

FCC TEST REPORT

Product : Mobile Phone
Trade mark : MI
Model/Type reference : MDG2
Report Number : 170615001RFM-1
Date of Issue : July 11, 2017
FCC ID : 2AFZZ-XMSG2
Test Standards : FCC 47 CFR Part 22 Subpart H
FCC 47 CFR Part 2 Subpart J
Test result : PASS

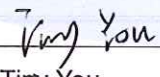
Prepared for:

Xiaomi Communications Co., Ltd.
The Rainbow City of China Resources, NO.68, Qinghe Middle Street,
Haidian District, Beijing, China

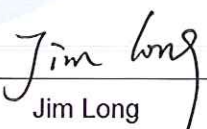
Prepared by:

Shenzhen UnionTrust Quality and Technology Co., Ltd.
16/F, Block A, Building 6, Baoneng Science and Technology Park,
Qingxiang Road No.1, Longhua New District, Shenzhen, China
TEL: +86-755-2823 0888
FAX: +86-755-2823 0886

Tested by:


Tiny You
Engineer

Reviewed by:


Jim Long
Senior Supervisor

Approved by:


Billy Li
Technical Director

Date:

July 11, 2017

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China
Tel: +86-755-28230888 Fax: +86-755-28230886 E-mail: info@uttlab.com [Http://www.uttlab.com](http://www.uttlab.com)

Version

Version No.	Date	Description
V1.0	July 11, 2017	Original



Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China
Tel: +86-755-28230888 Fax: +86-755-28230886 E-mail: info@uttlab.com [Http://www.uttlab.com](http://www.uttlab.com)

Content

	Page
1 GENERAL INFORMATION	4
1.1 CLIENT INFORMATION	4
1.2 GENERAL DESCRIPTION OF EUT	4
1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD	4
1.4 DESCRIPTION OF SUPPORT UNITS	5
1.5 TEST LOCATION	5
1.6 TEST FACILITY	6
1.7 DEVIATION FROM STANDARDS	6
1.8 ABNORMALITIES FROM STANDARD CONDITIONS	6
1.9 OTHER INFORMATION REQUESTED BY THE CUSTOMER	6
1.10 MEASUREMENT UNCERTAINTY (95% CONFIDENCE LEVELS, K=2)	6
2 TEST SUMMARY	7
3 EQUIPMENT LIST	8
4 TEST REQUIREMENT	10
4.1 TEST SETUP	10
4.1.1 For Conducted test setup	10
4.1.2 For Radiated Emissions test setup	11
4.2 TEST ENVIRONMENT	11
4.3 SYSTEM TEST CONFIGURATION	11
4.4 TEST CONDITION	12
4.4.1 Test channel	12
4.4.2 Test mode	12
5 RADIO TECHNICAL REQUIREMENTS SPECIFICATION	16
5.1 EFFECTIVE RADIATED POWER	16
5.2 CONDUCTED OUTPUT POWER	19
5.3 99%&26DB OCCUPIED BANDWIDTH	20
5.4 BAND EDGE AT ANTENNA TERMINALS	27
5.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS	35
5.6 FIELD STRENGTH OF SPURIOUS RADIATION	42
Spurious Emission Test Data (9 KHz ~ 30 MHz)	43
Spurious Emission Test Data (30 MHz ~ 1 GHz)	43
Spurious Emission Test Data (Above 1 GHz)	49
5.7 FREQUENCY STABILITY	55
APPENDIX 1 PHOTOGRAPHS OF TEST SETUP	57
APPENDIX 2 PHOTOGRAPHS OF EUT CONSTRUCTIONAL DETAILS	57

1 General Information

1.1 Client Information

Applicant:	Xiaomi Communications Co., Ltd.
Address of Applicant:	The Rainbow City of China Resources, NO.68, Qinghe Middle Street, Haidian District, Beijing, China
Manufacturer:	Xiaomi Communications Co., Ltd.
Address of Manufacturer:	The Rainbow City of China Resources, NO.68, Qinghe Middle Street, Haidian District, Beijing, China

1.2 General Description of EUT

Product Name:	Mobile Phone	
Model No.(EUT):	MDG2	
Add. Mode No.:	N/A	
Trade Mark:	MI	
EUT Supports Radios application:	GSM850/1900 WCDMA Band II/Band V LTE FDD Band 4 /Band 5 /Band 7 LTE TDD Band 38 Wlan 2400MHz-2483.5MHz 802.11b/g/n(HT20&HT40) Wlan 5150MHz-5350MHz, 5470MHz-5725MHz, 5725MHz-5850MHz support 802.11a/n/ac Bluetooth V3.0+EDR&Bluetooth V4.0 BLE GPS, Glonass	
Power Supply:	AC Adapter1	Model: MDY-08-EZ Input: 100-240V~50/60Hz 0.35A MAX Output: 5.0 V $\pm$ 2.0 A Manufacturer: Dongguan Aohai Power Technology Co., Ltd.
	AC Adapter2	Model: MDY-08-EZ Input: 100-240V~50/60Hz 0.35A MAX Output: 5.0 V $\pm$ 2.0 A Manufacturer: Jangsu Chenyang Electron Co., Ltd.
	Battery	Model: BN31 Brand: MI Rated Voltage: 3.85Vdc Battery Capacity: 3000mAh(Li-on Rechargeable)
USB Micro-C Plug Cable:	100cm(Shielded without ferrite)	
USB Changing Cable:	100cm(Shielded without ferrite)	
Sample Received Date:	June 10, 2017	
Sample Tested Date:	June 11, 2017 ~ July 11, 2017	

1.3 Product Specification subjective to this standard

Support Networks:	GSM, GPRS, EDGE, WCDMA, HSDPA, HSUPA,DC-HSDPA, LTE	
Type of Modulation:	GSM/GPRS:	GMSK
	EDGE:	GMSK, 8PSK
	WCDMA:	BPSK, QPSK, 16QAM(DL)
	LTE:	QPSK, 16QAM,64QAM(DL)
Frequency Range:	GSM/GPRS/EDGE:	824.2-848.8 MHz
	WCDMA:	826.4-846.6 MHz

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China
 Tel: +86-755-28230888 Fax: +86-755-28230886 E-mail: info@uttlab.com <http://www.uttlab.com>

	LTE Band 5(Channel Bandwidth: 1.4 MHz):	824.7-848.3 MHz
	LTE Band 5 (Channel Bandwidth: 3 MHz):	825.5-847.5MHz
	LTE Band 5 (Channel Bandwidth: 5 MHz):	826.5-846.5 MHz
	LTE Band 5 (Channel Bandwidth: 10 MHz):	829-844 MHz
Max RF Output Power:	GSM/GPRS850:	31.87dBm
	EDGE850:	26.60dBm
	WCDMA Band V	22.60dBm
	LTE Band 5(Channel Bandwidth: 1.4 MHz):	23.31dBm
	LTE Band 5 (Channel Bandwidth: 3 MHz):	23.35dBm
	LTE Band 5 (Channel Bandwidth: 5 MHz):	23.41dBm
	LTE Band 5 (Channel Bandwidth: 10 MHz):	23.44dBm
Type of Emission:	GSM/GPRS 850:	245KGXW
	EDGE 850:	247KG7W
	WCDMA Band V	4M14F9W
	LTE Band 5(Channel Bandwidth: 1.4 MHz):	1M10G7D, 1M10W7D
	LTE Band 5 (Channel Bandwidth: 3 MHz):	2M74G7D, 2M73W7D
	LTE Band 5 (Channel Bandwidth: 5 MHz):	4M52G7D, 4M52W7D
	LTE Band 5 (Channel Bandwidth: 10 MHz):	8M99G7D, 9M00W7D
IEMI:	SIM1: 865181030006425	
	SIM2: 865181030006433	
Type of Antenna:	PIFA Antenna	
Antenna Gain:	-2.4 dBi	
GPRS/EDGE Class:	Class 33	
Sample Type:	Portable device	
Normal Test voltage:	3.85Vdc	
Extreme Test voltage:	3.4 to 4.4Vdc	
Software Version:	QL1515-tissot	
Hardware Version:	P3A	

1.4 Description of Support Units

The EUT has been tested with associated equipment below.

1) Cable

Cable No.	Description	Connector Type	Cable Type/Length	Supplied by
1	Antenna Cable	SMA	30cm	UnionTrust

1.5 Test Location

All tests were performed at:

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China 518109

Telephone: +86 (0) 755 2823 0888 Fax: +86 (0) 755 2823 0886

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China
Tel: +86-755-28230888 Fax: +86-755-28230886 E-mail: info@uttlab.com [Http://www.uttlab.com](http://www.uttlab.com)

1.6 Test Facility

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

CNAS-Lab Code: L9069

The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the ISO/IEC/EN 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

IC-Registration No.: 21600-1

The 3m Semi-anechoic chamber of Shenzhen UnionTrust Quality and Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 21600-1.

A2LA-Lab Certificate No.: 4312.01

Shenzhen UnionTrust Quality and Technology Co., Ltd. has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

1.7 Deviation from Standards

None.

1.8 Abnormalities from Standard Conditions

None.

1.9 Other Information Requested by the Customer

None.

1.10 Measurement Uncertainty (95% confidence levels, k=2)

No.	Item	Measurement Uncertainty
1	Conducted emission 9KHz-150KHz	3.8 dB
2	Conducted emission 150KHz-30MHz	3.4 dB
3	Radiated emission 9KHz-30MHz	4.9 dB
4	Radiated emission 30MHz-1GHz	4.7 dB
5	Radiated emission 1GHz-18GHz	5.1 dB
6	Radiated emission 18GHz-26GHz	5.2 dB
7	Radiated emission 26GHz-40GHz	5.2 dB

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China
Tel: +86-755-28230888 Fax: +86-755-28230886 E-mail: info@uttlab.com <http://www.uttlab.com>

2 Test Summary

Test Item	Test Requirement	Test method	Result
Effective Radiated Power(ERP)	FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 22.913(a)	ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02	PASS
Conducted Output Power	FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 22.913(a)	ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02	PASS
99%&26dB Occupied Bandwidth	FCC 47 CFR Part 2.1049(h)	ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02	PASS
Band Edge at antenna terminals	FCC 47 CFR Part 2.1051 & FCC 47 CFR Part 22.917(a)	ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02	PASS
Spurious emissions at antenna terminals	FCC 47 CFR Part 2.1051 & FCC 47 CFR Part 22.917(a)(b)	ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02	PASS
Field strength of spurious radiation	FCC 47 CFR Part 2.1053 & FCC 47 CFR Part 22.917(a)(b)	ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02	PASS
Frequency stability	FCC 47 CFR Part 2.1055 & FCC 47 CFR Part 22.355	ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02	PASS

Remark:

Tx: In this whole report Tx (or tx) means Transmitter.
 Rx: In this whole report Rx (or rx) means Receiver.
 RF: In this whole report RF means Radiated Frequency.
 CH: In this whole report CH means channel.

3 Equipment List

3M Semi/full-anechoic Chamber						
Use d	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm-dd-yyyy)	Cal. Due date (mm-dd-yyyy)
☒	3M Chamber & Accessory Equipment	ETS-LINDGREN	3M	N/A	Dec. 20, 2015	Dec. 19, 2018
☐	Receiver	R&S	ESR7	1316.3003K07-101181-K3	Dec. 22, 2016	Dec. 22, 2017
☒	Receiver	R&S	ESIB26	100114	Dec. 22, 2016	Dec. 22, 2017
☐	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	Dec. 22, 2016	Dec. 22, 2017
☒	Loop Antenna	ETS-LINDGREN	6502	00202525	Jun. 24, 2015	Jun. 23, 2018
☒	Broadband Antenna	ETS-LINDGREN	3142E	00201566	Jul. 24, 2015	Jul. 23, 2018
☒	Preamplifier	HP	8447F	2805A02960	Dec. 22, 2016	Dec. 22, 2017
☒	Broadband Antenna (Pre-amplifier)	ETS-LINDGREN	3142E-PA	00201891	Dec. 30, 2016	Dec. 30, 2017
☐	Horn Antenna	ETS-LINDGREN	3117	00164202	Jul. 24, 2015	Jul. 23, 2018
☒	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117-PA	00201874	Dec. 30, 2016	Dec. 30, 2017
☐	Horn Antenna	ETS-LINDGREN	3116C	00200180	Jul. 28, 2015	Jul. 27, 2018
☐	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3116C-PA	00202652	Jul. 29, 2015	Jul. 28, 2018
☒	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
☐	Band rejection filter (5150MHz~5880MHz)	micro-tronics	BRM50716	G1868	Jun. 21, 2017	Jun. 20, 2018
☐	Band rejection filter (2400MHz~2500MHz)	micro-tronics	BRM50702	G248	Jun. 15, 2017	Jun. 14, 2018
☒	Highpass Filter (1.2GHz~18GHz)	Micro-Tronics	HPM50108	G552	Jan. 19, 2017	Jan. 19, 2018
☐	Highpass Filter (3GHz~18GHz)	Micro-Tronics	HPM50117	G005	Jan. 30, 2017	Jan. 30, 2018

Conducted RF test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm dd, yyyy)	Cal. Due date (mm dd, yyyy)
☒	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	Dec. 22, 2016	Dec. 22, 2017
☐	Receiver	R&S	ESR7	1316.3003K07-101181-K3	Dec. 22, 2016	Dec. 22, 2017
☒	USB Wideband Power Sensor	KEYSIGHT	U2021XA	MY55430035	Dec. 22, 2016	Dec. 22, 2017
☒	USB Wideband Power Sensor	KEYSIGHT	U2021XA	MY55430023	Dec. 22, 2016	Dec. 22, 2017

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China
Tel: +86-755-28230888 Fax: +86-755-28230886 E-mail: info@uttlab.com <http://www.uttlab.com>

☒	DC Source	KIKUSUI	PWR400L	LK003024	Sep. 21, 2016	Sep. 20, 2017
☒	Temp & Humidity chamber	Ispec	GL(U)04KA(W)	1692H201P3	Jun. 19, 2017	Jun. 18, 2018
☒	Communication test set	R&S	CMW500	130805	Mar. 22, 2017	Mar. 21, 2018

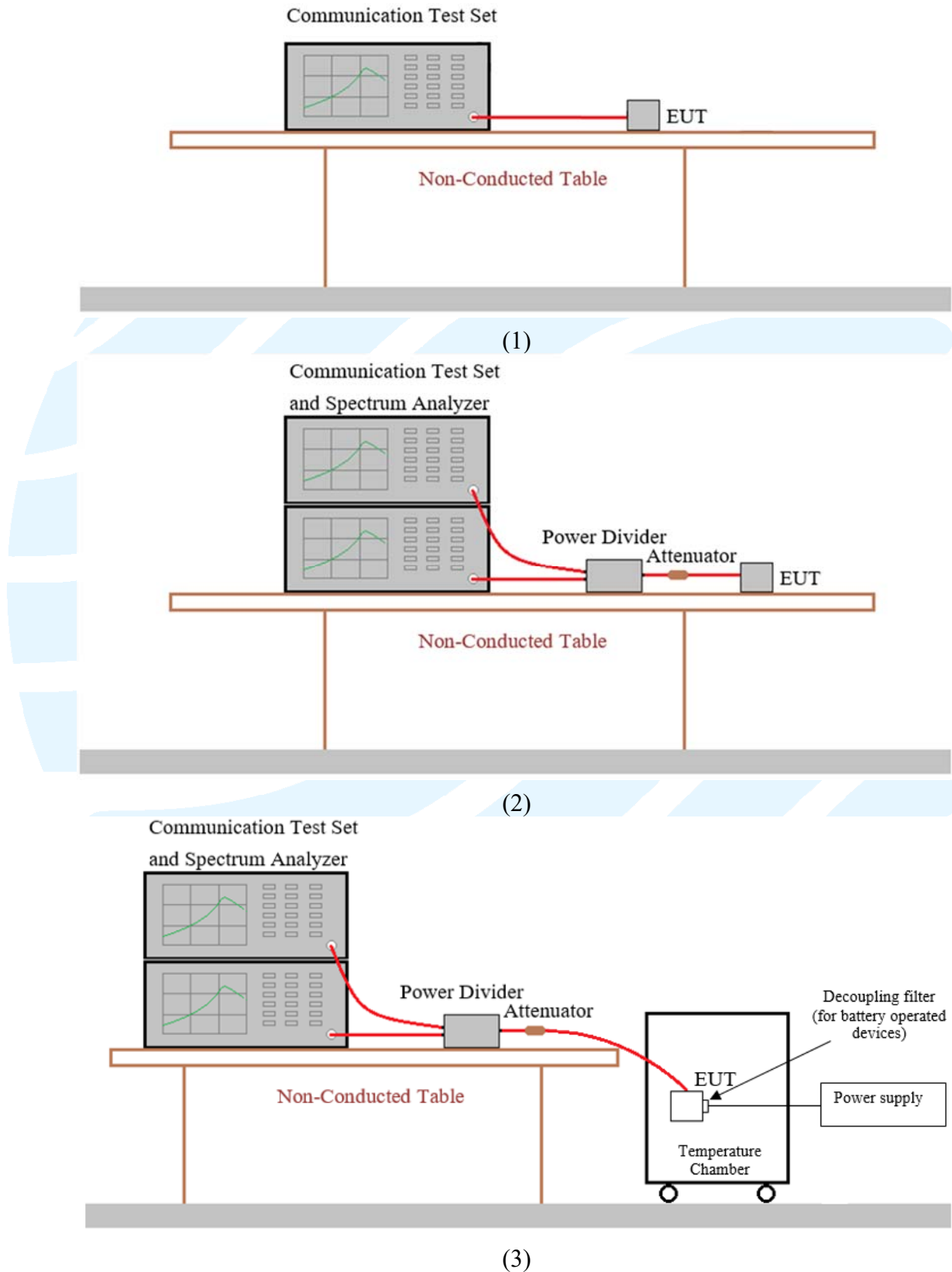

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China
Tel: +86-755-28230888 Fax: +86-755-28230886 E-mail: info@uttlab.com [Http://www.uttlab.com](http://www.uttlab.com)

4 Test Requirement

4.1 Test setup

4.1.1 For Conducted test setup



4.1.2 For Radiated Emissions test setup

Radiated Emissions setup:

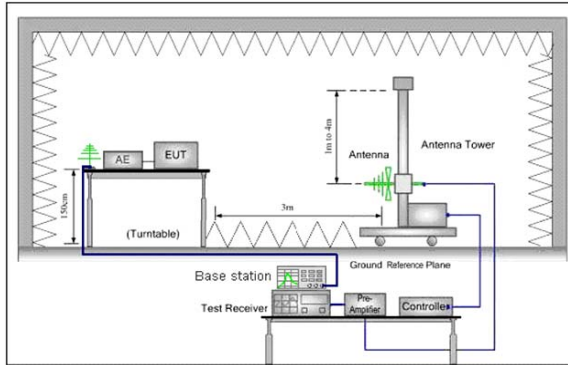


Figure 1.30MHz to 1GHz

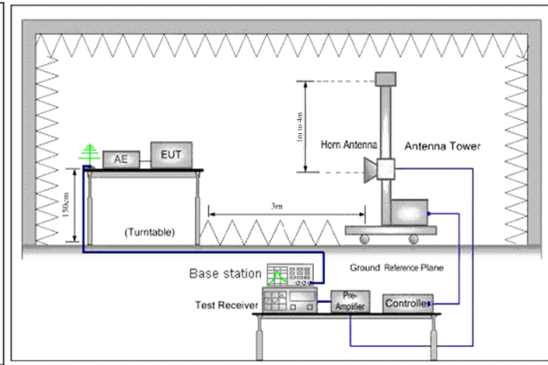


Figure 2. above 1GHz

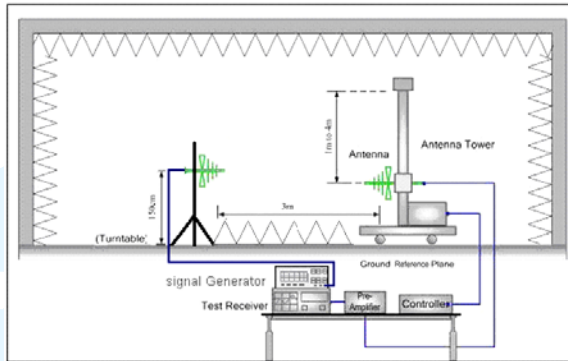


Figure 3. 30MHz to 1GHz

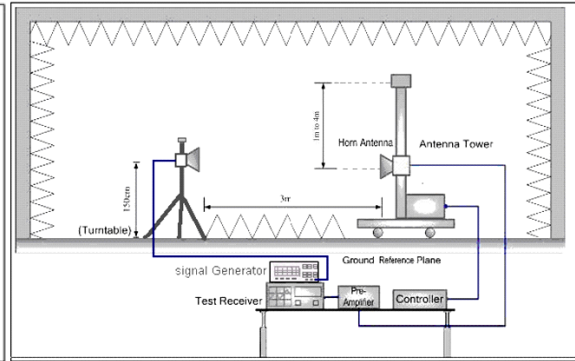


Figure 4. above 1GHz

4.2 Test Environment

Operating Environment:	
Temperature:	24.5 °C
Humidity:	57 % RH
Atmospheric Pressure:	101.2kpa

4.3 System Test Configuration

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, radiated emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario. It was powered by a 3.85Vdc rechargeable Li-on battery. Only the worst case data were recorded in this test report.

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

The worst case was found when positioned as the table below.

Mode	Worst-case Orientation	
	ERP	Radiated Emission
GSM	X axis	X axis
EDGE	X axis	X axis
WCDMA Band V	X axis	X axis
LTE Band 5	X axis	X axis

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China
Tel: +86-755-28230888 Fax: +86-755-28230886 E-mail: info@uttlab.com <http://www.uttlab.com>

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000MHz. The resolution is 1 MHz or greater for frequencies above 1000MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

Radiated emission measurement were performed from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

4.4 Test Condition

4.4.1 Test channel

Test Mode	Tx/Rx	RF Channel		
		Low(L)	Middle(M)	High(H)
GSM/GPRS/EDGE850	Tx (824 MHz ~ 849 MHz)	Channel 128	Channel 190	Channel 251
		824.2MHz	836.6 MHz	848.8 MHz
	Rx (869 MHz ~ 894 MHz)	Channel 128	Channel 190	Channel 251
		869.2 MHz	881.6 MHz	893.8 MHz
WCDMA band V	Tx (824 MHz ~ 849 MHz)	Channel 4132	Channel 4182	Channel 4233
		826.4 MHz	836.4 MHz	846.6 MHz
	Rx (869 MHz ~ 894 MHz)	Channel 4357	Channel 4407	Channel 4458
		871.4 MHz	881.4 MHz	891.6 MHz

Test Mode	Test Frequency ID	Bandwidth (MHz)	Number [UL]	Frequency of Uplink (MHz)	Number [DL]	Frequency of Downlink (MHz)
LTE band 5 TX:824–849 MHz RX: 869–894MHz	Low Range	1.4	20407	824.7	2407	869.7
		3	20415	825.5	2415	870.5
		5	20425	826.5	2425	871.5
		10	20450	829	2450	874
	Middle Range	1.4/3/5/10	20525	836.5	2525	881.5
	High Range	1.4	20643	848.3	2643	893.3
		3	20635	847.5	2635	892.5
		5	20625	846.5	2625	891.5
		10	20600	844	2600	889

4.4.2 Test mode

Pre-scan under all rate at lowest middle and highest channel, find the transmitter power as below:

SIM 1 Card Conducted transmitter power measurement result (Units: dBm).

Band	GSM850		
Channel	128	190	251
Frequency(MHz)	824.2MHz	836.6MHz	848.8MHz
GSM (GMSK, 1Tx-slot)	31.78	31.87	31.85
GPRS (GMSK, 1Tx-slot)	31.65	31.76	31.76
GPRS (GMSK, 2Tx-slot)	29.86	29.85	29.83
GPRS (GMSK, 3Tx-slot)	27.80	27.89	27.86

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China
Tel: +86-755-28230888 Fax: +86-755-28230886 E-mail: info@uttlab.com [Http://www.uttlab.com](http://www.uttlab.com)

GPRS (GMSK, 4Tx-slot)	26.48	26.52	26.57
EDGE (8PSK, 1Tx-slot)	26.57	26.59	26.60
EDGE (8PSK, 2Tx-slot)	24.22	24.11	24.17
EDGE (8PSK, 3Tx-slot)	23.44	23.41	23.39
EDGE (8PSK, 4Tx-slot)	22.27	22.38	22.33

Band	WCDMA Band V		
Channel	4132	4182	4233
Frequency(MHz)	826.4MHz	836.4MHz	846.6MHz
RMC 12.2K	22.60	22.57	22.55
HSDPA Subtest-1	22.01	21.98	22.00
HSDPA Subtest-2	21.99	21.95	21.98
HSDPA Subtest-3	21.52	21.48	21.47
HSDPA Subtest-4	21.51	21.47	21.46
HSUPA Subtest-1	22.00	21.96	21.98
HSUPA Subtest-2	21.89	21.94	21.96
HSUPA Subtest-3	21.50	21.45	21.43
HSUPA Subtest-4	21.51	21.48	21.45
HSUPA Subtest-5	21.98	21.94	21.93
DC-HSDPA Subtest-1	19.98	19.95	19.95
DC-HSDPA Subtest-2	20.97	20.96	20.88
DC-HSDPA Subtest-3	19.98	19.91	19.96
DC-HSDPA Subtest-4	21.96	21.90	21.91

LTE Band 5									
Channel Bandwidth: 1.4 MHz					Channel Bandwidth: 3 MHz				
Channel	RB Configuration		Average Power [dBm]		Channel	RB Configuration		Average Power [dBm]	
	Size	Offset	QPSK	16QAM		Size	Offset	QPSK	16QAM
LCH	1	0	22.87	21.91	LCH	1	0	22.91	21.95
	1	2	22.63	21.71		1	7	22.67	21.75
	1	5	23.09	22.16		1	14	23.13	22.20
	3	0	22.85	21.90		8	0	21.85	20.90
	3	1	22.61	21.70		8	3	21.89	20.89
	3	3	23.07	22.15		8	7	21.96	21.05
	6	0	21.82	20.85		15	0	21.86	20.89
MCH	1	0	22.95	22.30	MCH	1	0	22.99	22.34
	1	2	22.83	22.01		1	7	22.87	22.05
	1	5	23.15	22.18		1	14	23.19	22.22
	3	0	22.93	22.29		8	0	21.96	21.05
	3	1	22.81	22.00		8	3	22.17	21.01
	3	3	23.13	22.17		8	7	21.99	21.05
	6	0	21.96	20.96		15	0	22.00	21.00
HCH	1	0	23.03	22.32	HCH	1	0	23.07	22.36
	1	2	22.98	22.31		1	7	23.02	22.35
	1	5	23.31	22.33		1	14	23.35	22.37
	3	0	23.01	22.31		8	0	22.13	21.17
	3	1	22.96	22.30		8	3	22.18	21.21

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China
Tel: +86-755-28230888 Fax: +86-755-28230886 E-mail: info@uttlab.com <http://www.uttlab.com>

	3	3	23.29	22.32		8	7	22.15	21.25
	6	0	22.10	20.92		15	0	22.14	20.96
Channel Bandwidth: 5 MHz					Channel Bandwidth: 10 MHz				
LCH	1	0	22.97	22.01	LCH	1	0	23.00	22.04
	1	12	22.73	21.81		1	24	22.76	21.84
	1	24	23.19	22.26		1	49	23.22	22.29
	12	0	21.91	20.96		25	0	21.94	20.99
	12	6	21.95	20.95		25	12	21.98	20.98
	12	13	22.02	21.11		25	25	22.05	21.14
	25	0	21.92	20.95		50	0	21.95	20.98
MCH	1	0	23.05	22.40	MCH	1	0	23.08	22.43
	1	12	22.93	22.11		1	24	22.96	22.14
	1	24	23.25	22.28		1	49	23.28	22.31
	12	0	22.02	21.11		25	0	22.05	21.14
	12	6	22.23	21.07		25	12	22.26	21.10
	12	13	22.05	21.11		25	25	22.08	21.14
	25	0	22.06	21.06		50	0	22.09	21.09
HCH	1	0	23.13	22.42	HCH	1	0	23.16	22.45
	1	12	23.08	22.41		1	24	23.11	22.44
	1	24	23.41	22.43		1	49	23.44	22.46
	12	0	22.19	21.23		25	0	22.22	21.26
	12	6	22.24	21.27		25	12	22.27	21.30
	12	13	22.21	21.31		25	25	22.24	21.34
	25	0	22.20	21.02		50	0	22.23	21.05

Pre-scan all mode and data rates and positions, find worse case mode are chosen to the report, the worse mode as below:

Band	Radiated	Conducted
GSM/GPRS/EDGE 850	1) GSM (GMSK, 1Tx-slot) Link 2) GPRS (GMSK, 1Tx-slot) Link 3) EDGE (8PSK, 1Tx-slot) Link	1) GSM (GMSK, 1Tx-slot) Link 2) GPRS (GMSK, 1Tx-slot) Link 3) EDGE (8PSK, 1Tx-slot) Link
WCDMA Band V	RMC 12.2Kbps Link	RMC 12.2Kbps Link

LTE worse mode applicability and tested channel detail as below:

LTE-Band 5												
Item	Bandwidth(MHz)				Modulation		RB #			Test Channel		
	1.4	3	5	10	QPSK	16QAM	1	Half	Ful	L	M	H
ERP	☒	☒	☒	☒	☒	☒	☒	☐	☐	☒	☒	☒
Conducted output power	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
99% &26dB Occupied Bandwidth	☒	☒	☒	☒	☒	☒	☐	☐	☒	☒	☒	☒
Band Edge at antenna terminals	☒	☒	☒	☒	☒	☒	☒	☐	☒	☒	☐	☒
Spurious emissions at antenna terminals	☒	☒	☒	☒	☒	☒	☒	☐	☐	☒	☒	☒

Field strength of spurious radiation	☒	☒	☒	☒	☒	☐	☒	☐	☐	☐	☒	☐
Frequency stability	☐	☐	☐	☒	☒	☐	☐	☐	☒	☐	☒	☐
Remark: The mark “ ☒ ” means is chosen for testing The mark “ ☐ ” means is not chosen for testing The mark “-” means is not supported bandwidth												



5 Radio Technical Requirements Specification

Reference documents for testing:

No.	Identity	Document Title
1	FCC 47 CFR Part 22 Subpart H	PART 22 – PUBLIC MOBILE SERVICES Subpart H – Cellular Radiotelephone Service
2	47 CFR Part 2 Subpart J	Frequency allocations and radio treaty matters; general rules and regulations
3	ANSI/TIA/EIA-603-D 2010	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
4	KDB 971168 D01	KDB 971168 D01 Power Meas License Digital Systems v02r02

5.1 Effective Radiated Power

Test Requirement: FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 22.913(a)

Test Method: KDB 971168 D01v02r02 & ANSI/TIA/EIA-603-D 2010

Limit: The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

Test Procedure: Test procedure as below:

- 1) The EUT was powered ON and placed on a 0.8m high table at a 3 meter fully Anechoic Chamber. The antenna of the transmitter was extended to its maximum length. Modulation mode and the measuring receiver shall be tuned to the frequency of the transmitter under test.
- 2) The EUT was set 3 meters (above 18GHz the distance is 1 meter) away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 3) The disturbance of the transmitter was maximized on the test receiver display by raising and lowering from 1m to 4m the receive antenna and by rotating through 360° the turntable. After the fundamental emission was maximized, a field strength measurement was made.
- 4) Steps 1) to 3) were performed with the EUT and the receive antenna in both vertical and horizontal polarization.
- 5) The transmitter was then removed and replaced with another antenna. The center of the antenna was approximately at the same location as the center of the transmitter.
- 6) A signal at the disturbance was fed to the substitution antenna by means of a non-radiating cable. With both the substitution and the receive antennas horizontally polarized, the receive antenna was raised and lowered to obtain a maximum reading at the test receiver. The level of the signal generator was adjusted until the measured field strength level in step 3) is obtained for this set of conditions.
- 7) The output power into the substitution antenna was then measured.
- 8) Steps 6) and 7) were repeated with both antennas polarized.
- 9) Calculate power in dBm by the following formula:

$$\text{ERP(dBm)} = \text{Pg(dBm)} - \text{cable loss (dB)} + \text{antenna gain (dBi)}$$

$$\text{EIRP(dBm)} = \text{Pg(dBm)} - \text{cable loss (dB)} + \text{antenna gain (dBi)}$$

$$\text{EIRP} = \text{ERP} + 2.15\text{dB}$$

where:
Pg is the generator output power into the substitution antenna.
- 10) Test the EUT in the lowest channel, the middle channel the Highest channel
- 11) The radiation measurements are performed in X, Y, Z axis positioning for EUT operation mode, and found the X axis positioning which it is worse case.
- 12) Repeat above procedures until all frequencies measured was complete.

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China
Tel: +86-755-28230888 Fax: +86-755-28230888 E-mail: info@uttlab.com <http://www.uttlab.com>

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
30MHz-1GHz	Peak	100kHz	300kHz	Peak
Above 1GHz	Peak	1MHz	3MHz	Peak

Test Setup:

Refer to section 4.1.2 for details.

Instruments Used:

Refer to section 3 for details

Test Mode:

Link mode

Test Results:

Pass

Test Data:

Channel	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Result	Antenna Polaxis.
GSM 1Tx-slot					
128	824.2	27.33	38.45	Pass	H
		18.54	38.45	Pass	V
190	836.6	26.89	38.45	Pass	H
		19.03	38.45	Pass	V
251	848.8	27.76	38.45	Pass	H
		20.12	38.45	Pass	V
EDGE 1Tx-slot					
128	824.2	24.54	38.45	Pass	H
		16.23	38.45	Pass	V
190	836.6	24.32	38.45	Pass	H
		14.76	38.45	Pass	V
251	848.8	23.76	38.45	Pass	H
		15.33	38.45	Pass	V
WCDMA RMC 12.2Kbps					
4132	826.4	19.56	38.45	Pass	H
		18.95	38.45	Pass	V
4182	836.6	18.63	38.45	Pass	H
		16.87	38.45	Pass	V
4233	846.6	18.62	38.45	Pass	H
		19.29	38.45	Pass	V

Channel	Frequency (MHz)	ERP (dBm)		Limit (dBm)	Result	Antenna Polaxis.
		QPSK; RB:1	16QAM; RB:1			
LTE Band 5; Bandwidth 1.4MHz						
20407	824.7	20.32	18.45	33.01	Pass	H
		12.32	10.65	33.01	Pass	V
20525	836.5	21.28	18.87	33.01	Pass	H
		9.76	8.98	33.01	Pass	V
20643	848.3	19.33	18.54	33.01	Pass	H
		11.57	10.76	33.01	Pass	V
LTE Band 5; Bandwidth 3MHz						
20415	825.5	18.76	17.69	33.01	Pass	H
		10.67	9.45	33.01	Pass	V
20525	836.5	19.32	19.03	33.01	Pass	H
		11.32	10.95	33.01	Pass	V
20635	847.5	20.51	18.79	33.01	Pass	H
		12.56	11.33	33.01	Pass	V
LTE Band 5; Bandwidth 5MHz						
20425	826.5	17.77	17.32	33.01	Pass	H
		9.88	9.65	33.01	Pass	V
20525	836.5	18.65	17.89	33.01	Pass	H
		10.47	9.57	33.01	Pass	V
20625	846.5	18.89	18.44	33.01	Pass	H
		10.56	9.99	33.01	Pass	V
LTE Band 5; Bandwidth 10MHz						
20450	829	20.22	18.65	33.01	Pass	H
		11.43	10.57	33.01	Pass	V
20525	836.5	19.21	18.79	33.01	Pass	H
		11.33	10.42	33.01	Pass	V
20600	844	19.42	18.79	33.01	Pass	H
		9.97	9.66	33.01	Pass	V

5.2 Conducted Output Power

Test Requirement: FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 22.913(a)
Test Method: ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02
Limit: The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.
Test Procedure: The EUT was set up for the maximum power with GSM, GPRS, EDGE, WCDMA, CDMA, and LTE link data modulation and link up with simulator. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Setup: Refer to section 4.1.1(1) for details.

Instruments Used: Refer to section 3 for details

Test Mode: Link mode

Test Results: Pass

Test Data:

Note: The following is the worst conducted output power (Units: dBm), the full result can be also refer to section 4.4.2 for details.

For Cellular Band			
Channel	128	190	251
Frequency(MHz)	824.2MHz	836.6MHz	848.8MHz
GSM 1Tx-slot	31.78	31.87	31.85
GPRS 1Tx-slot	31.65	31.76	31.76
EDGE 1Tx-slot	26.57	26.59	26.60

WCDMA			
Channel	4132	4182	4233
Frequency(MHz)	826.4MHz	836.4MHz	846.6MHz
RMC 12.2Kbps	22.60	22.57	22.55

LTE Band 5									
Channel	RB Configuration		Average Power [dBm]		Channel	RB Configuration		Average Power [dBm]	
	Size	Offset	QPSK	16QAM		Size	Offset	QPSK	16QAM
Channel Bandwidth: 1.4 MHz					Channel Bandwidth: 3 MHz				
LCH	1	5	23.09	22.16	LCH	1	14	23.13	22.20
MCH	1	5	23.15	22.30	MCH	1	14	23.19	22.34
HCH	1	5	23.31	22.33	HCH	1	14	23.35	22.37
Channel Bandwidth: 5 MHz					Channel Bandwidth: 10 MHz				
LCH	1	24	23.19	22.26	LCH	1	49	23.22	22.29
MCH	1	24	23.25	22.28	MCH	1	49	23.28	22.43
HCH	1	24	23.41	22.43	HCH	1	49	23.44	22.46

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China
Tel: +86-755-28230888 Fax: +86-755-28230886 E-mail: info@uttlab.com [Http://www.uttlab.com](http://www.uttlab.com)

5.3 99%&26dB Occupied Bandwidth

Test Requirement:

FCC 47 CFR Part 2.1049(h) & FCC 47 CFR Part 22.917(b)

Test Method:

ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02

Test Procedure:

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at the low, middle and high channel in each band. The 99% and -26dB bandwidths was also measured and recorded.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Setup:

Refer to section 4.1.1(2) for details.

Instruments Used:

Refer to section 3 for details

Test Mode:

Link mode

Test Results:

Pass

Test Data:

For Cellular Band				
Test Mode	Channel	Frequency (MHz)	26 dB BW (kHz)	99% BW (kHz)
GSM 1Tx-slot	128	824.2	309.8	244.78
	190	836.6	312.0	245.13
	251	848.8	314.3	246.39
EDGE 1Tx-slot	128	824.2	313.6	247.02
	190	836.6	313.6	245.73
	251	848.8	291.2	237.84

For WCDMA				
Test Mode	Channel	Frequency (MHz)	26 dB BW (MHz)	99% BW (MHz)
RMC 12.2Kbps	4132	826.4	4.719	4.139
	4182	836.4	4.732	4.148
	4233	846.6	4.719	4.136

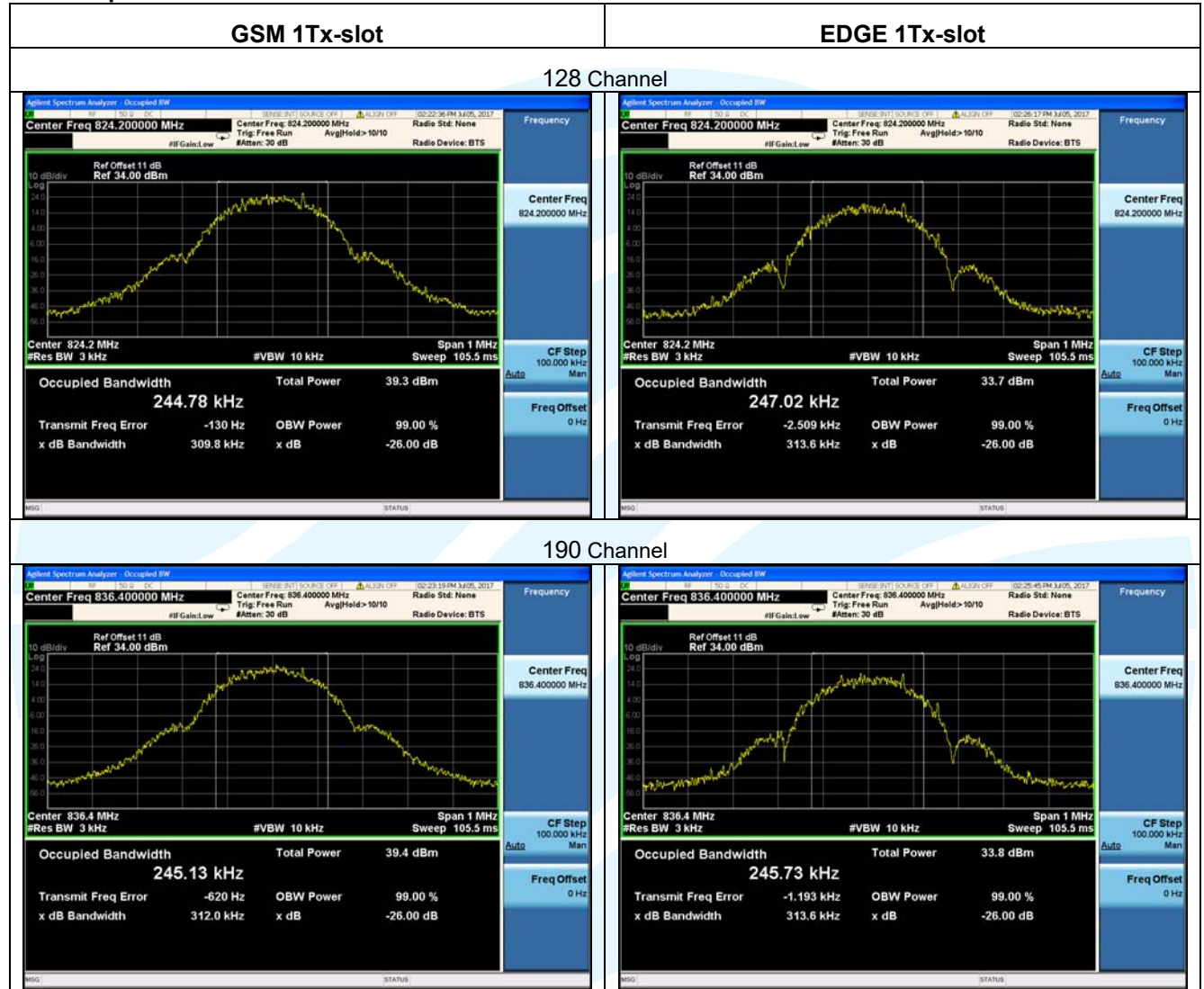
For LTE Band 5						
Channel Bandwidth: 1.4 MHz						
Channel	RB Configuration		26 dB BW (MHz)		99% BW (MHz)	
	Size	Offset	QPSK	16QAM	QPSK	16QAM
LCH	6	0	1.285	1.280	1.108	1.097
MCH	6	0	1.303	1.277	1.101	1.100
HCH	6	0	1.307	1.295	1.097	1.099
Channel Bandwidth: 3 MHz						
LCH	15	0	3.054	3.066	2.749	2.737
MCH	15	0	3.058	3.073	2.748	2.738
HCH	15	0a	3.061	3.061	2.743	2.743
Channel Bandwidth: 5 MHz						
LCH	25	0	5.014	5.017	4.512	4.522
MCH	25	0	5.004	5.066	4.508	4.527
HCH	25	0	5.036	4.995	4.529	4.518

Shenzhen UnionTrust Quality and Technology Co., Ltd.

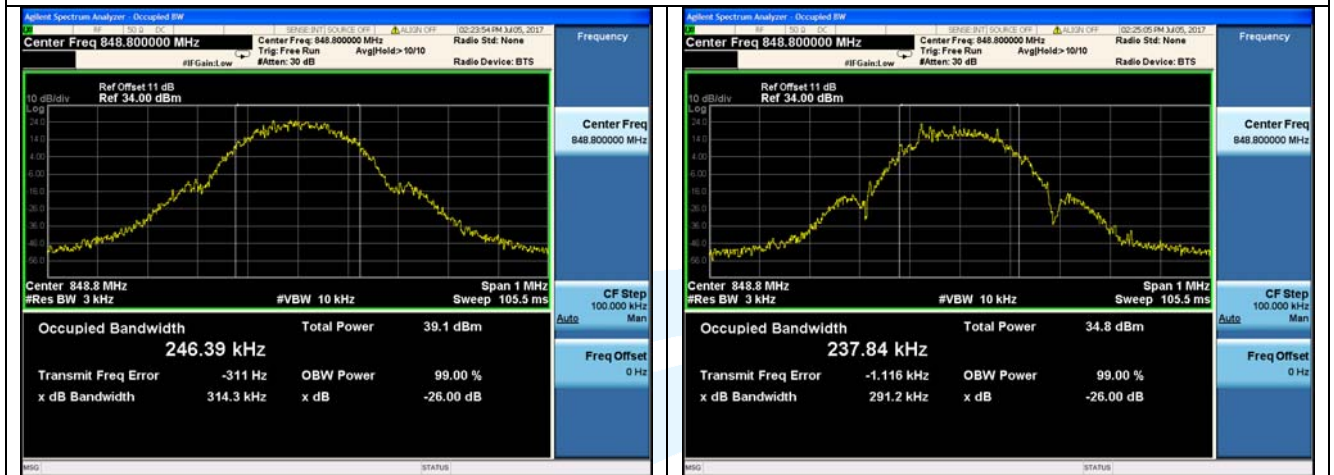
Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China
Tel: +86-755-28230888 Fax: +86-755-28230886 E-mail: info@uttlab.com <http://www.uttlab.com>

Channel Bandwidth: 10 MHz						
LCH	50	0	9.852	9.841	8.985	8.972
MCH	50	0	9.880	9.985	8.997	9.002
HCH	50	0	9.917	9.925	8.978	8.998

The test plot as follows:



251 Channel

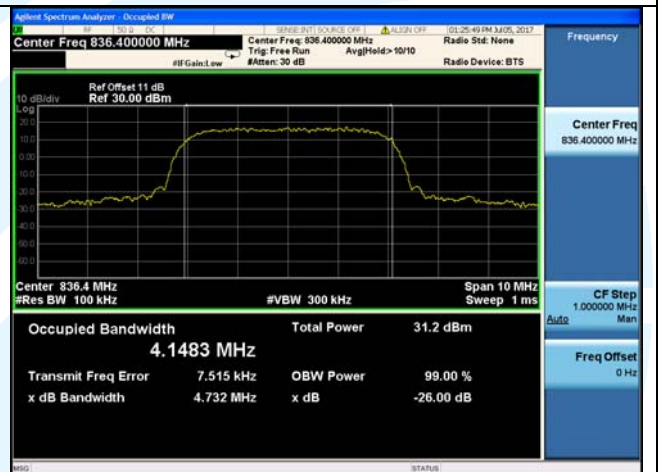


WCDMARMC 12.2Kbps

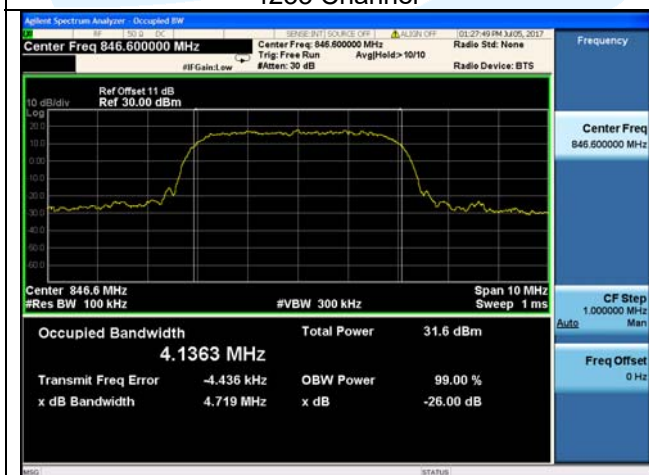
4132 Channel



4182 Channel



4233 Channel

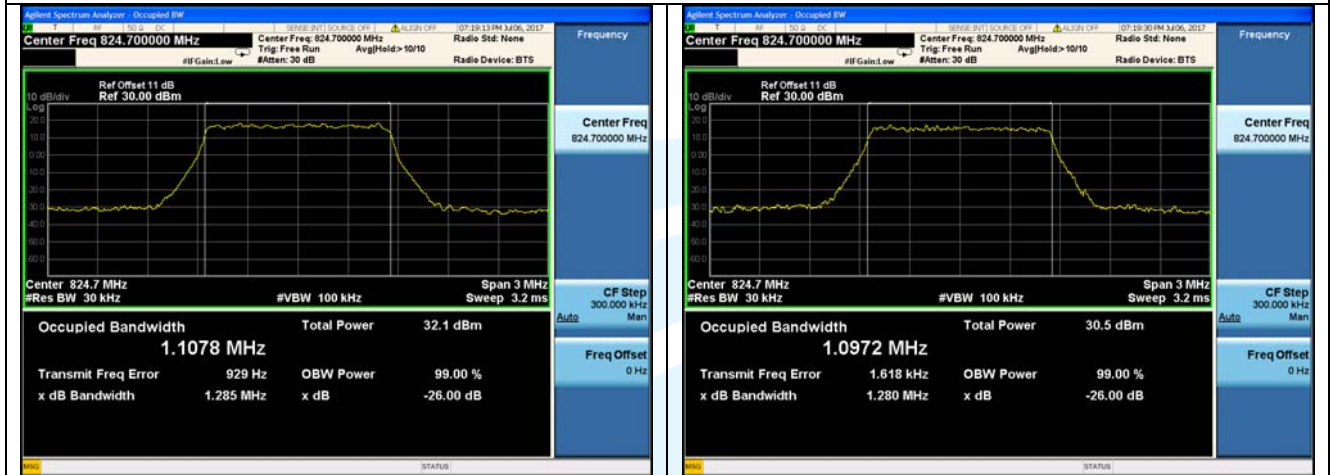


LTE_Band 5_Channel Bandwidth: 1.4 MHz_6RB#0

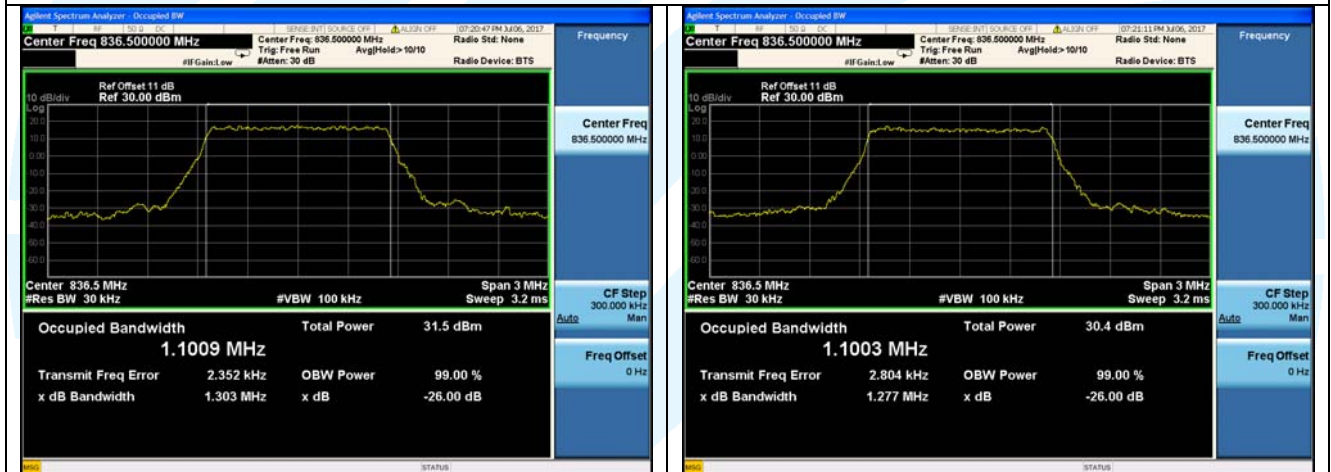
QPSK

16QAM

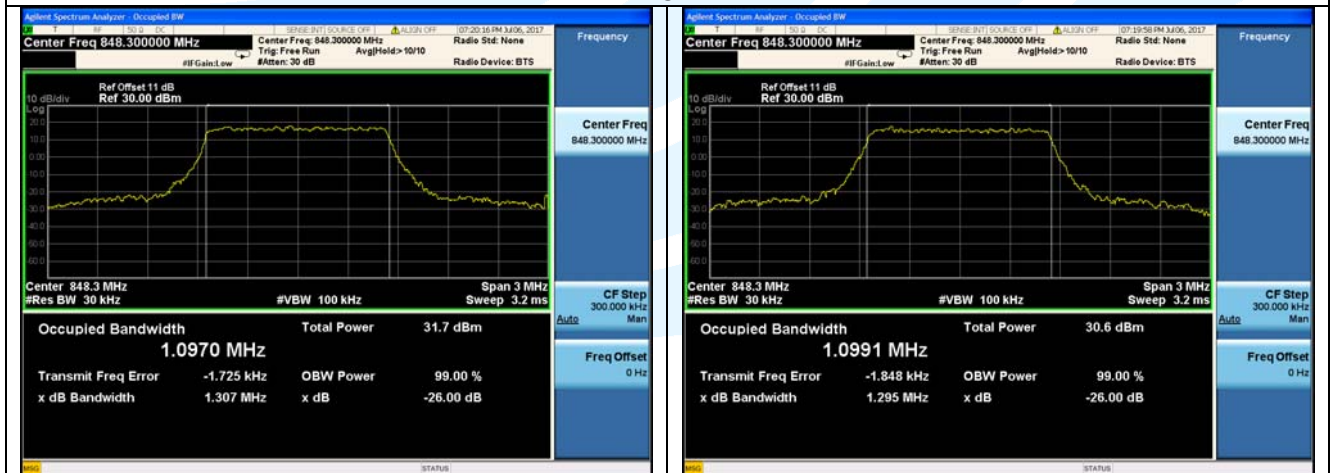
LCH



MCH



HCH



LTE_Band 5_Channel Bandwidth: 3 MHz_15RB#0

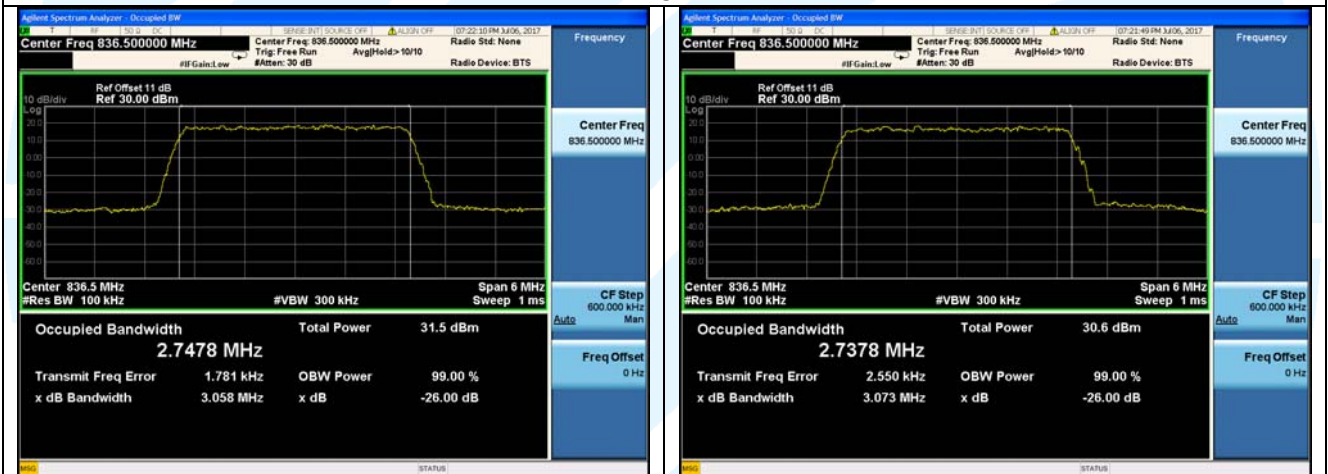
QPSK

16QAM

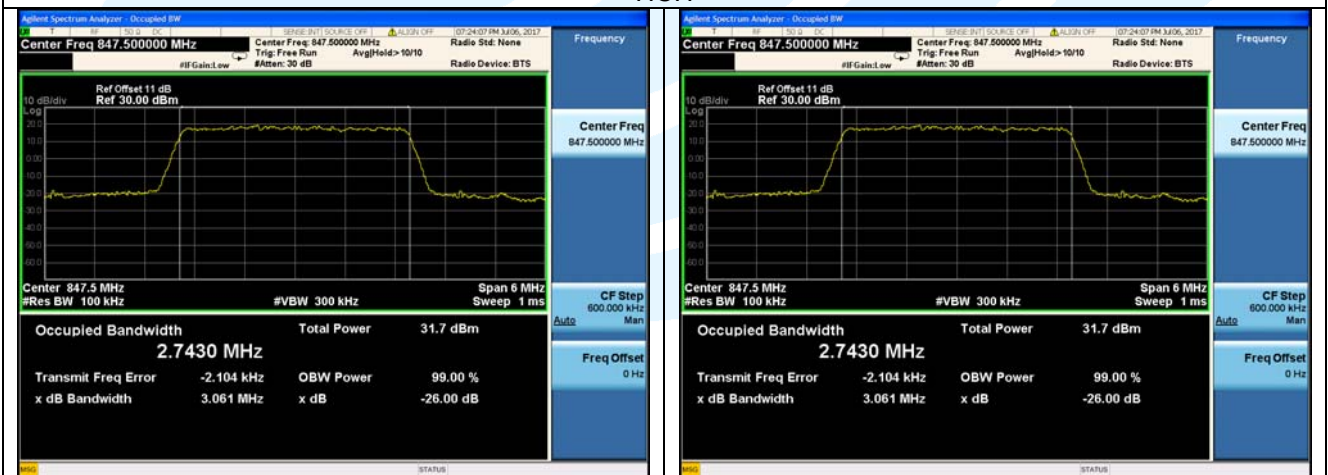
LCH



MCH



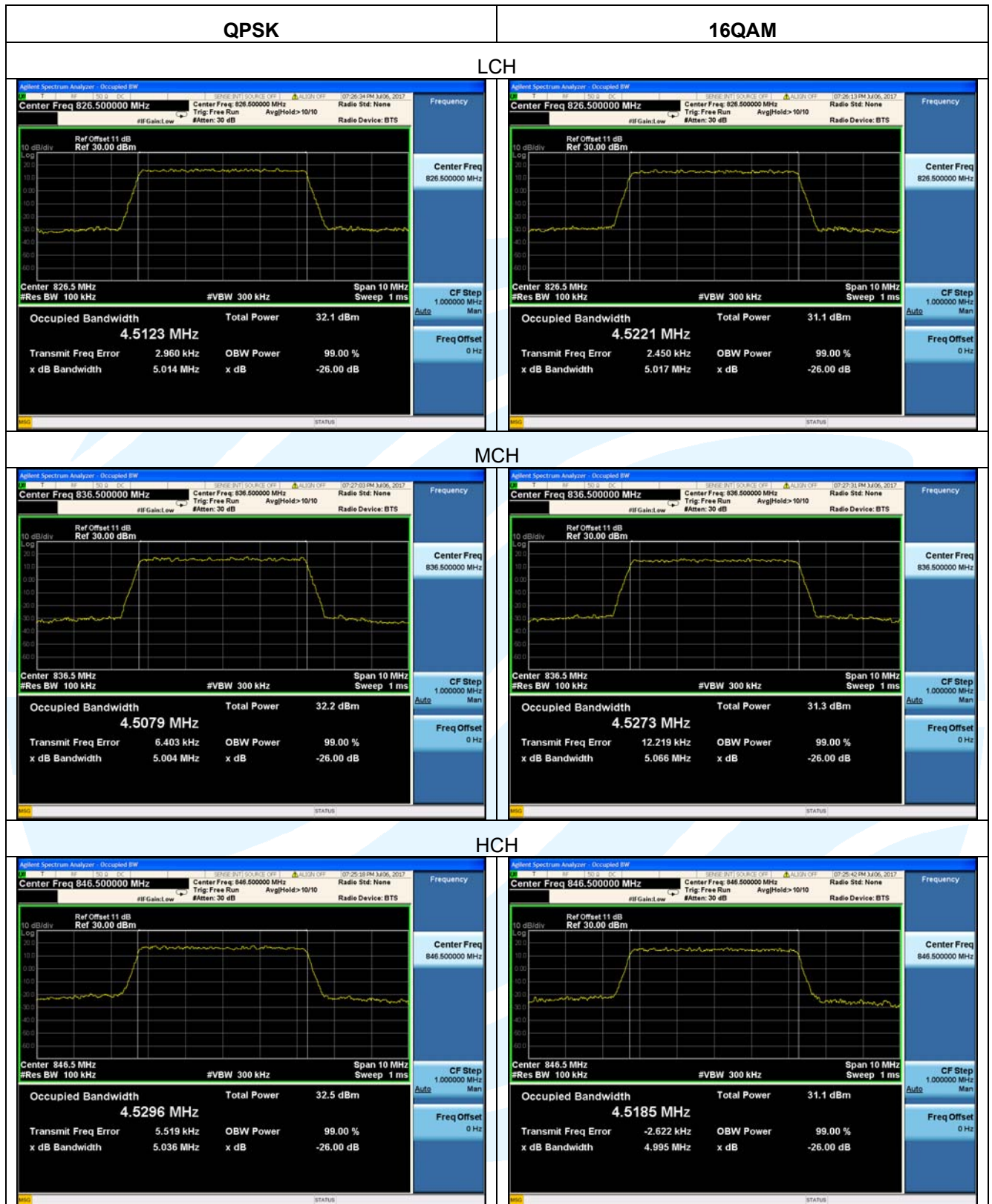
HCH

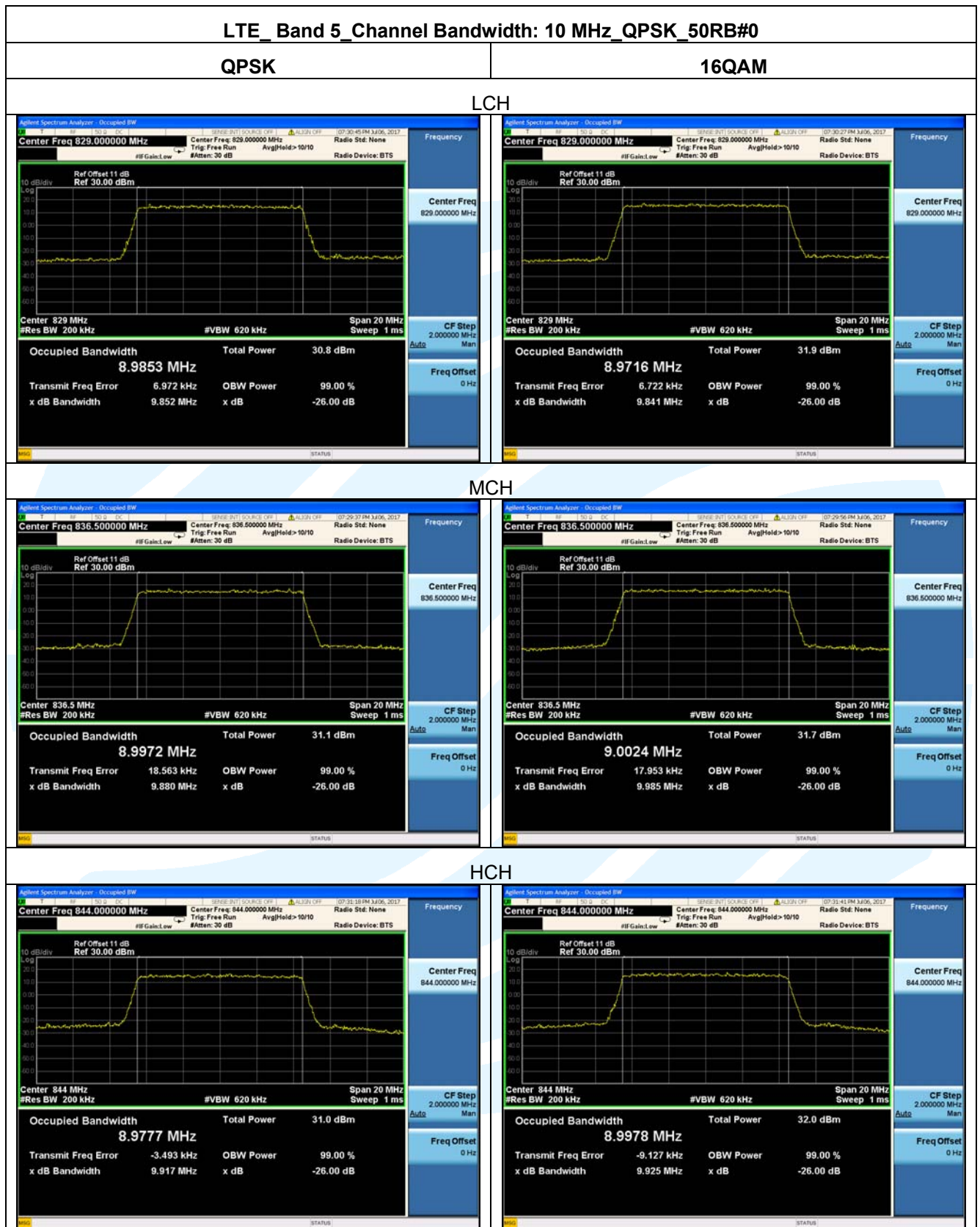


LTE_Band 5_Channel Bandwidth: 5 MHz_25RB#0

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China
 Tel: +86-755-28230888 Fax: +86-755-28230888 E-mail: info@uttlab.com <http://www.uttlab.com>

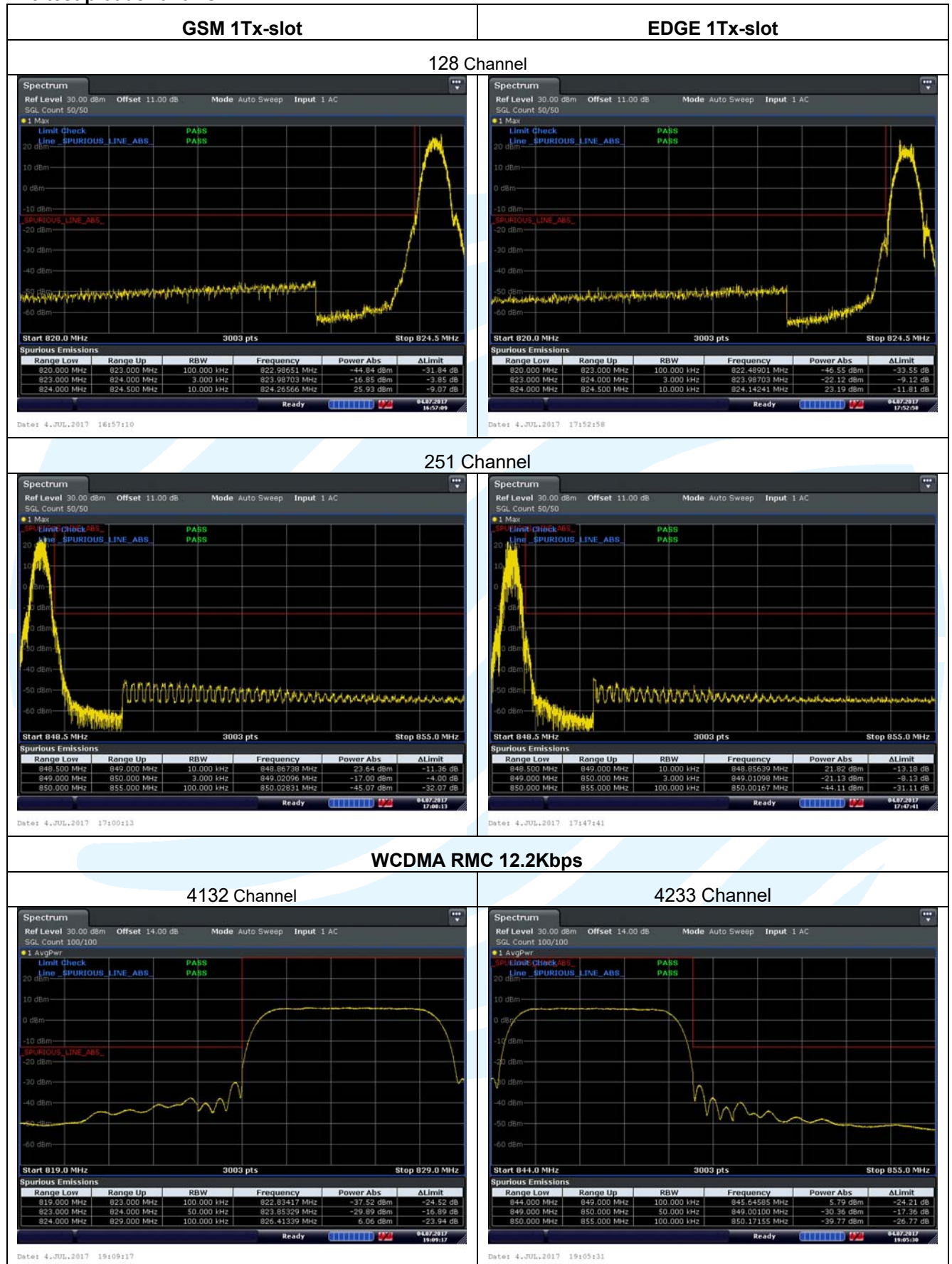




5.4 Band Edge at antenna terminals

Test Requirement:	FCC 47 CFR Part 2.1051 & FCC 47 CFR Part 22.917(a)
Test Method:	ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02
Limit:	The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. The emission limit equal to -13 dBm.
Test Procedure:	The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. For each band edge measurement: 1) Set the spectrum analyzer span to include the block edge frequency. 2) Set a marker to point the corresponding band edge frequency in each test case. 3) Set display line at -13 dBm 4) Set resolution bandwidth to at least 1% of emission bandwidth. Such as: a) The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 3 kHz and VB of the spectrum is 10 kHz (GSM/GPRS/EDGE). b) The center frequency of spectrum is the band edge frequency and span is 5 MHz. RB of the spectrum is 100 kHz and VB of the spectrum is 300 kHz (WCDMA). c) The center frequency of spectrum is the band edge frequency and span is 2 MHz. RB of the spectrum is 20 kHz and VB of the spectrum is 20 kHz (LTE Bandwidth 1.4 MHz). d) The center frequency of spectrum is the band edge frequency and span is 2 MHz. RB of the spectrum is 30 kHz and VB of the spectrum is 30 kHz (LTE Bandwidth 3 MHz). e) The center frequency of spectrum is the band edge frequency and span is 2 MHz. RB of the spectrum is 50 kHz and VB of the spectrum is 50 kHz (LTE Bandwidth 5 MHz) f) The center frequency of spectrum is the band edge frequency and span is 2 MHz. RB of the spectrum is 100 kHz and VB of the spectrum is 100 kHz (LTE Bandwidth 10 MHz) 5) Record the max trace plot into the test report Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.
Test Setup:	Refer to section 4.1.1(2) for details.
Instruments Used:	Refer to section 3 for details
Test Mode:	Link mode
Test Results:	Pass

The test plot as follows:

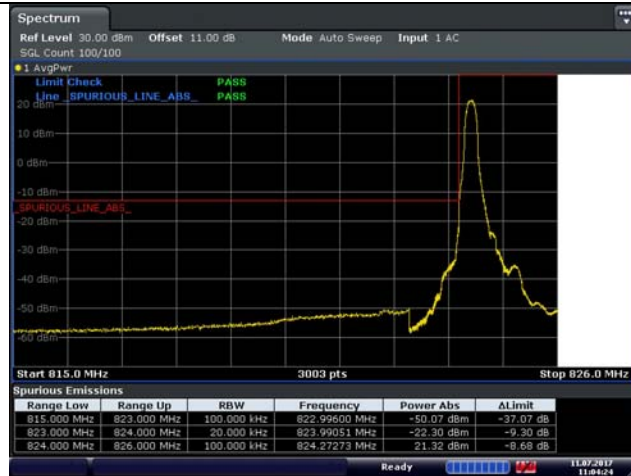


QPSK

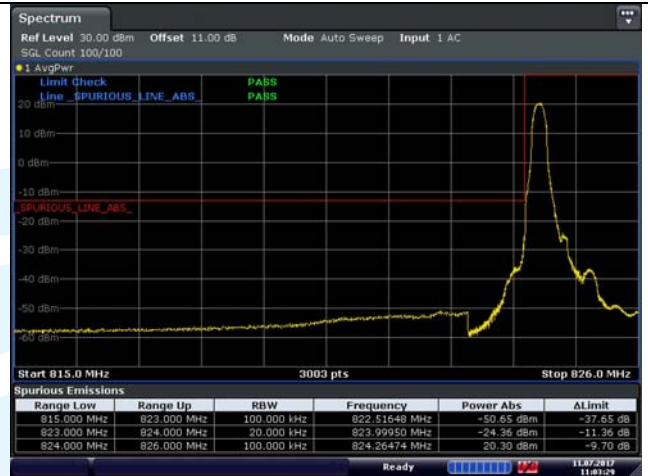
16QAM

LTE_Band 5_Channel Bandwidth: 1.4 MHz_1RB#0

LCH



Date: 11.JUL.2017 11:04:23



Date: 11.JUL.2017 11:03:29

HCH



Date: 11.JUL.2017 11:06:08



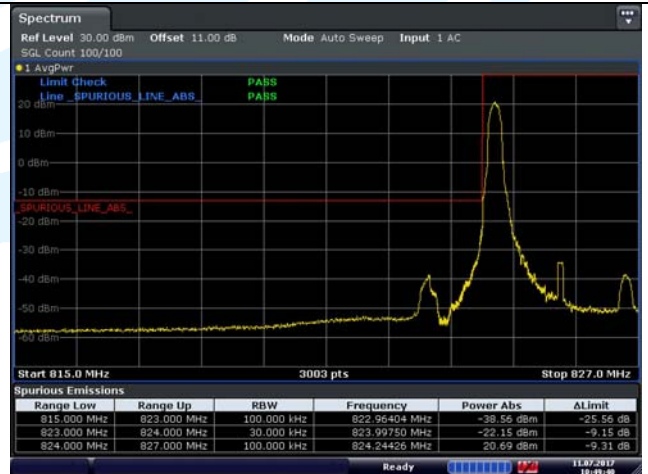
Date: 11.JUL.2017 11:07:46

LTE_Band 5_Channel Bandwidth: 3 MHz_1RB#0

LCH

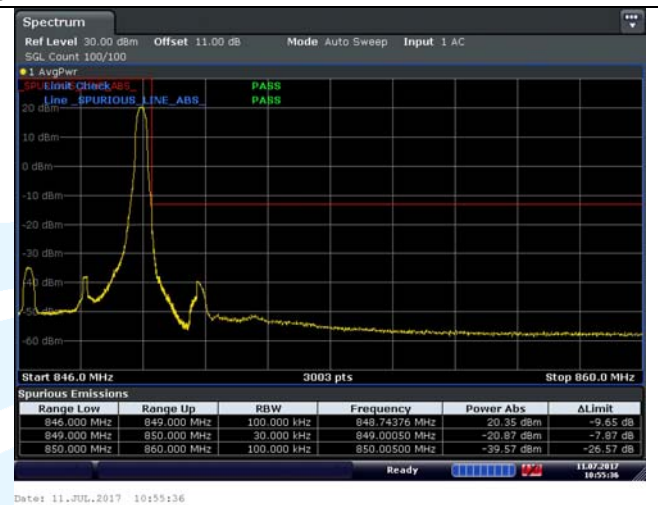


Date: 11.JUL.2017 10:51:36



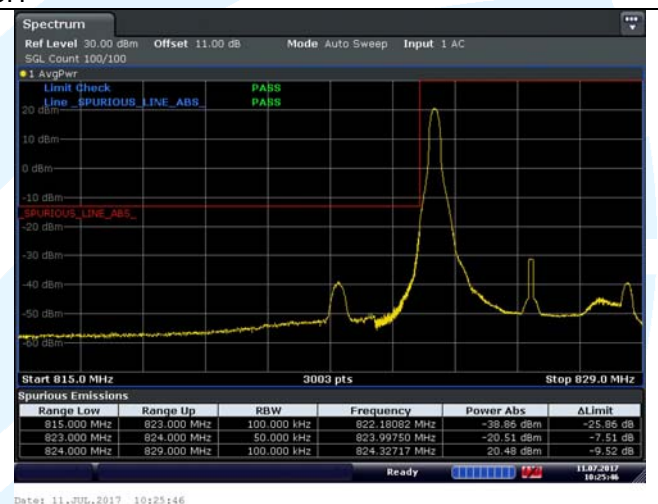
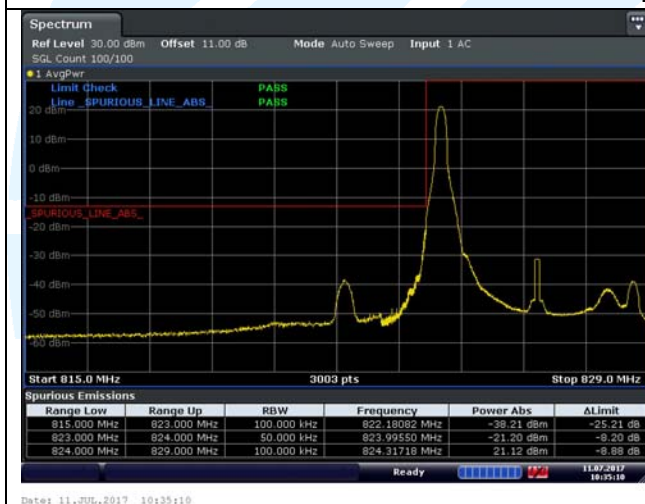
Date: 11.JUL.2017 10:49:39

HCH

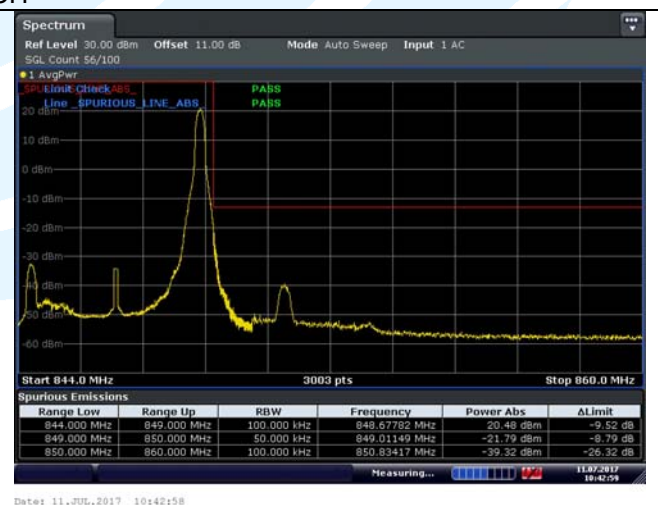
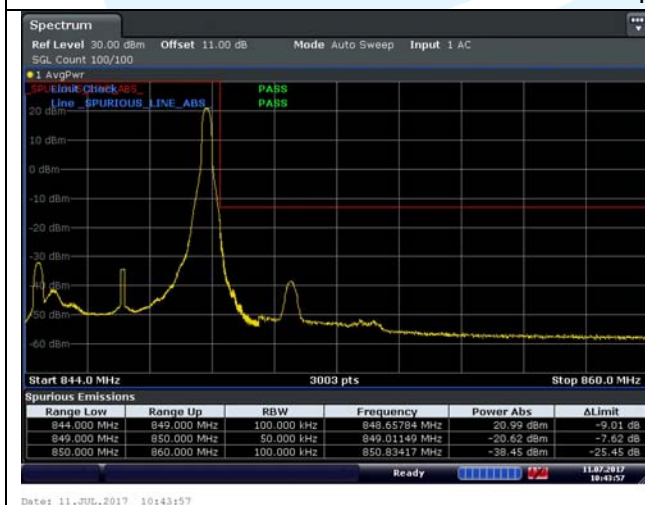


LTE_Band 5_Channel Bandwidth: 5 MHz_1RB#0

LCH

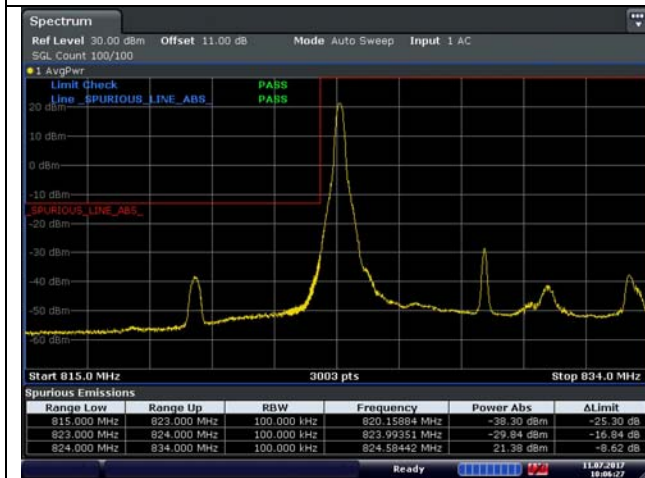


HCH

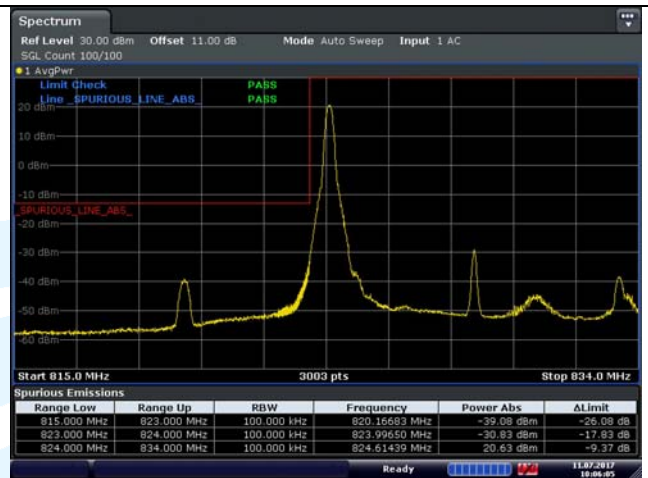


LTE_Band 5_Channel Bandwidth: 10 MHz_1RB#0

LCH

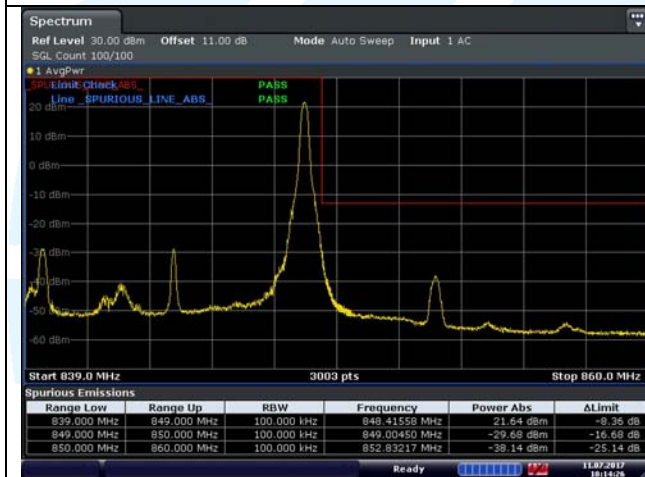


Date: 11.JUL.2017 10:06:27

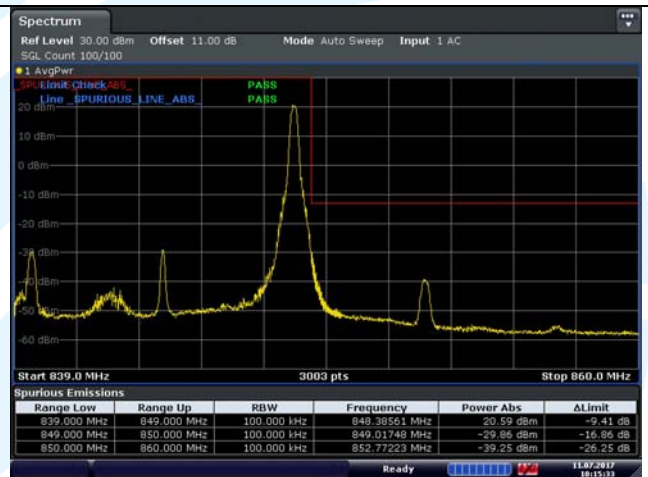


Date: 11.JUL.2017 10:06:05

HCH



Date: 11.JUL.2017 10:14:26



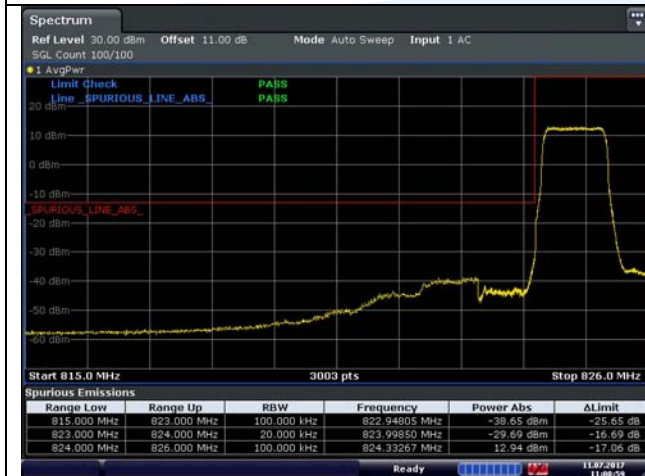
Date: 11.JUL.2017 10:15:33

QPSK

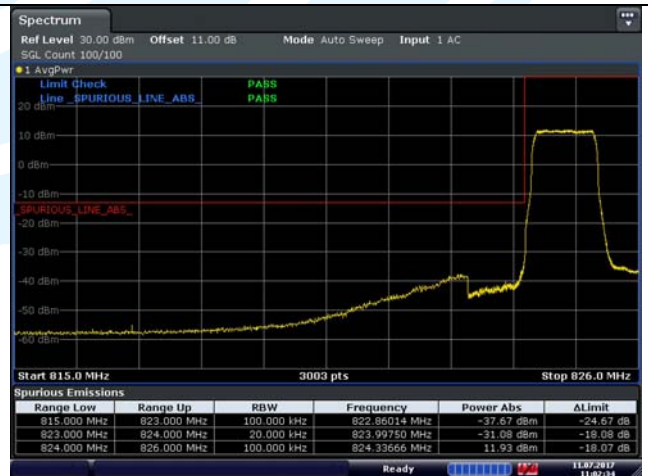
16QAM

LTE_Band 5_Channel Bandwidth: 1.4 MHz_6RB#0

LCH



Date: 11.JUL.2017 11:00:59



Date: 11.JUL.2017 11:02:34

HCH



LTE_Band 5_Channel Bandwidth: 3 MHz_15RB#0

LCH

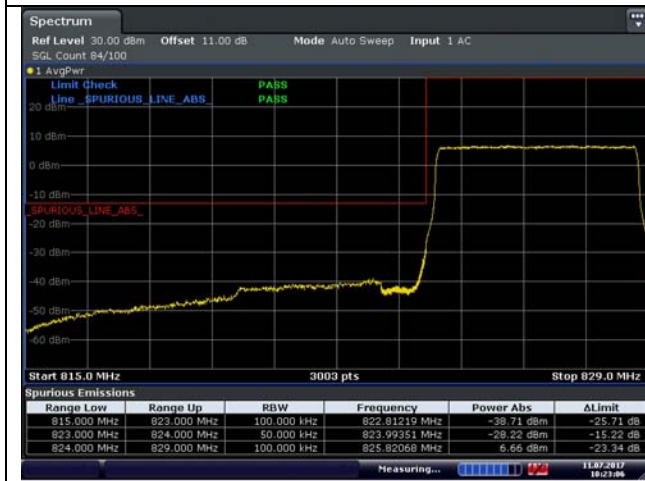


HCH

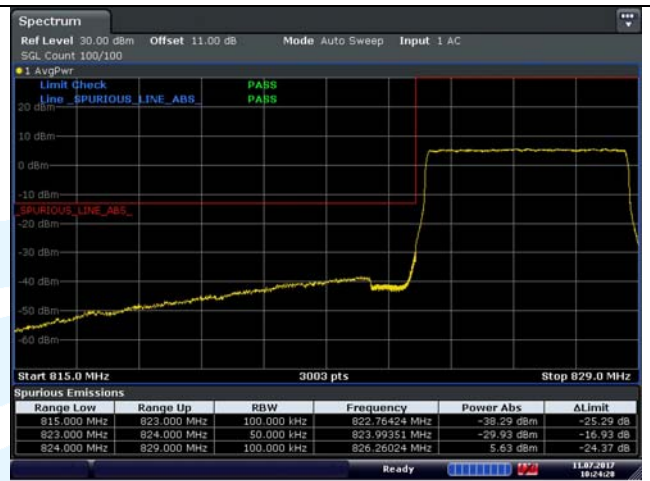


LTE_Band 5_Channel Bandwidth: 5 MHz_25RB#0

LCH



Date: 11.JUL.2017 10:23:06



Date: 11.JUL.2017 10:24:28

HCH



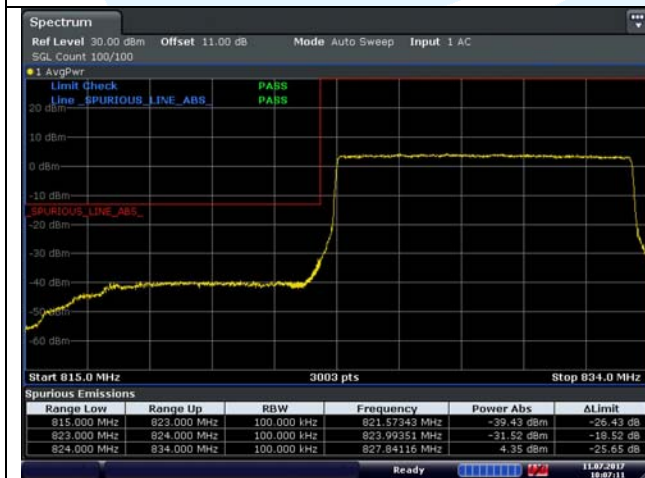
Date: 11.JUL.2017 10:40:07



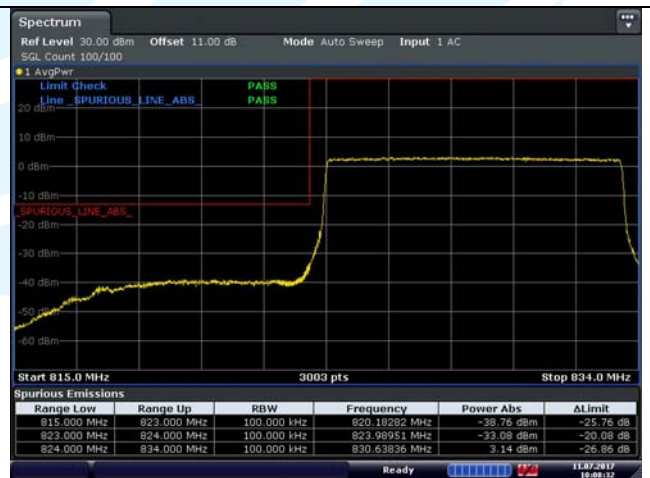
Date: 11.JUL.2017 10:41:23

LTE_Band 5_Channel Bandwidth: 10 MHz_50RB#0

LCH



Date: 11.JUL.2017 10:07:11



Date: 11.JUL.2017 10:08:32

HCH



5.5 Spurious emissions at antenna terminals

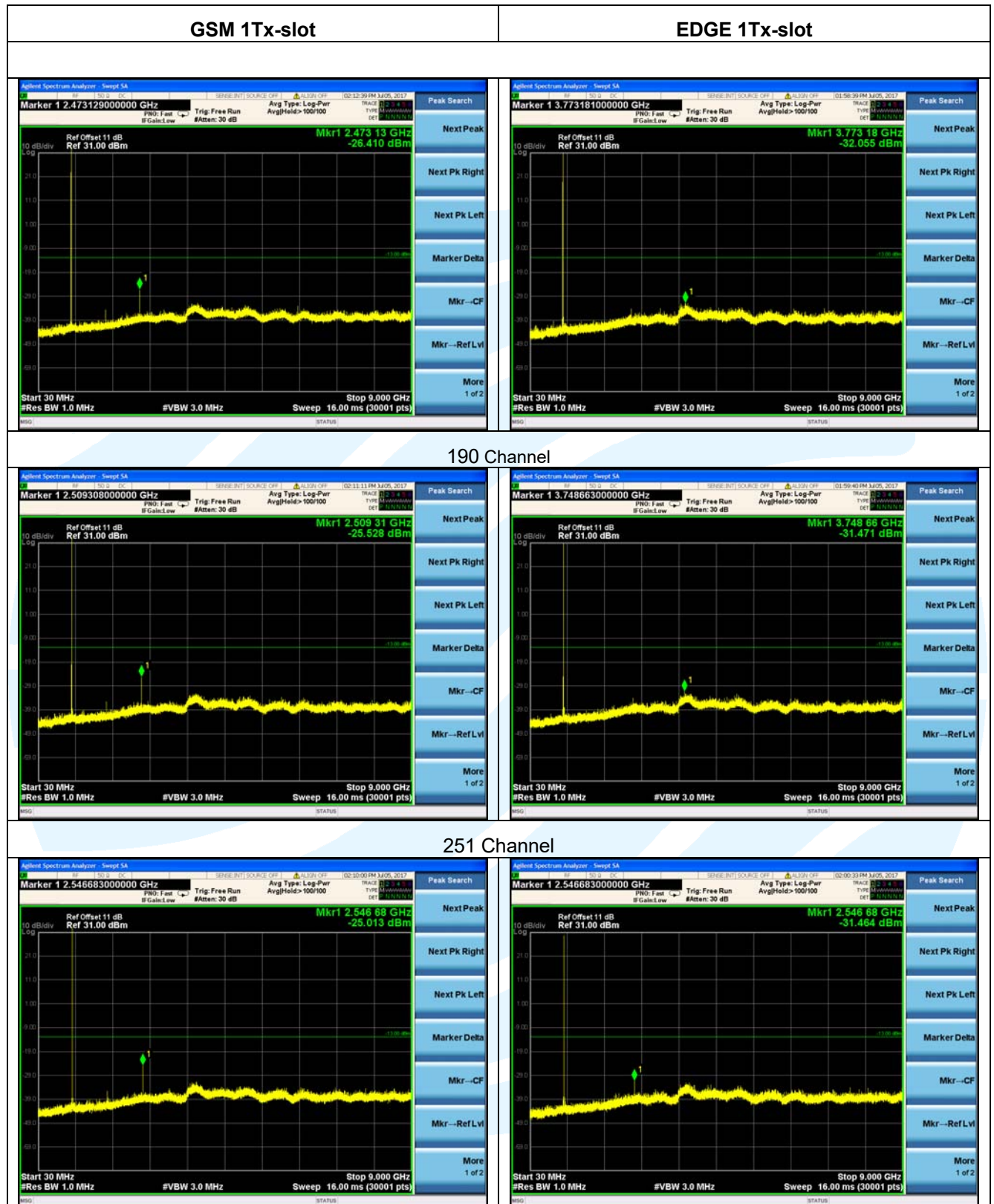
Test Requirement:	FCC 47 CFR Part 2.1051 & FCC 47 CFR Part 22.917(a)(b)
Test Method:	ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02
Limit:	The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. The emission limit equal to -13 dBm.
Test Procedure:	The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range. b. Measuring frequency range is from 9 kHz to 9 GHz. Set RBW & VBW to 100 kHz for the measurement below 1 GHz, and 1 MHz for the measurement above 1 GHz.
	Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.
Test Setup:	Refer to section 4.1.1(2) for details.
Instruments Used:	Refer to section 3 for details
Test Mode:	Link mode
Test Results:	Pass

The test plot as follows:

Spurious Emission Test Data (9 KHz ~ 30 MHz):

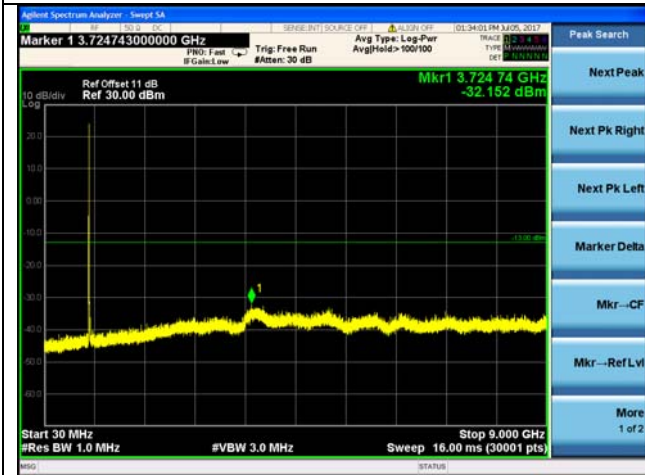
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

Spurious Emission Test Data (30 MHz ~ 9 GHz):



WCDMA RMC 12.2Kbps

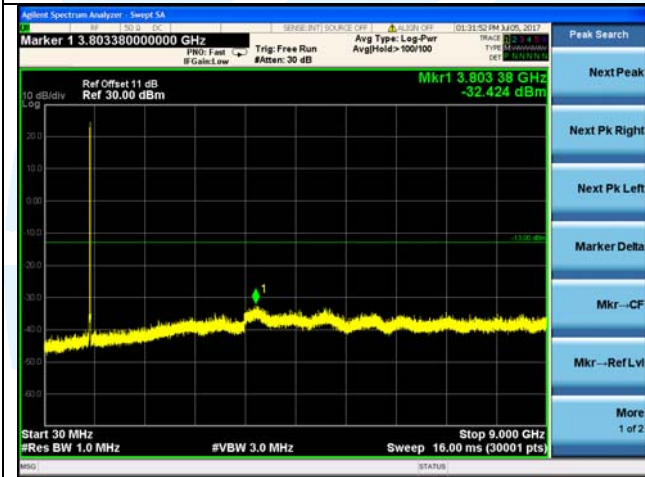
4132 Channel

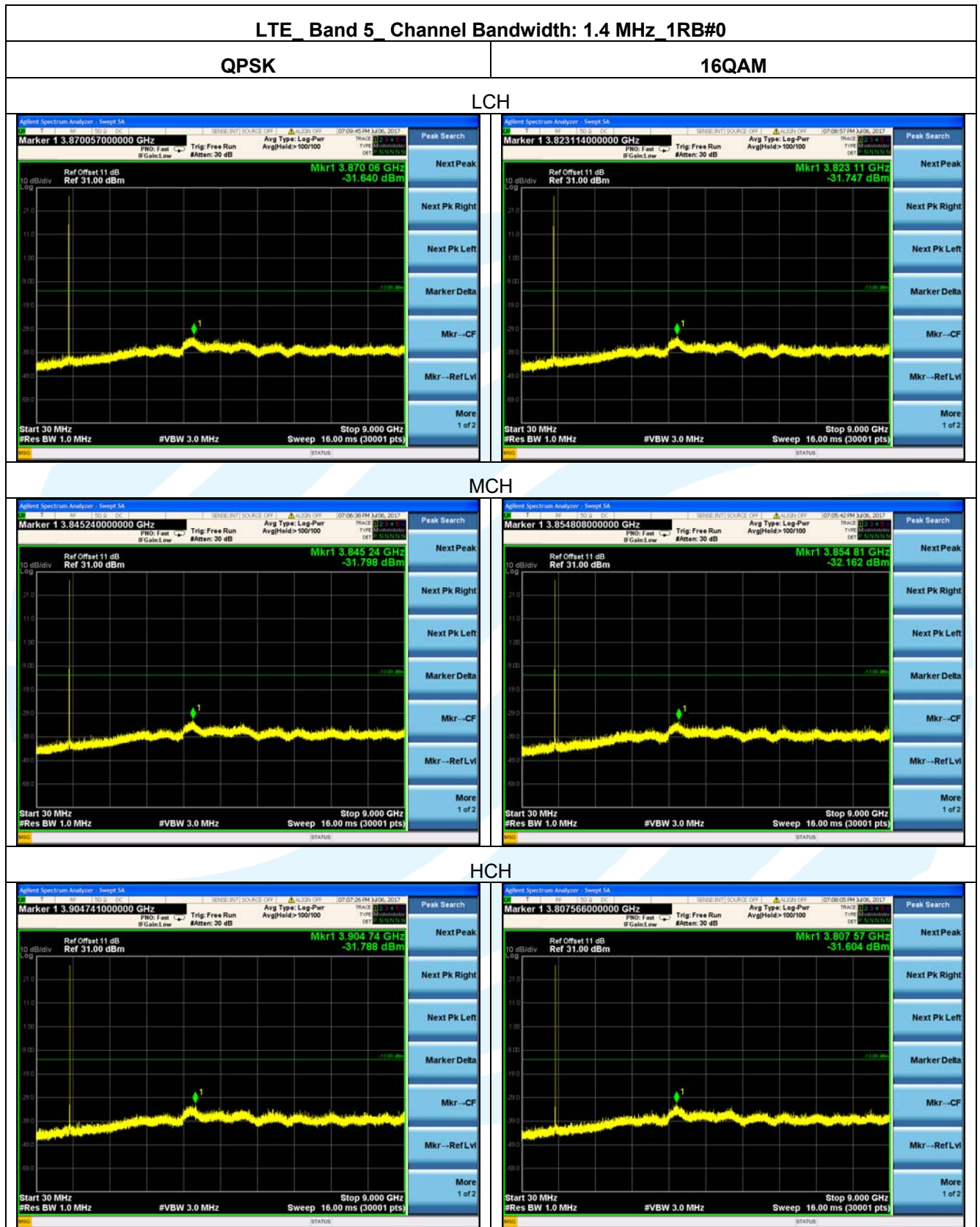


4182 Channel



4233 Channel



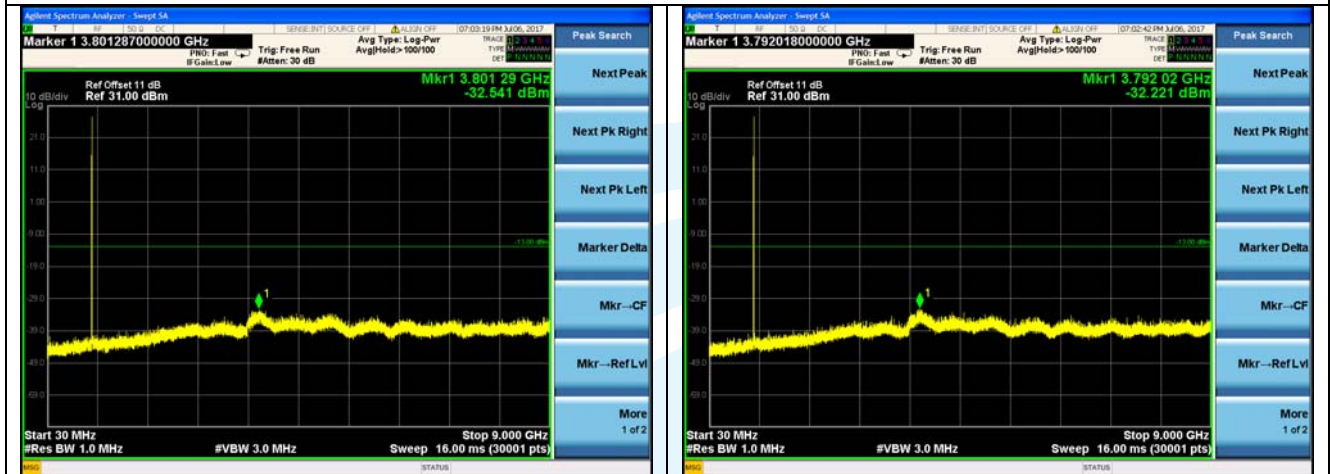


LTE_Band 5_Channel Bandwidth: 3 MHz_1RB#0

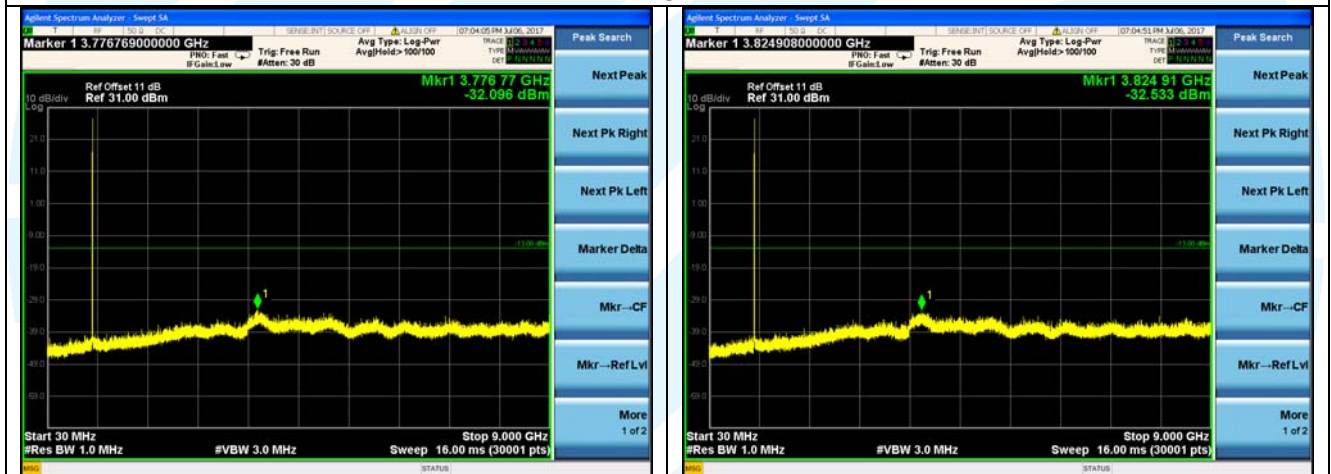
QPSK

16QAM

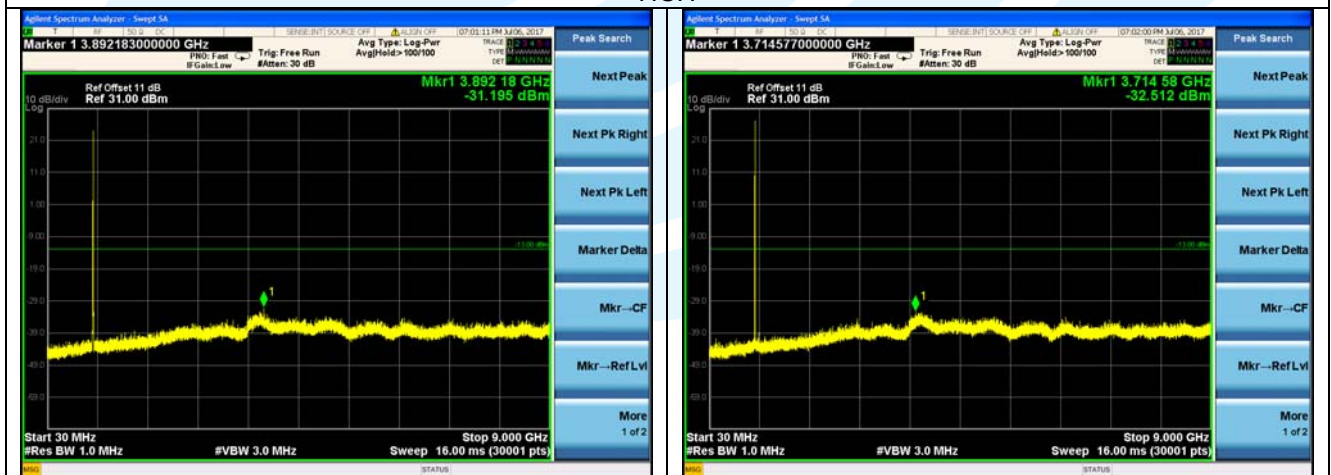
LCH



MCH



HCH

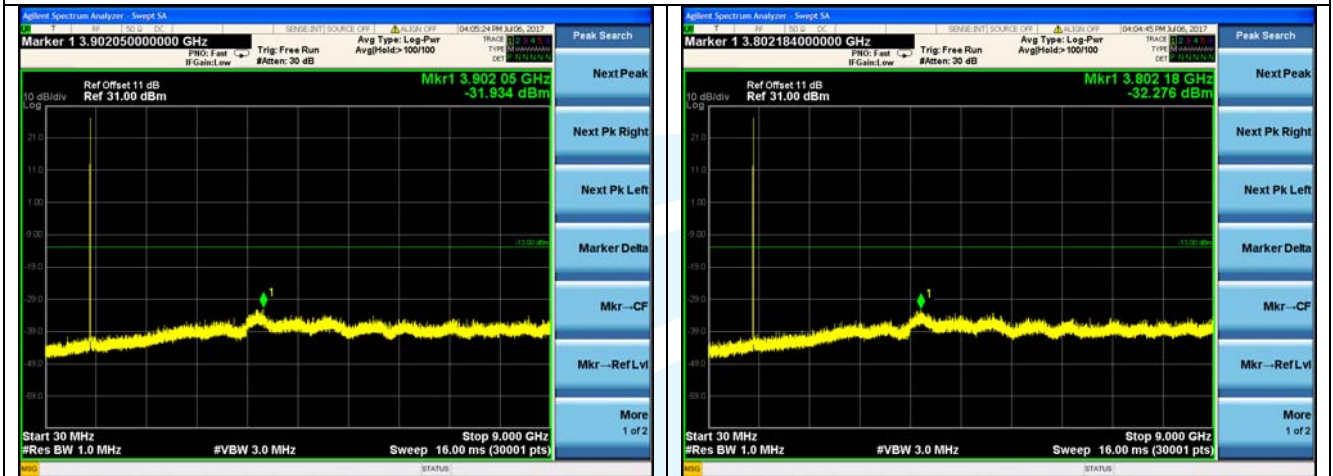


LTE_Band 5_Channel Bandwidth: 5 MHz_1RB#0

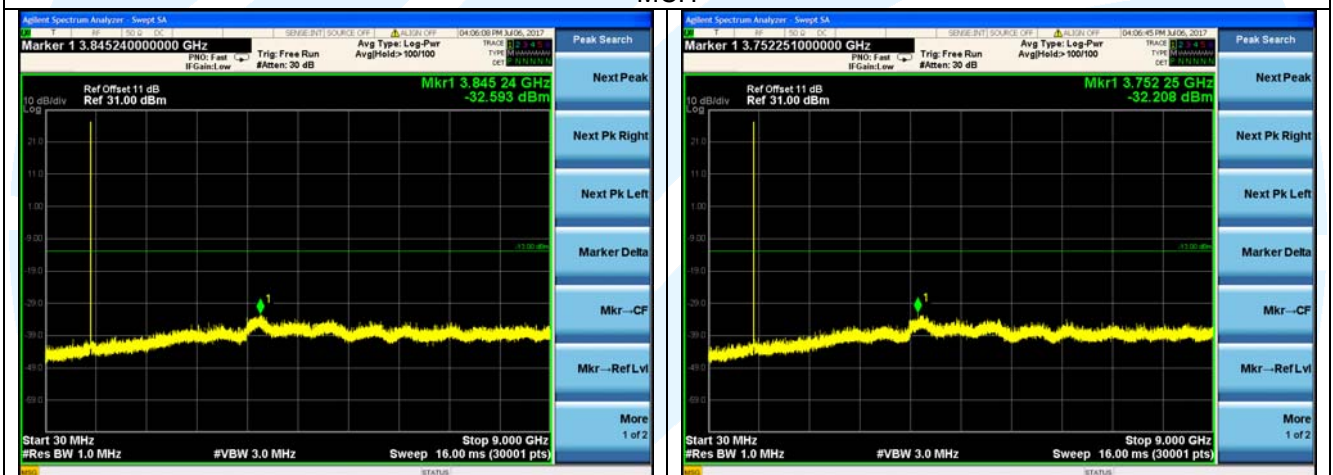
QPSK

16QAM

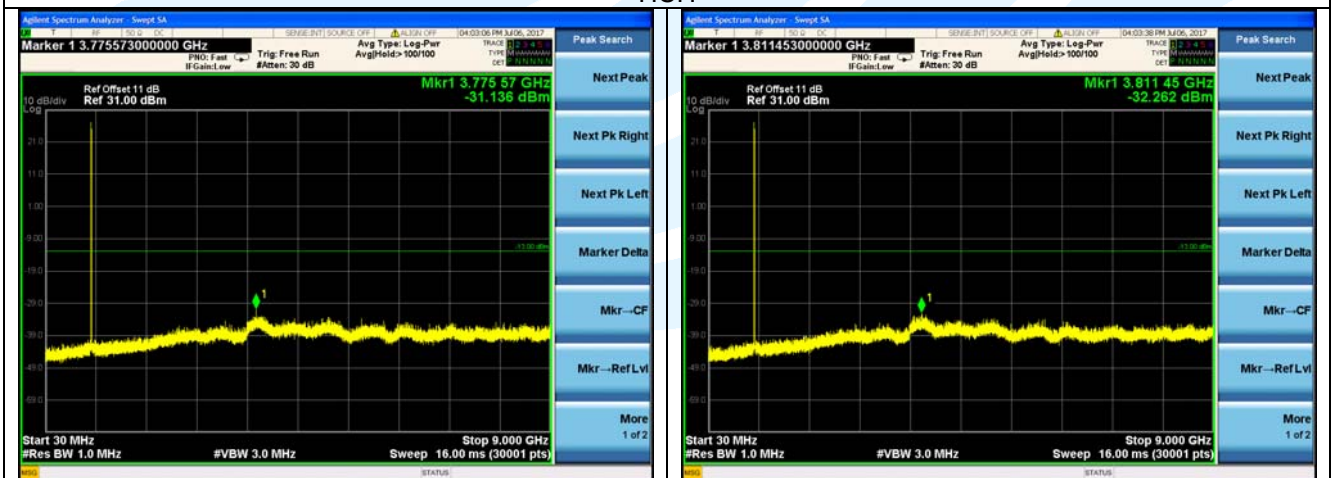
LCH



MCH



HCH

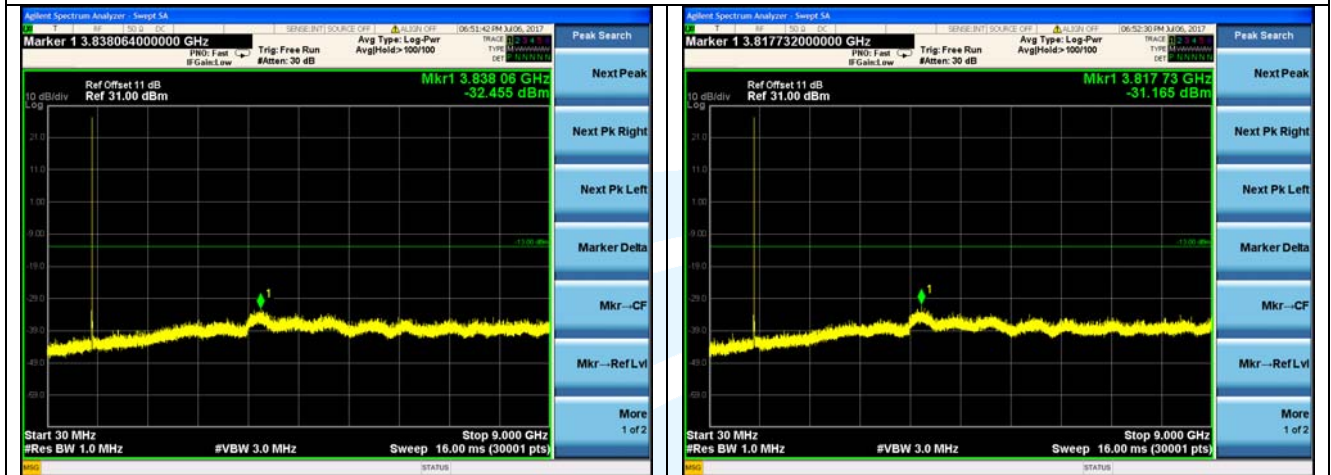


LTE_Band 5_Channel Bandwidth: 10 MHz_1RB#0

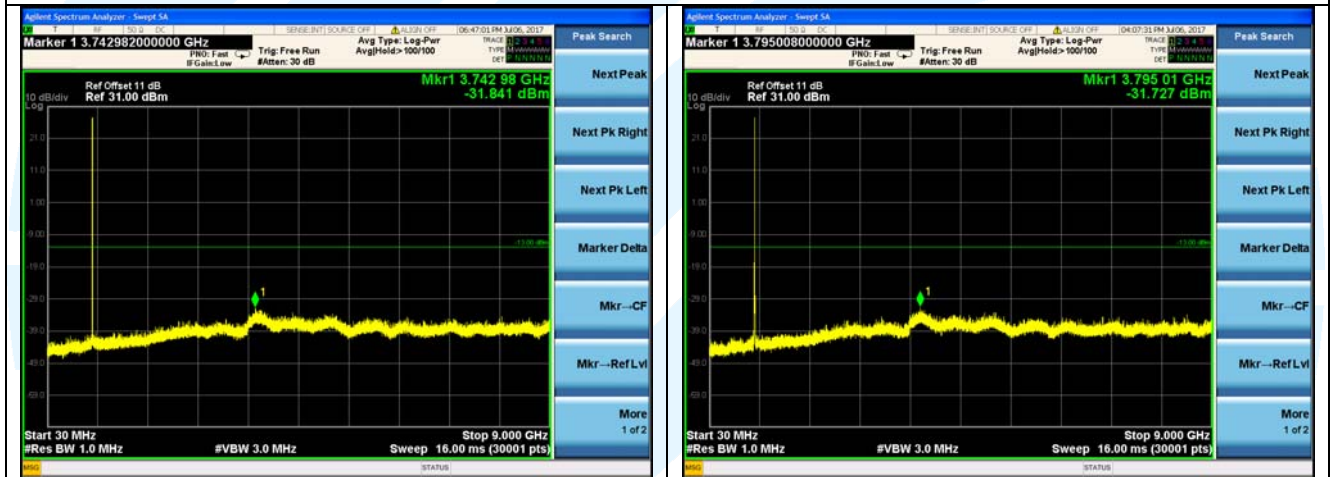
QPSK

16QAM

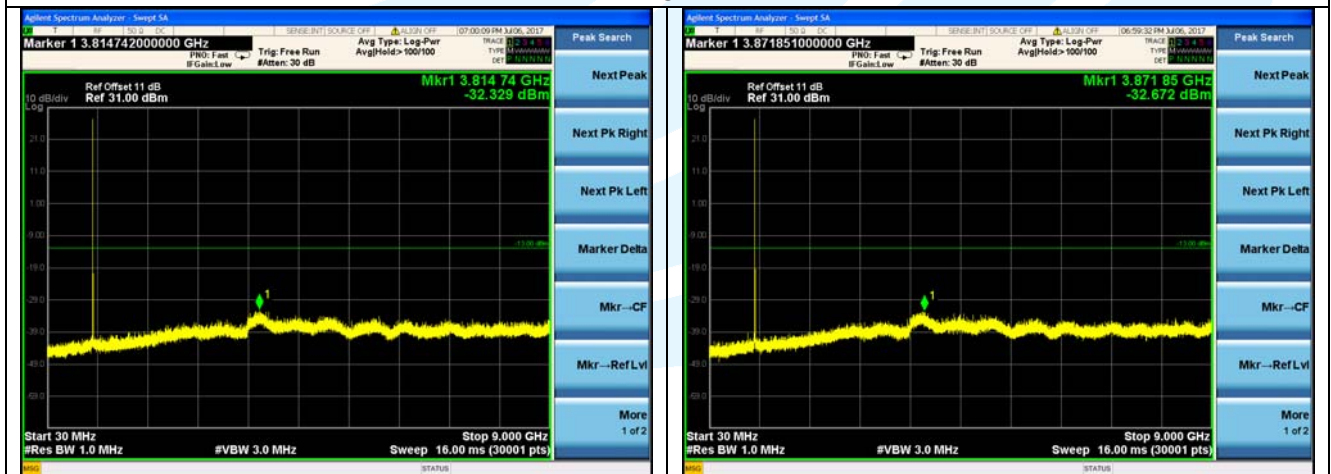
LCH



MCH



HCH



5.6 Field strength of spurious radiation

Test Requirement: FCC 47 CFR Part 2.1053 & FCC 47 CFR Part 22.917(a)(b)

Test Method: ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02

Limit: The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. The emission limit equal to -13 dBm.

Test Procedure:

1. Scan up to 10th harmonic, find the maximum radiation frequency to measure.
2. The technique used to find the Spurious Emissions of the transmitter was the antenna substitution method. Substitution method was performed to determine the actual ERP/EIRP emission levels of the EUT.

Test procedure as below:

- 1) The EUT was powered ON and placed on a 1.5m high table at a 3 meter fully Anechoic Chamber. The antenna of the transmitter was extended to its maximum length. Modulation mode and the measuring receiver shall be tuned to the frequency of the transmitter under test.
- 2) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 3) The disturbance of the transmitter was maximized on the test receiver display by raising and lowering from 1m to 4m the receive antenna and by rotating through 360° the turntable. After the fundamental emission was maximized, a field strength measurement was made.
- 4) Steps 1) to 3) were performed with the EUT and the receive antenna in both vertical and horizontal polarization.
- 5) The transmitter was then removed and replaced with another antenna. The center of the antenna was approximately at the same location as the center of the transmitter.
- 6) A signal at the disturbance was fed to the substitution antenna by means of a non-radiating cable. With both the substitution and the receive antennas horizontally polarized, the receive antenna was raised and lowered to obtain a maximum reading at the test receiver. The level of the signal generator was adjusted until the measured field strength level in step 3) is obtained for this set of conditions.
- 7) The output power into the substitution antenna was then measured.
- 8) Steps 6) and 7) were repeated with both antennas polarized.
- 9) Calculate power in dBm by the following formula:

$$\text{ERP(dBm)} = \text{Pg(dBm)} - \text{cable loss (dB)} + \text{antenna gain (dBi)}$$

$$\text{EIRP(dBm)} = \text{Pg(dBm)} - \text{cable loss (dB)} + \text{antenna gain (dBi)}$$

$$\text{EIRP} = \text{ERP} + 2.15\text{dB}$$

where:
Pg is the generator output power into the substitution antenna.
- 10) Test the EUT in the lowest channel, the middle channel the Highest channel
- 11) The radiation measurements are performed in X, Y, Z axis positioning for EUT operation mode, and found the X axis positioning which it is worse case.
- 12) Repeat above procedures until all frequencies measured was complete.

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
0.009MHz-30MHz	Peak	10kHz	30kHz	Peak
30MHz-1GHz	Peak	100kHz	300kHz	Peak
Above 1GHz	Peak	1MHz	3MHz	Peak

Test Setup: Refer to section 4.1.2 for details.

Instruments Used: Refer to section 3 for details

Test Mode: Link mode

Test Results: Pass

Test Data:

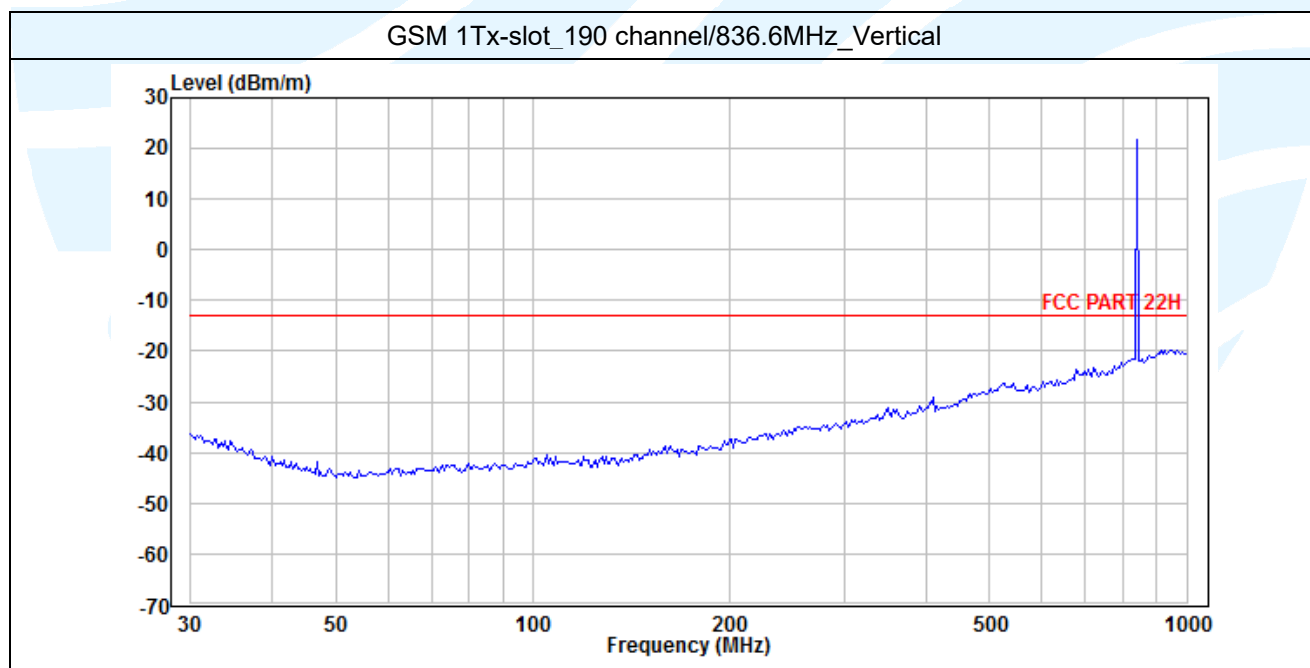
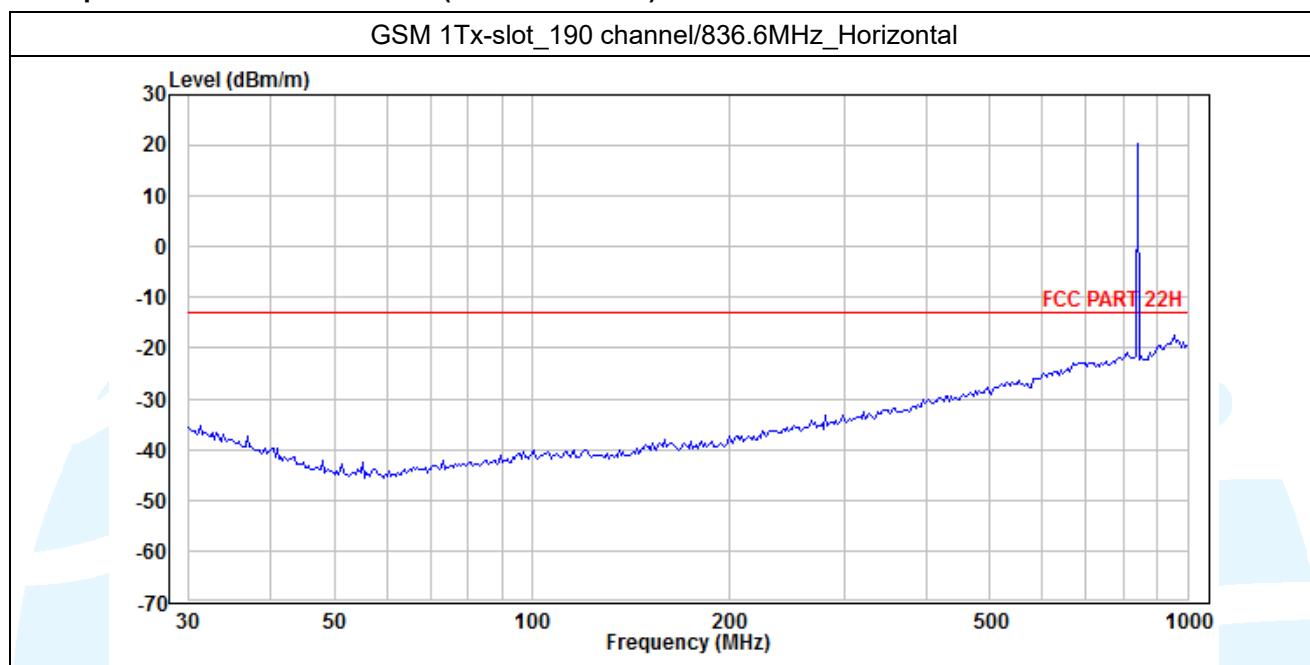
Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China
 Tel: +86-755-28230888 Fax: +86-755-28230888 E-mail: info@uttlab.com <http://www.uttlab.com>

Spurious Emission Test Data (9 KHz ~ 30 MHz)

The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

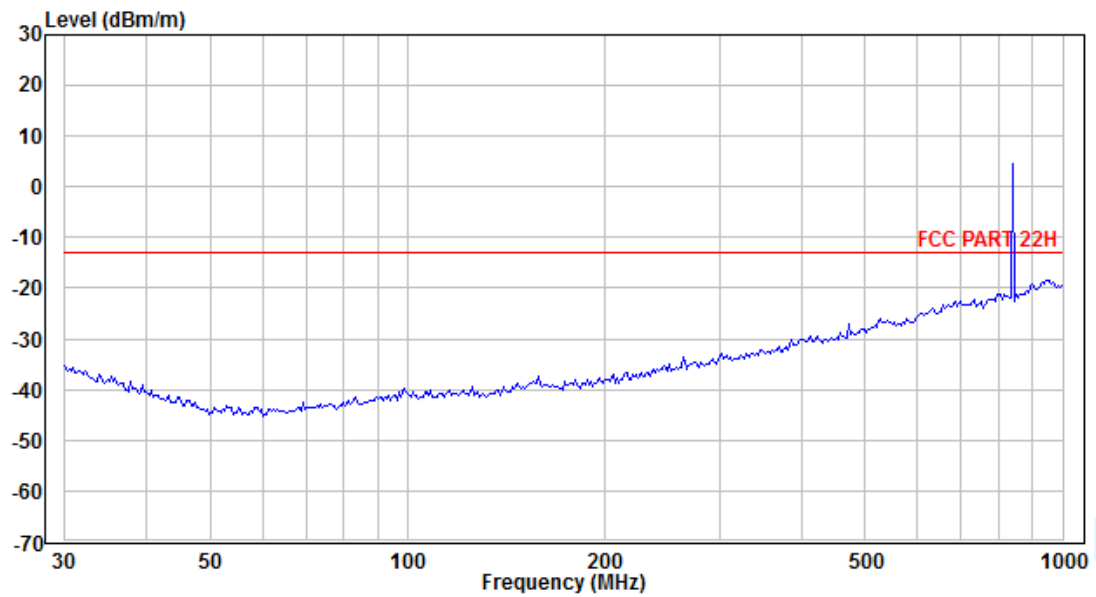
Spurious Emission Test Data (30 MHz ~ 1 GHz)



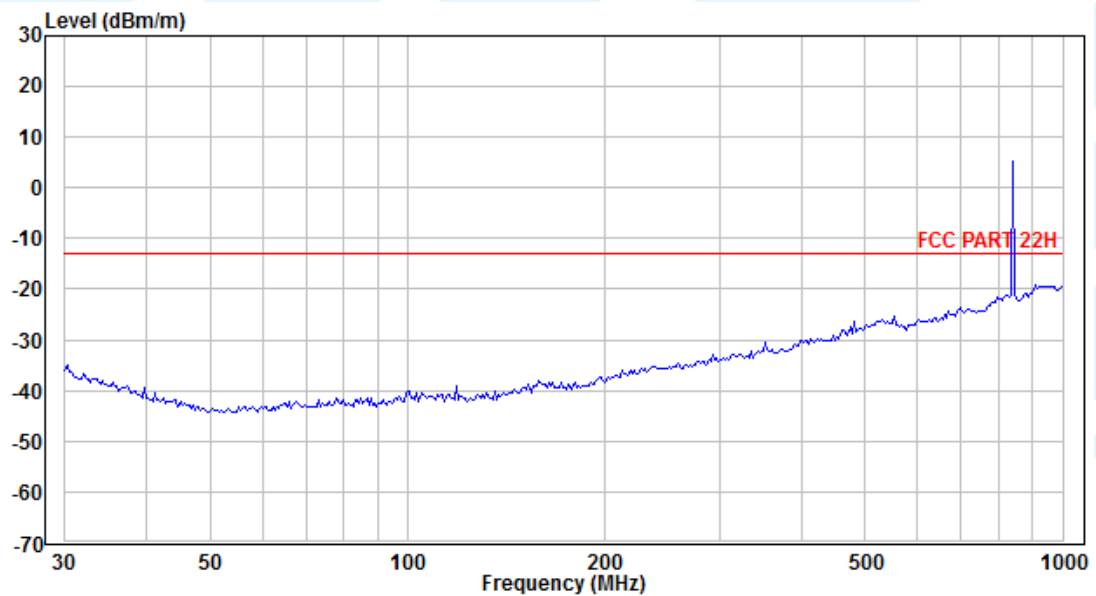
Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China
 Tel: +86-755-28230888 Fax: +86-755-28230886 E-mail: info@uttlab.com <http://www.uttlab.com>

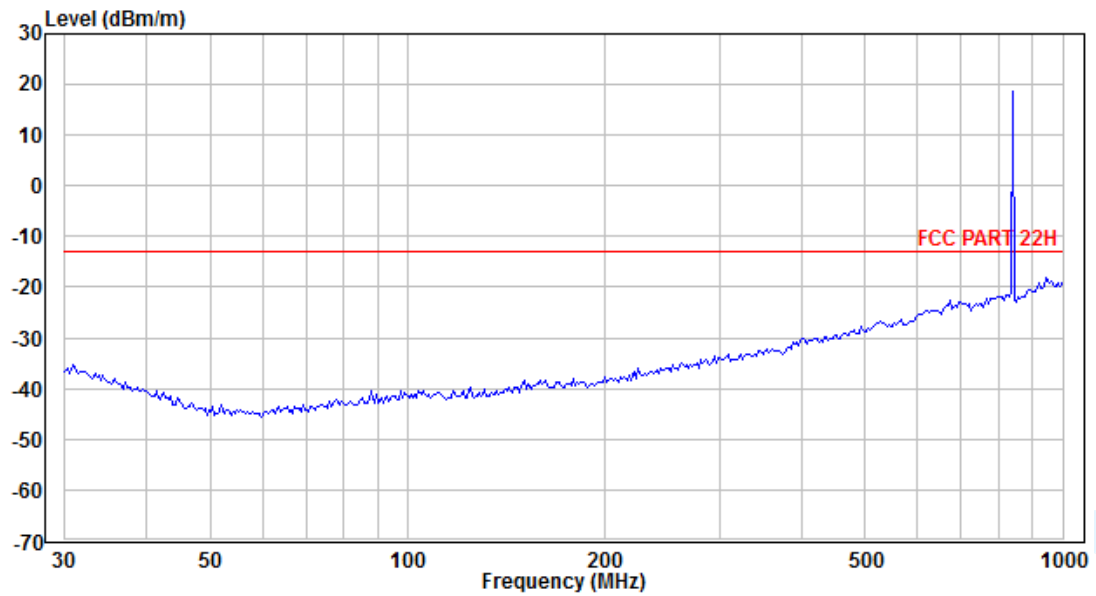
WCDMA RMC 12.2Kbps_4182 channel/836.4 MHz _Horizontal



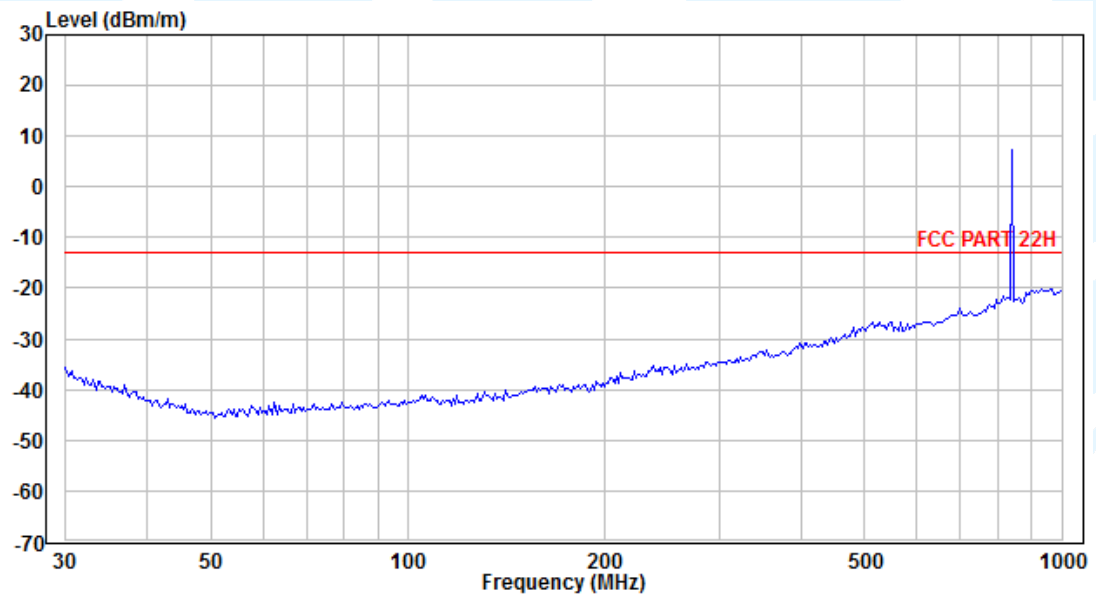
WCDMA RMC 12.2Kbps_4182 channel/836.4 MHz _Vertical



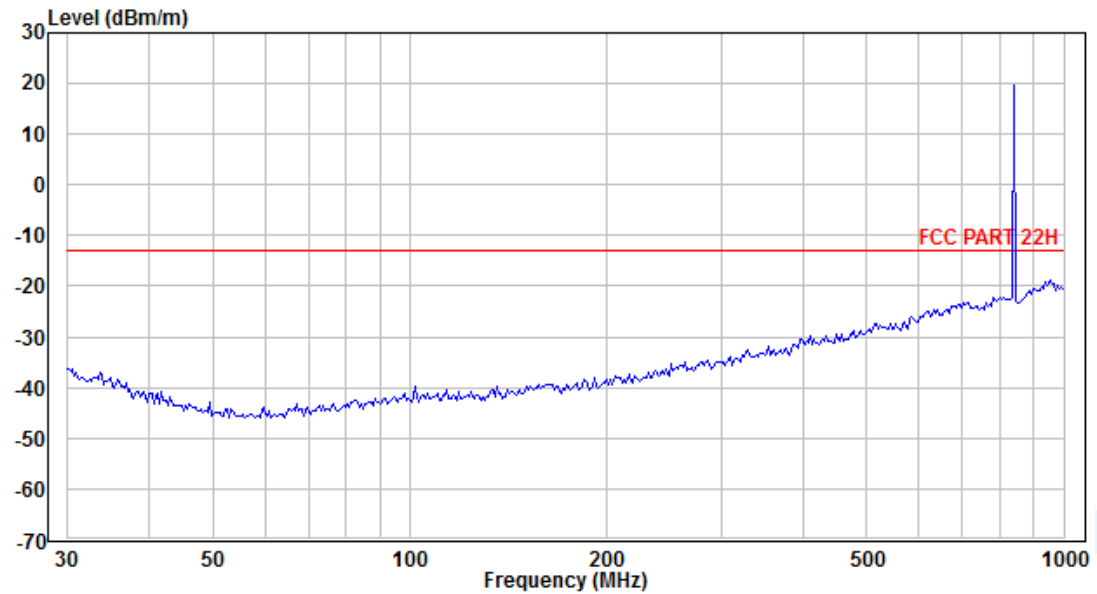
LTE Band 5; Bandwidth 1.4MHz; Modulation: QPSK; RB: 1; 20525/836.5MHz _Horizontal



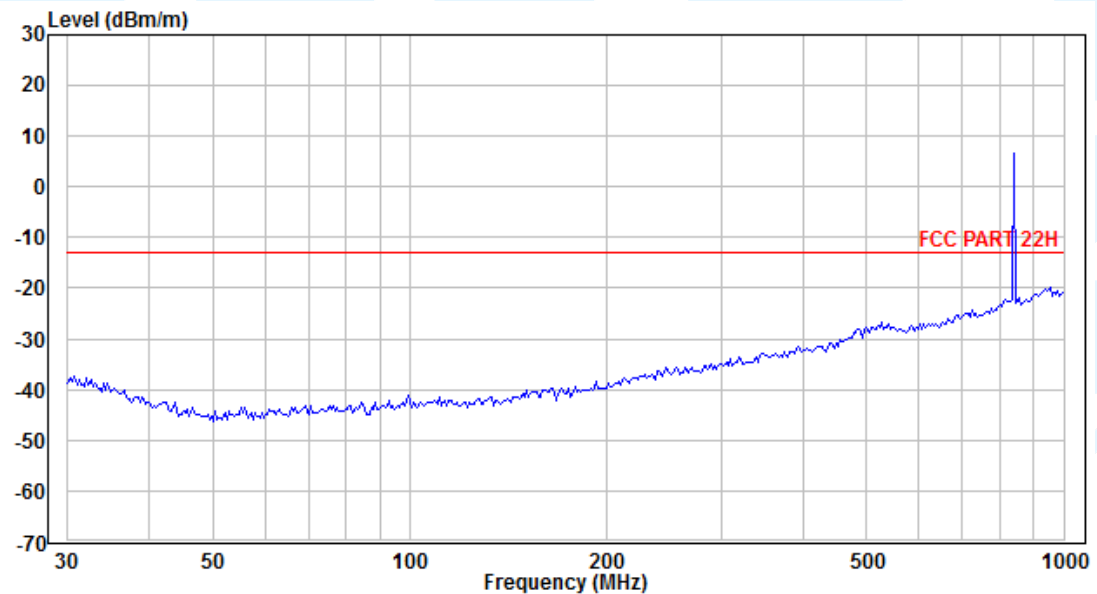
LTE Band 5; Bandwidth 1.4MHz; Modulation: QPSK; RB: 1; 20525/836.5MHz _Vertical



LTE Band 5; Bandwidth 3.0 MHz; Modulation: QPSK; RB: 1; 20525/836.5MHz _Horizontal



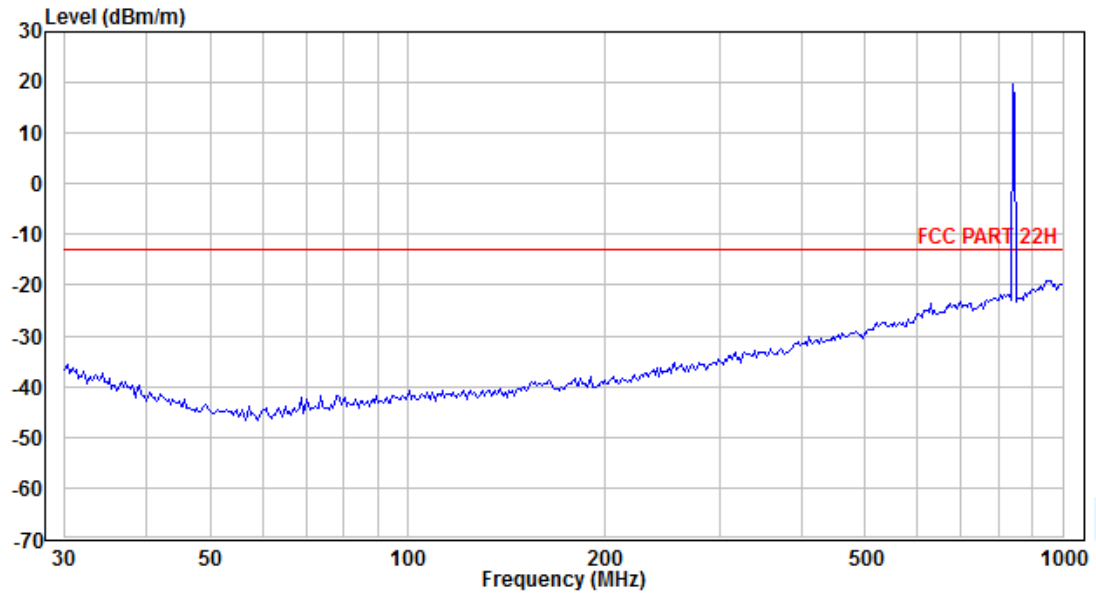
LTE Band 5; Bandwidth 3.0 MHz; Modulation: QPSK; RB: 1; 20525/836.5MHz _Vertical



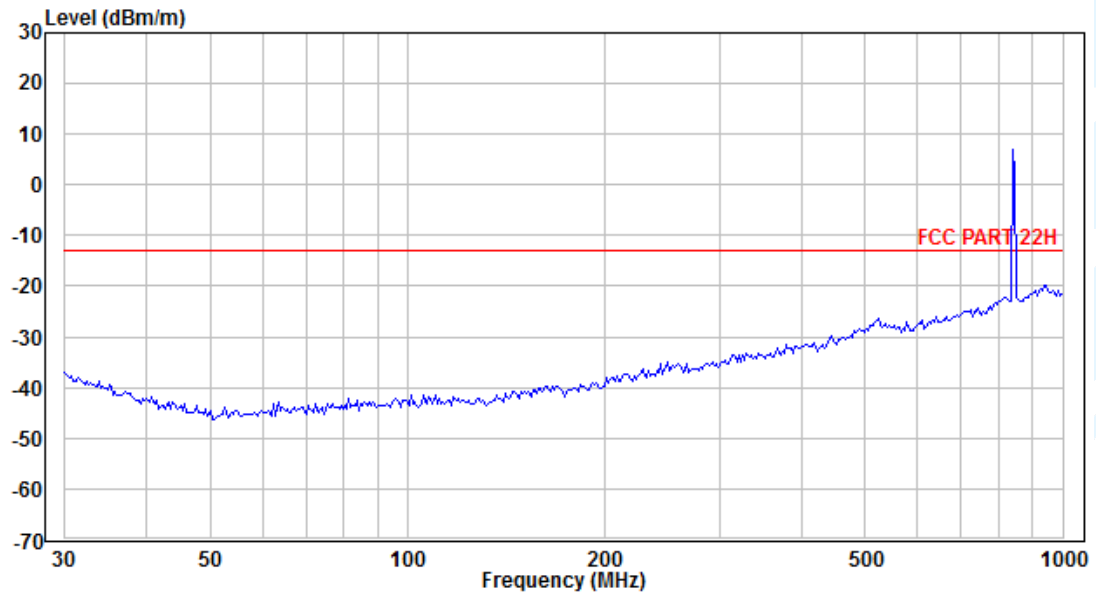
Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China
 Tel: +86-755-28230888 Fax: +86-755-28230886 E-mail: info@uttlab.com <http://www.uttlab.com>

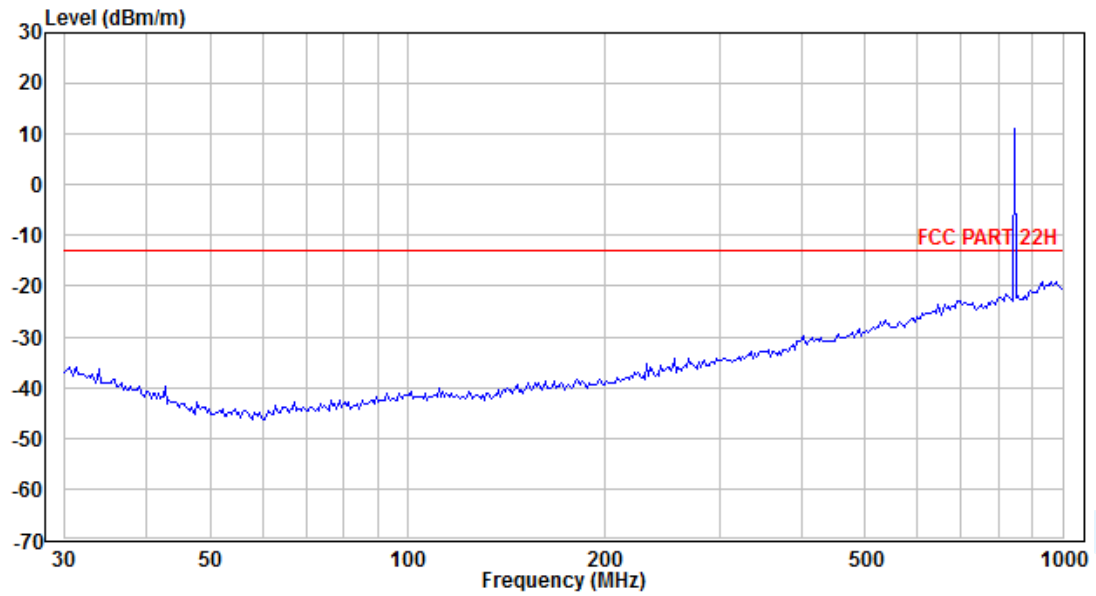
LTE Band 5; Bandwidth 5.0 MHz; Modulation: QPSK; RB:1; 20525/836.5MHz _Horizontal



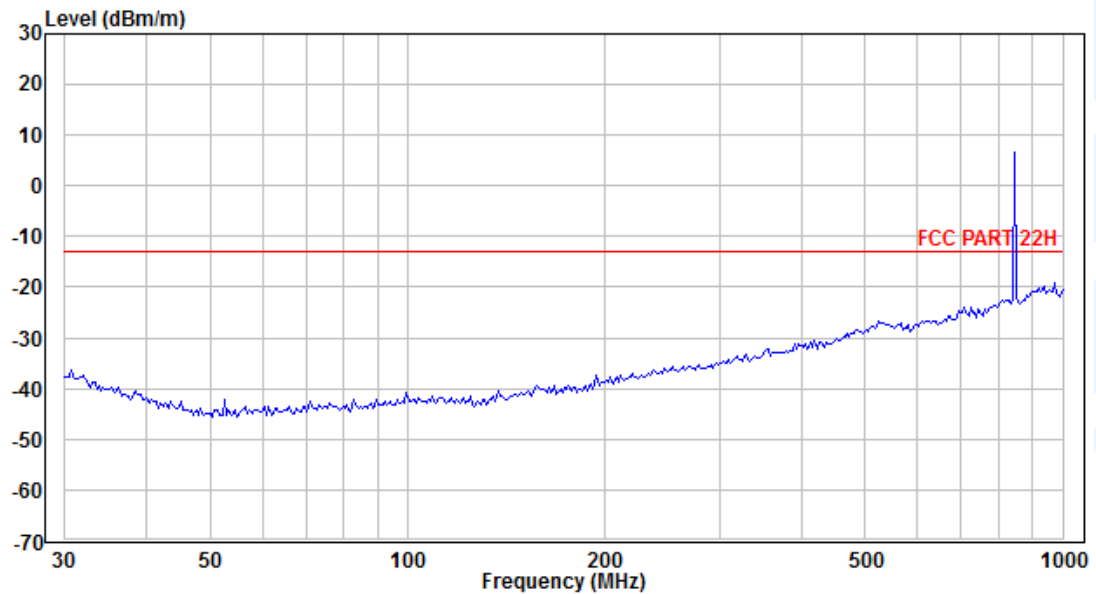
LTE Band 5; Bandwidth 5.0 MHz; Modulation: QPSK; RB: 1; 20525/836.5MHz _Vertical



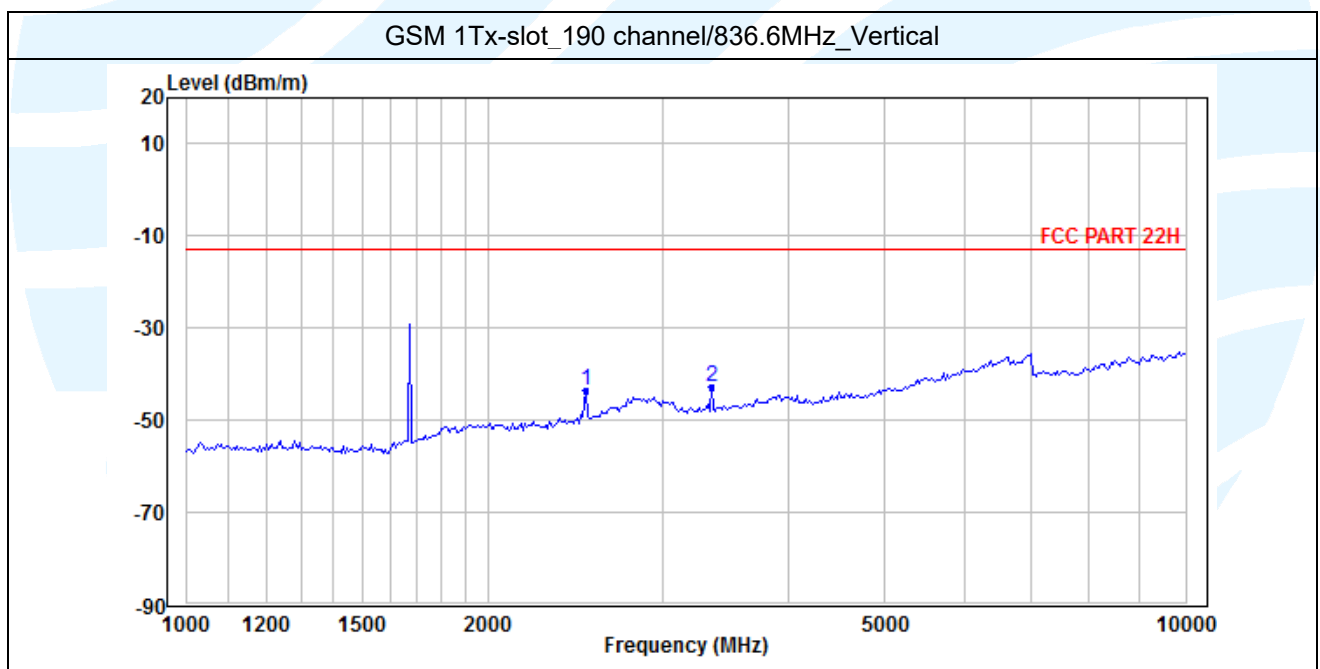
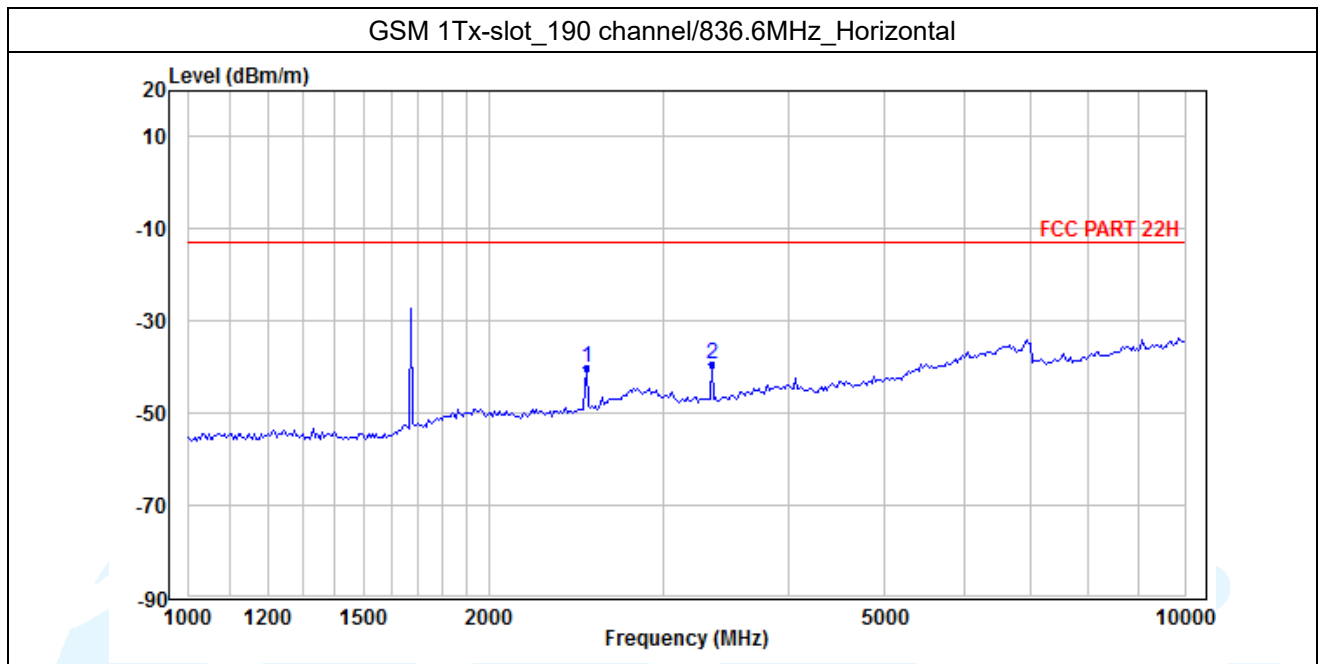
LTE Band 5; Bandwidth 10.0 MHz; Modulation :QPSK; RB:1; 20525/836.5MHz _Horizontal



LTE Band 5; Bandwidth 10.0 MHz; Modulation: QPSK; RB: 1; 20525/836.5MHz _Vertical



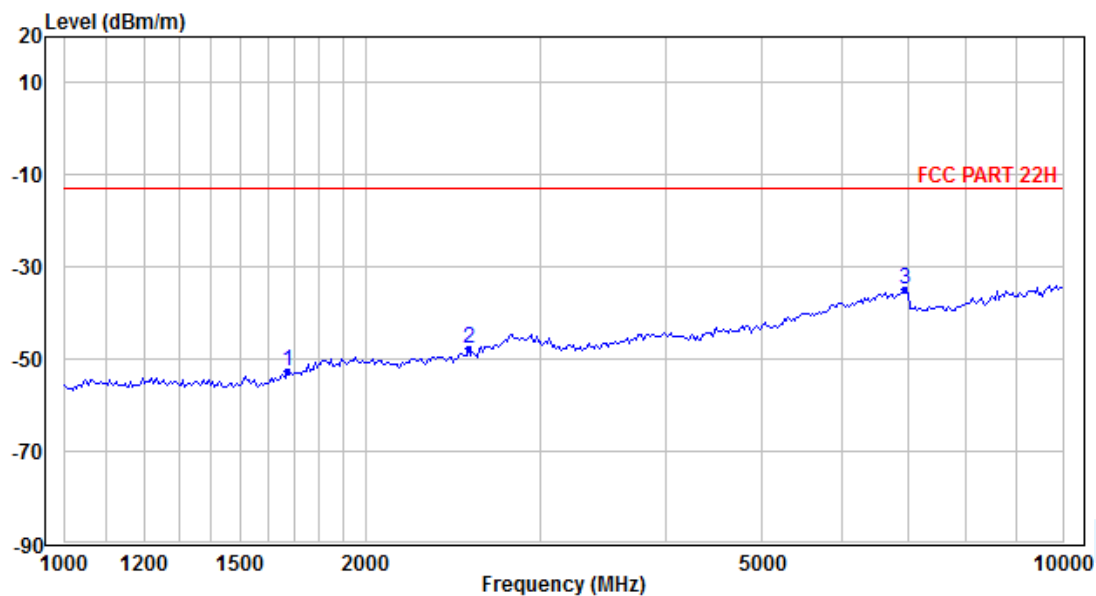
Spurious Emission Test Data (Above 1 GHz)



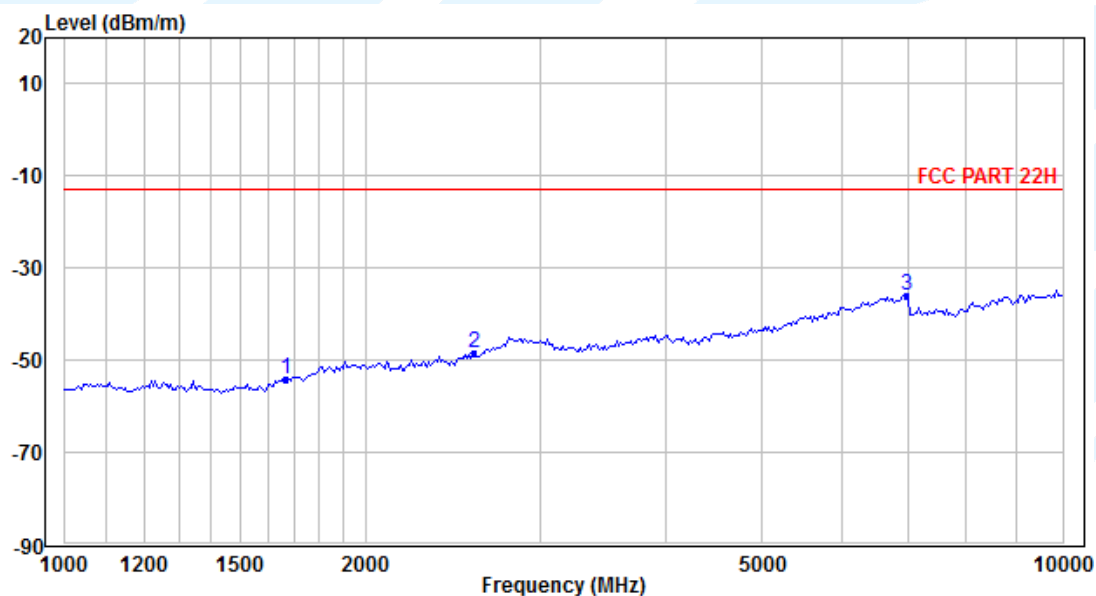
Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China
 Tel: +86-755-28230888 Fax: +86-755-28230886 E-mail: info@uttlab.com <http://www.uttlab.com>

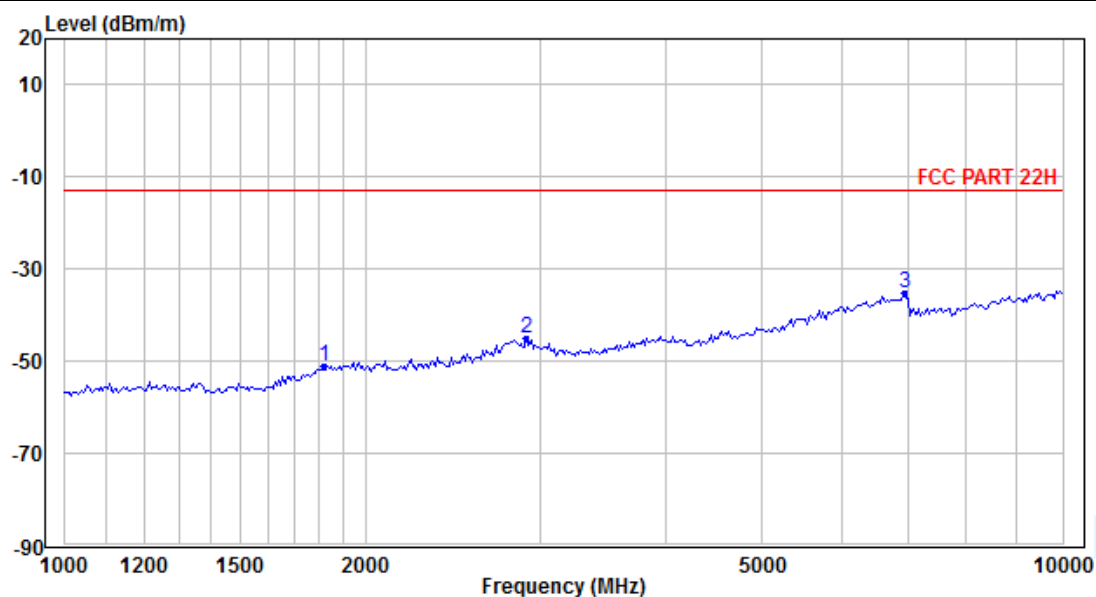
WCDMA RMC 12.2Kbps_4182 channel/836.4 MHz _Horizontal



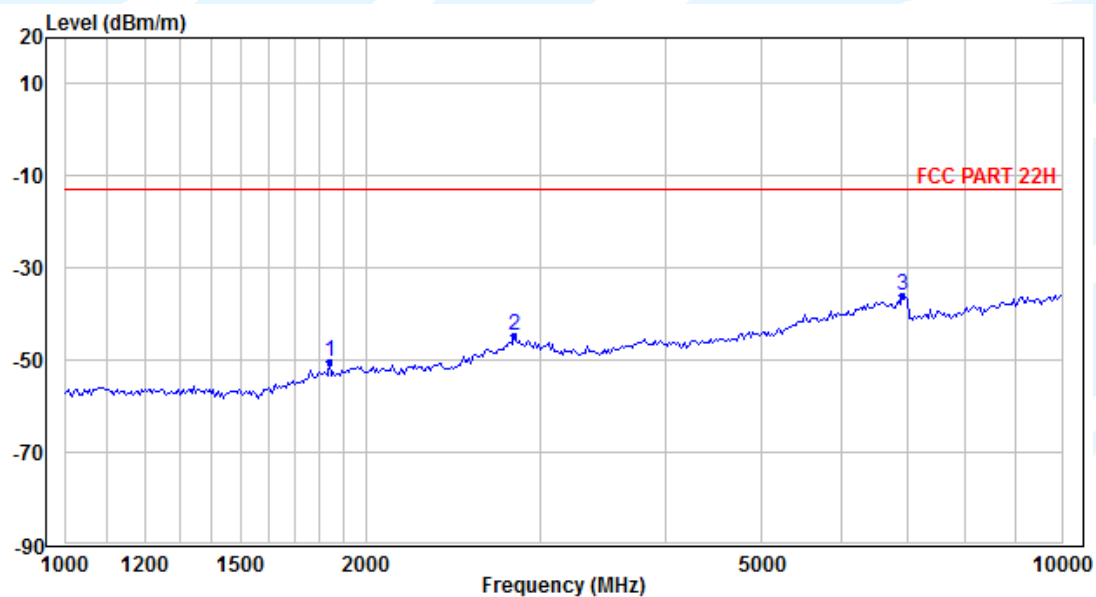
WCDMA RMC 12.2Kbps_4182 channel/836.4 MHz _Vertical



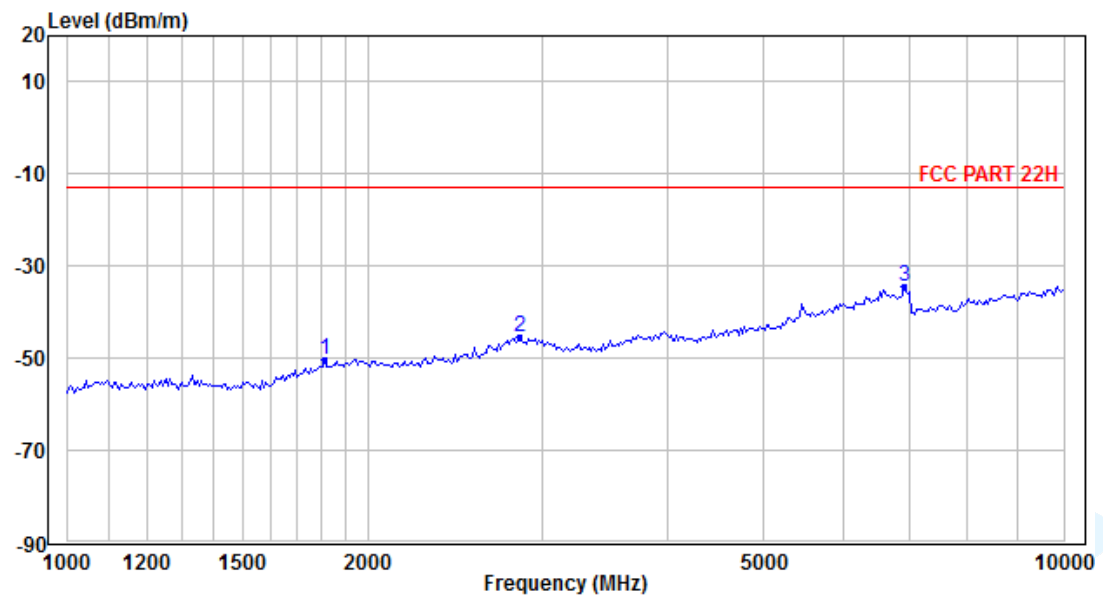
LTE Band 5; Bandwidth 1.4MHz; Modulation: QPSK; RB: 1; 20525/836.5MHz _Horizontal



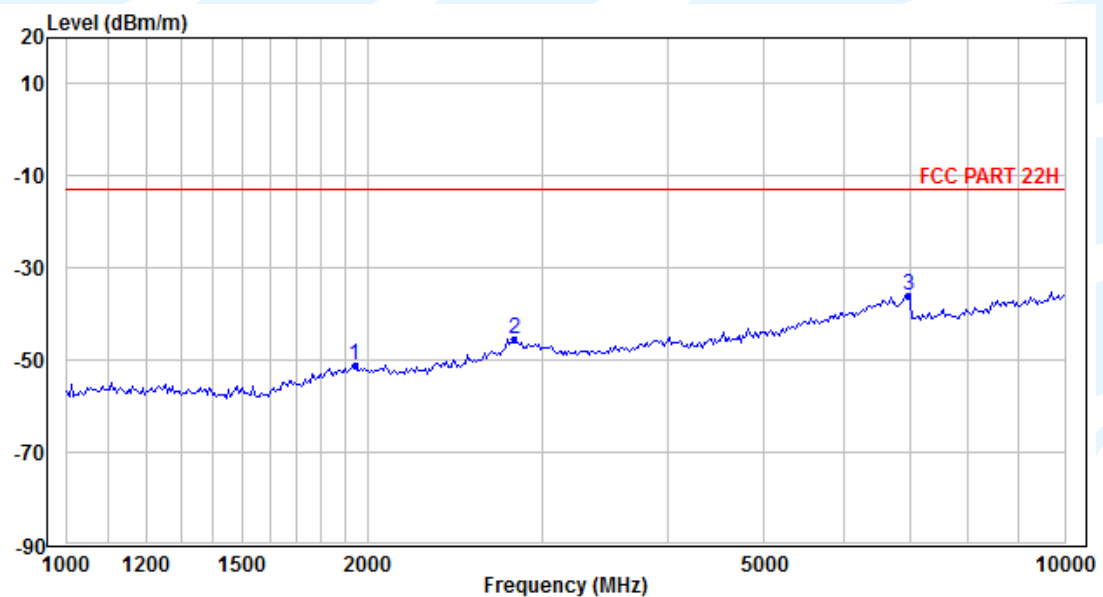
LTE Band 5; Bandwidth 1.4MHz; Modulation: QPSK; RB: 1; 20525/836.5MHz _Vertical



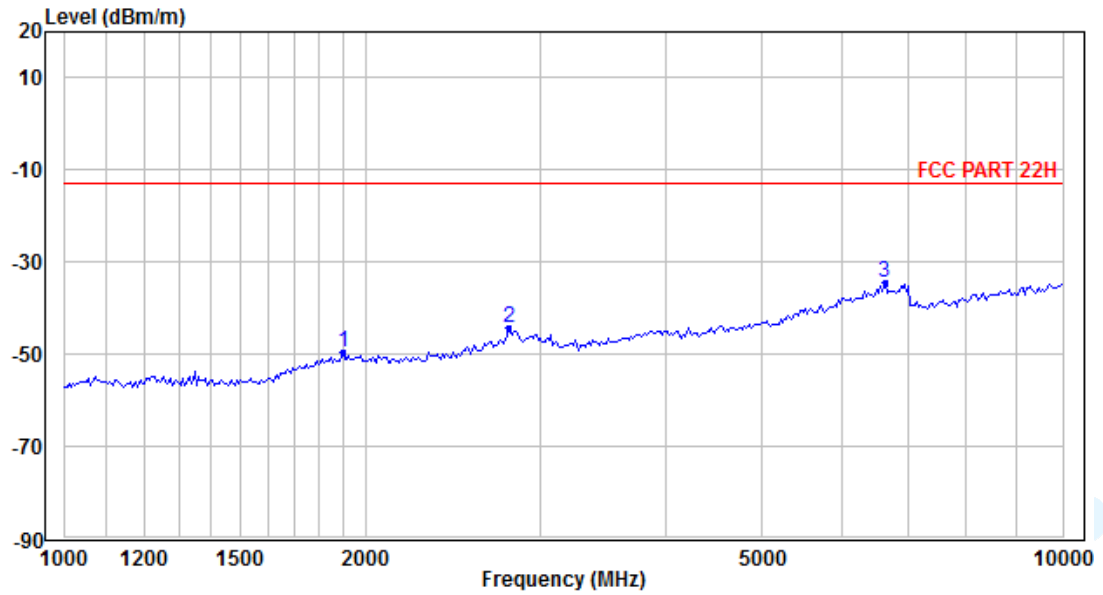
LTE Band 5; Bandwidth 3.0 MHz; Modulation: QPSK; RB: 1; 20525/836.5MHz _Horizontal



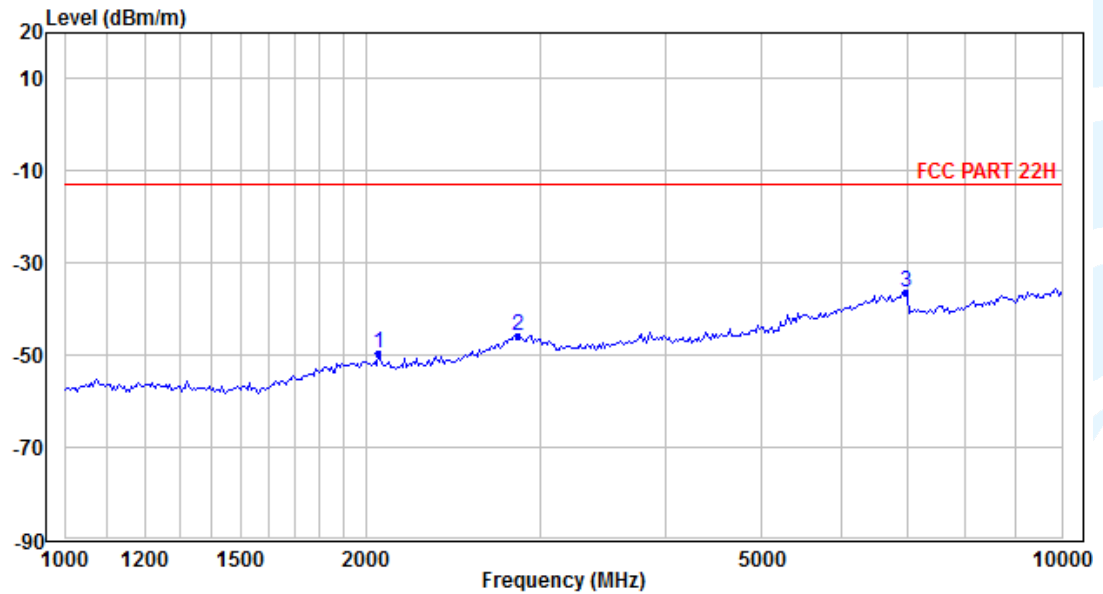
LTE Band 5; Bandwidth 3.0 MHz; Modulation: QPSK; RB: 1; 20525/836.5MHz _Vertical



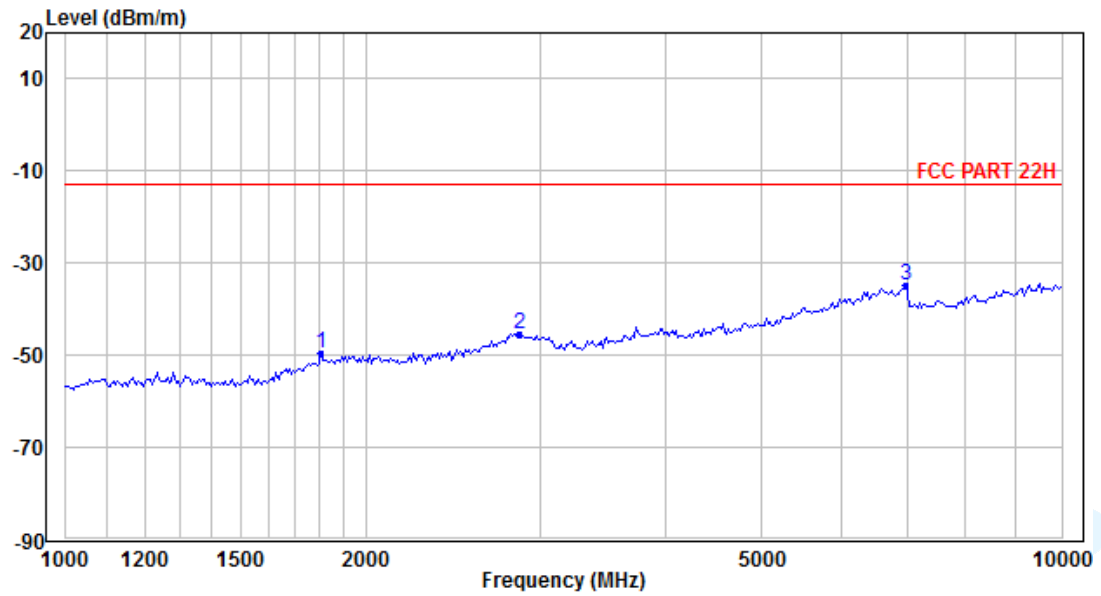
LTE Band 5; Bandwidth 5.0 MHz; Modulation: QPSK; RB:1; 20525/836.5MHz _Horizontal



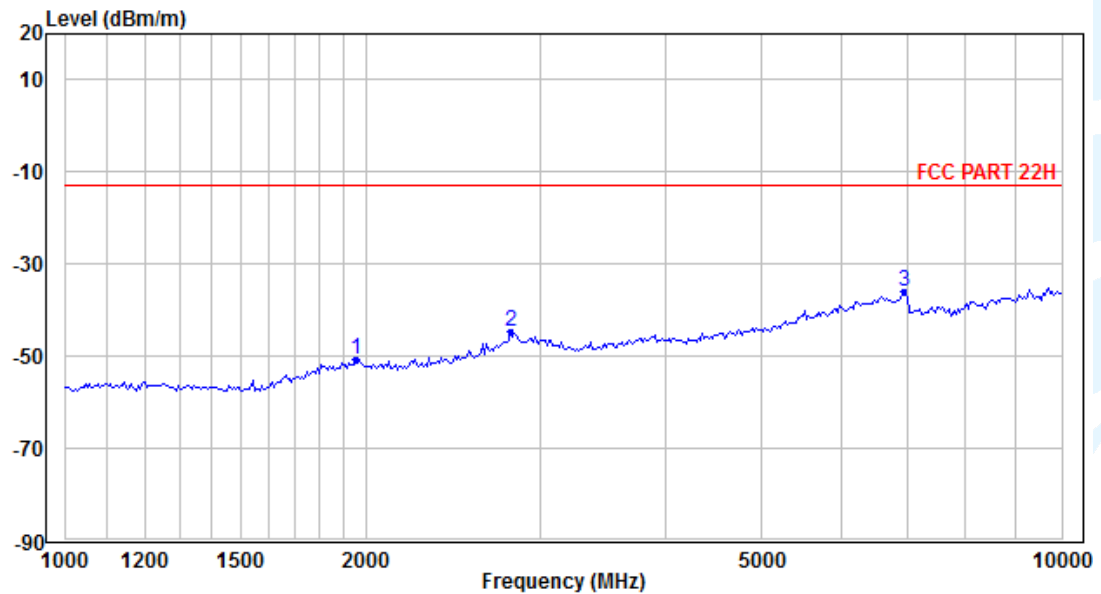
LTE Band 5; Bandwidth 5.0 MHz; Modulation: QPSK; RB: 1; 20525/836.5MHz _Vertical



LTE Band 5; Bandwidth 10.0 MHz; Modulation :QPSK; RB:1; 20525/836.5MHz _Horizontal



LTE Band 5; Bandwidth 10.0 MHz; Modulation: QPSK; RB: 1; 20525/836.5MHz _Vertical



5.7 Frequency stability

Test Requirement:	FCC 47 CFR Part 2.1055 & FCC 47 CFR Part 22.355
Test Method:	ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02
Limit:	The carrier frequency shall not depart from the reference frequency in excess of ± 2.5 ppm for mobile stations.
Test Procedure:	- Use CMW 500 or CMU 200 with Frequency Error measurement capability. - Temp. = -20° to $+50^{\circ}\text{C}$ - Voltage = low voltage, 3.6Vdc, Normal, 3.85Vdc and High voltage, 4.4Vdc. - Frequency Stability vs Temperature: The EUT is place inside a temperature chamber. The temperature is set to 20°C and allowed to stabilize. After sufficient soak time, the transmitting frequency error is measured. The temperature is increased by 10 degrees, allowed to stabilize and soak, and then the measurement is repeated. This is repeated until $+50^{\circ}\text{C}$ is reached. - Frequency Stability vs Voltage: The peak frequency error is recorded (worst-case).
Test Setup:	Refer to section 4.1.1(3) for details.
Instruments Used:	Refer to section 3 for details
Test Mode:	Link mode
Test Results:	Pass
Test Data:	

Modulation	Channel / Frequency (MHz)	Voltage (Vdc)	Temperature ($^{\circ}\text{C}$)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Pass/Fail
GSM 1Tx-slot							
GMSK	190/ 836.6	3.4	Normal	28	0.033	± 2.5	PASS
		3.85		21	0.025	± 2.5	PASS
		4.4		24	0.029	± 2.5	PASS
		3.85	50	34	0.041	± 2.5	PASS
			40	32	0.038	± 2.5	PASS
			30	26	0.031	± 2.5	PASS
			20	22	0.026	± 2.5	PASS
			10	28	0.033	± 2.5	PASS
			0	30	0.036	± 2.5	PASS
			-10	33	0.039	± 2.5	PASS
			-20	34	0.041	± 2.5	PASS

Modulation	Channel/ Frequency (MHz)	Voltage (Vdc)	Temperature ($^{\circ}\text{C}$)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Pass/Fail
EDGE 1Tx-slot							
8PSK	190/ 836.6	3.4	Normal	45	0.054	± 2.5	PASS
		3.85		42	0.050	± 2.5	PASS
		4.4		46	0.055	± 2.5	PASS
		3.85	50	51	0.061	± 2.5	PASS
			40	48	0.057	± 2.5	PASS
			30	46	0.055	± 2.5	PASS
			20	43	0.051	± 2.5	PASS

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China
Tel: +86-755-28230888 Fax: +86-755-28230888 E-mail: info@uttlab.com <http://www.uttlab.com>

			10	48	0.057	± 2.5	PASS
			0	50	0.060	± 2.5	PASS
			-10	53	0.063	± 2.5	PASS
			-20	55	0.066	± 2.5	PASS

Modulation	Channel/ Frequency (MHz)	Voltage (Vdc)	Temperature (°C)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Pass/ Fail
WCDMA RMC 12.2Kbps							
BPSK	4182/ 836.4	3.4	Normal	-18	-0.022	± 2.5	PASS
		3.85		-14	0.017	± 2.5	PASS
		4.4		-20	0.024	± 2.5	PASS
		3.85	50	-25	0.030	± 2.5	PASS
			40	-23	-0.027	± 2.5	PASS
			30	-15	-0.018	± 2.5	PASS
			20	-14	-0.017	± 2.5	PASS
			10	-18	-0.022	± 2.5	PASS
			0	-19	-0.023	± 2.5	PASS
			-10	-23	-0.027	± 2.5	PASS
			-20	-27	-0.032	± 2.5	PASS

Modulation	Channel/ Frequency (MHz)	Voltage (Vdc)	Temperature (°C)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Pass/ Fail
LTE Band 5; Channel Bandwidth: 10 MHz							
QPSK	20525/ 836.5	3.4	Normal	-21.33	-0.026	± 2.5	PASS
		3.85		-17.21	-0.021	± 2.5	PASS
		4.4		-23.28	-0.028	± 2.5	PASS
		3.85	50	-24.32	-0.029	± 2.5	PASS
			40	-22.56	-0.027	± 2.5	PASS
			30	-18.41	-0.022	± 2.5	PASS
			20	-17.09	-0.020	± 2.5	PASS
			10	-19.23	-0.023	± 2.5	PASS
			0	-20.37	-0.024	± 2.5	PASS
			-10	-22.55	-0.027	± 2.5	PASS
			-20	-25.56	-0.031	± 2.5	PASS

APPENDIX 1 PHOTOGRAPHS OF TEST SETUP

See test photographs attached in Appendix 1 for the actual connections between Product and support equipment.

APPENDIX 2 PHOTOGRAPHS OF EUT CONSTRUCTIONAL DETAILS

Refer to Appendix 2 for EUT external and internal photographs.

*** End of Report ***

The test report is effective only with both signature and specialized stamp. The result(s) shown in this report refer only to the sample(s) tested. Without written approval of UnionTrust, this report can't be reproduced except in full.