

FCC Report (LTE)

Applicant: Telrad Networks Ltd

Address of Applicant: Industrial Center PO Box 6118 Lod, 711600 Israel

Equipment Under Test (EUT)

Product Name: LTE Multi-mode MiFi

Model No.: EFLINKM1002X

FCC ID: ARA-EFLINKM1002X

Applicable standards: FCC CFR Title 47 Part 2: 2016
FCC CFR Title 47 Part27: 2016

Date of sample receipt: September 23, 2016

Date of Test: September 23-28, 2016

Date of report issued: September 28, 2016

Test Result : PASS *

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

Authorized Signature:

A circular blue ink stamp from GTS Laboratory Testing is visible. The stamp contains the text "GLOBAL UNITED TECHNOLOGY SERVICES CO., LTD.", "GTS", and "LABORATORY TESTING". A handwritten signature in black ink is written over the stamp.

Robinson Lo

Laboratory Manager

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product and does not permit the use of the GTS product certification mark. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

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1 Version

Version No.	Date	Description
00	September 28, 2016	Original

Prepared By:

Edward Pan

Date:

September 28, 2016

Project Engineer

Check By:

Andy Wu

Date:

September 28, 2016

Reviewer

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3 Test Summary

Test Item	Section in CFR 47	Result
RF Exposure (SAR)	Part 1.1307 Part 2.1093	Pass* (Please refer to SAR Report)
Conducted Peak Output Power	Part 2.1046 Part 27.50(h)(2)	Pass
Modulation Characteristics	Part 2.1047	N/A
99% & -26 dB Occupied Bandwidth	Part 2.1049 Part 27.53(m)(6)	Pass
Spurious Emissions at Antenna Terminal	Part 2.1051 Part 27.53(m)(4)/(m)(6)	Pass
Field Strength of Spurious Radiation	Part 2.1053 Part 27.53(m)(4)/(m)(6)	Pass
Out of band emission, Band Edge	Part 27.53(m)(4)/(m)(6)	Pass
Frequency stability vs. temperature	FCC Part27.54 FCC Part2.1055(a)(1)(b)	Pass
Frequency stability vs. voltage	FCC Part27.54 FCC Part2.1055(d)(1)(2)	Pass

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

4 General Information

4.1 Client Information

Applicant:	Telrad Networks Ltd
Address of Applicant:	Industrial Center PO Box 6118 Lod, 711600 Israel

4.2 General Description of EUT

Product Name:	LTE Multi-mode MiFi
Model No.:	EFLINKM1002X
Support Networks:	LTE
Support Bands:	LTE Band 41
Channel Bandwidth:	LTE Band 41: 5MHz; 10MHz; 15MHz; 20MHz
TX Frequency:	LTE Band 41: 2496.00MHz-2690.00MHz
Modulation type:	LTE Band 41: QPSK, 16QAM
Hardware Version:	P2.0
Software Version:	MF_N895_AT2.19_V01_20160810
Antenna type:	Integral Antenna
Antenna gain:	1.5dBi(LTE Band 41)
Power supply:	SWITCHING ADAPTER Model: ASUC37a-050100 Input: 100-240V,50/60Hz,0.3A Output: 5.0V,1.0A Or DC 3.7V 1800mAh Lithium-ion Rechargeable Battery

4.3 Related Submittal(s) / Grant (s)

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

4.4 Test Methodology

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

4.5 Test Facility

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

- **FCC —Registration No.: 600491**

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 600491, June 22, 2016.

- **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, August 15, 2016.

4.6 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.

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

Tel: 0755-27798480

Fax: 0755-27798960

5 Test Instruments list

Radiated Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.0(L)*6.0(W)* 6.0(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	Spectrum Analyzer	Agilent	E4440A	GTS533	June 29 2016	June 28 2017
4	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	June 29 2016	June 28 2017
5	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June 29 2016	June 28 2017
6	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	9120D-829	GTS208	June 29 2016	June 28 2017
7	Horn Antenna	ETS-LINDGREN	3160	GTS217	June 29 2016	June 28 2017
8	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
9	Coaxial Cable	GTS	N/A	GTS213	June 29 2016	June 28 2017
10	Coaxial Cable	GTS	N/A	GTS211	June 29 2016	June 28 2017
11	Coaxial cable	GTS	N/A	GTS210	June 29 2016	June 28 2017
12	Coaxial Cable	GTS	N/A	GTS212	June 29 2016	June 28 2017
13	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June 29 2016	June 28 2017
14	Amplifier(2GHz-20GHz)	HP	8349B	GTS206	June 29 2016	June 28 2017
15	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June 29 2016	June 28 2017
16	Band filter	Amindeon	82346	GTS219	June 29 2016	June 28 2017
17	Wideband Radio Communication Tester	ROHDE&SCHWARZ	CMW 500	GTS539	June 29 2016	June 28 2017

General used equipment:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Barometer	ChangChun	DYM3	GTS257	June 29 2016	June 28 2017

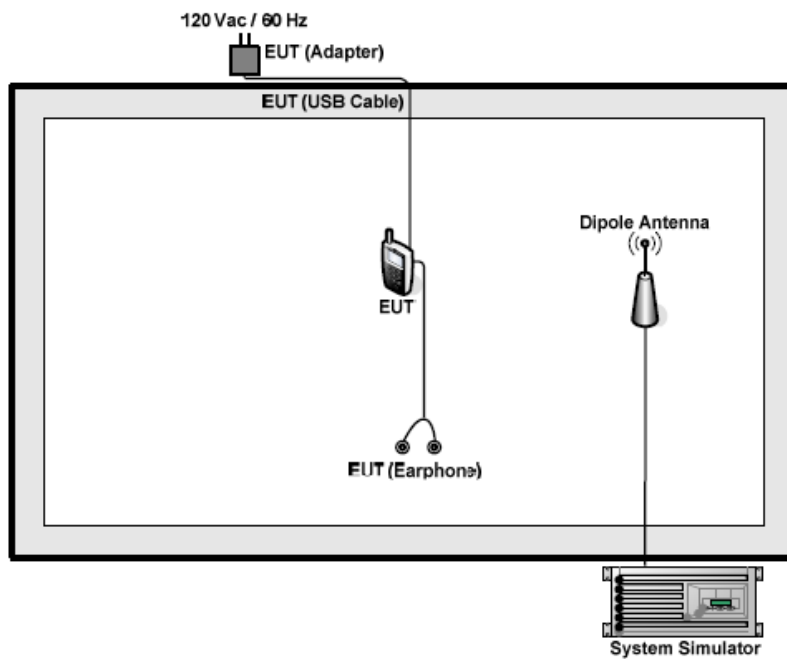
6 System test configuration

6.1 Test mode

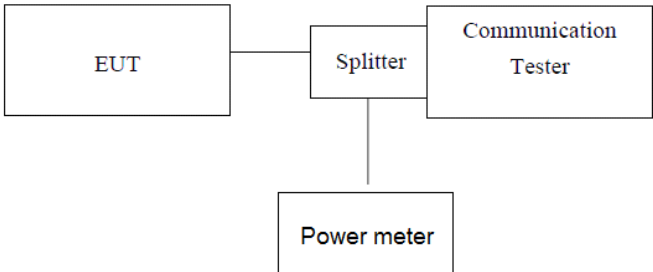
During all testing, EUT is in link mode with base station emulator at maximum power level. The spurious emission measurements were carried out in semi-anechoic chamber with 3-meter test range, and EUT is rotated on three test planes to find out the worst emission.

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

6.2 Configuration of Tested System



6.3 Conducted Peak Output Power

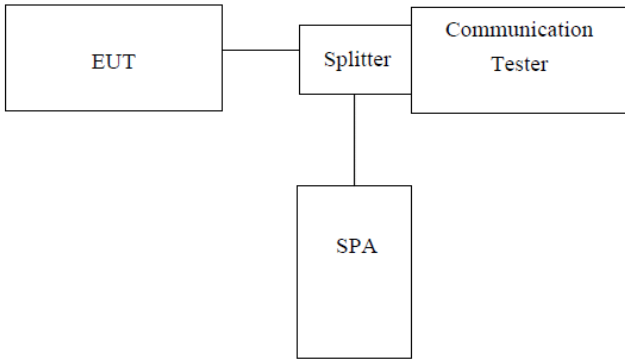
Test Requirement:	Part 27.50(h)(2)
Test Method:	FCC part2.1046
Limit:	LTE Band 41: 2W
Test setup:	 <i>Note: Measurement setup for testing on Antenna connector</i>
Test Procedure:	1. The transmitter output port was connected to base station. 2. The RF output of EUT was connected to the power meter by RF cable and attenuator, the path loss was compensated to the results for each measurement. 3. Set EUT at maximum power through base station. 4. Select lowest, middle, and highest channels for each band and different modulation. 5. Measure the maximum burst average power.
Test Instruments:	Refer to section 5.0 for details
Test mode:	Refer to section 6.1 for details
Test results:	Pass

Measurement Data

Band 41						
Bandwidth	Mode	RB Size	RB Offset	Actual output power(dBm)		
				Channel 39675 2498.5MHz	Channel 40620 2593MHz	Channel 41565 2687.5MHz
5MHz	QPSK	1	0	21.12	20.74	20.37
		1	13	21.11	20.65	20.22
		1	24	21.09	20.63	20.10
		12	0	21.06	20.72	20.43
		12	6	21.09	20.65	20.36
		12	13	21.03	20.71	20.32
		25	0	21.14	20.89	20.37
	16QAM	1	0	21.03	20.58	20.32
		1	13	21.06	20.53	20.15
		1	24	21.06	20.54	20.08
		12	0	21.02	20.64	20.42
		12	6	21.06	20.57	20.35
		12	13	21.01	20.63	20.31
		25	0	21.06	20.81	20.33
Bandwidth	Mode	RB Size	RB Offset	Actual output power(dBm)		
				Channel 39700 2501MHz	Channel 40620 2593MHz	Channel 41540 2685MHz
10MHz	QPSK	1	0	21.13	20.73	20.31
		1	25	21.12	20.73	20.48
		1	49	21.28	20.77	20.28
		25	0	21.19	20.85	20.52
		25	13	21.17	20.95	20.48
		25	25	21.18	20.83	20.37
		50	0	21.19	20.79	20.45
	16QAM	1	0	21.06	20.65	20.28
		1	25	21.09	20.68	20.50
		1	49	21.13	20.62	20.24
		25	0	21.12	20.73	20.49
		25	13	21.16	20.88	20.46
		25	25	21.17	20.72	20.35
		50	0	21.68	20.71	20.42
Bandwidth	Mode	RB Size	RB Offset	Actual output power(dBm)		
				Channel 39725 2503.5MHz	Channel 40620 2593MHz	Channel 41515 2682.5MHz
15MHz	QPSK	1	0	21.21	20.93	20.51
		1	38	21.16	20.76	20.35
		1	74	21.17	20.58	20.05
		36	0	21.21	20.83	20.51

		36	18	21.16	20.88	20.44
		36	39	21.22	20.77	20.36
		75	0	21.15	20.82	20.45
	16QAM	1	0	21.18	20.75	20.45
		1	38	21.14	20.69	20.33
		1	74	21.08	20.49	20.03
		36	0	21.19	20.76	20.46
		36	18	21.14	20.68	20.39
		36	39	21.13	20.71	20.43
		75	0	21.13	20.71	20.43
Bandwidth	Mode	RB Size	RB Offset	Actual output power(dBm)		
				Channel 39750 2506MHz	Channel 40620 2593MHz	Channel 41490 2680MHz
20MHz	QPSK	1	0	21.11	20.39	20.13
		1	50	21.41	20.82	20.66
		1	99	20.50	20.28	19.89
		50	0	21.25	20.71	20.51
		50	25	21.21	20.81	20.44
		50	50	21.23	20.77	20.38
		100	0	21.10	20.80	20.47
	16QAM	1	0	21.02	20.32	20.11
		1	50	21.36	20.77	20.61
		1	99	20.44	20.18	19.85
		50	0	21.23	20.65	20.49
		50	25	21.19	20.76	20.38
		50	50	21.18	20.69	20.35
		100	0	21.03	20.73	20.43

6.4 Occupied Bandwidth

Test Requirement:	FCC Part 27.53(m)(6)
Test Method:	FCC part2.1049
Test setup:	 <i>Note: Measurement setup for testing on Antenna connector</i>
Test Procedure:	1. The EUT's output RF connector was connected with a short cable to the spectrum analyzer 2. RBW was set to about 1% of emission BW, VBW= 3 times RBW. 3. -26dBc display line was placed on the screen (or 99% bandwidth), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace.
Test Instruments:	Refer to section 5.0 for details
Test mode:	Refer to section 6.1 for details
Test results:	Pass

Measurement Data

QPSK mode:

EUT Mode	Channel Bandwidth	Channel	RB Configure		99% Occupy bandwidth (KHz)	-26dB bandwidth (KHz)
			RB Size	RB Offset		
LTE Band 41	5MHz	Low range	25	0	4497.0	5468.0
		Mid range	25	0	4513.4	5499.0
		High range	25	0	4495.8	5337.0
	10MHz	Low range	50	0	8915.5	9813.0
		Mid range	50	0	8934.5	10246.0
		High range	50	0	8912.2	9786.0
	15MHz	Low range	75	0	13480.2	15455.0
		Mid range	75	0	13495.1	15496.0
		High range	75	0	13480.7	15440.0
	20MHz	Low range	100	0	17833.5	20492.0
		Mid range	100	0	17835.3	21227.0
		High range	100	0	17911.0	21021.0

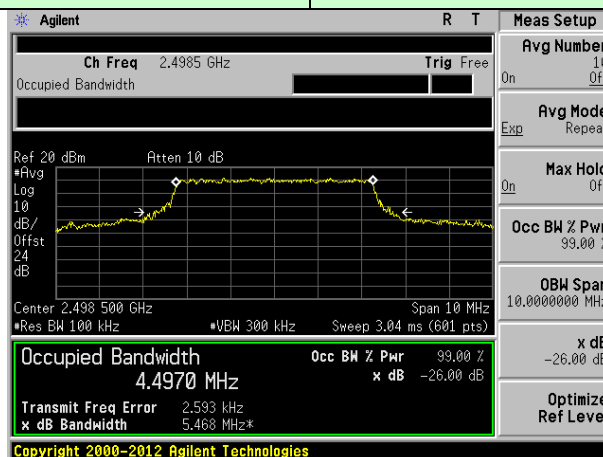
16QAM mode:

EUT Mode	Channel Bandwidth	Channel	RB Configure		99% Occupy bandwidth (KHz)	-26dB bandwidth (KHz)
			RB Size	RB Offset		
LTE Band 41	5MHz	Low range	25	0	4518.4	5532.0
		Mid range	25	0	4524.7	5722.0
		High range	25	0	4516.9	5534.0
	10MHz	Low range	50	0	8937.4	10770.0
		Mid range	50	0	8936.3	9998.0
		High range	50	0	8914.9	9927.0
	15MHz	Low range	75	0	13488.7	15777.0
		Mid range	75	0	13528.5	16364.0
		High range	75	0	13498.2	16163.0
	20MHz	Low range	100	0	17830.9	23957.0
		Mid range	100	0	17891.1	22577.0
		High range	100	0	17849.1	21613.0

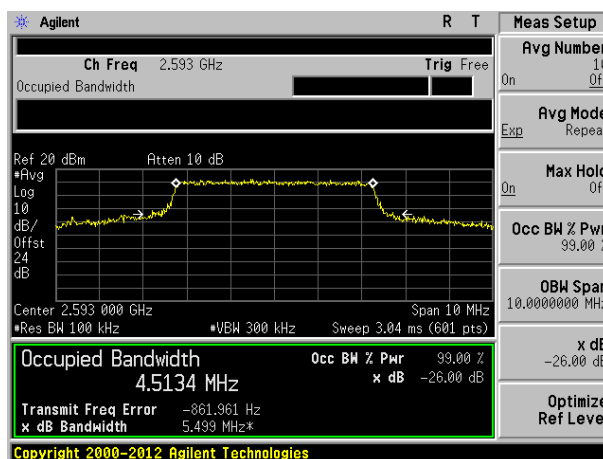
Test plot as follows:

QPSK mode:

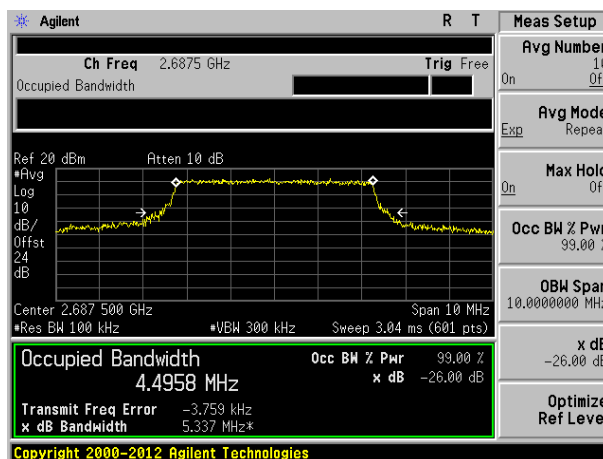
Test band: LTE Band 41	Channel Bandwidth: 5MHz
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Lowest channel

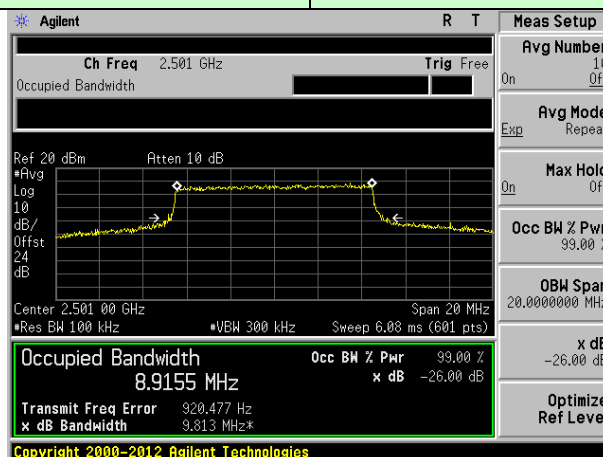


Middle channel

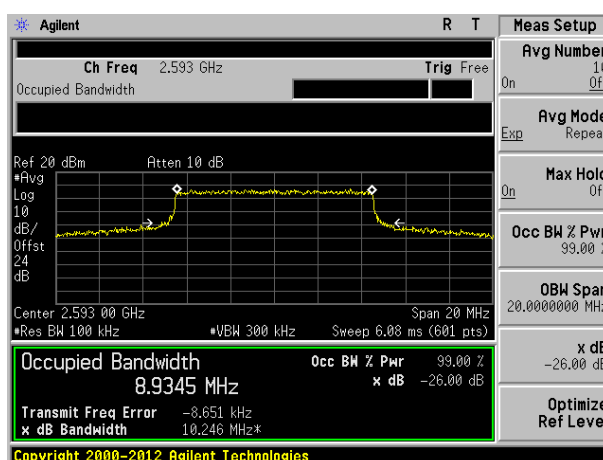


Highest channel

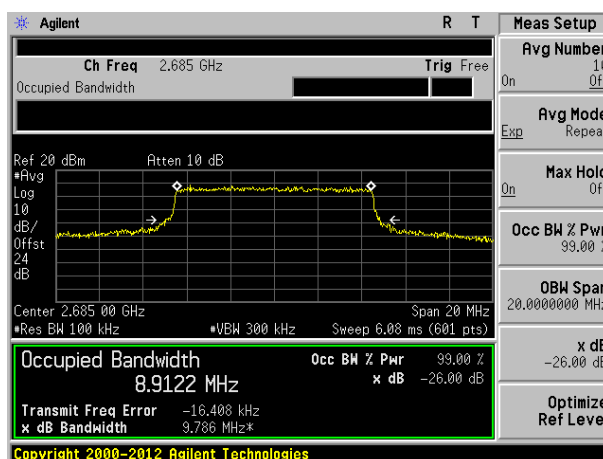
Test band: LTE Band 41	Channel Bandwidth: 10MHz
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Lowest channel

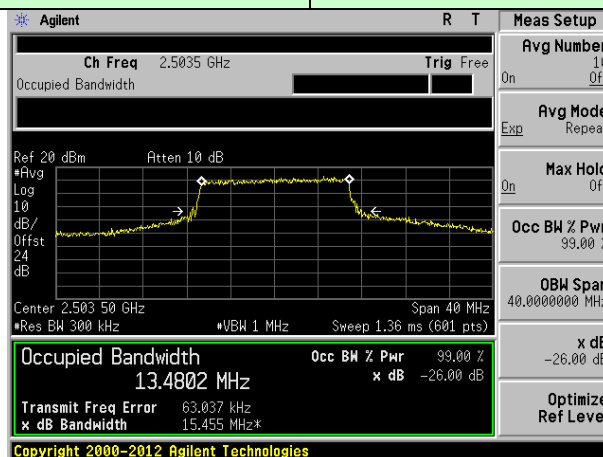


Middle channel

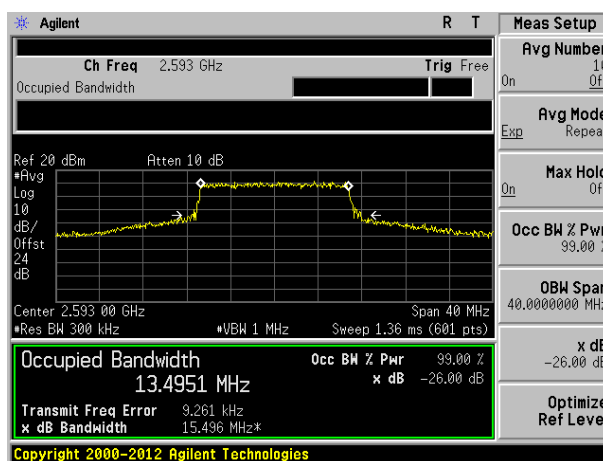


Highest channel

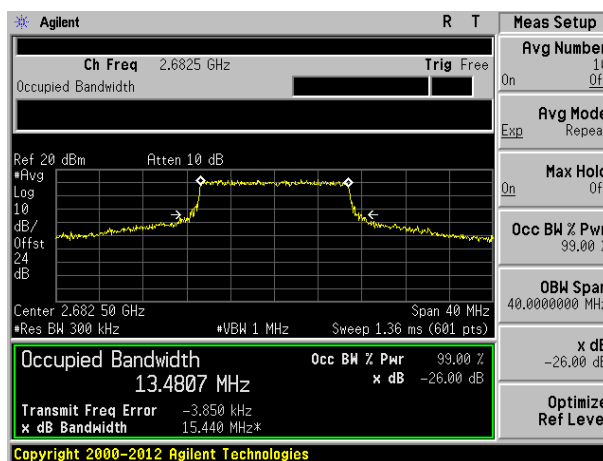
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Lowest channel

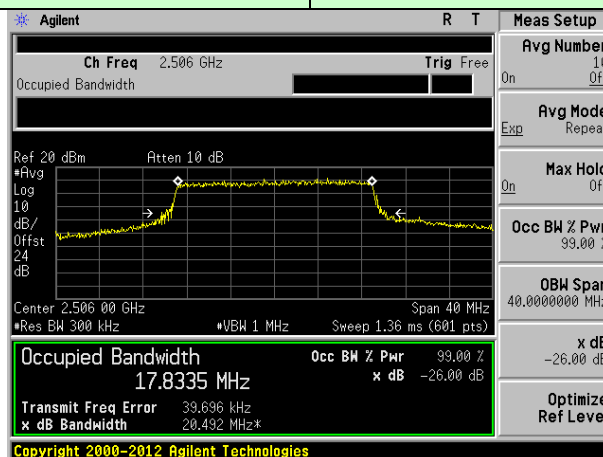


Middle channel

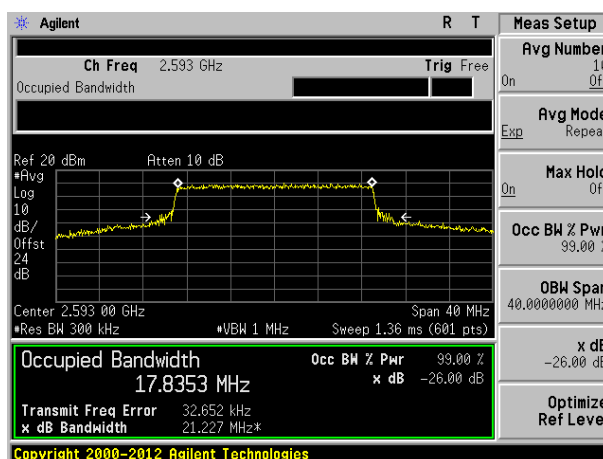


Highest channel

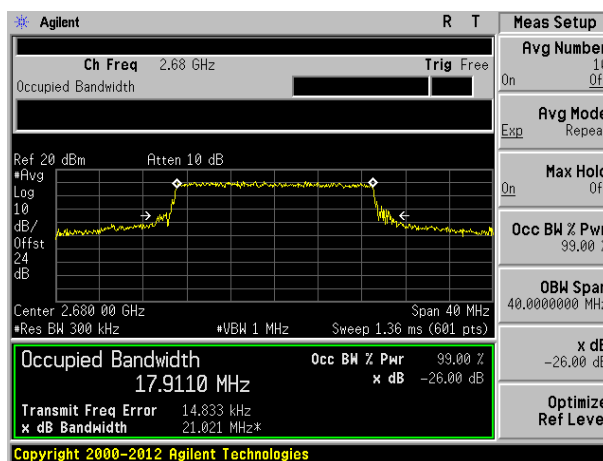
Test band: LTE Band 41	Channel Bandwidth: 20MHz
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Lowest channel



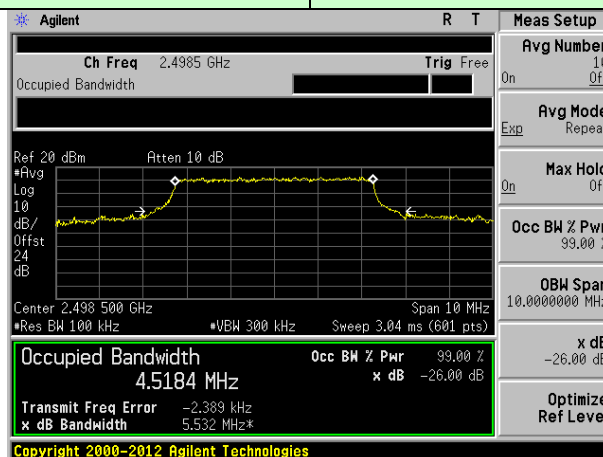
Middle channel



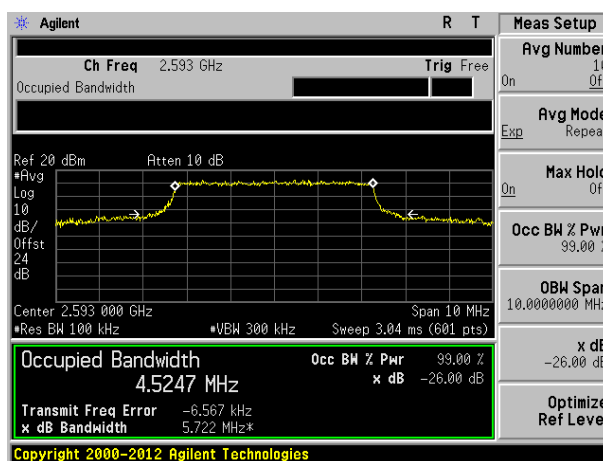
Highest channel

16QAM mode:

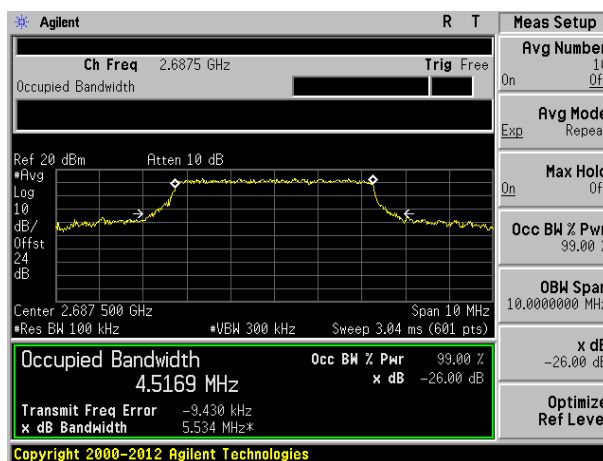
Test band: LTE Band 41	Channel Bandwidth: 5MHz
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Lowest channel

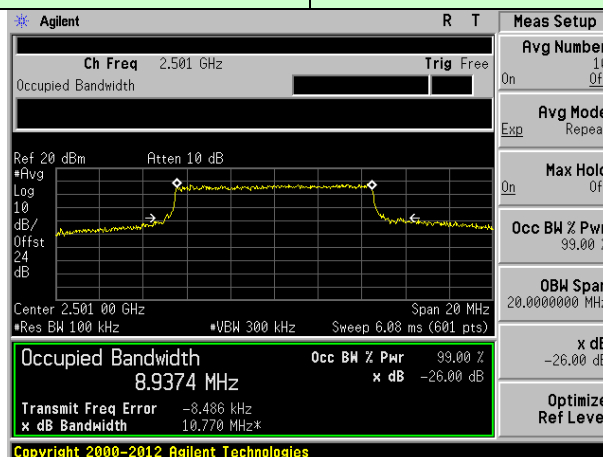


Middle channel

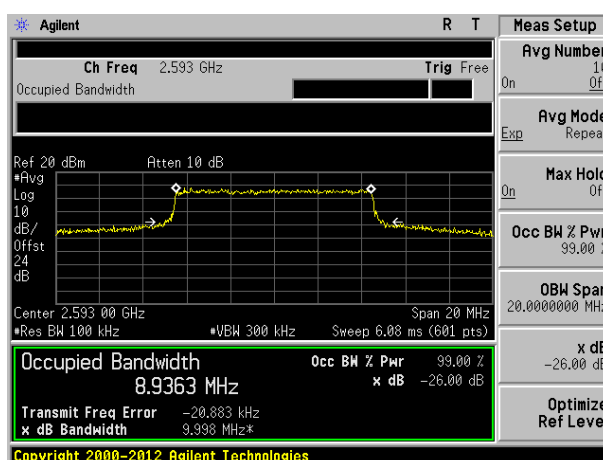


Highest channel

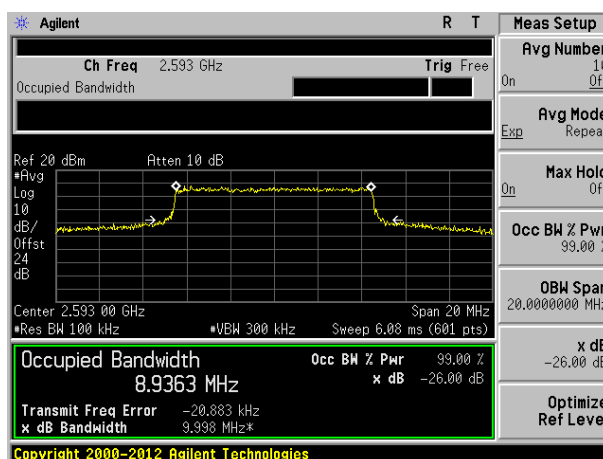
Test band: LTE Band 41	Channel Bandwidth: 10MHz
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Lowest channel

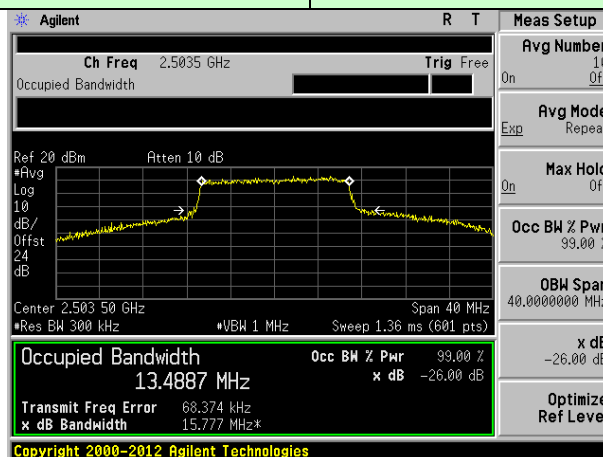


Middle channel

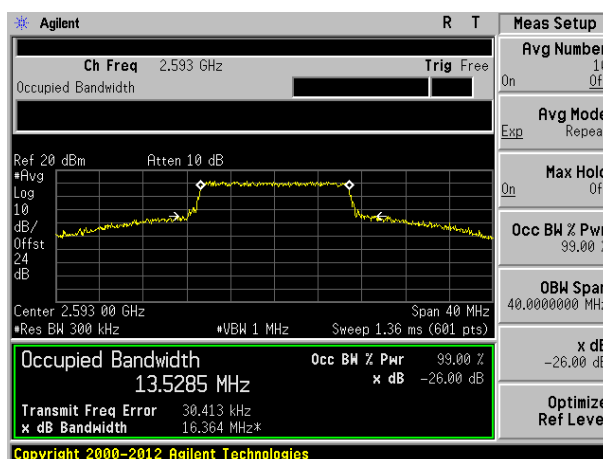


Highest channel

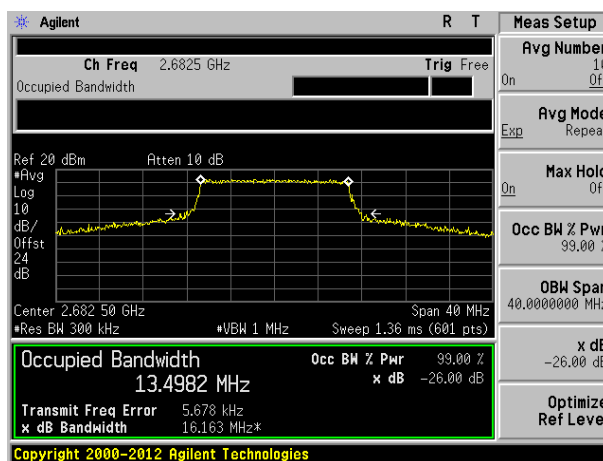
Test band: LTE Band 41	Channel Bandwidth: 15MHz
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Lowest channel

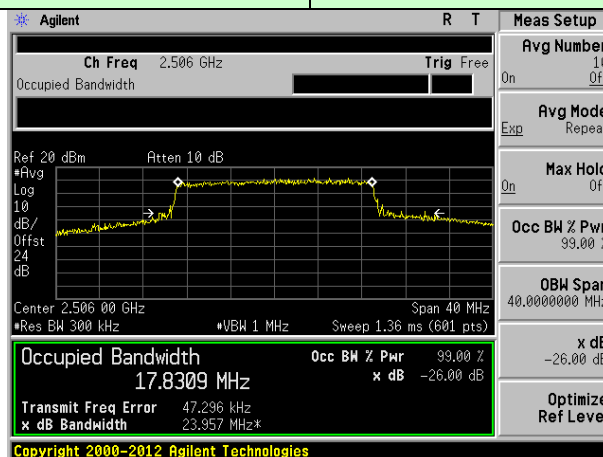


Middle channel

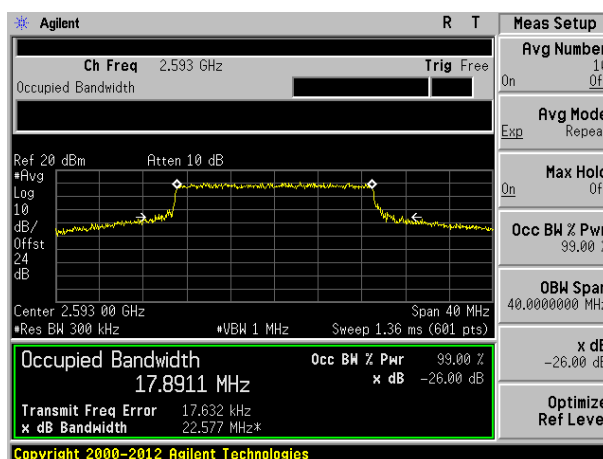


Highest channel

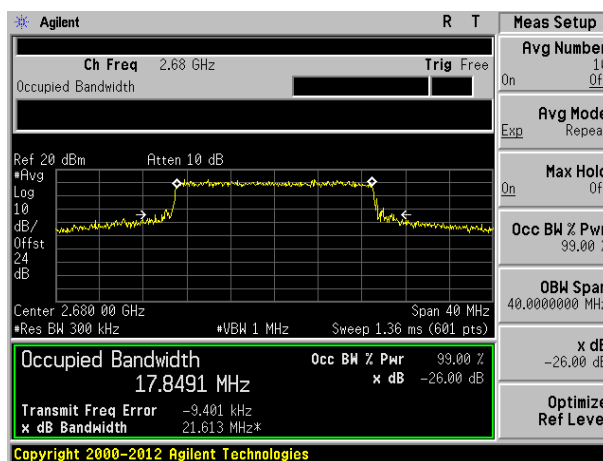
Test band: LTE Band 41	Channel Bandwidth: 20MHz
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Lowest channel



Middle channel

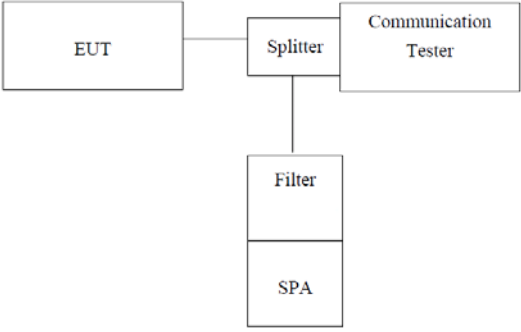


Highest channel

6.5 MODULATION CHARACTERISTIC

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

6.6 Out of band emission at antenna terminals

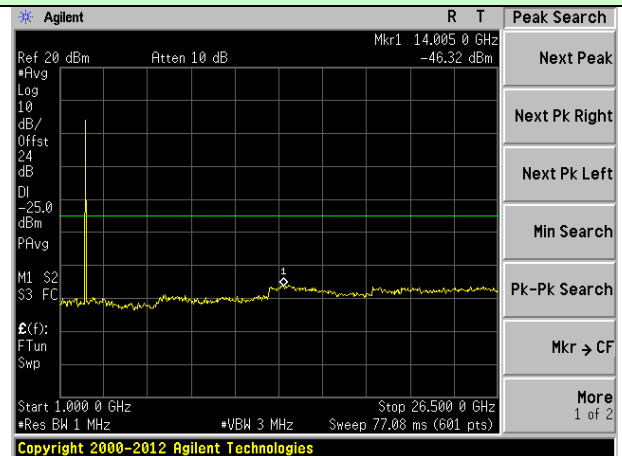
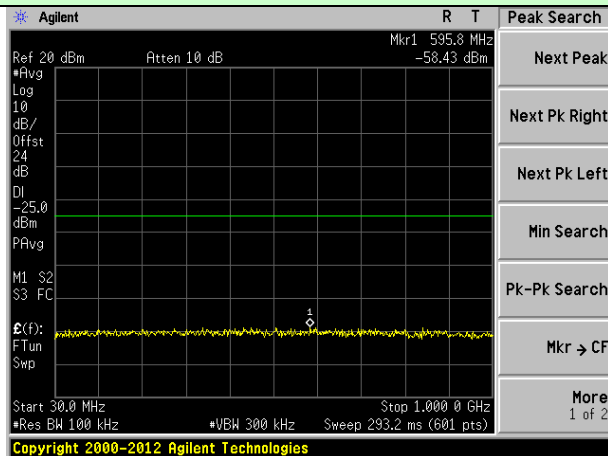
Test Requirement:	FCC Part 27.53(m)(4)/(m)(6)
Test Method:	FCC part2.1051
Limit:	-25dBm
Test setup:	 <i>Note: Measurement setup for testing on Antenna connector</i>
Test Procedure:	1 The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. 2 The resolution bandwidth of the spectrum analyzer was set at 1MHz, sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic. 3 For the out of band: Set the RBW, VBW = 1MHz, Start=30MHz, Stop= 10th harmonic. 4 the attenuation factor shall be not less than $40 + 10 \log (P)$ dB on all frequencies between the channel edge and 5 megahertz from the channel edge, $43 + 10 \log (P)$ dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and $55 + 10 \log (P)$ dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less than $43 + 10 \log (P)$ dB on all frequencies between 2490.5 MHz and 2496 MHz and $55 + 10 \log (P)$ dB at or below 2490.5MHz.
Test Instruments:	Refer to section 5.0 for details
Test mode:	Refer to section 6.1 for details
Test results:	Pass

Test plot as follows:

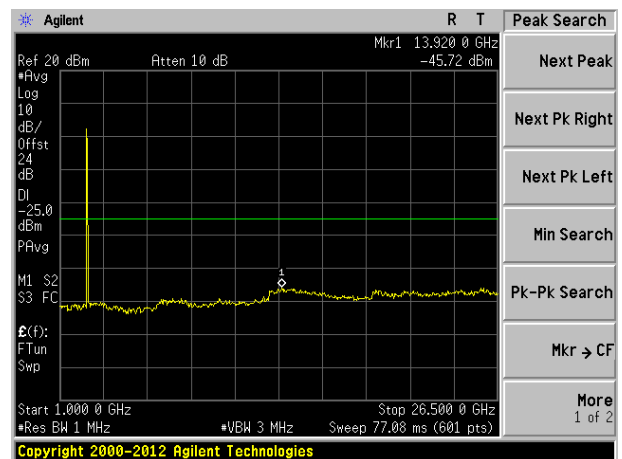
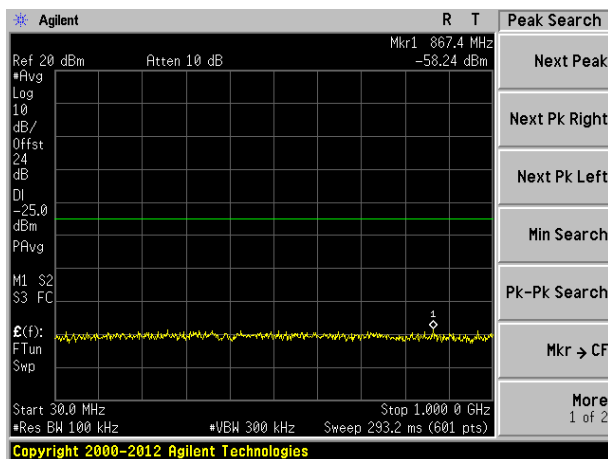
QPSK mode:

Test Mode: LTE Band 41

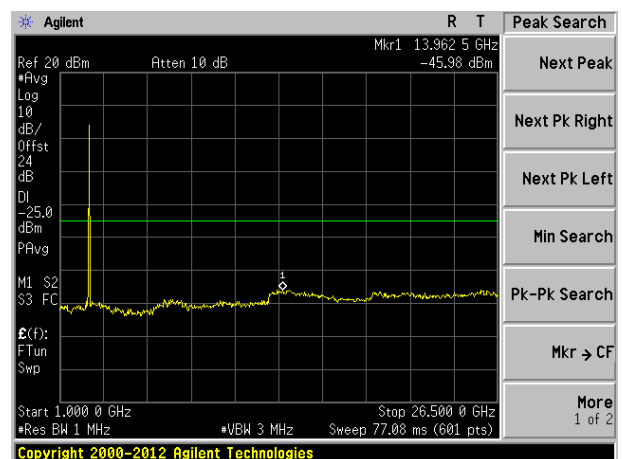
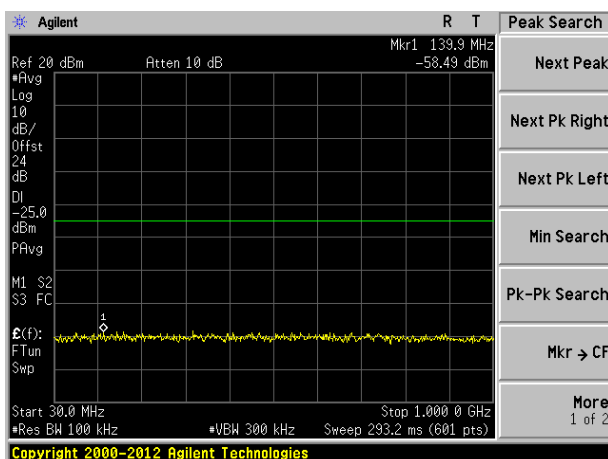
Channel Bandwidth: 5MHz



Lowest channel



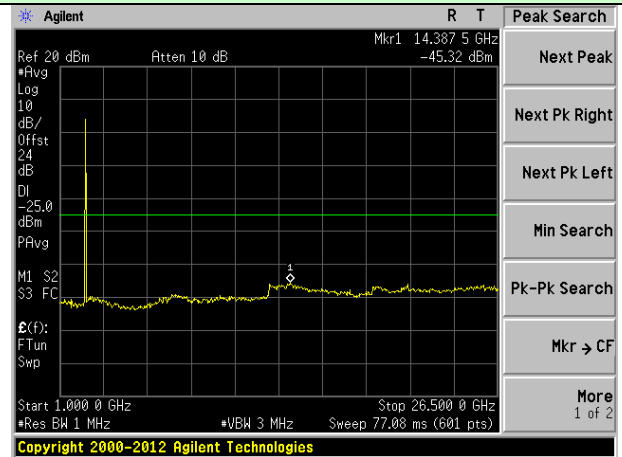
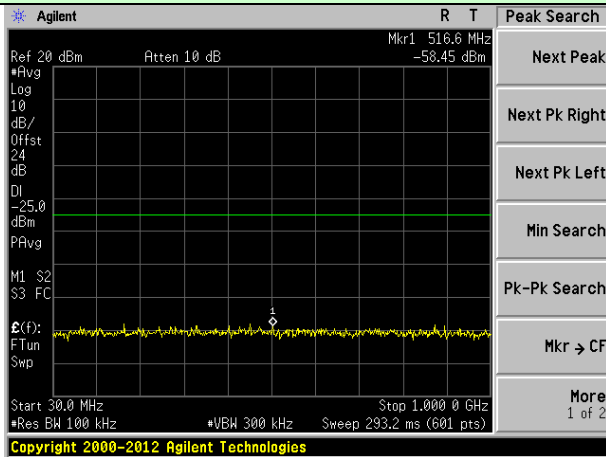
Middle channel



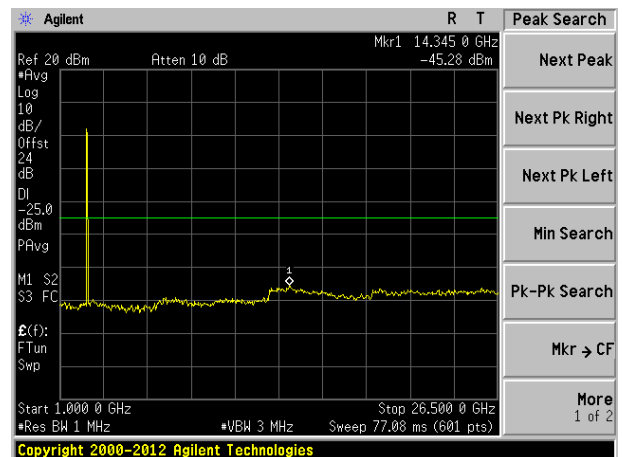
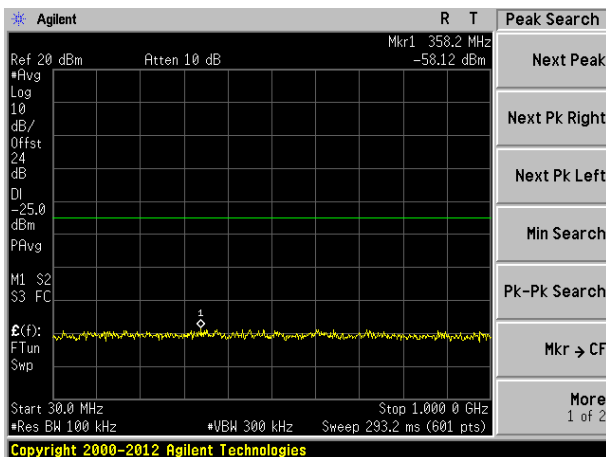
Highest channel

Test Mode: LTE Band 41

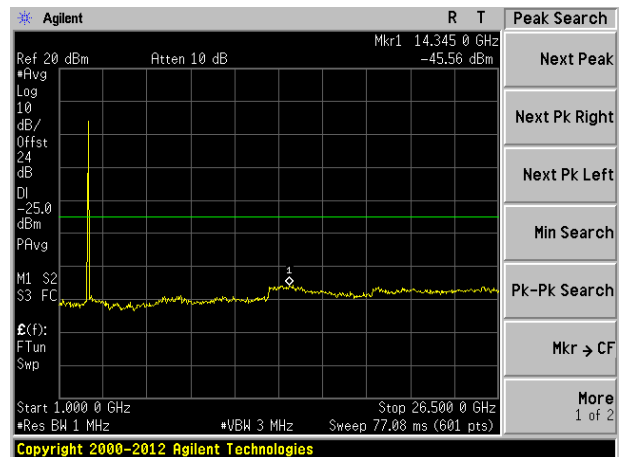
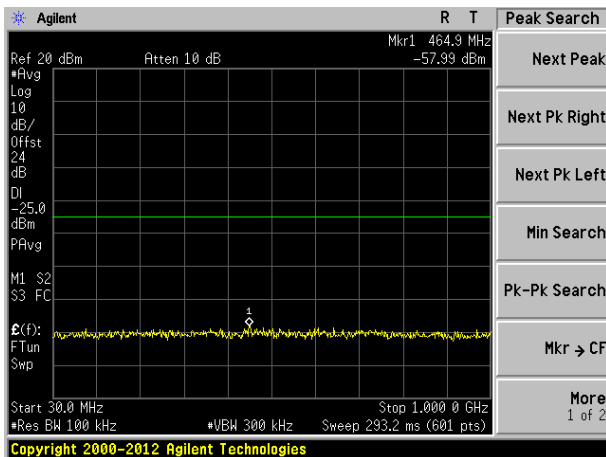
Channel Bandwidth: 10MHz



Lowest channel

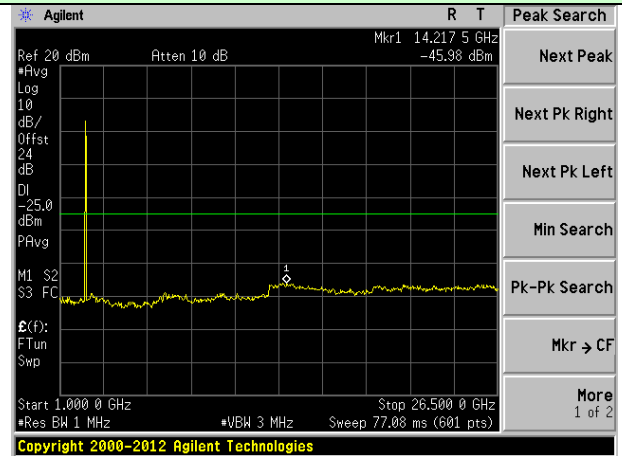
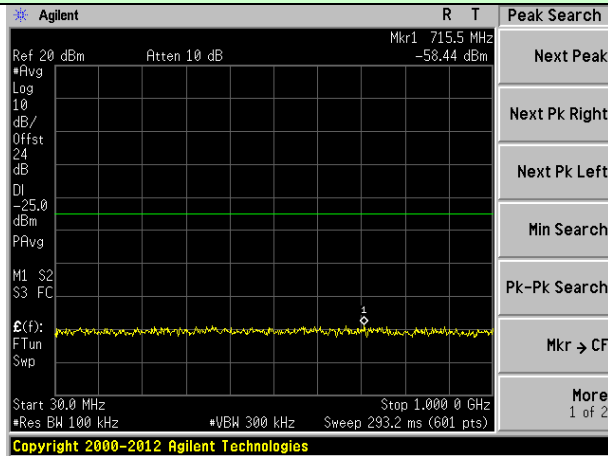


Middle channel

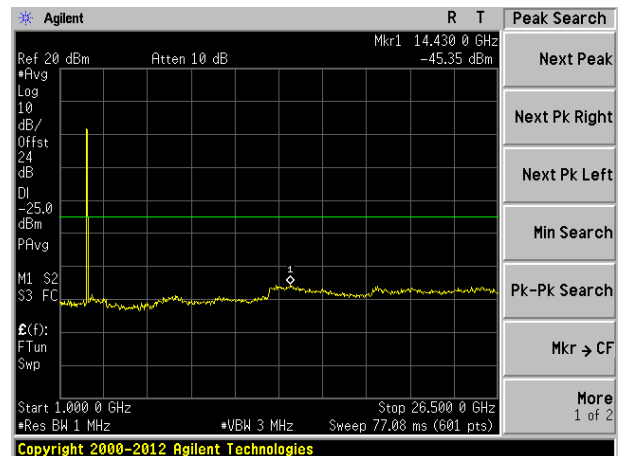
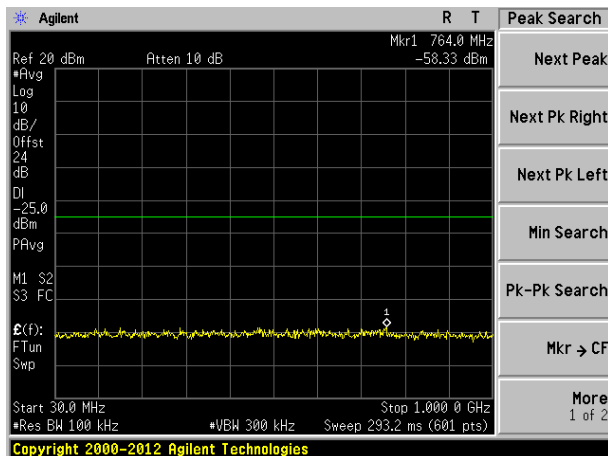


Highest channel

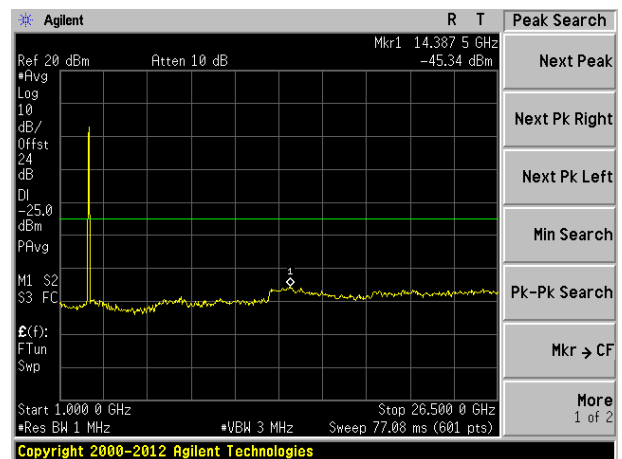
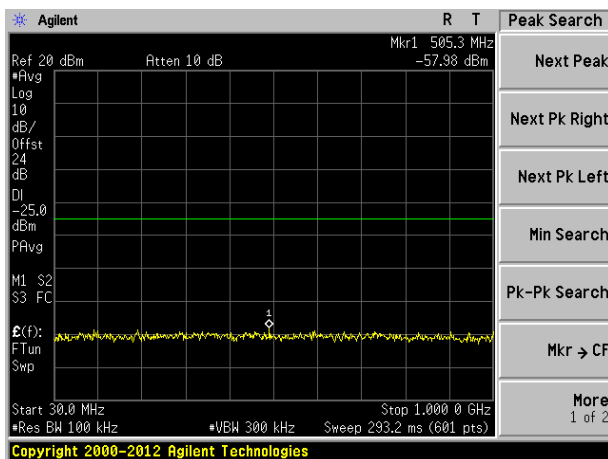
Test Mode: LTE Band 41	Channel Bandwidth: 15MHz
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Lowest channel

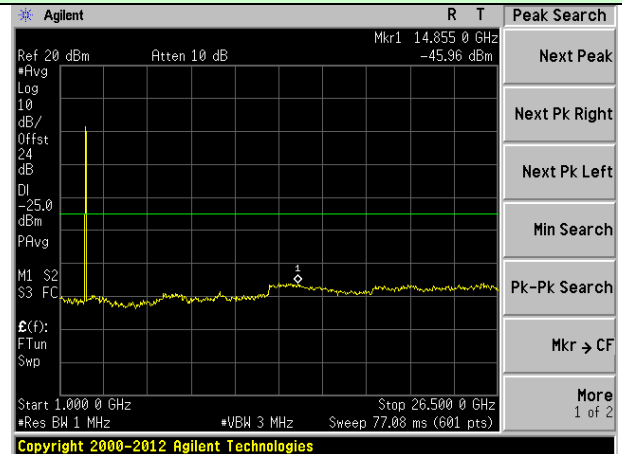
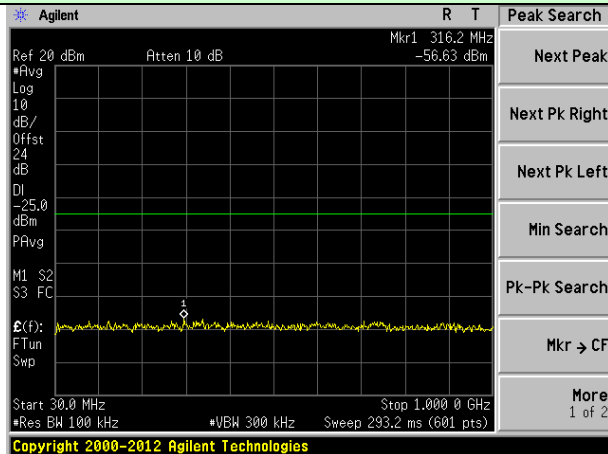


Middle channel

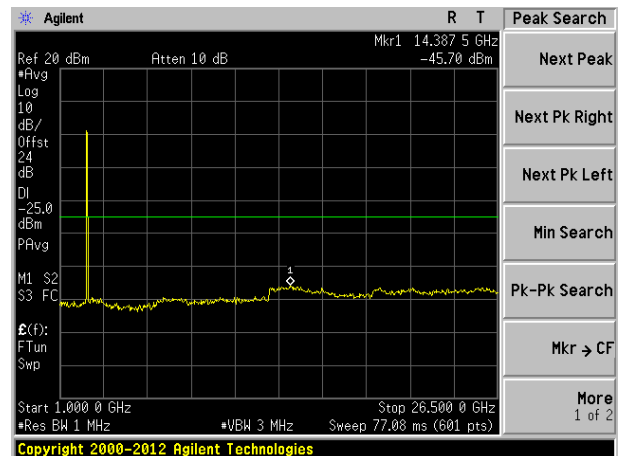
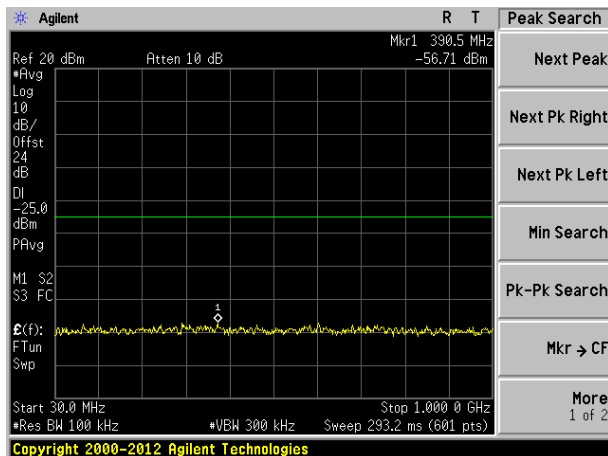


Highest channel

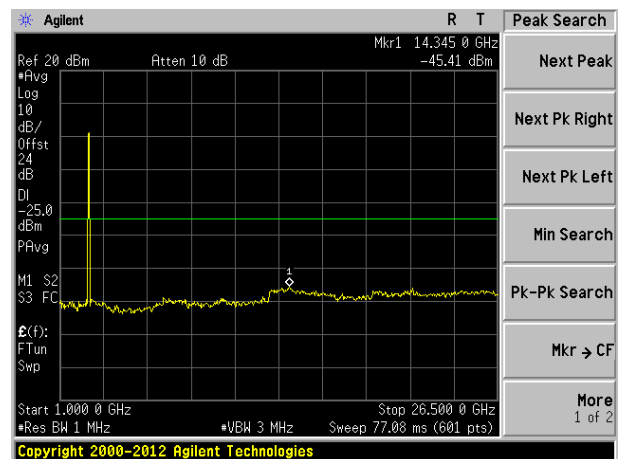
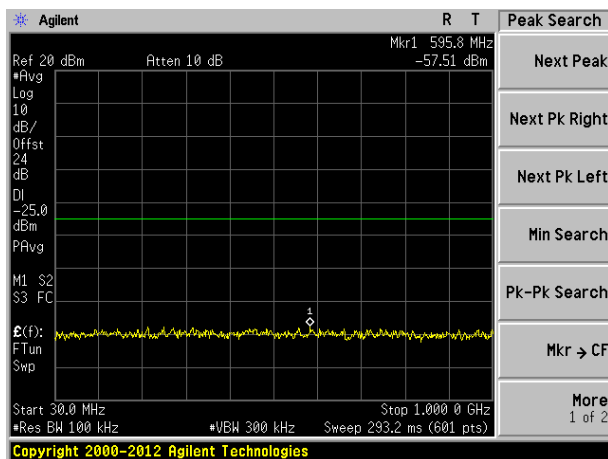
Test Mode: LTE Band 41	Channel Bandwidth: 20MHz
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Lowest channel



Middle channel

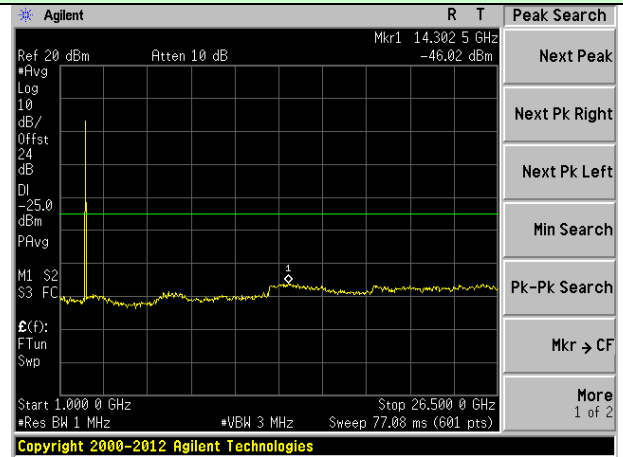
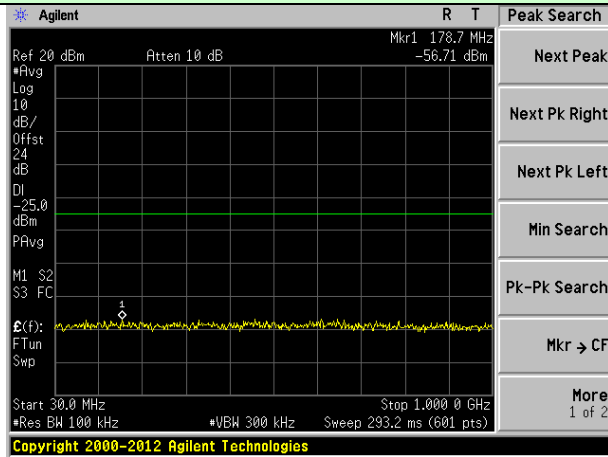


Highest channel

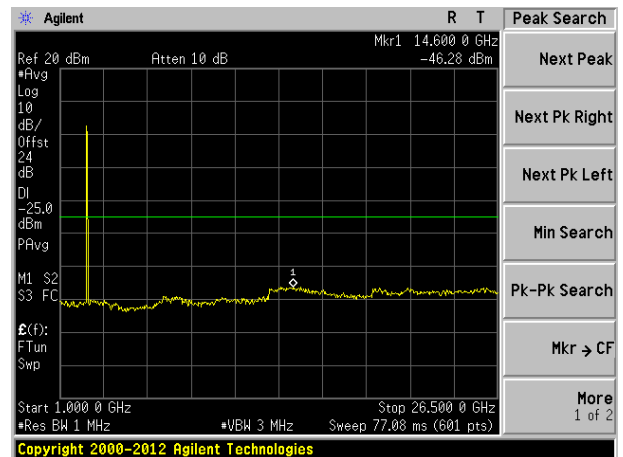
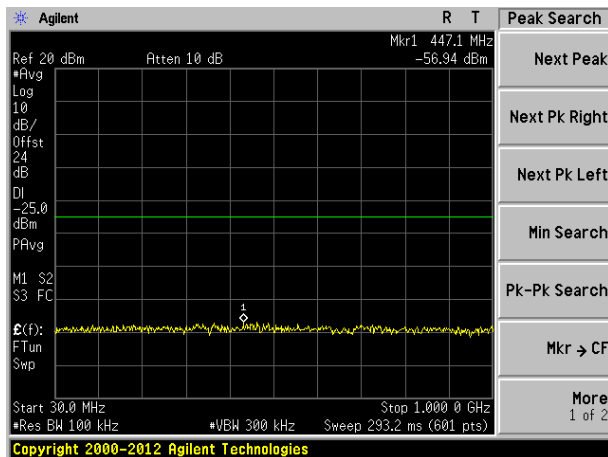
16QAM mode:

Test Mode: LTE Band 41

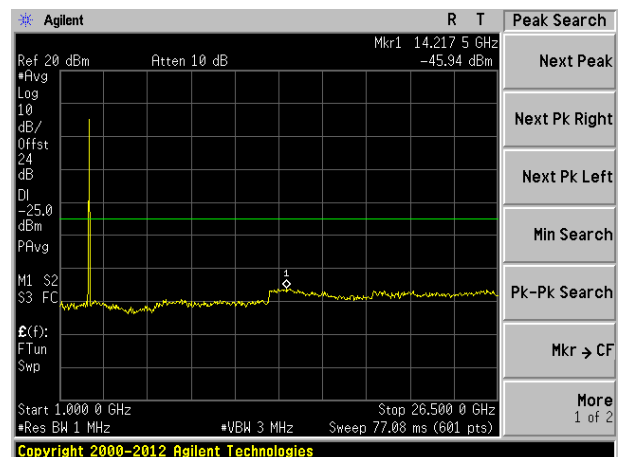
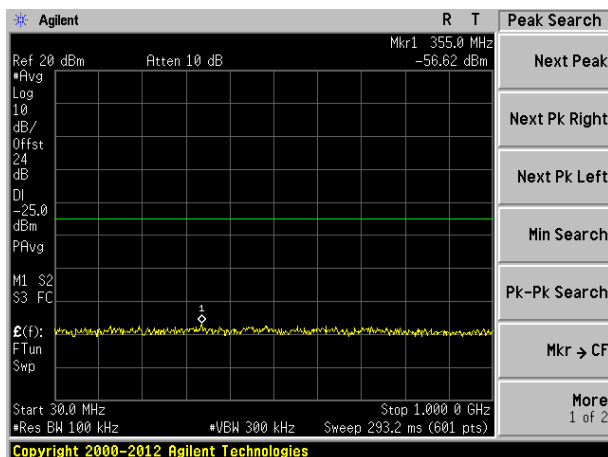
Channel Bandwidth: 5MHz



Lowest channel



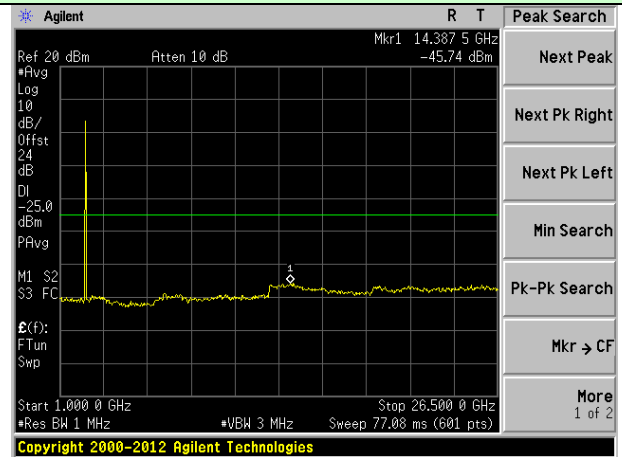
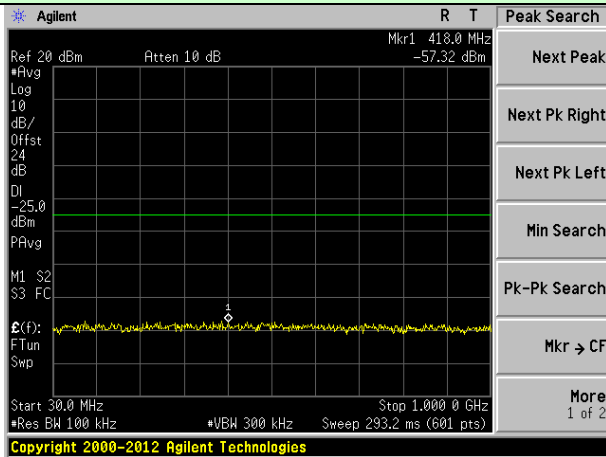
Middle channel



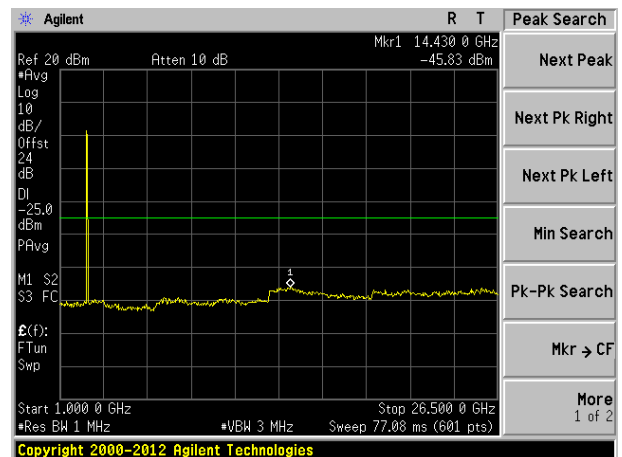
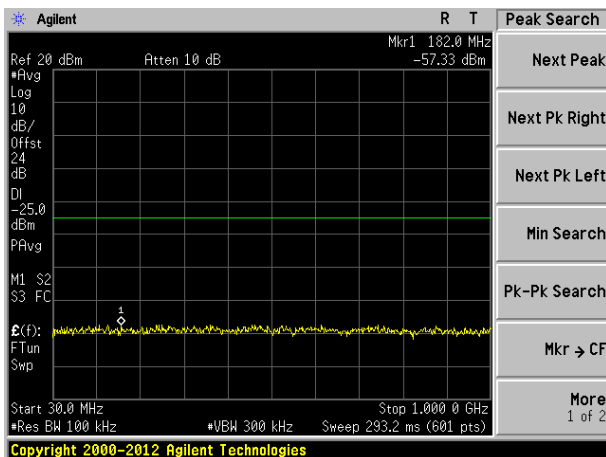
Highest channel

Test Mode: LTE Band 41

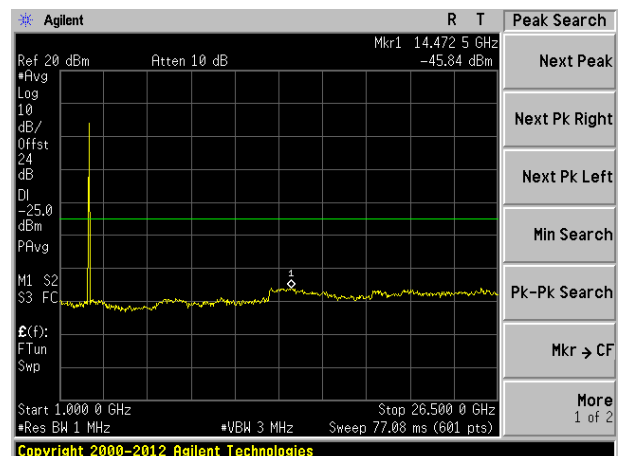
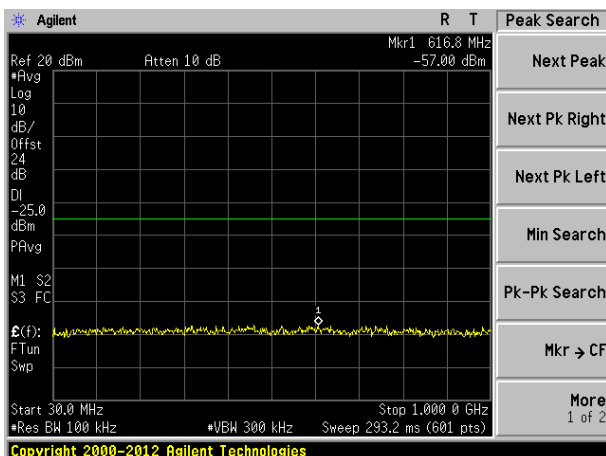
Channel Bandwidth: 10MHz



Lowest channel

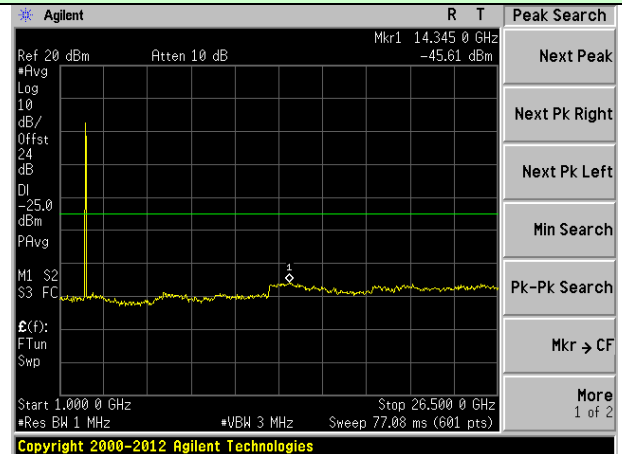
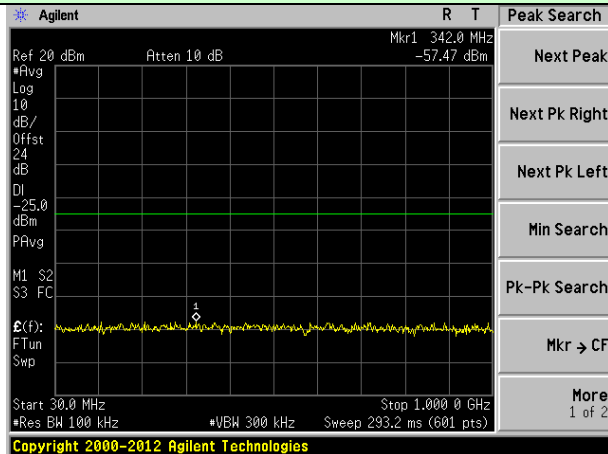


Middle channel

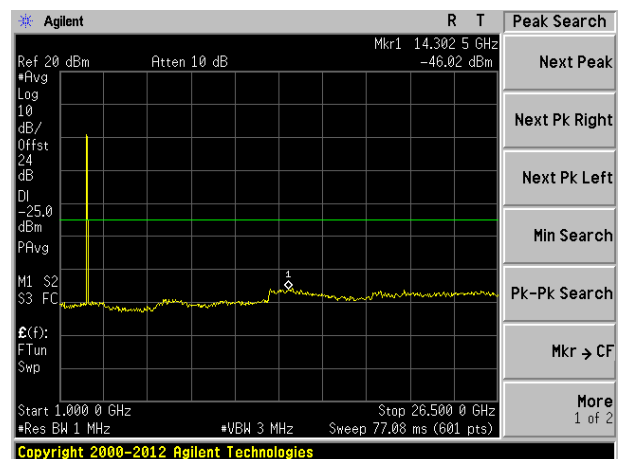
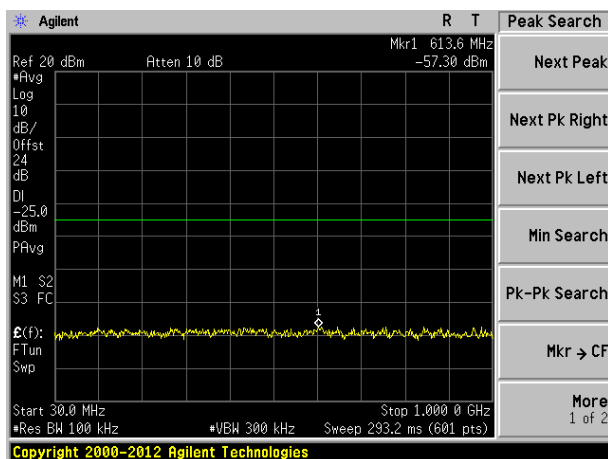


Highest channel

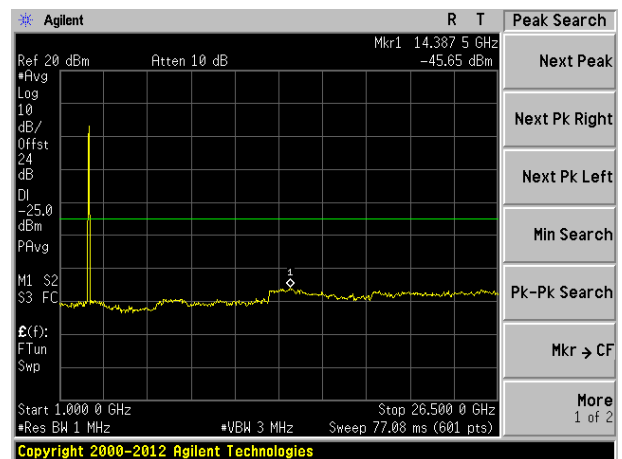
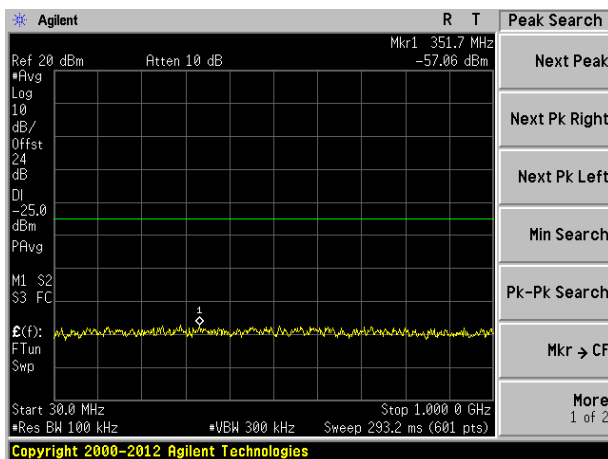
Test Mode: LTE Band 41	Channel Bandwidth: 15MHz
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Lowest channel

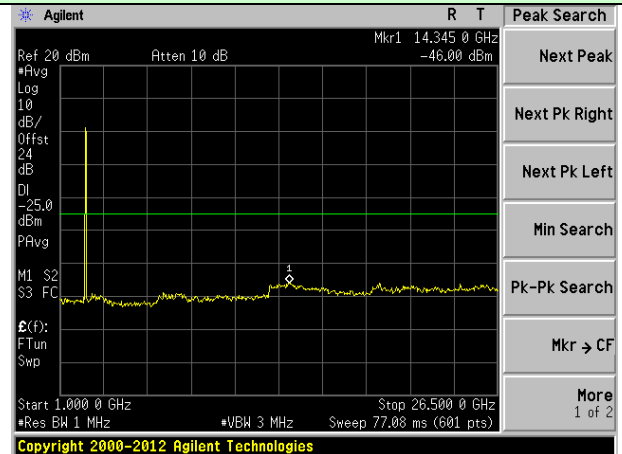
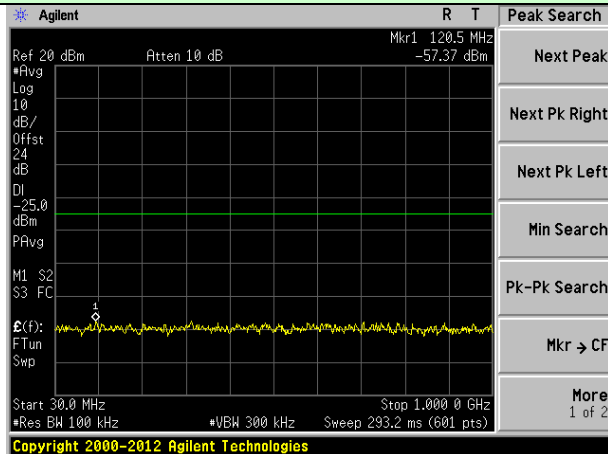


Middle channel

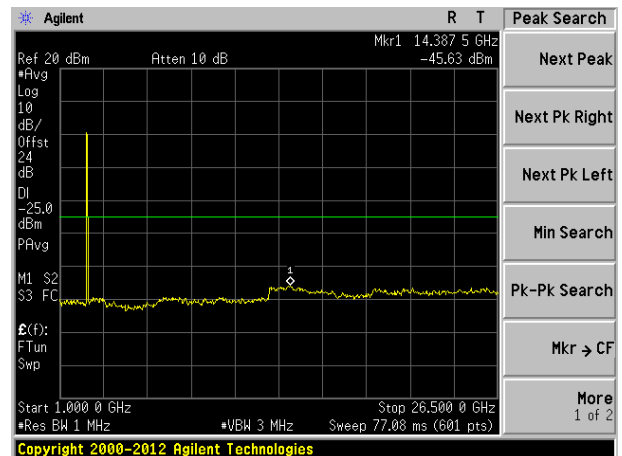
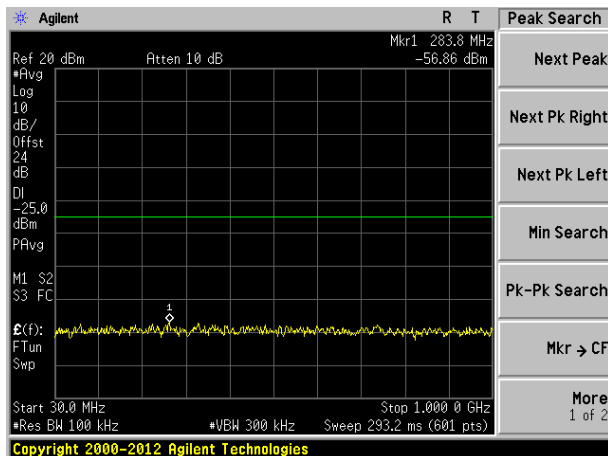


Highest channel

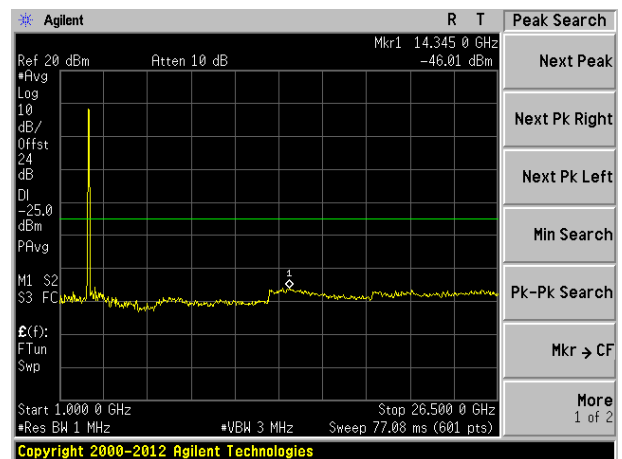
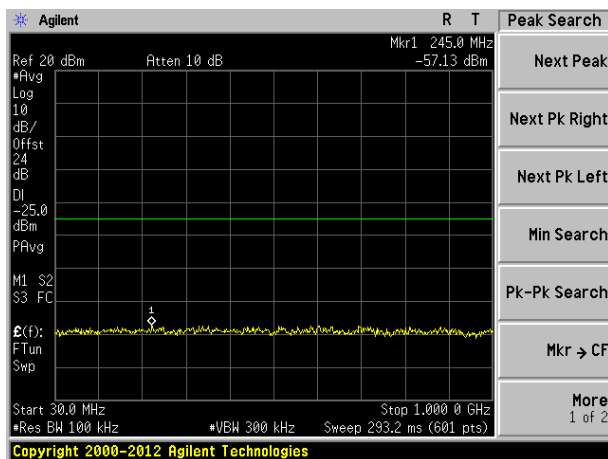
Test Mode: LTE Band 41	Channel Bandwidth: 20MHz
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Lowest channel



Middle channel

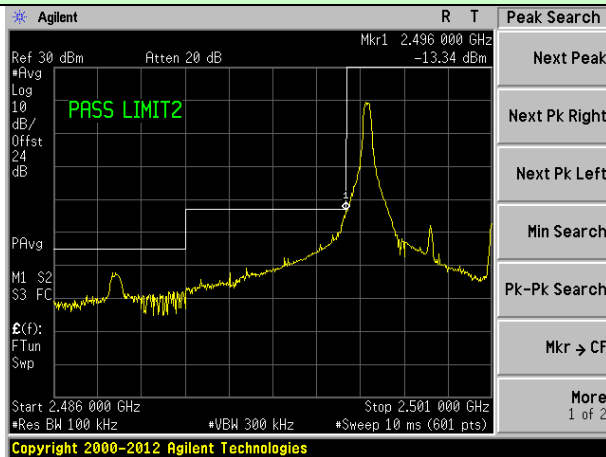


Highest channel

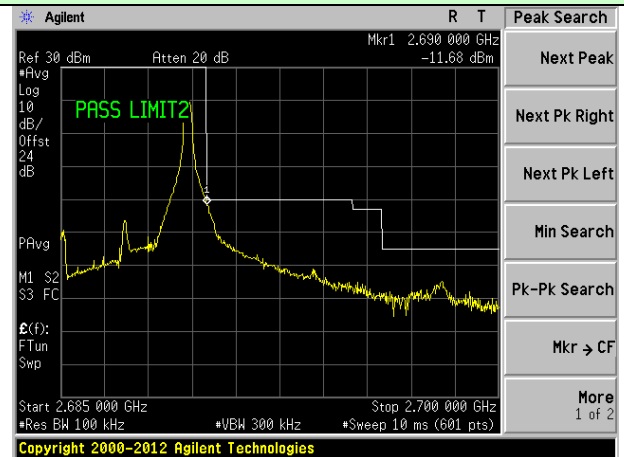
Band Edge:

LTE Band 41(QPSK mode)

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



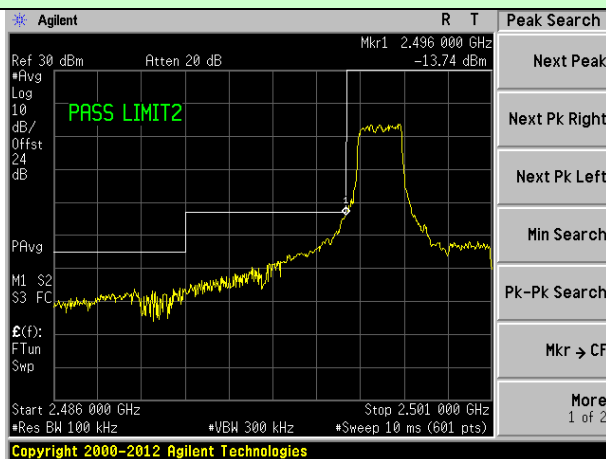
5MHz Bandwidth (RB size:1# RB offset:24#)



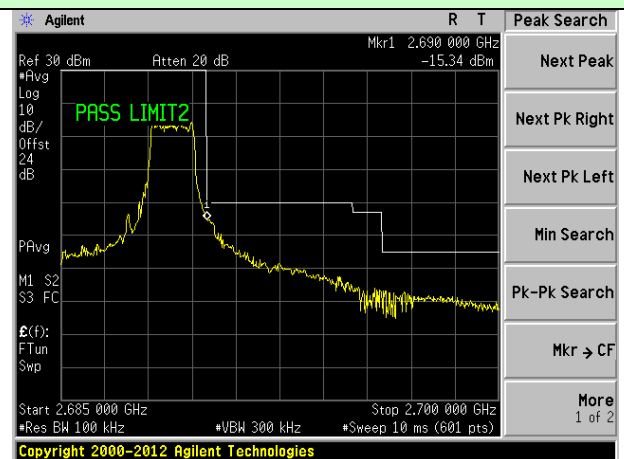
Lowest channel

Highest channel

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



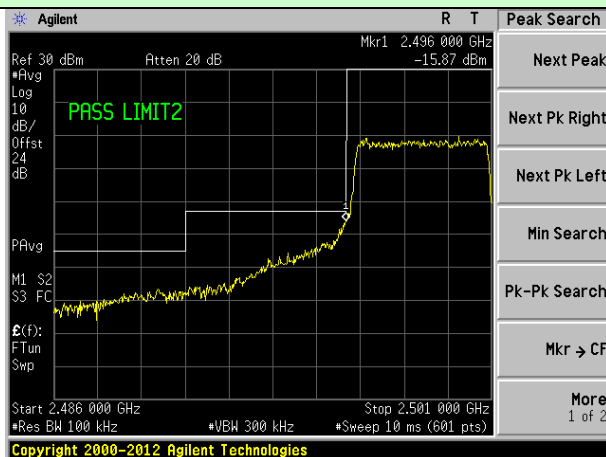
5MHz Bandwidth (RB size:12# RB offset:13#)



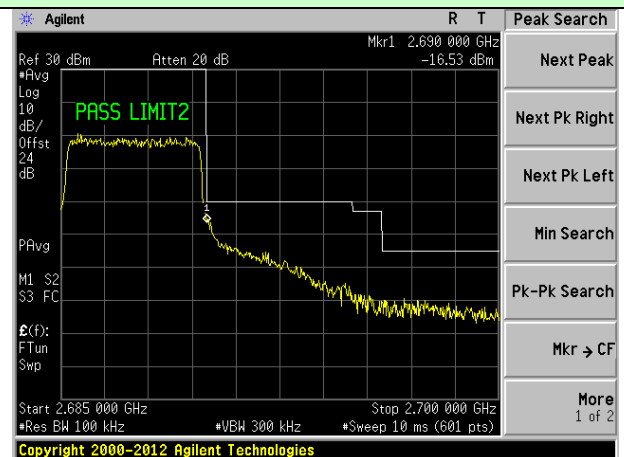
Lowest channel

Highest channel

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



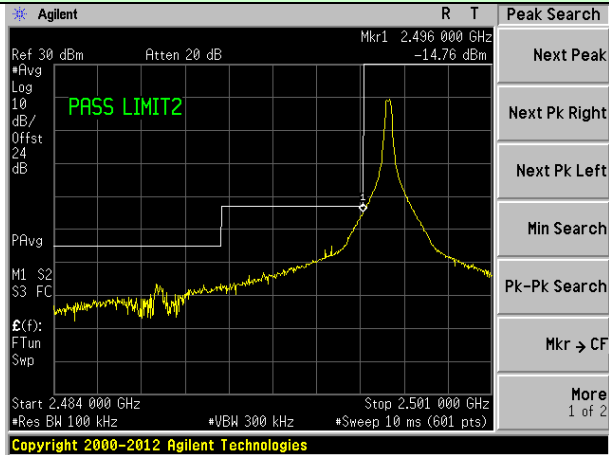
5MHz Bandwidth (RB size:25# RB offset:0#)



Lowest channel

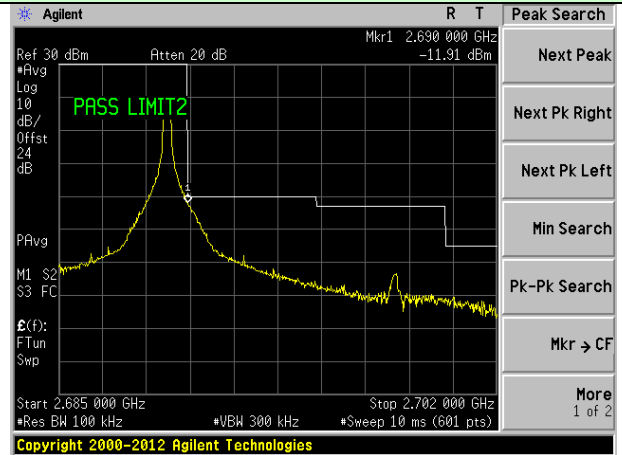
Highest channel

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



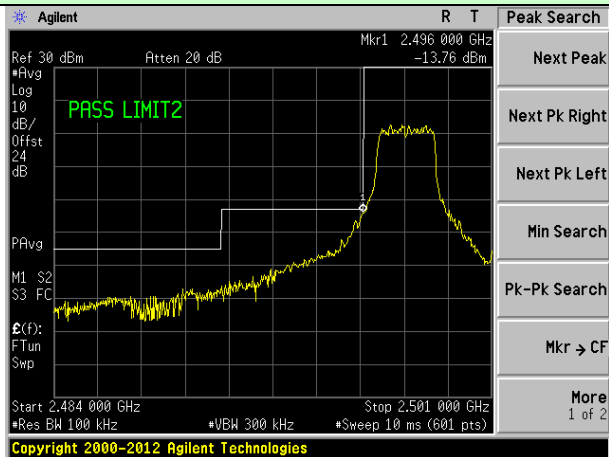
Lowest channel

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



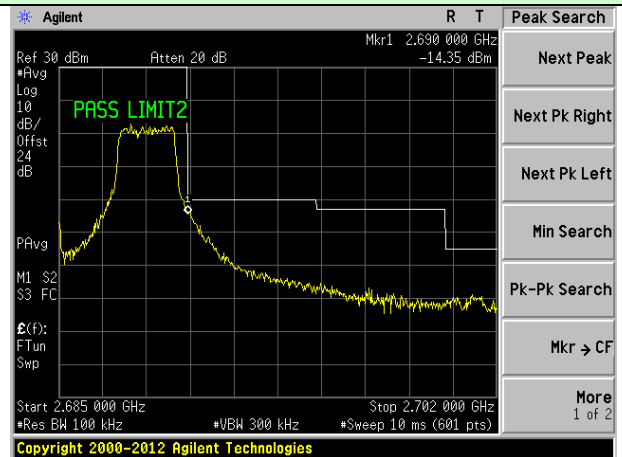
Highest channel

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



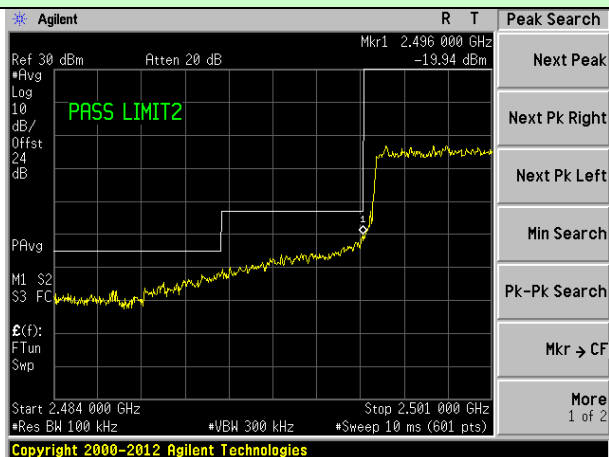
Lowest channel

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



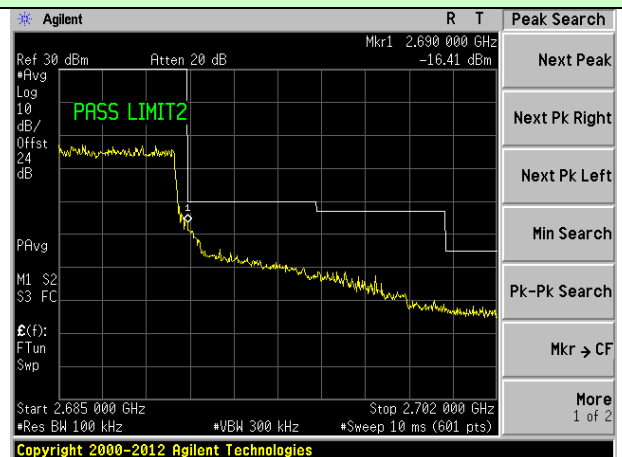
Highest channel

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



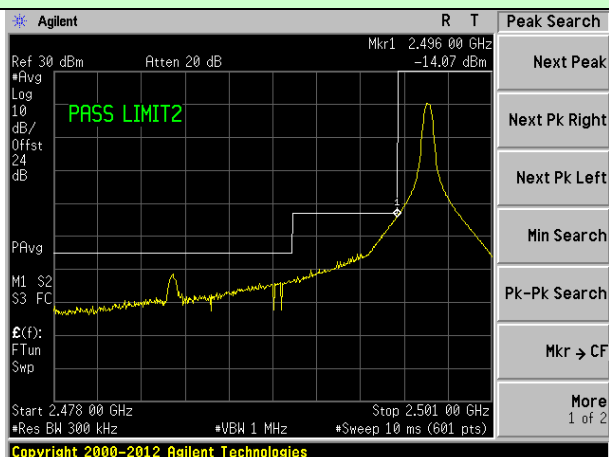
Lowest channel

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



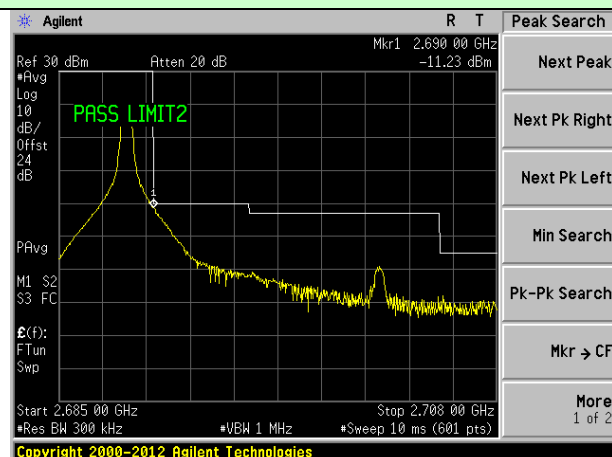
Highest channel

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



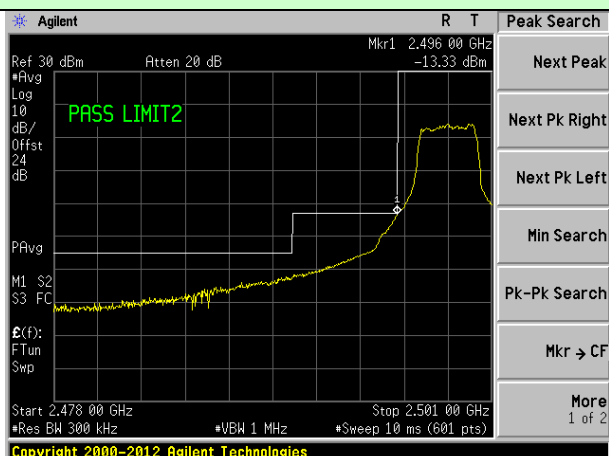
Lowest channel

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



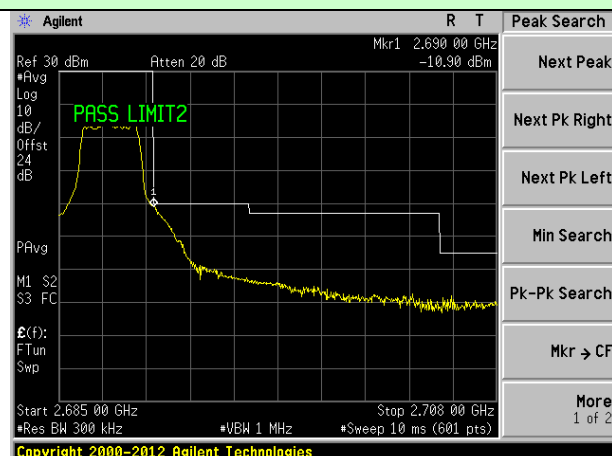
Highest channel

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



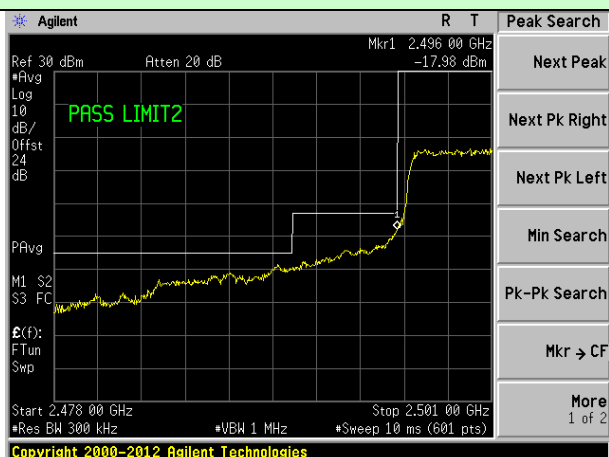
Lowest channel

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



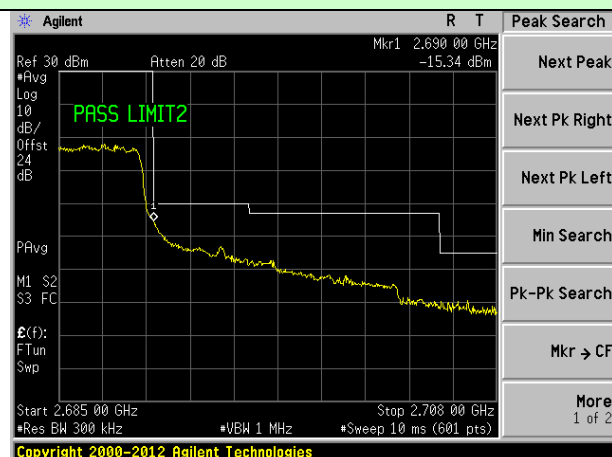
Highest channel

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

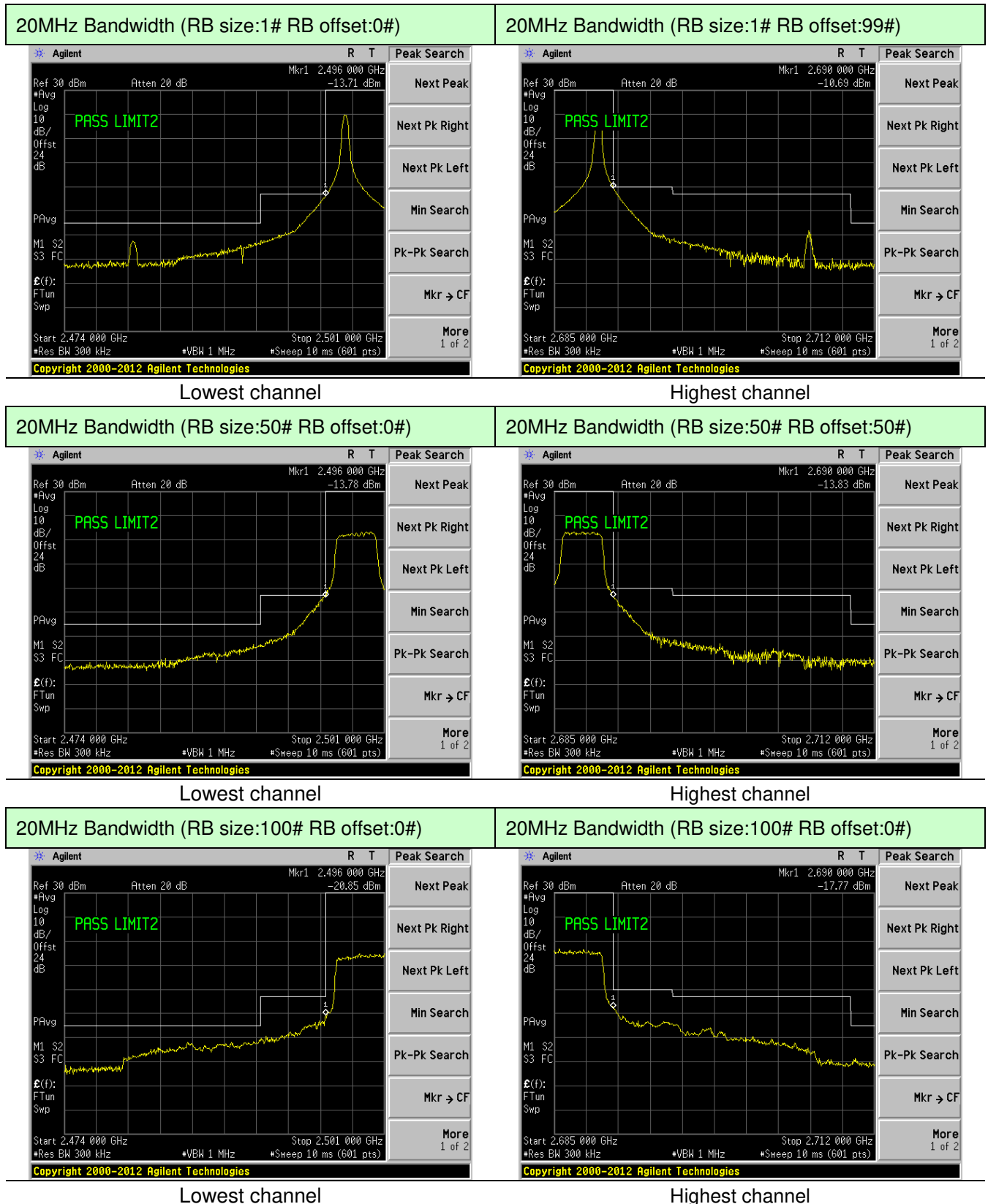


Lowest channel

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

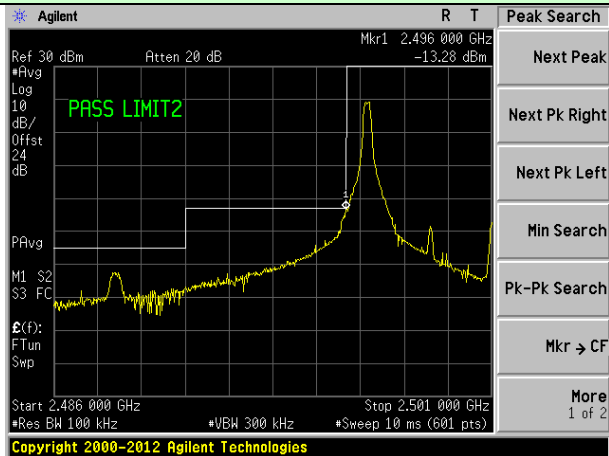


Highest channel



LTE Band 41(16QAM mode)

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



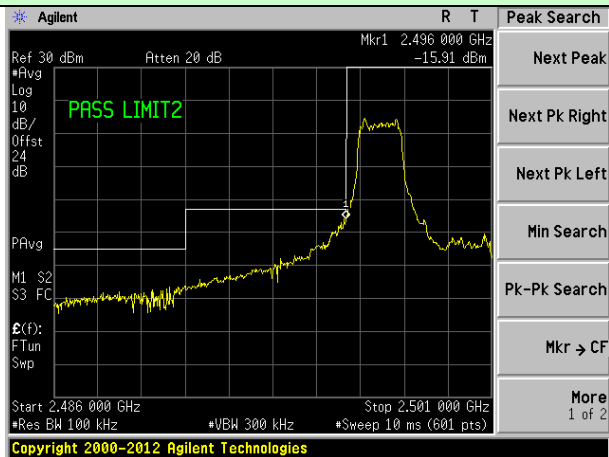
5MHz Bandwidth (RB size:1# RB offset:24#)



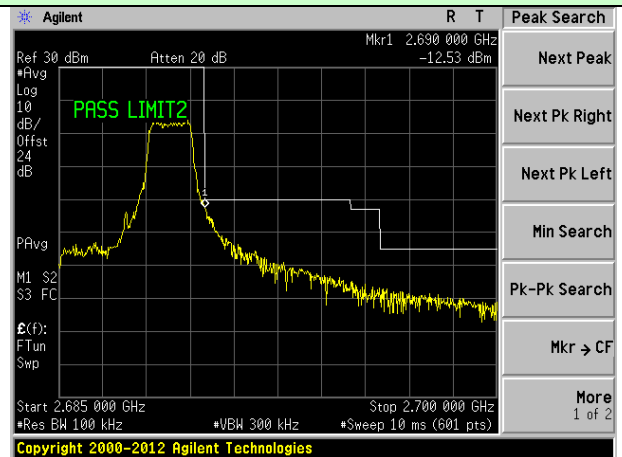
Lowest channel

Highest channel

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



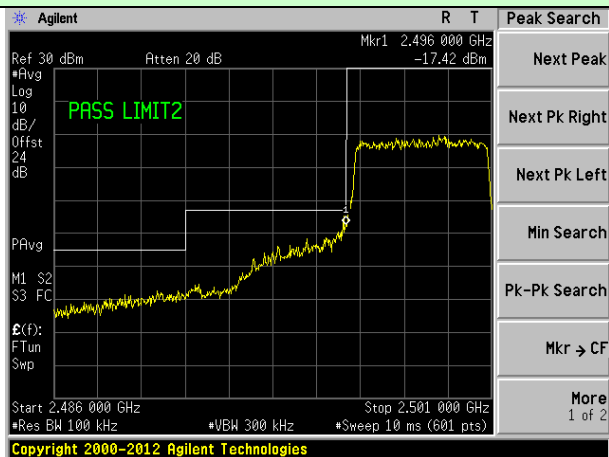
5MHz Bandwidth (RB size:12# RB offset:13#)



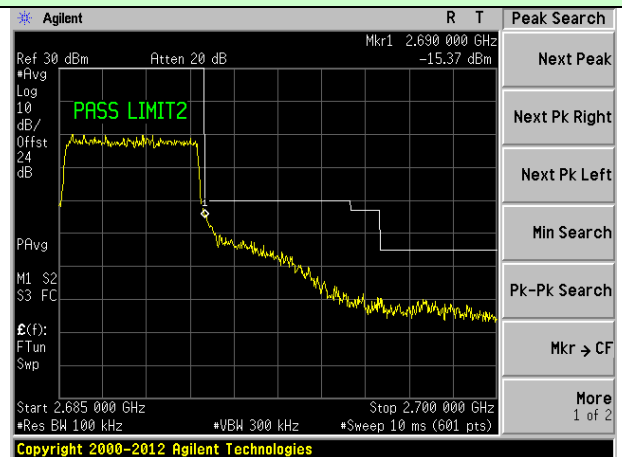
Lowest channel

Highest channel

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



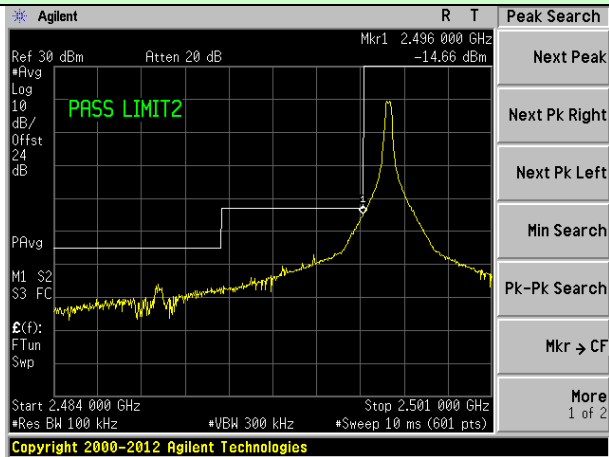
5MHz Bandwidth (RB size:25# RB offset:0#)



Lowest channel

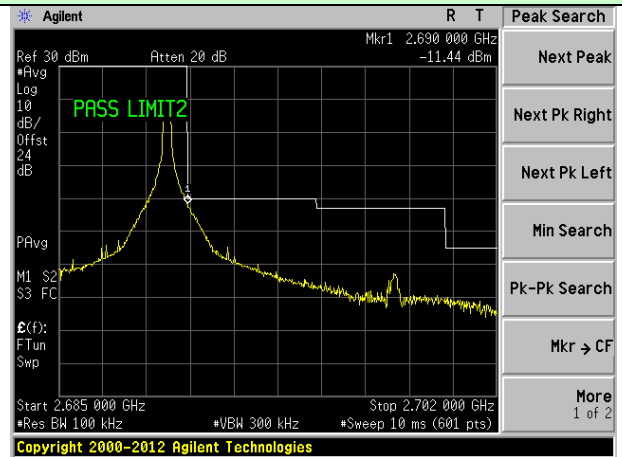
Highest channel

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



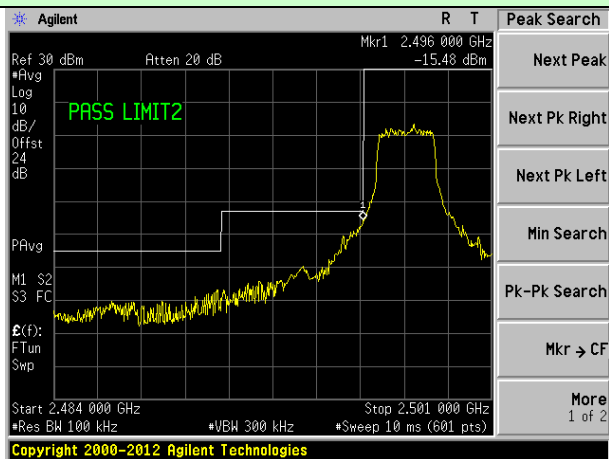
Lowest channel

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



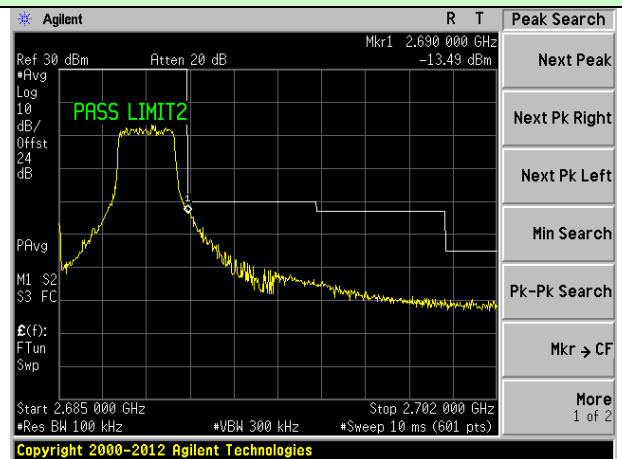
Highest channel

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



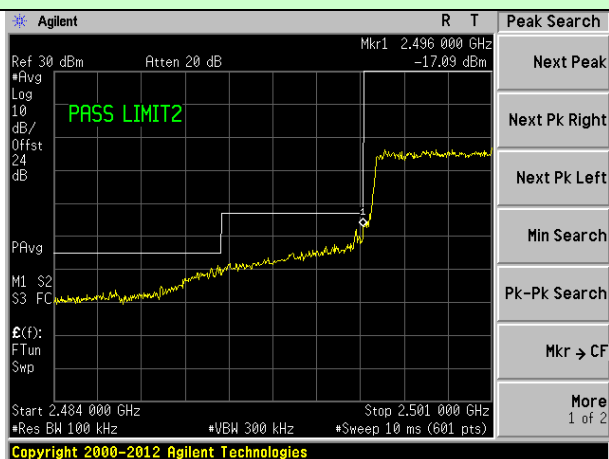
Lowest channel

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



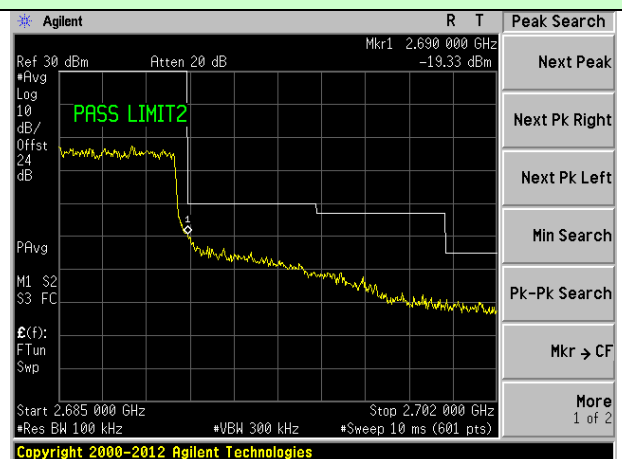
Highest channel

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

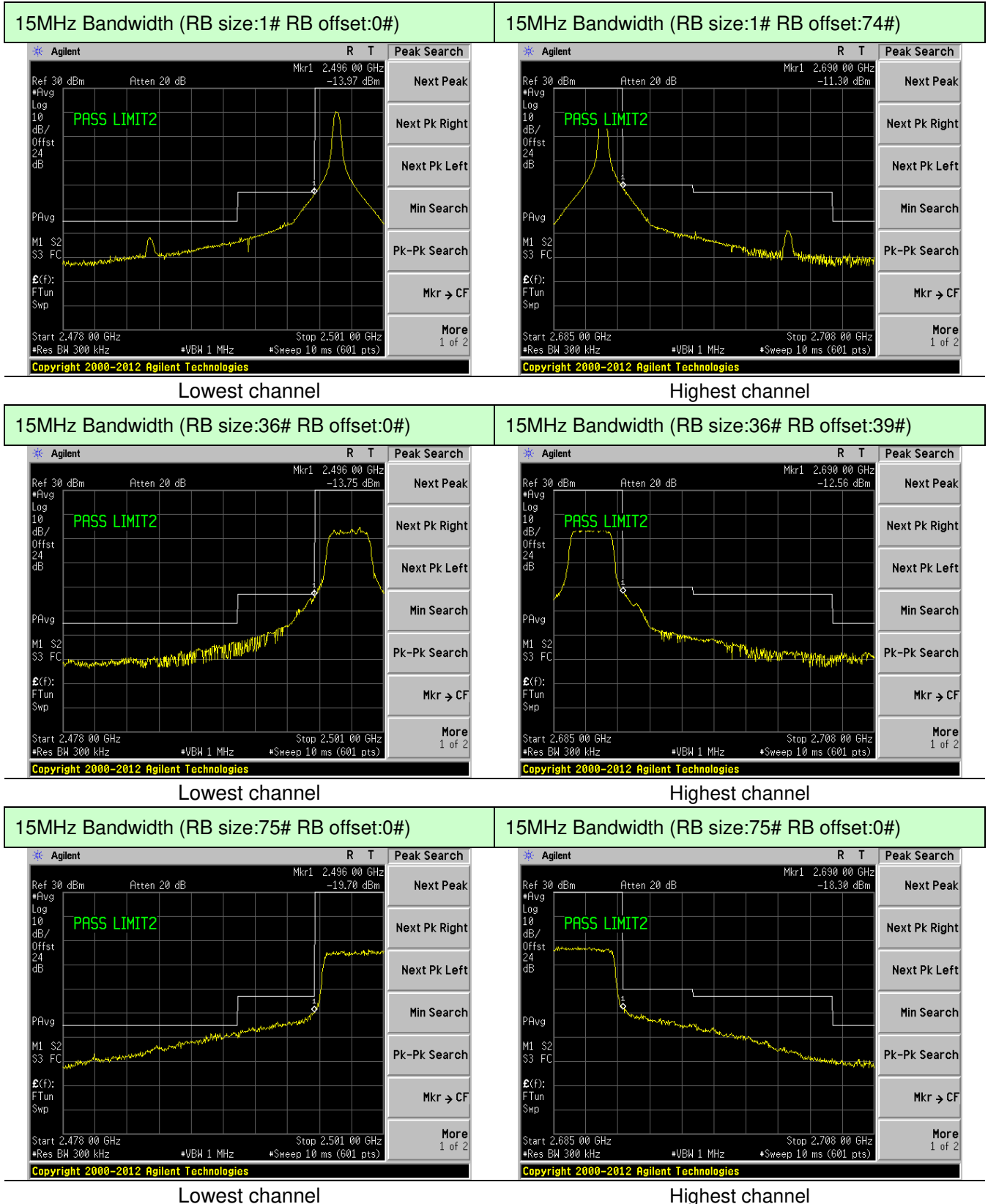


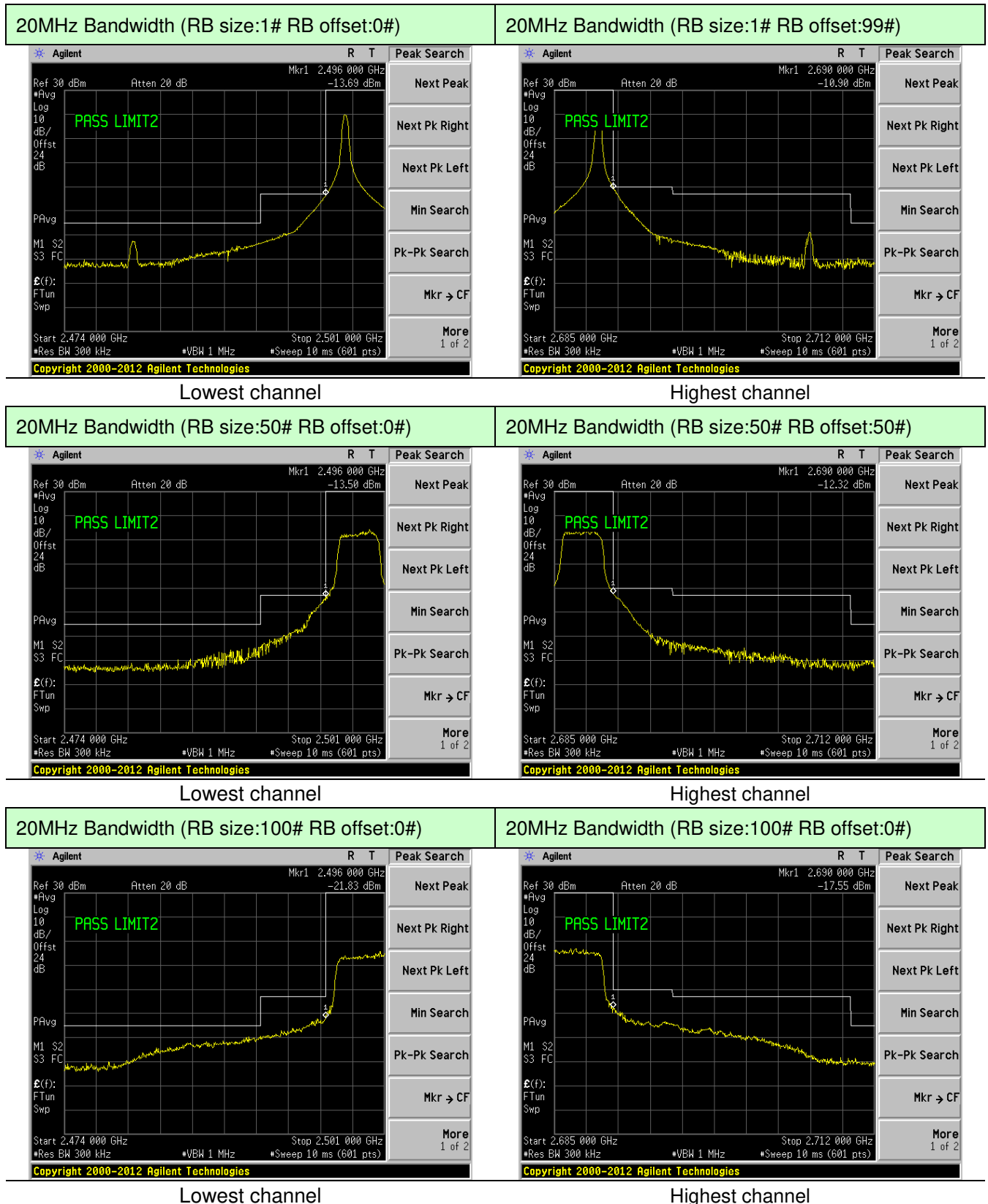
Lowest channel

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

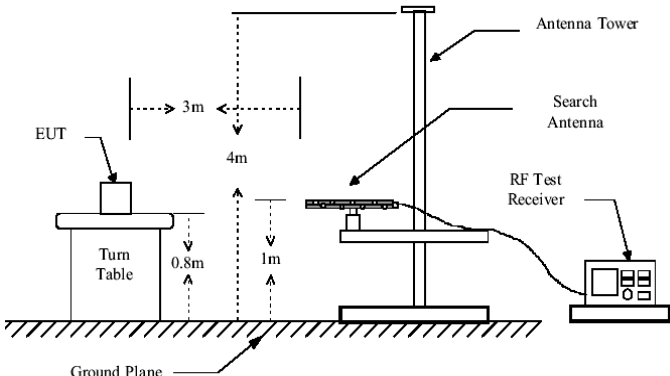
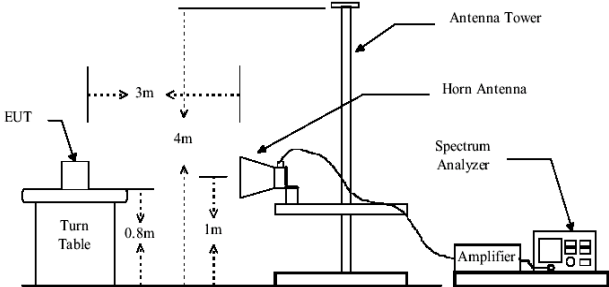
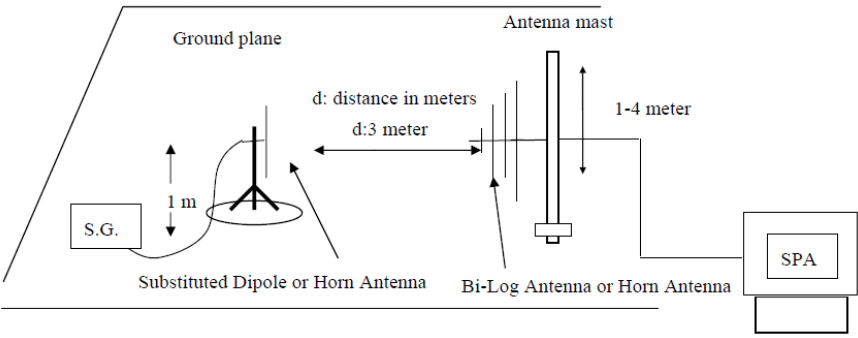


Highest channel





6.7 EIRP Measurement

Test Requirement:	Part 27.50(h)(2)
Test Method:	FCC part2.1046
Limit:	LTE Band 41: 2W (EIRP)
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. EIRP in frequency band 2570–2620MHz and 2496–2690MHz 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: $\text{EIRP} = \text{S.G. output (dBm)} + \text{Antenna Gain (dBi)} - \text{Cable Loss (dB)}$
Test Instruments:	Refer to section 5.0 for details
Test mode:	Refer to section 6.1 for details
Test results:	Pass

Measurement Data

QPSK mode:

EUT mode	Channel	EUT Pol.	Antenna Pol.	EIRP(dBm)	Limit (dBm)	Result
LTE Band 41 (5MHz)	Lowest	H	V	21.97	33.00	Pass
			H	19.85		
		E1	V	21.50		
			H	19.03		
		E2	V	20.56		
			H	17.65		
	Middle	H	V	21.70	33.00	Pass
			H	18.85		
		E1	V	21.00		
			H	18.46		
		E2	V	20.96		
			H	17.76		
	Highest	H	V	21.47	33.00	Pass
			H	19.10		
		E1	V	21.09		
			H	18.69		
		E2	V	21.08		
			H	18.42		

EUT mode	Channel	EUT Pol.	Antenna Pol.	EIRP(dBm)	Limit (dBm)	Result
LTE Band 41 (10MHz)	Lowest	H	V	21.93	33.00	Pass
			H	19.81		
		E1	V	21.45		
			H	18.98		
		E2	V	20.50		
			H	17.59		
	Middle	H	V	21.65	33.00	Pass
			H	18.78		
		E1	V	20.93		
			H	18.38		
		E2	V	20.90		
			H	17.69		
	Highest	H	V	21.41	33.00	Pass
			H	19.04		
		E1	V	21.03		
			H	18.63		
		E2	V	21.03		
			H	18.37		

EUT mode	Channel	EUT Pol.	Antenna Pol.	EIRP(dBm)	Limit (dBm)	Result
LTE Band 41 (15MHz)	Lowest	H	V	21.91	33.00	Pass
			H	19.79		
		E1	V	21.42		
			H	18.95		
		E2	V	20.47		
			H	17.56		
	Middle	H	V	21.62	33.00	Pass
			H	18.75		
		E1	V	20.89		
			H	18.34		
		E2	V	20.86		
			H	17.66		
	Highest	H	V	21.38	33.00	Pass
			H	19.01		
		E1	V	20.99		
			H	18.59		
		E2	V	21.01		
			H	18.34		

EUT mode	Channel	EUT Pol.	Antenna Pol.	EIRP(dBm)	Limit (dBm)	Result
LTE Band 41 (20MHz)	Lowest	H	V	21.36	33.00	Pass
			H	19.16		
		E1	V	20.73		
			H	18.18		
		E2	V	19.63		
			H	16.65		
	Middle	H	V	20.82	33.00	Pass
			H	17.78		
		E1	V	19.84		
			H	17.22		
		E2	V	19.92		
			H	16.64		
	Highest	H	V	20.60	33.00	Pass
			H	18.15		
		E1	V	20.07		
			H	17.59		
		E2	V	20.33		
			H	17.59		

16QAM mode:

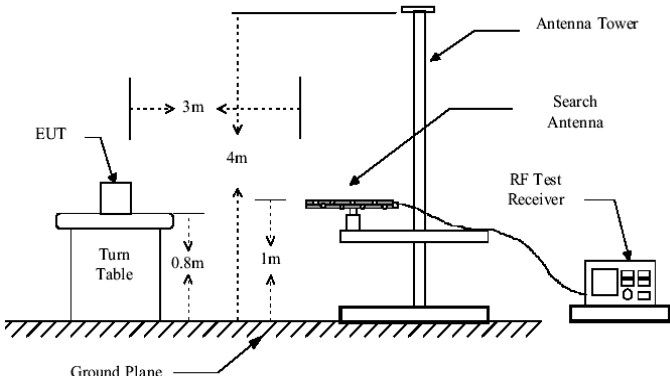
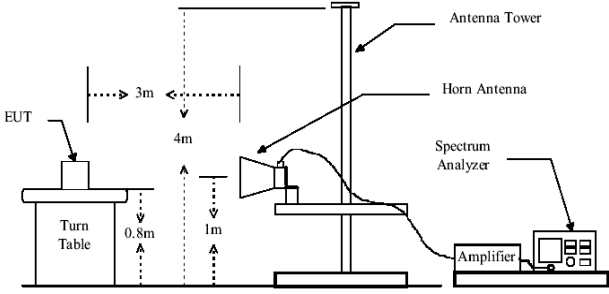
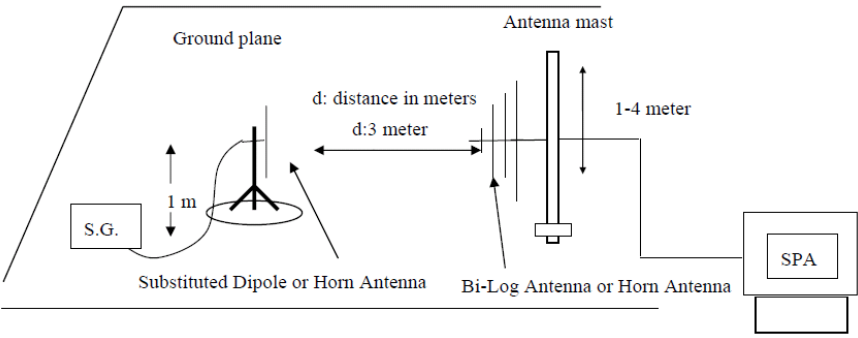
EUT mode	Channel	EUT Pol.	Antenna Pol.	EIRP(dBm)	Limit (dBm)	Result
LTE Band 41 (5MHz)	Lowest	H	V	22.08	33.00	Pass
			H	19.98		
		E1	V	21.63		
			H	19.18		
		E2	V	20.73		
			H	17.83		
	Middle	H	V	21.86	33.00	Pass
			H	19.04		
		E1	V	21.20		
			H	18.68		
		E2	V	21.14		
			H	17.96		
	Highest	H	V	21.62	33.00	Pass
			H	19.27		
		E1	V	21.27		
			H	18.89		
		E2	V	21.21		
			H	18.57		

EUT mode	Channel	EUT Pol.	Antenna Pol.	EIRP(dBm)	Limit (dBm)	Result
LTE Band 41 (10MHz)	Lowest	H	V	22.00	33.00	Pass
			H	19.89		
		E1	V	21.53		
			H	19.07		
		E2	V	20.61		
			H	17.70		
	Middle	H	V	21.75	33.00	Pass
			H	18.90		
		E1	V	21.06		
			H	18.52		
		E2	V	21.01		
			H	17.82		
	Highest	H	V	21.51	33.00	Pass
			H	19.15		
		E1	V	21.14		
			H	18.75		
		E2	V	21.12		
			H	18.46		

EUT mode	Channel	EUT Pol.	Antenna Pol.	EIRP(dBm)	Limit (dBm)	Result
LTE Band 41 (15MHz)	Lowest	H	V	22.04	33.00	Pass
			H	19.93		
		E1	V	21.58		
			H	19.12		
		E2	V	20.66		
			H	17.76		
	Middle	H	V	21.80	33.00	Pass
			H	18.96		
		E1	V	21.13		
			H	18.60		
		E2	V	21.07		
			H	17.88		
	Highest	H	V	21.56	33.00	Pass
			H	19.20		
		E1	V	21.20		
			H	18.81		
		E2	V	21.16		
			H	18.51		

EUT mode	Channel	EUT Pol.	Antenna Pol.	EIRP(dBm)	Limit (dBm)	Result
LTE Band 41 (20MHz)	Lowest	H	V	21.76	33.00	Pass
			H	19.62		
		E1	V	21.23		
			H	18.74		
		E2	V	20.24		
			H	17.31		
	Middle	H	V	21.40	33.00	Pass
			H	18.48		
		E1	V	20.60		
			H	18.03		
		E2	V	20.60		
			H	17.37		
	Highest	H	V	21.17	33.00	Pass
			H	18.77		
		E1	V	20.74		
			H	18.31		
		E2	V	20.82		
			H	18.13		

6.8 Field strength of spurious radiation measurement

Test Requirement:	FCC Part 27.53(m)(4)/(m)(6)
Test Method:	FCC part2.1053
Limit:	Band 38/41:-25dBm
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. $\text{ERP / EIRP} = \text{S.G. output (dBm)} + \text{Antenna Gain(dB/dBi)} - \text{Cable Loss (dB)}$
Test Instruments:	Refer to section 5.0 for details
Test mode:	Refer to section 6.1 for details
Test results:	Pass

Measurement Data

QPSK mode:

Test mode:	LTE Band 41(5MHz)		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
4997.00	Vertical	-36.51	-25.00	Pass
7495.50	V	-38.91		
9994.00	V	-40.91		
12492.50	V	-42.81		
14991.00	V	---		
4997.00	Horizontal	-41.12	-25.00	Pass
7495.50	H	-44.53		
9994.00	H	-45.90		
12492.50	H	-48.31		
14991.00	H	---		
Test mode:	LTE Band 41(5MHz)		Test channel:	Middle
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
5186.00	Vertical	-34.41	-25.00	Pass
7779.00	V	-36.89		
10372.00	V	-38.94		
12965.00	V	-40.91		
15558.00	V	---		
5186.00	Horizontal	-39.17	-25.00	Pass
7779.00	H	-42.67		
10372.00	H	-44.10		
12965.00	H	-46.57		
15558.00	H	---		
Test mode:	LTE Band 41(5MHz)		Test channel:	Highest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
5375.00	Vertical	-35.59	-25.00	Pass
8062.50	V	-37.99		
10750.00	V	-39.98		
13437.50	V	-41.89		
16125.00	V	---		
5375.00	Horizontal	-40.20	-25.00	Pass
8062.50	H	-43.60		
10750.00	H	-44.98		
13437.50	H	-47.37		
16125.00	H	---		

Test mode:	LTE Band 41(10MHz)		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
5002.00	Vertical	-36.48	-25.00	Pass
7503.00	V	-38.88		
10004.00	V	-40.88		
12505.00	V	-42.79		
15006.00	V	---		
5002.00	Horizontal	-41.10	-25.00	Pass
7503.00	H	-44.51		
10004.00	H	-45.88		
12505.00	H	-48.28		
15006.00	H	---		
Test mode:	LTE Band 41(10MHz)		Test channel:	Middle
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
5186.00	Vertical	-36.42	-25.00	Pass
7779.00	V	-38.82		
10372.00	V	-40.82		
12965.00	V	-42.73		
15558.00	V	---		
5186.00	Horizontal	-41.04	-25.00	Pass
7779.00	H	-44.45		
10372.00	H	-45.83		
12965.00	H	-48.24		
15558.00	H	---		
Test mode:	LTE Band 41(10MHz)		Test channel:	Highest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
5370.00	Vertical	-36.55	-25.00	Pass
8055.00	V	-38.96		
10740.00	V	-40.95		
13425.00	V	-42.85		
16110.00	V	---		
5370.00	Horizontal	-41.17	-25.00	Pass
8055.00	H	-44.57		
10740.00	H	-45.94		
13425.00	H	-48.34		
16110.00	H	---		

Test mode:	LTE Band 41(15MHz)		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
5007.00	Vertical	-36.71	-25.00	Pass
7510.50	V	-39.11		
10014.00	V	-41.09		
12517.50	V	-42.99		
15021.00	V	---		
5007.00	Horizontal	-41.31	-25.00	Pass
7510.50	H	-44.71		
10014.00	H	-46.07		
12517.50	H	-48.46		
15021.00	H	---		
Test mode:	LTE Band 41(15MHz)		Test channel:	Middle
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
5186.00	Vertical	-36.60	-25.00	Pass
7779.00	V	-39.00		
10372.00	V	-40.99		
12965.00	V	-42.89		
15558.00	V	---		
5186.00	Horizontal	-41.21	-25.00	Pass
7779.00	H	-44.61		
10372.00	H	-45.98		
12965.00	H	-48.38		
15558.00	H	---		
Test mode:	LTE Band 41(15MHz)		Test channel:	Highest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
5365.00	Vertical	-35.63	-25.00	Pass
8047.50	V	-38.06		
10730.00	V	-40.05		
13412.50	V	-42.00		
16095.00	V	---		
5365.00	Horizontal	-40.30	-25.00	Pass
8047.50	H	-43.73		
10730.00	H	-45.10		
13412.50	H	-47.50		
16095.00	H	---		

Test mode:	LTE Band 41(20MHz)		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
5012.00	Vertical	-37.26	-25.00	Pass
7518.00	V	-39.30		
10024.00	V	-40.99		
12530.00	V	-42.61		
15036.00	V	---		
5012.00	Horizontal	-41.17	-25.00	Pass
7518.00	H	-44.06		
10024.00	H	-45.24		
12530.00	H	-47.28		
15036.00	H	---		
Test mode:	LTE Band 41(20MHz)		Test channel:	Middle
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
5186.00	Vertical	-37.14	-25.00	Pass
7779.00	V	-39.19		
10372.00	V	-40.88		
12965.00	V	-42.50		
15558.00	V	---		
5186.00	Horizontal	-41.06	-25.00	Pass
7779.00	H	-43.96		
10372.00	H	-45.14		
12965.00	H	-47.19		
15558.00	H	---		
Test mode:	LTE Band 41(20MHz)		Test channel:	Highest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
5360.00	Vertical	-37.01	-25.00	Pass
8040.00	V	-39.07		
10720.00	V	-40.76		
13400.00	V	-42.39		
16080.00	V	---		
5360.00	Horizontal	-40.94	-25.00	Pass
8040.00	H	-43.85		
10720.00	H	-45.03		
13400.00	H	-47.09		
16080.00	H	---		

Remark:

1. The emission behaviour belongs to narrowband spurious emission.
2. Remark"---" means that the emission level is too low to be measured
3. The emission levels of below 1 GHz are very lower than the limit and not show in test report.

16QAM mode:

Test mode:	LTE Band 41(5MHz)		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
4997.00	Vertical	-37.21	-25.00	Pass
7495.50	V	-39.25		
9994.00	V	-40.94		
12492.50	V	-42.56		
14991.00	V	---		
4997.00	Horizontal	-41.12	-25.00	Pass
7495.50	H	-44.01		
9994.00	H	-45.19		
12492.50	H	-47.24		
14991.00	H	---		
Test mode:	LTE Band 41(5MHz)		Test channel:	Middle
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
5186.00	Vertical	-37.26	-25.00	Pass
7779.00	V	-39.30		
10372.00	V	-40.99		
12965.00	V	-42.61		
15558.00	V	---		
5186.00	Horizontal	-41.17	-25.00	Pass
7779.00	H	-44.06		
10372.00	H	-45.24		
12965.00	H	-47.28		
15558.00	H	---		
Test mode:	LTE Band 41(5MHz)		Test channel:	Highest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
5375.00	Vertical	-37.32	-25.00	Pass
8062.50	V	-39.36		
10750.00	V	-41.04		
13437.50	V	-42.66		
16125.00	V	---		
5375.00	Horizontal	-41.22	-25.00	Pass
8062.50	H	-44.11		
10750.00	H	-45.28		
13437.50	H	-47.32		
16125.00	H	---		

Test mode:	LTE Band 41(10MHz)		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
5002.00	Vertical	-37.33	-25.00	Pass
7503.00	V	-39.37		
10004.00	V	-41.05		
12505.00	V	-42.67		
15006.00	V	---		
5002.00	Horizontal	-41.23	-25.00	Pass
7503.00	H	-44.12		
10004.00	H	-45.29		
12505.00	H	-47.33		
15006.00	H	---		
Test mode:	LTE Band 41(10MHz)		Test channel:	Middle
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
5186.00	Vertical	-37.43	-25.00	Pass
7779.00	V	-39.46		
10372.00	V	-41.14		
12965.00	V	-42.76		
15558.00	V	---		
5186.00	Horizontal	-41.33	-25.00	Pass
7779.00	H	-44.21		
10372.00	H	-45.37		
12965.00	H	-47.40		
15558.00	H	---		
Test mode:	LTE Band 41(10MHz)		Test channel:	Highest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
5370.00	Vertical	-37.49	-25.00	Pass
8055.00	V	-39.53		
10740.00	V	-41.20		
13425.00	V	-42.82		
16110.00	V	---		
5370.00	Horizontal	-41.39	-25.00	Pass
8055.00	H	-44.26		
10740.00	H	-45.42		
13425.00	H	-47.45		
16110.00	H	---		

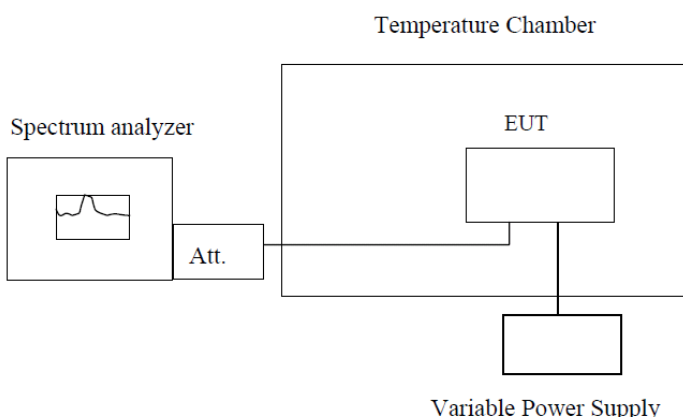
Test mode:	LTE Band 41(15MHz)		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
5007.00	Vertical	-36.86	-25.00	Pass
7510.50	V	-39.25		
10014.00	V	-41.23		
12517.50	V	-43.13		
15021.00	V	---		
5007.00	Horizontal	-41.45	-25.00	Pass
7510.50	H	-44.83		
10014.00	H	-46.19		
12517.50	H	-48.57		
15021.00	H	---		
Test mode:	LTE Band 41(15MHz)		Test channel:	Middle
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
5186.00	Vertical	-36.91	-25.00	Pass
7779.00	V	-39.29		
10372.00	V	-41.27		
12965.00	V	-43.17		
15558.00	V	---		
5186.00	Horizontal	-41.49	-25.00	Pass
7779.00	H	-44.87		
10372.00	H	-46.23		
12965.00	H	-48.61		
15558.00	H	---		
Test mode:	LTE Band 41(15MHz)		Test channel:	Highest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
5365.00	Vertical	-36.80	-25.00	Pass
8047.50	V	-39.19		
10730.00	V	-41.18		
13412.50	V	-43.08		
16095.00	V	---		
5365.00	Horizontal	-41.40	-25.00	Pass
8047.50	H	-44.79		
10730.00	H	-46.15		
13412.50	H	-48.53		
16095.00	H	---		

Test mode:	LTE Band 41(20MHz)		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
5012.00	Vertical	-36.97	-25.00	Pass
7518.00	V	-39.35		
10024.00	V	-41.33		
12530.00	V	-43.23		
15036.00	V	---		
5012.00	Horizontal	-41.55	-25.00	Pass
7518.00	H	-44.93		
10024.00	H	-46.28		
12530.00	H	-48.66		
15036.00	H	---		
Test mode:	LTE Band 41(20MHz)		Test channel:	Middle
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
5186.00	Vertical	-37.02	-25.00	Pass
7779.00	V	-39.40		
10372.00	V	-41.37		
12965.00	V	-43.27		
15558.00	V	---		
5186.00	Horizontal	-41.59	-25.00	Pass
7779.00	H	-44.97		
10372.00	H	-46.32		
12965.00	H	-48.69		
15558.00	H	---		
Test mode:	LTE Band 41(20MHz)		Test channel:	Highest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
5360.00	Vertical	-37.06	-25.00	Pass
8040.00	V	-39.44		
10720.00	V	-41.41		
13400.00	V	-43.31		
16080.00	V	---		
5360.00	Horizontal	-41.64	-25.00	Pass
8040.00	H	-45.01		
10720.00	H	-46.36		
13400.00	H	-48.73		
16080.00	H	---		

Remark:

1. The emission behaviour belongs to narrowband spurious emission.
2. Remark"---" means that the emission level is too low to be measured
3. The emission levels of below 1 GHz are very lower than the limit and not show in test report.

6.9 Frequency stability V.S. Temperature measurement

Test Requirement:	FCC Part27.54, 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 5.0 for details
Test mode:	Refer to section 6.1 for details
Test results:	Pass

Measurement Data

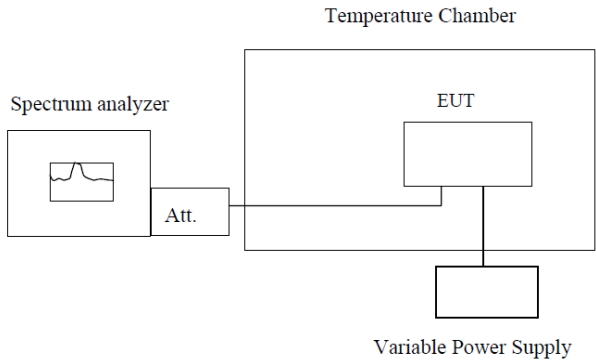
QPSK mode:

Reference Frequency: LTE Band 41 Middle channel=40620 channel=2593MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error			Result
		Hz	ppm		
3.70	-30	38	0.0146	2.5	Pass
	-20	41	0.0159		
	-10	36	0.0140		
	0	33	0.0127		
	10	35	0.0133		
	20	31	0.0121		
	30	49	0.0191		
	40	43	0.0165		
	50	41	0.0159		

16QAM mode:

Reference Frequency: LTE Band 41 Middle channel=40620 channel=2593MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error			Result
		Hz	ppm		
3.70	-30	37	0.0141	2.5	Pass
	-20	40	0.0153		
	-10	35	0.0135		
	0	32	0.0123		
	10	33	0.0129		
	20	30	0.0117		
	30	48	0.0184		
	40	41	0.0160		
	50	40	0.0153		

6.10 Frequency stability V.S. Voltage measurement

Test Requirement:	FCC Part27.54, 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 5.0 for details
Test mode:	Refer to section 6.1 for details
Test results:	Pass

Measurement Data

QPSK mode:

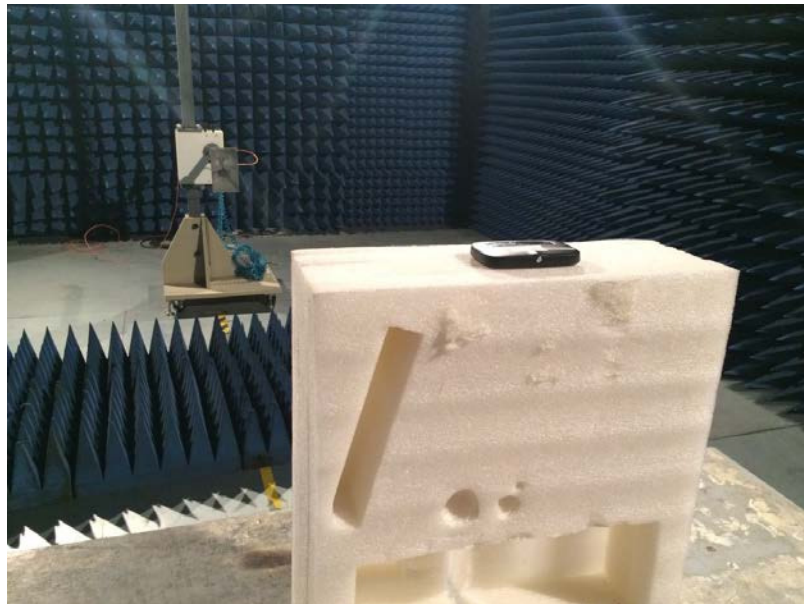
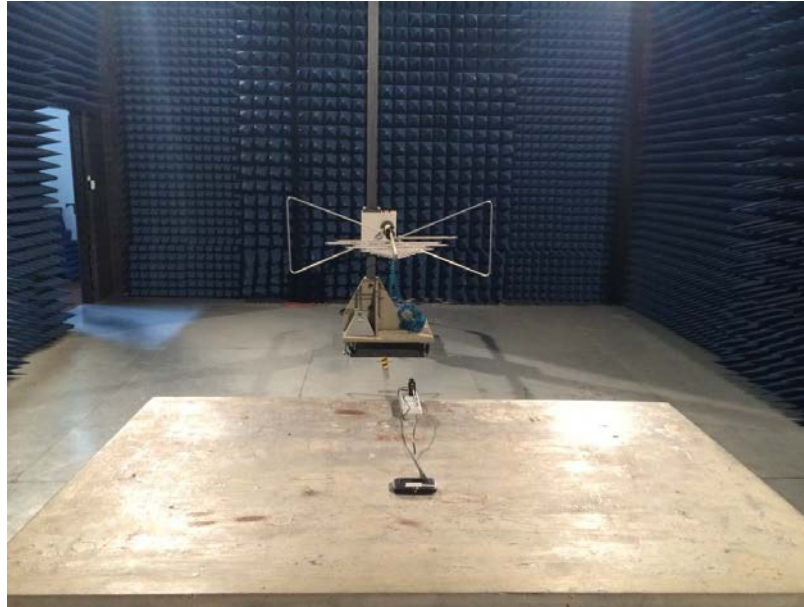
Reference Frequency: LTE Band 41 Middle channel=40620 channel=2593MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.25	24	0.0091	2.5	Pass
	3.70	15	0.0059		
	3.40	18	0.0070		

16QAM mode:

Reference Frequency: LTE Band 41 Middle channel=40620 channel=2593MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.25	22	0.0084	2.5	Pass
	3.70	14	0.0054		
	3.40	17	0.0064		

7 Test Setup Photo

Radiated Emission



8 EUT Constructional Details

Reference to the test report No. : GTS201609000223E01

-----End-----