



FCC/IC Test Report

FOR

Honeywell International Inc

Model Number: 70eLG0

Product Description: Dolphin 70e Black Enterprise Digital Assistant (EDA)

FCC ID: HD570ELG0

IC ID: 1693B-70E2

47 CFR Part 2, 22, 24

RSS-132 Issue 3

RSS-133 Issue 6

TEST REPORT #: EMC_HONEY_093_12003_70eLG0_WWAN

DATE: 2013-05-28



**FCC:
Accredited**

**IC recognized #
3462B-1**

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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	Identification of Accessory equipment.....	6
3.4	Environmental conditions during Test:	6
3.5	Dates of Testing:	6
4	Subject of Investigation.....	7
5	Summary of Measurement Results	8
6	Measurements.....	12
6.1	RF Power Output.....	12
6.1.1	<i>References</i>	12
6.1.2	<i>Measurement requirements:</i>	12
6.1.3	<i>Limits:</i>	12
6.1.4	<i>Conducted Output Power Measurement</i>	13
6.1.5	<i>PEAK-AVERAGE Ratio</i>	18
6.1.6	<i>Radiated Output Power Measurement</i>	24
6.2	Spurious Emissions Radiated	39
6.2.1	<i>References</i>	39
6.2.2	<i>Measurement requirements:</i>	39
6.2.3	<i>Limits:</i>	39
6.2.4	<i>Radiated out of band measurement procedure:</i>	41
6.2.5	<i>Sample Calculations for Radiated Measurements</i>	42
6.2.6	<i>Measurement Survey:</i>	42
6.2.7	<i>Test Conditions:</i>	42
6.2.8	<i>Test Results:</i>	43
7	Test Equipment and Ancillaries used for tests	70
8	Test Setup Diagrams	71
9	Revision History.....	72

1 Assessment

The following device was tested against the applicable criteria specified in FCC rules parts 2, 22 and 24 of Title 47 of the Code of Federal Regulations and Industry Canada Standards RSS 132 and RSS 133.

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

Company	Description	Model #
Honeywell International Inc	Dolphin 70e Black Enterprise Digital Assistant (EDA)	70ELG0

Responsible for Testing Laboratory:

2013-05-28	Compliance	Franz Engert (Acting Lab Manager)	
Date	Section	Name	Signature

Responsible for the Report:

2013-05-28	Compliance	Tunji Yusuf (EMC Engineer)	
Date	Section	Name	Signature

The test results of this test report relate exclusively to the test item specified in Section 3.

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
Acting Lab Manager:	Franz Engert
Test Engineer:	Tunji Yusuf

2.2 Identification of the Client

Applicant's Name:	Honeywell International Inc
Street Address:	700 Visions Drive
City/Zip Code	Skaneateles Falls, NY 13153
Country	USA
Contact Person:	Michael Robinson
Phone No.	+1 (315) 554 6387
Fax:	+1 (315) 554 6393
e-mail:	michael.robinson3@honeywell.com

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

Marketing Name:	Dolphin 70e Black
Model Number:	70eLG0
FCC-ID :	HD570ELG0
IC ID:	1693B-70E2
Product Description:	Dolphin 70e Black Enterprise Digital Assistant (EDA)
Technology / Type(s) of Modulation:	see the following spec of incorporated cellular module:
Integrated Module Info:	Sierra SL9090 (FCC ID: N7NSL9090 / IC ID: 2417C-SL9090) 850/900/1800/1900Mhz GSM power class 4/1; GPRS Class B, Multislot 10 operation; EDGE Multislot class 12 operation; modulation: GSM&GPRS&EDGE(MCS-1-4): GMSK; EDGE(MCS-5-8): 8PSK; 850/1900/2100 Mhz WCDMA / HSPA+; HSDPA Category 10 data rate - 14.4 Mbps; HSUPA Category 6 data rate - 5.76 Mbps; modulation: all QPSK (no QAM in uplink for given data rates); 800/1900 Mhz CDMA 1xRTT / EV-D0; CDMA EVDO Rev A data rate - 3.1 Mbps modulation: QPSK, HPSK;
Operating Frequency Ranges (MHz) / Channels:	GSM 850: 824.2-848.8; 125 channels; PCS 1900: 1850.2-1909.8; 300 channels; FDD II: 826.4 - 846.6; 278 channels; FDD V: 1852.4 – 1907.6; 103 channels; CDMA 2000/850: 824.70-848.31; 656 channels; CDMA 2000/1900: 1851.25- 1908.75; 906 channels;
Antenna info:	2 PIFA penta-band on plastic carrier, main and diversity (receive diversity only); documented max.antenna gain: 850 MHz: 0 dBi; 1900 MHz: = 2.1dBi
Rated Operating Voltage Range:	Vmin: 3.3V/ Vnom: 3.6V/ Vmax: 4.3V
Rated Operating Temperature Range:	Tmin: -30°C/ Tmax: 70°C

Test Sample Status:	Prototype
Other radios included in the device:	1. WLAN 802.11 a/b/g/n Murata LBEH5Z9UWC module with TI WL1273L Chipset 2.4 and 5.0 GHz bands of operation 2. BT 2.1+ EDR Murata LBEH5Z9UWC module 2.4 GHz band of operation 3. GPS 1575.42 MHz 4. NFC (NXP PN65N Module; 13.56 MHz)

3.2 Identification of the Equipment under Test (EUT)

EUT #	Serial Number	Sample	HW/SW Version
1	12357J000F	Radiated	DVT 1.5-9090/40.00

3.3 Identification of Accessory equipment

STE #	Type	Manufacturer	Model	Serial Number
1	AC Switching Power Supply	PHIHONG	PSAI05R-050Q	P112103004A1

3.4 Environmental conditions during Test:

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

Ambient Temperature: 20-25°C

Relative humidity: 40-60%

3.5 Dates of Testing:

01/08/2013 – 02/09/2013

4 Subject of Investigation

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

- 47 CFR Part 2: Title 47 of the Code of Federal Regulations: Chapter I-Federal Communications Commission Frequency allocations and radio treaty matters; general rules and regulations.
- 47 CFR Part 22: Title 47 of the Code of Federal Regulations: Chapter I-Federal Communications Commission subchapter B- common carrier services; Part 22- Public mobile services
- 47 CFR Part 24: Title 47 of the Code of Federal Regulations: Chapter I-Federal Communications Commission subchapter B- common carrier services; Part 24- Personal communication services
- RSS 132- Issue 3: Spectrum management and telecommunication policy- Radio Standards Specifications Cellular telephones employing new technologies operating in the bands 824-849MHz and 869-894MHz
- RSS 133- Issue 6: Spectrum management and telecommunication policy- Radio Standards Specifications- 2GHz personal communication services

This test report is to support a request for new equipment authorization under the FCC ID: **HD570ELG0** and IC ID: **1693B-70E2**.

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

This product integrates the precertified WWAN module : Sierra SL9090.

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: N7NSL9090.

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

GSM and UMTS 850 MHz Band:

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §22.913 (a) RSS132 5.4	RF Output Power	Nominal	GSM 850	■	□	□	□	Complies
			UMTS Band V	■	□	□	□	Complies
§2.1055 §22.355 RSS132 5.3	Frequency Stability	Nominal	GSM 850	□	□	□	■	Note 1
			UMTS Band V	□	□	□	■	Note 1
§2.1049 §22.917(b) RSS132 5.2	Occupied Bandwidth	Nominal	GSM 850	□	□	□	■	Note 1
			UMTS Band V	□	□	□	■	Note 1
§2.1051 §22.917 RSS132 5.5	Band Edge Compliance	Nominal	GSM 850	□	□	□	■	Note 1
			UMTS Band V	□	□	□	■	Note 1
§2.1051 §22.917 RSS132 5.5	Conducted Spurious Emissions	Nominal	GSM 850	□	□	□	■	Note 1
			UMTS Band V	□	□	□	■	Note 1
§2.1053 §22.917 RSS132 5.5	Radiated Spurious Emissions	Nominal	GSM 850	■	□	□	□	Complies
			UMTS Band V	■	□	□	□	Complies

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

Note 1: Leveraged from module certification.

CDMA 850MHz Band:

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §22.913 (a) RSS132 5.4	RF Output Power	Nominal	CDMA 850	■	□	□	□	Complies
			EVDO 850	■	□	□	□	Complies
§2.1055 §22.355 RSS132 5.3	Frequency Stability	Nominal	CDMA 850	□	□	□	■	Note 1
			EVDO 850	□	□	□	■	Note 1
§2.1049 §22.917(b) RSS132 5.2	Occupied Bandwidth	Nominal	CDMA 850	□	□	□	■	Note 1
			EVDO 850	□	□	□	■	Note 1
§2.1051 §22.917 RSS132 5.5	Band Edge Compliance	Nominal	CDMA 850	□	□	□	■	Note 1
			EVDO 850	□	□	□	■	Note 1
§2.1051 §22.917 RSS132 5.5	Conducted Spurious Emissions	Nominal	CDMA 850	□	□	□	■	Note 1
			EVDO 850	□	□	□	■	Note 1
§2.1053 §22.917 RSS132 5.5	Radiated Spurious Emissions	Nominal	CDMA 850	■	□	□	□	Complies
			EVDO 850	■	□	□	□	Complies

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

Note 1: Leveraged from module certification.

GSM and UMTS 1900 MHz Band:

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §24.232 (a) RSS133 6.4	RF Output Power	Nominal	GSM 1900	■	□	□	□	Complies
			UMTS Band II	■	□	□	□	Complies
§2.1055 §24.235 RSS133 6.3	Frequency Stability	Nominal	GSM 1900	□	□	□	■	Note 1
			UMTS Band II	□	□	□	■	Note 1
§2.1049 §24.238(b) RSS133 6.2	Occupied Bandwidth	Nominal	GSM 1900	□	□	□	■	Note 1
			UMTS Band II	□	□	□	■	Note 1
§2.1051 §24.238 RSS133 6.5	Band Edge Compliance	Nominal	GSM 1900	□	□	□	■	Note 1
			UMTS Band II	□	□	□	■	Note 1
§2.1051 §24.238 RSS133 6.5	Conducted Spurious Emissions	Nominal	GSM 1900	□	□	□	■	Note 1
			UMTS Band II	□	□	□	■	Note 1
§2.1053 §24.238 RSS133 6.5	Radiated Spurious Emissions	Nominal	GSM 1900	■	□	□	□	Complies
			UMTS Band II	■	□	□	□	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) RSS133 6.4	RF Output Power	Nominal	CDMA 1900	■	□	□	□	Complies
			EVDO 1900	■	□	□	□	Complies
§2.1055 §24.235 RSS133 6.3	Frequency Stability	Nominal	CDMA 1900	□	□	□	■	Note 1
			EVDO 1900	□	□	□	■	Note 1
§2.1049 §24.238(b) RSS133 6.2	Occupied Bandwidth	Nominal	CDMA 1900	□	□	□	■	Note 1
			EVDO 1900	□	□	□	■	Note 1
§2.1051 §24.238 RSS133 6.5	Band Edge Compliance	Nominal	CDMA 1900	□	□	□	■	Note 1
			EVDO 1900	□	□	□	■	Note 1
§2.1051 §24.238 RSS133 6.5	Conducted Spurious Emissions	Nominal	CDMA 1900	□	□	□	■	Note 1
			EVDO 1900	□	□	□	■	Note 1
§2.1053 §24.238 RSS133 6.5	Radiated Spurious Emissions	Nominal	CDMA 1900	■	□	□	□	Complies
			EVDO 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

IC: RSS-Gen Section 4.8; RSS 132 Section 5.4; RSS 133 Section 6.4

6.1.2 Measurement requirements:

6.1.2.1 FCC 2.1046: RF power output.

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

6.1.2.2 RSS-Gen 4.8: RF power output.

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

6.1.3 Limits:

6.1.3.1 FCC 22.913 (a) Effective radiated power limits.

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

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

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

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

6.1.3.3 RSS-132, Issue 3

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.

6.1.3.4 RSS-133, Issue 6

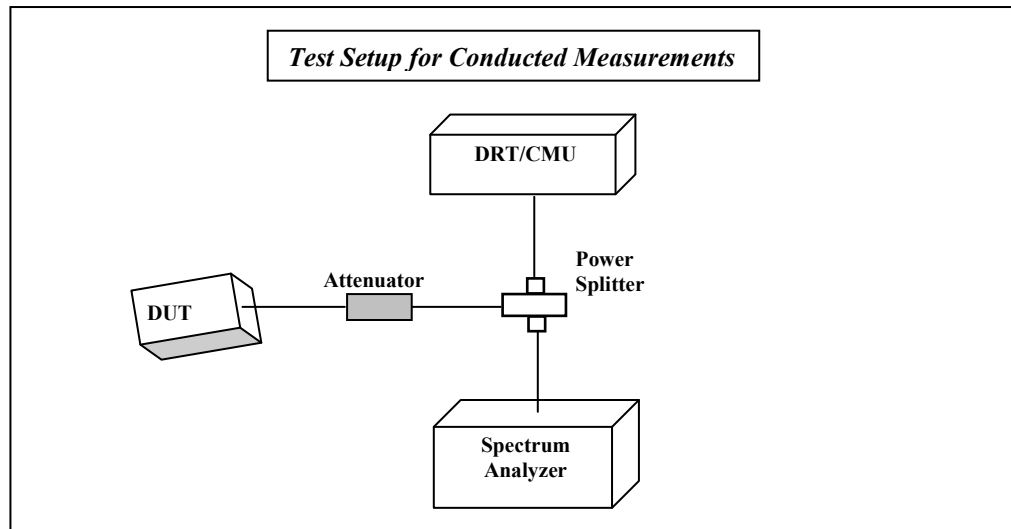
The equivalent isotropically radiated power (e.i.r.p.) for transmitters shall not exceed 2 watts maximum e.i.r.p.

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 continuous transmission.

6.1.4 Conducted Output Power Measurement

6.1.4.1 Measurement Procedure:

Ref: TIA-603C 2004 2.2.1



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

6.1.4.2 Measurement Uncertainty

+/- 0.5 dB

6.1.4.3 Test Conditions:

Tnom: 20°C; Vnom: 3.6 V

6.1.4.4 Measurement Results (Conducted Power Verification):

850MHz Band:

GSM Cellular 850 (GMSK Mode)		
Frequency (MHz)	Pre-Certified Module	Conducted Output Power Measurement Verification
	Peak (dBm)	Peak (dBm)
824.2	32.50	33.3
836.6	32.61	33.3
848.8	32.60	32.7

GSM Cellular 850 (8PSK Mode)		
Frequency (MHz)	Pre-Certified Module	Conducted Output Power Measurement Verification
	Peak (dBm)	Peak (dBm)
824.2	29.90	29.1
836.6	29.80	29.0
848.8	29.80	29.0

FDD V 850 (UMTS Mode)		
Frequency (MHz)	Pre-Certified Module Average Power	Conducted Output Power Measurement Verification
	Average (dBm)	Average (dBm)
826.2	26.46	26.98
836.6	26.35	26.72
846.6	26.39	27.19

CDMA 850 (1x-RTT Mode)		
Frequency (MHz)	Pre-Certified Module	Conducted Output Power Measurement Verification
	Average (dBm)	Average (dBm)
824.70	24.19	23.57
836.52	24.02	23.33
848.31	23.96	23.57

CDMA 850 (EVDO Rel A Mode)		
Frequency (MHz)	Pre-Certified Module Average Power	Conducted Output Power Measurement Verification
	Average (dBm)	Average (dBm)
824.70	24.34	23.92
836.52	24.20	23.61
848.31	24.23	23.79

1900MHz Band:

GSM PCS 1900 (GMSK Mode)		
Frequency (MHz)	Pre-Certified Module	Conducted Output Power Measurement Verification
	Peak (dBm)	Peak (dBm)
1850.2	29.40	30.2
1880	29.30	30.2
1909.8	29.52	30.1

GSM PCS 1900 (8PSK Mode)		
Frequency (MHz)	Pre-Certified Module	Conducted Output Power Measurement Verification
	Peak (dBm)	Peak (dBm)
1850.2	28.80	29.2
1880	28.30	29.3
1909.8	28.10	29.5

FDD II 1900 (UMTS Mode)		
Frequency (MHz)	Pre-Certified Module Average Power	Conducted Output Power Measurement Verification
	Average (dBm)	Average (dBm)
1852.4	26.10	27.01
1880	26.10	27.11
1907.6	25.96	27.4

CDMA 1900 (1x-RTT Mode)		
Frequency (MHz)	Pre-Certified Module	Conducted Output Power Measurement Verification
	Average (dBm)	Average (dBm)
1851.25	24.37	24.30
1880	24.28	23.79
1908.75	24.42	23.80

CDMA 1900 (EVDO Rel A Mode)		
Frequency (MHz)	Pre-Certified Module Average Power	Conducted Output Power Measurement Verification
	Average (dBm)	Average (dBm)
1851.25	24.49	22.95
1880	24.51	23.26
1908.75	24.47	23.3

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)

RSS-132(5.4); RSS-133(6.4)

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	GMSK	8PSK	UMTS	1x-RTT	EVDO Rel A
Low	0.2	3.3	3.33	4.73	6.86
Mid	0.1	3.2	3.29	4.91	7.25
High	0.1	3.2	3.25	4.31	6.35

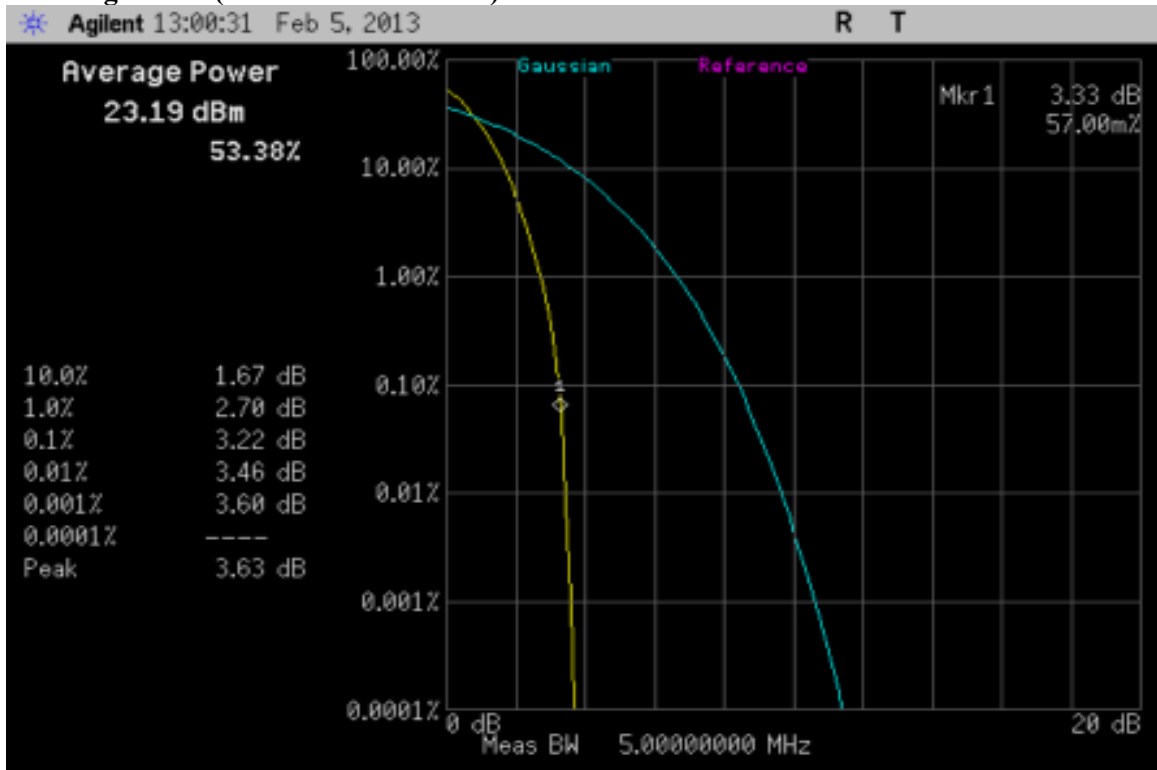
Peak-Average Ratio in 1900 MHz band of operation (dB)					
Channel	GMSK	8PSK	UMTS	1x-RTT	EVDO Rel A
Low	0.1	3.2	3.29	4.73	6.13
Mid	0.2	3.3	3.41	4.91	6.59
High	0.1	3.2	3.34	4.31	6.45

6.1.5.4 Test Verdict:

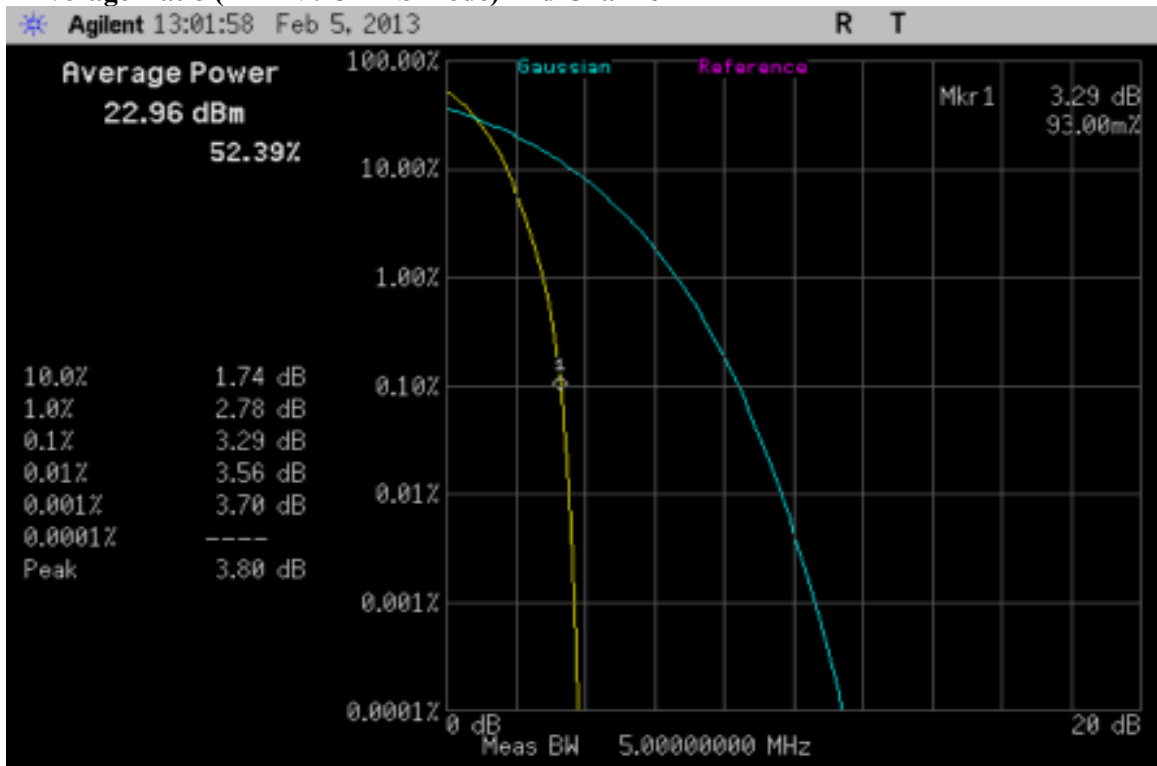
Pass

6.1.5.5 Test Data:

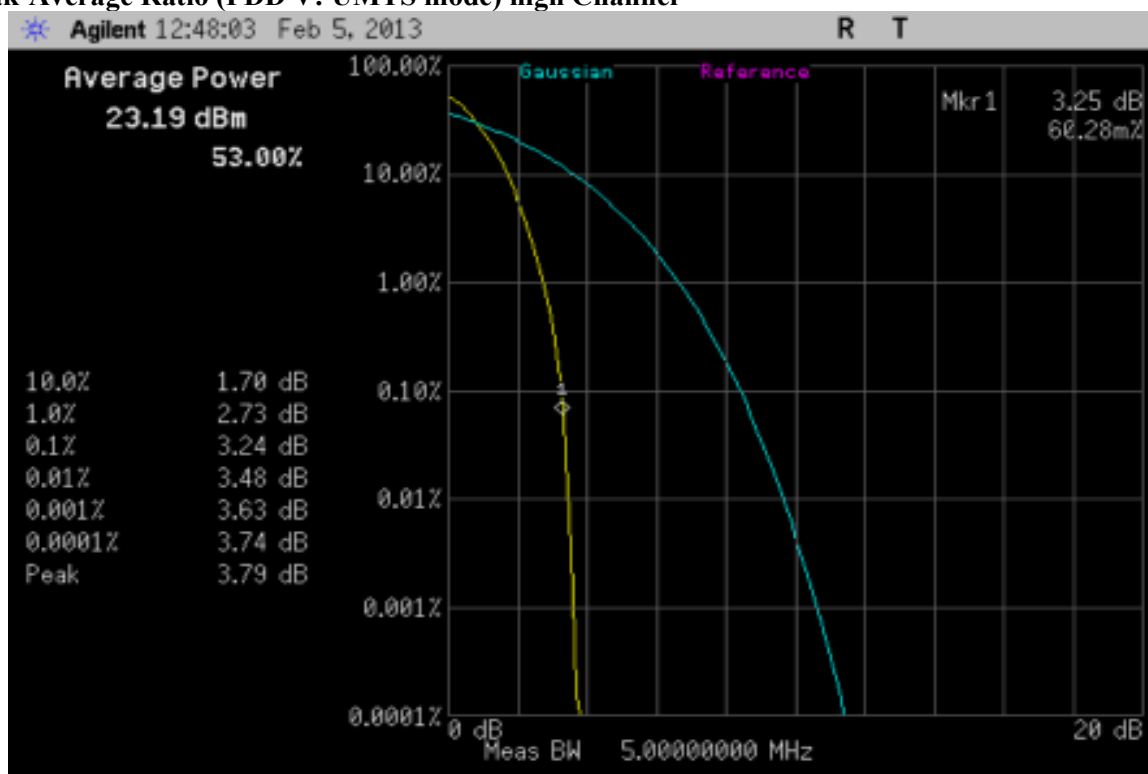
Peak-Average Ratio (FDD V: UMTS mode) low Channel



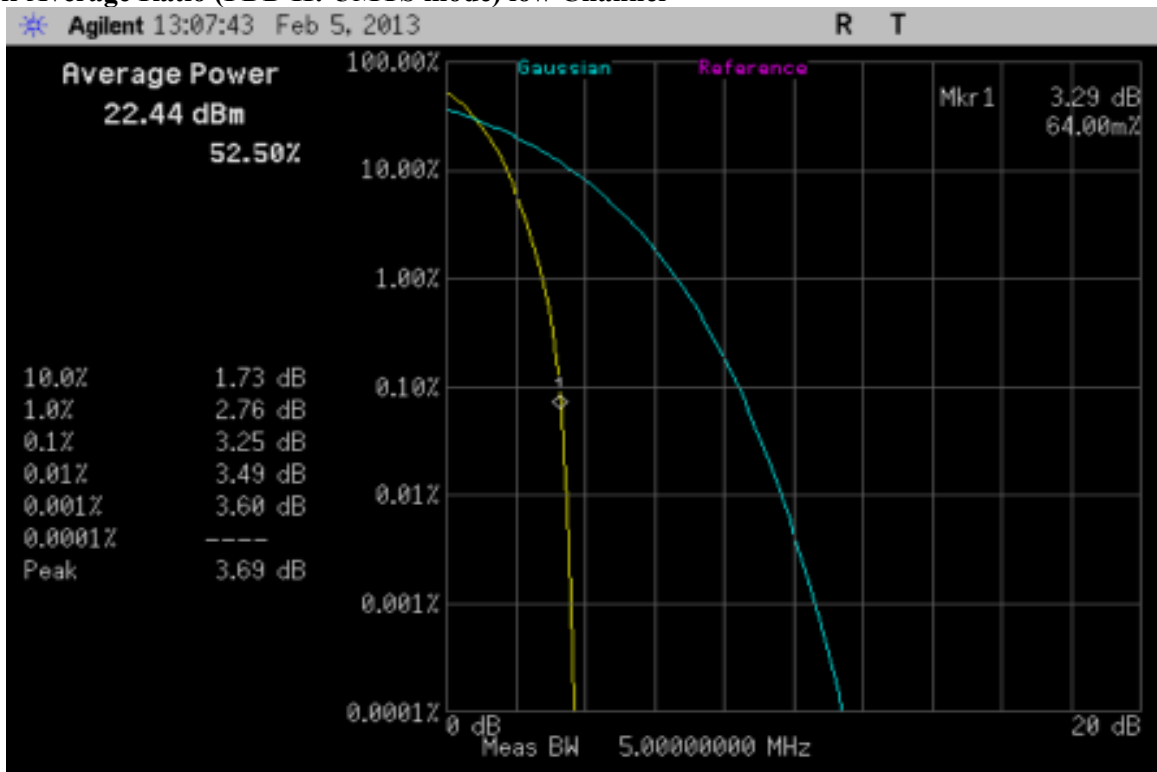
Peak-Average Ratio (FDD V: UMTS mode) mid Channel



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



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



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



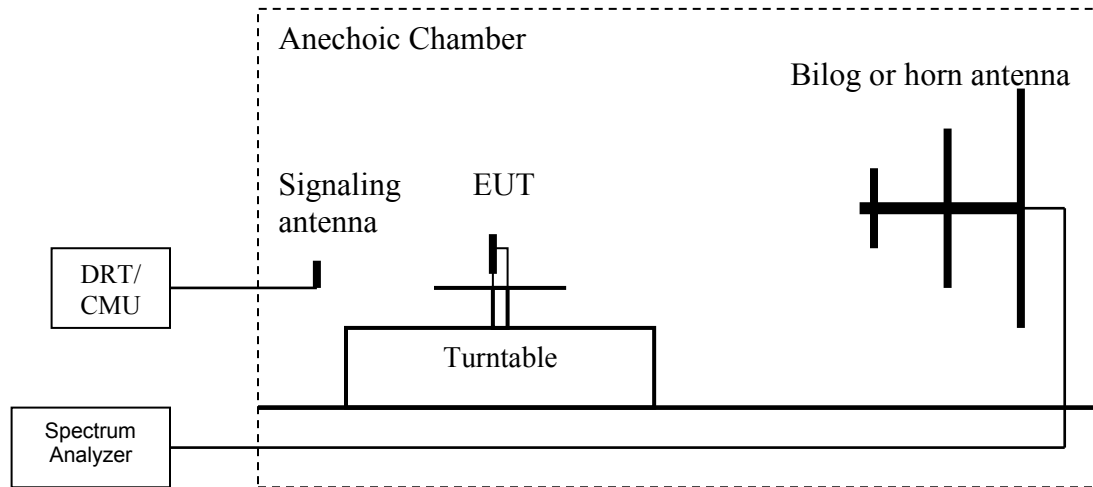
Peak-Average Ratio (FDD II: UMTS mode) high Channel



6.1.6 Radiated Output Power Measurement

6.1.6.1 Radiated Output Power Measurement procedure

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



1. Connect the equipment as shown in the above diagram with the EUT's antenna in center of the turn table.
2. Adjust the settings of the Digital Radio Communication Tester (DRT) to set the EUT to its maximum power at the required channel.
3. Set the spectrum analyzer to the channel frequency. Set the analyzer to measure peak hold with the required settings.
4. Rotate the EUT 360°. Record the peak level in dBm (**LVL**).
5. Replace the EUT with a vertically polarized half wave dipole or known gain antenna. The center of the antenna should be at the same location as the center of the EUT's antenna.
6. Connect the antenna to a signal generator with known output power and record the path loss in dB (**LOSS**). **LOSS** = Generator Output Power (dBm) – Analyzer reading (dBm).
7. Determine the ERP using the following equation:
ERP (dBm) = LVL (dBm) + LOSS (dB)
8. Determine the EIRP using the following equation:
EIRP (dBm) = ERP (dBm) + 2.14 (dB)
9. Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band.
10. Radiated emission measurements were made in GMSK (1 uplink slot), UMTS RMC 12.2k and CDMA 1xRTT modes.

6.1.6.2 Measurement Uncertainty

+/- 3 dB

6.1.6.3 Test Conditions:

Tnom: 20°C; Vnom: 3.6 V

6.1.6.4 Test Results

6.1.6.4.1 RF Power Output 850MHz band

Limits:

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

IC: Nominal Peak Output Power < 40.60 dBm (11.5W)

GSM 850: GMSK Mode	
Frequency (MHz)	Radiated Power
	ERP (dBm)
824.2	28.1
836.6	29.2
848.8	30.0

EGPRS 850: 8PSK Mode	
Frequency (MHz)	Radiated Power
	ERP (dBm)
824.2	22.5
836.6	24.0
848.8	25.0

FDD V: UMTS Mode	
Frequency (MHz)	Radiated Power
	ERP (dBm)
826.4	20.7
836.6	21.3
846.6	23.8

CDMA 850: 1x-RTT Mode	
Frequency (MHz)	Radiated Power
	ERP (dBm)
824.70	23.98
836.52	24.54
848.31	24.57

CDMA 850: EVDO Rel A Mode	
Frequency (MHz)	Radiated Power
	ERP (dBm)
824.70	25.20
836.52	25.76
848.31	25.78

6.1.6.5 Test Verdict

Pass.

6.1.6.5.1 RF Power Output 850MHz band

Limits:

Nominal Peak Output Power < 33 dBm (2W)

GSM 1900: GMSK Mode	
Frequency (MHz)	Radiated Power
	ERP (dBm)
1850.2	28.04
1880	27.05
1909.8	27.10

EGPRS 1900: 8PSK Mode	
Frequency (MHz)	Radiated Power
	ERP (dBm)
1850.2	26.94
1880	25.52
1909.8	25.64

FDD II: UMTS Mode	
Frequency (MHz)	Radiated Power
	ERP (dBm)
1852.4	25.1
1880	23.7
1907.6	23.8

CDMA 1900: 1x-RTT Mode	
Frequency (MHz)	Radiated Power
	ERP (dBm)
1851.25	26.18
1880	26.71
1908.75	25.28

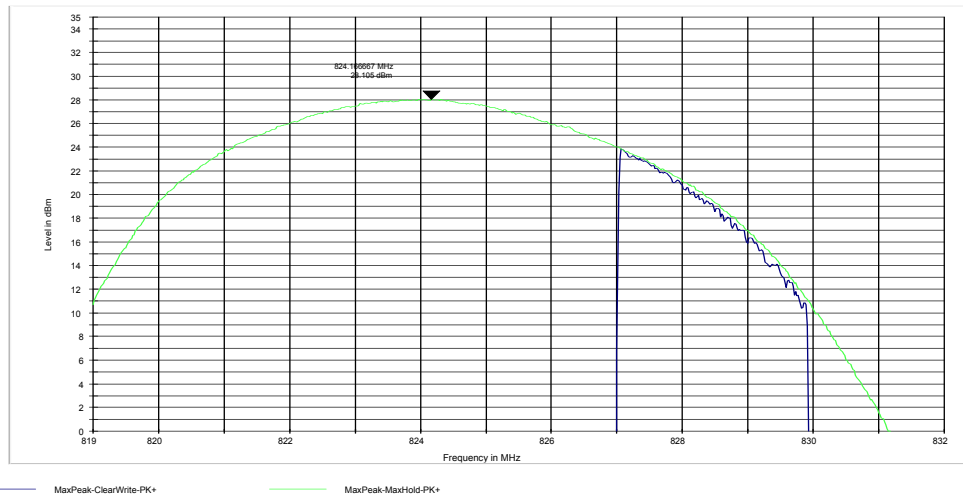
CDMA 1900: EVDO Rel A Mode	
Frequency (MHz)	Radiated Power
	ERP (dBm)
1851.25	25.87
1880	28.35
1908.75	29.00

6.1.6.6 Test Verdict

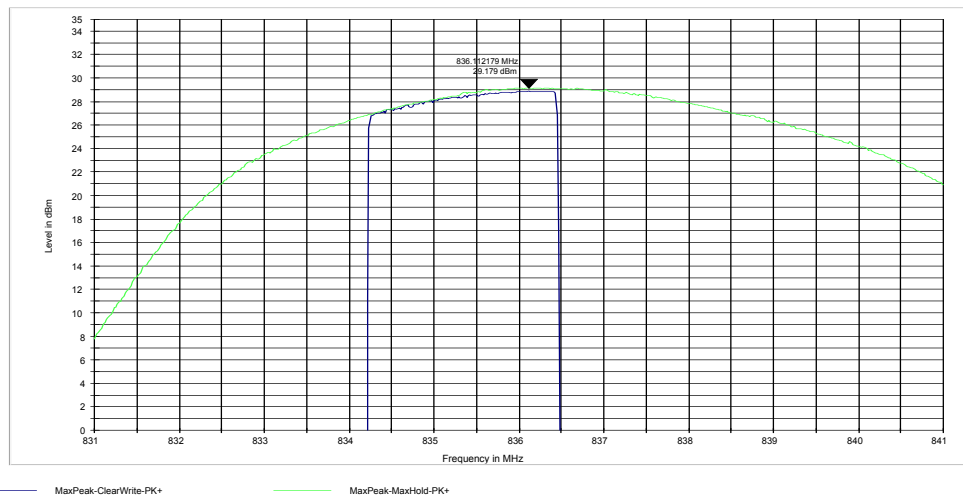
Pass.

6.1.6.7 Plots:

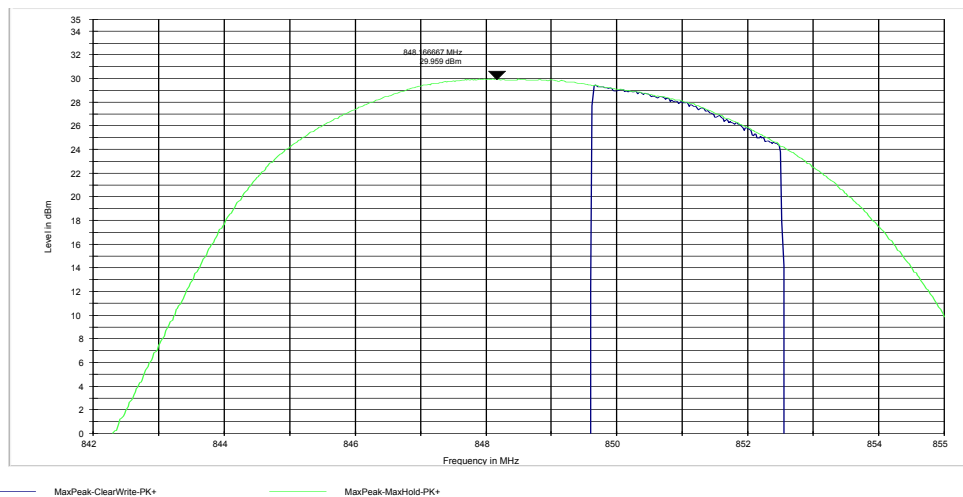
ERP (GSM 850) CHANNEL 128



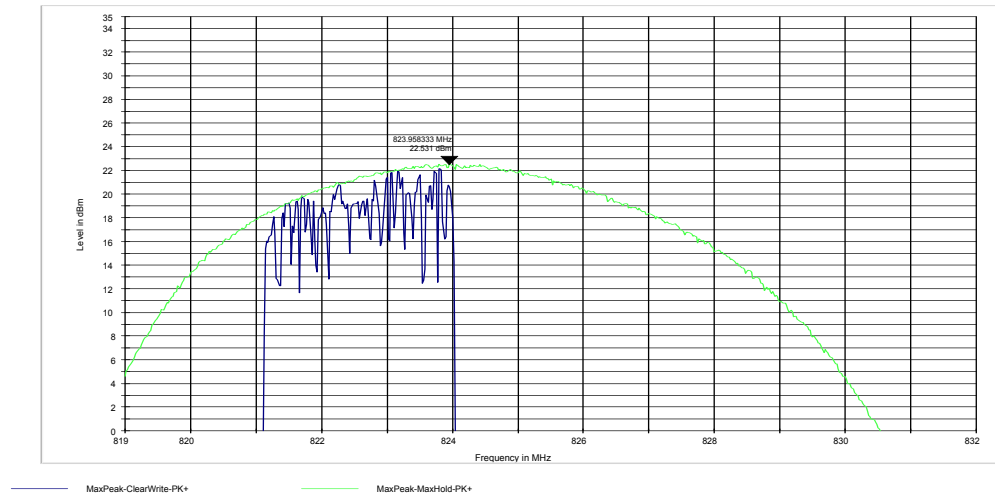
ERP (GSM 850) CHANNEL 190



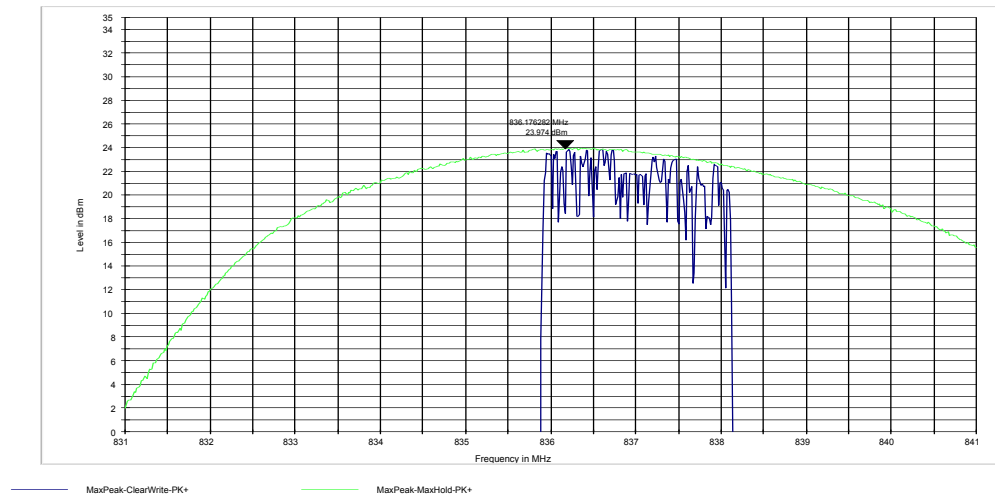
ERP (GSM 850) CHANNEL 251



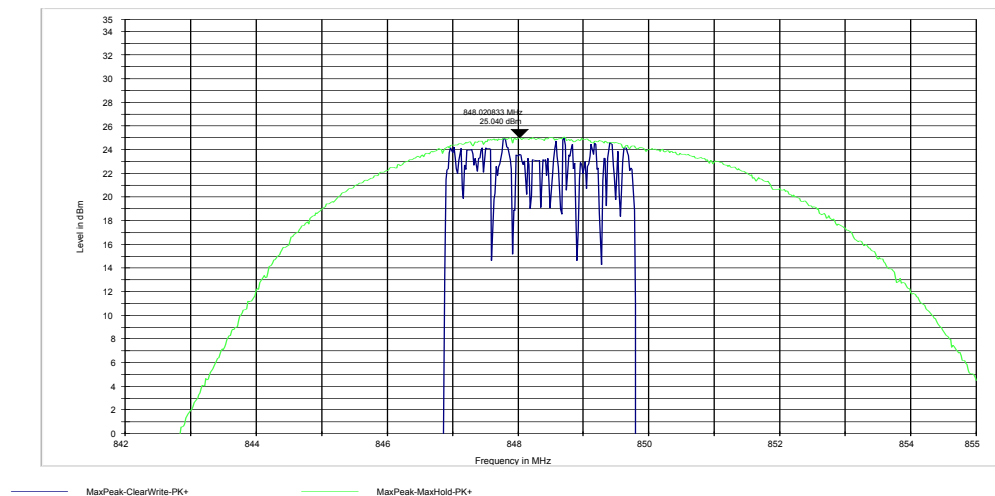
ERP (EGPRS 850) CHANNEL 128



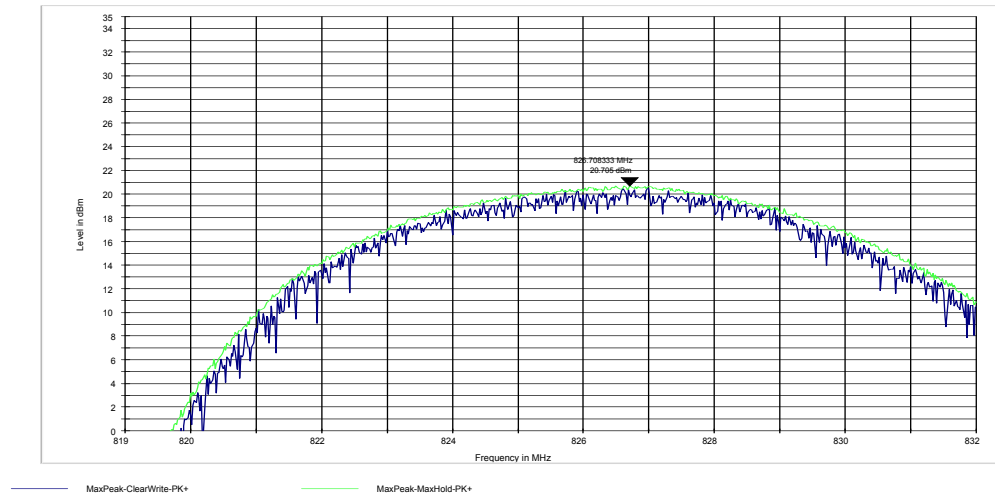
ERP (EGPRS 850) CHANNEL 190



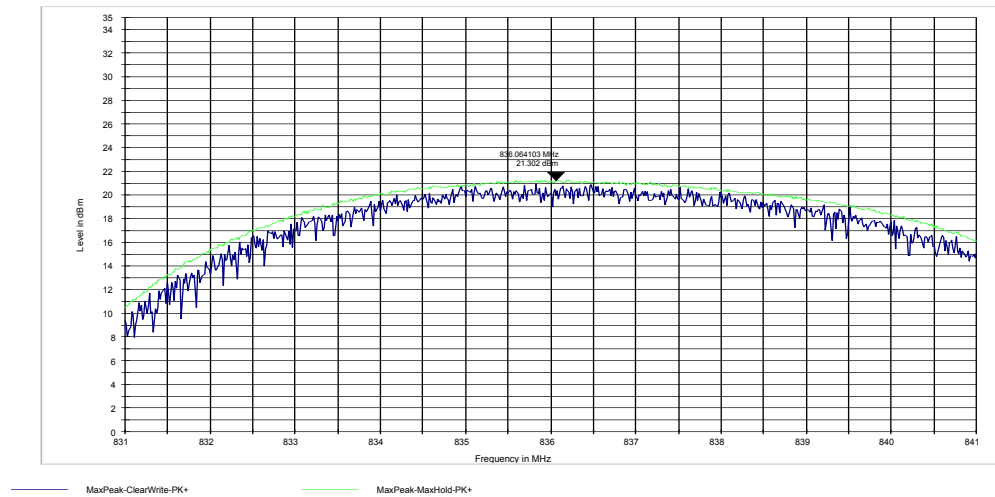
ERP (EGPRS 850) CHANNEL 251



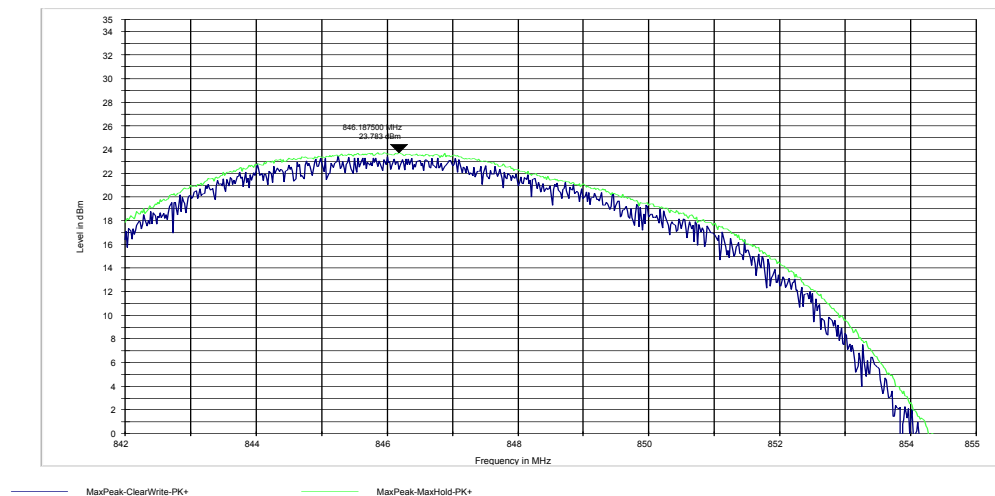
ERP (UMTS FDD5) CHANNEL 4132



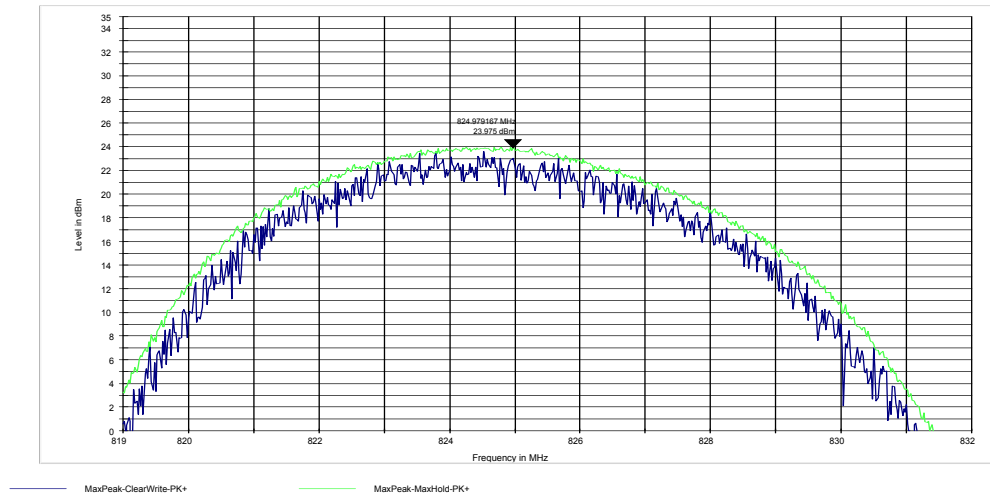
ERP (UMTS FDD5) CHANNEL 4183



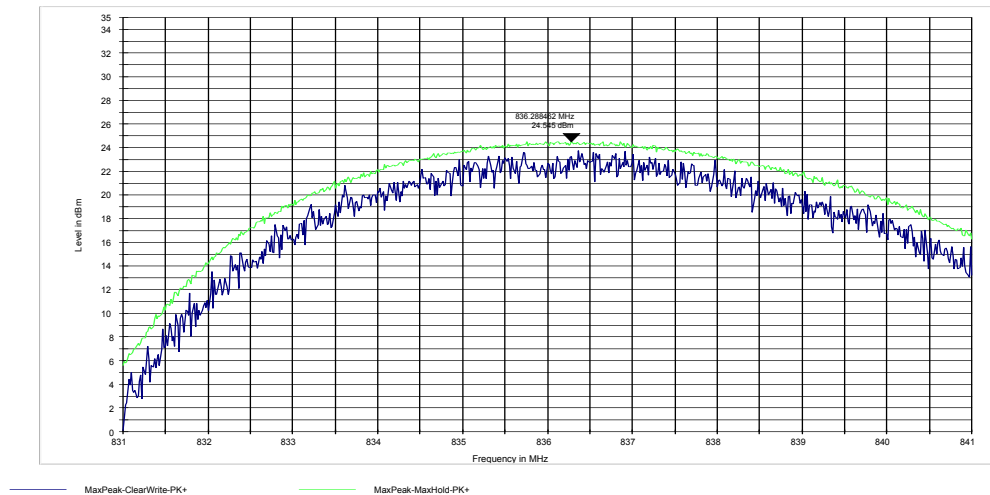
ERP (UMTS FDD5) CHANNEL 4233



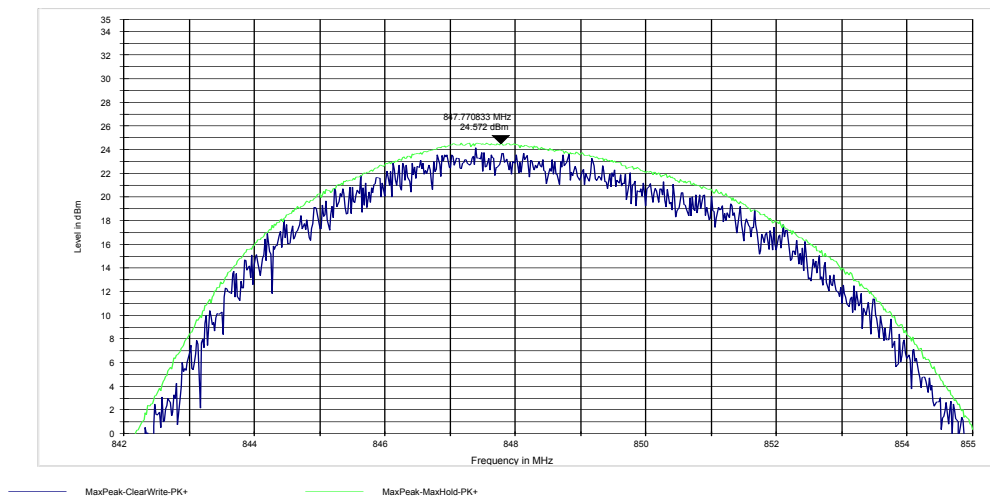
ERP (CDMA 1x-RTT 850) CHANNEL 1013



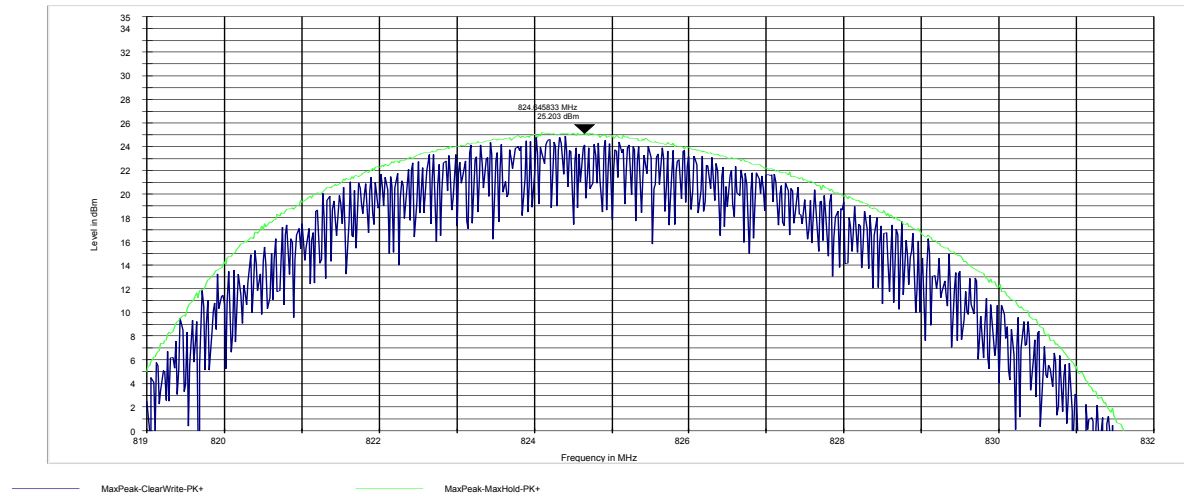
ERP (CDMA 1x-RTT 850) CHANNEL 384



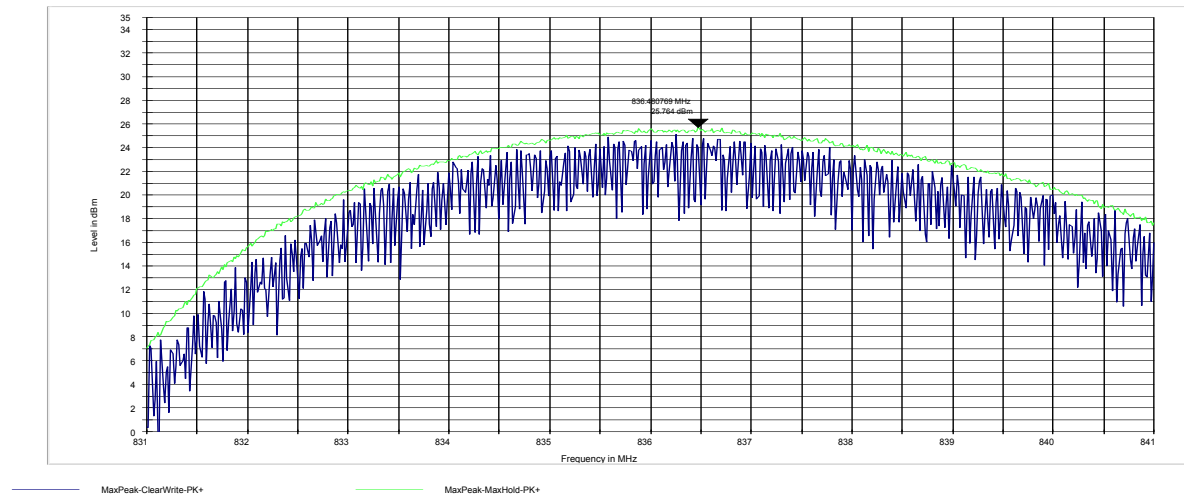
ERP (CDMA 1x-RTT 850) CHANNEL 777



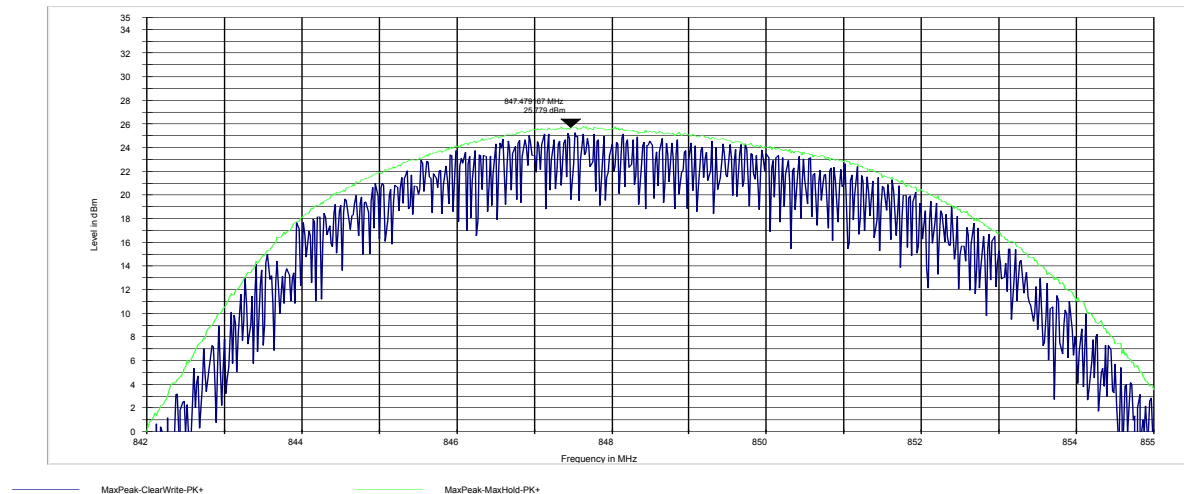
ERP (CDMA EVDO Rel A 850) CHANNEL 1013



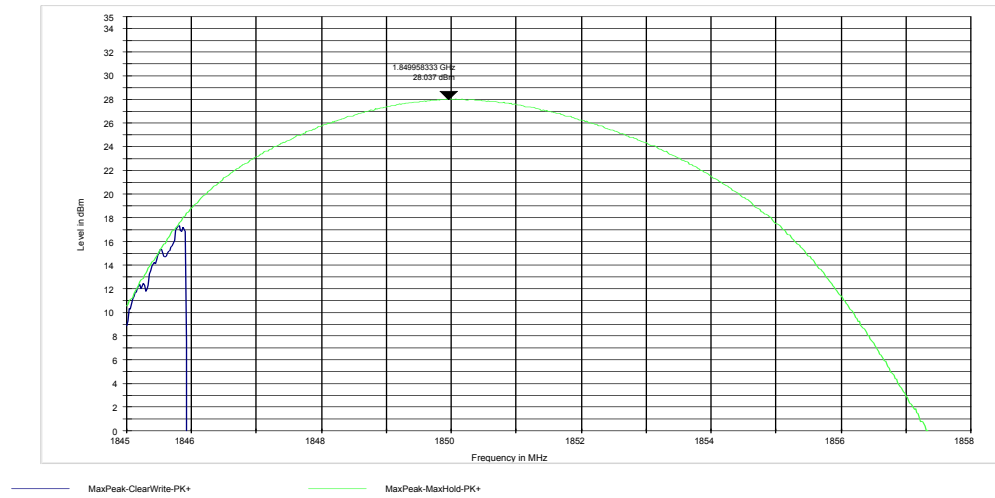
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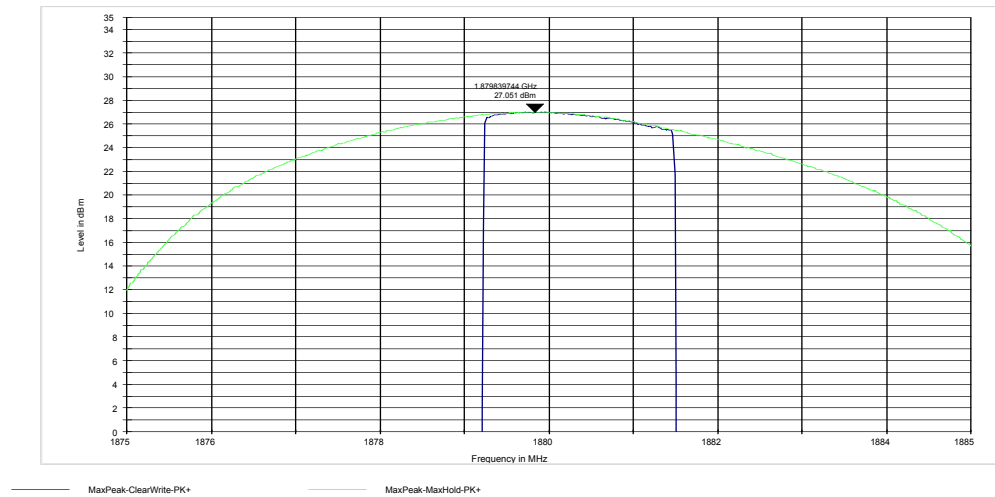
ERP (CDMA EVDO Rel A 850) CHANNEL 777



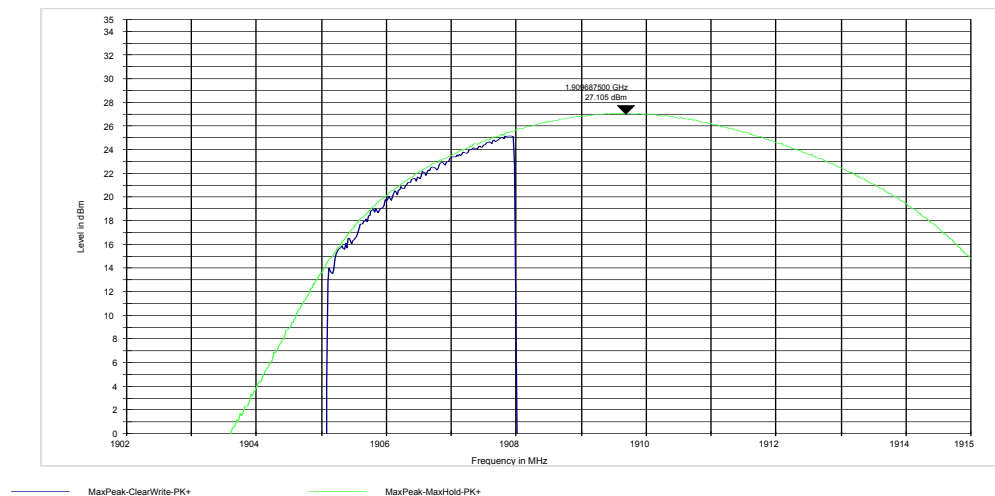
EIRP (PCS-1900) CHANNEL 512



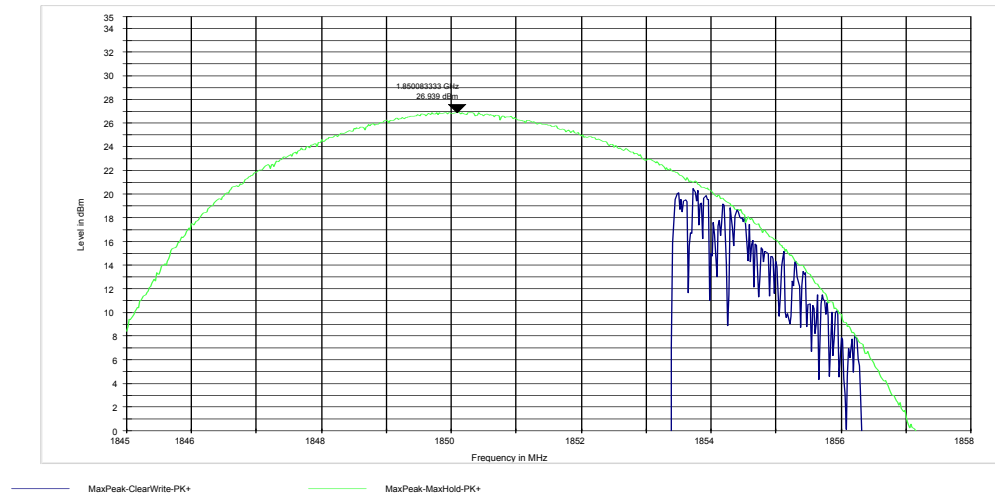
EIRP (PCS-1900) CHANNEL 661



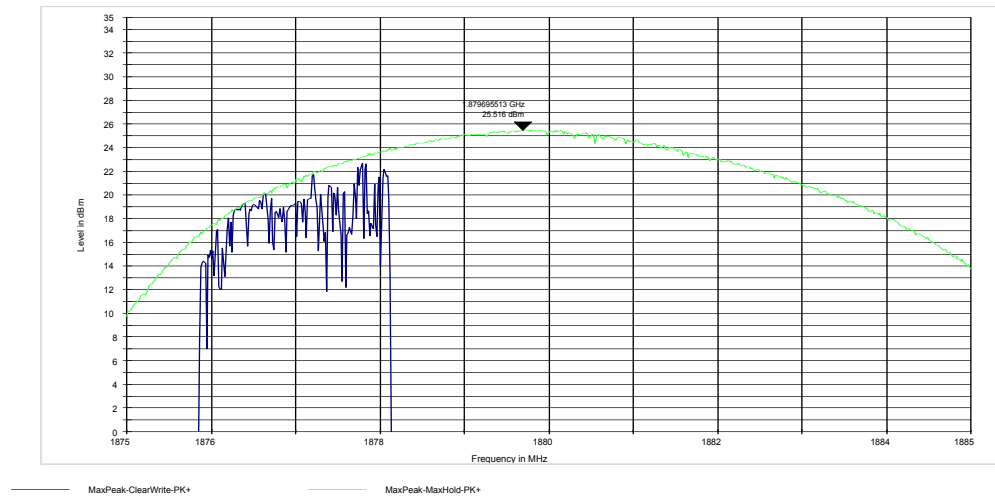
EIRP (PCS-1900) CHANNEL 810



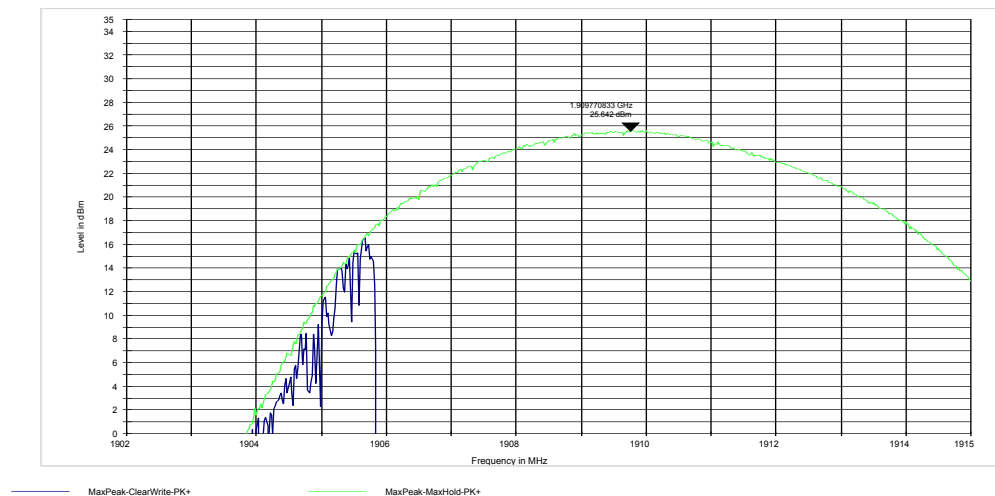
EIRP (EGPRS 1900) CHANNEL 512



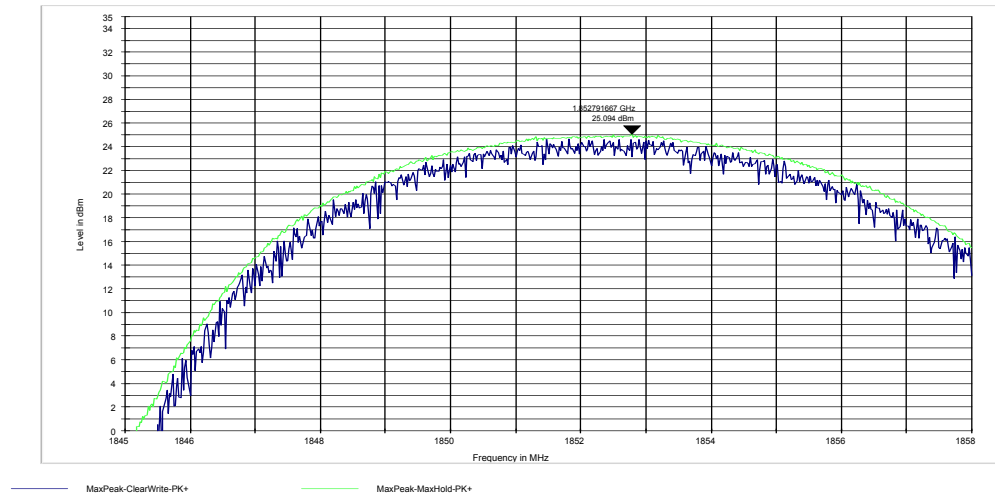
EIRP (EGPRS 1900) CHANNEL 661



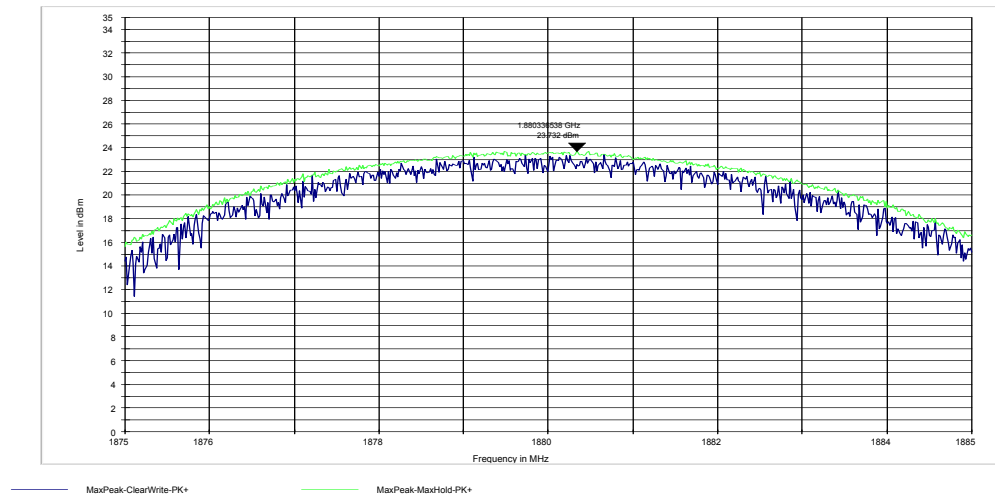
EIRP (EGPRS 1900) CHANNEL 810



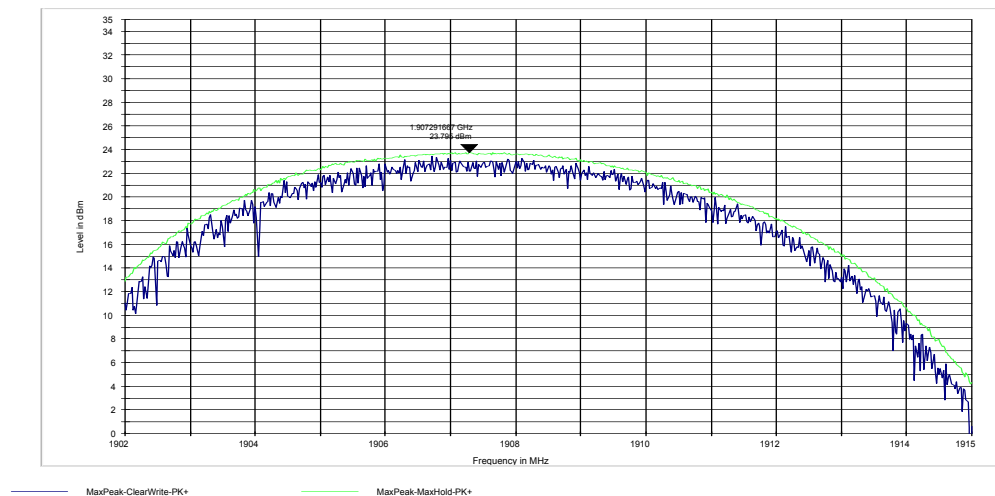
EIRP (UMTS FDD2) CHANNEL 9262



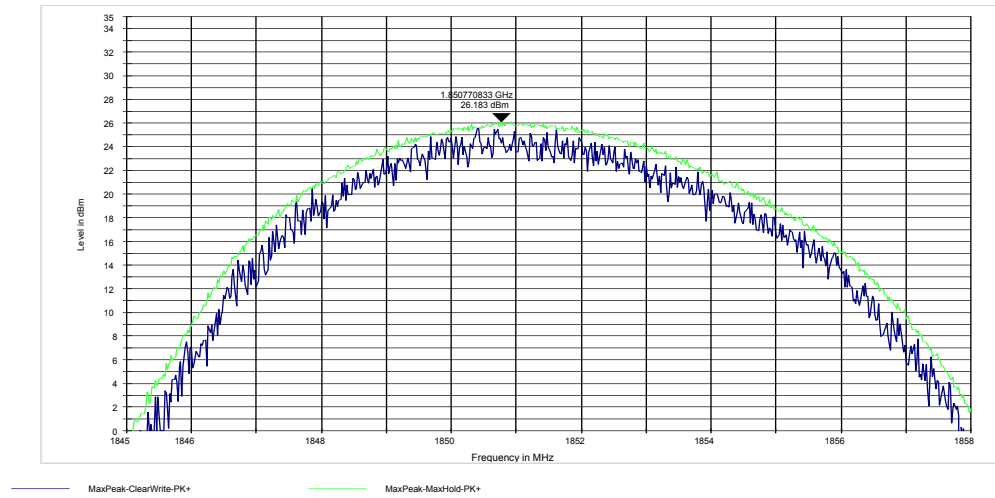
EIRP (UMTS FDD2) CHANNEL 9400



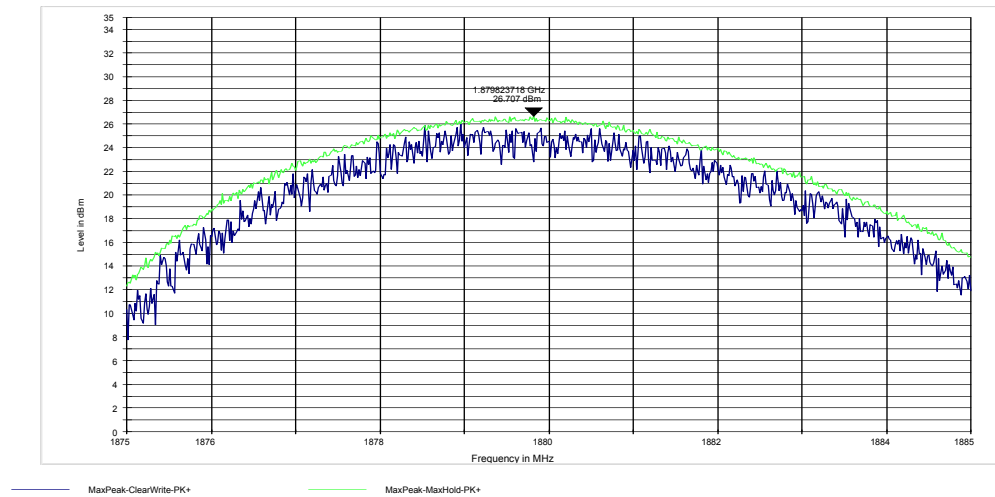
EIRP (UMTS FDD2) CHANNEL 9538



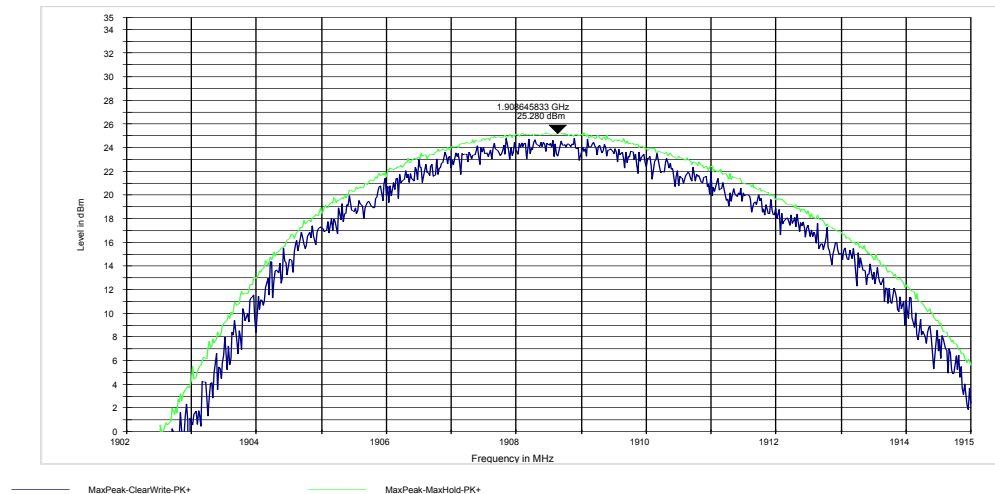
EIRP (CDMA 1x-RTT 1900) CHANNEL 25



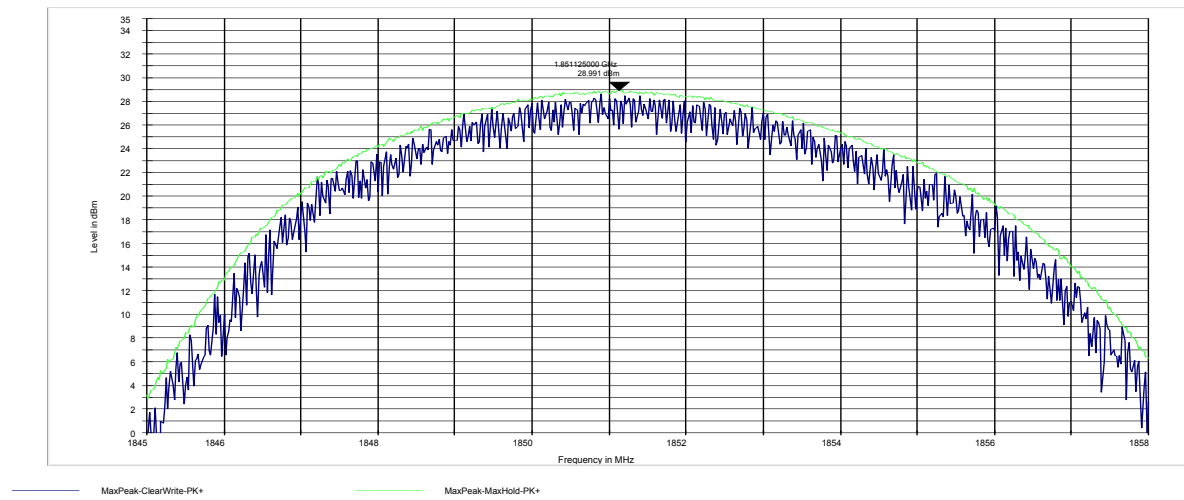
EIRP (CDMA 1x-RTT 1900) CHANNEL 600



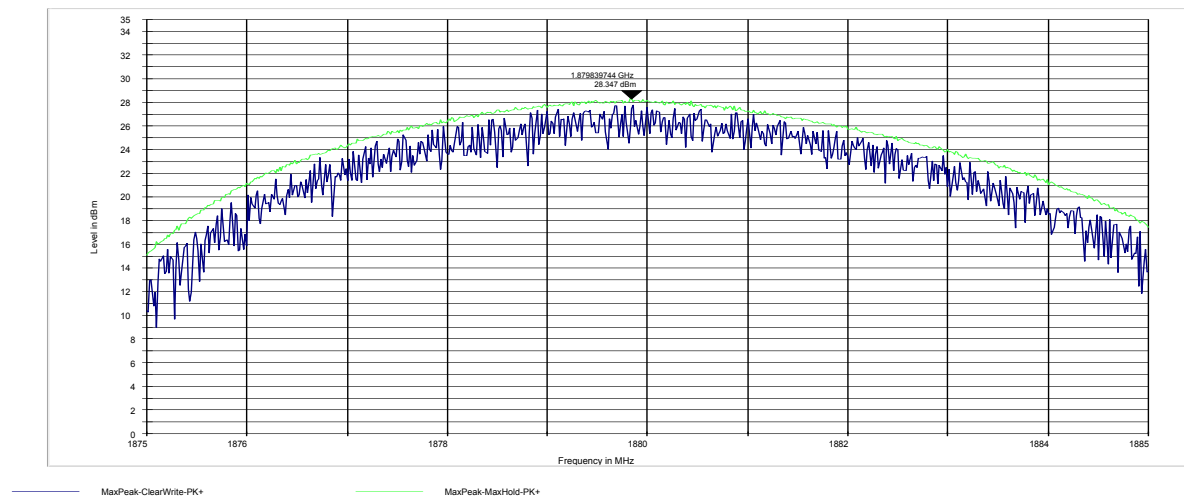
EIRP (CDMA 1x-RTT 1900) CHANNEL 1175



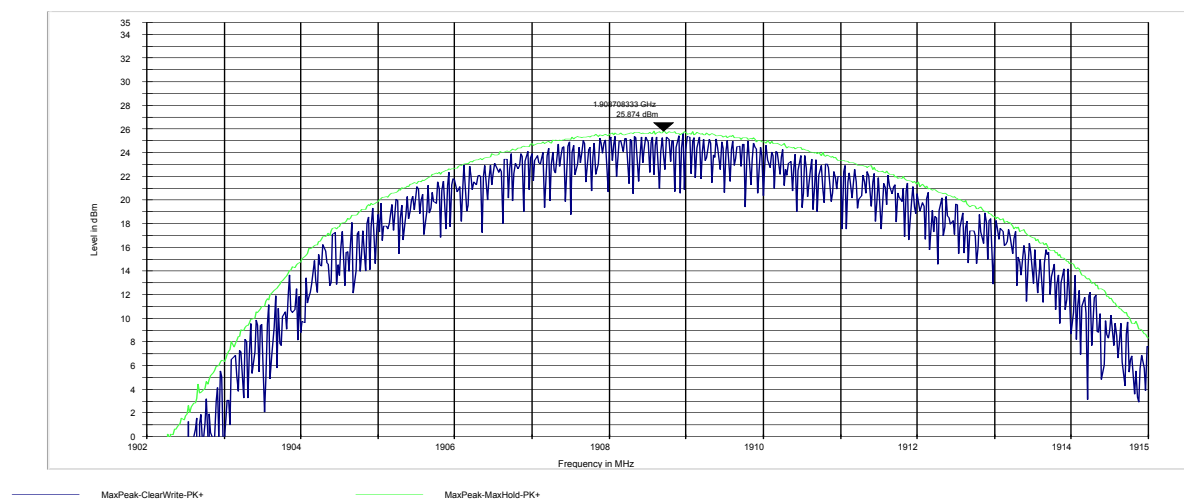
EIRP (CDMA EVDO Rel A 1900) CHANNEL 25



EIRP (CDMA EVDO Rel A 1900) CHANNEL 600



EIRP (CDMA EVDO Rel A 1900) CHANNEL 1175



6.2 Spurious Emissions Radiated

6.2.1 References

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

6.2.2 Measurement requirements:

6.2.2.1 FCC 2.1053: Field strength of spurious radiation.

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

6.2.2.2 RSS-Gen 4.9: Transmitter unwanted spurious emissions

The same parameter, peak power or average power, used for the transmitter output power measurement shall be used for unwanted emission measurements.

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

6.2.3 Limits:

(a) *Out of band emissions.* The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

For all power levels +30dBm to 0dBm, this becomes a constant specification of -13dBm.

6.2.3.1 FCC 22.917 Emission limitations for cellular equipment.

The rules in this section govern the spectral characteristics of emissions in the Cellular Radiotelephone Service.

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

6.2.3.2 FCC 24.238 Emission limitations for Broadband PCS equipment.

The rules in this section govern the spectral characteristics of emissions in the Broadband Personal Communications Service.

(b) *Measurement procedure.* Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the

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

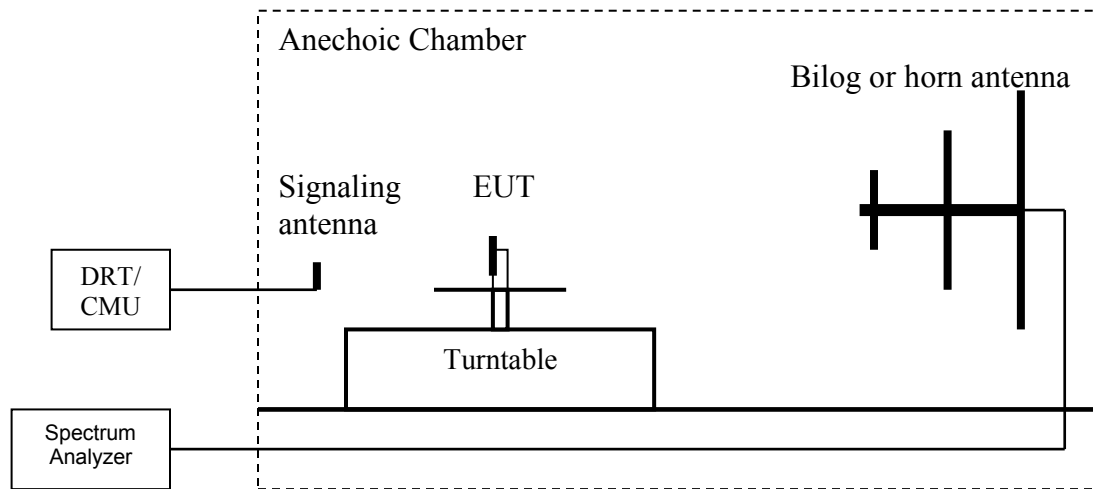
6.2.3.3 RSS-132 Section 5.5.1.1 and RSS-133 Section 6.5.1

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

After the first 1.5 MHz, the power of emissions shall be attenuated below the transmitter output power by at least $43 + 10 \log_{10}(P)$, dB, in any MHz of bandwidth.

6.2.4 Radiated out of band measurement procedure:

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



1. Connect the equipment as shown in the above diagram with the EUT's antenna in a horizontal orientation.
2. Adjust the settings of the Digital Radio Communication Tester (DRT) to set the EUT to its maximum power at the required channel.
3. Set the spectrum analyzer to measure peak hold with the required settings.
4. Place the measurement antenna in a horizontal orientation. Rotate the EUT 360°. Raise the measurement antenna up to 4 meters in 0.5 meters increments and rotate the EUT 360° at each height to maximize all emissions. Measure and record all spurious emissions (**LVL**) up to the tenth harmonic of the carrier frequency.
5. Replace the EUT with a horizontally polarized half wave dipole or known gain antenna. The center of the antenna should be at the same location as the center of the EUT's antenna.
6. Connect the antenna to a signal generator with known output power and record the path loss in dB (**LOSS**). **LOSS** = Generator Output Power (dBm) – Analyzer reading (dBm).
7. Determine the level of spurious emissions using the following equation:
Spurious (dBm) = **LVL** (dBm) + **LOSS** (dB):
8. Repeat steps 4, 5 and 6 with all antennas vertically polarized.
9. Determine the level of spurious emissions using the following equation:
Spurious (dBm) = **LVL** (dBm) + **LOSS** (dB):
10. Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band.
(**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 and no radiation was seen from a carrier in one block of the GSM-850 MHz and the PCS-1900 MHz band into any of the other blocks respectively. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

Radiated emission measurements were made in GMSK (1 uplink slot), UMTS RMC 12.2k and CDMA 1xRTT modes.

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 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	9.822	836.6	-9.35	848.8	10.347
2	1648.4	-52	1673.2	-49	1697.6	-50
3	2472.6	-56	2509.8	-47	2546.4	-55
4	3296.8	NF	3346.4	NF	3395.2	NF
5	4121	NF	4183	NF	4244	NF
6	4945.2	NF	5019.6	NF	5092.8	NF
7	5769.4	NF	5856.2	NF	5941.6	NF
8	6593.6	NF	6692.8	NF	6790.4	NF
9	7417.8	NF	7529.4	NF	7639.2	NF
10	8242	NF	8366	NF	8488	NF
NF = Noise Floor Measurement Uncertainty: ± 3 dB						

6.2.8.2 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	10.985	836.6	9.281	846.6	13.028
2	1652.8	NF	1673.2	-49	1693.2	-53
3	2479.2	-54	2509.8	-53	2539.8	-53
4	3305.6	-44	3346.4	-37	3386.4	-40
5	4132	NF	4183	NF	4233	NF
6	4958.4	NF	5019.6	NF	5079.6	NF
7	5784.8	NF	5856.2	NF	5926.2	NF
8	6611.2	NF	6692.8	NF	6772.8	NF
9	7437.6	NF	7529.4	NF	7619.4	NF
10	8264	NF	8366	NF	8466	NF
NF= Noise Floor Measurement Uncertainty: ± 3 dB						

6.2.8.3 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	14.139	1880.0	-21.206	1909.8	23.543
2	3700.4	NF	3760	NF	3819.6	NF
3	5550.6	NF	5640	NF	5729.4	NF
4	7400.8	NF	7520	NF	7639.2	NF
5	9251	NF	9400	NF	9549	NF
6	11101.2	NF	11280	NF	11458.8	NF
7	12951.4	NF	13160	NF	13368.6	NF
8	14801.6	NF	15040	NF	15278.4	NF
9	16651.8	NF	16920	NF	17188.2	NF
10	18502	NF	18800	NF	19098	NF
NF = Noise Floor Measurement Uncertainty: ± 3 dB						

6.2.8.4 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	20.767	1880.0	19.177	1907.6	20.080
2	3704.8	NF	3760	NF	3815.2	-49
3	5557.2	NF	5640	NF	5722.8	NF
4	7409.6	NF	7520	NF	7630.4	NF
5	9262	NF	9400	NF	9538	NF
6	11114.4	NF	11280	NF	11445.6	NF
7	12966.8	NF	13160	NF	13353.2	NF
8	14819.2	NF	15040	NF	15260.8	NF
9	16671.6	NF	16920	NF	17168.4	NF
10	18524	NF	18800	NF	19076	NF
NF= Noise Floor Measurement Uncertainty: ±3dB						

6.2.8.5 Test Results Transmitter Spurious Emission CDMA 850:

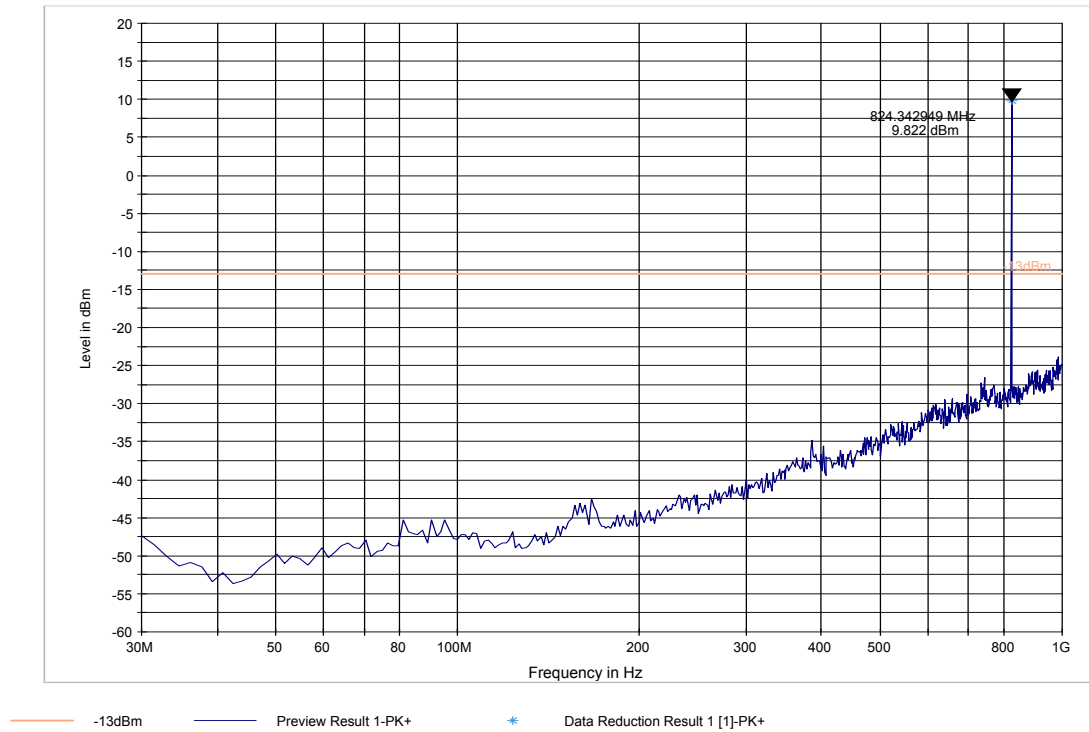
Harmonic	Tx ch-1013 Freq. (MHz)	Level (dBm)	Tx ch-384 Freq. (MHz)	Level (dBm)	Tx ch-777 Freq. (MHz)	Level (dBm)
1	824.7	14.942	836.52	8.969	848.31	16.434
2	1649.4	NF	1673.04	NF	1696.62	NF
3	2474.1	NF	2509.56	NF	2544.93	NF
4	3298.8	NF	3346.08	NF	3393.24	NF
5	4123.5	NF	4182.6	NF	4241.55	NF
6	4948.2	NF	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						

6.2.8.6 Test Results Transmitter Spurious Emission CDMA-1900:

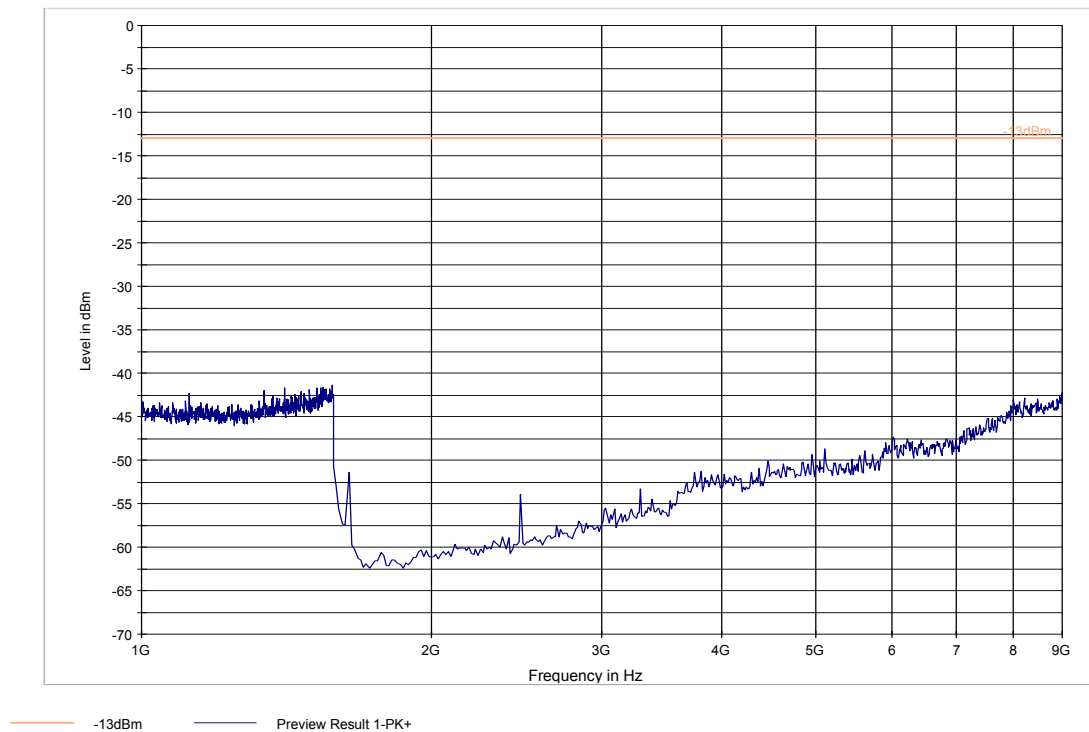
Harmonic	Tx ch-25 Freq.(MHz)	Level (dBm)	Tx ch-600 Freq. (MHz)	Level (dBm)	Tx ch-1175 Freq. (MHz)	Level (dBm)
1	1851.25	24.435	1880.0	16.460	1908.75	23.494
2	3702.5	NF	3760	NF	3817.5	-46
3	5553.75	NF	5640	NF	5726.25	-41
4	7405	NF	7520	NF	7635	NF
5	9256.25	NF	9400	NF	9543.75	NF
6	11107.5	NF	11280	NF	11452.5	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						

6.2.8.7 Plots:

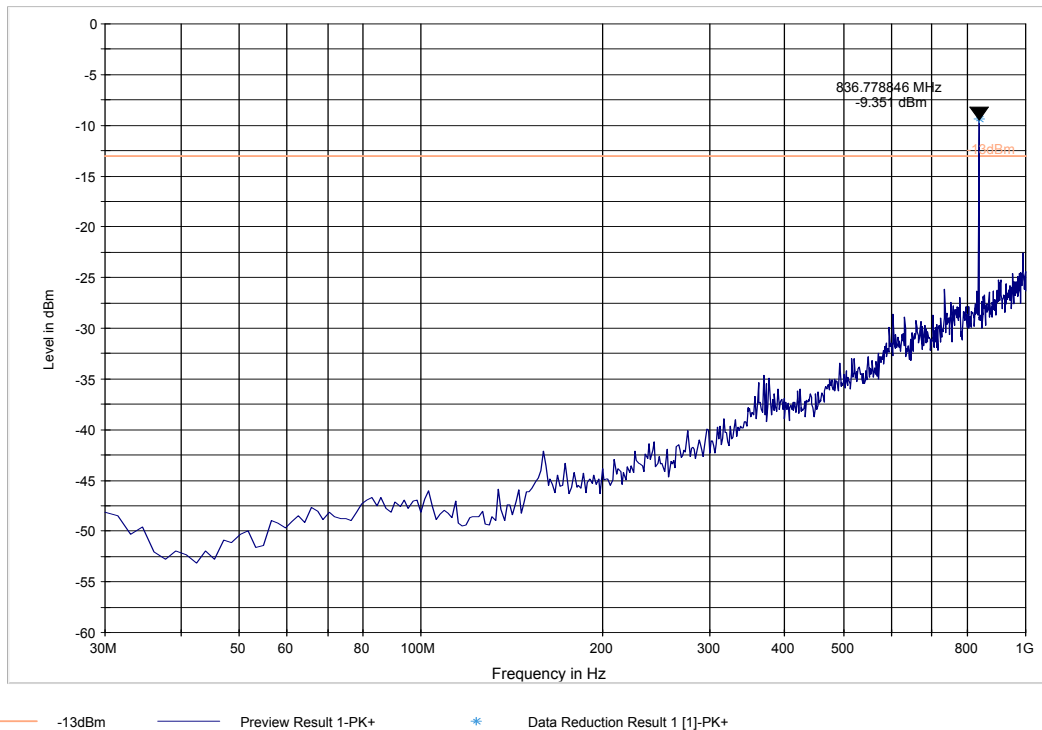
Radiated Spurious Emissions (GSM-850) Tx: Low Channel Test results 30M-1GHz



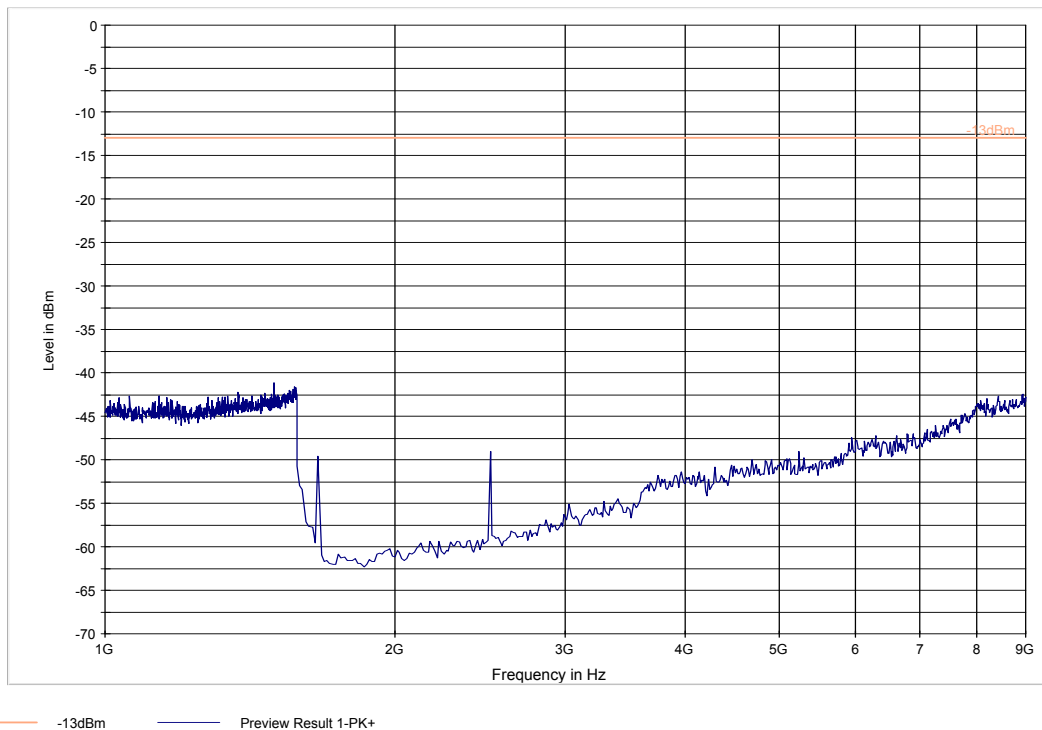
Test results 1GHz-9GHz



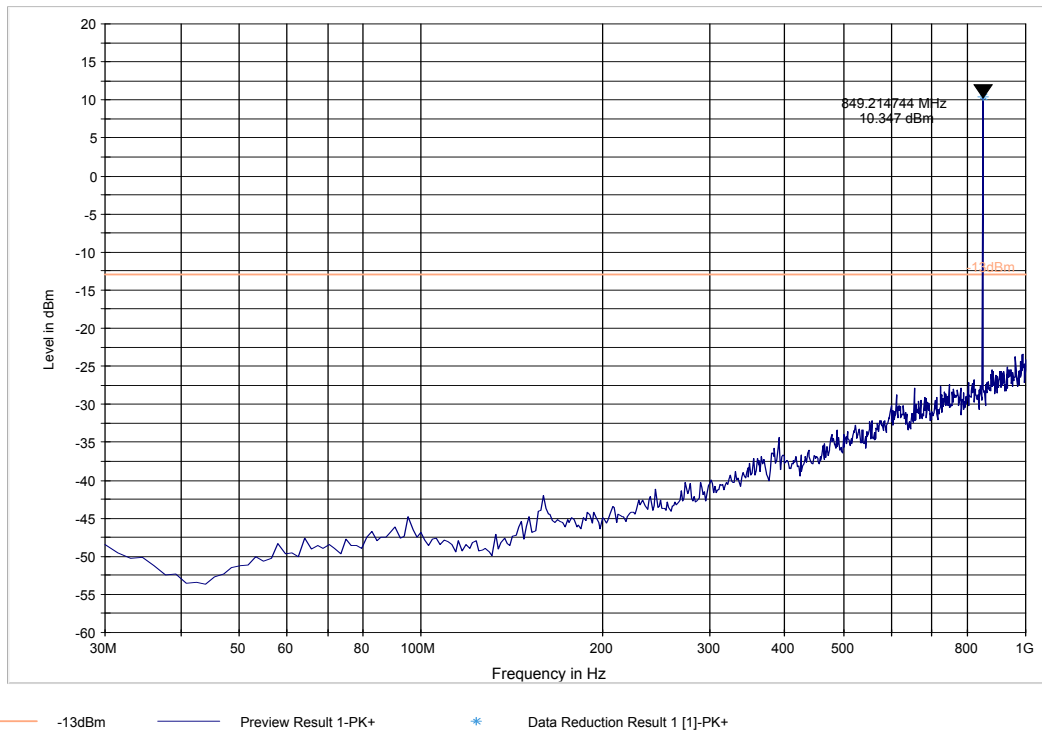
Radiated Spurious Emissions (GSM-850) Tx: Mid Channel
Test results 30M-1GHz



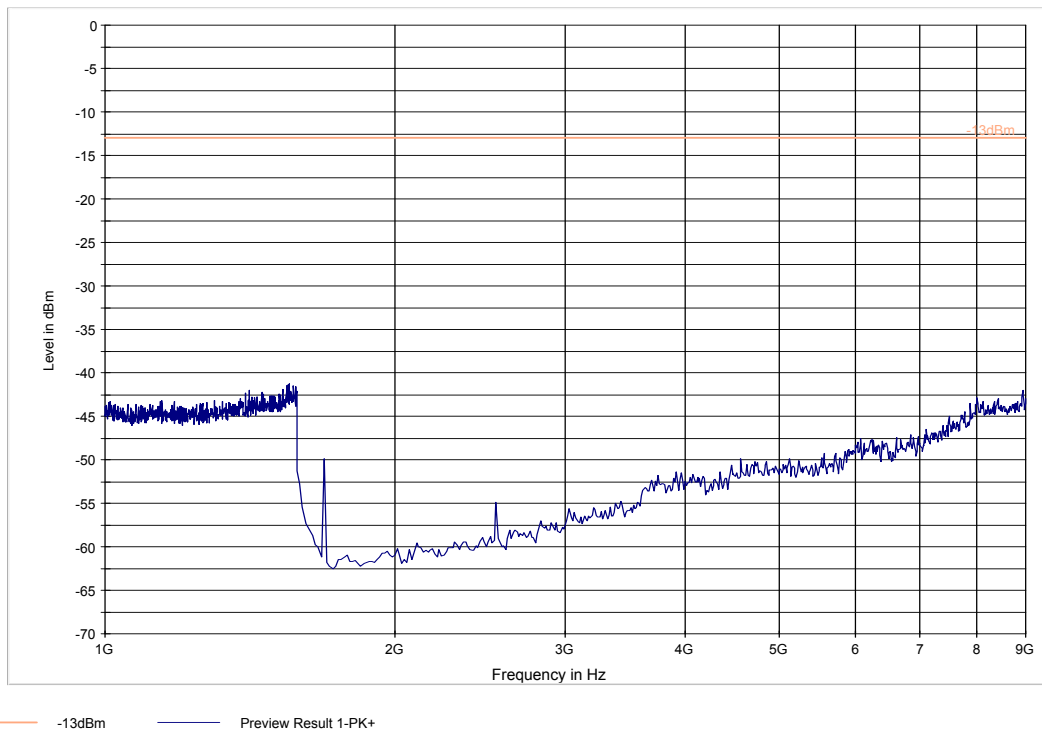
Test results 1GHz-9GHz



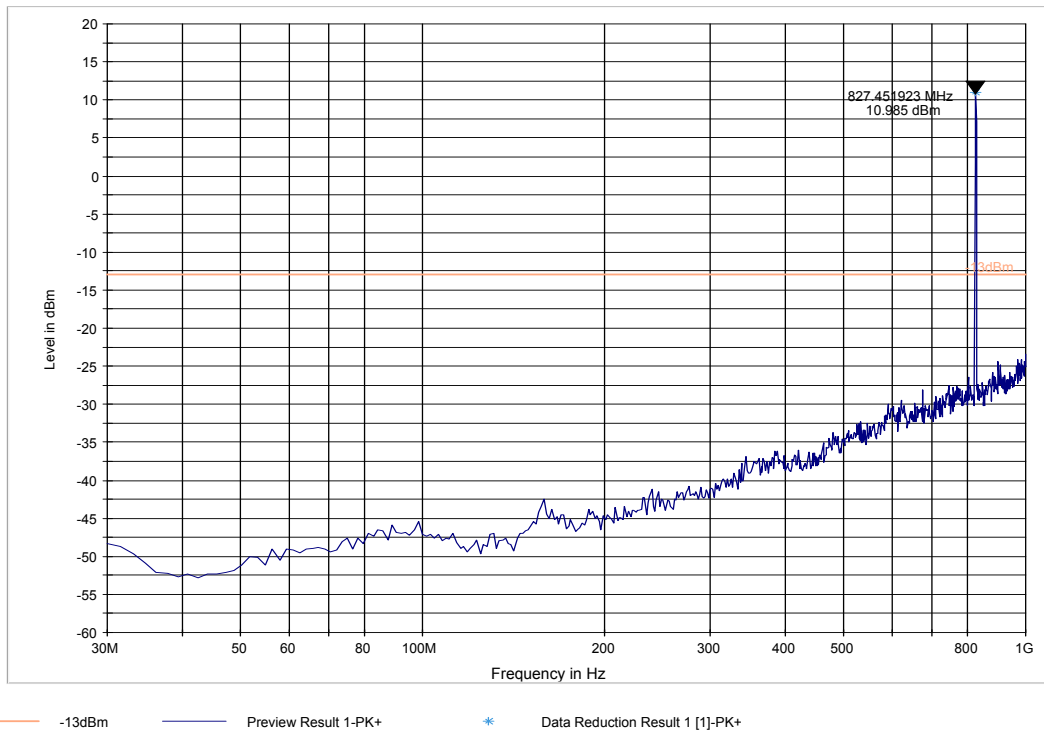
Radiated Spurious Emissions (GSM-850) Tx: High Channel
Test results 30M-1GHz



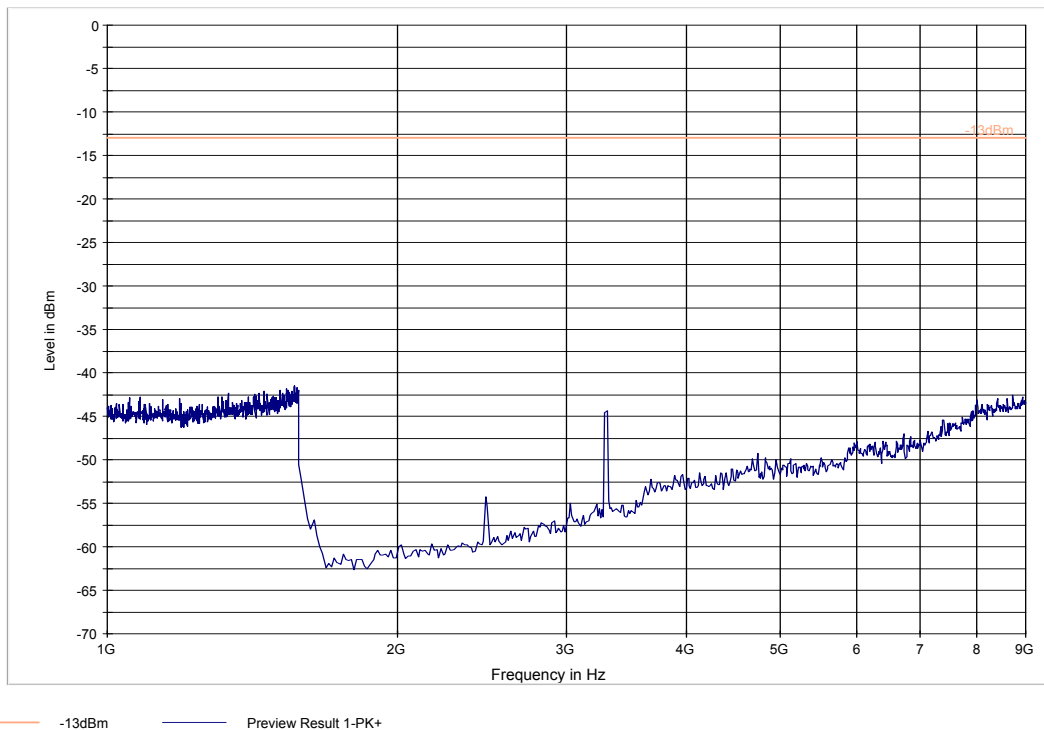
Test results 1GHz-9GHz



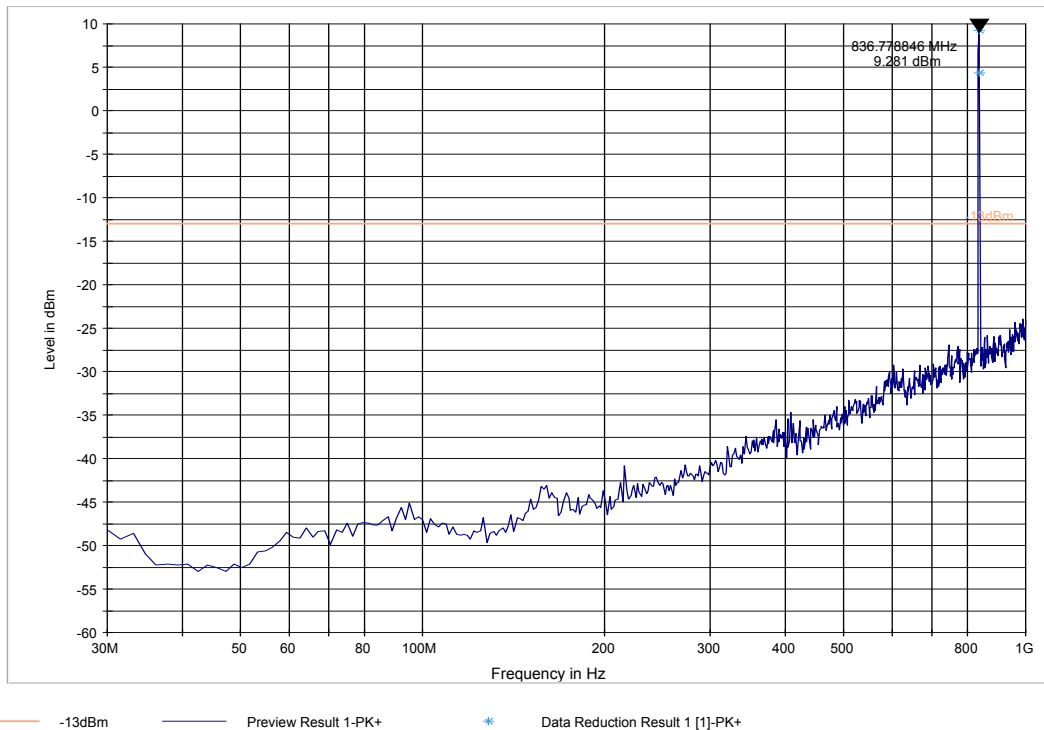
Radiated Spurious Emissions (UMTS Band 5) Tx: Low Channel
Test results 30M-1GHz



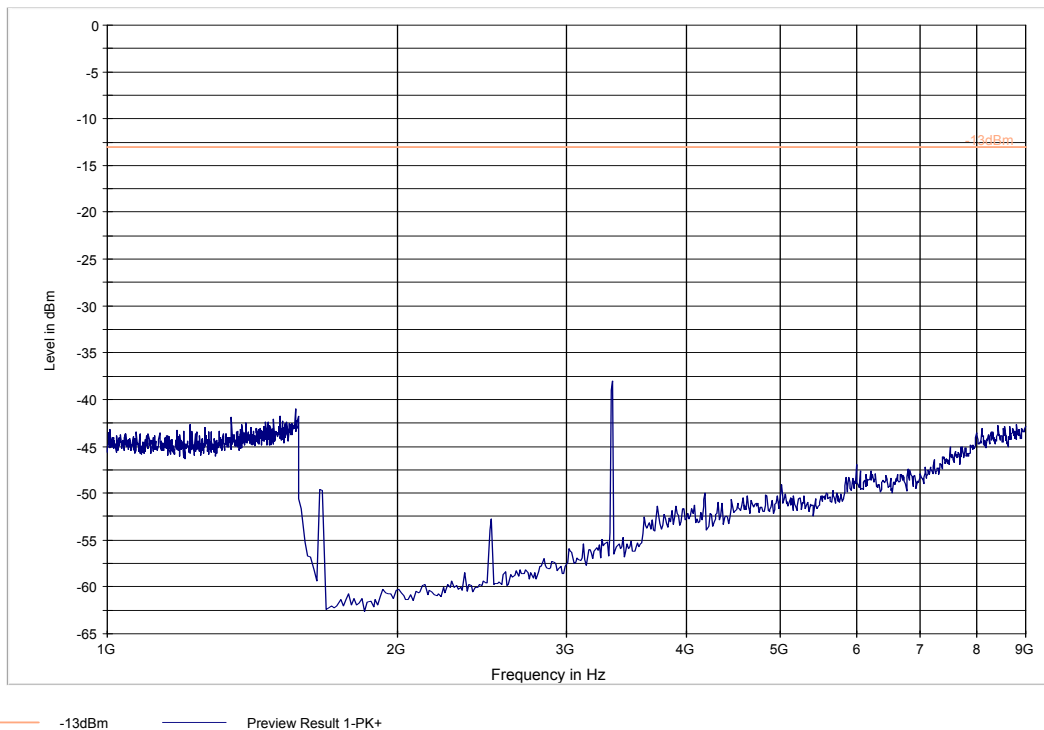
Test results 1GHz-9GHz



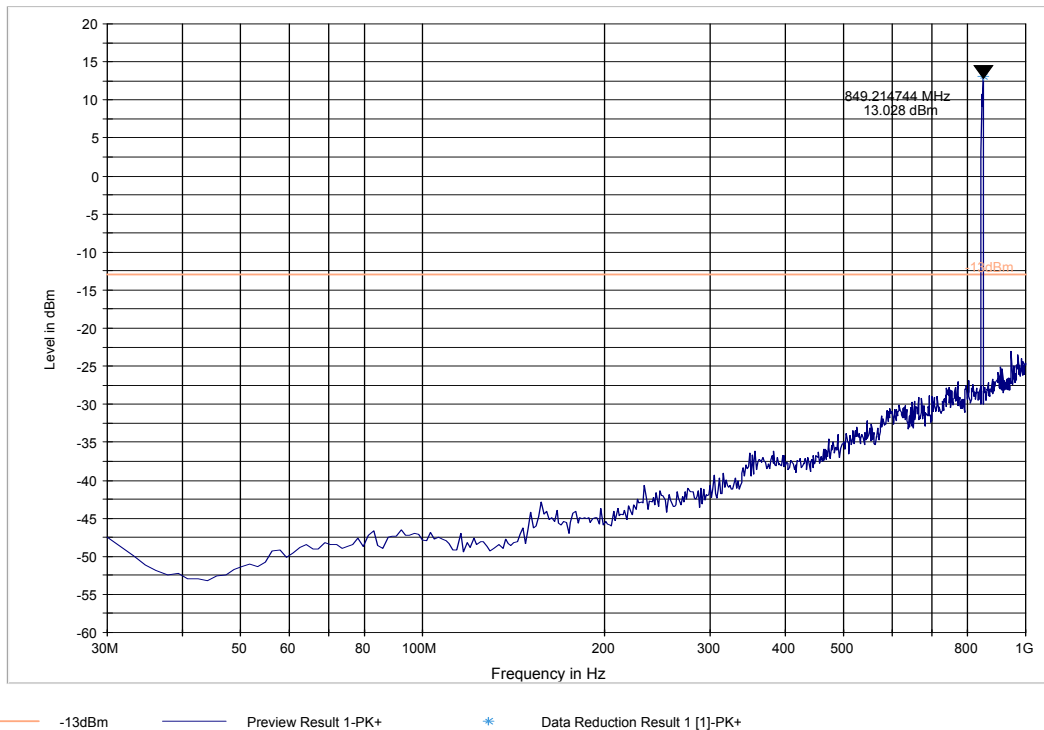
Radiated Spurious Emissions (UMTS Band 5) Tx: Mid Channel
Test results 30M-1GHz



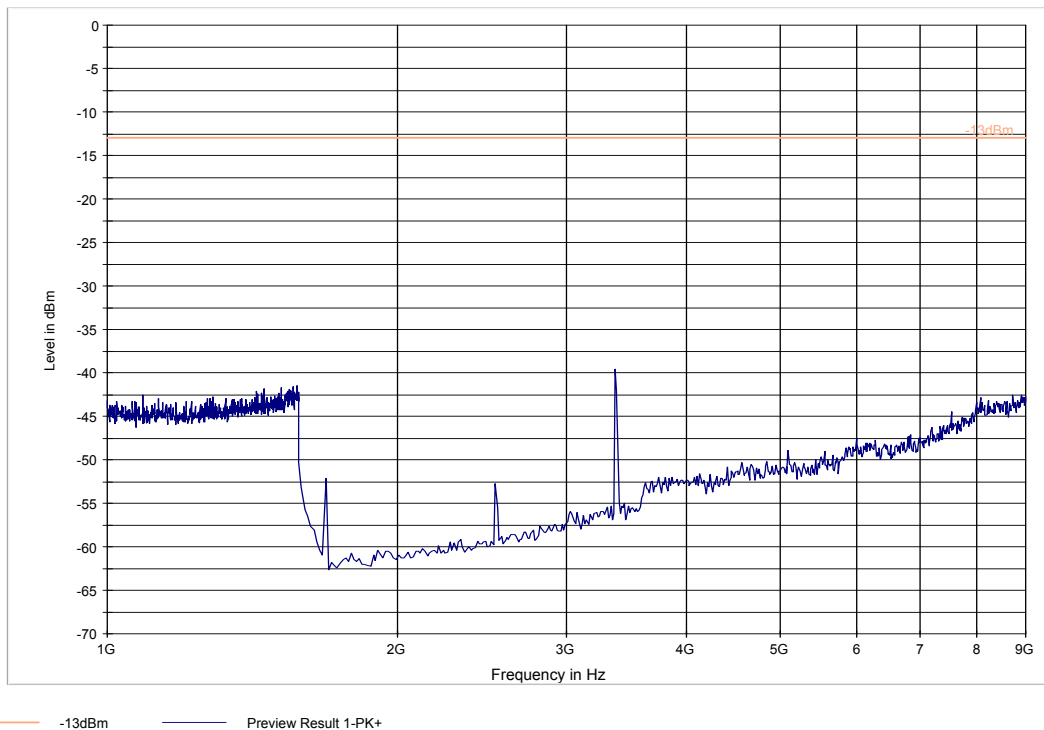
Test results 1GHz-9GHz



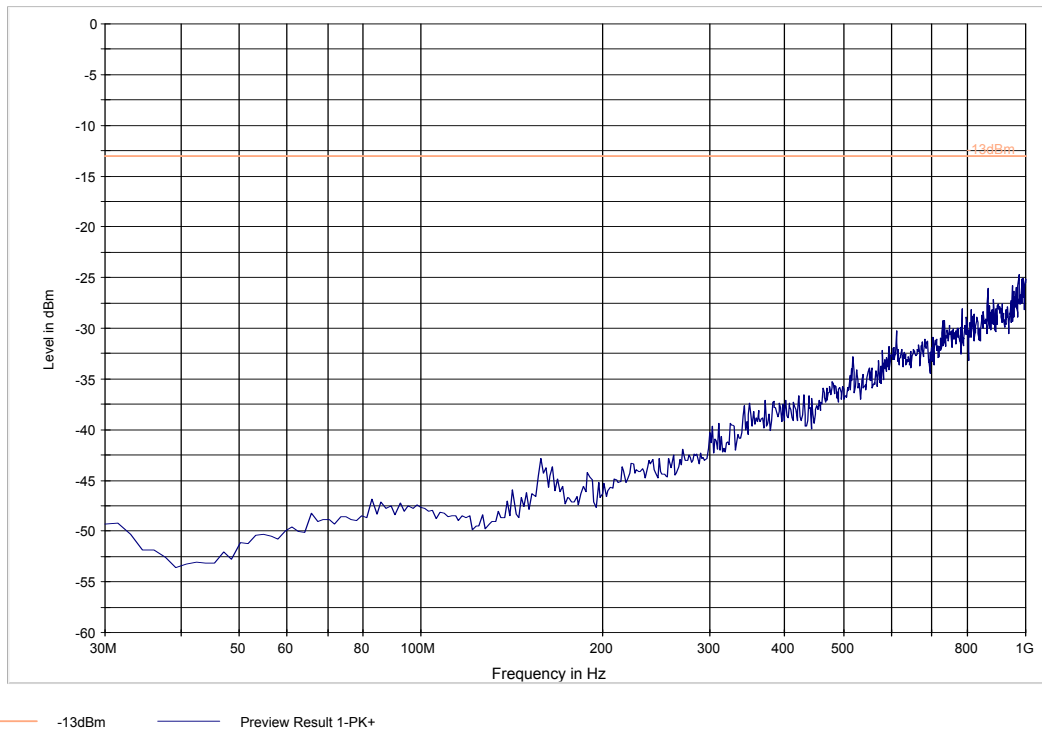
Radiated Spurious Emissions (UMTS Band 5) Tx: High Channel
Test results 30M-1GHz



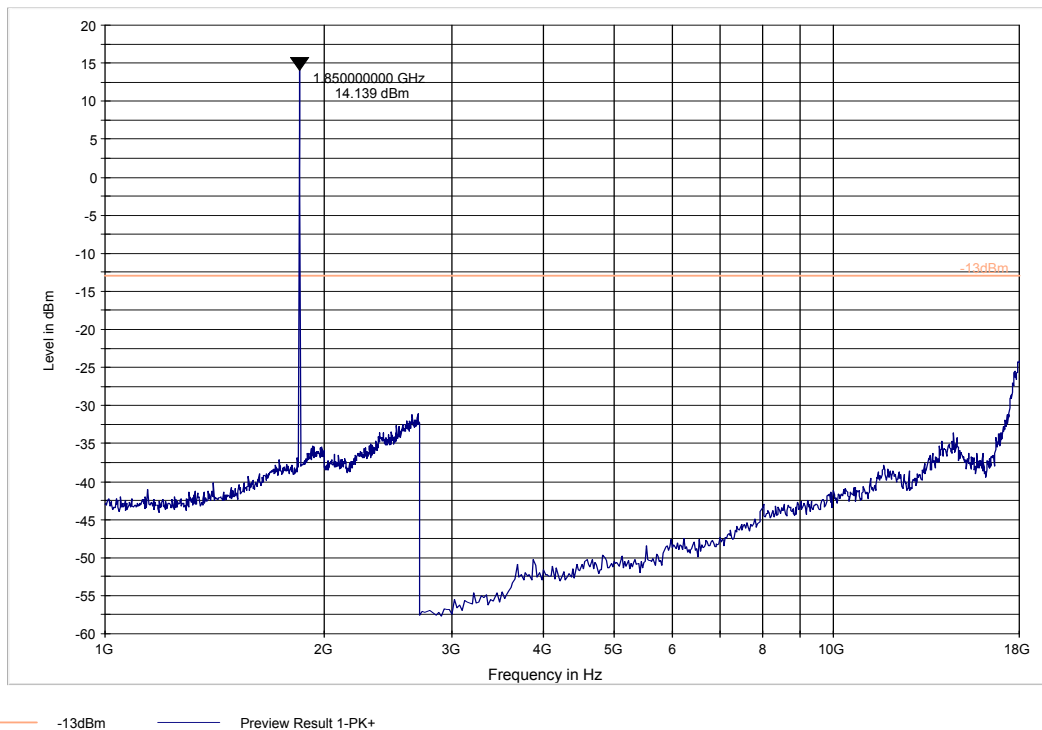
Test results 1GHz-9GHz



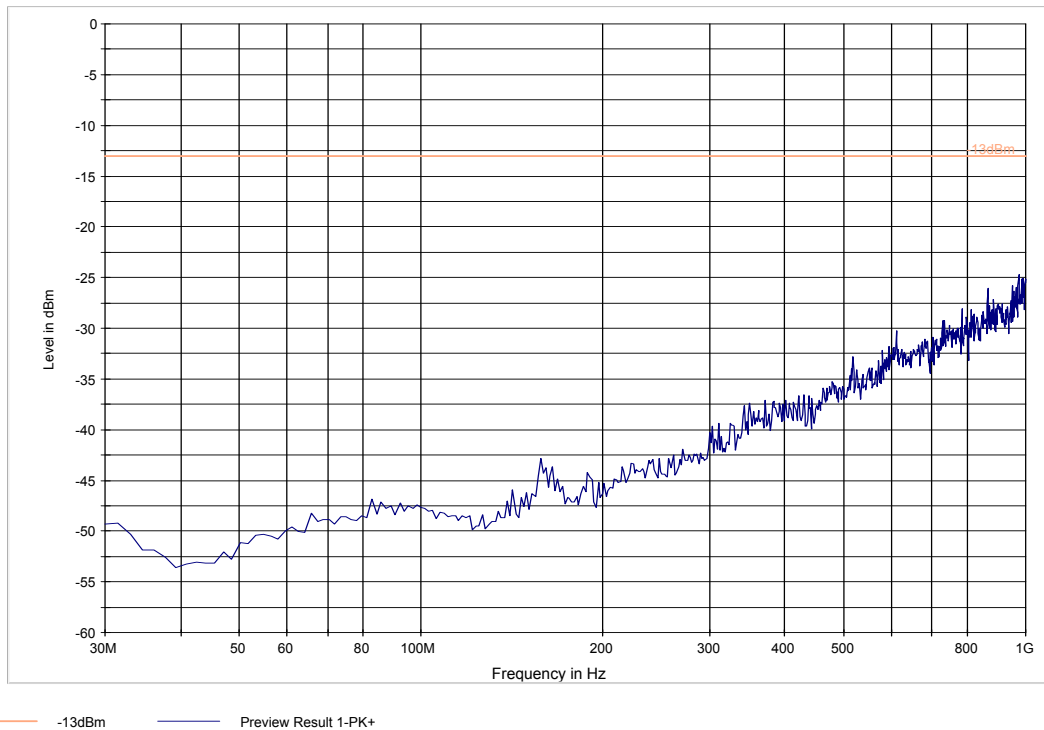
Radiated Spurious Emissions (GSM-1900) Tx: Low Channel
Test results 30M-1GHz



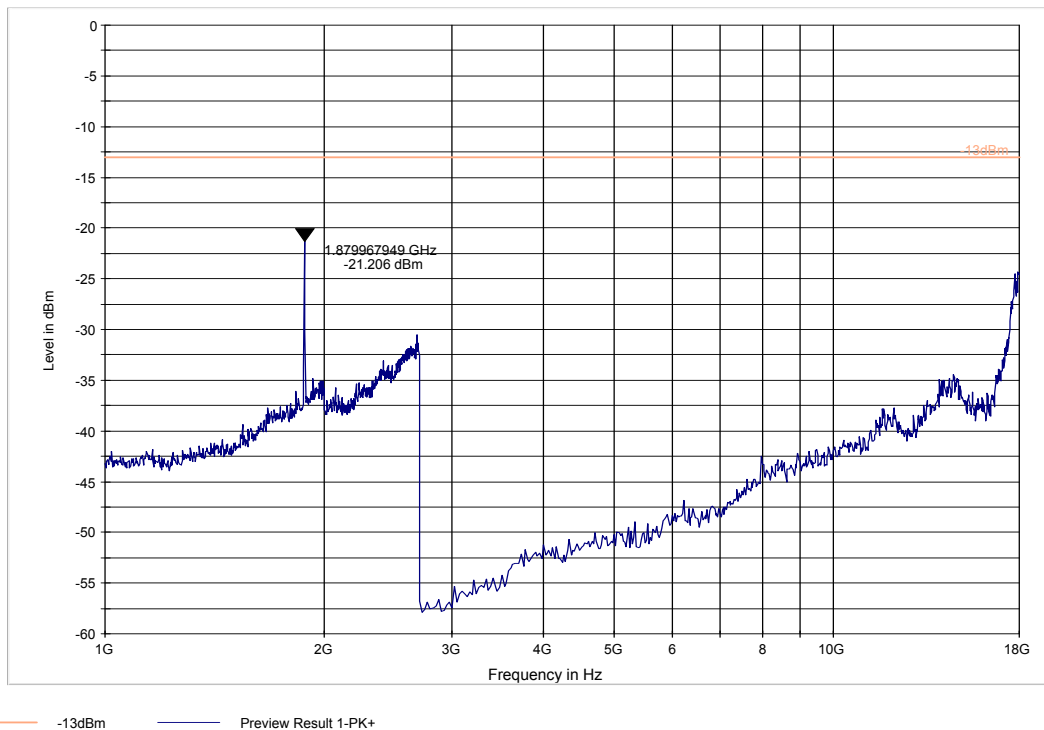
Test results 1GHz-18GHz



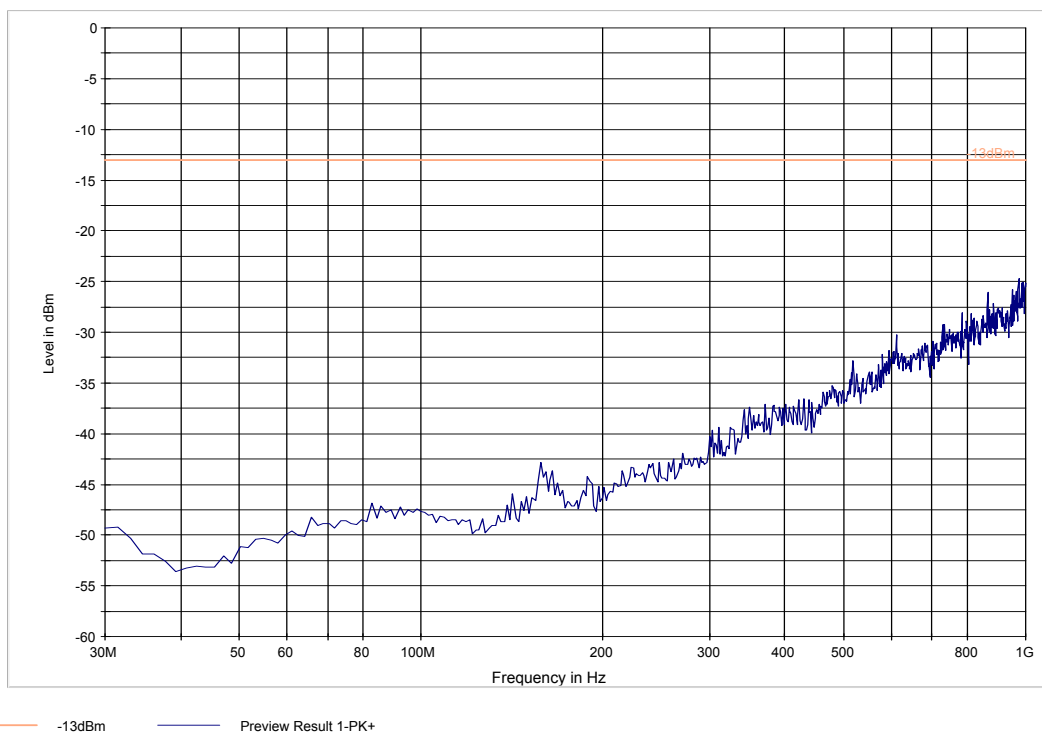
Radiated Spurious Emissions (GSM-1900) Tx: Mid Channel
Test results 30M-1GHz



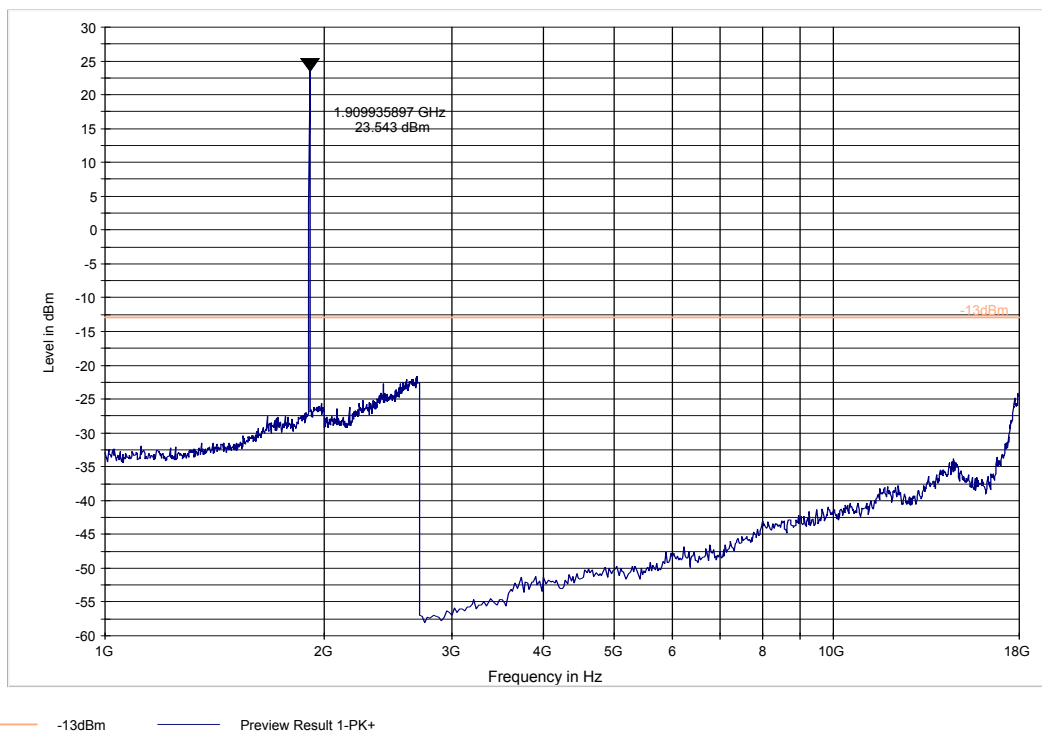
Test results 1GHz-18GHz



Radiated Spurious Emissions (GSM-1900) Tx: High Channel
Test results 30M-1GHz

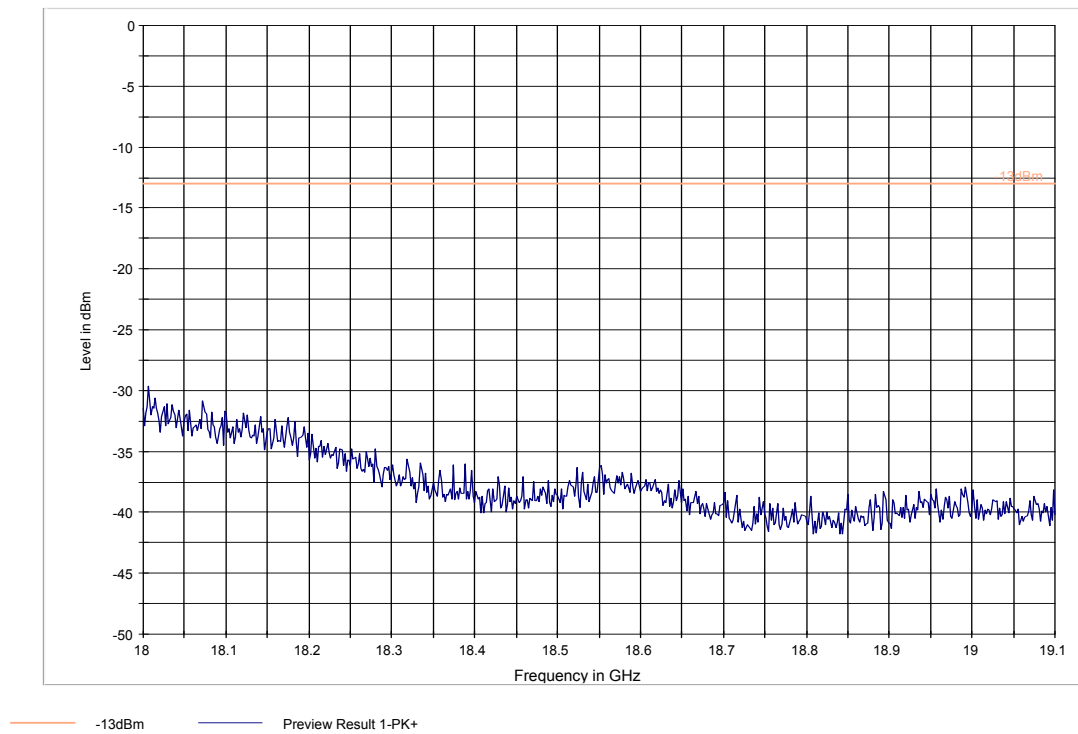


Test results 1GHz-18GHz

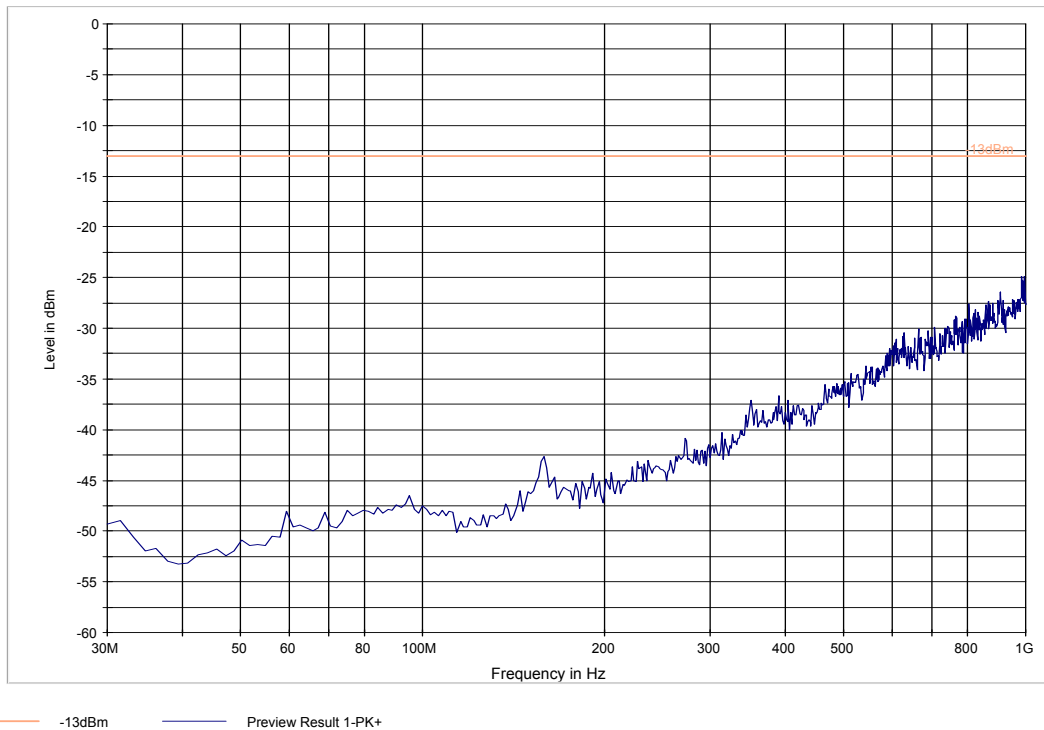


Test results 18GHz-19.1GHz

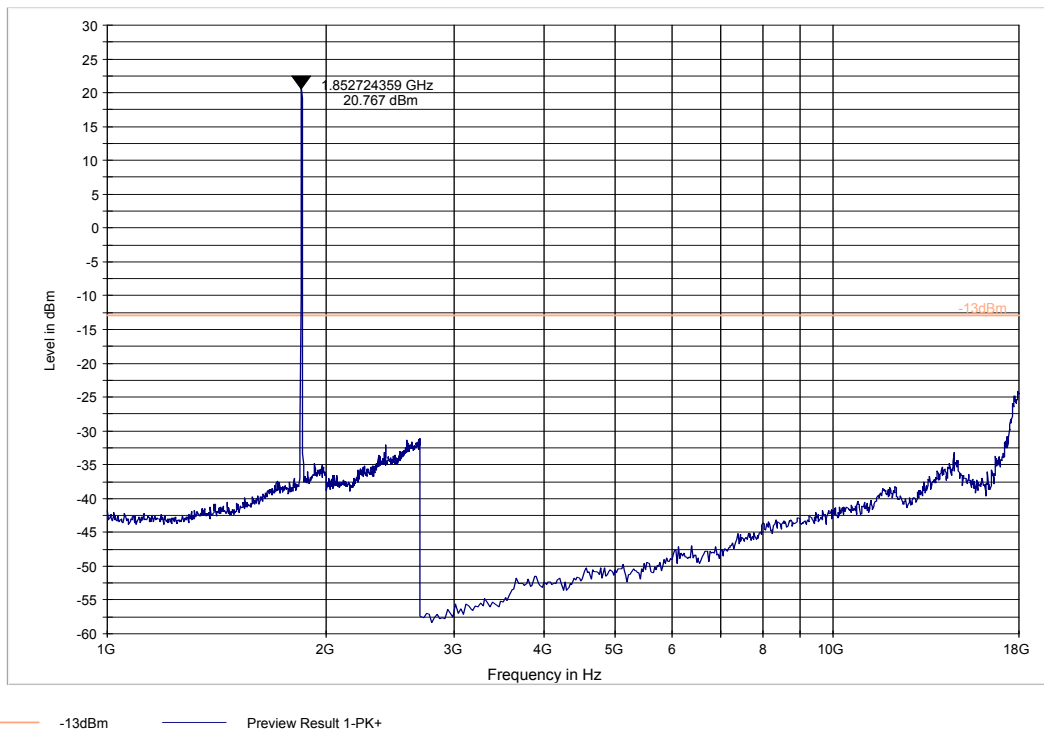
Note: Worst case representation of all channels



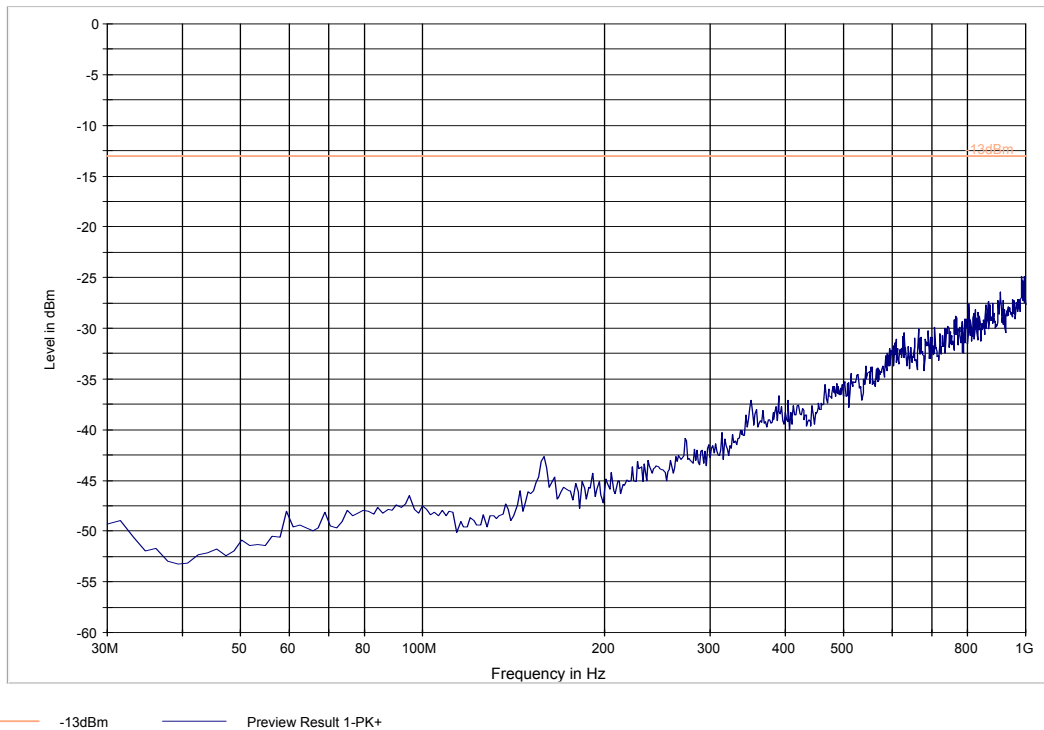
Radiated Spurious Emissions (UMTS Band 2) Tx: Low Channel
Test results 30M-1GHz



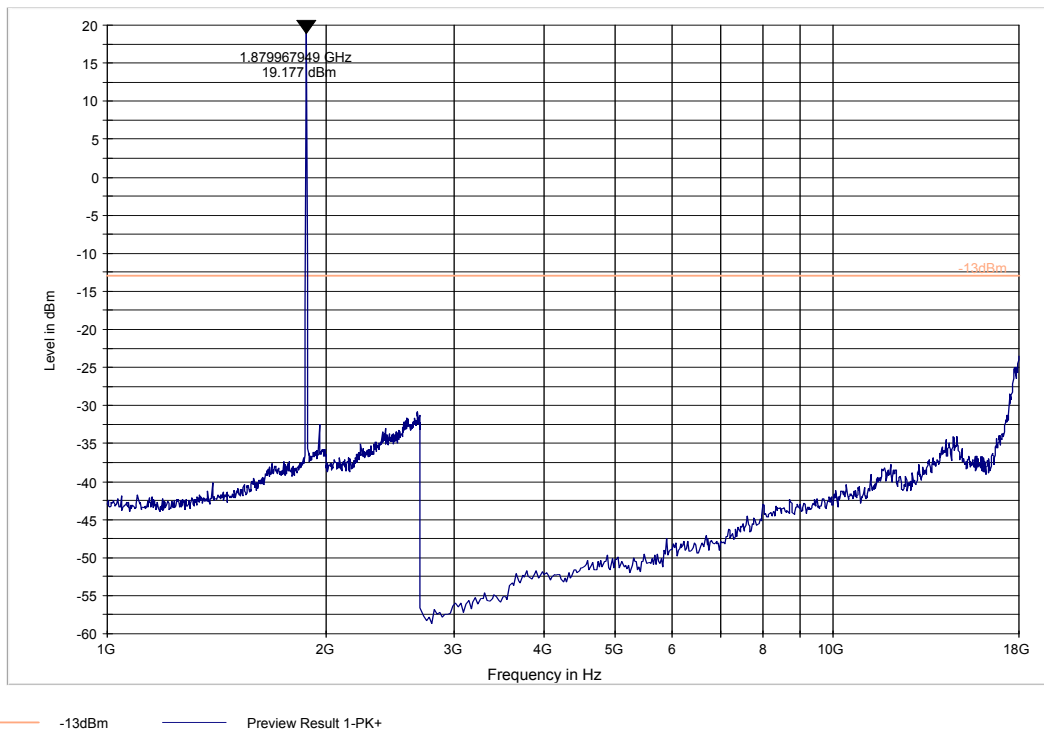
Test results 1GHz-18GHz



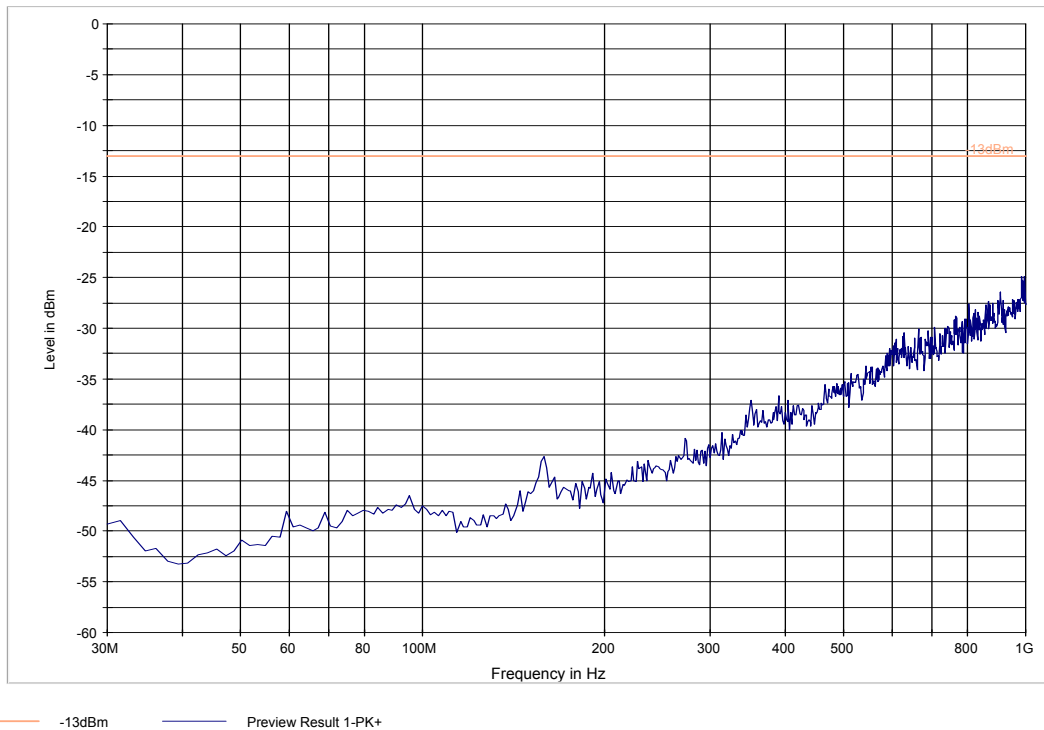
Radiated Spurious Emissions (UMTS Band 2) Tx: Mid Channel
Test results 30M-1GHz



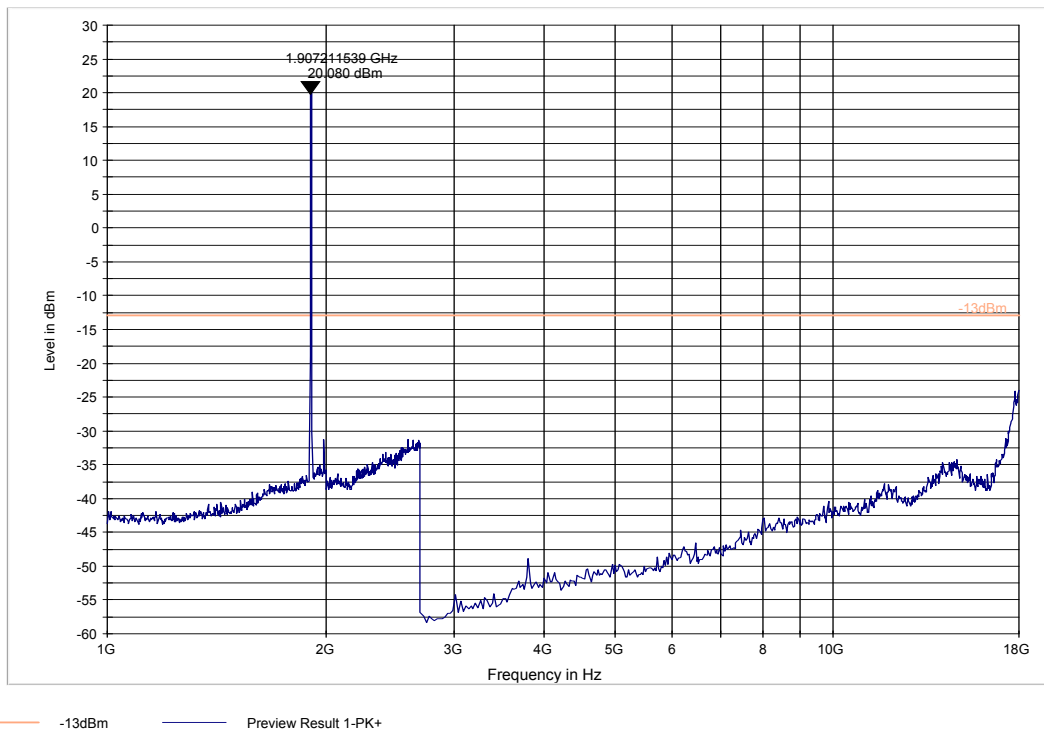
Test results 1GHz-18GHz



Radiated Spurious Emissions (UMTS Band 2) Tx: High Channel
Test results 30M-1GHz

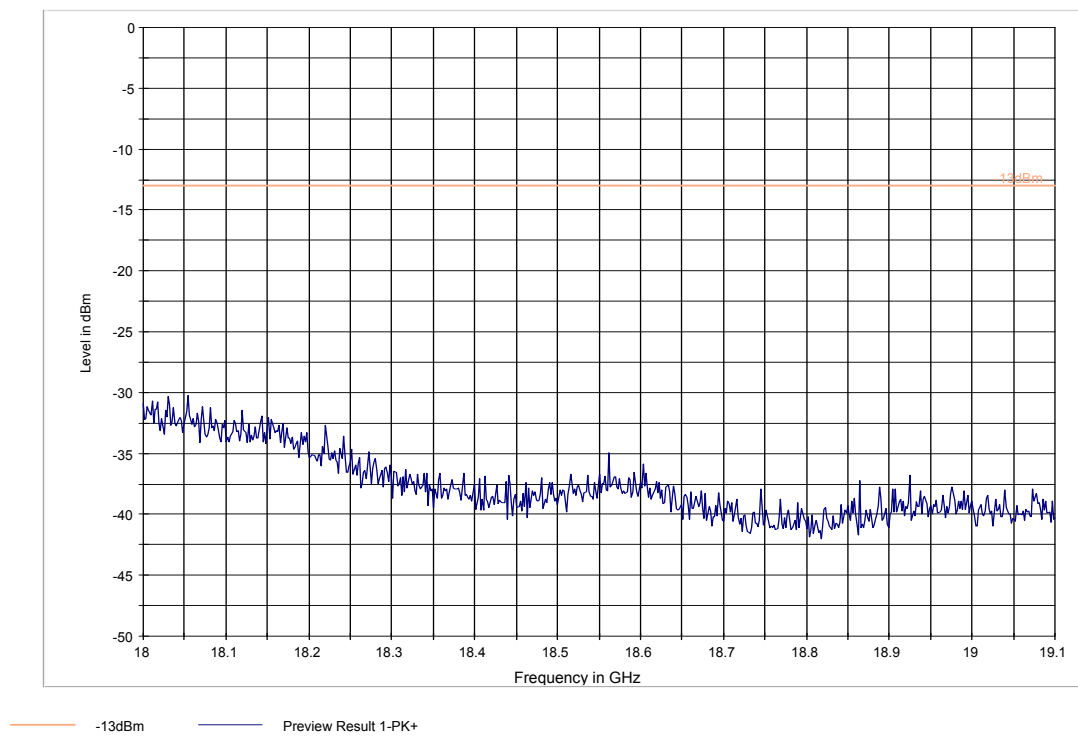


Test results 1GHz-18GHz

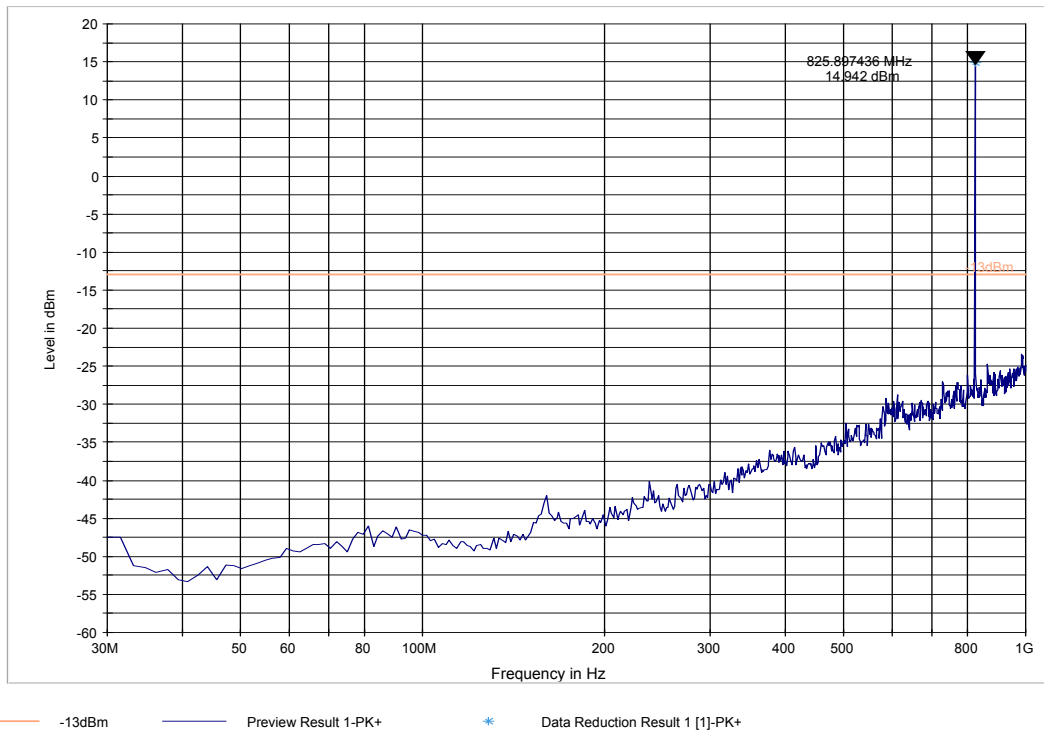


Test results 18GHz-19.1GHz

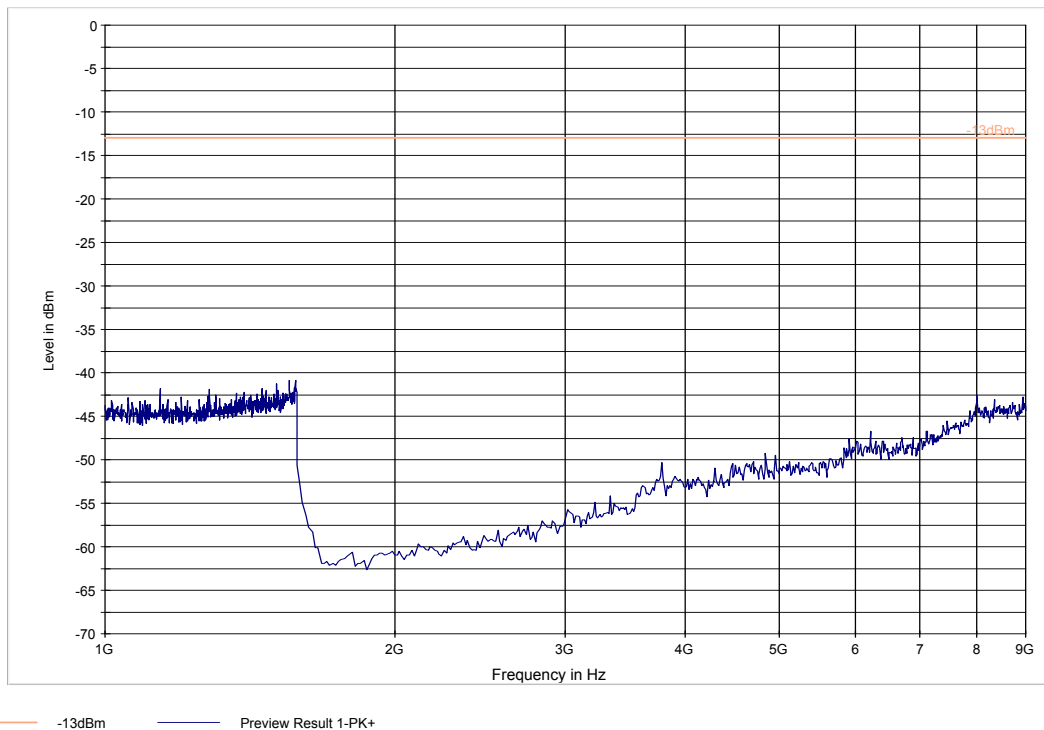
Note: Worst case representation of all channels



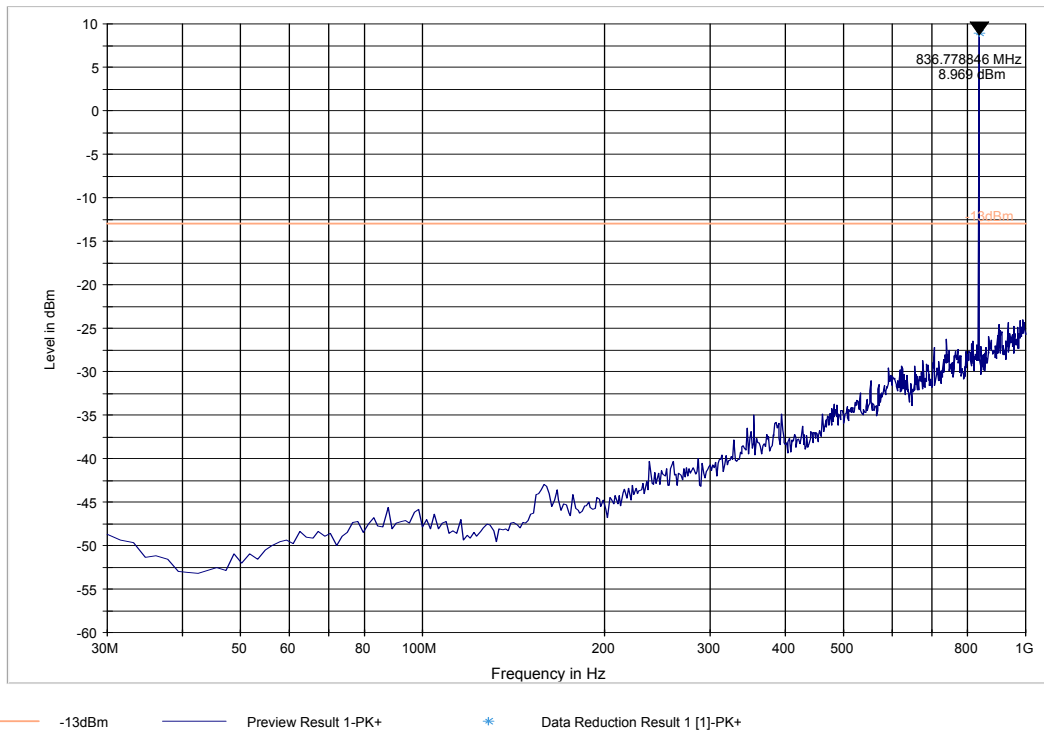
Radiated Spurious Emissions (CDMA-850) Tx: Low Channel
Test results 30MHz-1GHz



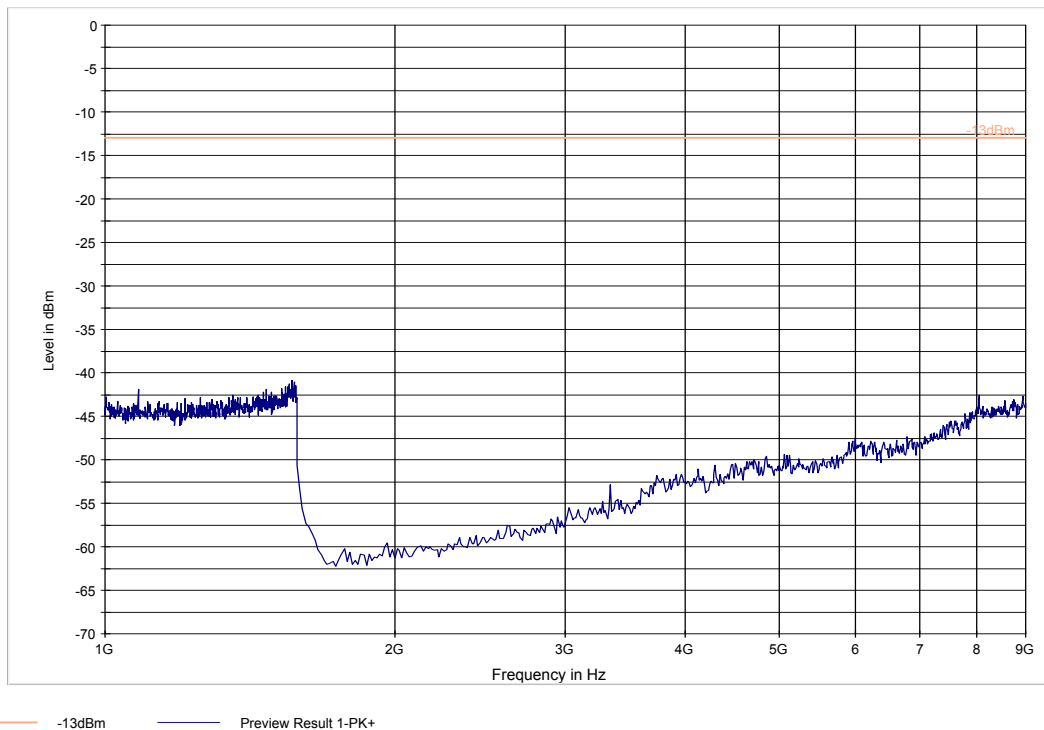
Test results 1GHz-9GHz



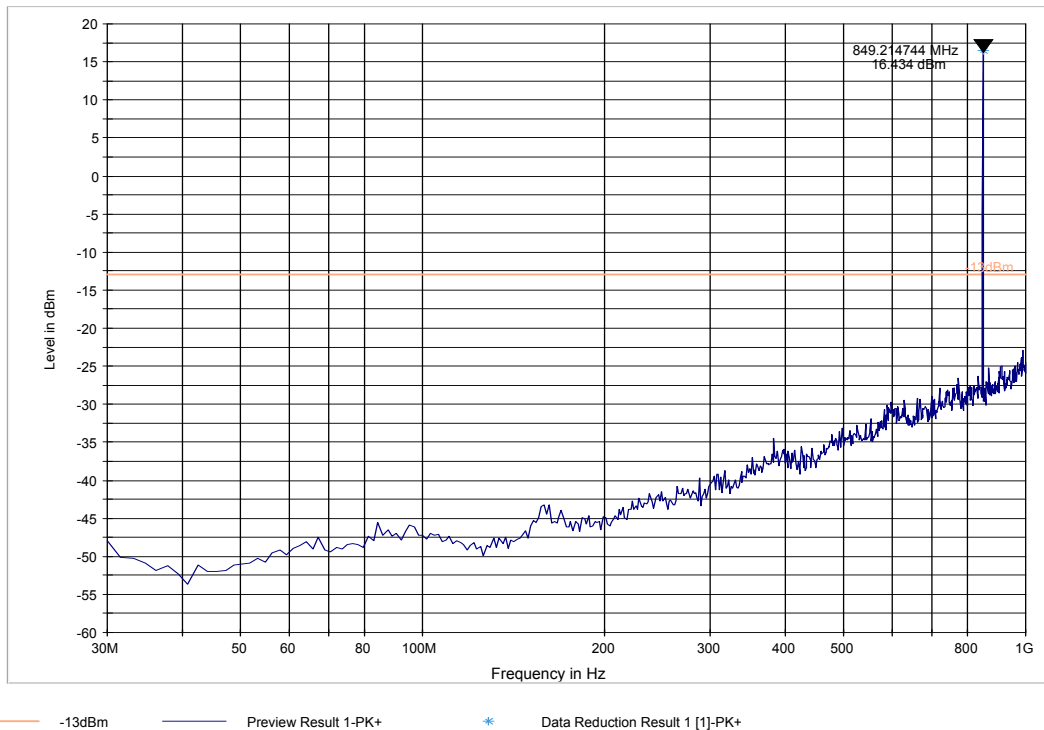
Radiated Spurious Emissions (CDMA-850) Tx: Mid Channel
Test results 30MHz-1GHz



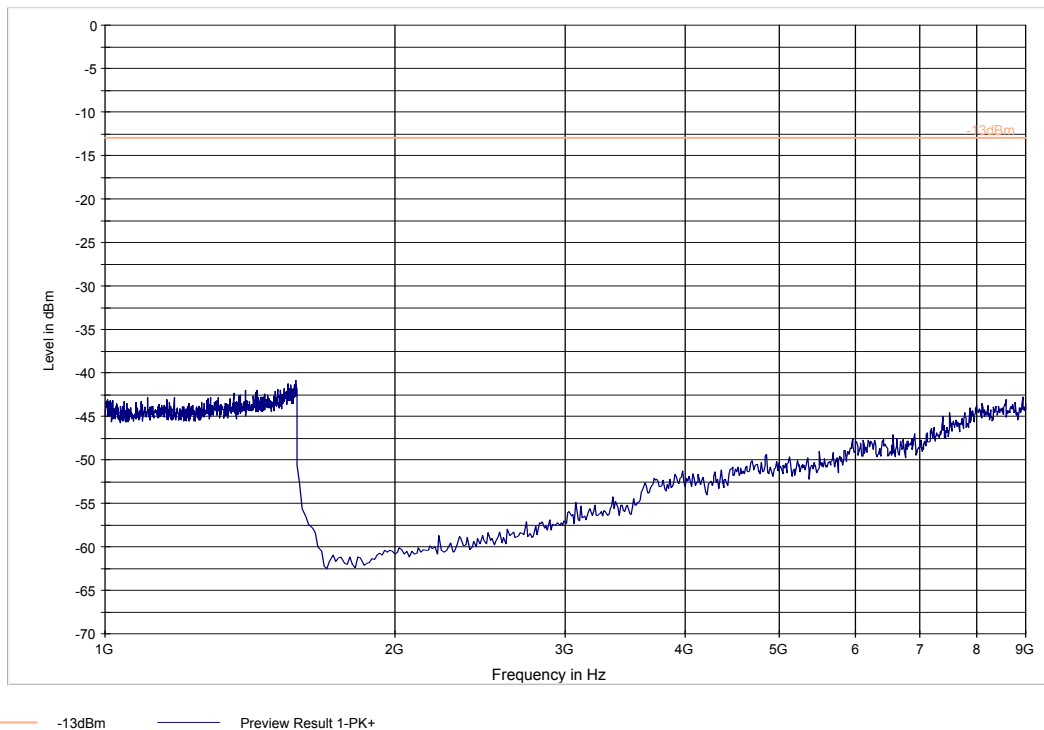
Test results 1GHz-9GHz



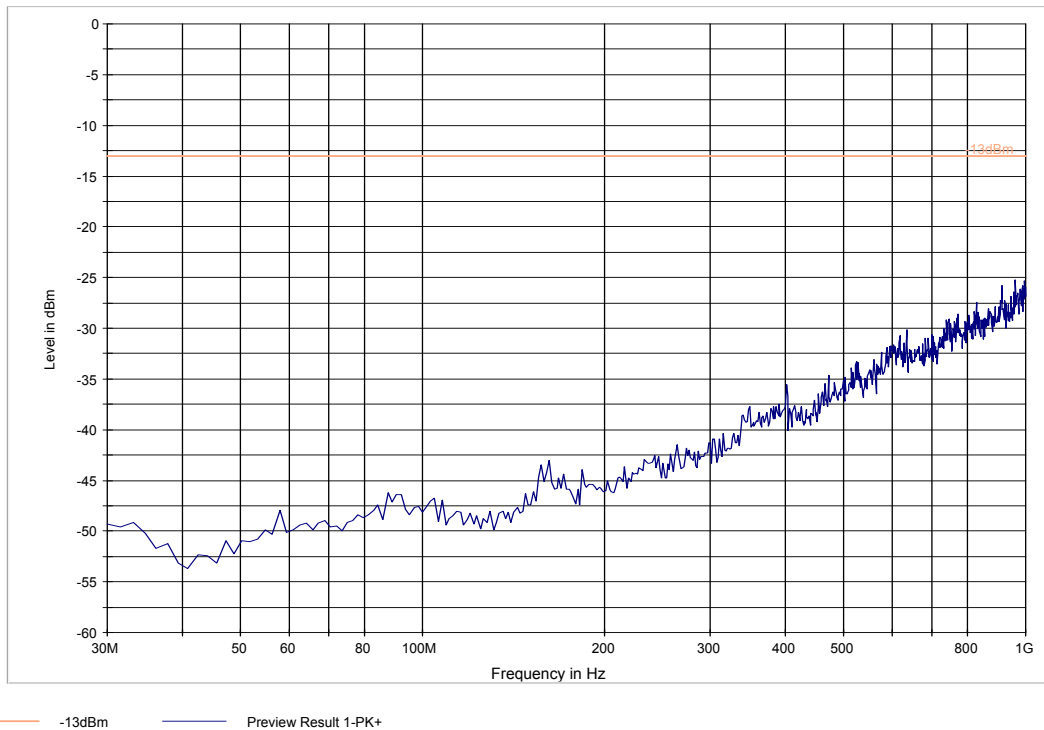
Radiated Spurious Emissions (CDMA-850) Tx: High Channel **Test results 30MHz-1GHz**



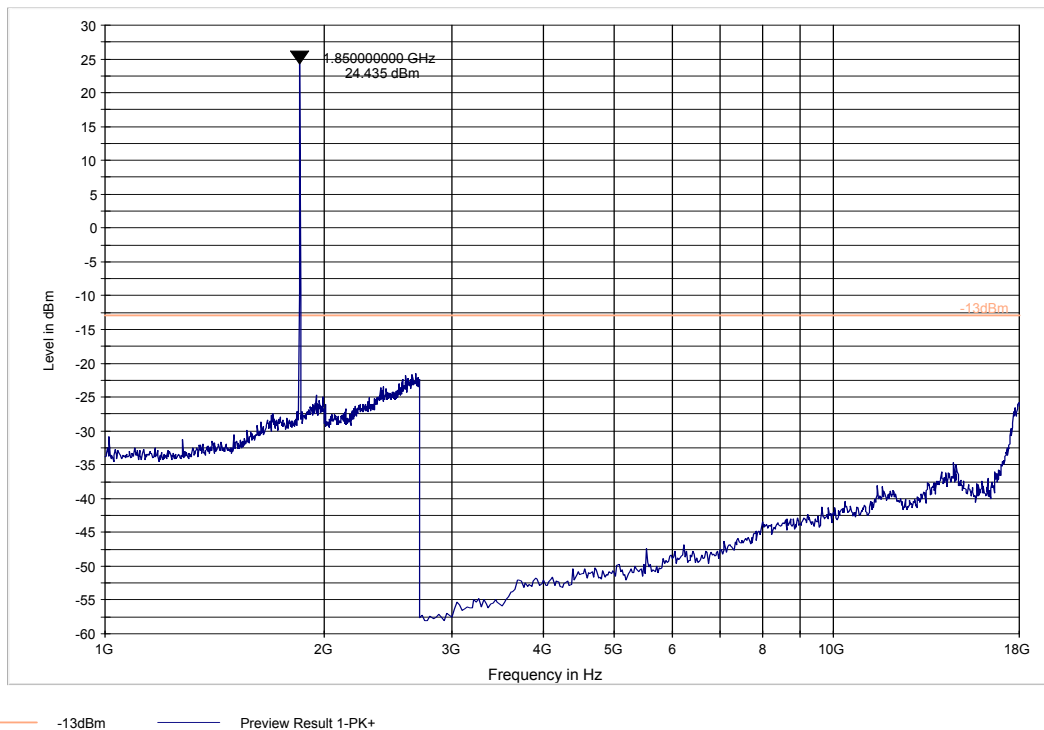
Test results 1GHz-9GHz



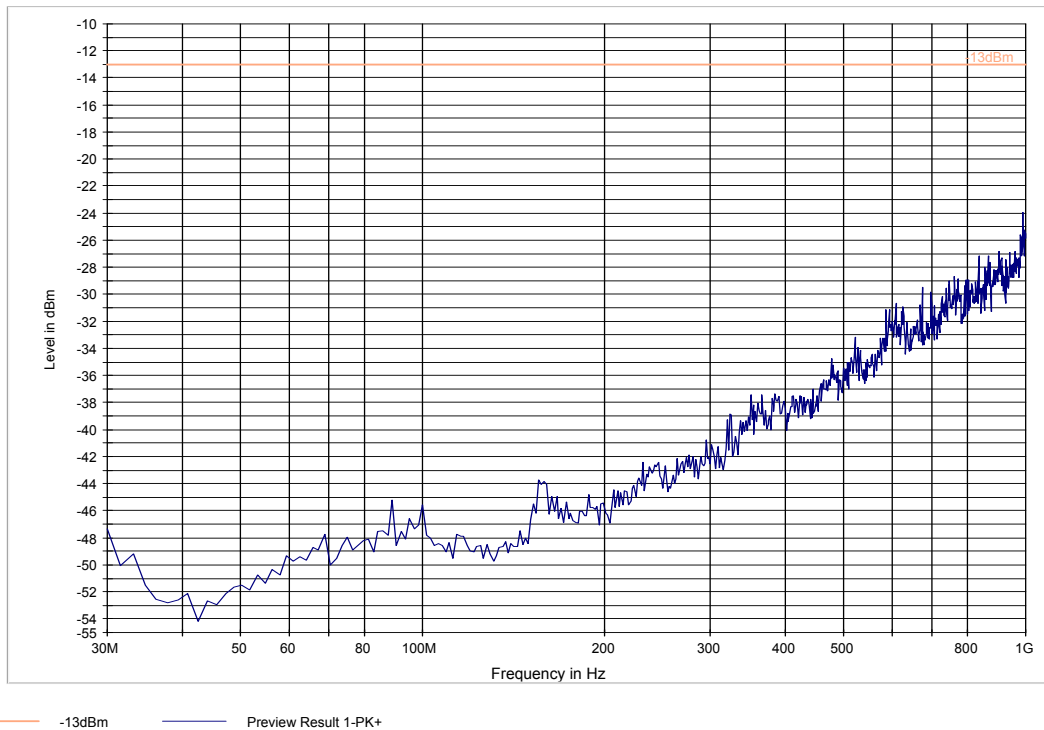
Radiated Spurious Emissions (CDMA-1900) Tx: Low Channel
Test results 30MHz-1GHz



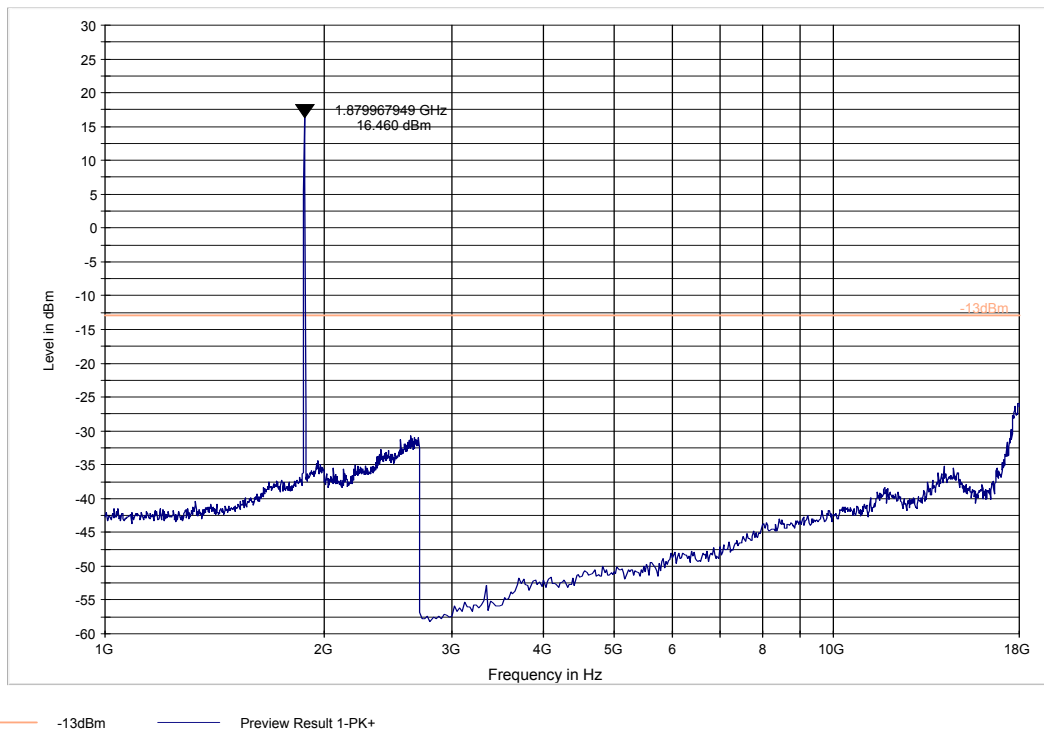
Test results 1GHz-18GHz



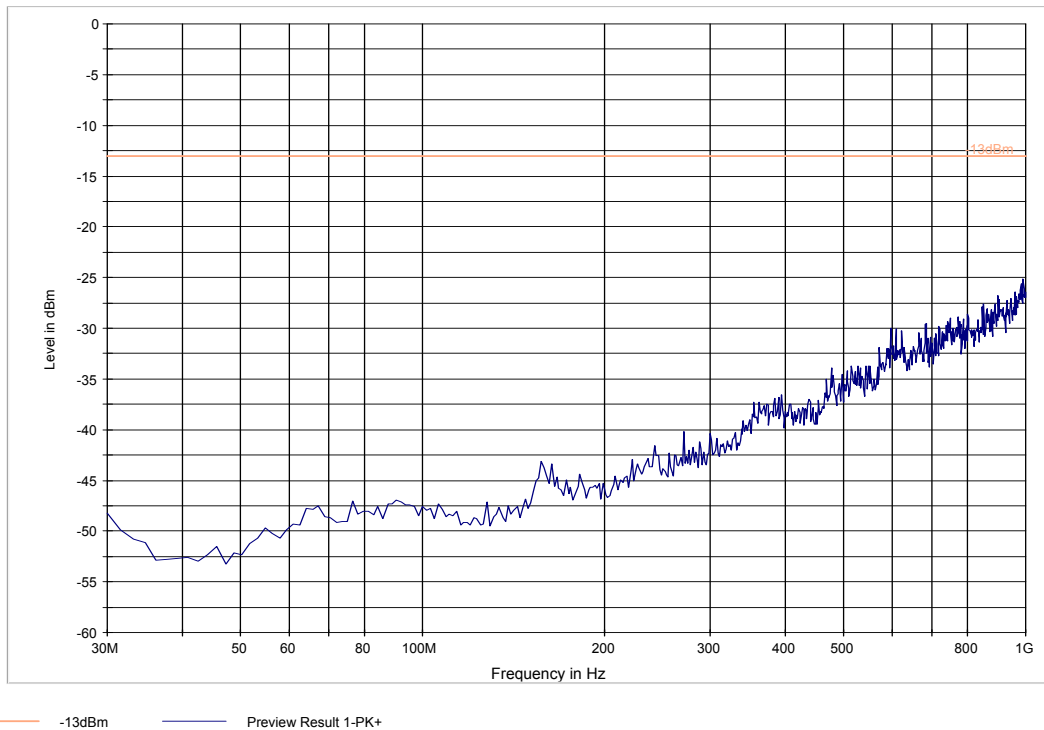
Radiated Spurious Emissions (CDMA-1900) Tx: Mid Channel
Test results 30MHz-1GHz



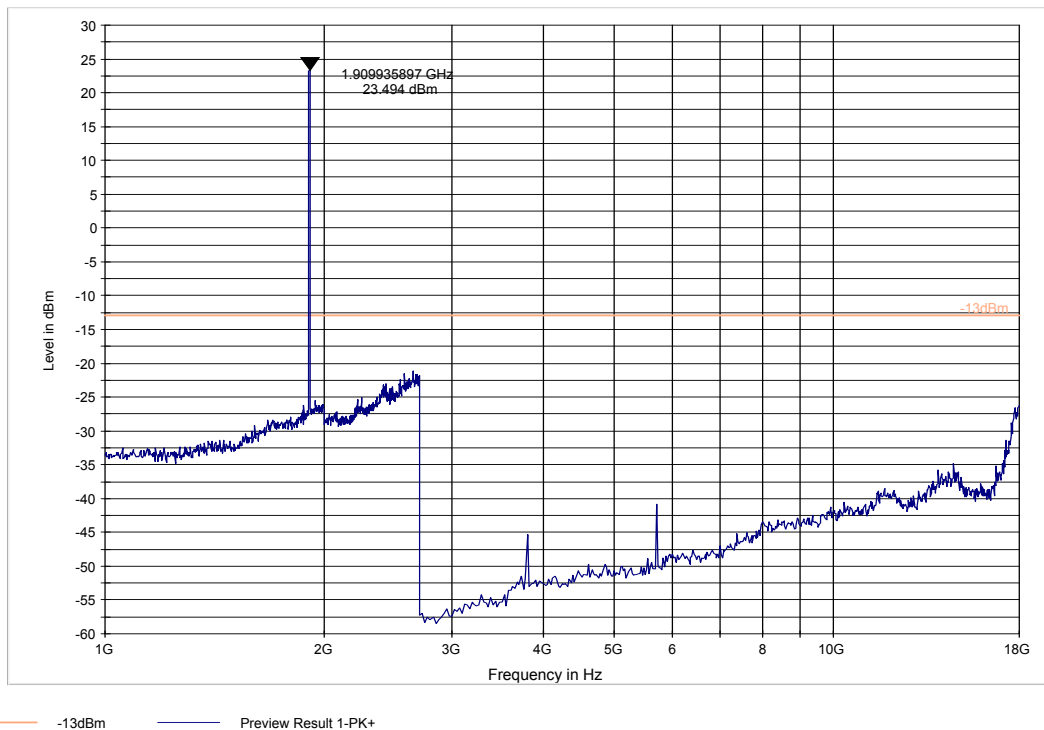
Test results 1GHz-18GHz



Radiated Spurious Emissions (CDMA-1900) Tx: High Channel
Test results 30MHz-1GHz

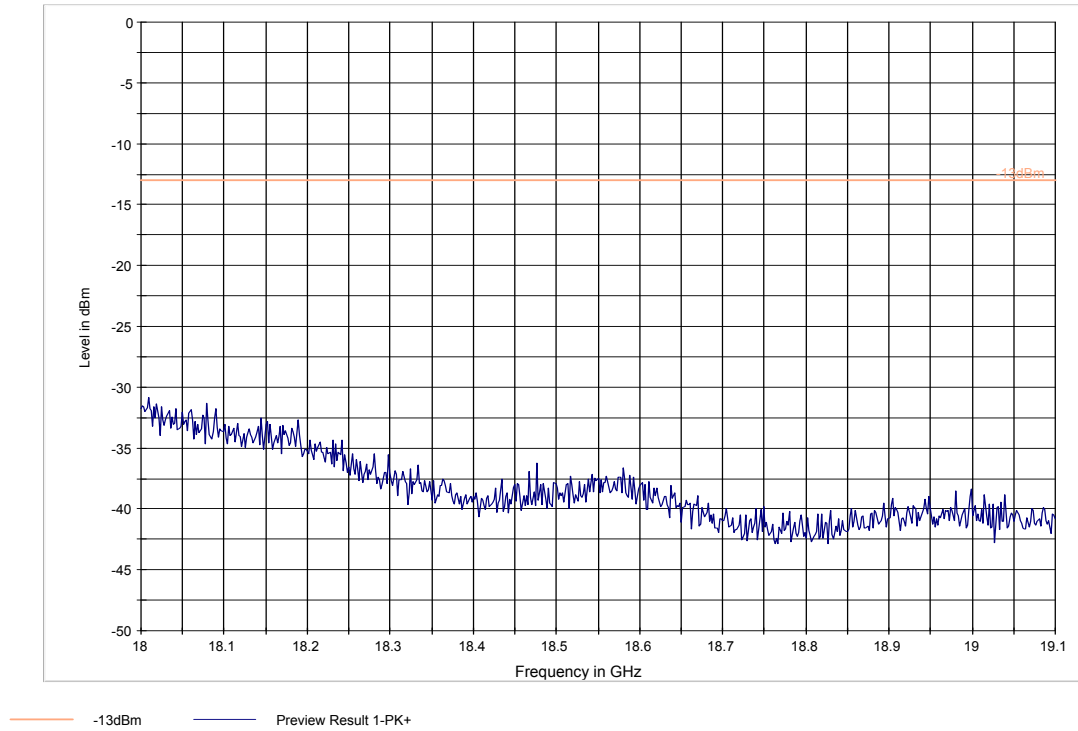


Test results 1GHz-18GHz



Test results 18GHz-19.1GHz

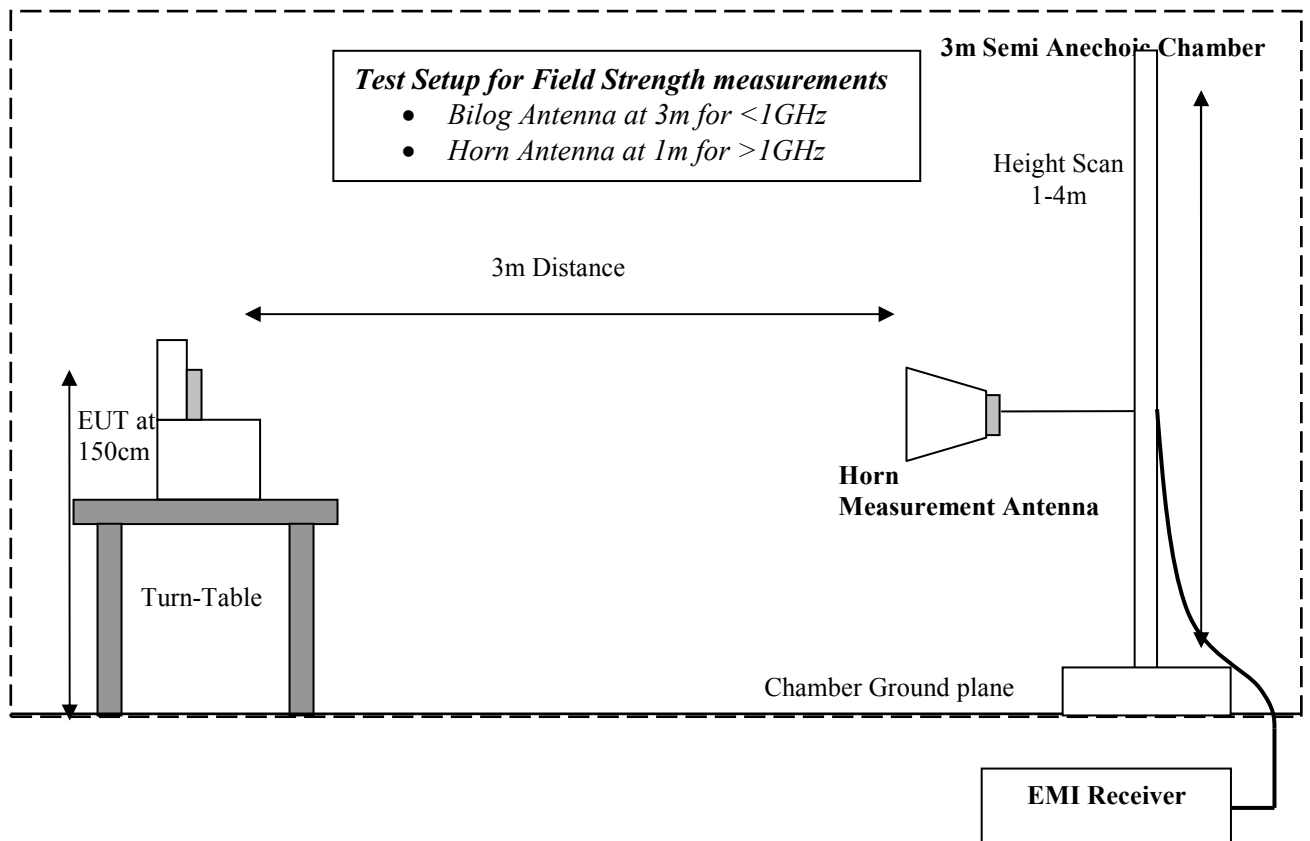
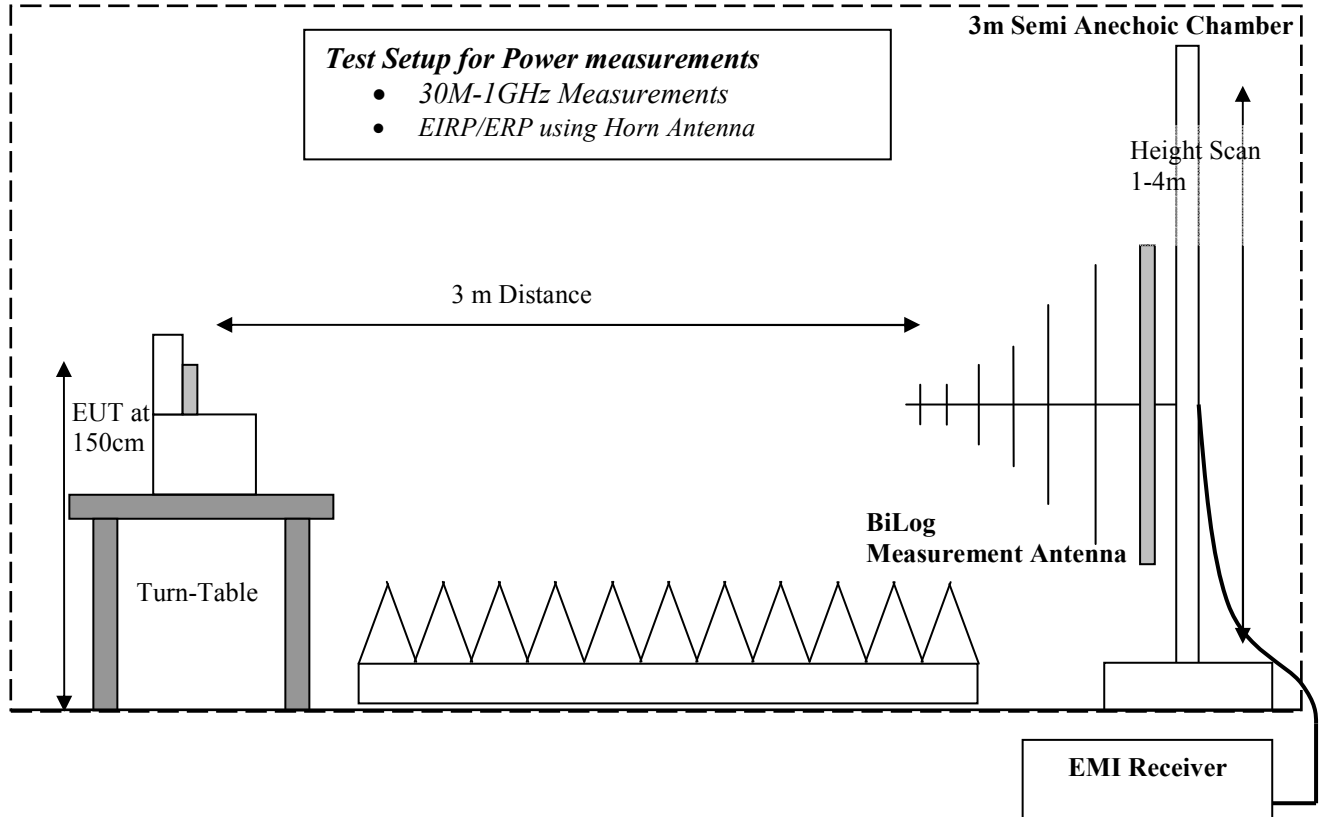
Note: Worst case representation of all channels



7 Test Equipment and Ancillaries used for tests

Instrument/Ancillary	Model	Manufacturer	Serial No.	Cal Date	Cal Interval
Radio Communication Tester	CMU 200	Rohde & Schwarz	101821	May 2011	2 Years
Radio Communication Tester	CMU 200	Rohde & Schwarz	109879	May 2011	2 Years
Radio Communication Tester	CMU 200	Rohde & Schwarz	110759	May 2011	2 Years
EMI Receiver/Analyzer	ESU 40	Rohde & Schwarz	100251	Aug 2012	2 Years
Spectrum Analyzer	FSU	Rohde & Schwarz	200302	May 2011	2 Years
Loop Antenna	6512	EMCO	00049838	Apr 2012	3 years
Biconilog Antenna	3141	EMCO	0005-1186	Mar 2012	3 years
Horn Antenna (1-18GHz)	3115	ETS	00035111	Mar 2012	3 years
Horn Antenna (1-18GHz)	3115	ETS	00035114	Apr 2012	3 years
Horn Antenna (18-40GHz)	3116	ETS	00070497	Aug 2011	3 years
Communication Antenna	IBP5-900/1940	Kathrein	n/a	n/a	n/a
High Pass Filter	5HC2700	Trilithic Inc.	9926013	Part of system calibration	
High Pass Filter	4HC1600	Trilithic Inc.	9922307	Part of system calibration	
6GHz High Pass Filter	HPM50106	Microtronics	001	Part of system calibration	
Pre-Amplifier	JS4-00102600	Miteq	00616	Part of system calibration	
LISN	50-25-2-08	FCC	08014	Jan 2012	1 year
Power Smart Sensor	R&S	NRP-Z81	100161	May 2011	2 Years
DC Power Supply	6655A	Hewlett Packard	3403A-00487	n/a	n/a
Multimeter	MM200	Klein	N/A	Apr 2011	2 Years
Temp Hum Logger	TM320	Dickson	03280063	Apr 2013	1 Year
Temp Hum Logger	TM325	Dickson	5285354	Apr 2013	1 Year

8 Test Setup Diagrams



9 **Revision History**

Date	Report Name	Changes to report	Report prepared by
2012-05-28	EMC_HONEY_093_12003_70eLG0_WWAN	First Version	Tunji Yusuf