

FCC TEST REPORT

(PART 22)

Product: LTE OBDII Hotspot

Model Name: Z6200

FCC ID: SRQ-Z6200

Applicant: ZTE Corporation

Address: ZTE Plaza, Keji Road South, Hi-Tech, Industrial Park, Nanshan District, Shenzhen, Guangdong, P.R.China

Manufacturer: ZTE Corporation

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Report No.: RF160830W005-2

Received Date: Aug. 14, 2016

Test Date: Aug. 15, 2016~ Sep. 01, 2016

Issued Date: Sep. 02, 2016

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF160830W005-2	Original release	Sep. 02, 2016



Test Report No.: RF160830W005-2

1 CERTIFICATION

PRODUCT: LTE OBDII Hotspot
BRAND NAME: ZTE
MODEL NAME: Z6200
APPLICANT: ZTE Corporation
TESTED: Aug. 15, 2016~ Sep. 01, 2016
TEST SAMPLE: Identical Prototype
TEST STANDARDS: FCC PART 22, Subpart H
ANSI/TIA/EIA-603-D

The above equipment has been tested by **Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

PREPARED BY : Yuqiang Yin , **DATE:** Sep. 02, 2016
(Yuqiang Yin/ Engineer)

APPROVED BY : Bill Yao , **DATE:** Sep. 02, 2016
(Bill Yao / Manager)

2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 22 & Part 2			
STANDARD SECTION	TEST TYPE	RESULT	REMARK
2.1046 22.913 (a)	Effective Radiated Power	PASS	Meet the requirement of limit.
2.1055 22.355	Frequency Stability	PASS	Meet the requirement of limit.
2.1049 22.917b	Occupied Bandwidth	PASS	Meet the requirement of limit.
--	Peak to average ratio*	PASS	Meet the requirement of limit.
22.917	Band Edge Measurements	PASS	Meet the requirement of limit.
2.1051 22.917	Conducted Spurious Emissions	PASS	Meet the requirement of limit.
2.1053 22.917	Radiated Spurious Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -17.26dB at 30.00MHz.

* Refer to KDB 971168 D01 Power Meas License Digital Systems v02r02.

2.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

MEASUREMENT	FREQUENCY	UNCERTAINTY
Conducted emissions	9kHz~30MHz	2.66dB
Radiated emissions	9KHz ~ 30MHz	2.74dB
	30MHz ~ 1GHz	3.55dB
	1GHz ~ 18GHz	4.84dB
	18GHz ~ 40GHz	1.94dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

2.2 TEST SITE AND INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESR7	101494	Apr. 05,16	Apr. 04,17
Signal and Spectrum Analyzer	Rohde&Schwarz	FSV7	102331	Nov. 09,15	Nov. 08,16
Bilog Antenna 1	Teseq	CBL 6111D	30643	Jul. 14, 16	Jul. 13, 17
Bilog Antenna 2	Teseq	CBL 6111D	27089	Jul. 14, 16	Jul. 13, 17
Horn Antenna (1GHz -18GHz)	ETS -Lindgren	3117	00062558	May 18,16	May 17,17
GPS Generator+ Antenna	TOJOIN	GNSS-5000A	E1-010119	Aug. 02, 16	Aug. 01, 17
3m Semi-anechoic Chamber	ETS-LINDGREN	9m*6m*6m	NSEMC003	Mar. 12,16	Mar. 11,18
Test Software	ADT	ADT_Radiated V7.6.15.9.2	N/A	N/A	N/A
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170242	Mar. 12,16	Mar. 11,17
Amplifier (9kHz-1GHz)	SONOMA	310D	186955	Mar. 04,16	Mar. 03, 17
Pre-Amplifier(1-18G)	HP	8449B	3008A00409	Apr. 25,16	Apr. 24,17
Pre-Amplifier (18GHz-40GHz)	EMCI	EMC 184045	980102	Nov. 20,15	Nov. 19,16
Test Software	ADT	ADT_Radiated V7.6.15.9.2	N/A	N/A	N/A
BLUETOOTH TESTER	Rohde&Schwarz	CBT32	100811	Aug. 29,16	Aug. 28,17
Power Sensor	Keysight	U2021XA	MY55060016	May 04,16	May 03,17
Power Sensor	Keysight	U2021XA	MY55060018	May 04,16	May 03,17
Digital Multimeter	FLUKE	15B	A1220010DG	Oct. 12, 15	Oct.11, 16
Humid & Temp Programmable Tester	Haida	HD-2257	110807201	Sep.07,15	Sep. 06,16
Oscilloscope	Agilent	DSO9254A	MY51260160	Nov. 28,15	Nov. 27,16
Signal Analyzer	Rohde & Schwarz	FSV7	102331	Nov. 09,15	Nov. 08,16
Signal Generator	Agilent	N5183A	MY50140980	Nov. 09,15	Nov. 08,16
ESG Vector Signal Generator	Agilent	E4438C	MY49072505	Apr. 22, 16	Apr. 21, 17
BLUETOOTH TESTER	Rohde&Schwarz	CBT32	100811	Aug. 29,16	Aug. 28,17

NOTE: 1. The calibration interval of the above test instruments is 12 months or 24 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

2. The test was performed in Dongguan 966 Chamber

3. The horn antenna are used only for the measurement of emission frequency above 1GHz if tested.

4. The FCC Site Registration No. is 502831.

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

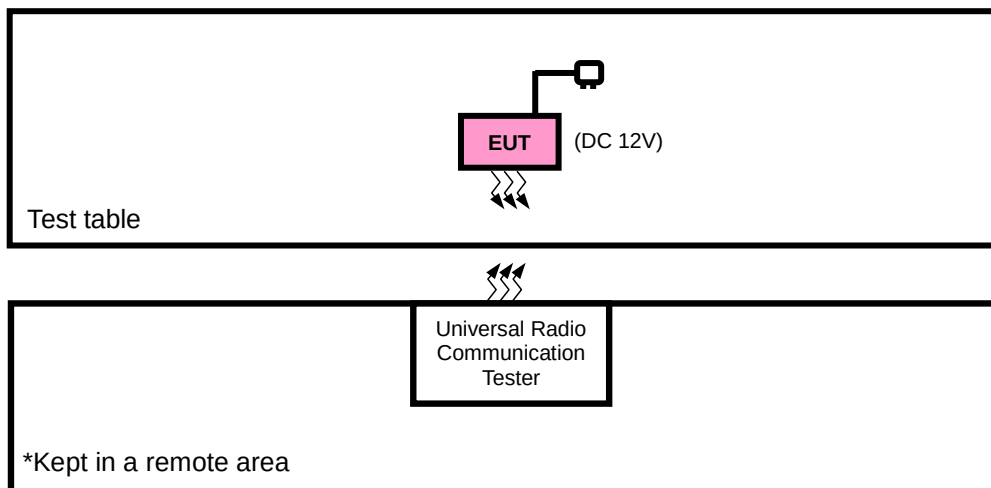
EUT	LTE OBDII Hotspot	
MODEL NAME	Z6200	
POWER SUPPLY	12Vdc	
MODULATION TYPE	LTE	QPSK, 16QAM
FREQUENCY RANGE	LTE Band 5 (Channel Bandwidth: 1.4MHz)	824.7MHz ~ 848.3MHz
	LTE Band 5 (Channel Bandwidth: 3MHz)	825.5MHz ~ 847.5MHz
	LTE Band 5 (Channel Bandwidth: 5MHz)	826.5MHz ~ 846.5MHz
	LTE Band 5 (Channel Bandwidth: 10MHz)	829MHz ~ 844MHz
MAX. ERP POWER	LTE Band 5 (Channel Bandwidth: 1.4MHz)	188mW
	LTE Band 5 (Channel Bandwidth: 3MHz)	198mW
	LTE Band 5 (Channel Bandwidth: 5MHz)	214mW
	LTE Band 5 (Channel Bandwidth: 10MHz)	174mW
EMISSION DESIGNATOR	LTE Band 5 (Channel Bandwidth: 1.4MHz)	QPSK: 1M09G7D
		16QAM: 1M09W7D
	LTE Band 5 (Channel Bandwidth: 3MHz)	QPSK: 2M69G7D
		16QAM: 2M68W7D
	LTE Band 5 (Channel Bandwidth: 5MHz)	QPSK: 4M48G7D
		16QAM: 4M47W7D
	LTE Band 5 (Channel Bandwidth: 10MHz)	QPSK: 8M95G7D
		16QAM: 8M96W7D
ANTENNA TYPE	Fixed Internal antenna with -0.9dBi gain	
HW VERSION	Z6200.H02	
SW VERSION	TMO_US_Z6200V1.0.0B03	
I/O PORTS	Refer to user's manual	
DATA CABLE	N/A	

NOTE:

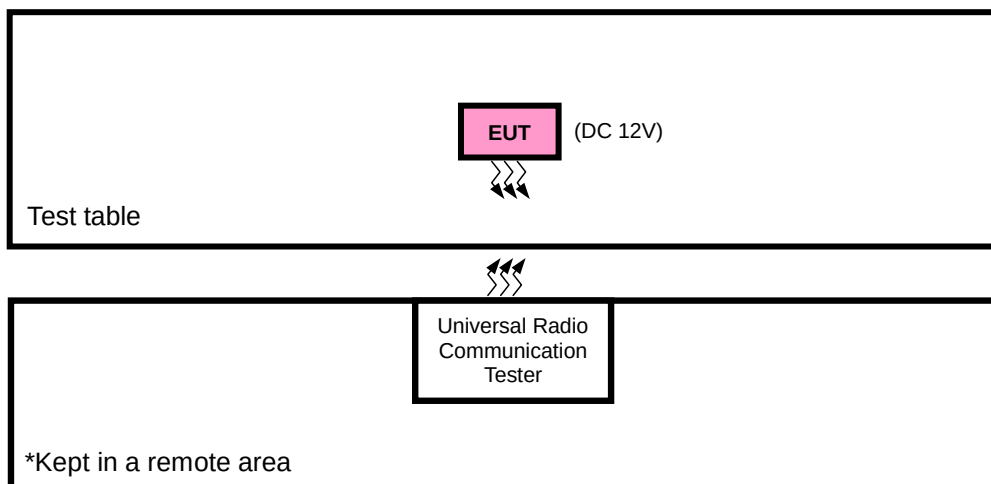
1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.

3.2 CONFIGURATION OF SYSTEM UNDER TEST

FOR RADIATION EMISSION TEST



FOR E.R.P. TEST



3.3 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	DC source	LONG WEI	PS-6403D	010934269	N/A
2	PC	HP	A6608CN	3CR83825X3	N/A

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	DC Line: Unshielded, Detachable 1.0m
2	AC Line: Unshielded, Detachable 1.5m

NOTE:

1. All power cords of the above support units are non shielded (1.8m).

3.4 TEST ITEM AND TEST CONFIGURATION

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports. The worst case in ERP and radiated emission was found when positioned on X-plane for GSM/EDGE/WCDMA and Z-plane for LTE. Following channel(s) was (were) selected for the final test as listed below:

EUT CONFIGURE MODE	DESCRIPTION
-	EUT with LTE link

LTE BAND 5 MODE

TEST ITEM	Available Channel	Tested Channel	Channel bandwidth	modulation	mode
ERP	20407 to 20643	20407, 20525, 20643	1.4MHz	QPSK,16QAM	1 RB / 0 RB Offset
	20415 to 20635	20415, 20525, 20635	3MHz	QPSK,16QAM	1 RB / 0 RB Offset
	20425 to 20625	20425, 20525, 20625	5MHz	QPSK,16QAM	1 RB / 0 RB Offset
	20450 to 20600	20450, 20525, 20600	10MHz	QPSK,16QAM	1 RB / 0 RB Offset
FREQUENCY STABILITY	20407 to 20643	20525	1.4MHz	QPSK	1 RB / 0 RB Offset
	20415 to 20635	20525	3MHz	QPSK	1 RB / 0 RB Offset
	20425 to 20625	20525	5MHz	QPSK	1 RB / 0 RB Offset
	20450 to 20600	20525	10MHz	QPSK	1 RB / 0 RB Offset
OCCUPIED BANDWIDTH	20407 to 20643	20407, 20525, 20643	1.4MHz	QPSK	6 RB / 0 RB Offset
				16QAM	6 RB / 0 RB Offset
	20415 to 20635	20415, 20525, 20635	3MHz	QPSK	15 RB / 0 RB Offset
				16QAM	15 RB / 0 RB Offset
	20425 to 20625	20425, 20525, 20625	5MHz	QPSK	25 RB / 0 RB Offset
				16QAM	25 RB / 0 RB Offset
	20450 to 20600	20450, 20525, 20600	10MHz	QPSK	50 RB / 0 RB Offset
				16QAM	50 RB / 0 RB Offset

BAND EDGE	20407 to 20643	20407	1.4 MHz	QPSK	1 RB / 0 RB Offset
					6 RB / 0 RB Offset
	20407 to 20643	20643	1.4 MHz	QPSK	1 RB / 5 RB Offset
					6 RB / 0 RB Offset
	20415 to 20635	20415	3 MHz	QPSK	1 RB / 0 RB Offset
					15 RB / 0 RB Offset
	20415 to 20635	20635	3 MHz	QPSK	1 RB / 14 RB Offset
					15 RB / 0 RB Offset
	20425 to 20625	20425	5MHz	QPSK	1 RB / 0 RB Offset
					25 RB / 0 RB Offset
	20425 to 20625	20625	5MHz	QPSK	1 RB / 24 RB Offset
					25 RB / 0 RB Offset
CONDCUDED EMISSION	20407 to 20643	20525	1.4MHz	QPSK	1 RB / 0 RB Offset
					1 RB / 0 RB Offset
	20415 to 20635	20525	3MHz	QPSK	1 RB / 0 RB Offset
					1 RB / 0 RB Offset
RADIATED EMISSION	20407 to 20643	20525	1.4MHz	QPSK	1 RB / 0 RB Offset
					1 RB / 0 RB Offset
	20415 to 20635	20525	3MHz	QPSK	1 RB / 0 RB Offset
					1 RB / 0 RB Offset

TEST ITEM	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
ERP	23deg. C, 62%RH	12Vdc	Yuqiang Yin
FREQUENCY STABILITY	23deg. C, 62%RH	12Vdc	Yuqiang Yin
OCCUPIED BANDWIDTH	23deg. C, 62%RH	12Vdc	Yuqiang Yin
BAND EDGE	23deg. C, 62%RH	12Vdc	Yuqiang Yin
CONDCUDED EMISSION	23deg. C, 62%RH	12Vdc	Yuqiang Yin
RADIATED EMISSION	25deg. C, 63.6%RH	12Vdc	Alex Chen



3.5 EUT OPERATING CONDITIONS

The EUT makes a call to the communication simulator. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency

3.6 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC 47 CFR Part 2

FCC 47 CFR Part 22

KDB 971168 D01 Power Meas License Digital Systems v02r02

ANSI/TIA/EIA-603-D

NOTE: All test items have been performed and recorded as per the above standards.

4 TEST TYPES AND RESULTS

4.1 OUTPUT POWER MEASUREMENT

4.1.1 LIMITS OF OUTPUT POWER MEASUREMENT

Mobile / Portable station are limited to 7 watts e.r.p.

4.1.2 TEST PROCEDURES

EIRP / ERP MEASUREMENT:

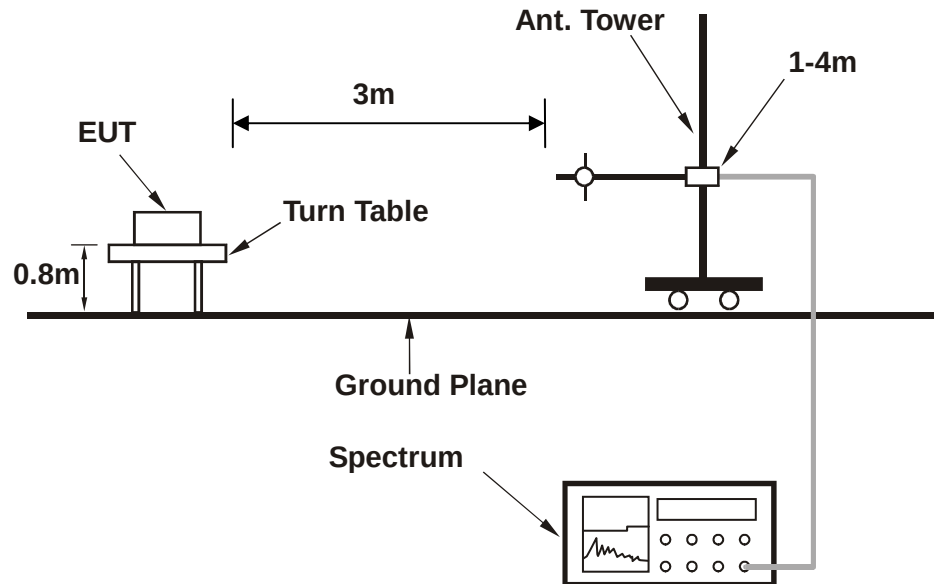
- a. All measurements were done at low, middle and high operational frequency range. RBW and VBW is 10MHz for LTE mode.
- b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The “Read Value” is the spectrum reading the maximum power value.
- c. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a tx cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to “Read Value” of step b. Record the power level of S.G
- d. $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn.}$
E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, $E.R.P \text{ power} = E.I.P.R \text{ power} - 2.15\text{dBi}.$

CONDUCTED POWER MEASUREMENT:

The EUT was set up for the maximum power with WCDMA & 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.

4.1.3 TEST SETUP

EIRP / ERP MEASUREMENT:



For the actual test configuration, please refer to the attached file (Test Setup Photo).

CONDUCTED POWER MEASUREMENT:



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.4 TEST RESULTS

CONDUCTED OUTPUT POWER (dBm)

Band/BW	Modulation	RB Size	RB Offset	Low CH 20407	Mid CH 20525	High CH 20643	3GPP MPR (dB)
				Frequency 824.7 MHz	Frequency 836.5 MHz	Frequency 848.3 MHz	
5/1.4	QPSK	1	0	22.80	23.02	22.72	0
		1	2	22.61	22.83	22.53	0
		1	5	22.53	22.75	22.45	0
		3	0	22.78	23.00	22.70	0
		3	1	22.59	22.81	22.51	0
		3	3	22.51	22.73	22.43	0
		6	0	21.55	21.77	21.47	1
	16QAM	1	0	21.81	22.03	21.73	1
		1	2	21.62	21.84	21.54	1
		1	5	21.54	21.76	21.46	1
		3	0	21.80	22.02	21.72	1
		3	1	21.61	21.83	21.53	1
		3	3	21.53	21.75	21.45	1
		6	0	20.56	20.78	20.48	2

Band/BW	Modulation	RB Size	RB Offset	Low CH 20415	Mid CH 20525	High CH 20635	3GPP MPR (dB)
				Frequency 825.5 MHz	Frequency 836.5 MHz	Frequency 847.5 MHz	
5/3	QPSK	1	0	22.84	23.06	22.76	0
		1	7	22.65	22.87	22.57	0
		1	14	22.57	22.79	22.49	0
		8	0	21.65	21.87	21.57	1
		8	3	21.57	21.79	21.49	1
		8	7	21.63	21.85	21.55	1
		15	0	21.59	21.81	21.51	1
	16QAM	1	0	21.85	22.07	21.77	1
		1	7	21.66	21.88	21.58	1
		1	14	21.58	21.80	21.50	1
		8	0	20.66	20.88	20.58	2
		8	3	20.58	20.80	20.50	2
		8	7	20.64	20.86	20.56	2
		15	0	20.60	20.82	20.52	2

Band/BW	Modulation	RB Size	RB Offset	Low CH 20425	Mid CH 20525	High CH 20625	3GPP MPR (dB)
				Frequency 826.5 MHz	Frequency 836.5 MHz	Frequency 846.5 MHz	
5/5	QPSK	1	0	22.90	23.12	22.82	0
		1	12	22.71	22.93	22.63	0
		1	24	22.63	22.85	22.55	0
		12	0	21.71	21.93	21.63	1
		12	6	21.63	21.85	21.55	1
		12	13	21.69	21.91	21.61	1
		25	0	21.65	21.87	21.57	1
	16QAM	1	0	21.91	22.13	21.83	1
		1	12	21.72	21.94	21.64	1
		1	24	21.64	21.86	21.56	1
		12	0	20.72	20.94	20.64	2
		12	6	20.64	20.86	20.56	2
		12	13	20.70	20.92	20.62	2
		25	0	20.66	20.88	20.58	2

Band/BW	Modulation	RB Size	RB Offset	Low CH 20450	Mid CH 20525	High CH 20600	3GPP MPR (dB)
				Frequency 829 MHz	Frequency 836.5 MHz	Frequency 844 MHz	
5/10	QPSK	1	0	22.93	23.15	22.85	0
		1	24	22.74	22.96	22.66	0
		1	49	22.66	22.88	22.58	0
		25	0	21.74	21.96	21.66	1
		25	12	21.66	21.88	21.58	1
		25	25	21.72	21.94	21.64	1
		50	0	21.68	21.90	21.60	1
	16QAM	1	0	21.94	22.16	21.86	1
		1	24	21.75	21.97	21.67	1
		1	49	21.67	21.89	21.59	1
		25	0	20.75	20.97	20.67	2
		25	12	20.67	20.89	20.59	2
		25	25	20.73	20.95	20.65	2
		50	0	20.69	20.91	20.61	2

ERP POWER (dBm)

LTE BAND 5

CHANNEL BANDWIDTH: 1.4MHz QPSK

Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	ERP(dBm)	ERP(mW)	Polarization (H/V)	LIMIT (W)
20407	824.7	-8.79	33.67	22.73	187.63	H	7
20525	836.5	-9.42	33.62	22.05	160.47	H	7
20643	848.3	-10.31	33.65	21.19	131.37	H	7
20407	824.7	-9.57	34.25	22.53	178.98	V	7
20525	836.5	-10.18	34.60	22.27	168.58	V	7
20643	848.3	-10.45	34.63	22.03	159.59	V	7

CHANNEL BANDWIDTH: 1.4MHz 16QAM

Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	ERP(dBm)	ERP(mW)	Polarization (H/V)	LIMIT (W)
20407	824.7	-9.62	33.67	21.90	154.99	H	7
20525	836.5	-10.44	33.62	21.03	126.88	H	7
20643	848.3	-11.41	33.65	20.09	101.98	H	7
20407	824.7	-10.40	34.25	21.70	147.84	V	7
20525	836.5	-11.20	34.60	21.25	133.29	V	7
20643	848.3	-11.55	34.63	20.93	123.88	V	7

CHANNEL BANDWIDTH: 3MHz QPSK

Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	ERP(dBm)	ERP(mW)	Polarization (H/V)	LIMIT (W)
20415	825.5	-8.60	33.72	22.97	198.20	H	7
20525	836.5	-9.36	33.62	22.11	162.70	H	7
20635	847.5	-10.18	33.65	21.32	135.49	H	7
20415	825.5	-9.38	34.30	22.77	189.28	V	7
20525	836.5	-10.12	34.60	22.33	170.92	V	7
20635	847.5	-10.32	34.57	22.10	162.22	V	7

CHANNEL BANDWIDTH: 3MHz 16QAM

Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	ERP(dBm)	ERP(mW)	Polarization (H/V)	LIMIT (W)
20415	825.5	-9.75	33.72	21.82	152.09	H	7
20525	836.5	-10.46	33.62	21.01	126.30	H	7
20635	847.5	-11.34	33.65	20.16	103.73	H	7
20415	825.5	-10.53	34.30	21.62	145.24	V	7
20525	836.5	-11.22	34.60	21.23	132.68	V	7
20635	847.5	-11.48	34.57	20.94	124.19	V	7

CHANNEL BANDWIDTH: 5MHz QPSK

Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	ERP(dBm)	ERP(mW)	Polarization (H/V)	LIMIT (W)
20425	826.5	-8.61	33.69	22.93	196.52	H	7
20525	836.5	-9.43	33.62	22.04	160.10	H	7
20625	846.5	-10.25	33.66	21.26	133.69	H	7
20425	826.5	-9.39	34.85	23.31	214.24	V	7
20525	836.5	-10.19	34.60	22.26	168.19	V	7
20625	846.5	-10.39	34.59	22.05	160.47	V	7

CHANNEL BANDWIDTH: 5MHz 16QAM

Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	ERP(dBm)	ERP(mW)	Polarization (H/V)	LIMIT (W)
20425	826.5	-9.47	33.69	22.07	161.21	H	7
20525	836.5	-10.30	33.62	21.17	131.04	H	7
20625	846.5	-11.10	33.66	20.41	109.93	H	7
20425	826.5	-10.25	34.85	22.45	175.75	V	7
20525	836.5	-11.06	34.60	21.39	137.66	V	7
20625	846.5	-11.24	34.59	21.20	131.95	V	7

CHANNEL BANDWIDTH: 10MHz QPSK

Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	ERP(dBm)	ERP(mW)	Polarization (H/V)	LIMIT (W)
20450	829	-9.19	33.73	22.39	173.18	H	7
20525	836.5	-9.88	33.62	21.59	144.34	H	7
20600	844	-10.83	33.51	20.53	113.06	H	7
20450	829	-9.97	34.54	22.42	174.42	V	7
20525	836.5	-10.64	34.60	21.81	151.64	V	7
20600	844	-10.97	34.46	21.34	135.99	V	7

CHANNEL BANDWIDTH: 10MHz 16QAM

Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	ERP(dBm)	ERP(mW)	Polarization (H/V)	LIMIT (W)
20450	829	-10.12	33.73	21.46	139.80	H	7
20525	836.5	-10.95	33.62	20.52	112.82	H	7
20600	844	-11.66	33.51	19.70	93.39	H	7
20450	829	-10.90	34.54	21.49	140.80	V	7
20525	836.5	-11.71	34.60	20.74	118.52	V	7
20600	844	-11.80	34.46	20.51	112.33	V	7

REMARKS: 1. ERP Output Power (dBm) = SPA Reading (dBm) + Correction Factor (dB).
2. Correction factor (dB) = Free Space Loss + Antenna Factor + Cable Loss.

4.2 FREQUENCY STABILITY MEASUREMENT

4.2.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT

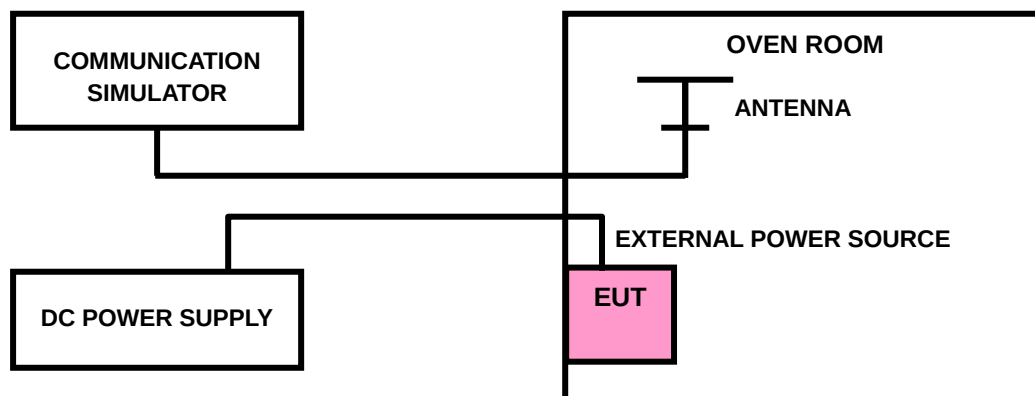
1.5 ppm is for base and fixed station. 2.5 ppm is for mobile station.

4.2.2 TEST PROCEDURE

- Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.
- EUT is connected the external power supply to control the DC input power. The test voltage range is from minimum to maximum working voltage. Each step shall be record the frequency error rate.
- The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the $\pm 0.5^{\circ}\text{C}$ during the measurement testing. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.

NOTE: The frequency error was recorded frequency error from the communication simulator.

4.2.3 TEST SETUP



4.2.4 TEST RESULTS

FREQUENCY ERROR VS. VOLTAGE

VOLTAGE (Volts)	FREQUENCY ERROR (ppm)				LIMIT (ppm)
	LTE Band 5				
	1.4MHz	3MHz	5MHz	10MHz	
12	0.0028	0.0029	0.0030	0.0028	2.5
9	0.0027	0.0028	0.0028	0.0027	2.5
16	0.0025	0.0026	0.0027	0.0026	2.5

NOTE: The applicant defined the normal working voltage of the battery is from 9Vdc to 16Vdc.

FREQUENCY ERROR vs. TEMPERATURE.

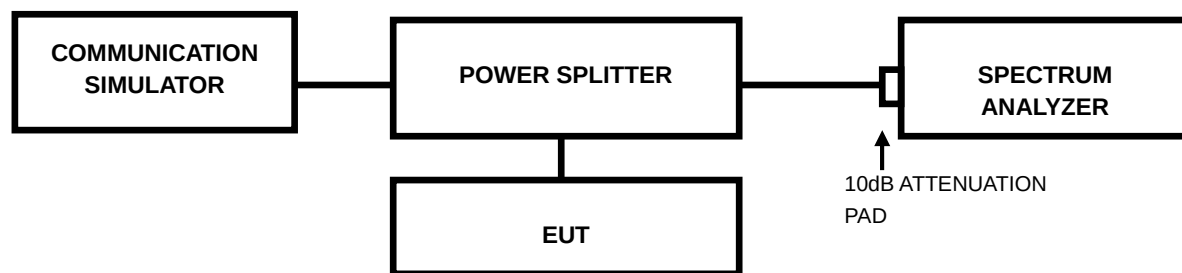
TEMP. (°C)	Frequency Error (ppm)				Limit (ppm)
	LTE Band 5				
	1.4 MHz	3 MHz	5 MHz	10MHz	
-30	0.0107	0.0104	0.0118	0.0113	2.5
-20	0.0081	0.0096	0.0113	0.0111	2.5
-10	0.0056	0.0091	0.0104	0.0101	2.5
0	0.0087	0.0088	0.0100	0.0091	2.5
10	0.0056	0.0077	0.0094	0.0085	2.5
20	0.0090	0.0076	0.0091	0.0077	2.5
30	0.0055	0.0071	0.0085	0.0063	2.5
40	0.0050	0.0064	0.0076	0.0052	2.5
50	0.0047	0.0054	0.0073	0.0049	2.5
60	0.0044	0.0052	0.0053	0.0043	2.5

4.3 OCCUPIED BANDWIDTH MEASUREMENT

4.3.1 TEST PROCEDURES

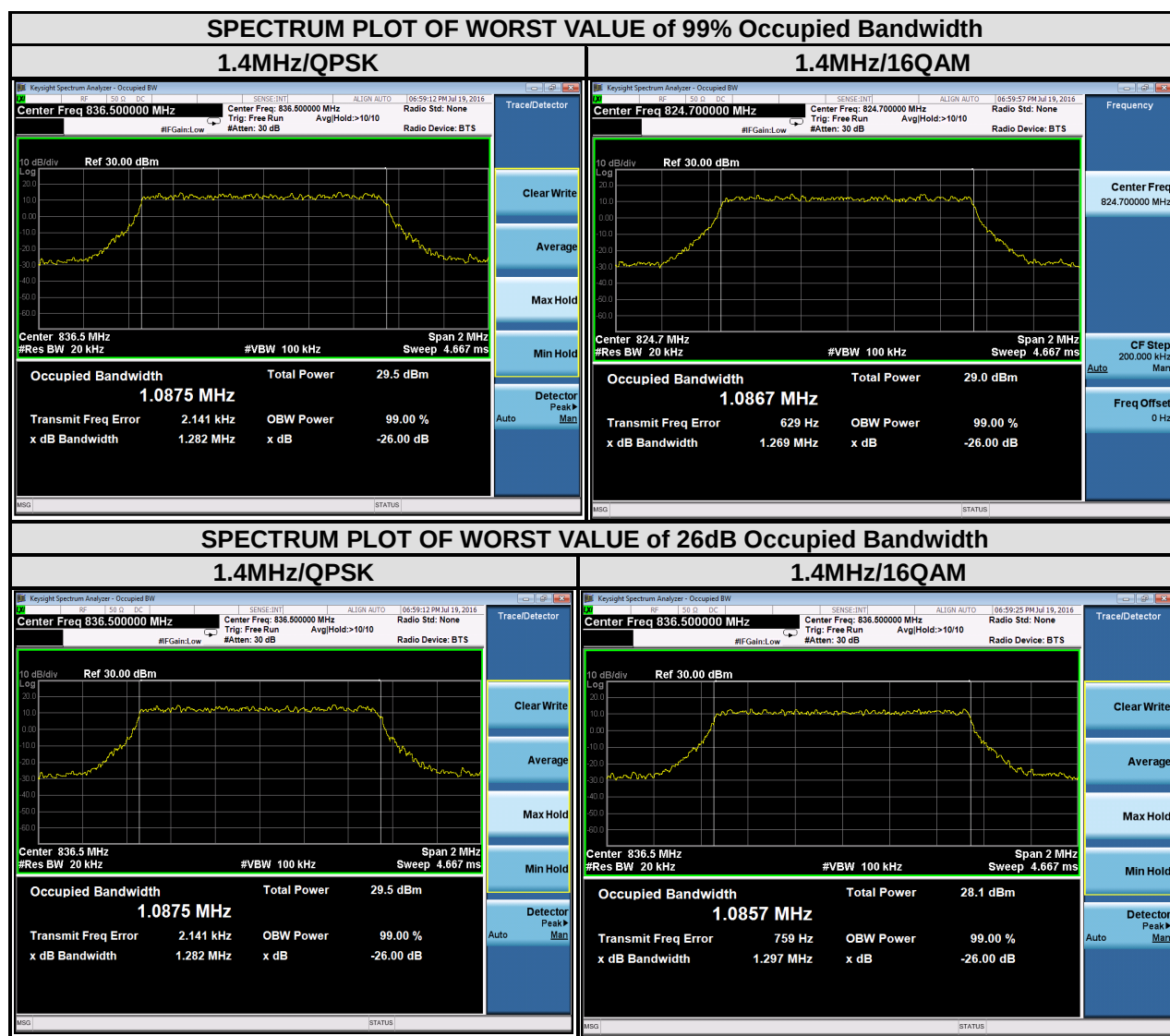
The EUT makes a call to the communication simulator. All measurements were done at low, middle and high operational frequency range. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.

4.3.2 TEST SETUP

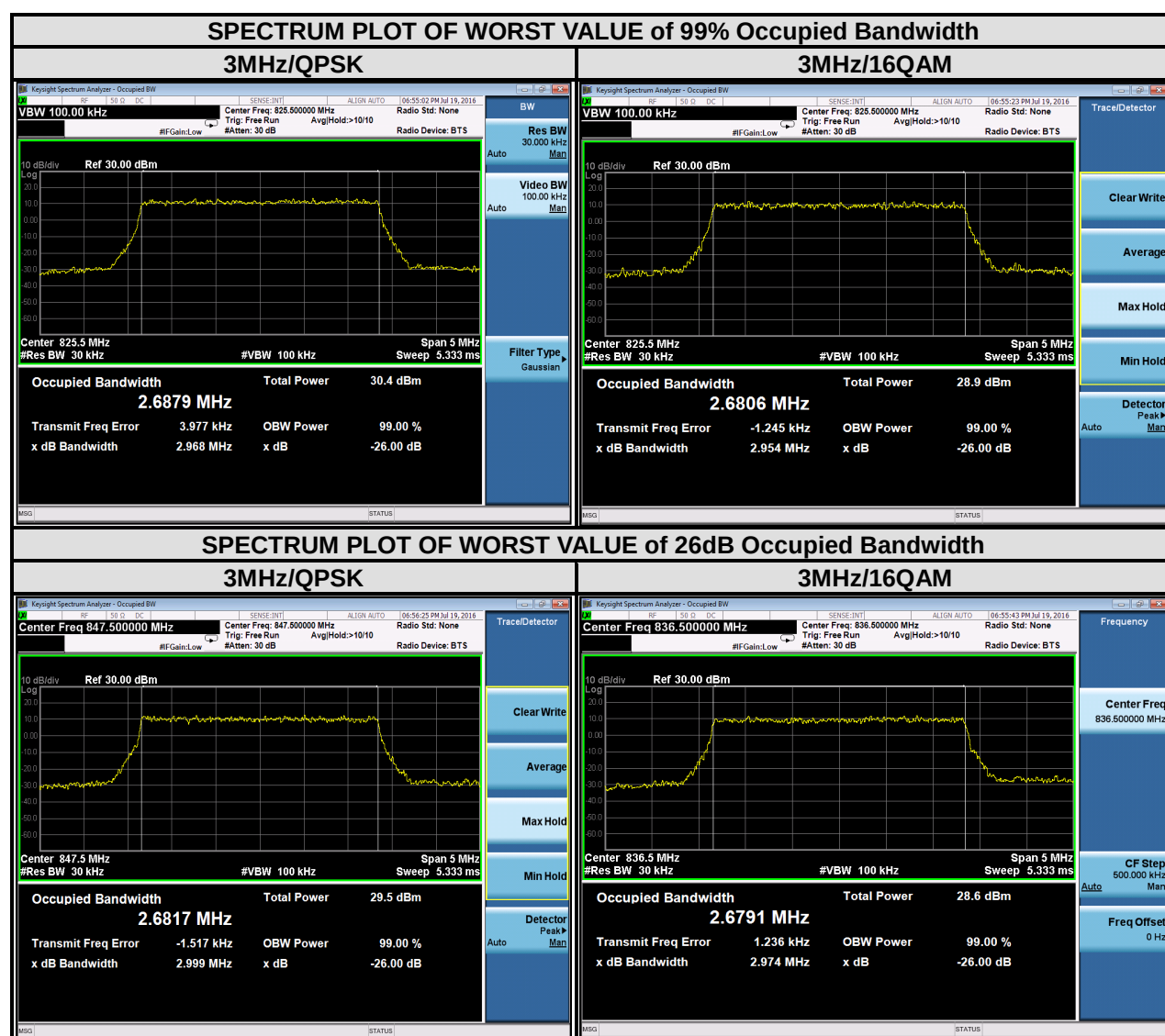


4.3.3 TEST RESULTS

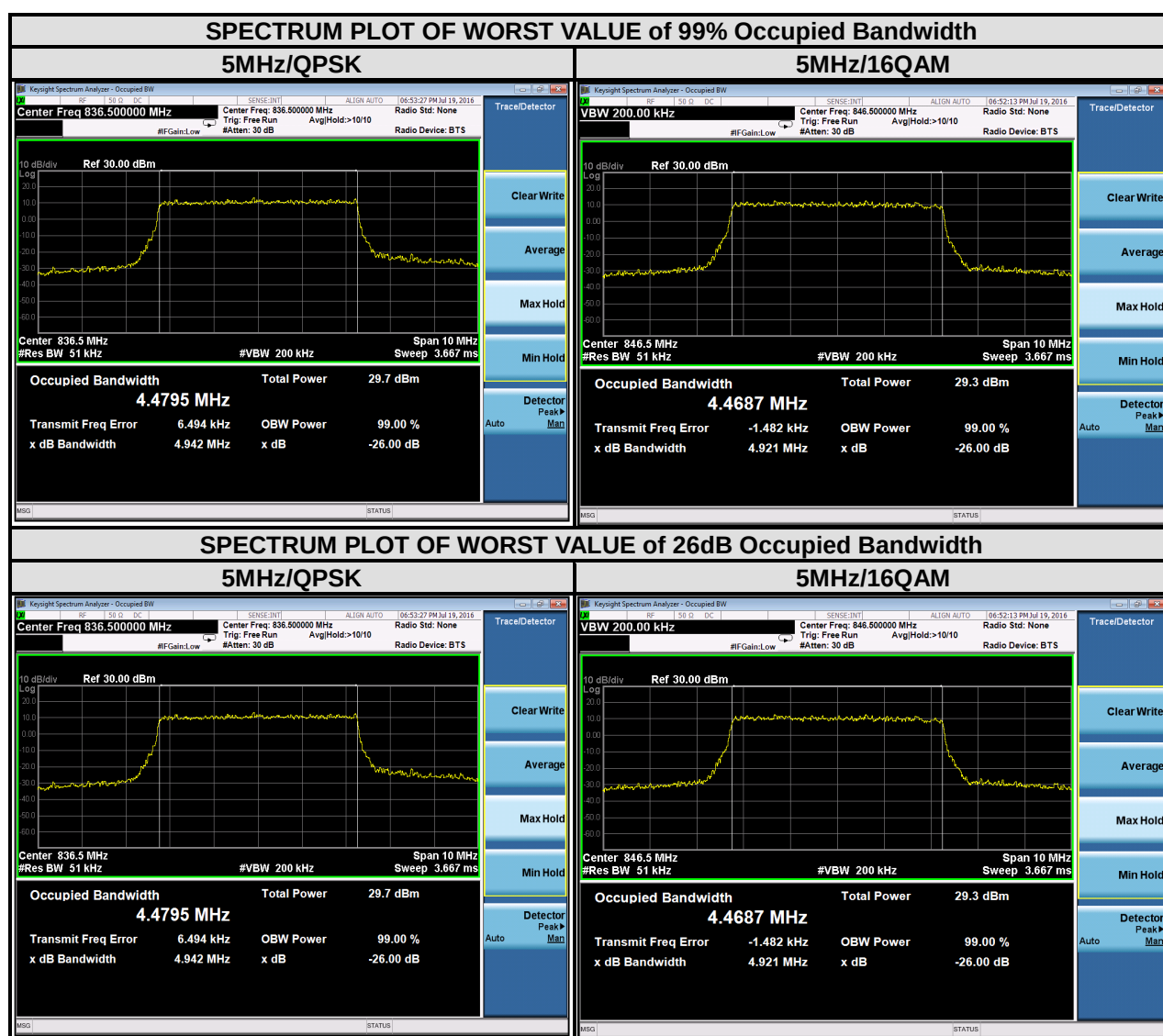
LTE band 5							
Channel Bandwidth : 1.4MHz							
Channel	Frequency (MHz)	99% Occupied bandwidth (MHz)		Channel	Frequency (MHz)	26 dB bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
20407	824.7	1.09	1.09	20407	824.7	1.26	1.27
20525	836.5	1.09	1.09	20525	836.5	1.28	1.30
20643	848.3	1.09	1.08	20643	848.3	1.27	1.27



LTE band 5							
Channel Bandwidth : 3MHz							
Channel	Frequency (MHz)	99% Occupied bandwidth (MHz)		Channel	Frequency (MHz)	26 dB bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
20415	825.5	2.69	2.68	20415	825.5	2.97	2.95
20525	836.5	2.69	2.68	20525	836.5	2.98	2.97
20635	847.5	2.68	2.68	20635	847.5	3.00	2.96



LTE band 5							
Channel Bandwidth : 5 MHz							
Channel	Frequency (MHz)	99% Occupied bandwidth (MHz)		Channel	Frequency (MHz)	26 dB bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
20425	826.5	4.48	4.46	20425	826.5	4.90	4.87
20525	836.5	4.48	4.46	20525	836.5	4.94	4.87
20625	846.5	4.47	4.47	20625	846.5	4.93	4.92



LTE band 5							
Channel Bandwidth : 10 MHz							
Channel	Frequency (MHz)	99% Occupied bandwidth (MHz)		Channel	Frequency (MHz)	26 dB bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
20450	829	8.93	8.94	20450	829	9.65	9.77
20525	836.5	8.95	8.96	20525	836.5	9.79	9.70
20600	844	8.93	8.92	20600	844	9.59	9.67

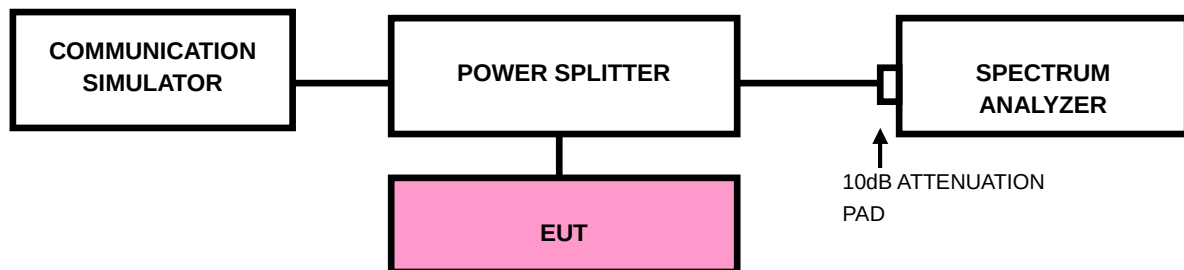


4.4 BAND EDGE MEASUREMENT

4.4.1 LIMITS OF BAND EDGE MEASUREMENT

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. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

4.4.2 TEST SETUP



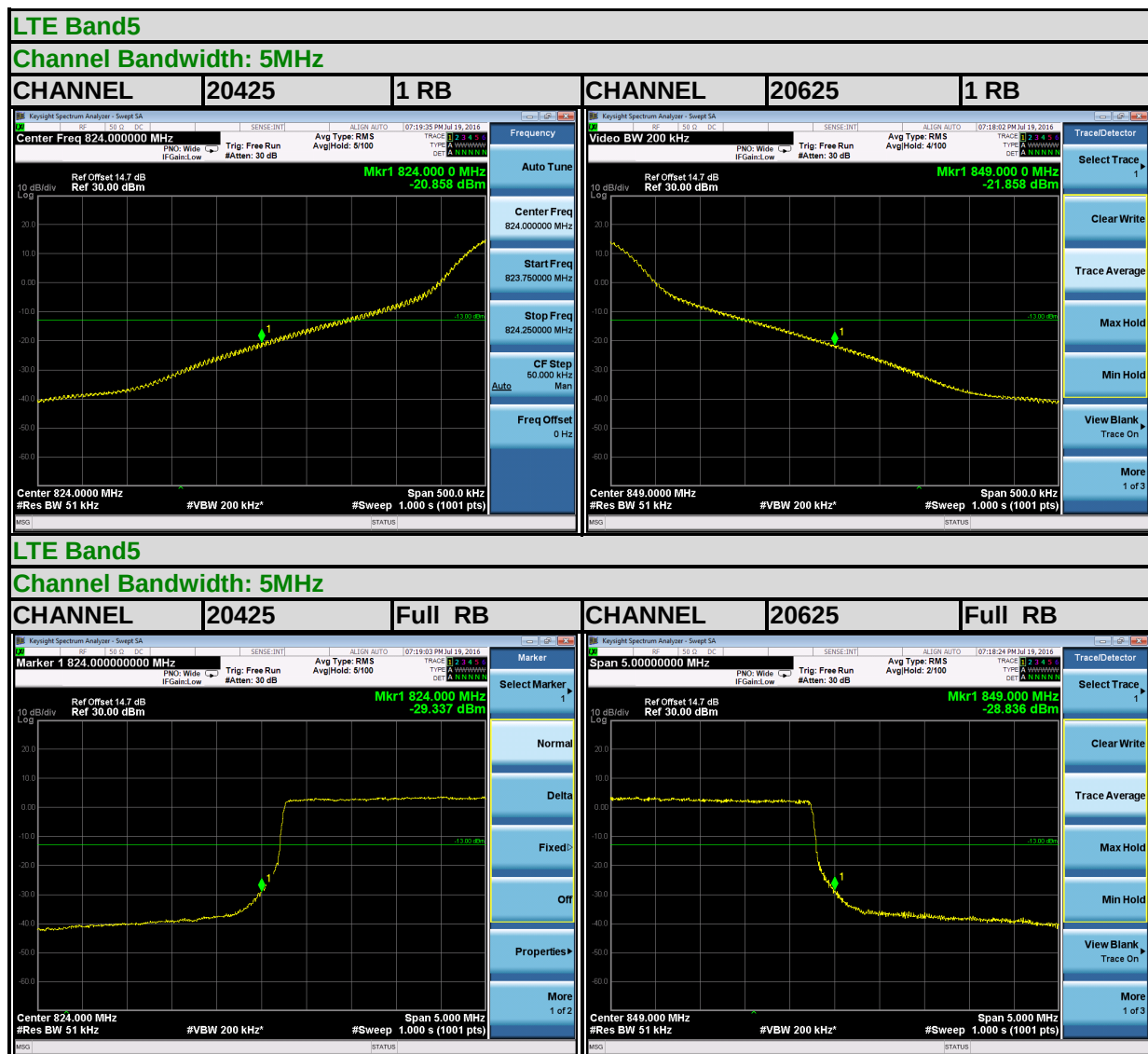
4.4.3 TEST PROCEDURES

- a. All measurements were done at low and high operational frequency range.
- b. The center frequency of spectrum is the band edge frequency and span is 1~5 MHz. RB of the spectrum is 20kHz and VB of the spectrum is 100 kHz. (LTE bandwidth 1.4MHz).
- c. The center frequency of spectrum is the band edge frequency and span is 1~5 MHz. RB of the spectrum is 30kHz and VB of the spectrum is 100kHz. (LTE bandwidth 3MHz)
- d. The center frequency of spectrum is the band edge frequency and span is 1~5 MHz. RB of the spectrum is 50kHz and VB of the spectrum is 200kHz. (LTE bandwidth 5MHz)
- e. The center frequency of spectrum is the band edge frequency and span is 1~5 MHz. RB of the spectrum is 100kHz and VB of the spectrum is 300kHz. (LTE bandwidth 10MHz)
- f. Record the max trace plot into the test report.

4.4.4 TEST RESULTS









4.5 CONDUCTED SPURIOUS EMISSIONS

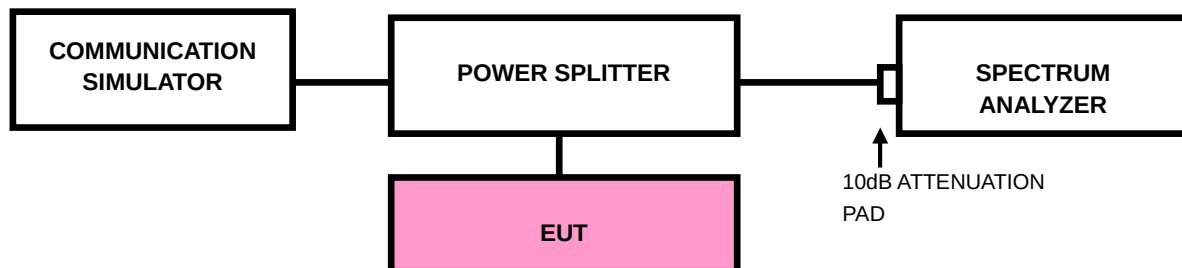
4.5.1 LIMITS OF CONDUCTED SPURIOUS EMISSIONS MEASUREMENT

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 -13dBm .

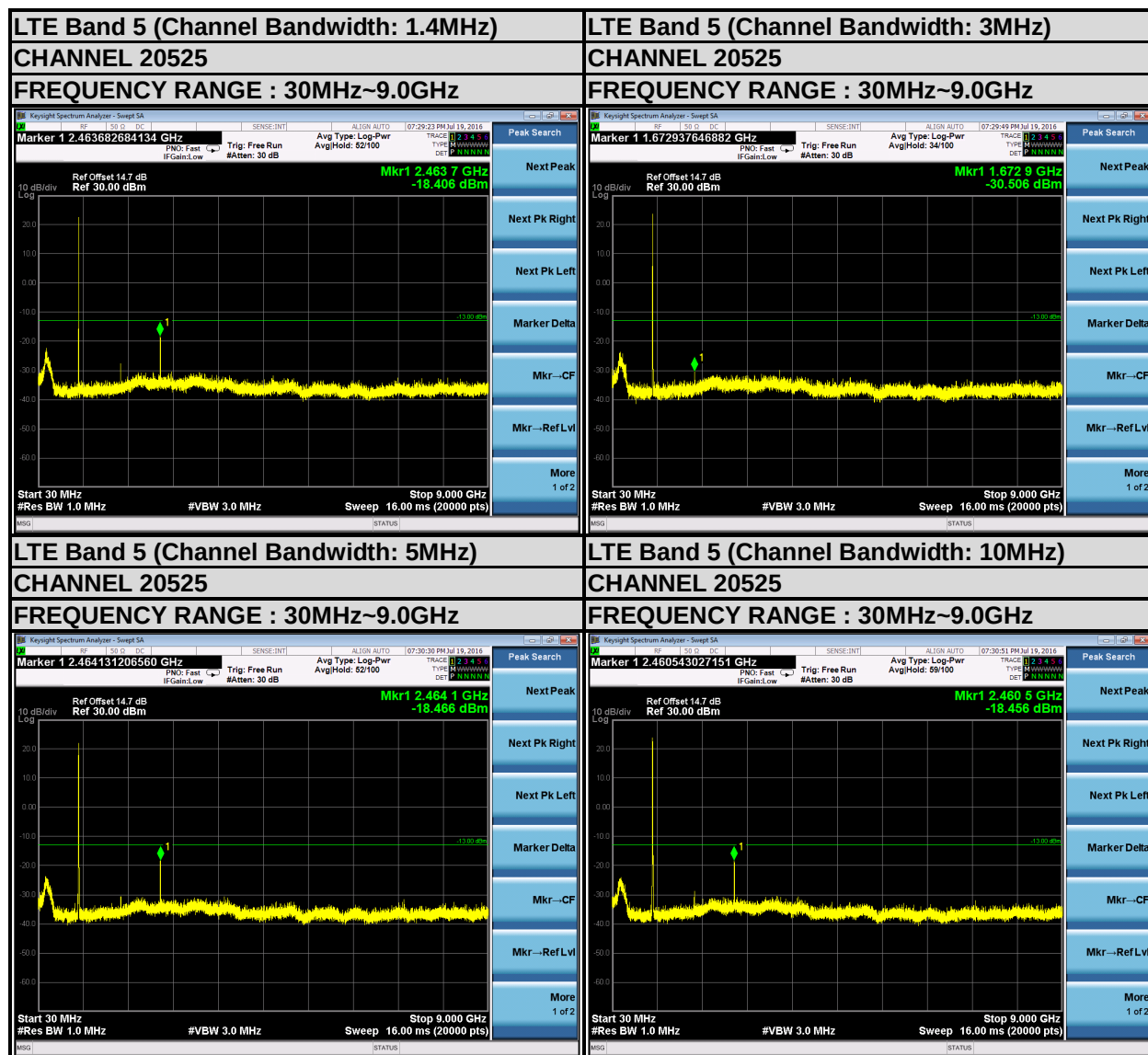
4.5.2 TEST PROCEDURE

- a. 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 9GHz. 20dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz is used for conducted emission measurement.

4.5.3 TEST SETUP



4.5.4 TEST RESULTS



4.6 RADIATED EMISSION MEASUREMENT

4.6.1 LIMITS OF RADIATED EMISSION MEASUREMENT

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 -13dBm .

4.6.2 TEST PROCEDURES

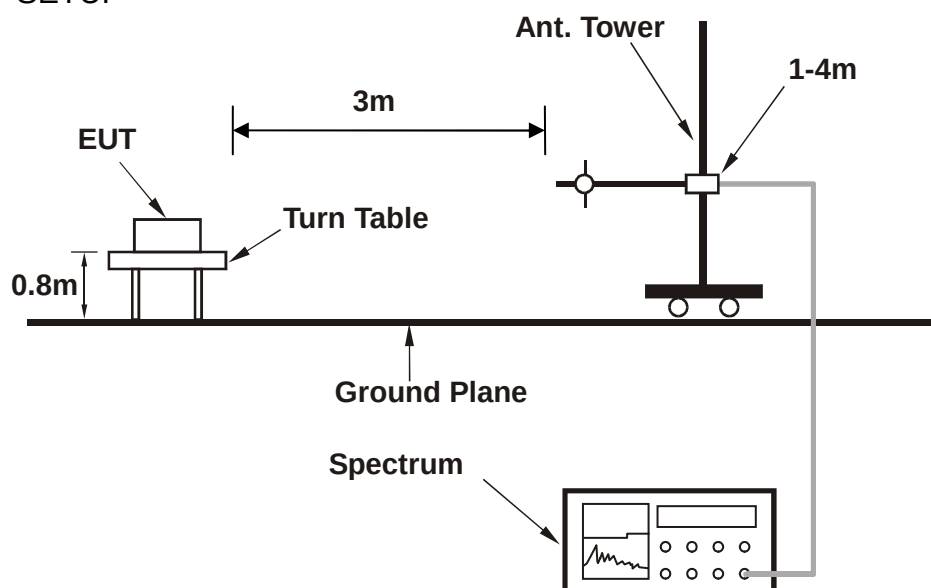
- a. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The “Read Value” is the spectrum reading the maximum power value.
- b. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to “Read Value” of step a. Record the power level of S.G
- c. $\text{EIRP} = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}$.
- d. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, $\text{E.R.P power} = \text{E.I.P.R power} - 2.15\text{dBi}$.

NOTE: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz/3MHz.

4.6.3 DEVIATION FROM TEST STANDARD

No deviation

4.6.4 TEST SETUP



For the actual test configuration, please refer to the attached file (Test Setup Photo).

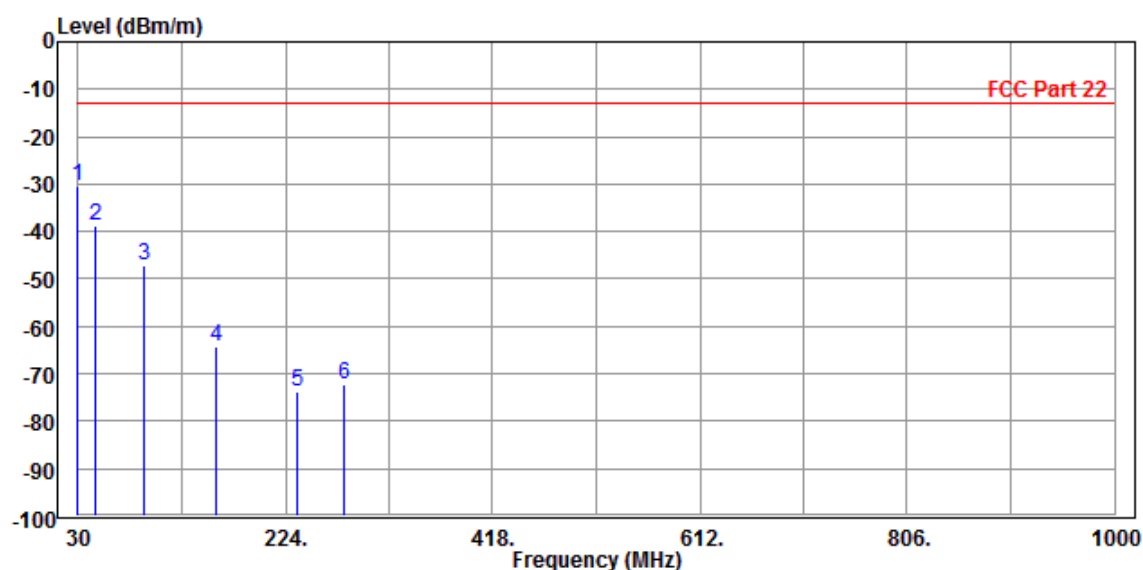
4.6.5 TEST RESULTS

BELOW 1GHz WORST-CASE DATA

LTE Band 5:

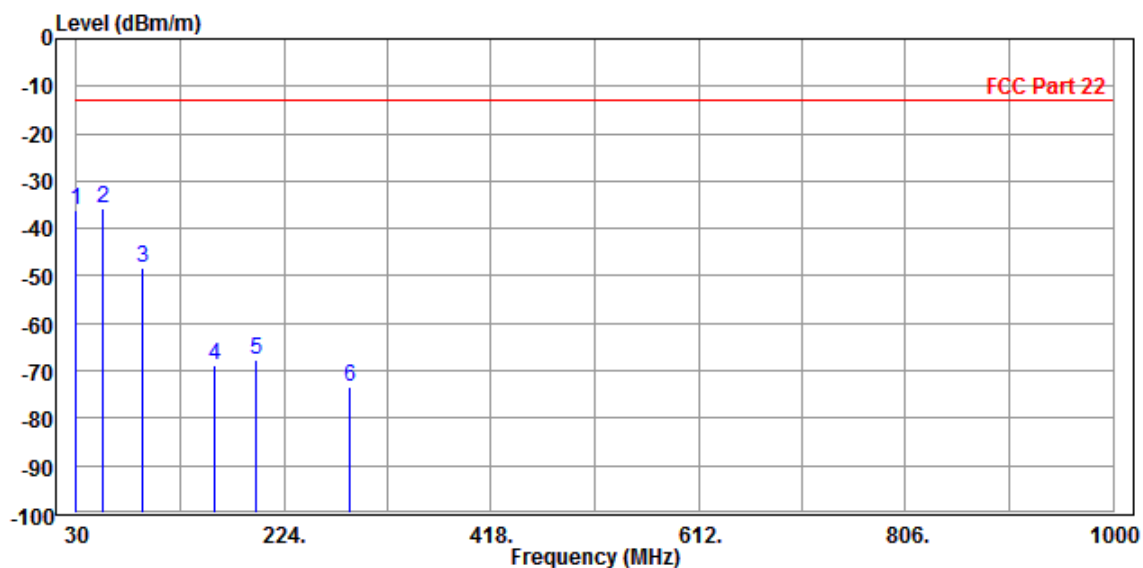
MODE	TX channel 20525	FREQUENCY RANGE	Below 1000MHz
ENVIRONMENTAL CONDITIONS	26deg. C, 56%RH	INPUT POWER	12Vdc
TESTED BY	Alex Chen		
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M			

		Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
		MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1	PP	30.000	-30.26	-49.60	-13.00	-17.26	19.34	Peak	Horizontal
2		46.490	-38.61	-44.95	-13.00	-25.61	6.34	Peak	Horizontal
3		91.110	-47.29	-38.01	-13.00	-34.29	-9.28	Peak	Horizontal
4		159.010	-64.24	-45.71	-13.00	-51.24	-18.53	Peak	Horizontal
5		235.640	-73.81	-57.26	-13.00	-60.81	-16.55	Peak	Horizontal
6		278.320	-72.24	-57.36	-13.00	-59.24	-14.88	Peak	Horizontal



MODE	TX channel 20525	FREQUENCY RANGE	Below 1000MHz
ENVIRONMENTAL CONDITIONS	26deg. C, 56%RH	INPUT POWER	12Vdc
TESTED BY	Alex Chen		
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M			

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
	MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1	30.000	-36.20	-41.53	-13.00	-23.20	5.33	Peak	Vertical
2 PP	54.250	-35.85	-27.88	-13.00	-22.85	-7.97	Peak	Vertical
3	92.080	-48.32	-37.75	-13.00	-35.32	-10.57	Peak	Vertical
4	159.010	-68.89	-53.55	-13.00	-55.89	-15.34	Peak	Vertical
5	197.810	-67.72	-56.81	-13.00	-54.72	-10.91	Peak	Vertical
6	286.080	-73.28	-61.92	-13.00	-60.28	-11.36	Peak	Vertical



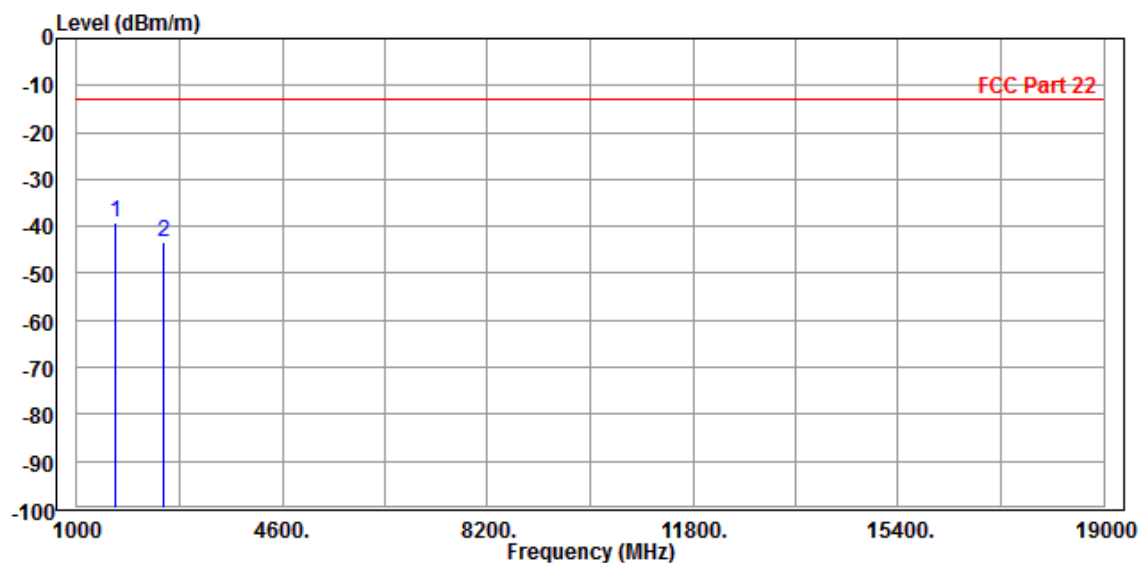
ABOVE 1GHz DATA

LTE Band 5

CHANNEL BANDWIDTH: 1.4MHz / QPSK

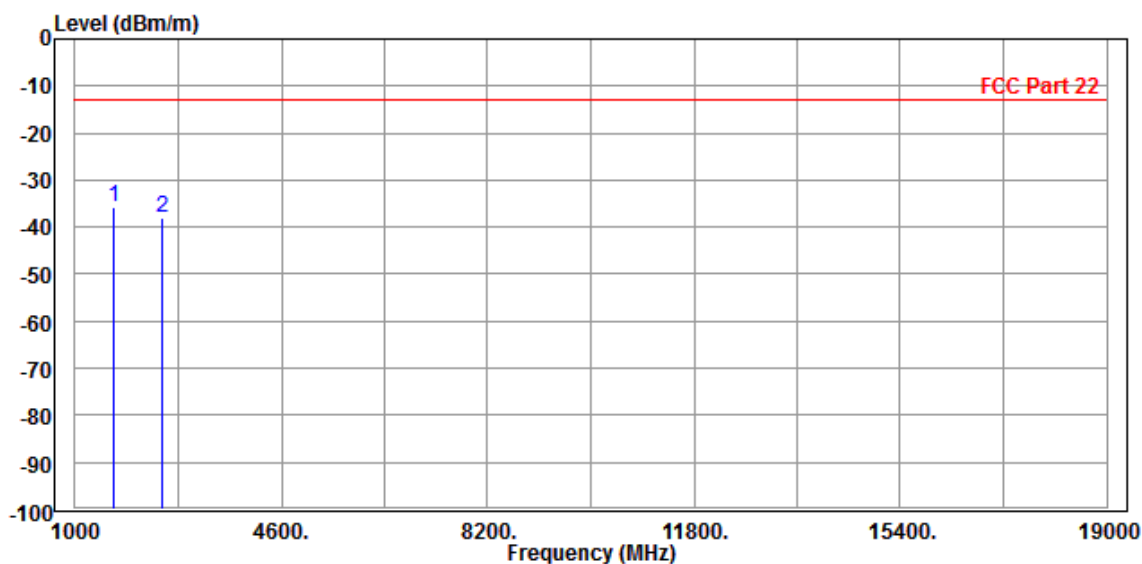
MODE	TX channel 20525	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	26deg. C, 56%RH	INPUT POWER	12Vdc
TESTED BY	Alex Chen		
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M			

			Read	Limit	Over			
	Freq	Level	Level	Line	Limit	Factor	Remark	Pol/Phase
	MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1 PP	1666.000	-39.27	-34.45	-13.00	-26.27	-4.82	Peak	Horizontal
2	2512.000	-43.21	-41.62	-13.00	-30.21	-1.59	Peak	Horizontal



MODE	TX channel 20525	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	26deg. C, 56%RH	INPUT POWER	12Vdc
TESTED BY	Alex Chen		
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M			

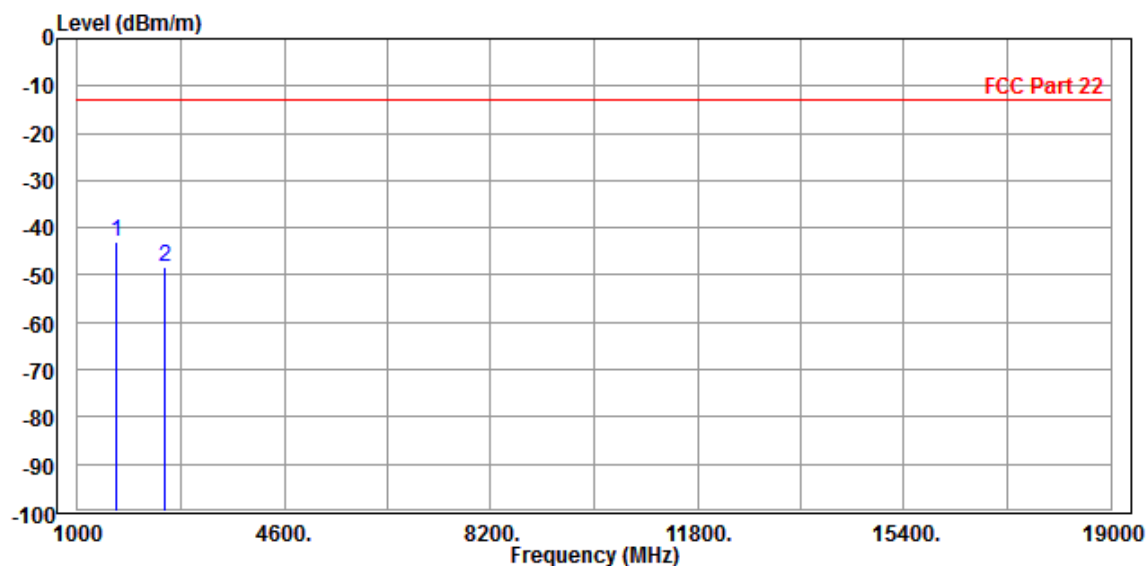
		Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
		MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1	PP	1666.000	-35.82	-32.44	-13.00	-22.82	-3.38	Peak	Vertical
2		2512.000	-38.06	-37.94	-13.00	-25.06	-0.12	Peak	Vertical



CHANNEL BANDWIDTH: 3MHz / QPSK

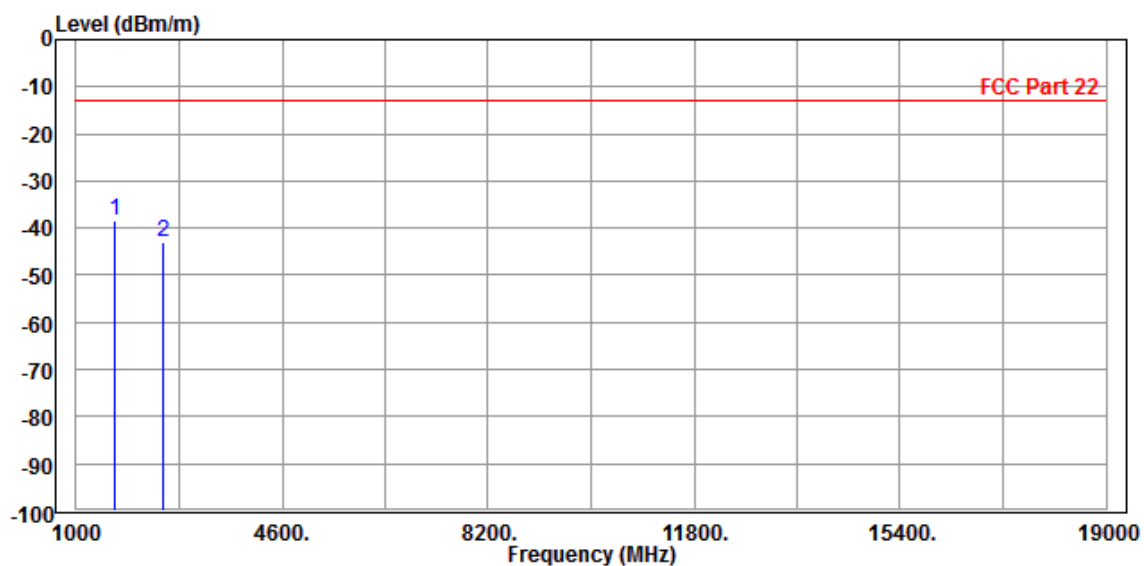
MODE	TX channel 20525	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	26deg. C, 56%RH	INPUT POWER	12Vdc
TESTED BY	Alex Chen		
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M			

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
	MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1 PP	1666.000	-42.98	-38.16	-13.00	-29.98	-4.82	Peak	Horizontal
2	2512.000	-48.42	-46.83	-13.00	-35.42	-1.59	Peak	Horizontal



MODE	TX channel 20525	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	26deg. C, 56%RH	INPUT POWER	12Vdc
TESTED BY	Alex Chen		
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M			

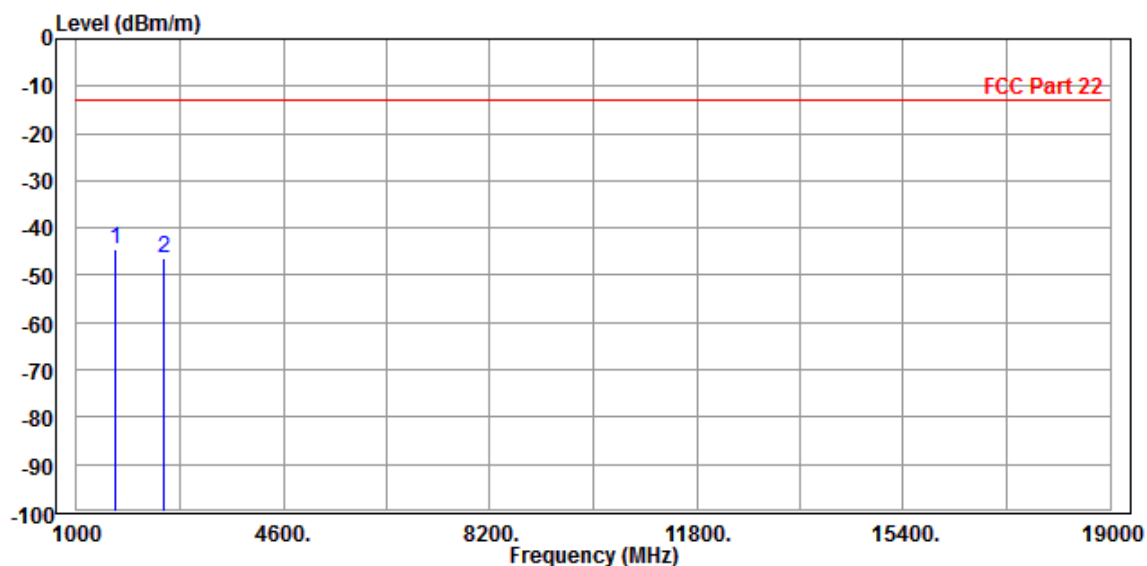
	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
	MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1 PP	1666.000	-38.30	-34.92	-13.00	-25.30	-3.38	Peak	Vertical
2	2512.000	-42.90	-42.78	-13.00	-29.90	-0.12	Peak	Vertical



CHANNEL BANDWIDTH: 5MHz / QPSK

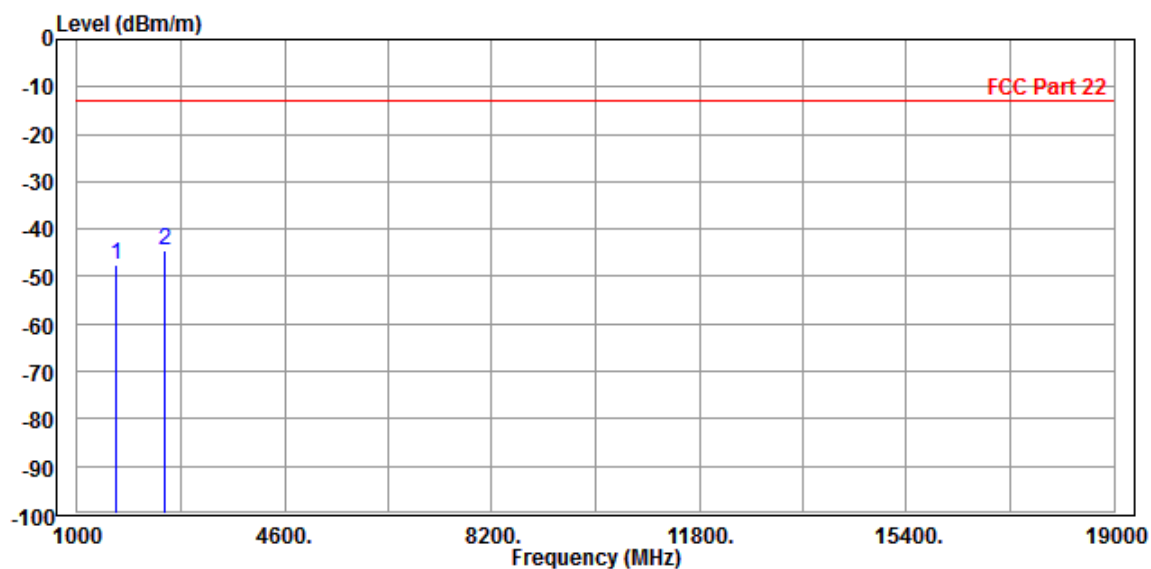
MODE	TX channel 20525	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	26deg. C, 56%RH	INPUT POWER	12Vdc
TESTED BY	Alex Chen		
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M			

			Read	Limit	Over			
	Freq	Level	Level	Line	Limit	Factor	Remark	Pol/Phase
	MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1	PP 1666.000	-44.54	-39.72	-13.00	-31.54	-4.82	Peak	Horizontal
2	2512.000	-46.21	-44.62	-13.00	-33.21	-1.59	Peak	Horizontal



MODE	TX channel 20525	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	26deg. C, 56%RH	INPUT POWER	12Vdc
TESTED BY	Alex Chen		
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M			

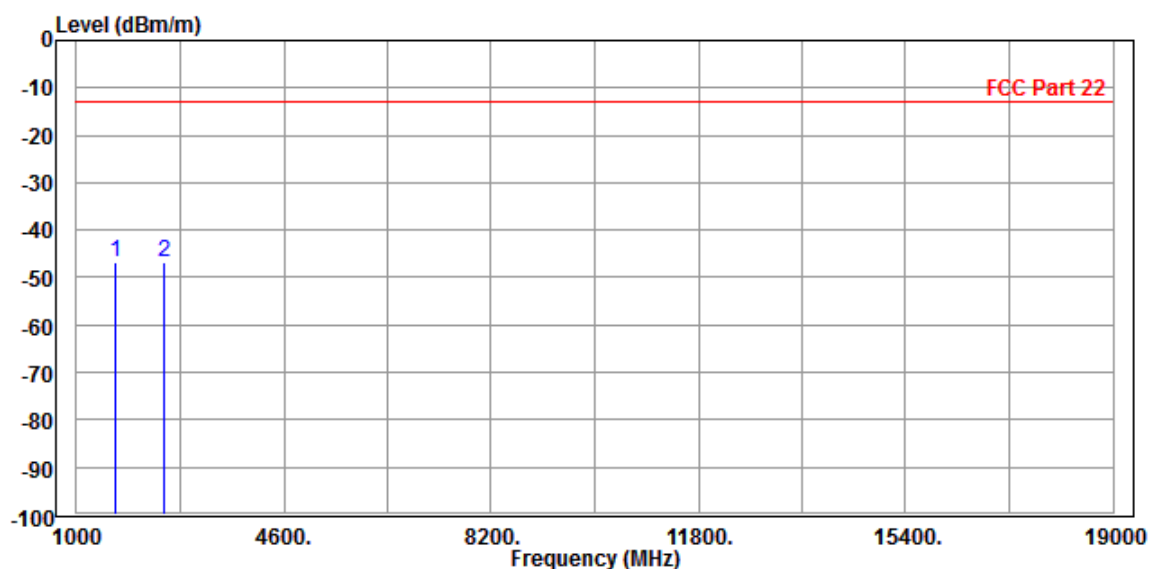
	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
	MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1	1666.000	-47.45	-44.07	-13.00	-34.45	-3.38	Peak	Vertical
2 PP	2512.000	-44.47	-44.35	-13.00	-31.47	-0.12	Peak	Vertical



CHANNEL BANDWIDTH: 10MHz / QPSK

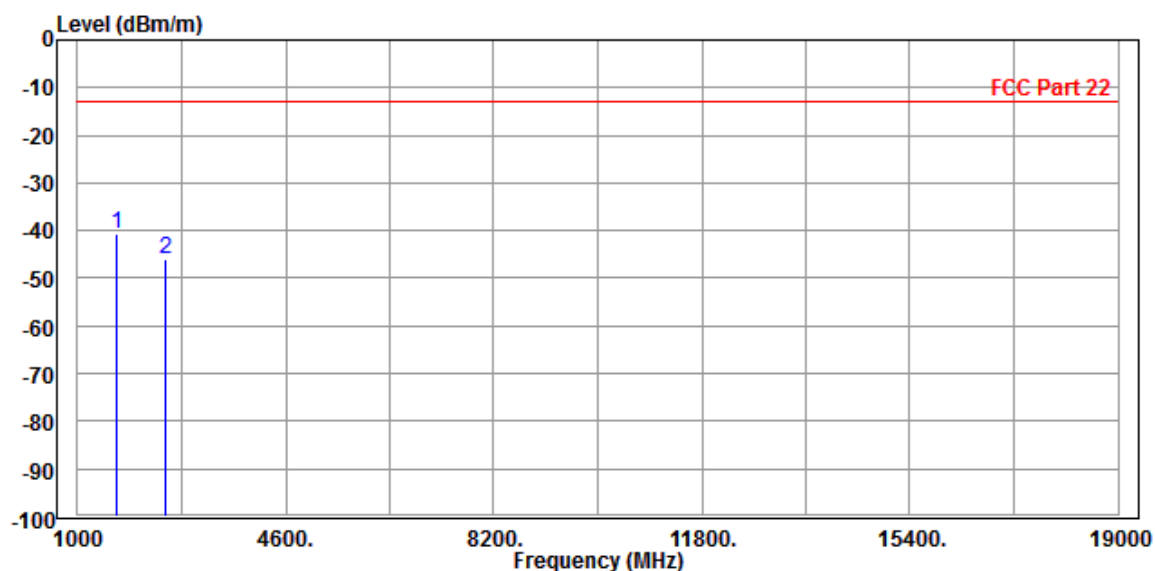
MODE	TX channel 20525	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	26deg. C, 56%RH	INPUT POWER	12Vdc
TESTED BY	Alex Chen		
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M			

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
	MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1	1666.000	-46.71	-41.89	-13.00	-33.71	-4.82	Peak	Horizontal
2 PP	2512.000	-46.63	-45.04	-13.00	-33.63	-1.59	Peak	Horizontal



MODE	TX channel 20525	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	26deg. C, 56%RH	INPUT POWER	12Vdc
TESTED BY	Alex Chen		
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M			

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
	MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1 PP	1666.000	-40.73	-37.35	-13.00	-27.73	-3.38	Peak	Vertical
2	2512.000	-45.99	-45.87	-13.00	-32.99	-0.12	Peak	Vertical

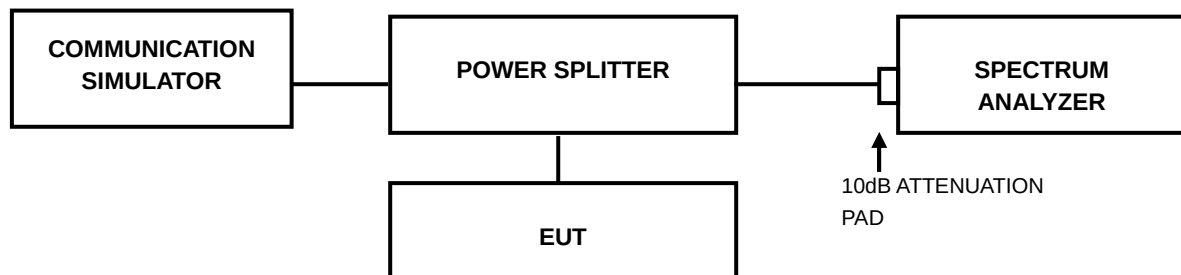


4.7 PEAK TO AVERAGE RATIO

4.7.1 LIMITS OF PEAK TO AVERAGE RATIO MEASUREMENT

In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13 dB

4.7.2 TEST SETUP



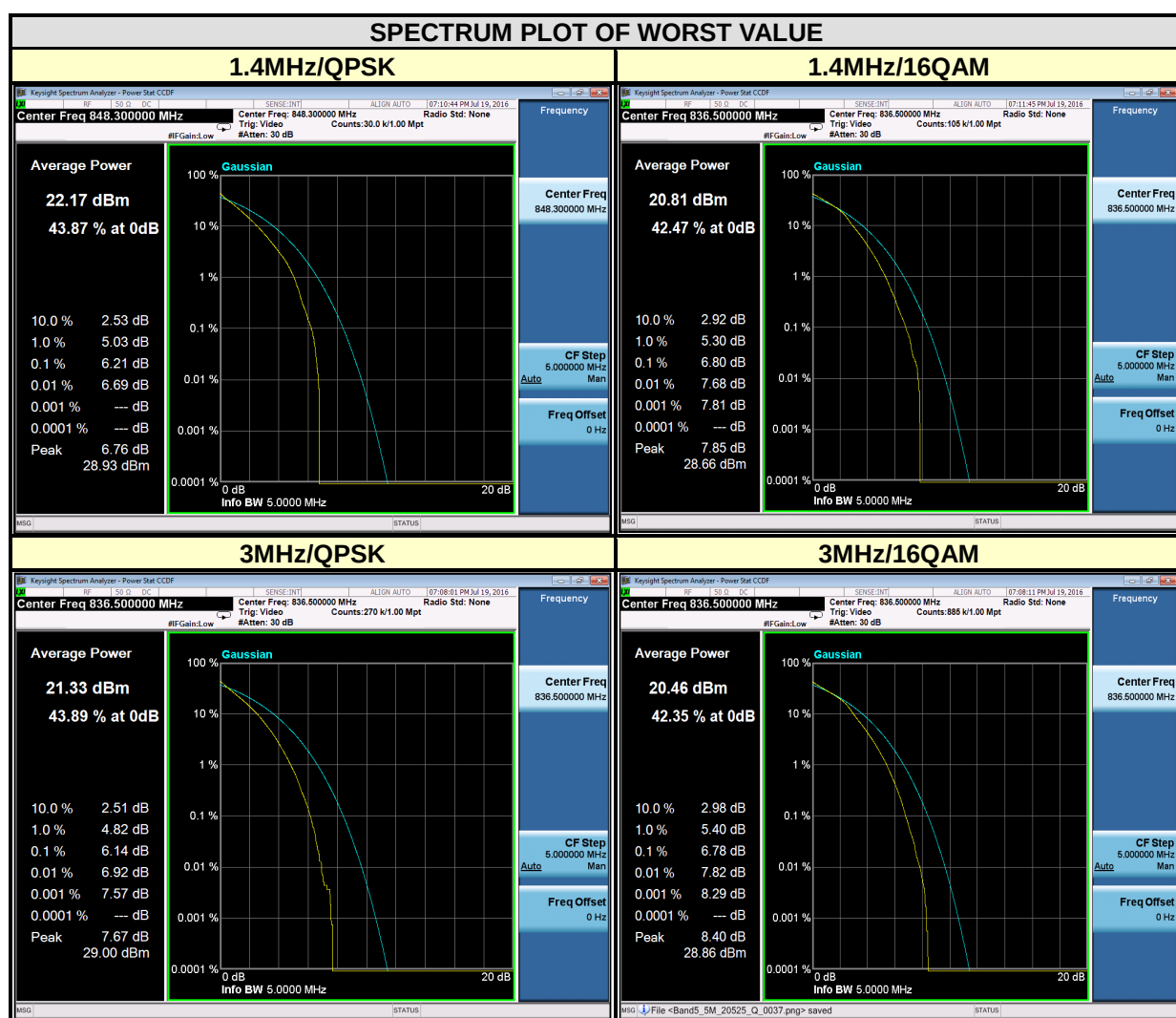
4.7.3 TEST PROCEDURES

1. Set resolution/measurement bandwidth $\geq$ signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1%.

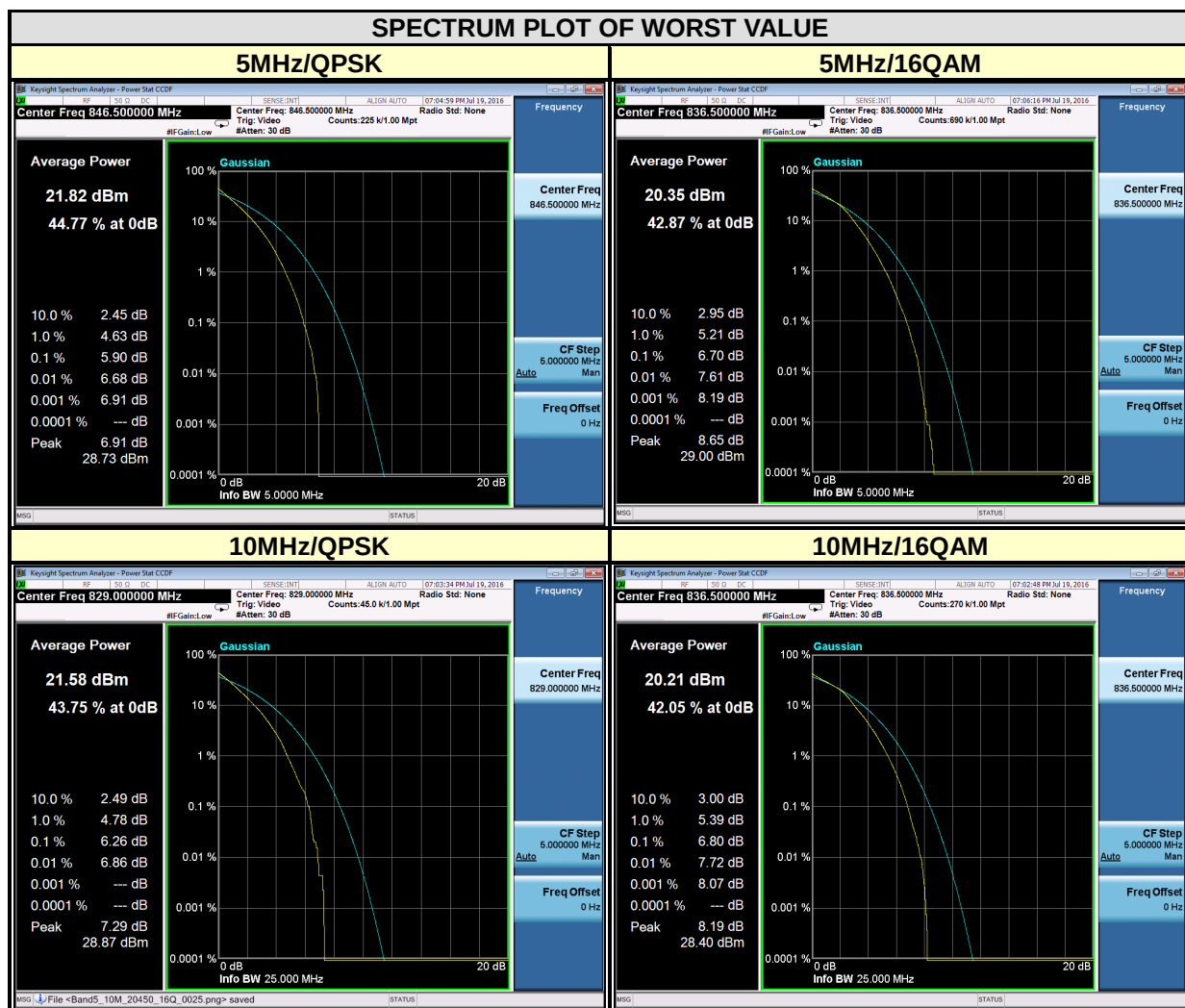
4.7.4 TEST RESULTS

LTE BAND 5

CHANNEL BANDWIDTH: 1.4MHz				CHANNEL BANDWIDTH: 3MHz			
CHANNEL	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)		CHANNEL	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)	
		QPSK	16QAM			QPSK	16QAM
20407	824.7	5.79	6.58	20415	825.5	5.76	6.51
20525	836.5	6.07	6.80	20525	836.5	6.14	6.78
20643	848.3	6.21	6.69	20635	847.5	6.13	6.74



CHANNEL BANDWIDTH: 5MHz				CHANNEL BANDWIDTH: 10MHz			
CHANNEL	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)		CHANNEL	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)	
		QPSK	16QAM			QPSK	16QAM
20425	826.5	5.74	6.49	20450	829	6.26	6.75
20525	836.5	5.84	6.70	20525	836.5	6.23	6.80
20625	846.5	5.90	6.57	20600	844	5.69	6.42





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5 PHOTOGRAPHS OF THE TEST CONFIGURATION

Please refer to the attached file (Test Setup Photo).



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6 INFORMATION ON THE TESTING LABORATORIES

We, Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch, were founded in 2002 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

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Web Site: www.adt.com.tw

The address and road map of all our labs can be found in our web site also.



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7 APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications are made to the EUT by the lab during the test.

---END---