Spectrum Report (LTE)

Applicant:	Positioning Universal Inc
Address of Applicant:	4660 La Jolla Village Drive Suite 1100, San Diego, California 92122, United States
Manufacturer:	Positioning Universal Inc
Address of Manufacturer:	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 22 FCC CFR Title 47 Part 24 FCC CFR Title 47 Part 27
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.

2 Version

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

Prepared By:	Tiger. Chen	***Date:***	*May 17, 2019*
	Project Engineer		
Check By:	Robinson Lo	***Date:***	*May 17, 2019*
	Reviewer		

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4 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 22.913 Part 24.232 (c) Part 27.50(c)(10)/(d)(4)	Pass
Peak-to-Average Ratio	FCC part24.232(d) FCC Part 27.50	Pass
Modulation Characteristics	Part 2.1047	N/A
99% & -26 dB Occupied Bandwidth	Part 2.1049 Part 22.917 Part 24.238 Part 27.53(h)/(g)	Pass
Spurious Emissions at Antenna Terminal	Part 2.1051 Part 22.917 Part 24.238 (a) Part 27.53(h)/(g)	Pass
Field Strength of Spurious Radiation	Part 2.1053 Part 22.917 Part 24.238 (a) Part 27.53(h)/(g)	Pass
Out of band emission, Band Edge	Part 22.917 Part 24.238 (a) Part 27.53(h)/(g)	Pass
Frequency stability vs. temperature	Part 2.1055(a)(1)(b)	Pass
Frequency stability vs. voltage	Part 2.1055(d)(1)(2)	Pass

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

N/A: Not applicable.

4.1 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%.			

5 General Information

5.1 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 12, LTE Band 25, LTE Band 26
Channel Bandwidth:	LTE Band 12: 5MHz; 10MHz LTE Band 25: 5MHz; 10MHz; 15MHz; 20MHz LTE Band 26: 5MHz; 10MHz; 15MHz
TX Frequency:	LTE Band 12: 701.5MHz-713.5MHz LTE Band 25: 1852.5MHz-1912.5MHz LTE Band 26 : 826.5MHz-846.5MHz
Modulation type:	LTE Band 12/25/26: QPSK, 16QAM
Antenna type:	Integral antenna
Antenna gain:	LTE Band 12: 0.7dBi LTE Band 25: -0.6dBi LTE Band 26: 0.7dBi
Power supply:	DC 12V

5.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is filing to comply with Section Part 27 and Part 24, Part 22 of the FCC CFR 47 Rules.

5.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures document on ANSI / TIA / EIA-603-D-2010 and FCC KDB 971168 D01 Power Meas. License Digital Systems v03r01 and ANSI C63.26, FCC CFR 47.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055 and 2.1057

5.4 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-

5.5 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

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. 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
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. 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

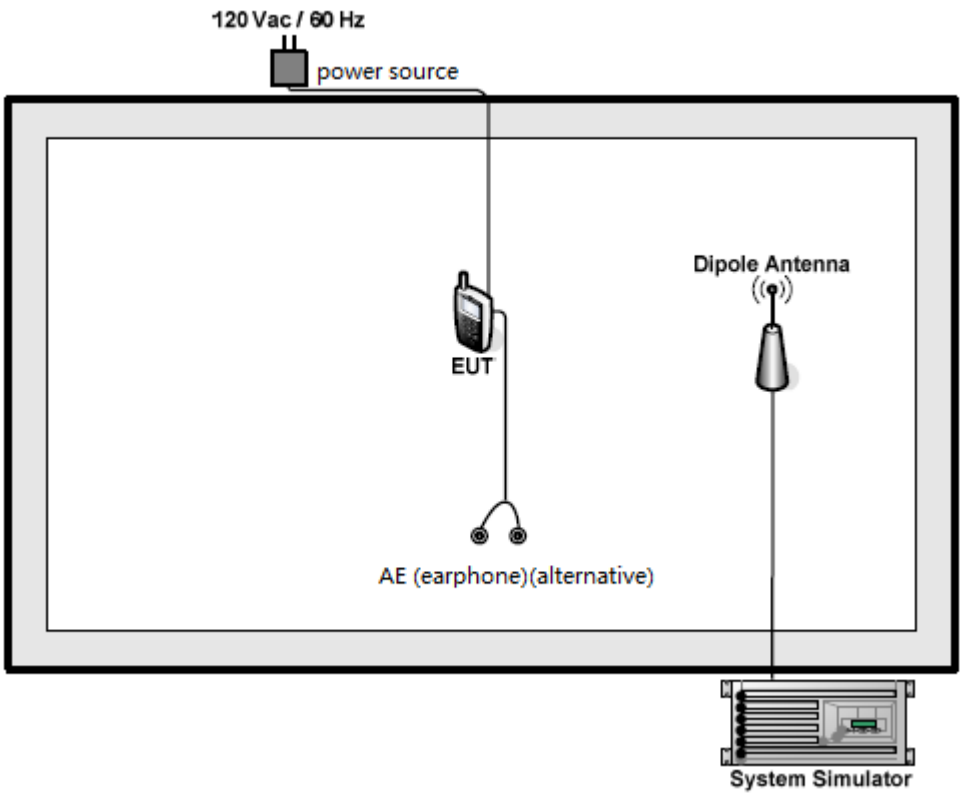
7 System test configuration

7.1 Test mode

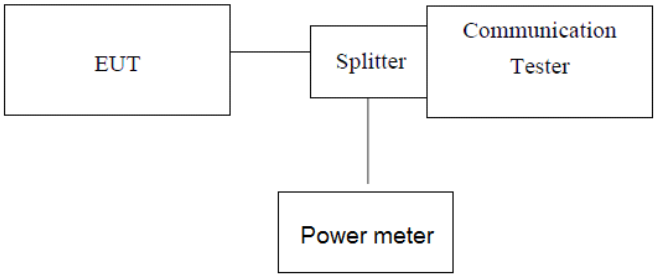
During all testing, EUT is in link mode with base station emulator at maximum power level. The spurious emission measurements were carried out in semi-anechoic chamber with 3-meter test range, and EUT is rotated on three test planes to find out the worst emission.

Test modes		
Band	Radiated	Conducted
LTE Band 12	■ QPSK and 16QAM link	■ QPSK and 16QAM link
LTE Band 25	■ QPSK and 16QAM link	■ QPSK and 16QAM link
LTE Band 26	■ QPSK and 16QAM link	■ QPSK and 16QAM link

7.2 Configuration of Tested System



7.3 Conducted Output Power

Test Requirement:	Part 24.232 (c); Part 27.50(c)(10)/(d)(4); FCC part22.913
Test Method:	FCC part2.1046
Limit:	LTE Band 12: 3W LTE Band 25: 2W LTE Band 26: 7W
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 6.0 for details
Test mode:	Refer to section 7.1 for details
Test results:	Pass

Measurement Data

Band 12						
Bandwidth	Mode	RB Size	RB Offset	Actual output power(dBm)		
				Channel 23035 701.5MHz	Channel 23095 707.5MHz	Channel 23155 713.5MHz
5MHz	QPSK	1	0	22.38	22.26	22.68
		1	12	22.85	22.96	22.74
		1	24	**23.72**	22.59	22.97
		12	0	22.51	23.20	23.41
		12	6	22.52	23.87	22.77
		12	13	23.08	22.07	22.78
		25	0	22.24	22.73	23.04
	16QAM	1	0	23.19	22.15	23.64
		1	12	23.17	22.07	22.16
		1	24	22.40	22.52	22.08
		12	0	22.33	22.66	22.14
		12	6	23.43	23.05	22.70
		12	13	23.60	23.43	22.36
		25	0	22.71	23.18	23.48
Bandwidth	Mode	RB Size	RB Offset	Actual output power(dBm)		
				Channel 23060 704.0MHz	Channel 23095 707.5MHz	Channel 23130 711.0MHz
10MHz	QPSK	1	0	22.18	22.44	22.32
		1	24	22.44	22.21	22.46
		1	49	22.09	22.44	22.86
		25	0	22.54	23.21	23.87
		25	12	22.67	22.03	**23.95**
		25	25	22.49	23.48	22.36
		50	0	22.01	22.35	23.58
	16QAM	1	0	22.65	23.80	23.78
		1	24	23.70	22.70	22.58
		1	49	22.97	22.99	22.99
		25	0	22.88	23.89	22.66
		25	12	22.89	22.83	23.14
		25	25	22.47	23.70	22.48
		50	0	22.72	23.34	23.52

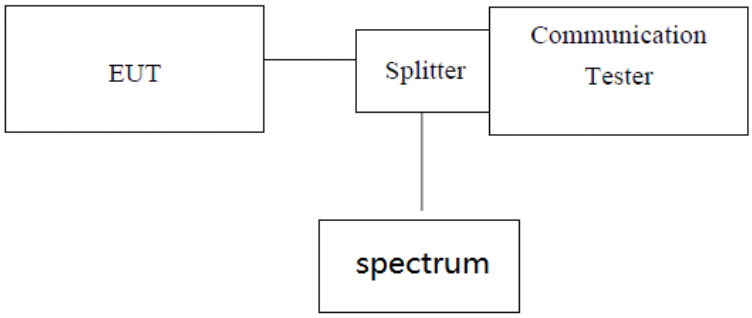
Band 25						
Bandwidth	Mode	RB Size	RB Offset	Actual output power(dBm)		
				Channel 26065 1852.5MHz	Channel 26365 1882.5MHz	Channel 26665 1912.5MHz
5MHz	QPSK	1	0	22.98	22.75	22.09
		1	12	21.08	21.88	22.46
		1	24	22.55	22.32	21.78
		12	0	22.00	22.57	22.54
		12	6	21.03	22.09	22.04
		12	13	22.52	22.44	21.37
		25	0	21.40	21.54	22.87
	16QAM	1	0	22.41	22.84	22.48
		1	12	21.03	22.57	22.48
		1	24	21.80	21.01	**22.89**
		12	0	21.26	21.15	21.61
		12	6	22.37	21.76	22.58
		12	13	21.35	21.79	21.15
		25	0	22.24	21.71	21.43
Bandwidth	Mode	RB Size	RB Offset	Actual output power(dBm)		
				Channel 26090 1855.0MHz	Channel 26365 1882.5MHz	Channel 16640 1910.0MHz
10MHz	QPSK	1	0	21.76	22.26	22.75
		1	24	21.04	22.30	21.79
		1	49	21.72	22.83	21.73
		25	0	21.13	22.88	22.34
		25	12	22.62	21.93	21.64
		25	25	21.69	22.31	21.48
		50	0	22.77	22.82	22.59
	16QAM	1	0	22.46	21.78	22.66
		1	24	22.07	21.76	21.22
		1	49	22.35	21.30	21.98
		25	0	21.49	21.04	21.41
		25	12	22.72	22.14	22.65
		25	25	**22.93**	22.70	21.34
		50	0	21.57	21.42	21.66

Bandwidth	Mode	RB Size	RB Offset	Actual output power(dBm)		
				Channel 26115 1857.5MHz	Channel 26365 1882.5MHz	Channel 26615 1907.5MHz
15MHz	QPSK	1	0	21.79	21.74	22.39
		1	38	21.43	21.01	22.68
		1	74	22.72	22.47	21.70
		38	0	21.64	21.18	21.08
		38	18	21.57	22.01	22.94
		38	37	22.36	22.04	21.55
		75	0	21.67	21.36	22.56
	16QAM	1	0	22.64	21.15	21.42
		1	38	21.68	22.34	22.42
		1	74	22.24	22.19	21.76
		38	0	22.16	22.10	21.43
		38	18	22.42	**22.96**	21.05
		38	37	21.06	21.19	22.43
		75	0	21.55	22.90	21.72
Bandwidth	Mode	RB Size	RB Offset	Actual output power(dBm)		
				Channel 26140 1860.0MHz	Channel 26365 1882.5MHz	Channel 26590 1905.0MHz
20MHz	QPSK	1	0	22.06	21.46	21.32
		1	49	22.09	22.50	**22.85**
		1	99	21.25	21.35	21.81
		50	0	22.41	21.87	21.75
		50	25	22.38	22.47	21.24
		50	50	22.42	22.54	22.79
		100	0	22.77	22.12	21.45
	16QAM	1	0	21.07	21.78	22.11
		1	49	21.62	22.28	21.64
		1	99	21.65	21.31	22.19
		50	0	21.40	21.73	22.18
		50	25	21.17	21.38	22.55
		50	50	22.71	21.81	21.19
		100	0	22.00	21.93	21.72

Band 26						
Bandwidth	Mode	RB Size	RB Offset	Actual output power(dBm)		
				Channel 26815 826.5MHz	Channel 26915 836.5MHz	Channel 27015 846.5MHz
5MHz	QPSK	1	0	22.75	22.80	21.73
		1	12	22.73	21.12	22.15
		1	24	22.71	22.50	22.05
		12	0	22.52	22.53	21.30
		12	6	21.69	22.21	22.53
		12	13	22.69	22.18	21.20
		25	0	21.71	22.03	22.15
	16QAM	1	0	22.40	21.47	22.04
		1	12	22.70	22.29	21.71
		1	24	22.60	22.55	22.35
		12	0	**22.97**	21.36	21.94
		12	6	22.03	22.01	22.96
		12	13	21.04	22.94	22.17
		25	0	22.68	21.09	21.12
Bandwidth	Mode	RB Size	RB Offset	Actual output power(dBm)		
				Channel 26840 829.0MHz	Channel 26915 836.5MHz	Channel 26990 844.0MHz
10MHz	QPSK	1	0	22.69	22.31	21.69
		1	24	21.86	22.62	22.86
		1	49	22.79	**22.98**	22.79
		25	0	22.51	21.19	22.51
		25	12	22.02	22.55	21.02
		25	25	21.05	22.31	22.05
		50	0	22.50	22.28	22.50
	16QAM	1	0	22.15	21.15	22.15
		1	24	22.05	22.97	21.05
		1	49	22.49	21.66	22.49
		25	0	22.93	22.06	21.93
		25	12	21.48	22.50	22.48
		25	25	22.62	22.72	21.62
		50	0	22.64	21.07	22.64

Bandwidth	Mode	RB Size	RB Offset	Actual output power(dBm)		
				Channel 26865 831.5MHz	Channel 26915 836.5MHz	Channel 26965 841.5MHz
15MHz	QPSK	1	0	21.88	22.71	21.08
		1	38	21.42	22.30	22.70
		1	74	21.75	22.04	21.06
		38	0	22.22	22.19	21.77
		38	18	22.58	21.54	22.47
		38	37	21.90	21.32	21.25
		75	0	22.78	**22.98**	22.13
	16QAM	1	0	21.56	22.00	21.36
		1	38	22.62	22.63	22.69
		1	74	21.08	22.06	22.28
		38	0	22.55	21.59	22.30
		38	18	21.56	21.68	22.79
		38	37	22.24	21.40	21.87
		75	0	21.93	22.18	21.03

7.4 Peak-to-Average Ratio

Test Requirement:	FCC part24.232(d) & FCC Part 27.50; Part 90
Test Method:	FCC part2.1046
Limit:	13db
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. 6. Record the maximum peak-to-average ratio value.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 7.1 for details
Test results:	Pass

Measurement data:

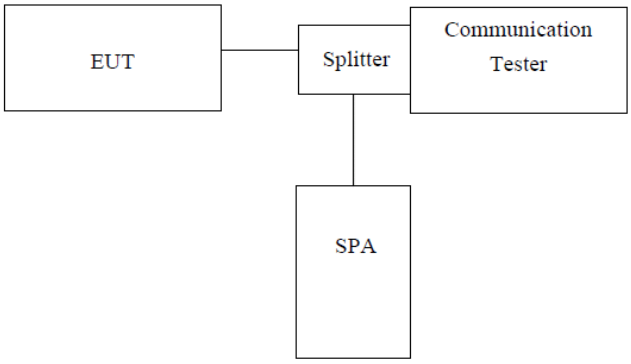
QPSK mode:

Test Band	Bandwidth	Peak to Average Ratio（dB）			Limit（dB）	Result
		Low Ch.	Middle Ch.	High Ch.		
LTE Band 12	5MHz	5.11	6.10	4.39	13	PASS
	10MHz	5.43	5.65	4.79	13	PASS
LTE Band 25	5MHz	6.44	4.74	6.15	13	PASS
	10MHz	5.27	5.22	4.50	13	PASS
	15MHz	6.63	5.37	5.73	13	PASS
	20MHz	5.09	4.35	5.85	13	PASS
LTE Band 26	5MHz	4.21	5.64	5.90	13	PASS
	10MHz	5.68	6.94	4.65	13	PASS
	15MHz	4.65	5.73	4.51	13	PASS

16QAM mode:

Test Band	Bandwidth	Peak to Average Ratio（dB）			Limit（dB）	Result
		Low Ch.	Middle Ch.	High Ch.		
LTE Band 12	5MHz	6.24	5.24	5.37	13	PASS
	10MHz	4.71	5.36	6.74	13	PASS
LTE Band 25	5MHz	6.16	5.50	6.83	13	PASS
	10MHz	5.54	4.78	5.64	13	PASS
	15MHz	5.30	4.67	6.15	13	PASS
	20MHz	6.03	5.20	4.15	13	PASS
LTE Band 26	5MHz	4.06	4.92	6.09	13	PASS
	10MHz	4.69	6.29	4.01	13	PASS
	15MHz	5.91	5.81	4.40	13	PASS

7.5 Occupy Bandwidth

Test Requirement:	Part 24.238; FCC Part 27.53(h)/(g) ; FCC part22.913
Test Method:	FCC part2.1049
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 6.0 for details
Test mode:	Refer to section 7.1 for details
Test results:	Pass

Measurement Data:

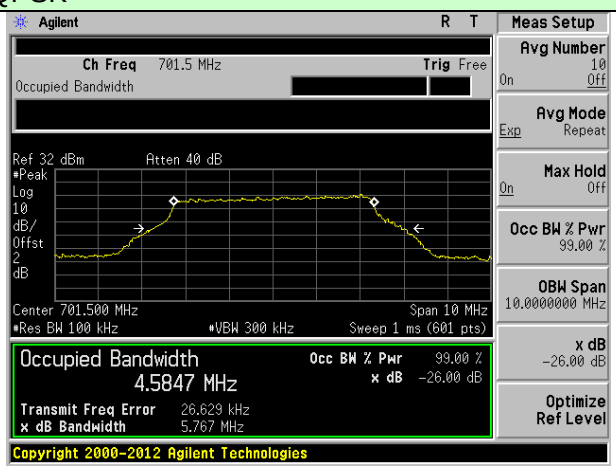
EUT Mode	Channel Bandwidth	Channel	RB Configure		QPSK(MHz)		16QAM(MHz)	
			RB Size	RB Offset	99% OCB	-26dB bandwidth	99% OCB	-26dB bandwidth
LTE Band 12	5MHz	Lowest	25	0	4.5847	5.767	4.5505	5.550
		Middle	25	0	4.5357	5.851	4.5835	5.827
		Highest	25	0	4.5527	5.752	4.5274	5.663
	10MHz	Lowest	50	0	8.9086	10.499	8.9155	10.099
		Middle	50	0	8.9642	10.582	8.9750	10.495
		Highest	50	0	8.9836	10.932	8.9884	10.933

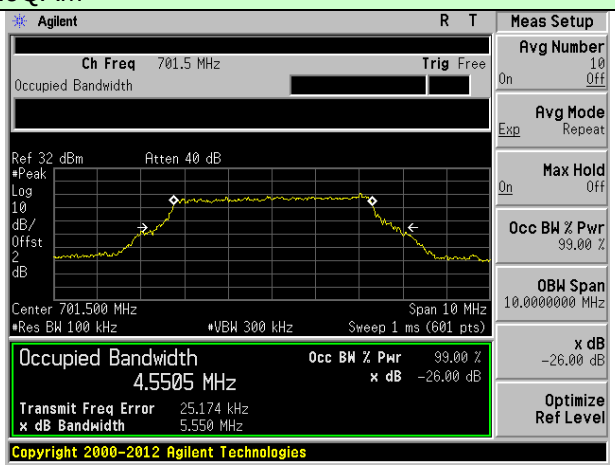
EUT Mode	Channel Bandwidth	Channel	RB Configure		QPSK(MHz)		16QAM(MHz)	
			RB Size	RB Offset	99% OCB	-26dB bandwidth	99% OCB	-26dB bandwidth
LTE Band 25	5MHz	Lowest	25	0	4.5558	5.794	4.5485	5.725
		Middle	25	0	4.5468	5.854	4.5387	5.749
		Highest	25	0	4.5657	5.961	4.5384	5.745
	10MHz	Lowest	50	0	8.9590	10.600	8.9508	10.600
		Middle	50	0	8.9691	10.862	8.9709	10.565
		Highest	50	0	8.9366	10.377	8.9341	10.421
	15MHz	Lowest	75	0	13.4831	16.219	13.4666	15.779
		Middle	75	0	13.5063	15.859	13.4878	16.244
		Highest	75	0	13.4655	15.947	13.4649	16.064
	20MHz	Lowest	100	0	17.9057	20.123	17.8945	20.250
		Middle	100	0	17.9310	20.165	17.9557	20.001
		Highest	100	0	17.9522	20.248	17.8917	19.897

EUT Mode	Channel Bandwidth	Channel	RB Configure		QPSK(MHz)		16QAM(MHz)	
			RB Size	RB Offset	99% OCB	-26dB bandwidth	99% OCB	-26dB bandwidth
LTE Band 26	5MHz	Lowest	25	0	4.5664	5.917	4.5526	5.868
		Middle	25	0	4.5705	5.876	4.5581	5.831
		Highest	25	0	4.5724	5.786	4.5741	5.994
	10MHz	Lowest	50	0	8.9697	10.568	8.9356	9.993
		Middle	50	0	8.9542	10.291	8.9611	10.624
		Highest	50	0	8.9206	10.263	8.9445	10.318
	15MHz	Lowest	75	0	13.4580	15.814	13.4325	15.784
		Middle	75	0	13.5103	16.047	13.5174	15.995
		Highest	75	0	13.4498	15.594	13.4509	15.901

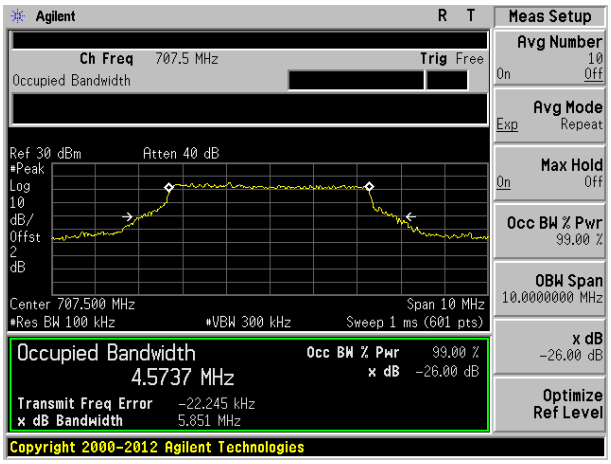
Test plot as follows:

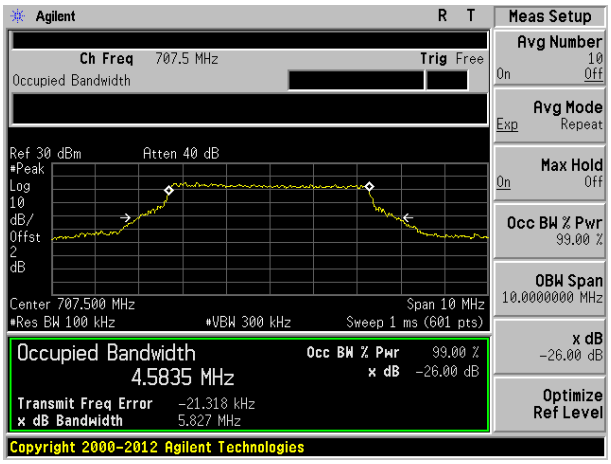
Test band: LTE Band 12	Channel Bandwidth: 5MHz
QPSK	16QAM



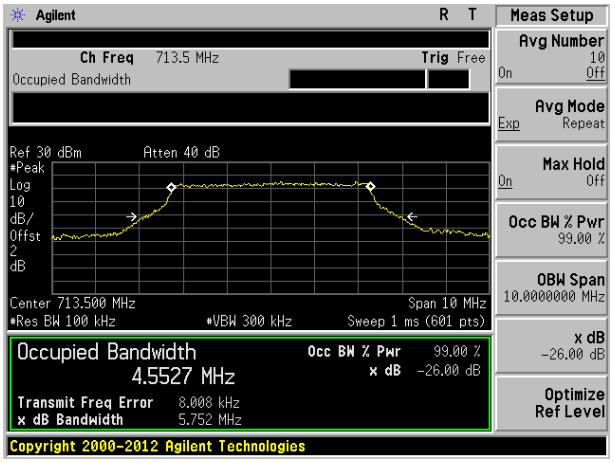


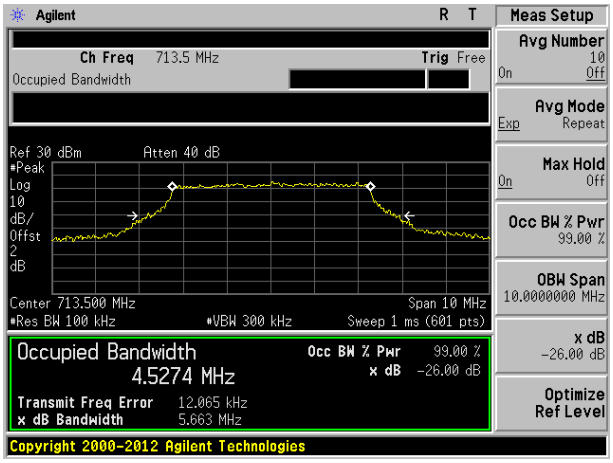
Lowest channel





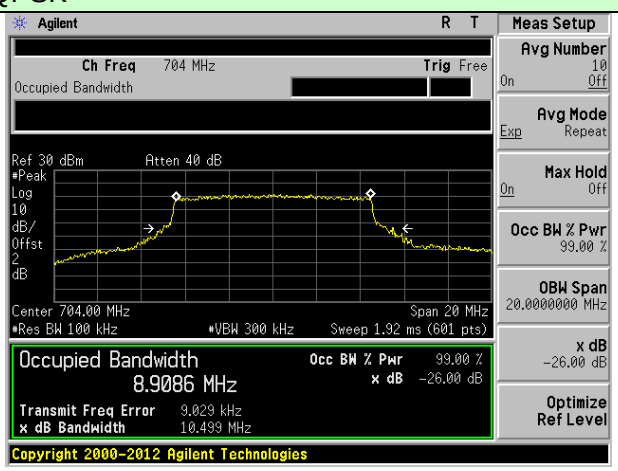
Middle channel

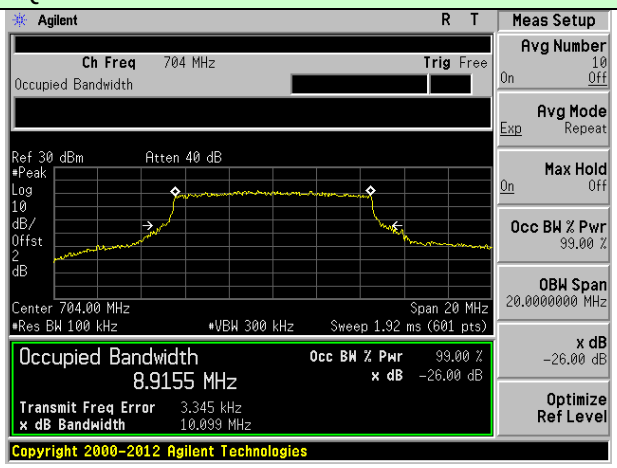




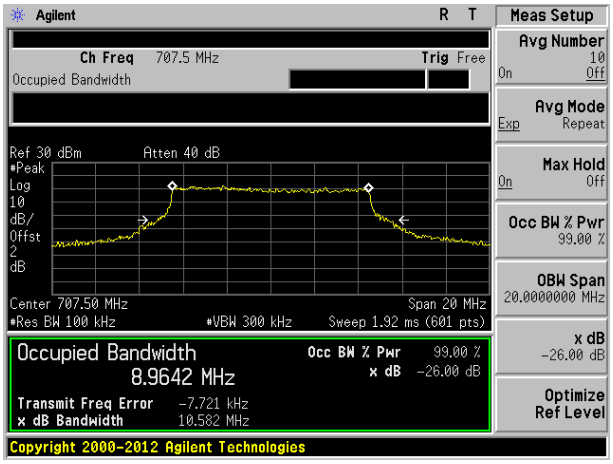
Highest channel

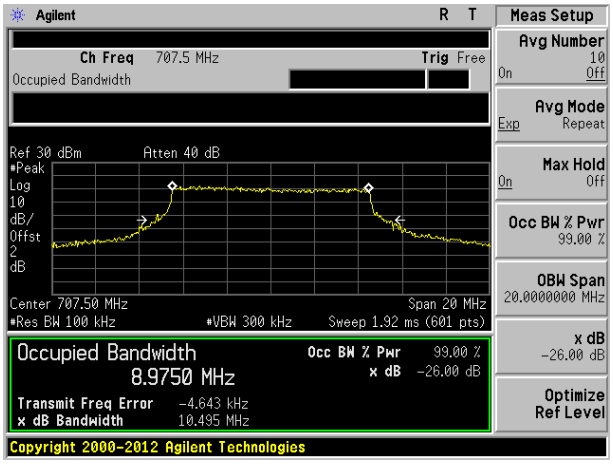
Test band: LTE Band 12	Channel Bandwidth:10MHz
QPSK	16QAM



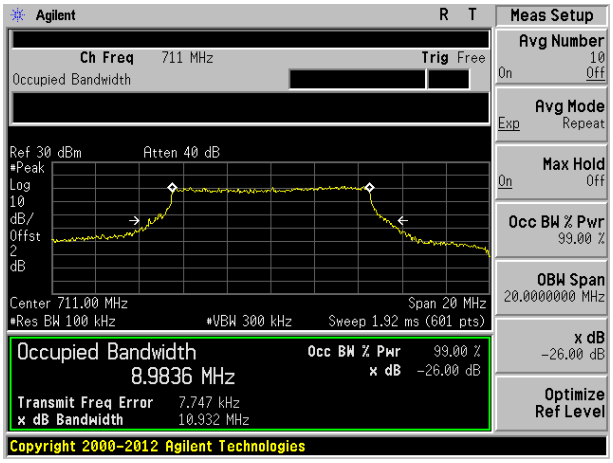


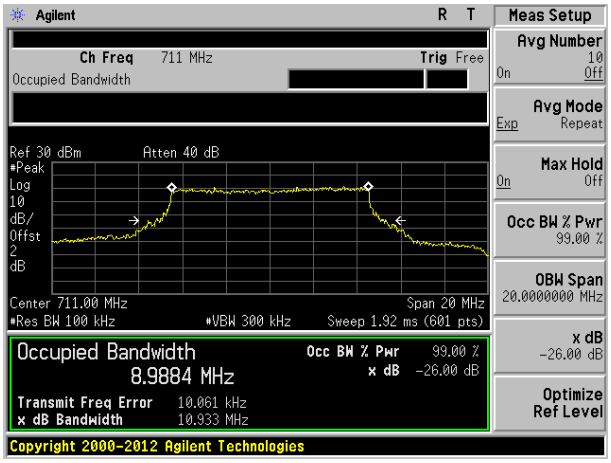
Lowest channel





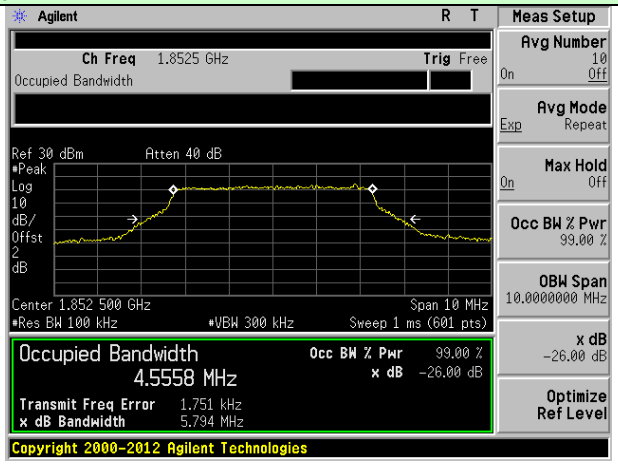
Middle channel

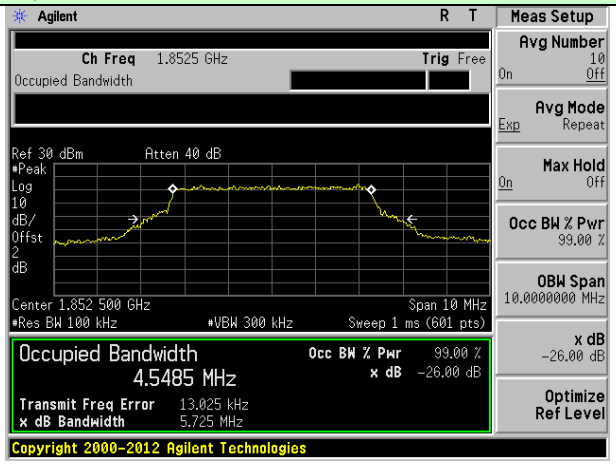




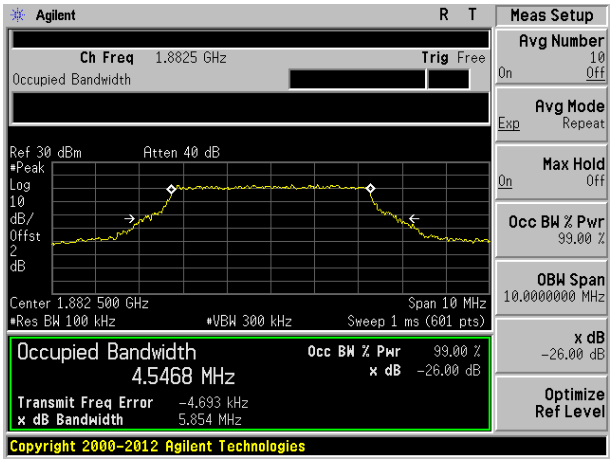
Highest channel

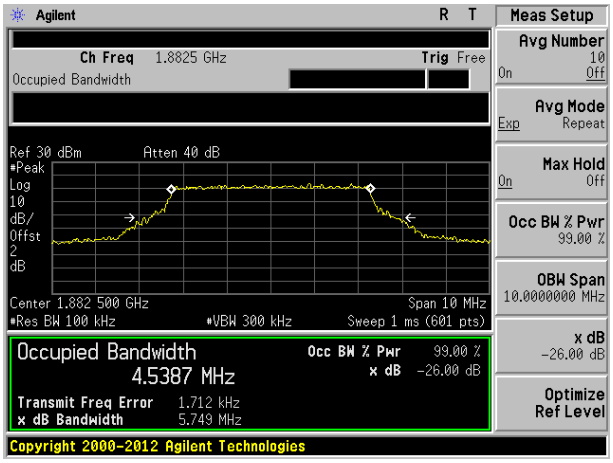
Test band: LTE Band 25	Channel Bandwidth: 5MHz
QPSK	16QAM



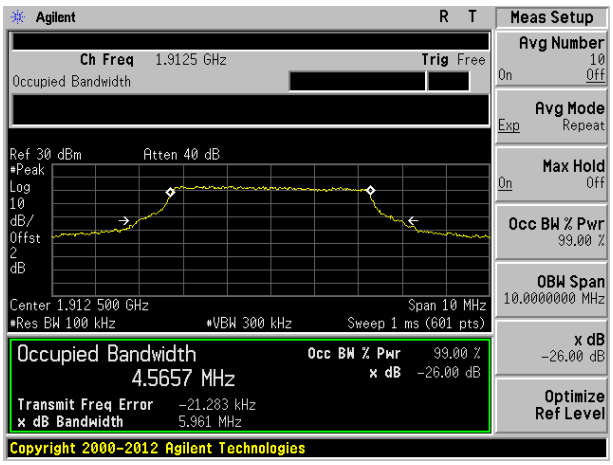


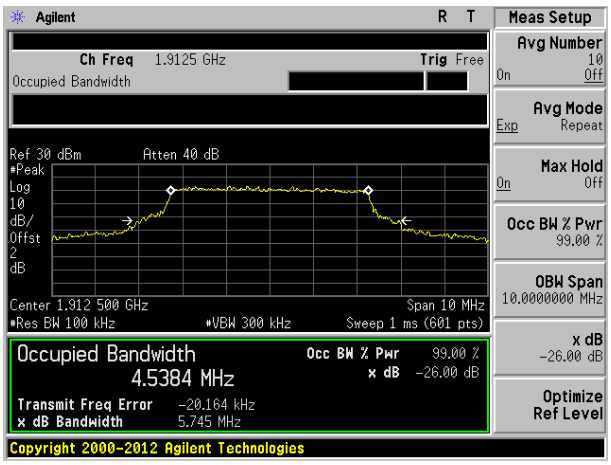
Lowest channel





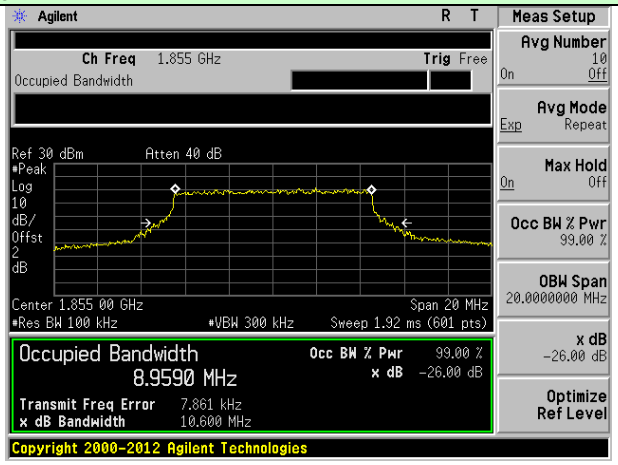
Middle channel

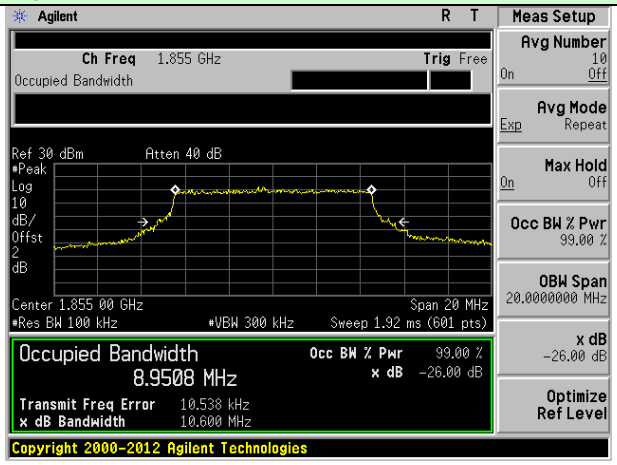




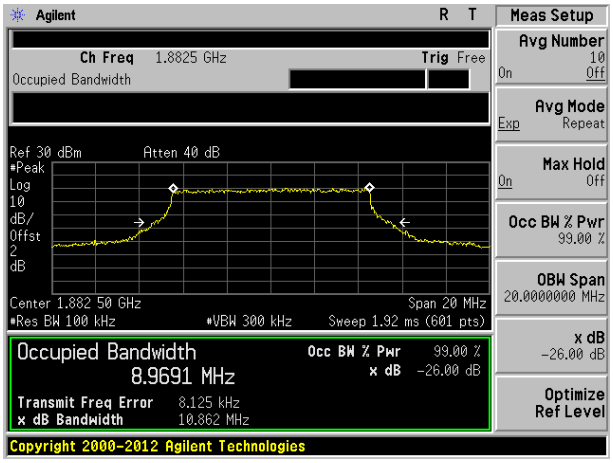
Highest channel

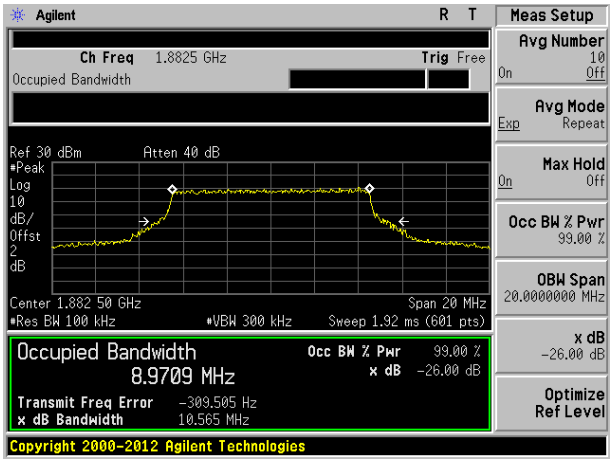
Test band: LTE Band 25	Channel Bandwidth:10MHz
QPSK	16QAM



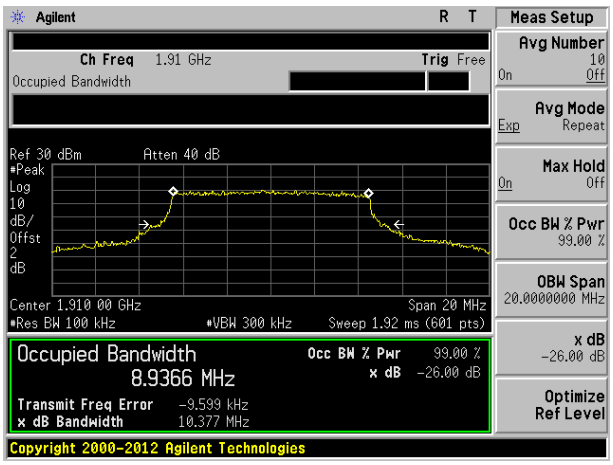


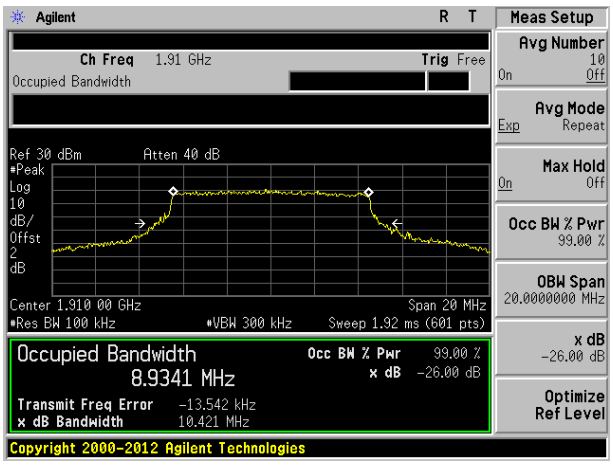
Lowest channel





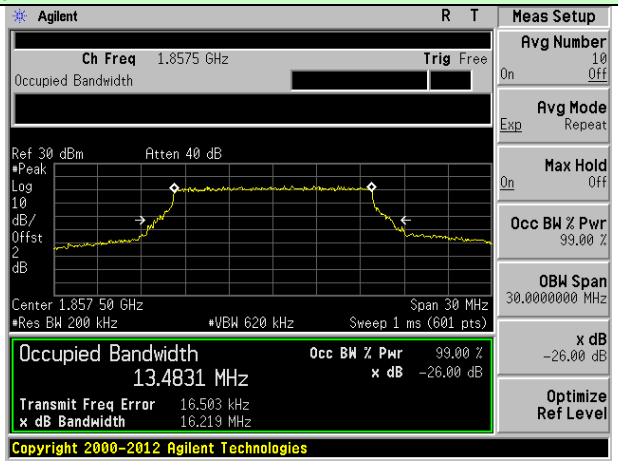
Middle channel

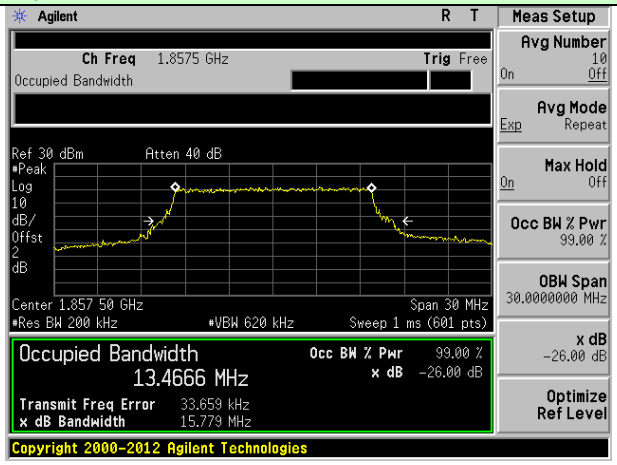




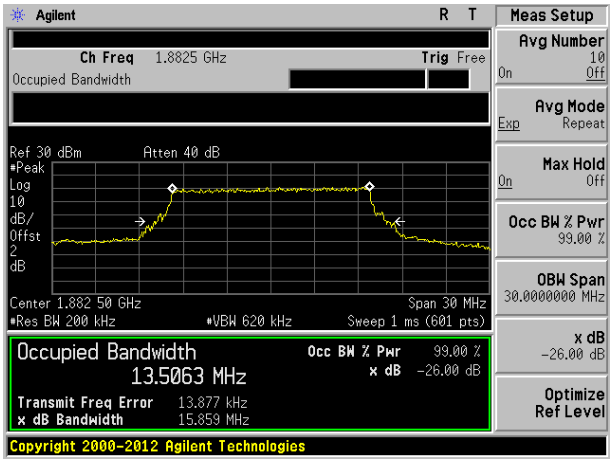
Highest channel

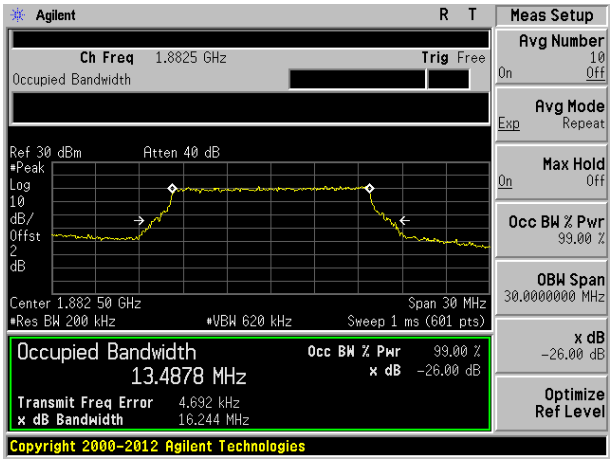
Test band: LTE Band 25	Channel Bandwidth:15MHz
QPSK	16QAM



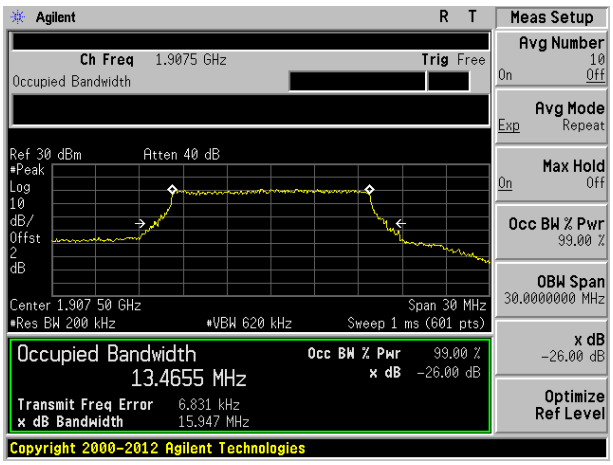


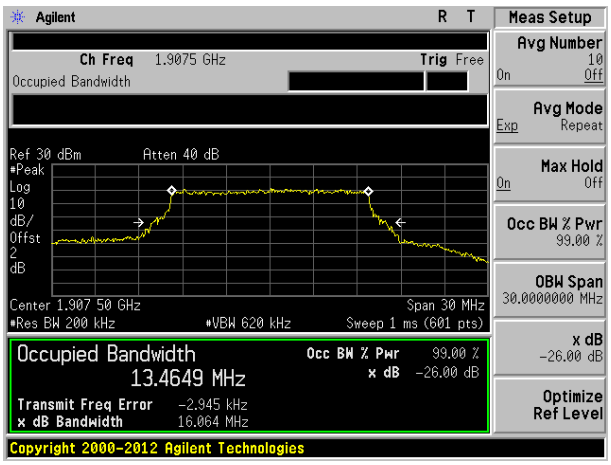
Lowest channel





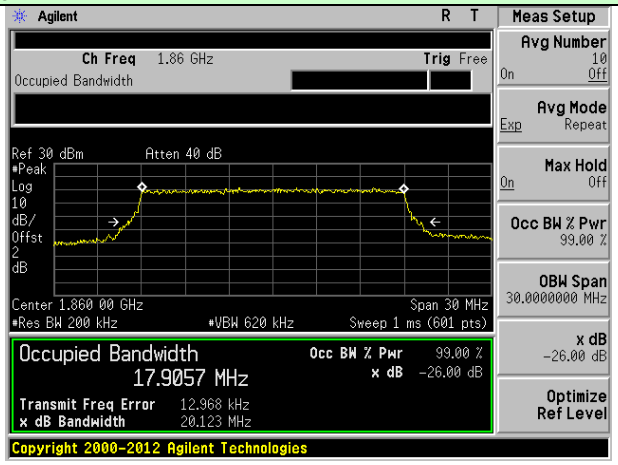
Middle channel

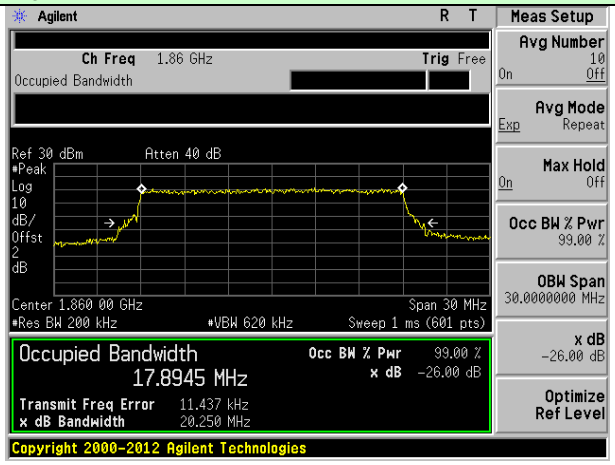




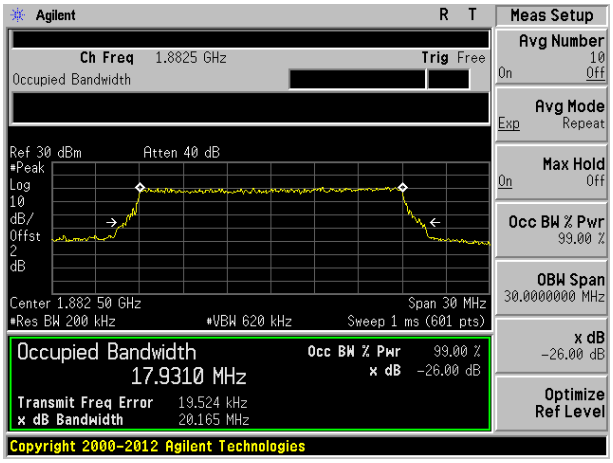
Highest channel

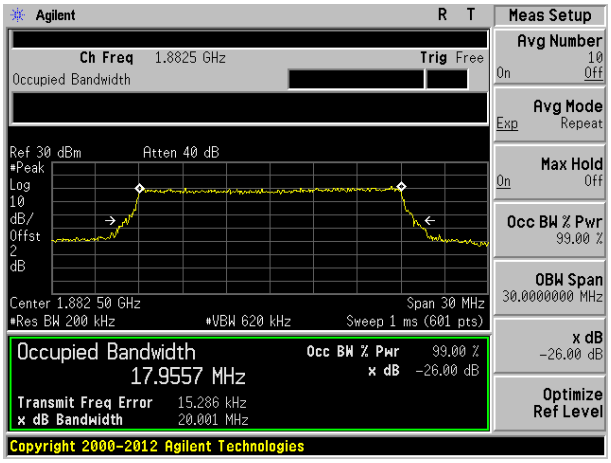
Test band: LTE Band 25	Channel Bandwidth:20MHz
QPSK	16QAM



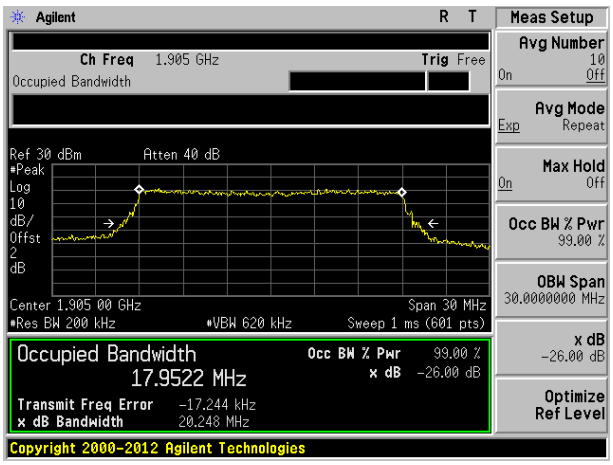


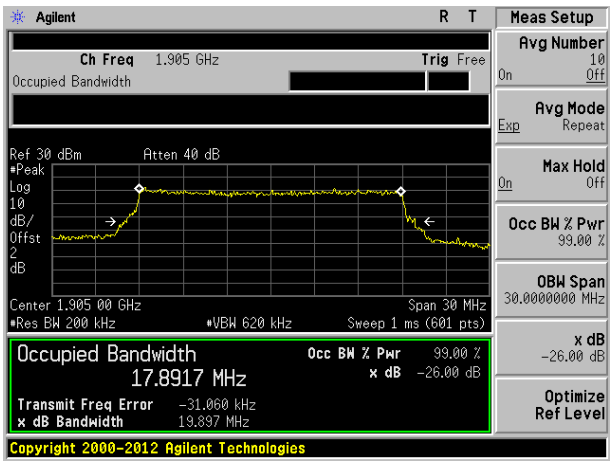
Lowest channel





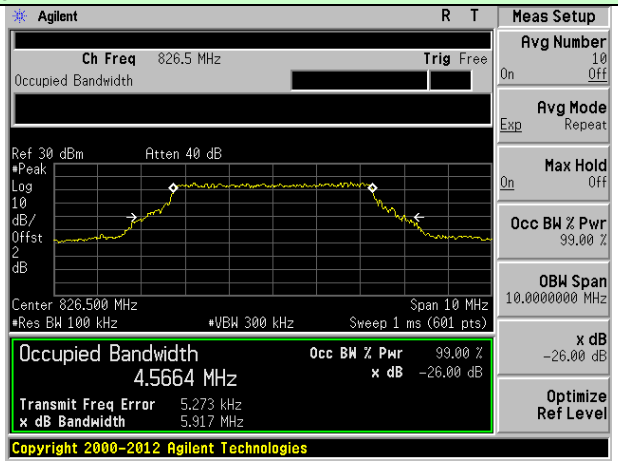
Middle channel

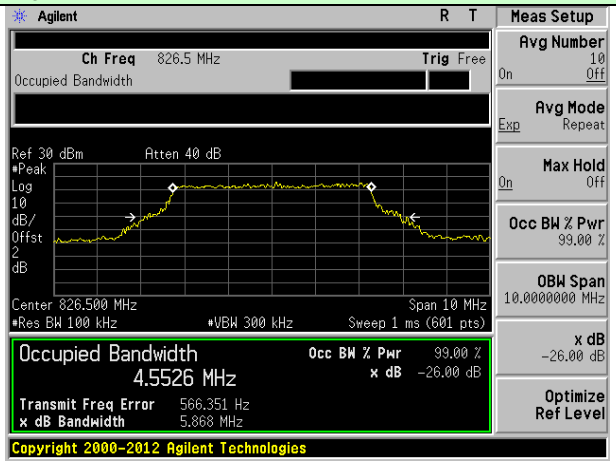




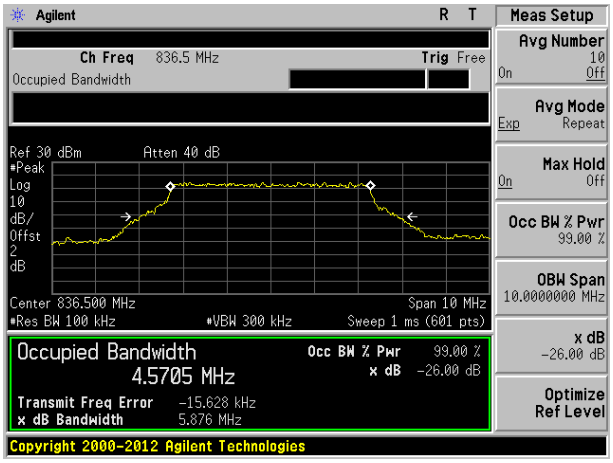
Highest channel

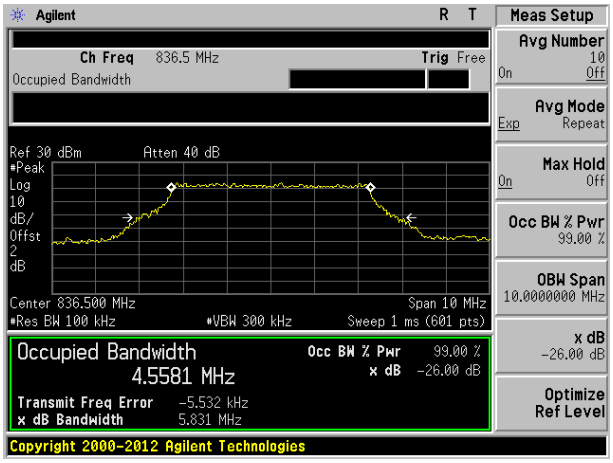
Test band: LTE Band 26	Channel Bandwidth: 5MHz
QPSK	16QAM



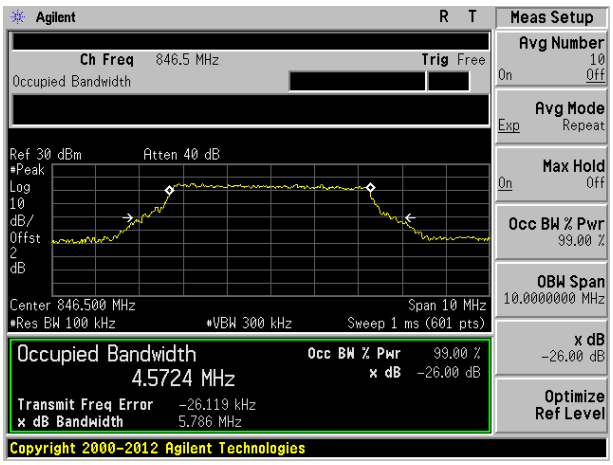


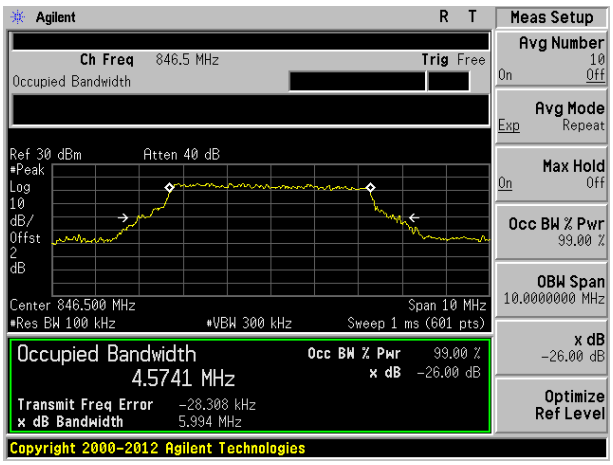
Lowest channel





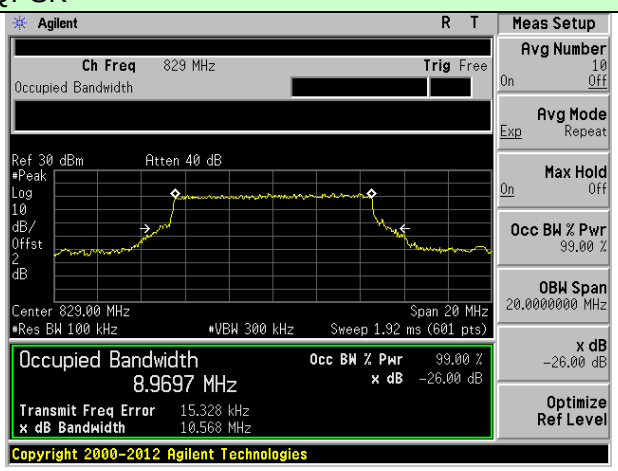
Middle channel

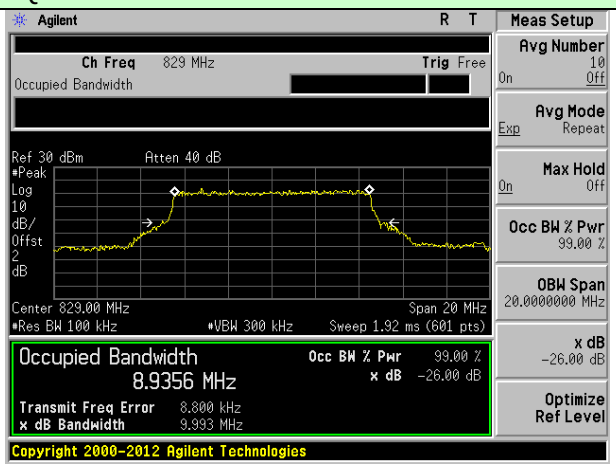




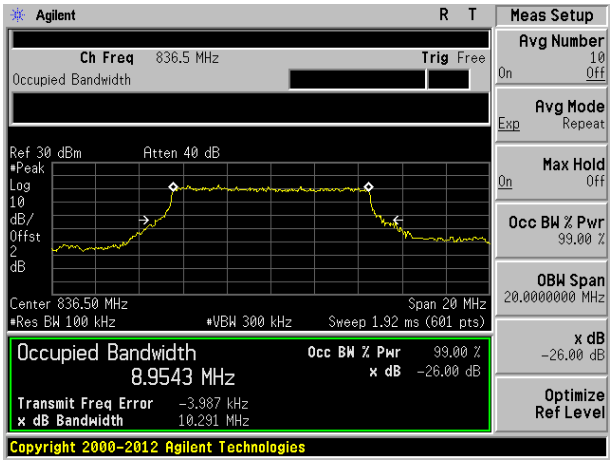
Highest channel

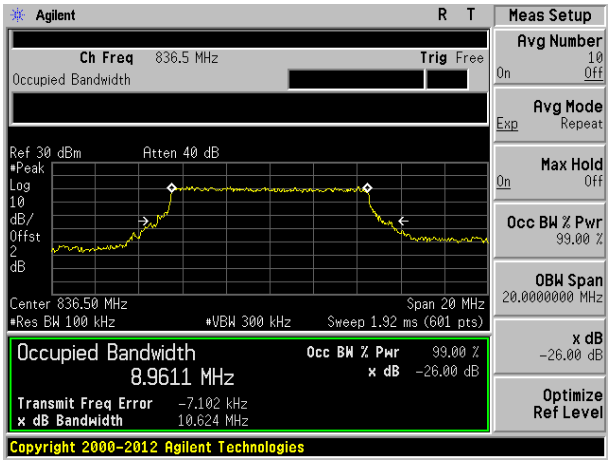
Test band: LTE Band 26	Channel Bandwidth: 10MHz
QPSK	16QAM



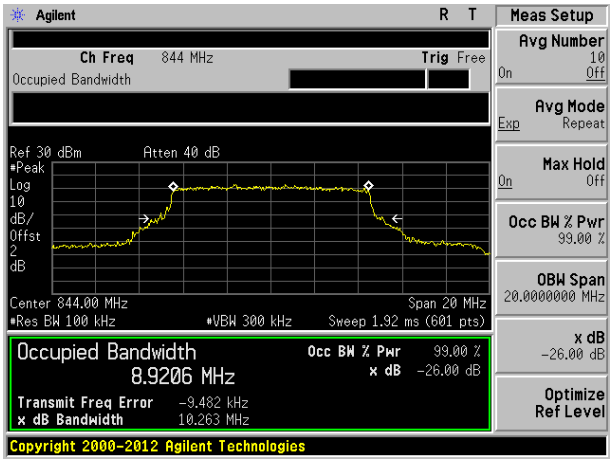


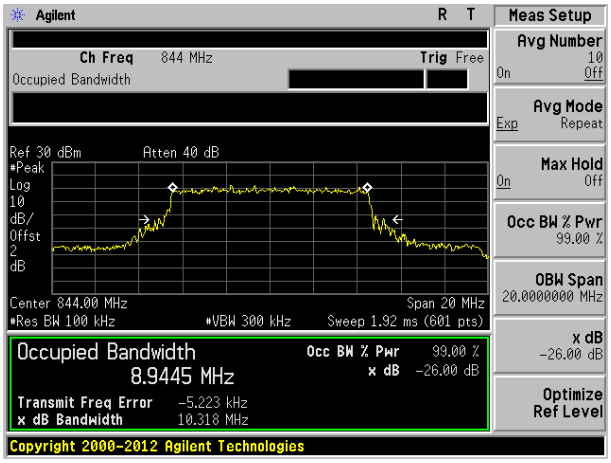
Lowest channel





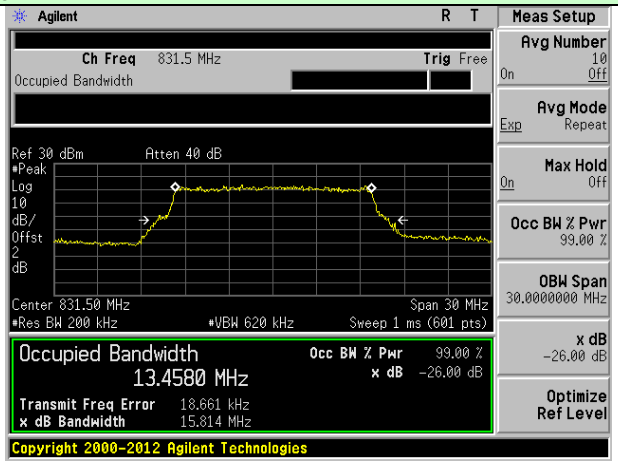
Middle channel

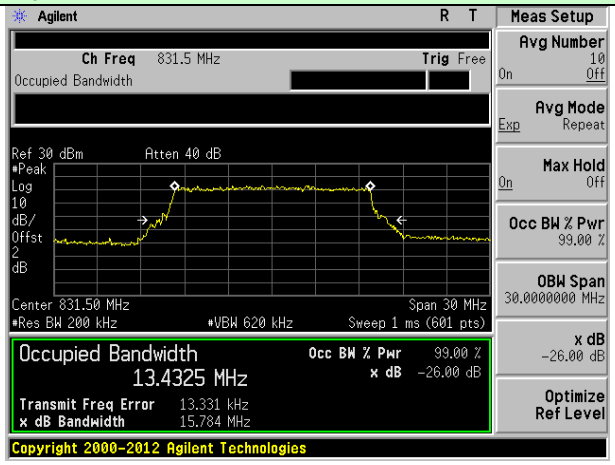




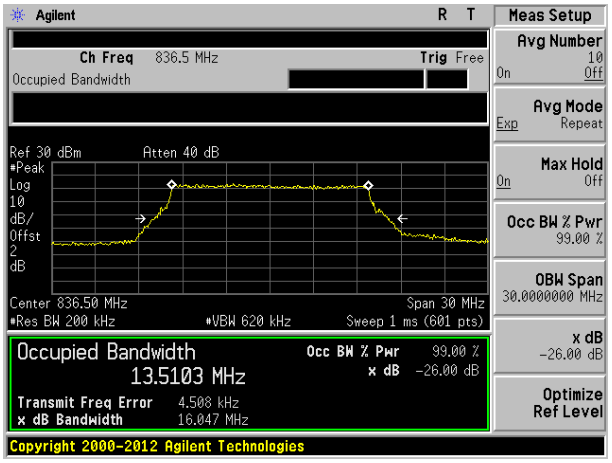
Highest channel

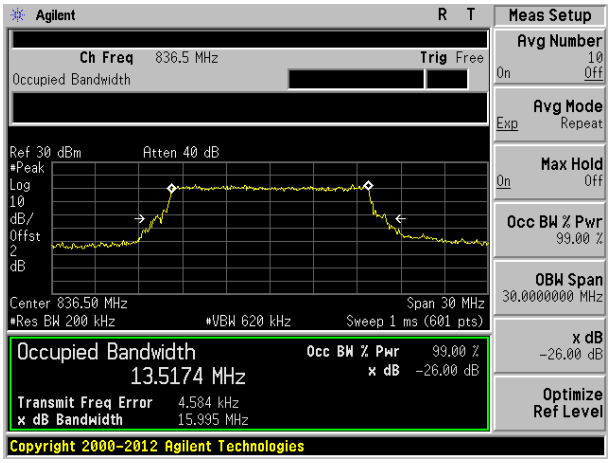
Test band: LTE Band 26	Channel Bandwidth: 15MHz
QPSK	16QAM



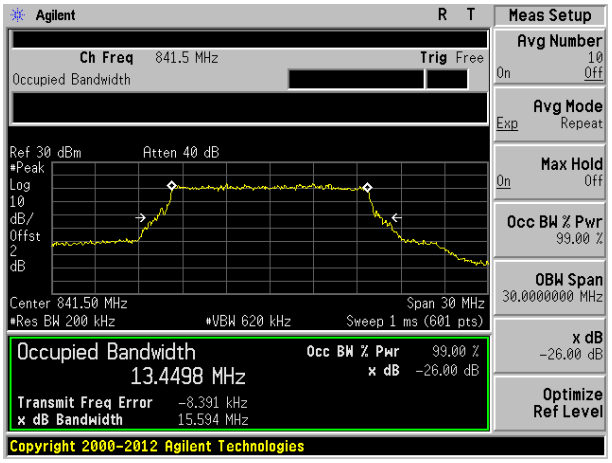


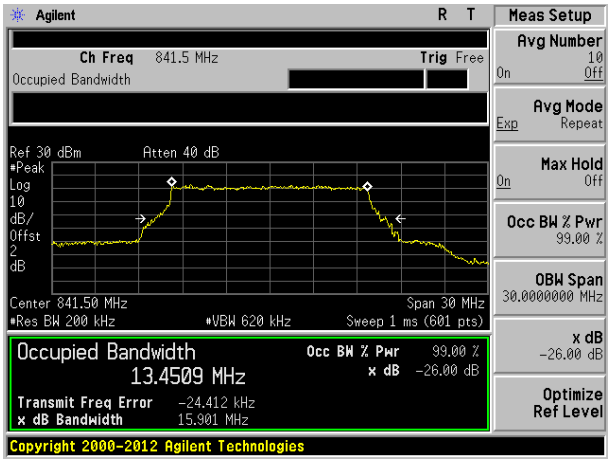
Lowest channel





Middle channel



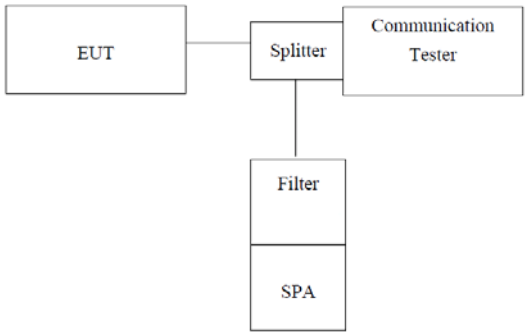


Highest channel

7.6 MODULATION CHARACTERISTIC

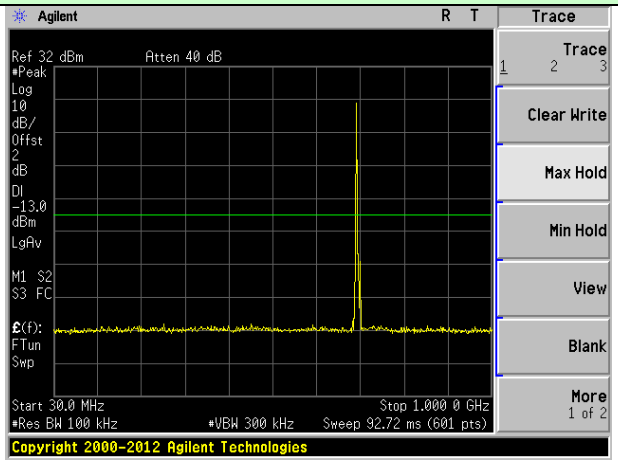
According to FCC § 2.1047(d), Part 27 there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

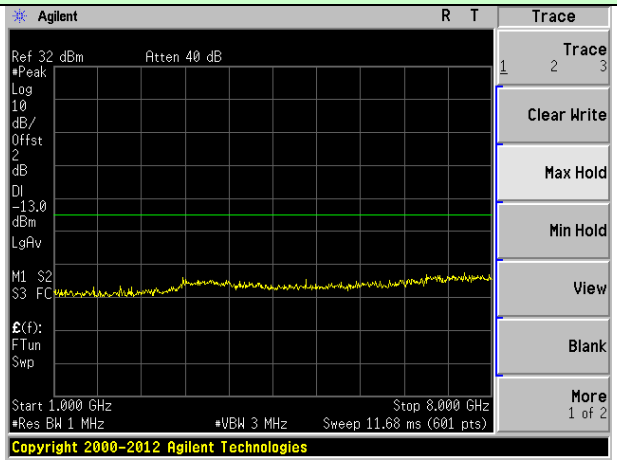
7.7 Out of band emission at antenna terminals

Test Requirement:	Part 24.238 (a); FCC Part 27.53(h)/(g) ; FCC part22.917
Test Method:	FCC part2.1051
Limit:	-13dBm
Test setup:	 *Note: Measurement setup for testing on Antenna connector*
Test Procedure:	ANSI C63.26 section 5.7
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 7.1 for details
Test results:	Pass

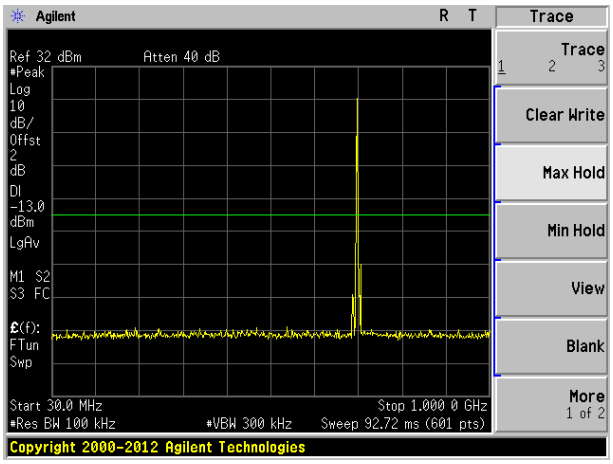
Test plot as follows:

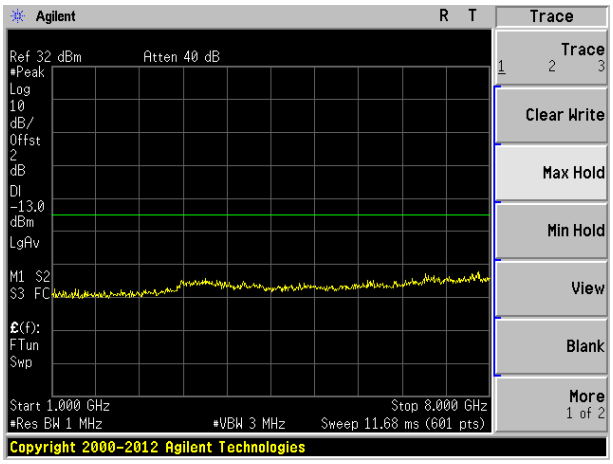
Test Mode: LTE Band 12	Channel Bandwidth: 5MHz



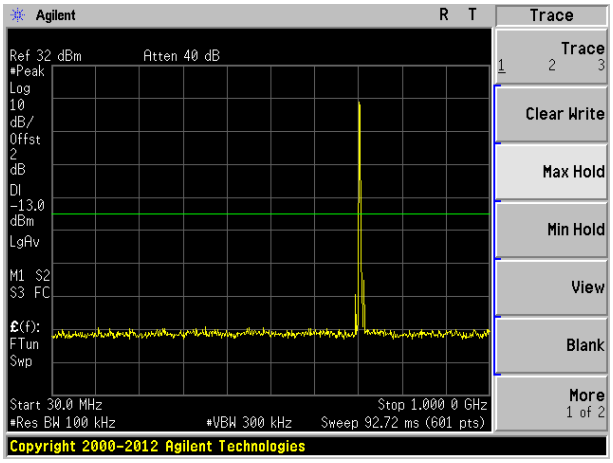


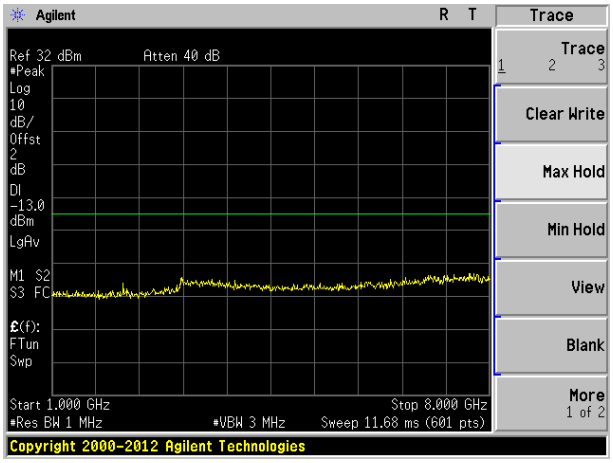
Lowest channel





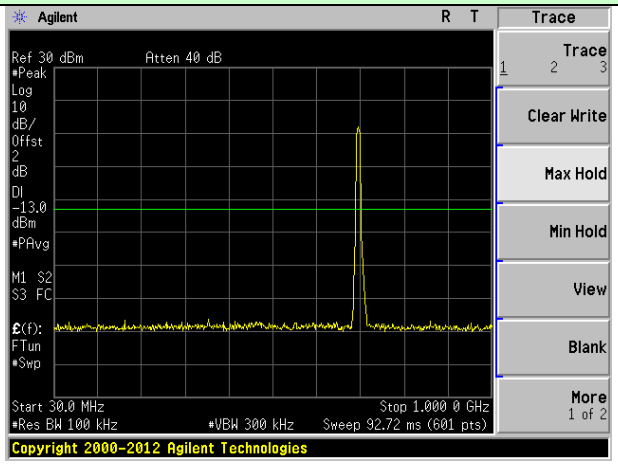
Middle channel

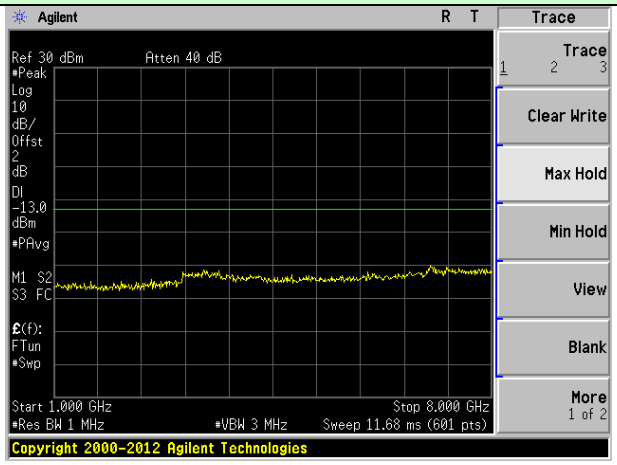




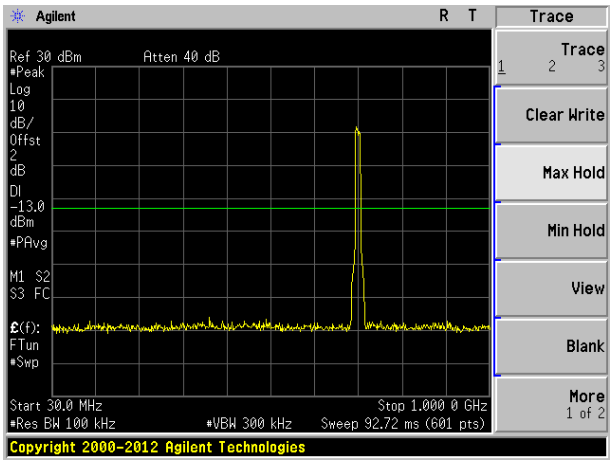
Highest channel

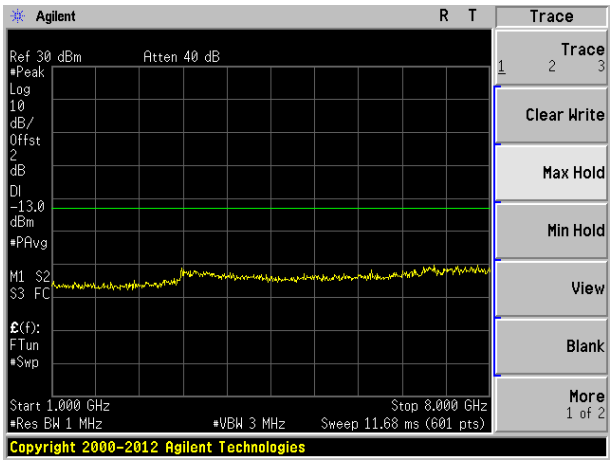
Test Mode: LTE Band 12	Channel Bandwidth: 10MHz



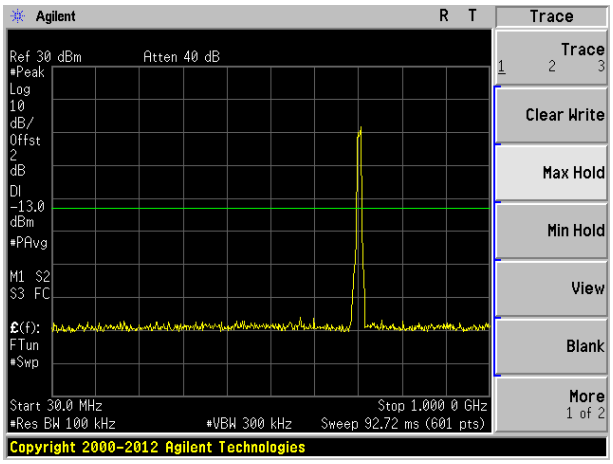


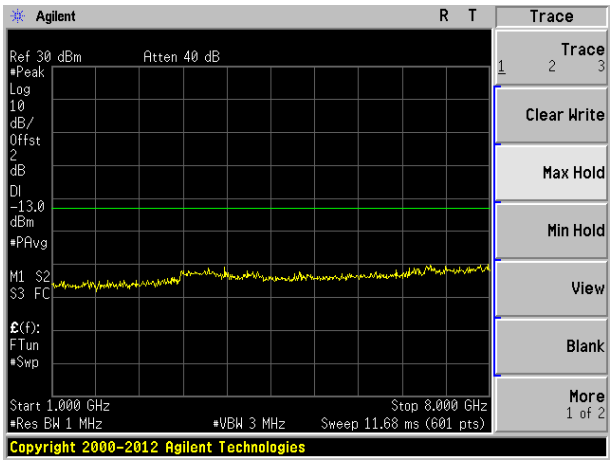
Lowest channel





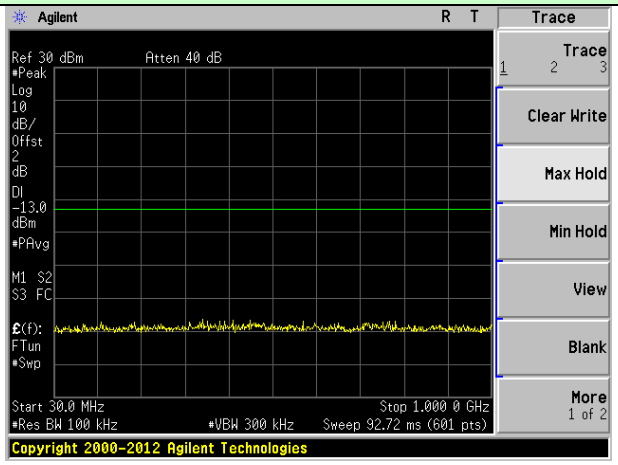
Middle channel

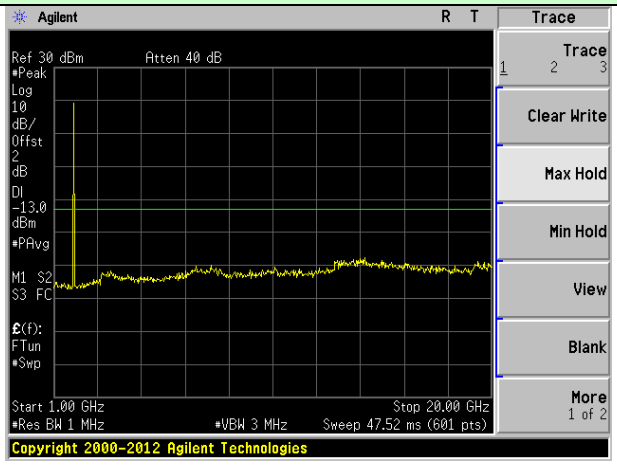




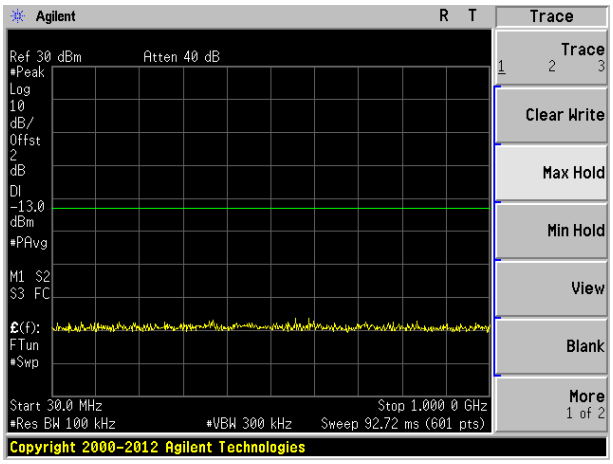
Highest channel

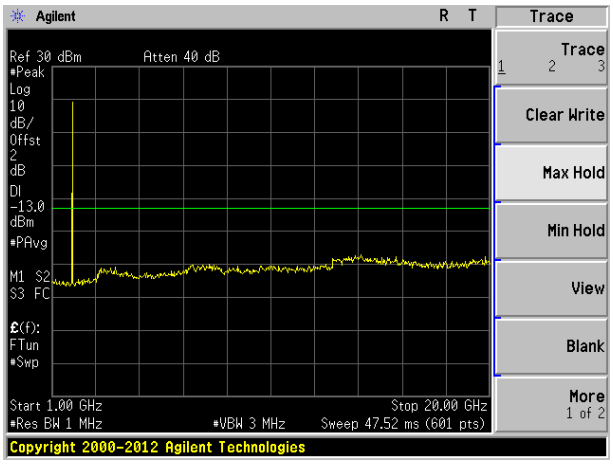
Test Mode: LTE Band 25	Channel Bandwidth: 5MHz



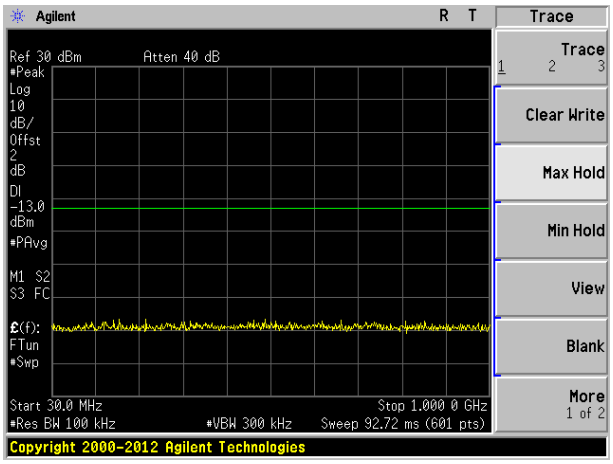


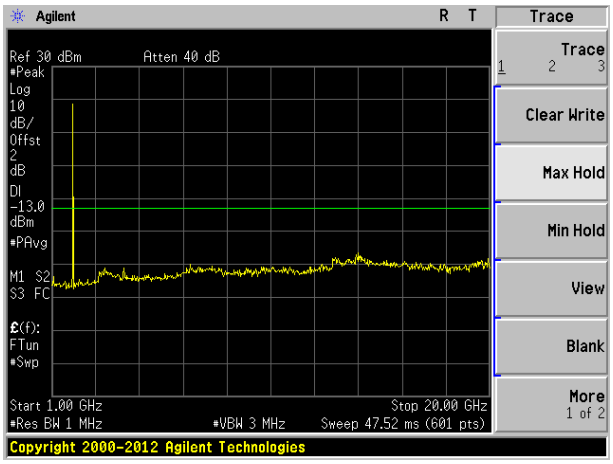
Lowest channel





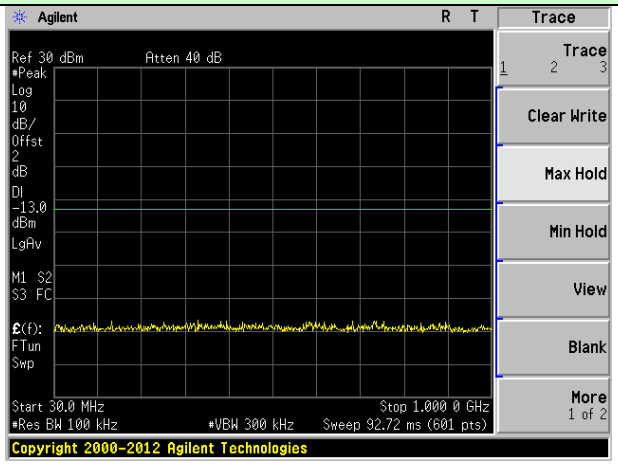
Middle channel

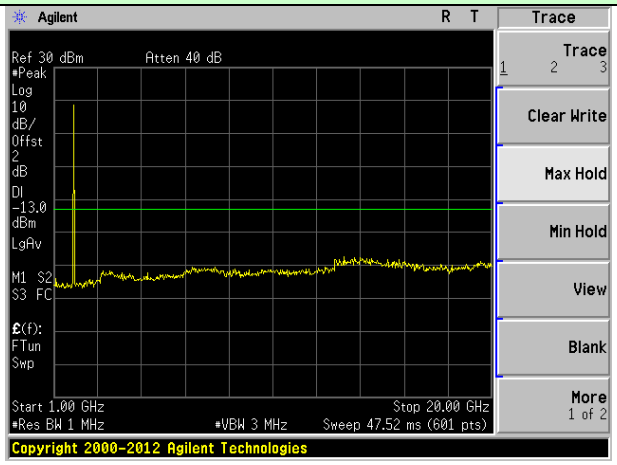




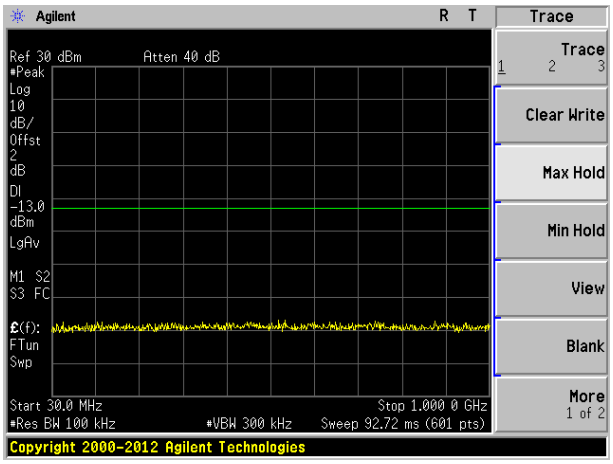
Highest channel

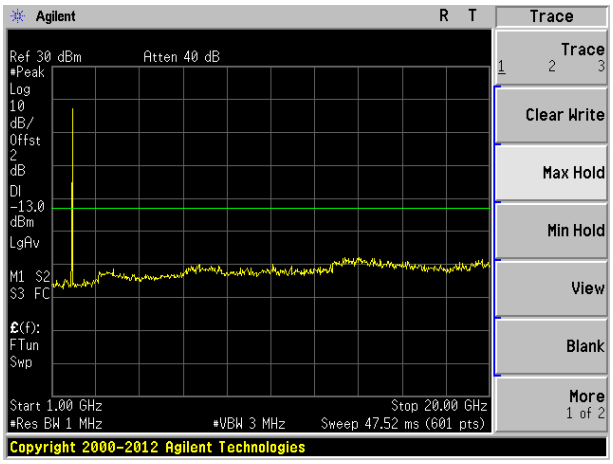
Test Mode: LTE Band 25	Channel Bandwidth: 10MHz



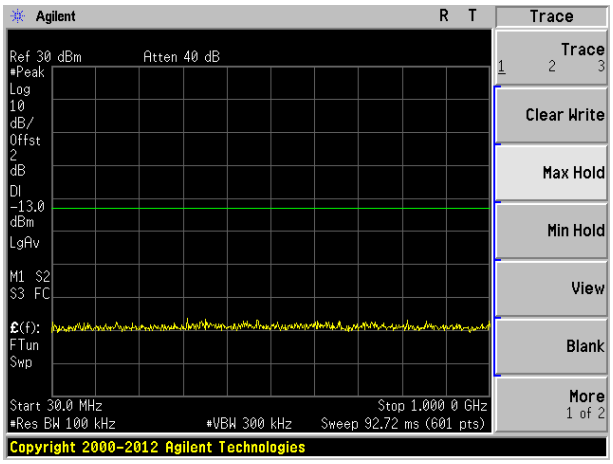


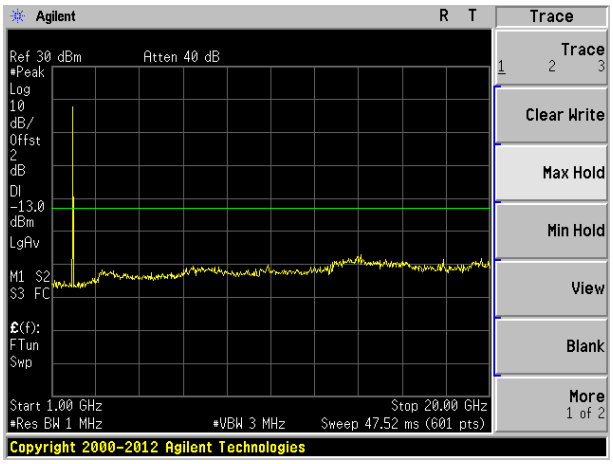
Lowest channel





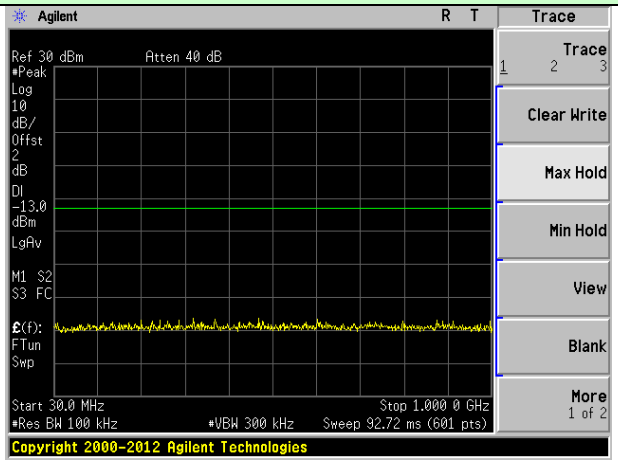
Middle channel

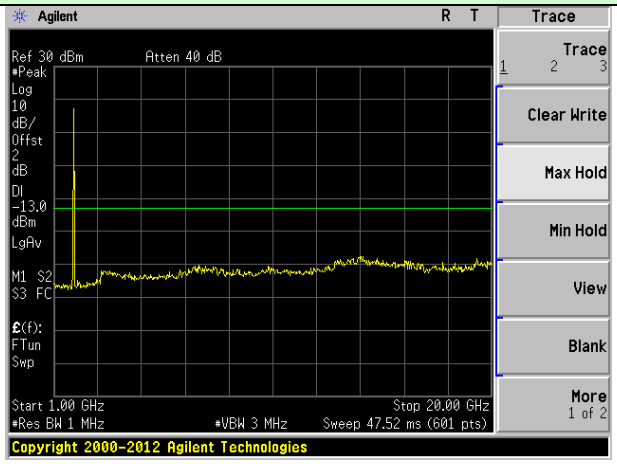




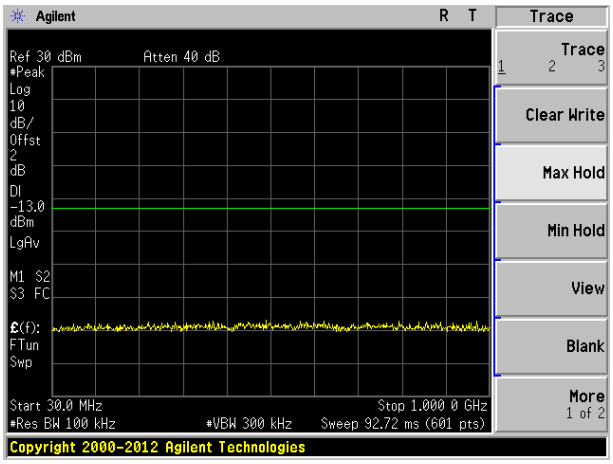
Highest channel

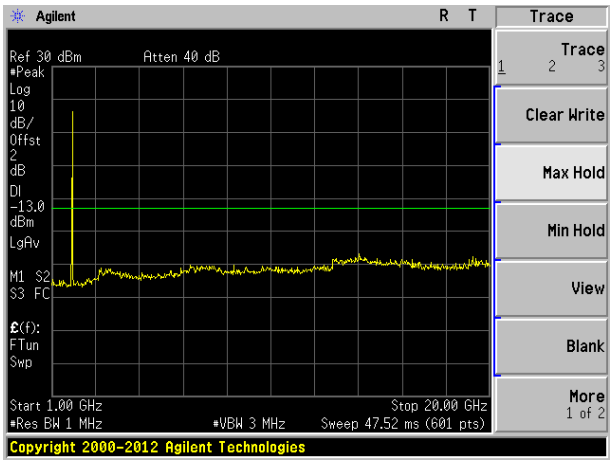
Test Mode: LTE Band 25	Channel Bandwidth: 15MHz



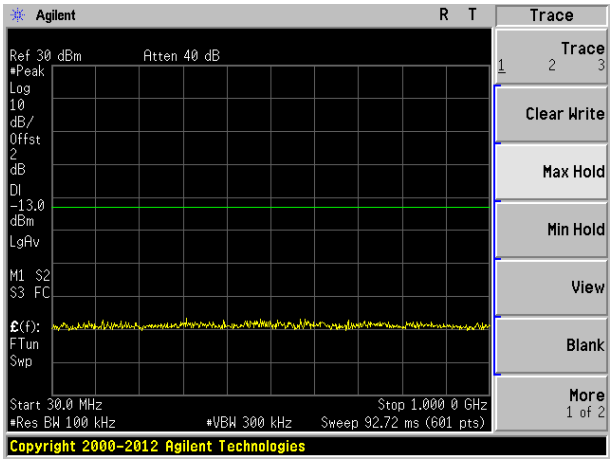


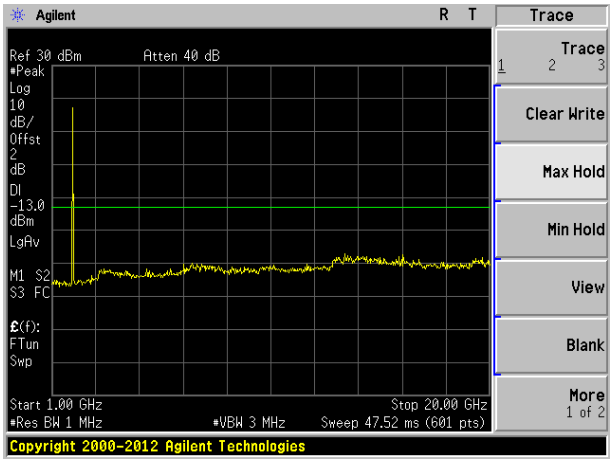
Lowest channel





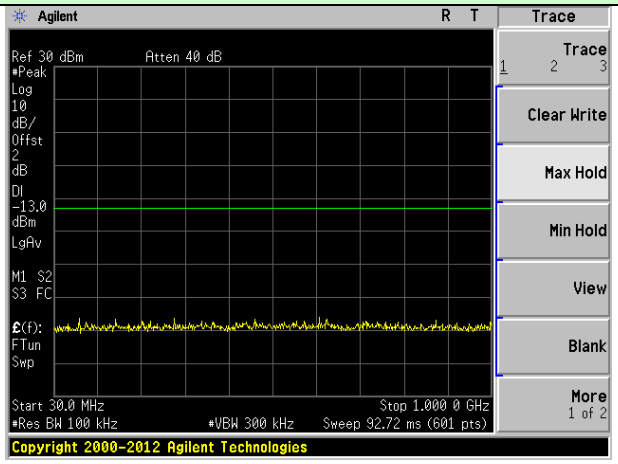
Middle channel

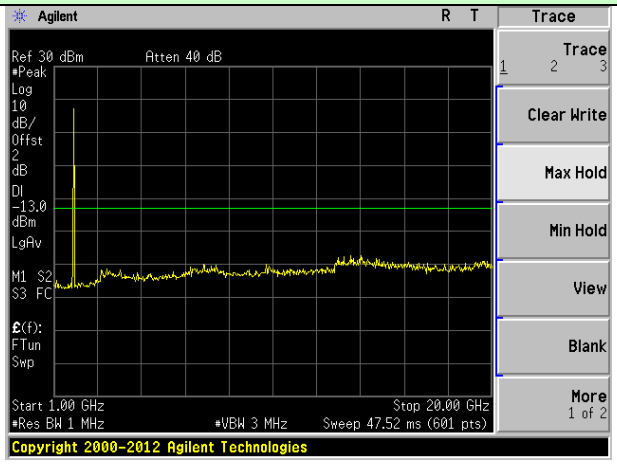




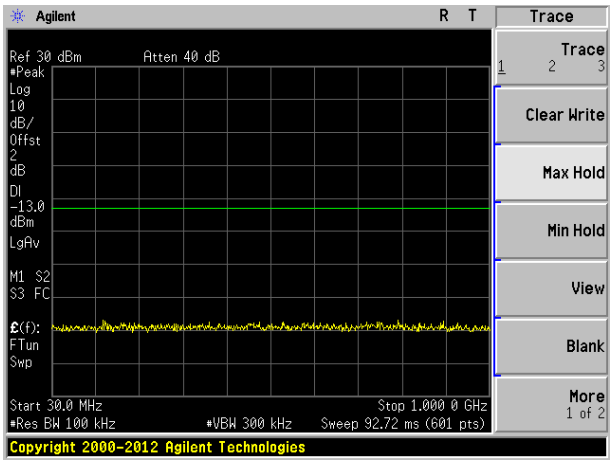
Highest channel

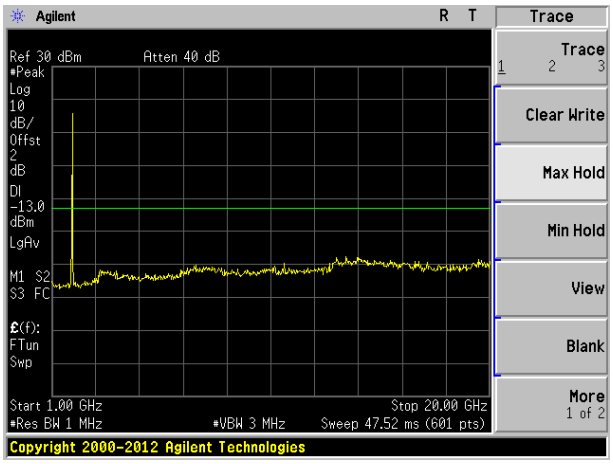
Test Mode: LTE Band 25	Channel Bandwidth: 20MHz



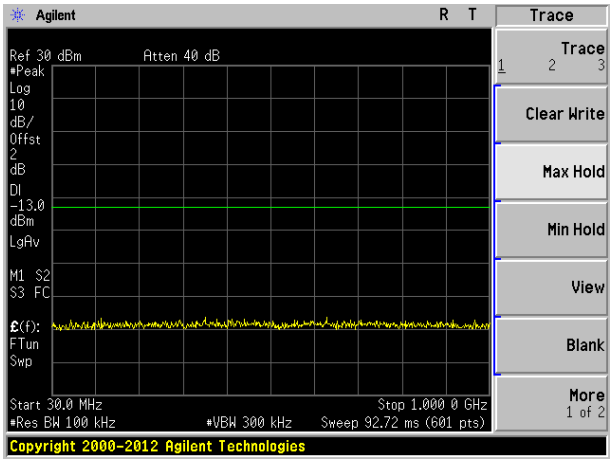


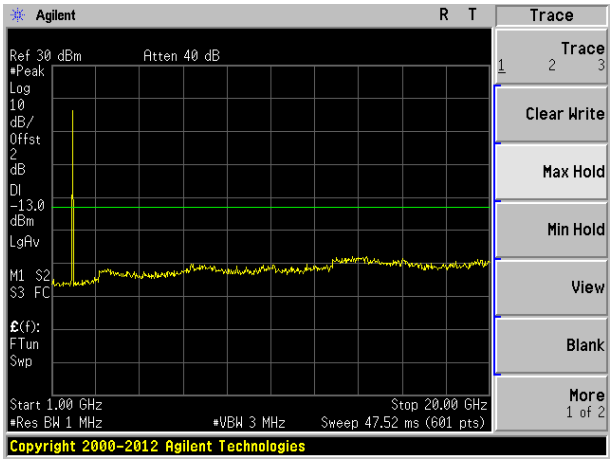
Lowest channel





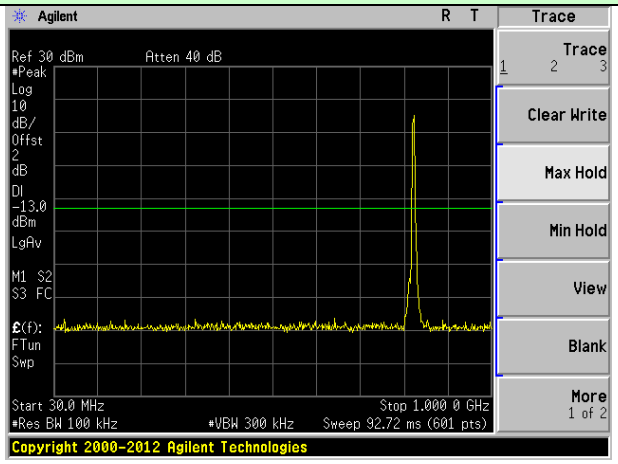
Middle channel

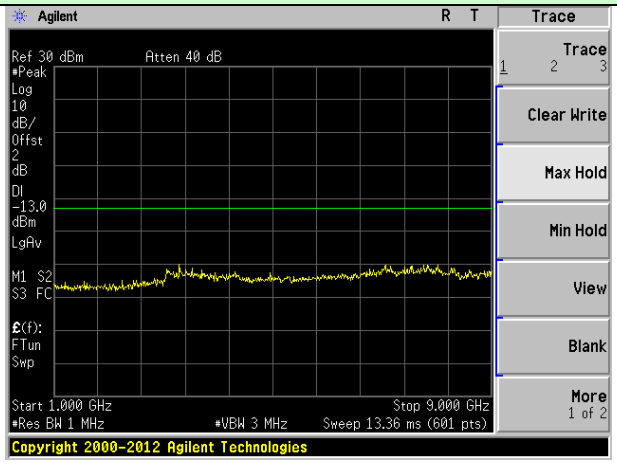




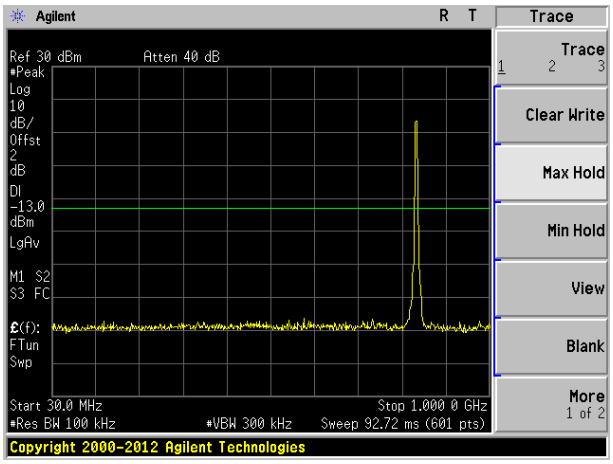
Highest channel

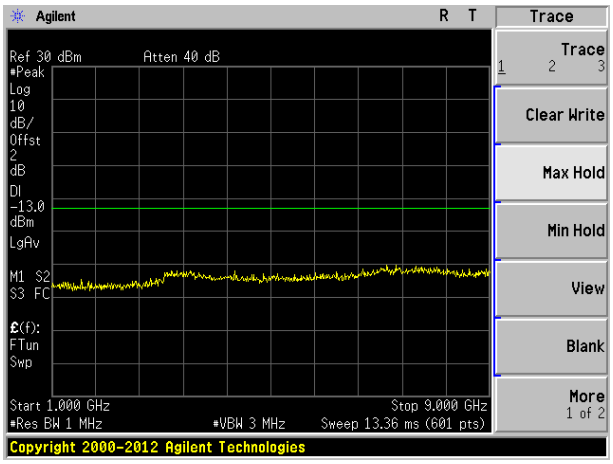
Test Mode: LTE Band 26	Channel Bandwidth: 5MHz



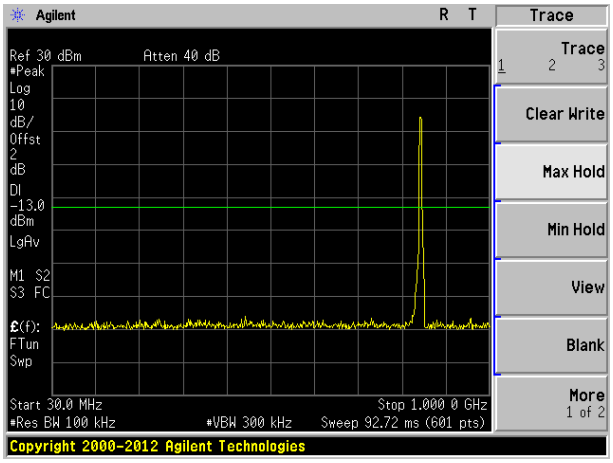


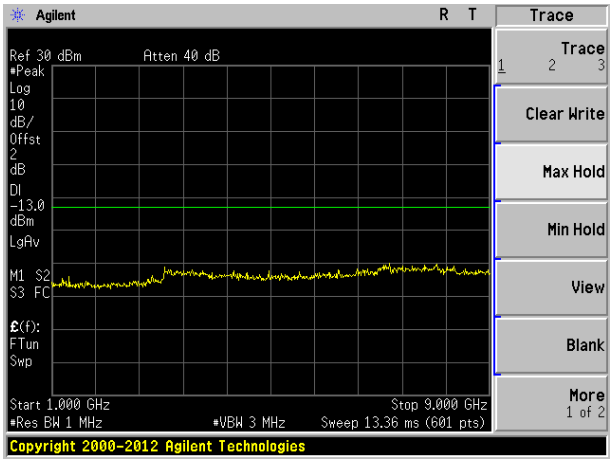
Lowest channel





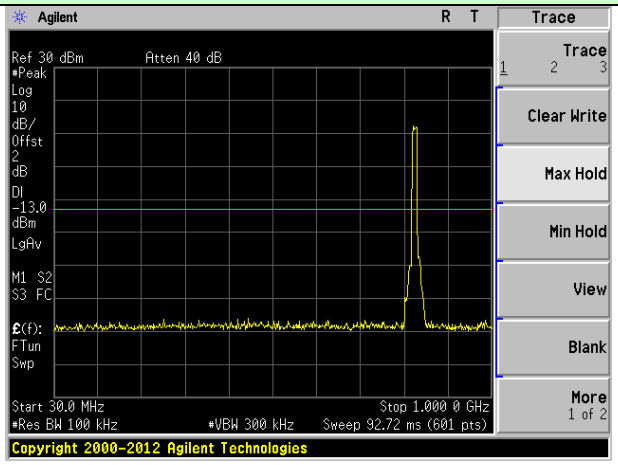
Middle channel

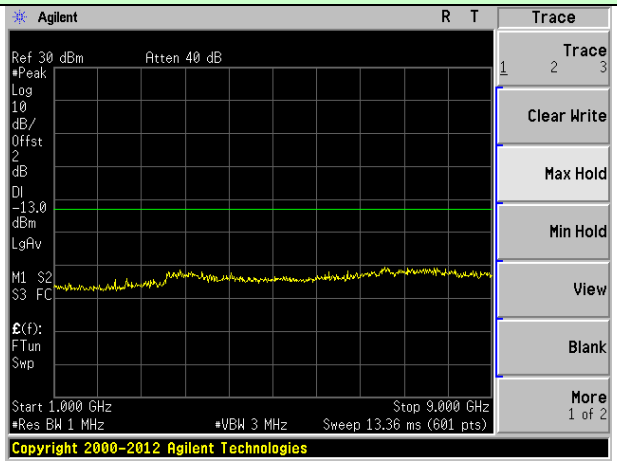




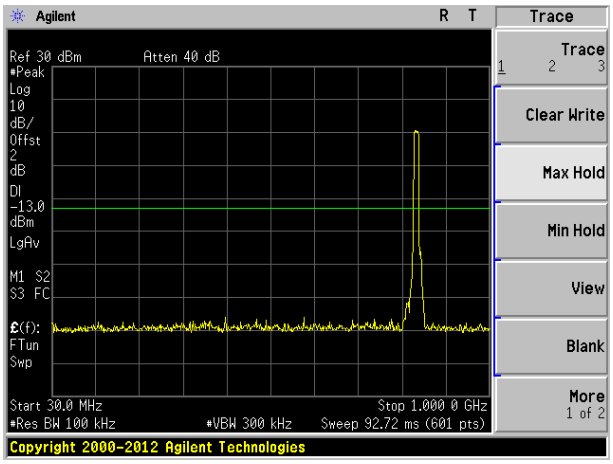
Highest channel

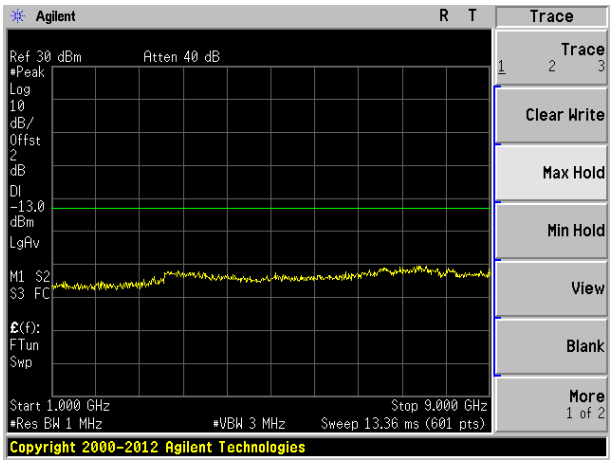
Test Mode: LTE Band 26	Channel Bandwidth: 10MHz



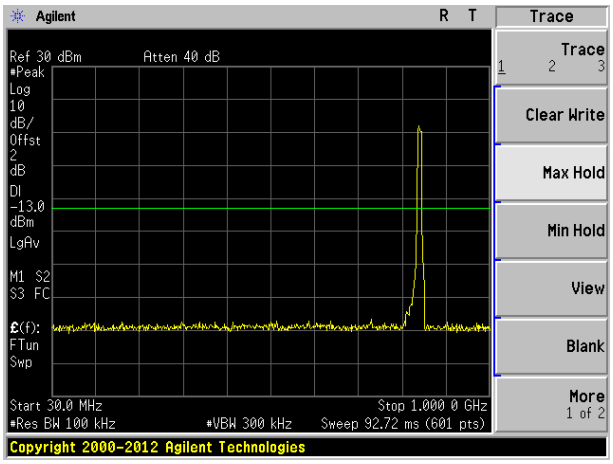


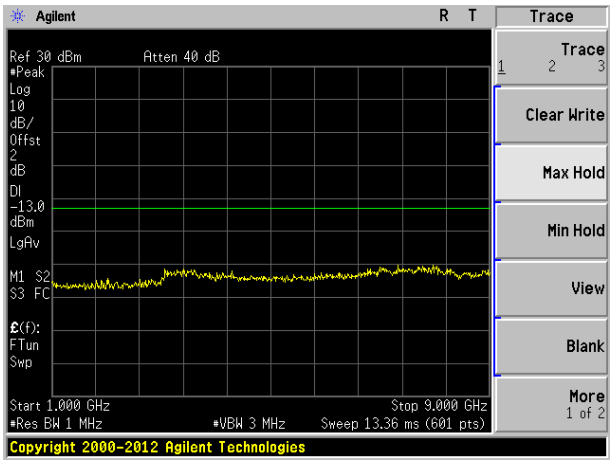
Lowest channel





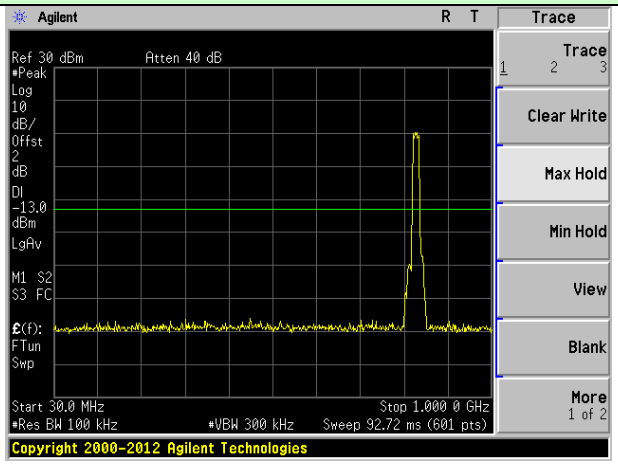
Middle channel

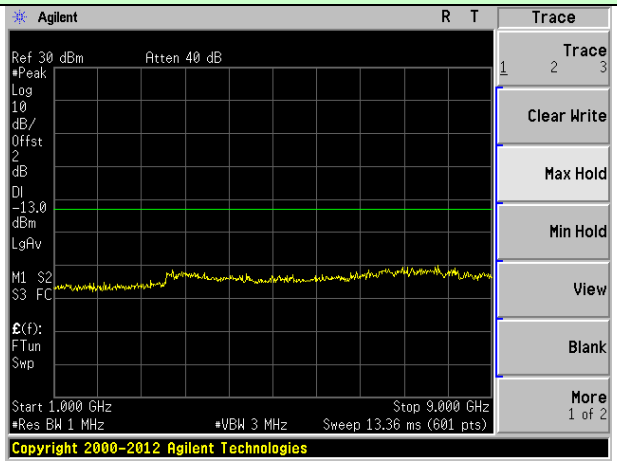




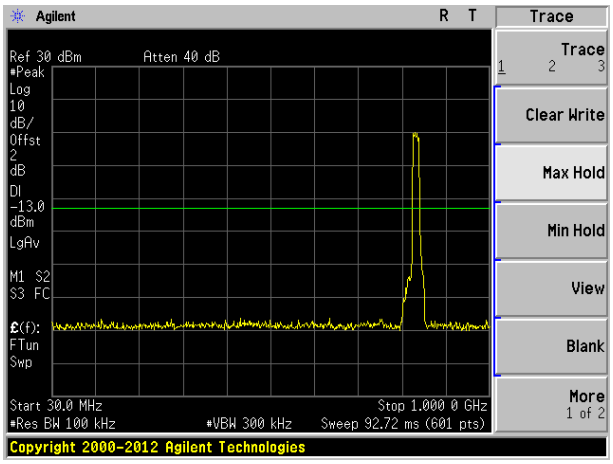
Highest channel

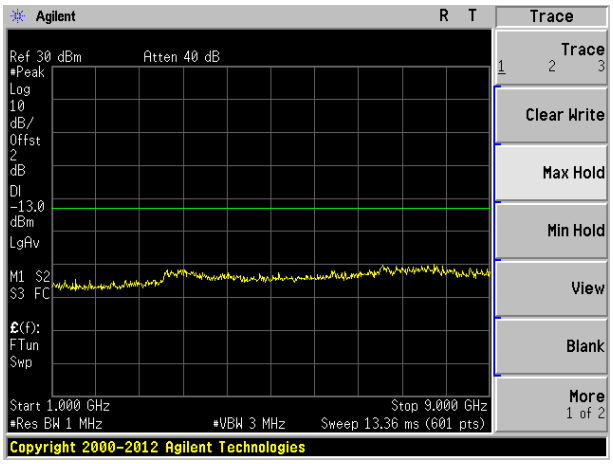
Test Mode: LTE Band 26	Channel Bandwidth: 15MHz



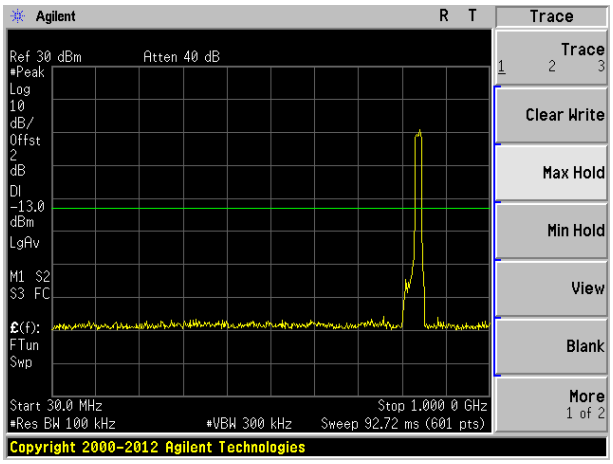


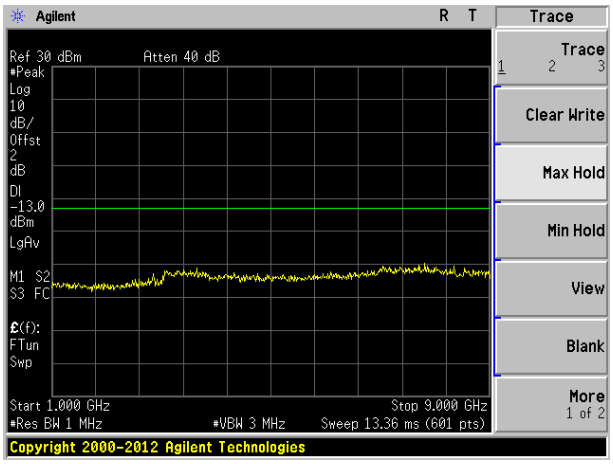
Lowest channel





Middle channel



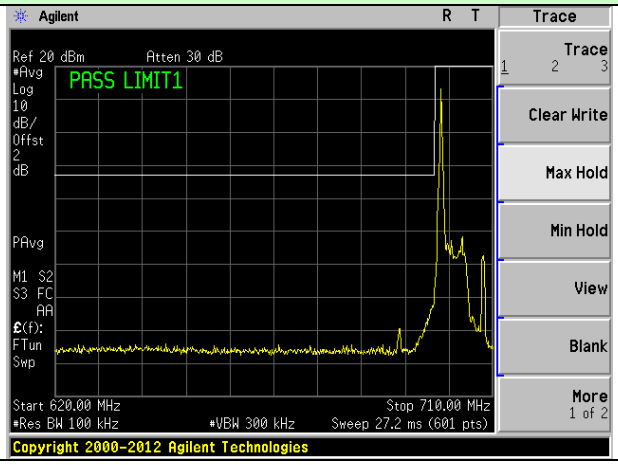
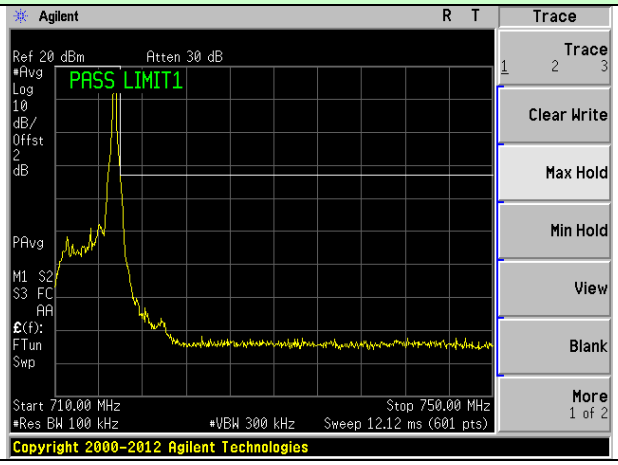


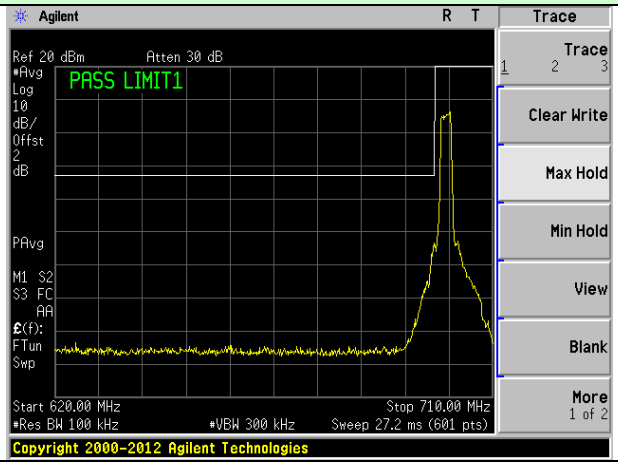
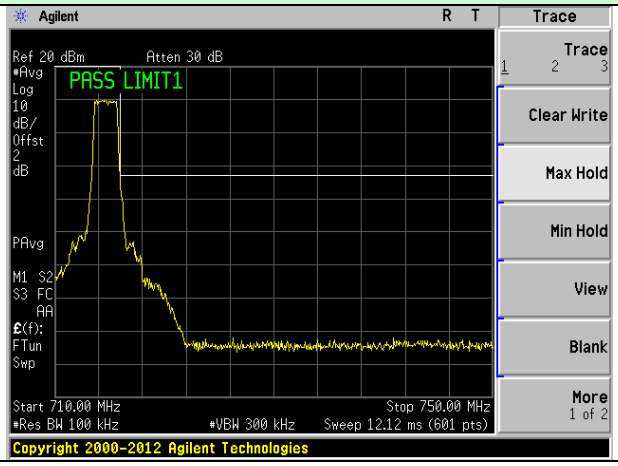
Highest channel

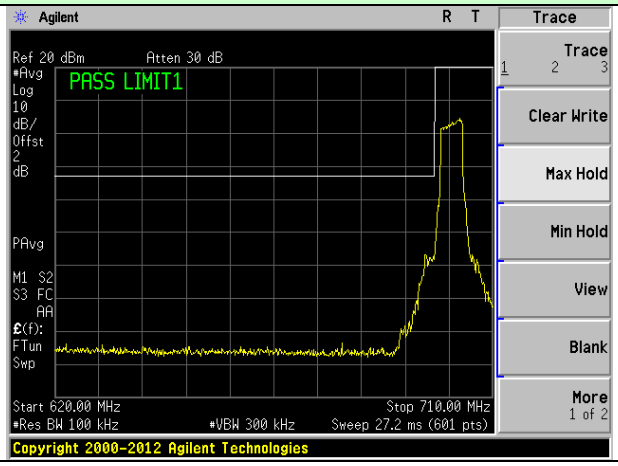
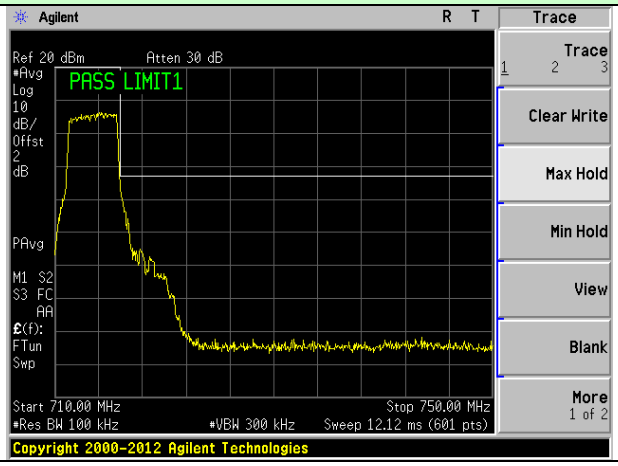
Band Edge:

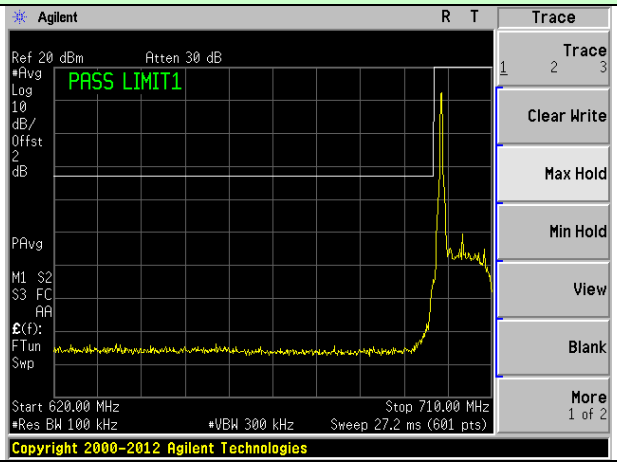
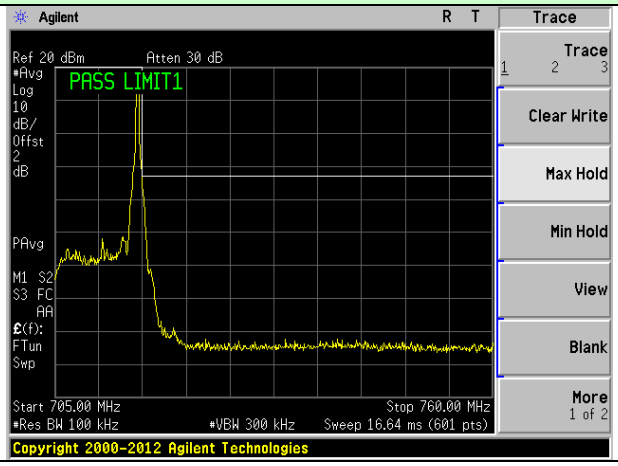
QPSK mode:

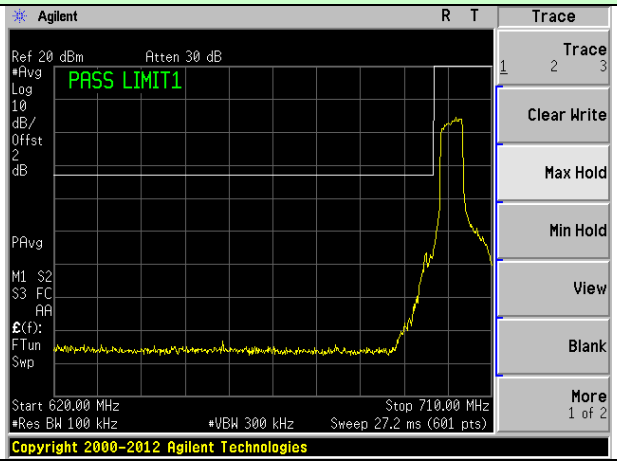
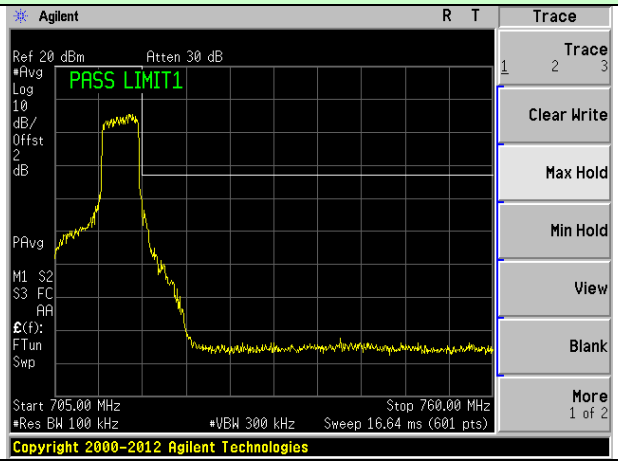
LTE Band 12

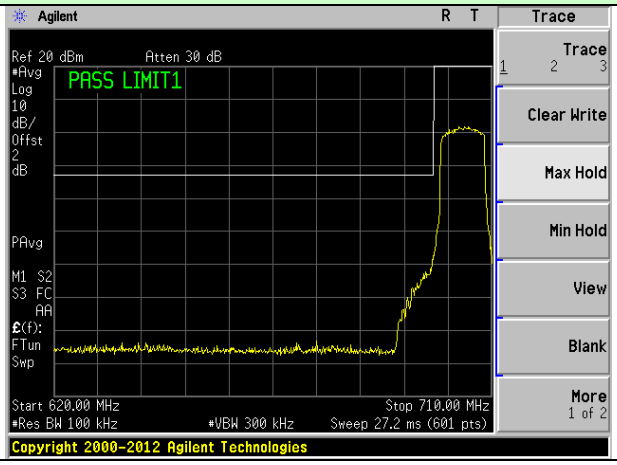
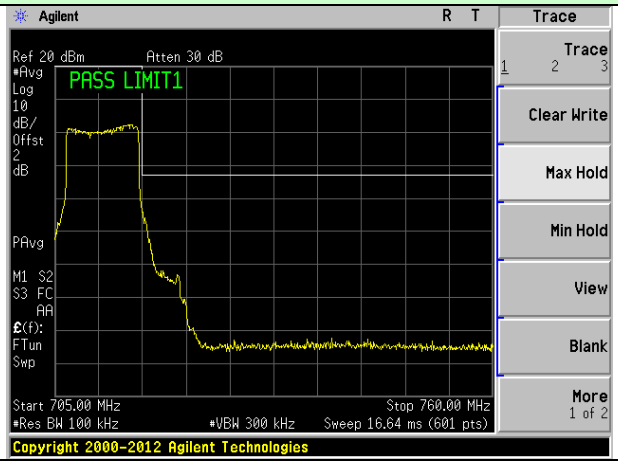
5MHz Bandwidth (RB size:1# RB offset:0#)	5MHz Bandwidth (RB size:1# RB offset:24#)
	
Lowest channel	Highest channel

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

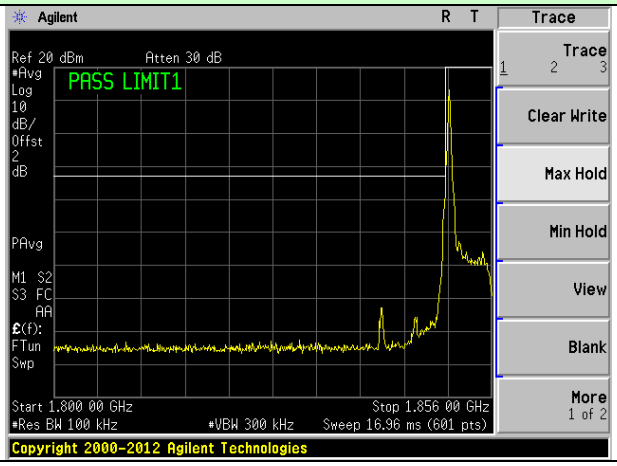
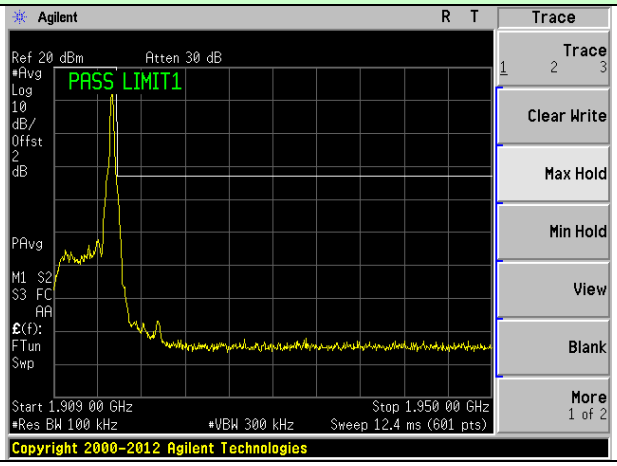
5MHz Bandwidth (RB size:25# RB offset:0#)	5MHz Bandwidth (RB size:25# RB offset:0#)
	
Lowest channel	Highest channel

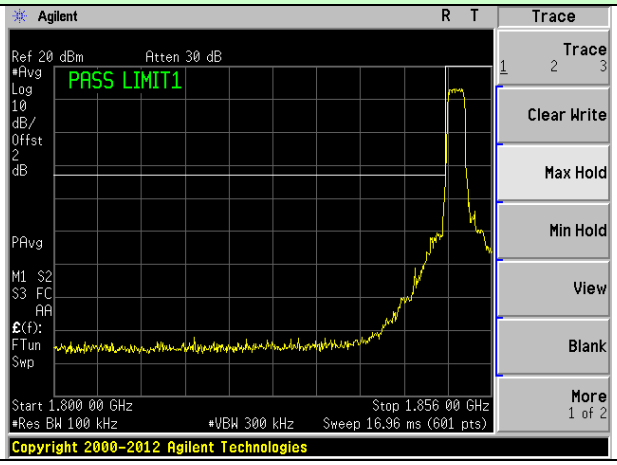
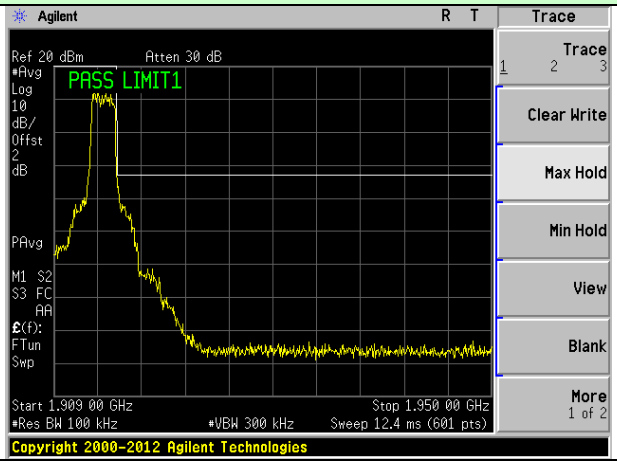
10MHz Bandwidth (RB size:1# RB offset:0#)	10MHz Bandwidth (RB size:1# RB offset:49#)
	
Lowest channel	Highest channel

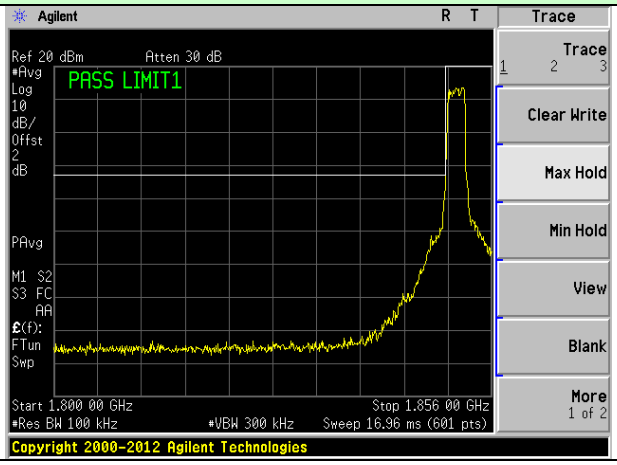
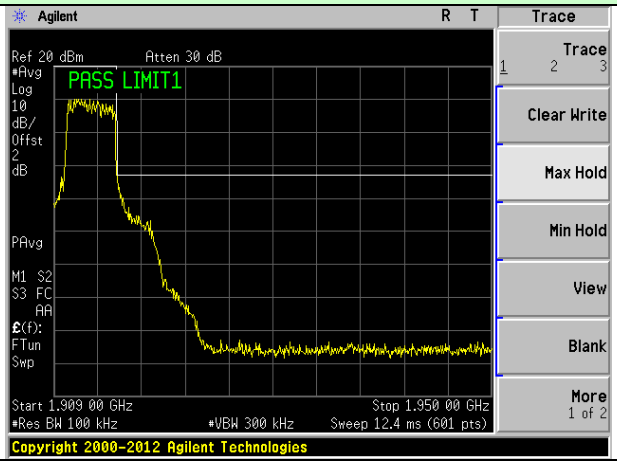
10MHz Bandwidth (RB size:25# RB offset:0#)	10MHz Bandwidth (RB size:25# RB offset:25#)
	
Lowest channel	Highest channel

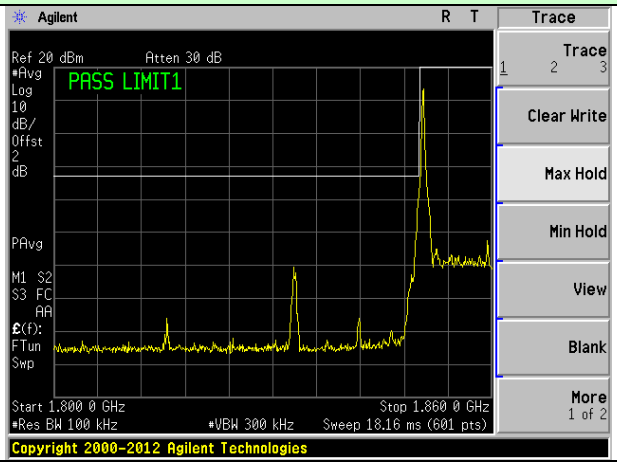
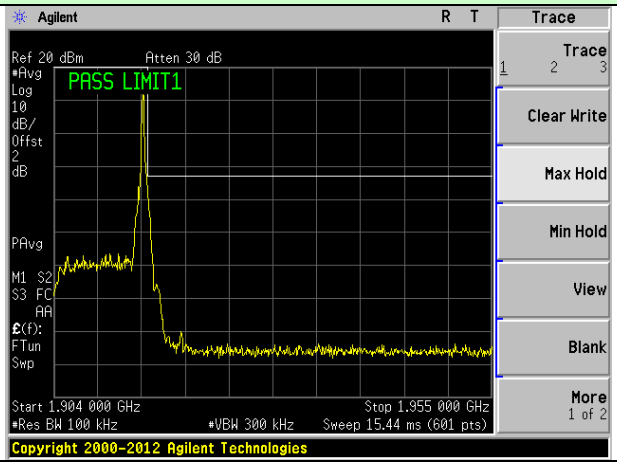
10MHz Bandwidth (RB size:50# RB offset:0#)	10MHz Bandwidth (RB size:50# RB offset:0#)
	
Lowest channel	Highest channel

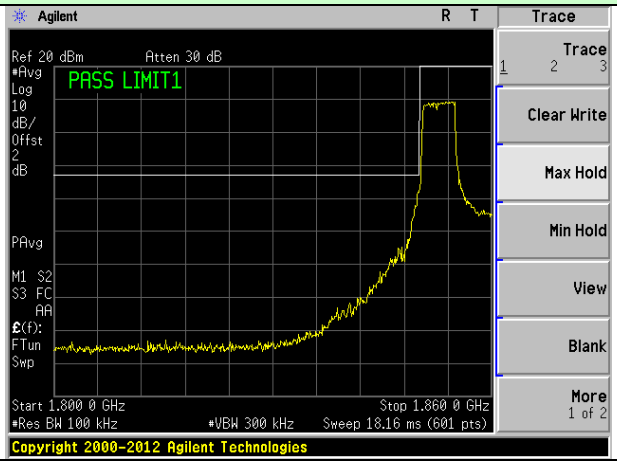
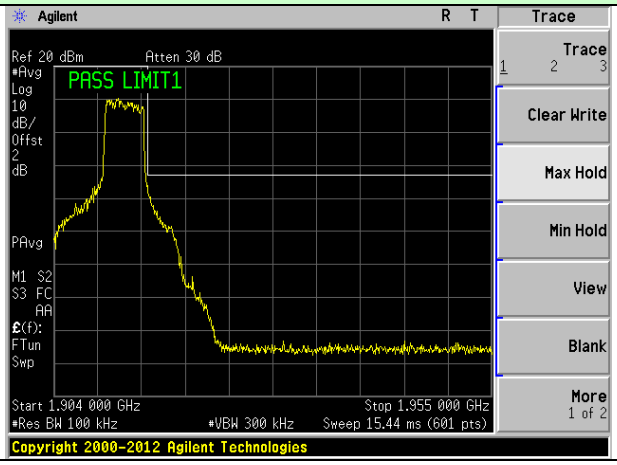
LTE Band 25

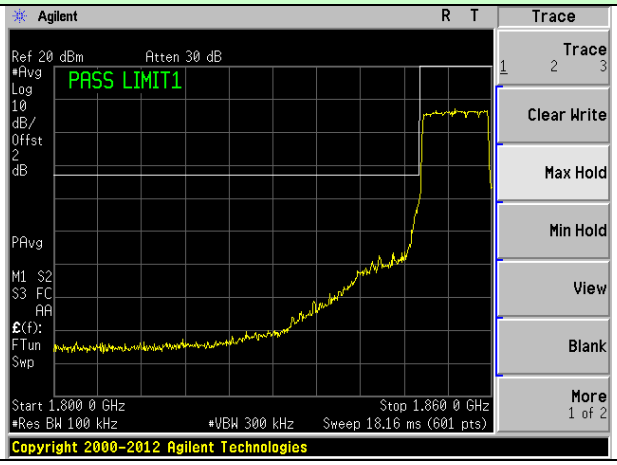
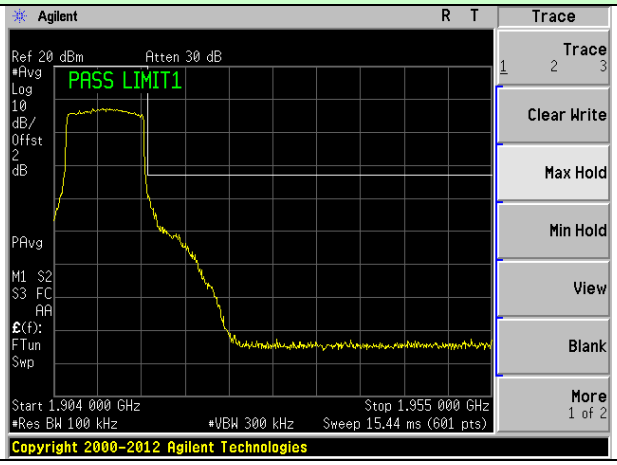
5MHz Bandwidth (RB size:1# RB offset:0#)	5MHz Bandwidth (RB size:1# RB offset:24#)
	
Lowest channel	Highest channel

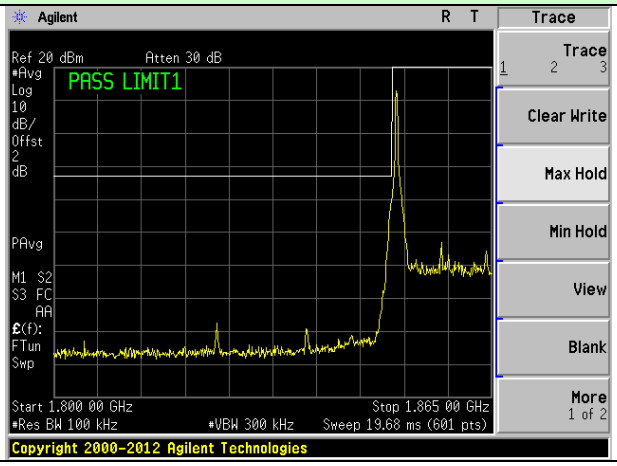
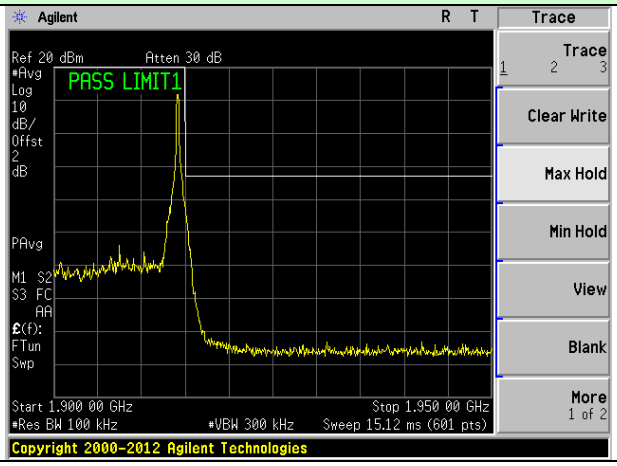
5MHz Bandwidth (RB size:12# RB offset:0#)	5MHz Bandwidth (RB size:12# RB offset:13#)
	
Lowest channel	Highest channel

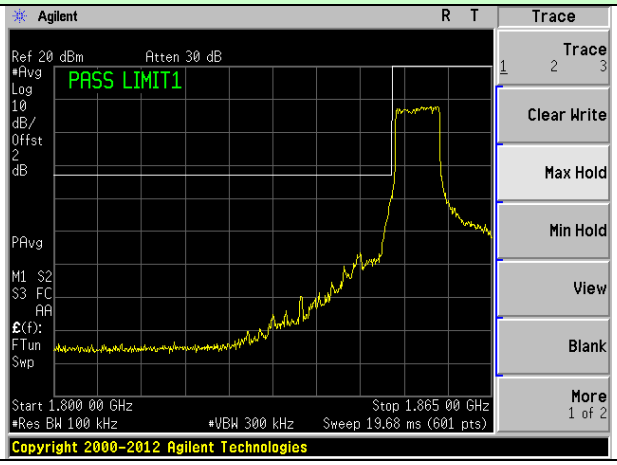
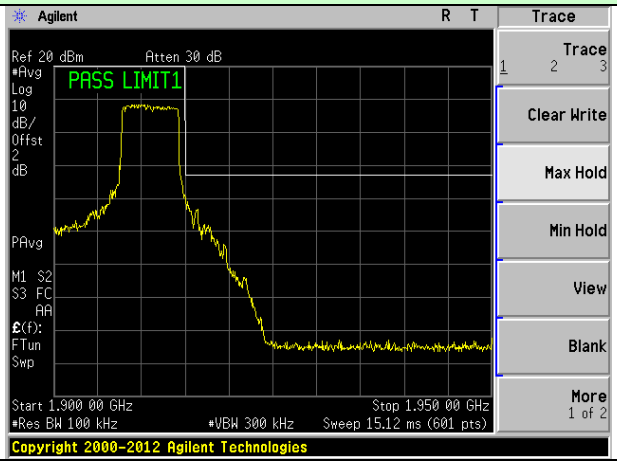
5MHz Bandwidth (RB size:25# RB offset:0#)	5MHz Bandwidth (RB size:25# RB offset:0#)
	
Lowest channel	Highest channel

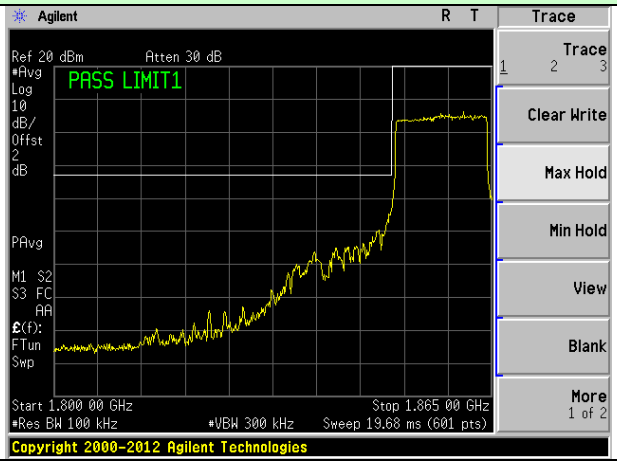
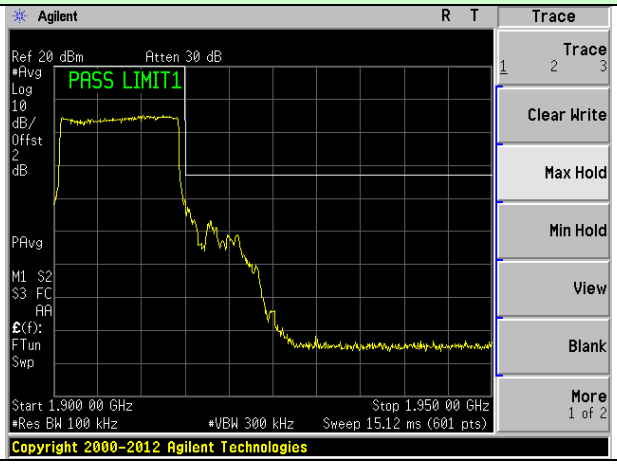
10MHz Bandwidth (RB size:1# RB offset:0#)	10MHz Bandwidth (RB size:1# RB offset:49#)
	
Lowest channel	Highest channel

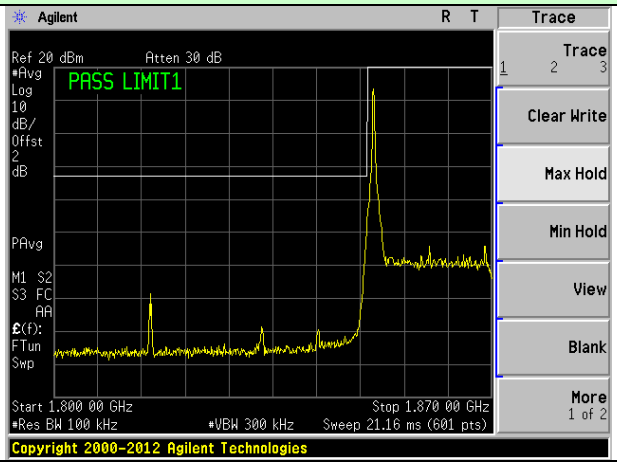
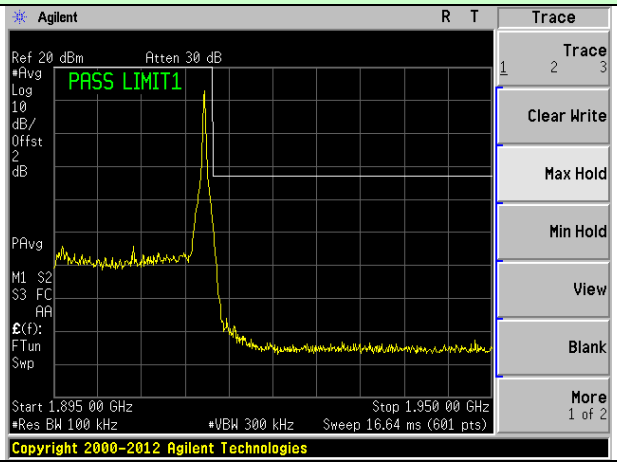
10MHz Bandwidth (RB size:25# RB offset:0#)	10MHz Bandwidth (RB size:25# RB offset:25#)
	
Lowest channel	Highest channel

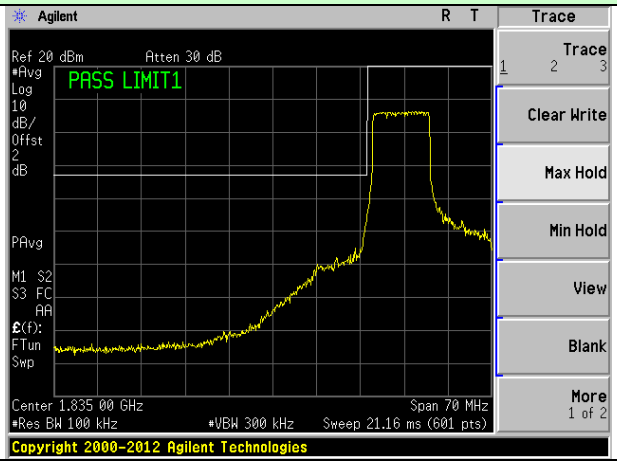
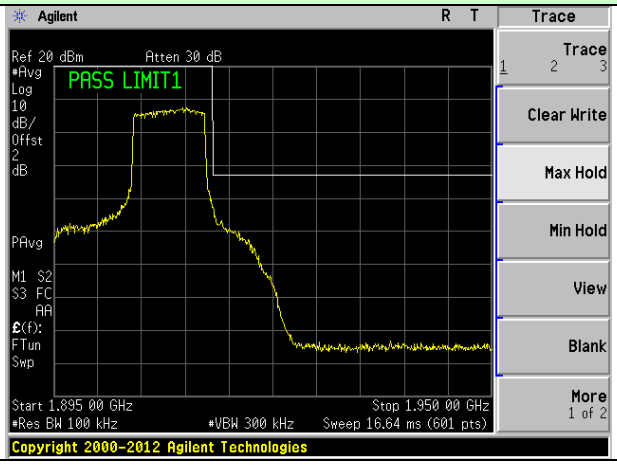
10MHz Bandwidth (RB size:50# RB offset:0#)	10MHz Bandwidth (RB size:50# RB offset:0#)
	
Lowest channel	Highest channel

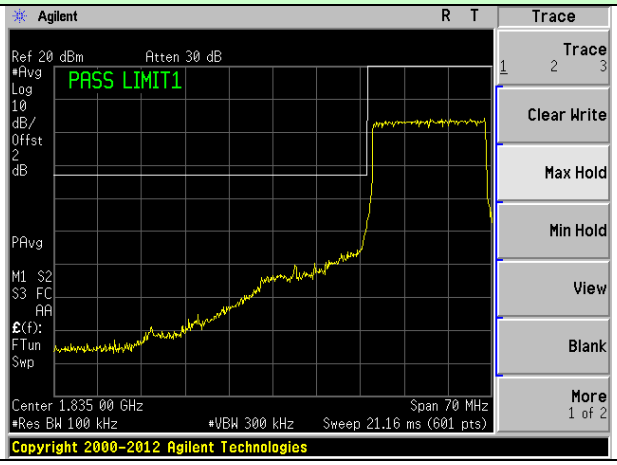
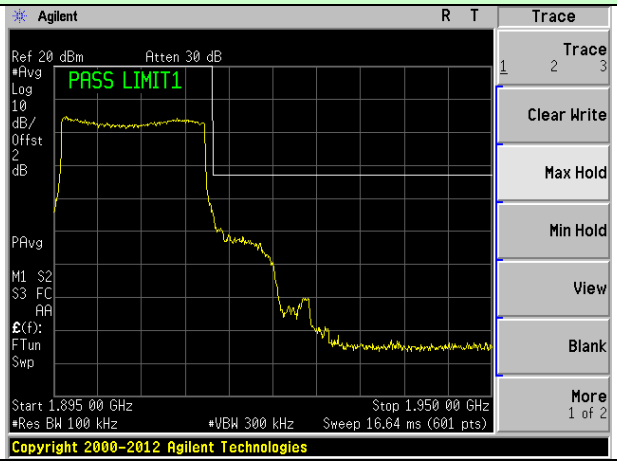
15MHz Bandwidth (RB size:1# RB offset:0#)	15MHz Bandwidth (RB size:1# RB offset:74#)
	
Lowest channel	Highest channel

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

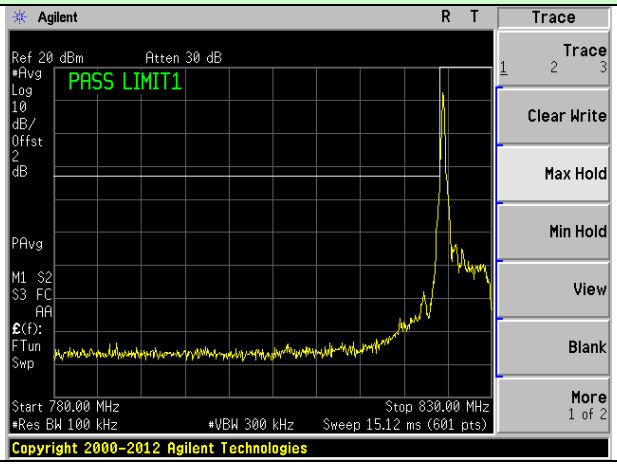
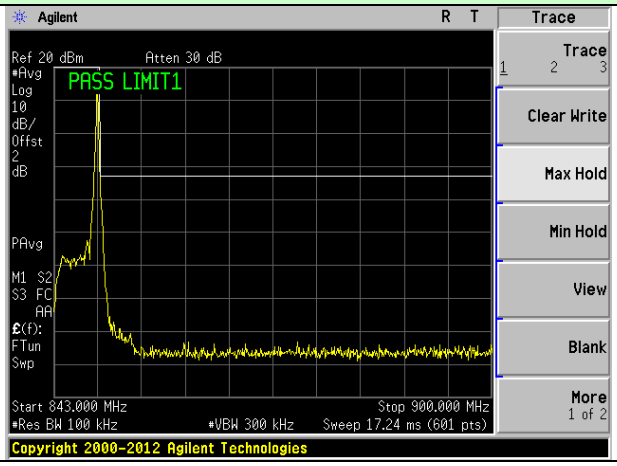
15MHz Bandwidth (RB size:75# RB offset:0#)	15MHz Bandwidth (RB size:75# RB offset:0#)
	
Lowest channel	Highest channel

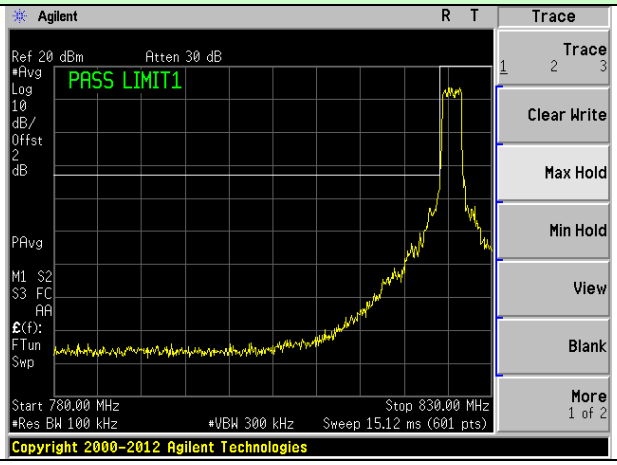
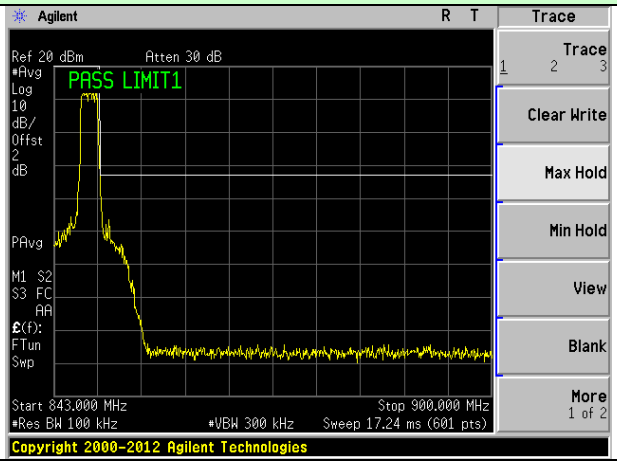
20MHz Bandwidth (RB size:1# RB offset:0#)	20MHz Bandwidth (RB size:1# RB offset:99#)
	
Lowest channel	Highest channel

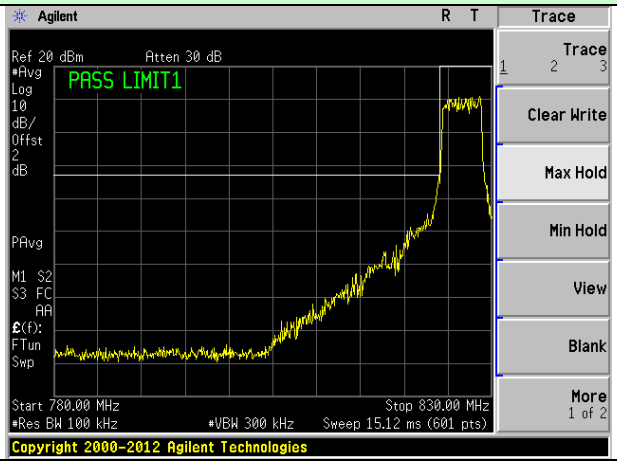
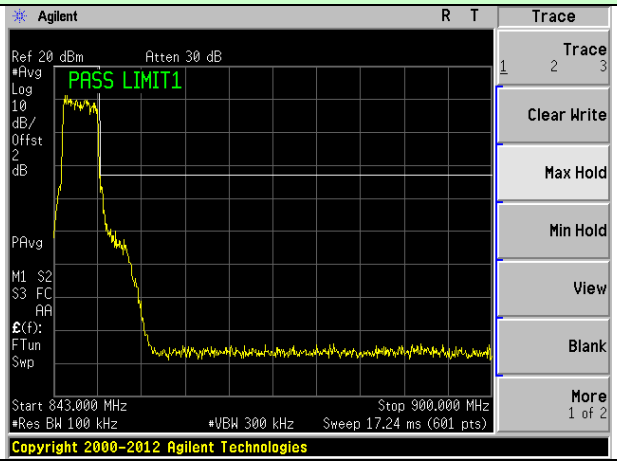
20MHz Bandwidth (RB size:50# RB offset:0#)	20MHz Bandwidth (RB size:50# RB offset:50#)
	
Lowest channel	Highest channel

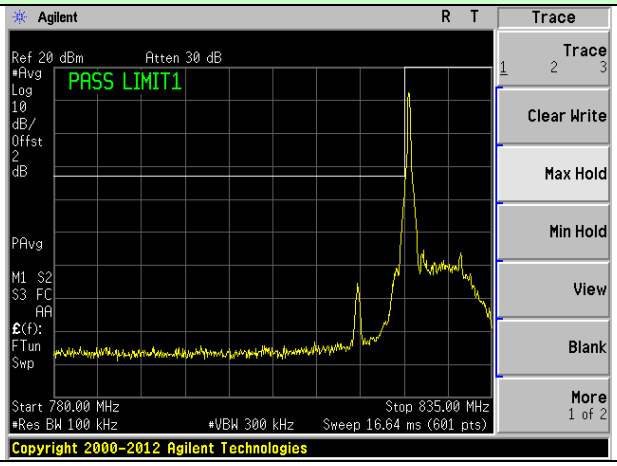
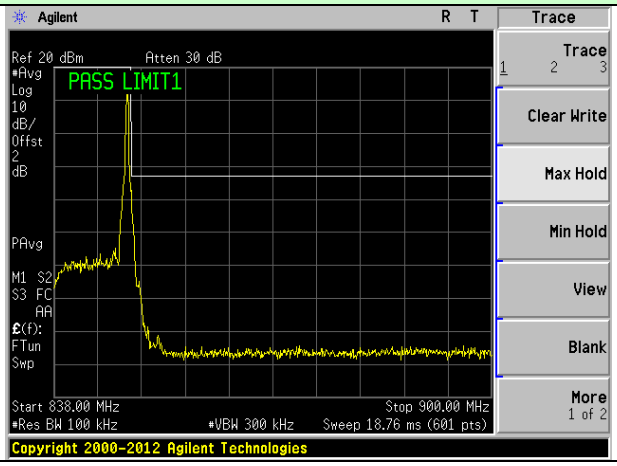
20MHz Bandwidth (RB size:100# RB offset:0#)	20MHz Bandwidth (RB size:100# RB offset:0#)
	
Lowest channel	Highest channel

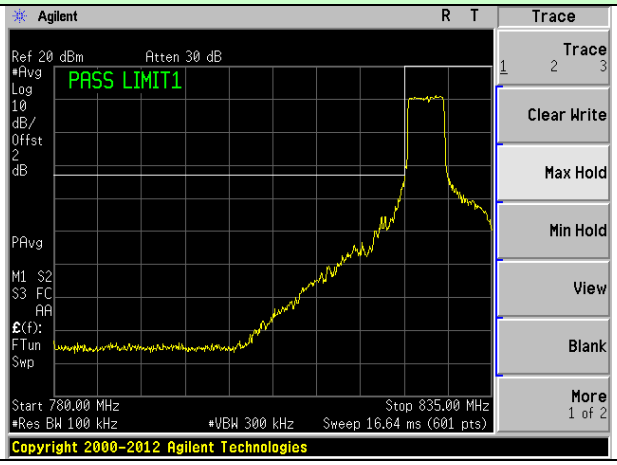
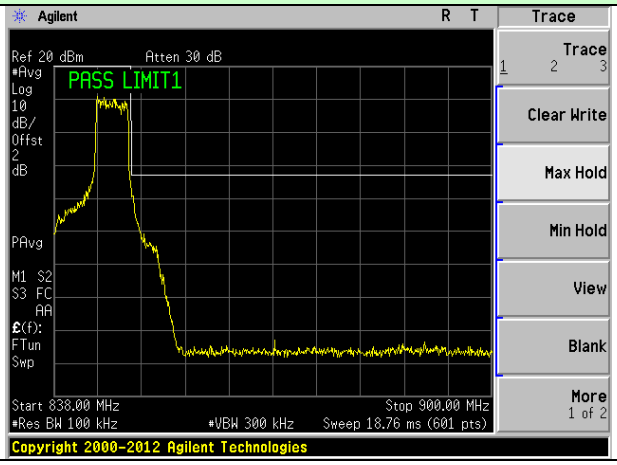
LTE Band 26

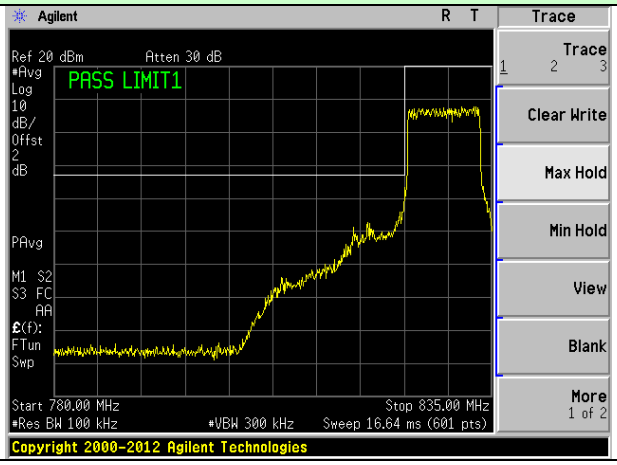
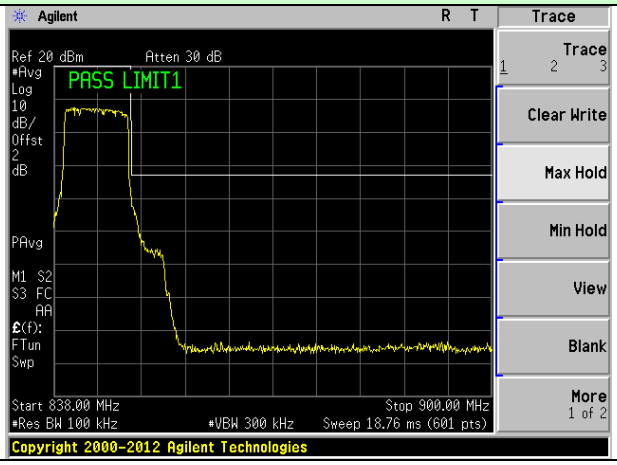
5MHz Bandwidth (RB size:1# RB offset:0#)	5MHz Bandwidth (RB size:1# RB offset:24#)
	
Lowest channel	Highest channel

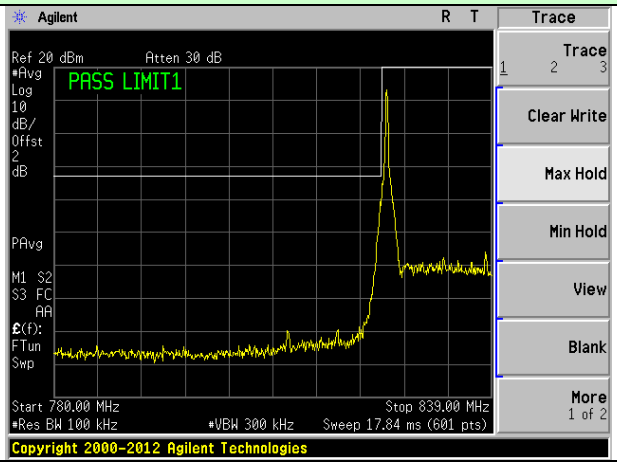
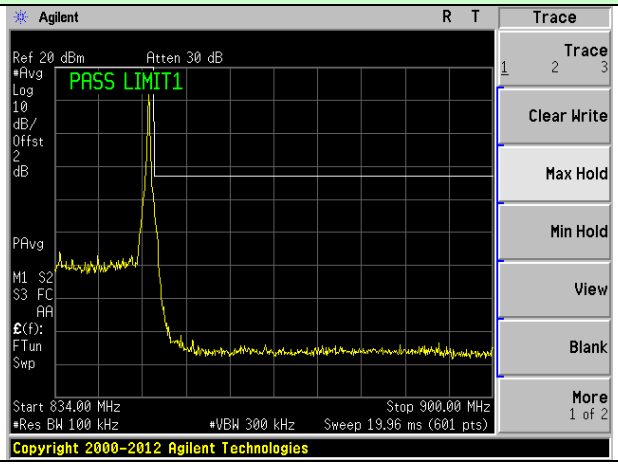
5MHz Bandwidth (RB size:12# RB offset:0#)	5MHz Bandwidth (RB size:12# RB offset:13#)
	
Lowest channel	Highest channel

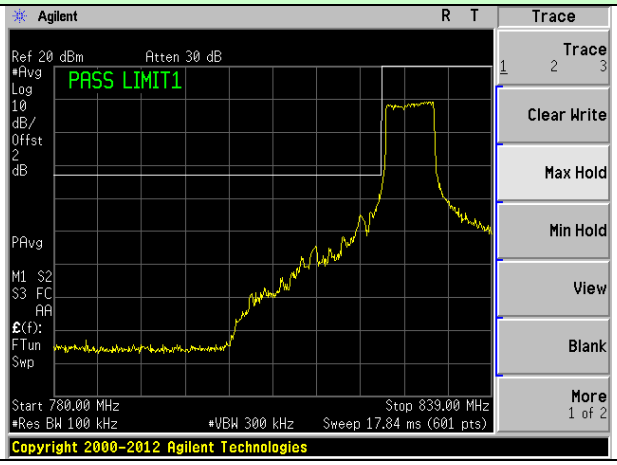
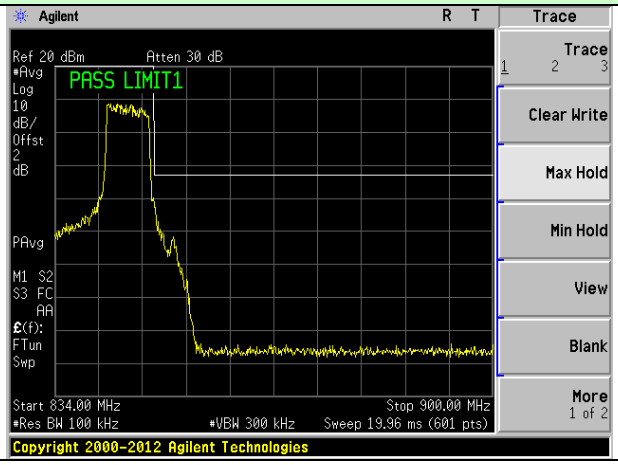
5MHz Bandwidth (RB size:25# RB offset:0#)	5MHz Bandwidth (RB size:25# RB offset:0#)
	
Lowest channel	Highest channel

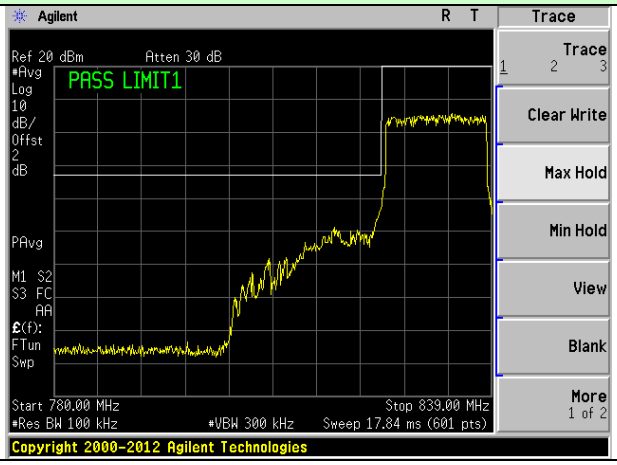
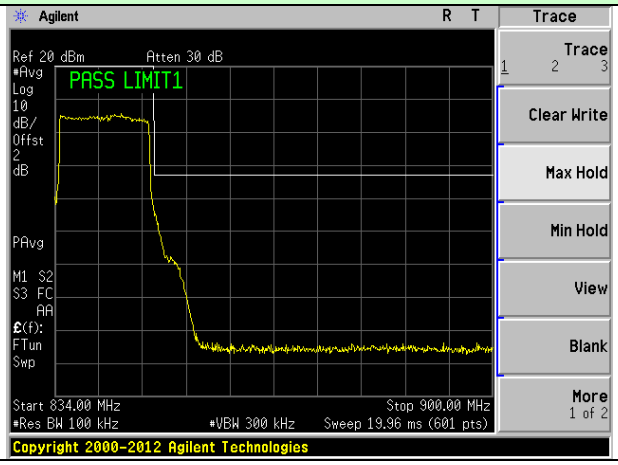
10MHz Bandwidth (RB size:1# RB offset:0#)	10MHz Bandwidth (RB size:1# RB offset:49#)
	
Lowest channel	Highest channel

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

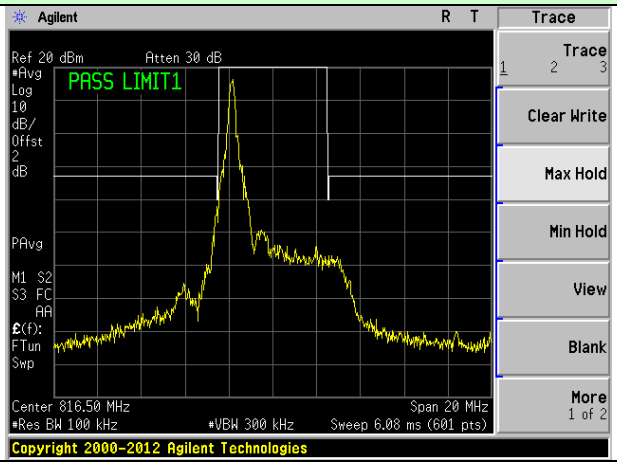
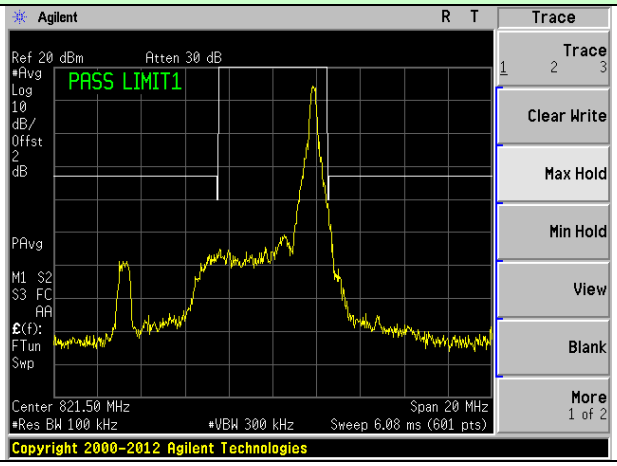
10MHz Bandwidth (RB size:50# RB offset:0#)	10MHz Bandwidth (RB size:50# RB offset:0#)
	
Lowest channel	Highest channel

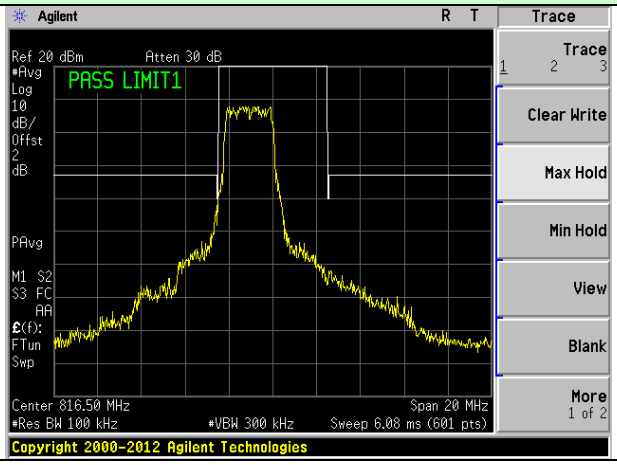
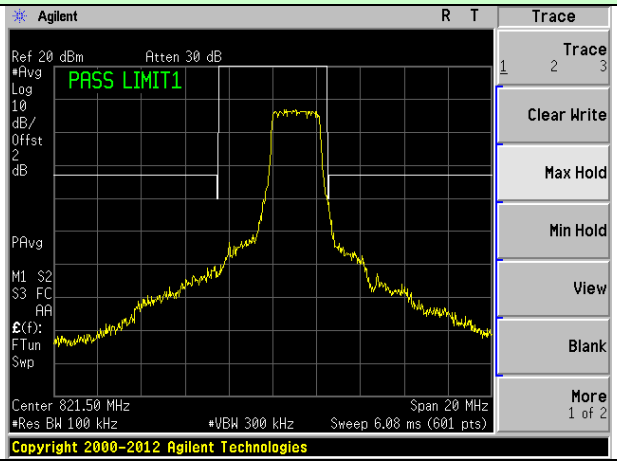
15MHz Bandwidth (RB size:1# RB offset:0#)	15MHz Bandwidth (RB size:1# RB offset:74#)
	
Lowest channel	Highest channel

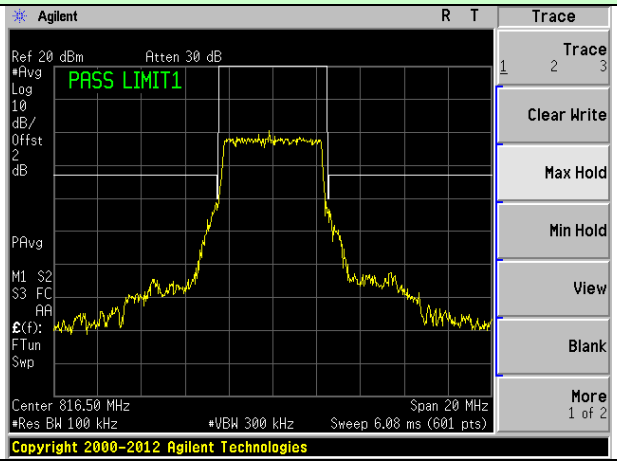
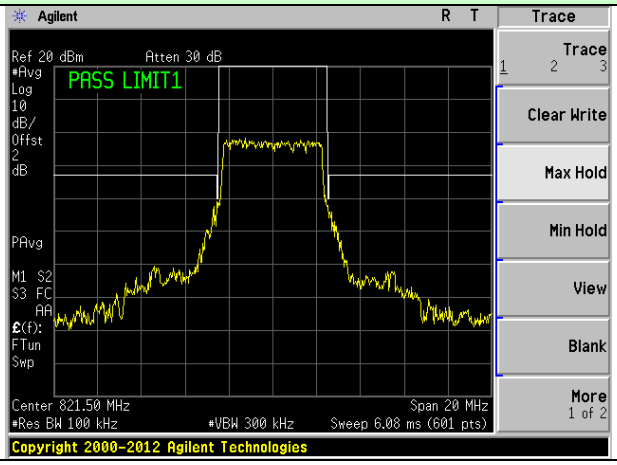
15MHz Bandwidth (RB size:36# RB offset:0#)	15MHz Bandwidth (RB size:36# RB offset:39#)
	
Lowest channel	Highest channel

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

Prat 90

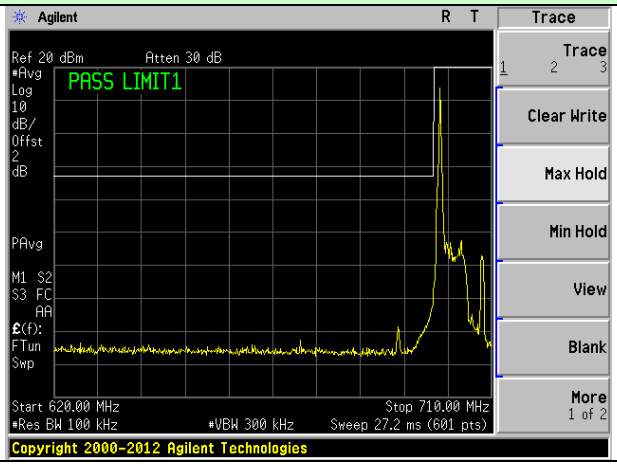
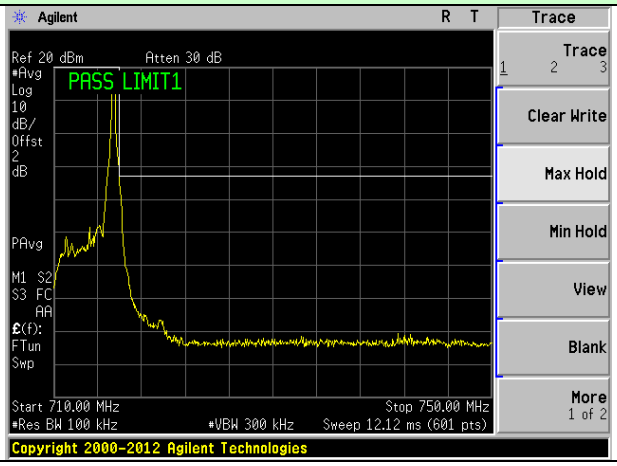
5MHz Bandwidth (RB size:1# RB offset:0#)	5MHz Bandwidth (RB size:1# RB offset:24#)
	
Lowest channel	Highest channel

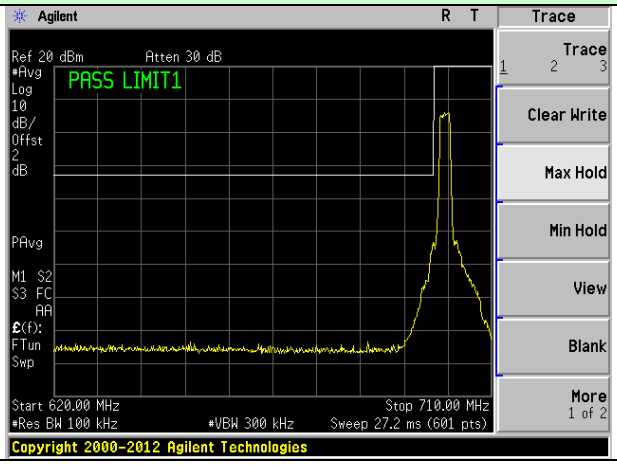
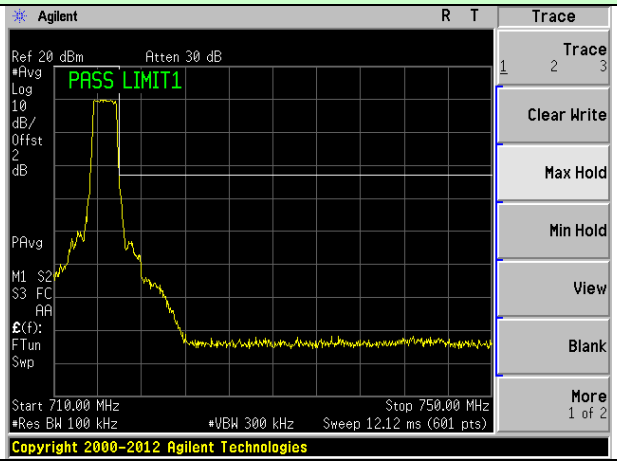
5MHz Bandwidth (RB size:12# RB offset:0#)	5MHz Bandwidth (RB size:12# RB offset:13#)
	
Lowest channel	Highest channel

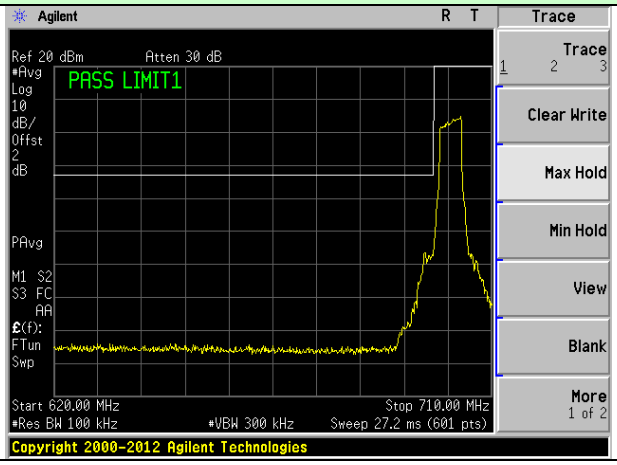
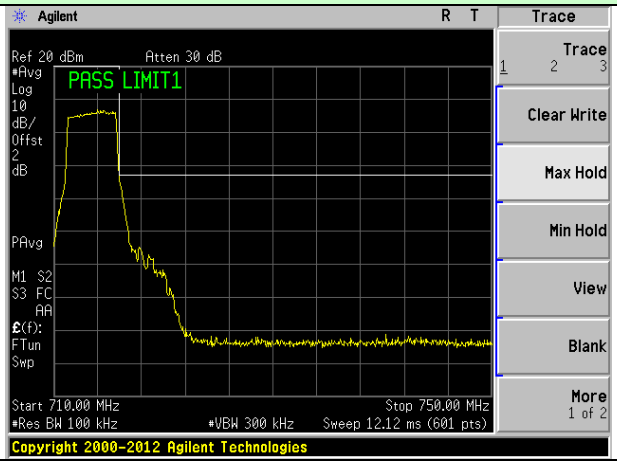
5MHz Bandwidth (RB size:25# RB offset:0#)	5MHz Bandwidth (RB size:25# RB offset:0#)
	
Lowest channel	Highest channel

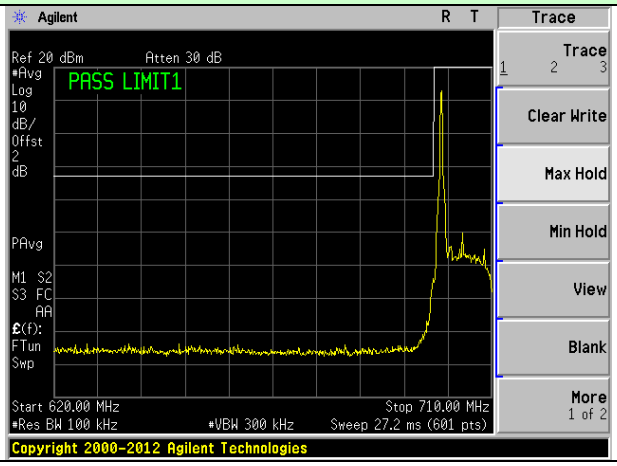
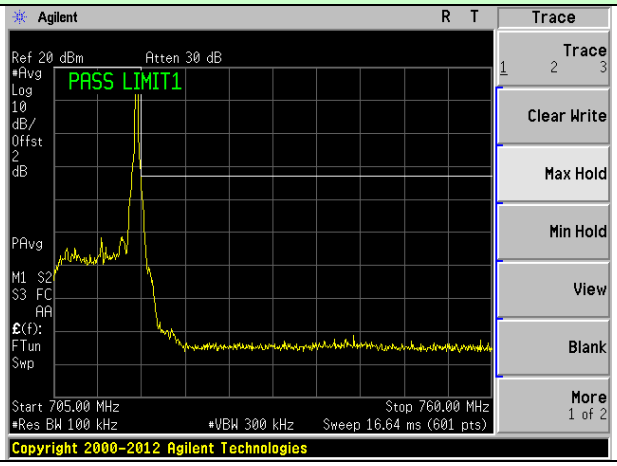
16QAM mode:

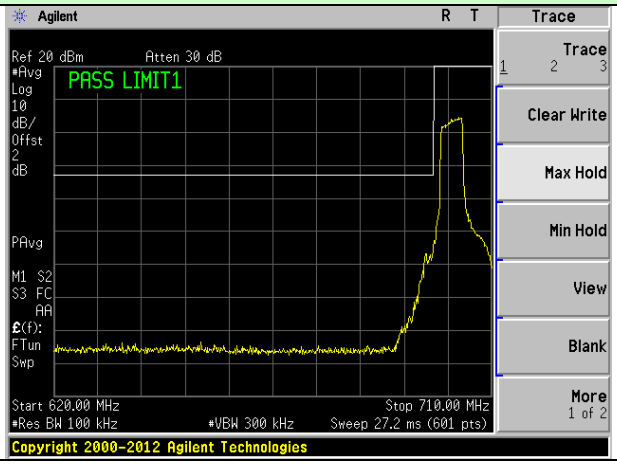
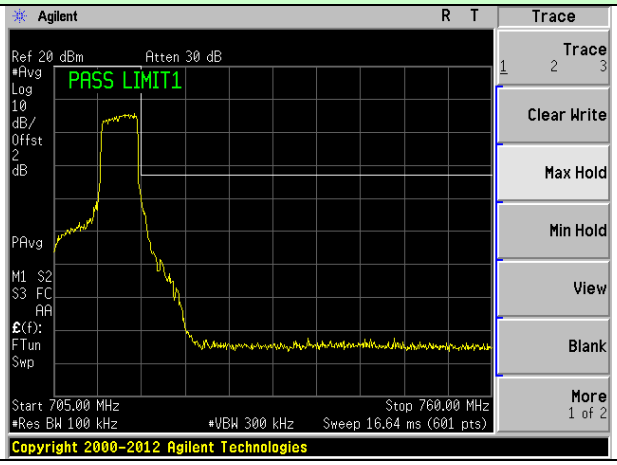
LTE Band 12

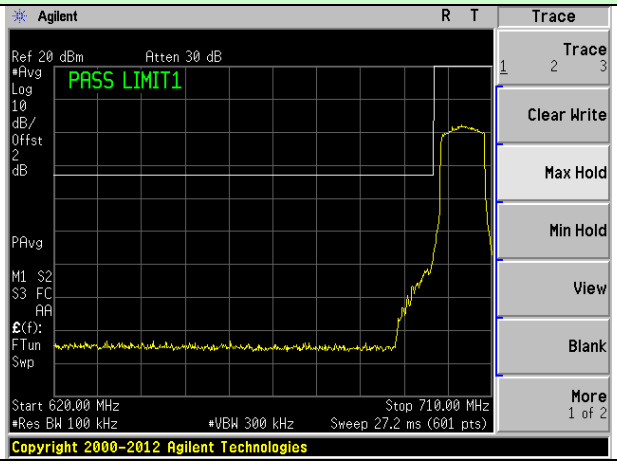
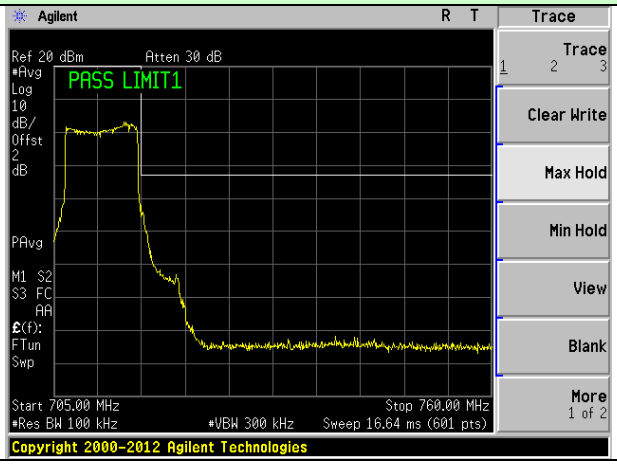
5MHz Bandwidth (RB size:1# RB offset:0#)	5MHz Bandwidth (RB size:1# RB offset:24#)
	
Lowest channel	Highest channel

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

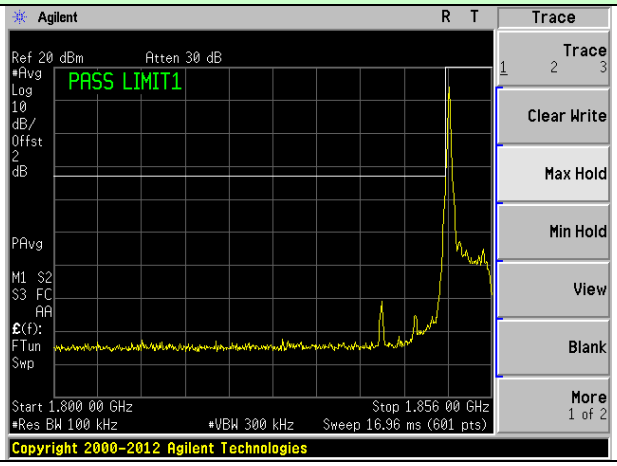
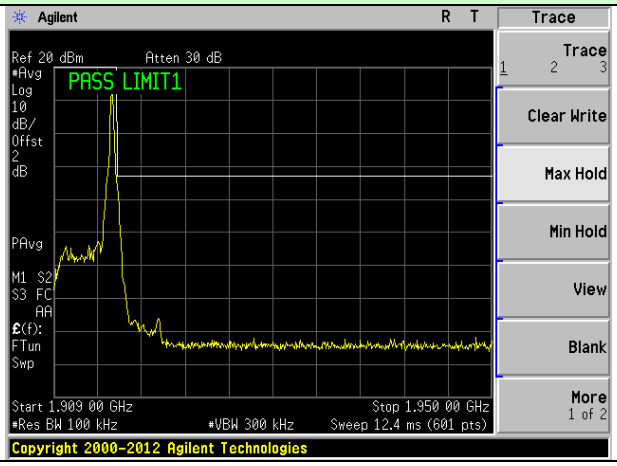
5MHz Bandwidth (RB size:25# RB offset:0#)	5MHz Bandwidth (RB size:25# RB offset:0#)
	
Lowest channel	Highest channel

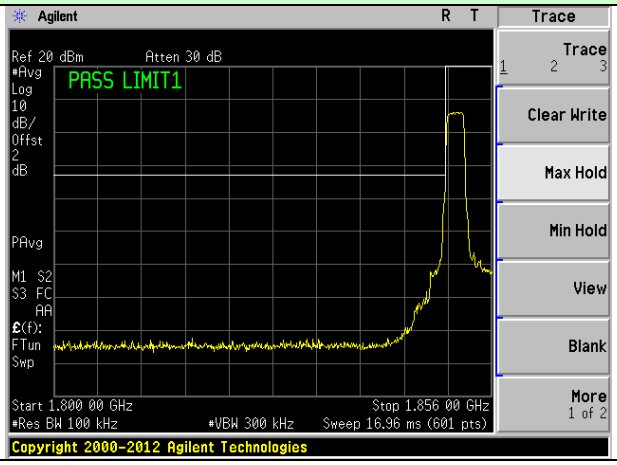
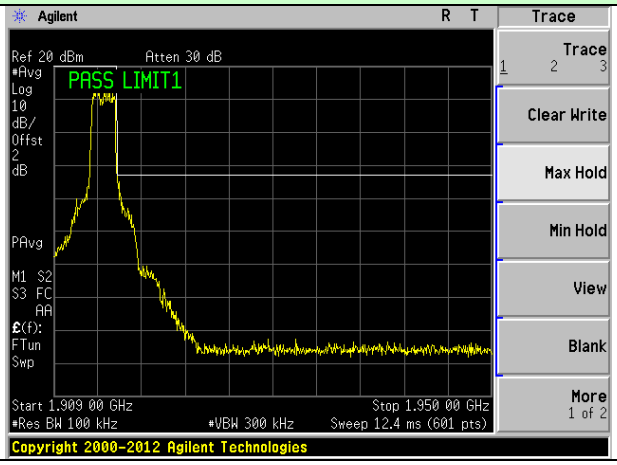
10MHz Bandwidth (RB size:1# RB offset:0#)	10MHz Bandwidth (RB size:1# RB offset:49#)
	
Lowest channel	Highest channel

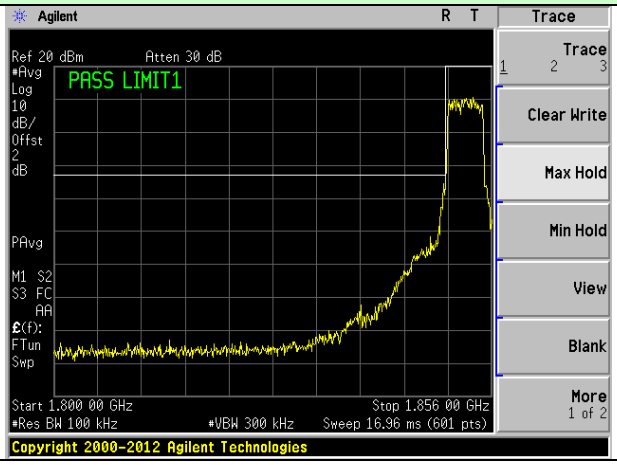
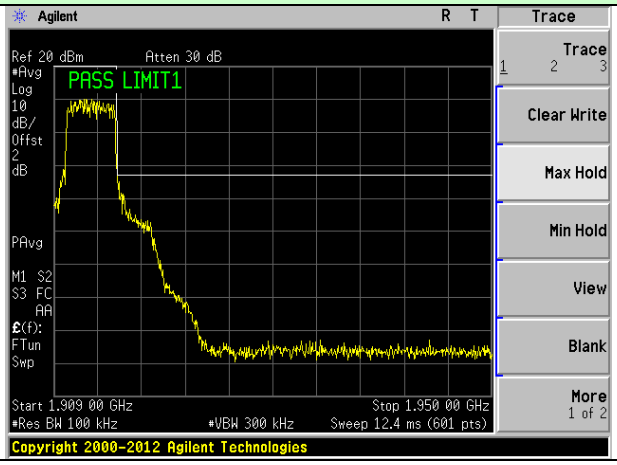
10MHz Bandwidth (RB size:25# RB offset:0#)	10MHz Bandwidth (RB size:25# RB offset:25#)
	
Lowest channel	Highest channel

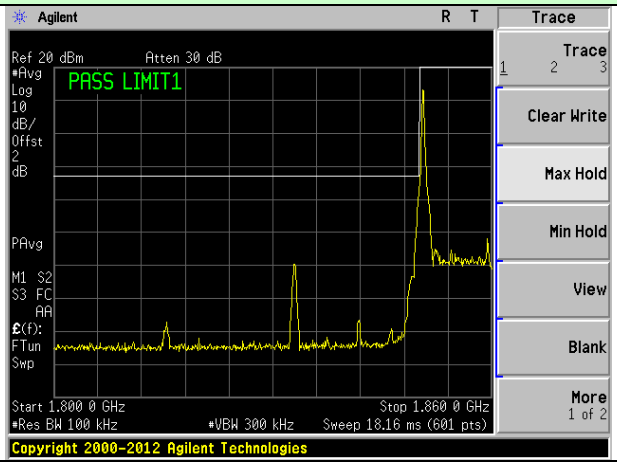
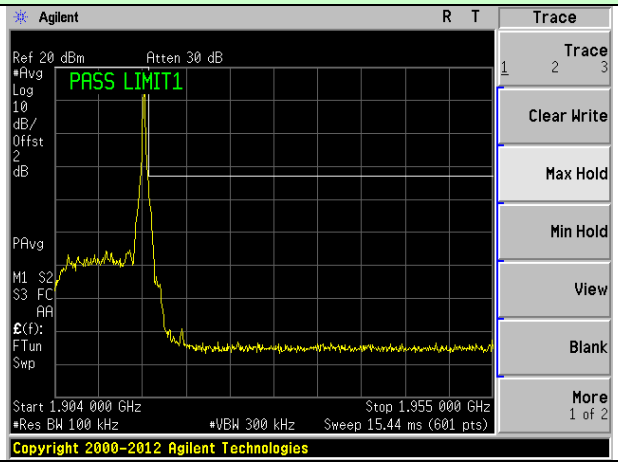
10MHz Bandwidth (RB size:50# RB offset:0#)	10MHz Bandwidth (RB size:50# RB offset:0#)
	
Lowest channel	Highest channel

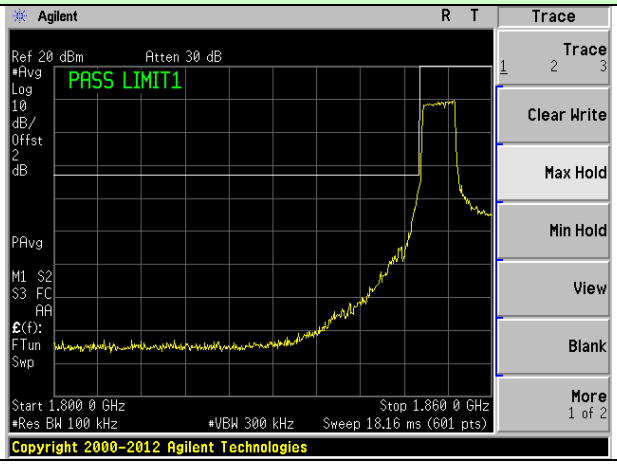
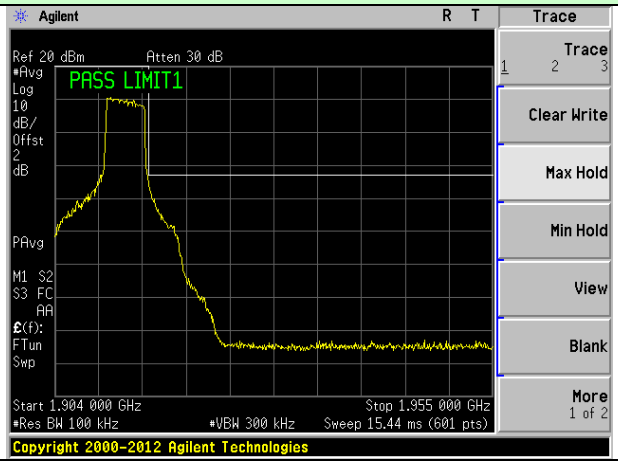
LTE Band 25

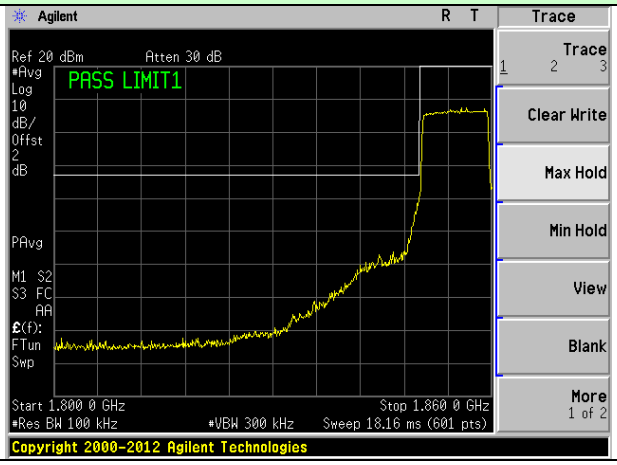
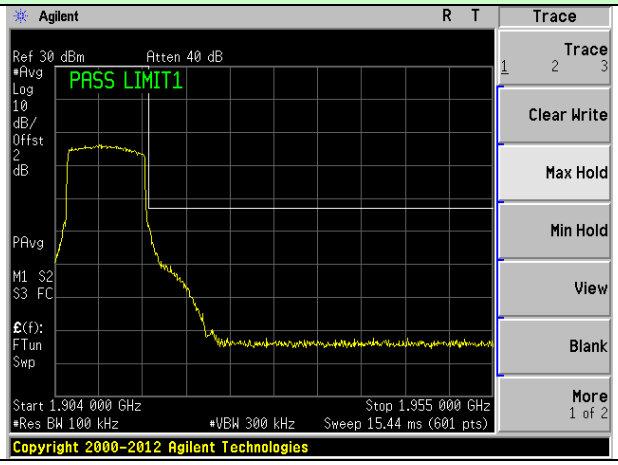
5MHz Bandwidth (RB size:1# RB offset:0#)	5MHz Bandwidth (RB size:1# RB offset:24#)
	
Lowest channel	Highest channel

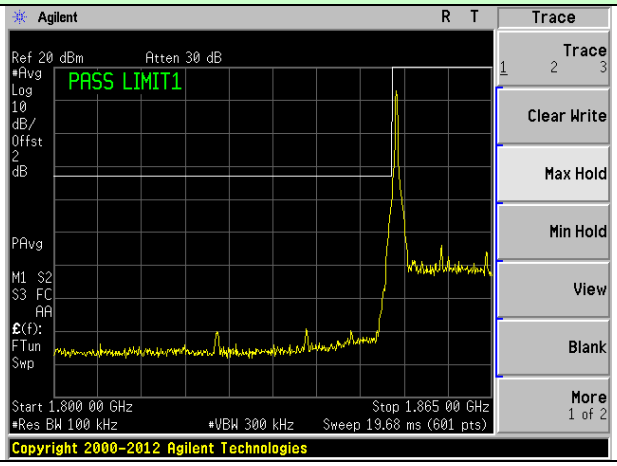
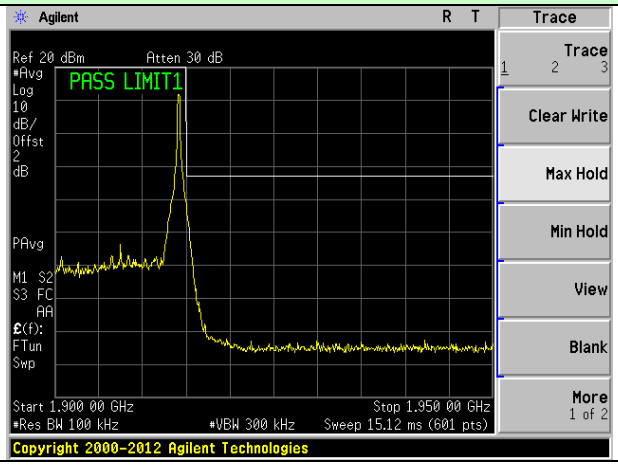
5MHz Bandwidth (RB size:12# RB offset:0#)	5MHz Bandwidth (RB size:12# RB offset:13#)
	
Lowest channel	Highest channel

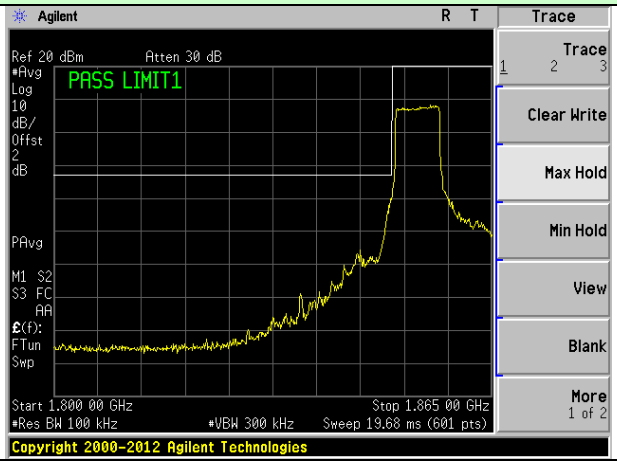
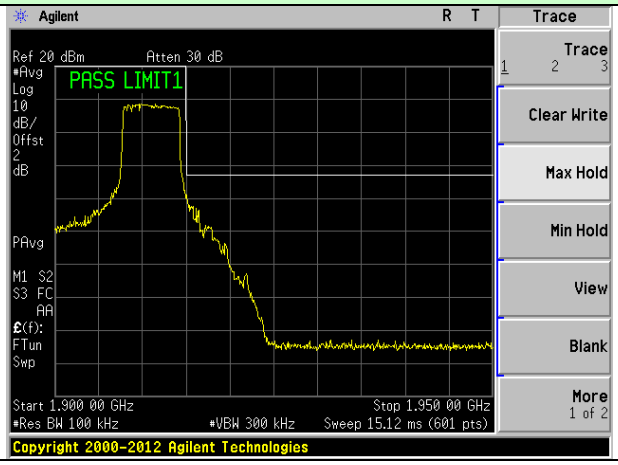
5MHz Bandwidth (RB size:25# RB offset:0#)	5MHz Bandwidth (RB size:25# RB offset:0#)
	
Lowest channel	Highest channel

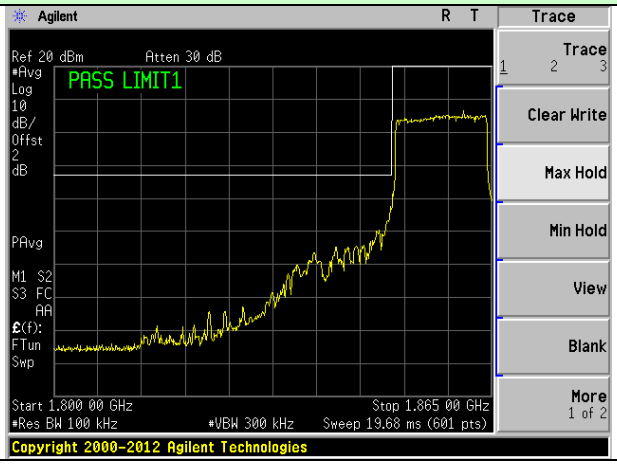
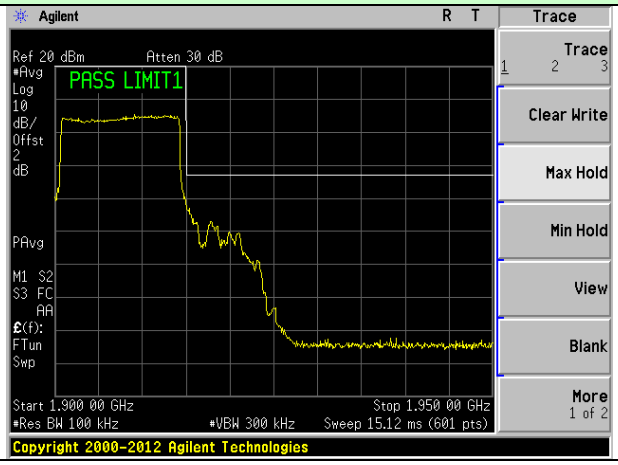
10MHz Bandwidth (RB size:1# RB offset:0#)	10MHz Bandwidth (RB size:1# RB offset:49#)
	
Lowest channel	Highest channel

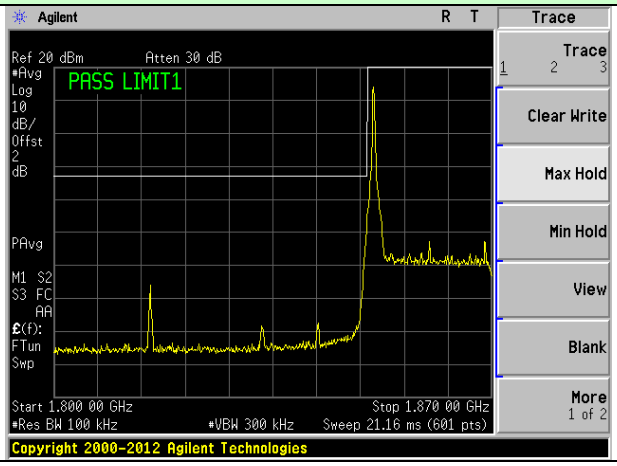
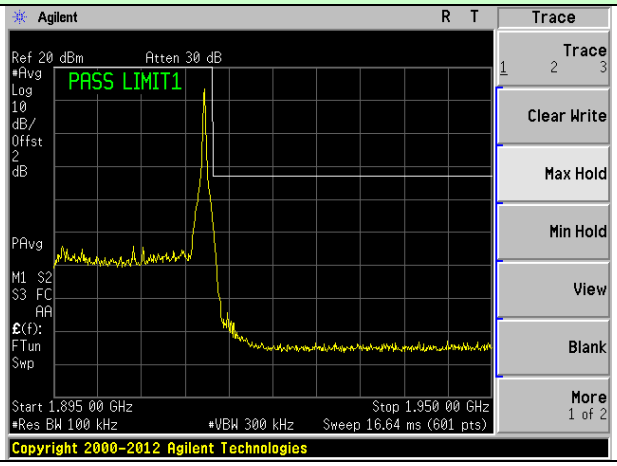
10MHz Bandwidth (RB size:25# RB offset:0#)	10MHz Bandwidth (RB size:25# RB offset:25#)
	
Lowest channel	Highest channel

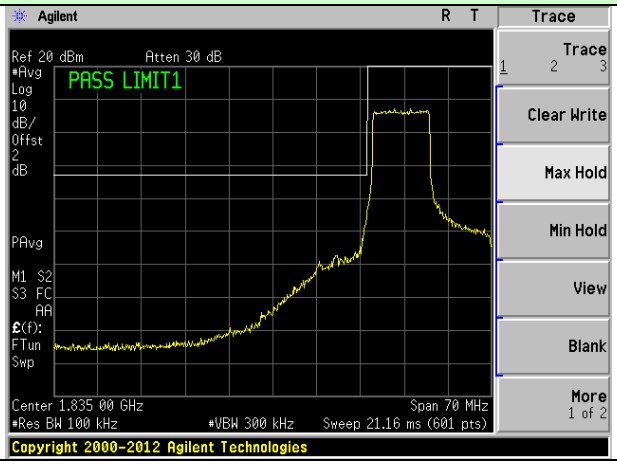
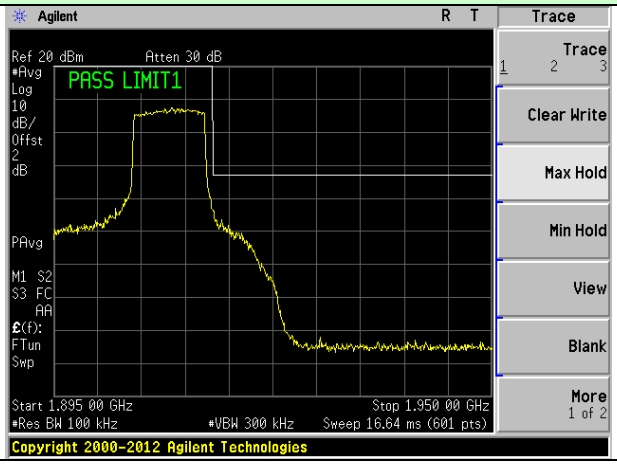
10MHz Bandwidth (RB size:50# RB offset:0#)	10MHz Bandwidth (RB size:50# RB offset:0#)
	
Lowest channel	Highest channel

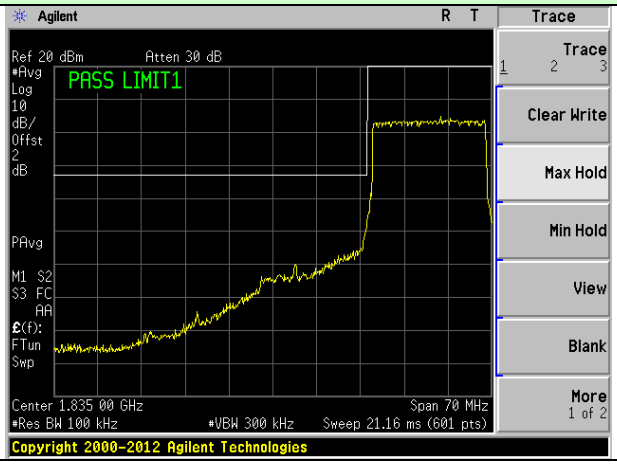
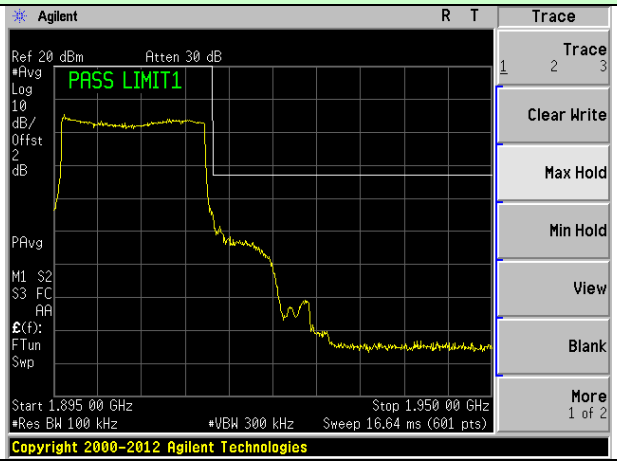
15MHz Bandwidth (RB size:1# RB offset:0#)	15MHz Bandwidth (RB size:1# RB offset:74#)
	
Lowest channel	Highest channel

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

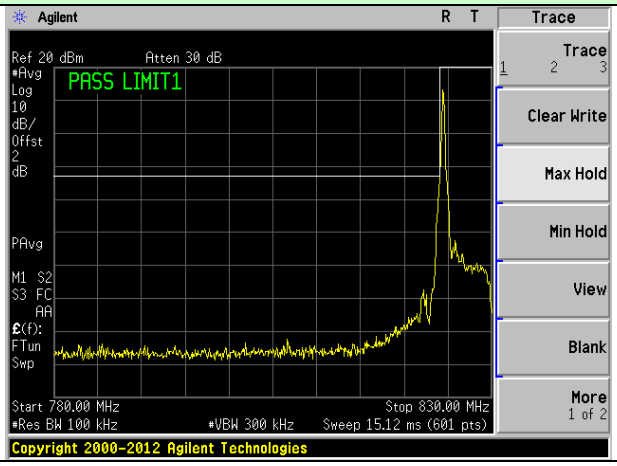
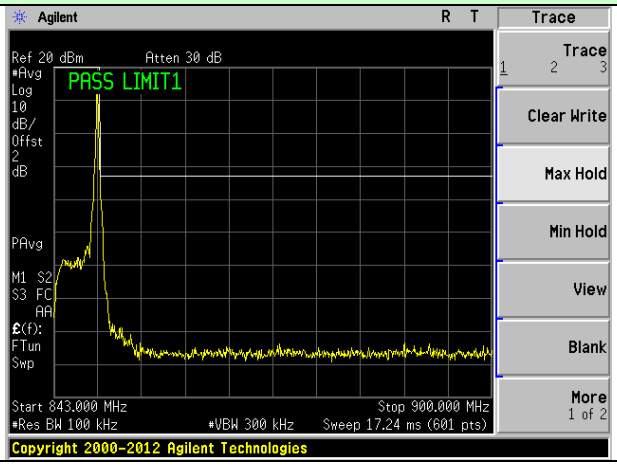
15MHz Bandwidth (RB size:75# RB offset:0#)	15MHz Bandwidth (RB size:75# RB offset:0#)
	
Lowest channel	Highest channel

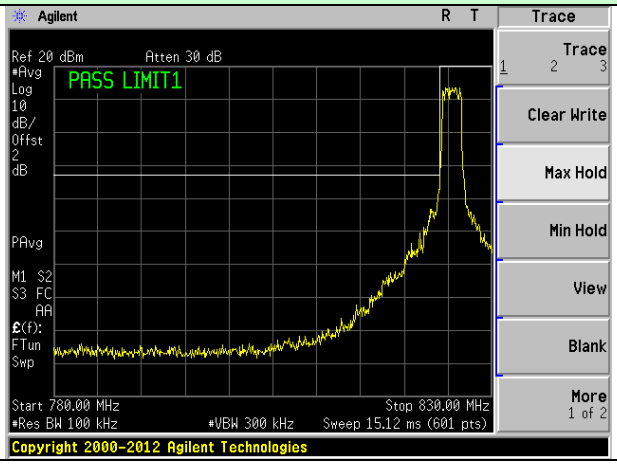
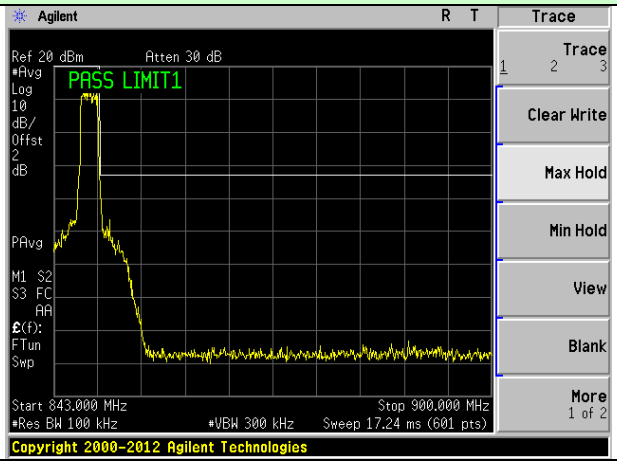
20MHz Bandwidth (RB size:1# RB offset:0#)	20MHz Bandwidth (RB size:1# RB offset:99#)
	
Lowest channel	Highest channel

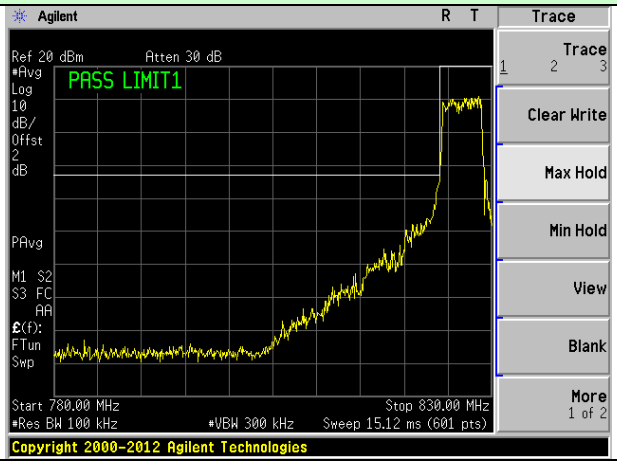
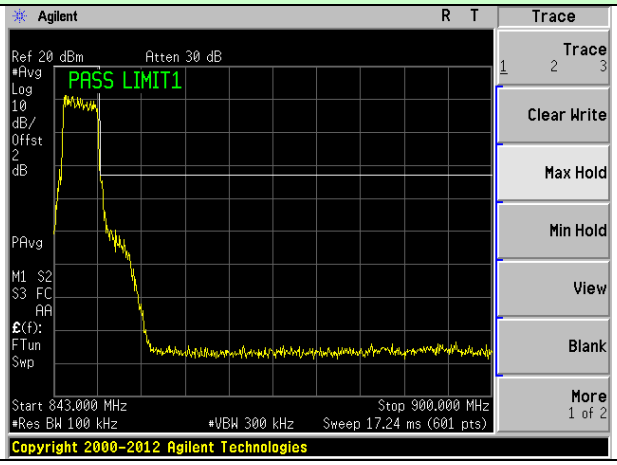
20MHz Bandwidth (RB size:50# RB offset:0#)	20MHz Bandwidth (RB size:50# RB offset:50#)
	
Lowest channel	Highest channel

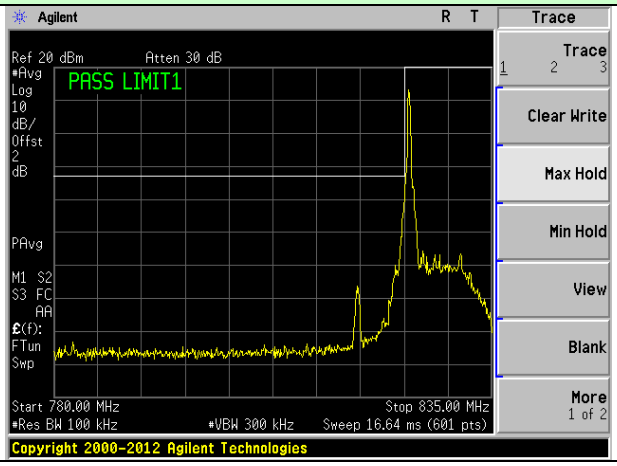
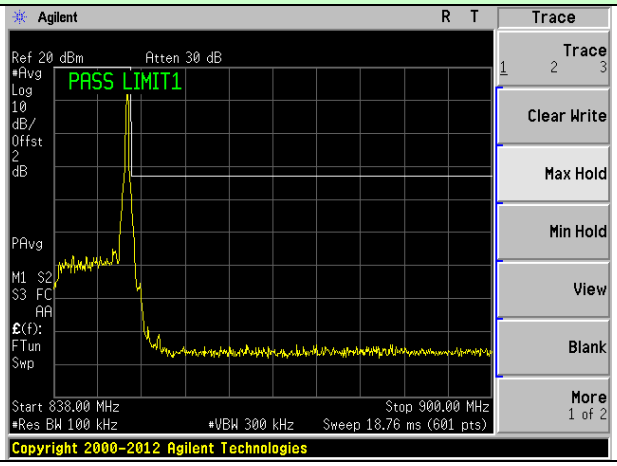
20MHz Bandwidth (RB size:100# RB offset:0#)	20MHz Bandwidth (RB size:100# RB offset:0#)
	
Lowest channel	Highest channel

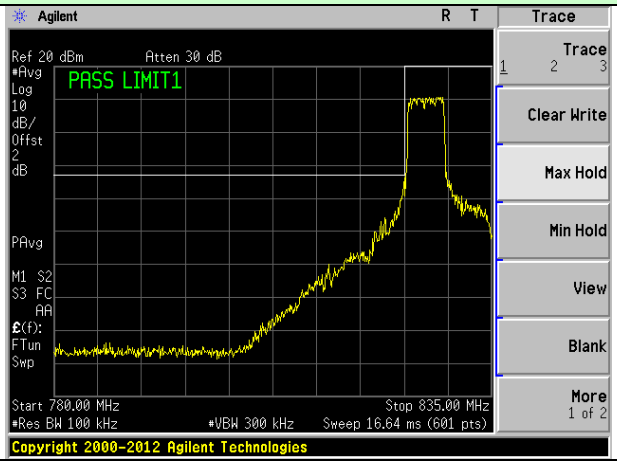
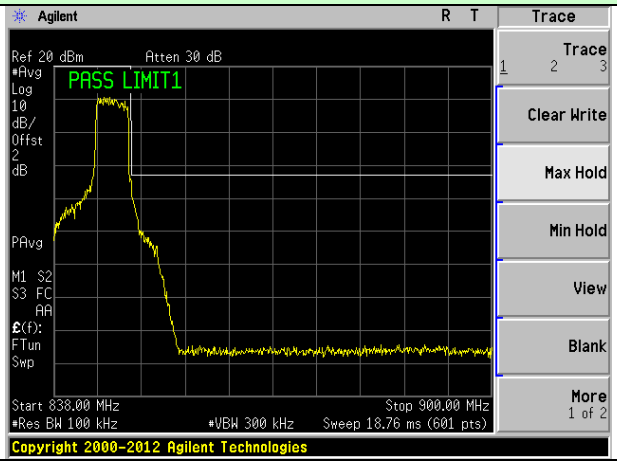
LTE Band 26

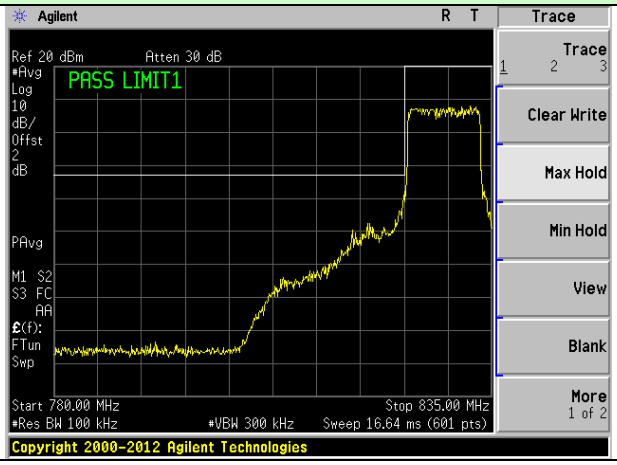
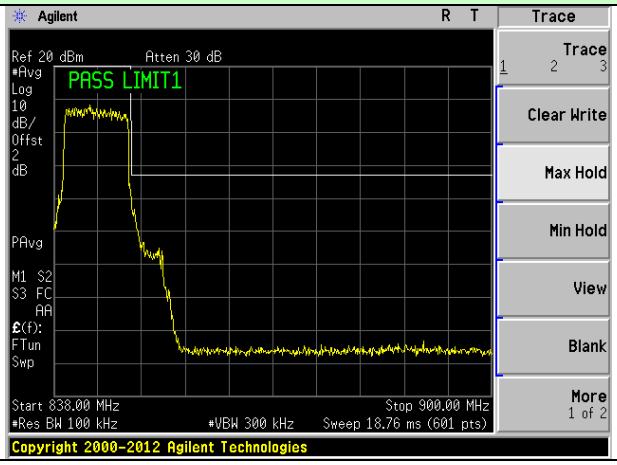
5MHz Bandwidth (RB size:1# RB offset:0#)	5MHz Bandwidth (RB size:1# RB offset:24#)
	
Lowest channel	Highest channel

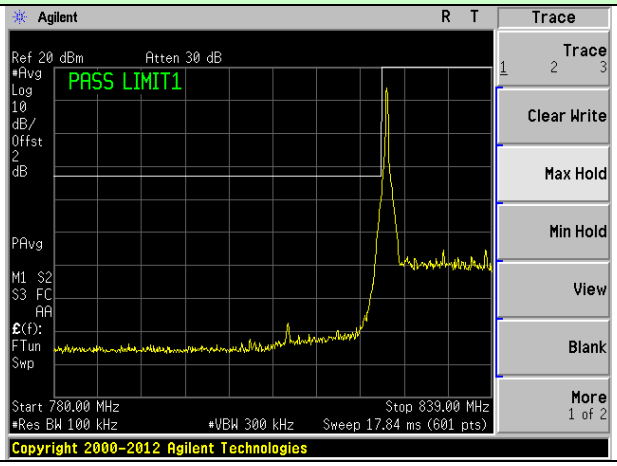
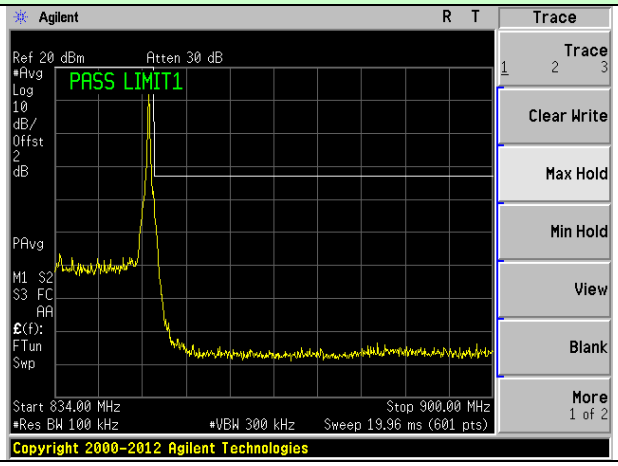
5MHz Bandwidth (RB size:12# RB offset:0#)	5MHz Bandwidth (RB size:12# RB offset:13#)
	
Lowest channel	Highest channel

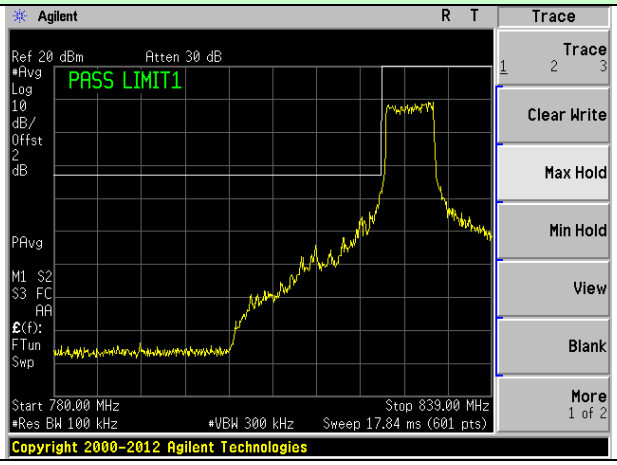
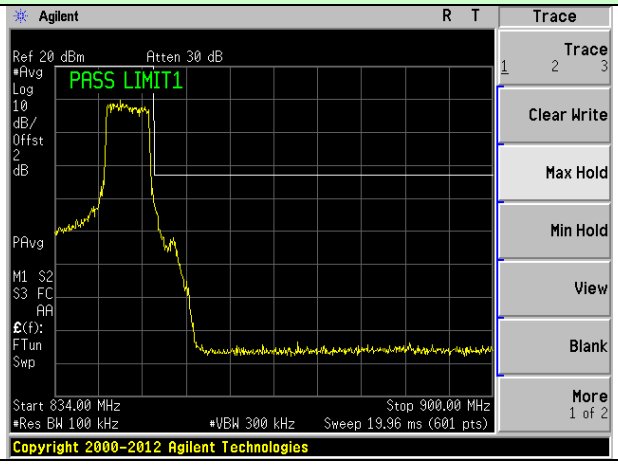
5MHz Bandwidth (RB size:25# RB offset:0#)	5MHz Bandwidth (RB size:25# RB offset:0#)
	
Lowest channel	Highest channel

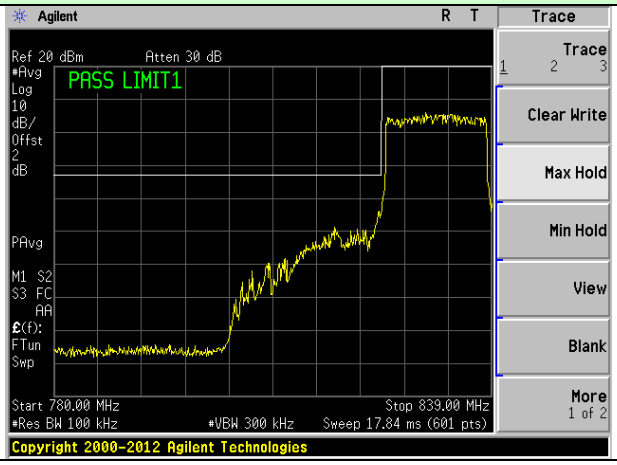
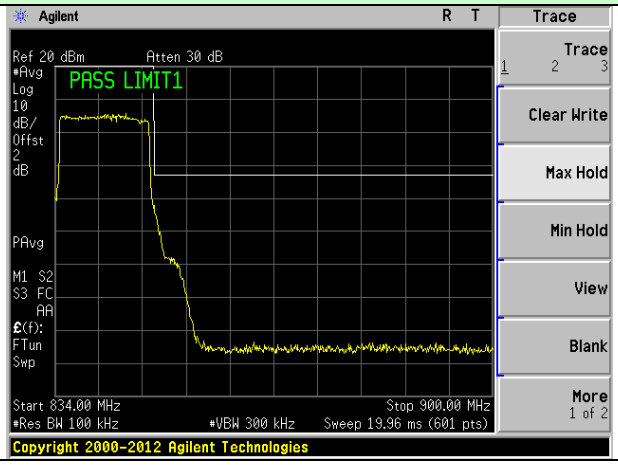
10MHz Bandwidth (RB size:1# RB offset:0#)	10MHz Bandwidth (RB size:1# RB offset:49#)
	
Lowest channel	Highest channel

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

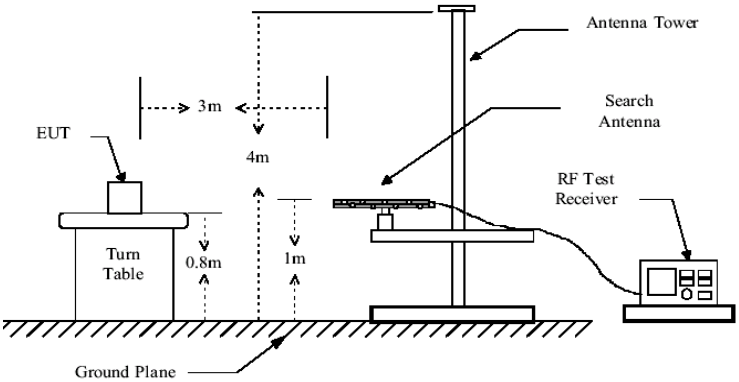
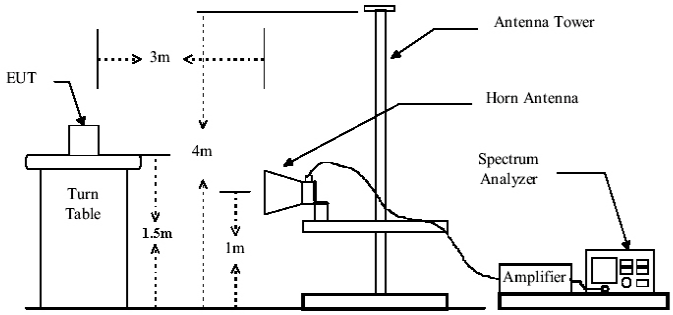
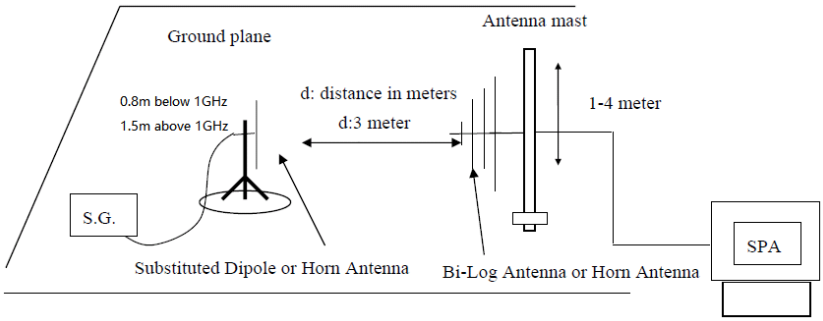
10MHz Bandwidth (RB size:50# RB offset:0#)	10MHz Bandwidth (RB size:50# RB offset:0#)
	
Lowest channel	Highest channel

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

7.8 ERP, EIRP Measurement

Test Requirement:	Part 24.238 (a); Part 27.50(c)(10)/(d)(4) ; FCC part22.913
Test Method:	FCC part2.1046
Limit:	LTE Band 12: 3W (ERP) LTE Band 25: 2W (ERP) LTE Band 26: 7W (ERP)
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 measurement, the EUT was communication with the station. The highest emission was recorded with the rotation of the turntable and the lowering of the test antenna from 4m to 1m. The reading was recorded and the field strength (E in dBuV/m) was calculated. 3. ERP in frequency band 777–787MHz were measured using a substitution method. The EUT was replaced by dipole antenna connected, the S.G. output was recorded and ERP was calculated asfollows: ERP = S.G. output (dBm) + Antenna Gain (dBd) – Cable Loss (dB) 4. EIRP in frequency band 1710–1755MHz were measured using a substitution method. The EUT was replaced by or horn antenna connected, the S.G. output was recorded and EIRP was calculated as follows: EIRP = S.G. output (dBm) + Antenna Gain (dBi) – Cable Loss (dB)
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 7.1 for details
Test results:	Pass

Measurement Data

The maximum value has been record:

EUT mode	Channel	Modulation	Polarization	SGP [dBm]	Substitution Gain[dBi]	Cable loss[dB]	EIRP (dBm)	Limit (dBm)	Result
LTE Band 12 (5M)	Lowest	QPSK	H	22.58	-2.46	1.45	21.57	34.77	Pass
	Middle	QPSK	H	22.63	-2.46	1.49	21.66	34.77	Pass
	Highest	QPSK	H	22.65	-2.46	1.53	21.72	34.77	Pass
	Lowest	16-QAM	H	21.8	-2.46	1.45	20.79	34.77	Pass
	Middle	16-QAM	H	22.82	-2.46	1.49	21.85	34.77	Pass
	Highest	16-QAM	H	21.61	-2.46	1.53	20.68	34.77	Pass

EUT mode	Channel	Modulation	Polarization	SGP [dBm]	Substitution Gain[dBi]	Cable loss[dB]	EIRP (dBm)	Limit (dBm)	Result
LTE Band 12 (10M)	Lowest	QPSK	H	22.74	-2.46	1.45	21.73	34.77	Pass
	Middle	QPSK	H	23.38	-2.46	1.49	22.41	34.77	Pass
	Highest	QPSK	H	21.45	-2.46	1.53	20.52	34.77	Pass
	Lowest	16-QAM	H	21.28	-2.46	1.45	20.27	34.77	Pass
	Middle	16-QAM	H	22.82	-2.46	1.49	21.85	34.77	Pass
	Highest	16-QAM	H	22.64	-2.46	1.53	21.71	34.77	Pass

EUT mode	Channel	Modulation	Polarization	SGP [dBm]	Substitution Gain[dBi]	Cable loss[dB]	EIRP (dBm)	Limit (dBm)	Result
LTE Band 25 (5M)	Lowest	QPSK	H	22.25	-1.93	1.13	21.45	33.00	Pass
	Middle	QPSK	H	22.88	-1.93	1.22	22.17	33.00	Pass
	Highest	QPSK	H	22.22	-1.93	1.34	21.63	33.00	Pass
	Lowest	16-QAM	H	23.24	-1.93	1.13	22.44	33.00	Pass
	Middle	16-QAM	H	22.12	-1.93	1.22	21.41	33.00	Pass
	Highest	16-QAM	H	22.45	-1.93	1.34	21.86	33.00	Pass

EUT mode	Channel	Modulation	Polarization	SGP [dBm]	Substitution Gain[dBi]	Cable loss[dB]	EIRP (dBm)	Limit (dBm)	Result
LTE Band 25 (10M)	Lowest	QPSK	H	22.56	-1.93	1.13	21.76	33.00	Pass
	Middle	QPSK	H	23.36	-1.93	1.22	22.65	33.00	Pass
	Highest	QPSK	H	21.95	-1.93	1.34	21.36	33.00	Pass
	Lowest	16-QAM	H	22.28	-1.93	1.13	21.48	33.00	Pass
	Middle	16-QAM	H	21.68	-1.93	1.22	20.97	33.00	Pass
	Highest	16-QAM	H	21.86	-1.93	1.34	21.27	33.00	Pass

EUT mode	Channel	Modulation	Polarization	SGP [dBm]	Substitution Gain[dBi]	Cable loss[dB]	EIRP (dBm)	Limit (dBm)	Result
LTE Band 25(15M)	Lowest	QPSK	H	22.3	-1.93	1.13	21.50	33.00	Pass
	Middle	QPSK	H	23.69	-1.93	1.22	22.98	33.00	Pass
	Highest	QPSK	H	23.38	-1.93	1.34	22.79	33.00	Pass
	Lowest	16-QAM	H	23.31	-1.93	1.13	22.51	33.00	Pass
	Middle	16-QAM	H	21.95	-1.93	1.22	21.24	33.00	Pass
	Highest	16-QAM	H	23.44	-1.93	1.34	22.85	33.00	Pass

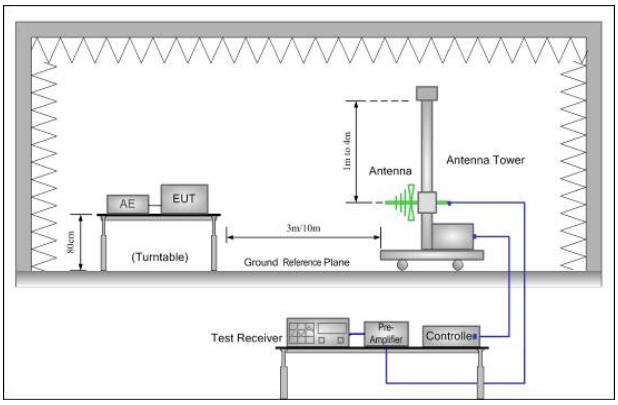
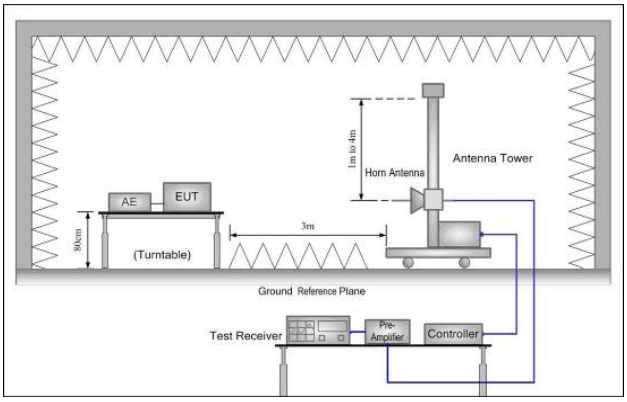
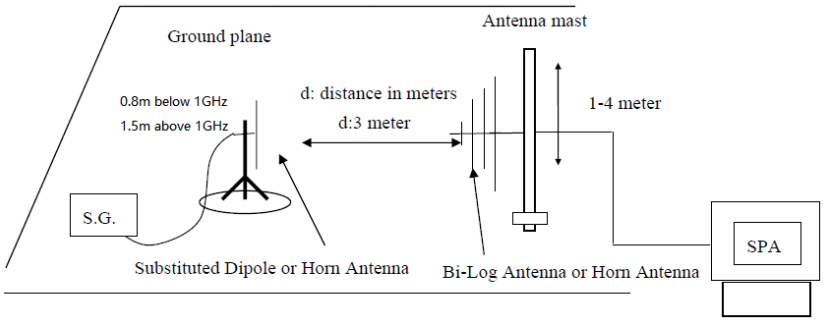
EUT mode	Channel	Modulation	Polarization	SGP [dBm]	Substitution Gain[dBi]	Cable loss[dB]	EIRP (dBm)	Limit (dBm)	Result
LTE Band 25 (20M)	Lowest	QPSK	H	23.22	-1.93	1.13	22.42	33.00	Pass
	Middle	QPSK	H	23.51	-1.93	1.22	22.80	33.00	Pass
	Highest	QPSK	H	21.83	-1.93	1.34	21.24	33.00	Pass
	Lowest	16-QAM	H	23.26	-1.93	1.13	22.46	33.00	Pass
	Middle	16-QAM	H	23.11	-1.93	1.22	22.40	33.00	Pass
	Highest	16-QAM	H	21.93	-1.93	1.34	21.34	33.00	Pass

EUT mode	Channel	Modulation	Polarization	SGP [dBm]	Substitution Gain[dBi]	Cable loss[dB]	EIRP (dBm)	Limit (dBm)	Result
LTE Band 26 (5M)	Lowest	QPSK	H	23.41	-2.08	1.55	22.88	38.45	Pass
	Middle	QPSK	H	22.97	-2.08	1.6	22.49	38.45	Pass
	Highest	QPSK	H	21.63	-2.08	1.65	21.20	38.45	Pass
	Lowest	16-QAM	H	23.28	-2.08	1.55	22.75	38.45	Pass
	Middle	16-QAM	H	22.01	-2.08	1.6	21.53	38.45	Pass
	Highest	16-QAM	H	23.38	-2.08	1.65	22.95	38.45	Pass

EUT mode	Channel	Modulation	Polarization	SGP [dBm]	Substitution Gain[dBi]	Cable loss[dB]	EIRP (dBm)	Limit (dBm)	Result
LTE Band 26 (10M)	Lowest	QPSK	H	22.44	-2.08	1.55	21.91	38.45	Pass
	Middle	QPSK	H	23.23	-2.08	1.6	22.75	38.45	Pass
	Highest	QPSK	H	23.74	-2.08	1.65	23.31	38.45	Pass
	Lowest	16-QAM	H	22.16	-2.08	1.55	21.63	38.45	Pass
	Middle	16-QAM	H	23.42	-2.08	1.6	22.94	38.45	Pass
	Highest	16-QAM	H	23.01	-2.08	1.65	22.58	38.45	Pass

EUT mode	Channel	Modulation	Polarization	SGP [dBm]	Substitution Gain[dBi]	Cable loss[dB]	EIRP (dBm)	Limit (dBm)	Result
LTE Band 26(15M)	Lowest	QPSK	H	21.63	-2.08	1.55	21.10	38.45	Pass
	Middle	QPSK	H	23.07	-2.08	1.6	22.59	38.45	Pass
	Highest	QPSK	H	23.06	-2.08	1.65	22.63	38.45	Pass
	Lowest	16-QAM	H	23.62	-2.08	1.55	23.09	38.45	Pass
	Middle	16-QAM	H	21.84	-2.08	1.6	21.36	38.45	Pass
	Highest	16-QAM	H	21.64	-2.08	1.65	21.21	38.45	Pass

7.9 Field strength of spurious radiation measurement

Test Requirement:	Part 24.238 (a); FCC Part 27.53(h)/(g) ; Part 22.913
Test Method:	FCC part2.1053
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 Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 7.1 for details
Test results:	Pass

Measurement Data
Remark：
1. The emission behaviour 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 12(5MHz)		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1403.00	H	-43.19	-13.00	Pass
2104.50	H	-44.96		
2806.00	H	-45.42		
3507.50	H	-44.45		
4209.00	H	-42.74		
1403.00	V	-45.12	-13.00	Pass
2104.50	V	-42.36		
2806.00	V	-44.31		
3507.50	V	-45.43		
4209.00	V	-44.09		
Test mode:	**LTE Band 12(5MHz)**		**Test channel:**	**Middle**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1415.00	H	-44.08	-13.00	Pass
2122.50	H	-42.57		
2830.00	H	-44.73		
3537.50	H	-44.95		
4245.00	H	-42.61		
1415.00	V	-45.34	-13.00	Pass
2122.50	V	-45.76		
2830.00	V	-45.67		
3537.50	V	-42.73		
4245.00	V	-42.11		
Test mode:	**LTE Band 12(5MHz)**		**Test channel:**	**Highest**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1427.00	H	-45.67	-13.00	Pass
2140.50	H	-43.67		
2854.00	H	-44.17		
3567.50	H	-44.56		
4281.00	H	-42.69		
1427.00	V	-44.01	-13.00	Pass
2140.50	V	-42.07		
2854.00	V	-42.61		
3567.50	V	-42.12		
4281.00	V	-43.93		

Test mode:	LTE Band 12(10MHz)		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1408.00	H	-44.77	-13.00	Pass
2112.00	H	-44.66		
2816.00	H	-44.90		
3520.00	H	-42.71		
4224.00	H	-42.96		
1408.00	V	-45.39	-13.00	Pass
2112.00	V	-43.19		
2816.00	V	-44.67		
3520.00	V	-42.46		
4224.00	V	-42.88		
Test mode:	**LTE Band 12(10MHz)**		**Test channel:**	**Middle**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1415.00	H	-45.75	-13.00	Pass
2122.50	H	-45.34		
2830.00	H	-45.73		
3537.50	H	-44.86		
4245.00	H	-46.00		
1415.00	V	-45.33	-13.00	Pass
2122.50	V	-42.11		
2830.00	V	-44.25		
3537.50	V	-42.24		
4245.00	V	-44.72		
Test mode:	**LTE Band 12(10MHz)**		**Test channel:**	**Highest**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1422.00	H	-45.28	-13.00	Pass
2133.00	H	-44.65		
2844.00	H	-45.24		
3555.00	H	-45.33		
4266.00	H	-44.53		
1422.00	V	-44.26	-13.00	Pass
2133.00	V	-44.56		
2844.00	V	-43.43		
3555.00	V	-43.79		
4266.00	V	-43.66		

Test mode:	LTE Band 25(5MHz)		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3705.00	H	-42.54	-13.00	Pass
5557.50	H	-43.38		
7410.00	H	-42.85		
9262.50	H	-43.51		
11115.00	H	-44.00		
3705.00	V	-45.51	-13.00	Pass
5557.50	V	-44.92		
7410.00	V	-43.58		
9262.50	V	-43.36		
11115.00	V	-43.69		
Test mode:	**LTE Band 25(5MHz)**		**Test channel:**	**Middle**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3765.00	H	-44.18	-13.00	Pass
5647.50	H	-42.94		
7530.00	H	-42.06		
9412.50	H	-42.16		
11295.00	H	-42.44		
3765.00	V	-43.73	-13.00	Pass
5647.50	V	-44.93		
7530.00	V	-43.84		
9412.50	V	-43.00		
11295.00	V	-42.15		
Test mode:	**LTE Band 25(5MHz)**		**Test channel:**	**Highest**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3825.00	H	-43.48	-13.00	Pass
5737.50	H	-43.65		
7650.00	H	-43.21		
9562.50	H	-44.36		
11475.00	H	-44.70		
3825.00	V	-43.36	-13.00	Pass
5737.50	V	-45.84		
7650.00	V	-45.71		
9562.50	V	-44.30		
11475.00	V	-44.95		

Test mode:	LTE Band 25(20MHz)		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3720.00	H	-42.57	-13.00	Pass
5580.00	H	-42.79		
7440.00	H	-42.14		
9300.00	H	-42.85		
11160.00	H	-45.81		
3720.00	V	-42.09	-13.00	Pass
5580.00	V	-44.18		
7440.00	V	-44.72		
9300.00	V	-42.17		
11160.00	V	-42.45		
Test mode:	**LTE Band 25(20MHz)**		**Test channel:**	**Middle**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3765.00	H	-43.09	-13.00	Pass
5647.50	H	-43.41		
7530.00	H	-45.62		
9412.50	H	-45.68		
11295.00	H	-44.79		
3765.00	V	-44.97	-13.00	Pass
5647.50	V	-42.04		
7530.00	V	-42.56		
9412.50	V	-45.26		
11295.00	V	-45.87		
Test mode:	**LTE Band 25(20MHz)**		**Test channel:**	**Highest**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3810.00	H	-44.28	-13.00	Pass
5715.00	H	-44.98		
7620.00	H	-43.23		
9525.00	H	-44.67		
11430.00	H	-43.76		
3810.00	V	-45.53	-13.00	Pass
5715.00	V	-45.79		
7620.00	V	-44.15		
9525.00	V	-43.72		
11430.00	V	-44.32		

Test mode:	LTE Band 26(5MHz)		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1653.00	H	-43.15	-13.00	Pass
2479.50	H	-43.54		
3306.00	H	-42.92		
4132.50	H	-43.18		
4959.00	H	-42.99		
1653.00	V	-43.82	-13.00	Pass
2479.50	V	-45.39		
3306.00	V	-44.25		
4132.50	V	-42.52		
4959.00	V	-42.23		
Test mode:	**LTE Band 26(5MHz)**		**Test channel:**	**Middle**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1673.00	H	-42.18	-13.00	Pass
2509.50	H	-43.26		
3346.00	H	-44.60		
4182.50	H	-44.67		
5019.00	H	-42.54		
1673.00	V	-43.40	-13.00	Pass
2509.50	V	-42.52		
3346.00	V	-43.53		
4182.50	V	-44.91		
5019.00	V	-44.77		
Test mode:	**LTE Band 26(5MHz)**		**Test channel:**	**Highest**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1693.00	H	-43.59	-13.00	Pass
2539.50	H	-45.22		
3386.00	H	-43.56		
4232.50	H	-43.50		
5079.00	H	-42.42		
1693.00	V	-45.88	-13.00	Pass
2539.50	V	-45.98		
3386.00	V	-42.48		
4232.50	V	-42.62		
5079.00	V	-43.16		

Test mode:	LTE Band 26(15MHz)		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1663.00	H	-45.56	-13.00	Pass
2494.50	H	-42.58		
3326.00	H	-45.36		
4157.50	H	-42.61		
4989.00	H	-42.89		
1663.00	V	-43.68	-13.00	Pass
2494.50	V	-42.76		
3326.00	V	-44.99		
4157.50	V	-45.52		
4989.00	V	-44.60		
Test mode:	**LTE Band 26(15MHz)**		**Test channel:**	**Middle**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1673.00	H	-43.03	-13.00	Pass
2509.50	H	-45.39		
3346.00	H	-45.54		
4182.50	H	-44.83		
5019.00	H	-44.52		
1673.00	V	-45.35	-13.00	Pass
2509.50	V	-43.71		
3346.00	V	-45.15		
4182.50	V	-45.51		
5019.00	V	-42.05		
Test mode:	**LTE Band 26(15MHz)**		**Test channel:**	**Highest**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1683.00	H	-43.68	-13.00	Pass
2524.50	H	-43.14		
3366.00	H	-45.01		
4207.50	H	-43.48		
5049.00	H	-45.29		
1683.00	V	-43.62	-13.00	Pass
2524.50	V	-45.79		
3366.00	V	-43.39		
4207.50	V	-42.88		
5049.00	V	-42.32		

16QAM mode:

Test mode:	LTE Band 12(5MHz)		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1403.00	H	-43.27	-13.00	Pass
2104.50	H	-42.82		
2806.00	H	-45.95		
3507.50	H	-43.76		
4209.00	H	-44.31		
1403.00	V	-44.71	-13.00	Pass
2104.50	V	-44.16		
2806.00	V	-43.17		
3507.50	V	-45.80		
4209.00	V	-45.91		
Test mode:	**LTE Band 12(5MHz)**		**Test channel:**	**Middle**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1415.00	H	-42.49	-13.00	Pass
2122.50	H	-44.71		
2830.00	H	-45.76		
3537.50	H	-44.26		
4245.00	H	-44.02		
1415.00	V	-45.16	-13.00	Pass
2122.50	V	-42.64		
2830.00	V	-45.65		
3537.50	V	-45.92		
4245.00	V	-42.73		
Test mode:	**LTE Band 12(5MHz)**		**Test channel:**	**Highest**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1427.00	H	-43.37	-13.00	Pass
2140.50	H	-43.38		
2854.00	H	-43.26		
3567.50	H	-43.96		
4281.00	H	-44.26		
1427.00	V	-45.92	-13.00	Pass
2140.50	V	-44.72		
2854.00	V	-42.26		
3567.50	V	-44.22		
4281.00	V	-45.85		

Test mode:	LTE Band 12(10MHz)		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1408.00	H	-42.85	-13.00	Pass
2112.00	H	-45.03		
2816.00	H	-43.26		
3520.00	H	-42.73		
4224.00	H	-42.84		
1408.00	V	-44.94	-13.00	Pass
2112.00	V	-42.95		
2816.00	V	-44.93		
3520.00	V	-44.12		
4224.00	V	-43.95		
Test mode:	**LTE Band 12(10MHz)**		**Test channel:**	**Middle**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1415.00	H	-43.88	-13.00	Pass
2122.50	H	-43.95		
2830.00	H	-44.62		
3537.50	H	-42.53		
4245.00	H	-45.07		
1415.00	V	-42.05	-13.00	Pass
2122.50	V	-42.74		
2830.00	V	-44.92		
3537.50	V	-42.55		
4245.00	V	-42.56		
Test mode:	**LTE Band 12(10MHz)**		**Test channel:**	**Highest**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1422.00	H	-43.47	-13.00	Pass
2133.00	H	-43.42		
2844.00	H	-42.38		
3555.00	H	-45.31		
4266.00	H	-43.81		
1422.00	V	-42.86	-13.00	Pass
2133.00	V	-44.99		
2844.00	V	-42.93		
3555.00	V	-45.62		
4266.00	V	-44.56		

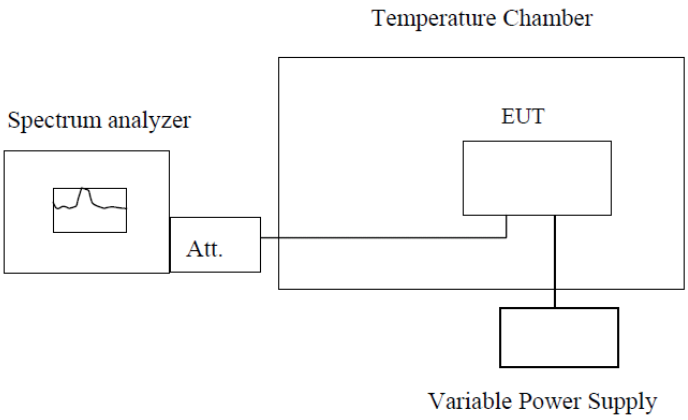
Test mode:	LTE Band 25(5MHz)		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3705.00	H	-44.20	-13.00	Pass
5557.50	H	-45.70		
7410.00	H	-44.56		
9262.50	H	-42.91		
11115.00	H	-43.70		
3705.00	V	-42.95	-13.00	Pass
5557.50	V	-44.79		
7410.00	V	-42.12		
9262.50	V	-44.07		
11115.00	V	-44.72		
Test mode:	**LTE Band 25(5MHz)**		**Test channel:**	**Middle**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3765.00	H	-44.41	-13.00	Pass
5647.50	H	-43.70		
7530.00	H	-45.41		
9412.50	H	-43.57		
11295.00	H	-43.75		
3765.00	V	-44.21	-13.00	Pass
5647.50	V	-45.91		
7530.00	V	-44.94		
9412.50	V	-45.93		
11295.00	V	-44.94		
Test mode:	**LTE Band 25(5MHz)**		**Test channel:**	**Highest**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3825.00	H	-44.08	-13.00	Pass
5737.50	H	-44.01		
7650.00	H	-42.17		
9562.50	H	-44.48		
11475.00	H	-44.72		
3825.00	V	-44.29	-13.00	Pass
5737.50	V	-43.22		
7650.00	V	-42.69		
9562.50	V	-43.16		
11475.00	V	-45.39		

Test mode:	LTE Band 25(20MHz)		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3720.00	H	-45.55	-13.00	Pass
5580.00	H	-45.98		
7440.00	H	-45.19		
9300.00	H	-44.51		
11160.00	H	-42.51		
3720.00	V	-45.35	-13.00	Pass
5580.00	V	-42.45		
7440.00	V	-42.99		
9300.00	V	-43.41		
11160.00	V	-42.05		
Test mode:	**LTE Band 25(20MHz)**		**Test channel:**	**Middle**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3765.00	H	-43.53	-13.00	Pass
5647.50	H	-42.22		
7530.00	H	-43.13		
9412.50	H	-44.07		
11295.00	H	-45.61		
3765.00	V	-44.68	-13.00	Pass
5647.50	V	-43.20		
7530.00	V	-44.17		
9412.50	V	-42.59		
11295.00	V	-43.17		
Test mode:	**LTE Band 25(20MHz)**		**Test channel:**	**Highest**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3810.00	H	-44.21	-13.00	Pass
5715.00	H	-42.80		
7620.00	H	-42.54		
9525.00	H	-45.40		
11430.00	H	-45.78		
3810.00	V	-45.60	-13.00	Pass
5715.00	V	-42.58		
7620.00	V	-43.89		
9525.00	V	-42.67		
11430.00	V	-43.34		

Test mode:	LTE Band 26(5MHz)		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1653.00	H	-43.17	-13.00	Pass
2479.50	H	-43.19		
3306.00	H	-42.08		
4132.50	H	-42.52		
4959.00	H	-43.34		
1653.00	V	-43.58	-13.00	Pass
2479.50	V	-45.09		
3306.00	V	-43.01		
4132.50	V	-43.70		
4959.00	V	-42.31		
Test mode:	**LTE Band 26(5MHz)**		**Test channel:**	**Middle**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1673.00	H	-45.48	-13.00	Pass
2509.50	H	-42.71		
3346.00	H	-45.92		
4182.50	H	-45.48		
5019.00	H	-45.66		
1673.00	V	-42.91	-13.00	Pass
2509.50	V	-43.82		
3346.00	V	-42.92		
4182.50	V	-44.77		
5019.00	V	-44.11		
Test mode:	**LTE Band 26(5MHz)**		**Test channel:**	**Highest**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1693.00	H	-44.91	-13.00	Pass
2539.50	H	-44.00		
3386.00	H	-45.88		
4232.50	H	-42.96		
5079.00	H	-43.35		
1693.00	V	-45.87	-13.00	Pass
2539.50	V	-42.45		
3386.00	V	-43.13		
4232.50	V	-43.03		
5079.00	V	-45.89		

Test mode:	LTE Band 26(15MHz)		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1663.00	H	-43.58	-13.00	Pass
2494.50	H	-42.73		
3326.00	H	-44.85		
4157.50	H	-43.89		
4989.00	H	-43.85		
1663.00	V	-43.75	-13.00	Pass
2494.50	V	-43.01		
3326.00	V	-42.39		
4157.50	V	-44.10		
4989.00	V	-44.00		
Test mode:	**LTE Band 26(15MHz)**		**Test channel:**	**Middle**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1673.00	H	-44.33	-13.00	Pass
2509.50	H	-43.84		
3346.00	H	-43.67		
4182.50	H	-42.20		
5019.00	H	-45.28		
1673.00	V	-45.15	-13.00	Pass
2509.50	V	-45.25		
3346.00	V	-43.56		
4182.50	V	-42.01		
5019.00	V	-44.25		
Test mode:	**LTE Band 26(15MHz)**		**Test channel:**	**Highest**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1683.00	H	-44.19	-13.00	Pass
2524.50	H	-42.80		
3366.00	H	-43.93		
4207.50	H	-44.15		
5049.00	H	-42.07		
1683.00	V	-45.67	-13.00	Pass
2524.50	V	-43.40		
3366.00	V	-45.21		
4207.50	V	-45.63		
5049.00	V	-43.77		

7.10 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:	 **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 6.0 for details
Test mode:	Refer to section 7.1 for details
Test results:	Pass

Measurement Data

QPSK mode:

Reference Frequency: LTE Band 12 Middle channel 707.5MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error			Result
		Hz	ppm		
12.0	-30	123	0.0654	2.5	Pass
	-20	139	0.0740		
	-10	117	0.0625		
	0	96	0.0509		
	10	112	0.0596		
	20	96	0.0509		
	30	161	0.0856		
	40	145	0.0769		
	50	139	0.0740		

Reference Frequency: LTE Band 25 Middle channel 1882.5MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error			Result
		Hz	ppm		
12.0	-30	92	0.0533	2.5	Pass
	-20	102	0.0589		
	-10	88	0.0505		
	0	78	0.0449		
	10	83	0.0477		
	20	73	0.0421		
	30	126	0.0729		
	40	107	0.0617		
	50	102	0.0589		

Reference Frequency: LTE Band 26 Middle channel 836.5MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error			Result
		Hz	ppm		
12.0	-30	116	0.0458	2.5	Pass
	-20	134	0.0527		
	-10	112	0.0444		
	0	98	0.0388		
	10	110	0.0432		
	20	96	0.0379		
	30	159	0.0629		
	40	139	0.0550		
	50	132	0.0521		

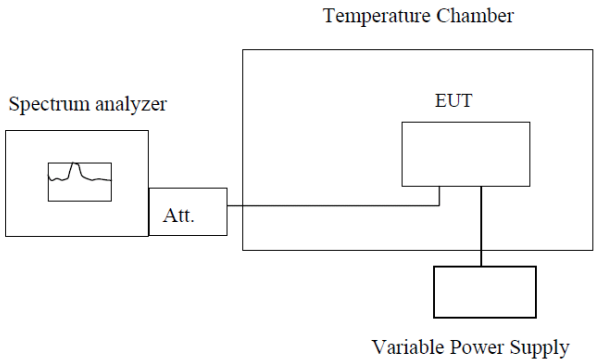
16QAM mode:

Reference Frequency: LTE Band 12 Middle channel 707.5MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error			Result
		Hz	ppm		
12.0	-30	109	0.0580	2.5	Pass
	-20	123	0.0656		
	-10	104	0.0555		
	0	85	0.0453		
	10	99	0.0529		
	20	85	0.0453		
	30	142	0.0758		
	40	128	0.0681		
	50	123	0.0656		

Reference Frequency: LTE Band 25 Middle channel 1882.5MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error			Result
		Hz	ppm		
12.0	-30	76	0.0438	2.5	Pass
	-20	84	0.0484		
	-10	72	0.0415		
	0	64	0.0369		
	10	68	0.0392		
	20	60	0.0346		
	30	104	0.0599		
	40	88	0.0507		
	50	84	0.0484		

Reference Frequency: LTE Band 26 Middle channel 836.5MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error			Result
		Hz	ppm		
12.0	-30	140	0.0552	2.5	Pass
	-20	161	0.0636		
	-10	136	0.0535		
	0	118	0.0467		
	10	132	0.0521		
	20	116	0.0456		
	30	193	0.0760		
	40	168	0.0664		
	50	159	0.0629		

7.11 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:	 **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 6.0 for details
Test mode:	Refer to section 7.1 for details
Test results:	Pass

Measurement Data

QPSK mode:

Reference Frequency: LTE Band 12 Middle channel 707.5MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	8	64	0.0339	2.5	Pass
	12	74	0.0391		
	30	83	0.0443		
Reference Frequency: LTE Band 25 Middle channel 1882.5MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	8	128	0.0738	2.5	Pass
	12	93	0.0534		
	30	104	0.0602		
Reference Frequency: LTE Band 26 Middle channel 836.5MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	8	138	0.1947	2.5	Pass
	12	157	0.2219		
	30	176	0.2484		

16QAM mode:

Reference Frequency: LTE Band 12 Middle channel 707.5MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	8	83	0.1169	2.5	Pass
	12	100	0.1420		
	30	100	0.1420		
Reference Frequency: LTE Band 25 Middle channel 1882.5MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	8	178	0.2501	2.5	Pass
	12	132	0.1856		
	30	141	0.1985		
Reference Frequency: LTE Band 26 Middle channel 836.5MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	8	181	0.0963	2.5	Pass
	12	208	0.1104		
	30	209	0.1110		

8 Test Setup Photo

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

9 EUT Constructional Details

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

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