

# Test Report (LTE)

**Applicant:** Shanghai Notion Information Technology CO. LTD

**Address of Applicant:** Floor 5,Building 5,NO 289,Bisheng Rd, Pudong district, Shanghai, China

**Manufacturer/Factory:** Shanghai Notion Information Technology CO. LTD

**Address of Manufacturer/Factory:** Floor 5,Building 5,NO 289,Bisheng Rd, Pudong district, Shanghai, China

**Equipment Under Test (EUT)**

Product Name: ODU/4G LTE Outdoor Modem

Model No.: MU261/MU261-Combo

**FCC ID:** 2AR45-MU261

**Applicable standards:** FCC CFR Title 47 Part 2  
FCC CFR Title 47 Part 27

**Date of sample receipt:** July 23, 2019

**Date of Test:** July 24, 2019-August 07, 2019

**Date of report issued:** August 08, 2019

**Test Result :** PASS \*

\* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:



**Robinson Lo**

**Laboratory Manager**

This results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

## 2 Version

Version No.	Date	Description
00	August 08, 2019	Original

**Prepared By:** Tiger Chen **Date:** August 08, 2019  
**Project Engineer**

**Check By:** Robinson **Date:** August 08, 2019  
**Reviewer**

### 3 Contents

	Page
<b>1 COVER PAGE</b> .....	<b>1</b>
<b>2 VERSION</b> .....	<b>2</b>
<b>3 CONTENTS</b> .....	<b>3</b>
<b>4 TEST SUMMARY</b> .....	<b>4</b>
<b>5 GENERAL INFORMATION</b> .....	<b>5</b>
5.1 GENERAL DESCRIPTION OF EUT .....	5
5.2 RELATED SUBMITTAL(S) / GRANT (S) .....	6
5.3 TEST METHODOLOGY.....	6
5.4 DEVIATION FROM STANDARDS .....	6
5.5 ABNORMALITIES FROM STANDARD CONDITIONS.....	6
5.6 TEST FACILITY .....	6
5.7 TEST LOCATION.....	6
<b>6 TEST INSTRUMENTS LIST</b> .....	<b>7</b>
<b>7 SYSTEM TEST CONFIGURATION</b> .....	<b>9</b>
7.1 TEST MODE .....	9
7.2 CONFIGURATION OF TESTED SYSTEM .....	9
7.3 ERP/EIRP OUTPUT POWER .....	10
7.4 PEAK-TO-AVERAGE RATIO .....	16
7.5 OCCUPY BANDWIDTH.....	17
7.6 MODULATION CHARACTERISTIC.....	23
7.7 OUT OF BAND EMISSION AT ANTENNA TERMINALS.....	23
7.8 FIELD STRENGTH OF SPURIOUS RADIATION MEASUREMENT.....	36
7.9 FREQUENCY STABILITY V.S. TEMPERATURE MEASUREMENT.....	39
7.10 FREQUENCY STABILITY V.S. VOLTAGE MEASUREMENT .....	41
<b>8 TEST SETUP PHOTO</b> .....	<b>42</b>
<b>9 EUT CONSTRUCTIONAL DETAILS</b> .....	<b>42</b>

## 4 Test Summary

Test Item	Section in CFR 47	Result
RF Exposure (SAR)	Part 1.1307 Part 2.1093	Pass* (Please refer to MPE Report)
RF Output Power	Part 2.1046 Part 27.50(c)(10)/(d)(4)	Pass
Peak-to-Average Ratio	FCC Part 27.50(a)	Pass
Modulation Characteristics	Part 2.1047	N/A
99% & -26 dB Occupied Bandwidth	Part 2.1049	Pass
Spurious Emissions at Antenna Terminal	Part 2.1051 Part 27.53(h)/(g)	Pass
Field Strength of Spurious Radiation	Part 2.1053 Part 27.53(h)/(g)/(m)	Pass
Out of band emission, Band Edge	Part 27.53(h)/(g)/(m)	Pass
Frequency stability vs. temperature	Part 2.1055(a)(1)(b)	Pass
Frequency stability vs. voltage	Part 2.1055(d)(1)(2)	Pass

*Remarks:*

1. *Pass: The EUT complies with the essential requirements in the standard.*
2. *N/A: Not applicable.*

## 5 General Information

### 5.1 General Description of EUT

Product Name:	ODU/4G LTE Outdoor Modem
Model No.:	MU261/MU261-Combo
Serial No.:	U26C19041000040
Hardware Version:	U26C_1_10
Software Version:	U26C_Newbaseline_swd_0313
Tested Sample(s) ID:	GTS201907000148-1
Support Networks:	LTE
Support Bands:	LTE Band 41
Channel Bandwidth:	LTE Band 41: 5MHz; 10MHz; 15MHz; 20MHz
TX Frequency:	LTE Band 41: 2496MHz ~2690MHz
Modulation type:	LTE Band 41: QPSK, 16QAM
Antenna type:	Integral Antenna
Antenna gain:	10dBi(Declare by applicant)
Power supply:	DC 24V PoE power supply

### Test Frequency

Test Mode	Channel Bandwidth	RF Channel		
		Lowest channel	Middle channel	Highest channel
LTE Band 41	5M	Channel 39675	Channel 40620	Channel 41565
		2498.5 MHz	2593.0 MHz	2687.5 MHz
	10M	Channel 39700	Channel 40620	Channel 41540
		2501.0 MHz	2593.0 MHz	2685.0 MHz
	15M	Channel 39725	Channel 40620	Channel 41515
		2503.5 MHz	2593.0 MHz	2682.5 MHz
	20M	Channel 39750	Channel 40620	Channel 41490
		2506.0 MHz	2593.0 MHz	2680.0 MHz

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

This submittal(s) (test report) is filing to comply with Section Part 27 of the FCC CFR 47 Rules.

## 5.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures document on ANSI C63.26:2015 and FCC CFR 47.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055 and 2.1057, TIA/EIA 603

## 5.4 Deviation from Standards

None.

## 5.5 Abnormalities from Standard Conditions

None.

## 5.6 Test Facility

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

- **FCC —Registration No.: 381383**

Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files. Registration 381383.

- **IC —Registration No.: 9079A**

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A

- **NVLAP (LAB CODE:600179-0)**

Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP). LAB CODE:600179-0

## 5.7 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.

Address: No. 123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102

Tel: 0755-27798480

Fax: 0755-27798960

## 6 Test Instruments list

Radiated Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	July. 03 2015	July. 02 2020
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	June. 26 2019	June. 25 2020
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June. 26 2019	June. 25 2020
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	June. 26 2019	June. 25 2020
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June. 26 2019	June. 25 2020
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	June. 26 2019	June. 25 2020
9	Coaxial Cable	GTS	N/A	GTS211	June. 26 2019	June. 25 2020
10	Coaxial cable	GTS	N/A	GTS210	June. 26 2019	June. 25 2020
11	Coaxial Cable	GTS	N/A	GTS212	June. 26 2019	June. 25 2020
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June. 26 2019	June. 25 2020
13	Amplifier(2GHz-20GHz)	HP	84722A	GTS206	June. 26 2019	June. 25 2020
14	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June. 26 2019	June. 25 2020
15	Band filter	Amindeon	82346	GTS219	June. 26 2019	June. 25 2020
16	Power Meter	Anritsu	ML2495A	GTS540	June. 26 2019	June. 25 2020
17	Power Sensor	Anritsu	MA2411B	GTS541	June. 26 2019	June. 25 2020
18	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	June. 26 2019	June. 25 2020
19	Splitter	Agilent	11636B	GTS237	June. 26 2019	June. 25 2020
20	Loop Antenna	ZHINAN	ZN30900A	GTS534	June. 26 2019	June. 25 2020
21	Breitband hornantenne	SCHWARZBECK	BBHA 9170	GTS579	Oct. 20 2018	Oct. 19 2019
22	Amplifier	TDK	PA-02-02	GTS574	Oct. 20 2018	Oct. 19 2019
23	Amplifier	TDK	PA-02-03	GTS576	Oct. 20 2018	Oct. 19 2019
24	PSA Series Spectrum Analyzer	Rohde & Schwarz	FSP	GTS578	June. 26 2019	June. 25 2020

<b>RF Conducted Test:</b>						
<b>Item</b>	<b>Test Equipment</b>	<b>Manufacturer</b>	<b>Model No.</b>	<b>Serial No.</b>	<b>Cal.Date (mm-dd-yy)</b>	<b>Cal.Due date (mm-dd-yy)</b>
1	MXA Signal Analyzer	Agilent	N9020A	GTS566	June. 26 2019	June. 25 2020
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 26 2019	June. 25 2020
3	Spectrum Analyzer	Agilent	E4440A	GTS533	June. 26 2019	June. 25 2020
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	June. 26 2019	June. 25 2020
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	June. 26 2019	June. 25 2020
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	June. 26 2019	June. 25 2020
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	June. 26 2019	June. 25 2020
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	June. 26 2019	June. 25 2020

<b>General used equipment:</b>						
<b>Item</b>	<b>Test Equipment</b>	<b>Manufacturer</b>	<b>Model No.</b>	<b>Inventory No.</b>	<b>Cal.Date (mm-dd-yy)</b>	<b>Cal.Due date (mm-dd-yy)</b>
1	Humidity/ Temperature Indicator	KTJ	TA328	GTS243	June. 26 2019	June. 25 2020
2	Barometer	ChangChun	DYM3	GTS255	June. 26 2019	June. 25 2020



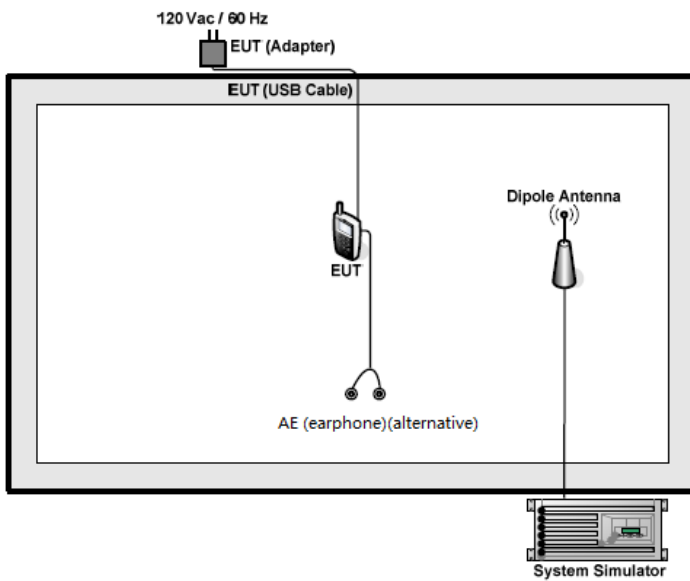
## 7 System test configuration

### 7.1 Test mode

During all testing, EUT is in link mode with base station emulator at maximum power level. The spurious emission measurements were carried out in semi-anechoic chamber with 3-meter test range, and EUT is rotated on three test planes to find out the worst emission.

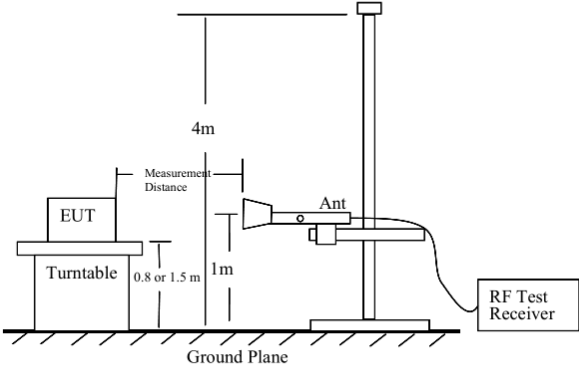
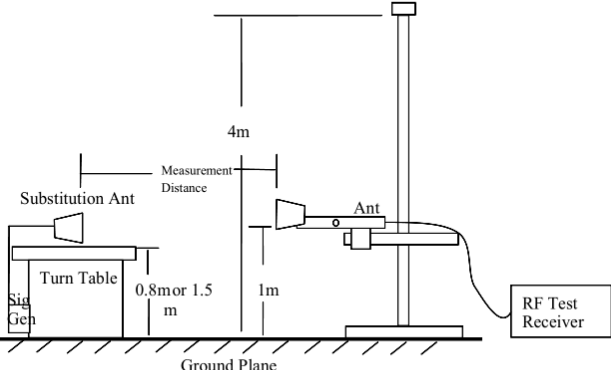
Test modes		
Band	Radiated	Conducted
LTE Band 41	■ QPSK and 16QAM link	■ QPSK and 16QAM link

### 7.2 Configuration of Tested System



## 7.3 ERP/EIRP Output Power

Test Requirement:	Part 27.50(c)(10)/(d)(4)
Test Method:	FCC part2.1046
Limit:	2W
Test setup:	<p><i>Note: Measurement setup for testing on Antenna connector</i></p> <p>Figure 6 — Test site-up for radiated ERP and/or EIRP measurements</p>

	<p style="text-align: center;">ANSI C63.26-2015 American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services</p>  <p style="text-align: center;"><b>Figure 6—Test site-up for radiated ERP and/or EIRP measurements</b></p>  <p style="text-align: center;"><b>Figure 7—Substitution method set-up for radiated emission</b></p>
<p>Test Procedure:</p>	<ol style="list-style-type: none"> <li>1. The transmitter output port was connected to base station.</li> <li>2. The RF output of EUT was connected to the power meter by RF cable and attenuator, the path loss was compensated to the results for each measurement.</li> <li>3. Set EUT at maximum power through base station.</li> <li>4. Select lowest, middle, and highest channels for each band and different modulation.</li> <li>5. Measure the maximum burst average power.</li> </ol>
<p>Test Instruments:</p>	<p>Refer to section 6.0 for details</p>
<p>Test mode:</p>	<p>Refer to section 6.1 for details</p>
<p>Test results:</p>	<p>Pass</p>

Measurement Data

Band 41						
Bandwidth	Mode	RB Size	RB Offset	Actual output power(dBm)		
				Channel 39675 2498.5MHz	Channel 40620 2593.0MHz	Channel 41565 2687.5MHz
5MHz	QPSK	1	0	22.47	23.08	22.96
		1	13	22.02	22.64	22.30
		1	24	23.37	23.83	22.75
		12	0	23.69	22.87	23.49
		12	6	22.90	23.41	22.79
		12	13	23.61	22.72	23.24
		25	0	22.96	23.67	23.22
	16QAM	1	0	22.49	23.41	23.06
		1	13	22.78	22.89	22.03
		1	24	22.92	23.82	23.47
		12	0	22.05	23.12	23.19
		12	6	22.39	<b>23.92</b>	22.65
		12	13	22.96	23.81	22.65
		25	0	23.26	23.42	22.38
Bandwidth	Mode	RB Size	RB Offset	Actual output power(dBm)		
				Channel 39700 2501.0MHz	Channel 40620 2593.0MHz	Channel 41540 2685.0MHz
10MHz	QPSK	1	0	23.58	22.62	22.18
		1	25	22.05	23.88	22.17
		1	49	22.07	22.06	22.52
		25	0	22.39	23.62	23.45
		25	13	23.36	23.53	22.94
		25	25	22.60	23.49	22.26
		50	0	22.50	23.80	23.35
	16QAM	1	0	22.66	23.62	23.47
		1	25	23.28	23.37	22.64
		1	49	22.35	23.87	22.77
		25	0	22.13	23.96	23.62
		25	13	23.02	23.05	22.09
		25	25	23.86	23.71	23.65
		50	0	23.83	<b>23.97</b>	22.81

Bandwidth	Mode	RB Size	RB Offset	Actual output power(dBm)		
				Channel 39725	Channel 40620 2593.0MHz	Channel 41515 2682.5MHz
15MHz	QPSK	1	0	22.62	22.10	23.30
		1	38	23.75	22.43	22.74
		1	74	23.73	22.98	22.24
		36	0	23.82	23.28	22.79
		36	18	23.09	22.12	22.14
		36	39	22.20	23.95	23.19
		75	0	22.13	23.48	22.39
	16QAM	1	0	23.31	23.26	22.45
		1	38	22.81	22.28	22.70
		1	74	23.43	22.80	23.41
		36	0	23.16	23.12	23.63
		36	18	23.68	23.73	22.19
		36	39	23.72	23.04	22.02
		75	0	23.70	23.52	<b>23.99</b>
Bandwidth	Mode	RB Size	RB Offset	Actual output power(dBm)		
				Channel 39750 2506.0MHz	Channel 40620 2593.0MHz	Channel 41490 2680.0MHz
20MHz	QPSK	1	0	23.02	23.32	23.34
		1	50	23.82	23.57	23.31
		1	99	22.32	22.01	23.66
		50	0	22.26	23.12	22.36
		50	25	23.57	<b>23.91</b>	23.16
		50	50	22.32	22.29	22.50
		100	0	22.45	22.73	23.02
	16QAM	1	0	22.14	23.54	22.54
		1	50	23.63	23.64	23.26
		1	99	22.38	23.39	23.46
		50	0	23.74	23.35	22.92
		50	25	23.59	23.78	22.95
		50	50	22.53	23.91	23.02
		100	0	22.35	22.22	23.81

**EIRP:**

Band 41						
Bandwidth	Mode	RB Size	RB Offset	Actual output power(dBm)		
				Channel 39675 2498.5MHz	Channel 40620 2593.0MHz	Channel 41565 2687.5MHz
5MHz	QPSK	1	0	24.47	25.08	24.96
		1	13	24.02	24.64	24.30
		1	24	25.37	25.83	24.75
		12	0	25.69	24.87	25.49
		12	6	24.90	25.41	24.79
		12	13	25.61	24.72	25.24
		25	0	24.96	25.67	25.22
	16QAM	1	0	24.49	25.41	25.06
		1	13	24.78	24.89	24.03
		1	24	24.92	25.82	25.47
		12	0	24.05	25.12	25.19
		12	6	24.39	25.92	24.65
		12	13	24.96	25.81	24.65
		25	0	25.26	25.42	24.38
Bandwidth	Mode	RB Size	RB Offset	Actual output power(dBm)		
				Channel 39700 2501.0MHz	Channel 40620 2593.0MHz	Channel 41540 2685.0MHz
10MHz	QPSK	1	0	25.58	24.62	24.18
		1	25	24.05	25.88	24.17
		1	49	24.07	24.06	24.52
		25	0	24.39	25.62	25.45
		25	13	25.36	25.53	24.94
		25	25	24.60	25.49	24.26
		50	0	24.50	25.80	25.35
	16QAM	1	0	24.66	25.62	25.47
		1	25	25.28	25.37	24.64
		1	49	24.35	25.87	24.77
		25	0	24.13	25.96	25.62
		25	13	25.02	25.05	24.09
		25	25	25.86	25.71	25.65
		50	0	25.83	25.97	24.81

Bandwidth	Mode	RB Size	RB Offset	Actual output power(dBm)		
				Channel 39725 2503.5MHz	Channel 40620 2593.0MHz	Channel 41515 2682.5MHz
15MHz	QPSK	1	0	24.62	24.10	25.30
		1	38	25.75	24.43	24.74
		1	74	25.73	24.98	24.24
		36	0	25.82	25.28	24.79
		36	18	25.09	24.12	24.14
		36	39	24.20	25.95	25.19
		75	0	24.13	25.48	24.39
	16QAM	1	0	25.31	25.26	24.45
		1	38	24.81	24.28	24.70
		1	74	25.43	24.80	25.41
		36	0	25.16	25.12	25.63
		36	18	25.68	25.73	24.19
		36	39	25.72	25.04	24.02
		75	0	25.70	25.52	25.99
Bandwidth	Mode	RB Size	RB Offset	Actual output power(dBm)		
				Channel 39750 2506.0MHz	Channel 40620 2593.0MHz	Channel 41490 2680.0MHz
20MHz	QPSK	1	0	25.02	25.32	25.34
		1	50	25.82	25.57	25.31
		1	99	24.32	24.01	25.66
		50	0	24.26	25.12	24.36
		50	25	25.57	25.91	25.16
		50	50	24.32	24.29	24.50
		100	0	24.45	24.73	25.02
	16QAM	1	0	24.14	25.54	24.54
		1	50	25.63	25.64	25.26
		1	99	24.38	25.39	25.46
		50	0	25.74	25.35	24.92
		50	25	25.59	25.78	24.95
		50	50	24.53	25.91	25.02
		100	0	24.35	24.22	25.81

## 7.4 Peak-to-Average Ratio

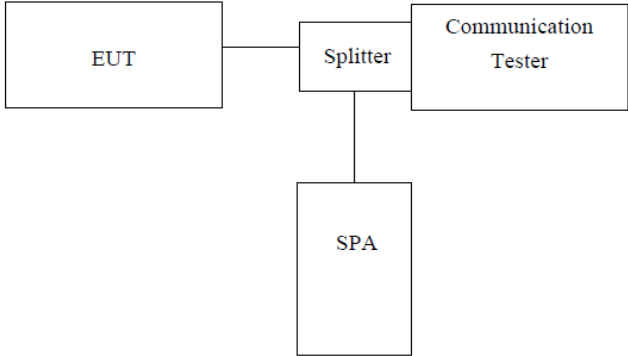
Test Requirement:	FCC Part 27.50
Test Method:	FCC part2.1046
Limit:	13db
Test setup:	<pre> graph LR     CC[Control Computer] --&gt; EUT[EUT]     PS[Power Supply] --&gt; EUT     EUT --&gt; PD[Power Divider]     PD --&gt; WC[Wireless Communication]     PD --&gt; SA[Spectrum Analyzer]             </pre>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 7.1 for details
Test results:	Pass

### Measurement data:

Test Band	Test mode		Peak to Average Ratio (dB)			Limit (dB)	Result
			Low Ch.	Middle Ch.	High Ch.		
LTE Band 41	QPSK	5M	4.83	4.86	4.87	13.00	PASS
		10M	5.04	5.65	5.02	13.00	PASS
		15M	6.28	6.81	6.19	13.00	PASS
		20M	6.93	6.04	6.28	13.00	PASS
	16QAM	5M	4.53	4.77	4.32	13.00	PASS
		10M	5.66	5.29	5.64	13.00	PASS
		15M	6.79	6.17	6.71	13.00	PASS
		20M	6.61	6.62	6.74	13.00	PASS



## 7.5 Occupy Bandwidth

Test Requirement:	FCC Part 27.53(h)/(g)
Test Method:	FCC part2.1049
Test setup:	 <p><i>Note: Measurement setup for testing on Antenna connector</i></p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 6.1 for details
Test results:	Pass

## Measurement Data

QPSK mode:

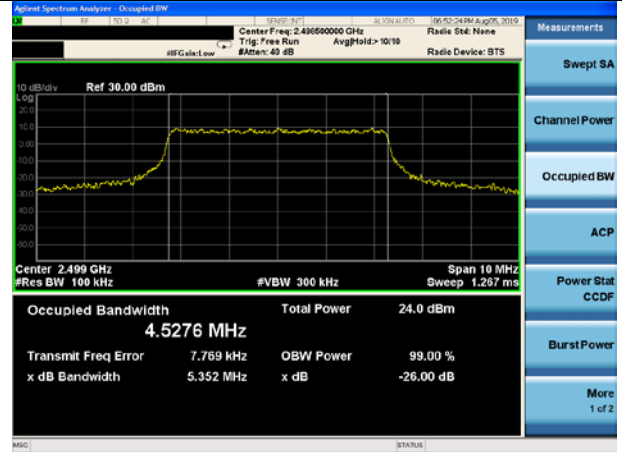
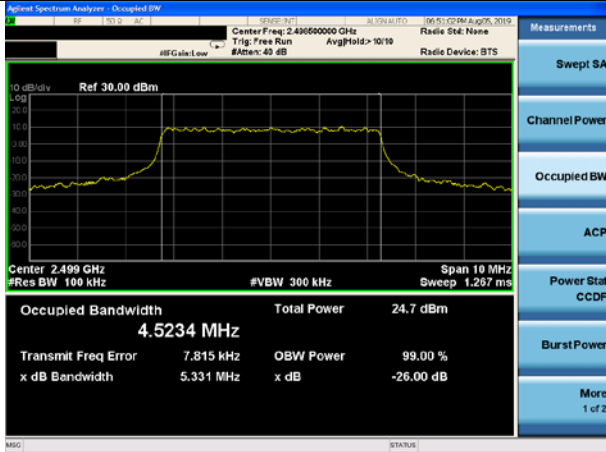
EUT Mode	Channel Bandwidth	Channel	RB Configure		99% Occupy bandwidth (MHz)	-26dB bandwidth (MHz)
			RB Size	RB Offset		
LTE Band 41	5MHz	Low range	6	0	4.5234	5.331
		Mid range	6	0	4.5615	5.576
		High range	6	0	4.5368	5.505
	10MHz	Low range	15	0	8.9862	10.57
		Mid range	15	0	8.9687	10.08
		High range	15	0	8.9735	9.991
	15MHz	Low range	25	0	13.452	15.46
		Mid range	25	0	13.456	15.17
		High range	25	0	13.444	15.48
	20MHz	Low range	50	0	17.905	20.78
		Mid range	50	0	17.887	19.93
		High range	50	0	17.868	19.83

16QAM mode:

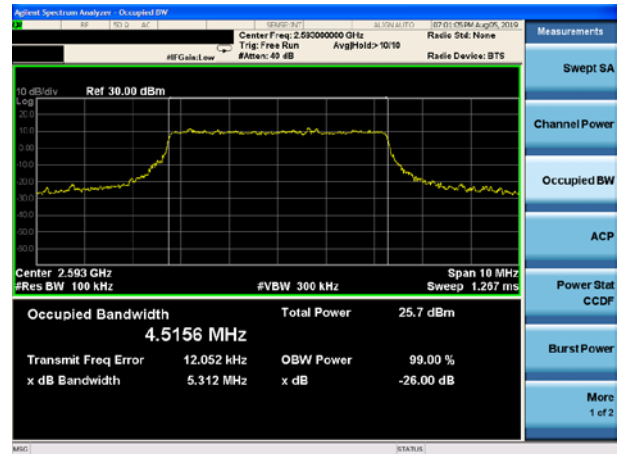
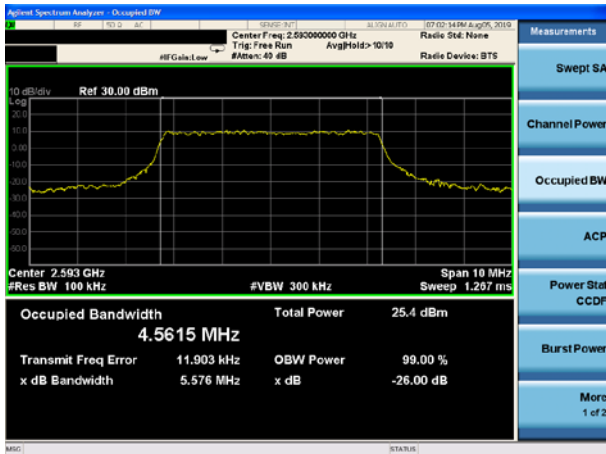
EUT Mode	Channel Bandwidth	Channel	RB Configure		99% Occupy bandwidth (MHz)	-26dB bandwidth (MHz)
			RB Size	RB Offset		
LTE Band 41	5MHz	Low range	6	0	4.5276	5.352
		Mid range	6	0	4.5156	5.312
		High range	6	0	4.5392	5.415
	10MHz	Low range	15	0	8.9659	10.41
		Mid range	15	0	8.9925	10.27
		High range	15	0	8.9761	10.47
	15MHz	Low range	25	0	13.458	15.42
		Mid range	25	0	13.470	15.27
		High range	25	0	13.446	15.42
	20MHz	Low range	50	0	17.895	20.34
		Mid range	50	0	17.872	20.24
		High range	50	0	17.860	20.04

Test plot as follows:

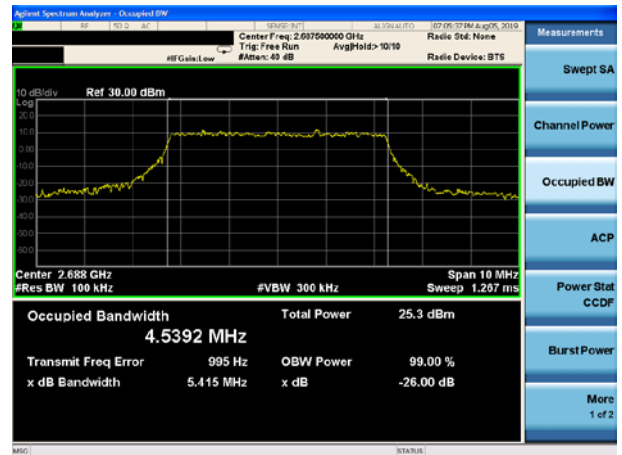
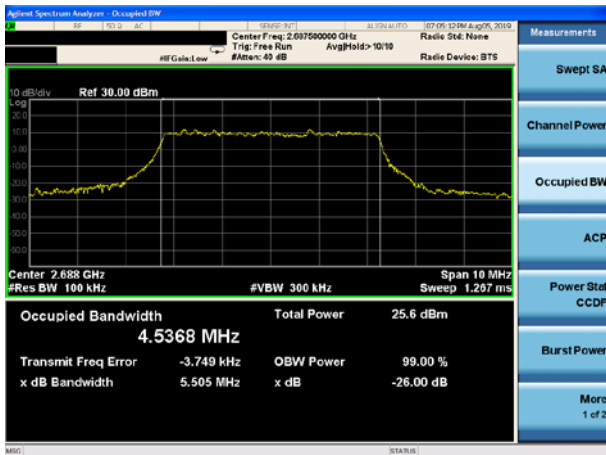
Channel Bandwidth: 5MHz	QPSK	Channel Bandwidth: 5MHz	16QAM
-------------------------	------	-------------------------	-------



Lowest channel

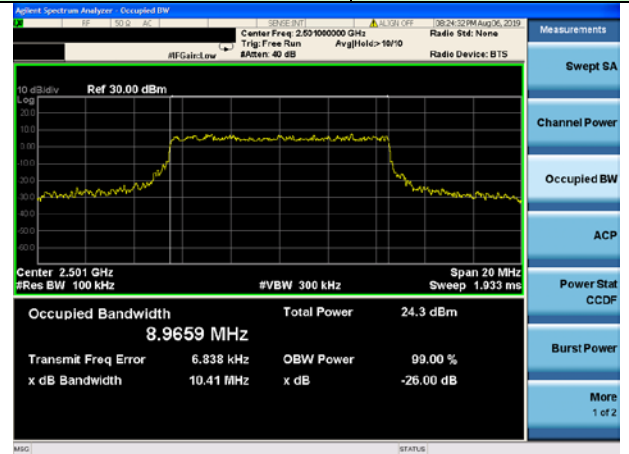
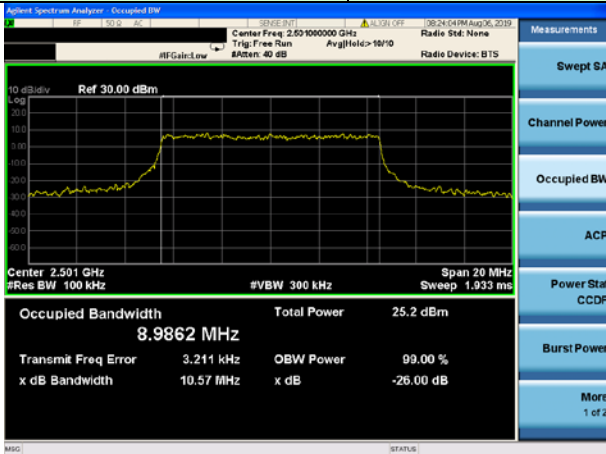


Middle channel

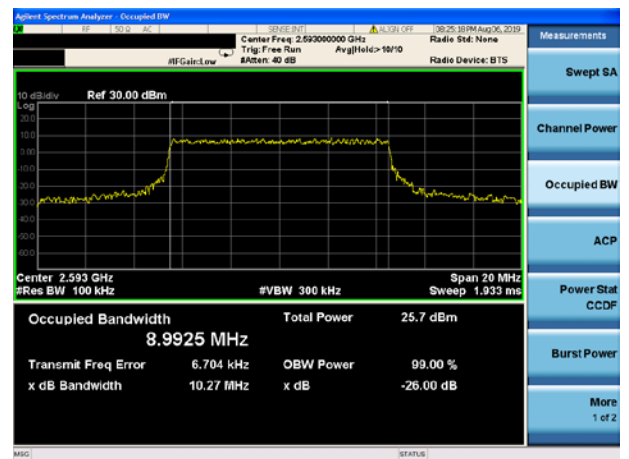
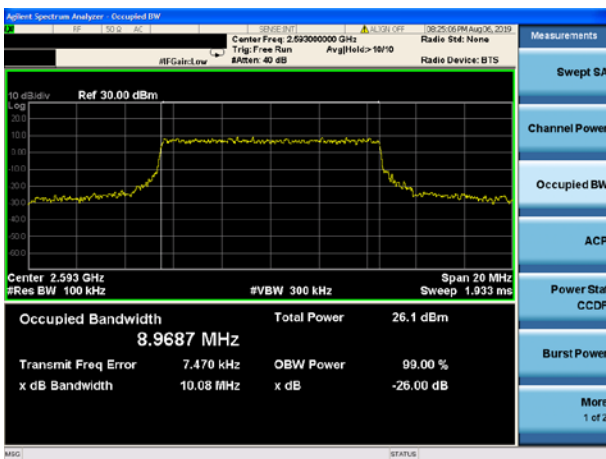


Highest channel

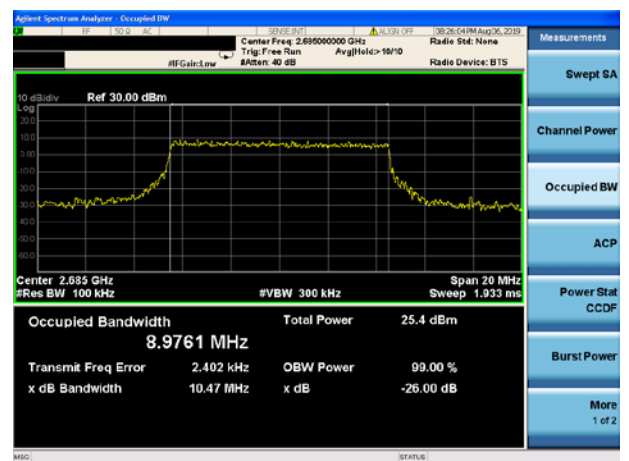
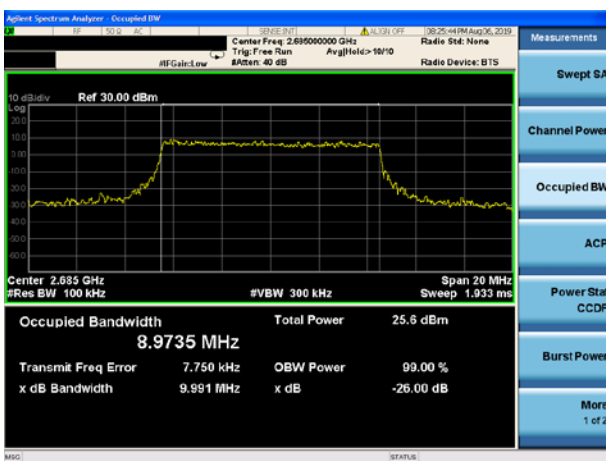
Channel Bandwidth: 10MHz	QPSK	Channel Bandwidth: 10MHz	16QAM
--------------------------	------	--------------------------	-------



Lowest channel

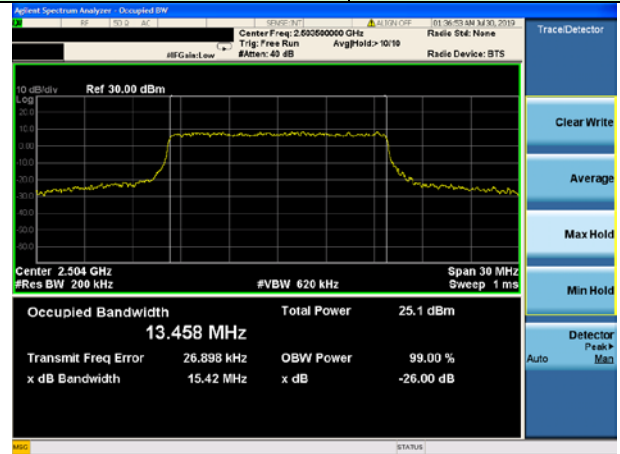
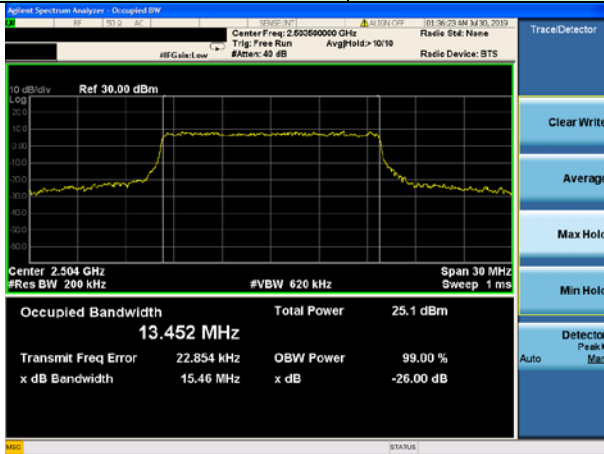


Middle channel

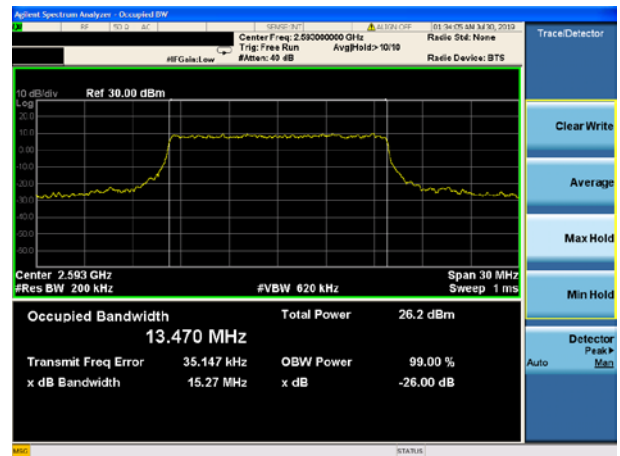
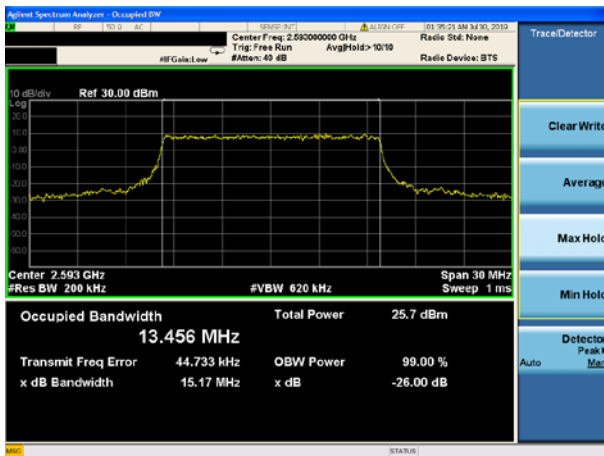


Highest channel

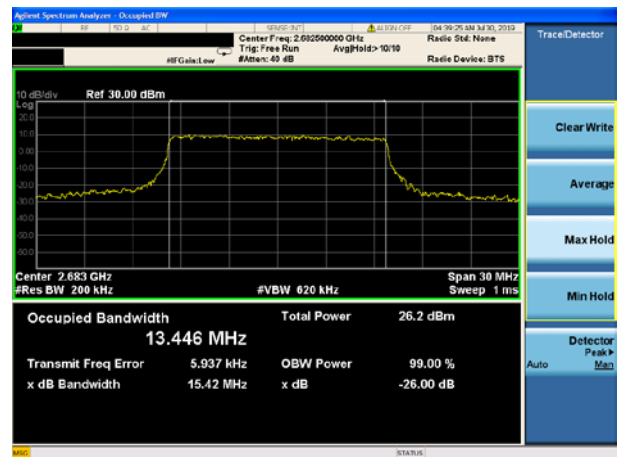
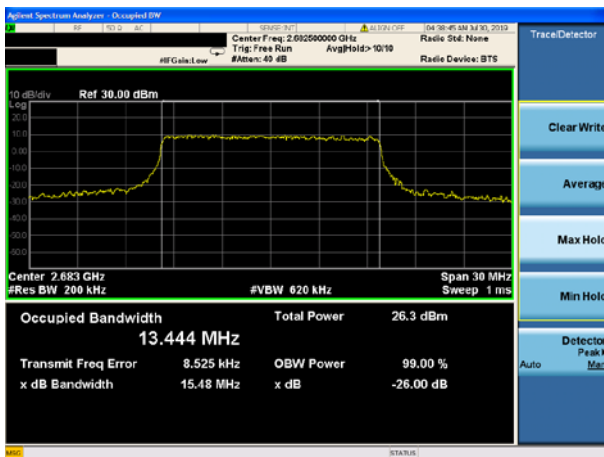
Channel Bandwidth: 15MHz	QPSK	Channel Bandwidth: 15MHz	16QAM
--------------------------	------	--------------------------	-------



Lowest channel

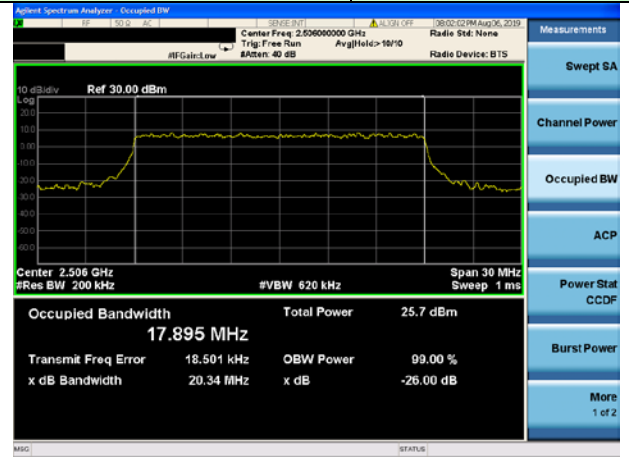
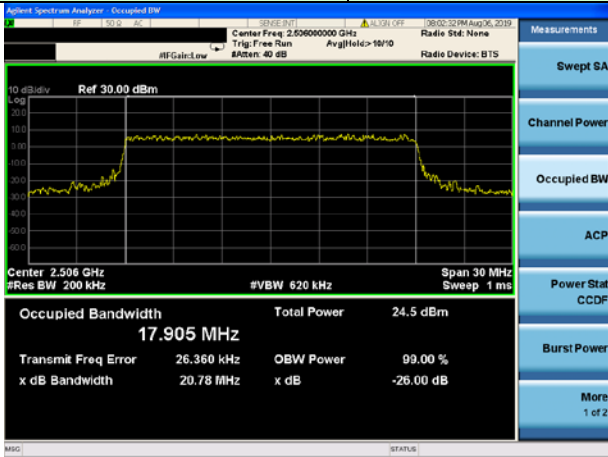


Middle channel

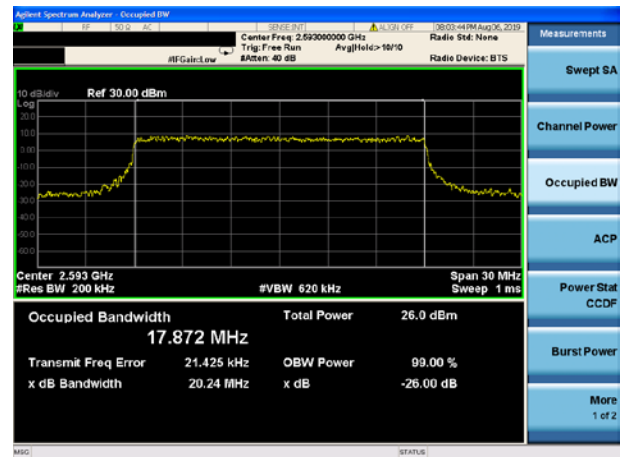
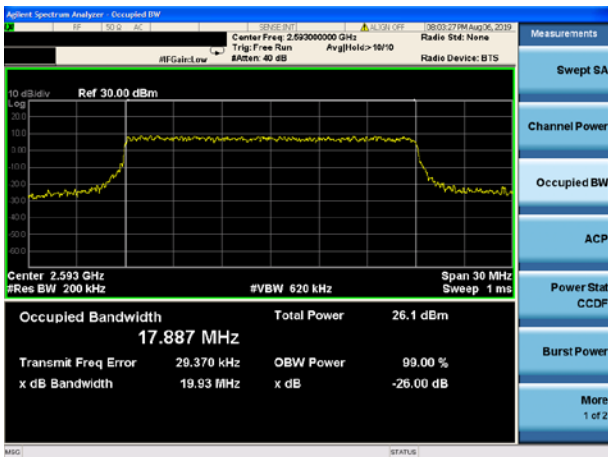


Highest channel

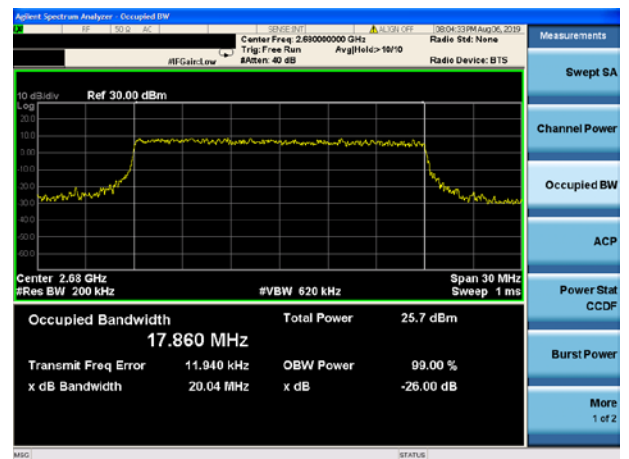
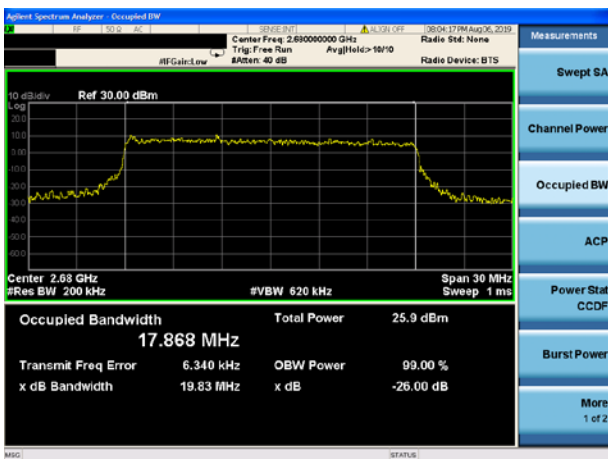
Channel Bandwidth: 20MHz	QPSK	Channel Bandwidth: 20MHz	16QAM
--------------------------	------	--------------------------	-------



Lowest channel



Middle channel

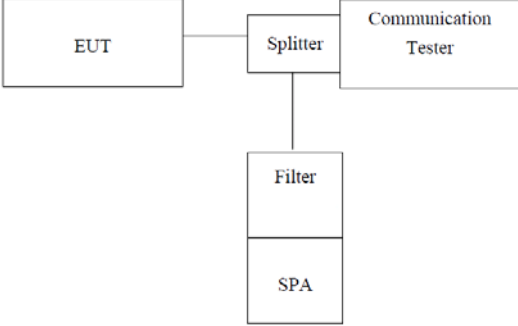


Highest channel

## 7.6 MODULATION CHARACTERISTIC

According to FCC § 2.1047(d), Part 27 there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

## 7.7 Out of band emission at antenna terminals

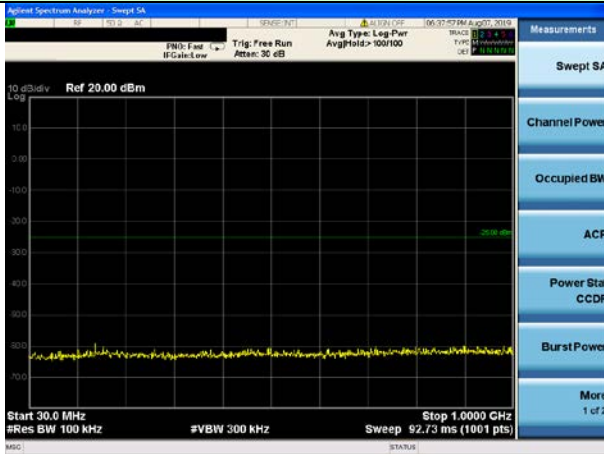
Test Requirement:	FCC Part 27.53(h)/(g)
Test Method:	FCC part2.1051
Limit:	-25dBm
Test setup:	 <p style="text-align: center;"><i>Note: Measurement setup for testing on Antenna connector</i></p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 6.1 for details
Test results:	Pass

Remark: Both modulation modes have been tested, showing only the worst QPSK test data.

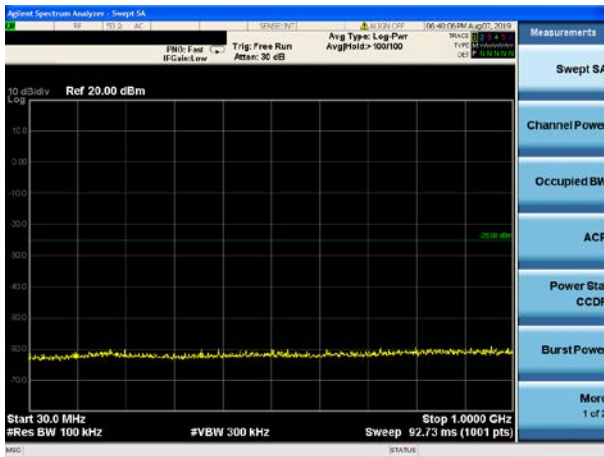
Test plot as follows:

Test Mode: LTE Band 41

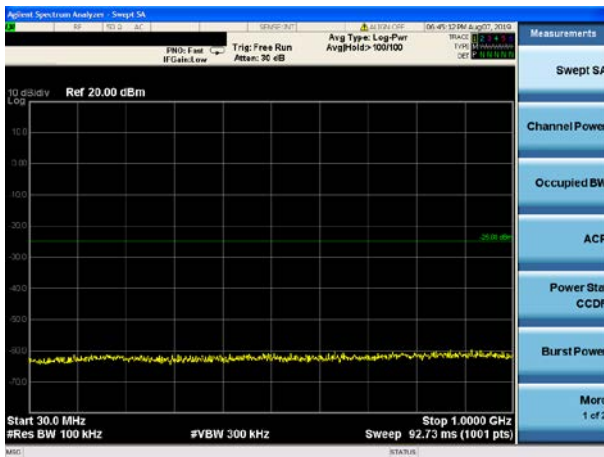
Channel Bandwidth: 5MHz



Lowest channel



Middle channel

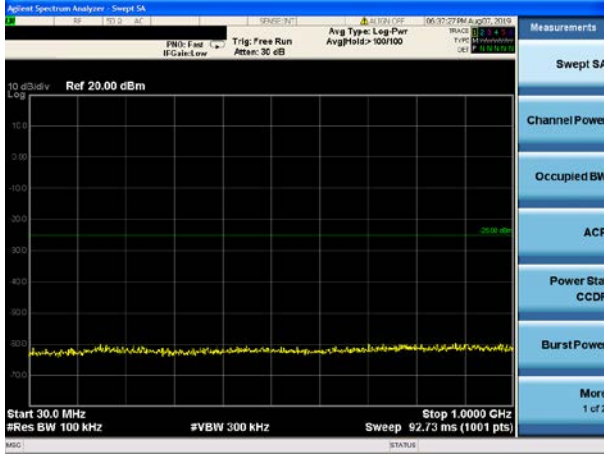


Highest channel

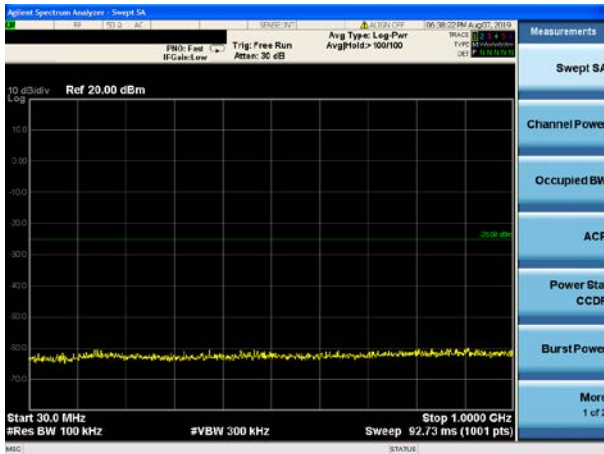


Test Mode: LTE Band 41

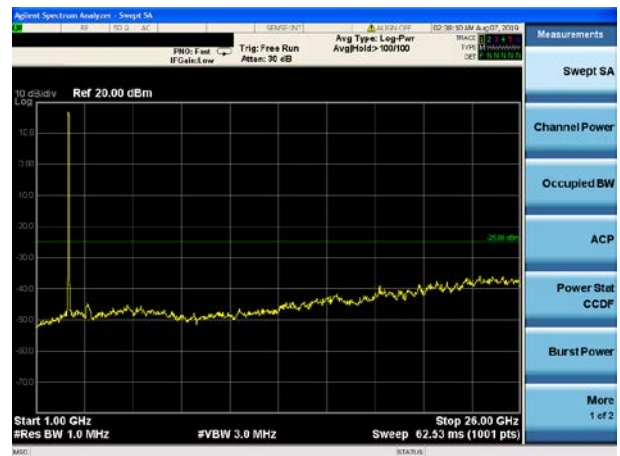
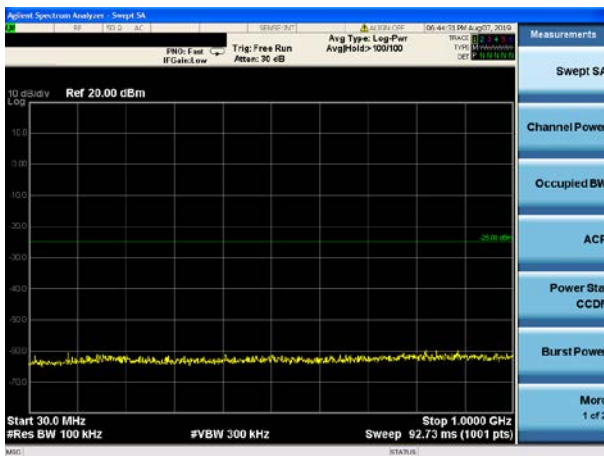
Channel Bandwidth: 10MHz



Lowest channel

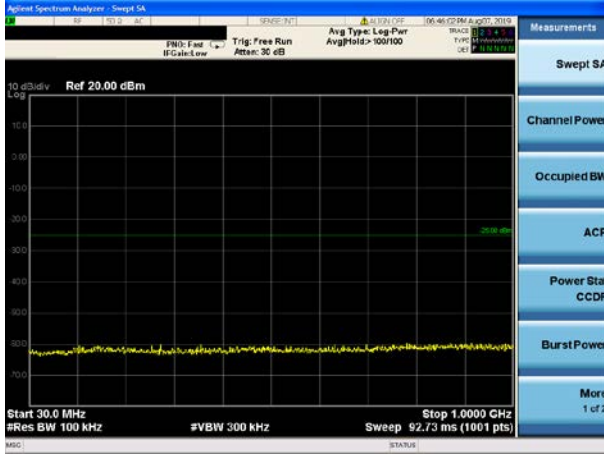


Middle channel

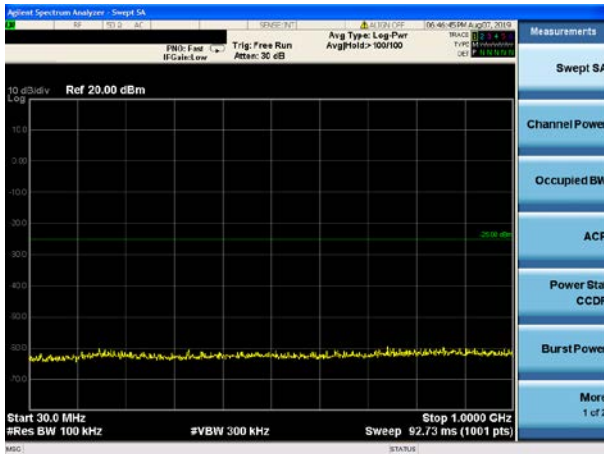


Highest channel

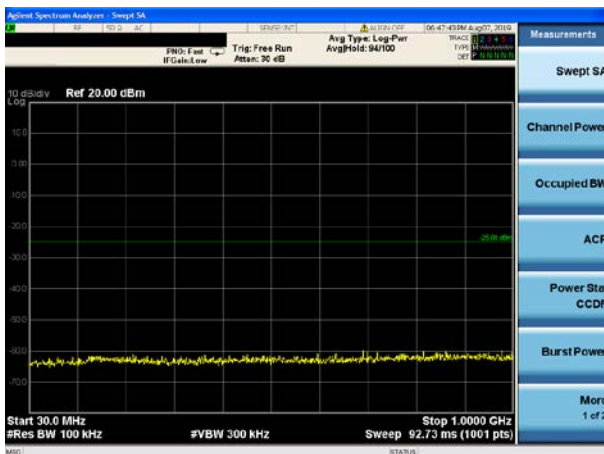
Test Mode: LTE Band 41      Channel Bandwidth: 15MHz



Lowest channel

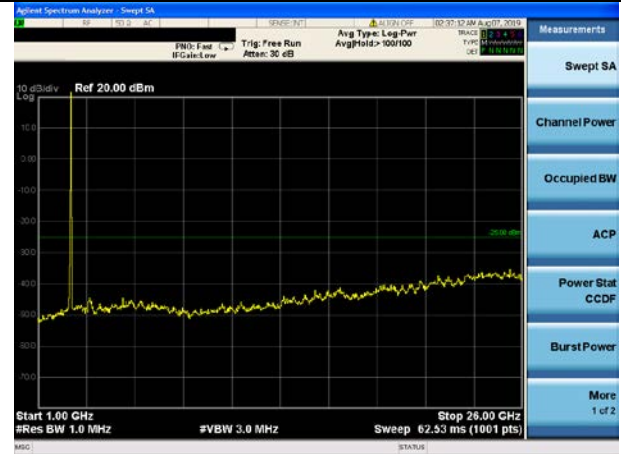
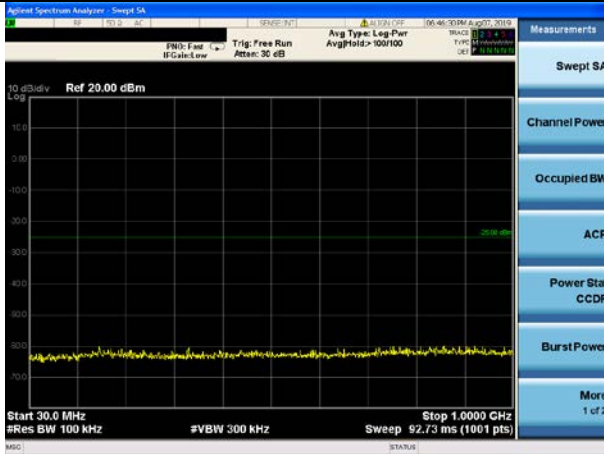


Middle channel

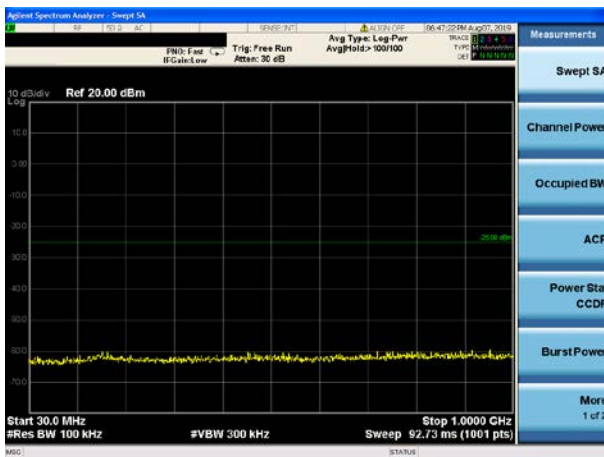


Highest channel

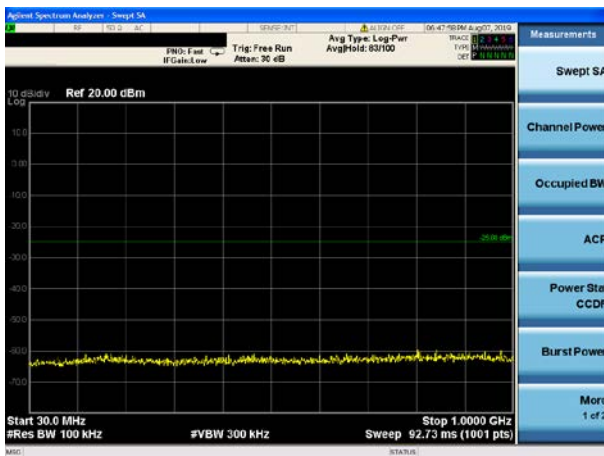
Test Mode: LTE Band 41 | Channel Bandwidth: 20MHz



Lowest channel



Middle channel



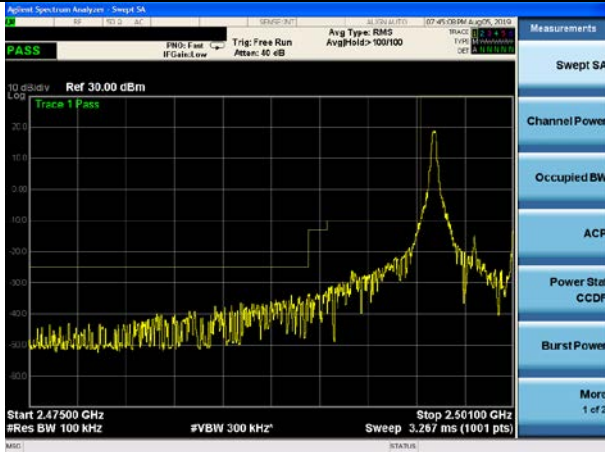
Highest channel

**Band Edge:**

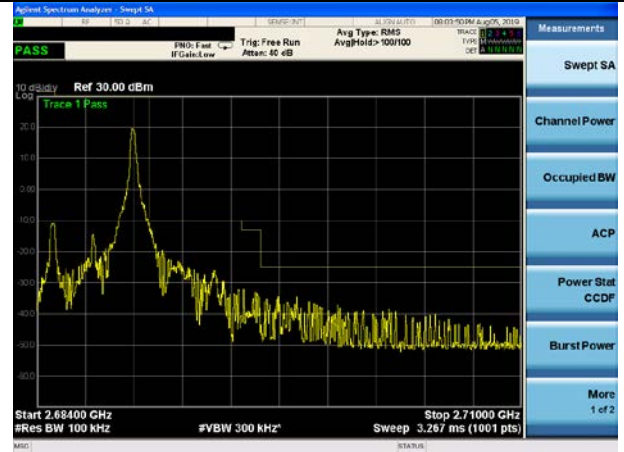
**QPSK mode:**

5MHz Bandwidth (RB size:1# RB offset:0#)

5MHz Bandwidth (RB size:1# RB offset:24#)



Lowest channel



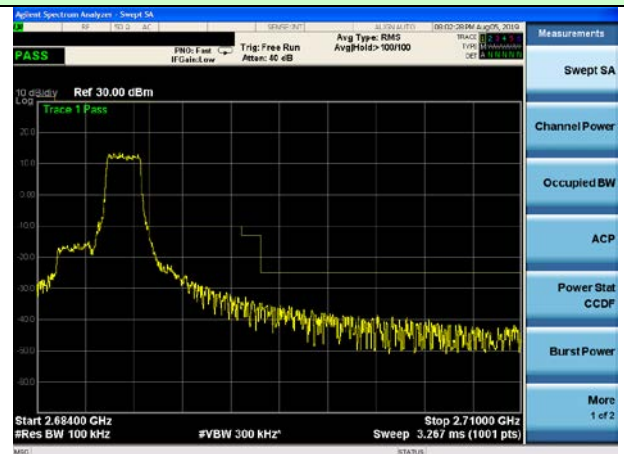
Highest channel

5MHz Bandwidth (RB size:12# RB offset:0#)

5MHz Bandwidth (RB size:12# RB offset:13#)



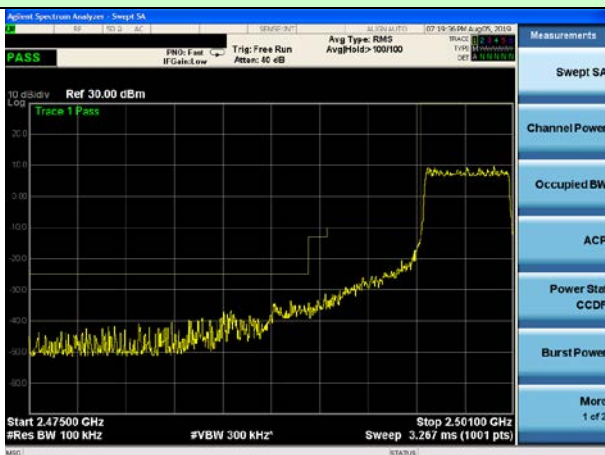
Lowest channel



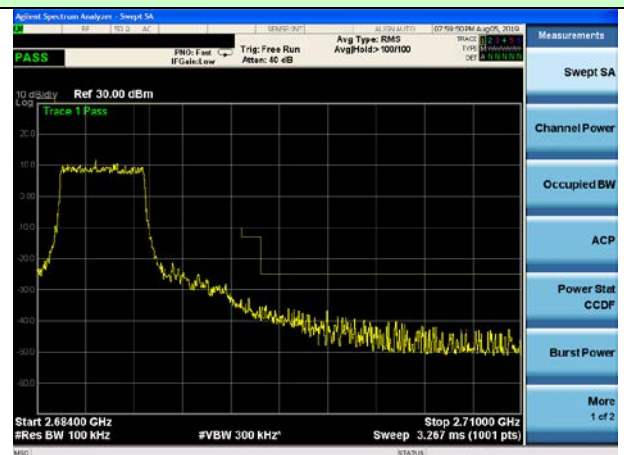
Highest channel

5MHz Bandwidth (RB size:25# RB offset:0#)

5MHz Bandwidth (RB size:25# RB offset:0#)

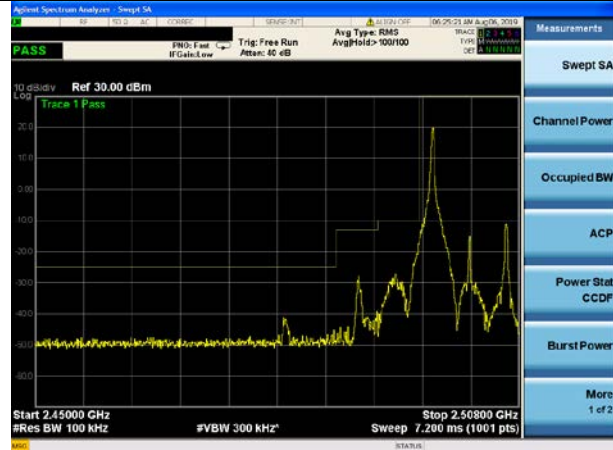


Lowest channel

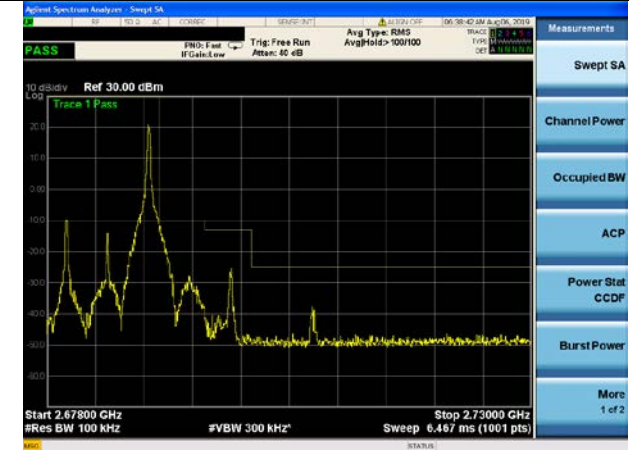


Highest channel

10MHz Bandwidth (RB size:1# RB offset:0#)      10MHz Bandwidth (RB size:1# RB offset:49#)

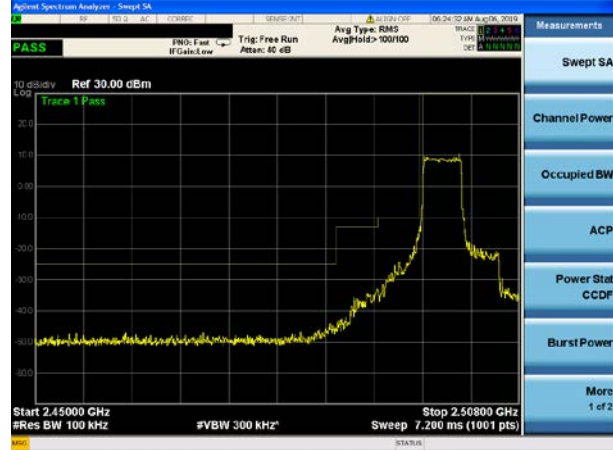


Lowest channel

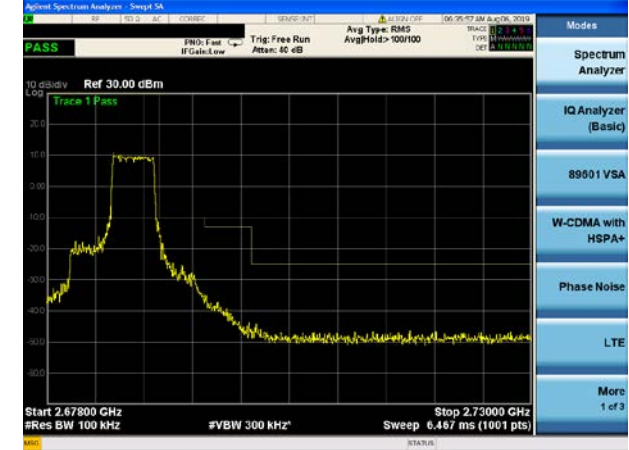


Highest channel

10MHz Bandwidth (RB size:25# RB offset:0#)      10MHz Bandwidth (RB size:25# RB offset:25#)



Lowest channel

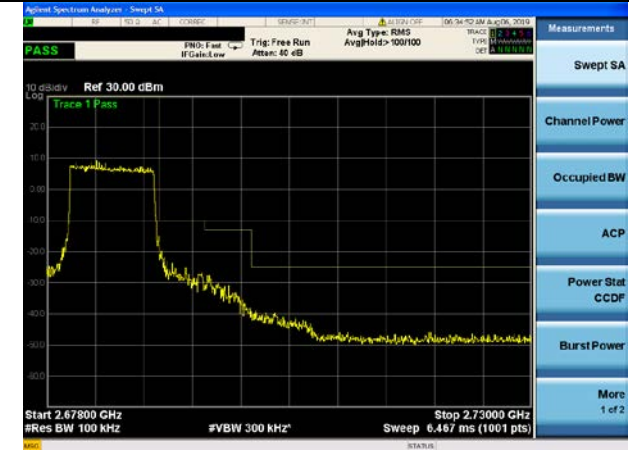


Highest channel

10MHz Bandwidth (RB size:50# RB offset:0#)      10MHz Bandwidth (RB size:50# RB offset:0#)

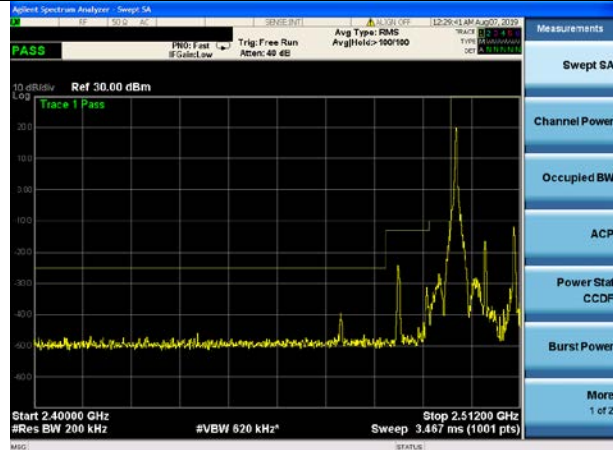


Lowest channel

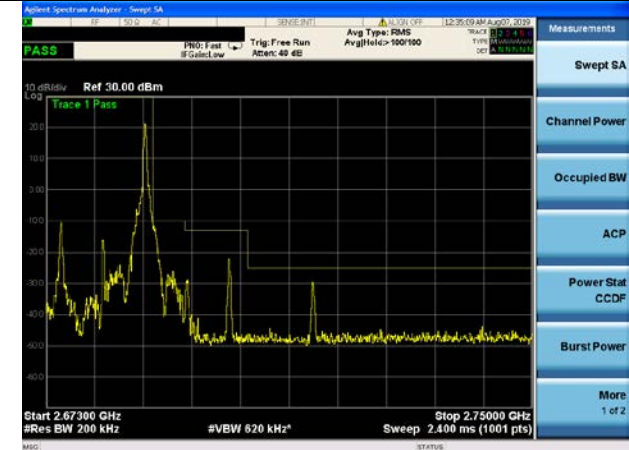


Highest channel

15MHz Bandwidth (RB size:1# RB offset:0#)      15MHz Bandwidth (RB size:1# RB offset:74#)

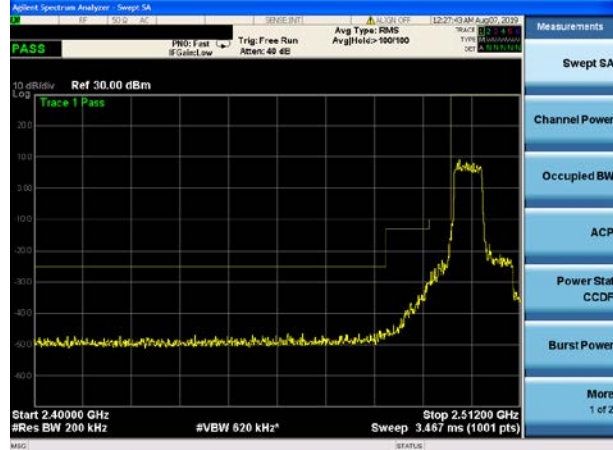


Lowest channel

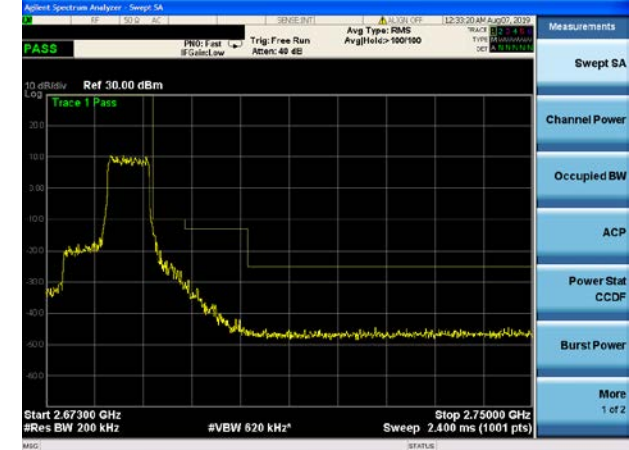


Highest channel

15MHz Bandwidth (RB size:36# RB offset:0#)      15MHz Bandwidth (RB size:36# RB offset:39#)

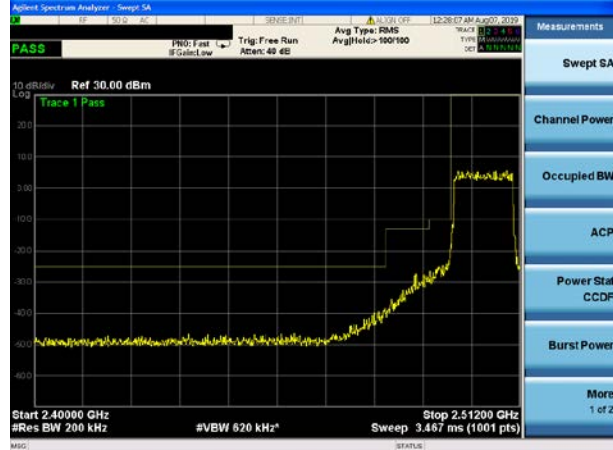


Lowest channel

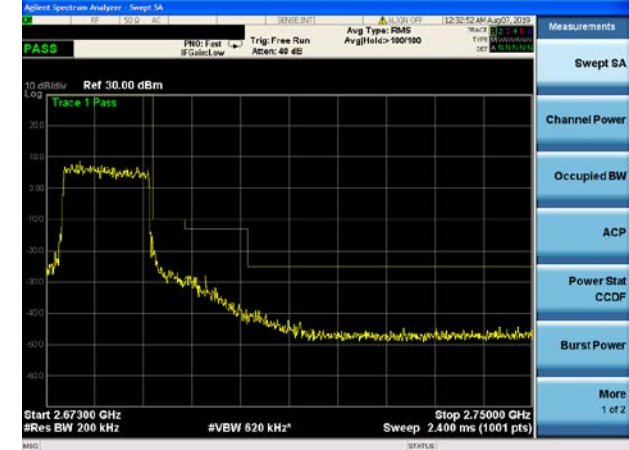


Highest channel

15MHz Bandwidth (RB size:75# RB offset:0#)      15MHz Bandwidth (RB size:75# RB offset:0#)

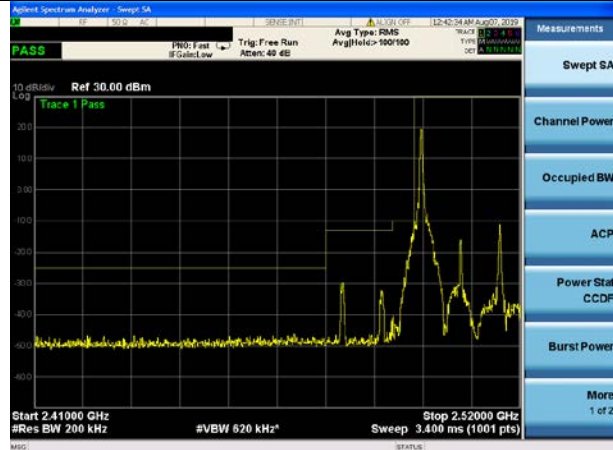


Lowest channel

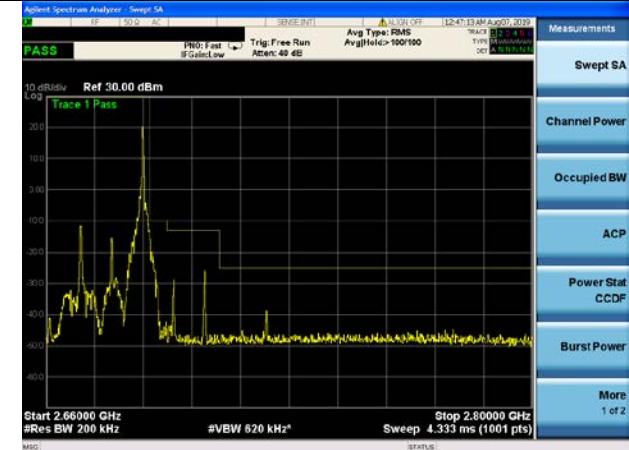


Highest channel

20MHz Bandwidth (RB size:1# RB offset:0#)      20MHz Bandwidth (RB size:1# RB offset:99#)

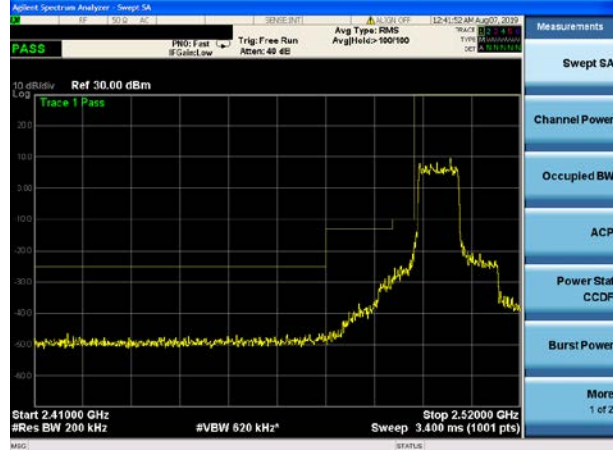


Lowest channel

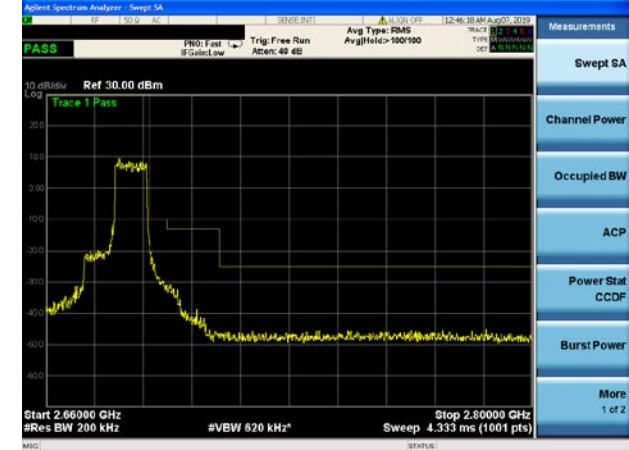


Highest channel

20MHz Bandwidth (RB size:50# RB offset:0#)      20MHz Bandwidth (RB size:50# RB offset:50#)

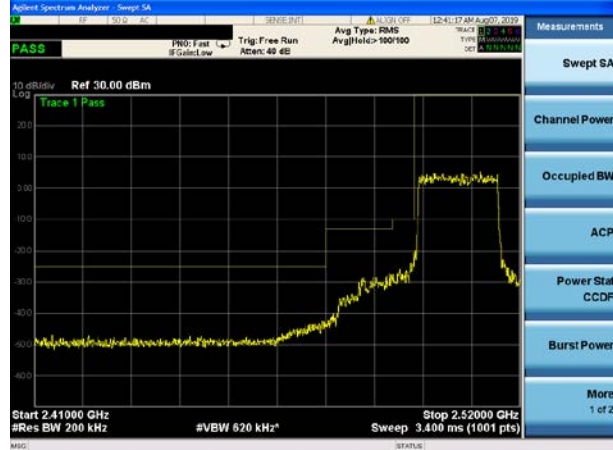


Lowest channel

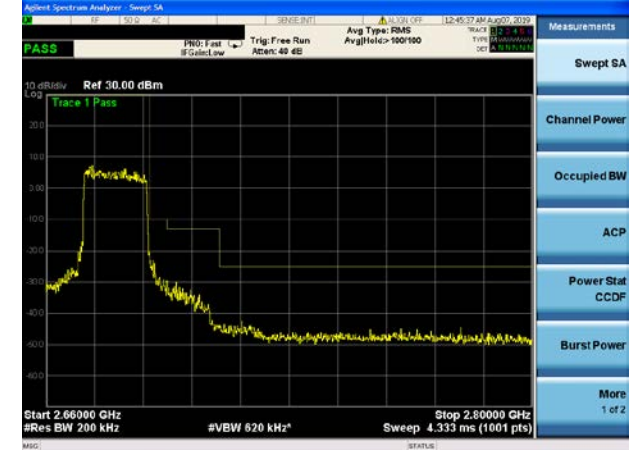


Highest channel

20MHz Bandwidth (RB size:100# RB offset:0#)      20MHz Bandwidth (RB size:100# RB offset:0#)



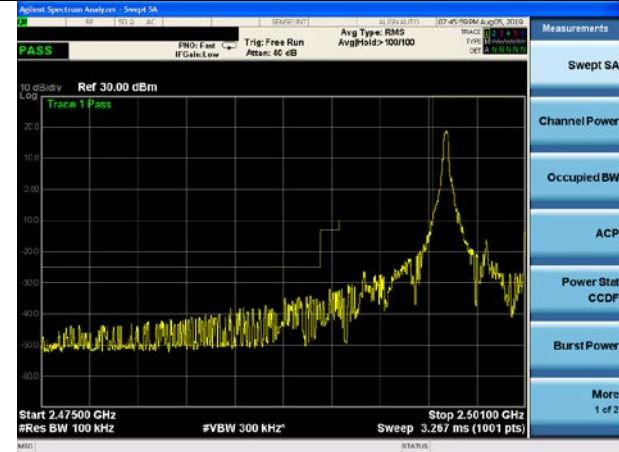
Lowest channel



Highest channel

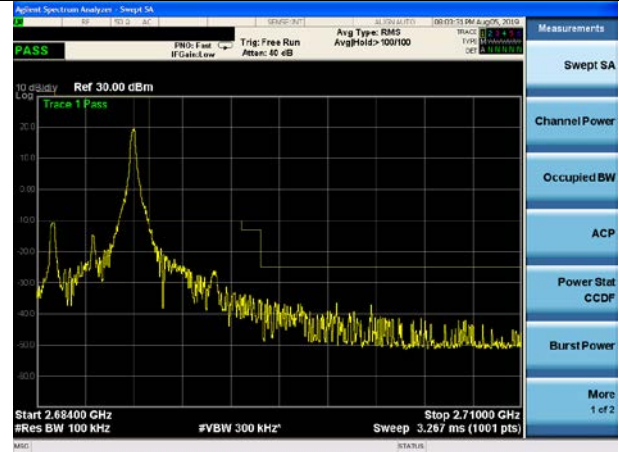
16QAM mode:

5MHz Bandwidth (RB size:1# RB offset:0#)



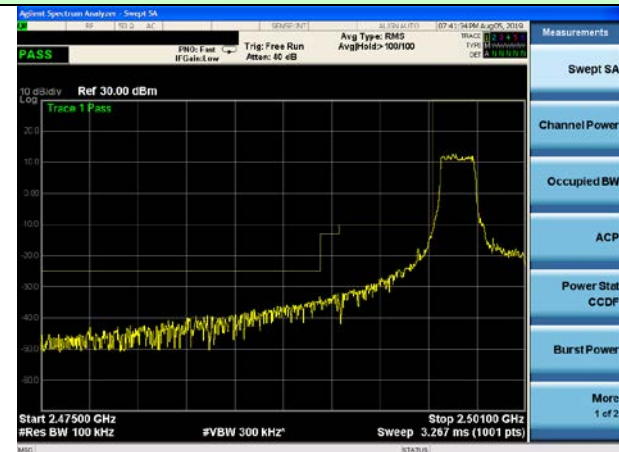
Lowest channel

5MHz Bandwidth (RB size:1# RB offset:24#)



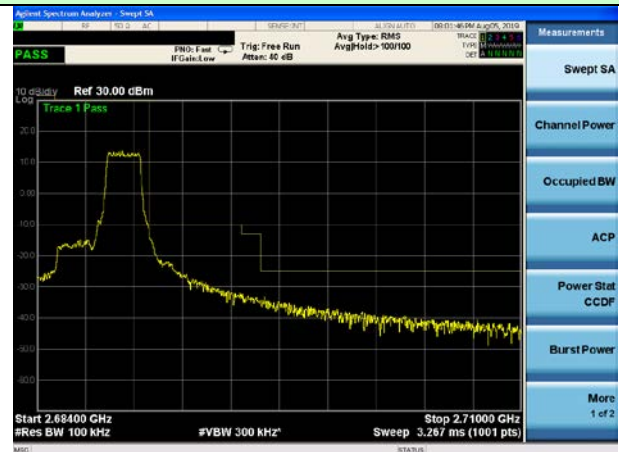
Highest channel

5MHz Bandwidth (RB size:12# RB offset:0#)



Lowest channel

5MHz Bandwidth (RB size:12# RB offset:13#)



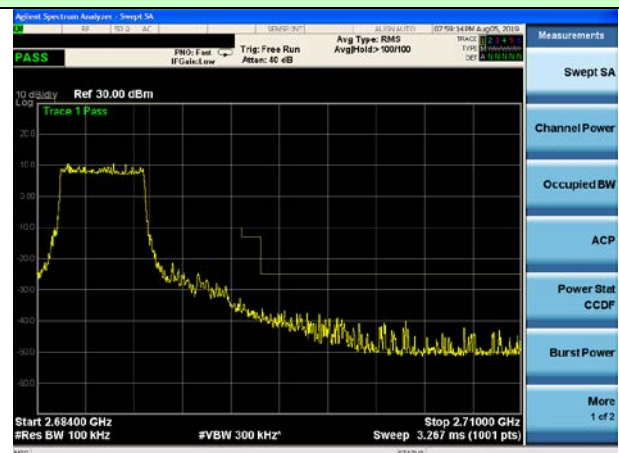
Highest channel

5MHz Bandwidth (RB size:25# RB offset:0#)



Lowest channel

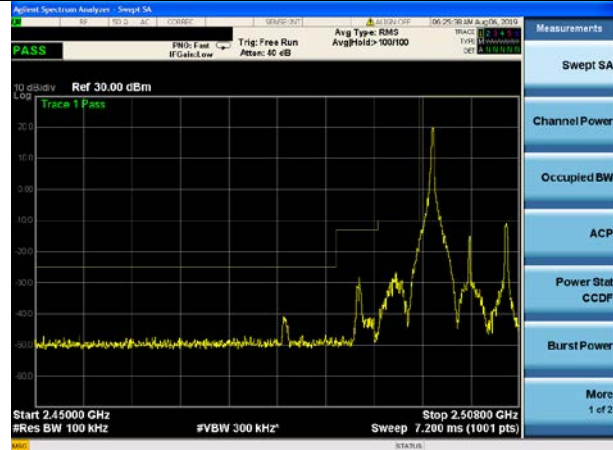
5MHz Bandwidth (RB size:25# RB offset:0#)



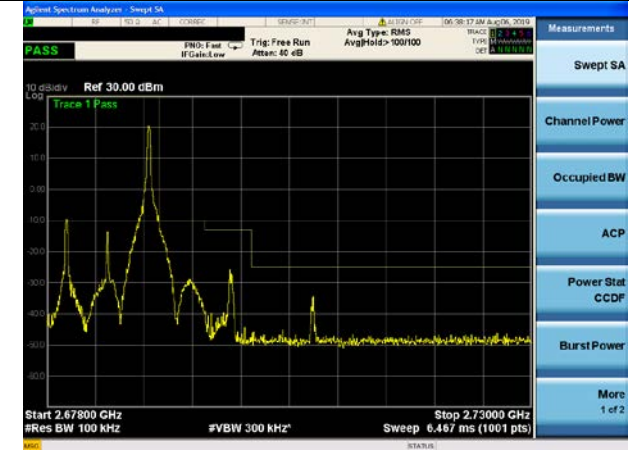
Highest channel



10MHz Bandwidth (RB size:1# RB offset:0#)      10MHz Bandwidth (RB size:1# RB offset:49#)

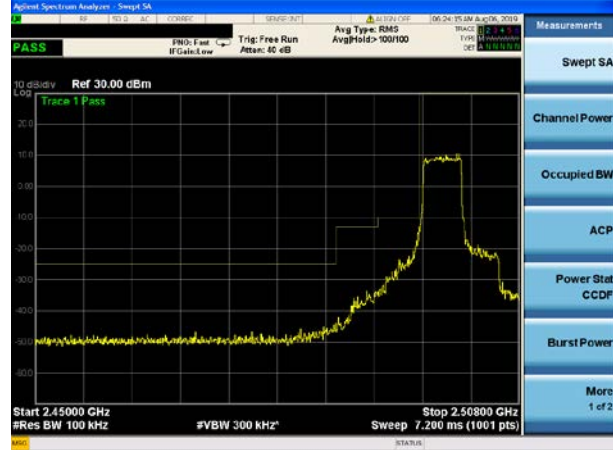


Lowest channel

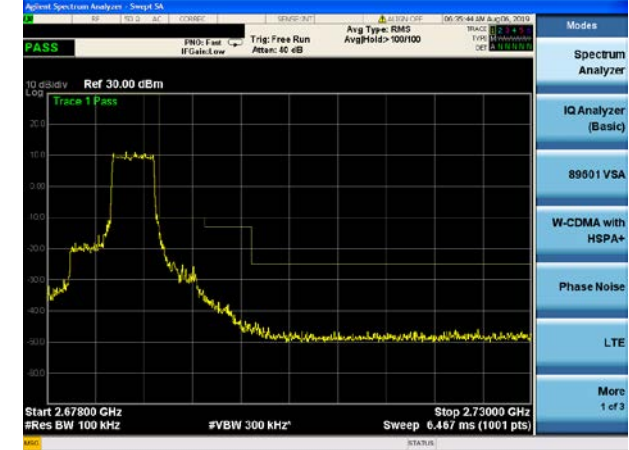


Highest channel

10MHz Bandwidth (RB size:25# RB offset:0#)      10MHz Bandwidth (RB size:25# RB offset:25#)

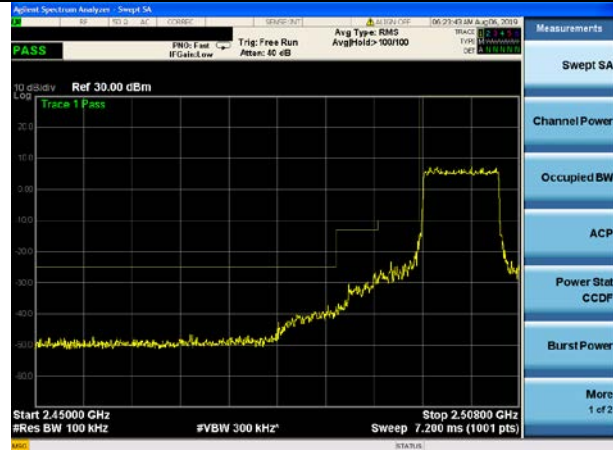


Lowest channel

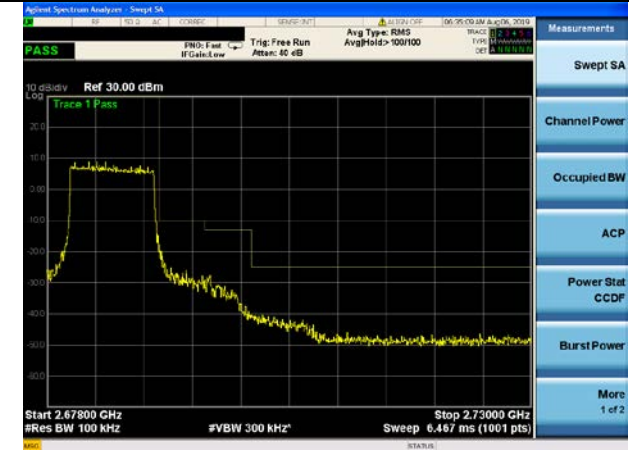


Highest channel

10MHz Bandwidth (RB size:50# RB offset:0#)      10MHz Bandwidth (RB size:50# RB offset:0#)



Lowest channel

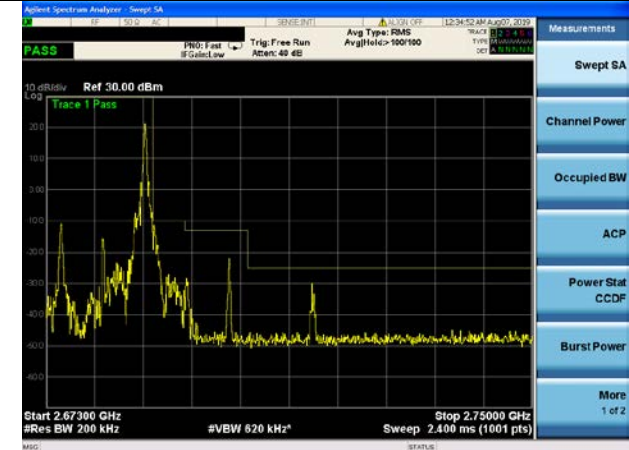


Highest channel

15MHz Bandwidth (RB size:1# RB offset:0#)      15MHz Bandwidth (RB size:1# RB offset:74#)

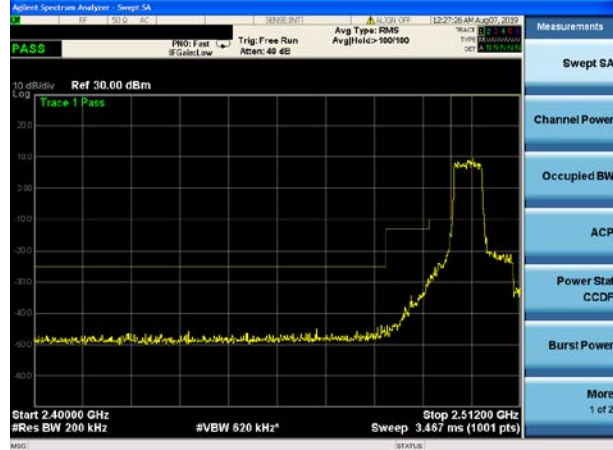


Lowest channel

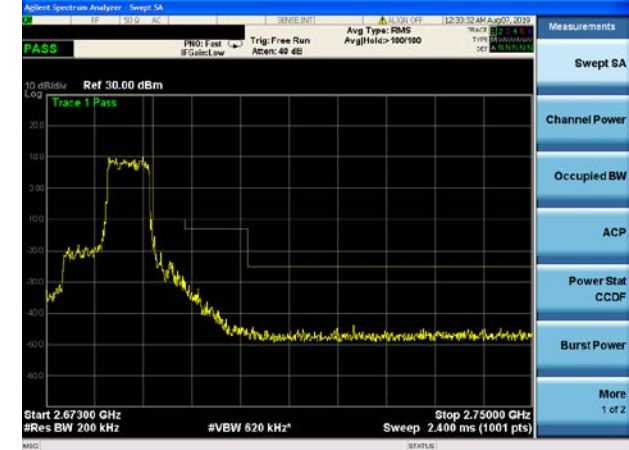


Highest channel

15MHz Bandwidth (RB size:36# RB offset:0#)      15MHz Bandwidth (RB size:36# RB offset:39#)

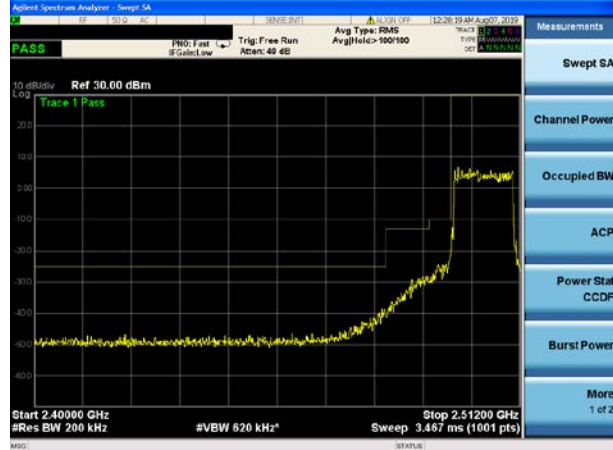


Lowest channel

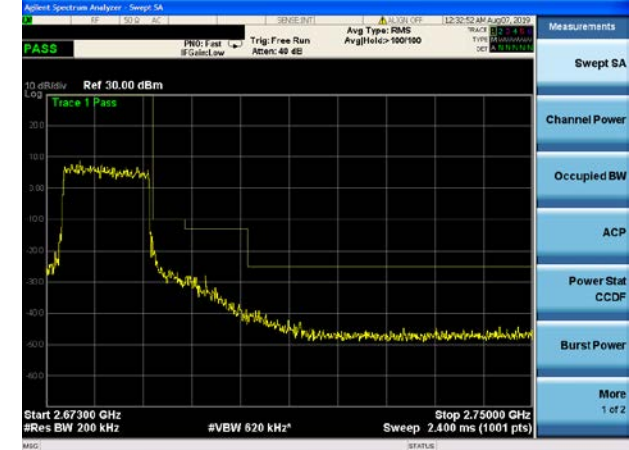


Highest channel

15MHz Bandwidth (RB size:75# RB offset:0#)      15MHz Bandwidth (RB size:75# RB offset:0#)

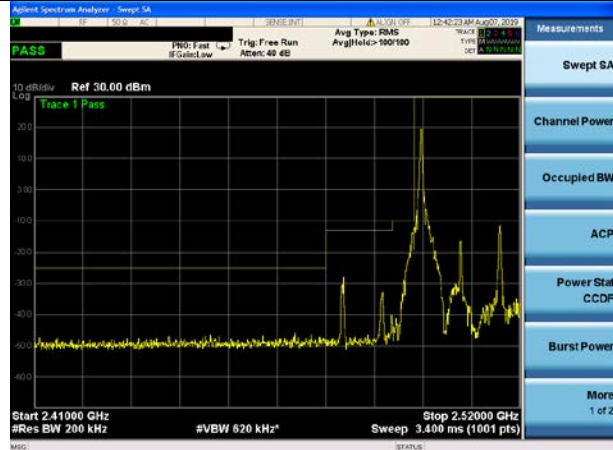


Lowest channel

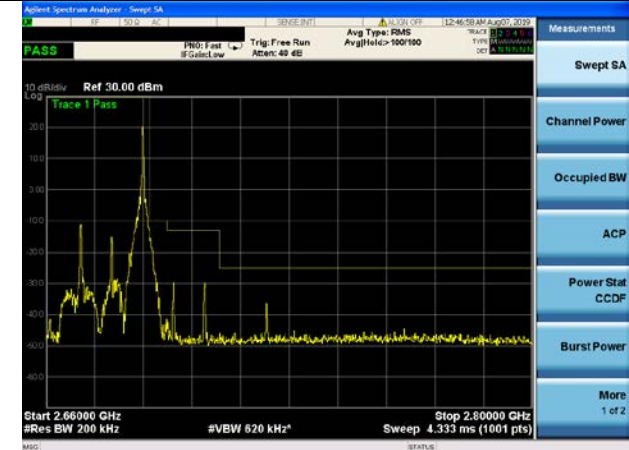


Highest channel

20MHz Bandwidth (RB size:1# RB offset:0#)      20MHz Bandwidth (RB size:1# RB offset:99#)



Lowest channel

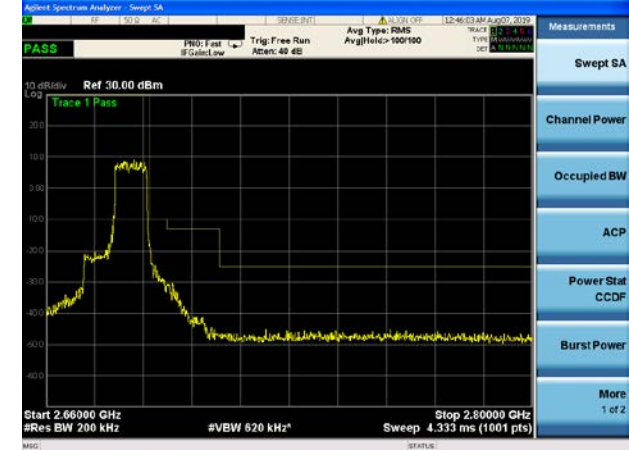


Highest channel

20MHz Bandwidth (RB size:50# RB offset:0#)      20MHz Bandwidth (RB size:50# RB offset:50#)

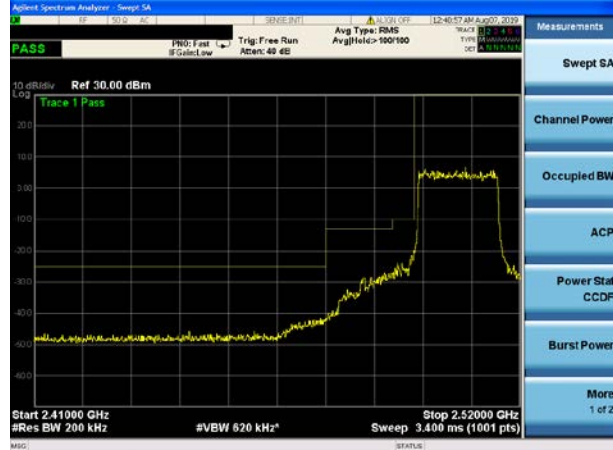


Lowest channel

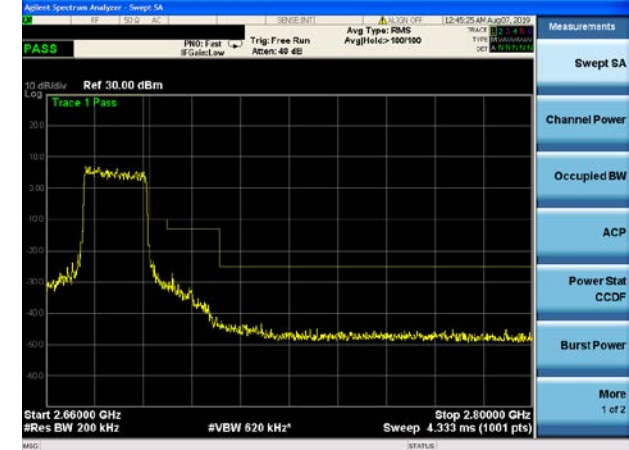


Highest channel

20MHz Bandwidth (RB size:100# RB offset:0#)      20MHz Bandwidth (RB size:100# RB offset:0#)

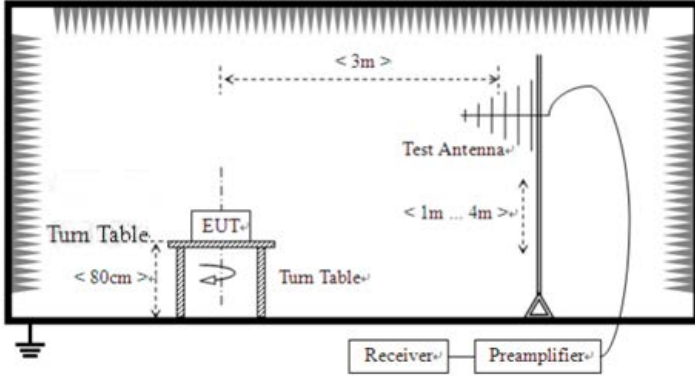
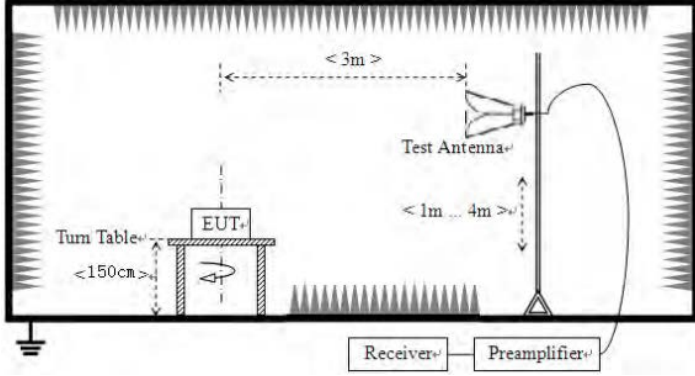
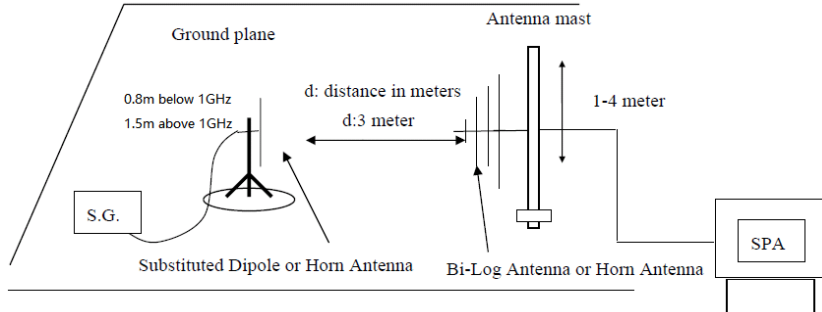


Lowest channel



Highest channel

## 7.8 Field strength of spurious radiation measurement

Test Requirement:	FCC Part 27.53(h)/(g)
Test Method:	FCC part 2.1053 and ANSI C63.26:2015
Limit:	-25dBm
Test setup:	<p>Below 1GHz</p>  <p>Above 1GHz</p>  <p>Substituted method:</p> 

Test Procedure:	<ol style="list-style-type: none"> <li>1. The EUT was placed on a non-conductive turntable using a non-conductive support. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and EMI spectrum analyzer.</li> <li>2. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.</li> <li>3. The frequency range up to tenth harmonic was investigated for each of three fundamental frequency (low, middle and high channels). Once spurious emission was identified, the power of the emission was determined using the substitution method.</li> <li>4. The spurious emissions attenuation was calculated as the difference between radiated power at the fundamental frequency and the spurious emissions frequency.  <math display="block">\text{ERP / EIRP} = \text{S.G. output (dBm)} + \text{Antenna Gain(dB/dBi)} - \text{Cable Loss (dB)}</math> </li> </ol>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 6.1 for details
Test results:	Pass

## Measurement Data

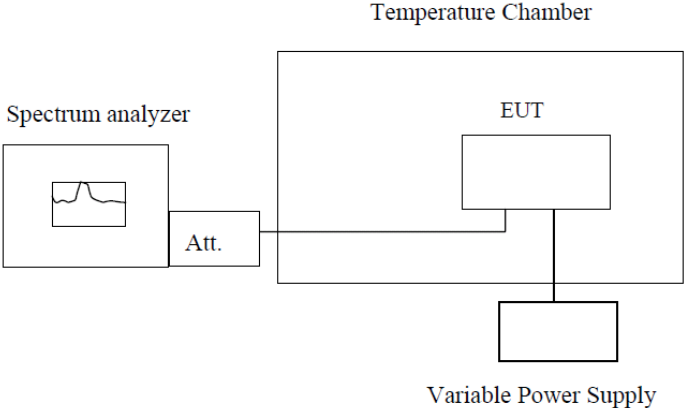
### Remark:

1. The emission behavior belongs to narrowband spurious emission.
2. The emission levels of below 1 GHz are very lower than the limit and not show in test report.

Remark: QPSK and 16QAM has been tested, QPSK is the worst mode, just reported the worst case

Test mode:		Band 41 (5MHz)		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result	
	Polarization	Level (dBm)			
5005.00	Vertical	-41.08	-25.00	Pass	
7507.50	V	-42.86			
10010.00	V	-40.17			
12512.50	V	-42.34			
15015.00	V	-42.04			
5005.00	Horizontal	-40.39	-25.00	Pass	
7507.50	H	-44.31			
10010.00	H	-43.92			
12512.50	H	-43.71			
15015.00	H	-43.05			
Test mode:		Band 41 (5MHz)		Test channel:	Middle
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result	
	Polarization	Level (dBm)			
5070.00	Vertical	-42.20	-25.00	Pass	
7605.00	V	-40.53			
10140.00	V	-40.48			
12675.00	V	-42.30			
15210.00	V	-43.54			
5070.00	Horizontal	-40.66	-25.00	Pass	
7605.00	H	-43.95			
10140.00	H	-43.31			
12675.00	H	-44.66			
15210.00	H	-41.96			
Test mode:		Band 41 (5MHz)		Test channel:	Highest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result	
	Polarization	Level (dBm)			
5135.00	Vertical	-41.24	-25.00	Pass	
7702.50	V	-42.33			
10270.00	V	-43.07			
12837.50	V	-41.70			
15405.00	V	-41.73			
5135.00	Horizontal	-40.23	-25.00	Pass	
7702.50	H	-43.18			
10270.00	H	-44.40			
12837.50	H	-46.51			
15405.00	H	-43.12			

## 7.9 Frequency stability V.S. Temperature measurement

Test Requirement:	FCC Part2.1055(a)(1)(b)
Test Method:	FCC Part2.1055(a)(1)(b)
Limit:	2.5ppm
Test setup:	 <p style="text-align: center;"><b>Note :</b> Measurement setup for testing on Antenna connector</p>
Test procedure:	<ol style="list-style-type: none"> <li>1. The equipment under test was connected to an external DC power supply and input rated voltage.</li> <li>2. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators.</li> <li>3. The EUT was placed inside the temperature chamber.</li> <li>4. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 25°C operating frequency as reference frequency.</li> <li>5. Turn EUT off and set the chamber temperature to -20°C. After the temperature stabilized for approximately 30 minutes recorded the frequency.</li> <li>6. Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached.</li> </ol>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 6.1 for details
Test results:	Pass

**Measurement Data**

**Modulation Mode: QPSK**

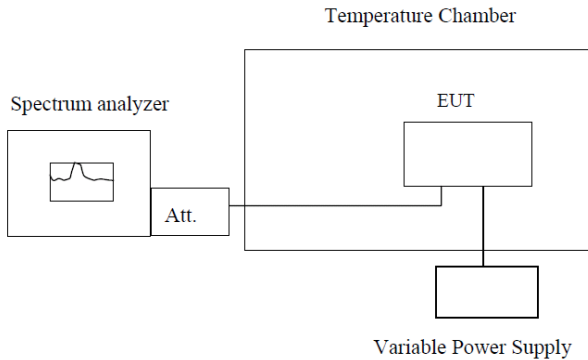
Reference Frequency: LTE Band 41 Middle channel= 40620					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
12	-30	134	0.0714	2.5	Pass
	-20	152	0.0808		
	-10	128	0.0683		
	0	105	0.0557		
	10	122	0.0651		
	20	105	0.0557		
	30	175	0.0933		
	40	158	0.0839		
	50	152	0.0808		

**Modulation Mode: 16QAM**

Reference Frequency: LTE Band 41 Middle channel= 40620					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
12	-30	93	0.0534	2.5	Pass
	-20	102	0.0590		
	-10	88	0.0506		
	0	78	0.0450		
	10	83	0.0478		
	20	73	0.0422		
	30	127	0.0731		
	40	107	0.0618		
	50	102	0.0590		



## 7.10 Frequency stability V.S. Voltage measurement

Test Requirement:	FCC Part2.1055(d)(1)(2)
Test Method:	FCC Part2.1055(d)(1)(2)
Limit:	2.5ppm
Test setup:	 <p style="text-align: center;">Temperature Chamber</p> <p style="text-align: center;">Spectrum analyzer</p> <p style="text-align: center;">Att.</p> <p style="text-align: center;">EUT</p> <p style="text-align: center;">Variable Power Supply</p> <p><b>Note :</b> Measurement setup for testing on Antenna connector</p>
Test procedure:	<ol style="list-style-type: none"> <li>1. Set chamber temperature to 25°C. Use a variable DC power source to power the EUT and set the voltage to rated voltage.</li> <li>2. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.</li> <li>3. Reduce the input voltage to specified extreme voltage variation (+/- 15%) and endpoint, record the maximum frequency change.</li> </ol>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 6.1 for details
Test results:	Pass

**Measurement Data**

**Modulation Mode: QPSK**

Reference Frequency: LTE Band 41 Middle channel= 40620					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	8	65	0.0348	2.5	Pass
	12	76	0.0402		
	15	86	0.0456		

**Modulation Mode: 16QAM**

Reference Frequency: LTE Band 41 Middle channel= 40620					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	8	111	0.0642	2.5	Pass
	12	81	0.0466		
	15	91	0.0525		

## 8 Test Setup Photo

Reference to the **appendix I** for details.

## 9 EUT Constructional Details

Reference to the **appendix II** for details.

-----End-----