FCC PART 22 AND PART 24 TEST REPORT

FCC Part 22 Subpart H / Part 24 Subpart E

Report Reference No.: **CTL1505251364-WF**

Compiled by: (position+printed name+signature)	Jacky Chen (File administrators)	*Jackychen*
Tested by: (position+printed name+signature)	Allen Wang (Test Engineer)	*Allen Wang*
Approved by: (position+printed name+signature)	Tracy Qi (Manager)	*Tracy Qi*

Product Name............................: GPS tracker watch

Model/Type reference...................: ETK-GPS01

List Model(s)...............................: ETK-GPS02, ETK-GPS03

Trade Mark....................................: EXONTEK

FCC ID..: **2AEZ6ETK-GPS01**

Applicant's name.........................: **Shenzhen Exon Technology Co., Ltd.**

Address of applicant....................: A616, Jinlian Building, No.134, Qianjin 2nd Road, Xixiang, Baoan district, Shenzhen, Guangdong, 518102, 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-C: 2004

TRF Originator……………………..: Shenzhen CTL Testing Technology Co., Ltd.

Master TRF…………………………: Dated 2011-01

Date of Receipt.............................: May. 15, 2015

Date of Test Date..........................: May. 06, 2015 - Jun. 05, 2015

Data of Issue.................................: Jun. 07, 2015

Result....: Positive

T E S T R E P O R T

Test Report No. :	CTL1505251364-WF	Jun. 07, 2015
		Date of issue

Equipment under Test	:	GPS tracker watch
Model /Type	:	ETK-GPS01
Listed Models	:	ETK-GPS02, ETK-GPS03
Applicant	:	**Shenzhen Exon Technology Co., Ltd.**
Address	:	A616, Jinlian Building, No.134, Qianjin 2nd Road, Xixiang, Baoan District, Shenzhen, Guangdong, 518102, China
Manufacturer	:	**Shenzhen Exon Technology Co., Ltd.**
Address	:	A616, Jinlian Building, No.134, Qianjin 2nd Road, Xixiang, Baoan District, Shenzhen, Guangdong, 518102, China

Test result	**Pass ***

∗ In the configuration tested, the EUT complied with the standards specified page 4.

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.

Contents

1 . S U M M A R Y

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.

47 CFR FCC Part 15 Subpart B: - Unintentional Radiators

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 C63.4:2009: 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 (c)	Pass
Peak-to-Average Ratio	Part 24.232 (d)	Pass
Modulation Characteristics	Part 2.1047	Pass
99% & -26 dB Occupied Bandwidth	Part 2.1049 Part 22.917 Part 24.238	Pass
Spurious Emissions at Antenna Terminal	Part 2.1051 Part 22.917 (a) Part 24.238 (a)	Pass
Field Strength of Spurious Radiation	Part 2.1053 Part 22.917 (a) Part 24.238 (a)	Pass
Out of band emission, Band Edge	Part 22.917 (a) Part 24.238 (a)	Pass
Frequency stability	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 watch
Model/Type reference:	ETK-GPS01
Power supply:	DC 3.7V from battery
Serial number:	Prototype
IMEI	352585060680067
Hardware version:	L20_V2.0
Software version:	L20_SW_V1.0
2G	
Operation Band:	GSM850, PCS1900
Supported Type:	GSM/GPRS/EGPRS
Power Class:	GSM850:Power Class 4
	PCS1900:Power Class 1
Modulation Type:	GMSK for GSM/GPRS/EGPRS
GSM Release Version	R99
GPRS Multislot Class	12
EGPRS Multislot Class	12
Hotsopt	Not Supported

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

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

Note:
1. For the ERP/EIRP and radiated emission test, every axis (X, Y, Z) was verified, and show the worst resulton this report.
2. GPRS and EGPRS both use GMSK modulation , so all of test items were done working at worst case GPRS 1TX slot for data mode.

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	2014/07/12	2015/07/11
EMI Test Receiver	R&S	ESCI	103710	2014/07/10	2015/07/09
Spectrum Analyzer	Agilent	E4407B	MY45108355	2014/07/06	2015/07/05
Controller	EM Electronics	Controller EM 1000	N/A	2014/07/06	2015/07/05
Horn Antenna	Sunol Sciences Corp.	DRH-118	A062013	2014/07/12	2015/07/11
Horn Antenna	SCHWARZBECK	BBHA9170	1562	2014/07/12	2015/07/11
Active Loop Antenna	SCHWARZBECK	FMZB1519	1519-037	2014/07/12	2015/07/11
LISN	R&S	ENV216	101316	2014/07/10	2015/07/09
LISN	SCHWARZBECK	NSLK8127	8127687	2014/07/10	2015/07/09
Microwave Preamplifier	HP	8349B	3155A00882	2014/07/10	2015/07/09
Amplifier	HP	8447D	3113A07663	2014/07/10	2015/07/09
Transient Limiter	Com-Power	LIT-153	532226	2014/07/10	2015/07/09
Radio Communication Tester	R&S	CMU200	3655A03522	2014/07/06	2015/07/05
Temperature/Humidity Meter	zhicheng	ZC1-2	22522	2014/07/10	2015/07/09
SIGNAL GENERATOR	HP	8647A	3200A00852	2014/07/10	2015/07/09
Wideband Peak Power Meter	Anritsu	ML2495A	220.23.35	2014/07/06	2015/07/05
Power Sensor	Anritsu	MA2411B	0738552	2014/07/06	2015/07/05
Climate Chamber	ESPEC	EL-10KA	A20120523	2014/07/06	2015/07/05
High-Pass Filter	K&L	9SH10-2700/X12750-O/O	/	2014/07/06	2015/07/05
High-Pass Filter	K&L	41H10-1375/U12750-O/O	/	2014/07/06	2015/07/05
RF Cable	HUBER+SUHNER	RG214	/	2014/07/09	2015/07/08

2.5. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID:2AEZ6ETK-GPS01 filing to comply with of the FCC Part 22 and Part 24 Rules.

2.6. Modifications

No modifications were implemented to meet testing criteria.
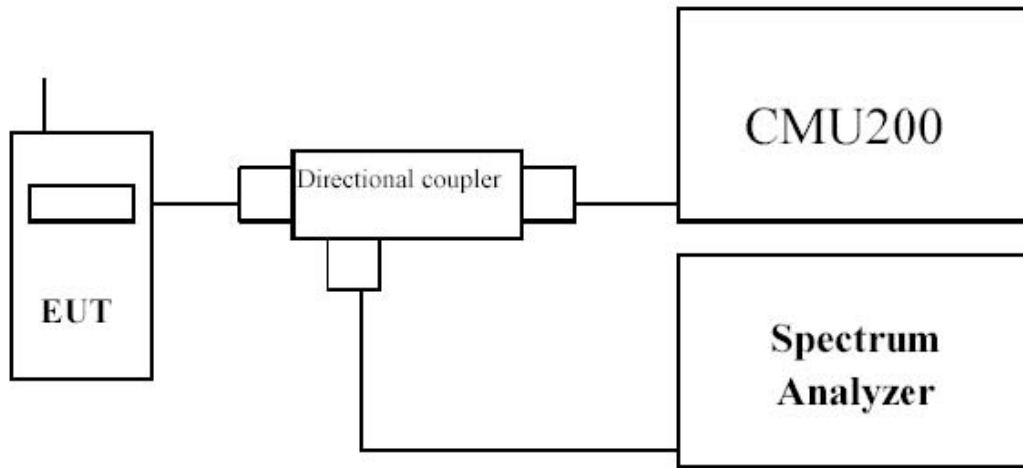
3. TEST CONDITIONS AND RESULTS
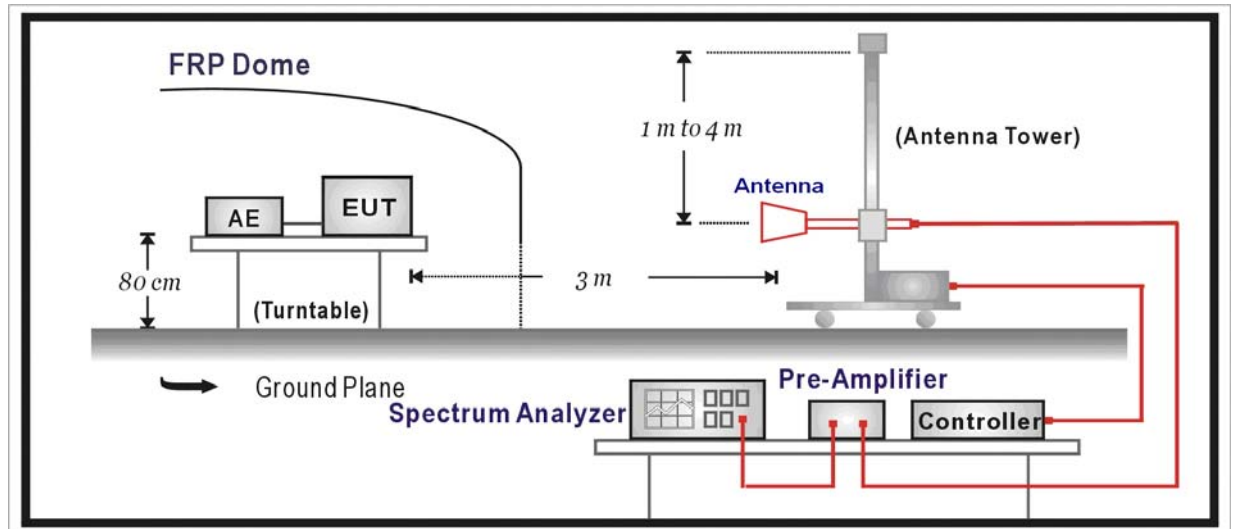
3.1. Output Power

LIMIT

GSM850/WCDMA Band V: 7W
PCS1900/WCDMA Band II: 2W

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 select 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 thefrequency 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)   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)   Test site anechoic chamber refer to ANSI C63.4:2009.

TEST RESULTS

Conducted Measurement:

EUT Mode	Channel	Frequency (MHz)	Avg.Burst Power (dBm)	Peak-to-Average Ratio (dB)	Limit (dBm)	Result
GSM 850 (GMSK)	128	824.20	32.91	/	38.45	Pass
	190	836.60	32.95	/		
	251	848.80	33.00	/		
GPRS850 (GMSK,1Slot)	128	824.20	32.90	/	38.45	Pass
	190	836.60	32.95	/		
	251	848.80	33.00	/		
EGPRS850 (GMSK, 1Slot)	128	824.20	32.86	/	33.01	Pass
	190	836.60	32.90	/		
	251	848.80	32.97	/		
PCS1900 (GMSK)	512	1850.20	29.73	0.28	33.01	Pass
	661	1880.00	29.78	0.41		
	810	1909.80	29.94	0.45		
GPRS1900 (GMSK,1Slot)	512	1850.20	29.70	0.49	33.01	Pass
	661	1880.00	29.76	0.39		
	810	1909.80	29.91	0.41		
EGPRS1900 (GMSK,1Slot)	512	1850.20	29.68	0.52	33.01	Pass
	661	1880.00	29.71	0.44		
	810	1909.80	29.90	0.46		

Note:
1. Peak-to-Average Ratio= maximum PK burst power-maximum Avg. burst power.
2. The Peak-to-Average Ratio (PAR) of the transmission may not exceed 13 dB.

Radiated Measurement:

Mode	Channel	Antenna Pol.	SA Reading (dBm)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBd)	ERP	Limit (dBm)	Result
GSM850 (GMSK)	128	V	-14.34	30.76	1.76	-0.02	28.98	38.45	Pass
		H	-3.79	21.23	1.76	-0.02	19.45		
	190	V	-14.67	30.30	1.75	0.10	28.65		
		H	-4.34	19.99	1.75	0.10	18.34		
	251	V	-14.31	29.64	1.78	0.13	27.99		
		H	-3.62	20.10	1.78	0.13	18.45		
GPRS850 (GMSK, 1slot)	128	V	-14.66	30.44	1.76	-0.02	28.66	38.45	Pass
		H	-5.59	19.43	1.76	-0.02	17.65		
	190	V	-14.78	30.19	1.75	0.10	28.54		
		H	-3.58	20.75	1.75	0.10	19.10		
	251	V	-15.10	28.85	1.78	0.13	27.20		
		H	-4.85	18.87	1.78	0.13	17.22		

Mode	Channel	Antenna Pol.	SA Reading (dBm)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBi)	EIRP	Limit (dBm)	Result
PCS1900 (GMSK)	512	V	21.24	19.84	2.68	10.40	27.56	33.01	Pass
		H	11.43	9.84	2.68	10.40	17.56		
	661	V	21.18	19.68	2.68	10.43	27.43		
		H	12.43	10.59	2.68	10.43	18.34		
	810	V	21.36	20.01	2.70	10.44	27.75		
		H	11.50	9.70	2.70	10.44	17.44		
GPRS1900 (GMSK, 1slot)	512	V	20.66	19.26	2.68	10.40	26.98	33.01	Pass
		H	10.73	9.14	2.68	10.40	16.86		
	661	V	21.76	20.26	2.68	10.43	28.01		
		H	12.85	11.01	2.68	10.43	18.76		
	810	V	20.96	19.61	2.70	10.44	27.35		
		H	11.28	9.48	2.70	10.44	17.22		

3.2. Modulation Characteristic

LIMIT

N/A

TEST CONFIGURATION
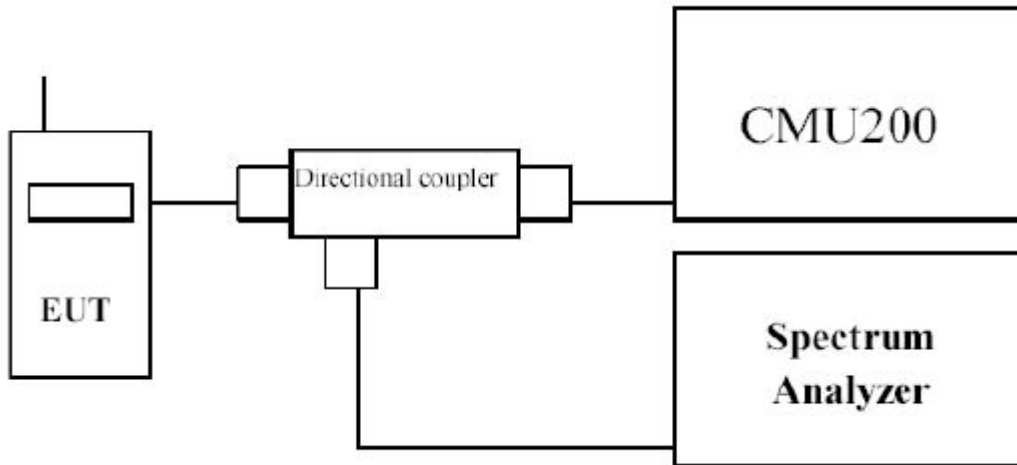
TEST PROCEDURE

GMSK is a form of binary signaling schemes which represent digital states as a shift between discrete sinusoidal frequencies called Frequency Shift Keying (FSK). Minimum Shift Keying (MSK) is continuous phase FSK with the smallest possible modulation index h. Modulation index is defined as:
$h = 2*F*Tb$
where F = Peak frequency deviation in Hz and Tb = Bit period in seconds

Two discrete frequencies, representing two distinct digital states, with equal phases at switch time t = 0 requires a minimum value of h = 0.5. The Gaussian part of GMSK describes the fact that the digital pulses are filtered in the time domain. This results in bits which are sinusoidal rather than square. The effective spectrum is then compressed with the average carrier frequency in the center of the passband. This is a great advantage because of the significantly reduced bandwidth. GMSK is utilized because of these bandwidth conservation properties.

The bandwidth for GSM is a 60 MHz up-link at 1850-1910 MHz and down-link at 1930-1990 MHz. The 65 MHz is divided into 299 channels, each of which is 200 kHz wide. Slight spectral spillage is allowed into neighboring channels (which is minimized by GMSK). This separated transmit/receive frequencies scheme under GSM enables easier duplex filtering.

Within the bandwidth, individual channels are subdivided into multiframes (made of 26 frames), frames (made of 8 time slots), and time slots (made of 8 fields). The time slots are 0.57 ms long allowing 156.25 bits of information including overhead.
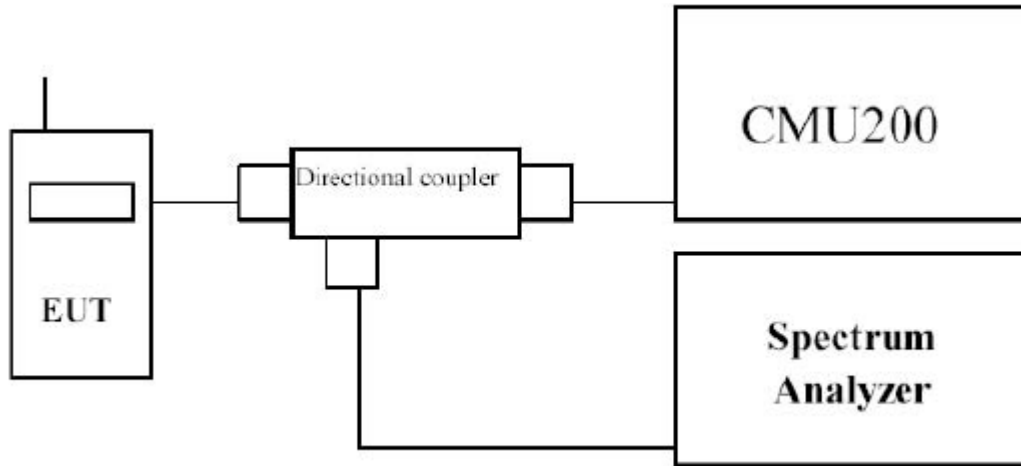
TEST RESULTS

The modulation of GSM was verified and confirmed compliance with requirement.

3.3. Occupied Bandwidth
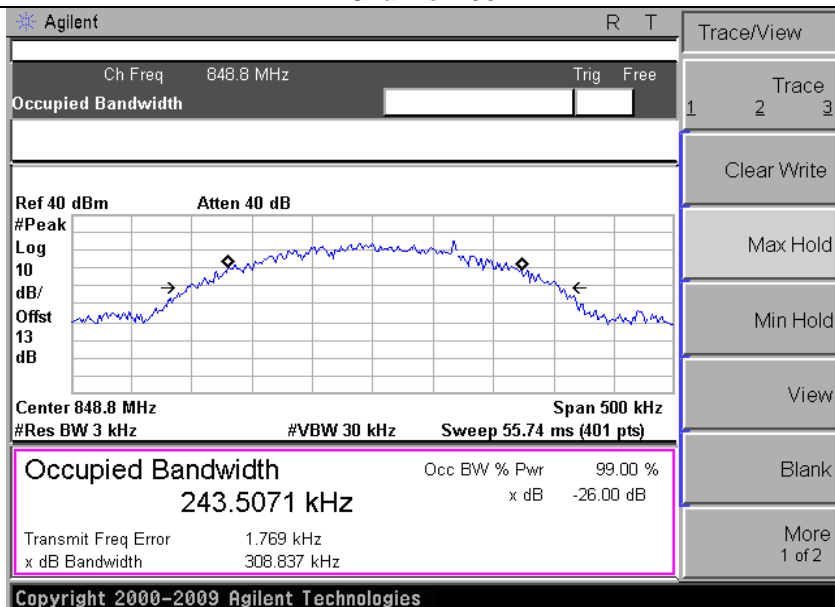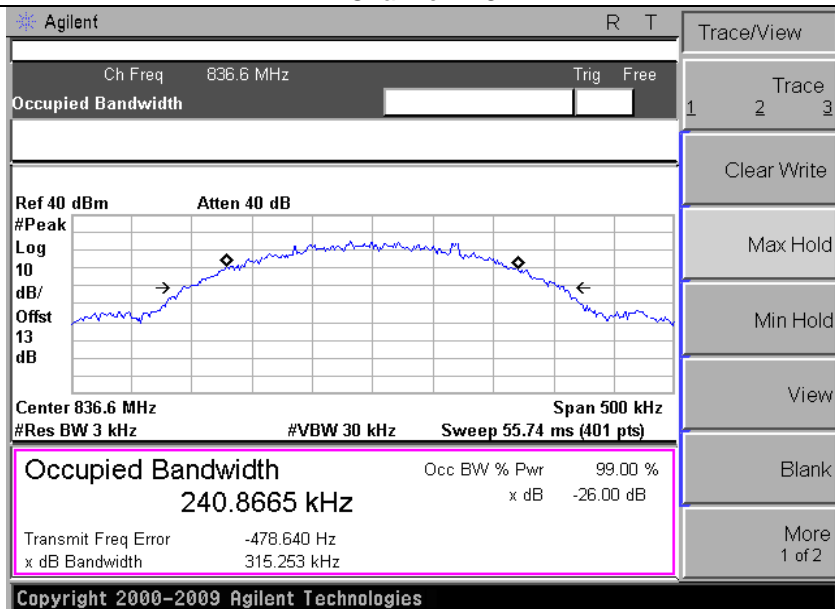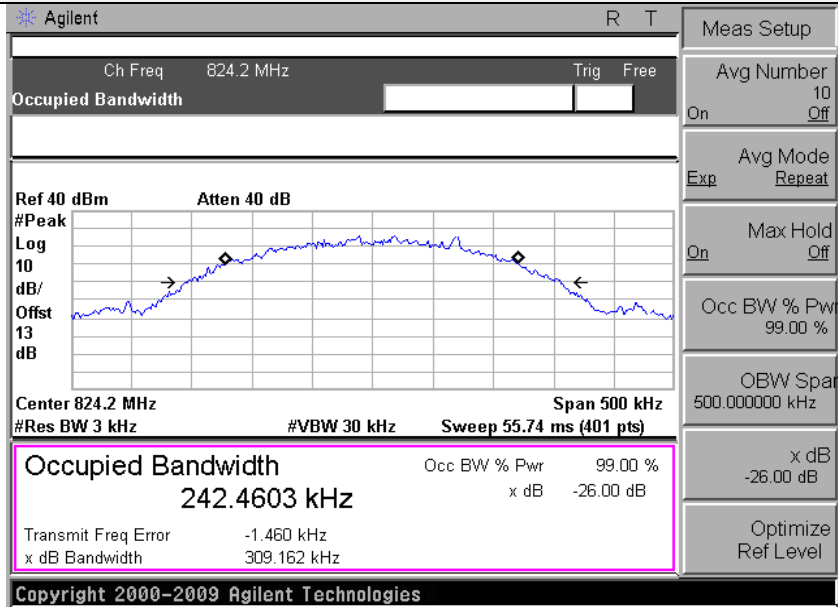
LIMIT

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)
GSM 850 (GMSK)	128	824.20	242.46	309.16
	190	836.60	240.87	315.25
	251	848.80	243.51	308.84
GPRS850 (GMSK,1Slot)	128	824.20	239.52	306.81
	190	836.60	241.09	308.11
	251	848.80	241.33	310.91
PCS1900 (GMSK)	512	1850.20	239.26	309.90
	661	1880.00	246.33	314.82
	810	1909.80	243.83	310.98
GPRS1900 (GMSK,1Slot)	512	1850.20	241.09	310.19
	661	1880.00	243.14	315.58
	810	1909.80	241.94	306.23

GSM850 For GMSK Modulation

Channel 128

Channel 190

Channel 251

GPRS850 For GMSK Modulation

Channel 128

Agilent   R   T   Trace/View

Ch Freq   824.2 MHz   Trig   Free

Occupied Bandwidth

Ref 40 dBm   Atten 40 dB

#Peak Log 10 dB/ Offst 13 dB

Center 824.2 MHz   Span 500 kHz
#Res BW 3 kHz   #VBW 30 kHz   Sweep 55.74 ms (401 pts)

Occupied Bandwidth   Occ BW % Pwr   99.00 %
239.5165 kHz   x dB   -26.00 dB
Transmit Freq Error   -457.200 Hz
x dB Bandwidth   306.814 kHz

Copyright 2000-2009 Agilent Technologies

Trace 1 2 3 | Clear Write | Max Hold | Min Hold | View | Blank | More 1 of 2

Channel 128

Agilent   R   T   Trace/View

Ch Freq   836.6 MHz   Trig   Free

Occupied Bandwidth

Ref 40 dBm   Atten 40 dB

#Peak Log 10 dB/ Offst 13 dB

Center 836.6 MHz   Span 500 kHz
#Res BW 3 kHz   #VBW 30 kHz   Sweep 55.74 ms (401 pts)

Occupied Bandwidth   Occ BW % Pwr   99.00 %
241.0901 kHz   x dB   -26.00 dB
Transmit Freq Error   622.031 Hz
x dB Bandwidth   308.107 kHz

Copyright 2000-2009 Agilent Technologies

Trace 1 2 3 | Clear Write | Max Hold | Min Hold | View | Blank | More 1 of 2

Channel 190

Agilent   R   T   Trace/View

Ch Freq   848.8 MHz   Trig   Free

Occupied Bandwidth

Ref 40 dBm   Atten 40 dB

#Peak Log 10 dB/ Offst 13 dB

Center 848.8 MHz   Span 500 kHz
#Res BW 3 kHz   #VBW 30 kHz   Sweep 55.74 ms (401 pts)

Occupied Bandwidth   Occ BW % Pwr   99.00 %
241.3348 kHz   x dB   -26.00 dB
Transmit Freq Error   905.265 Hz
x dB Bandwidth   310.913 kHz

Copyright 2000-2009 Agilent Technologies

Trace 1 2 3 | Clear Write | Max Hold | Min Hold | View | Blank | More 1 of 2

Channel 251

PCS1900 For GMSK Modulation

※ Agilent   R T
Ch Freq   1.8502 GHz   Trig Free
Occupied Bandwidth
Ref 33 dBm   #Atten 30 dB
#Peak Log 10 dB/ Offst 13 dB
Center 1.85 GHz   Span 500 kHz
#Res BW 3 kHz   #VBW 30 kHz   Sweep 55.74 ms (401 pts)
Occupied Bandwidth   Occ BW % Pwr   99.00 %
239.2606 kHz   x dB   -26.00 dB
Transmit Freq Error   -344.466 Hz
x dB Bandwidth   309.904 kHz
Copyright 2000-2009 Agilent Technologies
Trace/View — Trace 1 2 3 — Clear Write — Max Hold — Min Hold — View — Blank — More 1 of 2
Channel 512

※ Agilent   R T
Ch Freq   1.88 GHz   Trig Free
Occupied Bandwidth
Ref 33 dBm   #Atten 30 dB
#Peak Log 10 dB/ Offst 13 dB
Center 1.88 GHz   Span 500 kHz
#Res BW 3 kHz   #VBW 30 kHz   Sweep 55.74 ms (401 pts)
Occupied Bandwidth   Occ BW % Pwr   99.00 %
246.3310 kHz   x dB   -26.00 dB
Transmit Freq Error   -31.906 Hz
x dB Bandwidth   314.818 kHz
Copyright 2000-2009 Agilent Technologies
Freq/Channel — Center Freq 1.88000000 GHz — Start Freq 1.87975000 GHz — Stop Freq 1.88025000 GHz — CF Step 50.0000000 kHz Auto Man — Freq Offset 0.00000000 Hz — Signal Track On Off
Channel 661

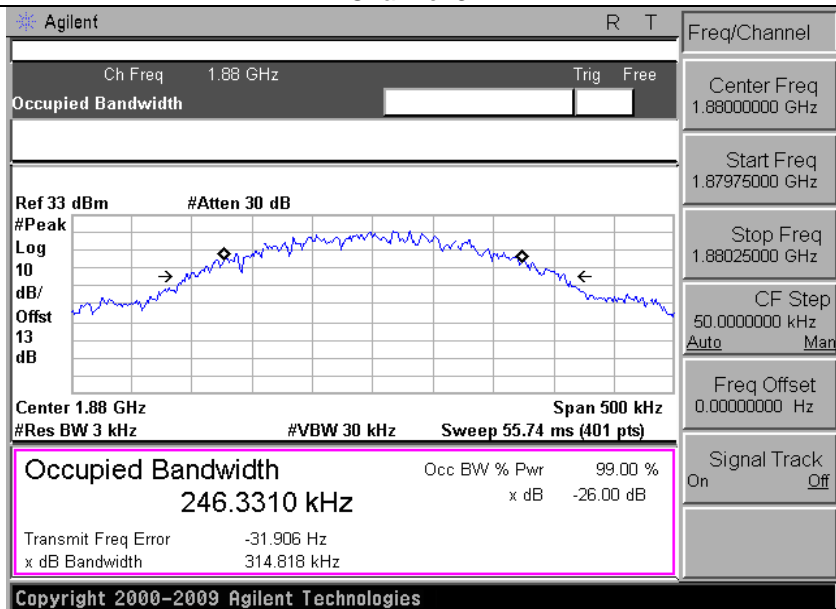| |
|:---:|
| ※ Agilent   R T |
| Ch Freq   1.9098 GHz   Trig Free |
| Occupied Bandwidth |
| Ref 33 dBm   #Atten 30 dB |
| #Peak Log 10 dB/ Offst 13 dB |
| Center 1.91 GHz   Span 500 kHz |
| #Res BW 3 kHz   #VBW 30 kHz   Sweep 55.74 ms (401 pts) |
| Occupied Bandwidth   Occ BW % Pwr   99.00 % |
| 243.8270 kHz   x dB   -26.00 dB |
| Transmit Freq Error   -41.850 Hz |
| x dB Bandwidth   310.977 kHz |
| Copyright 2000-2009 Agilent Technologies |
| Trace/View — Trace 1 2 3 — Clear Write — Max Hold — Min Hold — View — Blank — More 1 of 2 |
| *Channel 810* |

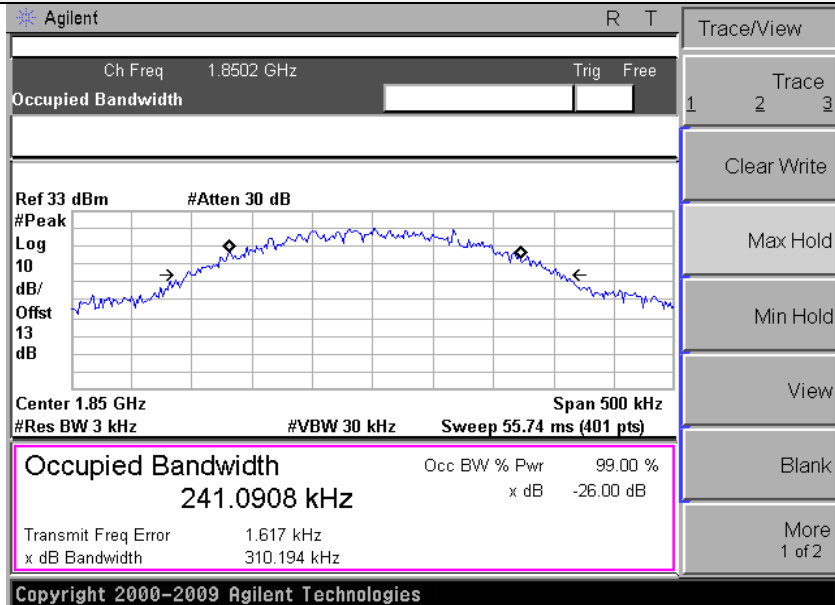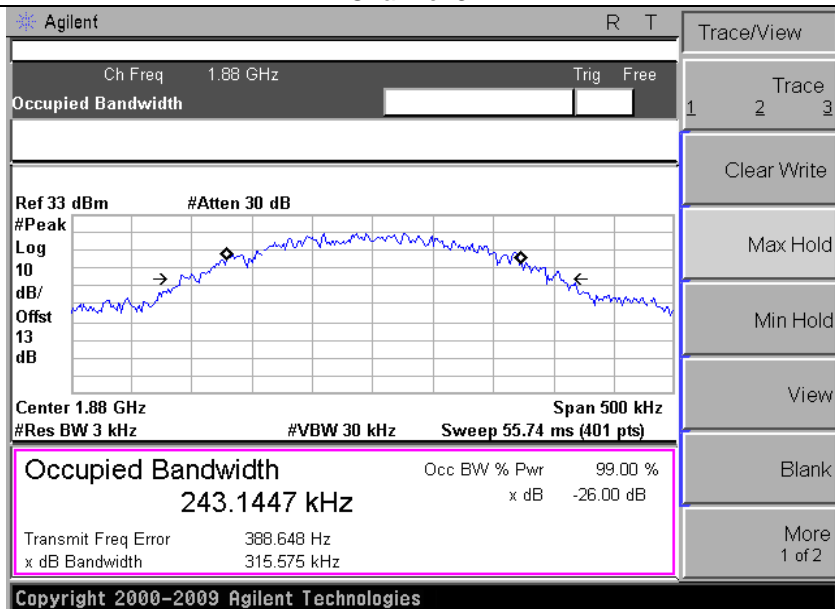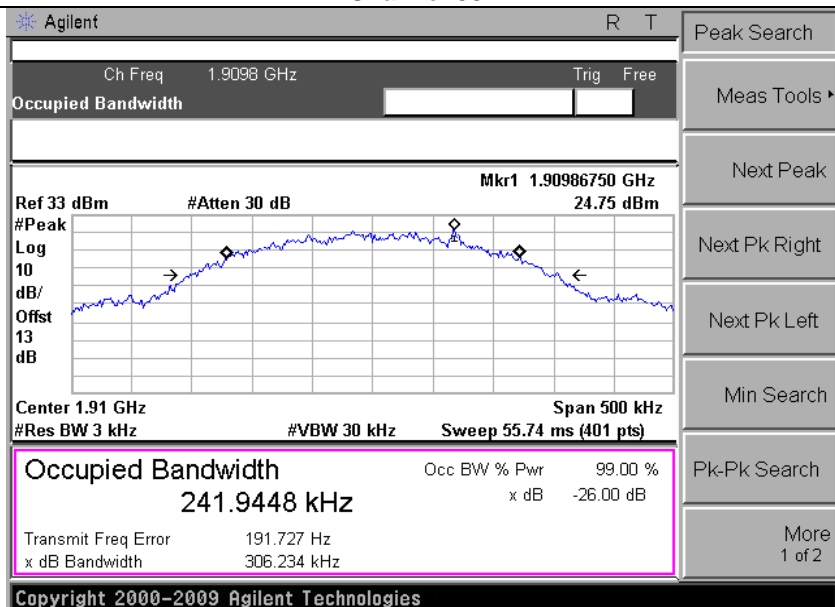| GPRS1900 For GMSK Modulation |
|---|

Channel 512
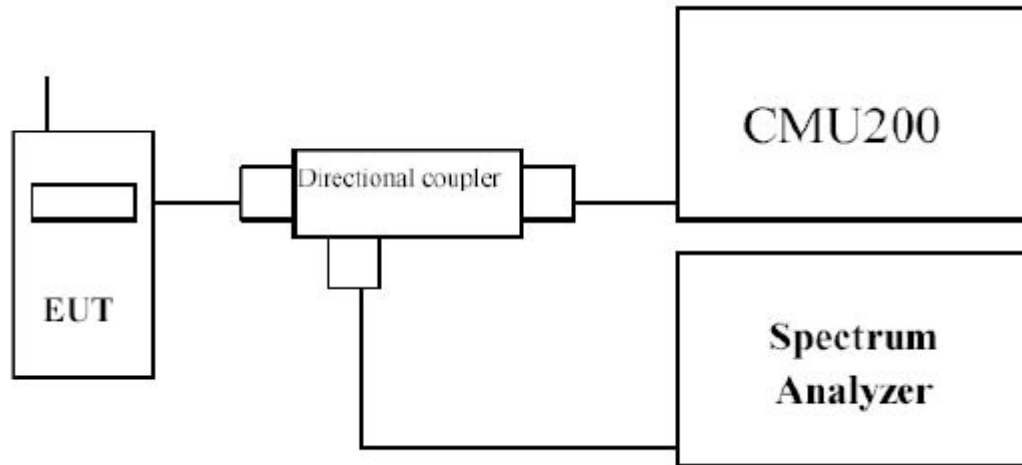

Channel 661

Channel 810

3.4. Band Edge compliance

<u>LIMIT</u>

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.
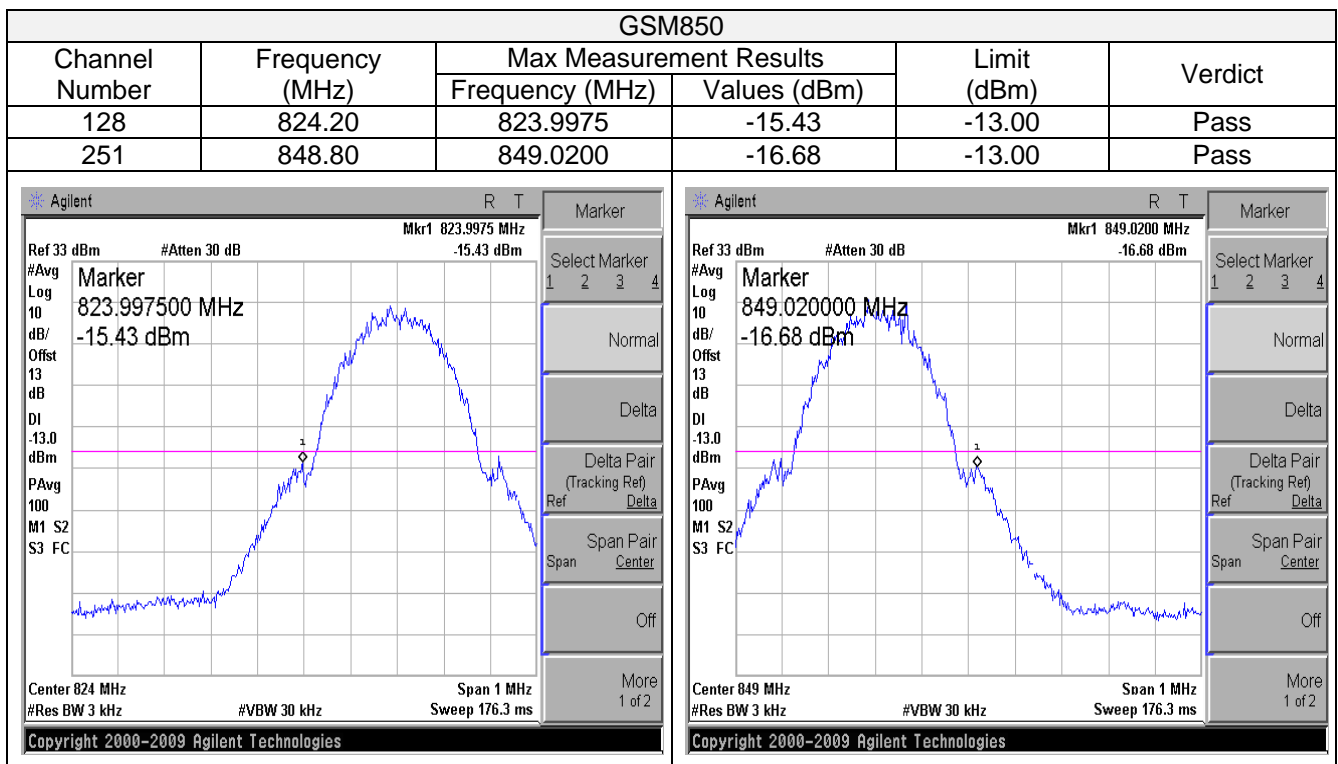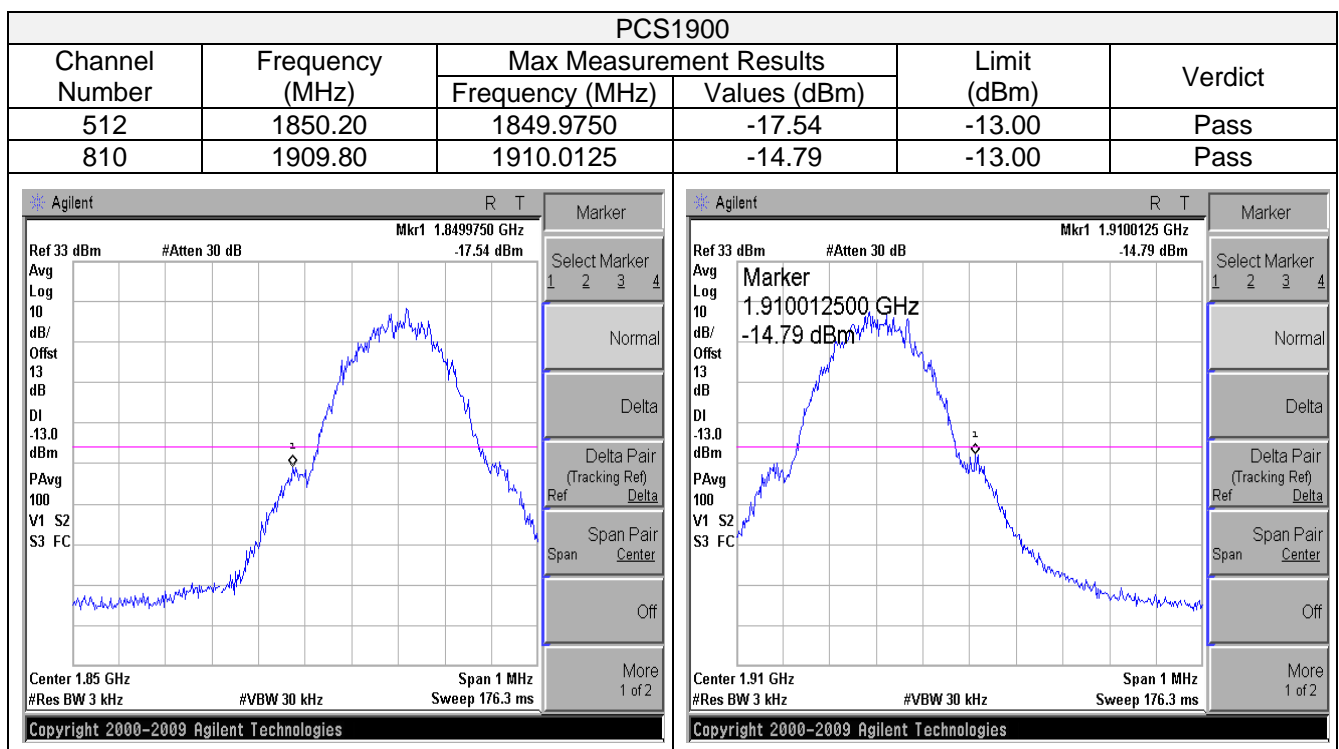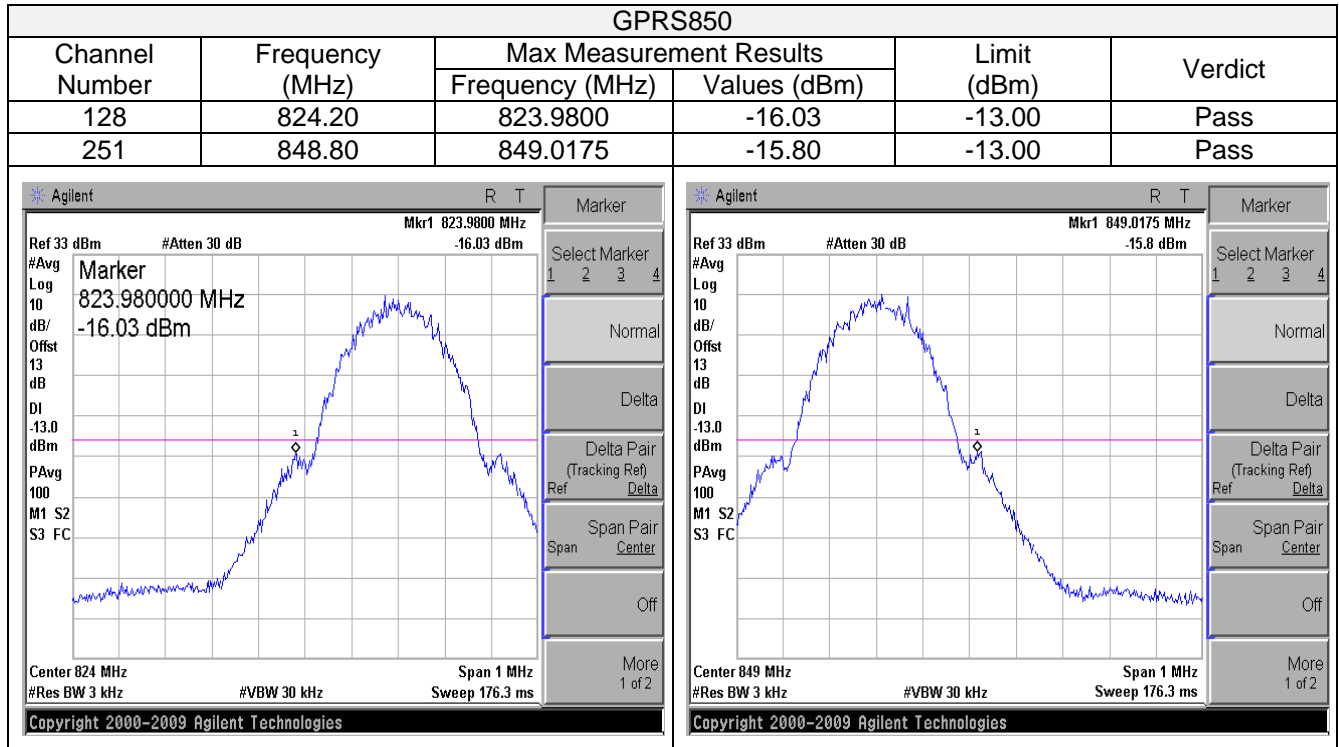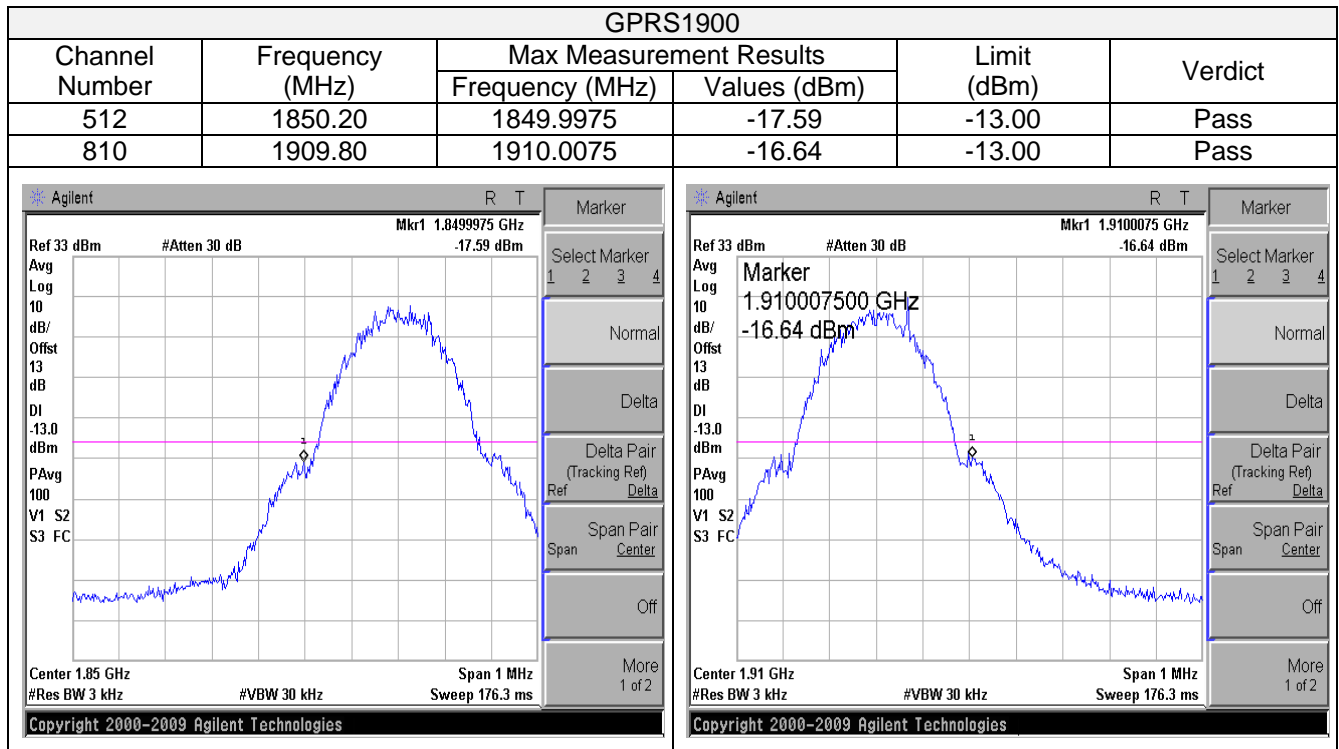
<u>TEST CONFIGURATION</u>

<u>TEST PROCEDURE</u>

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.

<u>TEST RESULTS</u>

GSM850					
Channel Number	Frequency (MHz)	Max Measurement Results		Limit (dBm)	Verdict
		Frequency (MHz)	Values (dBm)		
128	824.20	823.9975	-15.43	-13.00	Pass
251	848.80	849.0200	-16.68	-13.00	Pass

GPRS850					
Channel Number	Frequency (MHz)	Max Measurement Results		Limit (dBm)	Verdict
		Frequency (MHz)	Values (dBm)		
128	824.20	823.9800	-16.03	-13.00	Pass
251	848.80	849.0175	-15.80	-13.00	Pass

PCS1900					
Channel Number	Frequency (MHz)	Max Measurement Results		Limit (dBm)	Verdict
		Frequency (MHz)	Values (dBm)		
512	1850.20	1849.9750	-17.54	-13.00	Pass
810	1909.80	1910.0125	-14.79	-13.00	Pass

GPRS1900					
Channel Number	Frequency (MHz)	Max Measurement Results		Limit (dBm)	Verdict
		Frequency (MHz)	Values (dBm)		
512	1850.20	1849.9975	-17.59	-13.00	Pass
810	1909.80	1910.0075	-16.64	-13.00	Pass

3.5. 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.
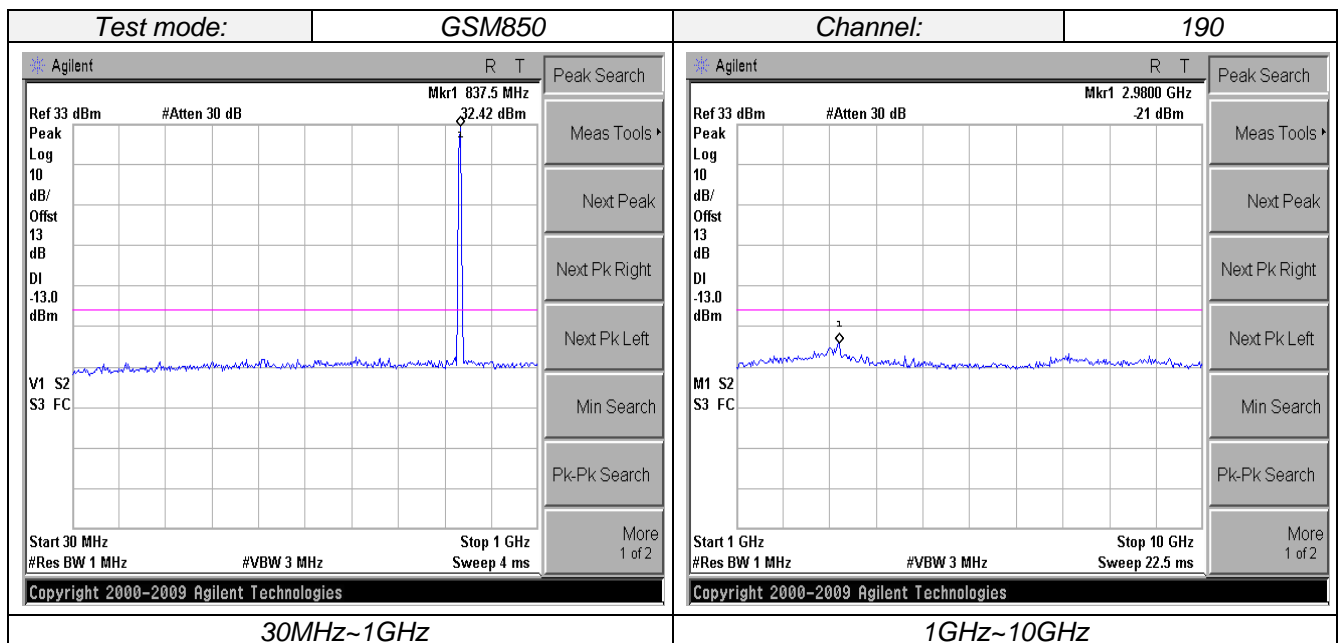
TEST CONFIGURATION

Conducted Spurious Measurement:
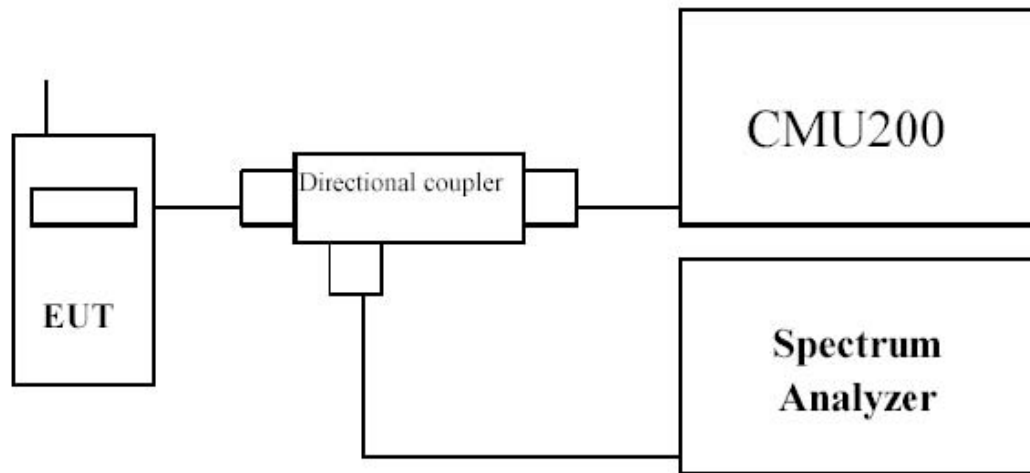
Radiated Spurious Measurement:
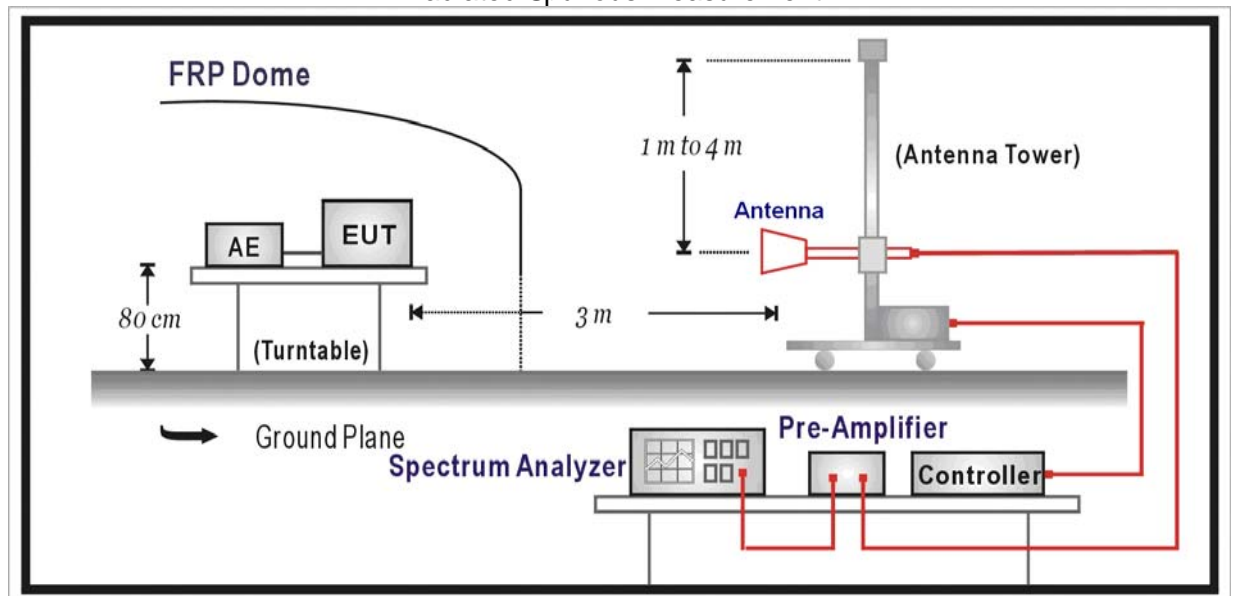
TEST PROCEDURE

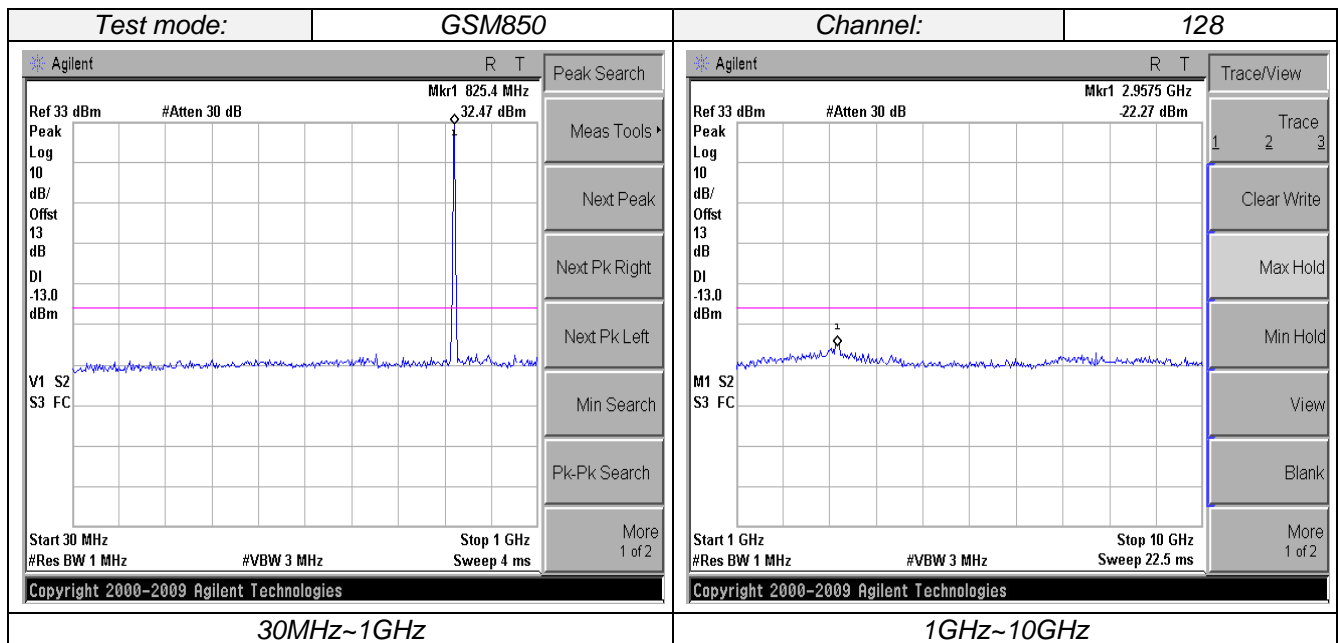The EUT was setup according to EIA/TIA 603C

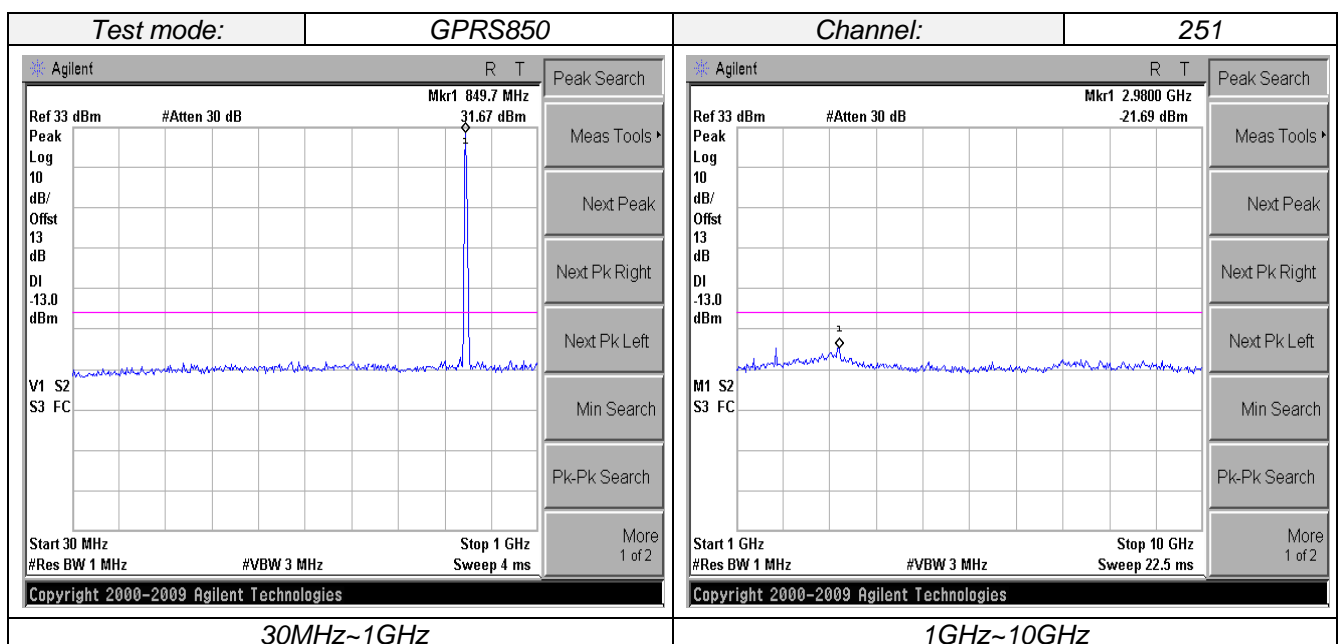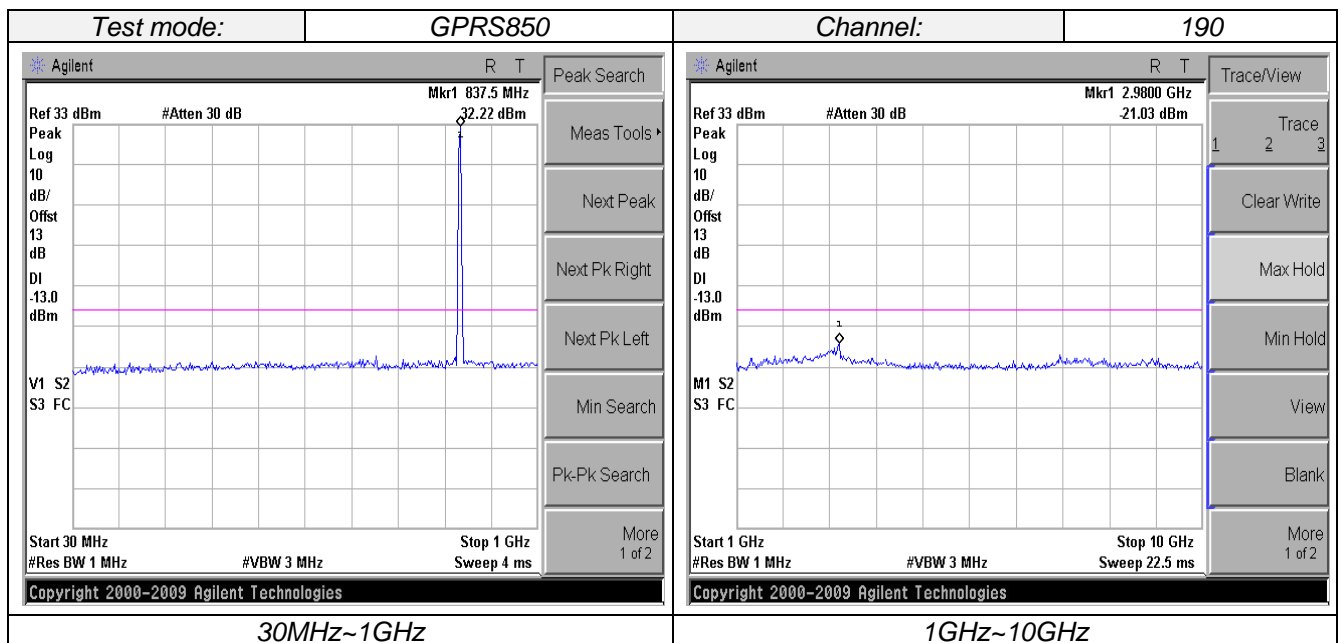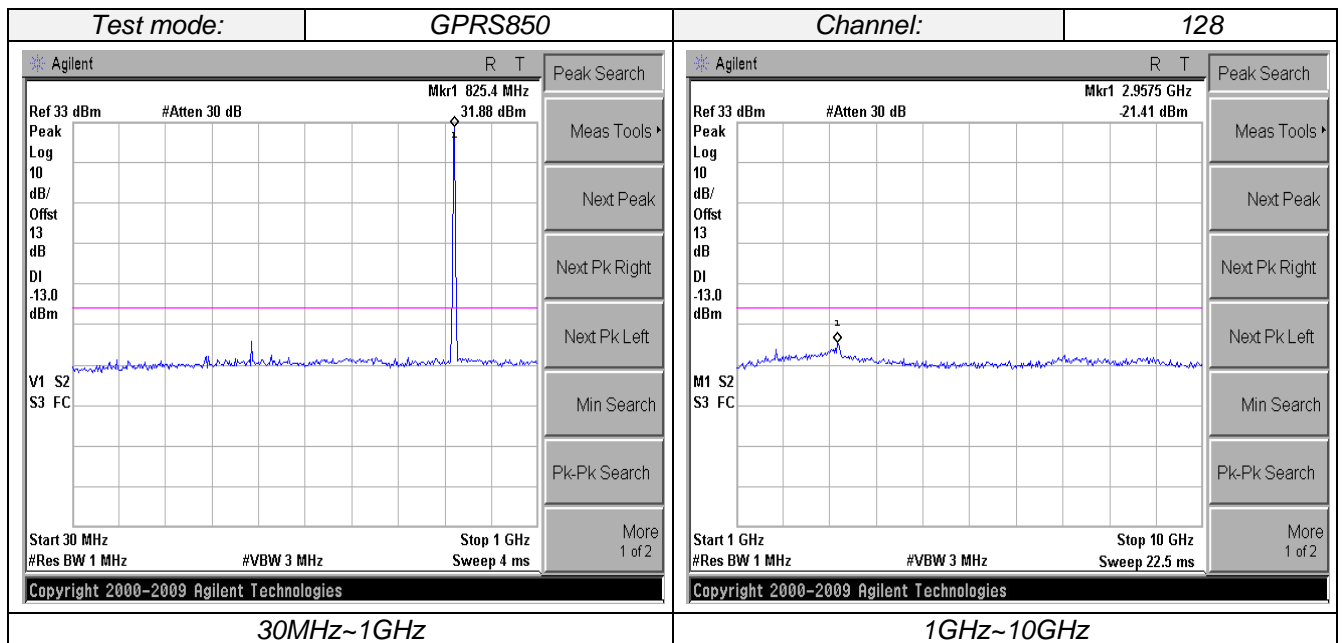**Conducted Spurious Measurement:**

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 select 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.
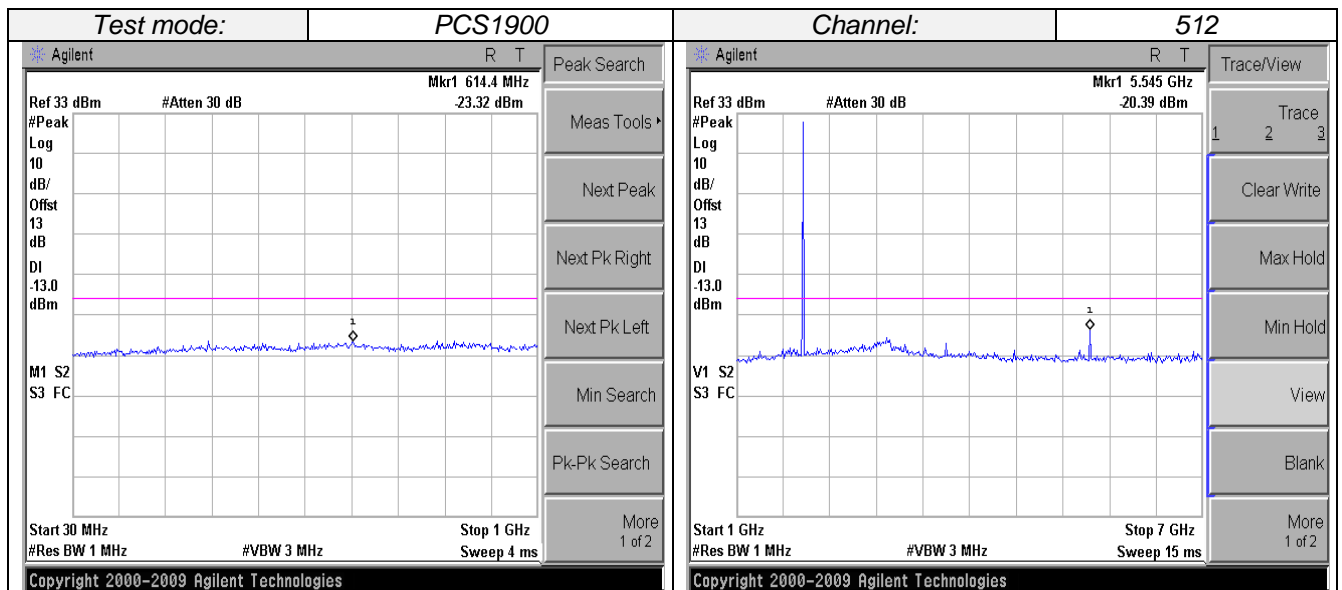
Radiated Spurious Measurement:

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.

r)   Test site anechoic chamber refer to ANSI C63.4: 2009

TEST RESULTS

Conducted Measurement:

Test mode:	GSM850	Channel:	128

30MHz~1GHz	1GHz~10GHz

Test mode:	GSM850	Channel:	190

30MHz~1GHz	1GHz~10GHz

Test mode:	GSM850	Channel:	251

30MHz~1GHz	1GHz~10GHz

Test mode:	GPRS850	Channel:	128

30MHz~1GHz	1GHz~10GHz

Test mode:	GPRS850	Channel:	190

30MHz~1GHz	1GHz~10GHz

Test mode:	GPRS850	Channel:	251

30MHz~1GHz	1GHz~10GHz

Test mode:	PCS1900	Channel:	512

30MHz~1GHz

1GHz~7GHz

7GHz~13.5GHz

13.5GHz~20GHz

Test mode:	PCS1900	Channel:	661

30MHz~1GHz

1GHz~7GHz

7GHz~13.5GHz	13.5GHz~20GHz

Test mode:	PCS1900	Channel:	810

30MHz~1GHz	1GHz~7GHz

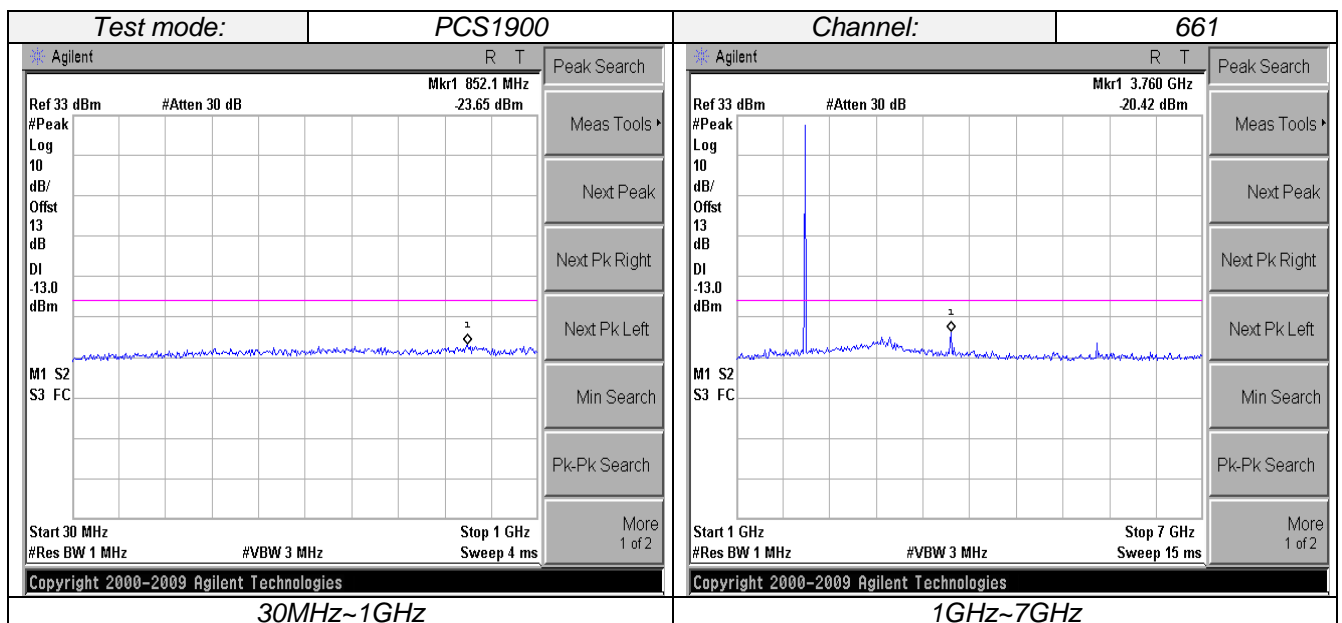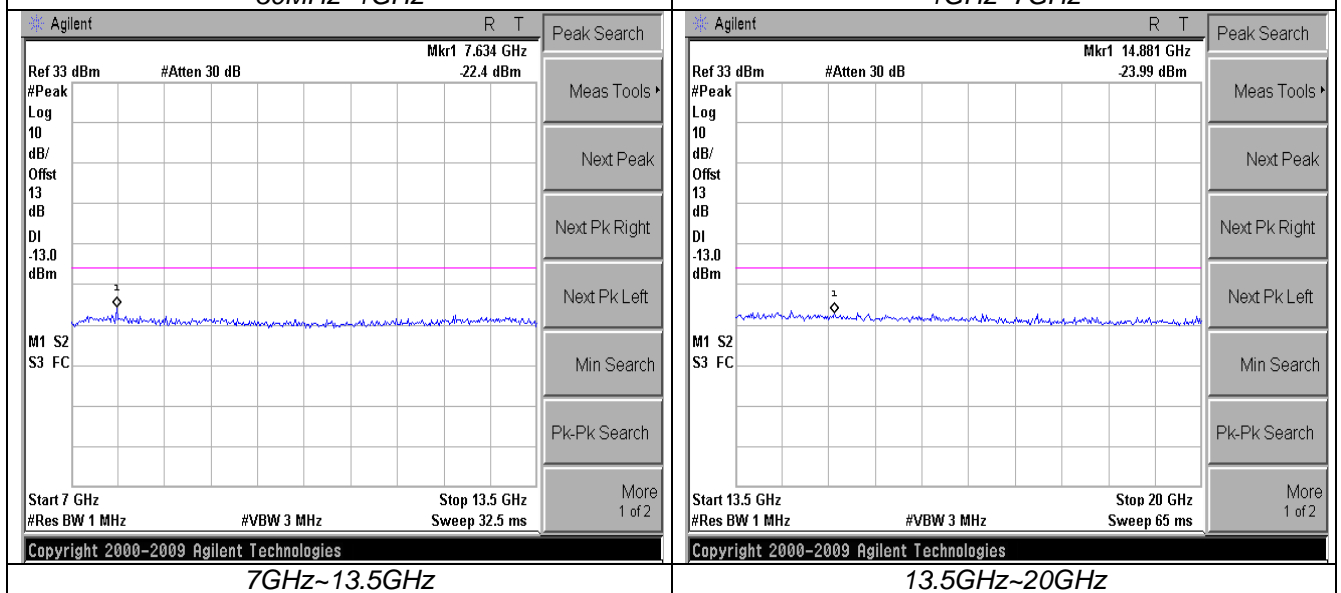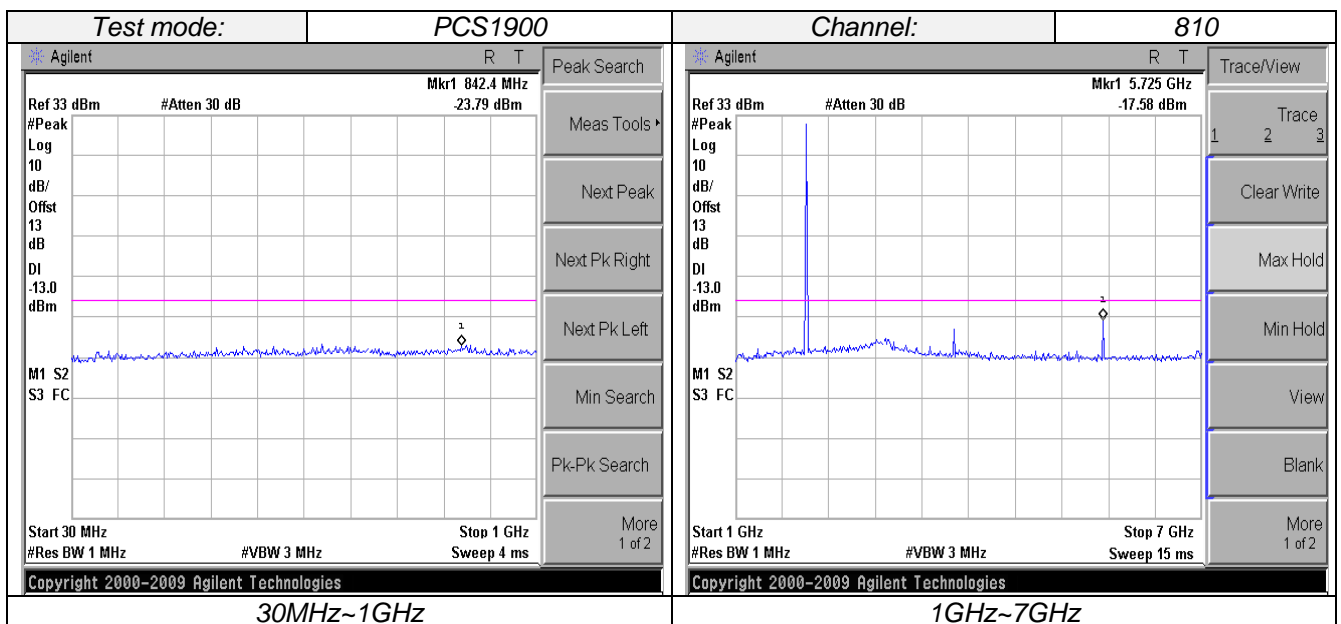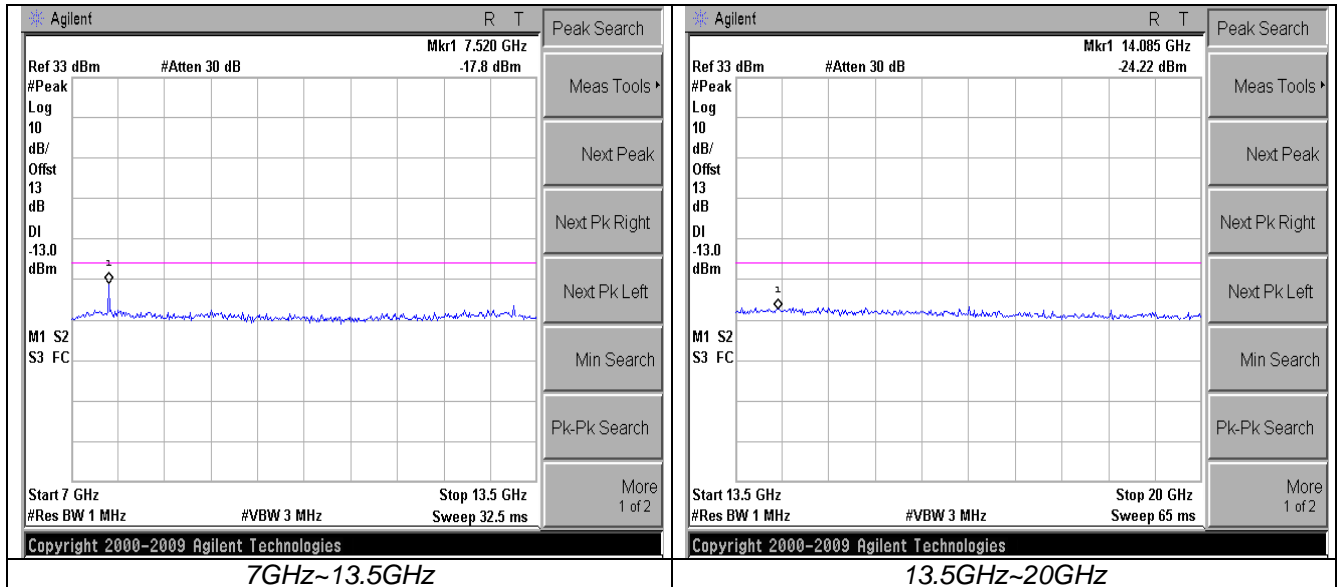| 7GHz~13.5GHz	13.5GHz~20GHz

Test mode:	GPRS1900	Channel:	512

30MHz~1GHz

1GHz~7GHz

7GHz~13.5GHz

13.5GHz~20GHz

Test mode:	GPRS1900	Channel:	661

30MHz~1GHz

1GHz~7GHz

7GHz~13.5GHz		13.5GHz~20GHz

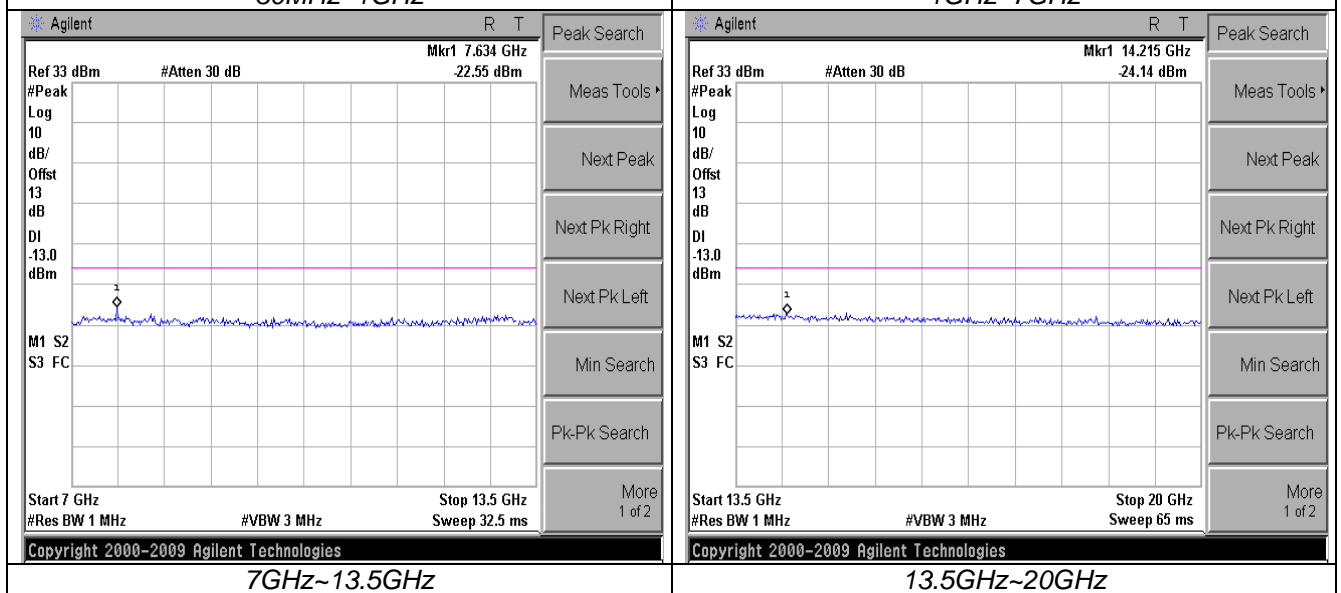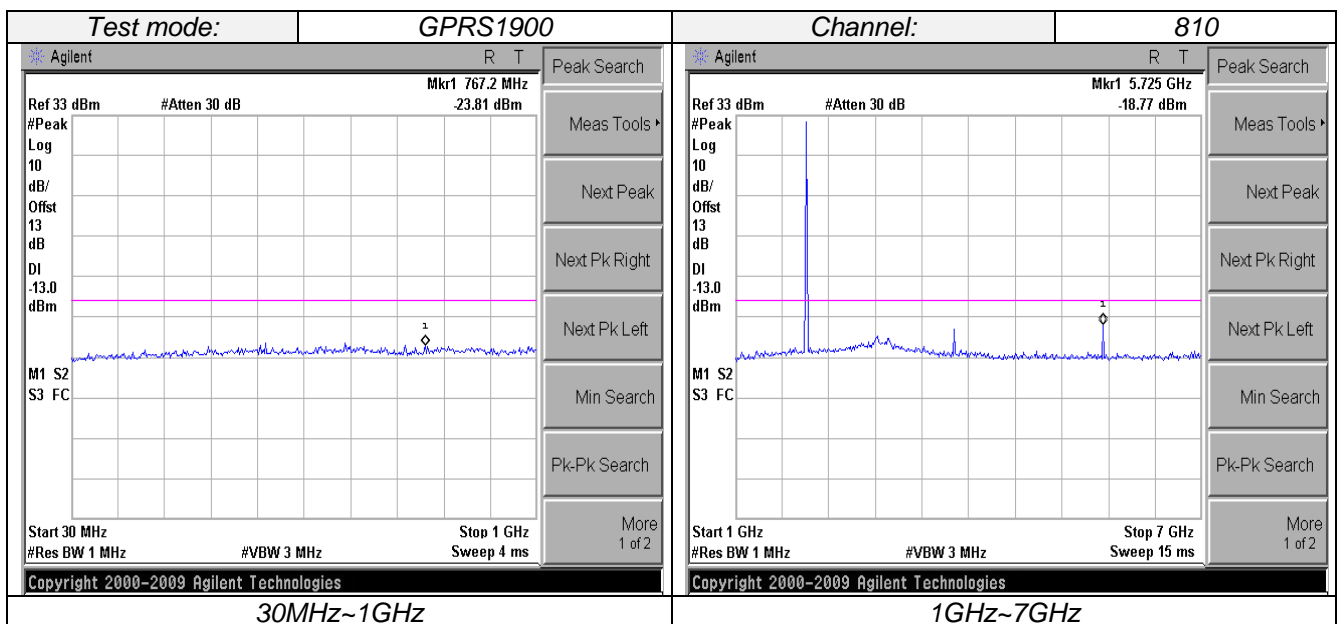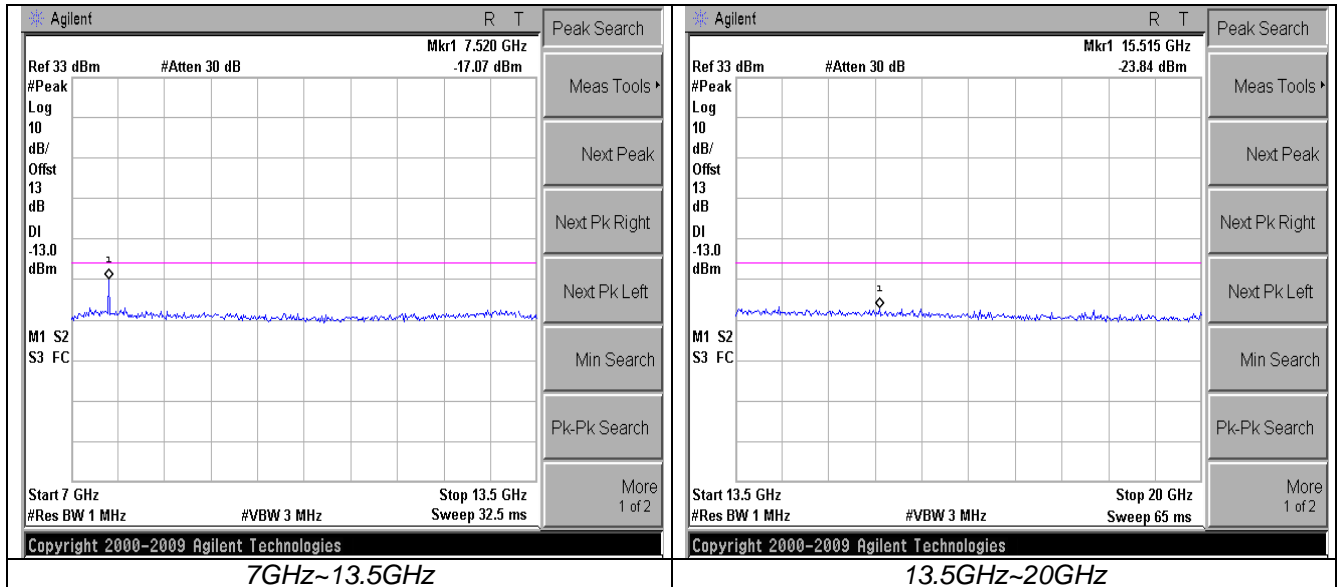| Test mode:	GPRS1900	Channel:	810
30MHz~1GHz		1GHz~7GHz	
7GHz~13.5GHz		13.5GHz~20GHz	

Radiated Measurement:

Channel	Frequency (MHz)	Antenna Pol.	SA Reading (dBm)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBi)	Spurious Emission Level (dBm)	Limit (dBm)	Result
					GSM850				
128	1648.40	Vertical	-30.01	-32.58	2.50	9.75	-25.35		
	2472.60	Vertical	-38.87	-37.92	3.12	10.48	-34.15		
	3296.80	Vertical	-55.95	-54.62	3.54	12.47	-45.36	-13.00	Pass
	4121.00	Vertical	-61.43	-57.59	3.87	13.59	-47.34		
	4945.20	Vertical	---	---	4.26	15.44	---		
	1648.40	Horizontal	-33.00	-35.66	2.50	9.75	-27.14		
	2472.60	Horizontal	-44.71	-43.61	3.12	10.48	-37.26		
	3296.80	Horizontal	-54.25	-52.80	3.54	12.47	-43.26	-13.00	Pass
	4121.00	Horizontal	-61.58	-58.04	3.87	13.59	-47.65		
	4945.20	Horizontal	---	---	4.26	15.44	---		
190	1673.20	Vertical	-30.35	-32.79	2.58	9.79	-25.58		
	2509.80	Vertical	-42.74	-41.83	3.15	10.59	-34.39		
	3346.40	Vertical	-56.26	-54.96	3.78	12.87	-45.87	-13.00	Pass
	4183.00	Vertical	-61.43	-57.76	3.96	13.98	-47.74		
	5019.60	Vertical	---	---	4.68	15.58	---		
	1673.20	Vertical	-32.31	-34.90	2.58	9.79	-27.69		
	2509.80	Horizontal	-46.25	-45.01	3.15	10.59	-37.57		
	3346.40	Horizontal	-53.85	-52.35	3.78	12.87	-43.26	-13.00	Pass
	4183.00	Horizontal	-61.39	-57.76	3.96	13.98	-47.74		
	5019.60	Horizontal	---	---	4.68	15.58	---		
251	1697.60	Vertical	-30.24	-32.71	2.62	9.98	-25.35		
	2546.40	Vertical	-45.05	-43.36	3.56	10.56	-36.36		
	3395.20	Vertical	-57.15	-55.45	3.90	12.87	-46.48	-13.00	Pass
	4244.00	Vertical	-62.75	-58.86	4.10	13.99	-48.97		
	5092.80	Vertical	---	---	5.15	16.04	---		
	1697.60	Horizontal	-31.58	-34.02	2.62	9.98	-26.66		
	2546.40	Horizontal	-44.35	-42.48	3.56	10.56	-35.48		
	3395.20	Horizontal	-57.46	-55.56	3.90	12.87	-46.59	-13.00	Pass
	4244.00	Horizontal	-61.51	-57.63	4.10	13.99	-47.74		
	5092.80	Horizontal	---	---	5.15	16.04	---		

Remark：
1.   Spurious Emission Level =SG Reading+ Antenna Gain- Cable Loss
2.   Factor= Spurious Emission Level - SA Reading
3.   Remark"---" means that the emission level is too low to be measured
4.   The emission levels of below 1 GHz are very lower than the limit and not show in test report.

Channel	Frequency (MHz)	Antenna Pol.	SA Reading (dBm)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBi)	Spurious Emission Level (dBm)	Limit (dBm)	Result
				GPRS850					
128	1648.40	Vertical	-30.31	-32.88	2.50	9.75	-25.63	-13.00	Pass
	2472.60	Vertical	-42.89	-41.94	3.12	10.48	-34.58		
	3296.80	Vertical	-56.13	-54.80	3.54	12.47	-45.87		
	4121.00	Vertical	-61.34	-57.50	3.87	13.59	-47.78		
	4945.20	Vertical	---	---	4.26	15.44	---		
	1648.40	Horizontal	-32.46	-35.12	2.50	9.75	-27.87	-13.00	Pass
	2472.60	Horizontal	-46.02	-44.92	3.12	10.48	-37.56		
	3296.80	Horizontal	-53.85	-52.40	3.54	12.47	-43.47		
	4121.00	Horizontal	-60.62	-57.08	3.87	13.59	-47.36		
	4945.20	Horizontal	---	---	4.26	15.44	---		
190	1673.20	Vertical	-30.43	-32.87	2.58	9.79	-25.66	-13.00	Pass
	2509.80	Vertical	-42.75	-41.84	3.15	10.59	-34.40		
	3346.40	Vertical	-56.37	-55.07	3.78	12.87	-45.98		
	4183.00	Vertical	-61.54	-57.87	3.96	13.98	-47.85		
	5019.60	Vertical	---	---	4.68	15.58	---		
	1673.20	Vertical	-32.34	-34.93	2.58	9.79	-27.72	-13.00	Pass
	2509.80	Horizontal	-46.33	-45.09	3.15	10.59	-37.65		
	3346.40	Horizontal	-53.94	-52.44	3.78	12.87	-43.35		
	4183.00	Horizontal	-61.32	-57.69	3.96	13.98	-47.67		
	5019.60	Horizontal	---	---	4.68	15.58	---		
251	1697.60	Vertical	-30.36	-32.83	2.62	9.98	-25.47	-13.00	Pass
	2546.40	Vertical	-46.25	-44.56	3.56	10.56	-37.56		
	3395.20	Vertical	-56.54	-54.84	3.90	12.87	-45.87		
	4244.00	Vertical	-63.25	-59.36	4.10	13.99	-49.47		
	5092.80	Vertical	---	---	5.15	16.04	---		
	1697.60	Horizontal	-31.39	-33.83	2.62	9.98	-26.47	-13.00	Pass
	2546.40	Horizontal	-45.44	-43.57	3.56	10.56	-36.57		
	3395.20	Horizontal	-57.34	-55.44	3.90	12.87	-46.47		
	4244.00	Horizontal	-61.64	-57.76	4.10	13.99	-47.87		
	5092.80	Horizontal	---	---	5.15	16.04	---		

Remark：
1.   Spurious Emission Level =SG Reading+ Antenna Gain- Cable Loss
2.   Factor= Spurious Emission Level - SA Reading
3.   Remark"---" means that the emission level is too low to be measured
4.   The emission levels of below 1 GHz are very lower than the limit and not show in test report.

Channel	Frequency (MHz)	Antenna Pol.	SA Reading (dBm)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBi)	Spurious Emission Level (dBm)	Limit (dBm)	Result
				PCS1900					
512	3700.40	Vertical	-38.45	-35.58	4.05	13.05	-26.58	-13.00	Pass
	5550.60	Vertical	-54.67	-49.71	5.22	16.25	-38.68		
	7400.80	Vertical	-63.16	-56.1	6.25	16.87	-45.48		
	9251.00	Vertical	-66.10	-58.78	6.98	17.98	-47.78		
	11101.20	Vertical	---	---	7.68	19.58	---		
	3700.40	Horizontal	-39.17	-36.29	4.05	13.05	-27.29	-13.00	Pass
	5550.60	Horizontal	-54.68	-49.47	5.22	16.25	-38.44		
	7400.80	Horizontal	-63.39	-56.31	6.25	16.87	-45.69		
	9251.00	Horizontal	-67.02	-59.25	6.98	17.98	-48.25		
	11101.20	Horizontal	---	---	7.68	19.58	---		
661	3760.00	Vertical	-37.45	-34.44	4.15	13.12	-25.47	-13.00	Pass
	5640.00	Vertical	-50.41	-45.35	5.36	16.35	-34.36		
	7520.00	Vertical	-63.57	-56.3	6.38	16.98	-45.70		
	9400.00	Vertical	-66.42	-58.55	7.10	18.09	-47.56		
	11280.00	Vertical	---	---	7.89	15.66	---		
	3760.00	Vertical	-39.66	-36.84	4.15	13.12	-27.87	-13.00	Pass
	5640.00	Horizontal	-53.73	-48.62	5.36	16.35	-37.63		
	7520.00	Horizontal	-60.56	-53.48	6.38	16.98	-42.88		
	9400.00	Horizontal	-66.84	-59.14	7.10	18.09	-48.15		
	11280.00	Horizontal	---	---	7.89	15.66	---		
810	3819.60	Vertical	-37.93	-31.14	4.20	9.98	-25.36	-13.00	Pass
	5729.40	Vertical	-54.19	-43.06	5.37	10.56	-37.87		
	7639.20	Vertical	-63.34	-51.88	6.44	12.87	-45.45		
	9549.00	Vertical	-68.66	-56.49	7.15	13.99	-49.65		
	11458.80	Vertical	---	---	8.04	16.04	---		
	3819.60	Horizontal	-39.51	-32.67	4.20	9.98	-26.89	-13.00	Pass
	5729.40	Horizontal	-52.95	-41.66	5.37	10.56	-36.47		
	7639.20	Horizontal	-64.67	-53.12	6.44	12.87	-46.69		
	9549.00	Horizontal	-66.86	-54.58	7.15	13.99	-47.74		
	11458.80	Horizontal	---	---	8.04	16.04	---		

Remark：
1. Spurious Emission Level =SG Reading+ Antenna Gain- Cable Loss
2. Factor= Spurious Emission Level - SA Reading
3. Remark"---" means that the emission level is too low to be measured
4. The emission levels of below 1 GHz are very lower than the limit and not show in test report.

Channel	Frequency (MHz)	Antenna Pol.	SA Reading (dBm)	SG Reading (dBm)	Cable Loss (dB)	Gain (dBi)	Spurious Emission Level (dBm)	Limit (dBm)	Result
				GPRS1900					
512	3700.40	Vertical	-39.45	-36.58	4.05	13.05	-27.58	-13.00	Pass
	5550.60	Vertical	-54.15	-49.19	5.22	16.25	-38.16		
	7400.80	Vertical	-63.33	-56.27	6.25	16.87	-45.65		
	9251.00	Vertical	-65.79	-58.47	6.98	17.98	-47.47		
	11101.20	Vertical	---	---	7.68	19.58	---		
	3700.40	Horizontal	-39.53	-36.65	4.05	13.05	-27.65	-13.00	Pass
	5550.60	Horizontal	-54.72	-49.51	5.22	16.25	-38.48		
	7400.80	Horizontal	-62.96	-55.88	6.25	16.87	-45.26		
	9251.00	Horizontal	-67.13	-59.36	6.98	17.98	-48.36		
	11101.20	Horizontal	---	---	7.68	19.58	---		
661	3760.00	Vertical	-37.63	-34.62	4.15	13.12	-25.65	-13.00	Pass
	5640.00	Vertical	-50.53	-45.47	5.36	16.35	-34.48		
	7520.00	Vertical	-64.85	-57.58	6.38	16.98	-46.98		
	9400.00	Vertical	-66.44	-58.57	7.10	18.09	-47.58		
	11280.00	Vertical	---	---	7.89	15.66	---		
	3760.00	Vertical	-38.93	-36.11	4.15	13.12	-27.14	-13.00	Pass
	5640.00	Horizontal	-53.66	-48.55	5.36	16.35	-37.56		
	7520.00	Horizontal	-61.37	-54.29	6.38	16.98	-43.69		
	9400.00	Horizontal	-66.94	-59.24	7.10	18.09	-48.25		
	11280.00	Horizontal	---	---	7.89	15.66	---		
810	3819.60	Vertical	-38.04	-31.25	4.20	9.98	-25.47	-13.00	Pass
	5729.40	Vertical	-54.20	-43.07	5.37	10.56	-37.88		
	7639.20	Vertical	-63.42	-51.96	6.44	12.87	-45.53		
	9549.00	Vertical	-68.70	-56.53	7.15	13.99	-49.69		
	11458.80	Vertical	---	---	8.04	16.04	---		
	3819.60	Horizontal	-39.52	-32.68	4.20	9.98	-26.90	-13.00	Pass
	5729.40	Horizontal	-53.02	-41.73	5.37	10.56	-36.54		
	7639.20	Horizontal	-64.70	-53.15	6.44	12.87	-46.72		
	9549.00	Horizontal	-66.94	-54.66	7.15	13.99	-47.82		
	11458.80	Horizontal	---	---	8.04	16.04	---		

Remark：
1. Spurious Emission Level =SG Reading+ Antenna Gain- Cable Loss
2. Factor= Spurious Emission Level - SA Reading
3. Remark"---" means that the emission level is too low to be measured
4. The emission levels of below 1 GHz are very lower than the limit and not show in test report.

3.6. Frequency Stability under Temperature & Voltage Variations

LIMIT

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

TEST CONFIGURATION
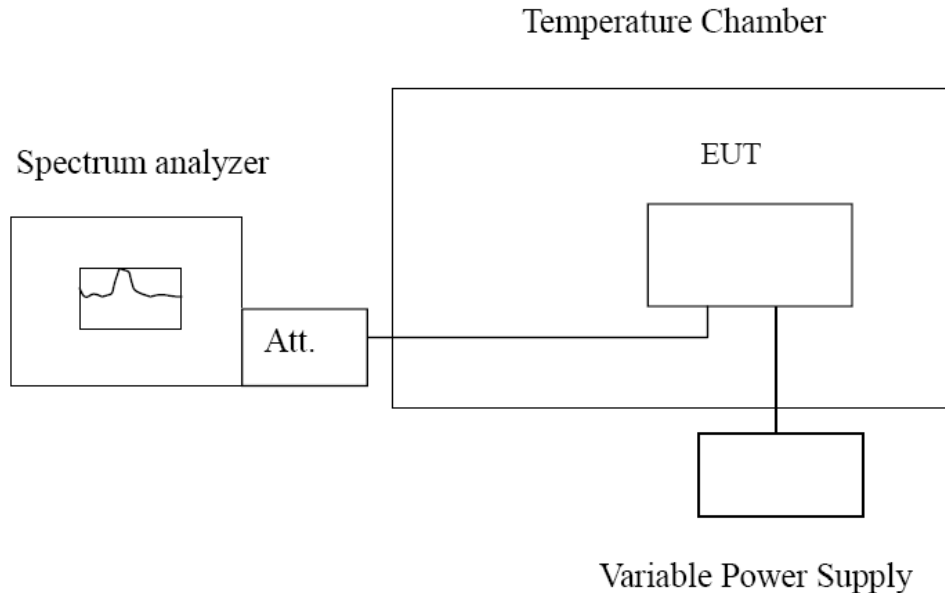
TEST PROCEDURE

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

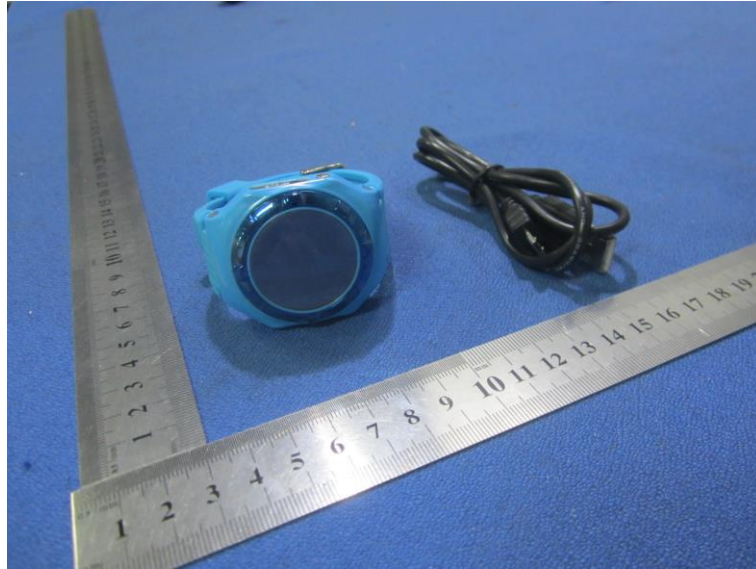Remark: we test all modulation type and record worst case at Voice mode.

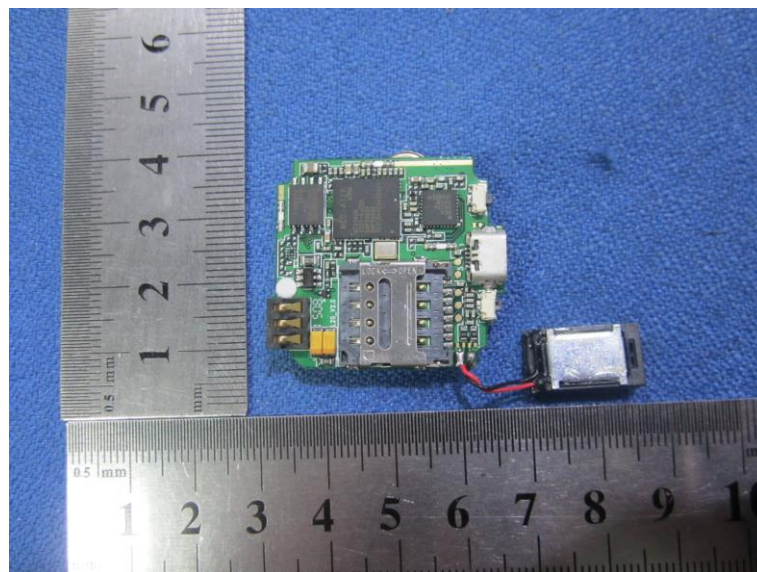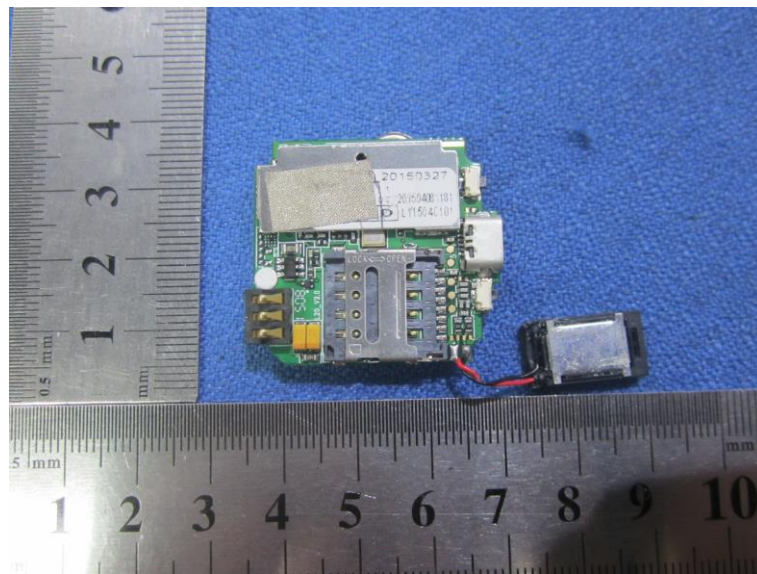| Reference Frequency: GSM850 Middle channel=190 frequency=836.6MHz					
Voltage (V)	Temperature (℃)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.70	-30	78	0.093	2.5	Pass
	-20	65	0.078		
	-10	84	0.100		
	0	69	0.082		
	10	55	0.066		
	20	49	0.059		
	30	76	0.091		
	40	68	0.081		
	50	59	0.071		
4.25	25	36	0.043		
End point 3.40	25	47	0.056		
Reference Frequency: PCS1900 Middle channel=661 frequency=1880MHz					
Voltage (V)	Temperature (℃)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.70	-30	57	0.030	Within the authorized frequency block	Pass
	-20	26	0.014		
	-10	23	0.012		
	0	14	0.007		
	10	23	0.012		
	20	59	0.031		
	30	44	0.023		
	40	39	0.021		
	50	58	0.031		
4.25	25	46	0.024		
End point 3.40	25	55	0.029		

4. Test Setup Photos of the EUT
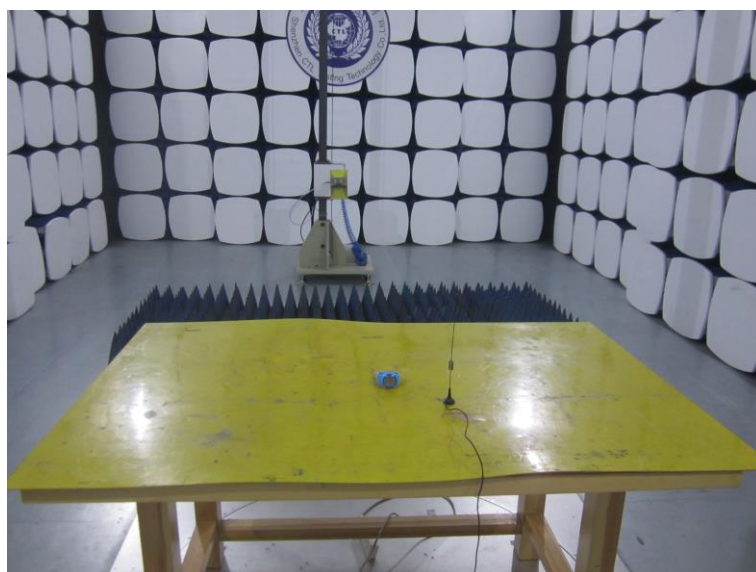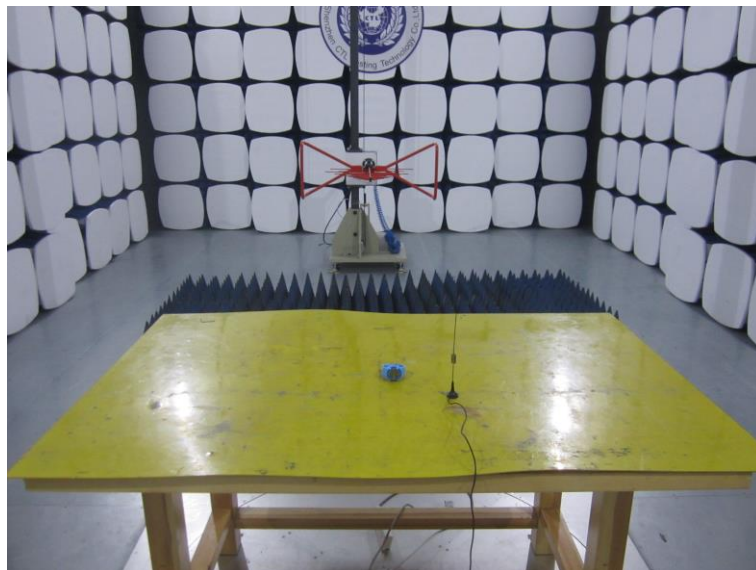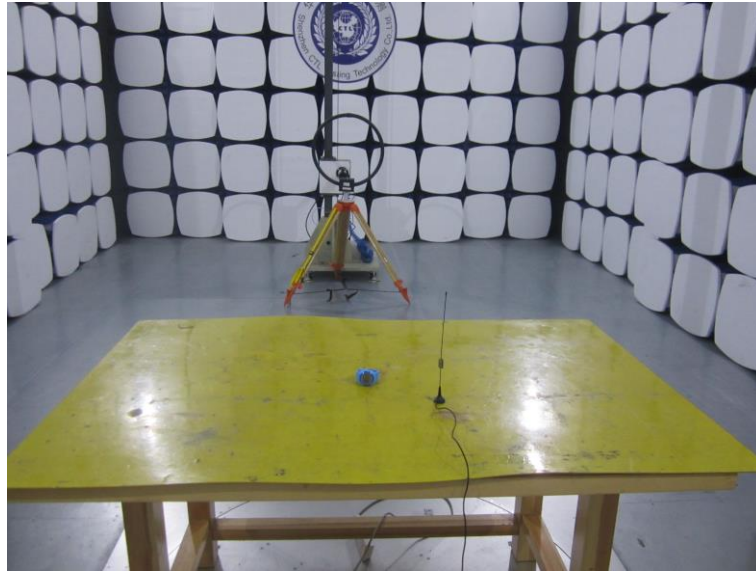
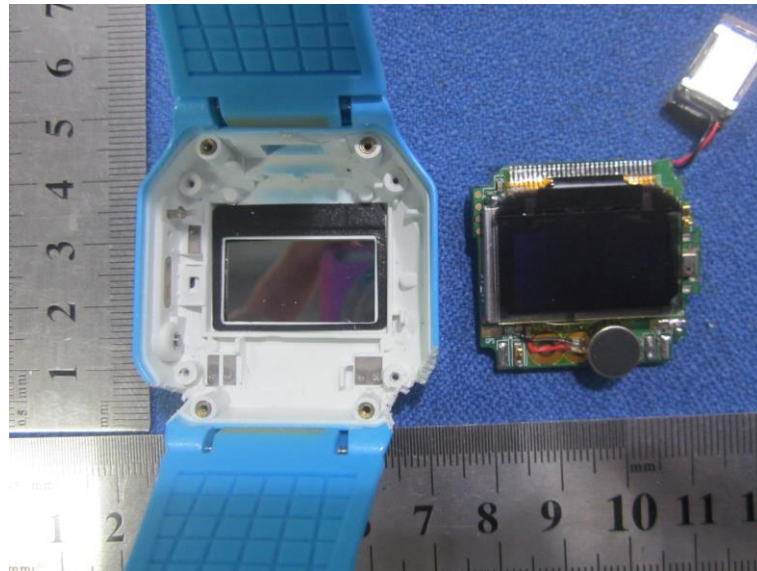# 5. External and Internal Photos of the EUT

External Photos of EUT

External Photos of EUT

Internal Photos of EUT

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