



FCC RF Test Report

APPLICANT : Positioning Universal Inc
EQUIPMENT : GPS TRACK
BRAND NAME : Positioning Universal
MODEL NAME : FT5000MW
FCC ID : 2AHRH-FT5000MW
STANDARD : 47 CFR Part 2, 22(H), 24(E)
CLASSIFICATION : PCS Licensed Transmitter (PCB)
TEST DATE(S) : Jul. 22, 2021

We, Sporton International (Kunshan) Inc., 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: Quectel, Model Name: BG95-M5, FCC ID: XMR202005BG95M5) 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 (Kunshan) Inc., 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 (Kunshan) Inc.

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People's Republic of China**



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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FG162602A	Rev. 01	Initial issue of report	Aug. 17, 2021



SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.4	§2.1046	Conducted Output Power	Reporting Only	PASS	-
	§22.913(a)(5)	Effective Radiated Power	< 7 Watts	PASS	-
	§24.232(c)	Equivalent Isotropic Radiated Power	< 2 Watts	PASS	-
3.5	§24.232(d)	Peak-to-Average Ratio	< 13 dB	PASS	1
3.6	§2.1049	Occupied Bandwidth	Reporting Only	PASS	1
3.7	§2.1051 §22.917(a) §24.238(a)	Band Edge Measurement	< 43+10log10(P[Watts])	PASS	1
3.8	§2.1051 §22.917(a) §24.238(a)	Conducted Emission	< 43+10log10(P[Watts])	PASS	1
3.9	§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 25.41 dB at 1672.000 MHz

Remark 1:

All test results were leveraged from module RF report which can refer to Report No. R2005A0283-R1V1& R2005A0283-R2V1.

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

Positioning Universal Inc

4660 La Jolla Village Drive, Suite 1100, SanDiego , CA92122

1.2 Manufacturer

Positioning Universal Inc

4660 La Jolla Village Drive, Suite 1100, SanDiego , CA92122

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	GPS TRACK
Brand Name	Positioning Universal
Model Name	FT5000MW
FCC ID	2AHRH-FT5000MW
HW Version	P2.1
SW Version	A0.15.5
EUT Stage	Production Unit

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 and close to 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: 32.47 dBm 1900: 29.97 dBm
Antenna Type	PIFA Antenna
Antenna Gain	Cellular Band: -3.5 dBi PCS Band: 1.1 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 Power, and Emission Designator

FCC Rule	Frequency Band	Frequency Range (MHz)	Type of Modulation	Maximum ERP/EIRP (W)
Part 22	GSM850 (GPRS)	824.2 ~ 848.8	GMSK	0.4808
Part 22	GSM850 (EDGE)	824.2 ~ 848.8	8PSK	0.1191
Part 24	GSM1900 (GPRS)	1850.2 ~ 1909.8	GMSK	1.2794
Part 24	GSM1900 (EDGE)	1850.2 ~ 1909.8	8PSK	0.5105

1.7 Testing Location

<FCC>-KS

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

Test Firm	Sporton International (Kunshan) Inc.		
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 TH01-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:

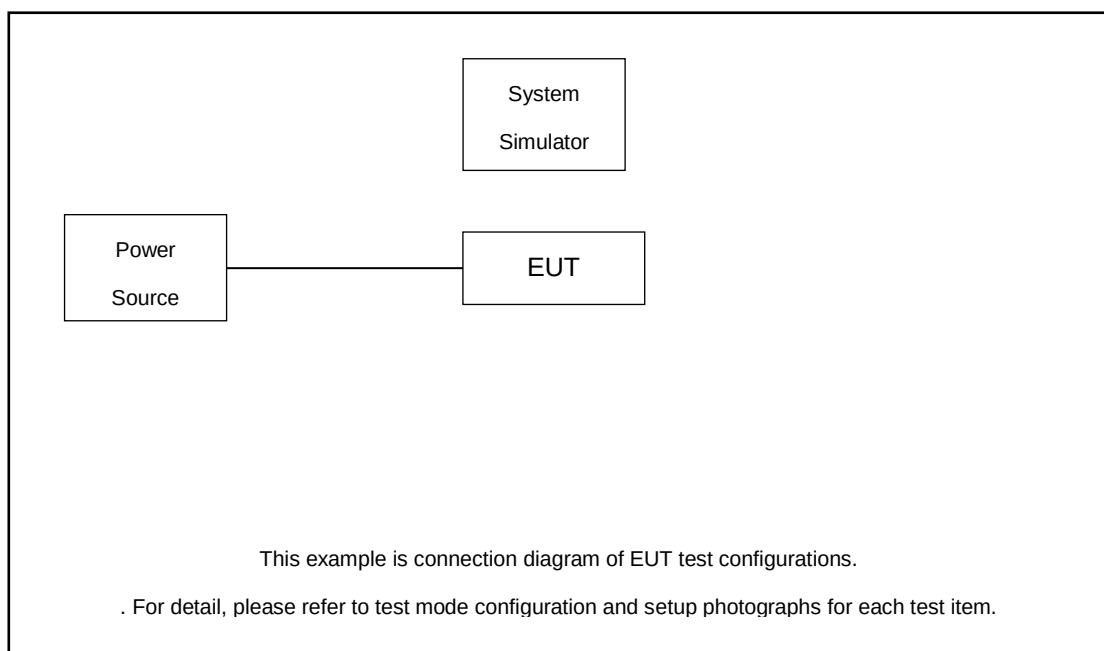
1. 30 MHz to 10th for GSM850.
2. 30 MHz to 10th for GSM1900

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	■ GPRS 1 Tx slots Link
	■ EDGE 1 Tx slots Link	■ EDGE 1 Tx slots Link
GSM 1900	■ GPRS 1 Tx slots Link	■ GPRS 1 Tx slots Link
	■ EDGE 1 Tx slots Link	■ EDGE 1 Tx slots Link

2.2 Connection Diagram of Test System



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

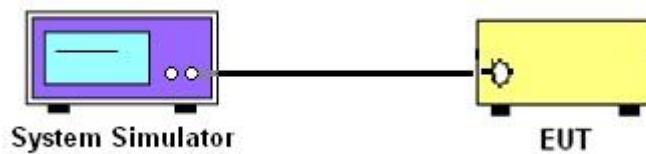
3 Conducted Test Result

3.1 Measuring Instruments

See list of measuring instruments of this test report.

3.2 Test Setup

3.2.1 Conducted Output Power



3.3 Test Result of Conducted Test

Please refer to Appendix A.



3.4 Conducted Output Power and ERP/EIRP

3.4.1 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

3.4.2 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.

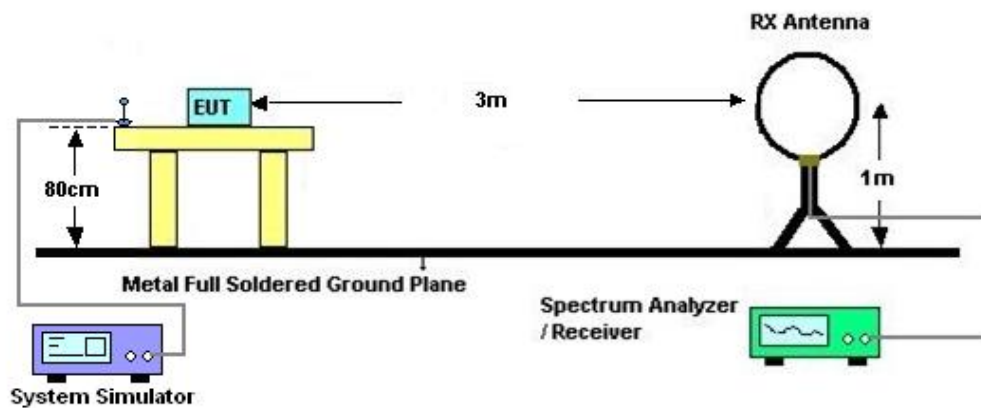
4 Radiated Test Items

4.1 Measuring Instruments

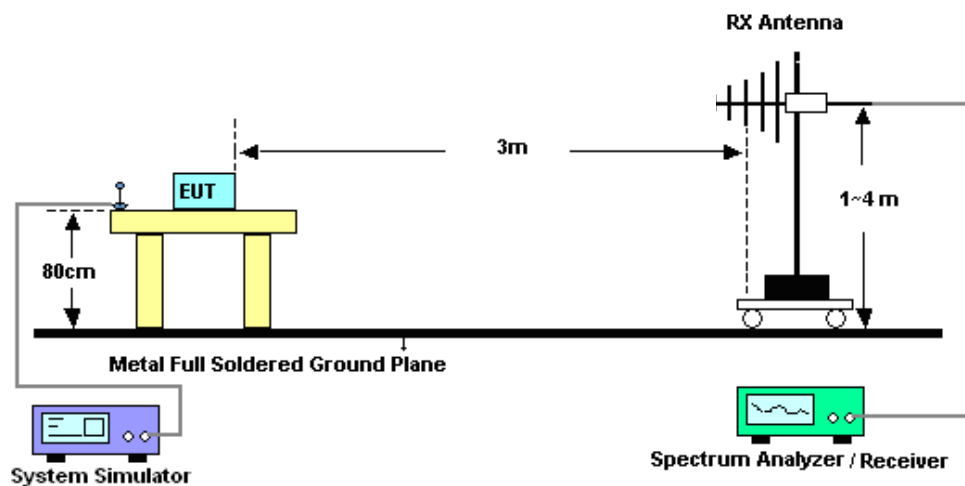
See list of measuring instruments of this test report.

4.2 Test Setup

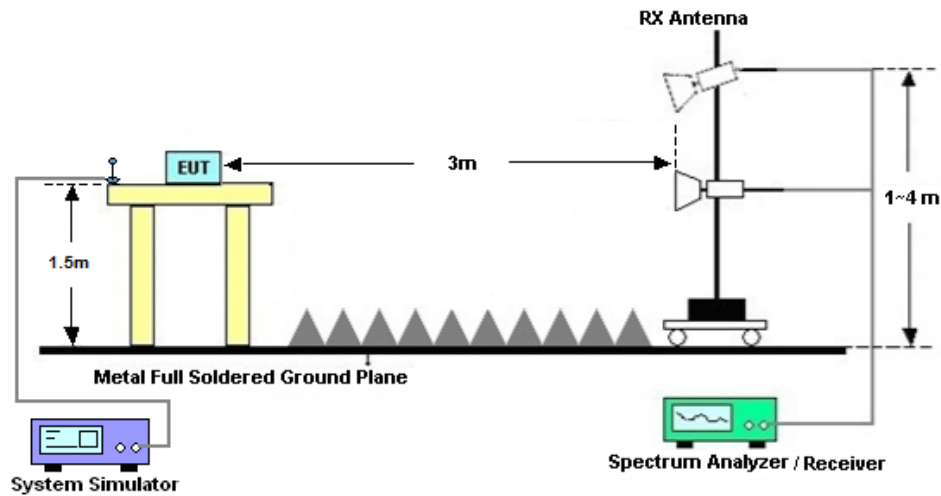
4.2.1 For radiated test below 30MHz



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. $EIRP \text{ (dBm)} = S.G. \text{ Power} - Tx \text{ Cable Loss} + Tx \text{ Antenna Gain}$
12. $ERP \text{ (dBm)} = EIRP - 2.15$
13. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
14. The limit line is derived from $43 + 10\log(P)$ 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	Jul. 22, 2021	Apr. 12, 2022	Radiation (03CH04-KS)
Bilog Antenna	TeseQ	CBL6111D	49922	30MHz-1GHz	May. 30, 2021	Jul. 22, 2021	May. 29, 2022	Radiation (03CH04-KS)
Horn Antenna	Schwarzbeck	BBHA9120D	1356	1GHz~18GHz	Apr. 18, 2021	Jul. 22, 2021	Apr. 17, 2022	Radiation (03CH04-KS)
SHF-EHF Horn	Com-power	AH-840	101115	18GHz~40GHz	Jan. 06, 2021	Jul. 22, 2021	Jan. 05, 2022	Radiation (03CH04-KS)
Amplifier	SONOMA	310N	187289	9KHz-1GHz	Jan. 06, 2021	Jul. 22, 2021	Jan. 05, 2022	Radiation (03CH04-KS)
Amplifier	MITEQ	EM18G40G GA	060728	18~40GHz	Jan. 07, 2021	Jul. 22, 2021	Jan. 06, 2022	Radiation (03CH04-KS)
high gain Amplifier	MITEQ	AMF-7D-00 101800-30-1	2025788	1Ghz-18Ghz	Jan. 06, 2021	Jul. 22, 2021	Jan.05, 2022	Radiation (03CH04-KS)
Amplifier	Keysight	83017A	MY57280106	500MHz~26.5GHz	Oct. 14, 2020	Jul. 22, 2021	Oct. 13, 2021	Radiation (03CH04-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Jul. 22, 2021	NCR	Radiation (03CH04-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Jul. 22, 2021	NCR	Radiation (03CH04-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Jul. 22, 2021	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
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Uncertainty of Radiated Emission Measurement (1 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.8dB
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----- THE END -----

Appendix A. Test Results of Conducted Test

Conducted Output Power(Average power) & ERP/EIRP

GSM850	Burst Average Power (dBm)			ERP(W)		
TX Channel	128	189	251			
Frequency (MHz)	824.2	836.4	848.8	L	M	H
GPRS 1 Tx slot	32.40	32.47	32.41	0.4732	0.4808	0.4742
GPRS 2 Tx slots	31.80	31.76	31.81	0.4121	0.4083	0.4130
GPRS 3 Tx slots	29.59	30.10	30.26	0.2477	0.2786	0.2891
GPRS 4 Tx slots	28.84	28.79	28.92	0.2084	0.2061	0.2123
EDGE 1 Tx slot	26.41	26.24	26.26	0.1191	0.1146	0.1151
EDGE 2 Tx slots	26.01	25.93	25.91	0.1086	0.1067	0.1062
EDGE 3 Tx slots	24.40	24.22	24.37	0.0750	0.0719	0.0745
EDGE 4 Tx slots	23.02	23.01	23.12	0.0546	0.0545	0.0558

GSM1900	Burst Average Power (dBm)			EIRP(W)		
TX Channel	512	661	810			
Frequency (MHz)	1850.2	1880	1909.8	L	M	H
GPRS 1 Tx slot	29.97	29.84	29.81	1.2794	1.2417	1.2331
GPRS 2 Tx slots	28.38	28.18	28.32	0.8872	0.8472	0.8750
GPRS 3 Tx slots	26.77	26.51	26.97	0.6124	0.5768	0.6412
GPRS 4 Tx slots	26.48	26.29	25.90	0.5728	0.5483	0.5012
EDGE 1 Tx slot	25.98	25.71	25.51	0.5105	0.4797	0.4581
EDGE 2 Tx slots	24.84	24.65	24.41	0.3926	0.3758	0.3556
EDGE 3 Tx slots	23.02	22.82	22.67	0.2582	0.2466	0.2382
EDGE 4 Tx slots	21.62	21.55	21.40	0.1871	0.1841	0.1778

Appendix B. Test Results of Radiated Test

Radiated Spurious Emission

GSM850 (GSM)								
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	-41.38	-13	-28.38	-48.35	1.58	10.70	H
	2510	-57.71	-13	-44.71	-65.96	2.102	12.50	H
	3348	-59.78	-13	-46.78	-68.67	2.856	13.90	H
	1672	-45.76	-13	-32.76	-52.73	1.58	10.70	V
	2510	-56.90	-13	-43.90	-65.15	2.10	12.50	V
	3348	-59.63	-13	-46.63	-68.52	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	-44.74	-13	-31.74	-51.71	1.58	10.70	H
	2510	-54.77	-13	-41.77	-63.02	2.102	12.50	H
	3348	-59.63	-13	-46.63	-68.52	2.856	13.90	H
	1672	-38.41	-13	-25.41	-45.38	1.58	10.70	V
	2508	-57.96	-13	-44.96	-66.21	2.10	12.50	V
	3348	-59.59	-13	-46.59	-68.48	2.86	13.90	V

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

GSM1900 (GSM)								
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	3759	-57.47	-13	-44.47	-69.73	2.641	14.90	H
	5640	-55.04	-13	-42.04	-66.90	2.94	14.80	H
	7524	-52.45	-13	-39.45	-62.22	3.39	13.16	H
	3759	-56.76	-13	-43.76	-69.02	2.64	14.90	V
	5640	-55.50	-13	-42.50	-67.36	2.94	14.80	V
	7524	-52.07	-13	-39.07	-61.84	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)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)
Middle	3759	-57.00	-13	-44.00	-69.26	2.641	14.90	H
	5640	-54.95	-13	-41.95	-66.81	2.94	14.80	H
	7524	-52.17	-13	-39.17	-61.94	3.39	13.16	H
	3759	-57.05	-13	-44.05	-69.31	2.64	14.90	V
	5640	-55.61	-13	-42.61	-67.47	2.94	14.80	V
	7524	-52.31	-13	-39.31	-62.08	3.39	13.16	V

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