



FCC Test Report

FOR:

ResMed Ltd.

Model Number: 370xx

Product Description: Continuous Positive Airway Pressure (CPAP) Device

FCC ID: 2ACHL-AIR10CD

47 CFR Part 2, 22, 24

TEST REPORT #: EMC_CONNE-025-14001_WWAN_v6

DATE: 2014-08-06



**FCC:
Accredited**

**IC recognized #
3462B-1**

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

Table of Contents

1	Assessment	3
2	Administrative Data	4
2.1	Identification of the Testing Laboratory Issuing the Test Report	4
2.2	Identification of the Client	4
2.3	Identification of the Manufacturer	4
3	Equipment under Test (EUT)	5
3.1	Specification of the Equipment under Test	5
3.2	Identification of the Equipment under Test (EUT)	6
3.3	Environmental conditions during Test:	6
3.4	Dates of Testing:	6
3.5	Miscellaneous EUT information:	6
4	Subject of Investigation	7
5	Summary of Measurement Results	8
6	Measurements	10
6.1	RF Power Output	10
6.1.1	<i>References</i>	10
6.1.2	<i>Measurement requirements:</i>	10
6.1.3	<i>Limits:</i>	10
6.1.4	<i>Conducted Output Power Measurement</i>	11
6.1.5	<i>PEAK-AVERAGE Ratio</i>	14
6.1.6	<i>Radiated Output Power Measurement</i>	16
6.2	Spurious Emissions Radiated	18
6.2.1	<i>References</i>	18
6.2.2	<i>Measurement requirements:</i>	18
6.2.3	<i>Limits:</i>	18
6.2.4	<i>Radiated out of band measurement procedure:</i>	19
6.2.5	<i>Sample Calculations for Radiated Measurements</i>	20
6.2.6	<i>Measurement Survey:</i>	20
6.2.7	<i>Test Conditions:</i>	20
6.2.8	<i>Test Results:</i>	21
7	Test Equipment and Ancillaries used for tests	29
8	Test Setup Diagrams	30
9	Revision History	31

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.

No deviations were ascertained during the course of the tests performed.

Company	Description	Model #
ResMed Ltd.	Continuous Positive Airway Pressure (CPAP) Device	370xx

Responsible for Testing Laboratory:

2014-08-06	Compliance	Milton Ponce de Leon (Test Lab Manager)	
Date	Section	Name	Signature

Responsible for the Report:

2014-08-06	Compliance	Muhammad Umair Anees (EMC Engineer)	
Date	Section	Name	Signature

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:	6370 Nancy Ridge Drive, Suite 101 San Diego, CA 92121 U.S.A.
Telephone:	+1 (858) 362 2400
Fax:	+1 (858) 587 4809
Test Lab Manager:	Milton Ponce de Leon
Responsible Project Leader	Muhammad Umair Anees

2.2 Identification of the Client

Applicant's Name:	ResMed Ltd.
Street Address:	1 Elizabeth Macarthur Drive
City/Zip Code	Bella Vista, NSW, 2153
Country	Australia
Contact Person:	Gerry O'Connor
Phone No.	+612 8884 2165
Fax:	+612 8884 2007
e-mail:	

2.3 Identification of the Manufacturer

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

3 Equipment under Test (EUT)

3.1 Specification of the Equipment under Test

Model Number:	370xx
Marketing Name¹:	AirSense 10 Series, AirCurve 10 Series
FCC-ID :	2ACHL-AIR10CD
Product Description:	Continuous Positive Airway Pressure (CPAP) Device
Technology / Type(s) of Modulation:	see the following spec of incorporated cellular module:
Integrated Module Info:	Telit CE910-DUAL (FCC ID: RI7CE910-DUAL / IC ID: 5131A-CE910DUAL) <ul style="list-style-type: none">• 800/1900 Mhz CDMA 1xRTT ; 153.6 kbps UL/DL data rates
Operating Frequency Ranges (MHz) / Channels:	CDMA Frequency Bands: 800/1900 MHz
Antenna info:	Anam Hexa-band Cellular SMD Antenna; Manufacturer stated antenna Gain: For 850 MHz band of operation: 1.49 dBi; For 1900 MHz band of operation: 2.3dBi
Rated Operating Voltage Range:	Vmin: 23 VDC/ Vnom: 24 VDC/ Vmax: 25 VDC
Rated Operating Temperature Range:	Tmin: +5°C/ Tmax: +35°C

NOTE:

1. See section 3.5 for a description of the differences of models.

3.2 Identification of the Equipment under Test (EUT)

EUT #	Serial Number	Model	HW Version	SW Version
1	SN 22131321514	37028	BOM 37033 rev1.0	Main Application SI567- 0200-9 Cellular Modules SI558-0210

3.3 Environmental conditions during Test:

The following environmental conditions were maintained during the course of testing:

Ambient Temperature: 20-25°C

Relative humidity: 40-60%

3.4 Dates of Testing:

05/08/2014 – 05/21/2014

3.5 Miscellaneous EUT information:

Only model 37028 was tested for EMC evaluation.

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

This test report is to support a request for new equipment authorization under the FCC ID: 2ACHL-AIR10CD

All testing was performed on the product referred to in Section 3 as EUT.

This product integrates the precertified WWAN module : Telit CE910-DUAL.

Per guidelines from KDB 996369, conducted signal test results from module certification is re-used for this certification as the output power has been verified to be within the specified production tolerances and measurement uncertainties.

The module test data can be obtained under the FCC Filing ID: R17CE910-DUAL.

This test report contains full radiated testing as per FCC 22H/24E and conducted power verification required per KDB 996369.

5 Summary of Measurement Results

CDMA 850MHz Band:

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

Note: NA= Not Applicable; NP= Not Performed.

Note 1: Leveraged from module certification.

CDMA 1900MHz Band:

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

Note: NA= Not Applicable; NP= Not Performed.

Note 1: Leveraged from module certification.

6 Measurements

6.1 RF Power Output

6.1.1 References

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

6.1.2 Measurement requirements:

6.1.2.1 FCC 2.1046: RF power output.

Power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on circuit elements as specified. The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

6.1.3 Limits:

6.1.3.1 FCC 22.913 (a) Effective radiated power limits.

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

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

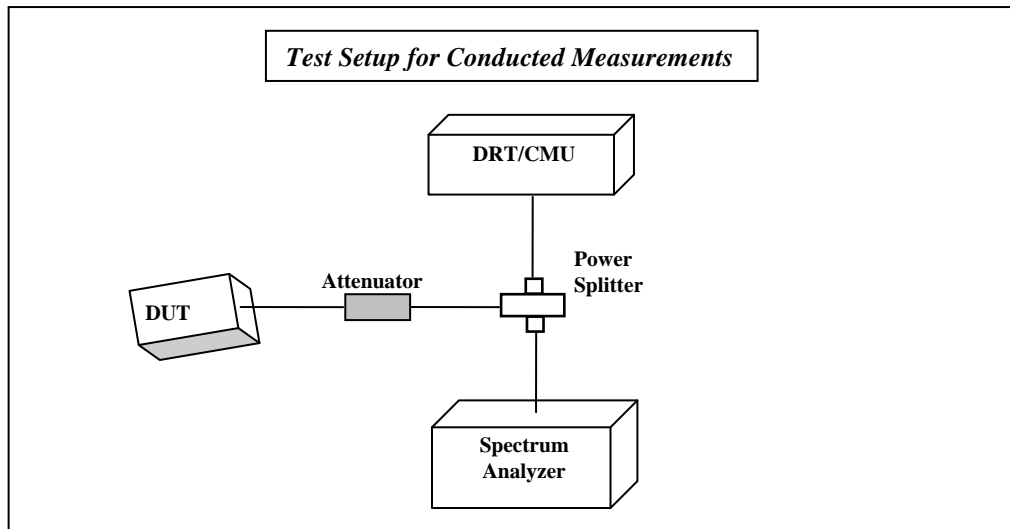
(b) Mobile/portable stations are limited to 2 Watts effective isotropic radiated power (EIRP).

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

6.1.4 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. CDMA mode measurements performed in 1xRTT

6.1.4.2 Measurement Uncertainty

+/- 0.5 dB

6.1.4.3 Test Conditions:

Tnom: 20°C; Vnom: 24 V

6.1.4.4 Measurement Results (Conducted Power Verification):

850MHz Band:

CDMA 850 (1x-RTT Mode)		
Frequency (MHz)	Pre-Certified Module	Conducted Output Power Measurement Verification
	Average Power (dBm)	Average Power (dBm)
824.70	24.65	24.90
836.52	24.49	24.85
848.31	24.1	24.81

1900MHz Band:

CDMA 1900 (1x-RTT Mode)		
Frequency (MHz)	Pre-certified Module	Conducted Output Power Measurement Verification
	Average (dBm)	Average (dBm)
1851.25	24.08	24.91
1880	24.29	24.95
1908.75	24.44	24.66

6.1.4.5 Verification Result

All measured results remain within the manufacturing tolerance and measurement uncertainty.

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:

FCC CFR 47 §24.232 (D)

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 (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of §24.51. 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	CDMA
Low	5.02
Mid	4.97
High	4.63

Peak-Average Ratio in 1900 MHz band of operation (dB)	
Channel	CDMA
Low	4.85
Mid	4.88
High	3.67

6.1.5.4 Test Verdict:

Pass

6.1.6 Radiated Output Power Measurement

6.1.6.1 Test Results

6.1.6.1.1 RF Power Output 850MHz band

Limits:

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

CDMA 850: 1x-RTT Mode	
Frequency (MHz)	Radiated Power
	ERP (dBm)
824.70	24.25
836.52	24.20
848.31	24.16

$$\text{ERP (dBm)} = \text{Conducted average output power (dBm)} + \text{Ant. Gain (dBi)} - 2.14 \text{ (dB)}$$

6.1.6.1.2 Test Verdict

Pass.

6.1.6.1.3 RF Power Output 1900MHz band

Limits:

Nominal Peak Output Power < 33 dBm (2W)

CDMA 1900: 1x-RTT Mode	
Frequency (MHz)	Radiated Power
	EIRP (dBm)
1851.25	27.21
1880	27.25
1908.75	26.96

$$\text{EIRP (dBm)} = \text{Conducted average output power (dBm)} + \text{Ant. Gain (dBi)}$$

6.1.6.1.4 Test Verdict

Pass.

6.2 Spurious Emissions Radiated

6.2.1 References

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

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.

6.2.3 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.

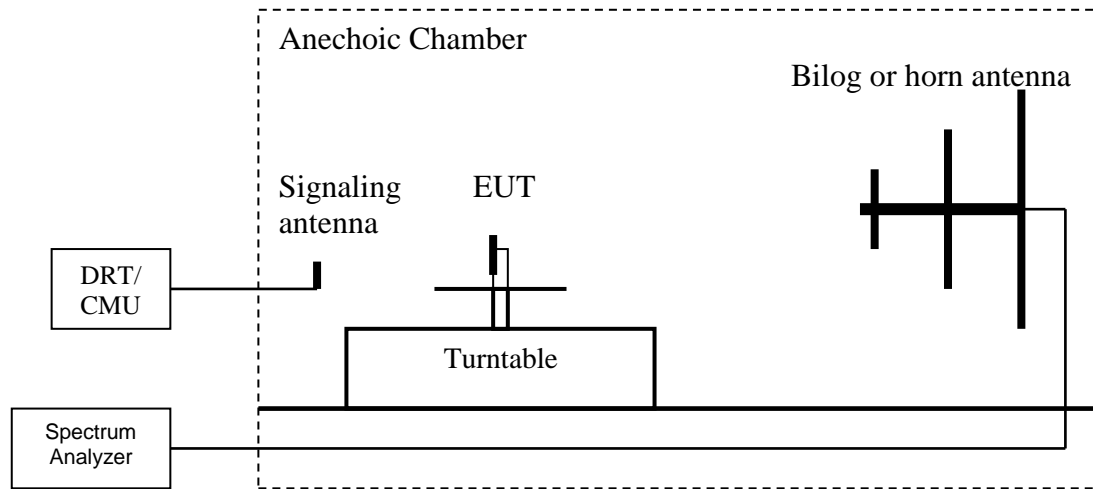
6.2.3.2 FCC 24.238 Emission limitations for Broadband PCS equipment.

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.

6.2.4 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.
(**Note:** 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-

$$\text{EIRP (dBm)} = \text{Signal Generator setting (dBm)} - \text{Cable Loss (dB)} + \text{Antenna Gain (dBi)}$$

Example:

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

6.2.6 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. 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 the CDMA 1xRTT mode.

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.

6.2.7 Test Conditions:

Tnom: 20°C; Vnom: 3.6 V

6.2.8 Test Results:

6.2.8.1 Test Results Transmitter Spurious Emission CDMA 850:

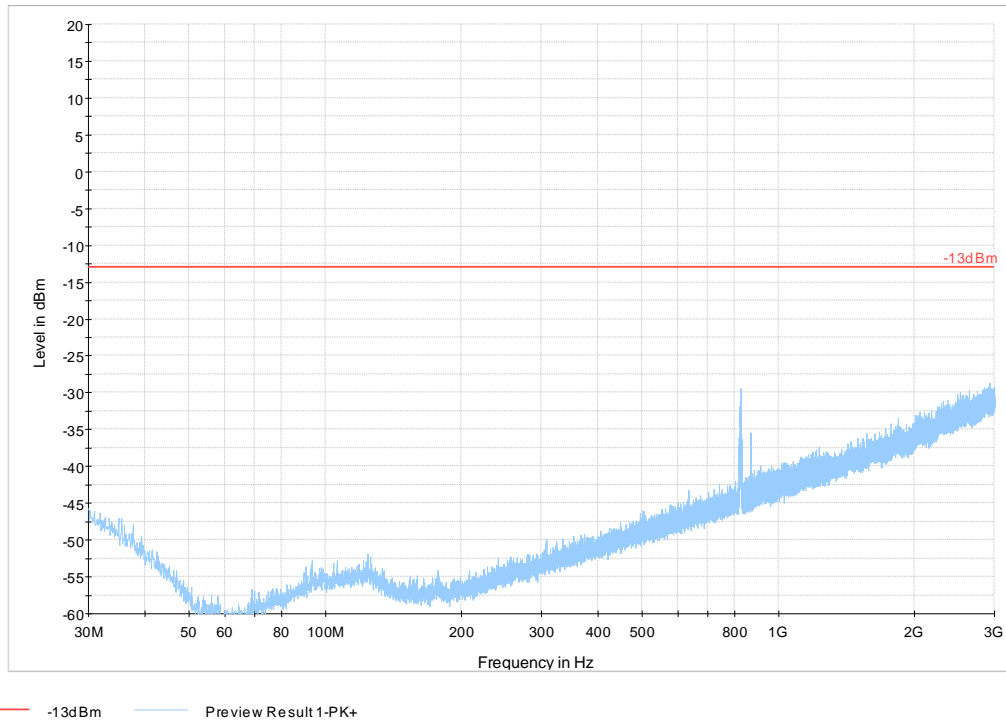
Harmonic	Tx ch-1013 Freq. (MHz)	Level (dBm)	Tx ch-384 Freq. (MHz)	Level (dBm)	Tx ch-777 Freq. (MHz)	Level (dBm)
1	824.7	-29.466	836.52	-30.198	848.31	-30.899
2	1649.4	NF	1673.04	-32.823	1696.62	NF
3	2474.1	NF	2509.56	NF	2544.93	NF
4	3298.8	NF	3346.08	-59.082	3393.24	-58.230
5	4123.5	NF	4182.6	NF	4241.55	NF
6	4948.2	NF	5019.12	NF	5089.86	NF
7	5772.9	NF	5855.64	NF	5938.17	NF
8	6597.6	NF	6692.16	NF	6786.48	NF
9	7422.3	NF	7528.68	NF	7634.79	NF
10	8247	NF	8365.2	NF	8483.1	NF
NF = Noise Floor Measurement Uncertainty: ± 3 dB						

6.2.8.2 Test Results Transmitter Spurious Emission CDMA-1900:

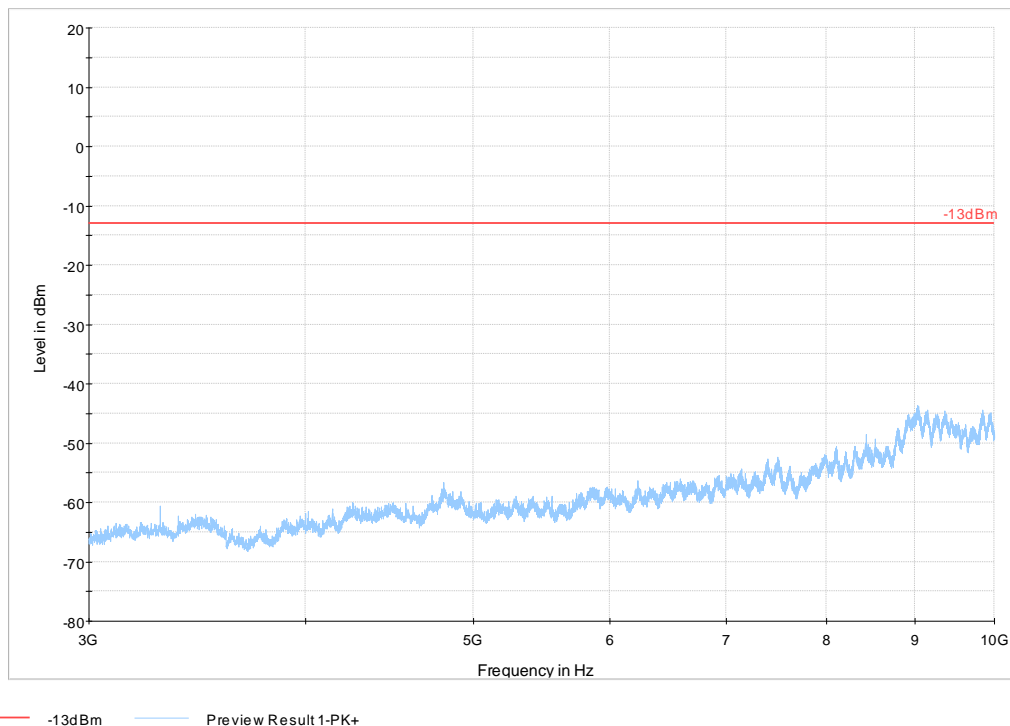
Harmonic	Tx ch-25 Freq.(MHz)	Level (dBm)	Tx ch-600 Freq. (MHz)	Level (dBm)	Tx ch-1175 Freq. (MHz)	Level (dBm)
1	1851.25	-27.81	1880.0	-24.64	1908.75	-23.492
2	3702.5	NF	3760	NF	3817.5	-51.000
3	5553.75	NF	5640	NF	5726.25	NF
4	7405	NF	7520	NF	7635	NF
5	9256.25	NF	9400	NF	9543.75	NF
6	11107.5	NF	11280	NF	11452.5	NF
7	12958.75	NF	13160	NF	13361.25	NF
8	14810	NF	15040	NF	15270	NF
9	16661.25	NF	16920	NF	17178.75	NF
10	18512.5	NF	18800	NF	19087.5	NF
NF = Noise Floor						
Measurement Uncertainty: ± 3 dB						

6.2.8.3 Plots:

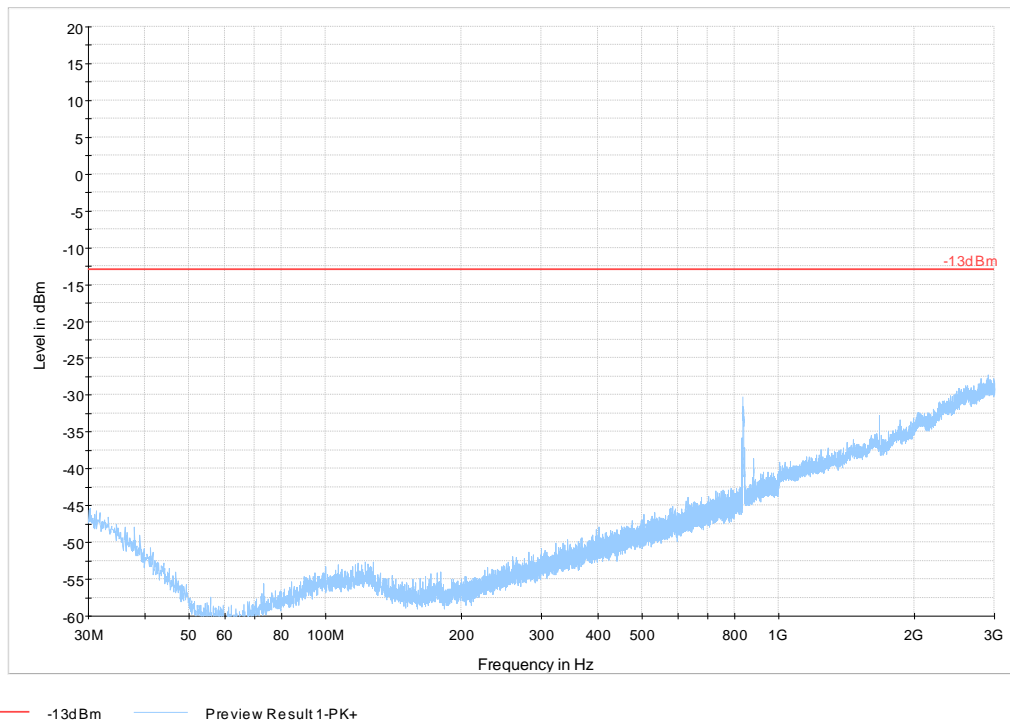
Radiated Spurious Emissions (CDMA-850) Tx: Low Channel Test results 30MHz-3GHz



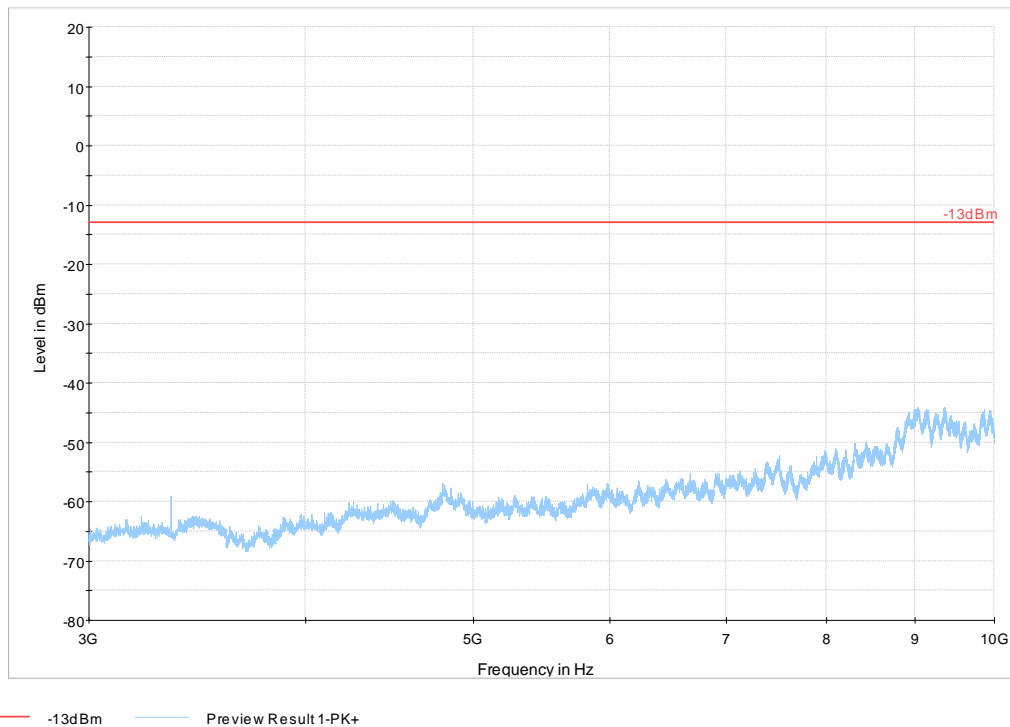
Test results 3GHz-10GHz



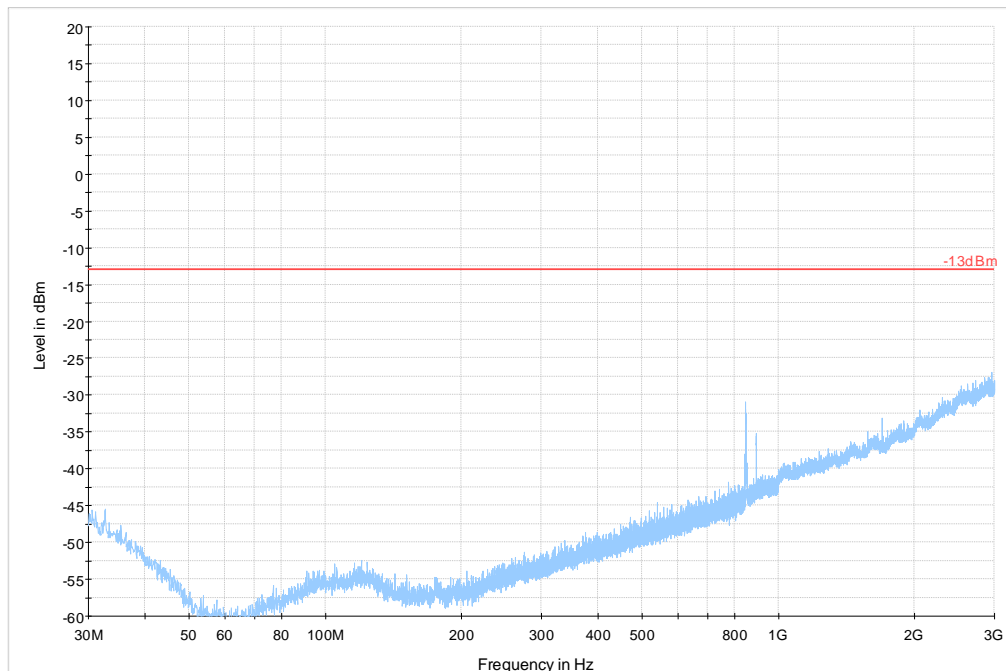
Radiated Spurious Emissions (CDMA-850) Tx: Mid Channel
Test results 30MHz-3GHz



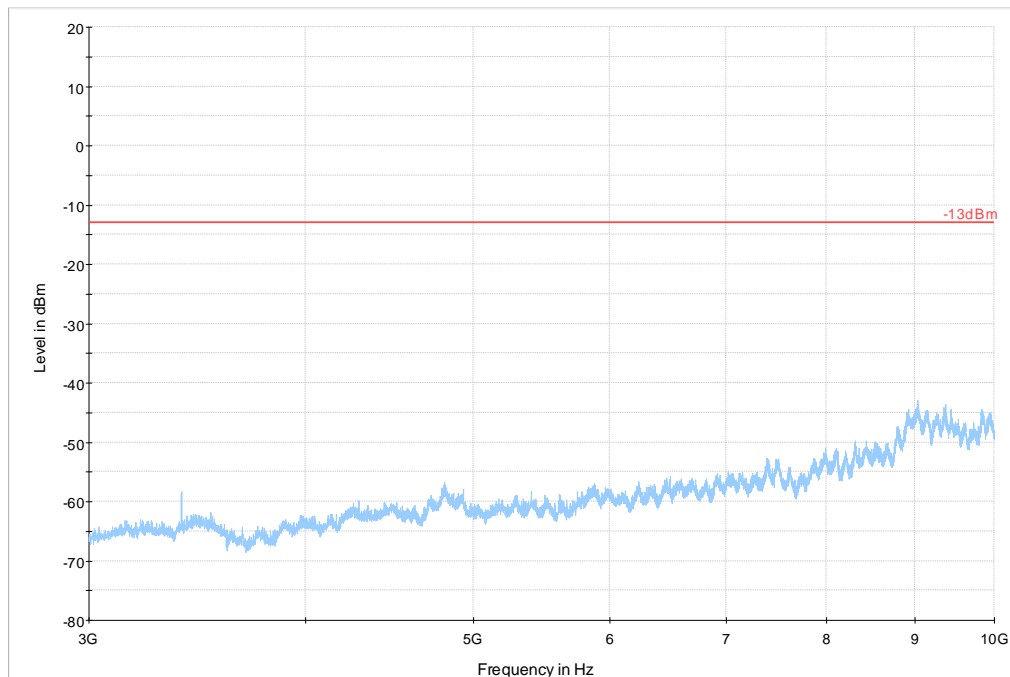
Test results 3GHz-10GHz



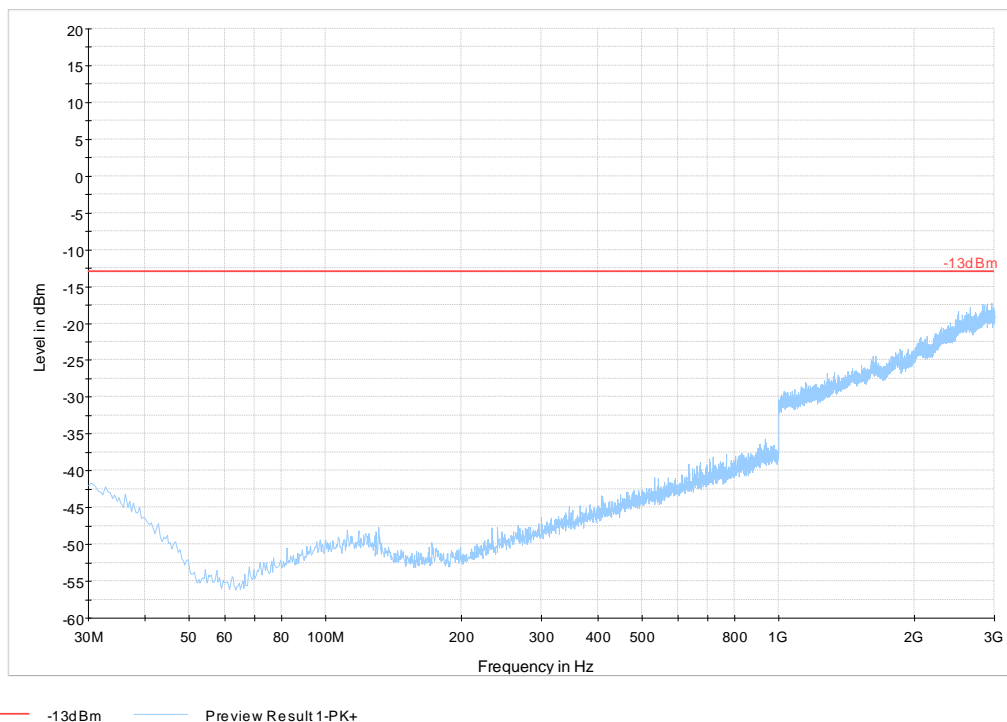
Radiated Spurious Emissions (CDMA-850) Tx: High Channel
Test results 30MHz-3GHz



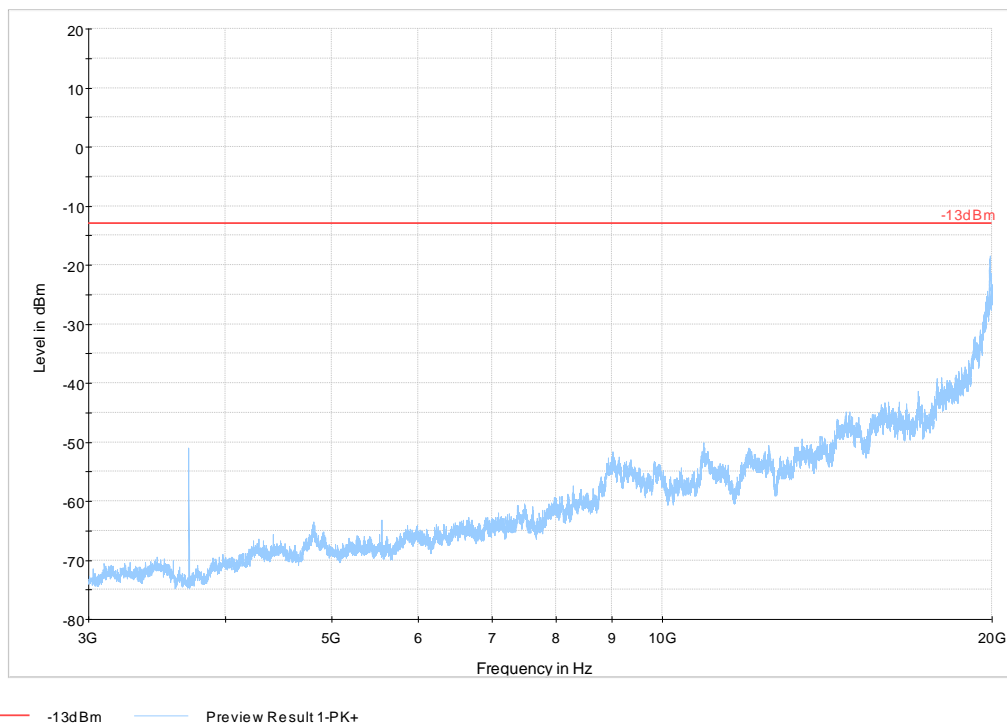
Test results 3GHz-10GHz



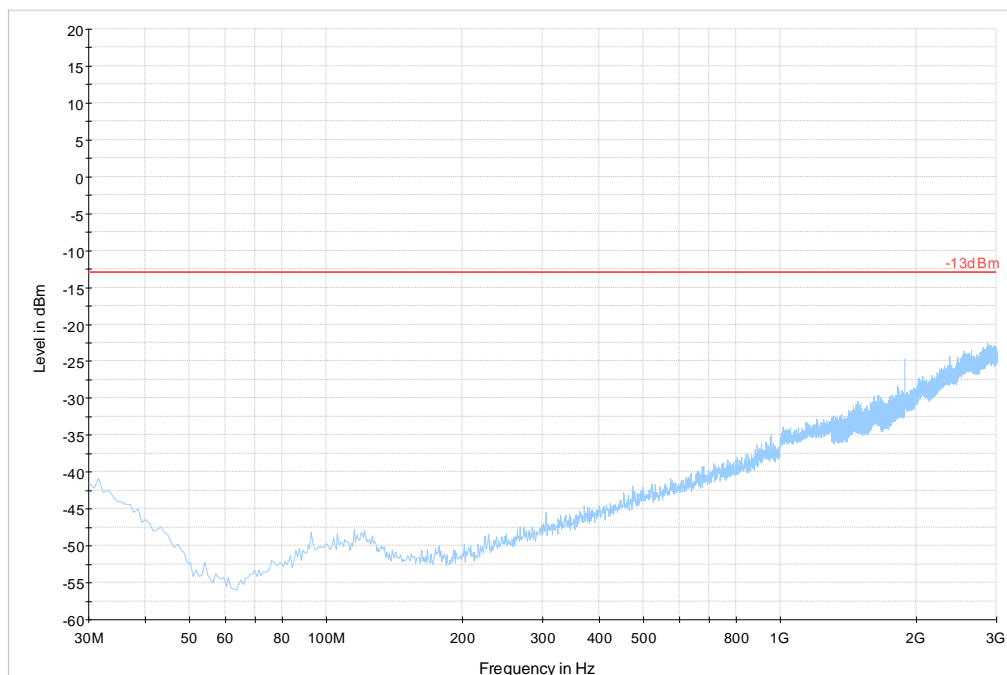
Radiated Spurious Emissions (CDMA-1900) Tx: Low Channel
Test results 30MHz-3GHz



Test results 3GHz-20GHz

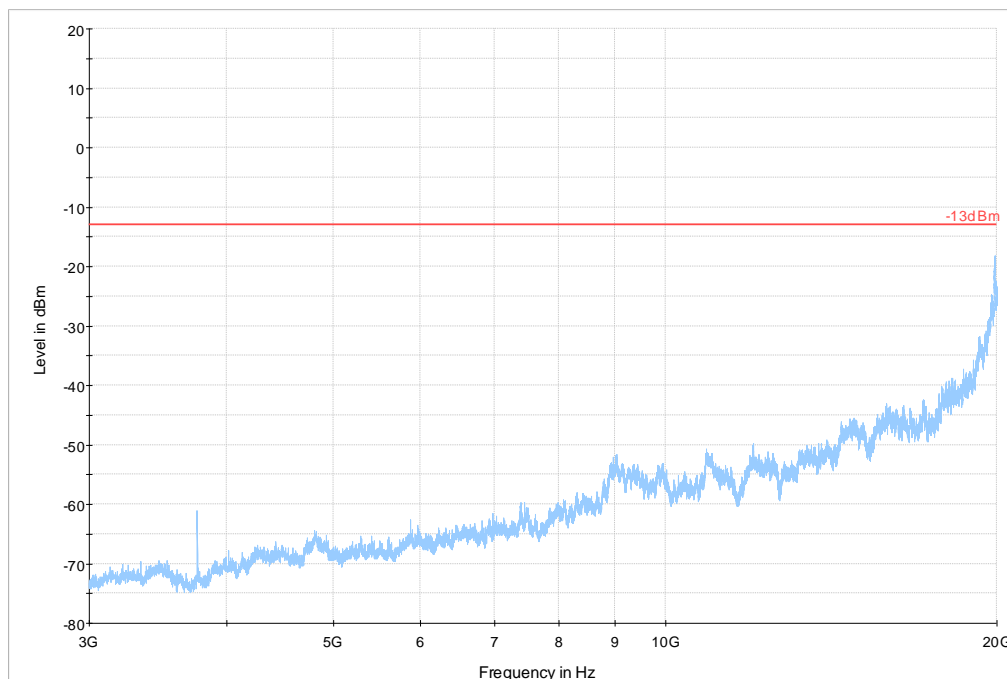


Radiated Spurious Emissions (CDMA-1900) Tx: Mid Channel
Test results 30MHz-3GHz



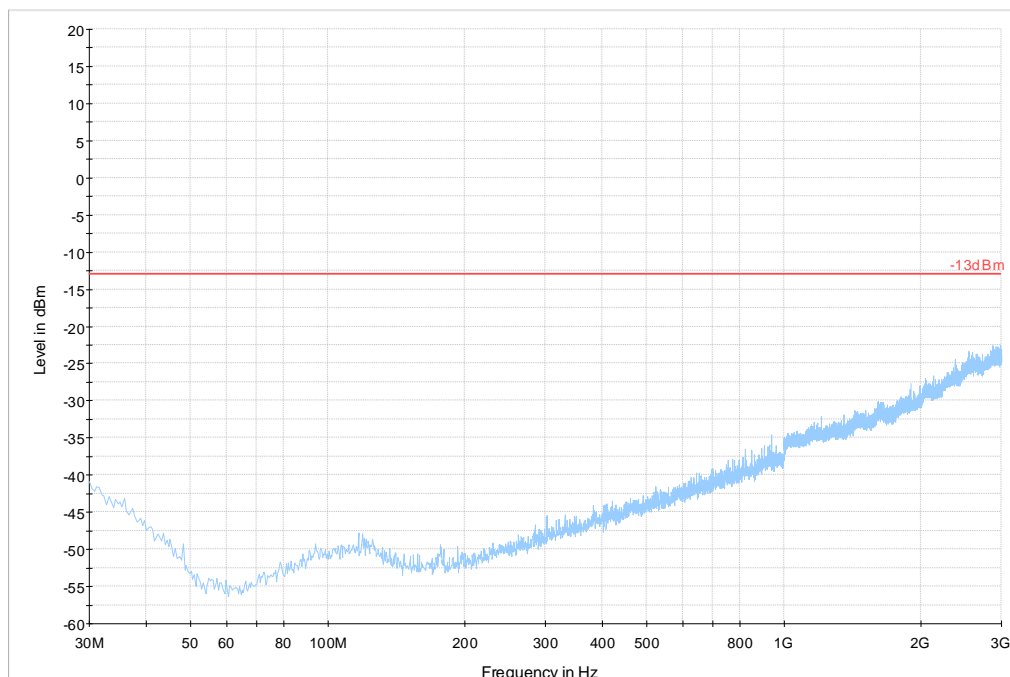
-13dBm Preview Result 1-PK+

Test results 3GHz-20GHz

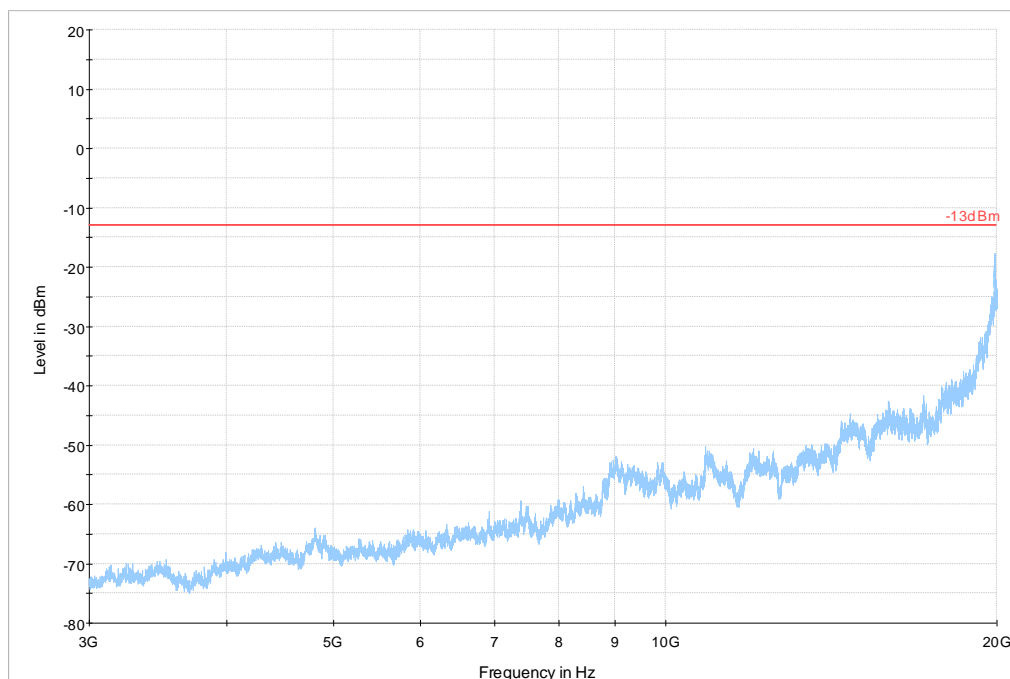


-13dBm Preview Result 1-PK+

Radiated Spurious Emissions (CDMA-1900) Tx: High Channel
Test results 30MHz-3GHz



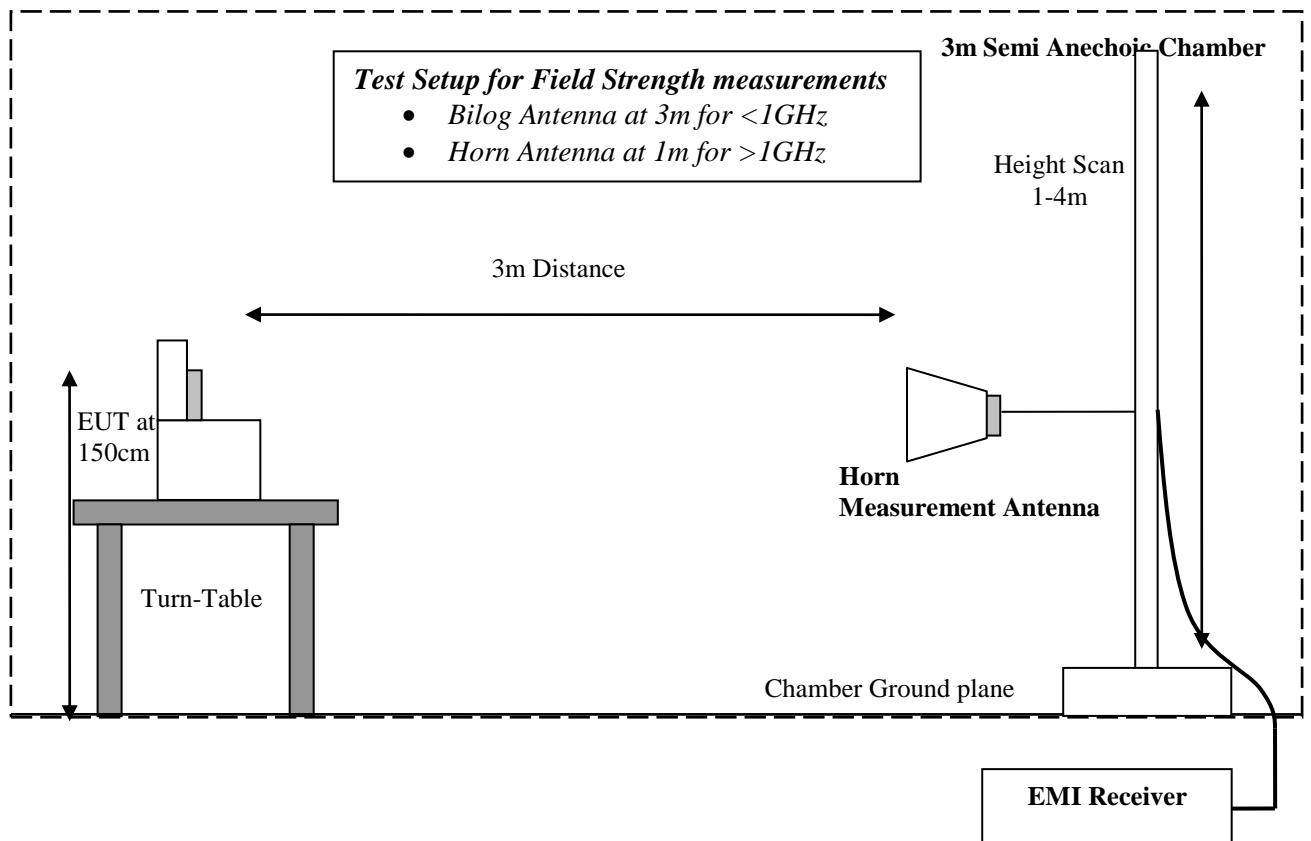
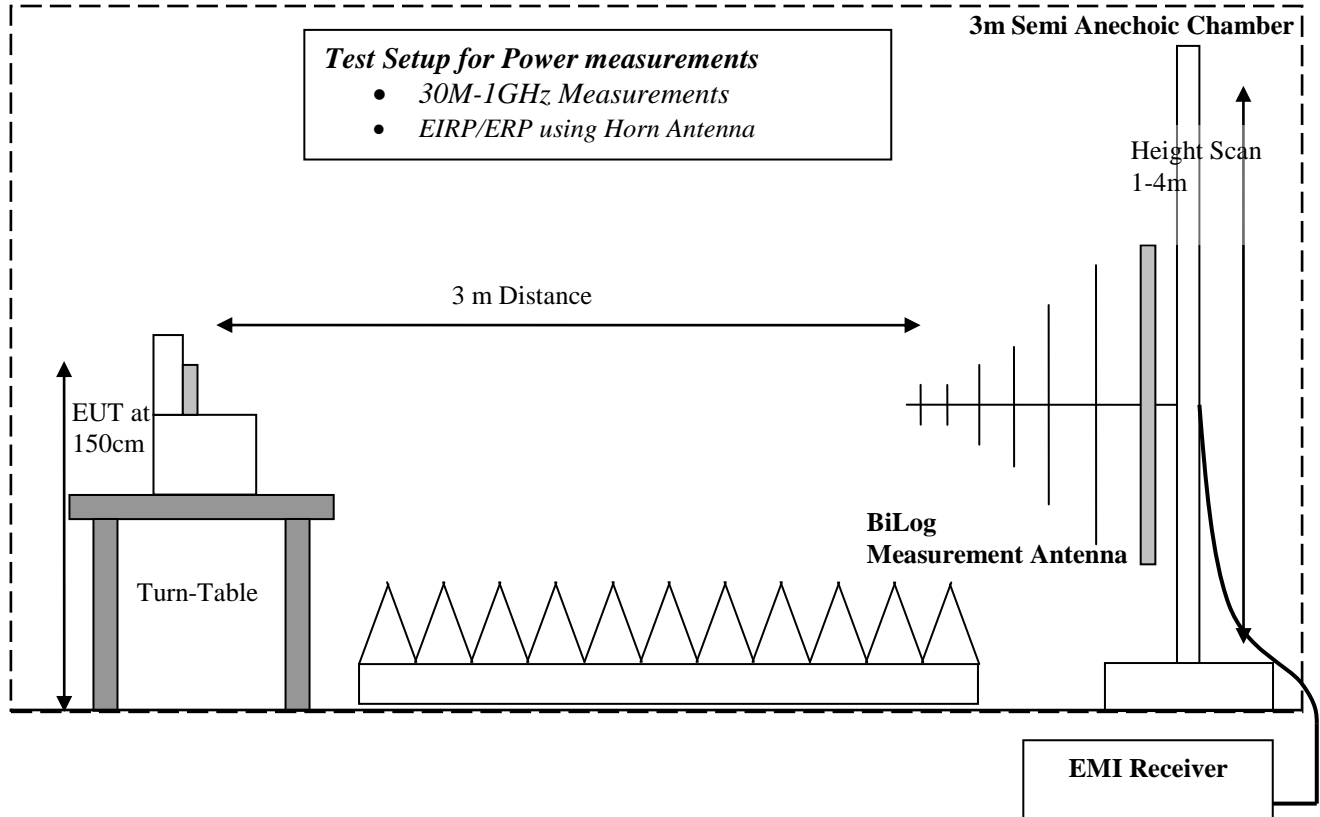
Test results 3GHz-20GHz



7 Test Equipment and Ancillaries used for tests

No.	Equipment Name	Manufacturer	Type/model	Serial No.	Cal Date	Cal Interval
3m Semi- Anechoic Chamber:						
	Turn table	EMCO	2075	N/A	N/A	N/A
	MAPS Position Controller	ETS Lindgren	2092	0004-1510	N/A	N/A
	Antenna Mast	EMCO	2075	N/A	N/A	N/A
	Relay Switch Unit	Rohde&Schwarz	RSU	338964/001	N/A	N/A
	EMI Receiver/Analyzer(*)	Rohde&Schwarz	ESU 40	100365	Feb 2013	2 Years
	1500MHz HP Filter	Filtek	HP12/1700	14c48	N/A	N/A
	2800 MHz HP Filter	Filtek	HP12/2800	14C47	N/A	N/A
	Pre-Amplifier	Miteq	JS40010260	340125	N/A	N/A
	Binconilog Antenna	EMCO	3141	0005-1186	Apr 2012	3 Years
	Binconilog Antenna	ETS	3149	J000123908	Feb 2012	3 years
	Horn Antenna	EMCO	3115	35114	Mar 2012	3 Years
	LISN	FCC	50-25-2-08	08014	Jul 2012	2 Year
Ancillary equipment						
	Multimeter	Klein Tools	MM200	001	Apr 2011	3 Years
	Humidity Temperature Logger	Dickson	TM320	03280063	Apr 2013	1 Year
	Digital Barometer	VWR	35519-055	91119547	Nov 2011	3 Years
	DC Power Supply	HP	E3610A	KR83023316	N/A	N/A
	DC Power Supply	Protek	3003B	H012771	N/A	N/A
	Communication Antenna	IBP5-900/1940	Kathrein	N/A	N/A	N/A

8 Test Setup Diagrams



9 Revision History

Date	Report Name	Changes to report	Report prepared by
05-19-2014	EMC_CONNE-025014001_WWAN	First Revision	Ashley Armenta
05-23-2014	EMC_CONNE-025014001_WWAN_v2	HW&SW Version	Ashley Armenta
06-09-2014	EMC_CONNE-025014001_WWAN_v3	FCC ID	Ashley Armenta
07-14-2014	EMC_CONNE-025014001_WWAN_v4	Model name change	M. Umair Aness
07-29-2014	EMC_CONNE-025014001_WWAN_v5	Apply calculated ERP/EIRP	M. Umair Aness
08-06-2014	EMC_CONNE-025-14001_WWAN_v6	Model Name change, remove annex	M. Umair Aness