FCC Test Report

(PART 24)

Report No.: RF160601W004-4

FCC ID: 2AFZZ-RS6031

Test Model: 2016031

Received Date: Jun. 01, 2016

Test Date: Jun. 02, 2016 ~ Jun. 28, 2016

Issued Date: Jun. 29, 2016

Applicant: Xiaomi Communications Co., Ltd.

Address: The Rainbow City of China Resources, NO.68, Qinghe Middle Street, Haidian District, Beijing, China

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

Lab Address: No. 47-2, 14th Ling, Chia Cau 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.

This report should not be used by the client to claim product certification, approval, or endorsement by TAF or any government agencies.

This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification. The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any government agencies.

TABLE OF CONTENTS

RELEASE CONTROL RECORD 3

1 Certificate of Conformity 4

2 Summary of Test Results 5

2.1 Measurement Uncertainty 5
2.2 Test Site And Instruments 5

3 General Information 7

3.1 General Description of EUT 7
3.2 Configuration Of System Under Test 9
3.2.1 Description Of Support Units 10
3.3 Test Mode Applicability and Tested Channel Detail 10
3.4 EUT Operating Conditions 12
3.5 General Description of Applied Standards 12

4 Test Types and Results 13

4.1 Output Power Measurement 13
4.1.1 Limits of Output Power Measurement 13
4.1.2 Test Procedures 13
4.1.3 Test Setup 14
4.1.4 Test Results 15
4.2 Frequency Stability Measurement 17
4.2.1 Limits of Frequency Stabiliity Measurement 17
4.2.2 Test Procedure 17
4.2.3 Test Setup 17
4.2.4 Test Results 18
4.3 Occupied Bandwidth Measurement 19
4.3.1 Test Procedure 19
4.3.2 Test Setup 19
4.3.3 Test Result 20
4.4 Band Edge Measurement 22
4.4.1 Limits of Band Edge Measurement 22
4.4.2 Test Setup 22
4.4.3 Test Procedures 22
4.4.4 Test Results 23
4.5 Peak To Average Ratio 24
4.5.1 Limits of Peak To Average Ratio Measurement 24
4.5.2 Test Setup 24
4.5.3 Test Procedures 24
4.5.4 Test Results 25
4.6 Conducted Spurious Emissions 26
4.6.1 Limits of Conducted Spurious Emissions Measurement 26
4.6.2 Test Setup 26
4.6.3 Test Procedure 26
4.6.4 Test Results 27
4.7 Radiated Emission Measurement 30
4.7.1 Limits of Radiated Emission Measurement 30
4.7.2 Test Procedure 30
4.7.3 Deviation from Test Standard 30
4.7.4 Test Setup 31
4.7.5 Test Results 32

5 Pictures of Test Arrangements 32

Appendix – Information on the Testing Laboratories 41

RELEASE CONTROL RECORD

Issue No.	Description	Date Issued
RF160601W004-4	Original release	Jun. 29, 2016

1 Certificate of Conformity

Product: Mobile Phone

Brand: MI

Test Model: 2016031

Sample Status: Identical Prototype

Applicant: Xiaomi Communications Co., Ltd.

Test Date: Jun. 02, 2016 ~ Jun. 28, 2016

Standards: FCC Part 24, Subpart E

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 EMC characteristics under the conditions specified in this report.

Prepared by : _____ , **Date:** Jun. 29, 2016

Amyee Qian / Engineer

Approved by : _____ , **Date:** Jun. 29, 2016

William Chung / Manager

2 Summary of Test Results

Applied Standard: FCC Part 24 & Part 2			
FCC Clause	Test Item	Result	Remarks
2.1046 24.232	Effective Radiated Power	PASS	Meet the requirement of limit.
2.1046 24.232(d)	Peak To Average Ratio	PASS	Meet the requirement of limit.
2.1055 24.235	Frequency Stability	PASS	Meet the requirement of limit.
2.1049 24.238(b)	Occupied Bandwidth	PASS	Meet the requirement of limit.
24.238(b)	Band Edge Measurements	PASS	Meet the requirement of limit.
2.1051 24.238	Conducted Spurious Emissions	PASS	Meet the requirement of limit.
2.1053 24.238	Radiated Spurious Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -5.61dB at 38.73MHz.

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	Expended Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.44 dB
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	2.93 dB
	200MHz ~1000MHz	2.95 dB
Radiated Emissions above 1 GHz	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

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESR7	101494	Apr. 05,16	Apr. 04,17
Signal and Spectrum Analyzer	Rohde&Schwarz	FSV40	101094	Apr. 05,16	Apr. 04,17
Bilog Antenna 1	Teseq	CBL 6111D	30643	Oct. 26,15	Jun. 24,17
Bilog Antenna 2	Teseq	CBL 6111D	27089	Oct. 25,15	Jun. 24,17
Horn Antenna	ETS-Lindgren	3117	00062558	May 30,15	May 29,17
Horn Antenna (15GHz-40GHz)	SCHWARZBECK	BBHA 9170	BBHA9170147	Jan. 21,15	Jan. 20,17
Amplifier	Burgeon	BPA-530	100220	Apr. 05,16	Apr. 04,17
Pre-Amplifier	HP	8449B	3008A00409	Apr. 24,16	Apr. 23,17
Pre-Amplifier (18GHz-40GHz)	EMCI	EMC 184045	980102	Nov. 11,15	Nov. 10,16
GPS Generator+ Antenna	TOJOIN	GNSS-5000A	E1-010119	Aug. 08, 14	Aug. 07, 16
3m Semi-anechoic Chamber	ETS-LINDGREN	9m*6m*6m	NSEMC003	Mar. 12,16	Mar. 11,18
Test Software	ADT	ADT_Radiated _V7.6.15.9.2	N/A	N/A	N/A
Power Meter	Anritsu	ML2495A	1139001	Feb.19,16	Feb. 18,17
Power Sensor	Anritsu	MA2411B	1126068	Feb.19,16	Feb. 18,17
Power Sensor	Keysight	U2021XA	MY55060016	May 27,15	May 26,17
Power Sensor	Keysight	U2021XA	MY55060018	May 27,15	May 26,17
Digital Multimeter	FLUKE	15B	A1220010DG	Oct. 12, 15	Oct. 11, 16
Humid & Temp Programmable Tester	Haida	HD-2257	110807201	Sep.07,15	Sep. 06,16
Oscilloscope	Agilent	DSO9254A	MY51260160	Nov. 09,15	Nov. 08,16
Signal Analyzer	Rohde & Schwarz	FSV7	102331	Nov. 09,15	Nov. 08,16
Signal Generator	Agilent	N5183A	MY50140980	Apr. 21, 16	Apr. 20, 17
ESG Vector Signal Generator	Agilent	E4438C	MY49072505	Sep. 01,15	Aug. 31,16
BLUETOOTH TESTER	Rohde&Schwarz	CBT32	100811	Oct. 12, 15	Oct. 11, 16

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 calibration interval of the loop antenna is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. The test was performed in HwaYa Chamber 4.
4. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
5. The FCC Site Registration No. is 460141.
6. The IC Site Registration No. is IC7450F-4.

3 General Information

3.1 General Description of EUT

PRODUCT	Mobile Phone	
BRAND	MI	
MODEL NAME	2016031	
POWER SUPPLY	5.0Vdc (adapter or host equipment) 3.85Vdc (battery)	
MODULATION TYPE	**GSM, GPRS:** GMSK **EDGE:** GMSK, 8PSK **WCDMA :** QPSK	
FREQUENCY RANGE	**GSM, GPRS, EDGE:** 1850.2MHz ~ 1909.8MHz	
	WCDMA: 1852.4MHz ~ 1907.6MHz	
MAX. EIRP POWER	**GSM**	581mW
	EDGE	258mW
	WCDMA	141mW
EMISSION DESIGNATOR	**GSM**	246KGXW
	EDGE	245KG7W
	WCDMA	4M16F9W
ANTENNA TYPE	PIFA Antenna with -0.03dBi gain	
HW VERSION	P4	
SW VERSION	V7.3.0.4.MALMIDE	
ACCESSORY DEVICE	Refer to note as below	
DATA CABLE	USB cable: non-shielded, detachable, 1.2m	

Note:

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

ADAPTER	
BRAND:	MI
MODEL:	MDY-08-EF
INPUT:	AC 100-240V, 500mA
OUTPUT:	DC 5V, 2000mA

3. The EUT matched the following USB cables:

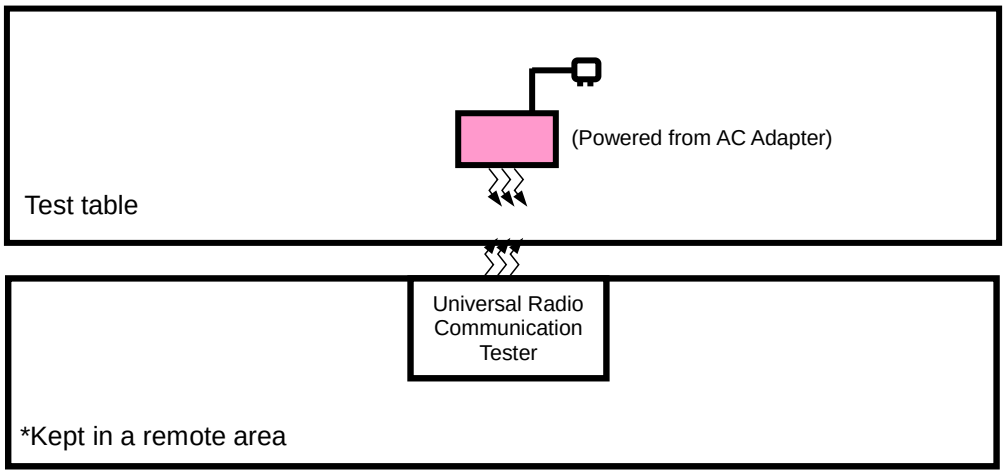
USB CABLE 1	
BRAND:	MI
MODEL:	KLC-2100
SIGNAL LINE:	1.2 METER

USB CABLE 2	
BRAND:	MI
MODEL:	RS418D010(RICHSTAR)
SIGNAL LINE:	1.2 METER

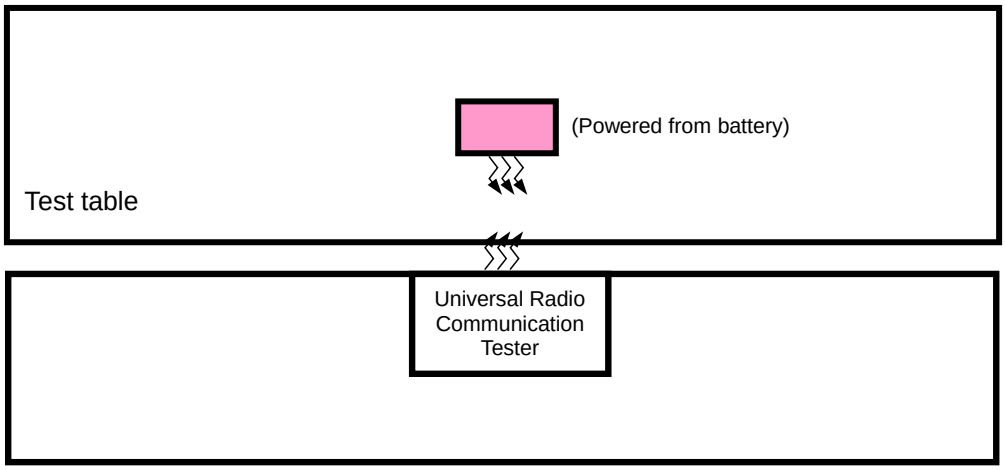
4. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.

3.2 Configuration Of System Under Test

FOR RADIATION EMISSION TEST



FOR E.R.P. TEST



3.2.1 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.

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

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

NOTE:

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

3.3 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 on Z-plane. Following channel(s) was (were) selected for the final test as listed below:

Test results are presented in the report as below.

Test Mode	Test Condition
A	Power from adapter
B	Power from battery

GSM MODE

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Mode
A	EIRP	512 to 810	512, 661, 810	GSM
B	Frequency Stability	512 to 810	661	GSM
A	Occupied Bandwidth	512 to 810	512, 661, 810	GSM, EDGE
A	Band Edge	512 to 810	512, 810	GSM, EDGE
A	Peak To Average Ratio	512 to 810	512, 661, 810	GSM, EDGE
A	Condcudeted Emission	512 to 810	512, 661, 810	GSM, EDGE
A	Radiated Emission Below 1GHz	512 to 810	512	GSM
A	Radiated Emission Above 1GHz	512 to 810	512, 661, 810	GSM

WCDMA MODE

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Mode
A	EIRP	9262 to 9538	9262, 9400, 9538	WCDMA
B	Frequency Stability	9262 to 9538	9400	WCDMA
A	Occupied Bandwidth	9262 to 9538	9262, 9400, 9538	WCDMA
A	Band Edge	9262 to 9538	9262, 9538	WCDMA
A	Peak To Average Ratio	9262 to 9538	9262, 9400, 9538	WCDMA
A	Condcudeted Emission	9262 to 9538	9262, 9400, 9538	WCDMA
A	Radiated Emission Below 1GHz	9262 to 9538	9262	WCDMA
A	Radiated Emission Above 1GHz	9262 to 9538	9262, 9400, 9538	WCDMA

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
EIRP	21deg. C, 71%RH 22deg. C, 71%RH	DC 3.85V from battery	Yuqiang Yin
Frequency Stability	24deg. C, 64%RH	DC 3.85V from battery	Yuqiang Yin
Occupied Bandwidth	24deg. C, 64%RH	DC 3.85V from battery	Yuqiang Yin
Band Edge	24deg. C, 64%RH	DC 3.85V from battery	Yuqiang Yin
Peak To Average Ratio	24deg. C, 64%RH	DC 3.85V from battery	Yuqiang Yin
Condcudeted Emission	24deg. C, 64%RH	5.0Vdc from adapter	Yuqiang Yin
Radiated Emission	21deg. C, 71%RH	5.0Vdc from adapter	Alex 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

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 24

KDB 971168 D01 Power Meas License Digital Systems v02r05

ANSI/TIA/EIA-603-D

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

4 Test Types and Results

4.1 Output Power Measurement

4.1.1 Limits of Output Power Measurement

Mobile / Portable station are limited to 2 watts e.i.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 and 5MHz for WCDMA 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

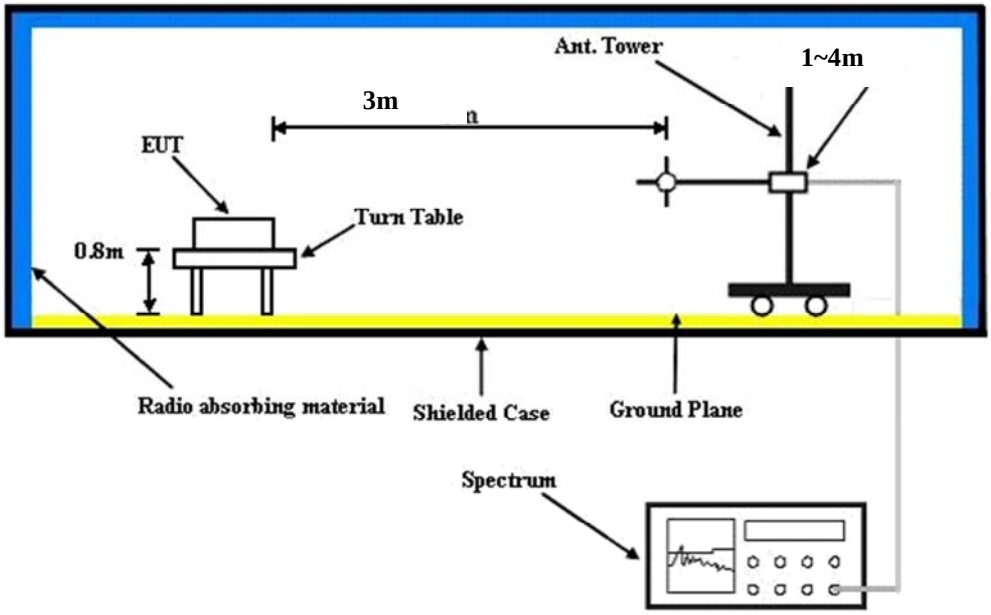
d. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn.

Conducted Power Measurement:

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

4.1.3 Test Setup

EIRP / ERP MEASUREMENT:



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

CONDUCTED POWER MEASUREMENT:

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

4.1.4 Test Results

CONDUCTED OUTPUT POWER (dBm)

Band	GSM1900		
Channel	**512**	**661**	**810**
Frequency (MHz)	**1850.2**	**1880.0**	**1909.8**
GSM	29.93	**30.11**	29.91
GPRS 8	30.02	30.09	29.98
GPRS 10	28.40	28.18	28.36
GPRS 11	27.29	27.07	26.93
GPRS 12	26.04	25.85	25.71
EDGE 8 (MCS1)	25.57	25.36	25.31
EDGE 10 (MCS1)	24.31	24.07	24.00
EDGE 11 (MCS9)	23.04	22.82	22.81
EDGE 12 (MCS9)	21.77	21.72	21.52

Band	WCDMA II		
Channel	**9262**	**9400**	**9538**
Frequency (MHz)	**1852.4**	**1880.0**	**1907.6**
RMC 12.2K	22.31	22.32	**22.58**
HSPA			
HSDPA Subtest-1	21.22	21.34	21.59
HSDPA Subtest-2	21.25	21.26	21.52
HSDPA Subtest-3	20.78	20.80	21.02
HSDPA Subtest-4	20.79	20.80	21.00
HSUPA Subtest-1	21.31	20.94	21.21
HSUPA Subtest-2	20.12	20.25	20.50
HSUPA Subtest-3	20.30	20.05	20.52
HSUPA Subtest-4	20.66	20.42	20.85
HSUPA Subtest-5	21.22	21.27	21.55

EIRP POWER (dBm)

GSM

Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	EIRP(dBm)	EIRP(mW)	Polarization (H/V)
512	1850.2	-24.08	43.83	19.75	94.41	H
661	1880.0	-24.23	43.57	19.34	85.90	H
810	1909.8	-23.74	44.57	20.83	121.06	H
512	1850.2	-19.28	46.39	27.11	514.04	V
661	1880.0	-19.46	47.10	27.64	**580.50**	V
810	1909.8	-20.12	45.98	25.86	385.12	V

EDGE

Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	EIRP(dBm)	EIRP(mW)	Polarization (H/V)
512	1850.2	-25.93	43.83	17.90	61.66	H
661	1880.0	-26.09	43.57	17.48	55.98	H
810	1909.8	-26.19	44.57	18.38	68.87	H
512	1850.2	-22.32	46.39	24.07	255.27	V
661	1880.0	-22.98	47.10	24.12	**258.11**	V
810	1909.8	-22.73	45.98	23.25	211.15	V

WCDMA

Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	EIRP(dBm)	EIRP(mW)	Polarization (H/V)
9262	1852.4	-28.92	43.83	14.91	30.97	H
9400	1880.0	-28.24	43.57	15.33	34.12	H
9538	1907.6	-28.86	44.57	15.71	37.24	H
9262	1852.4	-26.12	46.39	20.27	106.41	V
9400	1880.0	-25.60	47.10	21.50	**141.19**	V
9538	1907.6	-26.28	45.98	19.70	93.24	V

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

4.2 Frequency Stability Measurement

4.2.1 Limits of Frequency Stabiliity Measurement

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

4.2.2 Test Procedure

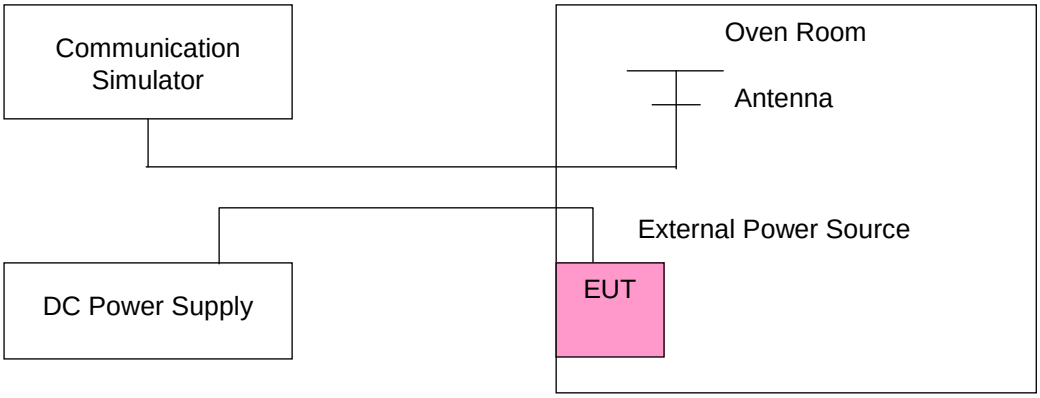
a. Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.

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	
3.85	-0.0013	0.0015	0.0015	2.5
3.6	-0.0016	-0.0017	-0.0016	2.5
4.35	-0.0019	-0.0016	-0.0015	2.5

NOTE: The applicant defined the normal working voltage of the battery is from 3.6Vdc to 4.35Vdc.

FREQUENCY ERROR vs. TEMPERATURE.

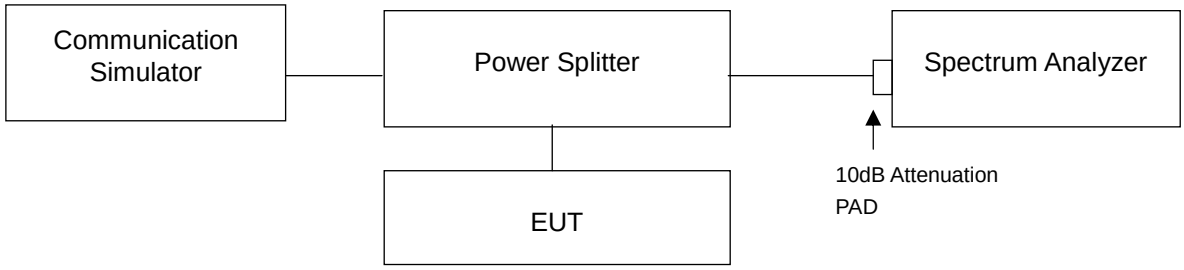
TEMP. (℃)	FREQUENCY ERROR (ppm)			LIMIT (ppm)
	GSM	EDGE	WCDMA	
-30	-0.0057	-0.0056	-0.0055	2.5
-20	-0.0051	-0.0048	-0.0049	2.5
-10	-0.0046	-0.0041	-0.0040	2.5
0	-0.0040	-0.0033	-0.0033	2.5
10	-0.0033	-0.0027	-0.0027	2.5
20	-0.0026	-0.0020	-0.0020	2.5
30	-0.0017	-0.0013	-0.0013	2.5
40	-0.0011	-0.0006	-0.0006	2.5
50	-0.0004	-0.0002	0.0000	2.5
60	0.0002	0.0004	0.0006	2.5

4.3 Occupied Bandwidth Measurement

4.3.1 Test Procedure

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

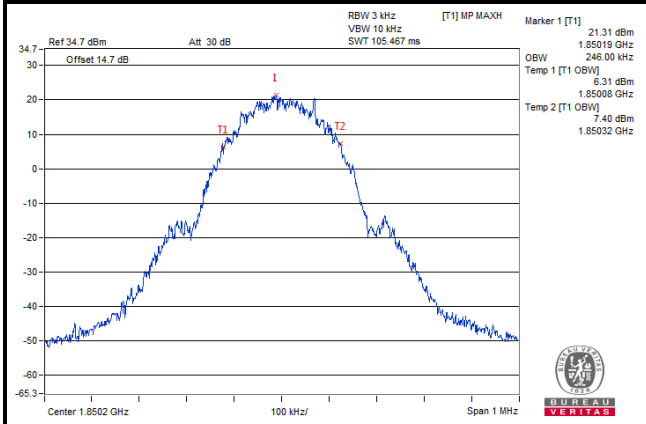


4.3.3 Test Result

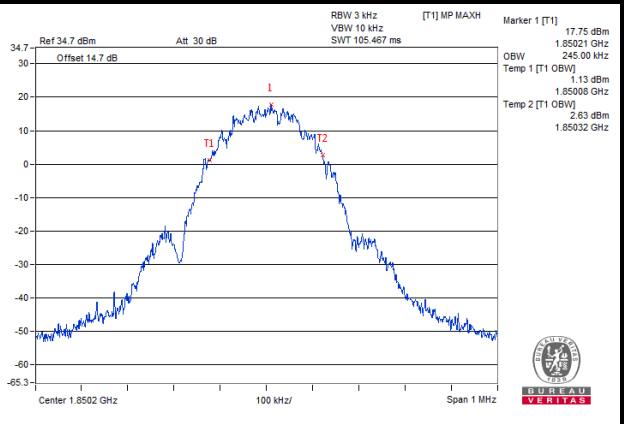
CHANNEL	FREQUENCY (MHz)	99% OCCUPIED BANDWIDTH (kHz)		CHANNEL	FREQUENCY (MHz)	99% OCCUPIED BANDWIDTH (MHz)
		GSM	EDGE			WCDMA
512	1850.2	246.00	245.00	9262	1852.4	4.14
661	1880.0	246.00	245.00	9400	1880.0	4.16
810	1909.8	245.00	243.00	9538	1907.6	4.15

SPECTRUM PLOT OF WORST VALUE

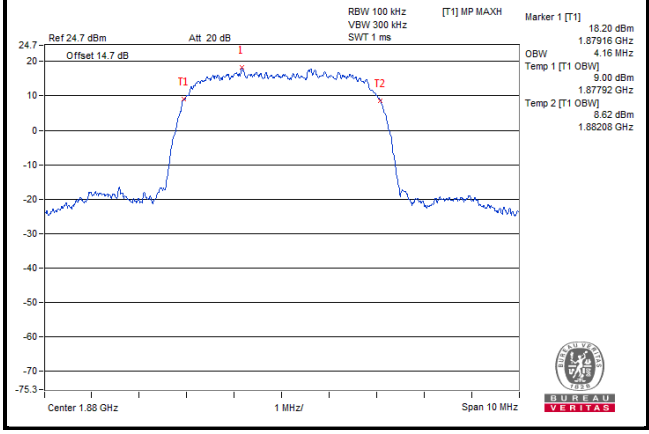
GSM



EDGE



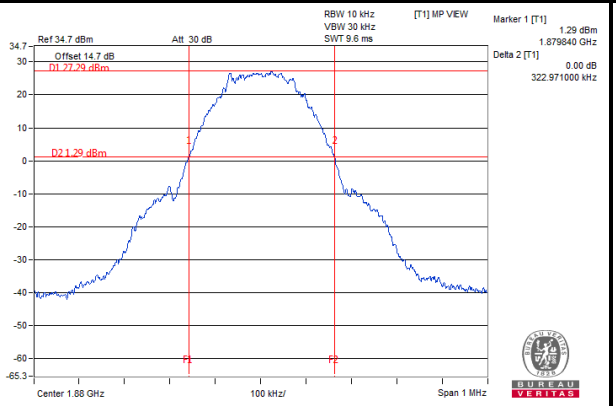
WCDMA



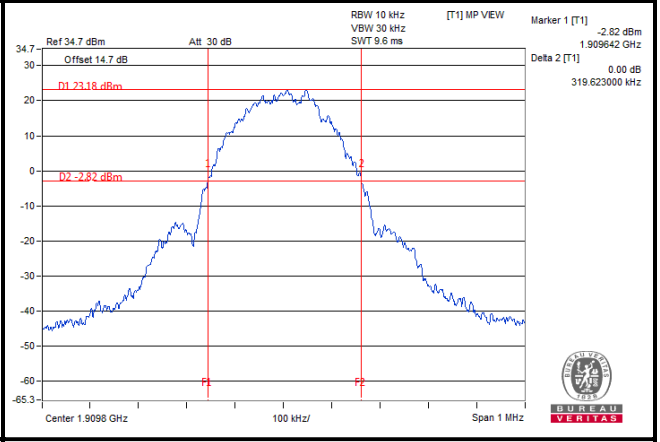
CHANNEL	FREQUENCY (MHz)	26dB BANDWIDTH (kHz)		CHANNEL	FREQUENCY (MHz)	26dB BANDWIDTH (MHz)
		GSM	EDGE			WCDMA
512	1850.2	321.06	314.11	9262	1852.4	4.76
661	1880.0	322.97	315.81	9400	1880.0	4.74
810	1909.8	316.71	319.62	9538	1907.6	4.73

SPECTRUM PLOT OF WORST VALUE

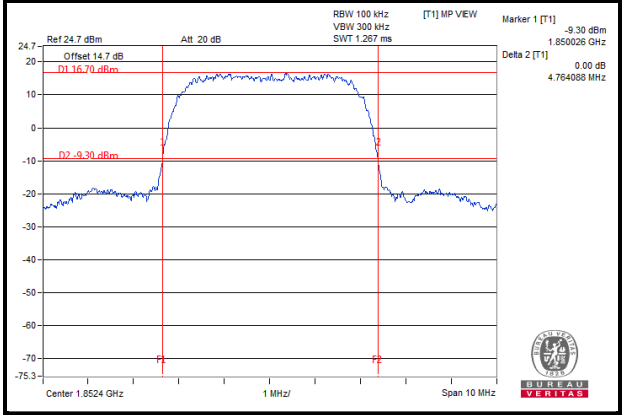
GSM



EDGE



WCDMA

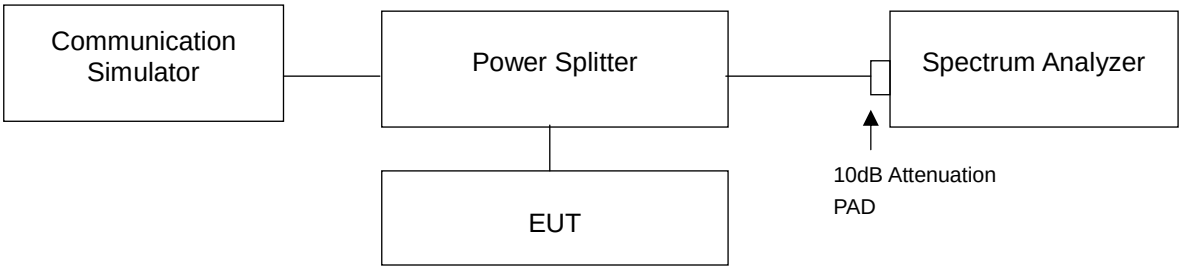


4.4 Band Edge Measurement

4.4.1 Limits of Band Edge Measurement

Power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

4.4.2 Test Setup



4.4.3 Test Procedures

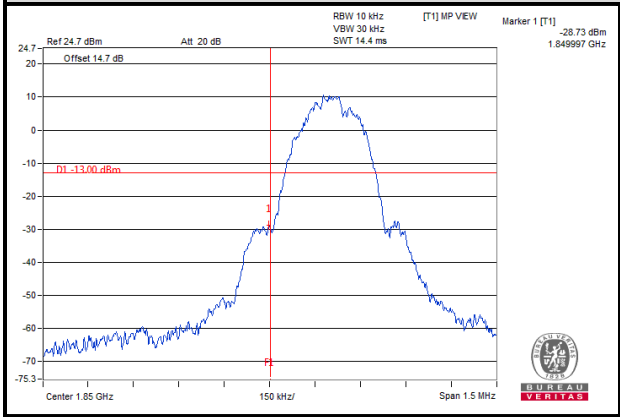
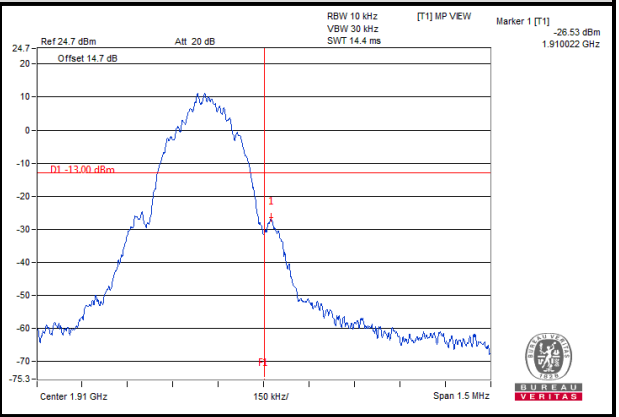
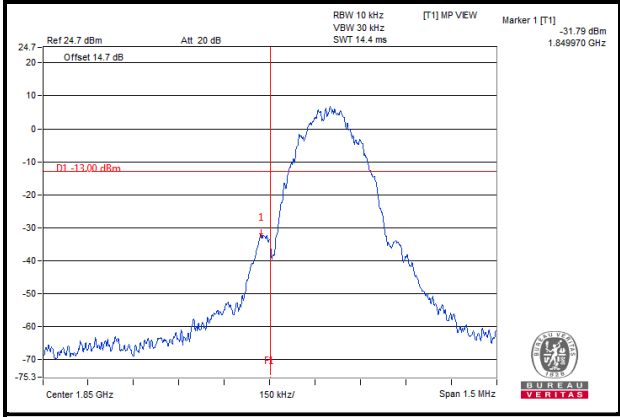
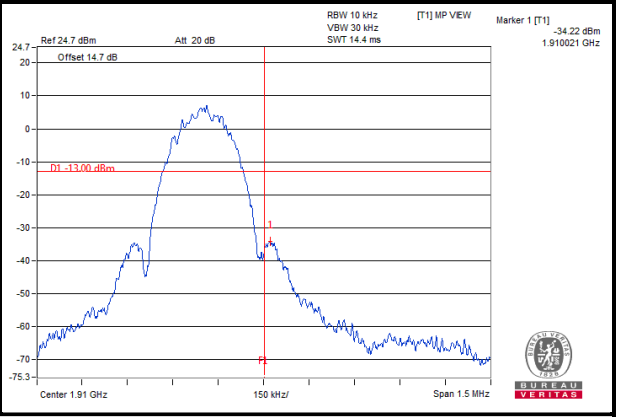
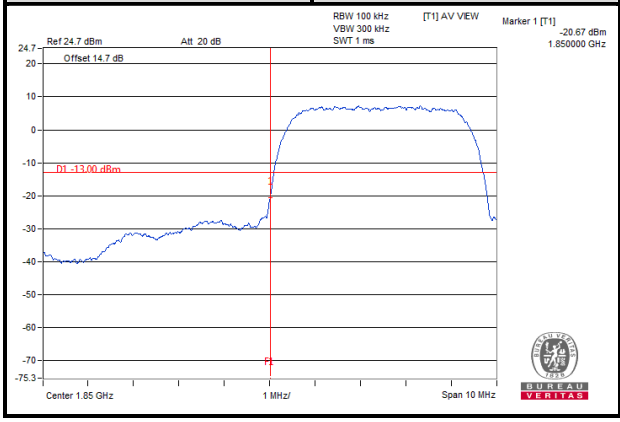
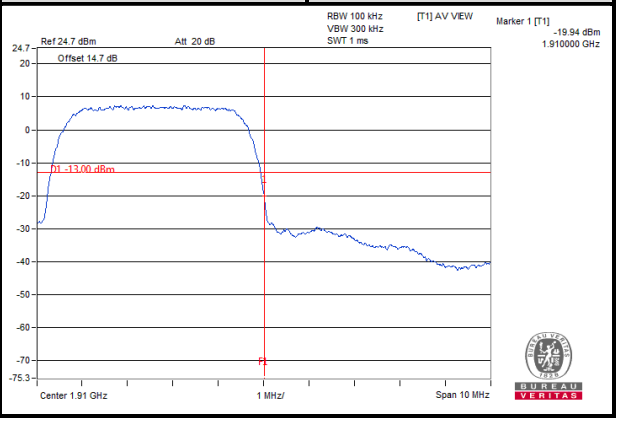
a. All measurements were done at low and high operational frequency range.

b. The center frequency of spectrum is the band edge frequency and span is 1.5MHz. 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 10MHz. RB of the spectrum is 100kHz and VB of the spectrum is 300kHz (WCDMA).

d. Record the max trace plot into the test report.

4.4.4 Test Results

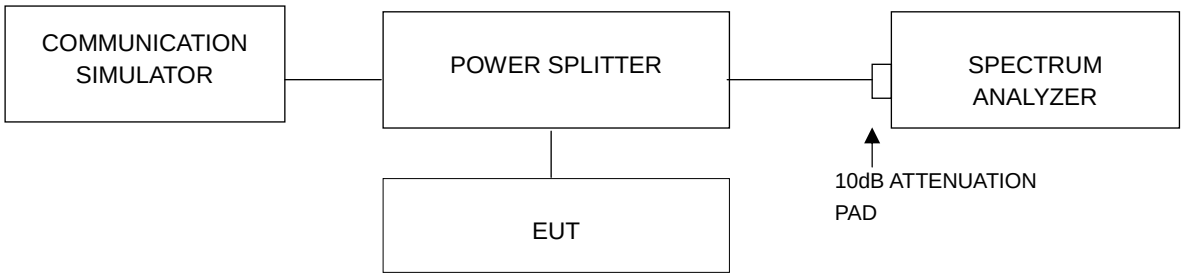
GSM			
CHANNEL	512	CHANNEL	810
GSM			
			
EDGE			
CHANNEL	512	CHANNEL	810
			
WCDMA			
CHANNEL	9262	CHANNEL	9538
			

4.5 Peak To Average Ratio

4.5.1 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.

4.5.2 Test Setup



4.5.3 Test Procedures

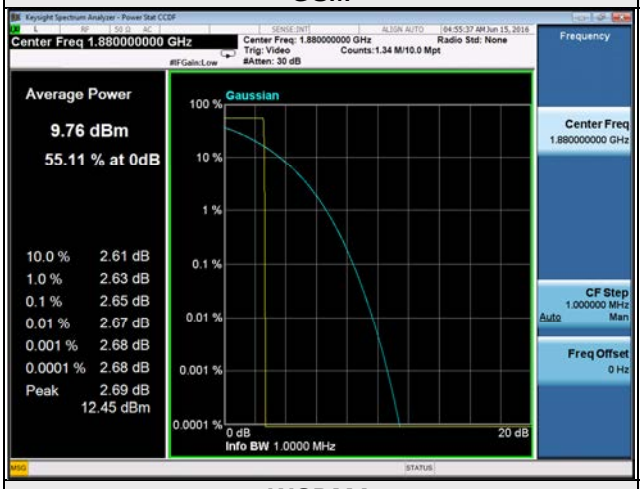
1. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1%.

4.5.4 Test Results

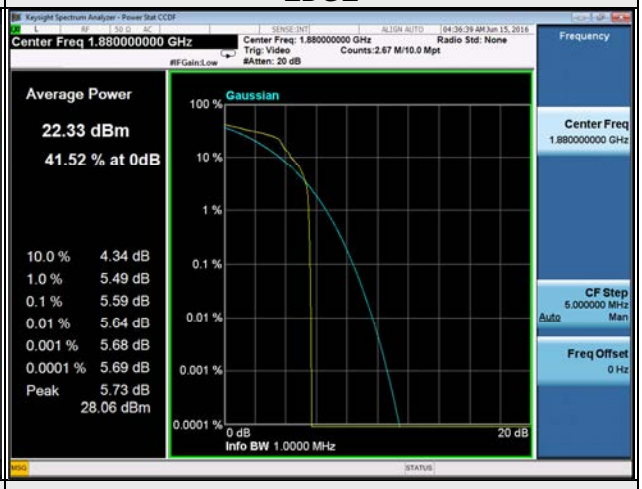
Channel	Frequency (MHz)	Peak To Average Ratio (dB)		Channel	Frequency (MHz)	Peak To Average Ratio (dB)
		GSM	EDGE			WCDMA
661	1880.0	2.65	5.59	9400	1880.0	2.92

SPECTRUM PLOT OF WORST VALUE

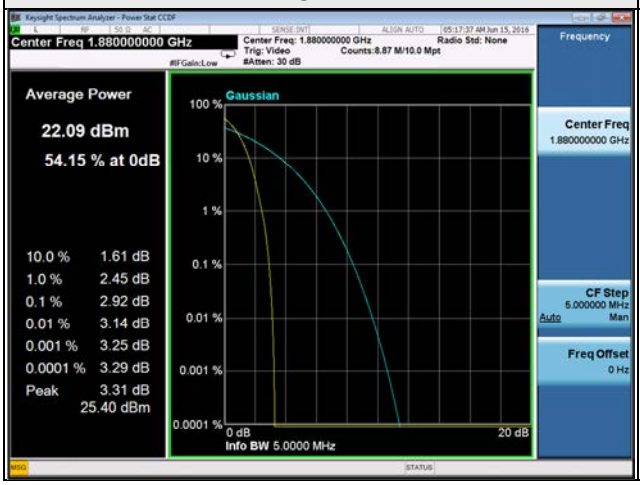
GSM



EDGE



WCDMA

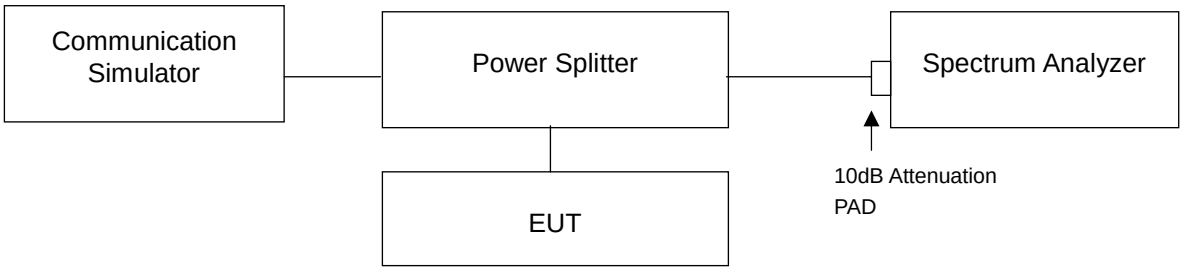


4.6 Conducted Spurious Emissions

4.6.1 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.

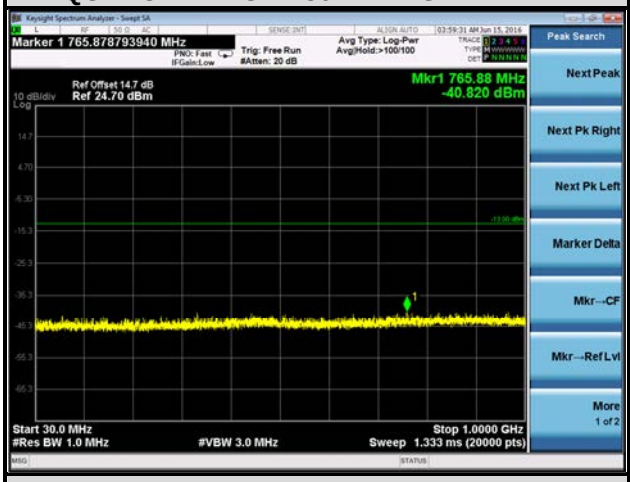
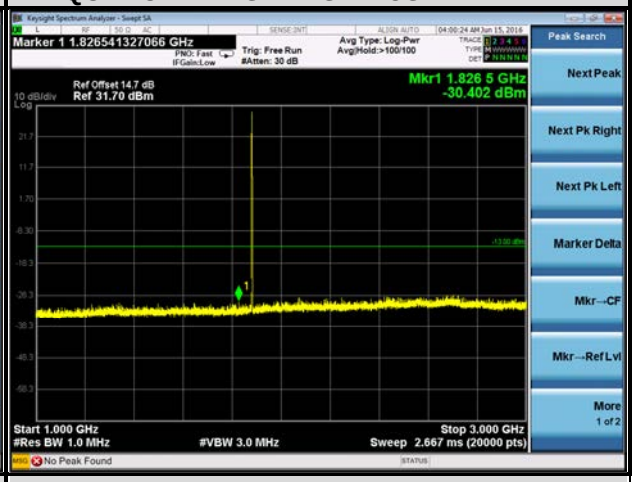
4.6.2 Test Setup

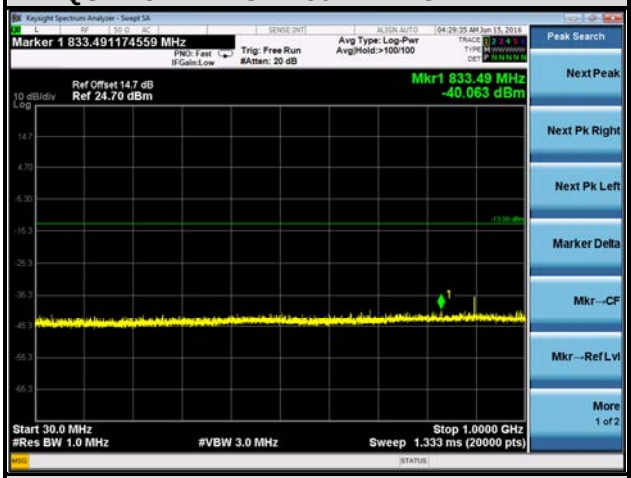
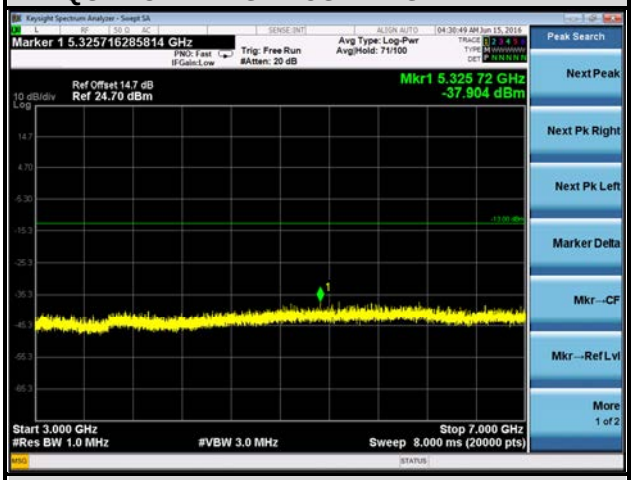
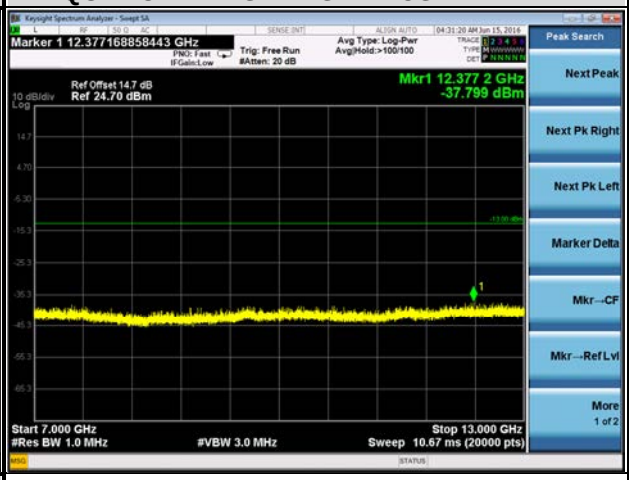
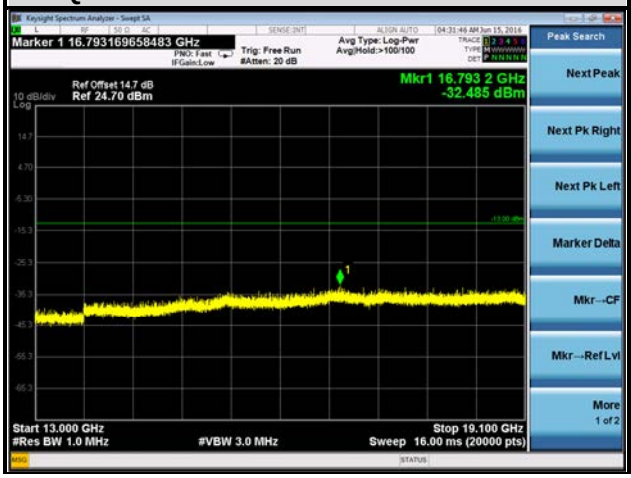


4.6.3 Test Procedure

a. The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
b. Measuring frequency range is from 9 kHz to 19.1GHz. 20dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz is used for conducted emission measurement.

4.6.4 Test Results

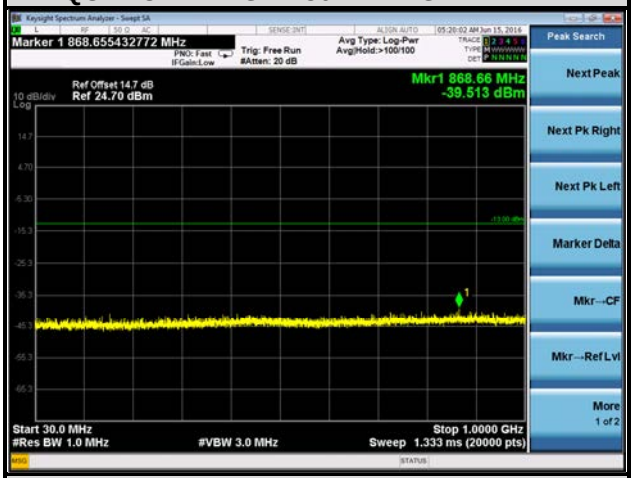
GSM	
CHANNEL 661	
FREQUENCY RANGE : 30MHz~1GHz	FREQUENCY RANGE : 1GHz~3GHz
	
FREQUENCY RANGE : 3GHz~7GHz	FREQUENCY RANGE : 7GHz~13GHz
FREQUENCY RANGE : 13GHz~19.1GHz	

EDGE	
CHANNEL 512	
FREQUENCY RANGE : 30MHz~1GHz	FREQUENCY RANGE : 1GHz~3GHz
	
FREQUENCY RANGE : 3GHz~7GHz	FREQUENCY RANGE : 7GHz~13GHz
	
FREQUENCY RANGE : 13GHz~19.1GHz	
	

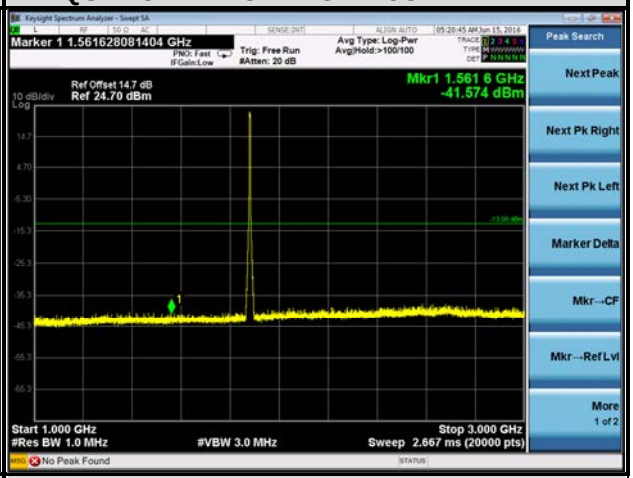
WCDMA

CHANNEL 9400

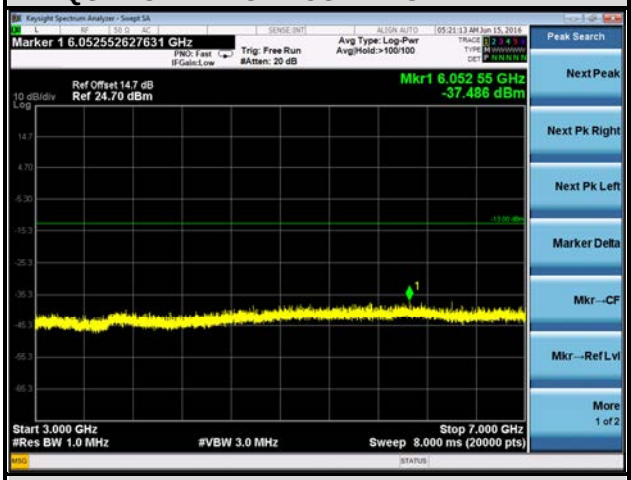
FREQUENCY RANGE : 30MHz~1GHz



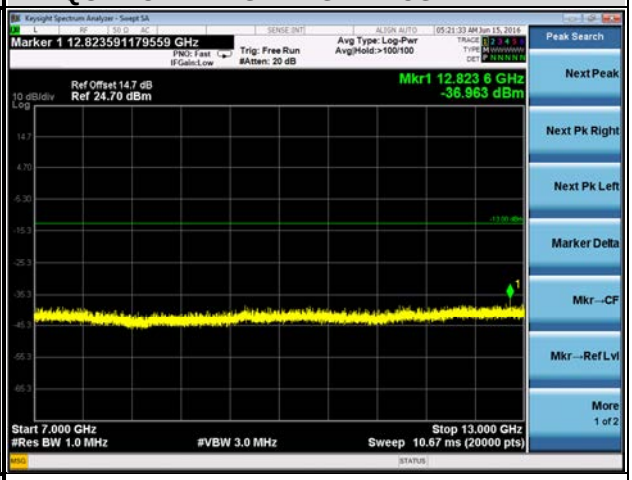
FREQUENCY RANGE : 1GHz~3GHz



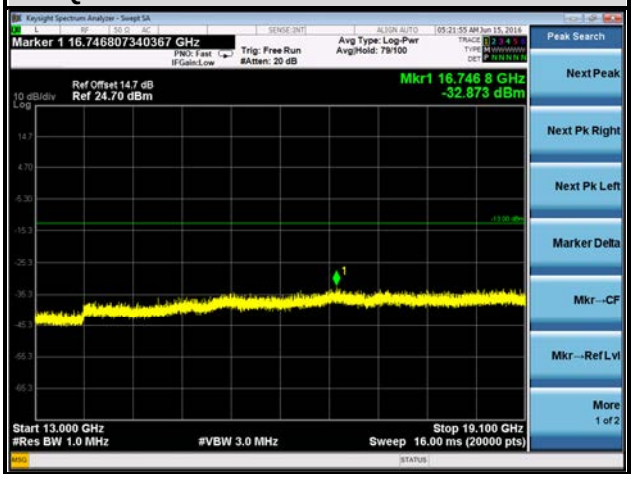
FREQUENCY RANGE : 3GHz~7GHz



FREQUENCY RANGE : 7GHz~13GHz



FREQUENCY RANGE : 13GHz~19.1GHz



4.7 Radiated Emission Measurement

4.7.1 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.

4.7.2 Test Procedure

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.

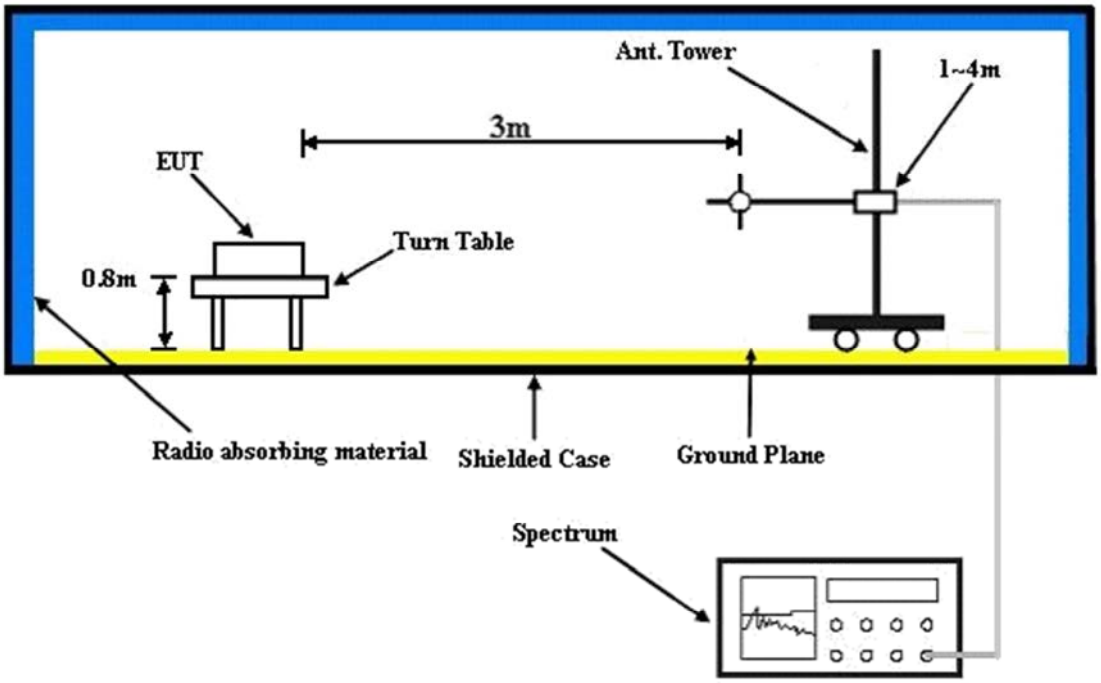
d. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.P.R power - 2.15dBi.

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

4.7.3 Deviation from Test Standard

No deviation.

4.7.4 Test Setup



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

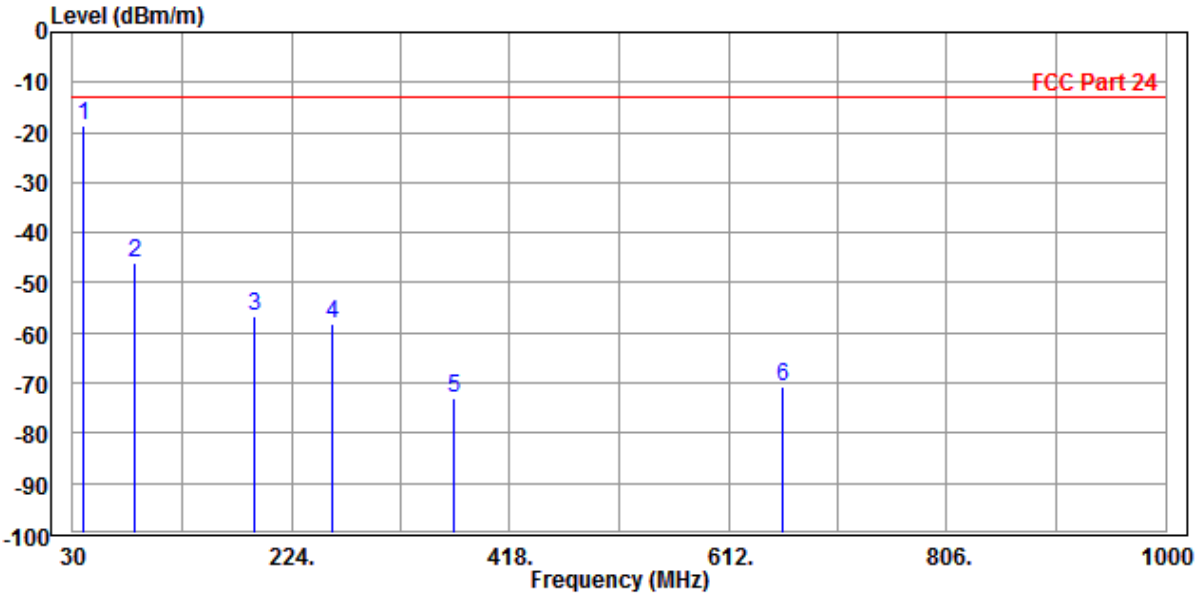
4.7.5 Test Results

BELOW 1GHz WORST-CASE DATA

GSM 1900:

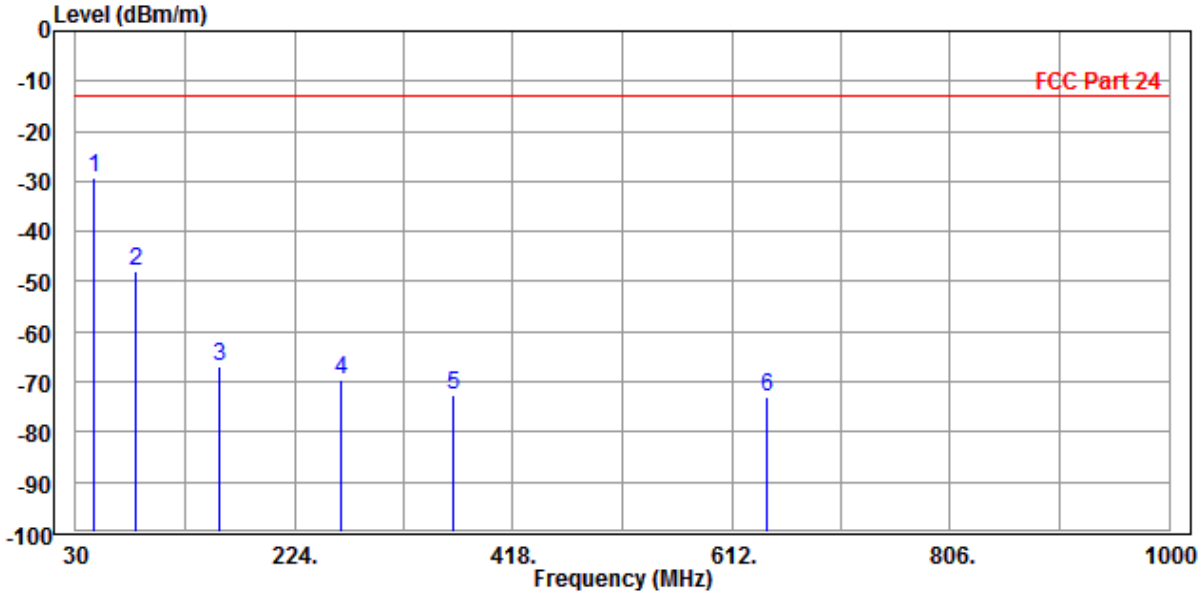
MODE	TX channel 661	**FREQUENCY RANGE**	Below 1000MHz
ENVIRONMENTAL CONDITIONS	26deg. C, 56%RH	**INPUT POWER**	DC 5V from adapter
TESTED BY	Alex Chen		
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M			

		Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
		MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1	PP	38.730	-18.61	-30.77	-13.00	-5.61	12.16	Peak	Horizontal
2		84.320	-46.15	-37.90	-13.00	-33.15	-8.25	Peak	Horizontal
3		191.020	-56.47	-39.00	-13.00	-43.47	-17.47	Peak	Horizontal
4		260.860	-58.05	-42.31	-13.00	-45.05	-15.74	Peak	Horizontal
5		367.560	-73.14	-61.59	-13.00	-60.14	-11.55	Peak	Horizontal
6		660.500	-70.76	-64.08	-13.00	-57.76	-6.68	Peak	Horizontal



MODE	TX channel 661	FREQUENCY RANGE	Below 1000MHz
ENVIRONMENTAL CONDITIONS	26deg. C, 56%RH	INPUT POWER	DC 5V from adapter
TESTED BY	Alex Chen		
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M			

		Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
		MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1	PP	45.520	-29.43	-26.09	-13.00	-16.43	-3.34	Peak	Vertical
2		83.350	-48.02	-37.68	-13.00	-35.02	-10.34	Peak	Vertical
3		158.040	-66.80	-51.39	-13.00	-53.80	-15.41	Peak	Vertical
4		265.710	-69.55	-58.10	-13.00	-56.55	-11.45	Peak	Vertical
5		365.620	-72.76	-61.70	-13.00	-59.76	-11.06	Peak	Vertical
6		644.010	-72.84	-65.99	-13.00	-59.84	-6.85	Peak	Vertical

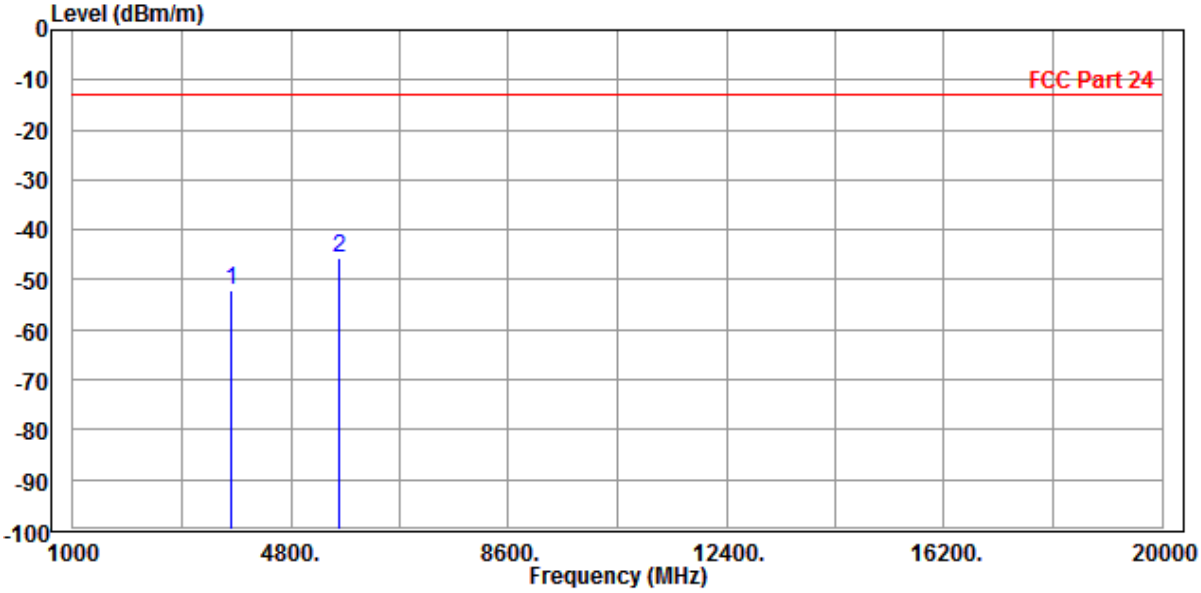


ABOVE 1GHz DATA

GSM 1900:

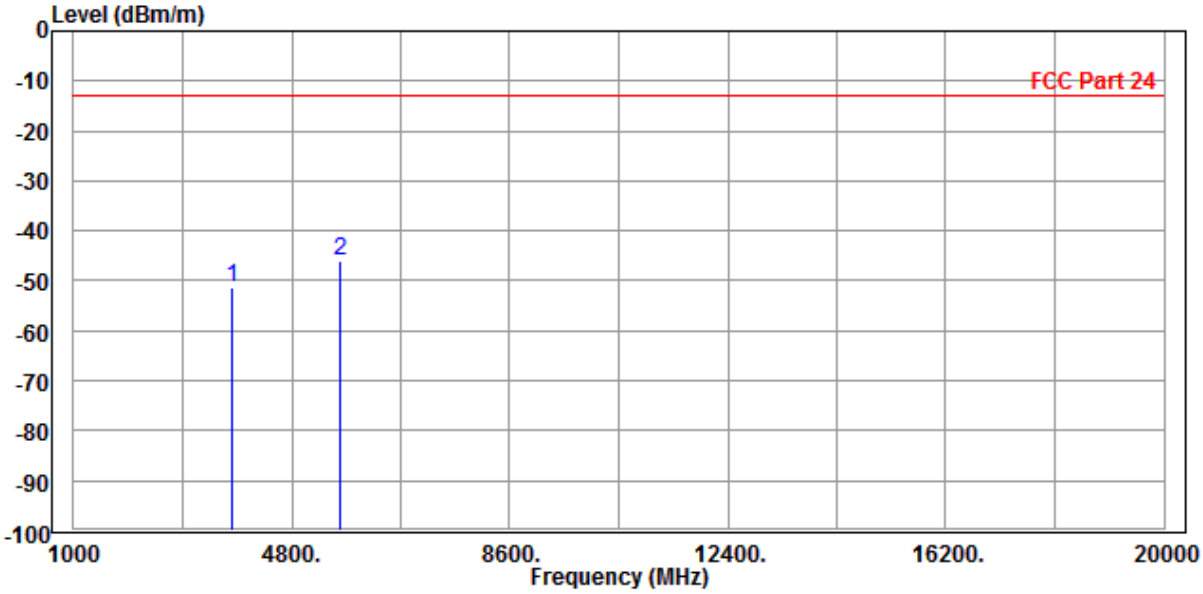
MODE	TX channel 661	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	26deg. C, 56%RH	INPUT POWER	DC 5V from adapter
TESTED BY	Alex Chen		
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M			

		Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
		MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1		3755.000	-51.92	-55.31	-13.00	-38.92	3.39	Peak	Horizontal
2	PP	5640.000	-45.60	-54.72	-13.00	-32.60	9.12	Peak	Horizontal



MODE	TX channel 661	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	26deg. C, 56%RH	INPUT POWER	DC 5V from adapter
TESTED BY	Alex Chen		
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M			

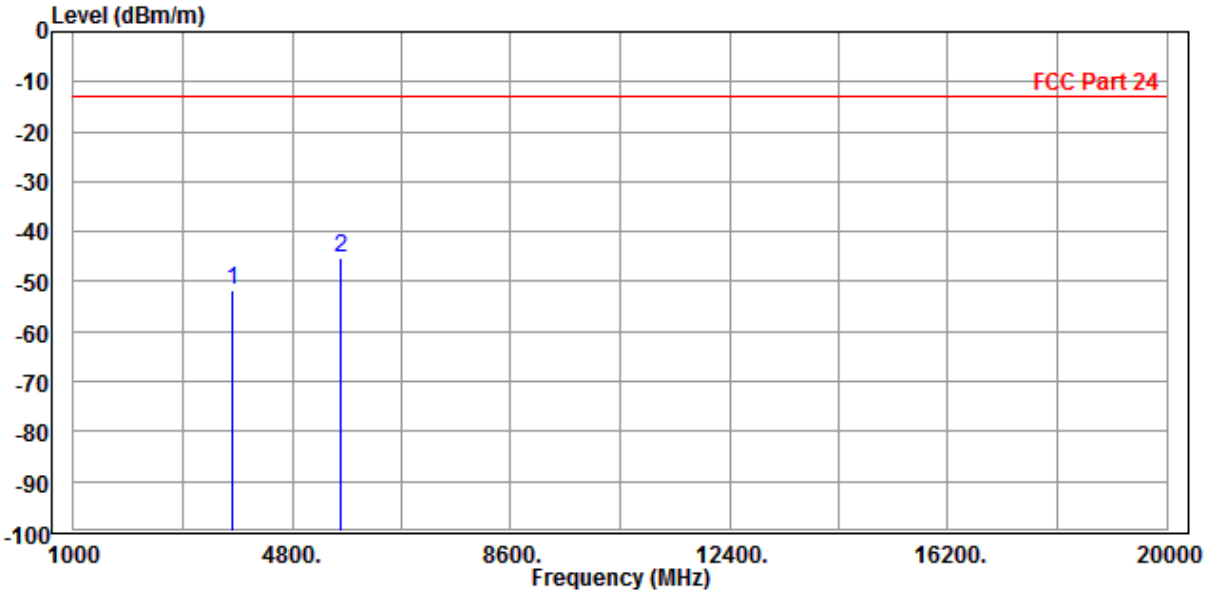
		Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
		MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1		3755.000	-51.28	-55.13	-13.00	-38.28	3.85	Peak	Vertical
2	PP	5640.000	-46.12	-54.38	-13.00	-33.12	8.26	Peak	Vertical



EDGE 1900:

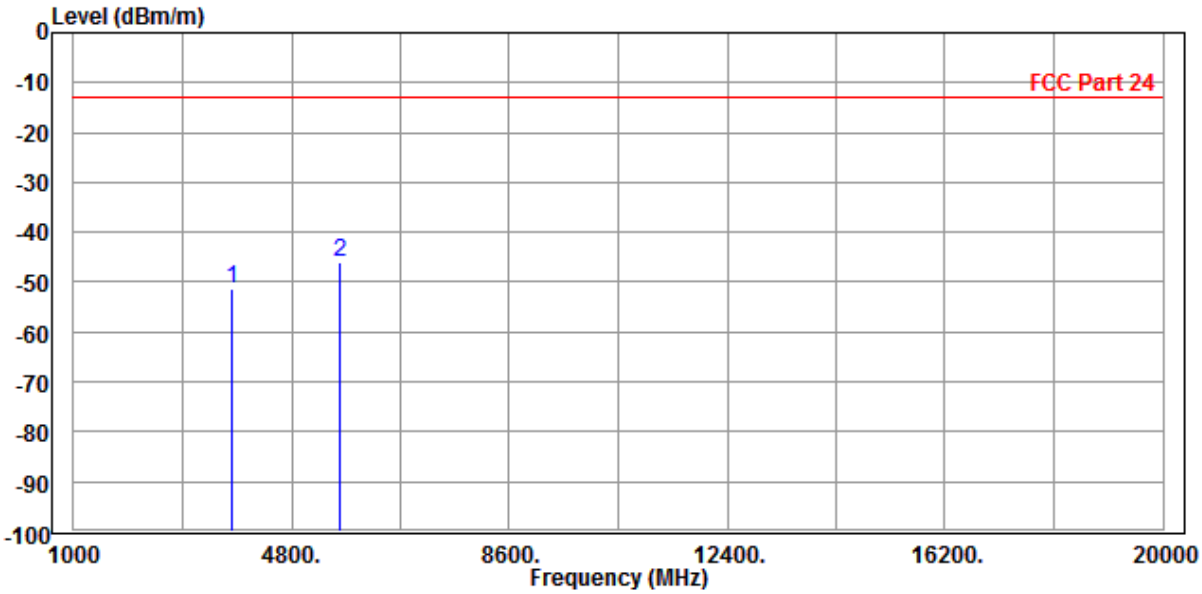
MODE	TX channel 661	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	26deg. C, 56%RH	INPUT POWER	DC 5V from adapter
TESTED BY	Alex Chen		
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M			

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
	MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1	3755.000	-51.54	-54.93	-13.00	-38.54	3.39	Peak	Horizontal
2 PP	5640.000	-45.19	-54.31	-13.00	-32.19	9.12	Peak	Horizontal



MODE	TX channel 661	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	26deg. C, 56%RH	INPUT POWER	DC 5V from adapter
TESTED BY	Alex Chen		
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M			

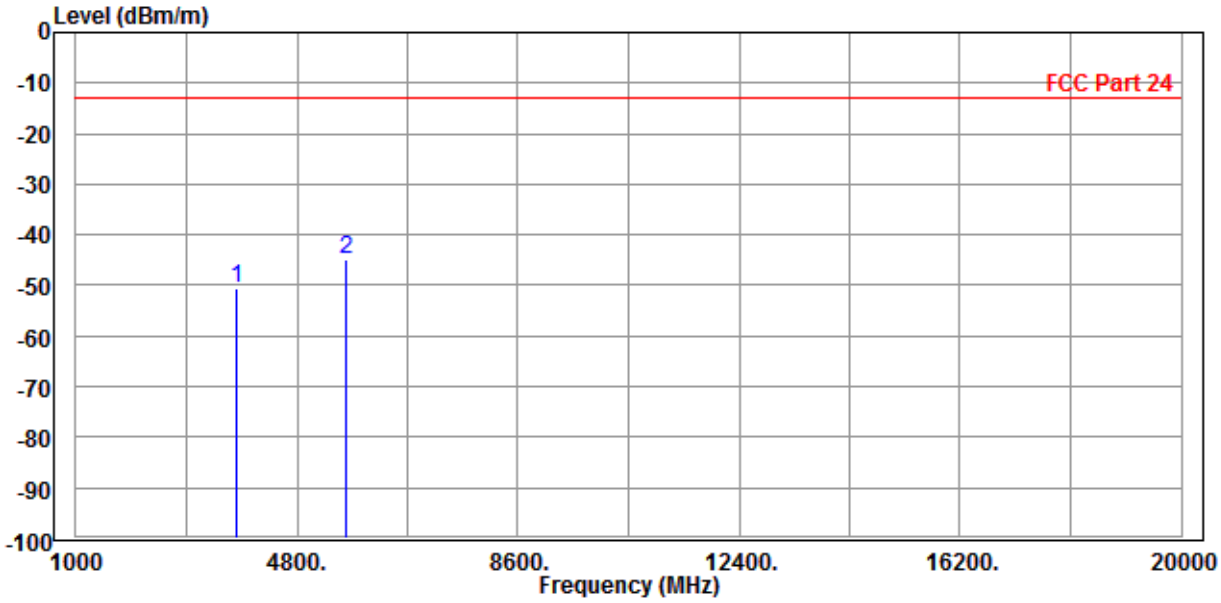
		Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
		MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1		3755.000	-51.20	-55.05	-13.00	-38.20	3.85	Peak	Vertical
2	PP	5640.000	-45.95	-54.21	-13.00	-32.95	8.26	Peak	Vertical



WCDMA Band II:

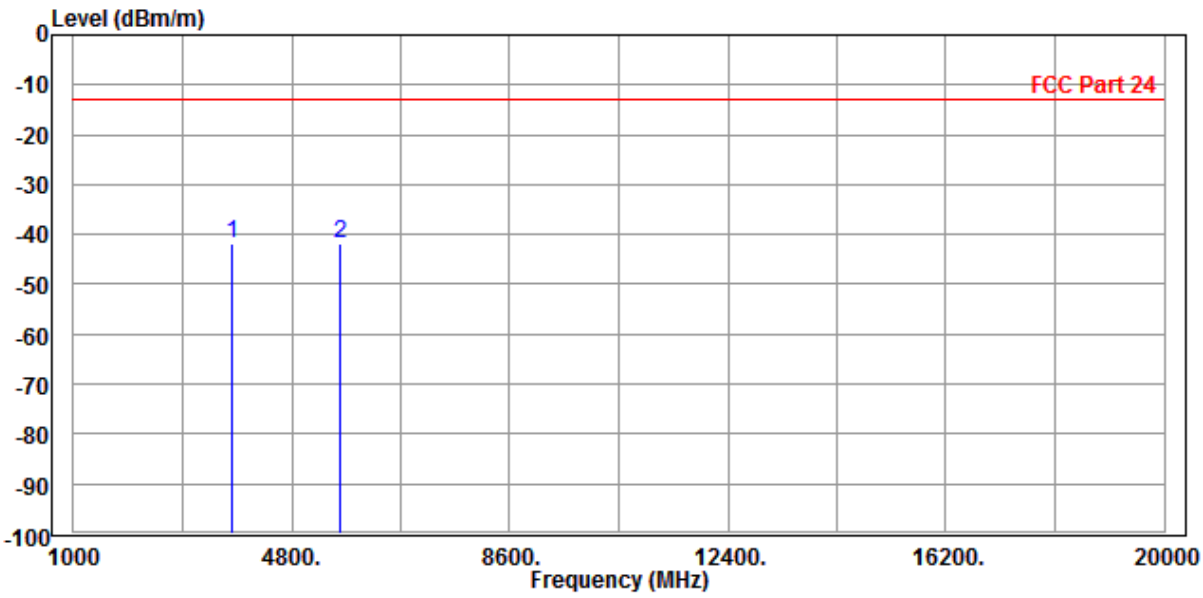
MODE	TX channel 9400	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	26deg. C, 56%RH	INPUT POWER	DC 5V from adapter
TESTED BY	Alex Chen		
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M			

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
	MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1	3755.000	-50.75	-54.14	-13.00	-37.75	3.39	Peak	Horizontal
2 PP	5640.000	-44.80	-53.92	-13.00	-31.80	9.12	Peak	Horizontal



MODE	TX channel 9400	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	26deg. C, 56%RH	INPUT POWER	DC 5V from adapter
TESTED BY	Alex Chen		
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M			

		Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
		MHz	dBm/m	dBm	dBm/m	dB	dB/m		
1	PP	3755.000	-41.75	-45.60	-13.00	-28.75	3.85	Peak	Vertical
2		5640.000	-41.86	-50.12	-13.00	-28.86	8.26	Peak	Vertical



5 Pictures of Test Arrangements

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

Appendix – 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:

Linko EMC/RF Lab
Tel: 886-2-26052180
Fax: 886-2-26051924

Hsin Chu EMC/RF Lab/Telecom Lab
Tel: 886-3-5935343
Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety
Tel: 886-3-3183232
Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com
Web Site: www.bureauveritas-adt.com

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

--- END ---