FCC TEST REPORT

FCC ID: SY4-B01011

On Behalf of

Shanghai Huace Navigation Technology LTD.
Handheld GNSS Data Collector
Model No.: LT50

Prepared for	:	Shanghai Huace Navigation Technology LTD.
Address	:	Building C, 599 Gaojing Road, Qingpu District, Shanghai, China

Prepared By	:	Shenzhen Alpha Product Testing Co., Ltd.
Address	:	Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103, Shenzhen, Guangdong, China

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TEST REPORT DECLARATION

Applicant	:	Shanghai Huace Navigation Technology LTD.
Address	:	Building C, 599 Gaojing Road, Qingpu District, Shanghai, China
Manufacturer	:	Shanghai Huace Navigation Technology LTD.
Address	:	Building C, 599 Gaojing Road, Qingpu District, Shanghai, China
EUT Description	:	Handheld GNSS Data Collector
		(A) Model No. : LT50
		(B) Trademark : CHCNAV

Measurement Standard Used:

FCC CFR Title 47 Part 2
FCC CFR Title 47 Part22 Subpart H
FCC CFR Title 47 Part24 Subpart E

The device described above is tested by Shenzhen Alpha Product Testing Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C limits both conducted and radiated emissions. The test results are contained in this test report and Shenzhen Alpha Product Testing Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

After the test, our opinion is that EUT compliance with the requirement of the above standards.

This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Shenzhen Alpha Product Testing Co., Ltd.

Tested by (name + signature).....:	Reak Yang Project Engineer	Reak Yang
Approved by (name + signature)…....:	Simple Guan Project Manager	
Date of issue…… ……..:	June 28, 2018	

Revision History

Revision	Issue Date	Revisions	Revised By
00	June 28, 2018	Initial released Issue	Simple Guan

1 Test Summary

Test Item	Section in CFR 47	Result
RF Exposure (SAR)	Part 1.1307 Part 2.1093	Pass* (Please refer to SAR Report)
RF Output Power	Part 2.1046 Part 22.913 (a)(2) Part 24.232 (c)	Pass
Peak-to-Average Ratio	Part 2.1046 Part 24.232 (d)	Pass
Modulation Characteristics	Part 2.1047	Pass
99% & -26 dB Occupied Bandwidth	Part 2.1049 Part 22.917 Part 24.238	Pass
Spurious Emissions at Antenna Terminal	Part 2.1051 Part 22.917 (a) Part 24.238 (a)	Pass
Field Strength of Spurious Radiation	Part 2.1053 Part 22.917 (a) Part 24.238 (a)	Pass
Out of band emission, Band Edge	Part 22.917 (a) Part 24.238 (a)	Pass
Frequency stability vs. temperature	Part 2.1055(a)(1)(b)	Pass
Frequency stability vs. voltage	Part 2.1055(d)(1)(2)	Pass

Pass: The EUT complies with the essential requirements in the standard.

2 General Information

2.1 General Description of EUT

Product Name:	Handheld GNSS Data Collector
Model No.:	LT50
Test Model No:	LT50
Remark: All above models are identical in the same PCB layout, interior structure and electrical circuits. The differences are color and model name for commercial purpose.	
Sample(s) Status:	Engineer sample
Quantity of tested samples	1
Serial No.:	N/A
Tested Sample(s) ID:	N/A
Hardware Version:	A5503_MPCB_V4.0_0905
Software Version:	A5502_V1.01
Support Networks:	GSM, GPRS, EGPRS, WCDMA
Support Bands:	GSM850, PCS1900, WCDMA Band V, WCDMA Band II
TX Frequency:	GSM850: 824.20MHz-848.80MHz PCS1900: 1850.20MHz-1909.80MHz WCDMA Band V: 826.40MHz -846.60MHz WCDMA Band II: 1852.40MHz -1907.60MHz
GPRS Class:	12
EGPRS Class	10
Modulation type:	GSM/GPRS: GMSK EGPRS: GMSK/8PSK WCDMA Band II/V: QPSK
Antenna type:	Internal antenna
Antenna gain:	0.56dBi(max.) For GSM 850 -1.18dBi(max.) For DCS 1900 0.58dBi(max.) For WCDMA Band V -1.23dBi(max.) For WCDMA Band II
Power supply:	DC 3.8V by battery or DC 5V from adapter input AC 120V, 60Hz

Operation Frequency List:

GSM 850		PCS1900		WCDMA Band V		WCDMA Band II	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
128	824.20	512	1850.20	4132	826.40	9262	1852.40
129	824.40	513	1850.40	4133	826.60	9263	1852.60
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
189	836.40	660	1879.80	4181	836.20	9399	1879.80
190	836.60	661	1880.00	4182	836.40	9400	1880.00
191	836.80	662	1880.20	4183	836.60	9401	1880.20
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
250	848.60	809	1909.60	4232	846.40	9537	1907.40
251	848.80	810	1909.80	4233	846.60	9538	1907.60

Regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Final test channel:

GSM 850		PCS1900		WCDMA Band V		WCDMA Band II	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
128	824.20	512	1850.20	4132	826.40	9262	1852.40
190	836.60	661	1880.00	4183	836.60	9400	1880.00
251	848.80	810	1909.80	4233	846.60	9538	1907.60

2.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is filing to comply with Section Part 22 subpart H and Part 24 subpart E of the FCC CFR 47 Rules.

2.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures document on TIA/EIA 603 and FCC CFR 47.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055 and 2.1057

2.4 Test Facility

Shenzhen Alpha Product Testing Co., Ltd

Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103, Shenzhen, Guangdong, China

June 21, 2018 File on Federal Communication Commission
Registration Number: 293961

July 25, 2017 Certificated by IC
Registration Number: 12135A

3 Test Instruments list

Equipment	Manufacturer	Model No.	Serial No.	Last cal.	Cal. Due day
Bilog Antenna	SCHWARZBECK	VULB 9168	9168-438	2016.09.30	2018.09.29
Horn Antenna	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D(1201)	2016.09.30	2018.09.29
Loop Antenna	SCHWARZBECK	FMZB 1519B	00005	2016.09.29	2018.09.28
Filter	KANGMAI	ZLPF-LDC-1000- 1959	1209002075	2017.09.22	2018.09.21
Filter	WAINWRIGHT	WHKX1.0G/15G - 10SS	SN40	2017.09.22	2018.09.21
Filter	WAINWRIGHT	WHKX2.80 /18G- 12SS	SN1	2017.09.22	2018.09.21
RF Cable	Resenberger	Cable 4	N/A	2017.09.22	2018.09.21
CMU200	ROHDE&SCHWARZ	CMU200	116785	2017.09.22	2018.09.21
CMW500	ROHDE&SCHWARZ	CMW500	1201.0002K50-117239-sM	2017.09.22	2018.09.21
Signal Analyzer	Agilent	N9020A	MY499100060	2017.09.23	2018.09.22
vector Signal Generator	Agilent	N5182A	MY49060042	2017.09.22	2018.09.21
vector Signal Generator	Agilent	E4438C	US44271917	2017.09.28	2018.09.27
Amplifier	Agilent	8449B	3008A02664	2017.09.23	2018.09.22
Test Receiver	ROHDE&SCHWARZ	ESR	1316.3003K03-102082-Wa	2017.09.23	2018.09.22
Bilog Antenna	SCHWARZBECK	VULB 9168	9168-438	2016.09.30	2018.09.29
9*6*6 anechoic	CHENYU	9*6*6	N/A	2016.07.21	2020.07.20
RF Cable	Resenberger	Cable 1	N/A	2017.09.22	2018.09.21
RF Cable	Resenberger	Cable 2	N/A	2017.09.22	2018.09.21
RF Cable	Resenberger	Cable 3	N/A	2017.09.28	2018.09.27
Power Sensor	Power Radio	RPR3006W	15100041SNO91	2017.09.23	2018.09.22
20dB Attenuator	ICPROBING	IATS1	82347	2017.09.22	2018.09.21
L.I.S.N.#1	Schwarzbeck	NSLK8126	8126466	2017.09.22	2018.09.21
L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	101043	2017.09.22	2018.09.21
POWER DIVIDER	Mini-circuits	PD-2SF-0010	N/A	2017.09.22	2018.09.21
POWER DIVIDER	Mini-circuits	PD-2SF-0010	N/A	2017.09.22	2018.09.21
Temperature& Humidity test chamber	GZGONGWEN	GDS-250	080821	2017.10.22	2018.10.23

4 System test configuration

4.1 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 three test planes to find out the worst emission.

Test modes		
Band	Radiated	Conducted
GSM 850	■ GSM link ■ GPRS 1 link ■ EPRS 1 link	■ GSM link ■ GPRS 1 link ■ EGPRS 1 link
PCS 1900	■ GSM link ■ GPRS 1 link ■ EGPRS 1 link	■ GSM link ■ GPRS 1 link ■ EGPRS 1 link
WCDMA II	■ RMC 12.2Kbps link	■ RMC 12.2Kbps link
WCDMA Band V	■ RMC 12.2Kbps link	■ RMC 12.2Kbps link

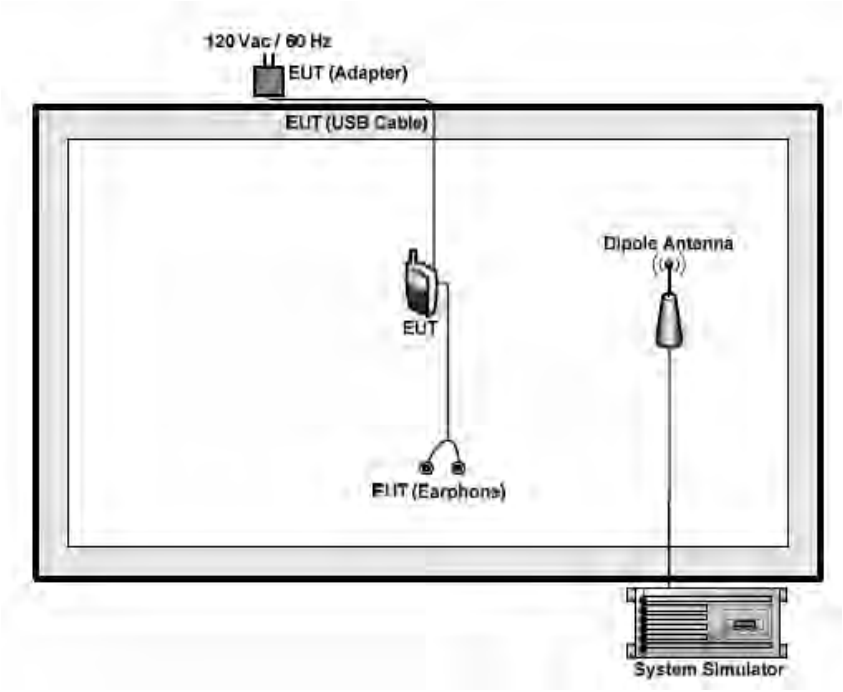
Note: The maximum power levels are GSM mode for GMSK link, GPRS multi-slot class 8 mode for GMSK link, EGPRS multi-slot class 8 mode for 8PSK link, RMC12.2Kbps mode for WCDMA Band V/II. only these modes were used for all tests.

The conducted power tables are as follows:

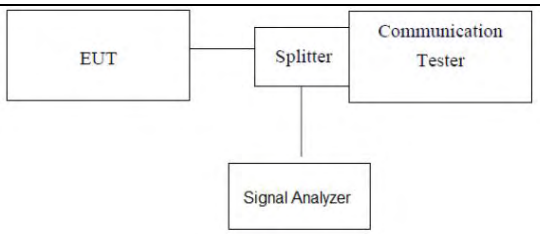
Conducted Power (dBm)						
Band	GSM850			PCS1900		
Channel	128	190	251	512	661	810
Frequency	824.20	836.60	848.80	1850.20	1880.00	1909.80
GSM (GMSK, 1 TX slot)	32.77	32.95	32.55	29.04	28.26	29.84
GPRS (GMSK, 1 TX slot)	32.89	33.06	32.43	29.15	28.89	28.32
GPRS (GMSK, 2 TX slot)	32.10	31.98	31.75	29.07	27.72	27.65
GPRS (GMSK, 3 TX slot)	29.75	29.71	30.49	27.23	26.47	25.70
GPRS (GMSK, 4 TX slot)	27.97	28.99	28.91	25.76	25.35	25.51
EGPRS (8PSK, 1 TX slot)	30.28	29.95	30.19	27.57	26.38	25.91
EGPRS (8PSK, 2 TX slot)	29.66	29.81	29.33	25.95	25.92	25.80
EGPRS (8PSK, 3 TX slot)	27.82	27.48	27.44	24.37	23.14	22.55
EGPRS (8PSK, 4 TX slot)	27.43	26.50	26.44	22.64	22.85	22.28

Conducted Power (dBm)						
Band	WCDMA Band II			WCDMA Band V		
Channel	9262	9400	9538	4132	4183	4233
Frequency	1852.4	1880.0	1907.6	826.4	836.6	846.6
RMC 12.2Kbps	19.94	20.23	19.74	22.75	22.28	22.85
HSDPA Subtest-1	19.93	20.37	20.38	21.45	21.62	22.00
HSDPA Subtest-2	19.96	20.46	20.06	21.64	21.16	21.90
HSDPA Subtest-3	20.19	19.79	19.57	21.70	21.84	21.66
HSDPA Subtest-4	19.79	20.19	19.98	22.19	21.97	21.66
HSUPA Subtest-1	20.32	19.89	19.48	21.66	21.58	21.74
HSUPA Subtest-2	20.16	20.41	19.67	22.22	21.09	21.57
HSUPA Subtest-3	20.34	19.89	19.56	22.03	21.48	21.64
HSUPA Subtest-4	20.40	19.88	19.70	22.11	21.33	21.55
HSUPA Subtest-5	20.26	20.65	19.86	21.80	21.42	21.36
AMR	20.05	20.19	19.61	22.02	21.52	22.08

4.2 Configuration of Tested System



4.3 Conducted AV Output Power

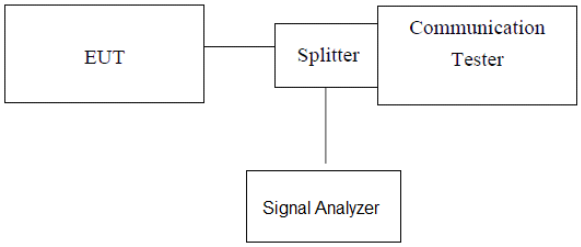
Test Requirement:	FCC part22.913(a) and FCC part24.232(b)
Test Method:	FCC part2.1046
Limit:	GSM850, WCDMA Band V: 7W PCS1900, WCDMA Band II: 2W
Test setup:	 *Note: Measurement setup for testing on Antenna connector*
Test Procedure:	1. The transmitter output port was connected to base station. 2. The RF output of EUT was connected to the Signal Analyzer by RF cable and attenuator, the path loss was compensated to the results for each measurement. 3. Set EUT at maximum power through base station. 4. Select lowest, middle, and highest channels for each band and different modulation. 5. Measure the maximum burst average power.
Test Instruments:	Refer to section 5.0 for details
Test mode:	Refer to section 6.1 for details
Test results:	Pass

Measurement Data

Burst Average Power (dBm)						
Band	GSM 850			PCS 1900		
Channel	128	190	251	512	661	810
Frequency (MHz)	824.2	836.6	848.8	1850.2	1880.0	1909.8
GSM(GMSK, 1-Slot)	32.77	32.95	32.55	29.04	28.26	29.84
GPRS (GMSK, 1-Slot)	32.89	33.06	32.43	29.15	28.89	28.32
GPRS (GMSK, 2-Slot)	32.10	31.98	31.75	29.07	27.72	27.65
GPRS (GMSK, 3-Slot)	29.75	29.71	30.49	27.23	26.47	25.70
GPRS (GMSK, 4-Slot)	27.97	28.99	28.91	25.76	25.35	25.51
EGPRS(8PSK, 1-Slot)	30.28	29.95	30.19	27.57	26.38	25.91
EGPRS(8PSK, 2-Slot)	29.66	29.81	29.33	25.95	25.92	25.80
EGPRS(8PSK, 3-Slot)	27.82	27.48	27.44	24.37	23.14	22.55
EGPRS(8PSK, 4-Slot)	27.43	26.50	26.44	22.64	22.85	22.28

Fram- Average Power(dBm)						
Band	GSM 850			PCS 1900		
Channel	128	190	251	512	661	810
Frequency (MHz)	824.2	836.6	848.8	1850.2	1880.0	1909.8
GSM(GMSK, 1-Slot)	23.74	23.92	23.52	20.01	19.23	20.81
GPRS (GMSK, 1-Slot)	23.86	24.03	23.40	20.12	19.86	19.29
GPRS (GMSK, 2-Slot)	26.08	25.96	25.73	23.05	21.70	21.63
GPRS (GMSK, 3-Slot)	25.49	25.45	26.23	22.97	22.21	21.44
GPRS (GMSK, 4-Slot)	24.96	25.98	25.90	22.75	22.34	22.50
EGPRS(8PSK, 1-Slot)	21.25	20.92	21.16	18.54	17.35	16.88
EGPRS(8PSK, 2-Slot)	23.64	23.79	23.31	19.93	19.90	19.78
EGPRS(8PSK, 3-Slot)	23.56	23.22	23.18	20.11	18.88	18.29
EGPRS(8PSK, 4-Slot)	24.42	23.49	23.43	19.63	19.84	19.27

4.4 Peak-to-Average Ratio

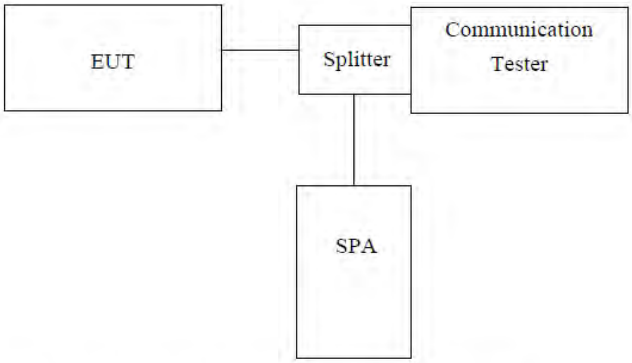
Test Requirement:	FCC part24.232(d)
Test Method:	FCC part2.1046
Limit:	13db
Test setup:	 *Note: Measurement setup for testing on Antenna connector*
Test Procedure:	1. The transmitter output port was connected to base station. 2. The RF output of EUT was connected to the Signal Analyzer by RF cable and attenuator, the path loss was compensated to the results for each measurement. 3. Set EUT at maximum power through base station. 4. Select lowest, middle, and highest channels for each band and different modulation. 5. Measure the maximum burst average power. 6. Record the maximum peak-to-average ratio value.
Test Instruments:	Refer to section 5.0 for details
Test mode:	Refer to section 6.1 for details
Test results:	Pass

Measurement data

Test mode	**Peak to Average Ratio (dB)**			**Limit (dB)**	**Result**
	Low Ch.	Middle Ch.	High Ch.		
GSM/TM1/GSM850	0.79	0.75	0.77	13	PASS
GSM/TM1/GSM1900	0.87	0.71	0.83	13	PASS

Test mode	**Peak to Average Ratio (dB)**			**Limit (dB)**	**Result**
	Low Ch.	Middle Ch.	High Ch.		
WCDMA Band II	3.09	2.49	3.02	13	PASS
WCDMA Band V	3.34	3.17	3.42		

4.5 Occupy Bandwidth

Test Requirement:	FCC part22.913(a) and FCC part24.232(b)
Test Method:	FCC part2.1049
Test setup:	 *Note: Measurement setup for testing on Antenna connector*
Test Procedure:	1. The EUT's output RF connector was connected with a short cable to the spectrum analyzer 2. RBW was set to about 1% of emission BW, VBW= 3 times RBW. 3. -26dBc display line was placed on the screen (or 99% bandwidth), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace.
Test Instruments:	Refer to section 5.0 for details
Test mode:	Refer to section 6.1 for details
Test results:	Pass

Measurement Data

EUT Mode	Channel	Frequency (MHz)	99% Occupy bandwidth (KHz)	-26dB bandwidth (KHz)
GSM 850 (GSM link)	128	824.20	245.43	316.2
	190	836.60	243.31	317.7
	251	848.80	246.79	314.6
GSM 850 (GPRS 1 link)	128	824.20	247.13	323.5
	190	836.60	247.47	314.9
	251	848.80	242.71	315.4
GSM 850 (EGPRS 1 link)	128	824.20	244.73	321.3
	190	836.60	245.58	316.8
	251	848.80	244.64	312.4
PCS 1900 (GSM link)	512	1850.20	244.47	318.1
	661	1880.00	245.35	320.7
	810	1909.80	244.42	316.1
PCS 1900 (GPRS 1 link)	512	1850.20	244.43	319.1
	661	1880.00	245.56	314.5
	810	1909.80	247.66	317.8
PCS 1900 (EGPRS 1 link)	512	1850.20	245.84	314.0
	661	1880.00	245.63	318.9
	810	1909.80	243.33	313.2
WCDMA Band V (RMC 12.2Kbps link)	4132	826.40	4116.3	4694.00
	4183	836.60	4131.7	4709.00
	4233	846.60	4111.4	4702.00
WCDMA Band II (RMC 12.2Kbps link)	9262	1852.4	4122.3	4716.00
	9400	1880.0	4104.5	4698.00
	9538	1907.6	4128.1	4700.00

Test plot as follows:

GSM 850 (GSM link)	GSM 850 (GPRS 1 link)

Lowest channel

Lowest channel

Middle channel

Middle channel

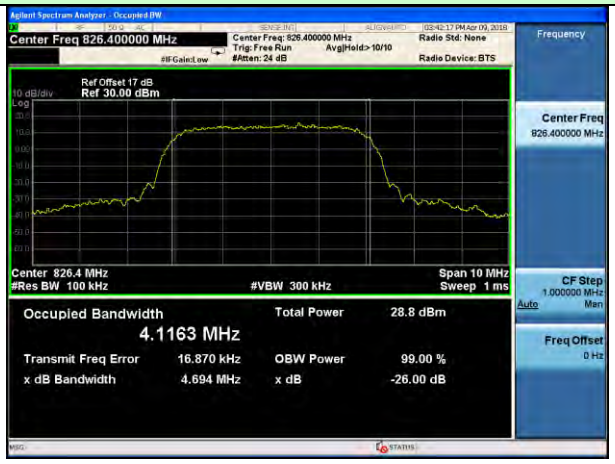
Highest channel

Highest channel

GSM 850 (EGPRS 1 link)	PCS 1900 (GSM link)
Lowest channel	Lowest channel
Middle channel	Middle channel
Highest channel	Highest channel

PCS 1900 (GPRS 1 link)	PCS 1900 (EGPRS 1 link)
Lowest channel	Lowest channel
Middle channel	Middle channel
Highest channel	Highest channel

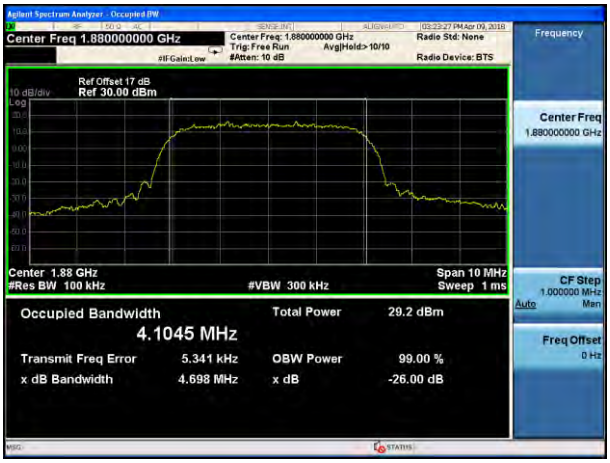
WCDMA Band V (RMC 12.2Kbps link)	WCDMA Band II (RMC 12.2Kbps link)



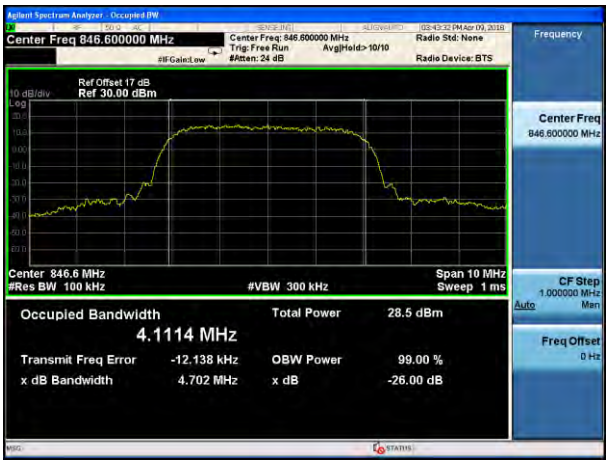
Lowest channel

Lowest channel

Middle channel



Middle channel



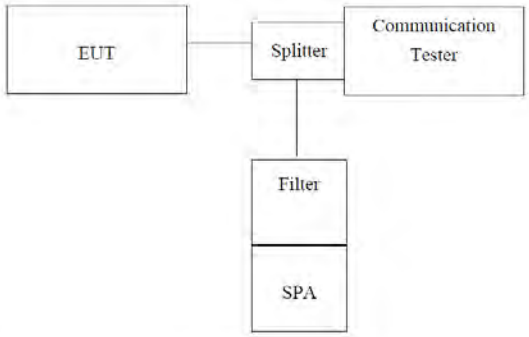
Highest channel

Highest channel

4.6 MODULATION CHARACTERISTIC

According to FCC § 2.1047(d), Part 22H & 24E there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

4.7 Out of band emission at antenna terminals

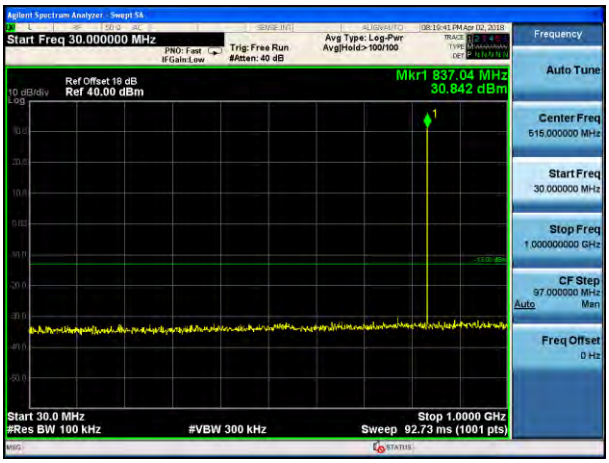
Test Requirement:	FCC part22.917(a) and FCC part24.238(a)
Test Method:	FCC part2.1051
Limit:	-13dBm
Test setup:	 *Note: Measurement setup for testing on Antenna connector*
Test Procedure:	1 The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. 2 The resolution bandwidth of the spectrum analyzer was set at 1MHz, sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic. 3 For the out of band: Set the RBW, VBW = 1MHz, Start=30MHz, Stop= 10th harmonic. 4 Band Edge Requirements: In the 1 MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 1 percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to measure the out of band Emissions.
Test Instruments:	Refer to section 5.0 for details
Test mode:	Refer to section 6.1 for details
Test results:	Pass

Test plot as follows:

Note: During the conducted spurious emission test, a band filter was used. The information of the filter is reported at section 6.0 (refer to item 24, 25).

Test Mode: Traffic mode	GSM 850 (GSM link)

Lowest channel



Middle channel

Highest channel

Test Mode: Traffic mode	GSM 850 (GPRS 1 link)

Lowest channel

Middle channel

Highest channel

Test Mode: Traffic mode	GSM 850 (EGPRS 1 link)

Lowest channel

Middle channel

Highest channel

Test Mode: Traffic mode	PCS1900 (GSM link)

Lowest channel

Middle channel

Highest channel

Test Mode: Traffic mode	PCS1900 (GPRS 1 link)

Lowest channel

Middle channel

Highest channel

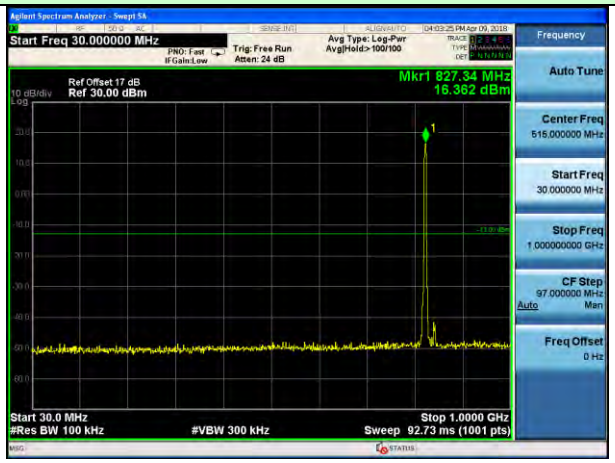
Test Mode: Traffic mode	PCS1900 (EGPRS 1 link)

Lowest channel

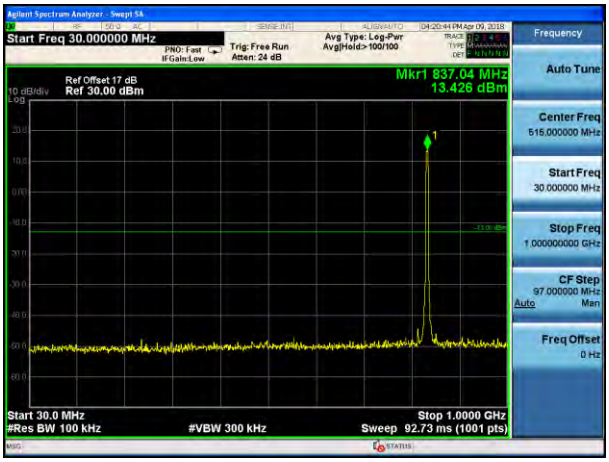
Middle channel

Highest channel

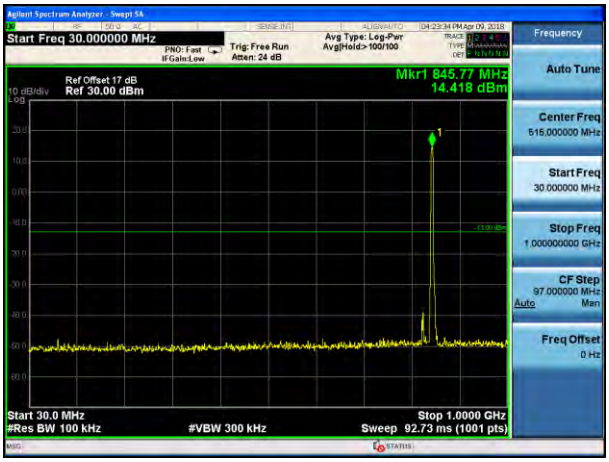
Test Mode: Traffic mode	WCDMA Band V (RMC 12.2Kbps link)



Lowest channel



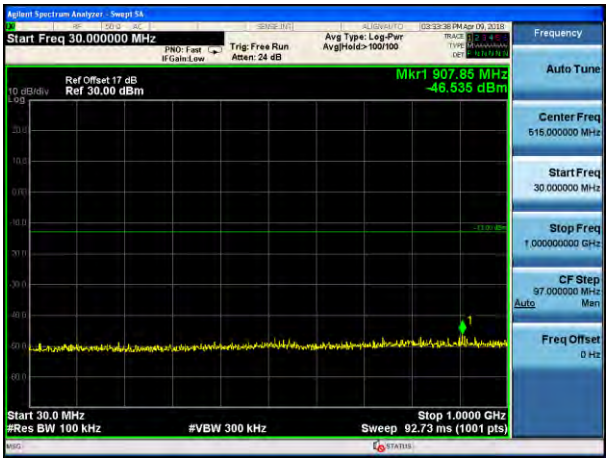
Middle channel



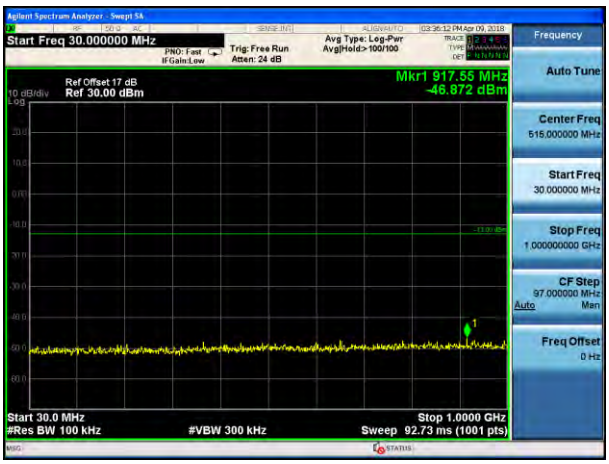
Highest channel

Test Mode: Traffic mode	WCDMA Band II (RMC 12.2Kbps link)

Lowest channel

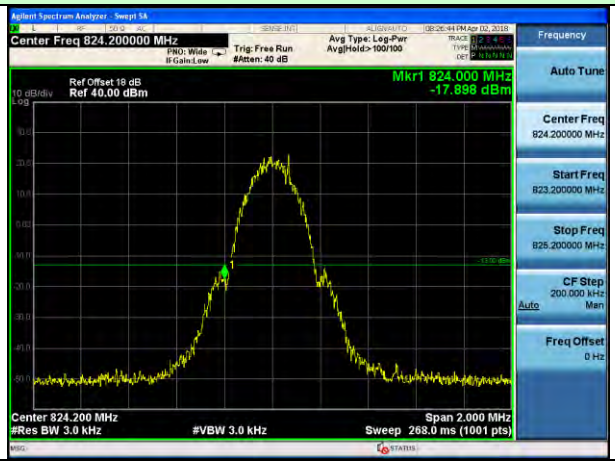
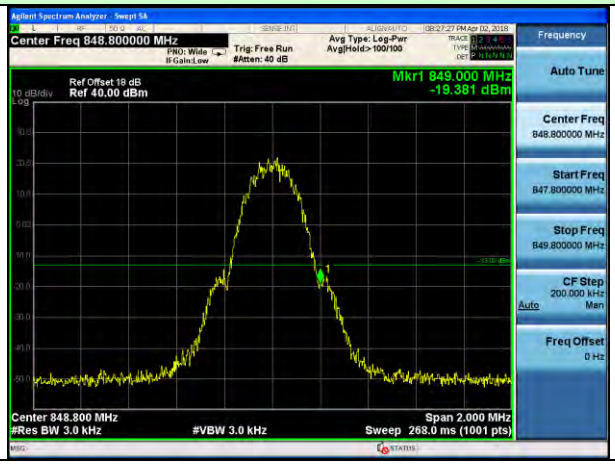


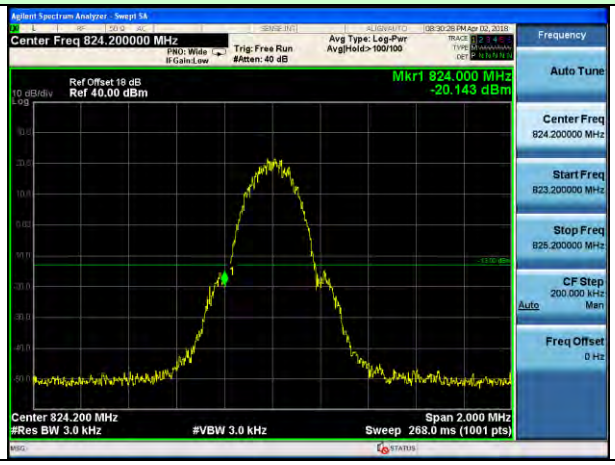
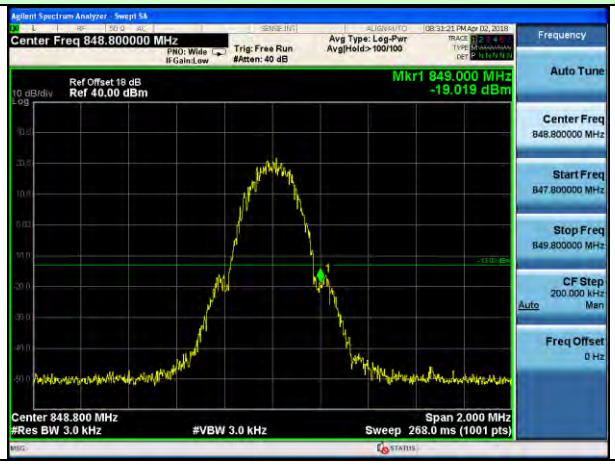
Middle channel

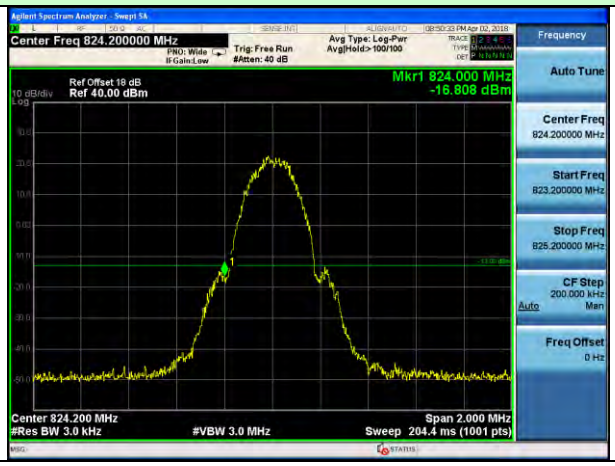


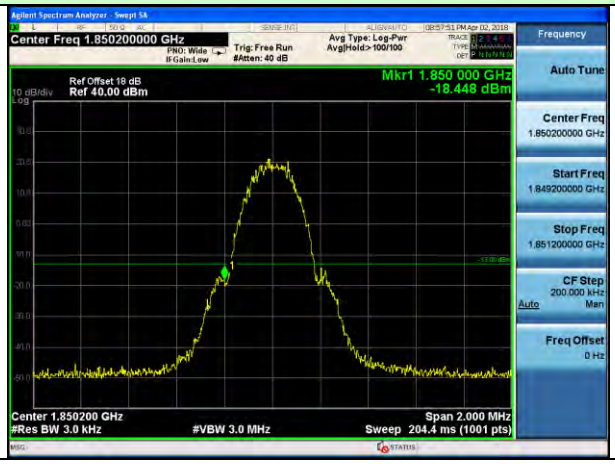
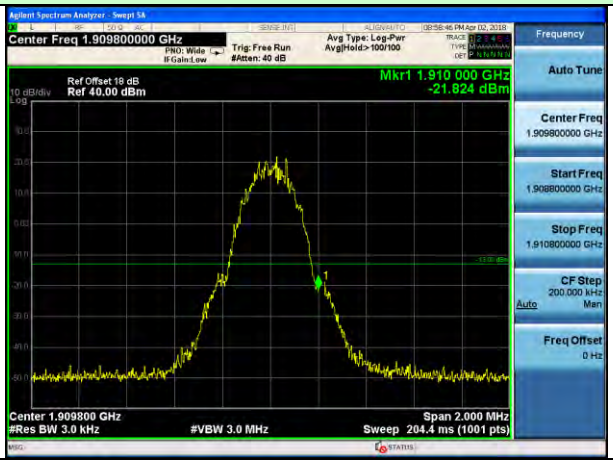
Highest channel

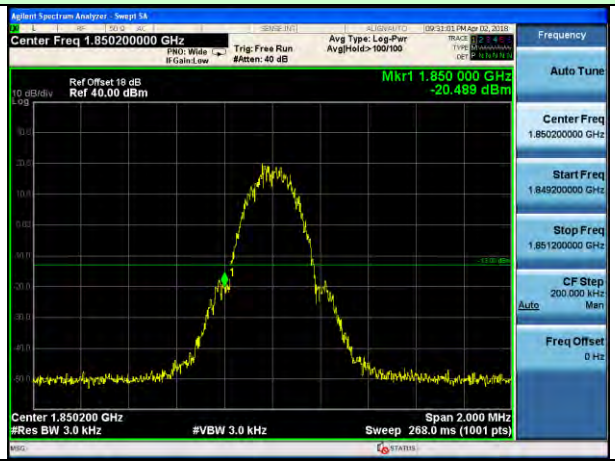
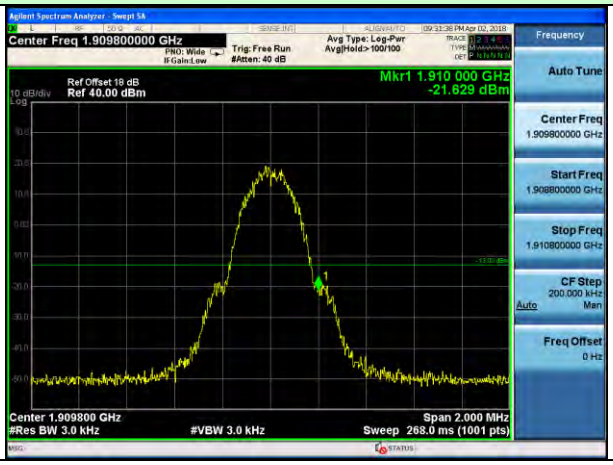
Band Edge:

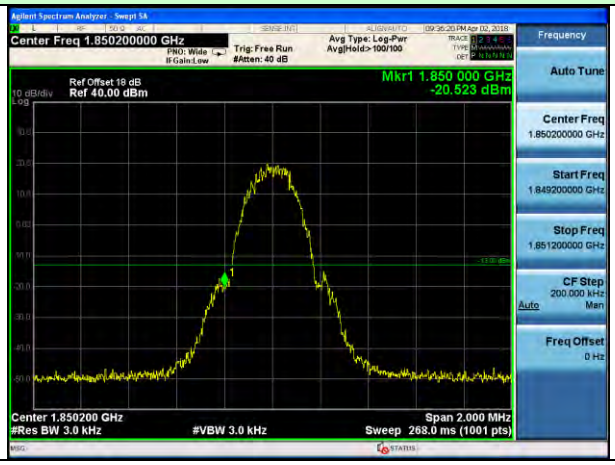
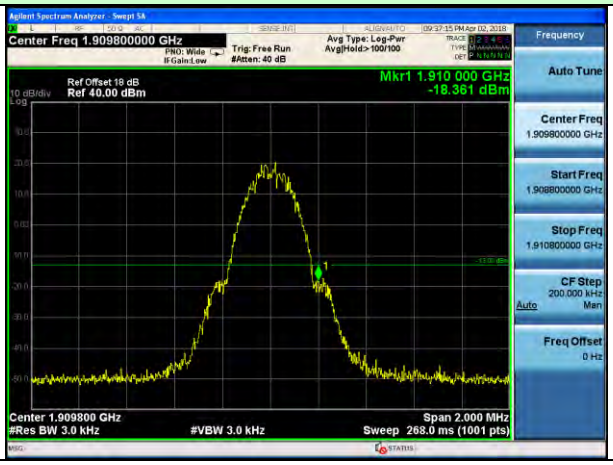
Test Mode: Traffic mode	GSM850 (GSM link)
	
Lowest channel	Highest channel

Test Mode: Traffic mode	GSM850 (GPRS 1 link)
	
Lowest channel	Highest channel

Test Mode: Traffic mode	GSM850 (EGPRS 1 link)
	
Lowest channel	Highest channel

Test Mode: Traffic mode	PCS1900 (GSM link)
	
Lowest channel	Highest channel

Test Mode: Traffic mode	PCS1900 (GPRS 1 link)
	
Lowest channel	Highest channel

Test Mode: Traffic mode	PCS1900 (EGPRS 1 link)
	
Lowest channel	Highest channel

Test Mode: Traffic mode	WCDMA Band V (RMC 12.2Kbps link)

Lowest channel

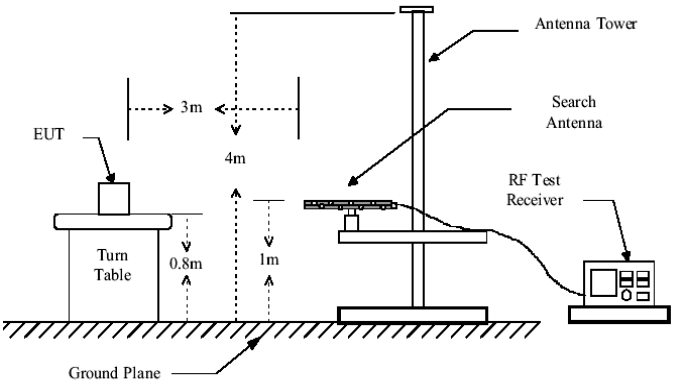
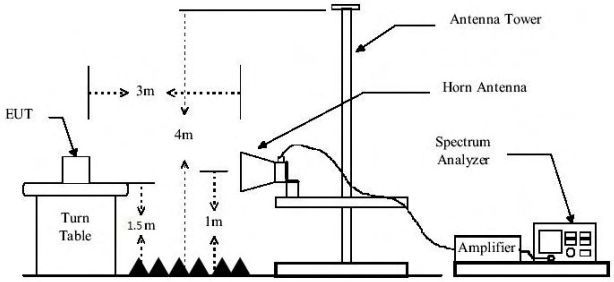
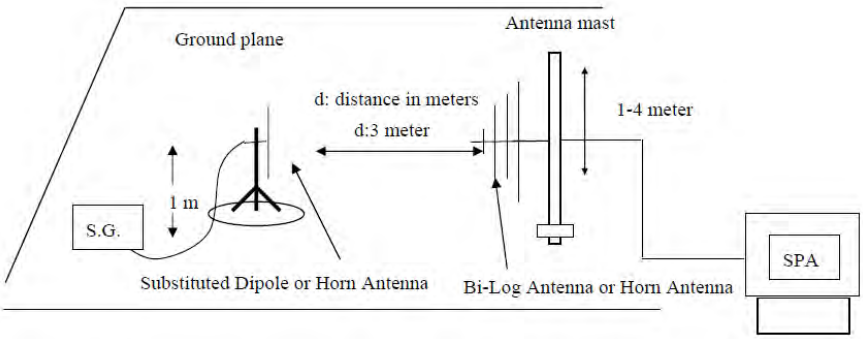
Highest channel

Test Mode: Traffic mode	WCDMA Band II (RMC 12.2Kbps link)

Lowest channel

Highest channel

4.8 ERP, EIRP Measurement

Test Requirement:	FCC part22.913(a) and FCC part24.232(b)
Test Method:	FCC part2.1046
Limit:	GSM850, WCDMA Band V: 7W PCS1900, WCDMA Band II: 2W
Test setup:	Below 1GHz  Above 1GHz  Substituted method: 

Test Procedure:	1. The EUT was placed on an non-conductive turntable using a non-conductive support. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and EMI spectrum analyzer. 2. During the measurement, the EUT was communication with the station. The highest emission was recorded with the rotation of the turntable and the lowering of the test antenna from 4m to 1m. The reading was recorded and the field strength (E in dBuV/m) was calculated. 3. ERP in frequency band 824.2 –848.80.8MHz were measured using a substitution method. The EUT was replaced by dipole antenna connected, the S.G. output was recorded and ERP was calculated asfollows: ERP = S.G. output (dBm) + Antenna Gain (dBd) – Cable Loss (dB) 4. EIRP in frequency band 1850.2 –1909.8MHz were measured using a substitution method. The EUT was replaced by or horn antenna connected, the S.G. output was recorded and EIRP was calculated as follows: EIRP = S.G. output (dBm) + Antenna Gain (dBi) – Cable Loss (dB)
Test Instruments:	Refer to section 5.0 for details
Test mode:	Refer to section 6.1 for details
Test results:	Pass

Measurement Data

EUT mode	Channel	EUT Pol.	Antenna Pol.	ERP(dBm)	Limit (dBm)	Result
GSM850 (GSM link)	Lowest	H	V	26.58	38.45	Pass
			H	30.03		
		E1	V	25.88		
			H	29.07		
		E2	V	26.34		
			H	30.44		
	Middle	H	V	26.37	38.45	Pass
			H	30.40		
		E1	V	26.13		
			H	29.73		
		E2	V	25.78		
			H	29.04		
	Highest	H	V	26.31	38.45	Pass
			H	30.00		
		E1	V	26.70		
			H	30.64		
		E2	V	26.00		
			H	26.67		

EUT mode	Channel	EUT Pol.	Antenna Pol.	ERP(dBm)	Limit (dBm)	Result
GSM850 (GPRS 1 link)	Lowest	H	V	27.18	38.45	Pass
			H	30.92		
		E1	V	26.40		
			H	29.90		
		E2	V	26.35		
			H	30.60		
	Middle	H	V	27.18	38.45	Pass
			H	30.77		
		E1	V	26.82		
			H	29.89		
		E2	V	25.76		
			H	29.64		
	Highest	H	V	26.57	38.45	Pass
			H	30.67		
		E1	V	26.78		
			H	30.86		
		E2	V	26.26		
			H	30.21		

EUT mode	Channel	EUT Pol.	Antenna Pol.	ERP(dBm)	Limit (dBm)	Result
GSM850 (EGPRS 1 link)	Lowest	H	V	27.09	38.45	Pass
			H	30.51		
		E1	V	27.19		
			H	30.52		
		E2	V	26.74		
			H	29.26		
	Middle	H	V	26.23	38.45	Pass
			H	30.21		
		E1	V	25.45		
			H	29.33		
		E2	V	25.45		
			H	28.58		
	Highest	H	V	27.90	38.45	Pass
			H	30.82		
		E1	V	26.87		
			H	29.72		
		E2	V	25.02		
			H	28.25		

EUT mode	Channel	EUT Pol.	Antenna Pol.	EIRP (dBm)	Limit (dBm)	Result
PCS1900 (GSM link)	Lowest	H	V	23.71	33.01	Pass
			H	27.50		
		E1	V	23.74		
			H	26.66		
		E2	V	22.57		
			H	26.15		
	Middle	H	V	24.11	33.01	Pass
			H	27.40		
		E1	V	23.46		
			H	27.15		
		E2	V	23.19		
			H	26.50		
	Highest	H	V	24.77	33.01	Pass
			H	27.72		
		E1	V	23.93		
			H	26.88		
		E2	V	23.34		
			H	27.05		

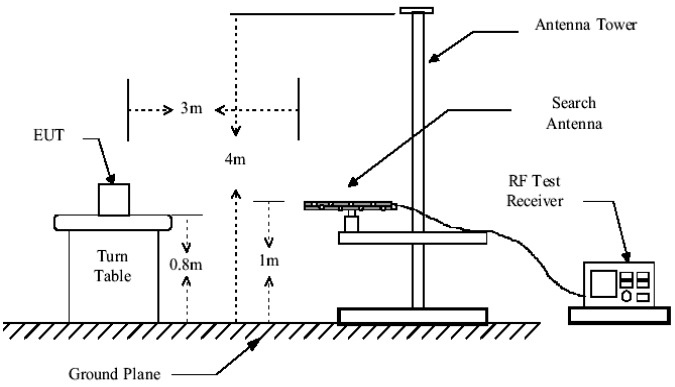
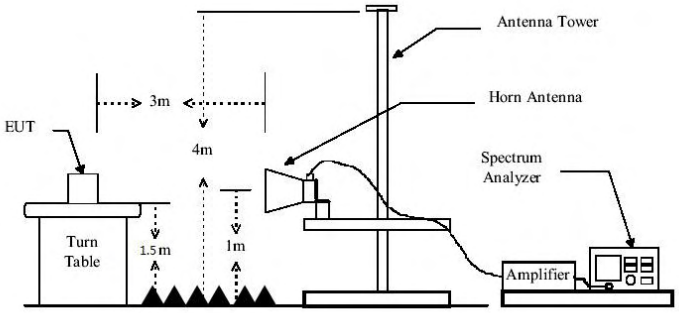
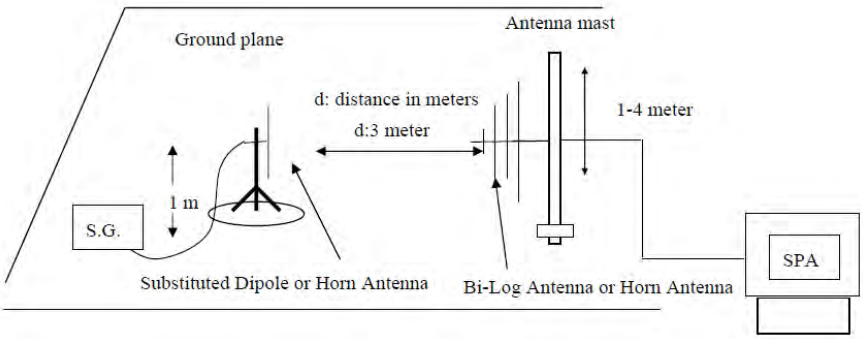
EUT mode	Channel	EUT Pol.	Antenna Pol.	EIRP (dBm)	Limit (dBm)	Result
PCS1900 (GPRS 1 link)	Lowest	H	V	20.90	33.01	Pass
			H	24.24		
		E1	V	20.27		
			H	23.53		
		E2	V	22.84		
			H	26.14		
	Middle	H	V	22.93	33.01	Pass
			H	26.02		
		E1	V	21.84		
			H	24.43		
		E2	V	21.56		
			H	23.84		
	Highest	H	V	23.49	33.01	Pass
			H	27.09		
		E1	V	23.88		
			H	26.93		
		E2	V	22.72		
			H	25.53		

EUT mode	Channel	EUT Pol.	Antenna Pol.	EIRP (dBm)	Limit (dBm)	Result
PCS1900 (EGPRS 1 link)	Lowest	H	V	22.92	33.01	Pass
			H	25.94		
		E1	V	22.78		
			H	25.67		
		E2	V	22.24		
			H	26.13		
	Middle	H	V	22.49	33.01	Pass
			H	26.26		
		E1	V	23.00		
			H	25.59		
		E2	V	21.85		
			H	24.89		
	Highest	H	V	23.89	33.01	Pass
			H	26.53		
		E1	V	23.74		
			H	26.44		
		E2	V	23.72		
			H	26.88		

EUT mode	Channel	EUT Pol.	Antenna Pol.	ERP(dBm)	Limit (dBm)	Result
WCDMA Band V	Lowest	H	V	23.07	38.45	Pass
			H	25.84		
		E1	V	22.83		
			H	25.67		
		E2	V	22.34		
			H	26.10		
	Middle	H	V	22.46	38.45	Pass
			H	26.30		
		E1	V	22.89		
			H	25.50		
		E2	V	21.98		
			H	24.84		
	Highest	H	V	23.93	38.45	Pass
			H	26.60		
		E1	V	23.81		
			H	26.59		
		E2	V	23.79		
			H	26.94		

EUT mode	Channel	EUT Pol.	Antenna Pol.	EIRP(dBm)	Limit (dBm)	Result
WCDMA Band II	Lowest	H	V	22.96	33.01	Pass
			H	25.85		
		E1	V	22.88		
			H	25.75		
		E2	V	22.25		
			H	26.04		
	Middle	H	V	22.44	33.01	Pass
			H	26.42		
		E1	V	22.94		
			H	25.50		
		E2	V	21.94		
			H	24.95		
	Highest	H	V	23.88	33.01	Pass
			H	26.57		
		E1	V	23.83		
			H	26.56		
		E2	V	23.80		
			H	27.01		

4.9 Field strength of spurious radiation measurement

Test Requirement:	FCC part22.917(a) and FCC part24.238(a)
Test Method:	FCC part2.1053
Limit:	-13dBm
Test setup:	Below 1GHz  Above 1GHz  Substituted method: 

Test Procedure:	1. The EUT was placed on an non-conductive turntable using a non-conductive support. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and EMI spectrum analyzer. 2. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations. 3. The frequency range up to tenth harmonic was investigated for each of three fundamental frequency (low, middle and high channels). Once spurious emission was identified, the power of the emission was determined using the substitution method. 4. The spurious emissions attenuation was calculated as the difference between radiated power at the fundamental frequency and the spurious emissions frequency. ERP / EIRP = S.G. output (dBm) + Antenna Gain(dB/dBi) – Cable Loss (dB)
Test Instruments:	Refer to section 5.0 for details
Test mode:	Refer to section 6.1 for details
Test results:	Pass

Measurement Data

Test mode:	GSM850		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1648.40	Vertical	-36.71	-13.00	Pass
2472.60	V	-39.33		
3296.80	V	-41.47		
4121.00	V	-43.68		
4945.20	V	---		
1648.40	Horizontal	-41.85	-13.00	Pass
2472.60	H	-45.69		
3296.80	H	-47.28		
4121.00	H	-49.91		
4945.20	H	---		
Test mode:	**GSM850**		**Test channel:**	**Middle**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1673.20	Vertical	-37.81	-13.00	Pass
2509.80	V	-40.08		
3346.40	V	-42.05		
4183.00	V	-43.69		
5019.60	V	---		
1673.20	Horizontal	-42.25	-13.00	Pass
2509.80	H	-45.40		
3346.40	H	-46.81		
4183.00	H	-48.89		
5019.60	H	---		
Test mode:	**GSM850**		**Test channel:**	**Highest**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1697.60	Vertical	-38.05	-13.00	Pass
2546.40	V	-40.00		
3395.20	V	-41.69		
4244.00	V	-43.29		
5092.80	V	---		
1697.60	Horizontal	-41.85	-13.00	Pass
2546.40	H	-44.73		
3395.20	H	-45.81		
4244.00	H	-47.77		
5092.80	H	---		

Remark：

1. The emission behaviour belongs to narrowband spurious emission.
2. Remark”---“ means that the emission level is too low to be measured
3. The emission levels of below 1 GHz are very lower than the limit and not show in test report.

Test mode:	PCS1900		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3700.40	Vertical	-36.79	-13.00	Pass
5550.60	V	-39.23		
7400.80	V	-41.26		
9251.00	V	-43.07		
11101.20	V	--		
3700.40	Horizontal	-41.40	-13.00	Pass
5550.60	H	-44.78		
7400.80	H	-46.11		
9251.00	H	-48.49		
11101.20	H	---		
Test mode:	**PCS1900**		**Test channel:**	**Middle**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3760.00	Vertical	-34.31	-13.00	Pass
5640.00	V	-36.85		
7520.00	V	-39.02		
9400.00	V	-40.87		
11280.00	V	--		
3760.00	Horizontal	-39.14	-13.00	Pass
5640.00	H	-42.71		
7520.00	H	-44.05		
9400.00	H	-46.47		
11280.00	H	---		
Test mode:	**PCS1900**		**Test channel:**	**Highest**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3819.60	Vertical	-35.63	-13.00	Pass
5729.40	V	-38.03		
7639.20	V	-39.96		
9549.00	V	-41.96		
11458.80	V	--		
3819.60	Horizontal	-40.26	-13.00	Pass
5729.40	H	-43.73		
7639.20	H	-45.02		
9549.00	H	-47.38		
11458.80	H	---		

Remark:

1. The emission behaviour belongs to narrowband spurious emission.
2. Remark"---" means that the emission level is too low to be measured
3. The emission levels of below 1 GHz are very lower than the limit and not show in test report.

Test mode:	WCDMA Band V		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1652.80	Vertical	-35.84	-13.00	Pass
2479.20	V	-39.61		
3305.60	V	-42.42		
4132.00	V	-40.07		
4958.40	V	--		
1652.80	Horizontal	-38.87	-13.00	Pass
2479.20	H	-41.55		
3305.60	H	-46.94		
4132.00	H	-50.75		
4958.40	H	---		
Test mode:	**WCDMA Band V**		**Test channel:**	**Middle**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1672.80	Vertical	-38.18	-13.00	Pass
2509.20	V	-39.47		
3345.60	V	-43.20		
4182.00	V	-45.62		
5018.40	V	--		
1672.80	Horizontal	-40.79	-13.00	Pass
2509.20	H	-42.70		
3345.60	H	-47.37		
4182.00	H	-49.98		
5018.40	H	---		
Test mode:	**WCDMA Band V**		**Test channel:**	**Highest**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1693.20	Vertical	-36.90	-13.00	Pass
2539.80	V	-39.35		
3386.40	V	-42.10		
4233.00	V	-44.93		
5079.60	V	--		
1693.20	Horizontal	-40.28	-13.00	Pass
2539.80	H	-42.88		
3386.40	H	-44.16		
4233.00	H	-50.46		
5079.60	H	---		

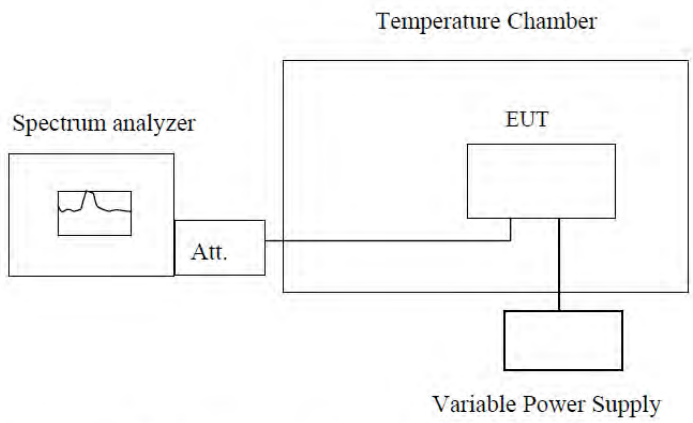
Remark：

1. The emission behaviour belongs to narrowband spurious emission.
2. Remark”---“ means that the emission level is too low to be measured
3. The emission levels of below 1 GHz are very lower than the limit and not show in test report.

Test mode:	WCDMA Band II		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3704.80	Vertical	-38.30	-13.00	Pass
5557.20	V	-41.48		
7409.60	V	-44.10		
9262.00	V	-46.47		
11114.40	V	--		
3704.80	Horizontal	-44.32	-13.00	Pass
5557.20	H	-48.68		
7409.60	H	-50.37		
9262.00	H	-53.49		
11114.40	H	---		
Test mode:	**WCDMA Band II**		**Test channel:**	**Middle**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3760.00	Vertical	-39.18	-13.00	Pass
5640.00	V	-41.98		
7520.00	V	-44.62		
9400.00	V	-46.87		
11280.00	V	--		
3760.00	Horizontal	-44.75	-13.00	Pass
5640.00	H	-48.96		
7520.00	H	-50.62		
9400.00	H	-53.58		
11280.00	H	---		
Test mode:	**WCDMA Band II**		**Test channel:**	**Highest**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3815.20	Vertical	-38.35	-13.00	Pass
5722.80	V	-41.19		
7630.40	V	-43.41		
9538.00	V	-45.62		
11445.60	V	--		
3815.20	Horizontal	-43.62	-13.00	Pass
5722.80	H	-47.53		
7630.40	H	-49.12		
9538.00	H	-51.88		
11445.60	H	---		

Remark:
1. The emission behaviour belongs to narrowband spurious emission.
2. Remark"---" means that the emission level is too low to be measured
3. The emission levels of below 1 GHz are very lower than the limit and not show in test report.

4.10 Frequency stability V.S. Temperature measurement

Test Requirement:	FCC Part2.1055(a)(1)(b)
Test Method:	FCC Part2.1055(a)(1)(b)
Limit:	2.5ppm
Test setup:	 **Note :** Measurement setup for testing on Antenna connector
Test procedure:	1. The equipment under test was connected to an external DC power supply and input rated voltage. 2. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. 3. The EUT was placed inside the temperature chamber. 4. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 25°C operating frequency as reference frequency. 5. Turn EUT off and set the chamber temperature to –20°C. After the temperature stabilized for approximately 30 minutes recorded the frequency. 6. Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached.
Test Instruments:	Refer to section 5.0 for details
Test mode:	Refer to section 6.1 for details
Test results:	Pass

Measurement Data

Reference Frequency: GSM850 (GSM link) Middle channel=190 channel=836.6MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.70	-30	37	0.0439	2.5	Pass
	-20	39	0.0466		
	-10	32	0.0380		
	0	33	0.0390		
	10	34	0.0411		
	20	27	0.0317		
	30	51	0.0612		
	40	42	0.0496		
	50	34	0.0410		

Reference Frequency: GSM850 (GPRS 1 link) Middle channel=190 channel=836.6MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.70	-30	18	0.0219	2.5	Pass
	-20	31	0.0367		
	-10	18	0.0220		
	0	17	0.0197		
	10	18	0.0210		
	20	13	0.0154		
	30	31	0.0376		
	40	32	0.0378		
	50	20	0.0238		

Reference Frequency: GSM850 (EGPRS 1 link) Middle channel=190 channel=836.6MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.70	-30	52	0.0620	2.5	Pass
	-20	54	0.0650		
	-10	46	0.0545		
	0	41	0.0490		
	10	49	0.0590		
	20	38	0.0455		
	30	72	0.0858		
	40	64	0.0763		
	50	54	0.0650		

Reference Frequency: PCS1900 (GSM link) Middle channel=661 channel=1880MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error			Result
		Hz	ppm		
3.70	-30	30	0.0160	2.5	Pass
	-20	47	0.0250		
	-10	34	0.0183		
	0	24	0.0130		
	10	29	0.0154		
	20	39	0.0207		
	30	57	0.0301		
	40	43	0.0228		
	50	40	0.0212		

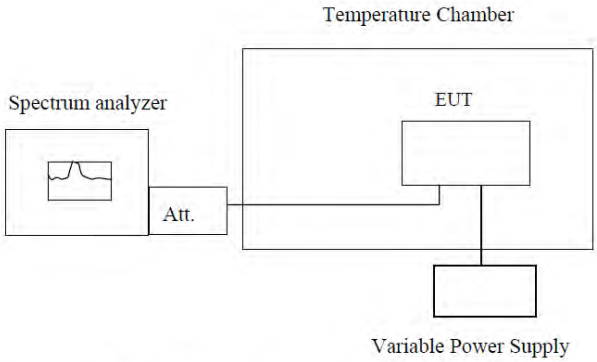
Reference Frequency: PCS1900 (GPRS 1 link) Middle channel=661 channel=1880MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error			Result
		Hz	ppm		
3.70	-30	38	0.0205	2.5	Pass
	-20	49	0.0261		
	-10	40	0.0214		
	0	35	0.0188		
	10	36	0.0192		
	20	29	0.0157		
	30	54	0.0289		
	40	40	0.0211		
	50	42	0.0226		

Reference Frequency: PCS1900 (EGPRS 1 link) Middle channel=661 channel=1880MHz					
Power supplied (Vdc)	Temperature (°C)	Frequency error			Result
		Hz	ppm		
3.70	-30	100	0.0531	2.5	Pass
	-20	123	0.0655		
	-10	94	0.0502		
	0	80	0.0424		
	10	104	0.0552		
	20	78	0.0416		
	30	140	0.0745		
	40	111	0.0589		
	50	120	0.0637		

Reference Frequency: WCDMA Band V Middle channel=4183 channel=836.6MHz					
Power supplied (Vdc)	Temperature (℃)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.70	-30	99	0.1184	2.5	Pass
	-20	137	0.1633		
	-10	158	0.1893		
	0	69	0.0830		
	10	112	0.1334		
	20	122	0.1454		
	30	182	0.2177		
	40	171	0.2043		
	50	206	0.2464		

Reference Frequency: WCDMA Band II Middle channel=9400 channel=1880.0MHz					
Power supplied (Vdc)	Temperature (℃)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.70	-30	89	0.0473	2.5	Pass
	-20	83	0.0441		
	-10	74	0.0391		
	0	70	0.0374		
	10	69	0.0365		
	20	62	0.0328		
	30	67	0.0354		
	40	74	0.0396		
	50	73	0.0386		

4.11 Frequency stability V.S. Voltage measurement

Test Requirement:	FCC Part2.1055(d)(1)(2)
Test Method:	FCC Part2.1055(d)(1)(2)
Limit:	2.5ppm
Test setup:	 **Note :** Measurement setup for testing on Antenna connector
Test procedure:	1. Set chamber temperature to 25°C. Use a variable DC power source to power the EUT and set the voltage to rated voltage. 2. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency. 3. Reduce the input voltage to specified extreme voltage variation (+/- 15%) and endpoint, record the maximum frequency change.
Test Instruments:	Refer to section 5.0 for details
Test mode:	Refer to section 6.1 for details
Test results:	Pass

Measurement Data

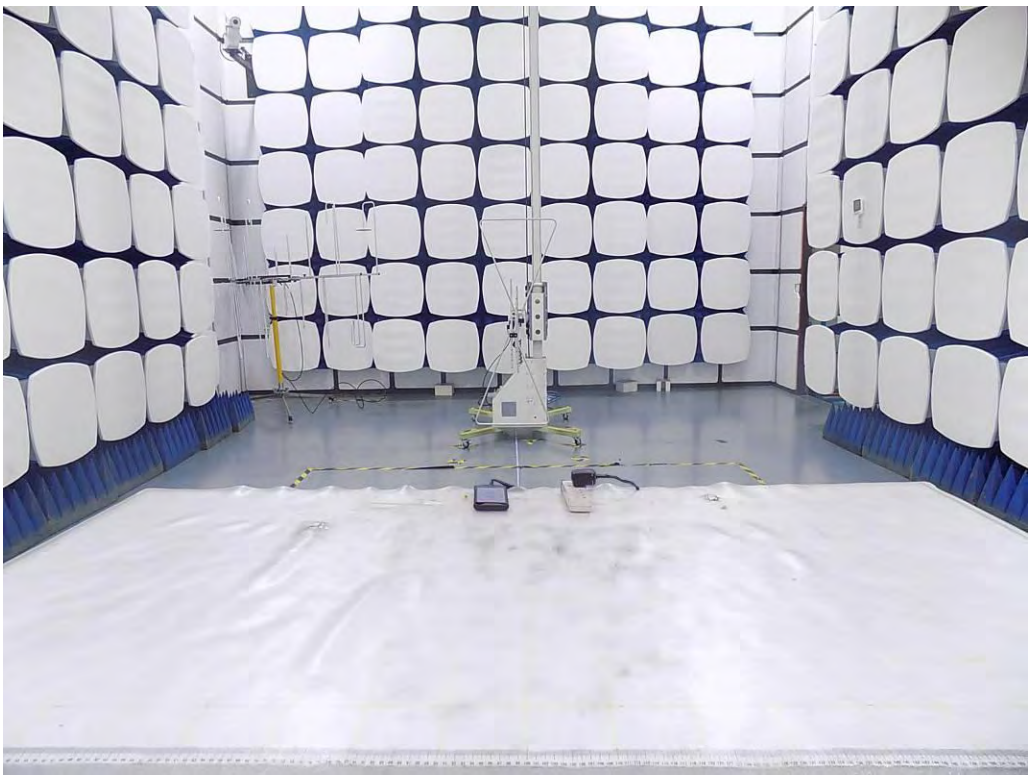
Reference Frequency: GSM850 (GSM link) Middle channel=190 channel=836.6MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.25	56	0.0669	2.5	Pass
	3.7	60	0.0712		
	3.4	68	0.0813		
Reference Frequency: GSM850 (GPRS 1 link) Middle channel=190 channel=836.6MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.25	32	0.0386	2.5	Pass
	3.7	30	0.0362		
	3.4	22	0.0264		
Reference Frequency: GSM850 (EGPRS 1 link) Middle channel=190 channel=836.6MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.25	31	0.0368	2.5	Pass
	3.7	32	0.0386		
	3.4	33	0.0400		

Reference Frequency: PCS1900 (GSM link) Middle channel=661 channel=1880MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.25	48	0.0257	2.5	Pass
	3.7	59	0.0314		
	3.4	60	0.0320		
Reference Frequency: PCS1900 (GPRS 1 link) Middle channel=661 channel=1880MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.25	47	0.0250	2.5	Pass
	3.7	35	0.0186		
	3.4	29	0.0156		
Reference Frequency: PCS1900 (EGPRS 1 link) Middle channel=661 channel=1880MHz					
Temperature (°C)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.25	62	0.0328	2.5	Pass
	3.7	71	0.0378		
	3.4	72	0.0381		

Reference Frequency: WCDMA Band V Middle channel=4183 channel=836.6MHz					
Temperature (℃)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.25	54	0.0644	2.5	Pass
	3.7	46	0.0552		
	3.4	60	0.0717		
Reference Frequency: WCDMA Band II Middle channel=940 channel=1880.0MHz					
Temperature (℃)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.25	10	0.0051	2.5	Pass
	3.7	16	0.0087		
	3.4	16	0.0085		

5 Test Setup Photo

Radiated Emission



6 EUT Constructional Details

Please refer to report T1880174 01.

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