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Module Integration Compliance Verification Report

EUT Name: AC GTW 03

Model No.: CB3

FCC Part 22, 24, 27

RSS-130 Issue 1, RSS-132 Issue 3, RSS-133 Issue 6, RSS-139 Issue 3

Prepared for:

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Revisions

Revision No.	Date MM/DD/YYYY	Reason for Change	Author
0	November 20, 2019	Original Document	NA
1	January 29, 2020	TCB Review	OC
2	February 3, 2020	TCB Review	OC

Note: Latest revision report will replace all previous reports.

Attestation of Test Results

Manufacturer:	Schindler Elevator Corporation 20 Whippany Road Morristown, NJ 07960
Name of Equipment:	AC GTW 03
Model No.	CB3
Type of Equipment:	Intentional Radiator
Test Dates:	October 28th, 2019 to November 15th, 2019

Test Specifications:

CFR 47 Part 22, 24, 27
RSS-130 Issue 1, RSS-132 Issue 3, RSS-133 Issue 6, RSS-139 Issue 3

Test Methods:

FCC KDB 971168, v03r01
ANSI C63.26-2015

The electromagnetic compatibility test and documented data described in this report has been performed and recorded by TUV Rheinland, in accordance with the standards and procedures listed herein. As the responsible authorized agent of the EMC laboratory, I hereby declare that the equipment described above has been shown to be compliant with the EMC requirements of the stated regulations and standards based on these results. If any special accessories and/or modifications were required for compliance, they are listed in the Executive Summary of this report.

The applied Module Integration Compliance Verification Testing documented in this report did not reveal any non-compliance.

This report must not be used to claim product endorsement by A2LA or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written authorization of TUV Rheinland of North America.

Osvaldo Casorla — Test Engineer — Date February 3, 2020

Richard Decker — Operations Manager — Date February 3, 2020

Testing Cert #3331.02 **US1131** **2932D**

1 Table of Contents

1 Executive Summary

1.1 Scope

This report is intended to document the status of conformance with the requirements of the FCC based on the results of testing performed on October 28th, 2019 through November 15th, 2019 on the AC GTW 03 manufactured by Schindler Elevator Corporation. This report only applies to the specific samples tested under the stated test conditions. It is the responsibility of the manufacturer to assure that additional production units of this model are manufactured with identical or EMI equivalent electrical and mechanical components. This report is further intended to document changes and modifications to the EUT throughout its life cycle. All documentation will be included as a supplement.

We have verified that all testing and results leveraged from the test reports of the modular approval are still valid and not impacted from updates to relevant rule parts or test stands since then.

Original test reports number with FCC ID: XMR201808EC25AF:

Part 20 report number: R1806A0301-R1V1
Part 24 report number: R1806A0301-R2V1
Part 27 report number: R1806A0301-R3V1

1.2 Purpose

Testing was performed to evaluate the EMC performance of the EUT in accordance with the applicable requirements, procedures, and criteria defined in the application of regulations and application of standards listed in this report.

1.3 Summary of Test Results

Table 1: Summary of Test Results

Test	Operating mode	Worse Case (Measured)	Result
Output Power	2.1046, 22.913(a)(5), 24.232(c), 27.50(d)(4) /27.50(b)(10) /27.50(c)(10) /27.50(h)(2)	Band 66, 23.92 dBm E.I.R.P.	**Complied**
Occupied Bandwidth	2.1049	See Note 2	**N/A**
Band Edge Compliance	2.1051 / 22.917(a), 24.238(a), 27.53(h) /27.53(g) /27.53(f) /27.53(c) /27.53(m)	See Note 2	**N/A**
Peak-to-Average Power Ratio	22.913(d)/ KDB 971168 D01(5.7) , 24.232/KDB 971168 D01(5.7), 27.50(d)/KDB971168 D01(5.7)	See Note 2	**N/A**
Frequency Stability	2.1055 / 22.355, 2.1055 / 24.235, 2.1055 / 27.54	See Note 2	**N/A**
Spurious Emissions at Antenna Terminals	2.1051 / 22.917(a), 2.1051 / 24.238(a), 2.1051 /27.53(h) /27.53(g) /27.53(f)	See Note 2	**N/A**
Transmitter unwanted emissions	2.1051 / 24.238(a), 22.917(a)	-3.97 dB @ 48.06 MHz, QP, Band 13	**Complied**

Note 1: Class B limits were applied where applicable.

Note 2: Covered by Modular Test report Number R1806A0301-R1V1/ R1V2/ R1V3 Issued on July 31, 2018.

1.4 Special Accessories

No special accessories were necessary in order to achieve compliance.

1.5 Equipment Modifications

None.

2 Laboratory Information

2.1 Accreditations & Endorsements

2.1.1 US Federal Communications Commission

TUV Rheinland of North America EMC test facilities located at 1279 Quarry Lane, Ste. A, Pleasanton, CA, 94566, and 5015 Brandin Ct, Fremont, CA. 94538, are recognized by the Commission for performing testing services for the general public on a fee basis. These laboratory test facilities have been fully described in reports submitted to and accepted by the FCC (Pleasanton Registration No. US1131, Fremont Registration No. US1131). The laboratory Scopes of Accreditation include Title 47 CFR Parts 15, 18 and 90. The accreditations are updated every three years.

2.1.2 A2LA

TUV Rheinland of North America EMC test facilities are accredited by the American Association for Laboratory Accreditation (A2LA). The laboratories have been assessed and accredited by A2LA in accordance with ISO Standard 17025:2017 (Testing Certificate #3331.02). The Scope of Laboratory Accreditation includes emission and immunity testing. The accreditations are updated annually.

2.1.3 Industry Canada

The Pleasanton 5-meter Semi-Anechoic Chamber, Registration No. 2932M-1, has been accepted by Industry Canada to perform testing to 3 and 5 meters based on the test procedures described in ANSI C63.4-2014. The Fremont 10-meter Semi-Anechoic Chamber, Registration No. 2932D-1, has been accepted by Industry Canada to perform testing to 3 and 10 meters based on the test procedures described in ANSI C63.4-2014.

2.1.4 Japan – VCCI

The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) is a group that consists of Information Technology Equipment (ITE) manufacturers and EMC test laboratories. The purpose of the Council is to take voluntary control measures against electromagnetic interference from Information Technology Equipment, and thereby contribute to the development of a socially beneficial and responsible state of affairs in the realm of Information Technology Equipment in Japan. TUV Rheinland of North America EMC test facilities located at 1279 Quarry Lane, Ste. A, Pleasanton, CA, 94566, and 5051 Brandin Ct, Fremont, CA. 94538, have been assessed and approved in accordance with the Regulations for Voluntary Control Measures.

VCCI Registration No. for Pleasanton: A-0326

VCCI Registration No. for Fremont: A-0327

2.1.5 Acceptance by Mutual Recognition Arrangement

The United States has an established agreement with specific countries under the Asia Pacific Laboratory Accreditation Corporation (APLAC) Mutual Recognition Arrangement. Under this agreement, all TUV Rheinland at 1279 Quarry Ln, Pleasanton, CA 94566 test results and test reports within the scope of the laboratory NIST / A2LA accreditation will be accepted by each member country.

2.2 Test Facilities and EMC Software

Test facilities are located at 1279 Quarry Lane, Ste. A, Pleasanton, California 94566, U.S.A. and 5015 Brandin Ct, Fremont, CA. 94538, U.S.A. (Fremont is the Pleasanton Annex).

2.2.1 Emission Test Facility

The Semi-Anechoic Chambers and AC Line Conducted measurement facilities used to collect radiated and conducted emissions data have been constructed in accordance with ANSI C63.7:1992. The Fremont 10 meter semi-anechoic chamber has been measured in accordance with and verified to comply with the theoretical volumetric normalized site attenuation of ANSI C63.4-2014 and SVSWR requirements of CISPR 16-1-4 Consol. Ed. 3.0 (2010-04), at test distances of 3 and 10 meters. This site has been described in reports dated November 1st, 2006, submitted to the FCC, and accepted by letter dated November 28, 2006. The site is listed with the FCC and accredited by A2LA (Testing Certificate #3331.02). The Pleasanton 5 meter semi-anechoic chamber has been verified to comply with the theoretical volumetric normalized site attenuation of ANSI C63.4-2014 and SVSWR requirements of CISPR 16-1-4 Consol. Ed. 3.0 (2010-04) at a test distance of 3 meters. This site has been described in reports dated November 1st, 2006, submitted to the FCC, and accepted by letter dated November 28, 2006. The site is listed with the FCC and accredited by A2LA (Testing Certificate #3331.02).

2.3 EMC Software - Fremont

Manufacturer	Name	Version	Test Type
Rohde & Schwarz	EMC32	10.40.10	Radiated Emissions

2.4 Measurement Uncertainty

Two types of measurement uncertainty are expressed in this report, per *ISO Guide To The Expression Of Uncertainty In Measurement*, 1st Edition, 1995.

The Combined Standard Uncertainty is the standard uncertainty of the result of a measurement when that result is obtained from the values of a number of other quantities; it is equal to the positive square root of the sum of the variances or co-variances of these other quantities, weighted according to how the measurement result varies with changes in these quantities. The term *standard uncertainty* is the result of a measurement expressed as a standard deviation.

The Expanded Uncertainty defines an interval about the result of a measurement that may be expected to encompass a large fraction of the distribution of values that could reasonably be attributed to the measurement. The fraction may be viewed as the coverage probability or level of confidence of the interval.

2.4.1 Sample Calculation – radiated & conducted emissions

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

Field Strength (dBμV/m) = RAW - AMP + CBL + ACF

Where: RAW = Measured level before correction (dBμV)

AMP = Amplifier Gain (dB)

CBL = Cable Loss (dB)

ACF = Antenna Correction Factor (dB/m)

$$\mu V/m = 10^{\frac{dB\mu V/m}{20}}$$

Sample radiated emissions calculation @ 30 MHz

Measurement +Antenna Factor–Amplifier Gain+Cable Loss=Radiated Emissions (dBuV/m)

25 dBuV/m + 17.5 dB – 20 dB + 1.0 dB = 23.5 dBuV/m

2.4.2 Measurement Uncertainties

Measurement Uncertainty – Radio Testing

The estimated combined standard uncertainty for frequency error measurements is ± 3.88 Hz
The estimated combined standard uncertainty for carrier power measurements is ± 1.59 dB.
The estimated combined standard uncertainty for adjacent channel power measurements is ± 1.47 dB.
The estimated combined standard uncertainty for modulation frequency response measurements is ± 0.46 dB.
The estimated combined standard uncertainty for transmitter conducted emission measurements is ± 4.01 dB

The expanded uncertainty at a level of 95% confidence is obtained by multiplying the combined standard uncertainty by a coverage factor of 2. Compliance criteria are not based on measurement uncertainty.

2.4.3 Measurement Uncertainty Emissions

Per CISPR 16-4-2	**U_{lab}**	**U_{cispr}**
Radiated Disturbance @ 10 meters		
30 – 1,000 MHz	2.25 dB	4.51 dB
Radiated Disturbance @ 3 meters		
30 – 1,000 MHz	2.26 dB	4.52 dB
1 – 6 GHz	2.12 dB	4.25 dB
6 – 18 GHz	2.47 dB	4.93 dB
Conducted Disturbance @ Mains Terminals		
150 kHz – 30 MHz	1.09 dB	2.18 dB
Disturbance Power		

2.5 Calibration Traceability

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Measurement method complies with ANSI/NCSL Z540-1-1994 and ISO Standard 17025:2017. Equipment calibration records are kept on file at the test facility.

3 Product Information

3.1 Introduction

This section provides a description of the Equipment Under Test (EUT), configurations, operating conditions. It is an overview of information provided by the manufacturer so that the test laboratory may perform the requested testing.

3.2 Customer

Table 2: Customer Information

Company Name	Schindler Elevator Corporation
Address	20 Whippany Road
City, State, Zip	Morristown, NJ 07960
Country	US
Phone	+1 201-40-0-1867

Technical Contact Information

Name	Guy, Monhollen
Phone nr.	+1 201-40-0-1867
E-mail	guy.monhollen@schindler.com

3.3 Product Description

Client provided Information:

CB3 is the easiest way to get telecommunication services to premises that cannot be reached by telephone landlines, but where there is adequate cellular telephone coverage.

Through the mobile network, CB3 allows you to make/receive calls from standard telephones, PBX, fax, modem, without difference with respect to a standard PSTN line.

Voice, data and fax services require different phone numbers: during the installation the end-user will be assigned three different phone numbers, for voice, data and fax reception respectively.

When making a call (both voice, data or fax), CB3 uses the main number (the voice number), while in order to receive a data or fax call, it is necessary that CB3 is called on its corresponding data or fax number.

It is equipped with an external battery that works during any network malfunction, with an estimated autonomy equal to 5 hours in call mode and 16 hours in stand-by mode.

3.4 **Equipment Under Test (EUT)**

Table 3: EUT Specifications

EUT Specification	
Power Input	8-30 V DC
Number of Antenna Feeds:	2, DIV and Main antenna ports
Hardware Version	EC25_Hardware_Design_V1.3
FW Software Version	EC25AFFAR07A08M4G
Cellular Transmit Frequency Band	LTE band: B2/B4/B5/B12/B13/B66/B71 WCDMA band: 2/4/5
Cellular Max. Rated Power Output	LTE/WCDMA bands 23dBm±2dB in call @ 724.7 mA
Cellular Antenna Type	External, Dynaflex 631 Dipole 2G-5G Sub6 wideband
Cellular Modulation Type	16-QAM, 64-QAM and QPSK
Type of Equipment	☐ Table Top ☒ Wall-mount ☐ Floor standing cabinet ☐ Other:

Table 4: Description of Sample used for Testing

Device	Serial Number	Configuration	Used For
CB3	A1NAB8C1P1EB1000031	Radiated	Radiated Tests

Table 5: Antenna Information

Number	Antenna Type	Description	Max Gain (dBi)
Antenna 0	External	LTE	5.0

3.5 Test Equipment Configuration

The EUT was tested as called for in the test standard and was configured and operated in a manner consistent with its intended use. The EUT was connected to the declared rated power and allowed to reach intended operating conditions. The placement of the EUT system components was guided by the test standard and selected to represent typical installation conditions.

In the case of a EUT that can operate in more than one configuration, preliminary testing was performed to determine the configuration that produced maximum radiation.

The final configuration was selected to produce the worst case radiation for emissions testing.

3.6 Operating Mode

In the case of a EUT that can operate in more than one state, preliminary testing was performed to determine the operating mode that produced maximum radiation.

The final operating mode was selected to produce the worst case radiation for emissions testing.

Table 5: Final Test Mode

Test	Operating mode
Transmitter unwanted emissions	LTE, RB1, QPSK (per Band): Mid channel: 10 MHz Channel Bandwidth, max power

4 Test Data

Testing was performed in accordance with FCC rules. These test methods are listed under the laboratory's A2LA Scope of Accreditation. This test measures the levels emanating from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices. Procedures described in ANSI C63.26-2015 and FCC KDB 971168 D01 V03r01 were used. Worst case configuration was determined to be QPSK and was the modulation chosen for testing throughout this report.

4.1 Conducted RF Output Power/ERP/ERIP

§2.1046(a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, 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 the circuit elements specified in §2.1033(c)(8). The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

§22.913(a)(5) The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

§24.232(c) Mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

§27.50(c)(10) Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP.

§27.50(d)(4) Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP.

4.1.1 Test Methodology

4.1.1.1 Spectrum Analyzer Method

KDB 971168 D01 V03 section 5 and ANSI C63.26-2015 Section 5.2.4.4 General procedure for measuring average power of a broadband signal with a spectrum analyzer or EMI receiver measurement procedure was used. The EUT was configured with the CMW 500 to the measured center frequency transmitting at a 100% duty cycle with the correct bandwidth, modulation, and Resource Block configuration in the case of LTE. In all cases the EUT was set to transmit at maximum power by the CMW500. The EUT was directly connected to the spectrum analyzer with the following settings:

1. Center frequency set to the EUT's channel center frequency
2. Span = 2-3 x the OBW
3. RBW = 1% to 5% OBW
4. VBW ≥ 3 x RBW
5. Sweep Points ≥ 2 x Span/RBW
6. Sweep time: Auto-couple
7. Detector = power averaging (rms)

The power measurement is made by averaging 100 or more traces. The final conducted power is calculated by integrating over the spectrum using the instruments channel power measurement function. The EIRP values are calculated using equation from section 5.6 of KDB 971168 D01 V03.

$EIRP = P_{measured} + GT - L_C$

ERP values are calculated using the EIRP by the following:

ERP = EIRP – 2.15 dB

Where:

$P_{measured}$ ≡ maximum conducted power

GT ≡ gain of transmitting antenna in dBi

L_C ≡ signal attenuation between transmitter and antenna in EUT

4.1.1.2 Average Power

KDB 971168 D01 section 5 and ANSI C63.26-2015 Section 5.2.4.2 – General procedure for measuring average power with an average power meter was used. The EUT was setup to transmit at 100% duty cycle and the center frequency, output power and resource block configuration (LTE) were all set using a CMW 500 call box. The EUT was directly connected to the power sensor. The power sensors VBW is greater than the OBW of the transmitting signal and the sensors rise time is faster than the rise time of the RF signal to ensure measurement integrity.

The EIRP values are calculated using equation from section 5.6 of KDB 971168 D01 V03.

$EIRP = P_{measured} + GT – Lc$

ERP values are calculated using the EIRP by the following:

ERP = EIRP – 2.15 dB

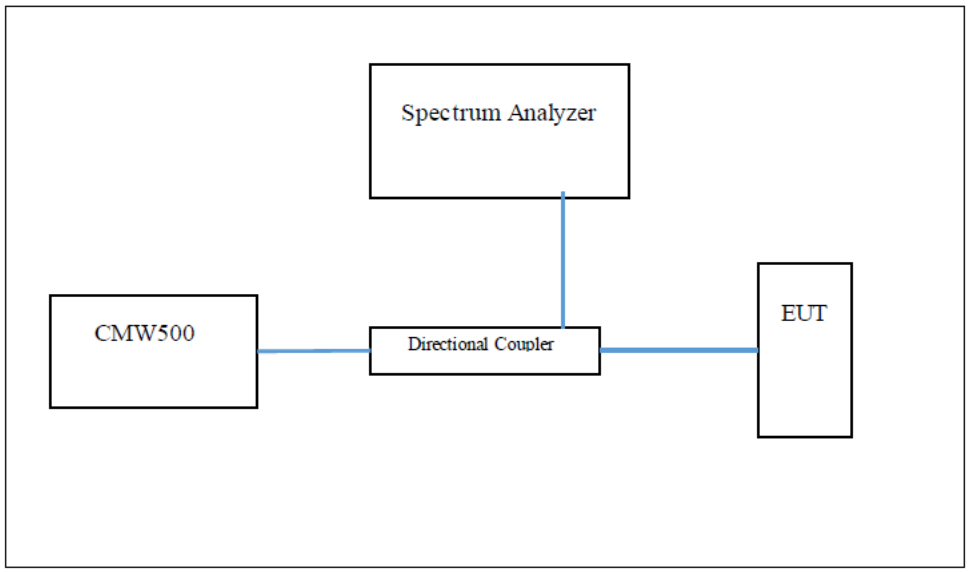
Where:

$P_{measured}$ ≡ maximum conducted power

GT ≡ gain of transmitting antenna in dBi

L_C ≡ signal attenuation between transmitter and antenna in EUT

4.1.2 Test Setup



4.1.3 Deviations

N/A

4.1.4 Test Results

Lower Frequency (MHz)	Upper Frequency (MHz)	Power Output cond. (W)	Power Output eirp/erp (dBm)	Limit E.I.R.P (dBm)	Limit E.R.P (dBm)	Margin (dB)	Results
826.4	846.6	0.209	26.05	-	38.45	-12.40	Pass
825.5	847.5	0.254	26.90	-	38.45	-11.55	Pass
829	844	0.252	26.86	-	38.45	-11.59	Pass
825.5	847.5	0.222	26.31	-	38.45	-12.14	Pass
829	844	0.219	26.25	-	38.45	-12.20	Pass
1852.4	1907.6	0.208	28.18	33	-	-4.82	Pass
1855	1905	0.243	28.86	33	-	-4.14	Pass
1860	1900	0.24	28.80	33	-	-4.20	Pass
1851.5	1908.5	0.202	28.05	33	-	-4.95	Pass
1860	1900	0.199	27.99	33	-	-5.01	Pass
1712.4	1752.6	0.222	28.46	30	-	-1.54	Pass
1711.5	1753.5	0.236	28.73	30	-	-1.27	Pass
1720	1745	0.231	28.64	30	-	-1.36	Pass
1711.5	1753.5	0.219	28.40	30	-	-1.60	Pass
1720	1745	0.216	28.34	30	-	-1.66	Pass
700.5	714.5	0.237	26.60	-	34.77	-8.17	Pass
704	711	0.234	26.54	-	34.77	-8.23	Pass
700.5	714.5	0.211	26.09	-	34.77	-8.68	Pass
704	711	0.195	25.75	-	34.77	-9.02	Pass
782	782	0.243	26.71	-	34.77	-8.06	Pass
782	782	0.219	26.25	-	34.77	-8.52	Pass
1715	1775	0.241	28.82	30	-	-1.18	Pass
1720	1770	0.238	28.77	30	-	-1.23	Pass
1711.5	1778.5	0.194	27.88	30	-	-2.12	Pass
1720	1770	0.19	27.79	30	-	-2.21	Pass
668	693	0.222	26.31	-	34.77	-8.46	Pass
673	688	0.221	26.29	-	34.77	-8.48	Pass
668	693	0.197	25.79	-	34.77	-8.98	Pass
673	688	0.194	25.73	-	34.77	-9.04	Pass
790.5	795.5	0.244	26.72	-	34.77	-8.05	Pass
793	793	0.243	26.71	-	34.77	-8.06	Pass
793	793	0.218	26.23	-	34.77	-8.54	Pass
Additional Output Power Verification Test Results							
Lower Frequency (MHz)	**Upper Frequency (MHz)**	**Power Output cond. (W)**	**Power Output eirp/erp (dBm)**	**Limit E.I.R.P (dBm)**	**Limit E.R.P (dBm)**	**Margin (dB)**	**Results**
824	849	0.164	22.16	-	38.45	-16.29	Pass
1850	1910	0.207	23.17	33	-	-9.83	Pass
1710	1785	0.205	23.12	30	-	-6.88	Pass
699	716	0.146	21.64	-	34.77	-13.13	Pass
1710	1780	0.247	23.92	30	-	-6.08	Pass
663	698	0.142	21.53	-	34.77	-13.24	Pass
777	787	0.168	22.25	-	34.77	-12.52	Pass

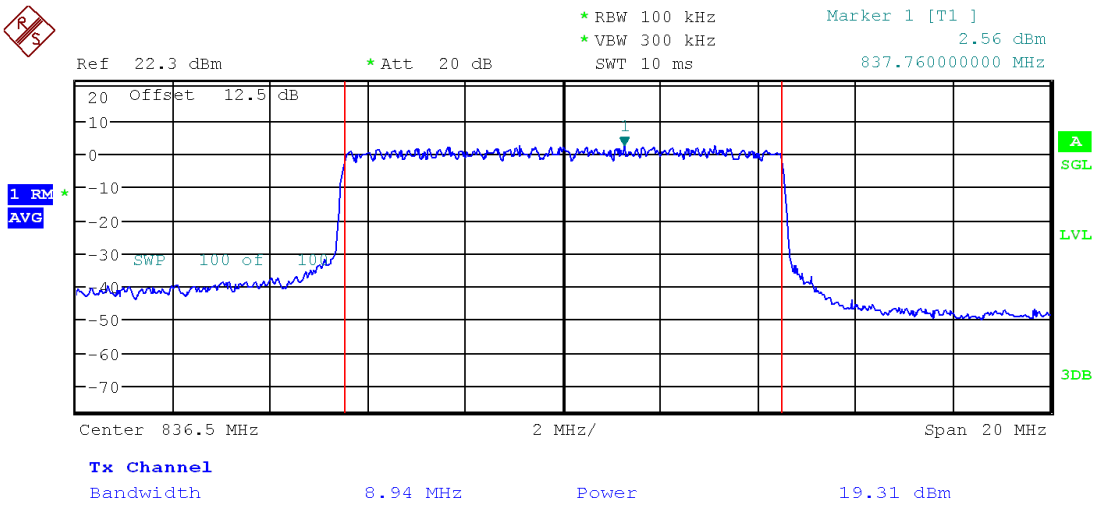


Figure 1: Average Power, Band 5 QPSK

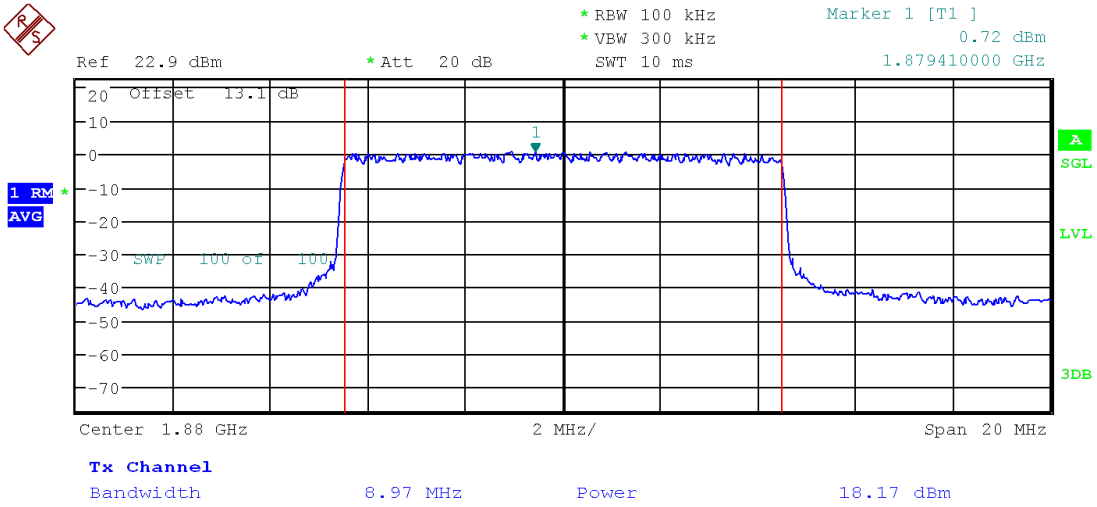


Figure 2: Average Power, Band 2 QPSK

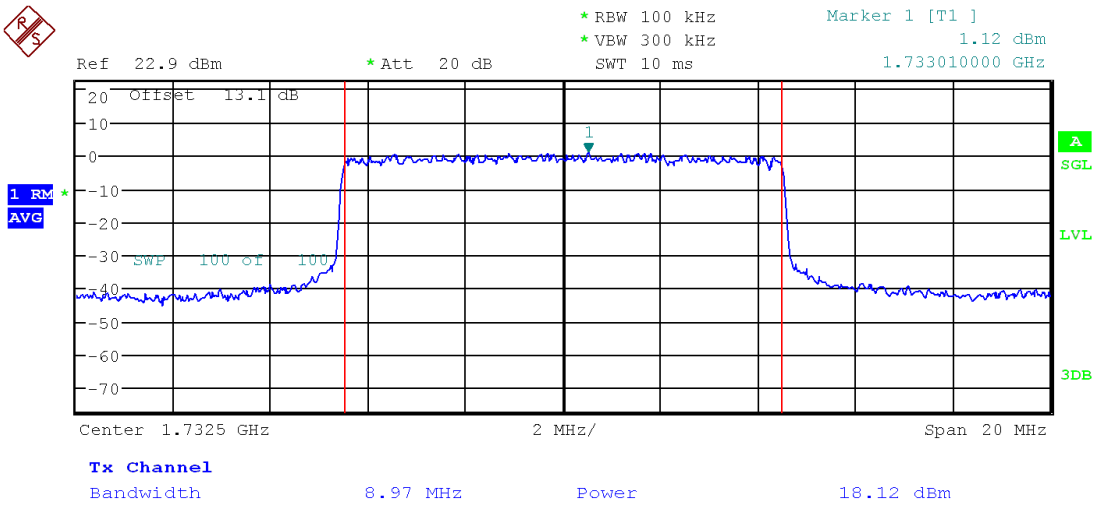


Figure 3: Average Power, Band 4 QPSK

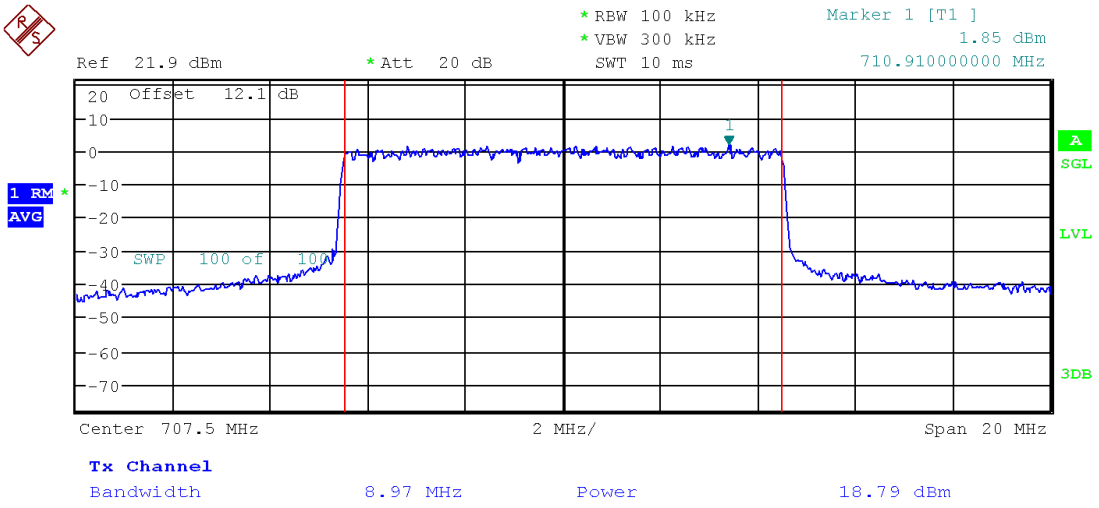


Figure 4: Average Power, Band 12 QPSK

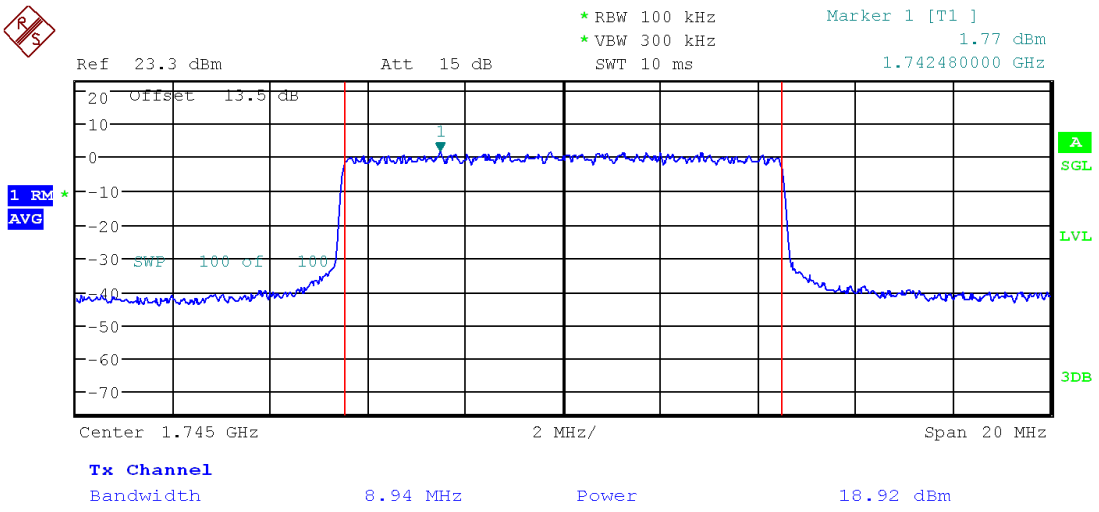


Figure 5: Average Power, Band 66 QPSK

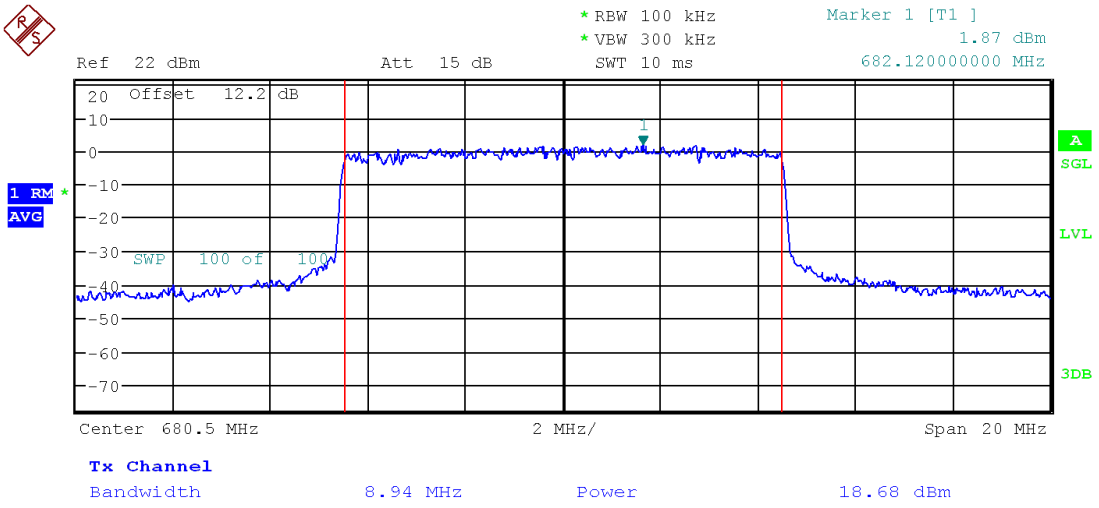


Figure 6: Average Power, Band 71 QPSK

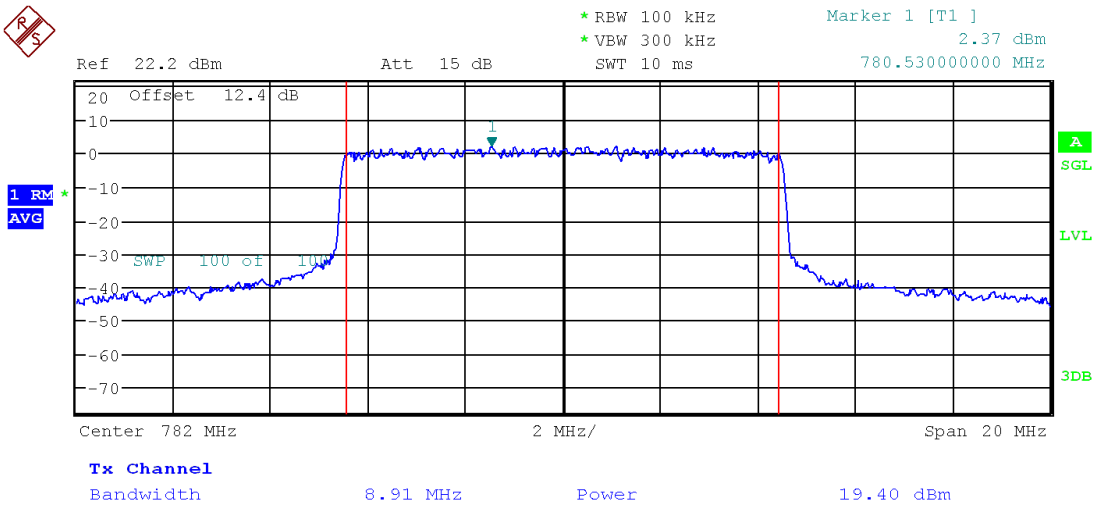


Figure 7: Average Power, Band 13 QPSK

4.2 Transmitter Unwanted Emissions

Transmitter spurious emissions are emissions outside the frequency range of the equipment when the equipment is in transmitting mode; per requirement of CFR47 parts 2.1051 / 2.1053 / 24.238(a) / 22.917(a).

4.2.1 Test Methodology

4.2.1.1 Preliminary Test

A test program that controls instrumentation and data logging was used to automate the preliminary RF emissions test procedure. The frequency range of interest was divided into sub-ranges. For each sub-range peak emission data was recorded and plotted while the turntable was rotated 360° in 90° steps and the measurement antenna was rotated in horizontal and vertical antenna polarization.

Preliminary emission profile testing was performed inside a semi-anechoic chamber. The EUT was placed on a non-conductive table 80 cm above the floor for emissions less than 1 GHz and 150cm above the floor for emissions greater than 1 GHz. The EUT was positioned as shown in the setup photographs. The measurement antenna was placed at a distance of 3m.

4.2.1.2 Final Test

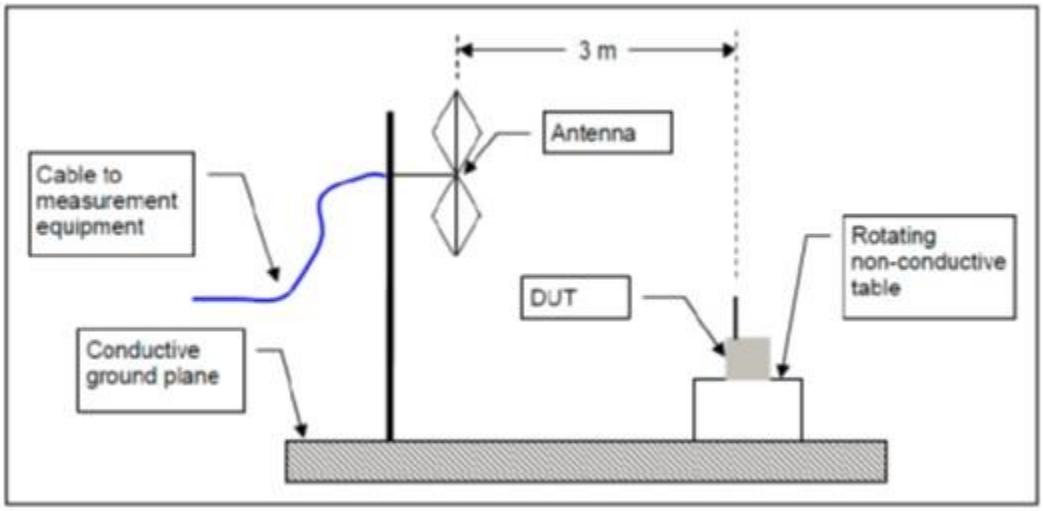
Final testing was performed on an NSA compliant test site.

For each frequency measured, the peak emission was maximized by manipulating the receiving antenna from 1 to 4 meters above the ground plane and placing it at the position that produced the maximum signal strength reading. The turntable was then rotated through 360° while observing the peak signal and placing the EUT at the position that produced maximum radiation. Emissions within 20 dB of the limit were measured.

Substitution measurements are done for emissions within 10 dB of the limit.

The final scans were performed on the worst EUT axis for three operating channels in the operating mode with the highest power.

Test Setup



4.2.1.3 Deviations

None.

4.2.2 Transmitter Spurious Emission Limit

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 where P is in watts. The limit is -13 dBm for any power.

4.2.3 Test Results

The final measurement data was taken under the worst case operating modes, configurations, and cable positions. It also reflects the results including any modifications and/or special accessories listed in section 1

Note: Below 30 MHz was investigated and no emissions was found above noise floor. No Emissions within 6dB of the limit were found above 18 GHz.

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

4.2.3.1 30MHz – 1GHz

Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
44.55	32.77	---	40.00	7.23	1000.00	120.00	100.00	V	-175.00	-16.30	
44.55	---	38.77	---	---	1000.00	120.00	100.00	V	-175.00	-16.30	
48.10	---	41.33	---	---	1000.00	120.00	100.00	V	-175.00	-17.60	
48.10	34.59	---	40.00	5.41	1000.00	120.00	100.00	V	-175.00	-17.60	
48.66	---	40.51	---	---	1000.00	120.00	100.00	V	180.00	-17.80	
48.66	34.29	---	40.00	5.71	1000.00	120.00	100.00	V	180.00	-17.80	
54.18	---	36.22	---	---	1000.00	120.00	100.00	V	180.00	-18.00	
54.18	29.27	---	40.00	10.73	1000.00	120.00	100.00	V	180.00	-18.00	
61.17	29.70	---	40.00	10.30	1000.00	120.00	100.00	V	81.00	-17.10	
61.17	---	36.36	---	---	1000.00	120.00	100.00	V	81.00	-17.10	
375.01	---	35.70	---	---	1000.00	120.00	100.00	H	17.00	-10.60	
375.01	32.92	---	46.00	13.08	1000.00	120.00	100.00	H	17.00	-10.60	

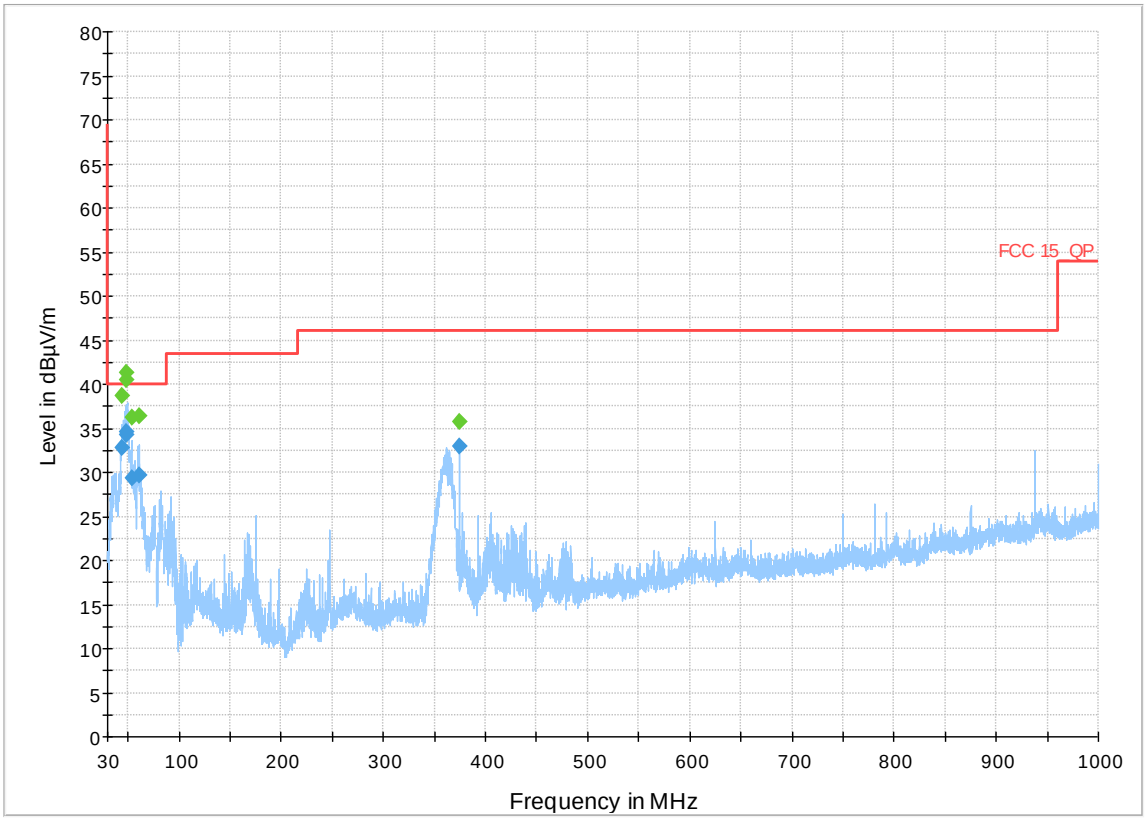


Figure 8: Radiated Spurious Emission 30MHz-1GHz – LTE Mid Channel band 2

Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
37.79	30.26	---	40.00	9.74	1000.00	120.00	101.00	V	-138.00	-12.20	
37.79	---	39.33	---	---	1000.00	120.00	101.00	V	-138.00	-12.20	
44.19	---	37.55	---	---	1000.00	120.00	100.00	V	-175.00	-16.10	
44.19	32.29	---	40.00	7.71	1000.00	120.00	100.00	V	-175.00	-16.10	
47.69	---	40.68	---	---	1000.00	120.00	101.00	V	-148.00	-17.50	
47.69	34.23	---	40.00	5.77	1000.00	120.00	101.00	V	-148.00	-17.50	
49.94	32.85	---	40.00	7.15	1000.00	120.00	100.00	V	-181.00	-18.20	
49.94	---	40.32	---	---	1000.00	120.00	100.00	V	-181.00	-18.20	
360.25	---	30.33	---	---	1000.00	120.00	101.00	V	156.00	-10.50	
360.25	26.89	---	46.00	19.11	1000.00	120.00	101.00	V	156.00	-10.50	
375.02	---	26.46	---	---	1000.00	120.00	101.00	V	163.00	-10.60	
375.02	22.99	---	46.00	23.01	1000.00	120.00	101.00	V	163.00	-10.60	

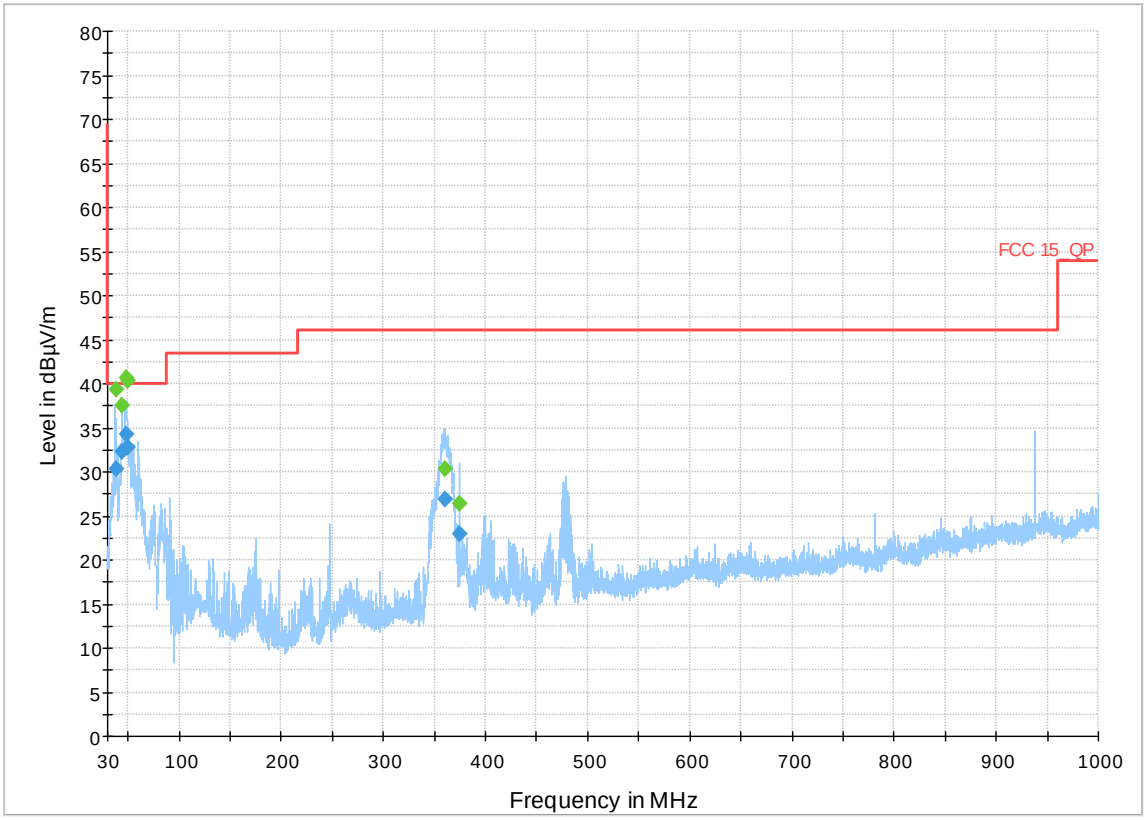


Figure 9: Radiated Spurious Emission 30MHz-1GHz – LTE Mid Channel band 4

Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
47.11	35.90	---	40.00	4.10	1000.00	120.00	100.00	V	-175.00	-17.30	
47.11	---	41.96	---	---	1000.00	120.00	100.00	V	-175.00	-17.30	
47.88	---	42.16	---	---	1000.00	120.00	100.00	V	-171.00	-17.50	
47.88	35.63	---	40.00	4.37	1000.00	120.00	100.00	V	-171.00	-17.50	
58.15	32.52	---	40.00	7.48	1000.00	120.00	100.00	V	14.00	-17.40	
58.15	---	40.54	---	---	1000.00	120.00	100.00	V	14.00	-17.40	
81.25	---	29.83	---	---	1000.00	120.00	100.00	V	-185.00	-19.80	
81.25	22.97	---	40.00	17.03	1000.00	120.00	100.00	V	-185.00	-19.80	
197.78	24.75	---	43.50	18.76	1000.00	120.00	154.00	H	-164.00	-14.70	
197.78	---	27.62	---	---	1000.00	120.00	154.00	H	-164.00	-14.70	
374.99	33.33	---	46.00	12.67	1000.00	120.00	100.00	V	-175.00	-10.60	
374.99	---	36.43	---	---	1000.00	120.00	100.00	V	-175.00	-10.60	

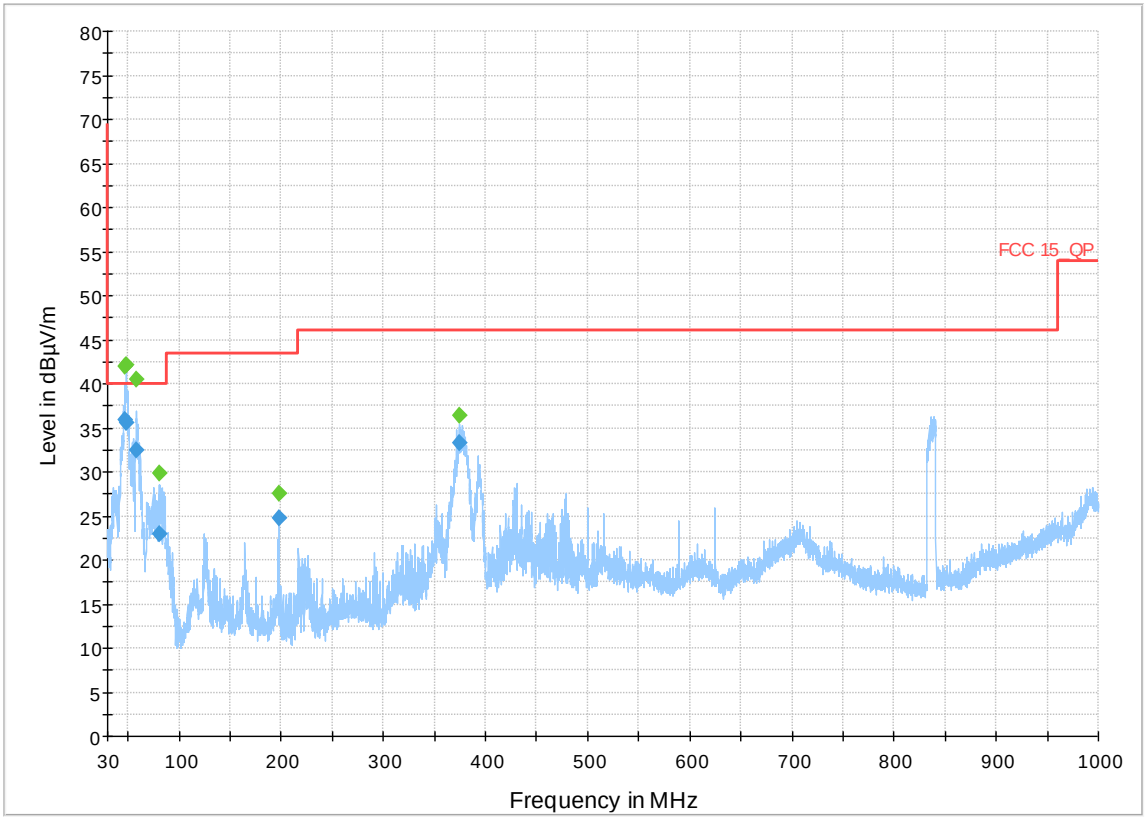


Figure 10: Radiated Spurious Emission 30MHz-1GHz – LTE Mid Channel band 5

Note: The 836.5 MHz is the Fundamental.

Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
47.93	33.77	---	40.00	6.23	1000.00	120.00	100.00	V	181.00	-17.60	
47.93	---	40.12	---	---	1000.00	120.00	100.00	V	181.00	-17.60	
50.00	32.49	---	40.00	7.51	1000.00	120.00	100.00	V	-175.00	-18.20	
50.00	---	40.10	---	---	1000.00	120.00	100.00	V	-175.00	-18.20	
60.12	29.78	---	40.00	10.22	1000.00	120.00	100.00	V	176.00	-17.10	
60.12	---	35.67	---	---	1000.00	120.00	100.00	V	176.00	-17.10	
176.00	---	27.54	---	---	1000.00	120.00	100.00	V	-53.00	-13.90	
176.00	23.65	---	43.51	19.86	1000.00	120.00	100.00	V	-53.00	-13.90	
363.15	28.29	---	46.00	17.71	1000.00	120.00	100.00	H	-120.00	-10.40	
363.15	---	31.65	---	---	1000.00	120.00	100.00	H	-120.00	-10.40	
375.02	---	32.13	---	---	1000.00	120.00	100.00	H	-112.00	-10.60	
375.02	28.86	---	46.00	17.14	1000.00	120.00	100.00	H	-112.00	-10.60	

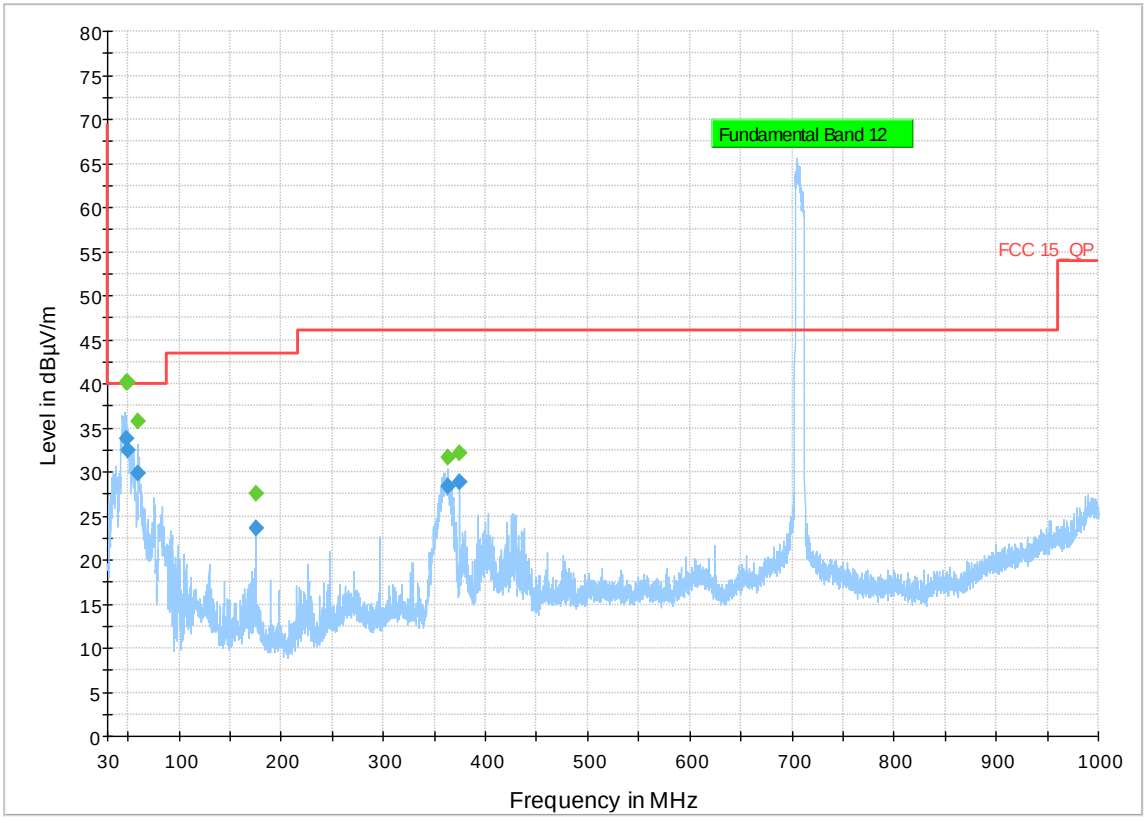


Figure 11: Radiated Spurious Emission 30MHz-1GHz – LTE Mid Channel band 12

Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
48.06	36.03	---	40.00	3.97	1000.00	120.00	100.00	V	-85.00	-17.60	
48.06	---	42.13	---	---	1000.00	120.00	100.00	V	-85.00	-17.60	
55.28	---	38.42	---	---	1000.00	120.00	100.00	V	175.00	-17.90	
55.28	29.96	---	40.00	10.04	1000.00	120.00	100.00	V	175.00	-17.90	
197.81	23.59	---	43.50	19.92	1000.00	120.00	100.00	V	-102.00	-14.70	
197.81	---	26.33	---	---	1000.00	120.00	100.00	V	-102.00	-14.70	
370.16	---	35.01	---	---	1000.00	120.00	100.00	H	-103.00	-10.30	
370.16	32.06	---	46.00	13.94	1000.00	120.00	100.00	H	-103.00	-10.30	
394.57	22.59	---	46.00	23.41	1000.00	120.00	100.00	H	83.00	-10.70	
394.57	---	26.81	---	---	1000.00	120.00	100.00	H	83.00	-10.70	
625.01	27.99	---	46.00	18.01	1000.00	120.00	280.00	H	-96.00	-6.20	
625.01	---	30.33	---	---	1000.00	120.00	280.00	H	-96.00	-6.20	

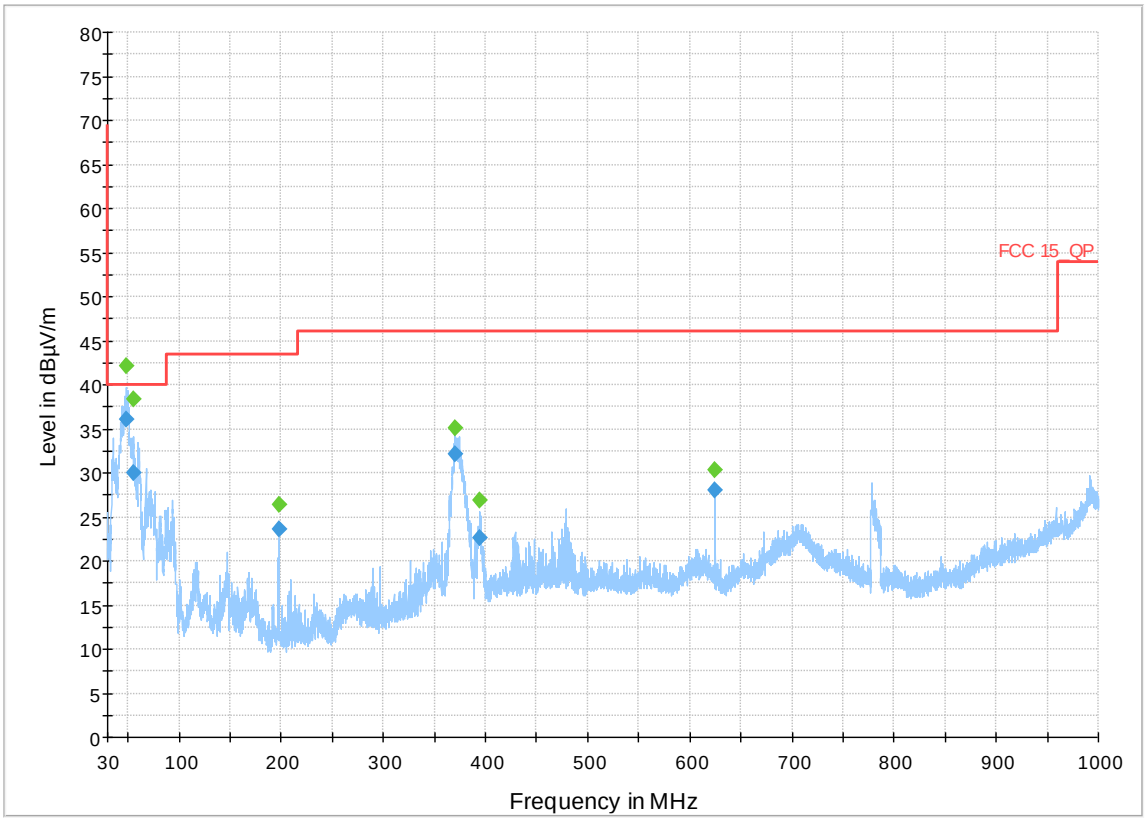


Figure 12: Radiated Spurious Emission 30MHz-1GHz – LTE Mid Channel band 13

Note: The 782 MHz is the Fundamental.

Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
48.14	35.92	---	40.00	4.08	1000.00	120.00	102.00	V	175.00	-17.60	
48.14	---	42.02	---	---	1000.00	120.00	102.00	V	175.00	-17.60	
59.86	---	41.78	---	---	1000.00	120.00	102.00	V	18.00	-17.10	
59.86	34.63	---	40.00	5.37	1000.00	120.00	102.00	V	18.00	-17.10	
360.58	25.29	---	46.00	20.71	1000.00	120.00	102.00	V	180.00	-10.50	
360.58	---	28.81	---	---	1000.00	120.00	102.00	V	180.00	-10.50	
374.99	25.01	---	46.00	20.99	1000.00	120.00	102.00	V	180.00	-10.60	
374.99	---	27.87	---	---	1000.00	120.00	102.00	V	180.00	-10.60	
625.01	25.54	---	46.00	20.46	1000.00	120.00	102.00	V	180.00	-6.20	
625.01	---	29.05	---	---	1000.00	120.00	102.00	V	180.00	-6.20	
937.51	---	33.72	---	---	1000.00	120.00	101.00	V	-53.00	-0.30	
937.51	31.54	---	46.00	14.46	1000.00	120.00	101.00	V	-53.00	-0.30	

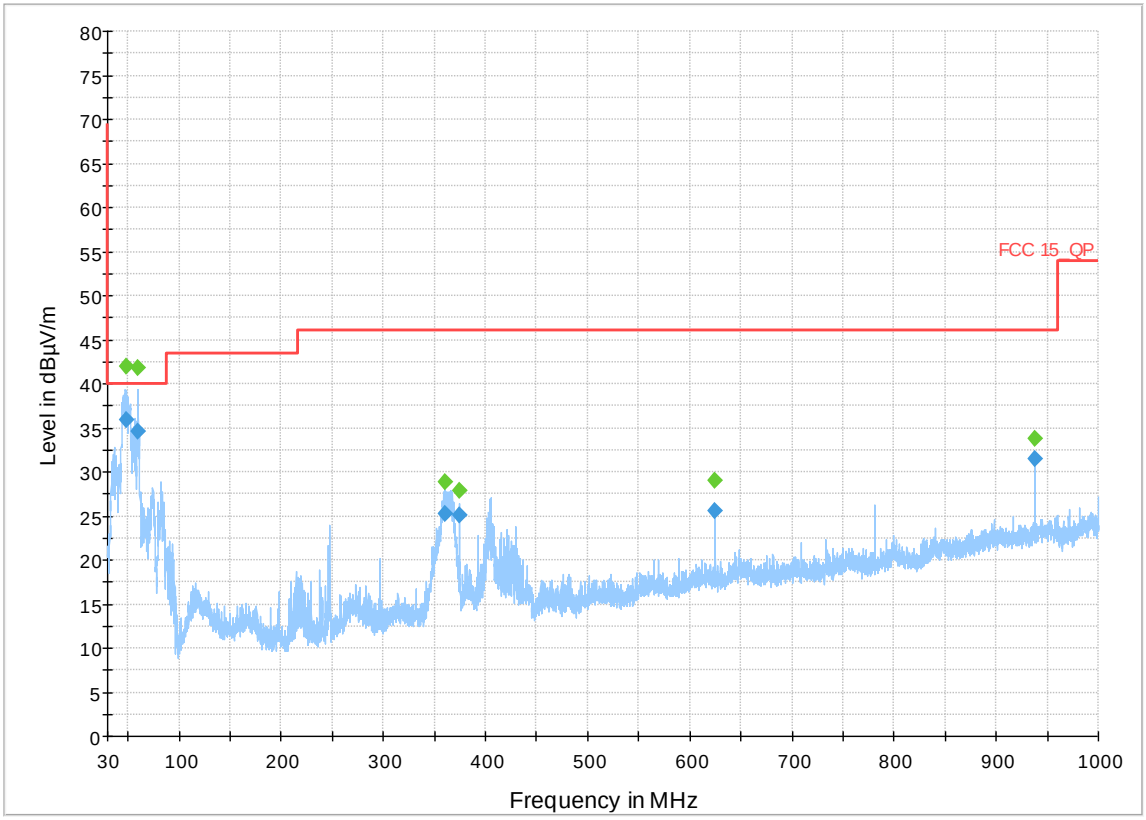


Figure 13: Radiated Spurious Emission 30MHz-1GHz – LTE Mid Channel band 66

Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
48.67	35.93	---	40.00	4.07	1000.00	120.00	101.00	V	-118.00	-17.80	
48.67	---	42.22	---	---	1000.00	120.00	101.00	V	-118.00	-17.80	
60.16	---	42.02	---	---	1000.00	120.00	101.00	V	70.00	-17.10	
60.16	35.41	---	40.00	4.59	1000.00	120.00	101.00	V	70.00	-17.10	
83.70	25.57	---	40.00	14.43	1000.00	120.00	101.00	V	-175.00	-20.10	
83.70	---	33.95	---	---	1000.00	120.00	101.00	V	-175.00	-20.10	
197.80	---	24.98	---	---	1000.00	120.00	101.00	V	-181.00	-14.70	
197.80	22.15	---	43.50	21.35	1000.00	120.00	101.00	V	-181.00	-14.70	
361.81	---	26.98	---	---	1000.00	120.00	100.00	H	-113.00	-10.40	
361.81	23.02	---	46.00	22.98	1000.00	120.00	100.00	H	-113.00	-10.40	
625.01	---	32.65	---	---	1000.00	120.00	101.00	V	-157.00	-6.20	
625.01	28.24	---	46.00	17.76	1000.00	120.00	101.00	V	-157.00	-6.20	

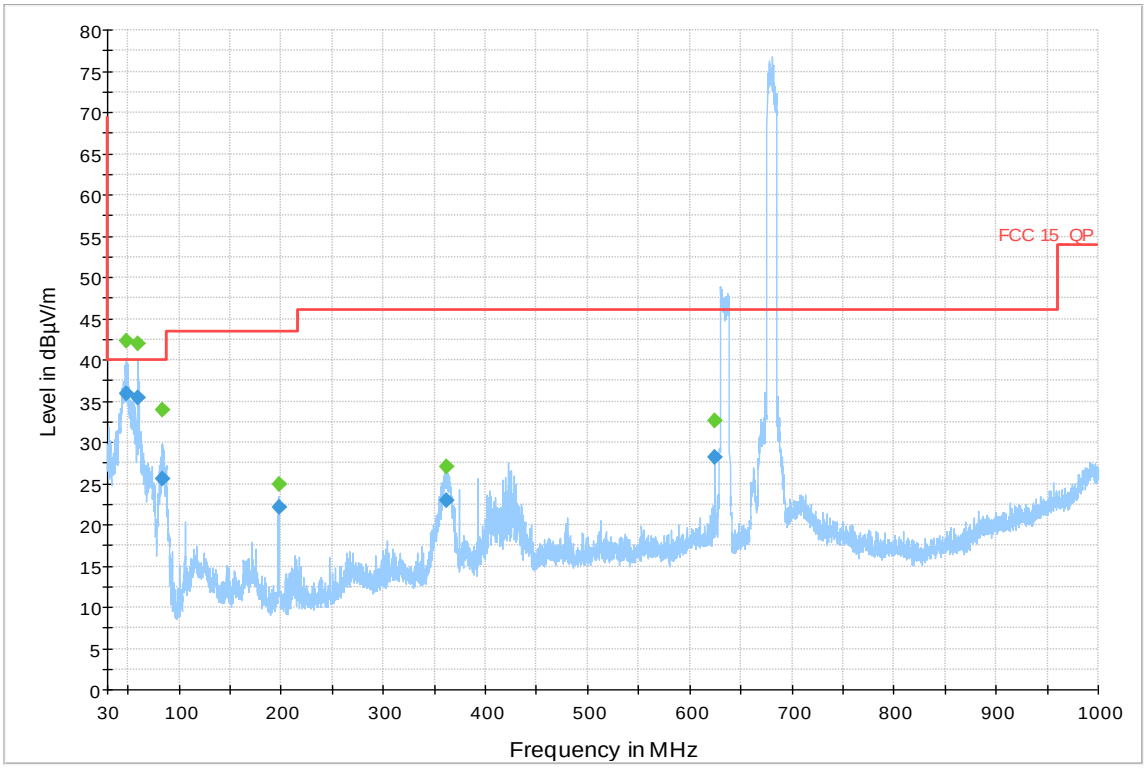


Figure 14: Radiated Spurious Emission 30MHz-1GHz – LTE Mid Channel band 71

Note: The 680.5 MHz is the Fundamental.

4.2.3.2 **1GHz – 3.0GHz**

Frequency (MHz)	MaxPeak (dBm)	Average (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
13358.88	---	-59.82	-13.00	46.82	1000.00	1000.00	254.00	H	-111.00	-12.70	
13358.88	-47.08	---	-13.00	34.08	1000.00	1000.00	254.00	H	-111.00	-12.70	
14223.65	-45.93	---	-13.00	32.93	1000.00	1000.00	294.00	V	162.00	-11.40	
14223.65	---	-58.66	-13.00	45.66	1000.00	1000.00	294.00	V	162.00	-11.40	
17948.84	-42.78	---	-13.00	29.78	1000.00	1000.00	300.00	H	103.00	-6.90	
17948.84	---	-55.76	-13.00	42.76	1000.00	1000.00	300.00	H	103.00	-6.90	

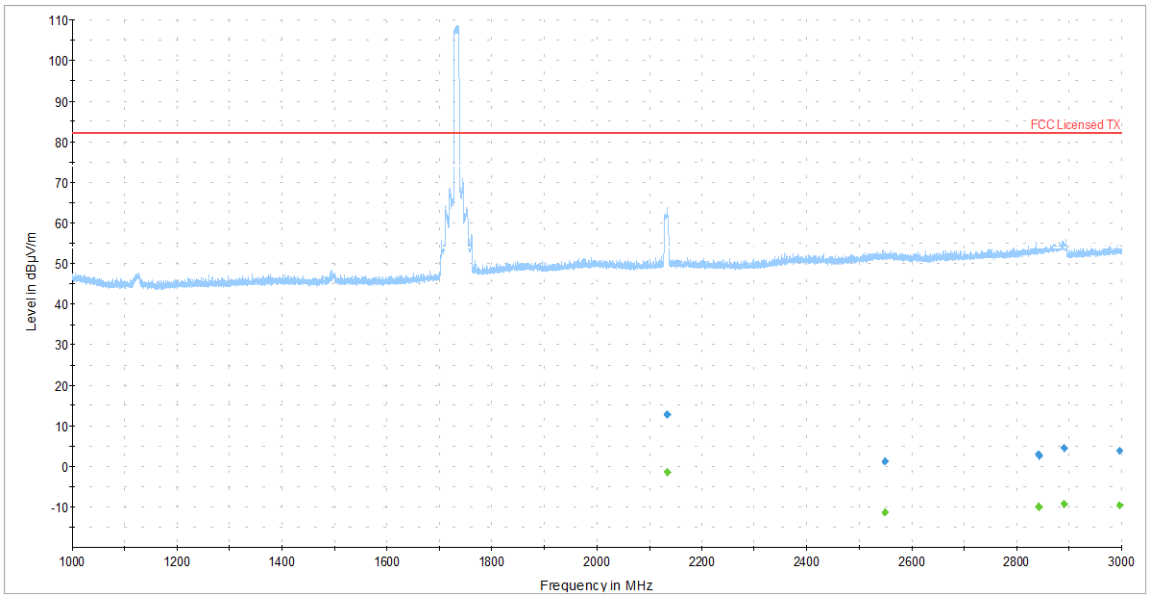


Figure 15: Radiated Spurious Emission 1GHz-3GHz – LTE Mid Channel band 4

Note: The 1732.5 MHz is the Fundamental.

Frequency (MHz)	MaxPeak (dBm)	Average (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
1125.87	-48.10	---	-13.00	35.10	1000.00	1000.00	254.00	H	-180.00	25.40	
1125.87	---	-60.32	-13.00	47.32	1000.00	1000.00	254.00	H	-180.00	25.40	
2142.83	---	-45.70	-13.00	32.70	1000.00	1000.00	267.00	V	-135.00	29.80	
2142.83	-31.05	---	-13.00	18.05	1000.00	1000.00	267.00	V	-135.00	29.80	
2486.81	---	-57.16	-13.00	44.16	1000.00	1000.00	102.00	H	180.00	30.30	
2486.81	-44.13	---	-13.00	31.13	1000.00	1000.00	102.00	H	180.00	30.30	
2863.77	-41.50	---	-13.00	28.50	1000.00	1000.00	154.00	V	180.00	31.40	
2863.77	---	-54.74	-13.00	41.74	1000.00	1000.00	154.00	V	180.00	31.40	
2890.45	---	-54.35	-13.00	41.35	1000.00	1000.00	100.00	V	-180.00	31.70	
2890.45	-41.54	---	-13.00	28.54	1000.00	1000.00	100.00	V	-180.00	31.70	
2995.55	---	-54.70	-13.00	41.70	1000.00	1000.00	141.00	V	180.00	32.50	
2995.55	-41.61	---	-13.00	28.61	1000.00	1000.00	141.00	V	180.00	32.50	

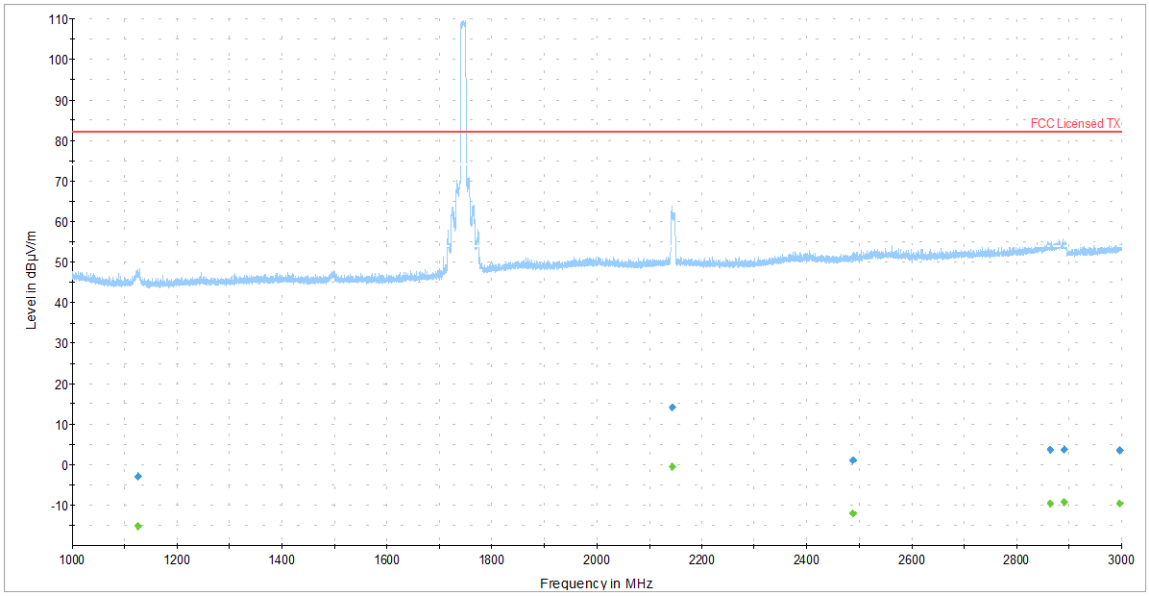


Figure 16: Radiated Spurious Emission 1GHz-3GHz – LTE Mid Channel band 66

Note: The 1745 MHz is the Fundamental.

4.2.3.3 **3GHz – 18GHz**

Frequency (MHz)	MaxPeak (dBm)	Average (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
13358.88	---	-59.82	-13	---	1000	1000	254	H	-111	-12.7	
13358.88	-47.08	---	-13	34.08	1000	1000	254	H	-111	-12.7	
14223.65	-45.93	---	-13	32.93	1000	1000	294	V	162	-11.4	
14223.65	---	-58.66	-13	---	1000	1000	294	V	162	-11.4	
17948.84	-42.78	---	-13	29.78	1000	1000	300	H	103	-6.9	
17948.84	---	-55.76	-13	---	1000	1000	300	H	103	-6.9	

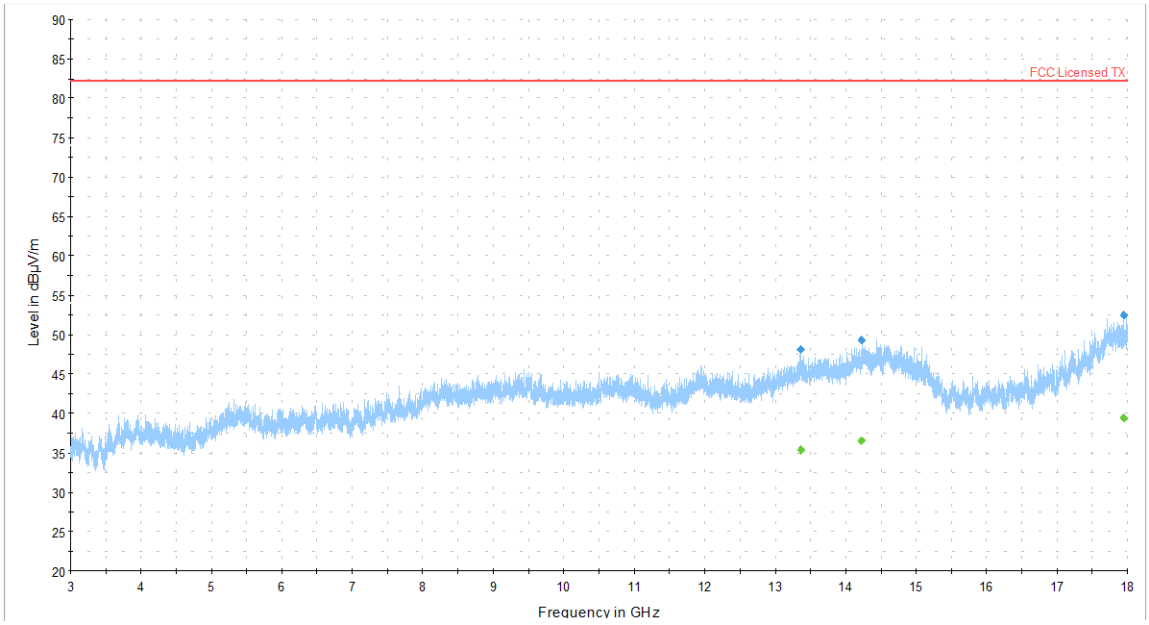


Figure 17: Radiated Spurious Emission 3GHz-18GHz – LTE Mid Channel band 4

Frequency (MHz)	MaxPeak (dBm)	Average (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
7512.69	-53.6	---	-13	40.6	1000	1000	230	V	-138	-19.1	
7512.69	---	-66.62	-13	---	1000	1000	230	V	-138	-19.1	
9364.37	-49.73	---	-13	36.73	1000	1000	250	V	-68	-16.4	
9364.37	---	-62.51	-13	---	1000	1000	250	V	-68	-16.4	
10624.33	-50.98	---	-13	37.98	1000	1000	178	H	-145	-15.6	
10624.33	---	-63.34	-13	---	1000	1000	178	H	-145	-15.6	
13260.44	---	-61.2	-13	---	1000	1000	246	V	-109	-12.8	
13260.44	-48.09	---	-13	35.09	1000	1000	246	V	-109	-12.8	
14592.15	-46.17	---	-13	33.17	1000	1000	250	V	-21	-11.9	
14592.15	---	-59.4	-13	---	1000	1000	250	V	-21	-11.9	
17679.15	---	-57.14	-13	---	1000	1000	250	H	-98	-8.6	
17679.15	-43.82	---	-13	30.82	1000	1000	250	H	-98	-8.6	

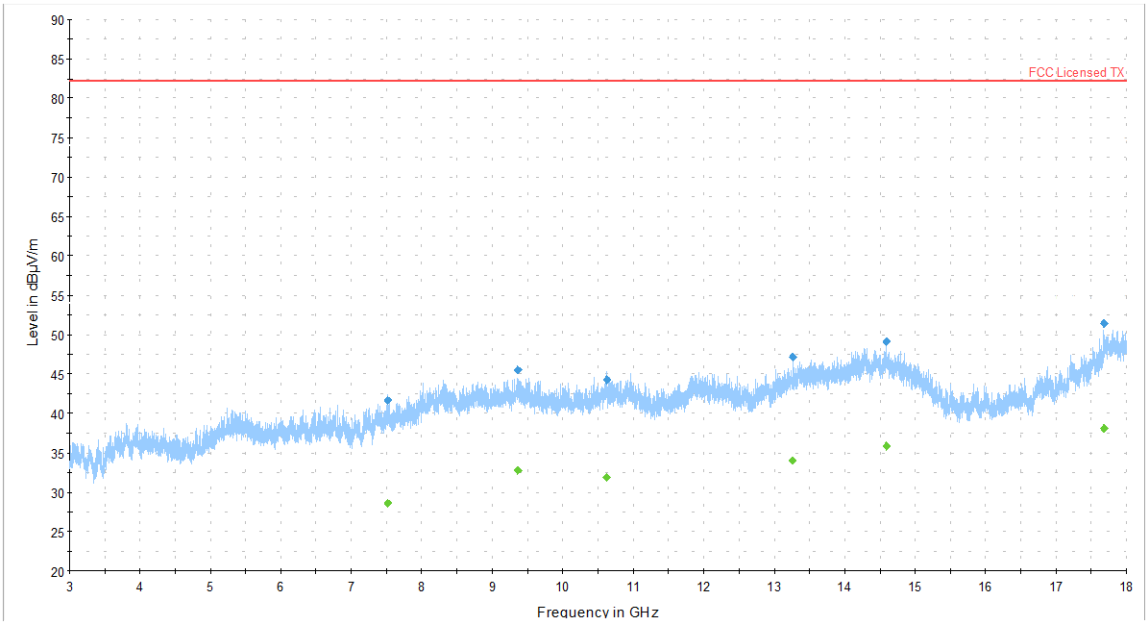


Figure 18: Radiated Spurious Emission 3GHz-18GHz – LTE Mid Channel band 66

4.2.3.4 1GHz – 18GHz

Frequency (MHz)	MaxPeak (dBm)	Average (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
1093.73	---	-62.32	-13.00	---	1000.00	1000.00	128.00	V	-19.00	-36.10	
1093.73	-56.15	---	-13.00	43.15	1000.00	1000.00	128.00	V	-19.00	-36.10	
1426.07	---	-65.72	-13.00	---	1000.00	1000.00	256.00	V	-10.00	-35.00	
1426.07	-56.08	---	-13.00	43.08	1000.00	1000.00	256.00	V	-10.00	-35.00	

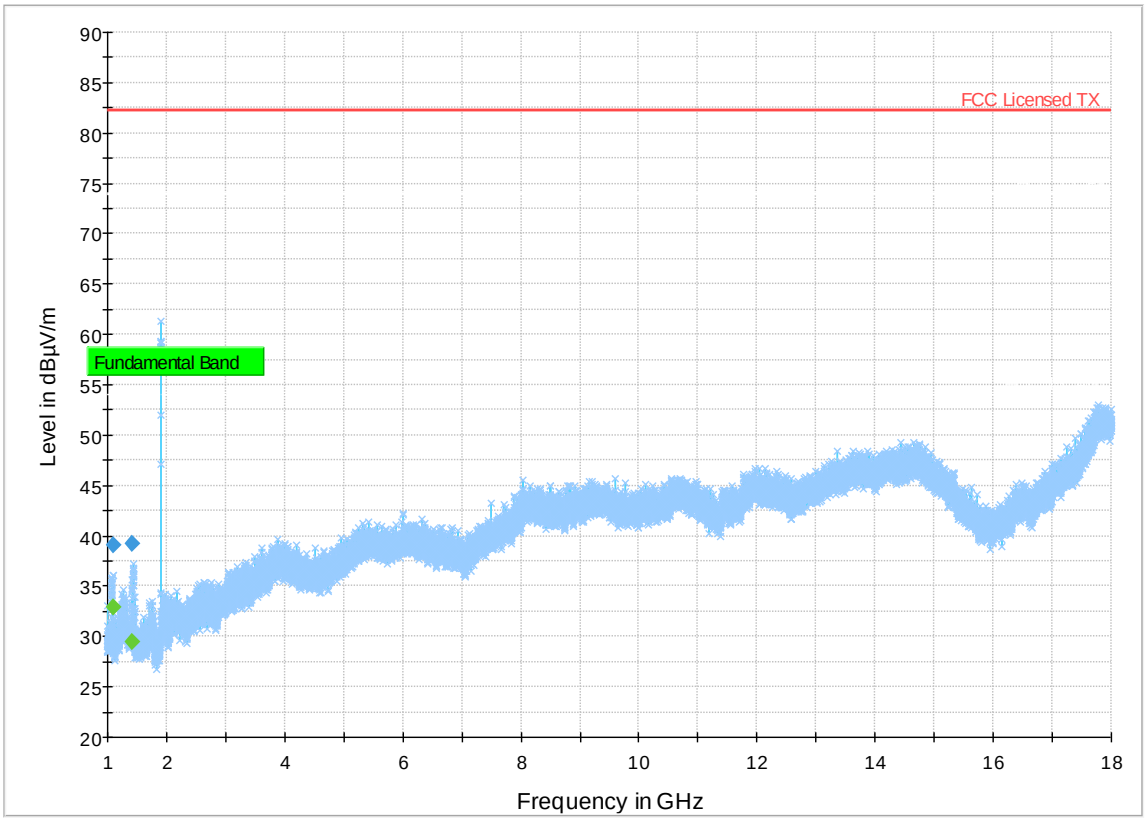


Figure 19: Radiated Spurious Emission 1GHz-18GHz – LTE Mid Channel band 2

Frequency (MHz)	MaxPeak (dBm)	Average (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
1135.47	-53.56	---	-13.00	40.56	1000.00	1000.00	200.00	V	-38.00	-36.30	
1135.47	---	-61.25	-13.00	48.25	1000.00	1000.00	200.00	V	-38.00	-36.30	
1516.80	---	-64.52	-13.00	51.52	1000.00	1000.00	100.00	V	18.00	-34.90	
1516.80	-56.07	---	-13.00	43.07	1000.00	1000.00	100.00	V	18.00	-34.90	
1673.35	-47.72	---	-13.00	34.72	1000.00	1000.00	101.00	V	-18.00	-34.20	
1673.35	---	-58.32	-13.00	45.32	1000.00	1000.00	101.00	V	-18.00	-34.20	

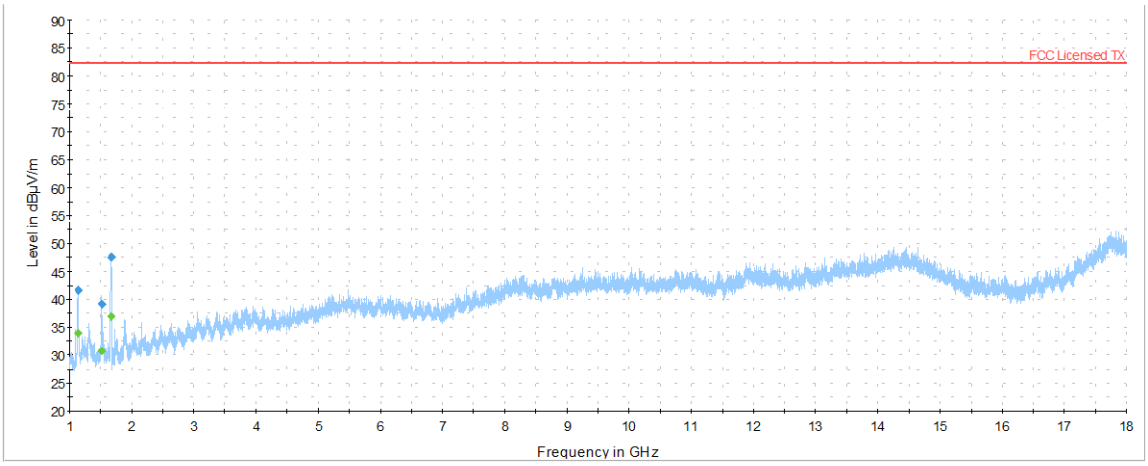


Figure 20: Radiated Spurious Emission 1GHz-18GHz – LTE Mid Channel band 5

Frequency (MHz)	MaxPeak (dBm)	Average (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
1134.26	---	-61.17	-13.00	48.17	1000.00	1000.00	200.00	V	-38.00	-36.30	
1134.26	-53.70	---	-13.00	40.70	1000.00	1000.00	200.00	V	-38.00	-36.30	
1410.27	-49.71	---	-13.00	36.71	1000.00	1000.00	115.00	V	6.00	-34.90	
1410.27	---	-61.68	-13.00	48.68	1000.00	1000.00	115.00	V	6.00	-34.90	
1511.00	-55.85	---	-13.00	42.85	1000.00	1000.00	100.00	V	19.00	-35.00	
1511.00	---	-64.37	-13.00	51.37	1000.00	1000.00	100.00	V	19.00	-35.00	

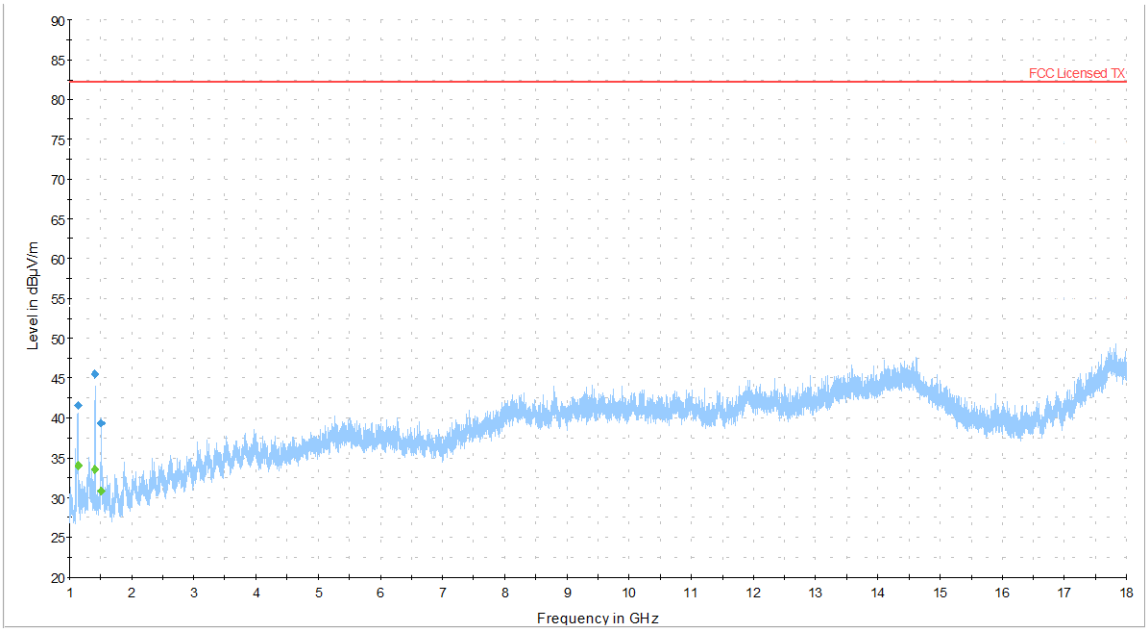


Figure 21: Radiated Spurious Emission 1GHz-18GHz – LTE Mid Channel band 12

Frequency (MHz)	MaxPeak (dBm)	Average (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
1131.75	-57.15	---	-13.00	44.15	1000.00	1000.00	200.00	V	-27.00	-36.20	
1131.75	---	-66.25	-13.00	53.25	1000.00	1000.00	200.00	V	-27.00	-36.20	
1509.08	---	-66.76	-13.00	53.76	1000.00	1000.00	115.00	V	19.00	-35.00	
1509.08	-56.91	---	-13.00	43.91	1000.00	1000.00	115.00	V	19.00	-35.00	
1886.68	-60.10	---	-13.00	47.10	1000.00	1000.00	141.00	H	-47.00	-32.10	
1886.68	---	-72.64	-13.00	59.64	1000.00	1000.00	141.00	H	-47.00	-32.10	

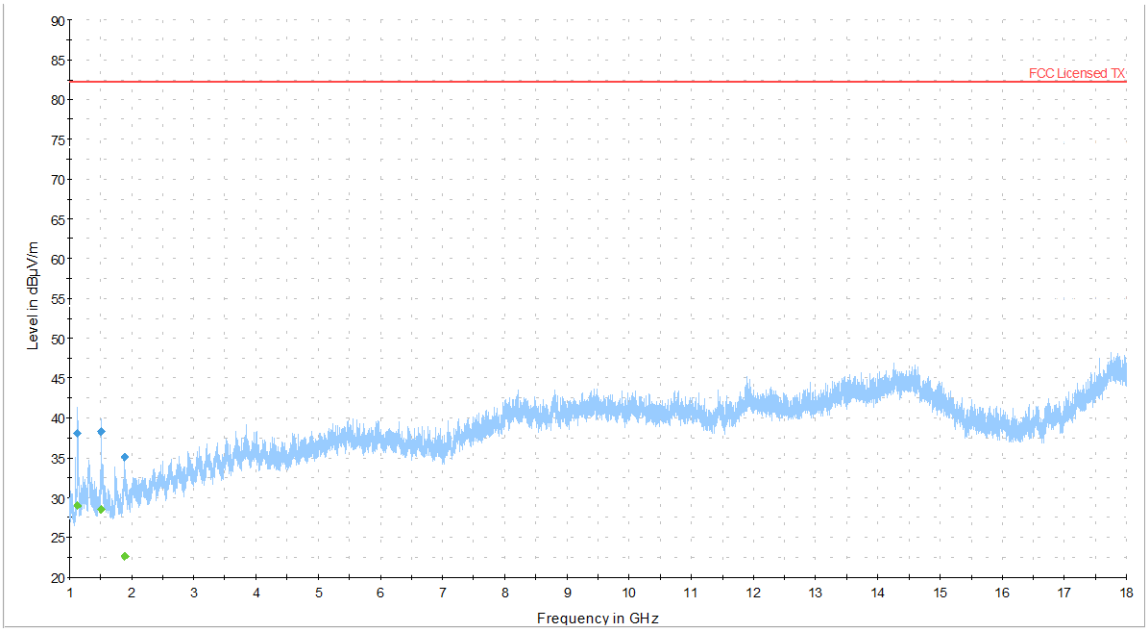


Figure 22: Radiated Spurious Emission 1GHz-18GHz – LTE Mid Channel band 13

Frequency (MHz)	MaxPeak (dBm)	Average (dBm)	Limit (dBm)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
1133.76	---	-66.36	-13.00	53.36	1000.00	1000.00	202.00	V	-39.00	-36.20	
1133.76	-57.78	---	-13.00	44.78	1000.00	1000.00	202.00	V	-39.00	-36.20	
1310.23	-58.75	---	-13.00	45.75	1000.00	1000.00	167.00	H	57.00	-35.40	
1310.23	---	-69.91	-13.00	56.91	1000.00	1000.00	167.00	H	57.00	-35.40	
1362.62	---	-67.13	-13.00	54.13	1000.00	1000.00	115.00	V	-2.00	-35.20	
1362.62	-56.02	---	-13.00	43.02	1000.00	1000.00	115.00	V	-2.00	-35.20	
1508.30	-55.77	---	-13.00	42.77	1000.00	1000.00	102.00	V	-19.00	-35.00	
1508.30	---	-64.35	-13.00	51.35	1000.00	1000.00	102.00	V	-19.00	-35.00	

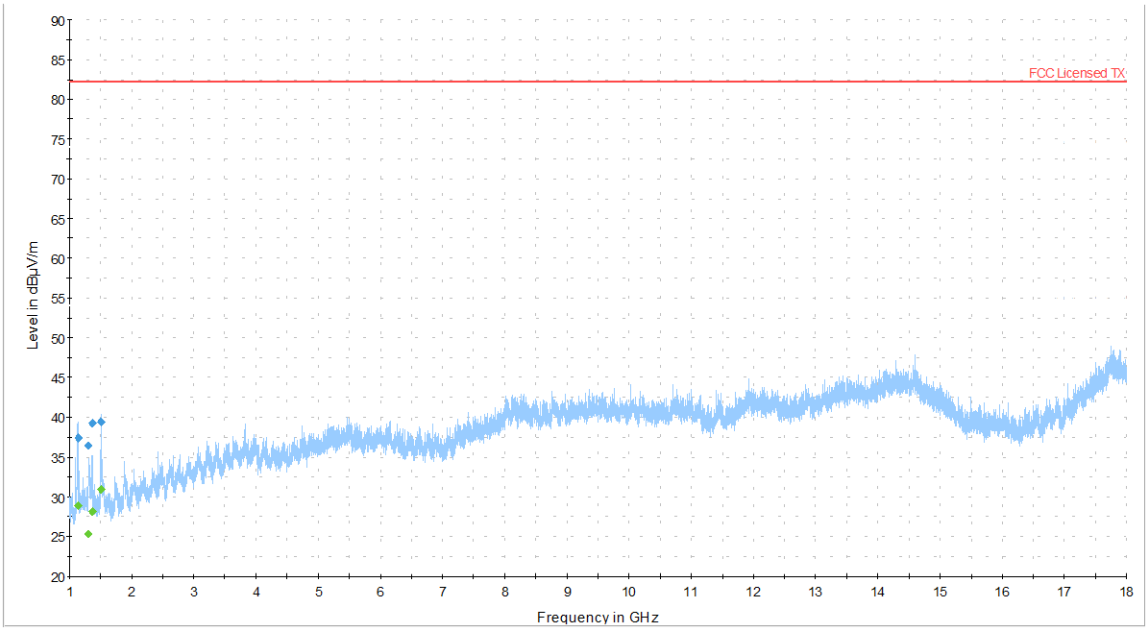


Figure 23: Radiated Spurious Emission 1GHz-18GHz – LTE Mid Channel band 71

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5 Test Equipment List

5.1 Equipment List

Table 6: Equipment List

Equipment	Manufacturer	Model #	Serial/Inst #	Last Cal mm/dd/yyyy	Next Cal mm/dd/yyyy
Spectrum Analyzer	Rohde & Schwarz	FSU26.5	200050	11/20/2018	11/20/2019
Spectrum Analyzer	Rohde & Schwarz	FSU8	101358	12/07/2018	12/07/2019
EMI Receiver	Rohde & Schwarz	ESIB40	100180	05/31/2018	05/31/2020
L.I.S.N.	Com-Power	LI-215	192000	01/16/2019	01/16/2020
Transient Limiter	Com-Power	LIT-930	531582	01/16/2019	01/16/2020
EMI Receiver	Agilent	MXE N9038A	MY51210195	01/16/2019	01/16/2020
Preamplifier, 9 kHz – 1 GHz	Sonoma	310N	213221	01/16/2019	01/16/2020
Bilog Antenna	Sunol Sciences	JB3	A060502	05/27/2018	05/27/2020
Amplifier	Miteq	TTA1800-30-HG	1842452	01/15/2019	01/15/2020
Horn Antenna	Sunol Sciences	DRH-118	A040806	03/05/2019	03/05/2020
Amplifier	HP	8449B	3008A01013	01/15/2019	01/15/2020
Amplifier	Sonoma	310N	185516	N/A (See Note)	
1.6 GHz Low Pass Filter	K&L Microwave	8L120-X1600-0/09135-0249	UA691-35	N/A (See Note)	
3.5 GHz High Pass Filter	Hewlett Packard	84300-80038	820004	N/A (See Note)	
2.4 GHz Notch Filter	Micro-Tronics	BRM50702	009	01/15/2019	01/15/2020

Note: Equipment is characterized before use.

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END OF REPORT