

**FCC PART 22/24/27 TEST REPORT**  
**FCC Part 22H/Part 24E/Part 27****Report Reference No. .... : LCS220207006AEC****FCC ID. .... : 2A54OSTMLT01****Date of Issue..... : January 14, 2024****Testing Laboratory Name ..... : Shenzhen LCS Compliance Testing Laboratory Ltd.****Address..... : 101, 201 Bldg A & 301 Bldg C, Juji Industrial Park  
Yabianxueziwei, Shajing Street, Baoan District, Shenzhen,  
518000, China****Applicant's name ..... : Scorpion Automotive Ltd****Address..... : Scorpion House, Drumhead Road, Chorley, Lancashire, PR6 7DE,  
UK****Test specification..... :****FCC CFR Title 47 Part 2, Part 22H, Part 24E, Part 27****Standard ..... : TIA-603-E: 2016****KDB971168 D01 Power Meas License Digital Systems v03r01****Test Report Form No ..... : LCSEMC-1.0****TRF Originator ..... : Shenzhen LCS Compliance Testing Laboratory Ltd.****Master TRF..... : Dated 2011-03****Shenzhen LCS Compliance Testing Laboratory Ltd. All rights reserved.**

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**Test item description..... : Scorpion M Series Tracking System****Trade Mark..... : Scorpion Automotive Ltd****Test Model ..... : STMLT01****Modulation Type ..... : QPSK, 16QAM****Rating..... : Input: DC 12V  
DC 3.7V by Rechargeable Li-ion Battery, 1050mAh****Hardware version..... : V0208****Software version ..... : V0220, Boot v8****Result..... : PASS****Compiled by:**

Jack Liu/ Administrator

**Supervised by:**

Jin Wang/ Technique principal

**Approved by:**

Gavin Liang/ Manager



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**TEST REPORT**

|                          |                        |                  |
|--------------------------|------------------------|------------------|
| <b>Test Report No. :</b> | <b>LCS220207006AEC</b> | January 14, 2024 |
|                          |                        | Date of issue    |

Equipment under Test : Scorpion M Series Tracking System

Test Model : STMLT01

**Applicant** : **Scorpion Automotive Ltd**

Address : Scorpion House, Drumhead Road, Chorley, Lancashire,  
PR6 7DE, UK

**Manufacturer** : **Scorpion Automotive Ltd**

Address : Plant 2, Drumhead Road, Chorley North Business Park,  
Chorley, Lancashire, PR6 7BX, UK

**Factory** : **Scorpion Automotive Ltd**

Address : Plant 2, Drumhead Road, Chorley North Business Park,  
Chorley, Lancashire, PR6 7BX, UK

|                     |             |
|---------------------|-------------|
| <b>Test Result:</b> | <b>PASS</b> |
|---------------------|-------------|

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.





Revision History

| Report Version | Issue Date       | Revision Content | Revised By |
|----------------|------------------|------------------|------------|
| 000            | January 14, 2024 | Initial Issue    | ---        |
|                |                  |                  |            |
|                |                  |                  |            |





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## 1 TEST STANDARDS

The tests were performed according to following standards:

[FCC Part 22H](#): Cellular Radiotelephone Service

[FCC Part 24E](#): Broadband PCS

[FCC Part 27](#): MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES

[TIA-603-E March 2016](#): Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

[47 CFR FCC Part 15 Subpart B](#): Unintentional Radiators

[FCC Part 2](#): FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS

[ANSI C63.4:2014](#): Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

[FCC KDB971168 D01](#): Power Meas License Digital Systems v03r01



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## 2 SUMMARY

### 2.1 General Remarks

|                                |   |                                   |
|--------------------------------|---|-----------------------------------|
| Date of receipt of test sample | : | March 02, 2022                    |
| Date of Test                   | : | March 02, 2022 ~ January 14, 2024 |
| Date of Report                 | : | January 14, 2024                  |

### 2.2 Product Description

The **Scorpion Automotive Ltd's** Model: STMLT01 or the "EUT" as referred to in this report; more general information as follows, for more details, refer to the user's manual of the EUT.

EUT : Scorpion M Series Tracking System  
Test Model : STMLT01  
Additional Model No. : STM01,STMTR01,STM02, DTSTM01,DTSTM02  
Model Declaration : PCB board, structure and internal of these model(s) are the same, So no additional models were tested  
Power Supply : Input: DC 12V  
DC 3.7V by Rechargeable Li-ion Battery, 1050mAh  
Hardware Version : V0208  
Software Version : V0220, Boot v8

Bluetooth :  
Frequency Range : 2402MHz ~ 2480MHz  
Channel Number : 40 channels for Bluetooth V5.0 (DTS)  
Channel Spacing : 2MHz for Bluetooth V5.0 (DTS)  
Modulation Type : GFSK for Bluetooth V5.0 (DTS)  
Bluetooth Version : V5.0  
Antenna Description : Internal Antenna, 3.5dBi(Max.)

2G :  
Support Band : ☒ GSM 900 (EU-Band) ☒ DCS 1800 (EU-Band)  
☒ GSM 850 (U.S.-Band) ☒ PCS 1900 (U.S.-Band)  
Release Version : R99  
GPRS Class : Class 12  
EGPRS Class : Class 12  
Type Of Modulation : GMSK for GPRS;GMSK/8PSK for EGPRS  
Antenna Description : Internal Antenna  
1.9dBi (max.) For GSM 850  
3.0dBi (max.) For PCS 1900

CatM1 :  
Support Band : ☒ CatM1 Band 2(U.S.-Band)  
☒ CatM1 Band 4(U.S.-Band)  
☒ CatM1 Band 5(U.S.-Band)  
☒ CatM1 Band 12(U.S.-Band)  
☒ CatM1 Band 13(U.S.-Band)





Release Version : R13  
Type Of Modulation : QPSK/16QAM  
Antenna Description : Internal Antenna  
3.0dBi (max.) For CatM1 Band 2  
3.0dBi (max.) For CatM1 Band 4  
1.9dBi (max.) For CatM1 Band 5  
1.9dBi (max.) For CatM1 Band 12  
1.9dBi (max.) For CatM1 Band 13  
Power Class : Class 3

GPS function : Support and only RX

Extreme temp. : -30°C to +50°C

Tolerance

Extreme vol. Limits : 3.3VDC to 4.2VDC (nominal: 3.7VDC)





## 2.3 Equipment under Test

### Power supply system utilised

|                      |   |   |                                        |   |           |
|----------------------|---|---|----------------------------------------|---|-----------|
| Power supply voltage | : | ○ | 120V/ 60 Hz                            | ○ | 115V/60Hz |
|                      |   | ○ | 12 V DC                                | ○ | 24 V DC   |
|                      |   | ● | Other (specified in blank below): 3.7V |   |           |

## 2.4 Short description of the Equipment under Test (EUT)

### 2.4.1 GeneralDescription

STMLT01 is subscriber equipment in the BLE/GSM/CatM1/GPS system. GPRS/EGPRS frequency band is Band II/V. CatM1 frequency band is band 2/4/5/12/13. The STMLT01 implements such functions as RF signal receiving/transmitting, GPRS/EGPRS/CatM1 protocol processing, video MMS service and etc.

## 2.5 Internal Identification of AE used during the test

| AE ID* | Description                     |
|--------|---------------------------------|
| AE1    | Rechargeable Li-Polymer Battery |
| AE2    | Switching Adapter               |

## 2.6 Normal Accessory setting

Fully charged battery was used during the test.

## 2.7 EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

- - supplied by the manufacturer
- - supplied by the lab

|   |             |                |   |
|---|-------------|----------------|---|
| ○ | Power Cable | Length (m) :   | / |
|   |             | Shield :       | / |
|   |             | Detachable :   | / |
| ○ | Multimeter  | Manufacturer : | / |
|   |             | Model No. :    | / |





## 2.8 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: 2A54OSTMLT01 filing to comply with FCC Part 22, Part 24 and Part 27 Rules

## 2.9 Modifications

No modifications were implemented to meet testing criteria.

## 2.10 General Test Conditions/Configurations

### 2.10.1 Test Environment

| EnvironmentParameter | SelectedValuesDuringTests |         |
|----------------------|---------------------------|---------|
| Relative Humidity    | Ambient                   |         |
| Temperature          | TN                        | Ambient |
| Voltage              | VL                        | DC 3.3V |
|                      | VN                        | DC 3.7V |
|                      | VH                        | DC 4.2V |

NOTE:VL=lower extreme testvoltage VN=nominal voltage  
VH=upper extreme testvoltage TN=normal temperature





### 3 TEST ENVIRONMENT

#### 3.1 Address of the test laboratory

**Shenzhen LCS Compliance Testing Laboratory Ltd**

101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Yabianxueziwei, Shajing Street, Baoan District, Shenzhen, 518000, China

The sites are constructed in conformance with the requirements of ANSI C63.4 (2014) and CISPR Publication 22.

#### 3.2 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

NVLAP Accreditation Code is 600167-0.

FCC Designation Number is CN5024.

CAB identifier is CN0071.

CNAS Registration Number is L4595.

#### 3.3 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

|                       |              |
|-----------------------|--------------|
| Temperature:          | 15-35 ° C    |
| Humidity:             | 30-60 %      |
| Atmospheric pressure: | 950-1050mbar |

#### 3.4 Test Description

**Band 2 (1850-1910MHz pairedwith 1930-1990MHz)**

| Test Item                                  | FCC Rule No.     | Requirements                                                                                               | Verdict |
|--------------------------------------------|------------------|------------------------------------------------------------------------------------------------------------|---------|
| Effective(Isotropic) Radiated Output Power | §2.1046, §24.232 | EIRP ≤ 2W                                                                                                  | PASS    |
| Peak-Average Ratio                         | §2.1046, §24.232 | FCC:Limit≤13dB                                                                                             | PASS    |
| Modulation Characteristics                 | §2.1047          | Digital modulation                                                                                         | N/A     |
| Bandwidth                                  | §2.1049          | OBW: No limit.<br>EBW: No limit.                                                                           | PASS    |
| Band Edges Compliance                      | §2.1051, §24.238 | ≤ -13dBm/1%*EBW,<br>In 1MHz bands immediately outside and adjacent to the frequency block.                 | PASS    |
| Spurious Emission at Antenna Terminals     | §2.1051, §24.238 | ≤-13dBm/1MHz,<br>from 9kHz to10 <sup>th</sup> harmonics but outside authorized Operating frequency ranges. | PASS    |
| Field Strength of Spurious Radiation       | §2.1053, §24.238 | ≤ -13dBm/1MHz.                                                                                             | PASS    |
| Frequency Stability                        | §2.1055, §24.235 | FCC: within authorized frequency block.                                                                    | PASS    |

NOTE 1:For the verdict, the“N/A”denotes“not applicable”,the“N/T”de notes “not tested”.



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**Band 4 (1710-1755MHz pairedwith 2110-2155MHz)**

| Test Item                                       | FCC RuleNo.        | Requirements                                                                                             | Verdict |
|-------------------------------------------------|--------------------|----------------------------------------------------------------------------------------------------------|---------|
| Effective(Isotropic) Radiated Power Output Data | §2.1046, §27.50(d) | EIRP ≤ 1W;                                                                                               | PASS    |
| Peak-Average Ratio                              | §2.1046, §27.50(d) | Limit≤13dB                                                                                               | Pass    |
| Modulation Characteristics                      | §2.1047            | Digitalmodulation                                                                                        | N/A     |
| Bandwidth                                       | §2.1049            | OBW: Nolimit.<br>EBW: Nolimit.                                                                           | PASS    |
| BandEdges Compliance                            | §2.1051, §27.53(h) | ≤ -13dBm/1%*EBW, in1 MHz bands immediately outside and adjacent to the frequency block.                  | PASS    |
| Spurious Emission at Antenna Terminals          | §2.1051, §27.53(h) | ≤ -13dBm/1MHz, from 9kHz to10 <sup>th</sup> harmonics but outside authorized operating frequency ranges. | PASS    |
| Frequency Stability                             | §2.1055, §27.54    | Within authorized bands of operation/frequency block.                                                    | PASS    |
| Radiated spurious emission                      | §2.1053, §27.53(h) | ≤ -13dBm/1MHz.                                                                                           | PASS    |

NOTE 1: For the verdict, the "N/A" denotes "not applicable", the "N/T" de notes "not tested"

**Band 5 (824-849MHz pairedwith 869-894MHz)**

| Test Item                                  | FCC Rule No.     | Requirements                                                                                               | Verdict |
|--------------------------------------------|------------------|------------------------------------------------------------------------------------------------------------|---------|
| Effective(Isotropic) Radiated Output Power | §2.1046, §22.913 | FCC: ERP ≤ 7W.                                                                                             | Pass    |
| Modulation Characteristics                 | §2.1047          | Digital modulation                                                                                         | N/A     |
| Bandwidth                                  | §2.1049          | OBW: No limit.<br>EBW: No limit.                                                                           | Pass    |
| Band Edges Compliance                      | §2.1051, §22.917 | ≤-13dBm/1%*EBW,<br>In 1MHz bands immediately outside and adjacent to<br>The frequency block.               | Pass    |
| Spurious Emission at Antenna Terminals     | §2.1051, §22.917 | FCC: ≤ -13dBm/100kHz,<br>from 9kHz to 10th harmonics but outside<br>authorized operating frequency ranges. | Pass    |
| Field Strength of Spurious Radiation       | §2.1053, §22.917 | FCC: ≤ -13dBm/100kHz.                                                                                      | Pass    |
| Frequency Stability                        | §2.1055, §22.355 | ≤ ±2.5ppm.                                                                                                 | Pass    |

NOTE 1:For the verdict, the"N/A"denotes"not applicable",the"N/T"de notes "not tested".



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**Band 12 (699-716MHz paired with 729-746MHz)**

| Test Item                                       | FCC Rule No.       | Requirements                                                                                    | Verdict |
|-------------------------------------------------|--------------------|-------------------------------------------------------------------------------------------------|---------|
| Effective(Isotropic) Radiated Power Output Data | §2.1046, §27.50(c) | ERP ≤ 3W;                                                                                       | PASS    |
| Peak-Average Ratio                              | §2.1046, §27.50(c) | Limit≤13dB                                                                                      | PASS    |
| Modulation Characteristics                      | §2.1047            | Digitalmodulation                                                                               | N/A     |
| Bandwidth                                       | §2.1049            | OBW: Nolimit.<br>EBW: Nolimit.                                                                  | PASS    |
| BandEdges Compliance                            | §2.1051, §27.53(g) | ≤ -13dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to The frequency block.        | PASS    |
| Spurious Emission at Antenna Terminals          | §2.1051, §27.53(g) | ≤ -13dBm/100KHz, from 9kHz to 10th harmonics but outside authorized Operating frequency ranges. | PASS    |
| Frequency Stability                             | §2.1055, §27.54    | Within authorized bands of operation/frequency block.                                           | PASS    |
| Radiated spurious emission                      | §2.1053, §27.53(g) | ≤ -13dBm/100KHz.                                                                                | PASS    |

NOTE 1: For the verdict, the "N/A" denotes "not applicable", the "N/T" denotes "not tested".

**Band 13 (777-787MHz paired with 746-756MHz)**

| Test Item                                       | FCC Rule No.       | Requirements                                                                                    | Verdict |
|-------------------------------------------------|--------------------|-------------------------------------------------------------------------------------------------|---------|
| Effective(Isotropic) Radiated Power Output Data | §2.1046, §27.50(b) | ERP ≤ 3W;                                                                                       | PASS    |
| Peak-Average Ratio                              | §2.1046, §27.50(b) | Limit≤13dB                                                                                      | PASS    |
| Modulation Characteristics                      | §2.1047            | Digitalmodulation                                                                               | N/A     |
| Bandwidth                                       | §2.1049            | OBW: Nolimit.<br>EBW: Nolimit.                                                                  | PASS    |
| BandEdges Compliance                            | §2.1051, §27.53(c) | ≤ -13dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to The frequency block.        | PASS    |
| Spurious Emission at Antenna Terminals          | §2.1051, §27.53(c) | ≤ -13dBm/100KHz, from 9kHz to 10th harmonics but outside authorized Operating frequency ranges. | PASS    |
| Frequency Stability                             | §2.1055, §27.54    | Within authorized bands of operation/frequency block.                                           | PASS    |
| Radiated spurious emission                      | §2.1053, §27.53(c) | ≤ -13dBm/100KHz.                                                                                | PASS    |

NOTE 1: For the verdict, the "N/A" denotes "not applicable", the "N/T" denotes "not tested".





### 3.5 Equipments Used during the Test

| Item | Equipment                           | Manufacturer      | Model No.  | Serial No.  | Cal Date                 | Due Date                 |
|------|-------------------------------------|-------------------|------------|-------------|--------------------------|--------------------------|
| 1    | Power Meter                         | R&S               | NRVS       | 100444      | 2023-06-09               | 2024-06-08               |
| 2    | Power Sensor                        | R&S               | NRV-Z81    | 100458      | 2023-06-09               | 2024-06-08               |
| 3    | Power Sensor                        | R&S               | NRV-Z32    | 10057       | 2023-06-09               | 2024-06-08               |
| 4    | LTE Test Software                   | Tonscend          | JS1120-1   | N/A         | N/A                      | N/A                      |
| 5    | RF Control Unit                     | Tonscend          | JS0806-1   | 158060009   | 2022-10-29<br>2023-10-28 | 2023-10-28<br>2024-10-27 |
| 6    | MXA Signal Analyzer                 | Agilent           | N9020A     | MY51250905  | 2022-10-29<br>2023-10-28 | 2023-10-28<br>2024-10-27 |
| 7    | WIDEBAND RADIO COMMUNICATION TESTER | R&S               | CMW 500    | 103818      | 2023-06-09               | 2024-06-08               |
| 8    | DC Power Supply                     | Agilent           | E3642A     | N/A         | 2022-10-29<br>2023-10-28 | 2023-10-28<br>2024-10-27 |
| 9    | EMI Test Software                   | AUDIX             | E3         | /           | N/A                      | N/A                      |
| 10   | 3m Semi Anechoic Chamber            | SIDT FRANKONIA    | SAC-3M     | 03CH03-HY   | 2023-06-09               | 2024-06-08               |
| 11   | Positioning Controller              | Max-Full          | MF7802BS   | MF780208586 | N/A                      | N/A                      |
| 12   | Active Loop Antenna                 | SCHWARZBECK       | FMZB 1519B | 00005       | 2021-08-29               | 2024-08-28               |
| 13   | By-log Antenna                      | SCHWARZBECK       | VULB9163   | 9163-470    | 2021-09-12               | 2024-09-11               |
| 14   | By-log Antenna                      | SCHWARZBECK       | VULB9163   | 9163-471    | 2021-09-12               | 2024-09-11               |
| 15   | Horn Antenna                        | SCHWARZBECK       | BBHA 9120D | 9120D-1925  | 2021-09-05               | 2024-09-04               |
| 16   | Horn Antenna                        | SCHWARZBECK       | BBHA 9120D | 9120D-1926  | 2021-09-05               | 2024-09-04               |
| 17   | Broadband Horn Antenna              | SCHWARZBECK       | BBHA 9170  | 791         | 2021-08-29               | 2024-08-28               |
| 18   | Broadband Horn Antenna              | SCHWARZBECK       | BBHA 9170  | 792         | 2021-08-29               | 2024-08-28               |
| 19   | Broadband Preamplifier              | SCHWARZBECK       | BBV9719    | 9719-025    | 2023-06-09               | 2024-06-08               |
| 20   | EMI Test Receiver                   | R&S               | ESR 7      | 101181      | 2023-06-09               | 2024-06-08               |
| 21   | RS SPECTRUM ANALYZER                | R&S               | FSP40      | 100503      | 2022-10-29<br>2023-10-28 | 2023-10-28<br>2024-10-27 |
| 22   | Broadband Preamplifier              | /                 | BP-01M18G  | P190501     | 2023-06-09               | 2024-06-08               |
| 23   | 6dB Attenuator                      | /                 | 100W/6dB   | 1172040     | 2023-06-09               | 2024-06-08               |
| 24   | 3dB Attenuator                      | /                 | 2N-3dB     | /           | 2022-10-29<br>2023-10-28 | 2023-10-28<br>2024-10-27 |
| 26   | Temperature & Humidity Chamber      | GUANGZHOU GOGNWEN | GDS-100    | 70932       | 2023-10-05               | 2024-10-04               |
| 27   | EMI Test Software                   | Farad             | EZ         | /           | N/A                      | N/A                      |





### 3.6 Measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to ETSI TR 100 028 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics" and is documented in the Shenzhen LCS Compliance Testing Laboratory Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen LCS Compliance Testing Laboratory Ltd. is reported:

| Test                                | Range      | Measurement Uncertainty | Notes |
|-------------------------------------|------------|-------------------------|-------|
| Radiated Emission                   | 30~1000MHz | 3.10 dB                 | (1)   |
| Radiated Emission                   | 1~18GHz    | 3.80 dB                 | (1)   |
| Radiated Emission                   | 18-40GHz   | 3.90 dB                 | (1)   |
| Conducted Disturbance               | 0.15~30MHz | 1.63 dB                 | (1)   |
| Conducted Power                     | 9KHz~18GHz | 0.61 dB                 | (1)   |
| Spurious RF Conducted Emission      | 9KHz~40GHz | 1.22 dB                 | (1)   |
| Band Edge Compliance of RF Emission | 9KHz~40GHz | 1.22 dB                 | (1)   |
| Occupied Bandwidth                  | 9KHz~40GHz | -                       | (1)   |

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=1.96$ .





## 4 TEST CONDITIONS AND RESULTS

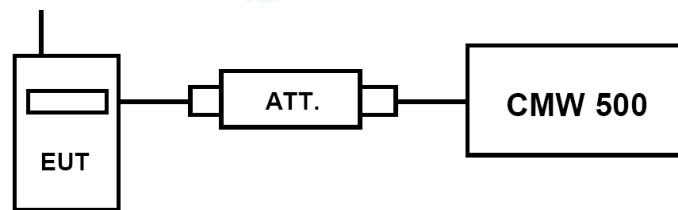
### 4.1 Output Power

#### TEST APPLICABLE

During the process of testing, the EUT was controlled via R&S Digital Radio Communication tester (CMW 500) to ensure max power transmission and proper modulation. This result contains output power and EIRP measurements for the EUT. In all cases, output power is within the specified limits.

#### 4.1.1. Conducted Output Power

##### TEST CONFIGURATION



##### TEST PROCEDURE

###### Conducted Power Measurement:

- Place the EUT on a bench and set it in transmitting mode.
- Connect a low loss RF cable from the antenna port to a CMW 500 by an Att.
- EUT Communicate with CMW 500 then selects a channel for testing.
- Add a correction factor to the display CMW 500, and then test.

##### TEST RESULTS

###### Remark:

- We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of CATM1 Band 2, CATM1 Band 4, CATM1 Band 5, CATM1 Band 12, CATM1 Band 13; recorded worst case for each Channel Bandwidth of CATM1 Band 2, CATM1 Band 4, CATM1 Band 5, CATM1 Band 12, CATM1 Band 13.
- For Band 2, please refer to Appendix B: Section B.1
- For Band 4, please refer to Appendix C: Section C.1
- For Band 5, please refer to Appendix D: Section D.1
- For Band 12, please refer to Appendix E: Section E.1
- For Band 13, please refer to Appendix F: Section F.1





## 4.1.2. Radiated Output Power

### LIMIT

This is the test for the maximum radiated power from the EUT.

Per §22.913(2) Extend coverage on a secondary basis into cellular unserved areas, as those areas are defined in §22.949, the ERP of base transmitters and cellular repeaters of such systems must not exceed 1000 Watts. The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

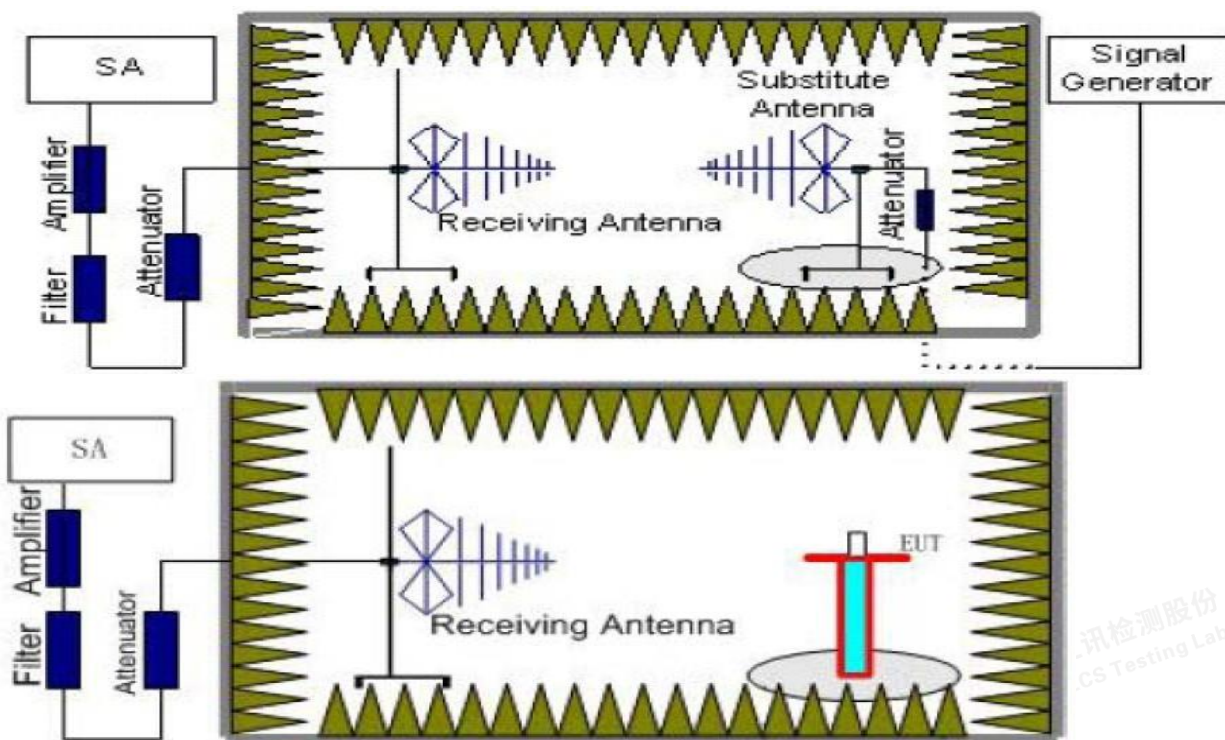
Rule Part 24.232(c) specifies, "Mobile/portable stations are limited to 2 watts e.i.r.p. Peak power" and 24.232(e) specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage."

Per Part 27.50(d) (4) specifies, Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755MHz band are limited to 1W EIRP. Fixed stations operating in this band are limited to a maximum antenna height of 10 meters above ground. Mobile and portable stations operating in this band must employ a means for limiting power to the minimum necessary for successful communications.

Per Part 27.50(c) (10) specifies, Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP.

Per Part 27.50(h) (2) specifies Mobile and other user stations. Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

### TEST CONFIGURATION



### TEST PROCEDURE

1. EUT was placed on a 1.50 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.50m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.
2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same



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power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.

- The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=1MHz, VBW=3MHz, And the maximum value of the receiver should be recorded as ( $P_r$ ).
- The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power ( $P_{Mea}$ ) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded ( $P_r$ ). The power of signal source ( $P_{Mea}$ ) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
- A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss ( $P_{cl}$ ), the Substitution Antenna Gain ( $G_a$ ) and the Amplifier Gain ( $P_{Ag}$ ) should be recorded after test.  
The measurement results are obtained as described below:  
$$\text{Power(EIRP)} = P_{Mea} + P_{Ag} - P_{cl} + G_a$$
- This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
- ERP can be calculated from EIRP by subtracting the gain of the dipole,  $ERP = EIRP - 2.15\text{dBi}$ .

## TEST RESULTS

### Radiated Measurement:

Remark:

- We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of CATM1 Band 2, CATM1 Band 4, CATM1 Band 5, CATM1 Band 12, CATM1 Band 13; recorded worst case for each Channel Bandwidth of CATM1 Band 2, CATM1 Band 4, CATM1 Band 5, CATM1 Band 12, CATM1 Band 13.
- $EIRP = P_{Mea}(\text{dBm}) - P_{cl}(\text{dB}) + P_{Ag}(\text{dB}) + G_a(\text{dBi})$
- $ERP = EIRP - 2.15\text{dBi}$  as EIRP by subtracting the gain of the dipole.
- Margin = Emission Level - Limit
- We tested the worst-case records for H and V directions, and only the worst-case records for V direction were recorded in the report.

#### CATM1 Band 2\_Channel Bandwidth 1.4MHz\_QPSK

| Frequency (MHz) | $P_{Mea}$ (dBm) | $P_{cl}$ (dB) | $G_a$ Antenna Gain(dB) | $P_{Ag}$ (dB) | Burst Average EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|-----------------|---------------|------------------------|---------------|--------------------------|-------------|-------------|--------------|
| 1850.7          | -19.11          | 4.03          | 8.38                   | 35.51         | 20.75                    | 33.01       | -12.26      | V            |
| 1880.0          | -19.51          | 4.08          | 8.33                   | 35.56         | 20.30                    | 33.01       | -12.71      | V            |
| 1909.3          | -19.02          | 4.14          | 8.26                   | 35.63         | 20.73                    | 33.01       | -12.28      | V            |

#### CATM1 Band 2\_Channel Bandwidth 3MHz\_QPSK

| Frequency (MHz) | $P_{Mea}$ (dBm) | $P_{cl}$ (dB) | $G_a$ Antenna Gain(dB) | $P_{Ag}$ (dB) | Burst Average EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|-----------------|---------------|------------------------|---------------|--------------------------|-------------|-------------|--------------|
| 1851.5          | -20.06          | 4.03          | 8.38                   | 35.51         | 19.80                    | 33.01       | -13.21      | V            |
| 1880.0          | -19.67          | 4.08          | 8.33                   | 35.56         | 20.14                    | 33.01       | -12.87      | V            |
| 1908.5          | -20.20          | 4.14          | 8.26                   | 35.63         | 19.55                    | 33.01       | -13.46      | V            |



**CATM1 Band 2\_Channel Bandwidth 5MHz\_QPSK**

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Aq</sub> (dB) | Burst Average EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|--------------------------|-------------|-------------|--------------|
| 1852.5          | -20.59                 | 4.03                 | 8.38                            | 35.51                | 19.27                    | 33.01       | -13.74      | V            |
| 1880.0          | -20.10                 | 4.08                 | 8.33                            | 35.56                | 19.71                    | 33.01       | -13.30      | V            |
| 1907.5          | -20.88                 | 4.14                 | 8.26                            | 35.63                | 18.87                    | 33.01       | -14.14      | V            |

**CATM1 Band 2\_Channel Bandwidth 10MHz\_QPSK**

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Aq</sub> (dB) | Burst Average EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|--------------------------|-------------|-------------|--------------|
| 1855.0          | -21.08                 | 4.03                 | 8.38                            | 35.51                | 18.78                    | 33.01       | -14.23      | V            |
| 1880.0          | -20.59                 | 4.08                 | 8.33                            | 35.56                | 19.22                    | 33.01       | -13.79      | V            |
| 1905.0          | -21.32                 | 4.14                 | 8.26                            | 35.63                | 18.43                    | 33.01       | -14.58      | V            |

**CATM1 Band 2\_Channel Bandwidth 15MHz\_QPSK**

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Aq</sub> (dB) | Burst Average EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|--------------------------|-------------|-------------|--------------|
| 1857.5          | -21.46                 | 4.03                 | 8.38                            | 35.51                | 18.40                    | 33.01       | -14.61      | V            |
| 1880.0          | -21.94                 | 4.08                 | 8.33                            | 35.56                | 17.87                    | 33.01       | -15.14      | V            |
| 1902.5          | -21.87                 | 4.14                 | 8.26                            | 35.63                | 17.88                    | 33.01       | -15.13      | V            |

**CATM1 Band 2\_Channel Bandwidth 20MHz\_QPSK**

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Aq</sub> (dB) | Burst Average EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|--------------------------|-------------|-------------|--------------|
| 1860.0          | -21.58                 | 4.03                 | 8.38                            | 35.51                | 18.28                    | 33.01       | -14.73      | V            |
| 1880.0          | -22.05                 | 4.08                 | 8.33                            | 35.56                | 17.76                    | 33.01       | -15.25      | V            |
| 1900.0          | -22.04                 | 4.14                 | 8.26                            | 35.63                | 17.71                    | 33.01       | -15.30      | V            |

**CATM1 Band 2\_Channel Bandwidth 1.4MHz\_16QAM**

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Aq</sub> (dB) | Burst Average EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|--------------------------|-------------|-------------|--------------|
| 1850.7          | -20.00                 | 4.03                 | 8.38                            | 35.51                | 19.86                    | 33.01       | -13.15      | V            |
| 1880.0          | -20.10                 | 4.08                 | 8.33                            | 35.56                | 19.71                    | 33.01       | -13.30      | V            |
| 1909.3          | -19.60                 | 4.14                 | 8.26                            | 35.63                | 20.15                    | 33.01       | -12.86      | V            |

**CATM1 Band 2\_Channel Bandwidth 3MHz\_16QAM**

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Aq</sub> (dB) | Burst Average EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|--------------------------|-------------|-------------|--------------|
| 1851.5          | -20.91                 | 4.03                 | 8.38                            | 35.51                | 18.95                    | 33.01       | -14.06      | V            |
| 1880.0          | -20.65                 | 4.08                 | 8.33                            | 35.56                | 19.16                    | 33.01       | -13.85      | V            |
| 1908.5          | -20.13                 | 4.14                 | 8.26                            | 35.63                | 19.62                    | 33.01       | -13.39      | V            |



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**CATM1 Band 2\_Channel Bandwidth 5MHz\_16QAM**

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Aq</sub> (dB) | Burst Average EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|--------------------------|-------------|-------------|--------------|
| 1852.5          | -21.08                 | 4.03                 | 8.38                            | 35.51                | 18.78                    | 33.01       | -14.23      | V            |
| 1880.0          | -21.16                 | 4.08                 | 8.33                            | 35.56                | 18.65                    | 33.01       | -14.36      | V            |
| 1907.5          | -21.48                 | 4.14                 | 8.26                            | 35.63                | 18.27                    | 33.01       | -14.74      | V            |

**CATM1 Band 2\_Channel Bandwidth 10MHz\_16QAM**

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Aq</sub> (dB) | Burst Average EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|--------------------------|-------------|-------------|--------------|
| 1855.0          | -21.50                 | 4.03                 | 8.38                            | 35.51                | 18.36                    | 33.01       | -14.65      | V            |
| 1880.0          | -21.75                 | 4.08                 | 8.33                            | 35.56                | 18.06                    | 33.01       | -14.95      | V            |
| 1905.0          | -21.67                 | 4.14                 | 8.26                            | 35.63                | 18.08                    | 33.01       | -14.93      | V            |

**CATM1 Band 2\_Channel Bandwidth 15MHz\_16QAM**

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Aq</sub> (dB) | Burst Average EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|--------------------------|-------------|-------------|--------------|
| 1857.5          | -22.47                 | 4.03                 | 8.38                            | 35.51                | 17.39                    | 33.01       | -15.62      | V            |
| 1880.0          | -22.37                 | 4.08                 | 8.33                            | 35.56                | 17.44                    | 33.01       | -15.57      | V            |
| 1902.5          | -22.21                 | 4.14                 | 8.26                            | 35.63                | 17.54                    | 33.01       | -15.47      | V            |

**CATM1 Band 2\_Channel Bandwidth 20MHz\_16QAM**

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Aq</sub> (dB) | Burst Average EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|--------------------------|-------------|-------------|--------------|
| 1860.0          | -22.18                 | 4.03                 | 8.38                            | 35.51                | 17.68                    | 33.01       | -15.33      | V            |
| 1880.0          | -22.69                 | 4.08                 | 8.33                            | 35.56                | 17.12                    | 33.01       | -15.89      | V            |
| 1900.0          | -22.42                 | 4.14                 | 8.26                            | 35.63                | 17.33                    | 33.01       | -15.68      | V            |

**CATM1 Band 4\_Channel Bandwidth 1.4MHz\_QPSK**

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Aq</sub> (dB) | Burst Average EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|--------------------------|-------------|-------------|--------------|
| 1710.7          | -18.66                 | 3.93                 | 9.05                            | 34.96                | 21.42                    | 30.00       | -8.58       | V            |
| 1732.5          | -18.82                 | 3.93                 | 8.89                            | 35.01                | 21.15                    | 30.00       | -8.85       | V            |
| 1754.3          | -19.27                 | 3.94                 | 8.76                            | 35.08                | 20.63                    | 30.00       | -9.37       | V            |

**CATM1 Band 4\_Channel Bandwidth 3MHz\_QPSK**

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Aq</sub> (dB) | Burst Average EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|--------------------------|-------------|-------------|--------------|
| 1711.5          | -19.07                 | 3.93                 | 9.05                            | 34.96                | 21.01                    | 30.00       | -8.99       | V            |
| 1732.5          | -19.15                 | 3.93                 | 8.89                            | 35.01                | 20.82                    | 30.00       | -9.18       | V            |
| 1753.5          | -19.49                 | 3.94                 | 8.76                            | 35.08                | 20.41                    | 30.00       | -9.59       | V            |



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**CATM1 Band 4\_Channel Bandwidth 5MHz\_QPSK**

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Aq</sub> (dB) | Burst Average EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|--------------------------|-------------|-------------|--------------|
| 1712.5          | -19.06                 | 3.93                 | 9.05                            | 34.96                | 21.02                    | 30.00       | -8.98       | V            |
| 1732.5          | -18.68                 | 3.93                 | 8.89                            | 35.01                | 21.29                    | 30.00       | -8.71       | V            |
| 1752.5          | -19.01                 | 3.94                 | 8.76                            | 35.08                | 20.89                    | 30.00       | -9.11       | V            |

**CATM1 Band 4\_Channel Bandwidth 10MHz\_QPSK**

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Aq</sub> (dB) | Burst Average EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|--------------------------|-------------|-------------|--------------|
| 1715.0          | -19.83                 | 3.93                 | 9.05                            | 34.96                | 20.25                    | 30.00       | -9.75       | V            |
| 1732.5          | -19.62                 | 3.93                 | 8.89                            | 35.01                | 20.35                    | 30.00       | -9.65       | V            |
| 1750.0          | -19.51                 | 3.94                 | 8.76                            | 35.08                | 20.39                    | 30.00       | -9.61       | V            |

**CATM1 Band 4\_Channel Bandwidth 15MHz\_QPSK**

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Aq</sub> (dB) | Burst Average EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|--------------------------|-------------|-------------|--------------|
| 1717.5          | -18.67                 | 3.93                 | 9.05                            | 34.96                | 21.41                    | 30.00       | -8.59       | V            |
| 1732.5          | -19.33                 | 3.93                 | 8.89                            | 35.01                | 20.64                    | 30.00       | -9.36       | V            |
| 1747.5          | -19.22                 | 3.94                 | 8.76                            | 35.08                | 20.68                    | 30.00       | -9.32       | V            |

**CATM1 Band 4\_Channel Bandwidth 20MHz\_QPSK**

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Aq</sub> (dB) | Burst Average EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|--------------------------|-------------|-------------|--------------|
| 1720.0          | -19.24                 | 3.93                 | 9.05                            | 34.96                | 20.84                    | 30.00       | -9.16       | V            |
| 1732.5          | -19.66                 | 3.93                 | 8.89                            | 35.01                | 20.31                    | 30.00       | -9.69       | V            |
| 1745.0          | -19.70                 | 3.94                 | 8.76                            | 35.08                | 20.20                    | 30.00       | -9.80       | V            |

**CATM1 Band 4\_Channel Bandwidth 1.4MHz\_16QAM**

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Aq</sub> (dB) | Burst Average EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|--------------------------|-------------|-------------|--------------|
| 1710.7          | -19.87                 | 3.93                 | 9.05                            | 34.96                | 20.21                    | 30.00       | -9.79       | V            |
| 1732.5          | -19.47                 | 3.93                 | 8.89                            | 35.01                | 20.50                    | 30.00       | -9.50       | V            |
| 1754.3          | -19.87                 | 3.94                 | 8.76                            | 35.08                | 20.03                    | 30.00       | -9.97       | V            |

**CATM1 Band 4\_Channel Bandwidth 3MHz\_16QAM**

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Aq</sub> (dB) | Burst Average EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|--------------------------|-------------|-------------|--------------|
| 1711.5          | -18.66                 | 3.93                 | 9.05                            | 34.96                | 21.42                    | 30.00       | -8.58       | V            |
| 1732.5          | -18.77                 | 3.93                 | 8.89                            | 35.01                | 21.20                    | 30.00       | -8.80       | V            |
| 1753.5          | -19.40                 | 3.94                 | 8.76                            | 35.08                | 20.50                    | 30.00       | -9.50       | V            |



**CATM1 Band 4 Channel Bandwidth 5MHz 16QAM**

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Aq</sub> (dB) | Burst Average EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|--------------------------|-------------|-------------|--------------|
| 1712.5          | -19.81                 | 3.93                 | 9.05                            | 34.96                | 20.27                    | 30.00       | -9.73       | V            |
| 1732.5          | -19.58                 | 3.93                 | 8.89                            | 35.01                | 20.39                    | 30.00       | -9.61       | V            |
| 1752.5          | -18.92                 | 3.94                 | 8.76                            | 35.08                | 20.98                    | 30.00       | -9.02       | V            |

**CATM1 Band 4 Channel Bandwidth 10MHz 16QAM**

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Aq</sub> (dB) | Burst Average EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|--------------------------|-------------|-------------|--------------|
| 1715.0          | -19.04                 | 3.93                 | 9.05                            | 34.96                | 21.04                    | 30.00       | -8.96       | V            |
| 1732.5          | -18.74                 | 3.93                 | 8.89                            | 35.01                | 21.23                    | 30.00       | -8.77       | V            |
| 1750.0          | -18.93                 | 3.94                 | 8.76                            | 35.08                | 20.97                    | 30.00       | -9.03       | V            |

**CATM1 Band 4 Channel Bandwidth 15MHz 16QAM**

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Aq</sub> (dB) | Burst Average EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|--------------------------|-------------|-------------|--------------|
| 1717.5          | -19.25                 | 3.93                 | 9.05                            | 34.96                | 20.83                    | 30.00       | -9.17       | V            |
| 1732.5          | -19.58                 | 3.93                 | 8.89                            | 35.01                | 20.39                    | 30.00       | -9.61       | V            |
| 1747.5          | -18.91                 | 3.94                 | 8.76                            | 35.08                | 20.99                    | 30.00       | -9.01       | V            |

**CATM1 Band 4 Channel Bandwidth 20MHz 16QAM**

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Aq</sub> (dB) | Burst Average EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|--------------------------|-------------|-------------|--------------|
| 1720.0          | -19.05                 | 3.93                 | 9.05                            | 34.96                | 21.03                    | 30.00       | -8.97       | V            |
| 1732.5          | -19.03                 | 3.93                 | 8.89                            | 35.01                | 20.94                    | 30.00       | -9.06       | V            |
| 1745.0          | -18.81                 | 3.94                 | 8.76                            | 35.08                | 21.09                    | 30.00       | -8.91       | V            |

**CATM1 Band 5 Channel Bandwidth 1.4MHz QPSK**

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | Correction (dB) | P <sub>Aq</sub> (dB) | Peak ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|-----------------|----------------------|----------------|-------------|-------------|--------------|
| 824.70          | -16.48                 | 3.45                 | 8.45                            | 2.15            | 33.79                | 20.16          | 38.45       | -18.29      | V            |
| 836.50          | -16.40                 | 3.49                 | 8.45                            | 2.15            | 33.85                | 20.26          | 38.45       | -18.19      | V            |
| 848.30          | -15.88                 | 3.55                 | 8.36                            | 2.15            | 33.88                | 20.66          | 38.45       | -17.79      | V            |

**CATM1 Band 5 Channel Bandwidth 3MHz QPSK**

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | Correction (dB) | P <sub>Aq</sub> (dB) | Peak ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|-----------------|----------------------|----------------|-------------|-------------|--------------|
| 825.50          | -16.40                 | 3.45                 | 8.45                            | 2.15            | 33.79                | 20.24          | 38.45       | -18.21      | V            |
| 836.50          | -16.22                 | 3.49                 | 8.45                            | 2.15            | 33.85                | 20.44          | 38.45       | -18.01      | V            |
| 847.50          | -16.25                 | 3.55                 | 8.36                            | 2.15            | 33.88                | 20.29          | 38.45       | -18.16      | V            |

**CATM1 Band 5 Channel Bandwidth 5MHz QPSK**

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | Correction (dB) | P <sub>Aq</sub> (dB) | Peak ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|-----------------|----------------------|----------------|-------------|-------------|--------------|
| 826.50          | -16.21                 | 3.45                 | 8.45                            | 2.15            | 33.79                | 20.43          | 38.45       | -18.02      | V            |
| 836.50          | -16.19                 | 3.49                 | 8.45                            | 2.15            | 33.85                | 20.47          | 38.45       | -17.98      | V            |
| 846.50          | -16.24                 | 3.55                 | 8.36                            | 2.15            | 33.88                | 20.30          | 38.45       | -18.15      | V            |



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CATM1 Band 5\_Channel Bandwidth 10MHz\_QPSK

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | Correction (dB) | P <sub>Aq</sub> (dB) | Peak ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|-----------------|----------------------|----------------|-------------|-------------|--------------|
| 829.00          | -16.01                 | 3.45                 | 8.45                            | 2.15            | 33.79                | 20.63          | 38.45       | -17.82      | V            |
| 836.50          | -15.89                 | 3.49                 | 8.45                            | 2.15            | 33.85                | 20.77          | 38.45       | -17.68      | V            |
| 844.00          | -16.14                 | 3.55                 | 8.36                            | 2.15            | 33.88                | 20.40          | 38.45       | -18.05      | V            |

CATM1 Band 5\_Channel Bandwidth 1.4MHz\_16QAM

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | Correction (dB) | P <sub>Aq</sub> (dB) | Peak ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|-----------------|----------------------|----------------|-------------|-------------|--------------|
| 824.70          | -17.06                 | 3.45                 | 8.45                            | 2.15            | 33.79                | 19.58          | 38.45       | -18.87      | V            |
| 836.50          | -16.52                 | 3.49                 | 8.45                            | 2.15            | 33.85                | 20.14          | 38.45       | -18.31      | V            |
| 848.30          | -17.27                 | 3.55                 | 8.36                            | 2.15            | 33.88                | 19.27          | 38.45       | -19.18      | V            |

CATM1 Band 5\_Channel Bandwidth 3MHz\_16QAM

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | Correction (dB) | P <sub>Aq</sub> (dB) | Peak ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|-----------------|----------------------|----------------|-------------|-------------|--------------|
| 825.50          | -17.31                 | 3.45                 | 8.45                            | 2.15            | 33.79                | 19.33          | 38.45       | -19.12      | V            |
| 836.50          | -16.58                 | 3.49                 | 8.45                            | 2.15            | 33.85                | 20.08          | 38.45       | -18.37      | V            |
| 847.50          | -16.58                 | 3.55                 | 8.36                            | 2.15            | 33.88                | 19.96          | 38.45       | -18.49      | V            |

CATM1 Band 5\_Channel Bandwidth 5MHz\_16QAM

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | Correction (dB) | P <sub>Aq</sub> (dB) | Peak ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|-----------------|----------------------|----------------|-------------|-------------|--------------|
| 826.50          | -16.57                 | 3.45                 | 8.45                            | 2.15            | 33.79                | 20.07          | 38.45       | -18.38      | V            |
| 836.50          | -16.51                 | 3.49                 | 8.45                            | 2.15            | 33.85                | 20.15          | 38.45       | -18.30      | V            |
| 846.50          | -17.16                 | 3.55                 | 8.36                            | 2.15            | 33.88                | 19.38          | 38.45       | -19.07      | V            |

CATM1 Band 5\_Channel Bandwidth 10MHz\_16QAM

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | Correction (dB) | P <sub>Aq</sub> (dB) | Peak ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|-----------------|----------------------|----------------|-------------|-------------|--------------|
| 829.00          | -16.74                 | 3.45                 | 8.45                            | 2.15            | 33.79                | 19.90          | 38.45       | -18.55      | V            |
| 836.50          | -17.09                 | 3.49                 | 8.45                            | 2.15            | 33.85                | 19.57          | 38.45       | -18.88      | V            |
| 844.00          | -16.59                 | 3.55                 | 8.36                            | 2.15            | 33.88                | 19.95          | 38.45       | -18.50      | V            |

CATM1 Band 12\_Channel Bandwidth 1.4MHz\_QPSK

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain (dB) | P <sub>Aq</sub> (dB) | Correction (dB) | Burst Average ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|----------------------------------|----------------------|-----------------|-------------------------|-------------|-------------|--------------|
| 699.70          | -14.24                 | 3.01                 | 8.29                             | 33.52                | 2.15            | 22.41                   | 34.77       | -12.36      | V            |
| 707.50          | -14.77                 | 3.02                 | 8.29                             | 33.52                | 2.15            | 21.87                   | 34.77       | -12.90      | V            |
| 715.30          | -14.50                 | 3.06                 | 8.29                             | 33.52                | 2.15            | 22.10                   | 34.77       | -12.67      | V            |

CATM1 Band 12\_Channel Bandwidth 3MHz\_QPSK

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain (dB) | P <sub>Aq</sub> (dB) | Correction (dB) | Burst Average ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|----------------------------------|----------------------|-----------------|-------------------------|-------------|-------------|--------------|
| 700.50          | -14.69                 | 3.01                 | 8.29                             | 33.52                | 2.15            | 21.96                   | 34.77       | -12.81      | V            |
| 707.50          | -14.99                 | 3.02                 | 8.29                             | 33.52                | 2.15            | 21.65                   | 34.77       | -13.12      | V            |
| 714.50          | -14.88                 | 3.06                 | 8.29                             | 33.52                | 2.15            | 21.72                   | 34.77       | -13.05      | V            |



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## CATM1 Band 12\_Channel Bandwidth 5MHz\_QPSK

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain (dB) | P <sub>Aq</sub> (dB) | Correction (dB) | Burst Avergae ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|----------------------------------|----------------------|-----------------|-------------------------|-------------|-------------|--------------|
| 701.50          | -15.76                 | 3.01                 | 8.29                             | 33.52                | 2.15            | 20.89                   | 34.77       | -13.88      | V            |
| 707.50          | -15.68                 | 3.02                 | 8.29                             | 33.52                | 2.15            | 20.96                   | 34.77       | -13.81      | V            |
| 713.50          | -15.62                 | 3.06                 | 8.29                             | 33.52                | 2.15            | 20.98                   | 34.77       | -13.79      | V            |

## CATM1 Band 12\_Channel Bandwidth 10MHz\_QPSK

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain (dB) | P <sub>Aq</sub> (dB) | Correction (dB) | Burst Avergae ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|----------------------------------|----------------------|-----------------|-------------------------|-------------|-------------|--------------|
| 704.00          | -15.99                 | 3.01                 | 8.29                             | 33.52                | 2.15            | 20.66                   | 34.77       | -14.11      | V            |
| 707.50          | -15.81                 | 3.02                 | 8.29                             | 33.52                | 2.15            | 20.83                   | 34.77       | -13.94      | V            |
| 711.00          | -15.97                 | 3.06                 | 8.29                             | 33.52                | 2.15            | 20.63                   | 34.77       | -14.14      | V            |

## CATM1 Band 12\_Channel Bandwidth 1.4MHz\_16QAM

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain (dB) | P <sub>Aq</sub> (dB) | Correction (dB) | Burst Avergae ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|----------------------------------|----------------------|-----------------|-------------------------|-------------|-------------|--------------|
| 699.70          | -15.28                 | 3.01                 | 8.29                             | 33.52                | 2.15            | 21.37                   | 34.77       | -13.40      | V            |
| 707.50          | -14.63                 | 3.02                 | 8.29                             | 33.52                | 2.15            | 22.01                   | 34.77       | -12.76      | V            |
| 715.30          | -14.58                 | 3.06                 | 8.29                             | 33.52                | 2.15            | 22.02                   | 34.77       | -12.75      | V            |

## CATM1 Band 12\_Channel Bandwidth 3MHz\_16QAM

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain (dB) | P <sub>Aq</sub> (dB) | Correction (dB) | Burst Avergae ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|----------------------------------|----------------------|-----------------|-------------------------|-------------|-------------|--------------|
| 700.50          | -15.10                 | 3.01                 | 8.29                             | 33.52                | 2.15            | 21.55                   | 34.77       | -13.22      | V            |
| 707.50          | -15.11                 | 3.02                 | 8.29                             | 33.52                | 2.15            | 21.53                   | 34.77       | -13.24      | V            |
| 714.50          | -15.72                 | 3.06                 | 8.29                             | 33.52                | 2.15            | 20.88                   | 34.77       | -13.89      | V            |

## CATM1 Band 12\_Channel Bandwidth 5MHz\_16QAM

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain (dB) | P <sub>Aq</sub> (dB) | Correction (dB) | Burst Avergae ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|----------------------------------|----------------------|-----------------|-------------------------|-------------|-------------|--------------|
| 701.50          | -15.70                 | 3.01                 | 8.29                             | 33.52                | 2.15            | 20.95                   | 34.77       | -13.82      | V            |
| 707.50          | -16.21                 | 3.02                 | 8.29                             | 33.52                | 2.15            | 20.43                   | 34.77       | -14.34      | V            |
| 713.50          | -15.60                 | 3.06                 | 8.29                             | 33.52                | 2.15            | 21.00                   | 34.77       | -13.77      | V            |

## CATM1 Band 12\_Channel Bandwidth 10MHz\_16QAM

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain (dB) | P <sub>Aq</sub> (dB) | Correction (dB) | Burst Avergae ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|----------------------------------|----------------------|-----------------|-------------------------|-------------|-------------|--------------|
| 704.00          | -16.60                 | 3.01                 | 8.29                             | 33.52                | 2.15            | 20.05                   | 34.77       | -14.72      | V            |
| 707.50          | -16.16                 | 3.02                 | 8.29                             | 33.52                | 2.15            | 20.48                   | 34.77       | -14.29      | V            |
| 711.00          | -16.59                 | 3.06                 | 8.29                             | 33.52                | 2.15            | 20.01                   | 34.77       | -14.76      | V            |



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**CATM1 Band 13\_Channel Bandwidth 5MHz\_QPSK**

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Aq</sub> (dB) | Correction (dB) | ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|-----------------|-----------|-------------|-------------|--------------|
| 779.5           | -17.78                 | 3.21                 | 9.61                            | 33.89                | 2.15            | 20.36     | 34.77       | -14.41      | V            |
| 782.0           | -18.36                 | 3.23                 | 9.52                            | 34.74                | 2.15            | 20.52     | 34.77       | -14.25      | V            |
| 784.5           | -17.64                 | 3.25                 | 9.43                            | 34.85                | 2.15            | 21.24     | 34.77       | -13.53      | V            |

**CATM1 Band 13\_Channel Bandwidth 10MHz\_QPSK**

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Aq</sub> (dB) | Correction (dB) | ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|-----------------|-----------|-------------|-------------|--------------|
| 782.0           | -17.26                 | 3.23                 | 9.52                            | 34.74                | 2.15            | 21.62     | 34.77       | -13.15      | V            |

**CATM1 Band 13\_Channel Bandwidth 5MHz\_16QAM**

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Aq</sub> (dB) | Correction (dB) | ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|-----------------|-----------|-------------|-------------|--------------|
| 779.5           | -18.79                 | 3.21                 | 9.61                            | 33.89                | 2.15            | 19.35     | 34.77       | -15.42      | V            |
| 782.0           | -19.22                 | 3.23                 | 9.52                            | 34.74                | 2.15            | 19.66     | 34.77       | -15.11      | V            |
| 784.5           | -18.93                 | 3.25                 | 9.43                            | 34.85                | 2.15            | 19.95     | 34.77       | -14.82      | V            |

**CATM1 Band 13\_Channel Bandwidth 10MHz\_16QAM**

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dB) | P <sub>Aq</sub> (dB) | Correction (dB) | ERP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|---------------------------------|----------------------|-----------------|-----------|-------------|-------------|--------------|
| 782.0           | -18.12                 | 3.23                 | 9.52                            | 34.74                | 2.15            | 20.76     | 34.77       | -14.01      | V            |



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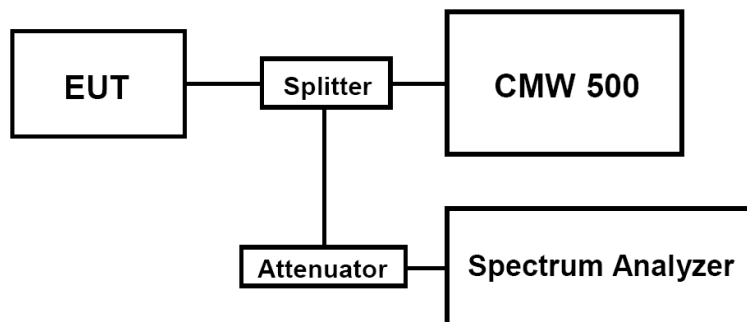


## 4.2 Peak-to-Average Ratio (PAR)

### LIMIT

The Peak-to-Average Ratio (PAR) of the transmission may not exceed 13 dB.

### TEST CONFIGURATION



### TEST PROCEDURE

1. Refer to instrument's analyzer instruction manual for details on how to use the power statistics/CCDF function;
2. Set resolution/measurement bandwidth  $\geq$  signal's occupied bandwidth;
3. Set the number of counts to a value that stabilizes the measured CCDF curve;
4. Set the measurement interval as follows:
  - 1). for continuous transmissions, set to 1 ms,
  - 2). for burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize and set the measurement interval to a time that is less than or equal to the burst duration.
5. Record the maximum PAPR level associated with a probability of 0.1%.

### TEST RESULTS

Remark:

1. We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of CATM1 Band 2, CATM1 Band 4, CATM1 Band 5, CATM1 Band 12, CATM1 Band 13; recorded worst case for each Channel Bandwidth of CATM1 Band 2, CATM1 Band 4, CATM1 Band 5, CATM1 Band 12, CATM1 Band 13.
2. For Band 2, please refer to Appendix B: Section B.2
3. For Band 4, please refer to Appendix C: Section C.2
4. For Band 5, please refer to Appendix D: Section D.2
5. For Band 12, please refer to Appendix E: Section E.2
6. For Band 13, please refer to Appendix F: Section F.2



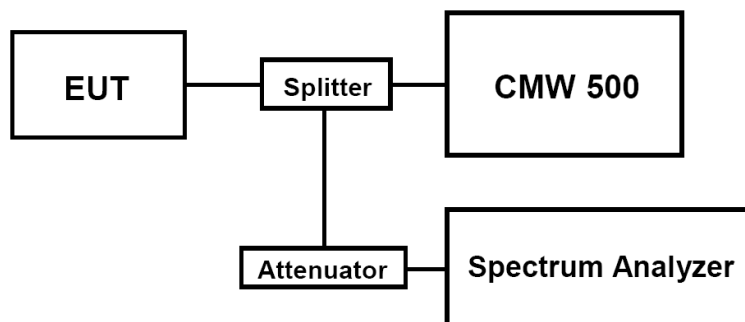


### 4.3 Occupied Bandwidth and Emission Bandwidth

#### LIMIT

N/A

#### TEST CONFIGURATION



#### TEST PROCEDURE

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at low, middle and high channel in each band. The -26dBc Emission bandwidth was also measured and recorded. Set RBW was set to about 1% of emission BW, VBW $\geq$ 3 times RBW.

-26dBc display line was placed on the screen (or 99% bandwidth), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace.

#### TEST RESULTS

##### *Remark:*

1. We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of CATM1 Band 2, CATM1 Band 4, CATM1 Band 5, CATM1 Band 12, CATM1 Band 13; recorded worst case for each Channel Bandwidth of CATM1 Band 2, CATM1 Band 4, CATM1 Band 5, CATM1 Band 12, CATM1 Band 13.
2. For Band 2, please refer to Appendix B: Section B.3
3. For Band 4, please refer to Appendix C: Section C.3
4. For Band 5, please refer to Appendix D: Section D.3
5. For Band 12, please refer to Appendix E: Section E.3
6. For Band 13, please refer to Appendix F: Section F.3



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## 4.4 Band Edge compliance

### LIMIT

*For CATM1 Band 2:* Per FCC §24.238 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.

*For CATM1 Band 4:* Per §27.53(h): For operations in the 1710–1755 MHz and 2110–2155 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log_{10}(P)$  dB.

*For CATM1 Band 5:* Per FCC §22.917 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.

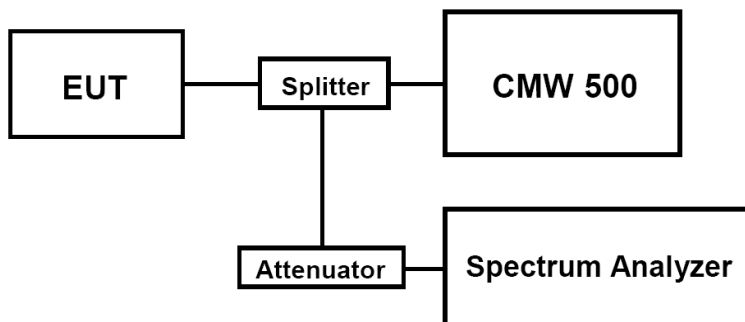
*For CATM1 Band 12:* Per §27.53 (g): For operations in the 698–746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least  $43 + 10 \log (P)$  dB.

*For CATM1 Band 13:* Per §27.53 (c): For operations in 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: 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;  
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;





## TEST CONFIGURATION



## TEST PROCEDURE

1. The transmitter output port was connected to base station.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator, the path loss was compensated to the results for each measurement.
3. Set EUT at maximum power through base station.
4. Select lowest and highest channels for each band and different modulation.
5. Measure Band edge using RMS (Average) detector by spectrum

## TEST RESULTS

### Remark:

1. We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of CATM1 Band 2, CATM1 Band 4, CATM1 Band 5, CATM1 Band 12, CATM1 Band 13,; recorded worst case for each Channel Bandwidth of CATM1 Band 2, CATM1 Band 4, CATM1 Band 5, CATM1 Band 12, CATM1 Band 13.
2. For Band 2, please refer to Appendix B: Section B.4
3. For Band 4, please refer to Appendix C: Section C.4
4. For Band 5, please refer to Appendix D: Section D.4
5. For Band 12, please refer to Appendix E: Section E.4
6. For Band 13, please refer to Appendix F: Section F.4



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## 1.1 Spurious Emission on Antenna Port

### LIMIT

For CATM1 Band 2: Per FCC §24.238 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.

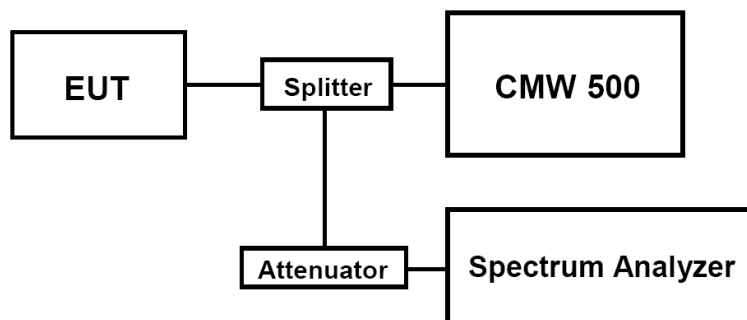
For CATM1 Band 4: Per §27.53(h): For operations in the 1710–1755 MHz and 2110–2155 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log_{10}(P)$  dB.

For CATM1 Band 5: Per FCC §22.917 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.

For CATM1 Band 12: Per §27.53 (g): For operations in 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.

For CATM1 Band 13: Per §27.53 (c): For operations in 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: 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;  
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;

### TEST CONFIGURATION



### TEST PROCEDURE

The EUT was setup according to TIA-603-E

- Place the EUT on a bench and set it in transmitting mode.
- Connect a low loss RF cable from the antenna port to a spectrum analyzer and CMW 500 by a Directional Couple.
- EUT Communicate with CMW 500, then select a channel for testing.
- Add a correction factor to the display of spectrum, and then test.
- The resolution bandwidth of the spectrum analyzer was set sufficient scans were taken to show the out of band Emission if any up to 10<sup>th</sup> harmonic.
- Please refer to following tables for test antenna conducted emissions.



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| Working Frequency | Sub range (GHz)   | RBW   | VBW   | Sweep time (s) |
|-------------------|-------------------|-------|-------|----------------|
| CATM1 Band 2      | 0.000009~0.000015 | 1KHz  | 3KHz  | Auto           |
|                   | 0.000015~0.03     | 10KHz | 30KHz | Auto           |
|                   | 0.03~26           | 1 MHz | 3 MHz | Auto           |
| CATM1 Band 4      | 0.000009~0.000015 | 1KHz  | 3KHz  | Auto           |
|                   | 0.000015~0.03     | 10KHz | 30KHz | Auto           |
|                   | 0.03~26           | 1 MHz | 3 MHz | Auto           |
| CATM1 Band 5      | 0.000009~0.000015 | 1KHz  | 3KHz  | Auto           |
|                   | 0.000015~0.03     | 10KHz | 30KHz | Auto           |
|                   | 0.03~26           | 1 MHz | 3 MHz | Auto           |
| CATM1 Band 12     | 0.000009~0.000015 | 1KHz  | 3KHz  | Auto           |
|                   | 0.000015~0.03     | 10KHz | 30KHz | Auto           |
|                   | 0.03~26           | 1 MHz | 3 MHz | Auto           |
| CATM1 Band 13     | 0.000009~0.000015 | 1KHz  | 3KHz  | Auto           |
|                   | 0.000015~0.03     | 10KHz | 30KHz | Auto           |
|                   | 0.03~26           | 1 MHz | 3 MHz | Auto           |

## TEST RESULTS

Remark:

1. We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of CATM1 Band 2, CATM1 Band 4, CATM1 Band 5, CATM1 Band 12, CATM1 Band 13; recorded worst case for each Channel Bandwidth of CATM1 Band 2, CATM1 Band 4, CATM1 Band 5, CATM1 Band 12, CATM1 Band 13.
2. For Band 2, please refer to Appendix B: Section B.5
3. For Band 4, please refer to Appendix C: Section C.5
4. For Band 5, please refer to Appendix D: Section D.5
5. For Band 12, please refer to Appendix E: Section E.5
6. For Band 13, please refer to Appendix F: Section F.5





## 4.5 Radiated Spurious Emission

### LIMIT

For CATM1 Band 2: Per FCC §24.238 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.

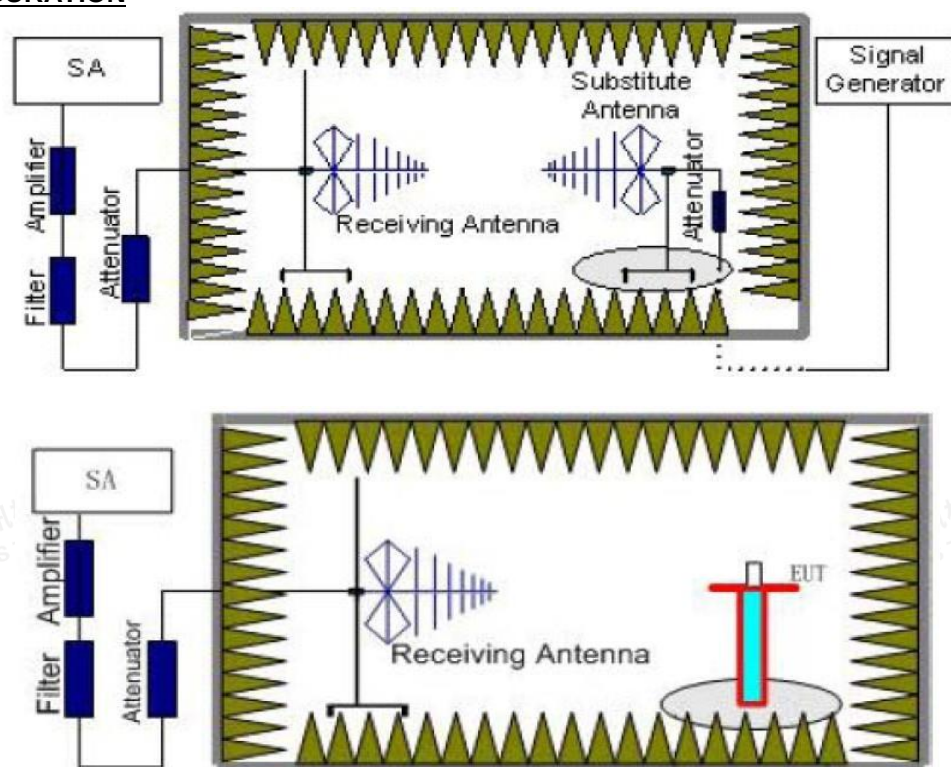
For CATM1 Band 4: Per §27.53(h): For operations in the 1710–1755 MHz and 2110–2155 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log_{10}(P)$  dB.

For CATM1 Band 5: Per FCC §22.917 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.

For CATM1 Band 12: Per §27.53 (g): For operations in 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.

For CATM1 Band 13: Per §27.53 (c): For operations in 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: 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;  
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;

### TEST CONFIGURATION



**TEST PROCEDURE**

1. EUT was placed on a 1.50 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.50m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.
2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
3. The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=1MHz, VBW=3MHz, And the maximum value of the receiver should be recorded as ( $P_r$ ).
4. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power ( $P_{Mea}$ ) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded ( $P_r$ ). The power of signal source ( $P_{Mea}$ ) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
5. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss ( $P_{cl}$ ), the Substitution Antenna Gain ( $G_a$ ) and the Amplifier Gain ( $P_{Ag}$ ) should be recorded after test.  
The measurement results are obtained as described below:  
$$\text{Power(EIRP)} = P_{Mea} + P_{Ag} - P_{cl} + G_a$$
6. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
7. ERP can be calculated from EIRP by subtracting the gain of the dipole,  $\text{ERP} = \text{EIRP} - 2.15\text{dBi}$ .
8. In order to make sure test results more clearly, we set frequency range and sweep time for difference frequency range as follows table:

| Working Frequency | Subrange (GHz) | RBW    | VBW    | Sweep time (s) |
|-------------------|----------------|--------|--------|----------------|
| CATM1 Band 2      | 0.00009~0.15   | 1KHz   | 3KHz   | 30             |
|                   | 0.00015~0.03   | 10KHz  | 30KHz  | 10             |
|                   | 0.03~1         | 100KHz | 300KHz | 10             |
|                   | 1~2            | 1 MHz  | 3 MHz  | 2              |
|                   | 2~5            | 1 MHz  | 3 MHz  | 3              |
|                   | 5~8            | 1 MHz  | 3 MHz  | 3              |
|                   | 8~11           | 1 MHz  | 3 MHz  | 3              |
|                   | 11~14          | 1 MHz  | 3 MHz  | 3              |
|                   | 14~18          | 1 MHz  | 3 MHz  | 3              |
|                   | 18~20          | 1 MHz  | 3 MHz  | 2              |
| CATM1 Band 4      | 0.00009~0.15   | 1KHz   | 3KHz   | 30             |
|                   | 0.00015~0.03   | 10KHz  | 30KHz  | 10             |
|                   | 0.03~1         | 100KHz | 300KHz | 10             |
|                   | 1~2            | 1 MHz  | 3 MHz  | 2              |
|                   | 2~5            | 1 MHz  | 3 MHz  | 3              |
|                   | 5~8            | 1 MHz  | 3 MHz  | 3              |
|                   | 8~11           | 1 MHz  | 3 MHz  | 3              |
|                   | 11~14          | 1 MHz  | 3 MHz  | 3              |
|                   | 14~18          | 1 MHz  | 3 MHz  | 3              |
|                   |                |        |        |                |
| CATM1 Band 5      | 0.00009~0.15   | 1KHz   | 3KHz   | 30             |
|                   | 0.00015~0.03   | 10KHz  | 30KHz  | 10             |
|                   | 0.03~1         | 100KHz | 300KHz | 10             |
|                   | 1~2            | 1 MHz  | 3 MHz  | 2              |



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|               |              |        |        |    |
|---------------|--------------|--------|--------|----|
|               | 2~5          | 1 MHz  | 3 MHz  | 3  |
|               | 5~8          | 1 MHz  | 3 MHz  | 3  |
|               | 8~9          | 1 MHz  | 3 MHz  | 3  |
| CATM1 Band 12 | 0.00009~0.15 | 1KHz   | 3KHz   | 30 |
|               | 0.00015~0.03 | 10KHz  | 30KHz  | 10 |
|               | 0.03~1       | 100KHz | 300KHz | 10 |
|               | 1~2          | 1 MHz  | 3 MHz  | 2  |
|               | 2~5          | 1 MHz  | 3 MHz  | 3  |
|               | 5~8          | 1 MHz  | 3 MHz  | 3  |
| CATM1 Band 13 | 0.00009~0.15 | 1KHz   | 3KHz   | 30 |
|               | 0.00015~0.03 | 10KHz  | 30KHz  | 10 |
|               | 0.03~1       | 100KHz | 300KHz | 10 |
|               | 1~2          | 1 MHz  | 3 MHz  | 2  |
|               | 2~5          | 1 MHz  | 3 MHz  | 3  |
|               | 5~8          | 1 MHz  | 3 MHz  | 3  |

| Frequency     | Channel | Frequency Range | Verdict |
|---------------|---------|-----------------|---------|
| CATM1 Band 2  | Low     | 9KHz -20GHz     | PASS    |
|               | Middle  | 9KHz -20GHz     | PASS    |
|               | High    | 9KHz -20GHz     | PASS    |
| CATM1 Band 4  | Low     | 9KHz -18GHz     | PASS    |
|               | Middle  | 9KHz -18GHz     | PASS    |
|               | High    | 9KHz -18GHz     | PASS    |
| CATM1 Band 5  | Low     | 9KHz -9GHz      | PASS    |
|               | Middle  | 9KHz -9GHz      | PASS    |
|               | High    | 9KHz -9GHz      | PASS    |
| CATM1 Band 12 | Low     | 9KHz -8GHz      | PASS    |
|               | Middle  | 9KHz -8GHz      | PASS    |
|               | High    | 9KHz -8GHz      | PASS    |
| CATM1 Band 13 | Low     | 9KHz -8GHz      | PASS    |
|               | Middle  | 9KHz -8GHz      | PASS    |
|               | High    | 9KHz -8GHz      | PASS    |

## TEST RESULTS

Remark:

1. We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of CATM1 Band 2, CATM1 Band 4, CATM1 Band 5, CATM1 Band 12, CATM1 Band 13.; recorded worst case for each Channel Bandwidth of CATM1 Band 2, CATM1 Band 4, CATM1 Band 5, CATM1 Band 12, CATM1 Band 13.
3. We were not recorded other points as values lower than limits.
4.  $\text{Power(EIRP)} = P_{\text{Mea}} + P_{\text{Ag}} - P_{\text{cl}} + G_{\text{a}}$
5.  $\text{Margin} = \text{EIRP} - \text{Limit}$



*CATM1 Band 2\_Channel Bandwidth 20MHz\_QPSK\_Low Channel*

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | Diatance | G <sub>a</sub> Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|----------|---------------------------------|-----------------|-------------|-------------|--------------|
| 3715.0          | -37.58                 | 5.26                 | 3.00     | 9.88                            | -32.96          | -13.00      | -19.96      | H            |
| 5572.5          | -45.91                 | 6.11                 | 3.00     | 11.36                           | -40.66          | -13.00      | -27.66      | H            |
| 3715.0          | -31.83                 | 5.26                 | 3.00     | 9.88                            | -27.21          | -13.00      | -14.21      | V            |
| 5572.5          | -35.06                 | 6.11                 | 3.00     | 11.36                           | -29.81          | -13.00      | -16.81      | V            |

*CATM1 Band 2\_Channel Bandwidth 20MHz\_QPSK\_Middle Channel*

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | Diatance | G <sub>a</sub> Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|----------|---------------------------------|-----------------|-------------|-------------|--------------|
| 3720.0          | -40.21                 | 5.32                 | 3.00     | 10.03                           | -35.50          | -13.00      | -22.50      | H            |
| 5580.0          | -43.66                 | 6.19                 | 3.00     | 11.41                           | -38.44          | -13.00      | -25.44      | H            |
| 3720.0          | -30.18                 | 5.32                 | 3.00     | 10.03                           | -25.47          | -13.00      | -12.47      | V            |
| 5580.0          | -33.54                 | 6.19                 | 3.00     | 11.41                           | -28.32          | -13.00      | -15.32      | V            |

*CATM1 Band 2\_Channel Bandwidth 20MHz\_QPSK\_High Channel*

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | Diatance | G <sub>a</sub> Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|----------|---------------------------------|-----------------|-------------|-------------|--------------|
| 3800.0          | -39.09                 | 5.36                 | 3.00     | 9.62                            | -34.83          | -13.00      | -21.83      | H            |
| 5700.0          | -45.74                 | 6.24                 | 3.00     | 11.46                           | -40.52          | -13.00      | -27.52      | H            |
| 3800.0          | -28.50                 | 5.36                 | 3.00     | 9.62                            | -24.24          | -13.00      | -11.24      | V            |
| 5700.0          | -34.68                 | 6.24                 | 3.00     | 11.46                           | -29.46          | -13.00      | -16.46      | V            |

*CATM1 Band 2\_Channel Bandwidth 20MHz\_16QAM\_Low Channel*

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | Diatance | G <sub>a</sub> Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|----------|---------------------------------|-----------------|-------------|-------------|--------------|
| 3715.0          | -40.70                 | 5.26                 | 3.00     | 9.88                            | -36.08          | -13.00      | -23.08      | H            |
| 5572.5          | -49.47                 | 6.11                 | 3.00     | 11.36                           | -44.22          | -13.00      | -31.22      | H            |
| 3715.0          | -34.60                 | 5.26                 | 3.00     | 9.88                            | -29.98          | -13.00      | -16.98      | V            |
| 5572.5          | -40.43                 | 6.11                 | 3.00     | 11.36                           | -35.18          | -13.00      | -22.18      | V            |

*CATM1 Band 2\_Channel Bandwidth 20MHz\_16QAM\_Middle Channel*

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | Diatance | G <sub>a</sub> Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|----------|---------------------------------|-----------------|-------------|-------------|--------------|
| 3720.0          | -42.36                 | 5.32                 | 3.00     | 10.03                           | -37.65          | -13.00      | -24.65      | H            |
| 5580.0          | -46.47                 | 6.19                 | 3.00     | 11.41                           | -41.25          | -13.00      | -28.25      | H            |
| 3720.0          | -34.84                 | 5.32                 | 3.00     | 10.03                           | -30.13          | -13.00      | -17.13      | V            |
| 5580.0          | -38.94                 | 6.19                 | 3.00     | 11.41                           | -33.72          | -13.00      | -20.72      | V            |

*CATM1 Band 2\_Channel Bandwidth 20MHz\_16QAM\_High Channel*

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | Diatance | G <sub>a</sub> Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|----------|---------------------------------|-----------------|-------------|-------------|--------------|
| 3800.0          | -41.61                 | 5.36                 | 3.00     | 9.62                            | -37.35          | -13.00      | -24.35      | H            |
| 5700.0          | -46.02                 | 6.24                 | 3.00     | 11.46                           | -40.80          | -13.00      | -27.80      | H            |
| 3800.0          | -31.37                 | 5.36                 | 3.00     | 9.62                            | -27.11          | -13.00      | -14.11      | V            |
| 5700.0          | -38.55                 | 6.24                 | 3.00     | 11.46                           | -33.33          | -13.00      | -20.33      | V            |



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*CATM1 Band 4\_Channel Bandwidth 20MHz\_QPSK\_Low Channel*

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | Diatance | G <sub>a</sub> Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|----------|---------------------------------|-----------------|-------------|-------------|--------------|
| 3440.0          | -40.35                 | 4.62                 | 3.00     | 9.81                            | -35.16          | -13.00      | -22.16      | H            |
| 5160.0          | -45.97                 | 5.94                 | 3.00     | 10.86                           | -41.05          | -13.00      | -28.05      | H            |
| 3440.0          | -34.69                 | 4.62                 | 3.00     | 9.81                            | -29.50          | -13.00      | -16.50      | V            |
| 5160.0          | -40.99                 | 5.94                 | 3.00     | 10.86                           | -36.07          | -13.00      | -23.07      | V            |

*CATM1 Band 4\_Channel Bandwidth 20MHz\_QPSK\_Middle Channel*

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | Diatance | G <sub>a</sub> Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|----------|---------------------------------|-----------------|-------------|-------------|--------------|
| 3465.0          | -40.89                 | 4.63                 | 3.00     | 9.84                            | -35.68          | -13.00      | -22.68      | H            |
| 5197.5          | -46.29                 | 5.94                 | 3.00     | 10.86                           | -41.37          | -13.00      | -28.37      | H            |
| 3465.0          | -34.60                 | 4.63                 | 3.00     | 9.84                            | -29.39          | -13.00      | -16.39      | V            |
| 5197.5          | -39.78                 | 5.94                 | 3.00     | 10.86                           | -34.86          | -13.00      | -21.86      | V            |

*CATM1 Band 4\_Channel Bandwidth 20MHz\_QPSK\_High Channel*

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | Diatance | G <sub>a</sub> Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|----------|---------------------------------|-----------------|-------------|-------------|--------------|
| 3490.0          | -43.08                 | 4.65                 | 3.00     | 9.90                            | -37.83          | -13.00      | -24.83      | H            |
| 5235.0          | -45.94                 | 5.95                 | 3.00     | 10.91                           | -40.98          | -13.00      | -27.98      | H            |
| 3490.0          | -36.76                 | 4.65                 | 3.00     | 9.90                            | -31.51          | -13.00      | -18.51      | V            |
| 5235.0          | -38.57                 | 5.95                 | 3.00     | 10.91                           | -33.61          | -13.00      | -20.61      | V            |

*CATM1 Band 4\_Channel Bandwidth 20MHz\_16QAM\_Low Channel*

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | Diatance | G <sub>a</sub> Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|----------|---------------------------------|-----------------|-------------|-------------|--------------|
| 3440.0          | -44.08                 | 4.62                 | 3.00     | 9.81                            | -38.89          | -13.00      | -25.89      | H            |
| 5160.0          | -51.62                 | 5.94                 | 3.00     | 10.86                           | -46.70          | -13.00      | -33.70      | H            |
| 3440.0          | -36.99                 | 4.62                 | 3.00     | 9.81                            | -31.80          | -13.00      | -18.80      | V            |
| 5160.0          | -42.83                 | 5.94                 | 3.00     | 10.86                           | -37.91          | -13.00      | -24.91      | V            |

*CATM1 Band 4\_Channel Bandwidth 20MHz\_16QAM\_Middle Channel*

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | Diatance | G <sub>a</sub> Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|----------|---------------------------------|-----------------|-------------|-------------|--------------|
| 3465.0          | -43.39                 | 4.63                 | 3.00     | 9.84                            | -38.18          | -13.00      | -25.18      | H            |
| 5197.5          | -50.89                 | 5.94                 | 3.00     | 10.86                           | -45.97          | -13.00      | -32.97      | H            |
| 3465.0          | -39.81                 | 4.63                 | 3.00     | 9.84                            | -34.60          | -13.00      | -21.60      | V            |
| 5197.5          | -41.49                 | 5.94                 | 3.00     | 10.86                           | -36.57          | -13.00      | -23.57      | V            |

*CATM1 Band 4\_Channel Bandwidth 20MHz\_16QAM\_High Channel*

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | Diatance | G <sub>a</sub> Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|----------|---------------------------------|-----------------|-------------|-------------|--------------|
| 3490.0          | -43.41                 | 4.65                 | 3.00     | 9.90                            | -38.16          | -13.00      | -25.16      | H            |
| 5235.0          | -51.66                 | 5.95                 | 3.00     | 10.91                           | -46.70          | -13.00      | -33.70      | H            |
| 3490.0          | -39.32                 | 4.65                 | 3.00     | 9.90                            | -34.07          | -13.00      | -21.07      | V            |
| 5235.0          | -44.94                 | 5.95                 | 3.00     | 10.91                           | -39.98          | -13.00      | -26.98      | V            |



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*CATM1 Band 5\_Channel Bandwidth 10MHz\_QPSK\_Low Channel*

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | Diatance | G <sub>a</sub> Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|----------|---------------------------------|-----------------|-------------|-------------|--------------|
| 1658.00         | -41.15                 | 3.86                 | 3.00     | 8.56                            | -36.45          | -13.00      | -23.45      | H            |
| 2487.00         | -47.05                 | 4.29                 | 3.00     | 6.98                            | -44.36          | -13.00      | -31.36      | H            |
| 1658.00         | -35.03                 | 3.86                 | 3.00     | 8.56                            | -30.33          | -13.00      | -17.33      | V            |
| 2487.00         | -36.50                 | 4.29                 | 3.00     | 6.98                            | -33.81          | -13.00      | -20.81      | V            |

*CATM1 Band 5\_Channel Bandwidth 10MHz\_QPSK\_Middle Channel*

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | Diatance | G <sub>a</sub> Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|----------|---------------------------------|-----------------|-------------|-------------|--------------|
| 1673.00         | -38.41                 | 3.90                 | 3.00     | 8.58                            | -33.73          | -13.00      | -20.73      | H            |
| 2509.50         | -44.96                 | 4.32                 | 3.00     | 6.80                            | -42.48          | -13.00      | -29.48      | H            |
| 1673.00         | -35.74                 | 3.90                 | 3.00     | 8.58                            | -31.06          | -13.00      | -18.06      | V            |
| 2509.50         | -39.72                 | 4.32                 | 3.00     | 6.80                            | -37.24          | -13.00      | -24.24      | V            |

*CATM1 Band 5\_Channel Bandwidth 10MHz\_QPSK\_High Channel*

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | Diatance | G <sub>a</sub> Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|----------|---------------------------------|-----------------|-------------|-------------|--------------|
| 1688.00         | -41.94                 | 3.91                 | 3.00     | 9.06                            | -36.79          | -13.00      | -23.79      | H            |
| 2532.00         | -44.11                 | 4.32                 | 3.00     | 6.65                            | -41.78          | -13.00      | -28.78      | H            |
| 1688.00         | -35.02                 | 3.91                 | 3.00     | 9.06                            | -29.87          | -13.00      | -16.87      | V            |
| 2532.00         | -39.17                 | 4.32                 | 3.00     | 6.65                            | -36.84          | -13.00      | -23.84      | V            |

*CATM1 Band 5\_Channel Bandwidth 10MHz\_16QAM\_Low Channel*

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | Diatance | G <sub>a</sub> Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|----------|---------------------------------|-----------------|-------------|-------------|--------------|
| 1658.00         | -43.55                 | 3.86                 | 3.00     | 8.56                            | -38.85          | -13.00      | -25.85      | H            |
| 2487.00         | -49.70                 | 4.29                 | 3.00     | 6.98                            | -47.01          | -13.00      | -34.01      | H            |
| 1658.00         | -39.87                 | 3.86                 | 3.00     | 8.56                            | -35.17          | -13.00      | -22.17      | V            |
| 2487.00         | -39.01                 | 4.29                 | 3.00     | 6.98                            | -36.32          | -13.00      | -23.32      | V            |

*CATM1 Band 5\_Channel Bandwidth 10MHz\_16QAM\_Middle Channel*

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | Diatance | G <sub>a</sub> Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|----------|---------------------------------|-----------------|-------------|-------------|--------------|
| 1673.00         | -44.72                 | 3.90                 | 3.00     | 8.58                            | -40.04          | -13.00      | -27.04      | H            |
| 2509.50         | -49.27                 | 4.32                 | 3.00     | 6.80                            | -46.79          | -13.00      | -33.79      | H            |
| 1673.00         | -37.43                 | 3.90                 | 3.00     | 8.58                            | -32.75          | -13.00      | -19.75      | V            |
| 2509.50         | -39.20                 | 4.32                 | 3.00     | 6.80                            | -36.72          | -13.00      | -23.72      | V            |

*CATM1 Band 5\_Channel Bandwidth 10MHz\_16QAM\_High Channel*

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | Diatance | G <sub>a</sub> Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|----------|---------------------------------|-----------------|-------------|-------------|--------------|
| 1688.00         | -42.58                 | 3.91                 | 3.00     | 9.06                            | -37.43          | -13.00      | -24.43      | H            |
| 2532.00         | -47.56                 | 4.32                 | 3.00     | 6.65                            | -45.23          | -13.00      | -32.23      | H            |
| 1688.00         | -39.46                 | 3.91                 | 3.00     | 9.06                            | -34.31          | -13.00      | -21.31      | V            |
| 2532.00         | -42.77                 | 4.32                 | 3.00     | 6.65                            | -40.44          | -13.00      | -27.44      | V            |



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*CATM1 Band 12\_Channel Bandwidth 10MHz\_QPSK\_Low Channel*

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | Diatance | G <sub>a</sub> Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|----------|---------------------------------|-----------------|-------------|-------------|--------------|
| 1408.00         | -39.73                 | 3.71                 | 3.00     | 9.02                            | -34.42          | -13.00      | -21.42      | H            |
| 2112.00         | -45.53                 | 4.22                 | 3.00     | 8.64                            | -41.11          | -13.00      | -28.11      | H            |
| 1408.00         | -35.04                 | 3.71                 | 3.00     | 9.02                            | -29.73          | -13.00      | -16.73      | V            |
| 2112.00         | -36.80                 | 4.22                 | 3.00     | 8.64                            | -32.38          | -13.00      | -19.38      | V            |

*CATM1 Band 12\_Channel Bandwidth 10MHz\_QPSK\_Middle Channel*

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | Diatance | G <sub>a</sub> Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|----------|---------------------------------|-----------------|-------------|-------------|--------------|
| 1415.00         | -41.98                 | 3.72                 | 3.00     | 9.04                            | -36.66          | -13.00      | -23.66      | H            |
| 2122.50         | -46.43                 | 4.23                 | 3.00     | 8.60                            | -42.06          | -13.00      | -29.06      | H            |
| 1415.00         | -35.18                 | 3.72                 | 3.00     | 9.04                            | -29.86          | -13.00      | -16.86      | V            |
| 2122.50         | -36.81                 | 4.23                 | 3.00     | 8.60                            | -32.44          | -13.00      | -19.44      | V            |

*CATM1 Band 12\_Channel Bandwidth 10MHz\_QPSK\_High Channel*

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | Diatance | G <sub>a</sub> Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|----------|---------------------------------|-----------------|-------------|-------------|--------------|
| 1422.00         | -39.25                 | 4.78                 | 3.00     | 8.91                            | -35.12          | -13.00      | -22.12      | H            |
| 2133.00         | -47.37                 | 4.25                 | 3.00     | 8.26                            | -43.36          | -13.00      | -30.36      | H            |
| 1422.00         | -36.40                 | 4.78                 | 3.00     | 8.91                            | -32.27          | -13.00      | -19.27      | V            |
| 2133.00         | -38.00                 | 4.25                 | 3.00     | 8.26                            | -33.99          | -13.00      | -20.99      | V            |

*CATM1 Band 12\_Channel Bandwidth 10MHz\_16QAM\_Low Channel*

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | Diatance | G <sub>a</sub> Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|----------|---------------------------------|-----------------|-------------|-------------|--------------|
| 1408.00         | -41.36                 | 3.71                 | 3.00     | 9.02                            | -36.05          | -13.00      | -23.05      | H            |
| 2112.00         | -46.05                 | 4.22                 | 3.00     | 8.64                            | -41.63          | -13.00      | -28.63      | H            |
| 1408.00         | -35.22                 | 3.71                 | 3.00     | 9.02                            | -29.91          | -13.00      | -16.91      | V            |
| 2112.00         | -37.22                 | 4.22                 | 3.00     | 8.64                            | -32.80          | -13.00      | -19.80      | V            |

*CATM1 Band 12\_Channel Bandwidth 10MHz\_16QAM\_Middle Channel*

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | Diatance | G <sub>a</sub> Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|----------|---------------------------------|-----------------|-------------|-------------|--------------|
| 1415.00         | -39.86                 | 3.72                 | 3.00     | 9.04                            | -34.54          | -13.00      | -21.54      | H            |
| 2122.50         | -45.42                 | 4.23                 | 3.00     | 8.60                            | -41.05          | -13.00      | -28.05      | H            |
| 1415.00         | -33.27                 | 3.72                 | 3.00     | 9.04                            | -27.95          | -13.00      | -14.95      | V            |
| 2122.50         | -39.72                 | 4.23                 | 3.00     | 8.60                            | -35.35          | -13.00      | -22.35      | V            |

*CATM1 Band 12\_Channel Bandwidth 10MHz\_16QAM\_High Channel*

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | Diatance | G <sub>a</sub> Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|----------|---------------------------------|-----------------|-------------|-------------|--------------|
| 1422.00         | -39.98                 | 4.78                 | 3.00     | 8.91                            | -35.85          | -13.00      | -22.85      | H            |
| 2133.00         | -45.29                 | 4.25                 | 3.00     | 8.26                            | -41.28          | -13.00      | -28.28      | H            |
| 1422.00         | -34.61                 | 4.78                 | 3.00     | 8.91                            | -30.48          | -13.00      | -17.48      | V            |
| 2133.00         | -39.50                 | 4.25                 | 3.00     | 8.26                            | -35.49          | -13.00      | -22.49      | V            |



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*CATM1 Band 13\_Channel Bandwidth 10MHz\_QPSK\_Middle Channel*

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | Diatance | G <sub>a</sub> Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|----------|---------------------------------|-----------------|-------------|-------------|--------------|
| 1564.0          | -60.09                 | 4.99                 | 3.00     | 11.12                           | -53.96          | -40.00      | -13.96      | H            |
| 2346.0          | -47.92                 | 5.85                 | 3.00     | 12.02                           | -41.75          | -13.00      | -28.75      | H            |
| 1564.0          | -60.08                 | 4.99                 | 3.00     | 11.12                           | -53.95          | -40.00      | -13.95      | V            |
| 2346.0          | -39.29                 | 5.85                 | 3.00     | 12.02                           | -33.12          | -13.00      | -20.12      | V            |

*CATM1 Band 13\_Channel Bandwidth 10MHz\_16QAM\_Middle Channel*

| Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | Diatance | G <sub>a</sub> Antenna Gain(dB) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Polarization |
|-----------------|------------------------|----------------------|----------|---------------------------------|-----------------|-------------|-------------|--------------|
| 1564.0          | -58.42                 | 4.99                 | 3.00     | 11.12                           | -52.29          | -40.00      | -12.29      | H            |
| 2346.0          | -45.49                 | 5.85                 | 3.00     | 12.02                           | -39.32          | -13.00      | -26.32      | H            |
| 1564.0          | -59.96                 | 4.99                 | 3.00     | 11.12                           | -53.83          | -40.00      | -13.83      | V            |
| 2346.0          | -39.19                 | 5.85                 | 3.00     | 12.02                           | -33.02          | -13.00      | -20.02      | V            |

Notes: All channel bandwidth were tested,the report recorded the worst data.



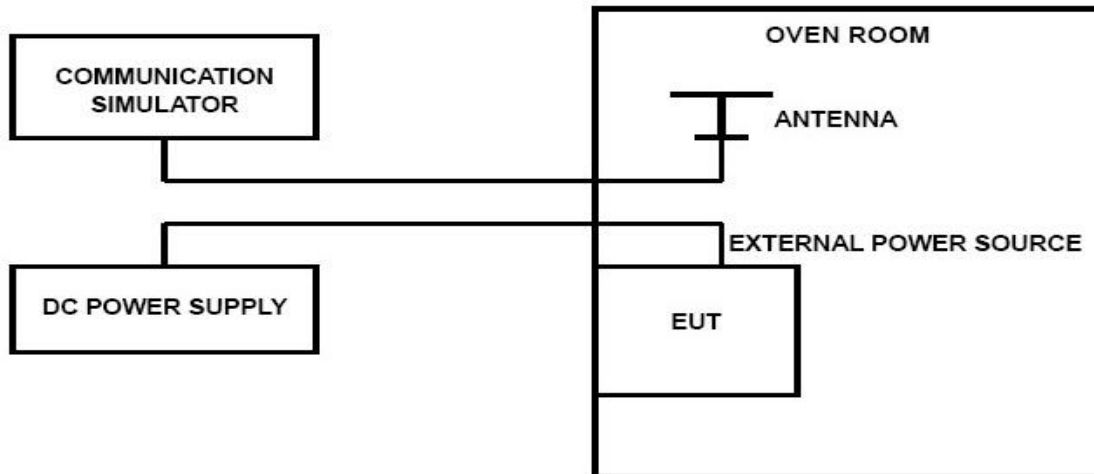


## 4.6 Frequency Stability under Temperature & Voltage Variations

### LIMIT

According to FCC §2.1055, §22.355, §24.235, §27.54 and §90.213 requirement, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation and should not exceed 2.5ppm.

### TEST CONFIGURATION



### TEST PROCEDURE

The EUT was setup according to TIA-603-E

#### **Frequency Stability Under Temperature Variations:**

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a "call mode". This is accomplished with the use of R&S CMW 500 DIGITAL RADIO COMMUNICATION TESTER.

1. Measure the carrier frequency at room temperature.
2. Subject the EUT to overnight soak at -30°C.
3. With the EUT, powered via nominal voltage, connected to the CMW 500 and in a simulated call on middle channel for LTE band 2, LTE band 4, LTE band 5, LTE band 7, LTE band 12, LTE Band 17, LTE band 38, LTE Band 41; measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
4. Repeat the above measurements at 10°C increments from -30°C to +50°C. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
5. Re-measure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments re-measuring carrier frequency at each voltage. Pause at nominal voltage for 1.5 hours unpowered, to allow any self-heating to stabilize, before continuing.
6. Subject the EUT to overnight soak at +50°C.
7. With the EUT, powered via nominal voltage, connected to the CMW 500 and in a simulated call on the centre channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
8. Repeat the above measurements at 10 °C increments from +50°C to -30°C. Allow at least 1.5 hours at each temperature, unpowered, before making measurements
9. At all temperature levels hold the temperature to +/- 0.5°C during the measurement procedure.

#### **Frequency Stability Under Voltage Variations:**

Set chamber temperature to 20°C. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.





Reduce the input voltage to specify extreme voltage variation ( $\pm 15\%$ ) and endpoint, record the maximum frequency change.

## TEST RESULTS

Remark:

We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of CATM1 Band 2, CATM1 Band 4, CATM1 Band 5, CATM1 Band 12, CATM1 Band 13; recorded worst case for each Channel Bandwidth of CATM1 Band 2, CATM1 Band 4, CATM1 Band 5, CATM1 Band 12, CATM1 Band 13.

CatM1 Band 2, QPSK, 1.4MHz bandwidth (worst case of all bandwidths)

| CATM1 Band 2 |                  |                     |                      |             |         |
|--------------|------------------|---------------------|----------------------|-------------|---------|
| DC Power     | Temperature (°C) | Frequency error(Hz) | Frequency error(ppm) | Limit (ppm) | Verdict |
| 3.3          | 20               | 19                  | 0.010                | $\pm 2.50$  | PASS    |
| 3.7          | 20               | -5                  | -0.003               | $\pm 2.50$  | PASS    |
| 4.2          | 20               | -2                  | -0.001               | $\pm 2.50$  | PASS    |
| 3.7          | -30              | 12                  | 0.006                | $\pm 2.50$  | PASS    |
| 3.7          | -20              | -1                  | -0.001               | $\pm 2.50$  | PASS    |
| 3.7          | -10              | -5                  | -0.003               | $\pm 2.50$  | PASS    |
| 3.7          | 0                | 12                  | 0.006                | $\pm 2.50$  | PASS    |
| 3.7          | 10               | -11                 | -0.006               | $\pm 2.50$  | PASS    |
| 3.7          | 20               | 3                   | 0.002                | $\pm 2.50$  | PASS    |
| 3.7          | 30               | -18                 | -0.010               | $\pm 2.50$  | PASS    |
| 3.7          | 40               | 12                  | 0.006                | $\pm 2.50$  | PASS    |
| 3.7          | 50               | -10                 | -0.005               | $\pm 2.50$  | PASS    |

CatM1 Band 2, 16QAM, 1.4MHz bandwidth (worst case of all bandwidths)

| CATM1 Band 2 |                  |                     |                      |             |         |
|--------------|------------------|---------------------|----------------------|-------------|---------|
| DC Power     | Temperature (°C) | Frequency error(Hz) | Frequency error(ppm) | Limit (ppm) | Verdict |
| 3.3          | 20               | -1                  | -0.001               | $\pm 2.50$  | PASS    |
| 3.7          | 20               | -24                 | -0.014               | $\pm 2.50$  | PASS    |
| 4.2          | 20               | -48                 | -0.027               | $\pm 2.50$  | PASS    |
| 3.7          | -30              | 4                   | 0.002                | $\pm 2.50$  | PASS    |
| 3.7          | -20              | 42                  | 0.024                | $\pm 2.50$  | PASS    |
| 3.7          | -10              | -24                 | -0.014               | $\pm 2.50$  | PASS    |
| 3.7          | 0                | -1                  | -0.001               | $\pm 2.50$  | PASS    |
| 3.7          | 10               | -14                 | -0.008               | $\pm 2.50$  | PASS    |
| 3.7          | 20               | 45                  | 0.026                | $\pm 2.50$  | PASS    |
| 3.7          | 30               | 31                  | 0.018                | $\pm 2.50$  | PASS    |
| 3.7          | 40               | 1                   | 0.001                | $\pm 2.50$  | PASS    |
| 3.7          | 50               | -31                 | -0.018               | $\pm 2.50$  | PASS    |



**CatM1 Band 4, QPSK, 1.4MHz bandwidth (worst case of all bandwidths)**

| CATM1 Band 4 |                  |                     |                      |             |         |
|--------------|------------------|---------------------|----------------------|-------------|---------|
| DC Power     | Temperature (°C) | Frequency error(Hz) | Frequency error(ppm) | Limit (ppm) | Verdict |
| 3.3          | 20               | 28                  | 0.016                | ±2.50       | PASS    |
| 3.7          | 20               | 1                   | 0.001                | ±2.50       | PASS    |
| 4.2          | 20               | 29                  | 0.017                | ±2.50       | PASS    |
| 3.7          | -30              | 46                  | 0.026                | ±2.50       | PASS    |
| 3.7          | -20              | 15                  | 0.009                | ±2.50       | PASS    |
| 3.7          | -10              | -6                  | -0.003               | ±2.50       | PASS    |
| 3.7          | 0                | 28                  | 0.016                | ±2.50       | PASS    |
| 3.7          | 10               | -26                 | -0.015               | ±2.50       | PASS    |
| 3.7          | 20               | -30                 | -0.017               | ±2.50       | PASS    |
| 3.7          | 30               | -9                  | -0.005               | ±2.50       | PASS    |
| 3.7          | 40               | 14                  | 0.008                | ±2.50       | PASS    |
| 3.7          | 50               | -27                 | -0.015               | ±2.50       | PASS    |

**CatM1 Band 4, 16QAM, 1.4MHz bandwidth (worst case of all bandwidths)**

| CATM1 Band 4 |                  |                     |                      |             |         |
|--------------|------------------|---------------------|----------------------|-------------|---------|
| DC Power     | Temperature (°C) | Frequency error(Hz) | Frequency error(ppm) | Limit (ppm) | Verdict |
| 3.3          | 20               | 29                  | 0.035                | ±2.50       | PASS    |
| 3.7          | 20               | 20                  | 0.024                | ±2.50       | PASS    |
| 4.2          | 20               | -8                  | -0.010               | ±2.50       | PASS    |
| 3.7          | -30              | 3                   | 0.004                | ±2.50       | PASS    |
| 3.7          | -20              | -8                  | -0.010               | ±2.50       | PASS    |
| 3.7          | -10              | -32                 | -0.039               | ±2.50       | PASS    |
| 3.7          | 0                | -38                 | -0.046               | ±2.50       | PASS    |
| 3.7          | 10               | 23                  | 0.028                | ±2.50       | PASS    |
| 3.7          | 20               | 30                  | 0.036                | ±2.50       | PASS    |
| 3.7          | 30               | -3                  | -0.004               | ±2.50       | PASS    |
| 3.7          | 40               | -48                 | -0.058               | ±2.50       | PASS    |
| 3.7          | 50               | 15                  | 0.018                | ±2.50       | PASS    |

**CatM1 Band 5, QPSK, 1.4MHz bandwidth(worst case of all bandwidths)**

| CATM1 Band 5 |                  |                     |                      |             |         |
|--------------|------------------|---------------------|----------------------|-------------|---------|
| DC Power     | Temperature (°C) | Frequency error(Hz) | Frequency error(ppm) | Limit (ppm) | Verdict |
| 3.3          | 20               | 11                  | 0.013                | ±2.50       | PASS    |
| 3.7          | 20               | 2                   | 0.002                | ±2.50       | PASS    |
| 4.2          | 20               | -45                 | -0.055               | ±2.50       | PASS    |
| 3.7          | -30              | 15                  | 0.018                | ±2.50       | PASS    |
| 3.7          | -20              | -14                 | -0.017               | ±2.50       | PASS    |
| 3.7          | -10              | 12                  | 0.015                | ±2.50       | PASS    |
| 3.7          | 0                | -35                 | -0.042               | ±2.50       | PASS    |
| 3.7          | 10               | 50                  | 0.061                | ±2.50       | PASS    |
| 3.7          | 20               | 29                  | 0.035                | ±2.50       | PASS    |
| 3.7          | 30               | 22                  | 0.027                | ±2.50       | PASS    |
| 3.7          | 40               | 42                  | 0.051                | ±2.50       | PASS    |
| 3.7          | 50               | 0                   | 0.000                | ±2.50       | PASS    |



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## CatM1 Band 5, 16QAM, 1.4MHz bandwidth(worst case of all bandwidths)

## CATM1 Band 5

| DC Power | Temperature (°C) | Frequency error(Hz) | Frequency error(ppm) | Limit (ppm) | Verdict |
|----------|------------------|---------------------|----------------------|-------------|---------|
| 3.3      | 20               | 3                   | 0.004                | ±2.50       | PASS    |
| 3.7      | 20               | -24                 | -0.029               | ±2.50       | PASS    |
| 4.2      | 20               | 47                  | 0.057                | ±2.50       | PASS    |
| 3.7      | -30              | -28                 | -0.034               | ±2.50       | PASS    |
| 3.7      | -20              | -37                 | -0.045               | ±2.50       | PASS    |
| 3.7      | -10              | 33                  | 0.040                | ±2.50       | PASS    |
| 3.7      | 0                | 29                  | 0.035                | ±2.50       | PASS    |
| 3.7      | 10               | -47                 | -0.057               | ±2.50       | PASS    |
| 3.7      | 20               | -46                 | -0.056               | ±2.50       | PASS    |
| 3.7      | 30               | 10                  | 0.012                | ±2.50       | PASS    |
| 3.7      | 40               | 11                  | 0.013                | ±2.50       | PASS    |
| 3.7      | 50               | 9                   | 0.011                | ±2.50       | PASS    |

## CatM1 Band 12, QPSK, 1.4MHz bandwidth (worst case of all bandwidths and modulation type)

## CATM1 Band 12

| DC Power | Temperature (°C) | Frequency error(Hz) | Frequency error(ppm) | Limit (ppm) | Verdict |
|----------|------------------|---------------------|----------------------|-------------|---------|
| 3.3      | 20               | 46                  | 0.065                | ±2.50       | PASS    |
| 3.7      | 20               | 44                  | 0.062                | ±2.50       | PASS    |
| 4.2      | 20               | -43                 | -0.061               | ±2.50       | PASS    |
| 3.7      | -30              | -29                 | -0.041               | ±2.50       | PASS    |
| 3.7      | -20              | 31                  | 0.044                | ±2.50       | PASS    |
| 3.7      | -10              | 34                  | 0.048                | ±2.50       | PASS    |
| 3.7      | 0                | 43                  | 0.061                | ±2.50       | PASS    |
| 3.7      | 10               | -21                 | -0.030               | ±2.50       | PASS    |
| 3.7      | 20               | -2                  | -0.003               | ±2.50       | PASS    |
| 3.7      | 30               | 3                   | 0.004                | ±2.50       | PASS    |
| 3.7      | 40               | -43                 | -0.061               | ±2.50       | PASS    |
| 3.7      | 50               | 36                  | 0.051                | ±2.50       | PASS    |

## CatM1 Band 12, 16QAM, 1.4MHz bandwidth (worst case of all bandwidths and modulation type)

## CATM1 Band 12

| DC Power | Temperature (°C) | Frequency error(Hz) | Frequency error(ppm) | Limit (ppm) | Verdict |
|----------|------------------|---------------------|----------------------|-------------|---------|
| 3.3      | 20               | 39                  | 0.055                | ±2.50       | PASS    |
| 3.7      | 20               | 35                  | 0.049                | ±2.50       | PASS    |
| 4.2      | 20               | 10                  | 0.014                | ±2.50       | PASS    |
| 3.7      | -30              | 34                  | 0.048                | ±2.50       | PASS    |
| 3.7      | -20              | -28                 | -0.040               | ±2.50       | PASS    |
| 3.7      | -10              | 19                  | 0.027                | ±2.50       | PASS    |
| 3.7      | 0                | 20                  | 0.028                | ±2.50       | PASS    |
| 3.7      | 10               | 7                   | 0.010                | ±2.50       | PASS    |
| 3.7      | 20               | -30                 | -0.042               | ±2.50       | PASS    |
| 3.7      | 30               | -9                  | -0.013               | ±2.50       | PASS    |
| 3.7      | 40               | -11                 | -0.016               | ±2.50       | PASS    |
| 3.7      | 50               | 17                  | 0.024                | ±2.50       | PASS    |



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## CatM1 Band 13, 5MHz bandwidth, QPSK (worst case of all bandwidths)

| CATM1 Band 13 |                  |                     |                      |             |         |
|---------------|------------------|---------------------|----------------------|-------------|---------|
| DC Power      | Temperature (°C) | Frequency error(Hz) | Frequency error(ppm) | Limit (ppm) | Verdict |
| 3.3           | 20               | -49                 | -0.063               | 2.50        | PASS    |
| 3.7           | 20               | 33                  | 0.042                | 2.50        | PASS    |
| 4.2           | 20               | -9                  | -0.012               | 2.50        | PASS    |
| 3.7           | -30              | -23                 | -0.029               | 2.50        | PASS    |
| 3.7           | -20              | 31                  | 0.040                | 2.50        | PASS    |
| 3.7           | -10              | 25                  | 0.032                | 2.50        | PASS    |
| 3.7           | 0                | 50                  | 0.064                | 2.50        | PASS    |
| 3.7           | 10               | -30                 | -0.038               | 2.50        | PASS    |
| 3.7           | 20               | 38                  | 0.049                | 2.50        | PASS    |
| 3.7           | 30               | 47                  | 0.060                | 2.50        | PASS    |
| 3.7           | 40               | -11                 | -0.014               | 2.50        | PASS    |
| 3.7           | 50               | -31                 | -0.040               | 2.50        | PASS    |

## CatM1 Band 13, 5MHz bandwidth, 16QAM (worst case of all bandwidths)

| CATM1 Band 13 |                  |                     |                      |             |         |
|---------------|------------------|---------------------|----------------------|-------------|---------|
| DC Power      | Temperature (°C) | Frequency error(Hz) | Frequency error(ppm) | Limit (ppm) | Verdict |
| 3.3           | 20               | -33                 | -0.042               | 2.50        | PASS    |
| 3.7           | 20               | 30                  | 0.038                | 2.50        | PASS    |
| 4.2           | 20               | -21                 | -0.027               | 2.50        | PASS    |
| 3.7           | -30              | -50                 | -0.064               | 2.50        | PASS    |
| 3.7           | -20              | 30                  | 0.038                | 2.50        | PASS    |
| 3.7           | -10              | 24                  | 0.031                | 2.50        | PASS    |
| 3.7           | 0                | 17                  | 0.022                | 2.50        | PASS    |
| 3.7           | 10               | -41                 | -0.052               | 2.50        | PASS    |
| 3.7           | 20               | 11                  | 0.014                | 2.50        | PASS    |
| 3.7           | 30               | 41                  | 0.052                | 2.50        | PASS    |
| 3.7           | 40               | 48                  | 0.061                | 2.50        | PASS    |
| 3.7           | 50               | -47                 | -0.060               | 2.50        | PASS    |



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## **5 Test Setup Photos of the EUT**

Pleaserefer to separated files for Test Setup Photos of the EUT.

## **6 External Photos of the EUT**

Pleaserefer to separated files for External Photos of the EUT.

## **7 Internal Photos of the EUT**

Pleaserefer to separated files for Internal Photos of the EUT.

\*\*\*\*\*End of Report\*\*\*\*\*

