FCC Report (WCDMA)

Applicant:	M-Labs Technologies, LLC
Address of Applicant:	4740 Von Karman,Suite150, Newport Beach, California 92660, United States
Manufacturer:	Asiatelco Technologies Co.
Address of Manufacturer:	#289 Bisheng Road, Building-8, 3F, Zhangjiang Hi-Tech Park, Pudong, Shanghai, 201204 China
Equipment Under Test (EUT)	
Product Name:	GPS Tracker
Model No.:	LN-L
Marketing Name:	LN-L 001
FCC ID:	2AAQ6LN01A
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:	May 17, 2018
Date of Test:	May 18-29, 2018
Date of report issued:	May 30, 2018
Test Result :	PASS *

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

Authorized Signature:

Robinson Lo
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	*May 30, 2018*	*Original*

Prepared By:	Bill. Yuan	***Date:***	*May 30, 2018*
	Project Engineer		
Check By:	Andy. wu	***Date:***	*May 30, 2018*
	Reviewer		

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4 Test Summary

Test Item	Section in CFR 47	Result
RF Exposure (SAR)	Part 1.1307 Part 2.1093	Passed (Please refer to MPE)
Conducted 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	Pass
99% & -26 dB Occupied Bandwidth	Part 2.1049 Part 22.917(b) Part 24.238(b) Part 27.53	Pass
Spurious Emissions at Antenna Terminals	Part 2.1051 Part 22.917 Part 24.238 Part 27.53	Pass
Field Strength of Spurious Radiation	Part 2.1053 Part 22.917 Part 24.238 Part 27.53	Pass
ERP and EIRP	Part 22.913(a) Part 24.232(b) Part 27.50	Pass
Out of band emission, Band Edge	Part 2.1051 Part 22.917 Part 24.238 Part 27.53	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

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

5 General Information

5.1 General Description of EUT

Product Name:	GPS Tracker
Model No.:	LN-L
S/N:	AS2050019160
Tested Sample(s) ID:	GTS201805000089-1
Hardware Version:	P1.3
Software Version:	1.0.1
Support Networks:	WCDMA
Support Bands:	WCDMA Band II, WCDMA Band IV, WCDMA Band V
TX Frequency:	WCDMA Band II: 1852.40MHz -1907.60MHz WCDMA Band IV: 1712.40MHz -1752.60MHz WCDMA Band V: 826.40MHz -846.60MHz
Modulation type:	WCDMA Band II/IV/V: QPSK
Antenna type:	PIFA Antenna
Antenna gain:	WCDMA Band II/IV/V: 1.0dBi(max)
Power supply:	Input: DC 10V to 14V (nominal: DC 12V) Polymer Li-ion Battery: DC 3.7V, 80mAh

Operation Frequency List:

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

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:

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
4183	836.60	9400	1880.00	1412	1732.40
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 subpart H and Part 24 subpart E 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 Test Facility

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

● **FCC —Registration No.: 381383**

Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fuly described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files. Registration 381383, January 08, 2018.

● **Industry Canada (IC) —Registration No.: 9079A-2**

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 Registration No.: 9079A-2, August 15, 2016

5.5 Test Location

All tests were performed at:
Global United Technology Services Co., Ltd. Address: No. 301-309, 3/F., 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

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. 03 2015	July. 02 2020
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	June.29 2017	June.28 2018
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June.29 2017	June.28 2018
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	9120D-829	GTS208	June.29 2017	June.28 2018
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June.29 2017	June.28 2018
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	June.29 2017	June.28 2018
9	Coaxial Cable	GTS	N/A	GTS211	June.29 2017	June.28 2018
10	Coaxial cable	GTS	N/A	GTS210	June.29 2017	June.28 2018
11	Coaxial Cable	GTS	N/A	GTS212	June.29 2017	June.28 2018
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June.29 2017	June.28 2018
13	Amplifier(2GHz-20GHz)	HP	8349B	GTS206	June.29 2017	June.28 2018
14	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June.29 2017	June.28 2018
15	Band filter	Amindeon	82346	GTS219	June.29 2017	June.28 2018
16	Universal radio communication tester	Rohde & Schwarz	CMU200	GTS538	June.29 2017	June.28 2018
17	Signal Generator	Rohde & Schwarz	SML03	GTS236	June.29 2017	June.28 2018
18	Temp. Humidity/ Barometer	Oregon Scientific	BA-888	GTS248	June.29 2017	June.28 2018
19	D.C. Power Supply	Instek	PS-3030	GTS232	NA	NA
20	Splitter	Agilent	11636B	GTS237	June.29 2017	June.28 2018
21	Power meter	Anritsu	ML2495A	GTS540	June.29 2017	June.28 2018
22	Spectrum Analyzer	Agilent	E4440A	GTS533	June.29 2017	June.28 2018
23	Temp.&Humidity chamber	Chuang wei	GDS-225	GTS005-1	June.29 2017	June.28 2018
24	Highpass filter	Micro-Tronics	HPM50108	GTS549	June.29 2017	June.28 2018
25	Highpass filter	Micro-Tronics	HPM50111	GTS550	June.29 2017	June.28 2018

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 three test planes to find out the worst emission.

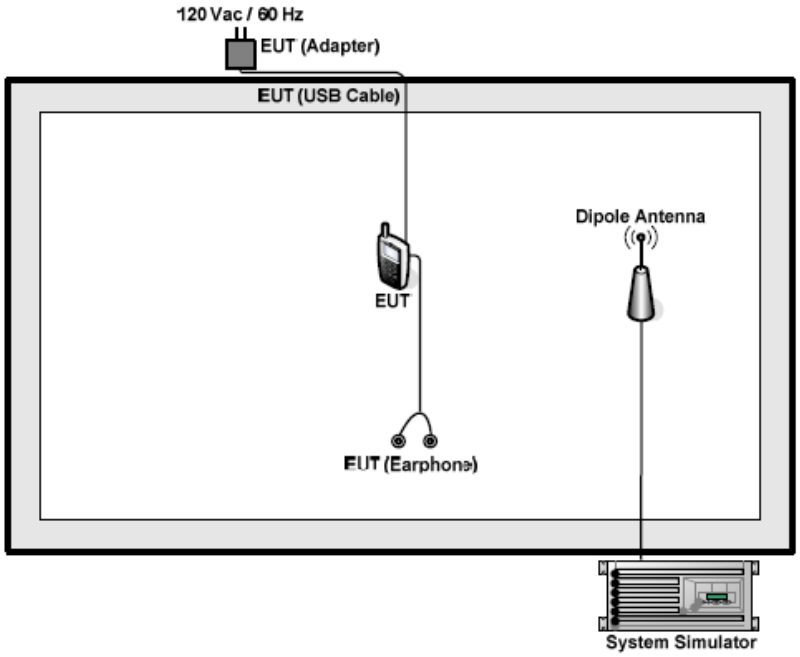
Test modes		
Band	Radiated	Conducted
WCDMA II	■ RMC 12.2Kbps link	■ RMC 12.2Kbps link
WCDMA Band V	■ RMC 12.2Kbps link	■ RMC 12.2Kbps link
WCDMA Band IV	■ RMC 12.2Kbps link	■ RMC 12.2Kbps link

Note: The maximum power levels is RMC12.2Kbps mode for WCDMA Band II&IV&V &.only these modes were used for all tests.

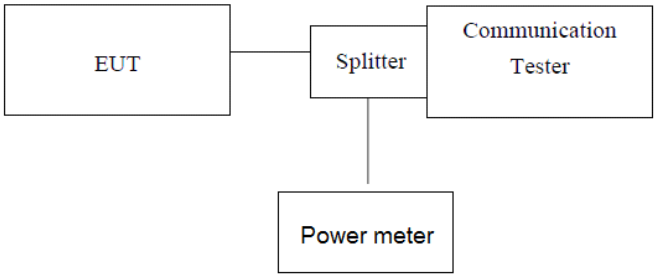
The conducted power tables are as follows:

Conducted Power (dBm)									
Band	WCDMA Band II			WCDMA Band V			WCDMA Band IV		
Channel	9262	9400	9538	4132	4183	4233	1312	1412	1513
Frequency	1852.4	1880.0	1907.6	826.4	836.6	846.6	1712.4	1732.4	1752.6
RMC 12.2Kbps	22.25	22.19	22.21	22.17	22.10	21.96	21.17	22.08	22.14
HSDPA Subtest-1	22.12	22.03	22.14	22.13	22.06	21.65	21.15	22.02	22.10
HSDPA Subtest-2	22.08	22.11	22.02	21.92	21.99	21.81	21.11	22.00	22.12
HSDPA Subtest-3	22.02	22.01	21.98	21.88	21.92	21.88	21.12	22.04	21.98
HSDPA Subtest-4	21.75	21.85	21.79	21.96	21.97	21.80	21.16	21.98	21.95
HSUPA Subtest-1	22.08	21.76	21.65	22.00	22.02	21.68	21.12	22.01	22.01
HSUPA Subtest-2	22.00	21.73	21.56	21.99	21.95	21.73	21.10	21.97	21.97
HSUPA Subtest-3	22.07	21.52	21.71	21.90	21.93	21.59	21.14	21.96	21.92
HSUPA Subtest-4	21.83	21.86	21.51	21.95	21.91	21.73	21.14	21.99	21.98
HSUPA Subtest-5	21.51	21.59	21.60	21.91	21.87	21.52	21.09	21.93	21.93

7.2 Configuration of Tested System



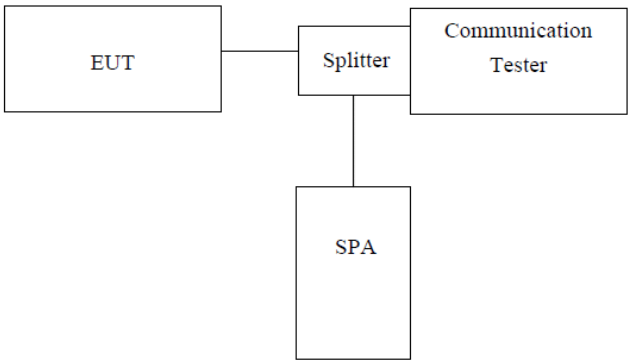
7.3 Conducted Output Power

Test Requirement:	FCC part 22.913(a) and FCC part 24.232(c) and FCC part 27.50
Test Method:	FCC part 2.1046
Limit:	WCDMA Band V: 7W(38.45dBm) WCDMA Band II: 2W(33dBm) WCDMA Band IV:1W(30dBm)
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 power meter 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 6.0 for details
Test mode:	Refer to section 7.1 for details
Test results:	Pass

Measurement Data

EUT Mode	Channel	Frequency (MHz)	Average power (dBm)	Limit (dBm)	Result
WCDMA Band V (RMC 12.2Kbps link)	4132	826.40	22.17	38.45	Pass
	4183	836.60	22.10		
	4233	846.60	21.96		
WCDMA Band II (RMC 12.2Kbps link)	9262	1852.4	22.25	33.01	Pass
	9400	1880.0	22.19		
	9538	1907.6	22.21		
WCDMA Band IV (RMC 12.2Kbps link)	1312	1712.4	22.17	30.00	Pass
	1412	1732.4	22.08		
	1513	1752.6	22.14		

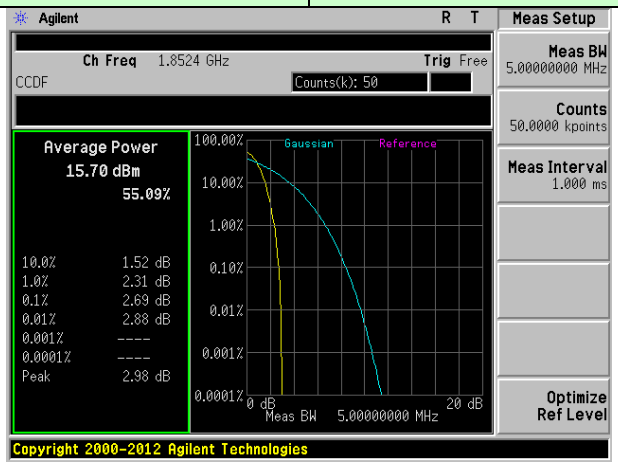
7.4 Peak-to-Average Ratio

Test Requirement:	FCC part 24.232 and Part 27.50
Test Method:	FCC part 2.1046
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 power meter 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 6.0 for details
Test mode:	Refer to section 7.1 for details
Test results:	Pass

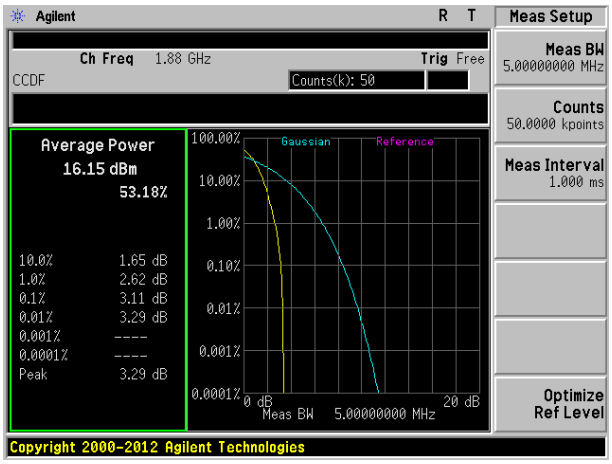
Measurement Data

Test mode	Peak to Average Ratio (dB)			Limit (dB)	Result
	Low Ch.	Middle Ch.	High Ch.		
WCDMA Band II	2.69	3.11	3.12	13	PASS
WCDMA Band IV	2.85	2.97	2.96	13	PASS
WCDMA Band V	2.76	3.58	2.96	13	PASS

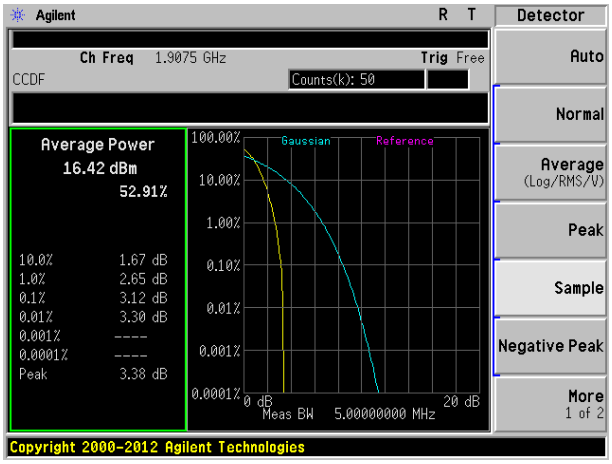
Test band:	WCDMA Band II



Lowest channel

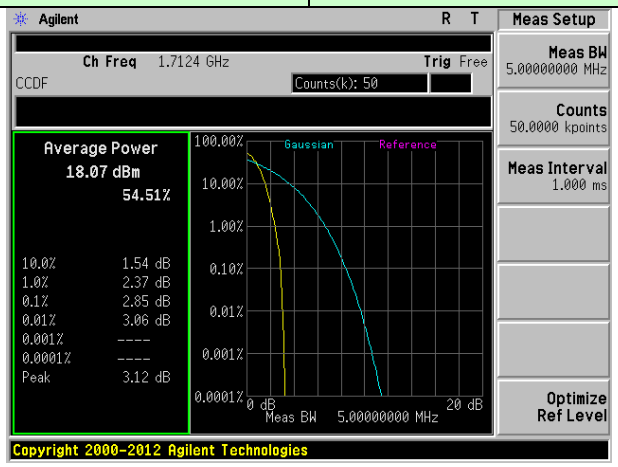


Middle channel

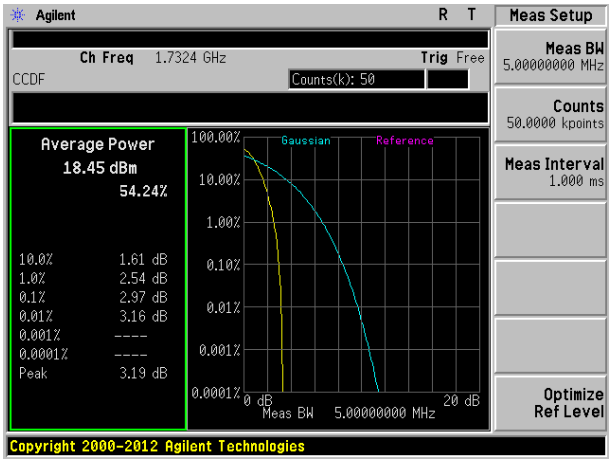


Highest channel

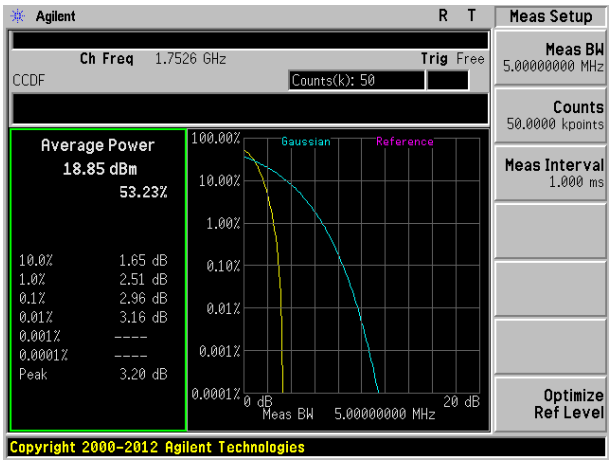
Test band:	WCDMA Band IV



Lowest channel

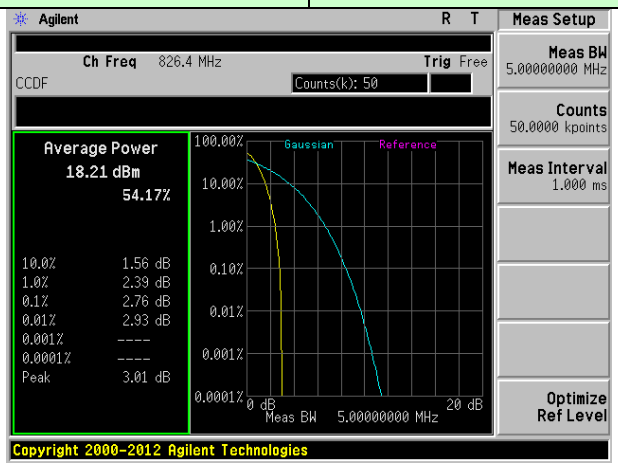


Middle channel

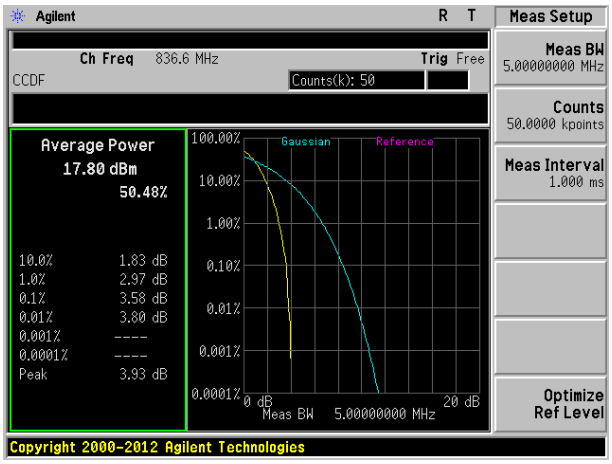


Highest channel

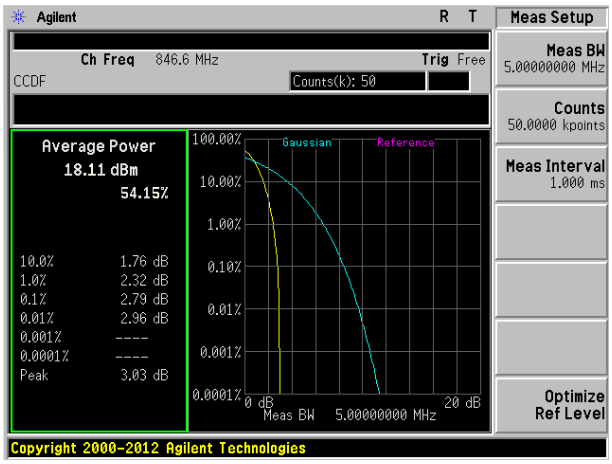
Test band:	WCDMA Band V



Lowest channel

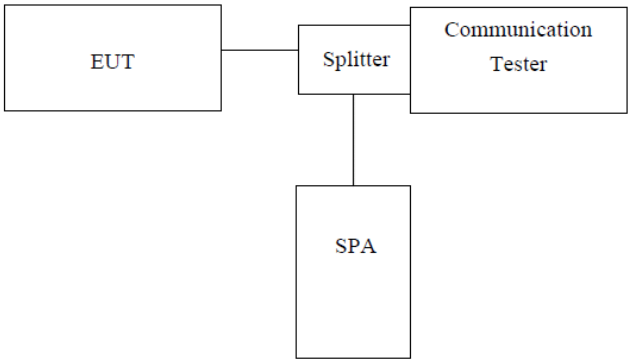


Middle channel



Highest channel

7.5 Occupy Bandwidth

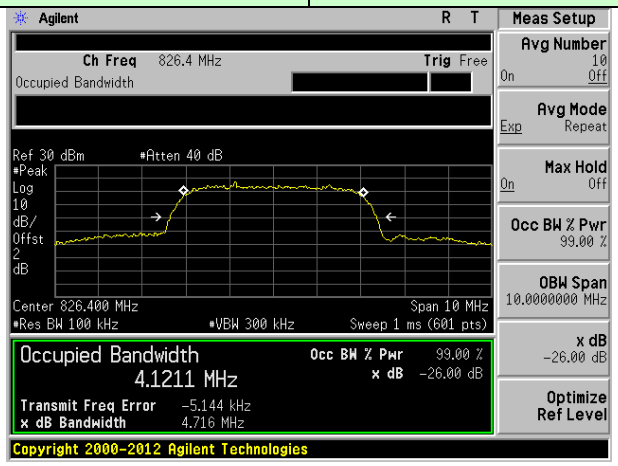
Test Requirement:	FCC part 22.917(b) and FCC part 24.238(b) and FCC part 27.53
Test Method:	FCC part 2.1049
Test setup:	 ***Note:*** *Measurement setup for testing on Antenna connector*
Test Procedure:	1. The EUT's output RF connector was connected with a short cable to the spectrum analyzer 2. RBW was 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 6.0 for details
Test mode:	Refer to section 7.1 for details
Test results:	Pass

Measurement Data

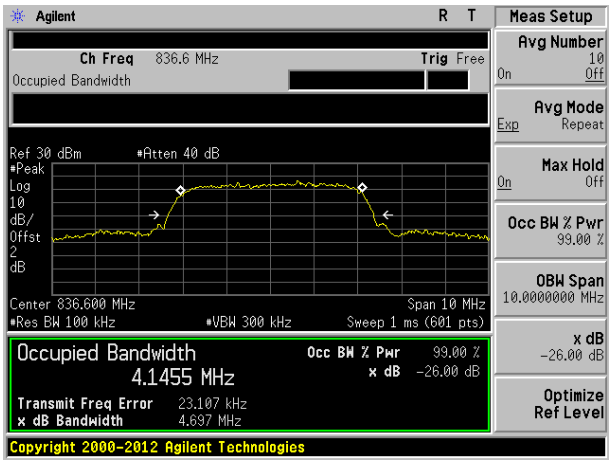
EUT Mode	Channel	Frequency (MHz)	99% Occupy bandwidth (KHz)	-26dB bandwidth (KHz)
WCDMA Band V (RMC 12.2Kbps link)	4132	826.40	4121.10	4716.00
	4183	836.60	4145.50	4697.00
	4233	846.60	4164.20	4723.00
WCDMA Band II (RMC 12.2Kbps link)	9262	1852.40	4145.10	4776.00
	9400	1880.00	4125.60	4732.00
	9538	1907.60	4108.90	4705.00
WCDMA Band IV (RMC 12.2Kbps link)	1312	1852.40	4149.40	4786.00
	1412	1880.00	4115.70	4746.00
	1513	1907.60	4133.20	4715.00

Test plot as follows:

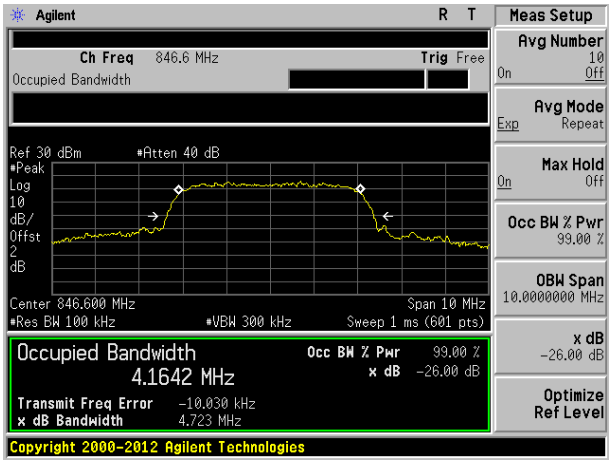
Test band:	WCDMA Band V (RMC 12.2Kbps link)



Lowest channel

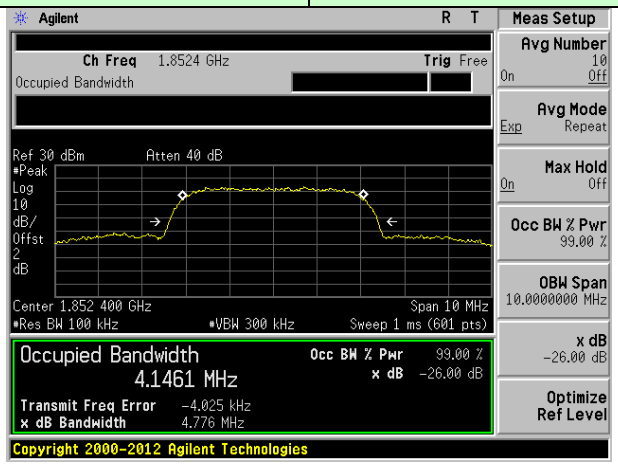


Middle channel

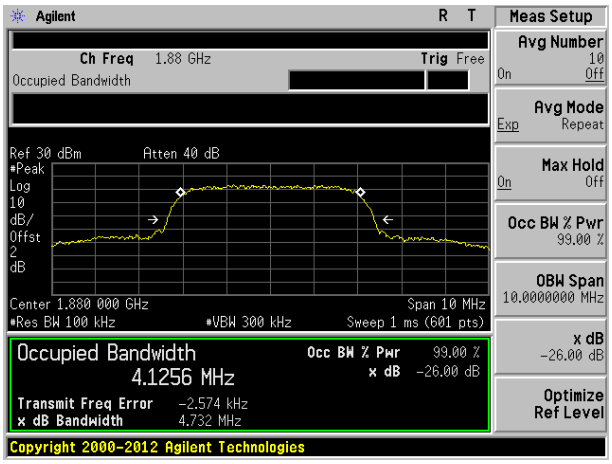


Highest channel

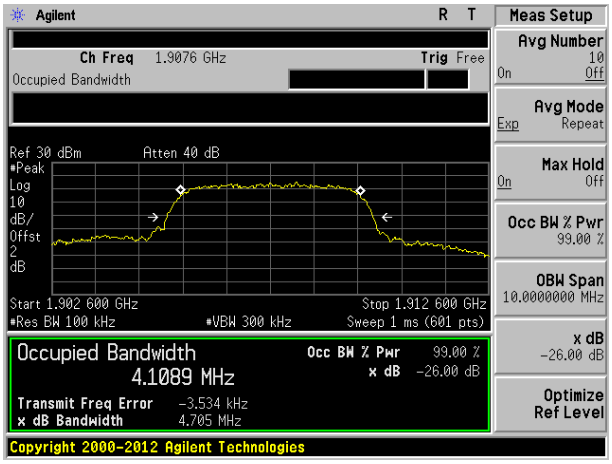
Test band:	WCDMA Band II (RMC 12.2Kbps link)



Lowest channel

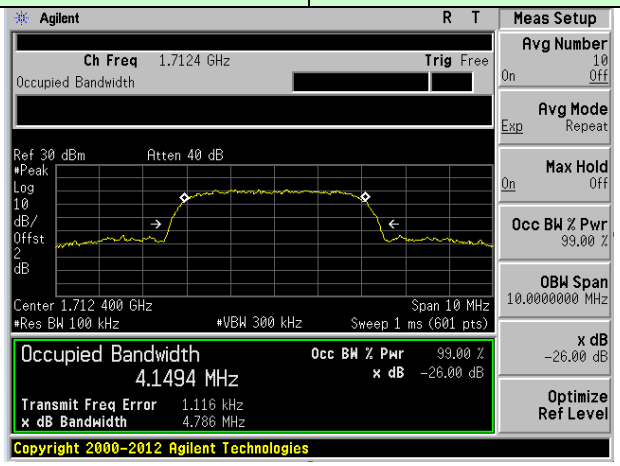


Middle channel

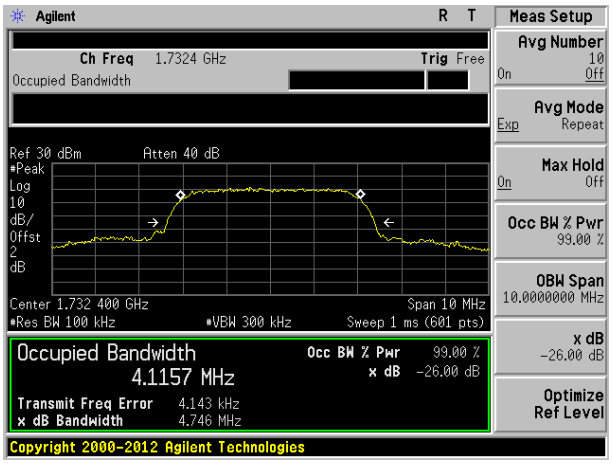


Highest channel

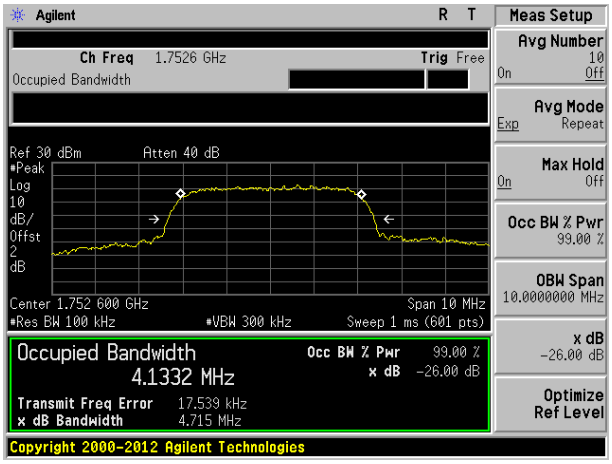
Test band:	WCDMA Band IV (RMC 12.2Kbps link)



Lowest channel



Middle channel

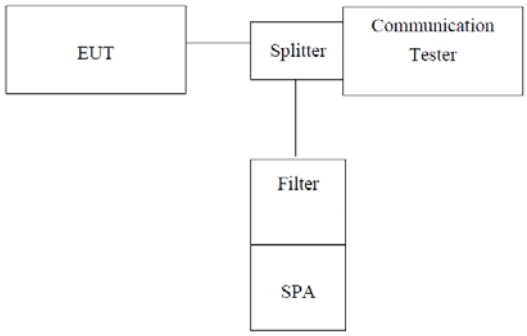


Highest channel

7.6 MODULATION CHARACTERISTIC

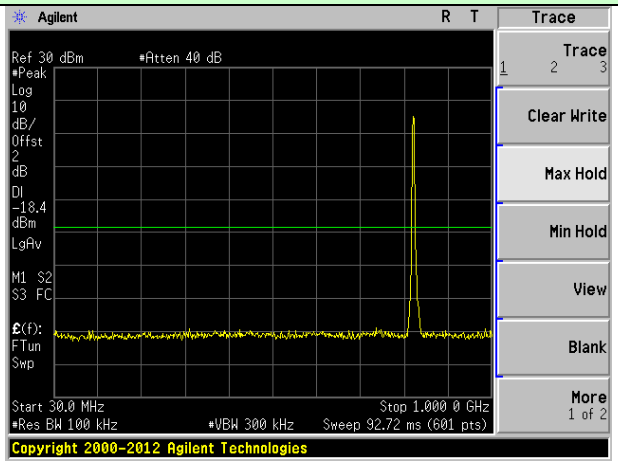
According to FCC § 2.1047(d), Part 22H & 24E& 27C there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

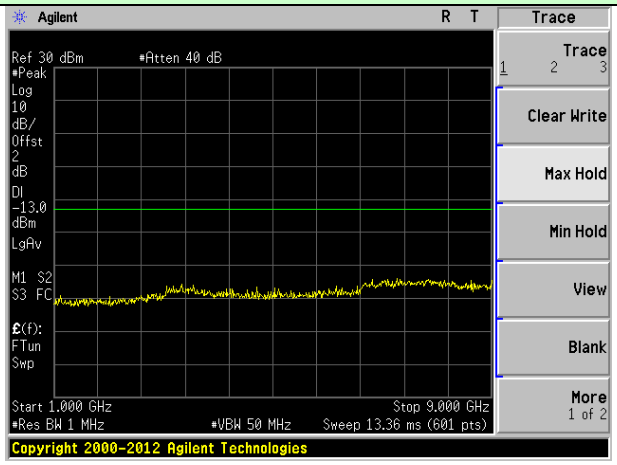
7.7 Out of band emission at antenna terminals

Test Requirement:	FCC part 22.917 and FCC part 24.238 and FCC part 27.53
Test Method:	FCC part 2.1051
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 6.0 for details
Test mode:	Refer to section 7.1 for details
Test results:	Pass

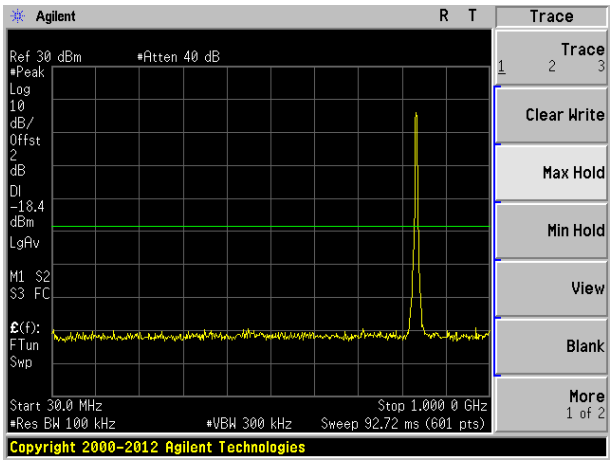
Test plot as follows:

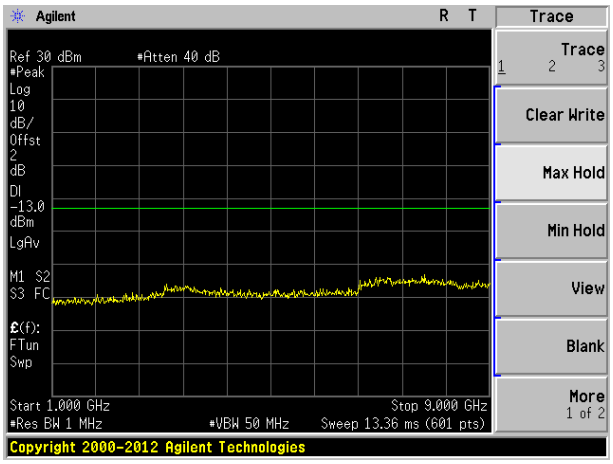
Test Mode: Traffic mode	WCDMA Band V (RMC 12.2Kbps link)



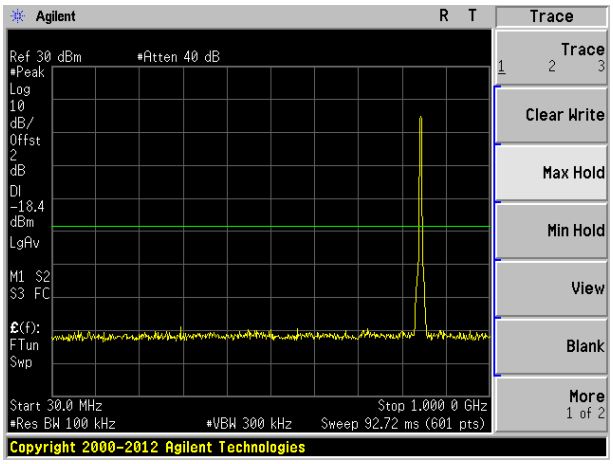


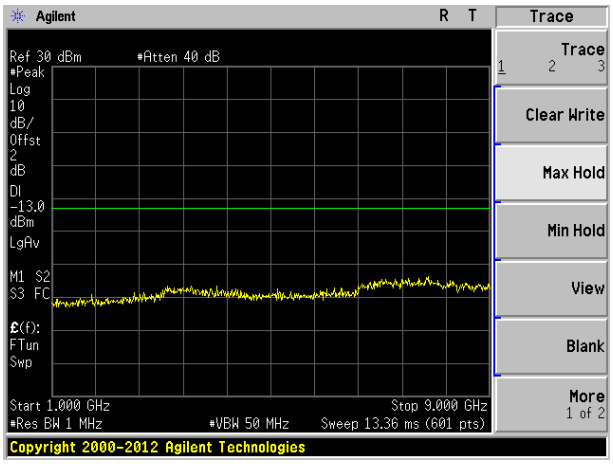
Lowest channel





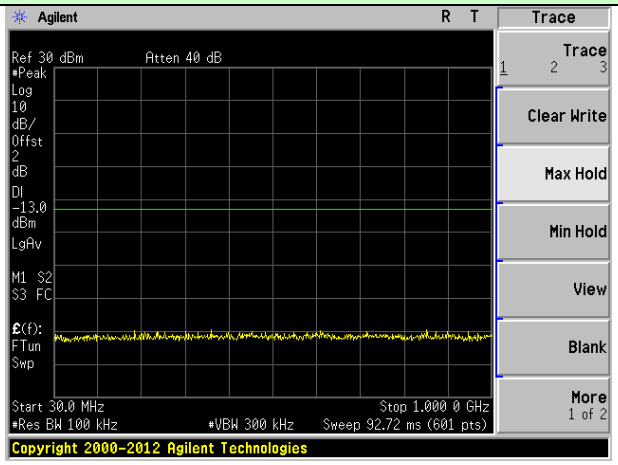
Middle channel

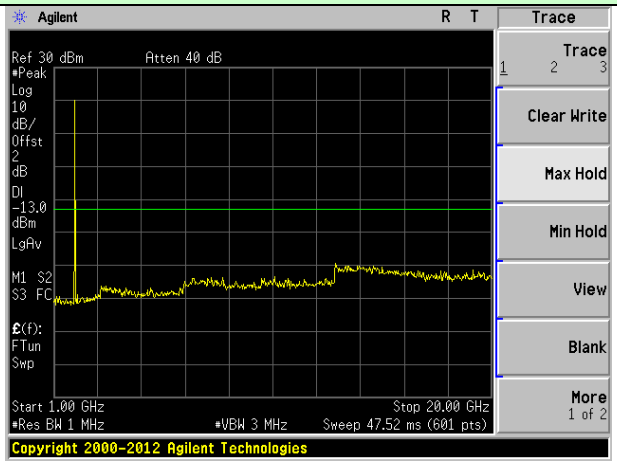




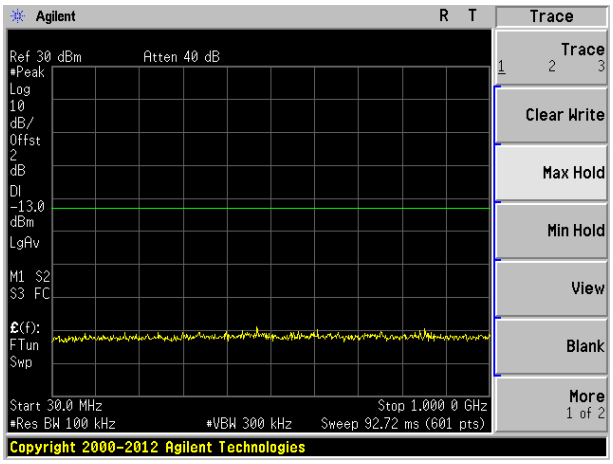
Highest channel

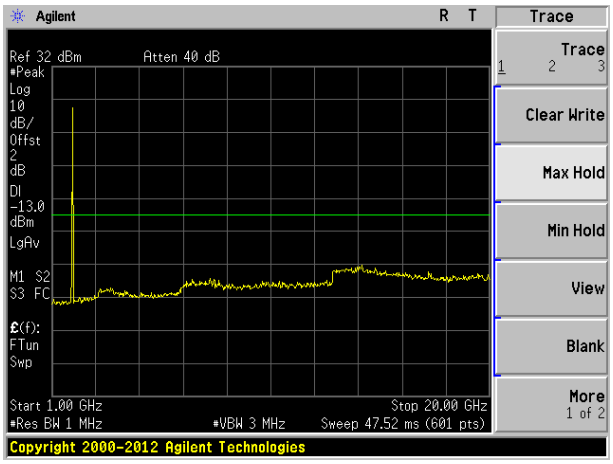
Test Mode: Traffic mode	WCDMA Band II (RMC 12.2Kbps link)



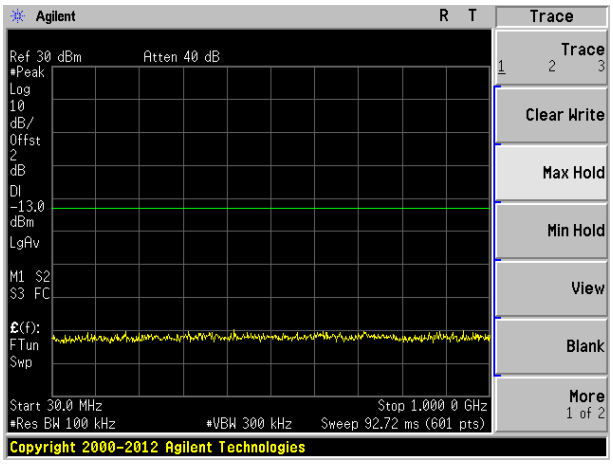


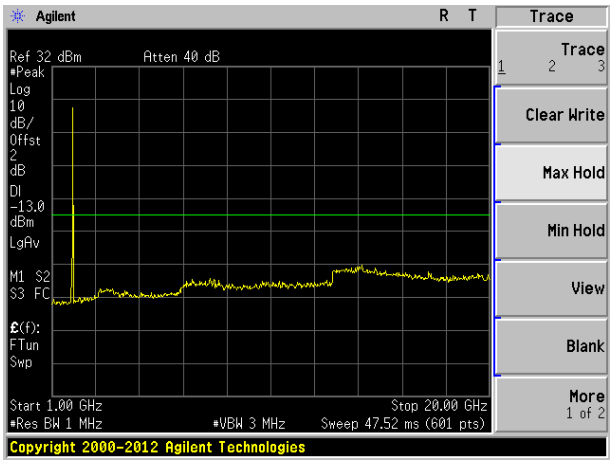
Lowest channel





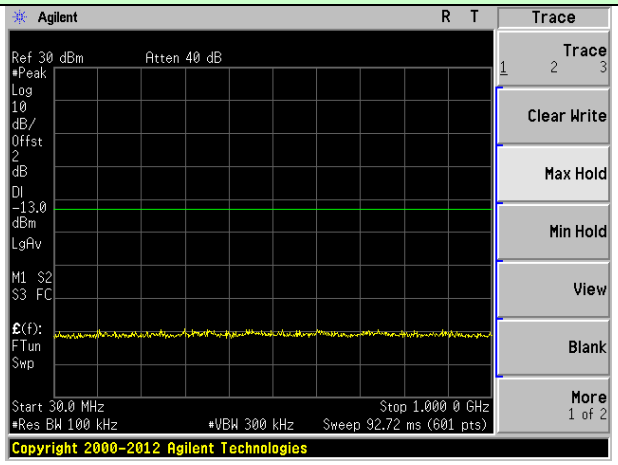
Middle channel

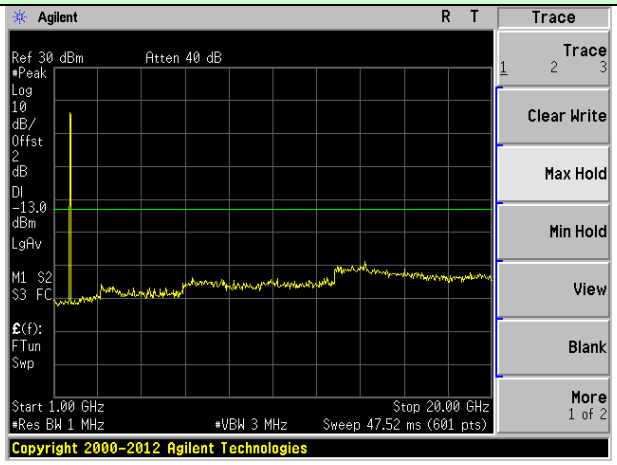




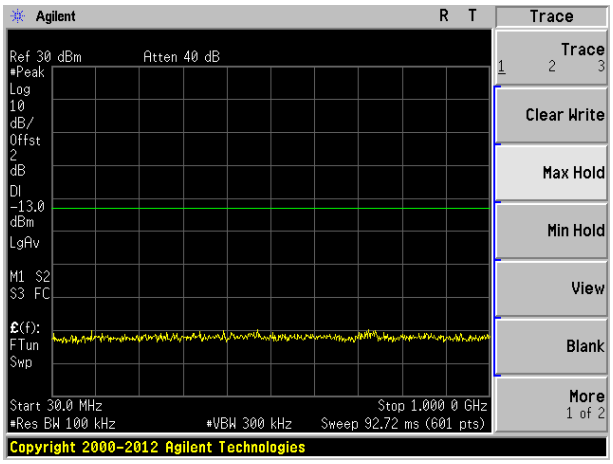
Highest channel

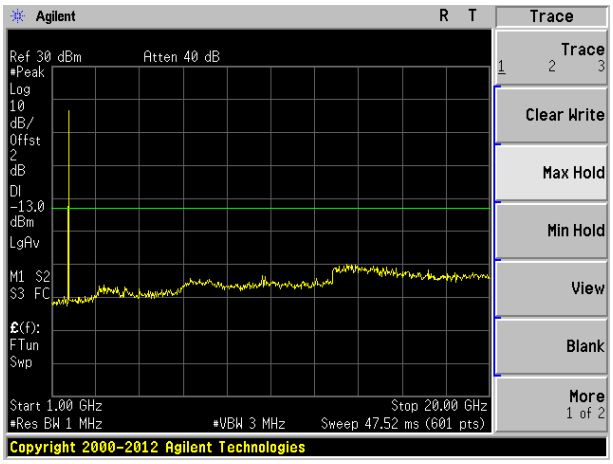
Test Mode: Traffic mode	WCDMA Band IV (RMC 12.2Kbps link)



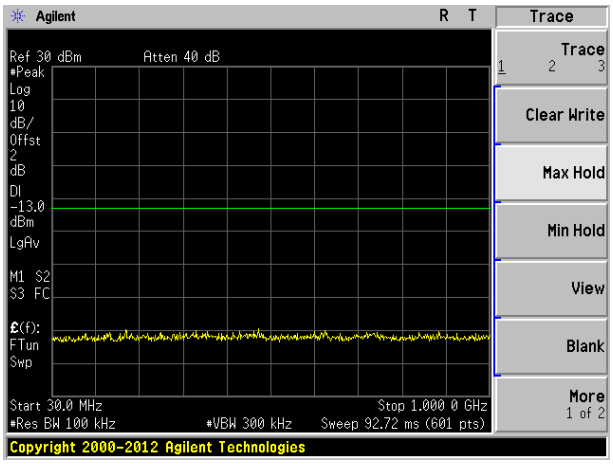


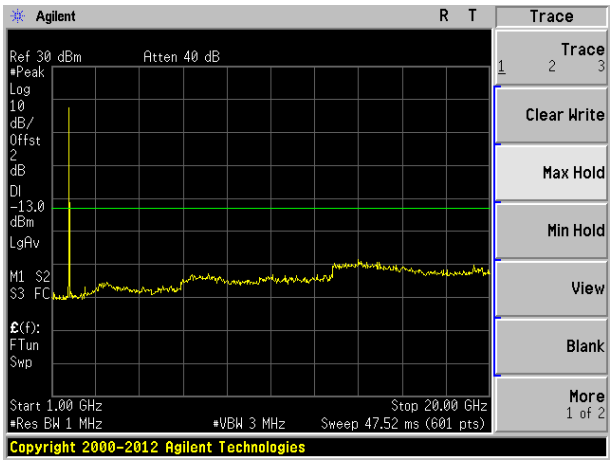
Lowest channel





Middle channel

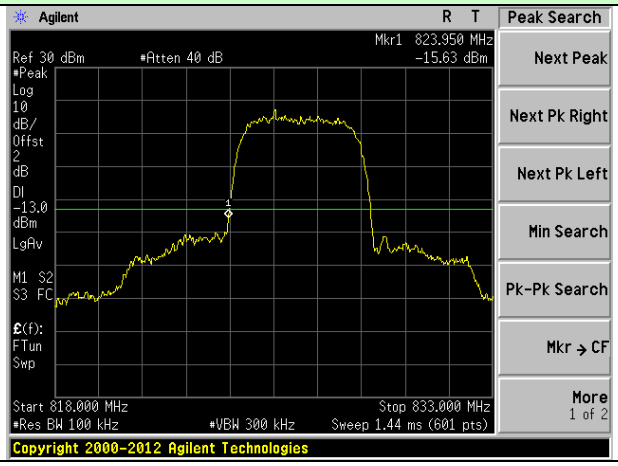




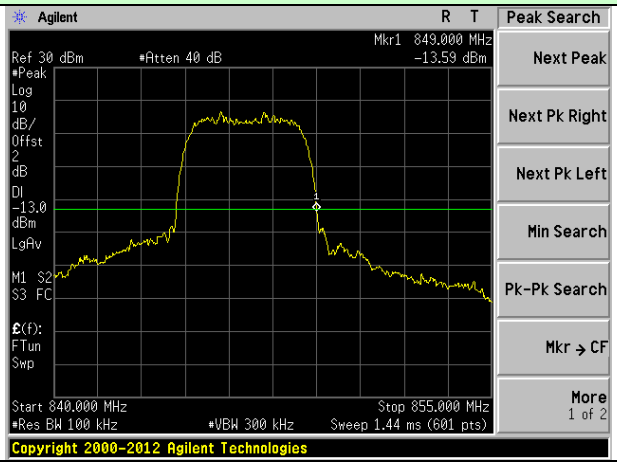
Highest channel

Band Edge:

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

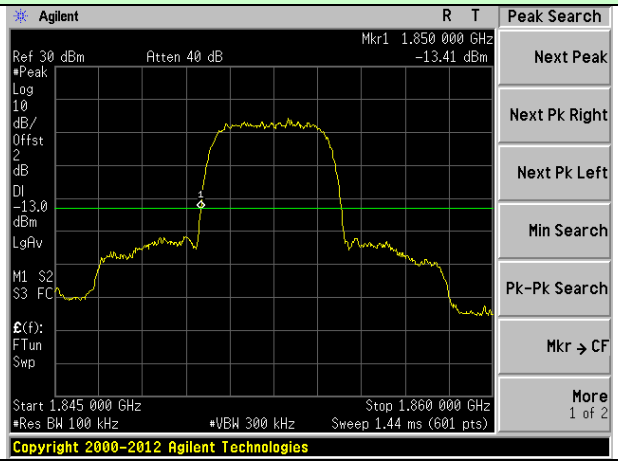


Lowest channel

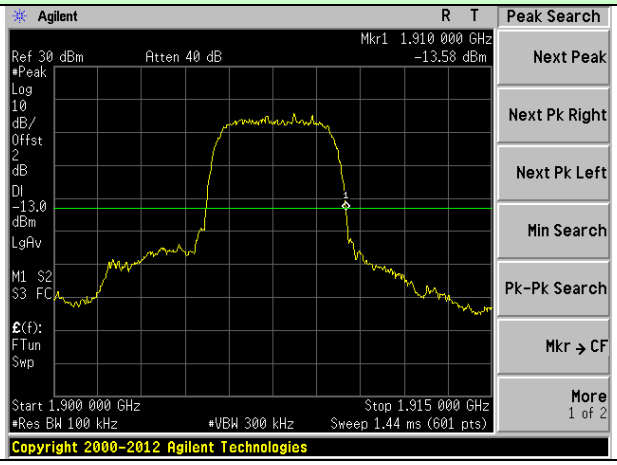


Highest channel

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

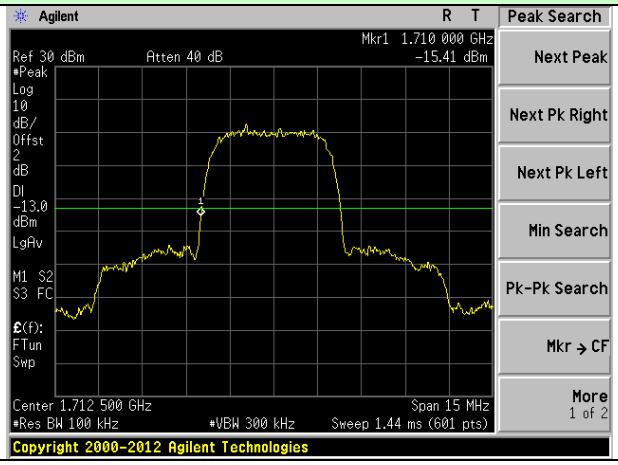


Lowest channel

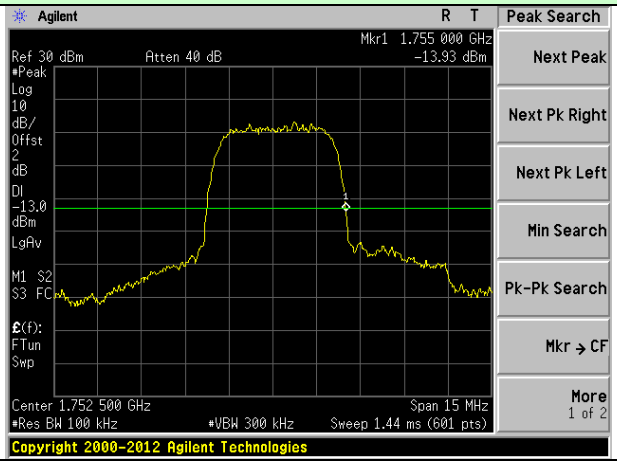


Highest channel

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

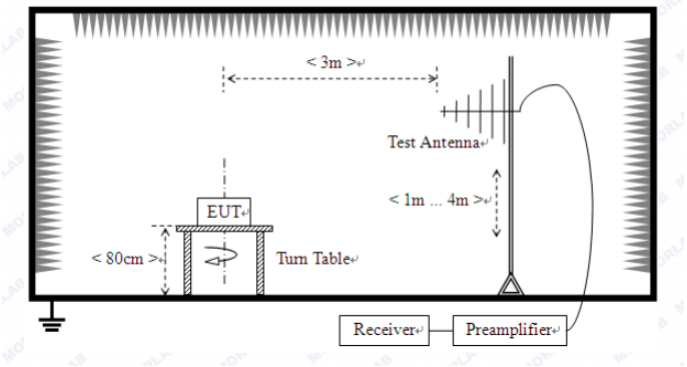
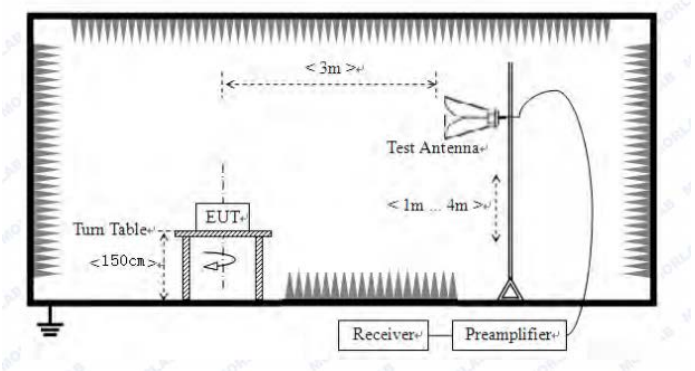
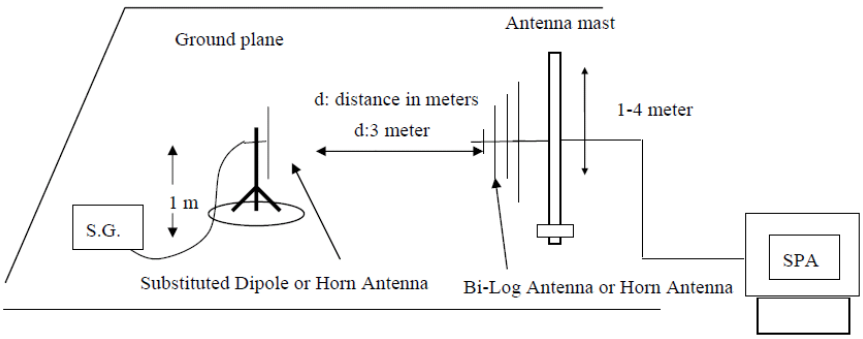


Lowest channel



Highest channel

7.8 ERP and EIRP Measurement

Test Requirement:	FCC part 22.913(a) and FCC part 24.232(b) and FCC part 27.50
Test Method:	FCC part 2.1046 and ANSI C63.26:2015
Limit:	WCDMA Band V: 7W(38.45dBm) ERP WCDMA Band II: 2W(33dBm) EIRP WCDMA Band IV:1W(30dBm) EIRP
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 6.0 for details
Test mode:	Refer to section 7.1 for details
Test results:	Pass

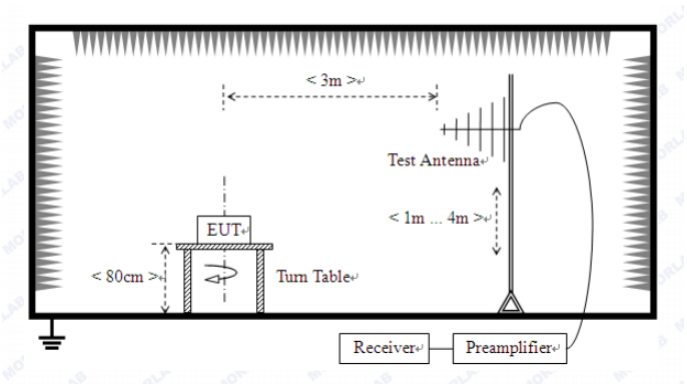
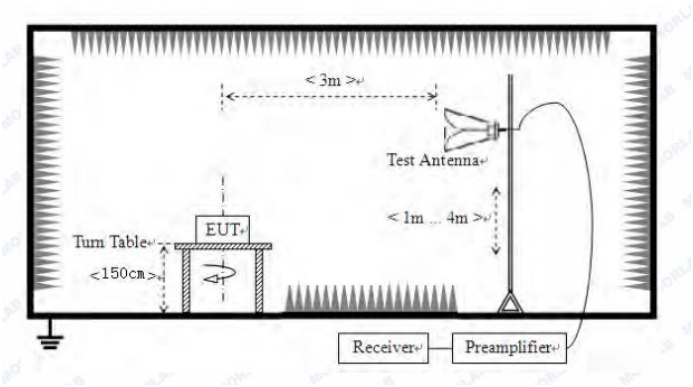
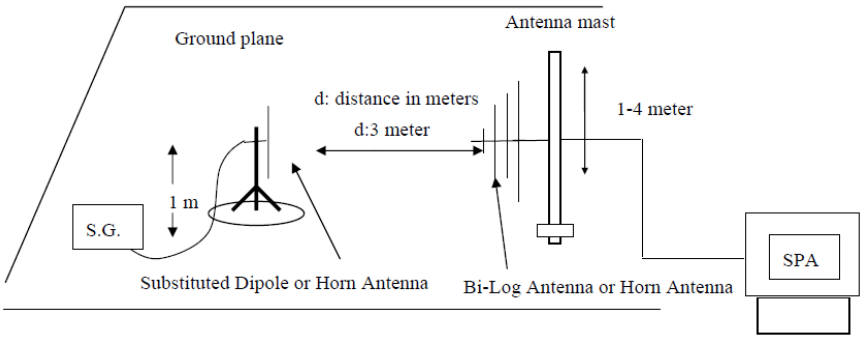
Measurement Data

EUT mode	Channel	EUT Pol.	Antenna Pol.	ERP(dBm)	Limit (dBm)	Result
WCDMA Band V	Lowest	H	V	21.95	38.45	Pass
			H	19.62		
		E1	V	20.85		
			H	18.05		
		E2	V	19.58		
			H	17.86		
	Middle	H	V	20.83	38.45	Pass
			H	18.05		
		E1	V	20.25		
			H	17.47		
		E2	V	20.23		
			H	16.82		
	Highest	H	V	19.99	38.45	Pass
			H	17.05		
		E1	V	19.47		
			H	16.03		
		E2	V	19.02		
			H	17.12		

EUT mode	Channel	EUT Pol.	Antenna Pol.	EIRP(dBm)	Limit (dBm)	Result
WCDMA Band II	Lowest	H	V	21.06	33.01	Pass
			H	19.88		
		E1	V	19.25		
			H	18.59		
		E2	V	19.26		
			H	18.69		
	Middle	H	V	20.04	33.01	Pass
			H	17.96		
		E1	V	18.85		
			H	17.74		
		E2	V	19.14		
			H	18.87		
	Highest	H	V	20.02	33.01	Pass
			H	18.71		
		E1	V	19.34		
			H	18.04		
		E2	V	18.39		
			H	17.63		

EUT mode	Channel	EUT Pol.	Antenna Pol.	EIRP(dBm)	Limit (dBm)	Result
WCDMA Band IV	Lowest	H	V	21.24	33.01	Pass
			H	19.07		
		E1	V	19.87		
			H	18.12		
		E2	V	20.11		
			H	18.35		
	Middle	H	V	20.30	33.01	Pass
			H	17.52		
		E1	V	19.67		
			H	17.85		
		E2	V	19.71		
			H	18.26		
	Highest	H	V	19.36	33.01	Pass
			H	17.58		
		E1	V	20.16		
			H	18.45		
		E2	V	20.15		
			H	18.70		

7.9 Field strength of spurious radiation measurement

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
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 6.0 for details
Test mode:	Refer to section 7.1 for details
Test results:	Pass

Measurement Data

Test mode:	WCDMA Band V		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1652.80	Vertical	-33.01	-13.00	Pass
2479.20	V	-36.94		
3305.60	V	-39.89		
4132.00	V	-37.48		
4958.40	V	---		
1652.80	Horizontal	-36.14	-13.00	Pass
2479.20	H	-39.10		
3305.60	H	-44.71		
4132.00	H	-48.61		
4958.40	H	---		
Test mode:	**WCDMA Band V**		**Test channel:**	**Middle**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1672.80	Vertical	-35.85	-13.00	Pass
2509.20	V	-37.32		
3345.60	V	-41.11		
4182.00	V	-43.63		
5018.40	V	---		
1672.80	Horizontal	-38.58	-13.00	Pass
2509.20	H	-40.70		
3345.60	H	-45.55		
4182.00	H	-48.16		
5018.40	H	---		
Test mode:	**WCDMA Band V**		**Test channel:**	**Highest**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1693.20	Vertical	-35.00	-13.00	Pass
2539.80	V	-37.57		
3386.40	V	-40.34		
4233.00	V	-43.28		
5079.60	V	---		
1693.20	Horizontal	-38.58	-13.00	Pass
2539.80	H	-41.17		
3386.40	H	-42.68		
4233.00	H	-49.05		
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.

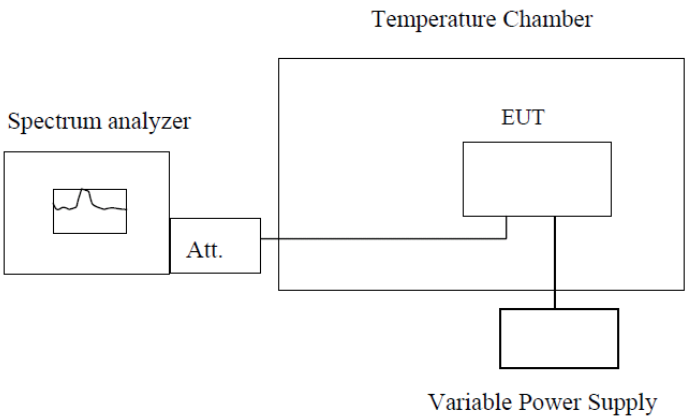
Test mode:	WCDMA Band II		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3704.46	Vertical	-33.70	-13.00	Pass
5556.86	V	-37.00		
7409.26	V	-39.79		
9261.66	V	-42.32		
11114.40	V	---		
3704.46	Horizontal	-40.00	-13.00	Pass
5556.86	H	-44.66		
7409.26	H	-46.65		
9261.66	H	-50.04		
11114.40	H	---		
Test mode:	**WCDMA Band II**		**Test channel:**	**Middle**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3759.83	Vertical	-35.40	-13.00	Pass
5639.83	V	-38.51		
7519.83	V	-41.12		
9399.83	V	-43.51		
11280.00	V	---		
3759.83	Horizontal	-41.33	-13.00	Pass
5639.83	H	-45.71		
7519.83	H	-47.56		
9399.83	H	-50.73		
11280.00	H	---		
Test mode:	**WCDMA Band II**		**Test channel:**	**Highest**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3815.03	Vertical	-35.41	-13.00	Pass
5722.63	V	-38.28		
7630.23	V	-40.69		
9537.83	V	-42.92		
11445.60	V	---		
3815.03	Horizontal	-40.90	-13.00	Pass
5722.63	H	-44.95		
7630.23	H	-46.66		
9537.83	H	-49.58		
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.

Test mode:	WCDMA Band IV		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3424.80	Vertical	-35.93	-13.00	Pass
5137.20	V	-36.82		
6849.60	V	-38.43		
8562.00	V	-40.73		
10274.40	V	---		
3424.80	Horizontal	-39.44	-13.00	Pass
5137.20	H	-41.34		
6849.60	H	-42.46		
8562.00	H	-45.63		
10274.40	H	---		
Test mode:	**WCDMA Band IV**		**Test channel:**	**Middle**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3464.80	Vertical	-37.41	-13.00	Pass
5197.20	V	-39.67		
6929.60	V	-41.41		
8662.00	V	-45.56		
10394.40	V	---		
3464.80	Horizontal	-40.85	-13.00	Pass
5197.20	H	-41.91		
6929.60	H	-44.30		
8662.00	H	-47.57		
10394.40	H	---		
Test mode:	**WCDMA Band IV**		**Test channel:**	**Highest**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3505.20	Vertical	-35.80	-13.00	Pass
5257.80	V	-37.35		
7010.40	V	-39.54		
8763.00	V	-40.66		
10515.60	V	---		
3505.20	Horizontal	-41.81	-13.00	Pass
5257.80	H	-45.81		
7010.40	H	-48.03		
8763.00	H	-51.19		
10515.60	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.

7.10 Frequency stability V.S. Temperature measurement

Test Requirement:	FCC part 22.355 and FCC part 24.235 and Part 27.54
Test Method:	FCC Part 2.1055(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 6.0 for details
Test mode:	Refer to section 7.1 for details
Test results:	Pass

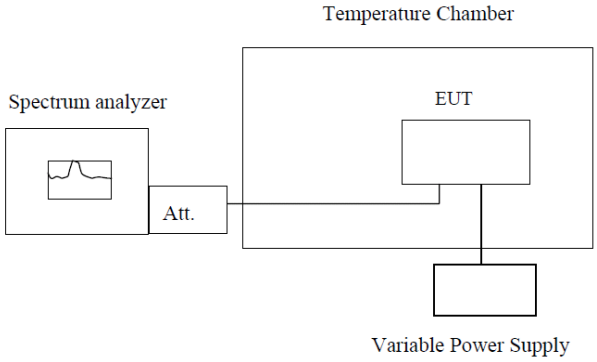
Measurement Data

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	33	0.0395	2.5	Pass
	-20	46	0.0552		
	-10	52	0.0623		
	0	25	0.0296		
	10	37	0.0438		
	20	40	0.0481		
	30	59	0.0708		
	40	56	0.0665		
	50	66	0.0794		

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	99	0.0524	2.5	Pass
	-20	88	0.0466		
	-10	75	0.0400		
	0	70	0.0374		
	10	64	0.0341		
	20	56	0.0295		
	30	70	0.0374		
	40	79	0.0420		
	50	75	0.0400		

Reference Frequency: WCDMA Band IV Middle channel=1412 channel=1732.4MHz					
Power supplied (Vdc)	Temperature (℃)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.70	-30	100	0.0576	2.5	Pass
	-20	90	0.0522		
	-10	74	0.0428		
	0	65	0.0373		
	10	54	0.0311		
	20	63	0.0366		
	30	81	0.0467		
	40	86	0.0498		
	50	107	0.0615		

7.11 Frequency stability V.S. Voltage measurement

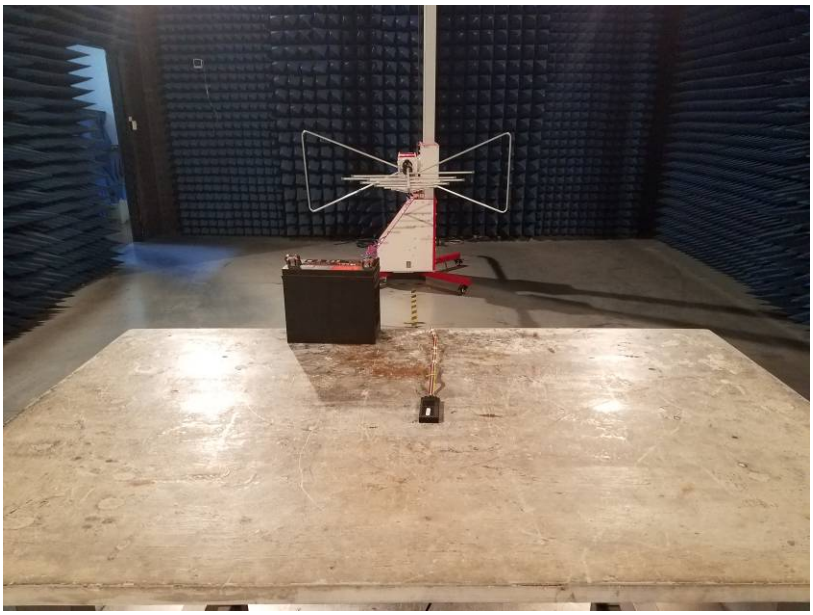
Test Requirement:	FCC part 22.355 and FCC part 24.235 and Part 27.54
Test Method:	FCC Part 2.1055(d)(1)(2)
Limit:	2.5ppm
Test setup:	 **Note :** Measurement setup for testing on Antenna connector
Test procedure:	1. Set chamber temperature to 25°C. Use a variable DC power source to power the EUT and set 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 6.0 for details
Test mode:	Refer to section 7.1 for details
Test results:	Pass

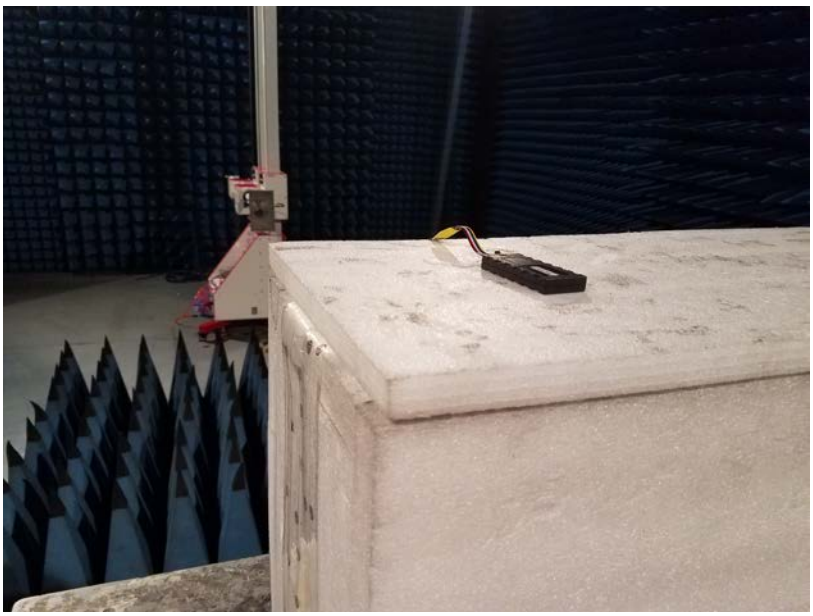
Measurement Data

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	26	0.0316	2.5	Pass
	3.70	35	0.0423		
	3.40	17	0.0209		
Reference Frequency: WCDMA Band II Middle channel=9400 channel=1880.0MHz					
Temperature (℃)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.25	65	0.0347	2.5	Pass
	3.70	54	0.0286		
	3.40	60	0.0321		
Reference Frequency: WCDMA Band IV Middle channel=1412 channel=1732.4MHz					
Temperature (℃)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.25	63	0.0366	2.5	Pass
	3.70	81	0.0466		
	3.40	76	0.0441		

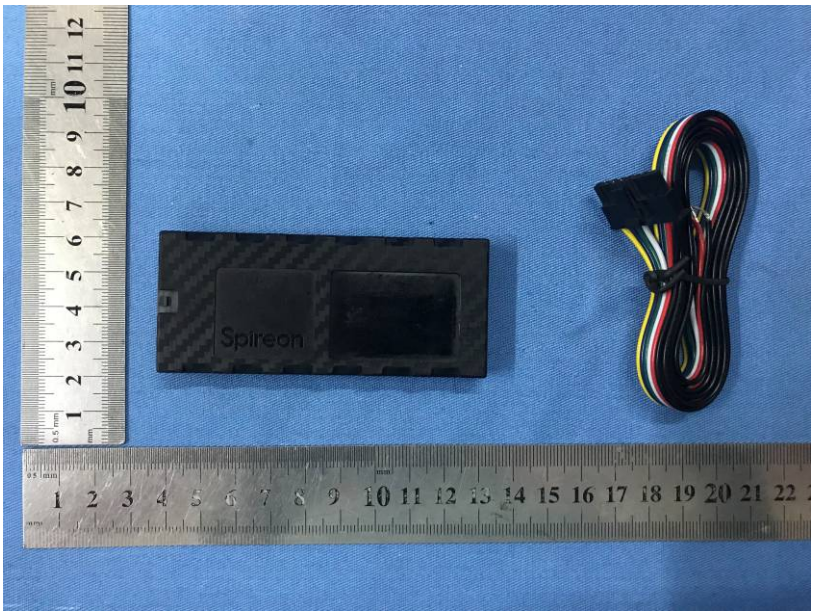
8 Test Setup Photo

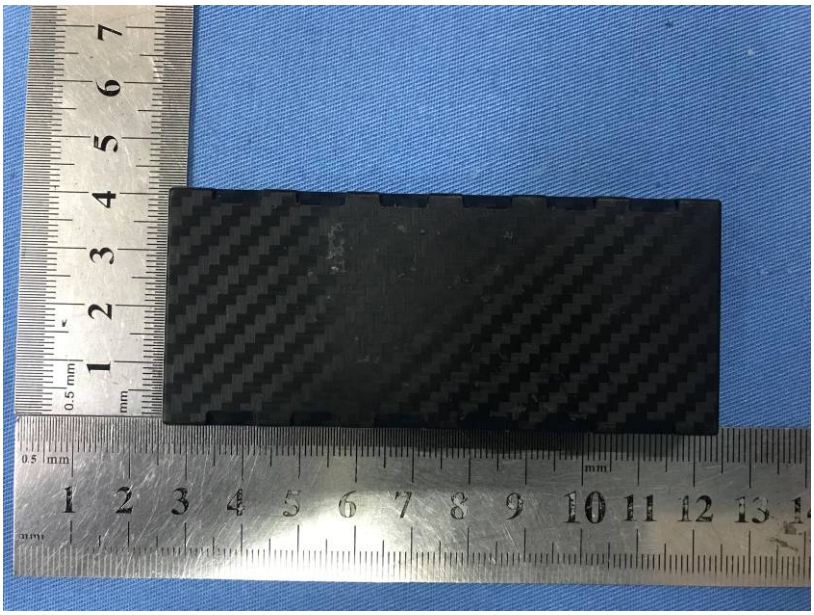
Radiated Emission

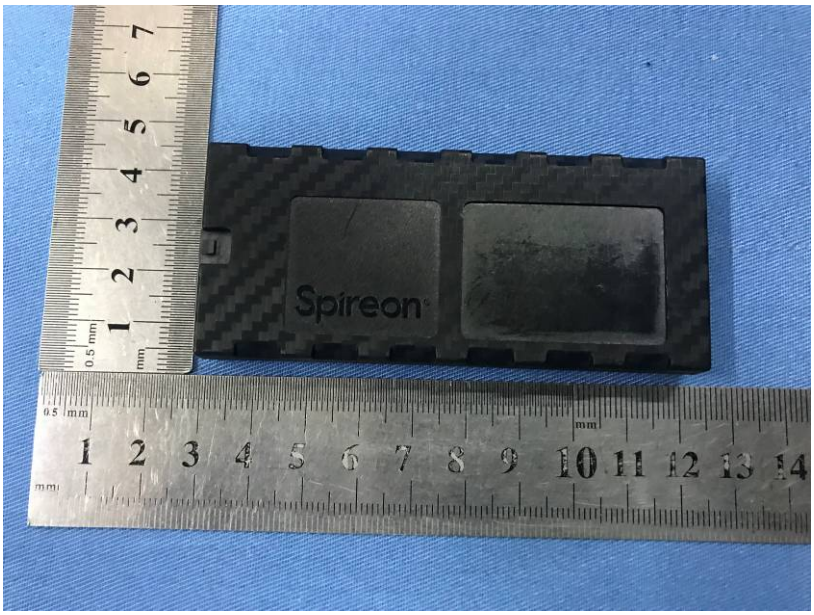


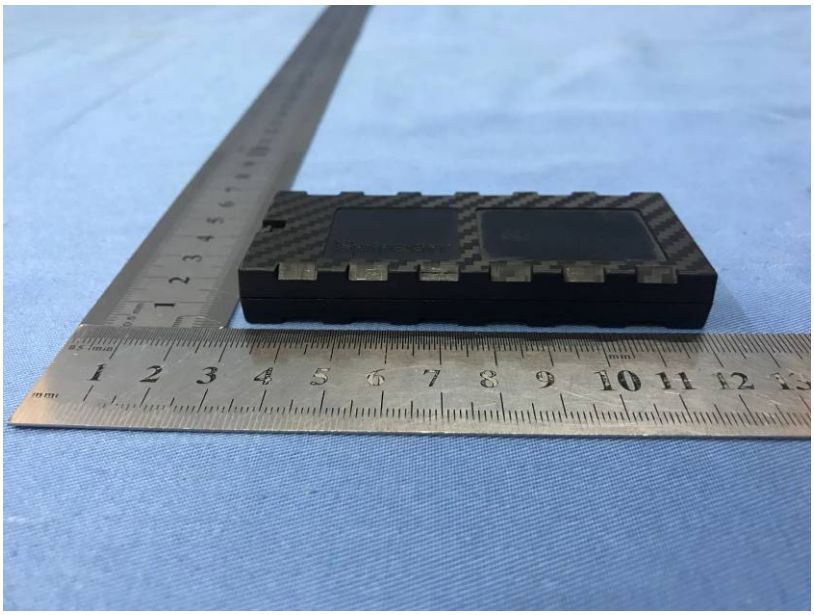


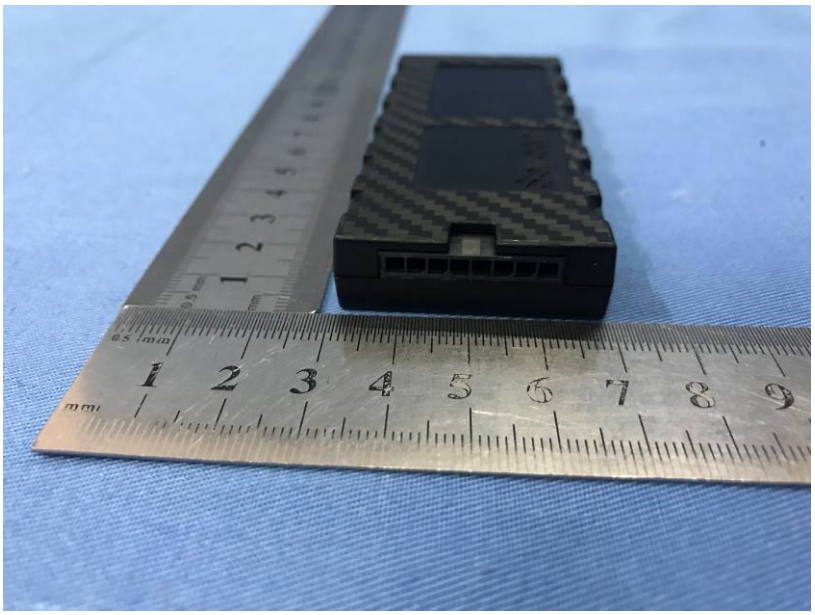
9 EUT Constructional Details

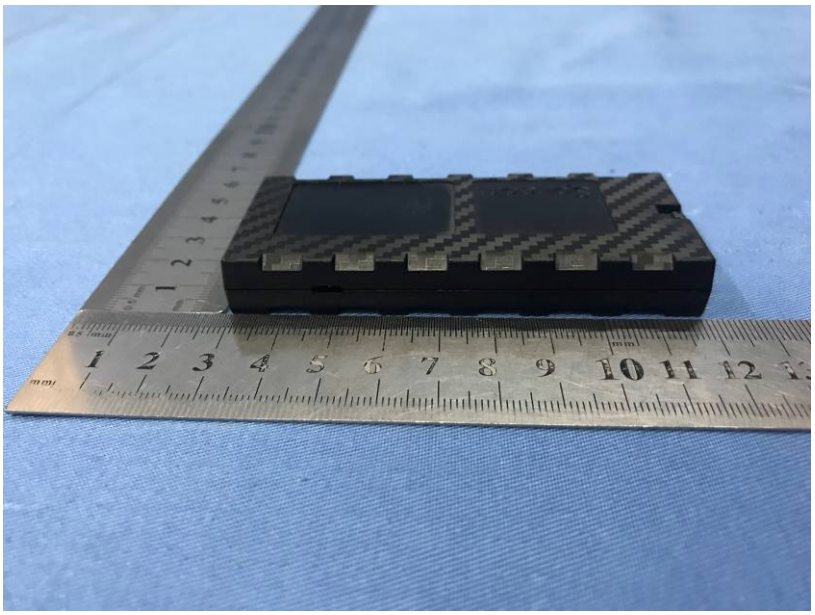


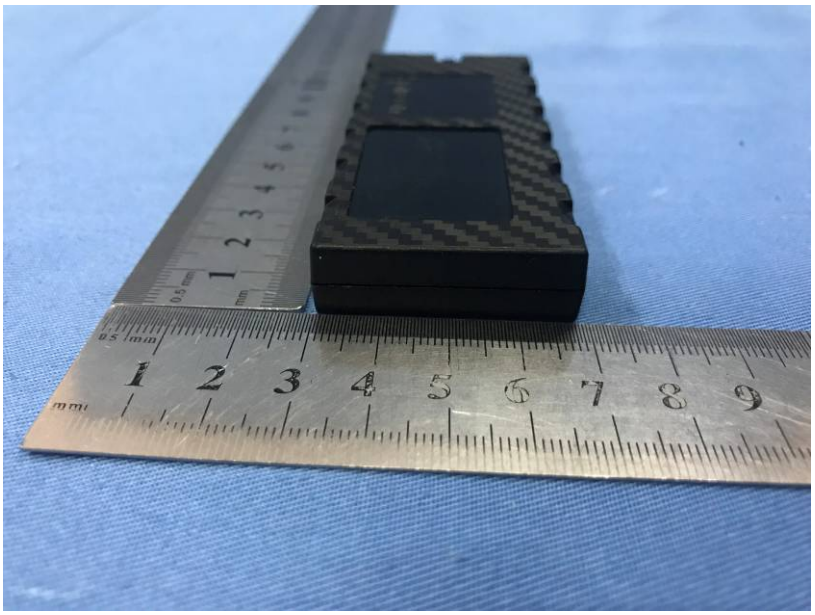


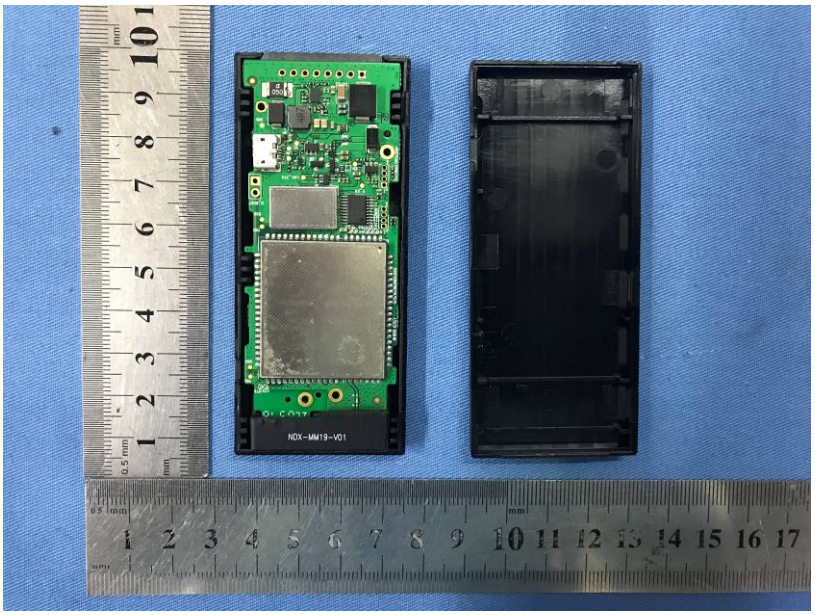

Spireon







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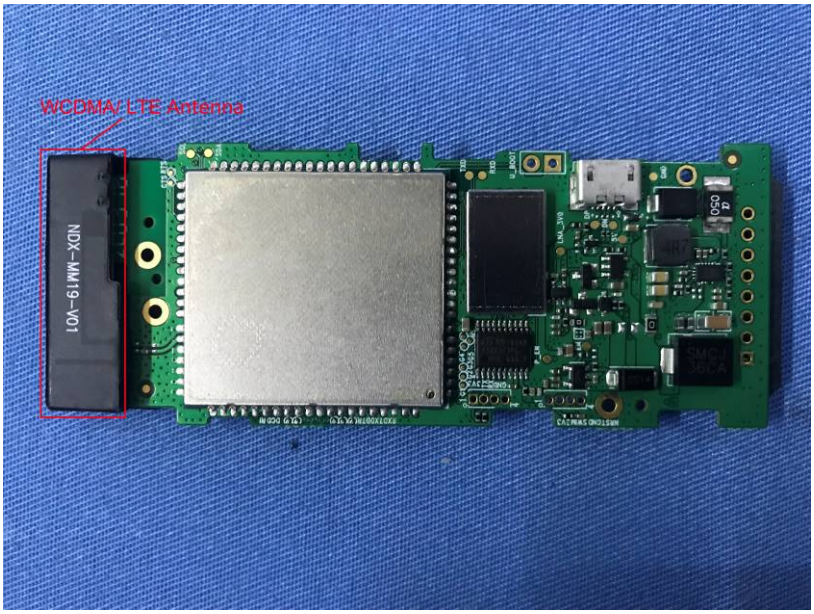
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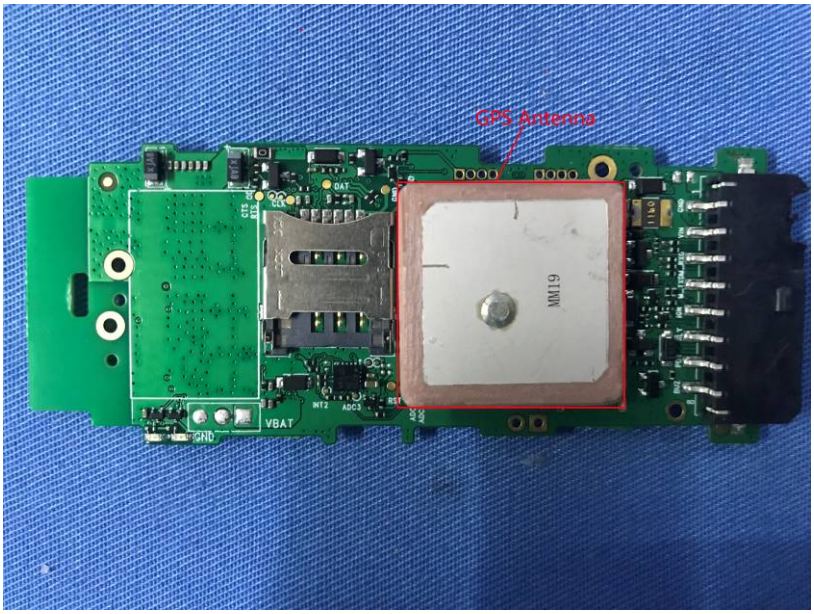
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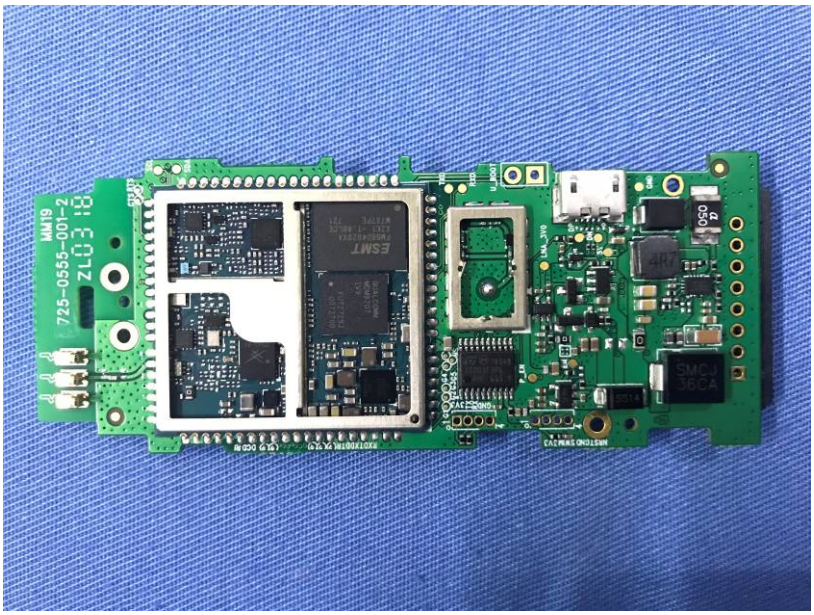
MM19
VBAT
GND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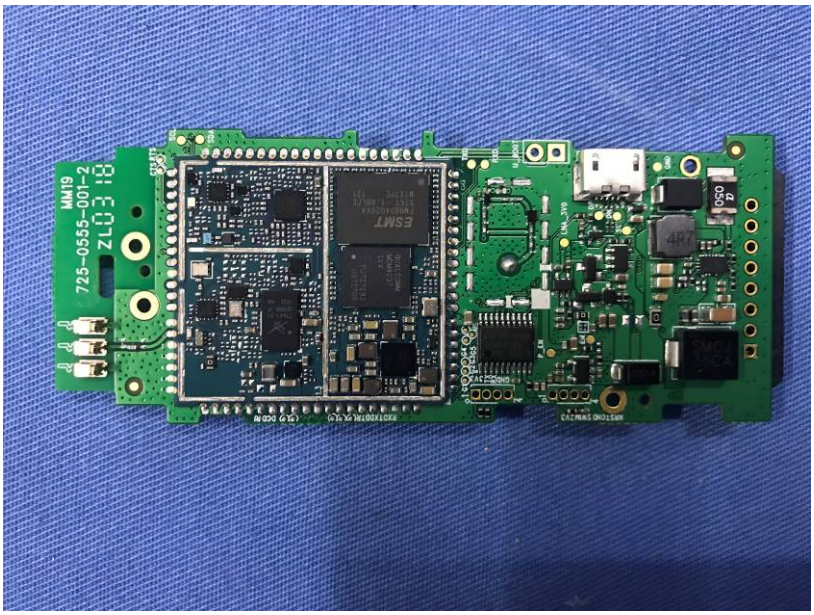
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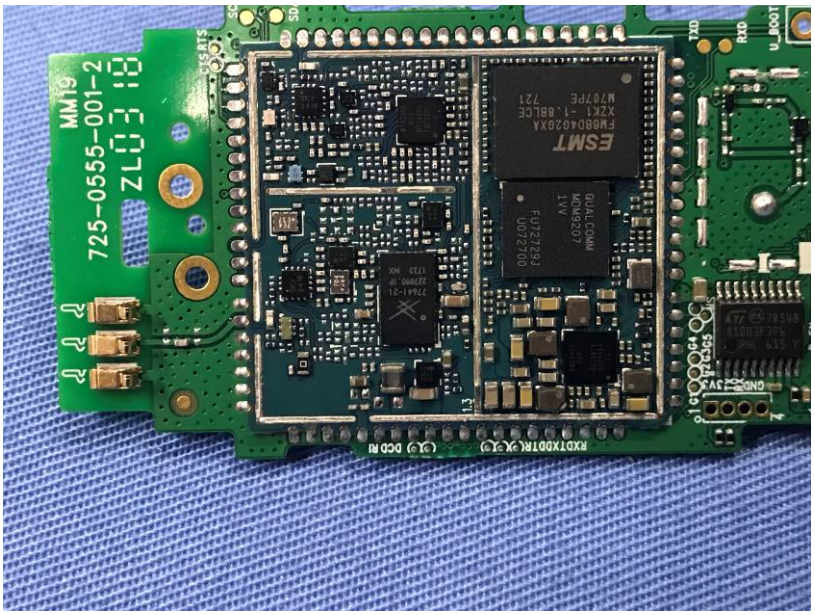

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