

## FCC Test Report (Part 27 – Cat-M1 B4/B12/B13/B66/B85)

**Report No.:** RFBFKV-WTW-P23050559-4

**FCC ID:** L6AITH100-1

**Test Model:** ITH100-1

**Received Date:** May 23, 2023

**Test Date:** May 29 ~ Jun. 09, 2023

**Issued Date:** Jul. 07, 2023

**Applicant:** BlackBerry Limited

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**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch  
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**FCC Registration /**

**Designation Number(1):** 788550 / TW0003

**FCC Registration /**

**Designation Number(2):** 281270 / TW0032



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## Table of Contents

<b>Release Control Record</b> .....	<b>4</b>
<b>1 Certificate of Conformity</b> .....	<b>5</b>
<b>2 Summary of Test Results</b> .....	<b>6</b>
2.1 Measurement Uncertainty.....	8
2.2 Test Site and Instruments.....	9
<b>3 General Information</b> .....	<b>10</b>
3.1 General Description of EUT.....	10
3.2 Configuration of System under Test.....	14
3.2.1 Description of Support Units.....	14
3.3 Test Mode Applicability and Tested Channel Detail.....	15
3.4 EUT Operating Conditions.....	25
3.5 General Description of Applied Standards and References.....	25
<b>4 Test Types and Results</b> .....	<b>26</b>
4.1 Output Power Measurement.....	26
4.1.1 Limits of Output Power Measurement.....	26
4.1.2 Test Procedures.....	26
4.1.3 Test Setup.....	26
4.1.4 Test Results.....	27
4.2 Modulation Characteristics Measurement.....	40
4.2.1 Limits of Modulation Characteristics.....	40
4.2.2 Test Procedure.....	40
4.2.3 Test Setup.....	40
4.2.4 Test Results.....	41
4.3 Frequency Stability Measurement.....	44
4.3.1 Limits of Frequency Stability Measurement.....	44
4.3.2 Test Procedure.....	44
4.3.3 Test Instruments.....	44
4.3.4 Test Setup.....	44
4.3.5 Test Results.....	45
4.4 Occupied Bandwidth Measurement.....	65
4.4.1 Limits of Occupied Bandwidth Measurement.....	65
4.4.2 Test Procedure.....	65
4.4.3 Test Setup.....	65
4.4.4 Test Result.....	66
4.5 Channel Edge / Out-of-Band Emissions Measurement.....	82
4.5.1 Limits of Band Edge / Out-of-Band Emissions Measurement.....	82
4.5.2 Test Setup.....	82
4.5.3 Test Procedures.....	82
4.5.4 Test Results.....	83
4.6 Peak to Average Ratio.....	103
4.6.1 Limits of Peak to Average Ratio Measurement.....	103
4.6.2 Test Setup.....	103
4.6.3 Test Procedures.....	103
4.6.4 Test Results.....	104
4.7 Conducted Spurious Emissions.....	112
4.7.1 Limits of Conducted Spurious Emissions Measurement.....	112
4.7.2 Test Setup.....	112
4.7.3 Test Procedure.....	112
4.7.4 Test Results.....	113
4.8 Radiated Emission Measurement.....	134
4.8.1 Limits of Radiated Emission Measurement.....	134
4.8.2 Test Procedure.....	134
4.8.3 Deviation from Test Standard.....	135

4.8.4 Test Setup.....	135
4.8.5 Test Results .....	136
<b>Appendix – Information of the Testing Laboratories .....</b>	<b>181</b>

### Release Control Record

Issue No.	Description	Date Issued
RFBFKV-WTW-P23050559-4	Original Release	Jul. 07, 2023

## 1 Certificate of Conformity

**Product:** Radar H2M IS  
**Brand:** BlackBerry  
**Test Model:** ITH100-1  
**Sample Status:** Engineering Sample  
**Applicant:** BlackBerry Limited  
**Test Date:** May 29 ~ Jun. 09, 2023  
**Standards:** FCC Part 27, Subpart C, F, H, L

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

**Prepared by :** Pettie Chen, **Date:** Jul. 07, 2023  
Pettie Chen / Senior Specialist

**Approved by :** Jeremy Lin, **Date:** Jul. 07, 2023  
Jeremy Lin / Project Engineer

## 2 Summary of Test Results

For Cat-M1 Band 4

Applied Standard: FCC Part 27 & Part 2			
FCC Clause	Test Item	Result	Remarks
2.1046 27.50 (d)	Equivalent Isotropically radiated power	Pass	Meet the requirement of limit.
2.1047	Modulation characteristics	Pass	Meet the requirement.
2.1055 27.54	Frequency Stability	Pass	Meet the requirement of limit.
2.1049	Emission Bandwidth	Pass	Meet the requirement of limit.
2.1051 27.53 (h)	Out of Band Emission Measurements	Pass	Meet the requirement of limit.
27.50 (d)(5)	Peak To Average Ratio	Pass	Meet the requirement of limit.
2.1051 27.53 (h)	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 27.53 (h)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -28.66 dB at 3465.00 MHz.

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

For Cat-M1 Band 12

Applied Standard: FCC Part 27 & Part 2			
FCC Clause	Test Item	Result	Remarks
2.1046 27.50 (c)	Effective radiated power	Pass	Meet the requirement of limit.
2.1047	Modulation characteristics	Pass	Meet the requirement.
2.1055 27.54	Frequency Stability	Pass	Meet the requirement of limit.
2.1049	Emission Bandwidth	Pass	Meet the requirement of limit.
2.1051 27.53 (g)	Out of Band Emission Measurements	Pass	Meet the requirement of limit.
--	Peak To Average Ratio	Pass	Meet the requirement of limit.
2.1051 27.53 (g)	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 27.53 (g)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -34.58 dB at 1415.00 MHz.

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

## For Cat-M1 Band 13

Applied Standard: FCC Part 27 & Part 2			
FCC Clause	Test Item	Result	Remarks
2.1046 27.50 (b)	Effective radiated power	Pass	Meet the requirement of limit.
2.1047	Modulation characteristics	Pass	Meet the requirement.
2.1055 27.54	Frequency Stability	Pass	Meet the requirement of limit.
2.1049	Emission Bandwidth	Pass	Meet the requirement of limit.
2.1051 27.53 (c)	Out of Band Emission Measurements	Pass	Meet the requirement of limit.
--	Peak To Average Ratio	Pass	Meet the requirement of limit.
2.1051 27.53 (c)(f)	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 27.53 (c)(f)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -10.09 dB at 1564.00 MHz.

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

## For Cat-M1 Band 66

Applied Standard: FCC Part 27 & Part 2			
FCC Clause	Test Item	Result	Remarks
2.1046 27.50(d)	Equivalent Isotropically radiated power	Pass	Meet the requirement of limit.
2.1047	Modulation characteristics	Pass	Meet the requirement.
2.1055 27.54	Frequency Stability	Pass	Meet the requirement of limit.
2.1049	Emission Bandwidth	Pass	Meet the requirement of limit.
2.1051 27.53(h)	Out of Band Emission Measurements	Pass	Meet the requirement of limit.
27.50(d)(5)	Peak To Average Ratio	Pass	Meet the requirement of limit.
2.1051 27.53(h)	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 27.53(h)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -27.06 dB at 3490.00 MHz.

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

For Cat-M1 Band 85

Applied Standard: FCC Part 27 & Part 2			
FCC Clause	Test Item	Result	Remarks
2.1046 27.50 (c)	Effective radiated power	Pass	Meet the requirement of limit.
2.1047	Modulation characteristics	Pass	Meet the requirement.
2.1055 27.54	Frequency Stability	Pass	Meet the requirement of limit.
2.1049	Emission Bandwidth	Pass	Meet the requirement of limit.
2.1051 27.53 (g)	Out of Band Emission Measurements	Pass	Meet the requirement of limit.
--	Peak To Average Ratio	Pass	Meet the requirement of limit.
2.1051 27.53 (g)	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 27.53 (g)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -31.77 dB at 1414.00 MHz.

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

## 2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) ( $\pm$ )
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.00 dB
	30MHz ~ 200MHz	2.91 dB
	200MHz ~ 1000MHz	2.92 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	1.76 dB
	18GHz ~ 40GHz	1.77 dB



## 2.2 Test Site and Instruments

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower Max-Full	MFT-151SS-0.5T	NA	NA	NA
Turn Table Max-Full	MF-7802BS	NA	NA	NA
Turn Table Controller Max-Full	MF-7802BS	MF780208674	NA	NA
EMI Test Receiver R&S	ESR3	102782	2022/12/12	2023/12/11
Signal & Spectrum Analyzer R&S	FSW43	101866	2023/1/10	2024/1/9
Loop Antenna TESEQ	HLA 6121	45745	2022/7/27	2023/7/26
Loop Antenna Electro-Metrics	EM-6879	269	2022/9/19	2023/9/18
Preamplifier EMCI	EMC001340	980201	2022/9/23	2023/9/22
RF Coaxial Cable EMCI	5D-NM-BM	140903+140902	2023/1/7	2024/1/6
Preamplifier EMCI	EMC330N	980782	2023/1/16	2024/1/15
Bi_Log Antenna Schwarzbeck	VULB 9168	9168-1213	2022/10/20	2023/10/19
RF Coaxial Cable EMCI	EMCCFD400-NM-NM-500	201233	2023/1/16	2024/1/15
RF Coaxial Cable EMCI	EMCCFD400-NM-NM-3000	201235	2023/1/16	2024/1/15
RF Coaxial Cable EMCI	EMCCFD400-NM-NM-9000	201236(with PAD)	2023/1/16	2024/1/15
Horn Antenna RFSPIN	DRH18-E	210103A18E	2022/11/13	2023/11/12
Preamplifier EMCI	EMC118A45SE	980808	2022/12/29	2023/12/28
RF Coaxial Cable EMCI	EMC104-SM-SM-1000	210102	2023/1/16	2024/1/15
RF Coaxial Cable EMCI	EMC104-SM-SM-3000	201231	2023/1/16	2024/1/15
RF Coaxial Cable EMCI	EMC104-SM-SM-9000	201243	2023/1/16	2024/1/15
Preamplifier EMCI	EMC184045SE	980788	2023/1/16	2024/1/15
Horn Antenna Schwarzbeck	BBHA 9170	9170-1049	2022/11/13	2023/11/12
RF Coaxial Cable EMCI	EMC101G-KM-KM-5000	201260	2023/1/16	2024/1/15
RF Coaxial Cable EMCI	EMC101G-KM-KM-3000	201257	2023/1/16	2024/1/15
RF Coaxial Cable EMCI	EMC101G-KM-KM-2000	201254	2023/1/16	2024/1/15
USB Wideband Power Sensor KEYSIGHT	U2021XA	MY55050005/MY55190004/ MY55190007/MY55210005	2022/7/13	2023/7/10
Wideband Radio Communication Tester R&S	CMW500	151084	2023/1/16	2024/1/15
Radio Communication Analyzer Anritsu	MT8821C	6201462755	2023/3/3	2024/3/2
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The test was performed in WM Chamber 8.

### 3 General Information

#### 3.1 General Description of EUT

Product	Radar H2M IS	
Brand	BlackBerry	
Test Model	ITH100-1	
Sample Status	Engineering Sample	
Power Supply Rating	7.2Vdc from battery	
Modulation Type	QPSK, 16QAM	
Operating Frequency	Cat-M1 Band 4 (Channel Bandwidth: 1.4 MHz)	1710.7MHz ~ 1754.3MHz
	Cat-M1 Band 4 (Channel Bandwidth: 3 MHz)	1711.5MHz ~ 1753.5MHz
	Cat-M1 Band 4 (Channel Bandwidth: 5 MHz)	1712.5MHz ~ 1752.5MHz
	Cat-M1 Band 4 (Channel Bandwidth: 10 MHz)	1715.0MHz ~ 1750.0MHz
	Cat-M1 Band 4 (Channel Bandwidth: 15 MHz)	1717.5MHz ~ 1747.5MHz
	Cat-M1 Band 4 (Channel Bandwidth: 20 MHz)	1720.0MHz ~ 1745.0MHz
	Cat-M1 Band 12 (Channel Bandwidth: 1.4 MHz)	699.7MHz ~ 715.3MHz
	Cat-M1 Band 12 (Channel Bandwidth: 3 MHz)	700.5MHz ~ 714.5MHz
	Cat-M1 Band 12 (Channel Bandwidth: 5 MHz)	701.5MHz ~ 713.5MHz
	Cat-M1 Band 12 (Channel Bandwidth: 10 MHz)	704.0MHz ~ 711.0MHz
	Cat-M1 Band 13 (Channel Bandwidth: 5 MHz)	779.5MHz ~ 784.5MHz
	Cat-M1 Band 13 (Channel Bandwidth: 10 MHz)	782.0MHz
	Cat-M1 Band 66 (Channel Bandwidth: 1.4 MHz)	1710.7 ~ 1779.3 MHz
	Cat-M1 Band 66 (Channel Bandwidth: 3 MHz)	1711.5 ~ 1778.5 MHz
	Cat-M1 Band 66 (Channel Bandwidth: 5 MHz)	1712.5 ~ 1777.5 MHz
	Cat-M1 Band 66 (Channel Bandwidth: 10 MHz)	1715.0 ~ 1775.0 MHz
	Cat-M1 Band 66 (Channel Bandwidth: 15 MHz)	1717.5 ~ 1772.5 MHz
	Cat-M1 Band 66 (Channel Bandwidth: 20 MHz)	1720.0 ~ 1770.0 MHz
	Cat-M1 Band 85 (Channel Bandwidth: 5 MHz)	700.5MHz ~ 713.5MHz
	Cat-M1 Band 85 (Channel Bandwidth: 10 MHz)	703.0MHz ~ 711.0MHz

		QPSK	16QAM
Max. EIRP Power	Cat-M1 Band 4 (Channel Bandwidth: 1.4 MHz)	393.550mW (25.95dBm)	323.594mW (25.10dBm)
	Cat-M1 Band 4 (Channel Bandwidth: 3 MHz)	398.107mW (26.00dBm)	333.426mW (25.23dBm)
	Cat-M1 Band 4 (Channel Bandwidth: 5 MHz)	395.367mW (25.97dBm)	373.250mW (25.72dBm)
	Cat-M1 Band 4 (Channel Bandwidth: 10 MHz)	387.258mW (25.88dBm)	378.443mW (25.78dBm)
	Cat-M1 Band 4 (Channel Bandwidth: 15 MHz)	397.192mW (25.99dBm)	393.550mW (25.95dBm)
	Cat-M1 Band 4 (Channel Bandwidth: 20 MHz)	403.645mW (26.06dBm)	396.278mW (25.98dBm)
	Cat-M1 Band 66 (Channel Bandwidth: 1.4 MHz)	543.250mW (27.35dBm)	456.037mW (26.59dBm)
	Cat-M1 Band 66 (Channel Bandwidth: 3 MHz)	545.758mW (27.37dBm)	472.063mW (26.74dBm)
	Cat-M1 Band 66 (Channel Bandwidth: 5 MHz)	518.800mW (27.15dBm)	518.800mW (27.15dBm)
	Cat-M1 Band 66 (Channel Bandwidth: 10 MHz)	519.996mW (27.16dBm)	530.884mW (27.25dBm)
	Cat-M1 Band 66 (Channel Bandwidth: 15 MHz)	542.001mW (27.34dBm)	532.108mW (27.26dBm)
	Cat-M1 Band 66 (Channel Bandwidth: 20 MHz)	549.541mW (27.40dBm)	538.270mW (27.31dBm)
	Max. ERP Power		QPSK
Cat-M1 Band 12 (Channel Bandwidth: 1.4 MHz)		111.944mW (20.49dBm)	98.175mW (19.92dBm)
Cat-M1 Band 12 (Channel Bandwidth: 3 MHz)		113.240mW (20.54dBm)	102.802mW (20.12dBm)
Cat-M1 Band 12 (Channel Bandwidth: 5 MHz)		109.901mW (20.41dBm)	104.954mW (20.21dBm)
Cat-M1 Band 12 (Channel Bandwidth: 10 MHz)		114.025mW (20.57dBm)	107.399mW (20.31dBm)
Cat-M1 Band 13 (Channel Bandwidth: 5 MHz)		150.314mW (21.77dBm)	151.705mW (21.81dBm)
Cat-M1 Band 13 (Channel Bandwidth: 10 MHz)		152.055mW (21.82dBm)	150.661mW (21.78dBm)
Cat-M1 Band 85 (Channel Bandwidth: 5 MHz)		121.899mW (20.86dBm)	115.611mW (20.63dBm)
Cat-M1 Band 85 (Channel Bandwidth: 10 MHz)		124.738mW (20.96dBm)	118.577mW (20.74dBm)

Emission Designator		QPSK	16QAM
	Cat-M1 Band 4 (Channel Bandwidth: 1.4 MHz)	1M09G7D	1M09D7W
	Cat-M1 Band 4 (Channel Bandwidth: 3 MHz)	1M08G7D	1M08D7W
	Cat-M1 Band 4 (Channel Bandwidth: 5 MHz)	1M09G7D	1M09D7W
	Cat-M1 Band 4 (Channel Bandwidth: 10 MHz)	1M09G7D	1M09D7W
	Cat-M1 Band 4 (Channel Bandwidth: 15 MHz)	1M09G7D	1M09D7W
	Cat-M1 Band 4 (Channel Bandwidth: 20 MHz)	1M09G7D	1M09D7W
	Cat-M1 Band 12 (Channel Bandwidth: 1.4 MHz)	1M09G7D	1M08D7W
	Cat-M1 Band 12 (Channel Bandwidth: 3 MHz)	1M08G7D	1M08D7W
	Cat-M1 Band 12 (Channel Bandwidth: 5 MHz)	1M09G7D	1M09D7W
	Cat-M1 Band 12 (Channel Bandwidth: 10 MHz)	1M09G7D	1M09D7W
	Cat-M1 Band 13 (Channel Bandwidth: 5 MHz)	1M09G7D	1M09D7W
	Cat-M1 Band 13 (Channel Bandwidth: 10 MHz)	1M08G7D	1M09D7W
	Cat-M1 Band 66 (Channel Bandwidth: 1.4 MHz)	1M08G7D	1M08D7W
	Cat-M1 Band 66 (Channel Bandwidth: 3 MHz)	1M08G7D	1M08D7W
	Cat-M1 Band 66 (Channel Bandwidth: 5 MHz)	1M09G7D	1M09D7W
	Cat-M1 Band 66 (Channel Bandwidth: 10 MHz)	1M09G7D	1M09D7W
	Cat-M1 Band 66 (Channel Bandwidth: 15 MHz)	1M09G7D	1M09D7W
	Cat-M1 Band 66 (Channel Bandwidth: 20 MHz)	1M09G7D	1M09D7W
	Cat-M1 Band 85 (Channel Bandwidth: 5 MHz)	1M09G7D	1M09D7W
Cat-M1 Band 85 (Channel Bandwidth: 10 MHz)	1M09G7D	1M09D7W	
Antenna Type	Refer to Note		
Antenna Connector	Refer to Note		
Accessory Device	Refer to Note		
Cable Supplied	Refer to Note		

Note:

1. The EUT consumes power from the following batteries.

Battery 1	
Brand	EVE
Model	BAT-63705-001
Power Rating	7.2V, 38Ah, 274 Wh

Battery 2	
Brand	Vitrocell
Model	BAT-63705-002
Power Rating	7.2V, 38Ah, 274 Wh

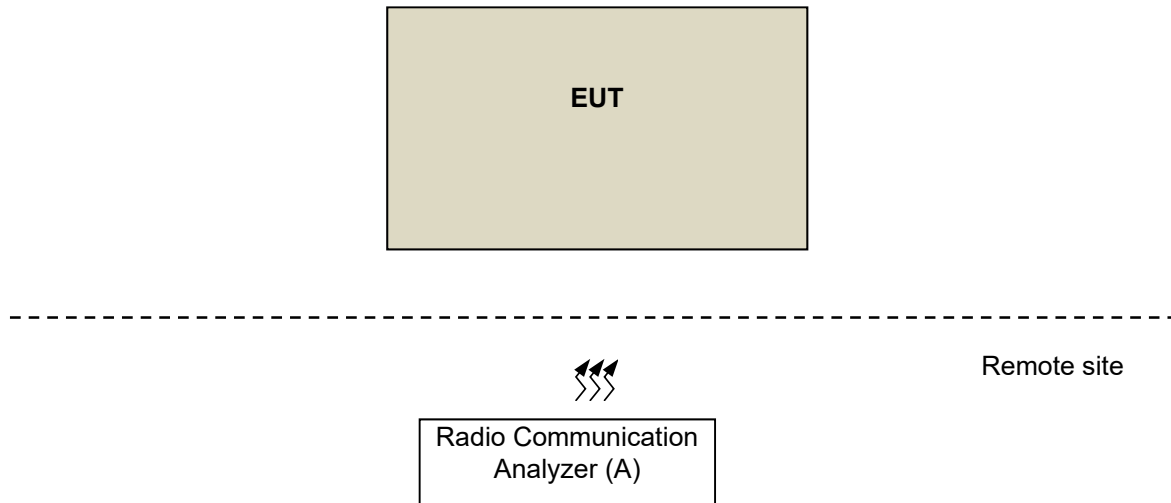
2. The antenna information for host is listed as below.

Type	Monopole with gnd resonator							
Connector	Murata MM8030-2610B/RJ3/RK0							
Antenna gain (dBi)								
Cat-M1 Band								
2	4	5	12	13	25	26	66	85
3.51	3.27	1.94	-0.33	0.69	3.51	1.94	3.84	-0.33

\* Detail antenna specification please refer to antenna datasheet or an antenna gain measurement report.

3. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

### 3.2 Configuration of System under Test



#### 3.2.1 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	Radio Communication Analyzer	Anritsu	MT8821C	6201462755	N/A	Provided by Lab

### 3.3 Test Mode Applicability and Tested Channel Detail

Pre-Scan:	EUT can be used in the following ways: X-axis/ Y-axis/ Z-axis. Pre-scan these ways and find the worst case as a representative test condition.
Worst Case:	X-axis/ Y-axis/ Z-axis Worst Condition: X-axis

EUT Configure Mode	Mode	Power
	A	Power from battery 1
	B	Power from battery 2

#### Cat-M1 Band 4

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	RB #
A	EIRP	19957 to 20393	19957 (1710.7MHz), 20175 (1732.5MHz), 20393 (1754.3MHz)	1.4MHz	QPSK / 16QAM	1 Full
		19965 to 20385	19965 (1711.5MHz), 20175 (1732.5MHz), 20385 (1753.5MHz)	3MHz	QPSK / 16QAM	1 Full
		19975 to 20375	19975 (1712.5MHz), 20175 (1732.5MHz), 20375 (1752.5MHz)	5MHz	QPSK / 16QAM	1 Full
		20000 to 20350	20000 (1715.0MHz), 20175 (1732.5MHz), 20350 (1750.0MHz)	10MHz	QPSK / 16QAM	1 Full
		20025 to 20325	20025 (1717.5MHz), 20175 (1732.5MHz), 20325 (1747.5MHz)	15MHz	QPSK / 16QAM	1 Full
		20050 to 20300	20050 (1720.0MHz), 20175 (1732.5MHz), 20300 (1745.0MHz)	20MHz	QPSK / 16QAM	1 Full
A	Modulation Characteristics	20050 to 20300	20175 (1732.5MHz)	20MHz	QPSK / 16QAM	Full
A	Frequency Stability	19957 to 20393	19957 (1710.7MHz), 20393 (1754.3MHz)	1.4MHz	QPSK	1
		19965 to 20385	19965 (1711.5MHz), 20385 (1753.5MHz)	3MHz	QPSK	1
		19975 to 20375	19975 (1712.5MHz), 20375 (1752.5MHz)	5MHz	QPSK	1
		20000 to 20350	20000 (1715.0MHz), 20350 (1750.0MHz)	10MHz	QPSK	1
		20025 to 20325	20025 (1717.5MHz), 20325 (1747.5MHz)	15MHz	QPSK	1
		20050 to 20300	20050 (1720.0MHz), 20300 (1745.0MHz)	20MHz	QPSK	1

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	RB #
A	Occupied Bandwidth	19957 to 20393	19957 (1710.7MHz), 20175 (1732.5MHz), 20393 (1754.3MHz)	1.4MHz	QPSK / 16QAM	Full
		19965 to 20385	19965 (1711.5MHz), 20175 (1732.5MHz), 20385 (1753.5MHz)	3MHz	QPSK / 16QAM	Full
		19975 to 20375	19975 (1712.5MHz), 20175 (1732.5MHz), 20375 (1752.5MHz)	5MHz	QPSK / 16QAM	Full
		20000 to 20350	20000 (1715.0MHz), 20175 (1732.5MHz), 20350 (1750.0MHz)	10MHz	QPSK / 16QAM	Full
		20025 to 20325	20025 (1717.5MHz), 20175 (1732.5MHz), 20325 (1747.5MHz)	15MHz	QPSK / 16QAM	Full
		20050 to 20300	20050 (1720.0MHz), 20175 (1732.5MHz), 20300 (1745.0MHz)	20MHz	QPSK / 16QAM	Full
A	Peak to Average Ratio	19957 to 20393	19957 (1710.7MHz), 20175 (1732.5MHz), 20393 (1754.3MHz)	1.4MHz	QPSK / 16QAM	1
		19965 to 20385	19965 (1711.5MHz), 20175 (1732.5MHz), 20385 (1753.5MHz)	3MHz	QPSK / 16QAM	1
		19975 to 20375	19975 (1712.5MHz), 20175 (1732.5MHz), 20375 (1752.5MHz)	5MHz	QPSK / 16QAM	1
		20000 to 20350	20000 (1715.0MHz), 20175 (1732.5MHz), 20350 (1750.0MHz)	10MHz	QPSK / 16QAM	1
		20025 to 20325	20025 (1717.5MHz), 20175 (1732.5MHz), 20325 (1747.5MHz)	15MHz	QPSK / 16QAM	1
		20050 to 20300	20050 (1720.0MHz), 20175 (1732.5MHz), 20300 (1745.0MHz)	20MHz	QPSK / 16QAM	1



EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	RB #
A	Band Edge	19957 to 20393	19957 (1710.7MHz)	1.4MHz	QPSK	1
			20393 (1754.3MHz)			Full
		19965 to 20385	19965 (1711.5MHz)	3MHz	QPSK	1
			20385 (1753.5MHz)			Full
		19975 to 20375	19975 (1712.5MHz)	5MHz	QPSK	1
			20375 (1752.5MHz)			Full
		20000 to 20350	20000 (1715.0MHz)	10MHz	QPSK	1
			20350 (1750.0MHz)			Full
		20025 to 20325	20025 (1717.5MHz)	15MHz	QPSK	1
			20325 (1747.5MHz)			Full
		20050 to 20300	20050 (1720.0MHz)	20MHz	QPSK	1
			20300 (1745.0MHz)			Full
A	Conducted Emission	19957 to 20393	19957 (1710.7MHz), 20175 (1732.5MHz), 20393 (1754.3MHz)	1.4MHz	QPSK	1
		19965 to 20385	19965 (1711.5MHz), 20175 (1732.5MHz), 20385 (1753.5MHz)	3MHz	QPSK	1
		19975 to 20375	19975 (1712.5MHz), 20175 (1732.5MHz), 20375 (1752.5MHz)	5MHz	QPSK	1
		20000 to 20350	20000 (1715.0MHz), 20175 (1732.5MHz), 20350 (1750.0MHz)	10MHz	QPSK	1
		20025 to 20325	20025 (1717.5MHz), 20175 (1732.5MHz), 20325 (1747.5MHz)	15MHz	QPSK	1
		20050 to 20300	20050 (1720.0MHz), 20175 (1732.5MHz), 20300 (1745.0MHz)	20MHz	QPSK	1
A, B	Radiated Emission Below 1GHz	20050 to 20300	20175 (1732.5MHz)	20MHz	QPSK	1
A	Radiated Emission Above 1GHz	19957 to 20393	19957 (1710.7MHz), 20175 (1732.5MHz), 20393 (1754.3MHz)	1.4MHz	QPSK	1
		19975 to 20375	19975 (1712.5MHz), 20175 (1732.5MHz), 20375 (1752.5MHz)	5MHz	QPSK	1
		20050 to 20300	20050 (1720.0MHz), 20175 (1732.5MHz), 20300 (1745.0MHz)	20MHz	QPSK	1

Note:

- For radiated emission below 1GHz, select the worst radiated emission channel (above 1GHz) for final testing.
- For radiated emission above 1GHz, according to 3GPP 36.521 Section 6.6.3.1.4, choose the lowest, 5MHz & highest channel bandwidth for final test.
- The output power for QPSK and 16QAM, measured value of QPSK is higher than 16QAM mode. Therefore, only Modulation characteristics, occupied bandwidth and Peak to average ratio items had been tested under QPSK and 16QAM modes, the other test items were performed under worse mode according to the maximum output power.

Cat-M1 Band 12

EUT Configure Mode	Test item	Available channel	Tested channel	Channel Bandwidth	Modulation	RB #
A	ERP	23017 to 23173	23017 (699.7MHz), 23095 (707.5MHz), 23173 (715.3MHz)	1.4MHz	QPSK / 16QAM	1 Full
		23025 to 23165	23025 (700.5MHz), 23095 (707.5MHz), 23165 (714.5MHz)	3MHz	QPSK / 16QAM	1 Full
		23035 to 23155	23035 (701.5MHz), 23095 (707.5MHz), 23155 (713.5MHz)	5MHz	QPSK / 16QAM	1 Full
		23060 to 23130	23060 (704.0MHz), 23095 (707.5MHz), 23130 (711.0 MHz)	10MHz	QPSK / 16QAM	1 Full
A	Modulation Characteristics	23060 to 23130	23095 (707.5MHz)	10MHz	QPSK / 16QAM	Full
A	Frequency Stability	23017 to 23173	23017 (699.7MHz), 23173 (715.3MHz)	1.4MHz	QPSK	1
		23025 to 23165	23025 (700.5MHz), 23165 (714.5MHz)	3MHz	QPSK	1
		23035 to 23155	23035 (701.5MHz), 23155 (713.5MHz)	5MHz	QPSK	1
		23060 to 23130	23060 (704.0MHz), 23130 (711.0MHz)	10MHz	QPSK	1
A	Emission Bandwidth	23017 to 23173	23017 (699.7MHz), 23095 (707.5MHz), 23173 (715.3MHz)	1.4MHz	QPSK / 16QAM	Full
		23025 to 23165	23025 (700.5MHz), 23095 (707.5MHz), 23165 (714.5MHz)	3MHz	QPSK / 16QAM	Full
		23035 to 23155	23035 (701.5MHz), 23095 (707.5MHz), 23155 (713.5MHz)	5MHz	QPSK / 16QAM	Full
		23060 to 23130	23060 (704.0MHz), 23095 (707.5MHz), 23130 (711.0MHz)	10MHz	QPSK / 16QAM	Full
A	Band Edge	23017 to 23173	23017 (699.7MHz), 23173 (715.3MHz)	1.4MHz	QPSK	1 Full
		23025 to 23165	23025 (700.5MHz), 23165 (714.5MHz)	3MHz	QPSK	1 Full
		23035 to 23155	23035 (701.5MHz), 23155 (713.5MHz)	5MHz	QPSK	1 Full
		23060 to 23130	23060 (704.0MHz), 23130 (711.0MHz)	10MHz	QPSK	1 Full

EUT Configure Mode	Test item	Available channel	Tested channel	Channel Bandwidth	Modulation	Mode
A	Peak to Average Ratio	23017 to 23173	23017 (699.7MHz), 23095 (707.5MHz), 23173 (715.3MHz)	1.4MHz	QPSK / 16QAM	1
		23025 to 23165	23025 (700.5MHz), 23095 (707.5MHz), 23165 (714.5MHz)	3MHz	QPSK / 16QAM	1
		23035 to 23155	23035 (701.5MHz), 23095 (707.5MHz), 23155 (713.5MHz)	5MHz	QPSK / 16QAM	1
		23060 to 23130	23060 (704.0MHz), 23095 (707.5MHz), 23130 (711.0MHz)	10MHz	QPSK / 16QAM	1
A	Conducted Emission	23017 to 23173	23017 (699.7MHz), 23095 (707.5MHz), 23173 (715.3MHz)	1.4MHz	QPSK	1
		23025 to 23165	23025 (700.5MHz), 23095 (707.5MHz), 23165 (714.5MHz)	3MHz	QPSK	1
		23035 to 23155	23035 (701.5MHz), 23095 (707.5MHz), 23155 (713.5MHz)	5MHz	QPSK	1
		23060 to 23130	23060 (704.0MHz), 23095 (707.5MHz), 23130 (711.0MHz)	10MHz	QPSK	1
A, B	Radiated Emission Below 1GHz	23060 to 23130	23095 (707.5MHz)	10MHz	QPSK	1
A	Radiated Emission Above 1GHz	23017 to 23173	23017 (699.7MHz), 23095 (707.5MHz), 23173 (715.3MHz)	1.4MHz	QPSK	1
		23035 to 23155	23035 (701.5MHz), 23095 (707.5MHz), 23155 (713.5MHz)	5MHz	QPSK	1
		23060 to 23130	23060 (704.0MHz), 23095 (707.5MHz), 23130 (711.0MHz)	10MHz	QPSK	1

Note:

1. For radiated emission below 1GHz, select the worst radiated emission channel (above 1GHz) for final testing.
2. For radiated emission above 1GHz, according to 3GPP 36.521 Section 6.6.3.1.4, choose the lowest, 5MHz & highest channel bandwidth for final test.
3. The output power for QPSK and 16QAM, measured value of QPSK is higher than 16QAM mode. Therefore, only Modulation characteristics, occupied bandwidth and Peak to average ratio items had been tested under QPSK and 16QAM modes, the other test items were performed under worse mode according to the maximum output power.

## Cat-M1 Band 13

EUT Configure Mode	Test item	Available channel	Tested channel	Channel Bandwidth	Modulation	RB #
A	ERP	23205 to 23255	23205 (779.5MHz), 23230 (782.0MHz), 23255 (784.5MHz)	5MHz	QPSK / 16QAM	1 Full
		23230	23230 (782.0MHz)	10MHz	QPSK / 16QAM	1 Full
A	Modulation Characteristics	23230	23230 (782.0MHz),	10MHz	QPSK / 16QAM	Full
A	Frequency Stability	23205 to 23255	23205 (779.5MHz), 23255 (784.5MHz)	5MHz	QPSK	1
		23230	23230 (782.0MHz),	10MHz	QPSK	1
A	Emission Bandwidth	23205 to 23255	23205 (779.5MHz), 23230 (782.0MHz), 23255 (784.5MHz)	5MHz	QPSK / 16QAM	Full
		23230	23230 (782.0MHz)	10MHz	QPSK / 16QAM	Full
A	Band Edge	23205 to 23255	23205 (779.5MHz), 23255 (784.5MHz)	5MHz	QPSK	1 Full
		23230	23230 (782.0MHz)	10MHz	QPSK	1 Full
A	Peak to Average Ratio	23205 to 23255	23205 (779.5MHz), 23230 (782.0MHz), 23255 (784.5MHz)	5MHz	QPSK / 16QAM	1
		23230	23230 (782.0MHz)	10MHz	QPSK / 16QAM	1
A	Conducted Emission	23205 to 23255	23205 (779.5MHz), 23230 (782.0MHz), 23255 (784.5MHz)	5MHz	QPSK	1
		23230	23230 (782.0MHz)	10MHz	QPSK	1
A, B	Radiated Emission Below 1GHz	23230	23230 (782.0MHz)	10MHz	QPSK	1
A	Radiated Emission Above 1GHz	23205 to 23255	23205 (779.5MHz), 23230 (782.0MHz), 23255 (784.5MHz)	5MHz	QPSK	1
		23230	23230 (782.0MHz)	10MHz	QPSK	1

## Note:

1. For radiated emission below 1GHz, select the worst radiated emission channel (above 1GHz) for final testing.
2. For radiated emission above 1GHz, according to 3GPP 36.521 Section 6.6.3.1.4, choose the 5MHz & highest channel bandwidth for final test.
3. The output power for QPSK and 16QAM, measured value of QPSK is higher than 16QAM mode. Therefore, only Modulation characteristics, occupied bandwidth and Peak to average ratio items had been tested under QPSK and 16QAM modes, the other test items were performed under worse mode according to the maximum output power.

## Cat-M1 Band 66

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	RB #
A	EIRP	131979 to 132665	131979 (1710.7MHz), 132322 (1745.0MHz), 132665 (1779.3MHz)	1.4MHz	QPSK / 16QAM	1 Full
		131987 to 132657	131987 (1711.5MHz), 132322 (1745.0MHz), 132657 (1778.5MHz)	3MHz	QPSK / 16QAM	1 Full
		131997 to 132647	131997 (1712.5MHz), 132322 (1745.0MHz), 132647 (1777.5MHz)	5MHz	QPSK / 16QAM	1 Full
		132022 to 132622	132022 (1715.0MHz), 132322 (1745.0MHz), 132622 (1775.0MHz)	10MHz	QPSK / 16QAM	1 Full
		132047 to 132597	132047 (1717.5MHz), 132322 (1745.0MHz), 132597 (1772.5MHz)	15MHz	QPSK / 16QAM	1 Full
		132072 to 132572	132072 (1720.0MHz), 132322 (1745.0MHz), 132572 (1770.0MHz)	20MHz	QPSK / 16QAM	1 Full
A	Modulation Characteristics	132072 to 132572	132322 (1745.0MHz)	20MHz	QPSK / 16QAM	Full
A	Frequency Stability	131979 to 132665	131979 (1710.7MHz), 132665 (1779.3MHz)	1.4MHz	QPSK	1
		131987 to 132657	131987 (1711.5MHz), 132657 (1778.5MHz)	3MHz	QPSK	1
		131997 to 132647	131997 (1712.5MHz), 132647 (1777.5MHz)	5MHz	QPSK	1
		132022 to 132622	132022 (1715.0MHz), 132622 (1775.0MHz)	10MHz	QPSK	1
		132047 to 132597	132047 (1717.5MHz), 132597 (1772.5MHz)	15MHz	QPSK	1
		132072 to 132572	132072 (1720.0MHz), 132572 (1770.0MHz)	20MHz	QPSK	1
A	Emission Bandwidth	131979 to 132665	131979 (1710.7MHz), 132322 (1745.0MHz), 132665 (1779.3MHz)	1.4MHz	QPSK / 16QAM	1
		131987 to 132657	131987 (1711.5MHz), 132322 (1745.0MHz), 132657 (1778.5MHz)	3MHz	QPSK / 16QAM	1
		131997 to 132647	131997 (1712.5MHz), 132322 (1745.0MHz), 132647 (1777.5MHz)	5MHz	QPSK / 16QAM	1
		132022 to 132622	132022 (1715.0MHz), 132322 (1745.0MHz), 132622 (1775.0MHz)	10MHz	QPSK / 16QAM	1
		132047 to 132597	132047 (1717.5MHz), 132322 (1745.0MHz), 132597 (1772.5MHz)	15MHz	QPSK / 16QAM	1
		132072 to 132572	132072 (1720.0MHz), 132322 (1745.0MHz), 132572 (1770.0MHz)	20MHz	QPSK / 16QAM	1

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	RB #
A	Band Edge	131979 to 132665	131979 (1710.7MHz), 132665 (1779.3MHz)	1.4MHz	QPSK	1 Full
		131987 to 132657	131987 (1711.5MHz), 132657 (1778.5MHz)	3MHz	QPSK	1 Full
		131997 to 132647	131997 (1712.5MHz), 132647 (1777.5MHz)	5MHz	QPSK	1 Full
		132022 to 132622	132022 (1715.0MHz), 132622 (1775.0MHz)	10MHz	QPSK	1 Full
		132047 to 132597	132047 (1717.5MHz), 132597 (1772.5MHz)	15MHz	QPSK	1 Full
		132072 to 132572	132072 (1720.0MHz), 132572 (1770.0MHz)	20MHz	QPSK	1 Full
A	Peak to Average Ratio	131979 to 132665	131979 (1710.7MHz), 132322 (1745.0MHz), 132665 (1779.3MHz)	1.4MHz	QPSK / 16QAM	1
		131987 to 132657	131987 (1711.5MHz), 132322 (1745.0MHz), 132657 (1778.5MHz)	3MHz	QPSK / 16QAM	1
		131997 to 132647	131997 (1712.5MHz), 132322 (1745.0MHz), 132647 (1777.5MHz)	5MHz	QPSK / 16QAM	1
		132022 to 132622	132022 (1715.0MHz), 132322 (1745.0MHz), 132622 (1775.0MHz)	10MHz	QPSK / 16QAM	1
		132047 to 132597	132047 (1717.5MHz), 132322 (1745.0MHz), 132597 (1772.5MHz)	15MHz	QPSK / 16QAM	1
		132072 to 132572	132072 (1720.0MHz), 132322 (1745.0MHz), 132572 (1770.0MHz)	20MHz	QPSK / 16QAM	1

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	RB #
A	Conducted Emission	131979 to 132665	131979 (1710.7MHz), 132322 (1745.0MHz), 132665 (1779.3MHz)	1.4MHz	QPSK	1
		131987 to 132657	131987 (1711.5MHz), 132322 (1745.0MHz), 132657 (1778.5MHz)	3MHz	QPSK	1
		131997 to 132647	131997 (1712.5MHz), 132322 (1745.0MHz), 132647 (1777.5MHz)	5MHz	QPSK	1
		132022 to 132622	132022 (1715.0MHz), 132322 (1745.0MHz), 132622 (1775.0MHz)	10MHz	QPSK	1
		132047 to 132597	132047 (1717.5MHz), 132322 (1745.0MHz), 132597 (1772.5MHz)	15MHz	QPSK	1
		132072 to 132572	132072 (1720.0MHz), 132322 (1745.0MHz), 132572 (1770.0MHz)	20MHz	QPSK	1
A, B	Radiated Emission Below 1GHz	132072 to 132572	132322 (1745.0MHz)	20MHz	QPSK	1
A	Radiated Emission Above 1GHz	131979 to 132665	131979 (1710.7MHz), 132322 (1745.0MHz), 132665 (1779.3MHz)	1.4MHz	QPSK	1
		131997 to 132647	131997 (1712.5MHz), 132322 (1745.0MHz), 132647 (1777.5MHz)	5MHz	QPSK	1
		132072 to 132572	132072 (1720.0MHz), 132322 (1745.0MHz), 132572 (1770.0MHz)	20MHz	QPSK	1

Note:

1. For radiated emission below 1GHz, select the worst radiated emission channel (above 1GHz) for final testing.
2. For radiated emission above 1GHz, according to 3GPP 36.521 Section 6.6.3.1.4, choose the lowest, 5MHz & highest channel bandwidth for final test.
3. The output power for QPSK and 16QAM, measured value of QPSK is higher than 16QAM mode. Therefore, only Modulation characteristics, occupied bandwidth and Peak to average ratio items had been tested under QPSK and 16QAM modes, the other test items were performed under worse mode according to the maximum output power.

## Cat-M1 Band 85

EUT Configure Mode	Test item	Available channel	Tested channel	Channel Bandwidth	Modulation	RB #
A	ERP	134027 to 134157	134027 (700.5MHz) 134092 (707.0MHz) 134157 (713.5MHz)	5MHz	QPSK / 16QAM	1 Full
		134052 to 134132	134052 (703.0MHz) 134092 (707.0MHz) 134132 (711.0MHz)	10MHz	QPSK / 16QAM	1 Full
A	Modulation Characteristics	134052 to 134132	134092 (707.0MHz)	10MHz	QPSK / 16QAM	Full
A	Frequency Stability	134027 to 134157	134027 (700.5MHz) 134157 (713.5MHz)	5MHz	QPSK	1
		134052 to 134132	134052 (703.0MHz) 134132 (711.0MHz)	10MHz	QPSK	1
A	Emission Bandwidth	134027 to 134157	134027 (700.5MHz) 134092 (707.0MHz) 134157 (713.5MHz)	5MHz	QPSK / 16QAM	Full
		134052 to 134132	134052 (703.0MHz) 134092 (707.0MHz) 134132 (711.0MHz)	10MHz	QPSK / 16QAM	Full
A	Band Edge	134027 to 134157	134027 (700.5MHz) 134157 (713.5MHz)	5MHz	QPSK	1 Full
		134052 to 134132	134052 (703.0MHz) 134132 (711.0MHz)	10MHz	QPSK	1 Full
A	Peak to Average Ratio	134027 to 134157	134027 (700.5MHz) 134092 (707.0MHz) 134157 (713.5MHz)	5MHz	QPSK / 16QAM	1
		134052 to 134132	134052 (703.0MHz) 134092 (707.0MHz) 134132 (711.0MHz)	10MHz	QPSK / 16QAM	1
A	Conducted Emission	134027 to 134157	134027 (700.5MHz) 134092 (707.0MHz) 134157 (713.5MHz)	5MHz	QPSK	1
		134052 to 134132	134052 (703.0MHz) 134092 (707.0MHz) 134132 (711.0MHz)	10MHz	QPSK	1
A, B	Radiated Emission Below 1GHz	134052 to 134132	134092 (707.0MHz)	10MHz	QPSK	1
A	Radiated Emission Above 1GHz	134027 to 134157	134027 (700.5MHz) 134092 (707.0MHz) 134157 (713.5MHz)	5MHz	QPSK	1
		134052 to 134132	134052 (703.0MHz) 134092 (707.0MHz) 134132 (711.0MHz)	10MHz	QPSK	1



**Note:**

1. For radiated emission below 1GHz, select the worst radiated emission channel (above 1GHz) for final testing.
2. For radiated emission above 1GHz, according to 3GPP 36.521 Section 6.6.3.1.4, choose the 5MHz & highest channel bandwidth for final test.
3. The output power for QPSK and 16QAM, measured value of QPSK is higher than 16QAM mode. Therefore, only Modulation characteristics, occupied bandwidth and Peak to average ratio items had been tested under QPSK and 16QAM modes, the other test items were performed under worse mode according to the maximum output power.

**Test Condition:**

Test Item	Environmental Conditions	Input Power	Tested By
ERP/EIRP	25deg. C, 60%RH	7.2Vdc	Willy Cheng
Modulation Characteristics	25deg. C, 60%RH	7.2Vdc	Willy Cheng
Frequency Stability	25deg. C, 60%RH	7.2Vdc	Willy Cheng
Emission Bandwidth	25deg. C, 60%RH	7.2Vdc	Willy Cheng
Band Edge	25deg. C, 60%RH	7.2Vdc	Willy Cheng
Peak To Average Ratio	25deg. C, 60%RH	7.2Vdc	Willy Cheng
Conducted Emission	25deg. C, 60%RH	7.2Vdc	Willy Cheng
Radiated Emission Below 1GHz	20deg. C, 64%RH	7.2Vdc	Edison Lee
Radiated Emission Above 1GHz	20deg. C, 64%RH	7.2Vdc	Edison Lee

**3.4 EUT Operating Conditions**

The EUT makes a call to the communication simulator. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency.

**3.5 General Description of Applied Standards and References**

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards and References:

**Test Standard:**

**FCC 47 CFR Part 2**

**FCC 47 CFR Part 27**

**ANSI/TIA/EIA-603-E 2016**

ANSI 63.26-2015

**References Test Guidance:**

**KDB 971168 D01 Power Meas License Digital Systems v03r01**

All test items have been performed as a reference to the above KDB test guidance.

## 4 Test Types and Results

### 4.1 Output Power Measurement

#### 4.1.1 Limits of Output Power Measurement

For Cat-M1 Band 4, Cat-M1 Band 66:  
Mobile / Portable station are limited to 1 watts e.i.r.p.

For Cat-M1 Cat-M1 Band 13:  
Control stations and mobile stations in the 746-757 MHz, 776-788 MHz and 805-806 MHz bands and fixed stations transmitting in the 787-788 MHz and 805-806 MHz bands are limited to 30 watts ERP.  
Portable stations (hand-held devices) transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands are limited to 3 watts ERP.

For Cat-M1 Band 12, Cat-M1 Band 85:  
Control stations and mobile stations in the 698-746 MHz band are limited to 30 watts ERP.  
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.

#### 4.1.2 Test Procedures

##### Conducted Power Measurement:

The EUT was set up for the maximum power with Cat-M1 link data modulation and link up with simulator (Built-in power meter). The average (rms) power measurement was performed on emulator and power value was measured from power function on emulator. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

##### Maximum EIRP / ERP

The relevant equation for determining the maximum ERP or EIRP from the measured RF output power is

given in Equation as follows:

$$\text{EIRP} = P_{\text{Meas}} + G_{\text{T}}$$

$$\text{ERP} = P_{\text{Meas}} + G_{\text{T}} - 2.15$$

where

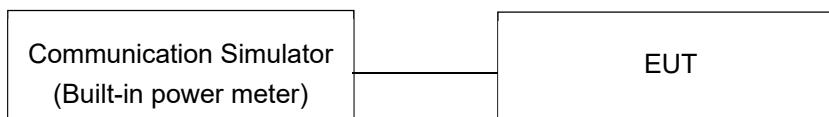
ERP or EIRP effective radiated power or equivalent isotropically radiated power, respectively  
(expressed in the same units as  $P_{\text{Meas}}$ , e.g., dBm or dBW)

$P_{\text{Meas}}$  measured transmitter output power or PSD, in dBm or dBW

$G_{\text{T}}$  gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)

#### 4.1.3 Test Setup

Conducted Power Measurement:



#### 4.1.4 Test Results

##### Conducted Output Power (dBm)

Cat-M1 Band 4						
BW	MCS Index	Channel		19957	20175	20393
		Frequency (MHz)		1710.7	1732.5	1754.3
1.4M	QPSK	1	0	22.53	22.68	22.48
		1	5	22.33	22.51	22.37
		6	0	20.59	20.68	20.47
	16QAM	1	0	21.79	21.83	21.73
		1	5	21.60	21.66	21.53
		6	0	19.99	19.12	18.96
BW	MCS Index	Channel		19965	20175	20385
		Frequency (MHz)		1711.5	1732.5	1753.5
3M	QPSK	1	0	22.64	22.73	22.64
		1	5	22.42	22.63	22.50
		6	0	20.44	20.68	20.46
	16QAM	1	0	21.92	21.96	21.80
		1	5	21.78	21.79	21.63
		6	0	19.69	19.72	19.95
BW	MCS Index	Channel		19975	20175	20375
		Frequency (MHz)		1712.5	1732.5	1752.5
5M	QPSK	1	0	22.47	22.44	22.70
		1	5	22.36	22.24	22.59
		6	0	21.69	21.65	21.56
	16QAM	1	0	22.34	22.45	22.14
		1	5	22.26	22.34	22.07
		6	0	21.71	21.76	21.13
BW	MCS Index	Channel		20000	20175	20350
		Frequency (MHz)		1715	1732.5	1750
10M	QPSK	1	0	22.54	22.42	22.61
		1	5	22.55	22.19	22.18
		6	0	21.63	21.75	21.73
	16QAM	1	0	22.33	22.51	22.30
		1	5	22.12	22.23	22.09
		6	0	21.26	21.83	21.65

Cat-M1 Band 4						
BW	MCS Index	Channel		20025	20175	20325
		Frequency (MHz)		1717.5	1732.5	1747.5
15M	QPSK	1	0	22.24	22.72	22.42
		1	5	22.13	22.30	22.20
		6	0	22.51	22.66	22.56
	16QAM	1	0	22.27	22.43	22.34
		1	5	22.15	22.32	22.22
		6	0	22.59	22.68	22.59
BW	MCS Index	Channel		20050	20175	20300
		Frequency (MHz)		1720	1732.5	1745
20M	QPSK	1	0	22.66	22.58	22.79
		1	5	22.04	22.19	22.10
		6	0	22.44	22.66	22.46
	16QAM	1	0	22.37	22.53	22.35
		1	5	22.14	22.30	22.21
		6	0	22.53	22.71	22.55

Cat-M1 Band 12						
BW	MCS Index	Channel		23017	23095	23173
		Frequency (MHz)		699.7	707.5	715.3
1.4M	QPSK	1	0	22.77	22.97	22.79
		1	5	22.70	22.78	22.60
		6	0	20.87	20.95	20.82
	16QAM	1	0	22.29	22.40	22.31
		1	5	22.25	22.34	22.19
		6	0	20.32	20.55	20.37
BW	MCS Index	Channel		23025	23095	23165
		Frequency (MHz)		700.5	707.5	714.5
3M	QPSK	1	0	22.88	23.02	22.97
		1	5	22.81	22.95	22.77
		6	0	20.90	21.01	20.88
	16QAM	1	0	22.45	22.60	22.40
		1	5	21.98	22.09	22.49
		6	0	19.92	20.04	20.26
BW	MCS Index	Channel		23035	23095	23155
		Frequency (MHz)		701.5	707.5	713.5
5M	QPSK	1	0	22.76	22.87	22.88
		1	5	22.60	22.89	22.71
		6	0	21.87	22.07	22.00
	16QAM	1	0	22.42	22.53	22.65
		1	5	22.38	22.69	22.51
		6	0	21.52	21.83	21.69
BW	MCS Index	Channel		23060	23095	23130
		Frequency (MHz)		704	707.5	711
10M	QPSK	1	0	22.83	22.98	23.05
		1	5	22.55	22.71	22.79
		6	0	21.94	22.01	22.08
	16QAM	1	0	22.55	22.60	22.79
		1	5	22.34	22.57	22.62
		6	0	21.65	21.73	21.85

Cat-M1 Band 13						
BW	MCS Index	Channel		23205	23230	23255
		Frequency (MHz)		779.5	782	784.5
5M	QPSK	1	0	23.16	23.19	23.23
		1	5	23.13	23.12	23.06
		6	0	22.34	22.45	22.41
	16QAM	1	0	23.08	23.21	23.25
		1	5	23.12	23.27	23.20
		6	0	22.29	22.52	22.49
BW	MCS Index	Channel		23230		
		Frequency (MHz)		782		
10M	QPSK	1	0	23.28		
		1	5	23.08		
		6	0	22.35		
	16QAM	1	0	23.24		
		1	5	23.14		
		6	0	22.26		

Cat-M1 Band 66						
BW	MCS Index	Channel		131979	132322	132665
		Frequency (MHz)		1710.7	1745	1779.3
1.4M	QPSK	1	0	23.51	23.32	23.14
		1	5	23.15	23.11	22.92
		6	0	21.50	21.28	21.22
	16QAM	1	0	22.75	22.57	22.10
		1	5	22.62	22.45	21.89
		6	0	20.76	20.43	20.15
BW	MCS Index	Channel		131987	132322	132657
		Frequency (MHz)		1711.5	1745	1778.5
3M	QPSK	1	0	23.53	23.36	23.19
		1	5	23.43	23.25	23.00
		6	0	21.57	21.32	21.17
	16QAM	1	0	22.90	22.67	22.18
		1	5	22.76	22.49	21.95
		6	0	20.72	20.52	19.96
BW	MCS Index	Channel		131997	132322	132647
		Frequency (MHz)		1712.5	1745	1777.5
5M	QPSK	1	0	23.31	23.18	23.03
		1	5	23.21	23.08	22.93
		6	0	22.44	22.32	22.08
	16QAM	1	0	23.23	23.00	23.31
		1	5	23.26	23.02	23.25
		6	0	22.49	22.37	22.17
BW	MCS Index	Channel		132022	132322	132622
		Frequency (MHz)		1715	1745	1775
10M	QPSK	1	0	23.32	23.16	23.13
		1	5	23.18	22.93	22.90
		6	0	22.46	22.29	22.08
	16QAM	1	0	23.35	23.19	23.41
		1	5	23.24	22.98	22.96
		6	0	22.58	22.35	22.16

Cat-M1 Band 66						
BW	MCS Index	Channel		132047	132322	132597
		Frequency (MHz)		1717.5	1745	1772.5
15M	QPSK	1	0	23.33	23.44	23.46
		1	5	23.13	22.97	23.28
		6	0	23.25	23.50	23.25
	16QAM	1	0	23.29	23.20	23.16
		1	5	23.18	22.99	22.94
		6	0	23.42	23.38	23.11
BW	MCS Index	Channel		132072	132322	132575
		Frequency (MHz)		1720	1745	1770
20M	QPSK	1	0	23.56	23.32	23.12
		1	5	23.16	22.90	22.90
		6	0	23.40	23.25	23.05
	16QAM	1	0	23.42	23.33	23.43
		1	5	23.20	22.95	23.20
		6	0	23.47	23.41	23.21

Cat-M1 Band 85						
BW	MCS Index	Channel		134027	134092	134157
		Frequency (MHz)		700.5	707	713.5
5M	QPSK	1	0	23.11	23.34	23.21
		1	5	22.98	23.28	23.06
		6	0	22.32	22.46	22.23
	16QAM	1	0	22.79	23.11	23.01
		1	5	22.87	23.09	22.96
		6	0	22.25	22.32	22.19
BW	MCS Index	Channel		134052	134092	134132
		Frequency (MHz)		703	707	711
10M	QPSK	1	0	23.28	23.31	23.44
		1	5	23.01	23.13	23.16
		6	0	22.31	22.43	22.46
	16QAM	1	0	22.96	23.09	23.22
		1	5	22.80	22.83	23.05
		6	0	22.03	22.24	22.29



**EIRP / ERP Power (dBm)**

Cat-M1 Band 4						
BW	MCS Index	Channel		19957	20175	20393
		Frequency (MHz)		1710.7	1732.5	1754.3
1.4M	QPSK	1	0	25.80	25.95	25.75
		1	5	25.60	25.78	25.64
		6	0	23.86	23.95	23.74
	16QAM	1	0	25.06	25.10	25.00
		1	5	24.87	24.93	24.80
		6	0	23.26	22.39	22.23
BW	MCS Index	Channel		19965	20175	20385
		Frequency (MHz)		1711.5	1732.5	1753.5
3M	QPSK	1	0	25.91	26.00	25.91
		1	5	25.69	25.90	25.77
		6	0	23.71	23.95	23.73
	16QAM	1	0	25.19	25.23	25.07
		1	5	25.05	25.06	24.90
		6	0	22.96	22.99	23.22
BW	MCS Index	Channel		19975	20175	20375
		Frequency (MHz)		1712.5	1732.5	1752.5
5M	QPSK	1	0	25.74	25.71	25.97
		1	5	25.63	25.51	25.86
		6	0	24.96	24.92	24.83
	16QAM	1	0	25.61	25.72	25.41
		1	5	25.53	25.61	25.34
		6	0	24.98	25.03	24.40

\*EIRP = Conducted + antenna gain (3.27dBi)

Cat-M1 Band 4						
BW	MCS Index	Channel		20000	20175	20350
		Frequency (MHz)		1715	1732.5	1750
10M	QPSK	1	0	25.81	25.69	25.88
		1	5	25.82	25.46	25.45
		6	0	24.90	25.02	25.00
	16QAM	1	0	25.60	25.78	25.57
		1	5	25.39	25.50	25.36
		6	0	24.53	25.10	24.92
BW	MCS Index	Channel		20025	20175	20325
		Frequency (MHz)		1717.5	1732.5	1747.5
15M	QPSK	1	0	25.51	25.99	25.69
		1	5	25.40	25.57	25.47
		6	0	25.78	25.93	25.83
	16QAM	1	0	25.54	25.70	25.61
		1	5	25.42	25.59	25.49
		6	0	25.86	25.95	25.86
BW	MCS Index	Channel		20050	20175	20300
		Frequency (MHz)		1720	1732.5	1745
20M	QPSK	1	0	25.93	25.85	26.06
		1	5	25.31	25.46	25.37
		6	0	25.71	25.93	25.73
	16QAM	1	0	25.64	25.80	25.62
		1	5	25.41	25.57	25.48
		6	0	25.80	25.98	25.82

\*EIRP = Conducted + antenna gain (3.27dBi)

Cat-M1 Band 12						
BW	MCS Index	Channel		23017	23095	23173
		Frequency (MHz)		699.7	707.5	715.3
1.4M	QPSK	1	0	20.29	20.49	20.31
		1	5	20.22	20.30	20.12
		6	0	18.39	18.47	18.34
	16QAM	1	0	19.81	19.92	19.83
		1	5	19.77	19.86	19.71
		6	0	17.84	18.07	17.89
BW	MCS Index	Channel		23025	23095	23165
		Frequency (MHz)		700.5	707.5	714.5
3M	QPSK	1	0	20.40	20.54	20.49
		1	5	20.33	20.47	20.29
		6	0	18.42	18.53	18.40
	16QAM	1	0	19.97	20.12	19.92
		1	5	19.50	19.61	20.01
		6	0	17.44	17.56	17.78
BW	MCS Index	Channel		23035	23095	23155
		Frequency (MHz)		701.5	707.5	713.5
5M	QPSK	1	0	20.28	20.39	20.40
		1	5	20.12	20.41	20.23
		6	0	19.39	19.59	19.52
	16QAM	1	0	19.94	20.05	20.17
		1	5	19.90	20.21	20.03
		6	0	19.04	19.35	19.21

\*ERP = Conducted + antenna gain (-0.33dBi) - 2.15

Cat-M1 Band 12						
BW	MCS Index	Channel		23060	23095	23130
		Frequency (MHz)		704	707.5	711
10M	QPSK	1	0	20.35	20.50	20.57
		1	5	20.07	20.23	20.31
		6	0	19.46	19.53	19.60
	16QAM	1	0	20.07	20.12	20.31
		1	5	19.86	20.09	20.14
		6	0	19.17	19.25	19.37

\*ERP = Conducted + antenna gain (-0.33dBi) - 2.15

Cat-M1 Band 13						
BW	MCS Index	Channel		23205	23230	23255
		Frequency (MHz)		779.5	782	784.5
5M	QPSK	1	0	21.70	21.73	21.77
		1	5	21.67	21.66	21.60
		6	0	20.88	20.99	20.95
	16QAM	1	0	21.62	21.75	21.79
		1	5	21.66	21.81	21.74
		6	0	20.83	21.06	21.03
BW	MCS Index	Channel		23230		
		Frequency (MHz)		782		
10M	QPSK	1	0	21.82		
		1	5	21.62		
		6	0	20.89		
	16QAM	1	0	21.78		
		1	5	21.68		
		6	0	20.80		

\*ERP = Conducted + antenna gain (0.69dBi) - 2.15

Cat-M1 Band 66						
BW	MCS Index	Channel		131979	132322	132665
		Frequency (MHz)		1710.7	1745	1779.3
1.4M	QPSK	1	0	27.35	27.16	26.98
		1	5	26.99	26.95	26.76
		6	0	25.34	25.12	25.06
	16QAM	1	0	26.59	26.41	25.94
		1	5	26.46	26.29	25.73
		6	0	24.60	24.27	23.99
BW	MCS Index	Channel		131987	132322	132657
		Frequency (MHz)		1711.5	1745	1778.5
3M	QPSK	1	0	27.37	27.20	27.03
		1	5	27.27	27.09	26.84
		6	0	25.41	25.16	25.01
	16QAM	1	0	26.74	26.51	26.02
		1	5	26.60	26.33	25.79
		6	0	24.56	24.36	23.80
BW	MCS Index	Channel		131997	132322	132647
		Frequency (MHz)		1712.5	1745	1777.5
5M	QPSK	1	0	27.15	27.02	26.87
		1	5	27.05	26.92	26.77
		6	0	26.28	26.16	25.92
	16QAM	1	0	27.07	26.84	27.15
		1	5	27.10	26.86	27.09
		6	0	26.33	26.21	26.01

\*EIRP = Conducted + antenna gain (3.84dBi)

Cat-M1 Band 66						
BW	MCS Index	Channel		132022	132322	132622
		Frequency (MHz)		1715	1745	1775
10M	QPSK	1	0	27.16	27.00	26.97
		1	5	27.02	26.77	26.74
		6	0	26.30	26.13	25.92
	16QAM	1	0	27.19	27.03	27.25
		1	5	27.08	26.82	26.80
		6	0	26.42	26.19	26.00
BW	MCS Index	Channel		132047	132322	132597
		Frequency (MHz)		1717.5	1745	1772.5
15M	QPSK	1	0	27.17	27.28	27.30
		1	5	26.97	26.81	27.12
		6	0	27.09	27.34	27.09
	16QAM	1	0	27.13	27.04	27.00
		1	5	27.02	26.83	26.78
		6	0	27.26	27.22	26.95
BW	MCS Index	Channel		132072	132322	132575
		Frequency (MHz)		1720	1745	1770
20M	QPSK	1	0	27.40	27.16	26.96
		1	5	27.00	26.74	26.74
		6	0	27.24	27.09	26.89
	16QAM	1	0	27.26	27.17	27.27
		1	5	27.04	26.79	27.04
		6	0	27.31	27.25	27.05

\*EIRP = Conducted + antenna gain (3.84dBi)

Cat-M1 Band 85						
BW	MCS Index	Channel		134027	134092	134157
		Frequency (MHz)		700.5	707	713.5
5M	QPSK	1	0	20.63	20.86	20.73
		1	5	20.50	20.80	20.58
		6	0	19.84	19.98	19.75
	16QAM	1	0	20.31	20.63	20.53
		1	5	20.39	20.61	20.48
		6	0	19.77	19.84	19.71
BW	MCS Index	Channel		134052	134092	134132
		Frequency (MHz)		703	707	711
10M	QPSK	1	0	20.80	20.83	20.96
		1	5	20.53	20.65	20.68
		6	0	19.83	19.95	19.98
	16QAM	1	0	20.48	20.61	20.74
		1	5	20.32	20.35	20.57
		6	0	19.55	19.76	19.81

\*ERP = Conducted + antenna gain (-0.33dBi) - 2.15

## 4.2 Modulation Characteristics Measurement

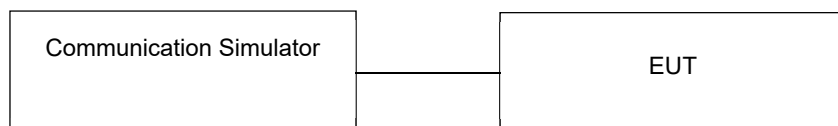
### 4.2.1 Limits of Modulation Characteristics

N/A

### 4.2.2 Test Procedure

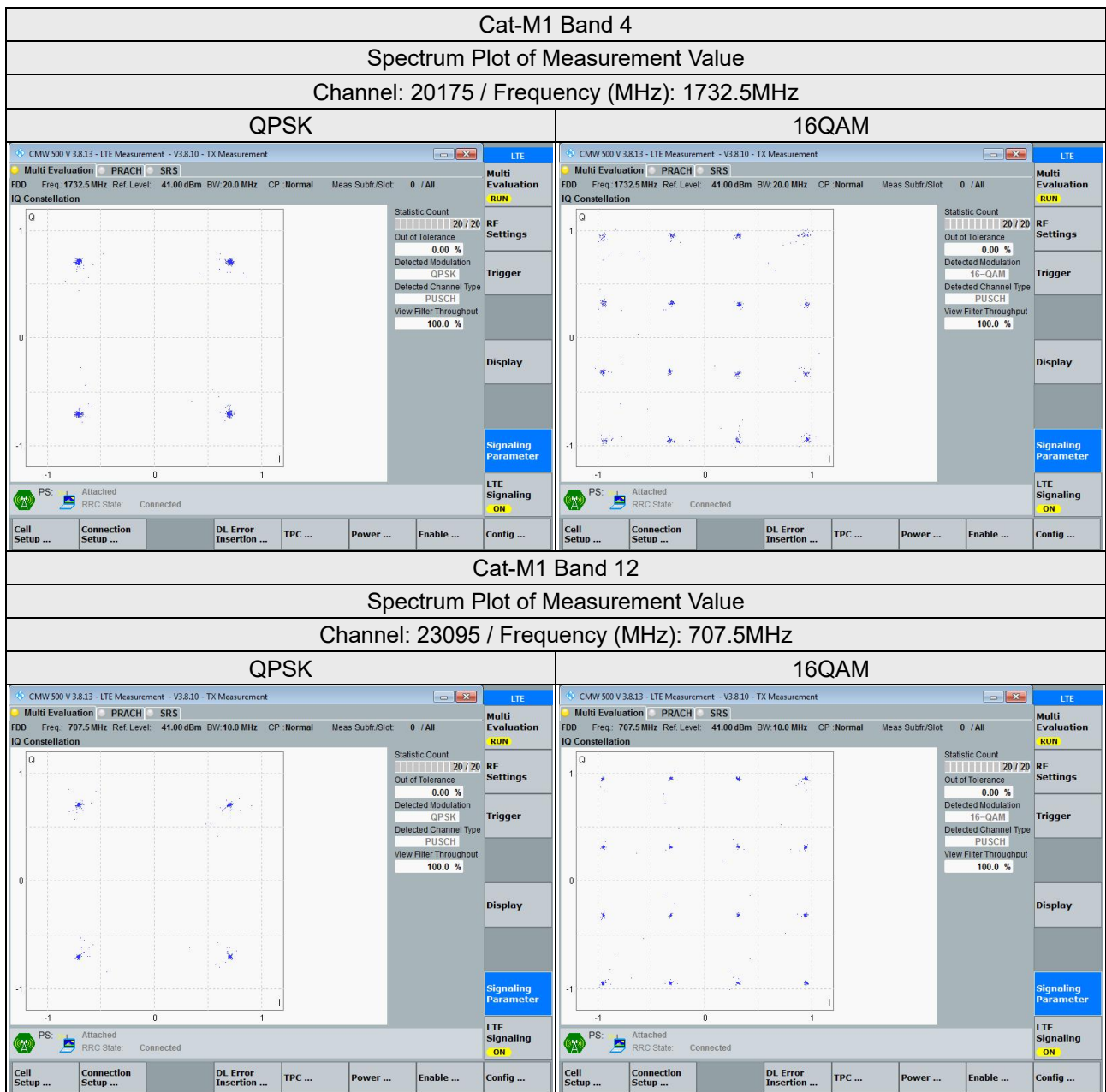
Connect the EUT to Communication Simulator via the antenna connector, the frequency band is set as EUT supported Modulation and Channels, the EUT output is matched with 50 ohm load, the waveform quality and constellation of the EUT was tested.

### 4.2.3 Test Setup





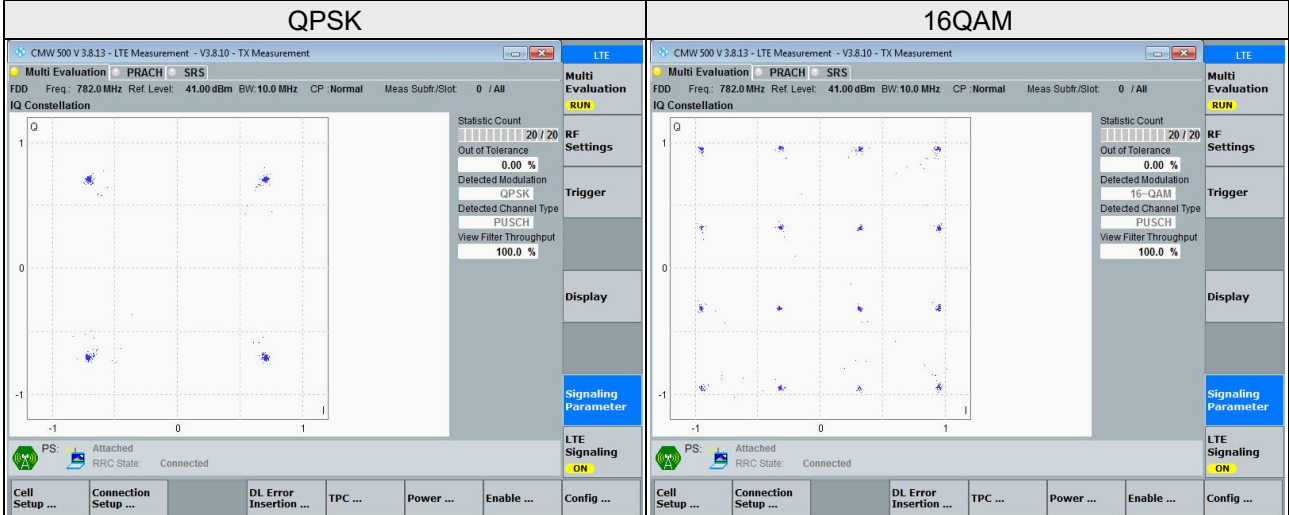
## 4.2.4 Test Results



### Cat-M1 Band 13

#### Spectrum Plot of Measurement Value

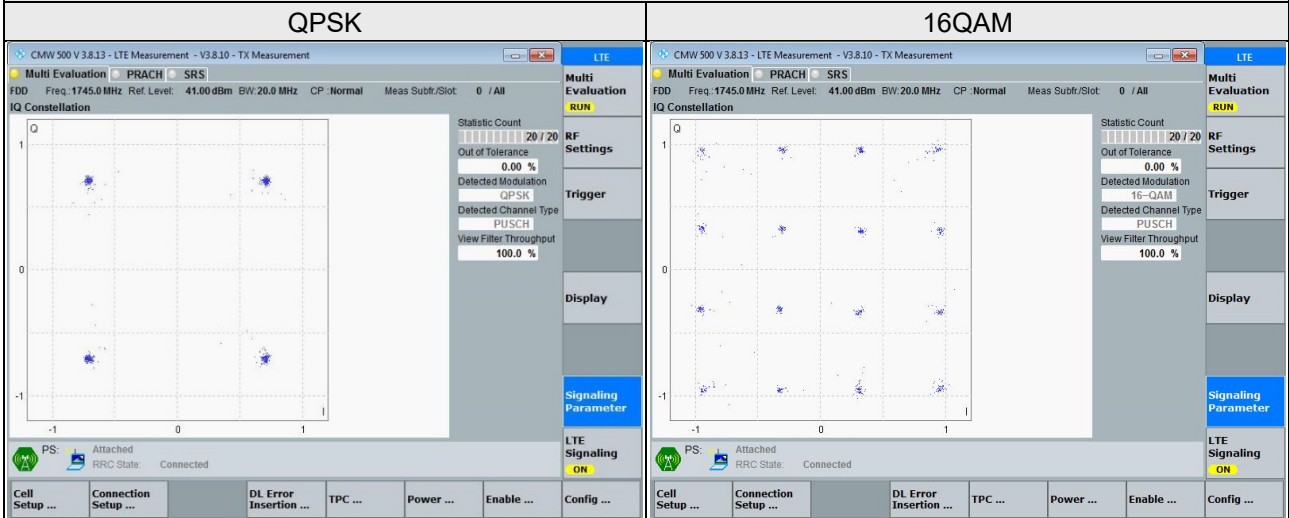
Channel: 23230 / Frequency (MHz): 782.0MHz



### Cat-M1 Band 66

#### Spectrum Plot of Measurement Value

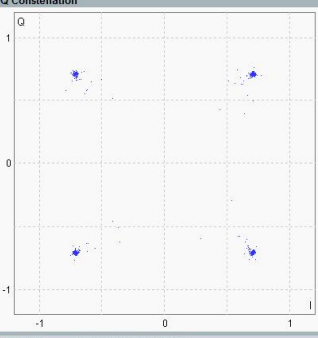
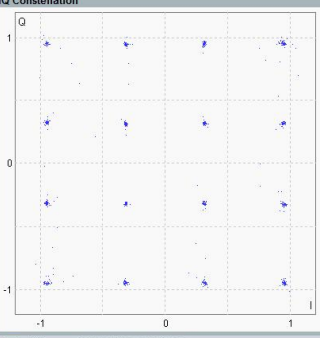
Channel: 132322 / Frequency (MHz): 1745.0MHz



Cat-M1 Band 85

Spectrum Plot of Measurement Value

Channel: 134092 / Frequency (MHz): 707.0MHz

QPSK					16QAM								
<p>CMW 500 V 3.8.13 - LTE Measurement - V3.8.10 - TX Measurement</p> <p>Multi Evaluation PRACH SRS</p> <p>FDD Freq: 707.0 MHz Ref. Level: 41.00 dBm BW: 10.0 MHz CP: Normal Meas Subfr./Slot: 0 / All</p> <p>IQ Constellation</p>  <p>Statistic Count: 20 / 20 Out of Tolerance: 0.00 % Detected Modulation: QPSK Detected Channel Type: PUSCH View Filter Throughput: 100.0 %</p> <p>RF Settings Trigger Display Signaling Parameter</p> <p>PS: Connection Established RRC State: Connected LTE Signaling ON</p>					<p>CMW 500 V 3.8.13 - LTE Measurement - V3.8.10 - TX Measurement</p> <p>Multi Evaluation PRACH SRS</p> <p>FDD Freq: 707.0 MHz Ref. Level: 41.00 dBm BW: 10.0 MHz CP: Normal Meas Subfr./Slot: 0 / All</p> <p>IQ Constellation</p>  <p>Statistic Count: 20 / 20 Out of Tolerance: 0.00 % Detected Modulation: 16-QAM Detected Channel Type: PUSCH View Filter Throughput: 100.0 %</p> <p>RF Settings Trigger Display Signaling Parameter</p> <p>PS: Connection Established RRC State: Connected LTE Signaling ON</p>								
Cell Setup ...	Connection Setup ...	DL Error Insertion ...	TPC ...	Power ...	Enable ...	Config ...	Repetition ...	Stop Condition ...	Statistic Count ...	Channel Bandwidth ...	Measurement Subframes ...	Assign Views	Config ...

### 4.3 Frequency Stability Measurement

#### 4.3.1 Limits of Frequency Stability Measurement

According to the FCC part 2.1055 shall be tested the frequency stability. The rule is defined that "The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block." The test extreme voltage is according to the 2.1055(d)(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment and the extreme temperature rule is comply with specification of EUT  $-30^{\circ}\text{C} \sim 50^{\circ}\text{C}$ .

#### 4.3.2 Test Procedure

- a. Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.
- b. EUT is connected the external power supply to control the DC input power. The test voltage range is from minimum to maximum working voltage. Each step shall be record the frequency error rate.
- c. The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the  $\pm 0.5^{\circ}\text{C}$  during the measurement testing. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.

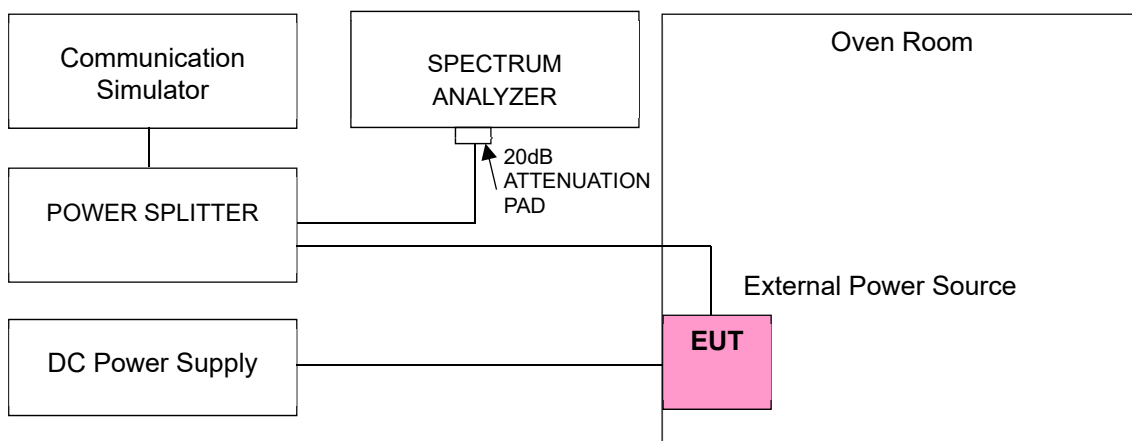
Note: The frequency error was recorded frequency error from the communication simulator.

#### 4.3.3 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Radio Communication Analyzer Anritsu	MT8821C	6261806803	Feb. 18, 2023	Feb. 17, 2024
Temperature & Humidity Chamber TERCHY	HRM-120RF	931022	Dec. 27, 2022	Dec. 26, 2023
Digital Multimeter Fluke	87-III	70360742	Jun. 23, 2022	Jun. 22, 2023
DC Power Supply Topward	6306A	727263	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

#### 4.3.4 Test Setup



#### 4.3.5 Test Results

##### Frequency Error vs. Voltage

Voltage (Vdc)	Cat-M1 Band 4			
	Channel Bandwidth 1.4 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
6.12	1710.6999960	-0.002	1754.3000030	0.002
7.2	1710.7000020	0.001	1754.3000040	0.002
8.28	1710.7000040	0.002	1754.2999960	-0.002

Note: The applicant defined the normal working voltage is from 6.12Vdc to 8.28Vdc.

##### Frequency Error vs. Temperature

Temp. (°C)	Cat-M1 Band 4			
	Channel Bandwidth 1.4 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-40	1710.6999990	-0.001	1754.3000030	0.002
-30	1710.7000040	0.002	1754.2999990	-0.001
-20	1710.7000010	0.001	1754.3000040	0.002
-10	1710.7000040	0.002	1754.3000020	0.001
0	1710.7000030	0.002	1754.3000020	0.001
10	1710.7000020	0.001	1754.2999960	-0.002
20	1710.6999970	-0.002	1754.3000030	0.002
30	1710.6999990	-0.001	1754.3000040	0.002
40	1710.6999970	-0.002	1754.3000030	0.002
50	1710.7000040	0.002	1754.2999980	-0.001
60	1710.7000030	0.002	1754.2999960	-0.002
70	1710.6999980	-0.001	1754.2999960	-0.002

**Frequency Error vs. Voltage**

Voltage (Vdc)	Cat-M1 Band 4			
	Channel Bandwidth 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
6.12	1711.4999960	-0.002	1753.4999980	-0.001
7.2	1711.4999970	-0.002	1753.5000020	0.001
8.28	1711.5000020	0.001	1753.5000040	0.002

Note: The applicant defined the normal working voltage is from 6.12Vdc to 8.28Vdc.

**Frequency Error vs. Temperature**

Temp. (°C)	Cat-M1 Band 4			
	Channel Bandwidth 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-40	1711.5000010	0.001	1753.4999990	-0.001
-30	1711.5000020	0.001	1753.4999980	-0.001
-20	1711.5000030	0.002	1753.4999990	-0.001
-10	1711.5000030	0.002	1753.4999960	-0.002
0	1711.5000030	0.002	1753.4999980	-0.001
10	1711.5000010	0.001	1753.4999990	-0.001
20	1711.5000040	0.002	1753.5000010	0.001
30	1711.4999980	-0.001	1753.4999970	-0.002
40	1711.4999980	-0.001	1753.5000030	0.002
50	1711.5000020	0.001	1753.4999960	-0.002
60	1711.5000030	0.002	1753.5000020	0.001
70	1711.4999990	-0.001	1753.5000010	0.001

**Frequency Error vs. Voltage**

Voltage (Vdc)	Cat-M1 Band 4			
	Channel Bandwidth 5MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
6.12	1712.4999960	-0.002	1752.5000040	0.002
7.2	1712.4999960	-0.002	1752.5000010	0.001
8.28	1712.5000020	0.001	1752.4999960	-0.002

Note: The applicant defined the normal working voltage is from 6.12Vdc to 8.28Vdc.

**Frequency Error vs. Temperature**

Temp. (°C)	Cat-M1 Band 4			
	Channel Bandwidth 5MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-40	1712.5000030	0.002	1752.4999980	-0.001
-30	1712.4999960	-0.002	1752.5000010	0.001
-20	1712.5000020	0.001	1752.4999990	-0.001
-10	1712.4999960	-0.002	1752.5000020	0.001
0	1712.5000010	0.001	1752.4999990	-0.001
10	1712.4999990	-0.001	1752.4999980	-0.001
20	1712.5000010	0.001	1752.5000040	0.002
30	1712.4999970	-0.002	1752.5000020	0.001
40	1712.5000010	0.001	1752.5000020	0.001
50	1712.5000020	0.001	1752.4999990	-0.001
60	1712.5000030	0.002	1752.5000040	0.002
70	1712.4999970	-0.002	1752.5000020	0.001

Frequency Error vs. Voltage

Voltage (Vdc)	Cat-M1 Band 4			
	Channel Bandwidth 10MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
6.12	1715.0000030	0.002	1750.0000020	0.001
7.2	1714.9999990	-0.001	1750.0000030	0.002
8.28	1714.9999960	-0.002	1749.9999990	-0.001

Note: The applicant defined the normal working voltage is from 6.12Vdc to 8.28Vdc.

Frequency Error vs. Temperature

Temp. (°C)	Cat-M1 Band 4			
	Channel Bandwidth 10MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-40	1714.9999980	-0.001	1749.9999980	-0.001
-30	1715.0000020	0.001	1750.0000010	0.001
-20	1715.0000040	0.002	1750.0000030	0.002
-10	1715.0000020	0.001	1750.0000030	0.002
0	1714.9999970	-0.002	1750.0000010	0.001
10	1715.0000040	0.002	1750.0000030	0.002
20	1715.0000030	0.002	1749.9999980	-0.001
30	1715.0000020	0.001	1749.9999990	-0.001
40	1714.9999970	-0.002	1750.0000030	0.002
50	1715.0000010	0.001	1750.0000040	0.002
60	1715.0000020	0.001	1750.0000040	0.002
70	1714.9999960	-0.002	1749.9999980	-0.001



**Frequency Error vs. Voltage**

Voltage (Vdc)	Cat-M1 Band 4			
	Channel Bandwidth 15MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
6.12	1717.4999970	-0.002	1747.5000040	0.002
7.2	1717.4999960	-0.002	1747.5000020	0.001
8.28	1717.4999990	-0.001	1747.5000040	0.002

Note: The applicant defined the normal working voltage is from 6.12Vdc to 8.28Vdc.

**Frequency Error vs. Temperature**

Temp. (°C)	Cat-M1 Band 4			
	Channel Bandwidth 15MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-40	1717.4999960	-0.002	1747.5000010	0.001
-30	1717.5000040	0.002	1747.5000010	0.001
-20	1717.4999970	-0.002	1747.4999980	-0.001
-10	1717.4999960	-0.002	1747.5000040	0.002
0	1717.4999980	-0.001	1747.5000030	0.002
10	1717.4999970	-0.002	1747.4999980	-0.001
20	1717.4999980	-0.001	1747.4999970	-0.002
30	1717.5000010	0.001	1747.4999970	-0.002
40	1717.5000040	0.002	1747.4999980	-0.001
50	1717.4999960	-0.002	1747.5000030	0.002
60	1717.5000030	0.002	1747.4999990	-0.001
70	1717.5000030	0.002	1747.4999980	-0.001

**Frequency Error vs. Voltage**

Voltage (Vdc)	Cat-M1 Band 4			
	Channel Bandwidth 20MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
6.12	1720.0000020	0.001	1744.9999990	-0.001
7.2	1719.9999980	-0.001	1745.0000040	0.002
8.28	1720.0000030	0.002	1744.9999990	-0.001

Note: The applicant defined the normal working voltage is from 6.12Vdc to 8.28Vdc.

**Frequency Error vs. Temperature**

Temp. (°C)	Cat-M1 Band 4			
	Channel Bandwidth 20MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-40	1719.9999960	-0.002	1745.0000040	0.002
-30	1719.9999960	-0.002	1744.9999990	-0.001
-20	1720.0000010	0.001	1744.9999970	-0.002
-10	1720.0000020	0.001	1745.0000030	0.002
0	1720.0000030	0.002	1744.9999960	-0.002
10	1720.0000020	0.001	1744.9999960	-0.002
20	1720.0000040	0.002	1745.0000030	0.002
30	1719.9999970	-0.002	1744.9999970	-0.002
40	1720.0000040	0.002	1744.9999970	-0.002
50	1720.0000010	0.001	1745.0000020	0.001
60	1719.9999980	-0.001	1745.0000030	0.002
70	1720.0000020	0.001	1744.9999990	-0.001

**Frequency Error vs. Voltage**

Voltage (Vdc)	Cat-M1 Band 12			
	Channel Bandwidth 1.4 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
6.12	699.7000020	0.003	715.2999990	-0.001
7.2	699.7000020	0.003	715.3000020	0.003
8.28	699.6999990	-0.001	715.2999960	-0.006

Note: The applicant defined the normal working voltage is from 6.12Vdc to 8.28Vdc.

**Frequency Error vs. Temperature**

Temp. (°C)	Cat-M1 Band 12			
	Channel Bandwidth 1.4 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-40	699.6999960	-0.006	715.2999970	-0.004
-30	699.6999990	-0.001	715.3000020	0.003
-20	699.7000020	0.003	715.2999970	-0.004
-10	699.6999970	-0.004	715.3000020	0.003
0	699.6999970	-0.004	715.3000020	0.003
10	699.6999990	-0.001	715.3000040	0.006
20	699.6999970	-0.004	715.3000020	0.003
30	699.7000040	0.006	715.2999980	-0.003
40	699.7000010	0.001	715.3000020	0.003
50	699.6999990	-0.001	715.3000040	0.006
60	699.6999970	-0.004	715.2999970	-0.004
70	699.6999970	-0.004	715.3000020	0.003

**Frequency Error vs. Voltage**

Voltage (Vdc)	Cat-M1 Band 12			
	Channel Bandwidth 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
6.12	700.4999970	-0.004	714.5000030	0.004
7.2	700.5000010	0.001	714.5000040	0.006
8.28	700.4999980	-0.003	714.5000010	0.001

Note: The applicant defined the normal working voltage is from 6.12Vdc to 8.28Vdc.

**Frequency Error vs. Temperature**

Temp. (°C)	Cat-M1 Band 12			
	Channel Bandwidth 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-40	700.4999970	-0.004	714.4999980	-0.003
-30	700.5000010	0.001	714.5000020	0.003
-20	700.4999990	-0.001	714.4999990	-0.001
-10	700.5000020	0.003	714.5000030	0.004
0	700.5000030	0.004	714.5000010	0.001
10	700.5000030	0.004	714.5000030	0.004
20	700.5000030	0.004	714.5000030	0.004
30	700.4999960	-0.006	714.5000010	0.001
40	700.4999980	-0.003	714.4999990	-0.001
50	700.5000020	0.003	714.4999990	-0.001
60	700.4999970	-0.004	714.4999980	-0.003
70	700.5000040	0.006	714.4999990	-0.001

Frequency Error vs. Voltage

Voltage (Vdc)	Cat-M1 Band 12			
	Channel Bandwidth 5MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
6.12	701.5000030	0.004	713.5000010	0.001
7.2	701.5000040	0.006	713.4999980	-0.003
8.28	701.5000010	0.001	713.4999990	-0.001

Note: The applicant defined the normal working voltage is from 6.12Vdc to 8.28Vdc.

Frequency Error vs. Temperature

Temp. (°C)	Cat-M1 Band 12			
	Channel Bandwidth 5MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-40	701.5000040	0.006	713.5000020	0.003
-30	701.5000010	0.001	713.4999970	-0.004
-20	701.4999990	-0.001	713.5000020	0.003
-10	701.5000020	0.003	713.4999980	-0.003
0	701.5000010	0.001	713.4999970	-0.004
10	701.4999960	-0.006	713.4999990	-0.001
20	701.5000010	0.001	713.4999970	-0.004
30	701.4999980	-0.003	713.5000030	0.004
40	701.4999980	-0.003	713.5000030	0.004
50	701.5000030	0.004	713.5000010	0.001
60	701.4999970	-0.004	713.5000020	0.003
70	701.5000020	0.003	713.5000030	0.004

**Frequency Error vs. Voltage**

Voltage (Vdc)	Cat-M1 Band 12			
	Channel Bandwidth 10MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
6.12	704.0000030	0.004	710.9999990	-0.001
7.2	703.9999980	-0.003	711.0000030	0.004
8.28	704.0000030	0.004	711.0000040	0.006

Note: The applicant defined the normal working voltage is from 6.12Vdc to 8.28Vdc.

**Frequency Error vs. Temperature**

Temp. (°C)	Cat-M1 Band 12			
	Channel Bandwidth 10MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-40	703.9999980	-0.003	711.0000040	0.006
-30	704.0000020	0.003	711.0000020	0.003
-20	704.0000040	0.006	710.9999960	-0.006
-10	703.9999980	-0.003	710.9999960	-0.006
0	704.0000040	0.006	710.9999960	-0.006
10	703.9999970	-0.004	710.9999990	-0.001
20	704.0000010	0.001	710.9999980	-0.003
30	704.0000010	0.001	710.9999980	-0.003
40	704.0000030	0.004	711.0000040	0.006
50	704.0000030	0.004	711.0000020	0.003
60	704.0000020	0.003	711.0000030	0.004
70	703.9999970	-0.004	711.0000010	0.001

**Frequency Error vs. Voltage**

Voltage (Vdc)	Cat-M1 Band 13			
	Channel Bandwidth 5MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
6.12	779.5000030	0.004	784.4999980	-0.003
7.2	779.4999990	-0.001	784.5000040	0.005
8.28	779.4999970	-0.004	784.4999960	-0.005

Note: The applicant defined the normal working voltage is from 6.12Vdc to 8.28Vdc.

**Frequency Error vs. Temperature**

Temp. (°C)	Cat-M1 Band 13			
	Channel Bandwidth 5MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-40	779.5000020	0.003	784.5000040	0.005
-30	779.4999970	-0.004	784.4999970	-0.004
-20	779.4999970	-0.004	784.4999980	-0.003
-10	779.4999970	-0.004	784.4999970	-0.004
0	779.5000030	0.004	784.4999970	-0.004
10	779.4999970	-0.004	784.4999990	-0.001
20	779.5000030	0.004	784.4999960	-0.005
30	779.4999970	-0.004	784.5000030	0.004
40	779.5000020	0.003	784.5000040	0.005
50	779.5000030	0.004	784.5000020	0.003
60	779.4999990	-0.001	784.5000020	0.003
70	779.5000040	0.005	784.4999990	-0.001

**Frequency Error vs. Voltage**

Voltage (Vdc)	Cat-M1 Band 13	
	Channel Bandwidth 10MHz	
	Frequency (MHz)	Frequency Error (ppm)
6.12	781.9999980	-0.003
7.2	781.9999960	-0.005
8.28	781.9999990	-0.001

Note: The applicant defined the normal working voltage is from 6.12Vdc to 8.28Vdc.

**Frequency Error vs. Temperature**

Temp. (°C)	Cat-M1 Band 13	
	Channel Bandwidth 10MHz	
	Frequency (MHz)	Frequency Error (ppm)
-40	781.9999980	-0.003
-30	781.9999980	-0.003
-20	781.9999960	-0.005
-10	782.0000010	0.001
0	781.9999970	-0.004
10	782.0000030	0.004
20	782.0000030	0.004
30	782.0000020	0.003
40	781.9999990	-0.001
50	782.0000010	0.001
60	781.9999960	-0.005
70	781.9999990	-0.001



**Frequency Error vs. Voltage**

Voltage (Vdc)	Cat-M1 Band 66			
	Channel Bandwidth 1.4 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
6.12	1710.6999970	-0.002	1779.3000020	0.001
7.2	1710.7000040	0.002	1779.2999980	-0.001
8.28	1710.7000010	0.001	1779.3000030	0.002

Note: The applicant defined the normal working voltage is from 6.12Vdc to 8.28Vdc.

**Frequency Error vs. Temperature**

Temp. (°C)	Cat-M1 Band 66			
	Channel Bandwidth 1.4 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-40	1710.7000030	0.002	1779.2999960	-0.002
-30	1710.6999970	-0.002	1779.3000010	0.001
-20	1710.7000040	0.002	1779.2999980	-0.001
-10	1710.7000010	0.001	1779.2999970	-0.002
0	1710.7000040	0.002	1779.3000030	0.002
10	1710.7000040	0.002	1779.3000010	0.001
20	1710.7000040	0.002	1779.2999970	-0.002
30	1710.6999960	-0.002	1779.3000010	0.001
40	1710.7000040	0.002	1779.3000040	0.002
50	1710.6999970	-0.002	1779.3000030	0.002
60	1710.6999980	-0.001	1779.3000020	0.001
70	1710.7000040	0.002	1779.2999960	-0.002

**Frequency Error vs. Voltage**

Voltage (Vdc)	Cat-M1 Band 66			
	Channel Bandwidth 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
6.12	1711.4999970	-0.002	1778.5000010	0.001
7.2	1711.5000010	0.001	1778.5000030	0.002
8.28	1711.4999980	-0.001	1778.4999970	-0.002

Note: The applicant defined the normal working voltage is from 6.12Vdc to 8.28Vdc.

**Frequency Error vs. Temperature**

Temp. (°C)	Cat-M1 Band 66			
	Channel Bandwidth 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-40	1711.4999960	-0.002	1778.4999960	-0.002
-30	1711.5000030	0.002	1778.5000010	0.001
-20	1711.5000020	0.001	1778.4999970	-0.002
-10	1711.4999980	-0.001	1778.5000010	0.001
0	1711.4999980	-0.001	1778.4999970	-0.002
10	1711.4999960	-0.002	1778.4999990	-0.001
20	1711.4999970	-0.002	1778.5000010	0.001
30	1711.5000010	0.001	1778.5000010	0.001
40	1711.5000020	0.001	1778.5000020	0.001
50	1711.4999990	-0.001	1778.4999980	-0.001
60	1711.5000020	0.001	1778.4999980	-0.001
70	1711.5000020	0.001	1778.5000010	0.001

Frequency Error vs. Voltage

Voltage (Vdc)	Cat-M1 Band 66			
	Channel Bandwidth 5MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
6.12	1712.5000010	0.001	1777.4999960	-0.002
7.2	1712.5000020	0.001	1777.4999970	-0.002
8.28	1712.5000010	0.001	1777.4999960	-0.002

Note: The applicant defined the normal working voltage is from 6.12Vdc to 8.28Vdc.

Frequency Error vs. Temperature

Temp. (°C)	Cat-M1 Band 66			
	Channel Bandwidth 5MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-40	1712.5000040	0.002	1777.5000010	0.001
-30	1712.5000040	0.002	1777.4999980	-0.001
-20	1712.5000030	0.002	1777.4999970	-0.002
-10	1712.5000040	0.002	1777.4999980	-0.001
0	1712.5000010	0.001	1777.4999970	-0.002
10	1712.4999970	-0.002	1777.5000010	0.001
20	1712.5000030	0.002	1777.4999970	-0.002
30	1712.4999970	-0.002	1777.4999960	-0.002
40	1712.4999960	-0.002	1777.5000030	0.002
50	1712.5000030	0.002	1777.4999990	-0.001
60	1712.4999980	-0.001	1777.5000030	0.002
70	1712.5000010	0.001	1777.5000030	0.002

**Frequency Error vs. Voltage**

Voltage (Vdc)	Cat-M1 Band 66			
	Channel Bandwidth 10MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
6.12	1714.9999980	-0.001	1774.9999970	-0.002
7.2	1714.9999980	-0.001	1774.9999970	-0.002
8.28	1714.9999970	-0.002	1774.9999980	-0.001

Note: The applicant defined the normal working voltage is from 6.12Vdc to 8.28Vdc.

**Frequency Error vs. Temperature**

Temp. (°C)	Cat-M1 Band 66			
	Channel Bandwidth 10MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-40	1715.0000040	0.002	1775.0000040	0.002
-30	1714.9999990	-0.001	1774.9999980	-0.001
-20	1714.9999970	-0.002	1774.9999990	-0.001
-10	1714.9999970	-0.002	1775.0000010	0.001
0	1714.9999970	-0.002	1775.0000020	0.001
10	1714.9999980	-0.001	1774.9999990	-0.001
20	1714.9999990	-0.001	1774.9999960	-0.002
30	1714.9999990	-0.001	1775.0000010	0.001
40	1714.9999980	-0.001	1774.9999970	-0.002
50	1714.9999960	-0.002	1775.0000020	0.001
60	1714.9999990	-0.001	1774.9999960	-0.002
70	1715.0000030	0.002	1775.0000040	0.002

**Frequency Error vs. Voltage**

Voltage (Vdc)	Cat-M1 Band 66			
	Channel Bandwidth 15MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
6.12	1717.4999980	-0.001	1772.4999970	-0.002
7.2	1717.4999960	-0.002	1772.4999960	-0.002
8.28	1717.5000030	0.002	1772.5000010	0.001

Note: The applicant defined the normal working voltage is from 6.12Vdc to 8.28Vdc.

**Frequency Error vs. Temperature**

Temp. (°C)	Cat-M1 Band 66			
	Channel Bandwidth 15MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-40	1717.5000030	0.002	1772.4999980	-0.001
-30	1717.5000030	0.002	1772.4999970	-0.002
-20	1717.4999990	-0.001	1772.5000040	0.002
-10	1717.5000040	0.002	1772.4999980	-0.001
0	1717.5000020	0.001	1772.5000040	0.002
10	1717.4999970	-0.002	1772.5000040	0.002
20	1717.4999960	-0.002	1772.4999960	-0.002
30	1717.4999960	-0.002	1772.4999980	-0.001
40	1717.4999970	-0.002	1772.5000030	0.002
50	1717.5000030	0.002	1772.5000040	0.002
60	1717.4999980	-0.001	1772.4999970	-0.002
70	1717.4999970	-0.002	1772.4999960	-0.002

**Frequency Error vs. Voltage**

Voltage (Vdc)	Cat-M1 Band 66			
	Channel Bandwidth 20MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
6.12	1720.0000010	0.001	1769.9999980	-0.001
7.2	1719.9999980	-0.001	1770.0000020	0.001
8.28	1720.0000020	0.001	1770.0000020	0.001

Note: The applicant defined the normal working voltage is from 6.12Vdc to 8.28Vdc.

**Frequency Error vs. Temperature**

Temp. (°C)	Cat-M1 Band 66			
	Channel Bandwidth 20MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-40	1719.9999960	-0.002	1770.0000030	0.002
-30	1719.9999970	-0.002	1770.0000040	0.002
-20	1719.9999960	-0.002	1769.9999970	-0.002
-10	1720.0000030	0.002	1769.9999980	-0.001
0	1719.9999960	-0.002	1770.0000020	0.001
10	1720.0000030	0.002	1769.9999990	-0.001
20	1720.0000010	0.001	1769.9999960	-0.002
30	1720.0000030	0.002	1769.9999990	-0.001
40	1720.0000020	0.001	1769.9999990	-0.001
50	1719.9999960	-0.002	1769.9999990	-0.001
60	1720.0000020	0.001	1770.0000020	0.001
70	1720.0000010	0.001	1770.0000020	0.001

**Frequency Error vs. Voltage**

Voltage (Vdc)	Cat-M1 Band 85			
	Channel Bandwidth 5MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
6.12	700.4999980	-0.003	713.5000020	0.003
7.2	700.5000040	0.006	713.5000010	0.001
8.28	700.4999990	-0.001	713.5000030	0.004

Note: The applicant defined the normal working voltage is from 6.12Vdc to 8.28Vdc.

**Frequency Error vs. Temperature**

Temp. (°C)	Cat-M1 Band 85			
	Channel Bandwidth 5MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-40	700.5000030	0.004	713.5000030	0.004
-30	700.5000040	0.006	713.4999990	-0.001
-20	700.5000040	0.006	713.5000040	0.006
-10	700.4999960	-0.006	713.4999990	-0.001
0	700.5000030	0.004	713.5000030	0.004
10	700.5000010	0.001	713.5000040	0.006
20	700.5000040	0.006	713.4999960	-0.006
30	700.5000010	0.001	713.4999960	-0.006
40	700.5000030	0.004	713.5000010	0.001
50	700.4999990	-0.001	713.4999970	-0.004
60	700.4999960	-0.006	713.5000020	0.003
70	700.4999990	-0.001	713.5000020	0.003

**Frequency Error vs. Voltage**

Voltage (Vdc)	Cat-M1 Band 85			
	Channel Bandwidth 10MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
6.12	702.9999980	-0.003	711.0000030	0.004
7.2	703.0000030	0.004	711.0000010	0.001
8.28	703.0000040	0.006	710.9999990	-0.001

Note: The applicant defined the normal working voltage is from 6.12Vdc to 8.28Vdc.

**Frequency Error vs. Temperature**

Temp. (°C)	Cat-M1 Band 85			
	Channel Bandwidth 10MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-40	702.9999980	-0.003	711.0000010	0.001
-30	703.0000030	0.004	710.9999980	-0.003
-20	703.0000030	0.004	710.9999980	-0.003
-10	703.0000020	0.003	710.9999970	-0.004
0	703.0000020	0.003	710.9999960	-0.006
10	702.9999990	-0.001	710.9999980	-0.003
20	703.0000040	0.006	710.9999980	-0.003
30	703.0000020	0.003	710.9999970	-0.004
40	703.0000010	0.001	711.0000010	0.001
50	703.0000010	0.001	710.9999960	-0.006
60	703.0000030	0.004	710.9999990	-0.001
70	702.9999970	-0.004	710.9999990	-0.001



## 4.4 Occupied Bandwidth Measurement

### 4.4.1 Limits of Occupied Bandwidth Measurement

The occupied bandwidth (OBW), that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 % of the total mean power radiated by a given emission.

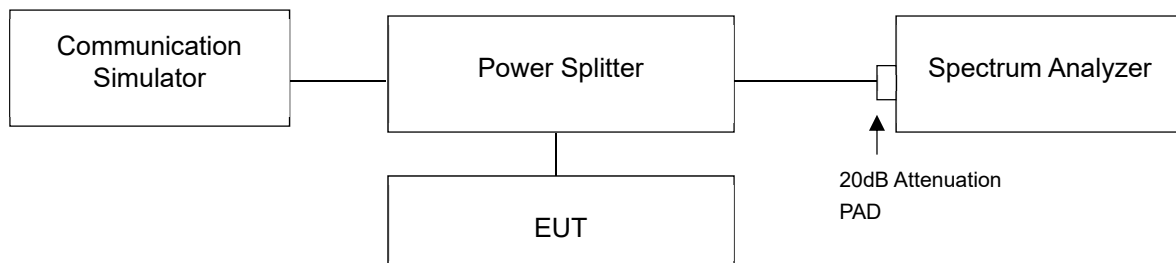
### 4.4.2 Test Procedure

For the 26dBc bandwidth measurement method, please refer to section 5.4.3 of ANSI C63.26.

- The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be wide enough to see sufficient roll off of the signal to make the measurement.
- The nominal RBW shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set  $\geq 3 \times \text{RBW}$ .
- Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation. See guidance provided in 4.2.3.
- The dynamic range of the spectrum analyzer at the selected RBW shall be more than 10 dB below the target “-X dB” requirement, i.e., if the requirement calls for measuring the -26 dB OBW, the spectrum analyzer noise floor at the selected RBW shall be at least 36 dB below the reference level.
- Set spectrum analyzer detection mode to peak, and the trace mode to max hold.
- Determine the following reference values: Set the EUT to transmit a modulated signal. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference value).
- Determine the “-X dB amplitude” as equal to (Reference Value - X). Alternatively, this calculation can be performed on the spectrum analyzer using the delta-marker measurement function.
- Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display such that each marker is at or slightly below the “-X dB amplitude” determined in step f). If a marker is below this “-X dB amplitude” value it should be as close as possible to this value. The OBW is the positive frequency difference between the two markers.
- The OBW shall be reported by providing plot(s) of the measuring instrument display, to include markers depicting the relevant frequency and amplitude information (e.g., marker table). The frequency and amplitude axis and scale shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

For the occupied bandwidth measurement method, please refer to section 5.4.4 of ANSI C63.26.

### 4.4.3 Test Setup



#### 4.4.4 Test Result

##### Occupied Bandwidth

Cat-M1 Band 4, Channel Bandwidth 1.4MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
19957	1710.7	1.0847	1.0847
20175	1732.5	1.0844	1.0854
20393	1754.3	1.0856	1.0834

Cat-M1 Band 4, Channel Bandwidth 3MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
19965	1711.5	1.0836	1.0836
20175	1732.5	1.0833	1.0835
20385	1753.5	1.0834	1.0841

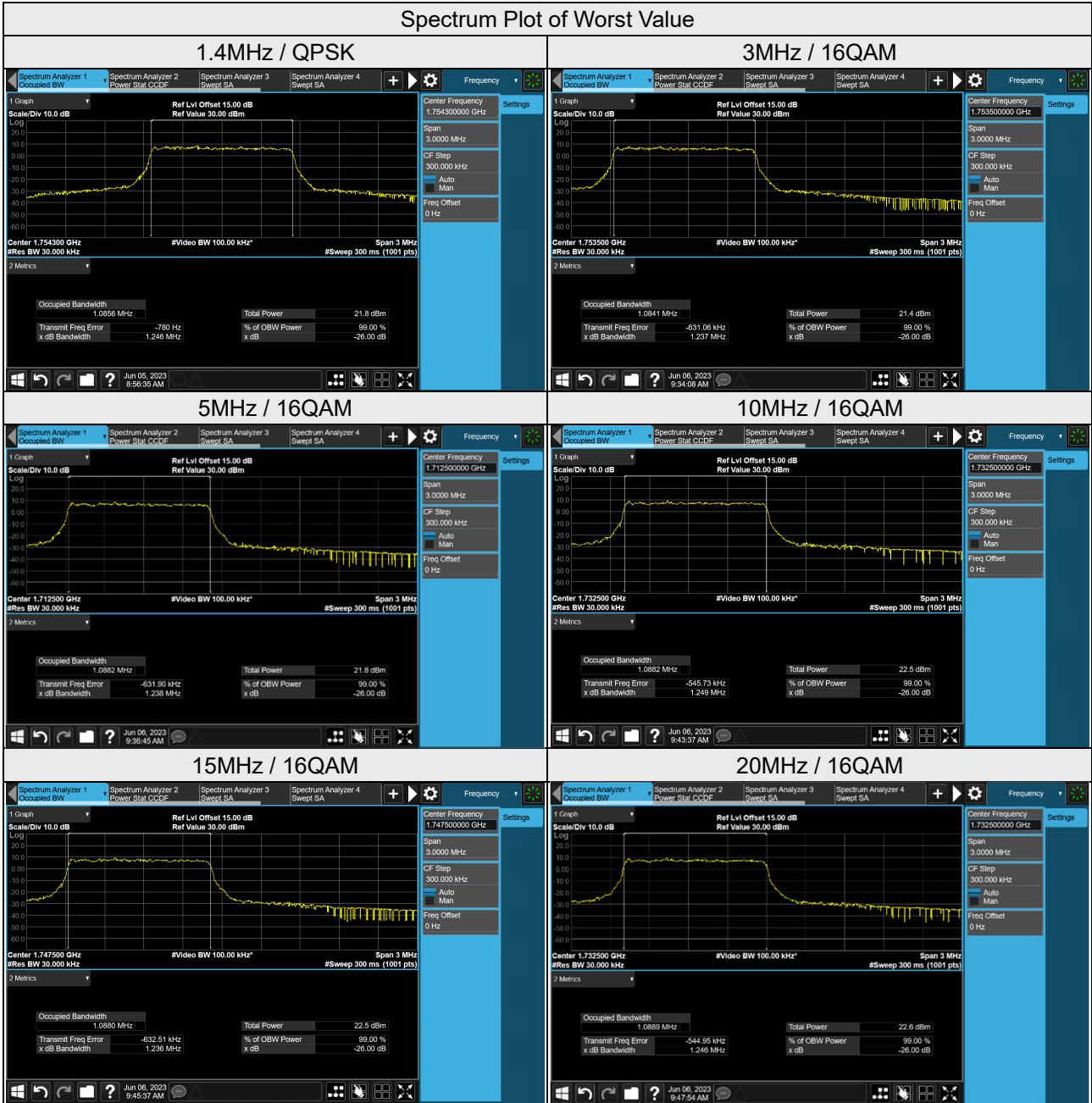
Cat-M1 Band 4, Channel Bandwidth 5MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
19975	1712.5	1.0876	1.0882
20175	1732.5	1.0879	1.0832
20375	1752.5	1.0878	1.0866

Cat-M1 Band 4, Channel Bandwidth 10MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
20000	1715.0	1.0870	1.0866
20175	1732.5	1.0875	1.0882
20350	1750.0	1.0876	1.0860

Cat-M1 Band 4, Channel Bandwidth 15MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
20025	1717.5	1.0876	1.0879
20175	1732.5	1.0869	1.0880
20325	1747.5	1.0866	1.0880



Cat-M1 Band 4, Channel Bandwidth 20MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
20050	1720.0	1.0882	1.0880
20175	1732.5	1.0877	1.0889
20300	1745.0	1.0882	1.0878



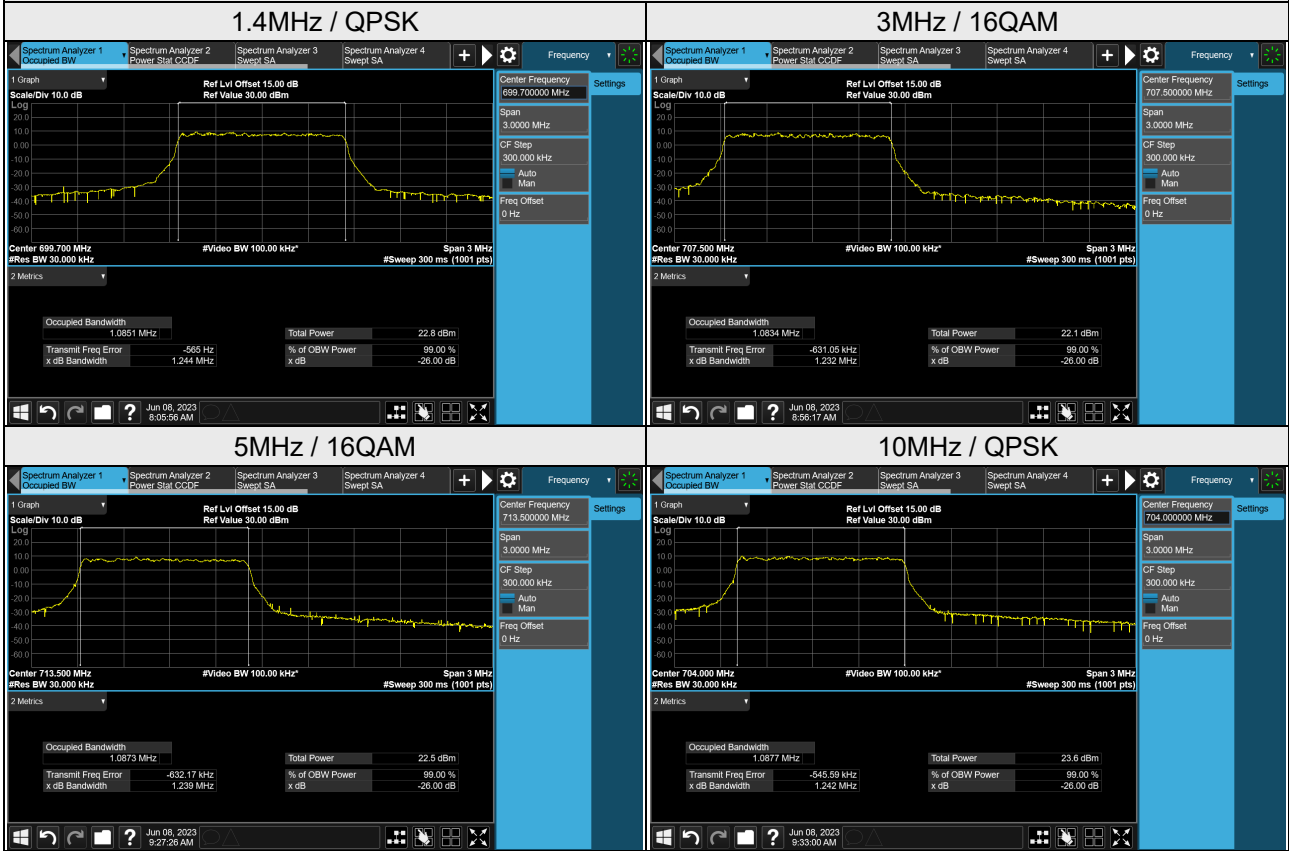
Cat-M1 Band 12, Channel Bandwidth 1.4MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
23017	699.7	1.0851	1.0840
23095	707.5	1.0849	1.0844
23173	715.3	1.0849	1.0848

Cat-M1 Band 12, Channel Bandwidth 3MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
23025	700.5	1.0832	1.0832
23095	707.5	1.0826	1.0834
23165	714.5	1.0822	1.0827

Cat-M1 Band 12, Channel Bandwidth 5MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
23035	701.5	1.0865	1.0819
23095	707.5	1.0865	1.0861
23155	713.5	1.0862	1.0873

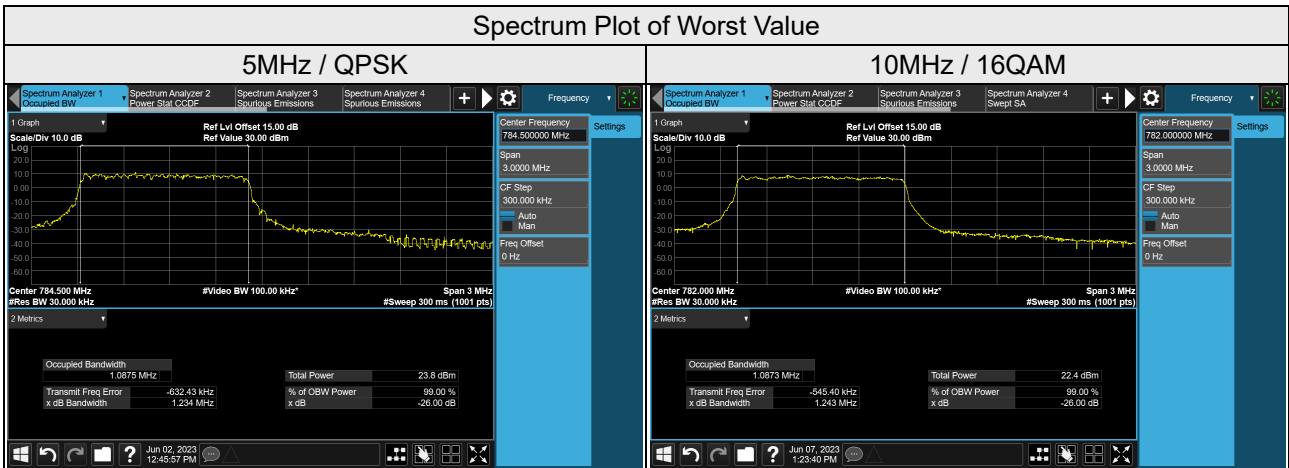
Cat-M1 Band 12, Channel Bandwidth 10MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
23060	704.0	1.0877	1.0873
23095	707.5	1.0866	1.0868
23130	711.0	1.0875	1.0875

### Spectrum Plot of Worst Value



Cat-M1 Band 13, Channel Bandwidth 5MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
23205	779.5	1.0831	1.0839
23230	782.0	1.0841	1.0860
23255	784.5	1.0875	1.0853

Cat-M1 Band 13, Channel Bandwidth 10MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
23230	782.0	1.0818	1.0873



Cat-M1 Band 66, Channel Bandwidth 1.4MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
131979	1710.7	1.0834	1.0848
132322	1745.0	1.0848	1.0833
132665	1779.3	1.0846	1.0848

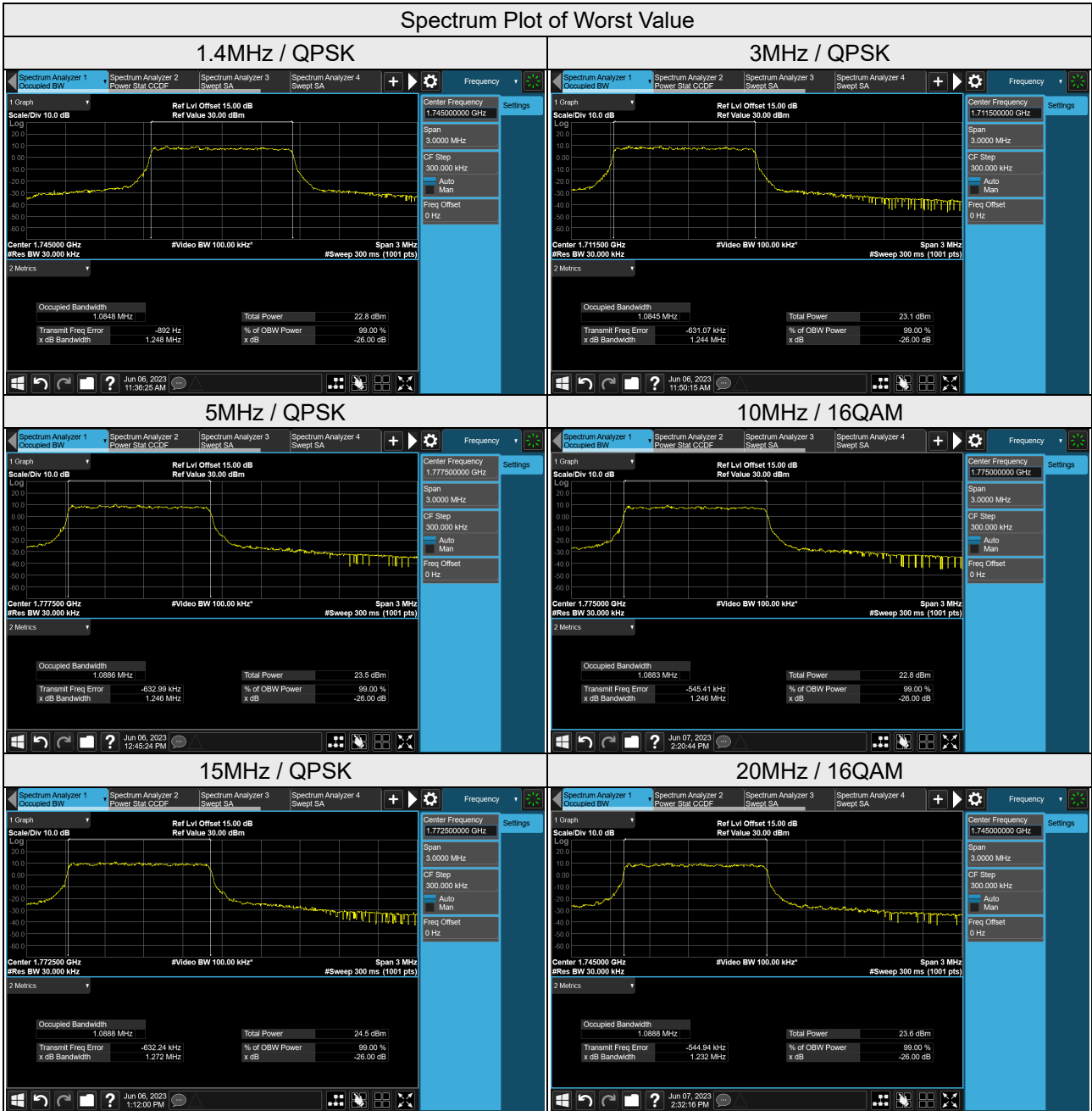
Cat-M1 Band 66, Channel Bandwidth 3MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
131987	1711.5	1.0845	1.0824
132322	1745.0	1.0845	1.0838
132657	1778.5	1.0841	1.0841

Cat-M1 Band 66, Channel Bandwidth 5MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
131997	1712.5	1.0883	1.0872
132322	1745.0	1.0882	1.0864
132647	1777.5	1.0886	1.0883

Cat-M1 Band 66, Channel Bandwidth 10MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
132022	1715.0	1.0881	1.0865
132322	1745.0	1.0875	1.0878
132622	1775.0	1.0874	1.0883

Cat-M1 Band 66, Channel Bandwidth 15MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
132047	1717.5	1.0871	1.0856
132322	1745.0	1.0873	1.0873
132597	1772.5	1.0888	1.0875

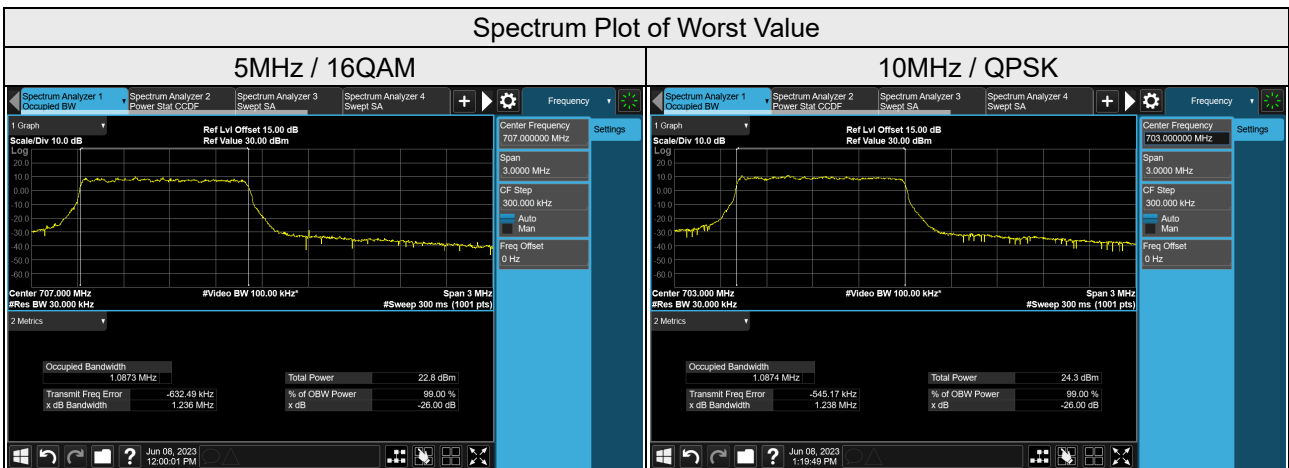
Cat-M1 Band 66, Channel Bandwidth 20MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
132072	1720.0	1.0881	1.0869
132322	1745.0	1.0866	1.0888
132572	1770.0	1.0880	1.0865





Cat-M1 Band 85, Channel Bandwidth 5MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
134027	700.5	1.0859	1.0866
134092	707.0	1.0868	1.0873
134157	713.5	1.0872	1.0849

Cat-M1 Band 85, Channel Bandwidth 10MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
134052	703.0	1.0874	1.0866
134092	707.0	1.0870	1.0873
134132	711.0	1.0869	1.0849



## 26dB Bandwidth

Cat-M1 Band 4, Channel Bandwidth 1.4MHz			
Channel	Frequency (MHz)	26dBc Bandwidth (MHz)	
		QPSK	16QAM
19957	1710.7	1.247	1.247
20175	1732.5	1.244	1.246
20393	1754.3	1.246	1.243

Cat-M1 Band 4, Channel Bandwidth 3MHz			
Channel	Frequency (MHz)	26dBc Bandwidth (MHz)	
		QPSK	16QAM
19965	1711.5	1.244	1.246
20175	1732.5	1.237	1.238
20385	1753.5	1.243	1.237

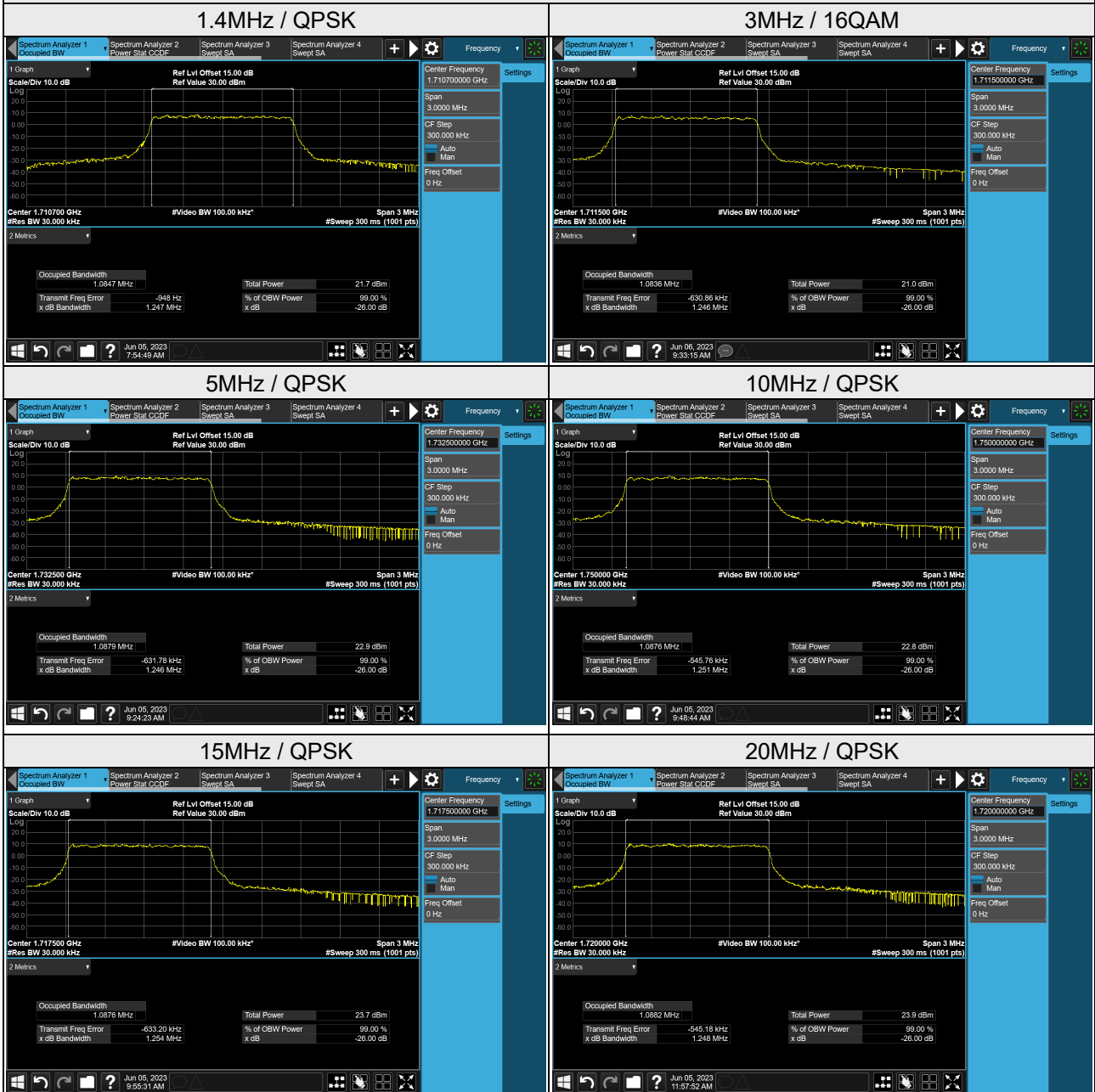
Cat-M1 Band 4, Channel Bandwidth 5MHz			
Channel	Frequency (MHz)	26dBc Bandwidth (MHz)	
		QPSK	16QAM
19975	1712.5	1.243	1.238
20175	1732.5	1.246	1.234
20375	1752.5	1.245	1.245

Cat-M1 Band 4, Channel Bandwidth 10MHz			
Channel	Frequency (MHz)	26dBc Bandwidth (MHz)	
		QPSK	16QAM
20000	1715.0	1.241	1.246
20175	1732.5	1.243	1.249
20350	1750.0	1.251	1.238

Cat-M1 Band 4, Channel Bandwidth 15MHz			
Channel	Frequency (MHz)	26dBc Bandwidth (MHz)	
		QPSK	16QAM
20025	1717.5	1.254	1.234
20175	1732.5	1.247	1.245
20325	1747.5	1.248	1.236

Cat-M1 Band 4, Channel Bandwidth 20MHz			
Channel	Frequency (MHz)	26dBc Bandwidth (MHz)	
		QPSK	16QAM
20050	1720.0	1.248	1.240
20175	1732.5	1.244	1.246
20300	1745.0	1.245	1.240

### Spectrum Plot of Worst Value



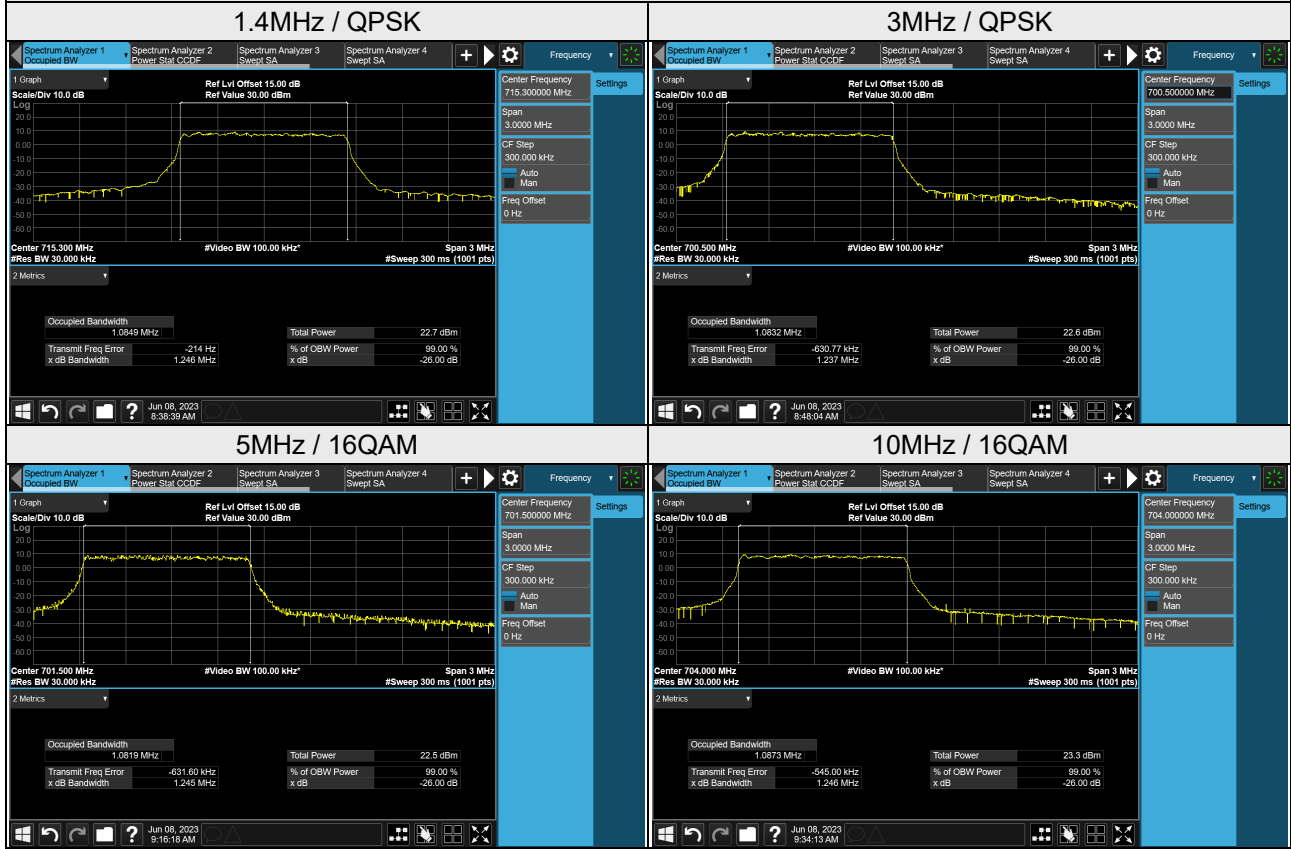
Cat-M1 Band 12, Channel Bandwidth 1.4MHz			
Channel	Frequency (MHz)	26dBc Bandwidth (MHz)	
		QPSK	16QAM
23017	699.7	1.244	1.244
23095	707.5	1.242	1.242
23173	715.3	1.246	1.241

Cat-M1 Band 12, Channel Bandwidth 3MHz			
Channel	Frequency (MHz)	26dBc Bandwidth (MHz)	
		QPSK	16QAM
23025	700.5	1.237	1.233
23095	707.5	1.236	1.232
23165	714.5	1.236	1.236

Cat-M1 Band 12, Channel Bandwidth 5MHz			
Channel	Frequency (MHz)	26dBc Bandwidth (MHz)	
		QPSK	16QAM
23035	701.5	1.235	1.245
23095	707.5	1.238	1.236
23155	713.5	1.233	1.239

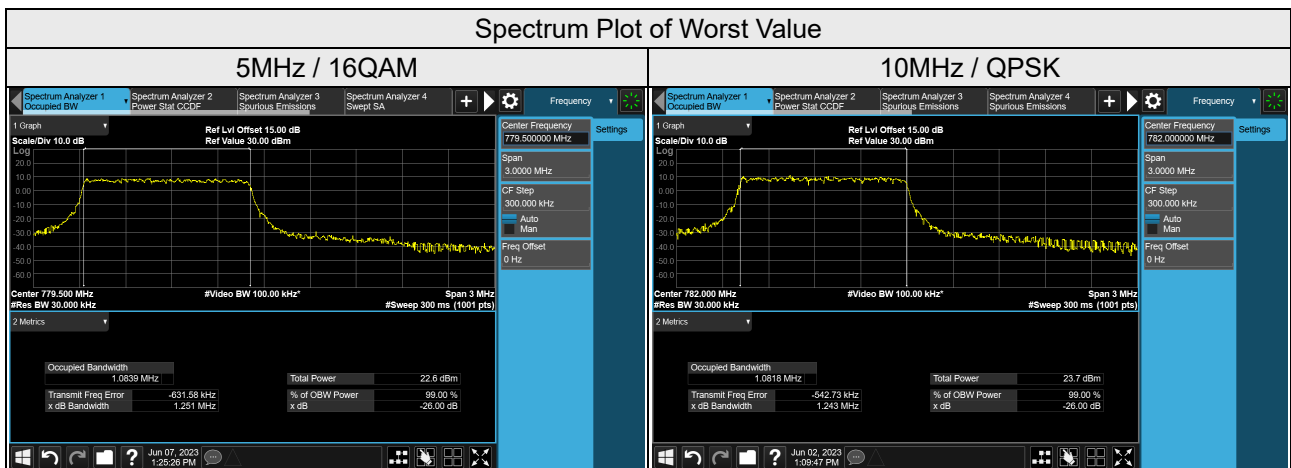
Cat-M1 Band 12, Channel Bandwidth 10MHz			
Channel	Frequency (MHz)	26dBc Bandwidth (MHz)	
		QPSK	16QAM
23060	704.0	1.242	1.246
23095	707.5	1.239	1.239
23130	711.0	1.241	1.233

### Spectrum Plot of Worst Value



Cat-M1 Band 13, Channel Bandwidth 5MHz			
Channel	Frequency (MHz)	26dBc Bandwidth (MHz)	
		QPSK	16QAM
23205	779.5	1.237	1.251
23230	782.0	1.231	1.230
23255	784.5	1.234	1.247

Cat-M1 Band 13, Channel Bandwidth 10MHz			
Channel	Frequency (MHz)	26dBc Bandwidth (MHz)	
		QPSK	16QAM
23230	782.0	1.243	1.243



Cat-M1 Band 66, Channel Bandwidth 1.4MHz			
Channel	Frequency (MHz)	26dBc Bandwidth (MHz)	
		QPSK	16QAM
131979	1710.7	1.241	1.243
132322	1745.0	1.248	1.242
132665	1779.3	1.238	1.242

Cat-M1 Band 66, Channel Bandwidth 3MHz			
Channel	Frequency (MHz)	26dBc Bandwidth (MHz)	
		QPSK	16QAM
131987	1711.5	1.244	1.244
132322	1745.0	1.245	1.237
132657	1778.5	1.242	1.238

Cat-M1 Band 66, Channel Bandwidth 5MHz			
Channel	Frequency (MHz)	26dBc Bandwidth (MHz)	
		QPSK	16QAM
131997	1712.5	1.247	1.247
132322	1745.0	1.254	1.229
132647	1777.5	1.246	1.244

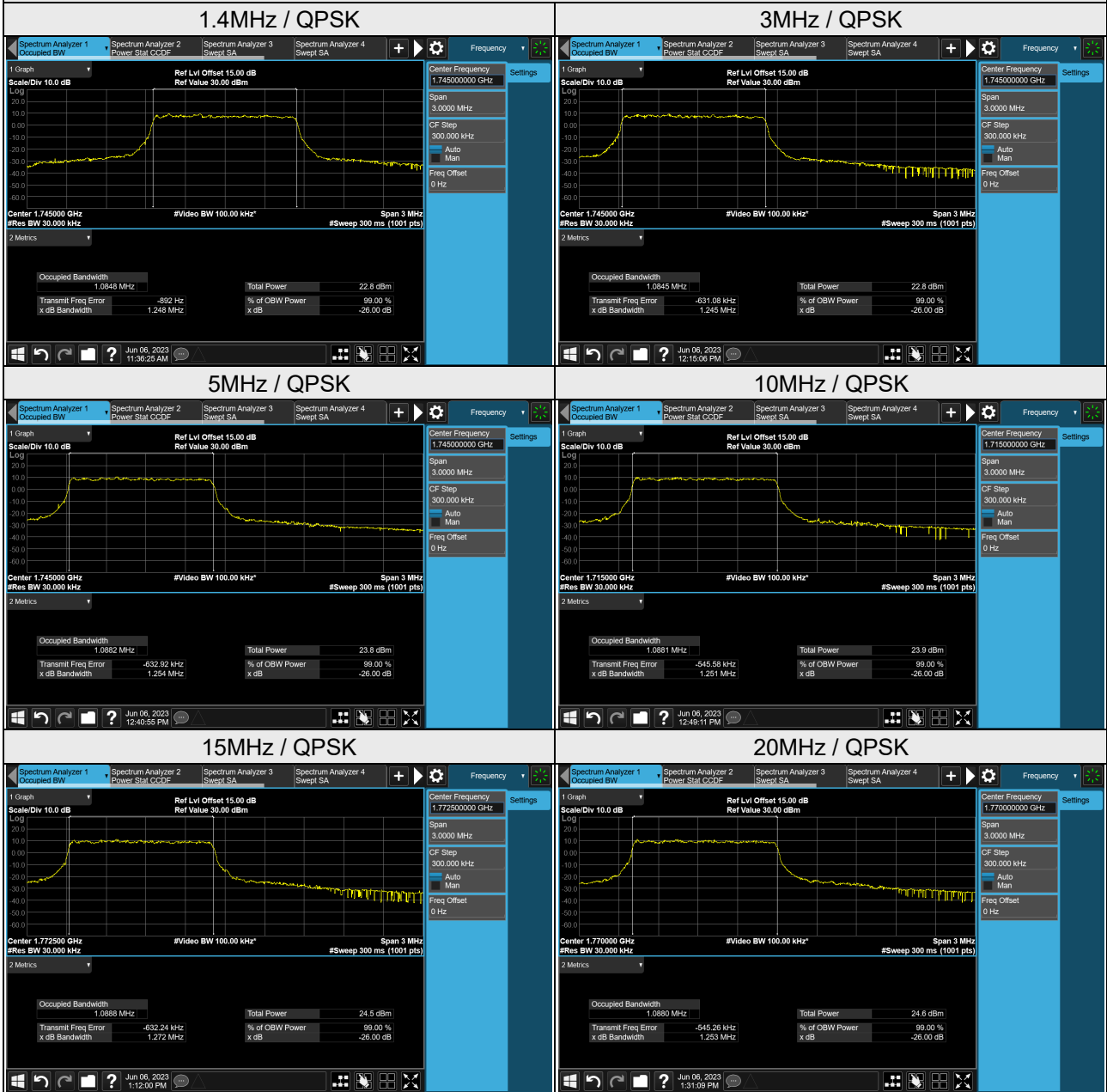
Cat-M1 Band 66, Channel Bandwidth 10MHz			
Channel	Frequency (MHz)	26dBc Bandwidth (MHz)	
		QPSK	16QAM
132022	1715.0	1.251	1.242
132322	1745.0	1.250	1.245
132622	1775.0	1.248	1.246

Cat-M1 Band 66, Channel Bandwidth 15MHz			
Channel	Frequency (MHz)	26dBc Bandwidth (MHz)	
		QPSK	16QAM
132047	1717.5	1.265	1.255
132322	1745.0	1.270	1.226
132597	1772.5	1.272	1.241

Cat-M1 Band 66, Channel Bandwidth 20MHz

Channel	Frequency (MHz)	26dBc Bandwidth (MHz)	
		QPSK	16QAM
132072	1720.0	1.248	1.241
132322	1745.0	1.251	1.232
132572	1770.0	1.253	1.249

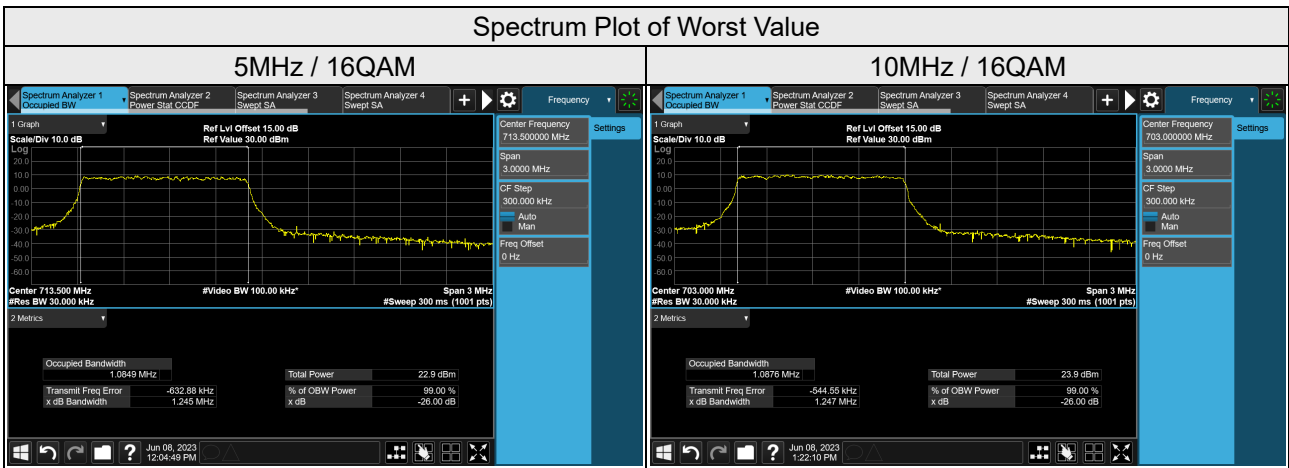
Spectrum Plot of Worst Value





Cat-M1 Band 85, Channel Bandwidth 5MHz			
Channel	Frequency (MHz)	26dBc Bandwidth (MHz)	
		QPSK	16QAM
134027	700.5	1.235	1.234
134092	707.0	1.238	1.236
134157	713.5	1.234	1.245

Cat-M1 Band 85, Channel Bandwidth 10MHz			
Channel	Frequency (MHz)	26dBc Bandwidth (MHz)	
		QPSK	16QAM
134052	703.0	1.238	1.247
134092	707.0	1.240	1.241
134132	711.0	1.243	1.243



## 4.5 Channel Edge / Out-of-Band Emissions Measurement

### 4.5.1 Limits of Band Edge / Out-of-Band Emissions Measurement

For Cat-M1 Band 4, Cat-M1 Band 66:

According to FCC 27.53(h) for operations in the 1695-1710MHz, 1710-1755MHz, 1755-1780 MHz, 1915-1920MHz, 1995-2000 MHz, 2000-2020MHz, 2110-2155MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log (P)$  dB.

For Cat-M1 Band 12, Cat-M1 Band 85:

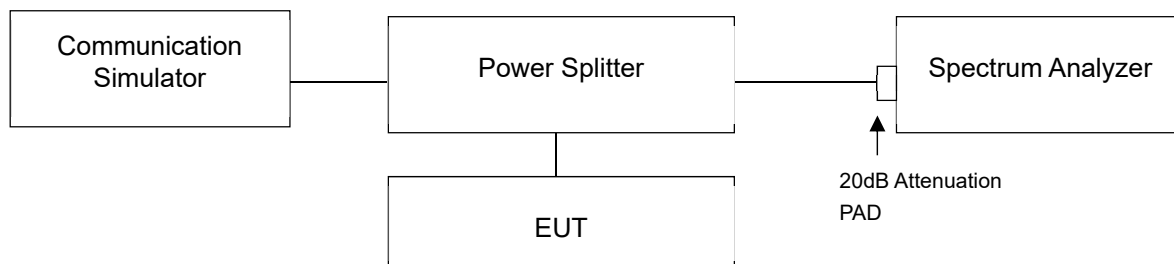
According to FCC 27.53(g) for operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least  $43 + 10 \log (P)$  dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater.

For Cat-M1 Band 13:

According to FCC 27.53(c)(2) for 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.

According to 27.53(c)(4) On all frequencies between 763-775MHz and 793-805MHz, by a factor not less than  $65 + 10 \log (P)$  dB in a 6.25 kHz band segment, for mobile and portable stations

### 4.5.2 Test Setup



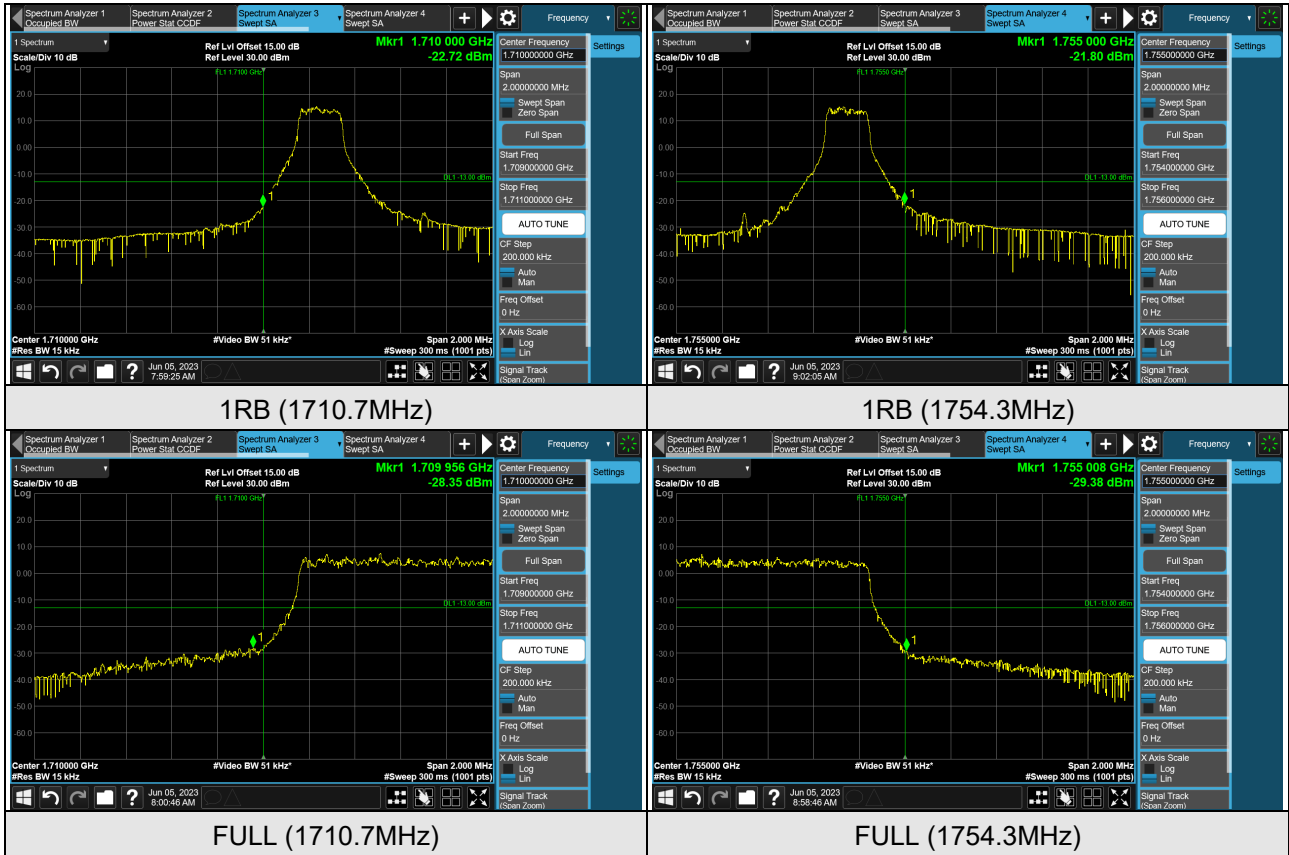
### 4.5.3 Test Procedures

- The EUT was set up for the rated peak power. The power was measured with Spectrum Analyzer. Band edge measurements were done at 2 channels: low and high operational frequency range.
- Measurement refer to ANSI C63.26 section 5.7.
- Measuring frequency band edge, narrow RBW (no less than 1% of the OBW) is used for conducted emission measurement.  $VBW \geq 3 \times RBW$ , Detector = Average.
- The center frequency of spectrum is the band edge frequency and span is 2MHz. RB of the spectrum is 15kHz and VB of the spectrum is 51kHz (Cat-M1 Band 4).
- The center frequency of spectrum is the band edge frequency and span is 2MHz. RB of the spectrum is 30kHz and VB of the spectrum is 100kHz (Cat-M1 Band 12, 66, 85).
- For Cat-M1 Band 13 measurements in the 763 - 775 MHz and 793 - 805 MHz band, the FCC limit is  $65 + 10 \log (P[\text{watt}])$  in a 6.25 kHz bandwidth. Since it was not possible to set the resolution bandwidth to 6.25 kHz with the available equipment, a bandwidth of 6.8 kHz was used instead to show compliance, and the correction factor is compensated at the spectrum.
- Record the max trace plot into the test report.

## 4.5.4 Test Results

### Band Edge

#### Cat-M1 Band 4 (Channel Bandwidth 1.4MHz)

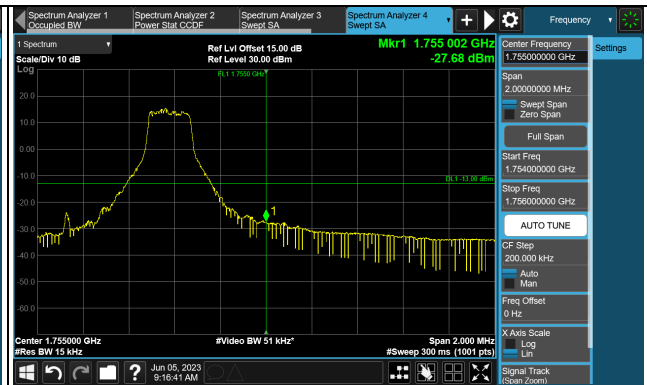




### Cat-M1 Band 4 (Channel Bandwidth 3MHz)



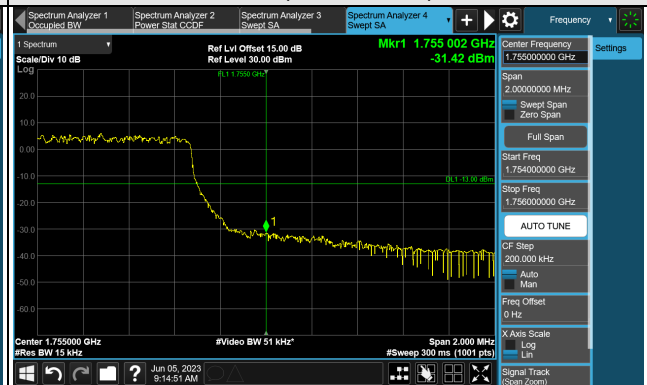
1RB (1711.5MHz)



1RB (1753.5MHz)



FULL (1711.5MHz)



FULL (1753.5MHz)