FCC / IC Test Report

FOR:

Xirgo Technologies, Inc

Model Name: XT-4860G5

Product Description: GPS Asset Tracking Device

FCC ID: GKM-XT4800
IC ID: 10281A-XT4800

47 CFR Part 2, 22, 24, 27

RSS-GEN Issue 3, RSS-132 Issue 3, RSS-133 Issue 6, RSS-139 Issue 2

TEST REPORT #: EMC_XIRGO-079_14001_FCC22_24_27_WWAN_rev2

DATE: 08-26-2014

FCC:
A2LA Accredited

IC recognized #
3462B-1

***CETECOM* Inc.**
6370 Nancy Ridge Drive ◆ San Diego, CA 92121 ◆ U.S.A.
Phone: + 1 (858) 362 2400 ◆ Fax: + 1 (858) 587 4809 ◆ E-mail: info@cetecomusa.com ◆ http://www.cetecom.com
CETECOM Inc. is a Delaware Corporation with Corporation number: 2905571

Table of Contents

1 Assessment

The following device was evaluated against the applicable criteria specified in FCC rules parts 2, 22, 24 and 27 of Title 47 of the Code of Federal Regulations and Industry Canada Standards RSS-Gen, RSS-132, RSS-133 and RSS -139.
No deviations were ascertained.

Company	Description	Model #
Xirgo Technologies	GPS Asset Tracking Device	XT-4860G5

Responsible for Testing Laboratory:

Date	Section	Name	Signature
08-26-2014	Compliance	Milton Ponce de Leon (Test Lab Manager)	Milton Ponce de Leon Digitally signed by Milton Ponce de Leon DN: cn=Milton Ponce de Leon, c=US, o=Cetecom Inc., ou=OTA, email=milton.deleon@cetecom.com Date: 2014.09.03 10:40:01 -07'00'

Responsible for the Report:

Date	Section	Name	Signature
08-26-2014	Compliance	Muhammad Umair Anees (EMC Engineer)	Muhammad Umair Anees Digitally signed by Muhammad Umair Anees DN: cn=Muhammad Umair Anees, c=US, o=EMC, ou=Compliance, email=Muhammad.Anees@cetecom.com Date: 2014.09.03 10:32:27 -07'00'

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 San Diego, CA 92121 U.S.A.
Telephone:	+1 (858) 362 2400
Fax:	+1 (858) 687-4809
Compliance Manager:	Milton Ponce de Leon
Responsible Project Leader:	Muhammad Umair Annes

2.2 Identification of the Client

Applicant's Name:	Xirgo Technologies, Inc
Street Address:	188 Camino Ruiz
City/Zip Code	Camarillo, CA/ 93012
Country	USA
Contact Person:	Nader Barakat
Phone No.	805-233-0583
Fax:	
e-mail:	nbarakat@xirgotech.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:	XT-4860G5
Model Number:	XT-4860G5
FCC-ID :	GKM-XT4800
IC ID:	10281A-XT4800
Product Description:	GPS Asset Tracking Device
Technology / Type(s) of Modulation:	uBlox Radio Module: LISA-U200-01 (FW22.9) FCC ID: XPYLISAU200 IC ID: 8595-LISAU200N GPRS / EDGE multi-slot class 33 operation modulation: GSM&GPRS&EDGE(MCS-1-4): GMSK; EDGE&EPGRS(MCS-5-8): 8PSK; WCDMA / HSPA+ 850/900/1700/1900 HSDPA Category 14 data rate - 21 Mbps; HSUPA Category 6 data rate - 5.76 Mbps;
Operating Frequency Ranges (MHz) / Channels (for US/CAN bands only):	GSM 850: 824.2-848.8; 125 channels GSM 1900: 1850.2-1909.8; 300 channels FDD II: 826.4 - 846.6; 278 channels FDD IV: 1712.4 -1752.5; 203 channels FDD V: 1852.4 -1907.6; 103 channels
Antenna Information as declared:	Internal Monopole, 850MHz: -2 dBi 1900MHz: 0 dBi 1700 MHz: 0 dBi
Power Supply/ Rated Operating Voltage Range:	Vmin: 8V dc/ Vnom: 12V dc / Vmax: 24V dc
Rated Operating Temperature Range:	–30°C ~ +70°C
Test Sample Status:	Pre-production
Other Radios included in the device:	GPS 1575.42 MHz; ZigBee IEEE 802.15.4 (2.4GHz)

3.2 Identification of the Equipment under Test (EUT)

EUT #	Serial Number	Sample	HW/SW Version
1	001	Radiated	XT-4860G5-001

3.3 Identification of Accessory equipment

AE #	Type	Manufacturer	Model	Serial Number
1				

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

06/16/2014 – 07/01/2014

3.6 Other Testing Notes

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).

All testing has been applied to the EUT while externally supplied with 12VDC (declared nominal operating voltage).

The EUT is tested on the low, mid and high channel of each of the supported cellular operation modes.

Taking into account guidance from FCC KDB 996369 (modular approval) and where relevant test procedures did not change conducted test results are leveraged based the related test reports
#6-0082-11-1-2a, 11-23-2011, CETECOM GmbH, Germany
#6-0082-11-1-2b, 11-27-2011, CETECOM GmbH, Germany
#EMC_CETEC_046-12001_WWAN_REV2, 10-24-2012, CETECOM Inc, USA
#6-0330-13-3-6a, 10-19-2013, CETECOM GmbH, Germany
of the certification of the integrated 3G module as listed in section 3.1 of this report.

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

47 CFR Part 27: Title 47 of the Code of Federal Regulations: Chapter I-Federal Communications Commission subchapter B- common carrier services; Part 27-Miscellaneous wireless 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

RSS-139- Issue 2: Spectrum management and telecommunication policy- Radio Standards Specifications- Advance wireless services equipment operating in the bands 1710-1755MHz and 2110-2155MHz

This test report is to support a request for new equipment authorization as single modular approval under the FCC ID: **GKM-XT4800** and IC ID **10281A-XT4800.**

5 Summary of Measurement Results

GSM and UMTS 850 MHz Band:

Specifications	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §22.913 (b) RSS-GEN, 4.8 RSS-132, 5.4	RF Output Power	Nominal	GSM 850	■	☐	☐	☐	Complies
			UMTS Band V	■	☐	☐	☐	Complies
RSS-1RSS-132(5.4)	Peak-to-average Ratio	Nominal	GSM 1900	☐	☐	☐	■	Note 1
§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
§2.1053 §22.917 RSS-GEN, 4.9 RSS-132, 5.5	Unwanted Emissions	Nominal	GSM 850	■	☐	☐	☐	Complies
			UMTS Band V	■	☐	☐	☐	Complies

Note: NA= Not Applicable; NP= Not Performed.
Note 1: Testing leveraged from test report of incorporated radio module.

GSM and UMTS 1900 MHz Band:

Specifications	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §24.232 (c)(d) RSS-GEN, 4.8 RSS-133, 6.4	RF Output Power	Nominal	GSM 1900	■	☐	☐	☐	Complies
			UMTS Band II	■	☐	☐	☐	Complies
§24.232 (d) RSS-1RSS-133(6.4)	Peak-to-average Ratio	Nominal	GSM 1900	☐	☐	☐	■	Note 1
			UMTS Band II	☐	☐	☐	■	Note 1
§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	■	☐	☐	☐	Complies
§2.1053 §24.238 RSS-GEN, 4.9 RSS-133, 6.5	Unwanted Emissions	Nominal	GSM 1900	■	☐	☐	☐	Complies
			UMTS Band II	■	☐	☐	☐	Complies

Note: NA= Not Applicable; NP= Not Performed.
Note 1: Testing leveraged from test report of incorporated radio module.

UMTS 1700 MHz Band:

Specifications	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §27.50(d)(4) RSS-GEN, 4.8 RSS-1RSS-139(6.4)	RF Output Power	Nominal	UMTS Band IV	■	☐	☐	☐	Complies
§27.50(d)(5) RSS-GEN, 4.8 RSS-1RSS-139(6.4)	Peak-to-average Ratio	Nominal	UMTS Band IV	☐	☐	☐	■	Note 1
§2.1055 §27.54 RSS-GEN, 4.7 RSS-139(6.3)	Frequency Stability	Extreme	UMTS Band IV	☐	☐	☐	■	Note 1
§2.1049 §27.53(h)RSS-Gen, 4.6	Occupied Bandwidth	Nominal	UMTS Band IV	☐	☐	☐	■	Note 1
§2.1051 §27.53(h) RSS-GEN, 4.9 RSS-139 6.5	Band Edge Compliance	Nominal	UMTS Band IV	☐	☐	☐	■	Note 1
§2.1053 §27.53(h) RSS-GEN, 4.9 RSS-139 6.5	Unwanted Emissions	Nominal	UMTS Band IV	■	☐	☐	☐	Complies

Note: NA= Not Applicable; NP= Not Performed.
Note 1: Testing leveraged from test report of incorporated radio module.

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 and Effective Radiated Power / Effective Isotropic Radiated Power

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.

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.

6.1.2 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

6.1.3 Limits:

ERP/EIRP (850 MHz Band)

FCC Part 22.913 (a) & RSS-132 Section 5.4

FCC: Peak ERP < 38.45 dBm (7W)
The effective radiated power (ERP) of mobile transmitters must not exceed 7 Watts.

IC: Average EIRP < 40.60 dBm (11.5W)
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.

EIRP (1900 MHz Band)

FCC Part 24.232 (c) (e) & RSS-133 Section 6.4/SRSP-510 Section 5.1.2

FCC: Peak EIRP < 33 dBm (2W)
(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.

IC: Average EIRP < 33 dBm (2W)
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 2 watts.

EIRP (1700 MHz Band)

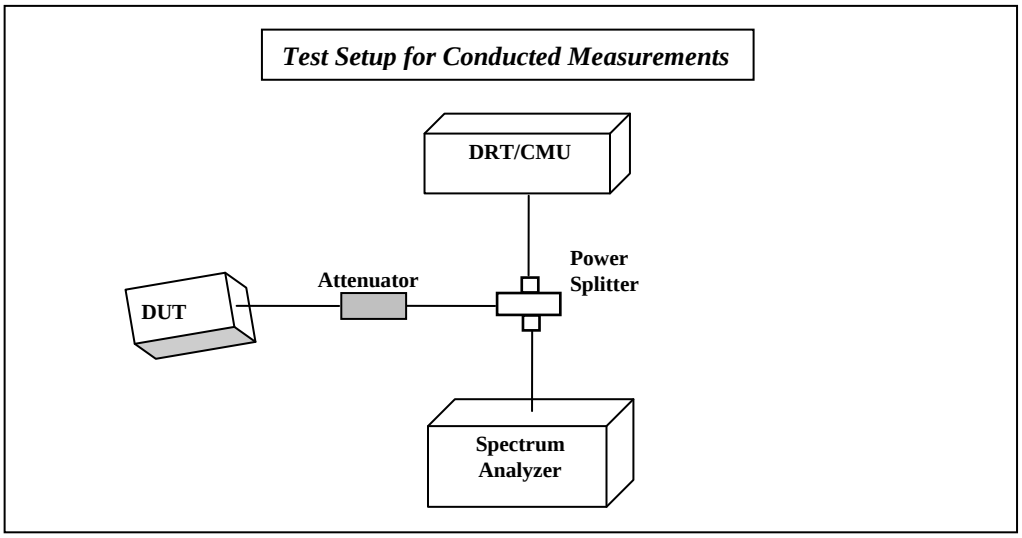
FCC Part 27.50 (d) (4) (6) & RSS-139 Section 6.4

FCC: Peak EIRP < 30 dBm (1W)
Fixed, mobile and portable (handheld stations) operating in the 1710-1755 MHz band are limited to 1 watt EIRP
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

IC: Average EIRP < 30 dBm (1W)
The average equivalent isotropically radiated power (e.i.r.p.) for fixed, mobile and portable transmitters in the 1710-1755 MHz shall not exceed 1 watt.

6.1.4 Measurement Procedure:

Measurement according to KDB 971168 D01v02r01 (Measurement guidance for certification of Licensed Digital Transmitters)
Section 5.1.2 for peak power
Section 5.2.3 for average power



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.

Adjust the settings of the CMU200 to set the EUT to its maximum power at the required channel.

Record the Peak and Average Output power level measured by the CMU200.

Correct the measured level for all losses in the RF path.

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.

GMSK mode measurements are performed in GSM 1 uplink slot configuration.

UMTS mode measurements are performed in RMC 12.2K configuration

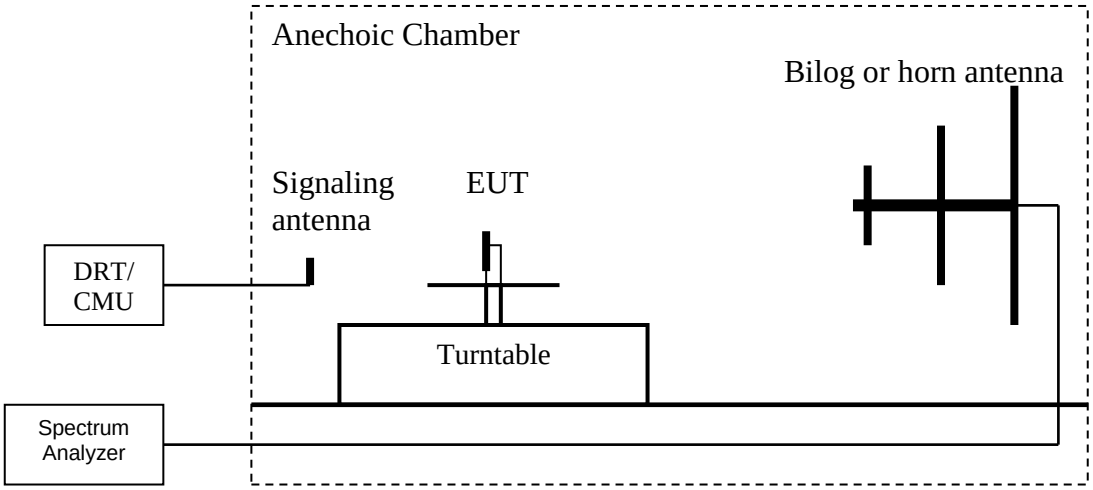
Measurement Uncertainty

+/- 0.5 dB

Test Conditions:

Tnom: 22°C; Vnom: 12 V

6.1.5 Measurement Procedure for Radiated Output Power



Connect the equipment as shown in the above diagram with the EUT's antenna in center of the turn table.
Adjust the settings of the Digital Radio Communication Tester (DRT) to set the EUT to its maximum power at the required channel.
Set the spectrum analyzer to the channel frequency. Set the analyzer to measure peak hold with the required settings.
Rotate the EUT 360°. Record the peak level in dBm (**LVL**).
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.
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).
Determine the ERP using the following equation:
ERP (dBm) = **LVL** (dBm) + **LOSS** (dB)
Determine the EIRP using the following equation:
EIRP (dBm) = **ERP** (dBm) + 2.14 (dB)
Measurements are performed with the EUT set to the low, middle and high channel of each frequency band and for all types of modulation schemes.
GMSK mode measurements are performed in GSM 1 uplink slot configuration.
UMTS mode measurements are performed in RMC 12.2K configuration

6.1.6 Test Results:

GSM 850MHz Band, GMSK modulation, 1 timeslot:

Frequency (MHz)	EIRP measured	ERP calculated	Limit FCC/IC
	RMS (dBm)	RMS (dBm)	Average in Burst (dBm)
824.70	31.6	29.5	38.45/40.6
836.52	33.2	31.1	38.45/40.6
848.31	34.5	**31.4**	38.45/40.6

UMTS 850MHz Band, QPSK mode:

Frequency (MHz)	EIRP measured	ERP calculated	Limit FCC/IC
	RMS (dBm)	RMS (dBm)	Average (dBm)
824.70	25.4	23.3	38.45/40.6
836.52	26.9	**24.8**	38.45/40.6
848.31	26.1	22.77	38.45/40.6

GSM 1900MHz Band, GMSK modulation, 1 timeslot:

Frequency (MHz)	EIRP measured	Limit FCC/IC
	RMS (dBm)	Average in Burst (dBm)
1851.25	31.4	33
1880	**31.6**	33
1908.75	30.2	33

UMTS 1900MHz Band, QPSK mode:

Frequency (MHz)	EIRP measured	Limit FCC/IC
	RMS (dBm)	Average (dBm)
1851.25	**25.1**	33
1880	25.1	33
1908.75	22.4	33

UMTS 1700MHz Band, QPSK mode:

Frequency (MHz)	EIRP measured	Limit FCC/IC
	Peak (dBm)	Average (dBm)
1712.4	24.2	33
1732.6	24.2	33
1752.6	**24.9**	33

6.1.7 Test Conditions:

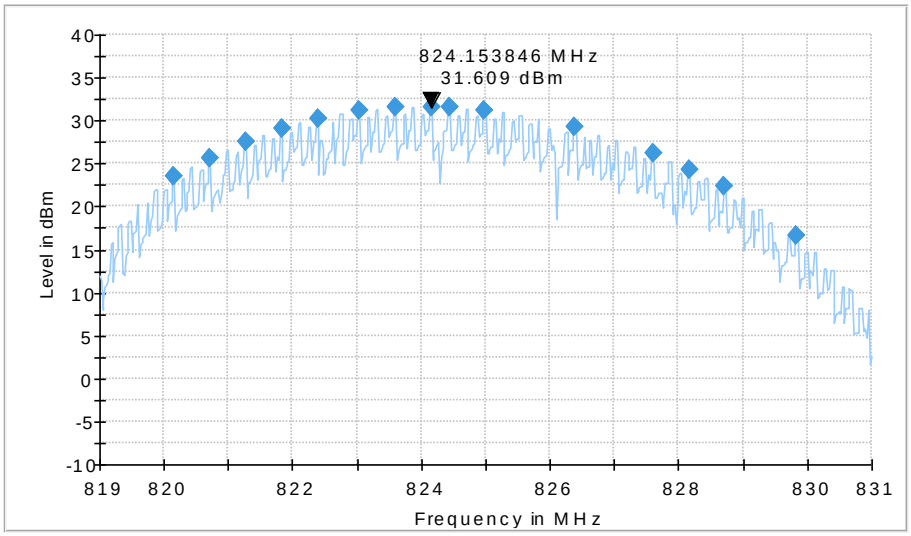
Tnom: 21°C; Vnom: 12V

6.1.8 Verdict

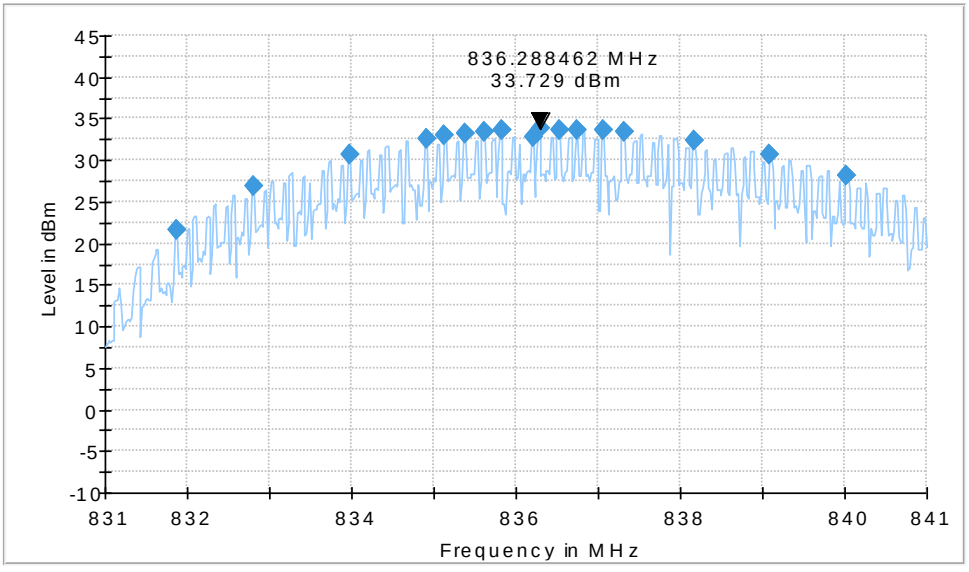
The EUT is passing EIRP/ERP limits for FCC and IC specifications.

6.1.9 Plots

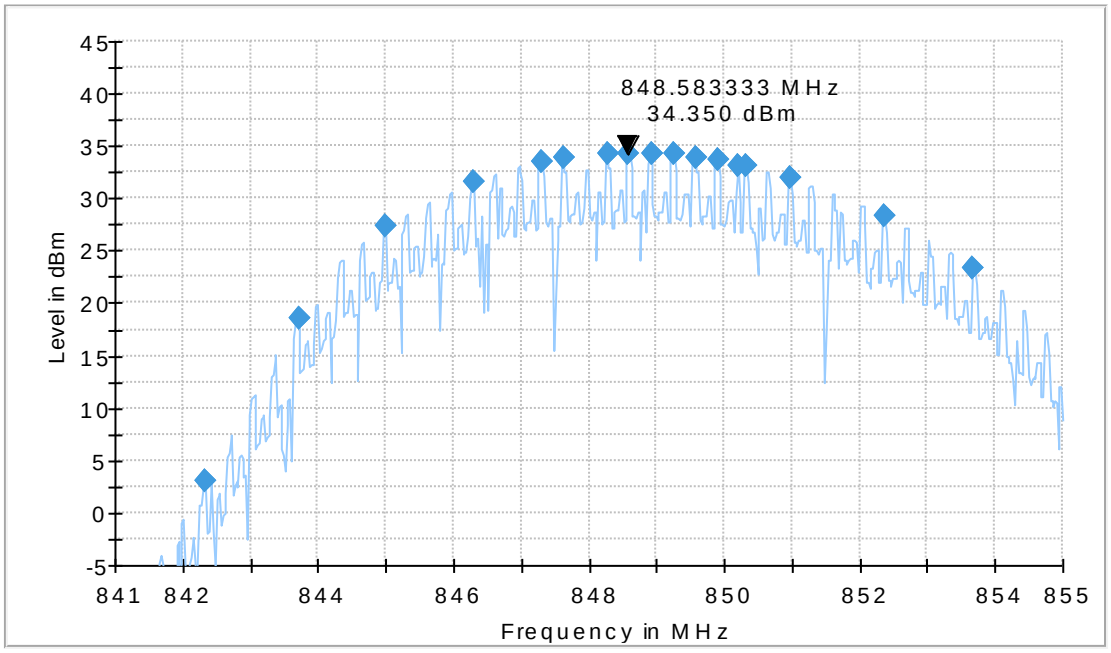
EIRP (GSM 850) Low Channel



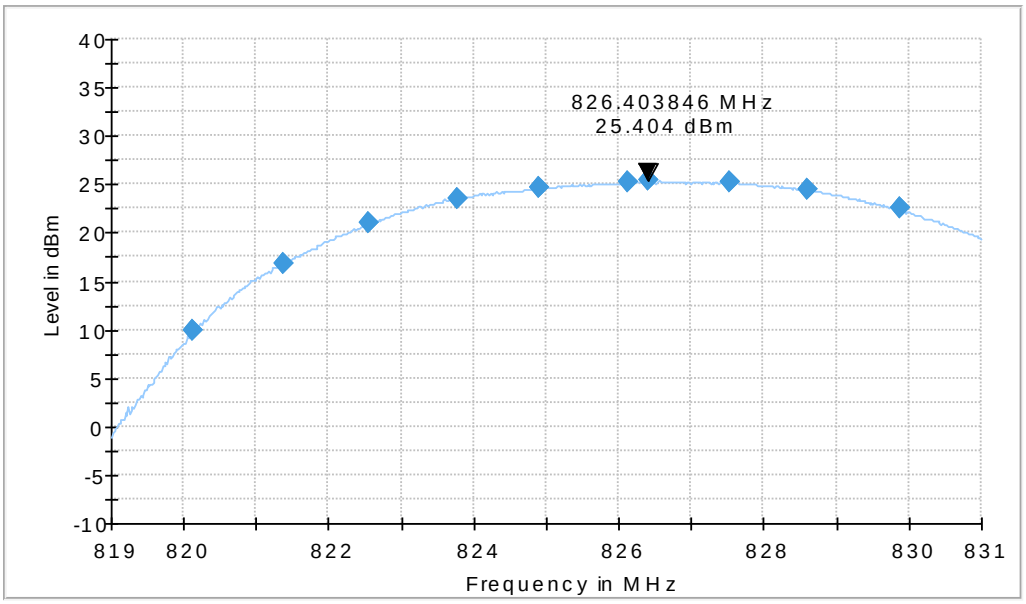
EIRP (GSM 850) Mid Channel



EIRP (GSM 850) High Channel



ERP (UMTS FDD5) Low Channel



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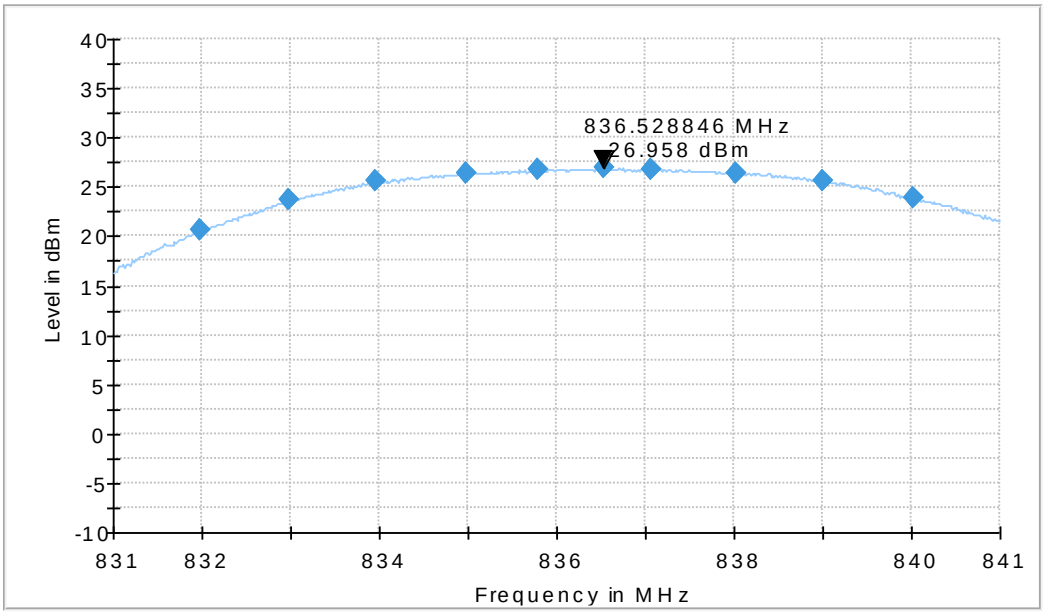

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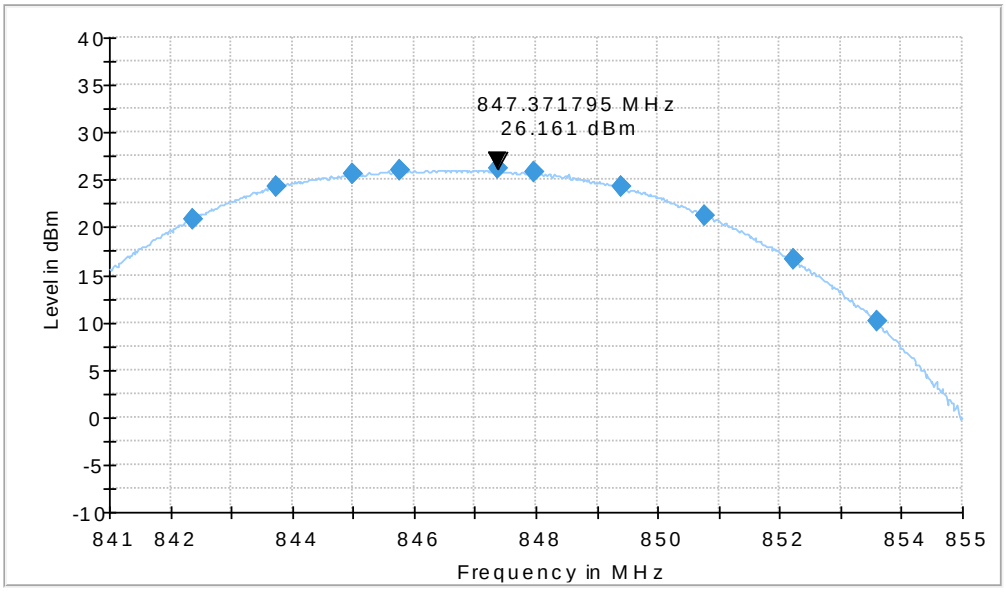
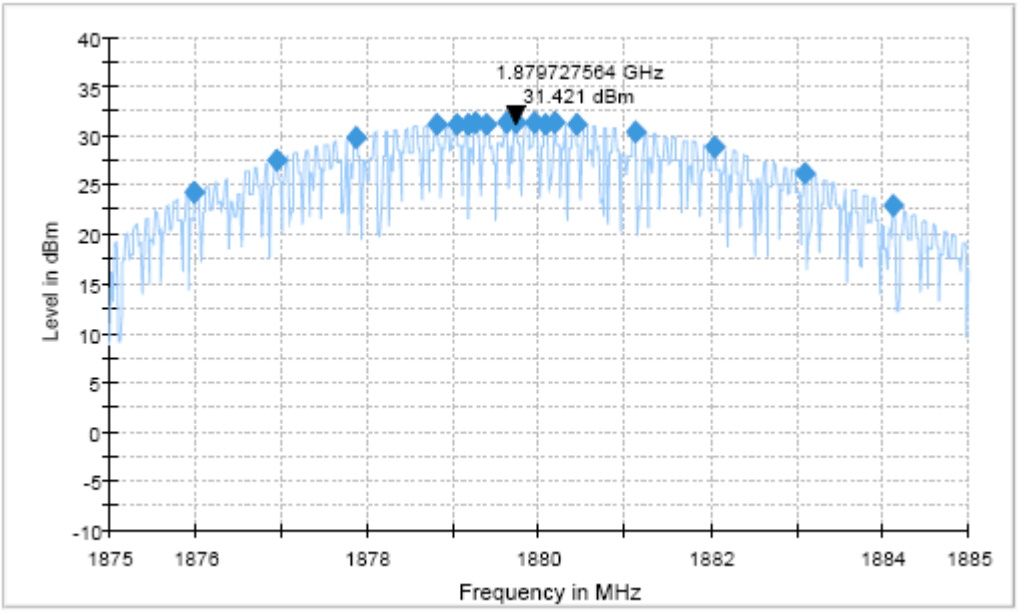


EIRP (GSM 1900) Low Channel



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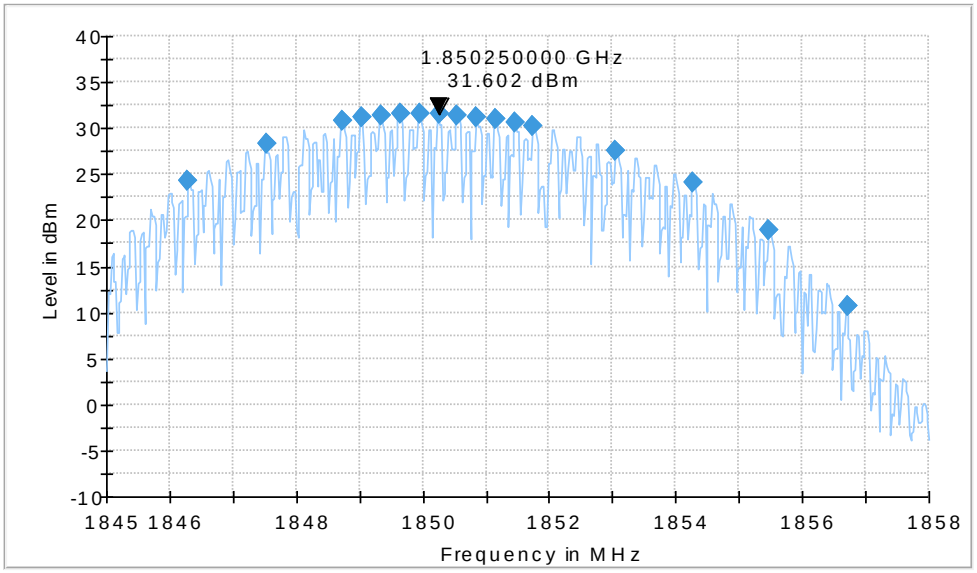
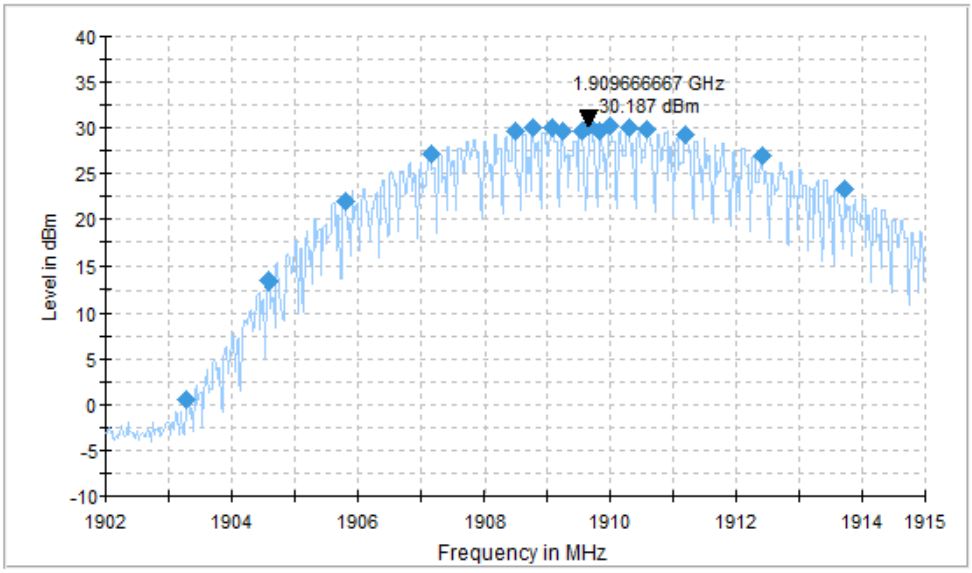
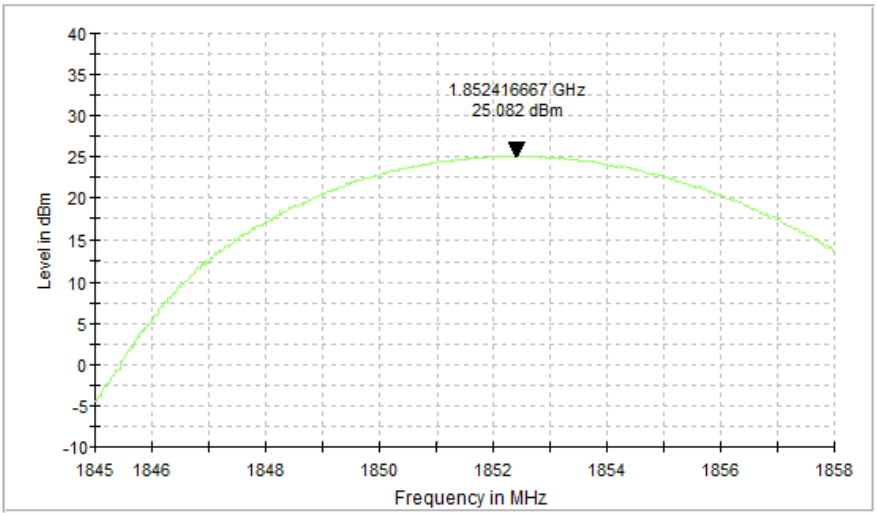


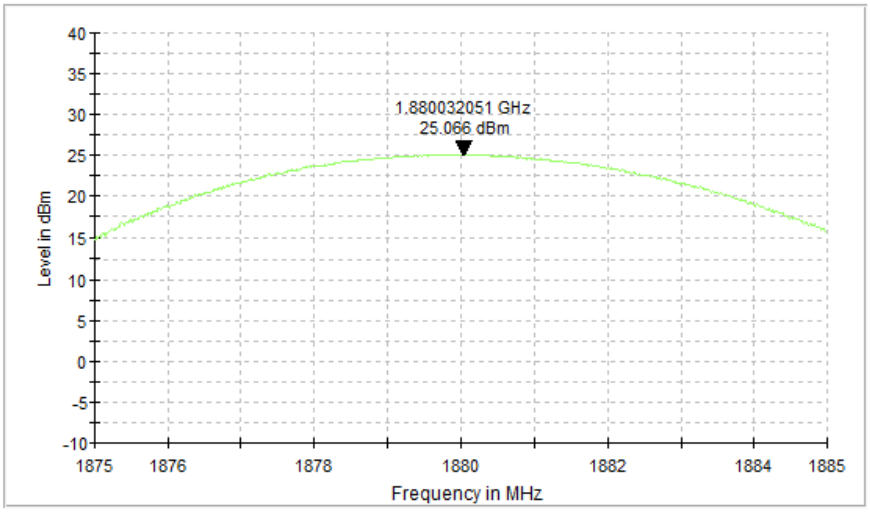
EIRP (GSM 1900) High Channel



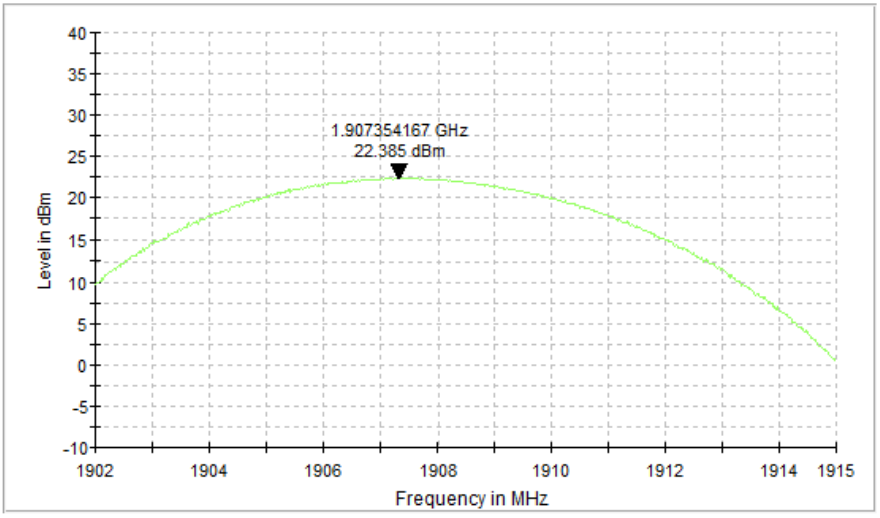
EIRP (UMTS FDD2) Low Channel



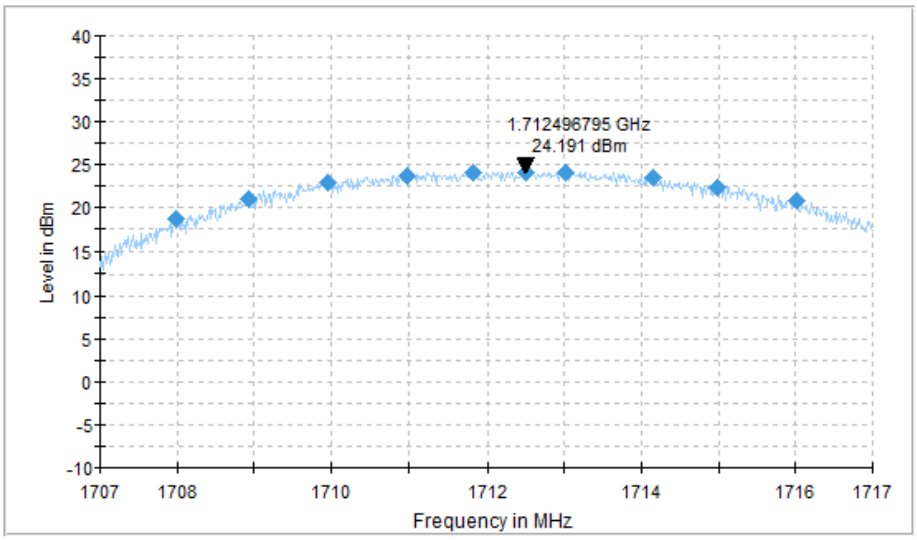
EIRP (UMTS FDD2) Mid Channel



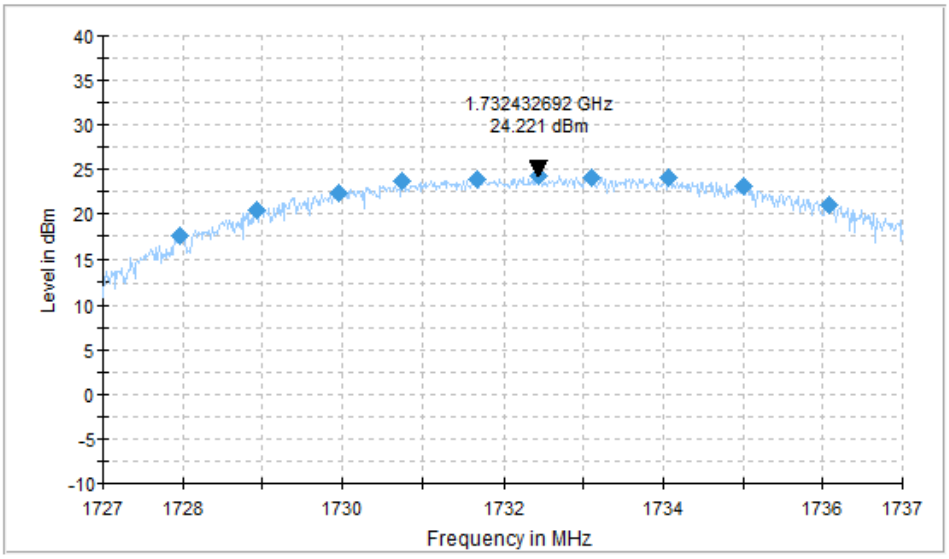
EIRP (UMTS FDD2) High Channel



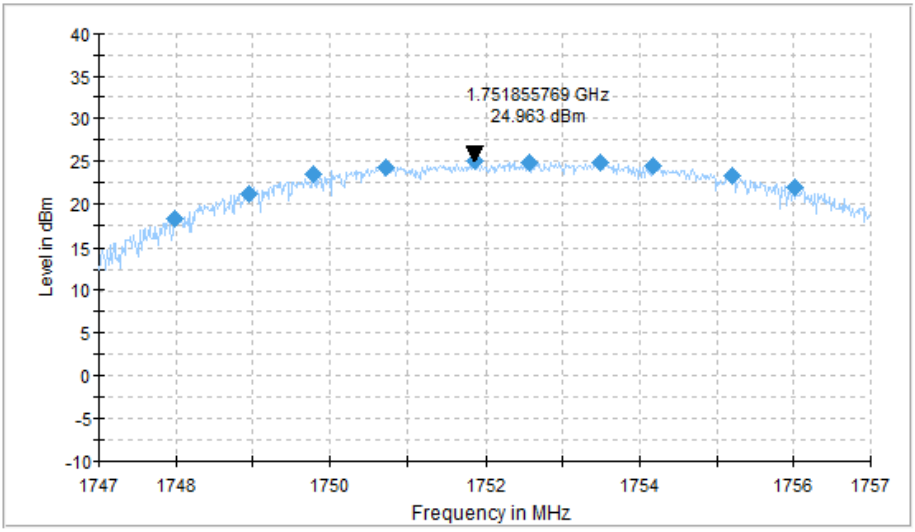
EIRP (UMTS FDD4) Low Channel



EIRP (UMTS FDD4) Mid Channel



EIRP (UMTS FDD4) High Channel



6.2 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:

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.

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 10th 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.

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.

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.

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.

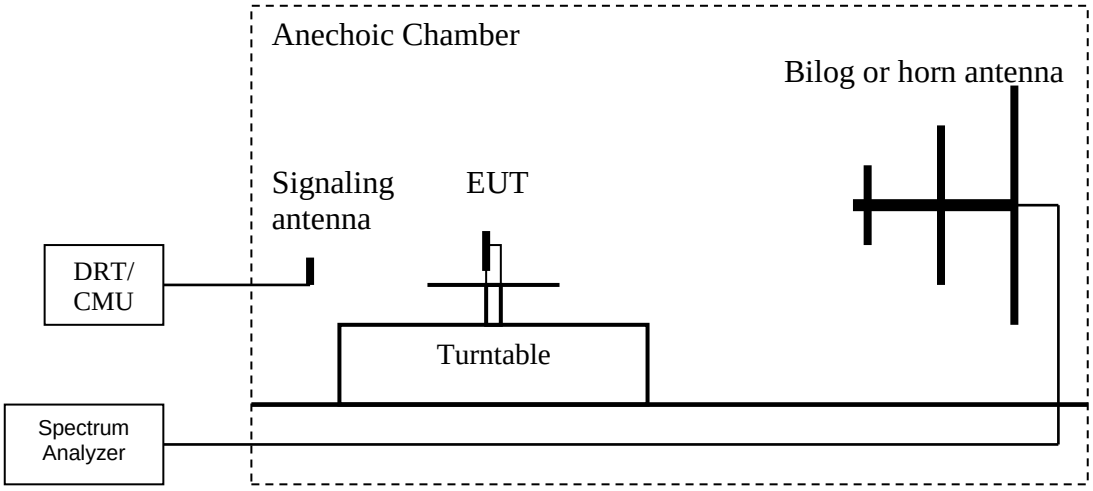
RSS-139 Section 6.5

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 Radiated out of band measurement procedure:

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



Connect the equipment as shown in the above diagram with the EUT's antenna in a horizontal orientation.

Adjust the settings of the Digital Radio Communication Tester (DRT) to set the EUT to its maximum power at the required channel.

Set the spectrum analyzer to measure peak hold with the required settings.

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.

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.

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).

Determine the level of spurious emissions using the following equation:

Spurious (dBm) = **LVL** (dBm) + **LOSS** (dB):

Repeat steps 4, 5 and 6 with all $_{\text{antennas}}$ vertically polarized.

Determine the level of spurious emissions using the following equation:

Spurious (dBm) = **LVL** (dBm) + **LOSS** (dB):

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

Power Measurements using Substitution Procedure:

The measurement on the Spectrum Analyzer is used as a basis for the Substitution procedure.
The EUT is replaced with a Signal Generator and an antenna. The setting on the Signal Generator is varied until the Spectrum Analyzer displays the original reading. EIRP is calculated as-

EIRP (dBm)= Signal Generator setting (dBm)- Cable Loss (dB)+ Antenna Gain (dBi)

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) and UMTS RMC 12.2k modes.
Additional spot checks in mid channel of operation for all modes were performed with the slimmer battery option of the device.

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.

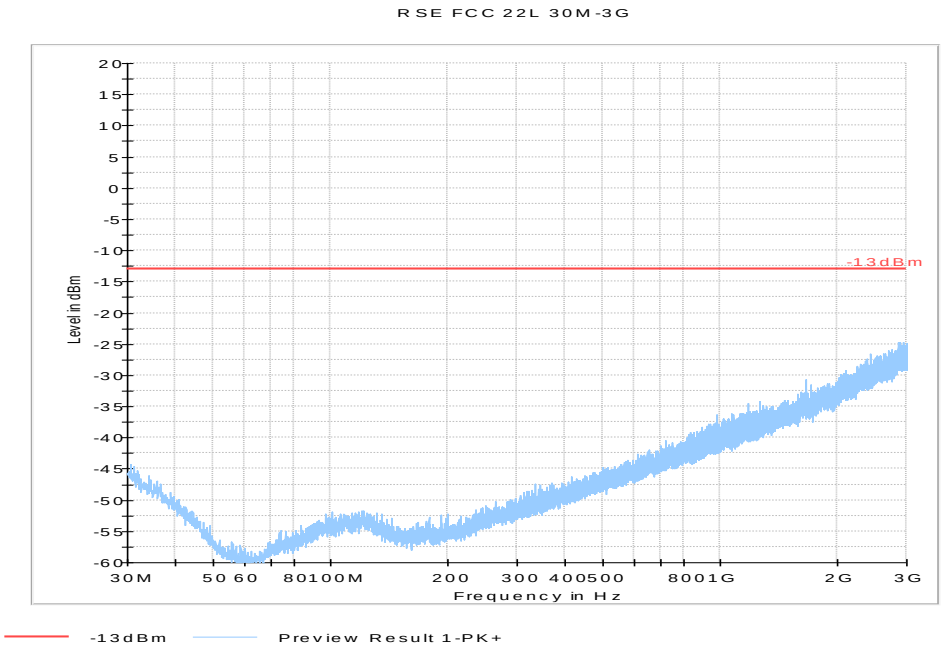
6.2.7 Test Conditions:

Tnom: 21^{o}C; Vnom: 12V

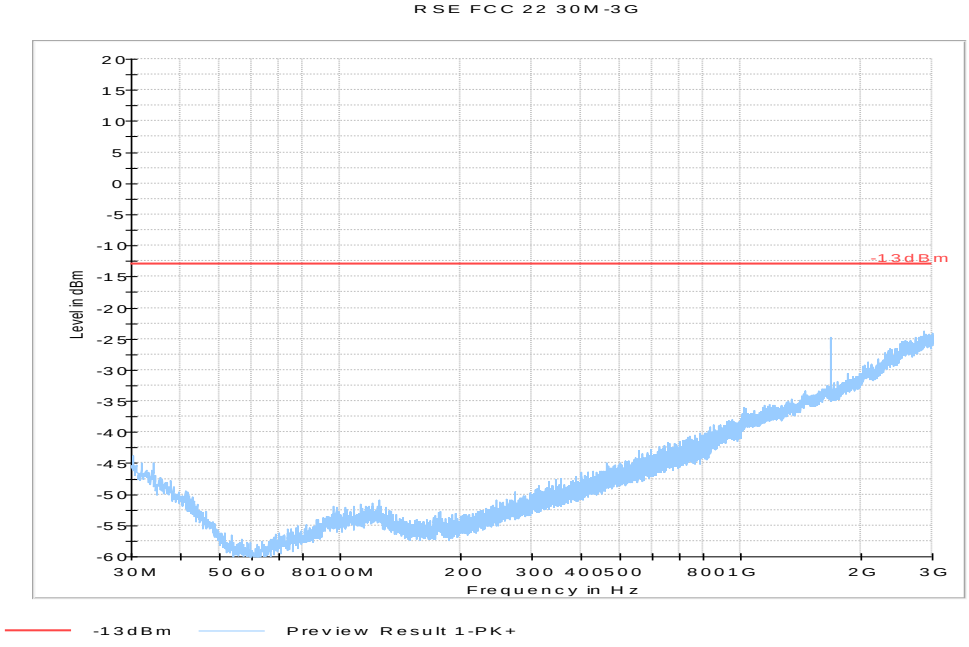
6.2.8 Plots:

Radiated Spurious Emissions (GSM850) Tx:

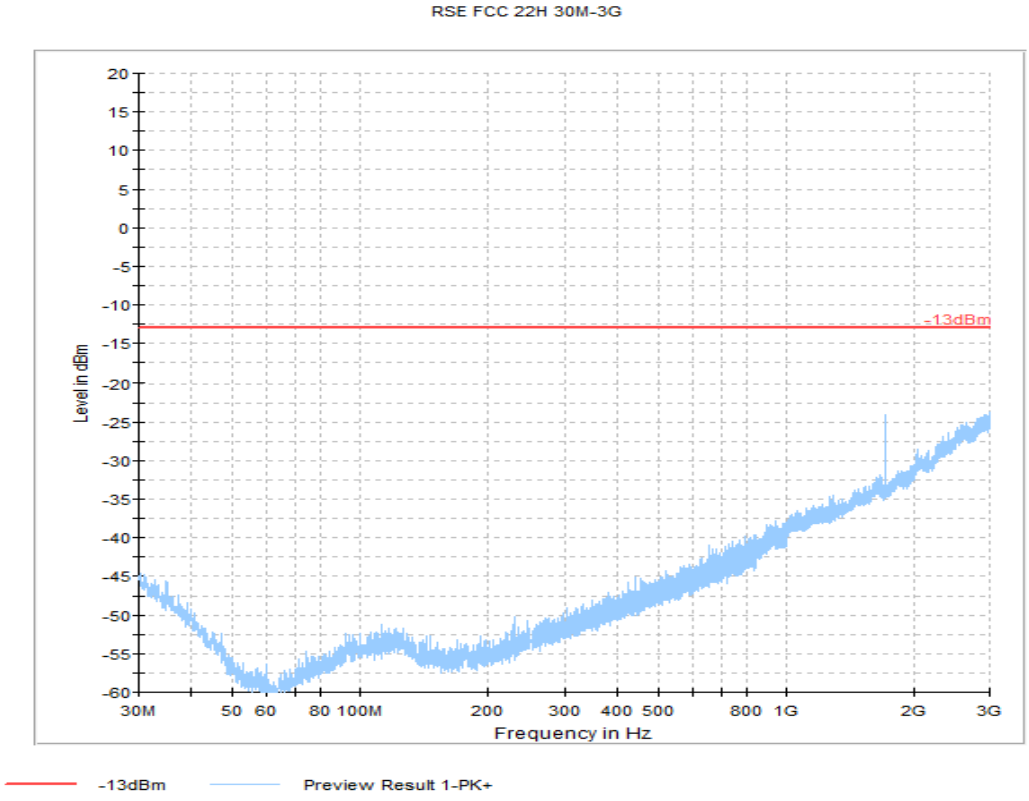
Test results - 30 MHz – 3GHz -Low Channel (GSM850)



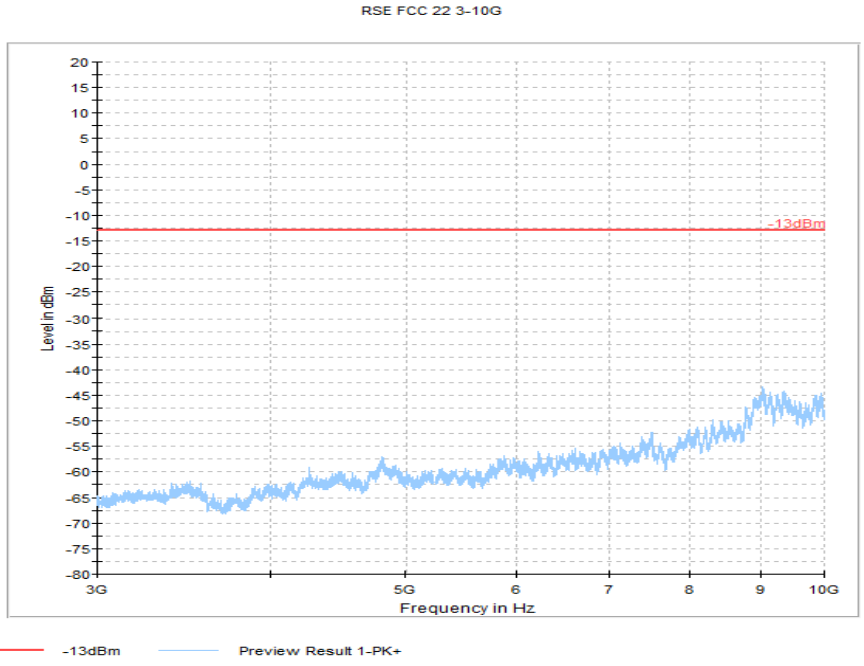
Test results - 30 MHz – 3GHz -Mid Channel (GSM850)



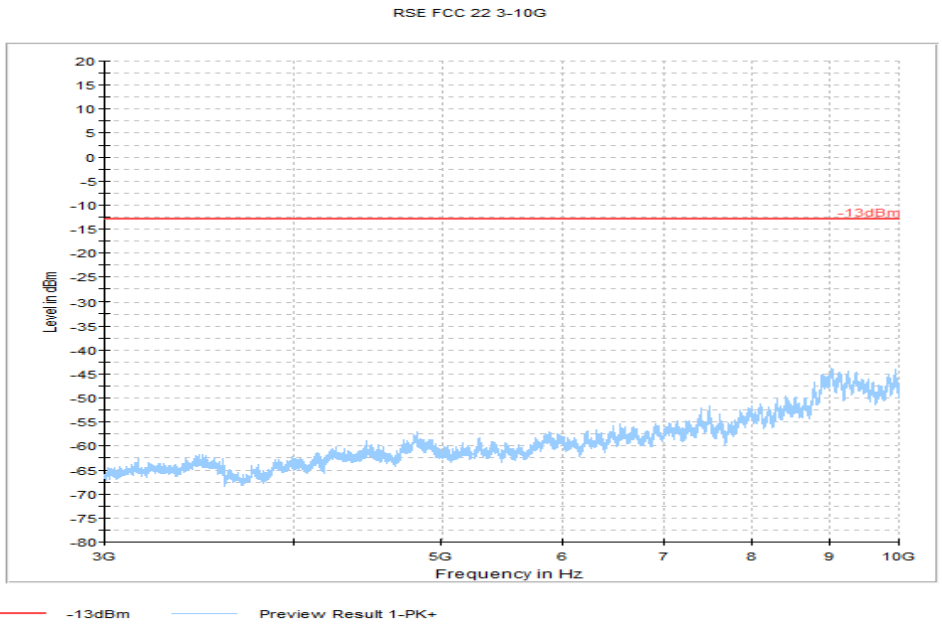
Test results - 30 MHz – 3GHz -High Channel (GSM850)



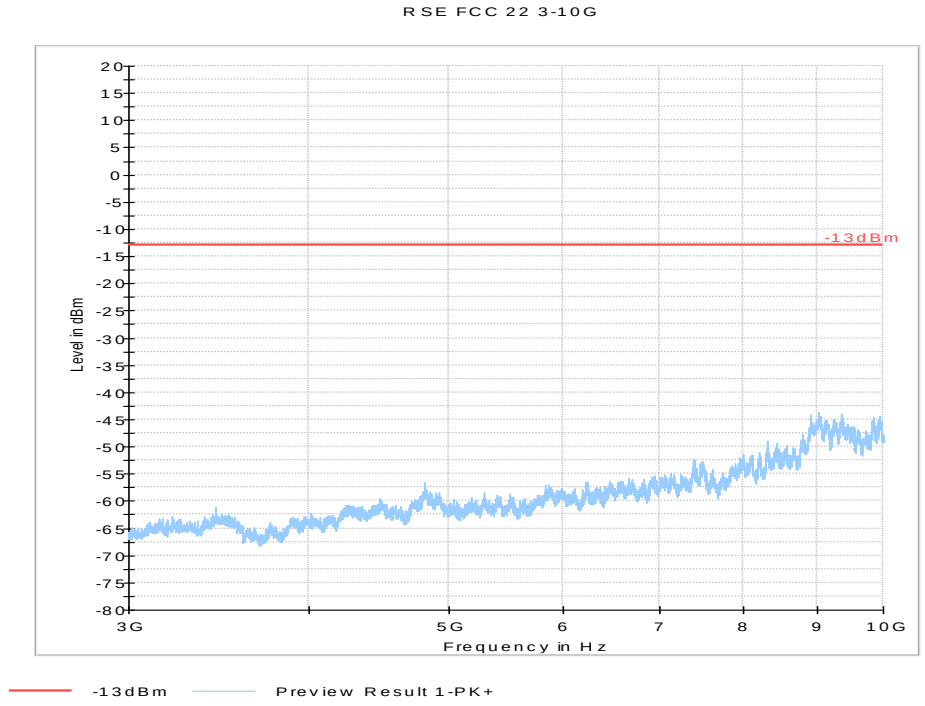
Test results – 3GHz – 10GHz -Low Channel (GSM850)



Test results – 3GHz – 10GHz -Mid Channel (GSM850)

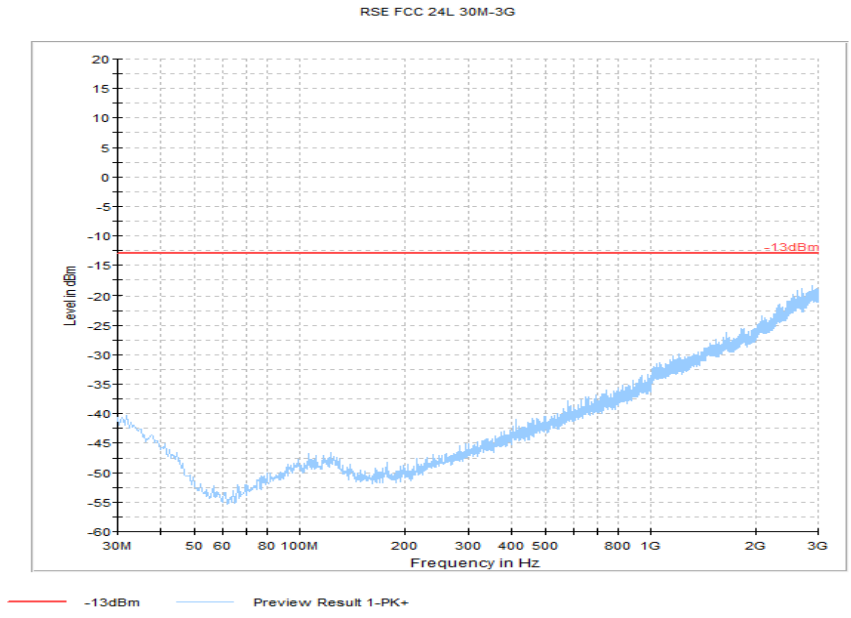


Test results – 3GHz – 10GHz -High Channel (GSM850)

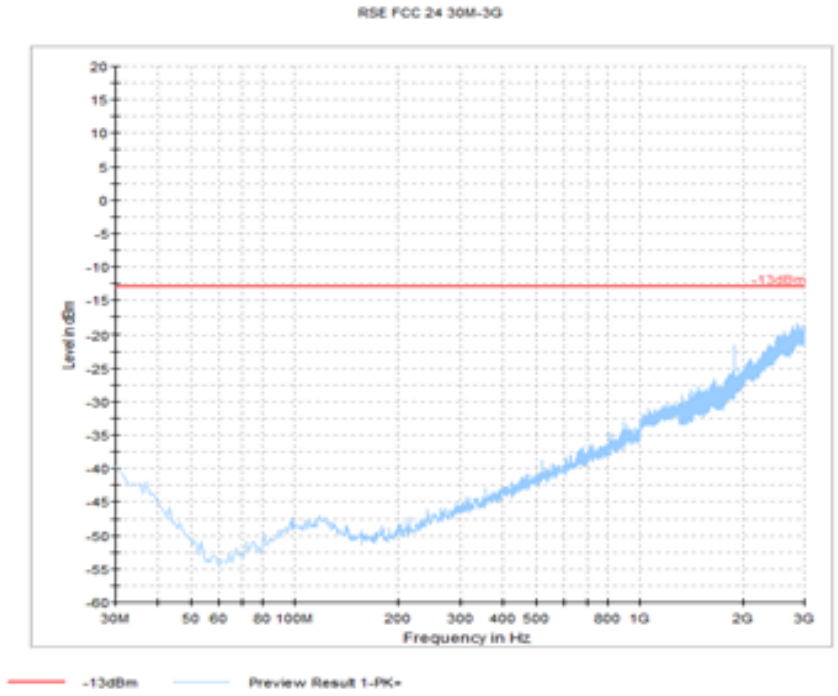


Radiated Spurious Emissions (GSM-1900) Tx:

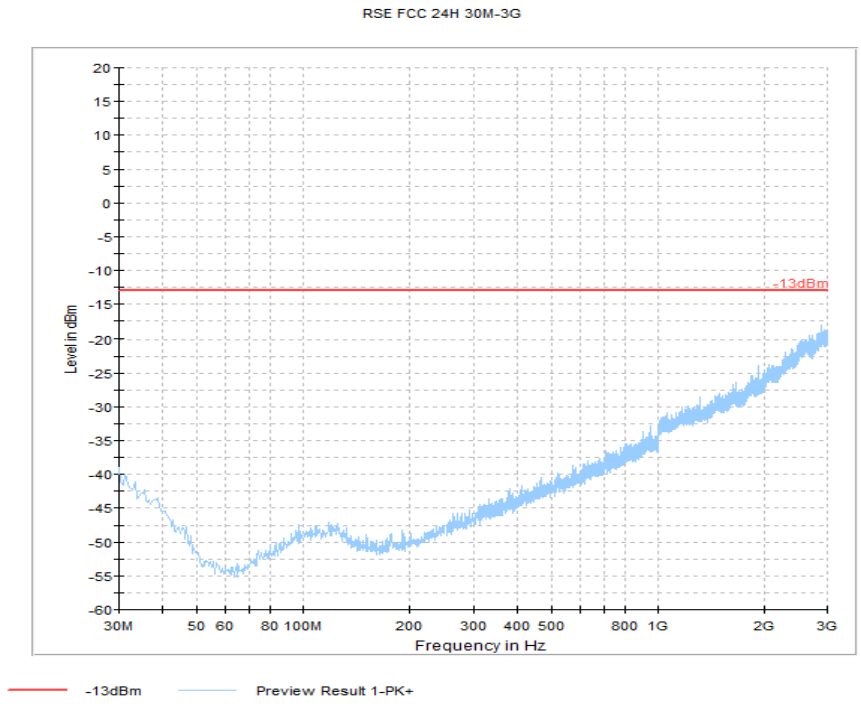
Test results 30MHz-3GHz – Low Channel (GSM-1900)



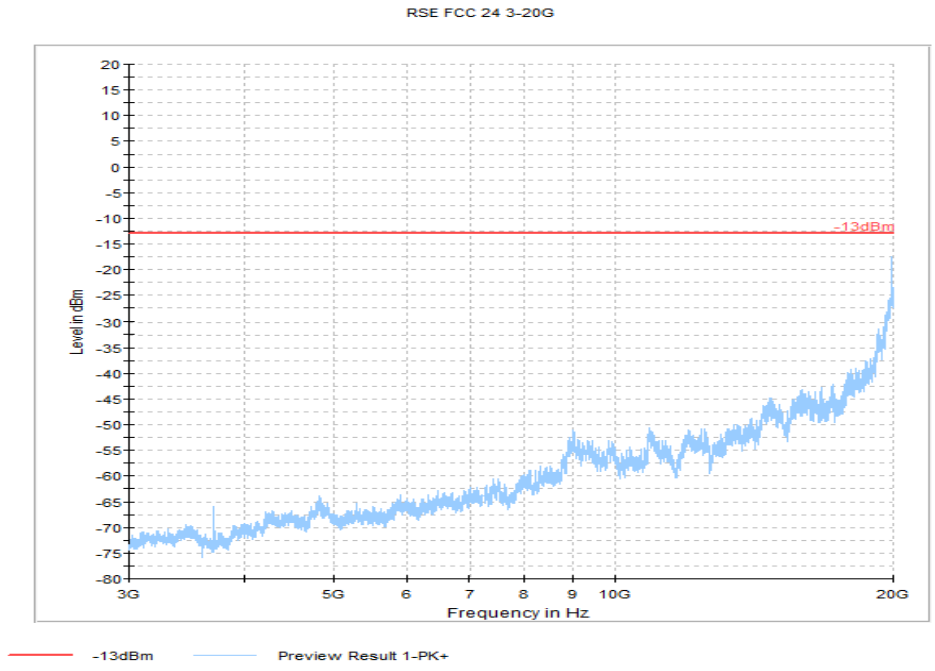
Test results 30MHz-3GHz – Mid Channel (GSM-1900)



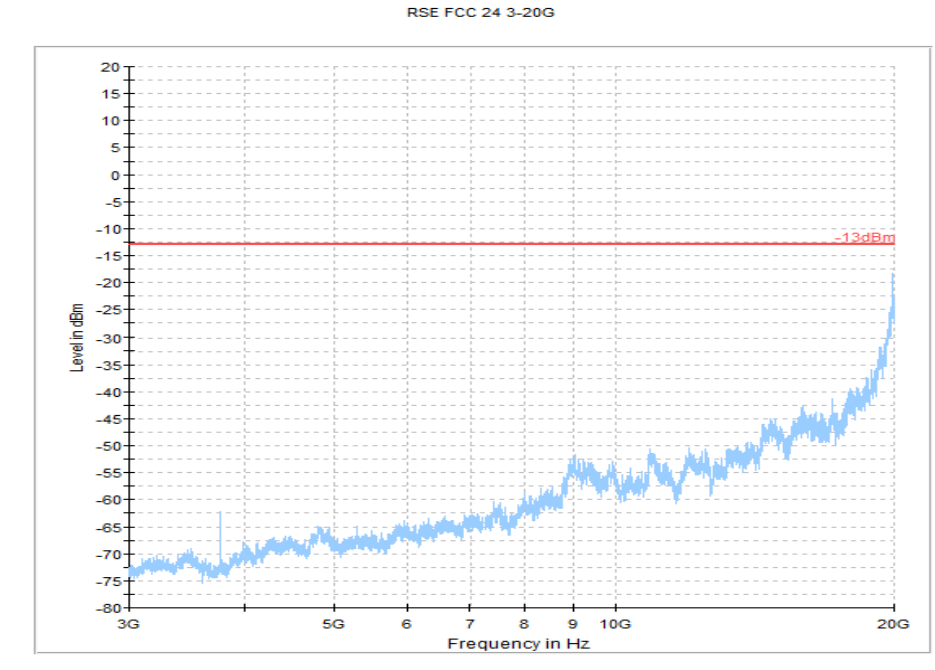
Test results 30MHz-3GHz – High Channel (GSM-1900)



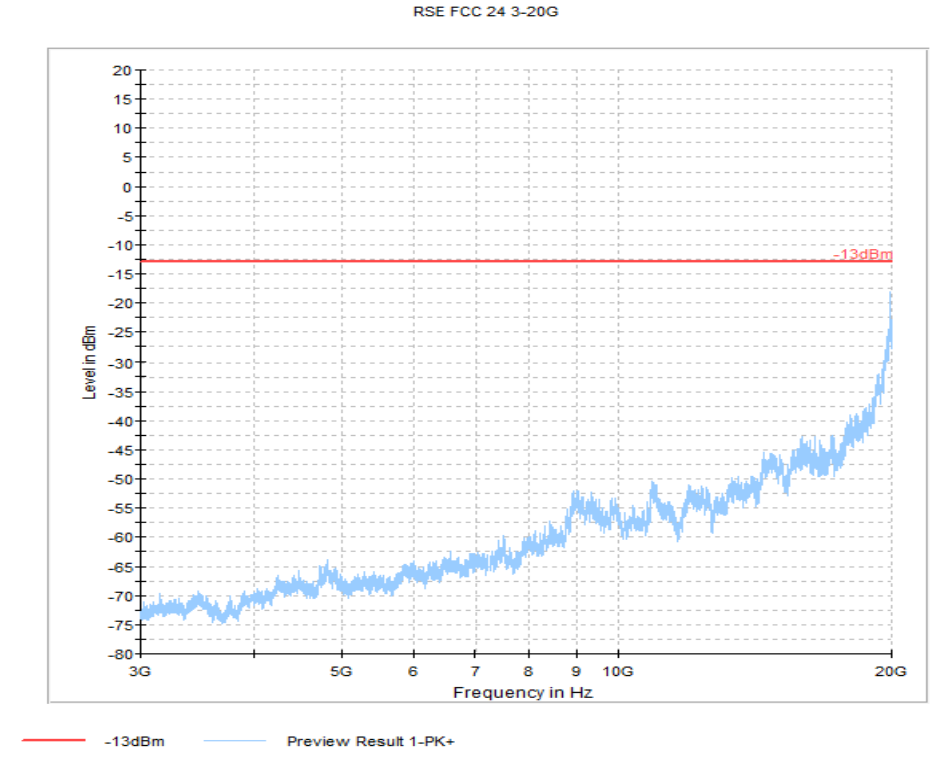
Test results 3 GHz-20 GHz – Low Channel (GSM-1900)



Test results 3 GHz-20 GHz – Mid Channel (GSM-1900)

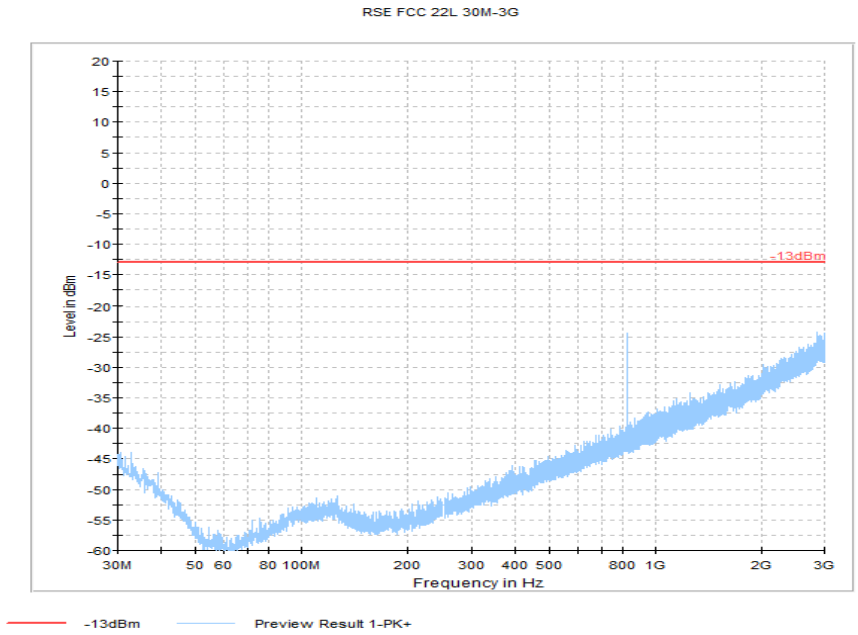


Test results 3 GHz-20 GHz – High Channel (GSM-1900)

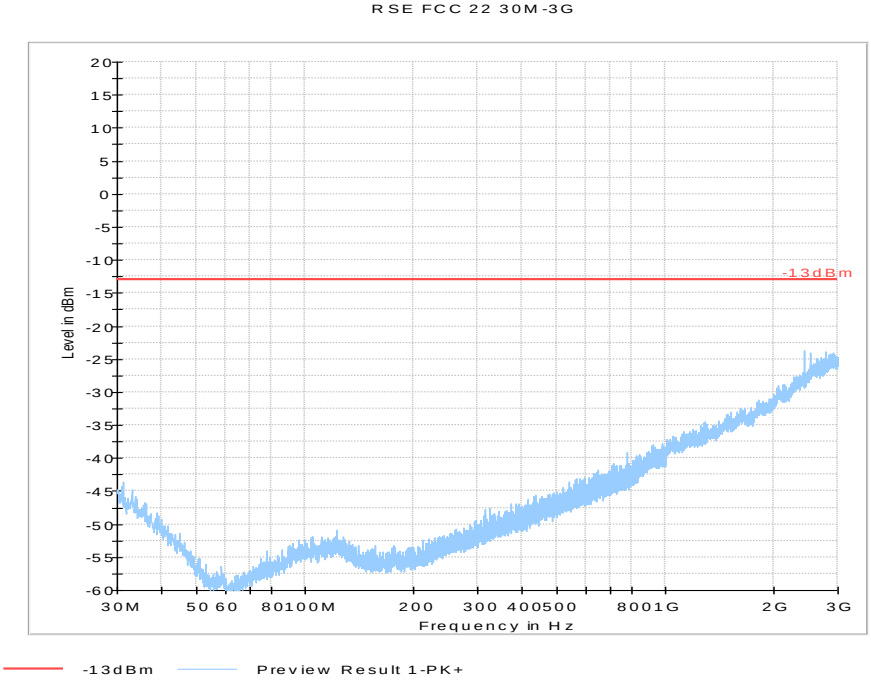


Radiated Spurious Emissions (UMTS Band 5) Tx:

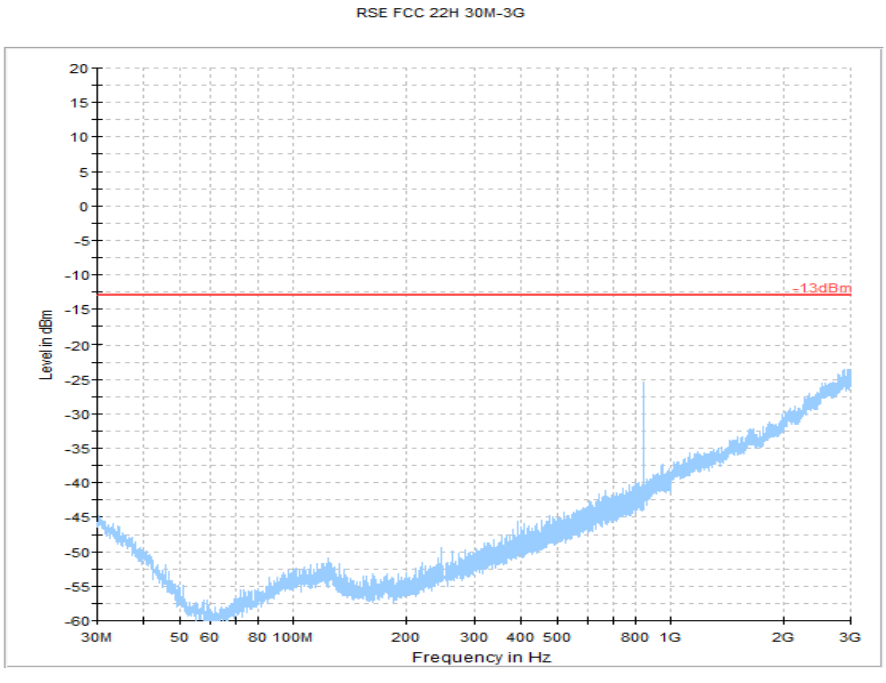
Test results 30MHz-1GHz – Low Channel (UMTS-Band 5)



Test results 30 MHz-1GHz – Mid Channel (UMTS-Band 5)

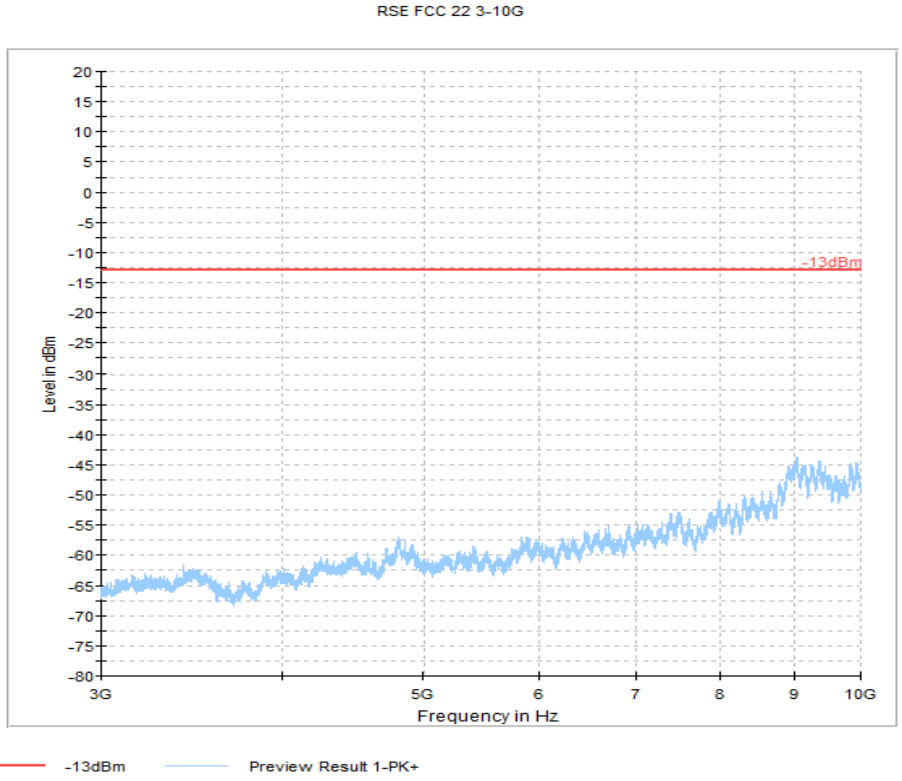


Test results 30MHz-1GHz – High Channel (UMTS-Band 5)

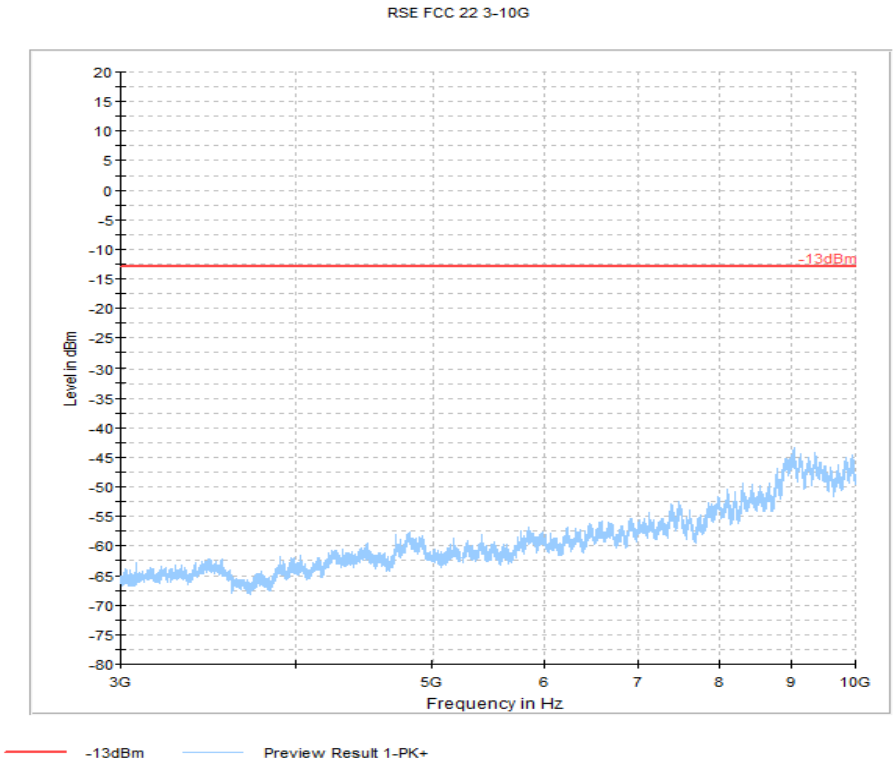


Radiated Spurious Emissions (UMTS Band 5) Tx:

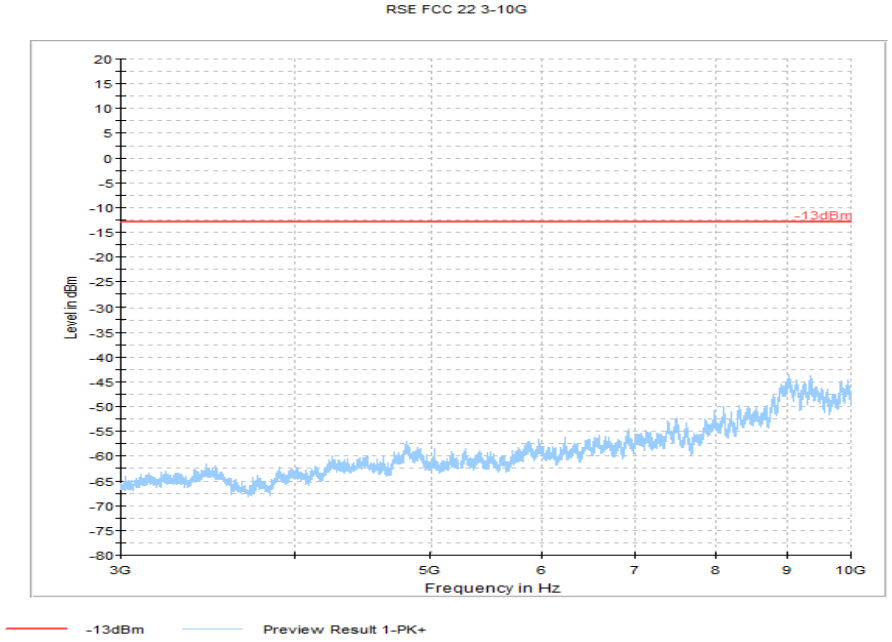
Test results 3GHz-10GHz – Low Channel (UMTS-Band 5)



Test results 3GHz-10GHz – Mid Channel (UMTS-Band 5)

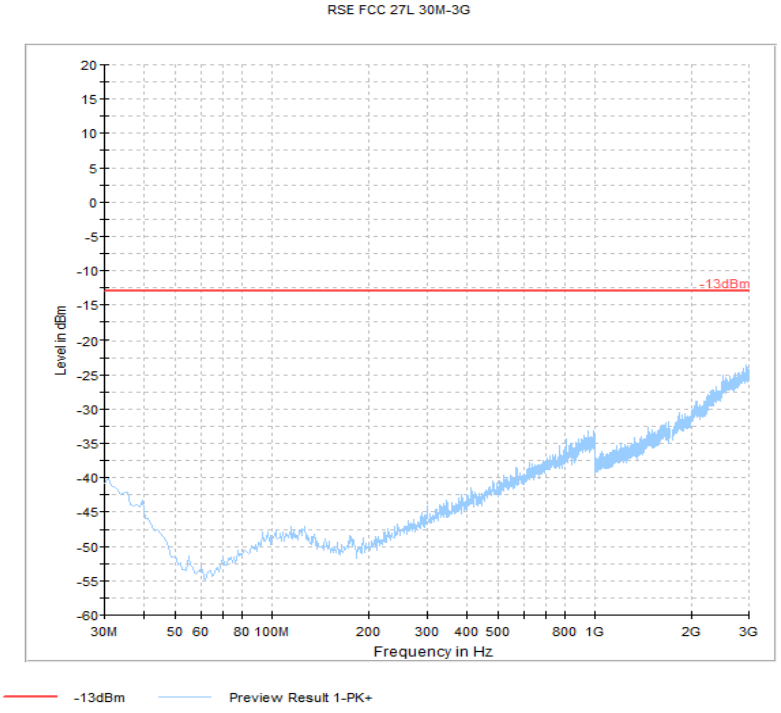


Test results 3GHz-10GHz – High Channel (UMTS-Band 5)

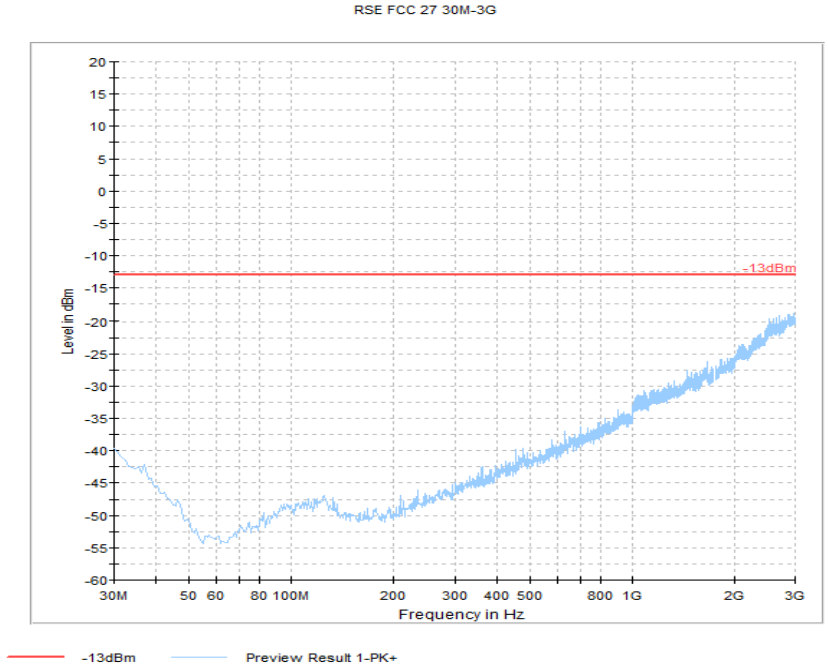


Radiated Spurious Emissions (UMTS Band 4) Tx:

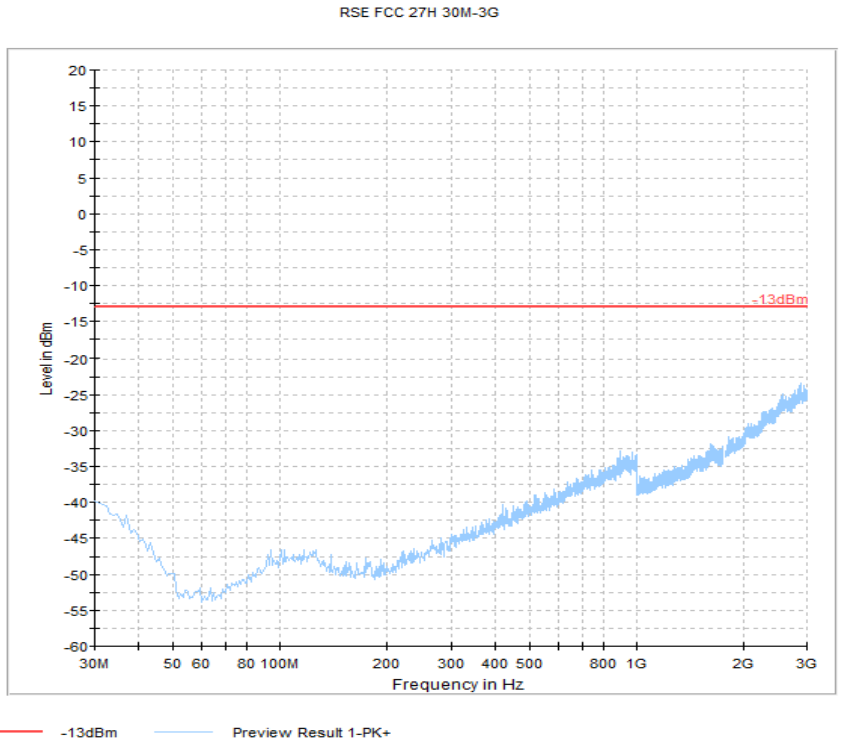
Test results 30MHz-3GHz– Low Channel (UMTS-Band 4)



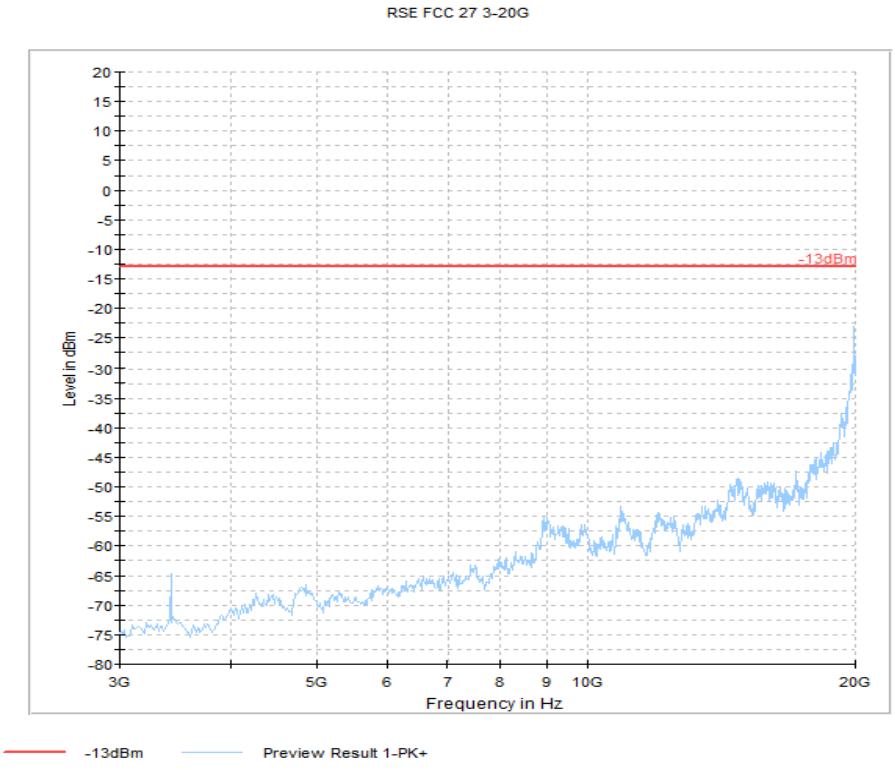
Test results 30 MHz-3GHz– Mid Channel (UMTS-Band 4)



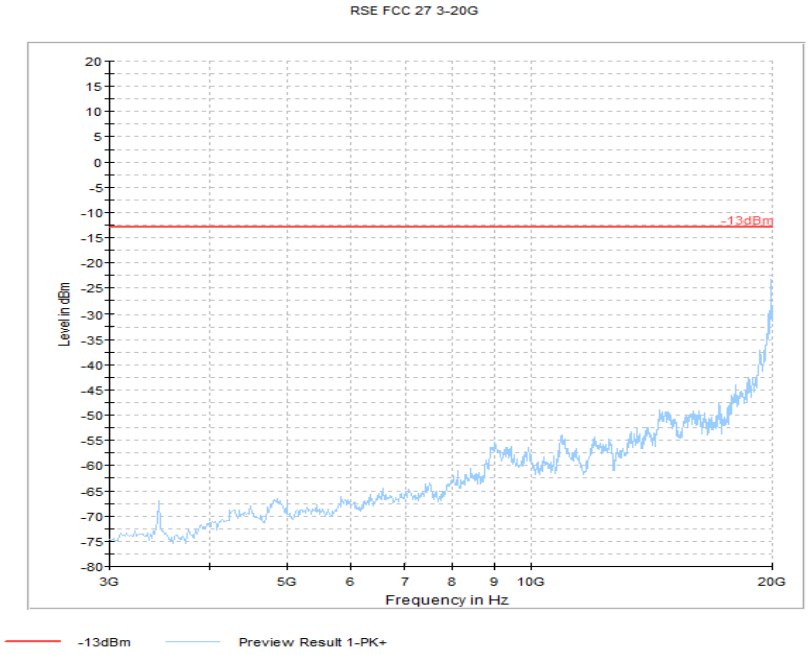
Test results 30MHz-3GHz– High Channel (UMTS-Band 4)



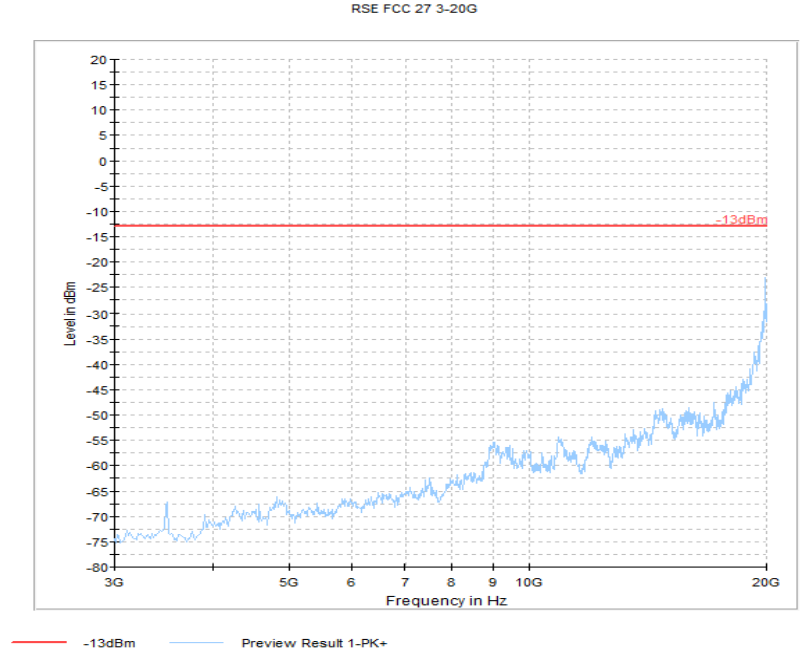
Test results 3GHz-20GHz– Low Channel (UMTS-Band 4)



Test results 3GHz-20GHz– Mid Channel (UMTS-Band 4)

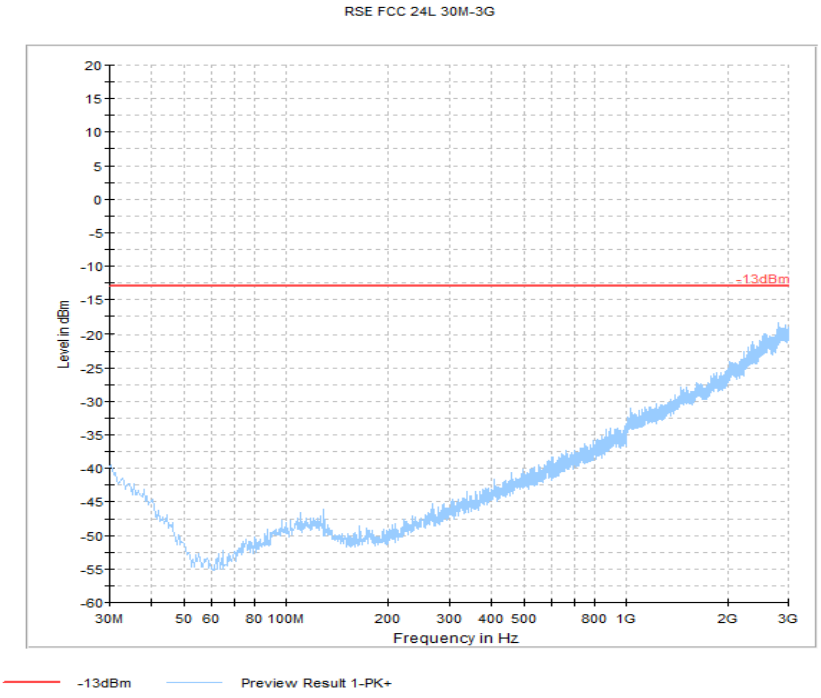


Test results 3GHz-20GHz– High Channel (UMTS-Band 4)

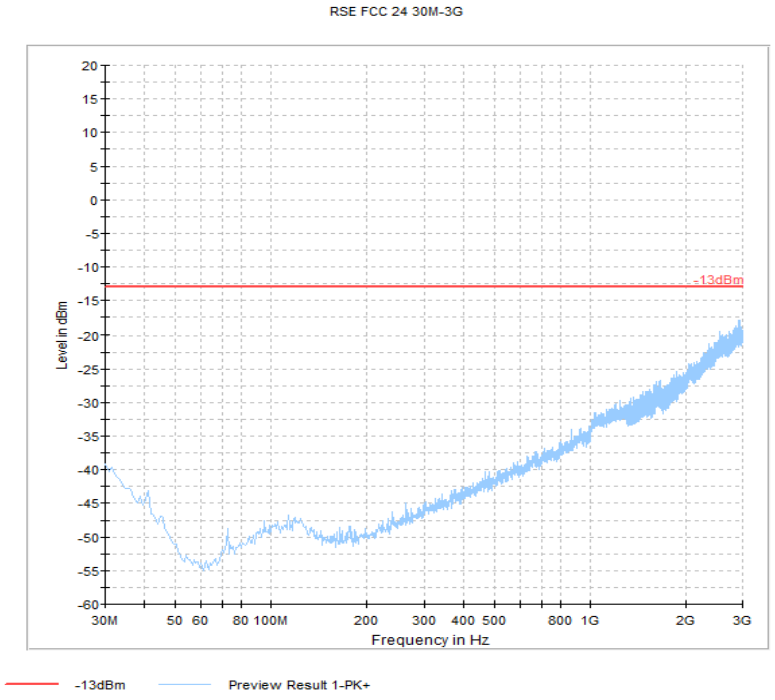


Radiated Spurious Emissions (UMTS Band 2) Tx:

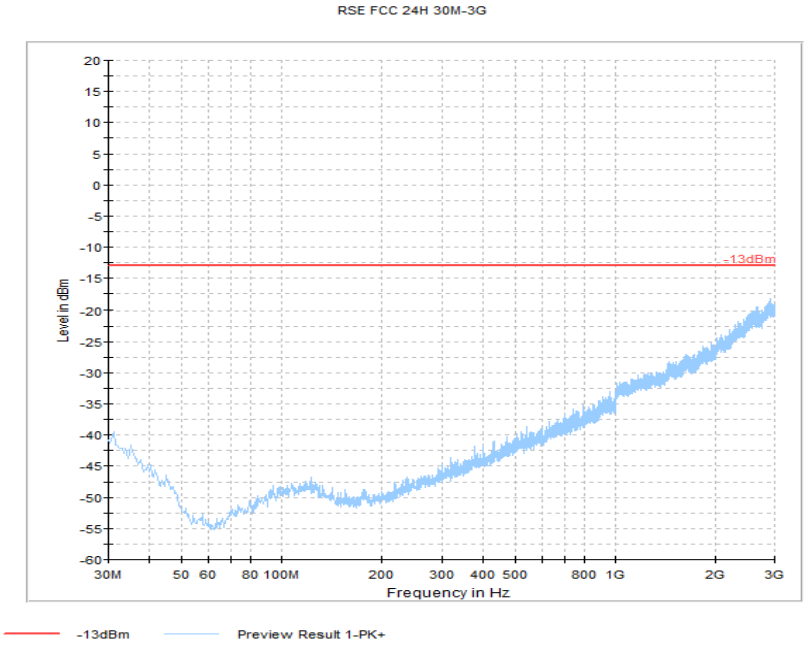
Test results 30 MHz-1GHz – Low Channel (UMTS-Band 2)



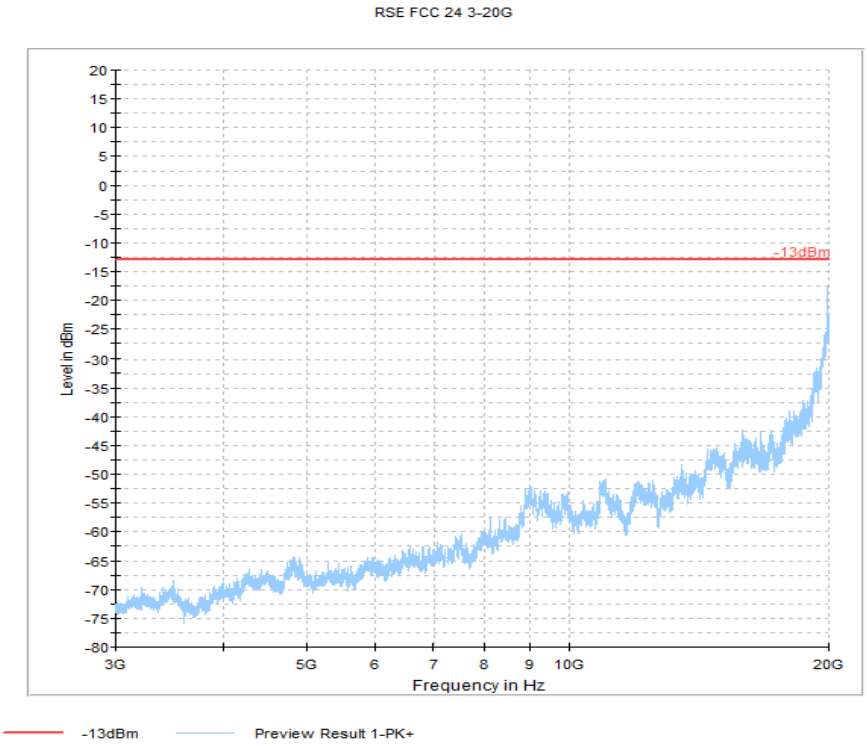
Test results 30 MHz-1GHz – Mid Channel (UMTS-Band 2)



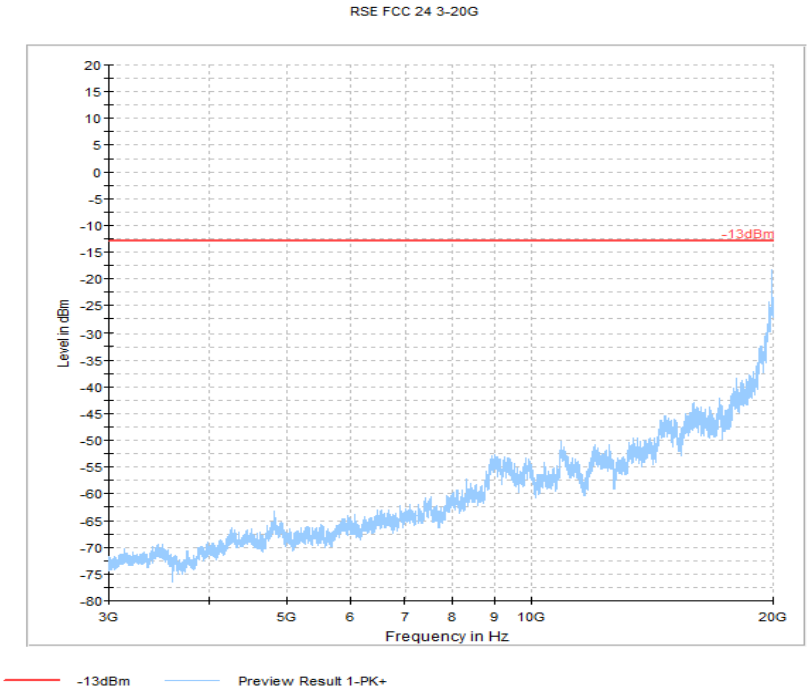
Test results 30 MHz-1GHz – High Channel (UMTS-Band 2)



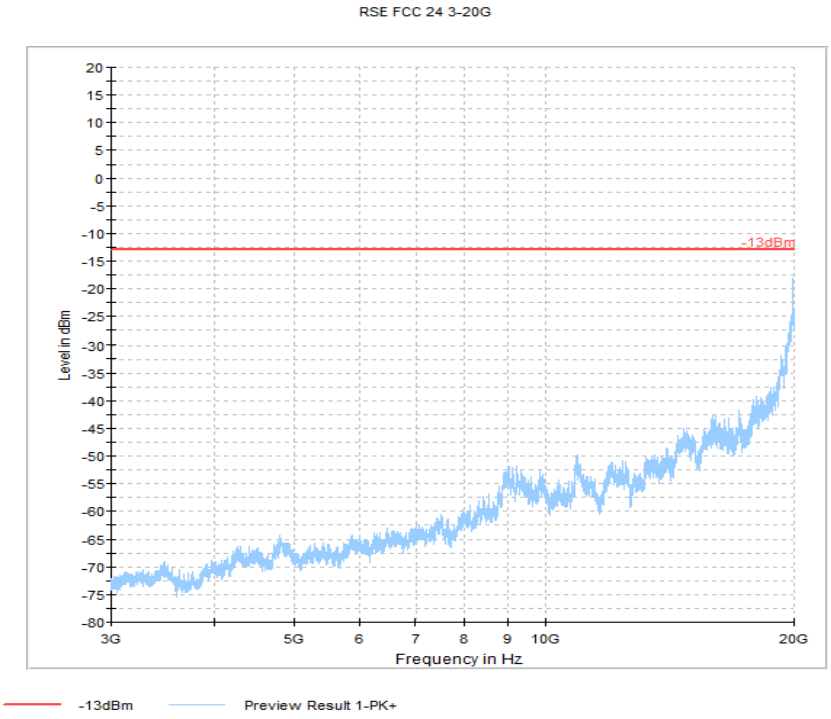
Test results 3 GHz-20 GHz – Low Channel (UMTS-Band 2)



Test results 3 GHz-20GHz – Mid Channel (UMTS-Band 2)



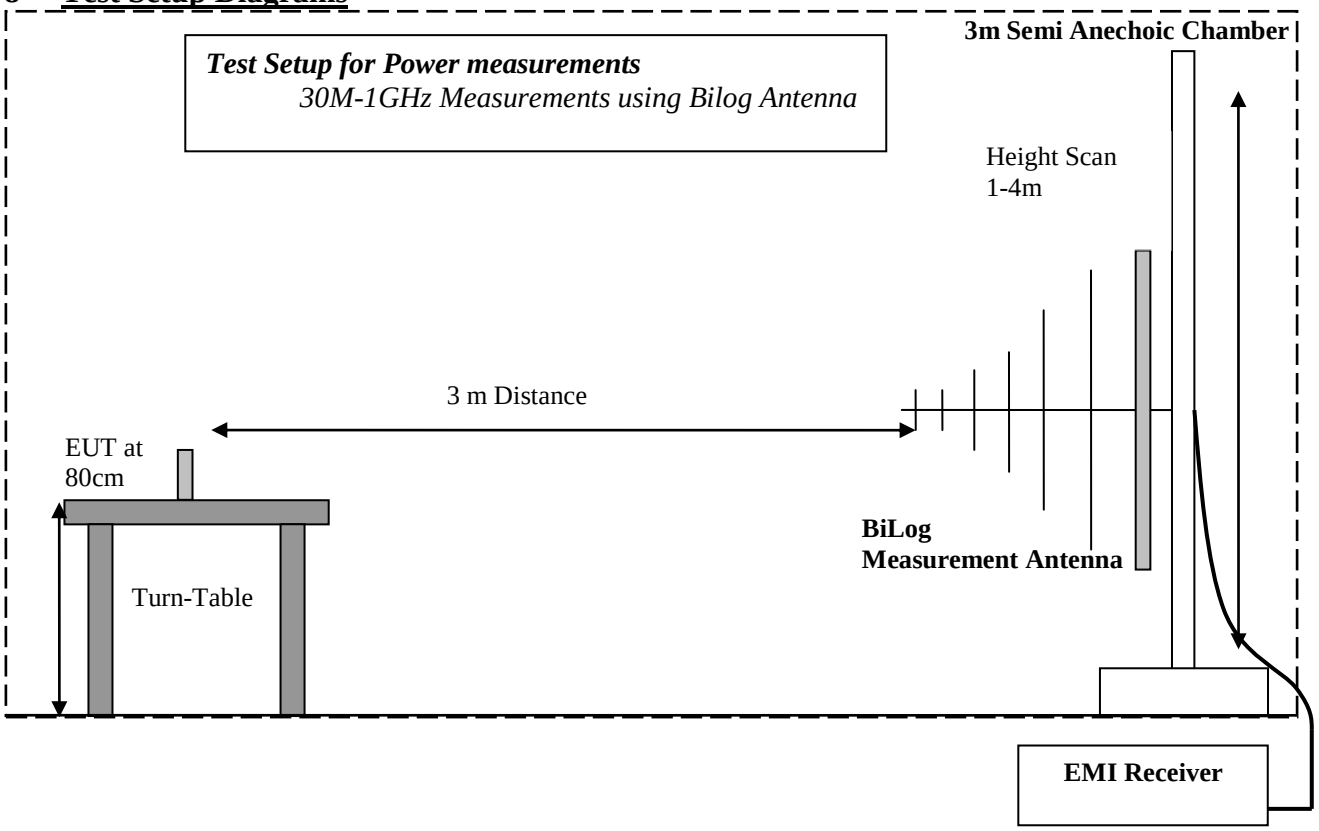
Test results 1 GHz-18GHz – High Channel (UMTS-Band 2)

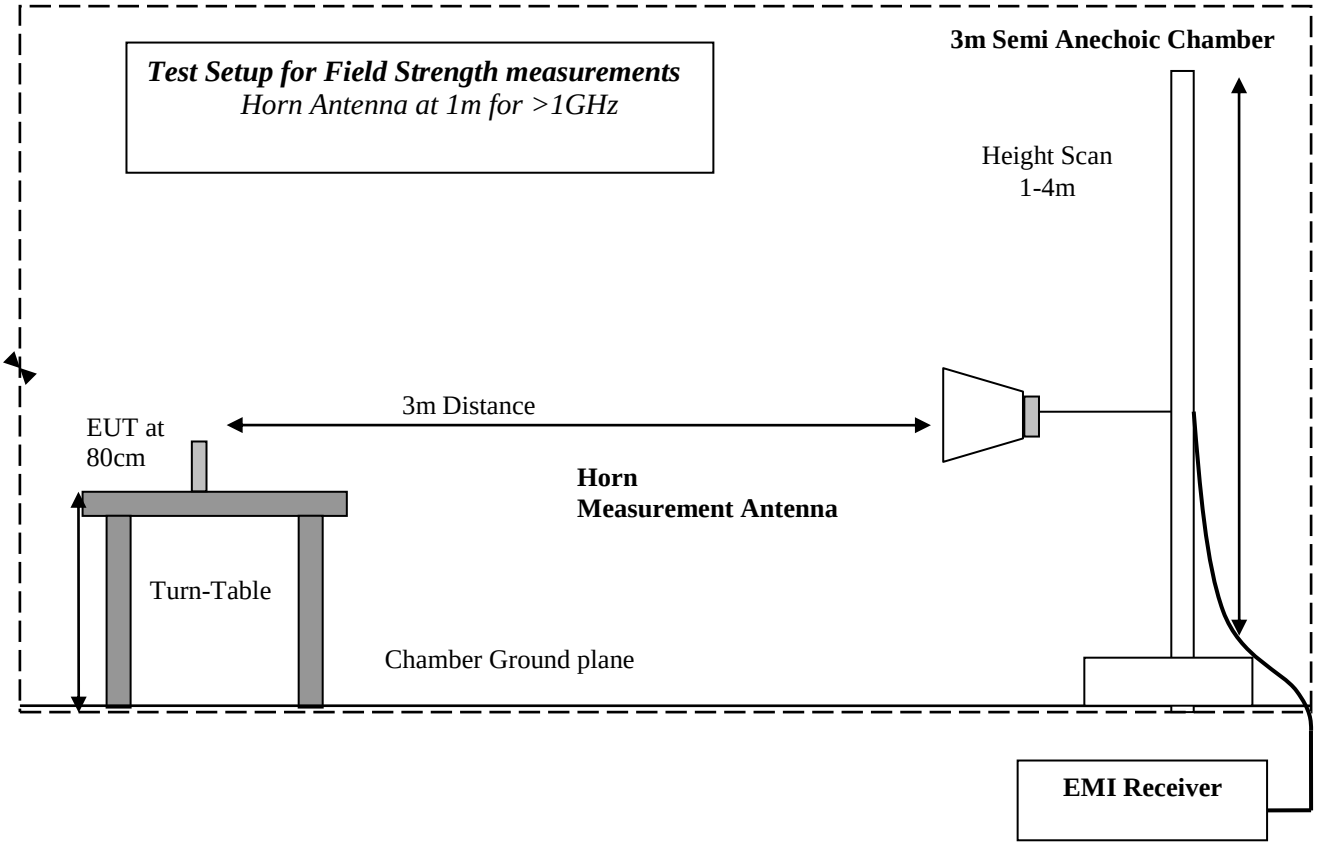


7 Test Equipment and Ancillaries used for tests

Equipment Name	Manufacturer	Type/Model	Serial No.	Cal Date	Cal Interval	Next cal date
3m Semi- Anechoic Chamber:						
Spectrum Analyzer	Rohde und Schwarz	FSU 26	200302	6/2013	2 years	6/2015
Radiocommunication Tester	Rohde and Schwarz	CMU 200	121672	2/2012	2 years	2/2014
Horn Antenna	ETS Lindgren	3115	35111	4/2012	3 year	4/2015
Log Periodic Antenna	Rohde and Schwarz	HL 050	100515	4/2013	3 year	4/2016
Ultralog Antenna	Rohde and Schwarz	HL 562	100495	2/2012	3 year	2/2015
Open Switch Control Unit	Rohde and Schwarz	OPS 130	10085	n/a		
Extention Unit Open Switch Control Unit	Rohde and Schwarz	OSP 150	10086	n/a		
Turn Table TT	Maturo	1.5 SI	TT 1.5SI/204/6070910	n/a		
Compact antenna Mast	Maturo	CAM 4.0-P	CAM4.0-P/067/6000910	n/a		
Multiple Control Unit	Maturo	MCU	2140910	n/a		
Pre-Amplifier	Rohde and Schwarz	TS-PR 18	100072	Part of the system calibration		
High Pass Filter	Mini-Circuits	SHP-1200+	RUU11201224	Part of the system calibration		
High Pass Filter	Wainwright Instr.	WHKX 3.0/18	109	Part of the system calibration		
Ancillary equipment:						
DC Power Supply	GW Instek	GPS-1850D	EM845907	n/a		

8 Test Setup Diagrams





9 Revision History

Date	Report Name	Changes to report	Report prepared by
07-16-2014	EMC_XIRGO-079-14001_FCC22_24_27_WWAN	First Version	MU
08-26-2014	EMC_XIRGO-079-14001_FCC22_24_27_WWAN_rev2	Replace Power Peak measurements by RMS values	MPDL