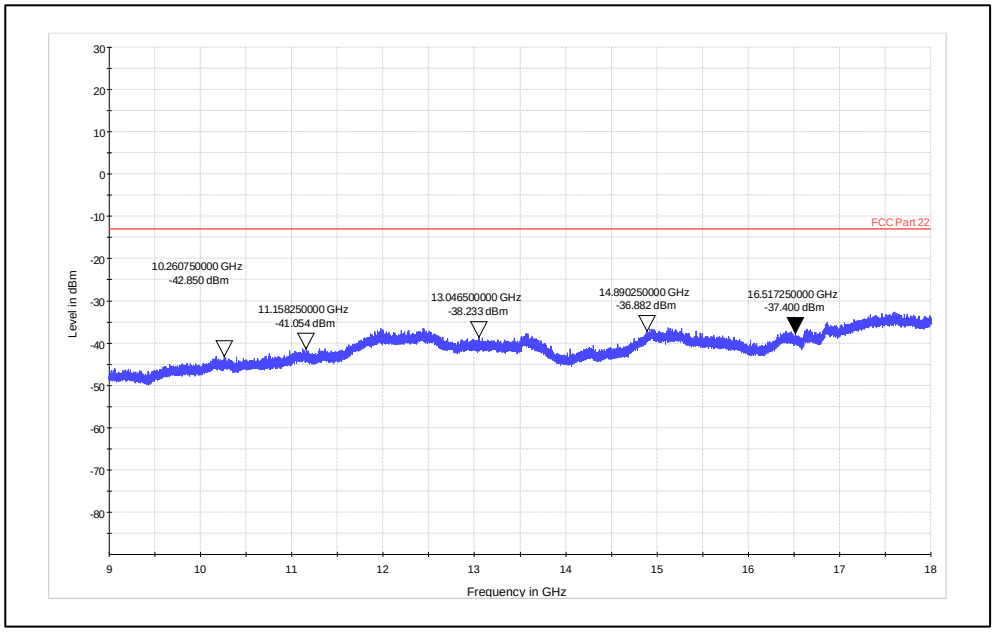
**Channel Frequency: 715.2MHz**



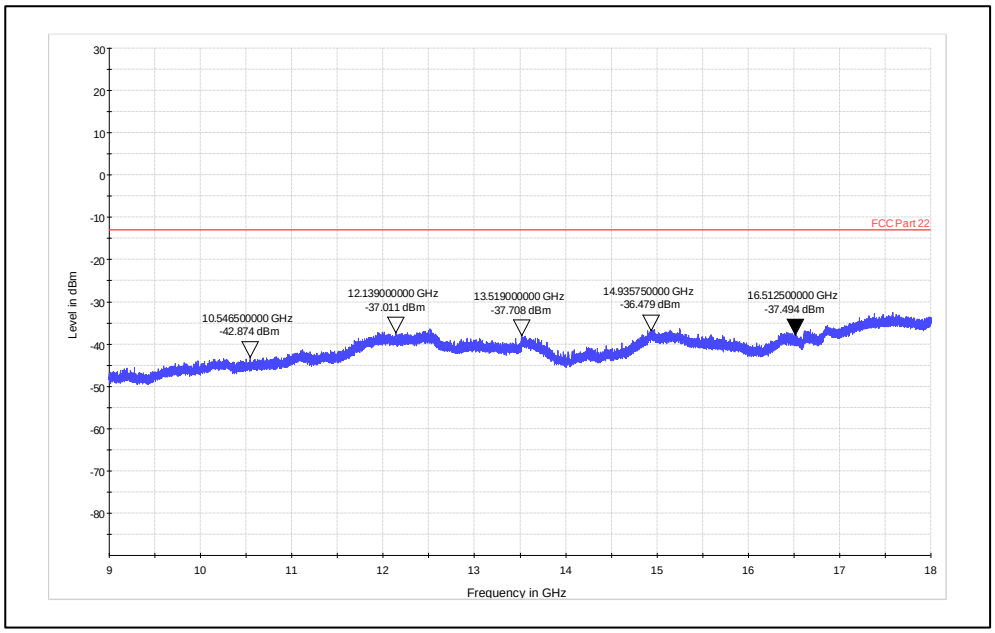

Frequency range: 1GHz-9GHz Polarization: Vertical




Frequency range: 1GHz-9GHz Polarization: Horizontal




Frequency range: 9GHz-18GHz Polarization: Vertical




Frequency range: 9GHz-18GHz Polarization: Horizontal

# 9 LIST OF TABLES



*****END OF TEST REPORT*****