FCC Test Report

(PART 24)

Report No.:	RFBGTL-WTW-P22050889-3 R1
FCC ID:	APYHRO00320
Received Date:	2022/7/21
Test Date:	2022/8/8 ~ 2022/8/19
Issued Date:	2022/9/8
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
Test Location (2):	B2F., No.215, Sec. 3, Beixin Rd., Xindian Dist., New Taipei City 231, Taiwan
FCC Registration / Designation Number:	788550 / TW0003 427177 / TW0011

Testing Laboratory
2021

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Release Control Record

Issue No.	Description	Date Issued
RFBGTL-WTW-P22050889-3	Original Release	2022/9/6
RFBGTL-WTW-P22050889-3 R1	Adding 2G GPRS Data	2022/9/8

1 Certificate of Conformity

Product: Cellular Phone

Brand: SHARP

Sample Status: Engineering Sample

Applicant: SHARP Corporation Mobile Communication BU

Test Date: 2022/8/8 ~ 2022/8/19

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 RF characteristics under the conditions specified in this report.

Prepared by : Lena Wang , **Date:** 2022/9/8

Lena Wang / Specialist

Approved by : Jeremy Lin , **Date:** 2022/9/8

Jeremy Lin / Project Engineer

2 Summary of Test Results

Applied Standard: FCC Part 24 & Part 2			
FCC Clause	**Test Item**	**Result**	**Remarks**
2.1046 24.232	Equivalent Isotropic Radiated Power	Pass	Meet the requirement of limit.
2.1047	Modulation Characteristics	Pass	Meet the requirement.
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	Occupied Bandwidth	Pass	Meet the requirement of limit.
24.238	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 -30.10 dB at 34.06 MHz.

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	9 kHz ~ 30 MHz	3.0400 dB
	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 & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent	N9038A	MY52260177	2021/9/1	2022/8/31
Spectrum Analyzer R&S	FSU43	101261	2022/4/11	2023/4/10
Horn Antenna ETS-Lindgren	3117	00143293	2021/11/14	2022/11/13
Bi_Log Antenna Schwarzbeck	VULB9168	9168-616	2021/10/27	2022/10/26
Horn Antenna Schwarzbeck	BBHA 9170	9170-480	2021/11/14	2022/11/13
Attenuator WOKEN	MDCS18N-10	MDCS18N-10-01	2022/4/5	2023/4/4
Loop Antenna EMCI	EM-6879	269	2021/9/16	2022/9/15
MXG Vector signal generator Agilent	N5182B	MY53050430	2021/11/25	2022/11/24
Preamplifier Agilent	310N	187226	2022/6/14	2023/6/13
Preamplifier Agilent	83017A	MY39501357	2022/6/14	2023/6/13
Pre-Ammlifier EMCI	EMC 184045	980116	2021/10/5	2022/10/4
Power Meter Anritsu	ML2495A	1012010	2021/9/9	2022/9/8
Power Sensor Anritsu	MA2411B	1315050	2021/9/9	2022/9/8
RF Coaxial Cable ETS-Lindgren	EMC104-SM-SM-10000	Cable-CH1-01(RFC-SMS-100-SMS-120+RFC-SMS-100-SMS-4	2022/6/14	2023/6/13
RF Coaxial Cable ETS-Lindgren	RFC-SMS-100-SMS-24-IN	Cable-CH1-02(RFC-SMS-100-SMS-24)	2022/6/14	2023/6/13
Fix tool for Boresight antenna tower BV	BAF-01	10	NA	NA
E3 Software AUDIX	E3	NA	NA	NA
Software BVADT	ADT_Radiated_V8.7.08	NA	NA	NA
Software BVADT	ADT_RF Test Software V6.6.5.4	NA	NA	NA
Antenna Tower MF	NA	NA	NA	NA
Turn Table MF	NA	NA	NA	NA
Controller Max-Full	MF-7802	NA	NA	NA
Radio Communication Analyzer Anritsu	MT8821C	6261806803	2022/2/16	2023/2/15

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 HsinTien 966 chamber 6.

3 General Information

3.1 General Description of EUT

Product	Cellular Phone	
Brand	SHARP	
Status of EUT	Engineering Sample	
Power Supply Rating	5.0 Vdc (adapter) 3.8 Vdc (battery)	
Modulation Type	GSM/GPRS	GMSK
Frequency Range	GSM/GPRS	1850.2 ~ 1909.8 MHz
Max. EIRP Power	GSM	1452.112 mW
	GPRS	1442.115 mW
Emission Designator	GSM	250KGXW
	GPRS	244KGXW
Antenna Type	Inverted-L Type Antenna with 1.7 dBi gain	
Accessory Device	Refer to Note as below	
Data Cable Supplied	Refer to Note as below	

Note:

1. The EUT uses following accessories.

Battery		
Brand	Model	Specification
N/A	N/A	3.8Vdc, 1680mAh

2. The EUT Configuration are list as below.

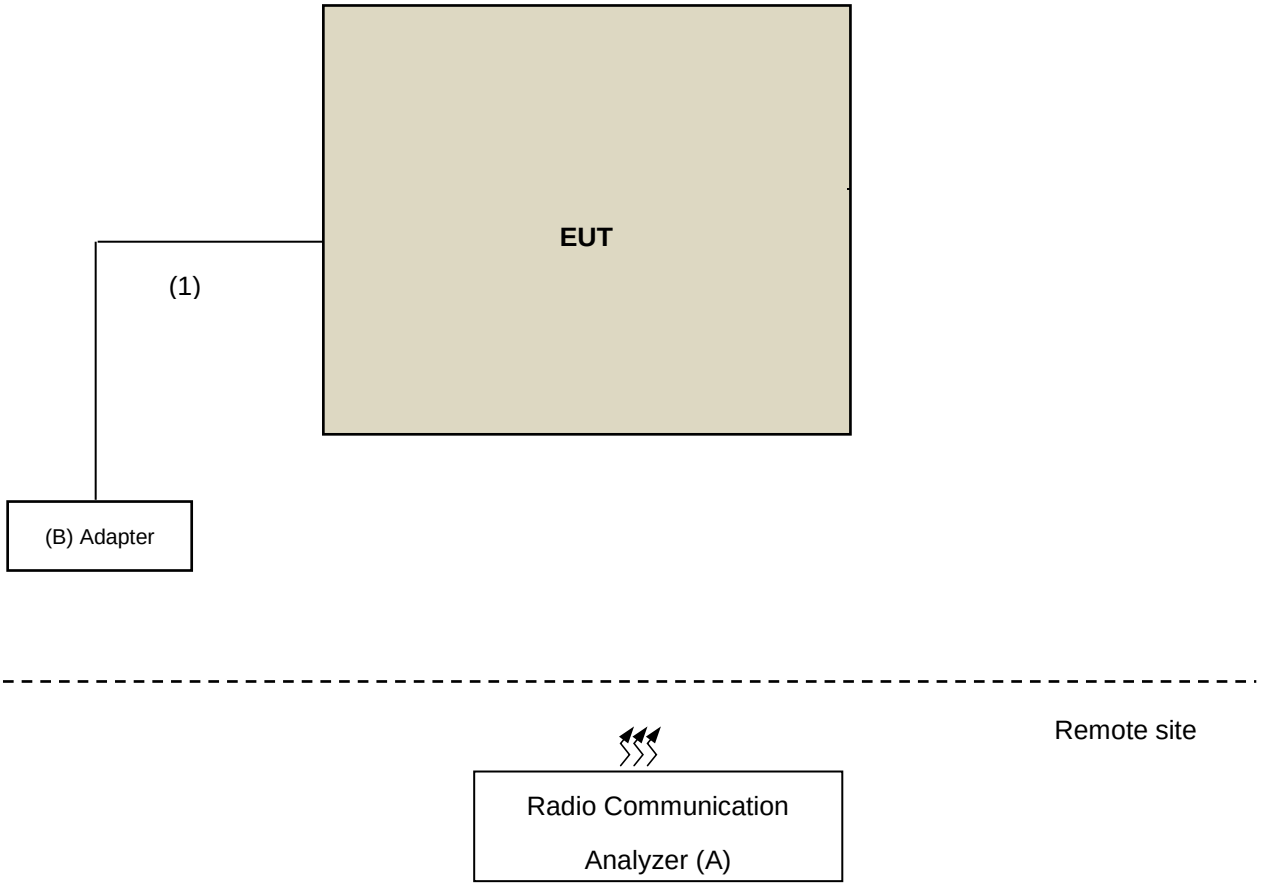
Config.	Description
1	Main Source (EUT with LCD 1)
2	2nd Source (EUT with LCD 2)

*From the above samples the worst cases were found in Main source. Therefore only the test of the mode was recorded in the report.

3. Detail antenna specification please refer to antenna datasheet and/or antenna measurement report.
4. The above EUT information is declared by manufacturer and for more detailed features description, please refers 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. 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
A	Radio Communication Analyzer	Anritsu	MT8821C	6261806803	N/A
B	Adapter	Salom	XN-2QC25	N/A	N/A

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	USB Cable	1	0.95	Y	0	Supplied by applicant

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

Band	EIRP	Radiated Emission
GSM	X-axis	X-axis

GSM

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

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
EIRP	26 deg. C, 58 % RH	120 Vac, 60 Hz	Willy Cheng
Modulation Characteristics	26 deg. C, 58 % RH	120 Vac, 60 Hz	Willy Cheng
Frequency Stability	26 deg. C, 58 % RH	120 Vac, 60 Hz	Willy Cheng
Occupied Bandwidth	26 deg. C, 58 % RH	120 Vac, 60 Hz	Willy Cheng
Band Edge	26 deg. C, 58 % RH	120 Vac, 60 Hz	Willy Cheng
Peak to Average Ratio	26 deg. C, 58 % RH	120 Vac, 60 Hz	Willy Cheng
Conducted Emission	26 deg. C, 58 % RH	120 Vac, 60 Hz	Willy Cheng
Radiated Emission	25 deg. C, 61 % 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 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 and references:

Test Standard:
FCC 47 CFR Part 2
FCC 47 CFR Part 24
ANSI 63.26-2015

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

References Test Guidance:
KDB 971168 D01 Power Meas License Digital Systems v03r01
ANSI/TIA/EIA-603-E 2016

NOTE: All test items have been performed as a reference to the above KDB test guidance.

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

Conducted Power Measurement:

The EUT was set up for the maximum power with GSM 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	GSM1900		
Channel	512	661	810
Frequency (MHz)	1850.2	1880.0	1909.8
GSM (GMSK, 1Tx-slot)	29.81	29.92	29.66
GPRS (GMSK, 1Tx-slot)	29.75	29.89	29.71
GPRS (GMSK, 2Tx-slot)	27.58	27.45	27.42
GPRS (GMSK, 3Tx-slot)	25.50	25.47	25.27
GPRS (GMSK, 4Tx-slot)	24.12	24.29	24.19

EIRP Power (dBm)

Band	GSM1900		
Channel	512	661	810
Frequency (MHz)	1850.2	1880.0	1909.8
GSM (GMSK, 1Tx-slot)	31.51	**31.62**	31.36
GPRS (GMSK, 1Tx-slot)	31.45	31.59	31.41
GPRS (GMSK, 2Tx-slot)	29.28	29.15	29.12
GPRS (GMSK, 3Tx-slot)	27.20	27.17	26.97
GPRS (GMSK, 4Tx-slot)	25.82	25.99	25.89

*EIRP = Conducted + antenna gain (1.7dBi)

4.2 Modulation Characteristics Measurement

4.2.1 Limits of Modulation Characteristics

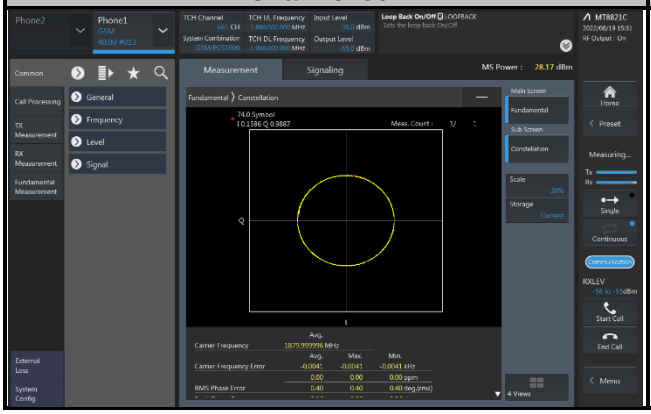
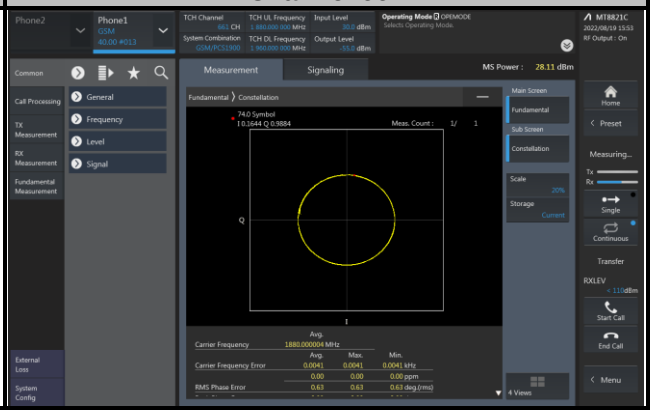
N/A

4.2.2 Test Setup

4.2.3 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.

4.2.4 Test Results

Spectrum Plot of Measurement	
GSM	**GPRS**
Channel 661	**Channel 661**
	

4.3 Frequency Stability Measurement

4.3.1 Limits of Frequency Stability Measurement

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

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.

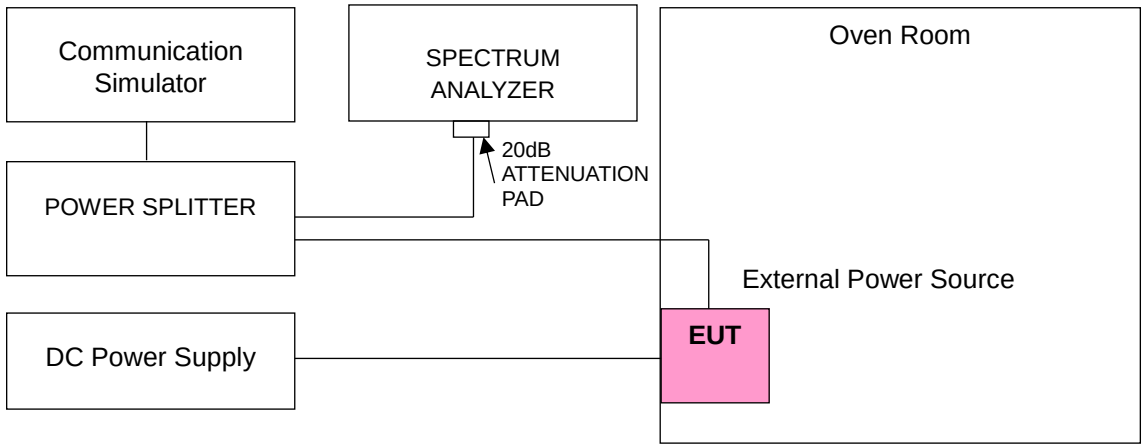
NOTE: The frequency error was recorded frequency error from the communication simulator.

4.3.3 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Radio Communication Analyzer Anritsu	MT8821C	6261806803	Feb. 16, 2022	Feb. 15, 2023
Temperature & Humidity Chamber TERCHY	HRM-120RF	931022	Jan. 03, 2022	Jan. 02, 2023
Digital Multimeter Fluke	87-III	70360742	Jun. 23, 2022	Jun. 22, 2023
DC Power Supply Topward	6306A	727263	NA	NA

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

4.3.4 Test Setup



4.3.5 Test Results

Frequency Error vs. Voltage

Voltage (Volts)	GSM			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.23	1850.2000030	0.002	1909.8000040	0.002
3.80	1850.2000020	0.001	1909.7999980	-0.001
4.37	1850.1999980	-0.001	1909.7999960	-0.002

Note: The applicant defined the normal working voltage of the battery is from 3.23 Vdc to 4.37 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	GSM			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1850.1999980	-0.001	1909.8000020	0.001
-20	1850.2000010	0.001	1909.7999980	-0.001
-10	1850.2000030	0.002	1909.8000040	0.002
0	1850.2000040	0.002	1909.8000020	0.001
10	1850.1999980	-0.001	1909.7999970	-0.002
20	1850.2000010	0.001	1909.8000010	0.001
30	1850.1999990	-0.001	1909.8000010	0.001
40	1850.1999980	-0.001	1909.7999990	-0.001
50	1850.2000040	0.002	1909.8000010	0.001

Frequency Error vs. Voltage

Voltage (Volts)	GPRS			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.80	1850.2000030	0.002	1909.8000010	0.001
3.23	1850.1999960	-0.002	1909.7999960	-0.002
4.37	1850.2000040	0.002	1909.8000020	0.001

Note: The applicant defined the normal working voltage of the battery is from 3.23 Vdc to 4.37 Vdc.

Frequency Error vs. Temperature

Temp. (℃)	GPRS			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1850.2000040	0.002	1909.7999990	-0.001
-20	1850.1999980	-0.001	1909.8000040	0.002
-10	1850.1999980	-0.001	1909.8000010	0.001
0	1850.2000010	0.001	1909.8000040	0.002
10	1850.2000040	0.002	1909.8000040	0.002
20	1850.2000020	0.001	1909.7999980	-0.001
30	1850.1999990	-0.001	1909.7999960	-0.002
40	1850.2000030	0.002	1909.7999960	-0.002
50	1850.1999990	-0.001	1909.7999990	-0.001

4.4 Occupied Bandwidth Measurement

4.4.1 Limits of Occupied Bandwidth Measurement

The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.

4.4.2 Test Procedure

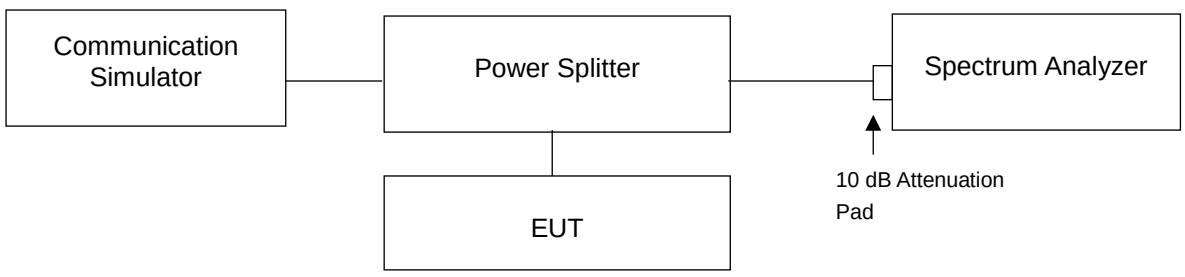
The EUT makes a call to the communication simulator. All measurements were done at low, middle and high operational frequency range. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency.

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).

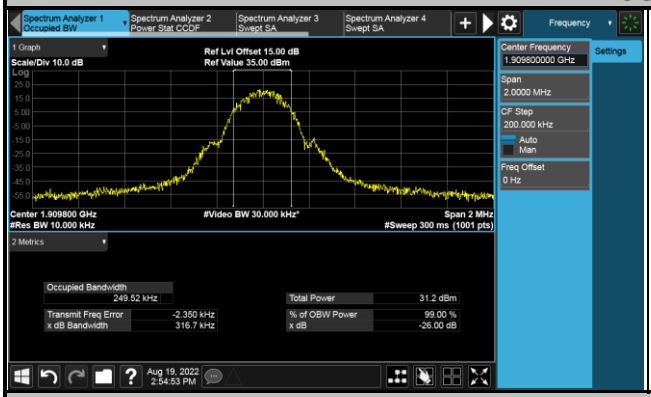
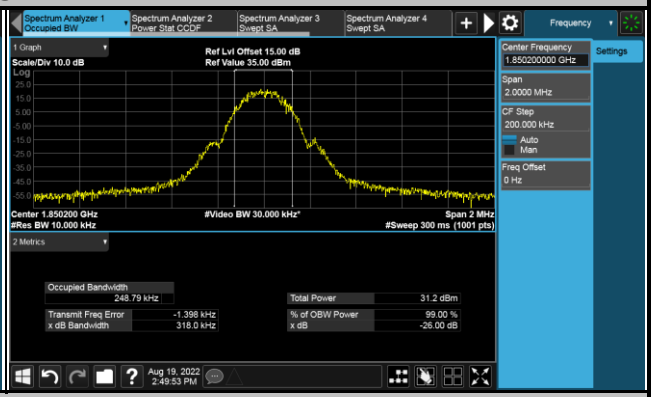
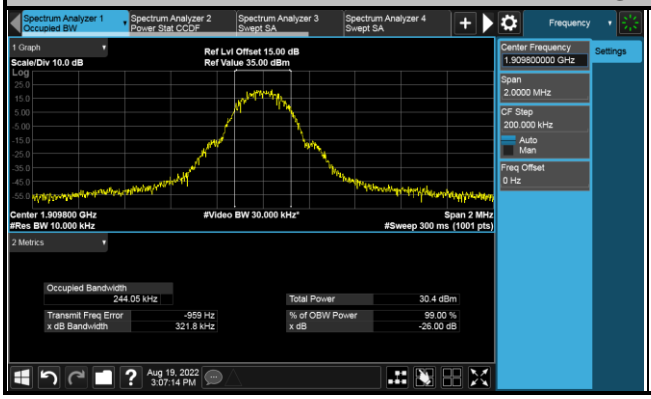
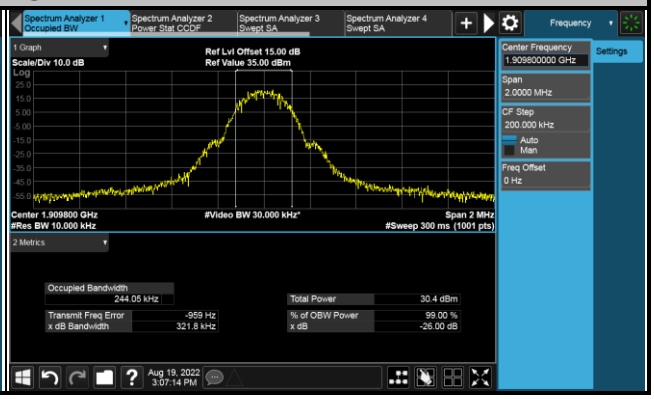
For the occupied bandwidth measurement method, please refer to section 5.4.4 of ANSI C63.26.

4.4.3 Test Setup



4.4.4 Test Result

GSM				GPRS			
Channel	Frequency (MHz)	99 % Occupied Bandwidth (kHz)	26 dB Bandwidth (kHz)	Channel	Frequency (MHz)	99 % Occupied Bandwidth (kHz)	26 dB Bandwidth (kHz)
512	1850.2	248.79	318.00	512	1850.2	244.01	317.40
661	1880.0	246.77	315.00	661	1880.0	243.79	316.00
810	1909.8	249.52	316.70	810	1909.8	244.05	321.80

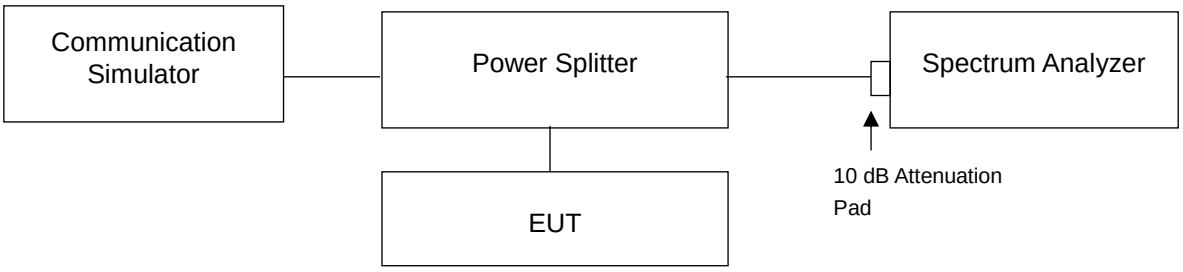
Spectrum Plot of Worst Value	
99 % Occupied Bandwidth	26 dB Bandwidth
GSM	
	
GPRS	
	

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.

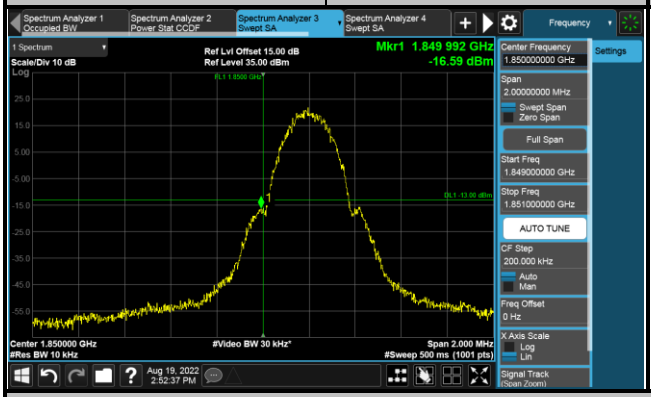
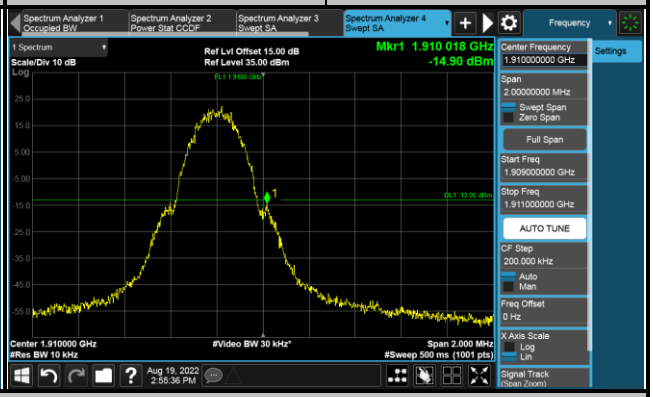
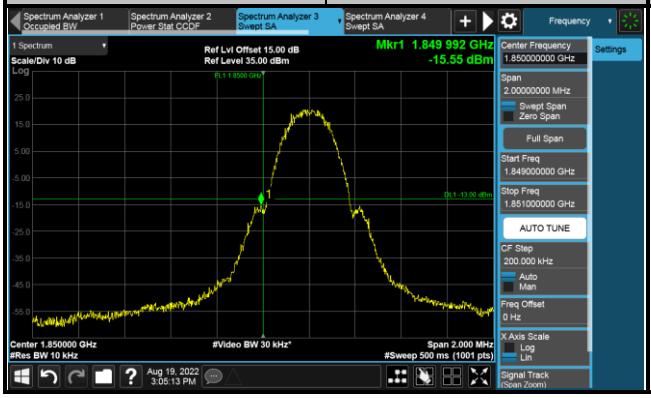
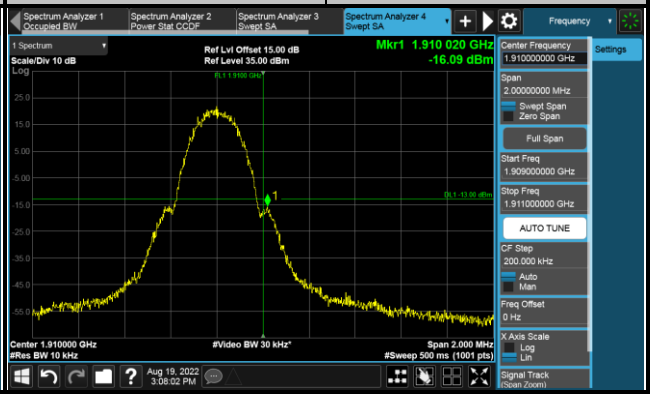
4.5.2 Test Setup



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 2 MHz. RB of the spectrum is 10 kHz and VB of the spectrum is 30 kHz (GSM/GPRS).
c. Record the max trace plot into the test report.

4.5.4 Test Results

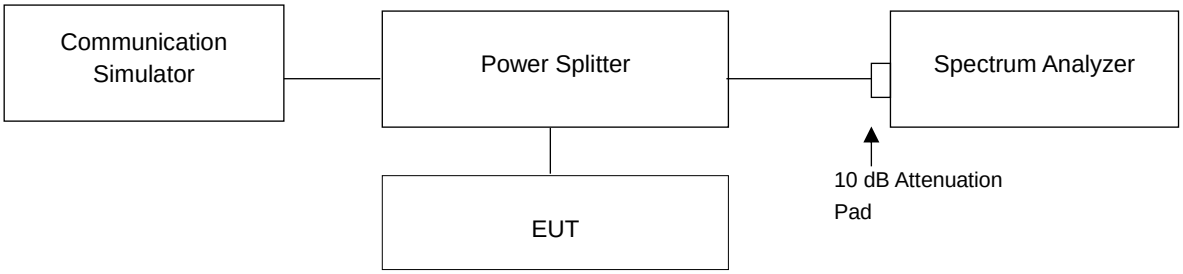
GSM			
Channel	512	Channel	810
			
GPRS			
Channel	512	Channel	810
			

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

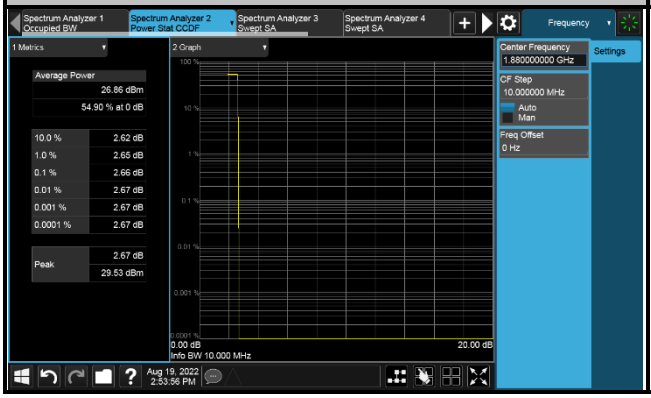
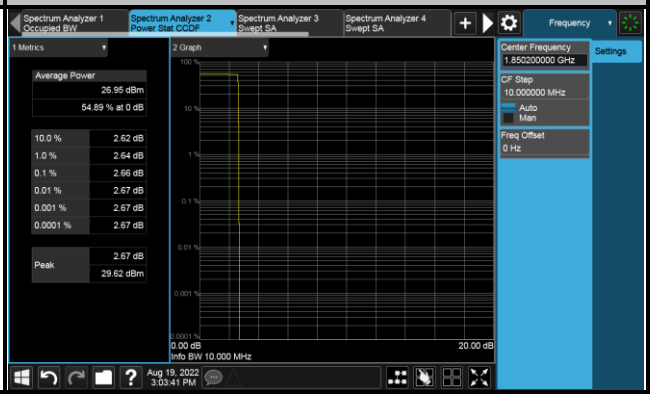


4.6.3 Test Procedures

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 %.

4.6.4 Test Results

Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		GSM	GPRS
512	1850.2	2.66	2.66
661	1880.0	2.66	2.66
810	1909.8	2.65	2.66

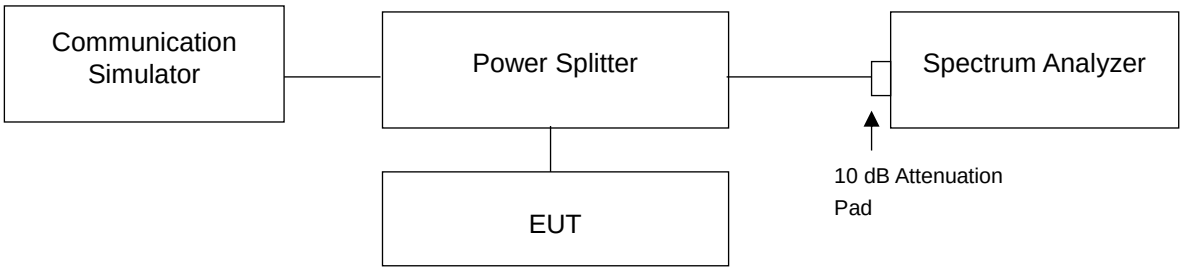
Spectrum Plot of Worst Value	
GSM	GPRS
	

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 -13 dBm.

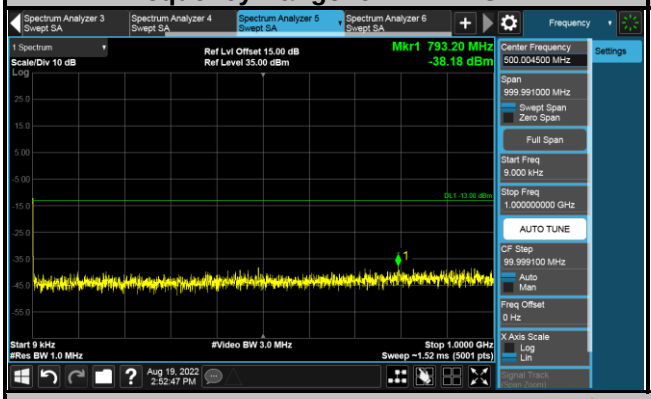
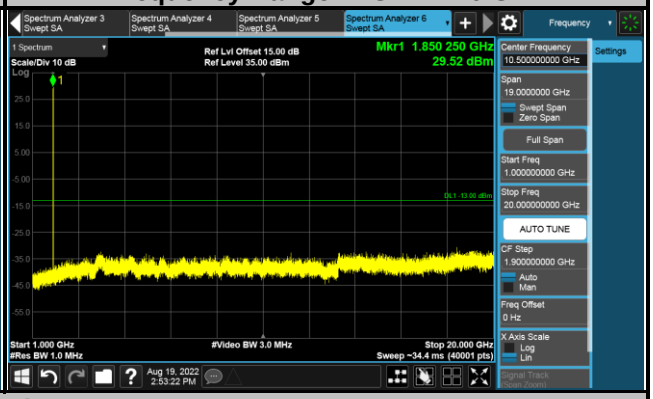
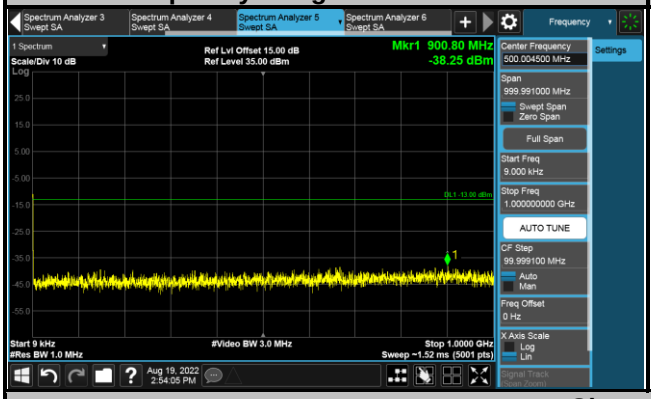
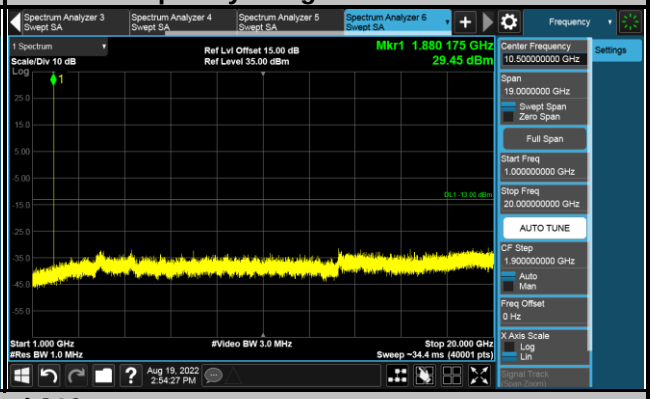
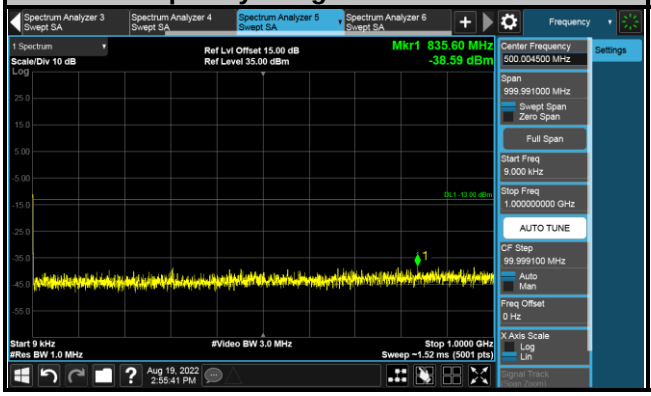
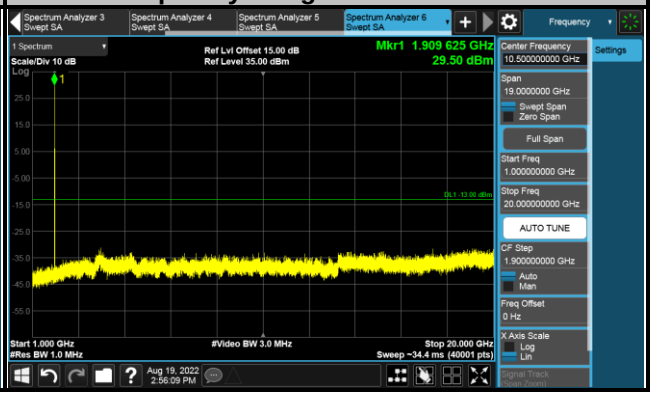
4.7.2 Test Setup



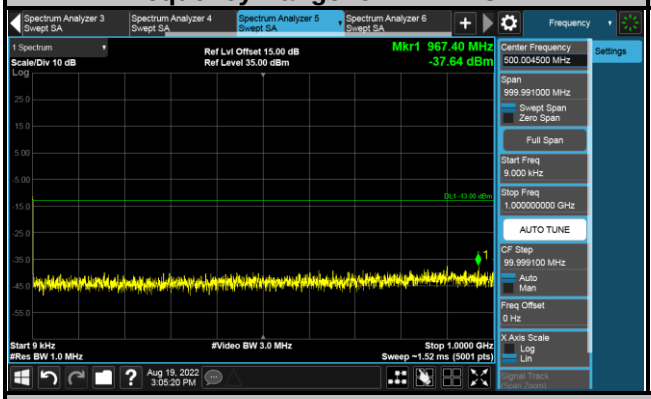
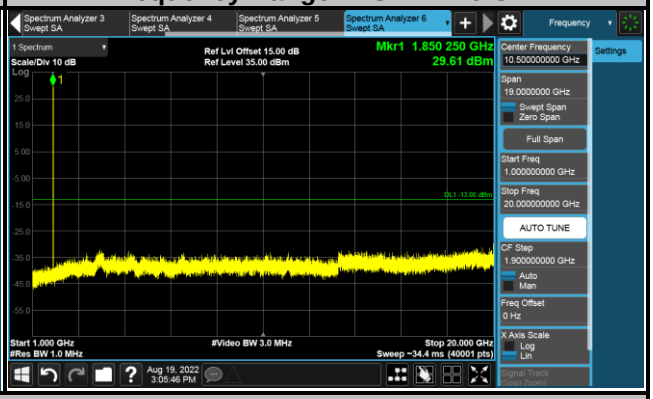
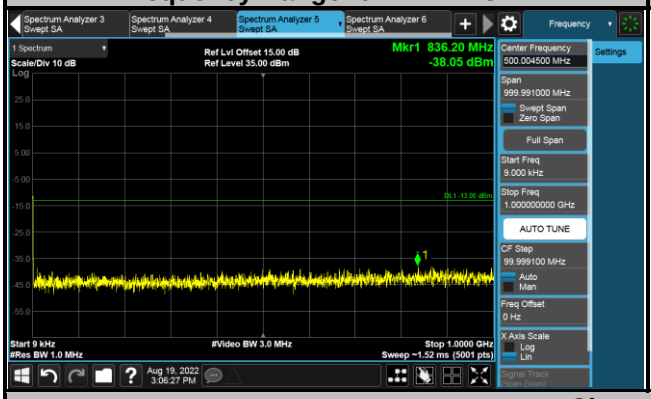
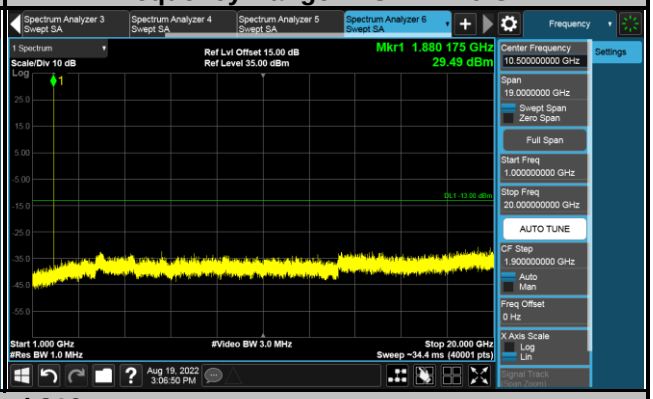
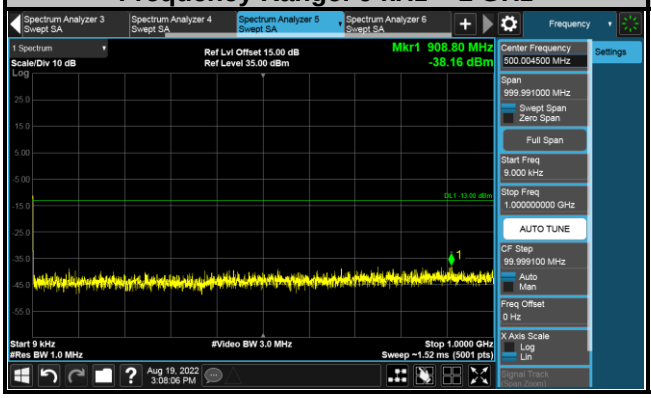
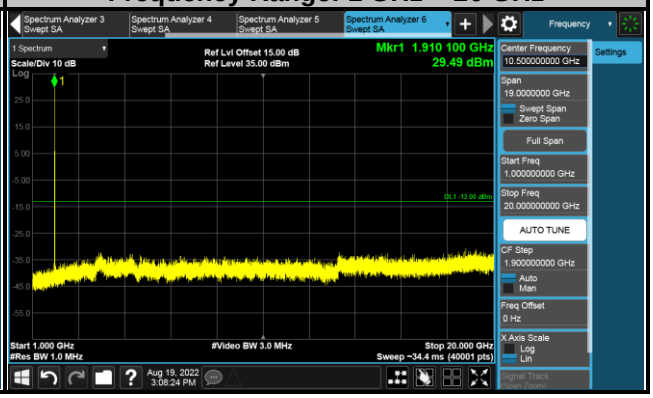
4.7.3 Test Procedure

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

4.7.4 Test Results

GSM	
Channel 512	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	
Channel 661	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	
Channel 810	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

Note: The signal over the limit in 9 kHz is from spectrum analyzer.

GPRS	
Channel 512	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	
Channel 661	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	
Channel 810	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 20 GHz
	

Note: The signal over the limit in 9 kHz is from spectrum analyzer.

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 is equal to -13 dBm.

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 1 MHz/3 MHz.
2. The emission levels were against the limit of frequency range 9 kHz ~ 30 MHz:

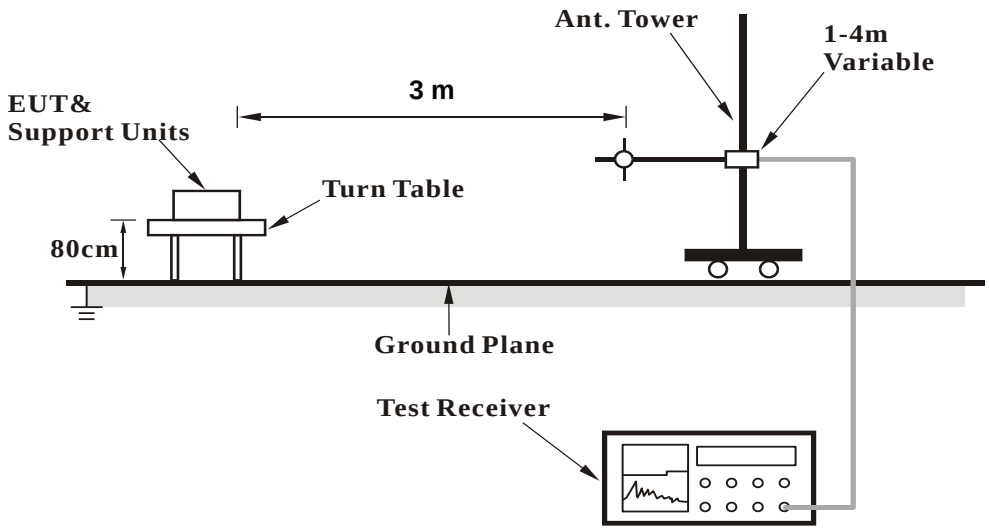
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

4.8.3 Deviation from Test Standard

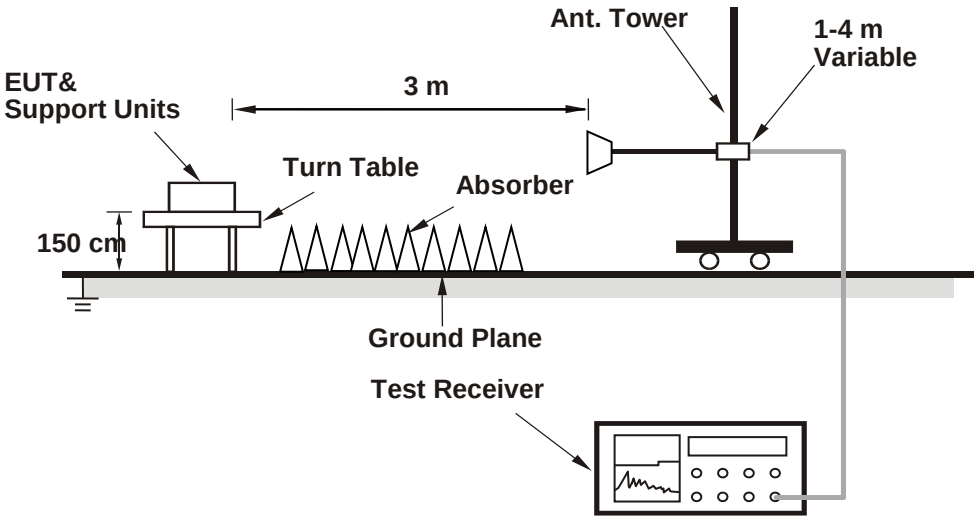
No deviation.

4.8.4 Test Setup

<Radiated Emission below or equal 1 GHz>



<Radiated Emission above 1 GHz>



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

4.8.5 Test Results

Below 1GHz

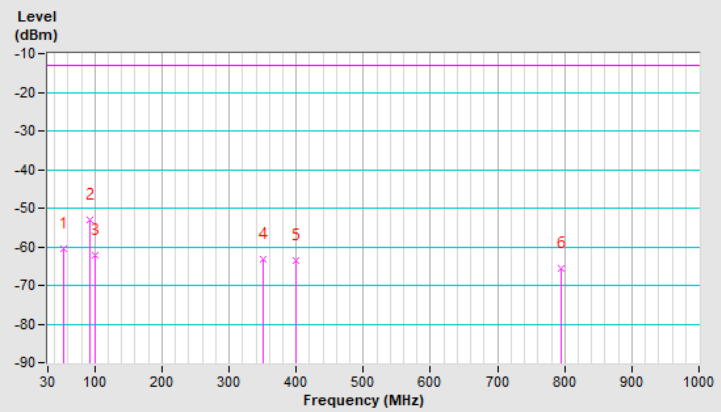
GSM:

RF Mode	TX PCS 1900	**Channel**	CH 661：1880 MHz
Frequency Range	30 MHz ~ 1 GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	**Frequency (MHz)**	**EIRP (dBm)**	**Limit (dBm)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	54.11	-60.42	-13.00	-47.42	1.10 H	317	53.32	-113.74
2	91.74	-53.00	-13.00	-40.00	1.87 H	164	65.63	-118.63
3	99.74	-62.22	-13.00	-49.22	1.12 H	214	55.32	-117.54
4	349.77	-63.33	-13.00	-50.33	1.06 H	104	47.94	-111.27
5	399.85	-63.51	-13.00	-50.51	1.78 H	348	46.48	-109.99
6	794.40	-65.44	-13.00	-52.44	1.15 H	101	37.68	-103.12

Remarks:

1. EIRP(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
3. Margin value = EIRP – Limit value
4. The other EIRP levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The EIRP levels were very low against the limit of frequency range 9 kHz ~ 30 MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

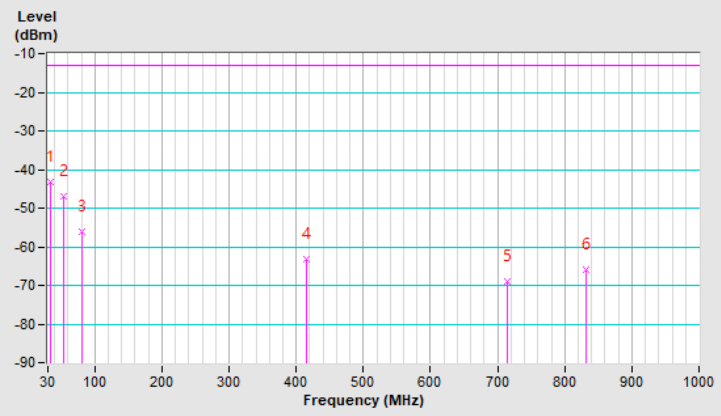


RF Mode	TX PCS 1900	Channel	CH 661：1880 MHz
Frequency Range	30 MHz ~ 1 GHz		

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	**34.06**	**-43.10**	**-13.00**	**-30.10**	**1.84 V**	**114**	**71.74**	**-114.84**
2	54.15	-46.86	-13.00	-33.86	1.63 V	33	66.88	-113.74
3	80.50	-56.07	-13.00	-43.07	1.18 V	307	62.00	-118.07
4	415.54	-63.38	-13.00	-50.38	1.09 V	38	46.34	-109.72
5	714.60	-69.14	-13.00	-56.14	1.45 V	104	34.92	-104.06
6	832.41	-66.00	-13.00	-53.00	1.00 V	22	36.35	-102.35

Remarks:

1. EIRP(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
3. Margin value = EIRP – Limit value
4. The other EIRP levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The EIRP levels were very low against the limit of frequency range 9 kHz ~ 30 MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



Above 1GHz

RF Mode	TX PCS 1900	Channel	CH 512：1850.2 MHz
Frequency Range	1 GHz ~ 20 GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3700.40	-52.13	-13.00	-39.13	1.37 H	124	34.16	-86.29
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3700.40	-52.06	-13.00	-39.06	1.18 V	166	34.23	-86.29

Remarks:

1. EIRP(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
3. Margin value = EIRP – Limit value
4. The other EIRP levels were very low against the limit.

RF Mode	TX PCS 1900	Channel	CH 661：1880 MHz
Frequency Range	1 GHz ~ 20 GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3760.00	-50.74	-13.00	-37.74	2.15 H	189	35.32	-86.06
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3760.00	-50.72	-13.00	-37.72	1.63 V	58	35.34	-86.06

Remarks:

1. EIRP(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
3. Margin value = EIRP – Limit value
4. The other EIRP levels were very low against the limit.

RF Mode	TX PCS 1900	Channel	CH 810：1909.8 MHz
Frequency Range	1 GHz ~ 20 GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3819.60	-51.79	-13.00	-38.79	1.38 H	34	34.01	-85.80
Antenna Polarity & Test Distance : Vertical at 3 m								
No	**Frequency (MHz)**	**EIRP (dBm)**	**Limit (dBm)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	3819.60	-51.32	-13.00	-38.32	1.58 V	20	34.48	-85.80

Remarks:

1. EIRP(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
3. Margin value = EIRP – Limit value
4. The other EIRP 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 according to ISO/IEC 17025.

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

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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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