

# FCC Test Report

## (PART 27)

**Report No.:** RFBFJZ-WTW-P22040598-7

**FCC ID:** V65E4811

**Test Model:** E4811

**Series Model:** E4811NC (refer to item 3.1 for more details)

**Received Date:** 2022/4/22

**Test Date:** 2022/5/17 ~ 2022/6/1

**Issued Date:** 2022/7/22

**Applicant:** Kyocera Corporation % Kyocera International, Inc.

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

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**Test Location (1):** No.19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City  
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**Test Location (2):** B2F., No.215, Sec. 3, Beixin Rd., Xindian Dist., New Taipei City 231, Taiwan

**FCC Registration /** 788550 / TW0003

**Designation Number:** 427177 / TW0011



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## Table of Contents

<b>Release Control Record</b> .....	<b>4</b>
<b>1 Certificate of Conformity</b> .....	<b>5</b>
<b>2 Summary of Test Results</b> .....	<b>6</b>
2.1 Measurement Uncertainty .....	7
2.2 Test Site and Instruments .....	8
<b>3 General Information</b> .....	<b>9</b>
3.1 General Description of EUT .....	9
3.2 Configuration of System under Test .....	11
3.2.1 Description of Support Units .....	11
3.3 Test Mode Applicability and Tested Channel Detail .....	12
3.4 EUT Operating Conditions .....	17
3.5 General Description of Applied Standards and references .....	17
<b>4 Test Types and Results</b> .....	<b>18</b>
4.1 Output Power Measurement .....	18
4.1.1 Limits of Output Power Measurement .....	18
4.1.2 Test Procedures .....	18
4.1.3 Test Setup .....	18
4.1.4 Test Results .....	19
4.2 Modulation Characteristics Measurement .....	31
4.2.1 Limits of Modulation Characteristics .....	31
4.2.2 Test Setup .....	31
4.2.3 Test Procedure .....	31
4.2.4 Test Results .....	31
4.3 Frequency Stability Measurement .....	33
4.3.1 Limits of Frequency Stability Measurement .....	33
4.3.2 Test Procedure .....	33
4.3.3 Test Setup .....	33
4.3.4 Test Results .....	34
4.4 Emission Bandwidth Measurement .....	46
4.4.1 Limits of Occupied Bandwidth Measurement .....	46
4.4.2 Test Procedure .....	46
4.4.3 Test Setup .....	46
4.4.4 Test Result .....	47
4.5 Channel Edge / Out-of-Band Emissions Measurement .....	59
4.5.1 Limits of Band Edge / Out-of-Band Emissions Measurement .....	59
4.5.2 Test Setup .....	59
4.5.3 Test Procedures .....	60
4.5.4 Test Results .....	61
4.6 Peak to Average Ratio .....	73
4.6.1 Limits of Peak to Average Ratio Measurement .....	73
4.6.2 Test Setup .....	73
4.6.3 Test Procedures .....	73
4.6.4 Test Results .....	74
4.7 Conducted Spurious Emissions .....	86
4.7.1 Limits of Conducted Spurious Emissions Measurement .....	86
4.7.2 Test Setup .....	86
4.7.3 Test Procedure .....	86
4.7.4 Test Results .....	87
4.8 Radiated Emission Measurement .....	101
4.8.1 Limits of Radiated Emission Measurement .....	101
4.8.2 Test Procedure .....	101
4.8.3 Deviation from Test Standard .....	101
4.8.4 Test Setup .....	102

4.8.5 Test Results .....	103
<b>5 Pictures of Test Arrangements.....</b>	<b>123</b>
<b>Appendix – Information of the Testing Laboratories .....</b>	<b>124</b>

### Release Control Record

Issue No.	Description	Date Issued
RFBFJZ-WTW-P22040598-7	Original Release	2022/7/22

## 1 Certificate of Conformity

**Product:** Feature Phone

**Brand:** Kyocera

**Test Model:** E4811

**Series Model:** E4811NC (refer to item 3.1 for more details)

**Sample Status:** Identical Prototype

**Applicant:** Kyocera Corporation % Kyocera International, Inc.

**Test Date:** 2022/5/17 ~ 2022/6/1

**Standards:** FCC Part 27, Subpart C, H, F, 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:** 2022/7/22  
Vera Huang / Specialist

**Approved by :** Jeremy Lin, **Date:** 2022/7/22  
Jeremy Lin / Project Engineer

## 2 Summary of Test Results

Applied Standard: FCC Part 27 & Part 2 (LTE 4)			
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 -33.05 dB at 88.86 MHz.

Applied Standard: FCC Part 27 & Part 2 (LTE 12)			
FCC Clause	Test Item	Result	Remarks
2.1046 27.50(c)	Equivalent 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 -36.05 dB at 2099.10 MHz.

Applied Standard: FCC Part 27 & Part 2 (LTE 13)			
FCC Clause	Test Item	Result	Remarks
2.1046 27.50(b)	Equivalent 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 -17.99 dB at 1564.00 MHz.

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

## 2.1 Measurement Uncertainty

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

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Radiated Emissions up to 1 GHz	9 kHz ~ 30 MHz	3.0400 dB
	30 MHz ~ 200 MHz	2.0153 dB
	200 MHz ~ 1000 MHz	2.0224 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	1.0121 dB
	18 GHz ~ 40 GHz	1.1508 dB

## 2.2 Test Site and Instruments

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Antenna Tower Max-Full	UNAT_5+	PAD-CH6-01	N/A	N/A
Antenna Tower Controller Max-Full	MF-7802	N/A	N/A	N/A
Bi_Log Antenna Schwarzbeck	VULB9168	9168-616	2021/10/27	2022/10/26
Preamplifier Agilent	310N	187226	2021/6/17	2022/6/16
Pre-amplifier EMCI	EMC001340	980201	2021/9/15	2022/9/14
RF Coaxial Cable EMCI	5D-NM-BM	140903+140902	2022/1/15	2023/1/14
RF Coaxial Cable ETS-Lindgren	EMC104-SM-SM-10000	Cable-CH1-01(RFC-SMS-100-SMS-120+RFC-SMS-100-SMS-4)	2021/6/17	2022/6/16
	RFC-SMS-100-SMS-24-IN	Cable-CH1-02(RFC-SMS-100-SMS-24)	2021/6/17	2022/6/16
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	N/A	N/A	N/A
Test Receiver Agilent	N9038A	MY52260177	2021/9/1	2022/8/31
Turn Table Max-Full	TT-1510	N/A	N/A	N/A
Turn Table Controller Max-Full	MF-7802	N/A	N/A	N/A
Boresight antenna tower fixture BV	BAF-02	8	N/A	N/A
Horn Antenna ETS-Lindgren	3117	00143293	2021/11/14	2022/11/13
Horn Antenna Schwarzbeck	BBHA 9170	BBHA9170241	2021/10/26	2022/10/25
Radio Communication Analyzer Anritsu	MT8821C	6261806803	2022/2/16	2023/2/15
Loop Antenna EMCI	EM-6879	269	2021/9/16	2022/9/15

Notes:

1. The test was performed in XD - 966 chamber 6.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.



### 3 General Information

#### 3.1 General Description of EUT

<b>Product</b>	Feature Phone	
<b>Brand</b>	Kyocera	
<b>Test Model</b>	E4811	
<b>Series Model</b>	E4811NC	
<b>Status of EUT</b>	Identical Prototype	
<b>Power Supply Rating</b>	5 Vdc (from adapter) 3.8 Vdc (from Li-ion battery)	
<b>Modulation Type</b>	QPSK, 16QAM	
<b>Frequency Range</b>	LTE Band 4 (Channel Bandwidth: 1.4 MHz)	1710.7 ~ 1754.3 MHz
	LTE Band 4 (Channel Bandwidth: 3 MHz)	1711.5 ~ 1753.5 MHz
	LTE Band 4 (Channel Bandwidth: 5 MHz)	1712.5 ~ 1752.5 MHz
	LTE Band 4 (Channel Bandwidth: 10 MHz)	1715.0 ~ 1750.0 MHz
	LTE Band 4 (Channel Bandwidth: 15 MHz)	1717.5 ~ 1747.5 MHz
	LTE Band 4 (Channel Bandwidth: 20 MHz)	1720.0 ~ 1745.0 MHz
	LTE Band 12 (Channel Bandwidth: 1.4 MHz)	699.7 ~ 715.3 MHz
	LTE Band 12 (Channel Bandwidth: 3 MHz)	700.5 ~ 714.5 MHz
	LTE Band 12 (Channel Bandwidth: 5 MHz)	701.5 ~ 713.5 MHz
	LTE Band 12 (Channel Bandwidth: 10 MHz)	704.0 ~ 711.0 MHz
	LTE Band 13 (Channel Bandwidth: 5 MHz)	779.5 ~ 784.5 MHz
	LTE Band 13 (Channel Bandwidth: 10 MHz)	782.0 MHz
<b>Emission Designator</b>	LTE Band 4 (Channel Bandwidth: 1.4 MHz)	1M09G7D
	LTE Band 4 (Channel Bandwidth: 3 MHz)	2M70G7D
	LTE Band 4 (Channel Bandwidth: 5 MHz)	4M49G7D
	LTE Band 4 (Channel Bandwidth: 10 MHz)	8M98D7W
	LTE Band 4 (Channel Bandwidth: 15 MHz)	13M5G7D
	LTE Band 4 (Channel Bandwidth: 20 MHz)	18M0D7W
	LTE Band 12 (Channel Bandwidth: 1.4 MHz)	1M09G7D
	LTE Band 12 (Channel Bandwidth: 3 MHz)	2M69D7W
	LTE Band 12 (Channel Bandwidth: 5 MHz)	4M50G7D
	LTE Band 12 (Channel Bandwidth: 10 MHz)	8M98D7W
	LTE Band 13 (Channel Bandwidth: 5 MHz)	4M50G7D
	LTE Band 13 (Channel Bandwidth: 10 MHz)	8M96G7D
<b>Max. ERP Power</b>	LTE Band 12 (Channel Bandwidth: 1.4 MHz)	49.659 mW (16.96dBm)
	LTE Band 12 (Channel Bandwidth: 3 MHz)	49.774 mW (16.97dBm)
	LTE Band 12 (Channel Bandwidth: 5 MHz)	50.119 mW (17.00dBm)
	LTE Band 12 (Channel Bandwidth: 10 MHz)	50.350 mW (17.02dBm)
	LTE Band 13 (Channel Bandwidth: 5 MHz)	107.152 mW (20.30dBm)
	LTE Band 13 (Channel Bandwidth: 10 MHz)	107.895 mW (20.33dBm)

<b>Max. EIRP Power</b>	LTE Band 4 (Channel Bandwidth: 1.4 MHz)	398.107 mW (26.00dBm)
	LTE Band 4 (Channel Bandwidth: 3 MHz)	400.867 mW (26.03dBm)
	LTE Band 4 (Channel Bandwidth: 5 MHz)	394.457 mW (25.96dBm)
	LTE Band 4 (Channel Bandwidth: 10 MHz)	392.645 mW (25.94dBm)
	LTE Band 4 (Channel Bandwidth: 15 MHz)	402.717 mW (26.05dBm)
	LTE Band 4 (Channel Bandwidth: 20 MHz)	404.576 mW (26.07dBm)
<b>Antenna Type</b>	Refer to Note as below	
<b>Accessory Device</b>	Refer to Note as below	
<b>Data Cable Supplied</b>	Refer to Note as below	

Note:

1. All models are listed as below. The model of E4811 was chosen for final test.

Brand	Model	Difference
Kyocera	E4811	with Camera function
	E4811NC	without Camera function

2. The EUT contains following accessory devices.

Product	Brand	Model	Description
Adapter	Kyocera	SCP-47ADT	I/P: 100-240 Vac, 50/60 Hz, 200 mA O/P: 5 Vdc, 1000 mA
Battery	Kyocera	SCP-73LBPS	3.8 Vdc, 1770 mAh, 6.8Wh
USB Cable	Kyocera	SCP-24SDC	1 m shielded Type A to Type C USB cable w/o core

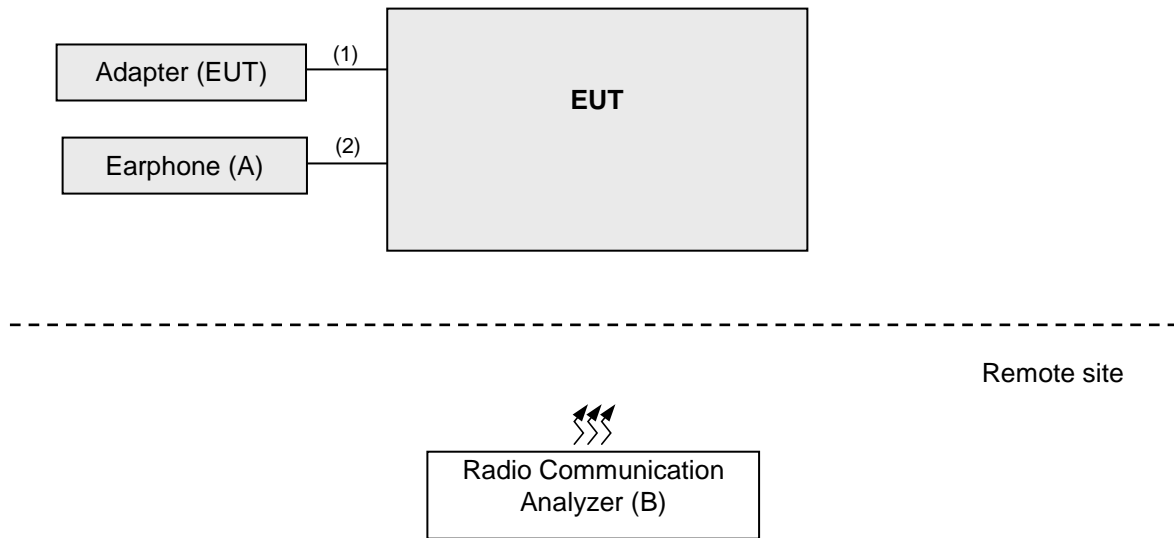
3. The antenna information is listed as below.

Band	Gain (dBi)	Antenna Type	Connector Type
LTE 4	2.19	Internal fixed monopole	N/A
LTE 12	-3.96	Internal fixed monopole	N/A
LTE 13	-0.86	Internal fixed monopole	N/A

4. Detail antenna specification please refer to antenna datasheet and/or antenna measurement report.

5. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

### 3.2 Configuration of System under Test



#### 3.2.1 Description of Support Units

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

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	Earphone	Funkey	FK-130102	NA	N/A	Supplied by applicant
B	Radio Communication Analyzer	Anritsu	MT8821C	6261806803	NA	Supplied by lab

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	USB Cable	1	1	No	0	Accessory of the EUT
2.	Earphone Cable	1	1	No	0	Supplied by applicant

Note: The core(s) is(are) originally attached to the cable(s).

### 3.3 Test Mode Applicability and Tested Channel Detail

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis, and antenna ports

The worst case was found when positioned as the table below. Following channel(s) was (were) selected for the final test as listed below:

Band	Radiated Emission
LTE Band 4	X-plane
LTE Band 12	X-plane
LTE Band 13	X-plane

#### LTE Band 4

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	RB #
-	EIRP	19957 to 20393	19957, 20175, 20393	1.4 MHz	QPSK, 16QAM	1 Half Full
		19965 to 20385	19965, 20175, 20385	3 MHz	QPSK, 16QAM	1 Half Full
		19975 to 20375	19975, 20175, 20375	5 MHz	QPSK, 16QAM	1 Half Full
		20000 to 20350	20000, 20175, 20350	10 MHz	QPSK, 16QAM	1 Half Full
		20025 to 20325	20025, 20175, 20325	15 MHz	QPSK, 16QAM	1 Half Full
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK, 16QAM	1 Half Full
-	Modulation Characteristics	20050 to 20300	20175	5 MHz	QPSK, 16QAM	Full
-	Frequency Stability	19957 to 20393	19957, 20393	1.4 MHz	QPSK	Full
		19965 to 20385	19965, 20385	3 MHz	QPSK	Full
		19975 to 20375	19975, 20375	5 MHz	QPSK	Full
		20000 to 20350	20000, 20350	10 MHz	QPSK	Full
		20025 to 20325	20025, 20325	15 MHz	QPSK	Full
		20050 to 20300	20050, 20300	20 MHz	QPSK	Full
-	Occupied Bandwidth	19957 to 20393	19957, 20175, 20393	1.4 MHz	QPSK, 16QAM	Full
		19965 to 20385	19965, 20175, 20385	3 MHz	QPSK, 16QAM	Full
		19975 to 20375	19975, 20175, 20375	5 MHz	QPSK, 16QAM	Full
		20000 to 20350	20000, 20175, 20350	10 MHz	QPSK, 16QAM	Full
		20025 to 20325	20025, 20175, 20325	15 MHz	QPSK, 16QAM	Full
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK, 16QAM	Full
-	Peak to Average Ratio	19957 to 20393	19957, 20175, 20393	1.4 MHz	QPSK, 16QAM	1
		19965 to 20385	19965, 20175, 20385	3 MHz	QPSK, 16QAM	1
		19975 to 20375	19975, 20175, 20375	5 MHz	QPSK, 16QAM	1
		20000 to 20350	20000, 20175, 20350	10 MHz	QPSK, 16QAM	1
		20025 to 20325	20025, 20175, 20325	15 MHz	QPSK, 16QAM	1
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK, 16QAM	1

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	RB #
-	Band Edge	19957 to 20393	19957, 20393	1.4 MHz	QPSK	1 Half Full
		19965 to 20385	19965, 20385	3 MHz	QPSK	1 Half Full
		19975 to 20375	19975, 20375	5 MHz	QPSK	1 Half Full
		20000 to 20350	20000, 20350	10 MHz	QPSK	1 Half Full
		20025 to 20325	20025, 20325	15 MHz	QPSK	1 Half Full
		20050 to 20300	20050, 20300	20 MHz	QPSK	1 Half Full
-	Conducted Emission	19957 to 20393	19957, 20175, 20393	1.4 MHz	QPSK	1
		19965 to 20385	19965, 20175, 20385	3 MHz	QPSK	1
		19975 to 20375	19975, 20175, 20375	5 MHz	QPSK	1
		20000 to 20350	20000, 20175, 20350	10 MHz	QPSK	1
		20025 to 20325	20025, 20175, 20325	15 MHz	QPSK	1
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK	1
-	Radiated Emission	19957 to 20393	19957, 20175, 20393	1.4 MHz	QPSK	1
		19975 to 20375	19975, 20175, 20375	5 MHz	QPSK	1
		20050 to 20300	20050, 20175, 20300	20 MHz	QPSK	1

**Note:**

1. This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation. Therefore, only modulation characteristics, occupied bandwidth and peak to average ratio items had been tested under QPSK, 16QAM mode, the other items were performed under QPSK mode only.
2. For radiated emission above 1 GHz, according to 3GPP 36.521 Section 6.6.3.1.4, choose the lowest, 5 MHz & highest channel bandwidth for final test.
3. For radiated emissions below 1 GHz, select the worst radiated emission channel for final testing.

### LTE Band 12

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	RB #
-	ERP	23017 to 23173	23017, 23095, 23173	1.4 MHz	QPSK, 16QAM	1 Half Full
		23025 to 23165	23025, 23095, 23165	3 MHz	QPSK, 16QAM	1 Half Full
		23035 to 23155	23035, 23095, 23155	5 MHz	QPSK, 16QAM	1 Half Full
		23060 to 23130	23060, 23095, 23130	10 MHz	QPSK, 16QAM	1 Half Full
-	Modulation Characteristics	23060 to 23130	23095	5 MHz	QPSK, 16QAM	Full
-	Frequency Stability	23017 to 23173	23017, 23173	1.4 MHz	QPSK	Full
		23025 to 23165	23025, 23165	3 MHz	QPSK	Full
		23035 to 23155	23035, 23155	5 MHz	QPSK	Full
		23060 to 23130	23060, 23130	10 MHz	QPSK	Full
-	Occupied Bandwidth	23017 to 23173	23017, 23095, 23173	1.4 MHz	QPSK, 16QAM	Full
		23025 to 23165	23025, 23095, 23165	3 MHz	QPSK, 16QAM	Full
		23035 to 23155	23035, 23095, 23155	5 MHz	QPSK, 16QAM	Full
		23060 to 23130	23060, 23095, 23130	10 MHz	QPSK, 16QAM	Full
-	Peak to Average Ratio	23017 to 23173	23017, 23095, 23173	1.4 MHz	QPSK, 16QAM	1
		23025 to 23165	23025, 23095, 23165	3 MHz	QPSK, 16QAM	1
		23035 to 23155	23035, 23095, 23155	5 MHz	QPSK, 16QAM	1
		23060 to 23130	23060, 23095, 23130	10 MHz	QPSK, 16QAM	1
-	Band Edge	23017 to 23173	23017, 23173	1.4 MHz	QPSK	1 Half Full
		23025 to 23165	23025, 23165	3 MHz	QPSK	1 Half Full
		23035 to 23155	23035, 23155	5 MHz	QPSK	1 Half Full
		23060 to 23130	23060, 23130	10 MHz	QPSK	1 Half Full

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	RB #
-	Conducted Emission	23017 to 23173	23017, 23095, 23173	1.4 MHz	QPSK	1
		23025 to 23165	23025, 23095, 23165	3 MHz	QPSK	1
		23035 to 23155	23035, 23095, 23155	5 MHz	QPSK	1
		23060 to 23130	23060, 23095, 23130	10 MHz	QPSK	1
-	Radiated Emission	23017 to 23173	23017, 23095, 23173	1.4 MHz	QPSK	1
		23035 to 23155	23035, 23095, 23155	5 MHz	QPSK	1
		23060 to 23130	23060, 23095, 23130	10 MHz	QPSK	1

**Note:**

1. This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation. Therefore, only modulation characteristics, occupied bandwidth and peak to average ratio items had been tested under QPSK, 16QAM mode, the other items were performed under QPSK mode only.
2. For radiated emission above 1 GHz, according to 3GPP 36.521 Section 6.6.3.1.4, choose the lowest, 5 MHz & highest channel bandwidth for final test.
3. For radiated emissions below 1 GHz, select the worst radiated emission channel for final testing.

### LTE Band 13

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	RB #
-	ERP	23205 to 23255	23205, 23230, 23255	5 MHz	QPSK, 16QAM	1 Half Full
		23230	23230	10 MHz	QPSK, 16QAM	1 Half Full
-	Modulation Characteristics	23230	23230	5 MHz	QPSK, 16QAM	Full
-	Frequency Stability	23205 to 23255	23205, 23255	5 MHz	QPSK	Full
		23230	23230	10 MHz	QPSK	Full
-	Occupied Bandwidth	23205 to 23255	23205, 23230, 23255	5 MHz	QPSK, 16QAM	Full
		23230	23230	10 MHz	QPSK, 16QAM	Full
-	Peak to Average Ratio	23205 to 23255	23205, 23230, 23255	5 MHz	QPSK, 16QAM	1
		23230	23230	10 MHz	QPSK, 16QAM	1
-	Band Edge	23205 to 23255	23205, 23255	5 MHz	QPSK	1 Half Full
		23230	23230	10 MHz	QPSK	1 Half Full
-	Conducted Emission	23205 to 23255	23205, 23230, 23255	5 MHz	QPSK	1
		23230	23230	10 MHz	QPSK	1
-	Radiated Emission	23205 to 23255	23205, 23230, 23255	5 MHz	QPSK	1
		23230	23230	10 MHz	QPSK	1

**Note:**

1. This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation. Therefore, only modulation characteristics, occupied bandwidth and peak to average ratio items had been tested under QPSK, 16QAM mode, the other items were performed under QPSK mode only.
2. For radiated emission above 1 GHz, according to 3GPP 36.521 Section 6.6.3.1.4, choose the lowest, 5 MHz & highest channel bandwidth for final test.
3. For radiated emissions below 1 GHz, select the worst radiated emission channel for final testing.



**Test Condition:**

Test Item	Environmental Conditions	Input Power	Tested By
ERP / EIRP	25 deg. C, 66 % RH	3.8 Vdc	James Yang
Modulation Characteristics	25 deg. C, 66 % RH	3.8 Vdc	James Yang
Frequency Stability	25 deg. C, 66 % RH	3.8 Vdc	James Yang
Occupied Bandwidth	25 deg. C, 66 % RH	3.8 Vdc	James Yang
Band Edge	25 deg. C, 66 % RH	3.8 Vdc	James Yang
Peak to Average Ratio	25 deg. C, 66 % RH	3.8 Vdc	James Yang
Conducted Emission	25 deg. C, 66 % RH	3.8 Vdc	James Yang
Radiated Emission	25 deg. C, 60 % RH	120 Vac, 60 Hz	Karl Lee / Charles Hsiao

**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 63.26-2015**

**Note:** All test items have been performed and recorded as per the above standards.

**References Test Guidance:**

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

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

**Note:** 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 Band 13:

Control stations and mobile stations in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands and fixed stations transmitting in the 787-788 MHz and 805-806 MHz bands are limited to 30 watts ERP.

Portable stations (hand-held devices) transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands are limited to 3 watts ERP.

For LTE Band 12:

Control and mobile stations in the 698-746 MHz band are limited to 30 watts ERP.

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

For LTE Band 4:

Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP.

#### 4.1.2 Test Procedures

##### Conducted Power Measurement:

- a. The EUT was set up for the maximum power with LTE link data modulation and link up with simulator (Built-in power meter).
- b. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

##### Maximum EIRP / ERP

The relevant equation for determining the maximum ERP or EIRP from the measured RF output power is given in Equation as follows:

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

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

where

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

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

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

#### 4.1.3 Test Setup

##### Conducted Power Measurement:



## 4.1.4 Test Results

**Conducted Output Power (dBm)**

LTE Band 4						
BW	MCS Index	Channel		19957	20175	20393
		Frequency (MHz)		1710.7	1732.5	1754.3
1.4M	QPSK	1	0	23.68	23.79	23.56
		1	2	23.61	23.81	23.41
		1	5	23.60	23.67	23.48
		3	0	23.54	23.55	23.57
		3	1	23.39	23.64	23.50
		3	3	23.41	23.47	23.42
		6	0	22.53	22.51	22.44
	16QAM	1	0	22.56	22.63	22.53
		1	2	22.44	22.52	22.34
		1	5	22.45	22.53	22.31
		3	0	22.65	22.62	22.56
		3	1	22.50	22.72	22.52
		3	3	22.53	22.57	22.43
		6	0	21.39	21.60	21.30

LTE Band 4						
BW	MCS Index	Channel		19965	20175	20385
		Frequency (MHz)		1711.5	1732.5	1753.5
3M	QPSK	1	0	23.51	23.80	23.46
		1	7	23.59	23.84	23.49
		1	14	23.46	23.73	23.48
		8	0	22.59	22.74	22.51
		8	3	22.45	22.67	22.36
		8	7	22.48	22.59	22.48
		15	0	22.42	22.71	22.39
	16QAM	1	0	22.45	22.59	22.42
		1	7	22.51	22.70	22.47
		1	14	22.49	22.54	22.43
		8	0	21.57	21.67	21.47
		8	3	21.50	21.63	21.34
		8	7	21.41	21.48	21.39
		15	0	21.56	21.59	21.45

LTE Band 4						
BW	MCS Index	Channel		19975	20175	20375
		Frequency (MHz)		1712.5	1732.5	1752.5
5M	QPSK	1	0	23.76	23.77	23.55
		1	12	23.54	23.73	23.50
		1	24	23.61	23.72	23.25
		12	0	22.56	22.68	22.30
		12	6	22.61	22.61	22.27
		12	13	22.48	22.64	22.24
		25	0	22.53	22.59	22.36
	16QAM	1	0	22.57	22.76	22.44
		1	12	22.52	22.64	22.32
		1	24	22.45	22.64	22.34
		12	0	21.61	21.69	21.48
		12	6	21.53	21.65	21.43
		12	13	21.48	21.58	21.42
		25	0	21.45	21.53	21.39

LTE Band 4						
BW	MCS Index	Channel		20000	20175	20350
		Frequency (MHz)		1715	1732.5	1750
10M	QPSK	1	0	23.59	23.75	23.54
		1	24	23.61	23.66	23.51
		1	49	23.59	23.68	23.53
		25	0	22.52	22.69	22.39
		25	12	22.53	22.63	22.53
		25	25	22.41	22.62	22.32
		50	0	22.49	22.59	22.38
	16QAM	1	0	22.43	22.76	22.36
		1	24	22.55	22.55	22.38
		1	49	22.54	22.47	22.29
		25	0	21.57	21.70	21.48
		25	12	21.48	21.57	21.41
		25	25	21.39	21.60	21.31
		50	0	21.46	21.49	21.33

LTE Band 4						
BW	MCS Index	Channel		20025	20175	20325
		Frequency (MHz)		1717.5	1732.5	1747.5
15M	QPSK	1	0	23.66	23.86	23.65
		1	37	23.73	23.79	23.62
		1	74	23.69	23.73	23.63
		36	0	22.57	22.70	22.52
		36	19	22.61	22.66	22.53
		36	39	22.59	22.64	22.48
		75	0	22.57	22.67	22.53
	16QAM	1	0	22.54	22.67	22.50
		1	37	22.58	22.70	22.52
		1	74	22.49	22.63	22.45
		36	0	21.60	21.73	21.61
		36	19	21.59	21.68	21.50
		36	39	21.53	21.68	21.50
		75	0	21.52	21.64	21.44

LTE Band 4						
BW	MCS Index	Channel		20050	20175	20300
		Frequency (MHz)		1720	1732.5	1745
20M	QPSK	1	0	23.76	23.88	23.69
		1	50	23.73	23.85	23.66
		1	99	23.70	23.82	23.63
		50	0	22.67	22.79	22.60
		50	25	22.63	22.75	22.56
		50	50	22.60	22.72	22.53
		100	0	22.62	22.74	22.55
	16QAM	1	0	22.64	22.76	22.57
		1	50	22.61	22.73	22.54
		1	99	22.57	22.69	22.50
		50	0	21.69	21.81	21.62
		50	25	21.63	21.75	21.56
		50	50	21.59	21.71	21.52
		100	0	21.61	21.73	21.54

LTE Band 12						
BW	MCS Index	Channel		23017	23095	23173
		Frequency (MHz)		699.7	707.5	715.3
1.4M	QPSK	1	0	23.04	23.03	23.07
		1	2	23.03	23.00	23.02
		1	5	23.00	23.02	22.94
		3	0	23.06	22.91	22.99
		3	1	22.91	23.12	22.96
		3	3	22.93	22.95	22.93
		6	0	21.92	22.10	21.94
	16QAM	1	0	21.96	22.06	21.99
		1	2	22.04	22.00	21.97
		1	5	21.95	22.01	21.98
		3	0	22.08	22.09	22.02
		3	1	22.06	22.05	22.01
		3	3	21.98	21.97	21.99
		6	0	22.02	22.08	21.96

LTE Band 12						
BW	MCS Index	Channel		23025	23095	23165
		Frequency (MHz)		700.5	707.5	714.5
3M	QPSK	1	0	23.08	23.04	23.07
		1	7	23.06	23.08	23.05
		1	14	23.00	23.00	22.96
		8	0	22.10	22.08	22.06
		8	3	22.05	22.06	22.04
		8	7	22.07	22.10	21.99
		15	0	22.01	22.05	21.99
	16QAM	1	0	22.07	22.14	22.10
		1	7	21.99	22.09	22.00
		1	14	22.03	22.00	21.96
		8	0	21.06	21.08	21.04
		8	3	21.05	21.02	20.94
		8	7	20.99	21.03	20.92
		15	0	20.95	21.01	20.92

LTE Band 12						
BW	MCS Index	Channel		23035	23095	23155
		Frequency (MHz)		701.5	707.5	713.5
5M	QPSK	1	0	23.11	23.03	23.08
		1	12	23.05	23.04	22.98
		1	24	22.96	23.02	23.01
		12	0	22.12	22.12	22.04
		12	6	22.04	22.04	22.10
		12	13	22.05	22.05	22.03
		25	0	22.10	22.03	22.00
	16QAM	1	0	22.04	22.13	22.10
		1	12	22.03	22.10	21.97
		1	24	21.96	22.02	22.04
		12	0	21.00	21.08	21.01
		12	6	20.99	21.03	21.01
		12	13	21.02	21.00	21.00
		25	0	20.94	21.00	21.02

LTE Band 12						
BW	MCS Index	Channel		23060	23095	23130
		Frequency (MHz)		704	707.5	711
10M	QPSK	1	0	23.11	23.13	23.09
		1	24	23.07	23.09	23.05
		1	49	23.05	23.07	23.03
		25	0	22.14	22.16	22.12
		25	12	22.12	22.14	22.10
		25	25	22.09	22.11	22.07
		50	0	22.11	22.13	22.09
	16QAM	1	0	22.12	22.14	22.10
		1	24	22.09	22.11	22.07
		1	49	22.06	22.08	22.04
		25	0	21.10	21.12	21.08
		25	12	21.05	21.07	21.03
		25	25	21.03	21.05	21.01
		50	0	21.04	21.06	21.02

LTE Band 13						
BW	MCS Index	Channel		23205	23230	23255
		Frequency (MHz)		779.5	782	784.5
5M	QPSK	1	0	23.25	23.31	23.29
		1	12	23.17	23.21	23.25
		1	24	23.08	23.08	23.02
		12	0	22.34	22.26	22.27
		12	6	22.22	22.27	22.29
		12	13	22.10	22.16	22.11
		25	0	22.17	22.22	22.25
	16QAM	1	0	22.60	22.58	22.53
		1	12	22.52	22.50	22.47
		1	24	22.39	22.36	22.37
		12	0	21.28	21.25	21.30
		12	6	21.28	21.21	21.20
		12	13	21.06	21.15	21.16
		25	0	21.23	21.16	21.21

LTE Band 13				
BW	MCS Index	Channel		23230
		Frequency (MHz)		782
10M	QPSK	1	0	23.34
		1	24	23.25
		1	49	23.12
		25	0	22.34
		25	12	22.32
		25	25	22.17
		50	0	22.26
	16QAM	1	0	22.61
		1	24	22.54
		1	49	22.42
		25	0	21.35
		25	12	21.30
		25	25	21.16
		50	0	21.25



**EIRP Power(dBm)**

LTE Band 4						
BW	MCS Index	Channel		19957	20175	20393
		Frequency (MHz)		1710.7	1732.5	1754.3
1.4M	QPSK	1	0	25.87	25.98	25.75
		1	2	25.80	<b>26.00</b>	25.60
		1	5	25.79	25.86	25.67
		3	0	25.73	25.74	25.76
		3	1	25.58	25.83	25.69
		3	3	25.60	25.66	25.61
		6	0	24.72	24.70	24.63
	16QAM	1	0	24.75	24.82	24.72
		1	2	24.63	24.71	24.53
		1	5	24.64	24.72	24.50
		3	0	24.84	24.81	24.75
		3	1	24.69	24.91	24.71
		3	3	24.72	24.76	24.62
		6	0	23.58	23.79	23.49

\*EIRP = Conducted + antenna gain (2.19dBi)

LTE Band 4						
BW	MCS Index	Channel		19965	20175	20385
		Frequency (MHz)		1711.5	1732.5	1753.5
3M	QPSK	1	0	25.70	25.99	25.65
		1	7	25.78	<b>26.03</b>	25.68
		1	14	25.65	25.92	25.67
		8	0	24.78	24.93	24.70
		8	3	24.64	24.86	24.55
		8	7	24.67	24.78	24.67
		15	0	24.61	24.90	24.58
	16QAM	1	0	24.64	24.78	24.61
		1	7	24.70	24.89	24.66
		1	14	24.68	24.73	24.62
		8	0	23.76	23.86	23.66
		8	3	23.69	23.82	23.53
		8	7	23.60	23.67	23.58
		15	0	23.75	23.78	23.64

\*EIRP = Conducted + antenna gain (2.19dBi)

LTE Band 4						
BW	MCS Index	Channel		19975	20175	20375
		Frequency (MHz)		1712.5	1732.5	1752.5
5M	QPSK	1	0	25.95	<b>25.96</b>	25.74
		1	12	25.73	25.92	25.69
		1	24	25.80	25.91	25.44
		12	0	24.75	24.87	24.49
		12	6	24.80	24.80	24.46
		12	13	24.67	24.83	24.43
		25	0	24.72	24.78	24.55
	16QAM	1	0	24.76	24.95	24.63
		1	12	24.71	24.83	24.51
		1	24	24.64	24.83	24.53
		12	0	23.80	23.88	23.67
		12	6	23.72	23.84	23.62
		12	13	23.67	23.77	23.61
		25	0	23.64	23.72	23.58

\*EIRP = Conducted + antenna gain (2.19dBi)

LTE Band 4						
BW	MCS Index	Channel		20000	20175	20350
		Frequency (MHz)		1715	1732.5	1750
10M	QPSK	1	0	25.78	<b>25.94</b>	25.73
		1	24	25.80	25.85	25.70
		1	49	25.78	25.87	25.72
		25	0	24.71	24.88	24.58
		25	12	24.72	24.82	24.72
		25	25	24.60	24.81	24.51
		50	0	24.68	24.78	24.57
	16QAM	1	0	24.62	24.95	24.55
		1	24	24.74	24.74	24.57
		1	49	24.73	24.66	24.48
		25	0	23.76	23.89	23.67
		25	12	23.67	23.76	23.60
		25	25	23.58	23.79	23.50
		50	0	23.65	23.68	23.52

\*EIRP = Conducted + antenna gain (2.19dBi)

LTE Band 4						
BW	MCS Index	Channel		20025	20175	20325
		Frequency (MHz)		1717.5	1732.5	1747.5
15M	QPSK	1	0	25.85	<b>26.05</b>	25.84
		1	37	25.92	25.98	25.81
		1	74	25.88	25.92	25.82
		36	0	24.76	24.89	24.71
		36	19	24.80	24.85	24.72
		36	39	24.78	24.83	24.67
		75	0	24.76	24.86	24.72
	16QAM	1	0	24.73	24.86	24.69
		1	37	24.77	24.89	24.71
		1	74	24.68	24.82	24.64
		36	0	23.79	23.92	23.80
		36	19	23.78	23.87	23.69
		36	39	23.72	23.87	23.69
		75	0	23.71	23.83	23.63

\*EIRP = Conducted + antenna gain (2.19dBi)

LTE Band 4						
BW	MCS Index	Channel		20050	20175	20300
		Frequency (MHz)		1720	1732.5	1745
20M	QPSK	1	0	25.95	<b>26.07</b>	25.88
		1	50	25.92	26.04	25.85
		1	99	25.89	26.01	25.82
		50	0	24.86	24.98	24.79
		50	25	24.82	24.94	24.75
		50	50	24.79	24.91	24.72
		100	0	24.81	24.93	24.74
	16QAM	1	0	24.83	24.95	24.76
		1	50	24.80	24.92	24.73
		1	99	24.76	24.88	24.69
		50	0	23.88	24.00	23.81
		50	25	23.82	23.94	23.75
		50	50	23.78	23.90	23.71
		100	0	23.80	23.92	23.73

\*EIRP = Conducted + antenna gain (2.19dBi)

**ERP Power (dBm)**

LTE Band 12						
BW	MCS Index	Channel		23017	23095	23173
		Frequency (MHz)		699.7	707.5	715.3
1.4M	QPSK	1	0	16.93	16.92	<b>16.96</b>
		1	2	16.92	16.89	16.91
		1	5	16.89	16.91	16.83
		3	0	16.95	16.80	16.88
		3	1	16.80	17.01	16.85
		3	3	16.82	16.84	16.82
		6	0	15.81	15.99	15.83
	16QAM	1	0	15.85	15.95	15.88
		1	2	15.93	15.89	15.86
		1	5	15.84	15.90	15.87
		3	0	15.97	15.98	15.91
		3	1	15.95	15.94	15.90
		3	3	15.87	15.86	15.88
		6	0	15.91	15.97	15.85

\*ERP = Conducted + antenna gain (-3.96dBi)-2.15

LTE Band 12						
BW	MCS Index	Channel		23025	23095	23165
		Frequency (MHz)		700.5	707.5	714.5
3M	QPSK	1	0	<b>16.97</b>	16.93	16.96
		1	7	16.95	<b>16.97</b>	16.94
		1	14	16.89	16.89	16.85
		8	0	15.99	15.97	15.95
		8	3	15.94	15.95	15.93
		8	7	15.96	15.99	15.88
		15	0	15.90	15.94	15.88
	16QAM	1	0	15.96	16.03	15.99
		1	7	15.88	15.98	15.89
		1	14	15.92	15.89	15.85
		8	0	14.95	14.97	14.93
		8	3	14.94	14.91	14.83
		8	7	14.88	14.92	14.81
		15	0	14.84	14.90	14.81

\*ERP = Conducted + antenna gain (-3.96dBi)-2.15

LTE Band 12						
BW	MCS Index	Channel		23035	23095	23155
		Frequency (MHz)		701.5	707.5	713.5
5M	QPSK	1	0	<b>17.00</b>	16.92	16.97
		1	12	16.94	16.93	16.87
		1	24	16.85	16.91	16.90
		12	0	16.01	16.01	15.93
		12	6	15.93	15.93	15.99
		12	13	15.94	15.94	15.92
		25	0	15.99	15.92	15.89
	16QAM	1	0	15.93	16.02	15.99
		1	12	15.92	15.99	15.86
		1	24	15.85	15.91	15.93
		12	0	14.89	14.97	14.90
		12	6	14.88	14.92	14.90
		12	13	14.91	14.89	14.89
		25	0	14.83	14.89	14.91

\*ERP = Conducted + antenna gain (-3.96dBi)-2.15

LTE Band 12						
BW	MCS Index	Channel		23060	23095	23130
		Frequency (MHz)		704	707.5	711
10M	QPSK	1	0	17.00	<b>17.02</b>	16.98
		1	24	16.96	16.98	16.94
		1	49	16.94	16.96	16.92
		25	0	16.03	16.05	16.01
		25	12	16.01	16.03	15.99
		25	25	15.98	16.00	15.96
		50	0	16.00	16.02	15.98
	16QAM	1	0	16.01	16.03	15.99
		1	24	15.98	16.00	15.96
		1	49	15.95	15.97	15.93
		25	0	14.99	15.01	14.97
		25	12	14.94	14.96	14.92
		25	25	14.92	14.94	14.90
		50	0	14.93	14.95	14.91

\*ERP = Conducted + antenna gain (-3.96dBi)-2.15

LTE Band 13						
BW	MCS Index	Channel		23205	23230	23255
		Frequency (MHz)		779.5	782	784.5
5M	QPSK	1	0	20.24	<b>20.30</b>	20.28
		1	12	20.16	20.20	20.24
		1	24	20.07	20.07	20.01
		12	0	19.33	19.25	19.26
		12	6	19.21	19.26	19.28
		12	13	19.09	19.15	19.10
		25	0	19.16	19.21	19.24
	16QAM	1	0	19.59	19.57	19.52
		1	12	19.51	19.49	19.46
		1	24	19.38	19.35	19.36
		12	0	18.27	18.24	18.29
		12	6	18.27	18.20	18.19
		12	13	18.05	18.14	18.15
		25	0	18.22	18.15	18.20

\*ERP = Conducted + antenna gain (-0.86dBi)-2.15

LTE Band 13				
BW	MCS Index	Channel		23230
		Frequency (MHz)		782
10M	QPSK	1	0	<b>20.33</b>
		1	24	20.24
		1	49	20.11
		25	0	19.33
		25	12	19.31
		25	25	19.16
		50	0	19.25
	16QAM	1	0	19.60
		1	24	19.53
		1	49	19.41
		25	0	18.34
		25	12	18.29
		25	25	18.15
		50	0	18.24

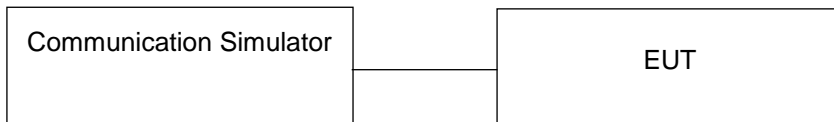
\*ERP = Conducted + antenna gain (-0.86dBi)-2.15

## 4.2 Modulation Characteristics Measurement

### 4.2.1 Limits of Modulation Characteristics

N/A

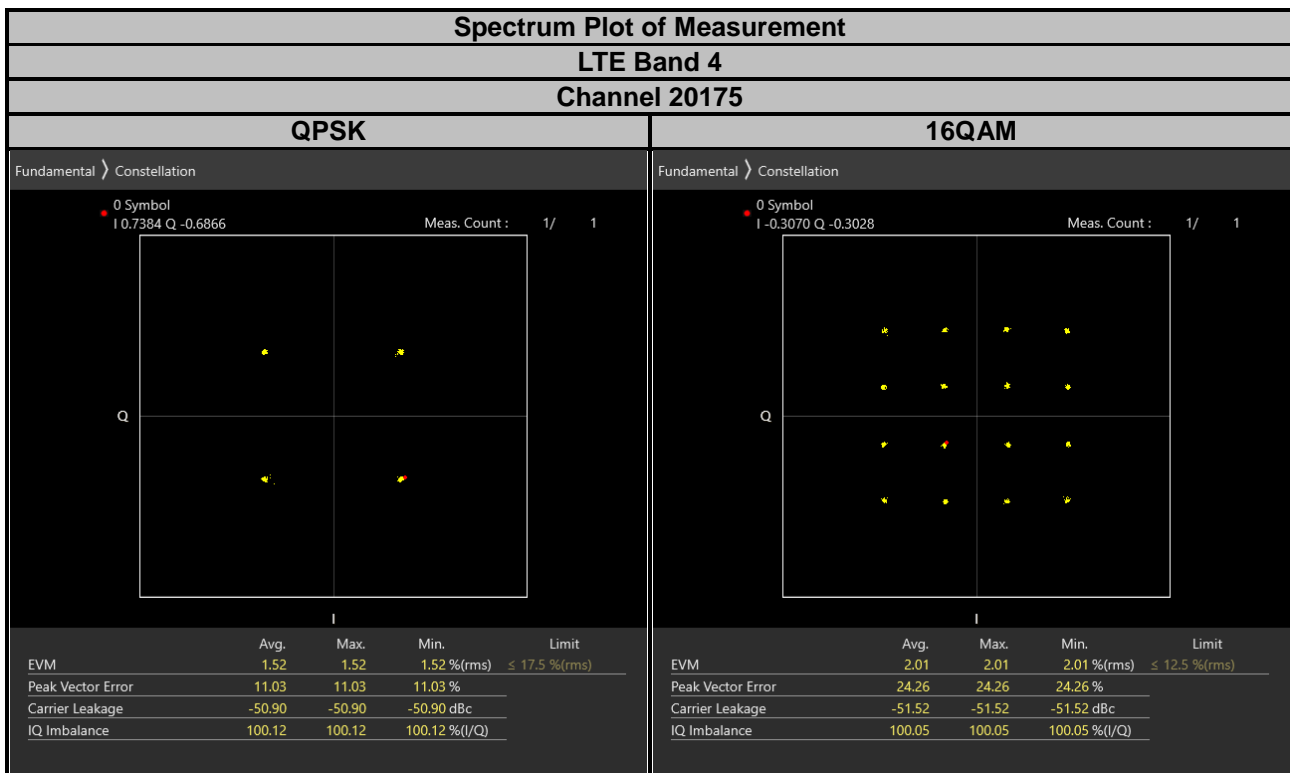
### 4.2.2 Test Setup

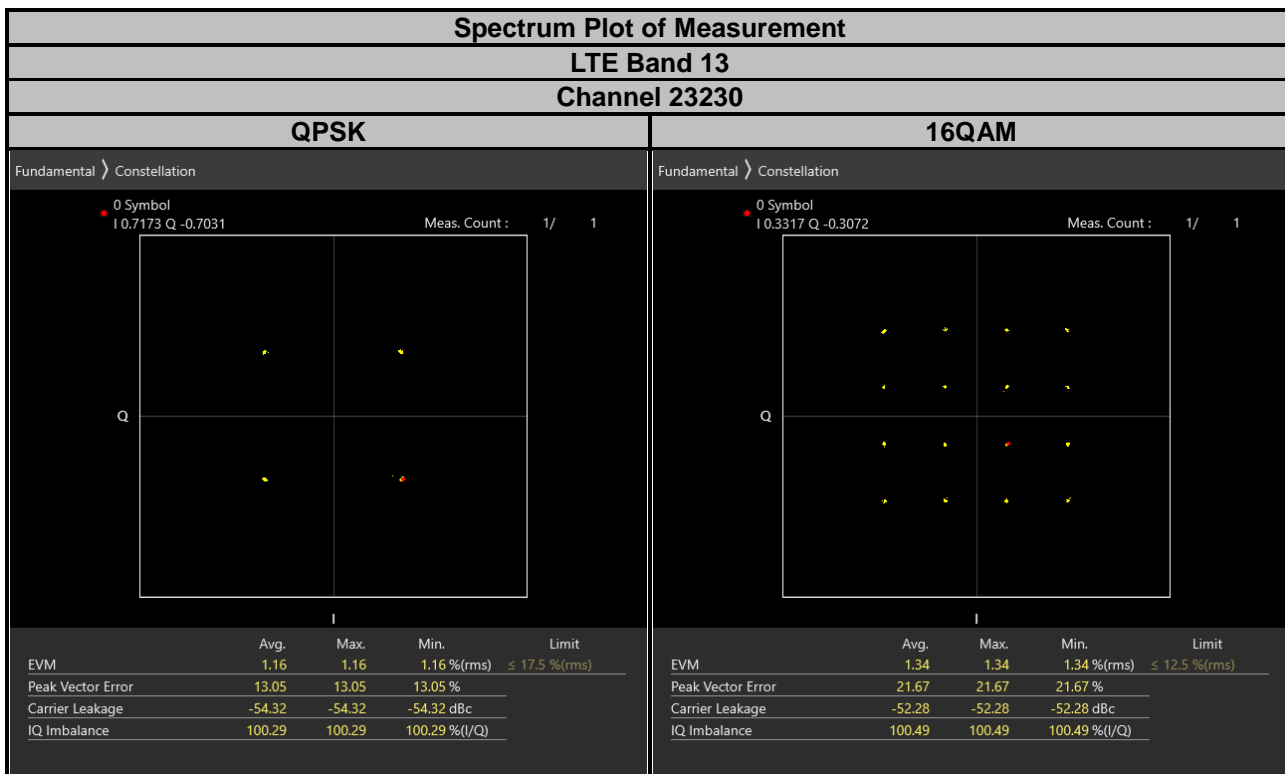
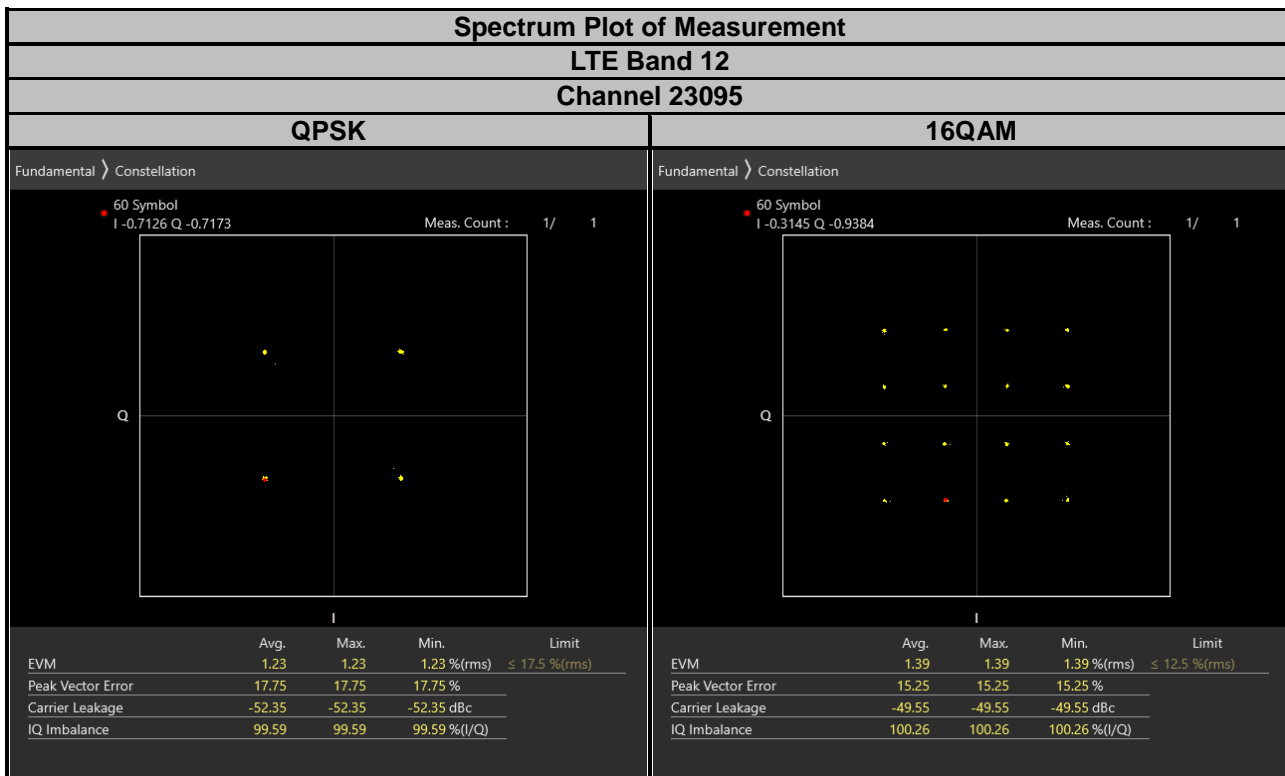


### 4.2.3 Test Procedure

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.

### 4.2.4 Test Results







### 4.3 Frequency Stability Measurement

#### 4.3.1 Limits of Frequency Stability Measurement

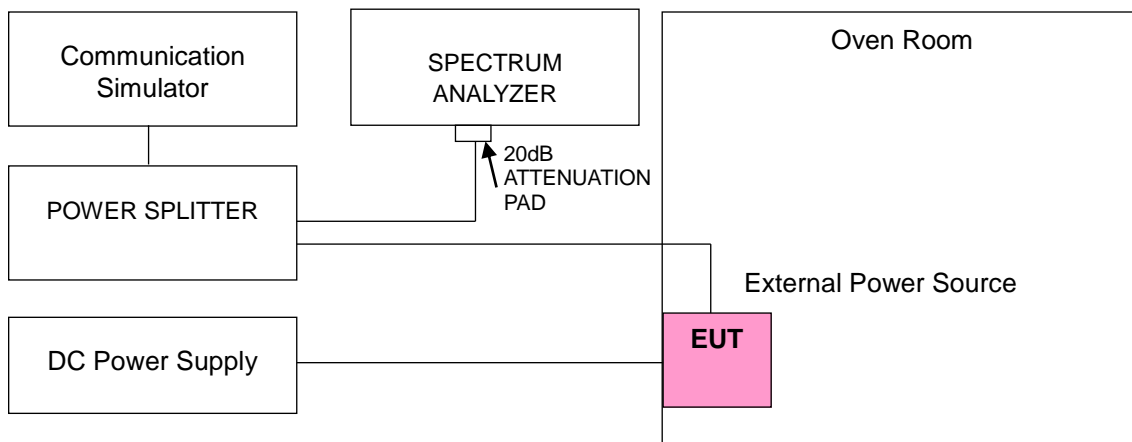
The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

#### 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 Setup



#### 4.3.4 Test Results

##### Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 4			
	Channel Bandwidth: 1.4 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.8	1710.700004	0.002	1754.300004	0.002
3.23	1710.700001	0.001	1754.300003	0.002
4.37	1710.700002	0.001	1754.300003	0.002

**Note:** The applicant defined the normal working voltage of the battery is from 3.23 Vdc to 4.37 Vdc.

##### 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	1710.700003	0.002	1754.300003	0.002
-20	1710.700002	0.001	1754.300003	0.002
-10	1710.700001	0.001	1754.300004	0.002
0	1710.700003	0.002	1754.300002	0.001
10	1710.700004	0.002	1754.300004	0.002
20	1710.699999	-0.001	1754.299998	-0.001
30	1710.699997	-0.002	1754.299999	-0.001
40	1710.699998	-0.001	1754.299996	-0.002
50	1710.699999	-0.001	1754.299998	-0.001
60	1710.699999	-0.001	1754.299998	-0.001

## Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 4			
	Channel Bandwidth: 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.8	1711.500001	0.001	1753.500004	0.002
3.23	1711.500001	0.001	1753.500003	0.002
4.37	1711.500001	0.001	1753.500002	0.001

**Note:** The applicant defined the normal working voltage of the battery is from 3.23 Vdc to 4.37 Vdc.

## 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	1711.500002	0.001	1753.500003	0.002
-20	1711.500003	0.002	1753.500001	0.001
-10	1711.500003	0.002	1753.500001	0.001
0	1711.500004	0.002	1753.500004	0.002
10	1711.500003	0.002	1753.500003	0.002
20	1711.499996	-0.002	1753.499999	-0.001
30	1711.499998	-0.001	1753.499999	-0.001
40	1711.499998	-0.001	1753.499998	-0.001
50	1711.499999	-0.001	1753.499997	-0.002
60	1711.499997	-0.002	1753.499997	-0.002

## Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 4			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.8	1712.500004	0.002	1752.500001	0.001
3.23	1712.500003	0.002	1752.500003	0.002
4.37	1712.500002	0.001	1752.500004	0.002

**Note:** The applicant defined the normal working voltage of the battery is from 3.23 Vdc to 4.37 Vdc.

## Frequency Error vs. Temperature

Temp. (°C)	LTE Band 4			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1712.500002	0.001	1752.500004	0.002
-20	1712.500002	0.001	1752.500002	0.001
-10	1712.500002	0.001	1752.500003	0.002
0	1712.500002	0.001	1752.500004	0.002
10	1712.500001	0.001	1752.500001	0.001
20	1712.499998	-0.001	1752.499996	-0.002
30	1712.499996	-0.002	1752.499998	-0.001
40	1712.499999	-0.001	1752.499999	-0.001
50	1712.499999	-0.001	1752.499996	-0.002
60	1712.499996	-0.002	1752.499999	-0.001

## Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 4			
	Channel Bandwidth: 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.8	1715.000001	0.001	1750.000001	0.001
3.23	1715.000002	0.001	1750.000003	0.002
4.37	1715.000002	0.001	1750.000001	0.001

**Note:** The applicant defined the normal working voltage of the battery is from 3.23 Vdc to 4.37 Vdc.

## Frequency Error vs. Temperature

Temp. (°C)	LTE Band 4			
	Channel Bandwidth: 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1715.000004	0.002	1750.000003	0.002
-20	1715.000001	0.001	1750.000003	0.002
-10	1715.000003	0.002	1750.000001	0.001
0	1715.000001	0.001	1750.000004	0.002
10	1715.000001	0.001	1750.000001	0.001
20	1714.999996	-0.002	1749.999999	-0.001
30	1714.999996	-0.002	1749.999998	-0.001
40	1714.999997	-0.002	1749.999998	-0.001
50	1714.999996	-0.002	1749.999997	-0.002
60	1714.999997	-0.002	1749.999999	-0.001

## Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 4			
	Channel Bandwidth: 15 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.8	1717.500004	0.002	1747.500004	0.002
3.23	1717.500004	0.002	1747.500003	0.002
4.37	1717.500002	0.001	1747.500003	0.002

**Note:** The applicant defined the normal working voltage of the battery is from 3.23 Vdc to 4.37 Vdc.

## Frequency Error vs. Temperature

Temp. (°C)	LTE Band 4			
	Channel Bandwidth: 15 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1717.500002	0.001	1747.500004	0.002
-20	1717.500003	0.002	1747.500001	0.001
-10	1717.500004	0.002	1747.500003	0.002
0	1717.500001	0.001	1747.500004	0.002
10	1717.500003	0.002	1747.500001	0.001
20	1717.499997	-0.002	1747.499999	-0.001
30	1717.499999	-0.001	1747.499998	-0.001
40	1717.499999	-0.001	1747.499998	-0.001
50	1717.499998	-0.001	1747.499999	-0.001
60	1717.499996	-0.002	1747.499997	-0.002

## Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 4			
	Channel Bandwidth: 20 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.8	1720.000003	0.002	1745.000004	0.002
3.23	1720.000003	0.002	1745.000003	0.002
4.37	1720.000002	0.001	1745.000002	0.001

**Note:** The applicant defined the normal working voltage of the battery is from 3.23 Vdc to 4.37 Vdc.

## Frequency Error vs. Temperature

Temp. (°C)	LTE Band 4			
	Channel Bandwidth: 20 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1720.000003	0.002	1745.000004	0.002
-20	1720.000004	0.002	1745.000002	0.001
-10	1720.000004	0.002	1745.000004	0.002
0	1720.000002	0.001	1745.000003	0.002
10	1720.000001	0.001	1745.000004	0.002
20	1719.999997	-0.002	1744.999998	-0.001
30	1719.999996	-0.002	1744.999998	-0.001
40	1719.999998	-0.001	1744.999996	-0.002
50	1719.999996	-0.002	1744.999997	-0.002
60	1719.999998	-0.001	1744.999996	-0.002

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 12			
	Channel Bandwidth: 1.4 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.8	699.700004	0.006	715.300004	0.006
3.23	699.700001	0.001	715.300001	0.001
4.37	699.700004	0.006	715.300004	0.006

**Note:** The applicant defined the normal working voltage of the battery is from 3.23 Vdc to 4.37 Vdc.

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	699.700003	0.004	715.300001	0.001
-20	699.700004	0.006	715.300004	0.006
-10	699.700003	0.004	715.300002	0.003
0	699.700003	0.004	715.300004	0.006
10	699.700004	0.006	715.300002	0.003
20	699.699998	-0.003	715.299999	-0.001
30	699.699996	-0.006	715.299996	-0.006
40	699.699996	-0.006	715.299996	-0.006
50	699.699999	-0.001	715.299996	-0.006
60	699.699999	-0.001	715.299996	-0.006



## Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 12			
	Channel Bandwidth: 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.8	700.500001	0.001	714.500004	0.006
3.23	700.500001	0.001	714.500002	0.003
4.37	700.500004	0.006	714.500004	0.006

**Note:** The applicant defined the normal working voltage of the battery is from 3.23 Vdc to 4.37 Vdc.

## 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	700.500002	0.003	714.500001	0.001
-20	700.500003	0.004	714.500004	0.006
-10	700.500002	0.003	714.500002	0.003
0	700.500001	0.001	714.500002	0.003
10	700.500001	0.001	714.500003	0.004
20	700.499997	-0.004	714.499999	-0.001
30	700.499997	-0.004	714.499998	-0.003
40	700.499999	-0.001	714.499997	-0.004
50	700.499999	-0.001	714.499996	-0.006
60	700.499997	-0.004	714.499996	-0.006

## Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 12			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.8	701.500004	0.006	713.500002	0.003
3.23	701.500003	0.004	713.500004	0.006
4.37	701.500002	0.003	713.500001	0.001

**Note:** The applicant defined the normal working voltage of the battery is from 3.23 Vdc to 4.37 Vdc.

## Frequency Error vs. Temperature

Temp. (°C)	LTE Band 12			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	701.500004	0.006	713.500001	0.001
-20	701.500001	0.001	713.500004	0.006
-10	701.500002	0.003	713.500002	0.003
0	701.500002	0.003	713.500004	0.006
10	701.500001	0.001	713.500003	0.004
20	701.499997	-0.004	713.499997	-0.004
30	701.499999	-0.001	713.499999	-0.001
40	701.499999	-0.001	713.499999	-0.001
50	701.499999	-0.001	713.499998	-0.003
60	701.499999	-0.001	713.499998	-0.003

**Frequency Error vs. Voltage**

Voltage (Volts)	LTE Band 12			
	Channel Bandwidth: 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.8	704.000003	0.004	711.000003	0.004
3.23	704.000001	0.001	711.000002	0.003
4.37	704.000004	0.006	711.000004	0.006

**Note:** The applicant defined the normal working voltage of the battery is from 3.23 Vdc to 4.37 Vdc.

**Frequency Error vs. Temperature**

Temp. (°C)	LTE Band 12			
	Channel Bandwidth: 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	704.000001	0.001	711.000002	0.003
-20	704.000004	0.006	711.000001	0.001
-10	704.000003	0.004	711.000004	0.006
0	704.000001	0.001	711.000002	0.003
10	704.000003	0.004	711.000004	0.006
20	703.999997	-0.004	710.999997	-0.004
30	703.999998	-0.003	710.999998	-0.003
40	703.999999	-0.001	710.999999	-0.001
50	703.999999	-0.001	710.999999	-0.001
60	703.999996	-0.006	710.999996	-0.006

## Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 13			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.8	779.500001	0.001	784.500001	0.001
3.23	779.500001	0.001	784.500002	0.003
4.37	779.500002	0.003	784.500004	0.005

**Note:** The applicant defined the normal working voltage of the battery is from 3.23 Vdc to 4.37 Vdc.

## Frequency Error vs. Temperature

Temp. (°C)	LTE Band 13			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	779.500001	0.001	784.500002	0.003
-20	779.500003	0.004	784.500002	0.003
-10	779.500002	0.003	784.500001	0.001
0	779.500004	0.005	784.500001	0.001
10	779.500001	0.001	784.500003	0.004
20	779.499999	-0.001	784.499998	-0.003
30	779.499999	-0.001	784.499996	-0.005
40	779.499999	-0.001	784.499998	-0.003
50	779.499998	-0.003	784.499999	-0.001
60	779.499999	-0.001	784.499996	-0.005

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 13	
	Channel Bandwidth: 10 MHz	
	Frequency (MHz)	Frequency Error (ppm)
3.8	782.000001	0.001
3.23	782.000004	0.005
4.37	782.000004	0.005

**Note:** The applicant defined the normal working voltage of the battery is from 3.23 Vdc to 4.37 Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 13	
	Channel Bandwidth: 10 MHz	
	Frequency (MHz)	Frequency Error (ppm)
-30	782.000003	0.004
-20	782.000003	0.004
-10	782.000004	0.005
0	782.000002	0.003
10	782.000002	0.003
20	781.999998	-0.003
30	781.999996	-0.005
40	781.999997	-0.004
50	781.999998	-0.003
60	781.999996	-0.005

## 4.4 Emission Bandwidth Measurement

### 4.4.1 Limits of Occupied Bandwidth Measurement

According to FCC 2.1049, the occupied bandwidth, 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.

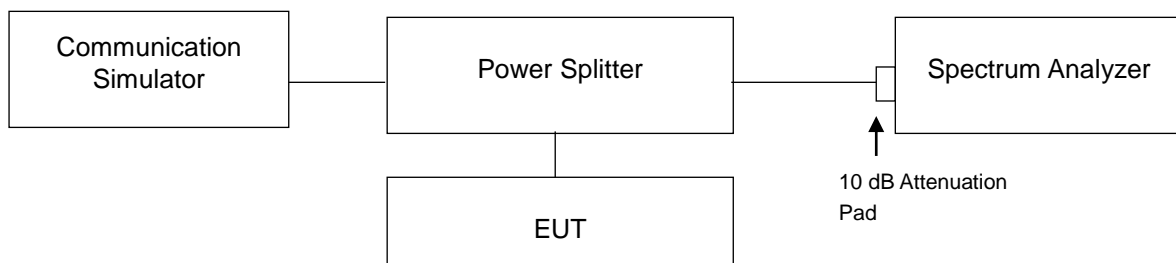
### 4.4.2 Test Procedure

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  $\geq 3 \times$  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



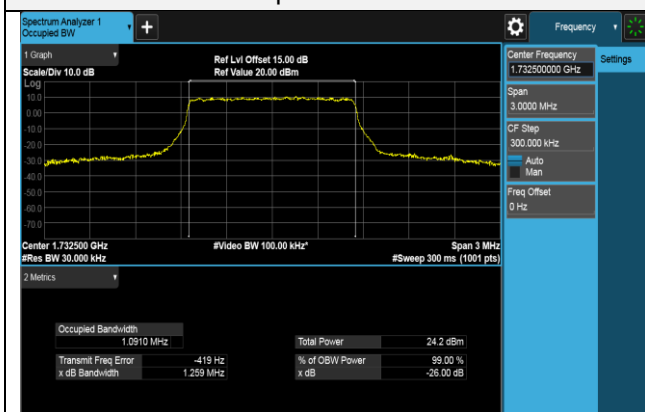
#### 4.4.4 Test Result

#### LTE Band 4 (Channel Bandwidth 1.4MHz)

Test Condition	Channel	Frequency (MHz)	Occupied bandwidth (MHz)	26 dB Bandwidth (MHz)
QPSK	19957	1710.7	1.0871	1.245
QPSK	20175	1732.5	1.0910	1.259
QPSK	20393	1754.3	1.0891	1.256
16QAM	19957	1710.7	1.0867	1.250
16QAM	20175	1732.5	1.0871	1.256
16QAM	20393	1754.3	1.0862	1.249

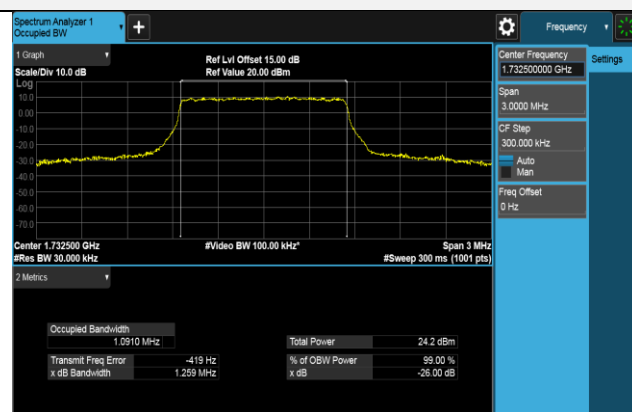
#### Spectrum Plot of Worst Value

##### Occupied bandwidth



QPSK CH 20175 (1732.5MHz)

##### 26 dB Bandwidth



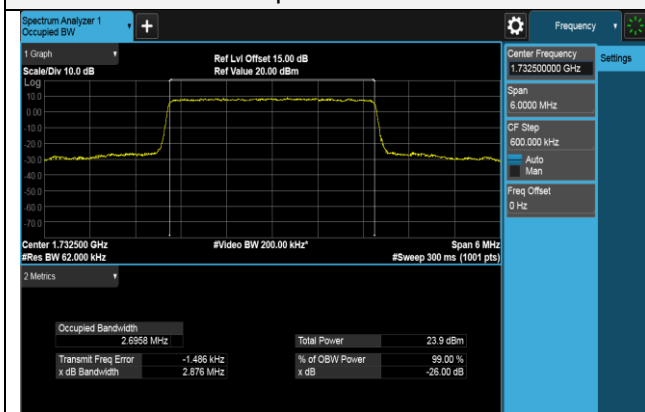
QPSK CH 20175 (1732.5MHz)

### LTE Band 4 (Channel Bandwidth 3MHz)

Test Condition	Channel	Frequency (MHz)	Occupied bandwidth (MHz)	26 dB Bandwidth (MHz)
QPSK	19965	1711.5	2.6941	2.868
QPSK	20175	1732.5	2.6958	2.876
QPSK	20385	1753.5	2.6954	2.873
16QAM	19965	1711.5	2.6940	2.876
16QAM	20175	1732.5	2.6936	2.880
16QAM	20385	1753.5	2.6934	2.879

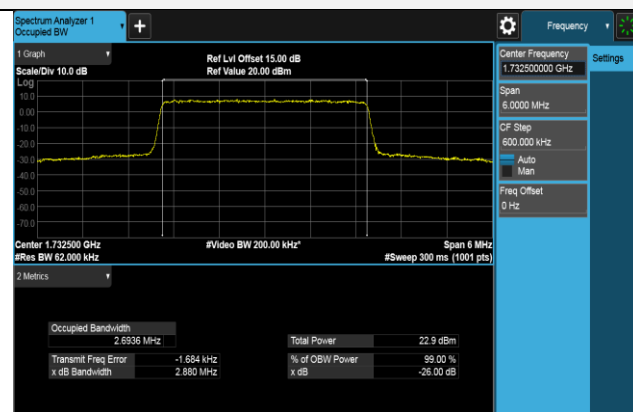
### Spectrum Plot of Worst Value

Occupied bandwidth



QPSK CH 20175 (1732.5MHz)

26 dB Bandwidth



16QAM CH 20175 (1732.5MHz)

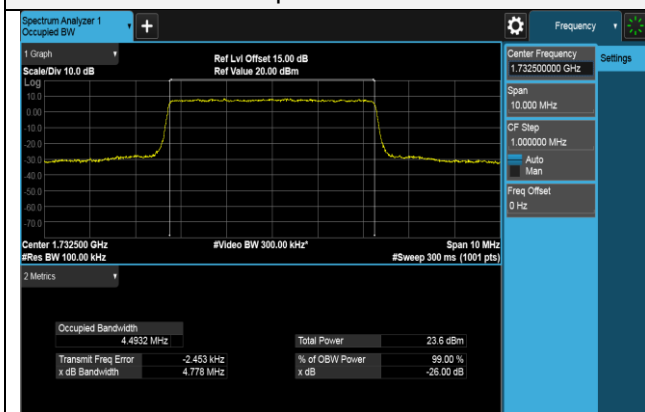


LTE Band 4 (Channel Bandwidth 5MHz)

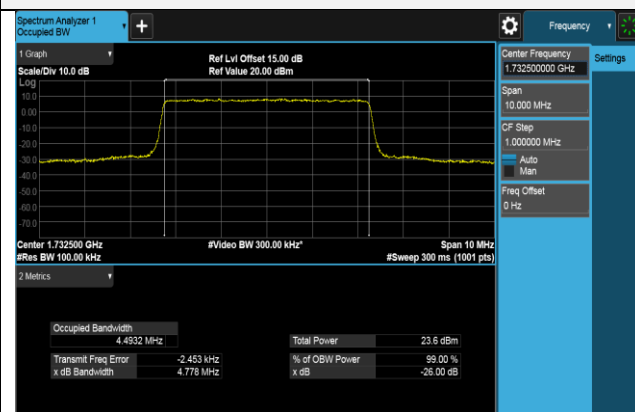
Test Condition	Channel	Frequency (MHz)	Occupied bandwidth (MHz)	26 dB Bandwidth (MHz)
QPSK	19975	1712.5	4.4920	4.774
QPSK	20175	1732.5	4.4932	4.778
QPSK	20375	1752.5	4.4884	4.769
16QAM	19975	1712.5	4.4896	4.766
16QAM	20175	1732.5	4.4897	4.773
16QAM	20375	1752.5	4.4879	4.767

Spectrum Plot of Worst Value

Occupied bandwidth



26 dB Bandwidth



QPSK CH 20175 (1732.5MHz)

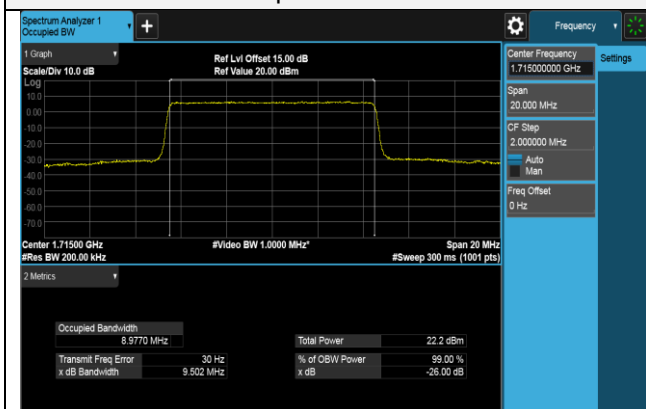
QPSK CH 20175 (1732.5MHz)

LTE Band 4 (Channel Bandwidth 10MHz)

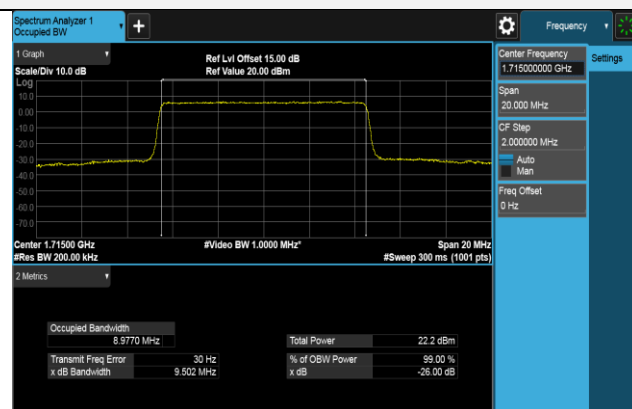
Test Condition	Channel	Frequency (MHz)	Occupied bandwidth (MHz)	26 dB Bandwidth (MHz)
QPSK	20000	1715	8.9714	9.501
QPSK	20175	1732.5	8.9687	9.489
QPSK	20350	1750	8.9702	9.496
16QAM	20000	1715	8.9770	9.502
16QAM	20175	1732.5	8.9714	9.498
16QAM	20350	1750	8.9697	9.495

Spectrum Plot of Worst Value

Occupied bandwidth



26 dB Bandwidth



16QAM CH 20000 (1715MHz)

16QAM CH 20000 (1715MHz)

LTE Band 4 (Channel Bandwidth 15MHz)

Test Condition	Channel	Frequency (MHz)	Occupied bandwidth (MHz)	26 dB Bandwidth (MHz)
QPSK	20025	1717.5	13.4642	14.227
QPSK	20175	1732.5	13.4518	14.220
QPSK	20325	1747.5	13.4694	14.214
16QAM	20025	1717.5	13.4584	14.230
16QAM	20175	1732.5	13.4489	14.214
16QAM	20325	1747.5	13.4568	14.227

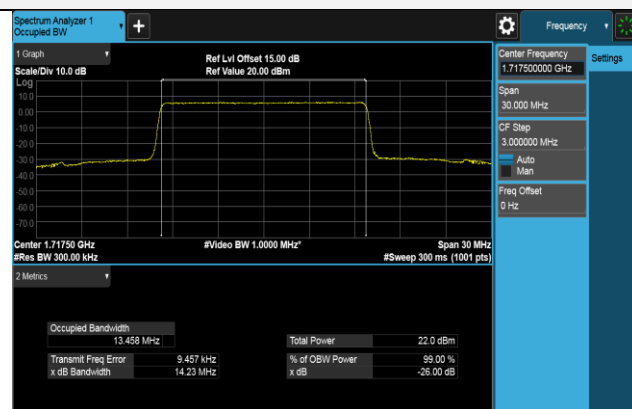
Spectrum Plot of Worst Value

Occupied bandwidth



QPSK CH 20325 (1747.5MHz)

26 dB Bandwidth



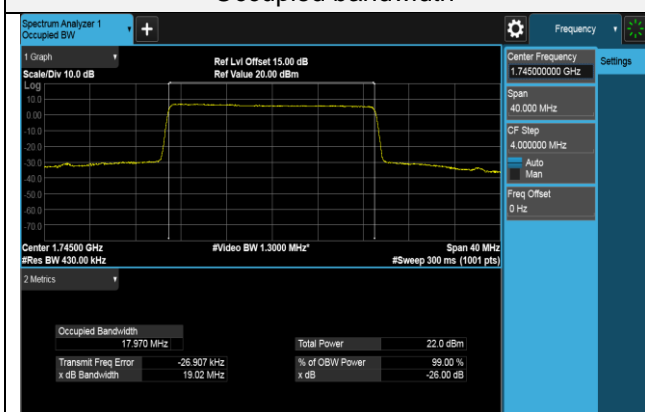
16QAM CH 20025 (1717.5MHz)

LTE Band 4 (Channel Bandwidth 20MHz)

Test Condition	Channel	Frequency (MHz)	Occupied bandwidth (MHz)	26 dB Bandwidth (MHz)
QPSK	20050	1720	17.9510	19.022
QPSK	20175	1732.5	17.9376	19.021
QPSK	20300	1745	17.9642	19.006
16QAM	20050	1720	17.9683	19.022
16QAM	20175	1732.5	17.9472	19.017
16QAM	20300	1745	17.9702	19.022

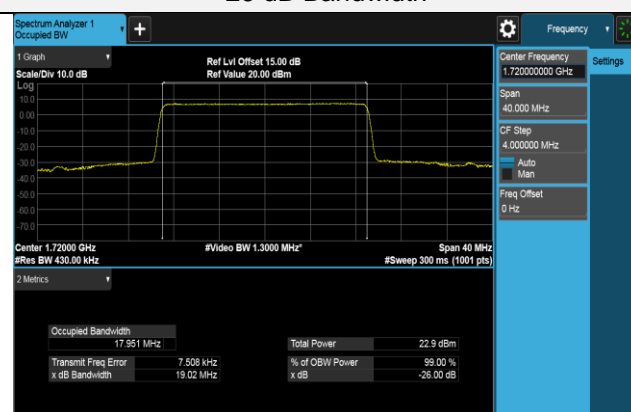
Spectrum Plot of Worst Value

Occupied bandwidth



16QAM CH 20300 (1745MHz)

26 dB Bandwidth



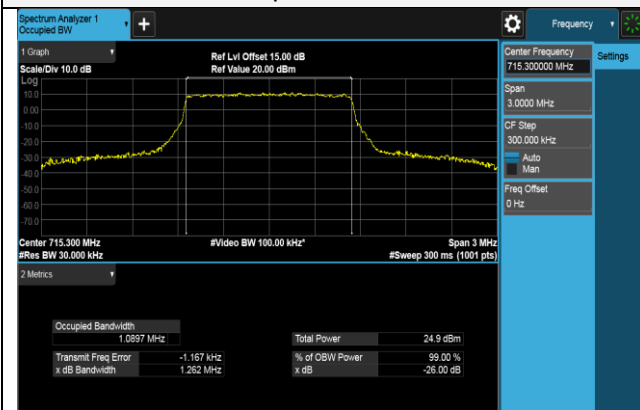
QPSK CH 20050 (1720MHz)

LTE Band 12 (Channel Bandwidth 1.4MHz)

Test Condition	Channel	Frequency (MHz)	Occupied bandwidth (MHz)	26 dB Bandwidth (MHz)
QPSK	23017	699.7	1.0854	1.250
QPSK	23095	707.5	1.0892	1.255
QPSK	23173	715.3	1.0897	1.262
16QAM	23017	699.7	1.0865	1.246
16QAM	23095	707.5	1.0871	1.251
16QAM	23173	715.3	1.0851	1.239

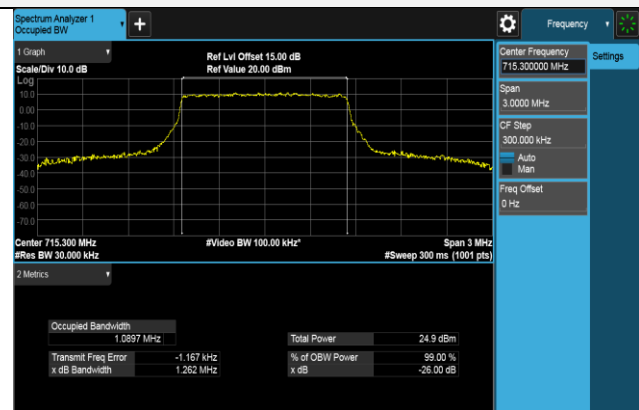
Spectrum Plot of Worst Value

Occupied bandwidth



QPSK CH 23173 (715.3MHz)

26 dB Bandwidth



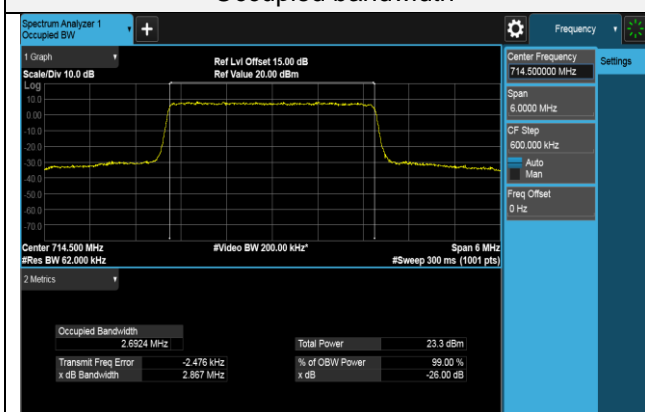
QPSK CH 23173 (715.3MHz)

LTE Band 12 (Channel Bandwidth 3MHz)

Test Condition	Channel	Frequency (MHz)	Occupied bandwidth (MHz)	26 dB Bandwidth (MHz)
QPSK	23025	700.5	2.6917	2.866
QPSK	23095	707.5	2.6922	2.871
QPSK	23165	714.5	2.6913	2.870
16QAM	23025	700.5	2.6913	2.875
16QAM	23095	707.5	2.6922	2.869
16QAM	23165	714.5	2.6924	2.867

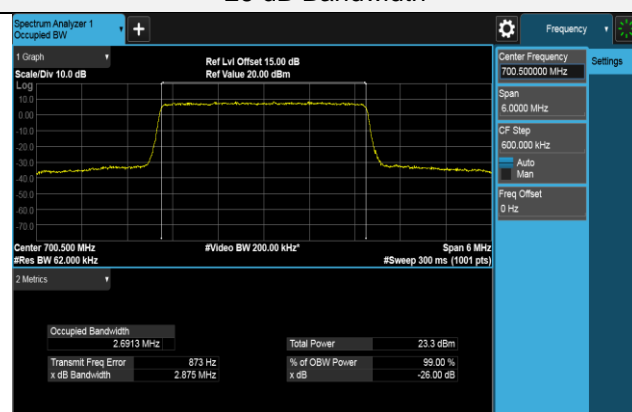
Spectrum Plot of Worst Value

Occupied bandwidth



16QAM CH 23165 (714.5MHz)

26 dB Bandwidth



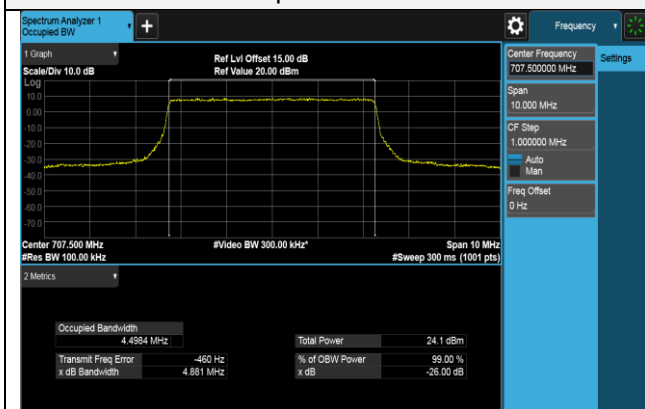
16QAM CH 23025 (700.5MHz)

LTE Band 12 (Channel Bandwidth 5MHz)

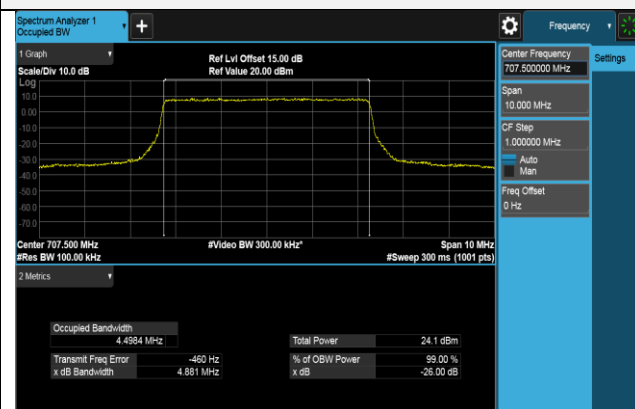
Test Condition	Channel	Frequency (MHz)	Occupied bandwidth (MHz)	26 dB Bandwidth (MHz)
QPSK	23035	701.5	4.4931	4.831
QPSK	23095	707.5	4.4984	4.881
QPSK	23155	713.5	4.4968	4.871
16QAM	23035	701.5	4.4883	4.845
16QAM	23095	707.5	4.4931	4.875
16QAM	23155	713.5	4.4921	4.861

Spectrum Plot of Worst Value

Occupied bandwidth



26 dB Bandwidth



QPSK CH 23095 (707.5MHz)

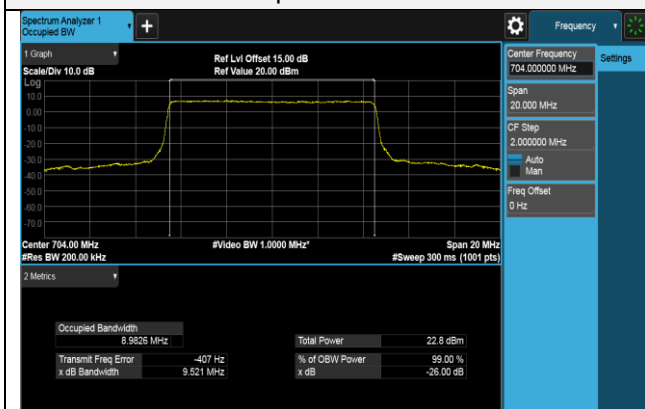
QPSK CH 23095 (707.5MHz)

### LTE Band 12 (Channel Bandwidth 10MHz)

Test Condition	Channel	Frequency (MHz)	Occupied bandwidth (MHz)	26 dB Bandwidth (MHz)
QPSK	23060	704	8.9811	9.564
QPSK	23095	707.5	8.9794	9.576
QPSK	23130	711	8.9721	9.522
16QAM	23060	704	8.9826	9.521
16QAM	23095	707.5	8.9798	9.532
16QAM	23130	711	8.9708	9.525

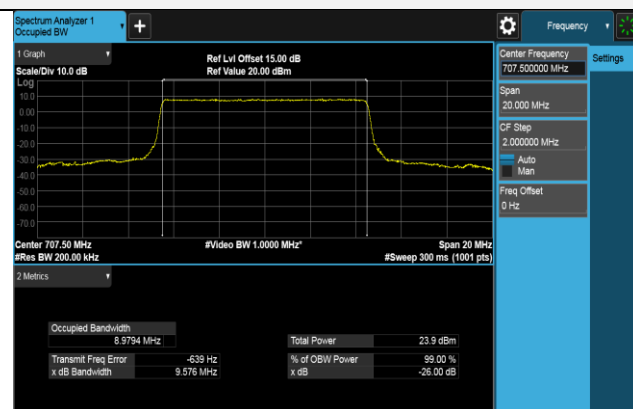
### Spectrum Plot of Worst Value

Occupied bandwidth



16QAM CH 23060 (704MHz)

26 dB Bandwidth



QPSK CH 23095 (707.5MHz)

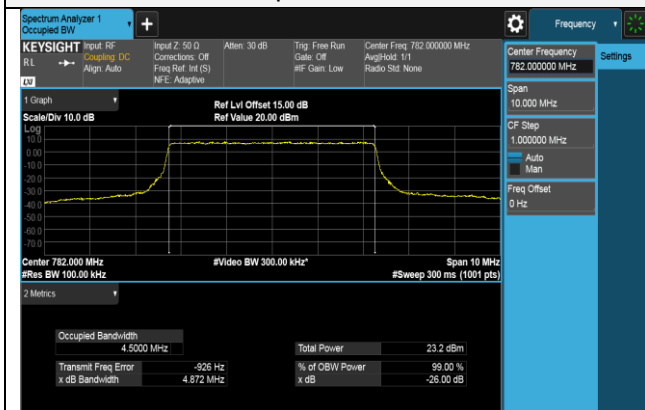


LTE Band 13 (Channel Bandwidth 5MHz)

Test Condition	Channel	Frequency (MHz)	Occupied bandwidth (MHz)	26 dB Bandwidth (MHz)
QPSK	23205	779.5	4.4815	4.859
QPSK	23230	782	4.5000	4.872
QPSK	23255	784.5	4.4909	4.801
16QAM	23205	779.5	4.4841	4.820
16QAM	23230	782	4.4947	4.866
16QAM	23255	784.5	4.4954	4.881

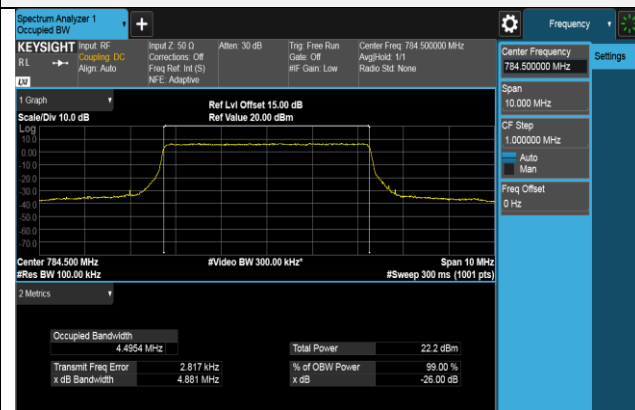
Spectrum Plot of Worst Value

Occupied bandwidth



QPSK CH 23230 (782MHz)

26 dB Bandwidth



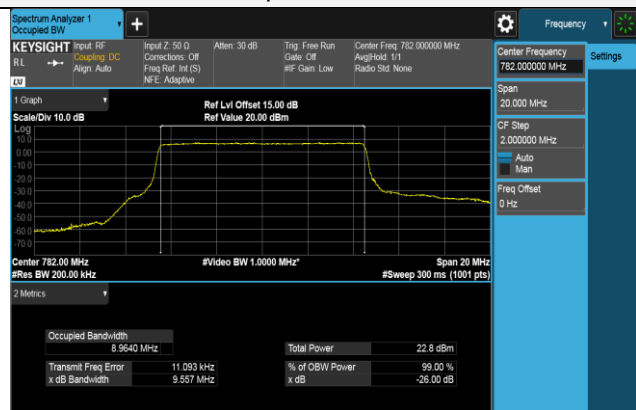
16QAM CH 23255 (784.5MHz)

LTE Band 13 (Channel Bandwidth 10MHz)

Test Condition	Channel	Frequency (MHz)	Occupied bandwidth (MHz)	26 dB Bandwidth (MHz)
QPSK	23230	782	8.9640	9.557
16QAM	23230	782	8.9595	9.535

Spectrum Plot of Worst Value

Occupied bandwidth



QPSK CH 23230 (782MHz)

26 dB Bandwidth



QPSK CH 23230 (782MHz)

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

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

For LTE Band 4:

According to FCC 27.53(h), for operations in the 1695-1710MHz, 1710-1755MHz, 1755-1780 MHz, 1915-1920MHz, 1995-2000 MHz, 2000-2020MHz, 2110-2155MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log (P)$  dB. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

For LTE Band 12:

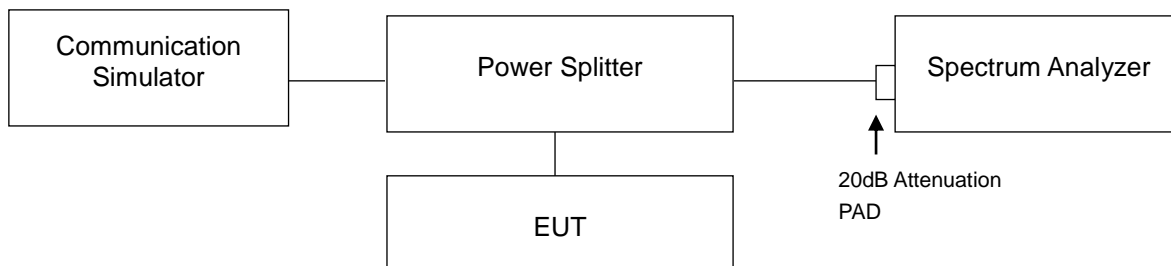
According to FCC 27.53(g), for operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least  $43 + 10 \log (P)$  dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

For LTE Band 13:

According to FCC 27.53(c)(2), for on any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

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

### 4.5.2 Test Setup

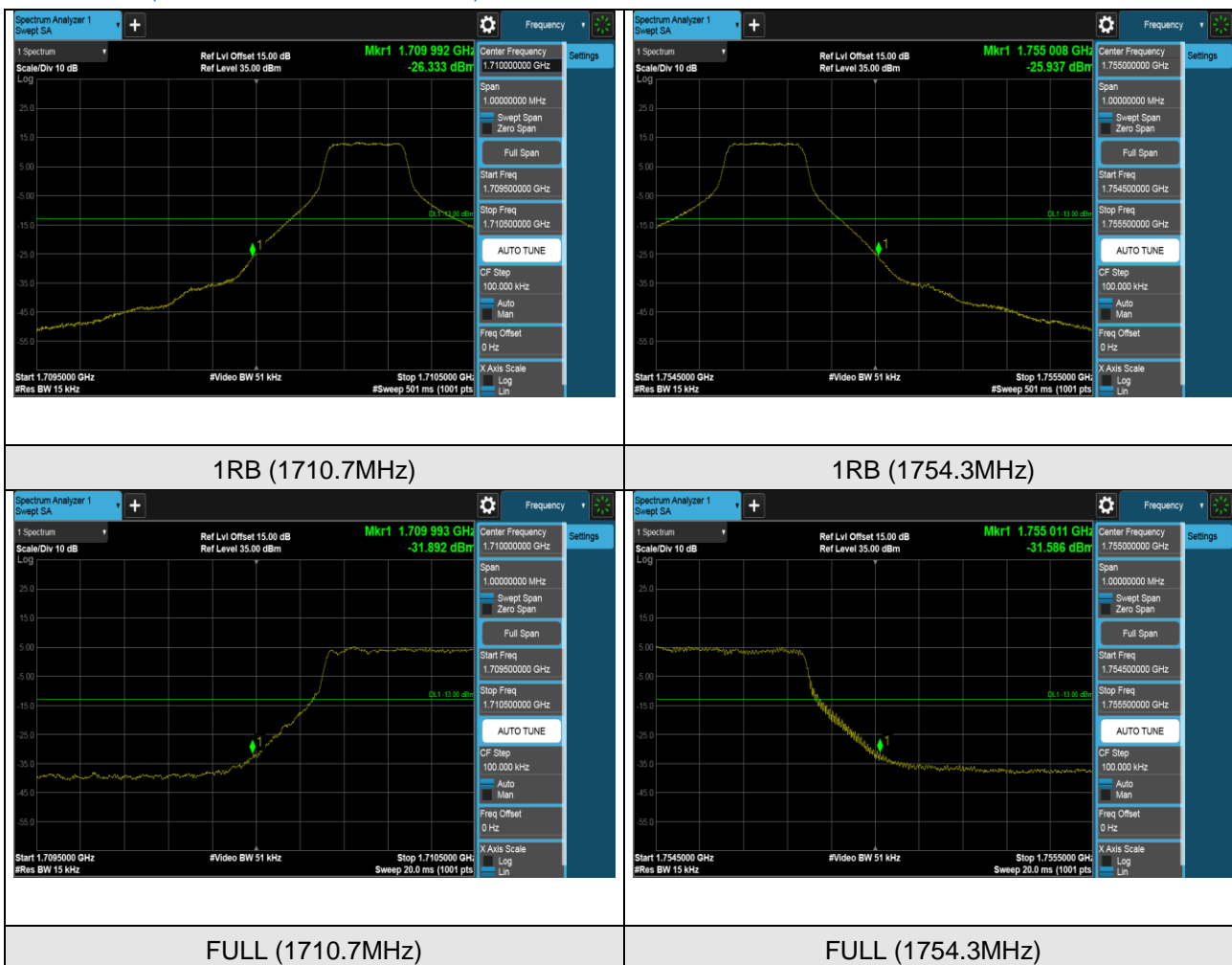


#### 4.5.3 Test Procedures

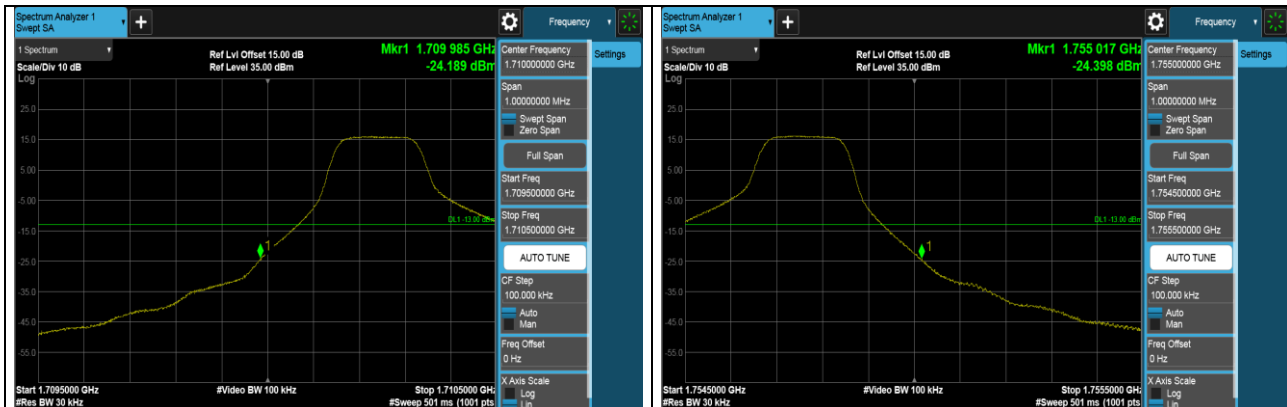
- a. All measurements were done at low and high operational frequency range.
- b. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 15 kHz or 30 kHz and VB of the spectrum is 51 kHz or 100 kHz (LTE Bandwidth 1.4 MHz).
- c. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 30 kHz and VB of the spectrum is 100 kHz (LTE Bandwidth 3 MHz).
- d. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 51 kHz and VB of the spectrum is 160 kHz (LTE Bandwidth 5 MHz).
- e. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 100 kHz and VB of the spectrum is 300 kHz (LTE Bandwidth 10 MHz).
- f. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 150 kHz and VB of the spectrum is 470 kHz (LTE Bandwidth 15 MHz).
- g. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 200 kHz and VB of the spectrum is 1 MHz (LTE Bandwidth 20 MHz).
- h. Record the max. trace plot into the test report.

## 4.5.4 Test Results

### LTE Band 4 (Channel Bandwidth 1.4MHz)

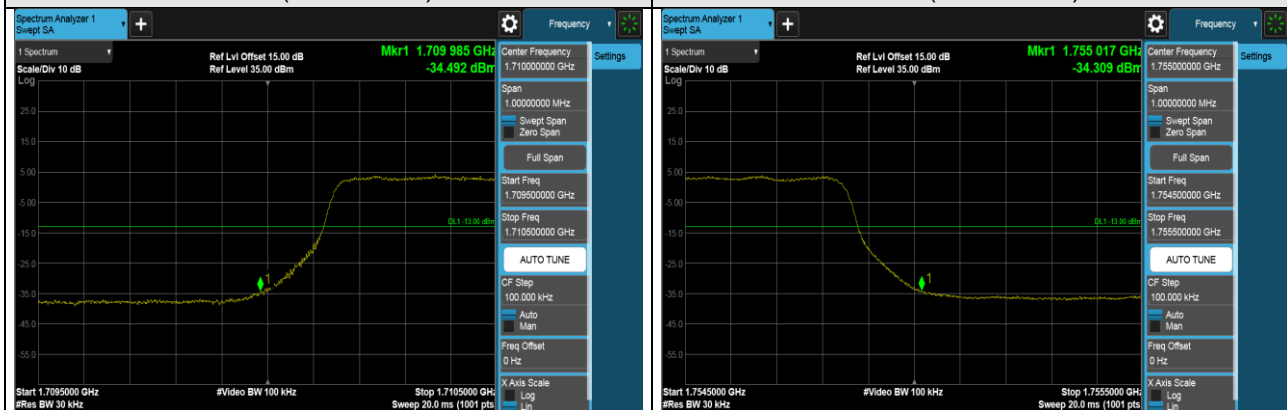


### LTE Band 4 (Channel Bandwidth 3MHz)



1RB (1711.5MHz)

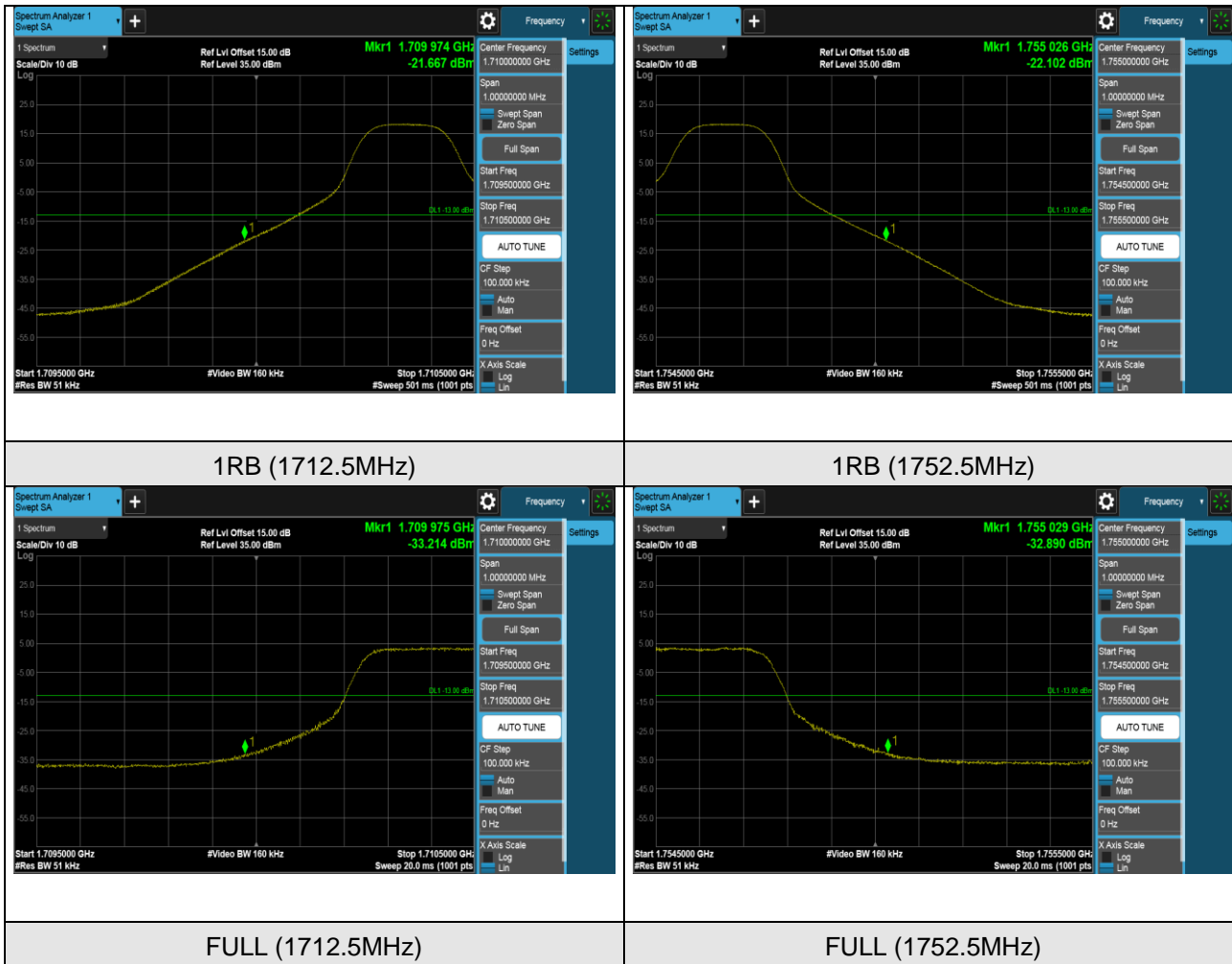
1RB (1753.5MHz)



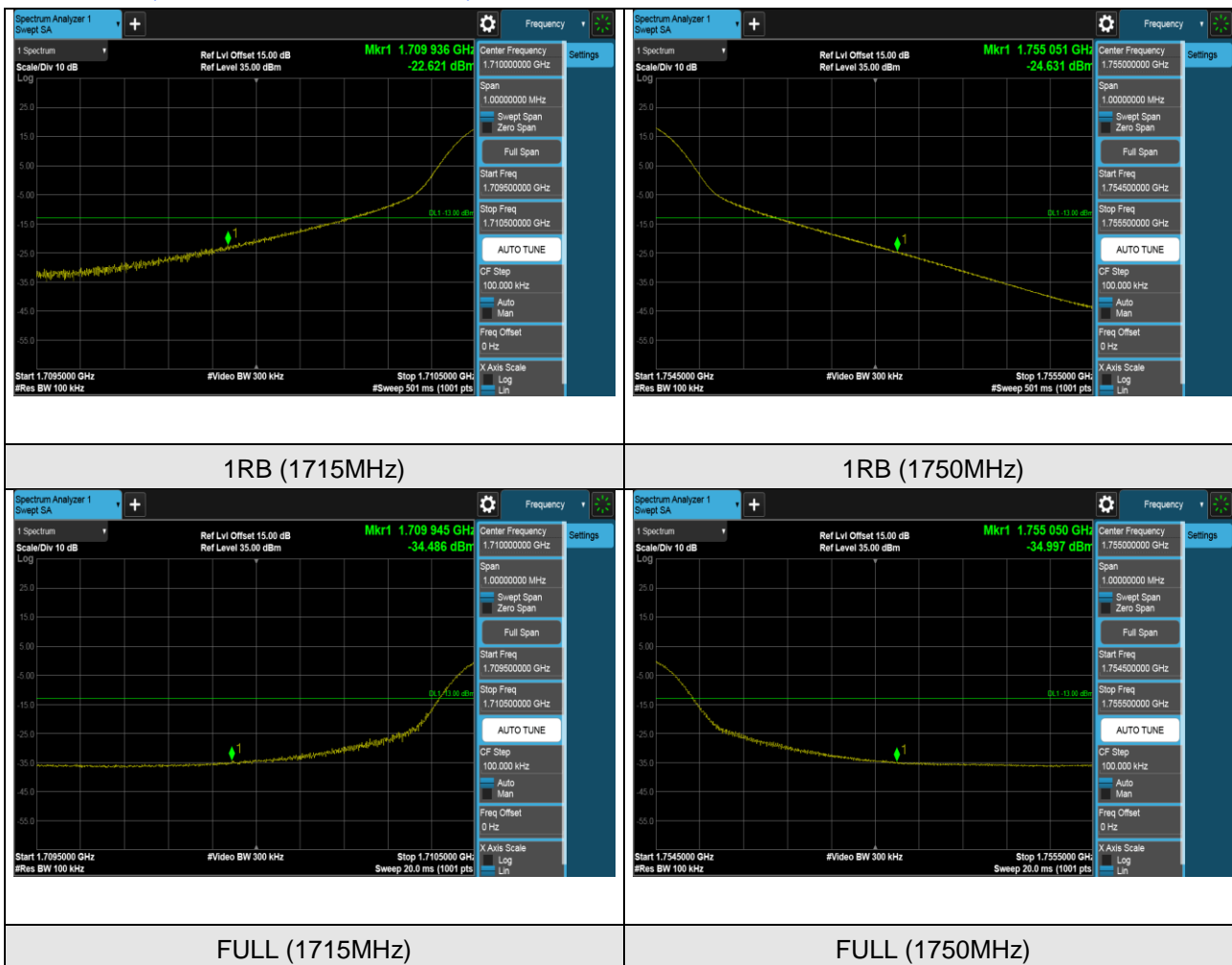
FULL (1711.5MHz)

FULL (1753.5MHz)

### LTE Band 4 (Channel Bandwidth 5MHz)

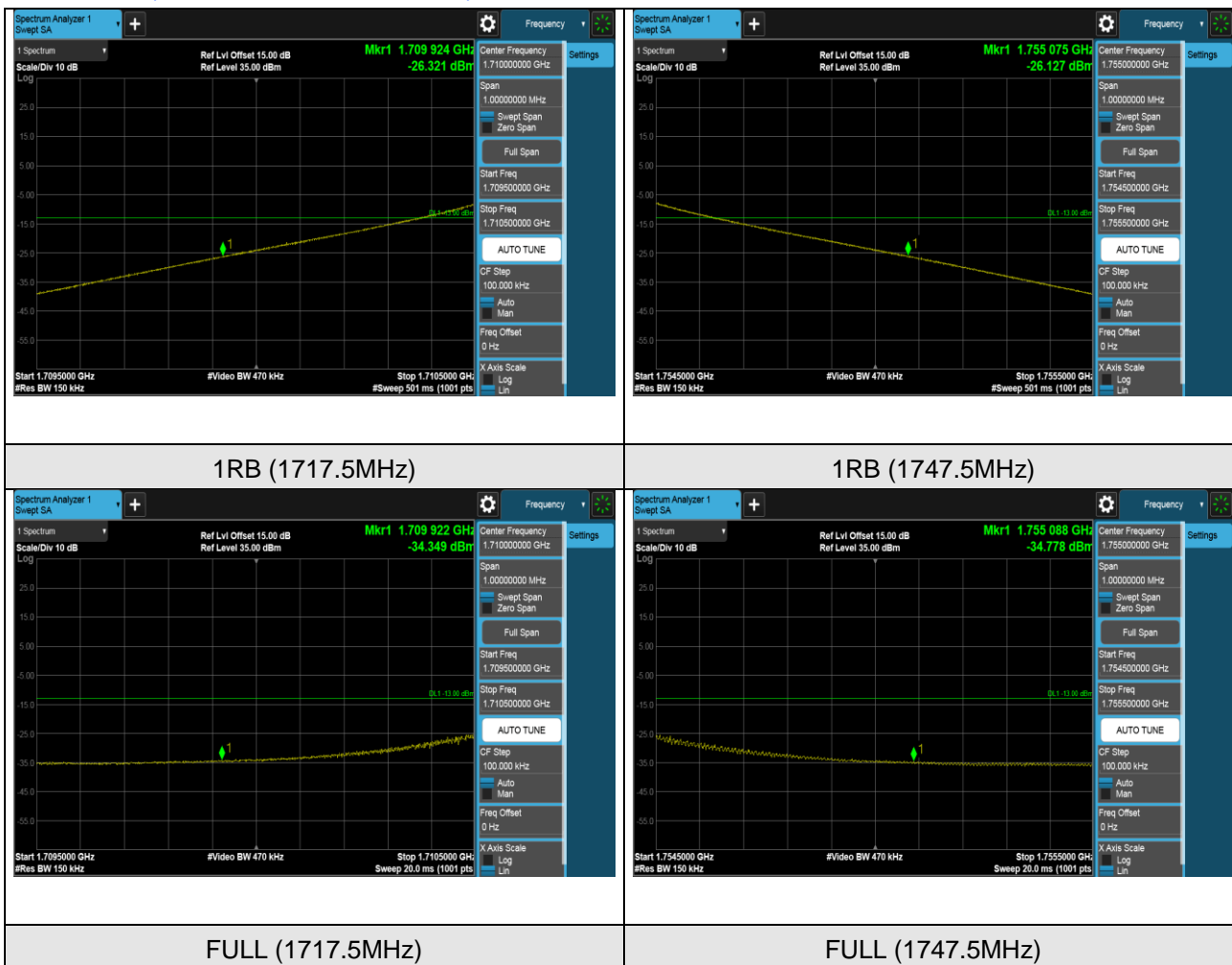


### LTE Band 4 (Channel Bandwidth 10MHz)

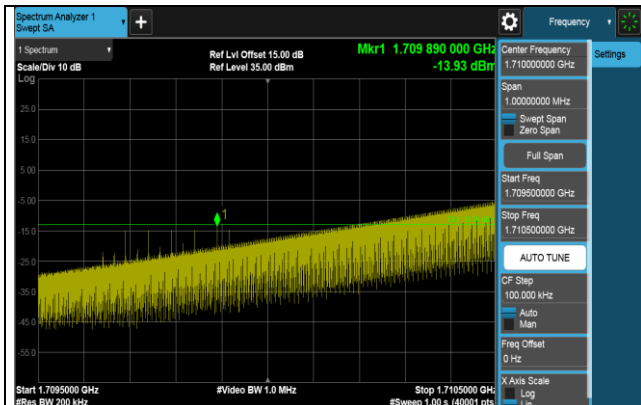




### LTE Band 4 (Channel Bandwidth 15MHz)



### LTE Band 4 (Channel Bandwidth 20MHz)



1RB (1720MHz)



1RB (1745MHz)

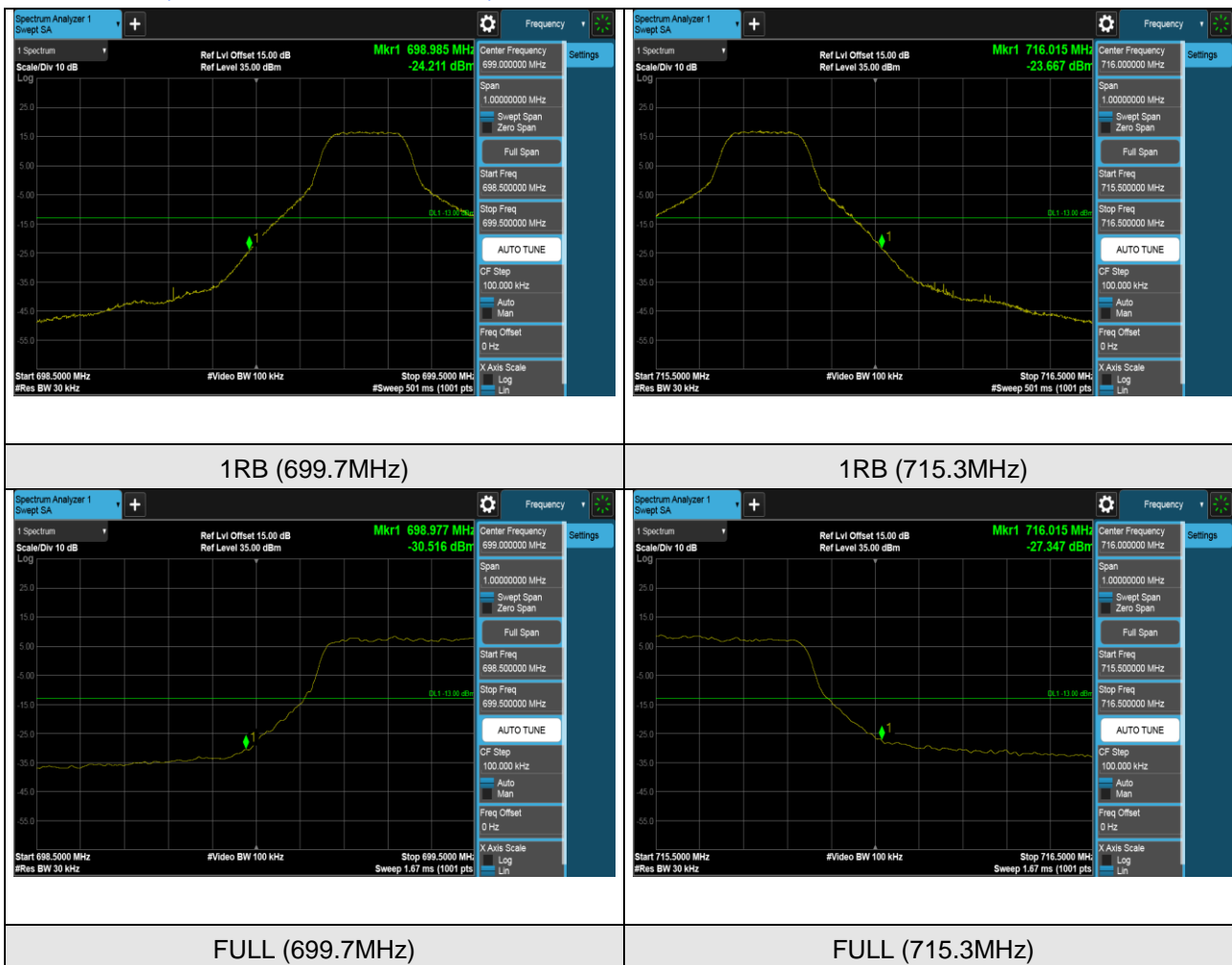


FULL (1720MHz)

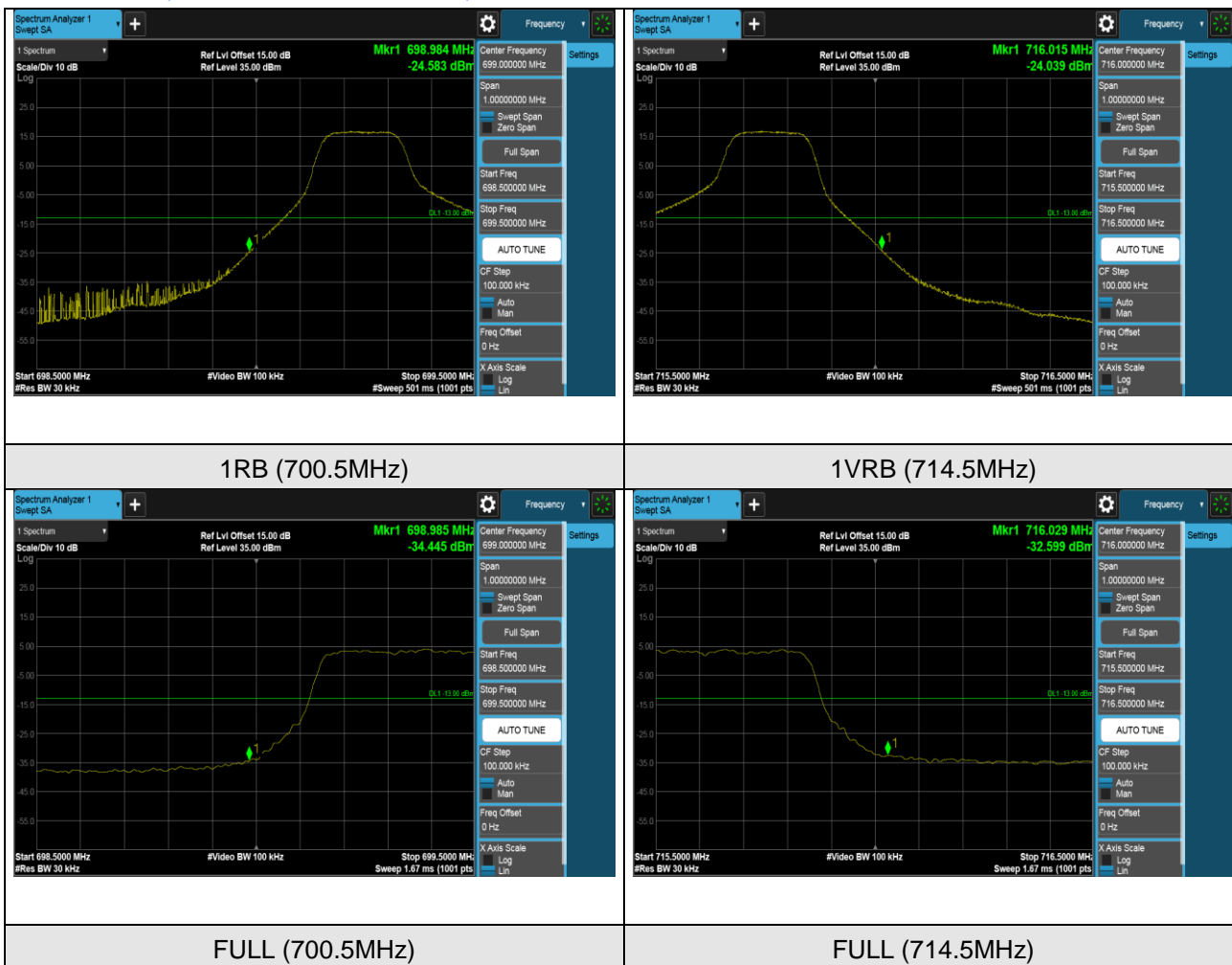


FULL (1745MHz)

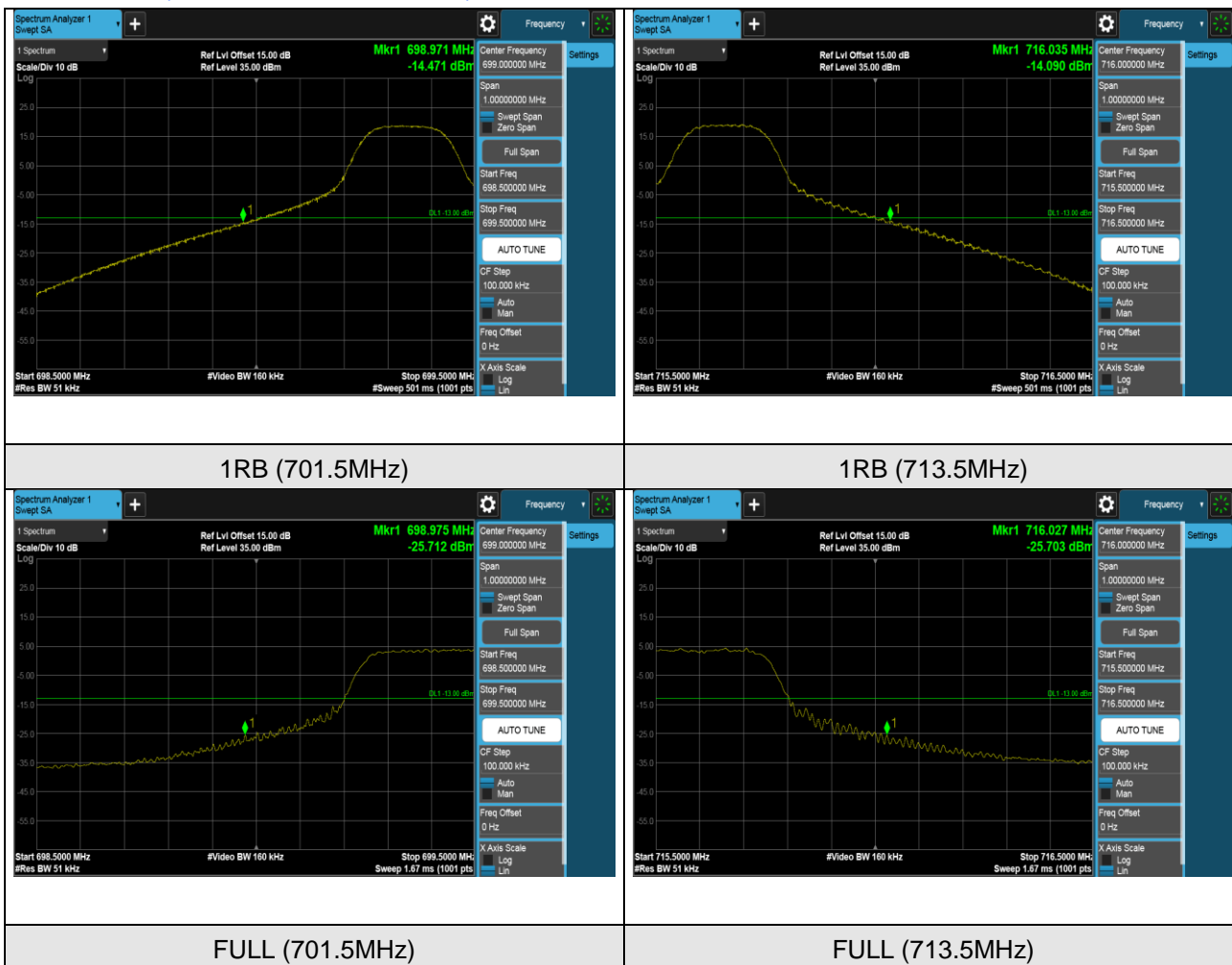
### LTE Band 12 (Channel Bandwidth 1.4MHz)



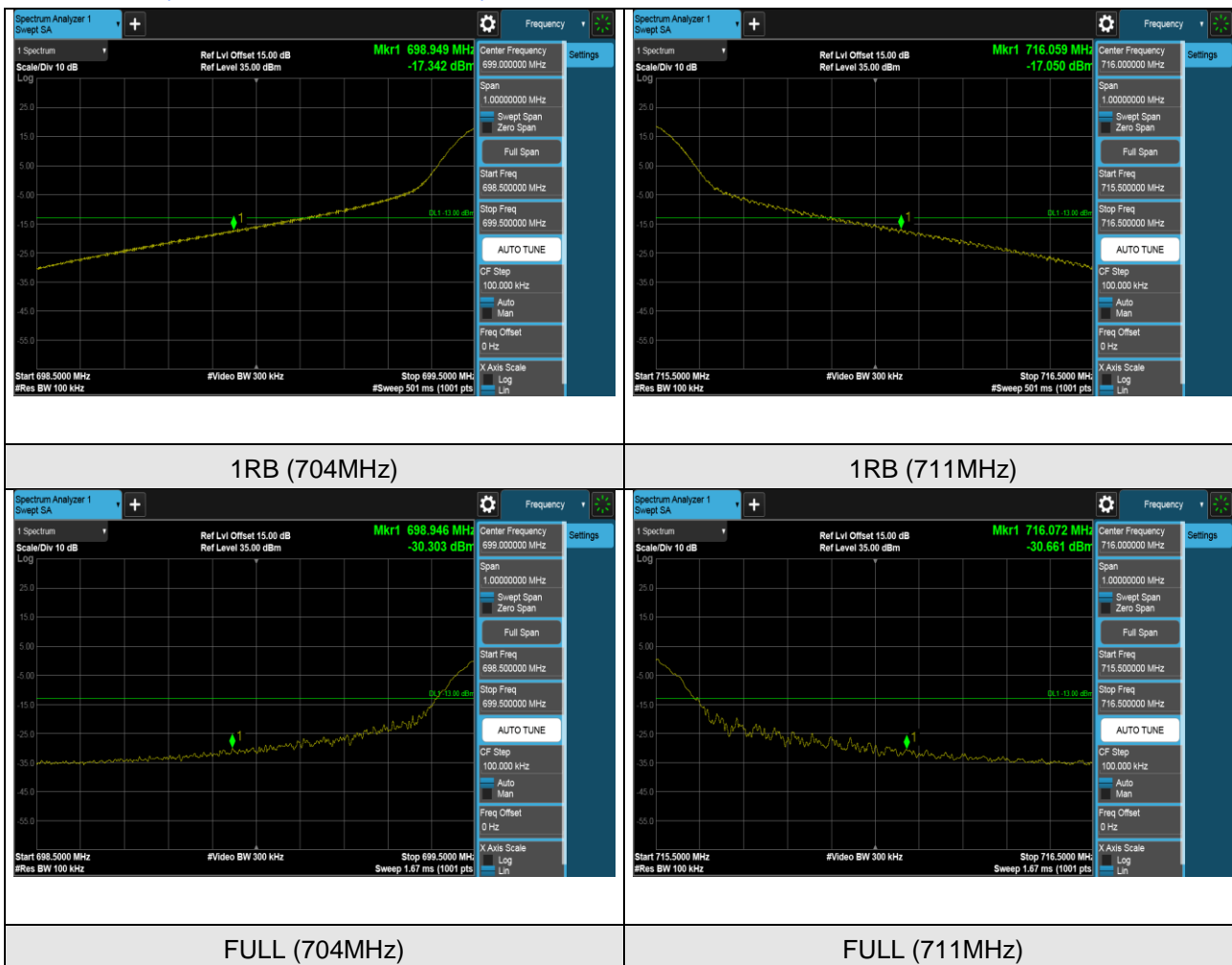
### LTE Band 12 (Channel Bandwidth 3MHz)



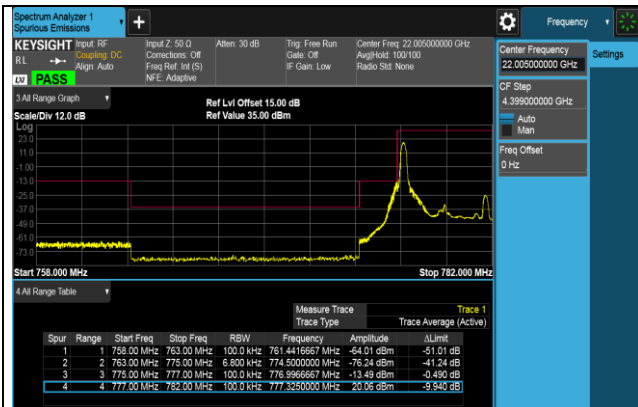
### LTE Band 12 (Channel Bandwidth 5MHz)



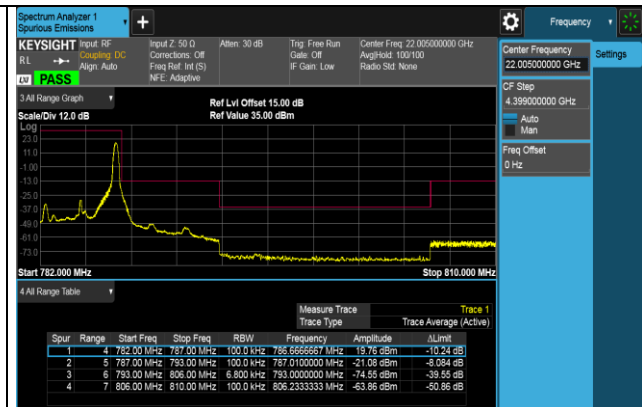
### LTE Band 12 (Channel Bandwidth 10MHz)



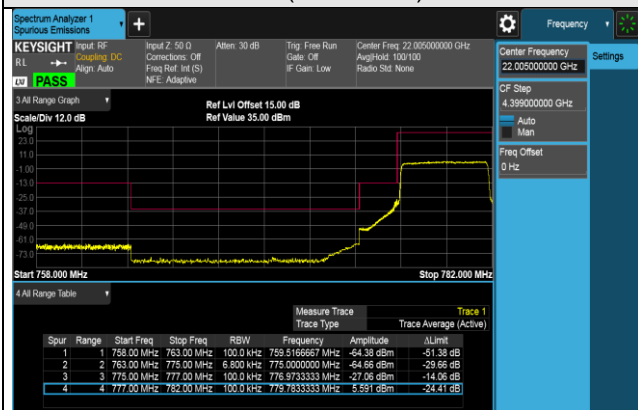
### LTE Band 13 (Channel Bandwidth 5MHz)



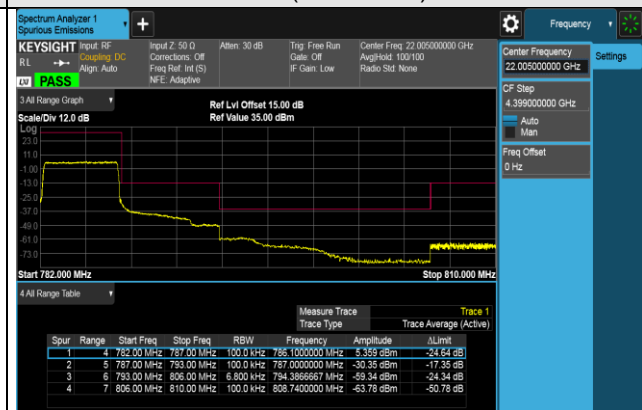
1RB (779.5MHz)



1RB (784.5MHz)



FULL (779.5MHz)

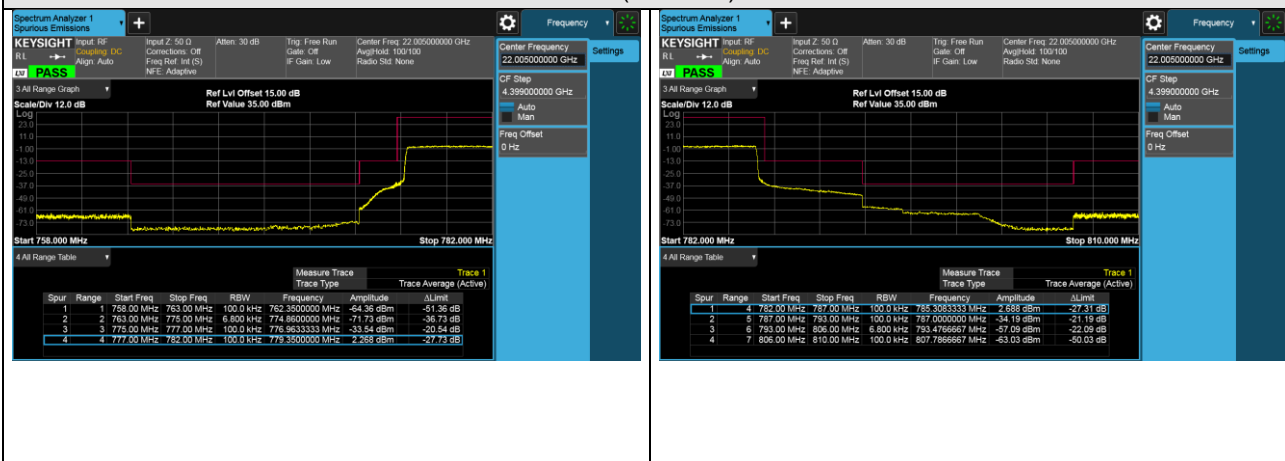


FULL (784.5MHz)

### LTE Band 13 (Channel Bandwidth 10MHz)



### 1RB (782MHz)



### FULL (782MHz)

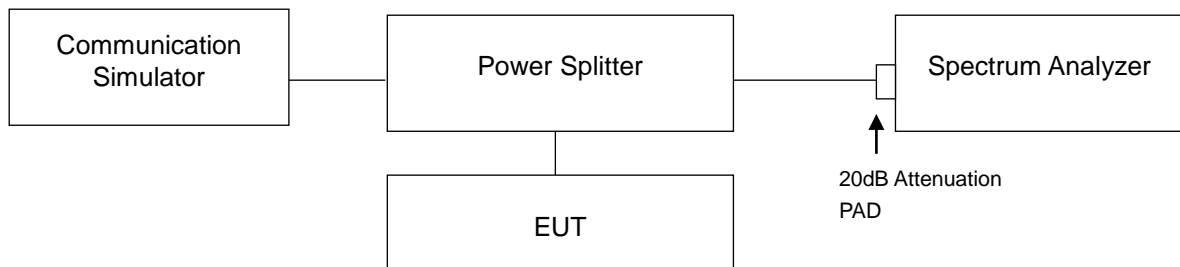


## 4.6 Peak to Average Ratio

### 4.6.1 Limits of Peak to Average Ratio Measurement

In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13 dB.

### 4.6.2 Test Setup



### 4.6.3 Test Procedures

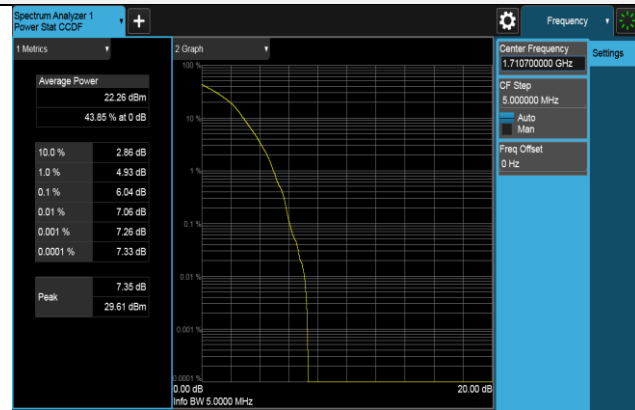
1. Set resolution/measurement bandwidth  $\geq$  signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1 %.

#### 4.6.4 Test Results

##### LTE Band 4 (Channel Bandwidth 1.4MHz)

Test Condition	Channel	Frequency (MHz)	Measure. Value(dB)	Limit dB	Result
QPSK	19957	1710.7	5.07	13	PASS
QPSK	20175	1732.5	4.41	13	PASS
QPSK	20393	1754.3	4.61	13	PASS
16QAM	19957	1710.7	6.04	13	PASS
16QAM	20175	1732.5	5.50	13	PASS
16QAM	20393	1754.3	5.62	13	PASS

Spectrum Plot of Worst Value

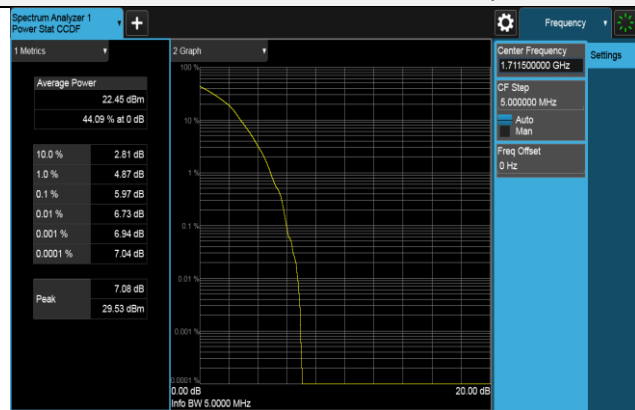


16QAM CH 19957 (1710.7MHz)

LTE Band 4 (Channel Bandwidth 3MHz)

Test Condition	Channel	Frequency (MHz)	Measure. Value(dB)	Limit dB	Result
QPSK	19965	1711.5	4.90	13	PASS
QPSK	20175	1732.5	4.41	13	PASS
QPSK	20385	1753.5	4.61	13	PASS
16QAM	19965	1711.5	5.97	13	PASS
16QAM	20175	1732.5	5.52	13	PASS
16QAM	20385	1753.5	5.60	13	PASS

Spectrum Plot of Worst Value

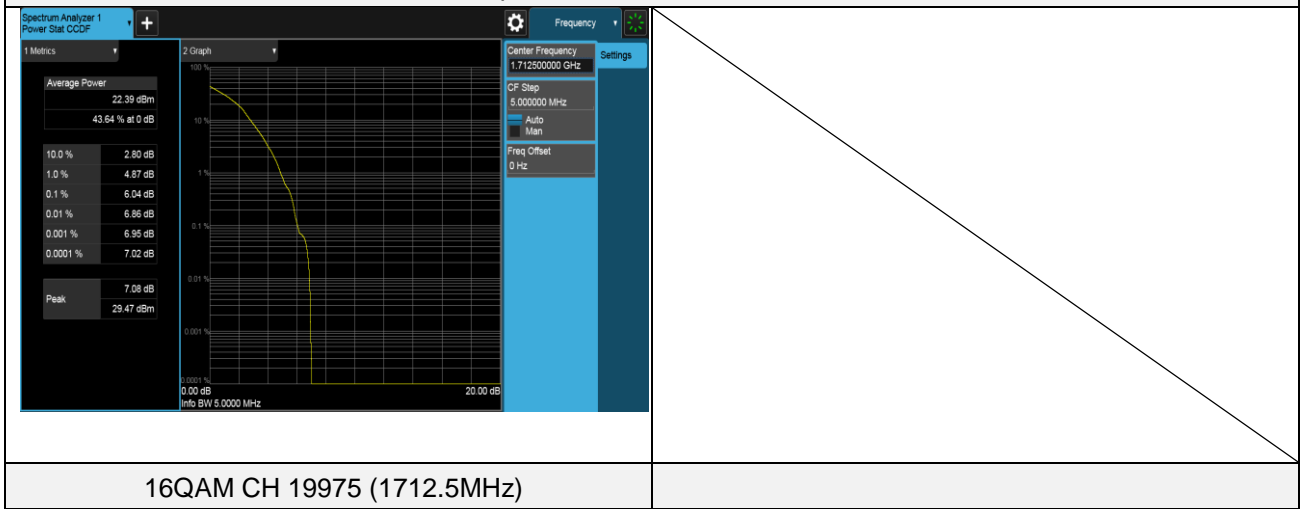


16QAM CH 19965 (1711.5MHz)

LTE Band 4 (Channel Bandwidth 5MHz)

Test Condition	Channel	Frequency (MHz)	Measure. Value(dB)	Limit dB	Result
QPSK	19975	1712.5	4.93	13	PASS
QPSK	20175	1732.5	4.43	13	PASS
QPSK	20375	1752.5	4.83	13	PASS
16QAM	19975	1712.5	6.04	13	PASS
16QAM	20175	1732.5	5.58	13	PASS
16QAM	20375	1752.5	5.92	13	PASS

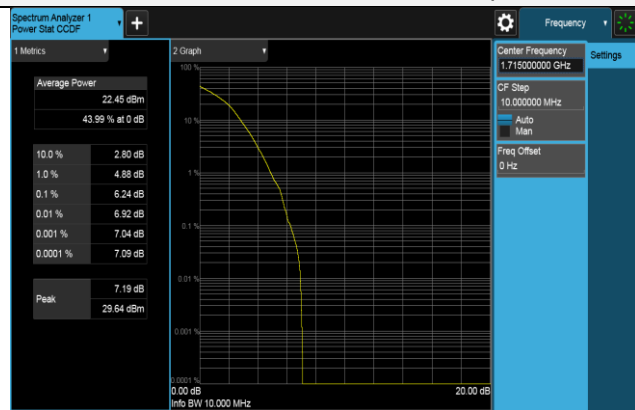
Spectrum Plot of Worst Value



LTE Band 4 (Channel Bandwidth 10MHz)

Test Condition	Channel	Frequency (MHz)	Measure. Value(dB)	Limit dB	Result
QPSK	20000	1715	4.94	13	PASS
QPSK	20175	1732.5	4.45	13	PASS
QPSK	20350	1750	4.86	13	PASS
16QAM	20000	1715	6.24	13	PASS
16QAM	20175	1732.5	5.42	13	PASS
16QAM	20350	1750	5.86	13	PASS

Spectrum Plot of Worst Value

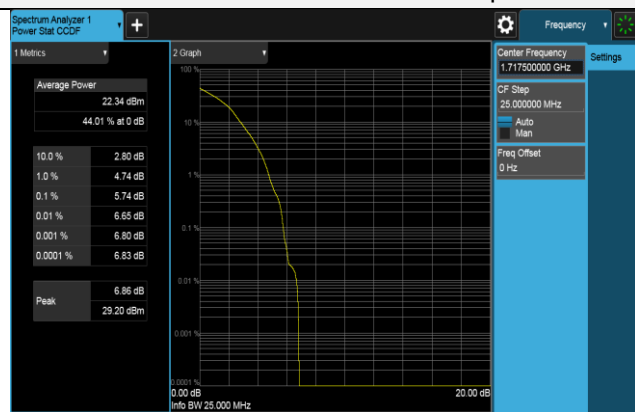


16QAM CH 20000 (1715MHz)

LTE Band 4 (Channel Bandwidth 15MHz)

Test Condition	Channel	Frequency (MHz)	Measure. Value(dB)	Limit dB	Result
QPSK	20025	1717.5	4.93	13	PASS
QPSK	20175	1732.5	4.52	13	PASS
QPSK	20325	1747.5	4.61	13	PASS
16QAM	20025	1717.5	5.74	13	PASS
16QAM	20175	1732.5	5.49	13	PASS
16QAM	20325	1747.5	5.69	13	PASS

Spectrum Plot of Worst Value

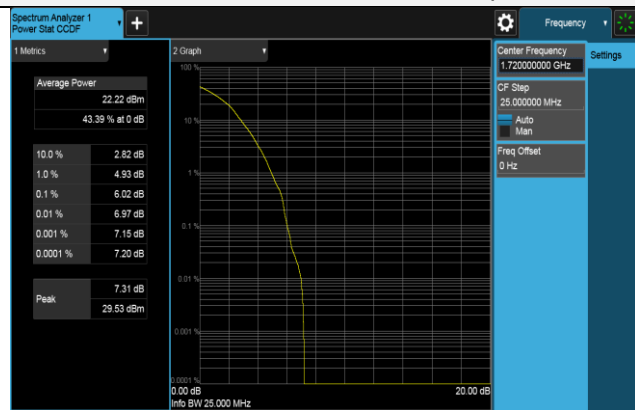


16QAM CH 20025 (1717.5MHz)

LTE Band 4 (Channel Bandwidth 20MHz)

Test Condition	Channel	Frequency (MHz)	Measure. Value(dB)	Limit dB	Result
QPSK	20050	1720	5.11	13	PASS
QPSK	20175	1732.5	4.67	13	PASS
QPSK	20300	1745	4.66	13	PASS
16QAM	20050	1720	6.02	13	PASS
16QAM	20175	1732.5	5.95	13	PASS
16QAM	20300	1745	5.73	13	PASS

Spectrum Plot of Worst Value

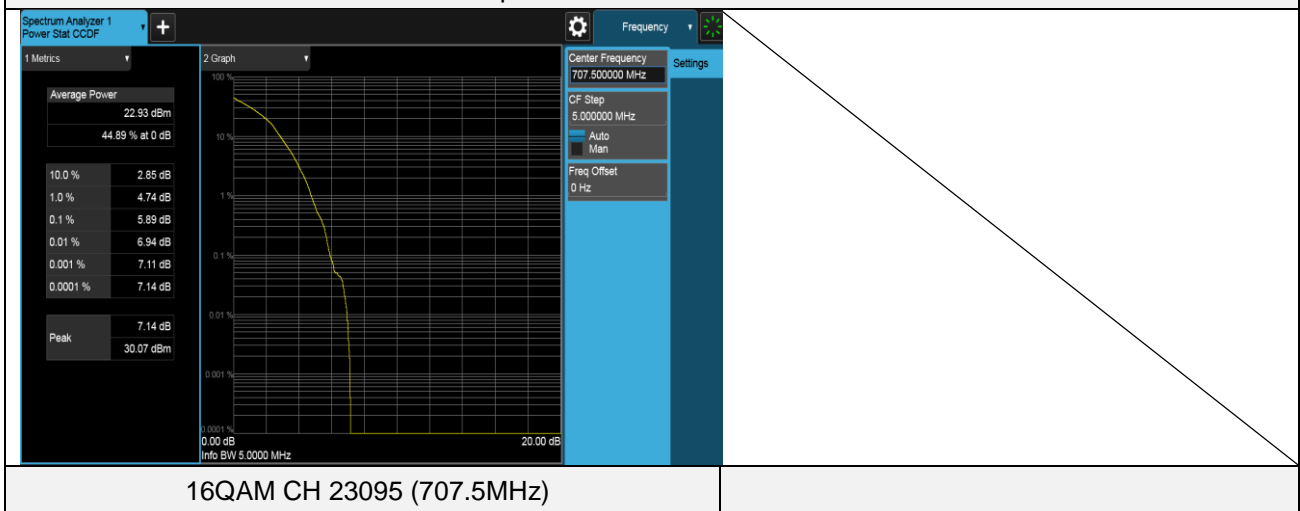


16QAM CH 20050 (1720MHz)

LTE Band 12 (Channel Bandwidth 1.4MHz)

Test Condition	Channel	Frequency (MHz)	Measure. Value(dB)	Limit dB	Result
QPSK	23017	699.7	4.79	13	PASS
QPSK	23095	707.5	4.83	13	PASS
QPSK	23173	715.3	4.43	13	PASS
16QAM	23017	699.7	5.85	13	PASS
16QAM	23095	707.5	5.89	13	PASS
16QAM	23173	715.3	5.40	13	PASS

Spectrum Plot of Worst Value

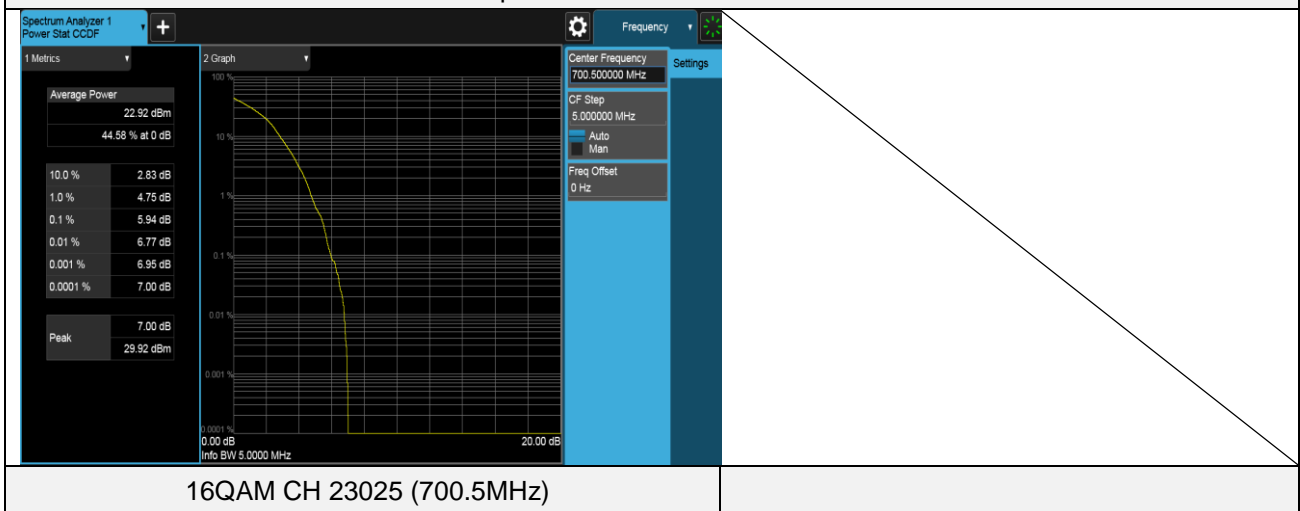




LTE Band 12 (Channel Bandwidth 3MHz)

Test Condition	Channel	Frequency (MHz)	Measure. Value(dB)	Limit dB	Result
QPSK	23025	700.5	4.74	13	PASS
QPSK	23095	707.5	4.78	13	PASS
QPSK	23165	714.5	4.48	13	PASS
16QAM	23025	700.5	5.94	13	PASS
16QAM	23095	707.5	5.87	13	PASS
16QAM	23165	714.5	5.67	13	PASS

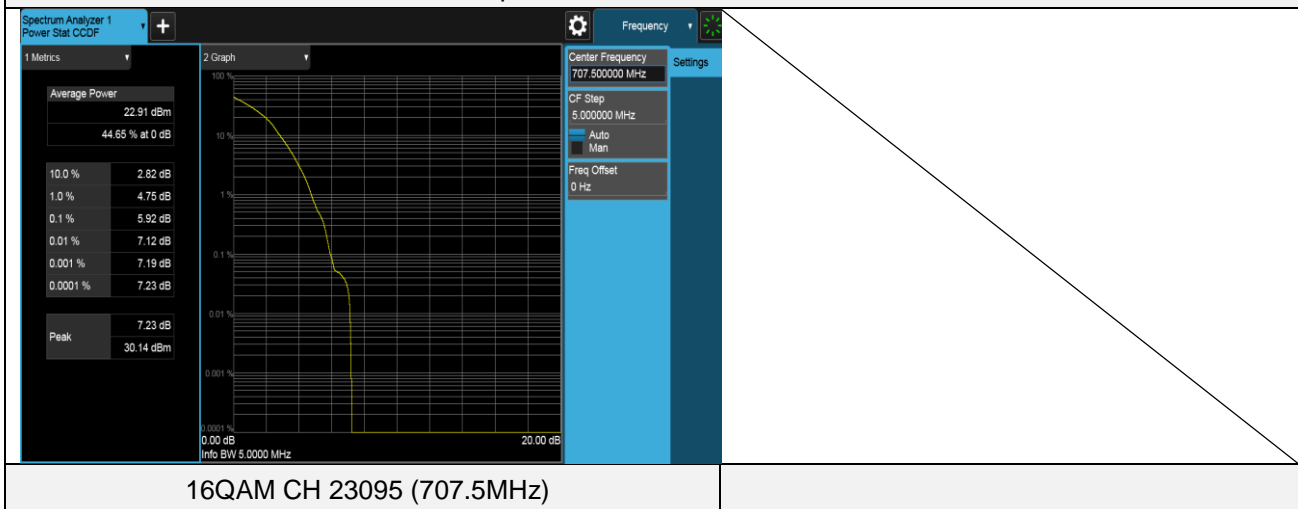
Spectrum Plot of Worst Value



LTE Band 12 (Channel Bandwidth 5MHz)

Test Condition	Channel	Frequency (MHz)	Measure. Value(dB)	Limit dB	Result
QPSK	23035	701.5	4.79	13	PASS
QPSK	23095	707.5	4.84	13	PASS
QPSK	23155	713.5	4.63	13	PASS
16QAM	23035	701.5	5.90	13	PASS
16QAM	23095	707.5	5.92	13	PASS
16QAM	23155	713.5	5.74	13	PASS

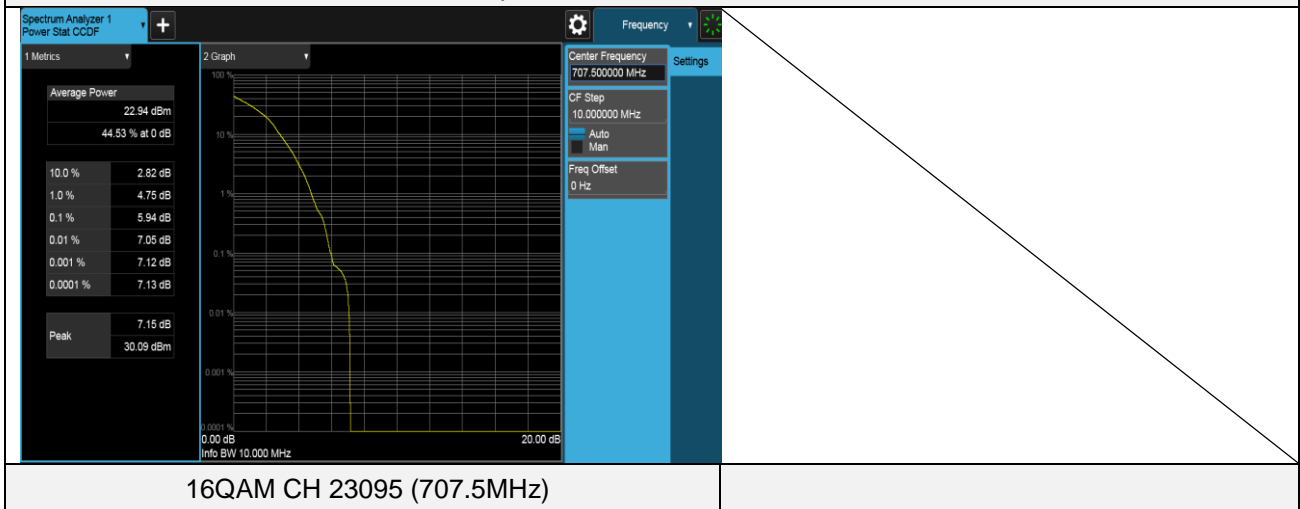
Spectrum Plot of Worst Value



LTE Band 12 (Channel Bandwidth 10MHz)

Test Condition	Channel	Frequency (MHz)	Measure. Value(dB)	Limit dB	Result
QPSK	23060	704	4.74	13	PASS
QPSK	23095	707.5	4.80	13	PASS
QPSK	23130	711	4.77	13	PASS
16QAM	23060	704	5.81	13	PASS
16QAM	23095	707.5	5.94	13	PASS
16QAM	23130	711	5.75	13	PASS

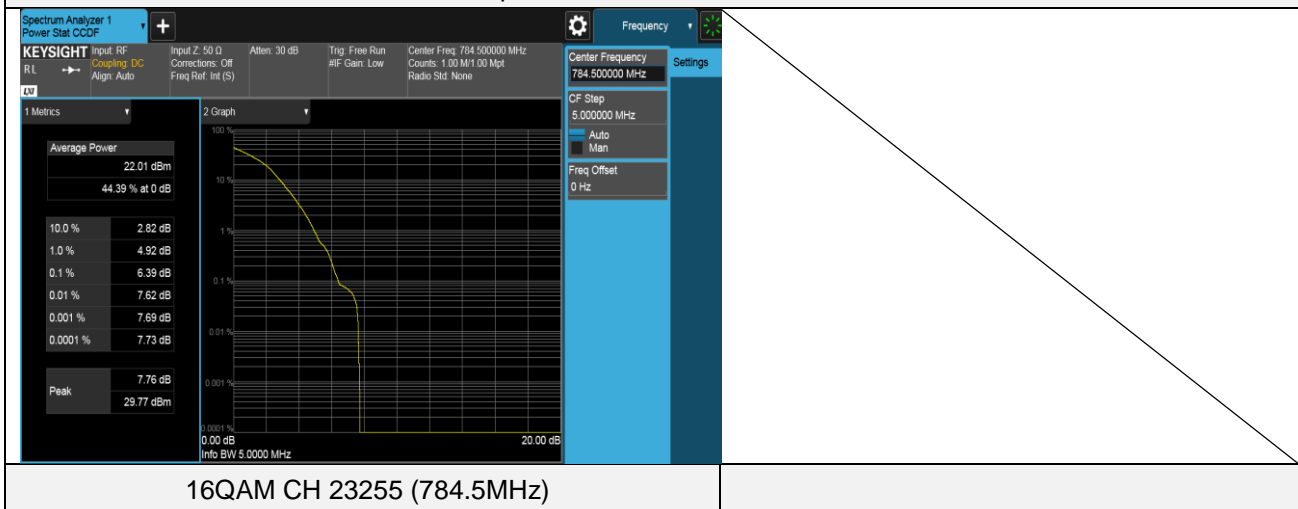
Spectrum Plot of Worst Value



LTE Band 13 (Channel Bandwidth 5MHz)

Test Condition	Channel	Frequency (MHz)	Measure. Value(dB)	Limit dB	Result
QPSK	23205	779.5	4.95	13	PASS
QPSK	23230	782	4.92	13	PASS
QPSK	23255	784.5	5.12	13	PASS
16QAM	23205	779.5	5.90	13	PASS
16QAM	23230	782	5.99	13	PASS
16QAM	23255	784.5	6.39	13	PASS

Spectrum Plot of Worst Value



LTE Band 13 (Channel Bandwidth 10MHz)

Test Condition	Channel	Frequency (MHz)	Measure. Value(dB)	Limit dB	Result
QPSK	23230	782	4.88	13	PASS
16QAM	23230	782	6.09	13	PASS

Spectrum Plot of Worst Value

