FCC Test Report

FOR:

FOR:

Manufacturer: System Planning Corporation

Model #: VERSA 203133-01

FCC ID: XDY-VERSA-01

47 CFR Part 2, 22, 24

TEST REPORT #: EMC_SYSTE_004_11001_WWAN
DATE: 2013-04-02

FCC: Accredited

IC recognized # 3462B-1

***CETECOM* Inc.**
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CETECOM Inc. is a Delaware Corporation with Corporation number: 2905571

Table of Contents

1 Assessment

The following device was tested against the applicable criteria specified in FCC rules Parts 2, 22 and 24 of the Code of Federal Regulations
No deviations were ascertained during the course of the tests performed.

Company	Description	Model #
System Planning Corporation	Local Control for remote installations.	VERSA 203133-01

Responsible for Testing Laboratory:

Date	Section	Name	Signature
2013-04-02	Compliance	Sajay Jose (EMC Lab Manager)	

Responsible for the Report:

Date	Section	Name	Signature
2013-04-02	Compliance	Tunji Yusuf (EMC Engineer)	

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Address:	411 Dixon Landing Road Milpitas, CA 95035 U.S.A.
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
Test Lab Manager:	Sajay Jose
Test Engineer:	Tunji Yusuf

2.2 Identification of the Client

Client:	System Planning Corporation
Street Address:	3601 Wilson Blvd, Suite 500
City/Zip Code	Arlington VA 22201
Country	USA
Contact Person:	Ronald Martin
Phone No.	703-351-8203
e-mail:	martin@sysplan.com

2.3 Identification of the Manufacturer

Same as Client.

3 Equipment under Test (EUT)

3.1 Specification of the Equipment under Test

Model No./Name:	VERSA 203133-01
Product Description:	Local Control for remote installations.
Hardware Version :	203133 -05
Software Version:	7.45.1 (SV08)
FCC ID:	XDY-VERSA-01
Integrated Module Info:	Sierra Wireless Q2687 (FCC ID: N7NQ2687)
Supported Frequency Bands:	850/900/1800/1900 MHz
Frequency Range of Test:	GSM 850: 824.2-848.8MHz; PCS 1900: 1850.2-1909.8MHz
No. of Channels:	GSM850: 125 and PCS 1900: 300
Type(s) of Modulation:	GMSK, 8PSK
Other Radios included in the device:	DTS/ IEEE 802.15.4 (ZigBee): 2.405-2.480 GHz Satellite Transmitter: 1610-1625 MHz GPS: Rx only 1575 MHz
Antenna Info:	Internal SMD Antenna Model: Taoglas PA.25a Manufacture reported peak gain (dBi): 0.9-1.8 (in frequency band 800-2200 MHz)
Rated Operating Voltage (V DC):	3.6
Rated Operating Temperature Range:	–40°C ~ +85°C
Test Sample Status:	Pre-Production

3.2 Identification of the Equipment Under Test (EUT)

EUT #	Serial Number/IMEI	HW Version	SW Version
1	35242104127809608	203133 -05	7.45.1 (SV08)

3.3 Max Output Power Summary:

Frequency Band(MHz)	GMSK Mode		8PSK Mode	
	Conducted Power (dBm)	Radiated Power (dBm)	Conducted Power (dBm)	Radiated Power (dBm)
850	32.0	32.09 (ERP)	29.4	30.03 (ERP)
1900	29.5	32.92 (EIRP)	28.6	32.27 (EIRP)

3.4 Environmental conditions during Test:

The following environmental conditions were maintained during the course of testing:
Ambient Temperature: 20-25^{o}C
Relative humidity: 40-60%

3.5 Dates of Testing:

13 Jan-16 Mar 14, 2012.

4 Subject of Investigation

The objective of the measurements done by Cetecom Inc. was to measure the performance of the EUT as specified by requirements listed in the following test standards:

- 47 CFR Part 2: Title 47 of the Code of Federal Regulations: Chapter I-Federal Communications Commission Frequency allocations and radio treaty matters; general rules and regulations.
- 47 CFR Part 22: Title 47 of the Code of Federal Regulations: Chapter I-Federal Communications Commission subchapter B- common carrier services; Part 22- Public mobile services
- 47 CFR Part 24: Title 47 of the Code of Federal Regulations: Chapter I-Federal Communications Commission subchapter B- common carrier services; Part 24- Personal communication services

This test report is to support a request for new equipment authorization under the FCC ID: XDY-VERSA-01. All testing was performed on the products referred to in Section 3 as EUT.

The EUT incorporates a pre-certified module Q2687 from Sierra Wireless.
This test report only covers the radiated test portion of the above listed FCC rule parts.

For conducted test results, reference is made to the results from the module‘s pre-certification and as documented in test report number SHEMO10030019402 issued by SGS-CSTS Standards Technical Services Co., Ltd. Mar 15, 2010 and as published on the module’s FCC filing.

5 Summary of Measurement Results

850 MHz Band:

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §22.913 (a)	RF Output Power	Nominal	GSM 850	■	☐	☐	☐	Complies
§2.1055 §22.355	Frequency Stability	Nominal	GSM 850	☐	☐	☐	■	Note 1
§2.1049 §22.917(b)	Occupied Bandwidth	Nominal	GSM 850	☐	☐	☐	■	Note 1
§2.1051 §22.917	Band Edge Compliance	Nominal	GSM 850	☐	☐	☐	■	Note 1
§2.1051 §22.917	Conducted Spurious Emissions	Nominal	GSM 850	☐	☐	☐	■	Note 1
§2.1053 §22.917	Radiated Spurious Emissions	Nominal	GSM 850	■	☐	☐	☐	Complies

Note: NA= Not Applicable; NP= Not Performed.
Note 1: Leveraged from module certification.

1900 MHz Band:

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §24.232 (a)	RF Output Power	Nominal	GSM 1900	■	☐	☐	☐	Complies
§2.1055 §24.235	Frequency Stability	Nominal	GSM 1900	☐	☐	☐	■	Note 1
§2.1049 §24.238(b)	Occupied Bandwidth	Nominal	GSM 1900	☐	☐	☐	■	Note 1
§2.1051 §24.238	Band Edge Compliance	Nominal	GSM 1900	☐	☐	☐	■	Note 1
§2.1051 §24.238	Conducted Spurious Emissions	Nominal	GSM 1900	☐	☐	☐	■	Note 1
§2.1053 §24.238	Radiated Spurious Emissions	Nominal	GSM 1900	■	☐	☐	☐	Complies

Note: NA= Not Applicable; NP= Not Performed.
Note 1: Leveraged from module certification.

6 Measurements

6.1 RF Power Output

6.1.1 References

FCC: CFR Part 2.1046, CFR Part 22.913, CFR Part 24.232

6.1.2 Measurement requirements:

6.1.2.1 FCC 2.1046: RF power output.

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 circuit elements as specified. The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

6.1.3 Limits:

6.1.3.1 FCC 22.913 (a) Effective radiated power limits.

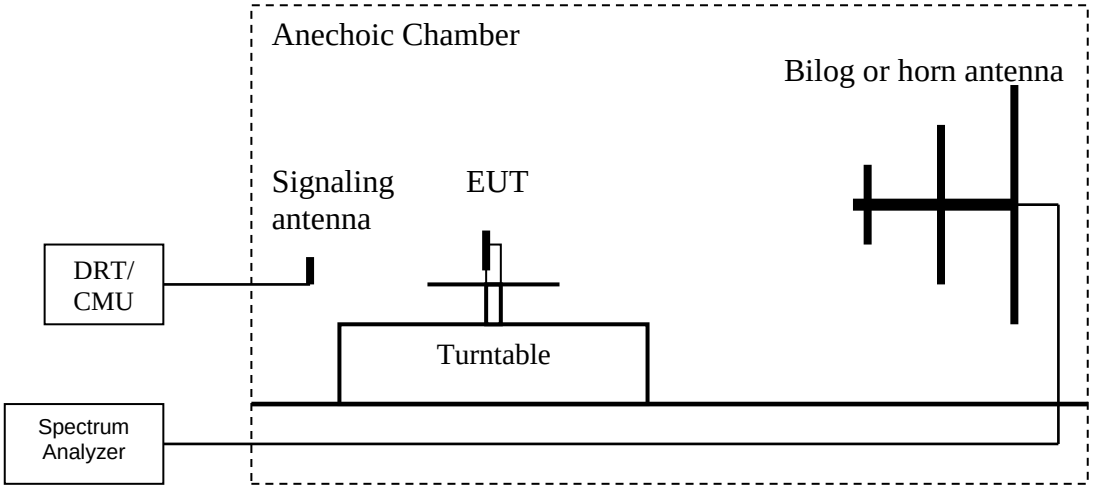
The effective radiated power (ERP) of mobile transmitters must not exceed 7 Watts.

6.1.3.2 FCC 24.232 (b)(c) Power limits.

(b) Mobile/portable stations are limited to 2 Watts effective isotropic radiated power (EIRP).
(c) Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms equivalent voltage. The measurement results shall be properly adjusted for any limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement over the full bandwidth of the channel.

6.1.4 Radiated Output Power Measurement procedure

Ref: TIA-603C 2004 -2.2.17.2 Effective Radiated Power (ERP) or Effective Isotropic Radiated Power (EIRP)



1. Connect the equipment as shown in the above diagram with the EUT's antenna in center of the turn table.
2. Adjust the settings of the Digital Radio Communication Tester (DRT) to set the EUT to its maximum power at the required channel.
3. Set the spectrum analyzer to the channel frequency. Set the analyzer to measure peak hold with the required settings.
4. Rotate the EUT 360°. Record the peak level in dBm (**LVL**).
5. Replace the EUT with a vertically polarized half wave dipole or known gain antenna. The center of the antenna should be at the same location as the center of the EUT's antenna.
6. Connect the antenna to a signal generator with known output power and record the path loss in dB (**LOSS)**. **LOSS** = Generator Output Power (dBm) – Analyzer reading (dBm).
7. Determine the ERP using the following equation:
   ERP (dBm) = **LVL** (dBm) + **LOSS** (dB)
8. Determine the EIRP using the following equation:
   EIRP (dBm) = **ERP** (dBm) + 2.14 (dB)
9. GMSK mode measurements are performed in GSM 1 uplink slot configuration.

6.1.4.1 Measurement Uncertainty

+/- 3 dB

6.1.4.2 Test Conditions:

Tnom: 20^{o}C; Vnom: 3.6 V

6.1.5 RF Power Output 850MHz band

Limit: FCC: Nominal Peak Output Power < 38.45 dBm (7W)

GSM 850		
Frequency (MHz)	**GMSK Mode**	**8PSK Mode**
	ERP (dBm)	**ERP (dBm)**
824.2	31.91	29.34
836.6	31.65	29.42
848.8	32.09	30.03

6.1.5.1 Measurement Verdict:

Pass.

6.1.6 RF Power Output 1900MHz band

Limit: Nominal Peak Output Power < 33 dBm (2W)

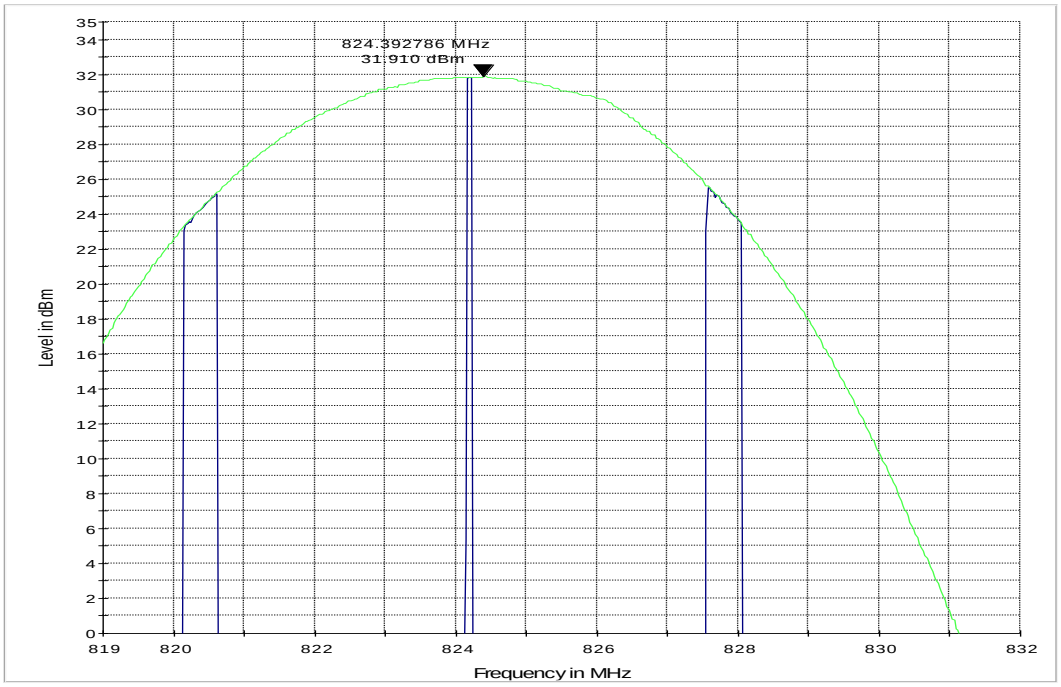
GSM 1900		
Frequency (MHz)	**GMSK Mode**	**8PSK Mode**
	EIRP (dBm)	**EIRP (dBm)**
1850.2	32.10	31.87
1880.0	32.27	31.93
1909.8	32.92	32.27

6.1.6.1 Measurement Verdict:

Pass.

6.2 Results

ERP (GSM 850) CHANNEL 128



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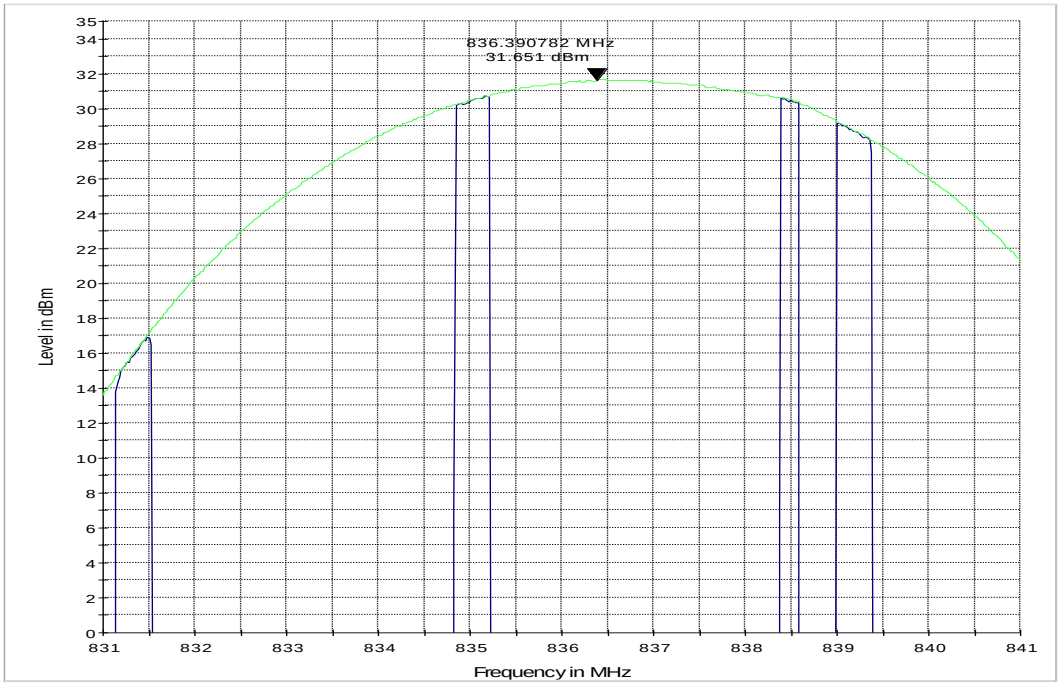

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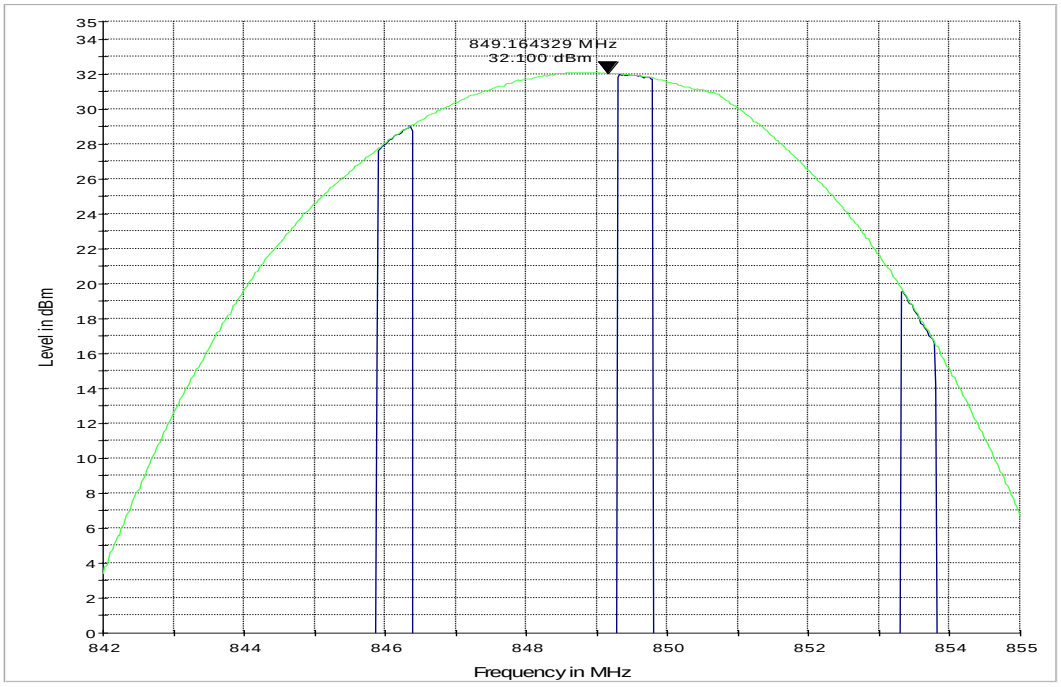

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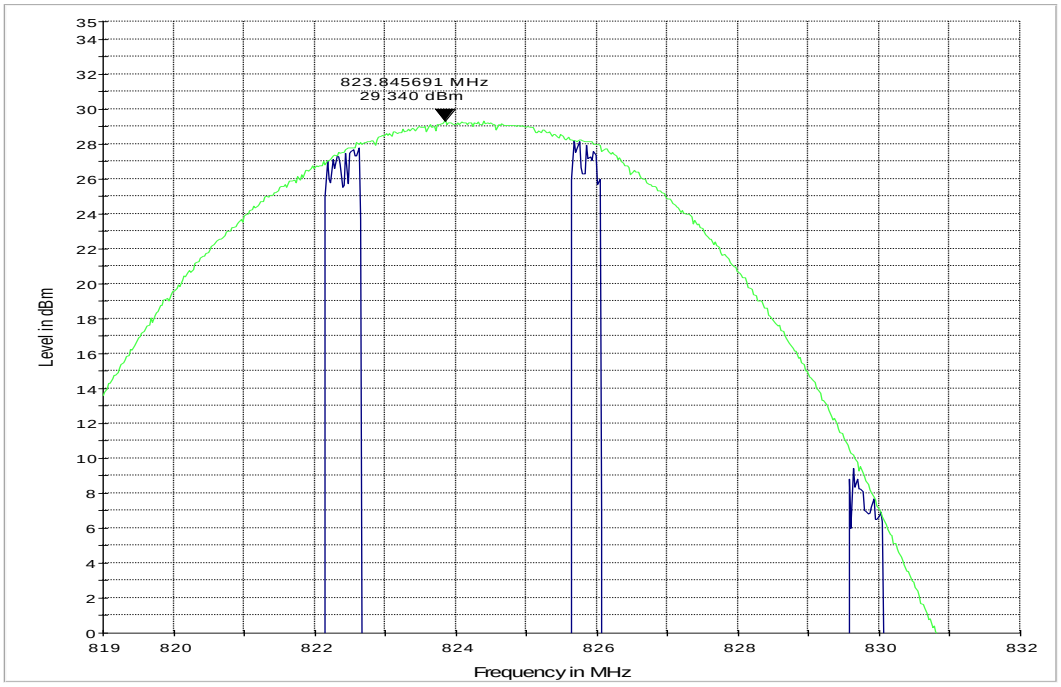

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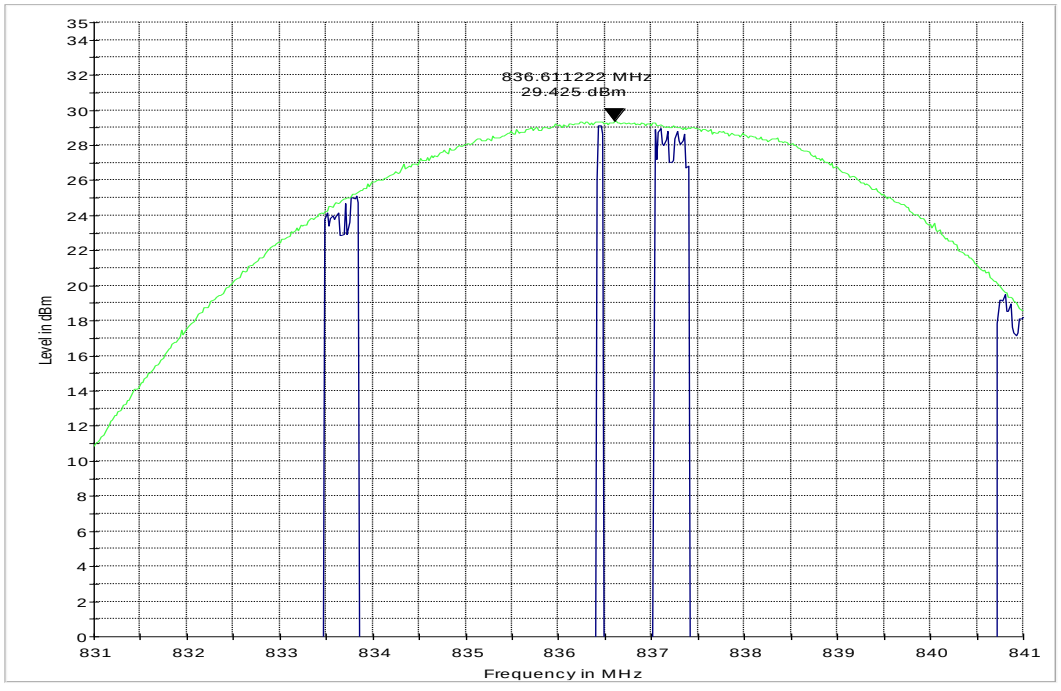

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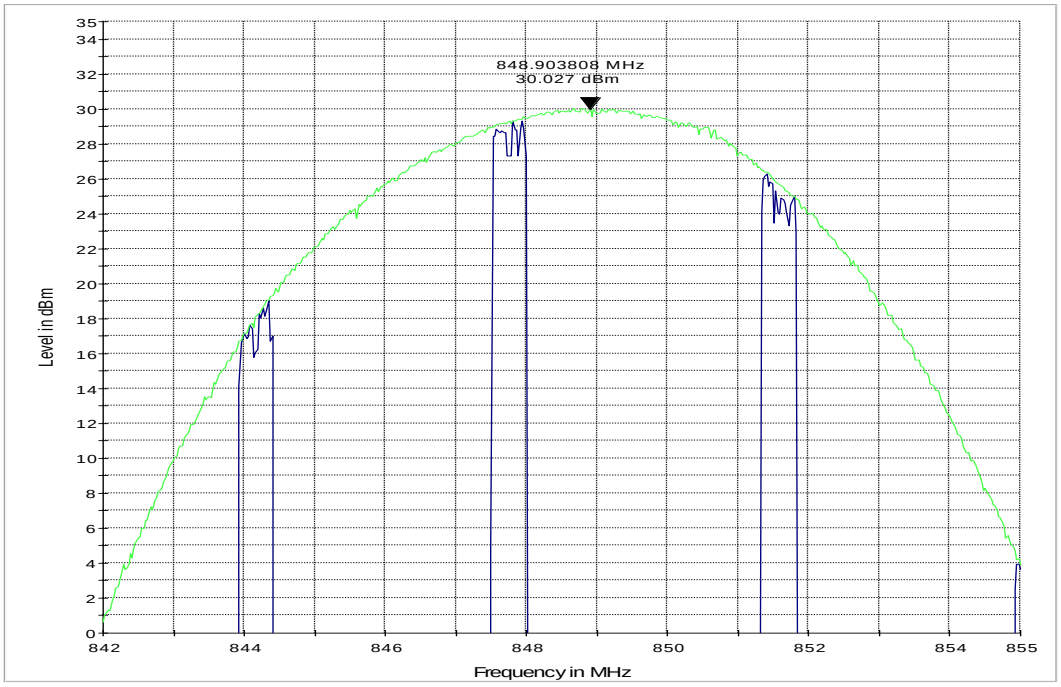
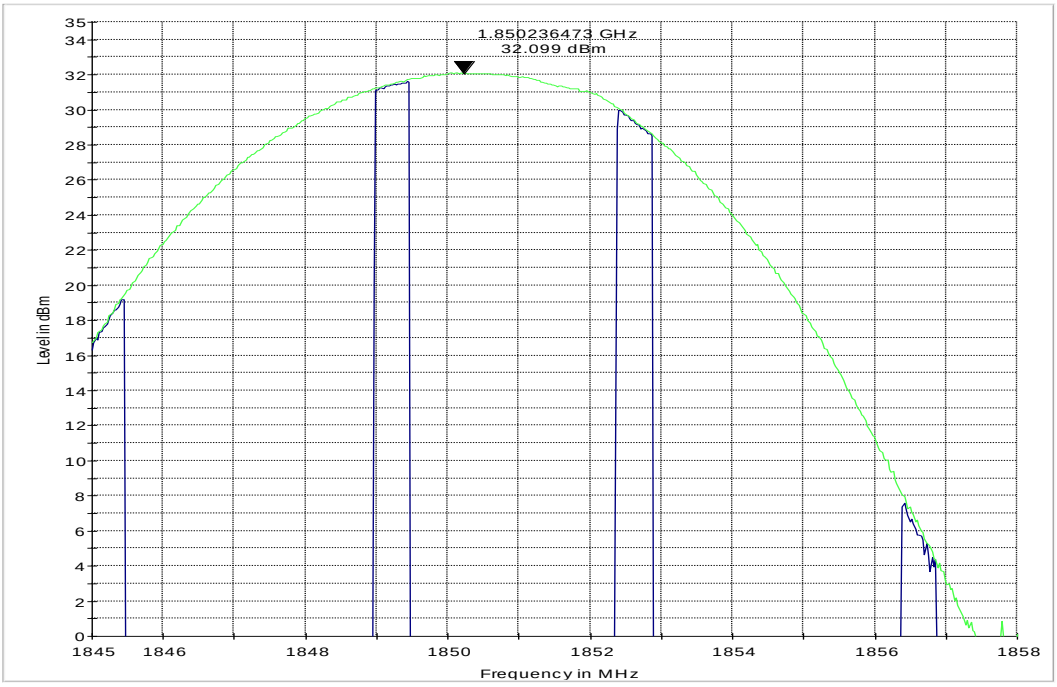
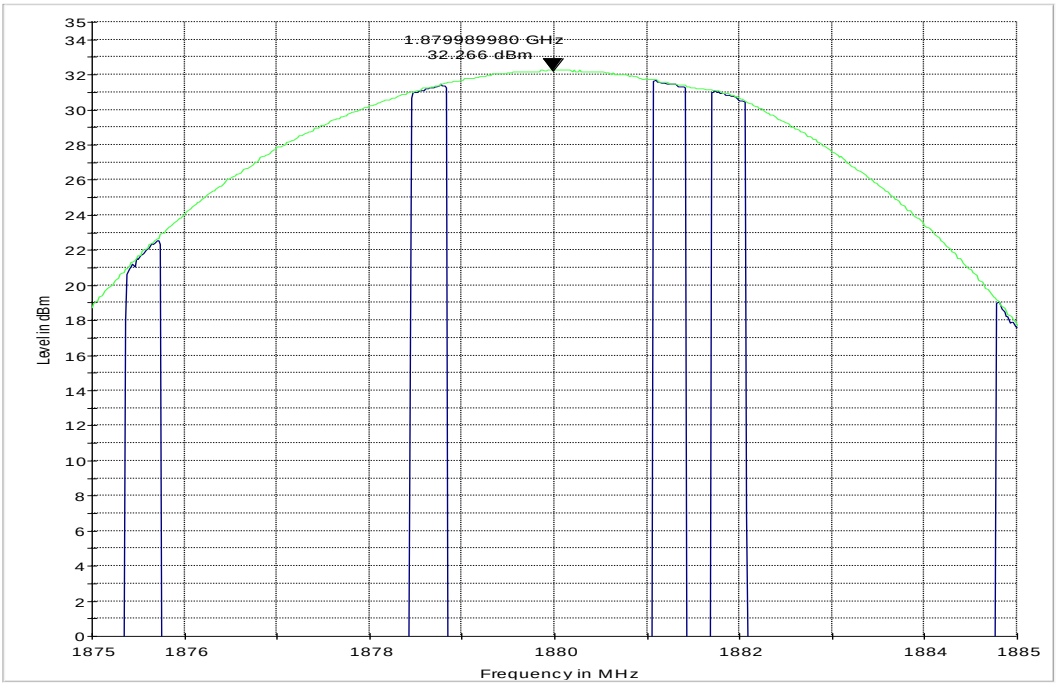


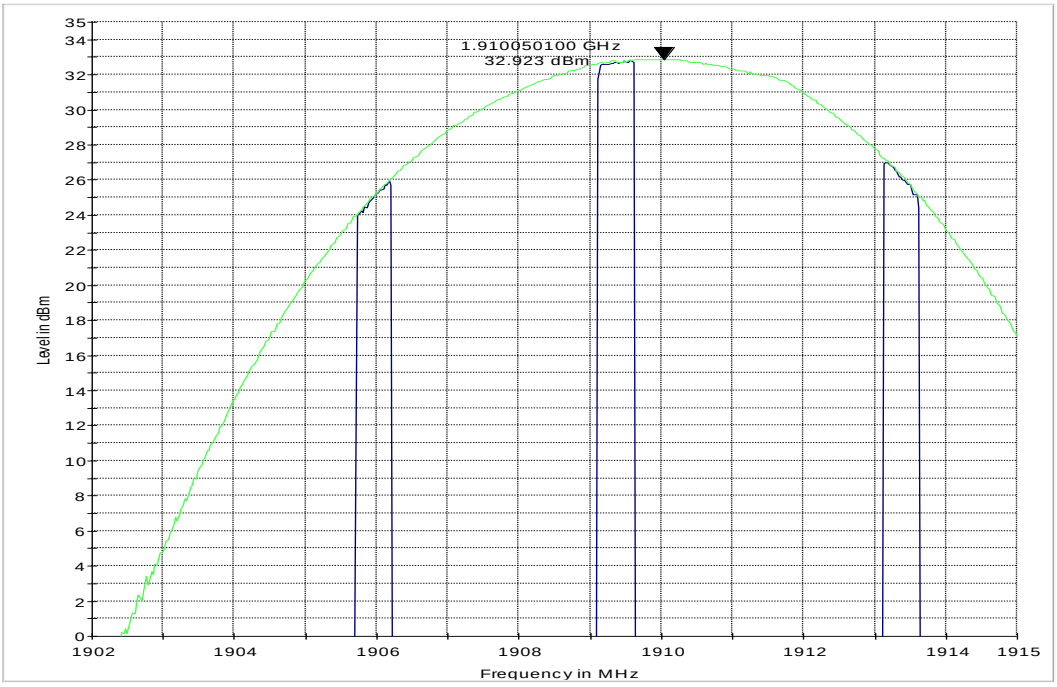
EIRP (PCS-1900) CHANNEL 512



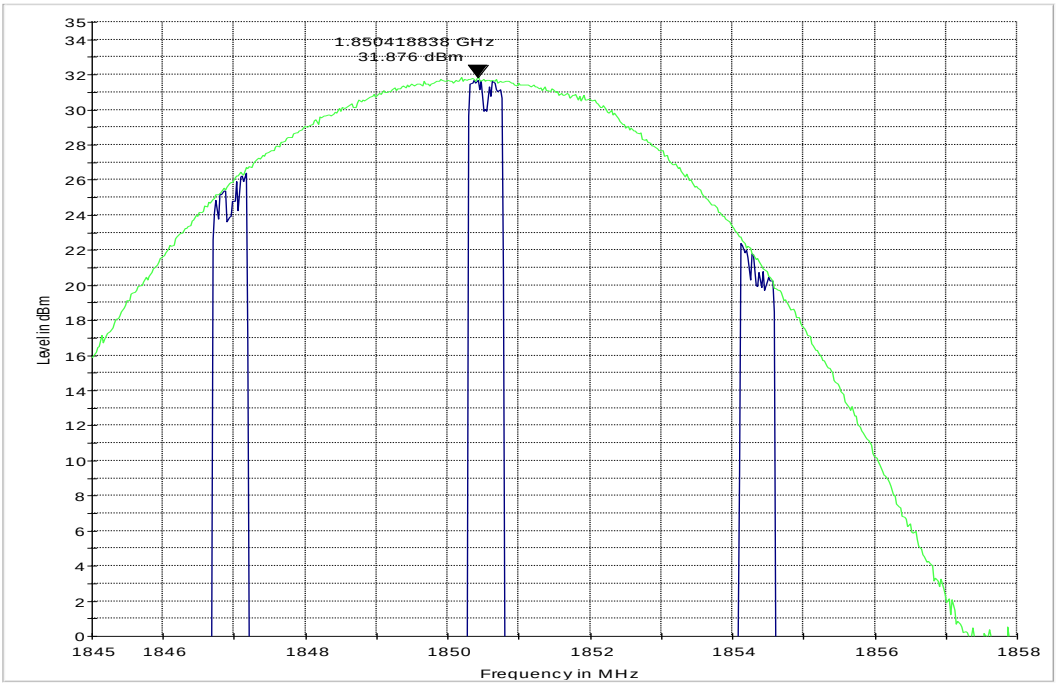
EIRP (PCS-1900) CHANNEL 661



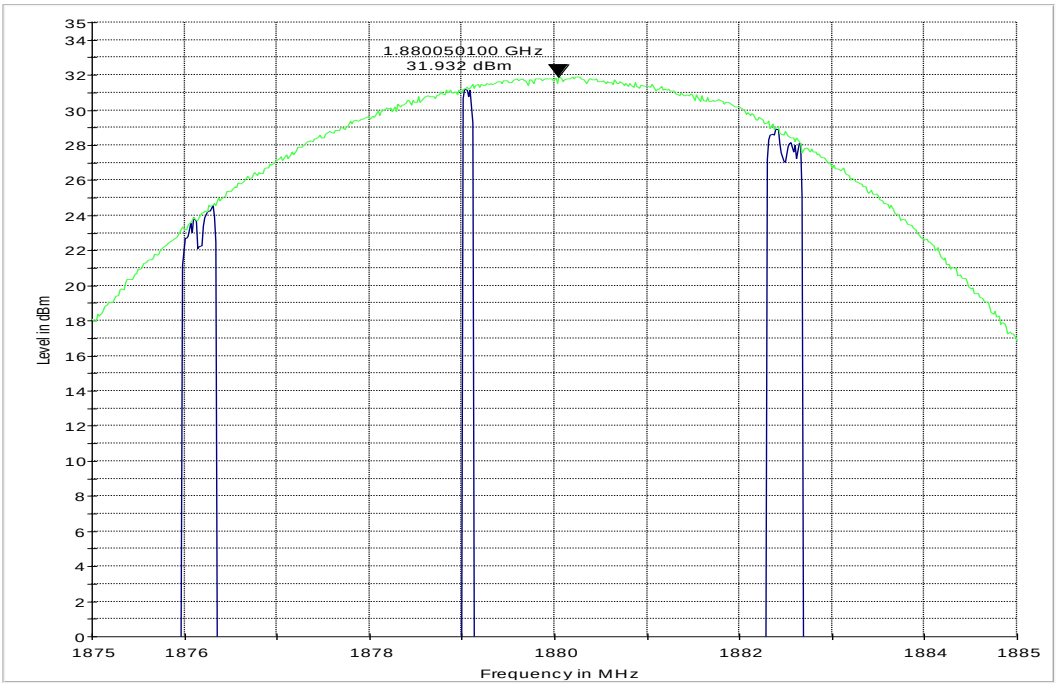
EIRP (PCS-1900) CHANNEL 810



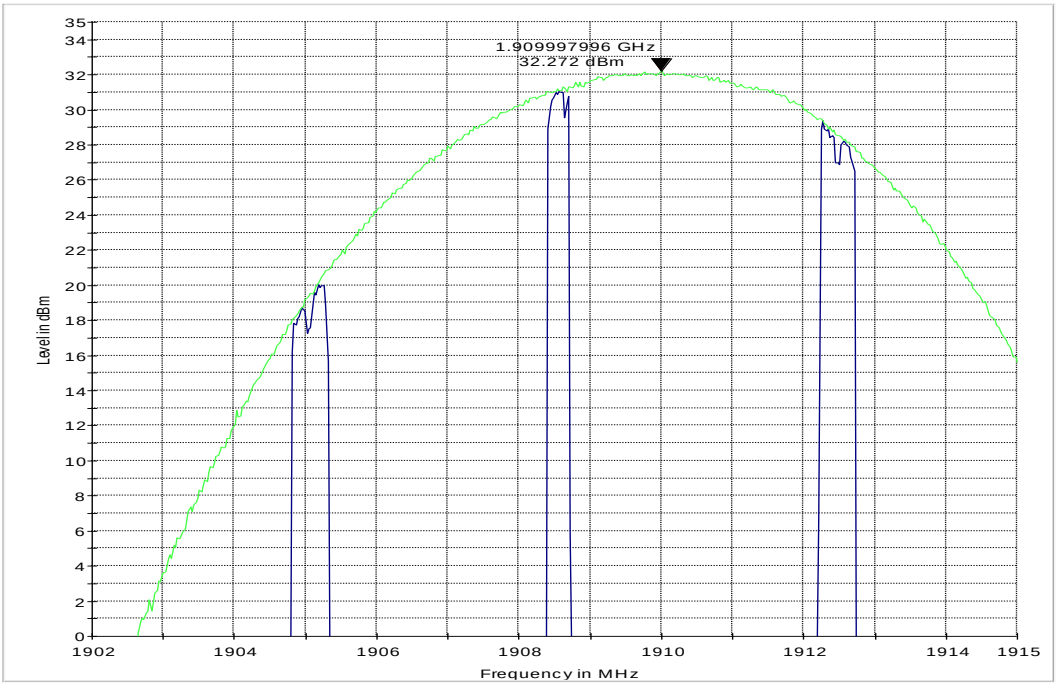
EIRP (EGPRS 1900) CHANNEL 512



EIRP (EGPRS 1900) CHANNEL 661



EIRP (EGPRS 1900) CHANNEL 810



6.3 Spurious Emissions Radiated

6.3.1 References

FCC: CFR Part 2.1053, CFR Part 22.917, CFR Part 24.238

6.3.2 Measurement requirements:

6.3.2.1 FCC 2.1053: Field strength of spurious radiation.

Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission.

6.3.3 Limits:

(a) *Out of band emissions*. 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.
For all power levels +30dBm to 0dBm, this becomes a constant specification of -13dBm.

6.3.3.1 FCC 22.917 Emission limitations for cellular equipment.

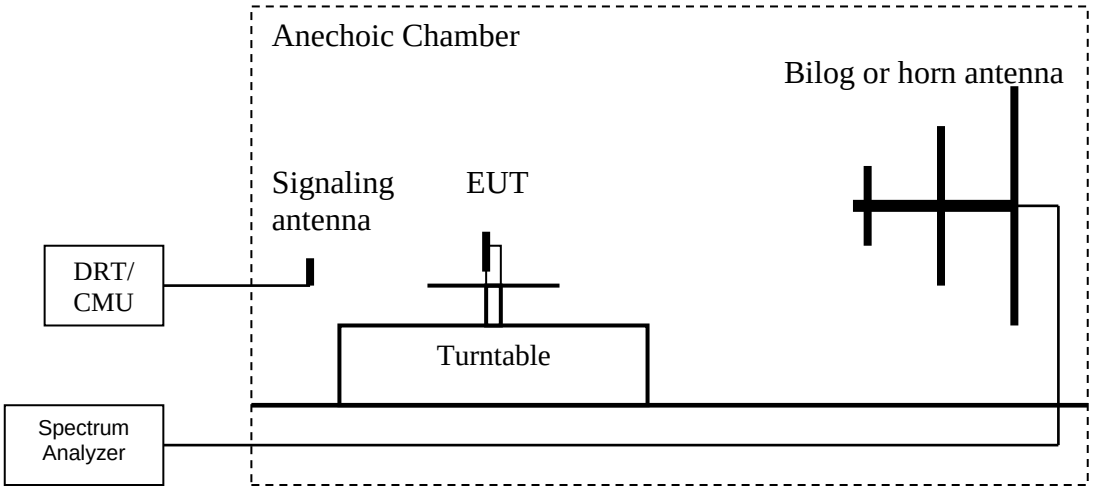
The rules in this section govern the spectral characteristics of emissions in the Cellular Radiotelephone Service.
(b) *Measurement procedure.* Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands 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. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 100 kHz of 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

6.3.3.2 FCC 24.238 Emission limitations for Broadband PCS equipment.

The rules in this section govern the spectral characteristics of emissions in the Broadband Personal Communications Service.
(b) Measurement procedure. Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz 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. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 100 kHz of 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

6.3.4 Radiated out of band measurement procedure:

Ref: TIA-603C 2004- 2.2.12 Unwanted emissions: Radiated Spurious



1. Connect the equipment as shown in the above diagram with the EUT's antenna in a horizontal orientation.
2. Adjust the settings of the Digital RadioCommunication Tester (DRT) to set the EUT to its maximum power at the required channel.
3. Set the spectrum analyzer to measure peak hold with the required settings.
4. Place the measurement antenna in a horizontal orientation. Rotate the EUT 360°. Raise the measurement antenna up to 4 meters in 0.5 meters increments and rotate the EUT 360° at each height to maximize all emissions. Measure and record all spurious emissions (**LVL**) up to the tenth harmonic of the carrier frequency.
5. Replace the EUT with a horizontally polarized half wave dipole or known gain antenna. The center of the antenna should be at the same location as the center of the EUT's antenna.
6. Connect the antenna to a signal generator with known output power and record the path loss in dB (**LOSS)**. **LOSS** = Generator Output Power (dBm) – Analyzer reading (dBm).
7. Determine the level of spurious emissions using the following equation: **Spurious** (dBm) = **LVL** (dBm) + **LOSS** (dB):
8. Repeat steps 4, 5 and 6 with all antennas vertically polarized.
9. Determine the level of spurious emissions using the following equation: **Spurious** (dBm) = **LVL** (dBm) + **LOSS** (dB):
10. Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band.

(N**ote:** Steps 5 and 6 above are performed prior to testing and **LOSS** is recorded by test software. Steps 3, 4 and 7 above are performed with test software.)

6.3.5 Sample Calculations for Radiated Measurements

6.3.5.1 Power Measurements using Substitution Procedure:

The measurement on the Spectrum Analyzer is used as a basis for the Substitution procedure.
The EUT is replaced with a Signal Generator and an antenna. The setting on the Signal Generator is varied until the Spectrum Analyzer displays the original reading. EIRP is calculated as-

EIRP (dBm)= Signal Generator setting (dBm)- Cable Loss (dB)+ Antenna Gain (dBi)

Example:

Frequency (MHz)	Measured SA (dBµV)	Signal Generator setting (dBm)	Antenna Gain (dBi)	Dipole Gain (dBd)	Cable Loss (dB)	EIRP (dBm)
1000	95.5	24.5	6.5	0	3.5	27.5

6.3.6 Measurement Survey:

The site is constructed in accordance with ANSI C63.4 requirements and is recognized by the FCC to be in compliance for a 3m site. The spectrum is scanned from 30MHz to the 10th harmonic of the highest frequency generated by the EUT.
Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the 850 MHz and 1900 MHz bands of operation.
It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the GSM-850 MHz and the PCS-1900 MHz band into any of the other blocks respectively. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

Radiated emission measurements were made in GMSK mode (1 uplink slot).

For radiated measurements, all data in this report shows the worst case emissions data between H/V antenna polarizations and for all 3 orthogonal orientations of the EUT.

Unless mentioned otherwise, the emission signals above the limit line in the plots are from the carrier.

Measurement Uncertainty= +/- 3.0 dB.

6.3.7 Test Conditions:

Tnom: 20^{o}C; Vnom: 3.6 V

6.3.8 Radiated out of band emissions results on EUT- Transmit Mode:

6.3.8.1 Test Results Transmitter Spurious Emission GSM850:

Harmonic	Tx ch-128 Freq. (MHz)	Level (dBm)	Tx ch-190 Freq. (MHz)	Level (dBm)	Tx ch-251 Freq. (MHz)	Level (dBm)
1	**824.2**	-	**836.6**	-	**848.8**	-
2	**1648.4**	NF	**1673.2**	NF	**1697.6**	NF
3	**2472.6**	NF	**2509.8**	NF	**2546.4**	NF
4	**3296.8**	NF	**3346.4**	NF	**3395.2**	NF
5	**4121**	NF	**4183**	NF	**4244**	NF
6	**4945.2**	NF	**5019.6**	NF	**5092.8**	NF
7	**5769.4**	NF	**5856.2**	NF	**5941.6**	NF
8	**6593.6**	NF	**6692.8**	NF	**6790.4**	NF
9	**7417.8**	NF	**7529.4**	NF	**7639.2**	NF
10	**8242**	NF	**8366**	NF	**8488**	NF
NF = Noise Floor Measurement Uncertainty: ±3dB						

6.3.8.2 Measurement Verdict

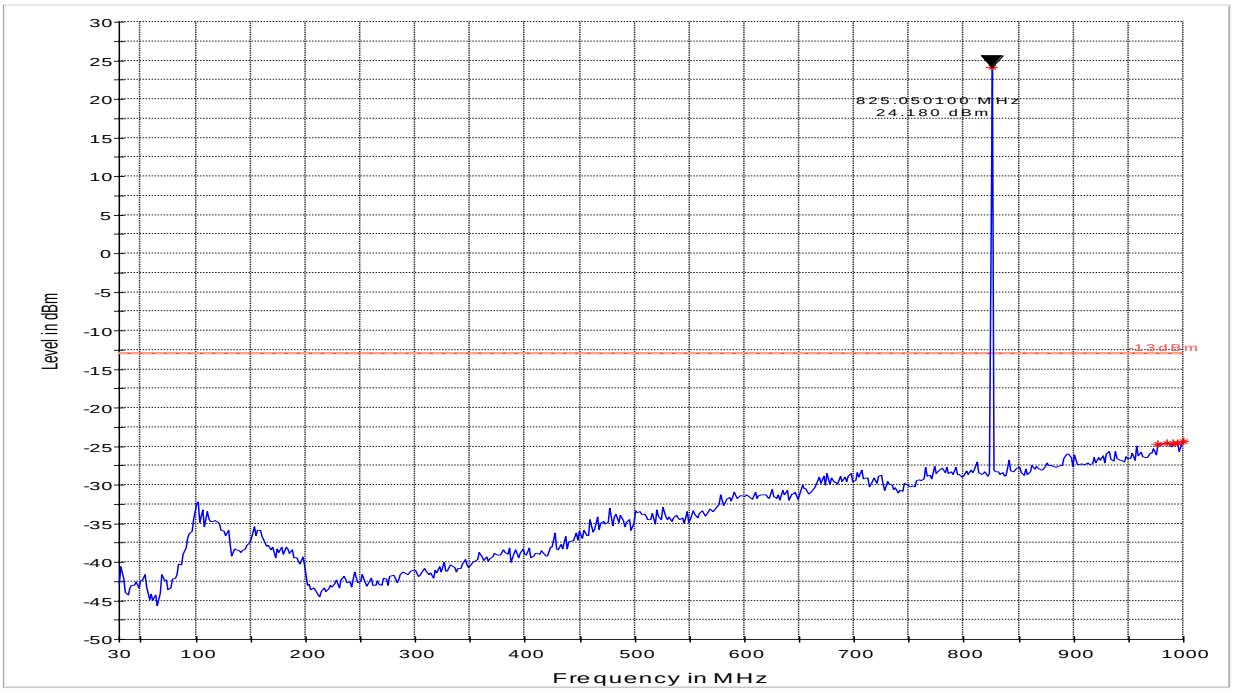
Pass.

6.3.9 Test Results

Radiated Spurious Emissions (GSM-850) Tx: Low Channel

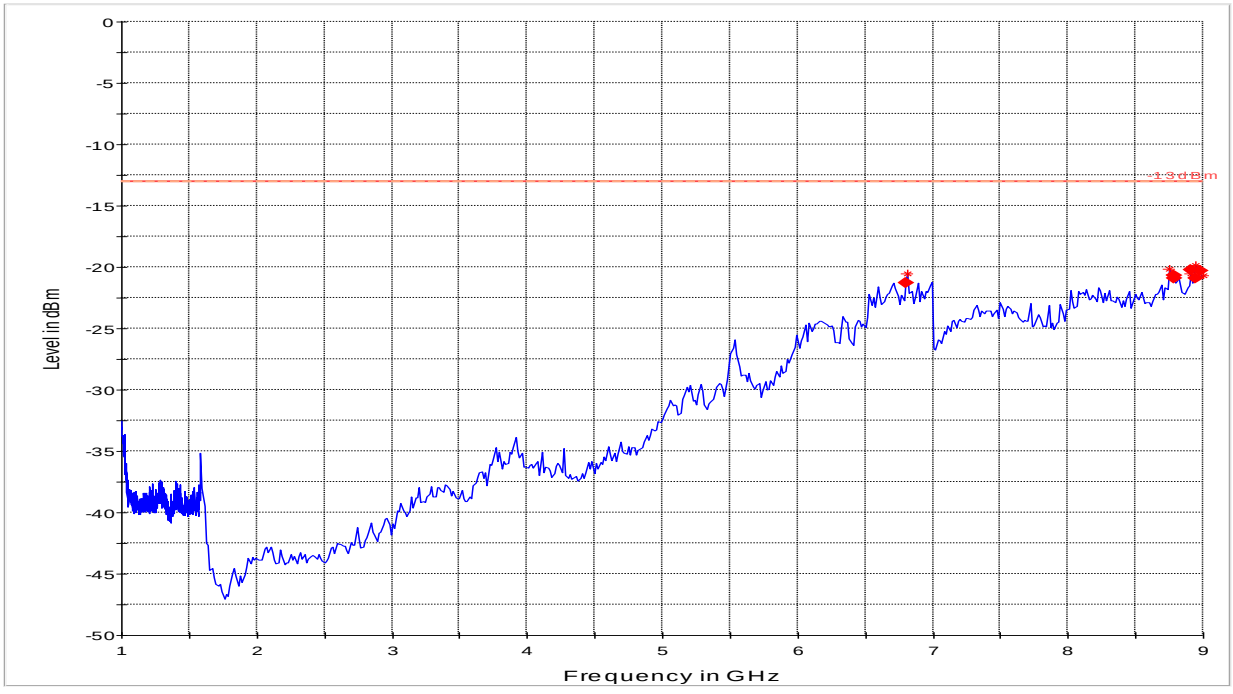
Test results 30M-1GHz

Emissions above the limit line is the Carrier signal in 850 Low band.



-13dBm.LimitLine -13dBm.LimitLine Preview Result 1 Data Reduction Result 1 [1]

Test results 1GHz-9GHz

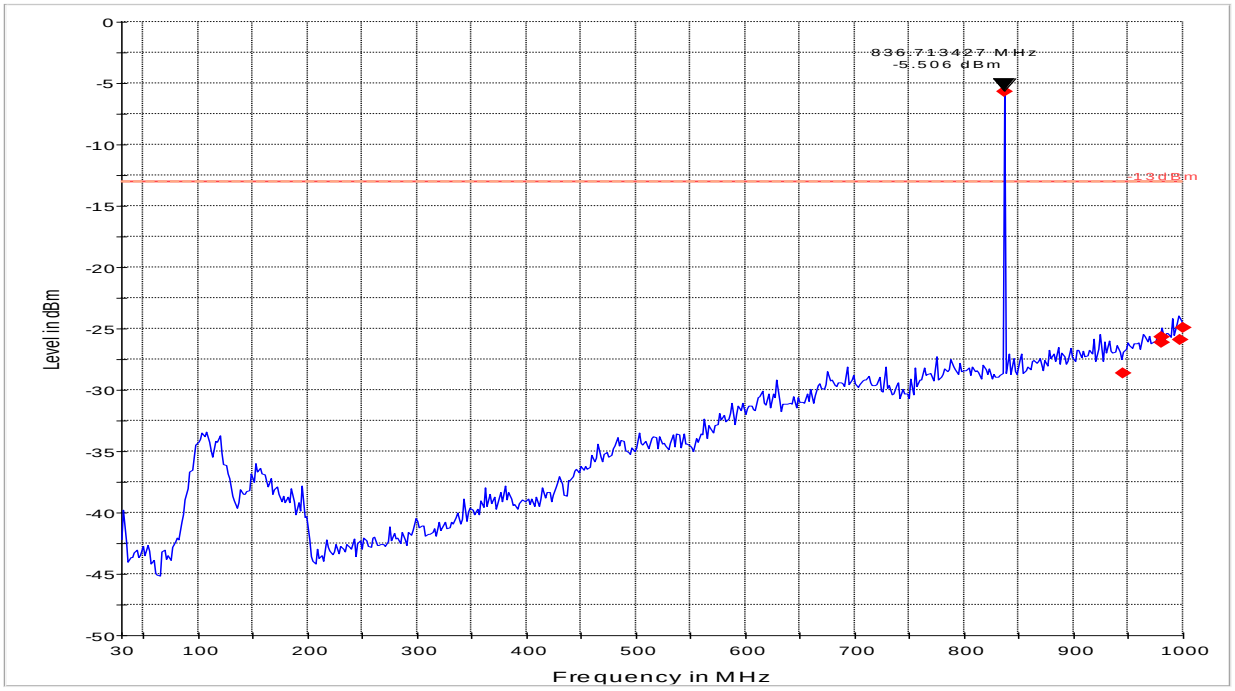


-13dBm.LimitLine -13dBm.LimitLine Preview Result 1 Data Reduction Result 1 [2] Final Result 1

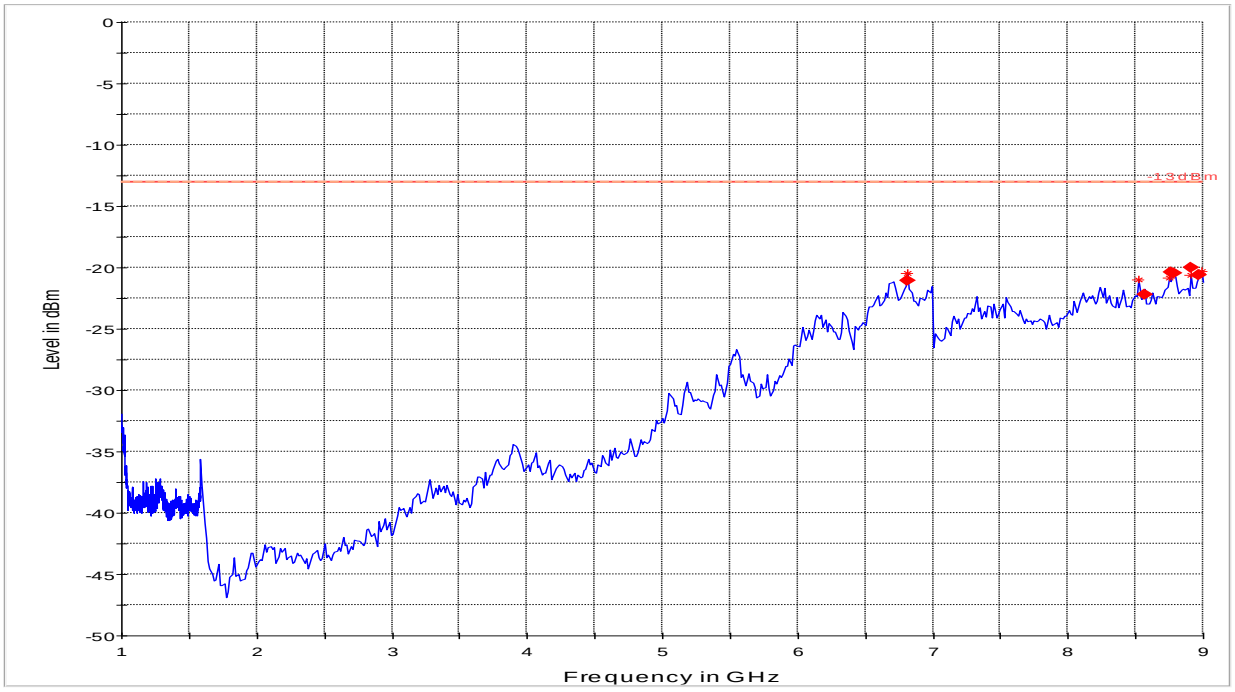
Radiated Spurious Emissions (GSM-850) Tx: Mid Channel

Test results 30M-1GHz

Emissions above the limit line is the Carrier signal in 850 Mid band.



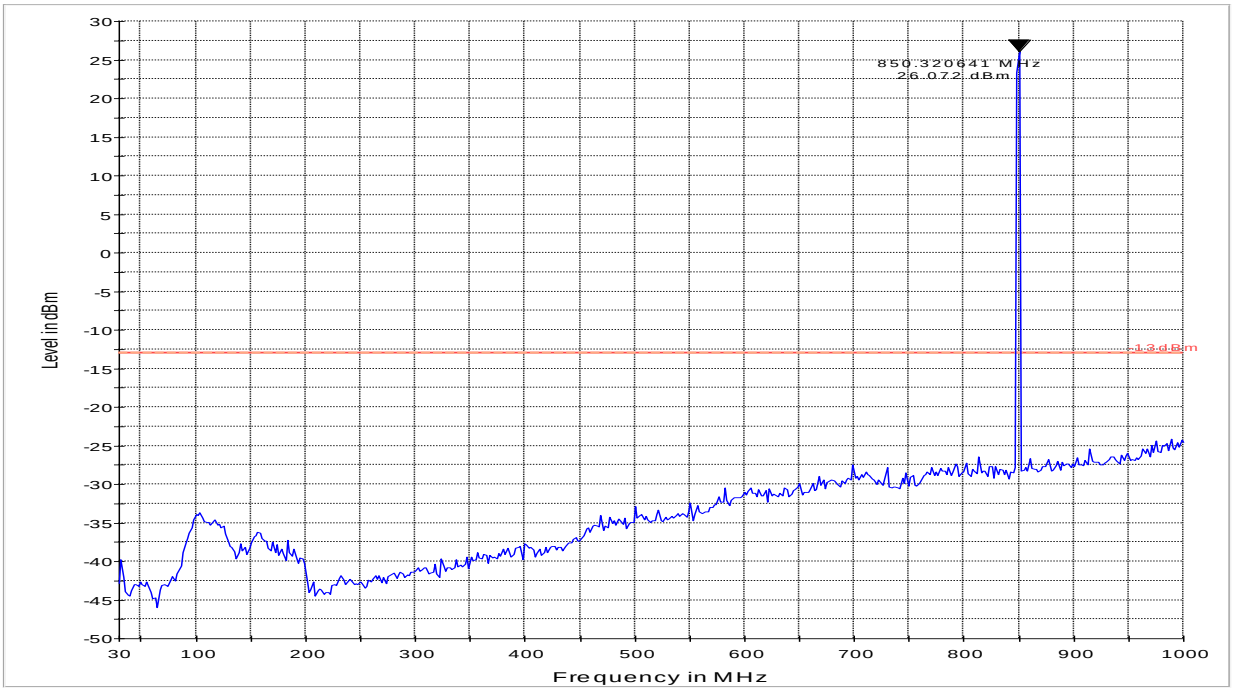
Test results 1GHz-9GHz



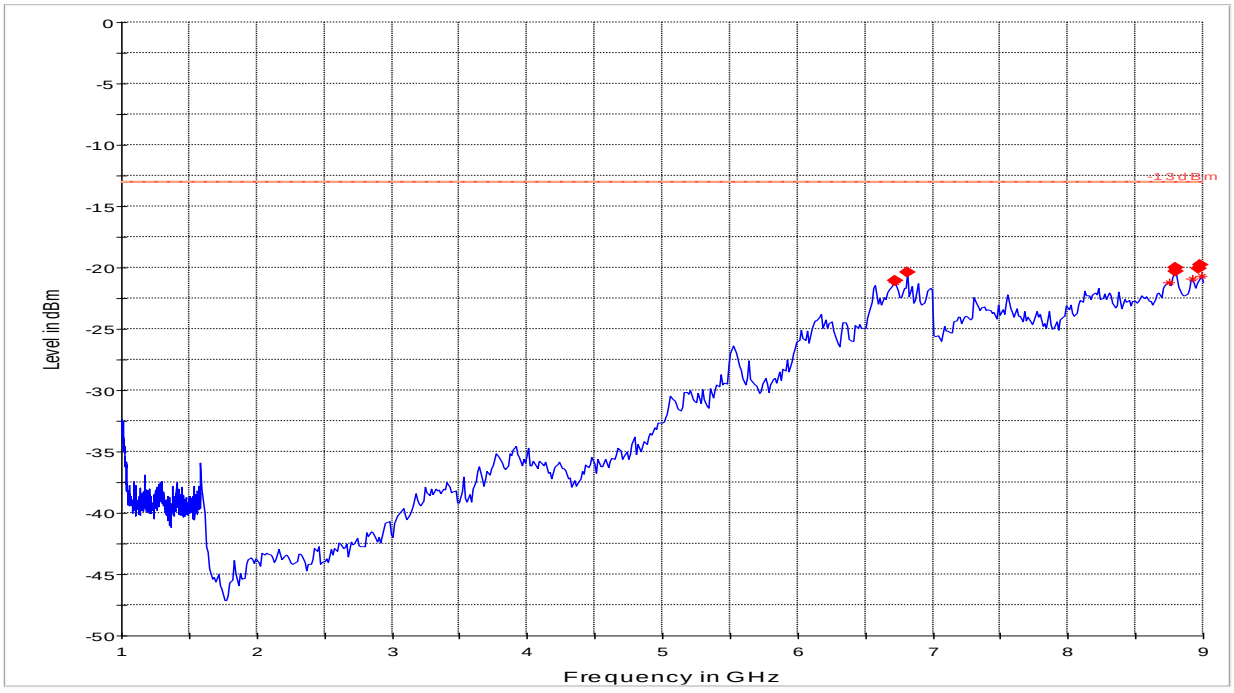
Radiated Spurious Emissions (GSM-850) Tx: High Channel

Test results 30M-1GHz

Emissions above the limit line is the Carrier signal in 850 High band.



Test results 1GHz-9GHz



6.3.9.1 Test Results Transmitter Spurious Emission PCS-1900:

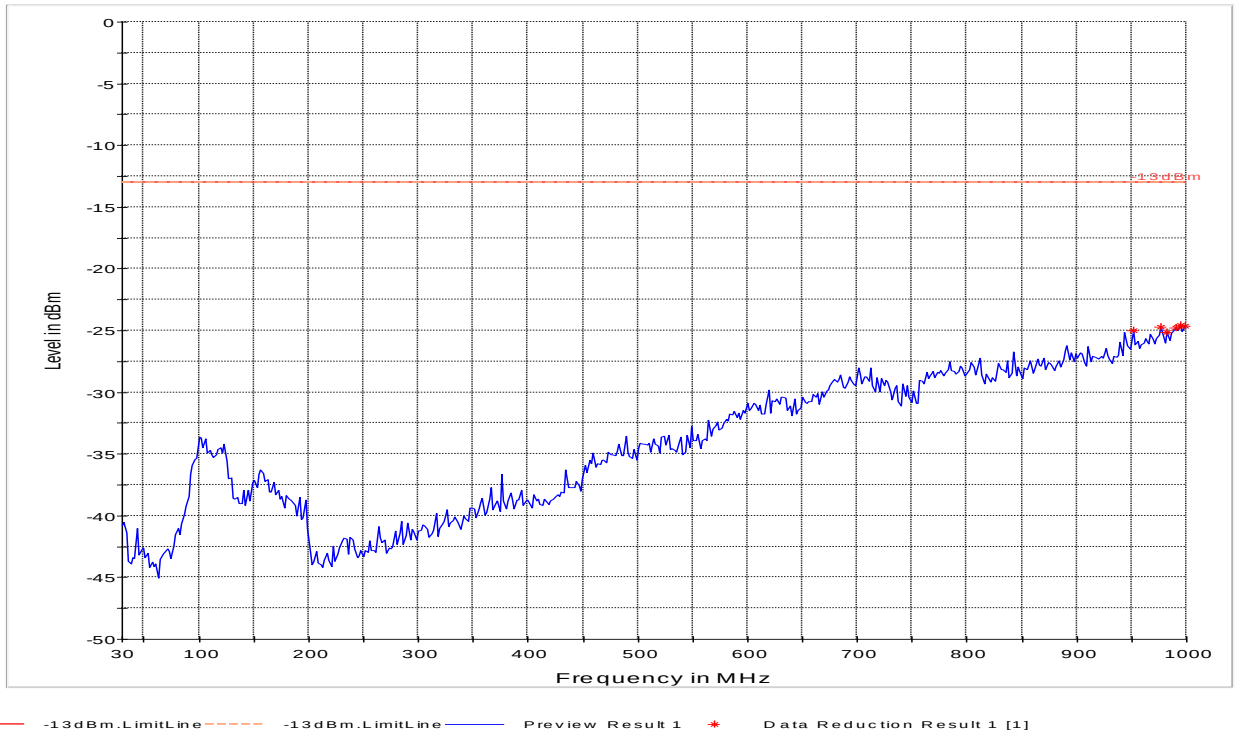
Harmonic	Tx ch-512 Freq.(MHz)	Level (dBm)	Tx ch-661 Freq. (MHz)	Level (dBm)	Tx ch-810 Freq. (MHz)	Level (dBm)
1	**1850.2**	-	**1880.0**	-	**1909.8**	-
2	**3700.4**	-41	**3760**	-37	**3819.6**	-40
3	**5550.6**	-39	**5640**	-42	**5729.4**	NF
4	**7400.8**	NF	**7520**	NF	**7639.2**	NF
5	**9251**	NF	**9400**	NF	**9549**	NF
6	**11101.2**	NF	**11280**	NF	**11458.8**	NF
7	**12951.4**	NF	**13160**	NF	**13368.6**	NF
8	**14801.6**	NF	**15040**	NF	**15278.4**	NF
9	**16651.8**	NF	**16920**	NF	**17188.2**	NF
10	**18502**	NF	**18800**	NF	**19098**	NF
NF = Noise Floor Measurement Uncertainty: ±3dB						

6.3.9.2 Measurement Result

Pass.

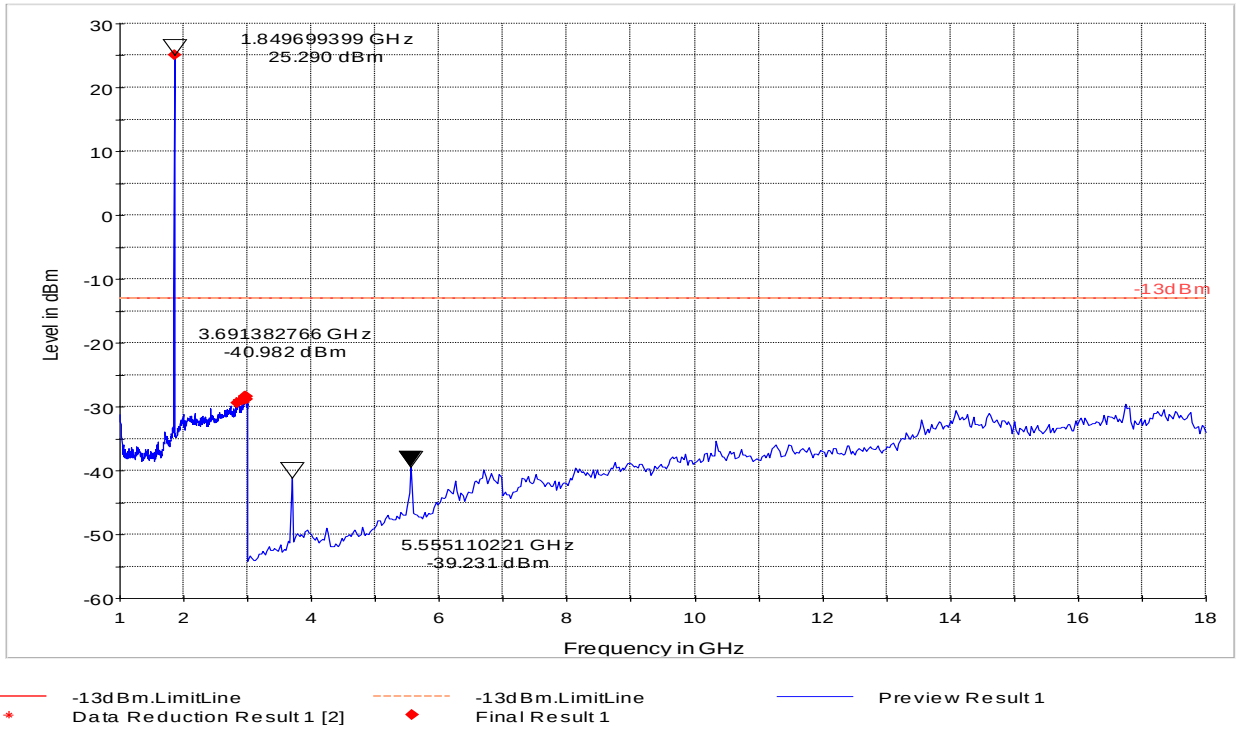
Radiated Spurious Emissions (GSM-1900) Tx: Low Channel

Test results 30M-1GHz

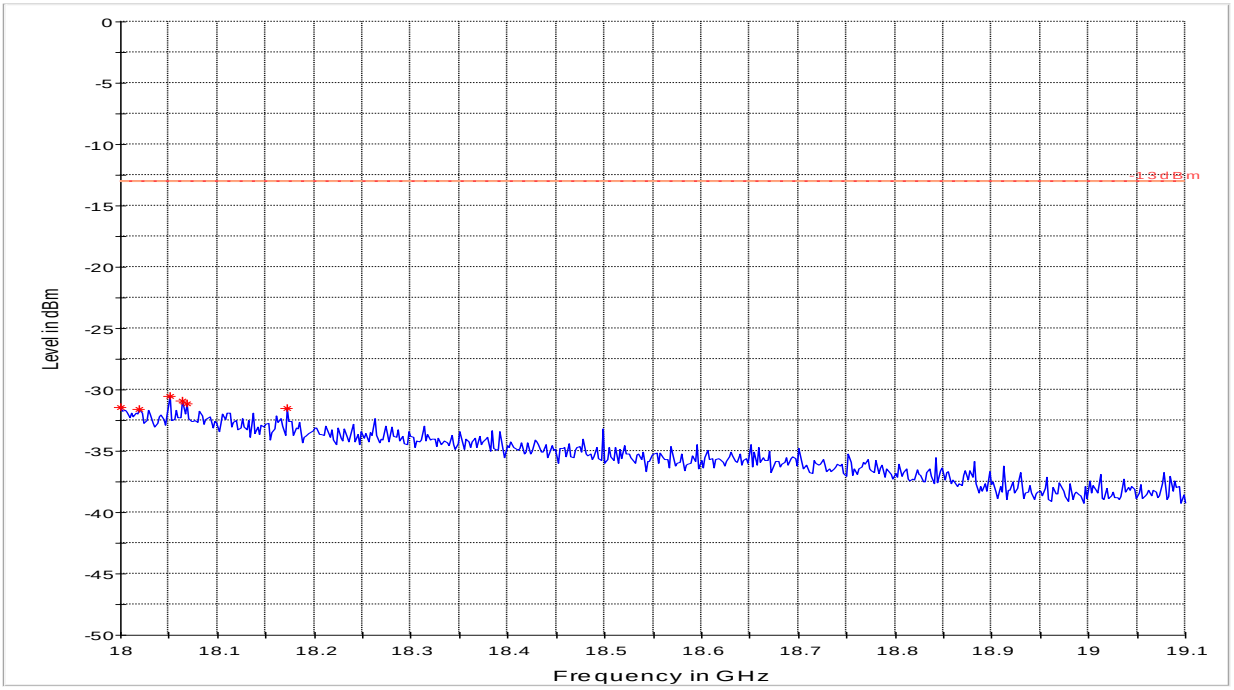


Test results 1GHz-18GHz

Emissions above the limit line is the Carrier signal in 1900 Low band.

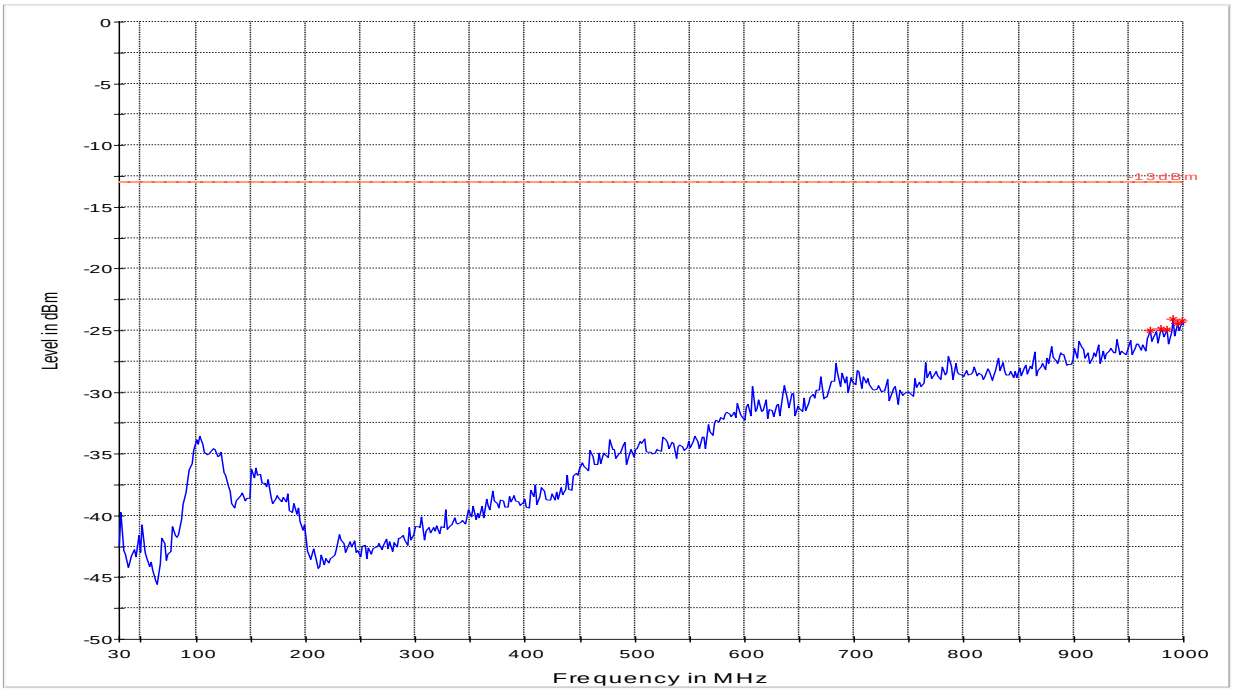


Test results 18GHz-19.1GHz



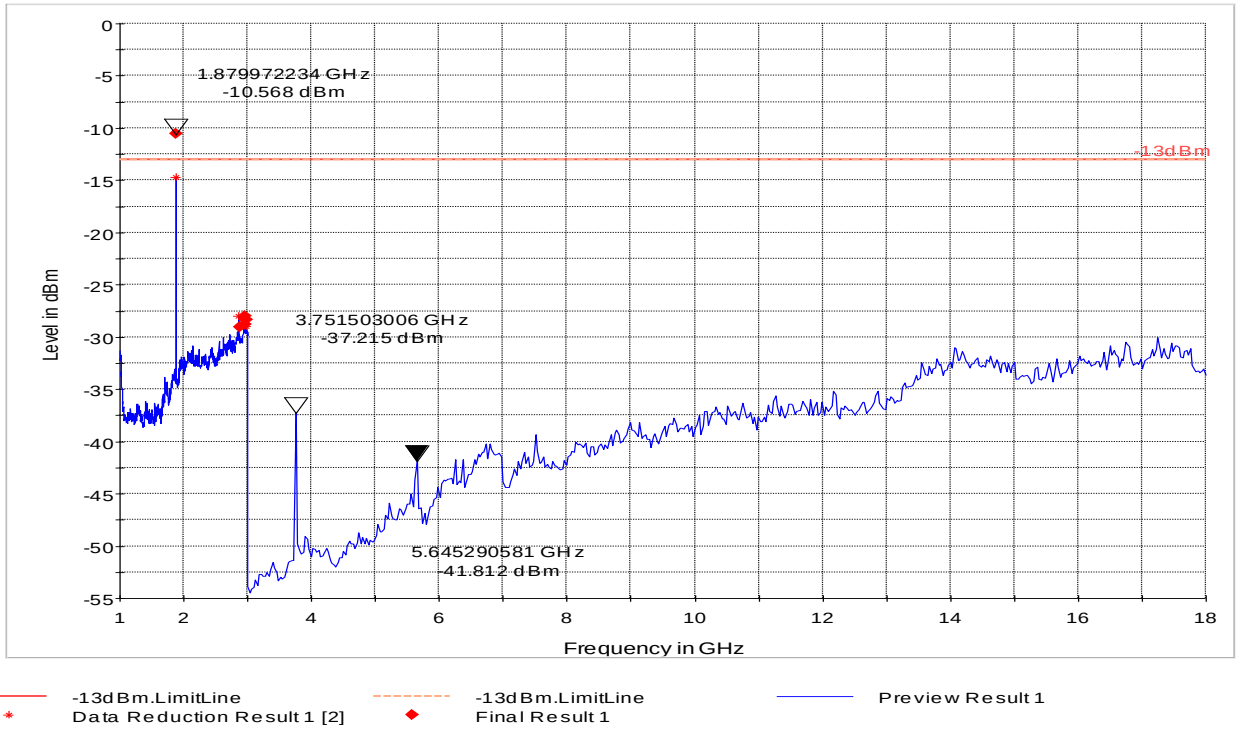
Radiated Spurious Emissions (GSM-1900) Tx: Mid Channel

Test results 30M-1GHz

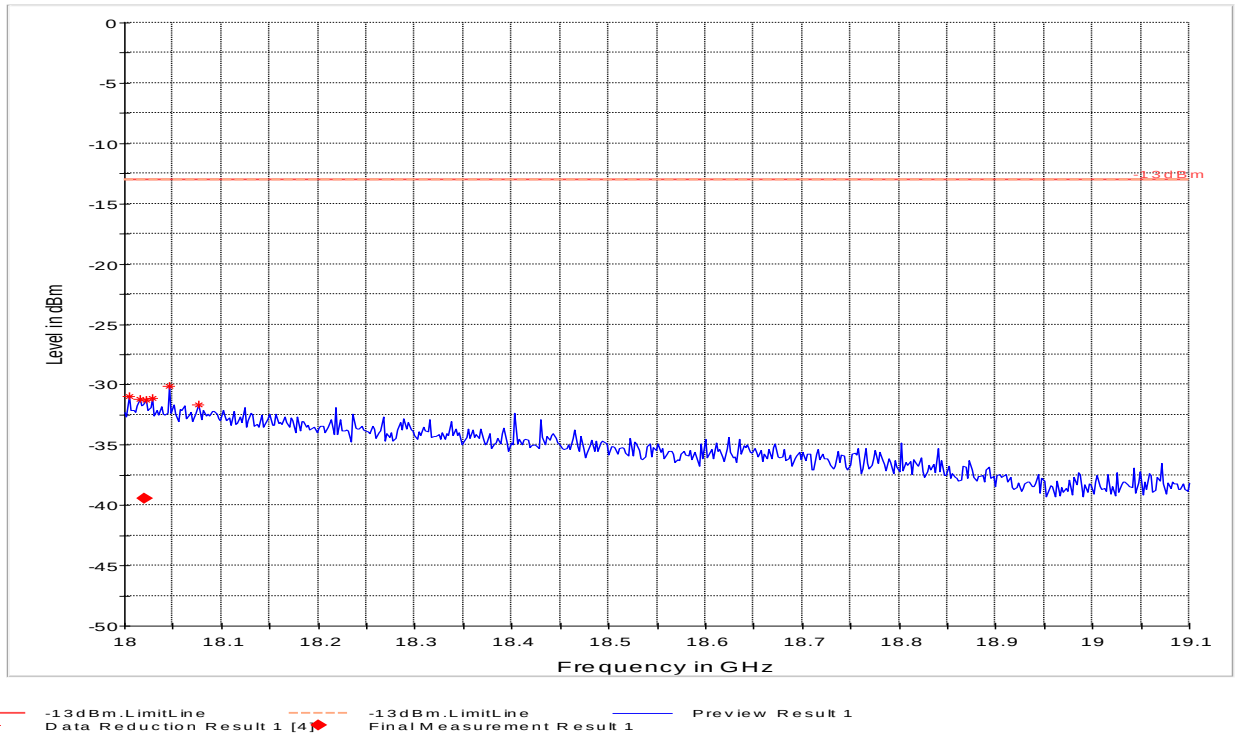


Test results 1GHz-18GHz

Emissions above the limit line is the Carrier signal in 1900 Mid band.

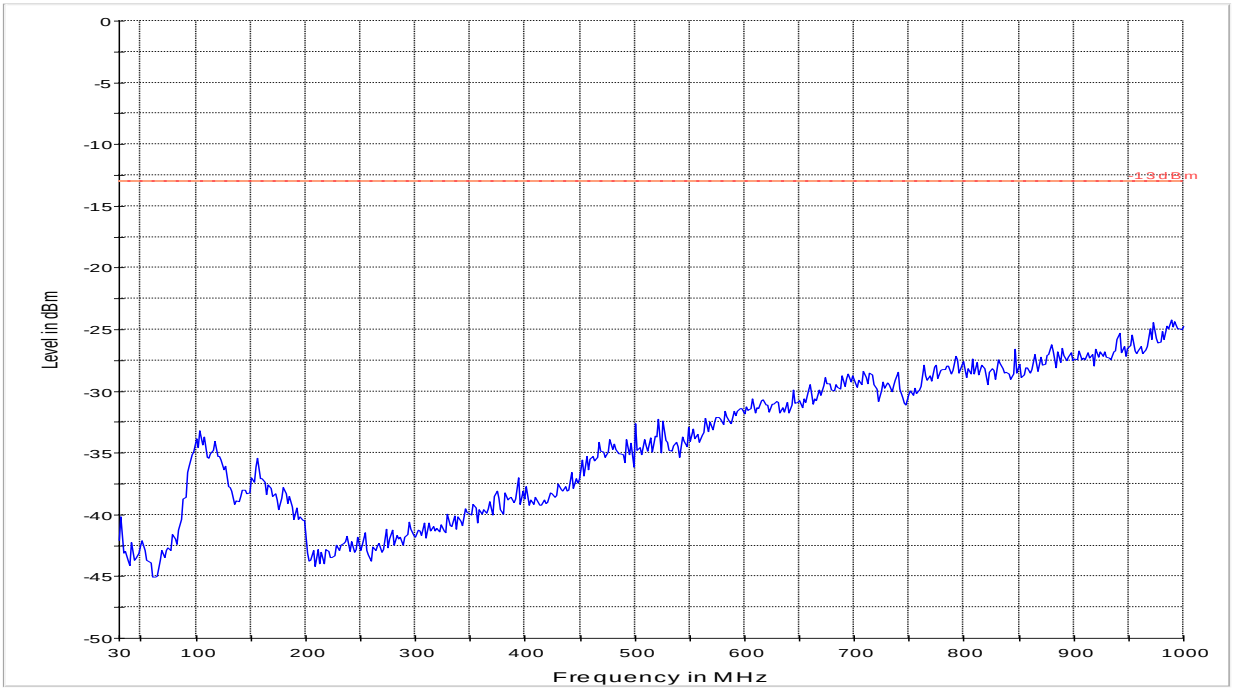


Test results 18GHz-19.1GHz



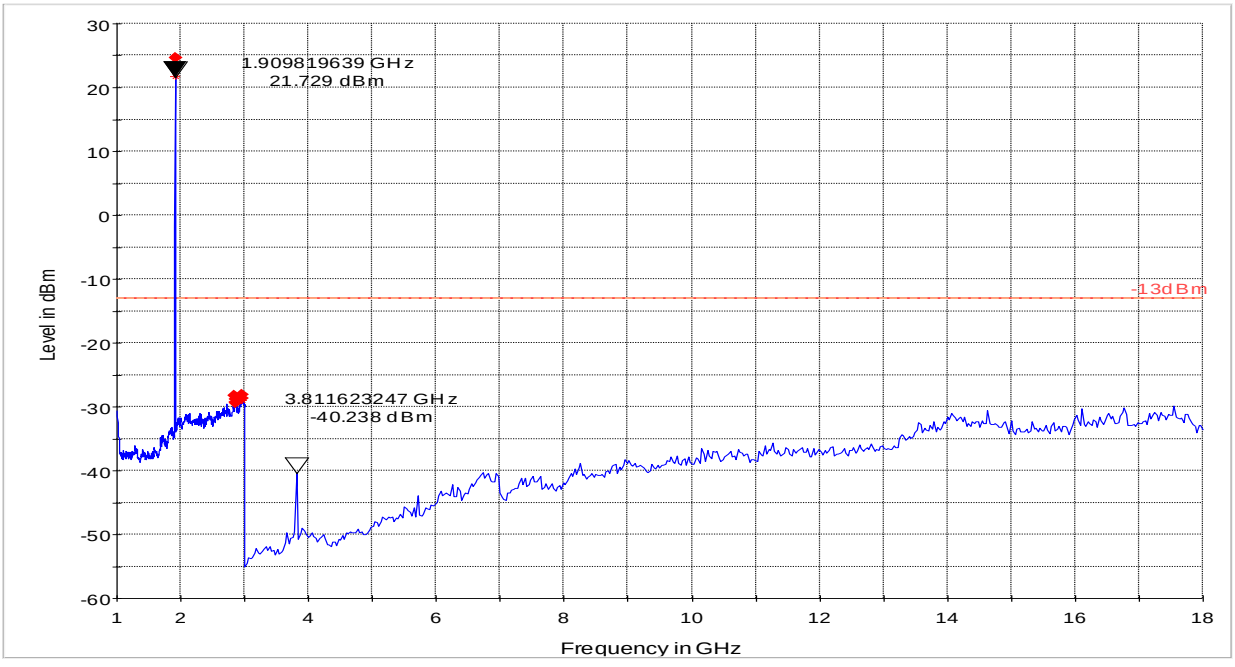
Radiated Spurious Emissions (GSM-1900) Tx: High Channel

Test results 30M-1GHz

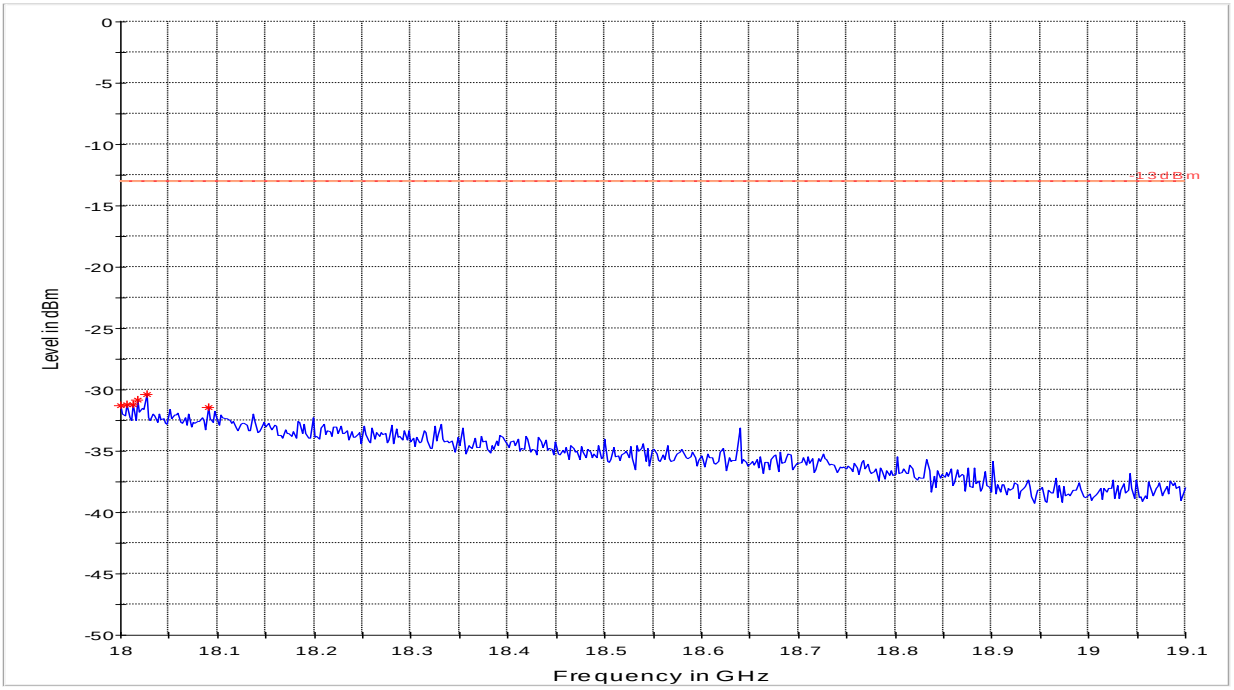


Test results 1GHz-18GHz

Emissions above the limit line is the Carrier signal in 1900 High band.



Test results 18GHz-19.1GHz

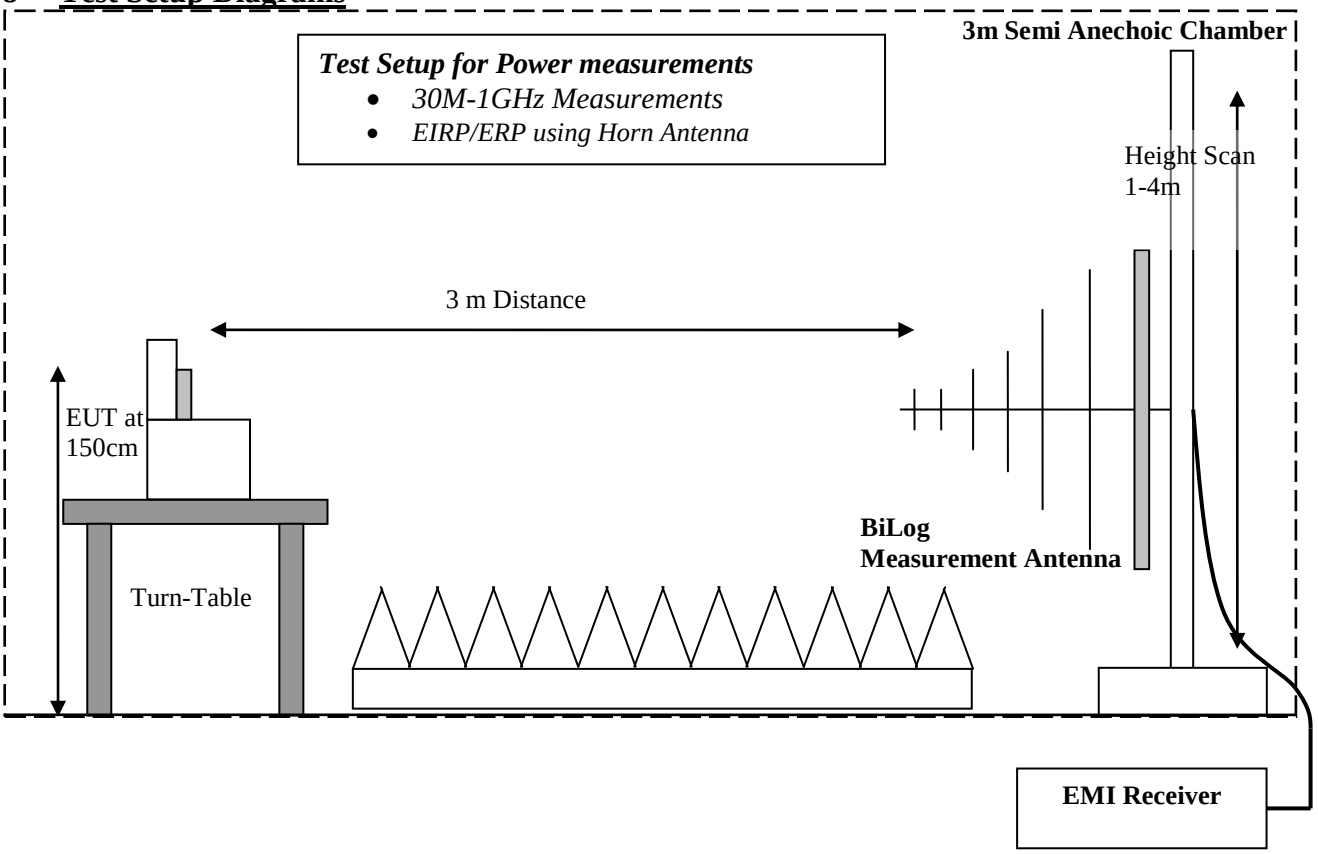


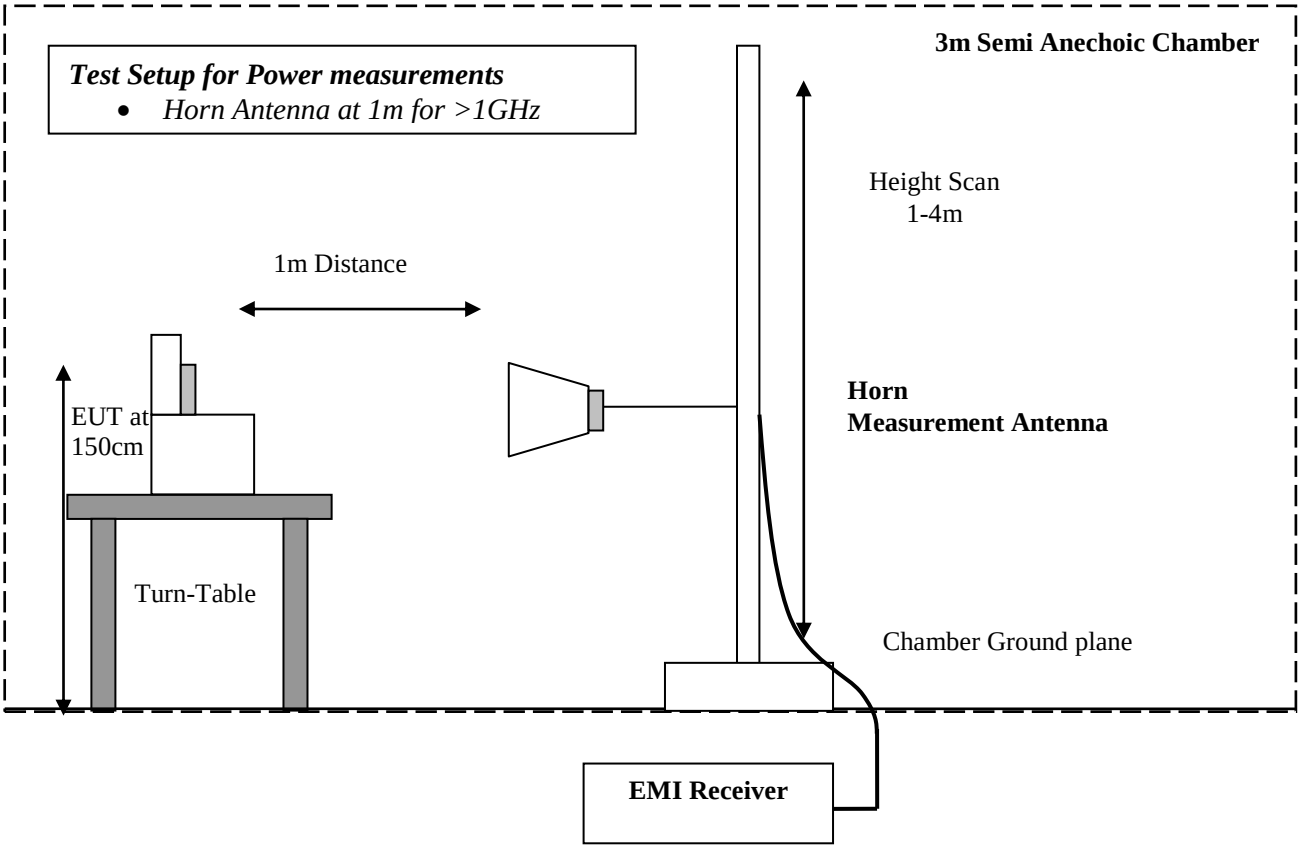
7 Test Equipment and Ancillaries used for tests

Test equipment calibration status at the time of testing shown below.

Instrument/Ancillary	Model	Manufacturer	Serial No.	Cal Date	Cal Interval
Radio Communication Tester	CMU 200	Rohde & Schwarz	101821	May 2011	2 Years
Radio Communication Tester	CMU 200	Rohde & Schwarz	109879	May 2011	2 Years
Radio Communication Tester	CMU 200	Rohde & Schwarz	110759	May 2011	2 Years
EMI Receiver/Analyzer	ESIB 40	Rohde & Schwarz	100107	May 2011	2 Years
Spectrum Analyzer	FSU	Rohde & Schwarz	200302	May 2011	2 Years
Loop Antenna	6512	EMCO	00049838	Oct 2011	3 years
Biconilog Antenna	3141	EMCO	0005-1186	June 2009	3 years
Horn Antenna (1-18GHz)	3115	ETS	00035114	Mar 2009	3 years
Horn Antenna (18-40GHz)	3116	ETS	00070497	Feb 2012	3 years
Communication Antenna	IBP5-900/1940	Kathrein	n/a	n/a	n/a
High Pass Filter	5HC2700	Trilithic Inc.	9926013	Part of system calibration	
High Pass Filter	4HC1600	Trilithic Inc.	9922307	Part of system calibration	
6GHz High Pass Filter	HPM50106	Microtronics	001	Part of system calibration	
Pre-Amplifier	JS4-00102600	Miteq	00616	Part of system calibration	
Power Smart Sensor	R&S	NRP-Z81	100161	May 2011	2 Years
DC Power Supply	E3610A	Hewlett Packard	KR83021224	n/a	n/a
DC Power Supply	E3610A	Hewlett Packard	KR83023316	n/a	n/a
DC Power Supply	6632A	Hewlett Packard	3524A-12822	n/a	n/a
DC Power Supply	6655A	Hewlett Packard	3403A-00487	n/a	n/a
Multimeter	MM200	Klein	N/A	Apr 2011	2 Years
Temp Hum Logger	TM320	Dickson	03280063	Feb 2012	1 Year
Temp Hum Logger	TM325	Dickson	5285354	Feb 2012	1 Year

8 Test Setup Diagrams





9 Revision History

Date	Report Name	Changes to report	Report prepared by
2013-04-02	EMC_SYSTE_004_11001_WWAN	First Version	T Yusuf