FCC/IC Test Report

FOR:

Model Name: MTSMC-H4-MI-GP, MTSMC-H4-MI-IP, MTSMC-H4-GP, MTSMC-H4-IP, MTSMC-H4-U

Socket Modem iCell

FCC ID: AU792U10E06832
IC ID: 125A-0040

47 CFR Part 2, 22, 24

RSS-132 Issue 2

RSS-133 Issue 5

TEST REPORT #: EMC_Multi_045_10001_FCC_22_24_Rev1
DATE: 2010-08-23

ilac-MRA

A2LA ACCREDITED TESTING LABORATORY Certificate #2135.01

Bluetooth Qualification Test Facility (BQTF)

CTIA Authorized Test Lab LAB CODE 20020328-00

FCC listed: A2LA Accredited

IC recognized # 3462B-1

***CETECOM* Inc.**
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CETECOM Inc. is a Delaware Corporation with Corporation number: 2113686
Board of Directors: Dr. Harald Ansorge, Hans Peter May. Gerhard Schirra

Table of Contents

1 Assessment

The following is in compliance with 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.

Company	Description	Model #
Multi-Tech Systems Inc.	Socket Modem iCell	MTSMC-H4-MI-GP, MTSMC-H4-MI-IP, MTSMC-H4-GP, MTSMC-H4-IP, MTSMC-H4-U

Responsible for Testing Laboratory:

Date	Section	Name	Signature
2010-08-23	Compliance	Marc Douat (Test Lab Manager)	

Responsible for the Report:

Date	Section	Name	Signature
2010-08-23	Compliance	Sajay Jose (EMC Engineer)	

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the EMC 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 Director:	Heiko Strehlow
Responsible Project Leader:	David Ahn

2.2 Identification of the Client

Applicant's Name:	Multi-Tech Systems Inc.
Street Address:	2205 Woodale Drive
City/Zip Code	Mounds View 55112
Country	USA
Contact Person:	Thomas Hofstede
Phone No.	763.717.5505
Fax:	763.717.5814
e-mail:	thofstede@multitech.com

2.3 Identification of the Manufacturer

Manufacturer's Name:	Same as above.
Manufacturers Address:	
City/Zip Code	
Country	

3 Equipment under Test (EUT)

3.1 Specification of the Equipment under Test

Marketing Name:	Socket Modem
Model No:	MTSMC-H4-MI-GP
Product Type:	HSPA embedded cellular modem incl. GPS daughter card and Universal IP stack/processor with USB interface from IP processor
Hardware Revision :	0
Software Revision :	K2.0.7.24B
FCC-ID:	AU792U10E06832
IC-ID :	125A-0040
Frequency:	GSM 850: 824.2-848.8MHz; PCS 1900: 1850.2-1909.8MHz FDD V: 826.4-846.6MHz; FDD II: 1852.4-1907.6MHz
Type(s) of Modulation:	GMSK; 8-PSK; QPSK; 16QAM
Number of channels:	GSM850: 125 and PCS 1900: 300 FDD II: 278/ FDD V: 103
Modem:	Sierra Wireless MC8790V (PCI Express Mini) HW Version: 1.0 SW Version: K2.0.7.24B
Antenna Type:	External
Power Supply:	Using developer board: 9V DC Operating voltage: 5V DC
Temperature Range:	-30 to 75 C

3.2 Identification of the Equipment Under Test (EUT)

EUT #	Serial Number	Modem	HW Status	SW Status
1	50840025K	MTSMC-H4-MI-GP	0	K2.0.7.24B
2	50840022K	MTSMC-H4-MI-GP	0	K2.0.7.24B

3.3 Identification of Accessory equipment

AE #	Type	Manufacturer	Model	Serial Number
1	Developer Board	Multi-Tech	MTSMI-UDK	14365836
2	Developer Board	Multi-Tech	MTSMI-UDK	14365837
3	AC Adapter	Globteck Inc.	GT-41052-1059	01006620L

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
- RSS 132- Issue 2: 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 5: Spectrum management and telecommunication policy- Radio Standards Specifications- 2GHz personal communication services

Testing was only performed on MTSMC-H4-MI-GP as it is the fully loaded model with all the functionality of each device in the product family. The radio module is the same on all the variants. The functionality of other models in the family are listed below-

Model	Functionality	Comment of change
MTSMC-H4-MI-GP	HSPA, Serial and USB interface, GPIO, IP Stack and GPS	Base or Parent model
MTSMC-H4-MI-IP	HSPA, Serial and USB interface, GPIO and IP Stack.	1. The GPS module is not integrated.
MTSMC-H4-GP	HSPA, Serial interface, IP Stack and GPS	1. No USB interface. 2. GPIO interface pins are removed.
MTSMC-H4-IP	HSPA, Serial interface, IP Stack	1. No USB interface. 2. GPIO interface pins are removed. 3. The GPS module is not integrated.
MTSMC-H4-U	HSPA and USB interface	1. No Serial interface. 2. GPIO interface pins are removed. 3. IP stack is not integrated.. 4. The GPS module is not integrated.

Only radiated testing is performed on this product. Conducted measurements are derived from the certified module test report (FCC ID: N7NMC8790 and IC ID: 2417C-MC8790).

5 Measurements

5.1 RF Power Output

5.1.1 References

FCC: CFR Part 2.1046, CFR Part 22.913, CFR Part 24.232
IC: RSS-Gen Section 4.8; RSS 132 Section 4.4; RSS 133 Section 6.4

5.1.2 Measurement requirements:

5.1.2.1 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.

5.1.2.2 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.

5.1.3 Limits:

5.1.3.1 FCC 22.913 (a) Effective radiated power limits.

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

5.1.3.2 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.

5.1.3.3 RSS-132 Section 4.4

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.

5.1.3.4 RSS-133 Section 6.4

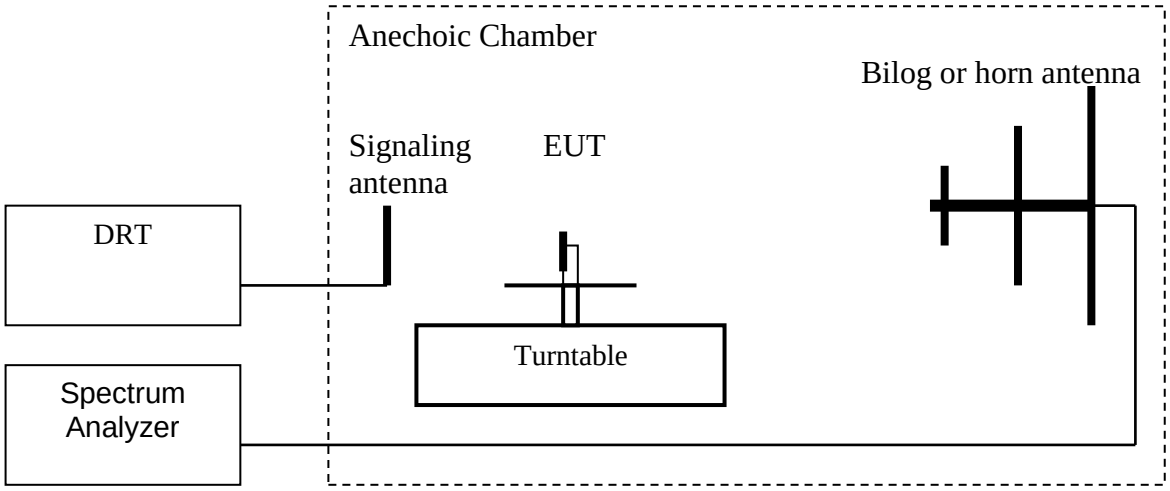
The average equivalent isotropically radiated power (e.i.r.p.) for transmitters shall not exceed the limits given in SRSP-510.
SRSP-510: Mobile stations and hand-held portables are limited to 2 watts maximum e.i.r.p.
In addition, when the transmitter power is measured in terms of average value, the peak-to-average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

5.1.4 Test Results:

Conducted output power is derived from the certified module test report (FCC ID: N7NMC8790 and IC ID: 2417C-MC8790).

5.1.5 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.

Spectrum analyzer settings: RBW=VBW=5MHz
(**Note:** Steps 5 and 6 above are performed prior to testing and **LOSS** is recorded by test software. Steps 3, 4, 7 and 8 above are performed with test software.)

5.1.6 RF Power Output 850MHz band

Limit: FCC: Nominal Peak Output Power < 38.45 dBm (7W)
IC: Nominal Peak Output Power < 40.60 dBm (11.5W)
Measurement Uncertainty (Radiated): ±3.0 dB

GSM 850: GMSK Mode	
Frequency (MHz)	**Radiated Peak Power**
	ERP (dBm)
824.2	31.2
836.6	32.3
848.8	33.3

EGPRS 850: 8PSK Mode	
Frequency (MHz)	**Radiated Peak Power**
	ERP (dBm)
824.2	29.5
836.6	30.5
848.8	31.4

FDD V: UMTS Mode	
Frequency (MHz)	**Radiated Peak Power**
	ERP (dBm)
826.4	25.9
836.6	26.4
846.6	27.4

5.1.7 RF Power Output 1900MHz band

Limit: Nominal Peak Output Power < 33 dBm (2W)
PAR many not exceed 13dB
Measurement Uncertainty (Radiated): ±3.0 dB

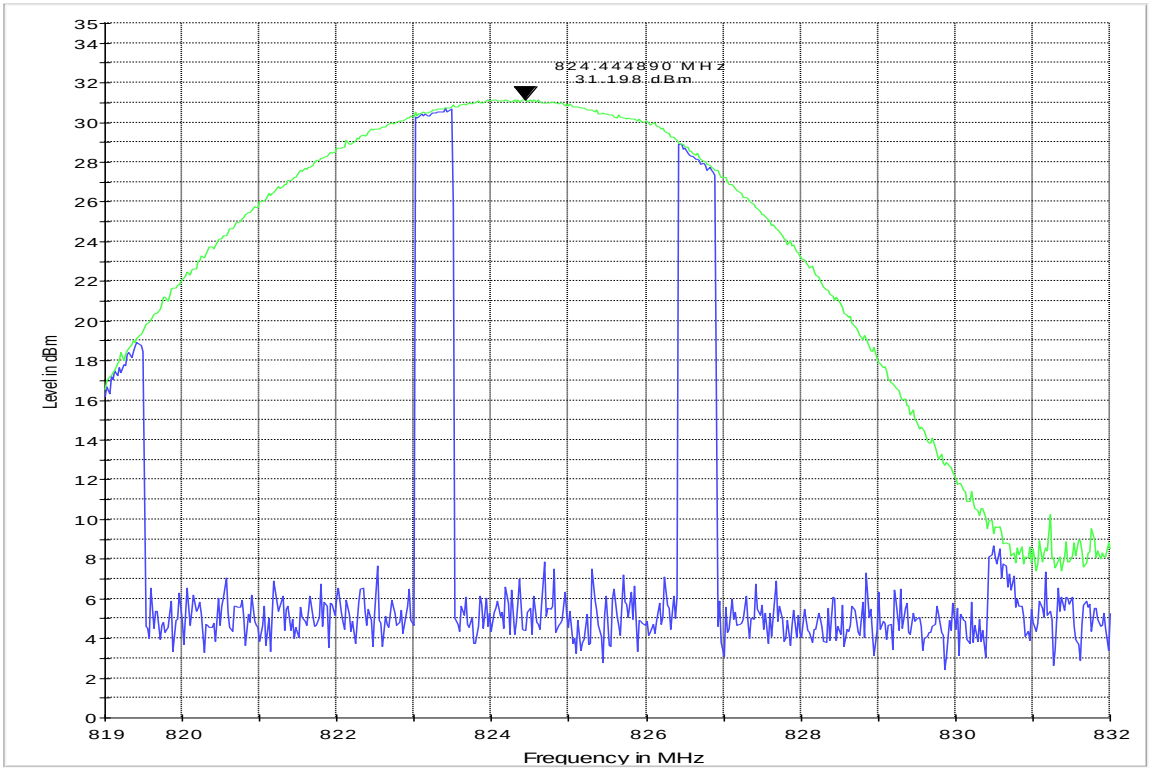
GSM 1900: GMSK Mode	
Frequency (MHz)	**Radiated Peak Power**
	EIRP (dBm)
1850.2	31.8
1880.0	30.8
1909.8	30.9

EGPRS 1900: 8PSK Mode	
Frequency (MHz)	**Radiated Peak Power**
	EIRP (dBm)
1850.2	31.5
1880.0	30.7
1909.8	30.7

FDD II: UMTS Mode	
Frequency (MHz)	**Radiated Peak Power**
	EIRP (dBm)
1852.4	29.3
1880.0	28.8
1907.6	28.5

5.1.8 Results

ERP (GSM 850) CHANNEL 128



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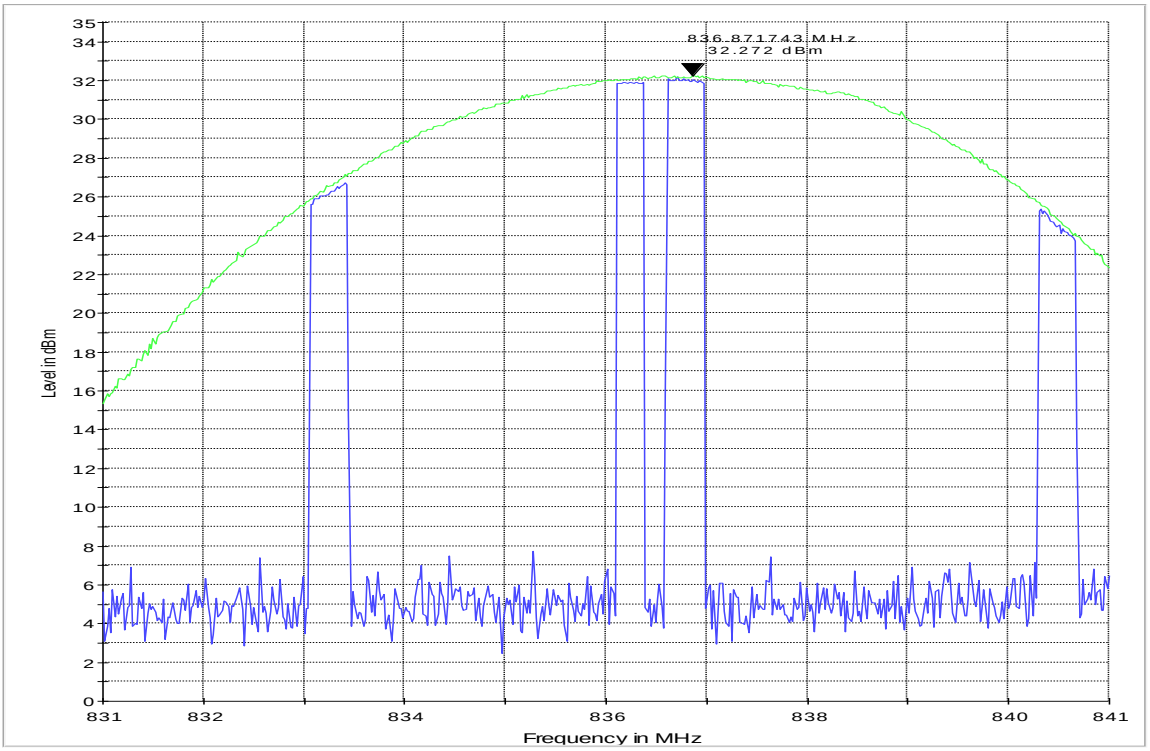

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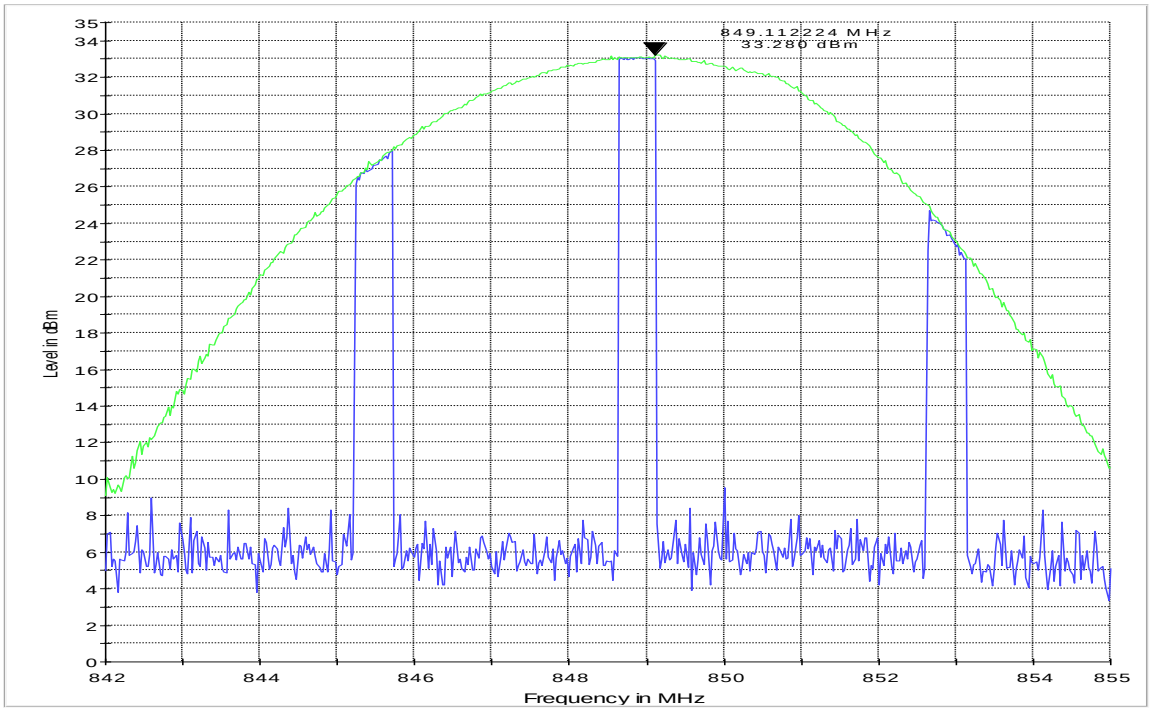

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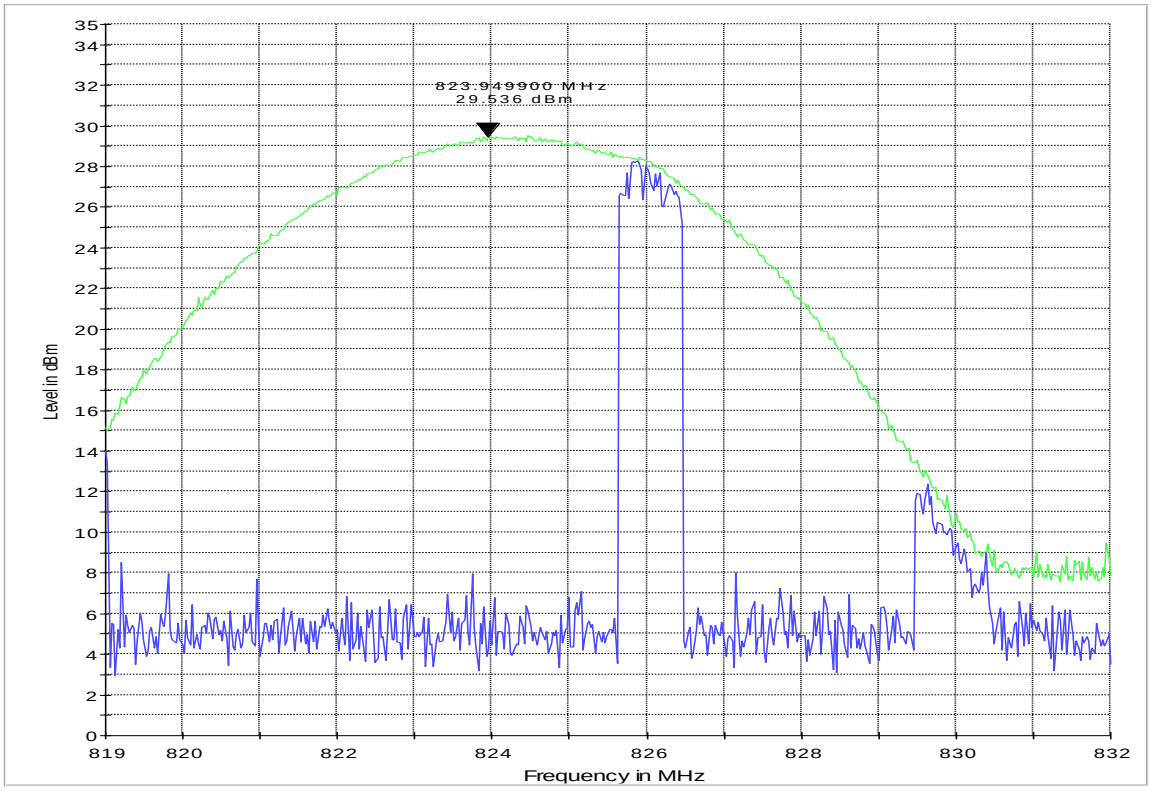

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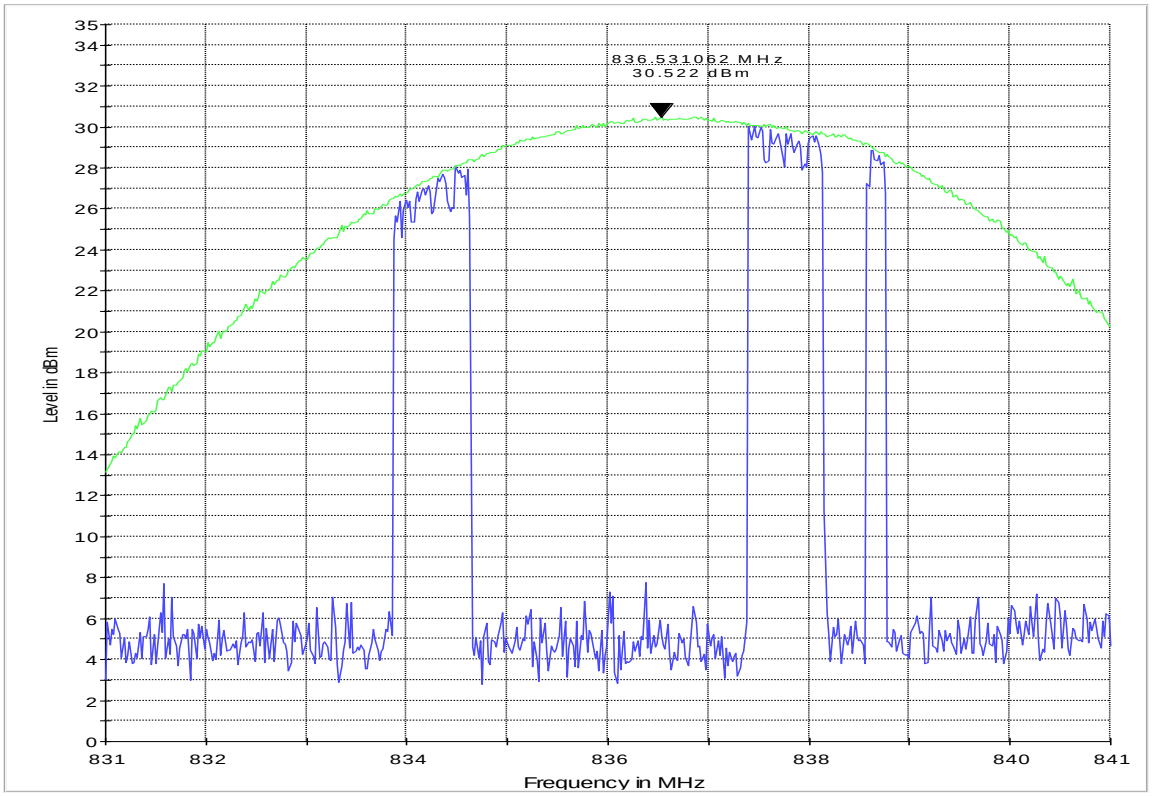

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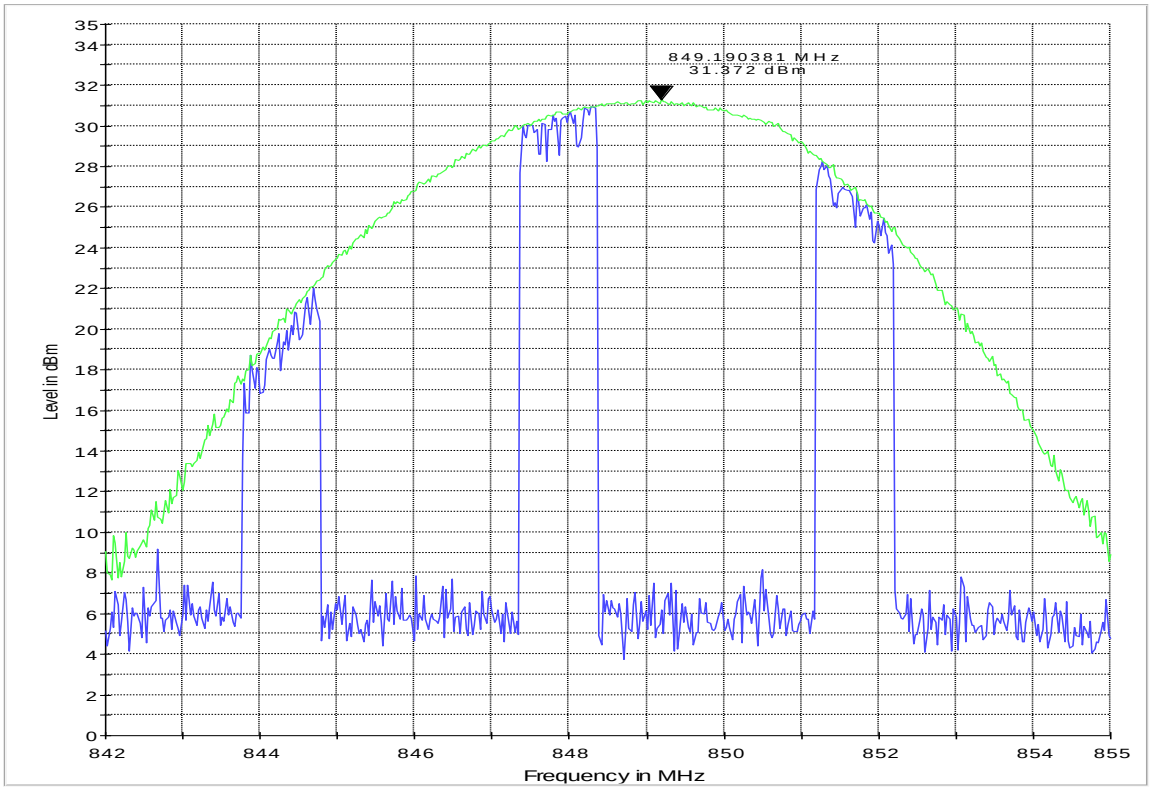
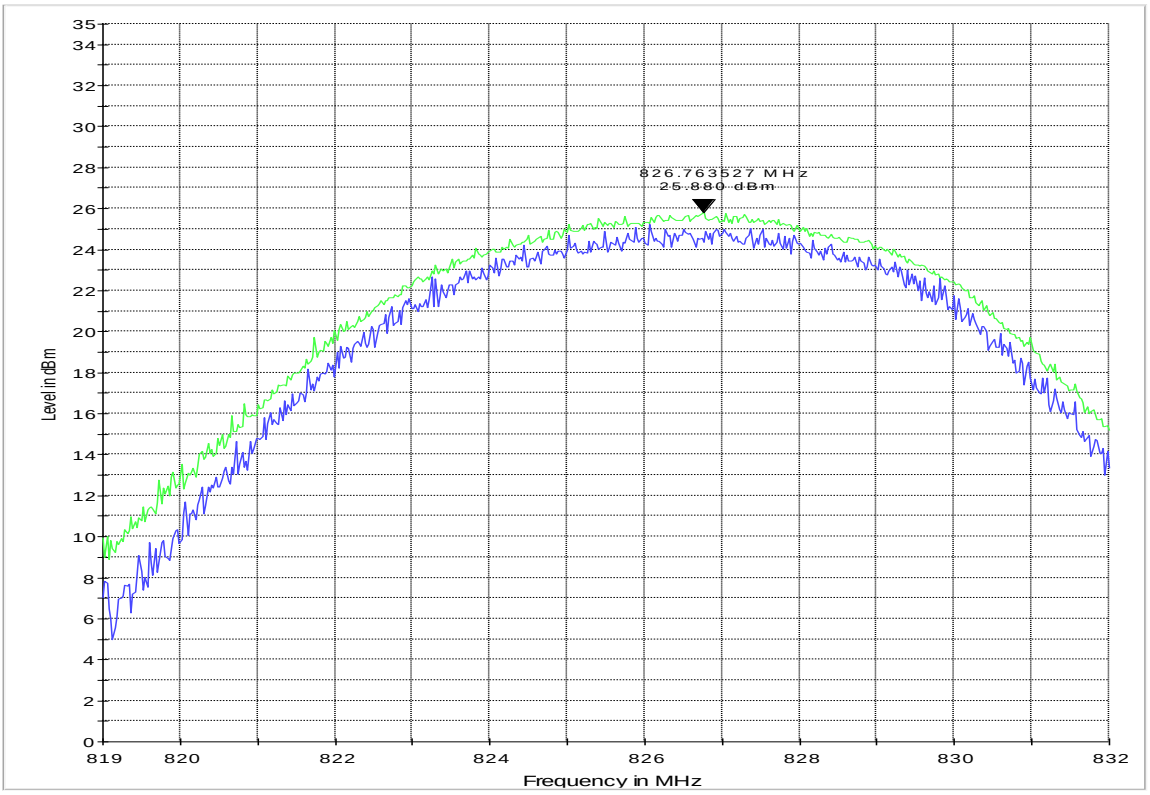
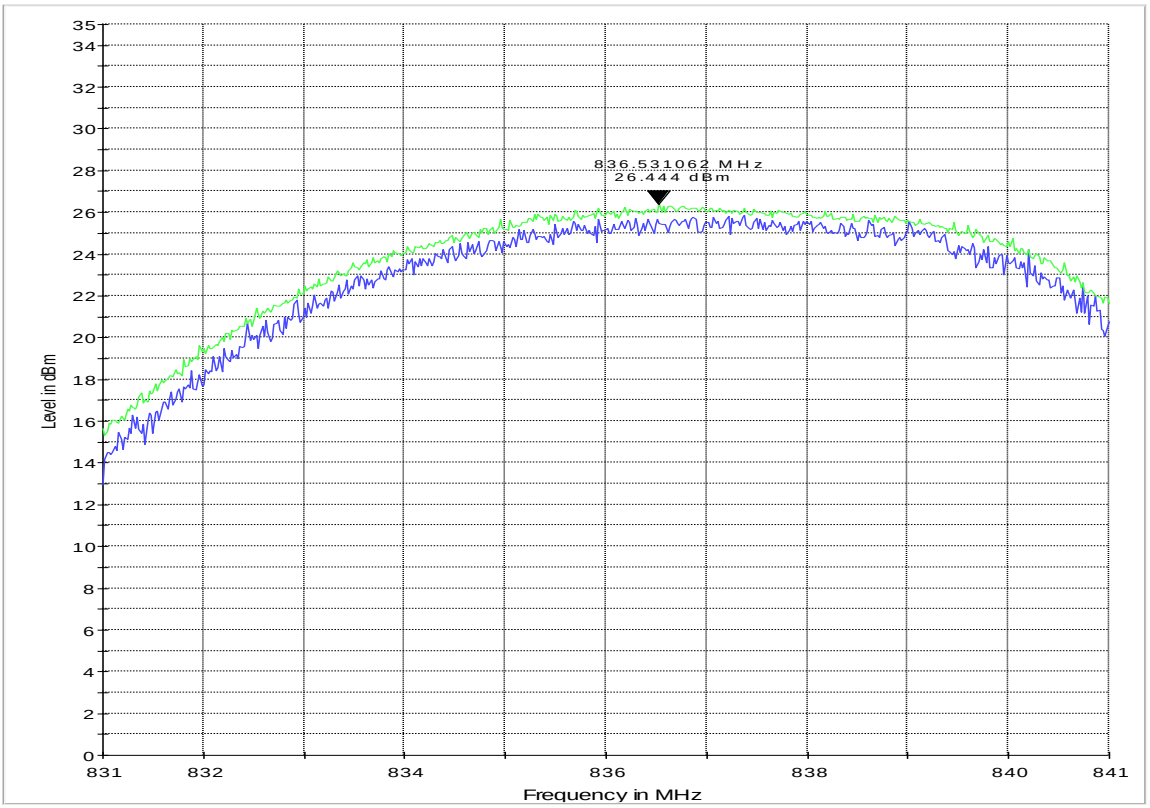


ERP (UMTS FDD5) CHANNEL 4132



ERP (UMTS FDD5) CHANNEL 4183



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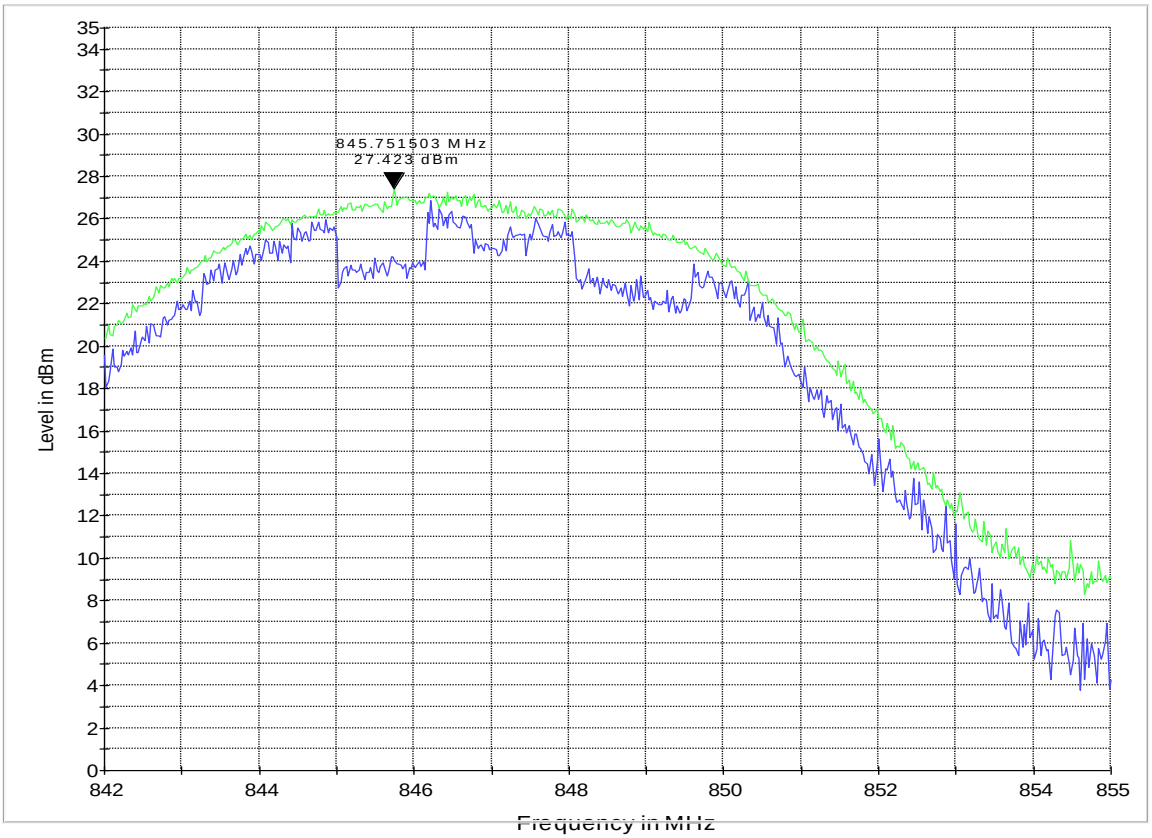
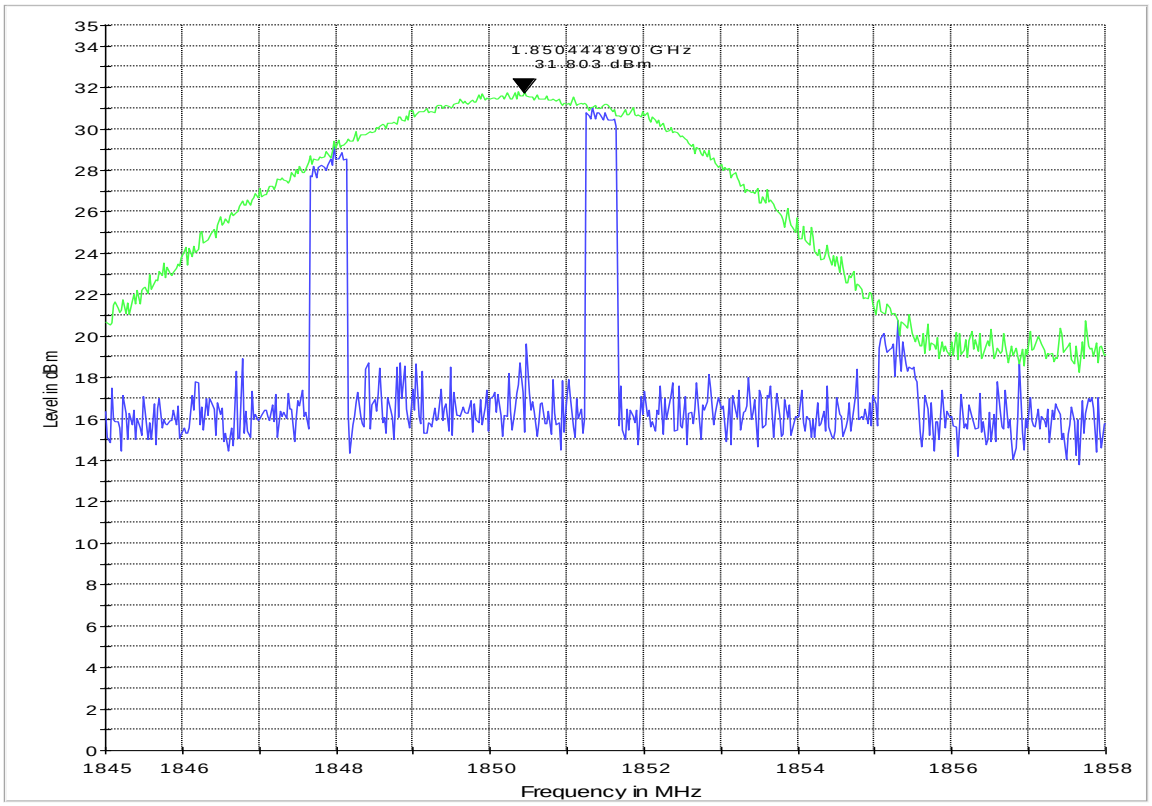
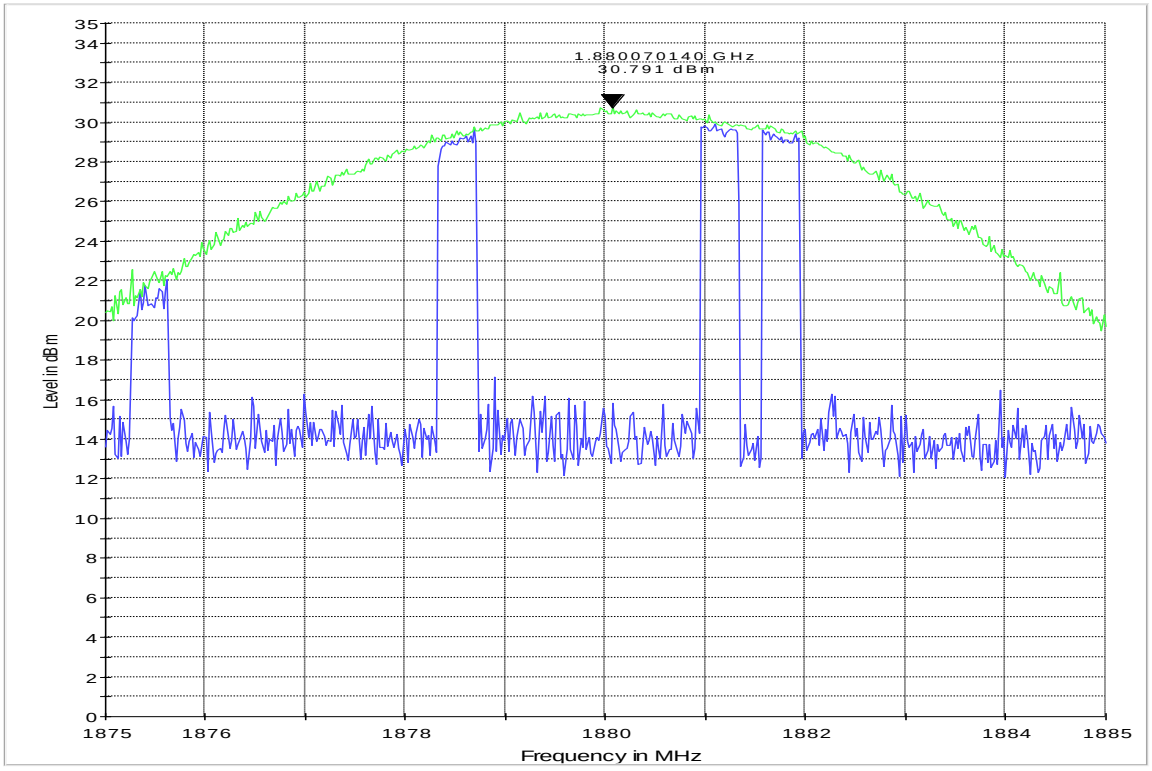


EIRP (PCS-1900) CHANNEL 512



EIRP (PCS-1900) CHANNEL 661



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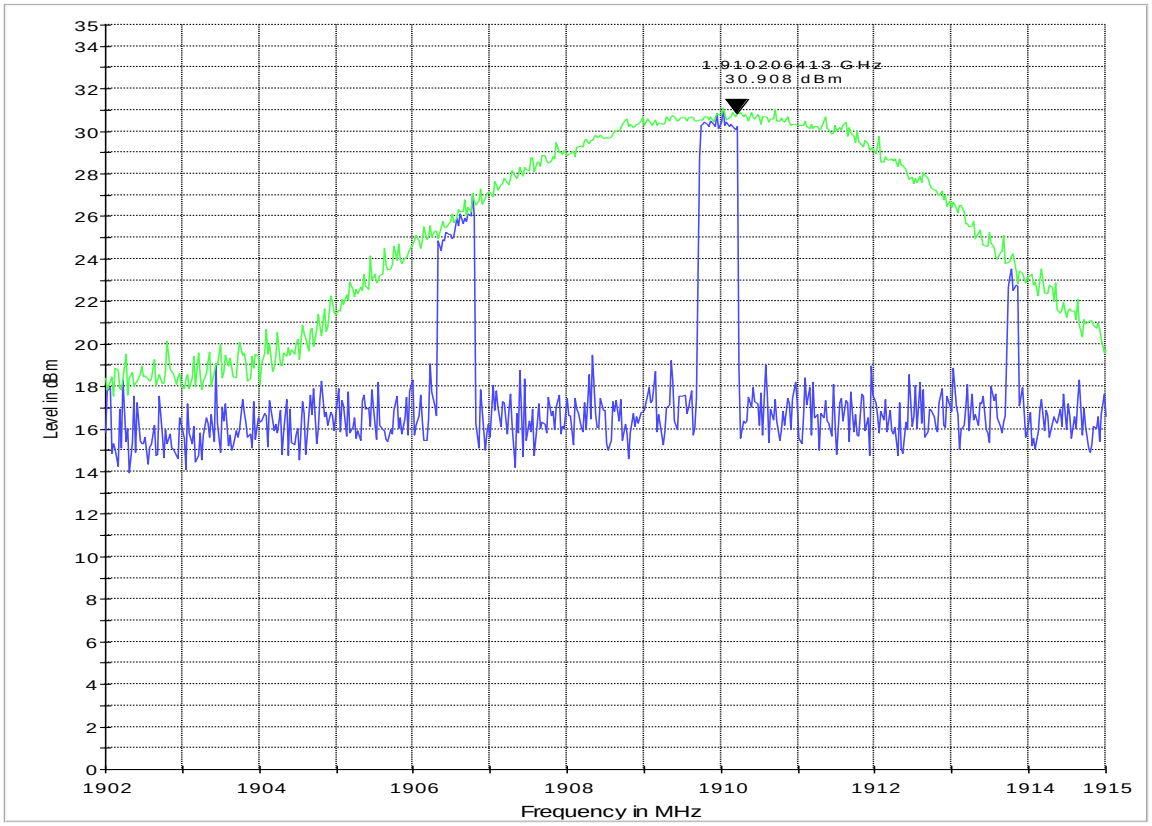
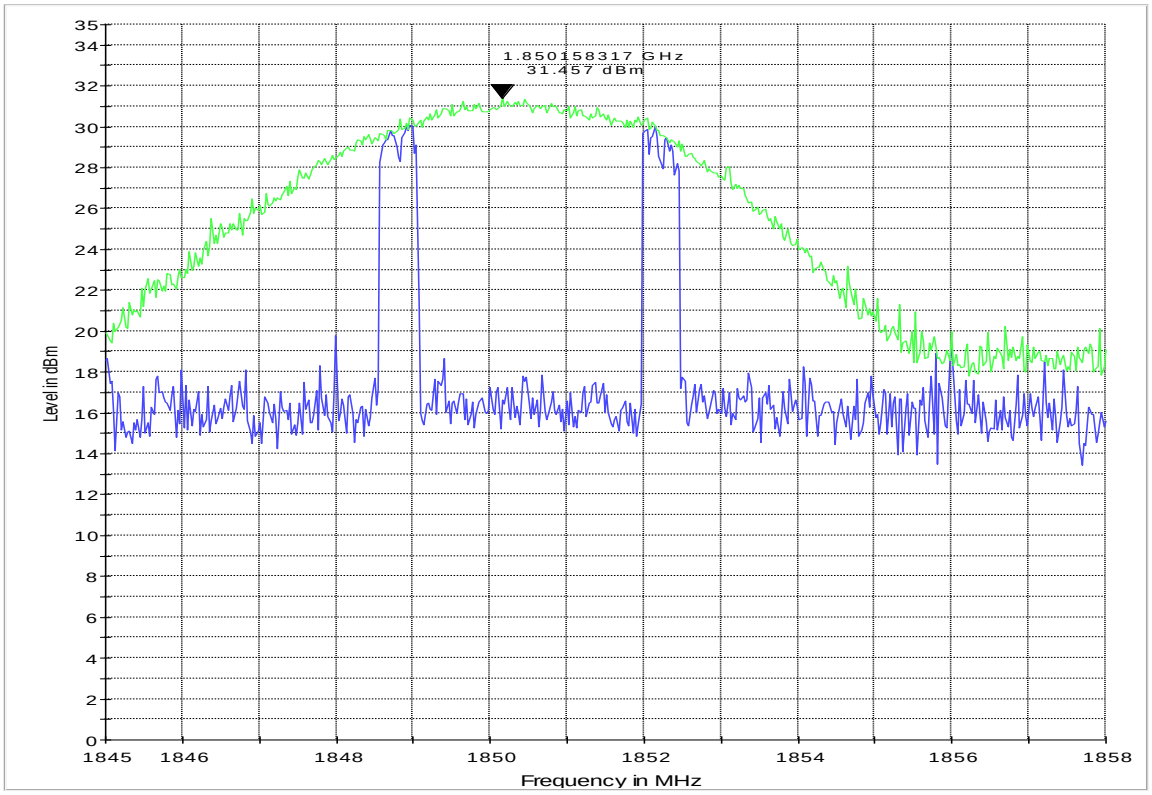


EIRP (EGPRS 1900) CHANNEL 512



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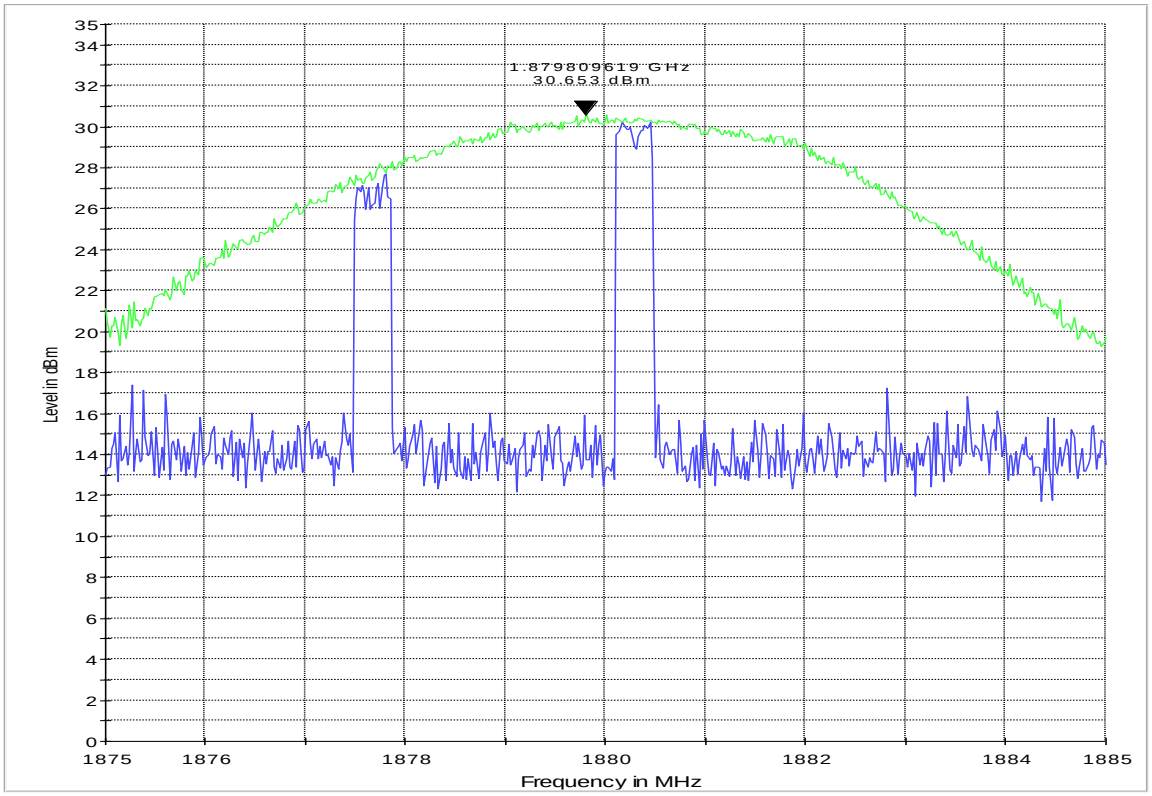

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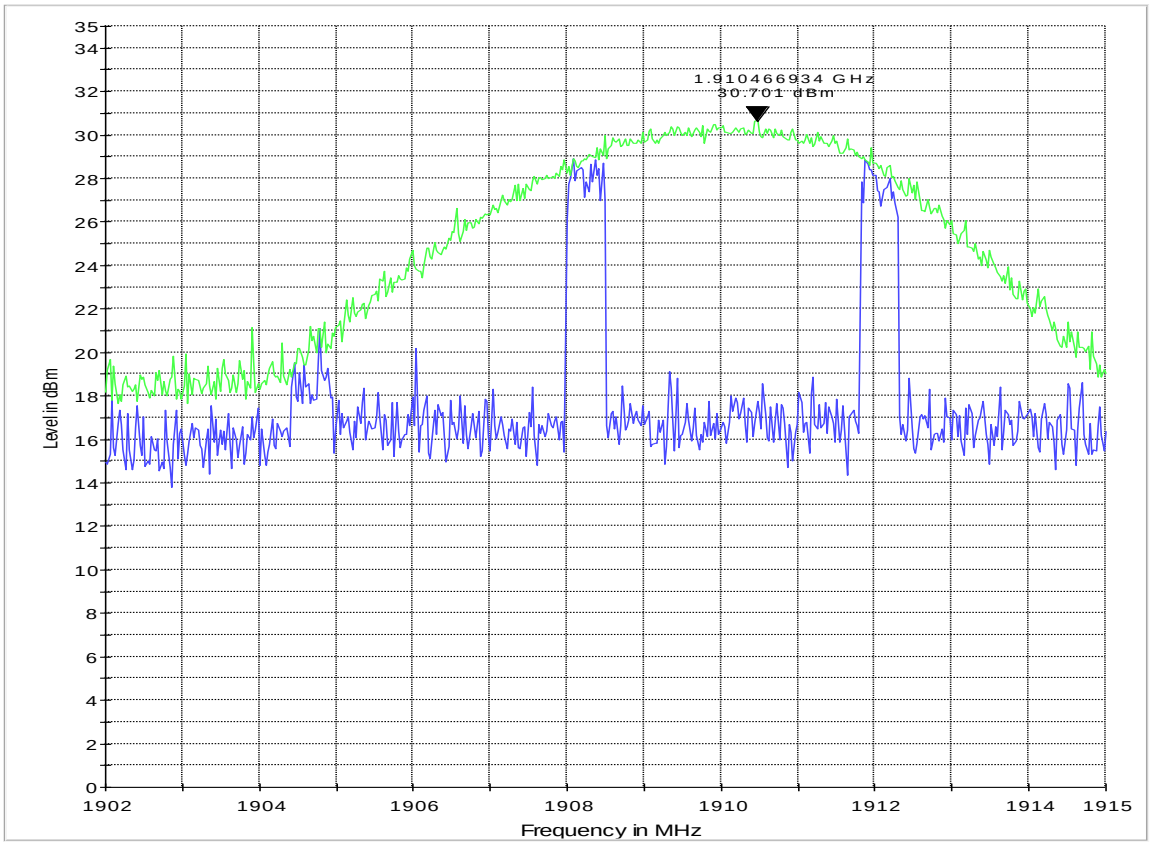
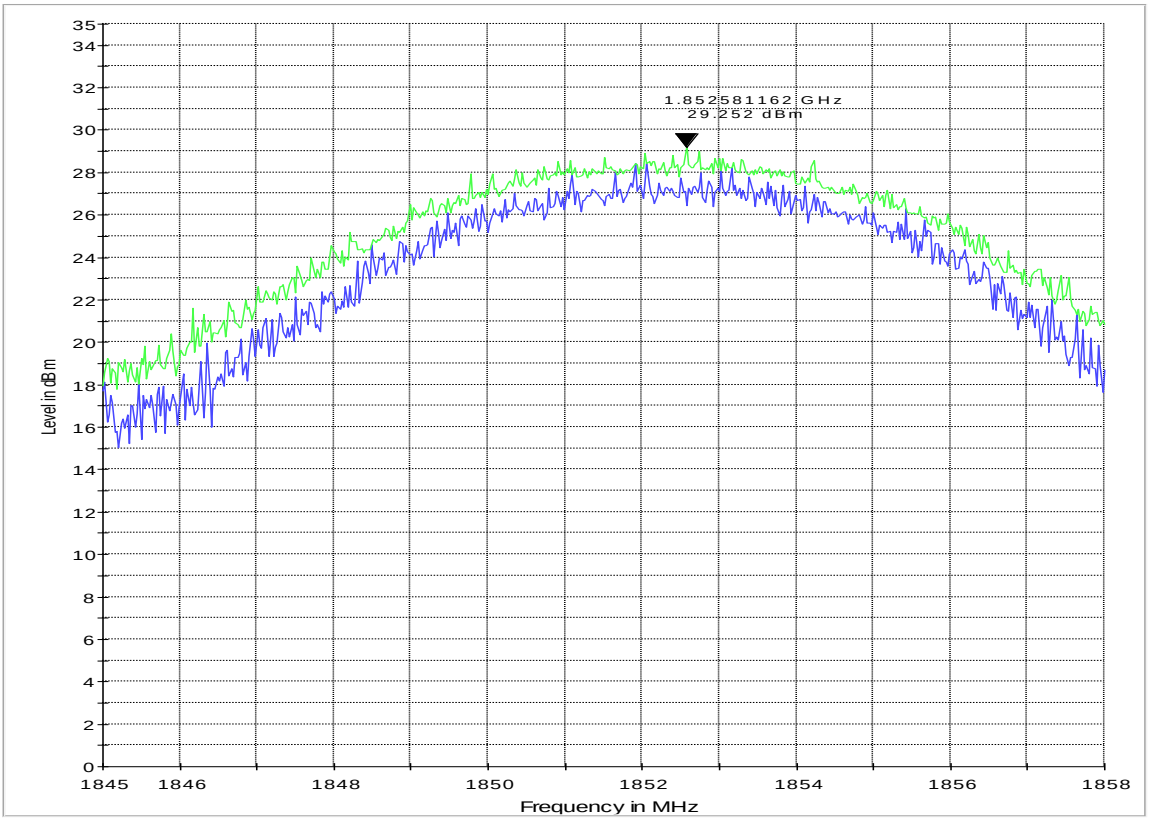


EIRP (UMTS FDD2) CHANNEL 9262



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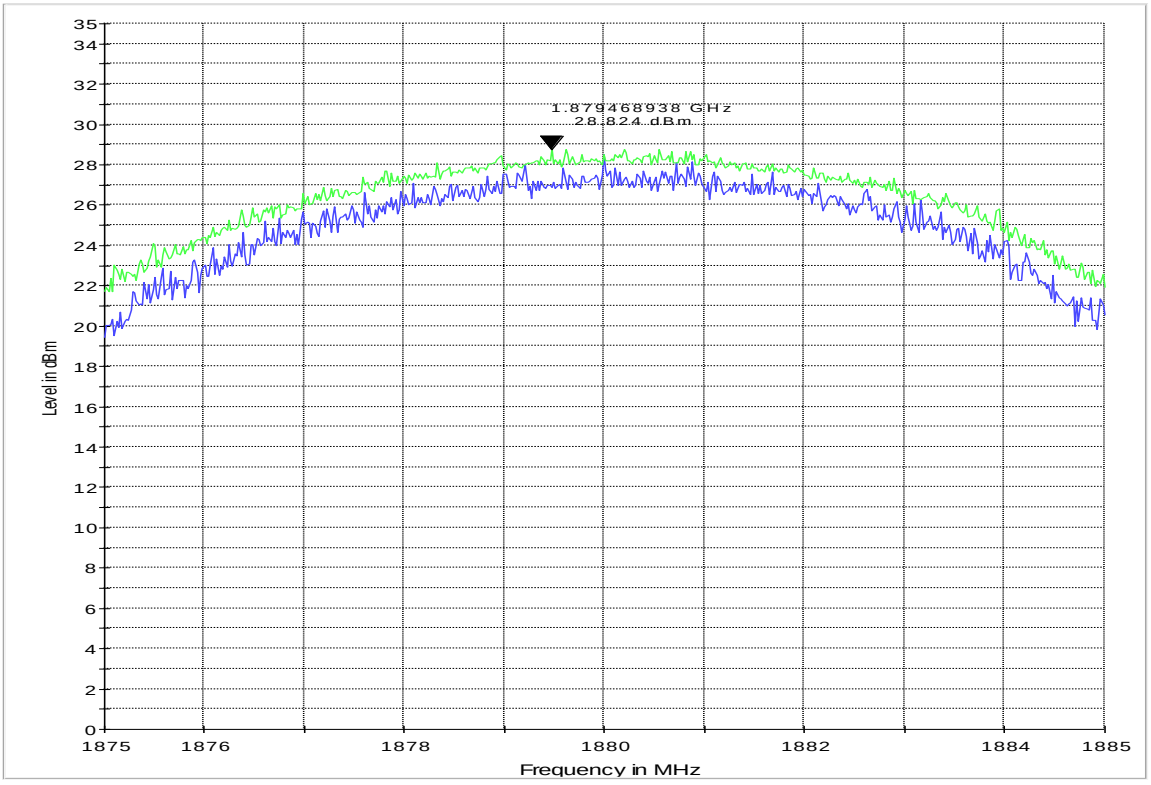

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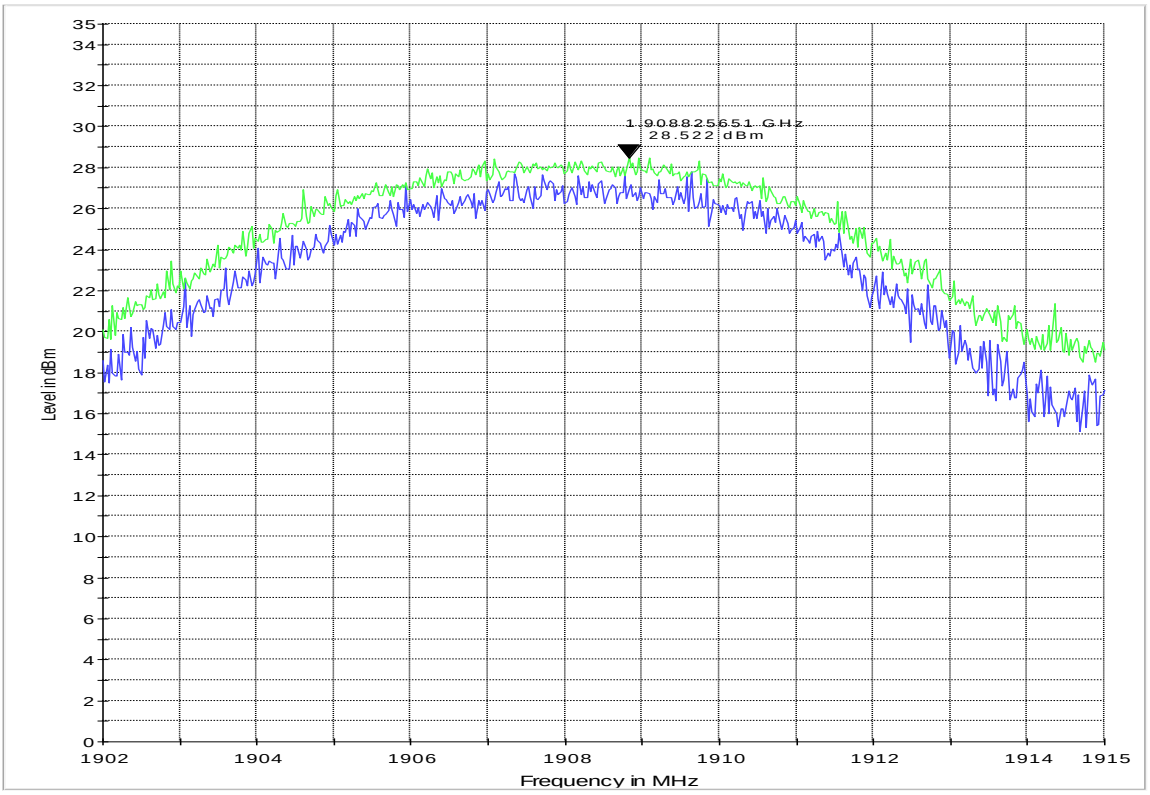


5.2 Occupied Bandwidth/Emission Bandwidth

5.2.1 References

FCC: CFR Part 2.1049, CFR Part 22.917, CFR Part 24.238
IC: RSS-Gen Section 4.6; RSS 132 Section 4.2; RSS 133 Section 6.2

5.2.2 Measurement requirements:

5.2.2.1 FCC 2.1049: Occupied bandwidth

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable.
(h) Transmitters employing digital modulation techniques-when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated.

5.2.2.2 RSS-Gen 4.6: Occupied bandwidth

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99 percent emission bandwidth, as calculated or measured. The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

5.2.3 Test Results:

Occupied bandwidth is derived from the certified module test report (FCC ID: N7NMC8790 and IC ID: 2417C-MC8790).

5.3 Frequency Stability

5.3.1 References

FCC: CFR Part 2.1055, CFR Part 22.355, CFR Part 24.235
IC: RSS-Gen Section 4.7; RSS 132 Section 4.3; RSS 133 Section 6.3

5.3.2 Measurement requirements:

5.3.2.1 Frequency Stability

Frequency stability is a measure of frequency drift due to temperature and supply voltage variations with reference to the frequency measured at an appropriate reference temperature and the rated supply voltage.
A hand-held device that is only capable of operating using internal batteries shall be tested using a new battery without any further requirement to vary the supply voltage. Alternatively, an external supply voltage can be used and set at the battery nominal voltage, and again at the battery operating end point voltage which shall be specified by the equipment manufacturer.

5.3.3 Test Results:

Frequency stability results are derived from the certified module test report (FCC ID: N7NMC8790 and IC ID: 2417C-MC8790).

5.4 Conducted Spurious Emissions

5.4.1 References

FCC: CFR Part 2.1051, CFR Part 22.917, CFR Part 24.238
IC: RSS-Gen Section 4.9; RSS 132 Section 4.5; RSS 133 Section 6.5

5.4.2 Measurement requirements:

5.4.2.1 FCC 2.1051: Spurious emissions at antenna terminals.

The radio frequency voltage or power generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in FCC 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

5.4.2.2 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.

5.4.3 Test Results:

Conducted spurious emissions test results are derived from the certified module test report (FCC ID: N7NMC8790 and IC ID: 2417C-MC8790).

5.5 Spurious Emissions Radiated

5.5.1 References

FCC: CFR Part 2.1053, CFR Part 22.917, CFR Part 24.238
IC: RSS-Gen Section 4.9; RSS 132 Section 4.5; RSS 133 Section 6.5

5.5.2 Measurement requirements:

5.5.2.1 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.

5.5.2.2 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.

5.5.3 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.

5.5.3.1 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.

5.5.3.2 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

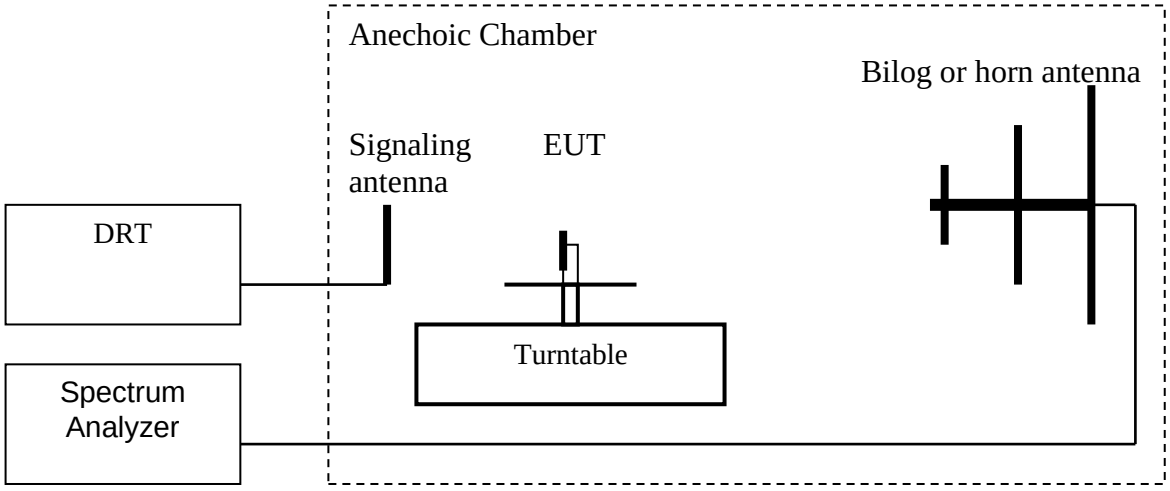
improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 100 kHz of 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

5.5.3.3 RSS-132 Section 4.5.1.1 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.

5.5.4 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.)

Spectrum analyzer settings: RBW=VBW=1MHz

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 GSM-850 & PCS-1900 bands. 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 only with Circuit Switched mode GMSK modulation because this mode represents the worse case emission for all the modulations for GSM. 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.

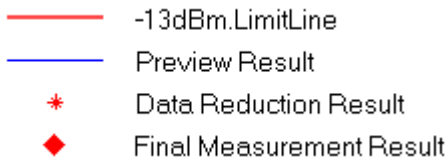
Radiated emissions measurements were made also with UMTS FDD mode.

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

5.5.5.1 Test Results Transmitter Spurious Emission GSM850:

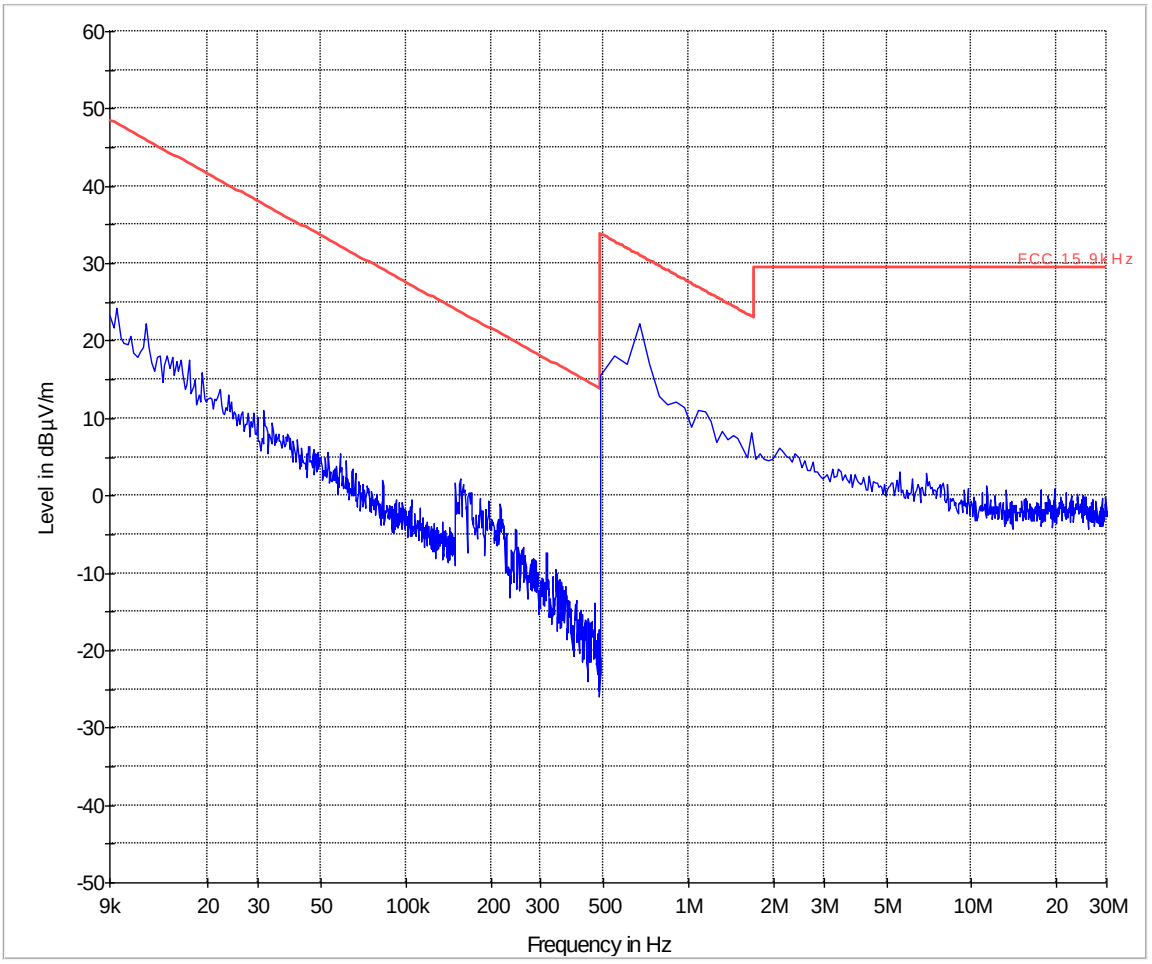
Harmonic	Tx ch-128 Freq. (MHz)	Level (dBm)	Tx ch-190 Freq. (MHz)	Level (dBm)	Tx ch-251 Freq. (MHz)	Level (dBm)
1	**824.2**	-	**836.6**	-	**848.8**	-
2	**1648.4**	NF	**1673.2**	NF	**1697.6**	NF
3	**2472.6**	NF	**2509.8**	NF	**2546.4**	NF
4	**3296.8**	NF	**3346.4**	NF	**3395.2**	NF
5	**4121**	NF	**4183**	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						

Legend for the plots:



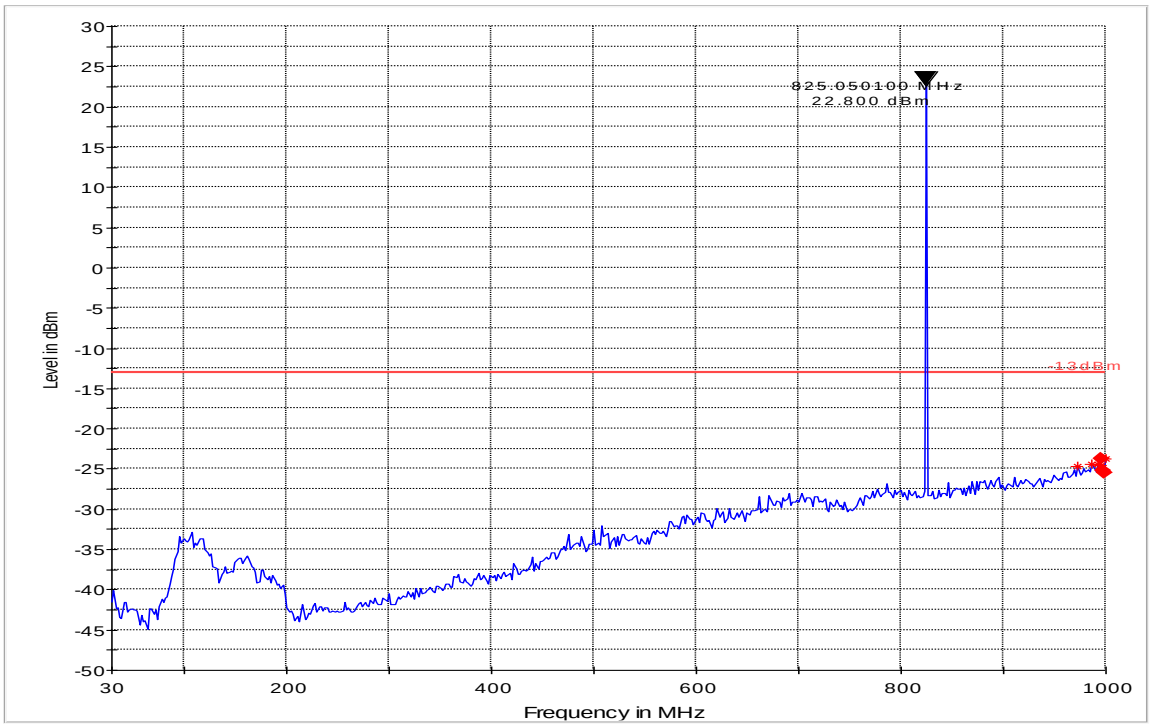
Radiated Spurious Emissions (GSM-850) Tx: Low Channel

Test results <30MHz (Worst case representation for all channels and bands)

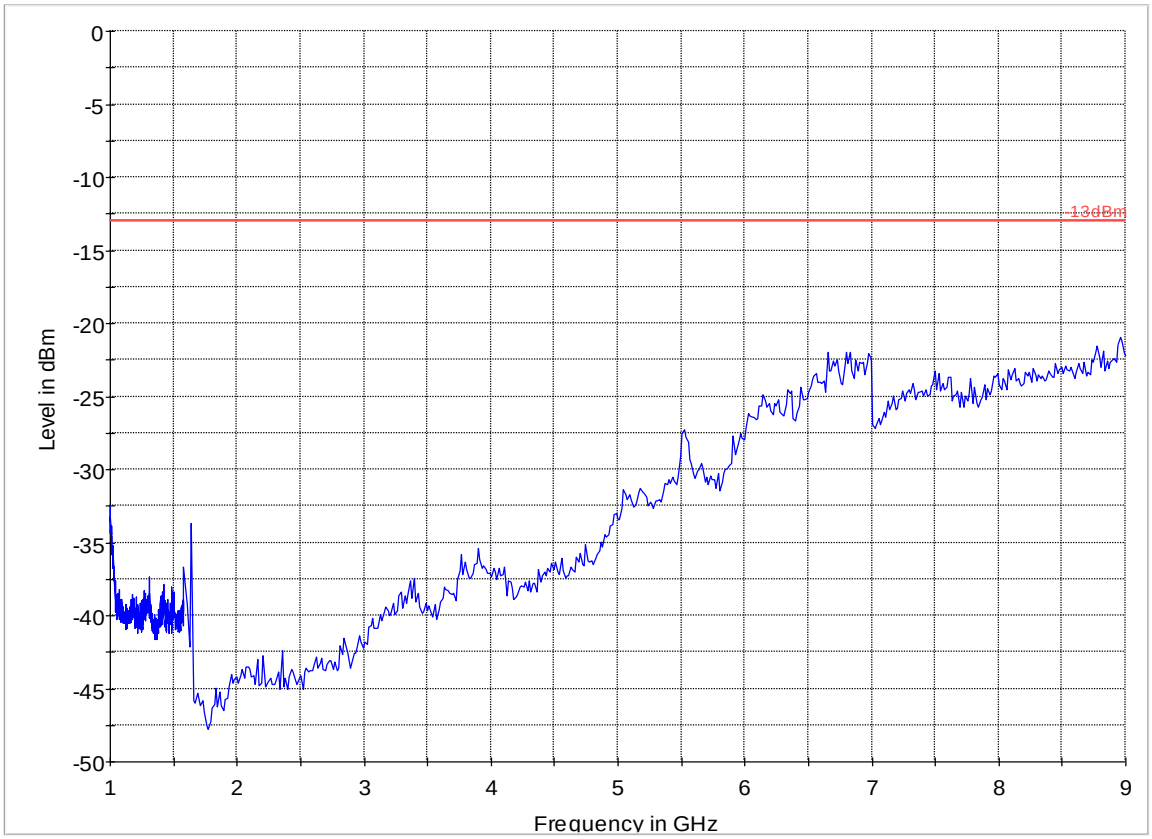


Radiated Spurious Emissions (GSM-850) Tx: Low Channel

Test results 30M-1GHz

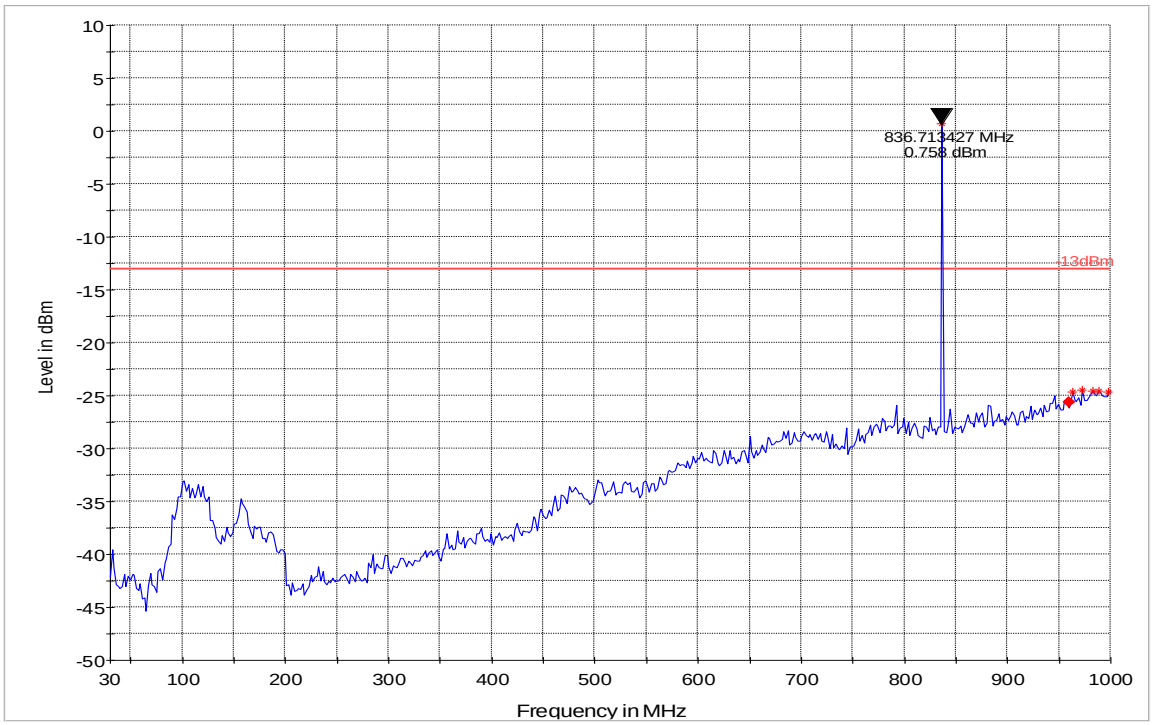


Test results 1GHz-9GHz

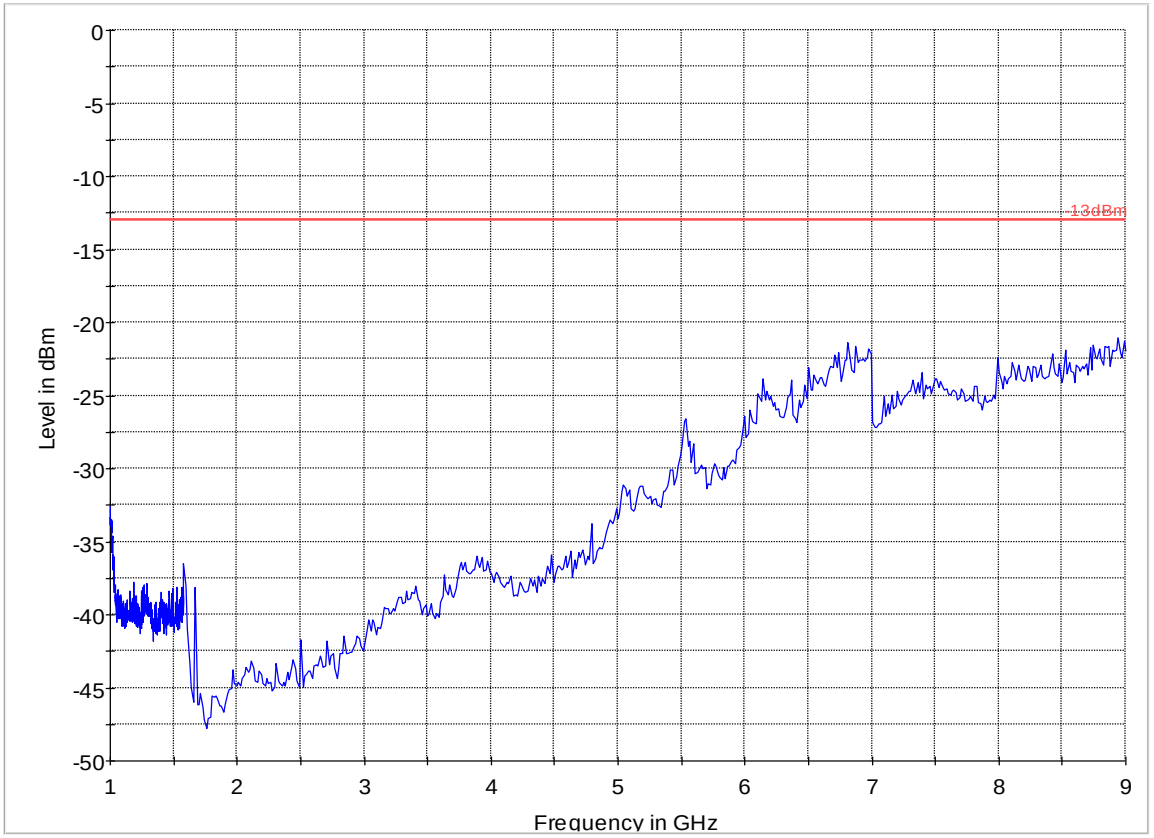


Radiated Spurious Emissions (GSM-850) Tx: Mid Channel

Test results 30M-1GHz

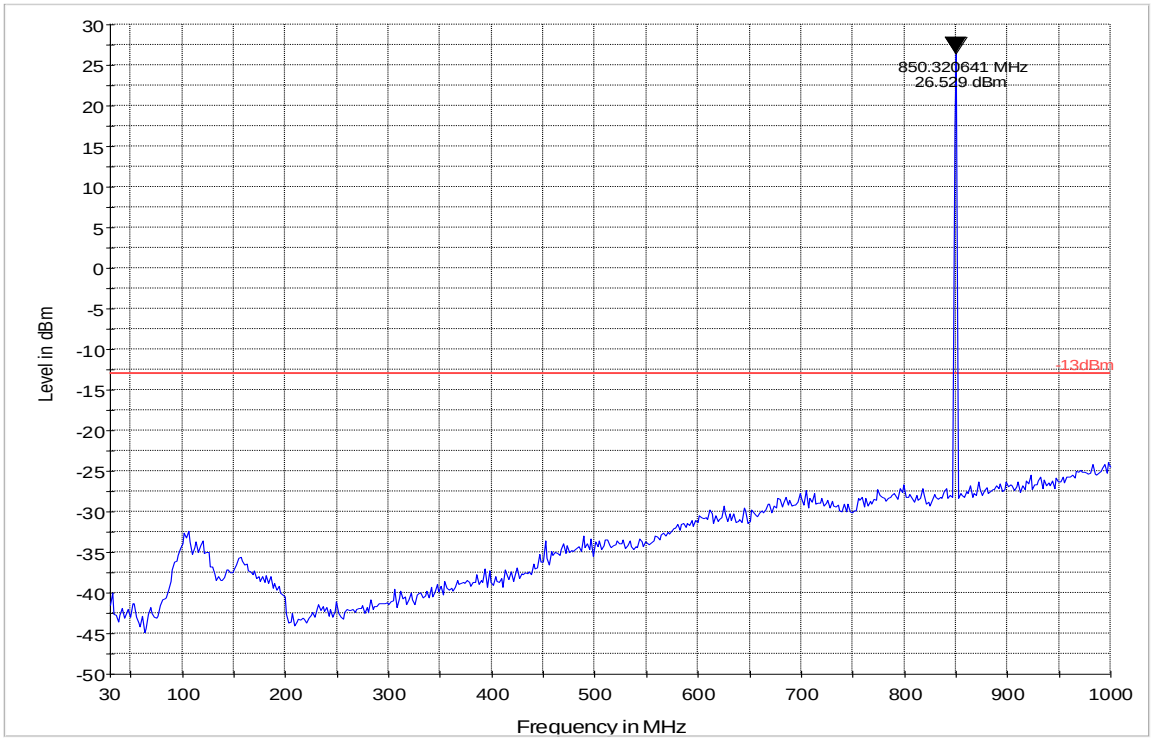


Test results 1GHz-9GHz

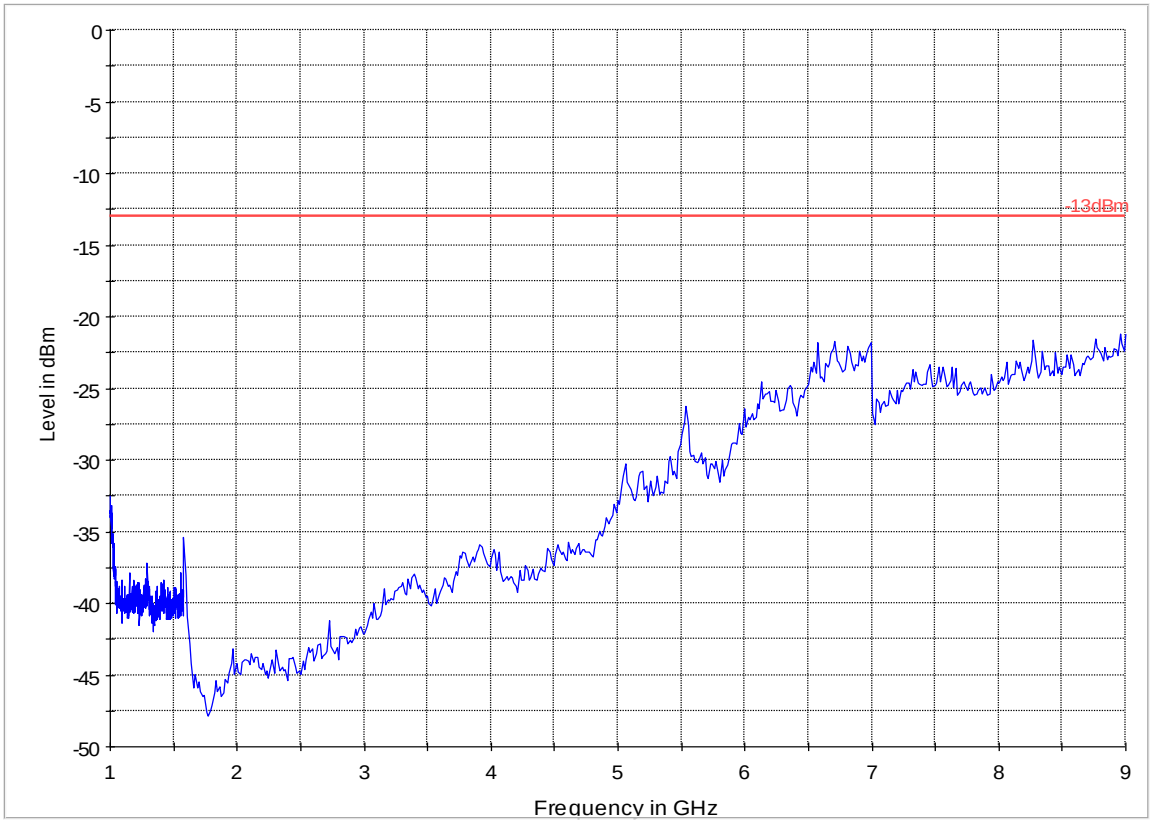


Radiated Spurious Emissions (GSM-850) Tx: High Channel

Test results 30M-1GHz



Test results 1GHz-9GHz



5.5.5.2 Test Results Transmitter Spurious Emission UMTS FDDV

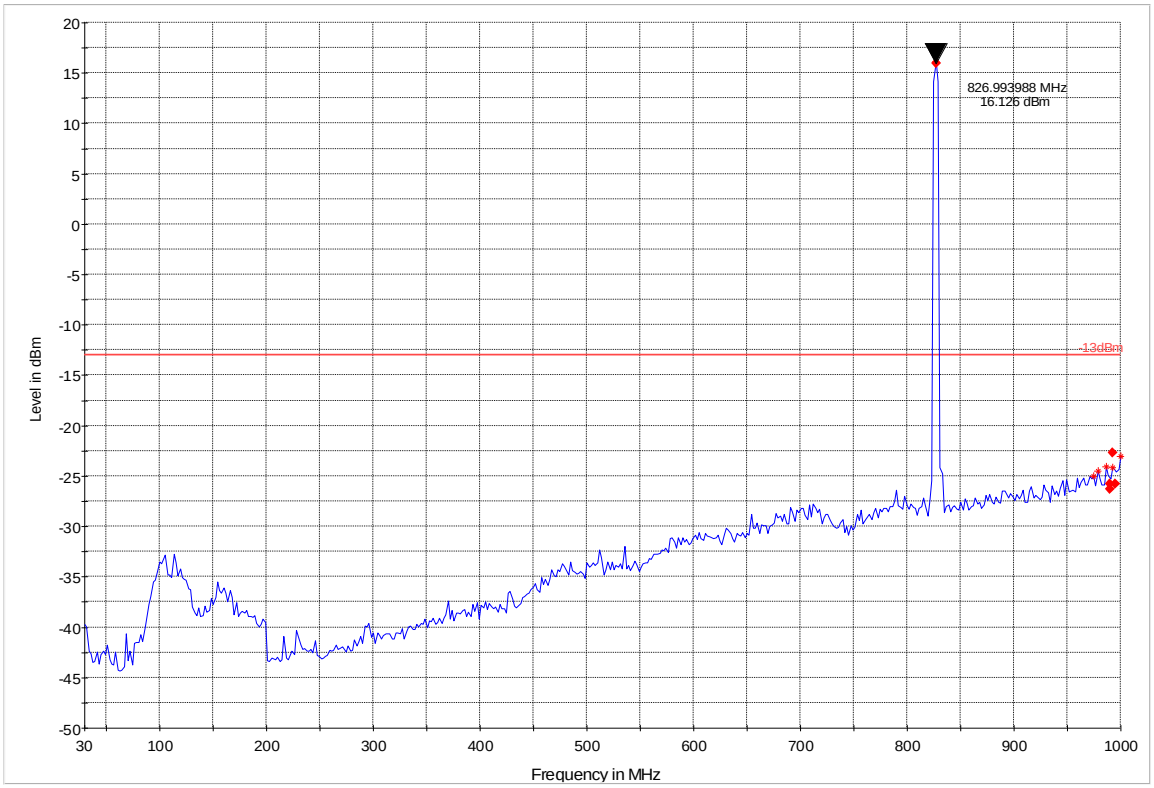
Harmonic	Tx ch-4132 Freq. (MHz)	Level (dBm)	Tx ch-4183 Freq. (MHz)	Level (dBm)	Tx ch-4233 Freq. (MHz)	Level (dBm)
1	**826.4**	-	**836.6**	-	**846.6**	-
2	**1652.8**	NF	**1673.2**	NF	**1693.2**	NF
3	**2479.2**	NF	**2509.8**	NF	**2539.8**	NF
4	**3305.6**	NF	**3346.4**	NF	**3386.4**	NF
5	**4132**	NF	**4183**	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						

Legend for the plots:

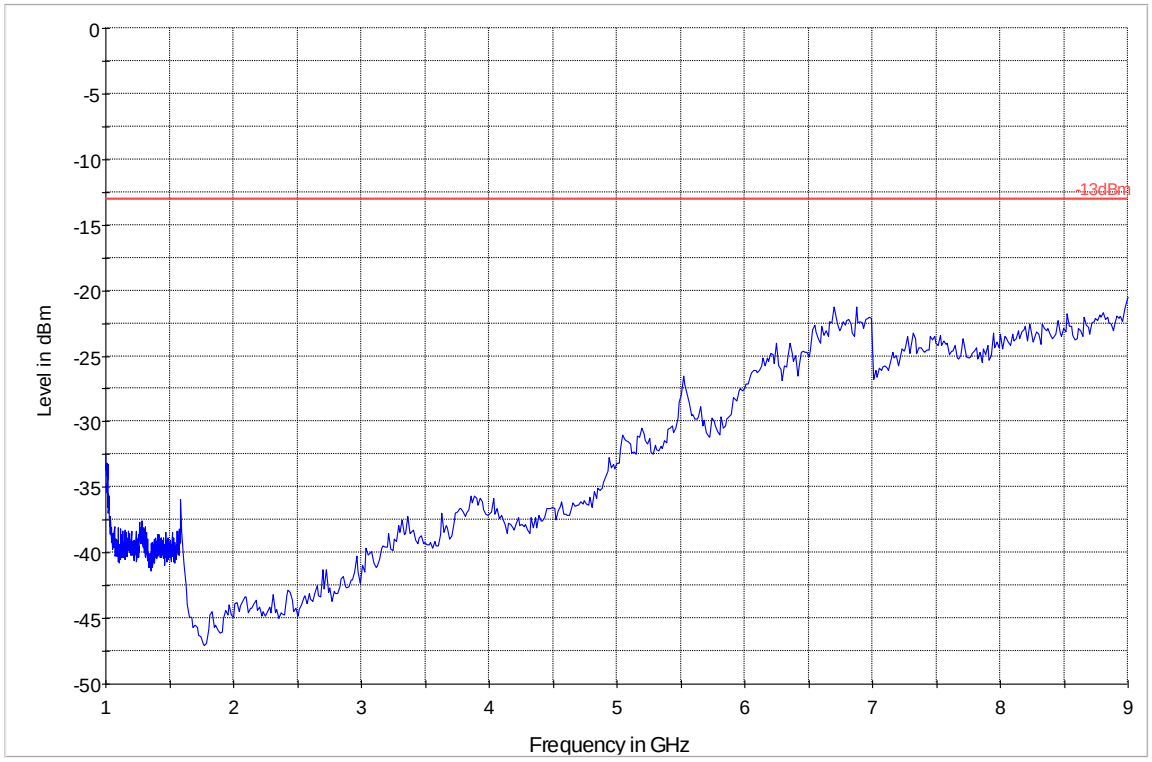
-13dBm.LimitLine
Preview Result
Data Reduction Result
Final Measurement Result

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

Test results 30M-1GHz

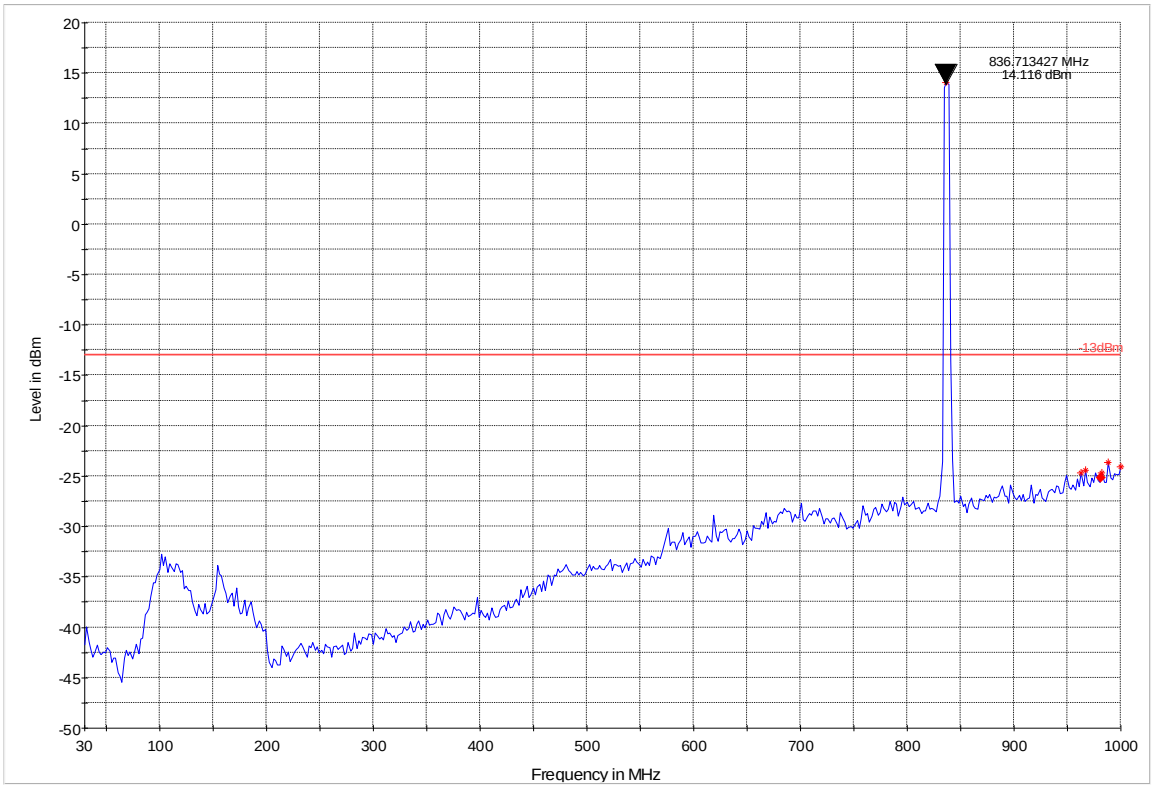


Test results 1GHz-9GHz

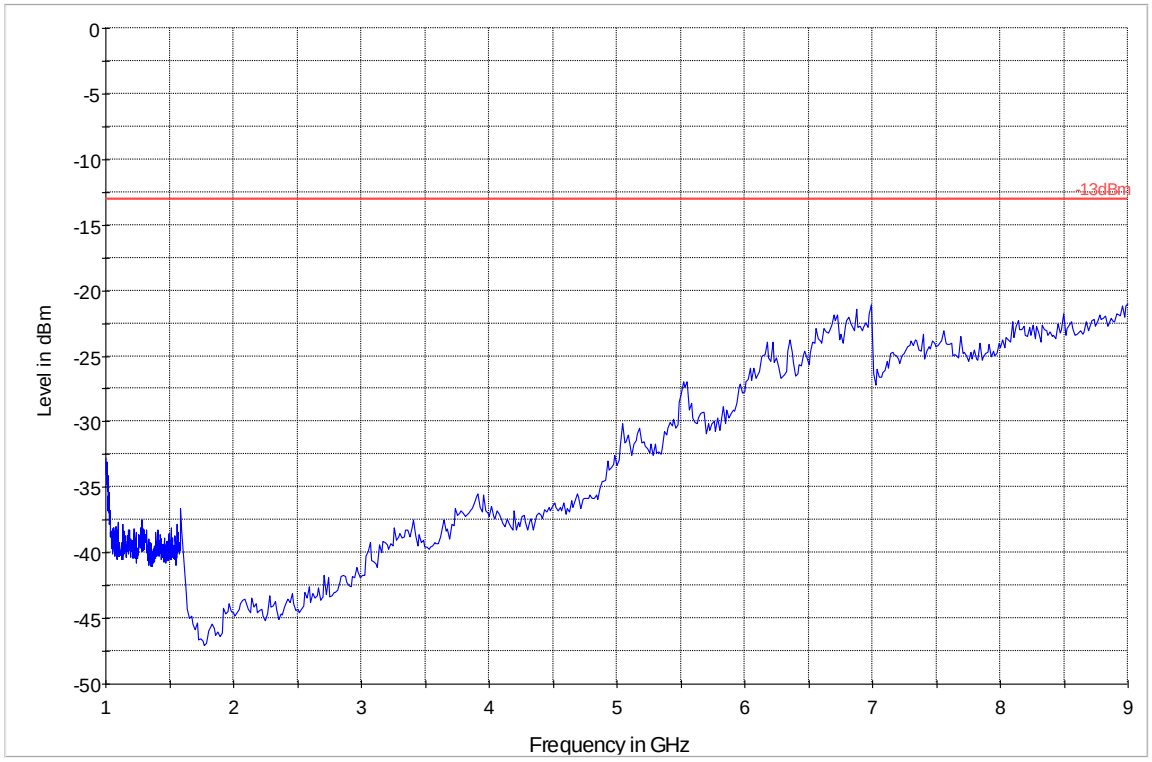


Radiated Spurious Emissions (UMTS Band 5) Tx: Mid Channel

Test results 30M-1GHz

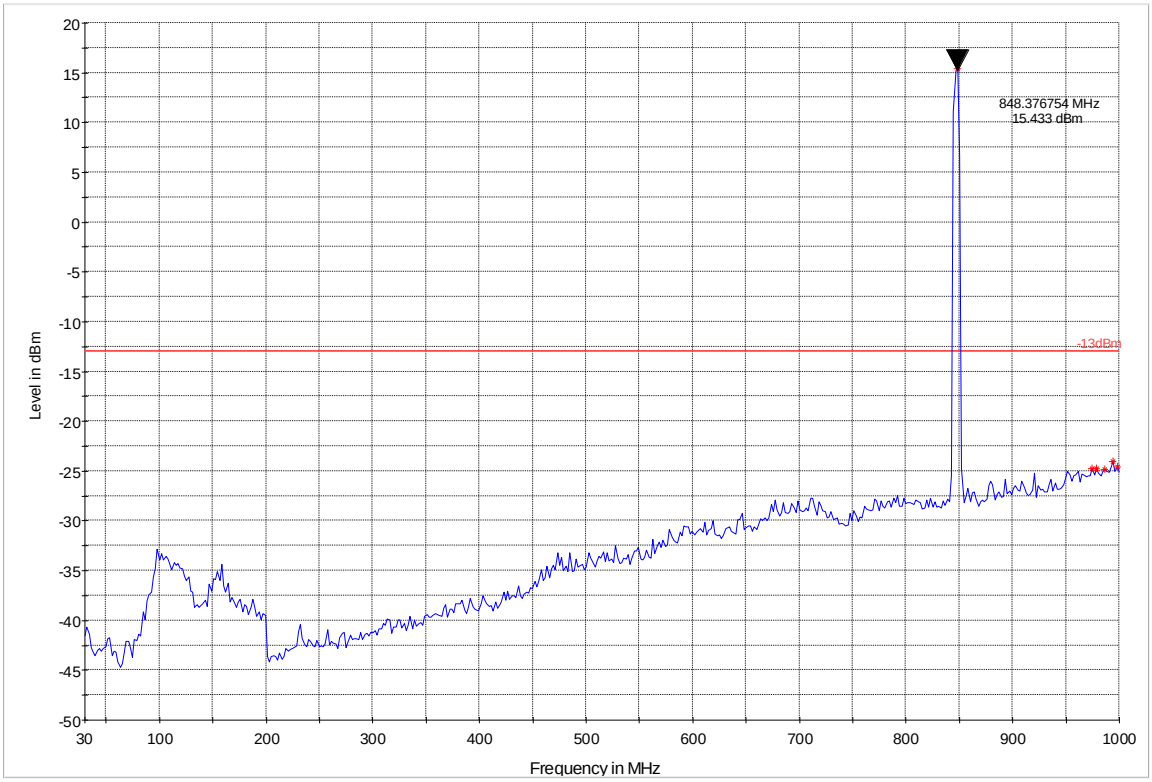


Test results 1GHz-9GHz

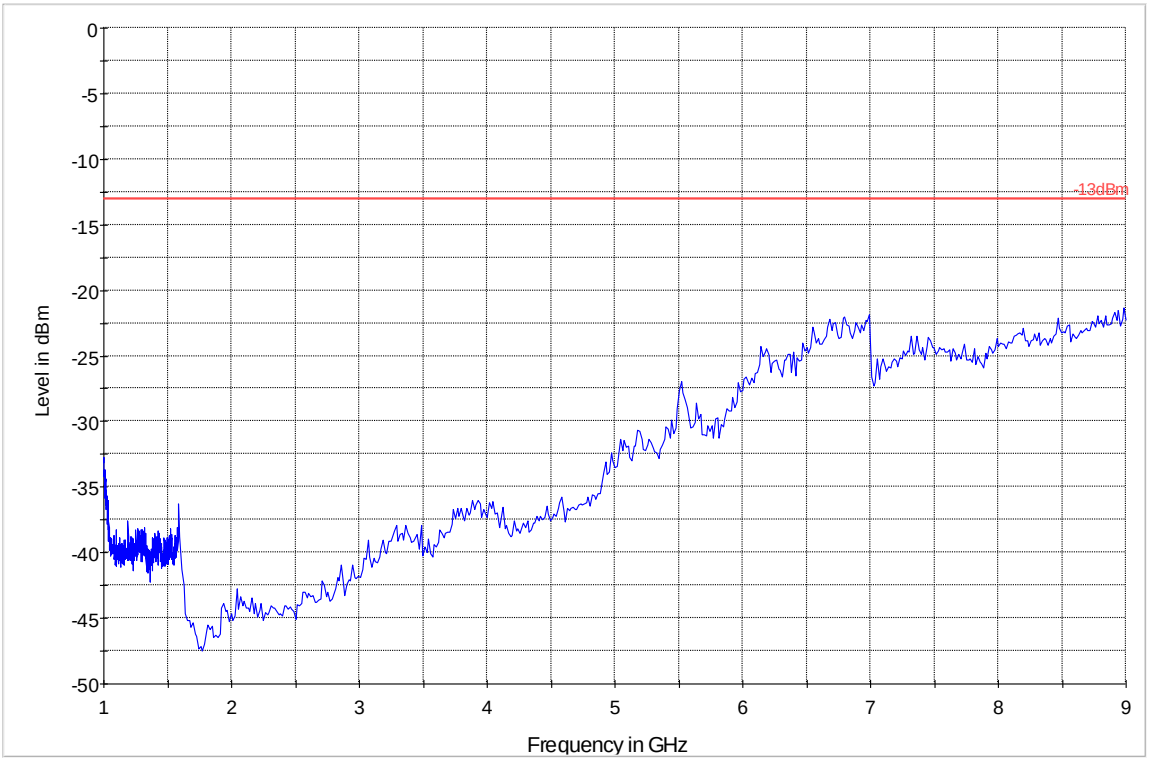


Radiated Spurious Emissions (UMTS Band 5) Tx: High Channel

Test results 30M-1GHz



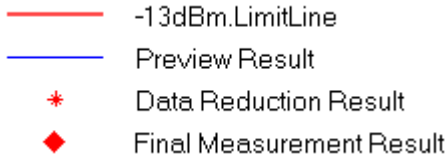
Test results 1GHz-9GHz



5.5.5.3 Test Results Transmitter Spurious Emission PCS-1900:

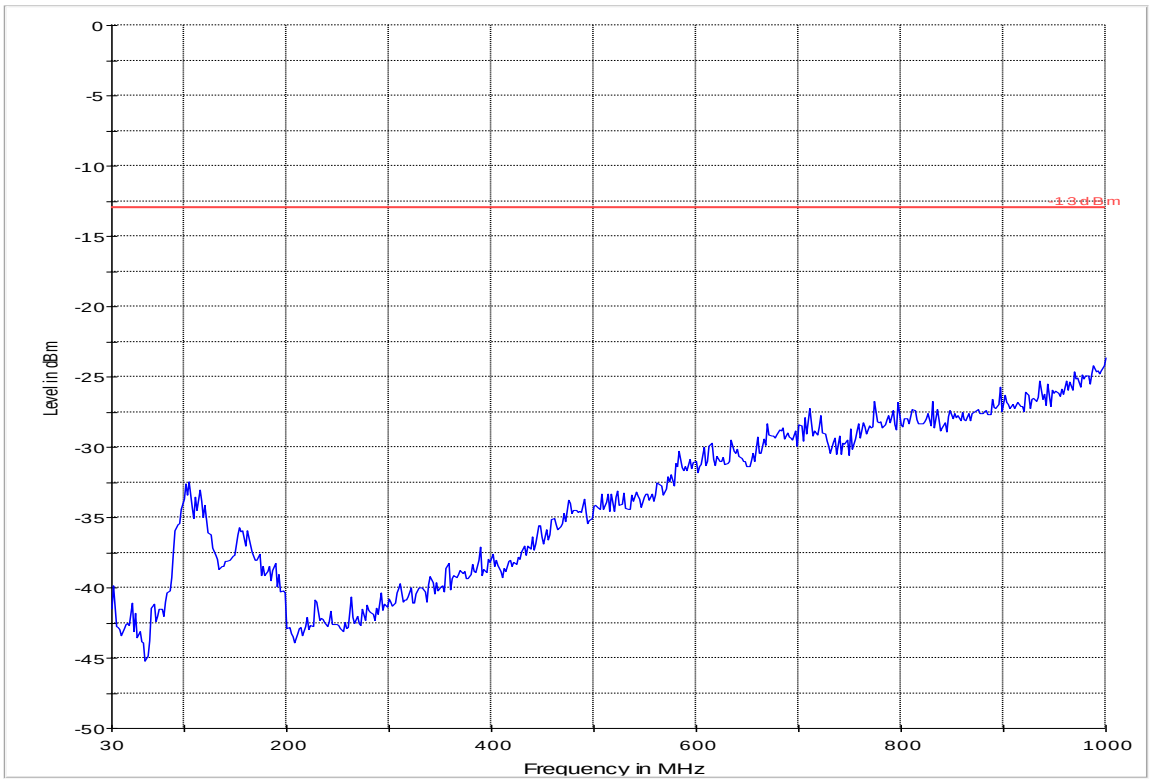
Harmonic	Tx ch-512 Freq.(MHz)	Level (dBm)	Tx ch-661 Freq. (MHz)	Level (dBm)	Tx ch-810 Freq. (MHz)	Level (dBm)
1	**1850.2**	-	**1880.0**	-	**1909.8**	-
2	**3700.4**	-47	**3760**	-46	**3819.6**	-47
3	**5550.6**	-46	**5640**	-45	**5729.4**	-45
4	**7400.8**	NF	**7520**	NF	**7639.2**	NF
5	**9251**	NF	**9400**	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						

Legend for the plots:

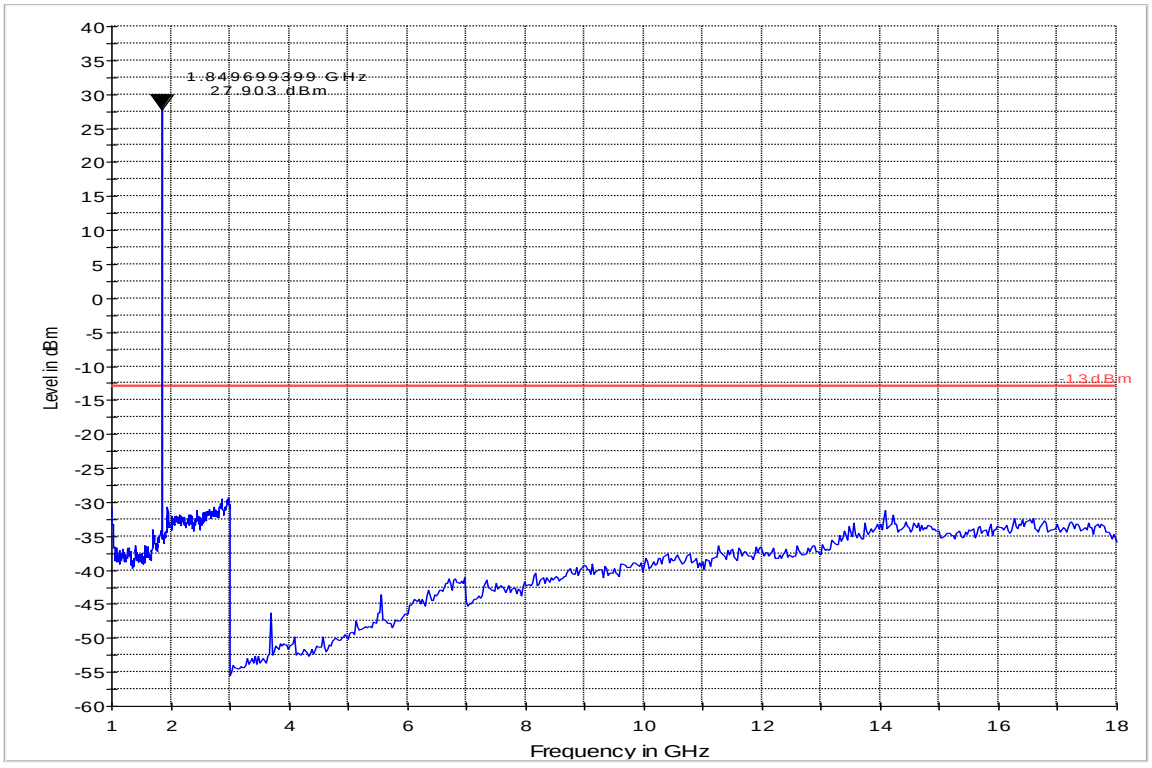


Radiated Spurious Emissions (GSM-1900) Tx: Low Channel

Test results 30M-1GHz

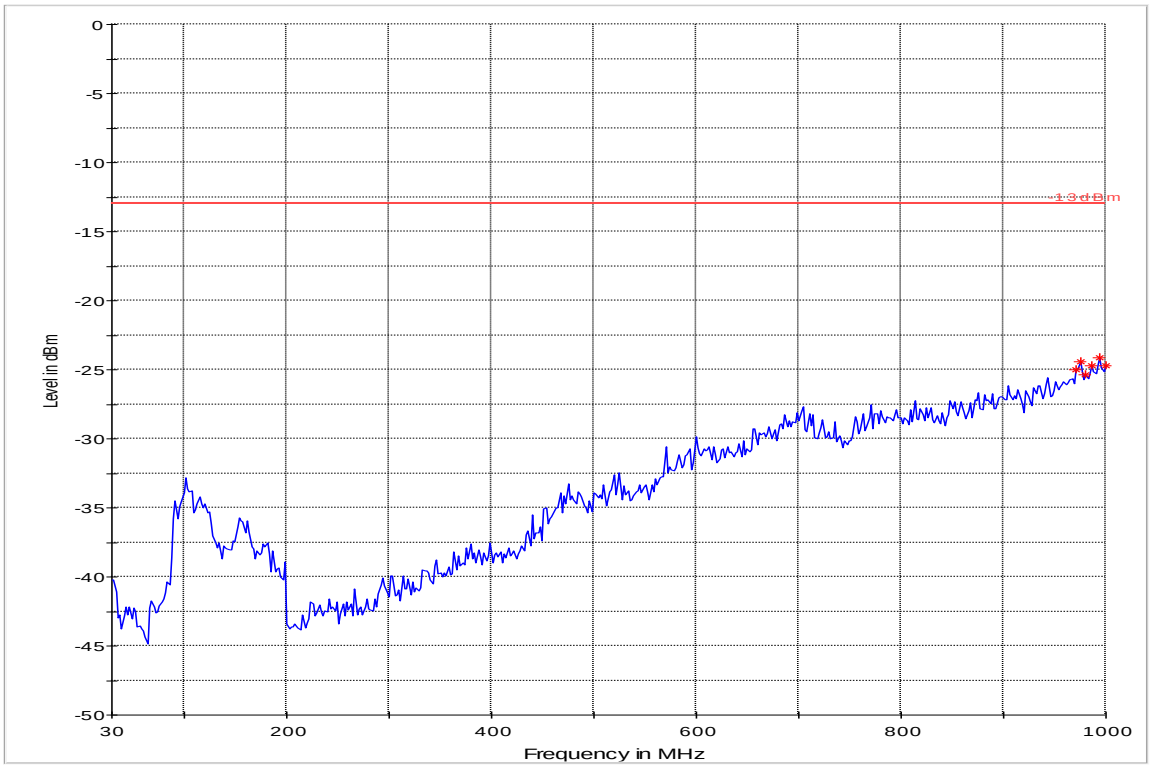


Test results 1GHz-18GHz

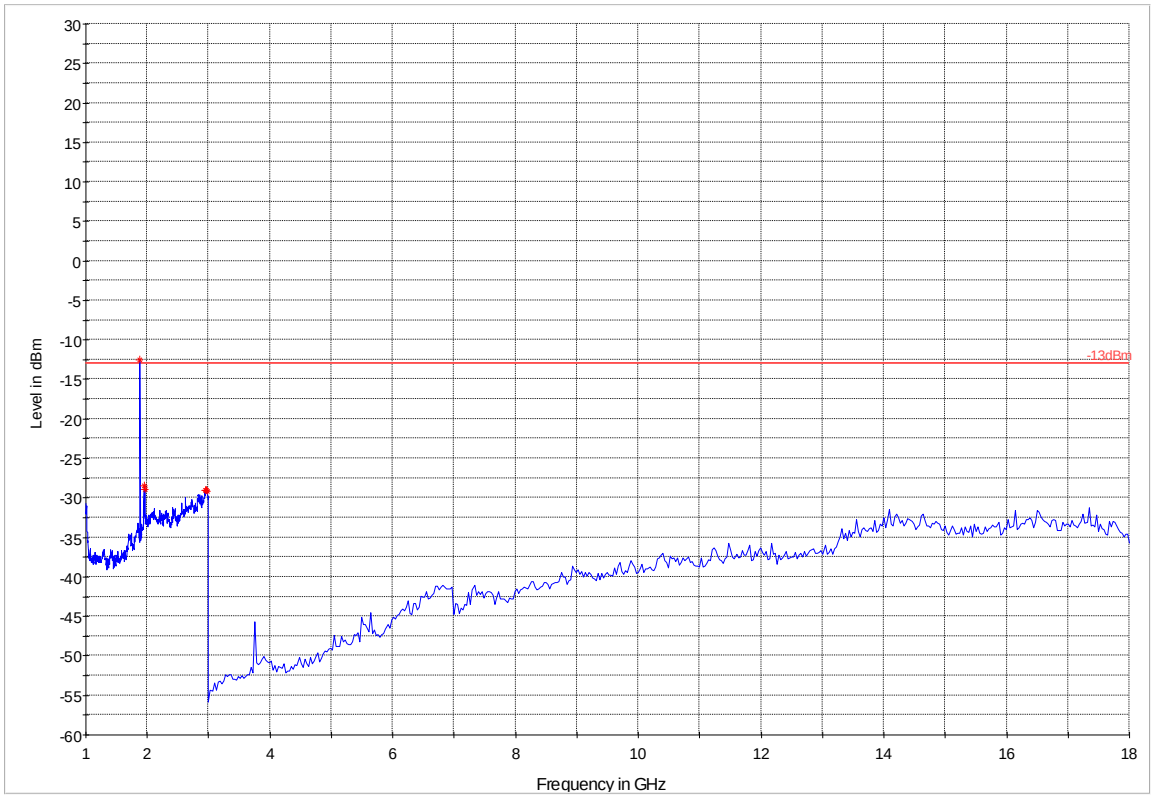


Radiated Spurious Emissions (GSM-1900) Tx: Mid Channel

Test results 30M-1GHz

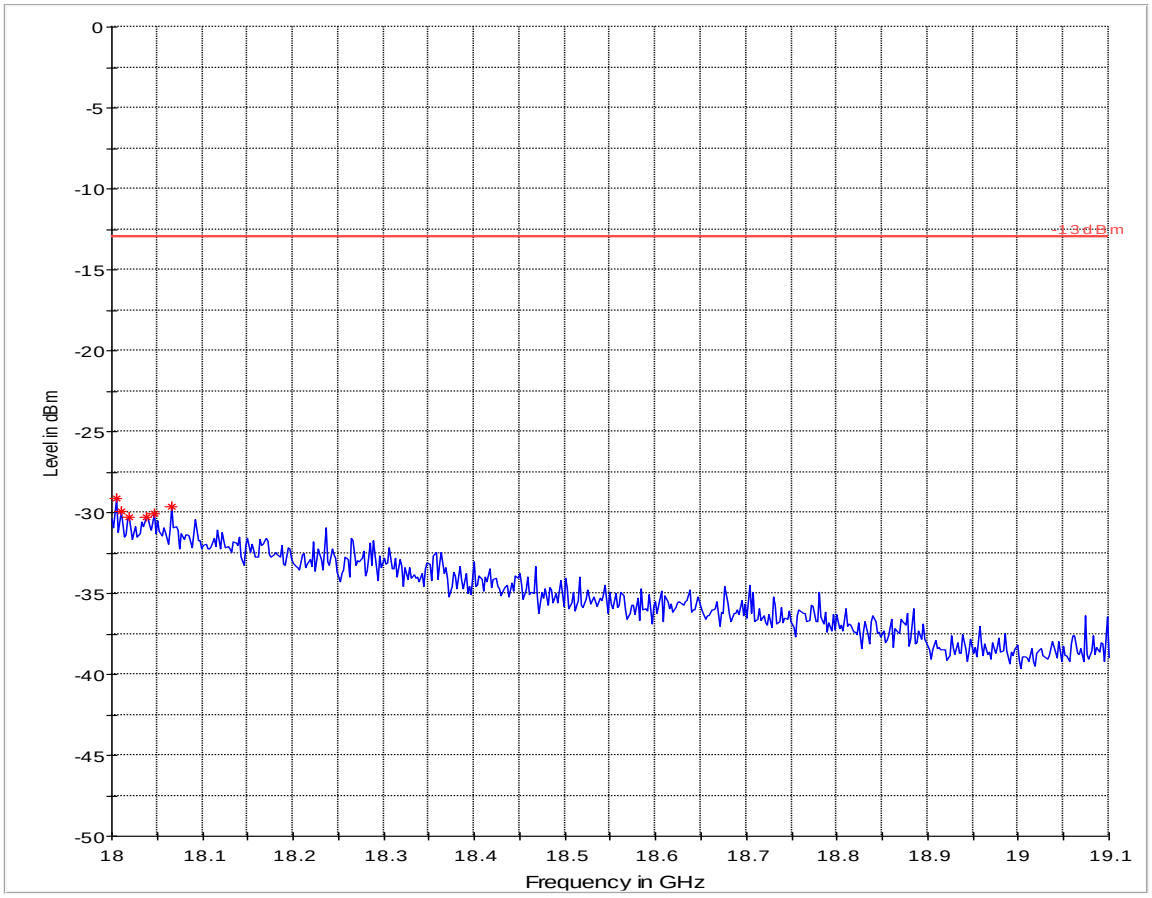


Test results 1GHz-18GHz



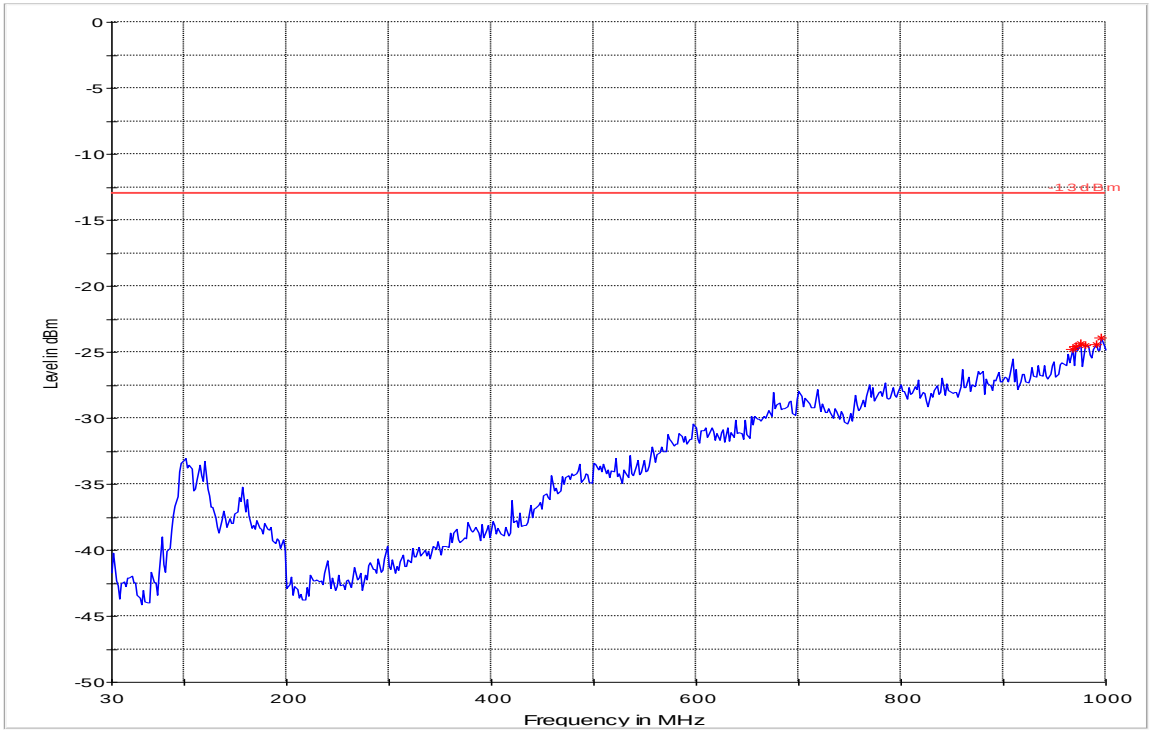
Test results 18GHz-19.1GHz

Note: Worst case representation of all channels

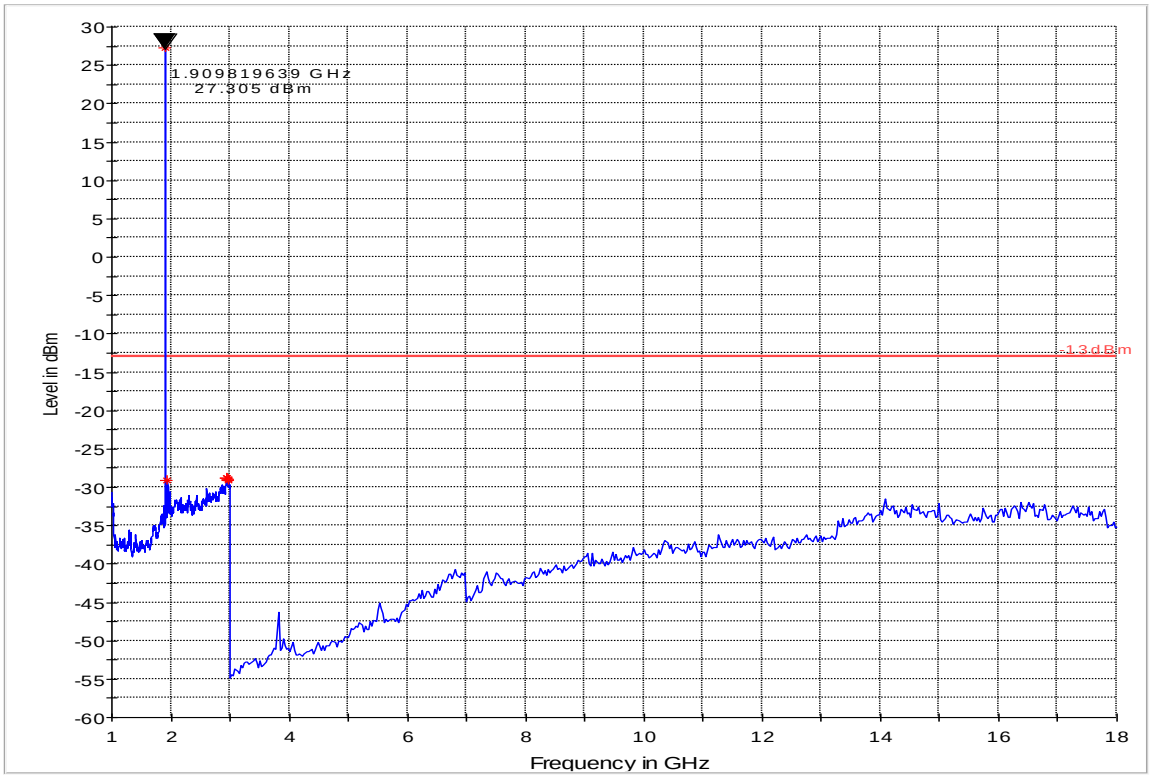


Radiated Spurious Emissions (GSM-1900) Tx: High Channel

Test results 30M-1GHz



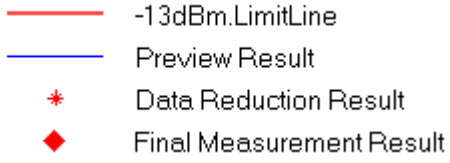
Test results 1GHz-18GHz



5.5.5.4 Test Results Transmitter Spurious Emission UMTS FDD2:

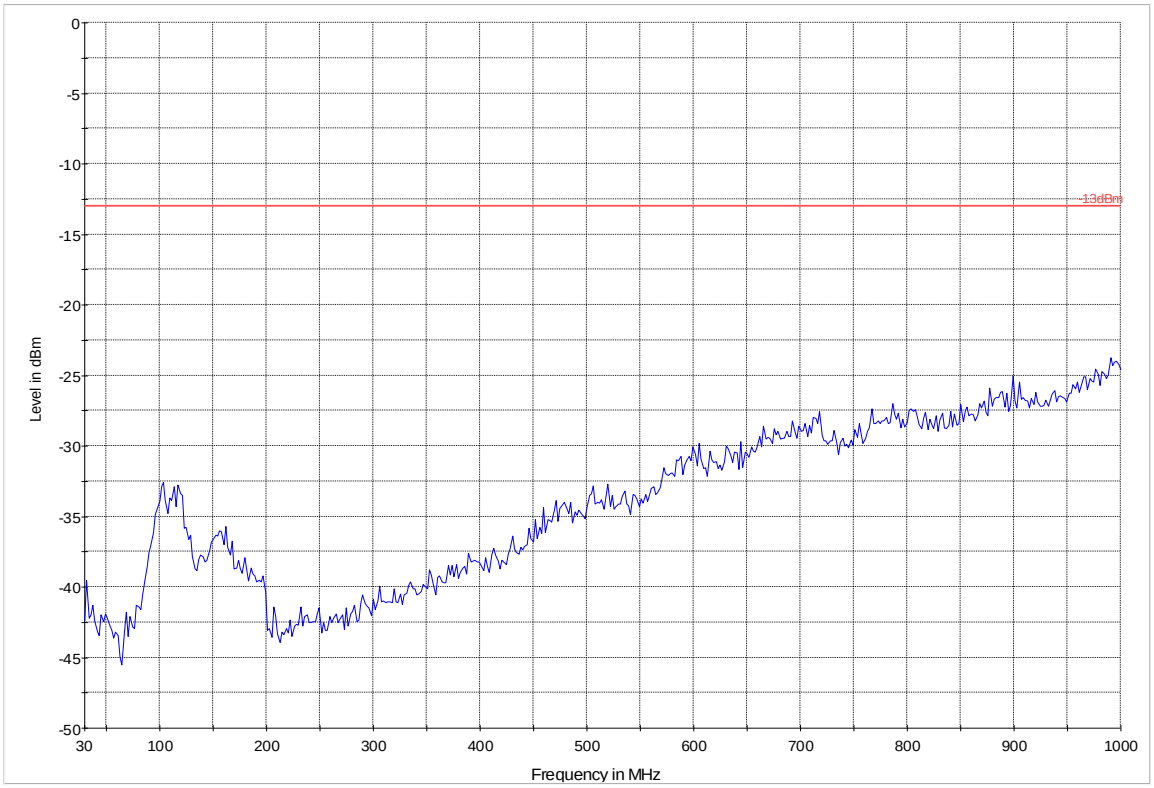
Harmonic	Tx ch-9262 Freq. (MHz)	Level (dBm)	Tx ch-9400 Freq. (MHz)	Level (dBm)	Tx ch-9538 Freq. (MHz)	Level (dBm)
1	**1852.4**	-	**1880.0**	-	**1907.6**	-
2	**3704.8**	-36	**3760**	-32	**3815.2**	-27
3	**5557.2**	-44	**5640**	NF	**5722.8**	NF
4	**7409.6**	NF	**7520**	NF	**7630.4**	NF
5	**9262**	NF	**9400**	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						

Legend for the plots:

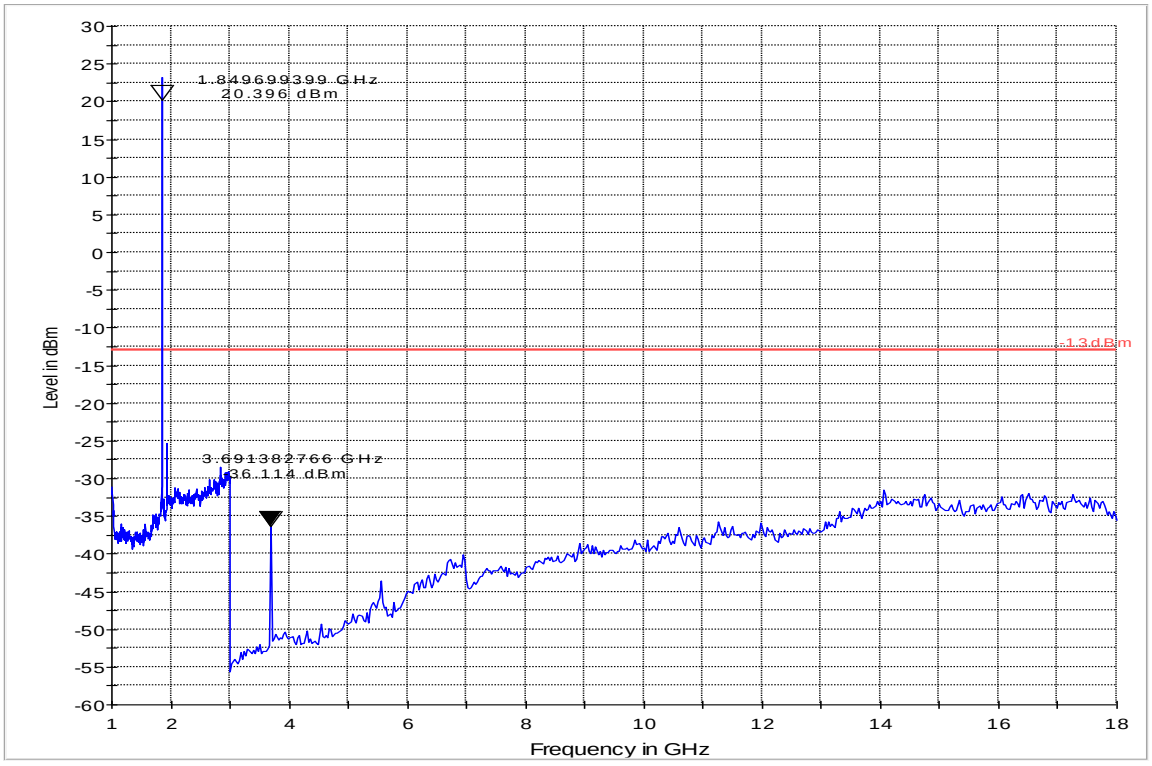


Radiated Spurious Emissions (UMTS Band 2) Tx: Low Channel

Test results 30M-1GHz

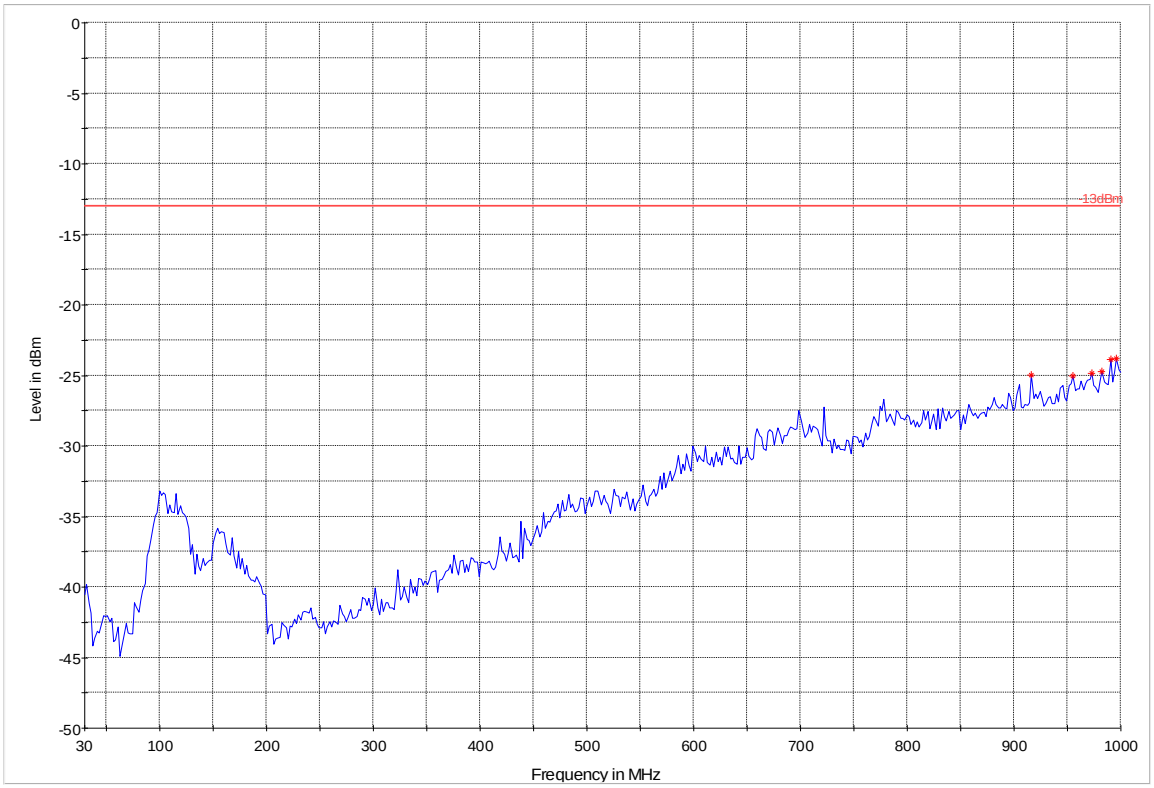


Test results 1GHz-18GHz

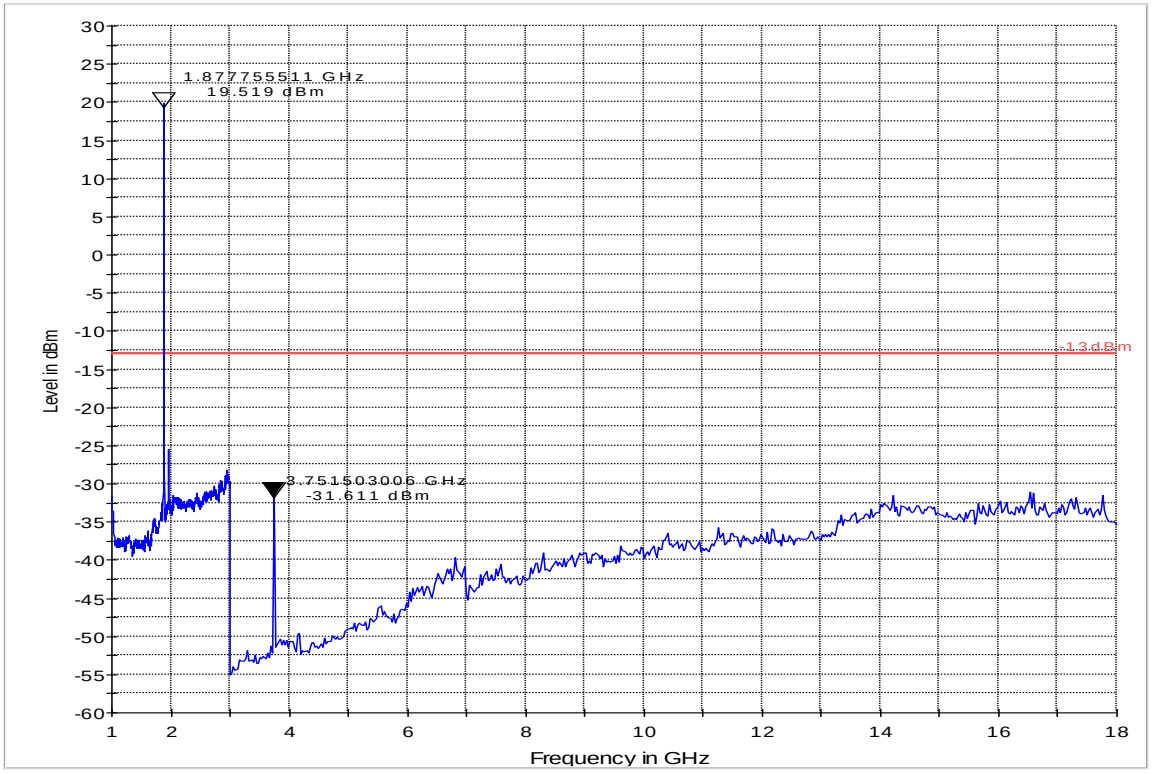


Radiated Spurious Emissions (UMTS Band 2) Tx: Mid Channel

Test results 30M-1GHz

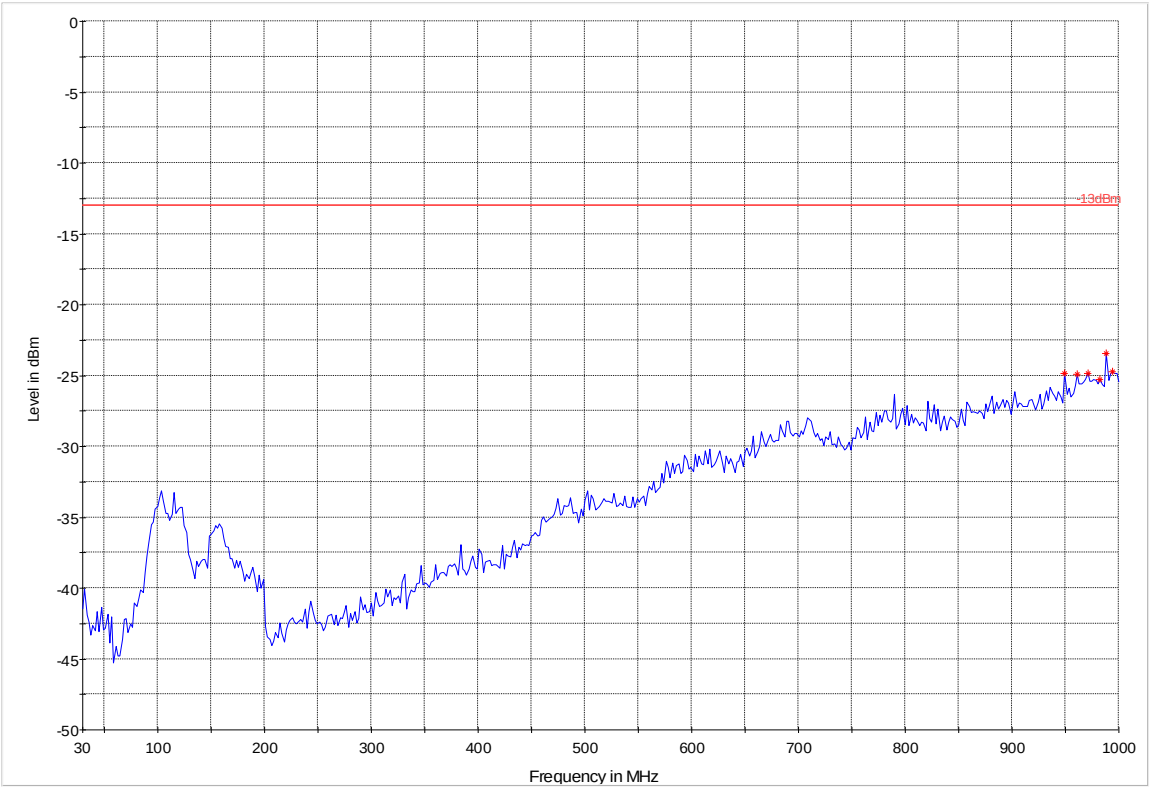


Test results 1GHz-18GHz

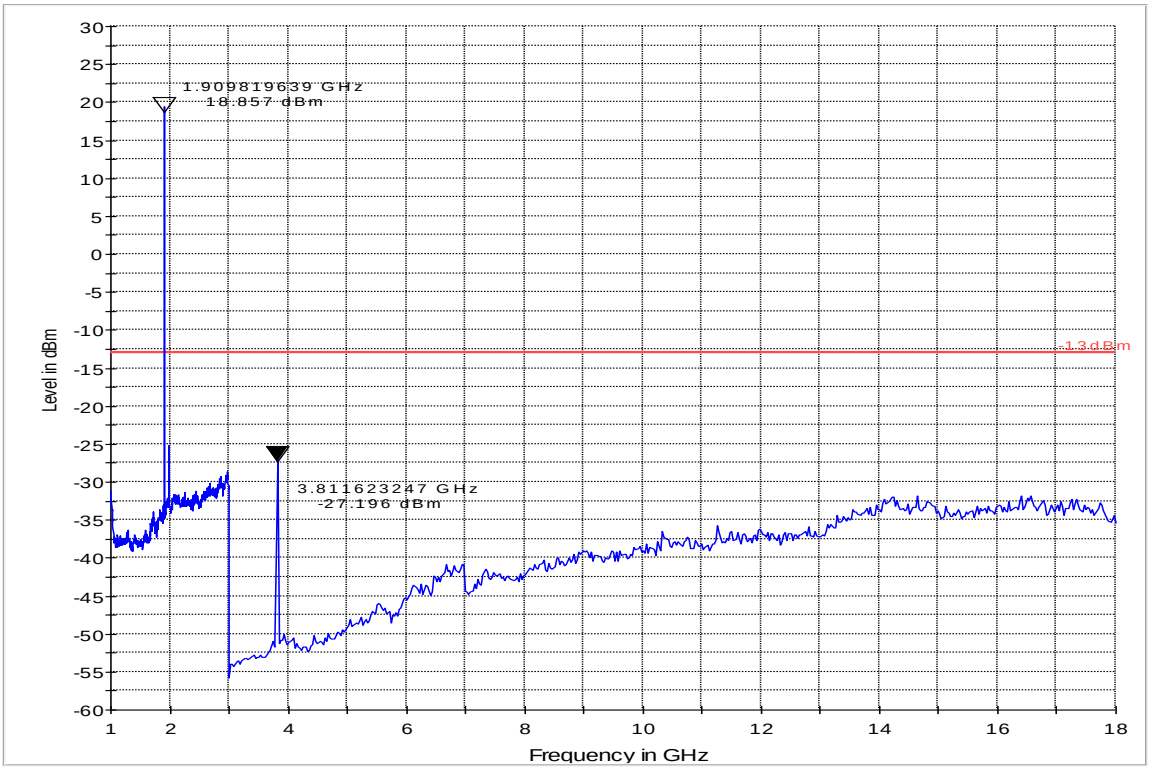


Radiated Spurious Emissions (UMTS Band 2) Tx: High Channel

Test results 30M-1GHz

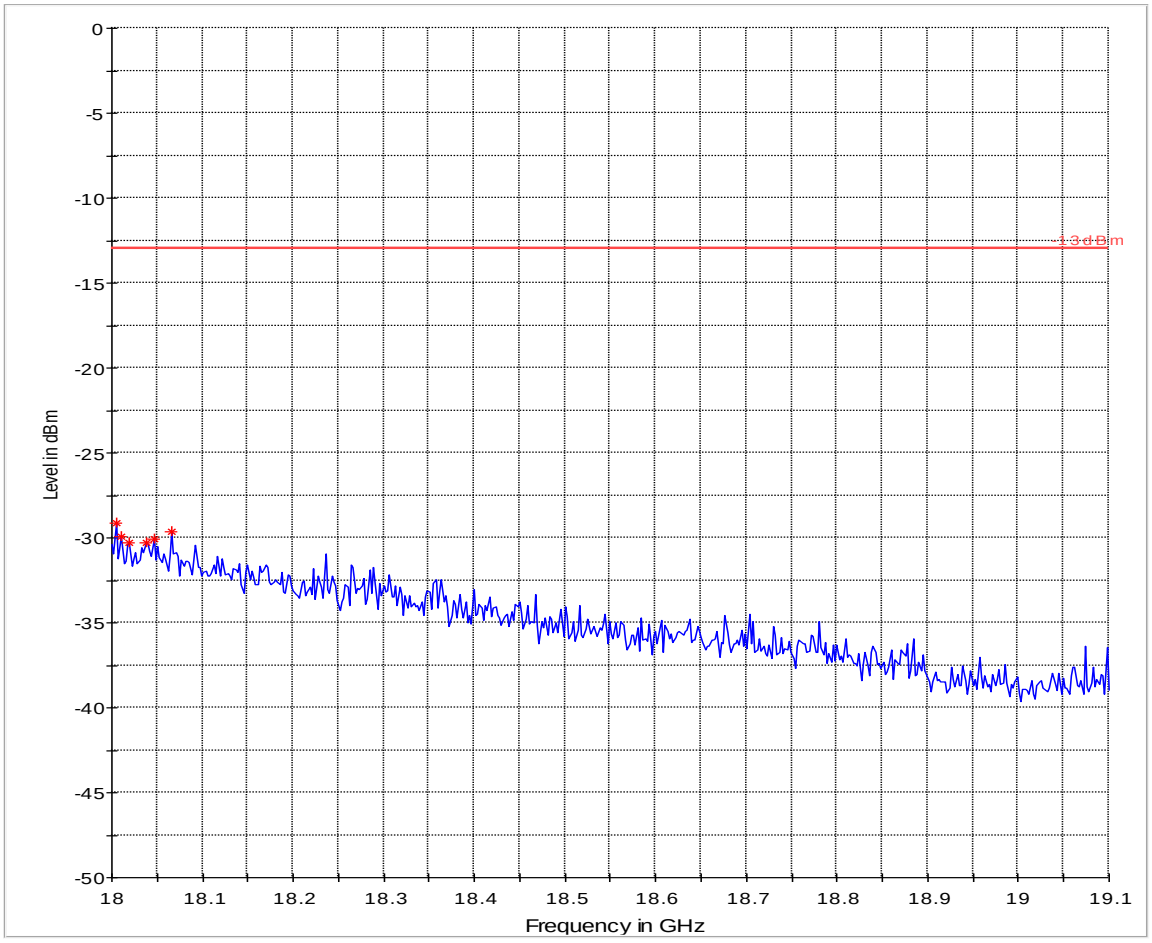


Test results 1GHz-18GHz



Test results 18GHz-19.1GHz

Note: Worst case representation of all channels



5.6 Radiated out of band emissions results on EUT- Receive Mode:

5.6.1 References

FCC: CFR Part 15.109, 2.1053
IC: RSS-Gen Section 4.10; RSS 132 Section 4.6; RSS-133 Section 6.6

5.6.2 Limits

5.6.2.1 §15.109 Radiated emission limits- Unintentional Radiators:

5.6.2.2 RSS-Gen Section 6

If a radiated measurement is made, all spurious emissions shall comply with the limits of table (1) as shown.

(a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency of emission (MHz)	Field strength (µV/m)
30–88	100 (40dBµV/m)
88–216	150 (43.5 dBµV/m)
216–960	200 (46 dBµV/m)
Above 960	500 (54 dBµV/m)

(b) The field strength of radiated emissions from a Class A digital device, as determined at a distance of 10 meters, shall not exceed the following:

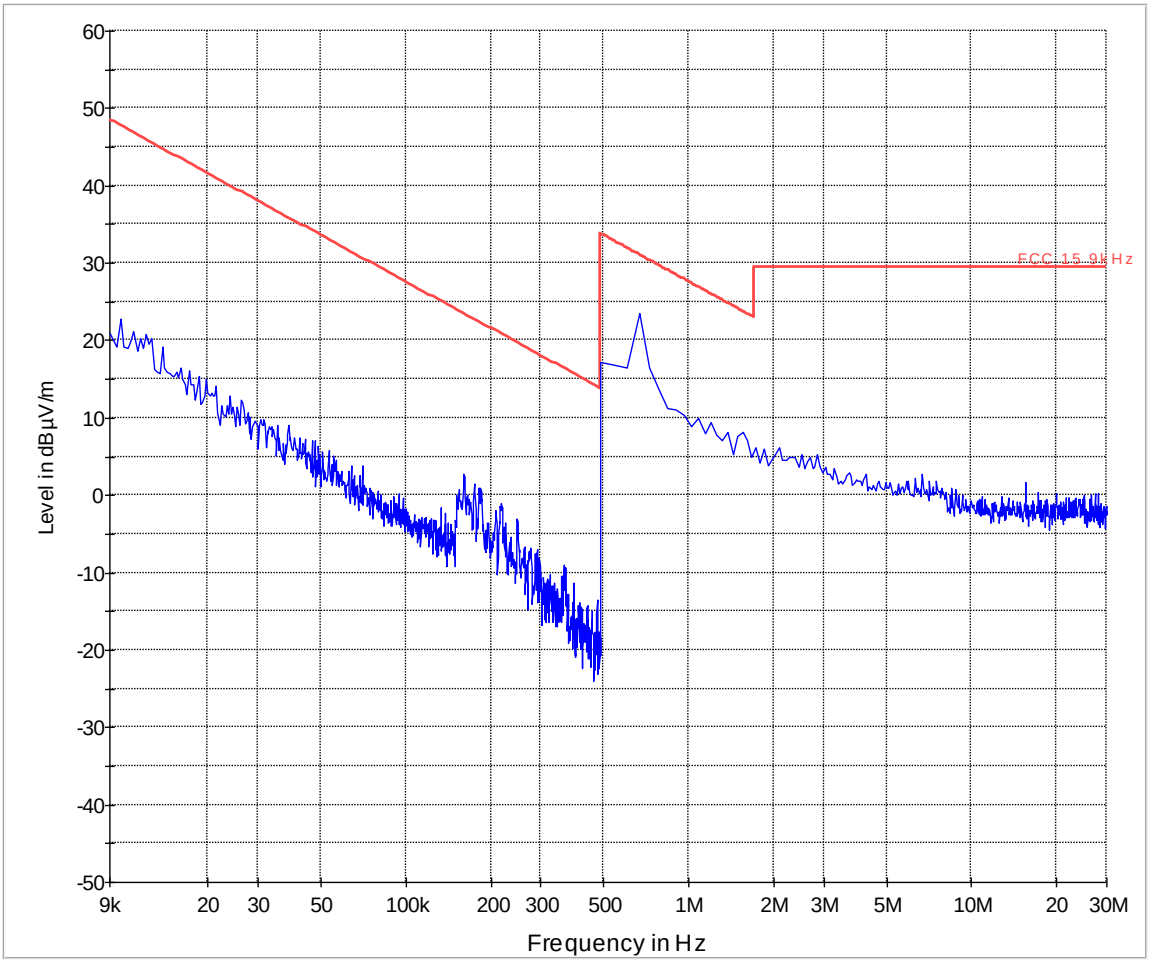
Frequency of emission (MHz)	Field strength (µV/m)
30–88	90
88–216	150
216–960	210
Above 960	300

5.6.2.3 Results

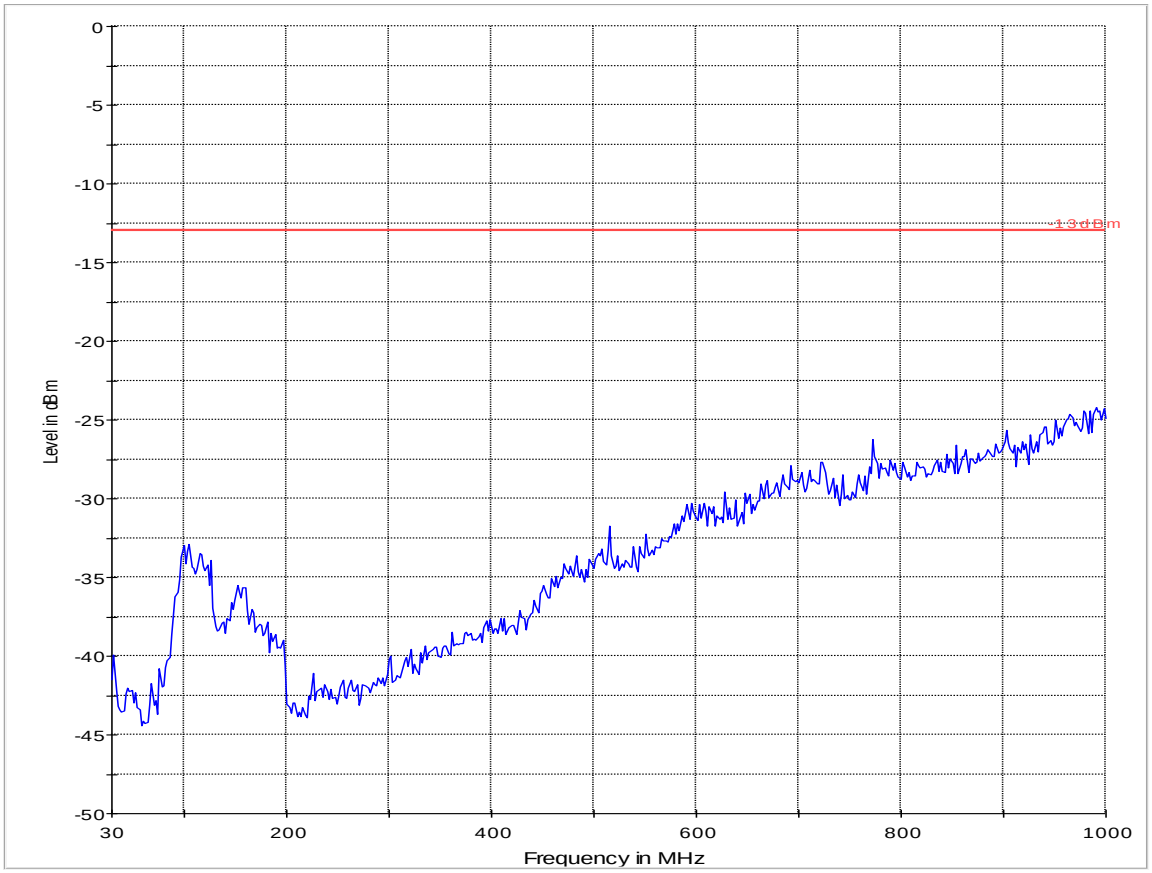
No significant emissions measurable. Plots reported here represent the worse case emissions for all EUT orientations and horizontal/vertical polarizations of the measurement antenna.
Worst case representation for all bands of operation.

5.6.2.4 Test Results Receiver Spurious Emission

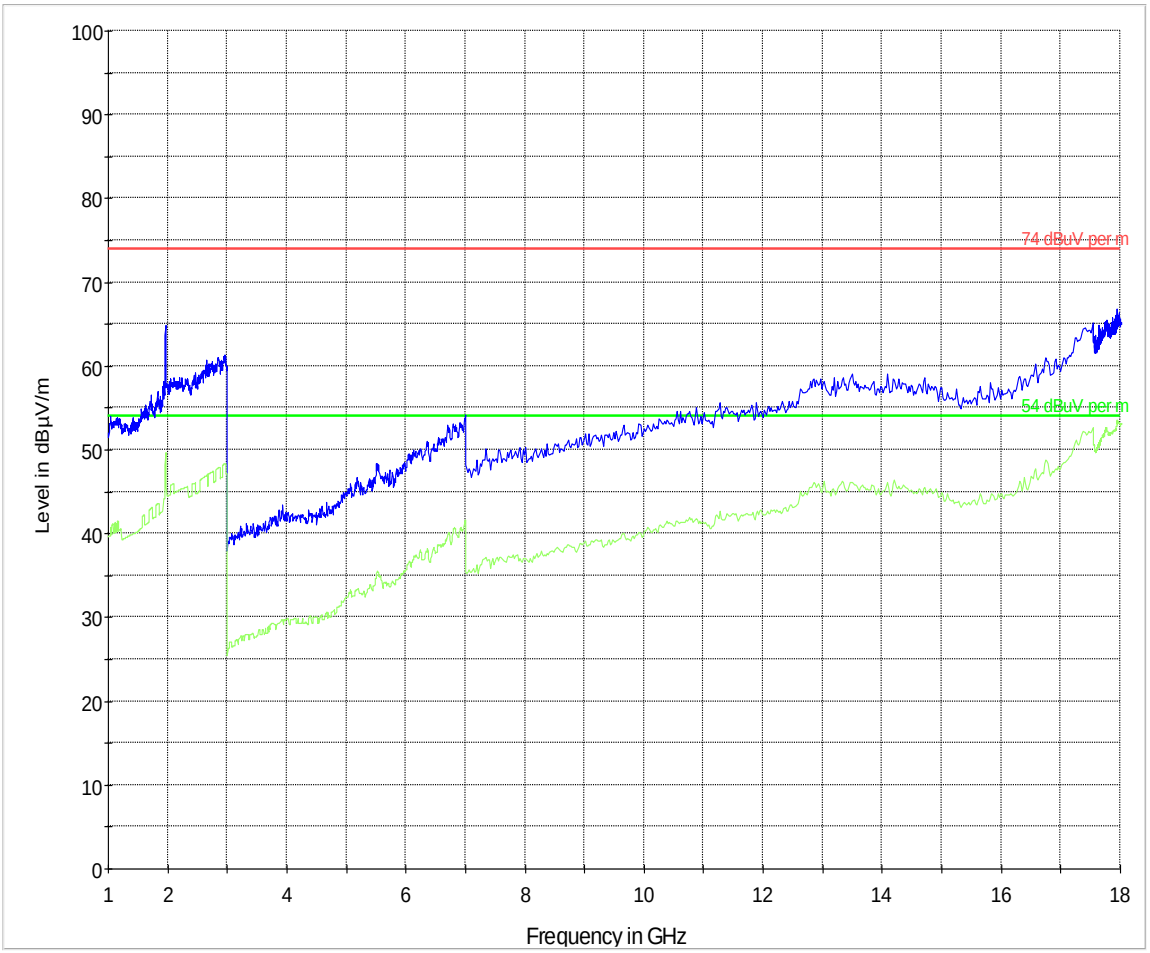
Receive Mode: <30MHz



Receive Mode: 30MHz-1GHz



Receive Mode: 1GHz-18GHz



74 dBuV per m
54 dBuV per m
MaxPeak-ClearWrite
Average-ClearWrite

5.7 AC Power Line Conducted Emissions

5.7.1 References:

FCC: CFR Part 15.207
IC: RSS-Gen Section 7.2.2
The purpose of this test is to measure unwanted radio frequency currents induced in any AC conductor external to the equipment which could conduct interference to other equipment via the AC electrical network.

5.7.2 Limits:

5.7.2.1 §15.207 Conducted limits- Intentional Radiators:

(a) Except as shown in paragraphs (b) and (c) of this section of the CFR, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table (1), as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

5.7.2.2 RSS-Gen 7.2.2

Except when the requirements applicable to a given device state otherwise, for any licence-exempt radiocommunication device equipped to operate from the public utility AC power supply, either directly or indirectly, the radio frequency voltage that is conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown below. The tighter limit applies at the frequency range boundaries.

Table 1:

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

*Decreases with the logarithm of the frequency.

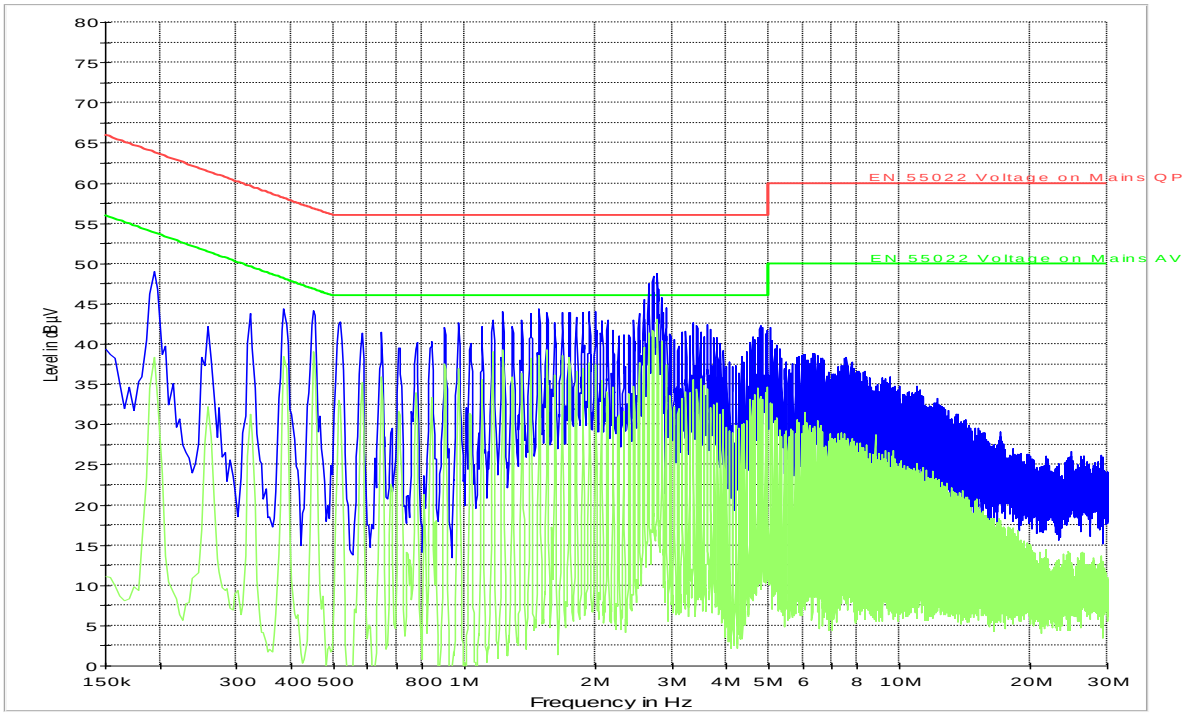
Analyzer Settings: CISPR Bandwidth- 9KHz.

5.7.3 Results

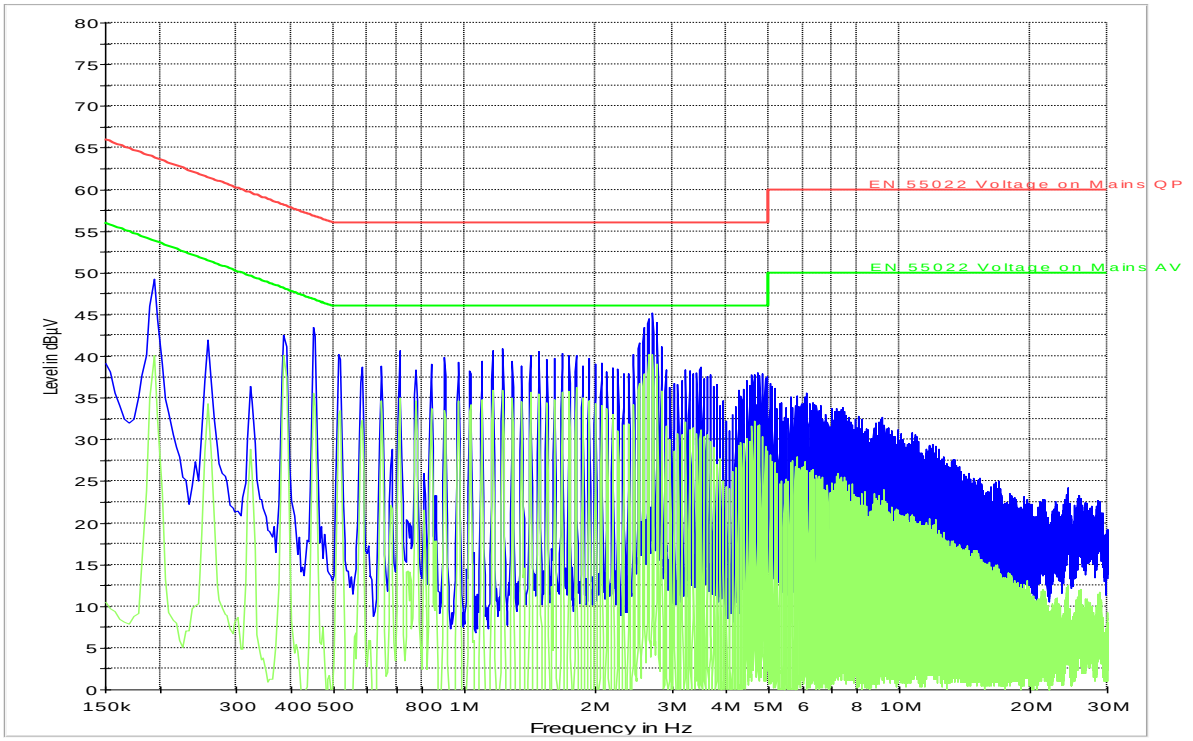
Plots shown here represent the combined worse case emissions for Line and Neutral.

5.7.4 Test Results:

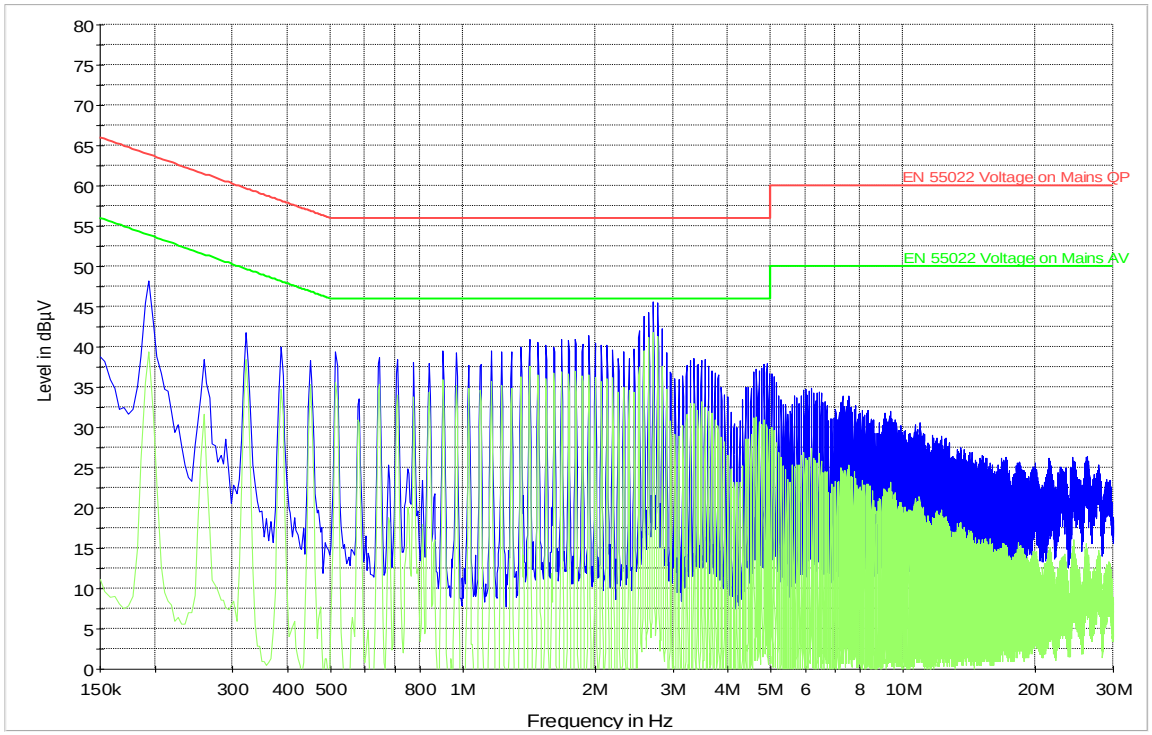
850 TX Mode:



1900 TX Mode:

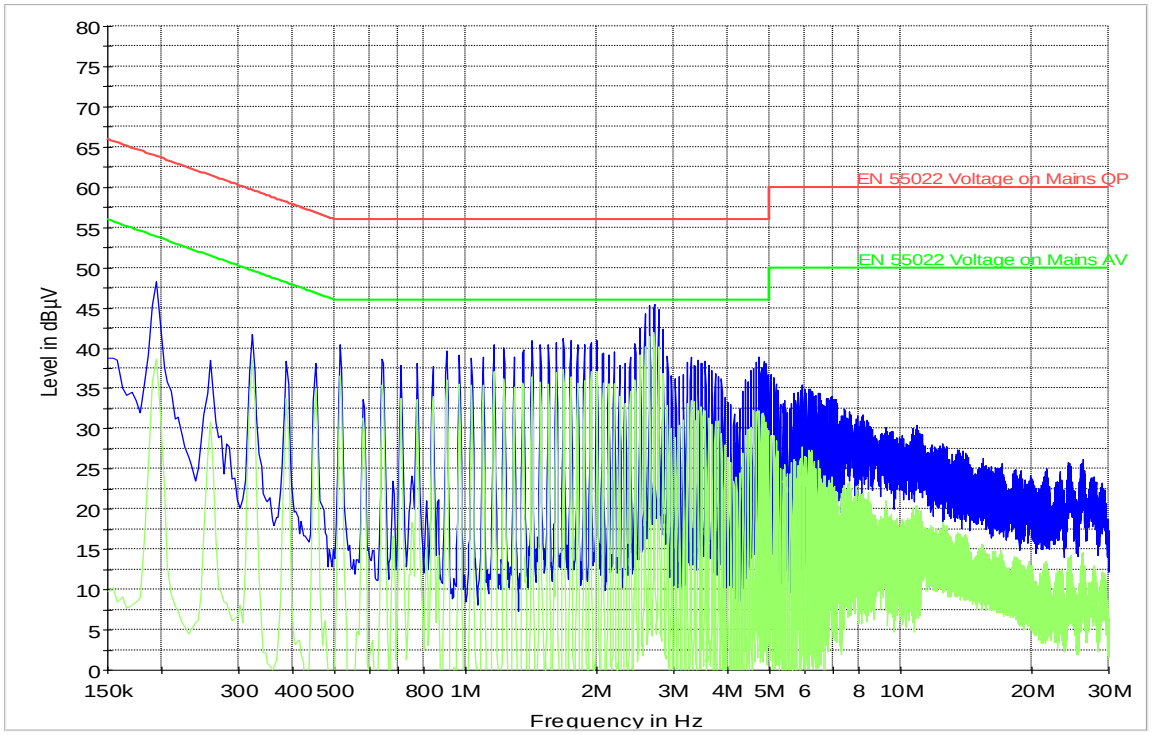


FDD II TX Mode:



MaxPeak-ClearWrite Average-ClearWrite Voltage on Mains QP Voltage on Mains AV

FDD V TX Mode:



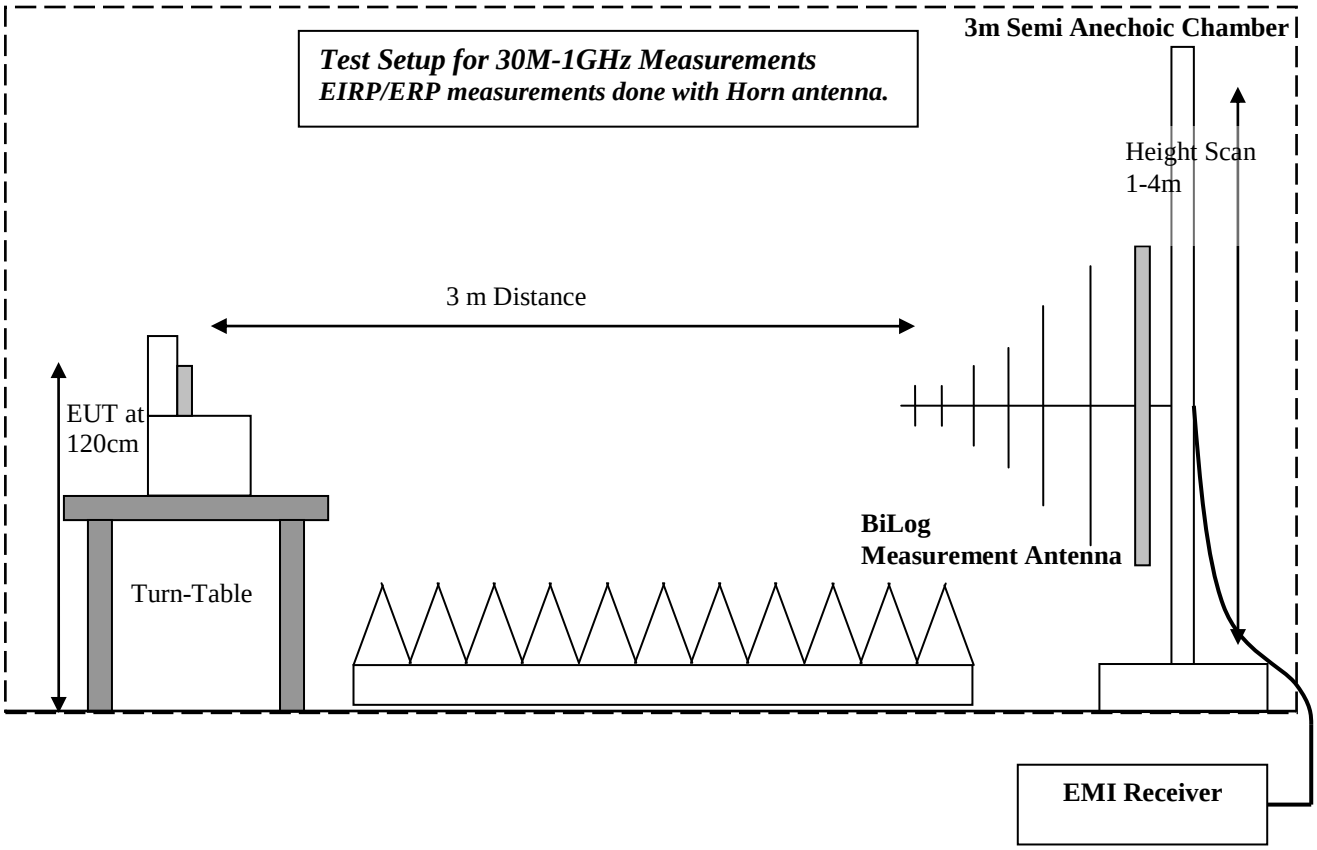
MaxPeak-ClearWrite Average-ClearWrite Voltage on Mains QP Voltage on Mains AV

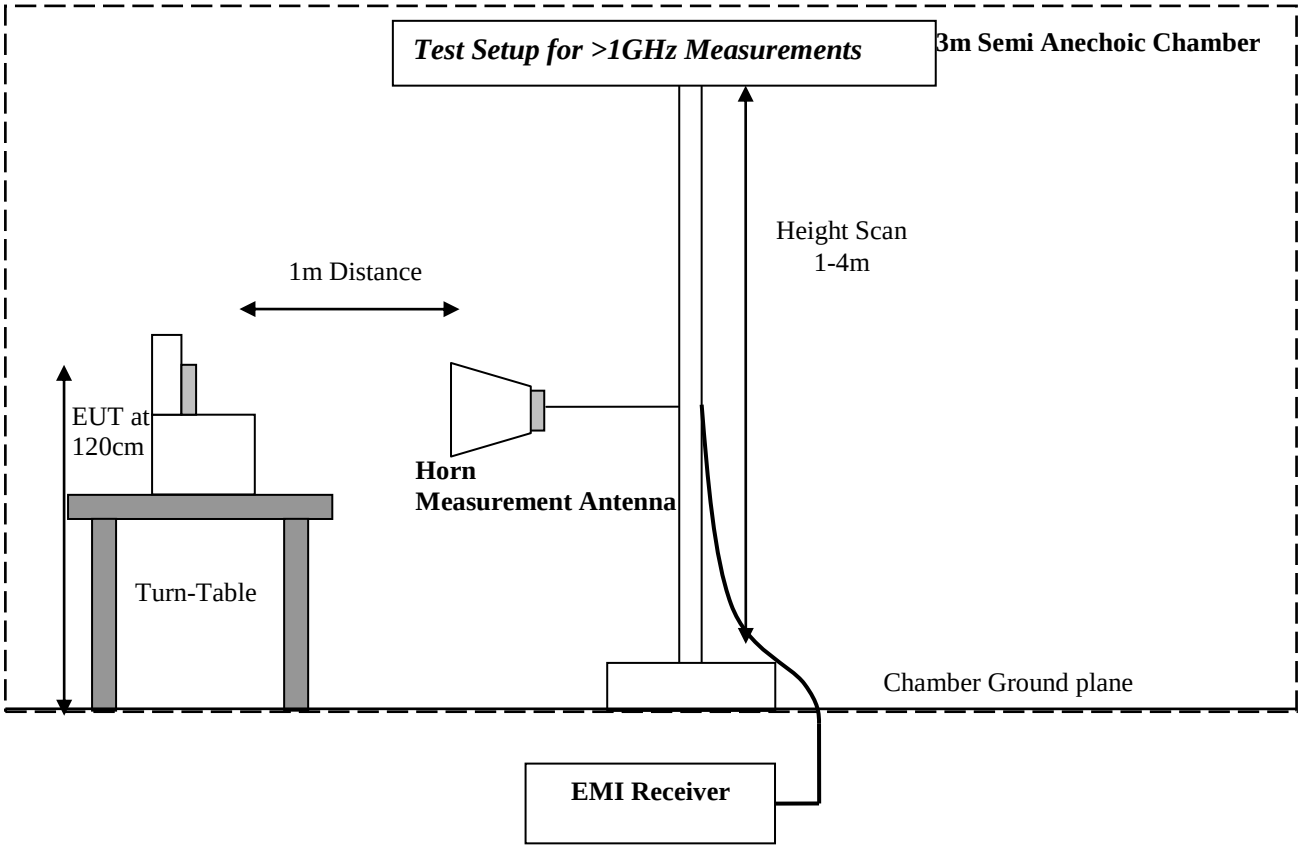
6 Test Equipment and Ancillaries used for tests

Instrument/Ancillary	Model	Manufacturer	Serial No.	Cal Date	Cal Interval
Radio Communication Tester	CMU 200	Rohde & Schwarz	101821	June 2010	1 year
Radio Communication Tester	CMU 200	Rohde & Schwarz	109879	June 2010	1 year
Radio Communication Tester	CMU 200	Rohde & Schwarz	110759	June 2010	1 year
Bluetooth Tester	CBT	Rohde & Schwarz	100212	May 2009	2 Years
EMI Receiver/Analyzer	ESIB 40	Rohde & Schwarz	100107	May 2010	1 year
Spectrum Analyzer	FSU	Rohde & Schwarz	200302	Dec 2009	1 year
Loop Antenna	6512	EMCO	00049838	April 2009	2 years
Biconilog Antenna	3141	EMCO	0005-1186	June 2009	2 years
Horn Antenna (1-18GHz)	3115	ETS	00035111	Jan 2009	3 years
Horn Antenna (18-40GHz)	3116	ETS	00070497	Jan 2009	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	June 2010	1 year
LISN	R&S	ESH3-Z5	836679/003	June 2010	1 Year
LISN	R&S	ESH3-Z6	836154/011	May 2009	2 Years
Power Smart Sensor	R&S	NRP-Z81	100161	June 2010	1 Year
Power Smart Sensor	R&S	NRP-Z22	100223	May 2010	1 Year
Upconverter	PXI-5610	NI	E93740	May 2010	2 years
Waveform Generator	PXI-5421	NI	E965F1	May 2010	2 years
10dB attenuator	ATT-0298-10	MidwestMicrowave	n/a	n/a	n/a
Power Splitter	11667B	Hewlett Packard	645348	n/a	n/a
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	179	Fluke	N/A	Feb 2010	1 Year
Temp Hum Logger	TM320	Dickson	03280063	Feb 2010	1 Year
Temp Hum Logger	TM325	Dickson	5285354	Feb 2010	1 Year

Note:
Equipment calibration is performed by an accredited calibration lab according to ISO 17025 requirements.
Calibration intervals are determined from manufacturer recommendation and/or lab discretion.
Cetecom Inc takes all measures to calibrate equipment before the due date; for instances when the equipment has to be used beyond the calibration due date, necessary steps are taken for calibration verification and documented until accredited calibration can be performed- to meet the Quality System requirements.

7 Block Diagrams





8 Revision History

Date	Report Name	Changes to report	Report prepared by
2010-08-02	**EMC_Multi_045_10001_FCC22_24**	**First Version**	**S Jose**
2010-08-23	**EMC_Multi_045_10001_FCC22_24_Rev1**	**Added data for <30MHz Radiated emissions**	**S Jose**