FCC Test Report

(PART 24)

Report No.: RF160705C01-6

FCC ID: PY7-93041M

Received Date: Jul. 05, 2016

Test Date: Jul. 19, 2016 ~ Jul. 22, 2016

Issued Date: Jul. 29, 2016

Applicant: Sony Mobile Communications Inc.

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Release Control Record

Issue No.	Description	Date Issued
RF160705C01-6	Original Release	Jul. 29, 2016

1 Certificate of Conformity

Product: Mobile Phone

Brand: Sony

Sample Status: Identical Prototype

Applicant: Sony Mobile Communications Inc.

Test Date: Jul. 19, 2016 ~ Jul. 22, 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 : Gina Liu , **Date:** Jul. 29, 2016

Gina Liu / Specialist

Approved by : Stanley Wu , **Date:** Jul. 29, 2016

Stanley Wu / Assistant Manager

2 Summary of Test Results

Applied Standard: FCC Part 24 & Part 2			
FCC Clause	**Test Item**	**Result**	**Remarks**
2.1046 24.232	Effective Isotropic 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 -36.72 dB at 3760 MHz.

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	150 kHz ~ 30 MHz	2.44 dB
Radiated Emissions up to 1 GHz	30 MHz ~ 200 MHz	2.0153 dB
	200 MHz ~1000 MHz	2.0224 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	1.0121 dB
	18 GHz ~ 40 GHz	1.1508 dB

2.2 Test Site And Instruments

Description & Manaufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent Technologies	N9038A	MY51210203	Jan. 21, 2016	Jan. 20, 2017
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Dec. 17, 2015	Dec. 16, 2016
BILOG Antenna SCHWARZBECK	VULB9168	9168-472	Jan. 07, 2016	Jan. 06, 2017
HORN Antenna ETS-Lindgren	3117	00143293	Jan. 04, 2016	Jan. 03, 2017
Double Ridge Guide Horn Antenna EMCO	3115	5619	Jan. 04, 2016	Jan. 03, 2017
BILOG Antenna SCHWARZBECK	VULB 9168	9168-153	Jan. 07, 2016	Jan. 06, 2017
Agilent Communications Tester-Wireless	8960 Series 10	MY53201073	Jul. 03, 2015	Jul. 02, 2017
Preamplifier Agilent	310N	187226	Jun. 24, 2016	Jun. 23, 2017
Preamplifier Agilent	83017A	MY39501357	Jun. 24, 2016	Jun. 23, 2017
Power Meter Anritsu	ML2495A	1232002	Sep. 21, 2015	Sep. 20, 2016
Power Sensor Anritsu	MA2411B	1207325	Sep. 21, 2015	Sep. 20, 2016
RF signal cable ETS-LINDGREN	5D-FB	Cable-CH1-01(RFC-SMS-100-SMS-120+RFC-SMS-100-SMS-400)	Jun. 24, 2016	Jun. 23, 2017
RF signal cable ETS-LINDGREN	8D-FB	Cable-CH1-02(RFC-SMS-100-SMS-24)	Jun. 24, 2016	Jun. 23, 2017
Software BV ADT	E3 8.130425b	NA	NA	NA
Antenna Tower MF	NA	NA	NA	NA
Turn Table MF	NA	NA	NA	NA
Antenna Tower &Turn Table Controller MF	MF-7802	NA	NA	NA
Communications Tester-Wireless Agilent	8960 Series 10	MY53201073	Jul. 03, 2015	Jul. 02, 2017
Radio Communication Analyzer Anritsu	MT8820C	6201240432	Jul. 06, 2015	Jul. 05, 2017

Note:
1. The calibration interval of the above test instruments is 12 / 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HsinTien Chamber 1.
3. The horn antenna and preamplifier (model: 83017A) are used only for the measurement of emission frequency above 1 GHz if tested.
4. The FCC Site Registration No. is 149147.
5. The IC Site Registration No. is IC7450I-1.

3 General Information

3.1 General Description of EUT

Product	Mobile Phone	
Brand	Sony	
Status of EUT	Identical Prototype	
Power Supply Rating	3.8Vdc (Embeded Battery) 5Vdc or 9Vdc or 12Vdc (Adapter)	
Modulation Type	GSM/GPRS	GMSK
	EDGE	GMSK, 8PSK
Frequency Range	GSM/GPRS/EDGE	1850.2 ~ 1909.8 MHz
Max. EIRP Power	GSM/GPRS	909.91 mW
	EDGE	363.33 mW
Emission Designator	GSM/GPRS	246KGXW
	EDGE	245KG7W
Antenna Type	Fixed Internal Antenna	
Accessory Device	Refer to Note as below	
Data Cable Supplied	Refer to Note as below	

Note:

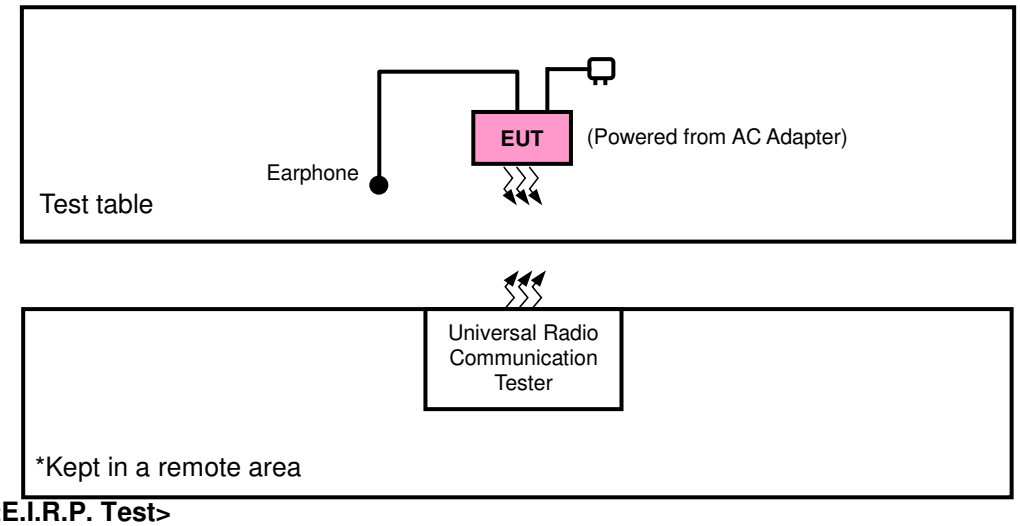
1. The EUT contains following accessory devices.

Product	Brand	Model	Type	Description
Adapter	Sony	UCH12	AC-0051	I/P: 100- 240Vac, 400mA, 50~60 Hz,
Earphone	Sony	MH410c	AG-1100	1.5m non-shielded cable w/o core
USB Cable	Sony	UCB20	AI-0160	0.95m shielded cable w/o core

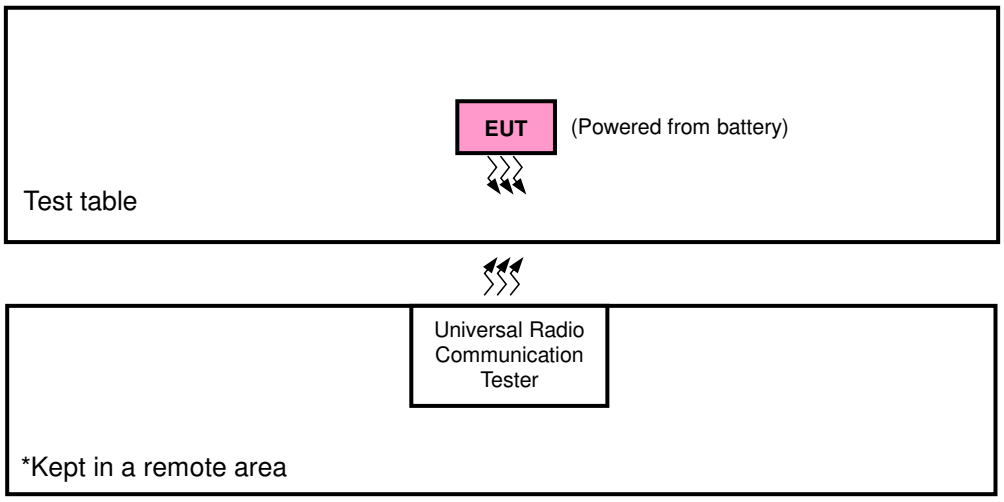
2. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3.2 Configuration of System under Test

<Radiated Emission Test>



<E.I.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.

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	EIRP	Radiated Emission
GSM	Z-plane	Y-axis
EDGE	Z-plane	Y-axis

GSM

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Mode
-	EIRP	512 to 810	512, 661, 810	GSM, EDGE
-	Frequency Stability	512 to 810	661	GSM, EDGE
-	Occupied Bandwidth	512 to 810	512, 661, 810	GSM, EDGE
-	Band Edge	512 to 810	512, 810	GSM, EDGE
-	Peak to Average Ratio	512 to 810	512, 661, 810	GSM, EDGE
-	Condcudeted Emission	512 to 810	661	GSM, EDGE
-	Radiated Emission	512 to 810	661	GSM, EDGE

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
EIRP	26 deg. C, 58 % RH	3.8 Vdc	Charles Hsiao
Frequency Stability	26 deg. C, 58 % RH	3.8 Vdc	Taylor Liu
Occupied Bandwidth	26 deg. C, 58 % RH	3.8 Vdc	Taylor Liu
Band Edge	26 deg. C, 58 % RH	3.8 Vdc	Taylor Liu
Peak to Average Ratio	26 deg. C, 58 % RH	3.8 Vdc	Taylor Liu
Condcudeted Emission	26 deg. C, 58 % RH	3.8 Vdc	Taylor Liu
Radiated Emission	25 deg. C, 65 % RH	120 Vac, 60 Hz	Charles Hsiao

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 v02r02
ANSI/TIA/EIA-603-D 2010

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:

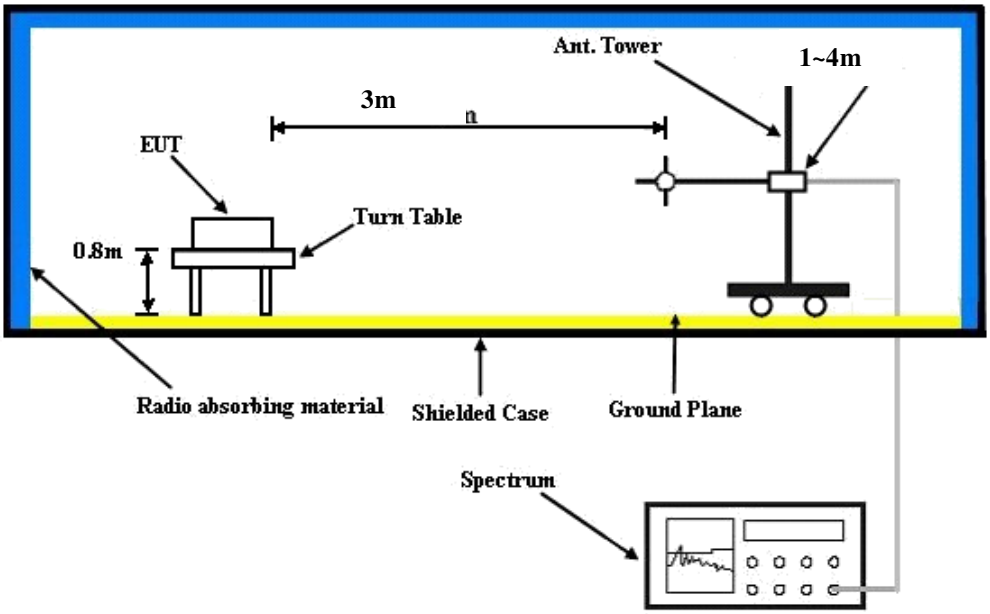
a. All measurements were done at low, middle and high operational frequency range. RBW and VBW is 1 MHz for GSM, GPRS & EDGE, 5 MHz for WCDMA and CDMA, and 10 MHz for LTE mode.
b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The “Read Value” is the spectrum reading the maximum power value.
c. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a tx cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to “Read Value” of step b. Record the power level of S.G.
d. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn.E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.P.R power - 2.15 dBi.

Conducted Power Measurement:

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

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:

4.1.4 Test Results

Conducted Output Power (dBm)

Band	GSM1900		
Channel	512	661	810
Frequency (MHz)	1850.2	1880.0	1909.8
GSM (GMSK, 1Tx-slot)	30.12	30.36	29.77
GPRS 8 (GMSK, 1Tx-slot)	30.15	30.31	29.75
GPRS 10 (GMSK, 2Tx-slot)	27.98	28.02	27.84
GPRS 11 (GMSK, 3Tx-slot)	26.11	26.08	25.90
GPRS 12 (GMSK, 4Tx-slot)	24.95	24.93	24.76
GPRS 30 (GMSK, 1Tx-slot)	30.32	30.38	30.30
GPRS 31 (GMSK, 2Tx-slot)	28.05	28.06	27.89
GPRS 32 (GMSK, 3Tx-slot)	26.17	26.15	25.87
GPRS 33 (GMSK, 4Tx-slot)	24.94	25.01	24.76
DTM (GMSK, 2Tx-slot)	27.82	27.84	27.56
DTM (GMSK, 3Tx-slot)	26.00	25.96	25.77
EDGE 8 (8PSK, 1Tx-slot)	26.38	26.36	26.15
EDGE 10 (8PSK, 2Tx-slot)	24.98	24.95	24.72
EDGE 11 (8PSK, 3Tx-slot)	23.00	22.95	22.71
EDGE 12 (8PSK, 4Tx-slot)	22.13	22.10	21.85
EDGE 30 (8PSK, 1Tx-slot)	26.38	26.36	26.16
EDGE 31 (8PSK, 2Tx-slot)	24.94	24.95	24.63
EDGE 32 (8PSK, 3Tx-slot)	23.02	22.97	22.73
EDGE 33 (8PSK, 4Tx-slot)	22.12	22.08	21.84
DTM (8PSK, 2Tx-slot)	24.81	24.75	24.51
DTM (8PSK, 3Tx-slot)	22.89	22.86	22.62

EIRP Power (dBm)

GSM							
Plane	**Channel**	**Frequency (MHz)**	**LVL (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (mW)**	**Polarization (H/V)**
Z	512	1850.2	-15.14	44.70	29.56	903.65	H
	661	1880.0	-15.11	44.70	29.59	909.91	
	810	1909.8	-15.06	44.57	29.51	893.92	
	512	1850.2	-20.77	44.27	23.50	223.87	V
	661	1880.0	-21.33	44.87	23.54	225.94	
	810	1909.8	-21.16	44.61	23.45	221.46	

EDGE							
Plane	**Channel**	**Frequency (MHz)**	**LVL (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (mW)**	**Polarization (H/V)**
Z	512	1850.2	-19.12	44.70	25.58	361.41	H
	661	1880.0	-19.18	44.70	25.52	356.45	
	810	1909.8	-18.97	44.57	25.60	363.33	
	512	1850.2	-24.75	44.27	19.52	89.54	V
	661	1880.0	-25.37	44.87	19.50	89.13	
	810	1909.8	-24.98	44.61	19.63	91.90	

4.2 Frequency Stability Measurement

4.2.1 Limits of Frequency Stabiliity Measurement

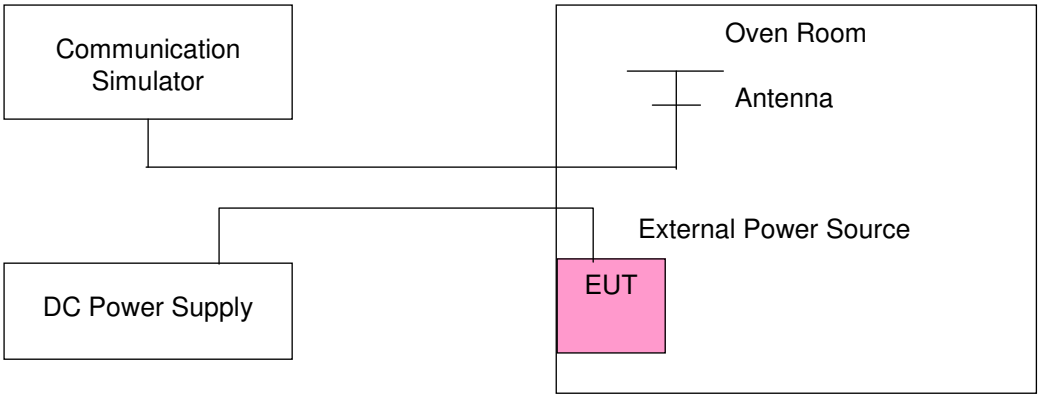
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

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	
3.8	0.002	0.001	2.5
3.6	0.002	0.001	2.5
4.2	0.002	0.001	2.5

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

Frequency Error vs. Temperature

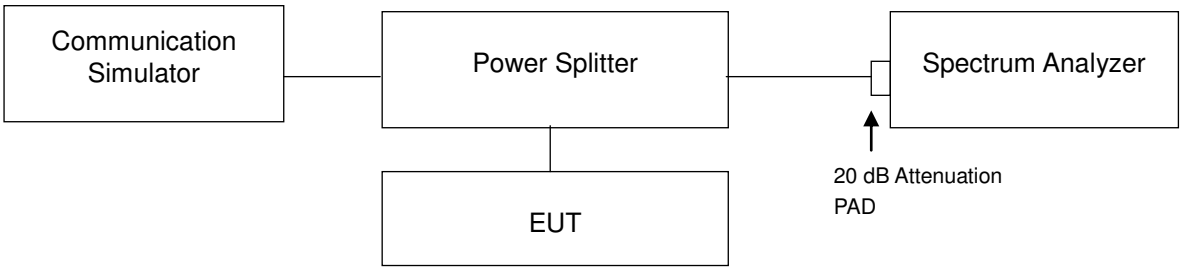
Temp. (℃)	Frequency Error (ppm)		Limit (ppm)
	GSM	EDGE	
-30	0.001	0.001	2.5
-20	0.001	0.001	2.5
-10	0.002	0.001	2.5
0	0.001	0.002	2.5
10	0.001	0.001	2.5
20	-0.001	-0.002	2.5
30	-0.002	-0.002	2.5
40	-0.001	-0.001	2.5
50	-0.001	-0.002	2.5
55	-0.001	-0.002	2.5

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

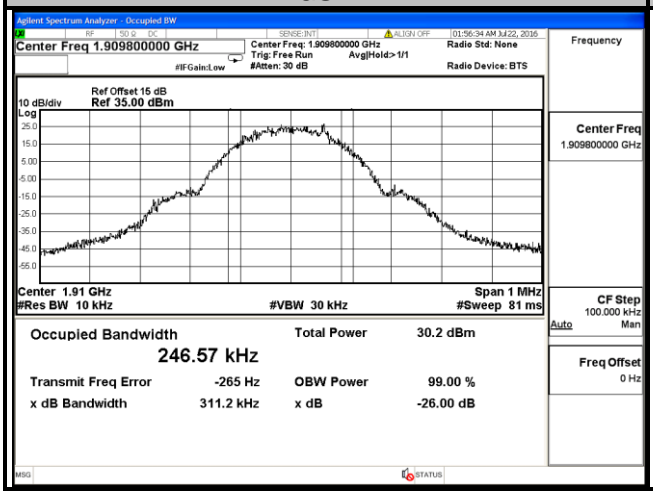


4.3.3 Test Result

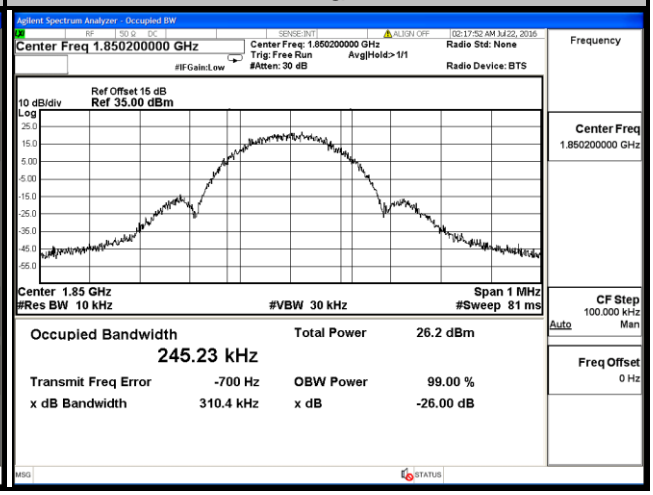
Channel	Frequency (MHz)	99 % Occupied Bandwidth (kHz)	
		GSM	EDGE
512	1850.2	245.43	245.23
661	1880.0	244.46	243.16
810	1909.8	246.57	243.71

Spectrum Plot of Worst Value

GSM



EDGE

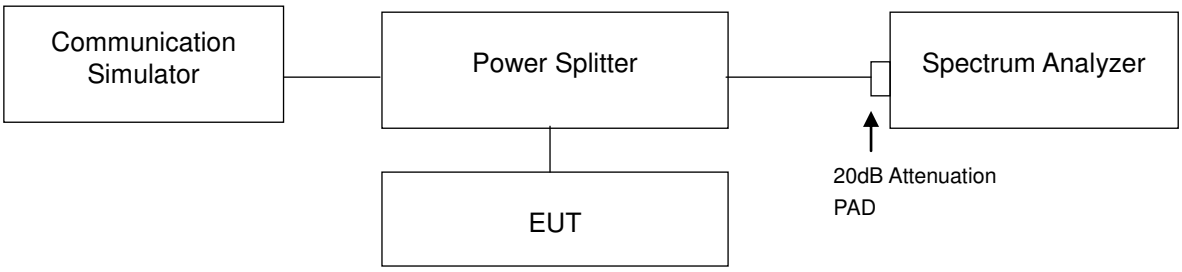


4.4 Band Edge Measurement

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

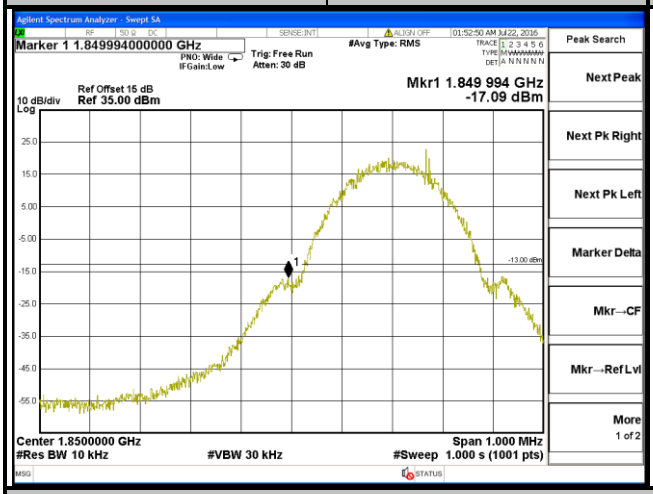


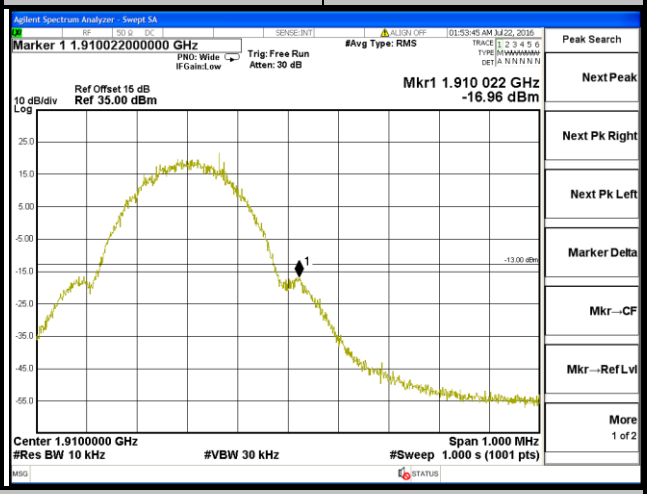
4.4.3 Test Procedures

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 MHz. RB of the spectrum is 10 kHz and VB of the spectrum is 30 kHz (GSM/GPRS/EDGE).
c. The center frequency of spectrum is the band edge frequency and span is 5 MHz. RB of the spectrum is 100 kHz and VB of the spectrum is 300 kHz (WCDMA).
d. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 13 kHz and VB of the spectrum is 51 kHz (LTE Bandwidth 1.4 MHz).
e. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 30 kHz and VB of the spectrum is 100 kHz (LTE Bandwidth 3 MHz).
f. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 100 kHz and VB of the spectrum is 300 kHz (LTE Bandwidth 5 MHz/10 MHz).
g. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 150 kHz and VB of the spectrum is 470 kHz (LTE Bandwidth 15 MHz).
h. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 180 kHz and VB of the spectrum is 560 kHz (LTE Bandwidth 20 MHz).
i. Record the max trace plot into the test report.

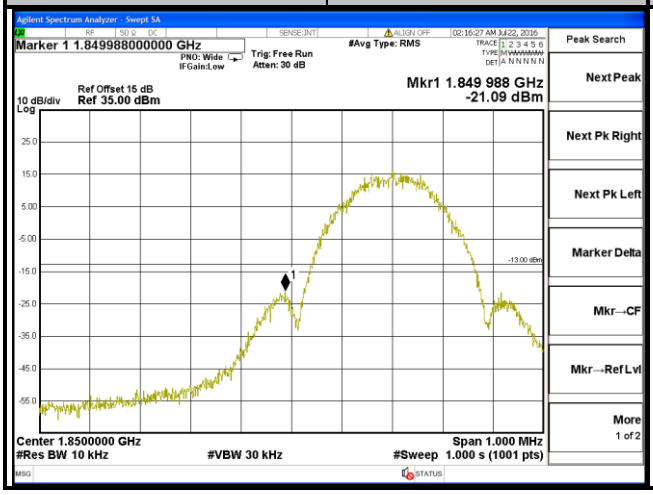
4.4.4 Test Results

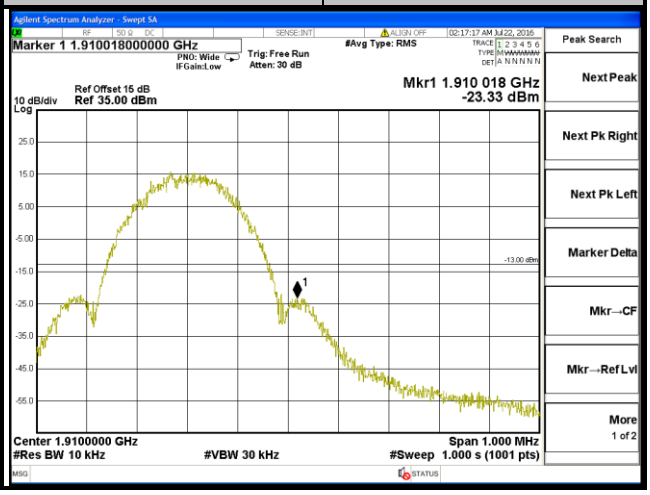
GSM			
Channel	512	Channel	810





EDGE			
Channel	512	Channel	810



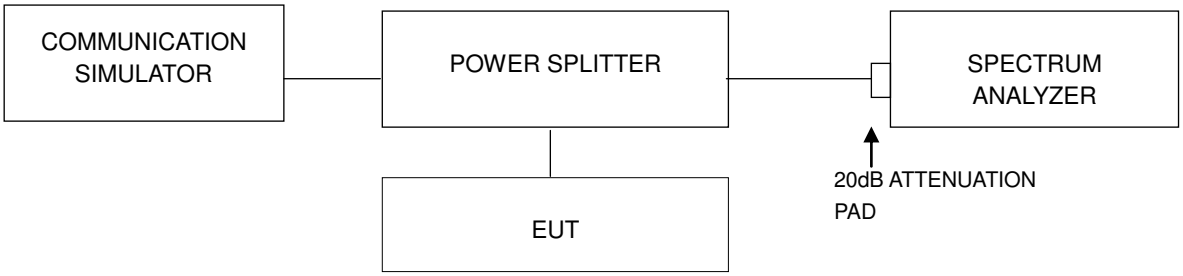


4.5 Peak to Average Ratio

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

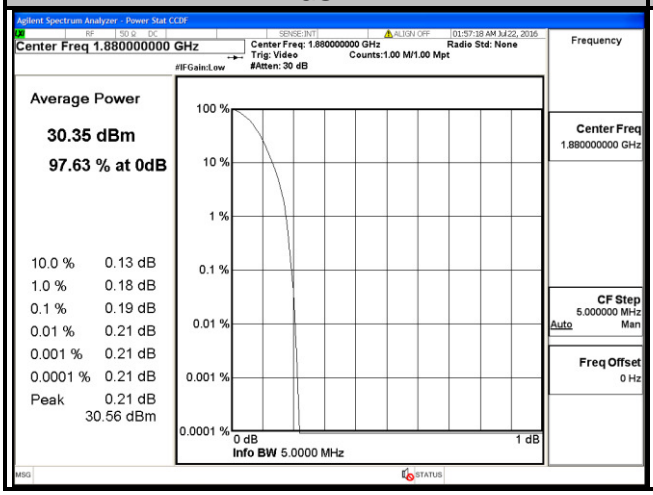
1. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1 %.

4.5.4 Test Results

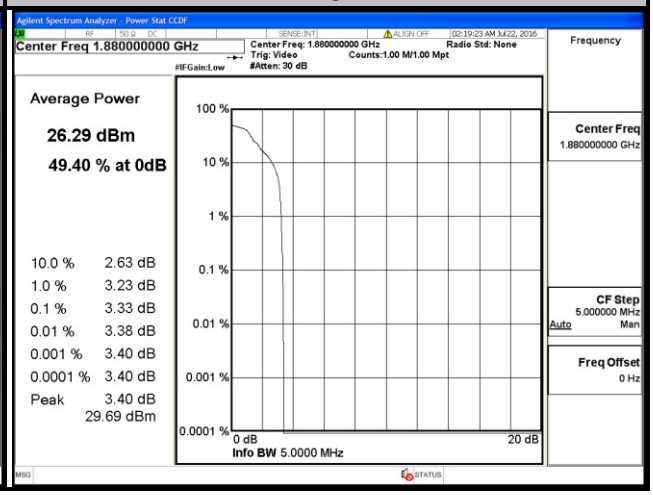
Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		GSM	EDGE
512	1850.2	0.18	3.31
661	1880.0	0.19	3.33
810	1909.8	0.19	3.33

Spectrum Plot of Worst Value

GSM



EDGE

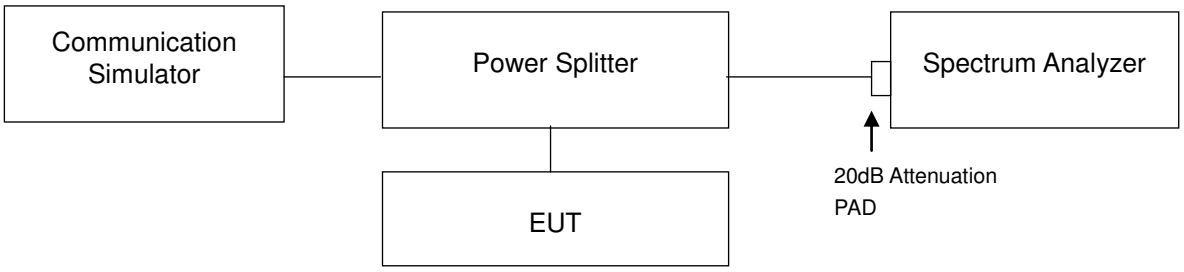


4.6 Conducted Spurious Emissions

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 –13 dBm.

4.6.2 Test Setup

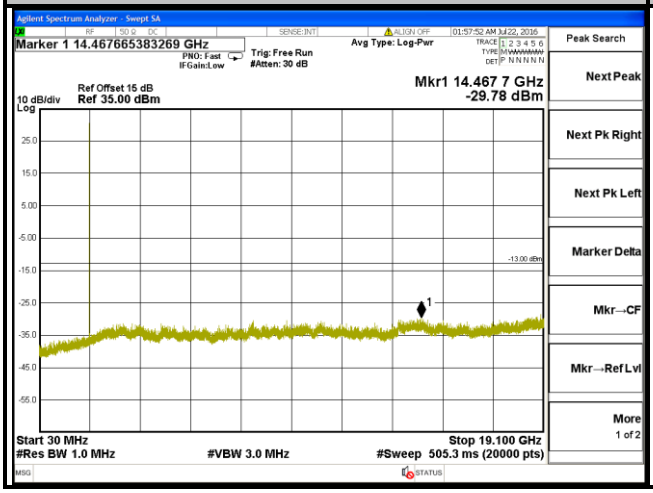
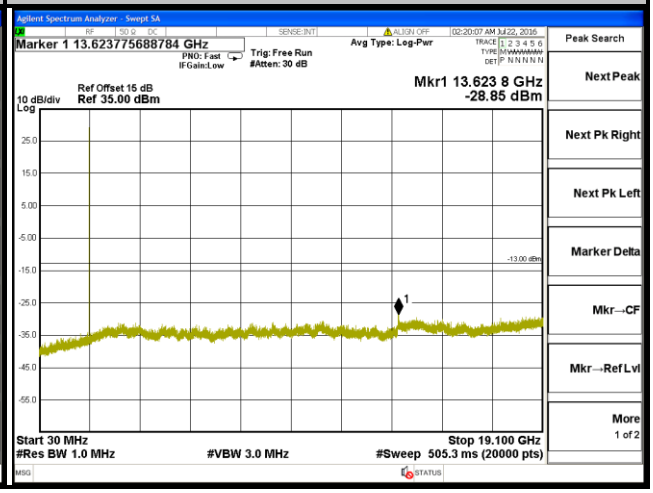


4.6.3 Test Procedure

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

4.6.4 Test Results

GSM	EDGE
Channel 661	Channel 661
	

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 is equal to –13 dBm.

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 0.8 m 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 1 m to 4 m 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.

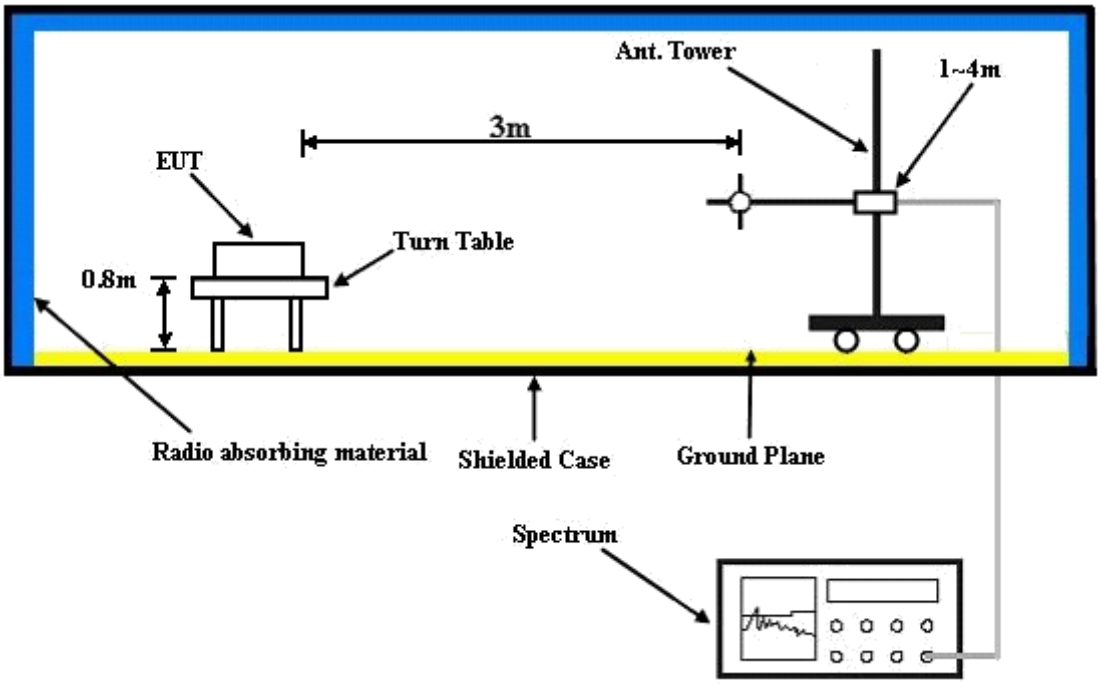
d. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.P.R power - 2.15 dBi.

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

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

GSM:

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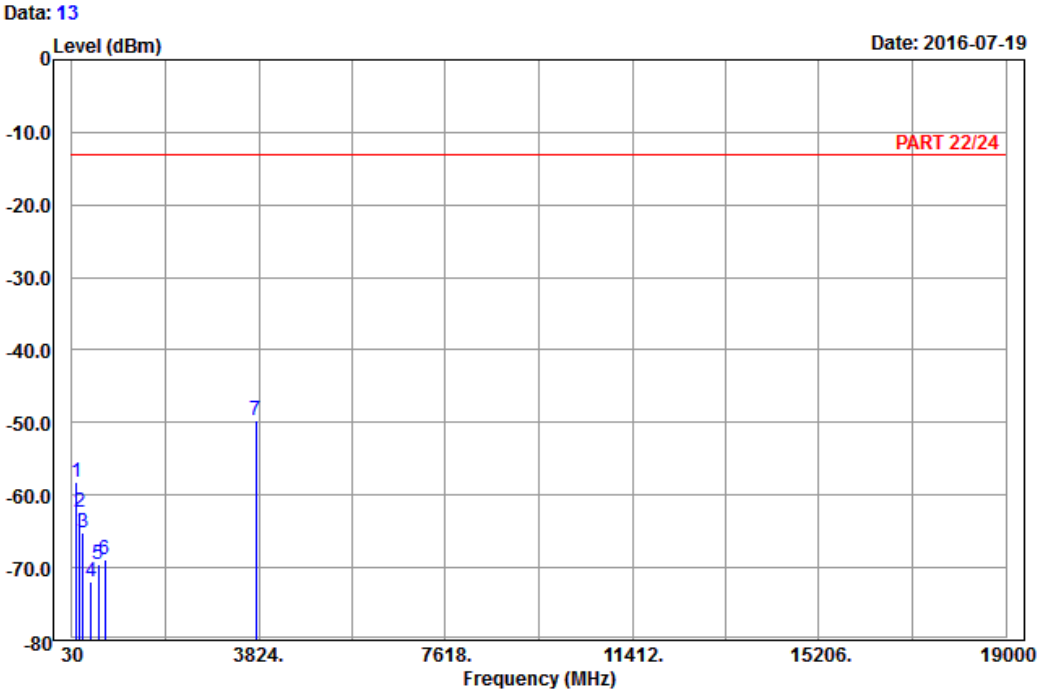
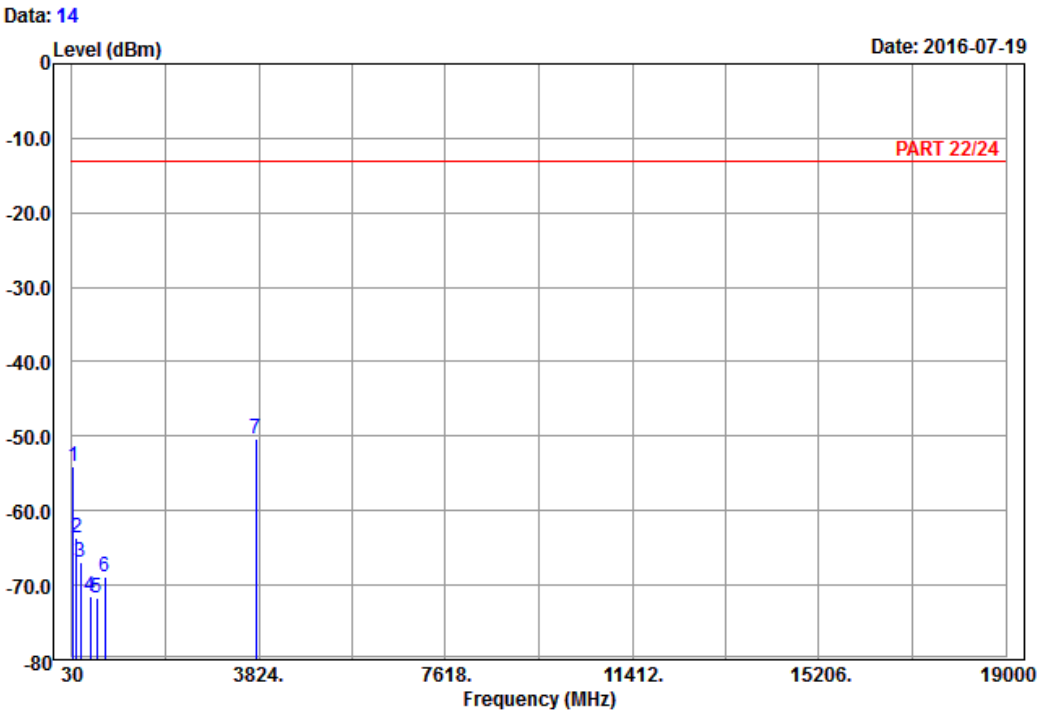


Site : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark : PCS 1900_Link_CH661
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	121.26	-58.29	-50.10	-13.00	-45.29	-8.19	Peak
2	187.95	-62.30	-56.60	-13.00	-49.30	-5.70	Peak
3	253.29	-65.20	-59.67	-13.00	-52.20	-5.53	Peak
4	411.30	-71.95	-68.95	-13.00	-58.95	-3.00	Peak
5	568.80	-69.48	-68.58	-13.00	-56.48	-0.90	Peak
6	693.40	-68.81	-68.46	-13.00	-55.81	-0.35	Peak
7 pp	3760.00	-49.72	-65.86	-13.00	-36.72	16.14	Peak

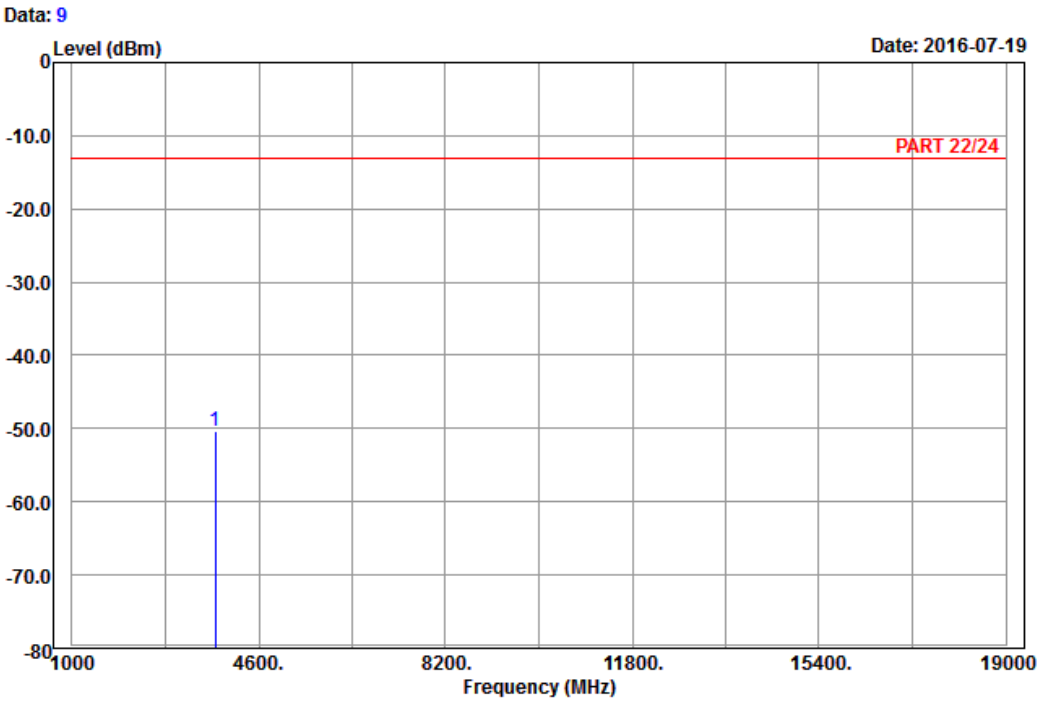


Site : 966 chamber 1
Condition: PART 22/24 Vertical
Remark : PCS 1900_Link_CH661
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	54.03	-54.01	-39.95	-13.00	-41.01	-14.06	Peak
2	127.74	-63.56	-55.79	-13.00	-50.56	-7.77	Peak
3	196.32	-66.95	-60.95	-13.00	-53.95	-6.00	Peak
4	405.00	-71.43	-68.56	-13.00	-58.43	-2.87	Peak
5	535.90	-71.67	-69.01	-13.00	-58.67	-2.66	Peak
6	695.50	-68.78	-68.43	-13.00	-55.78	-0.35	Peak
7 pp	3760.00	-50.38	-66.52	-13.00	-37.38	16.14	Peak

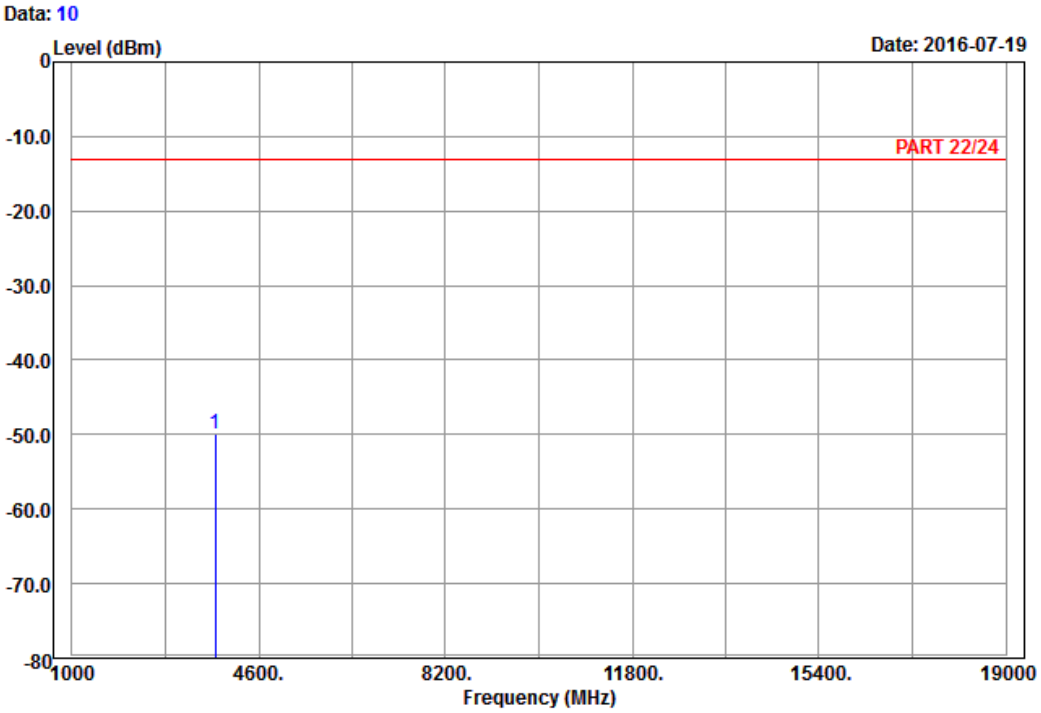
EDGE:

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 chamber 1
Condition: PART 22/24 Horizontal
Remark : EDGE 1900_Link_CH661
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3760.00	-50.38	-66.52	-13.00	-37.38	16.14	Peak



Site : 966 chamber 1
Condition: PART 22/24 Vertical
Remark : EDGE 1900_Link_CH661
Tested by: Charles Hsiao

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3760.00	-50.00	-66.14	-13.00	-37.00	16.14	Peak

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:

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Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab
Tel: 886-3-6668565
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Hwa Ya EMC/RF/Safety
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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.

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