FCC RF Test Report

APPLICANT	:	Trackunit Aps
EQUIPMENT	:	M7 4G LTE Vehicle Telematics Unit
MODEL NAME	:	M7MG
FCC ID	:	ZMF-M7MG
STANDARD	:	47 CFR Part 2, 22(H), 24(E)
CLASSIFICATION	:	PCS Licensed Transmitter (PCB)
TEST DATE(S)	:	Jan. 07, 2022

We, Sporton International Inc. (Kunshan), would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.26-2015 and shown compliance with the applicable technical standards.

This product installed a RF module (Brand Name: Telit, Model Name: ME910G1-WW, FCC ID: RI7ME910G1WW) during the test, only ERP/EIRP and RSE test items are tested in this report, all the other test results are quoted on module RF report.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. (Kunshan), the test report shall not be reproduced except in full.

Jason Jia

Reviewed by: Jason Jia / Supervisor

Alex Wang

Approved by: Alex Wang / Manager

Sporton International Inc. (Kunshan)

No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300

People's Republic of China

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FG1N2320A	Rev. 01	Initial issue of report	Feb. 11, 2022

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.4	§2.1046	Conducted Output Power	-	Report Only	-
	§22.913(a)(5)	Effective Radiated Power	< 7 Watts	PASS	-
	§24.232(c)	Equivalent Isotropic Radiated Power	< 2 Watts	PASS	-
-	§24.232(d)	Peak-to-Average Ratio	< 13 dB	PASS	1
-	§2.1049	Occupied Bandwidth	Reporting Only	PASS	1
-	§2.1051 §22.917(a) §24.238(a)	Band Edge Measurement	< 43+10log10(P[Watts])	PASS	1
-	§2.1051 §22.917(a) §24.238(a)	Conducted Emission	< 43+10log10(P[Watts])	PASS	1
-	§2.1055 §22.355	Frequency Stability for Temperature & Voltage	< 2.5 ppm for Part 22	PASS	1
	§2.1055 §24.235		Within Authorized Band		
4.4	§2.1053; §22.917(a); §24.238(a)	Field Strength of Spurious Radiation	< 43+10log10(P[Watts])	PASS	Under limit 33.65 dB at 1672.000 MHz

Remark 1:
All test results were leveraged from module RF report which can refer to Report No. STS1912245W03.

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.

1 General Description

1.1 Applicant

Trackunit Aps
Gasvaerksvej 24,4 sal.Aalborg Denmark

1.2 Manufacturer

Positioning Universal.
4660 La Jolla Village Drive, Suite 1100, San Diego, CA92122

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	M7 4G LTE Vehicle Telematics Unit
Model Name	M7MG
FCC ID	ZMF-M7MG
HW Version	P7
SW Version	M7PUI MAIN MCU V3.10
EUT Stage	Identical Prototype

Remark:

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. Verify that the power is less than the module power, so the module power is used when calculating EIRP in this report.

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx Frequency	**GPRS/EDGE:** 850: 824 MHz ~ 849 MHz 1900: 1850MHz ~ 1910MHz
Rx Frequency	**GPRS/EDGE:** 850: 869 MHz ~ 894 MHz 1900: 1930 MHz ~ 1990 MHz
Maximum Output Power to Antenna	**GPRS/EDGE:** 850: 33.23 dBm 1900: 30.41 dBm
Antenna Type	FPC Antenna
Antenna Gain	Cellular Band: 0 dBi PCS Band: 1 dBi
Type of Modulation	GPRS: GMSK EDGE: GMSK / 8PSK

1.5 Modification of EUT

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

1.6 Maximum ERP/EIRP

FCC Rule	Frequency Band	Frequency Range (MHz)	Type of Modulation	Maximum ERP/EIRP (W)
Part 22	GSM850 (GPRS)	824.2 ~ 848.8	GMSK	1.2823
Part 22	GSM850 (EDGE)	824.2 ~ 848.8	8PSK	0.3707
Part 24	GSM1900 (GPRS)	1850.2 ~ 1909.8	GMSK	1.3836
Part 24	GSM1900 (EDGE)	1850.2 ~ 1909.8	8PSK	0.5916

1.7 Testing Location

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Test Firm	Sporton International Inc. (Kunshan)		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158 FAX : +86-512-57900958		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	03CH04-KS	CN1257	314309

1.8 Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH04-KS	AUDIX	E3	6.2009-8-24a

1.9 Applicable Standards

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

- 47 CFR Part 2, 22(H), 24(E)
- ANSI C63.26-2015
- 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.

Radiated measurements were performed with rotating EUT in different three orthogonal test planes to find the maximum emission.

Radiated emissions were investigated as following frequency range:

1. 30 MHz to 9000 MHz for GSM850.
2. 30 MHz to 19100 MHz for GSM1900.

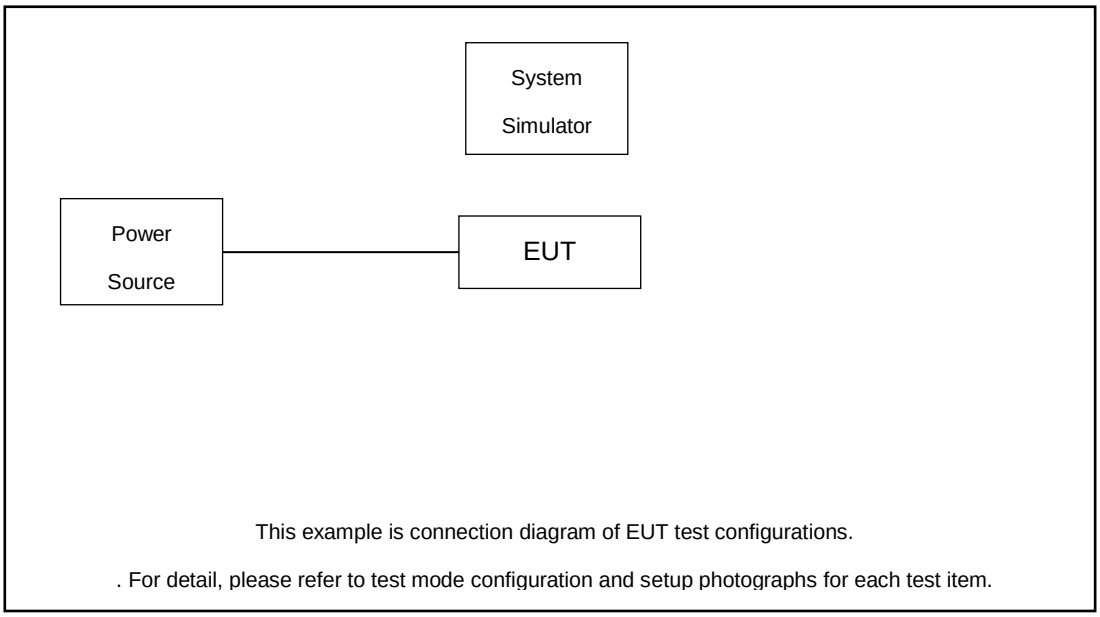
All modes and data rates and positions were investigated.

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

Test Modes		
Band	**Radiated TCs**	**Conducted TCs**
GSM 850	■ GPRS 1 Tx slots Link ■ EDGE 1 Tx slots Link	■ GPRS 1 Tx slots Link ■ EDGE 1 Tx slots Link
GSM 1900	■ GPRS 1 Tx slots Link ■ EDGE 1 Tx slots Link	■ GPRS 1 Tx slots Link ■ EDGE 1 Tx slots Link

Remark: The RSE margin is better than 10dB, so only the middle channel is selected for radiated testing.

2.2 Connection Diagram of Test System



This example is connection diagram of EUT test configurations.

. For detail, please refer to test mode configuration and setup photographs for each test item.

The EUT has been configuration operated in a manner tended to maximize its emission characteristics in a typical application.

2.3 Support Unit used in test configuration

Item	Equipment	Trade Name	Model No.	FCC ID	Data Cable	Power Cord
1.	System Simulator	R&S	CMU 200	N/A	N/A	Unshielded, 1.8 m
2.	System Simulator	Agilent	E5515C	N/A	N/A	Unshielded, 1.8 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
GSM1900	Channel	512	661	810
	Frequency	1850.2	1880.0	1909.8

3 Conducted Test Result

3.1 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.

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 testing follows ANSI C63.26 Section 5.2
2. The transmitter output port was connected to the system simulator.
3. Set EUT at maximum power through the system simulator.
4. Select lowest, middle, and highest channels for each band and different modulation.
5. Measure and record the power level from the system simulator.

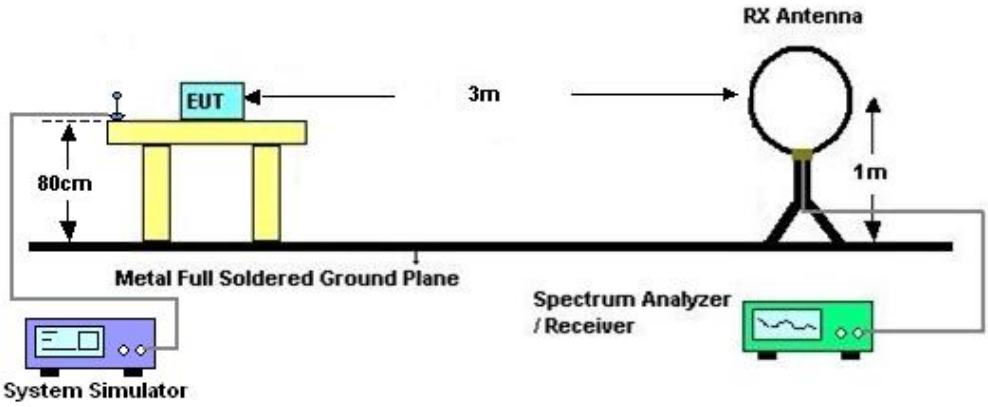
4 Radiated Test Items

4.1 Measuring Instruments

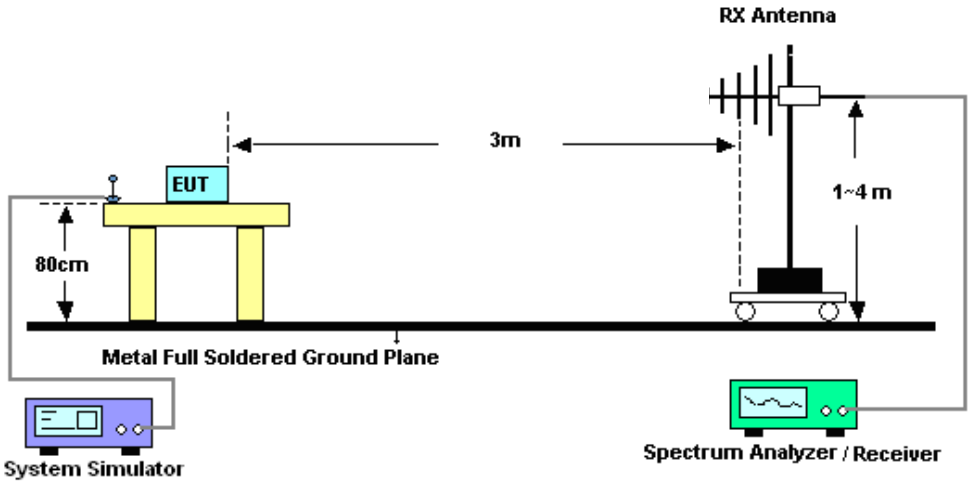
See list of measuring instruments of this test report.

4.2 Test Setup

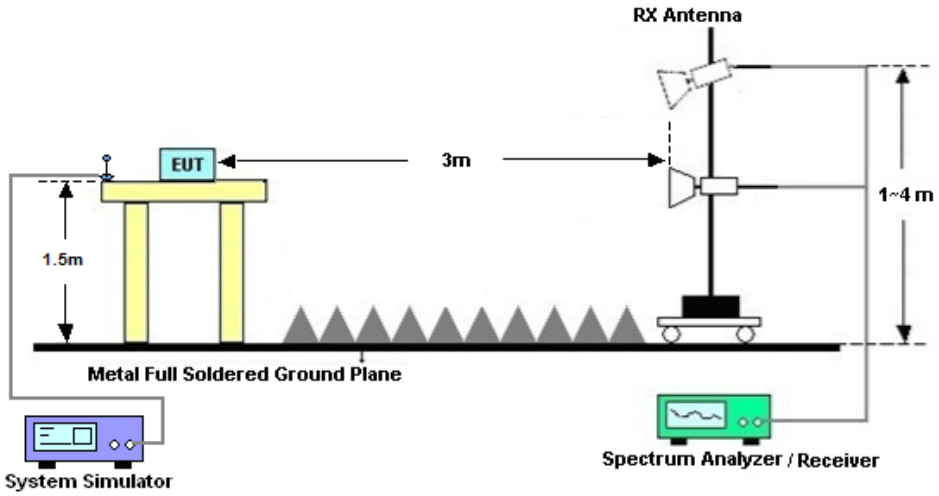
4.2.1 For radiated test below 30MHz



4.2.2 For radiated test from 30MHz to 1GHz



4.2.3 For radiated test above 1GHz



4.3 Test Result of Radiated Test

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

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

1. The testing follows ANSI C63.26 Section 5.5
2. 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.
3. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
4. The table was rotated 360 degrees to determine the position of the highest spurious emission.
5. 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.
6. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking record of maximum spurious emission.
7. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
8. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
9. Taking the record of output power at antenna port.
10. Repeat step 7 to step 8 for another polarization.
11. EIRP (dBm) = S.G. Power – Tx Cable Loss + Tx Antenna Gain
12. ERP (dBm) = EIRP - 2.15
13. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
14. 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
EXA Spectrum Analyzer	Keysight	N9010A	MY55150244	10Hz-44G,MAX 30dB	Apr. 13, 2021	Jan. 07, 2022	Apr. 12, 2022	Radiation (03CH04-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 30, 2021	Jan. 07, 2022	Oct. 29, 2022	Radiation (03CH04-KS)
Bilog Antenna	TeseQ	CBL6111D	49922	30MHz-1GHz	May 30, 2021	Jan. 07, 2022	May 29, 2022	Radiation (03CH04-KS)
Horn Antenna	Schwarzbeck	BBHA9120D	1356	1GHz~18GHz	Apr. 18, 2021	Jan. 07, 2022	Apr. 17, 2022	Radiation (03CH04-KS)
SHF-EHF Horn	Com-power	AH-840	101070	18GHz~40GHz	Jan. 05, 2022	Jan. 07, 2022	Jan. 04, 2023	Radiation (03CH04-KS)
Amplifier	SONOMA	310N	187289	9KHz-1GHz	Jan. 05, 2022	Jan. 07, 2022	Jan. 04, 2023	Radiation (03CH04-KS)
Amplifier	MITEQ	EM18G40GGA	060728	18~40GHz	Jan. 06, 2022	Jan. 07, 2022	Jan. 05, 2023	Radiation (03CH04-KS)
high gain Amplifier	MITEQ	AMF-7D-00101800-30-10P	2025788	1Ghz-18Ghz	Jan. 05, 2022	Jan. 07, 2022	Jan. 04, 2023	Radiation (03CH04-KS)
Amplifier	Keysight	83017A	MY57280106	500MHz~26.5GHz	Oct. 13, 2021	Jan. 07, 2022	Oct. 12, 2022	Radiation (03CH04-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Jan. 07, 2022	NCR	Radiation (03CH04-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Jan. 07, 2022	NCR	Radiation (03CH04-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Jan. 07, 2022	NCR	Radiation (03CH04-KS)

NCR: No Calibration Required

6 Uncertainty of Evaluation

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.26-2015. All the measurement uncertainty value were shown with a coverage K=2 to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**3.3dB**

Uncertainty of Radiated Emission Measurement (1 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.8dB**

---------- THE END ----------

Appendix A. Test Results of Conducted Test

Test Engineer :	Simle Wang	Temperature :	22~23℃
		Relative Humidity :	40~42%

Conducted Output Power(Average power) & ERP/EIRP

Band	Channel	PCL	Slot	Power	ERP	
				dBm	dBm	watts
GPRS850	128	3	1	32.89	30.74	1.1858
GPRS850	128	3	2	31.87	29.72	0.9376
GPRS850	128	3	3	29.91	27.76	0.5970
GPRS850	128	3	4	27.46	25.31	0.3396
GPRS850	190	3	1	33.14	30.99	1.2560
GPRS850	190	3	2	31.68	29.53	0.8974
GPRS850	190	3	3	29.42	27.27	0.5333
GPRS850	190	3	4	27.15	25	0.3162
GPRS850	251	3	1	33.23	31.08	1.2823
GPRS850	251	3	2	31.67	29.52	0.8954
GPRS850	251	3	3	29.15	27	0.5012
GPRS850	251	3	4	27.67	25.52	0.3565
Band	Channel	PCL	Slot	Power	ERP	
				dBm	dBm	watts
EGPRS850(8PSK)	128	3	1	27.31	25.16	0.3281
EGPRS850(8PSK)	128	3	2	27.52	25.37	0.3443
EGPRS850(8PSK)	128	3	3	27.04	24.89	0.3083
EGPRS850(8PSK)	128	3	4	26.08	23.93	0.2472
EGPRS850(8PSK)	190	3	1	27.08	24.93	0.3112
EGPRS850(8PSK)	190	3	2	27.11	24.96	0.3133
EGPRS850(8PSK)	190	3	3	27.67	25.52	0.3565
EGPRS850(8PSK)	190	3	4	26.74	24.59	0.2877
EGPRS850(8PSK)	251	3	1	27.17	25.02	0.3177
EGPRS850(8PSK)	251	3	2	27.34	25.19	0.3304
EGPRS850(8PSK)	251	3	3	27.84	25.69	0.3707
EGPRS850(8PSK)	251	3	4	26.84	24.69	0.2944

Band	Channel	PCL	Slot	Power(dBm)	EIRP	
				(dBm)	dBm	(watts)
GPRS1900	512	0	1	29.91	30.91	1.2331
GPRS1900	512	0	2	29.71	30.71	1.1776
GPRS1900	512	0	3	29.56	30.56	1.1376
GPRS1900	512	0	4	28.34	29.34	0.8590
GPRS1900	661	0	1	30.26	31.26	1.3366
GPRS1900	661	0	2	30.41	31.41	1.3836
GPRS1900	661	0	3	29.26	30.26	1.0617
GPRS1900	661	0	4	28.98	29.98	0.9954
GPRS1900	810	0	1	30.21	31.21	1.3213
GPRS1900	810	0	2	30.15	31.15	1.3032
GPRS1900	810	0	3	29.04	30.04	1.0093
GPRS1900	810	0	4	28.83	29.83	0.9616
Band	Channel	PCL	Slot	Power(dBm)	EIRP	
				(dBm)	dBm	(watts)
EGPRS1900(8PSK)	512	2	1	26.4	27.4	0.5495
EGPRS1900(8PSK)	512	2	2	26.25	27.25	0.5309
EGPRS1900(8PSK)	512	2	3	26.12	27.12	0.5152
EGPRS1900(8PSK)	512	2	4	26.22	27.22	0.5272
EGPRS1900(8PSK)	661	2	1	26.46	27.46	0.5572
EGPRS1900(8PSK)	661	2	2	26.14	27.14	0.5176
EGPRS1900(8PSK)	661	2	3	26.2	27.2	0.5248
EGPRS1900(8PSK)	661	2	4	26	27	0.5012
EGPRS1900(8PSK)	810	2	1	26.72	27.72	0.5916
EGPRS1900(8PSK)	810	2	2	26.53	27.53	0.5662
EGPRS1900(8PSK)	810	2	3	26.44	27.44	0.5546
EGPRS1900(8PSK)	810	2	4	26.3	27.3	0.5370

Appendix B. Test Results of Radiated Test

Radiated Spurious Emission

Test Engineer :	Chris Chen	Temperature :	22~23℃
		Relative Humidity :	41~42%

GSM850 (GPRS 1 Tx slots)								
Channel	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)
Middle	1672	-56.34	-13	-43.34	-63.31	1.58	10.70	H
	2512	-59.98	-13	-46.98	-68.23	2.102	12.50	H
	3344	-59.06	-13	-46.06	-67.95	2.856	13.90	H
	1672	-62.80	-13	-49.80	-69.77	1.58	10.70	V
	2512	-59.16	-13	-46.16	-67.41	2.10	12.50	V
	3344	-57.91	-13	-44.91	-66.80	2.86	13.90	V

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

GSM850 (EDGE 1 Tx slots)								
Channel	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)
Middle	1672	-46.65	-13	-33.65	-53.62	1.58	10.70	H
	2512	-59.94	-13	-46.94	-68.19	2.102	12.50	H
	3344	-58.78	-13	-45.78	-67.67	2.856	13.90	H
	1592	-59.32	-13	-46.32	-66.29	1.58	10.70	V
	2512	-59.00	-13	-46.00	-67.25	2.10	12.50	V
	3344	-58.64	-13	-45.64	-67.53	2.86	13.90	V

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

GSM1900 (GPRS 1 Tx slots)								
Channel	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)
Middle	3765	-52.48	-13	-39.48	-64.74	2.64	14.90	H
	5640	-53.23	-13	-40.23	-65.09	2.94	14.80	H
	7515	-52.94	-13	-39.94	-62.71	3.39	13.16	H
	3765	-50.09	-13	-37.09	-62.35	2.64	14.90	V
	5640	-52.54	-13	-39.54	-64.40	2.94	14.80	V
	7515	-52.89	-13	-39.89	-62.66	3.39	13.16	V

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

GSM1900 (EDGE 1 Tx slots)								
Channel	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)
Middle	3765	-55.39	-13	-42.39	-67.65	2.64	14.90	H
	5640	-54.16	-13	-41.16	-66.02	2.94	14.80	H
	7515	-53.26	-13	-40.26	-63.03	3.39	13.16	H
	3765	-53.99	-13	-40.99	-66.25	2.64	14.90	V
	5640	-53.90	-13	-40.90	-65.76	2.94	14.80	V
	7515	-52.15	-13	-39.15	-61.92	3.39	13.16	V

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