Shenzhen CTL Testing Technology Co., Ltd.
Tel: +86-755-89486194 E-Mail: ctl@ctl-lab.com

TEST REPORT

FCC Part 22 Subpart H / Part 24 Subpart E

Report Reference No. .....: **CTL1702278801-WF**

Compiled by: (position+printed name+signature)	Allen Wang (File administrators)	Allen Wang
Tested by: (position+printed name+signature)	Nice Nong (Test Engineer)	Nice Nong
Approved by: (position+printed name+signature)	Ivan Xie (Manager)	Ivan Xie

Product Name.....:	GPS TRACKER
Model/Type reference .....:	TK10SDC
List Model(s).....:	T8124G, T13G, TK05G, TK10G, TK15G, TK20G, T633G, T805G, T810G, T815G, T820G, T16G, T18G, T19G, T500G, T10G, T20G, T30G, T80G, TK20GSE
Trade Mark .....:	N/A
FCC ID .....:	**2ALE4-TK10SDC**
Applicant's name .....:	**ZhongShan Highyes Electronics Co.,LTD**
Address of applicant .....:	The third to the sixth floor, No.150, the Industrial Zone, Shaxi, Zhongshan City, Guangdong, China
Test Firm .....:	**Shenzhen CTL Testing Technology Co., Ltd.**
Address of Test Firm .....:	Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, Shenzhen, China 518055
Test specification.....:	
Standard.....:	**FCC CFR Title 47 Part 2, Part 22H and Part 24E** **EIA/TIA 603-D: 2010** **KDB 971168 D01**
TRF Originator .....:	Shenzhen CTL Testing Technology Co., Ltd.
Master TRF .....:	Dated 2011-01
Date of Receipt.....:	Mar. 07, 2017
Date of Test Date.....:	Mar. 07, 2017–Mar. 27, 2017
Data of Issue.....:	Mar. 28, 2017
Result.....:	Pass

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TEST REPORT

Test Report No. :	CTL1702278801-WF	Mar. 28, 2017
		Date of issue

Equipment under Test	:	GPS TRACKER
Model /Type	:	TK10SDC
Listed Models	:	T8124G, T13G, TK05G, TK10G, TK15G, TK20G, T633G, T805G, T810G, T815G, T820G, T16G, T18G, T19G, T500G, T10G, T20G, T30G, T80G, TK20GSE
Applicant	:	**ZhongShan Highyes Electronics Co.,LTD**
Address	:	The third to the sixth floor, No.150, the Industrial Zone, Shaxi, Zhongshan City, Guangdong, China
Manufacturer	:	**ZhongShan Highyes Electronics Co.,LTD**
Address	:	The third to the sixth floor, No.150, the Industrial Zone, Shaxi, Zhongshan City, Guangdong, China

Test result	**Pass ***

* In the configuration tested, the EUT complied with the standards specified page 5.

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

** Modified History **

Revisions	Description	Issued Data	Report No.	Remark
Version 1.0	Initial Test Report Release	2017-03-28	CTL1702278801-WF	Tracy Qi

Contents

1 SUMMARY 5

1.1 TEST STANDARDS 5
1.2 TEST DESCRIPTION 5
1.3 TEST FACILITY 6
1.4 STATEMENT OF THE MEASUREMENT UNCERTAINTY 6

2 GENERAL INFORMATION 7

2.1 ENVIRONMENTAL CONDITIONS 7
2.2 GENERAL DESCRIPTION OF EUT 7
2.3 DESCRIPTION OF TEST MODES AND TEST FREQUENCY 8
2.4 EQUIPMENTS USED DURING THE TEST 9
2.5 RELATED SUBMITTAL(S) / GRANT (S) 9
2.6 MODIFICATIONS 9

3 TEST CONDITIONS AND RESULTS 10

3.1 OUTPUT POWER 10
3.2 OCCUPIED BANDWIDTH 14
3.3 BAND EDGE COMPLIANCE 18
3.4 SPURIOUS EMISSION 22
3.5 FREQUENCY STABILITY UNDER TEMPERATURE & VOLTAGE VARIATIONS 32

4 TEST SETUP PHOTOS OF THE EUT 35

5 EXTERNAL AND INTERNAL PHOTOS OF THE EUT 36

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1 SUMMARY

1.1 TEST STANDARDS

The tests were performed according to following standards:
FCC Part 22: PRIVATE LAND MOBILE RADIO SERVICES.
FCC Part 24: PUBLIC MOBILE SERVICES
TIA/EIA 603 D June 2010: Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.
FCC Part 2: FREQUENCY ALLOCA-TIONS AND RADIO TREATY MAT-TERS; GENERAL RULES AND REG-ULATIONS
KDB971168 D01:v02r02 MEASUREMENT GUIDANCE FOR CERTIFICATION OF LICENSED DIGITAL TRANSMITTERS
ANSI C63.10-2013 Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

1.2 Test Description

Test Item	Section in CFR 47	Result
RF Output Power	Part 2.1046 Part 22.913 (a)(2) Part 24.232 ©	Pass
Peak-to-Average Ratio	Part 24.232 (d)	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	Part 2.1055 Part 22.355 Part 24.235	Pass

1.3 Test Facility

1.3.1 Address of the test laboratory

Shenzhen CTL Testing Technology Co., Ltd.
Floor 1-A, Baisha Technology Park, No. 3011, Shahexi Road, Nanshan, Shenzhen 518055 China

There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.4 and CISPR 22/EN 55022 requirements.

1.3.2 Laboratory accreditation

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

IC Registration No.: 9618B

The 3m alternate test site of Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration No.: 9618B on November 13, 2013.

FCC-Registration No.: 970318

Shenzhen CTL Testing Technology Co., Ltd. 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 our files. Registration 970318, December 19, 2013.

1.4 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen CTL Testing Technology Co., Ltd. Quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for CTL laboratory is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.10dB	(1)
Radiated Emission	Above 1GHz	4.32dB	(1)
Conducted Disturbance	0.15~30MHz	3.20dB	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

2 GENERAL INFORMATION

2.1 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Normal Temperature:	25°C
Relative Humidity:	55 %
Air Pressure:	101 kPa

2.2 General Description of EUT

Product Name:	GPS TRACKER
Model/Type reference:	TK10SDC
Power supply:	DC 3.7V from battery
2G	
Operation Band:	GSM850, GSM900, DCS1800, PCS1900
Supported type:	GPRS, EGPRS
Power Class:	GSM850,GSM900:Power Class 4 DCS1800, PCS1900:Power Class 1
Modulation Type:	GMSK for GPRS, 8-PSK for EGPRS
GSM Release Version	R99
GPRS Multisport Class	12
EGPRS Multislot Class	12
Antenna type:	FPC antenna
WCDMA	
Operation Band:	FDD Band I , FDD Band II, FDD Band V, FDD Band VIII
Power Class:	Power Class 3
Modilation Type:	QPSK for HSUPA/HSDPA
WCDMA Release Version:	R8
HSDPA Release Version:	Release 7, CAT14
HSUPA Release Version:	Release 6, CAT6
DC-HSUPA Release Version:	Not Supported
Antenna type:	FPC antenna

Note: For more details, refer to the user's manual of the EUT.

Remark: The GPRS/ EGPRS frequency band includes GSM850, GSM900, DCS1800 and PCS1900, but only GSM850 and PCS1900 bands test data included in this report. The HSPA frequency band support Band I, FDD Band II, FDD Band V, and FDD Band VIII but only Band II and Band V bands test data included in this report.

2.3 Description of Test Modes and Test Frequency

The EUT has been tested under typical operating condition. The CUM200 used to control the EUT staying in continuous transmitting and receiving mode for testing. Regards to the frequency band operation: the lowest、middle and highest frequency of channel were selected to perform the test, then shown on this report.

Test Frequency:

GSM 850		PCS1900	
Channel	Frequency (MHz)	Channel	Frequency (MHz)
128	824.20	512	1850.20
190	836.60	661	1880.00
251	848.80	810	1909.80

FDD Band II		FDD Band V	
Channel	Frequency (MHz)	Channel	Frequency (MHz)
9262	1852.4	4132	826.40
9400	1880.0	4182	836.60
9538	1907.6	4233	846.60

Test Modes:

The test mode(s) are selected according to relevant radio technology specifications.

Test Mode	Test Modes Description
Mode 1	GSM system, GPRS, GMSK modulation
Mode 2	GSM system, EDGE, 8PSK modulation
Mode 3	HSDPA system, QPSK modulation
Mode 4	HSUPA system, QPSK modulation

Note:

1. As HSDPA and HSUPA with the same emission designator, test result recorded in this report at the worst case Mode 3 with RCM 12.2Kbps only after exploratory scan.

2.4 Equipments Used during the Test

Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
Bilog Antenna	Sunol Sciences Corp.	JB1	A061713	2016/06/02	2017/06/01
Bilog Antenna	Sunol Sciences Corp.	JB1	A061714	2016/06/02	2017/06/01
EMI Test Receiver	R&S	ESCI	103710	2016/06/02	2017/06/01
Spectrum Analyzer	Agilent	E4407B	MY41440676	2016/05/21	2017/05/20
Spectrum Analyzer	Agilent	N9020	US46220290	2017/01/16	2018/01/17
Controller	EM Electronics	Controller EM 1000	N/A	2016/05/21	2017/05/20
Horn Antenna	Sunol Sciences Corp.	DRH-118	A062013	2016/05/19	2017/05/18
Horn Antenna	Sunol Sciences Corp.	DRH-118	A062014	2016/05/19	2017/05/18
Active Loop Antenna	SCHWARZBECK	FMZB1519	1519-037	2016/05/19	2017/05/18
Amplifier	Agilent	8349B	3008A02306	2016/05/19	2017/05/18
Amplifier	Agilent	8447D	2944A10176	2016/05/19	2017/05/18
Temperature/Humidity Meter	Gangxing	CTH-608	02	2016/05/20	2017/05/19
Radio Communication Tester	R&S	CMU200	115419	2016/10/17	2017/10/16
High-Pass Filter	K&L	9SH10-2700/X12750-O/O	N/A	2016/05/20	2017/05/19
High-Pass Filter	K&L	41H10-1375/U12750-O/O	N/A	2016/05/20	2017/05/19
RF Cable	HUBER+SUHNER	RG214	N/A	2016/06/02	2017/06/01
Climate Chamber	ESPEC	EL-10KA	A20120523	2016/05/19	2017/05/18
SIGNAL GENERATOR	Agilent	E4421B	US40051744	2016/05/19	2017/05/18
Directional Coupler	Agilent	87300B	3116A03638	2016/05/19	2017/05/18

2.5 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: 2ALE4-TK10SDC filing to comply with of the FCC Part 22 and Part 24 Rules.

2.6 Modifications

No modifications were implemented to meet testing criteria.

3 TEST CONDITIONS AND RESULTS

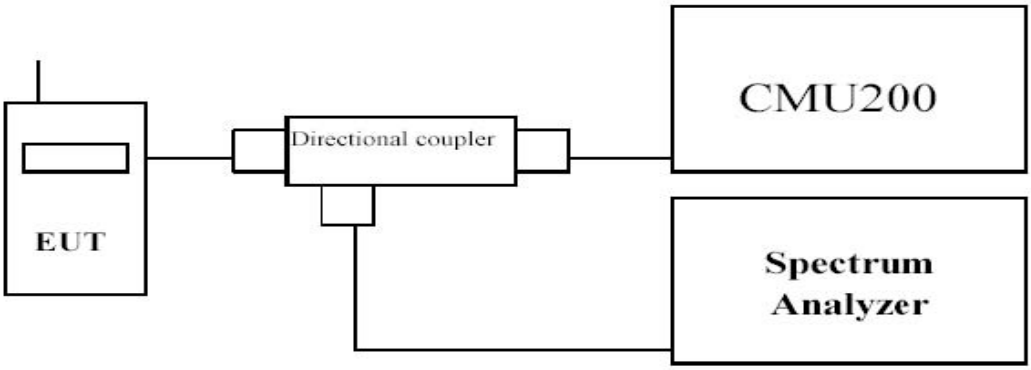
3.1 Output Power

LIMIT

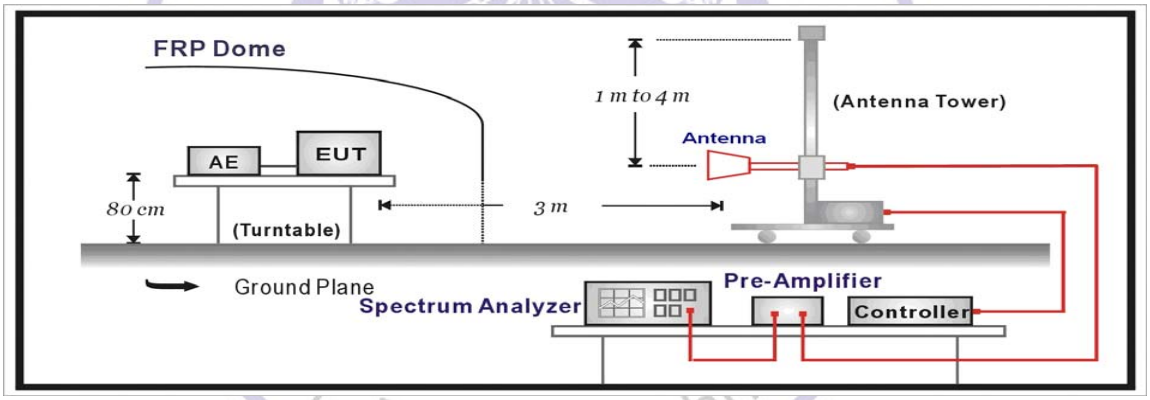
GSM850/WCDMA Band V: 7W
PCS1900/WCDMA Band II: 2W
The Peak-to-Average Ratio (PAR) of the transmission may not exceed 13 dB.

TEST CONFIGURATION

Conducted Power Measurement



Radiated Power Measurement:



TEST PROCEDURE

The EUT was setup according to EIA/TIA 603C

Conducted Power Measurement:

a) Place the EUT on a bench and set it in transmitting mode.

b) Connect a low loss RF cable from the antenna port to a spectrum analyzer and CMU200 by a Directional Couple.

c) EUT Communicate with CMU200 then selects a channel for testing.

d) Add a correction factor to the display of spectrum, and then test.

Radiated Power Measurement:

a) The EUT shall be placed at the specified height on a support, and in the position closest to normal use as declared by provider.

b) The test antenna shall be oriented initially for vertical polarization and shall be chosen to correspond to the frequency of the transmitter

c) The output of the test antenna shall be connected to the measuring receiver.

d) The transmitter shall be switched on and the measuring receiver shall be tuned to the frequency of the transmitter under test.

e) The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.

f) The transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.

g) The test antenna shall be raised and lowered again through the specified range of height until a maximum signal level is detected by the measuring receiver.

h) The maximum signal level detected by the measuring receiver shall be noted.

i) The transmitter shall be replaced by a substitution antenna.

j) The substitution antenna shall be orientated for vertical polarization and the length of the substitution antenna shall be adjusted to correspond to the frequency of the transmitter.

k) The substitution antenna shall be connected to a calibrated signal generator.

l) If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.

m) The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.

n) The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the measuring receiver.

o) The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.

p) The measure of the effective radiated power is the larger of the two levels recorded at the input to the substitution antenna, corrected for gain of the substitution antenna if necessary.

TEST RESULTS

Conducted Measurement:

EUT Mode	Channel	Frequency (MHz)	Avg.Burst Power (dBm)	Peak-to-Average Ratio (dB)	Limit (dBm)	Result
GPRS850 (GMSK,1Slot)	128	824.20	32.66	/	38.45	Pass
	190	836.60	32.85	/		
	251	848.80	32.45	/		
EGPRS850 (8PSK,1Slot)	128	824.20	27.23	/	38.45	Pass
	190	836.60	27.36	/		
	251	848.80	27.41	/		
GPRS1900 (GMSK,1Slot)	512	1850.20	29.56	0.41	33.01	Pass
	661	1880.00	29.66	0.65		
	810	1909.80	29.48	0.58		
EGPRS1900 (8PSK,1Slot)	512	1850.20	26.54	3.22	33.01	Pass
	661	1880.00	26.85	3.46		
	810	1909.80	26.90	3.35		
HSDPA Band II (QPSK)	9262	1852.40	22.54	3.74	33.01	Pass
	9400	1880.00	22.69	3.69		
	9538	1907.60	22.41	3.50		
HSUPA Band V (QPSK)	4132	826.40	22.23	/	38.45	Pass
	4183	836.60	22.67	/		
	4233	846.60	22.48	/		

Note: 1.Peak-to-Average Ratio= maximum PK burst power-maximum Avg. burst power.

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Radiated Measurement:

Note: 1. The field strength of radiation emission was measured in the following position: EUT stand-up position (Zaxis), lie-down position (X, Y axis). The data show in this report only with the worst case setup. After exploratory measurement the worst case of Z axis was reported.

Note: 2 We test the H direction and V direction and V direction is worse.

GPRS850

Channel	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	Correction (dB)	P_{Ag} (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
128	-10.16	2.42	8.45	2.15	36.82	30.54	38.45	7.91	V
190	-9.40	2.46	8.45	2.15	36.82	31.26	38.45	7.19	V
251	-10.35	2.53	8.36	2.15	36.82	30.15	38.45	8.30	V

EGPRS850

Channel	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	Correction (dB)	P_{Ag} (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
128	-14.48	2.42	8.45	2.15	36.82	26.22	38.45	12.23	V
190	-14.87	2.46	8.45	2.15	36.82	25.79	38.45	12.66	V
251	-14.29	2.53	8.36	2.15	36.82	26.21	38.45	12.24	V

GPRS1900

Channel	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	P_{Ag} (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
512	-11.45	3.41	10.24	33.6	28.98	33.01	4.03	V
661	-11.34	3.49	10.24	33.6	29.01	33.01	4.00	V
810	-11.54	3.55	10.23	33.6	28.74	33.01	4.27	V

EGPRS1900

Channel	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	P_{Ag} (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
512	-15.02	3.41	10.24	33.6	25.41	33.01	7.60	V
661	-14.70	3.49	10.24	33.6	25.65	33.01	7.36	V
810	-15.07	3.55	10.23	33.6	25.21	33.01	7.80	V

WCDMA BAND II

Channel	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	P_{Ag} (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
9262	-19.90	3.42	10.24	33.6	20.52	33.01	12.49	V
9400	-18.93	3.49	10.24	33.6	21.42	33.01	11.59	V
9538	-19.60	3.54	10.23	33.6	20.69	33.01	12.32	V

WCDMA BAND V

Channel	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	Correction (dB)	P_{Ag} (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
4132	-20.47	2.43	8.45	2.15	36.82	20.22	38.45	18.23	V
4183	-20.21	2.46	8.45	2.15	36.82	20.45	38.45	18.00	V
4233	-19.66	2.52	8.36	2.15	36.82	20.85	38.45	17.60	V

Remark:

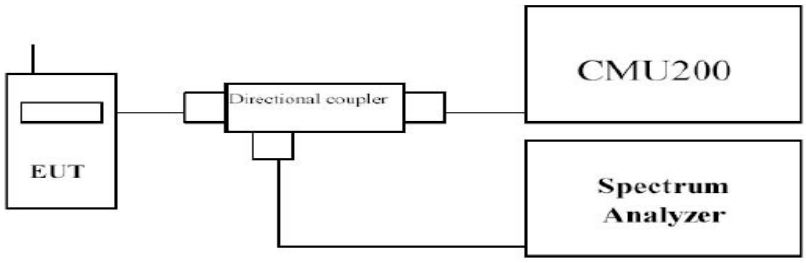
1. *$EIRP=P_{Mea}(dBm)-P_{cl}(dB)+P_{Ag}(dB)+G_a(dBi)$*
2. *ERP = EIRP – 2.15dBi as EIRP by subtracting the gain of the dipole.*

3.2 Occupied Bandwidth

LIMIT

N/A

TEST CONFIGURATION



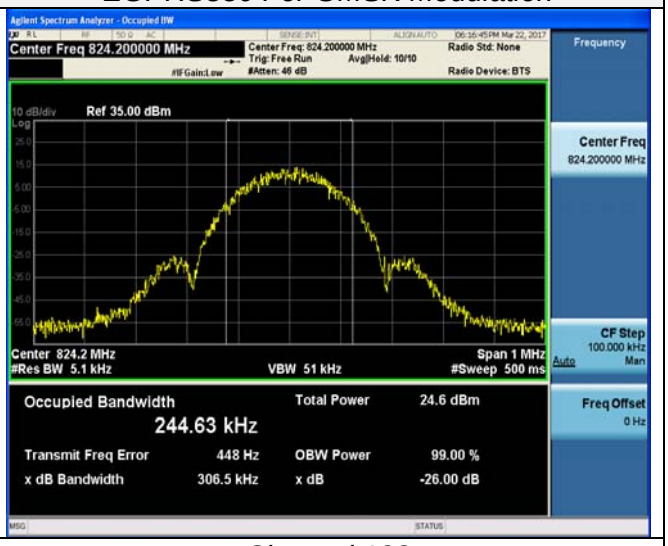
TEST PROCEDURE

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 RESULTS

EUT Mode	Channel	Frequency (MHz)	99% Occupy bandwidth (KHz)	-26dB bandwidth (KHz)
GPRS850 (GMSK,1Slot)	128	824.20	247.41	311.30
	190	836.60	245.69	312.40
	251	848.80	246.49	311.30
EGPRS850 (8PSK,1Slot)	128	824.20	244.63	305.60
	190	836.60	246.10	306.10
	251	848.80	248.91	309.10
GPRS1900 (GMSK,1Slot)	512	1850.20	245.60	311.10
	661	1880.00	245.18	318.00
	810	1909.80	243.04	314.00
EGPRS1900 (8PSK,1Slot)	512	1850.20	246.86	309.80
	661	1880.00	243.74	300.80
	810	1909.80	246.03	313.50
WCDMA Band II (QPSK)	9262	1852.4	4203.50	4878.00
	9400	1880.0	4206.50	4824.00
	9538	1907.6	4210.20	4840.00
WCDMA Band V (QPSK)	4132	826.4	4210.00	4845.00
	4183	836.6	4200.50	4848.00
	4233	846.6	4214.50	4842.00

Test plots as follow:

GPRS850 For GMSK Modulation	*EGPRS850 For GMSK Modulation*
	
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	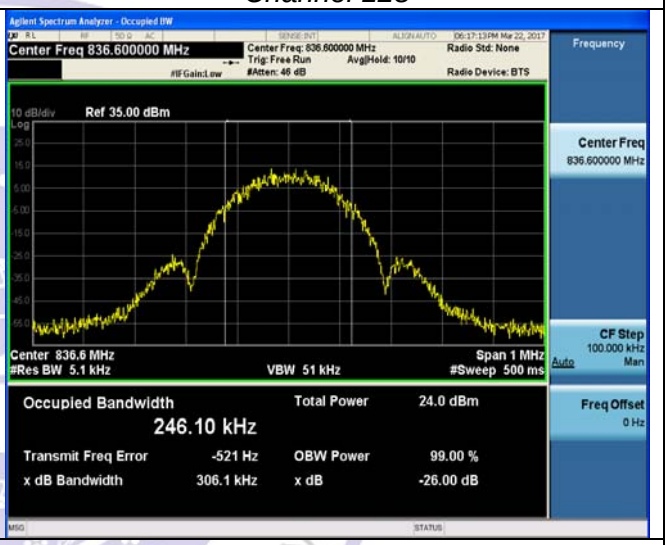
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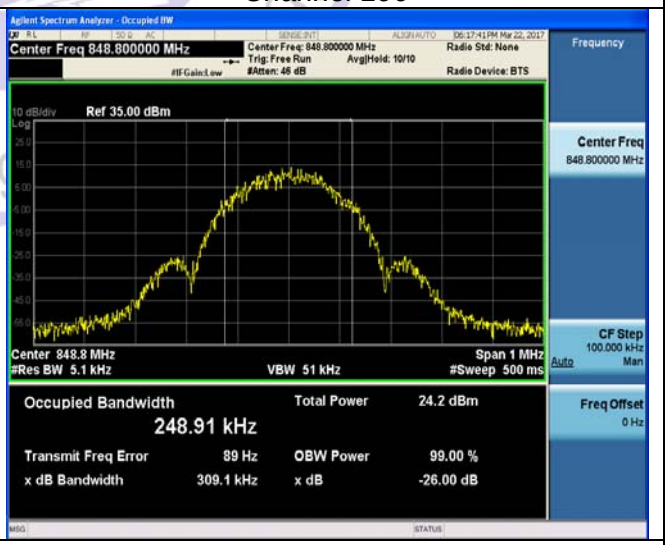
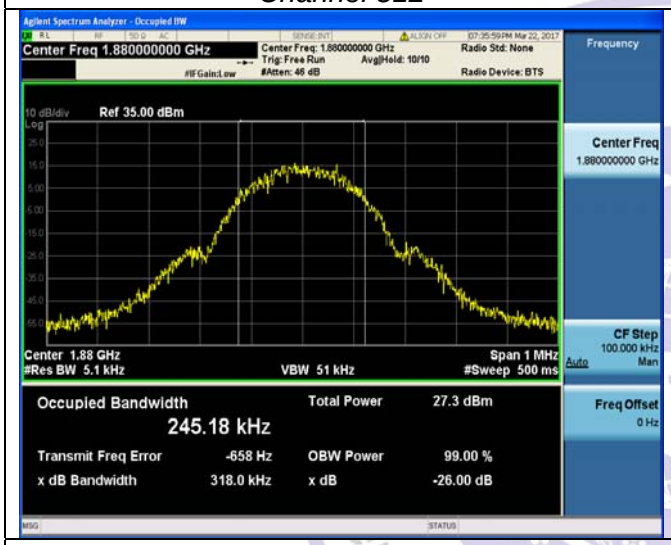
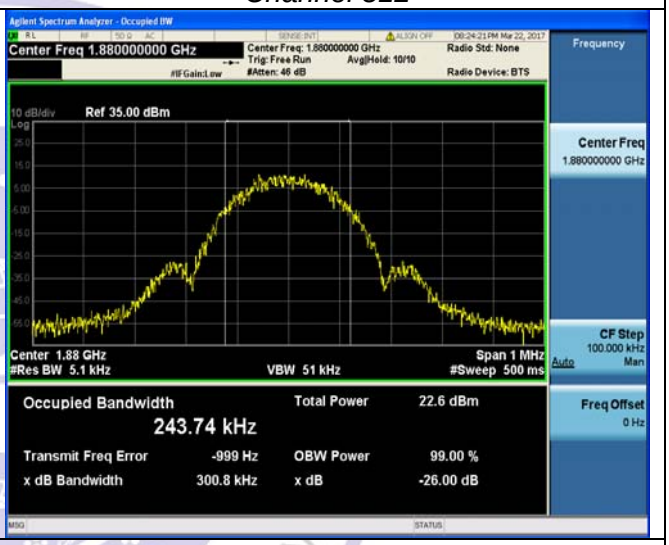
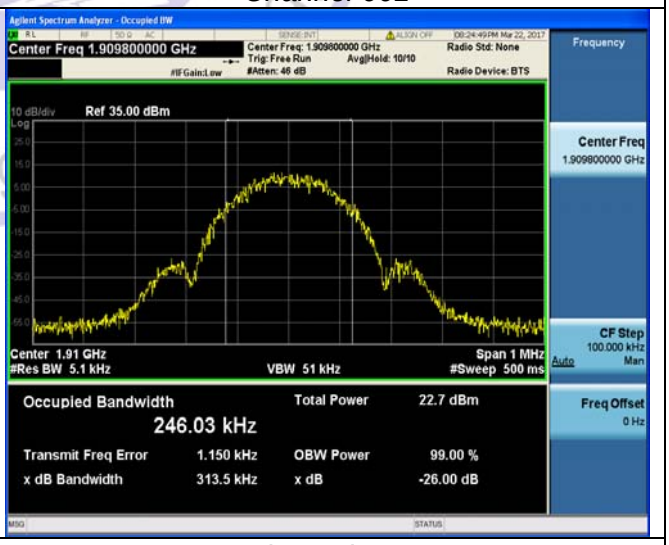
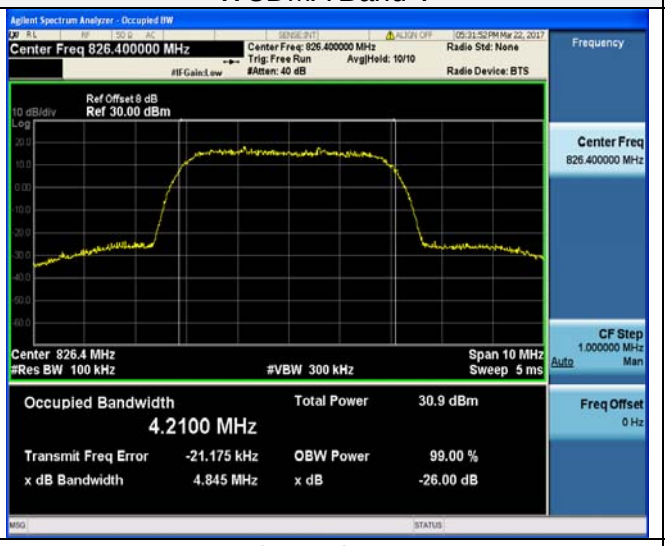
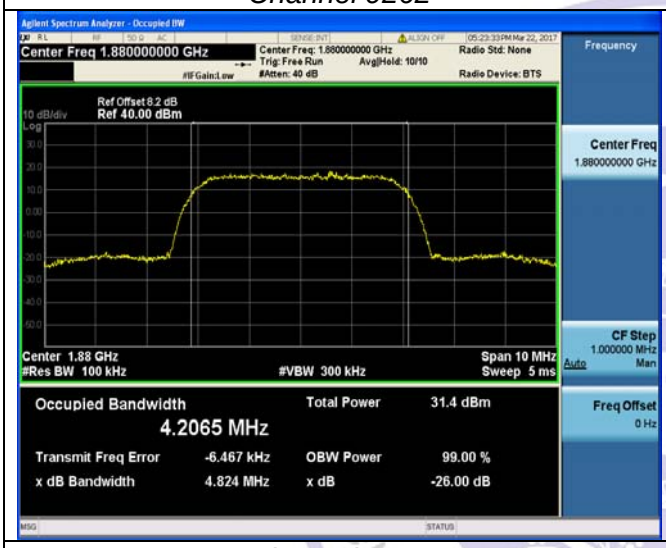
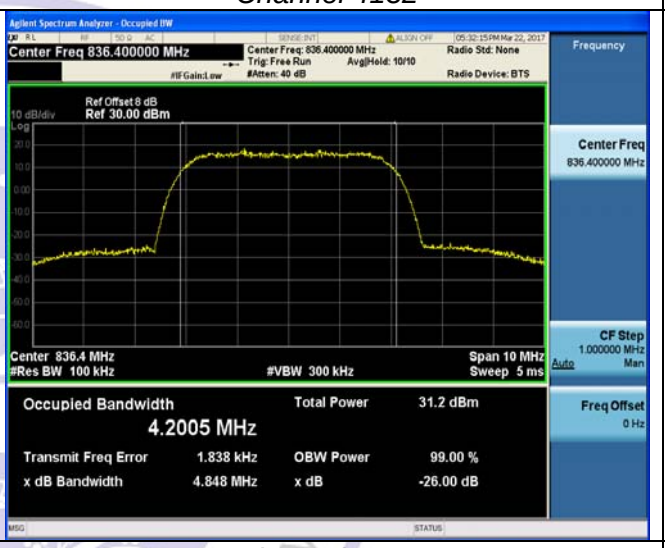
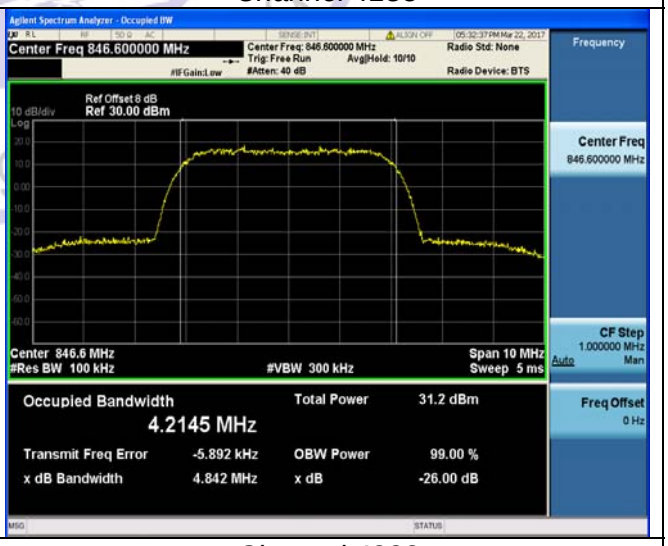
	
Channel 251	*Channel 251*

GPRS1900 For GMSK Modulation	EGPRS1900 For GMSK Modulation
Channel 512	Channel 512
	
Channel 661	Channel 661
	
Channel 810	Channel 810

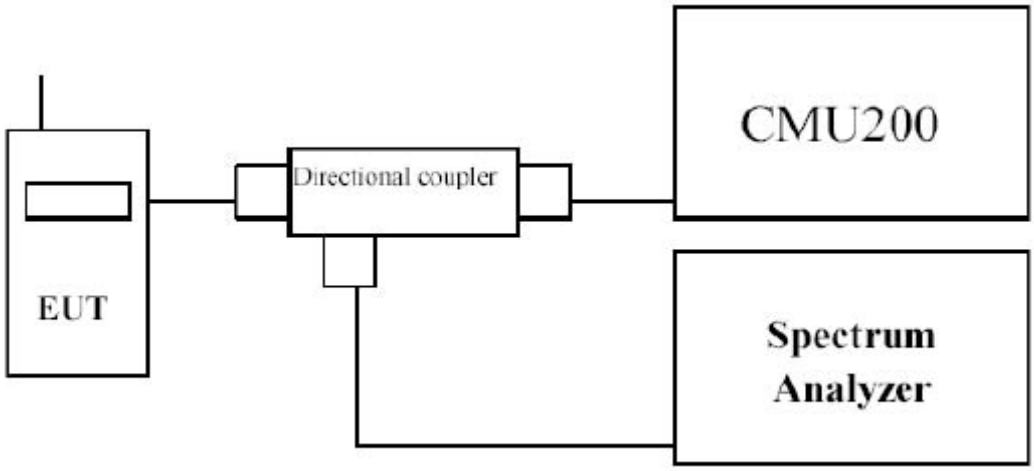
WCDMA Band II	WCDMA Band V
	
Channel 9262	Channel 4132
	
Channel 9400	Channel 4183
	
Channel 9538	Channel 4233

3.3 Band Edge compliance

LIMIT

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10log (P) dB.

TEST CONFIGURATION

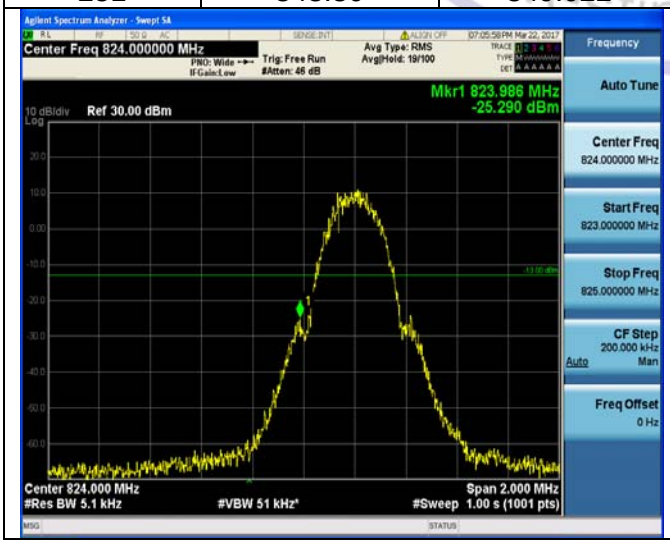


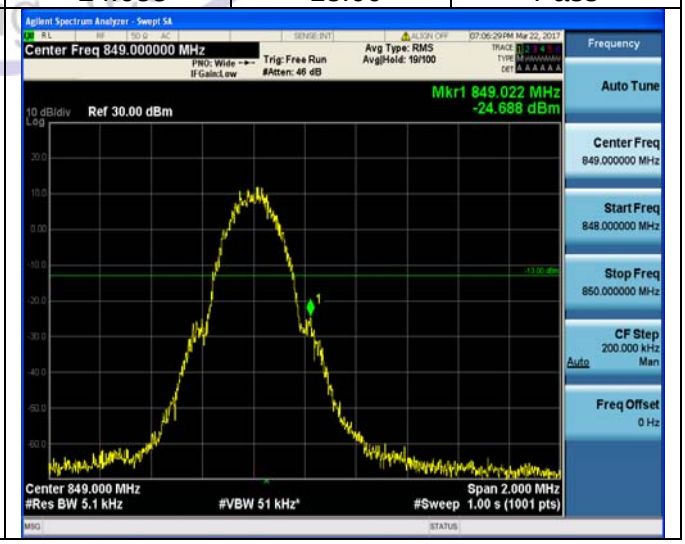
TEST PROCEDURE

In the 1MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to measure the out of band Emissions.

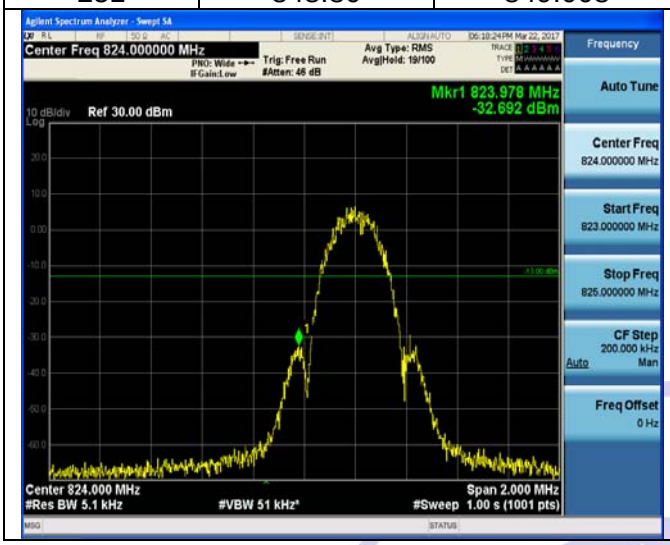
TEST RESULTS

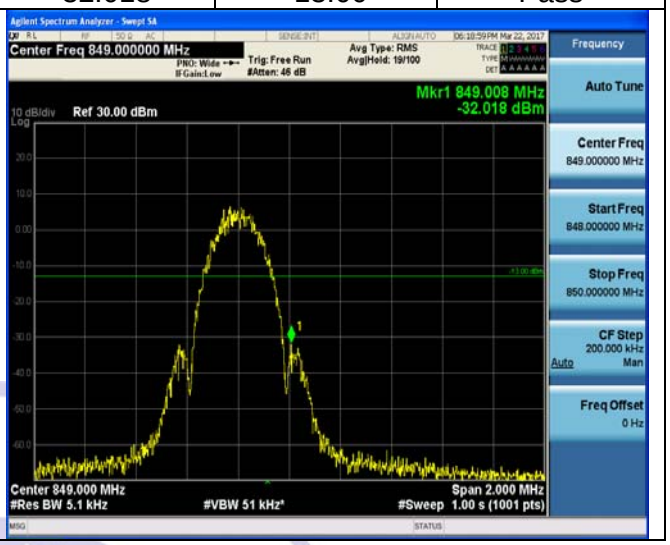
GPRS850					
Channel Number	Frequency (MHz)	Max Measurement Results		Limit (dBm)	Verdict
		Frequency (MHz)	Values (dBm)		
128	824.20	823.980	-25.290	-13.00	Pass
251	848.80	849.022	-24.688	-13.00	Pass



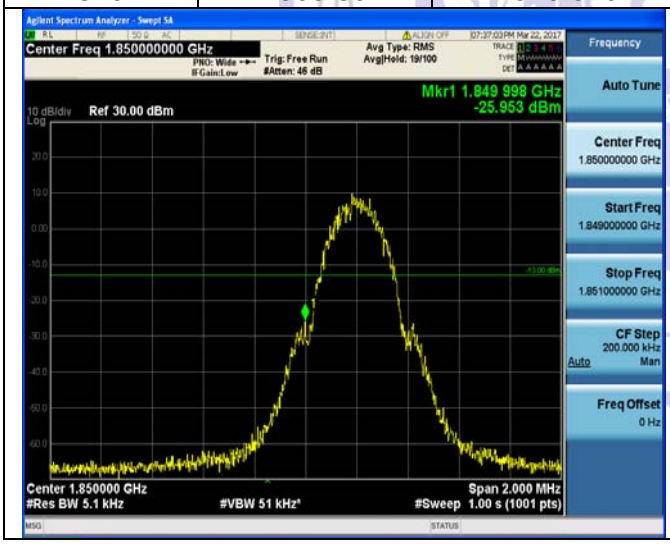


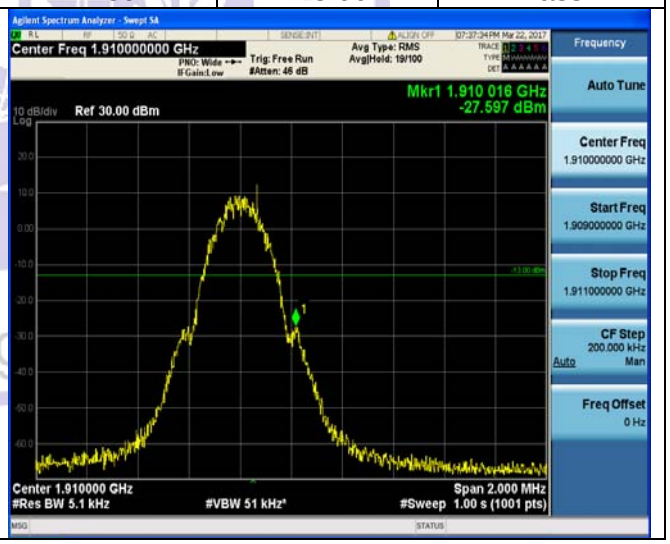
EGPRS850					
Channel Number	Frequency (MHz)	Measurement Results		Limit (dBm)	Verdict
		Frequency (MHz)	Values (dBm)		
128	824.20	823.978	-32.692	-13.00	Pass
251	848.80	849.008	-32.018	-13.00	Pass



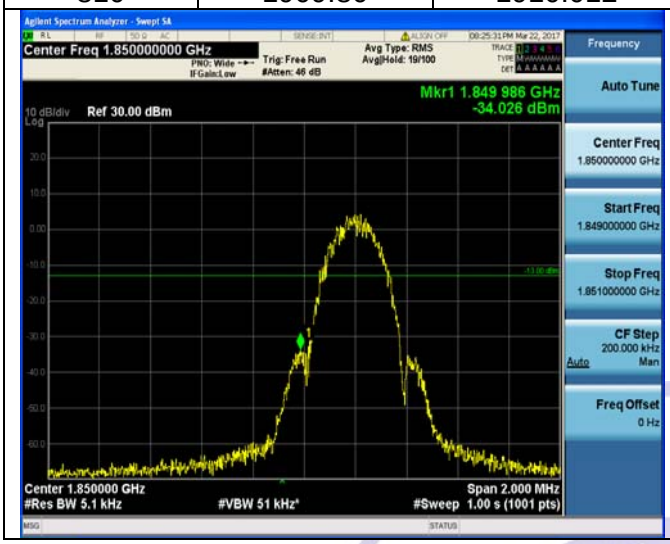


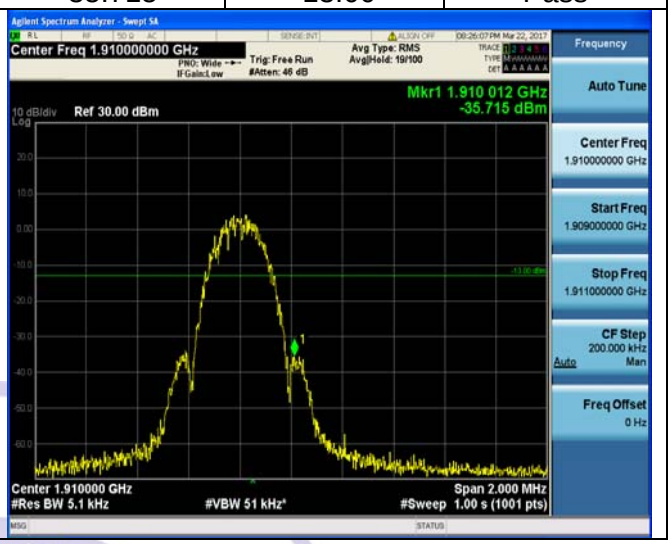
GPRS1900					
Channel Number	Frequency (MHz)	Measurement Results		Limit (dBm)	Verdict
		Frequency (MHz)	Values (dBm)		
512	1850.20	1849.998	-25.953	-13.00	Pass
810	1909.80	1910.016	-27.597	-13.00	Pass





EGPRS1900					
Channel Number	Frequency (MHz)	Measurement Results		Limit (dBm)	Verdict
		Frequency (MHz)	Values (dBm)		
512	1850.20	1849.986	-34.026	-13.00	Pass
810	1909.80	1910.012	-35.715	-13.00	Pass





WCDMA Band II					
Channel Number	Frequency (MHz)	Measurement Results		Limit (dBm)	Verdict
		Frequency (MHz)	Values (dBm)		
9262	1852.4	1849.875	-20.755	-13.00	Pass
9538	1907.6	1910.170	-19.987	-13.00	Pass

WCDMA Band V					
Channel Number	Frequency (MHz)	Measurement Results		Limit (dBm)	Verdict
		Frequency (MHz)	Values (dBm)		
4132	826.4	823.993	-19.389	-13.00	Pass
4233	846.6	849.001	-21.120	-13.00	Pass

Shenzhen CTL Testing Technology Co.,Ltd.

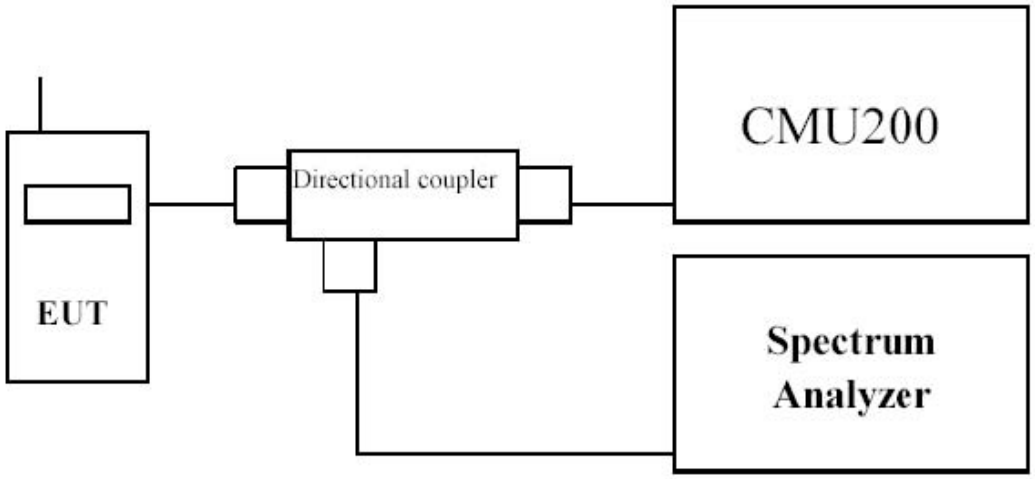
3.4 Spurious Emission

LIMIT

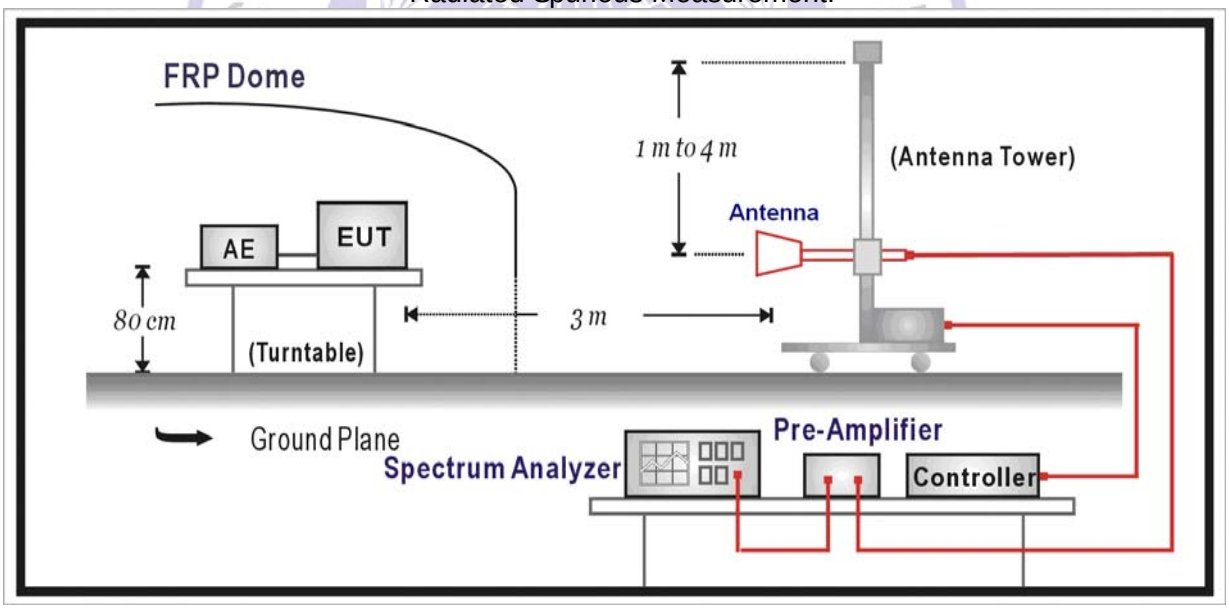
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10log (P) dB.

TEST CONFIGURATION

Conducted Spurious Measurement:



Radiated Spurious Measurement:



TEST PROCEDURE

The EUT was setup according to EIA/TIA 603C

Conducted Spurious Measurement:

a) Place the EUT on a bench and set it in transmitting mode.

b) Connect a low loss RF cable from the antenna port to a spectrum analyzer and CMU200 by a Directional Couple.

c) EUT Communicate with CMU200 then selects a channel for testing.

d) Add a correction factor to the display of spectrum, and then test.

e) The resolution bandwidth of the spectrum analyzer was set at 1MHz for Part 22 and 1MHz for Part 24, sufficient scans were taken to show the out of band Emission if any up to10th harmonic.

Radiated Spurious Measurement:

a) The EUT shall be placed at the specified height on a support, and in the position closest to normal use as declared by provider.

b) The test antenna shall be oriented initially for vertical polarization and shall be chosen to correspond to the frequency of the transmitter

c) The output of the test antenna shall be connected to the measuring receiver.

d) The transmitter shall be switched on and the measuring receiver shall be tuned to the frequency of the transmitter under test.

e) The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.

f) The transmitter shall then be rotated through 360°in the horizontal plane, until the maximum signal level is detected by the measuring receiver.

g) The test antenna shall be raised and lowered again through the specified range of height until a maximum signal level is detected by the measuring receiver.

h) The maximum signal level detected by the measuring receiver shall be noted.

i) The transmitter shall be replaced by a substitution antenna.

j) The substitution antenna shall be orientated for vertical polarization and the length of the substitution antenna shall be adjusted to correspond to the frequency of the transmitter.

k) The substitution antenna shall be connected to a calibrated signal generator.

l) If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.

m) The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.

n) The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the measuring receiver.

o) The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.

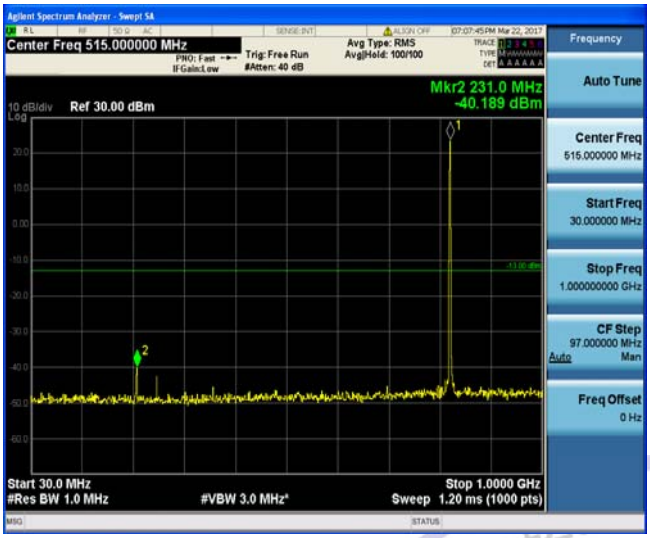
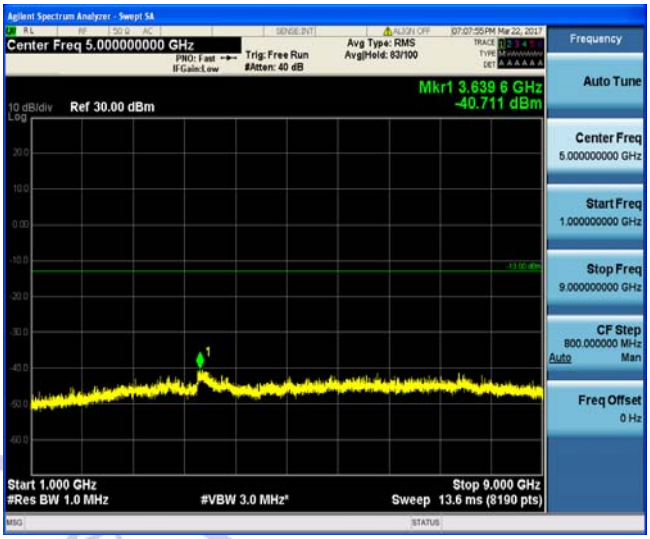
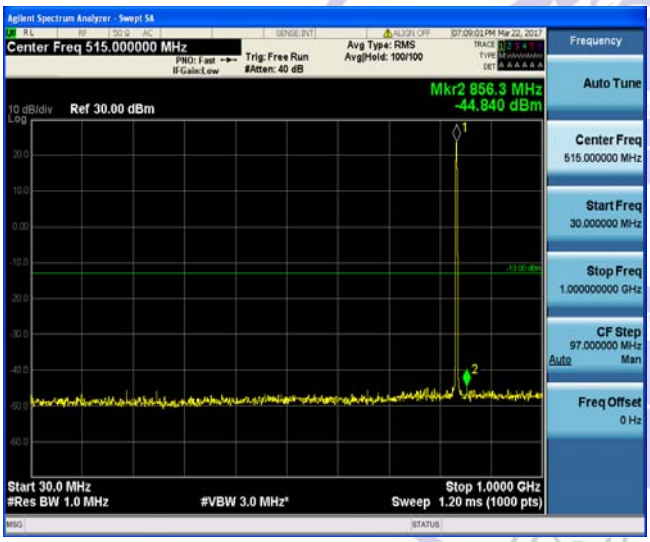
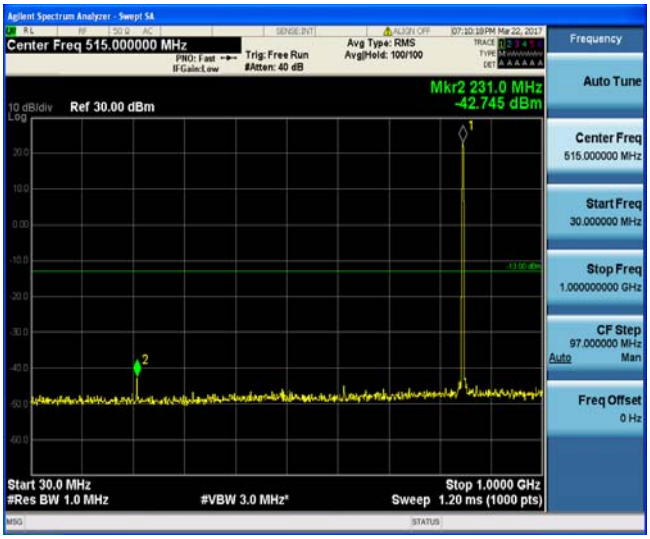
p) The measure of the effective radiated power is the larger of the two levels recorded at the input to the substitution antenna, corrected for gain of the substitution antenna if necessary.

q) The resolution bandwidth of the spectrum analyzer was set at 100 kHz for Part 22 and 1MHz for Part 24. The frequency range was checked up to 10th harmonic.

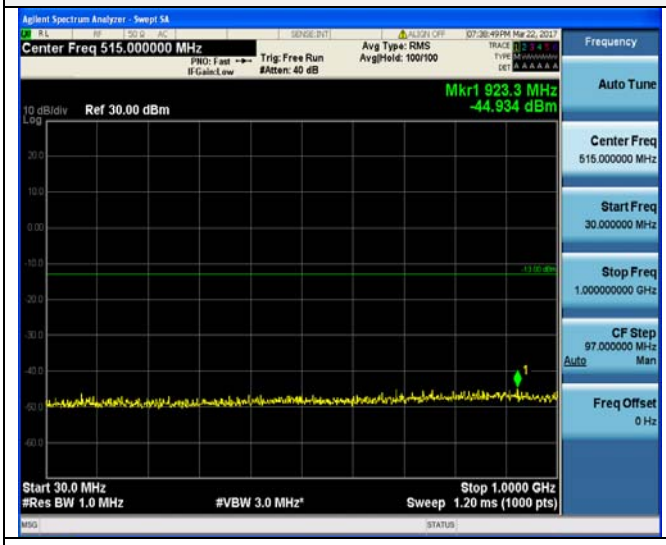
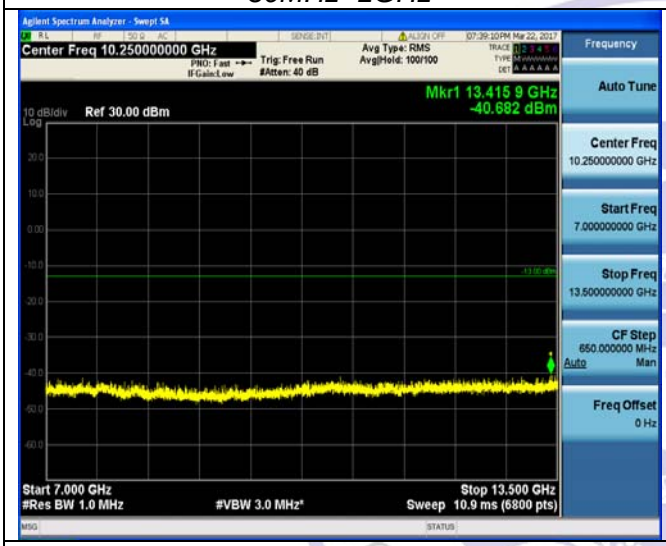
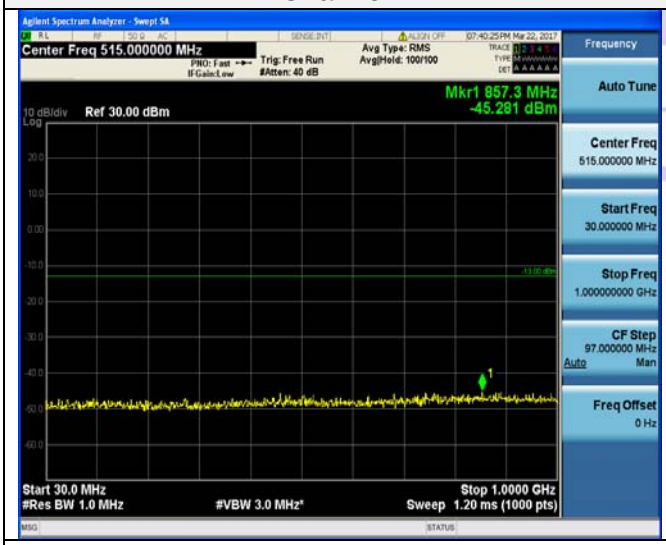
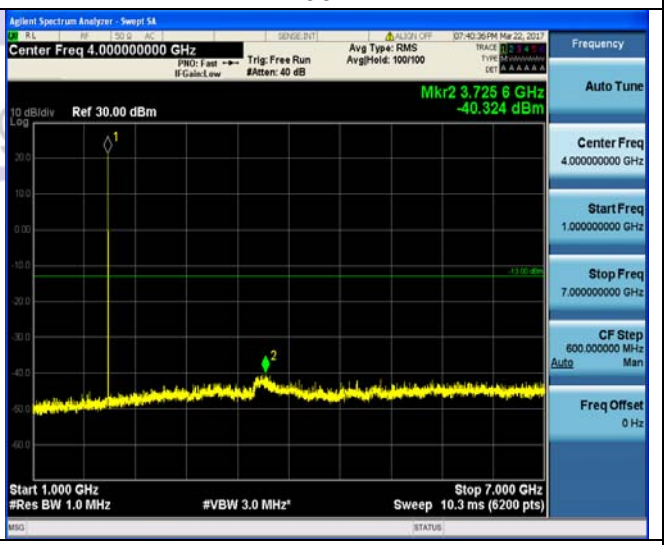
TEST RESULTS

Conducted Measurement:

GPRS850

Channel:	*128*
	
30MHz~1GHz	*1GHz~9GHz*
Channel:	*190*
	
30MHz~1GHz	*1GHz~9GHz*
Channel:	*251*
	
30MHz~1GHz	*1GHz~9GHz*

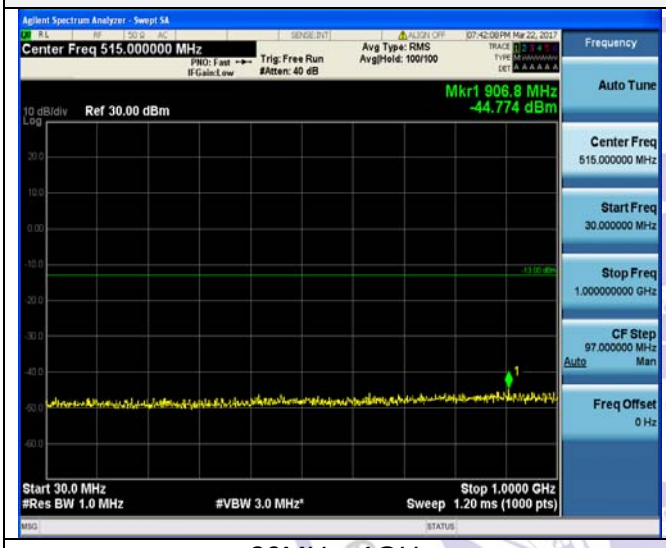
GPRS1900

Channel:	512
	
30MHz~1GHz	*1GHz~7GHz*
	
7GHz~13.5GHz	*13.5GHz~20GHz*
Channel:	*661*
	
30MHz~1GHz	*1GHz~7GHz*

7GHz~13.5GHz

13.5GHz~20GHz

Channel: 810



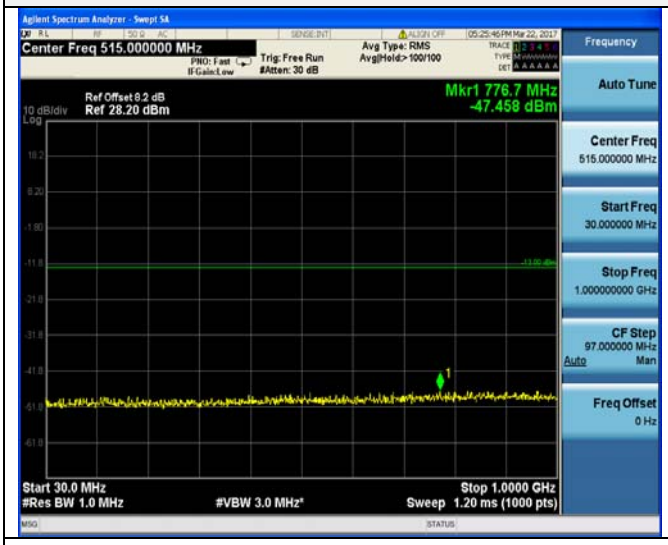
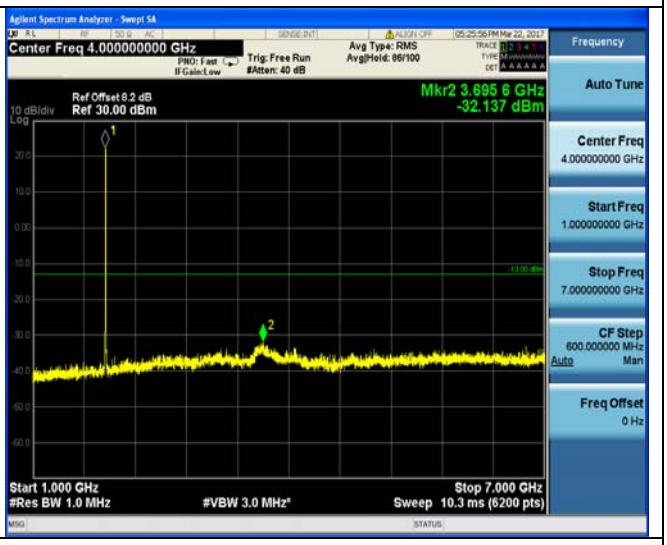
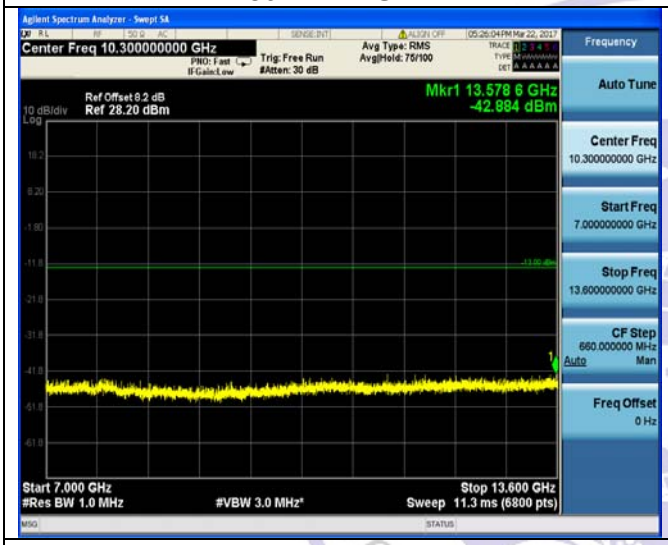
30MHz~1GHz

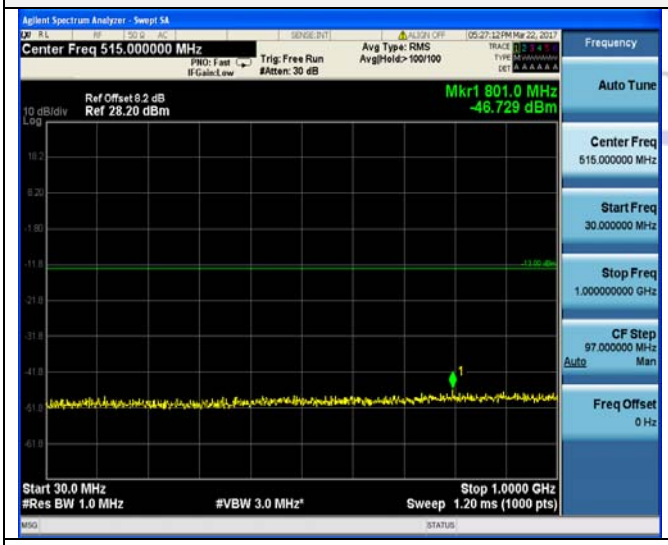
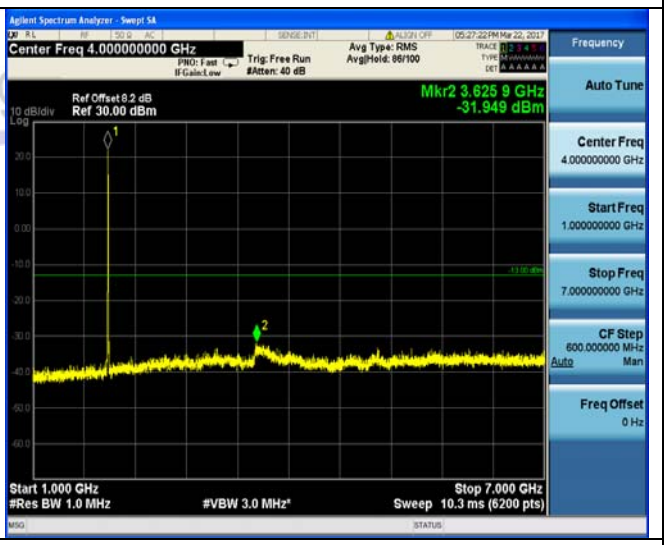
1GHz~7GHz

7GHz~13.5GHz

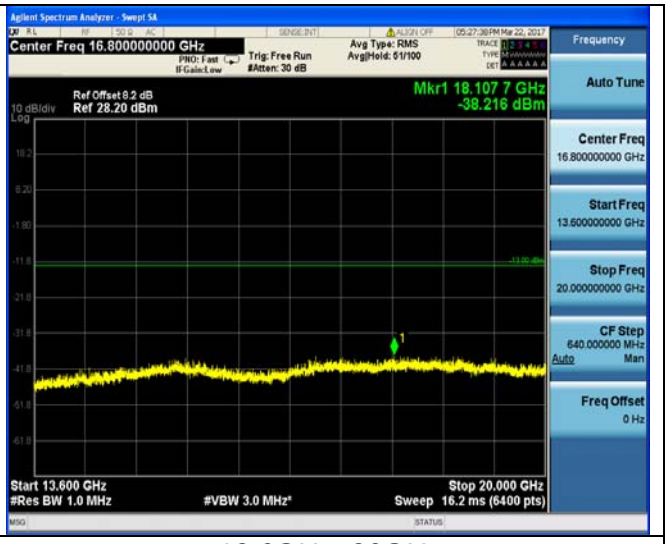
13.5GHz~20GHz

WCDMA Band II

Channel:	*9262*
	
30MHz~1GHz	*1GHz~7GHz*
	
7GHz~13.6GHz	*13.6GHz~20GHz*

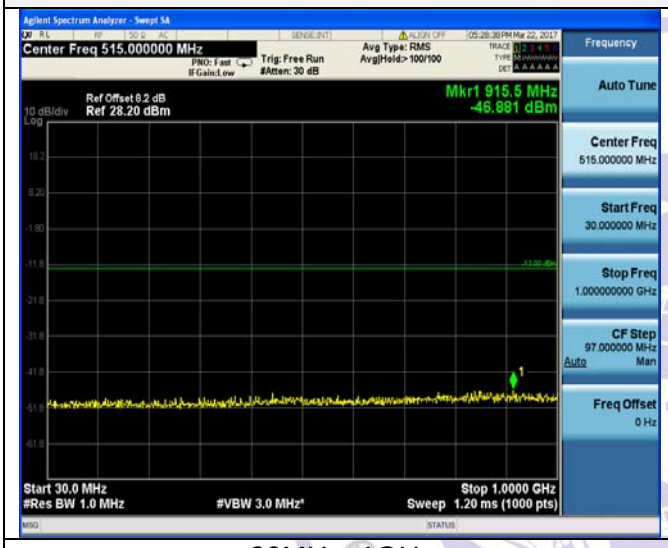
Channel:	*9400*
	
30MHz~1GHz	*1GHz~7GHz*

7GHz~13.6GHz

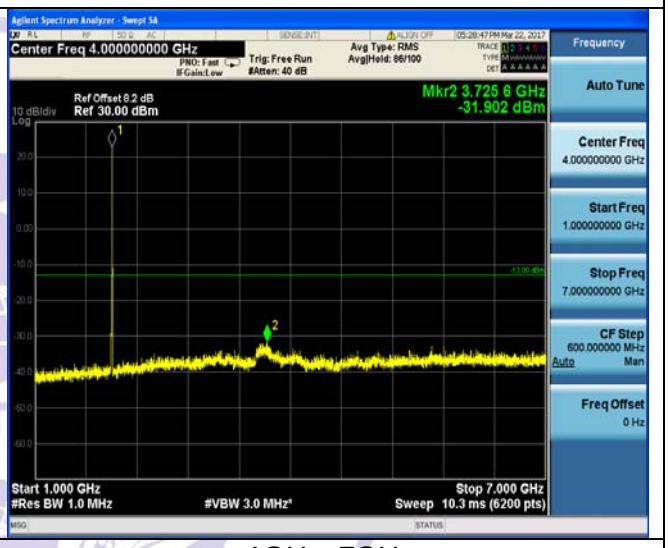


13.6GHz~20GHz

Channel: 9538



30MHz~1GHz

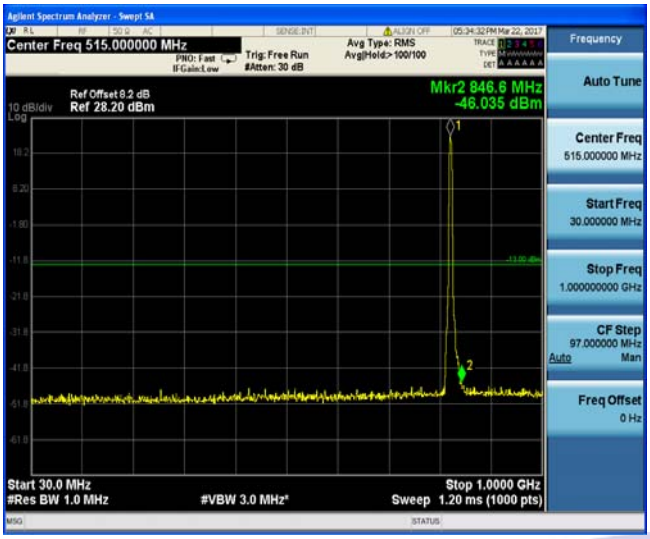
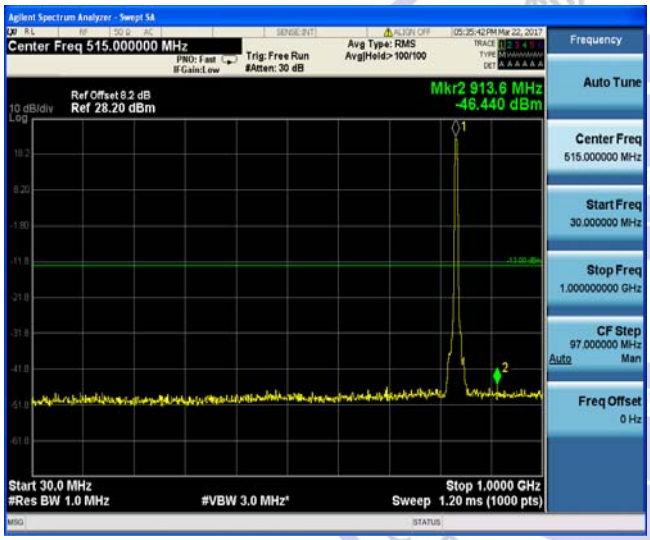
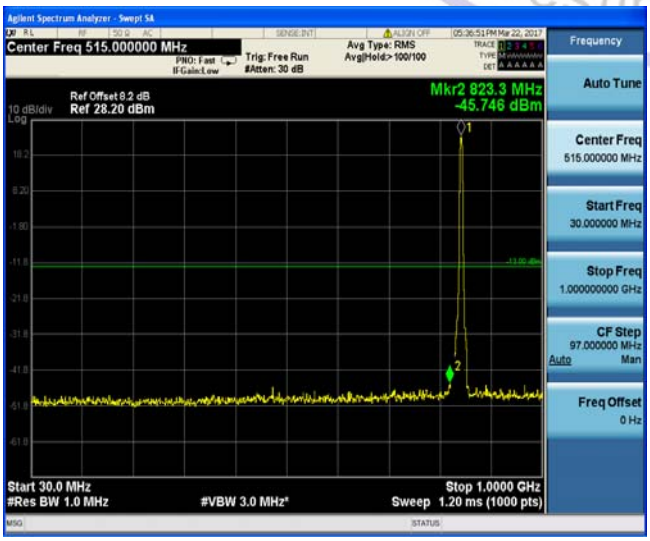


1GHz~7GHz

7GHz~13.6GHz

13.6GHz~20GHz

WCDMA Band V

Channel:	*4132*
	
30MHz~1GHz	*1GHz~9GHz*
Channel:	*4183*
	
30MHz~1GHz	*1GHz~9GHz*
Channel:	*4233*
	
30MHz~1GHz	*1GHz~9GHz*

Radiated Measurement:

GPRS850

Channel	Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
128	1648.40	-32.83	3.00	3.00	9.58	-26.25	-13.00	13.25	H
	2472.60	-35.49	3.47	3.00	10.72	-28.24	-13.00	15.24	H
	1648.40	-31.20	3.00	3.00	9.68	-24.52	-13.00	11.52	V
	2472.60	-34.11	3.47	3.00	10.72	-26.86	-13.00	13.86	V
190	1673.20	-33.72	3.14	3.00	9.61	-27.25	-13.00	14.25	H
	2509.80	-36.75	3.59	3.00	10.77	-29.57	-13.00	16.57	H
	1673.20	-32.05	3.14	3.00	9.61	-25.58	-13.00	12.58	V
	2509.80	-35.05	3.59	3.00	10.77	-27.87	-13.00	14.87	V
251	1697.60	-32.07	3.26	3.00	9.77	-25.56	-13.00	12.56	H
	2546.40	-36.86	3.69	3.00	10.89	-29.66	-13.00	16.66	H
	1697.60	-31.38	3.26	3.00	9.77	-24.87	-13.00	11.87	V
	2546.40	-32.66	3.69	3.00	10.89	-25.46	-13.00	12.46	V

EGPRS850

Channel	Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
128	1648.40	-37.14	3.00	3.00	9.58	-30.56	-13.00	17.56	H
	2472.60	-39.79	3.47	3.00	10.72	-32.54	-13.00	19.54	H
	1648.40	-35.55	3.00	3.00	9.68	-28.87	-13.00	15.87	V
	2472.60	-37.91	3.47	3.00	10.72	-30.66	-13.00	17.66	V
190	1673.20	-36.42	3.14	3.00	9.61	-29.95	-13.00	16.95	H
	2509.80	-40.29	3.59	3.00	10.77	-33.11	-13.00	20.11	H
	1673.20	-34.73	3.14	3.00	9.61	-28.26	-13.00	15.26	V
	2509.80	-39.58	3.59	3.00	10.77	-32.4	-13.00	19.40	V
251	1697.60	-36.25	3.26	3.00	9.77	-29.74	-13.00	16.74	H
	2546.40	-40.39	3.69	3.00	10.89	-33.19	-13.00	20.19	H
	1697.60	-35.29	3.26	3.00	9.77	-28.78	-13.00	15.78	V
	2546.40	-39.65	3.69	3.00	10.89	-32.45	-13.00	19.45	V

GPRS1900

Channel	Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
512	3700.40	-34.35	4.25	3.00	12.34	-26.26	-13.00	13.26	H
	5550.60	-36.99	4.97	3.00	13.52	-28.44	-13.00	15.44	H
	3700.40	-33.75	4.25	3.00	12.34	-25.66	-13.00	12.66	V
	5550.60	-36.30	4.97	3.00	13.52	-27.75	-13.00	14.75	V
661	3760.00	-34.85	4.38	3.00	12.34	-26.89	-13.00	13.89	H
	5640.00	-37.81	5.01	3.00	13.58	-29.24	-13.00	16.24	H
	3760.00	-33.74	4.38	3.00	12.34	-25.78	-13.00	12.78	V
	5640.00	-37.20	5.01	3.00	13.58	-28.63	-13.00	15.63	V
810	3819.60	-34.41	4.49	3.00	12.45	-26.45	-13.00	13.45	H
	5729.40	-37.97	5.26	3.00	13.66	-29.57	-13.00	16.57	H
	3819.60	-33.86	4.49	3.00	12.45	-25.90	-13.00	12.90	V
	5729.40	-37.24	5.26	3.00	13.66	-28.84	-13.00	15.84	V

EGPRS1900

Channel	Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
512	3700.40	-39.64	4.25	3.00	12.34	-31.55	-13.00	18.55	H
	5550.60	-44.20	4.97	3.00	13.52	-35.65	-13.00	22.65	H
	3700.40	-39.07	4.25	3.00	12.34	-30.98	-13.00	17.98	V
	5550.60	-43.29	4.97	3.00	13.52	-34.74	-13.00	21.74	V
661	3760.00	-40.16	4.38	3.00	12.34	-32.2	-13.00	19.20	H
	5640.00	-45.08	5.01	3.00	13.58	-36.51	-13.00	23.51	H
	3760.00	-39.16	4.38	3.00	12.34	-31.2	-13.00	18.20	V
	5640.00	-43.97	5.01	3.00	13.58	-35.4	-13.00	22.40	V
810	3819.60	-40.43	4.49	3.00	12.45	-32.47	-13.00	19.47	H
	5729.40	-44.96	5.26	3.00	13.66	-36.56	-13.00	23.56	H
	3819.60	-38.56	4.49	3.00	12.45	-30.6	-13.00	17.60	V
	5729.40	-44.17	5.26	3.00	13.66	-35.77	-13.00	22.77	V

WCDMA Band II

Channel	Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
9262	3704.80	-41.32	4.27	3.00	12.34	-33.25	-13.00	20.25	H
	5557.20	-44.78	4.99	3.00	13.52	-36.25	-13.00	23.25	H
	3704.80	-40.85	4.27	3.00	12.34	-32.78	-13.00	19.78	V
	5557.20	-44.13	4.99	3.00	13.52	-35.60	-13.00	22.60	V
9400	3760.00	-40.11	4.38	3.00	12.34	-32.15	-13.00	19.15	H
	5640.00	-45.14	5.01	3.00	13.58	-36.57	-13.00	23.57	H
	3760.00	-39.61	4.38	3.00	12.34	-31.65	-13.00	18.65	V
	5640.00	-44.04	5.01	3.00	13.58	-35.47	-13.00	22.47	V
9538	3815.20	-42.76	4.47	3.00	12.45	-34.78	-13.00	21.78	H
	5722.80	-44.49	5.23	3.00	13.66	-36.06	-13.00	23.06	H
	3815.20	-41.75	4.47	3.00	12.45	-33.77	-13.00	20.77	V
	5722.80	-42.00	5.23	3.00	13.66	-33.57	-13.00	20.57	V

WCDMA Band V

Channel	Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
9262	1652.80	-38.97	3.02	3.00	9.58	-32.41	-13.00	19.41	H
	2479.20	-44.71	3.51	3.00	10.72	-37.50	-13.00	24.50	H
	1652.80	-39.28	3.02	3.00	9.68	-32.62	-13.00	19.62	V
	2479.20	-40.66	3.51	3.00	10.72	-33.45	-13.00	20.45	V
9400	1673.20	-39.71	3.14	3.00	9.61	-33.24	-13.00	20.24	H
	2509.80	-43.44	3.59	3.00	10.77	-36.26	-13.00	23.26	H
	1673.20	-38.91	3.14	3.00	9.61	-32.44	-13.00	19.44	V
	2509.80	-41.65	3.59	3.00	10.77	-34.47	-13.00	21.47	V
9538	1693.20	-39.89	3.24	3.00	9.77	-33.36	-13.00	20.36	H
	2539.80	-43.38	3.65	3.00	10.89	-36.14	-13.00	23.14	H
	1693.20	-39.03	3.24	3.00	9.77	-32.50	-13.00	19.50	V
	2539.80	-41.91	3.65	3.00	10.89	-34.67	-13.00	21.67	V

Remark:

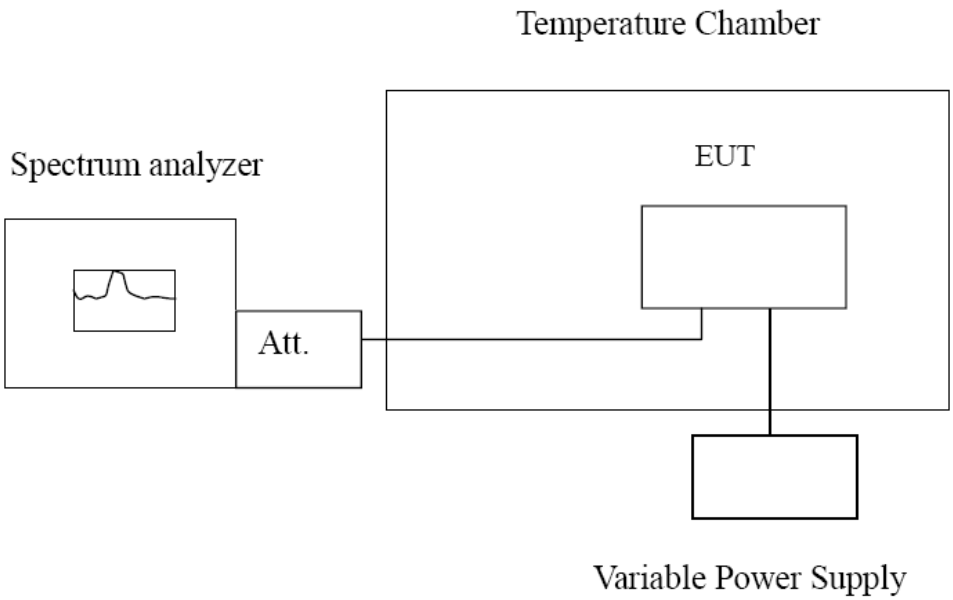
1. *EIRP=P_{Mea}(dBm)-P_{cl}(dB) +G_a(dBi)*
2. *We were not recorded other points as values lower than limits.*
3. *Margin = Limit - EIRP*

3.5 Frequency Stability under Temperature & Voltage Variations

LIMIT

Cellular Band: ±2.5ppm PCS Band: Within the authorized frequency block

TEST CONFIGURATION



TEST PROCEDURE

The EUT was setup according to EIA/TIA 603C

Frequency Stability under Temperature Variations:
The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20℃ operating frequency as reference frequency. Turn EUT off and set the chamber temperature to -30℃. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10℃ increased per stage until the highest temperature of +50℃ reached.

Frequency Stability under Voltage Variations:
Set chamber temperature to 20℃. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.
Reduce the input voltage to specify extreme voltage variation (±15%) and endpoint, record the maximum frequency change.

TEST RESULTS

Reference Frequency: GSM850 Middle channel=190 channel=836.6MHz					
Voltage (V)	Temperature (℃)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.70	-30	66.54	0.07954	2.5	Pass
	-20	75.41	0.09014		
	-10	54.78	0.06548		
	0	58.56	0.07000		
	10	65.41	0.07819		
	20	55.98	0.06691		
	30	42.56	0.05087		
	40	45.87	0.05483		
	50	54.50	0.06514		
4.26	25	60.22	0.07198		
End point 3.00	25	71.84	0.08587		

Reference Frequency: PCS1900 Middle channel=661 channel=1880MHz					
Voltage (V)	Temperature (℃)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.70	-30	47.56	0.02530	Within the authorized frequency block	Pass
	-20	54.21	0.02884		
	-10	59.60	0.03170		
	0	48.74	0.02593		
	10	50.22	0.02671		
	20	55.69	0.02962		
	30	49.87	0.02653		
	40	60.25	0.03205		
	50	58.20	0.03096		
4.26	25	45.78	0.02435		
End point 3.00	25	81.11	0.04314		

Reference Frequency: WCDMA Band II Middle channel=9400 channel=1880MHz					
Voltage (V)	Temperature (℃)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.70	-30	36.45	0.01939	Within the authorized frequency block	Pass
	-20	50.26	0.02673		
	-10	40.98	0.02180		
	0	39.74	0.02114		
	10	44.22	0.02352		
	20	38.63	0.02055		
	30	40.98	0.02180		
	40	60.23	0.03204		
	50	45.78	0.02435		
4.26	25	60.57	0.03222		
End point 3.00	25	84.70	0.04505		

Reference Frequency: WCDMA Band V Middle channel=4182 channel=836.6MHz					
Voltage (V)	Temperature (℃)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.70	-30	40.55	0.04847	2.5	Pass
	-20	60.59	0.07242		
	-10	58.01	0.06934		
	0	43.56	0.05207		
	10	55.50	0.06634		
	20	48.74	0.05826		
	30	50.26	0.06008		
	40	61.52	0.07354		
	50	55.47	0.06630		
4.26	25	60.35	0.07214		
End point 3.00	25	91.52	0.10940		

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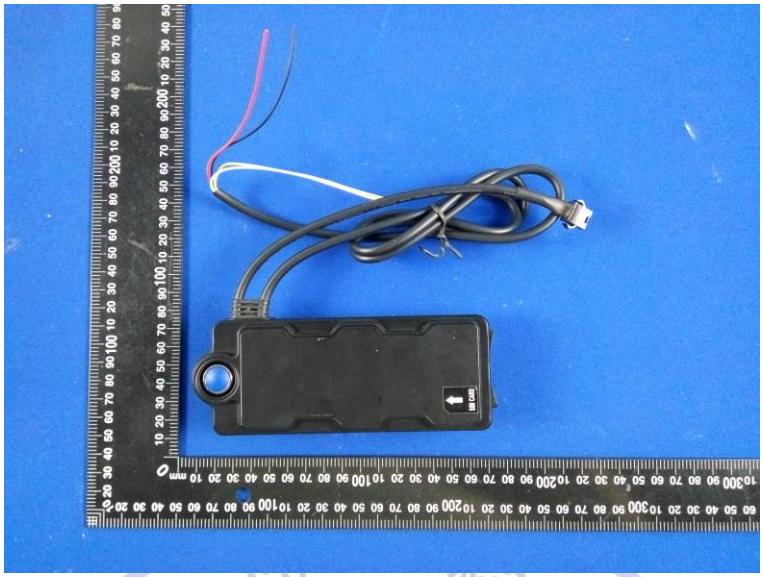
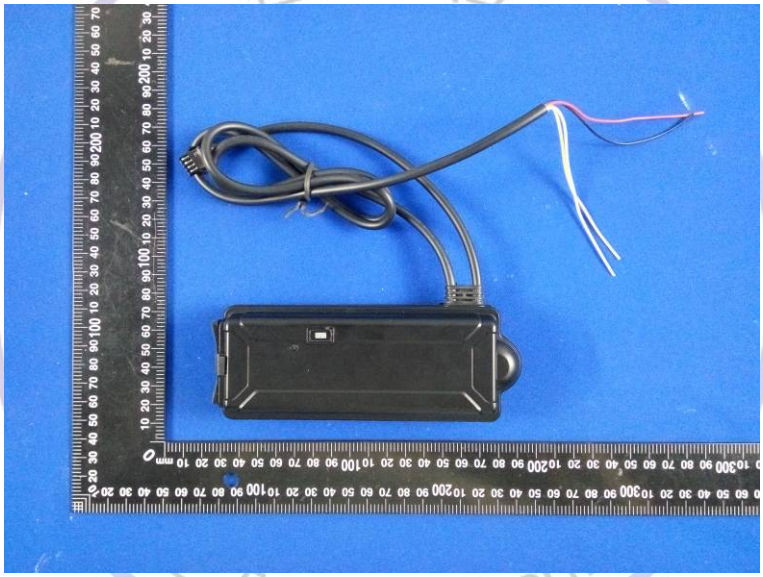
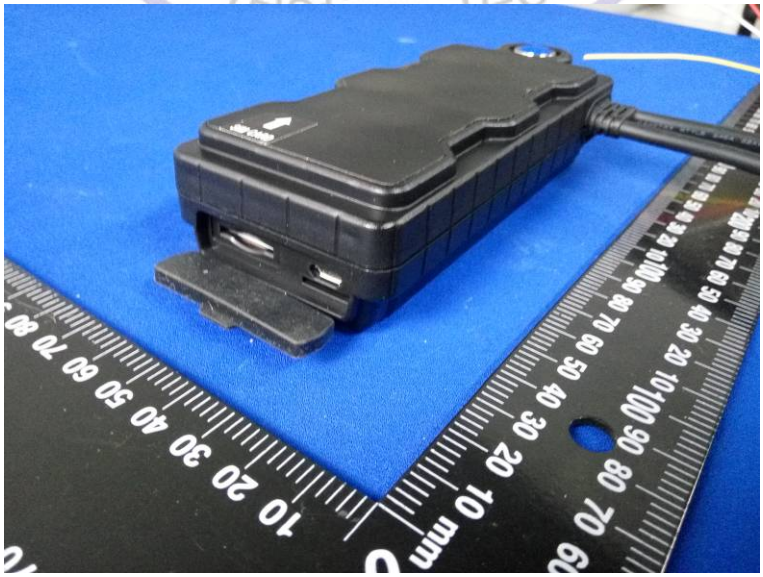
4 Test Setup Photos of the EUT

5 External and Internal Photos of the EUT

External Photos of EUT







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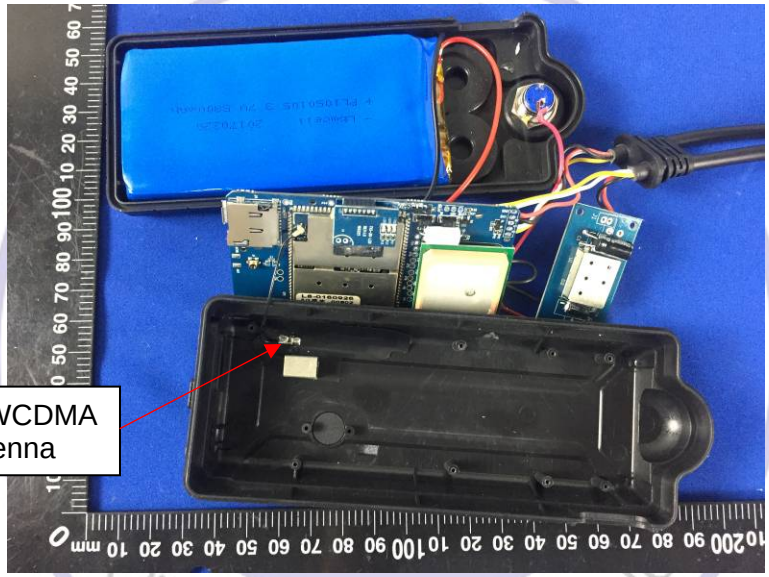
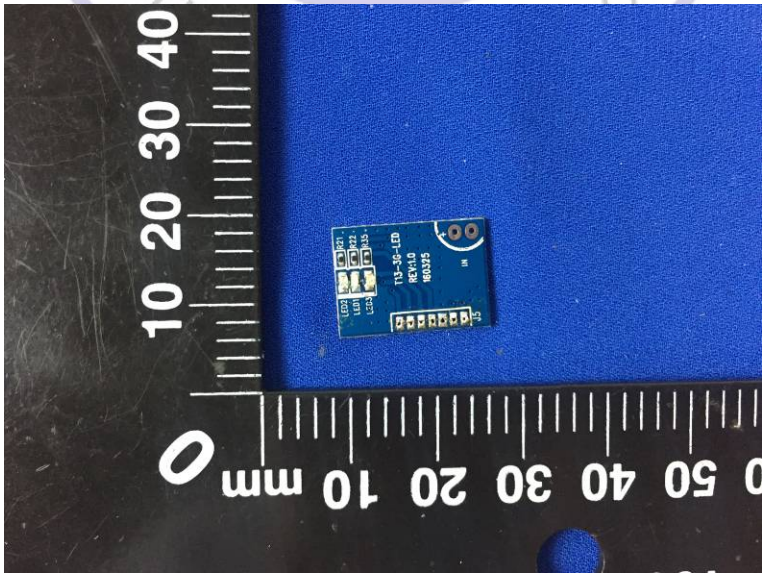
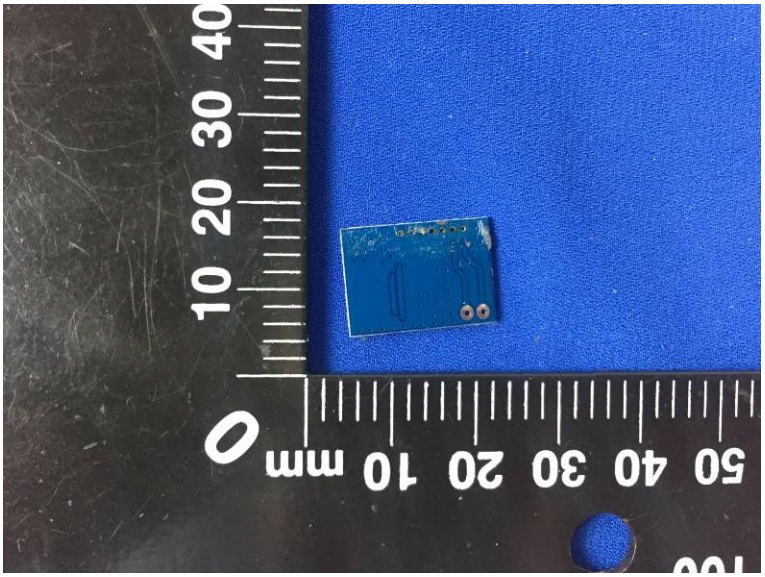
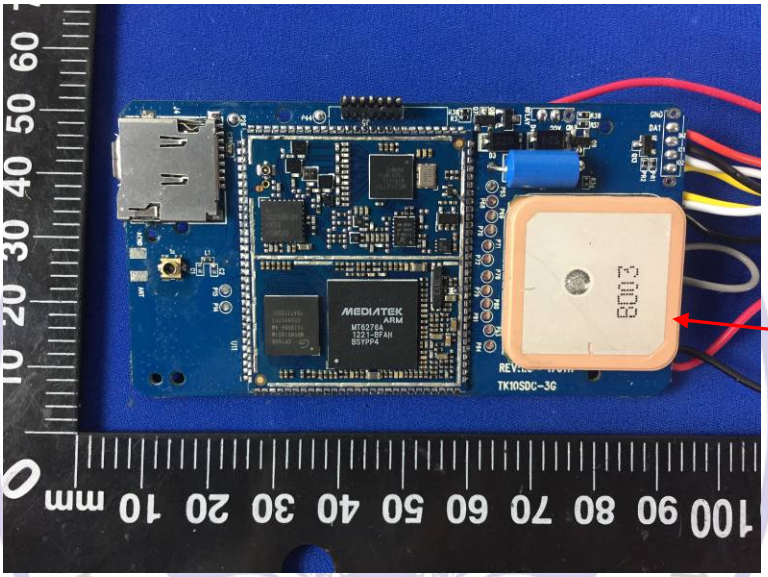
Internal Photos of EUT





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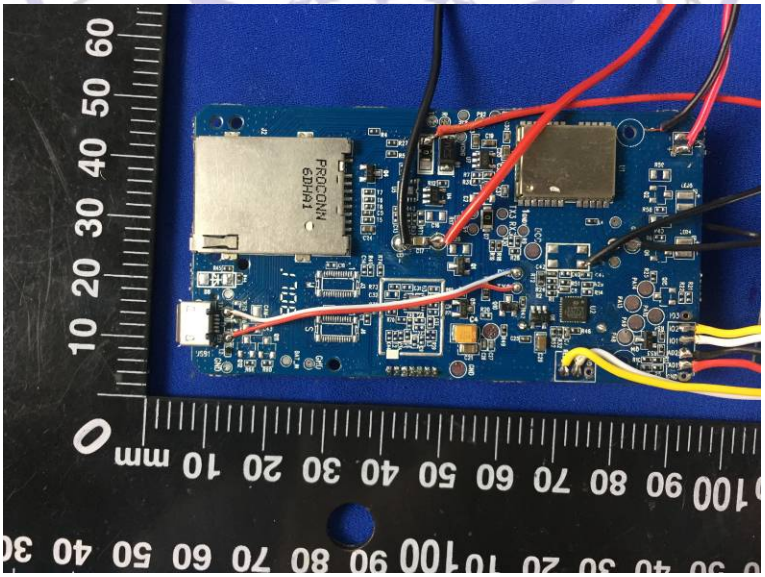
GPS Antenna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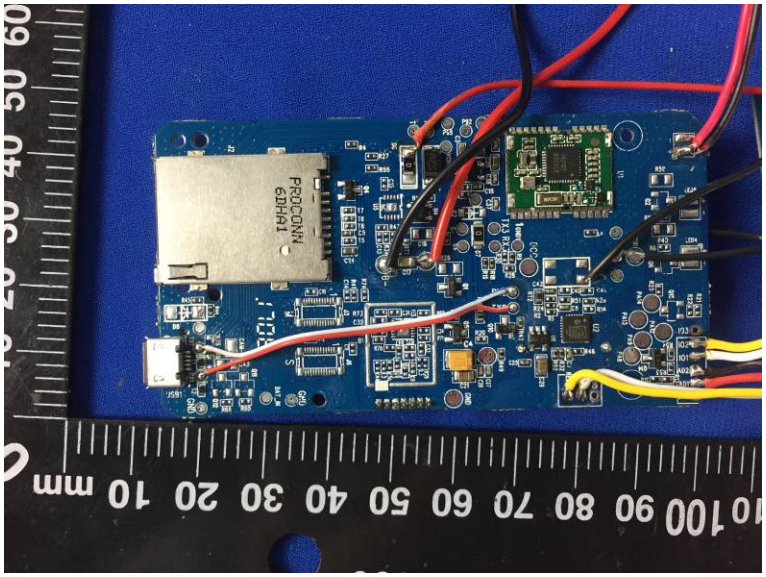
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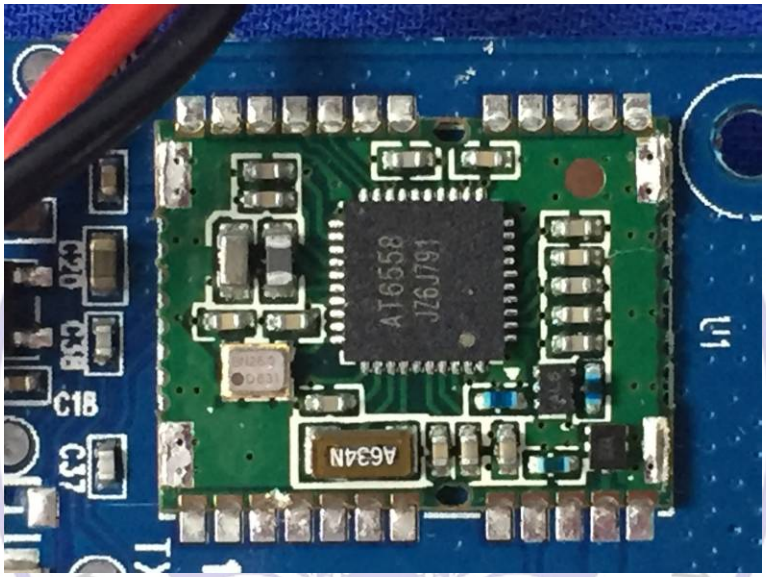
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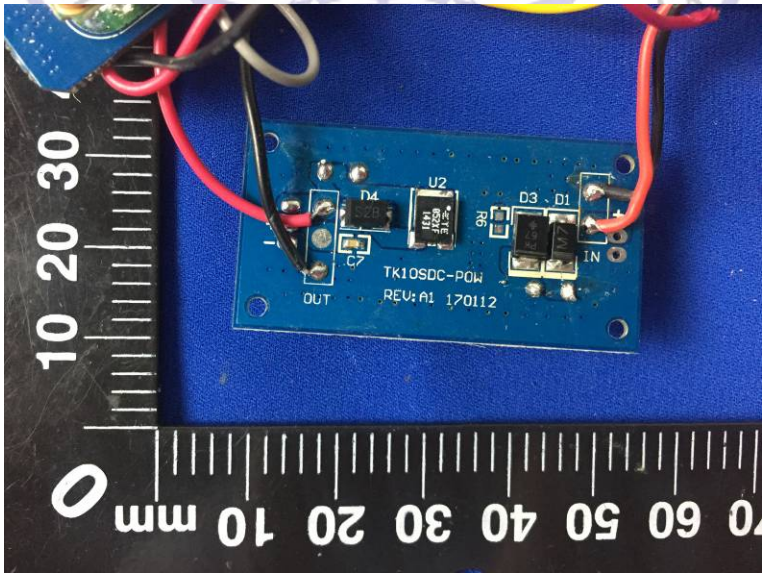
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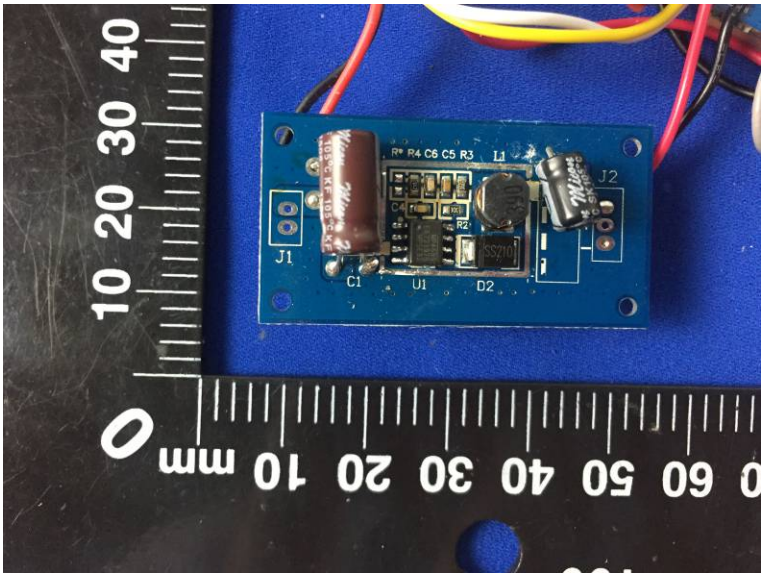

********** End of Report **********

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