FCC RADIO TEST REPORT

FCC ID	**:**	**APYHRO00277**
Equipment	**:**	**Smart phone**
Brand Name	**:**	**SHARP**
Applicant	**:**	**SHARP CORPORATION** **2-13-1, Hachihonmatsu-lida,** **Higashi-hiroshima-shi,Hiroshima pref. 739-0192, Japan**
Manufacturer	**:**	**SHARP CORPORATION** **1 Takumi-Cho, Sakai-Ku, Sakai-Shi, Osaka 590-8522, Japan**
Standard	**:**	**47 CFR Part 2, 22(H), 24(E)**

The product was received on Sep. 02, 2019 and testing was started from Sep. 15, 2019 and completed on Sep. 16, 2019. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI / TIA-603-E and has been in compliance with the applicable technical standards.

The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

The test results in this variant report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Louis Wu

Approved by: Louis Wu

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)

Table of Contents

History of this test report

Report No.	Version	Description	Issued Date
FG990231A	01	Initial issue of report	Oct. 02, 2019
FG990231A	02	Add the description of Sample difference	Oct. 09, 2019

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.2	§2.1046	Conducted Output Power	Pass	-
	§22.913 (a)(2)	Effective Radiated Power		
	§24.232 (c)	Equivalent Isotropic Radiated Power		
-	§24.232 (d)	Peak-to-Average Ratio	Not Required	-
-	§2.1049 §22.917 (b) §24.238 (b)	Occupied Bandwidth	Not Required	-
-	§2.1051 §22.917 (a) §24.238 (a)	Band Edge Measurement	Not Required	-
-	§2.1051 §22.917 (a) §24.238 (a)	Conducted Emission	Not Required	-
-	§2.1055 §22.355	Frequency Stability Temperature & Voltage	Not Required	-
	§2.1055 §24.235			-
4.4	§2.1053 §22.917 (a) §24.238 (a)	Field Strength of Spurious Radiation	Pass	Under limit 33.63 dB at 2544.000 MHz

Remark:

1. Not required means after assessing, test items are not necessary to carry out.
2. This is a variant report which can be referred Product Equality Declaration. All the test cases were performed on original report which can be referred to Sporton Report Number FG971613A. Based on the original report, the test case was verified.

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Wii Chang

Report Producer: Jessie Ho

1 General Description

1.1 Product Feature of Equipment Under Test

GSM/WCDMA/LTE, Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n, Wi-Fi 5GHz 802.11a/n/ac and GNSS.

Product Specification subjective to this standard	
Sample 1	1st vender parts
Sample 2	2nd vender parts
Antenna Type	WWAN: ILA & IFA Antenna WLAN: IFA Antenna Bluetooth: IFA Antenna GPS/Glonass/BDS/Galileo : ILA Antenna

Remark:

1. All test items were performed with Sample 1.

2. The difference between sample 1 & sample 2 is their suppliers of memory, battery , vibe motor components

1.2 Modification of EUT

No modifications are made to the EUT during all test items.

1.3 Testing Location

Test Site	SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	**Sporton Site No.**
	03CH11-HY
Test Engineer	Ryan Lin, JC Liang and Fu Chen
Temperature	22.6~25.6°C
Relative Humidity	53.4~62.2%

Note: The test site complies with ANSI C63.4 2014 requirement.

FCC Designation No.: TW0007

1.4 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ANSI C63.26-2015
- ANSI / TIA-603-E
- 47 CFR Part 2, 22(H), 24(E)
- FCC KDB 971168 D01 Power Meas. License Digital Systems v03r01
- FCC KDB 412172 D01 Determining ERP and EIRP v01r01

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

2 Test Configuration of Equipment Under Test

2.1 Test Mode

Antenna port conducted and radiated test items were performed according to KDB 971168 D01 Power Meas. License Digital Systems v03r01 with maximum output power.

For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Y plane for PCS Band and Z plane for Cellular Band) were recorded in this report.

Radiated emissions were investigated as following frequency range:

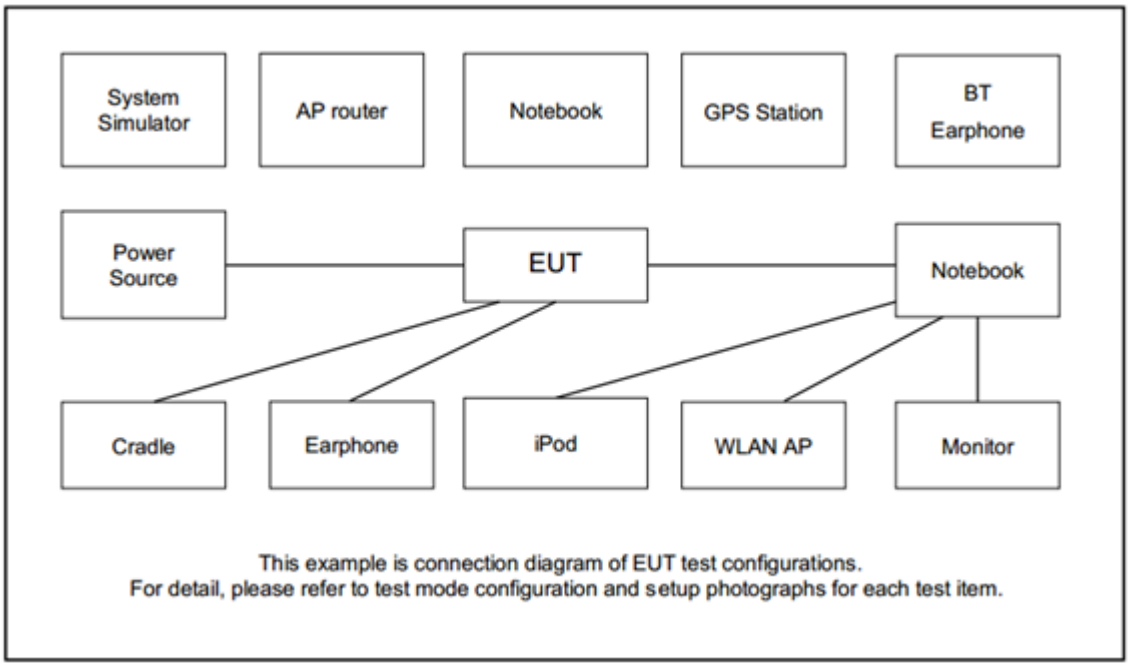
1. 30 MHz to 9000 MHz for GSM850 and WCDMA Band V.
2. 30 MHz to 19100 MHz for GSM1900

All modes and data rates and positions were investigated.

Test modes are chosen to be reported as the worst case configuration below:

Test Modes	
Band	**Radiated TCs**
GSM 850	■ GPRS Class 8 Link
GSM 1900	■ GPRS Class 8 Link
WCDMA Band V	■ RMC 12.2Kbps Link

2.2 Connection Diagram of Test System



2.3 Support Unit used in test configuration

Item	Equipment	Trade Name	Model No.	FCC ID	Data Cable	Power Cord
1.	System Simulator	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m
2.	Earphone	SHARP	RPHOEA007AFZZ	N/A	Unshielded, 1.2 m	N/A
3.	Adapter	SHARP	SH-AC05	N/A	N/A	Unshielded, 1.5 m

2.4 Frequency List of Low/Middle/High Channels

Frequency List				
Band	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
GSM850	Channel	128	189	251
	Frequency	824.2	836.4	848.8
WCDMA Band V	Channel	4132	4182	4233
	Frequency	826.4	836.4	846.6
GSM1900	Channel	512	661	810
	Frequency	1850.2	1880.0	1909.8

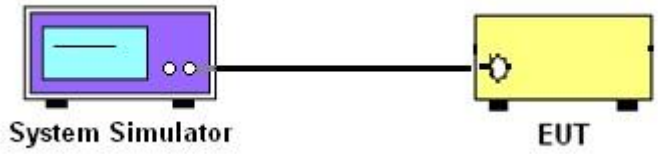
3 Conducted Test Result

3.1 Measuring Instruments

See list of measuring instruments of this test report.

3.1.1 Test Setup

3.1.2 Conducted Output Power



3.1.3 Test Result of Conducted Test

Please refer to Appendix A.

3.2 Conducted Output Power and ERP/EIRP

3.2.1 Description of the Conducted Output Power and ERP/EIRP

A system simulator was used to establish communication with the EUT. Its parameters were set to enforce EUT transmitting at the maximum power. The measured power in the radio frequency on the transmitter output terminals shall be reported.

The ERP of mobile transmitters must not exceed 7 Watts for GSM850 and WCDMA Band V.

The EIRP of mobile transmitters must not exceed 2 Watts for GSM1900.

According to KDB 412172 D01 Power Approach,

EIRP = $P_T + G_T – L_C$, ERP = EIRP -2.15, where

P_T = transmitter output power in dBm

G_T = gain of the transmitting antenna in dBi

L_C = signal attenuation in the connecting cable between the transmitter and antenna in dB

3.2.2 Test Procedures

1. The transmitter output port was connected to the system simulator.
2. Set EUT at maximum power through system simulator.
3. Select lowest, middle, and highest channels for each band and different modulation.
4. Measure the maximum burst average power for GSM and maximum average power for other modulation signal.

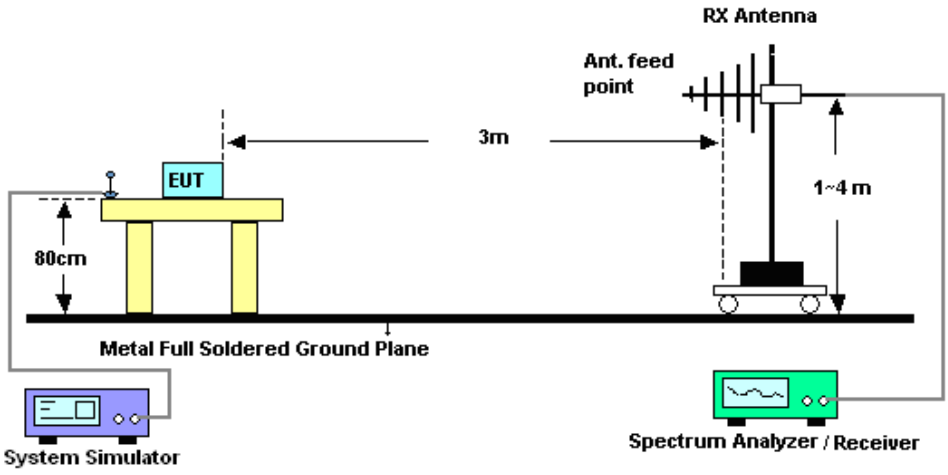
4 Radiated Test Items

4.1 Measuring Instruments

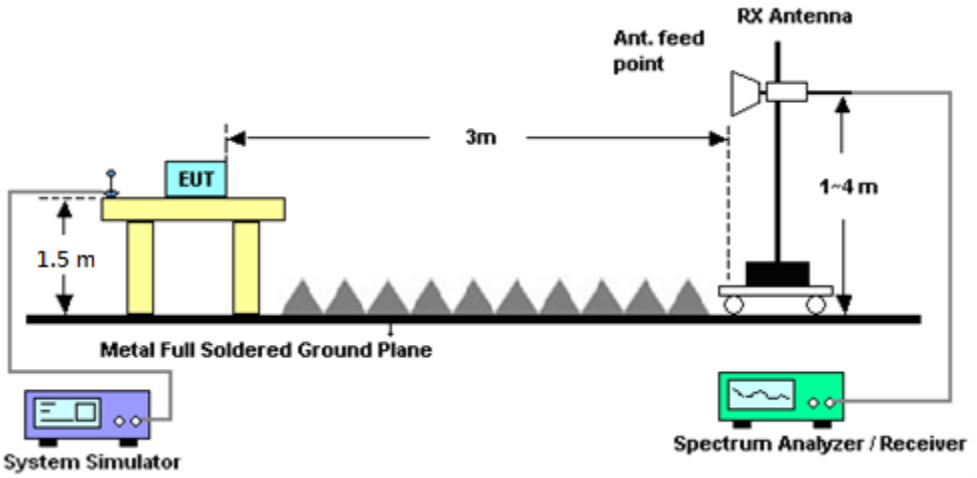
See list of measuring instruments of this test report.

4.2 Test Setup

For radiated test from 30MHz to 1GHz



For radiated test above 1GHz



4.3 Test Result of Radiated Test

Please refer to Appendix B.

4.4 Field Strength of Spurious Radiation Measurement

4.4.1 Description of Field Strength of Spurious Radiated Measurement

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least 43 + 10 log (P) dB. The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

4.4.2 Test Procedures

The testing follows FCC KDB 971168 D01 v03r01 Section 7 and ANSI / TIA-603-E Section 2.2.12.

1. The EUT was placed on a rotatable wooden table 0.8 meters for frequency below 1GHz and 1.5 meter for frequency above 1GHz above the ground.
2. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest spurious emission.
4. The height of the receiving antenna is varied between one meter and four meters to search for the maximum spurious emission for both horizontal and vertical polarizations.
5. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking record of maximum spurious emission.
6. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
7. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
8. Taking the record of output power at antenna port.
9. Repeat step 7 to step 8 for another polarization.
10. EIRP (dBm) = S.G. Power – Tx Cable Loss + Tx Antenna Gain
11. ERP (dBm) = EIRP - 2.15
12. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
13. The limit line is derived from 43 + 10log(P) dB below the transmitter power P(Watts)

5 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Preamplifier	EMEC	EM18G40G	060715	18GHz ~ 40GHz	Dec. 06, 2018	Sep. 15, 2019~ Sep. 16, 2019	Dec. 05, 2019	Radiation (03CH11-HY)
Amplifier	SONOMA	310N	187312	9kHz~1GHz	Dec. 04, 2018	Sep. 15, 2019~ Sep. 16, 2019	Dec. 03, 2019	Radiation (03CH11-HY)
Bilog Antenna	TESEQ	CBL 6111D&N-6-06	35414&AT-N0602	30MHz~1GHz	Oct. 13, 2018	Sep. 15, 2019~ Sep. 16, 2019	Oct. 12, 2019	Radiation (03CH11-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1326	1GHz ~ 18GHz	Oct. 15, 2018	Sep. 15, 2019~ Sep. 16, 2019	Oct. 14, 2019	Radiation (03CH11-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1328	1GHz ~ 18GHz	Nov. 09, 2018	Sep. 15, 2019~ Sep. 16, 2019	Nov. 08, 2019	Radiation (03CH11-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Nov. 23, 2017	Sep. 15, 2019~ Sep. 16, 2019	Nov. 22, 2019	Radiation (03CH11-HY)
Preamplifier	Keysight	83017A	MY53270148	1GHz~26.5GHz	Nov. 14, 2018	Sep. 15, 2019~ Sep. 16, 2019	Nov. 13, 2019	Radiation (03CH11-HY)
Spectrum Analyzer	Keysight	N9010A	MY54200486	10Hz ~ 44GHz	Oct. 18, 2018	Sep. 15, 2019~ Sep. 16, 2019	Oct. 17, 2019	Radiation (03CH11-HY)
Filter	Wainwright	WHKX12-1080-1200-15000-60ST	SN1	1.2GHz High Pass Filter	Mar. 19, 2019	Sep. 15, 2019~ Sep. 16, 2019	Mar. 18, 2020	Radiation (03CH11-HY)
Filter	Wainwright	WHKX12-2700-3000-18000-60ST	SN2	3GHz High Pass Filter	Jul. 15, 2019	Sep. 15, 2019~ Sep. 16, 2019	Jul. 14, 2020	Radiation (03CH11-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1~4m	N/A	Sep. 15, 2019~ Sep. 16, 2019	N/A	Radiation (03CH11-HY)
Turn Table	EMEC	TT 2000	N/A	0~360 Degree	N/A	Sep. 15, 2019~ Sep. 16, 2019	N/A	Radiation (03CH11-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY53290045	20MHz~8.4GHz	Jan. 19, 2019	Sep. 15, 2019~ Sep. 16, 2019	Jan. 18, 2020	Radiation (03CH11-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170584	18GHz- 40GHz	Dec. 05, 2018	Sep. 15, 2019~ Sep. 16, 2019	Dec. 04, 2019	Radiation (03CH11-HY)
Software	Audix	E3 6.2009-8-24	RK-001042	N/A	N/A	Sep. 15, 2019~ Sep. 16, 2019	N/A	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9837/4PE	9kHz-30MHz	Mar. 13, 2019	Sep. 15, 2019~ Sep. 16, 2019	Mar. 12, 2020	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY2859/2	30MHz-40GHz	Mar. 13, 2019	Sep. 15, 2019~ Sep. 16, 2019	Mar. 12, 2020	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9837/4PE	30M-18G	Mar. 13, 2019	Sep. 15, 2019~ Sep. 16, 2019	Mar. 12, 2020	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY4274/2	30MHz-40GHz	Mar. 13, 2019	Sep. 15, 2019~ Sep. 16, 2019	Mar. 12, 2020	Radiation (03CH11-HY)
SMB100A Signal Generator	R&S	SMB100A	181147	100kHz~40GHz	Nov. 12, 2018	Sep. 15, 2019~ Sep. 16, 2019	Nov. 10, 2020	Radiation (03CH11-HY)

6 Uncertainty of Evaluation

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**3.37**

Uncertainty of Radiated Emission Measurement (1 GHz ~ 18 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**3.67**

Uncertainty of Radiated Emission Measurement (18 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.03**

Appendix A. Test Results of Conducted Test

Conducted Output Power(Average power)

Conducted Power (*Unit: dBm)						
Band	GSM850			GSM1900		
Channel	128	189	251	512	661	810
Frequency	824.2	836.4	848.8	1850.2	1880	1909.8
GSM	32.05	32.02	**32.09**	29.00	28.87	29.00
GPRS class 8	32.07	32.03	**32.09**	**29.01**	28.93	28.97
GPRS class 10	30.51	30.51	30.61	27.13	27.04	27.07
GPRS class 11	28.70	28.73	28.70	25.15	25.08	25.22
GPRS class 12	27.30	27.35	27.38	23.71	23.77	23.77

Conducted Power (*Unit: dBm)			
Band	WCDMA Band V		
Channel	4132	4182	4233
Frequency	826.4	836.4	846.6
RMC 12.2K	23.74	**23.80**	23.71
HSDPA Subtest-1	22.77	22.78	22.72
HSDPA Subtest-2	22.80	22.83	22.72
HSDPA Subtest-3	22.30	22.34	22.21
HSDPA Subtest-4	22.31	22.33	22.23
HSUPA Subtest-1	22.74	22.75	22.72
HSUPA Subtest-2	20.71	20.77	20.66
HSUPA Subtest-3	21.73	21.76	21.71
HSUPA Subtest-4	20.75	20.75	20.67
HSUPA Subtest-5	22.80	22.80	22.70

Appendix B. Test Results of ERP/EIRP and Radiated Test

ERP/EIRP

Channel	Mode	Conducted		ERP	
		Power (dBm)	Power (Watts)	ERP(dBm)	ERP(W)
Lowest	GSM850	32.05	1.6032	23.90	0.2455
Middle	GSM	32.02	1.5922	23.87	0.2438
Highest	(GT - LC = -6 dB)	32.09	1.6181	23.94	0.2477
Lowest	WCDMA Band V	23.74	0.2366	15.59	0.0362
Middle	RMC 12.2Kbps	23.80	0.2399	15.65	0.0367
Highest	(GT - LC = -6 dB)	23.71	0.2350	15.56	0.0360
Limit	ERP < 7W	Result		PASS	

Channel	Mode	Conducted		EIRP	
		Power (dBm)	Power (Watts)	EIRP(dBm)	EIRP(W)
Lowest	GSM1900	29.01	0.7962	25.91	0.3899
Middle	GPRS class 8	28.93	0.7816	25.83	0.3828
Highest	(GT - LC = -3.1 dB)	28.97	0.7889	25.87	0.3864

Radiated Spurious Emission

Part 22H_GPRS 850

GPRS 850									
Channel	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)
Highest	1696	-56.29	-13	-43.29	-66.62	-63.34	0.53	9.73	H
	2544	-46.63	-13	-33.63	-60.13	-54.64	0.67	10.83	H
	3392	-58.05	-13	-45.05	-74.36	-67.41	0.77	12.28	H
									H
									H
									H
									H
	1696	-47.11	-13	-34.11	-56.82	-54.16	0.53	9.73	V
	2544	-51.40	-13	-38.40	-65.27	-59.41	0.67	10.83	V
	3392	-58.24	-13	-45.24	-74.14	-67.6	0.77	12.28	V
									V
									V
									V
									V

Remark: Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

Part 22H_WCDMA 850

WCDMA 850									
Channel	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)
Lowest	1656	-61.25	-13	-48.25	-71.14	-68.22	0.53	9.64	H
	2484	-60.09	-13	-47.09	-73.51	-68.08	0.65	10.79	H
	3312	-58.05	-13	-45.05	-74.2	-67.18	0.76	12.04	H
									H
									H
									H
									H
	1656	-58.90	-13	-45.90	-68.5	-65.87	0.53	9.64	V
	2484	-59.69	-13	-46.69	-73.53	-67.68	0.65	10.79	V
	3312	-58.13	-13	-45.13	-74.17	-67.26	0.76	12.04	V
									V
									V
									V
									V

Remark: Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

Part 24E_GPRS 1900

GPRS 1900									
Channel	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)
Lowest	3702	-57.22	-13	-44.22	-74.2	-69.01	0.72	12.52	H
	5550	-53.84	-13	-40.84	-75.65	-66.01	1.00	13.17	H
	7400	-52.14	-13	-39.14	-77.21	-61.54	1.18	10.58	H
									H
									H
									H
									H
	3702	-55.91	-13	-42.91	-74.06	-67.7	0.72	12.52	V
	5550	-54.41	-13	-41.41	-76.31	-66.58	1.00	13.17	V
	7400	-52.24	-13	-39.24	-77.1	-61.64	1.18	10.58	V
									V
									V
									V
									V

Remark: Spurious emissions within 30-1000MHz were found more than 20dB below limit line.