



# FCC RF TESTREPORT

Issued to

**esky wireless Inc**

For

**GPS Tracker**

Model Name : ES620  
 Trade Name : esky  
 Brand Name : esky  
 FCC ID : YR8ES620  
 Standard : 47 CFR Part 22 Subpart H  
 47 CFR Part 24 Subpart E  
 Test date : Dec.31,2015 to Feb.17,2016  
 Issue date : Feb.18,2016

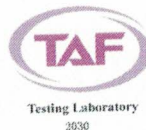
ShanghaiMORLAB Communications Technology Co., Ltd.



Tested by Wu Hongfei

Approved by Guy Yan

Review by Fang Min



The report refers only to the sample tested and does not apply to the bulk. This report is issued in confidence to the client and it will be strictly treated as such by the Shanghai MORLAB Communication Technology Co., Ltd. It may not be reproduced rather in its entirety or in part and it may not be used for advertising. The client to whom the report is issued may, however, show or send it or a certified copy thereof prepared by the Shanghai MORLAB Telecommunications Co., Ltd to his customer. Supplier or others persons directly concerned. Shanghai MORLAB Telecommunications Co., Ltd will not, without the consent of the client enter into any discussion of correspondence with any third party concerning the contents of the report. In the event of the improper use of the report, Shanghai MORLAB Telecommunications Co., Ltd reserves the rights to withdraw it and to adopt any other remedies which may be appropriate.

## DIRECTORY

<b>1.</b>	<b>General Information .....</b>	<b>4</b>
1.1	Applicant .....	4
1.2	Manufacturer .....	4
1.3	Description of EUT .....	4
<b>2.</b>	<b>Facilities and Accreditations .....</b>	<b>5</b>
2.1	Test Facility .....	5
2.2	Environmental Conditions .....	5
2.3	List of Equipments Used .....	5
<b>3.</b>	<b>Test Standards and Results .....</b>	<b>7</b>
<b>4.</b>	<b>Test Result .....</b>	<b>8</b>
4.1	Conducted Output Power .....	8
4.2	99%/-26dB Occupied Bandwidth .....	10
4.3	Frequency Stability .....	14
4.4	Peak-to-Average Ratio .....	17
4.5	Conducted Out of Band Emissions .....	21
4.6	Band Edge .....	28
4.7	Transmitter Radiated Power (EIRP/ERP) .....	31
4.8	Radiated Out of Band Emissions .....	34
	<b>Photos of the EUT.....</b>	<b>38</b>

**Change History**

Issue	Date	Reason for change
1.0	Feb.18,2016	First edition

## 1. General Information

### 1.1 Applicant

**esky wireless Inc**  
22-303 #328 street Xinghu, Suzhou, China

### 1.2 Manufacturer

**esky wireless Inc**  
22-303 #328 street Xinghu, Suzhou, China

### 1.3 Description of EUT

EUT Type .....: GPS Tracker  
Brand Name.....: esky  
Trade Name .....: esky  
Model Name.....: ES620  
Hardware Version .....: ES620-MB-H102  
Software Version .....: ES620\_V1.5\_B03\_160105  
Antenna type.....: Internal  
Antenna gain.....: GSM 850: 2 dBi  
GSM 1900: 2 dBi  
Frequency Range..... GSM 850MHz:  
Tx: 824.20-848.80 MHz (at intervals of 200kHz);  
Rx: 869.20-893.80 MHz (at intervals of 200kHz)  
GSM 1900MHz  
Tx: 1850.20-1909.80 MHz (at intervals of 200kHz);  
Rx: 1930.20-1989.80 MHz (at intervals of 200kHz)  
Modulation Type .....: GPRS/GSM mode with GMSK modulation  
Battery .....: 3.7V, 1000mAh

#### NOTE:

(1) The transmitter (Tx) frequency arrangement of the cellular 850MHz used by the EUT can be represented with the formula  $F(n)=824.2+0.2*(n-128)$ ,  $128 \leq n \leq 251$ ; the lowest, middle, highest channel numbers (ARFCHs) used and tested in this report are separately 128 (824.2MHz), 190(836.6MHz) and 251 (848.8MHz); the PCS 1900MHz used by the EUT can be represented with the formula  $F(n)=1850.2+0.2*(n-512)$ ,  $512 \leq n \leq 810$ ; the lowest, middle, highest channel numbers (ARFCHs) used and tested in this report are separately 512 (1850.2MHz), 661(1880.0MHz) and 810 (1909.8MHz).

(2) For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

## 2. Facilities and Accreditations

### 2.1 Test Facility

Shanghai MORLAB Communications Technology Co., Ltd. MORLAB Laboratory is a third party testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L6644. A 9\*6\*6(m) fully anechoic chamber was used for the radiated spurious emissions test.

### 2.2 Environmental Conditions

Ambient temperature: 20~25°C

Relative humidity: 40~60%

Atmosphere pressure: 86-102kPa

### 2.3 List of Equipments Used

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
System Simulator	Agilent	E5515C	GB46040102	2015.9.22	1year
Spectrum Analyzer	Agilent	E4440A	MY49420287	2015.9.22	1year
Spectrum Analyzer	Rohde&Schwarz	FSU26	200880	2015.10.10	1year
Power Splitter	Weinschel	1506A	NW521	(n.a.)	(n.a.)
Power Splitter	Mini-Circuits	ZFRSC-183-S+	765001016	(n.a.)	(n.a.)
Attenuator 1	Mini-Circuits	10dB	(n.a.)	(n.a.)	(n.a.)
Attenuator 2	Resnet	10dB	(n.a.)	(n.a.)	(n.a.)
Attenuator 3	Resnet	3dB	(n.a.)	(n.a.)	(n.a.)
DC Power Supply	Good Will	GPS-3030DD	EF920938	2015.10.12	2year
Temperature Chamber	YinHe Experimental Equip.	HL4003T	(n.a.)	2015.9.20	1year
Full-AnechoicChamber	Albatross	9m*6m*6m	(n.a.)	2015.1.21	2year
Singal Generator	Agilent	E4433B	MY43350266	2015.9.22	1year
Broadband Trilog Antenna	Schwarzbeck	VULB 9163	9163-561	2014.7.26	3year
Broadband Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-1033	2014.7.24	3year
Broadband Horn Antenna	Schwarzbeck	BBHA 9120LFA	BBHA-9120LFA	2014.7.18	3year
Broadband Horn Antenna	Schwarzbeck	BBHA 9170	BBHA91970171	2014.7.14	3year
Test Antenna-Loop	Rohde&Schwarz	HFH2-Z2	860004/001	2014.7.26	3year
Temporary Antenna Connector	Farpu	SMA-K	(n.a.)	(n.a.)	(n.a.)
RF Cable	(n.a.)	(n.a.)	(n.a.)	(n.a.)	(n.a.)

**NOTE:**

*Equipments listed above have been calibrated and are in the period of validation.*

### 3. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 2, Part 22 and part 24 for the EUT FCC ID Certification:

No.	Identity	Document Title
1	47 CFR Part 2	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS
2	47 CFR Part 22	PUBLIC MOBILE SERVICES
3	47 CFR Part 24	PERSONAL COMMUNICATIONS SERVICES

Test detailed items/section required by FCC rules & IC rules and results are as below:

No.	FCC Rules	Description	Result
1	2.1046	Conducted Output Power	PASS
2	2.1049	99%/-26dB Occupied Bandwidth	PASS
3	2.1055 22.355 24.235	Frequency Stability	PASS
4	24.232	Peak-to-Average Ratio	PASS
5	2.1051 2.1057 22.917 24.238	Conducted Out of Band Emissions	PASS
6	2.1051 2.1057 22.917 24.238	Band Edge	PASS
7	22.913 24.232	Transmitter Radiated Power (EIPR/ERP)	PASS
8	2.1053 2.1057 22.917 24.238	Radiated Out of Band Emissions	PASS

NOTE: Measurement method according to TIA/EIA 603.D-2010

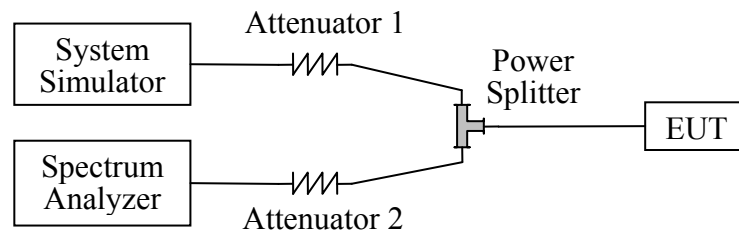
## 4. Test Result

### 4.1 Conducted Output Power

#### 4.1.1 Requirement

According to FCC section 2.1046(a), for transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in FCC section 2.1033(c)(8).

#### 4.1.2 Test Description



The EUT, which is powered by the DC Power Supply, is coupled to the Spectrum Analyzer (SA) and the System Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50 Ohm; the path loss as the factor is calibrated to correct the reading. The EUT is commanded by the SS to operate at the maximum output power i.e. Power Control Level (PCL) = 5 and Power Class = 4. A call is established between the EUT and the SS.



### 4.1.3 Test Result

Here the lowest, middle and highest channels are selected to perform testing to verify the conducted RF output power of the EUT.

Band	Channel	Frequency (MHz)	Measured Output Power(dBm)	Limited (dBm)	Verdict
GSM 850MHz	128	824.2	31.51	38.5	PASS
	190	836.6	31.75	38.5	PASS
	251	848.8	31.86	38.5	PASS
GSM 1900MHz	512	1850.2	29.24	33.0	PASS
	661	1880	29.45	33.0	PASS
	810	1909.8	29.68	33.0	PASS
GPRS 850MHz	128	824.2	30.16	38.5	PASS
	190	836.6	30.45	38.5	PASS
	251	848.8	31.27	38.5	PASS
GPRS 1900MHz	512	1850.2	28.56	33.0	PASS
	661	1880	29.36	33.0	PASS
	810	1909.8	29.44	33.0	PASS

*Note: Maximum burst average power for GSM.*

## 4.2 99%/-26dB Occupied Bandwidth

### 4.2.1 Definition

According to FCC section 2.1049, the occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.

Occupied bandwidth is also known as the 99% emission bandwidth.

### 4.2.2 Test Description

See section 4.1.1 of this report.

### 4.2.3 Test Results

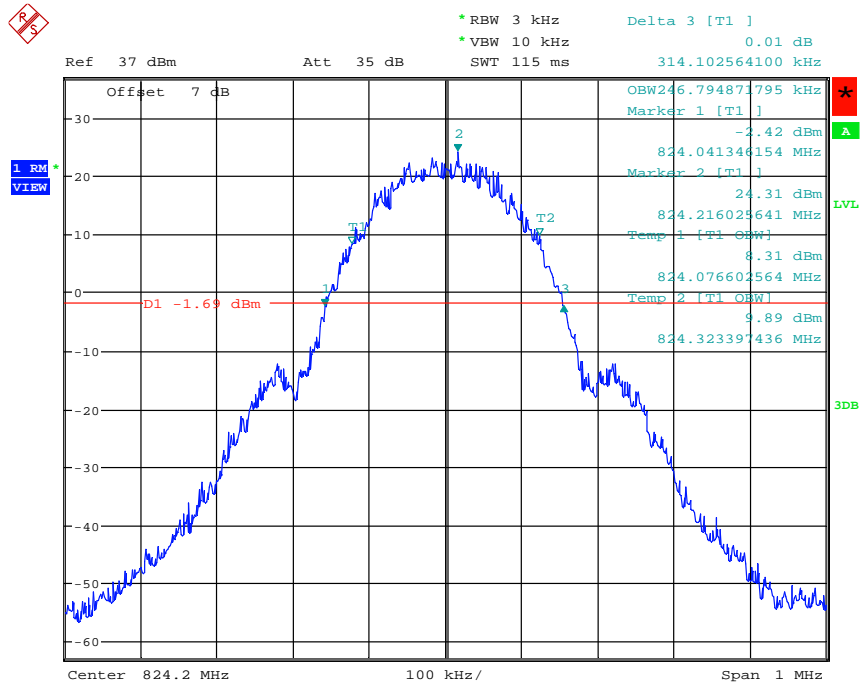
Here the lowest, middle and highest channels are tested to record the 99% occupied bandwidth, it's about 300kHz.

Band	Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	-26dB Occupied Bandwidth (MHz)	Refer to Plot
GSM/GPRS 850MHz	128	824.2	0.2467	0.3141	A1
	189	836.4	0.2435	0.3157	A2
	251	848.8	0.2467	0.3012	A3
GSM/GPRS 1900MHz	512	1850.2	0.2467	0.3141	B1
	661	1880	0.2451	0.3125	B2
	810	1909.8	0.2451	0.3012	B3

*Note :*

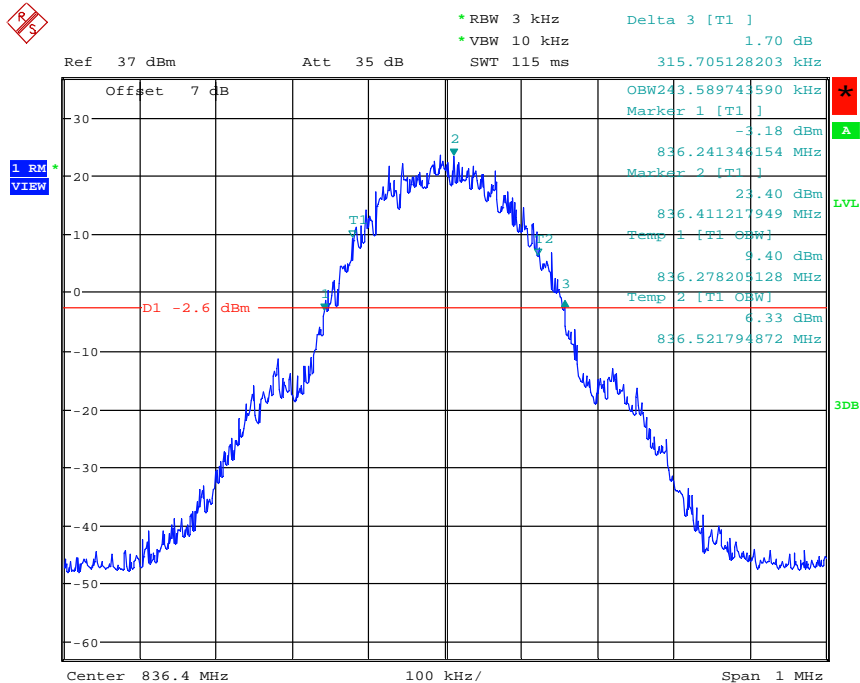
*1) Both GSM/GPRS mode was tested and the worst data was record.*

Test Plots:



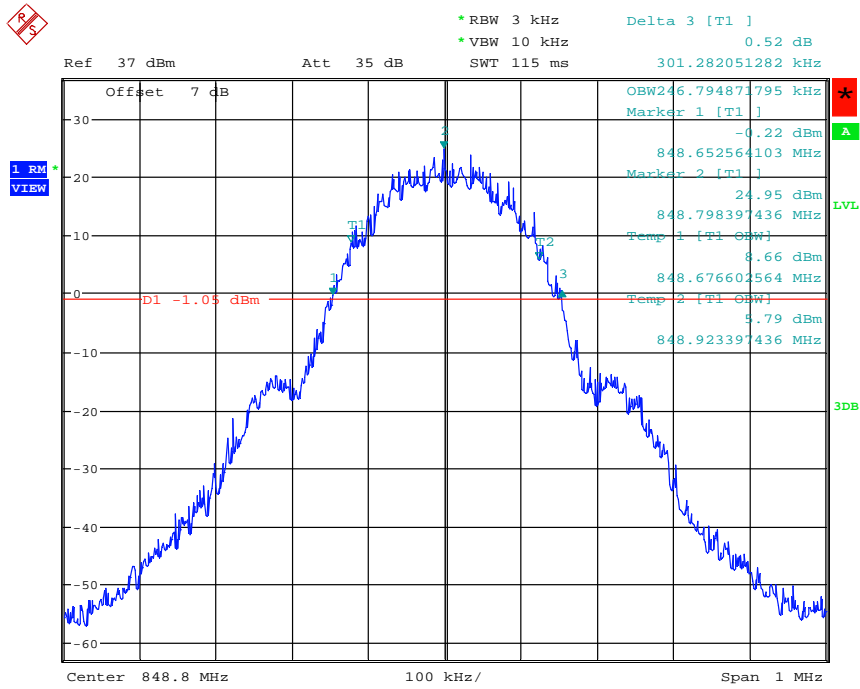
Date: 31.DEC.2015 17:06:08

(Plot A1: GSM 850MHz, Channel = 128)



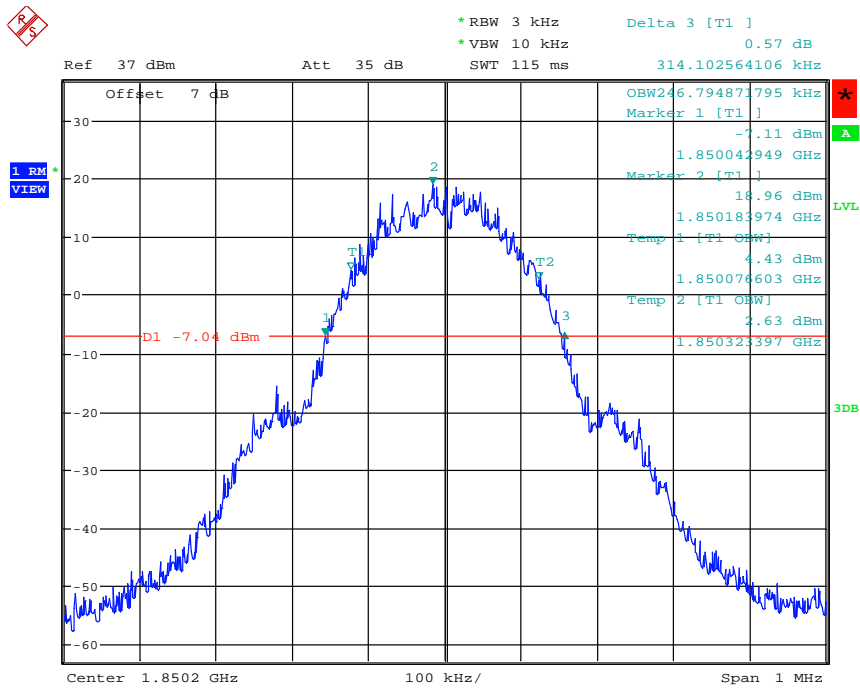
Date: 31.DEC.2015 17:04:01

(Plot A2: GSM 850MHz, Channel = 189)



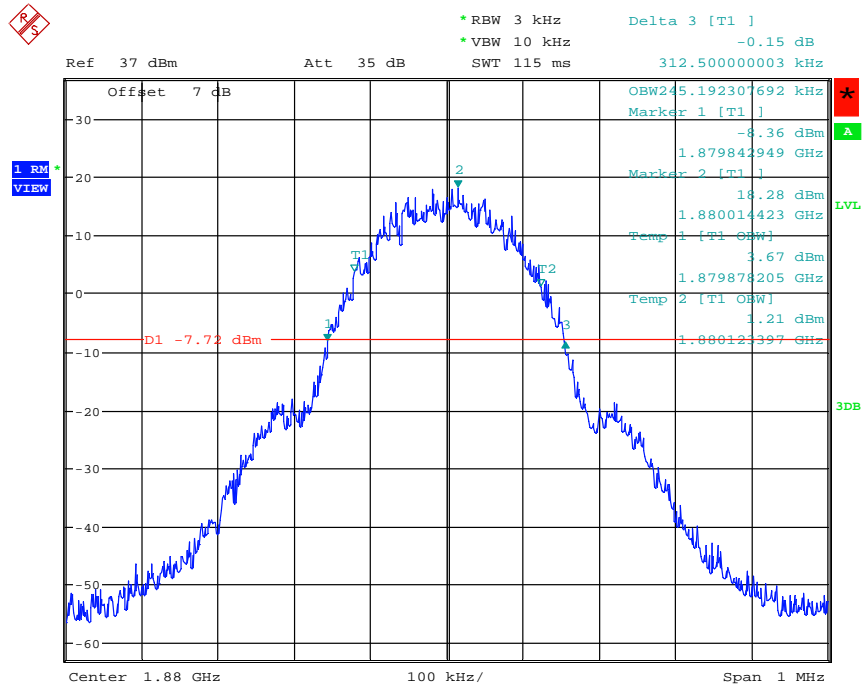
Date: 31.DEC.2015 17:08:26

(Plot A3: GSM 850MHz, Channel = 251)



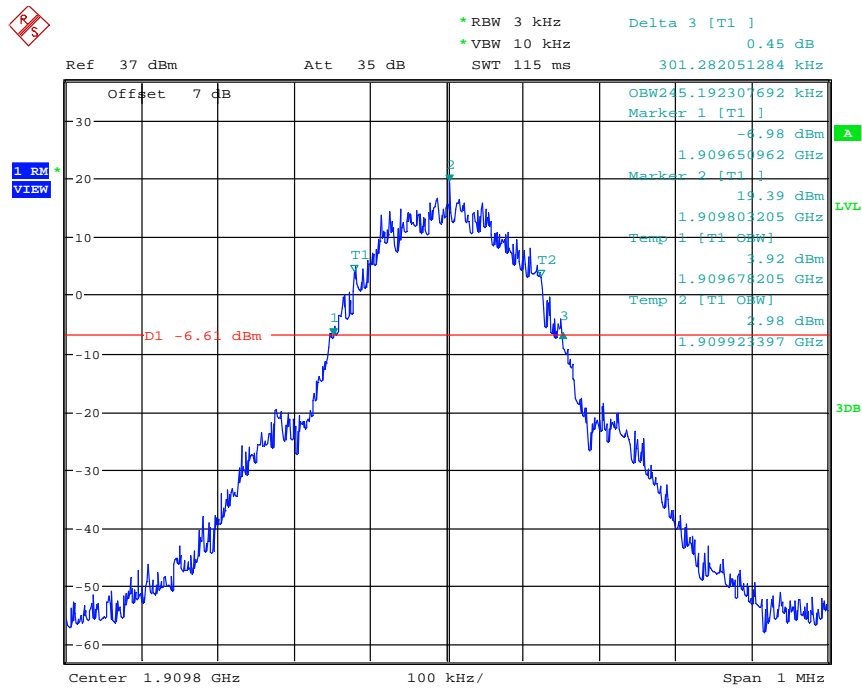
Date: 31.DEC.2015 17:27:00

(Plot B1: GSM 1900MHz, Channel =512)



Date: 31.DEC.2015 17:28:54

(Plot B2: GSM 1900MHz, Channel =661)



Date: 31.DEC.2015 17:32:05

(Plot B3:GSM 1900MHz, Channel =810)

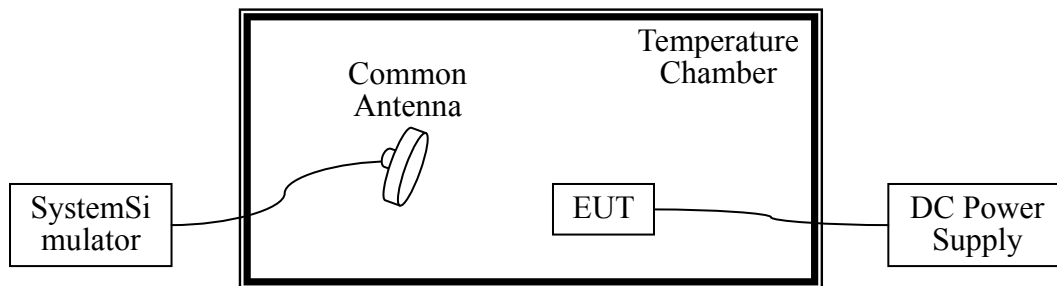
## 4.3 Frequency Stability

### 4.3.1 Requirement

According to FCC section 22.355 and FCC section 24.235, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. According to FCC section 2.1055, the test conditions are:

- (a) The temperature is varied from  $-30^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$  at intervals of not more than  $10^{\circ}\text{C}$ .
- (b) For hand carried battery powered equipment, the primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacture. The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided.

### 4.3.2 Test Description



### 4.3.3 Test Setup

The EUT, which is powered by the DC Power Supply directly, is located in the Temperature Chamber. The EUT is commanded by the System Simulator (SS) to operate at the maximum output power i.e. Power Control Level (PCL) = 5 and Power Class = 4. A call is established between the EUT and the SS via a Common Antenna.

### 4.3.4 Test Results

For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer; the normal temperature here used is 25°C. The frequency deviation limit is  $\pm 2.5$ ppm.

#### GSM mode

Band	Test Conditions		Frequency Deviation						Limit/Verdict
	Power (VDC)	Temp (°C)	Low Channel		Middle Channel		High Channel		
			Dev. Freq. Hz	Deviation (ppm)	Dev. Freq. Hz	Deviation (ppm)	Dev. Freq. Hz	Deviation (ppm)	±2.5ppm 850 ±1ppm 1900
850 MHz GSM/ GPRS	3.7	-30	---	---	---	---	---	---	PASS
		-20	-43	-0.051	38	0.045	47	0.055	
		-10	-44	-0.052	-37	-0.044	42	0.049	
		0	-53	-0.062	55	0.065	48	0.056	
		10	45	0.053	-57	-0.067	-52	-0.061	
		20	43	0.051	49	0.058	-48	-0.056	
		30	47	0.055	33	0.039	53	0.062	
		40	49	0.058	-38	-0.045	-46	-0.054	
		50	-51	-0.060	44	0.052	54	0.064	
		60	-61	-0.072	53	0.062	-33	-0.039	
		65	49	0.058	54	0.064	33	0.039	
	70	---	---	---	---	---	---		
	4.2	25	-41	-0.048	41	0.048	38	0.045	
3.6	25	-43	-0.051	-39	-0.046	44	0.052		
1900 MHz GSM/ GPRS	3.7	-30	---	---	---	---	---	---	PASS
		-20	-45	-0.024	42	0.022	56	0.029	
		-10	38	0.020	45	0.024	-55	-0.029	
		0	44	0.023	39	0.021	-56	-0.029	
		10	-41	-0.022	-38	-0.020	43	0.023	
		20	38	0.020	43	0.023	-44	-0.023	
		30	-41	-0.022	46	0.024	-40	-0.021	
		40	-48	-0.025	41	0.022	43	0.023	
		50	-36	-0.019	-35	-0.018	47	0.025	
		60	38	0.020	-43	-0.023	57	0.030	
		65	39	0.021	-44	-0.023	38	0.020	
	70	---	---	---	---	---	---		
	4.2	25	38	0.020	41	0.022	33	0.017	
3.6	25	43	0.023	-39	-0.021	38	0.020		

**NOTE:**

- (1) *The EUT stops transmitting at temperatures  $-30^{\circ}\text{C}$ ,  $70^{\circ}\text{C}$*
- (2) *The manufacturer declared that the EUT could work properly between temperatures  $-20^{\circ}\text{C}\sim 65^{\circ}\text{C}$ .*
- (3) *Normal Voltage =  $3.7\text{V}$ ; Max Voltage=  $4.2\text{V}$ ; Min Voltage= $3.6\text{V}$ .*

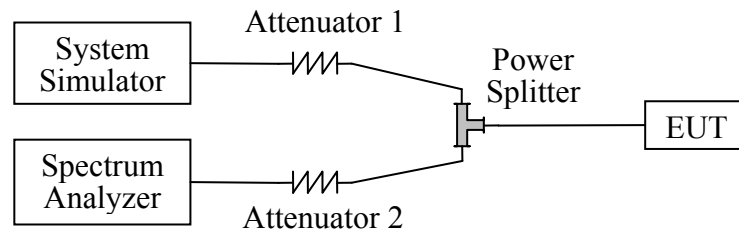


## 4.4 Peak-to-Average Ratio

### 4.4.1 Requirement

According to FCC section 24.232(d), power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of §24.51. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

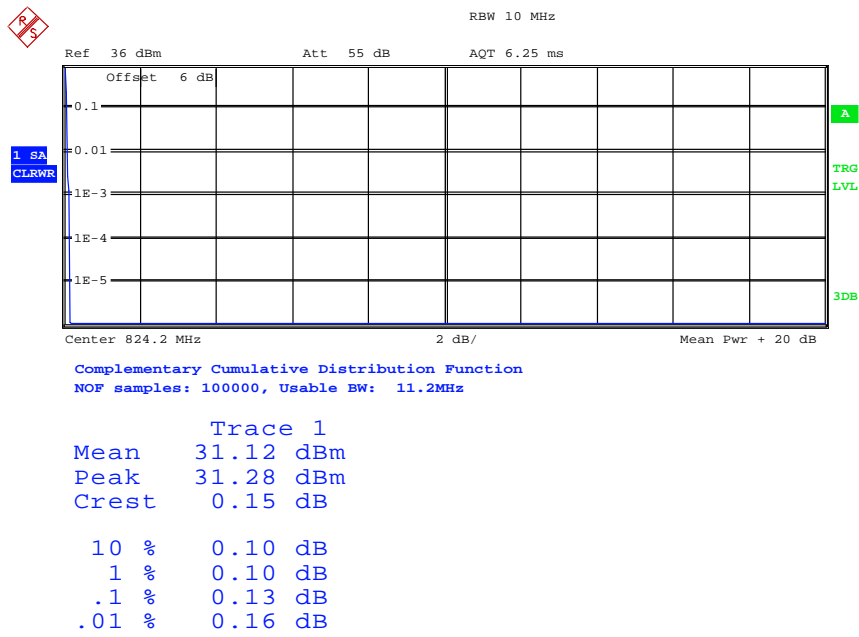
### 4.4.2 Test Description



### 4.4.3 Test Result

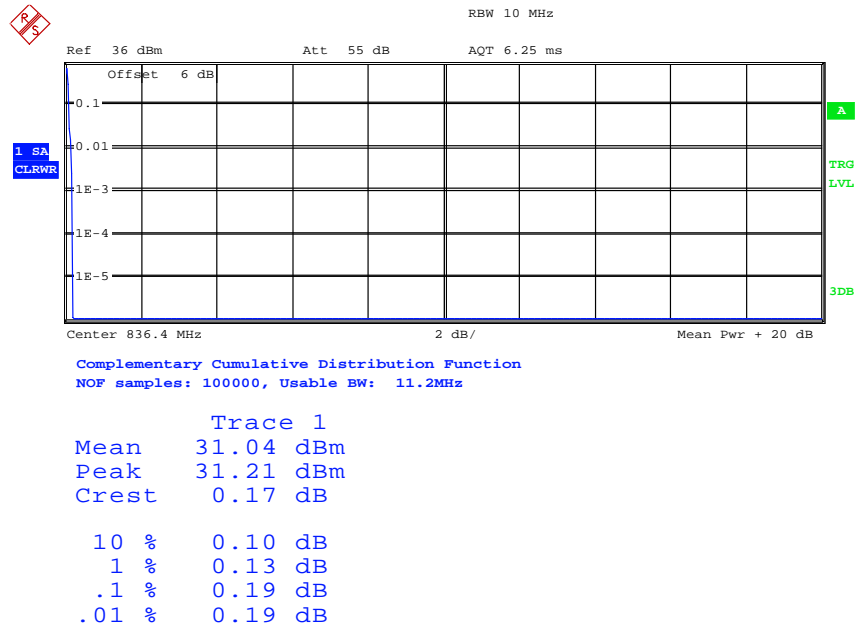
Band	Channel	Frequency (MHz)	Peak-to-Average Ratio (dB)	Refer to Plot
GSM 850MHz	128	824.2	0.16	A1
	189	836.4	0.19	A2
	251	848.8	0.22	A3
GSM 1900MHz	512	1850.2	0.22	B1
	661	1880	0.26	B2
	810	1909.8	0.22	B3

Test Plots:



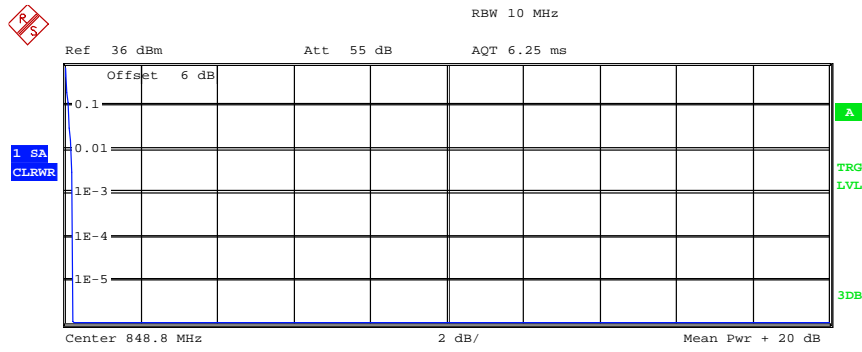
Date: 17.FEB.2016 11:46:56

(Plot A1: GSM 850MHz, Channel =128)



Date: 17.FEB.2016 11:47:35

(Plot A2: GSM 850MHz, Channel =189)



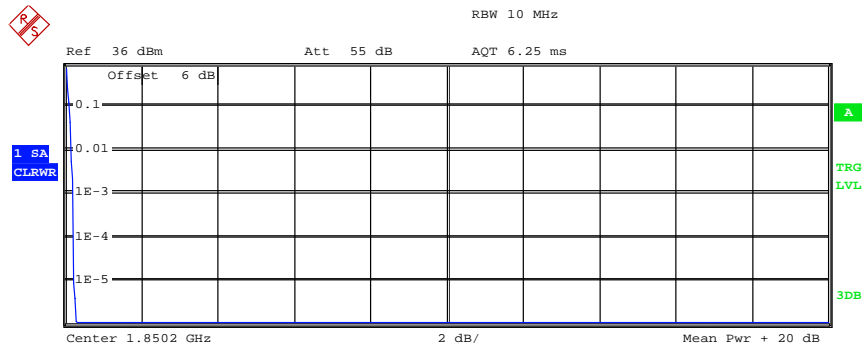
Complementary Cumulative Distribution Function  
 NOF samples: 100000, Usable BW: 11.2MHz

Trace 1  
 Mean 31.10 dBm  
 Peak 31.30 dBm  
 Crest 0.20 dB

10 % 0.10 dB  
 1 % 0.16 dB  
 .1 % 0.22 dB  
 .01 % 0.22 dB

Date: 17.FEB.2016 11:48:05

(Plot A3: GSM 850MHz, Channel =251)



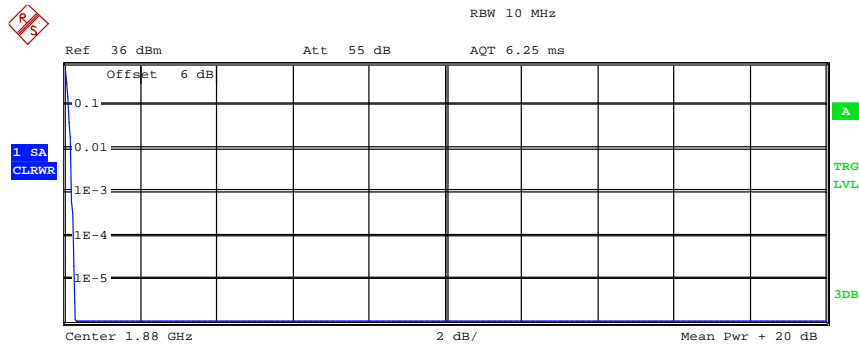
Complementary Cumulative Distribution Function  
 NOF samples: 100000, Usable BW: 11.2MHz

Trace 1  
 Mean 25.99 dBm  
 Peak 26.27 dBm  
 Crest 0.28 dB

10 % 0.10 dB  
 1 % 0.16 dB  
 .1 % 0.22 dB  
 .01 % 0.22 dB

Date: 17.FEB.2016 11:59:41

(Plot B1: GSM 1900MHz, Channel =512)

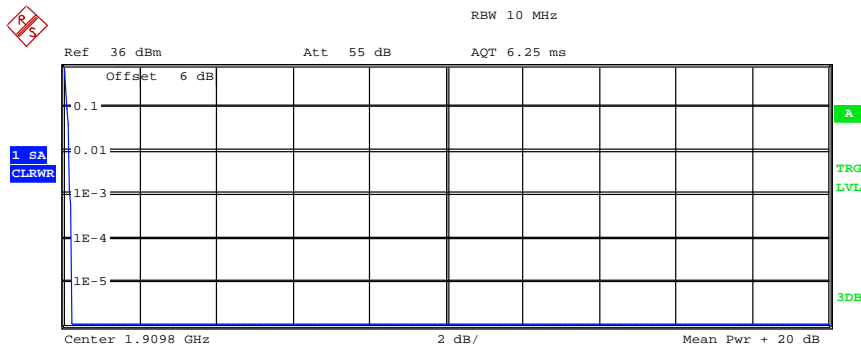


Complementary Cumulative Distribution Function  
 NOF samples: 100000, Usable BW: 11.2MHz

	Trace 1
Mean	25.09 dBm
Peak	25.35 dBm
Crest	0.26 dB
10 %	0.10 dB
1 %	0.16 dB
.1 %	0.19 dB
.01 %	0.26 dB

Date: 17.FEB.2016 12:00:18

(Plot B2: GSM 1900MHz, Channel =661)



Complementary Cumulative Distribution Function  
 NOF samples: 100000, Usable BW: 11.2MHz

	Trace 1
Mean	24.87 dBm
Peak	25.09 dBm
Crest	0.22 dB
10 %	0.10 dB
1 %	0.16 dB
.1 %	0.16 dB
.01 %	0.22 dB

Date: 17.FEB.2016 12:01:03

(Plot B3: GSM 1900MHz, Channel =810)

## 4.5 Conducted Out of Band Emissions

### 4.5.1 Requirement

According to FCC section 22.917(a) and FCC section 24.238(a), 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  $43 + 10 \cdot \log(P)$  dB. This calculated to be -13 dBm.

### 4.5.2 Test Description

See section 4.2.1 of this report.

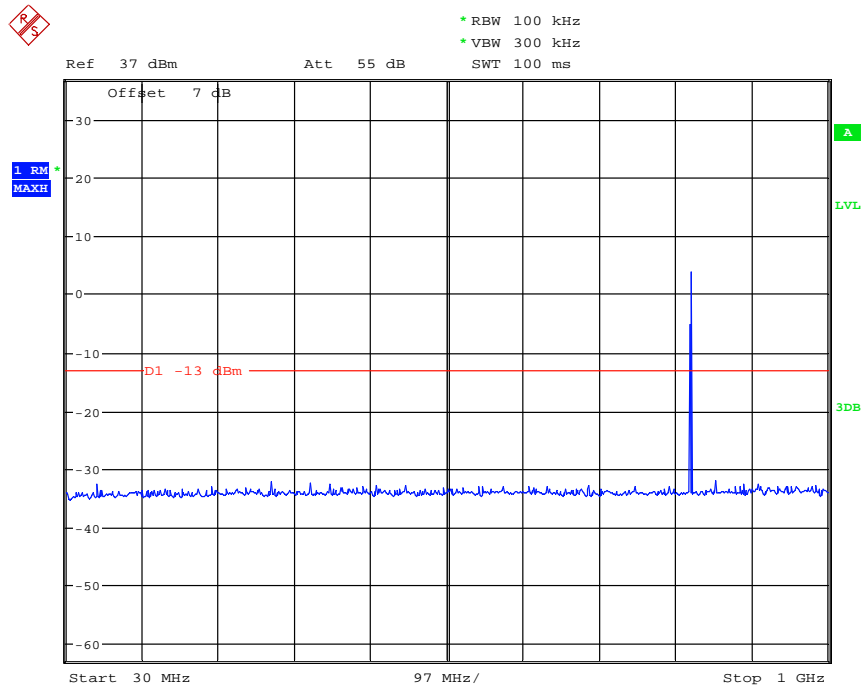
### 4.5.3 Test Results

The measurement frequency range is from 30 MHz to the 10<sup>th</sup> harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the out of band emissions.

Test Plots:

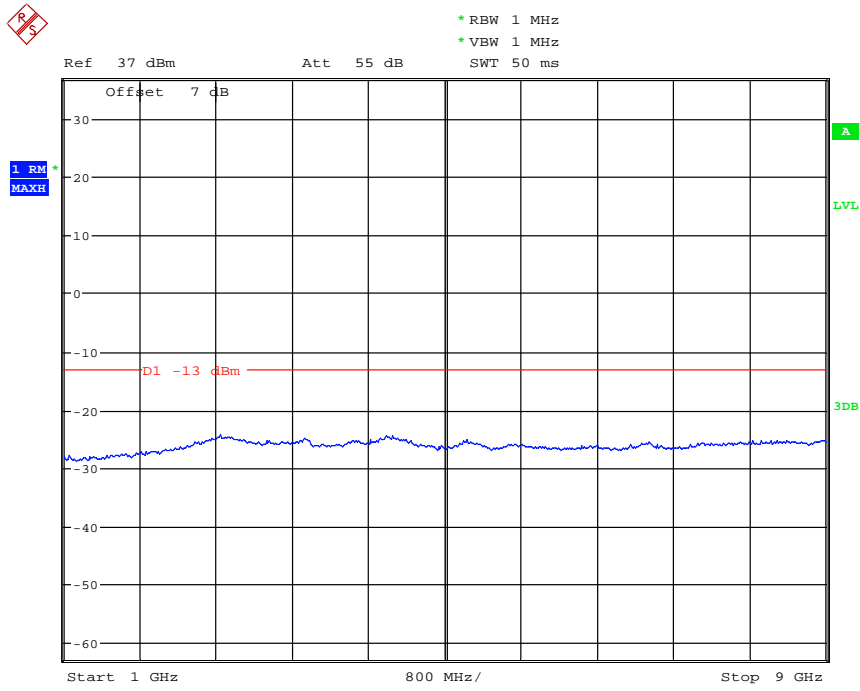
**NOTE:**

*the power of the EUT transmitting frequency should be ignored.*



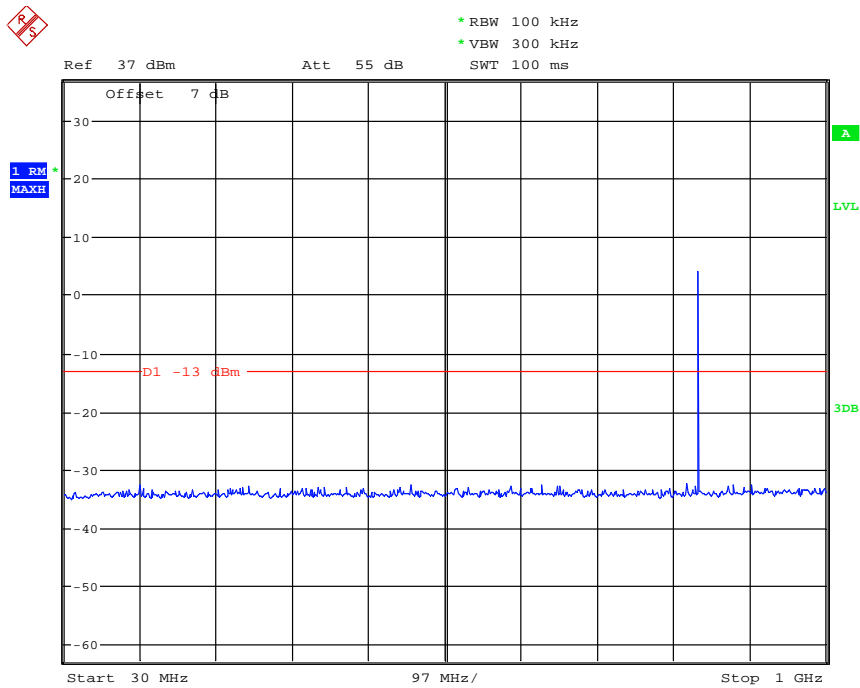
Date: 31.DEC.2015 17:53:58

(GSM 850MHz, Channel = 128, 30MHz to 1GHz)



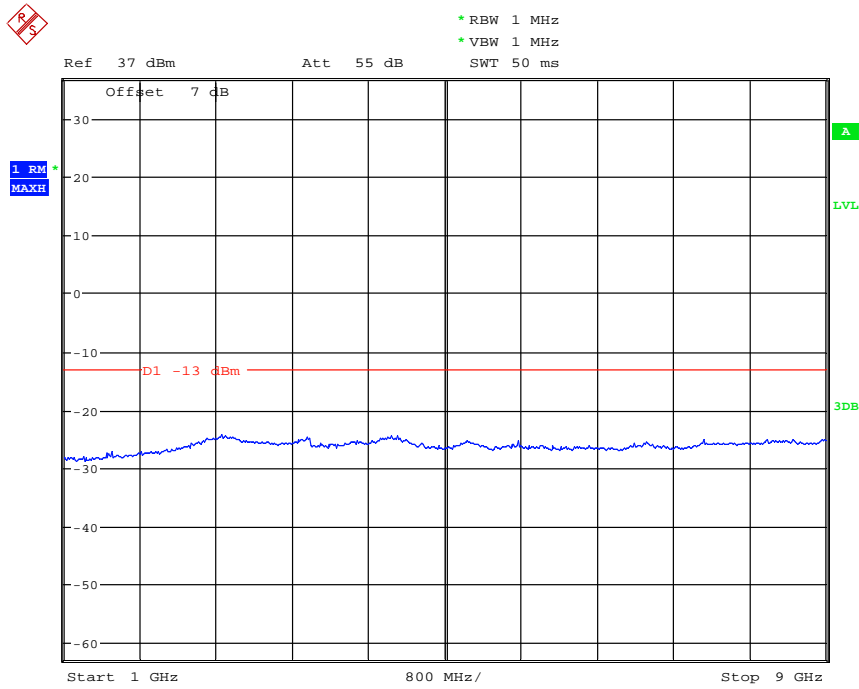
Date: 31.DEC.2015 17:56:17

(GSM 850MHz, Channel = 128, 1GHz to 9GHz)



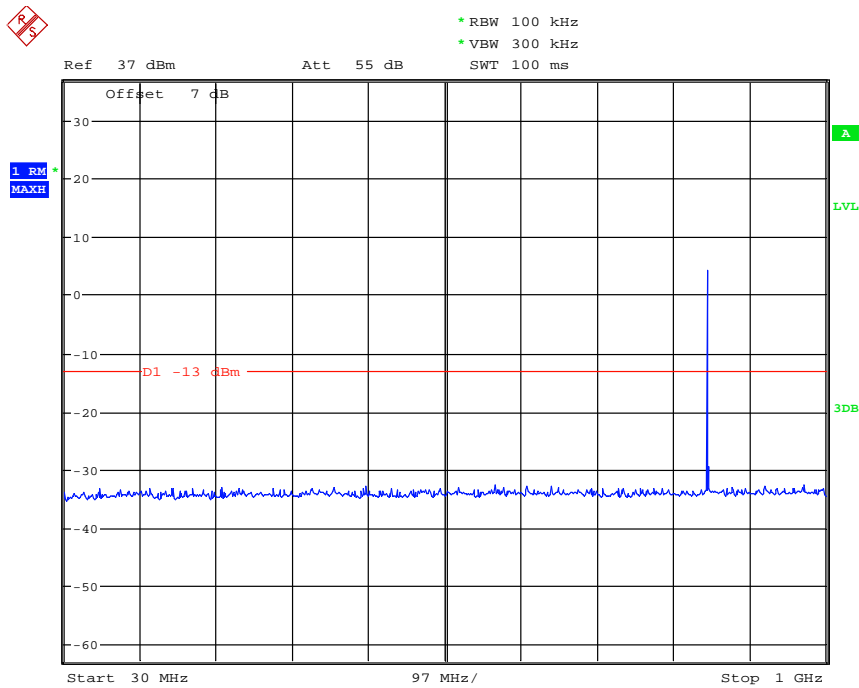
Date: 31.DEC.2015 17:54:21

(GSM 850MHz, Channel = 190, 30MHz to 1GHz)



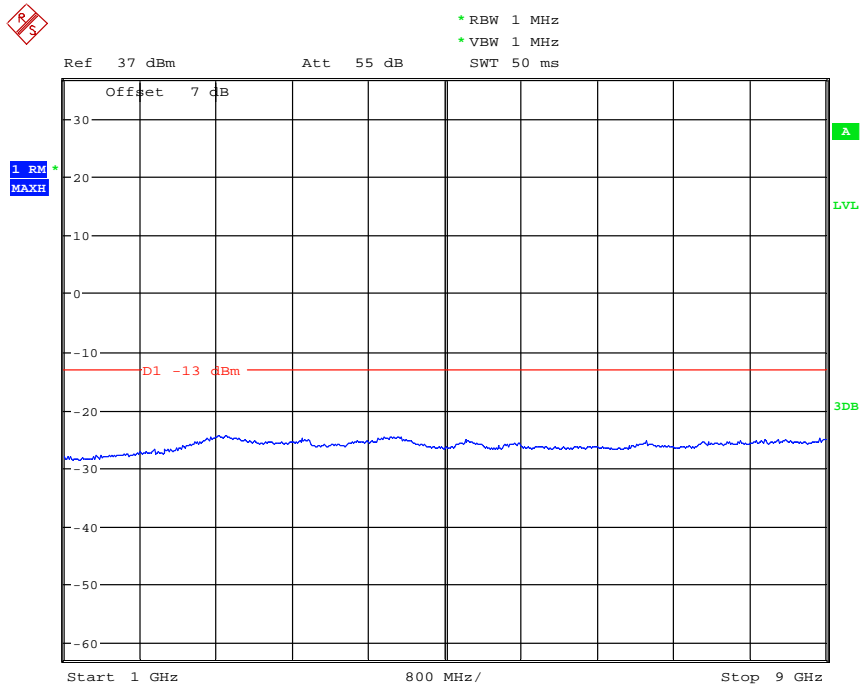
Date: 31.DEC.2015 17:55:54

(GSM 850MHz, Channel = 190, 1GHz to 9GHz)



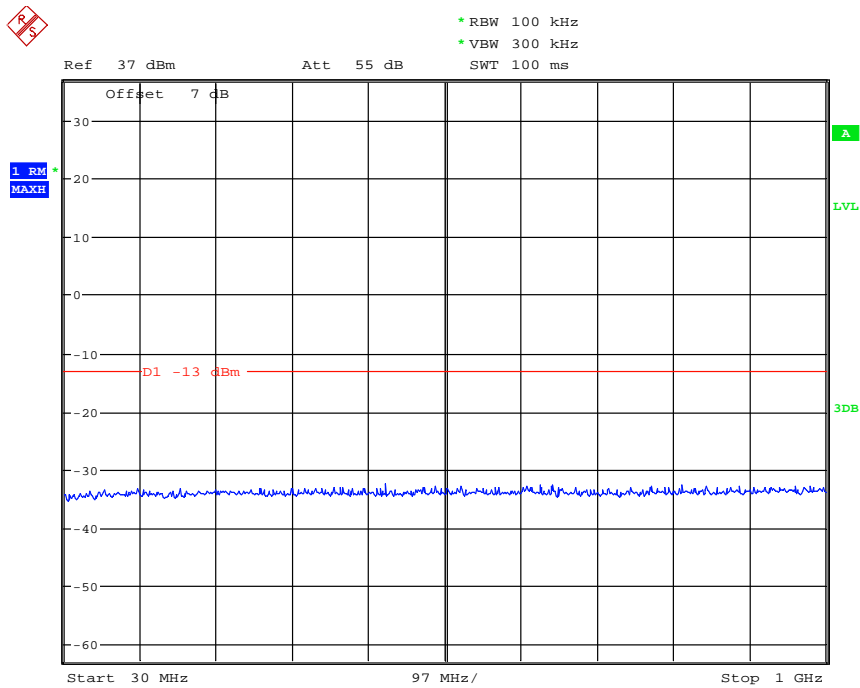
Date: 31.DEC.2015 17:54:42

(GSM 850MHz, Channel = 251, 30MHz to 1GHz)



Date: 31.DEC.2015 17:55:33

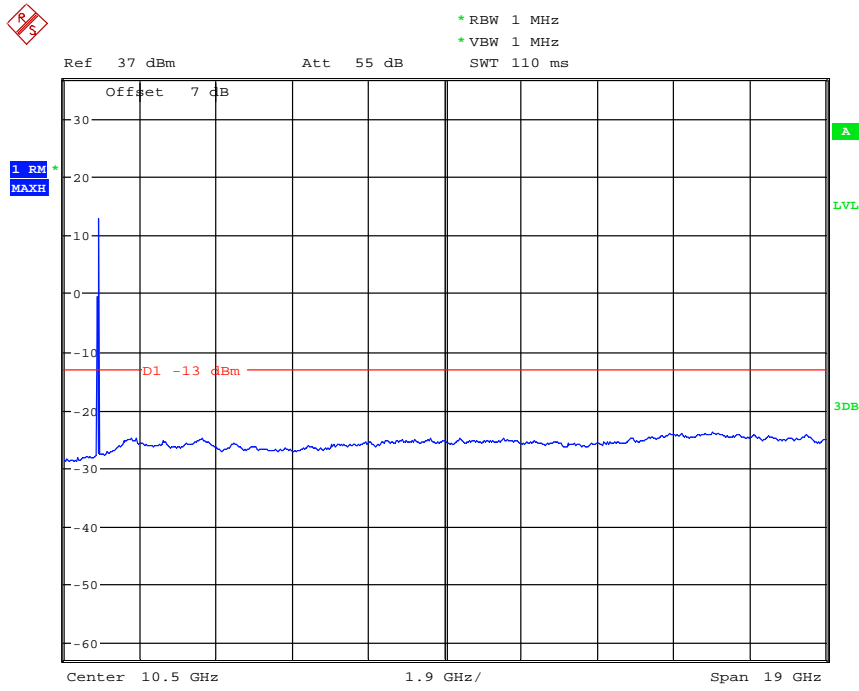
(GSM 850MHz, Channel = 251, 1GHz to 9GHz)



Date: 31.DEC.2015 17:52:12

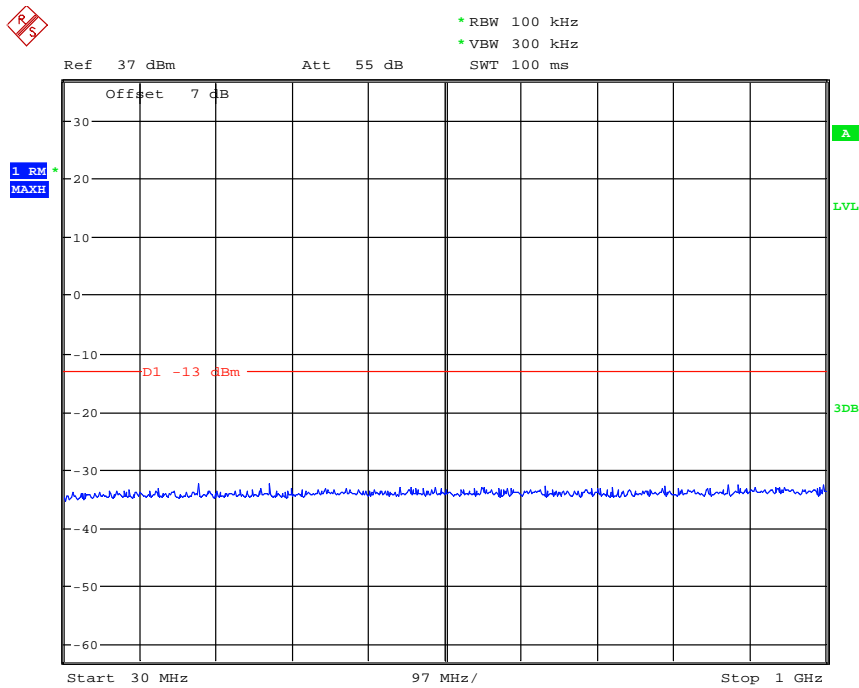
(GSM 1900MHz, Channel = 512, 30MHz to 1GHz)





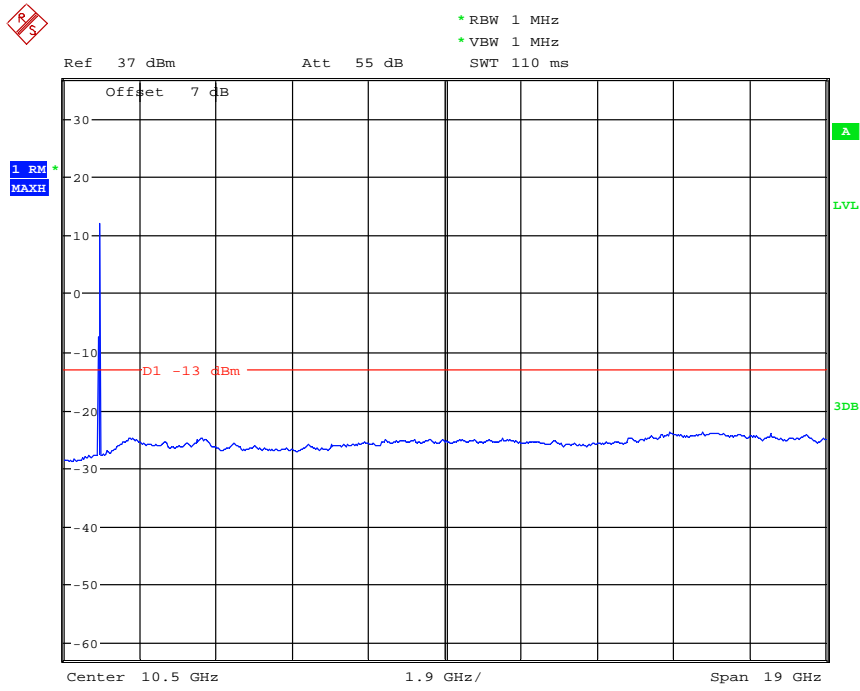
Date: 31.DEC.2015 17:50:48

(GSM 1900MHz, Channel = 512, 1GHz to 20GHz)



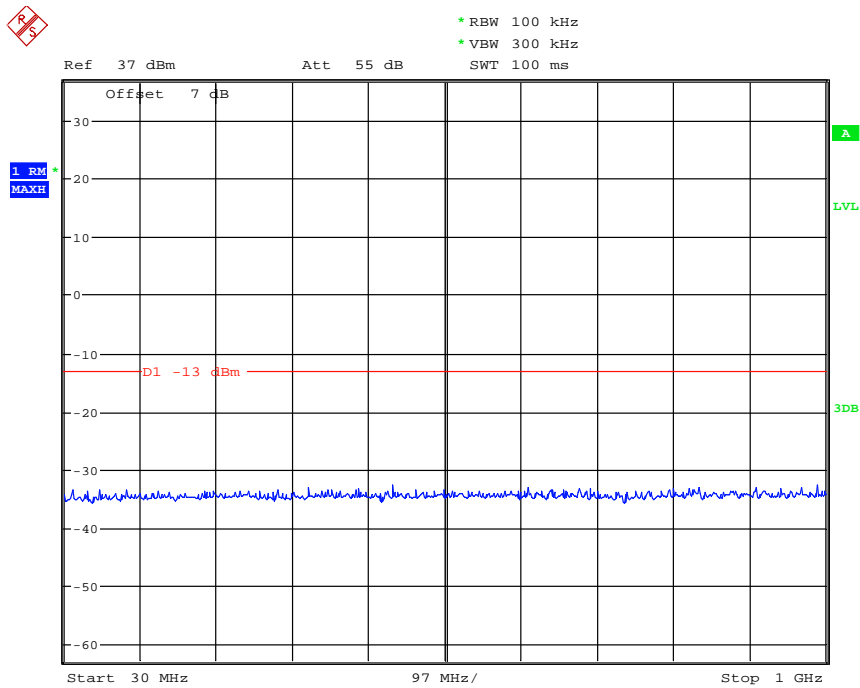
Date: 31.DEC.2015 17:52:42

(GSM 1900MHz, Channel = 661, 30MHz to 1GHz)



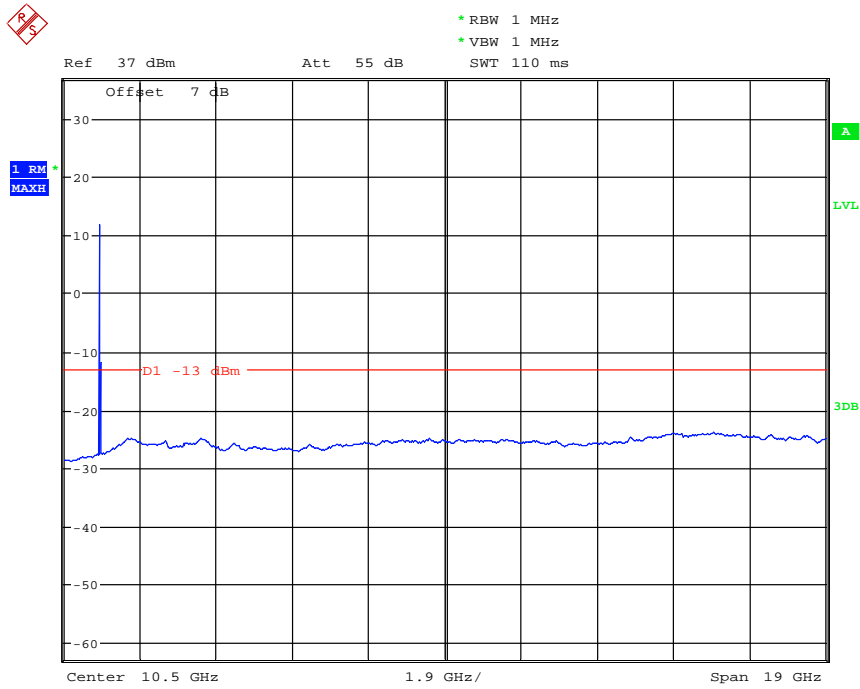
Date: 31.DEC.2015 17:50:14

(GSM 1900MHz, Channel = 661, 1GHz to 20GHz)



Date: 31.DEC.2015 17:46:42

(GSM 1900MHz, Channel = 810, 30MHz to 1GHz)



Date: 31.DEC.2015 17:49:17

(GSM 1900MHz, Channel = 810, 1GHz to 20GHz)

**NOTE:**

(1) GSM was tested and the worst result was reported.

## 4.6 Band Edge

### 4.6.1 Requirement

According to FCC section 22.917(b) and FCC section 24.238(b), in the 1MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth (26dB emission bandwidth) of the fundamental emission of the transmitter may be employed.

### 4.6.2 Test Description

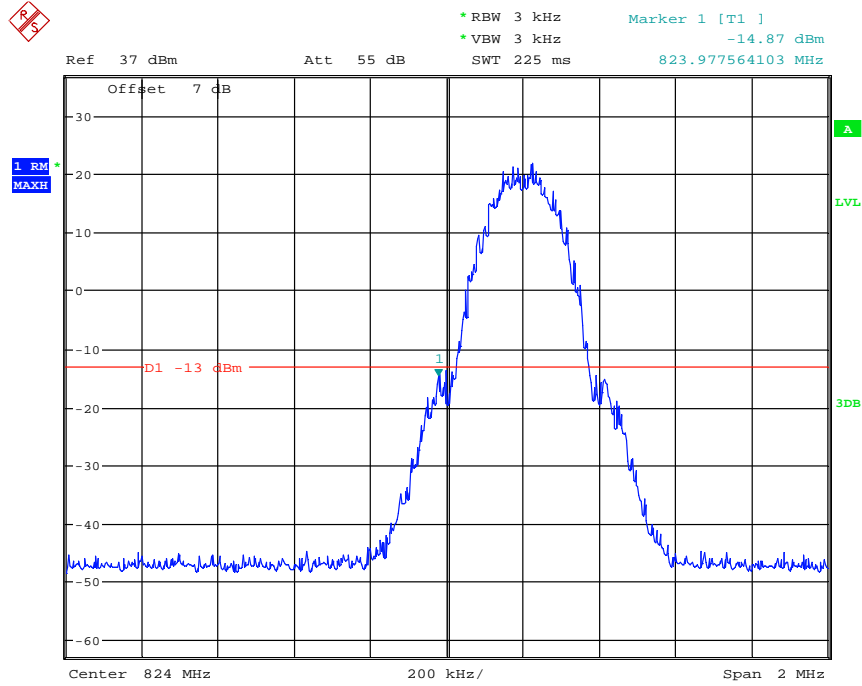
See section 4.2.1 of this report.

### 4.6.3 Test Results

The lowest and highest channels are tested to verify the band edge emissions.

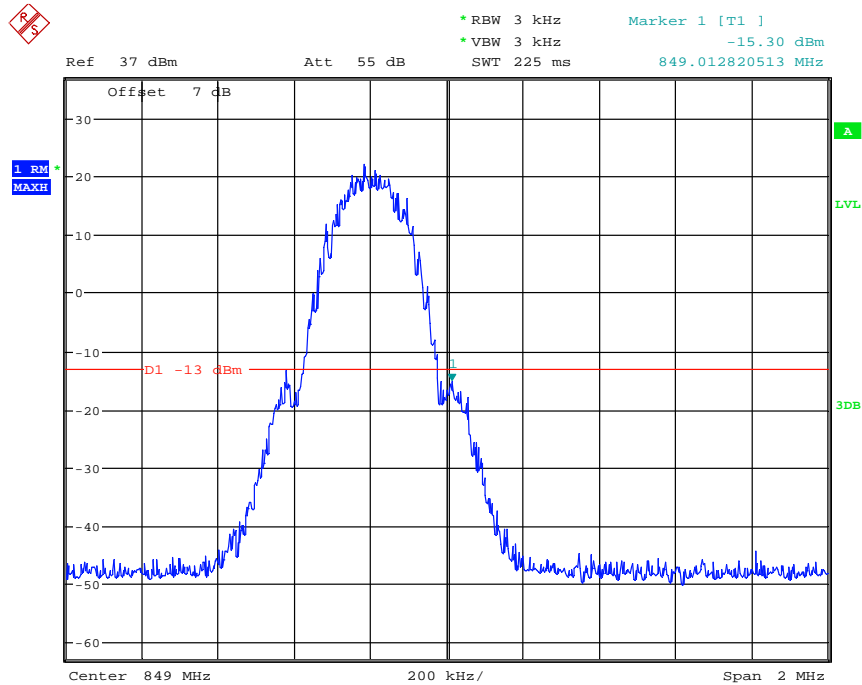
Band	Channel	Frequency (MHz)	Measured Max. Band Edge Emission (dBm)	Refer to Plot	Limit (dBm)	Verdict
GSM 850MHz	128	824.2	-14.87	Plat A1	-13	PASS
	251	848.8	-15.30	Plot A2		PASS
GSM 1900MHz	512	1850.2	-19.59	Plat B1		PASS
	810	1909.8	-20.99	Plot B2		PASS

Test Plots:



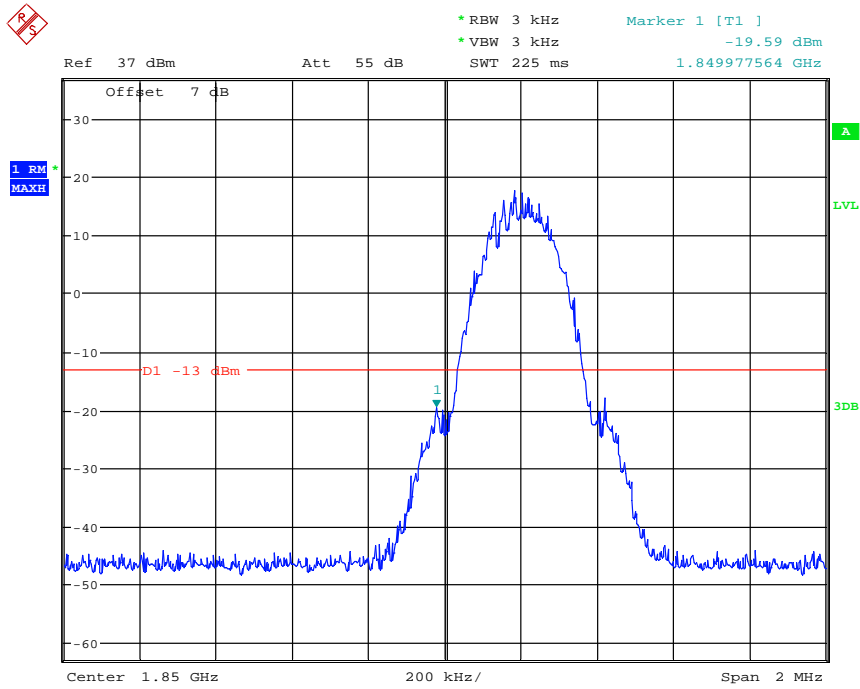
Date: 31.DEC.2015 18:01:57

(Plot A1:GSM 850 Channel = 128)



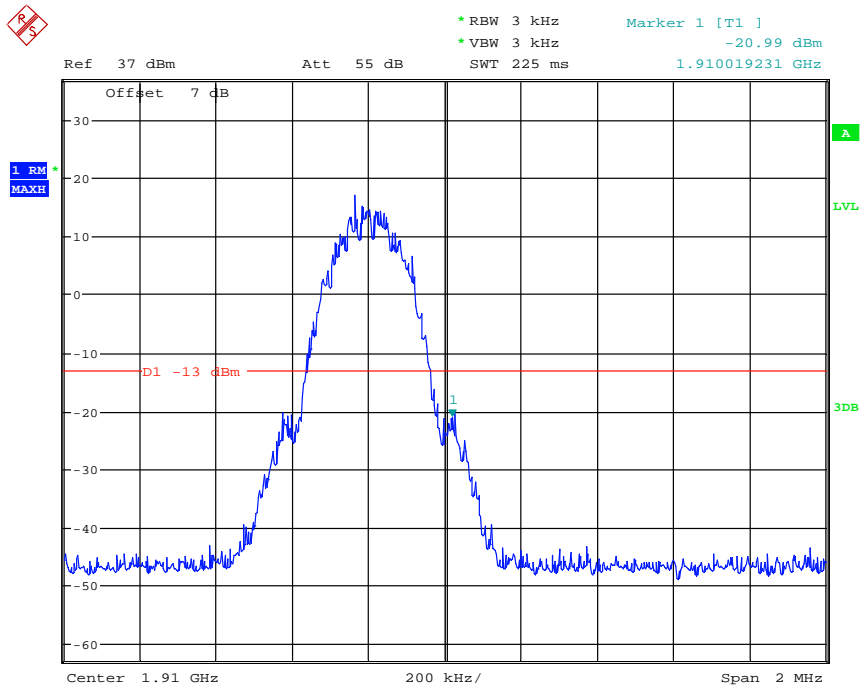
Date: 31.DEC.2015 18:04:25

(Plot A2:GSM 850 Channel = 251)



Date: 31.DEC.2015 18:06:00

(Plot B1:GSM 1900 Channel = 512)



Date: 31.DEC.2015 18:06:56

(Plot B2:GSM 1900 Channel = 810)

**NOTE:**

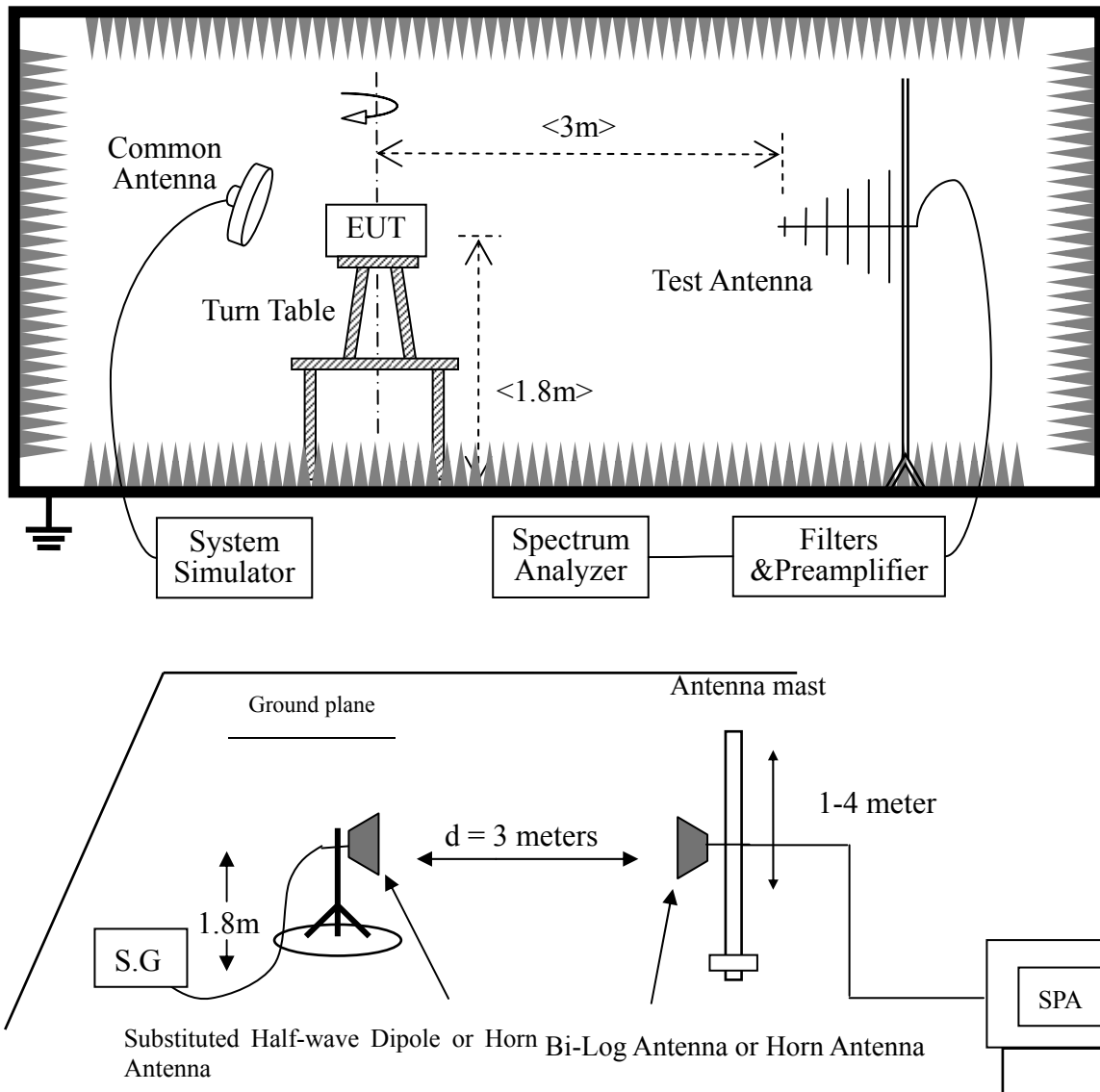
(1)Both GSM/GPRS was tested and the worst result was report ed.

## 4.7 Transmitter Radiated Power (EIRP/ERP)

### 4.7.1 Requirement

According to FCC section 22.913, the Effective Radiated Power (ERP) of mobile transmitters and auxiliary test transmitters must not exceed 7Watts, and FCCsection24.232, the broadband PCS mobile station is limited to 2Wattse.i.r.p.peak power.

### 4.7.2 Test Procedure



The measurements procedures in TIA-603C-2004 are used.

1. EUT was placed on a 1.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.8m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.

2. The EUT is then put into continuously transmitting mode at its maximum power level during the test. And the maximum value of the receiver should be recorded as ( $P_r$ ).
3. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power ( $P_{Mea}$ ) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded ( $P_r$ ). The power of signal source ( $P_{Mea}$ ) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
4. The cable loss ( $P_{cl}$ ) between the Signal Source with the Substitution Antenna and the Substitution Antenna Gain ( $G_a$ ) should be recorded after test. The measurement results are obtained as described below:  
$$\text{Power(EIRP)} = P_{Mea} + P_{cl} + G_a$$
5. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15dBi) and known input power.
6. ERP can be calculated from EIRP by subtracting the gain of the dipole,  $ERP = EIRP - 2.15\text{dBi}$ .



### 4.7.3 Test Results

The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. The lowest, middle and highest channels are tested. All modes are tested.

Limits

Band	Burst Peak ERP (dBm)
GSM 850MHz	≤38.5dBm (7W)
GSM 1900MHz	≤33.0dBm (2W)

Measurement Result

Band	Channel	PeakERP (dBm)	Limit(dBm)	Polarization
GSM 850	128	33.55	38.45	Horizontal
	190	32.56	38.45	Horizontal
	251	32.25	38.45	Horizontal
	128	31.42	38.45	Vertical
	190	31.66	38.45	Vertical
	251	31.34	38.45	Vertical
GSM 1900	512	28.67	33	Horizontal
	661	28.43	33	Horizontal
	810	28.74	33	Horizontal
	512	27.52	33	Vertical
	661	27.43	33	Vertical
	810	27.35	33	Vertical

Remark:

$$ERP(dBm) = P_{Mea} + P_{cl} + G_a - 2.15$$

## 4.8 Radiated Out of Band Emissions

### 4.8.1 Requirement

According to FCC section 22.917(a) and section 24.238(a), 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  $43+10*\log(P)$ dB. This calculated to be -13dBm.

### 4.8.2 Test Description

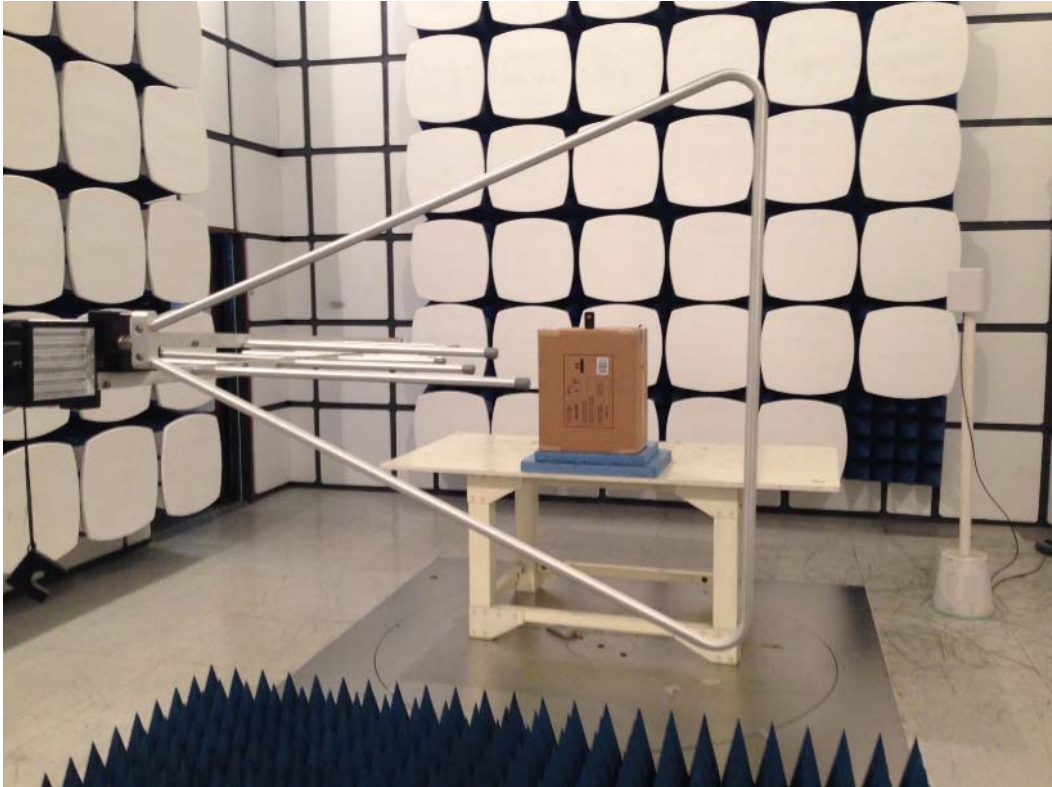
See section 4.6.2 of this report.

### 4.8.3 Test Procedure

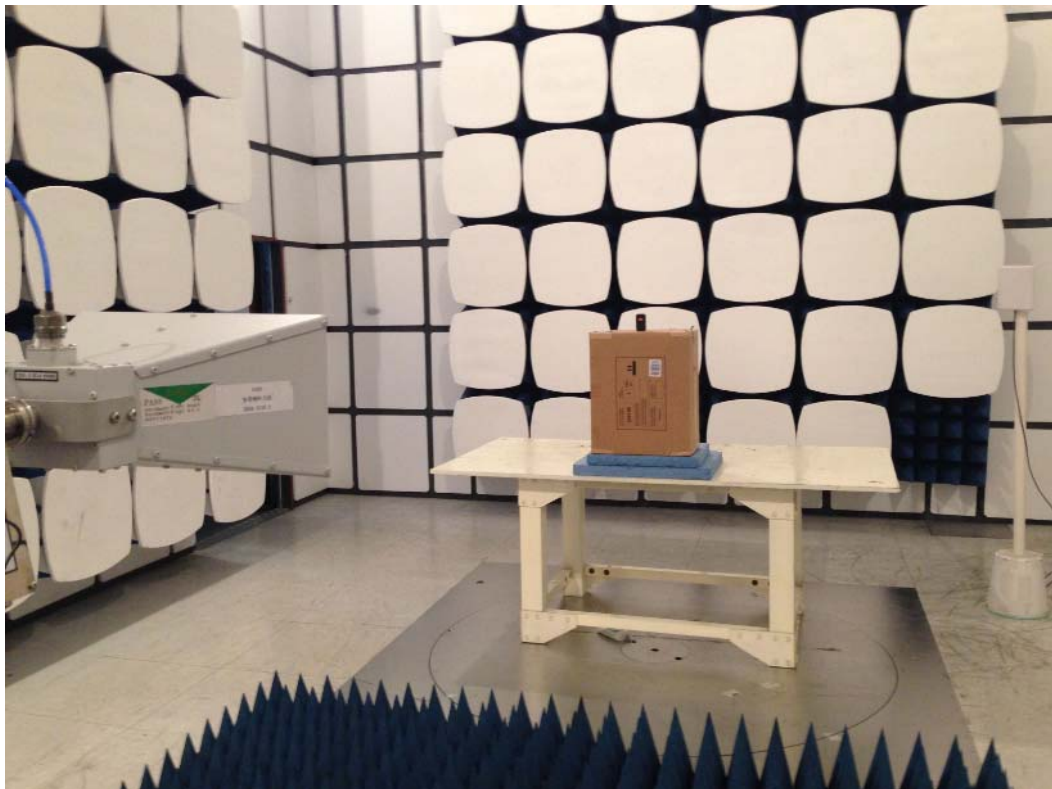
1. The lowest, middle and the highest channel were selected to perform tests respectively.
2. Employ the bi-log Test Antenna as the test system receiving antenna and set the frequency range of the Spectrum Analyzer from 30MHz to 1GHz.
3. The measurement is performed with the Test Antenna at both horizontal and vertical polarization respectively. Set the polarization of the Test Antenna to be horizontal.
4. The EUT was tested by rotating it 360 degrees with the antennas in both the vertical and horizontal orientation while raised from 1 to 4 meters to ensure the signal levels were maximized, mark the fundamental frequency and the harmonics thereof, after then record the harmonics and the plot.
5. Set the polarization of the Test Antenna to be vertical, then repeat step 5.
6. Employ the horn Test Antenna as the test system receiving antenna and set the frequency range of the Spectrum Analyzer from 1GHz to 10th harmonic of the fundamental frequency, then repeat step 4 to 6.
7. Set the frequency range of the Spectrum Analyzer suitably to capture the waveform; search peak and mark it; finally record the peak and the plot.

#### 4.8.4 Test photograph

Description: Transmitter Spurious Emissions Test Setup for 30MHz ~ 1GHz



Description: Transmitter Spurious Emissions Test Setup for above 1GHz



## 4.8.5 Test Results

Measured Max. Spurious Emission(dBm)						
Band	Channel	Polarization	Frequency	Level(dBm)	Limit(dBm)	Verdict
GSM 850MHz	128	V	1648.4	-29.8	-13	Pass
		V	2472.6	-39.3	-13	Pass
		V	3296.8	-46.6	-13	Pass
		V	4121.0	-45.5	-13	Pass
		V	4945.2	nf	-13	Pass
		H	1648.4	-48.2	-13	Pass
		H	2472.6	-38.3	-13	Pass
		H	3296.8	-48.7	-13	Pass
		H	4121.0	-49.1	-13	Pass
		H	4945.2	nf	-13	Pass
	190	V	1673.2	-29.6	-13	Pass
		V	2509.8	-43.3	-13	Pass
		V	3346.4	-46.4	-13	Pass
		V	4183.0	-45.9	-13	Pass
		V	5019.6	nf	-13	Pass
		H	1673.2	-50.3	-13	Pass
		H	2509.8	-43.5	-13	Pass
		H	3346.4	-47.6	-13	Pass
		H	4183.0	-45.7	-13	Pass
		H	5019.6	nf	-13	Pass
	251	V	1697.6	-43.2	-13	Pass
		V	2546.4	-46.3	-13	Pass
		V	3395.2	-48.6	-13	Pass
		V	4244.0	-49.2	-13	Pass
		V	5092.8	nf	-13	Pass
		H	1697.6	-52.3	-13	Pass
		H	2546.4	-42.6	-13	Pass
		H	3395.2	-47.3	-13	Pass
		H	4244.0	-45.7	-13	Pass
		H	5092.8	nf	-13	Pass

Measured Max. Spurious Emission(dBm)						
Band	Channel	Polarization	Frequency	Level(dBm)	Limit(dBm)	Verdict
GSM 1900MHz	512	V	3700.4	-52.4	-13	Pass
		V	5550.6	-46.7	-13	Pass
		V	7400.8	-44.5	-13	Pass
		V	9251.0	-39.7	-13	Pass
		V	11101.2	nf	-13	Pass
		H	3700.4	-49.1	-13	Pass
		H	5550.6	-46.4	-13	Pass
		H	7400.8	-44.2	-13	Pass
		H	9251.0	-40.7	-13	Pass
		H	11101.2	nf	-13	Pass
	661	V	3760.0	-48.2	-13	Pass
		V	5640.0	-47.1	-13	Pass
		V	7520.0	-43.7	-13	Pass
		V	9400.0	-40.3	-13	Pass
		V	11280.0	nf	-13	Pass
		H	3760.0	-48.8	-13	Pass
		H	5640.0	-46.9	-13	Pass
		H	7520.0	-44.4	-13	Pass
		H	9400.0	-40.6	-13	Pass
		H	11280.0	nf	-13	Pass
	810	V	3819.6	-49.2	-13	Pass
		V	5729.4	-47.3	-13	Pass
		V	7639.2	-43.7	-13	Pass
		V	9549.0	-42.4	-13	Pass
		V	11458.8	nf	-13	Pass
		H	3819.6	-48.5	-13	Pass
		H	5729.4	-47.6	-13	Pass
		H	7639.2	-43.2	-13	Pass
		H	9549.0	-40.9	-13	Pass
		H	11458.8	nf	-13	Pass

**NOTE:**

- 1) the power of the EUT transmitting frequency should be ignored.
- 2) All spurious emission tests were performed in X,Y,Z axis direction and EUT was tested in GSM and GPRS mode, Only the worst axis test condition was recored in this test report.
- 3) 'nf' means that the emission level is too low to read out from the noise floor.
- 4) The emission levels of below 1 GHz are very lower than the limit(<-40dBm) and not show in this report.

Photos of the EUT







**\*\* END OF REPORT \*\***