FCC/IC Partial Scope Test Report

for

Trapeze Software ULC

Rugged and Compact Vehicular Computer

FCC ID: RZ3-RAN4661
IC ID: 2234A-RAN4661, Model Name: Ranger 4 HSPAP

47 CFR Part 2, 22, 24

RSS-GEN Issue 3, RSS-132 Issue 3, RSS-133 Issue 6

TEST REPORT #: EMC_MENTO-013-13001_WWAN
DATE: 2013-04-20

FCC: 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 equipment as further described in section 3 of this test report was evaluated against the applicable criteria specified in FCC CFR47 Parts 2, 22 and 24 & Industry Canada Radio Standard Specifications RSS-GEN Issue 3, RSS-132 Issue 3 and RSS-133 Issue 6.
No deviations were ascertained during the course of the tests performed.

This partial scope test report inherits results from certification testing of a 3G cellular module which is incorporated in the evaluated device (details is section 3).

Manufacturer	Device Description	Model Name
Trapeze Software ULC	Rugged and Compact Vehicular Computer	Ranger 4 HSPAP

Responsible for Testing Laboratory:

Date	Section	Name	Signature
02-20-2014	Compliance	Franz Engert (Manager of Compliance)	Digitally signed by Franz Engert DN: cn=Franz Engert, c=US, o=CETECOM, ou=Complience, email=franz.engert@cetecom.com Date: 2014.02.20 17:42:52 -08'00'

Responsible for the Report:

Date	Section	Name	Signature
02-20-2014	Compliance	Josie Sabado (Test Lab Manager)	

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:	Franz Engert

2.2 Identification of the Client

Client:	Trapeze Software ULC
Street Address:	10, 2175 – 29 Street NE
City/Zip Code	Alberta T1Y 7H8
Country	Canada
Contact Person:	Stephen Hickle
Phone No.	(403) 777-3760
Fax:	(403) 777-3769
e-mail:	steven.hickle@trapezegroup.com

2.3 Identification of the Manufacturer

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

2.4 Date or Period of Testing

April 2 - 5, 2013

3 Equipment under Test (EUT) and Basic Test Information

3.1 Specification of the EUT

Model Name:	Ranger 4 HSPAP
Product Description:	Rugged and Compact Vehicular Computer
Hardware Revision :	4C
Software Revision :	1.03P
FCC-ID:	RZ3-RAN4661
IC-ID:	2234A-RAN4661, Model Number: Ranger 4 HSPAP
Integrated Module Information:	cellular 3G multiband radio module Option GTM661W; FCC-ID: NCMOMO6612; IC: 2734A- MO6612; HW Ver: 3.1, SW Ver: 1.8.1.0;
Frequency bands 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
Type(s) of Modulation:	GMSK; 8-PSK; QPSK
Number of channels:	GSM850: 125 and PCS 1900: 300 FDD II: 278/ FDD V: 103
Antenna Info:	type: monopole printed trace antenna documented peak gain 0.54 dBi @ 850 MHz, 1.89 dBi @ 1900 MHz
Rated Operating Voltage Range: (VDC)	6V (Low)/12V (Nom)/ 32V (High)
Rated Operating Temperature Range:	-30ºC to 65ºC
Other Radios included:	1. Redpine RS9110-N-11-02 WIFI Module, FCC-ID: XF6-RS9110N1102; IC: 8407A-91101102; 2. Bluetooth v2.1– Bluegiga WT21-N-HCIFCC-ID: QOQWT21N, IC: 5123A-BGTWT21N; 3. GPS
Test Sample Status	Production

3.2 Identification of the EUT

EUT #	S/N	HW Version	SW Version	Notes
1	31-12020019	4C	1.03P	Radiated Sample

3.3 Identification of Accessory equipment

AE #	Type	Manufacturer	Model	Serial Number
1	DC power cable	Mentor Engineering Inc.	4-CAS-CGRDMMLX18-31	PO.00009069-2

3.4 Test Supporting HW and / or SW

- Test SW to adjust channels, power level, etc., SW version not available;
- temporary antenna connection, see photographs;

3.5 Environmental Test Conditions

- Ambient Temperature: 20-25 °C
- Relative humidity: 40-60%

3.6 Default Test Temperature and Voltage

- Test Temperature: 20°C (nominal);
- Test Voltage: 12.0VDC(nominal);

Deviating test conditions are indicated at individual test description where applicable.

3.7 Measurement Uncertainty

- for conducted power and emission measurements: +/- 0.5dB;
- for radiated power and emission measurements: +/- 3.0 dB;

Where relevant deviating measurement uncertainty values are specified at individual tests.

3.8 Inheriting Test Results from Incorporated Module Certification:

Taking into account guidance from FCC KDB 996369 (modular approval) and where relevant test procedures did not change conducted test results are leveraged from the related test report number FG140819, issued bySporton International Inc. on Apr 29, 2011, of the certification of the integrated 3G module as identified in section 3.1.
This test report contains full radiated testing as per FCC 22H/24E and RSS-132/133 and conducted power verification required per KDB 996369.

3.9 Other Testing Notes:

1. The different cellular operation modes of the EUT as required for testing are controlled through the link with the Digital Radio Communication Tester (R&S CMU200).
2. The EUT is tested on the low, mid and high channel of each of the supported cellular operation modes.

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-GEN, Issue 3: General Requirements and Information for the Certification of Radio Apparatus
- 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

5 Summary of Measurement Results

GSM850 and FDD II:

Specifications	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §22.913 (a) RSS-GEN, 4.8 RSS-132, 5.4	RF Output Power	Nominal	GSM 850	■	☐	☐	☐	Complies
			UMTS Band V	■	☐	☐	☐	Complies
RSS-132 6.4	Peak-to-Average Ratio	Nominal	GSM 850	☐	☐	☐	■	Complies
			UMTS Band V	☐	☐	☐	■	Complies
§2.1055 §22.355 RSS-GEN, 4.7 RSS-132 5.3	Frequency Stability	Nominal	GSM 850	☐	☐	☐	■	Note 1
			UMTS Band V	☐	☐	☐	■	Note 1
§2.1049 §22.917(b) RSS-GEN, 4.6	Occupied Bandwidth	Nominal	GSM 850	☐	☐	☐	■	Note 1
			UMTS Band V	☐	☐	☐	■	Note 1
§2.1051 §22.917 RSS-GEN, 4.9 RSS-132, 5.5	Band Edge Compliance	Nominal	GSM 850	☐	☐	☐	■	Note 1
			UMTS Band V	☐	☐	☐	■	Note 1
§2.1051 §22.917 RSS-GEN, 4.9 RSS-132, 5.5	Conducted Spurious Emissions	Nominal	GSM 850	☐	☐	☐	■	Note 1
			UMTS Band V	☐	☐	☐	■	Note 1
§2.1053 §22.917 RSS-GEN, 4.9 RSS-132, 5.5	Radiated Spurious Emissions	Nominal	GSM 850	■	☐	☐	☐	Complies
			UMTS Band V	■	☐	☐	☐	Complies

NA= Not Applicable; NP= Not Performed.
Note 1: Leveraged from incorporated 3G module test report (see section 3).

PCS1900 and FDD V:

Specifications	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §24.232 (a) RSS-GEN, 4.8 RSS-133, 6.4	RF Output Power	Nominal	GSM 1900	■	☐	☐	☐	Complies
			UMTS Band II	■	☐	☐	☐	Complies
§24.232 (d) RSS-133 6.4	Peak-to-Average Ratio	Nominal	GSM 850	☐	☐	☐	■	Complies
			UMTS Band V	☐	☐	☐	■	Complies
§2.1055 §24.235 RSS-GEN, 4.7 RSS-133, 6.3	Frequency Stability	Nominal	GSM 1900	☐	☐	☐	■	Note 1
			UMTS Band II	☐	☐	☐	■	Note 1
§2.1049 RSS-GEN, 4.6	Occupied Bandwidth	Nominal	GSM 1900	☐	☐	☐	■	Note 1
			UMTS Band II	☐	☐	☐	■	Note 1
§2.1051 §24.238 RSS-GEN, 4.9 RSS-133, 6.5	Band Edge Compliance	Nominal	GSM 1900	☐	☐	☐	■	Note 1
			UMTS Band II	☐	☐	☐	■	Note 1
§2.1051 §24.238 RSS-GEN, 4.9 RSS-133, 6.5	Conducted Spurious Emissions	Nominal	GSM 1900	☐	☐	☐	■	Note 1
			UMTS Band II	☐	☐	☐	■	Note 1
§2.1053 §24.238 RSS-GEN, 4.9 RSS-133, 6.5	Radiated Spurious Emissions	Nominal	GSM 1900	■	☐	☐	☐	Complies
			UMTS Band II	■	☐	☐	☐	Complies

NA= Not Applicable; NP= Not Performed.
Note 1: Leveraged from incorporated 3G module test report (see section 3).

6 Measurements

Testing is performed according to the guidelines provided in *FCC publication (KDB) 971168 D01 Power Meas License Digital Systems v02r01: Measurement Guidance for Certification of Licensed Digital Transmitters7, June 2013* and according to relevant parts of TIA-603C 2004 as detailed below.

6.1 RF Power Output

6.1.1 References

FCC: CFR Part 2.1046, CFR Part 22.913, CFR Part 24.232, CFR Part 27.50
IC: RSS-Gen Section 4.8; RSS-132 Section 5.4; RSS-133 Section 6.4, RSS-139 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. For comparative purposes, the measurements of emission power and unwanted emissions can be in peak or average provided that the same parameter is used when measuring both.

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.

(4) Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band are limited to 1 watt EIRP.

(5) Equipment employed must be authorized in accordance with the provisions of §24.51. Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (d)(6) of this section. 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) 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 instrument 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 for the emission in question over the full bandwidth of the channel.

6.1.3.1 RSS-132, Issue 3, cl. 5.4

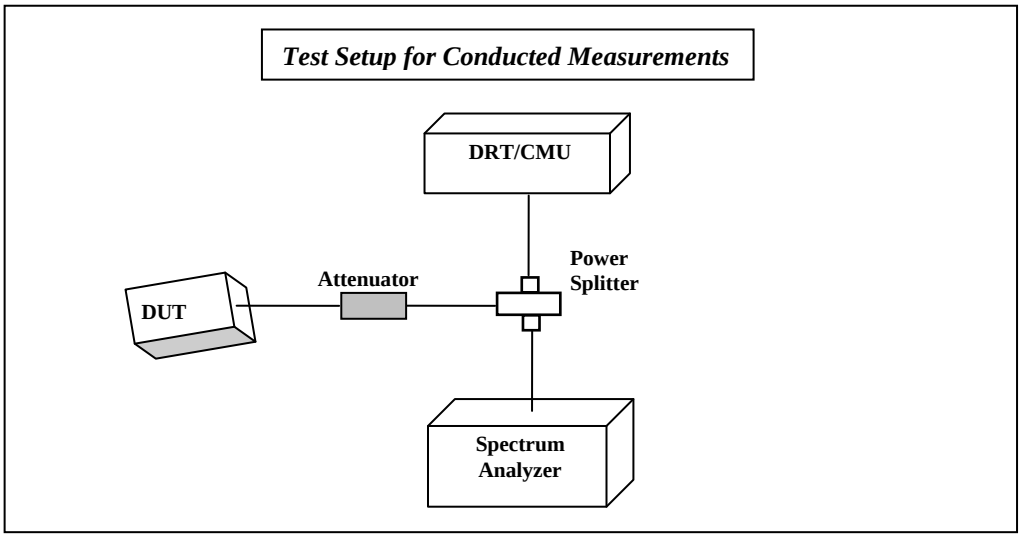
The transmitter output power shall be measured in terms of average power. The equivalent isotropically radiated power (e.i.r.p.) for mobile equipment shall not exceed 11.5 watts.
In addition, the peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time using a signal corresponding to the highest PAPR during periods of continuous transmission.

6.1.3.2 RSS-133, Issue 6, cl. 4.1 and 6.4

The transmitter power shall be measured in terms of average power.
The equivalent isotropically radiated power (e.i.r.p.) for transmitters shall not exceed 2 watts maximum e.i.r.p. In addition, the transmitter's peak-to-average power ratio (PAPR) shall not exceed 13 dB for more than 0.1% of the time using a signal corresponding to the highest PAPR during periods of

6.1.4 Conducted Output Power Measurement Procedure

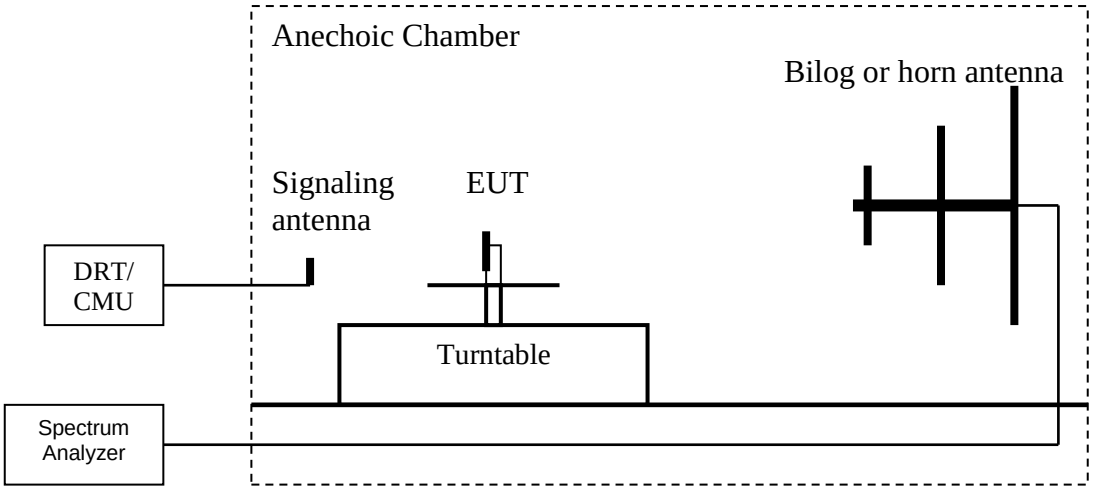
Ref: TIA-603C 2004 2.2.1



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 are performed in GSM 1 uplink slot configuration.
    b. UMTS mode measurements are performed in RMC 12.2K configuration

6.1.5 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 and to required settings: peak detector, max hold trace, RBW>OBW, VBW>3xRBW, sweeptime auto couple, span > 2x RBW;
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.
10. Radiated emission measurements were made in GMSK (1 uplink slot) and UMTS RMC 12.2k.

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.

6.1.6 RF Output Power and PAR - Results:

RF output power values given in dBm if not indicated otherwise.

Frequency (MHz)	Measured Average Output Power from module's test report / rated average max.	Average Output Power (*)	Peak Output Power (*)	PAR calculated	Peak ERP / EIRP	gain calculated (dBi)
850 GMSK						
824.2	32.46 / 33.0	32.0	32.2	0.2	**30.6 / 32.8**	0.6
836.6	32.41	31.7	31.9	0.2	**31.0 / 33.2**	1.3
848.8	32.23	31.5	31.7	0.2	**30.0 / 32.2**	1.5
850 8PSK						
824.2	27.16 / 28.0	26.7	30.0	3.3	**27.6 / 29.8**	-0.2
836.6	27.09	26.6	29.9	3.3	**27.8 / 30.0**	0.1
848.8	27.14	26.3	29.5	3.2	**28.3 / 30.5**	1.0
FDD V						
826.4	22.21 / 24	21.1	24.8	3.7	**22.8 / 25.0**	0.2
836.0	22.03	21.2	24.9	3.7	**22.0 / 24.2**	-0.7
846.6	21.90	21.0	25.0	4	**23.4 / 25.6**	0.6
1900 GMSK						
1850.2	28.97 / 30.0	28.1	28.0	-0.1	**30.2**	2.2
1880	29.11	28.0	27.9	-0.1	**29.0**	1.1
1909.8	28.94	28.8	28.1	-0.7	**28.5**	0.4
1900 8PSK						
1850.2	26.26 / 27.0	24.3	27.6	3.3	**29.8**	2.2
1880	26.24	24.2	27.6	3.4	**28.8**	1.2
1909.8	26.24	24.3	27.7	3.4	**27.8**	0.1
FDD II						
1852.4	23.40 / 25	21.5	25.3	3.8	**25.1**	-0.2
1880	23.31	21.7	25.4	3.7	**25.6**	0.2
1907.6	22.80	21.2	24.4	3.2	**23.4**	-1.0

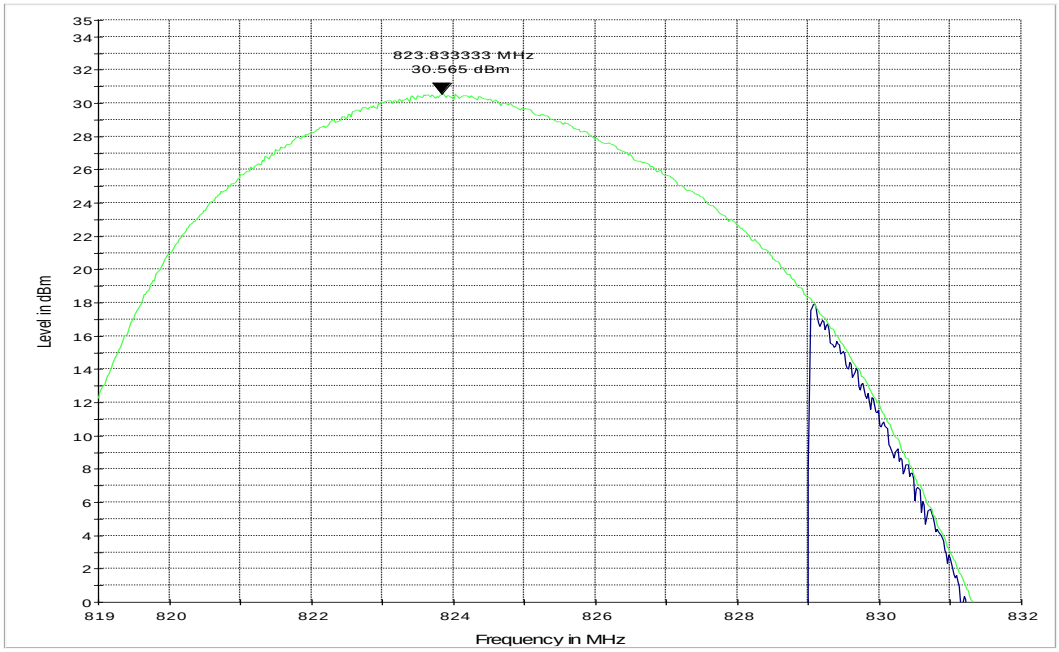
(*) measured at the integrated module's main ufl connector adapting with ca. 43mm long semi rigid low loss cable with approx 0.1 dB loss;

6.1.7 Measurement Verdict - RF Output Power and PAR: PASS

(All measured results remain within the manufacturing tolerance as taken from the 3G module manufacturer's specification.
All PAR values within the limit. All radiated values within ERP / EIRP limits)

6.1.8 Measurement Plots – ERP / EIRP

ERP (GSM 850) CHANNEL 128



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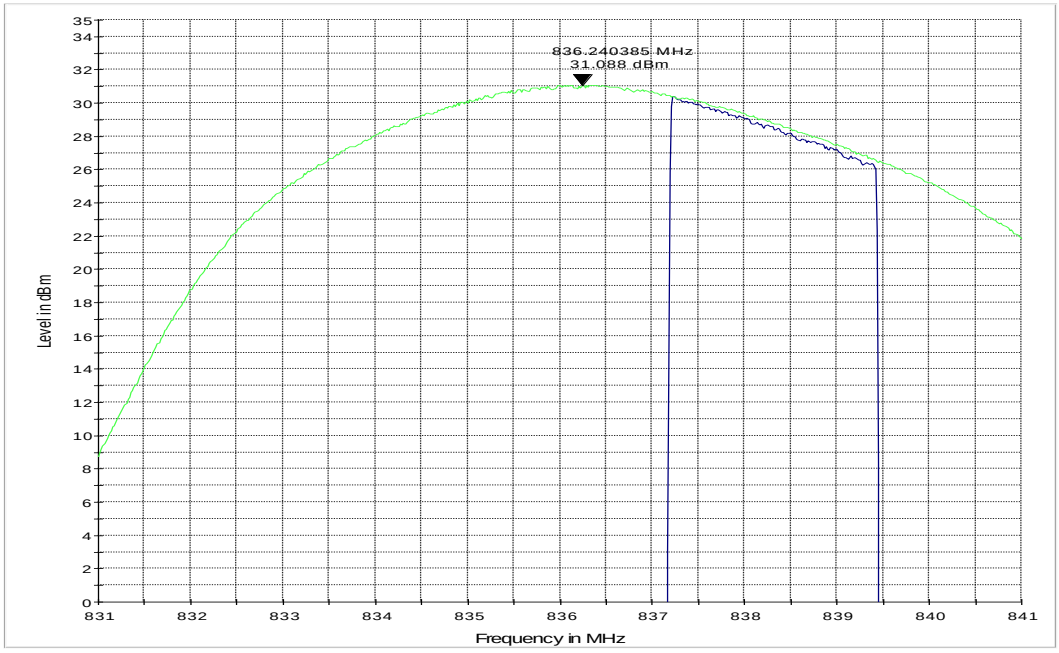
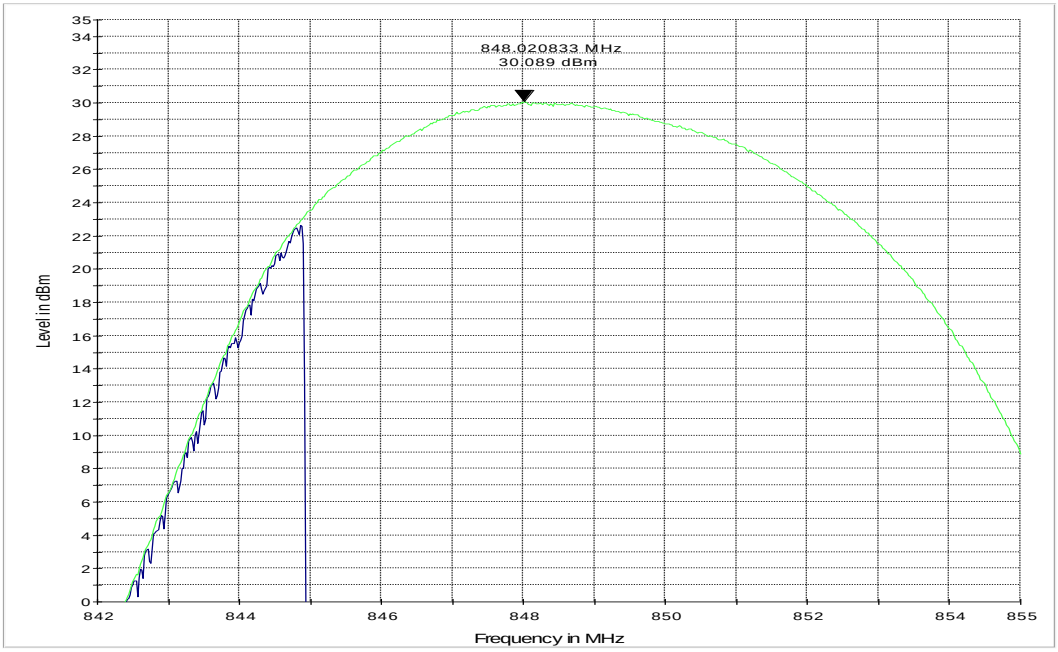


ERP (GSM 850) CHANNEL 251



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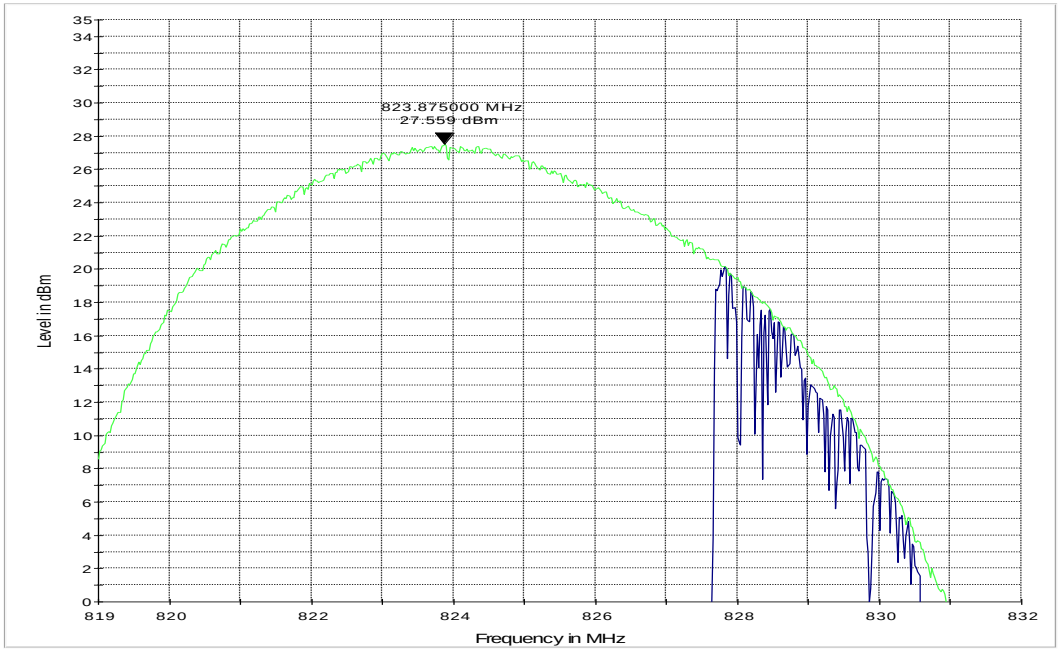

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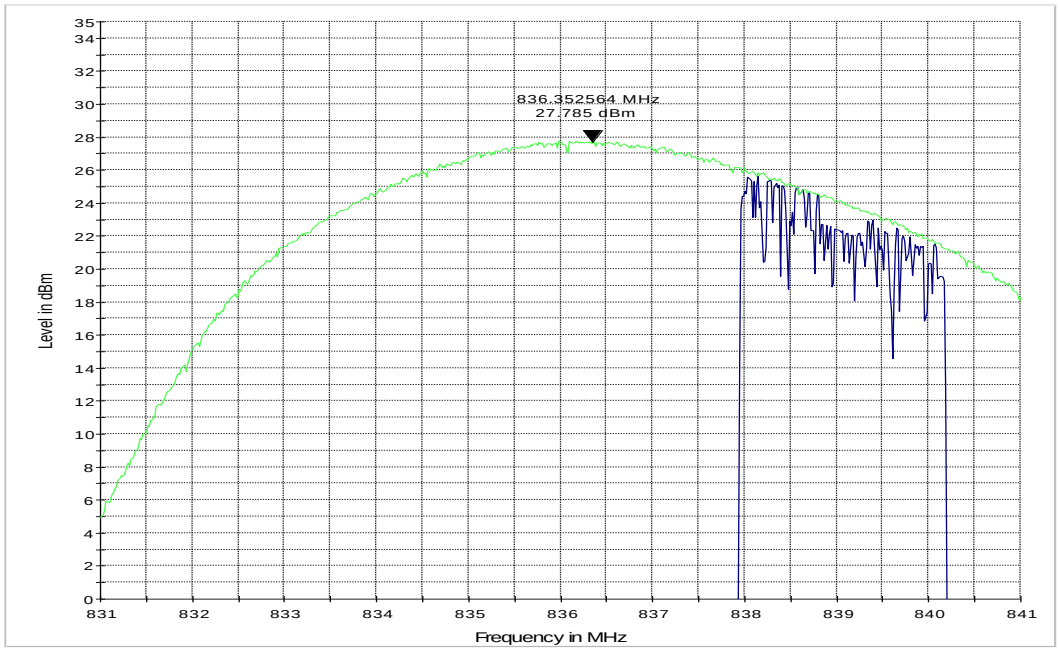

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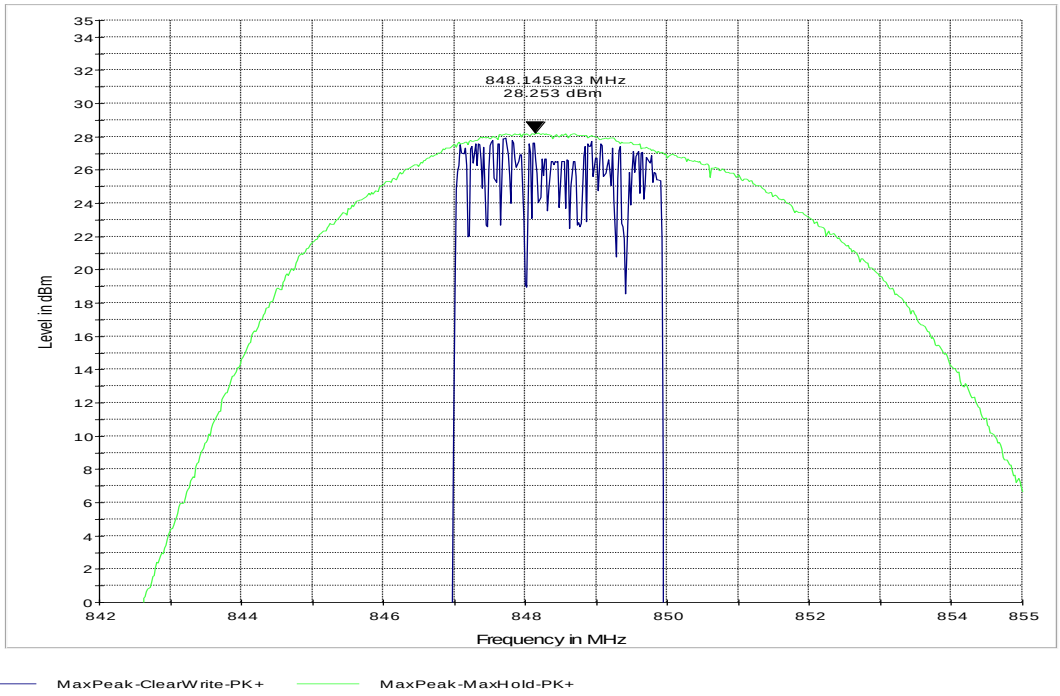
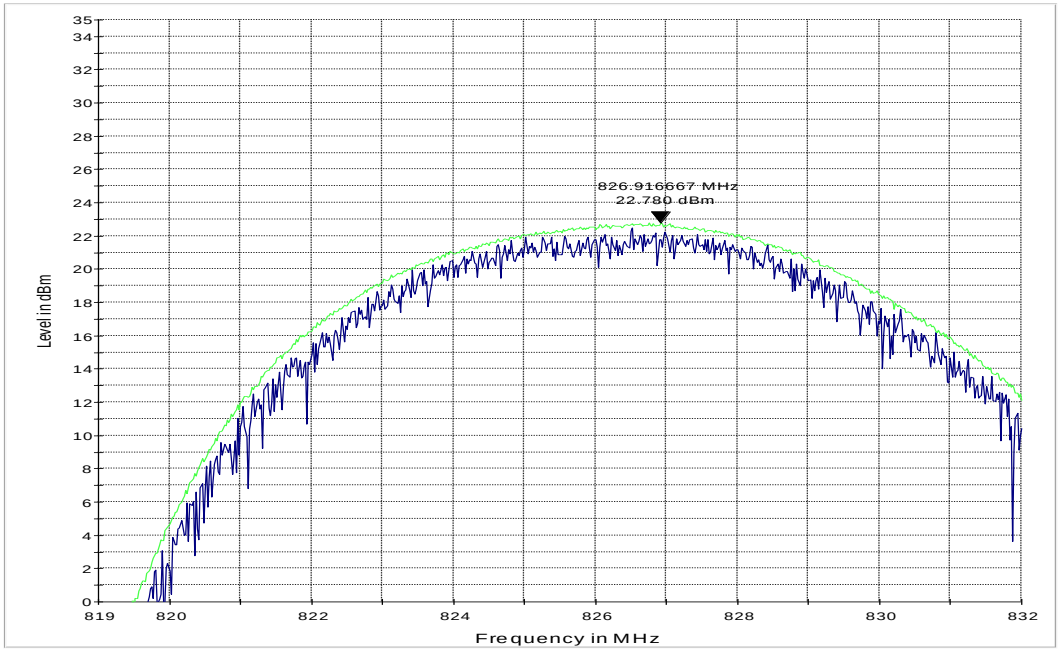
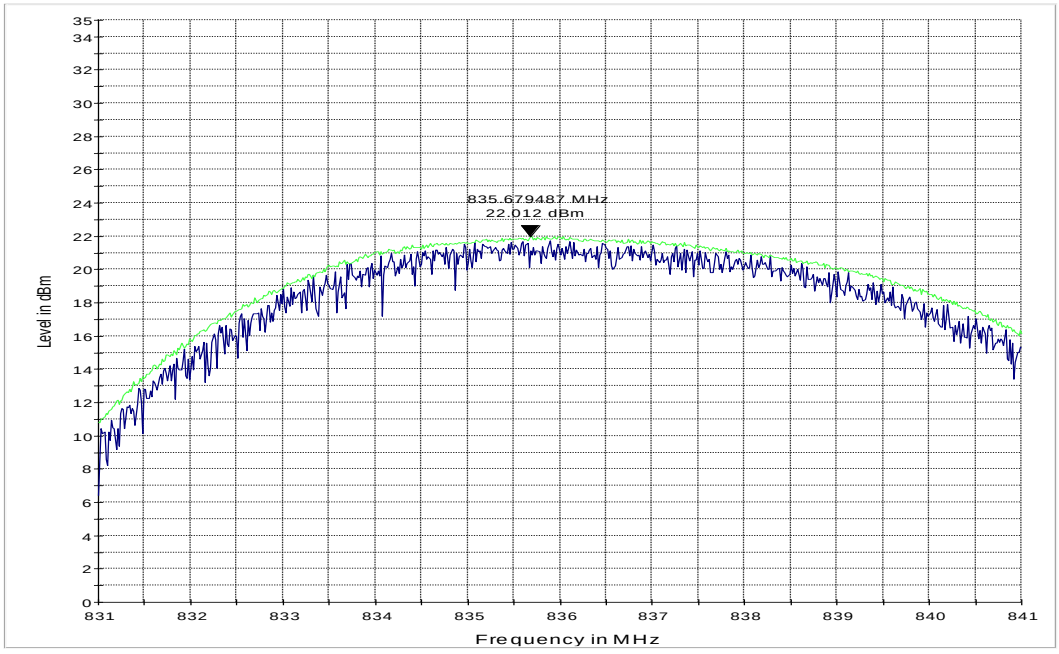


ERP (UMTS FDD5) CHANNEL 4132



ERP (UMTS FDD5) CHANNEL 4183



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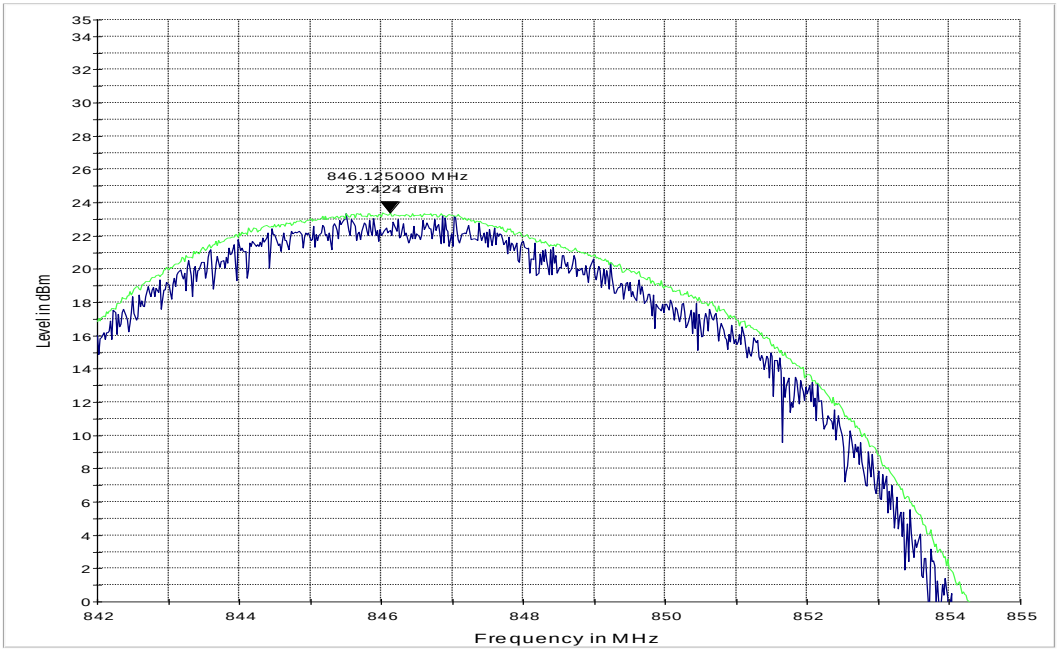

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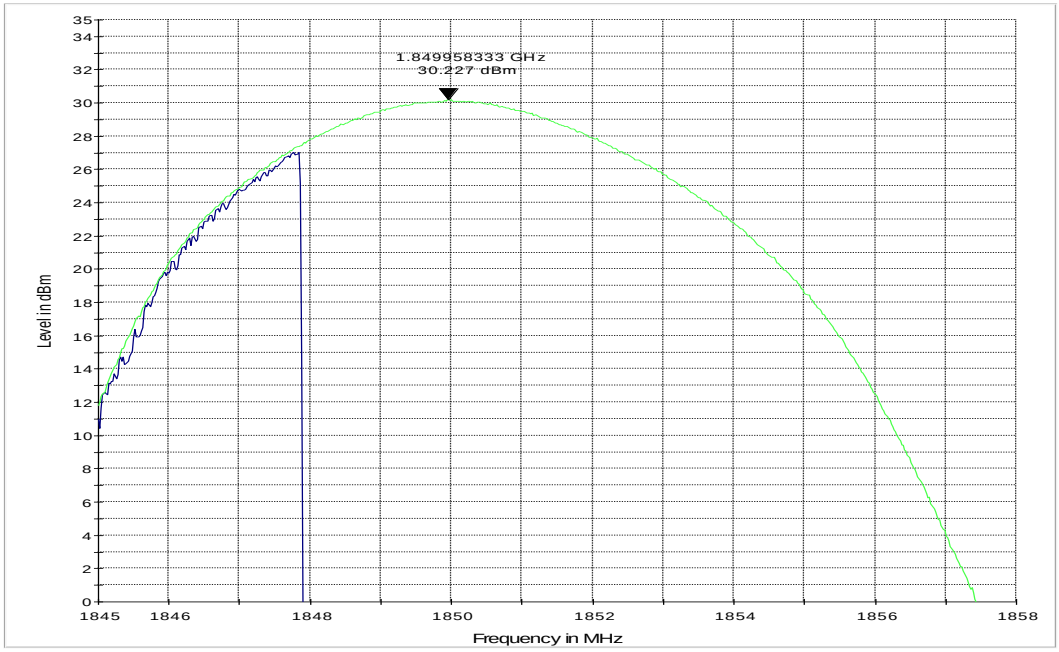

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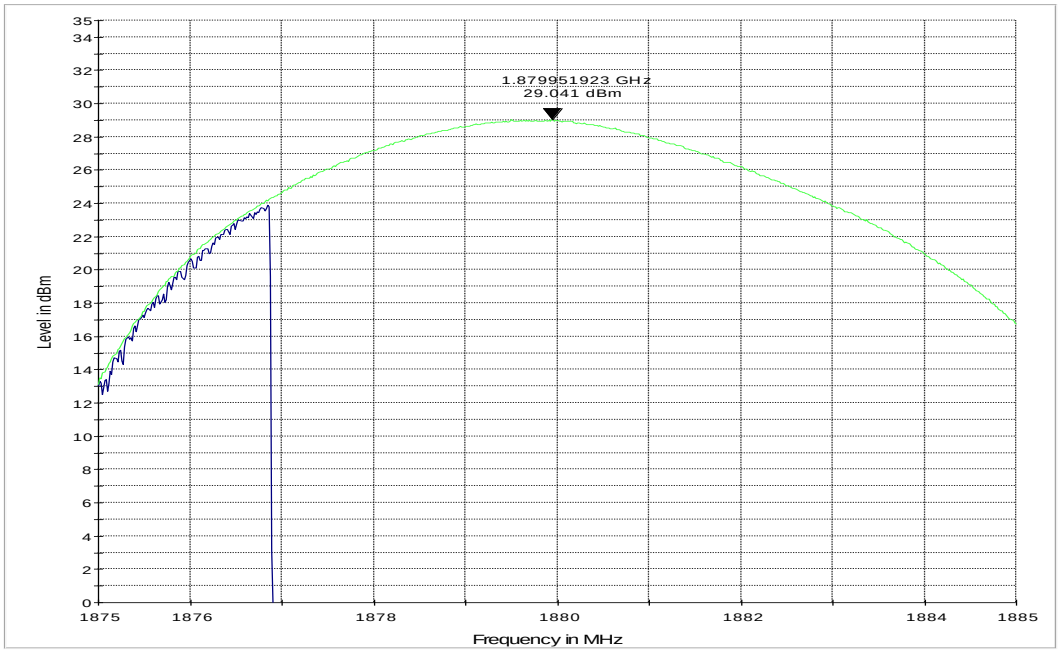

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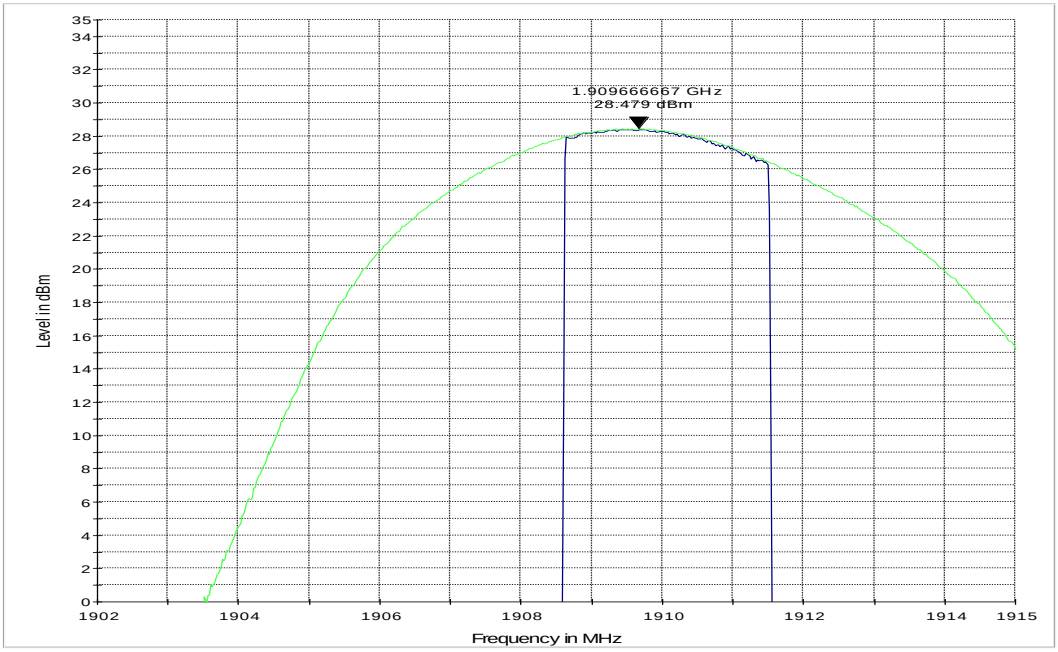

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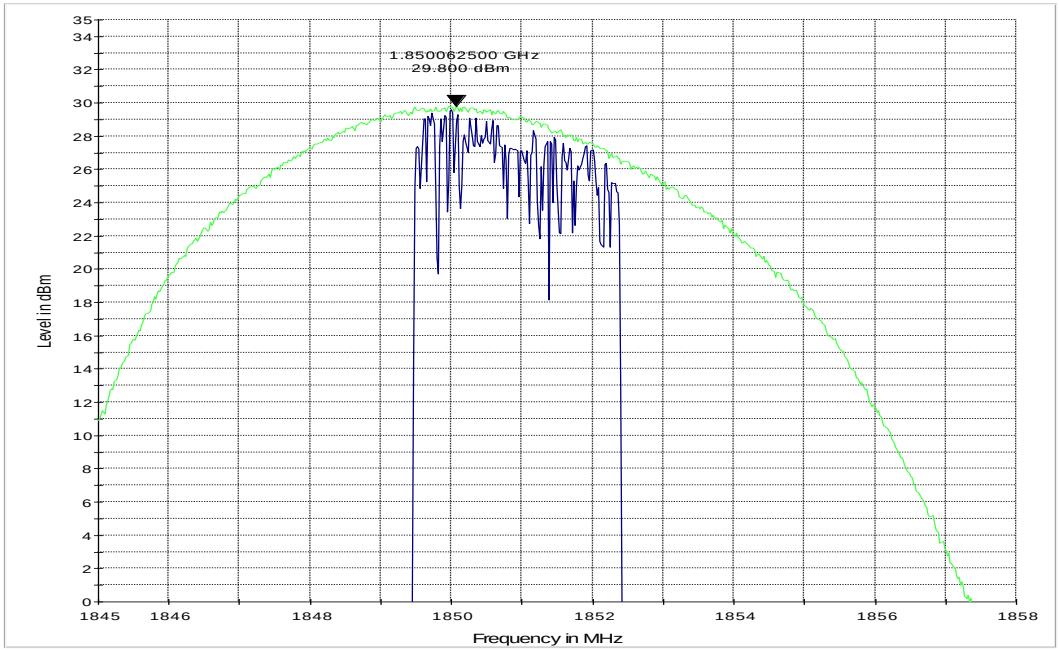

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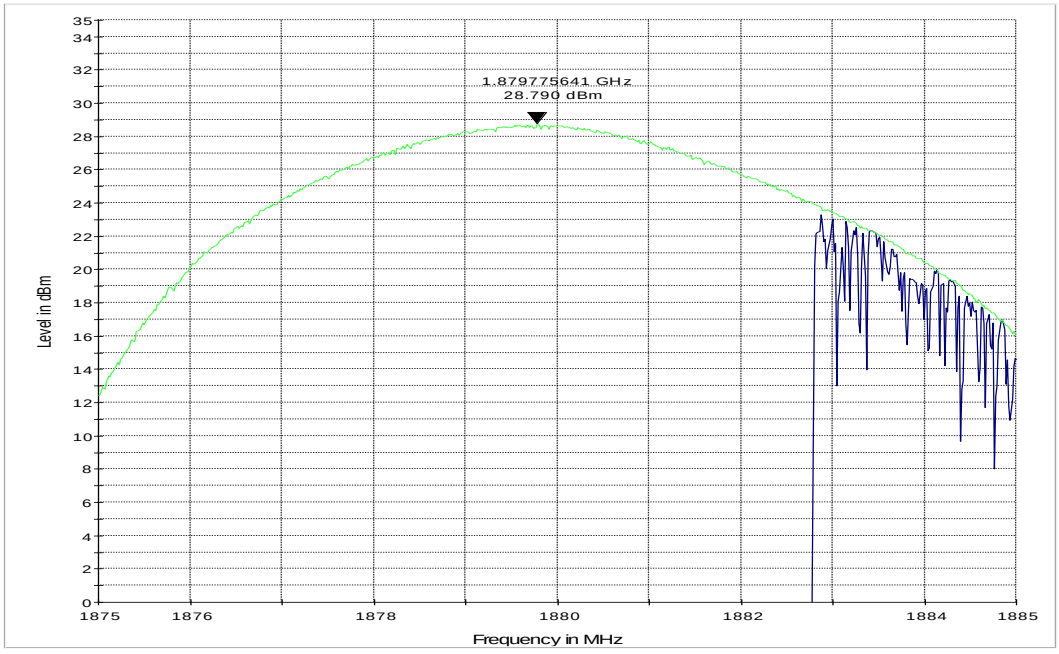

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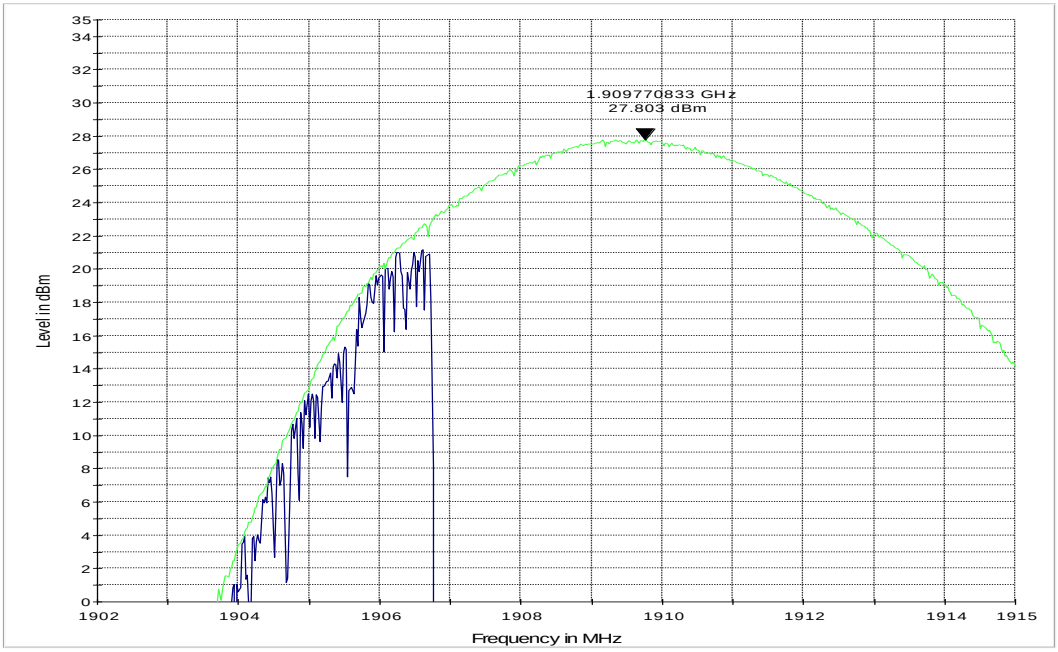
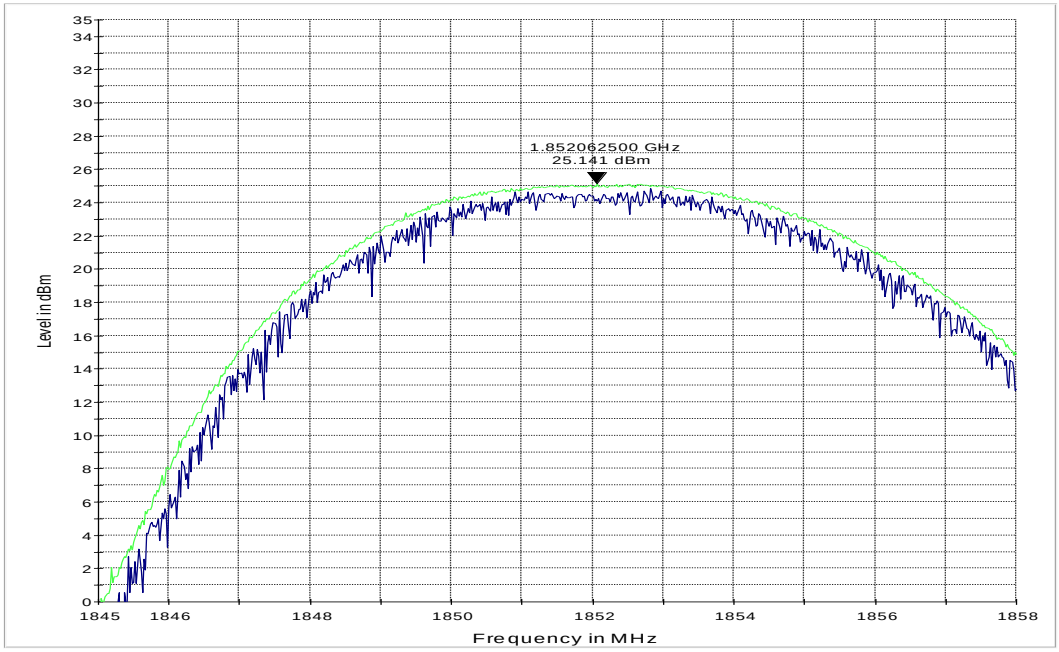
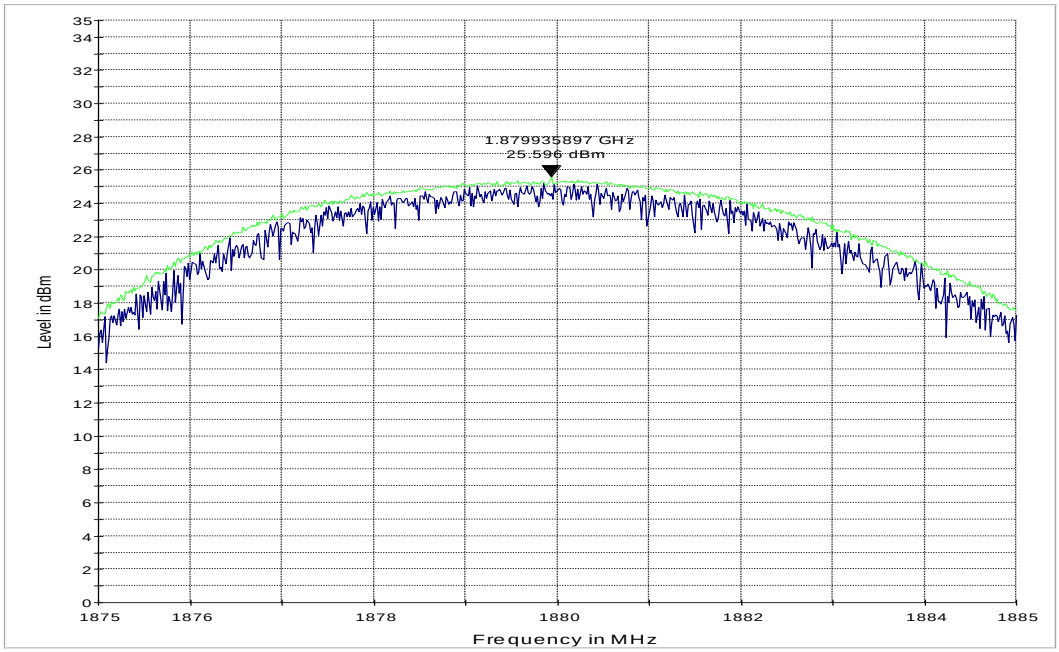


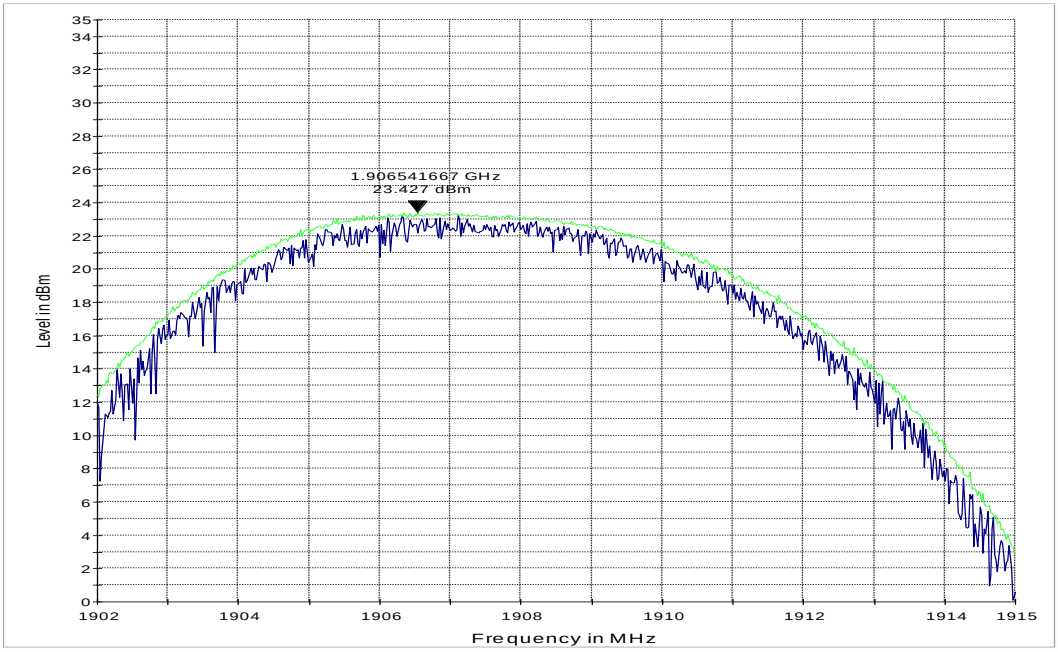
EIRP (UMTS FDD2) CHANNEL 9262



EIRP (UMTS FDD2) CHANNEL 9400



EIRP (UMTS FDD2) CHANNEL 9538



6.2 Transmitter Spurious Emissions - Radiated

6.2.1 References

FCC: CFR Part 2.1053, CFR Part 22.917, CFR Part 24.238, CFR Part 27.53
IC: RSS-Gen Section 4.9; RSS-132 Section 5.5; RSS-133 Section 6.5, RSS-139 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.

§2.1057 Frequency spectrum to be investigated.

(a) In all of the measurements set forth in §§2.1051 and 2.1053, the spectrum shall be investigated from the lowest radio frequency signal generated in the equipment, without going below 9 kHz, up to at least the frequency shown below:

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.

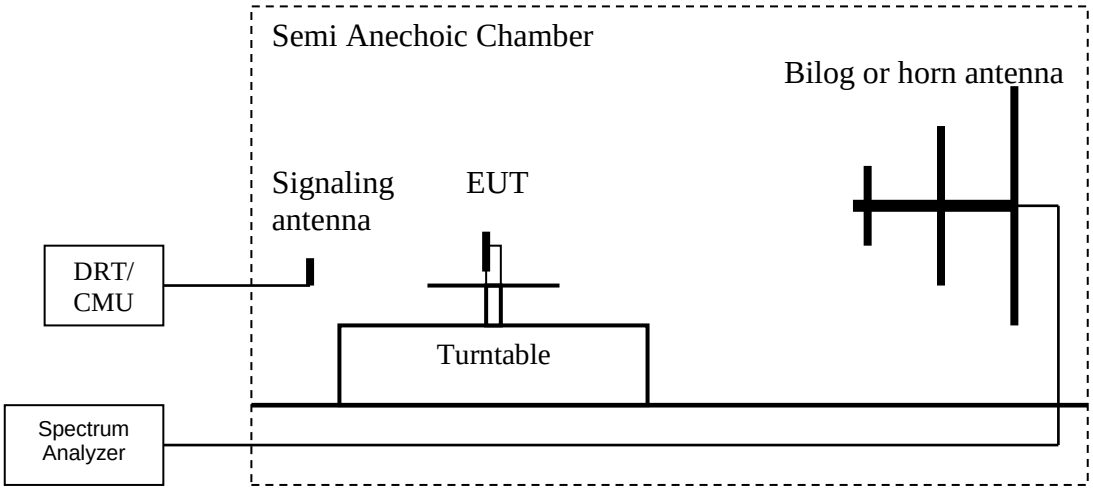
6.2.3.4 RSS-139 Section 6.5

In the first 1.0 MHz bands immediately outside and adjacent to the equipment's operating frequency block, the emission power 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 outside the equipment's operating frequency block, the emission power in any 1 MHz bandwidth shall be attenuated below the transmitter output power P (in watts) by at least $43 + 10 \log_{10}(P)$, dB.

6.2.4 Measurement Procedure:

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



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

6.2.5 Sample Calculations for Radiated Measurements

6.2.5.1 Power Measurements using Substitution Procedure:

1. The measurement from the Spectrum Analyzer is used as a basis for the Substitution procedure.

2. 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 reading as in Step 1.

Radiated Power (dBm)= Signal Generator setting (dBm)- Cable Loss (dB)+ Antenna Gain (dBi)
Example:

Frequency (MHz)	Signal Generator setting (dBm)	Antenna Gain (dBi)	Cable Loss (dB)	EIRP (dBm)
1000	24.5	6.5	3.5	27.5

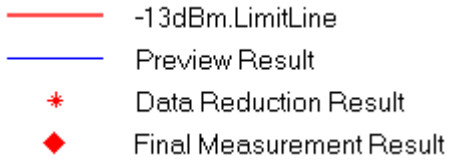
6.2.6 Measurement Survey:

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 GSM-850, PCS-1900, UMTS FDD II, UMTS FDD V.

GSM mode radiated emissions measurements are only done in circuit switched GMSK modulation since the output power in this mode is higher than in 8PSK mode, and hence considered worst case.

For radiated measurements, all data in this report shows the worst case emissions data between H/V antenna polarizations and for all 3 orthogonal orientations of the EUT.
Unless mentioned otherwise, the emission signals above the limit line in the plots are from the carrier.

Legend for the plots on the following pages:



6.2.7 Test Results - Radiated Transmitter Spurious Emissions

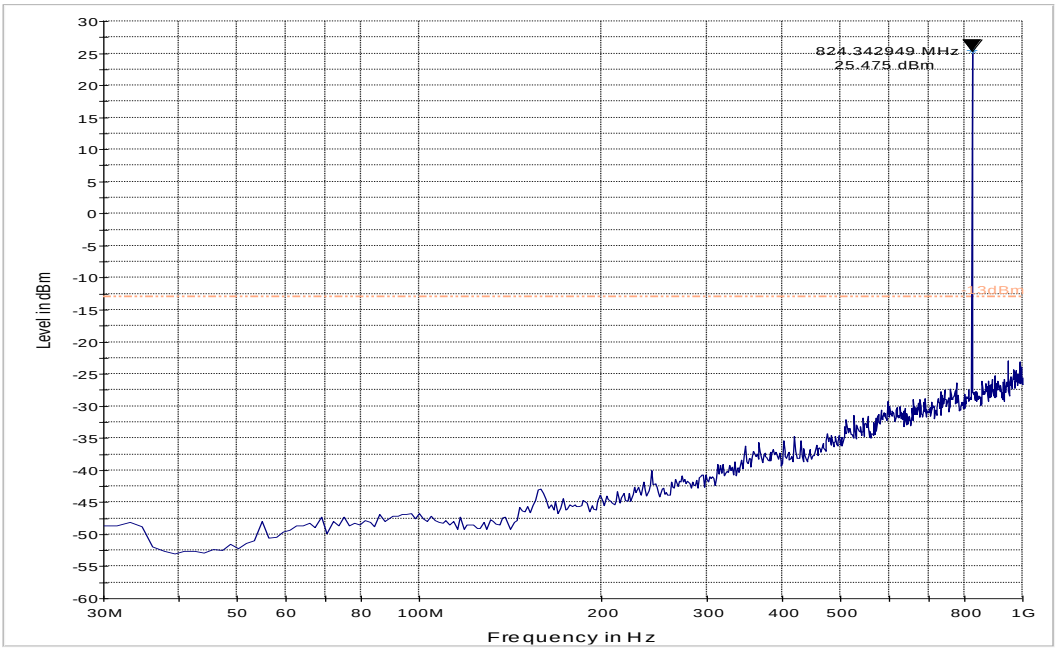
6.2.7.1 TX Spurious Emissions GSM850:

Harmonic	Tx ch-128 Freq. (MHz)	Level (dBm)	Tx ch-190 Freq. (MHz)	Level (dBm)	Tx ch-251 Freq. (MHz)	Level (dBm)
1	**1648.4**	-48.4	**1673.2**	-44.1	**1697.6**	-48.5
2	**2472.6**	-46.5	**2509.8**	-49.5	**2546.4**	-47.8
3	**3296.8**	-52.5	**3346.4**	-52.5	**3395.2**	-51.5
4	**4121**	NF	**4183**	NF	**4244**	NF
5	**4945.2**	NF	**5019.6**	NF	**5092.8**	NF
6	**5769.4**	NF	**5856.2**	NF	**5941.6**	NF
7	**6593.6**	NF	**6692.8**	NF	**6790.4**	NF
8	**7417.8**	NF	**7529.4**	NF	**7639.2**	NF
9	**8242**	NF	**8366**	NF	**8488**	NF
NF = Noise Floor Measurement Uncertainty: ±3dB						

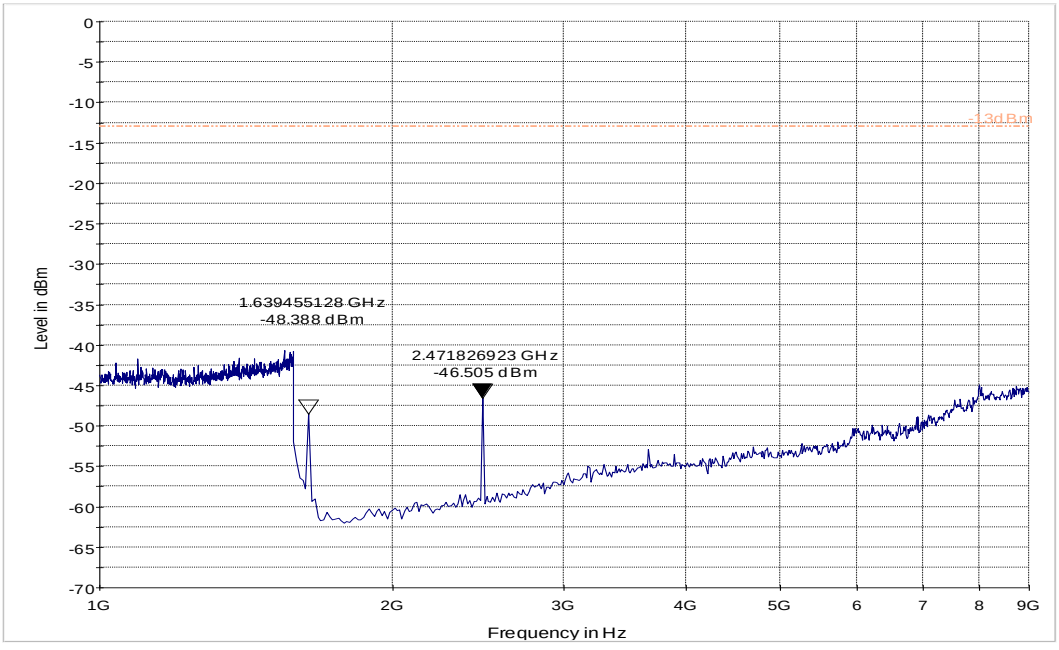
Plots - TX Spurious Emissions GSM850: see follwing pages

TX Spurious Emissions GSM850: Low Channel

Test results 30M-1GHz:
Emission signal above the limit line in the plots is from the Carrier.

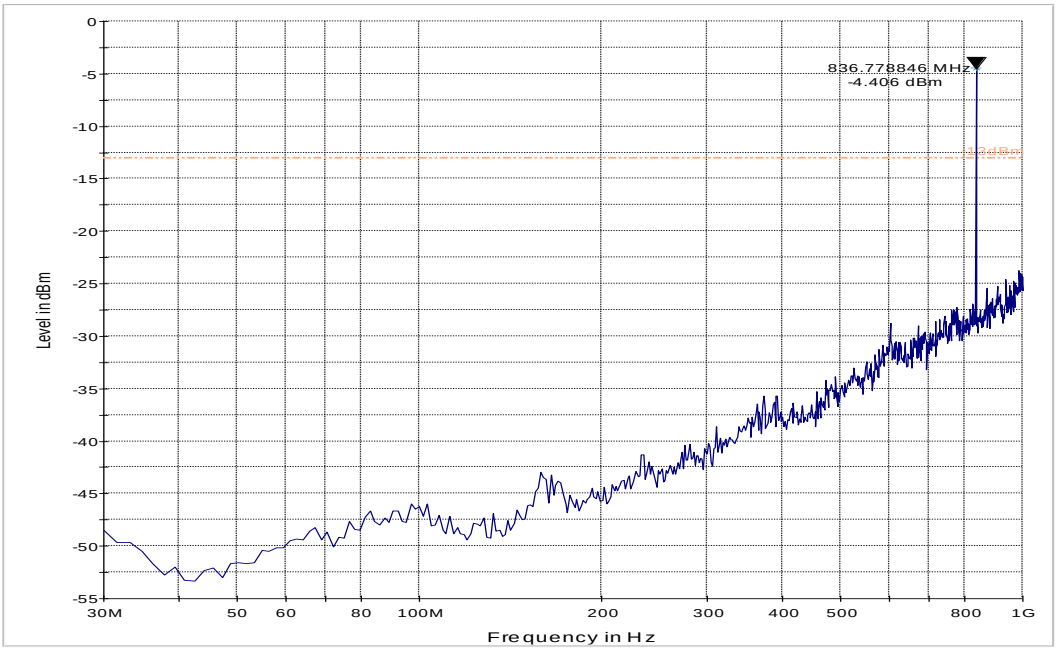


Test results 1GHz-9GHz



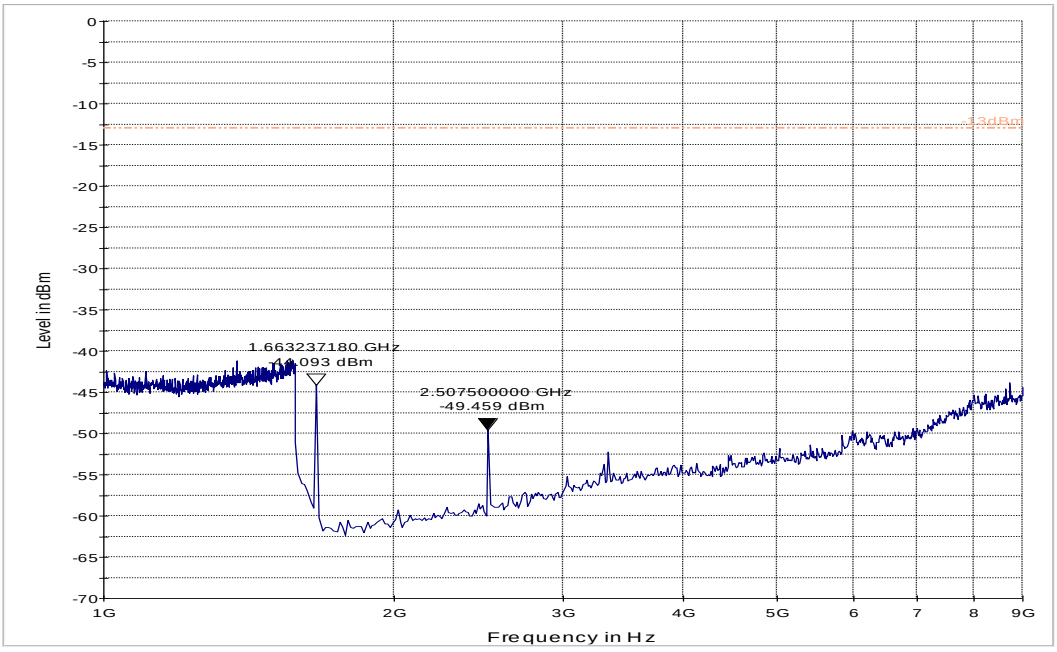
TX Spurious Emissions GSM850: Mid Channel

Test results 30M-1GHz:
Emission signal above the limit line in the plots is from the Carrier.



-13dBm Preview Result 1-PK+ Data Reduction Result 1 [1]-PK+

Test results 1GHz-9GHz

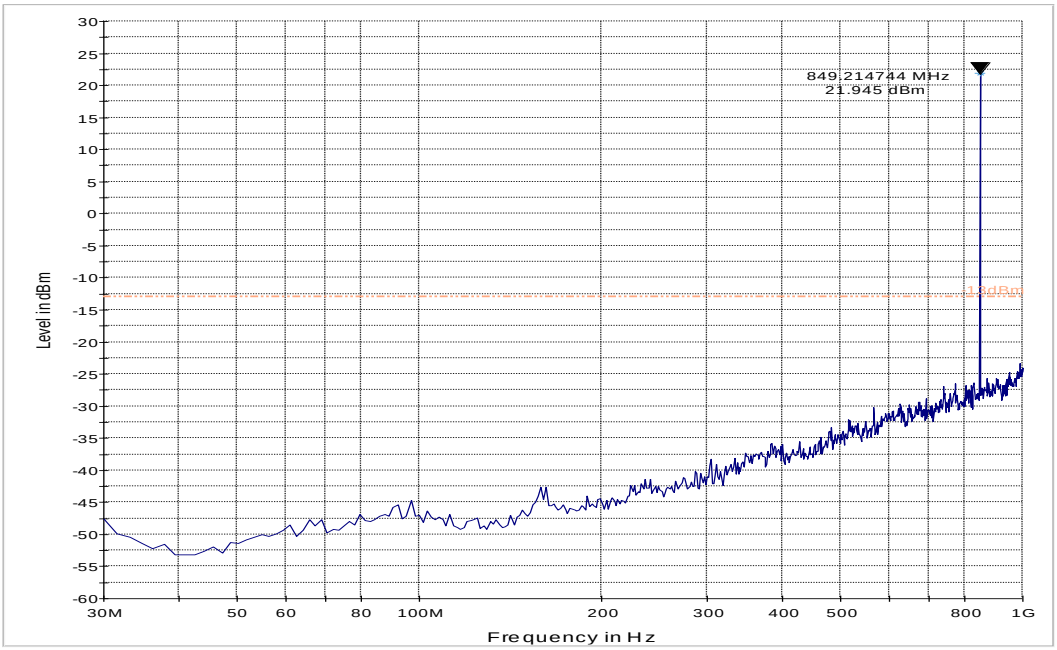


-13dBm Preview Result 1-PK+

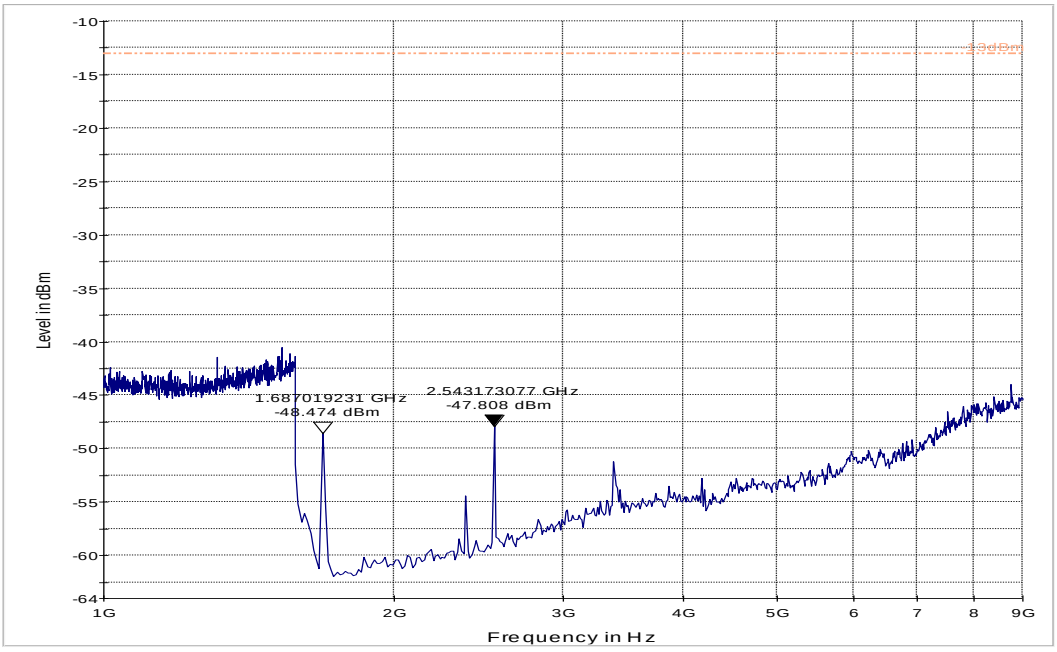
TX Spurious Emissions GSM850: High Channel

Test results 30M-1GHz

Emission signal above the limit line in the plots is from the Carrier.



Test results 1GHz-9GHz



6.2.7.2 TX Spurious Emissions UMTS FDDV

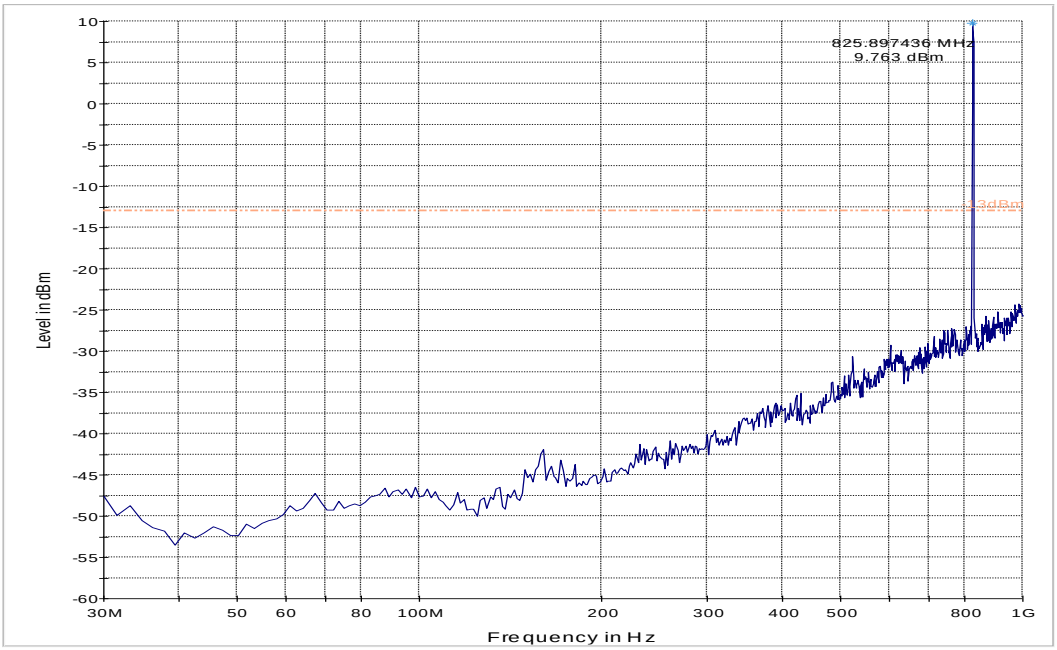
Harmonic	Tx ch-4132 Freq. (MHz)	Level (dBm)	Tx ch-4183 Freq. (MHz)	Level (dBm)	Tx ch-4233 Freq. (MHz)	Level (dBm)
1	**1652.8**	NF	**1673.2**	NF	**1693.2**	NF
2	**2479.2**	NF	**2509.8**	NF	**2539.8**	NF
3	**3305.6**	-53	**3346.4**	-52.5	**3386.4**	-52
4	**4132**	NF	**4183**	NF	**4233**	NF
5	**4958.4**	NF	**5019.6**	NF	**5079.6**	NF
6	**5784.8**	NF	**5856.2**	NF	**5926.2**	NF
7	**6611.2**	NF	**6692.8**	NF	**6772.8**	NF
8	**7437.6**	NF	**7529.4**	NF	**7619.4**	NF
9	**8264**	NF	**8366**	NF	**8466**	NF
NF= Noise Floor Measurement Uncertainty: ±3dB						

Plots - TX Spurious Emissions FDD V: see follwing pages

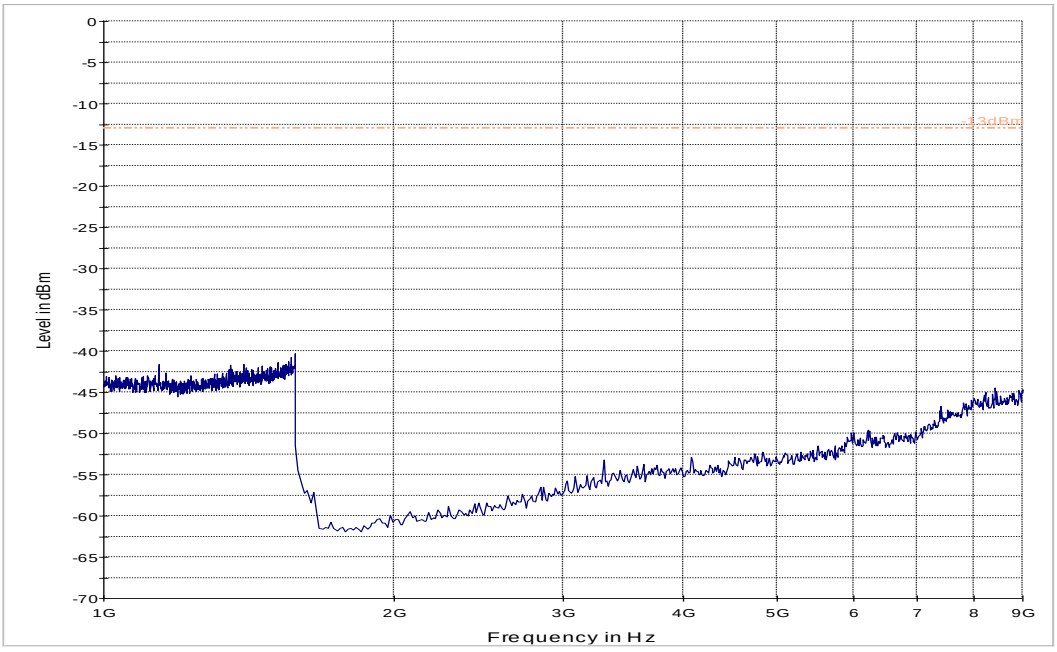
TX Spurious Emissions FDD V: Low Channel

Test results 30M-1GHz

Emission signal above the limit line in the plots is from the Carrier.



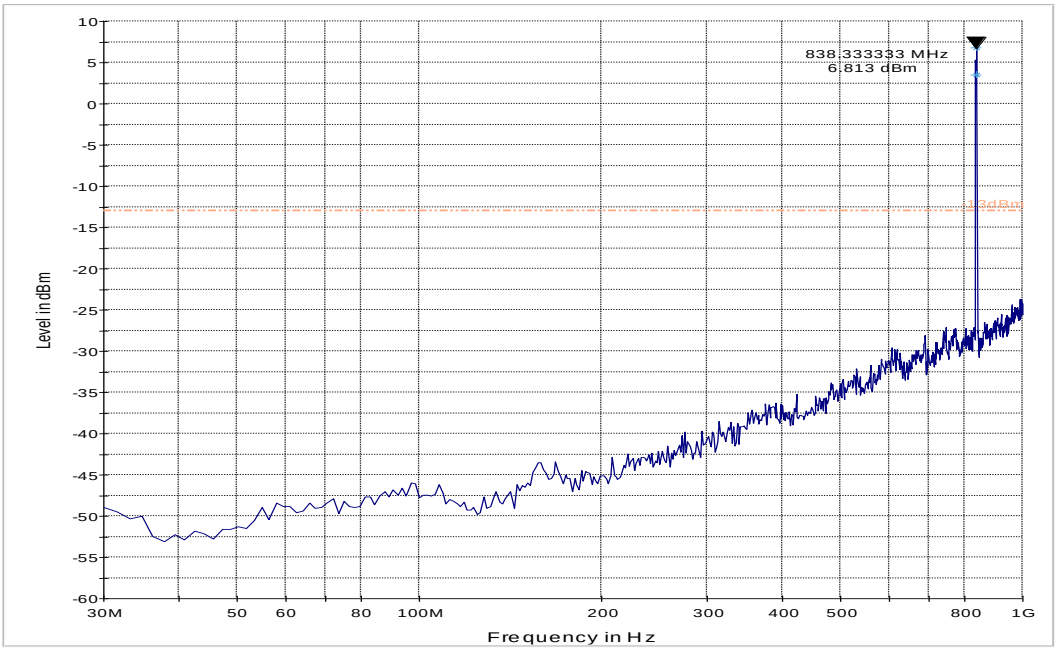
Test results 1GHz-9GHz



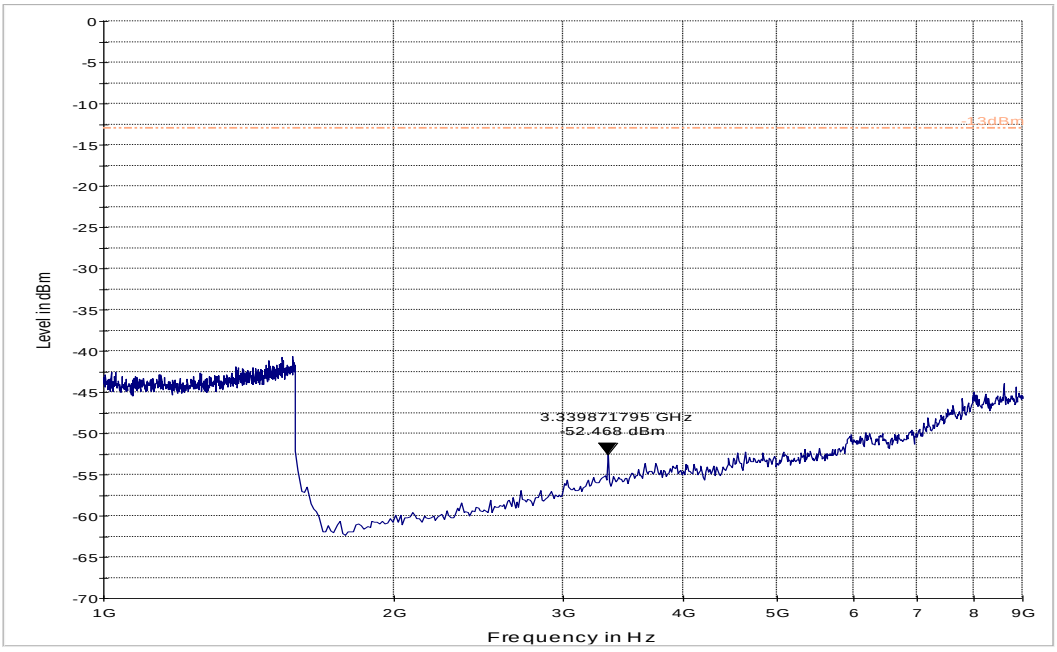
TX Spurious Emissions FDD V: Mid Channel

Test results 30M-1GHz

Emission signal above the limit line in the plots is from the Carrier.



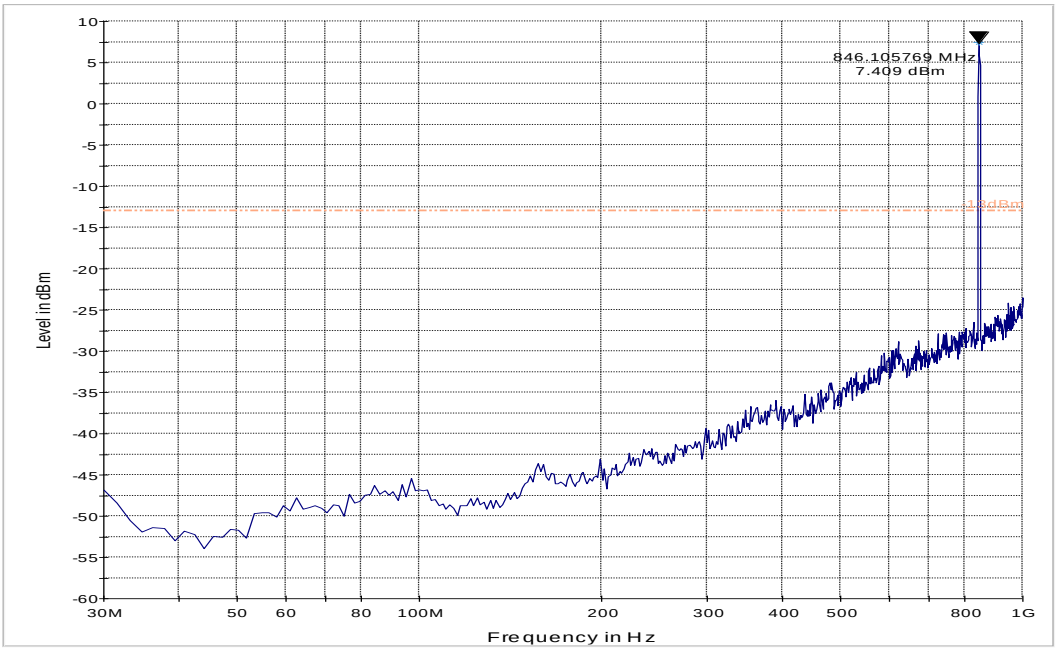
Test results 1GHz-9GHz



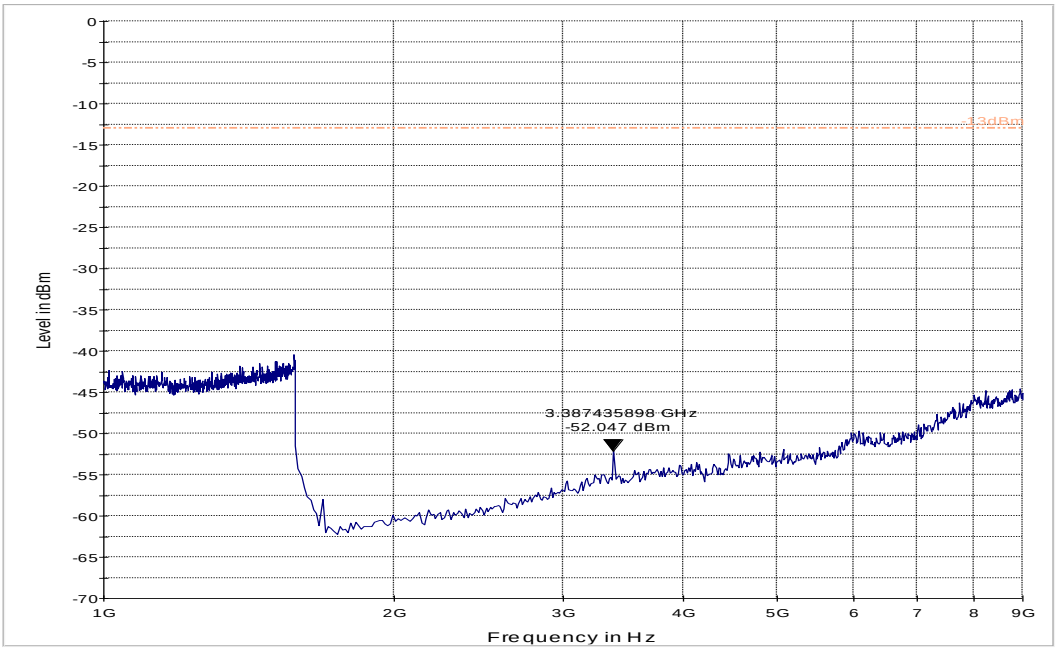
TX Spurious Emissions FDD V: High Channel

Test results 30M-1GHz

Emission signal above the limit line in the plots is from the Carrier.



Test results 1GHz-9GHz



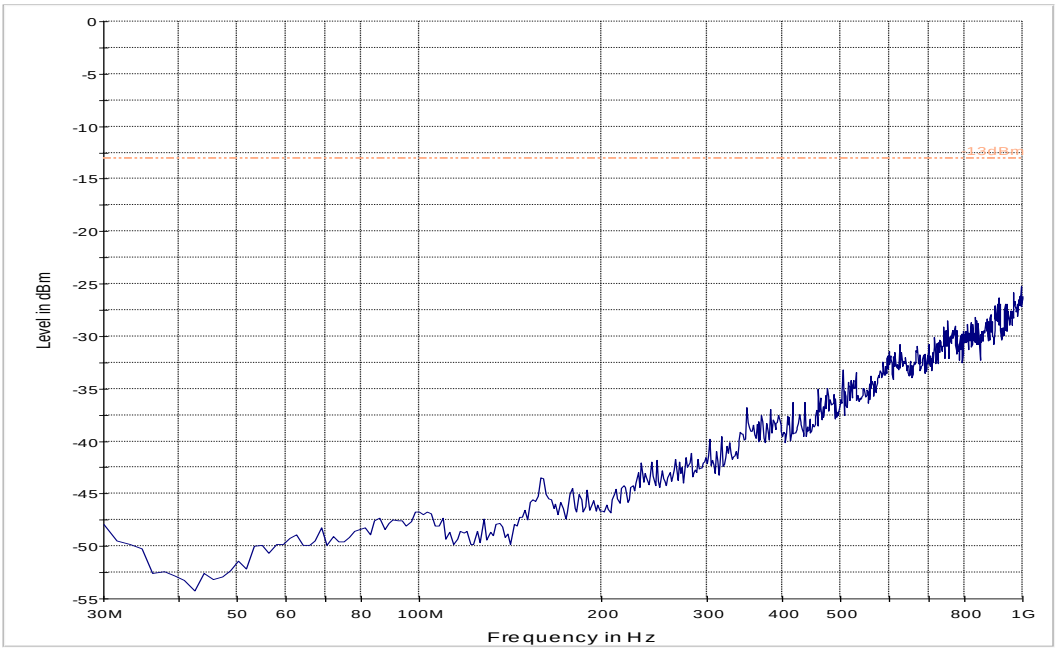
6.2.7.3 TX Spurious Emissions PCS1900

Harmonic	Tx ch-512 Freq.(MHz)	Level (dBm)	Tx ch-661 Freq. (MHz)	Level (dBm)	Tx ch-810 Freq. (MHz)	Level (dBm)
1	**3700.4**	-52	**3760**	-52	**3819.6**	NF
2	**5550.6**	-50	**5640**	NF	**5729.4**	NF
3	**7400.8**	NF	**7520**	NF	**7639.2**	NF
4	**9251**	NF	**9400**	NF	**9549**	NF
5	**11101.2**	NF	**11280**	NF	**11458.8**	NF
6	**12951.4**	NF	**13160**	NF	**13368.6**	NF
7	**14801.6**	NF	**15040**	NF	**15278.4**	NF
8	**16651.8**	NF	**16920**	NF	**17188.2**	NF
9	**18502**	NF	**18800**	NF	**19098**	NF
NF = Noise Floor Measurement Uncertainty: ±3dB						

Plots - TX Spurious Emissions PCS1900: see follwing pages

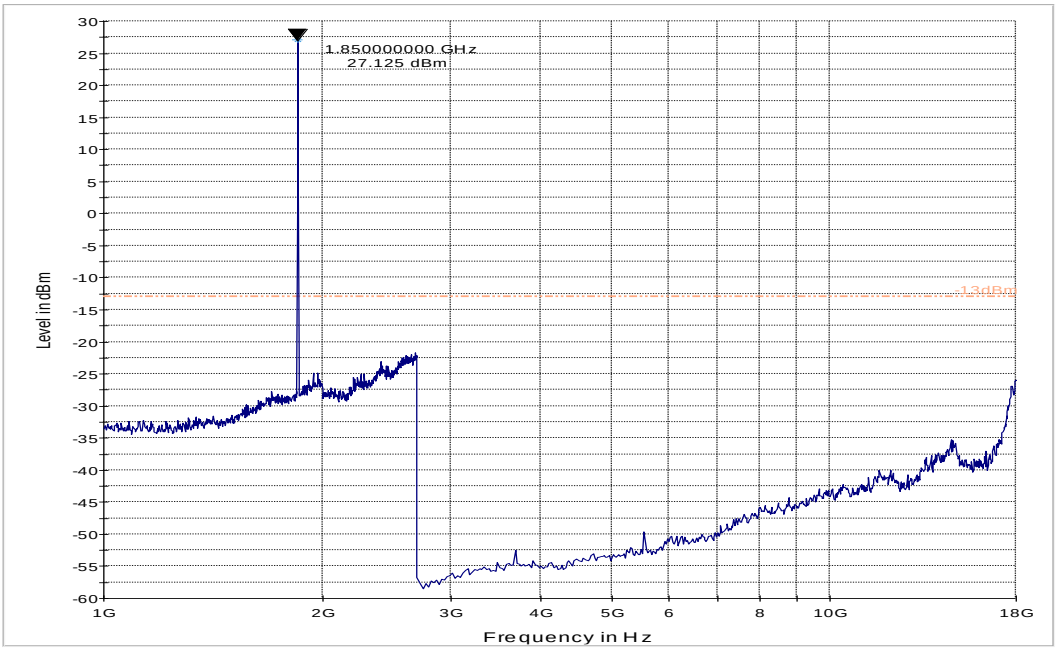
TX Spurious Emissions PCS1900: Low Channel

Test results 30M-1GHz



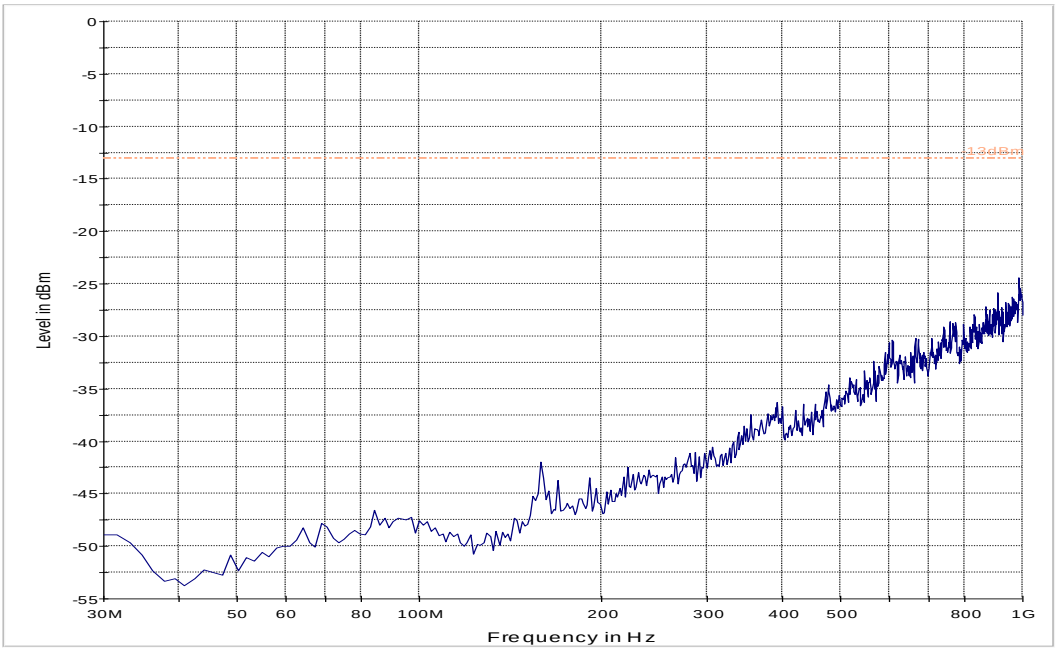
Test results 1GHz-18GHz

Emission signal above the limit line in the plots is from the Carrier.



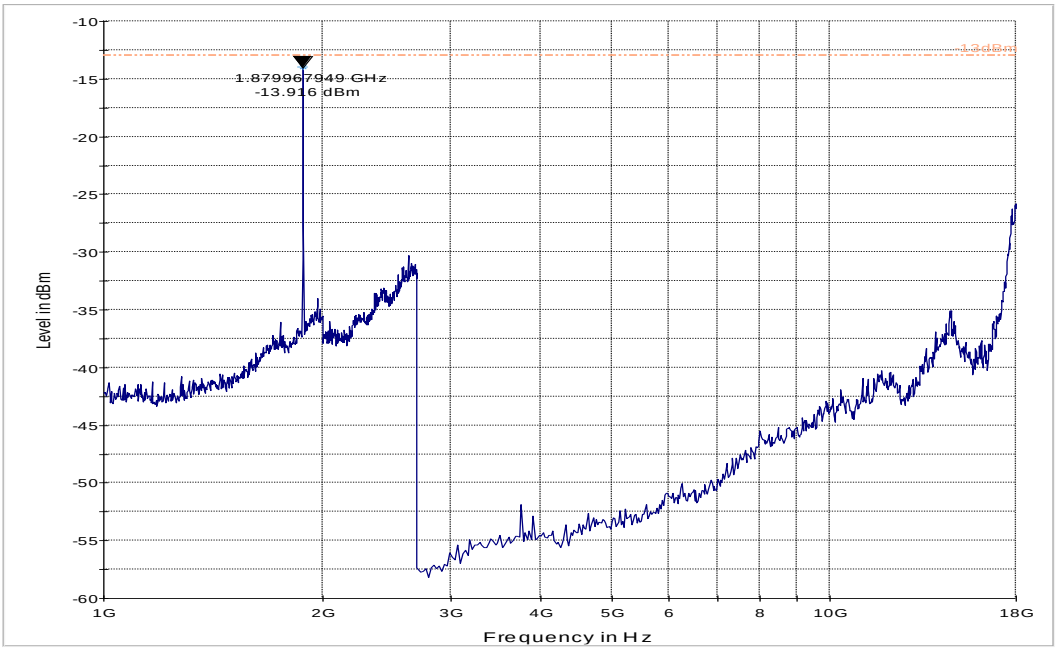
TX Spurious Emissions PCS1900: Mid Channel

Test results 30M-1GHz



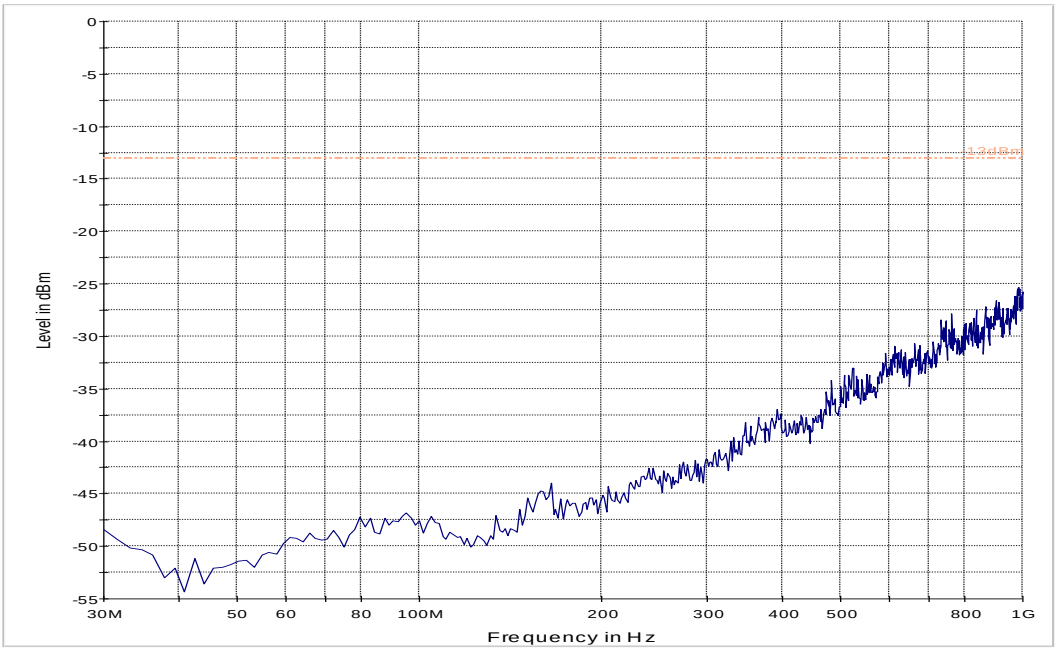
Test results 1GHz-18GHz

Emission signal above the limit line in the plots is from the Carrier.



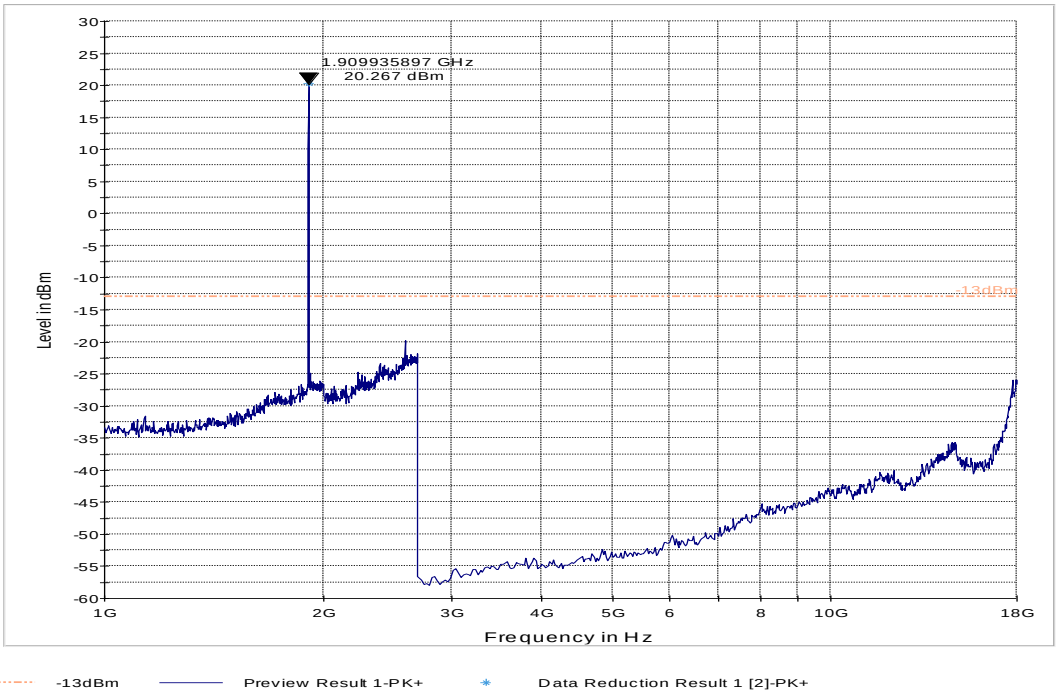
TX Spurious Emissions PCS1900: High Channel

Test results 30M-1GHz

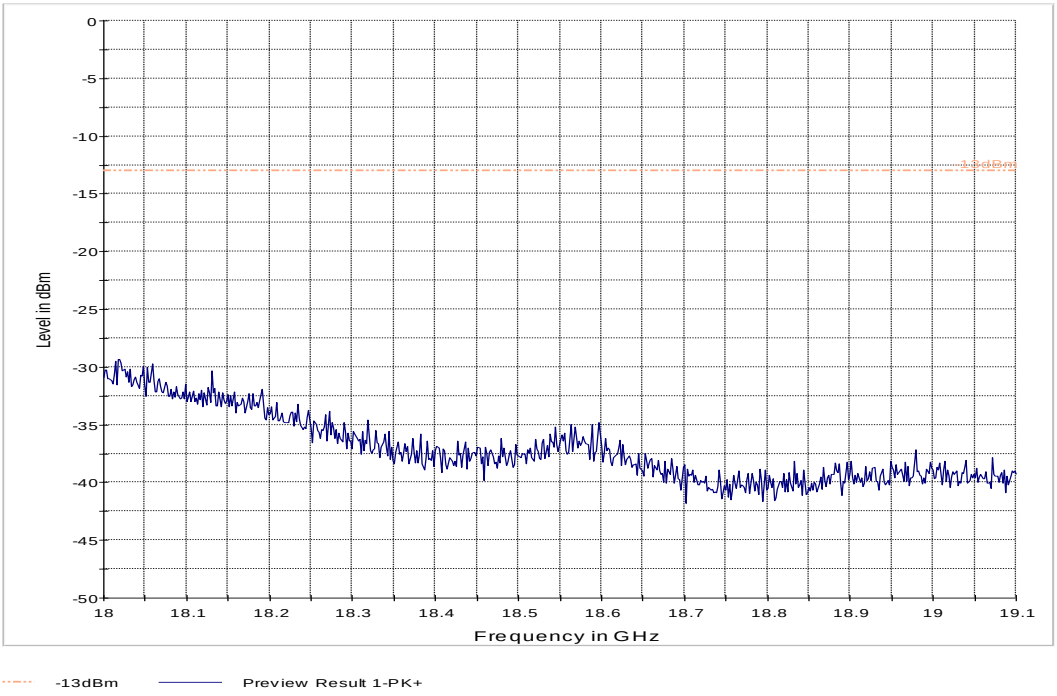


Test results 1GHz-18GHz

Emission signal above the limit line in the plots is from the Carrier.



Test results 18GHz-19.1GHz Tx: Mid Channel
Worst case representation for all channels in this band.



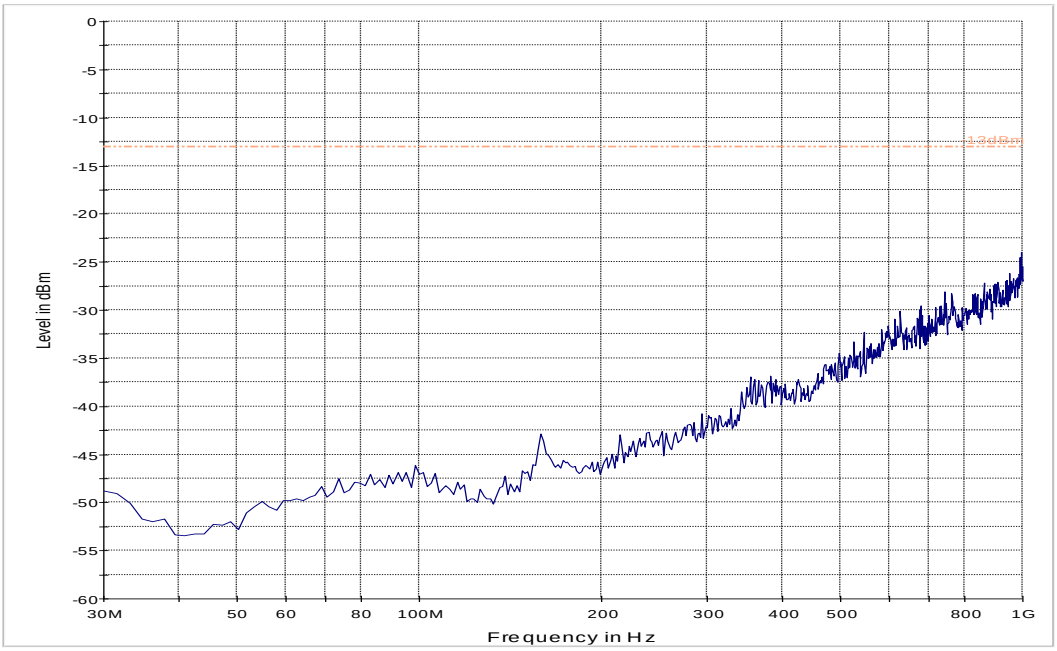
6.2.7.4 TX Spurious Emissions UMTS FDD II

Harmonic	Tx ch-9262 Freq. (MHz)	Level (dBm)	Tx ch-9400 Freq. (MHz)	Level (dBm)	Tx ch-9538 Freq. (MHz)	Level (dBm)
1	**3704.8**	-40.4	**3760**	-37.3	**3815.2**	-43.9
2	**5557.2**	NF	**5640**	NF	**5722.8**	NF
3	**7409.6**	NF	**7520**	NF	**7630.4**	NF
4	**9262**	NF	**9400**	NF	**9538**	NF
5	**11114.4**	NF	**11280**	NF	**11445.6**	NF
6	**12966.8**	NF	**13160**	NF	**13353.2**	NF
7	**14819.2**	NF	**15040**	NF	**15260.8**	NF
8	**16671.6**	NF	**16920**	NF	**17168.4**	NF
9	**18524**	NF	**18800**	NF	**19076**	NF
NF= Noise Floor Measurement Uncertainty: ±3dB						

Plots - TX Spurious Emissions FDD II: see follwing pages

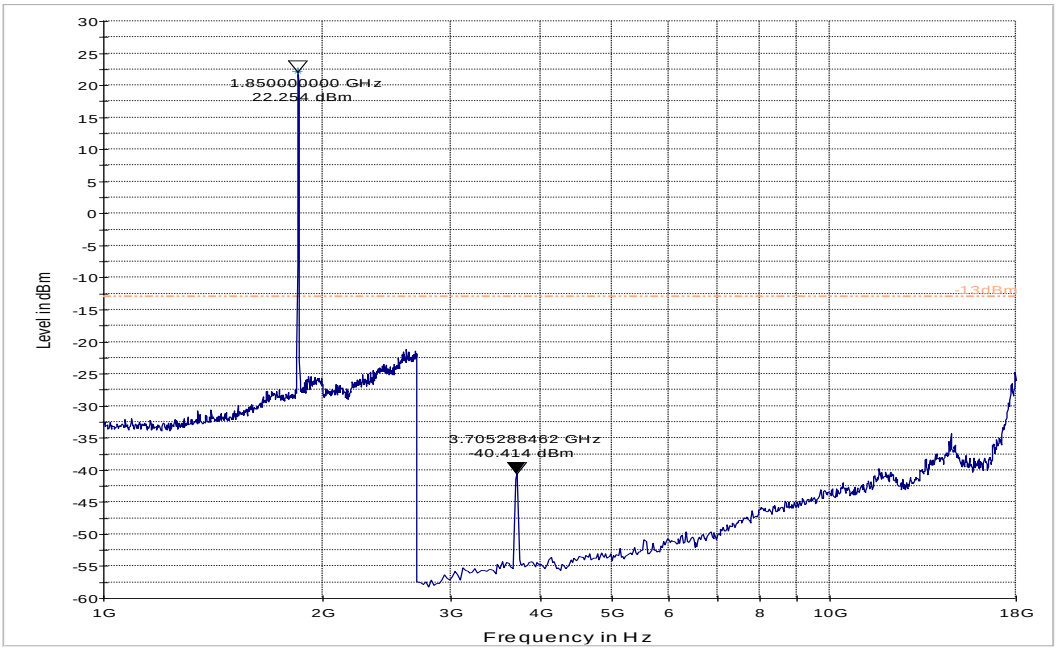
TX Spurious Emissions FDD II: Low Channel

Test results 30M-1GHz



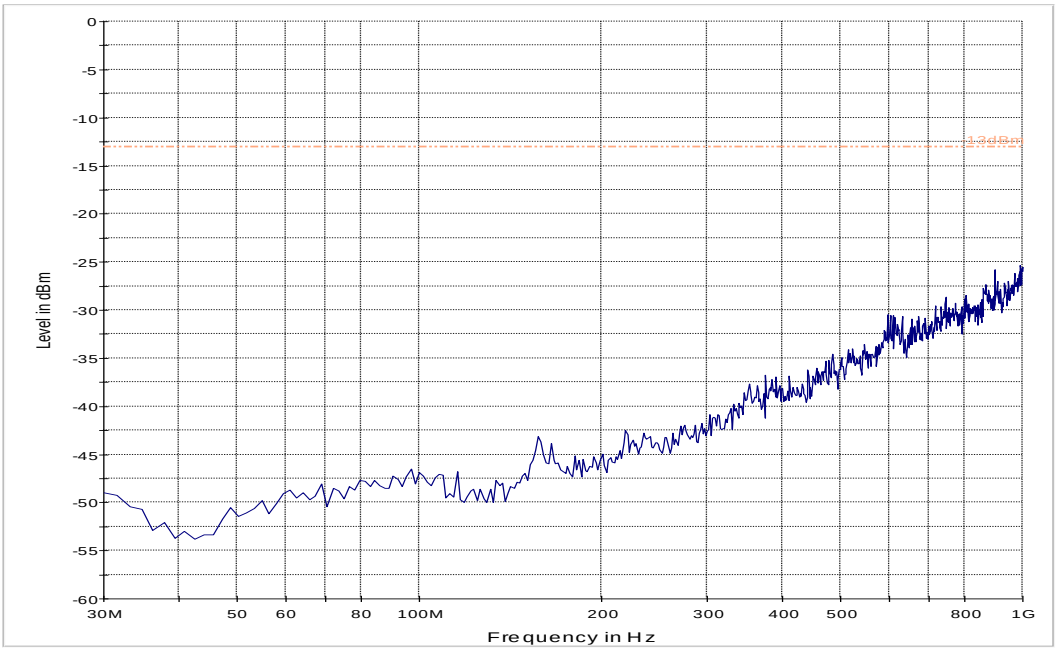
Test results 1GHz-18GHz

Emission signal above the limit line in the plots is from the Carrier.



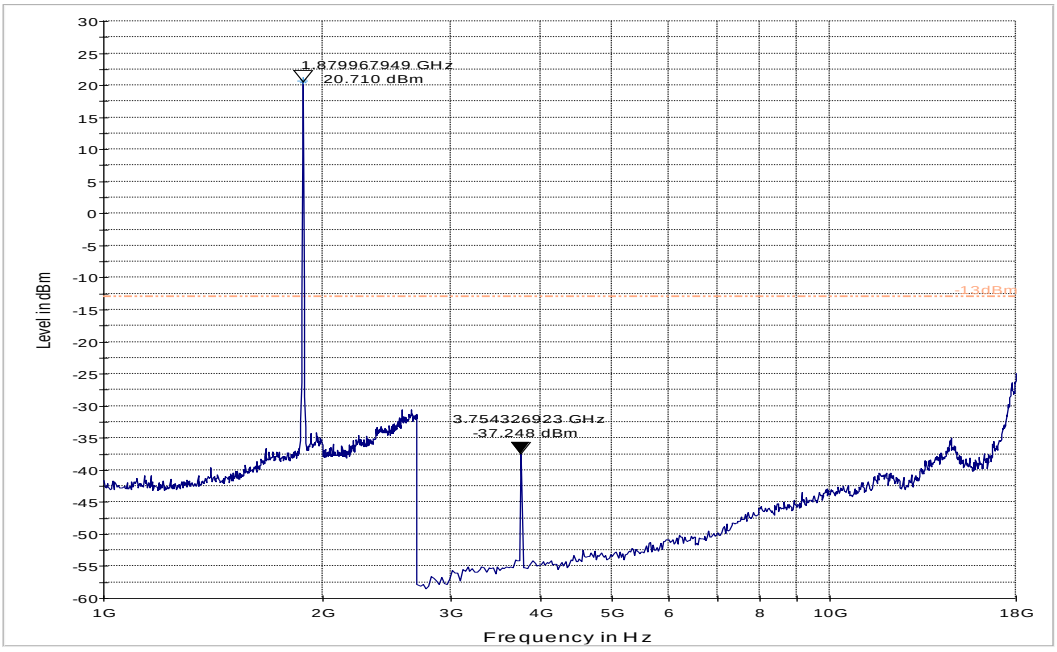
TX Spurious Emissions FDD II: Mid Channel

Test results 30M-1GHz



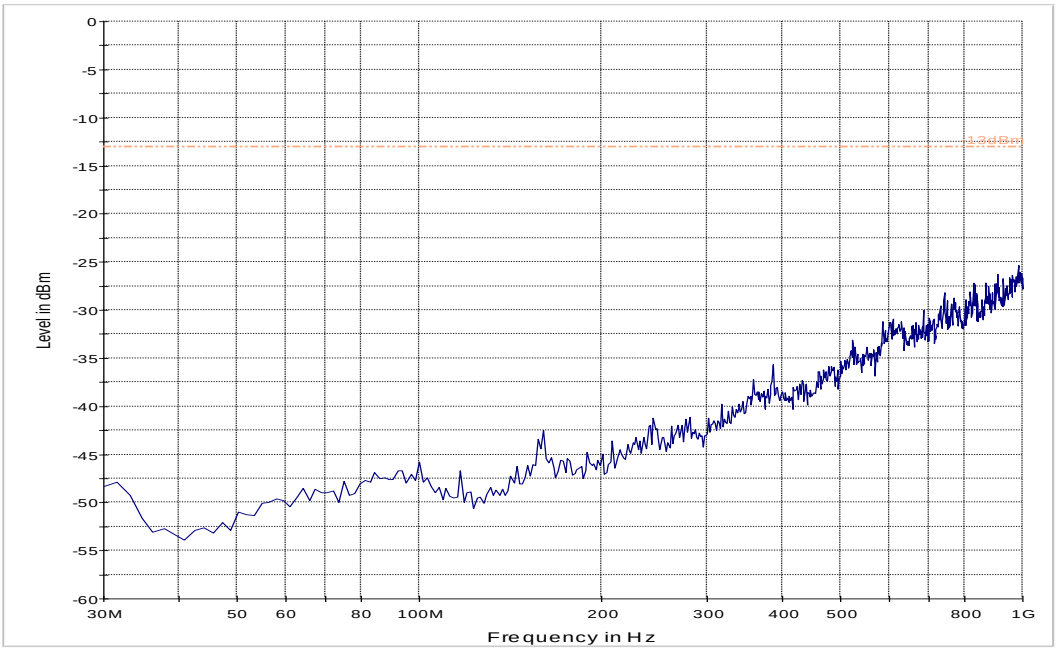
Test results 1GHz-18GHz

Emission signal above the limit line in the plots is from the Carrier.



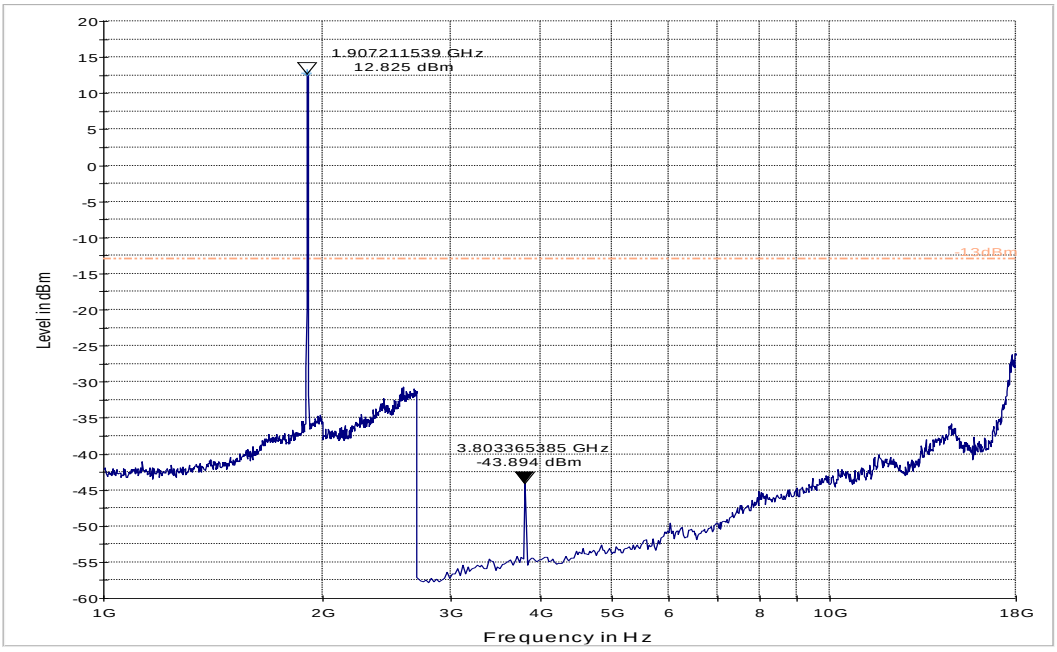
TX Spurious Emissions FDD II: High Channel

Test results 30M-1GHz

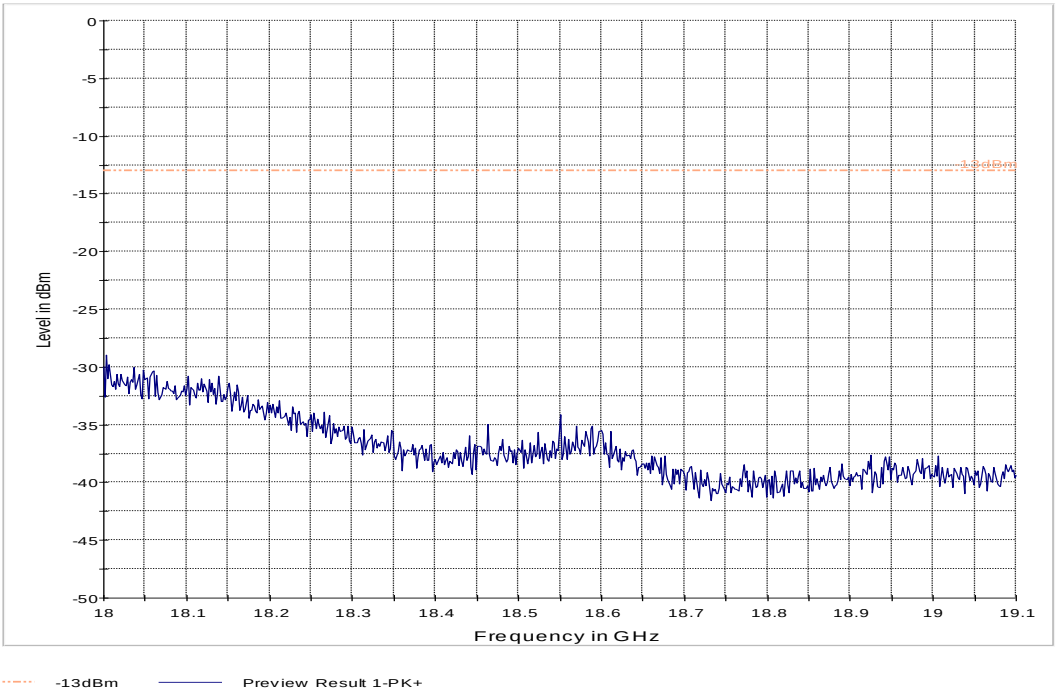


Test results 1GHz-18GHz

Emission signal above the limit line in the plots is from the Carrier.



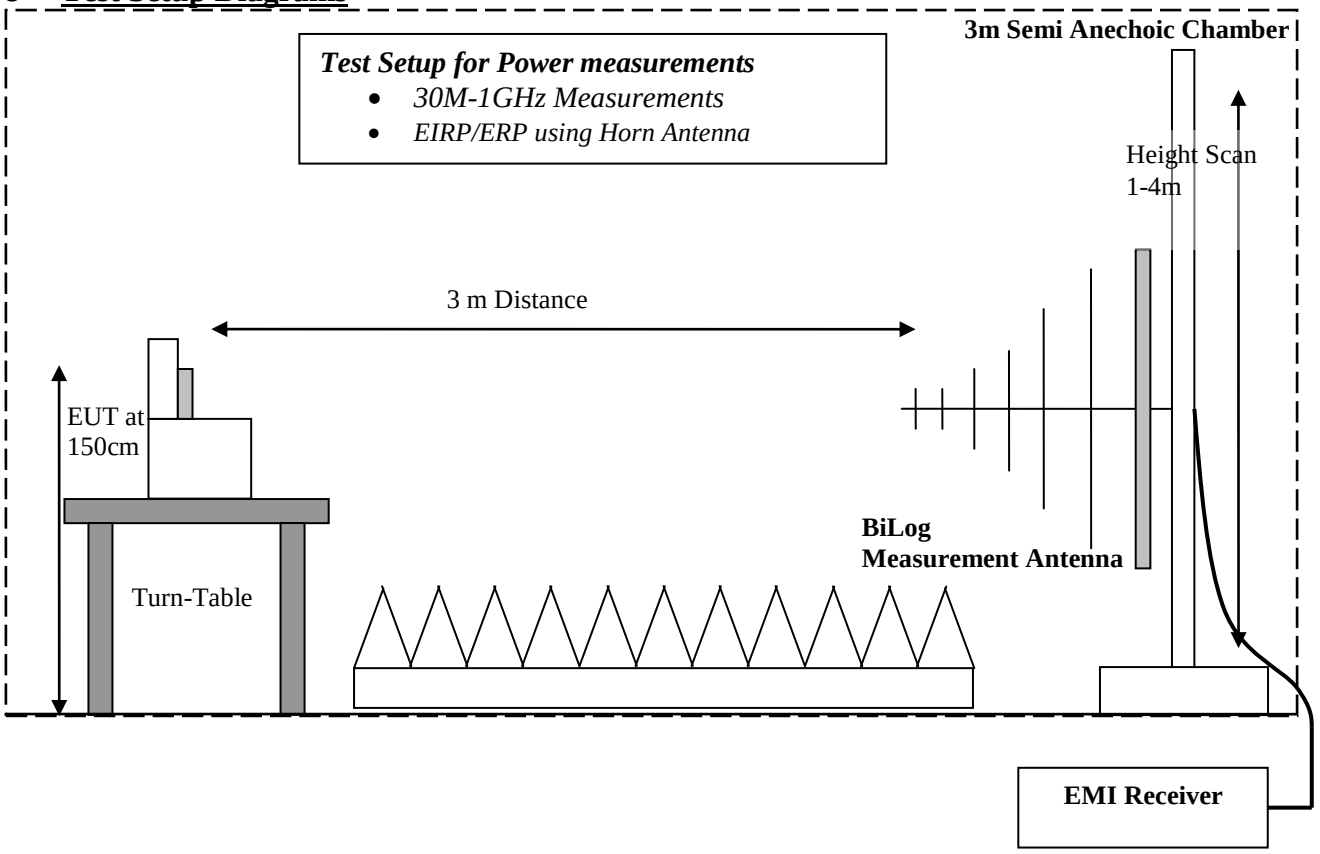
TX Spurious Emissions FDD II: Mid Channel
Worst case representation for all channels in this band.

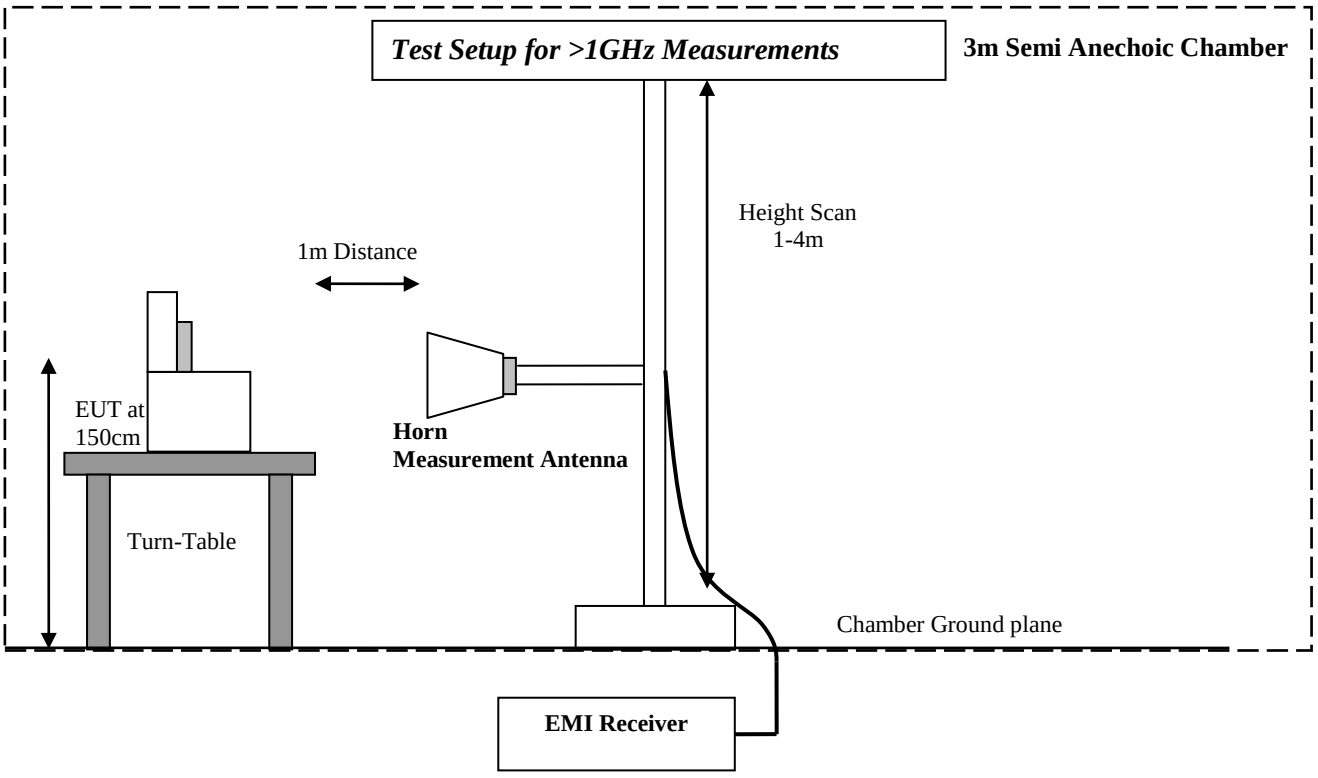


7 Test Equipment and Ancillaries used for tests

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

8 Test Setup Diagrams





9 Revision History

Date	Change Description	Revision
2014-02-20	n.a.	initial