

TEST REPORT

Applicant: Trackunit Aps

Address of Applicant: Gasvaerksvej 24, 4 sal, Aalborg DK-9000, Denmark

Manufacturer: Positioning Universal

Address of Manufacturer: 4660 La Jolla Village Dr., Suite 1100, SAN DIEGO, CA 92122, United States Of America

Equipment Under Test (EUT)

Product Name: M7 4G LTE Vehicle Telematics Unit

Model No.: M7LW

FCC ID: ZMF-M7LW

Applicable standards: FCC CFR Title 47 Part 2
FCC CFR Title 47 Part 22
FCC CFR Title 47 Part 24
FCC CFR Title 47 Part 27

Date of sample receipt: September 9, 2022

Date of Test: September 9-20, 2022

Date of report issued: September 20, 2022

Test Result : PASS *

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:



Robinson Luo

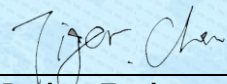
Laboratory Manager

This results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

2 Version

Version No.	Date	Description
00	September 20, 2022	Original

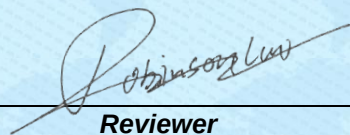
Prepared By:


Project Engineer

Date:

September 20, 2022

Check By:


Reviewer

Date:

September 20, 2022

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4 Test Summary

Test Item	Section in CFR 47	Result
ERP and EIRP	Part 2.1046 Part 22.913 (a) Part 24.232 (c) Part 27.50	Pass
RF Output Power	Part 2.1046 Part 22.913 (a) Part 24.232 (c) Part 27.50	Pass*
Peak-to-Average Ratio	Part 2.1046 Part 24.232 Part 27.50	Pass*
Modulation Characteristics	Part 2.1047	N/A
99% Occupied Bandwidth & 26dB Bandwidth	Part 2.1049 Part 22.917(b) Part 24.238(b) Part 27.53	Pass*
Spurious Emissions at Antenna Terminal	Part 2.1051 Part 22.917 Part 24.238 Part 27.53	Pass*
Spurious Radiation Emissions	Part 2.1053 Part 22.917 Part 24.238 Part 27.53	Pass
Out of band emission, Band Edge	Part 22.913(a) Part 24.232(b) Part 27.50	Pass*
Frequency stability vs. temperature	Part 2.1055(a)(1)(b) Part 22.355 Part 24.235 Part 27.54	Pass*
Frequency stability vs. voltage	Part 2.1055(d)(1)(2) Part 22.355 Part 24.235 Part 27.54	Pass*

Remarks:

1. Pass*: This device has installed a certified modular which FCC ID: RI7LE910CXWWX, so these conducted test data directly reference the modular's data..
2. N/A: Not applicable.

5 General Information

5.1 General Description of EUT

Product Name:	M7 4G LTE Vehicle Telematics Unit
Model No.:	M7LW
Test sample(s) ID:	GTS202209000128-1
Sample(s) Status:	Engineer sample
Serial No.:	7970000001, 7970000002
Hardware Version:	P7
Software Version:	2.1.1.0
Support Bands:	GSM850, PCS1900, WCDMA Band II, WCDMA Band IV, WCDMA Band V
TX Frequency:	GSM850: 824.20MHz-848.80MHz PCS1900: 1850.20MHz-1909.80MHz WCDMA Band II: 1852.40MHz -1907.60MHz WCDMA Band IV: 1712.40MHz -1752.60MHz WCDMA Band V: 826.40MHz -846.60MHz
Modulation type:	GSM/GPRS: GMSK EGPRS: GMSK/8PSK WCDMA Band II/IV/V: QPSK
Antenna type:	PIFA Antenna
Antenna gain:	1.5dBi
Power supply:	DC 12V or DC 3.7V 1900mAh battery

Operation Frequency List:

GSM 850		PCS1900	
Channel	Frequency (MHz)	Channel	Frequency (MHz)
128	824.20	512	1850.20
129	824.40	513	1850.40
⋮	⋮	⋮	⋮
189	836.40	660	1879.80
190	836.60	661	1880.00
191	836.80	662	1880.20
⋮	⋮	⋮	⋮
250	848.60	809	1909.60
251	848.80	810	1909.80

WCDMA Band V		WCDMA Band II		WCDMA Band IV	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
4132	826.40	9262	1852.40	1312	1712.40
4133	826.60	9263	1852.60	1313	1712.60
⋮	⋮	⋮	⋮	⋮	⋮
4181	836.20	9399	1879.80	1411	1732.20
4182	836.40	9400	1880.00	1412	1732.40
4183	836.60	9401	1880.20	1413	1732.60
⋮	⋮	⋮	⋮	⋮	⋮
4232	846.40	9537	1907.40	1512	1752.40
4233	846.60	9538	1907.60	1513	1752.60

5.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is filing to comply with Section Part 22 /24/27 of the FCC CFR 47 Rules.

5.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures document on ANSI C63.26:2015 and FCC CFR 47.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055 and 2.1057

5.4 Deviation from Standards

None.

5.5 Abnormalities from Standard Conditions

None.

5.6 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **FCC —Registration No.: 381383**

Designation Number: CN5029

Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files.

- **IC —Registration No.: 9079A**

CAB identifier: CN0091

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with.

- **NVLAP (LAB CODE:600179-0)**

Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).

5.7 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.

Address: No. 123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102

Tel: 0755-27798480

Fax: 0755-27798960

6 Test Instruments list

Radiated Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	July 02, 2020	July 01, 2025
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	April 22, 2022	April 21, 2023
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9168	GTS640	March 21, 2022	March 20, 2023
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	June 12, 2022	June 11, 2023
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June 23, 2022	June 22, 2023
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	April 22, 2022	April 21, 2023
9	Coaxial Cable	GTS	N/A	GTS211	April 22, 2022	April 21, 2023
10	Coaxial cable	GTS	N/A	GTS210	April 22, 2022	April 21, 2023
11	Coaxial Cable	GTS	N/A	GTS212	April 22, 2022	April 21, 2023
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	April 22, 2022	April 21, 2023
13	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June 23, 2022	June 22, 2023
14	Band filter	Amindeon	82346	GTS219	June 23, 2022	June 22, 2023
15	Power Meter	Anritsu	ML2495A	GTS540	June 23, 2022	June 22, 2023
16	Power Sensor	Anritsu	MA2411B	GTS541	June 23, 2022	June 22, 2023
17	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	April 22, 2022	April 21, 2023
18	Splitter	Agilent	11636B	GTS237	June 23, 2022	June 22, 2023
19	Loop Antenna	ZHINAN	ZN30900A	GTS534	Nov. 30, 2021	Nov. 29, 2022
20	Broadband Preamplifier	SCHWARZBECK	BBV9718	GTS535	April 22, 2022	April 21, 2023
21	Breitband hornantenna	SCHWARZBECK	BBHA 9170	GTS579	Oct. 17, 2021	Oct. 16, 2022
22	Amplifier	TDK	PA-02-02	GTS574	Oct. 17, 2021	Oct. 16, 2022
23	Amplifier	TDK	PA-02-03	GTS576	Oct. 17, 2021	Oct. 16, 2022
24	PSA Series Spectrum Analyzer	Rohde & Schwarz	FSP	GTS578	June 23, 2022	June 22, 2023
25	Amplifier(1GHz-26.5GHz)	HP	8449B	GTS601	April 22, 2022	April 21, 2023

General used equipment:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Humidity/ Temperature Indicator	KTJ	TA328	GTS243	April 25, 2022	April 24, 2023
2	Barometer	KUMAO	SF132	GTS647	July 26, 2022	July 25, 2023

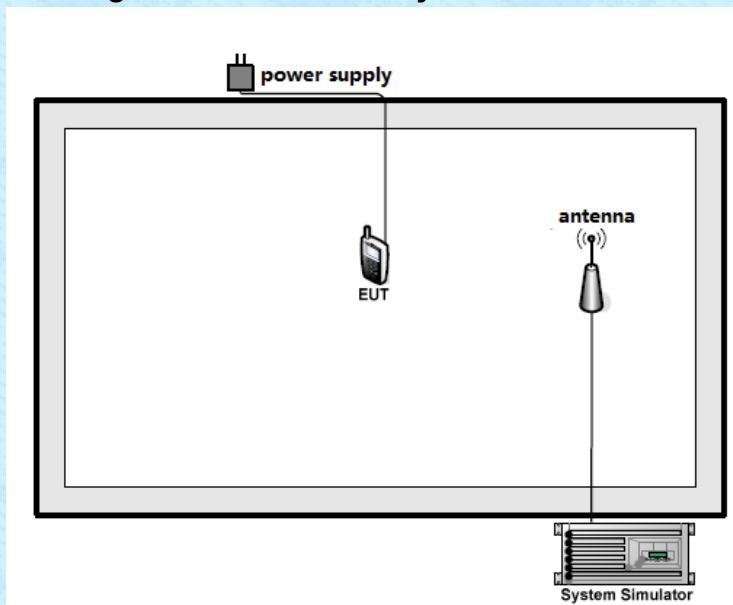
7 System test configuration

7.1 Test mode

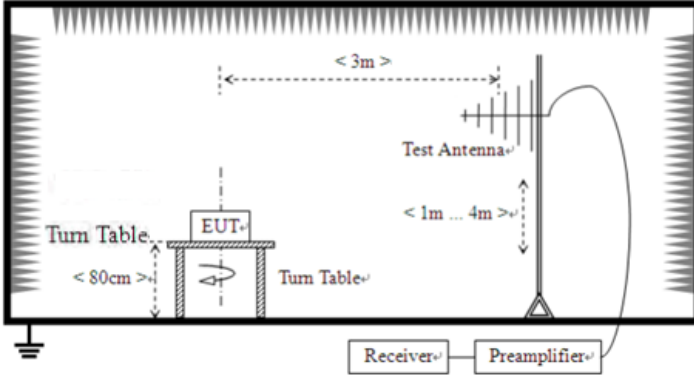
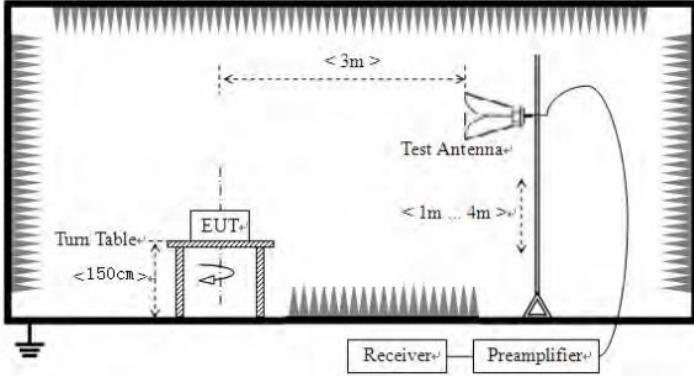
During all testing, EUT is in link mode with base station emulator at maximum power level. The spurious emission measurements were carried out in semi-anechoic chamber with 3-meter test range, and EUT is rotated on the worst emission.

Band	Test Mode
GSM 850	GPRS 1 slot, Middle channel
PCS 1900	GPRS 1 slot, Middle channel
WCDMA II	RMC 12.2Kbps link, Middle channel
WCDMA Band IV	RMC 12.2Kbps link, Middle channel
WCDMA Band V	RMC 12.2Kbps link, Middle channel

7.2 Configuration of Tested System



7.3 ERP/EIRP

Test Requirement:	FCC Part 22.913(a), Part 24.232(c), Part 27.50
Test Method:	FCC Part 2.1046
Limit:	GSM850, WCDMA Band V: 7W(38.45dBm) PCS1900, WCDMA Band II: 2W(33.01dBm) WCDMA Band IV: 1W(30.00dBm)
Test setup:	For radiated emissions from 30MHz to 1GHz  For radiated emissions above 1GHz 
Test Procedure:	Below 1GHz test procedure as below: 1. The EUT was powered ON and placed on a 0.8m high table in the chamber. The antenna of the transmitter was extended to its maximum length. 2. The disturbance of the transmitter was maximized on the test receiver display by raising and lowering from 1m to 4m the receive antenna and by rotating through 360° the turntable. After the fundamental emission was maximized, a field strength measurement was made. 3. Steps 1) and 2) were performed with the EUT and the receive antenna in both vertical and horizontal polarization. 4. The transmitter was then removed and replaced with another antenna. The center of the antenna was approximately at the same location as the center of the transmitter. 5. A signal at the disturbance was fed to the substitution antenna by means of a non-radiating cable. With both the substitution and the receive antennas horizontally polarized, the receive antenna was raised and lowered to obtain a maximum reading at the test receiver. The level of the signal generator was adjusted until the measured field strength level in step 2) is obtained for this set of conditions. 6. The output power into the substitution antenna was then measured. 7. Steps 5) and 6) were repeated with both antennas polarized.

	8. Calculate power in dBm by the following formula: $ERP\ (dBm) = Pg(dBm) - \text{cable loss (dB)} + \text{antenna gain (dBd)}$ Where: Pg is the generator output power into the substitution antenna. Above 1GHz test procedure as below: 1. Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber 2. Calculate power in dBm by the following formula: $EIRP(dBm) = Pg(dBm) - \text{cable loss (dB)} + \text{antenna gain (dBi)}$ $EIRP = ERP + 2.15dB$ Where: Pg is the generator output power into the substitution antenna. 3. Test the EUT in the lowest channel, the middle channel the Highest channel 4. The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, Only the test worst case mode is recorded in the report. 5. Repeat above procedures until all frequencies measured was complete.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 7.1 for details
Test results:	Pass

Measurement Data

Only show the worst case

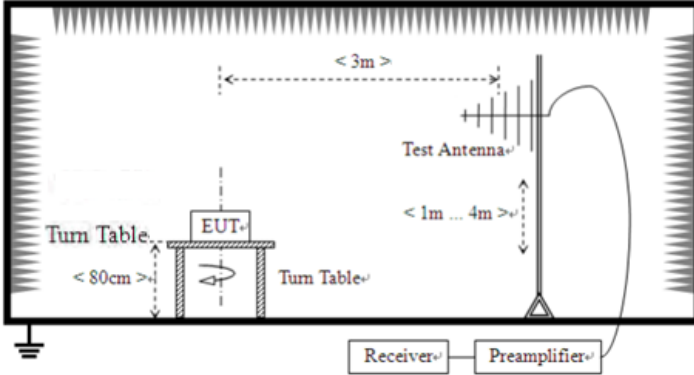
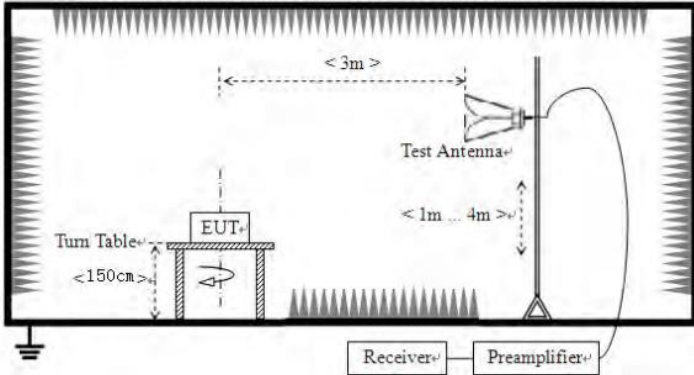
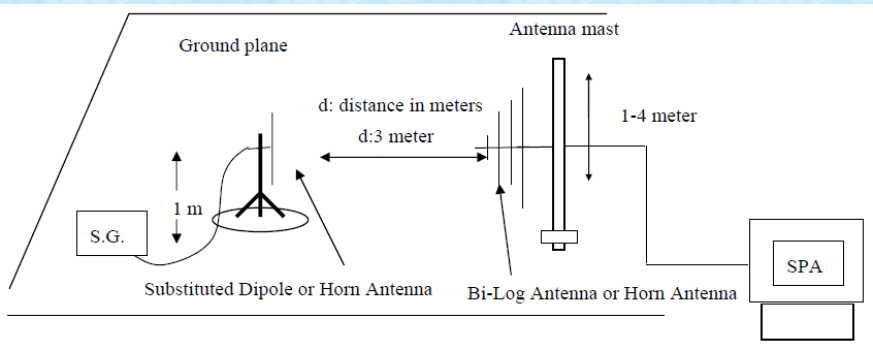
Mode	Channel	Polarization	ERP (dBm)	Limit (dBm)	Conclusion
GSM850	128	Horizontal	31.17	38.45	Pass
	190	Horizontal	31.56	38.45	Pass
	251	Horizontal	30.96	38.45	Pass
EGPRS850	128	Horizontal	25.31	38.45	Pass
	190	Horizontal	25.26	38.45	Pass
	251	Horizontal	25.60	38.45	Pass

Mode	Channel	Polarization	EIRP (dBm)	Limit (dBm)	Conclusion
GSM1900	512	Horizontal	29.87	33.00	Pass
	661	Horizontal	29.93	33.00	Pass
	810	Horizontal	29.33	33.00	Pass
EGPRS1900	512	Horizontal	26.36	33.00	Pass
	661	Horizontal	25.98	33.00	Pass
	810	Horizontal	26.16	33.00	Pass

Mode	Channel	Polarization	EIRP (dBm)	Limit (dBm)	Conclusion
WCDMA Band II	9262	Horizontal	24.27	33.00	Pass
	9400	Horizontal	24.29	33.00	Pass
	9538	Horizontal	23.86	33.00	Pass
WCDMA Band IV	1312	Horizontal	24.37	30.00	Pass
	1413	Horizontal	24.06	30.00	Pass
	1513	Horizontal	24.47	30.00	Pass

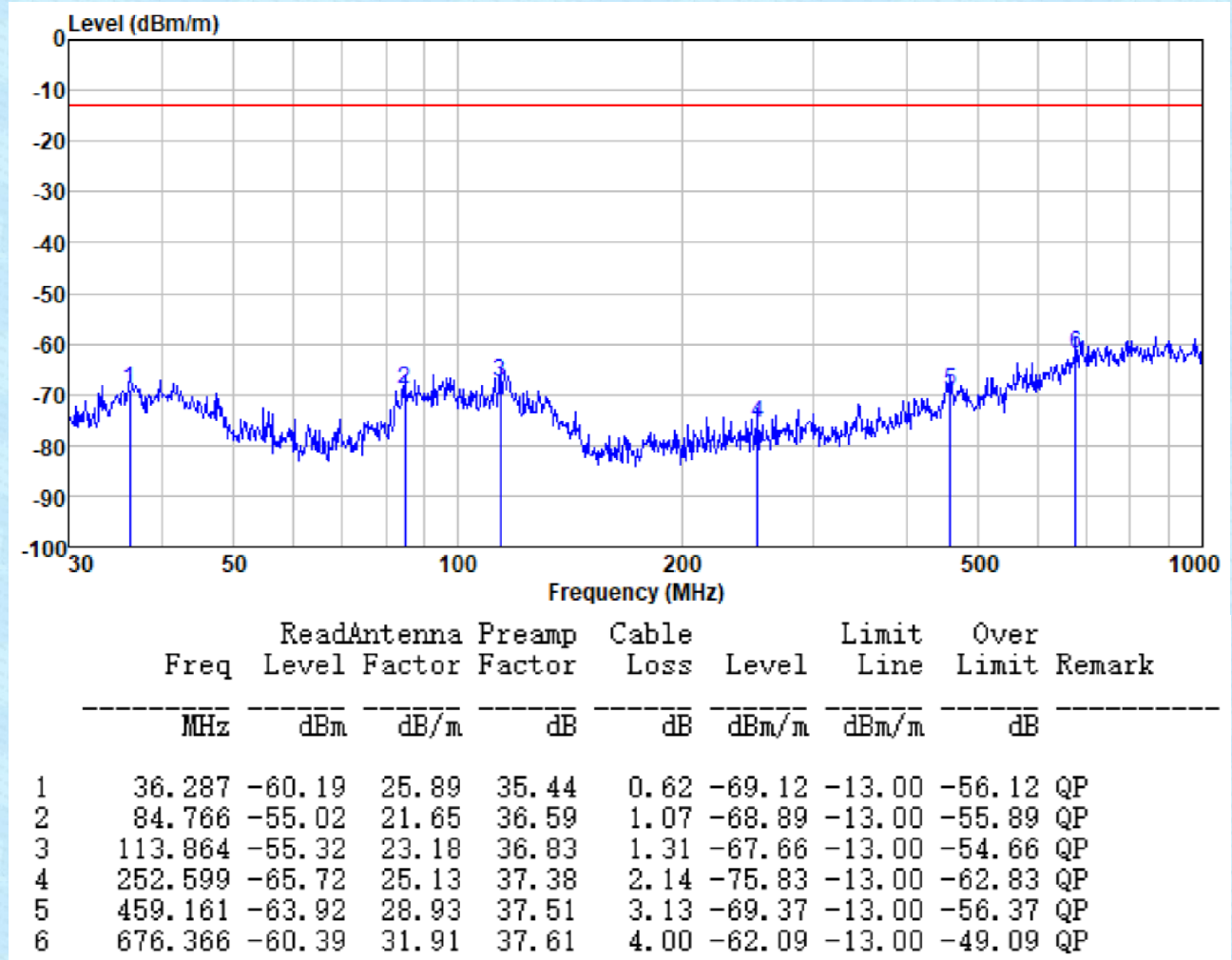
Mode	Channel	Polarization	ERP (dBm)	Limit (dBm)	Conclusion
WCDMA Band V	4132	Horizontal	22.67	38.45	Pass
	4182	Horizontal	22.64	38.45	Pass
	4233	Horizontal	22.39	38.45	Pass

7.4 Spurious Radiation Emissions

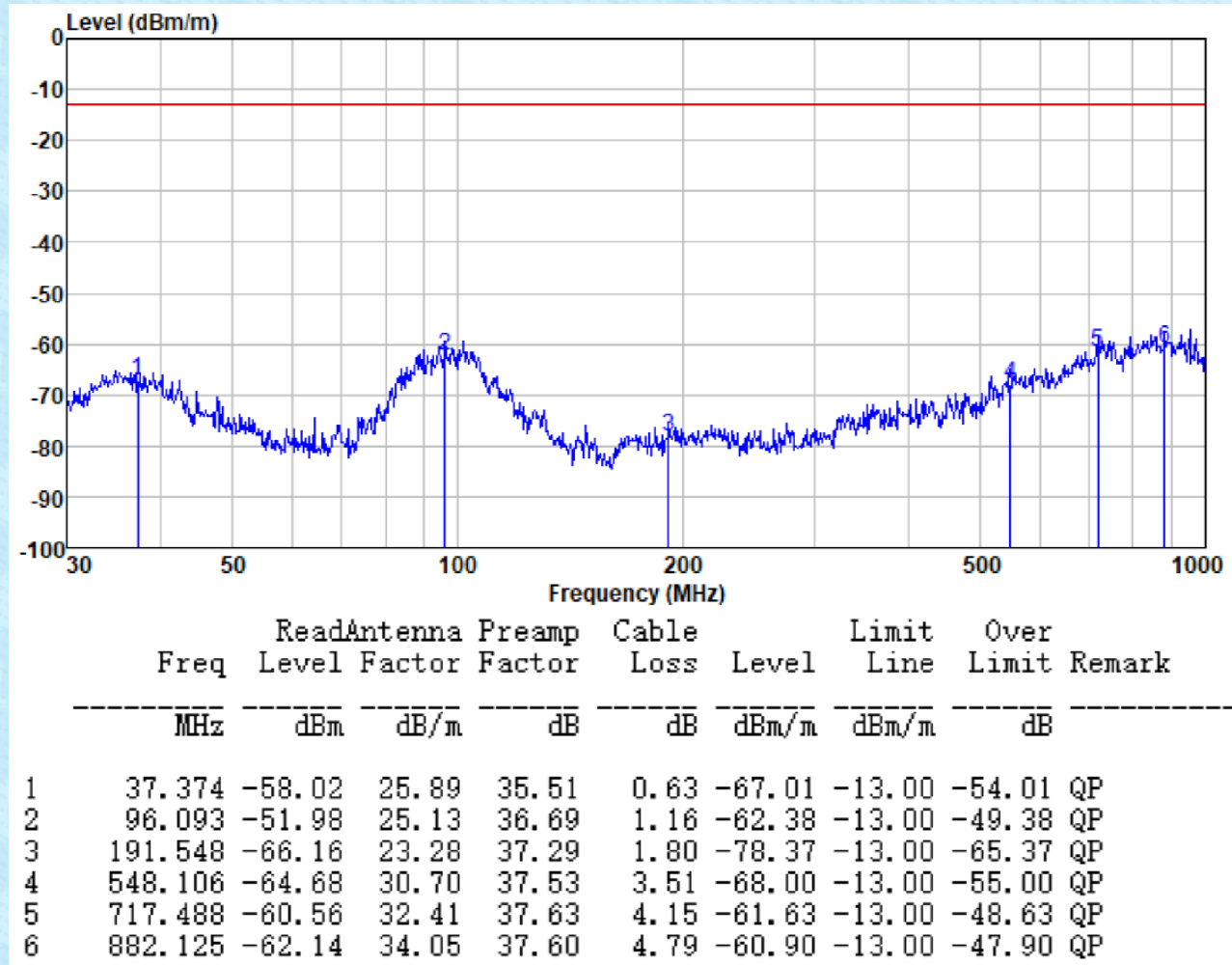
Test Requirement:	FCC part 22.917 and FCC part 24.238 and Part 27.53
Test Method:	FCC part 2.1053 and ANSI C63.26:2015
Test setup:	Below 1GHz  Above 1GHz  Substituted method: 
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 7.1 for details
Test results:	Pass

Measurement Data**Below 1GHz**

Pre-scan all test modes, found worst case at WCDMA Band 2, and so only show the test result of it

Horizontal:

Vertical:



Above 1GHz

Only show the worst case

GPRS850									
Channel	Frequency (MHz)	Ant. Pol.	Result (dBm)	Factor (dB)	Limit (dBm)	Margin (dB)	Ant. Height[cm]	Turntable deg.	verdict
Middle	1442.00	H	-47.92	-11.82	-13.00	-46.74	150	266.75	Pass
	5556.00	H	-55.14	-0.65	-13.00	-42.79	150	111.78	Pass
	14328.00	H	-60.92	12.91	-13.00	-35.01	150	270.03	Pass
	2428.00	V	-51.21	-8.50	-13.00	-46.71	150	81.45	Pass
	8157.00	V	-56.46	6.67	-13.00	-36.79	150	24.96	Pass
	16742.00	V	-61.56	15.38	-13.00	-33.18	150	57.58	Pass

EGPRS850									
Channel	Frequency (MHz)	Ant. Pol.	Result (dBm)	Factor (dB)	Limit (dBm)	Margin (dB)	Ant. Height[cm]	Turntable deg.	verdict
Middle	1673.20	H	-51.38	-11.82	-13.00	-50.20	150	252.67	Pass
	2509.80	H	-46.67	-8.31	-13.00	-41.98	150	250.36	Pass
	3346.40	H	-53.66	-6.22	-13.00	-46.88	150	241.23	Pass
	1673.20	V	-46.36	-11.82	-13.00	-45.18	150	170.52	Pass
	2509.80	V	-53.31	-8.31	-13.00	-48.62	150	165.22	Pass
	3346.40	V	-46.93	-6.22	-13.00	-40.15	150	177.05	Pass

GPRS1900									
Channel	Frequency (MHz)	Ant. Pol.	Result (dBm)	Factor (dB)	Limit (dBm)	Margin (dB)	Ant. Height[cm]	Turntable deg.	verdict
Middle	2394.00	H	-51.31	-8.55	-13.00	-46.86	150	287.61	Pass
	9007.00	H	-56.39	7.28	-13.00	-36.11	150	23.18	Pass
	17235.00	H	-62.37	16.91	-13.00	-32.46	150	231.87	Pass
	2054.00	V	-50.25	-9.16	-13.00	-46.41	150	70.19	Pass
	7375.00	V	-55.38	5.47	-13.00	-36.91	150	243.55	Pass
	16147.00	V	-61.09	13.93	-13.00	-34.16	150	326.35	Pass

EGPRS1900									
Channel	Frequency (MHz)	Ant. Pol.	Result (dBm)	Factor (dB)	Limit (dBm)	Margin (dB)	Ant. Height[cm]	Turntable deg.	verdict
Middle	3760.00	H	-49.33	-5.99	-13.00	-42.32	150	251.05	Pass
	5640.00	H	-51.24	-0.58	-13.00	-38.82	150	244.68	Pass
	7520.00	H	-48.36	5.87	-13.00	-29.49	150	245.32	Pass
	3760.00	V	-48.37	-5.99	-13.00	-41.36	150	160.25	Pass
	5640.00	V	-50.59	-0.58	-13.00	-38.17	150	190.30	Pass
	7520.00	V	-49.63	5.87	-13.00	-30.76	150	165.24	Pass

WCDMA Band II @RMC 12.2Kbps link									
Channel	Frequency (MHz)	Ant. Pol.	Result (dBm)	Factor (dB)	Limit (dBm)	Margin (dB)	Ant. Height[cm]	Turntable deg.	verdict
Middle	2683.00	H	-51.50	-7.87	-13.00	-46.37	150	105.49	Pass
	6712.00	H	-56.04	3.09	-13.00	-39.95	150	73.16	Pass
	16334.00	H	-60.39	14.58	-13.00	-32.81	150	354.98	Pass
	1646.00	V	-48.86	-10.89	-13.00	-46.75	150	117.84	Pass
	7681.00	V	-55.81	6.18	-13.00	-36.63	150	103.73	Pass
	15416.00	V	-60.99	13.06	-13.00	-34.93	150	47.73	Pass

WCDMA Band IV @RMC 12.2Kbps link									
Channel	Frequency (MHz)	Ant. Pol.	Result (dBm)	Factor (dB)	Limit (dBm)	Margin (dB)	Ant. Height[cm]	Turntable deg.	verdict
Middle	1816.00	H	-49.73	-10.06	-13.00	-46.79	150	299.89	Pass
	10452.00	H	-58.67	9.87	-13.00	-35.80	150	24.34	Pass
	13614.00	H	-62.04	10.85	-13.00	-38.19	150	29.01	Pass
	2972.00	V	-51.61	-7.07	-13.00	-45.68	150	105.72	Pass
	7681.00	V	-55.81	6.18	-13.00	-36.63	150	198.51	Pass
	12968.00	V	-61.54	8.33	-13.00	-40.21	150	99.25	Pass

WCDMA Band V @RMC 12.2Kbps link									
Channel	Frequency (MHz)	Ant. Pol.	Result (dBm)	Factor (dB)	Limit (dBm)	Margin (dB)	Ant. Height[cm]	Turntable deg.	verdict
Middle	3312.00	H	-51.91	-6.46	-13.00	-45.37	150	75.51	Pass
	8871.00	H	-57.03	7.15	-13.00	-36.88	150	117.55	Pass
	14736.00	H	-61.88	13.24	-13.00	-35.64	150	46.87	Pass
	2326.00	V	-50.75	-8.67	-13.00	-46.42	150	282.23	Pass
	11744.00	V	-58.22	9.26	-13.00	-35.96	150	244.66	Pass
	16912.00	V	-62.86	15.46	-13.00	-34.40	150	181.65	Pass

8 Test Setup Photo

Reference to the **appendix I** for details.

9 EUT Constructional Details

Reference to the **appendix II** for details.

-----End-----