Spectrum Report (LTE)

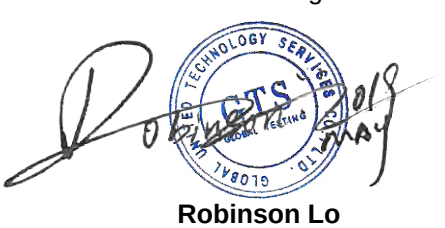
Applicant:	Positioning Universal Inc
Address of Applicant:	4660 La Jolla Village Drive Suite 1100, San Diego, California 92122, United States
Manufacturer/Factory:	Positioning Universal Inc
Address of Manufacturer/Factory:	4660 La Jolla Village Drive Suite 1100, San Diego, California 92122, United States

Equipment Under Test (EUT)

Product Name:	LTE Cat 1 Vehicle Telematics and Radio Telecommunications Device
Model No.:	FJ1000LS
FCC ID:	2AHRH-FJ1000LS
Applicable standards:	FCC CFR Title 47 Part 2 FCC CFR Title 47 Part 90(S)
Date of sample receipt:	April 09, 2019
Date of Test:	April 10, 2019-May 17, 2019
Date of report issued:	May 17, 2019
Test Result :	PASS *

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

Authorized Signature:

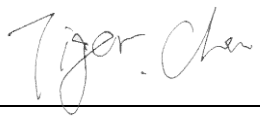


Robinson Lo
Laboratory Manager

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.

1 Version

Version No.	Date	Description
00	*May 17, 2019*	*Original*

Prepared By:  ***Date:*** *May 17, 2019*

Project Engineer

Check By: ***Date:*** *May 17, 2019*

Reviewer

2 Contents

Page

SPECTRUM REPORT (LTE) **1**

1 VERSION **2**

2 CONTENTS **3**

3 TEST SUMMARY **4**

3.1 MEASUREMENT UNCERTAINTY 4

4 GENERAL INFORMATION **5**

4.1 GENERAL DESCRIPTION OF EUT 5
4.2 RELATED SUBMITTAL(S) / GRANT (S) 6
4.3 TEST METHODOLOGY 6
4.4 TEST FACILITY 6
4.5 TEST LOCATION 6

5 TEST INSTRUMENTS LIST **7**

6 SYSTEM TEST CONFIGURATION **8**

6.1 TEST MODE 8
6.2 CONFIGURATION OF TESTED SYSTEM 8
6.3 CONDUCTED AVERAGE OUTPUT POWER 9
6.4 ADJACENT CHANNEL POWER 14
6.5 OCCUPY BANDWIDTH 15
6.6 MODULATION CHARACTERISTIC 18
6.7 OUT OF BAND EMISSION AT ANTENNA TERMINALS 18
6.8 FIELD STRENGTH OF SPURIOUS RADIATION MEASUREMENT 27
6.9 FREQUENCY STABILITY V.S. TEMPERATURE MEASUREMENT 33
6.10 FREQUENCY STABILITY V.S. VOLTAGE MEASUREMENT 35

7 TEST SETUP PHOTO **37**

8 EUT CONSTRUCTIONAL DETAILS **37**

3 Test Summary

Test Item	Section in CFR 47	Result
RF Exposure (SAR)	Part 1.1307 Part 2.1091	Pass* (Please refer to MPE Report)
RF Output Power	Part 2.1046 Part 90.635	Pass
Adjacent channel power	Part 90.221(c)	Pass
Modulation Characteristics	Part 2.1047	N/A
99% & -26 dB Occupied Bandwidth	Part 2.1049 Part 90.209	Pass
Spurious Emissions at Antenna Terminal	Part 2.1051 Part 90.691	Pass
Field Strength of Spurious Radiation	Part 2.1053 Part 90.691	Pass
Out of band emission, Band Edge	Part 2.1051 Part 90.691	Pass
Frequency stability for temperature & voltage	Part 2.1055	Pass

Pass: The EUT complies with the essential requirements in the standard.

N/A: Not applicable.

3.1 Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	9kHz ~ 30MHz	± 4.34dB	(1)
Radiated Emission	30MHz ~ 1000MHz	± 4.24dB	(1)
Radiated Emission	1GHz ~ 26.5GHz	± 4.68dB	(1)
Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.			

4 General Information

4.1 General Description of EUT

Product Name:	LTE Cat 1 Vehicle Telematics and Radio Telecommunications Device
Model No.:	FJ1000LS
S/N:	50HS92000100
Tested Sample(s) ID:	GTS201904000070-1
Hardware Version:	P5
Software Version:	LR4.3.4.3-42551
Support Networks:	LTE
Support Bands:	LTE Band 26
Channel Bandwidth:	5MHz; 10MHz; 15MHz
Maximum output power to antenna:	23.96dBm
TX Frequency:	816.5MHz-821.5MHz
Modulation type:	QPSK, 16QAM
Antenna type:	Integral antenna
Antenna gain:	0.7dBi
Power supply:	DC 12V

4.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is filing to comply with Section Part 90 of the FCC CFR 47 Rules.

4.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures document on TIA/EIA 603 and ANSI C63.4, FCC CFR 47.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055 and 2.1057

4.4 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.

● **Industry Canada (IC) —Registration No.: 9079A-2**

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-2.

● **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

4.5 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.

Address: No. 301-309, 3/F., Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102

Tel: 0755-27798480

Fax: 0755-27798960

5 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. 27 2018	June. 26 2019
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June. 27 2018	June. 26 2019
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	June. 27 2018	June. 26 2019
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June. 27 2018	June. 26 2019
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	June. 27 2018	June. 26 2019
9	Coaxial Cable	GTS	N/A	GTS211	June. 27 2018	June. 26 2019
10	Coaxial cable	GTS	N/A	GTS210	June. 27 2018	June. 26 2019
11	Coaxial Cable	GTS	N/A	GTS212	June. 27 2018	June. 26 2019
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June. 27 2018	June. 26 2019
13	Amplifier(2GHz-20GHz)	HP	84722A	GTS206	June. 27 2018	June. 26 2019
14	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June. 27 2018	June. 26 2019
15	Band filter	Amindeon	82346	GTS219	June. 27 2018	June. 26 2019
16	Power Meter	Anritsu	ML2495A	GTS540	June. 27 2018	June. 26 2019
17	Power Sensor	Anritsu	MA2411B	GTS541	June. 27 2018	June. 26 2019
18	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	June. 27 2018	June. 26 2019
19	Splitter	Agilent	11636B	GTS237	June. 27 2018	June. 26 2019
20	Loop Antenna	ZHINAN	ZN30900A	GTS534	June. 27 2018	June. 26 2019

General used equipment:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	Humidity/ Temperature Indicator	KTJ	TA328	GTS243	June. 27 2018	June. 26 2019
2	Barometer	ChangChun	DYM3	GTS255	June. 27 2018	June. 26 2019

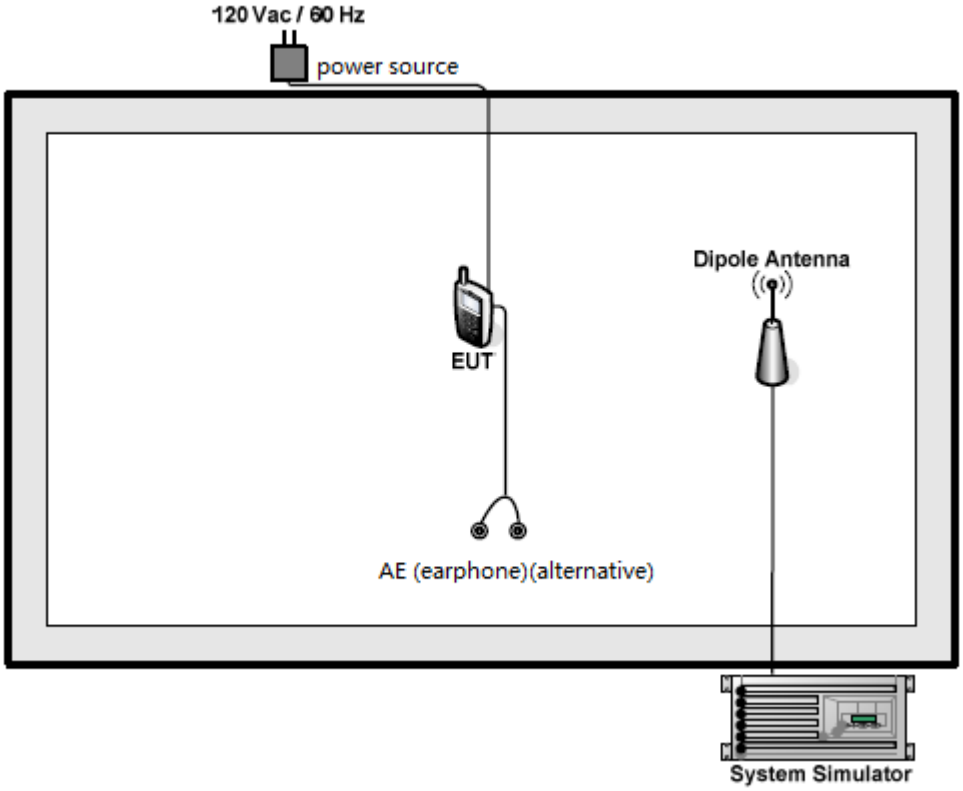
6 System test configuration

6.1 Test mode

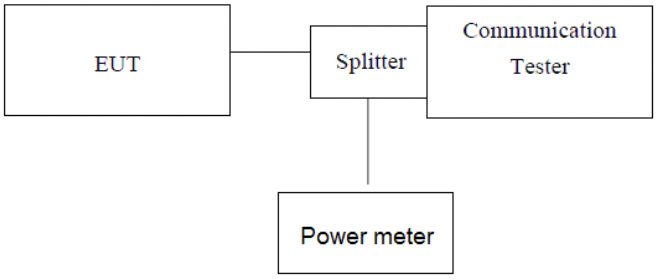
During all testing, EUT is in link mode with base station emulator at maximum power level. The spurious emission measurements were carried out in semi-anechoic chamber with 3-meter test range, and EUT is rotated on three test planes to find out the worst emission.

Test modes		
Band	Radiated	Conducted
LTE Band 26	■ QPSK and 16QAM link	■ QPSK and 16QAM link

6.2 Configuration of Tested System



6.3 Conducted Average Output Power

Test Requirement:	Part 90
Limit:	100W
Test setup:	 *Note: Measurement setup for testing on Antenna connector*
Test Procedure:	1. The transmitter output port was connected to base station. 2. The RF output of EUT was connected to the power meter by RF cable and attenuator, the path loss was compensated to the results for each measurement. 3. Set EUT at maximum power through base station. 4. Select lowest, middle, and highest channels for each band and different modulation. 5. Measure the maximum burst average power.
Test Instruments:	Refer to section 5.0 for details
Test mode:	Refer to section 6.1 for details
Test results:	Pass

Measurement Data

Band 26						
Bandwidth	Mode	RB Size	RB Offset	Actual output power(dBm)		
				Channel 26715 816.5MHz	Channel 26740 819.0MHz	Channel 26765 821.5MHz
5MHz	QPSK	1	0	23.25	22.38	22.55
		1	12	22.72	23.44	22.52
		1	24	23.05	23.56	23.13
		12	0	23.52	23.20	22.63
		12	6	22.54	23.42	23.74
		12	13	22.25	22.21	23.26
		25	0	23.91	22.69	22.73
	16QAM	1	0	23.94	22.60	22.67
		1	12	23.93	23.22	23.49
		1	24	22.29	22.27	23.85
		12	0	23.65	22.03	23.72
		12	6	23.67	22.82	23.73
		12	13	23.47	23.75	**23.96**
		25	0	23.94	23.51	22.75
Bandwidth	Mode	RB Size	RB Offset	Actual output power(dBm)		
					Channel 26740 819.0MHz	
10MHz	QPSK	1	0		22.73	
		1	24		22.75	
		1	49		22.77	
		25	0		23.58	
		25	12		22.94	
		25	25		23.28	
		50	0		22.48	
	16QAM	1	0		23.51	
		1	24		23.48	
		1	49		23.16	
		25	0		22.15	
		25	12		**23.81**	
		25	25		22.15	
		50	0		23.56	

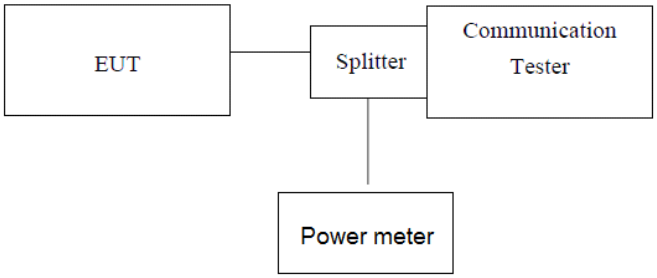
Bandwidth	Mode	RB Size	RB Offset	Actual output power(dBm)		
				Channel 26765 821.5MHz		
15MHz	QPSK	1	0	23.19		
		1	38	**23.80**		
		1	74	22.37		
		38	0	22.81		
		38	18	22.48		
		38	37	22.33		
		75	0	22.23		
	16QAM	1	0	23.40		
		1	38	22.12		
		1	74	22.66		
		38	0	22.45		
		38	18	23.36		
		38	37	22.04		
		75	0	22.23		

ERP:

Band 26						
Bandwidth	Mode	RB Size	RB Offset	Actual output power(dBm)		
				Channel 26715 816.5MHz	Channel 26740 819.0MHz	Channel 26765 821.5MHz
5MHz	QPSK	1	0	25.93	24.87	25.19
		1	12	24.89	25.93	24.92
		1	24	24.94	24.60	25.36
		12	0	25.41	24.37	24.82
		12	6	24.11	24.66	24.30
		12	13	25.88	24.68	24.06
		25	0	25.93	25.38	25.30
	16QAM	1	0	25.11	25.62	24.27
		1	12	24.82	25.83	25.13
		1	24	25.20	25.15	24.24
		12	0	24.05	24.40	25.38
		12	6	25.99	25.39	24.63
		12	13	25.33	25.33	24.10
		25	0	25.71	25.60	24.52
Bandwidth	Mode	RB Size	RB Offset	Actual output power(dBm)		
					Channel 26740 819.0MHz	
10MHz	QPSK	1	0		24.47	
		1	24		24.57	
		1	49		24.38	
		25	0		25.57	
		25	12		24.87	
		25	25		24.54	
		50	0		25.42	
	16QAM	1	0		24.05	
		1	24		25.22	
		1	49		24.33	
		25	0		25.50	
		25	12		24.69	
		25	25		25.28	
		50	0		24.82	

Bandwidth	Mode	RB Size	RB Offset	Actual output power(dBm)		
				Channel 26765 821.5MHz		
15MHz	QPSK	1	0	25.30		
		1	38	24.93		
		1	74	25.26		
		38	0	24.25		
		38	18	24.60		
		38	37	25.17		
		75	0	24.71		
	16QAM	1	0	25.96		
		1	38	25.25		
		1	74	25.95		
		38	0	25.84		
		38	18	24.87		
		38	37	24.16		
		75	0	24.31		

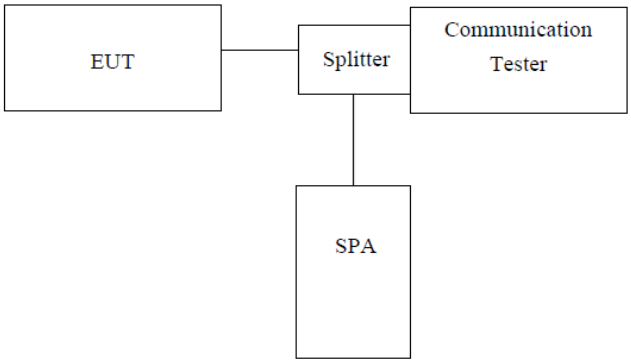
6.4 Adjacent channel power

Test Requirement:	Part 90.221
Limit:	Frequency offset: Maximum ACP (dBc) for devices less than 15 watts 25kHz: -55dBc 50kHz: -65dBc 75kHz: -65dBc
Test setup:	 *Note: Measurement setup for testing on Antenna connector*
Test Procedure:	6. The transmitter output port was connected to base station. 7. 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. 8. Set EUT at maximum power through base station. 9. Select lowest, middle, and highest channels for each band and different modulation. 10. Measure the adjacent power levels.
Test Instruments:	Refer to section 5.0 for details
Test mode:	Refer to section 6.1 for details
Test results:	Pass

Measurement data:

	Channel Bandwidth	Channel	RB Configure		Maximum ACP(dBc)		
			RB Size	RB Offset	25kHz	50kHz	75kHz
Band 26	5MHz	Lowest	25	0	-61.22	-70.69	-71.53
		Middle	25	0	-61.86	-67.41	-70.17
		Highest	25	0	-62.89	-70.81	-70.29
	10MHz	Middle	50	0	-62.63	-67.80	-70.14
	15MHz	Lowest	75	0	-64.12	-70.47	-72.91

6.5 Occupy Bandwidth

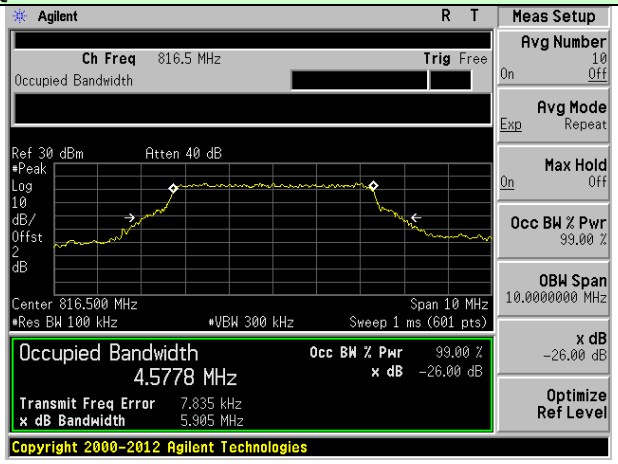
Test Requirement :	Part 90.209
Test setup:	 *Note: Measurement setup for testing on Antenna connector*
Test Procedure:	1. The EUT's output RF connector was connected with a short cable to the spectrum analyzer 2. RBW was set to about 1% of emission BW, VBW= 3 times RBW. 3. -26dBc display line was placed on the screen (or 99% bandwidth), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace.
Test Instruments:	Refer to section 5.0 for details
Test mode:	Refer to section 6.1 for details
Test results:	Pass

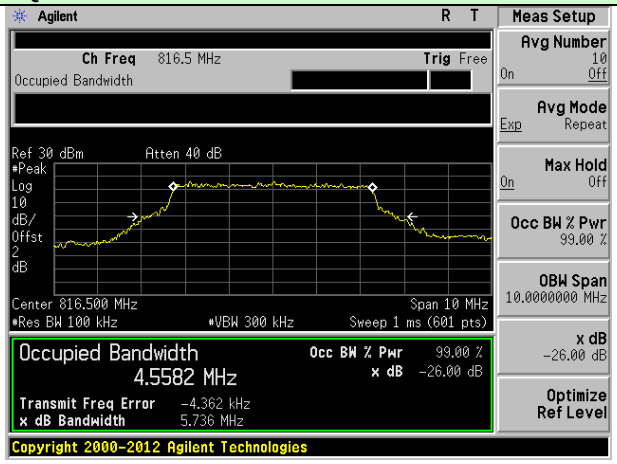
Measurement Data

	Channel Bandwidth	Channel	RB Configure		-26dB bandwidth (MHz)	
			RB Size	RB Offset	QPSK	16QAM
Band 26	5MHz	Lowest	25	0	5.905	5.736
		Middle	25	0	5.735	5.896
		Highest	25	0	5.895	5.910
	10MHz	Middle	50	0	10.496	10.359
	15MHz	Lowest	75	0	16.234	15.902

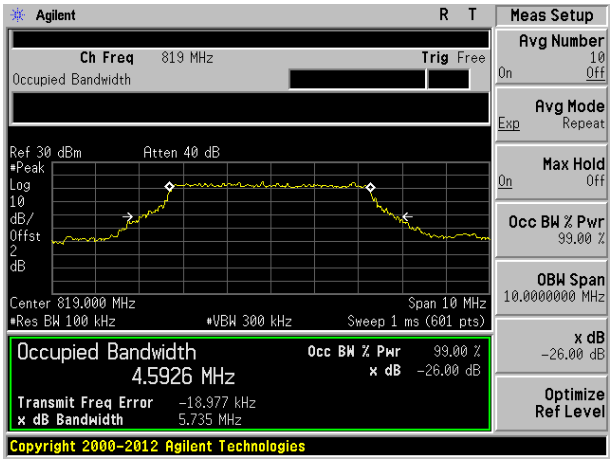
Test plot as follows:

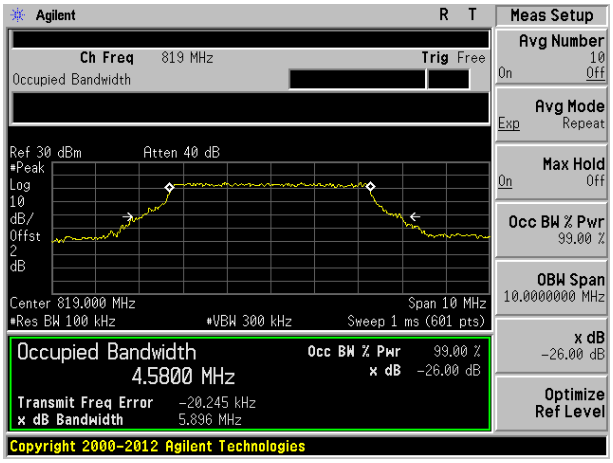
Test band: LTE Band 26	Channel Bandwidth: 5MHz
QPSK	16QAM



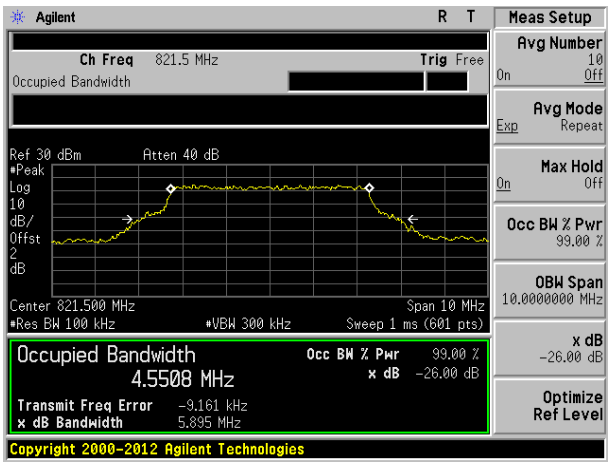


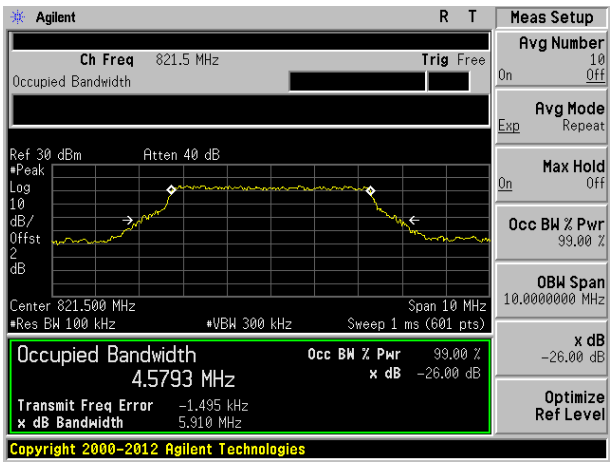
Lowest channel





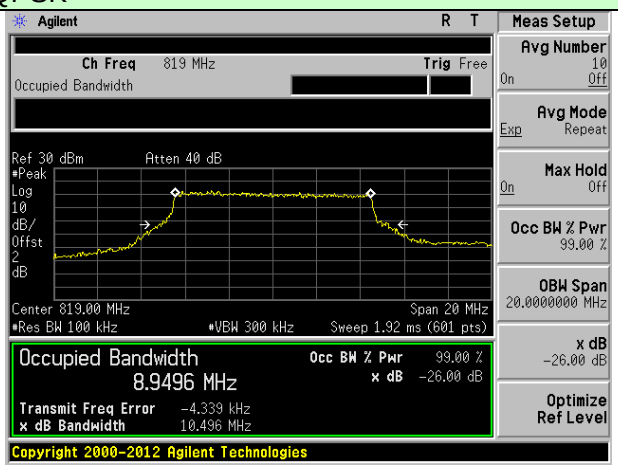
Middle channel

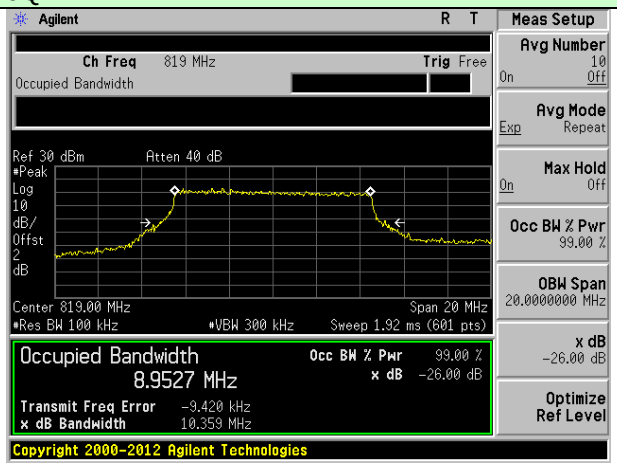




Highest channel

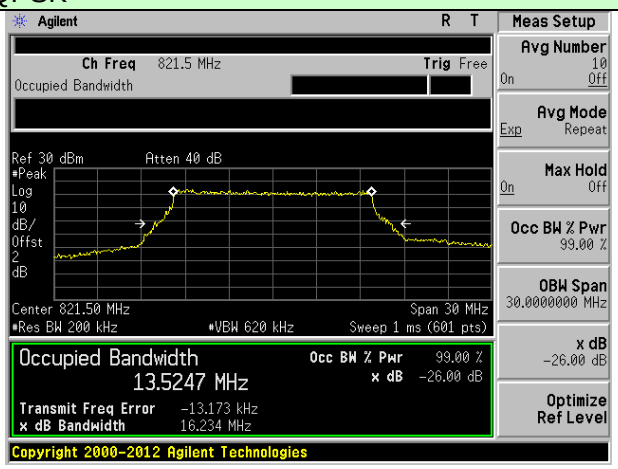
Test band: LTE Band 26	Channel Bandwidth: 10MHz
QPSK	16QAM

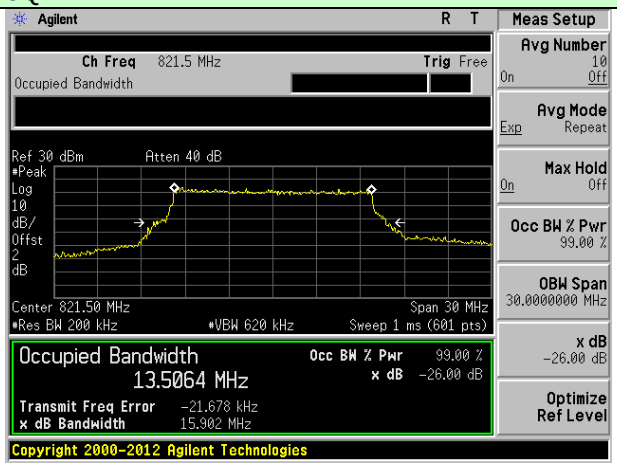




Middle channel

Test band: LTE Band 26	Channel Bandwidth: 15MHz
QPSK	16QAM



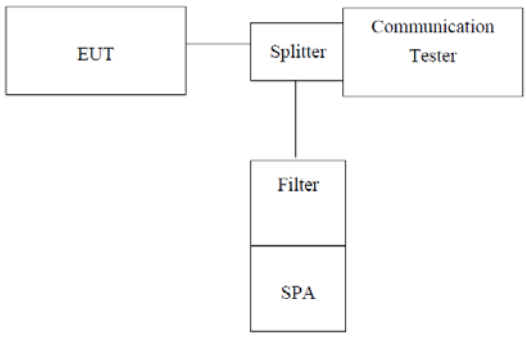


Lowest channel

6.6 MODULATION CHARACTERISTIC

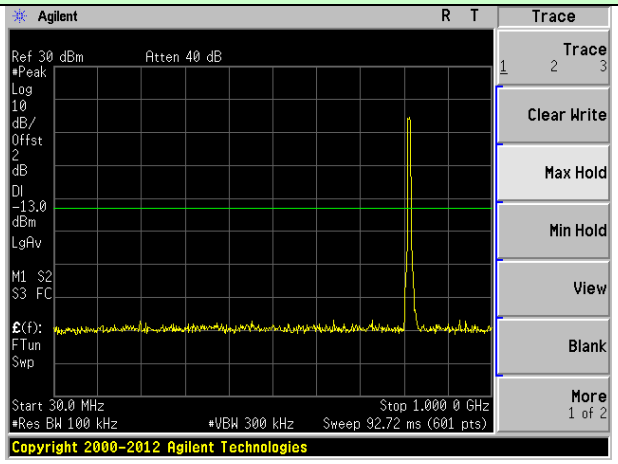
According to FCC § 2.1047(d), Part 27 there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

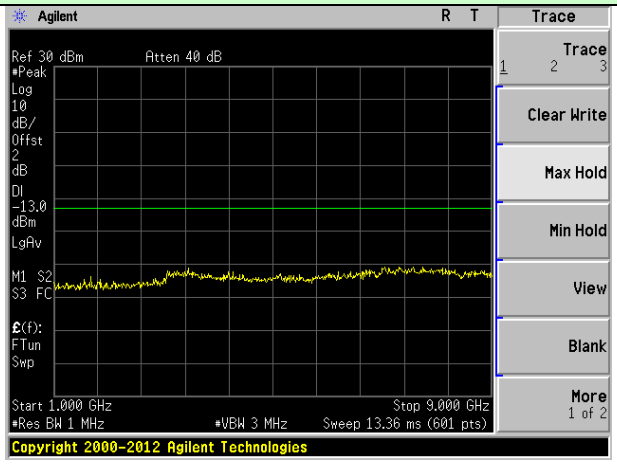
6.7 Out of band emission at antenna terminals

Test Requirement :	Part 90.691
Limit:	-13dBm for any frequency removed from the EA licensee's frequency block greater than 37.5 kHz -20dBm for any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz,
Test setup:	 *Note: Measurement setup for testing on Antenna connector*
Test Procedure:	1 The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. 2 The resolution bandwidth of the spectrum analyzer was set at 1MHz, sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic. 3 For the out of band: Set the RBW, VBW = 1MHz, Start=30MHz, Stop= 10th harmonic. 4 Band Edge Requirements: In the 1 MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 1 percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to measure the out of band Emissions.
Test Instruments:	Refer to section 5.0 for details
Test mode:	Refer to section 6.1 for details
Test results:	Pass

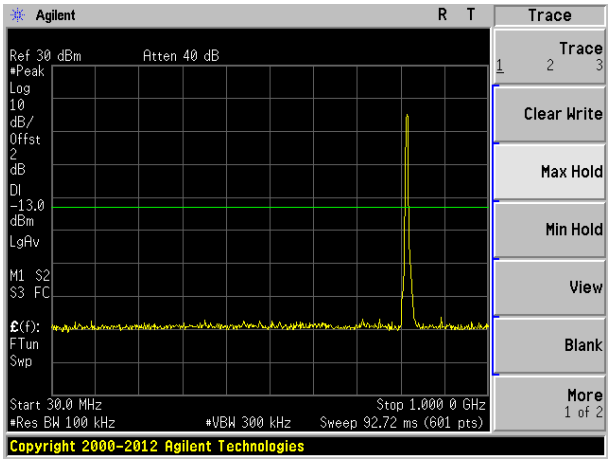
Test plot as follows:

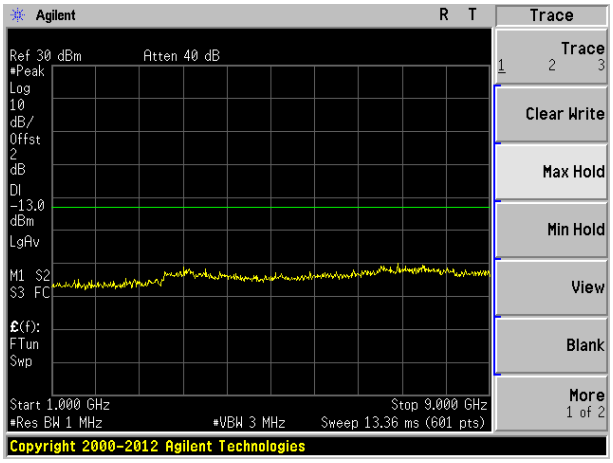
Test Mode: LTE Band 26	Channel Bandwidth: 5MHz



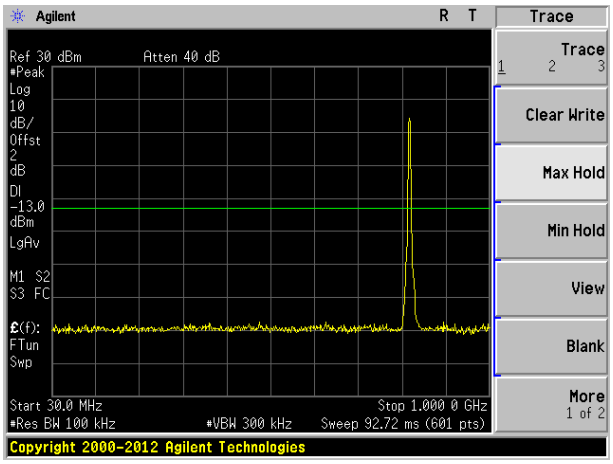


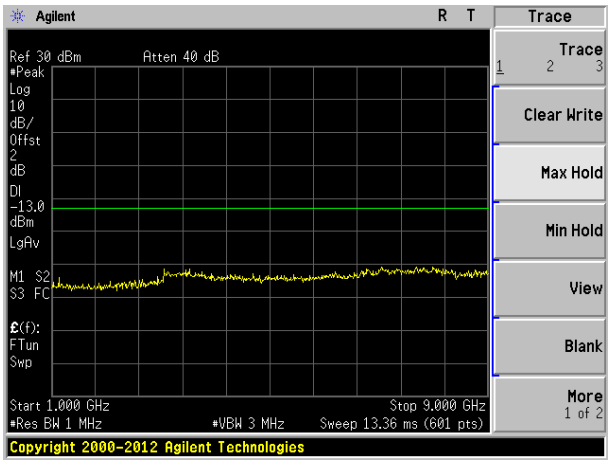
Lowest channel





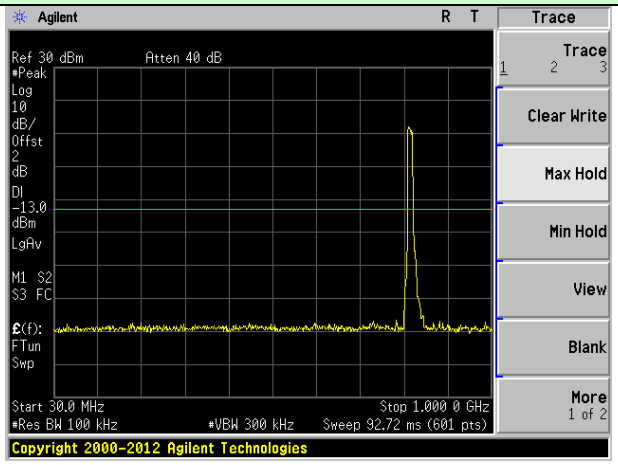
Middle channel

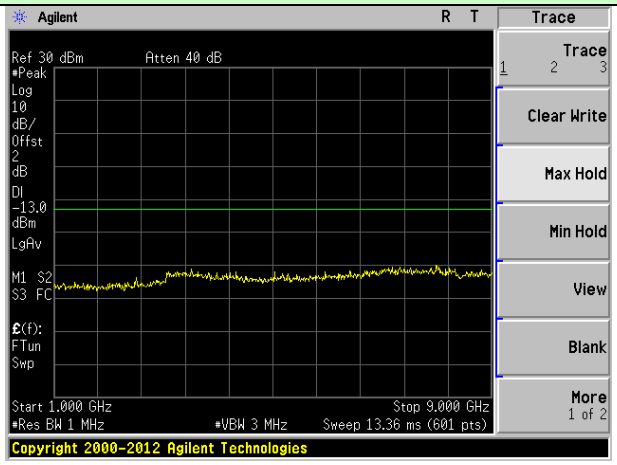




Highest channel

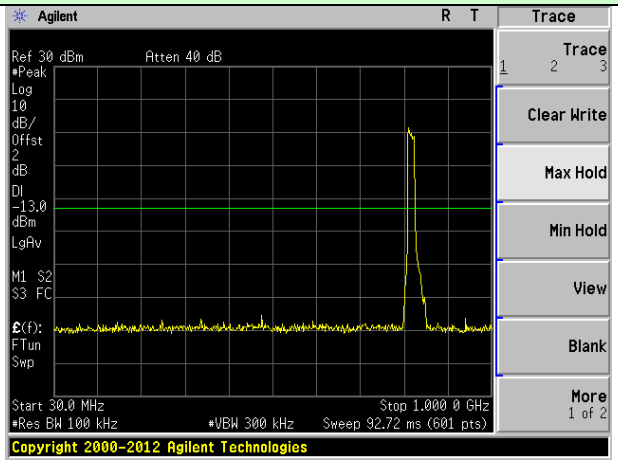
Test Mode: LTE Band 26	Channel Bandwidth: 10MHz

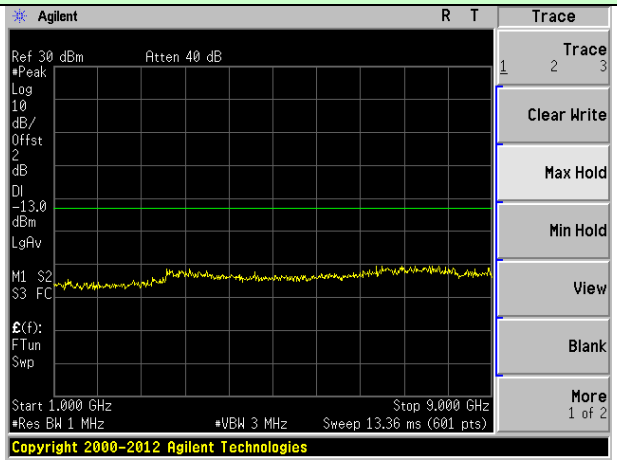




Middle channel

Test Mode: LTE Band 26	Channel Bandwidth: 15MHz

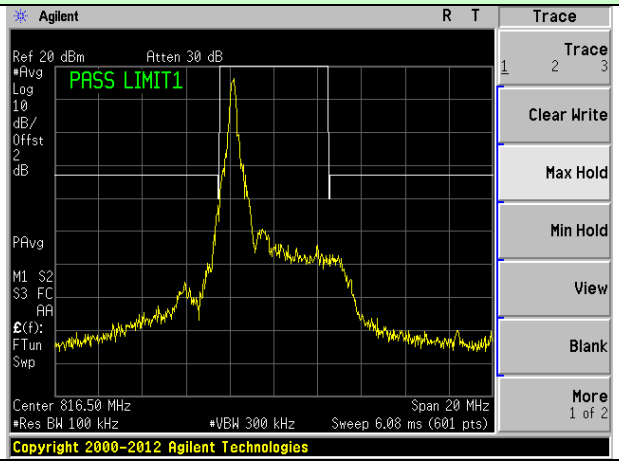
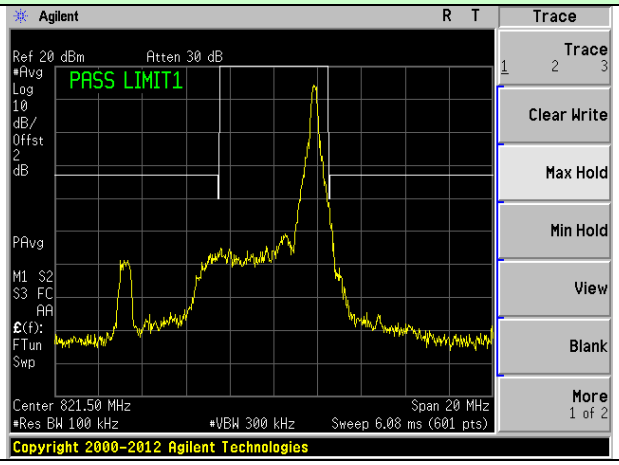


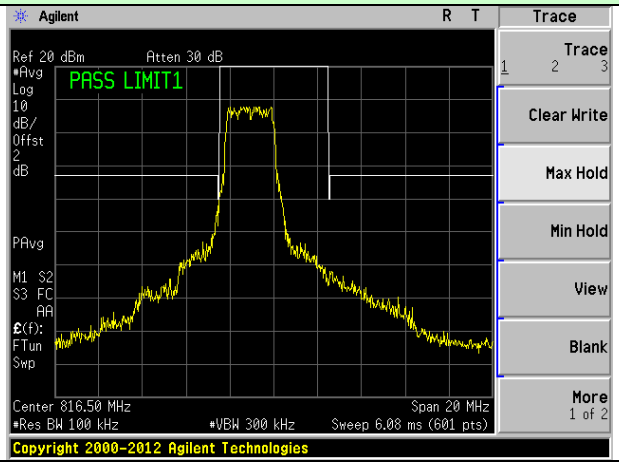
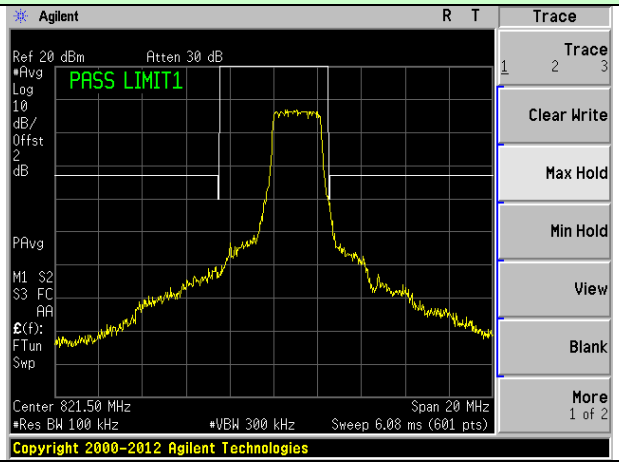


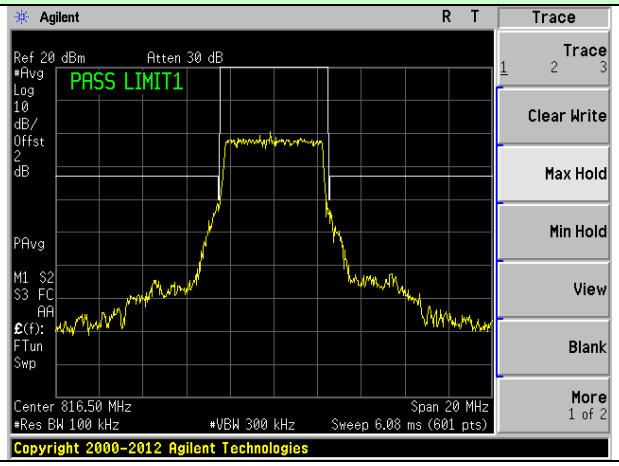
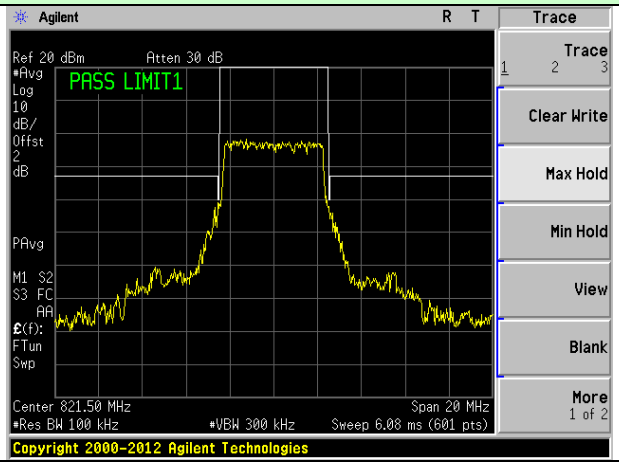
Lowest channel

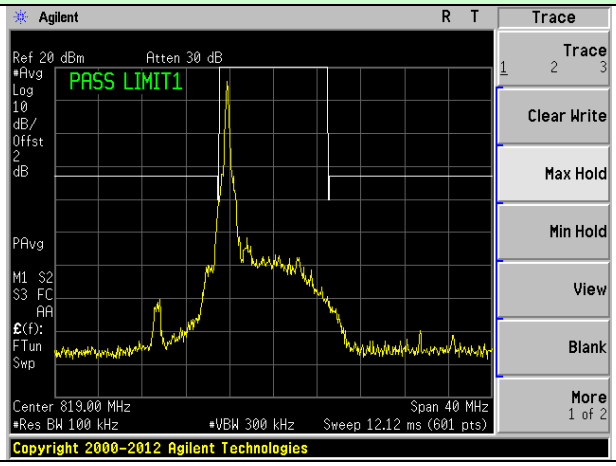
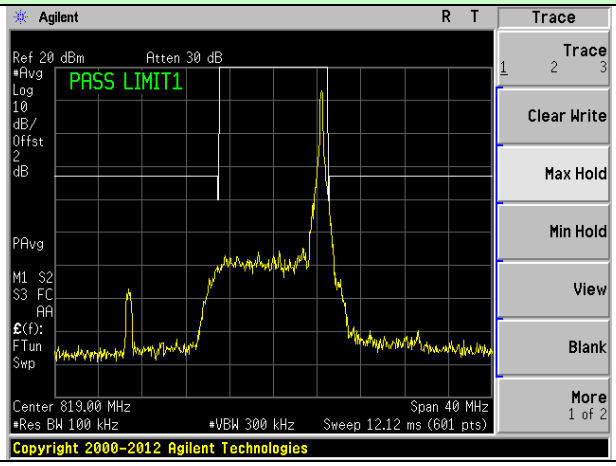
Band Edge:

QPSK mode:

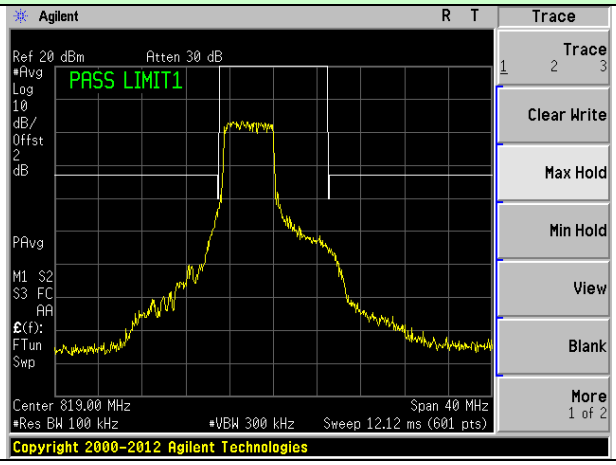
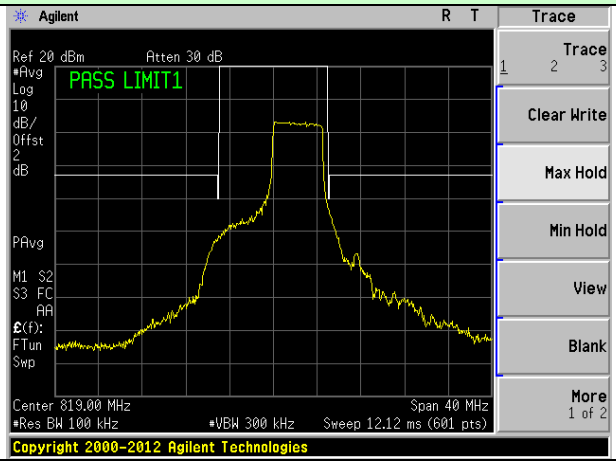
5MHz Bandwidth (RB size:1# RB offset:0#)	5MHz Bandwidth (RB size:1# RB offset:24#)
	
Lowest channel	Highest channel

5MHz Bandwidth (RB size:12# RB offset:0#)	5MHz Bandwidth (RB size:12# RB offset:13#)
	
Lowest channel	Highest channel

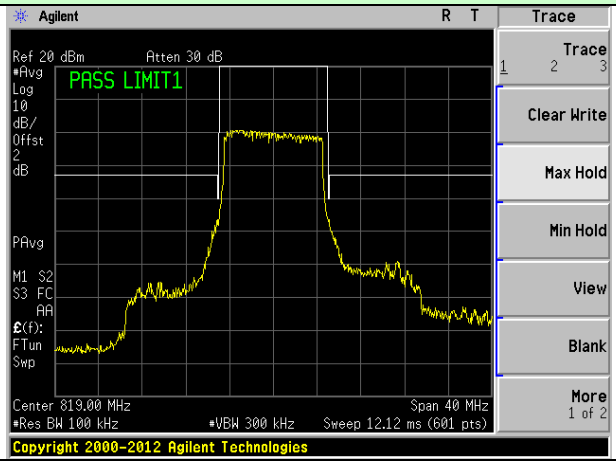
5MHz Bandwidth (RB size:25# RB offset:0#)	5MHz Bandwidth (RB size:25# RB offset:0#)
	
Lowest channel	Highest channel

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

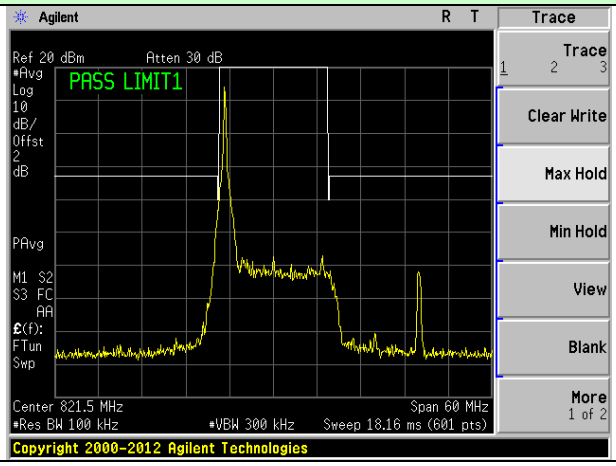
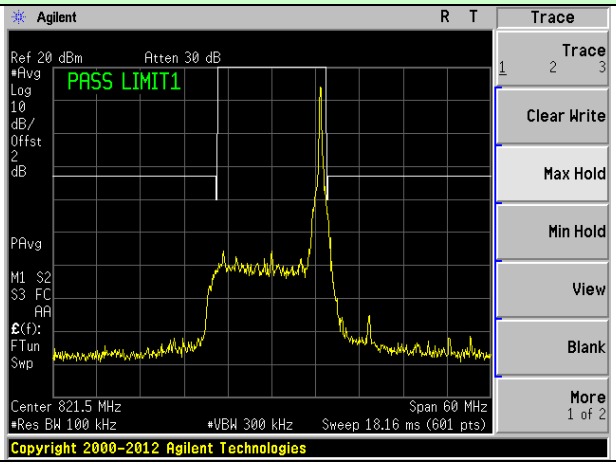
Middle channel

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

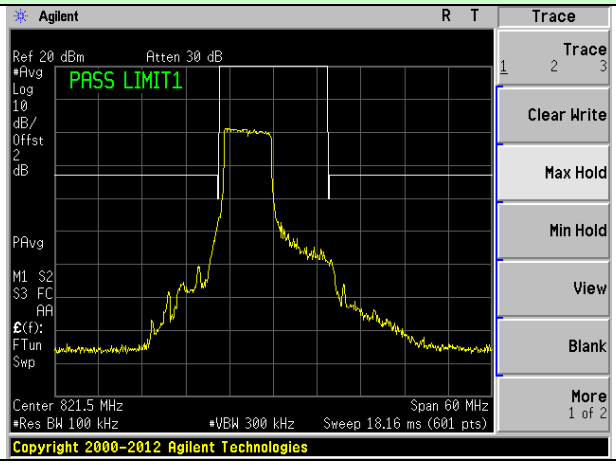
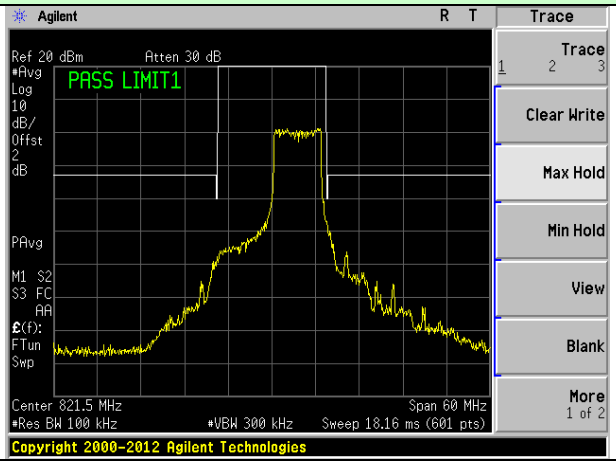
Middle channel

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

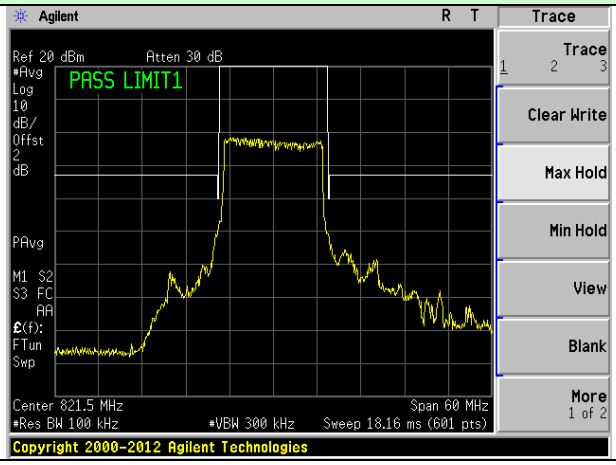
Middle channel

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

Lowest Channel

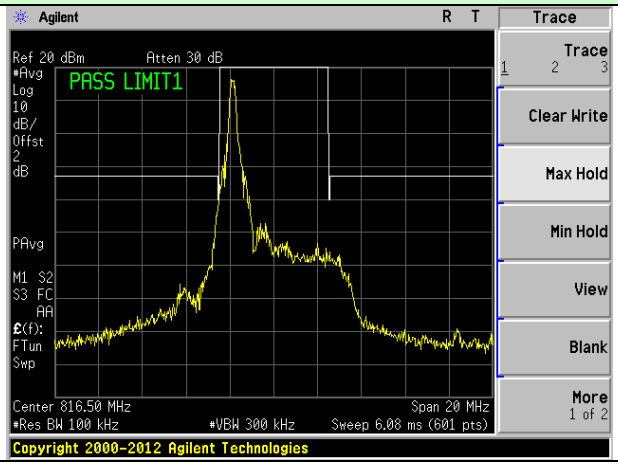
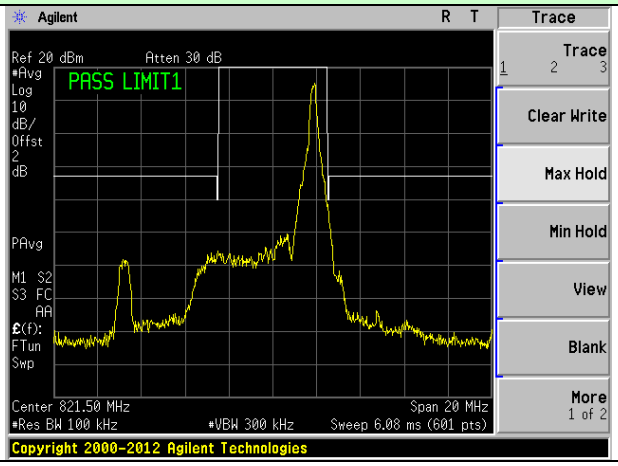
15MHz Bandwidth (RB size:36# RB offset:39#)	15MHz Bandwidth (RB size:39# RB offset:36#)
	

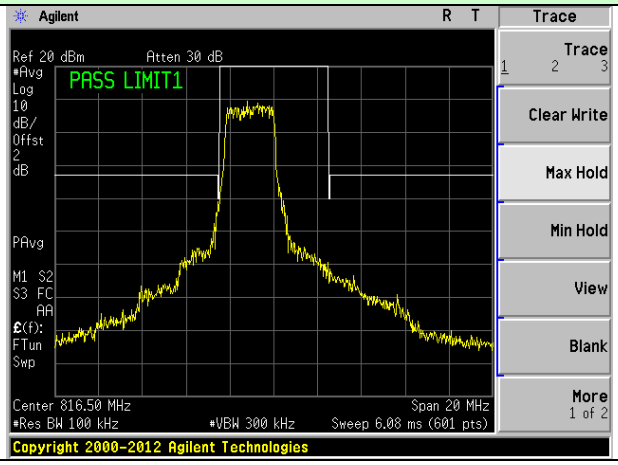
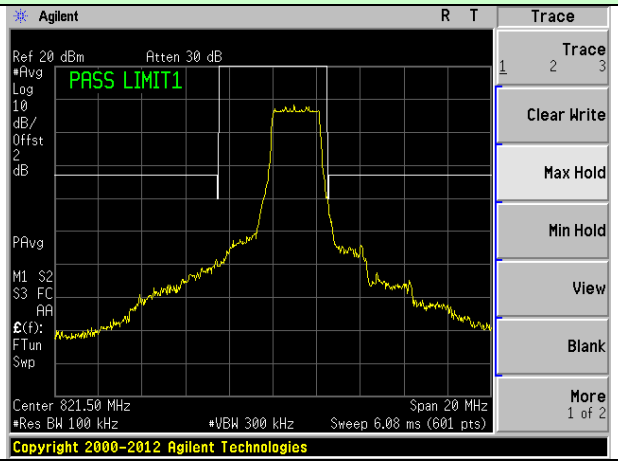
Lowest Channel

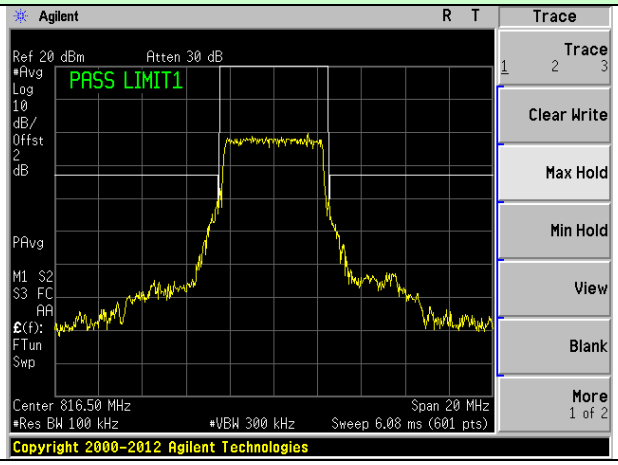
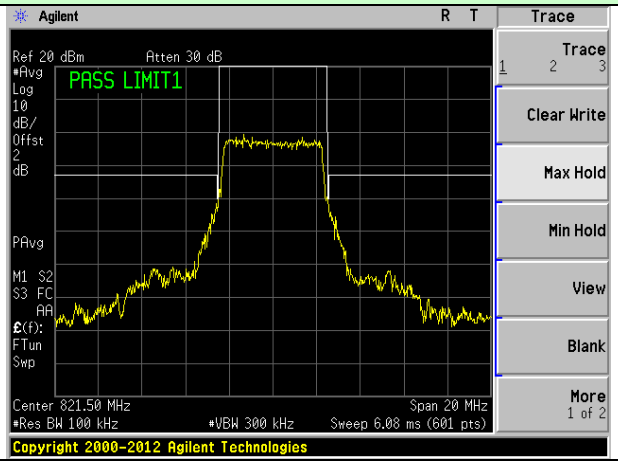
15MHz Bandwidth (RB size:75# RB offset:0#)	
	

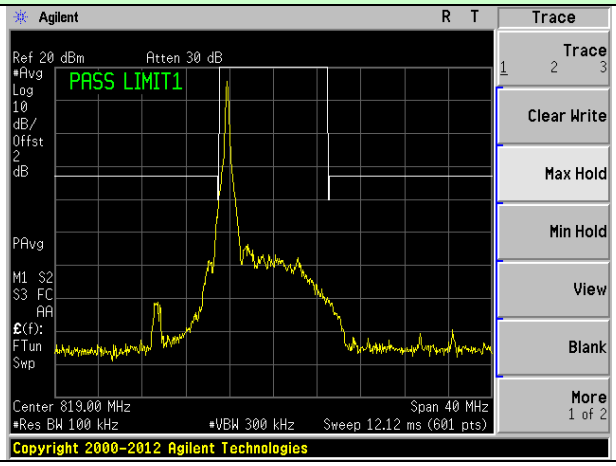
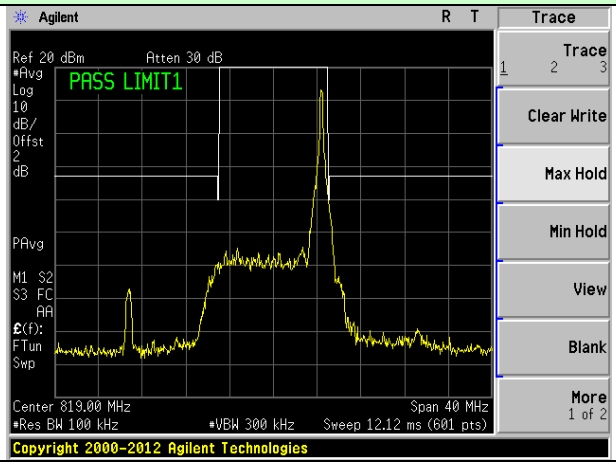
Lowest Channel

16QAM mode:

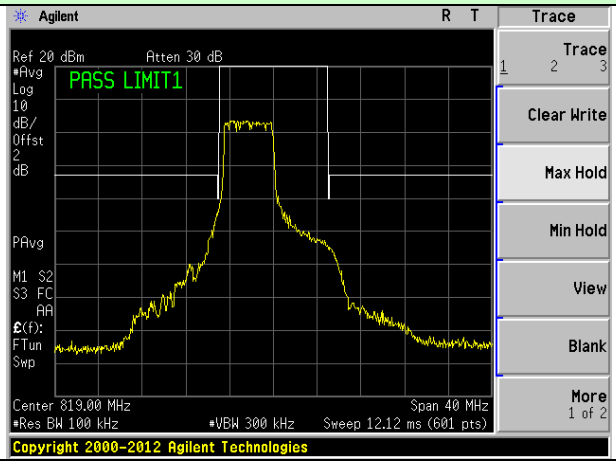
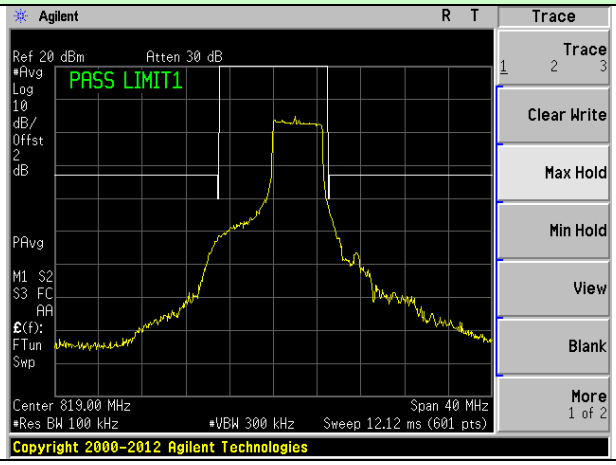
5MHz Bandwidth (RB size:1# RB offset:0#)	5MHz Bandwidth (RB size:1# RB offset:24#)
	
Lowest channel	Highest channel

5MHz Bandwidth (RB size:12# RB offset:0#)	5MHz Bandwidth (RB size:12# RB offset:13#)
	
Lowest channel	Highest channel

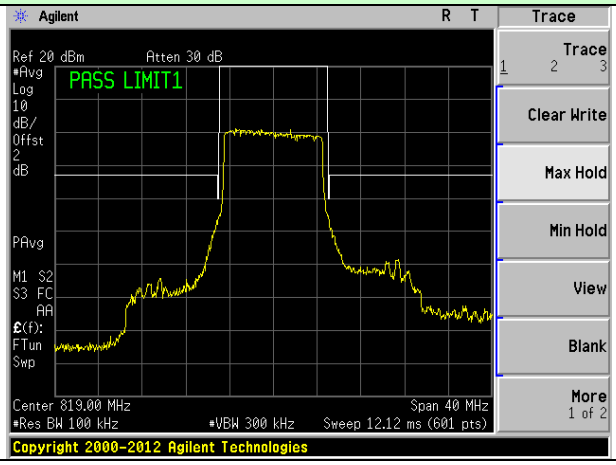
5MHz Bandwidth (RB size:25# RB offset:0#)	5MHz Bandwidth (RB size:25# RB offset:0#)
	
Lowest channel	Highest channel

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

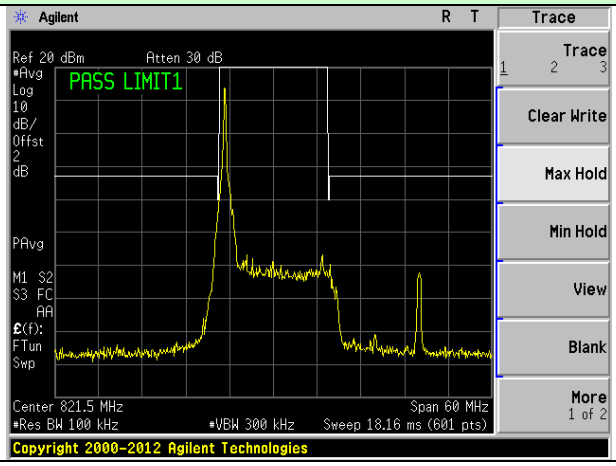
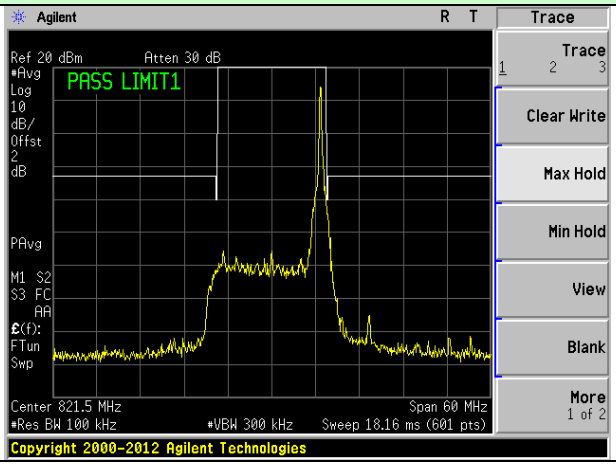
Middle channel

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

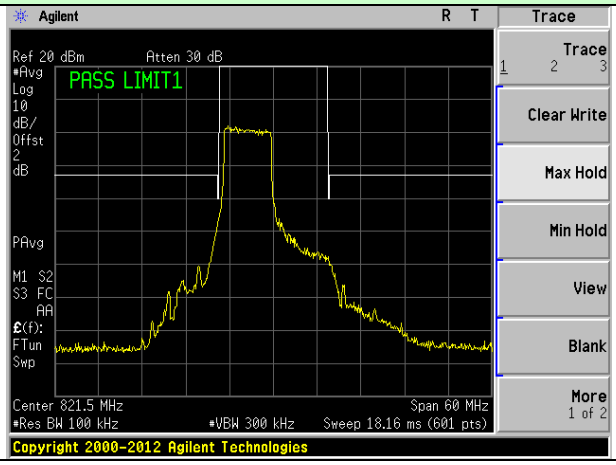
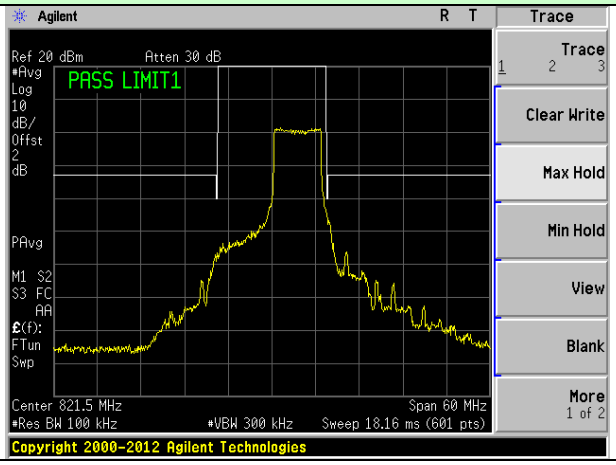
Middle channel

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

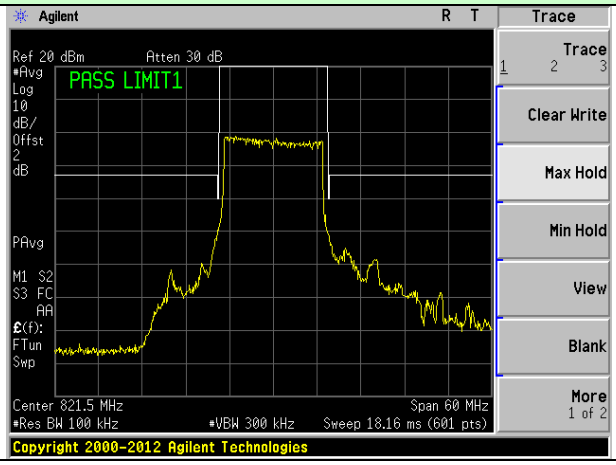
Middle channel

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

Lowest Channel

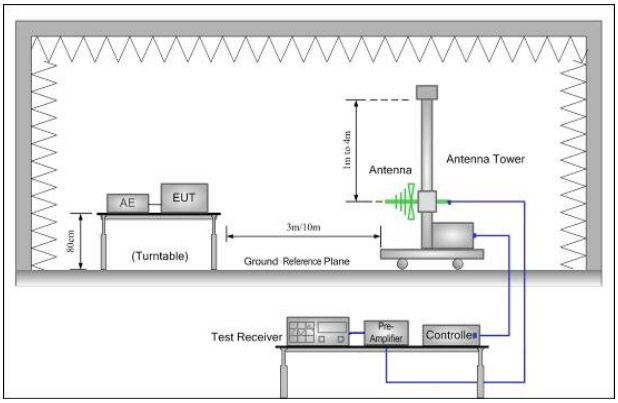
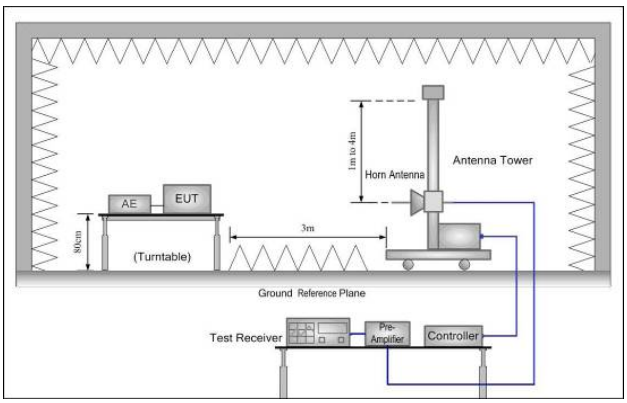
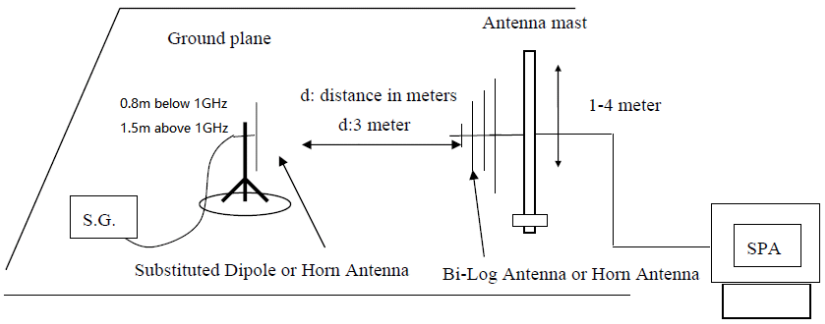
15MHz Bandwidth (RB size:36# RB offset:39#)	15MHz Bandwidth (RB size:39# RB offset:36#)
	

Lowest Channel

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

Lowest Channel

6.8 Field strength of spurious radiation measurement

Test Requirement:	Part 90
Limit:	-13dBm
Test setup:	Below 1GHz  Above 1GHz  Substituted method: 

Test Procedure:	1. The EUT was placed on an 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. 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. 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. 4. The spurious emissions attenuation was calculated as the difference between radiated power at the fundamental frequency and the spurious emissions frequency. ERP / EIRP = S.G. output (dBm) + Antenna Gain(dB/dBi) – Cable Loss (dB)					
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1 012mbar
Test Instruments:	Refer to section 5.0 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.

QPSK mode:

Test mode:	**LTE Band 26(5MHz)**		**Test channel:**	**Lowest**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1633.00	Vertical	-42.45	-13.00	Pass
2449.50	V	-43.86		
3266.00	V	-44.86		
4082.50	V	-42.76		
4899.00	V	-39.56		
1633.00	Horizontal	-41.07	-13.00	Pass
2449.50	H	-44.48		
3266.00	H	-42.86		
4082.50	H	-43.26		
4899.00	H	-40.35		
Test mode:	**LTE Band 26(5MHz)**		**Test channel:**	**Middle**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1638.00	Vertical	-43.41	-13.00	Pass
2457.00	V	-44.89		
3276.00	V	-42.94		
4095.00	V	-43.91		
4914.00	V	-42.83		
1638.00	Horizontal	-44.17	-13.00	Pass
2457.00	H	-42.67		
3276.00	H	-44.10		
4095.00	H	-42.57		
4914.00	H	-40.93		
Test mode:	**LTE Band 26(5MHz)**		**Test channel:**	**Highest**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1643.00	Vertical	-43.46	-13.00	Pass
2464.50	V	-44.87		
3286.00	V	-43.87		
4107.50	V	-41.77		
4929.00	V	-40.84		
1643.00	Horizontal	-42.08	-13.00	Pass
2464.50	H	-43.49		
3286.00	H	-44.87		
4107.50	H	-43.27		
4929.00	H	-41.11		

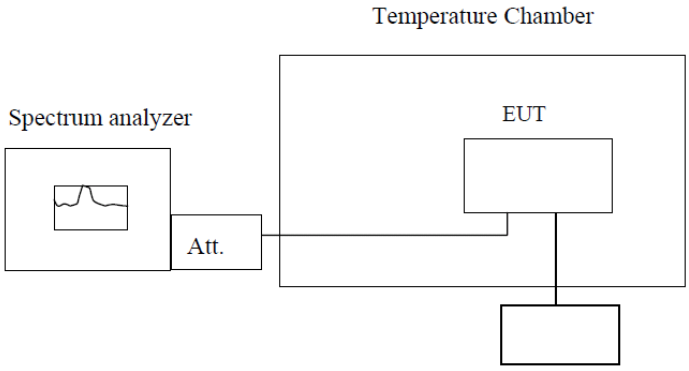
Test mode:	LTE Band 26(10MHz)		Test channel:	Middle
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1638.00	Vertical	-42.05	-13.00	Pass
2457.00	V	-41.20		
3276.00	V	-41.53		
4095.00	V	-41.30		
4914.00	V	-42.62		
1638.00	Horizontal	-44.01	-13.00	Pass
2457.00	H	-43.71		
3276.00	H	-42.97		
4095.00	H	-43.10		
4914.00	H	-43.28		
Test mode:	**LTE Band 26(15MHz)**		**Test channel:**	**Lowest**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1643.00	Vertical	-43.36	-13.00	Pass
2464.50	V	-42.97		
3286.00	V	-42.50		
4107.50	V	-42.56		
4929.00	V	-43.70		
1643.00	Horizontal	-43.58	-13.00	Pass
2464.50	H	-43.66		
3286.00	H	-42.07		
4107.50	H	-42.36		
4929.00	H	-43.90		

16QAM mode:

Test mode:	LTE Band 26(5MHz)		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1633.00	Vertical	-41.63	-13.00	Pass
2449.50	V	-41.67		
3266.00	V	-41.14		
4082.50	V	-42.45		
4899.00	V	-43.75		
1633.00	Horizontal	-43.08	-13.00	Pass
2449.50	H	-41.15		
3266.00	H	-42.04		
4082.50	H	-43.65		
4899.00	H	-43.36		
Test mode:	**LTE Band 26(5MHz)**		**Test channel:**	**Middle**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1638.00	Vertical	-42.98	-13.00	Pass
2457.00	V	-42.43		
3276.00	V	-43.03		
4095.00	V	-44.65		
4914.00	V	-44.03		
1638.00	Horizontal	-44.56	-13.00	Pass
2457.00	H	-41.91		
3276.00	H	-42.96		
4095.00	H	-43.59		
4914.00	H	-42.59		
Test mode:	**LTE Band 26(5MHz)**		**Test channel:**	**Highest**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1643.00	Vertical	-43.94	-13.00	Pass
2464.50	V	-43.98		
3286.00	V	-41.27		
4107.50	V	-43.82		
4929.00	V	-42.37		
1643.00	Horizontal	-43.44	-13.00	Pass
2464.50	H	-43.23		
3286.00	H	-41.08		
4107.50	H	-41.61		
4929.00	H	-42.59		

Test mode:	LTE Band 26(10MHz)		Test channel:	Middle
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1638.00	Vertical	-42.52	-13.00	Pass
2457.00	V	-43.88		
3276.00	V	-44.41		
4095.00	V	-43.58		
4914.00	V	-41.44		
1638.00	Horizontal	-43.92	-13.00	Pass
2457.00	H	-43.65		
3276.00	H	-41.33		
4095.00	H	-41.25		
4914.00	H	-42.53		
Test mode:	**LTE Band 26(15MHz)**		**Test channel:**	**Lowest**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1643.00	Vertical	-44.25	-13.00	Pass
2464.50	V	-44.86		
3286.00	V	-43.47		
4107.50	V	-43.31		
4929.00	V	-44.15		
1643.00	Horizontal	-44.26	-13.00	Pass
2464.50	H	-44.07		
3286.00	H	-44.11		
4107.50	H	-44.79		
4929.00	H	-44.16		

6.9 Frequency stability V.S. Temperature measurement

Test Requirement:	FCC Part2.1055(a)(1)(b)
Limit:	±2.5ppm
Test setup:	 **Note :** Measurement setup for testing on Antenna connector
Test procedure:	1. The equipment under test was connected to an external DC power supply and input rated voltage. 2. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. 3. The EUT was placed inside the temperature chamber. 4. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 25°C operating frequency as reference frequency. 5. Turn EUT off and set the chamber temperature to –20°C. After the temperature stabilized for approximately 30 minutes recorded the frequency. 6. Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached.
Test Instruments:	Refer to section 5.0 for details
Test mode:	Refer to section 6.1 for details
Test results:	Pass

Measurement Data

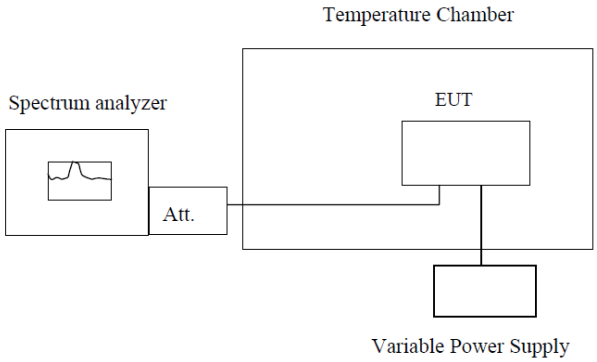
QPSK mode:

Reference Frequency: LTE Band 26 Middle channel=26740 channel=819MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
12	-30	69	0.0365	±2.5	Pass
	-20	77	0.0410		
	-10	66	0.0349		
	0	54	0.0288		
	10	63	0.0334		
	20	54	0.0288		
	30	89	0.0471		
	40	80	0.0426		
	50	77	0.0410		

16QAM mode:

Reference Frequency: LTE Band 26 Middle channel=26740 channel=819MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
12	-30	74	0.0424	±2.5	Pass
	-20	81	0.0469		
	-10	70	0.0402		
	0	62	0.0358		
	10	66	0.0380		
	20	58	0.0335		
	30	100	0.0580		
	40	85	0.0491		
	50	81	0.0469		

6.10 Frequency stability V.S. Voltage measurement

Test Requirement:	FCC Part2.1055(d)(1)(2)
Limit:	±2.5ppm
Test setup:	 **Note :** Measurement setup for testing on Antenna connector
Test procedure:	1. Set chamber temperature to 25°C. Use a variable DC power source to power the EUT and set the voltage to rated voltage. 2. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency. 3. Reduce the input voltage to specified extreme voltage variation (+/- 15%) and endpoint, record the maximum frequency change.
Test Instruments:	Refer to section 5.0 for details
Test mode:	Refer to section 6.1 for details
Test results:	Pass

Measurement Data

QPSK mode:

Reference Frequency: LTE Band 26 Middle channel=26740 channel=819MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	8	47	0.0251	±2.5	Pass
	12	54	0.0290		
	30	62	0.0328		

16QAM mode:

Reference Frequency: LTE Band 26 Middle channel=26740 channel=819MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	8	71	0.0411	±2.5	Pass
	12	52	0.0298		
	30	58	0.0336		

7 Test Setup Photo

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

8 EUT Constructional Details

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

-----End------