FCC Test Report
(Part 22 – GSM, WCDMA B5, LTE B5)

Report No.:	RFBGTL-WTW-P22020475-6
FCC ID:	APYHRO00314
Received Date:	Feb. 19, 2022
Test Date:	Apr. 25 ~ Apr. 29, 2022
Issued Date:	May 30, 2022
Applicant:	SHARP Corporation Mobile Communication BU
Address:	2-13-1 Iida Hachihonmatsu Higashi-hiroshima City, Hiroshima 730-0192, Japan
Manufacturer:	Sharp Corporation
Address:	1 Takumi-cho, Sakai-ku, Sakai City, Osaka 590-8522, Japan
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Lin Kou Laboratories
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan
Test Location (1):	No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN
FCC Registration / Designation Number:	788550 / TW0003
Test Location (2):	No. 70, Wenming Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)
FCC Registration / Designation Number:	281270 / TW0032

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Release Control Record

Issue No.	Description	Date Issued
RFBGTL-WTW-P22020475-6	Original release	May 30, 2022

1 Certificate of Conformity

Product:	Smart Phone
Brand:	SHARP
Sample Status:	Engineering sample
Applicant:	SHARP Corporation Mobile Communication BU
Manufacturer:	Sharp Corporation
Test Date:	Apr. 25 ~ Apr. 29, 2022
Standards:	FCC Part 22, Subpart H

The above equipment 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 RF characteristics under the conditions specified in this report.

Prepared by : Celine Chou , **Date:** May 30, 2022

Celine Chou / Senior Specialist

Approved by : Jeremy Lin , **Date:** May 30, 2022

Jeremy Lin / Project Engineer

2 Summary of Test Results

Applied Standard: FCC Part 22 & Part 2			
FCC Clause	Test Item	Result	Remarks
2.1046 22.913 (a)	Effective radiated power	Pass	Meet the requirement of limit.
2.1047	Modulation Characteristics	Pass	Meet the requirement
22.913 (d)	Peak To Average Ratio	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 -29.77dB at 39.70MHz.

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

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	Expanded Uncertainty (k=2) (±)
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.00 dB
	30MHz ~ 200MHz	2.91 dB
	200MHz ~1000MHz	2.93 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	1.76 dB
	18GHz ~ 40GHz	1.77 dB

2.2 Test Site and Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver KEYSIGHT	N9038B	MY60180018	Feb. 18, 2022	Feb. 17, 2023
Spectrum Analyzer KEYSIGHT	N9020B	MY60110513	Dec. 24, 2021	Dec. 23, 2022
BILOG Antenna SCHWARZBECK	VULB9168	9168-1214	Oct. 27, 2021	Oct. 26, 2022
HORN Antenna RF SPIN	DRH18-E	210101A18E	Nov. 14, 2021	Nov. 13, 2022
HORN Antenna SCHWARZBECK	BBHA 9170	9170-1049	Nov. 14, 2021	Nov. 13, 2022
Loop Antenna EMCI	EM-6879	269	Sep. 16, 2021	Sep. 15, 2022
Loop Antenna TESEQ	HLA 6121	45745	Jul. 21, 2021	Jul. 20, 2022
Preamplifier EMCI	EMC330N	980798	Jan. 17, 2022	Jan. 16, 2023
Preamplifier EMCI	EMC118A45SE	980809	Dec. 30, 2021	Dec. 29, 2022
Preamplifier EMCI	EMC184045SE	980786	Jan. 17, 2022	Jan. 16, 2023
RF signal cable EMCI	EMC104-SM-SM-(9000+3000+1000)	201244+ 201232+ 210103	Jan. 17, 2022	Jan. 16, 2023
RF signal cable EMCI	EMCCFD400-NM-NM-(9000+3000+500)	201251+ 201249+ 201248	Jan. 17, 2022	Jan. 16, 2023
RF signal cable EMCI	EMC101G-KM-KM-(5000+3000+2000)	201261+201258+201255	Jan. 17, 2022	Jan. 16, 2023
Software BV ADT	ADT_Radiated_V7.6.15.9.5	NA	NA	NA
Antenna Tower Max-Full	MFA-515BSN	NA	NA	NA
Turn Table Max-Full	MFT-201SS	NA	NA	NA
Turn Table Controller Max-Full	MF-7802BS	MF780208676	NA	NA
Temperature & Humidity Chamber TERCHY	HRM-120RF	931022	Jan. 03, 2022	Jan. 02, 2023
True RMS Clamp Meter Fluke	325	31130711WS	Jun. 02, 2021	Jun. 01, 2022
DC power supply Keysight	U8002A	MY56330015	NA	NA
Radio Communication Analyzer Anritsu	MT8821C	6261806803	Feb. 16, 2022	Feb. 15, 2023

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in WM Chamber 9.

3 General Information

3.1 General Description of EUT

Product	Smart Phone			
Brand	SHARP			
Sample Status	Engineering sample			
Power Supply Rating	3.87Vdc (Battery) 5Vdc (Adapter)			
Modulation Type	GSM, GPRS: GMSK WCDMA: BPSK, QPSK HSDPA: BPSK HSUPA: QPSK LTE: QPSK, 16QAM, 64QAM			
Operating Frequency	GSM, GPRS	824.2MHz ~ 848.8MHz		
	WCDMA Band 5	826.4MHz ~ 846.6MHz		
	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)	829.0MHz ~ 844.0MHz		
Max. ERP Power	GSM	417.830mW (26.21dBm)		
	GPRS	416.869mW (26.20dBm)		
	WCDMA Band 5	47.753mW (16.79dBm)		
		QPSK	16QAM	64QAM
	LTE Band 5 (Channel Bandwidth 1.4MHz)	37.844mW (15.78dBm)	32.063mW (15.06dBm)	24.434mW (13.88dBm)
	LTE Band 5 (Channel Bandwidth 3MHz)	38.371mW (15.84dBm)	32.885mW (15.17dBm)	24.491mW (13.89dBm)
	LTE Band 5 (Channel Bandwidth 5MHz)	38.194mW (15.82dBm)	32.285mW (15.09dBm)	24.889mW (13.96dBm)
	LTE Band 5 (Channel Bandwidth 10MHz)	50.234mW (17.01dBm)	39.902mW (16.01dBm)	31.769mW (15.02dBm)
Emission Designator	GSM	246KGXW		
	GPRS	250KGXW		
	WCDMA Band 5	4M15F9W		
		QPSK	16QAM	64QAM
	LTE Band 5 (Channel Bandwidth 1.4MHz)	1M09G7D	1M09D7W	1M09D7W
	LTE Band 5 (Channel Bandwidth 3MHz)	2M70G7D	2M70D7W	2M70D7W
	LTE Band 5 (Channel Bandwidth 5MHz)	4M50G7D	4M50D7W	4M49D7W
	LTE Band 5 (Channel Bandwidth 10MHz)	8M98G7D	8M98D7W	8M98D7W
Antenna Type	Refer to note			
Antenna Connector	Refer to note			
Accessory Device	Refer to note			
Cable Supplied	NA			

Note:

1. The EUT uses following devices.

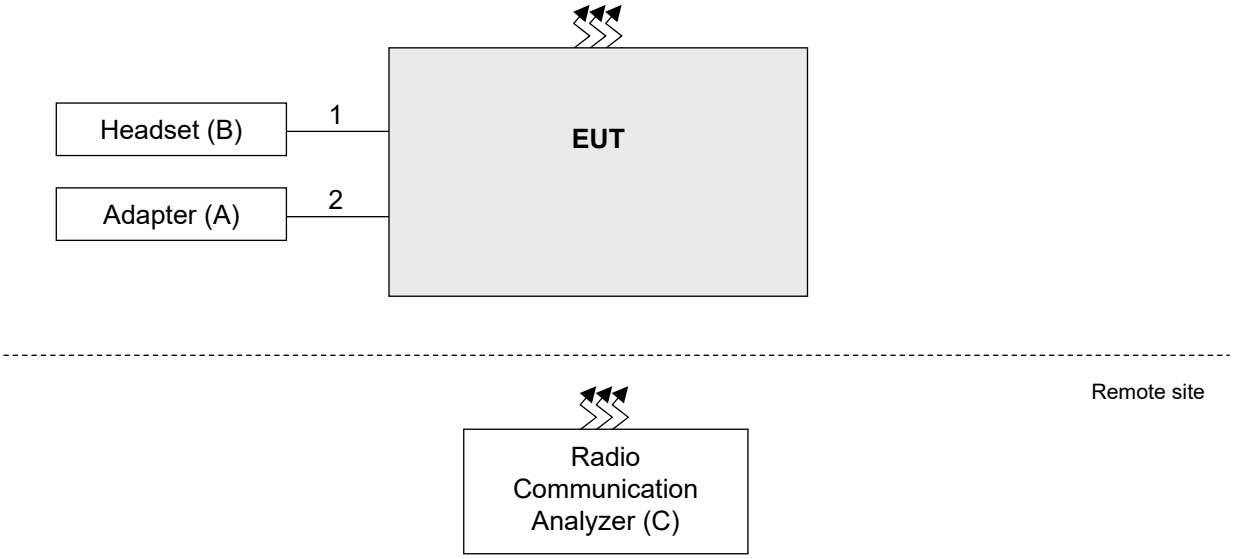
Product	Brand	Model	Description
Adapter (Support unit)	Salom	XN-2QC25	Input: 100-240Vac, 50/60Hz, 0.2A Output: 5.0Vdc, 800mA
Battery	-	-	3.87Vdc, Rated 4870mAh (18.9Wh), Typ. 5000mAh (19.4Wh)
Headset (Support unit)	Ambibio	AB-HI02JS	-
USB cable (Support unit)	Luxshare-ICT	L6KU2007-CS-H	0.95m shielded cable without core

2. The antenna information is listed as below.

Ant. No.	Type	Connector	Gain (dBi)										
			GSM 850	GSM 1900	WCDMA B2 / LTE B2	WCDMA B4 / LTE B4	WCDMA B5 / LTE B5	LTE B7	LTE B12	LTE B13	LTE B17	LTE B38	LTE B41
1	PIFA	IPEX	-	-2.9	-2.9	-4.9	-	-1.8	-	-	-	-1.9	-1.9
3	PIFA	IPEX	-4.8	-	-	-	-4.8	-	-5.6	-5.3	-5.6	-	-

* The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

3.2 Configuration of System under Test



3.2.1 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.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Adapter	Salom	XN-2QC25	N/A	N/A	Provided by client
B.	Headset	Ambibio	AB-HI02JS	N/A	N/A	Provided by client
C.	Radio Communication Analyzer	Anritsu	MT8821C	6261806803	NA	-

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item C acted as a communication partner to transfer data.

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	Earphone Cable	1	1.1	N	0	Provided by client
2.	USB Cable	1	1	Y	0	Provided by client

3.3 Test Mode Applicability and Tested Channel Detail

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 as the table below. Following channel(s) was (were) selected for the final test as listed below:

Band	Radiated Emission
GSM	Z-plane
WCDMA Band 5	Z-plane
LTE Band 5	Z-plane

GSM Mode

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Mode
-	ERP	128 to 251	128 (824.2MHz), 189 (836.4MHz), 251 (848.8MHz)	GSM, GPRS
-	Modulation Characteristics	128 to 251	189 (836.4MHz)	GSM, GPRS
-	Frequency Stability	128 to 251	128 (824.2MHz), 251 (848.8MHz)	GSM
-	Occupied Bandwidth	128 to 251	128 (824.2MHz), 189 (836.4MHz), 251 (848.8MHz)	GSM, GPRS
-	Band Edge	128 to 251	128(824.2MHz), 251(848.8MHz)	GSM, GPRS
-	Peak To Average Ratio	128 to 251	128 (824.2MHz), 189 (836.4MHz), 251 (848.8MHz)	GSM, GPRS
-	Conducted Emission	128 to 251	128 (824.2MHz), 189 (836.4MHz), 251 (848.8MHz)	GSM, GPRS
-	Radiated Emission	128 to 251	128 (824.2MHz), 189 (836.4MHz), 251 (848.8MHz)	GSM

Note: For radiated emission below 1GHz, select the worst radiated emission channel (above 1GHz) for final testing.

WCDMA Band 5

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Mode
-	ERP	4132 to 4233	4132 (826.4MHz), 4182 (836.4MHz), 4233 (846.6MHz)	WCDMA, HSDPA, HSUPA
-	Modulation Characteristics	4132 to 4233	4182 (836.4MHz)	WCDMA, HSDPA, HSUPA
-	Frequency Stability	4132 to 4233	4132 (826.4MHz), 4233 (846.6MHz)	WCDMA
-	Occupied Bandwidth	4132 to 4233	4132 (826.4MHz), 4182 (836.4MHz), 4233 (846.6MHz)	WCDMA, HSDPA, HSUPA
-	Band Edge	4132 to 4233	4132 (826.4MHz), 4233 (846.6MHz)	WCDMA, HSDPA, HSUPA
-	Peak To Average Ratio	4132 to 4233	4132 (826.4MHz), 4182 (836.4MHz), 4233 (846.6MHz)	WCDMA, HSDPA, HSUPA
-	Conducted Emission	4132 to 4233	4132 (826.4MHz), 4182 (836.4MHz), 4233 (846.6MHz)	WCDMA, HSDPA, HSUPA
-	Radiated Emission	4132 to 4233	4132 (826.4MHz), 4182 (836.4MHz), 4233 (846.6MHz)	WCDMA

Note: For radiated emission below 1GHz, select the worst radiated emission channel (above 1GHz) for final testing.

LTE Band 5

EUT Configure Mode	Test item	Available channel	Tested channel	Channel Bandwidth	Modulation	Mode
-	ERP	20407 to 20643	20407 (824.7MHz), 20525 (836.5MHz), 20643 (848.3MHz)	1.4MHz	QPSK / 16QAM / 64QAM	1 Half Full
		20415 to 20635	20415 (825.5MHz), 20525 (836.5MHz), 20635 (847.5MHz)	3MHz	QPSK / 16QAM / 64QAM	1 Half Full
		20425 to 20625	20425 (826.5MHz), 20525 (836.5MHz), 20625 (846.5MHz)	5MHz	QPSK / 16QAM / 64QAM	1 Half Full
		20450 to 20600	20450 (829.0MHz), 20525 (836.5MHz), 20600 (844.0MHz)	10MHz	QPSK / 16QAM / 64QAM	1 Half Full
-	Modulation Characteristics	20450 to 20600	20525 (836.5MHz)	10MHz	QPSK / 16QAM / 64QAM	Full
-	Frequency Stability	20407 to 20643	20407 (824.7MHz), 20643 (848.3MHz)	1.4MHz	QPSK	Full
		20415 to 20635	20415 (825.5MHz), 20635 (847.5MHz)	3MHz	QPSK	Full
		20425 to 20625	20425 (826.5MHz), 20625 (846.5MHz)	5MHz	QPSK	Full
		20450 to 20600	20450 (829.0MHz), 20600 (844.0MHz)	10MHz	QPSK	Full
-	Occupied Bandwidth	20407 to 20643	20407 (824.7MHz), 20525 (836.5MHz), 20643 (848.3MHz)	1.4MHz	QPSK / 16QAM / 64QAM	Full
		20415 to 20635	20415 (825.5MHz), 20525 (836.5MHz), 20635 (847.5MHz)	3MHz	QPSK / 16QAM / 64QAM	Full
		20425 to 20625	20425 (826.5MHz), 20525 (836.5MHz), 20625 (846.5MHz)	5MHz	QPSK / 16QAM / 64QAM	Full
		20450 to 20600	20450 (829.0MHz), 20525 (836.5MHz), 20600 (844.0MHz)	10MHz	QPSK / 16QAM / 64QAM	Full
-	Band Edge	20407 to 20643	20407 (824.7MHz), 20643 (848.3MHz)	1.4MHz	QPSK	1 Half Full
		20415 to 20635	20415 (825.5MHz), 20635 (847.5MHz)	3MHz	QPSK	1 Half Full
		20425 to 20625	20425 (826.5MHz), 20625 (846.5MHz)	5MHz	QPSK	1 Half Full
		20450 to 20600	20450 (829.0MHz), 20600 (844.0MHz)	10MHz	QPSK	1 Half Full

EUT Configure Mode	Test item	Available channel	Tested channel	Channel Bandwidth	Modulation	Mode
-	Peak to Average Ratio	20407 to 20643	20407 (824.7MHz), 20525 (836.5MHz), 20643 (848.3MHz)	1.4MHz	QPSK / 16QAM / 64QAM	1
		20415 to 20635	20415 (825.5MHz), 20525 (836.5MHz), 20635 (847.5MHz)	3MHz	QPSK / 16QAM / 64QAM	1
		20425 to 20625	20425 (826.5MHz), 20525 (836.5MHz), 20625 (846.5MHz)	5MHz	QPSK / 16QAM / 64QAM	1
		20450 to 20600	20450 (829.0MHz), 20525 (836.5MHz), 20600 (844.0MHz)	10MHz	QPSK / 16QAM / 64QAM	1
-	Conducted Emission	20407 to 20643	20407 (824.7MHz), 20525 (836.5MHz), 20643 (848.3MHz)	1.4MHz	QPSK	1
		20415 to 20635	20415 (825.5MHz), 20525 (836.5MHz), 20635 (847.5MHz)	3MHz	QPSK	1
		20425 to 20625	20425 (826.5MHz), 20525 (836.5MHz), 20625 (846.5MHz)	5MHz	QPSK	1
		20450 to 20600	20450 (829.0MHz), 20525 (836.5MHz), 20600 (844.0MHz)	10MHz	QPSK	1
-	Radiated Emission	20407 to 20643	20407 (824.7MHz), 20525 (836.5MHz), 20643 (848.3MHz)	1.4MHz	QPSK	1
		20425 to 20625	20425 (826.5MHz), 20525 (836.5MHz), 20625 (846.5MHz)	5MHz	QPSK	1
		20450 to 20600	20450 (829.0MHz), 20525 (836.5MHz), 20600 (844.0MHz)	10MHz	QPSK	1

Note:

1. For radiated emission below 1GHz, select the worst radiated emission channel (above 1GHz) for final testing.
2. For radiated emission above 1GHz, according to 3GPP 36.521-1 Section 6.6.3.1.4.1, choose the lowest, 5MHz & highest channel bandwidth for final test.
3. The output power for QPSK, 16QAM and 64QAM, measured value of QPSK is higher than 16QAM, and 64QAM mode. Therefore, only Modulation characteristics, occupied bandwidth and Peak to average ratio items had been tested under QPSK, 16QAM and 64QAM modes, the other test items were performed under worse mode according to the maximum output power.

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
ERP	25deg. C, 60%RH	3.87Vdc	Willy Cheng
Modulation Characteristics	25deg. C, 60%RH	3.87Vdc	Willy Cheng
Frequency Stability	25deg. C, 60%RH	3.87Vdc	Willy Cheng
Occupied Bandwidth	25deg. C, 60%RH	3.87Vdc	Willy Cheng
Band Edge	25deg. C, 60%RH	3.87Vdc	Willy Cheng
Peak To Average Ratio	25deg. C, 60%RH	3.87Vdc	Willy Cheng
Conducted Emission	25deg. C, 60%RH	3.87Vdc	Willy Cheng
Radiated Emission	27deg. C, 66%RH	120Vac, 60Hz	Tim Chen

3.4 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

3.5 General Description of Applied Standards and References

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

Test Standard:

FCC 47 CFR Part 2

FCC 47 CFR Part 22

ANSI/TIA/EIA-603-E 2016

ANSI 63.26-2015

References Test Guidance:

KDB 971168 D01 Power Meas License Digital Systems v03r01

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

Conducted Power Measurement:

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

Maximum EIRP / ERP

The relevant equation for determining the maximum ERP or EIRP from the measured RF output power is given in Equation as follows:

$EIRP = P_{Meas} + G_T$

$ERP = P_{Meas} + G_T - 2.15$

where

ERP or EIRP effective radiated power or equivalent isotropically radiated power, respectively (expressed in the same units as P_{Meas}, e.g., dBm or dBW)

P_{Meas} measured transmitter output power or PSD, in dBm or dBW

G_T gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)

4.1.3 Test Setup

Conducted Power Measurement:

4.1.4 Test Results

Conducted Output Power (dBm)

Band	GSM 850		
Channel	128	189	251
Frequency	824.2	836.4	848.8
GSM	33.16	33.07	33.13
GPRS 1Tx Slot	33.15	32.88	32.94
GPRS 2Tx Slot	31.47	31.32	31.40
GPRS 3Tx Slot	29.82	29.62	29.86
GPRS 4Tx Slot	28.83	28.91	28.62

Band	WCDMA V		
TX Channel	4132	4182	4233
Rx Channel	4357	4407	4458
Frequency	826.4	836.4	846.6
RMC 12.2K	23.66	23.74	23.67
HSDPA Subtest-1	22.66	22.73	22.68
HSDPA Subtest-2	22.64	22.73	22.67
HSDPA Subtest-3	22.14	22.24	22.18
HSDPA Subtest-4	22.10	22.25	22.18
HSUPA Subtest-1	22.65	22.72	22.66
HSUPA Subtest-2	20.63	20.72	20.64
HSUPA Subtest-3	21.63	21.72	21.66
HSUPA Subtest-4	20.64	20.73	20.69
HSUPA Subtest-5	22.70	22.70	22.70

LTE Band 5						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		20450	20525	20600
		Frequency (MHz)		829	836.5	844
10M	QPSK	1	0	23.84	23.96	23.89
		1	24	23.69	23.81	23.74
		1	49	23.67	23.79	23.72
		25	0	22.78	22.90	22.83
		25	12	22.70	22.82	22.75
		25	25	22.66	22.78	22.71
		50	0	22.77	22.89	22.82
10M	16QAM	1	0	22.71	22.84	22.67
		1	24	22.61	22.76	22.49
		1	49	22.96	22.48	22.71
		25	0	21.81	21.93	21.86
		25	12	21.79	21.91	21.84
		25	25	21.77	21.89	21.82
		50	0	21.70	21.82	21.75
10M	64QAM	1	0	21.89	21.74	21.94
		1	24	21.85	21.97	21.90
		1	49	21.61	21.73	21.66
		25	0	20.81	20.93	20.86
		25	12	20.76	20.88	20.81
		25	25	20.73	20.85	20.78
		50	0	20.72	20.84	20.77

LTE Band 5						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		20425	20525	20625
		Frequency (MHz)		826.5	836.5	846.5
5M	QPSK	1	0	22.65	22.77	22.74
		1	12	22.52	22.69	22.63
		1	24	22.54	22.61	22.61
		12	0	21.59	21.71	21.66
		12	6	21.53	21.70	21.56
		12	13	21.52	21.59	21.58
		25	0	21.57	21.70	21.65
5M	16QAM	1	0	21.95	22.04	22.03
		1	12	21.85	22.02	21.96
		1	24	21.76	21.89	21.84
		12	0	20.67	20.81	20.71
		12	6	20.65	20.72	20.65
		12	13	20.57	20.70	20.65
		25	0	20.55	20.62	20.58
5M	64QAM	1	0	20.79	20.91	20.81
		1	12	20.71	20.79	20.78
		1	24	20.45	20.56	20.51
		12	0	19.64	19.75	19.72
		12	6	19.65	19.68	19.69
		12	13	19.53	19.67	19.64
		25	0	19.61	19.66	19.66

LTE Band 5						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		20415	20525	20635
		Frequency (MHz)		825.5	836.5	847.5
3M	QPSK	1	0	22.69	22.79	22.75
		1	7	22.51	22.64	22.56
		1	14	22.47	22.66	22.56
		8	0	21.60	21.78	21.64
		8	3	21.54	21.66	21.65
		8	7	21.52	21.61	21.58
		15	0	21.64	21.77	21.72
3M	16QAM	1	0	21.96	22.12	22.07
		1	7	21.91	22.06	21.99
		1	14	21.76	21.89	21.88
		8	0	20.62	20.77	20.68
		8	3	20.59	20.74	20.68
		8	7	20.58	20.75	20.71
		15	0	20.55	20.68	20.63
3M	64QAM	1	0	20.69	20.82	20.84
		1	7	20.69	20.82	20.71
		1	14	20.50	20.61	20.53
		8	0	19.61	19.76	19.67
		8	3	19.61	19.73	19.62
		8	7	19.57	19.73	19.59
		15	0	19.55	19.66	19.60

LTE Band 5						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		20407	20525	20643
		Frequency (MHz)		824.7	836.5	848.3
1.4M	QPSK	1	0	22.57	22.73	22.56
		1	2	22.48	22.58	22.54
		1	5	22.38	22.61	22.55
		3	0	22.57	22.71	22.62
		3	1	22.46	22.61	22.43
		3	3	22.45	22.49	22.41
		6	0	21.49	21.73	21.60
1.4M	16QAM	1	0	21.87	22.01	21.91
		1	2	21.77	21.88	21.96
		1	5	21.68	21.81	21.75
		3	0	21.49	21.78	21.66
		3	1	21.50	21.71	21.50
		3	3	21.50	21.72	21.60
		6	0	20.50	20.69	20.55
1.4M	64QAM	1	0	20.60	20.82	20.77
		1	2	20.68	20.83	20.66
		1	5	20.35	20.51	20.39
		3	0	20.53	20.74	20.67
		3	1	20.53	20.64	20.67
		3	3	20.50	20.56	20.43
		6	0	19.54	19.60	19.57

ERP Power (dBm)

Band	GSM 850		
Channel	128	189	251
Frequency	824.2	836.4	848.8
GSM	26.21	26.12	26.18
GPRS 1Tx Slot	26.20	25.93	25.99
GPRS 2Tx Slot	24.52	24.37	24.45
GPRS 3Tx Slot	22.87	22.67	22.91
GPRS 4Tx Slot	21.88	21.96	21.67

*ERP = Conducted + antenna gain (-4.80dBi) - 2.15

Band	WCDMA V		
TX Channel	4132	4182	4233
Rx Channel	4357	4407	4458
Frequency	826.4	836.4	846.6
RMC 12.2K	16.71	16.79	16.72
HSDPA Subtest-1	15.71	15.78	15.73
HSDPA Subtest-2	15.69	15.78	15.72
HSDPA Subtest-3	15.19	15.29	15.23
HSDPA Subtest-4	15.15	15.30	15.23
HSUPA Subtest-1	15.70	15.77	15.71
HSUPA Subtest-2	13.68	13.77	13.69
HSUPA Subtest-3	14.68	14.77	14.71
HSUPA Subtest-4	13.69	13.78	13.74
HSUPA Subtest-5	15.75	15.75	15.75

*ERP = Conducted + antenna gain (-4.80dBi) - 2.15

LTE Band 5						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		20450	20525	20600
		Frequency (MHz)		829	836.5	844
10M	QPSK	1	0	16.89	17.01	16.94
		1	24	16.74	16.86	16.79
		1	49	16.72	16.84	16.77
		25	0	15.83	15.95	15.88
		25	12	15.75	15.87	15.80
		25	25	15.71	15.83	15.76
		50	0	15.82	15.94	15.87
10M	16QAM	1	0	15.76	15.89	15.72
		1	24	15.66	15.81	15.54
		1	49	16.01	15.53	15.76
		25	0	14.86	14.98	14.91
		25	12	14.84	14.96	14.89
		25	25	14.82	14.94	14.87
		50	0	14.75	14.87	14.80
10M	64QAM	1	0	14.94	14.79	14.99
		1	24	14.90	15.02	14.95
		1	49	14.66	14.78	14.71
		25	0	13.86	13.98	13.91
		25	12	13.81	13.93	13.86
		25	25	13.78	13.90	13.83
		50	0	13.77	13.89	13.82

*ERP = Conducted + antenna gain (-4.80dBi) - 2.15

LTE Band 5						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		20425	20525	20625
		Frequency (MHz)		826.5	836.5	846.5
5M	QPSK	1	0	15.70	15.82	15.79
		1	12	15.57	15.74	15.68
		1	24	15.59	15.66	15.66
		12	0	14.64	14.76	14.71
		12	6	14.58	14.75	14.61
		12	13	14.57	14.64	14.63
		25	0	14.62	14.75	14.70
5M	16QAM	1	0	15.00	15.09	15.08
		1	12	14.90	15.07	15.01
		1	24	14.81	14.94	14.89
		12	0	13.72	13.86	13.76
		12	6	13.70	13.77	13.70
		12	13	13.62	13.75	13.70
		25	0	13.60	13.67	13.63
5M	64QAM	1	0	13.84	13.96	13.86
		1	12	13.76	13.84	13.83
		1	24	13.50	13.61	13.56
		12	0	12.69	12.80	12.77
		12	6	12.70	12.73	12.74
		12	13	12.58	12.72	12.69
		25	0	12.66	12.71	12.71

*ERP = Conducted + antenna gain (-4.80dBi) - 2.15

LTE Band 5						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		20415	20525	20635
		Frequency (MHz)		825.5	836.5	847.5
3M	QPSK	1	0	15.74	15.84	15.80
		1	7	15.56	15.69	15.61
		1	14	15.52	15.71	15.61
		8	0	14.65	14.83	14.69
		8	3	14.59	14.71	14.70
		8	7	14.57	14.66	14.63
		15	0	14.69	14.82	14.77
3M	16QAM	1	0	15.01	15.17	15.12
		1	7	14.96	15.11	15.04
		1	14	14.81	14.94	14.93
		8	0	13.67	13.82	13.73
		8	3	13.64	13.79	13.73
		8	7	13.63	13.80	13.76
		15	0	13.60	13.73	13.68
3M	64QAM	1	0	13.74	13.87	13.89
		1	7	13.74	13.87	13.76
		1	14	13.55	13.66	13.58
		8	0	12.66	12.81	12.72
		8	3	12.66	12.78	12.67
		8	7	12.62	12.78	12.64
		15	0	12.60	12.71	12.65

*ERP = Conducted + antenna gain (-4.80dBi) - 2.15

LTE Band 5						
BW	MCS Index	RB Size	RB Offset	Low	Mid	High
		Channel		20407	20525	20643
		Frequency (MHz)		824.7	836.5	848.3
1.4M	QPSK	1	0	15.62	15.78	15.61
		1	2	15.53	15.63	15.59
		1	5	15.43	15.66	15.60
		3	0	15.62	15.76	15.67
		3	1	15.51	15.66	15.48
		3	3	15.50	15.54	15.46
		6	0	14.54	14.78	14.65
1.4M	16QAM	1	0	14.92	15.06	14.96
		1	2	14.82	14.93	15.01
		1	5	14.73	14.86	14.80
		3	0	14.54	14.83	14.71
		3	1	14.55	14.76	14.55
		3	3	14.55	14.77	14.65
		6	0	13.55	13.74	13.60
1.4M	64QAM	1	0	13.65	13.87	13.82
		1	2	13.73	13.88	13.71
		1	5	13.40	13.56	13.44
		3	0	13.58	13.79	13.72
		3	1	13.58	13.69	13.72
		3	3	13.55	13.61	13.48
		6	0	12.59	12.65	12.62

*ERP = Conducted + antenna gain (-4.80dBi) - 2.15

4.2 Modulation Characteristics Measurement

4.2.1 Limits of Modulation Characteristics

N/A

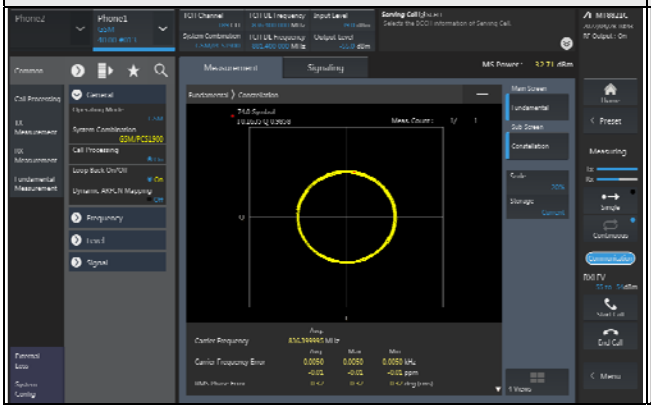
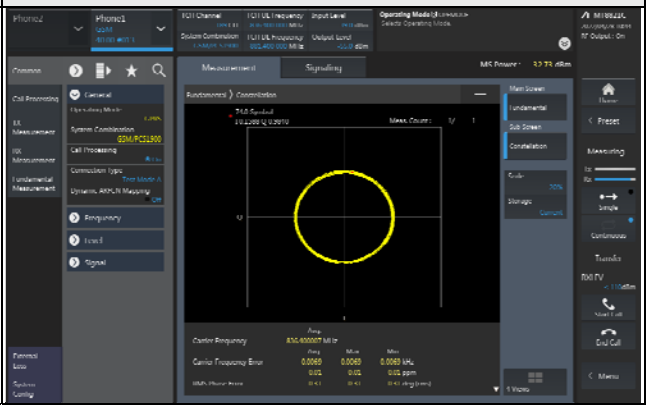
4.2.2 Test Procedure

Connect the EUT to Communication Simulator via the antenna connector, The frequency band is set as EUT supported Modulation and Channels, the EUT output is matched with 50 ohm load, the waveform quality and constellation of the EUT was tested.

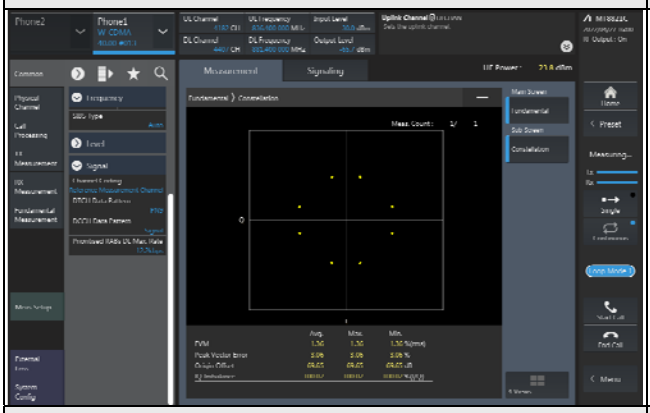
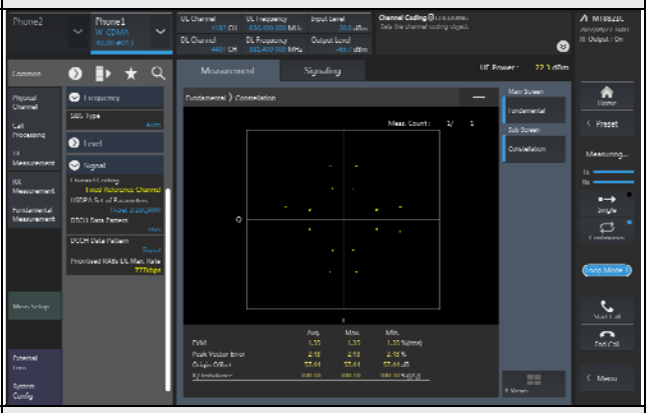
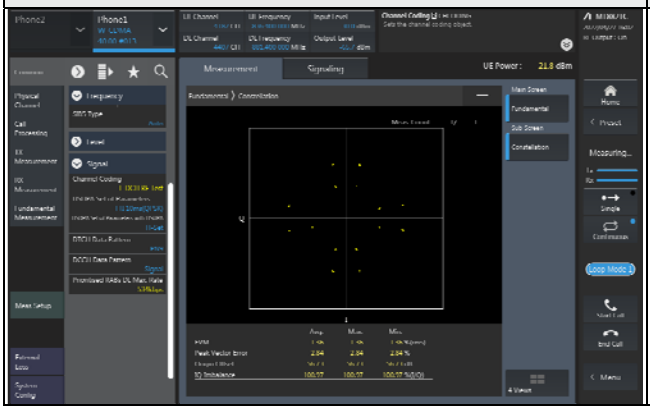
4.2.3 Test Setup

4.2.4 Test Results

GSM

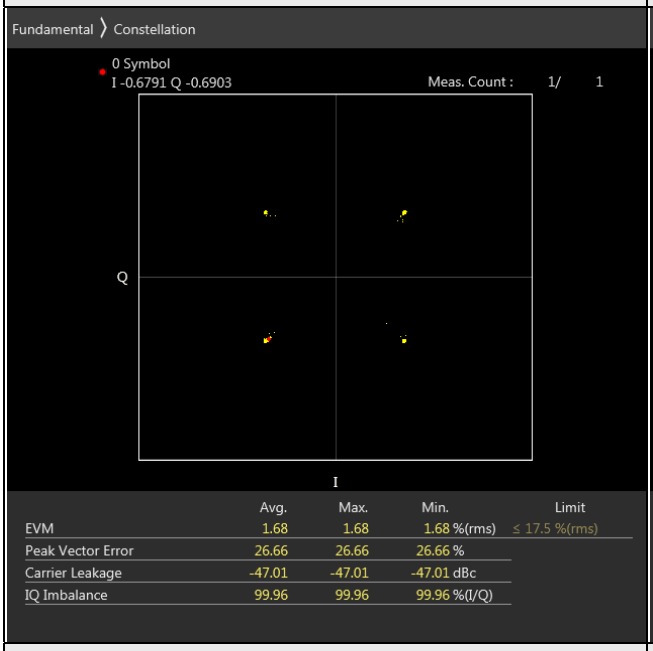
Spectrum Plot of Measurement Value	
Channel: 189 / Frequency (MHz): 836.4MHz	
GSM	GPRS
	

WCDMA

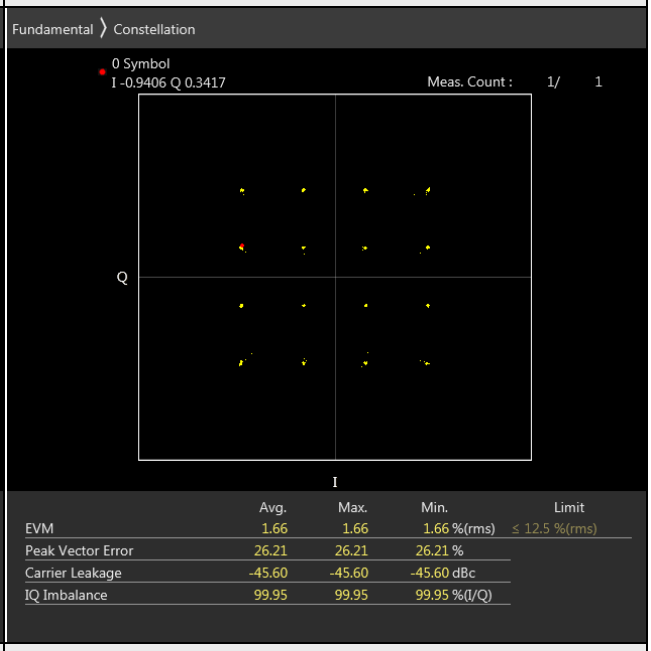
Spectrum Plot of Measurement Value	
Channel: 4182 / Frequency (MHz): 836.4MHz	
WCDMA	HSDPA
	
HSUPA	
	

LTE Band 5

Spectrum Plot of Measurement Value	
Channel: 20525 / Frequency (MHz): 836.5MHz	
QPSK	16QAM

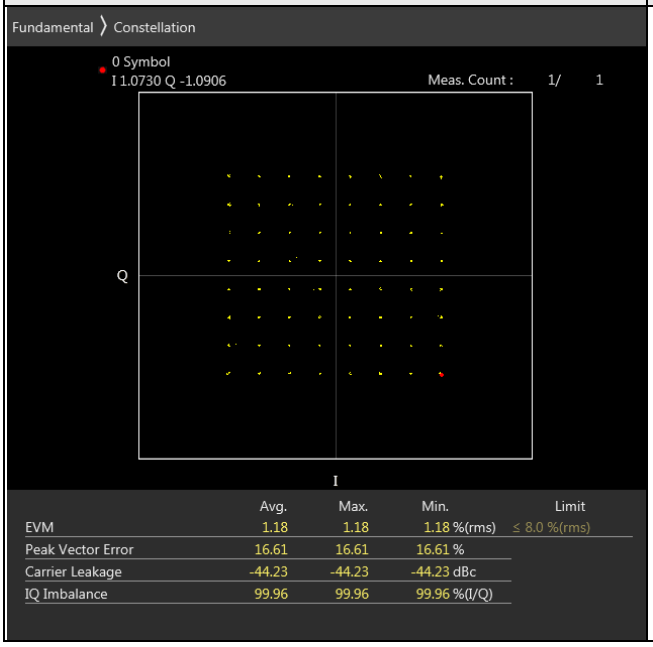


	Avg.	Max.	Min.	Limit
EVM	1.68	1.68	1.68 %(rms)	≤ 17.5 %(rms)
Peak Vector Error	26.66	26.66	26.66 %	
Carrier Leakage	-47.01	-47.01	-47.01 dBc	
IQ Imbalance	99.96	99.96	99.96 %(I/Q)	



	Avg.	Max.	Min.	Limit
EVM	1.66	1.66	1.66 %(rms)	≤ 12.5 %(rms)
Peak Vector Error	26.21	26.21	26.21 %	
Carrier Leakage	-45.60	-45.60	-45.60 dBc	
IQ Imbalance	99.95	99.95	99.95 %(I/Q)	

64QAM	



	Avg.	Max.	Min.	Limit
EVM	1.18	1.18	1.18 %(rms)	≤ 8.0 %(rms)
Peak Vector Error	16.61	16.61	16.61 %	
Carrier Leakage	-44.23	-44.23	-44.23 dBc	
IQ Imbalance	99.96	99.96	99.96 %(I/Q)	

4.3 Frequency Stability Measurement

4.3.1 Limits of Frequency Stability Measurement

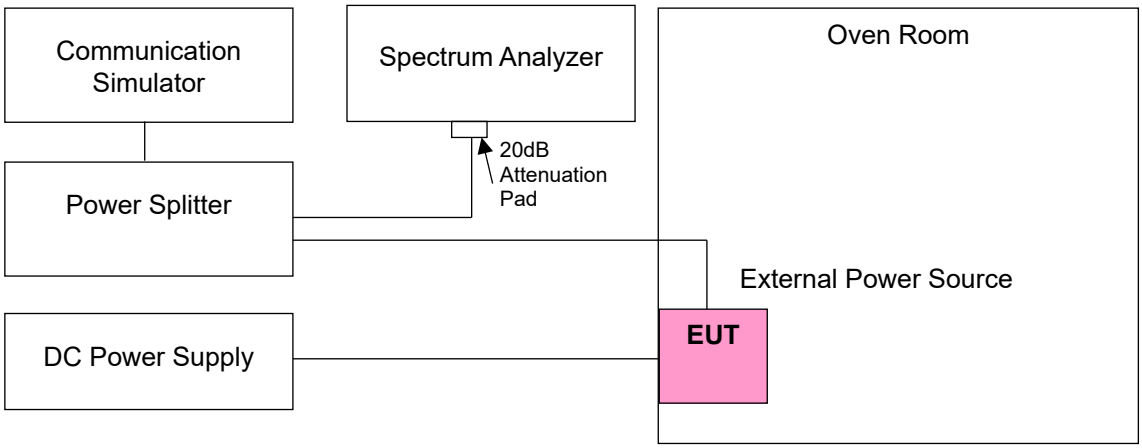
1.5 ppm is for base and fixed station. 2.5 ppm is for mobile station.

4.3.2 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.

4.3.3 Test Setup



4.3.4 Test Results

Frequency Error vs. Voltage

Voltage (Vdc)	GSM			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.60	824.200002	0.002	848.800001	0.001
3.87	824.200004	0.005	848.800001	0.001
4.45	824.200003	0.004	848.800001	0.001

Note: The applicant defined the normal working voltage is from 3.60Vdc to 4.45Vdc.

Frequency Error vs. Temperature

Temp. (℃)	GSM			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	824.200001	0.001	848.800002	0.002
-20	824.200003	0.004	848.800001	0.001
-10	824.200004	0.005	848.800002	0.002
0	824.200002	0.002	848.800001	0.001
10	824.199998	-0.002	848.799997	-0.004
20	824.199997	-0.004	848.799997	-0.004
30	824.199999	-0.001	848.799999	-0.001
40	824.199998	-0.002	848.799998	-0.002
50	824.199996	-0.005	848.799998	-0.002

Frequency Error vs. Voltage

Voltage (Vdc)	WCDMA			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.60	826.400004	0.005	846.600003	0.004
3.87	826.400001	0.001	846.600004	0.005
4.45	826.400002	0.002	846.600002	0.002

Note: The applicant defined the normal working voltage is from 3.60Vdc to 4.45Vdc.

Frequency Error vs. Temperature

Temp. (℃)	WCDMA			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	826.400004	0.005	846.600001	0.001
-20	826.400002	0.002	846.600002	0.002
-10	826.400002	0.002	846.600003	0.004
0	826.400003	0.004	846.600002	0.002
10	826.399997	-0.004	846.599997	-0.004
20	826.399998	-0.002	846.599997	-0.004
30	826.399998	-0.002	846.599996	-0.005
40	826.399998	-0.002	846.599999	-0.001
50	826.399998	-0.002	846.599998	-0.002

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 5			
	Channel Bandwidth 1.4 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.60	824.700004	0.005	848.300001	0.001
3.87	824.700002	0.002	848.300003	0.004
4.45	824.700002	0.002	848.300001	0.001

Note: The applicant defined the normal working voltage is from 3.60Vdc to 4.45Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 5			
	Channel Bandwidth 1.4 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	824.700035	0.042	848.300024	0.028
-20	824.700023	0.028	848.300034	0.040
-10	824.700037	0.045	848.300034	0.040
0	824.700039	0.047	848.300019	0.022
10	824.700036	0.044	848.300036	0.042
20	824.699962	-0.046	848.299968	-0.038
30	824.699983	-0.021	848.299972	-0.033
40	824.699973	-0.033	848.299977	-0.027
50	824.699967	-0.040	848.299986	-0.017

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 5			
	Channel Bandwidth 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.60	825.500001	0.001	847.500004	0.005
3.87	825.500004	0.005	847.500001	0.001
4.45	825.500003	0.004	847.500003	0.004

Note: The applicant defined the normal working voltage is from 3.60Vdc to 4.45Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 5			
	Channel Bandwidth 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	825.500004	0.005	847.500003	0.004
-20	825.500001	0.001	847.500002	0.002
-10	825.500001	0.001	847.500001	0.001
0	825.500001	0.001	847.500001	0.001
10	825.499999	-0.001	847.499999	-0.001
20	825.499997	-0.004	847.499999	-0.001
30	825.499997	-0.004	847.499997	-0.004
40	825.499997	-0.004	847.499998	-0.002
50	825.499999	-0.001	847.499999	-0.001

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 5			
	Channel Bandwidth 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.60	826.500003	0.004	846.500004	0.005
3.87	826.500004	0.005	846.500002	0.002
4.45	826.500001	0.001	846.500001	0.001

Note: The applicant defined the normal working voltage is from 3.60Vdc to 4.45Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 5			
	Channel Bandwidth 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	826.500002	0.002	846.500001	0.001
-20	826.500001	0.001	846.500001	0.001
-10	826.500003	0.004	846.500003	0.004
0	826.500003	0.004	846.500001	0.001
10	826.499999	-0.001	846.499998	-0.002
20	826.499999	-0.001	846.499999	-0.001
30	826.499998	-0.002	846.499999	-0.001
40	826.499996	-0.005	846.499996	-0.005
50	826.499997	-0.004	846.499997	-0.004

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 5			
	Channel Bandwidth 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.60	829.000001	0.001	844.000004	0.005
3.87	829.000003	0.004	844.000004	0.005
4.45	829.000003	0.004	844.000003	0.004

Note: The applicant defined the normal working voltage is from 3.60Vdc to 4.45Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 5			
	Channel Bandwidth 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	829.000001	0.001	844.000004	0.005
-20	829.000001	0.001	844.000002	0.002
-10	829.000004	0.005	844.000003	0.004
0	829.000003	0.004	844.000004	0.005
10	828.999998	-0.002	843.999998	-0.002
20	828.999999	-0.001	843.999997	-0.004
30	828.999998	-0.002	843.999999	-0.001
40	828.999996	-0.005	843.999998	-0.002
50	828.999996	-0.005	843.999996	-0.005

4.4 Occupied Bandwidth Measurement

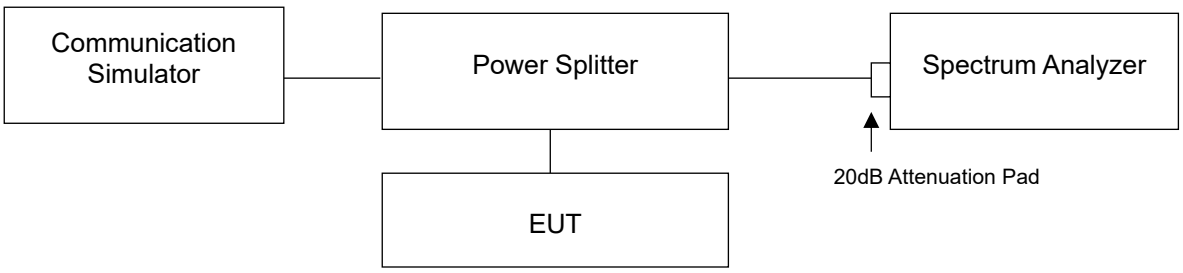
4.4.1 Test Procedure

For the 26dBc bandwidth measurement method, please refer to section 5.4.3 of ANSI C63.26.

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be wide enough to see sufficient roll off of the signal to make the measurement.
b) The nominal RBW shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set ≥ 3 × RBW.
c) Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation. See guidance provided in 4.2.3.
d) The dynamic range of the spectrum analyzer at the selected RBW shall be more than 10 dB below the target "−X dB" requirement, i.e., if the requirement calls for measuring the −26 dB OBW, the spectrum analyzer noise floor at the selected RBW shall be at least 36 dB below the reference level.
e) Set spectrum analyzer detection mode to peak, and the trace mode to max hold.
f) Determine the following reference values: Set the EUT to transmit a modulated signal. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference value).
g) Determine the "−X dB amplitude" as equal to (Reference Value − X). Alternatively, this calculation can be performed on the spectrum analyzer using the delta-marker measurement function.
h) Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display such that each marker is at or slightly below the "−X dB amplitude" determined in step f). If a marker is below this "−X dB amplitude" value it should be as close as possible to this value. The OBW is the positive frequency difference between the two markers.
i) The OBW shall be reported by providing plot(s) of the measuring instrument display, to include markers depicting the relevant frequency and amplitude information (e.g., marker table). The frequency and amplitude axis and scale shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

For the occupied bandwidth measurement method, please refer to section 5.4.4 of ANSI C63.26.

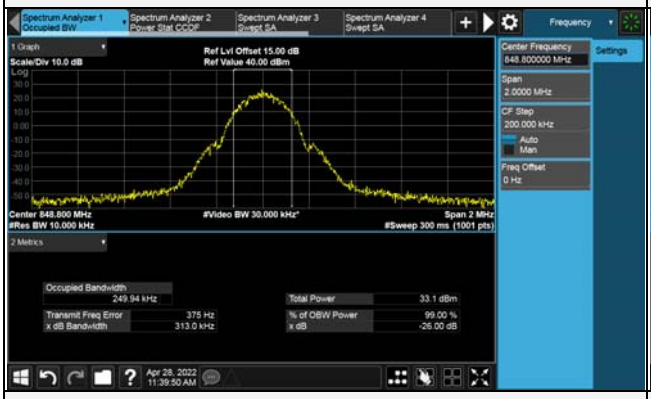
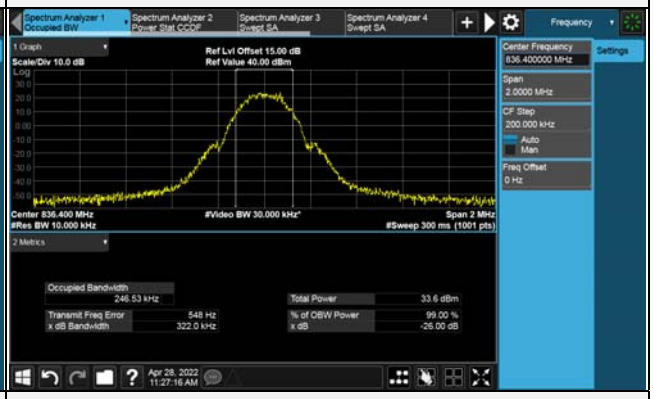
4.4.2 Test Setup



4.4.3 Test Result

GSM

Test Condition	Channel	Frequency (MHz)	Occupied bandwidth (kHz)	26dB Bandwidth (kHz)
GSM	128	824.2	245.71	313.80
GSM	189	836.4	246.53	322.00
GSM	251	848.8	246.25	321.20
GPRS	128	824.2	247.83	312.70
GPRS	189	836.4	245.14	312.50
GPRS	251	848.8	249.94	313.00

Spectrum Plot of Worst Value	
Occupied bandwidth	26dB Bandwidth
	
GPRS CH 251 (848.8MHz)	GSM CH 189 (836.4MHz)

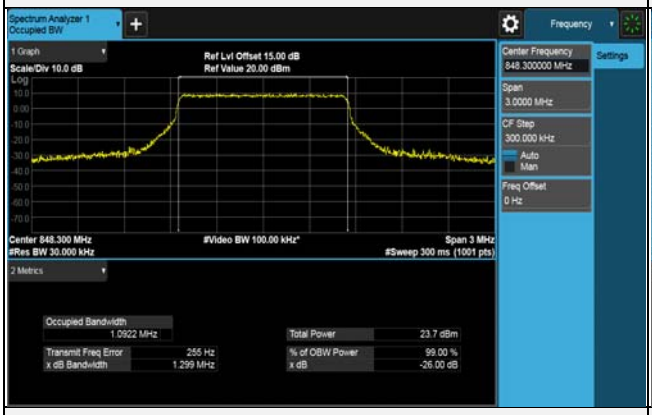
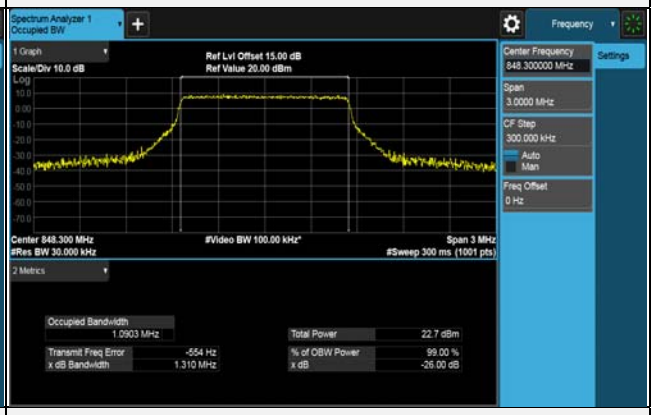
WCDMA

Test Condition	Channel	Frequency (MHz)	Occupied bandwidth (MHz)	26dB Bandwidth (MHz)
WCDMA	4132	826.4	4.15	4.71
WCDMA	4182	836.4	4.15	4.72
WCDMA	4233	846.6	4.15	4.71
HSDPA	4132	826.4	4.15	4.72
HSDPA	4182	836.4	4.15	4.72
HSDPA	4233	846.6	4.15	4.71
HSUPA	4132	826.4	4.15	4.71
HSUPA	4182	836.4	4.15	4.72
HSUPA	4233	846.6	4.15	4.71

Spectrum Plot of Worst Value	
Occupied bandwidth	26dB Bandwidth
	
WCDMA CH 4132 (826.4MHz)	WCDMA CH 4132 (826.4MHz)

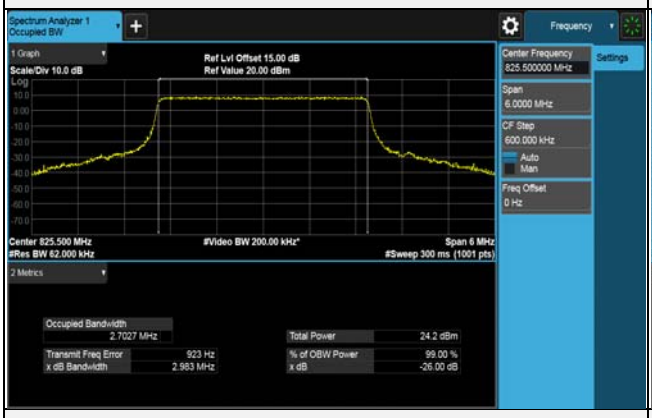
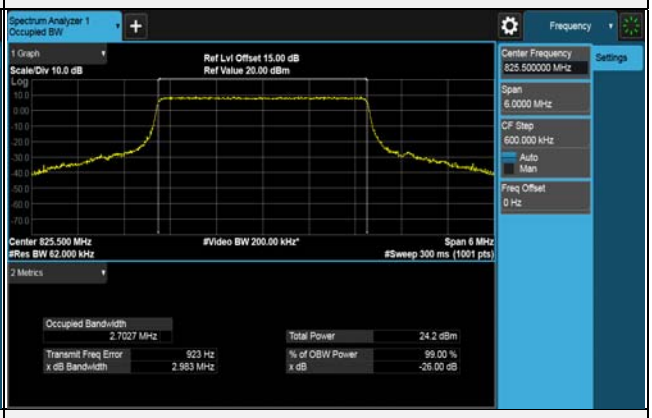
LTE Band 5 (Channel Bandwidth 1.4MHz)

Test Condition	Channel	Frequency (MHz)	Occupied bandwidth (MHz)	26dB Bandwidth (MHz)
QPSK	20407	824.7	1.0901	1.290
QPSK	20525	836.5	1.0920	1.301
QPSK	20643	848.3	1.0908	1.288
16QAM	20407	824.7	1.0921	1.269
16QAM	20525	836.5	1.0904	1.302
16QAM	20643	848.3	1.0922	1.299
64QAM	20407	824.7	1.0900	1.303
64QAM	20525	836.5	1.0904	1.300
64QAM	20643	848.3	1.0903	1.310

Spectrum Plot of Worst Value	
Occupied bandwidth	26dB Bandwidth
	
16QAM CH 20643 (848.3MHz)	64QAM CH 20643 (848.3MHz)

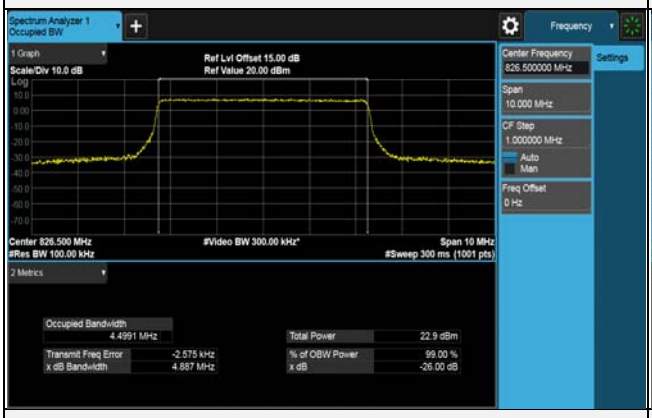
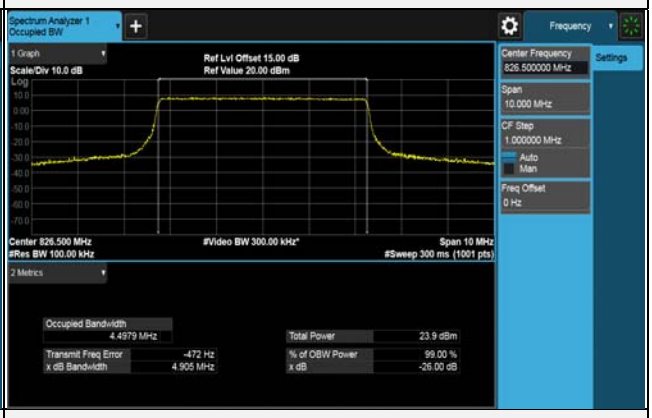
LTE Band 5 (Channel Bandwidth 3MHz)

Test Condition	Channel	Frequency (MHz)	Occupied bandwidth (MHz)	26dB Bandwidth (MHz)
QPSK	20415	825.5	2.7027	2.983
QPSK	20525	836.5	2.7021	2.973
QPSK	20635	847.5	2.6995	2.939
16QAM	20415	825.5	2.7014	2.937
16QAM	20525	836.5	2.7023	2.960
16QAM	20635	847.5	2.7004	2.972
64QAM	20415	825.5	2.7017	2.946
64QAM	20525	836.5	2.7014	2.944
64QAM	20635	847.5	2.7002	2.952

Spectrum Plot of Worst Value	
Occupied bandwidth	26dB Bandwidth
	
QPSK CH 20415 (825.5MHz)	QPSK CH 20415 (825.5MHz)

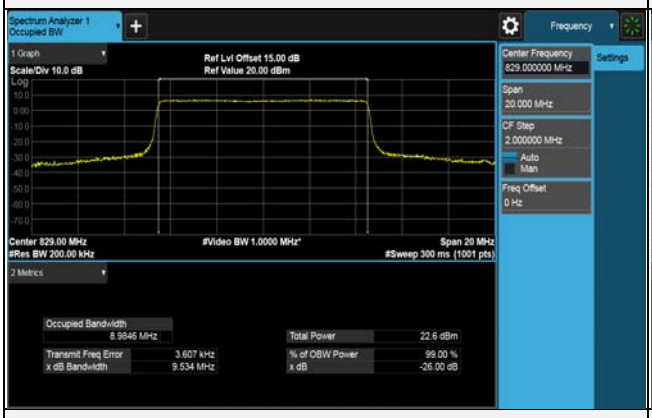
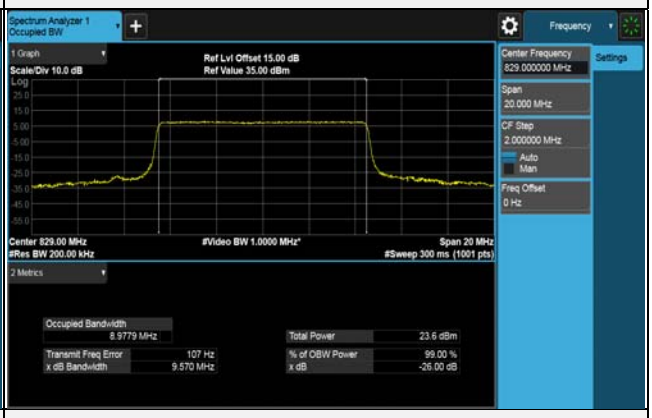
LTE Band 5 (Channel Bandwidth 5MHz)

Test Condition	Channel	Frequency (MHz)	Occupied bandwidth (MHz)	26dB Bandwidth (MHz)
QPSK	20425	826.5	4.4979	4.905
QPSK	20525	836.5	4.4928	4.871
QPSK	20625	846.5	4.4941	4.870
16QAM	20425	826.5	4.4991	4.887
16QAM	20525	836.5	4.4947	4.872
16QAM	20625	846.5	4.4939	4.876
64QAM	20425	826.5	4.4930	4.873
64QAM	20525	836.5	4.4925	4.852
64QAM	20625	846.5	4.4904	4.893

Spectrum Plot of Worst Value	
Occupied bandwidth	26dB Bandwidth
	
16QAM CH 20425 (826.5MHz)	QPSK CH 20425 (826.5MHz)

LTE Band 5 (Channel Bandwidth 10MHz)

Test Condition	Channel	Frequency (MHz)	Occupied bandwidth (MHz)	26dB Bandwidth (MHz)
QPSK	20450	829	8.9779	9.570
QPSK	20525	836.5	8.9643	9.538
QPSK	20600	844	8.9791	9.537
16QAM	20450	829	8.9846	9.534
16QAM	20525	836.5	8.9672	9.566
16QAM	20600	844	8.9703	9.558
64QAM	20450	829	8.9795	9.531
64QAM	20525	836.5	8.9647	9.524
64QAM	20600	844	8.9756	9.535

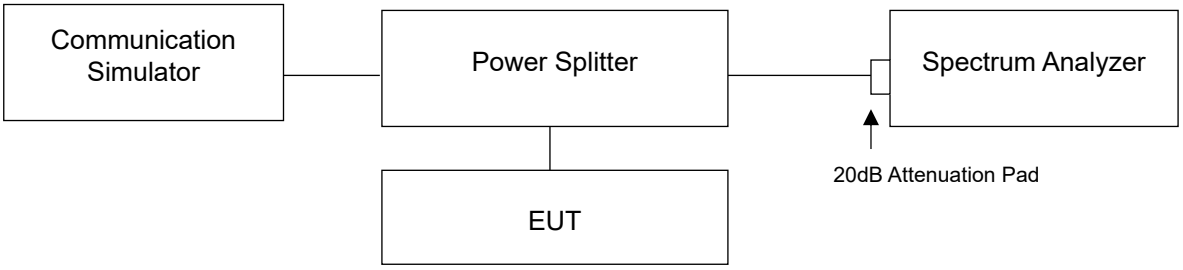
Spectrum Plot of Worst Value	
Occupied bandwidth	26dB Bandwidth
	
16QAM CH 20450 (829MHz)	QPSK CH 20450 (829MHz)

4.5 Band Edge Measurement

4.5.1 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.

4.5.2 Test Setup

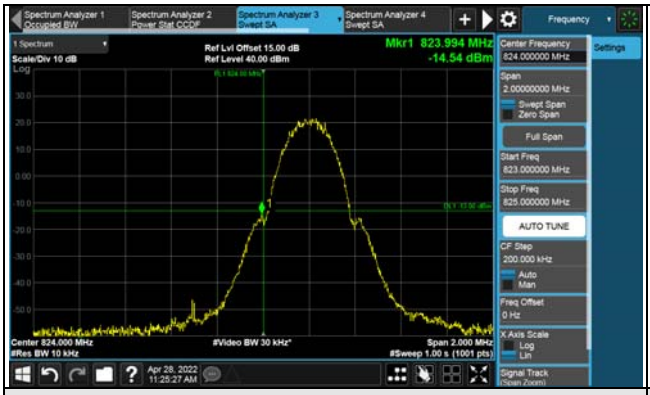
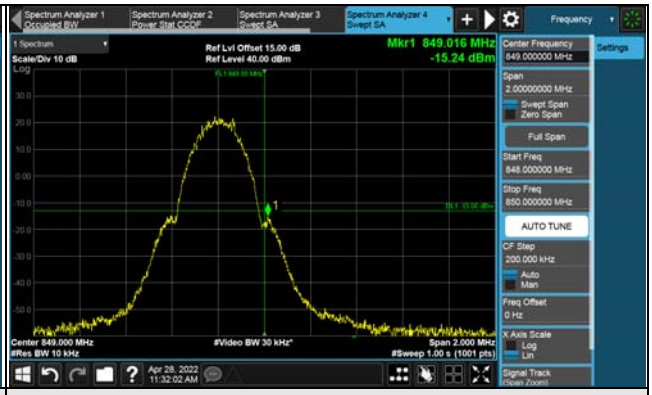


4.5.3 Test Procedures

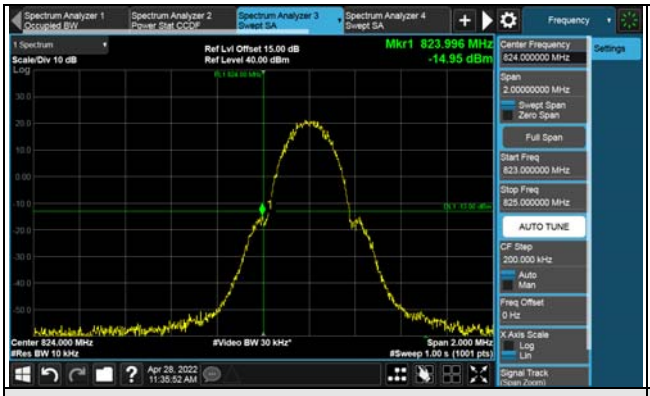
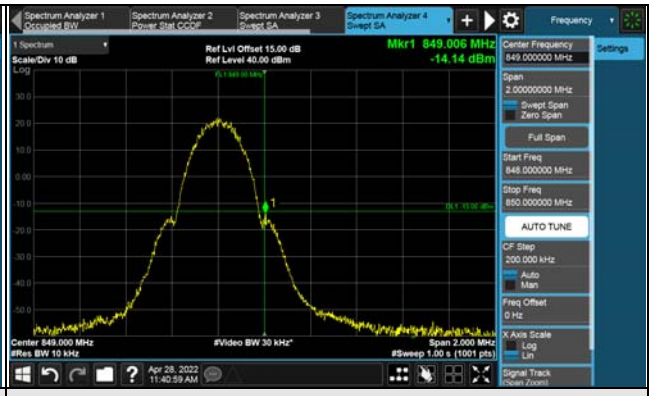
a. All measurements were done at low and high operational frequency range.
b. The center frequency of spectrum is the band edge frequency and span is 2MHz. RB of the spectrum is 10kHz and VB of the spectrum is 30kHz (GSM / GPRS).
c. The center frequency of spectrum is the band edge frequency and span is 1MHz. RB of the spectrum is 51kHz and VB of the spectrum is 160kHz (WCDMA / HSDPA / HSUPA).
d. The center frequency of spectrum is the band edge frequency and span is 1MHz. RB of the spectrum is 15kHz and VB of the spectrum is 51kHz (LTE Channel Bandwidth 1.4MHz).
e. The center frequency of spectrum is the band edge frequency and span is 1MHz. RB of the spectrum is 30kHz and VB of the spectrum is 100kHz (LTE Channel Bandwidth 3MHz).
f. The center frequency of spectrum is the band edge frequency and span is 1MHz. RB of the spectrum is 51kHz and VB of the spectrum is 160kHz (LTE Channel Bandwidth 5MHz).
g. The center frequency of spectrum is the band edge frequency and span is 1MHz. RB of the spectrum is 100kHz and VB of the spectrum is 300kHz (LTE Channel Bandwidth 10MHz).
h. Record the max trace plot into the test report.

4.5.4 Test Results

GSM

	
824.2MHz	848.5MHz

GPRS

	
824.2MHz	848.5MHz

WCDMA

	
826.4MHz	846.6MHz

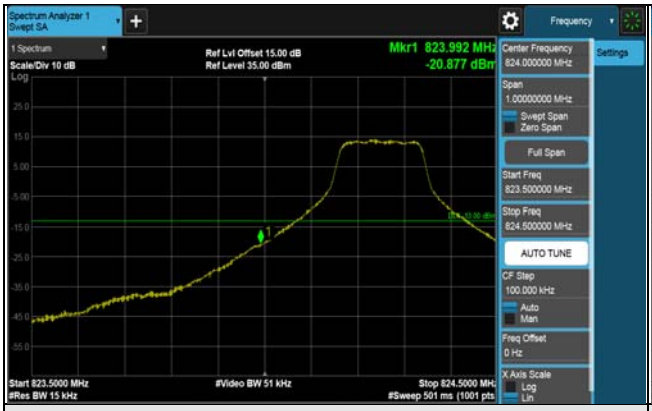
HSDPA

	
826.4MHz	846.6MHz

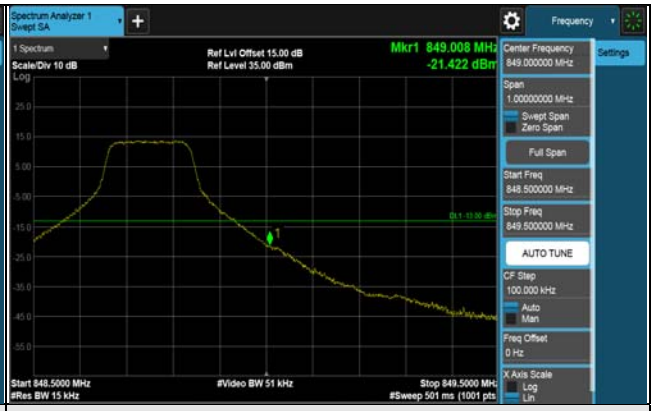
HSUPA

	
826.4MHz	846.6MHz

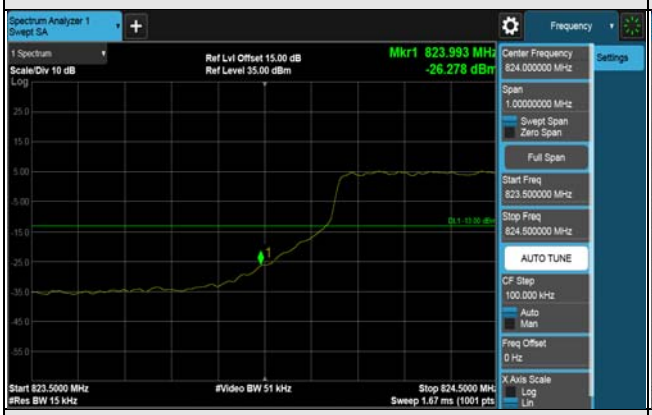
LTE Band 5 (Channel Bandwidth 1.4MHz)



VRB (824.7MHz)



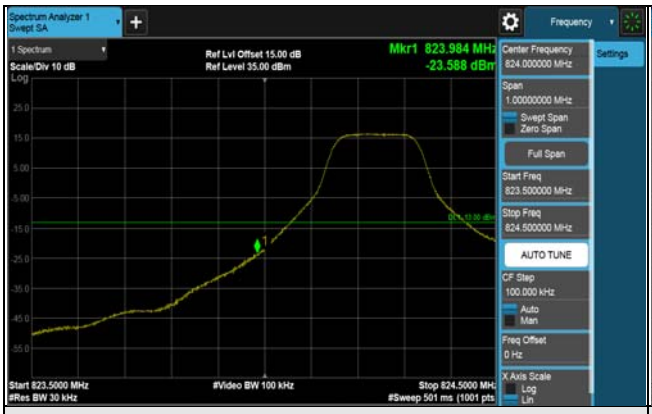
VRB (848.3MHz)



FULL (824.7MHz)

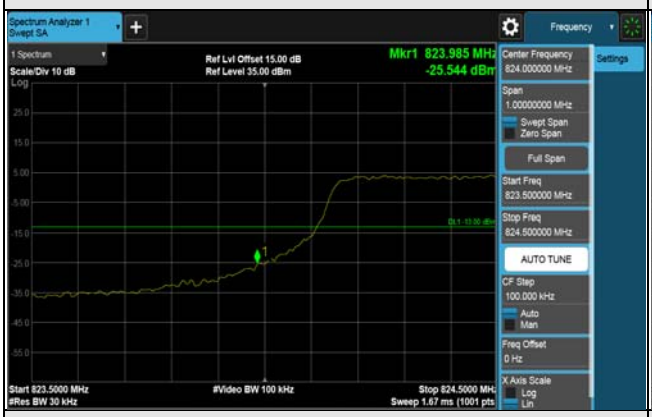
FULL (848.3MHz)

LTE Band 5 (Channel Bandwidth 3MHz)

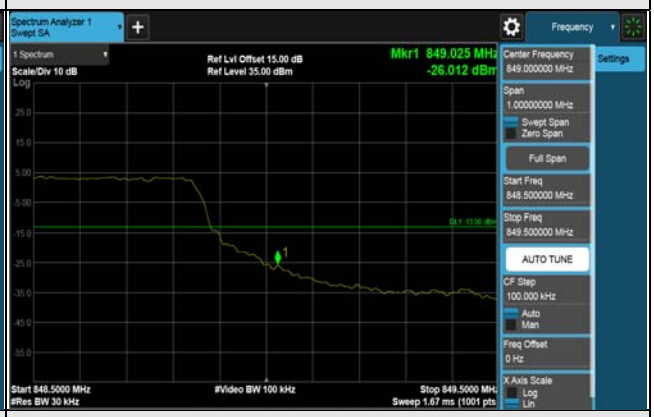


VRB (825.5MHz)

VRB (847.5MHz)



FULL (825.5MHz)



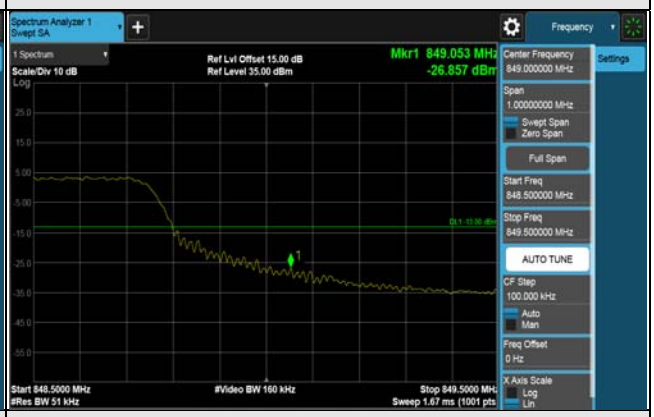
FULL (847.5MHz)

LTE Band 5 (Channel Bandwidth 5MHz)

VRB (826.5MHz)

VRB (846.5MHz)

FULL (826.5MHz)



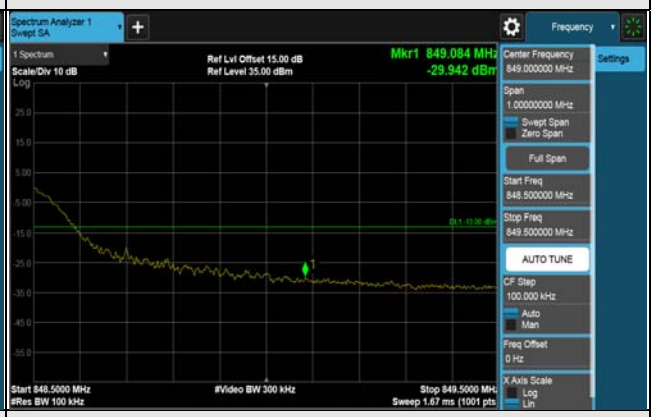
FULL (846.5MHz)

LTE Band 5 (Channel Bandwidth 10MHz)

VRB (829MHz)

VRB (844MHz)

FULL (829MHz)



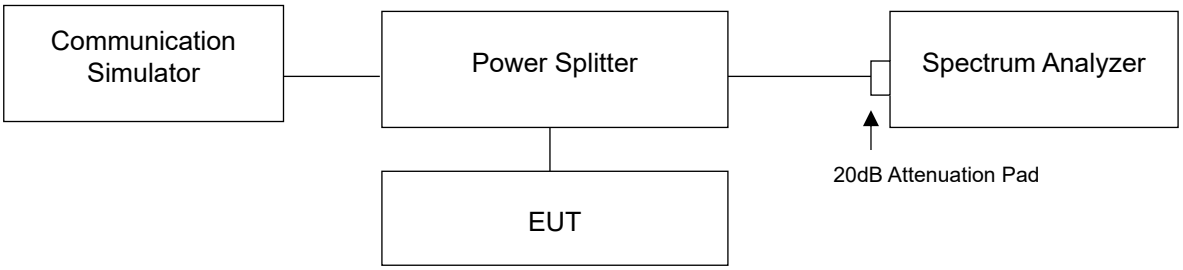
FULL (844MHz)

4.6 Peak to Average Ratio

4.6.1 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

4.6.2 Test Setup



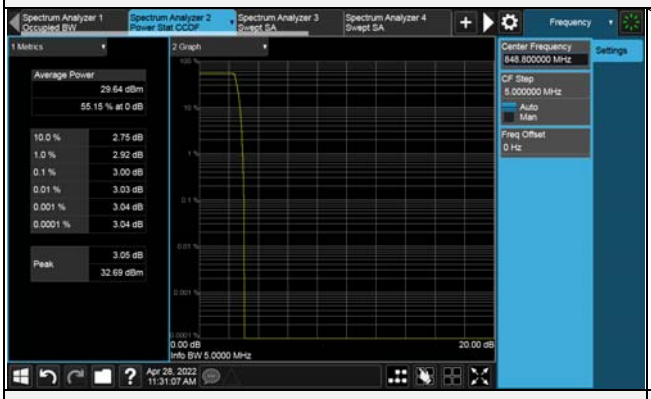
4.6.3 Test Procedures

a. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;
b. Set the number of counts to a value that stabilizes the measured CCDF curve;
c. Record the maximum PAPR level associated with a probability of 0.1%.

4.6.4 Test Results

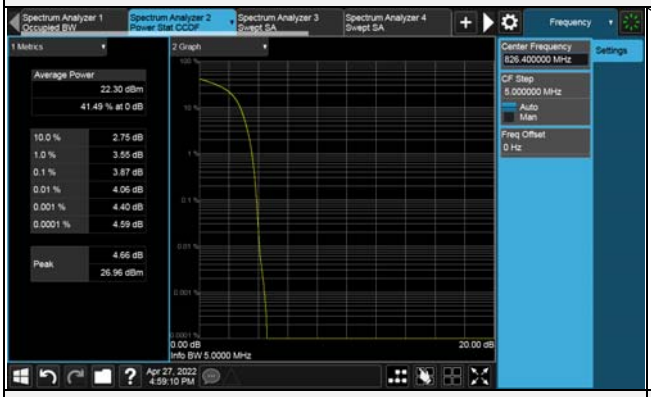
GSM

Test Condition	Channel	Frequency (MHz)	Measure. Value (dB)	Limit (dB)	Result
GSM	128	824.2	2.98	13	Pass
GSM	189	836.4	2.99	13	Pass
GSM	251	848.8	3.00	13	Pass
GPRS	128	824.2	2.98	13	Pass
GPRS	189	836.4	2.98	13	Pass
GPRS	251	848.8	3.00	13	Pass

Spectrum Plot of Worst Value	
	
GSM CH 251 (848.8MHz)	

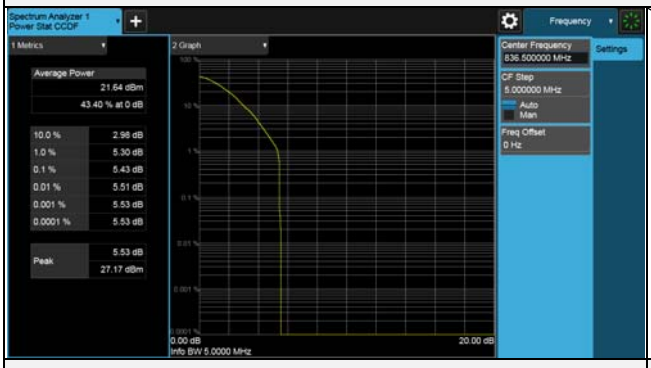
WCDMA

Test Condition	Channel	Frequency (MHz)	Measure. Value (dB)	Limit (dB)	Result
WCDMA	4132	826.4	2.96	13	Pass
WCDMA	4182	836.4	2.88	13	Pass
WCDMA	4233	846.6	2.97	13	Pass
HSDPA	4132	826.4	3.87	13	Pass
HSDPA	4182	836.4	3.78	13	Pass
HSDPA	4233	846.6	3.83	13	Pass
HSUPA	4132	826.4	3.85	13	Pass
HSUPA	4182	836.4	3.77	13	Pass
HSUPA	4233	846.6	3.86	13	Pass

Spectrum Plot of Worst Value	
	
HSDPA CH 4132 (826.4MHz)	

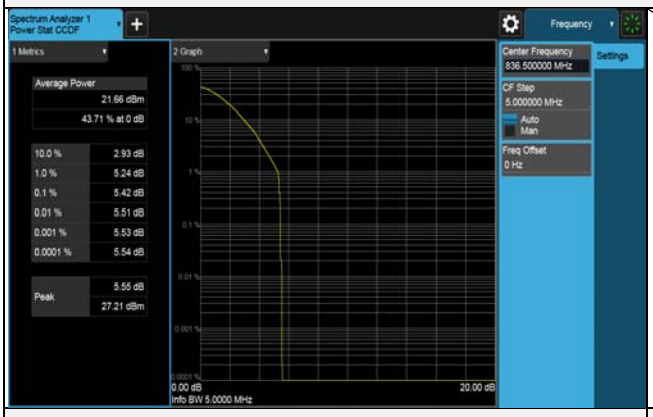
LTE Band 5 (Channel Bandwidth 1.4MHz)

Test Condition	Channel	Frequency (MHz)	Measure. Value (dB)	Limit (dB)	Result
QPSK	20407	824.7	3.48	13	Pass
QPSK	20525	836.5	3.47	13	Pass
QPSK	20643	848.3	3.50	13	Pass
16QAM	20407	824.7	4.49	13	Pass
16QAM	20525	836.5	4.51	13	Pass
16QAM	20643	848.3	4.60	13	Pass
64QAM	20407	824.7	5.38	13	Pass
64QAM	20525	836.5	5.43	13	Pass
64QAM	20643	848.3	5.36	13	Pass

Spectrum Plot of Worst Value	
	
64QAM CH 20525 (836.5MHz)	

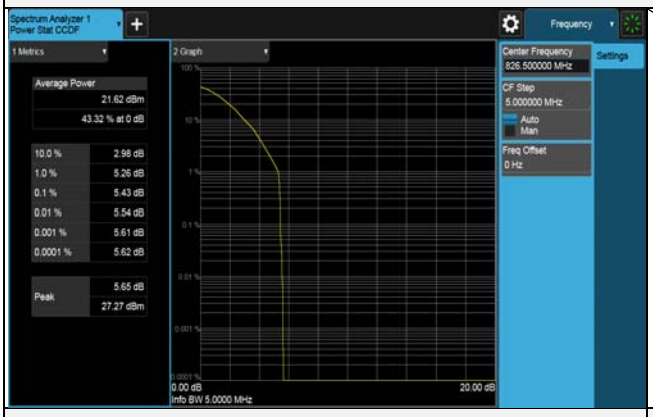
LTE Band 5 (Channel Bandwidth 3MHz)

Test Condition	Channel	Frequency (MHz)	Measure. Value (dB)	Limit (dB)	Result
QPSK	20415	825.5	3.53	13	Pass
QPSK	20525	836.5	3.59	13	Pass
QPSK	20635	847.5	3.54	13	Pass
16QAM	20415	825.5	4.45	13	Pass
16QAM	20525	836.5	4.47	13	Pass
16QAM	20635	847.5	4.54	13	Pass
64QAM	20415	825.5	5.41	13	Pass
64QAM	20525	836.5	5.42	13	Pass
64QAM	20635	847.5	5.39	13	Pass

Spectrum Plot of Worst Value	
	
64QAM CH 20525 (836.5MHz)	

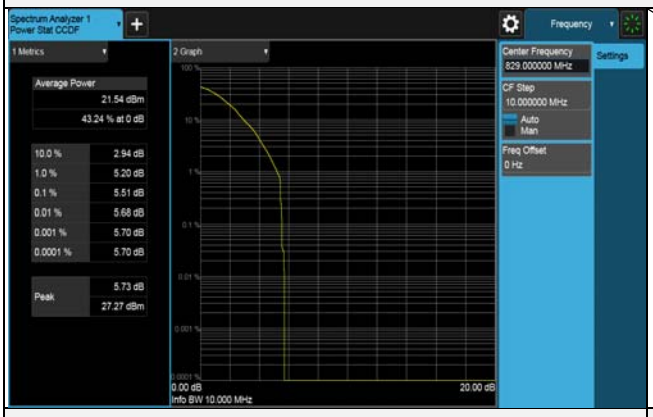
LTE Band 5 (Channel Bandwidth 5MHz)

Test Condition	Channel	Frequency (MHz)	Measure. Value (dB)	Limit (dB)	Result
QPSK	20425	826.5	3.51	13	Pass
QPSK	20525	836.5	3.51	13	Pass
QPSK	20625	846.5	3.55	13	Pass
16QAM	20425	826.5	4.49	13	Pass
16QAM	20525	836.5	4.52	13	Pass
16QAM	20625	846.5	4.52	13	Pass
64QAM	20425	826.5	5.43	13	Pass
64QAM	20525	836.5	5.38	13	Pass
64QAM	20625	846.5	5.41	13	Pass

Spectrum Plot of Worst Value	
	
64QAM CH 20425 (826.5MHz)	

LTE Band 5 (Channel Bandwidth 10MHz)

Test Condition	Channel	Frequency (MHz)	Measure. Value (dB)	Limit (dB)	Result
QPSK	20450	829	3.50	13	Pass
QPSK	20525	836.5	3.50	13	Pass
QPSK	20600	844	3.53	13	Pass
16QAM	20450	829	4.52	13	Pass
16QAM	20525	836.5	4.50	13	Pass
16QAM	20600	844	4.54	13	Pass
64QAM	20450	829	5.51	13	Pass
64QAM	20525	836.5	5.41	13	Pass
64QAM	20600	844	5.51	13	Pass

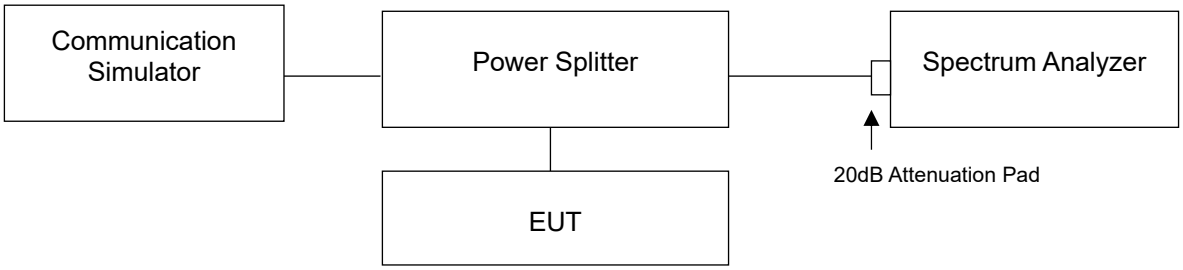
Spectrum Plot of Worst Value	
	
64QAM CH 20450 (829MHz)	

4.7 Conducted Spurious Emissions

4.7.1 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.

4.7.2 Test Setup



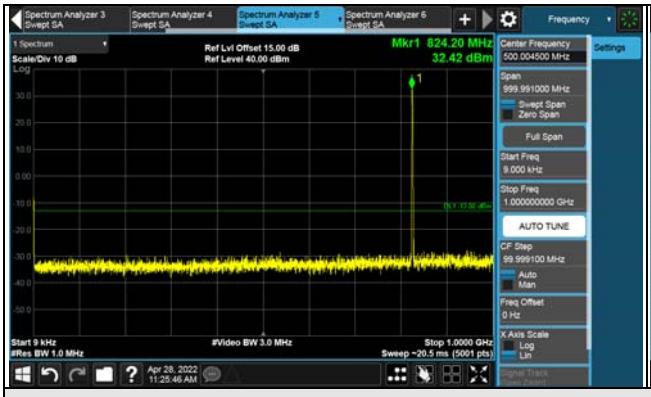
4.7.3 Test Procedure

a. All measurements were done at low, middle and high channels operational frequency range.

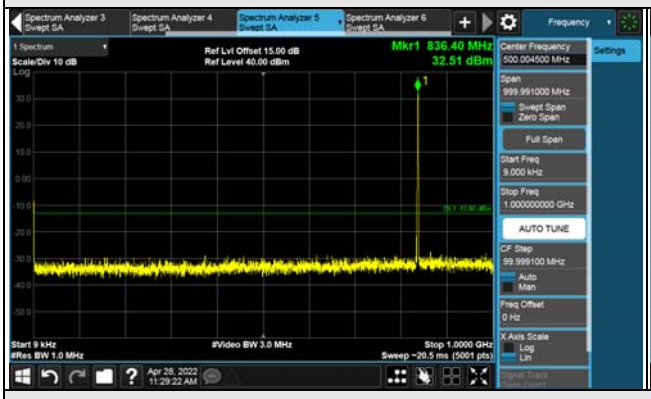
a. Measuring frequency range is from 9kHz to 9GHz / 10GHz. 20dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz are used for conducted emission measurement.

4.7.4 Test Results

GSM



CH 128 (824.2MHz)



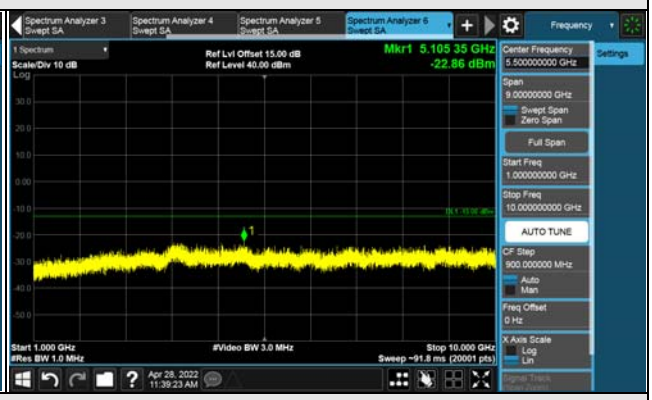
CH 189 (836.4MHz)

CH 251 (848.8MHz)

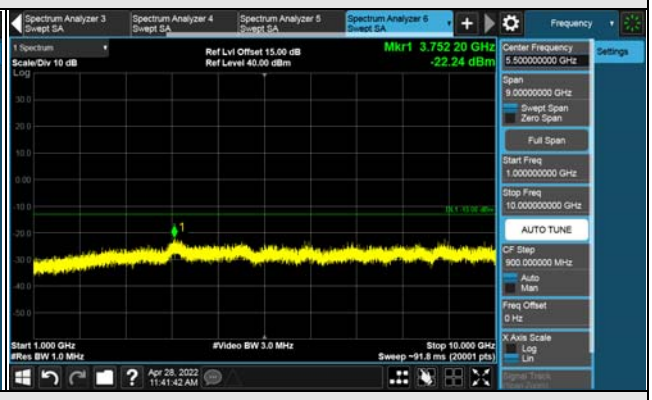
*The 9kHz signal over the limit is from Spectrum.

GPRS

CH 128 (824.2MHz)



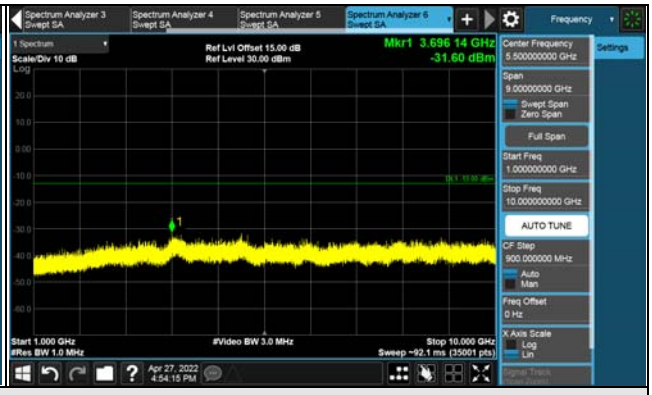
CH 189 (836.4MHz)



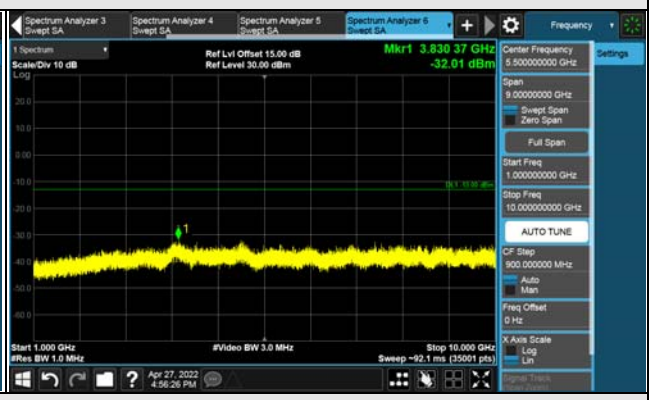
CH 251 (848.8MHz)

*The 9kHz signal over the limit is from Spectrum.

WCDMA



CH 4132 (826.4MHz)

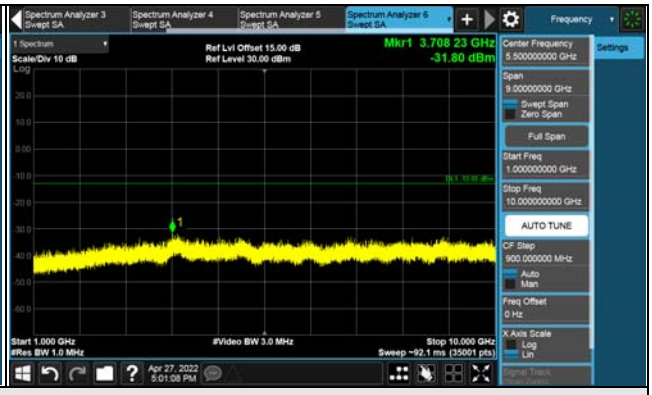


CH 4182 (836.4MHz)

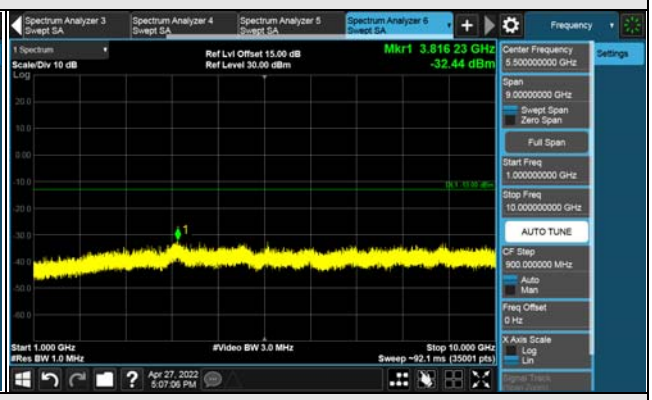
CH 4233 (846.6MHz)

*The 9kHz signal over the limit is from Spectrum.

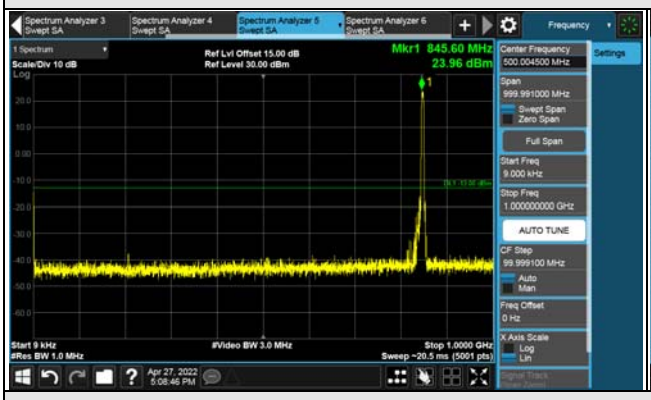
HSDPA

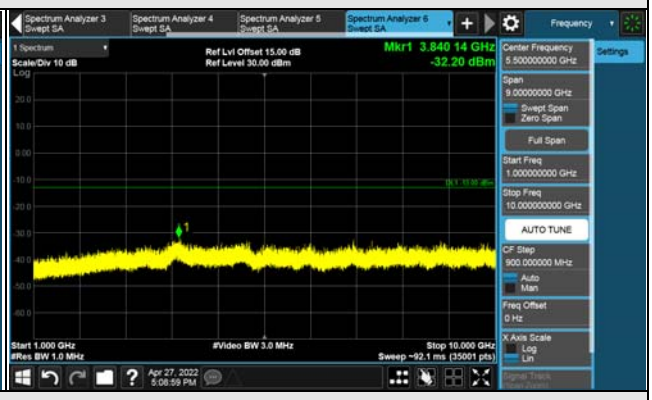


CH 4132 (826.4MHz)



CH 4182 (836.4MHz)

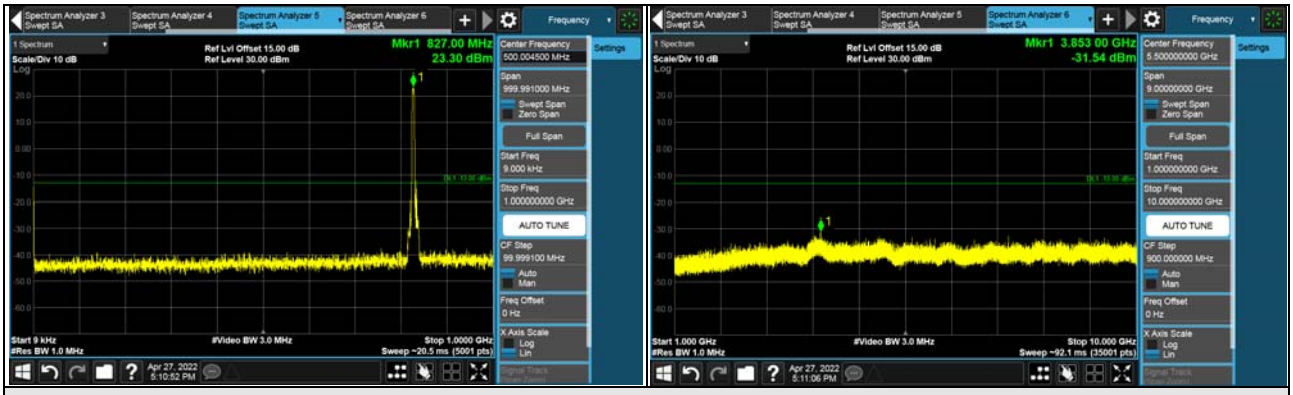




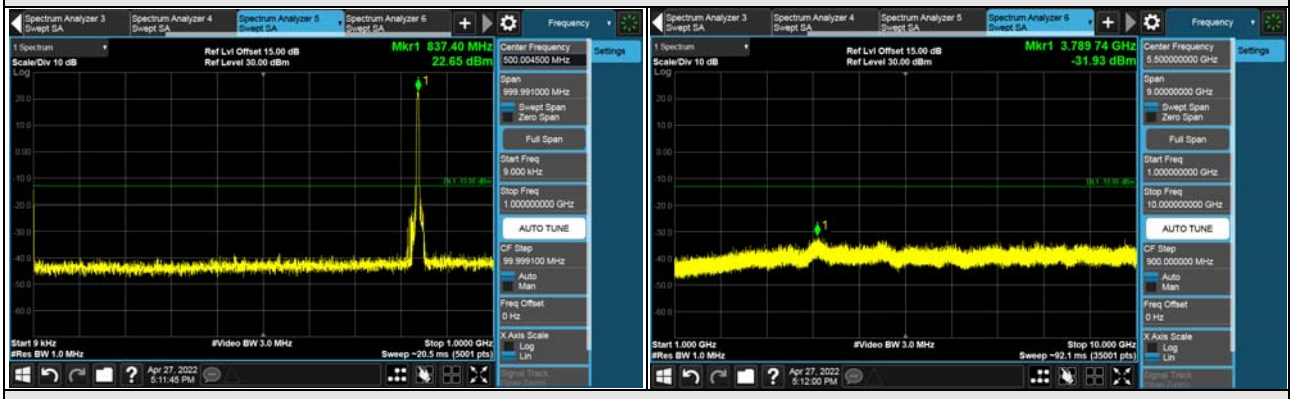
CH 4233 (846.6MHz)

*The 9kHz signal over the limit is from Spectrum.

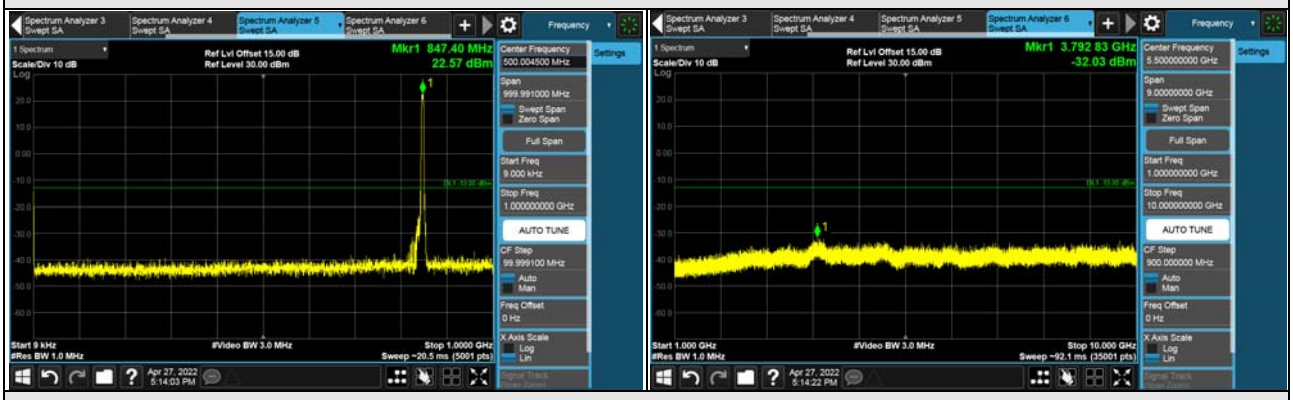
HSUPA



CH 4132 (826.4MHz)



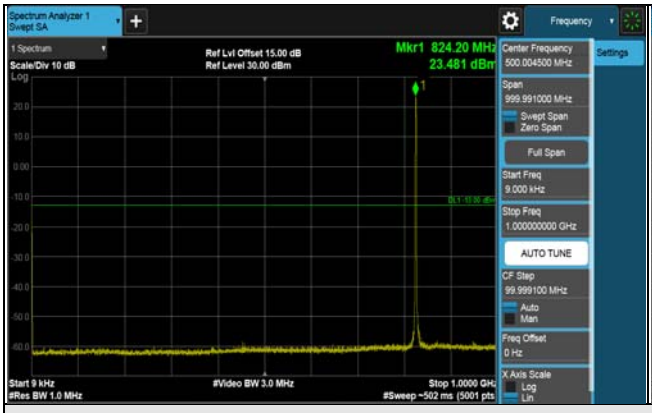
CH 4182 (836.4MHz)

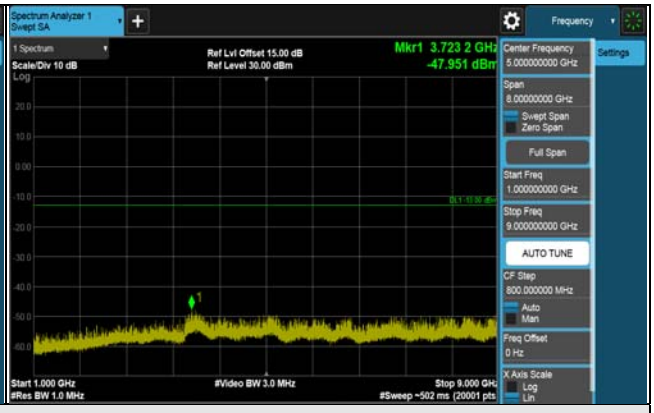


CH 4233 (846.6MHz)

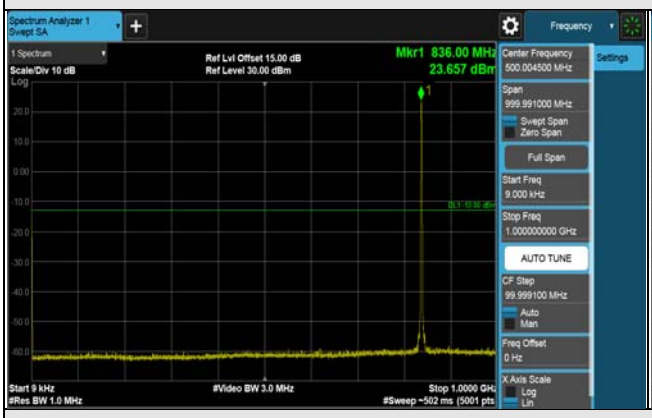
*The 9kHz signal over the limit is from Spectrum.

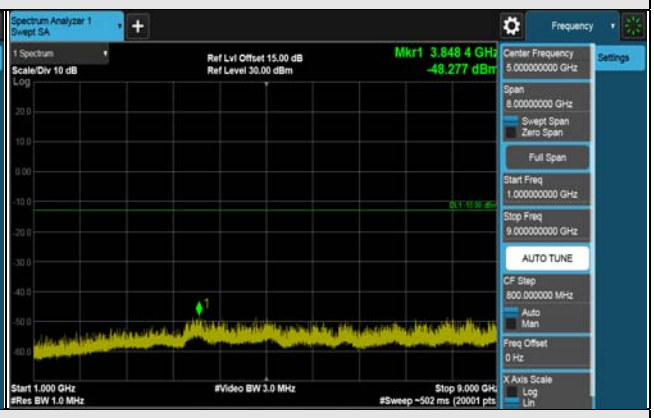
LTE Band 5 (Channel Bandwidth 1.4MHz)



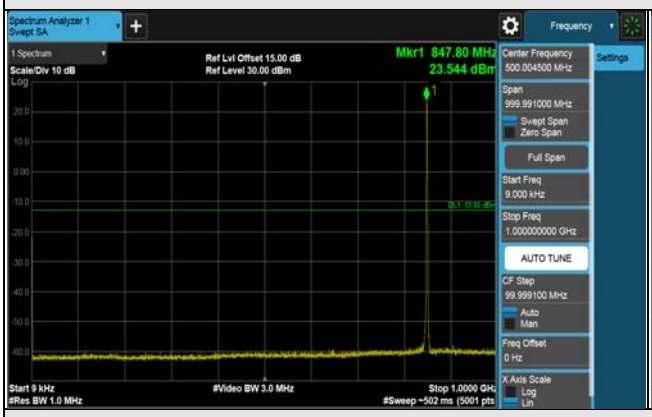


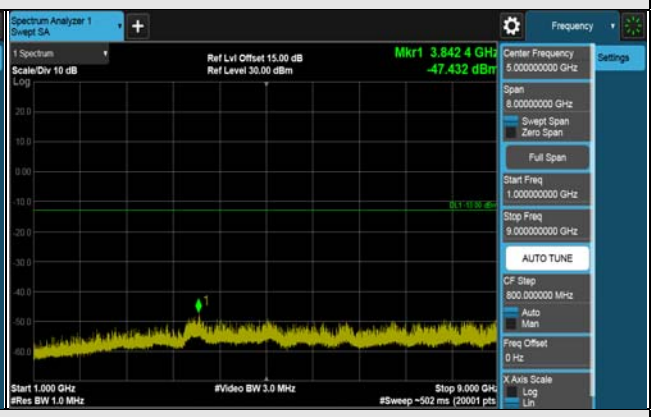
CH 20407 (824.7MHz)





CH 20525 (836.5MHz)

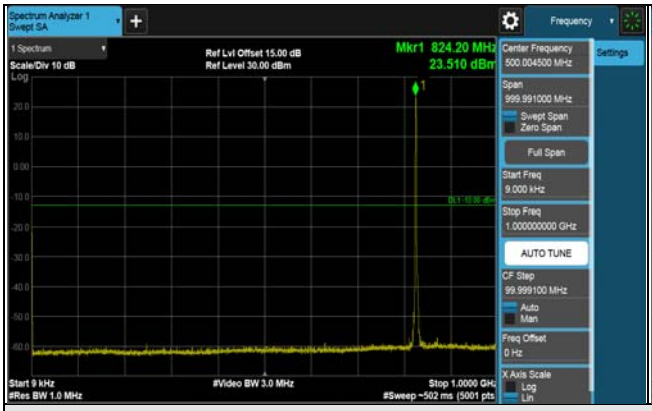


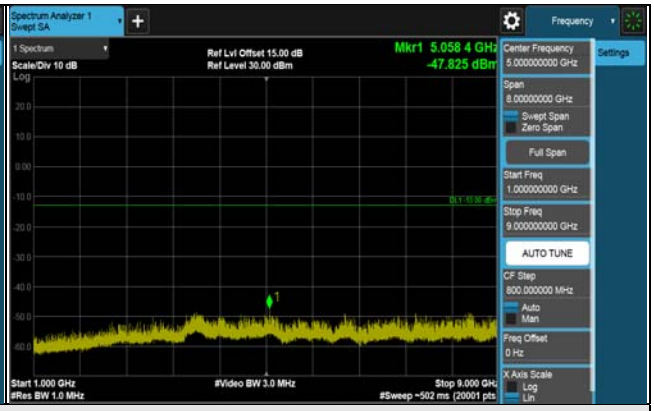


CH 20643 (848.3MHz)

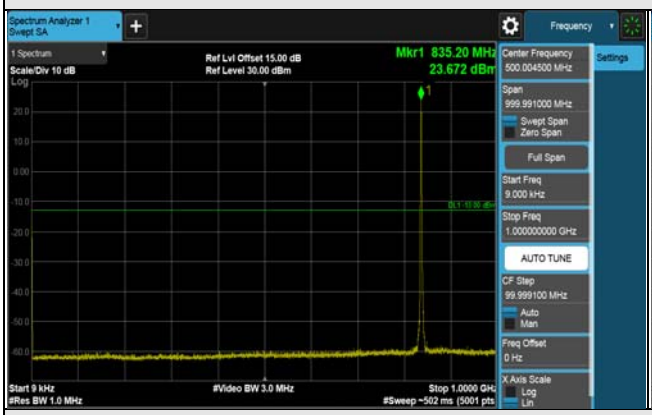
*The 9kHz signal over the limit is from Spectrum.

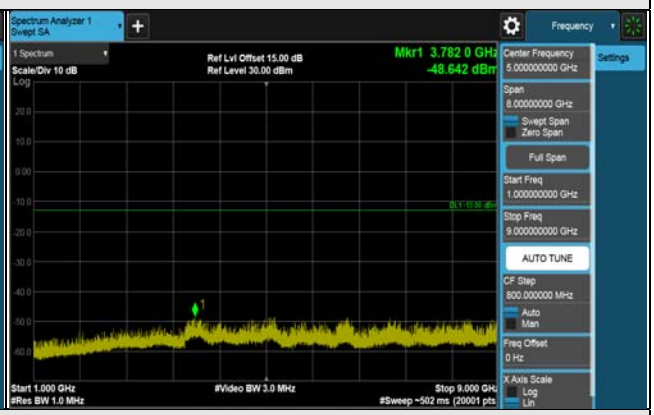
LTE Band 5 (Channel Bandwidth 3MHz)



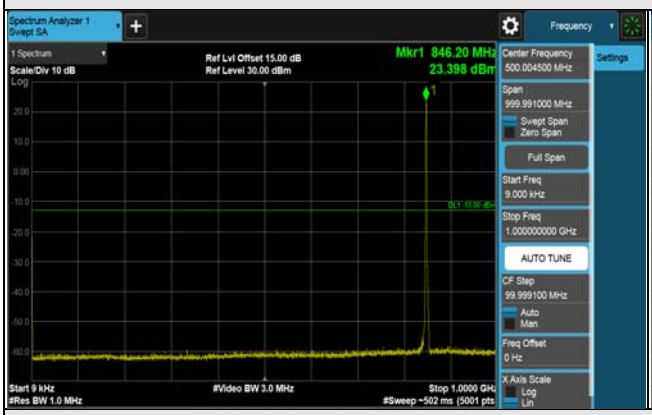


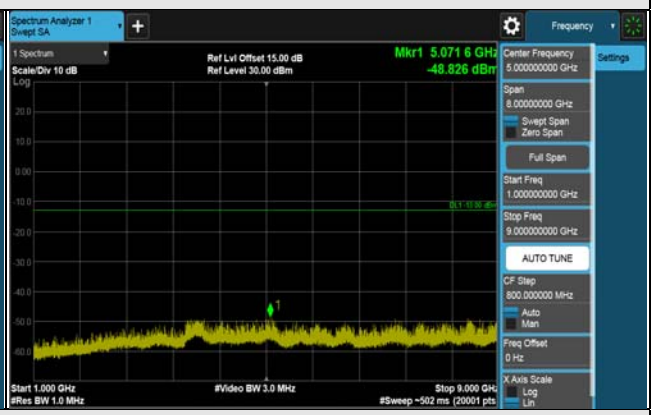
CH 20415 (825.5MHz)





CH 20525 (836.5MHz)

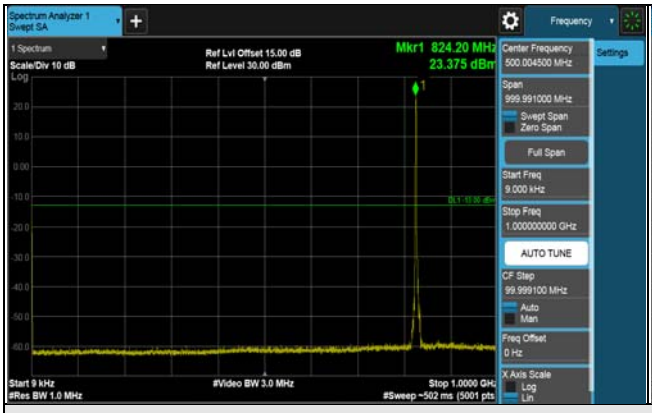


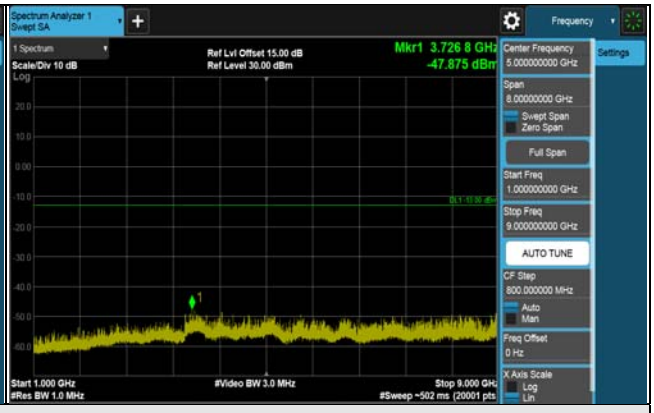


CH 20635 (847.5MHz)

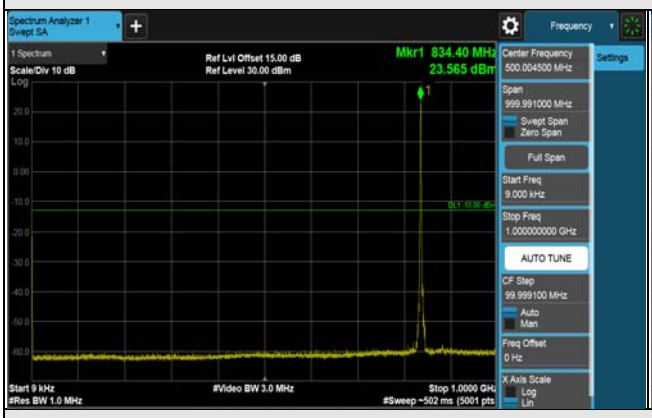
*The 9kHz signal over the limit is from Spectrum.

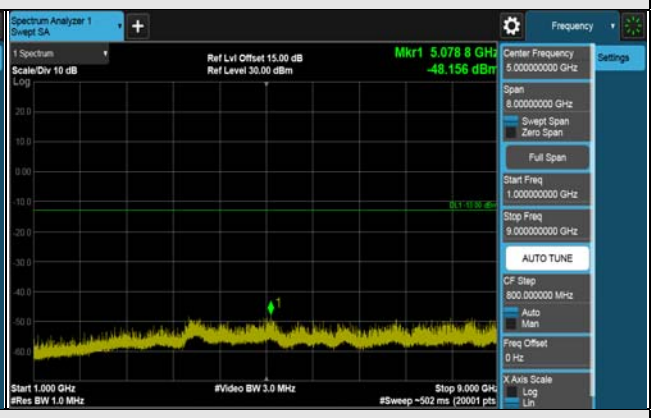
LTE Band 5 (Channel Bandwidth 5MHz)



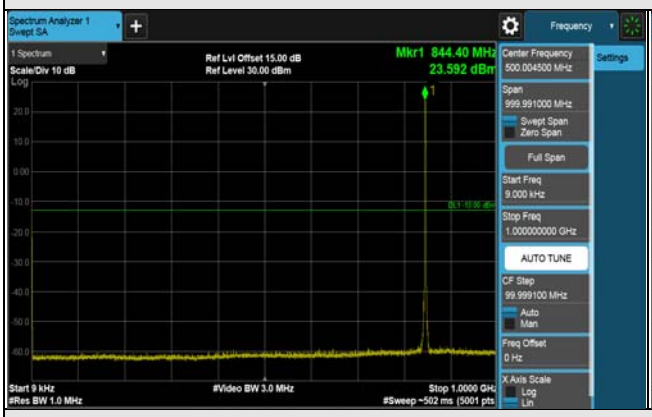


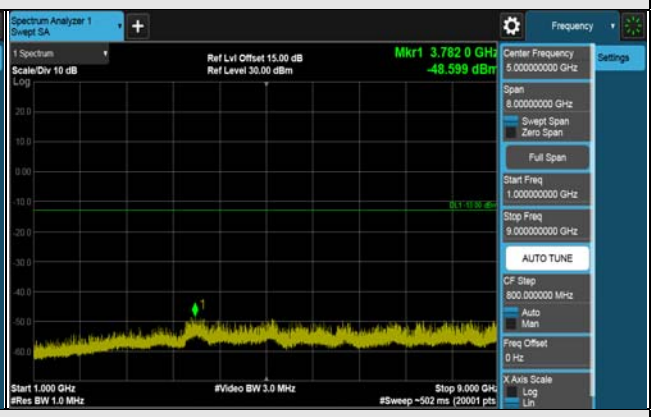
CH 20425 (826.5MHz)





CH 20525 (836.5MHz)

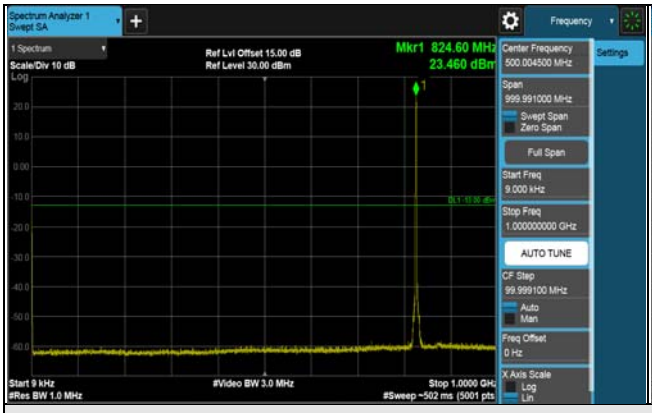


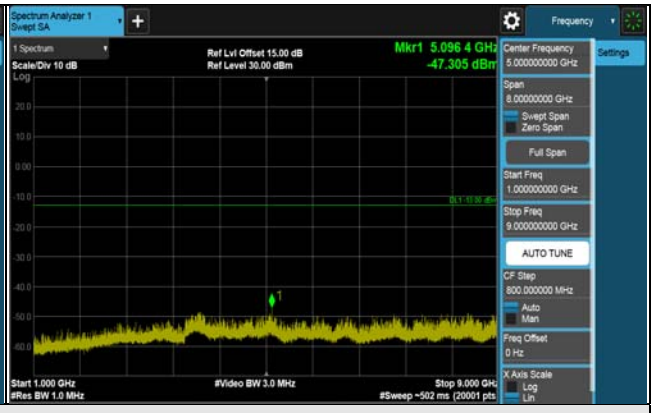


CH 20625 (846.5MHz)

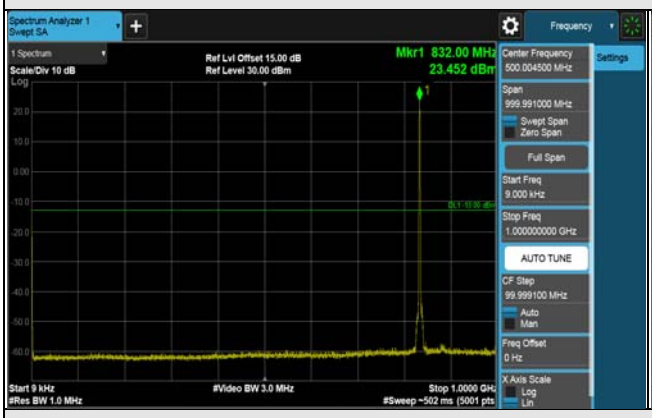
*The 9kHz signal over the limit is from Spectrum.

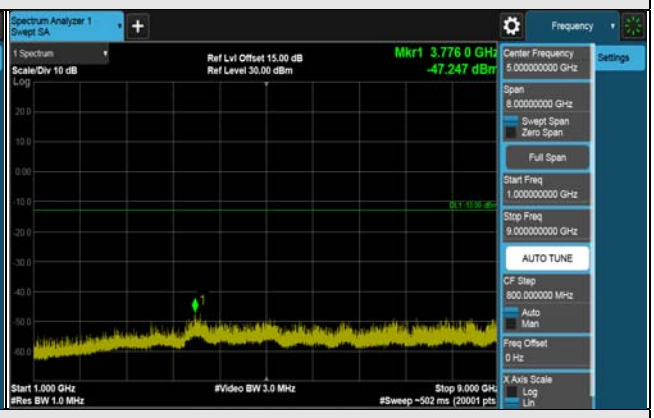
LTE Band 5 (Channel Bandwidth 10MHz)



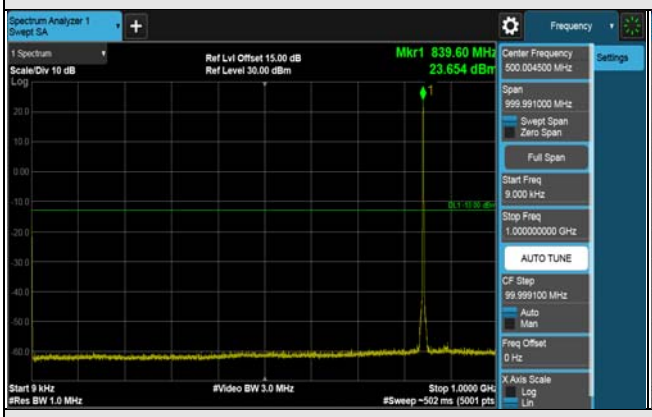


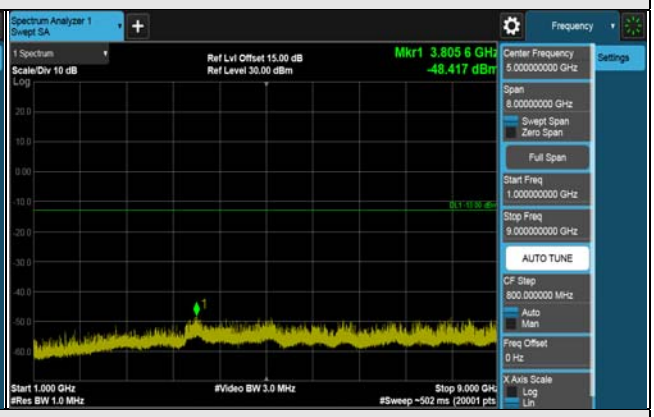
CH 20450 (829MHz)





CH 20525 (836.5MHz)





CH 20600 (844MHz)

*The 9kHz signal over the limit is from Spectrum.

4.8 Radiated Emission Measurement

4.8.1 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.

4.8.2 Test Procedure

a. In the semi-anechoic chamber, EUT placed on the 0.8m (below or equal 1GHz) and/or 1.5m (above 1GHz) 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 height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

c. Perform a field strength measurement and record the worse read value, is the field strength value via a spectrum reading obtained corrected for antenna factor, cable loss and pre-amplifier factor and then mathematically convert the measured field strength level to EIRP/ERP level.

d. Following C63.26 section 5.5 and 5.2.7
   - EIRP (dBm) = E (dBμV/m) + 20log(D) - 104.8; where D is the measurement distance (in the far field region) in m.
   - ERP (dBm) = E (dBμV/m) + 20log(D) - 104.8 - 2.15; where D is the measurement distance (in the far field region) in m.

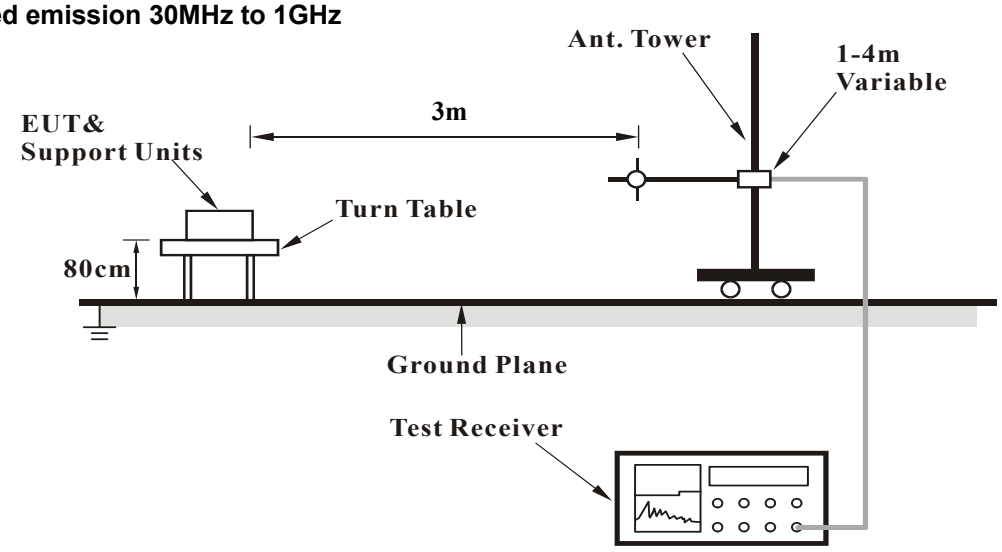
Note:
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz/3MHz.
2. The emission levels were against the limit of frequency range 9 kHz ~ 30 MHz:
   The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

4.8.3 Deviation from Test Standard

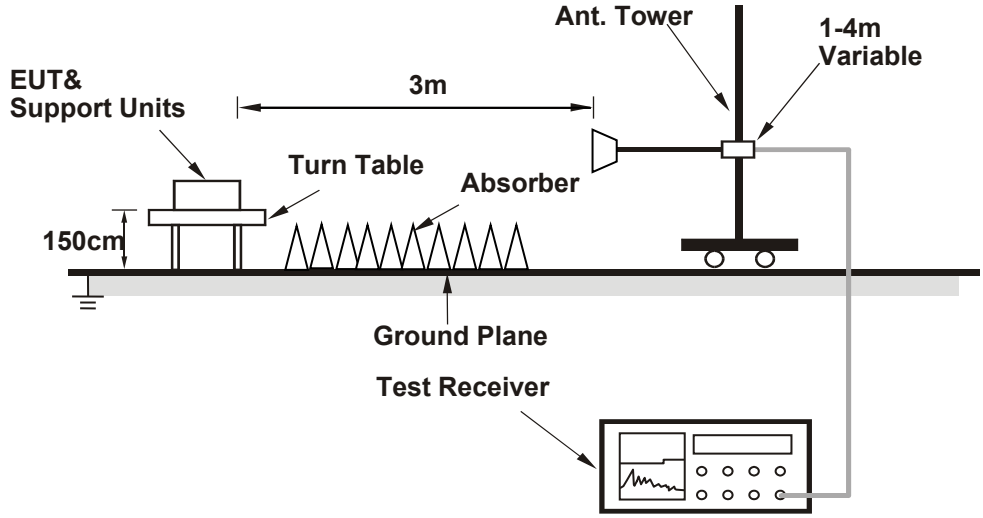
No deviation.

4.8.4 Test Setup

For radiated emission 30MHz to 1GHz



For radiated emission above 1GHz



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

4.8.5 Test Results

Below 1GHz

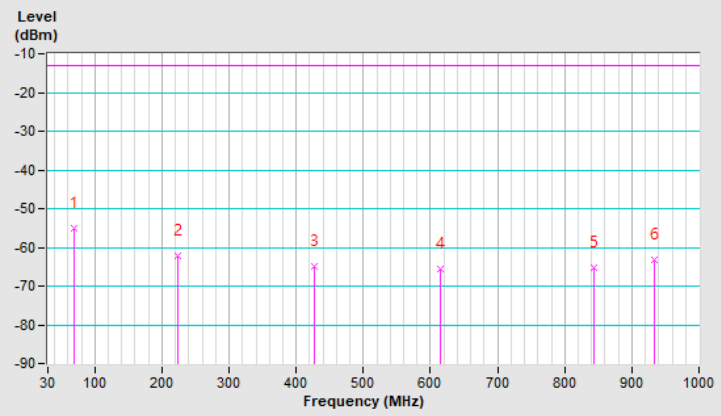
GSM

Mode	TX channel 189 (836.4MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	27deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Tim Chen		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	68.80	-54.92	-13.00	-41.92	2.49 H	315	57.73	-112.65
2	223.03	-62.24	-13.00	-49.24	1.00 H	109	51.54	-113.78
3	426.73	-64.83	-13.00	-51.83	1.99 H	2	41.91	-106.74
4	613.94	-65.44	-13.00	-52.44	1.50 H	5	37.13	-102.57
5	843.83	-65.17	-13.00	-52.17	1.99 H	266	34.37	-99.54
6	934.04	-63.06	-13.00	-50.06	1.50 H	71	35.03	-98.09

Remarks:

1. ERP(dBm) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8 - 2.15
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

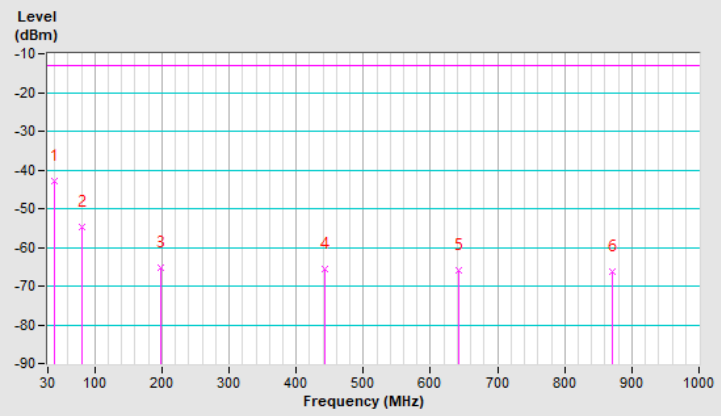


Mode	TX channel 189 (836.4MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	27deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Tim Chen		

Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	**39.70**	**-42.77**	**-13.00**	**-29.77**	**1.01 V**	**175**	**68.32**	**-111.09**
2	80.44	-54.85	-13.00	-41.85	1.01 V	323	60.70	-115.55
3	197.81	-65.40	-13.00	-52.40	2.01 V	157	48.36	-113.76
4	442.25	-65.51	-13.00	-52.51	1.01 V	186	40.60	-106.11
5	642.07	-66.03	-13.00	-53.03	2.01 V	71	36.08	-102.11
6	870.99	-66.33	-13.00	-53.33	1.01 V	111	33.02	-99.35

Remarks:

1. ERP(dBm) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8 - 2.15
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.



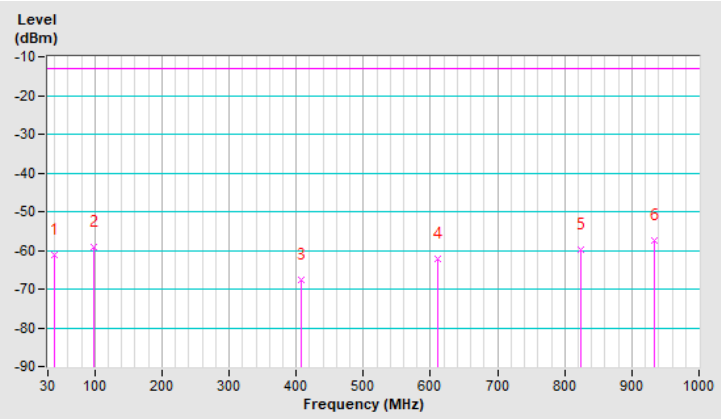
WCDMA

Mode	TX channel 4182 (836.4MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	27deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Tim Chen		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	39.70	-61.25	-13.00	-48.25	2.49 H	115	49.84	-111.09
2	98.87	-59.10	-13.00	-46.10	1.50 H	295	56.12	-115.22
3	408.30	-67.65	-13.00	-54.65	2.49 H	121	39.60	-107.25
4	611.03	-62.24	-13.00	-49.24	1.50 H	209	40.32	-102.56
5	824.43	-59.93	-13.00	-46.93	2.49 H	2	39.83	-99.76
6	933.07	-57.62	-13.00	-44.62	2.49 H	2	40.49	-98.11

Remarks:

1. ERP(dBm) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8 - 2.15
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

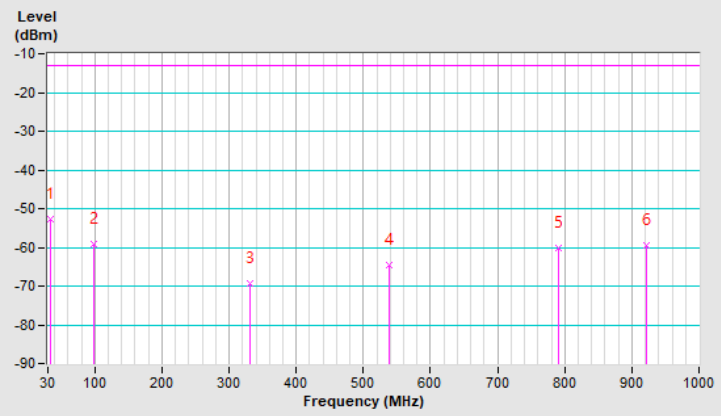


Mode	TX channel 4182 (836.4MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	27deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Tim Chen		

Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	33.88	-52.82	-13.00	-39.82	1.51 V	168	58.92	-111.74
2	98.87	-59.12	-13.00	-46.12	1.51 V	303	56.10	-115.22
3	330.70	-69.27	-13.00	-56.27	2.50 V	161	39.61	-108.88
4	539.25	-64.58	-13.00	-51.58	1.51 V	122	39.97	-104.55
5	790.48	-60.24	-13.00	-47.24	1.51 V	12	40.10	-100.34
6	922.40	-59.41	-13.00	-46.41	1.51 V	241	38.91	-98.32

Remarks:

1. ERP(dBm) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8 - 2.15
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.



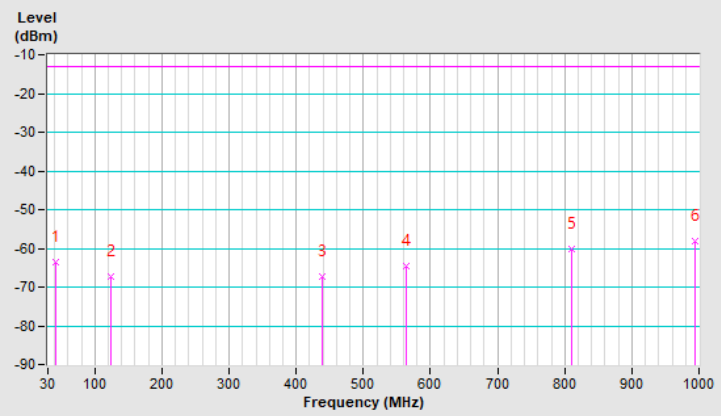
LTE Band 5 (Channel Bandwidth 10MHz)

Mode	TX channel 20525 (836.5MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	27deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Tim Chen		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	41.64	-63.50	-13.00	-50.50	1.50 H	98	47.40	-110.90
2	124.09	-67.30	-13.00	-54.30	2.49 H	259	45.10	-112.40
3	439.34	-67.30	-13.00	-54.30	1.50 H	2	38.90	-106.20
4	564.47	-64.50	-13.00	-51.50	1.50 H	194	39.60	-104.10
5	809.88	-60.30	-13.00	-47.30	2.49 H	73	39.90	-100.20
6	993.21	-58.20	-13.00	-45.20	2.49 H	343	39.50	-97.70

Remarks:

1. ERP(dBm) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8 - 2.15
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

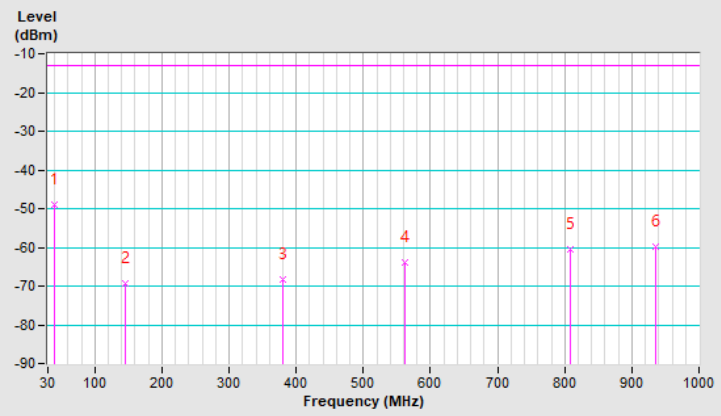


Mode	TX channel 20525 (836.5MHz)	Frequency Range	Below 1000 MHz
Environmental Conditions	27deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Tim Chen		

Antenna Polarity & Test Distance : Vertical at 3m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	40.67	-49.10	-13.00	-36.10	1.51 V	106	61.90	-111.00
2	145.43	-69.30	-13.00	-56.30	1.51 V	244	41.40	-110.70
3	380.17	-68.20	-13.00	-55.20	1.51 V	341	39.60	-107.80
4	562.53	-63.90	-13.00	-50.90	2.50 V	44	40.20	-104.10
5	807.94	-60.60	-13.00	-47.60	1.51 V	18	39.50	-100.10
6	935.98	-59.70	-13.00	-46.70	1.51 V	50	38.40	-98.10

Remarks:

1. ERP(dBm) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8 - 2.15
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.



Above 1GHz

GSM

Mode	TX channel 128 (824.2MHz	Frequency Range	1GHz ~ 10GHz
Environmental Conditions	27deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Tim Chen		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1648.40	-52.60	-13.00	-39.60	1.99 H	188	51.50	-104.10
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1648.40	-49.90	-13.00	-36.90	2.50 V	148	54.20	-104.10

Remarks:

1. ERP(dBm) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8 - 2.15
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

Mode	TX channel 189 (836.4MHz)	Frequency Range	1GHz ~ 10GHz
Environmental Conditions	27deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Tim Chen		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1672.80	-52.30	-13.00	-39.30	1.96 H	183	51.70	-104.00
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1672.80	-49.40	-13.00	-36.40	2.51 V	139	54.60	-104.00

Remarks:

1. ERP(dBm) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8 - 2.15
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

Mode	TX channel 251 (848.8MHz)	Frequency Range	1GHz ~ 10GHz
Environmental Conditions	27deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Tim Chen		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1697.60	-52.70	-13.00	-39.70	2.03 H	191	51.30	-104.00
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1697.60	-50.50	-13.00	-37.50	2.43 V	142	53.50	-104.00

Remarks:

1. ERP(dBm) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8 - 2.15
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

WCDMA

Mode	TX channel 4132 (826.4MHz)	Frequency Range	1GHz ~ 20GHz
Environmental Conditions	27deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Tim Chen		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1652.80	-58.20	-13.00	-45.20	1.45 H	33	45.80	-104.00
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1652.80	-57.50	-13.00	-44.50	1.54 V	123	46.50	-104.00

Remarks:

1. ERP(dBm) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8 - 2.15
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

Mode	TX channel 4182 (836.4MHz)	Frequency Range	1GHz ~ 20GHz
Environmental Conditions	27deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Tim Chen		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1672.80	-57.80	-13.00	-44.80	1.54 H	123	46.20	-104.00
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1672.80	-56.90	-13.00	-43.90	1.51 V	109	47.10	-104.00

Remarks:

1. ERP(dBm) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8 - 2.15
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

Mode	TX channel 4233 (846.6MHz)	Frequency Range	1GHz ~ 20GHz
Environmental Conditions	27deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Tim Chen		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1693.20	-58.20	-13.00	-45.20	1.42 H	59	45.80	-104.00
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1693.20	-57.70	-13.00	-44.70	1.76 V	141	46.30	-104.00

Remarks:

1. ERP(dBm) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8 - 2.15
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

LTE Band 5 (Channel Bandwidth 1.4MHz)

Mode	TX channel 20407 (824.7MHz)	Frequency Range	1GHz ~ 9GHz
Environmental Conditions	27deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Tim Chen		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1649.40	-59.20	-13.00	-46.20	1.40 H	104	44.90	-104.10
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1649.40	-57.90	-13.00	-44.90	1.14 V	101	46.20	-104.10

Remarks:

1. ERP(dBm) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8 - 2.15
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

Mode	TX channel 20525 (836.5MHz)	Frequency Range	1GHz ~ 9GHz
Environmental Conditions	27deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Tim Chen		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1673.00	-58.90	-13.00	-45.90	1.44 H	106	45.10	-104.00
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1673.00	-57.60	-13.00	-44.60	1.06 V	102	46.40	-104.00

Remarks:

1. ERP(dBm) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8 - 2.15
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

Mode	TX channel 20643 (848.3MHz)	Frequency Range	1GHz ~ 9GHz
Environmental Conditions	27deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Tim Chen		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1696.60	-59.10	-13.00	-46.10	1.36 H	105	44.90	-104.00
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1696.60	-57.80	-13.00	-44.80	1.09 V	87	46.20	-104.00

Remarks:

1. ERP(dBm) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8 - 2.15
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

LTE Band 5 (Channel Bandwidth 5MHz)

Mode	TX channel 20425 (826.5MHz)	Frequency Range	1GHz ~ 9GHz
Environmental Conditions	27deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Tim Chen		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1653.00	-59.10	-13.00	-46.10	1.45 H	102	44.90	-104.00
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1653.00	-57.60	-13.00	-44.60	1.13 V	102	46.40	-104.00

Remarks:

1. ERP(dBm) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8 - 2.15
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

Mode	TX channel 20525 (836.5MHz)	Frequency Range	1GHz ~ 9GHz
Environmental Conditions	27deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Tim Chen		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1673.00	-59.20	-13.00	-46.20	1.43 H	108	44.80	-104.00
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1673.00	-57.80	-13.00	-44.80	1.12 V	113	46.20	-104.00

Remarks:

1. ERP(dBm) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8 - 2.15
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

Mode	TX channel 20625 (846.5MHz)	Frequency Range	1GHz ~ 9GHz
Environmental Conditions	27deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Tim Chen		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1693.00	-59.10	-13.00	-46.10	1.42 H	101	44.90	-104.00
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1693.00	-57.80	-13.00	-44.80	1.10 V	105	46.20	-104.00

Remarks:

1. ERP(dBm) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8 - 2.15
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

LTE Band 5 (Channel Bandwidth 10MHz)

Mode	TX channel 20450 (829.0MHz)	Frequency Range	1GHz ~ 9GHz
Environmental Conditions	27deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Tim Chen		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1658.00	-59.00	-13.00	-46.00	1.38 H	99	45.00	-104.00
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1658.00	-57.70	-13.00	-44.70	1.11 V	103	46.30	-104.00

Remarks:

1. ERP(dBm) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8 - 2.15
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

Mode	TX channel 20525 (836.5MHz)	Frequency Range	1GHz ~ 9GHz
Environmental Conditions	27deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Tim Chen		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1673.00	-58.80	-13.00	-45.80	1.42 H	102	45.20	-104.00
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1673.00	-57.60	-13.00	-44.60	1.11 V	102	46.40	-104.00

Remarks:

1. ERP(dBm) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8 - 2.15
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

Mode	TX channel 20600 (844.0MHz)	Frequency Range	1GHz ~ 9GHz
Environmental Conditions	27deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Tim Chen		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1688.00	-59.10	-13.00	-46.10	1.42 H	101	44.90	-104.00
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1688.00	-57.70	-13.00	-44.70	1.13 V	103	46.30	-104.00

Remarks:

1. ERP(dBm) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + 20log(D) – 104.8 - 2.15
3. Margin value = ERP – Limit value
4. The other ERP levels were very low against the limit.

5 Pictures of Test Arrangements

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

Appendix – Information of 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 FCC recognized accredited test firms and 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.

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