

FCC Test Report

(Part 27 – LTE B4/B12/B13/B66/B85, NB-IoT B4/B12/B13/B66/B71/B85)

Report No.: RFBCKS-WTW-P22090987-3

FCC ID: 2A82RMARK3

Test Model: Mark 3

Received Date: Oct. 17, 2022

Test Date: Oct. 24, 2022 ~ Oct. 31, 2022 (For effective radiated power, equivalent isotropically radiated power and radiated spurious emissions test)
Dec. 25, 2022 ~ Jan. 13, 2023 (For all tests except effective radiated power, equivalent isotropically radiated power and radiated spurious emissions test)

Issued Date: Jan. 10, 2023

Applicant: Arable Labs Inc.

Address: 51 Federal St., San Francisco, CA 94107, USA

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lin Kou Laboratories

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Test Location: No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City
33383, TAIWAN

**FCC Registration /
Designation Number:** 788550 / TW0003



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Release Control Record

Issue No.	Description	Date Issued
RFBCKS-WTW-P22090987-3	Original Release	Jan. 10, 2023

1 Certificate of Conformity

Product: Arable Mark 3

Brand: Arable Labs

Test Model: Mark 3

Sample Status: Engineering Sample

Applicant: Arable Labs Inc.

Test Date: Oct. 24, 2022 ~ Oct. 31, 2022 (For effective radiated power, equivalent isotropically radiated power and radiated spurious emissions test)
Dec. 25, 2022 ~ Jan. 13, 2023 (For all tests except effective radiated power, equivalent isotropically radiated power and radiated spurious emissions test)

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 : Vera Huang, **Date:** Jan. 10, 2023
Vera Huang / Specialist

Approved by : Jeremy Lin, **Date:** Jan. 10, 2023
Jeremy Lin / Project Engineer

2 Summary of Test Results

For LTE Band 4 and NB-IoT 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 -27.63 dB at 47.46 MHz.

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

For LTE Band 12 and NB-IoT 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 -33.39 dB at 50.37 MHz.

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

For LTE Band 13 and NB-IoT 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 -7.87 dB at 1564.00 MHz.

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

For LTE Band 66 and NB-IoT 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 -28.11 dB at 3558.60 MHz.

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

For NB-IoT Band 71

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 27.53(g)	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 -32.59 dB at 54.25 MHz.

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

For LTE Band 85 and NB-IoT 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 -30.53 dB at 48.43 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	2.44 dB
	30MHz ~ 200MHz	2.93 dB
	200MHz ~ 1000MHz	2.95 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.26 dB
	18GHz ~ 40GHz	1.94 dB

2.2 Test Site and Instruments

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Test Receiver Agilent	N9038A	MY51210129	Apr. 08, 2022	Apr. 07, 2023
Signal Analyzer Agilent	N9010A	MY52220314	Dec. 03, 2021 Dec. 09, 2022	Dec. 02, 2022 Dec. 08, 2023
Loop Antenna TESEQ	HLA 6121	45745	Jul. 27, 2022	Jul. 26, 2023
Pre-amplifier EMCI	EMC001340	980201	Sep. 23, 2022	Sep. 22, 2023
RF Coaxial Cable EMCI	5D-NM-BM	140903+140902	Jan. 15, 2022	Jan. 14, 2023
Preamplifier EMCI	EMC 330H	980112	Oct. 01, 2022	Sep. 30, 2023
BILOG Antenna SCHWARZBECK	VULB 9168	9168-472	Oct. 21, 2022	Oct. 20, 2023
RF Coaxial Cable WOKEN	8D-FB	Cable-Ch10-01	Oct. 01, 2022	Sep. 30, 2023
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-969	Nov. 14, 2021 Nov. 13, 2022	Nov. 13, 2022 Nov. 12, 2023
Preamplifier EMCI	EMC 012645	980115	Oct. 01, 2022	Sep. 30, 2023
RF Coaxial Cable EMCI	EMC104-SM-SM-8000	171005	Oct. 01, 2022	Sep. 30, 2023
RF Coaxial Cable HUBER+SUHNNER	SUCOFLEX 104	EMC104-SM-SM-1000(140807)	Oct. 01, 2022	Sep. 30, 2023
RF FLITER MICRO-TRONICS	BRM50716	058	Jun. 14, 2022	Jun. 13, 2023
RF FLITER MICRO-TRONICS	BRM17690	005	Jun. 14, 2022	Jun. 13, 2023
Pre-Amplifier EMCI	EMC 184045	980116	Oct. 01, 2022	Sep. 30, 2023
Broadband Horn Antenna SCHWARZBECK	BBHA 9170	148	Nov. 14, 2021 Nov. 13, 2022	Nov. 13, 2022 Nov. 12, 2023
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower Max-Full	MFA-440H	AT93021705	NA	NA
Turn Table Max-Full	MFT-201SS	NA	NA	NA
Antenna Tower & Turn Table Controller Max-Full	MF-7802	NA	NA	NA
Boresight antenna tower fixture BV	BAF-02	7	NA	NA
Radio Communication Analyzer Anritsu	MT8821C	6201462755	Mar. 03, 2022	Mar. 02, 2023

Notes:

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 HY - 966 chamber 5.

3 General Information

3.1 General Description of EUT

Product	Arable Mark 3	
Brand	Arable Labs	
Test Model	Mark 3	
Sample Status	Engineering Sample	
Power Supply Rating	3.7Vdc (Battery*2pcs) 5.0Vdc (Solar panels or host)	
Modulation Type	LTE: QPSK, 16QAM NB-IoT: BPSK, QPSK (Subcarrier Spacing: 3.75kHz,15kHz)	
Operating Frequency	eMTC	
	LTE Band 4 (Channel Bandwidth: 1.4 MHz)	1710.7MHz ~ 1754.3MHz
	LTE Band 4 (Channel Bandwidth: 3 MHz)	1711.5MHz ~ 1753.5MHz
	LTE Band 4 (Channel Bandwidth: 5 MHz)	1712.5MHz ~ 1752.5MHz
	LTE Band 4 (Channel Bandwidth: 10 MHz)	1715.0MHz ~ 1750.0MHz
	LTE Band 4 (Channel Bandwidth: 15 MHz)	1717.5MHz ~ 1747.5MHz
	LTE Band 4 (Channel Bandwidth: 20 MHz)	1720.0MHz ~ 1745.0MHz
	LTE Band 12 (Channel Bandwidth: 1.4 MHz)	699.7MHz ~ 715.3MHz
	LTE Band 12 (Channel Bandwidth: 3 MHz)	700.5MHz ~ 714.5MHz
	LTE Band 12 (Channel Bandwidth: 5 MHz)	701.5MHz ~ 713.5MHz
	LTE Band 12 (Channel Bandwidth: 10 MHz)	704.0MHz ~ 711.0MHz
	LTE Band 13 (Channel Bandwidth: 5 MHz)	779.5MHz ~ 784.5MHz
	LTE Band 13 (Channel Bandwidth: 10 MHz)	782.0MHz
	LTE Band 66 (Channel Bandwidth: 1.4 MHz)	1710.7 ~ 1779.3 MHz
	LTE Band 66 (Channel Bandwidth: 3 MHz)	1711.5 ~ 1778.5 MHz
	LTE Band 66 (Channel Bandwidth: 5 MHz)	1712.5 ~ 1777.5 MHz
	LTE Band 66 (Channel Bandwidth: 10 MHz)	1715.0 ~ 1775.0 MHz
	LTE Band 66 (Channel Bandwidth: 15 MHz)	1717.5 ~ 1772.5 MHz
	LTE Band 66 (Channel Bandwidth: 20 MHz)	1720.0 ~ 1770.0 MHz
	LTE Band 85 (Channel Bandwidth: 5 MHz)	700.5MHz ~ 713.5MHz
	LTE Band 85 (Channel Bandwidth: 10 MHz)	703.0MHz ~ 711.0MHz
	NB-IoT Standalone	
	NB-IoT Band 4	1710.2MHz ~ 1754.8MHz
	NB-IoT Band 12	699.2MHz ~ 715.8MHz
	NB-IoT Band 13	777.2MHz ~ 786.8MHz
	NB-IoT Band 66	1710.2MHz ~ 1779.8MHz
	NB-IoT Band 71	663.2MHz ~ 697.8MHz
	NB-IoT Band 85	698.2MHz ~ 715.8MHz

Max. EIRP Power	eMTC		
		QPSK	16QAM
	LTE Band 4 (Channel Bandwidth: 1.4 MHz)	355.631mW (25.51dBm)	349.140mW (25.43dBm)
	LTE Band 4 (Channel Bandwidth: 3 MHz)	376.704mW (25.76dBm)	368.129mW (25.66dBm)
	LTE Band 4 (Channel Bandwidth: 5 MHz)	366.438mW (25.64dBm)	356.451mW (25.52dBm)
	LTE Band 4 (Channel Bandwidth: 10 MHz)	365.595mW (25.63dBm)	341.193mW (25.33dBm)
	LTE Band 4 (Channel Bandwidth: 15 MHz)	375.837mW (25.75dBm)	368.129mW (25.66dBm)
	LTE Band 4 (Channel Bandwidth: 20 MHz)	379.315mW (25.79dBm)	345.144mW (25.38dBm)
	LTE Band 66 (Channel Bandwidth: 1.4 MHz)	365.595mW (25.63dBm)	359.749mW (25.56dBm)
	LTE Band 66 (Channel Bandwidth: 3 MHz)	378.443mW (25.78dBm)	363.915mW (25.61dBm)
	LTE Band 66 (Channel Bandwidth: 5 MHz)	386.367mW (25.87dBm)	363.915mW (25.61dBm)
	LTE Band 66 (Channel Bandwidth: 10 MHz)	368.129mW (25.66dBm)	352.371mW (25.47dBm)
	LTE Band 66 (Channel Bandwidth: 15 MHz)	381.066mW (25.81dBm)	364.754mW (25.62dBm)
	LTE Band 66 (Channel Bandwidth: 20 MHz)	387.258mW (25.88dBm)	381.944mW (25.82dBm)
	NB-IoT Standalone		
		BPSK	QPSK
	NB-IoT Band 4	400.867mW (26.03dBm)	402.717mW (26.05dBm)
	NB-IoT Band 66	414.954mW (26.18dBm)	424.620mW (26.28dBm)
Max. ERP Power	eMTC		
		QPSK	16QAM
	LTE Band 12 (Channel Bandwidth: 1.4 MHz)	157.398mW (21.97dBm)	151.705mW (21.81dBm)
	LTE Band 12 (Channel Bandwidth: 3 MHz)	162.181mW (22.10dBm)	147.231mW (21.68dBm)
	LTE Band 12 (Channel Bandwidth: 5 MHz)	159.221mW (22.02dBm)	147.231mW (21.68dBm)
	LTE Band 12 (Channel Bandwidth: 10 MHz)	167.109mW (22.23dBm)	153.109mW (21.85dBm)
	LTE Band 13 (Channel Bandwidth: 5 MHz)	161.436mW (22.08dBm)	152.405mW (21.83dBm)
	LTE Band 13 (Channel Bandwidth: 10 MHz)	163.305mW (22.13dBm)	149.279mW (21.74dBm)
	LTE Band 85 (Channel Bandwidth: 5 MHz)	168.655mW (22.27dBm)	156.675mW (21.95dBm)
	LTE Band 85 (Channel Bandwidth: 10 MHz)	174.582mW (22.42dBm)	159.588mW (22.03dBm)
	NB-IoT Standalone		
		BPSK	QPSK
	NB-IoT Band 12	193.197mW (22.86dBm)	196.336mW (22.93dBm)
	NB-IoT Band 13	190.108mW (22.79dBm)	195.434mW (22.91dBm)
	NB-IoT Band 71	204.174mW (23.10dBm)	205.589mW (23.13dBm)
	NB-IoT Band 85	184.502mW (22.66dBm)	189.234mW (22.77dBm)

	eMTC		
		QPSK	16QAM
Emission Designator	LTE Band 4 (Channel Bandwidth: 1.4 MHz)	1M09G7D	914KD7W
	LTE Band 4 (Channel Bandwidth: 3 MHz)	1M09G7D	913KD7W
	LTE Band 4 (Channel Bandwidth: 5 MHz)	1M09G7D	911KD7W
	LTE Band 4 (Channel Bandwidth: 10 MHz)	1M09G7D	913KD7W
	LTE Band 4 (Channel Bandwidth: 15 MHz)	1M09G7D	912KD7W
	LTE Band 4 (Channel Bandwidth: 20 MHz)	1M09G7D	914KD7W
	LTE Band 12 (Channel Bandwidth: 1.4 MHz)	1M08G7D	913KD7W
	LTE Band 12 (Channel Bandwidth: 3 MHz)	1M08G7D	916KD7W
	LTE Band 12 (Channel Bandwidth: 5 MHz)	1M09G7D	910KD7W
	LTE Band 12 (Channel Bandwidth: 10 MHz)	1M09G7D	909KD7W
	LTE Band 13 (Channel Bandwidth: 5 MHz)	1M09G7D	911KD7W
	LTE Band 13 (Channel Bandwidth: 10 MHz)	1M09G7D	910KD7W
	LTE Band 66 (Channel Bandwidth: 1.4 MHz)	1M09G7D	914KD7W
	LTE Band 66 (Channel Bandwidth: 3 MHz)	1M08G7D	914KD7W
	LTE Band 66 (Channel Bandwidth: 5 MHz)	1M09G7D	910KD7W
	LTE Band 66 (Channel Bandwidth: 10 MHz)	1M09G7D	912KD7W
	LTE Band 66 (Channel Bandwidth: 15 MHz)	1M09G7D	922KD7W
	LTE Band 66 (Channel Bandwidth: 20 MHz)	1M09G7D	925KD7W
	LTE Band 85 (Channel Bandwidth: 5 MHz)	1M09G7D	910KD7W
	LTE Band 85 (Channel Bandwidth: 10 MHz)	1M09G7D	912KD7W
	NB-IoT Standalone		
		BPSK	QPSK
	NB-IoT Band 4	85K3G7D	192KG7D
	NB-IoT Band 12	90K6G7D	191KG7D
	NB-IoT Band 13	90K5G7D	190KG7D
	NB-IoT Band 66	84K3G7D	192KG7D
	NB-IoT Band 71	68K3G7D	191KG7D
	NB-IoT Band 85	82K9G7D	191KG7D
Antenna Type	Refer to Note		
Antenna Connector	Refer to Note		
Accessory Device	Refer to Note		
Cable Supplied	Refer to Note		

Note:

1. The EUT uses following accessories.

Solar panels		
Brand	Model	
Voltaic Systems	P293	
M8 to USB Cable		
Specification		
2.5m non-shielded without core		
Battery		
Brand	Model	Specification
K2 Energy	K2B3V7EB	Power Rating : 3.7Vdc, 7.5Ah (2pcs)

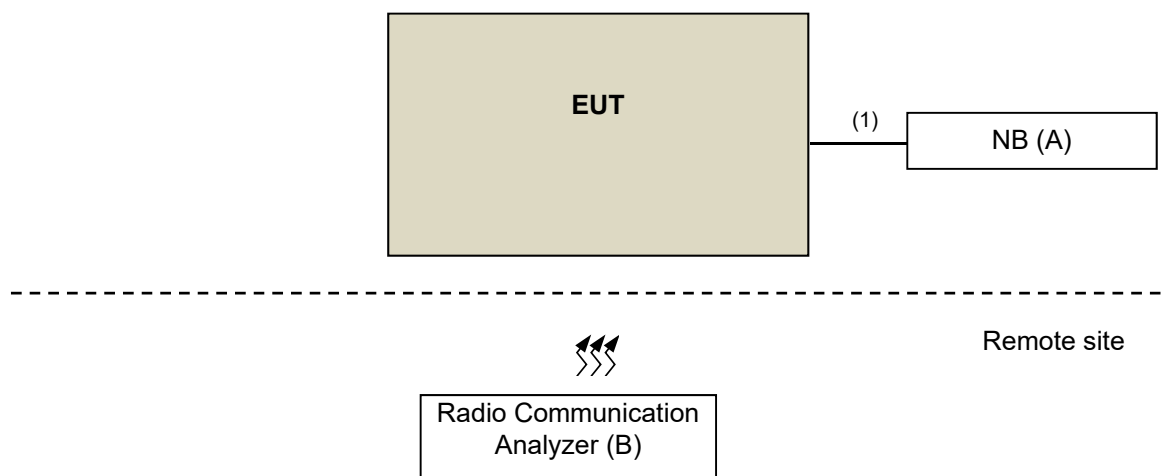
2. The antenna information for host is listed as below.

Type		Dipole									
Connector		N Plug									
Antenna gain (dBi)											
GSM 850	GSM 1900	eMTC Band 26	NB-IoT Band 71	eMTC / NB-IoT Band							
				2	4	5	12	13	25	66	85
1.8	3.2	1.8	1.8	3.2	3.2	1.8	1.8	1.8	3.2	3.2	1.8

* 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.
4. NB-IoT test method refers to 3GPP TS 36.521-1 V17.4.0 (2022-09) section 6.1. For NB-IoT tests in all operating frequency bands, standalone is used as the default operating mode unless otherwise specified by the test case.

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	NB	Lenovo	80Q7	PF0KUGU6	N/A	Provided by Lab
B	Radio Communication Analyzer	Anritsu	MT8821C	6201462755	N/A	Provided by Lab

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	M8 to USB Cable	1	2.5	N	0	Accessory of EUT

3.3 Test Mode Applicability and Tested Channel Detail

Pre-Scan:	The Power Supply have the following modes: Battery/Solar panels/host. Pre-scan these modes of Power Supply and find the worst case as a representative test condition.
Worst Case:	Power Supply Worst Condition: host

eMTC

LTE Band 4

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

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.

LTE Band 12

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

EUT Configure Mode	Test item	Available channel	Tested channel	Channel Bandwidth	Modulation	Mode
-	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
-	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
-	Radiated Emission Below 1GHz	23060 to 23130	23130 (711.0MHz)	10MHz	QPSK	1
-	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.

LTE Band 13

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

LTE Band 66

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

LTE Band 85

EUT Configure Mode	Test item	Available channel	Tested channel	Channel Bandwidth	Modulation	RB #
-	ERP	134027 to 134157	134027 (700.5MHz) 134092 (707.0MHz) 134157 (713.5MHz)	5MHz	QPSK / 16QAM	1 Half Full
		134052 to 134132	134052 (703.0MHz) 134092 (707.0MHz) 134132 (711.0MHz)	10MHz	QPSK / 16QAM	1 Half Full
-	Modulation Characteristics	134052 to 134132	134092 (707.0MHz)	10MHz	QPSK / 16QAM	Full
-	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
-	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
-	Band Edge	134027 to 134157	134027 (700.5MHz) 134157 (713.5MHz)	5MHz	QPSK	1 Half Full
		134052 to 134132	134052 (703.0MHz) 134132 (711.0MHz)	10MHz	QPSK	1 Half Full
-	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
-	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
-	Radiated Emission Below 1GHz	134052 to 134132	134092 (707.0MHz)	10MHz	QPSK	1
-	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.

NB-IoT Band 4

EUT Configure Mode	Test item	Available channel		Tested Channel	Channel Bandwidth	Subcarrier Spacing	Modulation	Number of Subcarrier / Starting Subcarrier
-	EIRP	Standalone	19952 to 20398	19952 (1710.2MHz), 20175 (1732.5MHz), 20398 (1754.8MHz)	-	3.75kHz	BPSK	1@0 1@47
							QPSK	1@0 1@47
					-	15kHz	BPSK	1@0 1@11
							QPSK	1@0 1@11 12@0
-	Modulation Characteristics	Standalone	19952 to 20398	20175 (1732.5MHz)	-	3.75kHz	BPSK	1@0
					-	15kHz	QPSK	12@0
-	Frequency Stability	Standalone	19952 to 20398	20175 (1732.5MHz)	-	3.75kHz	BPSK	1@0
					-	15kHz	QPSK	12@0
-	Emission Bandwidth	Standalone	19952 to 20398	19952 (1710.2MHz), 20175 (1732.5MHz), 20398 (1754.8MHz)	-	3.75kHz	BPSK	1@0 1@47
					-	15kHz	QPSK	12@0
-	Band Edge	Standalone	19952 to 20398	19952 (1710.2MHz), 20398 (1754.8MHz)	-	3.75kHz	BPSK	1@0 1@47
					-	15kHz	QPSK	1@0 1@11 12@0
-	Peak to Average Ratio	Standalone	19952 to 20398	19952 (1710.2MHz), 20175 (1732.5MHz), 20398 (1754.8MHz)	-	3.75kHz	BPSK	1@0 1@47
					-	15kHz	QPSK	12@0
-	Conducted Emission	Standalone	19952 to 20398	19952 (1710.2MHz), 20175 (1732.5MHz), 20398 (1754.8MHz)	-	3.75kHz	BPSK	1@0
					-	15kHz	QPSK	12@0
-	Radiated Emission Below 1GHz	Standalone	19952 to 20398	20175 (1732.5MHz)	-	15kHz	QPSK	1@0
-	Radiated Emission Above 1GHz	Standalone	19952 to 20398	19952 (1710.2MHz), 20175 (1732.5MHz), 20398 (1754.8MHz)	-	15kHz	QPSK	1@0

Note: For radiated emission below 1GHz, select the worst radiated emission channel (above 1GHz) for final testing.

NB-IoT Band 12

EUT Configure Mode	Test item	Available channel		Tested Channel	Channel Bandwidth	Subcarrier Spacing	Modulation	Number of Subcarrier / Starting Subcarrier
-	ERP	Standalone	23012 to 23178	23012 (699.2MHz), 23095 (707.5MHz), 23178 (715.8MHz)	-	3.75kHz	BPSK	1@0 1@47
							QPSK	1@0 1@47
					-	15kHz	BPSK	1@0 1@11
							QPSK	1@0 1@11 12@0
-	Modulation Characteristics	Standalone	23012 to 23178	23095 (707.5MHz)	-	3.75kHz	BPSK	1@0
					-	15kHz	QPSK	12@0
-	Frequency Stability	Standalone	23012 to 23178	23095 (707.5MHz)	-	3.75kHz	BPSK	1@0
					-	15kHz	QPSK	12@0
-	Emission Bandwidth	Standalone	23012 to 23178	23012 (699.2MHz), 23095 (707.5MHz), 23178 (715.8MHz)	-	3.75kHz	BPSK	1@0 1@47
					-	15kHz	QPSK	12@0
-	Band Edge	Standalone	23012 to 23178	23012 (699.2MHz), 23178 (715.8MHz)	-	3.75kHz	BPSK	1@0 1@47
					-	15kHz	QPSK	1@0 1@11 12@0
-	Peak to Average Ratio	Standalone	23012 to 23178	23012 (699.2MHz), 23095 (707.5MHz), 23178 (715.8MHz)	-	3.75kHz	BPSK	1@0 1@47
					-	15kHz	QPSK	12@0
-	Conducted Emission	Standalone	23012 to 23178	23012 (699.2MHz), 23095 (707.5MHz), 23178 (715.8MHz)	-	3.75kHz	BPSK	1@0
					-	15kHz	QPSK	12@0
-	Radiated Emission Below 1GHz	Standalone	23012 to 23178	23095 (707.5MHz)	-	15kHz	QPSK	1@0
-	Radiated Emission Above 1GHz	Standalone	23012 to 23178	23012 (699.2MHz), 23095 (707.5MHz), 23178 (715.8MHz)	-	15kHz	QPSK	1@0

Note: For radiated emission below 1GHz, select the worst radiated emission channel (above 1GHz) for final testing.

NB-IoT Band 13

EUT Configure Mode	Test item	Available channel		Tested Channel	Channel Bandwidth	Subcarrier Spacing	Modulation	Number of Subcarrier / Starting Subcarrier
-	ERP	Standalone	23182 to 23278	23182 (777.2MHz), 23230 (782.0MHz), 23278 (786.8MHz)	-	3.75kHz	BPSK	1@0 1@47
							QPSK	1@0 1@47
					-	15kHz	BPSK	1@0 1@11
							QPSK	1@0 1@11 12@0
-	Modulation Characteristics	Standalone	23182 to 23278	23230 (782.0MHz)	-	3.75kHz	BPSK	1@0
					-	15kHz	QPSK	12@0
-	Frequency Stability	Standalone	23182 to 23278	23230 (782.0MHz)	-	3.75kHz	BPSK	1@0
					-	15kHz	QPSK	12@0
-	Emission Bandwidth	Standalone	23182 to 23278	23182 (777.2MHz), 23230 (782.0MHz), 23278 (786.8MHz)	-	3.75kHz	BPSK	1@0 1@47
					-	15kHz	QPSK	12@0
-	Band Edge	Standalone	23182 to 23278	23182 (777.2MHz), 23278 (786.8MHz)	-	3.75kHz	BPSK	1@0 1@47
					-	15kHz	QPSK	1@0 1@11 12@0
-	Peak to Average Ratio	Standalone	23182 to 23278	23182 (777.2MHz), 23230 (782.0MHz), 23278 (786.8MHz)	-	3.75kHz	BPSK	1@0 1@47
					-	15kHz	QPSK	12@0
-	Conducted Emission	Standalone	23182 to 23278	23182 (777.2MHz), 23230 (782.0MHz), 23278 (786.8MHz)	-	3.75kHz	BPSK	1@0
					-	15kHz	QPSK	12@0
-	Radiated Emission Below 1GHz	Standalone	23182 to 23278	23230 (782.0MHz)	-	15kHz	QPSK	1@0
-	Radiated Emission Above 1GHz	Standalone	23182 to 23278	23182 (777.2MHz), 23230 (782.0MHz), 23278 (786.8MHz)	-	15kHz	QPSK	1@0

Note: For radiated emission below 1GHz, select the worst radiated emission channel (above 1GHz) for final testing.

NB-IoT Band 66

EUT Configure Mode	Test item	Available channel		Tested Channel	Channel Bandwidth	Subcarrier Spacing	Modulation	Number of Subcarrier / Starting Subcarrier
-	EIRP	Standalone	131974 to 132670	131974 (1710.2MHz), 132322 (1745.0MHz), 132670 (1779.8MHz)	-	3.75kHz	BPSK	1@0 1@47
							QPSK	1@0 1@47
					-	15kHz	BPSK	1@0 1@11
							QPSK	1@0 1@11 12@0
-	Modulation Characteristics	Standalone	131974 to 132670	132322 (1745.0MHz)	-	3.75kHz	BPSK	1@0
					-	15kHz	QPSK	12@0
-	Frequency Stability	Standalone	131974 to 132670	132322 (1745.0MHz)	-	3.75kHz	BPSK	1@0
					-	15kHz	QPSK	12@0
-	Emission Bandwidth	Standalone	131974 to 132670	131974 (1710.2MHz), 132322 (1745.0MHz), 132670 (1779.8MHz)	-	3.75kHz	BPSK	1@0 1@47
					-	15kHz	QPSK	12@0
-	Band Edge	Standalone	131974 to 132670	131974 (1710.2MHz), 132670 (1779.8MHz)	-	3.75kHz	BPSK	1@0 1@47
					-	15kHz	QPSK	1@0 1@11 12@0
-	Peak to Average Ratio	Standalone	131974 to 132670	131974 (1710.2MHz), 132322 (1745.0MHz), 132670 (1779.8MHz)	-	3.75kHz	BPSK	1@0 1@47
					-	15kHz	QPSK	12@0
-	Conducted Emission	Standalone	131974 to 132670	131974 (1710.2MHz), 132322 (1745.0MHz), 132670 (1779.8MHz)	-	3.75kHz	BPSK	1@0
					-	15kHz	QPSK	12@0
-	Radiated Emission Below 1GHz	Standalone	131974 to 132670	132322 (1745.0MHz)	-	15kHz	QPSK	1@0
-	Radiated Emission Above 1GHz	Standalone	131974 to 132670	131974 (1710.2MHz), 132322 (1745.0MHz), 132670 (1779.8MHz)	-	15kHz	QPSK	1@0

Note: For radiated emission below 1GHz, select the worst radiated emission channel (above 1GHz) for final testing.

NB-IoT Band 71

EUT Configure Mode	Test item	Available channel		Tested Channel	Channel Bandwidth	Subcarrier Spacing	Modulation	Number of Subcarrier / Starting Subcarrier
-	ERP	Standalone	133124 to 133470	133124 (663.2MHz), 133297 (680.5MHz), 133470 (697.8MHz)	-	3.75kHz	BPSK	1@0 1@47
							QPSK	1@0 1@47
					-	15kHz	BPSK	1@0 1@11
							QPSK	1@0 1@11 12@0
-	Modulation Characteristics	Standalone	133124 to 133470	133297 (680.5MHz)	-	3.75kHz	BPSK	1@0
					-	15kHz	QPSK	12@0
-	Frequency Stability	Standalone	133124 to 133470	133297 (680.5MHz)	-	3.75kHz	BPSK	1@0
					-	15kHz	QPSK	12@0
-	Emission Bandwidth	Standalone	133124 to 133470	133124 (663.2MHz), 133297 (680.5MHz), 133470 (697.8MHz)	-	3.75kHz	BPSK	1@0 1@47
					-	15kHz	QPSK	12@0
-	Band Edge	Standalone	133124 to 133470	133124 (663.2MHz), 133470 (697.8MHz)	-	3.75kHz	BPSK	1@0 1@47
					-	15kHz	QPSK	1@0 1@11 12@0
-	Peak to Average Ratio	Standalone	133124 to 133470	133124 (663.2MHz), 133297 (680.5MHz), 133470 (697.8MHz)	-	3.75kHz	BPSK	1@0 1@47
					-	15kHz	QPSK	12@0
-	Conducted Emission	Standalone	133124 to 133470	133124 (663.2MHz), 133297 (680.5MHz), 133470 (697.8MHz)	-	3.75kHz	BPSK	1@0
					-	15kHz	QPSK	12@0
-	Radiated Emission Below 1GHz	Standalone	133124 to 133470	133297 (680.5MHz)	-	15kHz	QPSK	1@0
-	Radiated Emission Above 1GHz	Standalone	133124 to 133470	133124 (663.2MHz), 133297 (680.5MHz), 133470 (697.8MHz)	-	15kHz	QPSK	1@0

Note: For radiated emission below 1GHz, select the worst radiated emission channel (above 1GHz) for final testing.

NB-IoT Band 85

EUT Configure Mode	Test item	Available channel		Tested Channel	Channel Bandwidth	Subcarrier Spacing	Modulation	Number of Subcarrier / Starting Subcarrier
-	ERP	Standalone	134004 to 134180	134004 (698.2MHz), 134092 (707.0MHz), 134180 (715.8MHz)	-	3.75kHz	BPSK	1@0 1@47
							QPSK	1@0 1@47
					-	15kHz	BPSK	1@0 1@11
							QPSK	1@0 1@11 12@0
-	Modulation Characteristics	Standalone	134004 to 134180	134092 (707.0MHz)	-	3.75kHz	BPSK	1@0
					-	15kHz	QPSK	12@0
-	Frequency Stability	Standalone	134004 to 134180	134092 (707.0MHz)	-	3.75kHz	BPSK	1@0
					-	15kHz	QPSK	12@0
-	Emission Bandwidth	Standalone	134004 to 134180	134004 (698.2MHz), 134092 (707.0MHz), 134180 (715.8MHz)	-	3.75kHz	BPSK	1@0 1@47
					-	15kHz	QPSK	12@0
-	Band Edge	Standalone	134004 to 134180	134004 (698.2MHz), 134180 (715.8MHz)	-	3.75kHz	BPSK	1@0 1@47
					-	15kHz	QPSK	1@0 1@11 12@0
-	Peak to Average Ratio	Standalone	134004 to 134180	134004 (698.2MHz), 134092 (707.0MHz), 134180 (715.8MHz)	-	3.75kHz	BPSK	1@0 1@47
					-	15kHz	QPSK	12@0
-	Conducted Emission	Standalone	134004 to 134180	134004 (698.2MHz), 134092 (707.0MHz), 134180 (715.8MHz)	-	3.75kHz	BPSK	1@0
					-	15kHz	QPSK	12@0
-	Radiated Emission Below 1GHz	Standalone	134004 to 134180	134092 (707.0MHz)	-	15kHz	QPSK	1@0
-	Radiated Emission Above 1GHz	Standalone	134004 to 134180	134004 (698.2MHz), 134092 (707.0MHz), 134180 (715.8MHz)	-	15kHz	QPSK	1@0

Note: For radiated emission below 1GHz, select the worst radiated emission channel (above 1GHz) for final testing.

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
ERP/EIRP	25deg. C, 60%RH	120 Vac, 60 Hz	James Yang
Modulation Characteristics	25deg. C, 60%RH	120 Vac, 60Hz	Willy Cheng
Frequency Stability	25deg. C, 60%RH	3.7Vdc	Willy Cheng
Emission Bandwidth	25deg. C, 60%RH	120 Vac, 60Hz	Willy Cheng
Band Edge	25deg. C, 60%RH	120 Vac, 60Hz	Willy Cheng
Peak To Average Ratio	25deg. C, 60%RH	120 Vac, 60Hz	Willy Cheng
Conducted Emission	25deg. C, 60%RH	120 Vac, 60Hz	Willy Cheng
Radiated Emission Below 1GHz	23deg. C, 71%RH	120 Vac, 60 Hz	Thomas Cheng
Radiated Emission Above 1GHz	23deg. C, 71%RH	120 Vac, 60 Hz	Thomas Cheng Vincent Chen

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 LTE and NB-IoT Band 4, LTE and NB-IoT Band 66:
Mobile / Portable station are limited to 1 watts e.i.r.p.

For LTE and NB-IoT Band 12, LTE and NB-IoT Band 13, NB-IoT Band 71, LTE and NB-IoT Band 85:
Control and mobile stations in the 698-746 MHz, 746-757 MHz, 787-788 MHz and 805-806 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, 746-757 MHz, 787-788 MHz and 805-806 MHz 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 NB-IoT and eMTC link data modulation and link up with simulator (Built-in power meter). 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:

$$\text{EIRP} = P_{\text{Meas}} + G_T$$

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

where

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

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

G_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)

eMTC

LTE Band 4						
BW	MCS Index	Channel		19957	20175	20393
		Frequency (MHz)		1710.7	1732.5	1754.3
1.4M	QPSK	1	0	22.19	22.31	22.28
		1	6	22.18	22.30	22.24
		6	0	21.12	21.24	21.15
	16QAM	1	0	22.11	22.23	22.11
		1	6	22.08	22.20	22.06
		6	0	21.03	21.14	21.03

LTE Band 4						
BW	MCS Index	Channel		19965	20175	20385
		Frequency (MHz)		1711.5	1732.5	1753.5
3M	QPSK	1	0	21.99	22.56	22.43
		1	6	22.17	22.39	22.03
		6	0	21.09	21.16	21.19
	16QAM	1	0	21.88	22.46	22.19
		1	6	21.85	22.01	21.92
		6	0	21.44	21.06	21.08

LTE Band 4						
BW	MCS Index	Channel		19975	20175	20375
		Frequency (MHz)		1712.5	1732.5	1752.5
5M	QPSK	1	0	22.24	22.44	22.01
		1	6	22.37	22.23	22.37
		6	0	22.13	22.33	21.91
	16QAM	1	0	21.86	21.99	22.00
		1	6	22.32	22.17	22.24
		6	0	21.10	21.44	21.47

LTE Band 4						
BW	MCS Index	Channel		20000	20175	20350
		Frequency (MHz)		1715	1732.5	1750
10M	QPSK	1	0	22.38	22.42	22.22
		1	6	22.06	22.43	22.26
		6	0	21.96	22.08	22.04
	16QAM	1	0	22.05	22.13	21.83
		1	6	21.94	21.90	22.13
		6	0	21.95	22.07	22.02

LTE Band 4						
BW	MCS Index	Channel		20025	20175	20325
		Frequency (MHz)		1717.5	1732.5	1747.5
15M	QPSK	1	0	22.46	22.55	22.17
		1	6	22.05	22.52	22.00
		6	0	22.40	22.54	21.99
	16QAM	1	0	21.96	21.99	22.06
		1	6	21.99	22.46	21.98
		6	0	21.78	21.88	21.87

LTE Band 4						
BW	MCS Index	Channel		20050	20175	20300
		Frequency (MHz)		1720	1732.5	1745
20M	QPSK	1	0	22.31	22.59	22.27
		1	6	22.19	22.07	22.52
		6	0	22.36	22.40	22.18
	16QAM	1	0	22.13	22.10	22.14
		1	6	22.18	22.06	21.84
		6	0	22.05	22.01	22.04

LTE Band 12						
BW	MCS Index	Channel		23017	23095	23173
		Frequency (MHz)		699.7	707.5	715.3
1.4M	QPSK	1	0	22.16	22.32	22.25
		1	6	22.14	22.30	22.22
		6	0	21.12	21.11	21.14
	16QAM	1	0	22.10	22.16	22.14
		1	6	22.08	22.14	22.10
		6	0	21.03	21.07	21.04

LTE Band 12						
BW	MCS Index	Channel		23025	23095	23165
		Frequency (MHz)		700.5	707.5	714.5
3M	QPSK	1	0	22.10	22.32	22.45
		1	6	22.44	22.16	22.01
		6	0	21.07	21.03	21.04
	16QAM	1	0	22.03	22.02	22.02
		1	6	22.01	21.92	21.95
		6	0	21.04	21.08	21.05

LTE Band 12						
BW	MCS Index	Channel		23035	23095	23155
		Frequency (MHz)		701.5	707.5	713.5
5M	QPSK	1	0	21.97	22.36	22.37
		1	6	22.10	22.22	21.96
		6	0	21.91	22.31	22.13
	16QAM	1	0	21.90	22.03	21.89
		1	6	21.88	21.84	21.92
		6	0	21.50	21.40	21.05

LTE Band 12						
BW	MCS Index	Channel		23060	23095	23130
		Frequency (MHz)		704	707.5	711
10M	QPSK	1	0	22.40	22.58	22.36
		1	6	22.03	22.15	21.92
		6	0	22.31	22.46	22.26
	16QAM	1	0	21.78	22.20	21.89
		1	6	22.01	22.10	21.85
		6	0	21.79	21.92	21.87

LTE Band 13						
BW	MCS Index	Channel		23205	23230	23255
		Frequency (MHz)		779.5	782	784.5
5M	QPSK	1	0	22.23	22.43	22.31
		1	6	22.19	22.41	22.28
		6	0	21.94	22.22	22.10
	16QAM	1	0	21.92	22.18	22.05
		1	6	21.88	22.16	22.03
		6	0	21.25	21.55	21.40

LTE Band 13						
BW	MCS Index	Channel		23230		
		Frequency (MHz)		782		
10M	QPSK	1	0	22.48		
		1	6	22.44		
		6	0	22.35		
	16QAM	1	0	22.09		
		1	6	22.08		
		6	0	21.85		

LTE Band 66						
BW	MCS Index	Channel		131979	132322	132665
		Frequency (MHz)		1710.7	1745	1779.3
1.4M	QPSK	1	0	22.26	22.43	22.34
		1	6	22.22	22.42	22.29
		6	0	21.17	21.14	21.24
	16QAM	1	0	22.16	22.36	22.19
		1	6	22.14	22.32	22.16
		6	0	21.07	21.09	21.01

LTE Band 66						
BW	MCS Index	Channel		131987	132322	132657
		Frequency (MHz)		1711.5	1745	1778.5
3M	QPSK	1	0	22.13	22.58	22.43
		1	6	22.15	22.17	22.11
		6	0	21.49	21.17	21.04
	16QAM	1	0	21.93	22.18	22.41
		1	6	21.87	22.15	22.04
		6	0	21.68	21.35	21.94

LTE Band 66						
BW	MCS Index	Channel		131997	132322	132647
		Frequency (MHz)		1712.5	1745	1777.5
5M	QPSK	1	0	22.40	22.67	22.48
		1	6	21.94	22.66	22.53
		6	0	21.87	22.22	22.17
	16QAM	1	0	21.95	22.36	22.41
		1	6	21.92	22.27	22.37
		6	0	21.45	21.24	21.95

LTE Band 66						
BW	MCS Index	Channel		132022	132322	132622
		Frequency (MHz)		1715	1745	1775
10M	QPSK	1	0	22.07	22.31	22.10
		1	6	21.97	22.41	22.08
		6	0	22.44	22.20	22.46
	16QAM	1	0	22.05	22.13	22.08
		1	6	21.95	22.03	22.05
		6	0	21.86	22.18	22.27

LTE Band 66						
BW	MCS Index	Channel		132047	132322	132597
		Frequency (MHz)		1717.5	1745	1772.5
15M	QPSK	1	0	22.17	22.17	22.54
		1	6	22.33	22.20	22.27
		6	0	22.16	22.61	22.36
	16QAM	1	0	22.15	22.13	22.42
		1	6	21.87	22.18	21.89
		6	0	22.12	22.05	22.12

LTE Band 66						
BW	MCS Index	Channel		132072	132322	132575
		Frequency (MHz)		1720	1745	1770
20M	QPSK	1	0	22.04	22.68	22.61
		1	6	21.96	22.52	22.13
		6	0	22.00	22.48	22.07
	16QAM	1	0	21.96	22.62	22.31
		1	6	21.95	22.16	22.10
		6	0	21.88	22.23	22.04

LTE Band 85						
BW	MCS Index	Channel		134027	134092	134157
		Frequency (MHz)		700.5	707	713.5
5M	QPSK	1	0	22.45	22.62	22.57
		1	6	22.41	22.61	22.54
		6	0	22.03	21.90	22.10
	16QAM	1	0	22.00	22.30	22.27
		1	6	21.96	22.25	22.23
		6	0	21.01	20.68	20.87

LTE Band 85						
BW	MCS Index	Channel		134052	134092	134132
		Frequency (MHz)		703	707	711
10M	QPSK	1	0	22.57	22.77	22.52
		1	6	22.36	22.64	22.39
		6	0	22.28	22.37	22.13
	16QAM	1	0	22.18	22.38	22.38
		1	6	22.07	22.15	22.00
		6	0	21.72	21.84	21.70

NB-IoT Band 4

BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		19952	20175	20398
		Frequency (MHz)		1710.2	1732.5	1754.8
Stand-alone	3.75k BPSK	1	0	22.22	22.34	22.68
		1	47	22.28	22.59	22.56
	3.75k QPSK	1	0	22.73	22.47	22.75
		1	47	22.44	22.70	22.65
	15k BPSK	1	0	22.61	22.83	22.37
		1	11	22.68	22.70	22.66
	15k QPSK	1	0	22.74	22.85	22.63
		1	11	22.78	22.80	22.68
		12	0	21.21	21.45	21.40

NB-IoT Band 12

BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		23012	23095	23178
		Frequency (MHz)		699.2	707.5	715.8
Stand-alone	3.75k BPSK	1	0	22.87	22.75	22.96
		1	47	22.77	22.89	22.99
	3.75k QPSK	1	0	22.97	22.99	23.02
		1	47	22.98	23.19	23.04
	15k BPSK	1	0	23.20	23.21	23.01
		1	11	22.89	23.05	23.04
	15k QPSK	1	0	23.07	23.28	23.16
		1	11	23.07	23.15	23.27
		12	0	22.81	23.10	22.85

NB-IoT Band 13

BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		23182	23230	23278
		Frequency (MHz)		777.2	782	786.8
Stand-alone	3.75k BPSK	1	0	22.51	22.85	22.99
		1	47	22.43	22.76	23.04
	3.75k QPSK	1	0	22.60	22.90	23.02
		1	47	22.54	22.85	23.08
	15k BPSK	1	0	22.42	22.91	22.79
		1	11	23.14	22.96	23.10
	15k QPSK	1	0	22.63	23.26	23.16
		1	11	23.23	23.25	23.15
		12	0	20.88	20.97	20.86

NB-IoT Band 66

BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		131974	132322	132670
		Frequency (MHz)		1710.2	1745	1779.8
Stand-alone	3.75k BPSK	1	0	22.64	22.65	22.61
		1	47	22.72	22.82	22.52
	3.75k QPSK	1	0	22.70	22.77	22.72
		1	47	22.76	22.85	22.82
	15k BPSK	1	0	22.86	22.98	22.66
		1	11	22.93	22.95	22.65
	15k QPSK	1	0	22.91	23.08	22.71
		1	11	22.98	23.02	22.69
		12	0	20.76	20.82	20.66

NB-IoT Band 71

BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		133124	133297	133470
		Frequency (MHz)		663.2	680.5	697.8
Stand-alone	3.75k BPSK	1	0	23.12	23.17	23.03
		1	47	23.13	23.23	22.90
	3.75k QPSK	1	0	23.22	23.26	23.10
		1	47	23.24	23.30	23.09
	15k BPSK	1	0	23.13	23.45	23.38
		1	11	23.05	23.37	23.29
	15k QPSK	1	0	23.25	23.48	23.27
		1	11	23.40	23.42	23.35
		12	0	21.22	21.36	21.23

NB-IoT Band 85

BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		134004	134092	134180
		Frequency (MHz)		698.2	707	715.8
Stand-alone	3.75k BPSK	1	0	22.64	22.53	22.56
		1	47	22.96	22.73	22.71
	3.75k QPSK	1	0	22.85	22.95	22.72
		1	47	23.01	23.02	22.89
	15k BPSK	1	0	22.64	22.86	22.81
		1	11	22.78	23.01	22.95
	15k QPSK	1	0	22.91	23.12	22.92
		1	11	22.85	23.05	23.02
		12	0	20.70	20.74	20.63

EIRP / ERP Power (dBm)

eMTC

LTE Band 4						
BW	MCS Index	Channel		19957	20175	20393
		Frequency (MHz)		1710.7	1732.5	1754.3
1.4M	QPSK	1	0	25.39	25.51	25.48
		1	6	25.38	25.50	25.44
		6	0	24.32	24.44	24.35
	16QAM	1	0	25.31	25.43	25.31
		1	6	25.28	25.40	25.26
		6	0	24.23	24.34	24.23

*EIRP = Conducted + antenna gain (3.2dBi)

LTE Band 4						
BW	MCS Index	Channel		19965	20175	20385
		Frequency (MHz)		1711.5	1732.5	1753.5
3M	QPSK	1	0	25.19	25.76	25.63
		1	6	25.37	25.59	25.23
		6	0	24.29	24.36	24.39
	16QAM	1	0	25.08	25.66	25.39
		1	6	25.05	25.21	25.12
		6	0	24.64	24.26	24.28

*EIRP = Conducted + antenna gain (3.2dBi)

LTE Band 4						
BW	MCS Index	Channel		19975	20175	20375
		Frequency (MHz)		1712.5	1732.5	1752.5
5M	QPSK	1	0	25.44	25.64	25.21
		1	6	25.57	25.43	25.57
		6	0	25.33	25.53	25.11
	16QAM	1	0	25.06	25.19	25.20
		1	6	25.52	25.37	25.44
		6	0	24.30	24.64	24.67

*EIRP = Conducted + antenna gain (3.2dBi)

LTE Band 4						
BW	MCS Index	Channel		20000	20175	20350
		Frequency (MHz)		1715	1732.5	1750
10M	QPSK	1	0	25.58	25.62	25.42
		1	6	25.26	25.63	25.46
		6	0	25.16	25.28	25.24
	16QAM	1	0	25.25	25.33	25.03
		1	6	25.14	25.10	25.33
		6	0	25.15	25.27	25.22

*EIRP = Conducted + antenna gain (3.2dBi)

LTE Band 4						
BW	MCS Index	Channel		20025	20175	20325
		Frequency (MHz)		1717.5	1732.5	1747.5
15M	QPSK	1	0	25.66	25.75	25.37
		1	6	25.25	25.72	25.20
		6	0	25.60	25.74	25.19
	16QAM	1	0	25.16	25.19	25.26
		1	6	25.19	25.66	25.18
		6	0	24.98	25.08	25.07

*EIRP = Conducted + antenna gain (3.2dBi)

LTE Band 4						
BW	MCS Index	Channel		20050	20175	20300
		Frequency (MHz)		1720	1732.5	1745
20M	QPSK	1	0	25.51	25.79	25.47
		1	6	25.39	25.27	25.72
		6	0	25.56	25.60	25.38
	16QAM	1	0	25.33	25.30	25.34
		1	6	25.38	25.26	25.04
		6	0	25.25	25.21	25.24

*EIRP = Conducted + antenna gain (3.2dBi)

LTE Band 12						
BW	MCS Index	Channel		23017	23095	23173
		Frequency (MHz)		699.7	707.5	715.3
1.4M	QPSK	1	0	21.81	21.97	21.90
		1	6	21.79	21.95	21.87
		6	0	20.77	20.76	20.79
	16QAM	1	0	21.75	21.81	21.79
		1	6	21.73	21.79	21.75
		6	0	20.68	20.72	20.69

*ERP = Conducted + antenna gain (1.8dBi) - 2.15

LTE Band 12						
BW	MCS Index	Channel		23025	23095	23165
		Frequency (MHz)		700.5	707.5	714.5
3M	QPSK	1	0	21.75	21.97	22.10
		1	6	22.09	21.81	21.66
		6	0	20.72	20.68	20.69
	16QAM	1	0	21.68	21.67	21.67
		1	6	21.66	21.57	21.60
		6	0	20.69	20.73	20.70

*ERP = Conducted + antenna gain (1.8dBi) - 2.15

LTE Band 12						
BW	MCS Index	Channel		23035	23095	23155
		Frequency (MHz)		701.5	707.5	713.5
5M	QPSK	1	0	21.62	22.01	22.02
		1	6	21.75	21.87	21.61
		6	0	21.56	21.96	21.78
	16QAM	1	0	21.55	21.68	21.54
		1	6	21.53	21.49	21.57
		6	0	21.15	21.05	20.70

*ERP = Conducted + antenna gain (1.8dBi) - 2.15

LTE Band 12						
BW	MCS Index	Channel		23060	23095	23130
		Frequency (MHz)		704	707.5	711
10M	QPSK	1	0	22.05	22.23	22.01
		1	6	21.68	21.80	21.57
		6	0	21.96	22.11	21.91
	16QAM	1	0	21.43	21.85	21.54
		1	6	21.66	21.75	21.50
		6	0	21.44	21.57	21.52

*ERP = Conducted + antenna gain (1.8dBi) - 2.15

LTE Band 13						
BW	MCS Index	Channel		23205	23230	23255
		Frequency (MHz)		779.5	782	784.5
5M	QPSK	1	0	21.88	22.08	21.96
		1	6	21.84	22.06	21.93
		6	0	21.59	21.87	21.75
	16QAM	1	0	21.57	21.83	21.70
		1	6	21.53	21.81	21.68
		6	0	20.90	21.20	21.05

*ERP = Conducted + antenna gain (1.8dBi) - 2.15

LTE Band 13						
BW	MCS Index	Channel		23230		
		Frequency (MHz)		782		
10M	QPSK	1	0	22.13		
		1	6	22.09		
		6	0	22.00		
	16QAM	1	0	21.74		
		1	6	21.73		
		6	0	21.50		

*ERP = Conducted + antenna gain (1.8dBi) - 2.15

LTE Band 66						
BW	MCS Index	Channel		131979	132322	132665
		Frequency (MHz)		1710.7	1745	1779.3
1.4M	QPSK	1	0	25.46	25.63	25.54
		1	6	25.42	25.62	25.49
		6	0	24.37	24.34	24.44
	16QAM	1	0	25.36	25.56	25.39
		1	6	25.34	25.52	25.36
		6	0	24.27	24.29	24.21

*EIRP = Conducted + antenna gain (3.2dBi)

LTE Band 66						
BW	MCS Index	Channel		131987	132322	132657
		Frequency (MHz)		1711.5	1745	1778.5
3M	QPSK	1	0	25.33	25.78	25.63
		1	6	25.35	25.37	25.31
		6	0	24.69	24.37	24.24
	16QAM	1	0	25.13	25.38	25.61
		1	6	25.07	25.35	25.24
		6	0	24.88	24.55	25.14

*EIRP = Conducted + antenna gain (3.2dBi)

LTE Band 66						
BW	MCS Index	Channel		131997	132322	132647
		Frequency (MHz)		1712.5	1745	1777.5
5M	QPSK	1	0	25.60	25.87	25.68
		1	6	25.14	25.86	25.73
		6	0	25.07	25.42	25.37
	16QAM	1	0	25.15	25.56	25.61
		1	6	25.12	25.47	25.57
		6	0	24.65	24.44	25.15

*EIRP = Conducted + antenna gain (3.2dBi)

LTE Band 66						
BW	MCS Index	Channel		132022	132322	132622
		Frequency (MHz)		1715	1745	1775
10M	QPSK	1	0	25.27	25.51	25.30
		1	6	25.17	25.61	25.28
		6	0	25.64	25.40	25.66
	16QAM	1	0	25.25	25.33	25.28
		1	6	25.15	25.23	25.25
		6	0	25.06	25.38	25.47

*EIRP = Conducted + antenna gain (3.2dBi)

LTE Band 66						
BW	MCS Index	Channel		132047	132322	132597
		Frequency (MHz)		1717.5	1745	1772.5
15M	QPSK	1	0	25.37	25.37	25.74
		1	6	25.53	25.40	25.47
		6	0	25.36	25.81	25.56
	16QAM	1	0	25.35	25.33	25.62
		1	6	25.07	25.38	25.09
		6	0	25.32	25.25	25.32

*EIRP = Conducted + antenna gain (3.2dBi)

LTE Band 66						
BW	MCS Index	Channel		132072	132322	132575
		Frequency (MHz)		1720	1745	1770
20M	QPSK	1	0	25.24	25.88	25.81
		1	6	25.16	25.72	25.33
		6	0	25.20	25.68	25.27
	16QAM	1	0	25.16	25.82	25.51
		1	6	25.15	25.36	25.30
		6	0	25.08	25.43	25.24

*EIRP = Conducted + antenna gain (3.2dBi)

LTE Band 85						
BW	MCS Index	Channel		134027	134092	134157
		Frequency (MHz)		700.5	707	713.5
5M	QPSK	1	0	22.10	22.27	22.22
		1	6	22.06	22.26	22.19
		6	0	21.68	21.55	21.75
	16QAM	1	0	21.65	21.95	21.92
		1	6	21.61	21.90	21.88
		6	0	20.66	20.33	20.52

*ERP = Conducted + antenna gain (1.8dBi) - 2.15

LTE Band 85						
BW	MCS Index	Channel		134052	134092	134132
		Frequency (MHz)		703	707	711
10M	QPSK	1	0	22.22	22.42	22.17
		1	6	22.01	22.29	22.04
		6	0	21.93	22.02	21.78
	16QAM	1	0	21.83	22.03	22.03
		1	6	21.72	21.80	21.65
		6	0	21.37	21.49	21.35

*ERP = Conducted + antenna gain (1.8dBi) - 2.15

NB-IoT Band 4

BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		19952	20175	20398
		Frequency (MHz)		1710.2	1732.5	1754.8
Stand-alone	3.75k BPSK	1	0	25.42	25.54	25.88
		1	47	25.48	25.79	25.76
	3.75k QPSK	1	0	25.93	25.67	25.95
		1	47	25.64	25.90	25.85
	15k BPSK	1	0	25.81	26.03	25.57
		1	11	25.88	25.90	25.86
	15k QPSK	1	0	25.94	26.05	25.83
		1	11	25.98	26.00	25.88
		12	0	24.41	24.65	24.60

*EIRP = Conducted + antenna gain (3.2dBi)

NB-IoT Band 12

BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		23012	23095	23178
		Frequency (MHz)		699.2	707.5	715.8
Stand-alone	3.75k BPSK	1	0	22.52	22.40	22.61
		1	47	22.42	22.54	22.64
	3.75k QPSK	1	0	22.62	22.64	22.67
		1	47	22.63	22.84	22.69
	15k BPSK	1	0	22.85	22.86	22.66
		1	11	22.54	22.70	22.69
	15k QPSK	1	0	22.72	22.93	22.81
		1	11	22.72	22.80	22.92
		12	0	22.46	22.75	22.50

*ERP = Conducted + antenna gain (1.8dBi) - 2.15

NB-IoT Band 13

BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		23182	23230	23278
		Frequency (MHz)		777.2	782	786.8
Stand-alone	3.75k BPSK	1	0	22.16	22.50	22.64
		1	47	22.08	22.41	22.69
	3.75k QPSK	1	0	22.25	22.55	22.67
		1	47	22.19	22.50	22.73
	15k BPSK	1	0	22.07	22.56	22.44
		1	11	22.79	22.61	22.75
	15k QPSK	1	0	22.28	22.91	22.81
		1	11	22.88	22.90	22.80
		12	0	20.53	20.62	20.51

*ERP = Conducted + antenna gain (1.8dBi) - 2.15

NB-IoT Band 66

BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		131974	132322	132670
		Frequency (MHz)		1710.2	1745	1779.8
Stand-alone	3.75k BPSK	1	0	25.84	25.85	25.81
		1	47	25.92	26.02	25.72
	3.75k QPSK	1	0	25.90	25.97	25.92
		1	47	25.96	26.05	26.02
	15k BPSK	1	0	26.06	26.18	25.86
		1	11	26.13	26.15	25.85
	15k QPSK	1	0	26.11	26.28	25.91
		1	11	26.18	26.22	25.89
		12	0	23.96	24.02	23.86

*EIRP = Conducted + antenna gain (3.2dBi)

NB-IoT Band 71

BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		133124	133297	133470
		Frequency (MHz)		663.2	680.5	697.8
Stand-alone	3.75k BPSK	1	0	22.77	22.82	22.68
		1	47	22.78	22.88	22.55
	3.75k QPSK	1	0	22.87	22.91	22.75
		1	47	22.89	22.95	22.74
	15k BPSK	1	0	22.78	23.10	23.03
		1	11	22.70	23.02	22.94
	15k QPSK	1	0	22.90	23.13	22.92
		1	11	23.05	23.07	23.00
		12	0	20.87	21.01	20.88

*ERP = Conducted + antenna gain (1.8dBi) - 2.15

NB-IoT Band 85

BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		134004	134092	134180
		Frequency (MHz)		698.2	707	715.8
Stand-alone	3.75k BPSK	1	0	22.29	22.18	22.21
		1	47	22.61	22.38	22.36
	3.75k QPSK	1	0	22.50	22.60	22.37
		1	47	22.66	22.67	22.54
	15k BPSK	1	0	22.29	22.51	22.46
		1	11	22.43	22.66	22.60
	15k QPSK	1	0	22.56	22.77	22.57
		1	11	22.50	22.70	22.67
		12	0	20.35	20.39	20.28

*ERP = Conducted + antenna gain (1.8dBi) - 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

eMTC

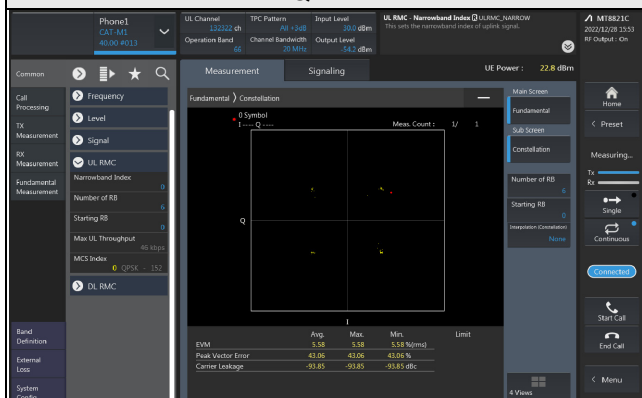


LTE Band 66

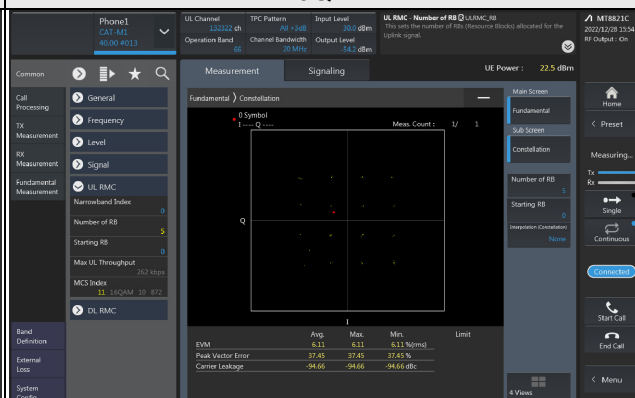
Spectrum Plot of Measurement Value

Channel: 132322 / Frequency (MHz): 1745.0MHz

QPSK



16QAM

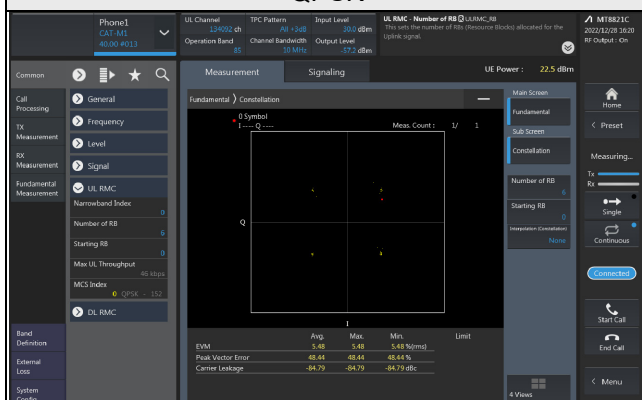


LTE Band 85

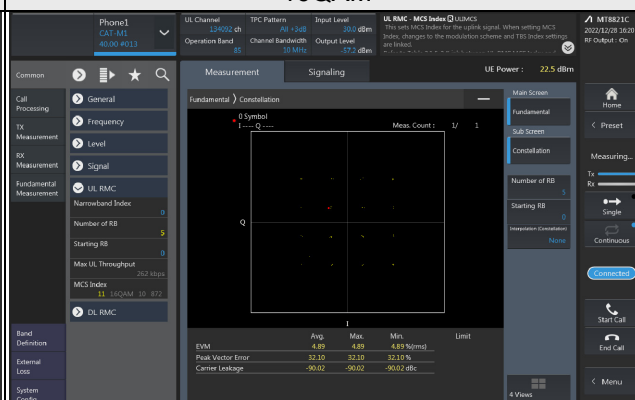
Spectrum Plot of Measurement Value

Channel: 134092 / Frequency (MHz): 707.0MHz

QPSK



16QAM

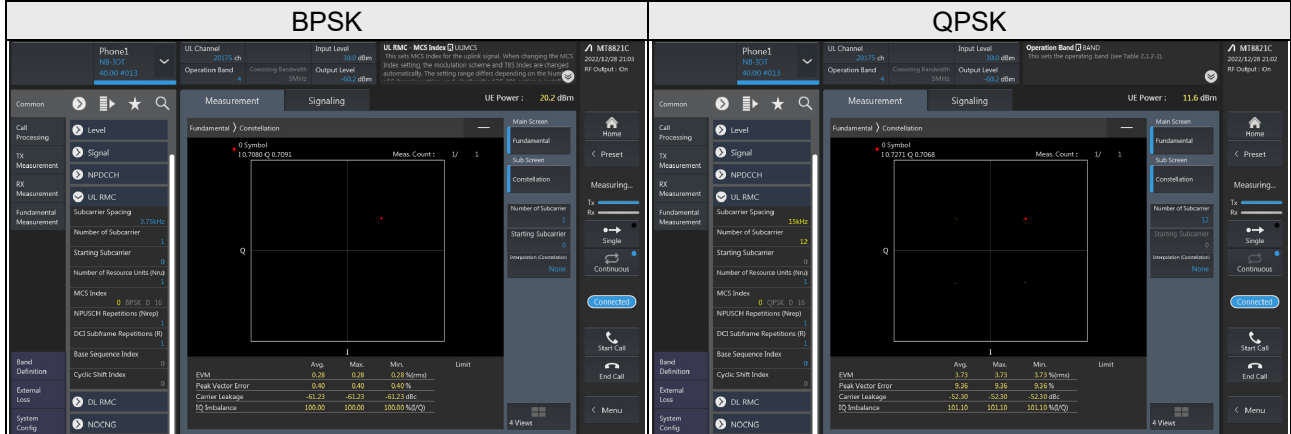


NB-IoT

LTE Band 4

Spectrum Plot of Measurement Value

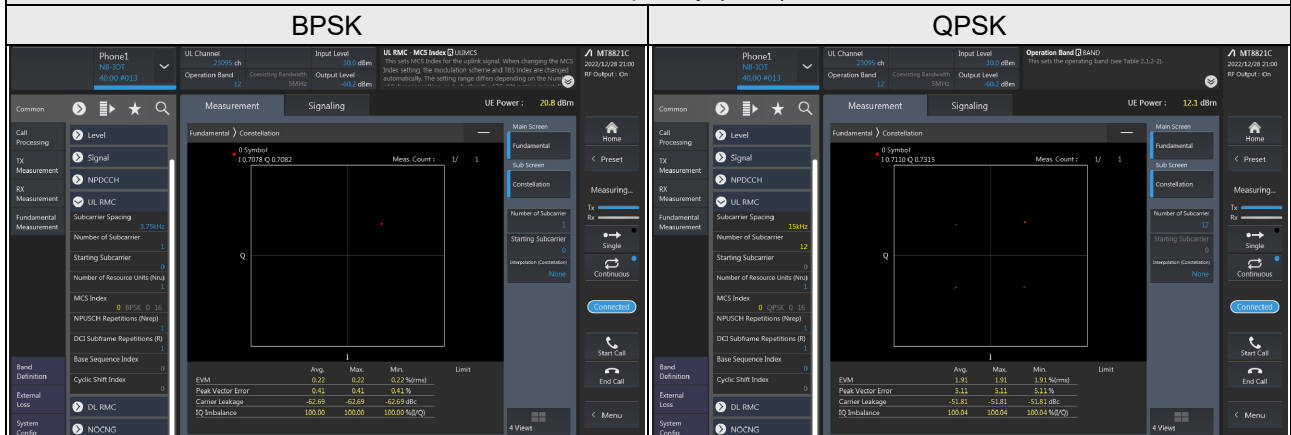
Channel: 20175 / Frequency (MHz): 1732.5MHz



LTE Band 12

Spectrum Plot of Measurement Value

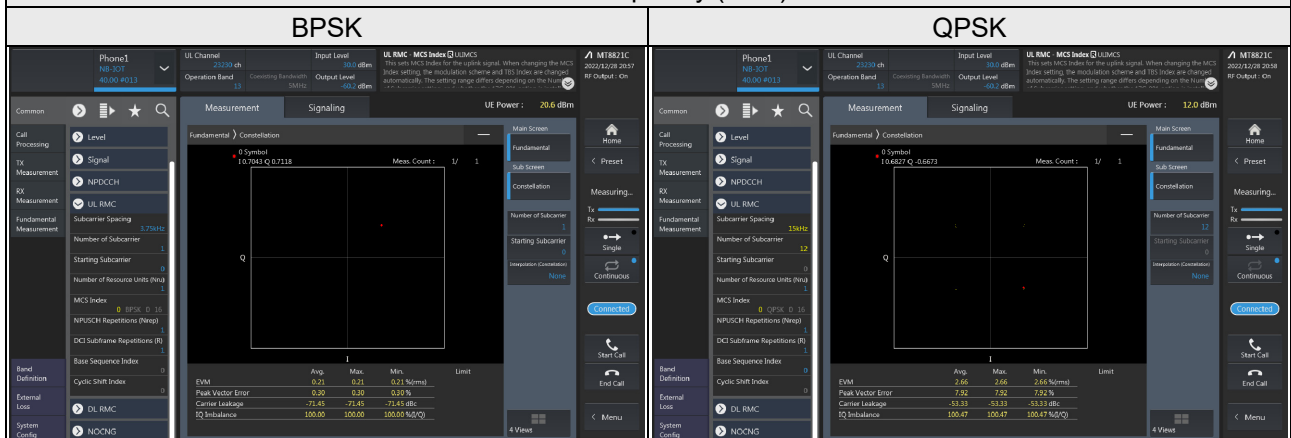
Channel: 23095 / Frequency (MHz): 707.5MHz



LTE Band 13

Spectrum Plot of Measurement Value

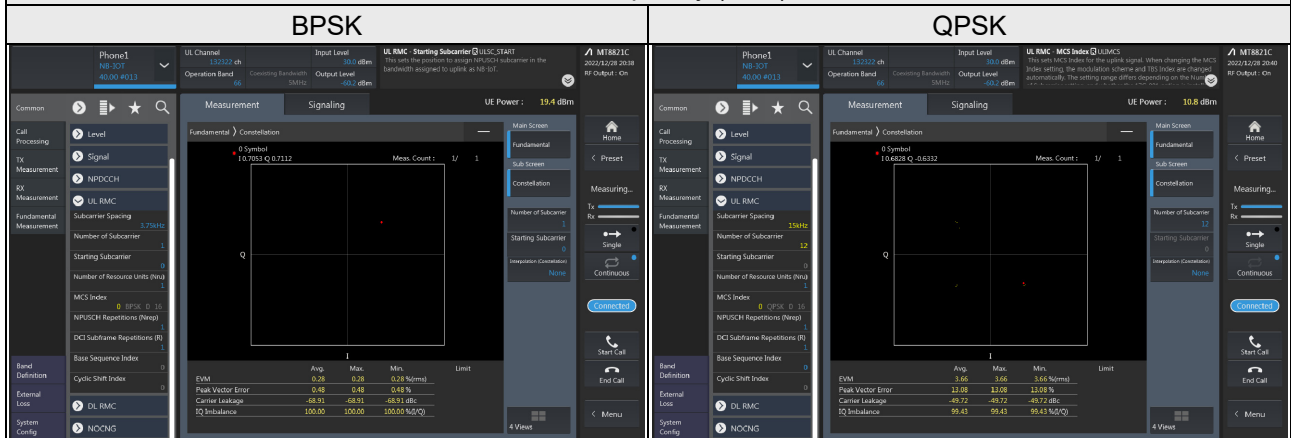
Channel: 23230 / Frequency (MHz): 782.0MHz



LTE Band 66

Spectrum Plot of Measurement Value

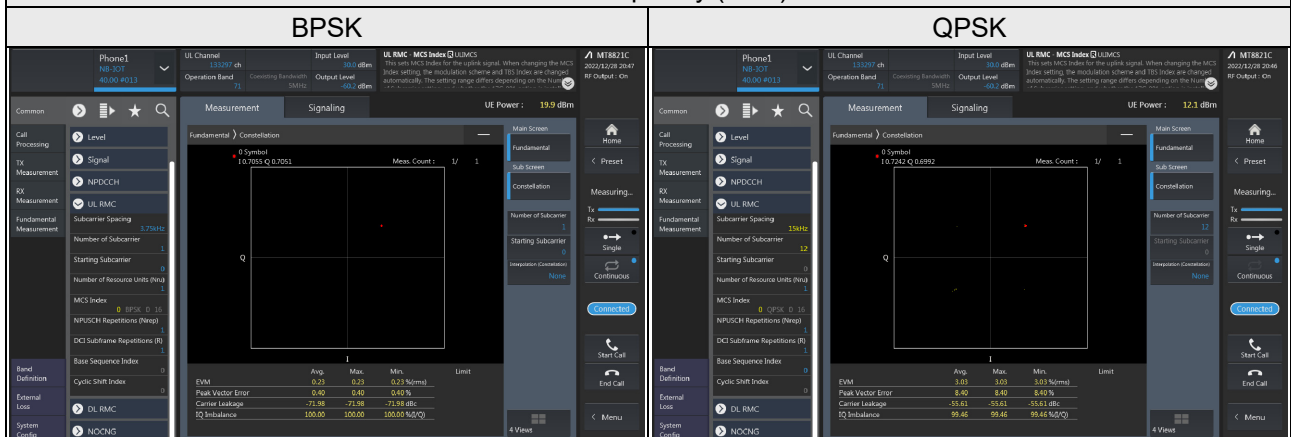
Channel: 132322 / Frequency (MHz): 1745.0MHz



LTE Band 71

Spectrum Plot of Measurement Value

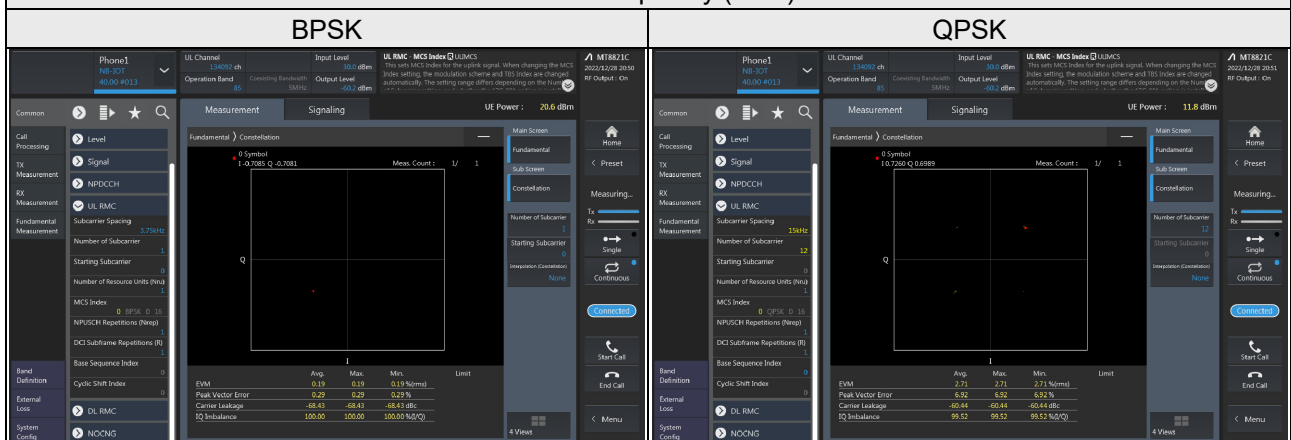
Channel: 133297 / Frequency (MHz): 680.50MHz



LTE Band 85

Spectrum Plot of Measurement Value

Channel: 134092 / Frequency (MHz): 707.0MHz



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

- 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.
- 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.
- 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.

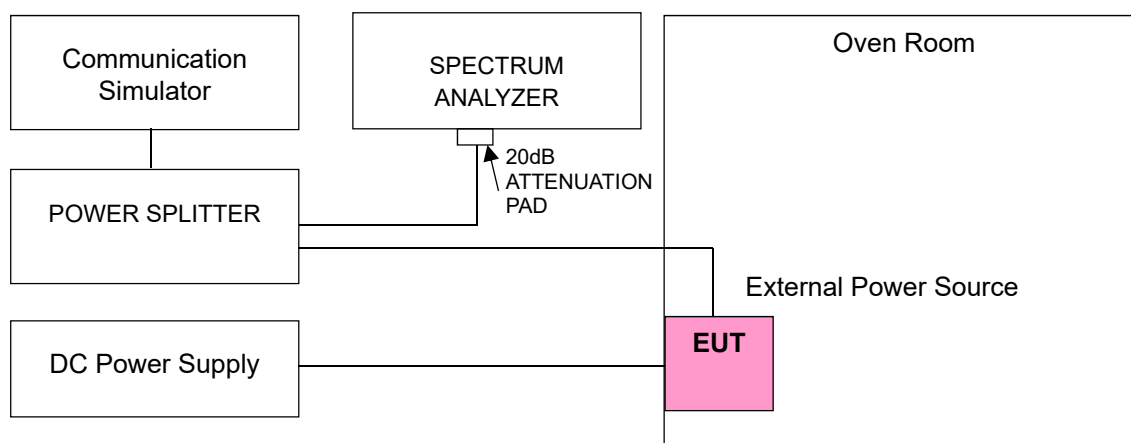
Note: The frequency error was recorded frequency error from the communication simulator.

4.3.3 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Radio Communication Analyzer Anritsu	MT8821C	6261806803	Feb. 16, 2022	Feb. 15, 2023
Temperature & Humidity Chamber TERCHY	HRM-120RF	931022	Jan. 03, 2022	Jan. 02, 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

eMTC

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 4			
	Channel Bandwidth 1.4 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.15	1710.6999980	-0.001	1754.2999960	-0.002
3.7	1710.6999980	-0.001	1754.2999970	-0.002
4.26	1710.7000030	0.002	1754.3000020	0.001

Note: The applicant defined the normal working voltage is from 3.15Vdc to 4.26Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 4			
	Channel Bandwidth 1.4 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1710.6999970	-0.002	1754.3000020	0.001
-20	1710.7000040	0.002	1754.2999990	-0.001
-10	1710.6999980	-0.001	1754.3000030	0.002
0	1710.7000010	0.001	1754.3000040	0.002
10	1710.7000040	0.002	1754.2999970	-0.002
20	1710.6999990	-0.001	1754.2999980	-0.001
30	1710.7000020	0.001	1754.3000010	0.001
40	1710.7000030	0.002	1754.2999980	-0.001
50	1710.6999980	-0.001	1754.3000010	0.001
60	1710.7000030	0.002	1754.3000020	0.001

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 4			
	Channel Bandwidth 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.15	1711.5000020	0.001	1753.5000020	0.001
3.7	1711.4999990	-0.001	1753.5000010	0.001
4.26	1711.4999970	-0.002	1753.5000040	0.002

Note: The applicant defined the normal working voltage is from 3.15Vdc to 4.26Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 4			
	Channel Bandwidth 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1711.4999980	-0.001	1753.4999970	-0.002
-20	1711.5000030	0.002	1753.5000020	0.001
-10	1711.5000010	0.001	1753.5000030	0.002
0	1711.4999990	-0.001	1753.4999990	-0.001
10	1711.4999970	-0.002	1753.4999970	-0.002
20	1711.5000010	0.001	1753.4999960	-0.002
30	1711.4999990	-0.001	1753.4999990	-0.001
40	1711.4999980	-0.001	1753.5000020	0.001
50	1711.5000040	0.002	1753.5000040	0.002
60	1711.4999980	-0.001	1753.4999990	-0.001

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 4			
	Channel Bandwidth 5MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.15	1712.5000040	0.002	1752.4999970	-0.002
3.7	1712.5000040	0.002	1752.4999980	-0.001
4.26	1712.4999980	-0.001	1752.4999960	-0.002

Note: The applicant defined the normal working voltage is from 3.15Vdc to 4.26Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 4			
	Channel Bandwidth 5MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1712.5000010	0.001	1752.5000010	0.001
-20	1712.4999990	-0.001	1752.4999970	-0.002
-10	1712.4999970	-0.002	1752.5000040	0.002
0	1712.4999980	-0.001	1752.4999980	-0.001
10	1712.4999960	-0.002	1752.4999970	-0.002
20	1712.5000020	0.001	1752.5000010	0.001
30	1712.5000010	0.001	1752.5000010	0.001
40	1712.5000040	0.002	1752.5000040	0.002
50	1712.5000020	0.001	1752.5000030	0.002
60	1712.4999970	-0.002	1752.5000020	0.001

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 4			
	Channel Bandwidth 10MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.15	1715.0000040	0.002	1749.9999990	-0.001
3.7	1714.9999970	-0.002	1750.0000010	0.001
4.26	1715.0000020	0.001	1750.0000040	0.002

Note: The applicant defined the normal working voltage is from 3.15Vdc to 4.26Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 4			
	Channel Bandwidth 10MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1715.0000020	0.001	1749.9999990	-0.001
-20	1715.0000010	0.001	1750.0000030	0.002
-10	1714.9999970	-0.002	1750.0000040	0.002
0	1714.9999960	-0.002	1750.0000010	0.001
10	1715.0000030	0.002	1750.0000040	0.002
20	1715.0000020	0.001	1749.9999960	-0.002
30	1715.0000040	0.002	1750.0000010	0.001
40	1715.0000040	0.002	1750.0000010	0.001
50	1714.9999990	-0.001	1750.0000020	0.001
60	1715.0000010	0.001	1750.0000030	0.002

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 4			
	Channel Bandwidth 15MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.15	1717.4999980	-0.001	1747.4999970	-0.002
3.7	1717.4999990	-0.001	1747.4999990	-0.001
4.26	1717.4999980	-0.001	1747.5000030	0.002

Note: The applicant defined the normal working voltage is from 3.15Vdc to 4.26Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 4			
	Channel Bandwidth 15MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1717.5000030	0.002	1747.4999990	-0.001
-20	1717.4999970	-0.002	1747.5000020	0.001
-10	1717.5000020	0.001	1747.4999970	-0.002
0	1717.4999960	-0.002	1747.5000010	0.001
10	1717.4999990	-0.001	1747.5000020	0.001
20	1717.5000020	0.001	1747.4999970	-0.002
30	1717.5000020	0.001	1747.4999990	-0.001
40	1717.5000030	0.002	1747.5000030	0.002
50	1717.5000040	0.002	1747.4999970	-0.002
60	1717.5000020	0.001	1747.4999960	-0.002

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 4			
	Channel Bandwidth 20MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.15	1719.9999970	-0.002	1744.9999980	-0.001
3.7	1719.9999970	-0.002	1745.0000030	0.002
4.26	1719.9999960	-0.002	1745.0000010	0.001

Note: The applicant defined the normal working voltage is from 3.15Vdc to 4.26Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 4			
	Channel Bandwidth 20MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1720.0000040	0.002	1744.9999980	-0.001
-20	1719.9999990	-0.001	1745.0000020	0.001
-10	1720.0000040	0.002	1744.9999960	-0.002
0	1720.0000020	0.001	1744.9999960	-0.002
10	1720.0000020	0.001	1745.0000010	0.001
20	1719.9999960	-0.002	1745.0000020	0.001
30	1719.9999990	-0.001	1745.0000030	0.002
40	1720.0000010	0.001	1745.0000030	0.002
50	1720.0000040	0.002	1745.0000040	0.002
60	1720.0000020	0.001	1744.9999970	-0.002

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 12			
	Channel Bandwidth 1.4 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.15	699.6999970	-0.004	715.2999960	-0.006
3.7	699.7000040	0.006	715.2999990	-0.001
4.26	699.6999980	-0.003	715.2999990	-0.001

Note: The applicant defined the normal working voltage is from 3.15Vdc to 4.26Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 12			
	Channel Bandwidth 1.4 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	699.6999970	-0.004	715.2999960	-0.006
-20	699.7000010	0.001	715.3000030	0.004
-10	699.7000040	0.006	715.2999970	-0.004
0	699.7000030	0.004	715.2999970	-0.004
10	699.7000020	0.003	715.2999980	-0.003
20	699.6999980	-0.003	715.3000020	0.003
30	699.6999990	-0.001	715.2999990	-0.001
40	699.7000020	0.003	715.3000010	0.001
50	699.6999990	-0.001	715.3000030	0.004
60	699.7000020	0.003	715.2999990	-0.001

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 12			
	Channel Bandwidth 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.15	700.4999990	-0.001	714.4999970	-0.004
3.7	700.4999960	-0.006	714.5000010	0.001
4.26	700.4999960	-0.006	714.5000010	0.001

Note: The applicant defined the normal working voltage is from 3.15Vdc to 4.26Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 12			
	Channel Bandwidth 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	700.5000020	0.003	714.4999980	-0.003
-20	700.5000030	0.004	714.4999980	-0.003
-10	700.5000040	0.006	714.4999980	-0.003
0	700.4999990	-0.001	714.4999990	-0.001
10	700.4999960	-0.006	714.5000010	0.001
20	700.4999970	-0.004	714.4999980	-0.003
30	700.4999970	-0.004	714.5000030	0.004
40	700.4999980	-0.003	714.4999960	-0.006
50	700.5000040	0.006	714.4999960	-0.006
60	700.5000030	0.004	714.4999980	-0.003

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 12			
	Channel Bandwidth 5MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.15	701.4999960	-0.006	713.5000030	0.004
3.7	701.4999980	-0.003	713.4999960	-0.006
4.26	701.5000020	0.003	713.4999980	-0.003

Note: The applicant defined the normal working voltage is from 3.15Vdc to 4.26Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 12			
	Channel Bandwidth 5MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	701.5000010	0.001	713.5000030	0.004
-20	701.5000020	0.003	713.4999970	-0.004
-10	701.4999960	-0.006	713.5000010	0.001
0	701.4999990	-0.001	713.5000020	0.003
10	701.5000030	0.004	713.4999960	-0.006
20	701.5000040	0.006	713.4999960	-0.006
30	701.5000020	0.003	713.4999970	-0.004
40	701.4999960	-0.006	713.5000020	0.003
50	701.5000030	0.004	713.4999960	-0.006
60	701.4999990	-0.001	713.5000030	0.004

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 12			
	Channel Bandwidth 10MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.15	704.0000040	0.006	710.9999980	-0.003
3.7	703.9999980	-0.003	710.9999990	-0.001
4.26	703.9999960	-0.006	711.0000020	0.003

Note: The applicant defined the normal working voltage is from 3.15Vdc to 4.26Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 12			
	Channel Bandwidth 10MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	704.0000040	0.006	711.0000040	0.006
-20	704.0000010	0.001	710.9999990	-0.001
-10	704.0000040	0.006	711.0000040	0.006
0	704.0000030	0.004	710.9999960	-0.006
10	704.0000010	0.001	711.0000040	0.006
20	704.0000030	0.004	711.0000020	0.003
30	704.0000030	0.004	711.0000010	0.001
40	703.9999960	-0.006	711.0000030	0.004
50	703.9999960	-0.006	711.0000010	0.001
60	703.9999990	-0.001	711.0000020	0.003

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 13			
	Channel Bandwidth 5MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.15	779.4999980	-0.003	784.5000040	0.005
3.7	779.4999980	-0.003	784.5000040	0.005
4.26	779.4999990	-0.001	784.5000030	0.004

Note: The applicant defined the normal working voltage is from 3.15Vdc to 4.26Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 13			
	Channel Bandwidth 5MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	779.5000010	0.001	784.5000010	0.001
-20	779.4999970	-0.004	784.4999960	-0.005
-10	779.5000020	0.003	784.5000020	0.003
0	779.4999990	-0.001	784.4999980	-0.003
10	779.4999990	-0.001	784.4999980	-0.003
20	779.4999980	-0.003	784.4999980	-0.003
30	779.4999970	-0.004	784.5000010	0.001
40	779.4999980	-0.003	784.5000040	0.005
50	779.4999980	-0.003	784.5000040	0.005
60	779.5000030	0.004	784.4999980	-0.003

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 13	
	Channel Bandwidth 10MHz	
	Frequency (MHz)	Frequency Error (ppm)
3.15	781.9999960	-0.005
3.7	781.9999980	-0.003
4.26	781.9999970	-0.004

Note: The applicant defined the normal working voltage is from 3.15Vdc to 4.26Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 13	
	Channel Bandwidth 10MHz	
	Frequency (MHz)	Frequency Error (ppm)
-30	782.0000030	0.004
-20	781.9999970	-0.004
-10	781.9999980	-0.003
0	782.0000010	0.001
10	782.0000040	0.005
20	781.9999970	-0.004
30	782.0000010	0.001
40	782.0000040	0.005
50	782.0000030	0.004
60	781.9999990	-0.001

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 66			
	Channel Bandwidth 1.4 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.15	1710.7000020	0.001	1779.3000010	0.001
3.7	1710.7000040	0.002	1779.2999990	-0.001
4.26	1710.6999960	-0.002	1779.2999990	-0.001

Note: The applicant defined the normal working voltage is from 3.15Vdc to 4.26Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 66			
	Channel Bandwidth 1.4 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1710.7000040	0.002	1779.2999960	-0.002
-20	1710.7000020	0.001	1779.3000010	0.001
-10	1710.7000040	0.002	1779.3000020	0.001
0	1710.6999990	-0.001	1779.3000040	0.002
10	1710.7000010	0.001	1779.3000040	0.002
20	1710.7000040	0.002	1779.3000040	0.002
30	1710.6999980	-0.001	1779.2999980	-0.001
40	1710.6999960	-0.002	1779.3000020	0.001
50	1710.6999990	-0.001	1779.2999990	-0.001

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 66			
	Channel Bandwidth 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.15	1711.4999960	-0.002	1778.4999990	-0.001
3.7	1711.5000010	0.001	1778.4999990	-0.001
4.26	1711.4999970	-0.002	1778.5000010	0.001

Note: The applicant defined the normal working voltage is from 3.15Vdc to 4.26Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 66			
	Channel Bandwidth 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1711.5000030	0.002	1778.4999980	-0.001
-20	1711.5000040	0.002	1778.5000040	0.002
-10	1711.4999980	-0.001	1778.5000010	0.001
0	1711.4999990	-0.001	1778.4999970	-0.002
10	1711.5000020	0.001	1778.5000030	0.002
20	1711.4999980	-0.001	1778.5000030	0.002
30	1711.4999980	-0.001	1778.4999980	-0.001
40	1711.5000040	0.002	1778.4999990	-0.001
50	1711.5000020	0.001	1778.5000040	0.002
60	1711.4999960	-0.002	1778.5000030	0.002

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 66			
	Channel Bandwidth 5MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.15	1712.5000010	0.001	1777.5000020	0.001
3.7	1712.5000020	0.001	1777.4999960	-0.002
4.26	1712.5000010	0.001	1777.4999960	-0.002

Note: The applicant defined the normal working voltage is from 3.15Vdc to 4.26Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 66			
	Channel Bandwidth 5MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1712.5000020	0.001	1777.5000040	0.002
-20	1712.5000020	0.001	1777.4999970	-0.002
-10	1712.5000030	0.002	1777.4999990	-0.001
0	1712.5000020	0.001	1777.4999970	-0.002
10	1712.5000020	0.001	1777.5000020	0.001
20	1712.4999960	-0.002	1777.5000010	0.001
30	1712.4999980	-0.001	1777.4999990	-0.001
40	1712.5000040	0.002	1777.4999960	-0.002
50	1712.4999970	-0.002	1777.4999980	-0.001
60	1712.4999990	-0.001	1777.5000020	0.001

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 66			
	Channel Bandwidth 10MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.15	1714.9999970	-0.002	1775.0000020	0.001
3.7	1715.0000010	0.001	1775.0000010	0.001
4.26	1715.0000020	0.001	1775.0000020	0.001

Note: The applicant defined the normal working voltage is from 3.15Vdc to 4.26Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 66			
	Channel Bandwidth 10MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1715.0000020	0.001	1774.9999960	-0.002
-20	1714.9999970	-0.002	1774.9999990	-0.001
-10	1715.0000030	0.002	1775.0000010	0.001
0	1714.9999970	-0.002	1775.0000010	0.001
10	1714.9999980	-0.001	1775.0000020	0.001
20	1715.0000020	0.001	1774.9999980	-0.001
30	1714.9999970	-0.002	1775.0000010	0.001
40	1714.9999970	-0.002	1775.0000030	0.002
50	1714.9999970	-0.002	1774.9999960	-0.002
60	1714.9999980	-0.001	1775.0000010	0.001

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 66			
	Channel Bandwidth 15MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.15	1717.4999970	-0.002	1772.4999970	-0.002
3.7	1717.4999980	-0.001	1772.5000010	0.001
4.26	1717.5000030	0.002	1772.5000010	0.001

Note: The applicant defined the normal working voltage is from 3.15Vdc to 4.26Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 66			
	Channel Bandwidth 15MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1717.4999980	-0.001	1772.4999970	-0.002
-20	1717.5000030	0.002	1772.4999970	-0.002
-10	1717.4999980	-0.001	1772.4999990	-0.001
0	1717.4999960	-0.002	1772.4999990	-0.001
10	1717.4999990	-0.001	1772.4999990	-0.001
20	1717.5000020	0.001	1772.4999990	-0.001
30	1717.4999960	-0.002	1772.5000010	0.001
40	1717.4999970	-0.002	1772.4999980	-0.001
50	1717.4999960	-0.002	1772.5000040	0.002
60	1717.4999970	-0.002	1772.5000010	0.001

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 66			
	Channel Bandwidth 20MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.15	1719.9999990	-0.001	1769.9999990	-0.001
3.7	1719.9999980	-0.001	1770.0000020	0.001
4.26	1720.0000020	0.001	1770.0000010	0.001

Note: The applicant defined the normal working voltage is from 3.15Vdc to 4.26Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 66			
	Channel Bandwidth 20MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1719.9999980	-0.001	1769.9999970	-0.002
-20	1719.9999990	-0.001	1770.0000040	0.002
-10	1719.9999980	-0.001	1769.9999980	-0.001
0	1720.0000020	0.001	1770.0000030	0.002
10	1720.0000010	0.001	1769.9999980	-0.001
20	1719.9999960	-0.002	1769.9999990	-0.001
30	1720.0000020	0.001	1769.9999970	-0.002
40	1719.9999980	-0.001	1769.9999960	-0.002
50	1719.9999980	-0.001	1769.9999980	-0.001
60	1719.9999970	-0.002	1770.0000020	0.001

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 85			
	Channel Bandwidth 5MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.15	700.4999990	-0.001	713.5000020	0.003
3.7	700.4999990	-0.001	713.5000020	0.003
4.26	700.5000020	0.003	713.4999970	-0.004

Note: The applicant defined the normal working voltage is from 3.15Vdc to 4.26Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 85			
	Channel Bandwidth 5MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	700.4999990	-0.001	713.4999990	-0.001
-20	700.5000030	0.004	713.4999980	-0.003
-10	700.5000010	0.001	713.4999970	-0.004
0	700.5000030	0.004	713.4999960	-0.006
10	700.4999990	-0.001	713.5000020	0.003
20	700.4999990	-0.001	713.4999970	-0.004
30	700.5000040	0.006	713.5000020	0.003
40	700.4999990	-0.001	713.5000010	0.001
50	700.4999980	-0.003	713.4999980	-0.003
60	700.4999990	-0.001	713.5000030	0.004

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 85			
	Channel Bandwidth 10MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.15	703.0000020	0.003	710.9999970	-0.004
3.7	703.0000010	0.001	710.9999990	-0.001
4.26	702.9999960	-0.006	711.0000020	0.003

Note: The applicant defined the normal working voltage is from 3.15Vdc to 4.26Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 85			
	Channel Bandwidth 10MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	702.9999980	-0.003	710.9999960	-0.006
-20	702.9999960	-0.006	711.0000020	0.003
-10	703.0000030	0.004	710.9999960	-0.006
0	702.9999990	-0.001	711.0000020	0.003
10	702.9999970	-0.004	710.9999990	-0.001
20	702.9999970	-0.004	710.9999980	-0.003
30	703.0000020	0.003	711.0000010	0.001
40	702.9999970	-0.004	710.9999960	-0.006
50	703.0000040	0.006	711.0000040	0.006
60	703.0000020	0.003	710.9999990	-0.001

NB-IoT
Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 4			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.15	1710.200004	0.002	1754.799999	-0.001
3.7	1710.199997	-0.002	1754.800002	0.001
4.26	1710.200001	0.001	1754.799996	-0.002

Note: The applicant defined the normal working voltage is from 3.15Vdc to 4.26Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 4			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1710.200002	0.001	1754.800001	0.001
-20	1710.199996	-0.002	1754.799997	-0.002
-10	1710.199998	-0.001	1754.800004	0.002
0	1710.199999	-0.001	1754.800002	0.001
10	1710.200004	0.002	1754.799998	-0.001
20	1710.199997	-0.002	1754.800003	0.002
30	1710.200003	0.002	1754.800003	0.002
40	1710.199996	-0.002	1754.799999	-0.001
50	1710.200002	0.001	1754.799996	-0.002
60	1710.199999	-0.001	1754.800003	0.002

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 12			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.15	699.199998	-0.003	715.800002	0.003
3.7	699.199996	-0.006	715.799999	-0.001
4.26	699.200003	0.004	715.800003	0.004

Note: The applicant defined the normal working voltage is from 3.15Vdc to 4.26Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 12			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	699.200002	0.003	715.800002	0.003
-20	699.199999	-0.001	715.800002	0.003
-10	699.199998	-0.003	715.800003	0.004
0	699.200004	0.006	715.800002	0.003
10	699.199998	-0.003	715.800004	0.006
20	699.200001	0.001	715.800001	0.001
30	699.199999	-0.001	715.799998	-0.003
40	699.199996	-0.006	715.799999	-0.001
50	699.200002	0.003	715.800004	0.006
60	699.200003	0.004	715.799999	-0.001

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 13			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.15	777.199998	-0.003	786.799998	-0.003
3.7	777.199997	-0.004	786.799999	-0.001
4.26	777.199996	-0.005	786.799996	-0.005

Note: The applicant defined the normal working voltage is from 3.15Vdc to 4.26Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 13			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	777.200004	0.005	786.800002	0.003
-20	777.199996	-0.005	786.799998	-0.003
-10	777.200001	0.001	786.800002	0.003
0	777.200004	0.005	786.799998	-0.003
10	777.199999	-0.001	786.800001	0.001
20	777.200004	0.005	786.800001	0.001
30	777.200002	0.003	786.800002	0.003
40	777.199999	-0.001	786.800001	0.001
50	777.200001	0.001	786.799997	-0.004
60	777.200002	0.003	786.799999	-0.001

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 66			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.15	1710.200001	0.001	1779.800001	0.001
3.7	1710.200004	0.002	1779.800001	0.001
4.26	1710.199997	-0.002	1779.800003	0.002

Note: The applicant defined the normal working voltage is from 3.15Vdc to 4.26Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 66			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1710.199999	-0.001	1779.800003	0.002
-20	1710.199999	-0.001	1779.799998	-0.001
-10	1710.200002	0.001	1779.800001	0.001
0	1710.200004	0.002	1779.799998	-0.001
10	1710.200003	0.002	1779.799996	-0.002
20	1710.199998	-0.001	1779.800004	0.002
30	1710.199999	-0.001	1779.799997	-0.002
40	1710.199997	-0.002	1779.799999	-0.001
50	1710.200002	0.001	1779.800001	0.001
60	1710.199999	-0.001	1779.800003	0.002

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 71			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.15	663.199997	-0.005	697.799997	-0.004
3.7	663.199999	-0.002	697.800003	0.004
4.26	663.199996	-0.006	697.799996	-0.006

Note: The applicant defined the normal working voltage is from 3.15Vdc to 4.26Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 71			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	663.199997	-0.005	697.799996	-0.006
-20	663.199996	-0.006	697.800003	0.004
-10	663.200001	0.002	697.800003	0.004
0	663.199997	-0.005	697.800001	0.001
10	663.199998	-0.003	697.799998	-0.003
20	663.199998	-0.003	697.800003	0.004
30	663.200001	0.002	697.799997	-0.004
40	663.200004	0.006	697.799998	-0.003
50	663.199996	-0.006	697.799999	-0.001
60	663.200002	0.003	697.799997	-0.004

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 85			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.15	698.199999	-0.001	715.799996	-0.006
3.7	698.200002	0.003	715.800004	0.006
4.26	698.199999	-0.001	715.800004	0.006

Note: The applicant defined the normal working voltage is from 3.15Vdc to 4.26Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 85			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	698.200004	0.006	715.799998	-0.003
-20	698.199999	-0.001	715.800004	0.006
-10	698.199998	-0.003	715.800002	0.003
0	698.199999	-0.001	715.799996	-0.006
10	698.199997	-0.004	715.799996	-0.006
20	698.200001	0.001	715.799997	-0.004
30	698.199997	-0.004	715.800004	0.006
40	698.200004	0.006	715.800004	0.006
50	698.200003	0.004	715.800001	0.001
60	698.200002	0.003	715.799996	-0.006

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.

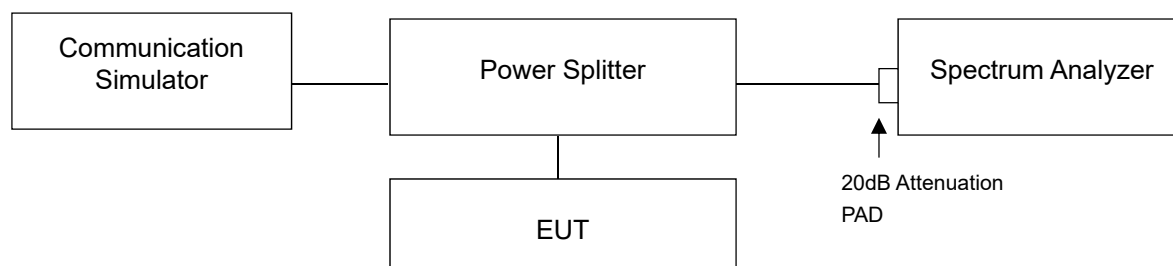
4.4.2 Test Procedure

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 eMTC

LTE Band 4, Channel Bandwidth 1.4MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
19957	1710.7	1.084	0.912
20175	1732.5	1.084	0.914
20393	1754.3	1.085	0.910

LTE Band 4, Channel Bandwidth 3MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
19965	1711.5	1.084	0.913
20175	1732.5	1.085	0.913
20385	1753.5	1.084	0.912

LTE Band 4, Channel Bandwidth 5MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
19975	1712.5	1.085	0.911
20175	1732.5	1.084	0.910
20375	1752.5	1.086	0.910

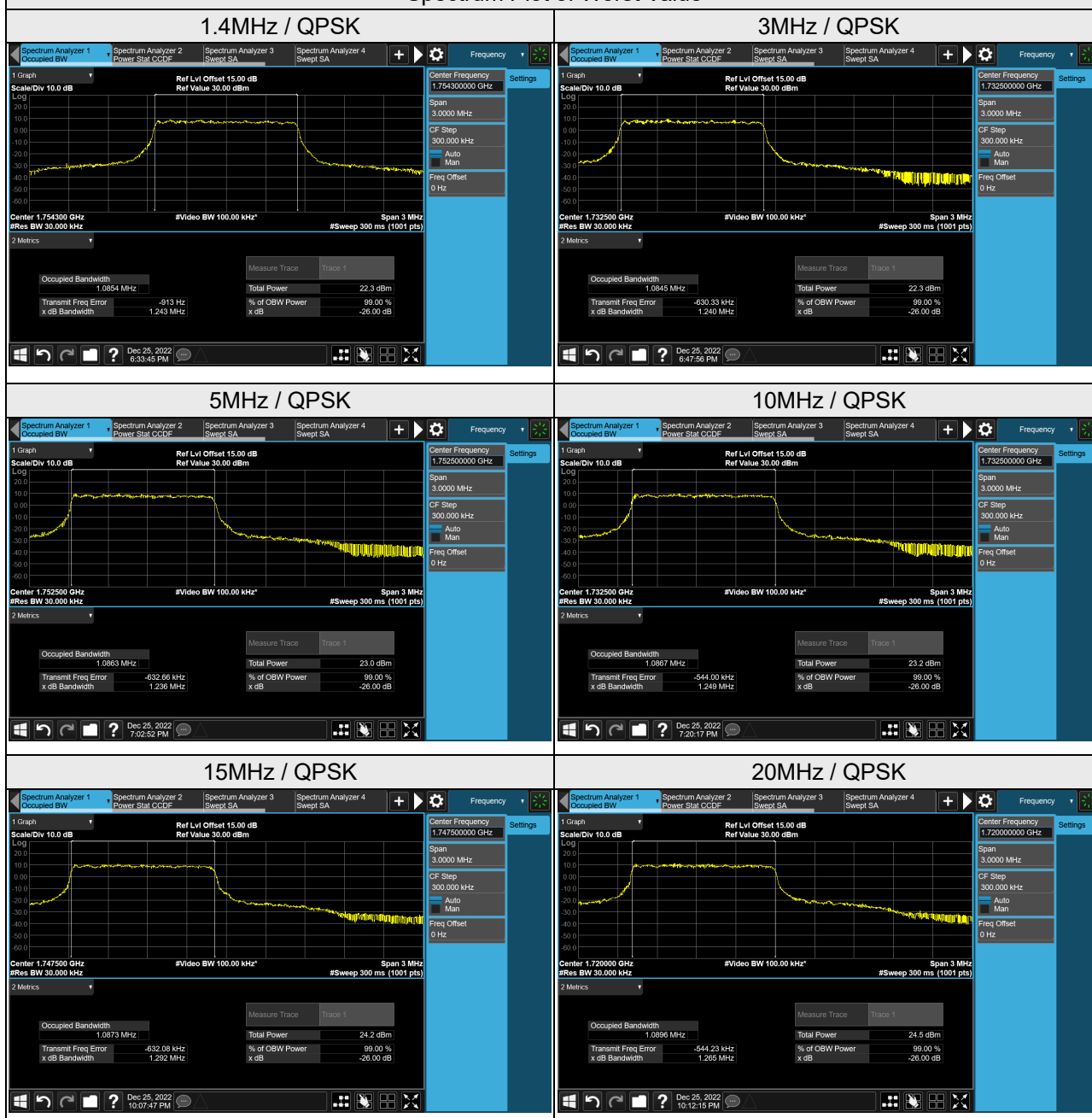
LTE Band 4, Channel Bandwidth 10MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
20000	1715.0	1.086	0.908
20175	1732.5	1.087	0.909
20350	1750.0	1.086	0.913

LTE Band 4, Channel Bandwidth 15MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
20025	1717.5	1.087	0.910
20175	1732.5	1.087	0.912
20325	1747.5	1.087	0.911

LTE Band 4, Channel Bandwidth 20MHz

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
20050	1720.0	1.090	0.913
20175	1732.5	1.087	0.914
20300	1745.0	1.088	0.913

Spectrum Plot of Worst Value



LTE Band 12, Channel Bandwidth 1.4MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
23017	699.7	1.084	0.913
23095	707.5	1.084	0.912
23173	715.3	1.083	0.910

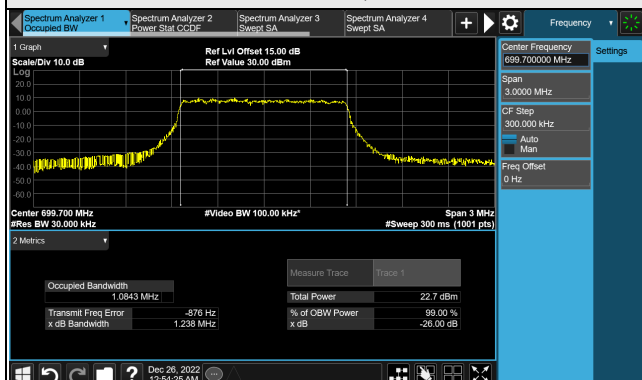
LTE Band 12, Channel Bandwidth 3MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
23025	700.5	1.083	0.911
23095	707.5	1.083	0.913
23165	714.5	1.084	0.916

LTE Band 12, Channel Bandwidth 5MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
23035	701.5	1.084	0.909
23095	707.5	1.085	0.909
23155	713.5	1.087	0.910

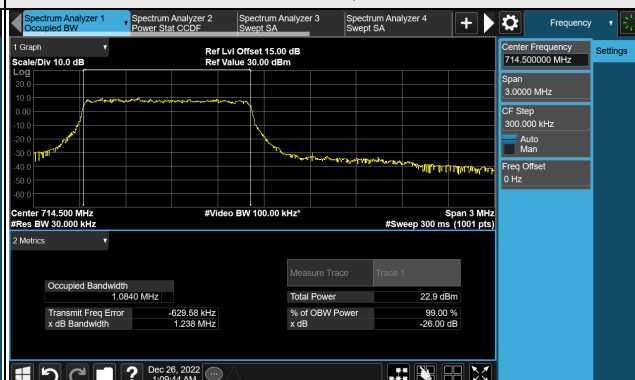
LTE Band 12, Channel Bandwidth 10MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
23060	704.0	1.082	0.909
23095	707.5	1.084	0.908
23130	711.0	1.087	0.909

Spectrum Plot of Worst Value

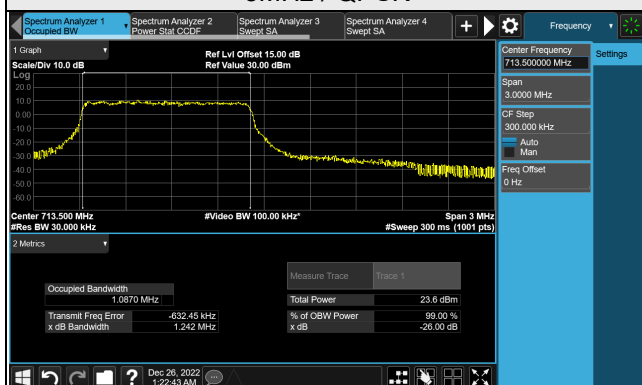
1.4MHz / QPSK



3MHz / QPSK



5MHz / QPSK



10MHz / QPSK

