FCC/IC Test Report

FOR

Manufacturer: Itron Inc.

Model: I210 3G

Product Description: Smart Meter

FCC ID: QHC-010102A
IC ID: 4393B-010102A

47 CFR Part 2, 22, 24

RSS 132 Issue 3

RSS 133 Issue 6

TEST REPORT #: EMC_ITRO1-008-12001_WWAN
DATE: 2013-04-25

FCC listed:
A2LA Accredited

IC recognized #
3462B-1

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

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1 Assessment

The following device was tested against the applicable criteria specified in FCC rules Parts 2, 22 and 24 of Title 47 of the Code of Federal Regulations and Industry Canada Standards RSS 132 and RSS 133
No deviations were ascertained during the course of the tests performed.

Company	Description	Model
Itron Inc.	Smart Meter	I210 3G

Responsible for Testing Laboratory:

Date	Section	Name	Signature
2013-04-25	Compliance	Sajay Jose (Test Lab Manager)	

Responsible for the Report:

Date	Section	Name	Signature
2013-04-25	Compliance	Daniel Salinas (EMC Engineer)	

The test results of this test report relate exclusively to the test item specified in Section3.
CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM Inc. USA.

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:	Daniel Salinas

2.2 Identification of the Client

Client:	Itron Inc.
Street Address:	440 Old Canton Road Suite 300
City/Zip Code	Jackson MS 39211
Country	USA
Contact Person:	Mike Mathis
Phone No.	+1 (601) 362 1780 x1018
e-mail:	Mike.mathis@itron.com

2.3 Identification of the Manufacturer

Same as Client.

2.4 Environmental conditions during Test:

The following environmental conditions were maintained during the course of testing:
Ambient Temperature: 20-25oC
Relative humidity: 40-60%

2.5 Dates of Testing:

Nov 29, 2012 – Apr 17, 2013

3 Equipment under Test (EUT)

3.1 Specification of the Equipment under Test

Model:	I210 3G
Product Description:	Smart Meter
Hardware Version :	55M-000600050
Software Version :	660-040404-P01
FCC-ID:	QHC-010102A
IC ID:	4393B-010102A
Frequency Range of Test:	GSM 850: 824.2-848.8MHz; PCS 1900: 1850.2-1909.8MHz FDD V: 826.4-846.6MHz; FDD II: 1852.4-1907.6MHz
No. of Channels:	GSM850: 125 and PCS 1900: 300 FDD II: 278 and FDD V: 102
Type(s) of Modulation:	GSM: GMSK, 8-PSK UMTS: QPSK
Antenna Info:	Type: Ribbon Di-pole Manufacturer stated Antenna Gain: -1 dBi for GSM 850 MHz band of operation 1 dBi for PCS 1900 MHz band of operation.
Rated Operating Voltage Range (DC):	90VAC / 240VAC / 260 VAC
Rated Operating Temperature Range:	-40 °C / 25 °C / 85°C
Test Sample Status:	Production

3.2 Identification of the Equipment under Test (EUT)

EUT #	Serial Number	HW Version	SW Version
1	43915685	55M-000600050	660-040404-P01

4 Subject of Investigation

The objective of the measurements applied by CETECOM Inc. was to establish compliance of the EUT as described under Ch. 3 of this Test Report, with the applicable criteria specified in

- 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
- RSS 132- Issue 3: Spectrum management and telecommunication policy- Radio Standards Specifications Cellular telephones employing new technologies operating in the bands 824-849MHz and 869-894MHz
- RSS 133- Issue 6: Spectrum management and telecommunication policy- Radio Standards Specifications- 2GHz personal communication services

This test report is to support a request for new equipment authorization under the FCC ID: QHC-010102A and IC ID: 4393B-010102A**.**

Based on the manufacturer declaration that the device under test is identical to a sister model I210 3G with FCC ID: QHC-I2103G and IC ID 4393B-I2103G, except from being equipped with a higher gain WAN antenna and having the 900MHz receiver of the sister model removed, only radiated tests have been applied.
For conducted test results, reference is made to the related test report available from the FCC EAS listing of the above identified sister model.

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
			UMTS Band V	■	☐	☐	☐	Complies
§2.1055 §22.355	Frequency Stability	Nominal	GSM 850	☐	☐	☐	■	Note*
			UMTS Band V	☐	☐	☐	■	Note*
§2.1049 §22.917(b)	Occupied Bandwidth	Nominal	GSM 850	☐	☐	☐	■	Note*
			UMTS Band V	☐	☐	☐	■	Note*
§2.1051 §22.917	Band Edge Compliance	Nominal	GSM 850	☐	☐	☐	■	Note*
			UMTS Band V	☐	☐	☐	■	Note*
§2.1051 §22.917	Conducted Spurious Emissions	Nominal	GSM 850	☐	☐	☐	■	Note*
			UMTS Band V	☐	☐	☐	■	Note*
§2.1053 §22.917	Radiated Spurious Emissions	Nominal	GSM 850	■	☐	☐	☐	Complies
			UMTS Band V	■	☐	☐	☐	Complies

Note: NA= Not Applicable; NP= Not Performed.
* Tests NP since leveraged from variant, with same radio, and as available under FCC ID: QHC-I2103G, test report #EMC_SAMR1_037_11001_FCC22_24 issued by CETECOM Inc. on 09-12-2011.

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
			UMTS Band II	■	☐	☐	☐	Complies
§2.1055 §24.235	Frequency Stability	Nominal	GSM 1900	☐	☐	☐	■	Note*
			UMTS Band II	☐	☐	☐	■	Note*
§2.1049 §24.238(b)	Occupied Bandwidth	Nominal	GSM 1900	☐	☐	☐	■	Note*
			UMTS Band II	☐	☐	☐	■	Note*
§2.1051 §24.238	Band Edge Compliance	Nominal	GSM 1900	☐	☐	☐	■	Note*
			UMTS Band II	☐	☐	☐	■	Note*
§2.1051 §24.238	Conducted Spurious Emissions	Nominal	GSM 1900	☐	☐	☐	■	Note*
			UMTS Band II	☐	☐	☐	■	Note*
§2.1053 §24.238	Radiated Spurious Emissions	Nominal	GSM 1900	■	☐	☐	☐	Complies
			UMTS Band II	■	☐	☐	☐	Complies

Note: NA= Not Applicable; NP= Not Performed.
* Tests NP since leveraged from variant, with same radio, and as available under FCC ID: QHC-I2103G, test report #EMC_SAMR1_037_11001_FCC22_24 issued by CETECOM Inc. on 09-12-2011.

6 Measurements

6.1 RF Power Output

6.1.1 References

FCC: CFR Part 2.1046, CFR Part 22.913, CFR Part 24.232
IC: RSS-Gen Section 4.8; RSS 132 Section 5.4; RSS 133 Section 6.4

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.

6.1.2.2 RSS-Gen 4.8: RF power output.

Transmitter output power measurements shall be carried out before the unwanted emissions test. The transmitter output power value, obtained from this test, serves as the reference level used to determine the unwanted emissions.

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.

6.1.3.3 RSS-132 Section 5.4

The transmitter output power shall not exceed the limits given in SRSP-503.
SRSP-503: The maximum EIRP shall be 11.5W for mobile stations. In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13 dB.

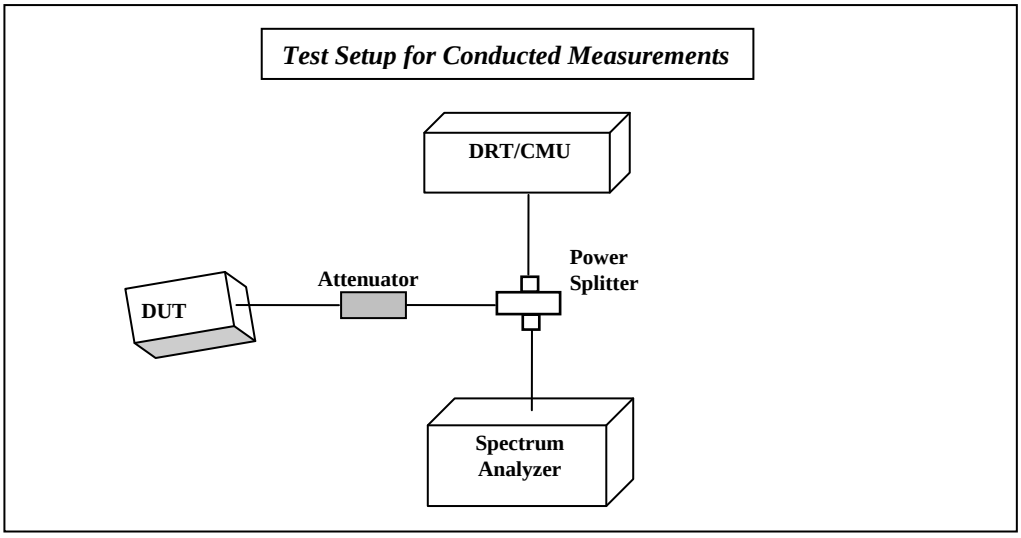
6.1.3.4 RSS-133 Section 6.4

The average equivalent isotropically radiated power (e.i.r.p.) for transmitters shall not exceed the limits given in SRSP-510.
SRSP-510: Mobile stations and hand-held portables are limited to 2 watts maximum e.i.r.p.
In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13 dB.

6.1.4 Conducted Output Power Measurement

6.1.4.1 Measurement Procedure:

Ref: TIA-603C 2004 2.2.1



1. Connect the equipment as shown in the above diagram. A Digital Radio Communication Tester (DRT: R&S CMU200 here) is used to enable the EUT to transmit and to measure the output power.
2. Adjust the settings of the CMU200 to set the EUT to its maximum power at the required channel.
3. Record the Peak and Average Output power level measured by the CMU200.
4. Correct the measured level for all losses in the RF path.
5. Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band and for all types of modulation schemes.
    a. GMSK mode measurements performed in 1 Uplink configuration
    b. EGPRS mode measurements performed in 1 Uplink MCS-9 configuration
    c. UMTS mode measurements performed in RMC 12.2k configuration

Measurement Uncertainty= +/- 0.5 dB

6.1.4.2 Test Conditions:

Tnom: 25°C; Vnom: 240 VAC

6.1.4.3 Measurement Results:

GSM 850: GMSK Mode		
Frequency (MHz)	**Conducted Peak Output Power from the EUT**	**Conducted Average Output Power**
	(dBm)	**(dBm)**
824.2	31.5	31.4
836.6	31.4	31.3
848.8	31.4	31.3

EGPRS 850: 8PSK Mode		
Frequency (MHz)	**Conducted Peak Output Power from the EUT**	**Conducted Average Output Power**
	(dBm)	**(dBm)**
824.2	29.3	26.2
836.6	29.2	26.1
848.8	29.2	26.0

FDD V: UMTS Mode	
Frequency (MHz)	**Conducted Peak Output Power from the EUT**
	(dBm)
826.2	26.0
836.6	25.9
846.6	25.9

GSM 1900: GMSK Mode		
Frequency (MHz)	**Conducted Peak Output Power from the EUT**	**Conducted Average Output Power**
	(dBm)	**(dBm)**
1850.2	29.1	28.9
1880	28.5	28.3
1909.8	28.0	27.9

EGPRS 1900: 8PSK Mode		
Frequency (MHz)	**Conducted Peak Output Power from the EUT**	**Conducted Average Output Power**
	(dBm)	**(dBm)**
1850.2	28.5	25.3
1880	27.9	24.8
1909.8	27.4	24.3

FDD II: UMTS Mode	
Frequency (MHz)	**Conducted Peak Output Power**
	(dBm)
1852.4	25.3
1880	25.3
1907.6	25.1

6.1.5 PEAK-AVERAGE Ratio

A Peak to average ratio measurement is performed at the conducted port of the EUT. For CDMA signals, the spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level.

6.1.5.1 Limits:

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.

6.1.5.2 Test Procedure:

(GSM/ EGPRS modes) = Measured Peak output power- Measured Average Output power
(UMTS Mode)= based on CCDF measurement on Spectrum Analyzer

6.1.5.3 Test Results:

Peak-Average Ratio in 850 MHz band of operation (dB)			
Channel	**GMSK Mode**	**8PSK Mode**	**UMTS Mode**
Low	0.1	2.9	3.2
Mid	0.1	2.9	3.3
High	0.1	3.2	3.2

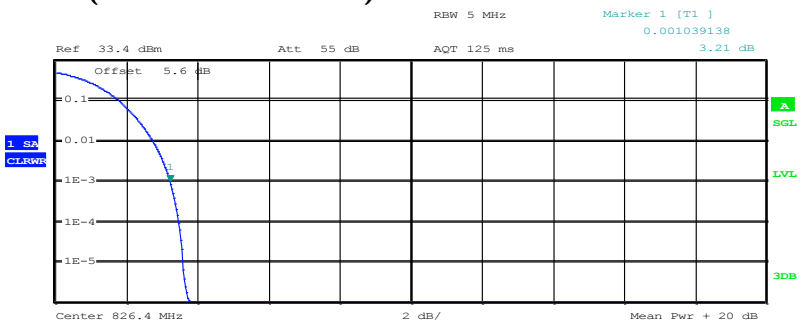
Peak-Average Ratio in 1900 MHz band of operation (dB)			
Channel	**GMSK Mode**	**8PSK Mode**	**UMTS Mode**
Low	0.2	3.2	3.4
Mid	0.2	3.1	3.4
High	0.1	3.1	3.4

6.1.5.4 Test Verdict:

Pass

6.1.5.5 Test Data:

Peak-Average Ratio (FDD V: UMTS mode) low Channel



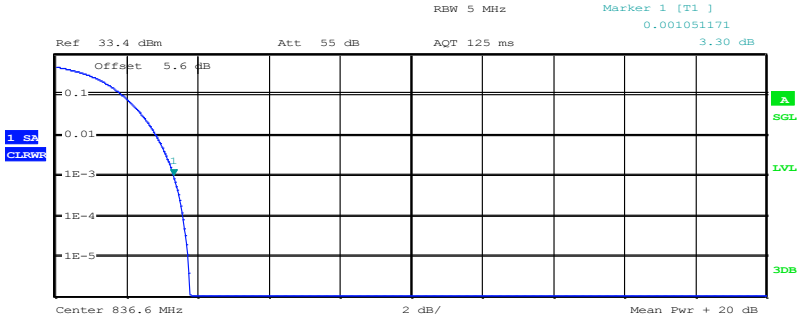
Complementary Cumulative Distribution Function (1000000 samples)

	Trace 1
Mean	21.78 dBm
Peak	25.58 dBm
Crest	3.80 dB
10 %	1.76 dB
1 %	2.72 dB
.1 %	3.21 dB
.01 %	3.46 dB

low

Date: 17.APR.2013 02:22:46

Peak-Average Ratio (FDD V: UMTS mode) mid Channel



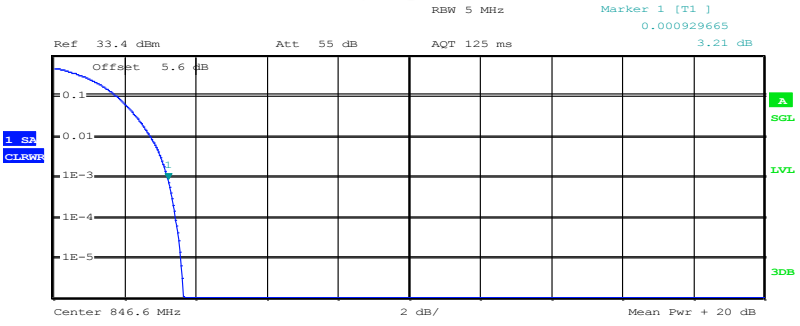
Complementary Cumulative Distribution Function (1000000 samples)

	Trace 1
Mean	21.54 dBm
Peak	25.36 dBm
Crest	3.83 dB
10 %	1.86 dB
1 %	2.82 dB
.1 %	3.30 dB
.01 %	3.56 dB

low

Date: 17.APR.2013 02:21:34

Peak-Average Ratio (FDD V: UMTS mode) high Channel



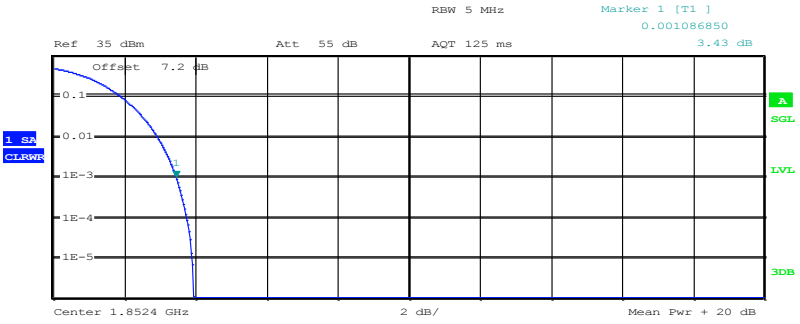
Complementary Cumulative Distribution Function (1000000 samples)

	Trace 1
Mean	21.94 dBm
Peak	25.65 dBm
Crest	3.71 dB
10 %	1.76 dB
1 %	2.72 dB
.1 %	3.21 dB
.01 %	3.43 dB

low

Date: 17.APR.2013 02:20:08

Peak-Average Ratio (FDD II: UMTS mode) low Channel



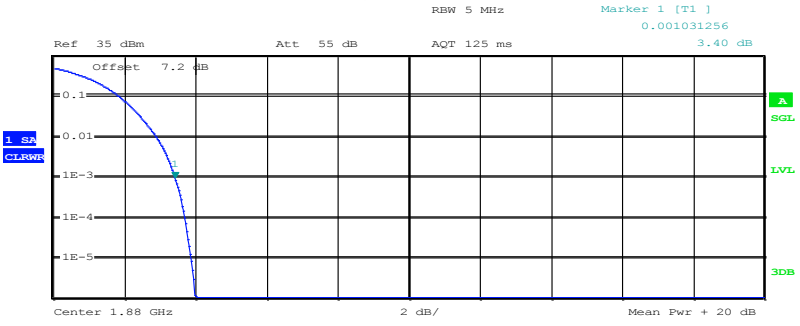
Complementary Cumulative Distribution Function (1000000 samples)

	Trace 1
Mean	21.05 dBm
Peak	25.06 dBm
Crest	4.01 dB
10 %	1.86 dB
1 %	2.92 dB
.1 %	3.43 dB
.01 %	3.75 dB

low

Date: 18.APR.2013 00:24:33

Peak-Average Ratio (FDD II: UMTS mode) mid Channel



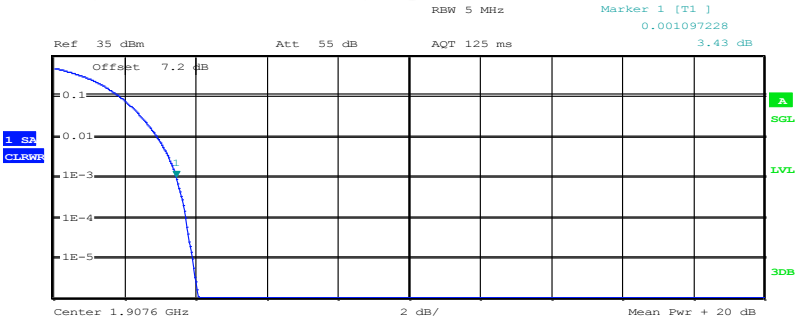
Complementary Cumulative Distribution Function (1000000 samples)

	Trace 1
Mean	20.73 dBm
Peak	24.78 dBm
Crest	4.04 dB
10 %	1.83 dB
1 %	2.85 dB
.1 %	3.40 dB
.01 %	3.69 dB

low

Date: 18.APR.2013 00:25:16

Peak-Average Ratio (FDD II: UMTS mode) high Channel



Complementary Cumulative Distribution Function (1000000 samples)

	Trace 1
Mean	21.04 dBm
Peak	25.13 dBm
Crest	4.09 dB
10 %	1.83 dB
1 %	2.88 dB
.1 %	3.43 dB
.01 %	3.72 dB

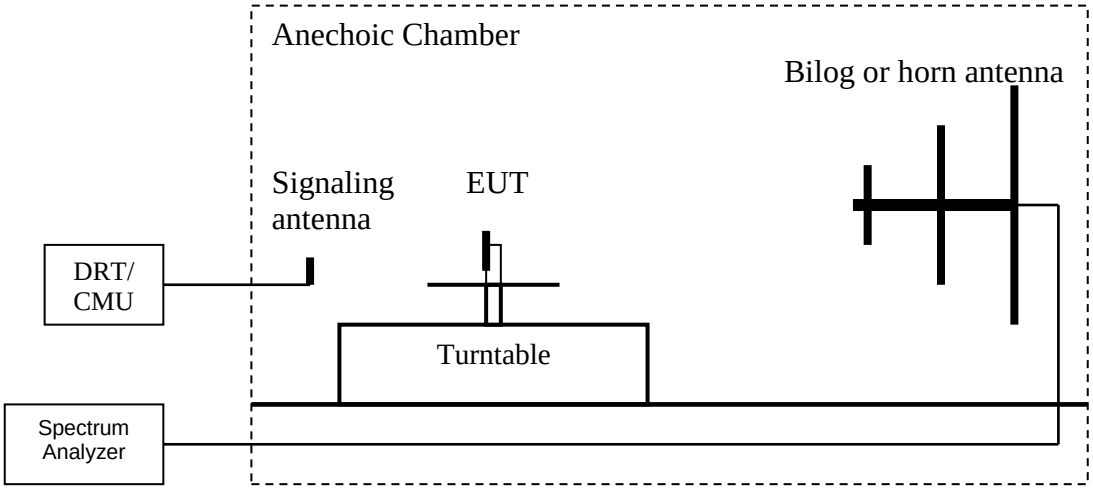
low

Date: 18.APR.2013 00:19:20

6.1.6 Radiated Output Power Measurement

6.1.6.1 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. Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band.

6.1.7 Test Conditions:

Tnom: 25°C; Vnom: 240 VAC

6.1.8 Test Verdict

Pass.

6.1.9 Test Results

6.1.9.1 RF Power Output 850MHz band

Limits:
Limit: FCC: Nominal Peak Output Power < 38.45 dBm (7W)
IC: Nominal Peak Output Power < 40.60 dBm (11.5W)

GSM 850: GMSK Mode	
Frequency (MHz)	**Radiated Power**
	ERP (dBm)
824.2	29.1
836.6	29.4
848.8	29.1

EGPRS 850: 8PSK Mode	
Frequency (MHz)	**Radiated Power**
	ERP (dBm)
824.2	26.8
836.6	27.0
848.8	26.9

FDD V: UMTS Mode	
Frequency (MHz)	**Radiated Power**
	ERP (dBm)
826.4	23.5
836.6	23.1
846.6	23.3

6.1.9.2 RF Power Output 1900MHz band

Limits:

Nominal Peak Output Power < 33 dBm (2W)

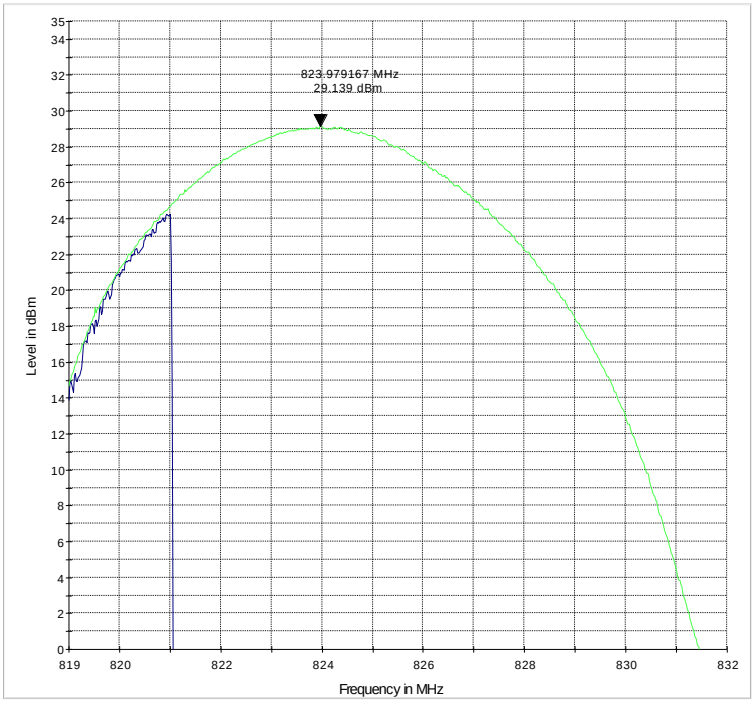
GSM 1900: GMSK Mode	
Frequency (MHz)	**Radiated Power**
	EIRP (dBm)
1850.2	29.6
1880.0	30.4
1909.8	29.2

EGPRS 1900: 8PSK Mode	
Frequency (MHz)	**Radiated Power**
	EIRP (dBm)
1850.2	28.7
1880.0	29.1
1909.8	28.3

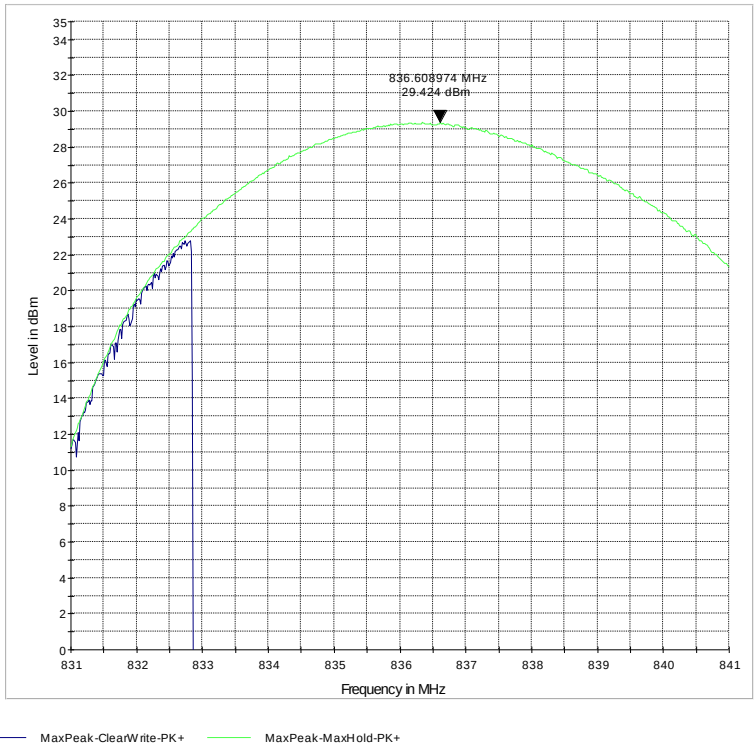
FDD II: UMTS Mode	
Frequency (MHz)	**Radiated Power**
	EIRP (dBm)
1852.4	24.2
1880.0	26.0
1907.6	25.6

6.1.9.3 Plots:

ERP (GSM 850) CHANNEL 128



ERP (GSM 850) CHANNEL 190



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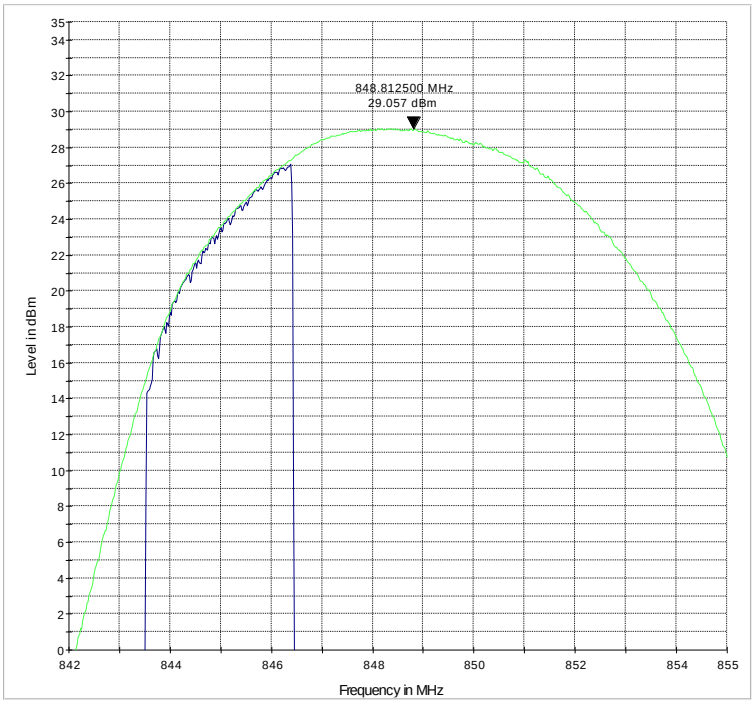

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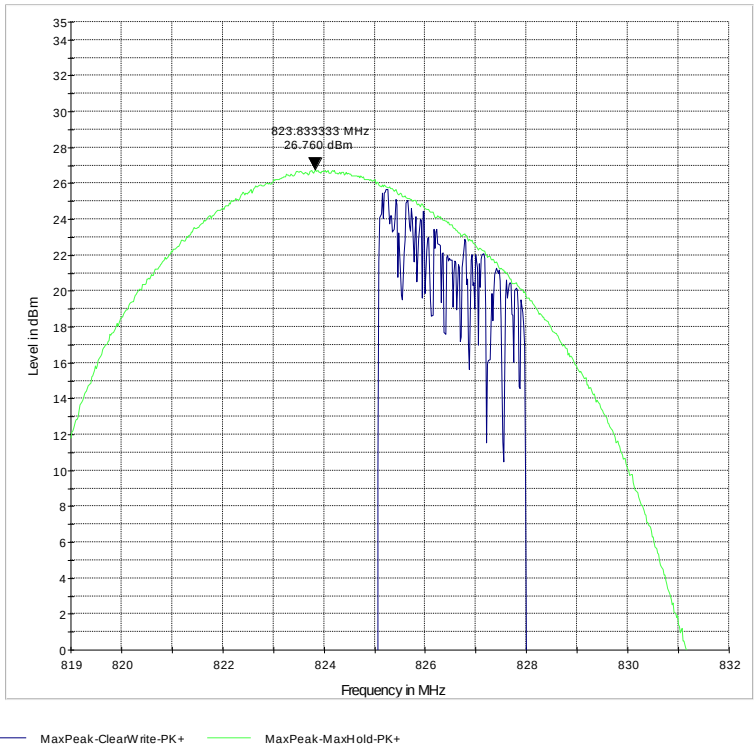

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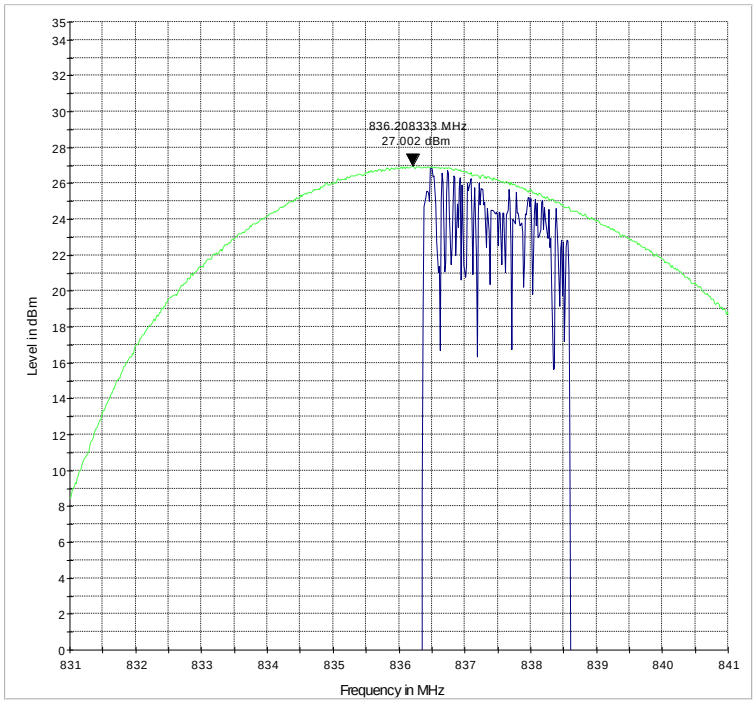

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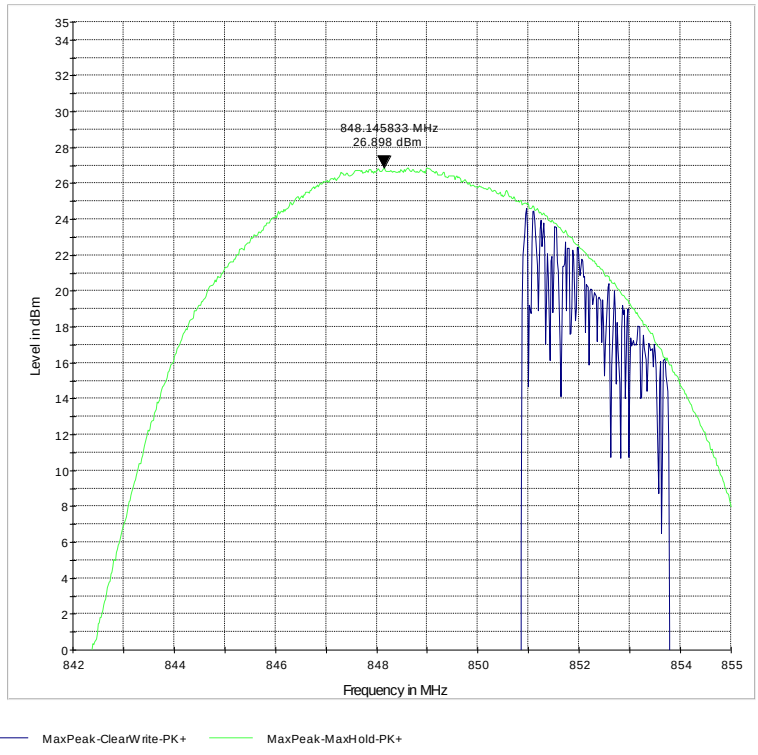
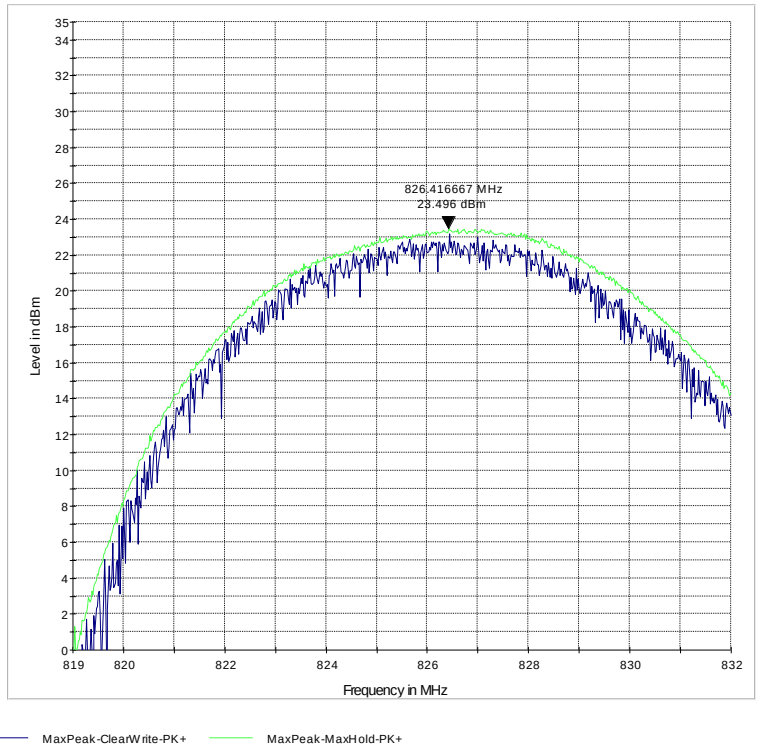


ERP (UMTS FDD5) CHANNEL 4132



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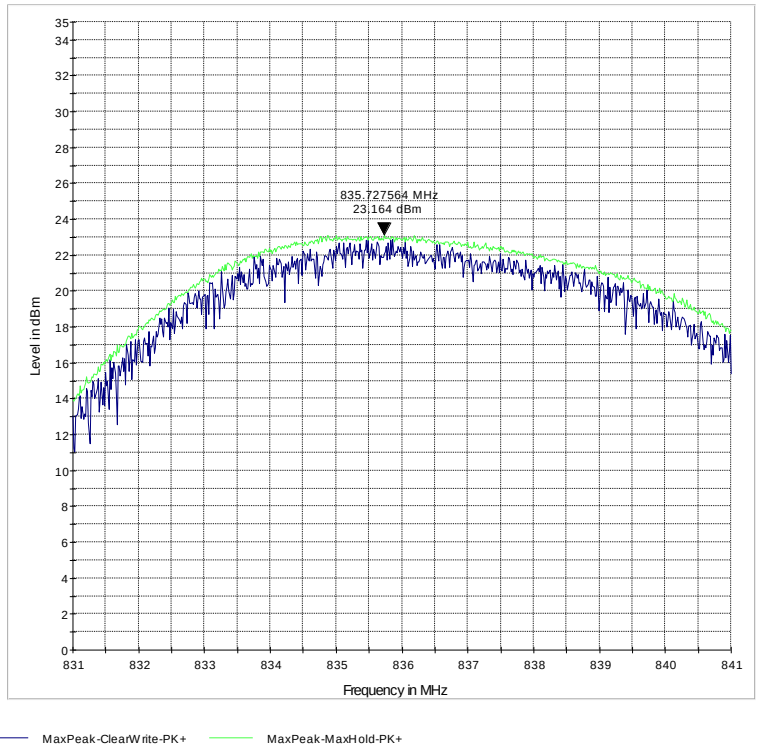
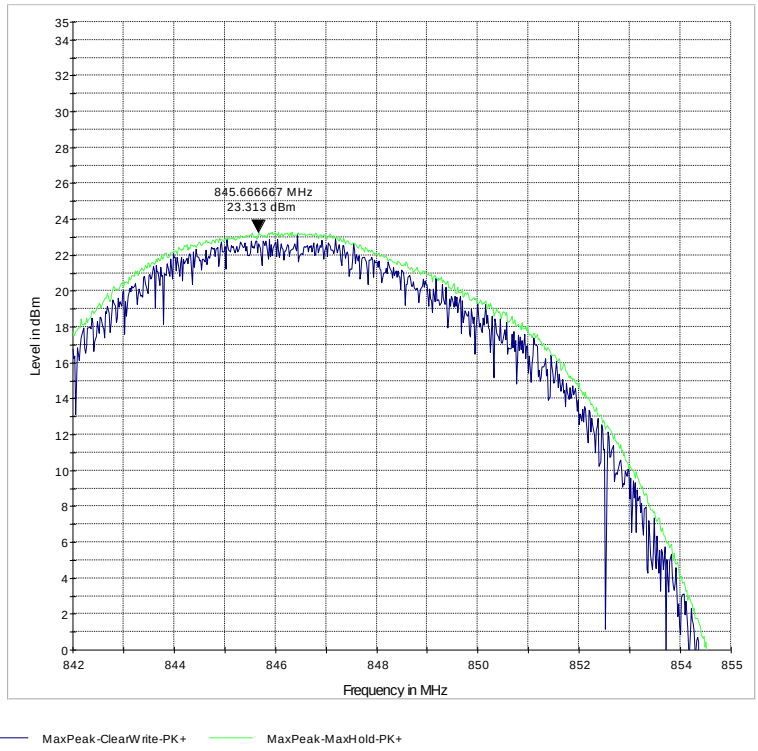
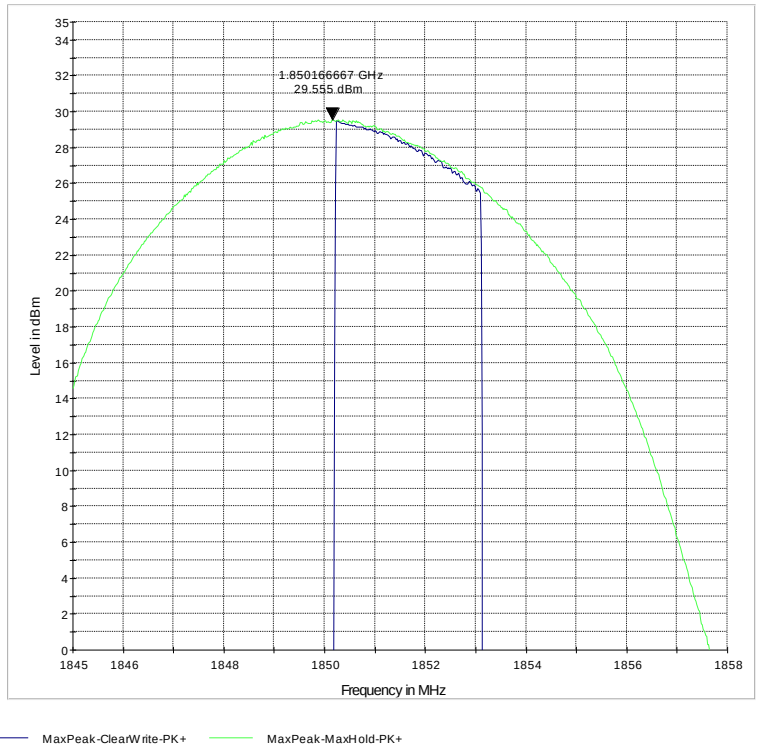


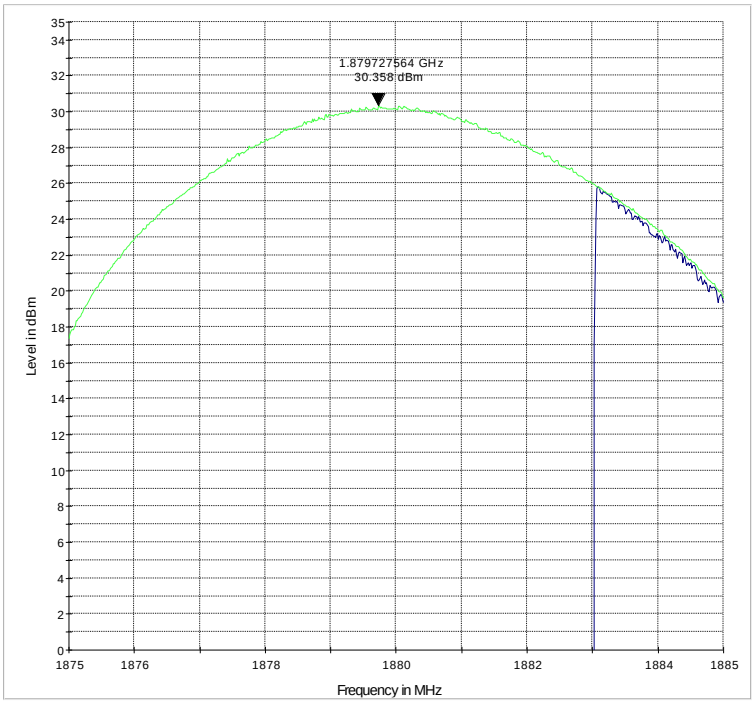
ERP (UMTS FDD5) CHANNEL 4233



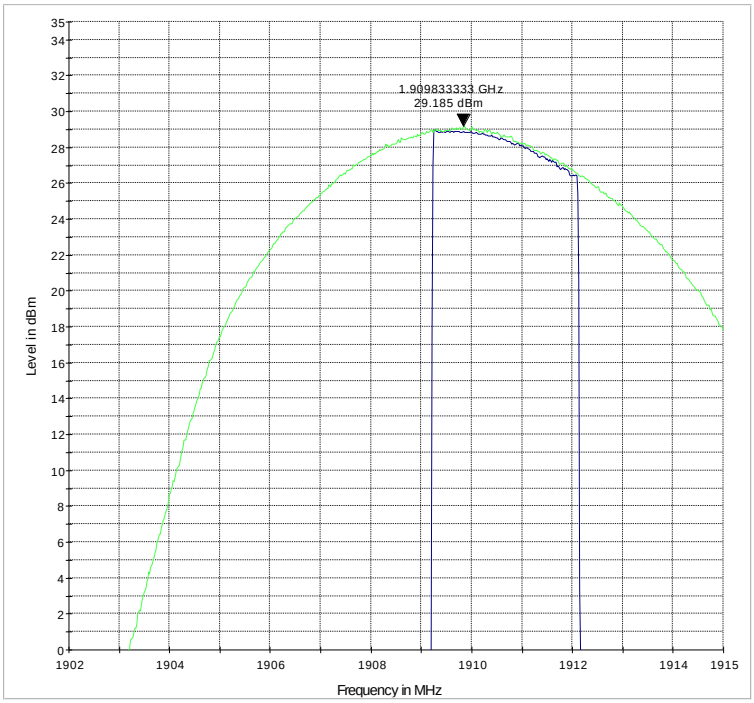
EIRP (PCS-1900) CHANNEL 512



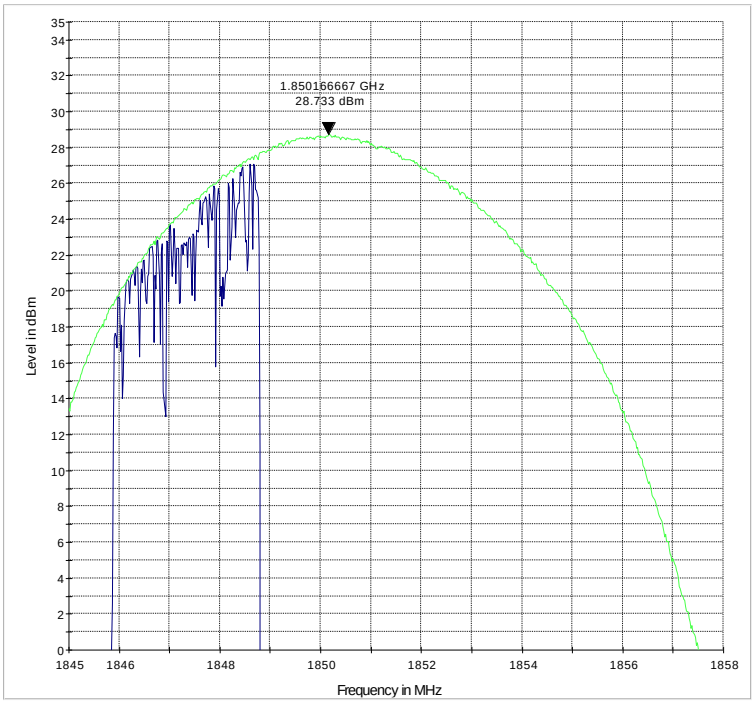
EIRP (PCS-1900) CHANNEL 661



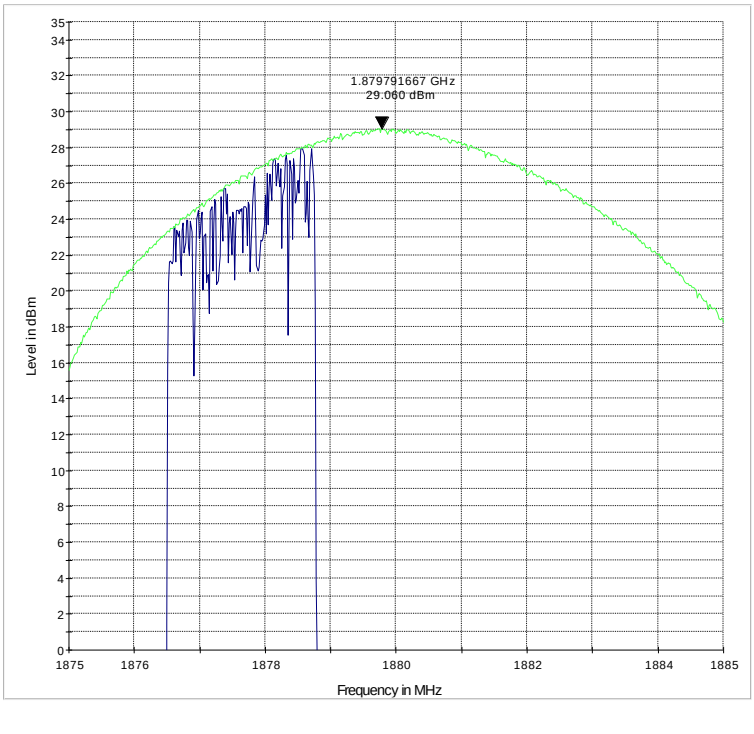
EIRP (PCS-1900) CHANNEL 810



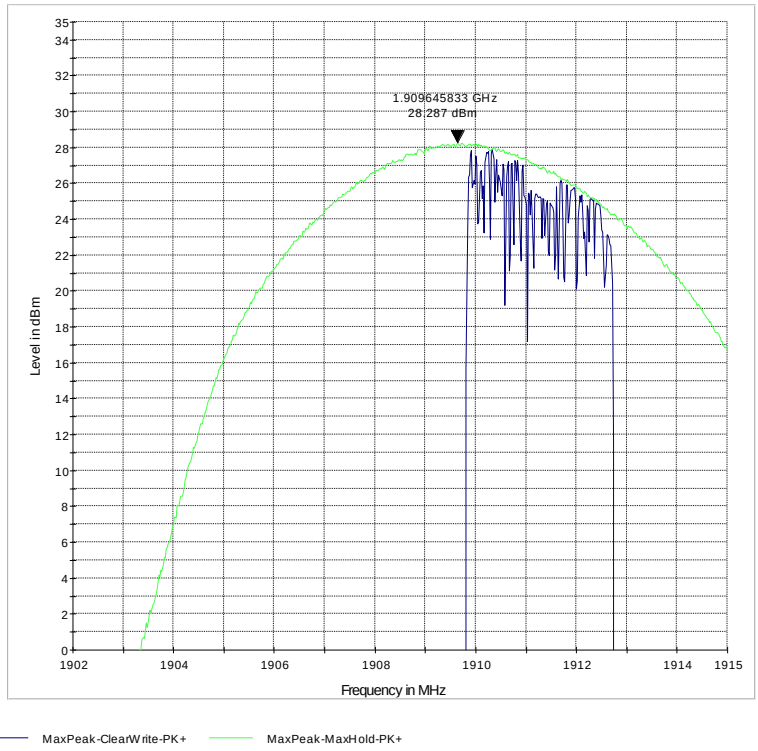
EIRP (EGPRS 1900) CHANNEL 512



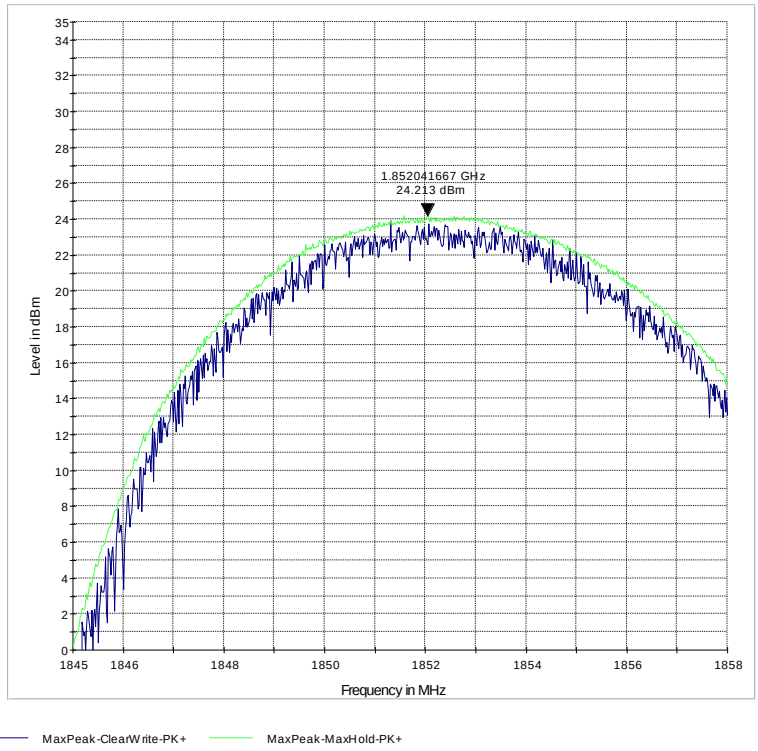
EIRP (EGPRS 1900) CHANNEL 661



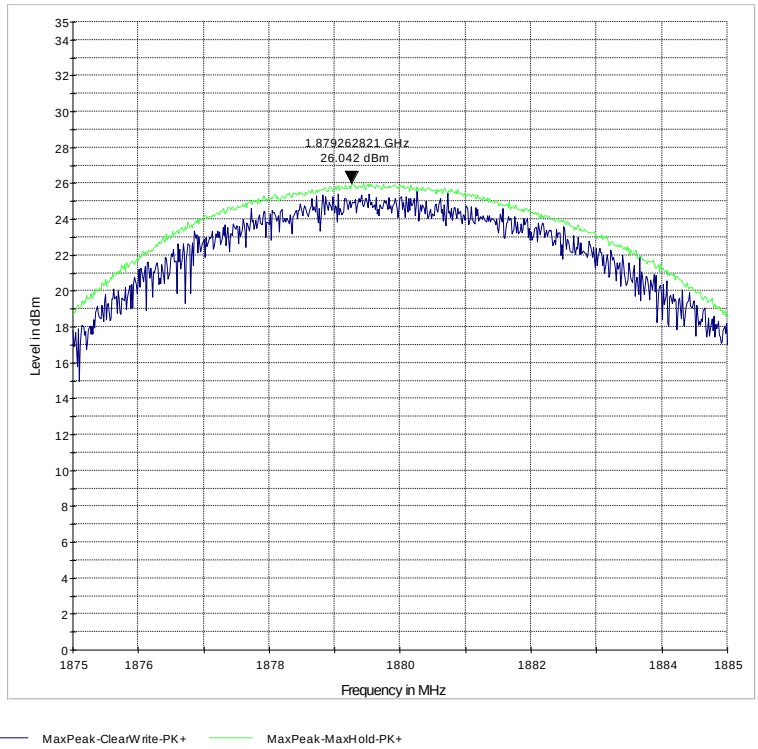
EIRP (EGPRS 1900) CHANNEL 810



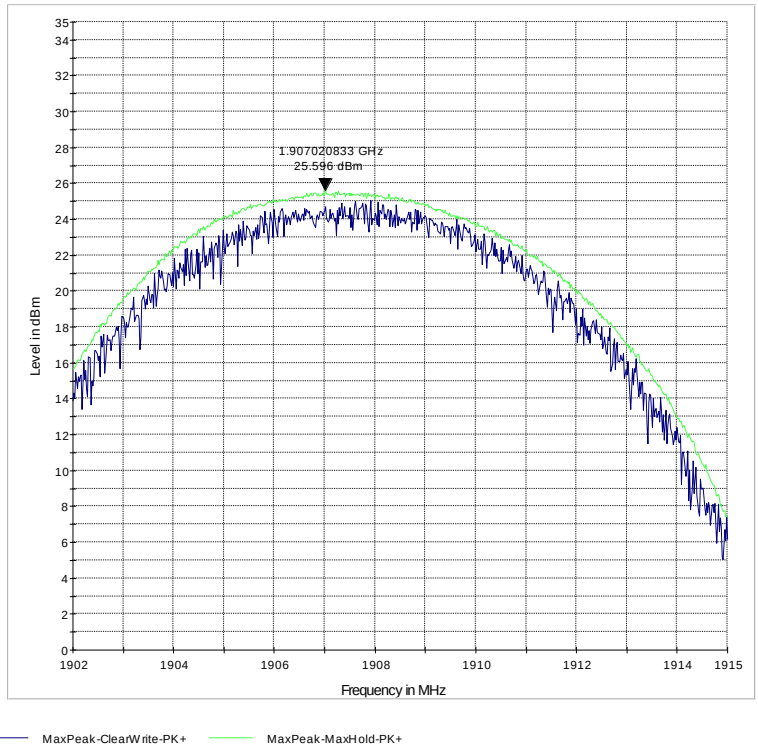
EIRP (UMTS FDD2) CHANNEL 9262



EIRP (UMTS FDD2) CHANNEL 9400



EIRP (UMTS FDD2) CHANNEL 9538



6.2 Spurious Emissions Radiated

6.2.1 References

FCC: CFR Part 2.1053, CFR Part 22.917, CFR Part 24.238
IC: RSS-Gen Section 4.9; RSS 132 Section 5.5; RSS 133 Section 6.5

6.2.2 Measurement requirements:

6.2.2.1 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.

6.2.2.2 RSS-Gen 4.9: Transmitter unwanted spurious emissions

The same parameter, peak power or average power, used for the transmitter output power measurement shall be used for unwanted emission measurements.
The search for unwanted emissions shall be from the lowest frequency internally generated or used in the device (local oscillator, intermediate or carrier frequency), or from 30 MHz, whichever is the lower, to the 5th harmonic of the highest frequency generated without exceeding 40 GHz.

6.2.3 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.

6.2.3.1 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.

6.2.3.2 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

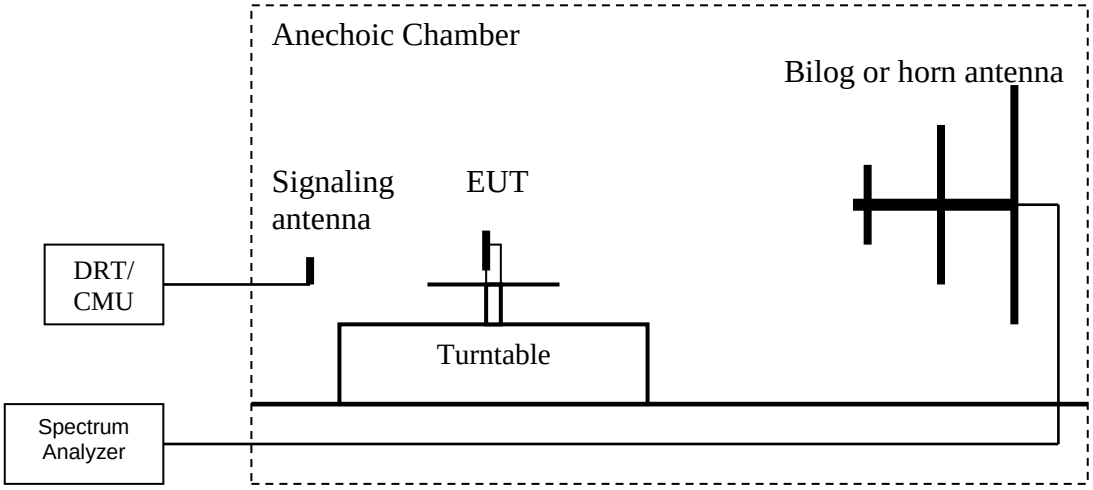
bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*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.

6.2.3.3 RSS-132 Section 5.5.1.1 and RSS-133 Section 6.5.1

In the first 1.0 MHz band immediately outside and adjacent to the licensee's frequency block, the power of emissions per any 1% of the emission bandwidth shall be attenuated below the transmitter output power P (in watts) by at least $43 + 10 \log_{10}(P)$, dB. After the first 1.0 MHz, the power of emissions shall be attenuated below the transmitter output power by at least $43 + 10 \log_{10}(P)$, dB, in any 100 kHz bandwidth.
After the first 1.5 MHz, the power of emissions shall be attenuated below the transmitter output power by at least $43 + 10 \log_{10}(P)$, dB, in any MHz of bandwidth.

6.2.4 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 Radio Communication 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.)

6.2.5 Sample Calculations for Radiated Measurements

6.2.5.1 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)
Eg:

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

6.2.6 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 & PCS-1900 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 and RMC Modes (for UMTS), since these modes operate with the highest output power and hence represents the worst case scenario.

All measurements are done in horizontal and vertical antenna polarization; and on three orientations of the EUT. The plots show the worst case where it is not indicated otherwise. Unless mentioned otherwise, the peaks in the plots are from the carrier frequency.

6.2.7 Test Conditions:

Tnom: 25^{o}C; Vnom: 240 VAC

6.2.8 Test Verdict:

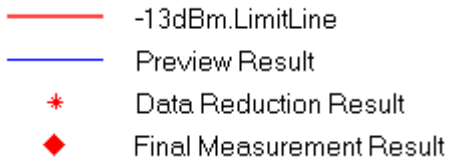
Pass.

6.2.9 Test Results:

6.2.9.1 Test Results Transmitter Spurious Emission GSM850:

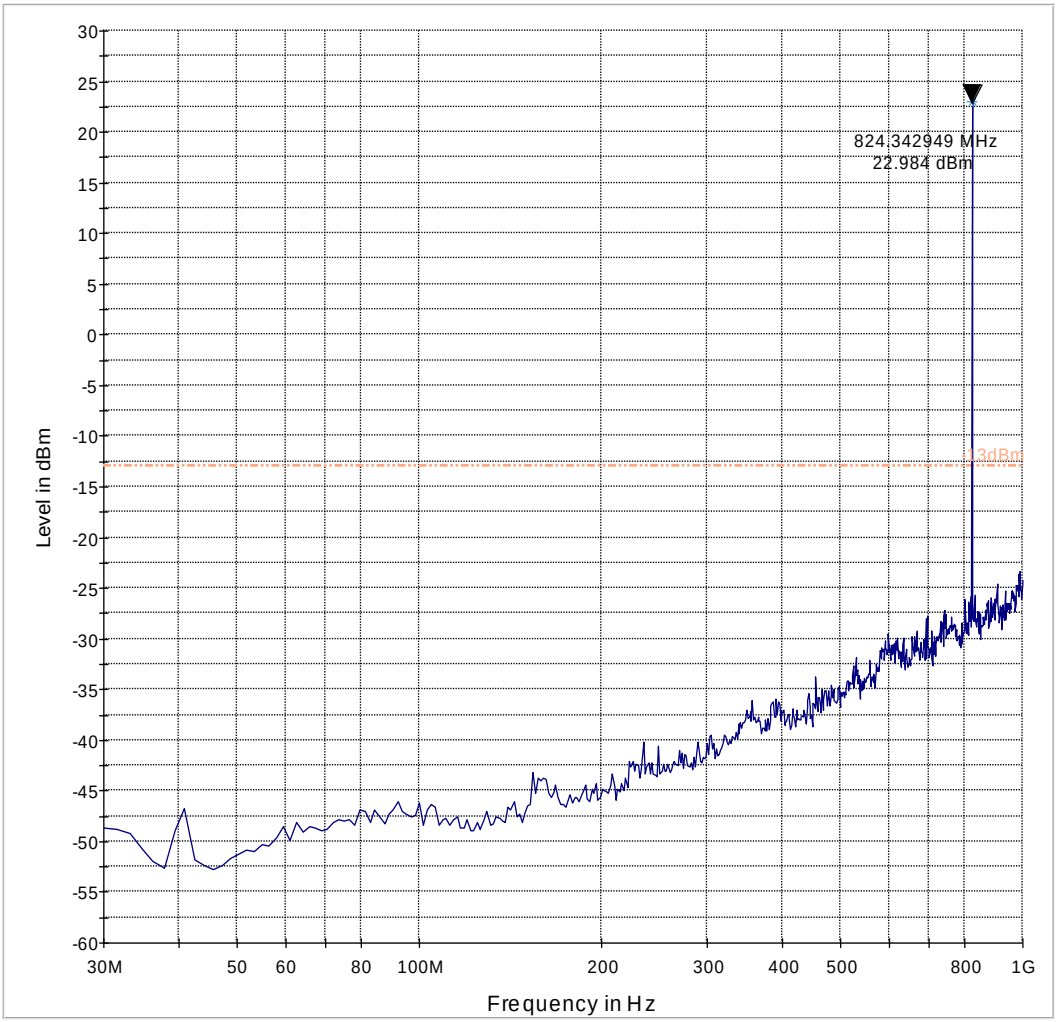
Harmonic	Tx ch-128 Freq. (MHz)	Level (dBm)	Tx ch-190 Freq. (MHz)	Level (dBm)	Tx ch-251 Freq. (MHz)	Level (dBm)
1	**824.2**	-	**836.6**	-	**848.8**	-
2	**1648.4**	-54	**1673.2**	-48	**1697.6**	-47
3	**2472.6**	-47.86	**2509.8**	-47.47	**2546.4**	-46.86
4	**3296.8**	NF	**3346.4**	NF	**3395.2**	NF
5	**4121**	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						

Legend for the plots:

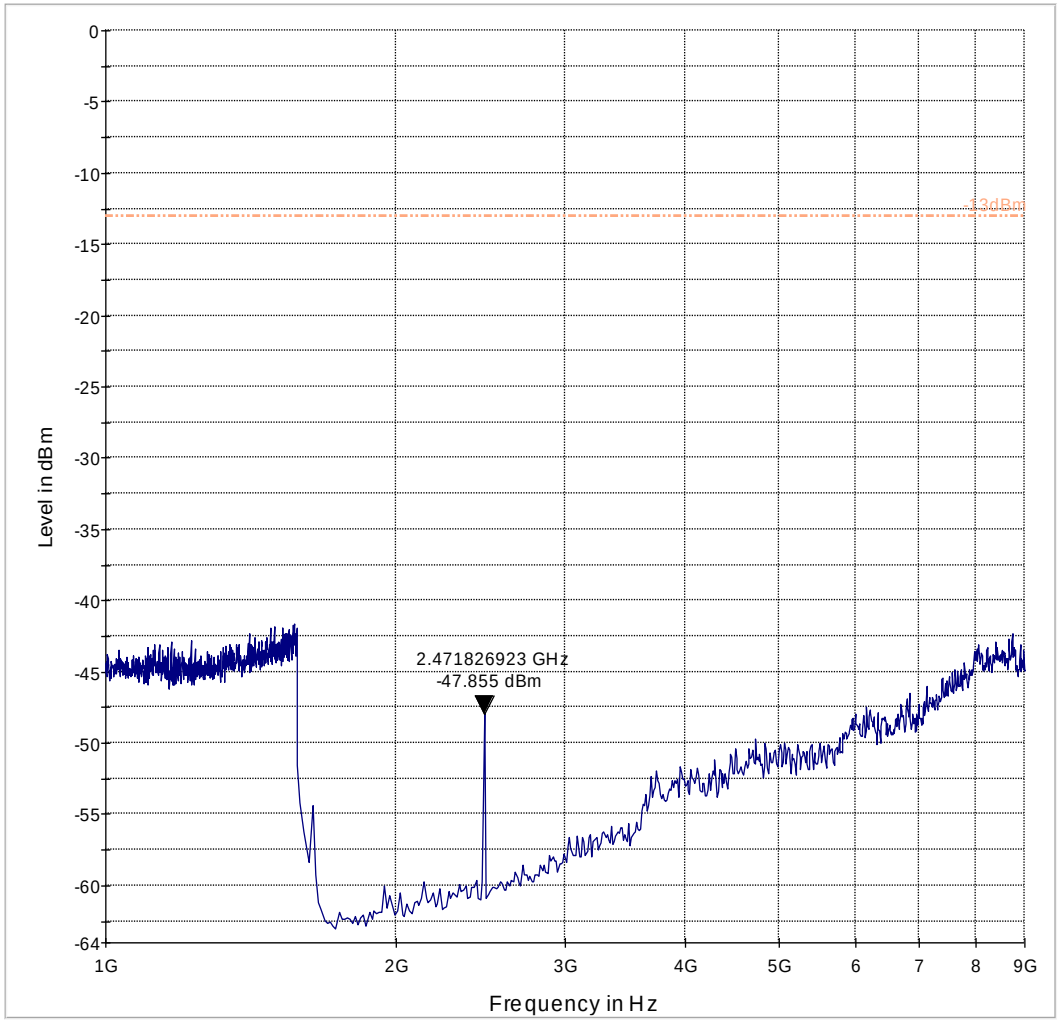


Radiated Spurious Emissions (GSM-850) TX: Low Channel

Test results 30M-1GHz

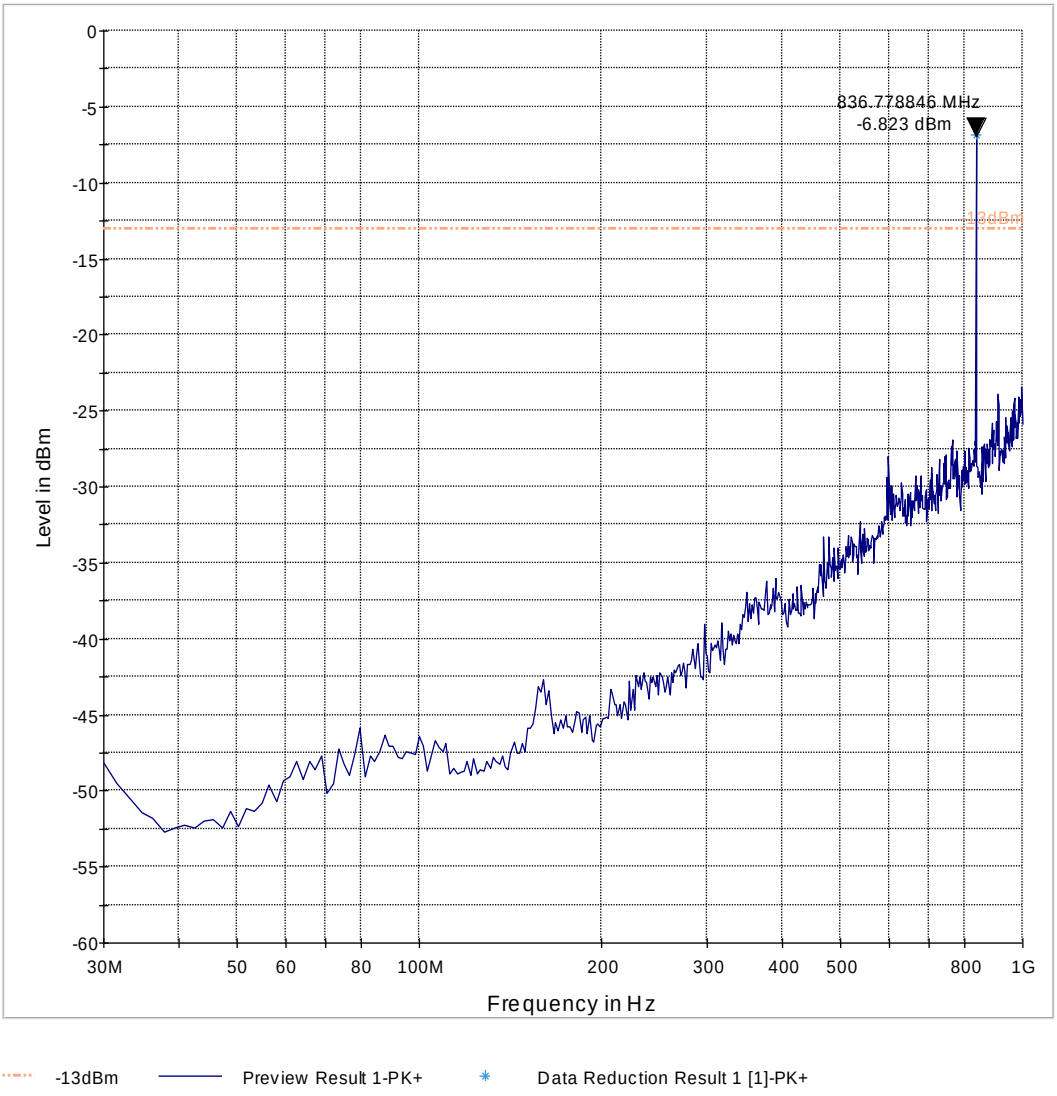


Test results 1GHz-9GHz

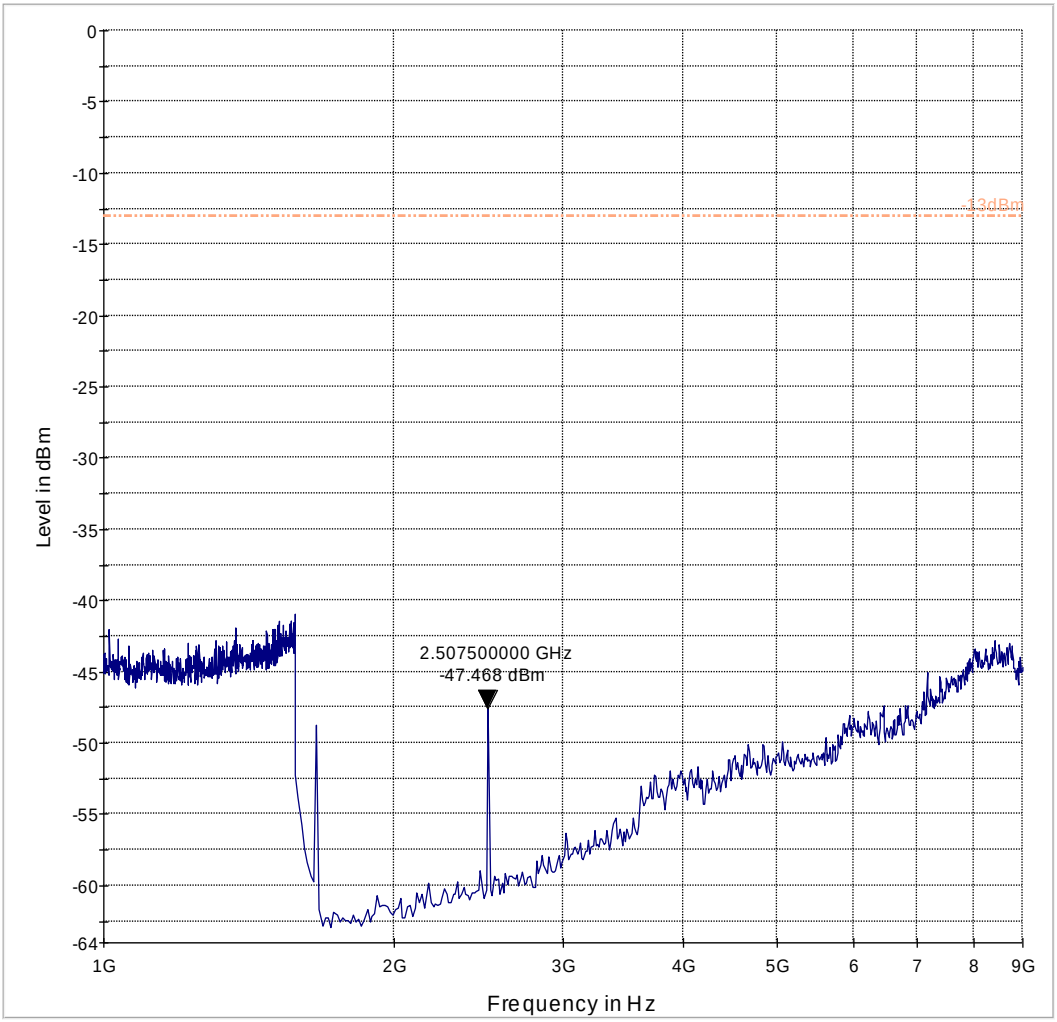


Radiated Spurious Emissions (GSM-850) TX: Mid Channel

Test results 30M-1GHz

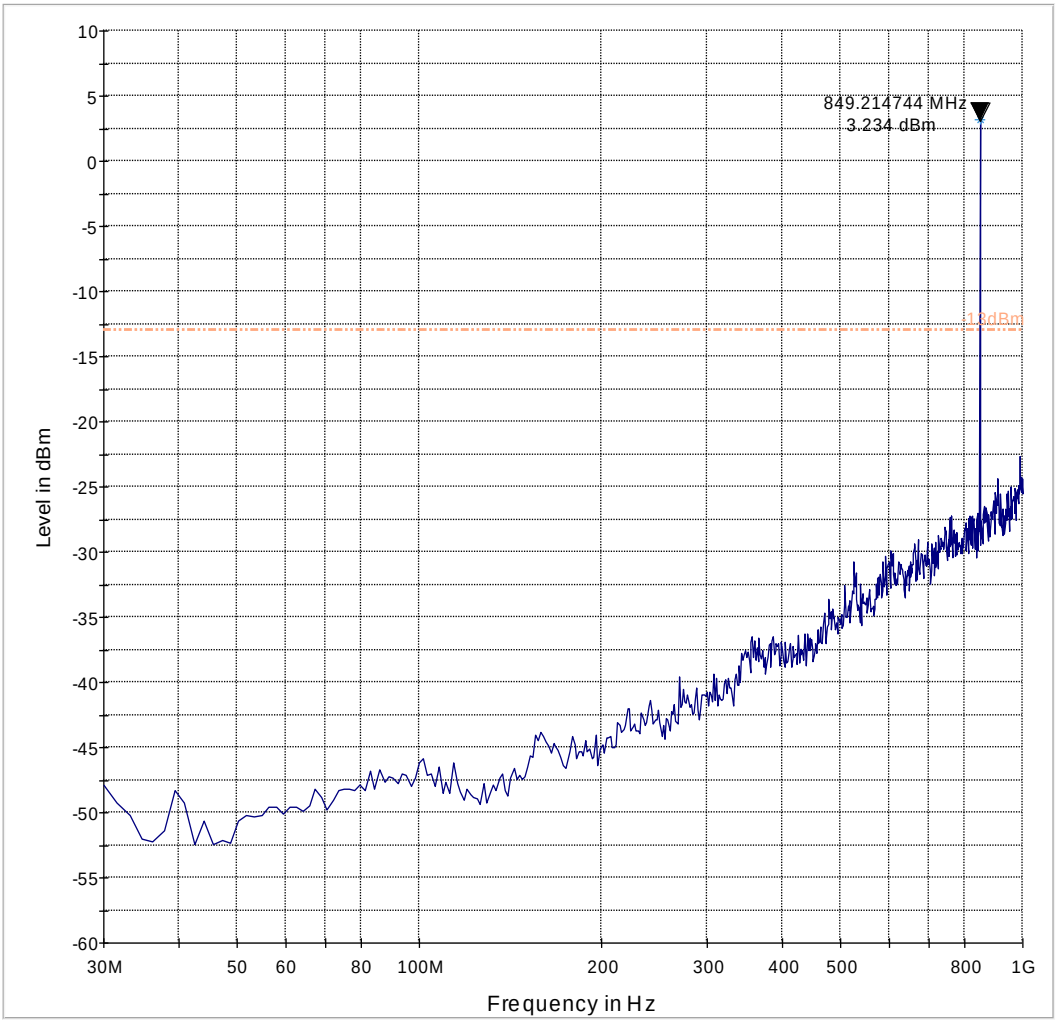


Test results 1GHz-9GHz

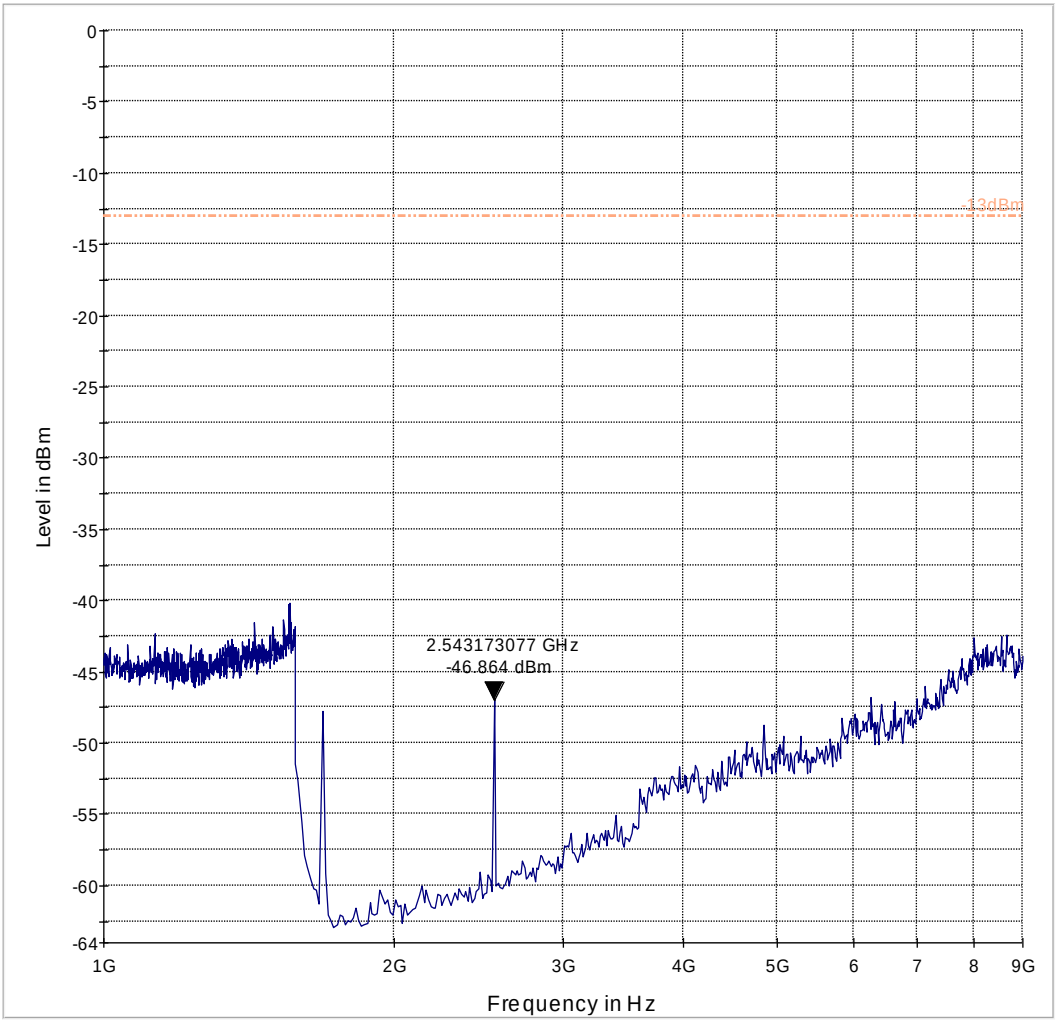


Radiated Spurious Emissions (GSM-850) TX: High Channel

Test results 30M-1GHz



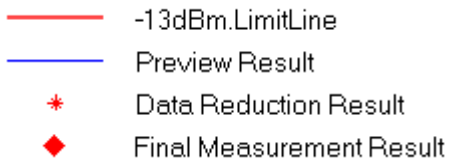
Test results 1GHz-9GHz



6.2.9.2 Test Results Transmitter Spurious Emission UMTS FDDV

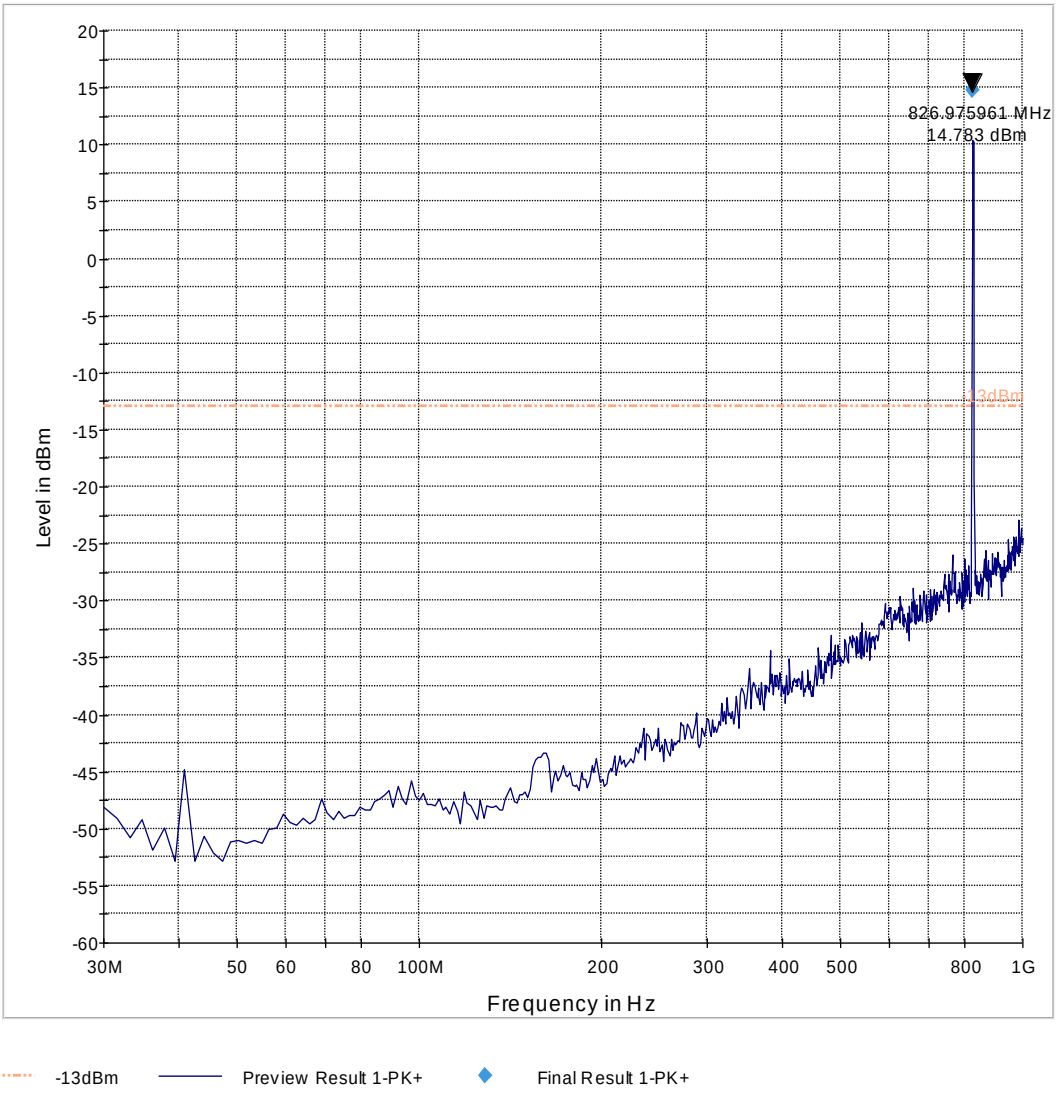
Harmonic	Tx ch-4132 Freq. (MHz)	Level (dBm)	Tx ch-4183 Freq. (MHz)	Level (dBm)	Tx ch-4233 Freq. (MHz)	Level (dBm)
1	**826.4**	-	**836.6**	-	**846.6**	-
2	**1652.8**	NF	**1673.2**	NF	**1693.2**	NF
3	**2479.2**	-57	**2509.8**	NF	**2539.8**	NF
4	**3305.6**	-50	**3346.4**	NF	**3386.4**	NF
5	**4132**	NF	**4183**	NF	**4233**	NF
6	**4958.4**	NF	**5019.6**	NF	**5079.6**	NF
7	**5784.8**	NF	**5856.2**	NF	**5926.2**	NF
8	**6611.2**	NF	**6692.8**	NF	**6772.8**	NF
9	**7437.6**	NF	**7529.4**	NF	**7619.4**	NF
10	**8264**	NF	**8366**	NF	**8466**	NF
NF= Noise Floor Measurement Uncertainty: ±3dB						

Legend for the plots:

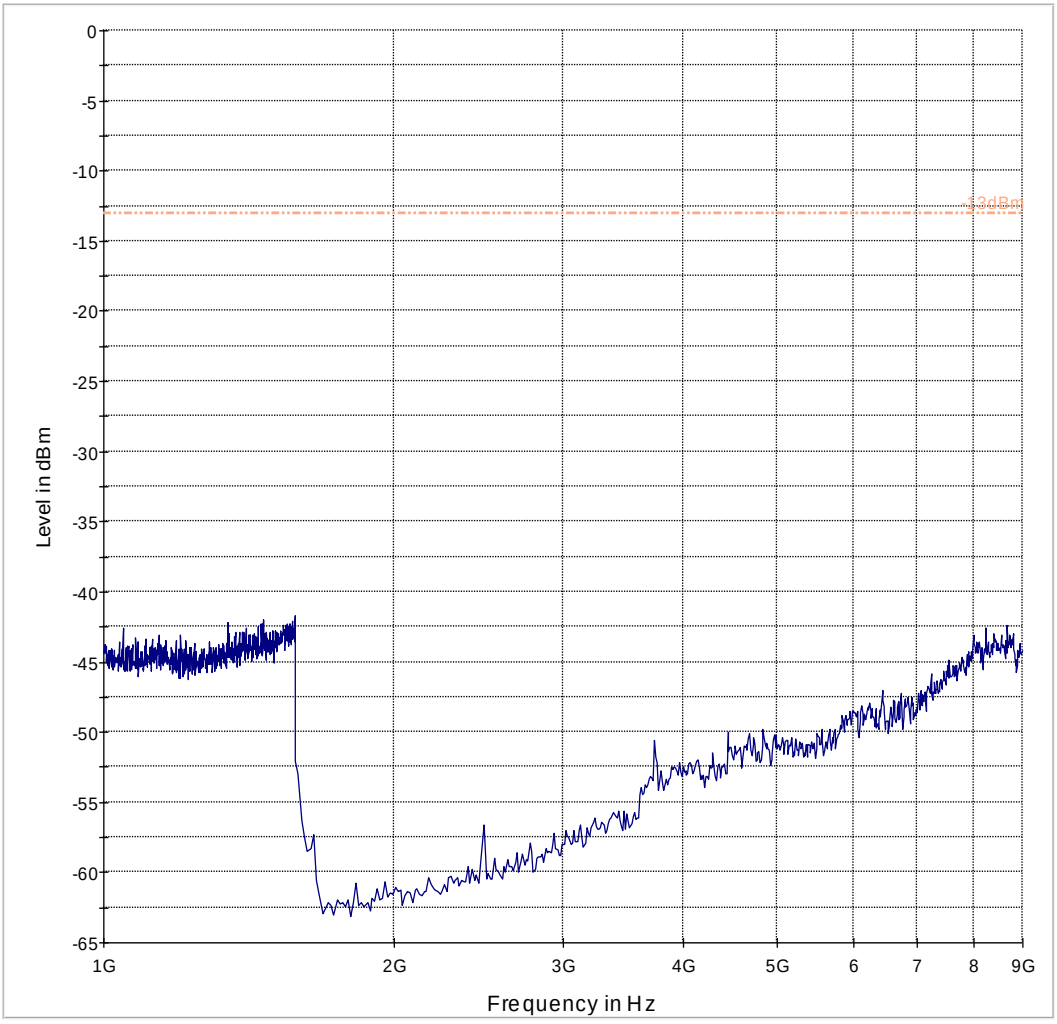


Radiated Spurious Emissions (UMTS Band 5) TX: Low Channel

Test results 30M-1GHz

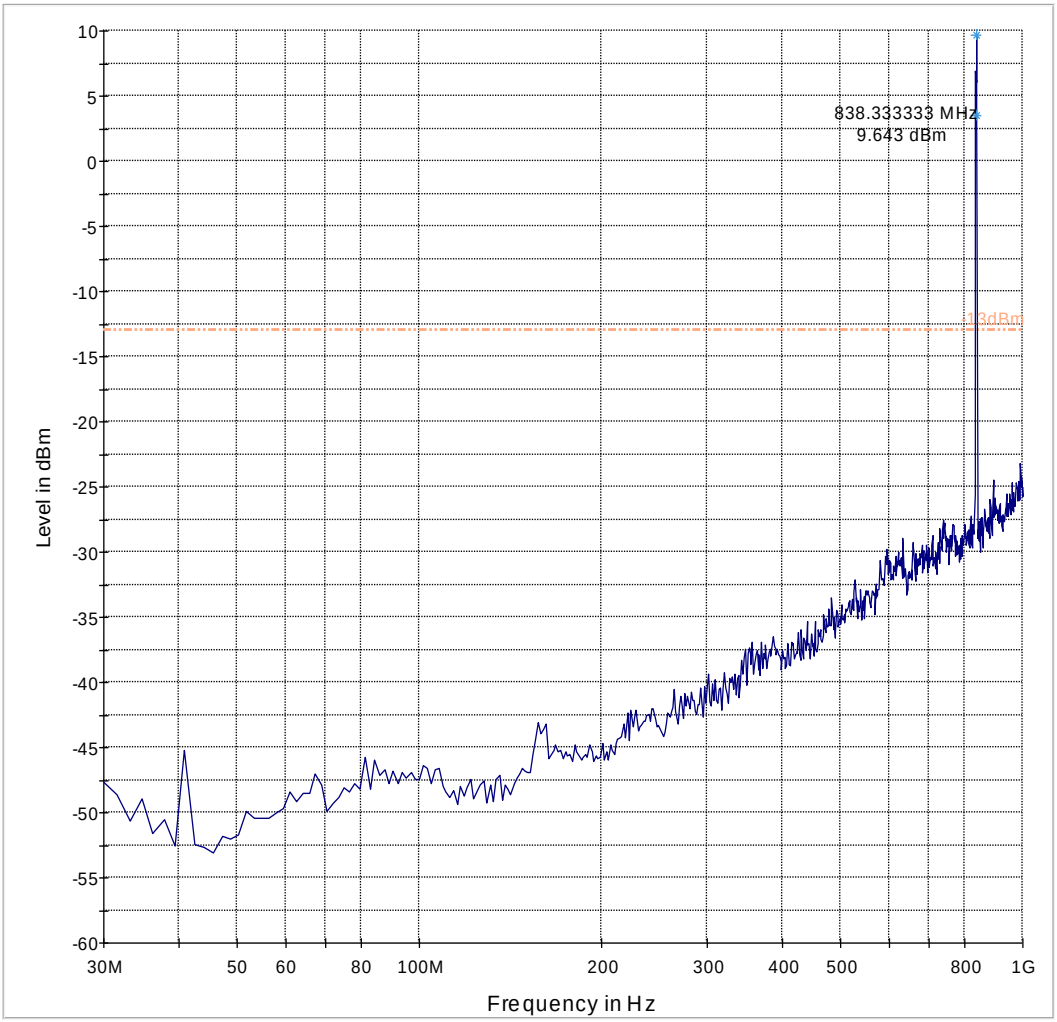


Test results 1GHz-9GHz

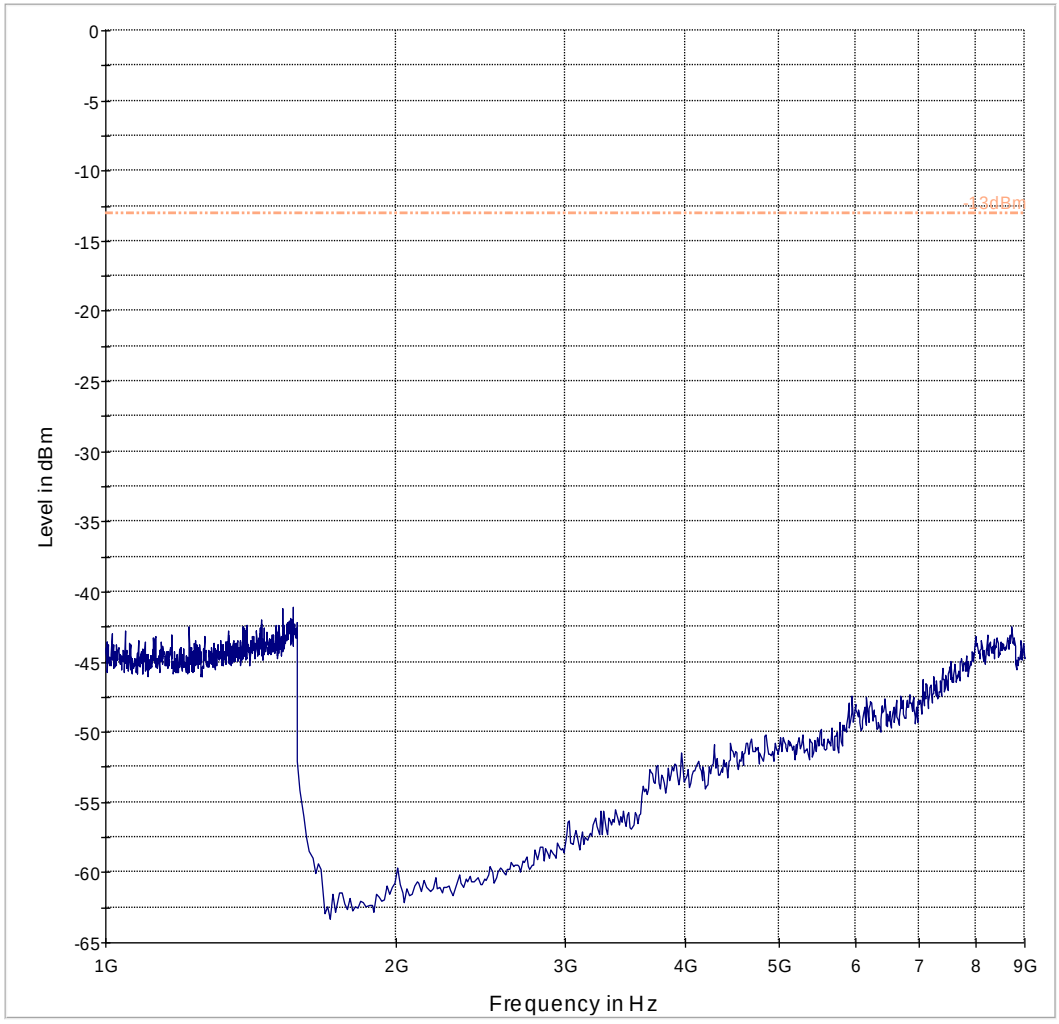


Radiated Spurious Emissions (UMTS Band 5) TX: Mid Channel

Test results 30M-1GHz

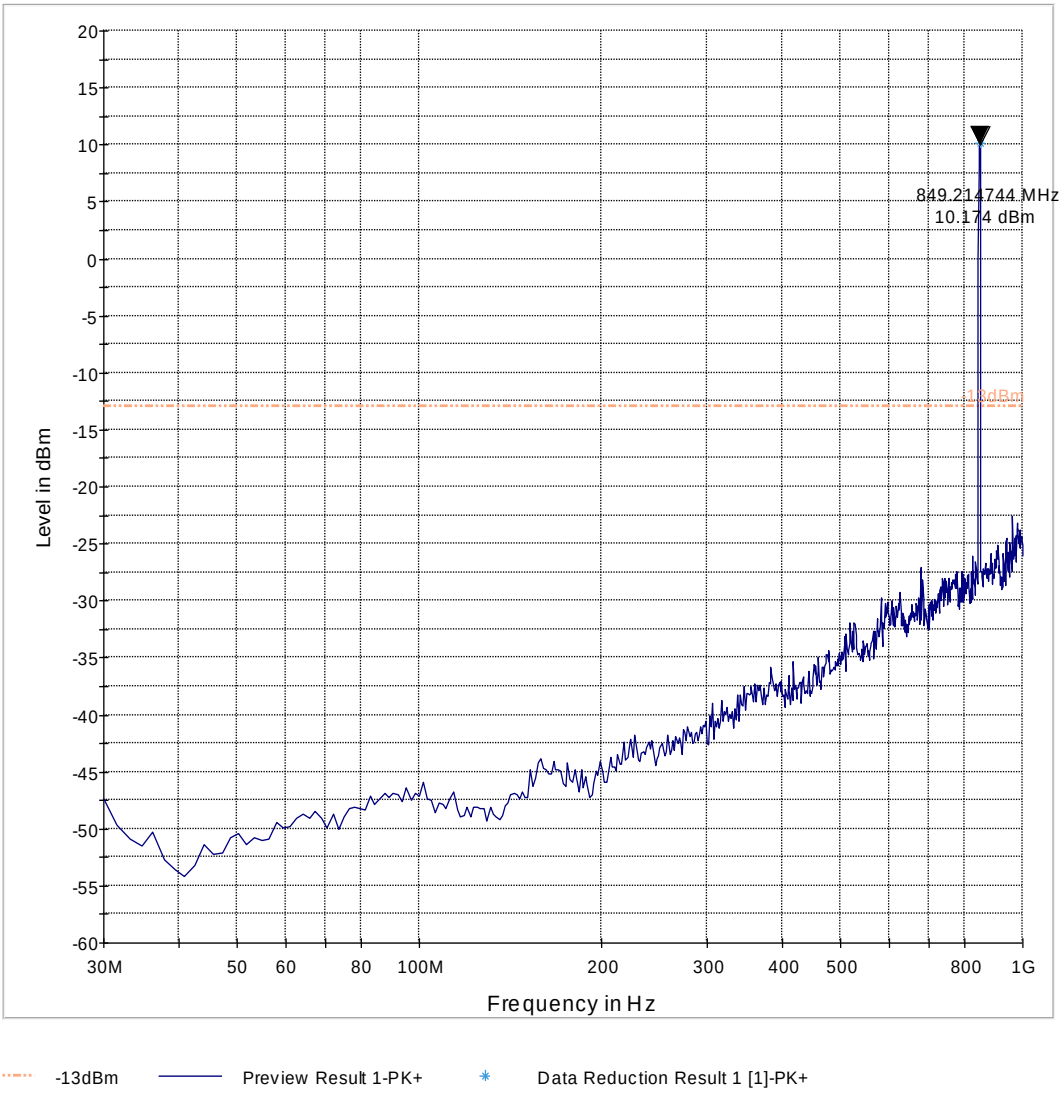


Test results 1GHz-9GHz

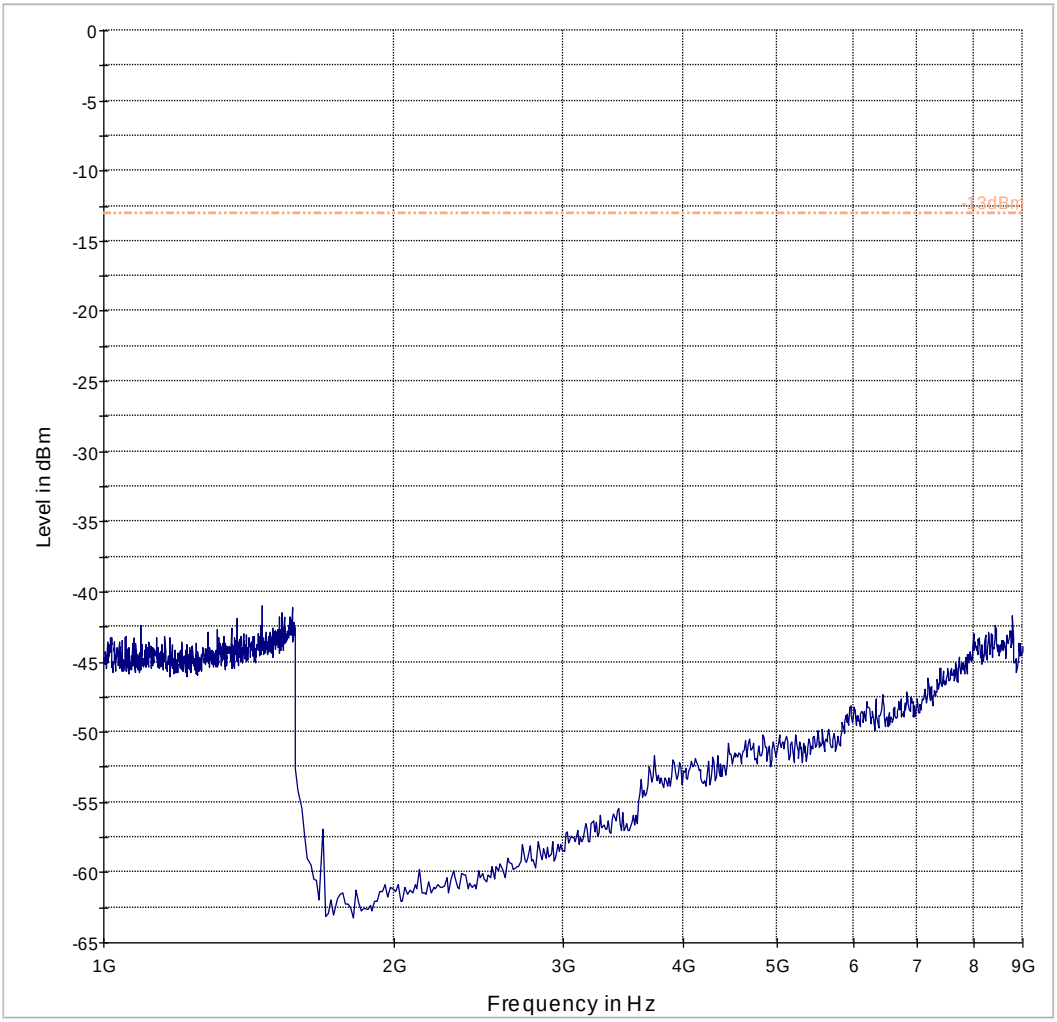


Radiated Spurious Emissions (UMTS Band 5) TX: High Channel

Test results 30M-1GHz



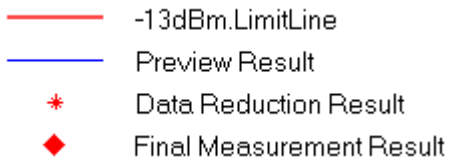
Test results 1GHz-9GHz



6.2.9.3 Test Results Transmitter Spurious Emission PCS-1900:

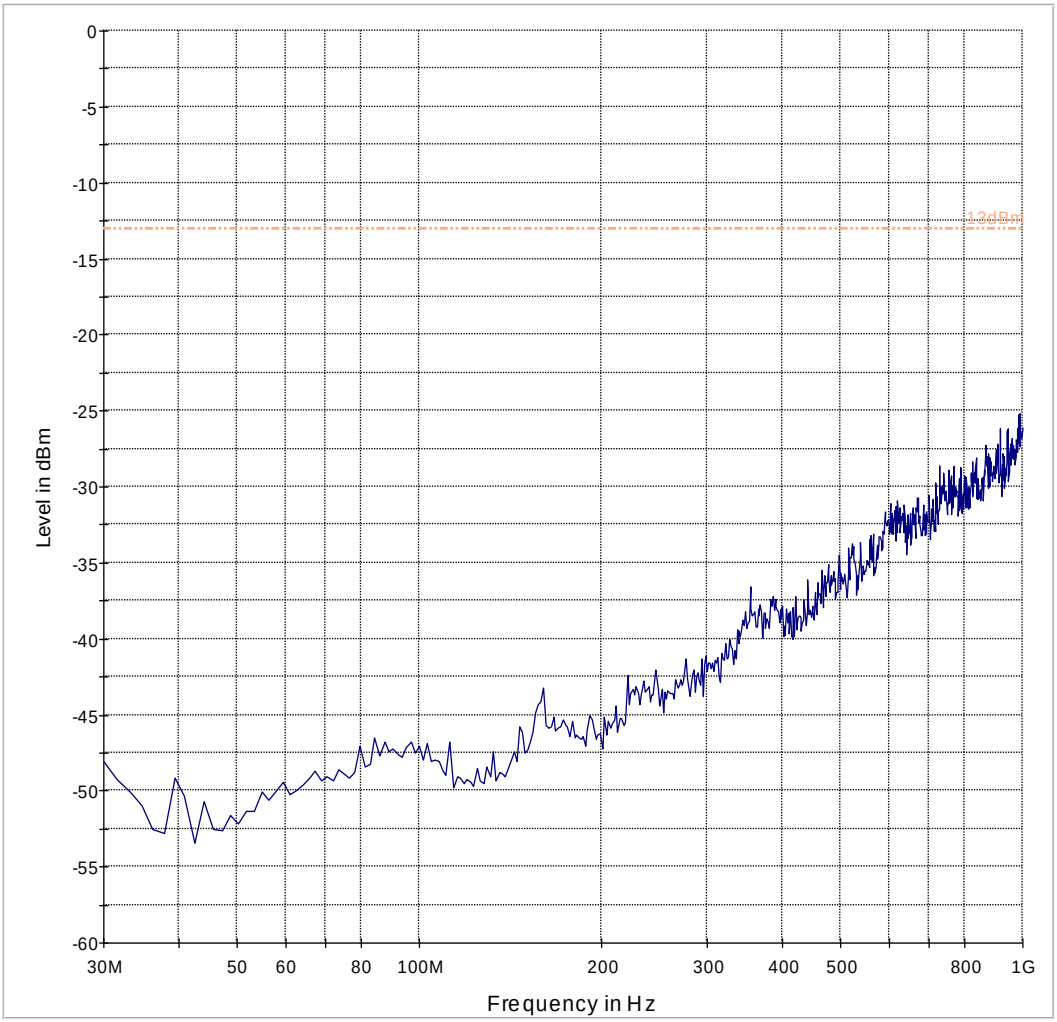
Harmonic	Tx ch-512 Freq.(MHz)	Level (dBm)	Tx ch-661 Freq. (MHz)	Level (dBm)	Tx ch-810 Freq. (MHz)	Level (dBm)
1	**1850.2**	-	**1880.0**	-	**1909.8**	-
2	**3700.4**	NF	**3760**	NF	**3819.6**	NF
3	**5550.6**	NF	**5640**	NF	**5729.4**	NF
4	**7400.8**	NF	**7520**	NF	**7639.2**	NF
5	**9251**	NF	**9400**	NF	**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						

Legend for the plots:

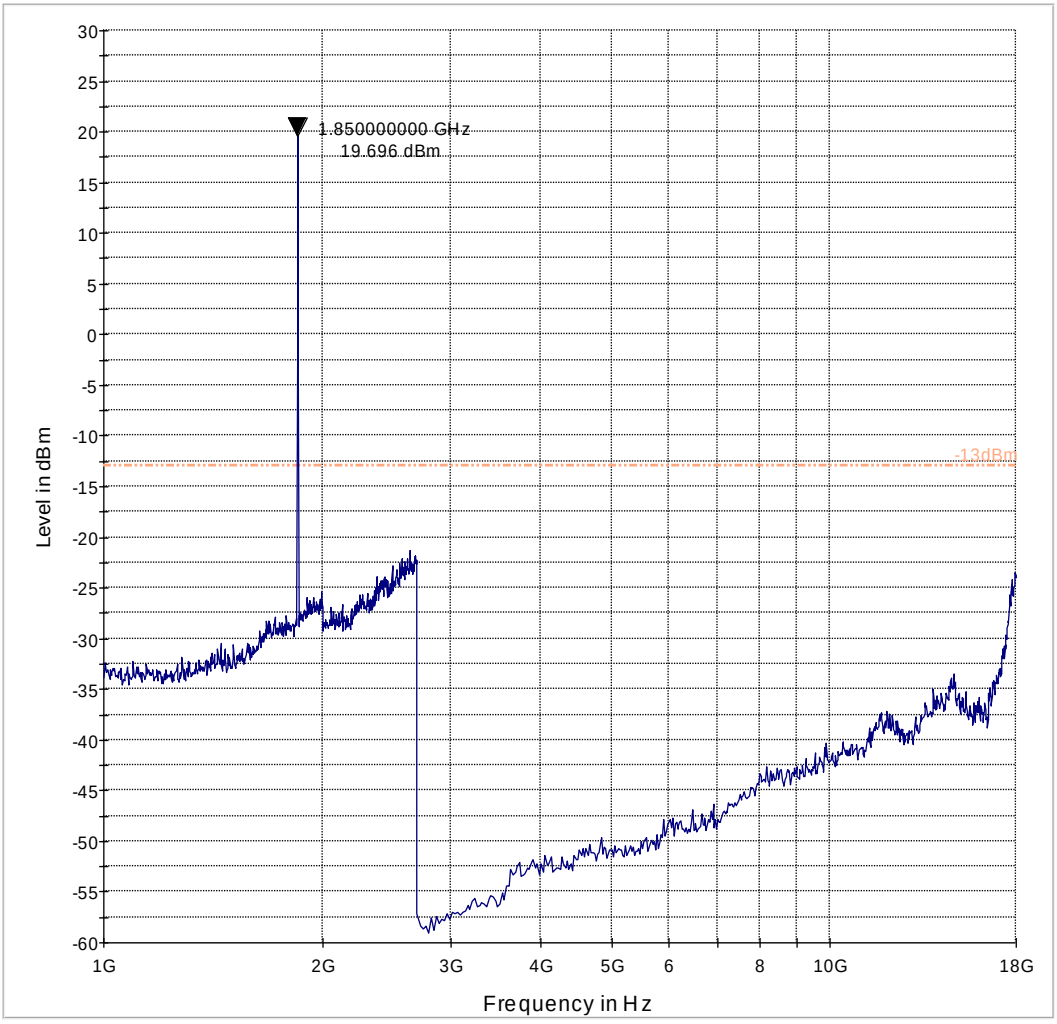


Radiated Spurious Emissions (GSM-1900) TX: Low Channel

Test results 30M-1GHz

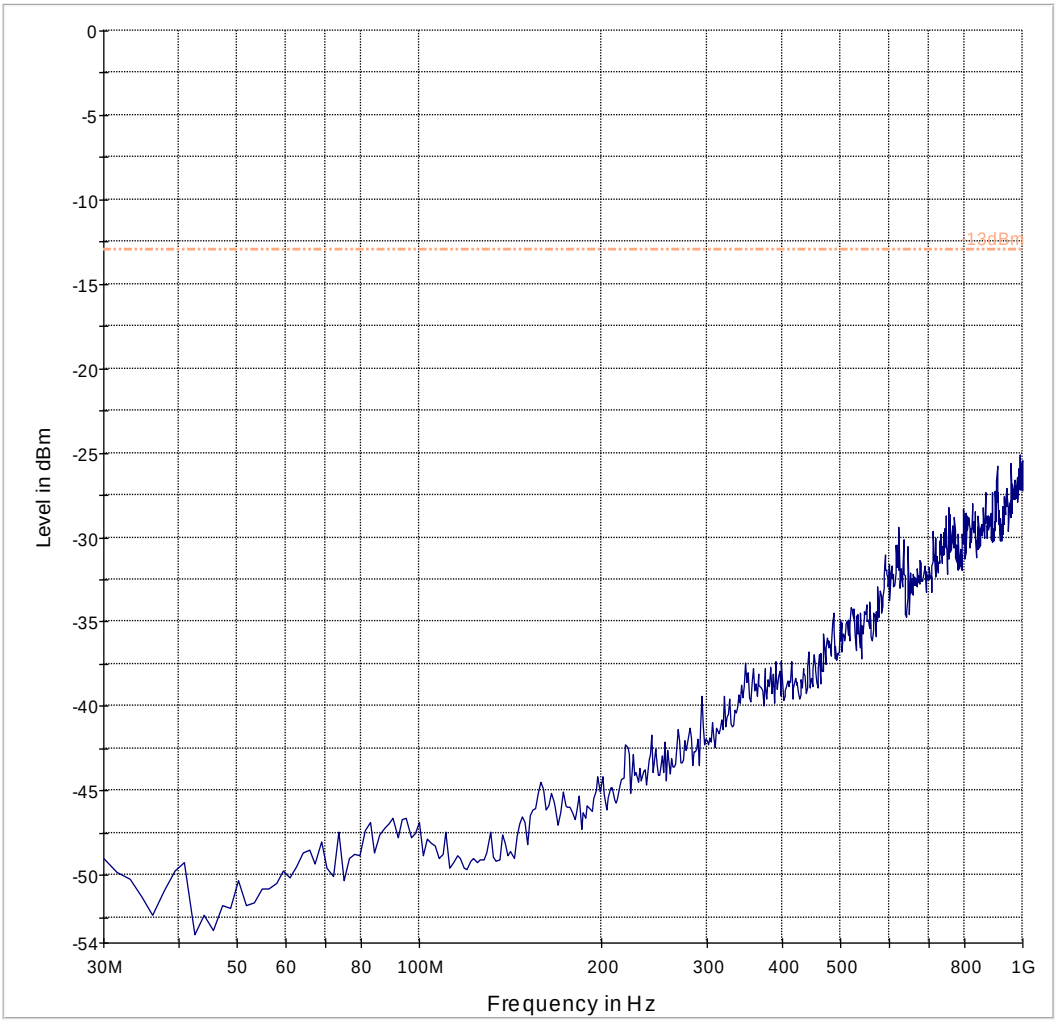


Test results 1GHz-18GHz

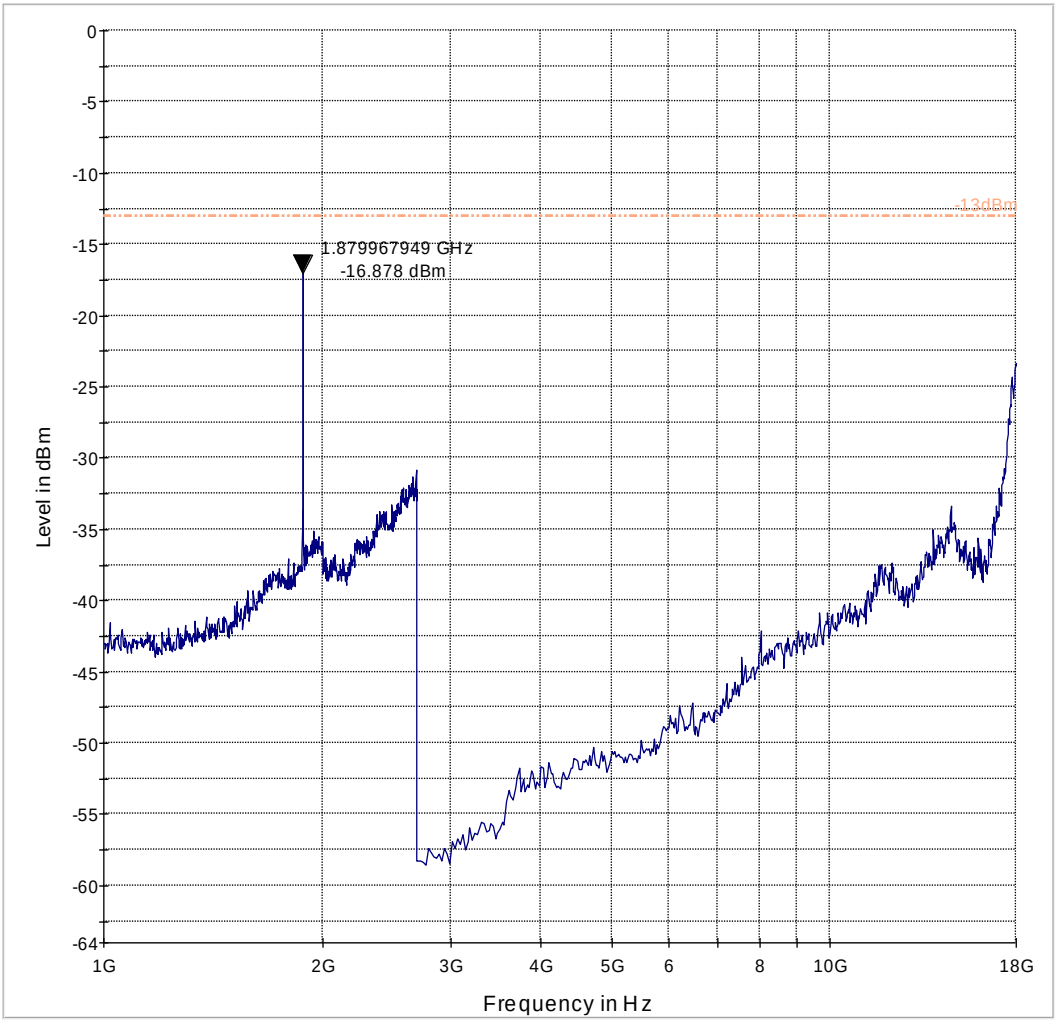


Radiated Spurious Emissions (GSM-1900) TX: Mid Channel

Test results 30M-1GHz

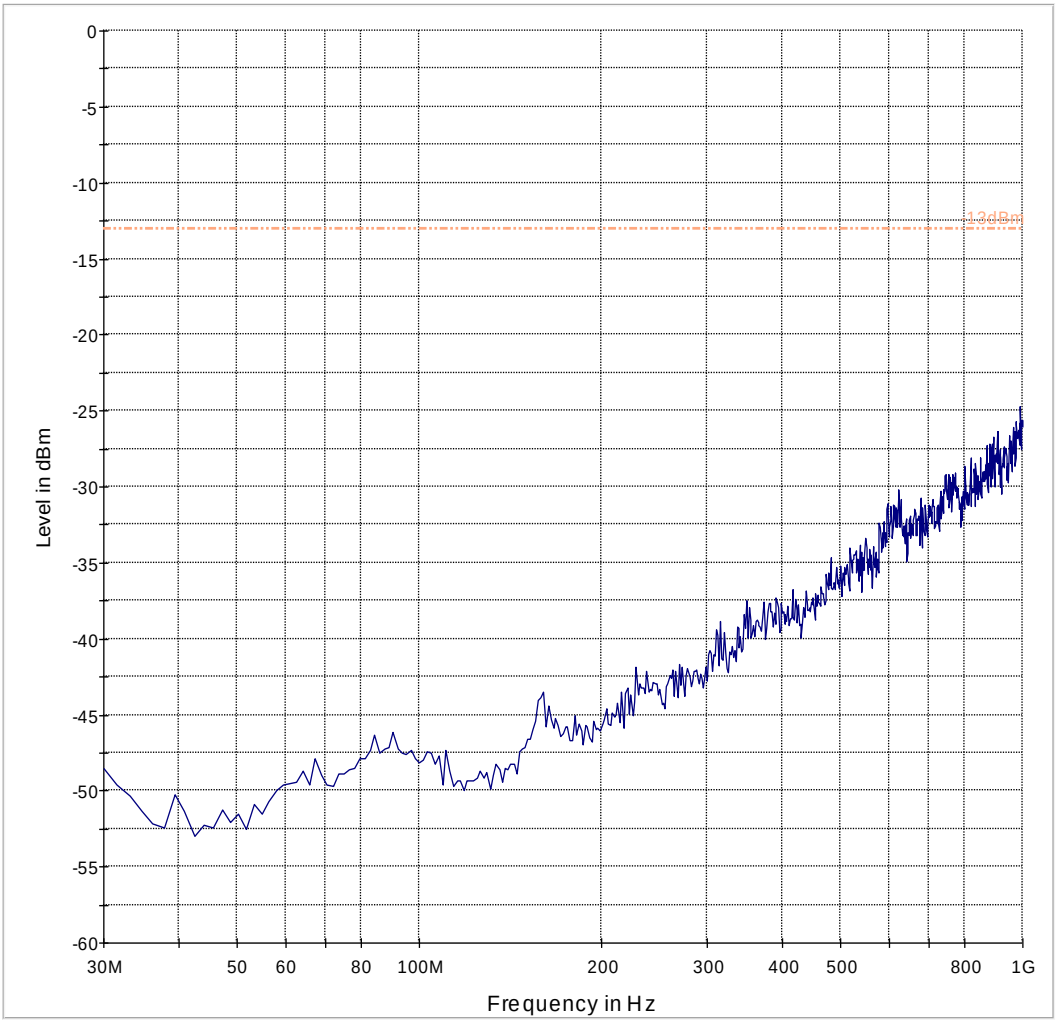


Test results 1GHz-18GHz

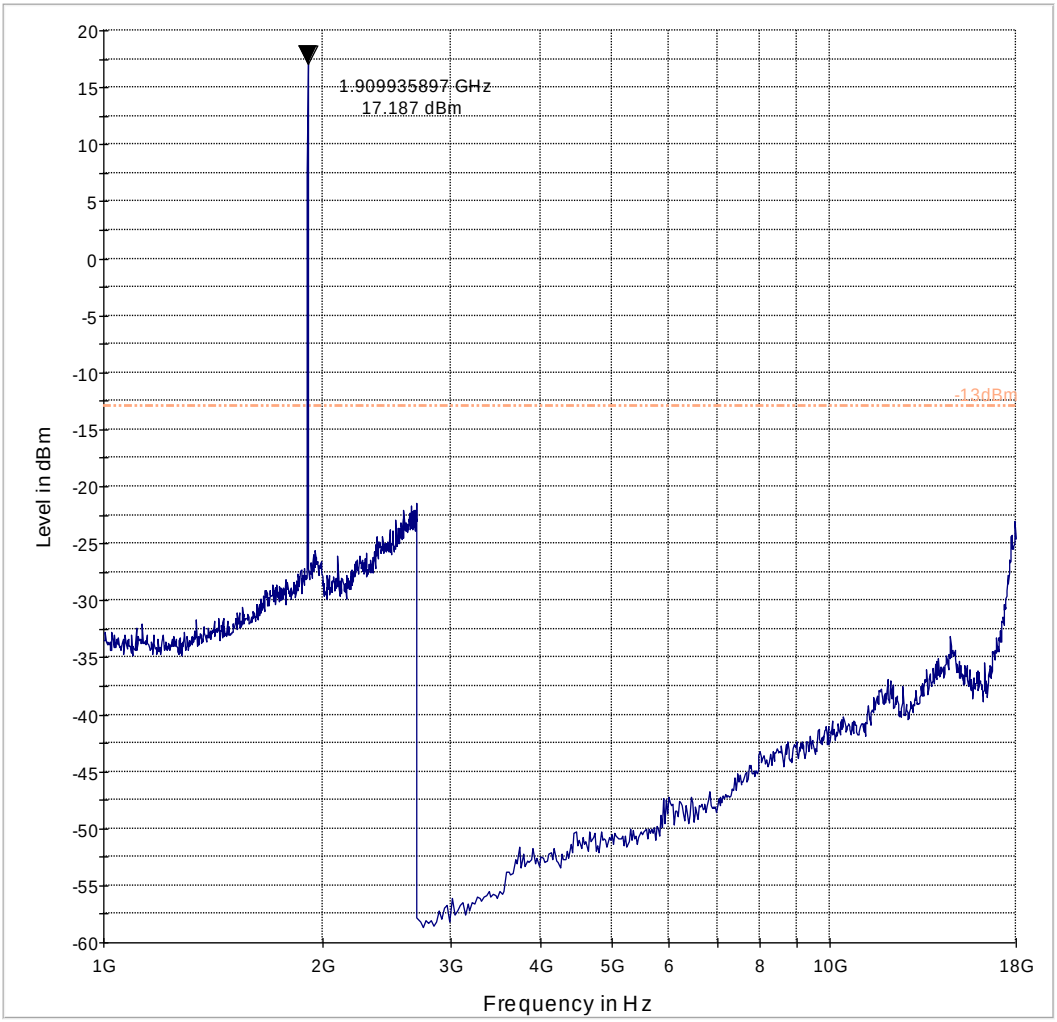


Radiated Spurious Emissions (GSM-1900) TX: High Channel

Test results 30M-1GHz

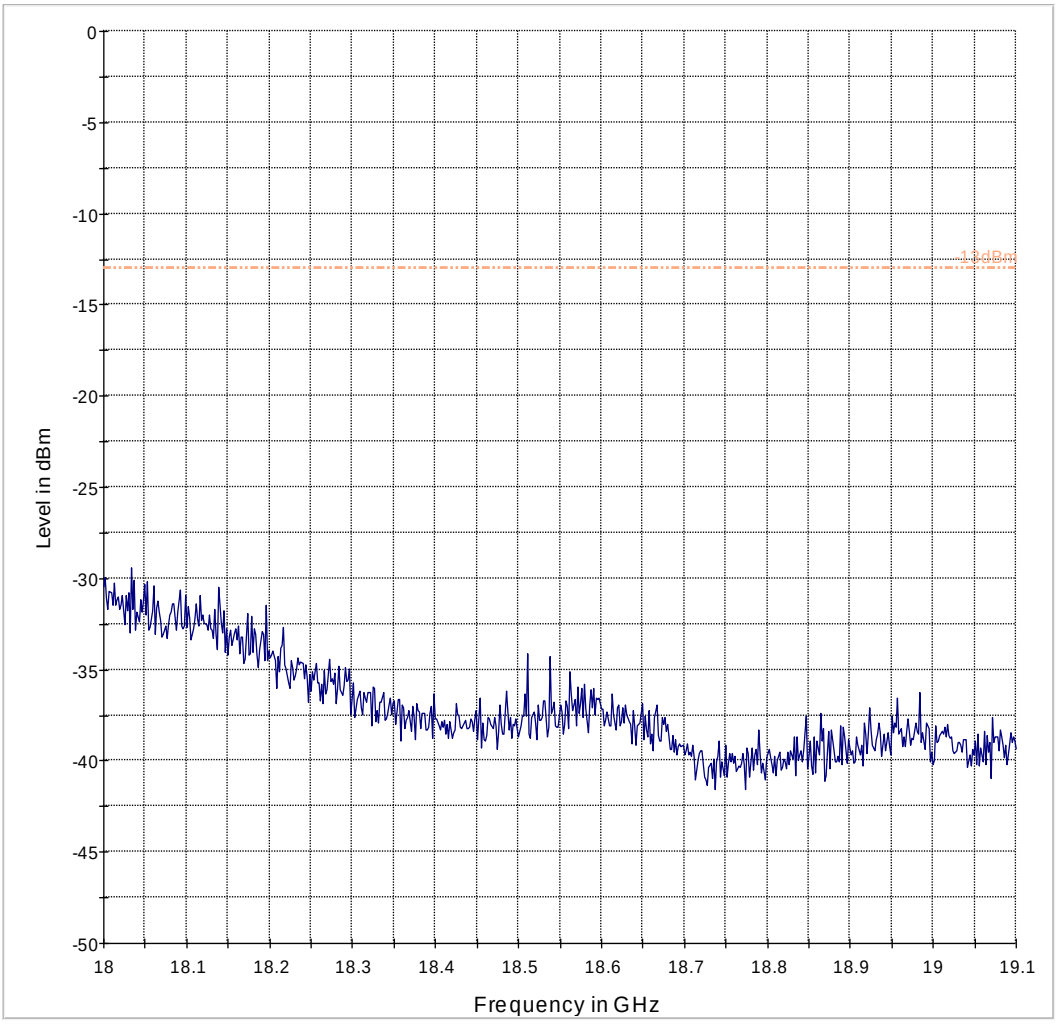


Test results 1GHz-18GHz



Test results 18GHz-19.1GHz

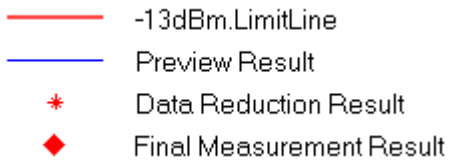
Note: Worst case representation for all channels of operation in band.



6.2.9.4 Test Results Transmitter Spurious Emission UMTS FDD2:

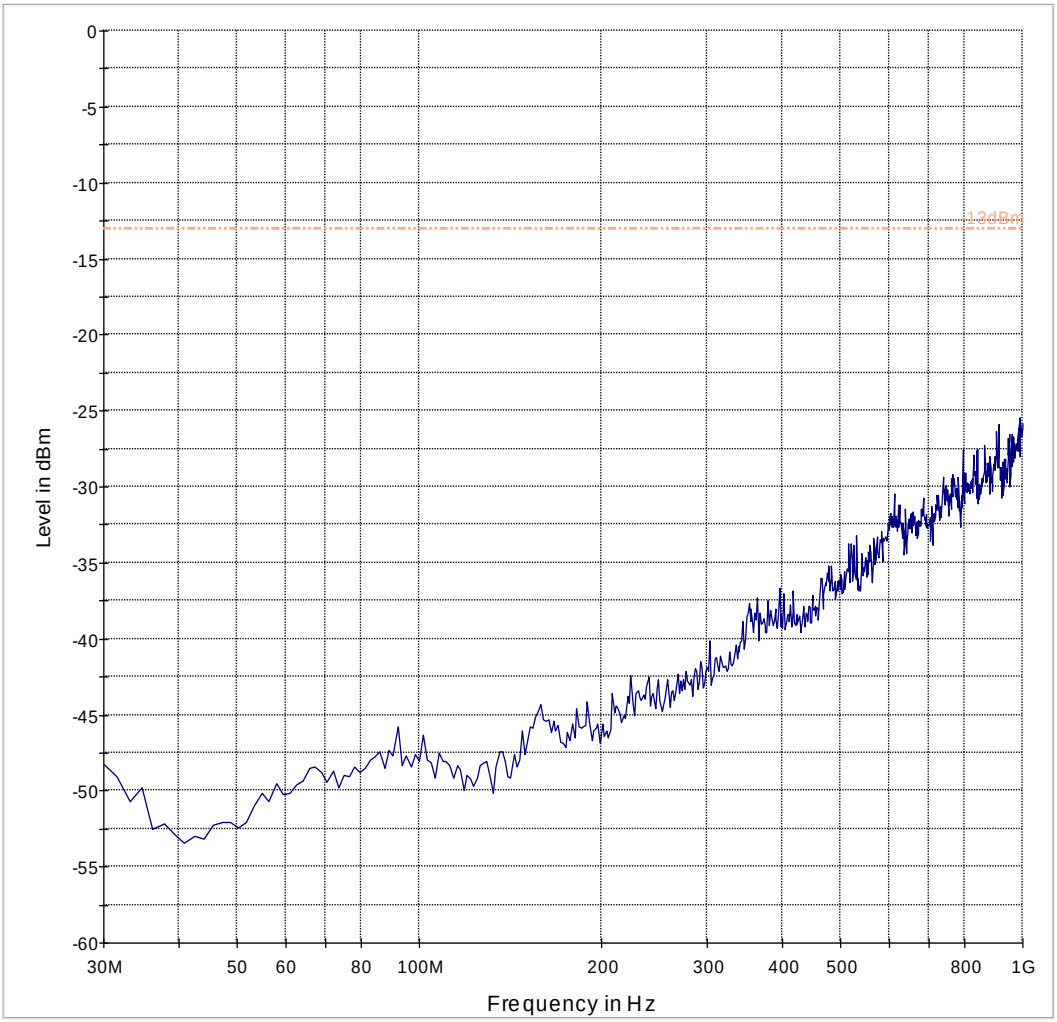
Harmonic	Tx ch-9262 Freq. (MHz)	Level (dBm)	Tx ch-9400 Freq. (MHz)	Level (dBm)	Tx ch-9538 Freq. (MHz)	Level (dBm)
1	**1852.4**	-	**1880.0**	-	**1907.6**	-
2	**3704.8**	NF	**3760**	NF	**3815.2**	NF
3	**5557.2**	NF	**5640**	NF	**5722.8**	NF
4	**7409.6**	NF	**7520**	NF	**7630.4**	NF
5	**9262**	NF	**9400**	NF	**9538**	NF
6	**11114.4**	NF	**11280**	NF	**11445.6**	NF
7	**12966.8**	NF	**13160**	NF	**13353.2**	NF
8	**14819.2**	NF	**15040**	NF	**15260.8**	NF
9	**16671.6**	NF	**16920**	NF	**17168.4**	NF
10	**18524**	NF	**18800**	NF	**19076**	NF
NF= Noise Floor Measurement Uncertainty: ±3dB						

Legend for the plots:

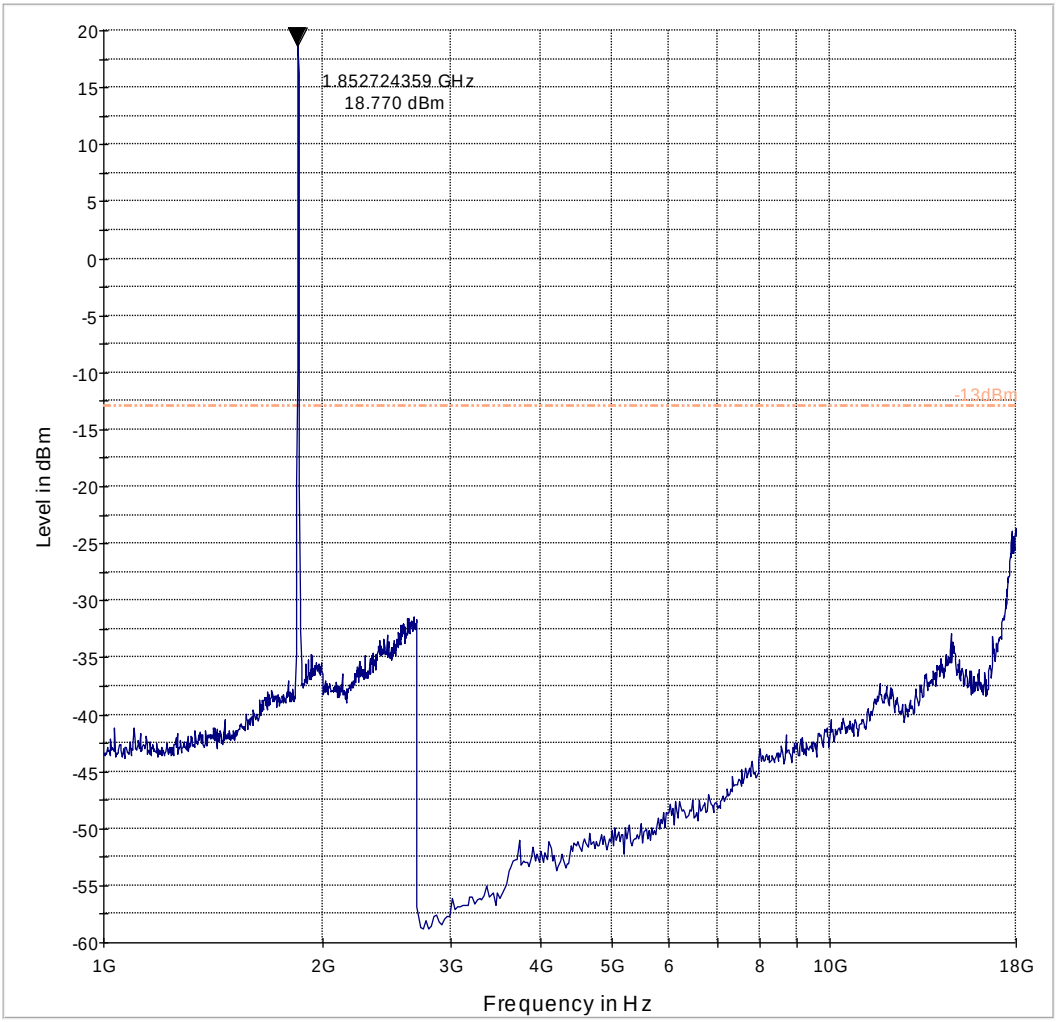


Radiated Spurious Emissions (UMTS Band 2) TX: Low Channel

Test results 30M-1GHz

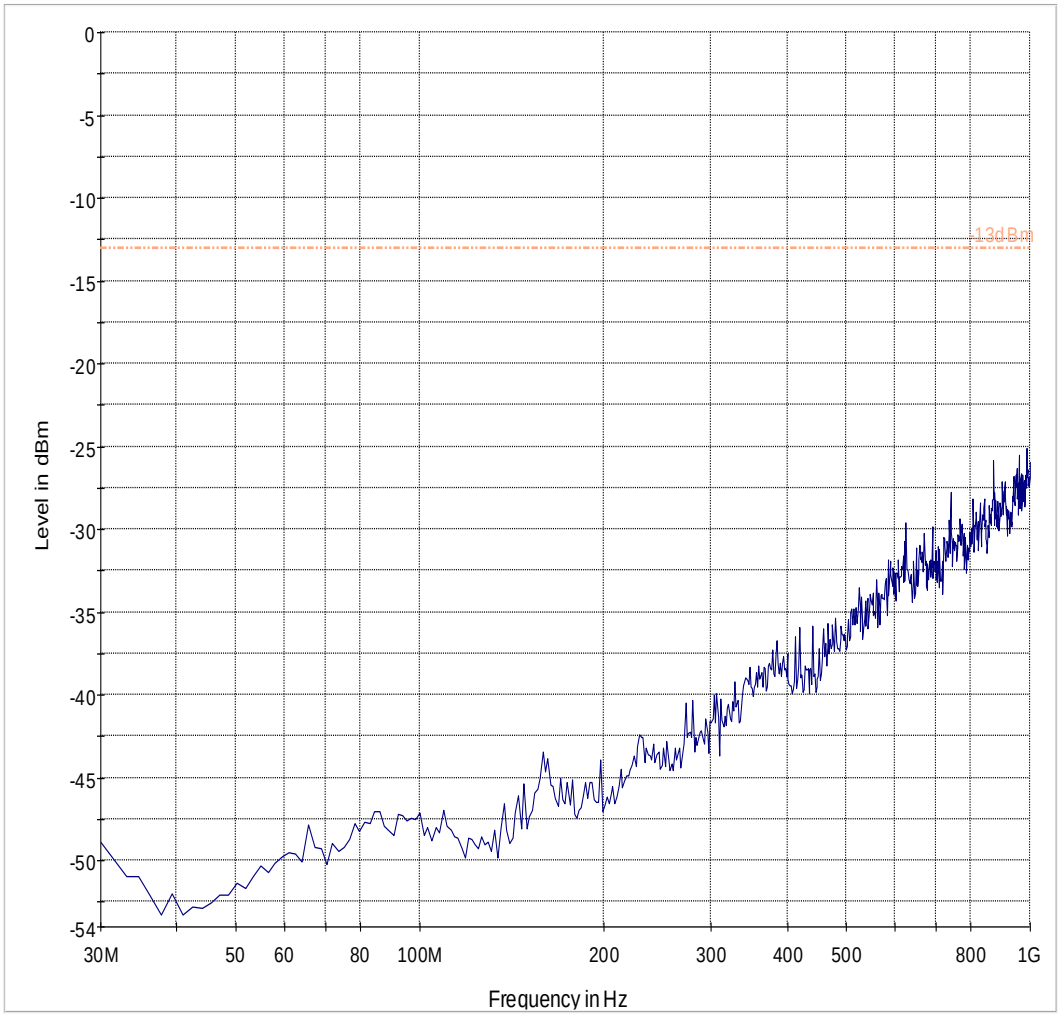


Test results 1GHz-18GHz

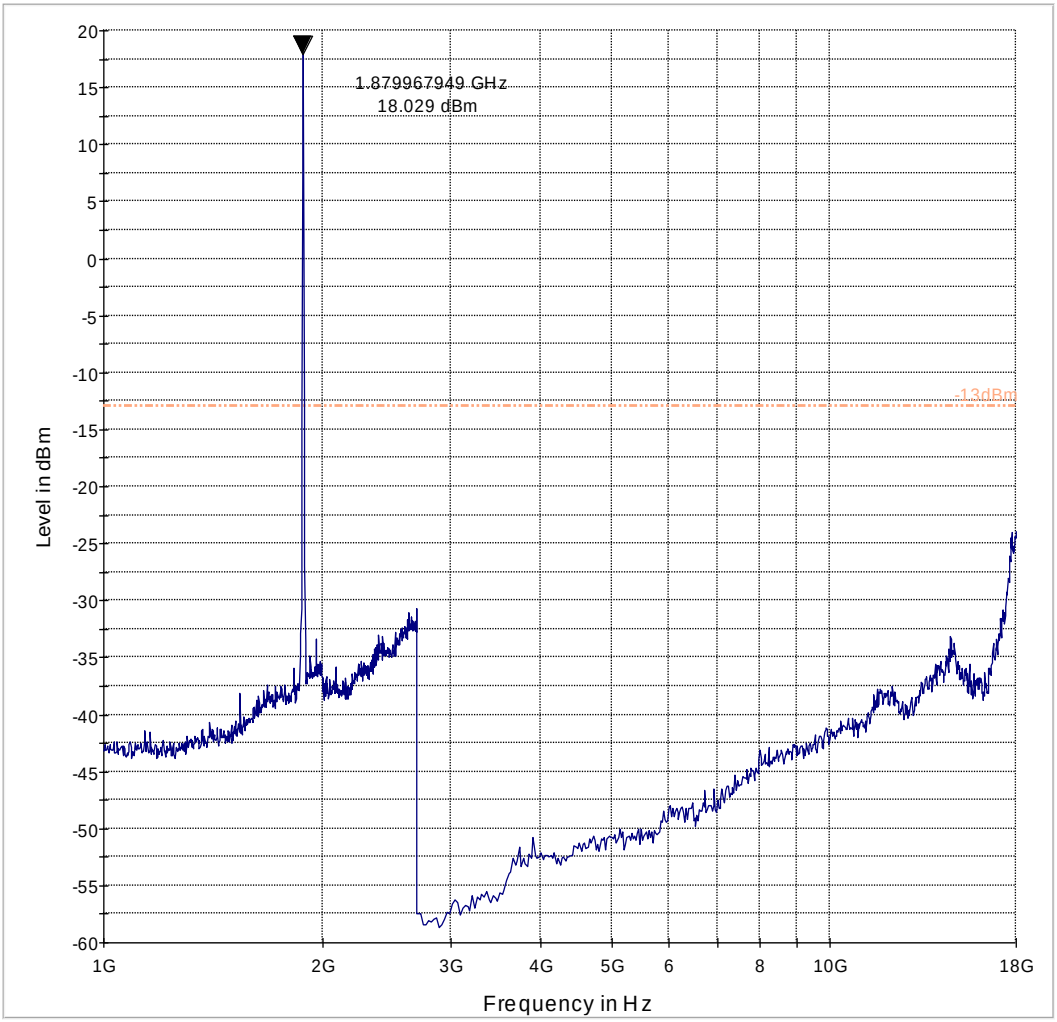


Radiated Spurious Emissions (UMTS Band 2) TX: Mid Channel

Test results 30M-1GHz

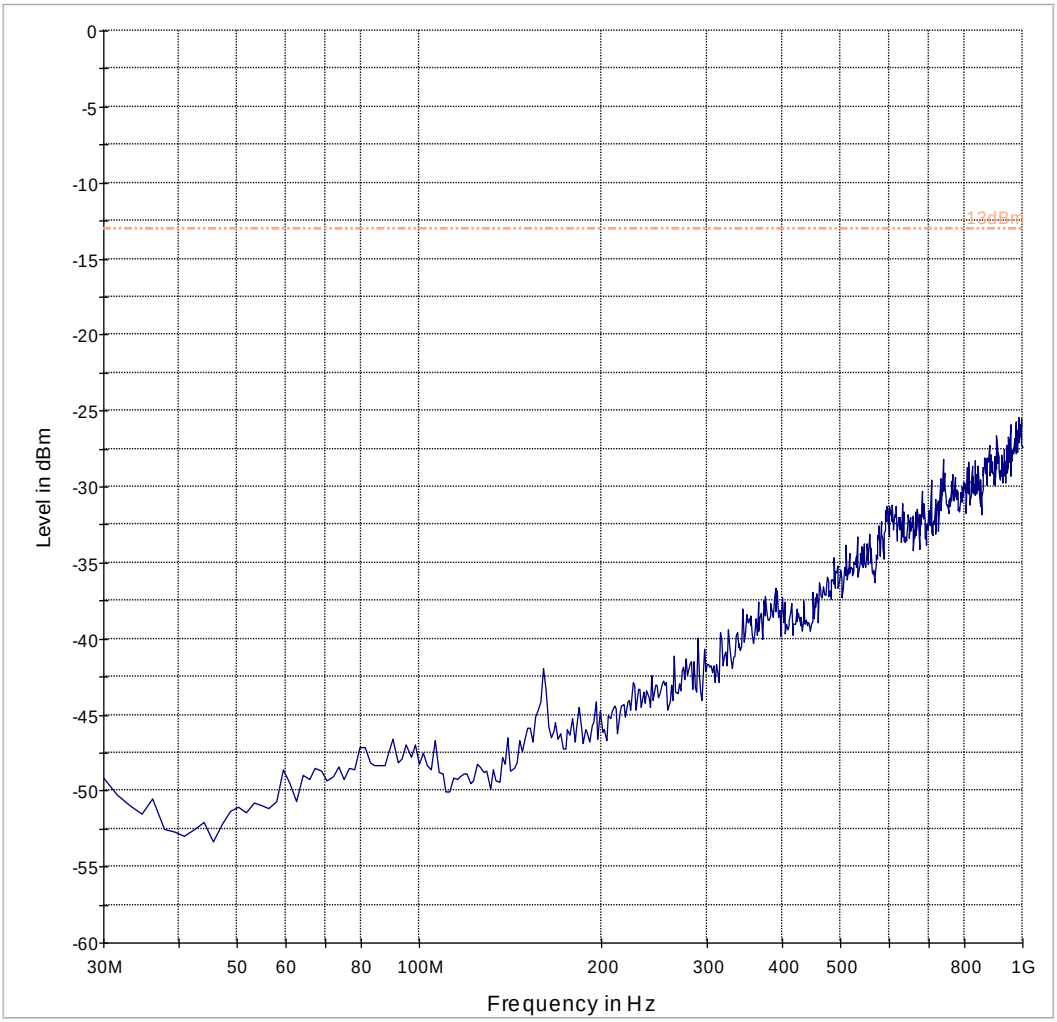


Test results 1GHz-18GHz

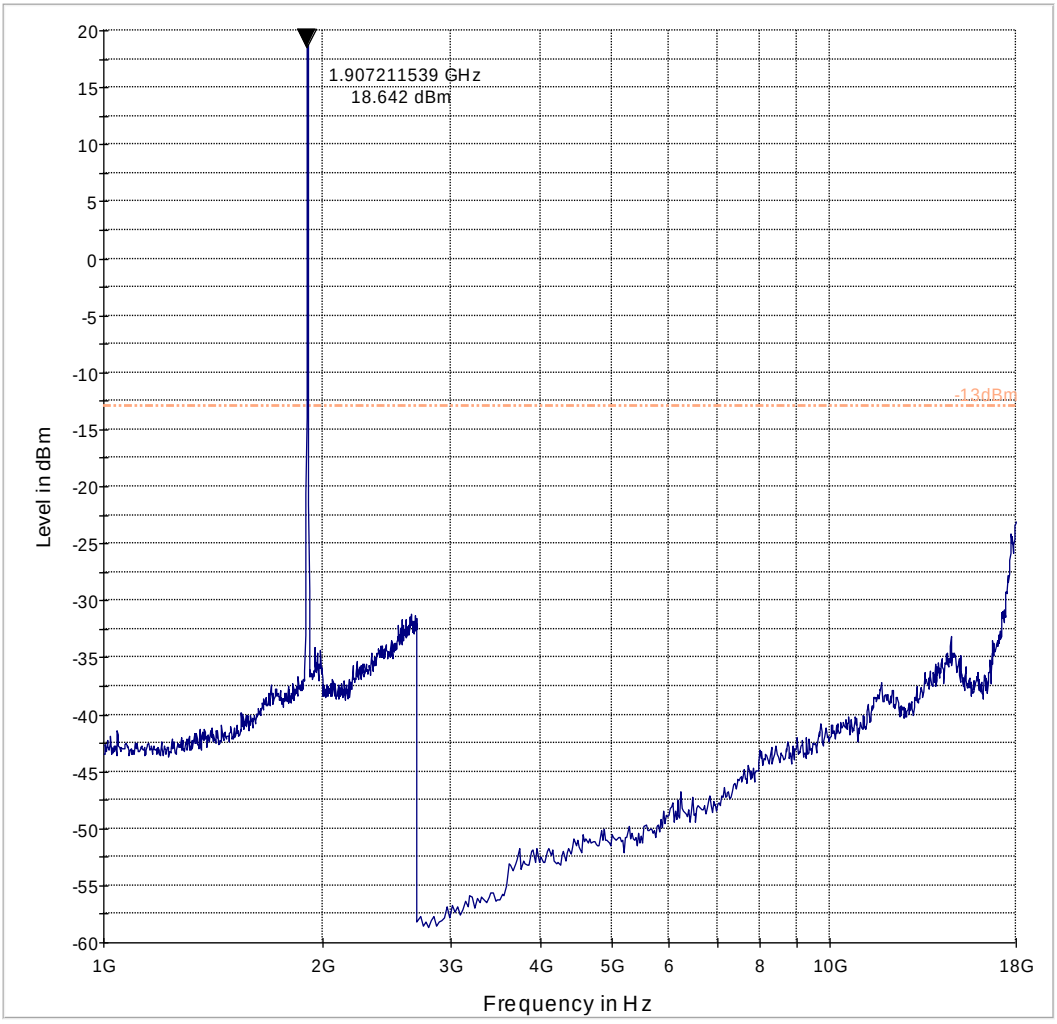


Radiated Spurious Emissions (UMTS Band 2) TX: High Channel

Test results 30M-1GHz

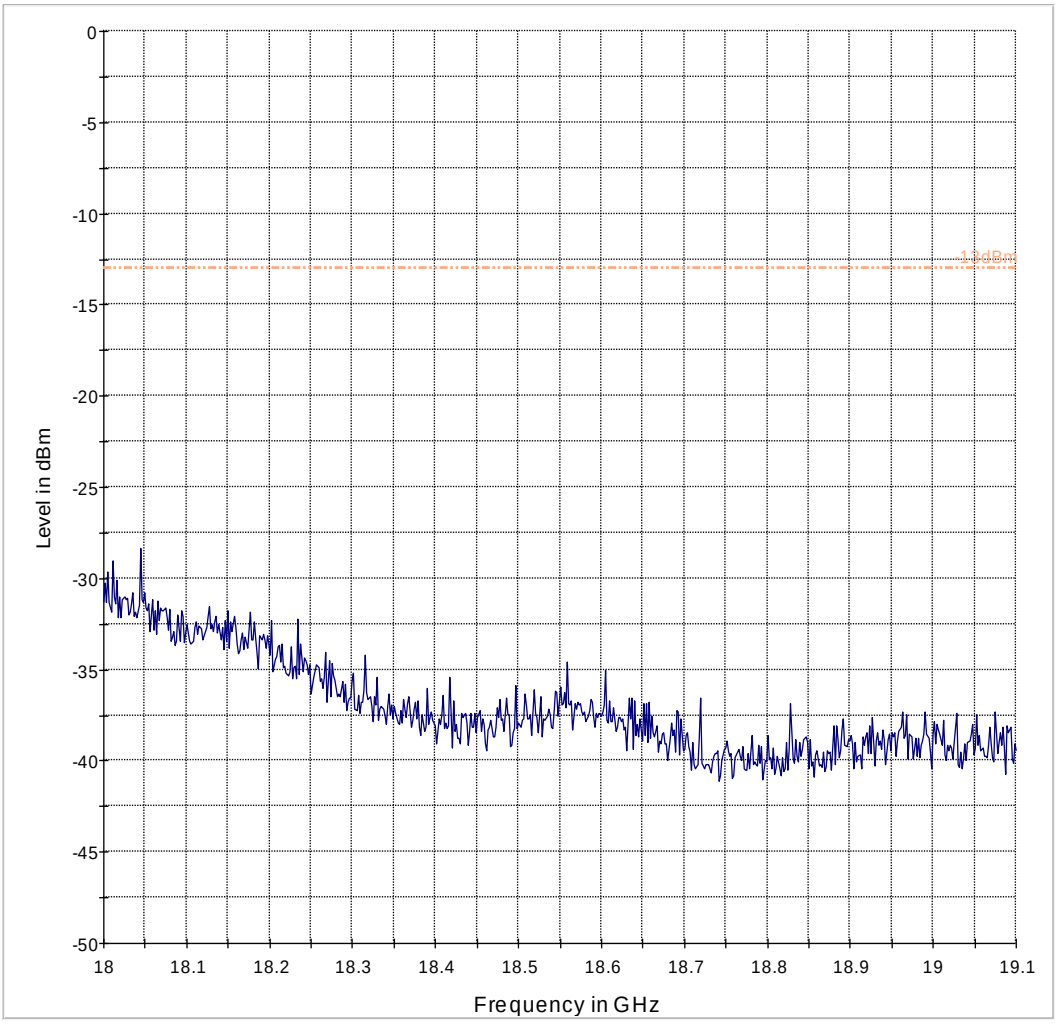


Test results 1GHz-18GHz



Test results 18GHz-19.1GHz

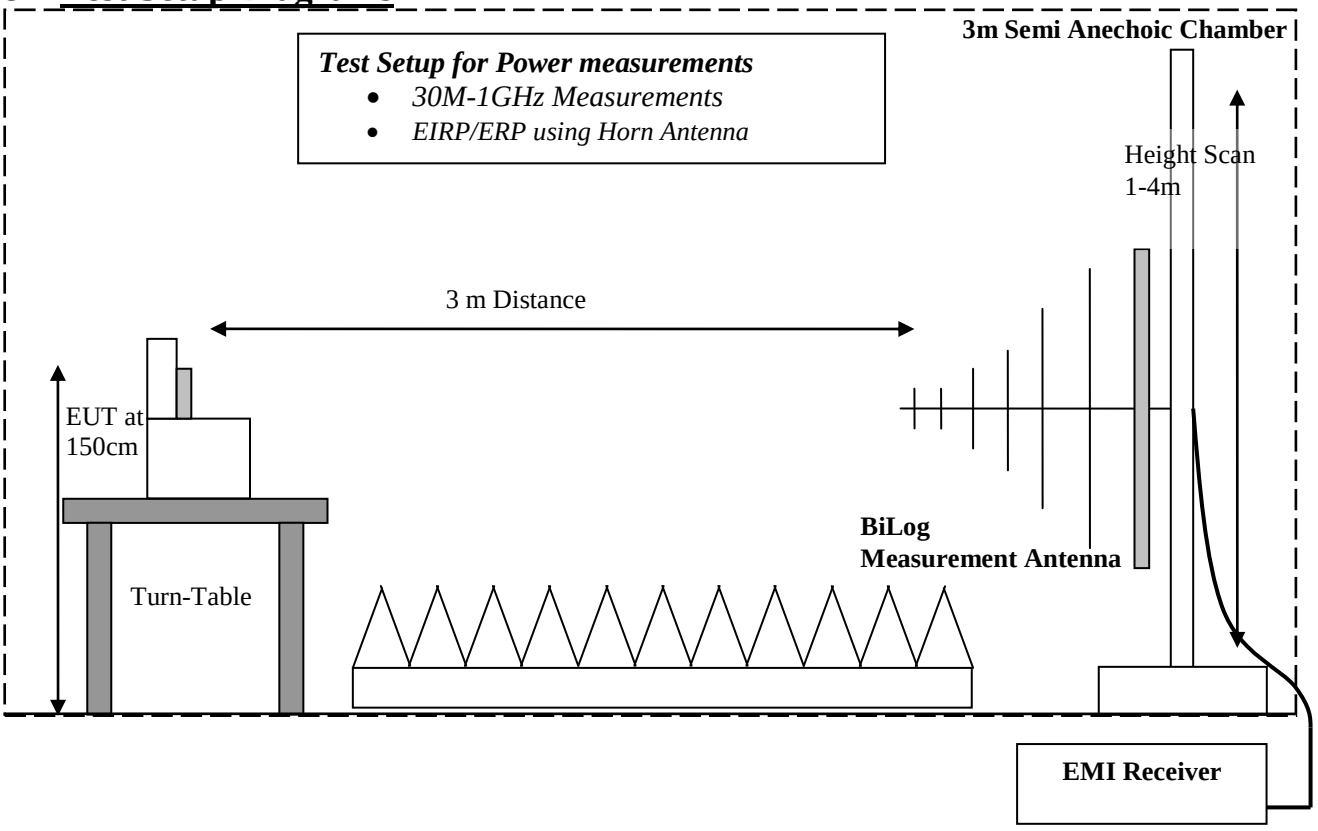
Note: Worst case representation for all channels of operation in band.

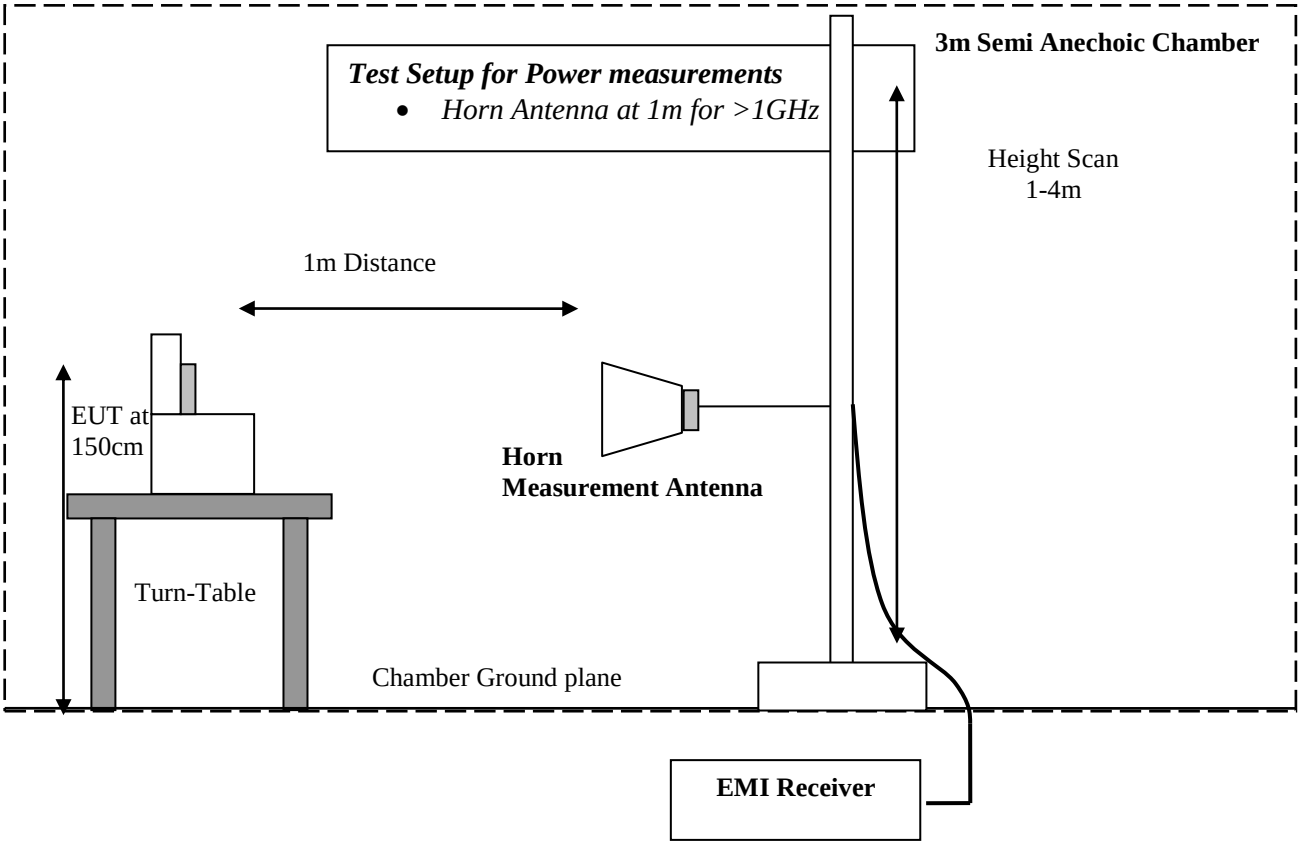


7 Test Equipment and Ancillaries used for tests

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	ESU 40	Rohde & Schwarz	100251	Aug 2012	2 Years
Spectrum Analyzer	FSU	Rohde & Schwarz	200302	May 2011	2 Years
Loop Antenna	6512	EMCO	00049838	Apr 2012	3 years
Biconilog Antenna	3141	EMCO	0005-1186	Mar 2012	3 years
Horn Antenna (1-18GHz)	3115	ETS	00035111	Mar 2012	3 years
Horn Antenna (1-18GHz)	3115	ETS	00035114	Apr 2012	3 years
Horn Antenna (18-40GHz)	3116	ETS	00070497	Aug 2011	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	
LISN	50-25-2-08	FCC	08014	Jan 2012	1 year
Power Smart Sensor	R&S	NRP-Z81	100161	May 2011	2 Years
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	Apr 2013	1 Year
Temp Hum Logger	TM325	Dickson	5285354	Apr 2013	1 Year

8 Test Setup Diagrams





9 Revision History

Date	Report Name	Changes to report	Report prepared by
2013-04-25	EMC_ITRO1-008-12001_WWAN	First Version	Daniel Salinas