

FCC Test Report

(PART 24)

Report No.: RFBGTL-WTW-P22050889A-3

FCC ID: APYHRO00320

Received Date: 2022/7/21

Test Date: 2022/9/6 ~ 2022/9/26

Issued Date: 2022/10/6

Applicant: SHARP Corporation Mobile Communication BU

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Japan

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FCC Registration / 788550 / TW0003

Designation Number: 427177 / TW0011



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Release Control Record

Issue No.	Description	Date Issued
RFBGTL-WTW-P22050889A-3	Original Release	2022/10/6

1 Certificate of Conformity

Product: Cellular Phone

Brand: SHARP

Sample Status: Engineering Sample

Applicant: SHARP Corporation Mobile Communication BU

Test Date: 2022/9/6 ~ 2022/9/26

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:** 2022/10/6
Lena Wang / Specialist

Approved by : Jeremy Lin , **Date:** 2022/10/6
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	N/A	Refer to note
24.232(d)	Peak to Average Ratio	N/A	Refer to note
2.1055 24.235	Frequency Stability	N/A	Refer to note
2.1049	Occupied Bandwidth	N/A	Refer to note
24.238	Band Edge Measurements	N/A	Refer to note
2.1051 24.238	Conducted Spurious Emissions	N/A	Refer to note
2.1053 24.238	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -33.14 dB at 54.84 MHz.

Note:

1. This report is a partial report, only test item of Equivalent Isotropic Radiated Power and Radiated Spurious Emissions tests were verified and recorded in this report. Other testing data please refer to original report no.: RFBGTL-WTW-P22050889-3.
2. 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 KEYSIGHT	N9038A	MY55420137	2022/4/27	2023/4/26
Spectrum Analyzer R&S	FSU43	101261	2022/4/11	2023/4/10
Loop Antenna TESEQ	HLA 6121	45745	2022/07/27	2023/07/26
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
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-Amplifier EMCI	EMC 184045	980116	2021/10/5	2022/10/4
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	1364.583 mW
	GPRS	1250.259 mW
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:

- The purpose of this test report is to apply for Class II Permissive Change with new SKU based on the BV CPS report no.: RFBGTL-WTW-P22050889-3 R1. The new SKU compared with original report are minor HW components differences and added one more new accessory. Please refer to the operational description for detailed differences information.
- Measurement results in the original test report BV CPS report no.: RFBGTL-WTW-P22050889-3 R1 are partially leveraged in the test report with new evaluation on Equivalent Isotropic Radiated Power and Radiated Spurious Emissions test to demonstrate compliance.
- The EUT uses following accessories.

Battery		
Brand	Model	Specification
Supplier A	Supplier A	3.8Vdc, 1680mAh
Cradle		
Brand	Model	Specification
Supplier A	Supplier A	-

- 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.

- There're 2 Sample for the EUT listed as below:

Sample A: EUT + Adapter

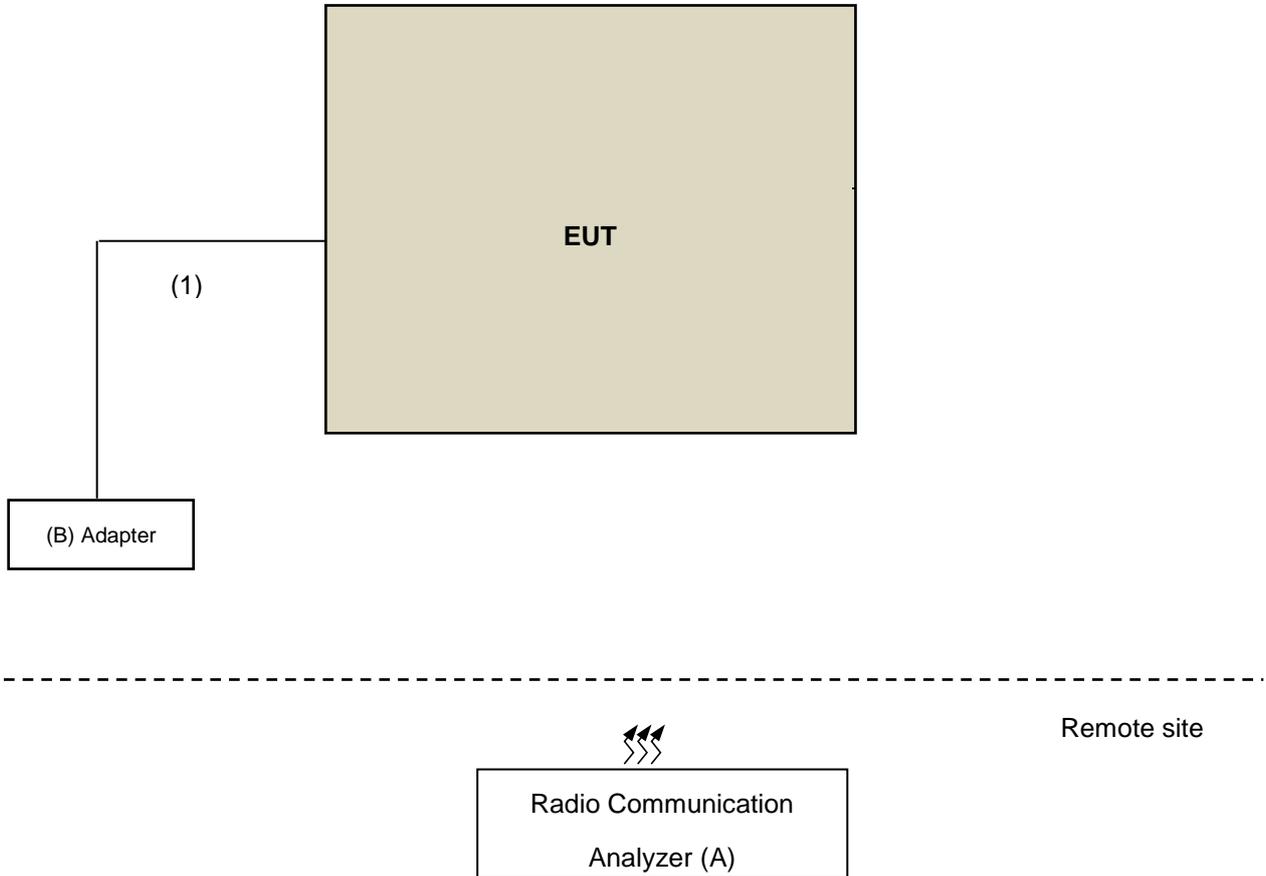
Sample B: EUT + Adapter + Cradle

- Detail antenna specification please refer to antenna datasheet and/or antenna measurement report.
- 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.

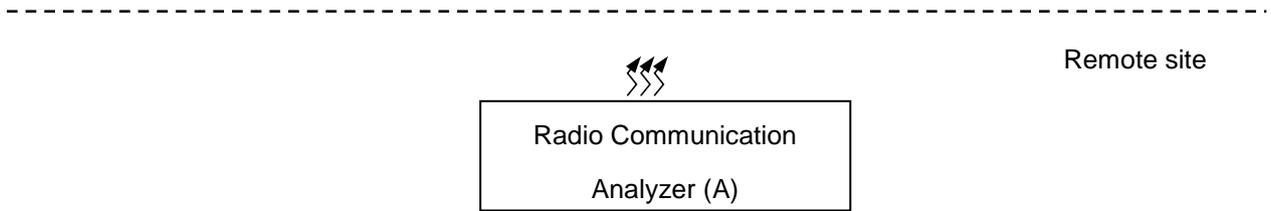
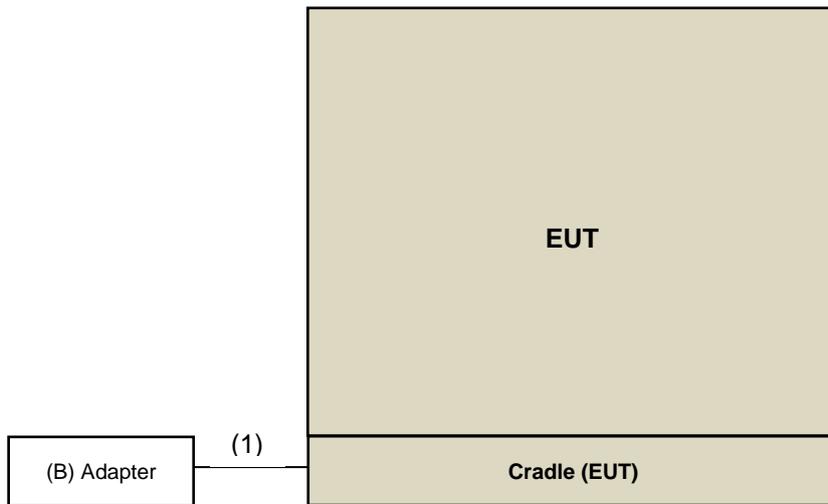
3.2 Configuration of System under Test

<Radiated Emission Test> & <E.I.R.P. Test>

Mode A



Mode B



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
A	EIRP	512 to 810	512, 661, 810	GSM, GPRS
A	Radiated Emission above 1 GHz	512 to 810	512, 661, 810	GSM
A, B	Radiated Emission below 1 GHz	512 to 810	661	GSM

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
EIRP	26 deg. C, 58 % RH	120 Vac, 60 Hz	Jisyong Wang
Radiated Emission	25 deg. C, 61 % RH	120 Vac, 60 Hz	Karl Lee, 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 and GPRS 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:

$$\text{EIRP} = P_{\text{Meas}} + G_{\text{T}}$$

$$\text{ERP} = P_{\text{Meas}} + G_{\text{T}} - 2.15$$

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)	29.29	29.65	29.46
GPRS (GMSK, 1Tx-slot)	29.26	29.27	29.25
GPRS (GMSK, 2Tx-slot)	27.01	27.03	27.59
GPRS (GMSK, 3Tx-slot)	25.10	25.14	25.18
GPRS (GMSK, 4Tx-slot)	23.96	24.15	24.18

EIRP Power (dBm)

Band	GSM1900		
Channel	512	661	810
Frequency (MHz)	1850.2	1880.0	1909.8
GSM (GMSK, 1Tx-slot)	30.99	31.35	31.16
GPRS (GMSK, 1Tx-slot)	30.96	30.97	30.95
GPRS (GMSK, 2Tx-slot)	28.71	28.73	29.29
GPRS (GMSK, 3Tx-slot)	26.80	26.84	26.88
GPRS (GMSK, 4Tx-slot)	25.66	25.85	25.88

*EIRP = Conducted + antenna gain (1.7dBi)

4.2 Radiated Emission Measurement

4.2.1 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.

4.2.2 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) = $E \text{ (dB}\mu\text{V/m)} + 20\log(D) - 104.8$; where D is the measurement distance (in the far field region) in m.
ERP (dBm) = $E \text{ (dB}\mu\text{V/m)} + 20\log(D) - 104.8 - 2.15$; 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:

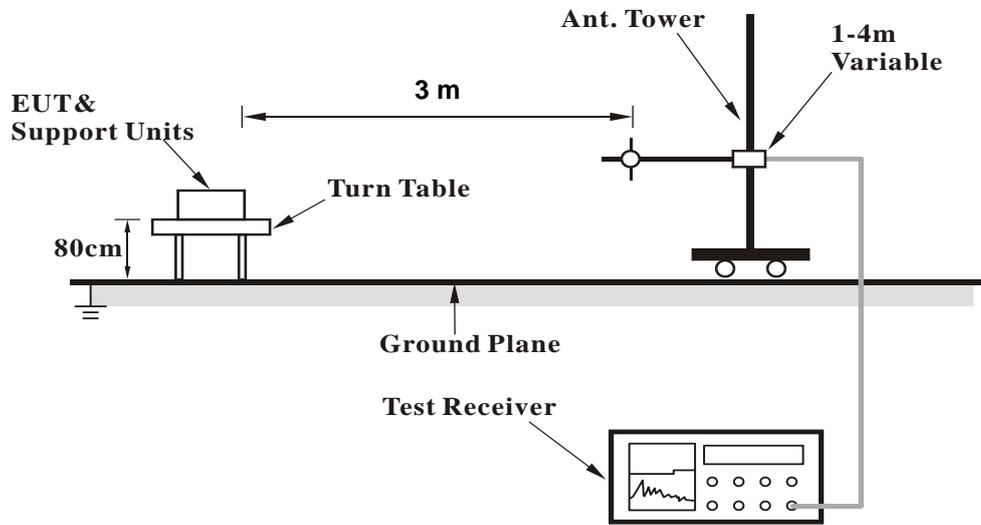
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

4.2.3 Deviation from Test Standard

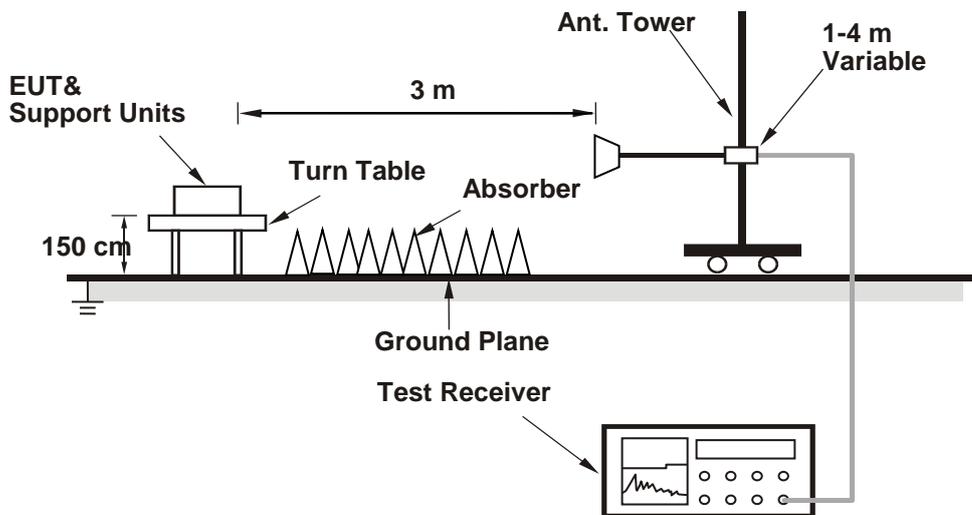
No deviation.

4.2.4 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).

4.2.5 Test Results

Below 1GHz

GSM:

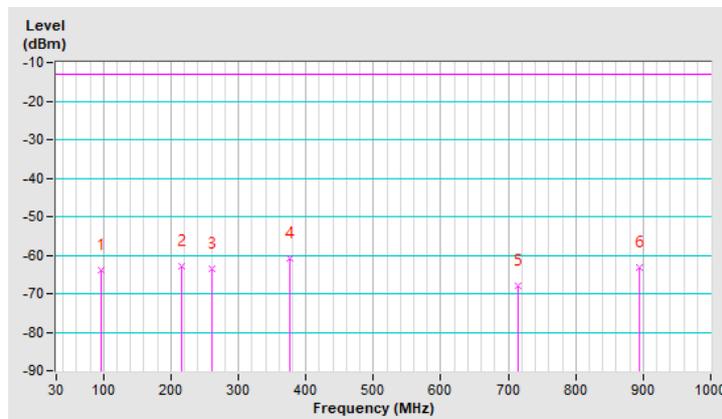
Mode A

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

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	95.61	-64.00	-13.00	-51.00	2.10 H	155	54.44	-118.44
2	216.30	-62.80	-13.00	-49.80	1.81 H	209	53.21	-116.01
3	260.85	-63.52	-13.00	-50.52	2.15 H	147	50.40	-113.92
4	376.30	-60.94	-13.00	-47.94	1.02 H	167	49.58	-110.52
5	715.10	-67.81	-13.00	-54.81	2.19 H	153	36.23	-104.04
6	894.30	-63.07	-13.00	-50.07	2.25 H	148	38.40	-101.47

Remarks:

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

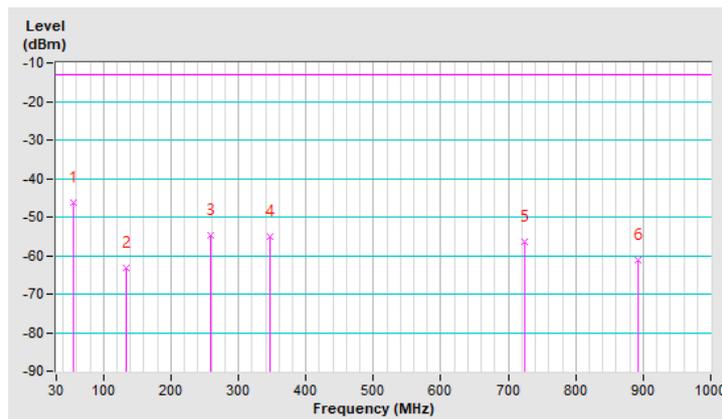


RF Mode	TX PCS 1900	Channel	CH 661 : 1880 MHz
Frequency Range	30MHz ~ 1GHz		

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	54.84	-46.14	-13.00	-33.14	1.26 V	184	67.60	-113.74
2	133.95	-63.33	-13.00	-50.33	1.62 V	74	50.43	-113.76
3	258.96	-54.86	-13.00	-41.86	2.26 V	108	59.13	-113.99
4	346.20	-55.15	-13.00	-42.15	2.26 V	151	56.21	-111.36
5	724.20	-56.48	-13.00	-43.48	1.94 V	203	47.42	-103.90
6	891.50	-61.33	-13.00	-48.33	1.15 V	26	40.14	-101.47

Remarks:

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



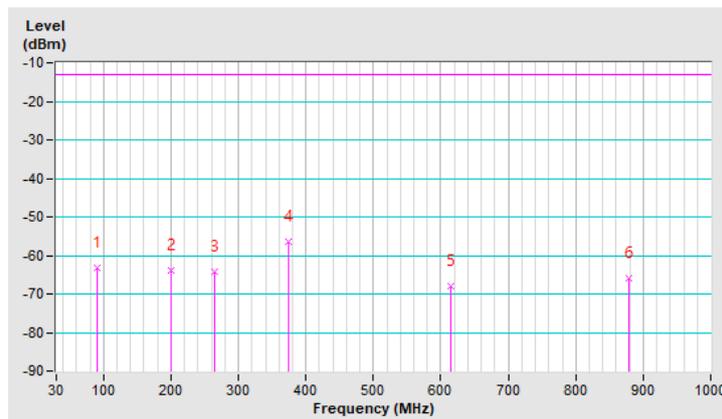
Mode B

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

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	91.03	-63.37	-13.00	-50.37	1.08 H	241	55.38	-118.75
2	200.10	-63.90	-13.00	-50.90	1.05 H	315	52.34	-116.24
3	264.55	-64.38	-13.00	-51.38	1.97 H	144	49.37	-113.75
4	374.84	-56.41	-13.00	-43.41	1.35 H	152	54.14	-110.55
5	615.00	-67.90	-13.00	-54.90	1.63 H	32	37.55	-105.45
6	878.87	-66.04	-13.00	-53.04	1.56 H	357	35.78	-101.82

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.

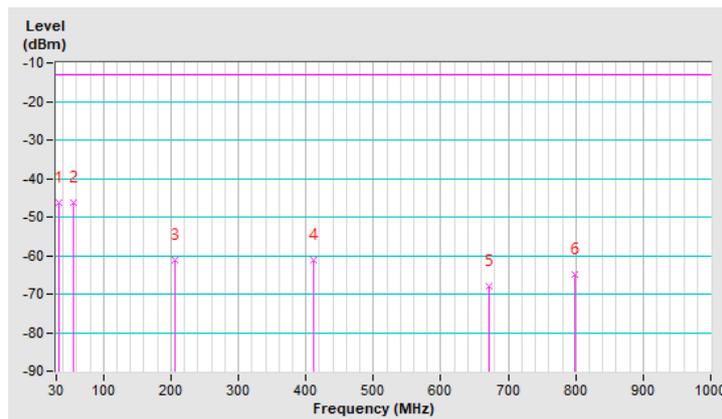


RF Mode	TX PCS 1900	Channel	CH 661 : 1880 MHz
Frequency Range	30MHz ~ 1GHz		

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	33.78	-46.30	-13.00	-33.30	1.91 V	118	68.50	-114.80
2	55.70	-46.20	-13.00	-33.20	1.79 V	135	67.50	-113.70
3	206.54	-61.20	-13.00	-48.20	1.37 V	208	55.10	-116.30
4	410.84	-61.30	-13.00	-48.30	1.33 V	325	48.50	-109.80
5	671.10	-68.00	-13.00	-55.00	1.78 V	25	37.00	-105.00
6	797.80	-64.80	-13.00	-51.80	1.77 V	185	38.30	-103.10

Remarks:

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



Above 1GHz

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

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	-52.56	-13.00	-39.56	1.00 H	229	33.73	-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	-52.41	-13.00	-39.41	1.00 V	229	33.88	-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	1GMHz ~ 20GHz		

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	-51.14	-13.00	-38.14	1.06 H	154	34.92	-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	-51.08	-13.00	-38.08	1.06 V	154	34.98	-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	1GMHz ~ 20GHz		

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	-52.02	-13.00	-39.02	1.33 H	325	33.78	-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	-51.71	-13.00	-38.71	1.33 V	325	34.09	-85.80

Remarks:

1. $EIRP(dBm) = Raw\ Value(dBuV) + Correction\ Factor(dB/m)$
2. $Correction\ Factor(dB/m) = Antenna\ Factor(dB/m) + Cable\ Factor(dB) - Pre-Amplifier\ Factor(dB) + 20\log(D) - 104.8$
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.

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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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