FCC TEST REPORT

(PART 22)

REPORT NO.: RF141216C28

MODEL NO.: Z00D

FCC ID: MSQZ00D

RECEIVED: Dec. 16, 2014

TESTED: Dec. 26, 2014 ~ Jan. 07, 2015

ISSUED: Jan. 16, 2015

APPLICANT: ASUSTek COMPUTER INC.

ADDRESS: 4F, No. 150, LI-TE Rd., PEITOU, TAIPEI 112, TAIWAN

ISSUED BY: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

LAB ADDRESS: No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan (R.O.C.)

TEST LOCATION: No. 19, Hwa Ya 2nd Rd, Wen Hwa Tsuen, Kwei Shan Hsiang, Taoyuan Hsien 333, Taiwan, R.O.C.

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF141216C28	Original release	Jan. 16, 2015

1 CERTIFICATION

PRODUCT:	ASUS Phone
MODEL:	Z00D
BRAND:	ASUS
APPLICANT:	ASUSTek COMPUTER INC.
TESTED:	Dec. 26, 2014 ~ Jan. 07, 2015
TEST SAMPLE:	Production Unit
STANDARDS:	**FCC PART 22, Subpart H**

The above equipment (model: Z00D) has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan 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 : Gina Liu **, DATE :** Jan. 16, 2015

Gina Liu / Specialist

APPROVED BY : Sam chen **, DATE :** Jan. 16, 2015

Sam Chen / Senior Project Engineer

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	Occupied Bandwidth	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 -25.71dB at 2509.20MHz.

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	2.44 dB
Radiated emissions	30MHz ~ 200MHz	2.93 dB
	200MHz ~1000MHz	2.95 dB
	1GHz ~ 18GHz	2.26 dB
	18GHz ~ 40GHz	1.94 dB

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

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESCI	100744	Apr. 15, 2014	Apr. 14, 2015
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Dec. 10, 2014	Dec. 09, 2015
BILOG Antenna SCHWARZBECK	VULB9168	9168-472	Feb. 27. 2014	Feb. 26, 2015
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-969	Feb. 19, 2014	Feb. 18, 2015
HORN Antenna SCHWARZBECK	BBHA 9170	9170-480	Aug. 27, 2014	Aug. 26, 2015
Preamplifier EMCI	EMC 012645	980115	Dec. 12, 2014	Dec. 11, 2015
Preamplifier EMCI	EMC 184045	980116	Jan. 13, 2014	Jan. 12, 2015
Preamplifier EMCI	EMC 330H	980071	Feb. 27, 2014	Feb. 26, 2015
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	309219/4 2950114	Oct. 18, 2014	Oct. 17, 2015
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	250130/4	Oct. 18, 2014	Oct. 17, 2015
RF signal cable Worken	RG-213	NA	Nov. 07, 2014	Nov. 06, 2015
Software BV ADT	E3 6.120103	NA	NA	NA
Antenna Tower MF	MFA-440H	NA	NA	NA
Turn Table MF	MFT-201SS	NA	NA	NA
Antenna Tower &Turn Table Controller MF	MF-7802	NA	NA	NA
Power Splitter Woken	2-18GHz 2Way SMA Fwd.:30W/Rev.:2W Isolated Power	COM412W5E3	Apr. 17, 2014	Apr. 16, 2015
JFW 20dB attenuation	50HF-020-SMA	NA	NA	NA
Communications Tester-Wireless	E5515C	MY52102544	Sep. 11, 2014	Sep. 10, 2016
Radio Communication Analyzer	MT8820C	6201300640	Aug. 01, 2013	Jul. 31, 2015

NOTE: 1. The calibration interval of the above test instruments is 12 / 24 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The test was performed in HwaYa Chamber 10.
3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Site Registration No. is 690701.
5. The IC Site Registration No. is IC 7450F-10.

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

EUT	ASUS Phone	
MODEL NO.	Z00D	
POWER SUPPLY	3.8Vdc (Battery) 5.2Vdc (Adapter)	
MODULATION TYPE	**GSM/GPRS**	GMSK
	EDGE	GMSK, 8PSK
	WCDMA	BPSK
	LTE	QPSK, 16QAM
FREQUENCY RANGE	**GSM/EDGE/GPRS**	824.2MHz ~ 848.8MHz
	WCDMA	826.4MHz ~ 846.6MHz
	LTE 5 (Channel Bandwidth: 1.4MHz)	824.7MHz ~ 848.3MHz
	LTE 5 (Channel Bandwidth: 3MHz)	825.5MHz ~ 847.5MHz
	LTE 5 (Channel Bandwidth: 5MHz)	826.5MHz ~ 846.5MHz
	LTE 5 (Channel Bandwidth: 10MHz)	829MHz ~ 844MHz
MAX. ERP POWER	**GSM**	646.84mW
	EDGE	151.98mW
	WCDMA	62.20mW
	LTE 5 (Channel Bandwidth: 1.4MHz)	48.84mW
	LTE 5 (Channel Bandwidth: 3MHz)	48.22mW
	LTE 5 (Channel Bandwidth: 5MHz)	48.53mW
	LTE 5 (Channel Bandwidth: 10MHz)	48.87mW
EMISSION DESIGNATOR	**GSM**	244KGXW
	EDGE	246KG7W
	WCDMA	4M08F9W
	LTE 5 (Channel Bandwidth: 1.4MHz)	1M09G7D
	LTE 5 (Channel Bandwidth: 3MHz)	2M70G7D
	LTE 5 (Channel Bandwidth: 5MHz)	4M49W7D
	LTE 5 (Channel Bandwidth: 10MHz)	8M98W7D
ANTENNA TYPE	Fixed Internal Antenna	
I/O PORTS	Refer to users' manual	
DATA CABLE	Refer to NOTE as below	
ACCESSORY DEVICES	Refer to NOTE as below	

NOTE:

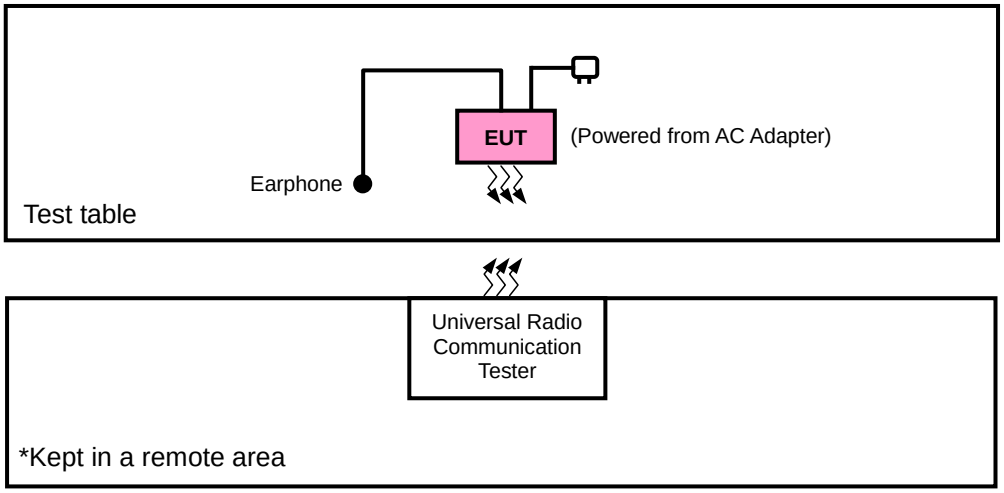
1. The EUT contains following accessory devices.

ITEM	BRAND	MODEL	SPECIFICATION
Adapter 1	ASUS	PA-1070-07	I/P: 100-240Vac, 50/60Hz, 0.25A O/P: 5.2Vdc, 1.35A
Adapter 2	ASUS	PSM06A-050Q	I/P: 100-240Vac, 50/60Hz, 0.25A O/P: 5.2Vdc, 1.35A
Adapter 3	ASUS	AD2005320	I/P: 100-240Vac, 50/60Hz, 0.25A O/P: 5.2Vdc, 1.35A
Battery	ASUS	C11P1423	3.8Vdc, 9.5Wh
USB Cable 1	ASUS	L65U-2009-CS-B	0.9m shielded cable w/o core
USB Cable 2	ASUS	AA781000	0.85m shielded cable w/o core
USB Cable 3	ASUS	CUBB04M-AS0D0-EF	0.88m shielded cable w/o core
Earphone	ASUS	EPA1342-1BA03-EH	1.17m non-shielded cable w/o core
CPU	INTEL	CPU G8065101274708 927907	1.6G/760pin
LCD Panel	AUO	H499TAN04.0	--
Front Camera	Chicony	CCFE21520003870LH	--
Rear Camera	Chicony	CBAE82620003873LH	--
WWAN Module	Intel	Modem: XGLOD716G Transceiver: SMARTi4G PMB5740	--
WLAN/BT Module	BROADCOM	BCM4343S	--
EMMC	HYNIX	H26M41103HPR	8GB

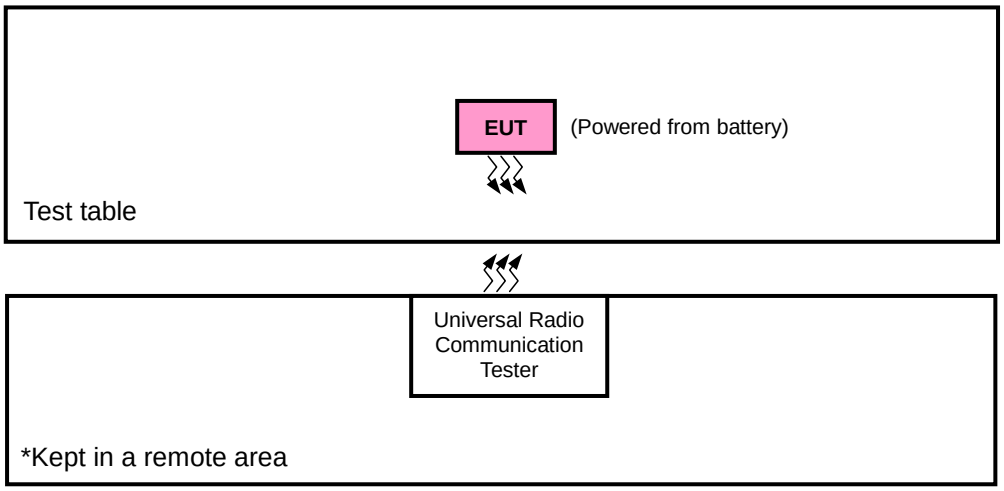
2. The above EUT information was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

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.

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 was found when positioned on X-plane for ERP and Z-axis for radiated emission. Following channel(s) was (were) selected for the final test as listed below:

GSM MODE

EUT CONFIGURE MODE	TEST ITEM	AVAILABLE CHANNEL	TESTED CHANNEL	MODE
-	ERP	128 to 251	128, 189, 251	GSM, EDGE
-	FREQUENCY STABILITY	128 to 251	189	GSM, EDGE
-	OCCUPIED BANDWIDTH	128 to 251	128, 189, 251	GSM, EDGE
-	BAND EDGE	128 to 251	128, 251	GSM, EDGE
-	CONDUCTED EMISSION	128 to 251	189	GSM, EDGE
-	RADIATED EMISSION	128 to 251	189	GSM, EDGE

WCDMA MODE

EUT CONFIGURE MODE	TEST ITEM	AVAILABLE CHANNEL	TESTED CHANNEL	MODE
-	ERP	4132 to 4233	4132, 4182, 4233	WCDMA
-	FREQUENCY STABILITY	4132 to 4233	4182	WCDMA
-	OCCUPIED BANDWIDTH	4132 to 4233	4132, 4182, 4233	WCDMA
-	BAND EDGE	4132 to 4233	4132, 4233	WCDMA
-	CONDUCTED EMISSION	4132 to 4233	4182	WCDMA
-	RADIATED EMISSION	4132 to 4233	4182	WCDMA

LTE BAND 5 MODE

EUT CONFIGURE MODE	TEST ITEM	AVAILABLE CHANNEL	TESTED CHANNEL	CHANNEL BANDWIDTH	MODULATION	MODE
-	ERP	20407 to 20643	20407, 20525, 20643	1.4MHz	QPSK, 16QAM	1 RB / 2 RB Offset
		20415 to 20635	20415, 20525, 20635	3MHz	QPSK, 16QAM	1 RB / 7 RB Offset
		20425 to 20625	20425, 20525, 20625	5MHz	QPSK, 16QAM	1 RB / 12 RB Offset
		20450 to 20600	20450, 20525, 20600	10MHz	QPSK, 16QAM	1 RB / 24 RB Offset
-	FREQUENCY STABILITY	20407 to 20643	20525	1.4MHz	QPSK	1 RB / 2 RB Offset
		20415 to 20635	20525	3MHz	QPSK	1 RB / 7 RB Offset
		20425 to 20625	20525	5MHz	QPSK	1 RB / 12 RB Offset
		20450 to 20600	20525	10MHz	QPSK	1 RB / 24 RB Offset
-	OCCUPIED BANDWIDTH	20407 to 20643	20407, 20525, 20643	1.4MHz	QPSK, 16QAM	6 RB / 0 RB Offset
		20415 to 20635	20415, 20525, 20635	3MHz	QPSK, 16QAM	15 RB / 0 RB Offset
		20425 to 20625	20425, 20525, 20625	5MHz	QPSK, 16QAM	25 RB / 0 RB Offset
		20450 to 20600	20450, 20525, 20600	10MHz	QPSK, 16QAM	50 RB / 0 RB Offset
-	BAND EDGE	20407 to 20643	20407	1.4MHz	QPSK	1 RB / 0 RB Offset
						6 RB / 0 RB Offset
			20643	1.4MHz	QPSK	1 RB / 5 RB Offset
						6 RB / 0 RB Offset
		20415 to 20635	20415	3MHz	QPSK	1 RB / 0 RB Offset
						15 RB / 0 RB Offset
			20635	3MHz	QPSK	1 RB / 14 RB Offset
						15 RB / 0 RB Offset
		20425 to 20626	20425	5MHz	QPSK	1 RB / 0 RB Offset
						25 RB / 0 RB Offset
			20600	5MHz	QPSK	1 RB / 24 RB Offset
						25 RB / 0 RB Offset
		20450 to 20600	20450	10MHz	QPSK	1 RB / 0 RB Offset
						50 RB / 0 RB Offset
			20600	10MHz	QPSK	1 RB / 49 RB Offset
						50 RB / 0 RB Offset
-	CONDUCTED EMISSION	20407 to 20643	20525	1.4MHz	QPSK	1 RB / 2 RB Offset
		20415 to 20635	20525	3MHz	QPSK	1 RB / 7 RB Offset
		20425 to 20625	20525	5MHz	QPSK	1 RB / 12 RB Offset
		20450 to 20600	20525	10MHz	QPSK	1 RB / 24 RB Offset
-	RADIATED EMISSION	20450 to 20600	20525	10MHz	QPSK	1 RB / 24 RB Offset

Note: This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation.

TEST CONDITION:

TEST ITEM	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
ERP	26deg. C, 58%RH	3.8Vdc	Taylor Liu
FREQUENCY STABILITY	26deg. C, 58%RH	3.8Vdc	Taylor Liu
OCCUPIED BANDWIDTH	26deg. C, 58%RH	3.8Vdc	Taylor Liu
BAND EDGE	26deg. C, 58%RH	3.8Vdc	Taylor Liu
CONDUCTED EMISSION	26deg. C, 58%RH	3.8Vdc	Taylor Liu
RADIATED EMISSION	25deg. C, 65%RH	120Vac, 60Hz	Karl Lee

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
ANSI/TIA/EIA-603-C 2004

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

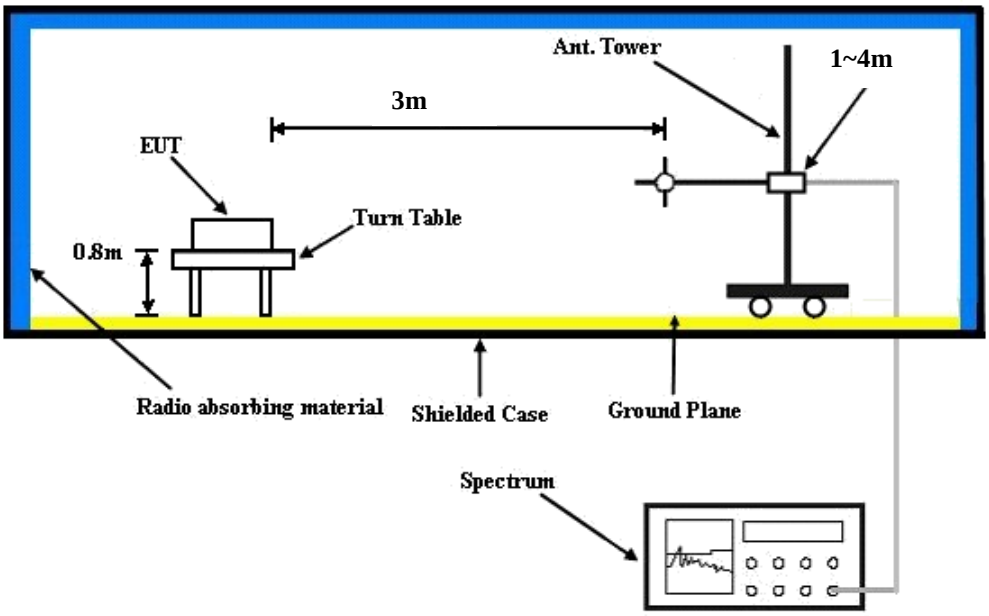
a. All measurements were done at low, middle and high operational frequency range. RBW and VBW is 1MHz for GSM, GPRS & EDGE, 5MHz for WCDMA & CDMA, and 10MHz for LTE mode.
b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, 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 = Output power level of S.G – TX cable loss + 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 power = E.I.R.P power - 2.15dBi.

CONDUCTED POWER MEASUREMENT:

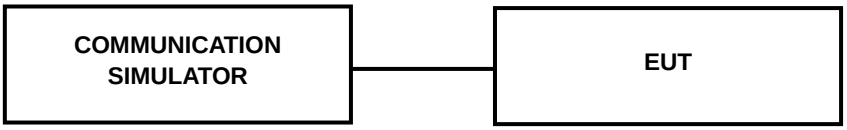
The EUT was set up for the maximum power with GSM, GPRS, EDGE, WCDMA & CDMA & LTE link data modulation and link up with simulator. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

4.1.3 TEST SETUP

EIRP / ERP MEASUREMENT:



CONDUCTED POWER MEASUREMENT:



4.1.4 TEST RESULTS

CONDUCTED OUTPUT POWER (dBm)

Band	GSM850		
Channel	128	189	251
Frequency (MHz)	824.2	836.4	848.8
GSM (1 Uplink)	**32.98**	32.82	32.94
GPRS 8 (GMSK, 1 slot)	32.97	32.81	32.93
GPRS 10 (GMSK, 2 slot)	32.91	32.75	32.87
EDGE 8 (GMSK, 1 Uplink)	26.86	26.70	26.82
EDGE 10 (GMSK, 2 Uplink)	26.73	26.57	26.69

Band	WCDMA V		
Channel	4132	4182	4233
Frequency (MHz)	826.4	836.4	846.6
RMC 12.2K	**22.49**	22.38	22.42
HSDPA Subtest-1	21.95	21.84	21.88
HSDPA Subtest-2	21.90	21.79	21.83
HSDPA Subtest-3	21.43	21.32	21.36
HSDPA Subtest-4	21.42	21.31	21.35
HSUPA Subtest-1	22.21	22.10	22.14
HSUPA Subtest-2	20.72	20.61	20.65
HSUPA Subtest-3	21.20	21.09	21.13
HSUPA Subtest-4	20.51	20.40	20.44
HSUPA Subtest-5	21.47	21.36	21.40

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low CH 20407	Mid CH 20525	High CH 20643		Low CH 20407	Mid CH 20525	High CH 20643	
			824.7 MHz	836.5 MHz	848.3 MHz		824.7 MHz	836.5 MHz	848.3 MHz	
5 / 1.4M	1	0	21.47	21.54	21.45	0	20.46	20.53	20.44	1
	1	2	21.51	21.48	21.50	0	20.50	20.47	20.49	1
	1	5	21.30	21.27	21.29	0	20.29	20.26	20.28	1
	3	0	20.58	20.59	20.57	0	19.57	19.58	19.56	1
	3	1	20.46	20.43	20.45	0	19.45	19.42	19.44	1
	3	3	20.39	20.36	20.38	0	19.38	19.35	19.37	1
	6	0	20.47	20.48	20.46	1	19.46	19.47	19.45	2

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low CH 20415	Mid CH 20525	High CH 20635		Low CH 20415	Mid CH 20525	High CH 20635	
			825.5 MHz	836.5 MHz	847.5 MHz		825.5 MHz	836.5 MHz	847.5 MHz	
5 / 3M	1	0	21.58	21.65	21.56	0	20.57	20.64	20.55	1
	1	7	21.62	21.59	21.61	0	20.61	20.58	20.60	1
	1	14	21.41	21.38	21.40	0	20.40	20.37	20.39	1
	8	0	20.69	20.70	20.68	1	19.68	19.69	19.67	2
	8	3	20.57	20.54	20.56	1	19.56	19.53	19.55	2
	8	7	20.50	20.47	20.49	1	19.49	19.46	19.48	2
	15	0	20.58	20.59	20.57	1	19.57	19.58	19.56	2

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low CH 20425	Mid CH 20525	High CH 20625		Low CH 20425	Mid CH 20525	High CH 20625	
			826.5 MHz	836.5 MHz	846.5 MHz		826.5 MHz	836.5 MHz	846.5 MHz	
5 / 5M	1	0	21.69	21.76	21.67	0	20.68	20.75	20.66	1
	1	12	21.73	21.70	21.72	0	20.72	20.69	20.71	1
	1	24	21.52	21.49	21.51	0	20.51	20.48	20.50	1
	12	0	20.80	20.81	20.79	1	19.79	19.80	19.78	2
	12	6	20.68	20.65	20.67	1	19.67	19.64	19.66	2
	12	13	20.61	20.58	20.60	1	19.60	19.57	19.59	2
	25	0	20.69	20.70	20.68	1	19.68	19.69	19.67	2

Band / BW	RB Size	RB Offset	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
			Low CH 20450	Mid CH 20525	High CH 20600		Low CH 20450	Mid CH 20525	High CH 20600	
			829.0 MHz	836.5 MHz	844.0 MHz		829.0 MHz	836.5 MHz	844.0 MHz	
5 / 10M	1	0	21.80	21.87	21.78	0	20.79	20.86	20.77	1
	1	24	21.84	21.81	21.83	0	20.83	20.80	20.82	1
	1	49	21.63	21.60	21.62	0	20.62	20.59	20.61	1
	25	0	20.91	20.92	20.90	1	19.90	19.91	19.89	2
	25	12	20.79	20.76	20.78	1	19.78	19.75	19.77	2
	25	25	20.72	20.69	20.71	1	19.71	19.68	19.70	2
	50	0	20.80	20.81	20.79	1	19.79	19.80	19.78	2

ERP POWER (dBm)

GSM							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	ERP(dBm)	ERP(mW)	Polarization (H/V)
X	128	824.2	-0.95	31.208	28.11	646.84	H
	189	836.4	-1.67	31.3	27.48	559.76	H
	251	848.8	-1.38	31.222	27.69	587.76	H
	128	824.2	-8.01	31.504	21.34	136.27	V
	189	836.4	-8.23	31.117	20.74	118.49	V
	251	848.8	-9.19	31.922	20.58	114.34	V

EDGE							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	ERP(dBm)	ERP(mW)	Polarization (H/V)
X	128	824.2	-7.24	31.208	21.82	151.98	H
	189	836.4	-7.71	31.3	21.44	139.32	H
	251	848.8	-7.62	31.222	21.45	139.70	H
	128	824.2	-13.85	31.504	15.50	35.51	V
	189	836.4	-13.63	31.117	15.34	34.17	V
	251	848.8	-14.33	31.922	15.44	35.01	V

WCDMA							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	ERP(dBm)	ERP(mW)	Polarization (H/V)
X	4132	826.4	-11.12	31.208	17.94	62.20	H
	4182	836.4	-11.58	31.3	17.57	57.15	H
	4233	846.6	-11.27	31.222	17.80	60.28	H
	4132	826.4	-19.97	31.504	9.38	8.68	V
	4182	836.4	-19.45	31.117	9.52	8.95	V
	4233	846.6	-20.02	31.922	9.75	9.44	V

LTE Band 5							
Channel Bandwidth: 1.4MHz / QPSK							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	ERP(dBm)	ERP(mW)	Polarization (H/V)
X	20407	824.7	-12.17	31.208	16.89	48.84	H
	20525	836.5	-12.33	31.3	16.82	48.08	H
	20643	848.3	-12.42	31.222	16.65	46.26	H
	20407	824.7	-17.95	31.504	11.40	13.82	V
	20525	836.5	-17.37	31.117	11.60	14.44	V
	20643	848.3	-18.55	31.922	11.22	13.25	V

LTE Band 5							
Channel Bandwidth: 1.4MHz / 16QAM							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	ERP(dBm)	ERP(mW)	Polarization (H/V)
X	20407	824.7	-13.87	31.208	15.19	33.02	H
	20525	836.5	-13.88	31.3	15.27	33.65	H
	20643	848.3	-13.93	31.222	15.14	32.67	H
	20407	824.7	-18.64	31.504	10.71	11.79	V
	20525	836.5	-18.87	31.117	10.10	10.23	V
	20643	848.3	-19.14	31.922	10.63	11.57	V

LTE Band 5							
Channel Bandwidth: 3MHz / QPSK							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	ERP(dBm)	ERP(mW)	Polarization (H/V)
X	20415	825.5	-12.38	31.208	16.68	46.54	H
	20525	836.5	-12.42	31.3	16.73	47.10	H
	20635	847.5	-12.24	31.222	16.83	48.22	H
	20415	825.5	-17.99	31.504	11.36	13.69	V
	20525	836.5	-17.38	31.117	11.59	14.41	V
	20635	847.5	-17.74	31.922	12.03	15.97	V

LTE Band 5							
Channel Bandwidth: 3MHz / 16QAM							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	ERP(dBm)	ERP(mW)	Polarization (H/V)
X	20415	825.5	-13.89	31.208	15.17	32.87	H
	20525	836.5	-13.95	31.3	15.20	33.11	H
	20635	847.5	-13.12	31.222	15.95	39.37	H
	20415	825.5	-18.62	31.504	10.73	11.84	V
	20525	836.5	-17.99	31.117	10.98	12.52	V
	20635	847.5	-19.37	31.922	10.40	10.97	V

LTE Band 5							
Channel Bandwidth: 5MHz / QPSK							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	ERP(dBm)	ERP(mW)	Polarization (H/V)
X	20425	826.5	-12.27	31.208	16.79	47.73	H
	20525	836.5	-12.29	31.3	16.86	48.53	H
	20625	846.5	-12.36	31.222	16.71	46.90	H
	20425	826.5	-17.99	31.504	11.36	13.69	V
	20525	836.5	-17.49	31.117	11.48	14.05	V
	20625	846.5	-17.81	31.922	11.96	15.71	V

LTE Band 5							
Channel Bandwidth: 5MHz / 16QAM							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	ERP(dBm)	ERP(mW)	Polarization (H/V)
X	20425	826.5	-13.70	31.208	15.36	34.34	H
	20525	836.5	-13.82	31.3	15.33	34.12	H
	20625	846.5	-13.58	31.222	15.49	35.42	H
	20425	826.5	-18.36	31.504	10.99	12.57	V
	20525	836.5	-18.77	31.117	10.20	10.46	V
	20625	846.5	-19.12	31.922	10.65	11.62	V

LTE Band 5							
Channel Bandwidth: 10MHz / QPSK							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	ERP(dBm)	ERP(mW)	Polarization (H/V)
X	20450	829	-12.52	31.208	16.54	45.06	H
	20525	836.5	-12.26	31.3	16.89	48.87	H
	20600	844	-12.38	31.222	16.69	46.69	H
	20450	829	-17.72	31.504	11.63	14.57	V
	20525	836.5	-17.15	31.117	11.82	15.19	V
	20600	844	-18.15	31.922	11.62	14.53	V

LTE Band 5							
Channel Bandwidth: 10MHz / 16QAM							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	ERP(dBm)	ERP(mW)	Polarization (H/V)
X	20450	829	-13.87	31.208	15.19	33.02	H
	20525	836.5	-13.61	31.3	15.54	35.81	H
	20600	844	-13.64	31.222	15.43	34.93	H
	20450	829	-19.24	31.504	10.11	10.27	V
	20525	836.5	-18.70	31.117	10.27	10.63	V
	20600	844	-19.36	31.922	10.41	11.00	V

4.2 FREQUENCY STABILITY MEASUREMENT

4.2.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT

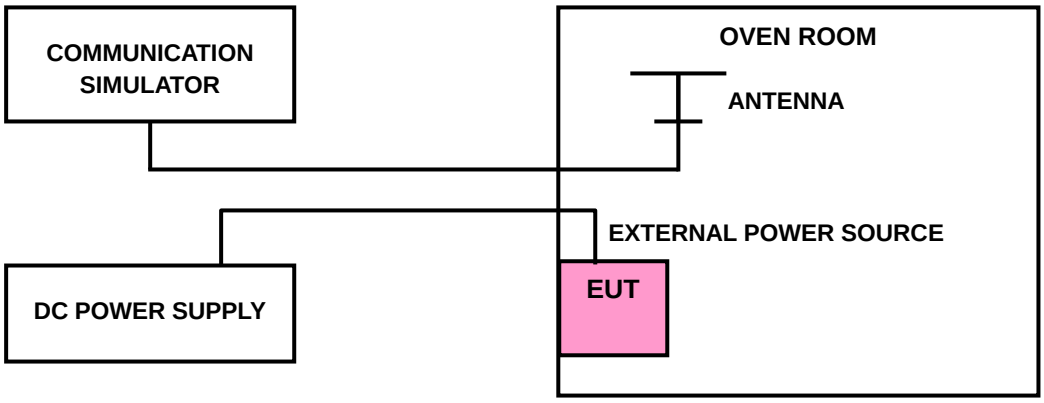
1.5 ppm is for base and fixed station. 2.5 ppm is for mobile station.

4.2.2 TEST PROCEDURE

a. 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.
b. 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.
c. The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the ±0.5℃ 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)
	GSM	EDGE	WCDMA	
3.8	0.002	0.004	0.004	2.5
3.6	0.004	0.003	0.001	2.5
4.2	0.003	0.001	0.003	2.5

NOTE: The applicant defined the normal working voltage of the battery is from 3.6Vdc to 4.2Vdc.

FREQUENCY ERROR vs. TEMPERATURE

TEMP. (℃)	FREQUENCY ERROR (ppm)			LIMIT (ppm)
	GSM	EDGE	WCDMA	
-30	0.003	0.004	0.005	2.5
-20	0.002	0.002	-0.002	2.5
-10	0.004	-0.003	-0.004	2.5
0	-0.003	-0.002	-0.003	2.5
10	-0.003	-0.004	-0.004	2.5
20	-0.004	-0.005	0.002	2.5
30	-0.002	-0.002	0.004	2.5
40	-0.001	0.003	0.002	2.5
55	0.006	0.004	0.002	2.5

Note:

1. The applicant declared that the normal operating temperature of the EUT is from -30°C to 55°C.

FREQUENCY ERROR vs. VOLTAGE

VOLTAGE (Volts)	FREQUENCY ERROR (ppm)				LIMIT (ppm)
	LTE Band 5				
	1.4MHz	3MHz	5MHz	10MHz	
3.8	0.002151823	0.003825463	0.00251046	0.002151823	2.5
3.6	0.003227735	0.003227735	0.00167364	0.003108189	2.5
4.2	0.004064555	0.00251046	0.004662283	0.003586372	2.5

NOTE: The applicant defined the normal working voltage of the battery is from 3.6Vdc to 4.2Vdc.

FREQUENCY ERROR vs. TEMPERATURE

TEMP. (℃)	FREQUENCY ERROR (ppm)				LIMIT (ppm)
	LTE Band 5				
	1.4MHz	3MHz	5MHz	10MHz	
-30	0.002271369	0.003825463	0.002869097	0.001912732	2.5
-20	0.002988643	0.001434549	0.006335923	0.003227735	2.5
-10	0.003945009	-0.004423192	-0.003945009	0.002869097	2.5
0	-0.004781829	-0.002630006	-0.002988643	-0.001912732	2.5
10	-0.003227735	-0.003705918	-0.002032277	-0.003227735	2.5
20	-0.006575015	-0.002749552	-0.006575015	-0.004662283	2.5
30	-0.002630006	-0.001912732	-0.002271369	-0.002151823	2.5
40	0.005140466	0.004901375	0.005140466	-0.003466826	2.5
50	0.004662283	0.003825463	0.004542738	0.005020921	2.5
55	0.002271369	0.003825463	0.002869097	0.001912732	2.5

Note:

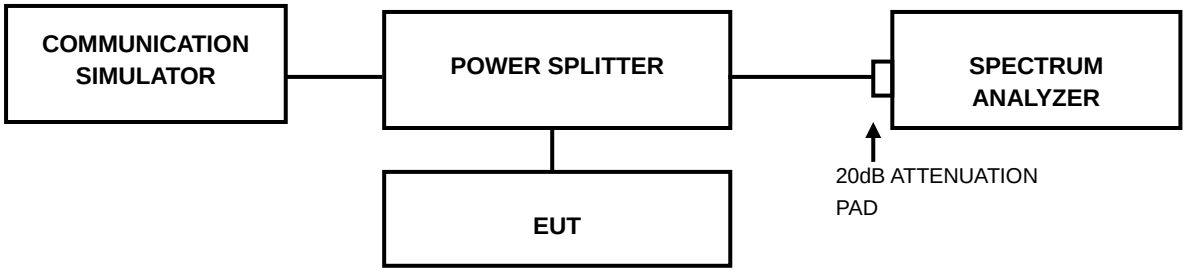
1. The applicant declared that the normal operating temperature of the EUT is from -30°C to 55°C.

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

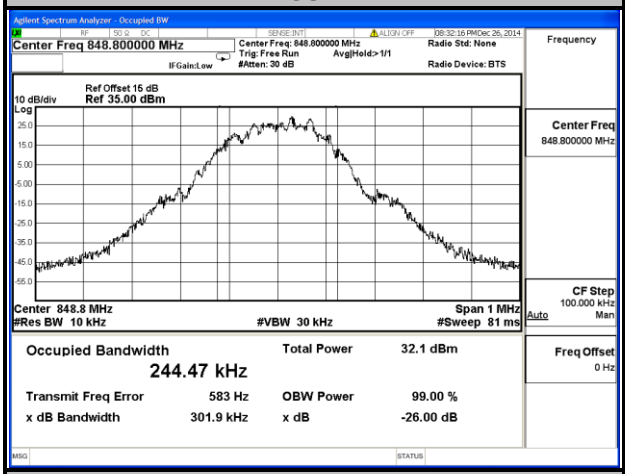


4.3.3 TEST RESULTS

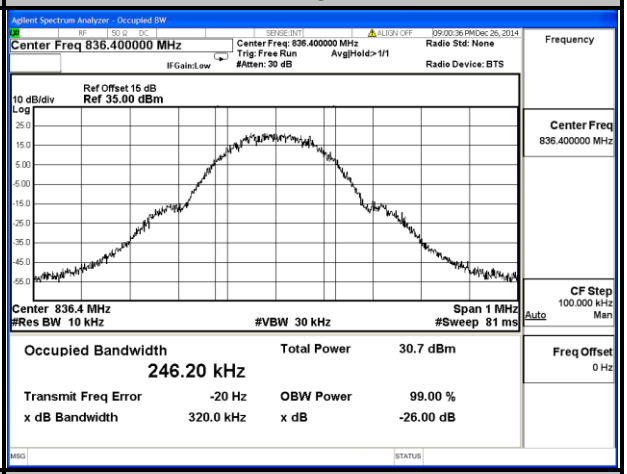
CHANNEL	FREQUENCY (MHz)	99% OCCUPIED BANDWIDTH (kHz)		CHANNEL	FREQUENCY (MHz)	99% OCCUPIED BANDWIDTH (MHz)
		GSM	EDGE			WCDMA
128	824.2	244.28	246.08	4132	826.4	4.08
189	836.4	238.85	246.20	4182	836.4	4.08
251	848.8	244.47	245.37	4233	846.6	4.08
CHANNEL	**FREQUENCY (MHz)**	**26dB BANDWIDTH (kHz)**		**CHANNEL**	**FREQUENCY (MHz)**	**26dB BANDWIDTH (MHz)**
		GSM	EDGE			WCDMA
128	824.2	301.30	314.90	4132	826.4	4.64
189	836.4	297.20	320.00	4182	836.4	4.64
251	848.8	301.90	307.80	4233	846.6	4.64

SPECTRUM PLOT OF WORST VALUE

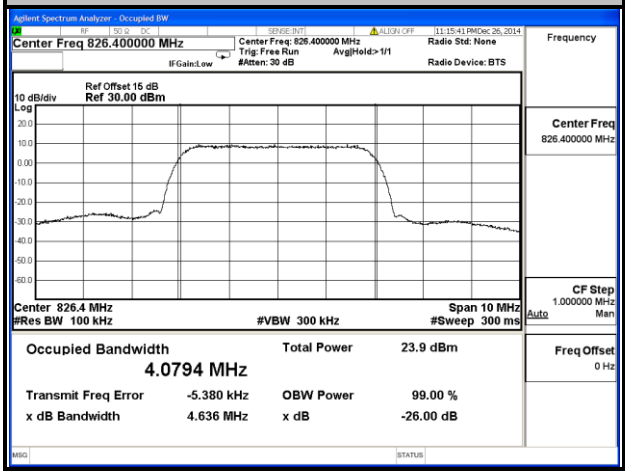
GSM



EDGE



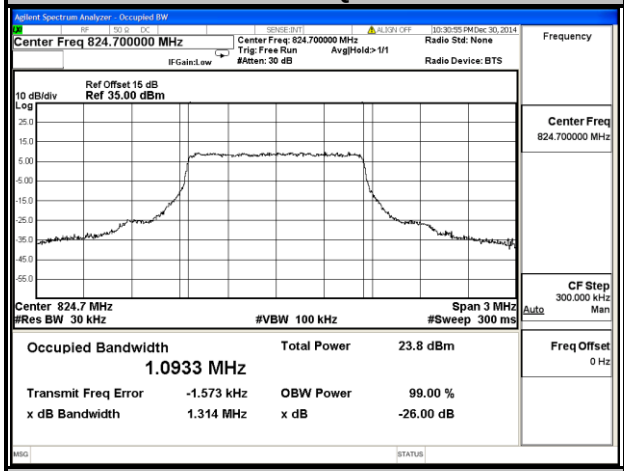
WCDMA



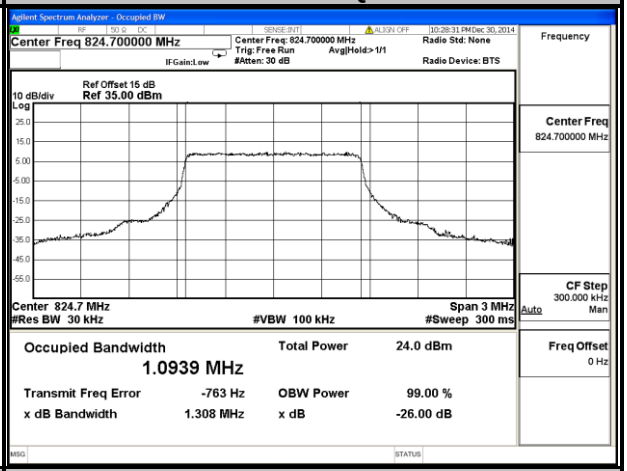
LTE BAND 5							
CHANNEL BANDWIDTH: 1.4MHz				CHANNEL BANDWIDTH: 3MHz			
CHANNEL	FREQUENCY (MHz)	99% OCCUPIED BANDWIDTH (MHz)		CHANNEL	FREQUENCY (MHz)	99% OCCUPIED BANDWIDTH (MHz)	
		QPSK	16QAM			QPSK	16QAM
20407	824.7	1.09	1.09	20415	825.5	2.70	2.70
20525	836.5	1.09	1.09	20525	836.5	2.70	2.70
20643	848.3	1.09	1.09	20635	847.5	2.70	2.69
CHANNEL	FREQUENCY (MHz)	26dB BANDWIDTH (MHz)		CHANNEL	FREQUENCY (MHz)	26dB BANDWIDTH (MHz)	
		QPSK	16QAM			QPSK	16QAM
20407	824.7	1.31	1.31	20415	825.5	2.92	2.92
20525	836.5	1.30	1.30	20525	836.5	2.91	2.93
20643	848.3	1.29	1.27	20635	847.5	2.91	2.91

SPECTRUM PLOT OF WORST VALUE

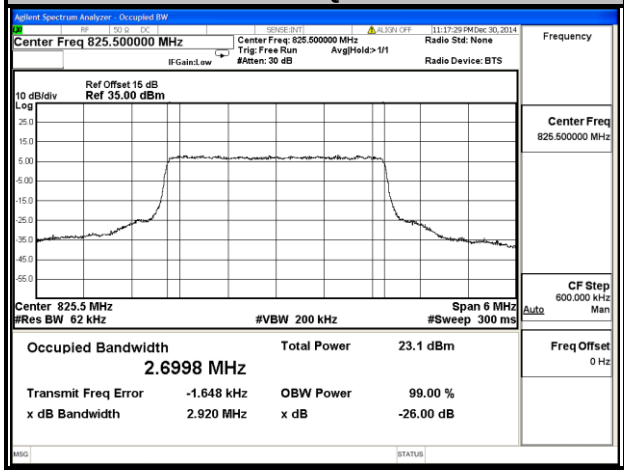
1.4MHz / QPSK



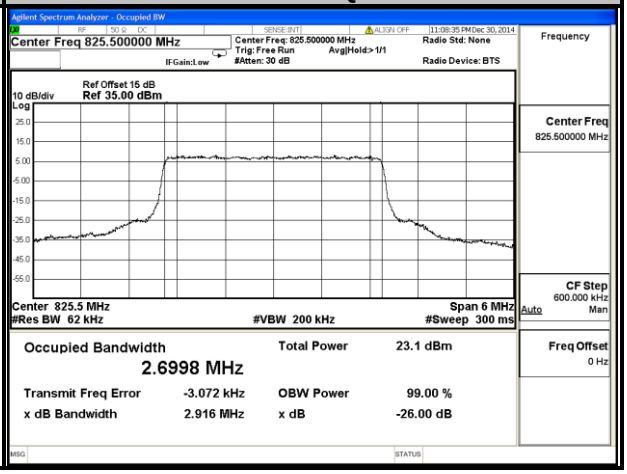
1.4MHz / 16QAM



3MHz / QPSK



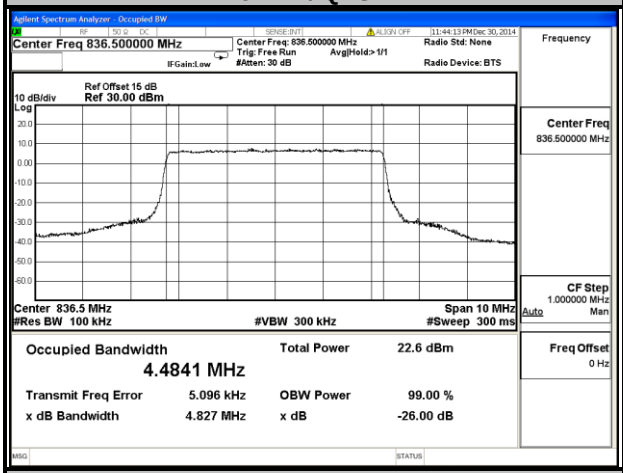
3MHz / 16QAM



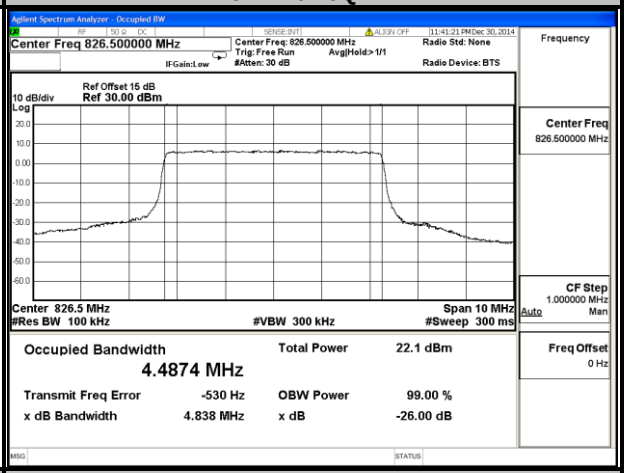
LTE BAND 5							
CHANNEL BANDWIDTH: 5MHz				CHANNEL BANDWIDTH: 10MHz			
CHANNEL	FREQUENCY (MHz)	99% OCCUPIED BANDWIDTH (MHz)		CHANNEL	FREQUENCY (MHz)	99% OCCUPIED BANDWIDTH (MHz)	
		QPSK	16QAM			QPSK	16QAM
20425	826.5	4.48	4.49	20450	829.0	8.97	8.97
20525	836.5	4.48	4.49	20525	836.5	8.97	8.98
20625	846.5	4.48	4.48	20600	844.0	8.95	8.95
CHANNEL	FREQUENCY (MHz)	26dB BANDWIDTH (MHz)		CHANNEL	FREQUENCY (MHz)	26dB BANDWIDTH (MHz)	
		QPSK	16QAM			QPSK	16QAM
20425	826.5	4.83	4.84	20450	829.0	9.52	9.57
20525	836.5	4.83	4.81	20525	836.5	9.53	9.58
20625	846.5	4.79	4.82	20600	844.0	9.52	9.56

SPECTRUM PLOT OF WORST VALUE

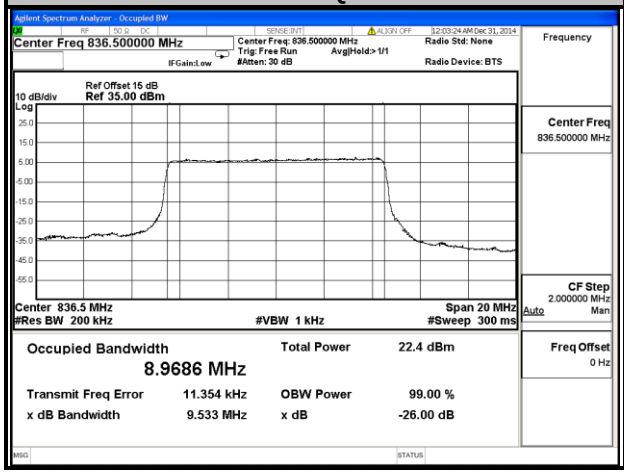
5MHz / QPSK



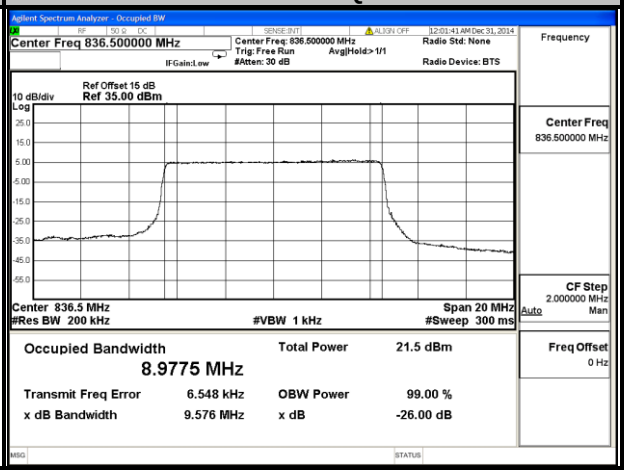
5MHz / 16QAM



10MHz / QPSK



10MHz / 16QAM

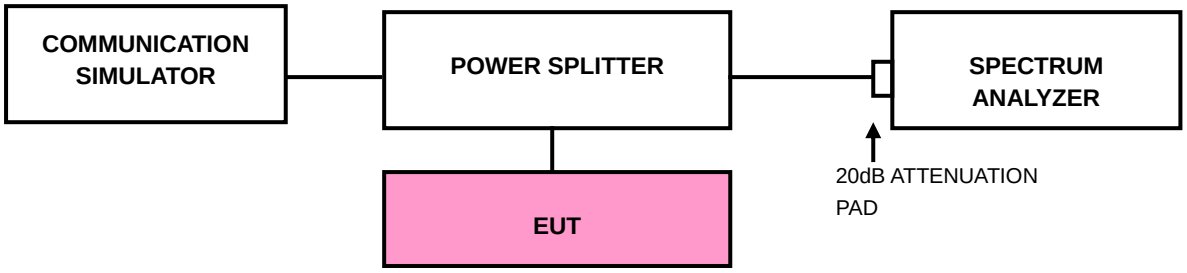


4.4 BAND EDGE MEASUREMENT

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.

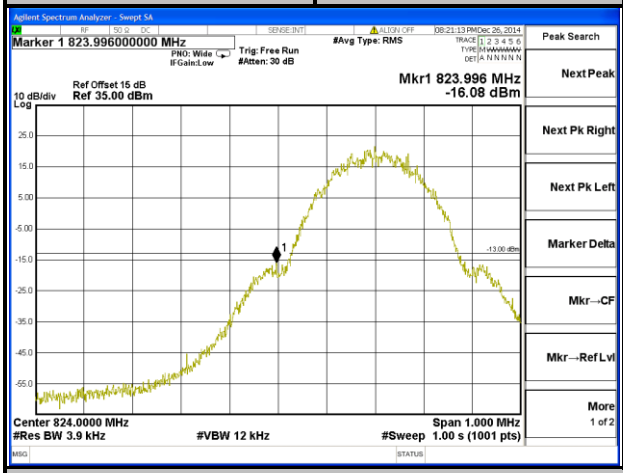
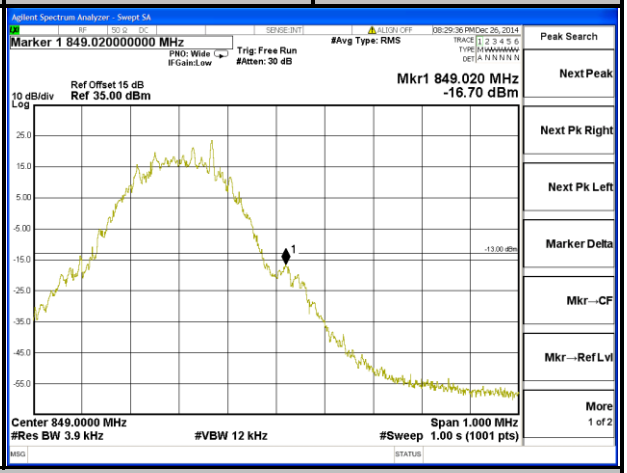
4.4.2 TEST SETUP

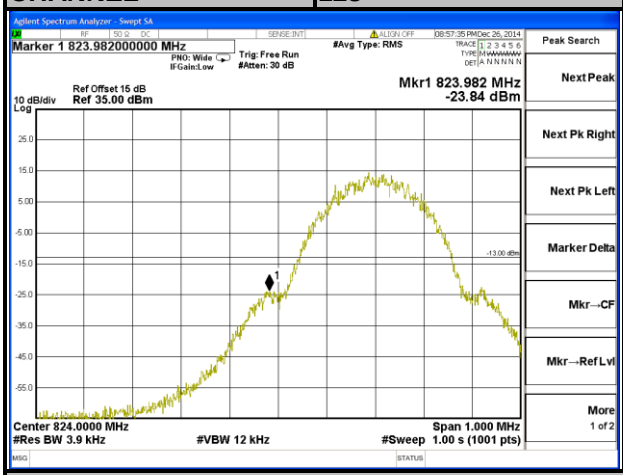
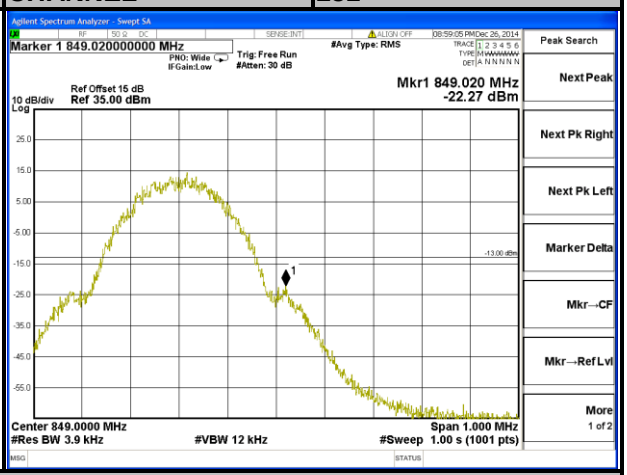


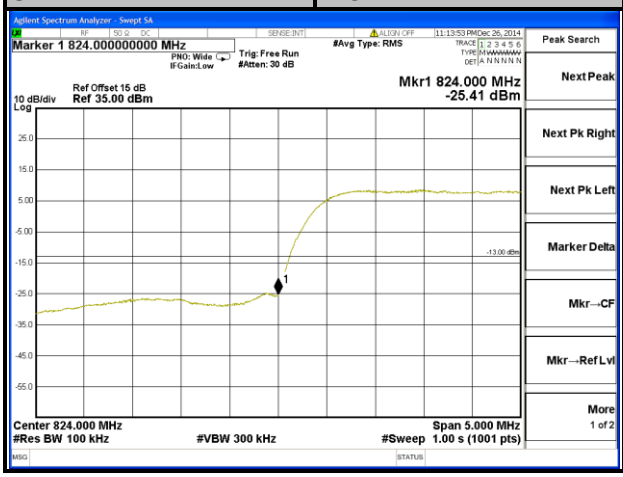
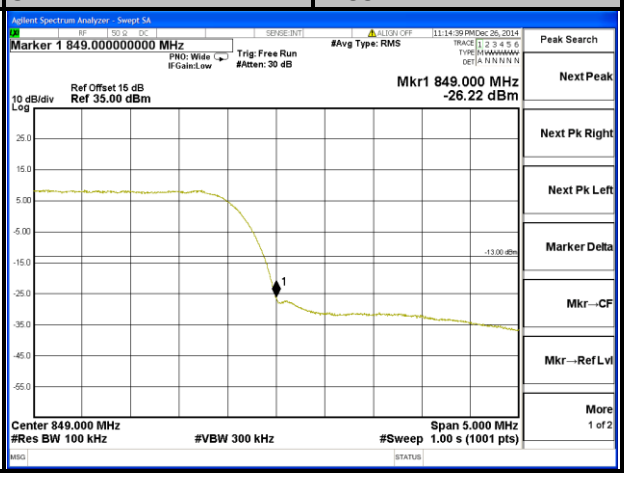
4.4.3 TEST PROCEDURES

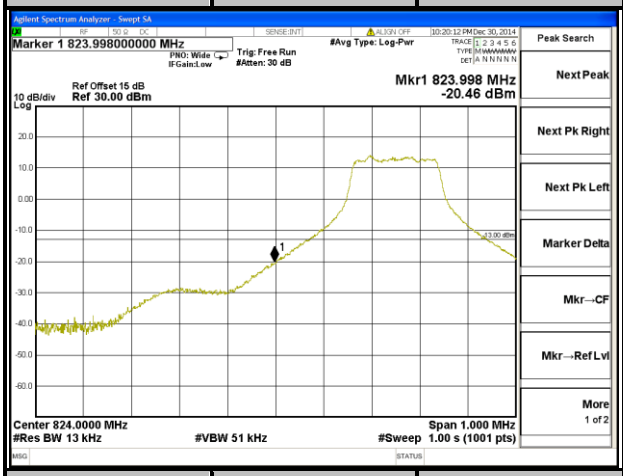
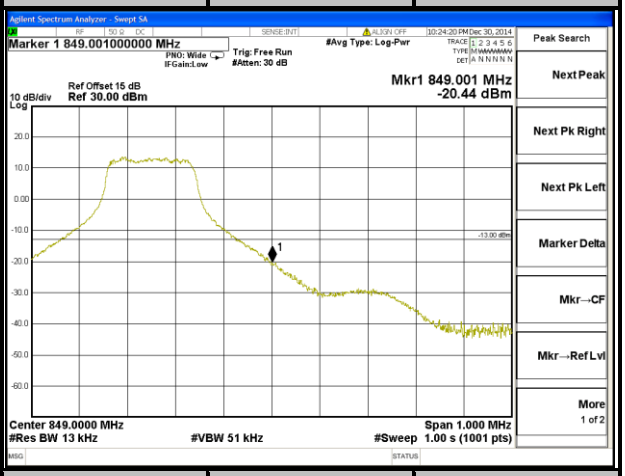
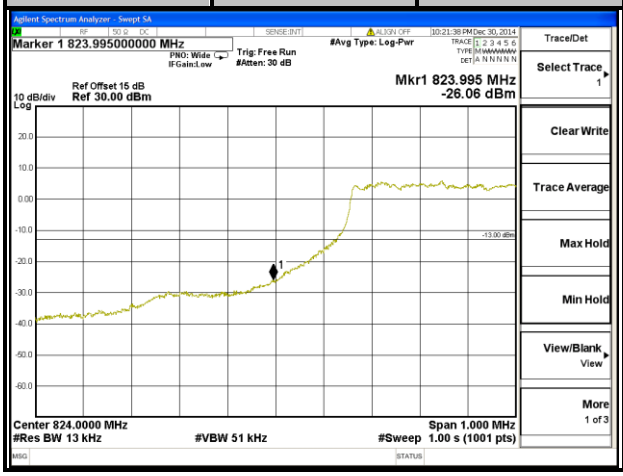
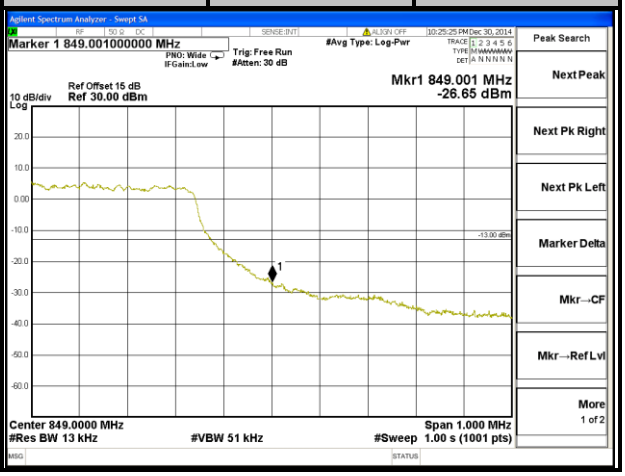
a. All measurements were done at low and high operational frequency range.
b. The center frequency of spectrum is the band edge frequency and span is 1MHz. RB of the spectrum is 3kHz and VB of the spectrum is 10kHz (GSM/GPRS/ EDGE).
c. The center frequency of spectrum is the band edge frequency and span is 5MHz. RB of the spectrum is 100kHz and VB of the spectrum is 300kHz (WCDMA/LTE).
d. The center frequency of spectrum is the band edge frequency and span is 2MHz. RB of the spectrum is 13kHz and VB of the spectrum is 51kHz (CDMA).
e. Record the max trace plot into the test report.

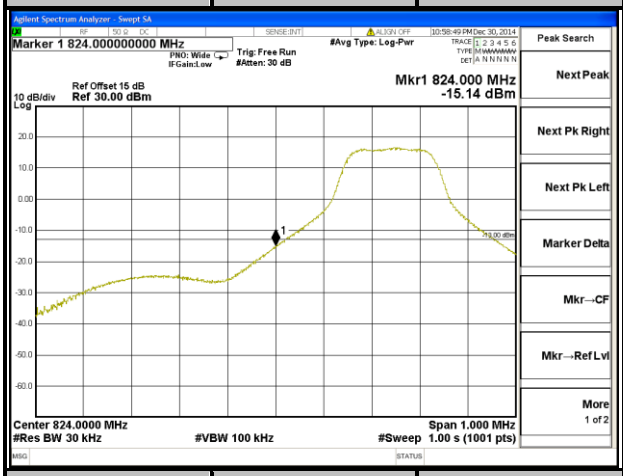
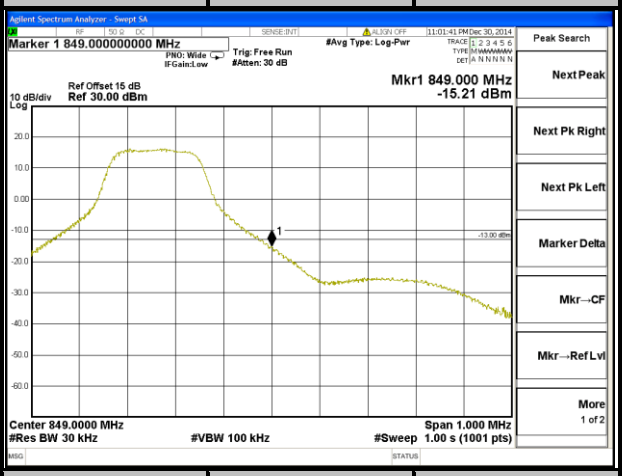
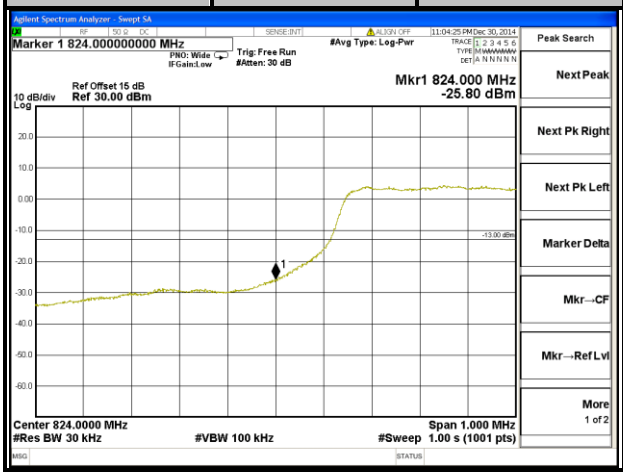
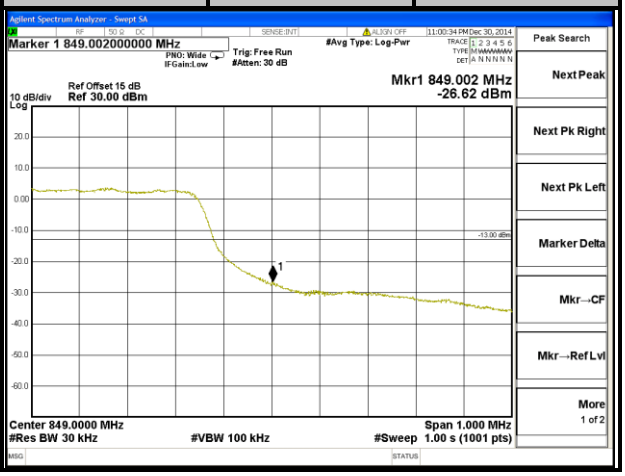
4.4.4 TEST RESULTS

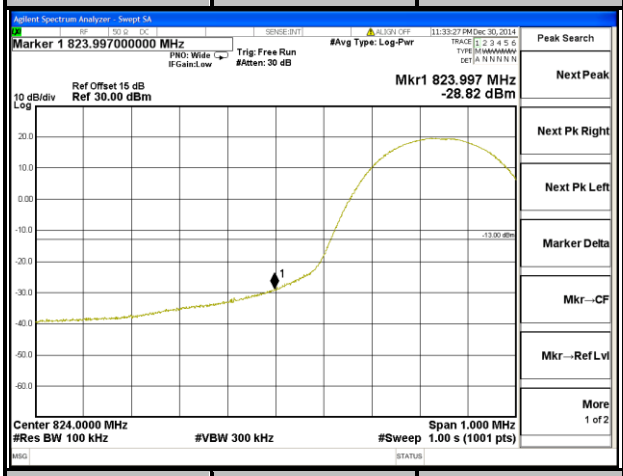
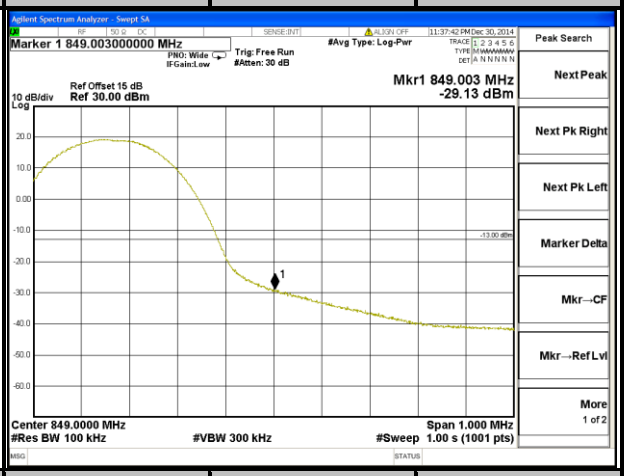
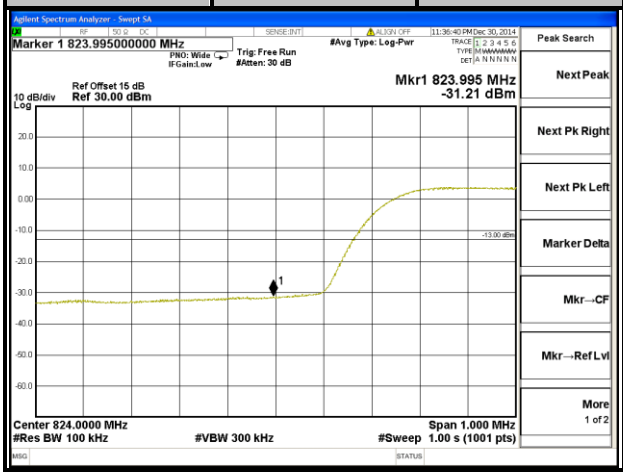
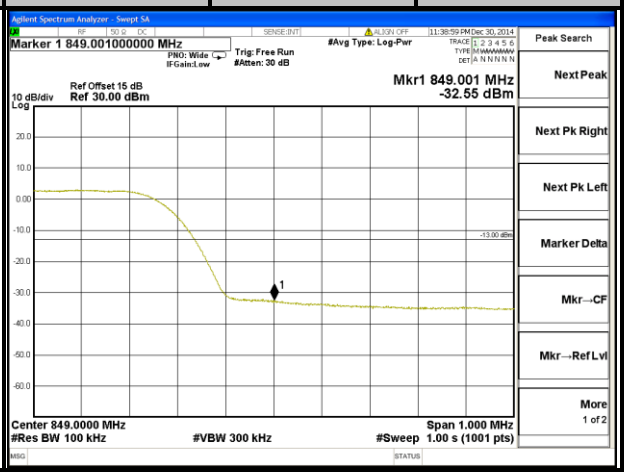
GSM			
CHANNEL	128	CHANNEL	251
			

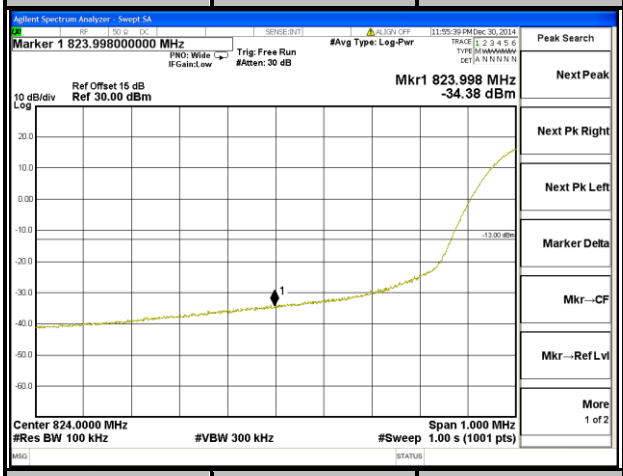
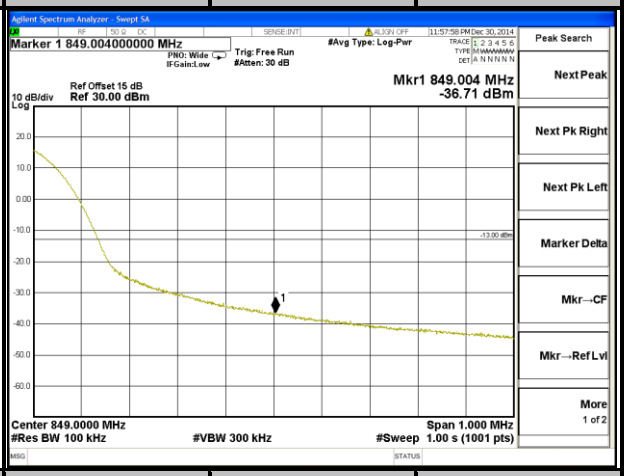
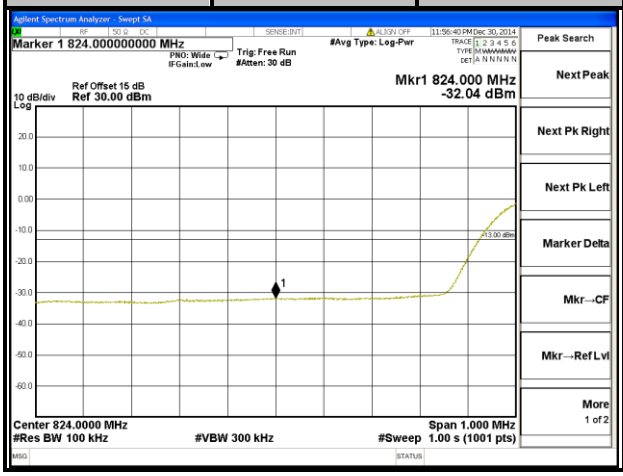
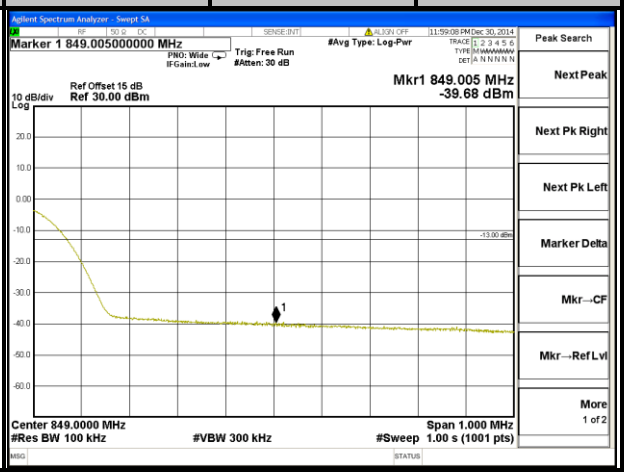
EDGE			
CHANNEL	128	CHANNEL	251
			

WCDMA			
CHANNEL	4132	CHANNEL	4233
			

LTE BAND 5					
CHANNEL BANDWIDTH: 1.4MHz					
CHANNEL	20407	1 RB	CHANNEL	20643	1 RB
					
CHANNEL	20407	6 RB	CHANNEL	20643	6 RB
					

LTE BAND 5					
CHANNEL BANDWIDTH: 3MHz					
CHANNEL	20415	1 RB	CHANNEL	20635	1 RB
					
CHANNEL	20415	15 RB	CHANNEL	20635	15 RB
					

LTE BAND 5					
CHANNEL BANDWIDTH: 5MHz					
CHANNEL	20425	1 RB	CHANNEL	20625	1 RB
					
CHANNEL	20425	25 RB	CHANNEL	20625	25 RB
					

LTE BAND 5					
CHANNEL BANDWIDTH: 10MHz					
CHANNEL	20450	1 RB	CHANNEL	20600	1 RB
					
CHANNEL	20450	50 RB	CHANNEL	20600	50 RB
					

4.5 CONDUCTED SPURIOUS EMISSIONS

4.5.1 LIMITS OF CONDUCTED SPURIOUS EMISSIONS MEASUREMENT

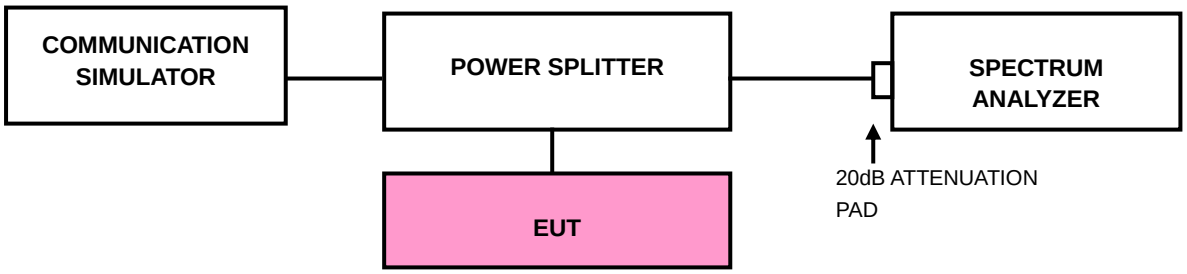
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. The emission limit is equal to -13dBm.

4.5.2 TEST PROCEDURE

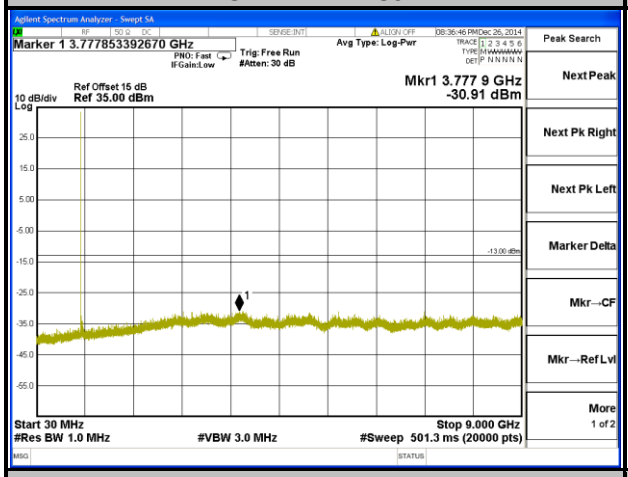
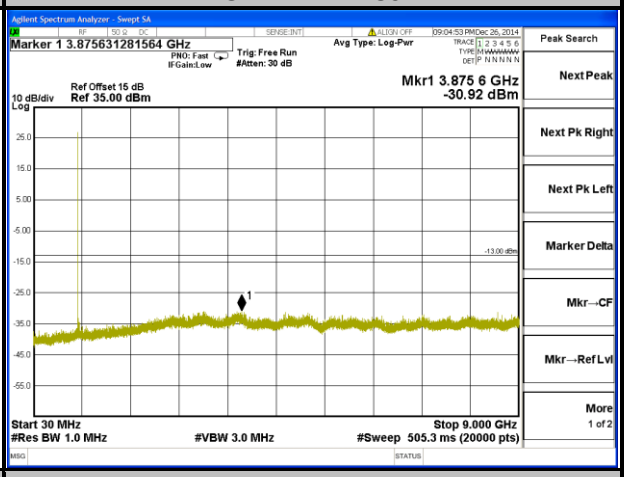
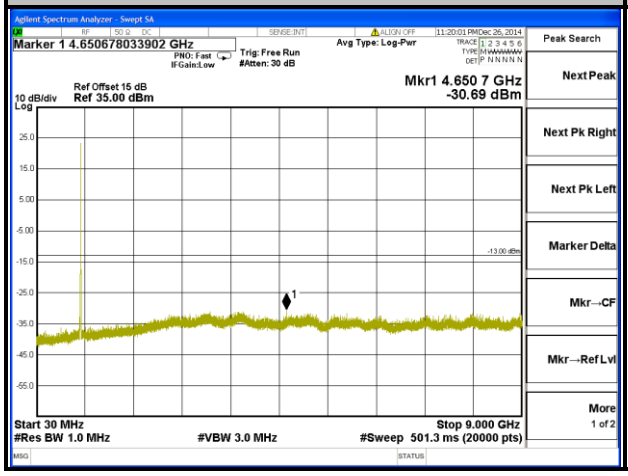
a. The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.

b. Measuring frequency range is from 30 MHz to 9GHz. 10dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz is used for conducted emission measurement.

4.5.3 TEST SETUP



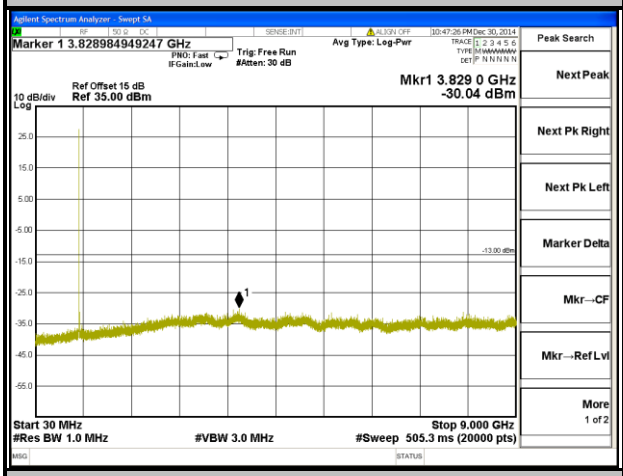
4.5.4 TEST RESULTS

GSM	EDGE
CHANNEL 189	CHANNEL 189
	
WCDMA	
CHANNEL 4182	
	

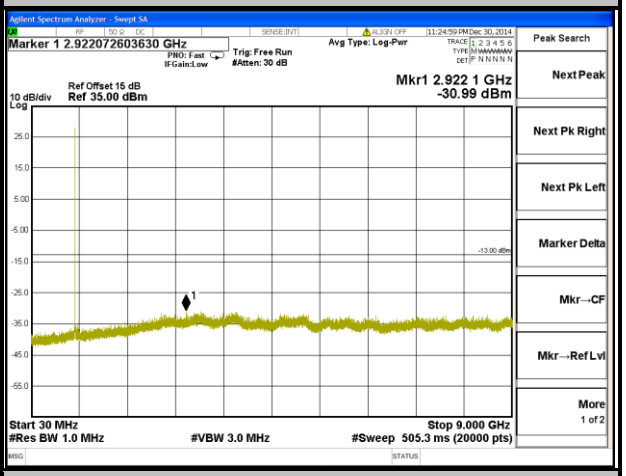
LTE BAND 5

CHANNEL 20525

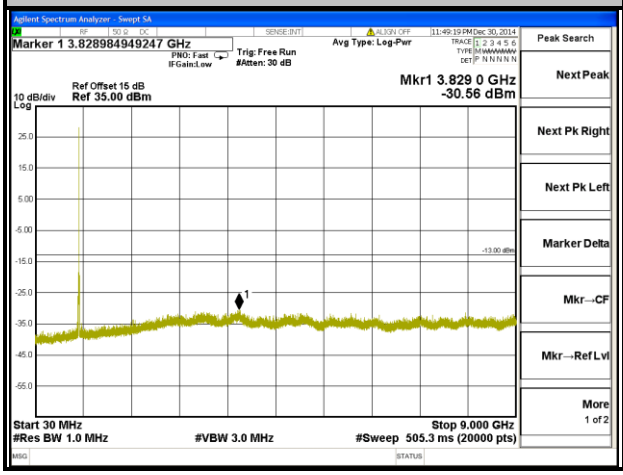
Channel Bandwidth: 1.4MHz



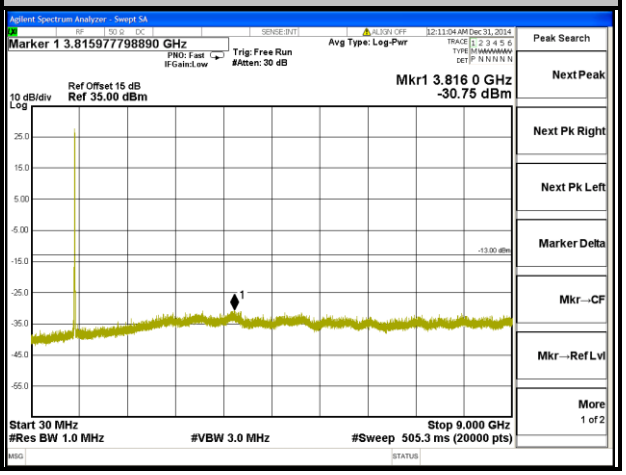
Channel Bandwidth: 3MHz



Channel Bandwidth: 5MHz



Channel Bandwidth: 10MHz



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 is equal to -13dBm.

4.6.2 TEST PROCEDURES

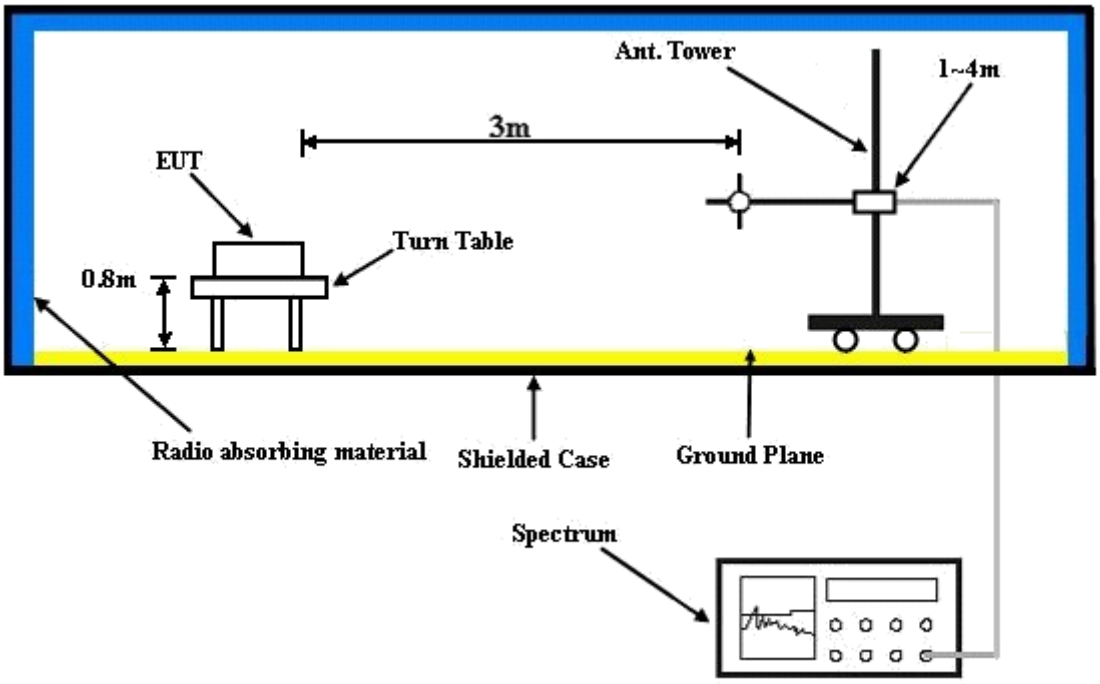
a. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 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. EIRP = Output power level of S.G – TX cable loss + 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, E.R.P power = E.I.R.P power - 2.15dBi.

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

GSM:

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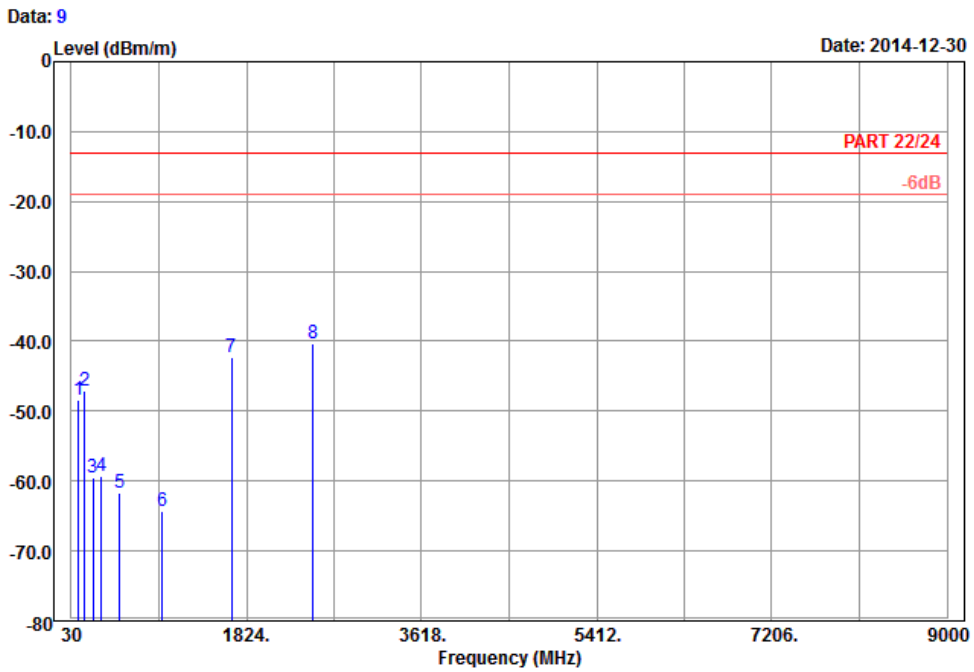

Site : 966 chamber 1
Condition: PART 22/24 3m Horizontal
Remark : GSM 850_Link_CH189
Tested by: Will Chen
Plane : Z

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm/m	dBm	dBm/m	dB	dB/m	
1	101.55	-48.40	-38.51	-13.00	-35.40	-9.89	Peak
2	162.84	-47.04	-39.66	-13.00	-34.04	-7.38	Peak
3	251.40	-59.55	-54.03	-13.00	-46.55	-5.52	Peak
4	339.20	-59.20	-53.70	-13.00	-46.20	-5.50	Peak
5	526.80	-61.79	-58.42	-13.00	-48.79	-3.37	Peak
6	965.00	-64.30	-69.46	-13.00	-51.30	5.16	Peak
7	1672.80	-42.30	-50.21	-13.00	-29.30	7.91	Peak
8 pp	2509.20	-40.26	-51.54	-13.00	-27.26	11.28	Peak

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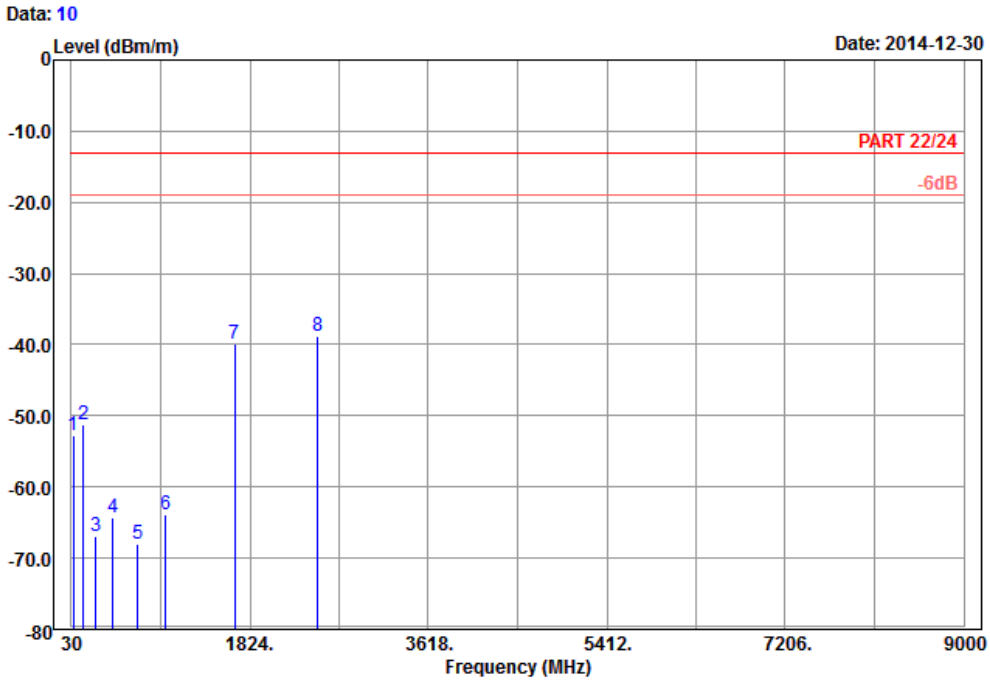

Site : 966 chamber 1
Condition: PART 22/24 3m Vertical
Remark : GSM 850_Link_CH189
Tested by: Will Chen
Plane : Z

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm/m	dBm	dBm/m	dB	dB/m	
1	47.82	-52.74	-39.63	-13.00	-39.74	-13.11	Peak
2	154.47	-51.31	-43.47	-13.00	-38.31	-7.84	Peak
3	278.13	-67.01	-61.25	-13.00	-54.01	-5.76	Peak
4	443.50	-64.21	-60.51	-13.00	-51.21	-3.70	Peak
5	696.20	-68.08	-67.72	-13.00	-55.08	-0.36	Peak
6	977.60	-63.96	-69.16	-13.00	-50.96	5.20	Peak
7	1672.80	-39.95	-47.86	-13.00	-26.95	7.91	Peak
8 pp	2509.20	-38.71	-49.99	-13.00	-25.71	11.28	Peak

EDGE:

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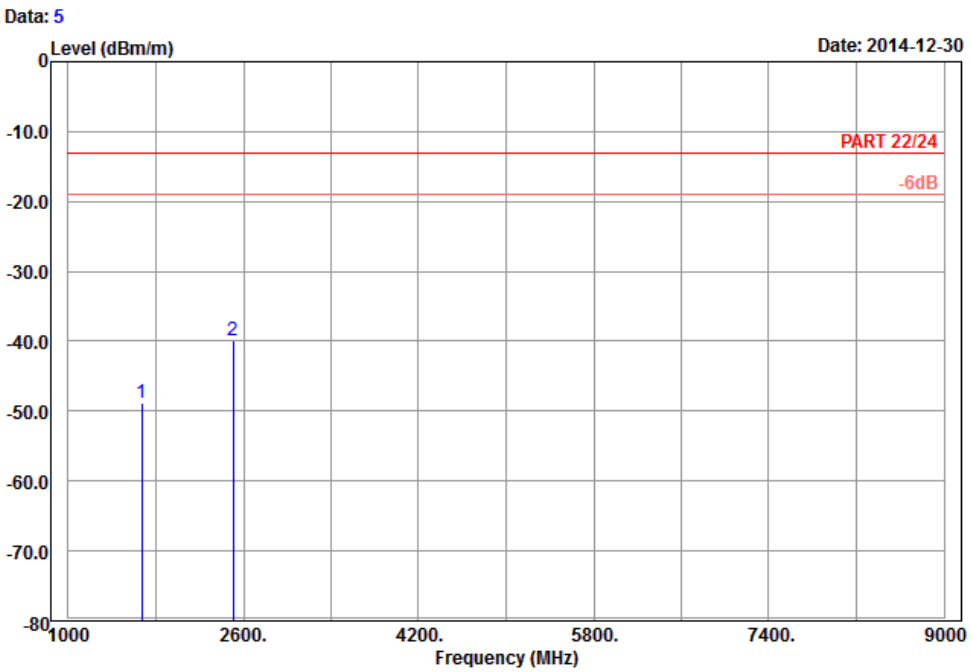
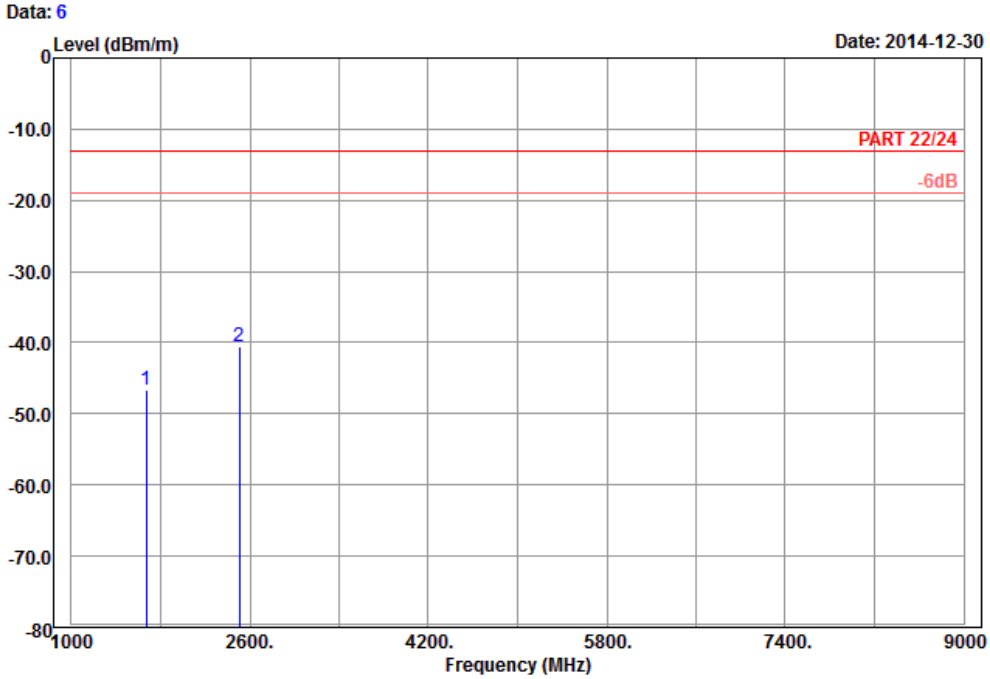


Site : 966 chamber 1
Condition: PART 22/24 3m Horizontal
Remark : EDGE 850_Link_CH189
Tested by: Will Chen
Plane : Z

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm/m	dBm	dBm/m	dB	dB/m	
1	1672.80	-48.91	-56.82	-13.00	-35.91	7.91	Peak
2 pp	2509.20	-39.90	-51.18	-13.00	-26.90	11.28	Peak



Site : 966 chamber 1
Condition: PART 22/24 3m Vertical
Remark : EDGE 850_Link_CH189
Tested by: Will Chen
Plane : Z

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm/m	dBm	dBm/m	dB	dB/m	
1	1672.80	-46.58	-54.49	-13.00	-33.58	7.91	Peak
2 pp	2509.20	-40.52	-51.80	-13.00	-27.52	11.28	Peak

WCDMA:

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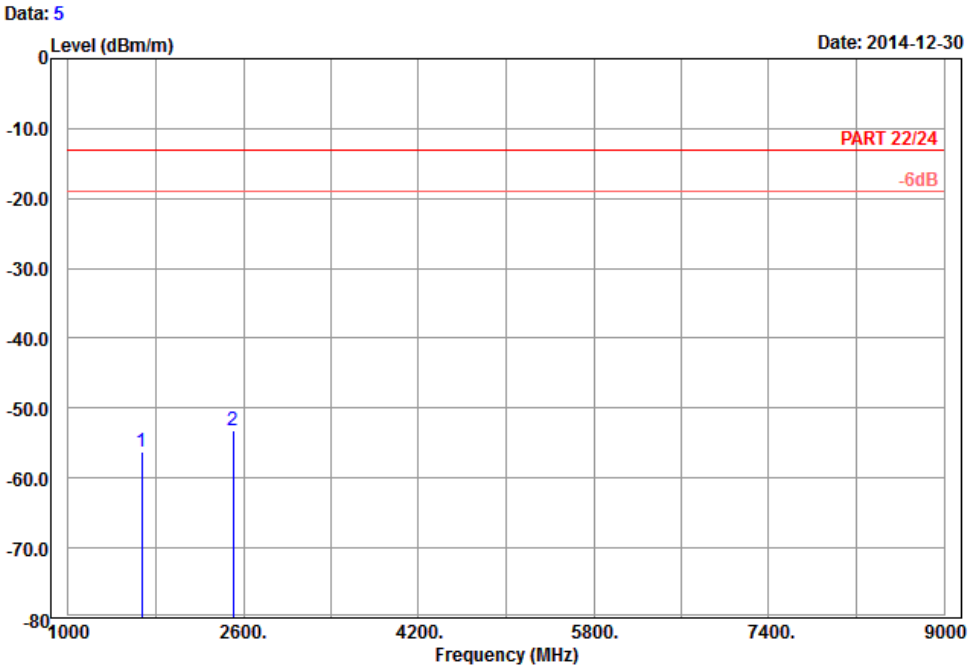
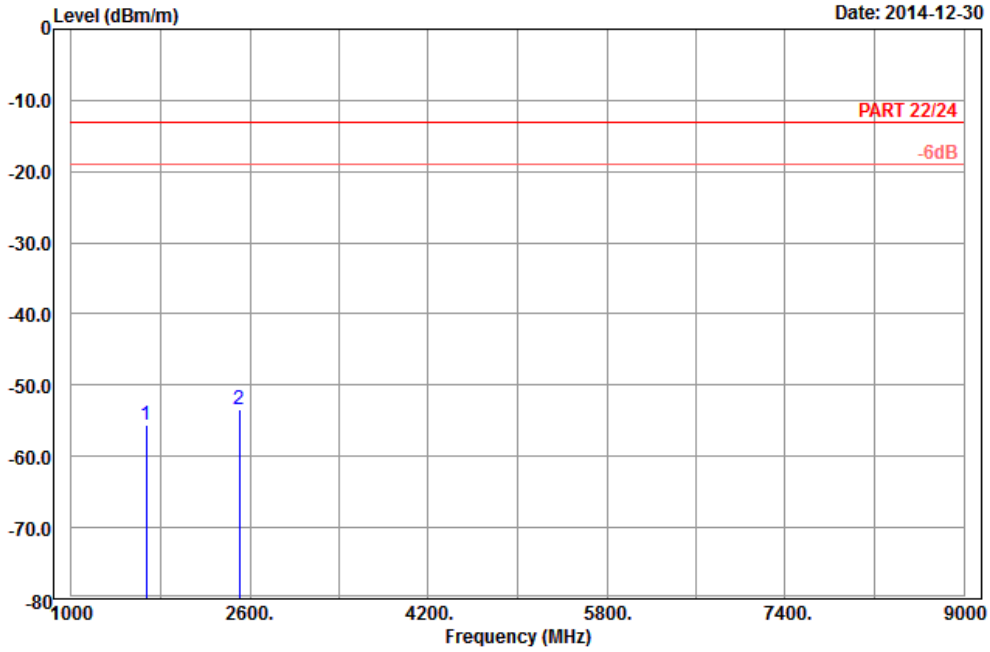


Site : 966 chamber 1
Condition: PART 22/24 3m Horizontal
Remark : Band V_Link_CH4182
Tested by: Will Chen
Plane : Z

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm/m	dBm	dBm/m	dB	dB/m	
1	1672.80	-56.23	-64.14	-13.00	-43.23	7.91	Peak
2 pp	2509.20	-53.21	-64.49	-13.00	-40.21	11.28	Peak

Data: 6



Site : 966 chamber 1
Condition: PART 22/24 3m Vertical
Remark : Band V_Link_CH4182
Tested by: Will Chen
Plane : Z

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm/m	dBm	dBm/m	dB	dB/m	
1	1672.80	-55.51	-63.42	-13.00	-42.51	7.91	Peak
2 pp	2509.20	-53.45	-64.73	-13.00	-40.45	11.28	Peak

LTE BAND 5

CHANNEL BANDWIDTH: 10MHz / QPSK

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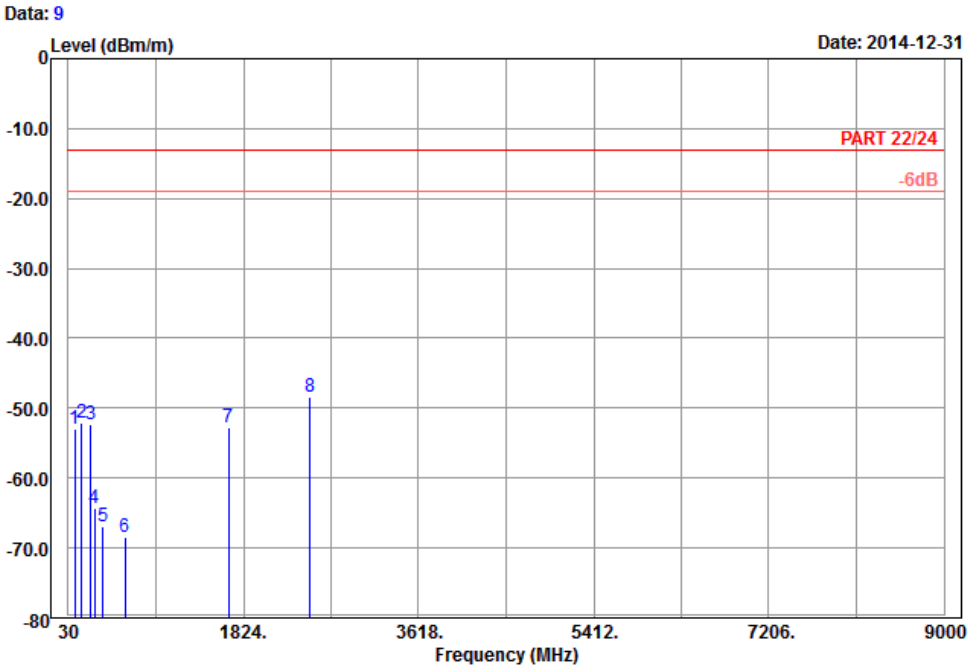
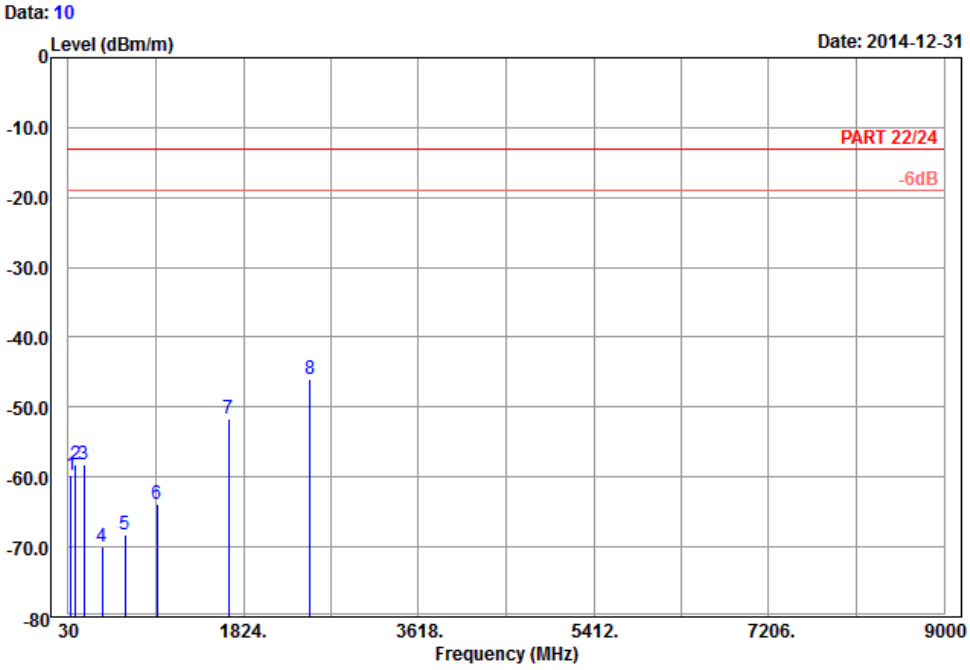



```
Site      : 966 chamber 1
Condition: PART 22/24 3m Horizontal
Remark    : LTE_Band 5_QPSK(1,0)_10M_CH20525
Tested by: Karl Lee
Plane     : Z
```

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm/m	dBm	dBm/m	dB	dB/m	
1	99.93	-53.08	-42.96	-13.00	-40.08	-10.12	Peak
2	166.89	-52.07	-45.08	-13.00	-39.07	-6.99	Peak
3	263.55	-52.23	-46.60	-13.00	-39.23	-5.63	Peak
4	301.40	-64.33	-58.39	-13.00	-51.33	-5.94	Peak
5	382.60	-66.95	-63.33	-13.00	-53.95	-3.62	Peak
6	615.00	-68.42	-68.68	-13.00	-55.42	0.26	Peak
7	1673.00	-52.69	-60.60	-13.00	-39.69	7.91	Peak
8 pp	2509.50	-48.31	-59.59	-13.00	-35.31	11.28	Peak



Site : 966 chamber 1
Condition: PART 22/24 3m Vertical
Remark : LTE_Band 5_QPSK(1,0)_10M_CH20525
Tested by: Karl Lee
Plane : Z

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm/m	dBm	dBm/m	dB	dB/m	
1	59.16	-59.78	-45.72	-13.00	-46.78	-14.06	Peak
2	100.20	-58.20	-48.08	-13.00	-45.20	-10.12	Peak
3	191.19	-58.16	-52.38	-13.00	-45.16	-5.78	Peak
4	377.00	-69.89	-65.96	-13.00	-56.89	-3.93	Peak
5	614.30	-68.24	-68.51	-13.00	-55.24	0.27	Peak
6	936.30	-63.79	-68.29	-13.00	-50.79	4.50	Peak
7	1673.00	-51.74	-59.65	-13.00	-38.74	7.91	Peak
8 pp	2509.50	-46.06	-57.34	-13.00	-33.06	11.28	Peak

5 PHOTOGRAPHS OF THE TEST CONFIGURATION

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

6 INFORMATION ON THE TESTING LABORATORIES

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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

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

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

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