FCC/IC Test Report

FOR:
Xirgo Technologies Inc.

Model Number:
XT4970D

Product Description:
Vehicle Solar harvesting GPS/Cellular Tracker with BT/ZGB Tech

FCC ID: GKM-XT4970D
IC ID: 10281A-XT4970D

Per
47 CFR Part 2, 22, 24, 27
RSS-GEN Issue 4, RSS-130, RSS-132 Issue 3, RSS-133 Issue 6, RSS-139 Issue 3

TEST REPORT #: EMC_XIRGO-111-15001_FCC 22 24 27_v1.3
DATE: 02-19-2016

ilac-MRA A2LA ACCREDITED TESTING LABORATORY Certificate #2135.02

FCC Recognized
A2LA Accredited
IC recognized # 3462E-1

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1 Assessment

The following device was evaluated against the applicable criteria specified in FCC rules parts 22, 24 and 27 of Title 47 of the Code of Federal Regulations and RSS-GEN Issue 4, RSS-130, RSS-132 Issue 3, RSS-133 Issue 6, RSS-139 Issue 3 of the commission for Innovation, Science and Economic Development Canada.

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

Company	Description	Model #
Xirgo Technologies Inc.	Vehicle Solar harvesting GPS/Cellular Tracker with BT/ZGB Tech	XT4970D

Responsible for Testing Laboratory:

02-19-2016	Compliance	Heiko Strehlow (VP RC & EMC)	
Date	**Section**	**Name**	**Signature**

Responsible for the Report:

02-19-2016	Compliance	Franz Engert (Compliance Manager)	Digitally signed by Franz Engert DN: cn=Franz Engert, c=US, o=CETECOM, ou=Complience, email=franz.engert@cetecom.com
Date	**Section**	**Name**	**Signature**

The test results of this test report relate exclusively to the test item specified in Section3.
CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM Inc. USA.

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Address:	6370 Nancy Ridge Drive, Suite 101 San Diego, CA 92121 U.S.A.
Telephone:	+1 (858) 362 2400
Fax:	+1 (858) 587 4809
Compliance Manager:	Franz Engert
Project Engineer:	Anthony Planinac

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:	Johnny Chen
Phone No.	805-338-2204
Fax:	
e-mail:	Jchen@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

Model #:	XT4970D
Product Description:	Vehicle Solar harvesting GPS/Cellular Tracker with BT/ZGB Tech
FCC-ID:	GKM-XT4970D
IC certification number , HVIN, PMN, FVIN:	10281A-XT4970D, XT4970D, CXT4970D, NA
Technology/ Type(s) of Modulation:	UMTS/HSUPA LTE SC-FDMA with QPSK and 16QAM (Module ublox TOBY-L201, FCC ID: XPYTOBYL201, IC: 8595A-TOBYL201)
Operating Frequency Ranges (MHz)/ Channels:	UMTS FDD II / LTE Band 2 (1800MHz): 1850 MHz – 1910 MHz LTE Band 4 (1700 MHz): 1710 -1755 MHz UMTS FDD V / LTE Band 5 (800MHz): 824 MHz – 849 MHz LTE Band 13 (700 MHz): 777 MHz – 787 MHz LTE Band 17 (700 MHz): 704 MHz – 716 MHz BT and ZigBee: ISM band 2.4GHz – 2.4835GHz
Antenna info:	cellular radio: SMD dielectric antenna peak gain: 3.05dBi @ Band 4 -0.21dBi @ Band 13,17 0.77dBi @ Band 5 2.92dBi @ Band 2 BT and ZigBee: SMD ceramic antenna 1.5dBi @ 2.45GHz
Co-located Transmitters/ Antennas?	■Yes ☐No
Device Category:	■ Fixed Installation ☐ Mobile ☐Portable ☐ Mixed Mobile and Portable
Exposure Category:	☐ Occupational/ Controlled ■ General Population/ Uncontrolled
Other radios included in product	Bluetooth 4.1 with BT-BDR (GFSK), BT-EDR (DQPSK), BT-EDR (8DPSK), BT-LE (GFSK) ZigBee (TI CC2530 with CC2591 LNA/PA)

Power Supply/ Rated Operating Voltage Range:	Vmin: 8.0V dc/ Vnom: 12.0V dc / Vmax: 24.0V dc
Lowest-/Highest Frequency used	32kHz / 2155MHz
operating temperature range	-40 ºC to 70 ºC
Test Sample Status:	Pre-production

3.2 Identification of the Equipment under Test (EUT)

EUT #	Serial Number	Sample	HW/SW Version
1	XT4970D SN1	Radiated	XT4970D-001/ XT4970D-01

3.3 Identification of Accessory equipment

AE #	Type	Model	HW Version	SW Version	
1	Power Supply	Protek – 3003B	NA	NA	
2					

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

2015-11-26 –2015-12-18

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 4: General Requirements and Information for the Certification of Radio Apparatus
- RSS-130 – Issue 1: RSS-130 — Mobile Broadband Services (MBS) Equipment Operating in the Frequency Bands 698-756 MHz and 777-787 MHz
- 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 3: 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 under the
FCC ID: GKM-XT4970D and IC ID:10281A-XT4970D.
All testing was performed on the product referred to in Section 3 as EUT.

This product integrates the precertified LTE module : TOBY-L201.

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 uncertainities and there has been no relevant change in rules for these measuremtns since the modular report was issued.
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The module test data can be obtained under the FCC Filing ID: **XPYTOBYL201** and IC Filling: **8595A-TOBYL201.**

5 Summary of Measurement Results

5.1 UMTS FDD II (1900 MHz):

Specifications	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §24.232 (c)(d) RSS-GEN, 6.12 RSS-133, 6.4	RF Output Power	Nominal	UMTS Rel 99, HSDPA, HSUPA	☐	☐	☐	■	Complies
§24.232 (d) RSS-133(6.12)	Peak-to-average Ratio	Nominal	UMTS Rel 99, HSDPA, HSUPA	☐	☐	☐	■	Complies
§2.1055 §24.235 RSS-GEN, 6.11 RSS-133, 6.3	Frequency Stability	Extreme	UMTS Rel 99, HSDPA, HSUPA	☐	☐	☐	■	Complies
§2.1049 RSS-GEN, 6.6	Occupied Bandwidth	Nominal	UMTS Rel 99, HSDPA, HSUPA	☐	☐	☐	■	Complies
§2.1051 §24.238 RSS-GEN, 6.13 RSS-133, 6.5	Band Edge Compliance	Nominal	UMTS Rel 99, HSDPA, HSUPA	☐	☐	☐	■	Complies
§2.1053 §24.238 RSS-GEN, 6.13 RSS-133, 6.5	Unwanted Emissions	Nominal	UMTS Rel 99	■	☐	☐	☐	Complies

Note: According to the module report the highest powers are delivered with the EUT operating in Rel 99 Dual Channel PSK modulation. Thus measurements in this report have been limited to this modulation.
NA= Not Applicable; NP= Not Performed.Measurements compliance documented in modular report

5.2 UMTS FDD V (850 MHz):

Specifications	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §22.913 (b) RSS-GEN, 6.12 RSS-132, 5.4	RF Output Power	Nominal	UMTS Rel 99, HSDPA, HSUPA	☐	☐	☐	■	Complies
RSS-132(5.4)	Peak-to-average Ratio	Extreme	UMTS Rel 99, HSDPA, HSUPA	☐	☐	☐	■	Complies
§2.1055 §22.355 RSS-GEN, 6.11 RSS-132 5.3	Frequency Stability	Extreme	UMTS Rel 99, HSDPA, HSUPA	☐	☐	☐	■	Complies
§2.1049 §22.917(b) RSS-GEN, 6.6	Occupied Bandwidth	Nominal	UMTS Rel 99, HSDPA, HSUPA	☐	☐	☐	■	Complies
§2.1051 §22.917 RSS-GEN, 6.13 RSS-132, 5.5	Band Edge Compliance	Nominal	UMTS Rel 99, HSDPA, HSUPA	☐	☐	☐	■	Complies
§2.1053 §22.917 RSS-GEN, 6.13 RSS-132, 5.5	Unwanted Emissions	Nominal	UMTS Rel 99	■	☐	☐	☐	Complies

Note: According to the module report the highest powers are delivered with the EUT operating in Rel 99 Dual Channel PSK modulation. Thus measurements in this report have been limited to this modulation.
NA= Not Applicable; NP= Not Performed.Measurements compliance documented in modular report

5.3 LTE Band 2 (1900 MHz):

Specifications	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §24.232 (c)(d) RSS-GEN, 6.12 RSS-133, 6.4	RF Output Power	Nominal	QPSK, 16QAM	☐	☐	☐	■	Complies
§24.232 (d) RSS-133(6.12)	Peak-to-average Ratio	Nominal	QPSK, 16QAM	☐	☐	☐	■	Complies
§2.1055 §24.235 RSS-GEN, 6.11 RSS-133, 6.3	Frequency Stability	Extreme	QPSK, 16QAM	☐	☐	☐	■	Complies
§2.1049 RSS-GEN, 6.6	Occupied Bandwidth	Nominal	QPSK, 16QAM	☐	☐	☐	■	Complies
§2.1051 §24.238 RSS-GEN, 6.13 RSS-133, 6.5	Band Edge Compliance	Nominal	QPSK, 16QAM	☐	☐	☐	■	Complies
§2.1053 §24.238 RSS-GEN, 6.13 RSS-133, 6.5	Unwanted Emissions	Nominal	QPSK	■	☐	☐	☐	Complies

Note: According to the module report the highest powers are delivered with the QPSK modulation. Thus measurements in this report have been limited to this modulation.

NA= Not Applicable; NP= Not Performed.Measurements compliance documented in modular report.

5.4 LTE Band 4 (1700 MHz):

Specifications	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §27.50(d)(4) RSS-GEN, 6.12 RSS-139(6.5)	RF Output Power	Nominal	QPSK, 16QAM	☐	☐	☐	■	Complies
§27.50(d)(5) RSS-GEN, 6.12 RSS-139(6.5)	Peak-to-average Ratio	Nominal	QPSK, 16QAM	☐	☐	☐	■	Complies
§2.1055 §27.54 RSS-GEN, 6.11 RSS-139(6.4)	Frequency Stability	Extreme	QPSK, 16QAM	☐	☐	☐	■	Complies
§2.1049 §27.53(g) RSS-Gen, 6.6	Occupied Bandwidth	Nominal	QPSK, 16QAM	☐	☐	☐	■	Complies
§2.1051 §27.53(g) RSS-GEN, 6.13 RSS-139 6.6	Band Edge Compliance	Nominal	QPSK, 16QAM	☐	☐	☐	■	Complies
§2.1053 §27.53(g) RSS-GEN, 6.13 RSS-139 6.6	Unwanted Emissions	Nominal	QPSK	■	☐	☐	☐	Complies

Note: According to the module report the highest powers are delivered with the QPSK modulation. Thus measurements in this report have been limited to this modulation.

NA= Not Applicable; NP= Not Performed.Measurements compliance documented in modular report

5.5 LTE Band 5 (850 MHz):

Specifications	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §22.913 (b) RSS-GEN, 6.12 RSS-132, 5.4	RF Output Power	Nominal	QPSK, 16QAM	☐	☐	☐	■	Complies
RSS-132(5.4)	Peak-to-average Ratio	Extreme	QPSK, 16QAM	☐	☐	☐	■	Complies
§2.1055 §22.355 RSS-GEN, 6.11 RSS-132 5.3	Frequency Stability	Extreme	QPSK, 16QAM	☐	☐	☐	■	Complies
§2.1049 §22.917(b) RSS-GEN, 6.6	Occupied Bandwidth	Nominal	QPSK, 16QAM	☐	☐	☐	■	Complies
§2.1051 §22.917 RSS-GEN, 6.13 RSS-132, 5.5	Band Edge Compliance	Nominal	QPSK, 16QAM	☐	☐	☐	■	Complies
§2.1053 §22.917 RSS-GEN, 6.13 RSS-132, 5.5	Unwanted Emissions	Nominal	QPSK	■	☐	☐	☐	Complies

Note: According to the module report the highest powers are delivered with the QPSK modulation. Thus measurements in this report have been limited to this modulation.

NA= Not Applicable; NP= Not Performed.Measurements compliance documented in modular report

5.6 LTE Band 13 (700 MHz):

Specifications	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §27.50(d)(4) RSS-GEN, 6.12 RSS-130 (4.4)	RF Output Power	Nominal	QPSK, 16QAM	☐	☐	☐	■	Complies
§27.50(d)(5) RSS-GEN, 6.12 RSS-130 (4.4)	Peak-to-average Ratio	Nominal	QPSK, 16QAM	☐	☐	☐	■	Complies
§2.1055 §27.54 RSS-GEN, 6.11 RSS-130 (4.3)	Frequency Stability	Extreme	QPSK, 16QAM	☐	☐	☐	■	Complies
§2.1049 §27.53(g) RSS-Gen, 6.6	Occupied Bandwidth	Nominal	QPSK, 16QAM	☐	☐	☐	■	Complies
§2.1051 §27.53(g) RSS-GEN, 6.13 RSS-130 4.6	Band Edge Compliance	Nominal	QPSK, 16QAM	☐	☐	☐	■	Complies
§2.1053 §27.53(g) RSS-GEN, 6.13 RSS-130 4.6	Unwanted Emissions	Nominal	QPSK	■	☐	☐	☐	Complies

Note: According to the module report the highest powers are delivered with the QPSK modulation. Thus measurements in this report have been limited to this modulation.

NA= Not Applicable; NP= Not Performed.Measurements compliance documented in modular report

5.7 LTE Band 17 (700 MHz):

Specifications	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §27.50(d)(4) RSS-GEN, 6.12 RSS-130 (4.4)	RF Output Power	Nominal	QPSK, 16QAM	☐	☐	☐	■	Complies
§27.50(d)(5) RSS-GEN, 6.12 RSS-130 (4.4)	Peak-to-average Ratio	Nominal	QPSK, 16QAM	☐	☐	☐	■	Complies
§2.1055 §27.54 RSS-GEN, 6.11 RSS-130 (4.3)	Frequency Stability	Extreme	QPSK, 16QAM	☐	☐	☐	■	Complies
§2.1049 §27.53(g) RSS-Gen, 6.6	Occupied Bandwidth	Nominal	QPSK, 16QAM	☐	☐	☐	■	Complies
§2.1051 §27.53(g) RSS-GEN, 6.13 RSS-130 4.6	Band Edge Compliance	Nominal	QPSK, 16QAM	☐	☐	☐	■	Complies
§2.1053 §27.53(g) RSS-GEN, 6.13 RSS-130 4.6	Unwanted Emissions	Nominal	QPSK	■	☐	☐	☐	Complies

Note: According to the module report the highest powers are delivered with the QPSK modulation. Thus measurements in this report have been limited to this modulation.

NA= Not Applicable; NP= Not Performed.Measurements compliance documented in modular report

6 Measurement Uncertainty

For Power Output, Peak-Average Ratio, Band Edge Unwanted Emissions and Radiated Spurious Emissions the measurement uncertainty has been determined to:

	Uncertainty in dB radiated <30MHz	Uncertainty in dB radiated 30MHz - 1GHz	Uncertainty in dB radiated 1GHz - 3GHz	Uncertainty in dB radiated > 3GHz	Uncertainty in dB Conducted measurement
standard deviation k=1	2.12	2.19	2.54	0.87	0.61
95% confidence interval in dB	4.16	4.28	4.98	1.71	1.20
95% confidence interval in dB in delta to Result (rounded up to next decimal point)	+/- 2.1 dB	+/- 2.2 dB	+/- 2.5dB	+/- 0.9dB	+/- 0.7dB

Assesment from 3-12-2014 including contributions (as applicable) for NSA of chamber, VSWR of chamber, Uncertainty contribution of the antennas, Uncertainty contributions of FSV40, Uncertainty contribution of non-conducting table and all mismatch uncertainties of the involved equipment.

7 Spurious Emissions Radiated

7.1 References

FCC: CFR Part 2.1053, CFR Part 22.917, CFR Part 24.238, CFR Part 27.53

7.2 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 6.13: 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.

7.3 Limits

7.3.1 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.

7.3.2 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.

7.3.3 FCC27.53 (g)

(g) For operations in the 1710–1755 MHz and 2110–2155 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least 43 + 10 log10 (P) dB.
(1) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. 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.

7.3.4 RSS-130 Section 4.6.1

The power of any unwanted emissions in any 100 kHz bandwidth on any frequency outside the frequency range(s) within which the equipment is designed to operate shall be attenuated below the transmitter power, P (dBW), by at least 43 + 10 log10 p (watts), dB. However, in the 100 kHz band immediately outside the equipment's operating frequency range, a resolution bandwidth of 30 kHz may be employed.
(a) The power of any unwanted emissions in any 6.25 kHz bandwidth for all frequencies between 763-775 MHz and 793-806 MHz shall be attenuated below the transmitter power, P (dBW), by at least:
(i) 76 + 10 log10 p(watts), dB, for base and fixed equipment, and
(ii) 65 + 10 log10 p(watts), dB, for mobile and portable equipment.
(b) The e.i.r.p. in the band 1559-1610 MHz shall not exceed -70 dBW/MHz for wideband signal and -80 dBW for discrete emission with bandwidth less than 700 Hz.

7.3.5 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.

7.3.6 RSS-139 Section 6.6

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.

7.4 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)

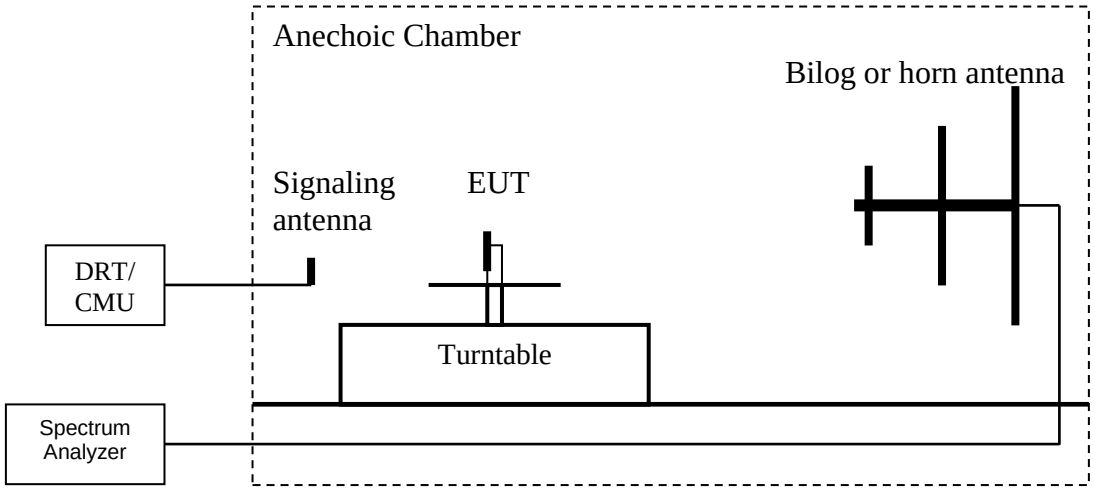
Example:

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

7.5 Test Conditions:

Tnom: 20ºC; Vnom: 3.6 V

7.6 Setup and deviations



Measurements setup was according to ANSI C63.4 – 2014. Final measurements have been performed according to the substitution method described in **TIA-603C 2004- 2.2.12 Unwanted emissions: Radiated Spurious Emissions**

Deviating from the standard measurements have been performed only on mid channel. Other channels will be measured only if an emission with less than 20dB margin to the limit is identified on mid channel.

Deviating from the standard measurements have only been performed in the range from 30MHz to 18GHz. Frequencies below 30MHz and above 18GHz will be measured if any emission with less than 20dB margin is identified between 30MHz and 18GHz.

For LTE the configuration with 1 RB at 10MHz channels has been chosen as a worst case configuration because it delivered the highest powers in the modular report for the TOBY L201 module.
Highest powers and smallest possible bandwidtch also deliver highest power density.

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.

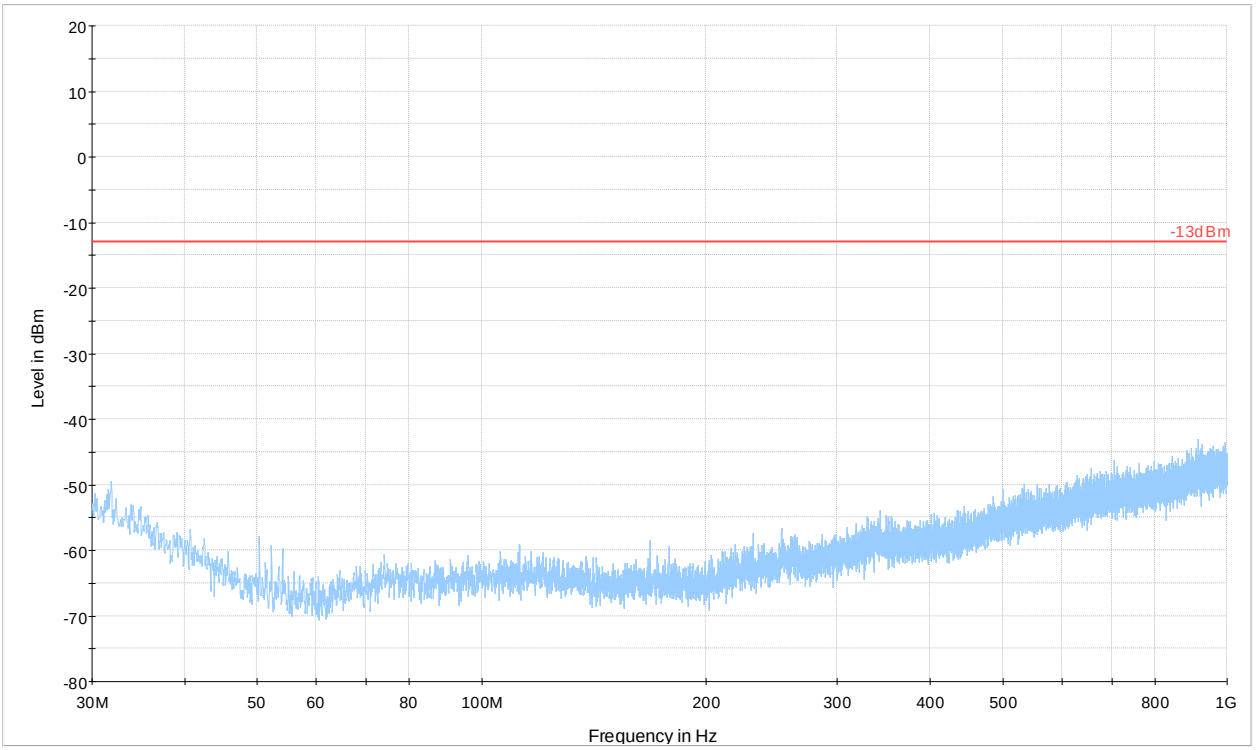
Unless mentioned otherwise, the emission signals above the limit line in the plots are from the carrier

7.7 Test Results

7.7.1 Spurious Emission FDD II mid channel :

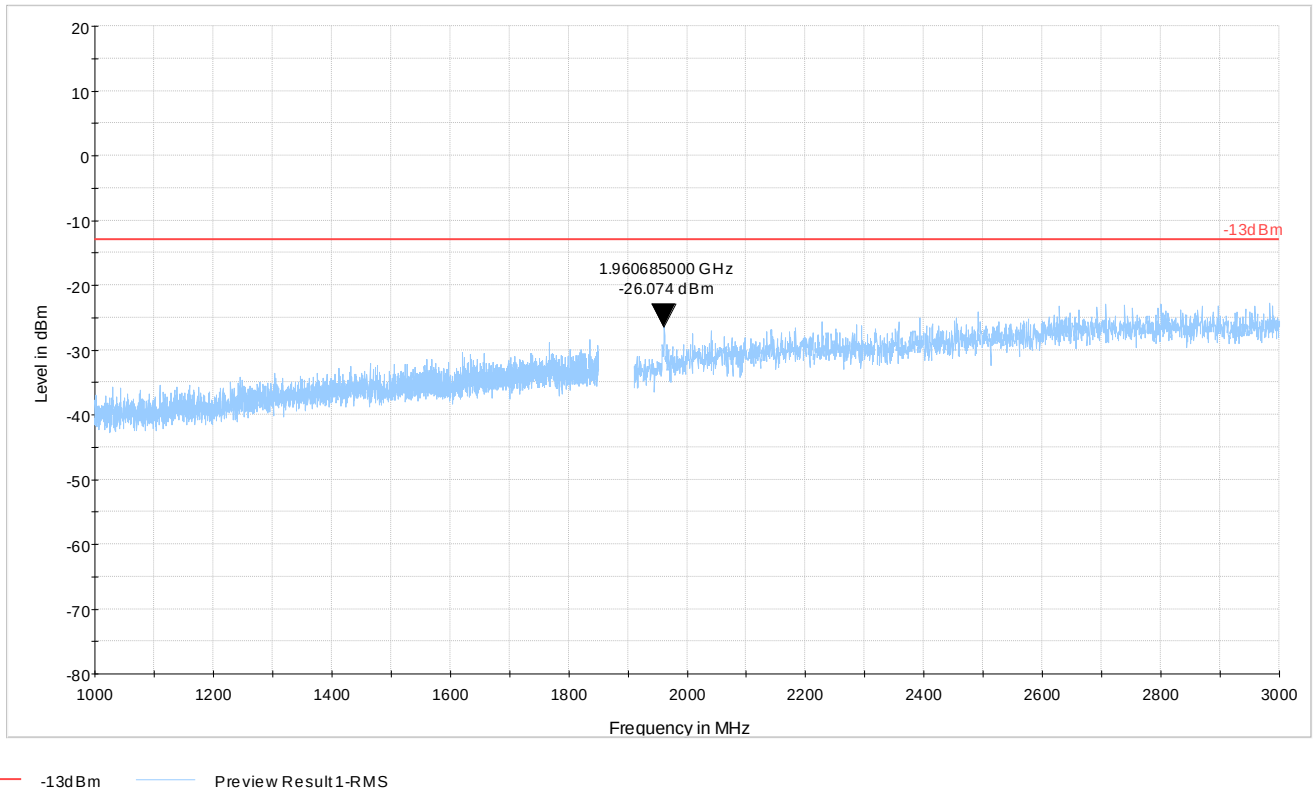
7.7.1.1 30MHz to 1GHz

FDD II (1850 MHz – 1910 MHz) -Modulation: Dual channel QPSK		
Mode: WCDMA	**30MHz to 1GHz**	**RMS**



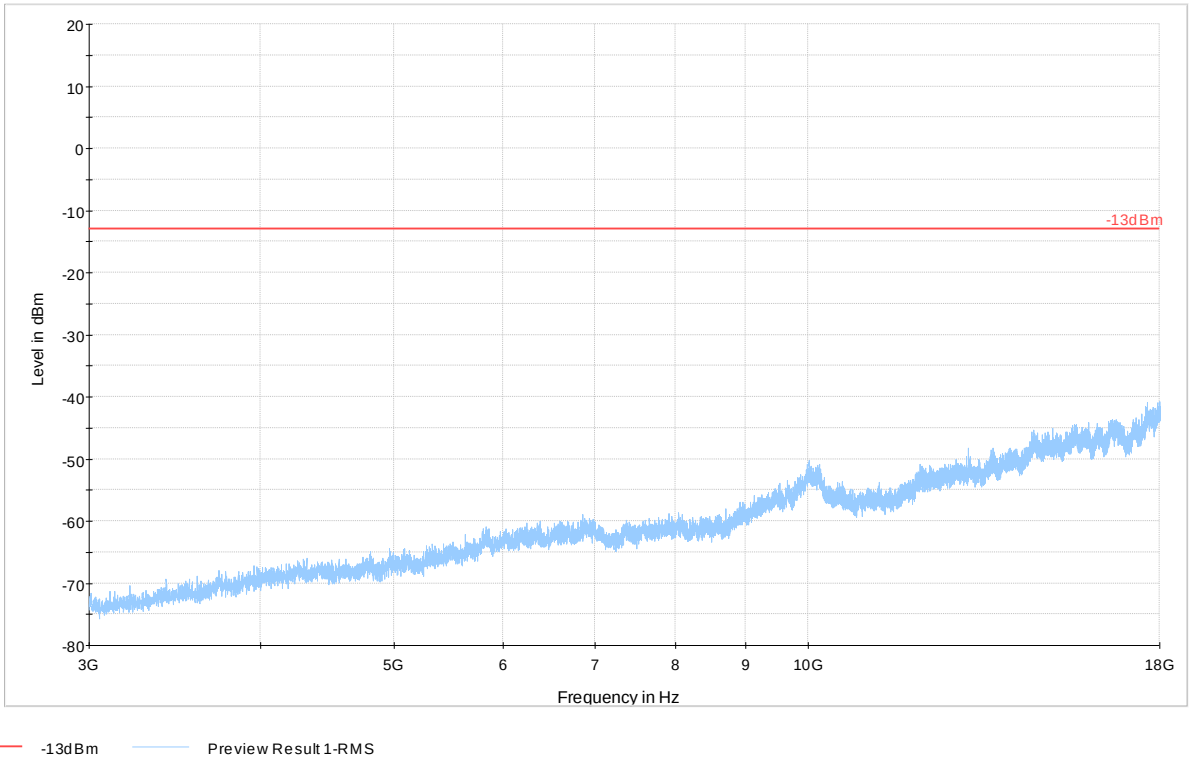
7.7.1.2 1GHz to 3GHz

FDD II (1850 MHz – 1910 MHz) -Modulation: Dual channel QPSK		
Mode: WCDMA	**1GHz to 3GHz**	**RMS**



7.7.1.3 3GHz to 18GHz

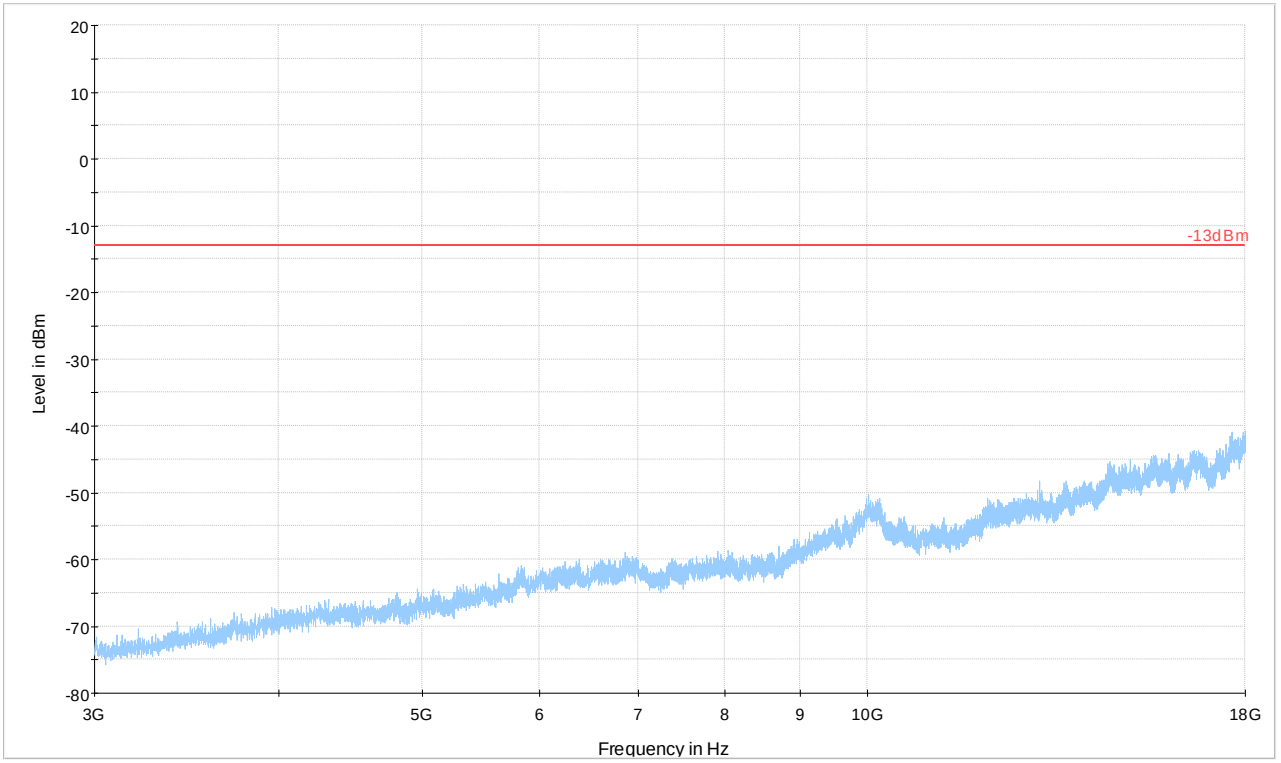
FDD II (1850 MHz – 1910 MHz) -Modulation: Dual channel QPSK		
Mode: WCDMA	**3GHz to 18GHz**	**RMS**



7.7.2 Spurious Emission FDD V mid channel:

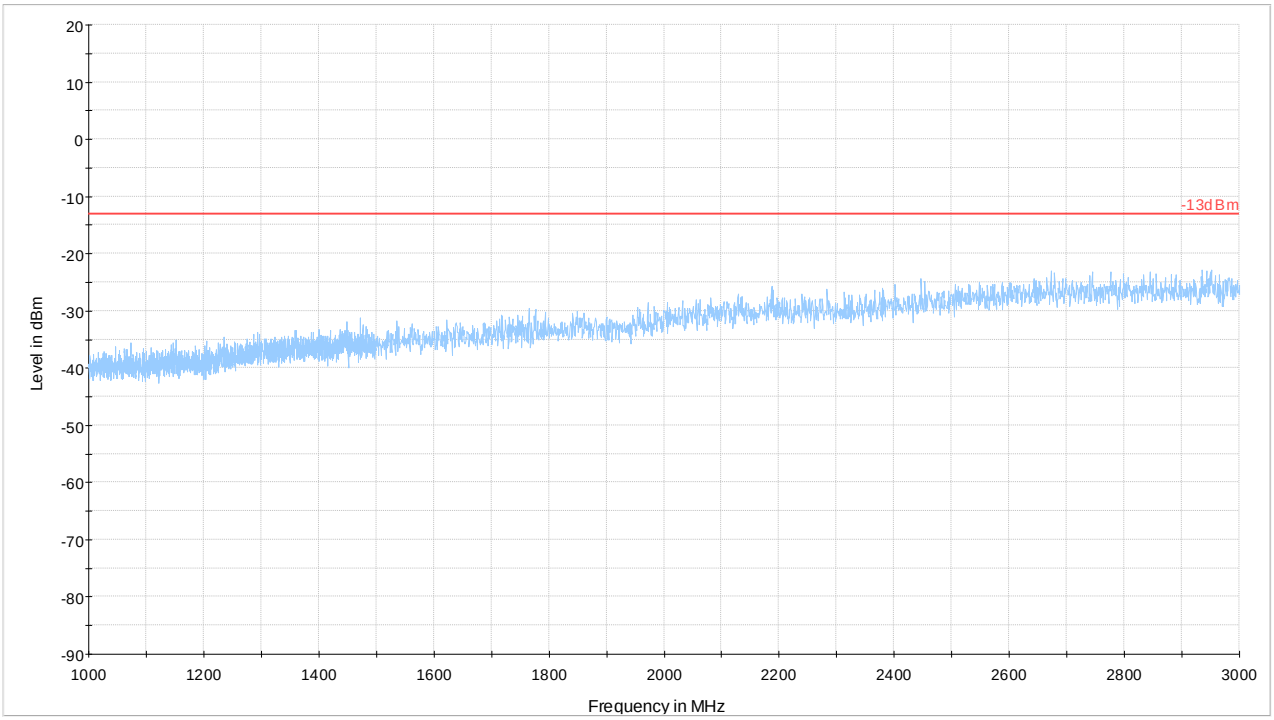
7.7.2.1 30MHz to 1GHz

FDD V (824 MHz – 849 MHz) -Modulation: Dual channel QPSK		
Mode: WCDMA	**30MHz to 1GHz**	**RMS**



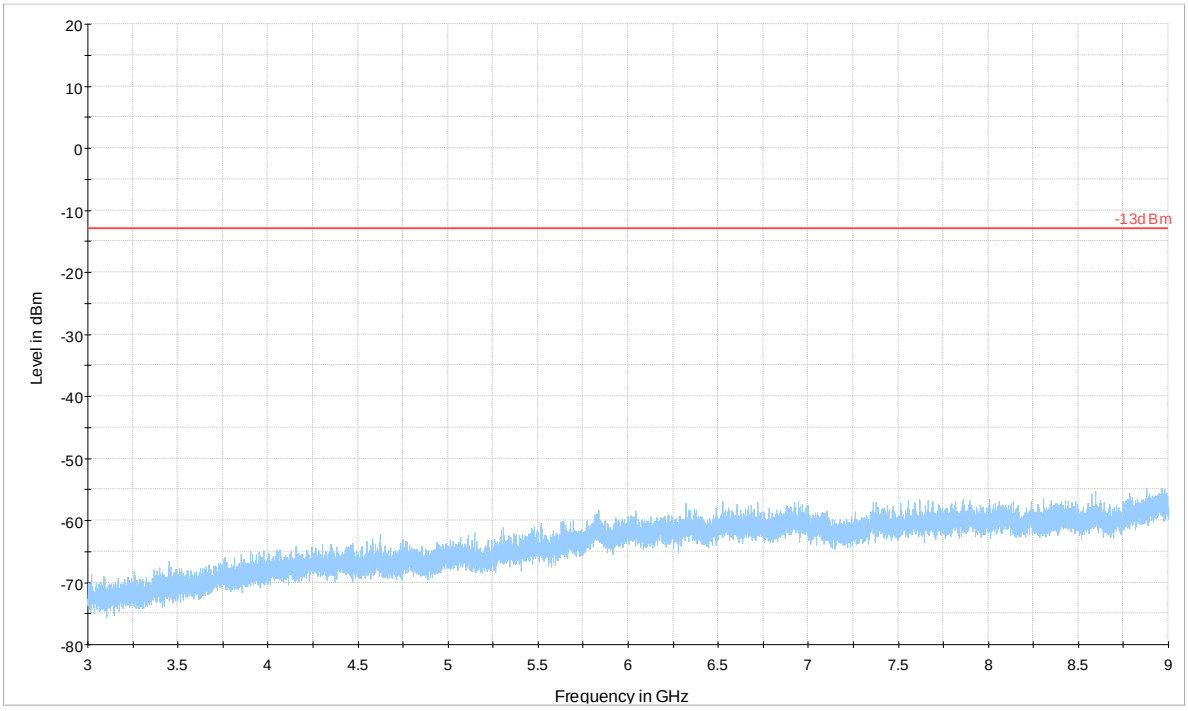
7.7.2.2 1GHz to 3GHz

FDD V (824 MHz – 849 MHz) -Modulation: SC-FDMA		
Mode: WCDMA	**1GHz to 3GHz**	**RMS**



7.7.2.3 3GHz to 9GHz

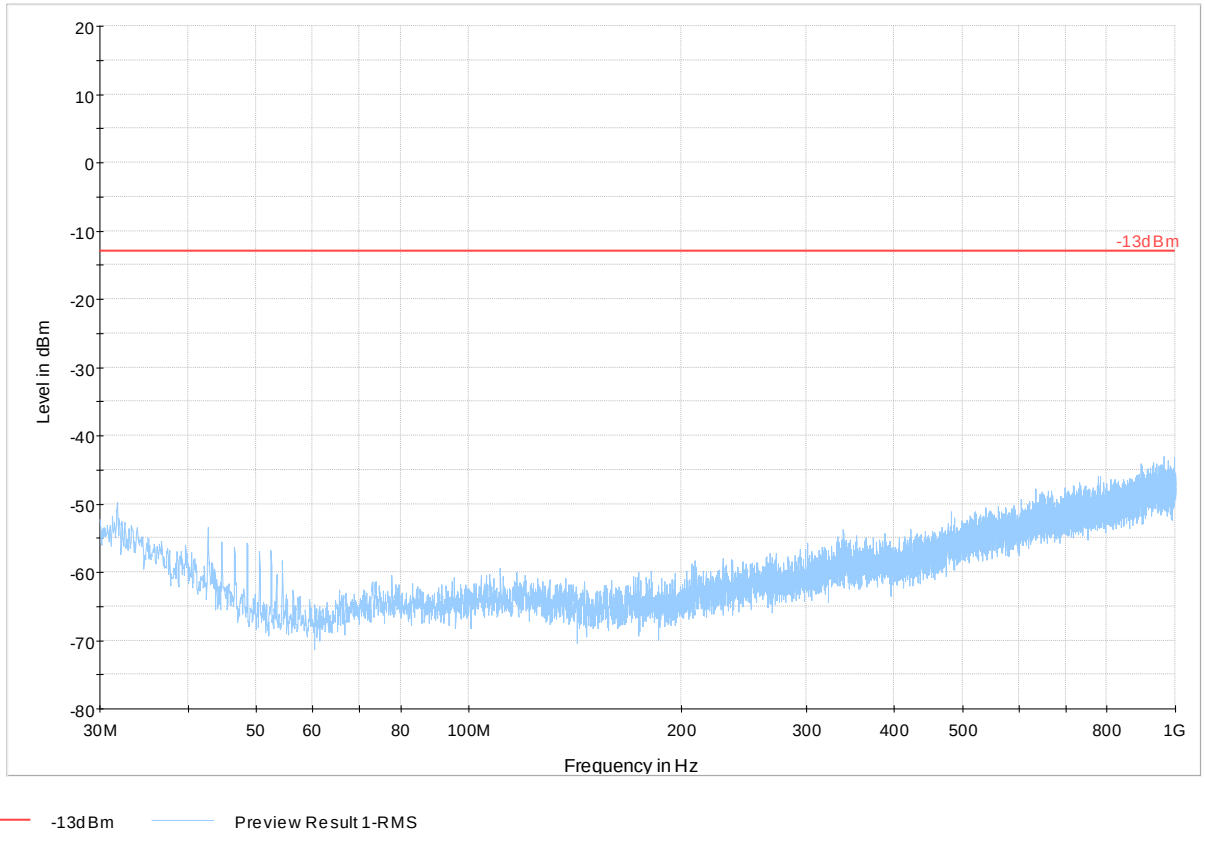
FDD V (824 MHz – 849 MHz) -Modulation: SC-FDMA		
Mode: WCDMA	**3GHz to 9 GHz**	**RMS**



7.7.3 Spurious Emission LTE Band 2 mid channel SC-FDMA with QPSK:

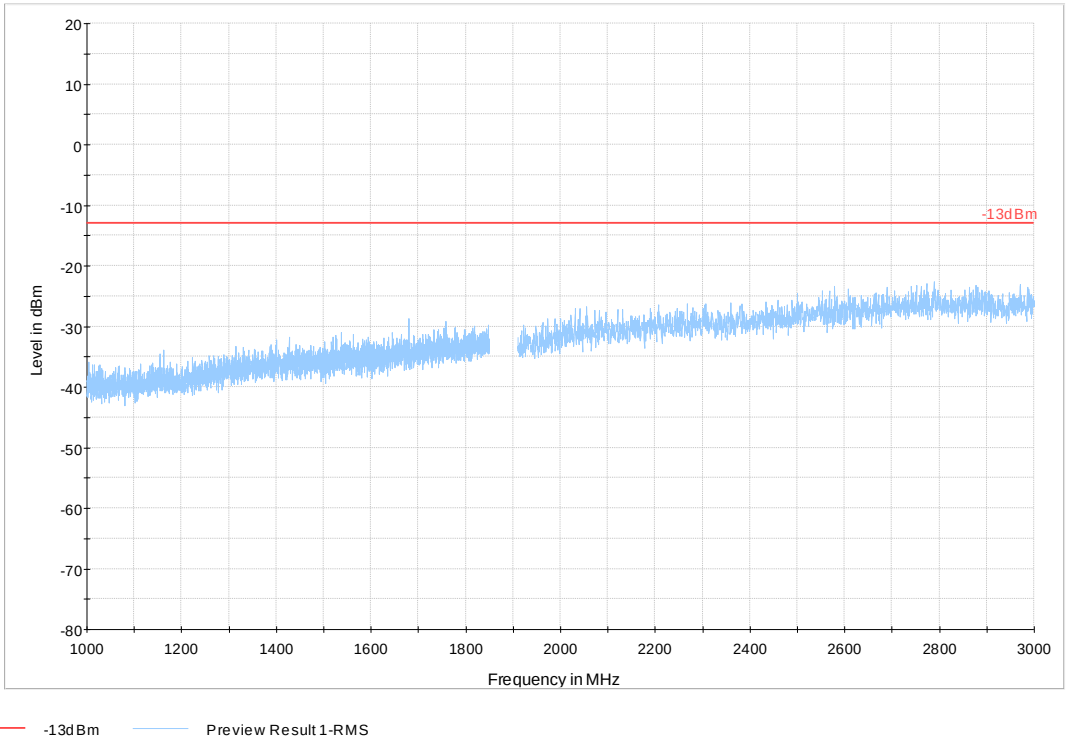
7.7.3.1 30MHz to 1GHz

LTE Band 2 (1850 MHz – 1910 MHz) -Modulation: SC-FDMA with QPSK		
RB Size = 1	**RB Offset** = 12	**BW (MHz)** = 10



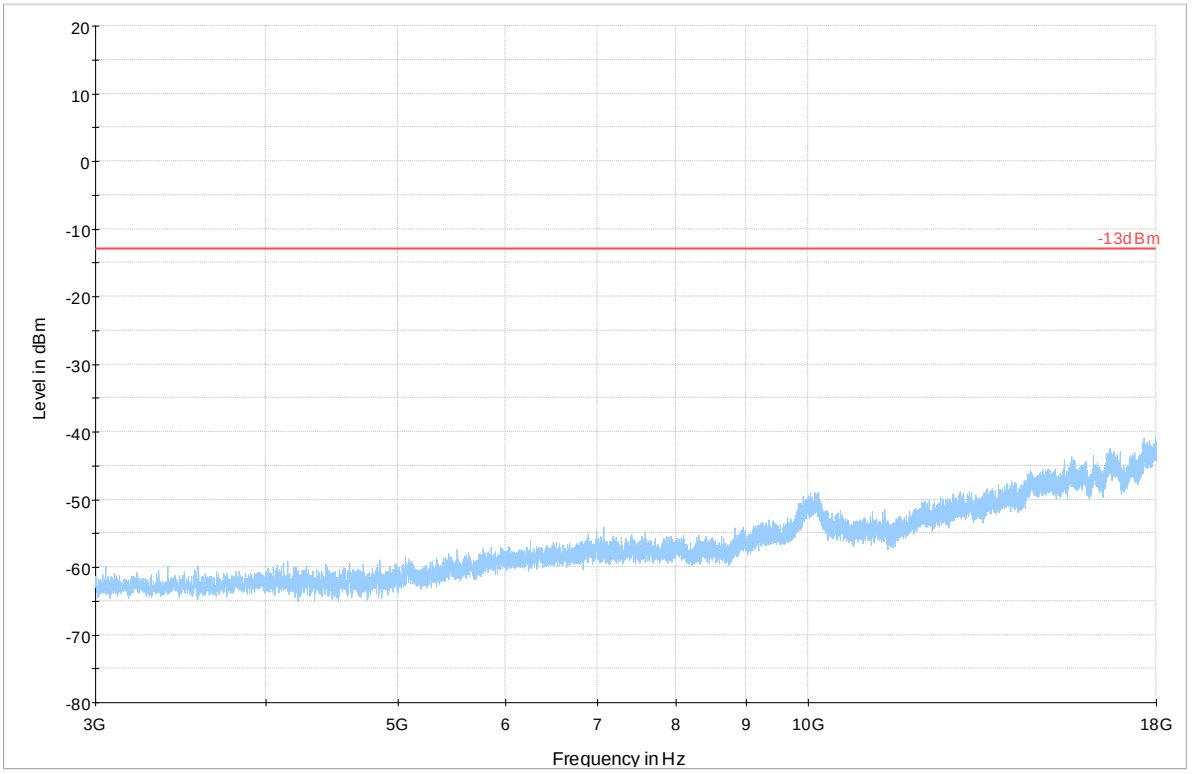
7.7.3.2 1GHz to 3GHz

LTE Band 2 (1850 MHz – 1910 MHz) -Modulation: SC-FDMA with QPSK		
RB Size = 1	**RB Offset** = 12	**BW (MHz)** = 10



7.7.3.3 3GHz to 18GHz

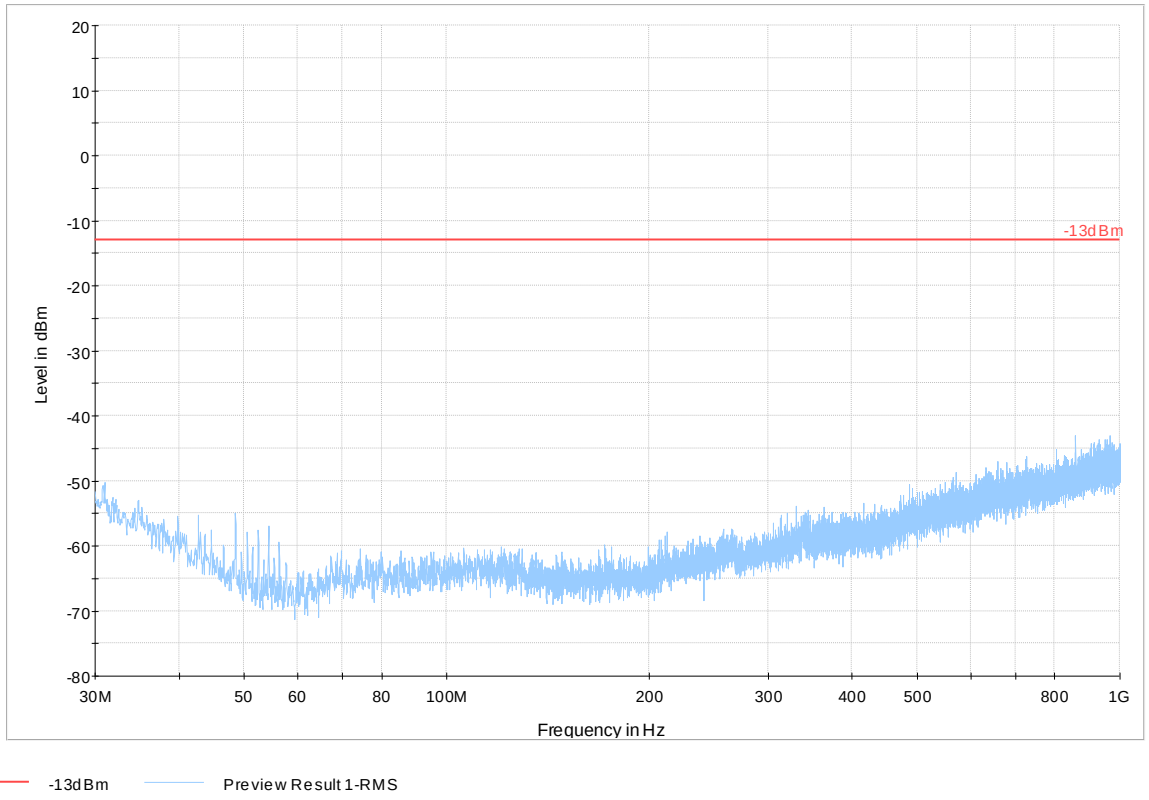
LTE Band 2 (1850 MHz – 1910 MHz) -Modulation: SC-FDMA with QPSK		
RB Size = 1	**RB Offset** = 12	**BW (MHz)** = 10



7.7.4 Spurious Emission LTE Band 4 mid channel SC-FDMA with QPSK:

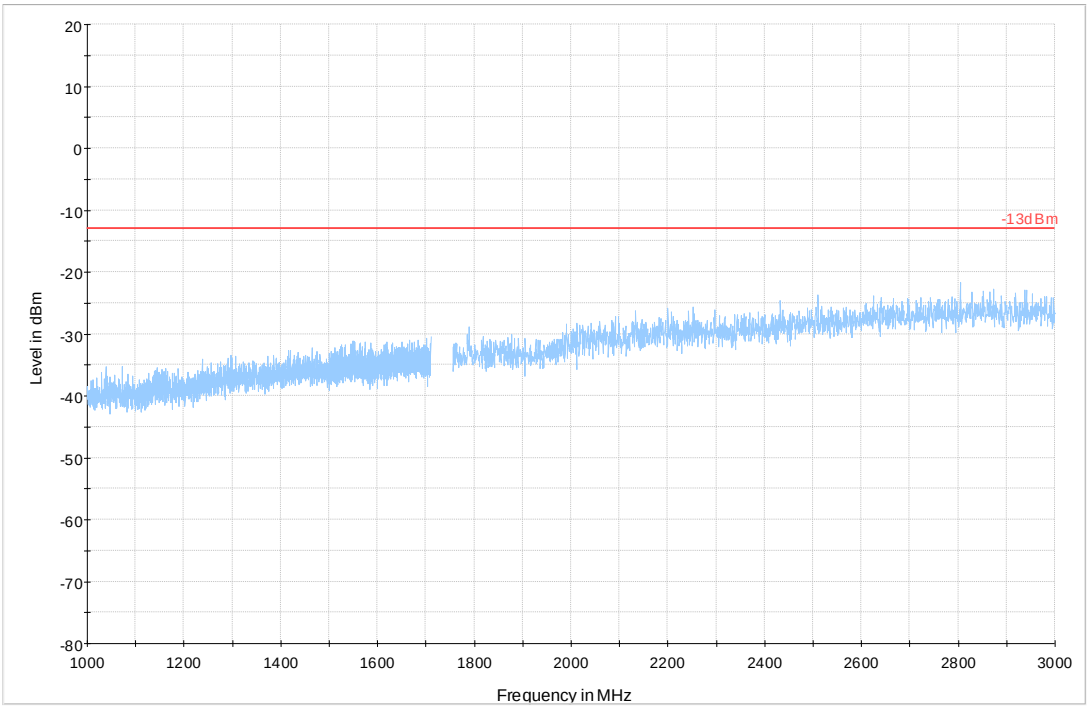
7.7.4.1 30MHz to 1GHz

LTE Band 4 (1710-1755 MHz) -Modulation: SC-FDMA with QPSK		
RB Size = 1	**RB Offset** = 12	**BW (MHz)** = 10



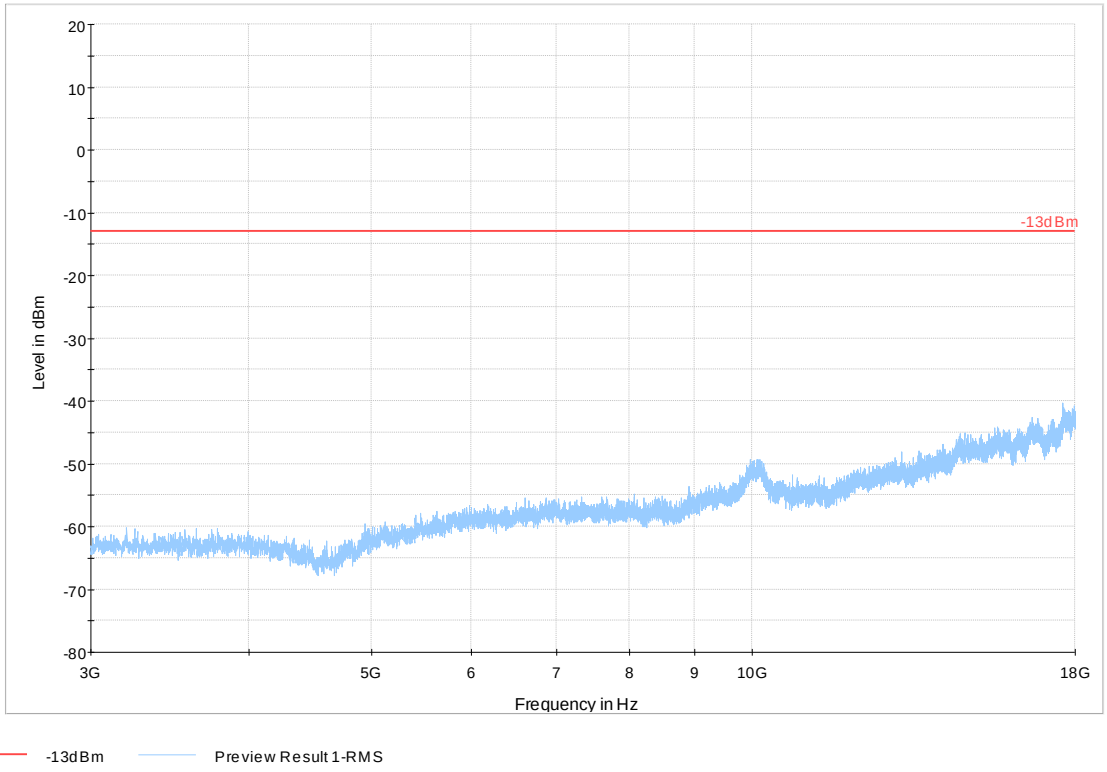
7.7.4.2 1GHz to 3GHz

LTE Band 4 (1710 MHz – 1755 MHz) -Modulation: SC-FDMA with QPSK		
RB Size = 1	**RB Offset** = 12	**BW (MHz)** = 10



7.7.4.3 3GHz to 18GHz

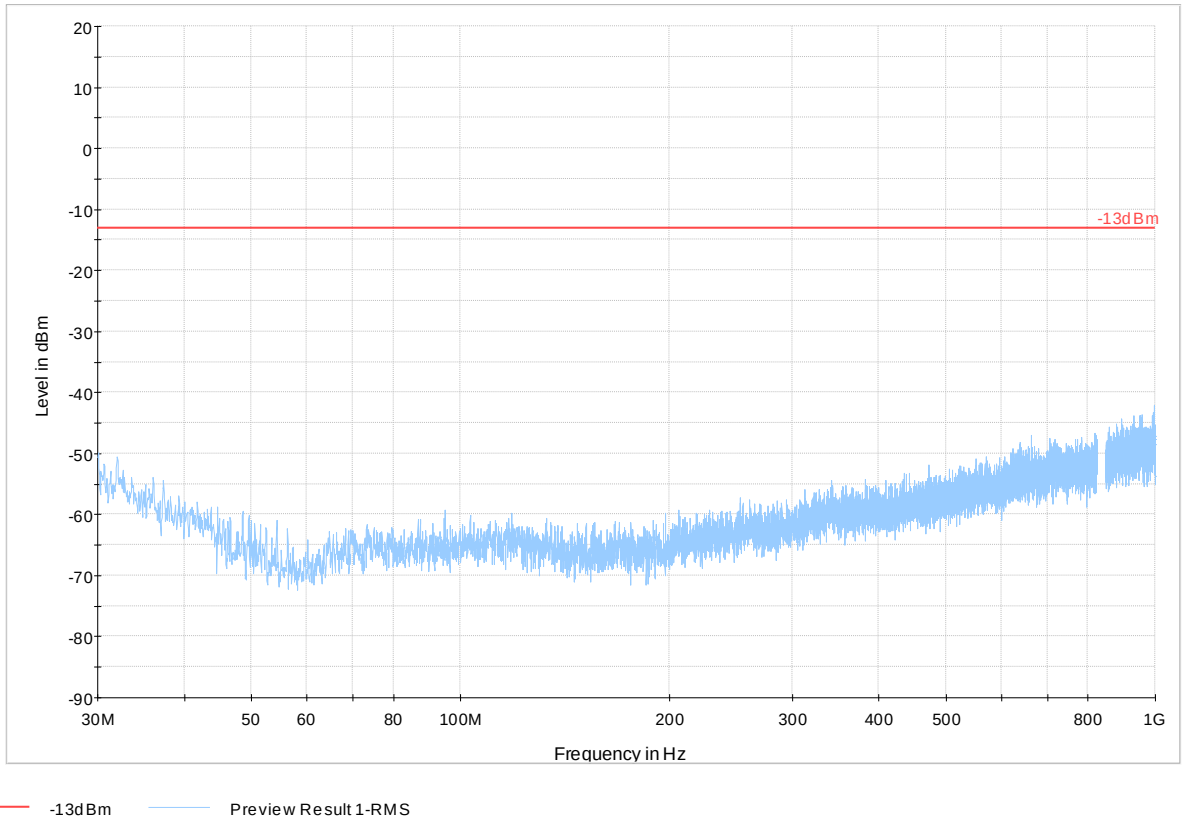
LTE Band 4 (1710 MHz – 1755 MHz) -Modulation: SC-FDMA with QPSK		
RB Size = 1	**RB Offset** = 12	**BW (MHz)** = 10



7.7.5 Spurious Emissions LTE Band 5 mid channel SC-FDMA with QPSK:

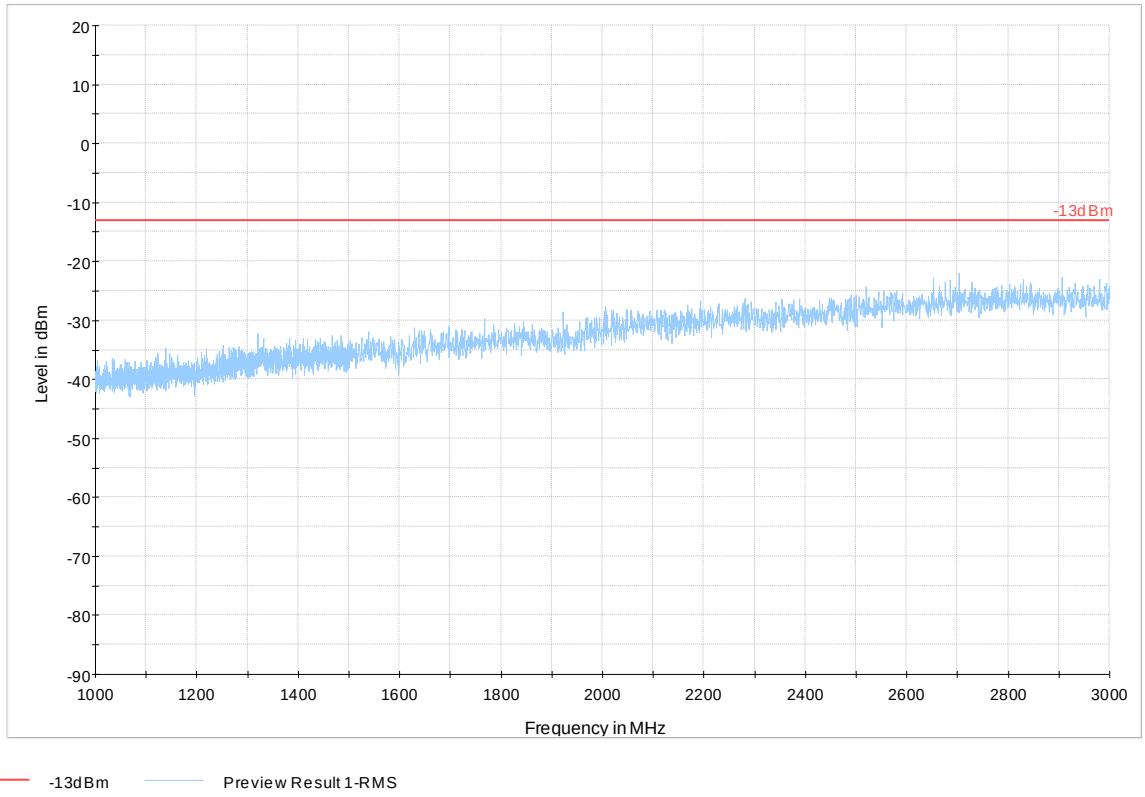
7.7.5.1 30MHz to 1GHz

LTE Band 5 (824 MHz – 849 MHz) -Modulation: SC-FDMA with QPSK		
RB Size = 1	**RB Offset** = 12	**BW (MHz)** = 10



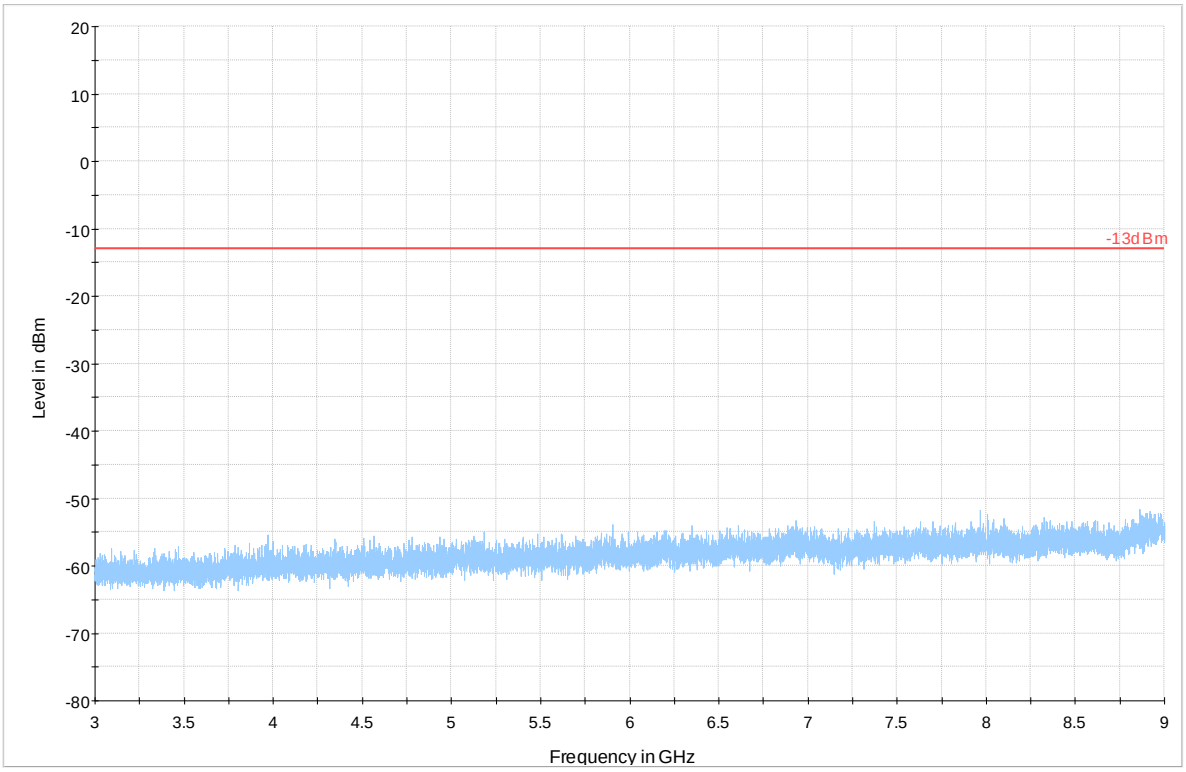
7.7.5.2 1GHz to 3GHz

LTE Band 5 (824 MHz – 849 MHz) -Modulation: SC-FDMA with QPSK		
RB Size = 1	**RB Offset** = 12	**BW (MHz)** = 10



7.7.5.3 3GHz to 9GHz

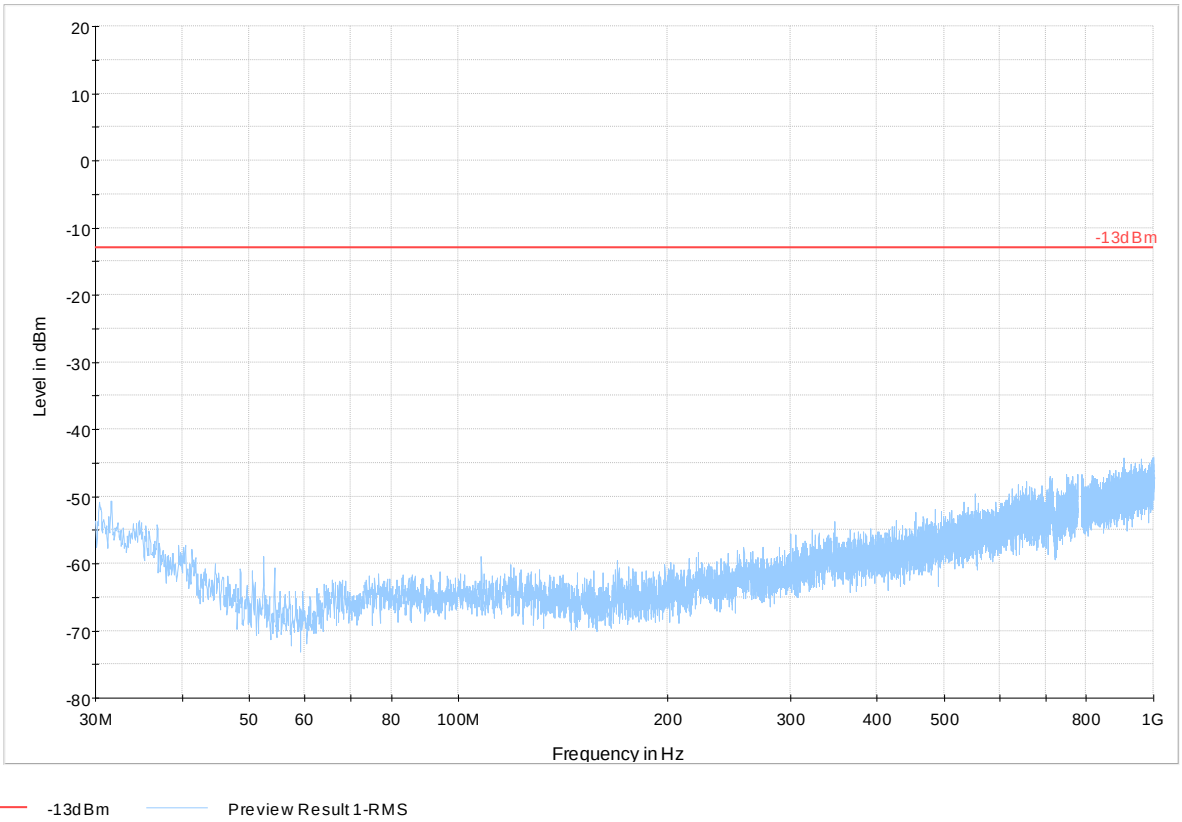
LTE Band 5 (824 MHz – 849 MHz) -Modulation: SC-FDMA with QPSK		
RB Size = 1	**RB Offset** = 12	**BW (MHz)** = 10



7.7.6 Spurious Emission LTE Band 13 mid channel SC-FDMA with QPSK:

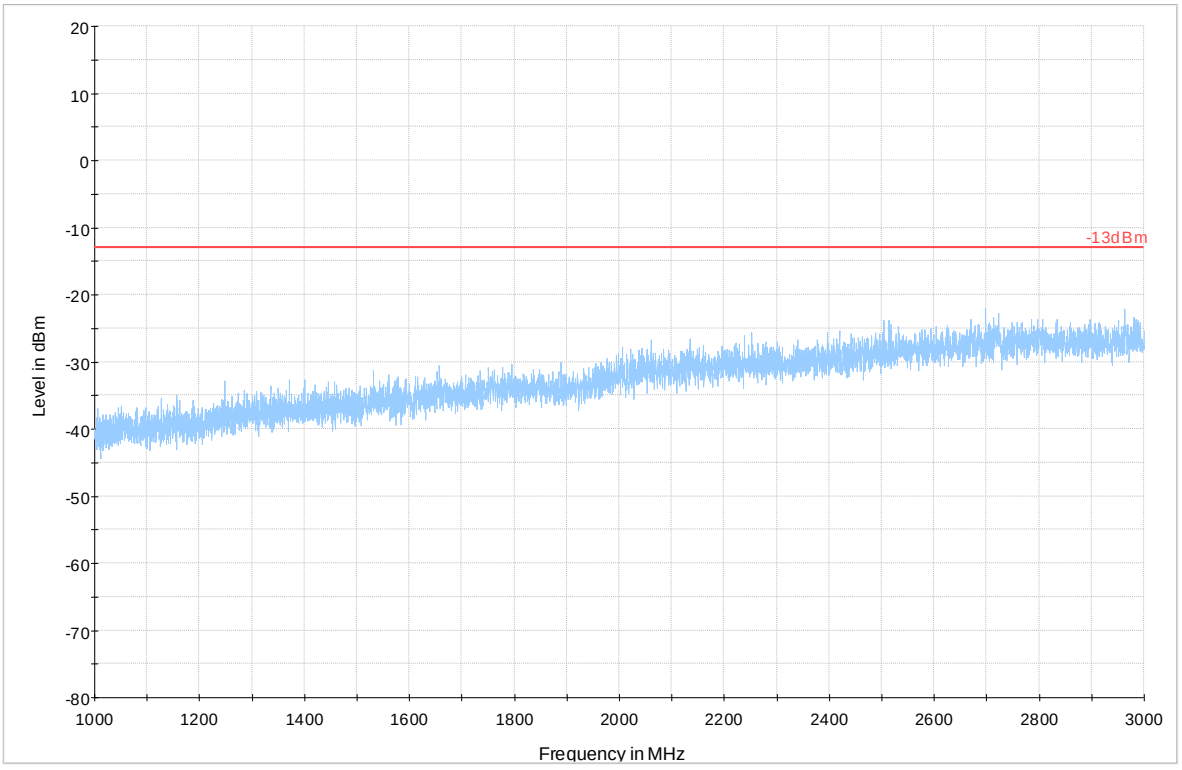
7.7.6.1 30MHz to 1GHz

LTE Band 13 (777 MHz – 787 MHz) -Modulation: SC-FDMA with QPSK		
RB Size = 1	**RB Offset** = 12	**BW (MHz)** = 10



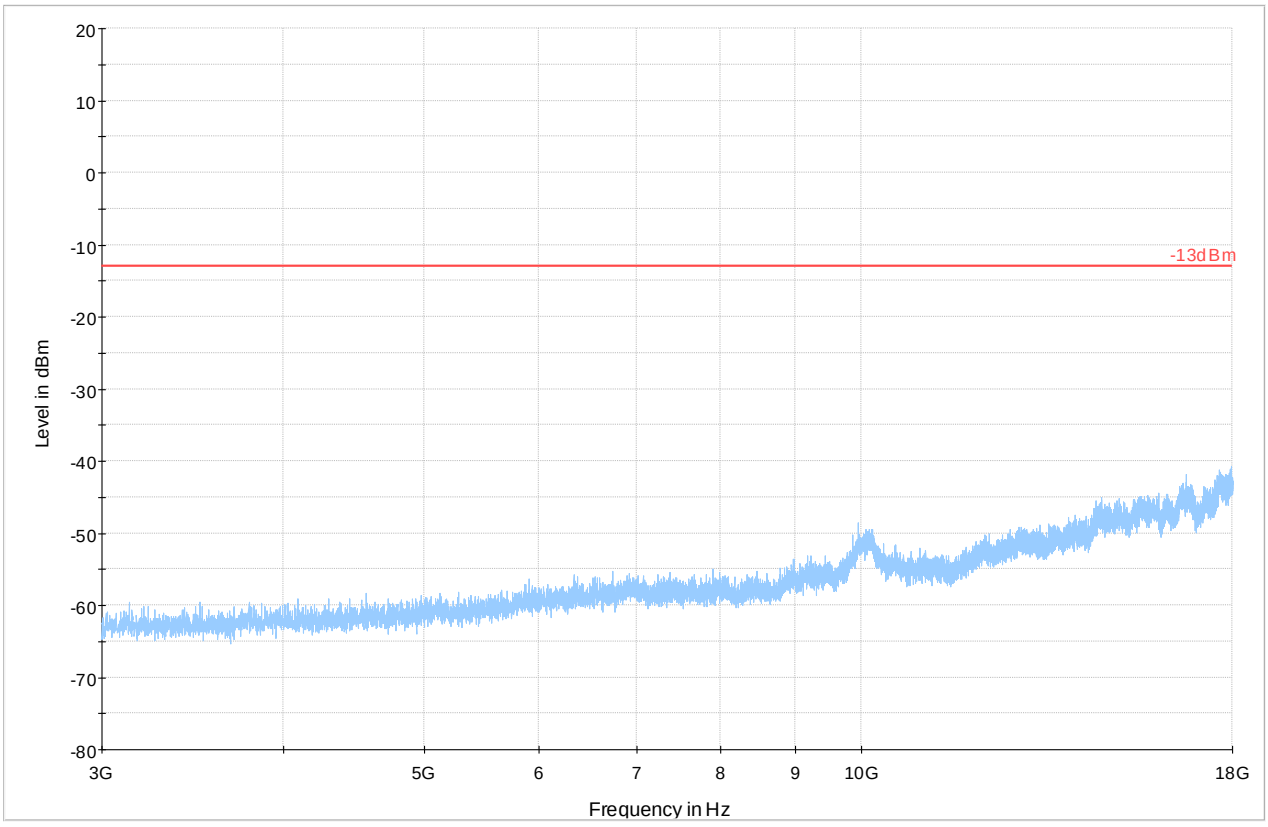
7.7.6.2 1GHz to 3GHz

LTE Band 13 (777 MHz – 787 MHz) -Modulation: SC-FDMA with QPSK		
RB Size = 1	**RB Offset** = 12	**BW (MHz)** = 10



7.7.6.3 3GHz to 18GHz

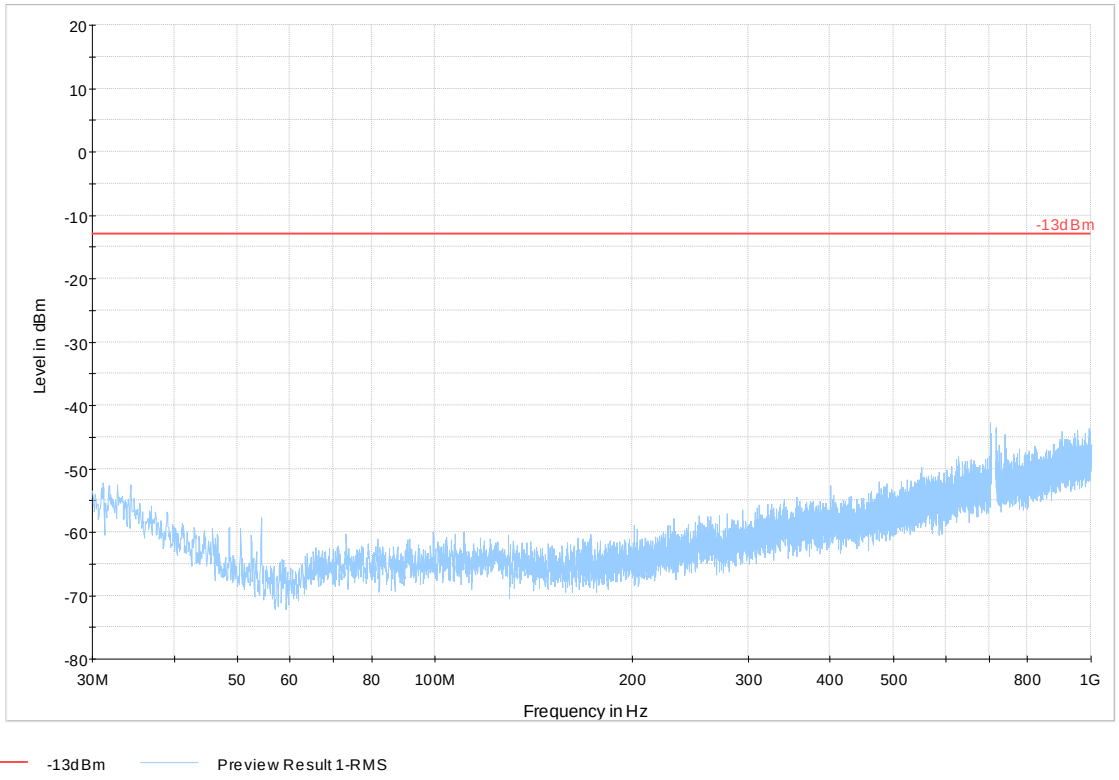
LTE Band 13 (777 MHz – 787 MHz) -Modulation: SC-FDMA with QPSK		
RB Size = 1	**RB Offset** = 12	**BW (MHz)** = 10



7.7.7 Spurious Emission LTE Band 17 mid channel SC-FDMA with QPSK:

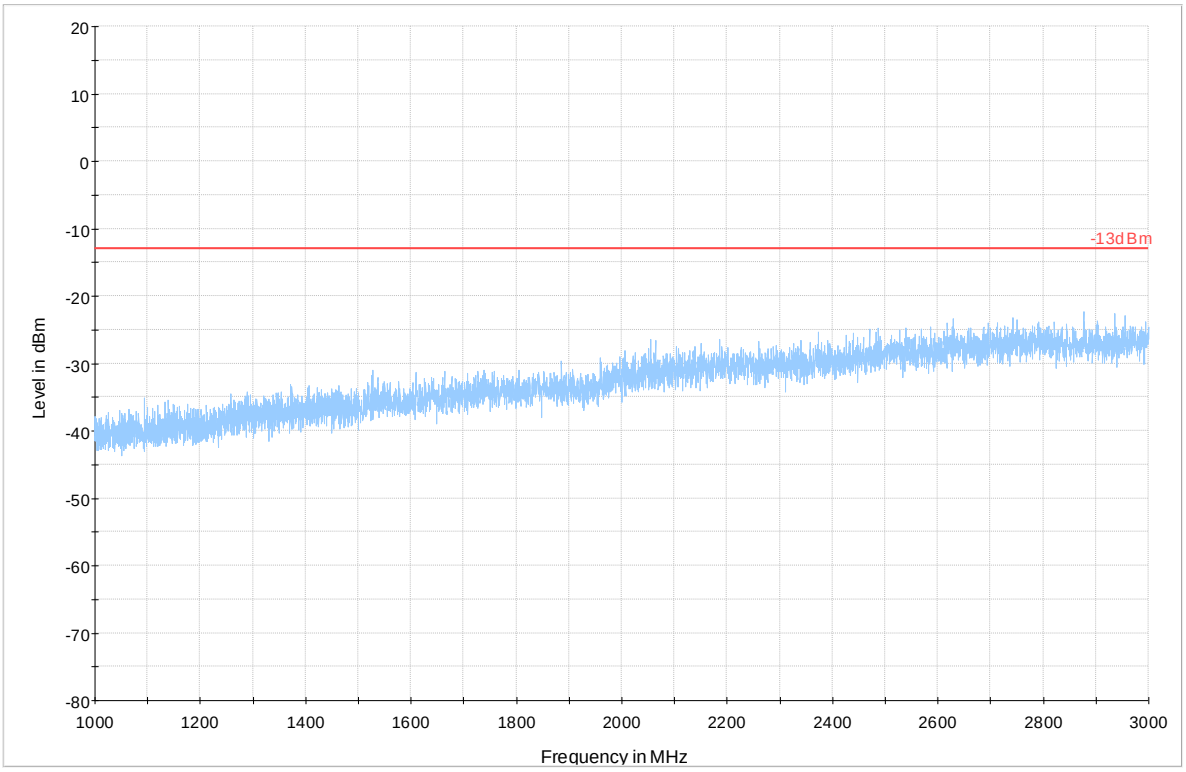
7.7.7.1 30MHz to 1GHz

LTE Band 17(704 MHz – 716 MHz) -Modulation: SC-FDMA with QPSK		
RB Size = 1	**RB Offset** = 12	**BW (MHz)** = 10



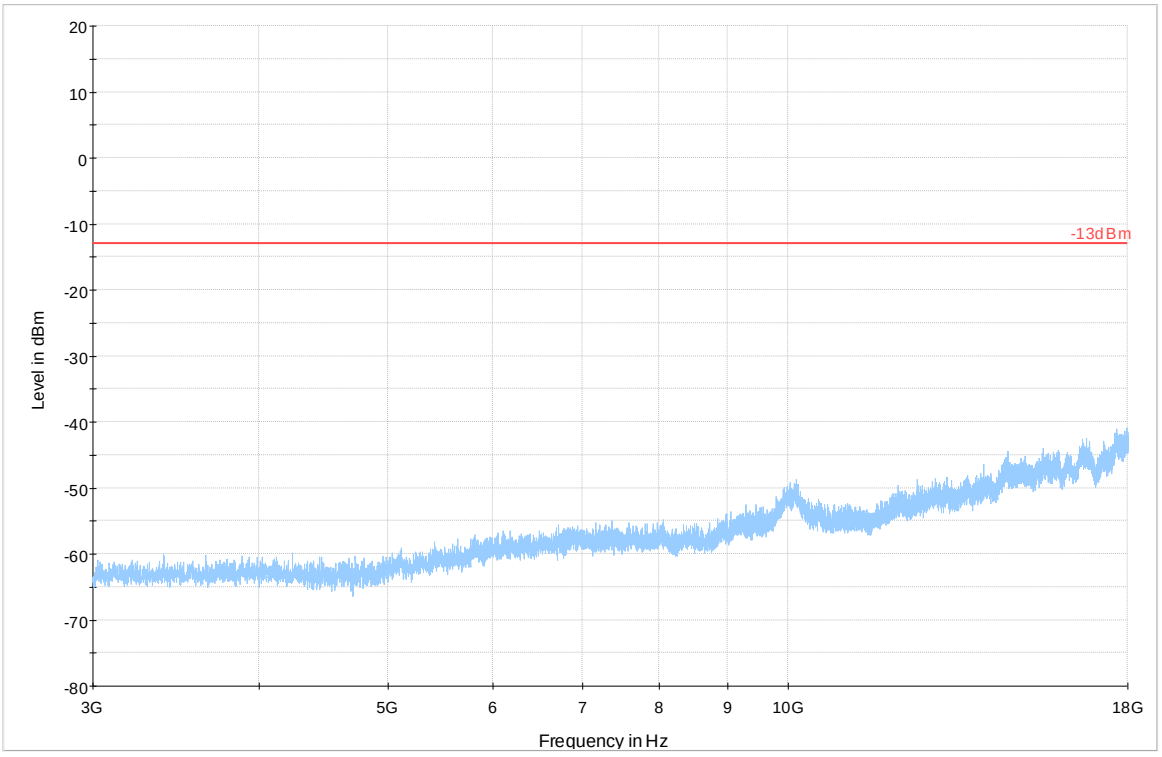
7.7.7.2 1GHz to 3GHz

LTE Band 17(704 MHz – 716 MHz) -Modulation: SC-FDMA with QPSK		
Measurement results		
RB Size = 1	**RB Offset** = 12	**BW (MHz)** = 10



7.7.7.3 3GHz to 18GHz

LTE Band 17 (704 MHz – 716 MHz) -Modulation: SC-FDMA with QPSK		
RB Size = 1	**RB Offset** = 12	**BW (MHz)** = 10



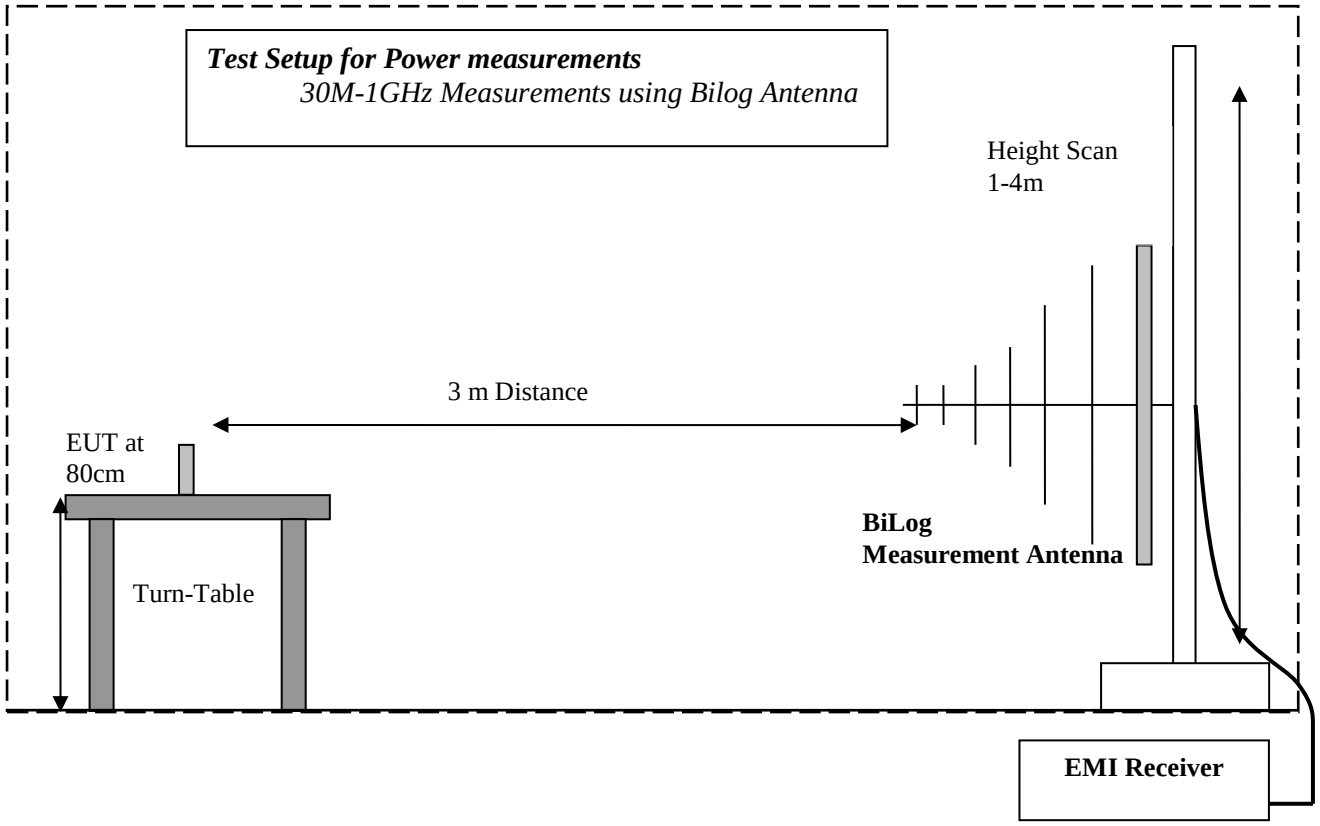
8 Test Equipment and Ancillaries used for tests

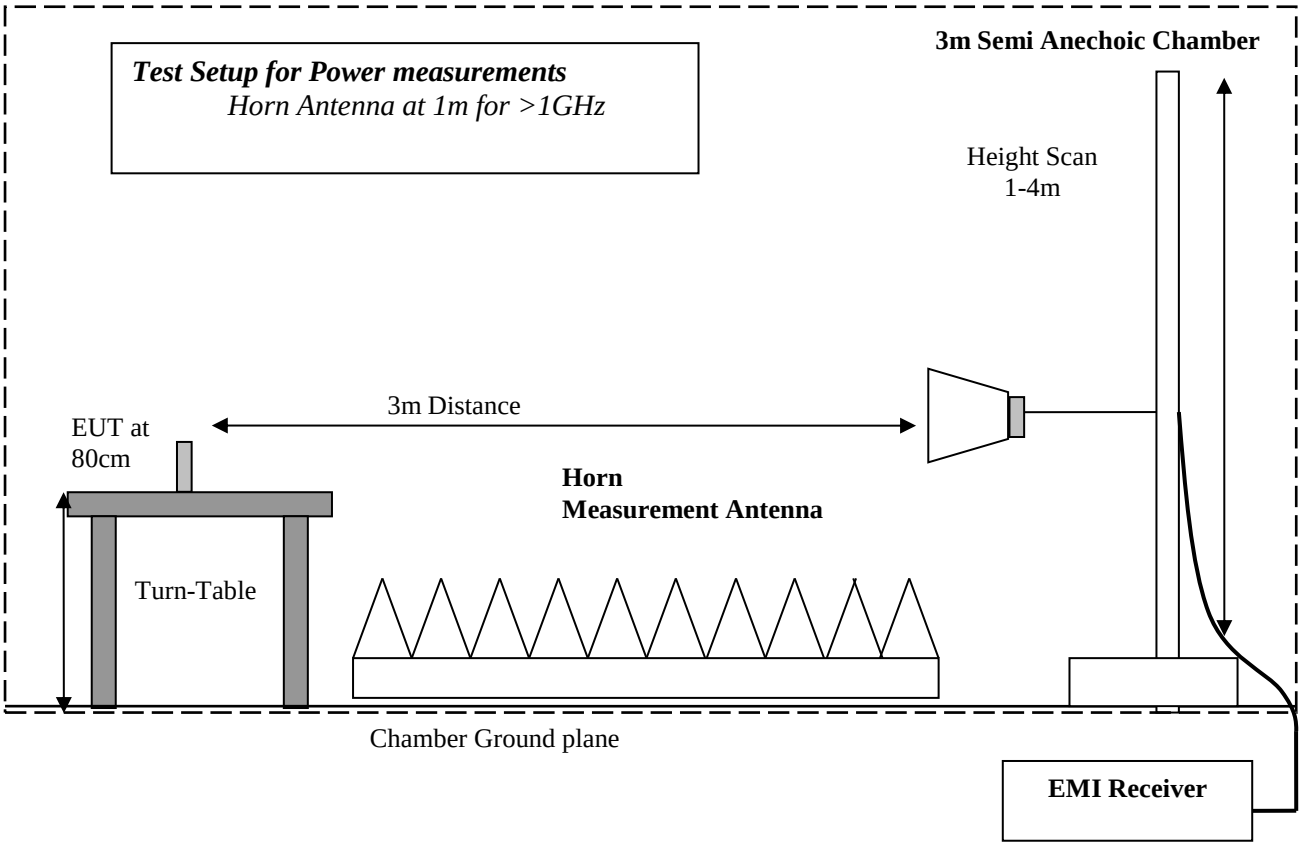
8.1 San Diego EMC Lab used for radiated emissions

Equipment Name	Manufacturer	Type/Model	Serial No.	Cal Date	Cal Interval	Next cal date
3m Semi- Anechoic Chamber:						
Spectrum Analyzer	Rohde und Schwarz	FSV 40	101022	7/2014	3 years	7/2017
Receiver	Rohde und Schwarz	ESR3	101663	2/2013	3 years	2/2016
LISN	Rohde und Schwarz	ESV 216	101129	1/2013	3 years	1/2016
Radiocommunication Tester	Rohde and Schwarz	CMU 200	121672	7/2013	2 years	7/2015
Log Periodic Antenna	Rohde and Schwarz	HL 050	100515	4/2013	3 year	4/2016
Ultralog Antenna	Rohde and Schwarz	HL 562	100495	5/2015	3 year	5/2018
Double-ridge Horn Antenna (1G-18G)	ETS-Lindgren	3117-PA	00167061	7/2014	3 year	7/2017
Double-ridge Horn Antenna (18G-40G)	ETS-Lindgren	3116C-PA	00166821	7/2014	3 year	7/2017
Loop Antenna	ETS-Lindgren	6512	00164698	7/2014	3 year	7/2017
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		
Turntable	Maturo	1.5 SI	TT 1.5SI/204/607 0910	n/a		
Compact antenna Mast	Maturo	CAM 4.0-P	CAM4.0-P/067/600091 0	n/a		
Multiple Control Unit	Maturo	MCU	2140910	n/a		

Calibration status valid at the time of testing.
Equipment used meets the measurement uncertainty requirements as required per applicable standards for 95% confidence levels.
Calibration due dates, unless defined specifically, falls on the last day of the month.
Items indicated “N/A” for cal status either do not specifically require calibration or is internally characterized before use.

9 Test Setup Diagrams




Test Setup for Power measurements
Horn Antenna at 1m for >1GHz
3m Semi Anechoic Chamber
Height Scan
1-4m
3m Distance
EUT at
80cm
Horn
Measurement Antenna
Turn-Table
Chamber Ground plane
EMI Receiver

10 Revision History

Date	Report Name	Changes to report	Report prepared by
01-22-2016	EMC_XIRGO-111-15001_FCC222427_v1.0.docx	First release	T. Planinac
02-10-2016	EMC_XIRGO-111-15001_FCC222427_v1.1.docx	added extended RSE scans to 18GHz	F. Engert
02-10-2016	EMC_XIRGO-111-15001_FCC222427_v1.2.docx	Correct LTE uplink modulation. Add EIRP measurements.	F. Engert
02-19-2016	EMC_XIRGO-111-15001_FCC222427_v1.3.docx	Move EIRP results to MPE report as radio filing powers will be based on module data	F. Engert