

# EMI MEASUREMENT AND TEST REPORT



For

**Blue Sun Solutions, LLC**

927 S. Azusa Ave. City of Industry, Los Angeles, CA 91748, USA

**FCC ID: AVP-TRUCKTRACKER**

February 20, 2012

This Report Concerns: Original Report		Equipment Type: Vehicle Tracker	
Test Engineer:		Eric Li 	
Report No.:		BST12010156Y-1ER-3	
Receive EUT Date/Test Date:		February 06, 2012/ February 07-18, 2012	
Reviewed By:		Christina 	
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## **1. GENERAL INFORMATION**

### **1.1. Report information**

1.1.1. This report is not a certificate of quality; it only applies to the sample of the specific product/equipment given at the time of its testing. The results are not used to indicate or imply that they are application to the similar items. In addition, such results must not be used to indicate or imply that BST approves recommends or endorses the manufacture, supplier or use of such product/equipment, or that BST in any way guarantees the later performance of the product/equipment.

1.1.2. The sample/s mentioned in this report is/are supplied by Applicant, BST therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture or any information supplied.

Additional copies of the report are available to the Applicant at an additional fee. No third part can obtain a copy of this report through BST, unless the applicant has authorized BST in writing to do so.

Test Facility -

The test site used to collect the radiated data is located on the address of

SinTek Laboratory Co., Ltd.

(FCC Registered Test Site Number: 963441) on

No.7, Xinshidai Industrial, Guantian Village, Shiyan Town, Baoan District, Shenzhen, Guangdong 518108, China

The Test Site is constructed and calibrated to meet the FCC requirements.

### **1.2. Measurement Uncertainty**

Available upon request.

## 2. PRODUCT DESCRIPTION

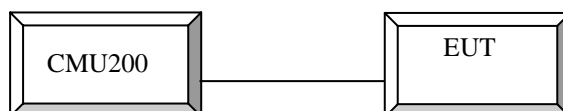
### 2.1. EUT Description

Description	: Vehicle Tracker
Applicant	: Blue Sun Solutions, LLC 927 S. Azusa Ave. City of Industry, Los Angeles, CA 91748, USA
Manufacture	: Redview Limited Rm 702, Building A, Tsing Hua High-Tech Park, Nanshan District, Shenzhen, China
Model Number	: VT200
Power Supply	: DC 12V

#### **Additonal Information**

Operating Frequency	: GSM 850: 824.2MHz-848.8MHz GSM 1900: 1850.2MHz-1909.8MHz
Rated Power	: GSM 850: 33dBm GSM 1900: 30dBm
Antenna Gain	: 1.2dBi

### 2.2. Block Diagram of EUT Configuration



### 2.3. Test Conditions

Temperature: 20~25  
Relative Humidity: 45~55%

### 3. FCC ID LABEL

**FCC ID: AVP-TRUCKTRACKER**

**Label Location on EUT**

**EUT View/ FCC ID Label Location**



**4. TEST RESULTS SUMMARY**

<b>FCC RULE</b>	<b>DESCRIPTION OF TEST</b>	<b>Result</b>
1.1310 2.1093	RF EXPOSURE (MPE)	Compliant
15.107	Conducted Emission	N/A
15.109	Radiated Emission	Compliant
2.1046 22.913 (a) 24.232(b)	RF Output Power	Compliant
2.1049(h)	Occupied Bandwidth	Compliant
2.1051 22.917 (a) 24.238(a)	Spurious Emissions at Antenna Terminal	Compliant
2.1053 22.917 (a) 24.238(a)	Field Strength of Spurious Radiation	Compliant
2.1055 22.355 24.235	Frequency stability vs. temperature Frequency stability vs. voltage	Compliant

**Modifications**

No modification was made.

## 5. TEST EQUIPMENT USED

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Sunol Sciences	Horn Antenna	DRH-118	A052604	2011-09-25	2012-09-25
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2011-03-11	2012-03-11
Rohde & Schwarz	Spectrum Analyzer	FSEM30	849720/019	2011-05-09	2012-05-09
HP	Preamplifier	8449B	3008A00277	2011-09-29	2012-09-29
HP	Signal Generator	HP8657A	2849U00982	2011-10-16	2012-10-16
HP	Amplifier	HP8447D	2944A09795	2011-11-15	2012-11-15
Giga-tronics	Signal Generator	1026	270801	2011-09-29	2012-09-29
COM POWER	Dipole Antenna	AD-100	041000	2011-09-25	2012-09-25
A.H. System	Horn Antenna	SAS-200/571	135	2011-05-17	2012-05-17
Rohde & Schwarz	Universal Radio Communication Tester	CMU200	1100.0008.02	2011-06-21	2012-06-21
Rohde & Schwarz	EMI Test Receiver	ESCI	100224	2011-10-16	2012-10-16
WUHUAN	Temperature & Humidity Chamber	HTP205	20021115	2011-12-28	2012-12-28

6. §15.107 CONDUCTED EMISSION TEST

6.1. Applicable Standard

According to FCC §15.107, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN).

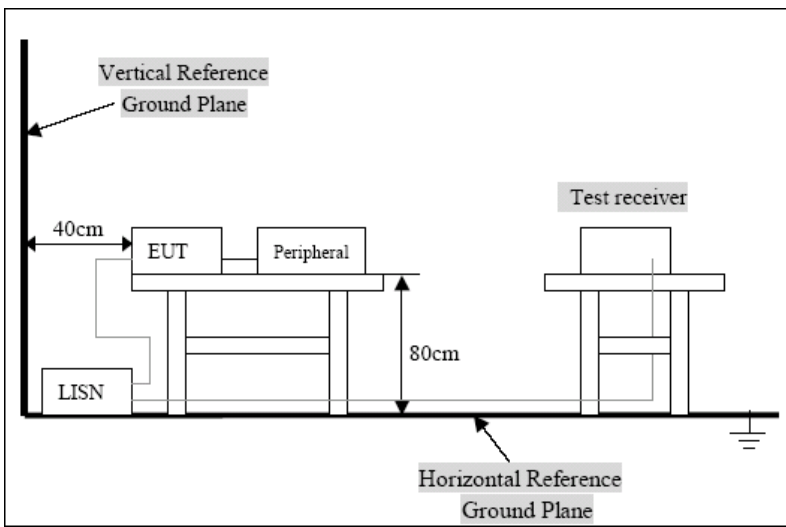
Frequency range (MHz)	Conducted Limit (dB $\mu$ V), Class B digital device	
	Quasi-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
0.50 - 30	60	50

6.2. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.).This provides a 50ohm/50uh coupling inpedance for the measuring equipment.The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uh coupling inpedance with 50ohm termination.

Both sides of A.C. Line are check for maximum conducted interference.In order to find the maximum emission,the relative positions of equipment and all of the interface cables must be changed according to ASIN C63.4:2003 on conducted measurement. Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

6.3. Test Setup





#### **6.4. Test Data**

**N/A.**

There is no connection to AC mains. Therefore, the test is not applicable and skipped.

7. §15.109 RADIATION EMISSIONS TEST

7.1. Applicable Standard

According to FCC §15.109, the radiated emission shall not exceed the limits in the following table

FREQUENCY (MHz)	DISTANCE (Meters)	FIELD STRENGTHS LIMITS (dBμV/m)
30 ~ 88	3	40.0
88 ~ 216	3	43.5
216 ~ 960	3	46.0
Above 1000	3	54.0

Note:(1) The smaller limit shall apply at the edge between two frequency bands.  
(2) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the EUT or system.

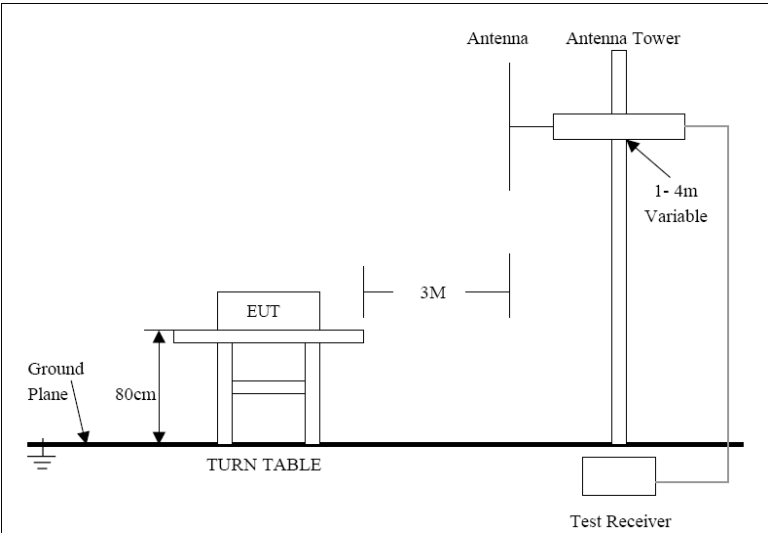
7.2. Test Procedure

The EUT is placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on a antenna tower. The antenna can move up and down between 1 to 4 meters to find out the maximum emission level. Broadband antenna (calibrated by dipole antenna) are used as a receiving antenna. Both horizontal and vertical polarization of the antenna are set on measurement.

The bandwidth of test receiver is set at 120kHz in 30-1000MHz.

The EUT is tested in Semi-anechoic Chamber. The frequency range from 30MHz to 1000MHz is checked. All the test results are listed in Section 7.7.

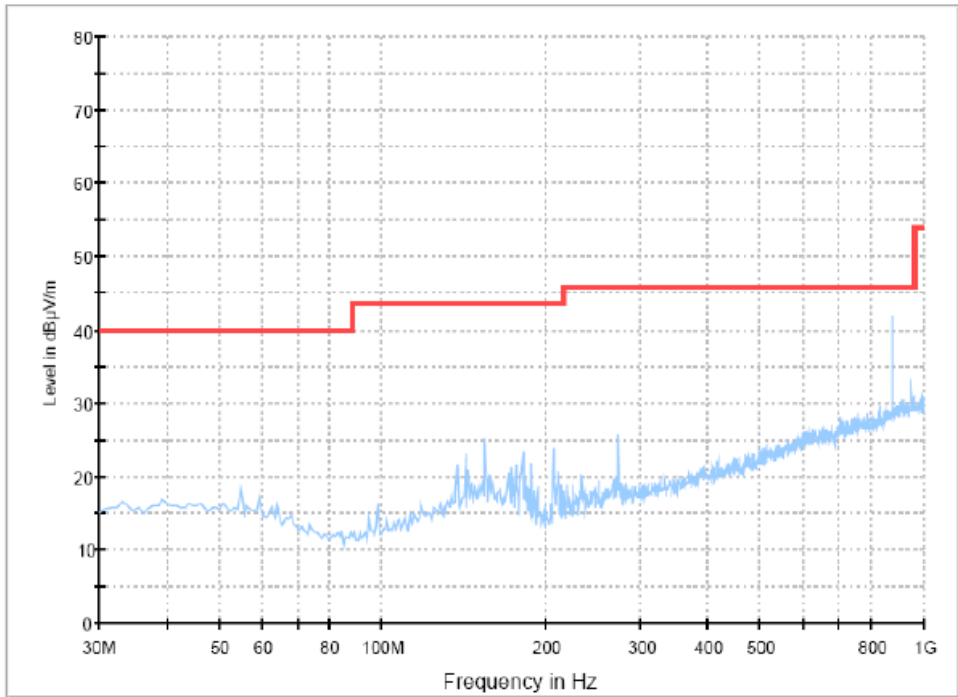
7.3. Test Setup



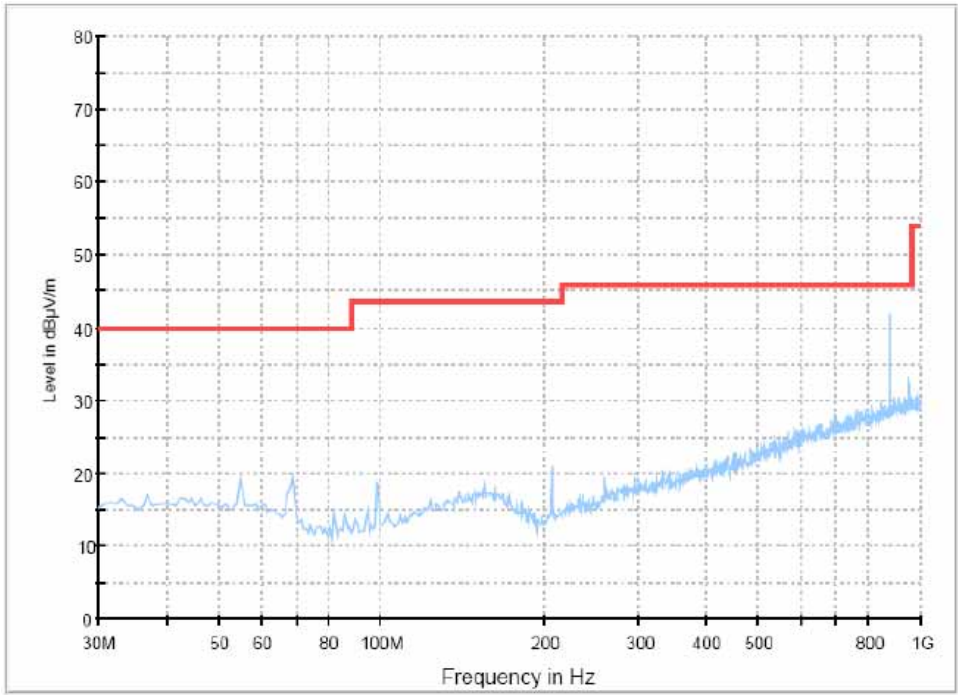
7.4. Test Data

Pass

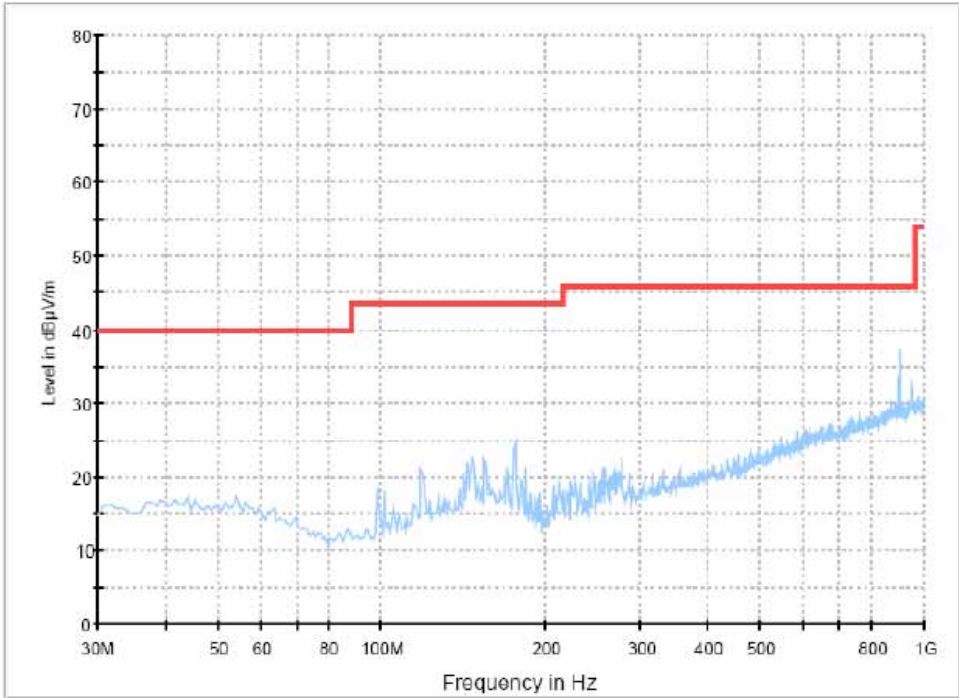
Test on GSM 850 mode  
Horizontal(30MHz -1GHz)



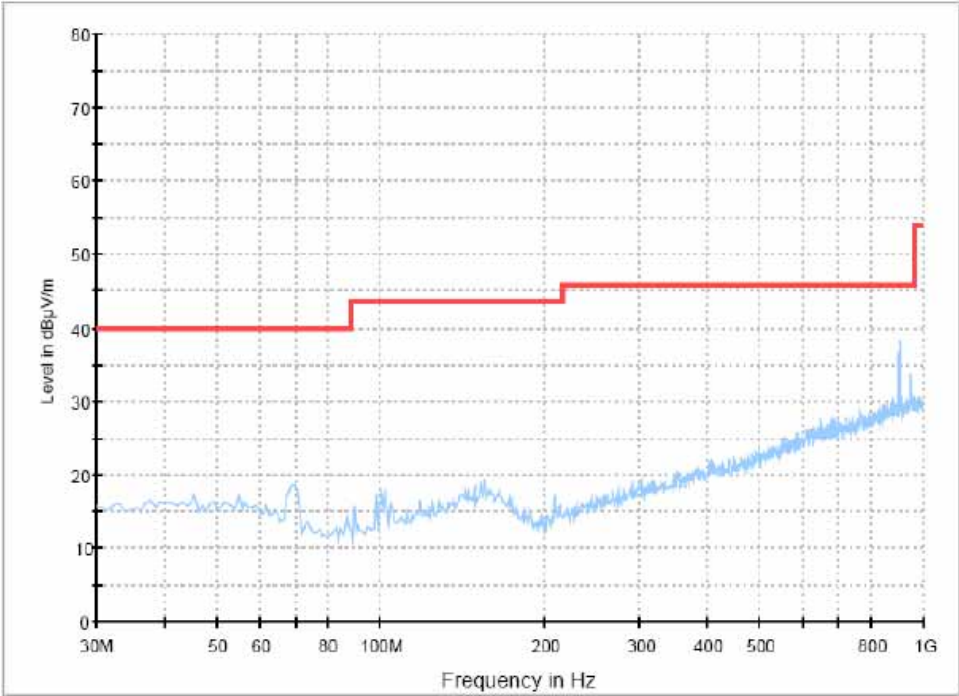
Vertical(30MHz -1GHz)



Test on GSM 1900 mode.  
Horizontal(30MHz -1GHz)



Vertical(30MHz -1GHz)



## 8. §2.1046, §22.913 (A), §24.232(B) - RF OUTPUT POWER

### 8.1. Applicable Standard

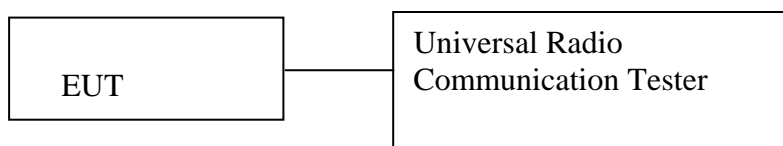
According to FCC §2.1046 and §22.913 (a), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

According to FCC §2.1046 and §24.232(b), Peak power measurement, Mobile station are limited to 2W.

### 8.2. Test Procedure

*Conducted method:*

The RF output of the transmitter was connected to the wireless test set and the spectrum analyzer through sufficient attenuation.



*Radiated method:*

TIA 603-C section 2.2.17

**8.3. Test Data****Pass****Environmental Conditions**

Temperature:	25°C
Relative Humidity:	56%
ATM Pressure:	100.0kPa

**RF Conducted output power****Test on GSM 850 mode**

Channel	Frequency (MHz)	Maximum Antenna gain (dB)	Conducted RF Output Power (dBm)	Calculated Power (dBm)	Limit (dBm)
Low	824.2	1.2	32.1	33.3	38.5
Middle	836.6	1.2	32.0	33.2	38.5
High	848.8	1.2	32.1	33.3	38.5

**Test on PCS 1900 mode**

Channel	Frequency (MHz)	Maximum Antenna gain (dB)	Conducted RF Output Power (dBm)	Calculated Power (dBm)	Limit (dBm)
Low	1850.2	1.2	29.2	30.4	33
Middle	1880.0	1.2	29.3	30.5	33
High	1909.8	1.2	29.5	30.7	33

Radiated output power:

Below 1GHz was RBW=300kHz, VBW=1MHz

Above 1GHz was RBW=1MHz, VBW=3MHz

Test on GSM 850 mode

Channel	Frequency (MHz)	Antenna Pol.	RF Output Power ERP (dBm)	Limit (dBm)
Low	824.2	H	22.03	38.5
		V	20.12	38.5
Middle	836.6	H	22.09	38.5
		V	19.84	38.5
High	848.8	H	23.17	38.5
		V	21.56	38.5

Test on PCS 1900 mode

Channel	Frequency (MHz)	Antenna Pol.	RF Output Power EIRP (dBm)	Limit (dBm)
Low	1850.2	H	21.75	33
		V	19.86	33
Middle	1880.0	H	21.25	33
		V	19.37	33
High	1909.8	H	20.96	33
		V	19.33	33

## 9. §2.1049 - OCCUPIED BANDWIDTH

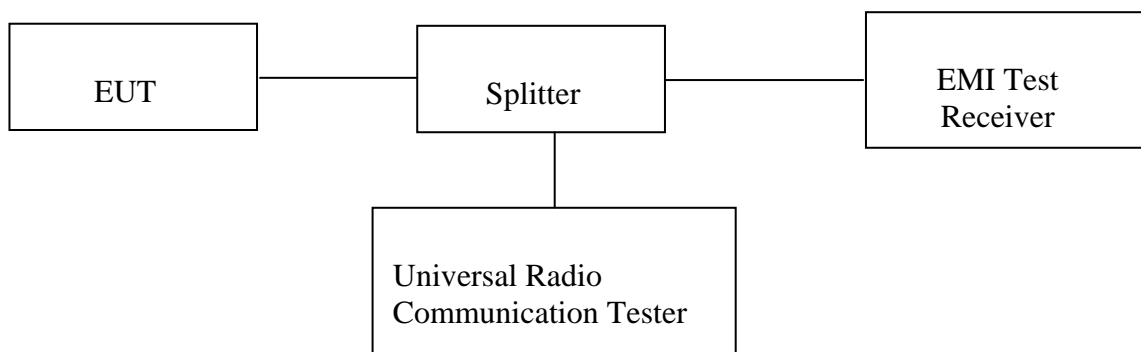
### 9.1. Applicable Standards

CFR 47 §2.1049

### 9.2. Test Procedure

The RF output of the transmitter was connected to the simulator and the spectrum analyzer through sufficient attenuation.

The EUT output RF connector was connected with a short a cable to the spectrum analyzer, RBW was set to about 1% of emission BW, VBW $\geq$ 3 times RBW, 99% bandwidth were measured and recorded, the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace.



### 9.3. Test Data

#### Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	56%
ATM Pressure:	100.0kPa

#### Test on GSM 850 mode

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	836.6	247.6

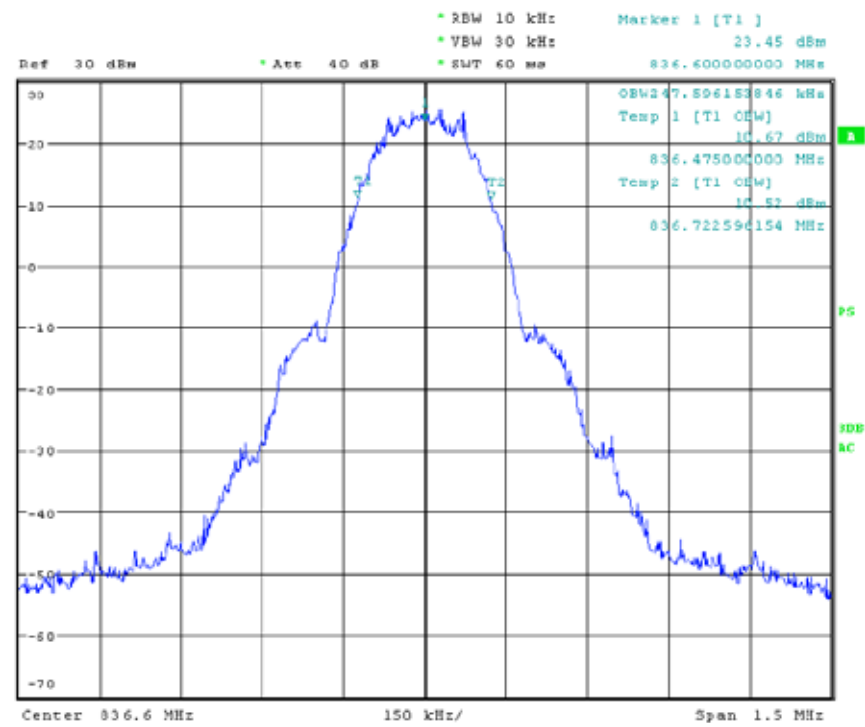
#### Test on PCS 1900 mode

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	1880.0	247.6

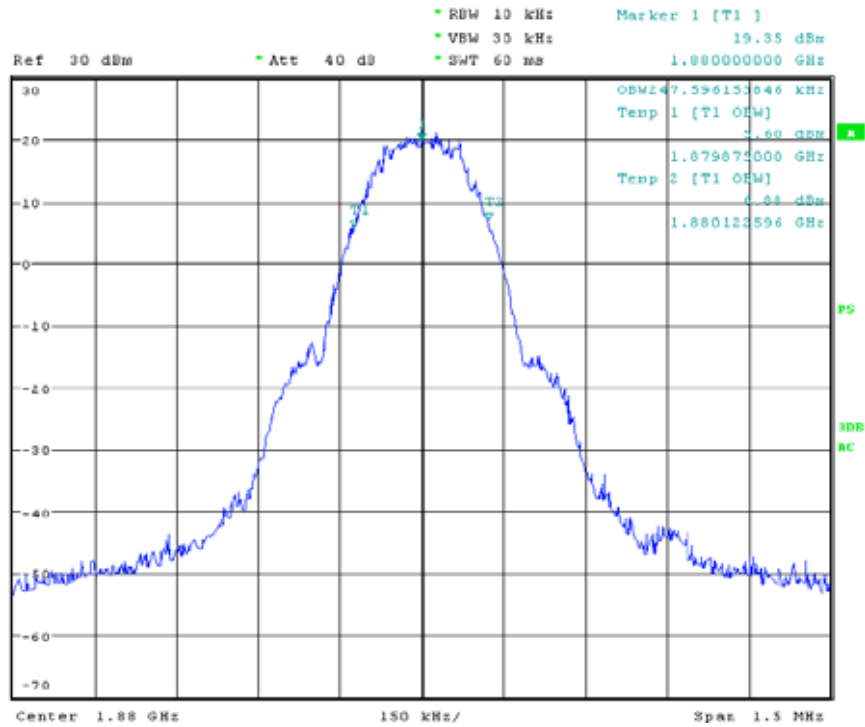


99% Bandwidth

GSM 850 Channel Mid



PCS 1900 Channel Mid



10. §2.1051, §22.917(A), §24.238(A) - SPURIOUS EMISSIONS AT ANTENNA

TERMINALS

10.1.Applicable Standards

CFR 47 §2.1051, §22.917(a) and §24.238(a)

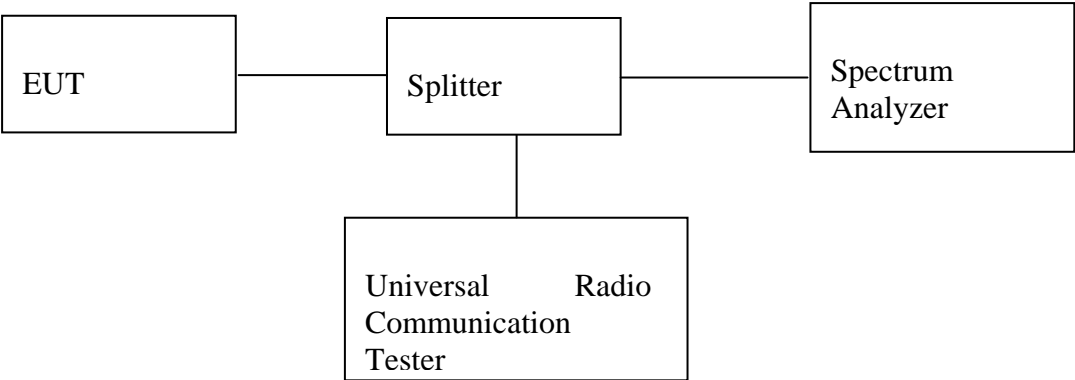
FCC part 22.917(a), 24.238(a) the magnitude of each spurious and harmonic emission that can be detected when the equipment is operated under the conditions specification in the instruction manual and/or alignment procedure, shall not be less than 43+10log(Mean power in watts) dBc below the mean power output outside a license’s frequency block(-13dBm).

10.2.Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of spectrum analyzer was set at 1MHz, sufficient scans were taken to show the out of band Emission is any up to 10<sup>th</sup> harmonic.

For the out of band: set RBW, VBW=1MHz, stat=30MHz, stop= 10<sup>th</sup> harmonic. Limit=-13dBm.

Band Edge requirements: In 1Mhz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 1 % of bandwidth of fundamental emission of the transmitter any be employed to measure the out of band emission. Limit=-13dBm.



10.3.Test Data

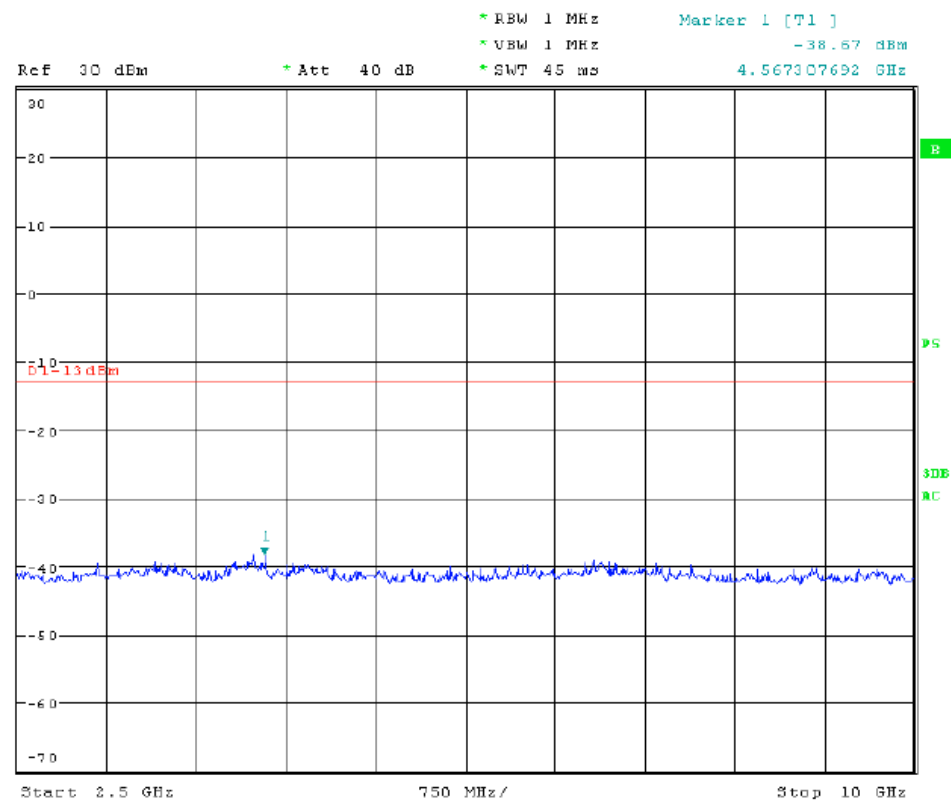
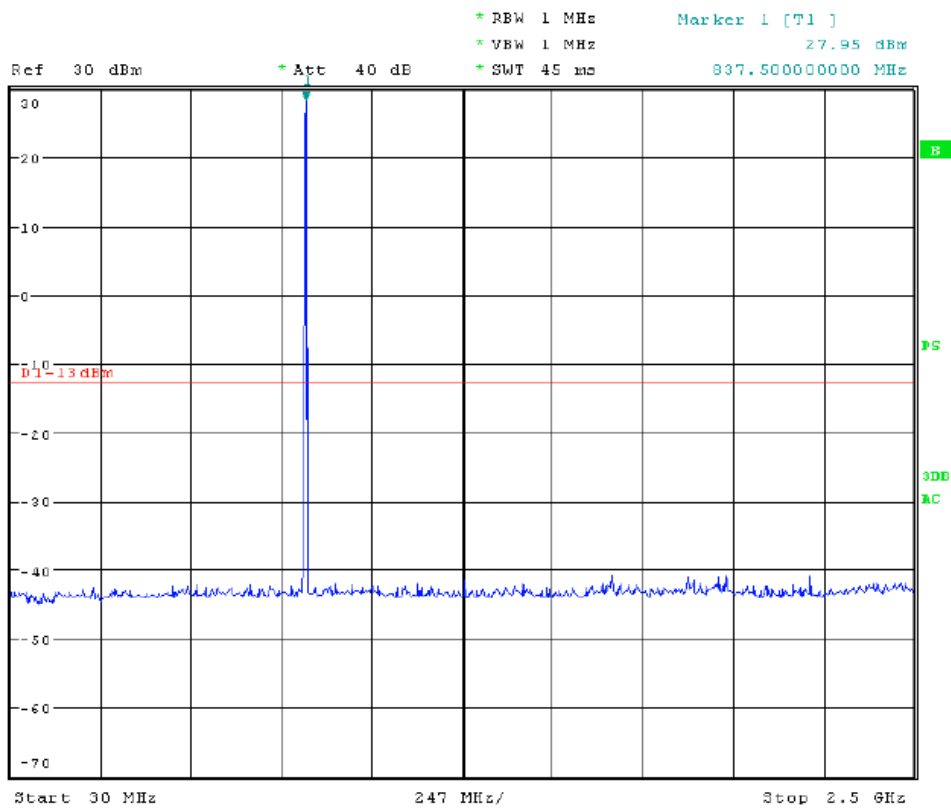
Pass.

Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	56%
ATM Pressure:	100.0kPa

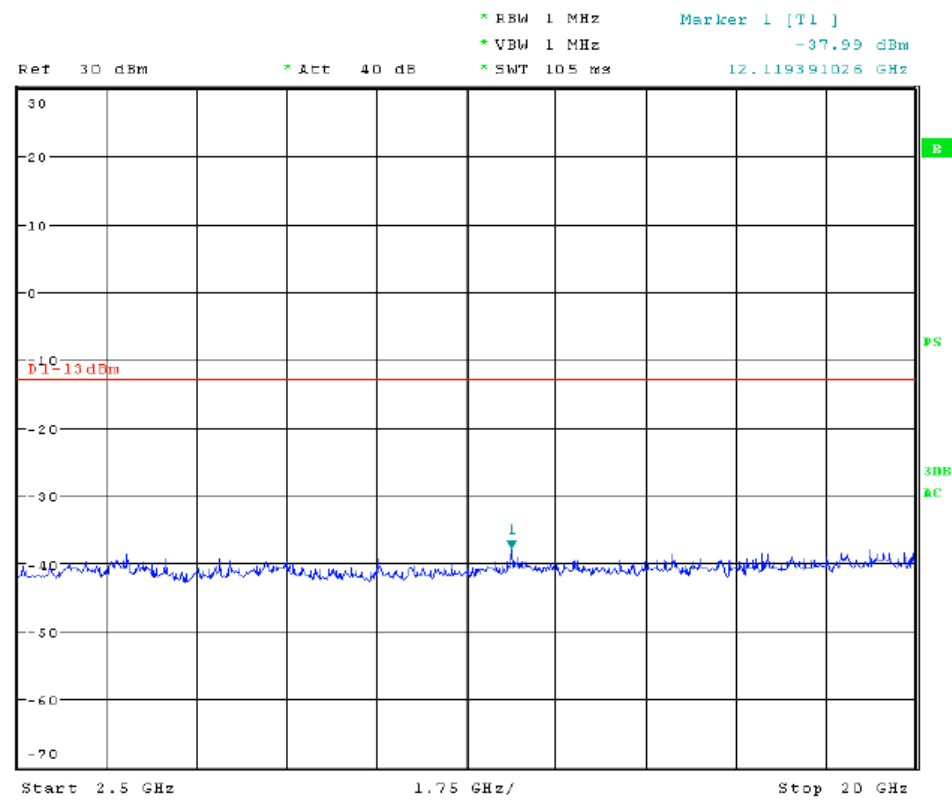
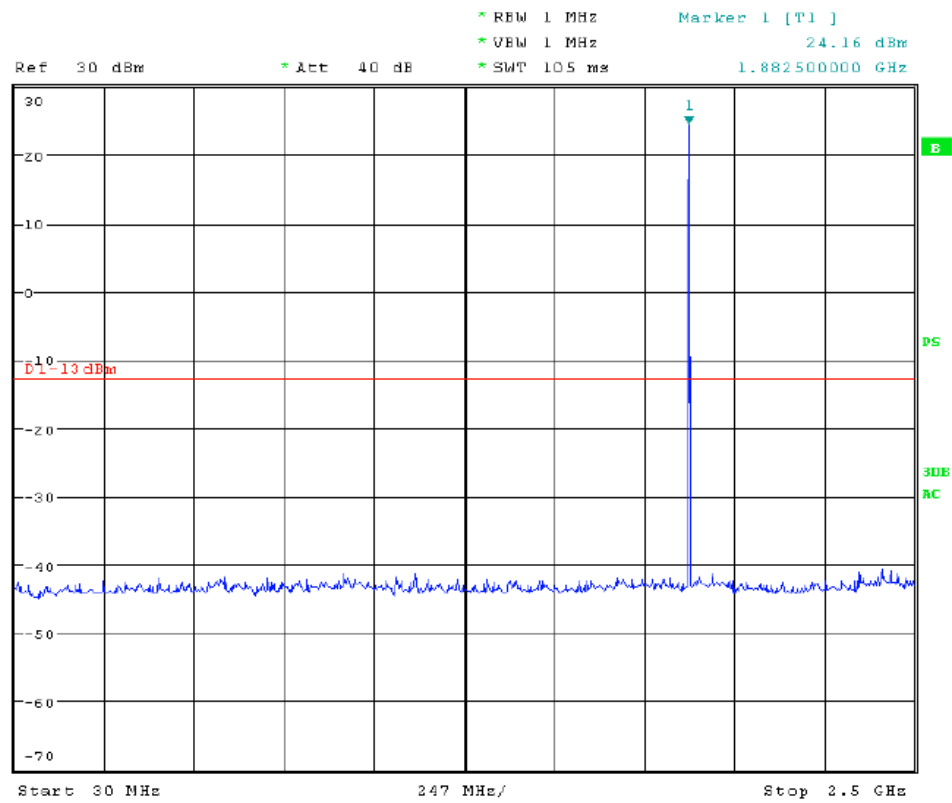
Out of band Emission

GSM 850 Channel Mid

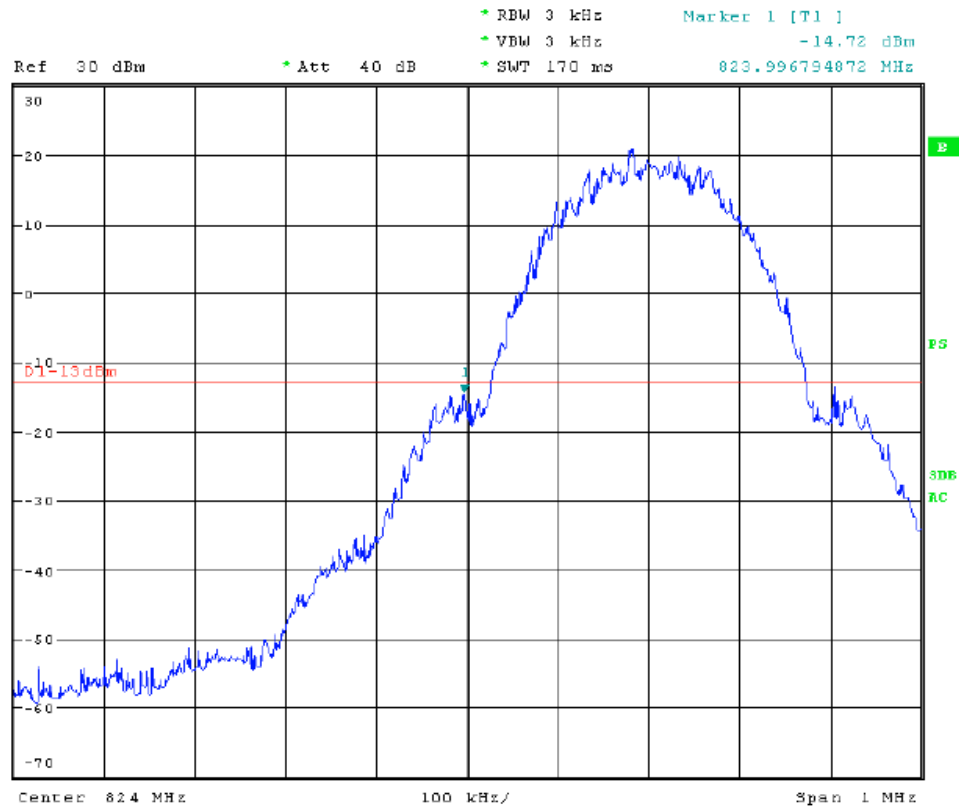


Out of band Emission

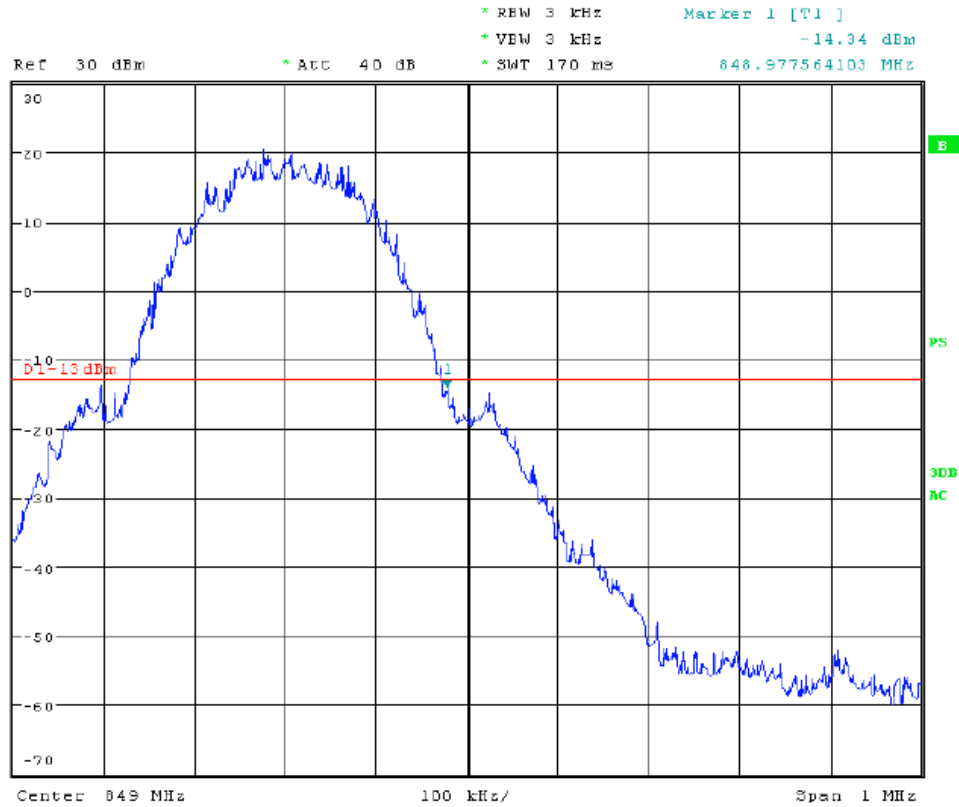
PCS 1900 Channel Mid



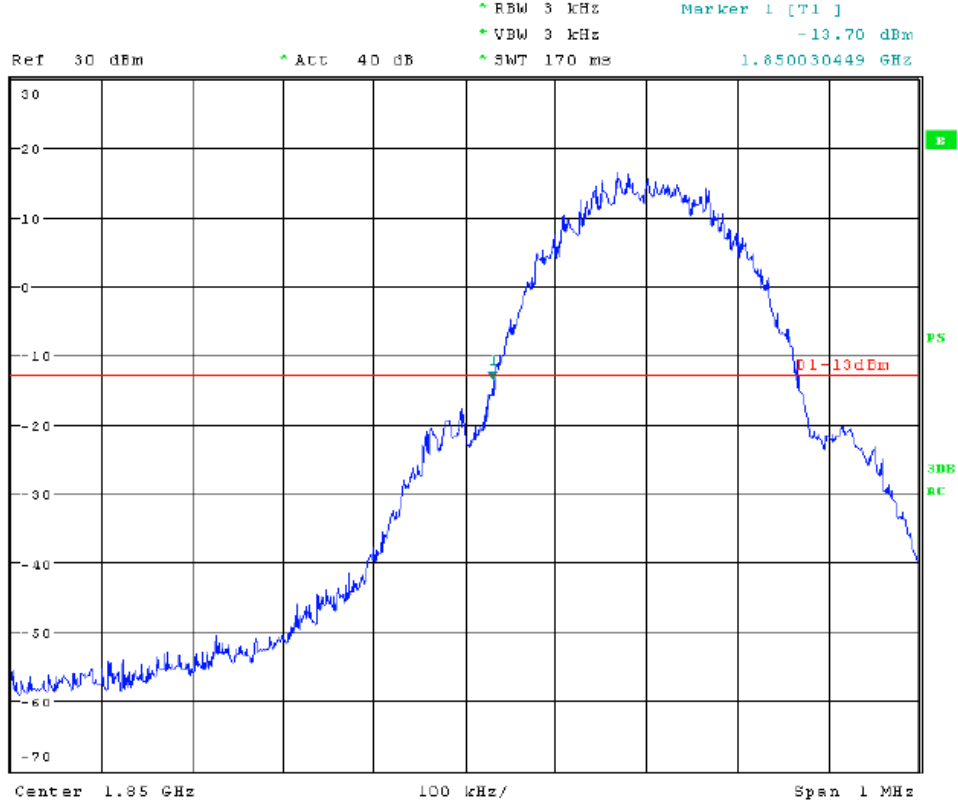
Band Edge emission GSM 850 Channel Low



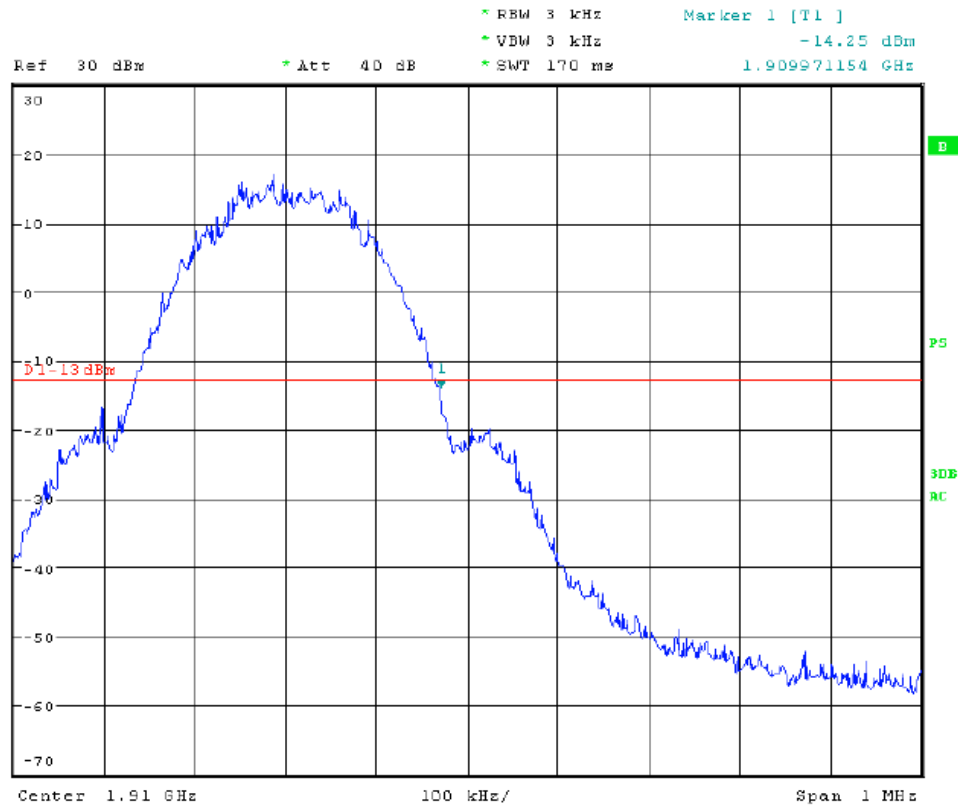
Band Edge emission GSM 850 Channel high



Band Edge emission PCS 1900 Channel Low



Band Edge emission PCS 1900 Channel high



## 11. §2.1053, §22.917(A), §24.238(A) - SPURIOUS RADIATED EMISSIONS

### 11.1.Applicable Standards

CFR 47 §2.1053, §22.917(a) and §24.238(a)

FCC part 22.917(a), 24.238(a) the magnitude of each spurious and harmonic emission that can be detected when the equipment is operated under the conditions specification in the instruction manual and/or alignment procedure, shall not be less than  $43+10\log(\text{Mean power in watts})$  dBc below the mean power output outside a license's frequency block(-13dBm).

### 11.2.Test Procedure

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB =  $10 \lg (\text{TXpwr in Watts}/0.001)$  – the absolute level

Spurious attenuation limit in dB =  $43 + 10 \text{ Log}_{10} (\text{power out in Watts})$

### 11.3.Test Data

**Pass**

Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	56%
ATM Pressure:	100.0kPa

**GSM 850 mode****Operation mode: TX CH Low 824.2MHz mode**

Frequency (MHz)	Antenna Pol.	Spurious Emissions ERP (dBm)	Limit (dBm)
1648.40	H	-49.56	-13.0
2472.60	H	-49.33	-13.0
3296.80	H	-31.58	-13.0
4121.00	H	-34.72	-13.0
1648.40	V	-48.06	-13.0
2472.60	V	-49.23	-13.0
3296.80	V	-32.67	-13.0
4121.00	V	-33.19	-13.0

**Operation mode: TX CH Mid 836.6MHz mode**

Frequency (MHz)	Antenna Pol.	Spurious Emissions ERP (dBm)	Limit (dBm)
1673.20	H	-50.06	-13.0
2509.80	H	-48.87	-13.0
3346.40	H	-32.35	-13.0
4183.00	H	-36.64	-13.0
1673.20	V	-47.28	-13.0
2509.80	V	-48.03	-13.0
3346.40	V	-33.37	-13.0
4183.00	V	-34.26	-13.0

**Operation mode: TX CH High 848.8MHz mode**

Frequency (MHz)	Antenna Pol.	Spurious Emissions ERP (dBm)	Limit (dBm)
1697.60	H	-49.62	-13.0
2546.40	H	-49.33	-13.0
3395.20	H	-34.41	-13.0
4244.00	H	-36.28	-13.0
1697.60	V	-48.53	-13.0
2546.40	V	-47.39	-13.0
3395.20	V	-32.45	-13.0
4244.00	V	-35.97	-13.0



**PCS 1900 mode****Operation mode: TX CH Low 1850.2MHz mode**

Frequency (MHz)	Antenna Pol.	Spurious Emissions EIRP (dBm)	Limit (dBm)
1800.00	H	-49.86	-13.0
3700.40	H	-45.31	-13.0
5550.60	H	-46.59	-13.0
7400.80	H	-51.64	-13.0
9251.00	H	-53.95	-13.0
1800.00	V	-48.36	-13.0
3700.40	V	-40.67	-13.0
5550.60	V	-44.28	-13.0
7400.80	V	-50.41	-13.0
9251.00	V	-52.07	-13.0

**Operation mode: TX CH Mid 1880.0MHz mode**

Frequency (MHz)	Antenna Pol.	Spurious Emissions EIRP (dBm)	Limit (dBm)
1800.00	H	-49.36	-13.0
3760.00	H	-43.68	-13.0
5640.00	H	-45.69	-13.0
7520.00	H	-51.35	-13.0
9400.00	H	-52.17	-13.0
1800.00	V	-47.87	-13.0
3760.00	V	-37.45	-13.0
5640.00	V	-45.93	-13.0
7520.00	V	-50.61	-13.0
9400.00	V	-52.54	-13.0

**Operation mode: TX CH High 1909.8MHz mode**

Frequency (MHz)	Antenna Pol.	Spurious Emissions EIRP (dBm)	Limit (dBm)
1800.00	H	-48.51	-13.0
3819.60	H	-45.12	-13.0
5729.80	H	-42.87	-13.0
7639.20	H	-48.68	-13.0
9549.00	H	-52.14	-13.0
1800.00	V	-46.34	-13.0
3819.60	V	-36.95	-13.0
5729.80	V	-45.17	-13.0
7639.20	V	-50.64	-13.0
9549.00	V	-50.97	-13.0

## 12. §2.1055, §22.355, §24.235 - FREQUENCY STABILITY

### 12.1.Applicable Standard

CFR47 §2.1055, §22.355, §24.235

Frequency Tolerance: +/-2.5ppm for 850MHz band  
+/-2.5ppm for 1900MHz band

### 12.2.Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to communication test set via feed-through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the communication test set.

Frequency Stability vs. Voltage: An external variable DC power supply was connected to the battery terminals of the equipment under test. The voltage was set to 115% of the nominal value and was then decreased until the transmitter light no longer illuminated; i.e., the battery end point. The output frequency was recorded for each battery voltage.

### 12.3.Test Data

**Pass**

#### Environmental Conditions

<b>Temperature:</b>	<b>25 ° C</b>
<b>Relative Humidity:</b>	<b>56%</b>
<b>ATM Pressure:</b>	<b>100.0kPa</b>

**Frequency Stability vs. Temperature**

Reference Frequency: GSM 850 Mid channel 836.6MHz@ 25 degree			
Limit: +/- 2.5ppm = 2091Hz			
Environment Temperature	Frequency	Delta (Hz)	Limit (Hz)
(degree)	(MHz)		
-30	836.599928	72	2091
-20	836.599967	33	2091
-10	836.599986	14	2091
0	836.599989	11	2091
10	836.599991	9	2091
20	836.599995	5	2091
30	836.600014	-14	2091
40	836.600021	-21	2091
50	836.600038	-38	2091

Reference Frequency: PCS 1900 Mid channel 1880MHz@ 25 degree			
Limit: +/- 2.5ppm = 4700Hz			
Environment Temperature	Frequency	Delta (Hz)	Limit (Hz)
(degree)	(MHz)		
-30	1879.999934	66	4700
-20	1879.999965	35	4700
-10	1879.999981	19	4700
0	1879.999986	14	4700
10	1879.999989	11	4700
20	1879.999992	8	4700
30	1880.000012	-12	4700
40	1880.000033	-33	4700
50	1880.000057	-57	4700

**Frequency Stability vs. Voltage**

Reference Frequency: GSM 850 Mid channel 836.6MHz@ 25 degree			
Limit: +/- 2.5ppm = 2091Hz			
Power Supply	Frequency	Delta (Hz)	Limit (Hz)
Vdc	(MHz)		
13.8	836.600027	-27	2091
12.0	836.599994	6	2091
10.2	836.599982	18	2091

Reference Frequency: PCS 1900 Mid channel 1880MHz@ 25 degree			
Limit: +/- 2.5ppm = 4700Hz			
Power Supply	Frequency	Delta (Hz)	Limit (Hz)
Vdc	(MHz)		
13.8	1880.000024	-24	2091
12.0	1880.000007	-7	2091
10.2	1879.999975	25	2091