



**Choose certainty.
Add value.**

Report On

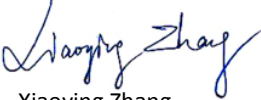
Application for Grant of Equipment Authorization of the
Inseego Corp.
MD8800 Wireless Module

FCC CFR 47 Part 2 90 and 96: 2018
RSS-192 Issue 3 January 2008
RSS-197 Issue 1 February 2010

Report No. 72140663D Rev 1.0

March 2019



REPORT ON	Radio Testing of the Inseego Corp. MD8800 Wireless Module
TEST REPORT NUMBER	72140663D Rev 1.0
PREPARED FOR	Inseego Corp. 9605 Scranton Road, Suite 300 San Diego, CA 92121 USA
CONTACT PERSON	Roman Olmos Senior Regulatory Engineer (858) 812-0606 roman.olmos@inseego.com
PREPARED BY	 Xiaoying Zhang Name Authorized Signatory Title: EMC/Wireless Test Engineer
APPROVED BY	 Ferdinand S. Custodio Name Authorized Signatory Title: Senior EMC Test Engineer/Wireless Team Lead
DATED	March 28, 2019



Revision History

72140663D Rev 1.0 Inseego Corp. MD8800 Wireless Module					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
12/28/2018	-	Initial Release			Ferdinand S. Custodio
03/28/2019	Initial Release	Rev 1.0	Changed FCC ID	All	Ferdinand S. Custodio

CONTENTS

Section	Page No
1	REPORT SUMMARY..... 5
1.1	Introduction..... 6
1.2	Brief Summary of Results..... 7
1.3	Product Information 8
1.4	EUT Test configuration..... 10
1.5	Deviations from the Standard..... 12
1.6	Modification Record 12
1.7	Test Methodology..... 12
1.8	Test Facility Location..... 12
1.9	Test Facility Registration 12
1.10	Sample Calculations 14
2	TEST DETAILS 15
2.1	Transmitter Conducted Power Measurements 16
2.2	Effective Isotropic Radiated Power and Power Spectral Density..... 26
2.3	Occupied Bandwidth..... 33
2.4	Band Edge 37
2.5	Conducted Spurious Emissions 56
2.6	Field Strength of Spurious Radiation 87
2.7	Frequency Stability 97
2.8	Receiver Spurious Emissions..... 102
3	TEST EQUIPMENT USED 104
3.1	Test Equipment Used..... 105
3.2	Measurement Uncertainty 106
4	DIAGRAM OF TEST SETUP 108
4.1	Test Setup Diagram..... 109
5	ACCREDITATION, DISCLAIMERS AND COPYRIGHT 113
5.1	Accreditation, Disclaimers and Copyright..... 114



SECTION 1

REPORT SUMMARY

Radio Testing of the
Inseego Corp.
MD8800 Wireless Module



1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Inseego Corp. MD8800 Wireless Module to the requirements of the following:

- FCC CFR 47 Part 2 90 and 96: 2018
- RSS-Gen Issue 5 April 2018
- RSS-192 Issue 3 January 2008
- RSS-197 Issue 1 February 2010

Objective	To perform Radio Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Inseego Corp.
Product Trademark/Brand	Inseego
Product Marketing Name	MD8800
Model Number(s)	MD8800
FCC ID Number	PKRISGMD8800
IC Number	3229A-MD8800
Serial Number(s)	AS190818B00021 AZ280418A00132 (Host Model MIFI8800L serial number)
Number of Samples Tested	2
Test Specification/Issue/Date	• FCC CFR 47 Part 2 90 and 96 (October 1, 2018) • RSS-192 Issue 3 January 2008 - Fixed Wireless Access Equipment Operating in the Band 3450-3650 MHz • RSS-197 Issue 1 February 2010 – Wireless Broadband Access Equipment Operating in the Band 3650-3700 MHz • RSS-Gen Issue 5: April 2018 - General Requirements for Compliance of Radio Apparatus • ANSI C63.26-2015: American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services
Start of Test	June 25, 2018
Finish of Test	October 24, 2018
Name of Engineer(s)	Xiaoying Zhang
Related Document(s)	• 72139211D_Novatel MIFI8800L_FCC Part 90 96_LTE Band 48_RSS 192 197_Test Report.pdf • Supporting documents for EUT certification are separate exhibits.

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC CFR 47 Part 2 90 and 96: 2018 with cross-reference to the corresponding ISSED RSS standard is shown below.

Section	FCC Part Sections(s)	RSS Section(s)	Test Description	Result
2.1	2.1046	RSS-192 (5.4)	Transmitter Conducted Output Power	Compliant*
2.2	2.1046 96.41(b) 90.1321(c)	RSS-192 (5.4) RSS-197 (5.6)	Effective Isotropic Radiated Power and Power Spectral Density	Compliant*
-	96.41(g)	-	Peak-Average Ratio	N/A*
2.3	2.1049 96.41(e)(3) 90.1323(a)	RSS-Gen (6.7)	Occupied Bandwidth	Compliant*
2.4	2.1051 96.41(e)(1)(3) 90.1323(a)	RSS-192 (5.5) RSS-197 (5.7)	Band Edge and Emission Mask	Compliant*
2.5	2.1051 96.41(e)(1)(2)(3) 90.1323(a)	RSS-192 (5.5) RSS-197 (5.7)	Conducted Spurious Emissions	Compliant*
2.6	2.1053 96.41(e) 90.1323(a)	RSS-192 (5.5) RSS-197 (5.7)	Field Strength of Spurious Radiation	Compliant
2.7	2.1055	RSS-192 (5.3) RSS-197 (5.3)	Frequency Stability	Compliant*
2.8	-	RSS-192 (5.6) RSS-197 (5.8) RSS-Gen 7.4	Receiver Spurious Emissions	Compliant*

N/A* Not applicable. For CBSD only.

Compliant*: The module was previously tested in a host under Model Number MIFI8800L. All the conducted measurements for LTE Band 48 were from the host and covered under test report 72139211D_Novatel MIFI8800L_FCC Part 90 96_LTE Band 48_RSS 192 197_Test Report.pdf.



1.3 PRODUCT INFORMATION

1.3.1 EUT General Description

The Equipment Under Test (EUT) was an Inseego Corp. MD8800 Wireless Module. The EUT is a Wireless Hotspot Modem supporting 2G/3G/4G, Wi-Fi, and GPS/GLNSS Technologies. The EUT is mounted on a mini ground plane for the ease of testing. The EUT comes with a USB Port to connect to an AC Adaptor.

1.3.2 Technical Description

EUT Description	Wireless Module
Product Marketing Name	MD8800
Model Number(s)	MD8800
Rated Voltage	Input 100-240VAC, Output 5V (External AC-DC Power Adapter)
Mode Verified	LTE Band 48: 3550-3700 MHz
Capability	WCDMA Band 2, 5 and LTE Band 2, 4, 5, 7, 13, 14, 46, 48, 66
Primary Unit (EUT)	☒ Production ☐ Pre-Production ☐ Engineering
Manufacturer declared Rated Power	23 dBm

(Client declaration, max. antenna gain covered under this test report)

LTE Bands	Frequency(ies)	Antenna Gains
Band 48	3550-3700 MHz	2.9 dBi

1.3.3 Transmit Frequency Table

LTE Band 48					
Modulation	Bandwidth (MHz)	Tx Frequency (MHz)	Emission Designator	EIRP / 10 MHz	
				Max Power (dBm)	Max Power (Watts)
QPSK	5	3550 - 3650	4M49G7D	21.98	0.16
	10		8M96G7D	21.91	0.16
	15		13M4G7D	20.72	0.12
	20		17M9G7D	19.19	0.08
16QAM	5		4M47W7D	21.0	0.13
	10		8M96W7D	20.86	0.12
	15		13M4W7D	19.63	0.09
	20		17M9W7D	18.21	0.07
64QAM	5		4M47W7D	20.14	0.10
	10		8M96W7D	20.06	0.10
	15		13M4W7D	18.77	0.08
	20		17M9W7D	17.33	0.05

LTE Band 48					
Modulation	Bandwidth (MHz)	Tx Frequency (MHz)	Emission Designator	EIRP / 25 MHz	
				Max Power (dBm)	Max Power (Watts)
QPSK	5	3650 - 3700	4M48G7D	22.78	0.19
	10		8M96G7D	22.9	0.19
	15		13M4G7D	22.86	0.19
	20		18M0G7D	22.97	0.20
16QAM	5		4M48W7D	22.07	0.16
	10		8M97W7D	22.05	0.16
	15		13M5W7D	22.01	0.16
	20		17M9W7D	22.17	0.16
64QAM	5		4M49W7D	21.08	0.13
	10		8M97W7D	21.15	0.13
	15		13M4W7D	20.98	0.13
	20		17M9W7D	21.2	0.13

1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
A	Conducted antenna port measurement. EUT is powered via AC Adapter and controlled by a call box to transmit at max power.
B	Radiated test setup / case spurious emissions. The EUT is mounted on a mini ground plane for the ease of testing and powered via AC Adaptor. The Antenna port is terminated by the call box.
C	Conducted antenna port measurement. EUT in receive mode and is powered by USB via AC Adapter.

1.4.2 EUT Exercise Software

EUT is controlled by a CMW 500 Wideband Radio Communication Tester or a Keysight E7515A UXM Wireless Test Set. There are no other test software used during verification.

1.4.3 Support Equipment and I/O cables

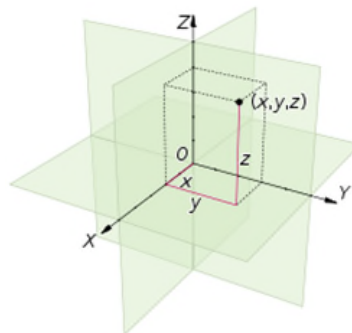
Manufacturer	Equipment/Cable	Description
Inseego Corp.	USB Cable	Standard USB Type A to USB Type C
Inseego Corp.	External AC-DC Power Adapter	Model: SSW-2783, PN: 40123126.01 Input: 100-240VAC, 50/60Hz, 0.5A Output: 5VDC, max. 2A

1.4.4 Worst Case Configuration

Worst-case configuration used in this test report as per output power measurements:

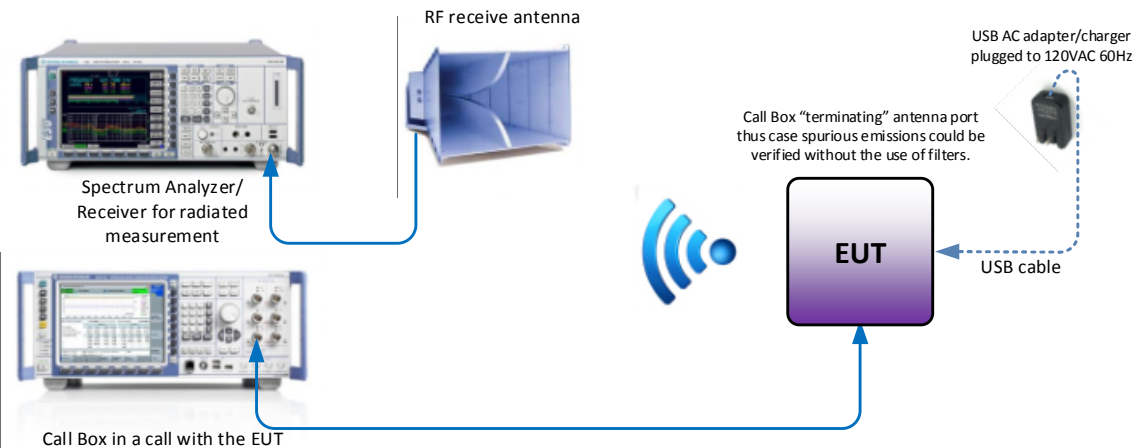
Band	Channel BW	Modulation	RB Size/Offset
Band 48 (3450 – 3650 MHz)	15 MHz	QPSK	1/0
Band 48 (3650 – 3700 MHz)	20 MHz	QPSK	1/0

For radiated measurements X, Y, and Z orientations were verified. The verification was determined “X” as worst case configuration.

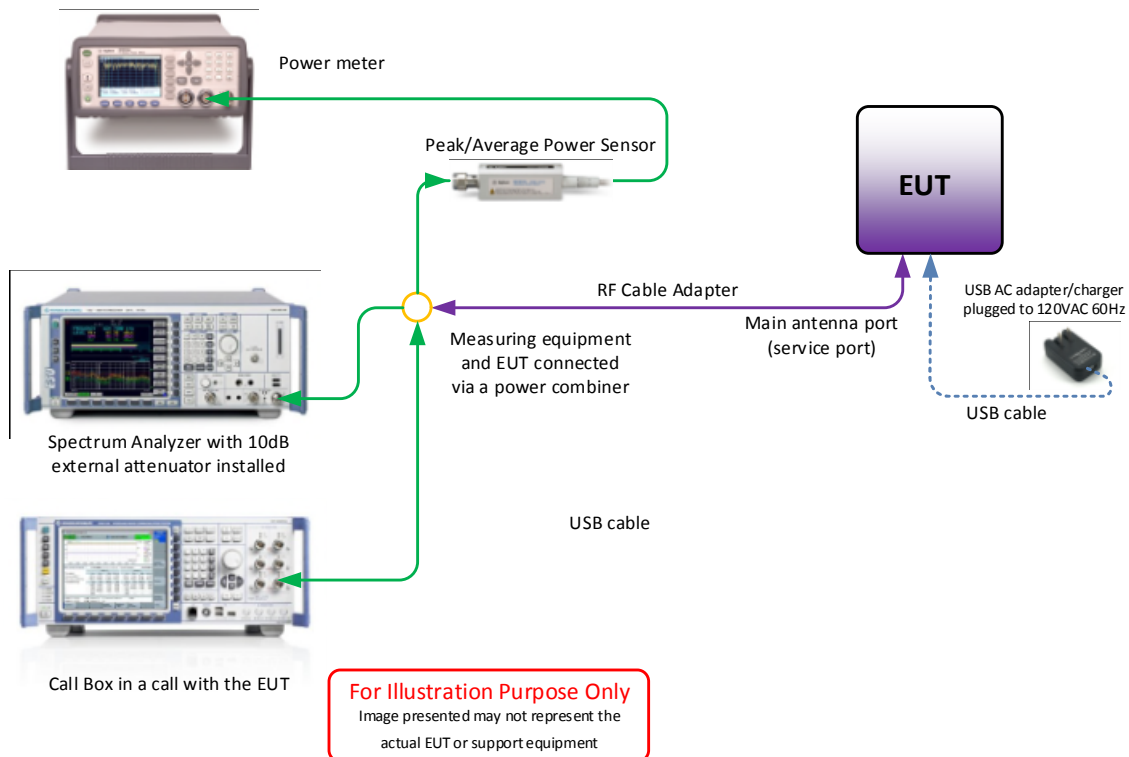


1.4.5 Simplified Test Configuration Diagram

Radiated Test Configuration/Conducted Emissions Test Configuration



Conducted (Antenna Port) Test Configuration





1.5 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standards or test plan were made during testing.

1.6 MODIFICATION RECORD

Description of Modification	Modification Fitted By	Date Modification Fitted
Serial Number AS190818B00021, AZ280418A00132 (Host Model MIFI8800L serial number)		
None	—	—

The table above details modifications made to the EUT during the test programme. The modifications incorporated during each test (if relevant) are recorded on the appropriate test pages.

1.7 TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.26-2015, American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services.

For conducted and radiated emissions the equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted according to the Operating Instructions provided by the manufacturer/client.

1.8 TEST FACILITY LOCATION

1.8.1 TÜV SÜD America Inc. (Mira Mesa)

10040 Mesa Rim Road, San Diego, CA 92121-2912 (32.901268,-117.177681). Phone: (858) 678-1400 Fax: (858) 546-0364.

1.8.2 TÜV SÜD America Inc. (Rancho Bernardo)

16936 Via Del Campo, San Diego, CA 92127-1708 (33.018644,-117.092409). Phone: (858) 678-1400 Fax: (858) 546-0364.

1.9 TEST FACILITY REGISTRATION

1.9.1 FCC – Designation No.: US1146

TUV SUD America Inc. (San Diego), is an accredited test facility with the site description report on file and has met all the requirements specified in §2.948 of the FCC rules. The acceptance letter from the FCC is maintained in our files and the Designation is US1146.



1.9.2 Innovation, Science and Economic Development Canada (IC) Registration No.: 3067A-1 & 22806-1

The 10m Semi-anechoic chamber of TUV SUD America Inc. (San Diego Rancho Bernardo) has been registered by Certification and Engineering Bureau of Innovation, Science and Economic Development Canada for radio equipment testing with Registration No. 3067A-1.

The 3m Semi-anechoic chamber of TUV SUD America Inc. (San Diego Mira Mesa) has been registered by Certification and Engineering Bureau of Innovation, Science and Economic Development Canada for radio equipment testing with Registration No. 22806-1.

1.9.3 BSMI – Laboratory Code: SL2-IN-E-028R (US0102)

TUV Product Service Inc. (San Diego) is a recognized EMC testing laboratory by the BSMI under the MRA (Mutual Recognition Arrangement) with the United States. Accreditation includes CNS 13438 up to 6GHz.

1.9.4 NCC (National Communications Commission - US0102)

TUV SUD America Inc. (San Diego) is listed as a Foreign Recognized Telecommunication Equipment Testing Laboratory and is accredited to ISO/IEC 17025 (A2LA Certificate No.2955.13) which under APEC TEL MRA Phase 1 was designated as a Conformity Assessment Body competent to perform testing of equipment subject to the Technical Regulations covered under its scope of accreditation including RTTE01, PLMN01 and PLMN08 for TTE type of testing and LP002 for Low-Power RF Device type of testing.

1.9.5 VCCI – Registration No. A-0280 and A-0281

TUV SUD America Inc. (San Diego) is a VCCI registered measurement facility which includes radiated field strength measurement, radiated field strength measurement above 1GHz, mains port interference measurement and telecommunication port interference measurement.

1.9.6 RRA – Identification No. US0102

TUV SUD America Inc. (San Diego) is National Radio Research Agency (RRA) recognized laboratory under Phase I of the APEC Tel MRA.

1.9.7 OFCA – U.S. Identification No. US0102

TUV SUD America Inc. (San Diego) is recognized by Office of the Communications Authority (OFCA) under Appendix B, Phase I of the APEC Tel MRA.

1.10 SAMPLE CALCULATIONS

1.10.1 LTE Emission Designator (QPSK)

Emission Designator = 4M51G7D
 G = Phase Modulation
 7= Quantized/Digital Info
 D = Data Transmission, telemetry, telecommand

1.10.2 LTE Emission Designator (16QAM)

Emission Designator = 4M50W7D
 W = Frequency Modulation
 7= Quantized/Digital Info
 D = Data Transmission, telemetry, telecommand

1.10.3 Spurious Radiated Emission (below 1GHz)

Measuring equipment raw measurement (dBμV) @ 30 MHz			24.4
Correction Factor (dB)	Asset# 1066 (cable)	0.3	-12.6
	Asset# 1172 (cable)	0.3	
	Asset# 1016 (preamplifier)	-30.7	
	Asset# 1175(cable)	0.3	
	Asset# 1002 (antenna)	17.2	
Reported QuasiPeak Final Measurement (dBμV/m) @ 30MHz			11.8

1.10.4 Spurious Radiated Emission – Substitution Method

Example = 84dBμV/m @ 1413 MHz (numerical sample only)

The field strength reading of 84dBμV/m @ 1413 MHz (2nd Harmonic of 706.5 MHz) is the maximized measurement when the EUT is on the turntable measured at 3 meters. The gain of the substituted antenna is 7.8dBi while the transmit cable loss is 1.0 dB (cable between signal generator and the substituted antenna). The signal generator level is adjusted until the 84dBμV/m level at the receiving end is replicated (identical test setup, i.e. same antenna, cable/s and preamp). If the adjusted signal generator level is -18dBm, then we have the following for both EIRP and ERP as required:

$$\begin{aligned}
 P_{\text{EIRP}} &= -18 \text{ dBm} + 7.8 \text{ dBi} - 1 \text{ dB} \\
 &= 11.2 \text{ dBm} \\
 P_{\text{ERP}} &= P_{\text{EIRP}} - 2.15 \text{ dB} \\
 &= 11.2 \text{ dBm} - 2.15 \text{ dB} \\
 &= 9.05 \text{ dBm}
 \end{aligned}$$



SECTION 2

TEST DETAILS

Radio Testing of the
Inseego Corp.
MD8800 Wireless Module



2.1 TRANSMITTER CONDUCTED POWER MEASUREMENTS

2.1.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1046
RSS-192, Clause 5.4

2.1.2 Standard Applicable

The conducted power measurements were made in accordance to FCC Part 2 Clause 2.1046 and RSS-192 Clause 5.4.

RSS-192, Clause 5.4:

The average output power, P_{mean} , shall be within ± 2.0 dB of the manufacturer's rated power. The e.i.r.p shall comply with the limits specified in SRSP-303.4.

2.1.3 Equipment Under Test and Modification State

Serial No: AZ280418A00132 / Test Configuration A

2.1.4 Date of Test/Initial of test personnel who performed the test

June 29, 2018 / XYZ

2.1.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	24.80 °C
Relative Humidity	43.2 %
ATM Pressure	98.8kPa

2.1.7 Additional Observations

- This is a conducted test using Power Meter.
- The path loss were measured and entered as a level offset.
- Low, Middle and High channels for all bandwidths with different RB size and RB offset and modulations were verified and reported.

2.1.8 Test Results

LTE Band 48 (3550-3650 MHz) according to FCC Part 96 / RSS-192							
Bandwidth (MHz)	Channel	Frequency (MHz)	Modulation	No. RB	RB Start	Average Power (dBm)	Peak Power (dBm)
5.0	55265	3552.5	QPSK	1	0	19.45	27.0
				1	13	19.42	26.91
				1	24	19.44	27.02
				25	0	18.53	27.45
			16QAM	1	0	18.74	28.06
				1	13	18.74	27.89
				1	24	18.7	27.98
				25	0	17.46	28.07
			64QAM	1	0	17.67	28.88
				1	13	17.66	28.78
				1	24	17.62	28.84
				25	0	16.52	27.98
	55740	3600	QPSK	1	0	20.04	27.6
				1	13	20.0	27.55
				1	24	19.99	27.52
				25	0	19.08	28.08
			16QAM	1	0	19.35	28.53
				1	13	19.34	28.49
				1	24	19.29	28.51
				25	0	18.1	28.72
			64QAM	1	0	18.46	28.49
				1	13	18.36	28.61
				1	24	18.3	28.49
				25	0	17.24	28.94
	56215	3647.5	QPSK	1	0	19.63	27.34
				1	13	19.55	27.07
				1	24	19.48	27.11
				25	0	18.44	27.86
			16QAM	1	0	18.91	28.27
				1	13	18.86	28.13
				1	24	18.81	28.18
				25	0	17.62	28.75
			64QAM	1	0	17.88	28.98
				1	13	17.88	28.77
				1	24	17.86	28.72
				25	0	16.64	27.72

LTE Band 48 (3550-3650 MHz) according to FCC Part 96 / RSS-192							
Bandwidth (MHz)	Channel	Frequency (MHz)	Modulation	No. RB	RB Start	Average Power (dBm)	Peak Power (dBm)
10.0	55290	3555	QPSK	1	0	19.39	26.94
				1	25	19.27	26.81
				1	49	19.29	26.86
				50	0	18.38	27.83
			16QAM	1	0	18.43	27.9
				1	25	18.33	27.82
				1	49	18.39	27.83
				50	0	17.34	27.69
			64QAM	1	0	17.71	28.88
				1	25	17.68	28.64
				1	49	17.7	28.8
				50	0	16.5	28.08
	55740	3600	QPSK	1	0	20.09	27.49
				1	25	19.94	27.38
				1	49	19.85	27.41
				50	0	19.01	28.22
			16QAM	1	0	19.3	28.45
				1	25	19.08	28.42
				1	49	19.03	28.46
				50	0	17.96	28.62
			64QAM	1	0	18.31	28.48
				1	25	18.09	28.4
				1	49	18.02	28.43
				50	0	17.16	28.36
	56190	3645	QPSK	1	0	19.6	27.14
				1	25	19.35	26.92
				1	49	19.19	26.89
				50	0	18.48	27.7
			16QAM	1	0	18.81	28.18
				1	25	18.61	28.06
				1	49	18.53	27.96
				50	0	17.62	28.15
			64QAM	1	0	17.71	28.65
				1	25	17.45	28.38
				1	49	17.33	28.84
				50	0	16.55	29.21

LTE Band 48 (3550-3650 MHz) according to FCC Part 96 / RSS-192							
Bandwidth (MHz)	Channel	Frequency (MHz)	Modulation	No. RB	RB Start	Average Power (dBm)	Peak Power (dBm)
15.0	55315	3557.5	QPSK	1	0	19.52	27.01
				1	38	19.36	26.77
				1	74	19.47	26.9
				75	0	18.36	27.68
			16QAM	1	0	18.89	28.01
				1	38	18.61	27.83
				1	74	18.71	27.87
				75	0	17.55	27.76
			64QAM	1	0	17.75	28.88
				1	38	17.61	28.74
				1	74	17.72	28.71
				75	0	16.51	27.81
	55740	3600	QPSK	1	0	20.26	27.62
				1	38	20.01	27.45
				1	74	19.99	27.53
				75	0	19.10	28.23
			16QAM	1	0	19.35	28.56
				1	38	19.13	28.38
				1	74	19.08	28.47
				75	0	18.02	28.41
			64QAM	1	0	18.33	28.53
				1	38	18.19	28.42
				1	74	18.18	28.44
				75	0	17.15	28.96
	56165	3642.5	QPSK	1	0	19.88	27.33
				1	38	19.41	27.0
				1	74	19.27	26.87
				75	0	18.59	17.89
			16QAM	1	0	18.97	28.44
				1	38	18.49	28.07
				1	74	18.35	29.97
				75	0	17.69	28.33
			64QAM	1	0	18.26	29.3
				1	38	17.82	29.0
				1	74	17.66	28.33
				75	0	16.73	27.98

LTE Band 48 (3550-3650 MHz) according to FCC Part 96 / RSS-192							
Bandwidth (MHz)	Channel	Frequency (MHz)	Modulation	No. RB	RB Start	Average Power (dBm)	Peak Power (dBm)
20.0	55340	3560	QPSK	1	0	19.59	27.09
				1	50	19.53	26.92
				1	99	19.57	27.03
				100	0	18.34	27.7
			16QAM	1	0	18.64	28.13
				1	50	18.47	27.9
				1	99	18.71	28.0
				100	0	17.62	27.88
			64QAM	1	0	17.89	28.99
				1	50	17.58	28.68
				1	99	17.85	28.87
				100	0	16.6	27.72
	55740	3600	QPSK	1	0	20.03	27.42
				1	50	19.83	27.2
				1	99	19.76	27.24
				100	0	18.81	27.89
			16QAM	1	0	19.39	28.43
				1	50	19.07	28.23
				1	99	19.01	28.25
				100	0	17.81	28.32
			64QAM	1	0	18.34	29.17
				1	50	18.16	29.05
				1	99	18.07	29.18
				100	0	16.96	28.52
	56140	3640	QPSK	1	0	20.03	27.67
				1	50	19.52	27.14
				1	99	19.23	26.91
				100	0	18.72	27.76
			16QAM	1	0	19.15	28.59
				1	50	18.61	28.19
				1	99	18.49	28.01
				100	0	17.84	28.58
			64QAM	1	0	18.26	29.54
				1	50	17.67	29.0
				1	99	17.57	28.97
				100	0	16.86	28.22

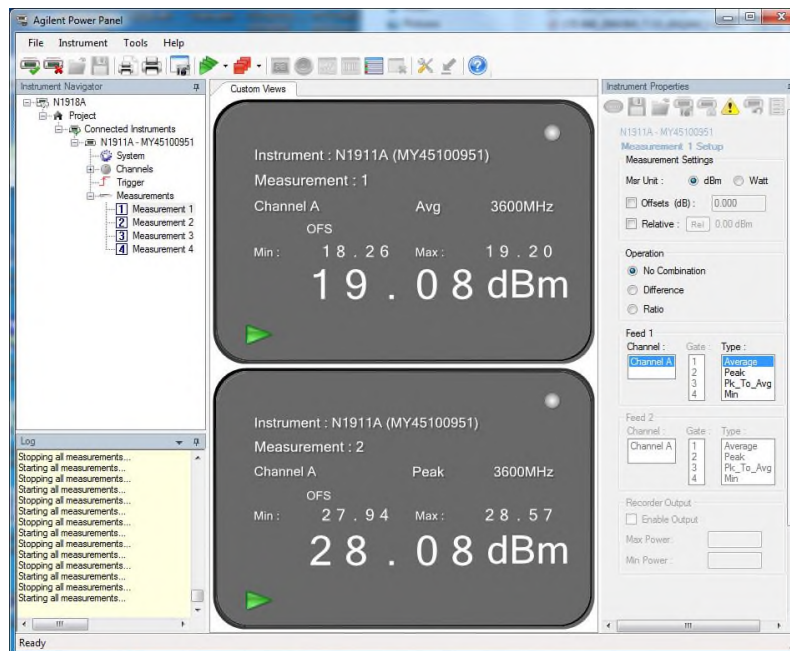
LTE Band 48 (3650-3700 MHz) according to FCC Part 90 / RSS-197							
Bandwidth (MHz)	Channel	Frequency (MHz)	Modulation	No. RB	RB Start	Average Power (dBm)	Peak Power (dBm)
5.0	56265	3652.5	QPSK	1	0	19.63	27.28
				1	13	19.58	27.2
				1	24	19.53	27.21
				25	0	19.41	27.16
			16QAM	1	0	18.94	28.28
				1	13	18.94	28.15
				1	24	18.83	28.16
				25	0	17.66	27.9
			16QAM	1	0	17.94	29.18
				1	13	17.81	29.02
				1	24	17.87	28.83
				25	0	16.66	28.64
	56490	3675	QPSK	1	0	19.88	27.46
				1	13	19.73	27.41
				1	24	19.87	27.48
				25	0	18.77	27.89
			16QAM	1	0	19.17	28.5
				1	13	19.16	28.46
				1	24	19.13	28.49
				25	0	17.94	28.84
			16QAM	1	0	18.18	28.55
				1	13	18.12	28.5
				1	24	18.14	28.48
				25	0	16.96	28.49
	56715	3697.5	QPSK	1	0	19.7	27.3
				1	13	19.69	27.2
				1	24	19.67	27.24
				25	0	18.66	27.92
			16QAM	1	0	19.02	28.37
				1	13	19.12	28.33
				1	24	19.05	28.46
				25	0	17.9	28.25
			16QAM	1	0	18.07	29.22
				1	13	18.02	29.29
				1	24	18.01	29.32
				25	0	16.9	29.2

LTE Band 48 (3650-3700 MHz) according to FCC Part 90 / RSS-197							
Bandwidth (MHz)	Channel	Frequency (MHz)	Modulation	No. RB	RB Start	Average Power (dBm)	Peak Power (dBm)
10.0	56290	3655	QPSK	1	0	19.66	27.35
				1	25	19.43	27.07
				1	49	19.49	27.12
				50	0	18.58	27.79
			16QAM	1	0	18.92	28.32
				1	25	18.71	28.19
				1	49	18.65	28.09
				50	0	17.73	28.3
			64QAM	1	0	17.91	28.37
				1	25	17.61	28.16
				1	49	17.7	28.07
				50	0	16.74	28.6
	56490	3675	QPSK	1	0	20.0	27.48
				1	25	19.82	27.41
				1	49	19.88	27.48
				50	0	18.81	28.0
			16QAM	1	0	19.15	28.49
				1	25	19.15	28.43
				1	49	19.07	28.5
				50	0	17.98	28.66
			64QAM	1	0	18.13	28.56
				1	25	18.05	28.4
				1	49	18.12	28.4
				50	0	16.98	28.58
	56690	3695	QPSK	1	0	19.89	27.31
				1	25	19.55	27.14
				1	49	19.58	27.22
				50	0	18.57	27.76
			16QAM	1	0	18.79	28.26
				1	25	18.68	28.23
				1	49	18.7	28.22
				50	0	17.68	28.52
			64QAM	1	0	18.25	29.28
				1	25	18.11	29.19
				1	49	18.04	29.31
				50	0	16.89	28.19

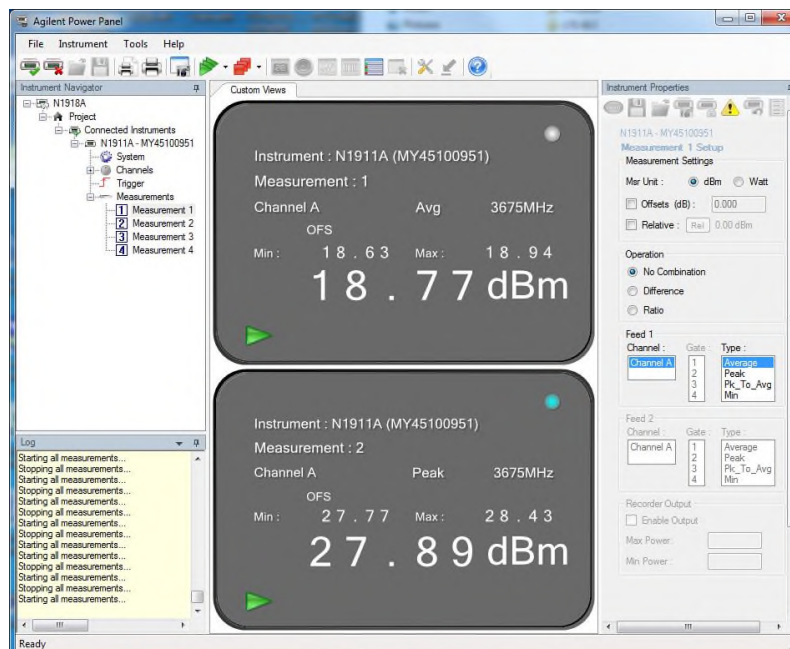
LTE Band 48 (3650-3700 MHz) according to FCC Part 90 / RSS-197							
Bandwidth (MHz)	Channel	Frequency (MHz)	Modulation	No. RB	RB Start	Average Power (dBm)	Peak Power (dBm)
15.0	56315	3657.5	QPSK	1	0	19.73	27.21
				1	38	19.44	26.96
				1	74	19.32	26.85
				75	0	18.45	27.89
			16QAM	1	0	18.84	28.29
				1	38	18.47	27.94
				1	74	18.39	27.87
				75	0	17.61	28.19
			64QAM	1	0	18.08	29.17
				1	38	17.75	28.96
				1	74	17.71	28.9
				75	0	16.65	28.12
	56490	3675	QPSK	1	0	19.96	27.53
				1	38	19.79	27.38
				1	74	19.95	27.4
				75	0	18.76	28.29
			16QAM	1	0	19.11	28.41
				1	38	18.97	28.34
				1	74	19.06	28.53
				75	0	17.99	28.51
			64QAM	1	0	18.07	28.47
				1	38	18.04	28.35
				1	74	18.12	28.59
				75	0	17.01	29.11
	56665	3692.5	QPSK	1	0	19.81	27.29
				1	38	19.63	27.15
				1	74	19.67	27.24
				75	0	18.74	27.98
			16QAM	1	0	18.99	28.23
				1	38	18.87	28.18
				1	74	18.96	28.29
				75	0	17.73	28.82
			64QAM	1	0	18.07	29.12
				1	38	17.92	29.14
				1	74	17.93	29.13
				75	0	16.82	28.38

LTE Band 48 (3650-3700 MHz) according to FCC Part 90 / RSS-197							
Bandwidth (MHz)	Channel	Frequency (MHz)	Modulation	No. RB	RB Start	Average Power (dBm)	Peak Power (dBm)
20.0	56340	3660	QPSK	1	0	19.81	27.25
				1	50	19.4	26.94
				1	99	19.38	26.87
				100	0	18.55	27.73
			16QAM	1	0	18.98	28.39
				1	50	18.71	28.07
				1	99	18.63	27.92
				100	0	17.63	28.17
			64QAM	1	0	18.05	29.94
				1	50	17.71	28.94
				1	99	17.54	28.8
				100	0	16.64	28.4
	56490	3675	QPSK	1	0	20.03	27.54
				1	50	19.88	27.42
				1	99	20.06	27.52
				100	0	18.91	28.11
			16QAM	1	0	19.27	28.47
				1	50	19.08	28.27
				1	99	19.33	28.59
				100	0	17.96	28.69
			64QAM	1	0	18.3	29.25
				1	50	18.1	29.25
				1	99	18.27	29.42
				100	0	17.04	28.73
	56640	3690	QPSK	1	0	20.07	27.46
				1	50	19.87	27.32
				1	99	19.73	27.24
				100	0	18.92	28.09
			16QAM	1	0	19.17	28.38
				1	50	19.05	28.28
				1	99	19.05	28.34
				100	0	18.08	28.96
			64QAM	1	0	18.19	29.2
				1	50	17.95	29.2
				1	99	17.98	29.3
				100	0	17.1	28.89

2.1.9 Sample Test Measurement Screen



LTE Band 48 (3550 – 3650 MHz)_5M Bandwidth Middle Channel QPSK Full RB



LTE Band 48 (3650 – 3700 MHz)_5 MHz Bandwidth_Middle Channel QPSK Full RB

2.2 EFFECTIVE ISOTROPIC RADIATED POWER AND POWER SPECTRAL DENSITY

2.2.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1046
FCC 47 CFR Part 96, Clause 41(b)
FCC 47 CFR Part 90, Clause 90.1321(c)
RSS-192, Clause 5.4
RSS-197, Clause 5.6

2.2.2 Standard Applicable

FCC 47 CFR Part 96, Clause 96.41:

(b) Unless otherwise specified in this section, the maximum effective isotropic radiated power (EIRP) and maximum Power Spectral Density (PSD) of any CBSD and End User Device must comply with the limits shown in the table below:

Device	Maximum EIRP (dBm/10 MHz)	Maximum PSD (dBm/MHz)
End User Device	23	N/A
Category A CBSD	30	20
Category B CBSD	47	37

RSS-192, Clause 5.4:

The average output power, P_{mean} , shall be within 2.0 dB of the manufacturer's rated power. The e.i.r.p shall comply with the limits specified in SRSP-303.4.

FCC 47 CFR Part 90, Clause 90.1321:

(c) Mobile and portable stations are limited to 1 watt/25 MHz EIRP. In any event, the peak EIRP density shall not exceed 40 milliwatts in any one-mega-hertz slice of spectrum.

RSS-197, Clause 5.6;

The maximum e.i.r.p density of mobile equipment shall not exceed 40 mW in any 1 MHz bandwidth.

2.2.3 Equipment Under Test and Modification State

Serial No: AZ280418A00132, Test Configuration A

2.2.4 Date of Test/Initial of test personnel who performed the test

July 09, 2018 / XYZ

2.2.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.



2.2.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	27.8 °C
Relative Humidity	39.4 %
ATM Pressure	98.8 kPa

2.2.7 Additional Observations

- EIRP was calculated as per Section 1.2 and 1.3 of KDB412172 D01 (Determining ERP and EIRP v01r01).
- Calculation formula in logarithmic terms:

$$\text{EIRP} = P_T + G_T - L_c$$

Where:

P_T = transmitter conducted output power dBm (Section 2.1 of this test report)
 G_T = gain of the transmitting antenna, in dBi (EIRP);
 L_c = signal attenuation in the connecting cable between the transmitter and antenna, in dB (EUT poses an internal Antenna. The loss between the EUT and the antenna port is considered negligible).

- Maximum EIRP (dBm/10 MHz) for 3550 – 3650 MHz 15 MHz and 20 MHz bandwidth is calculated using the following formula:

$$\text{Maximum EIRP (dBm/10 MHz)} = \text{EIRP}_{(\text{Full RB})} - 10 \lg (\text{OBW} / 10)$$

- This is a conducted test for EIRP Density in any 1 MHz.
- The path loss were measured and entered as a level offset.
- Low, Middle and High channels for all modulations were verified and reported.



2.2.8 Test Results

LTE Band 48 (3550 – 3650 MHz) EIRP according to FCC Part 96 / RSS-192									
Modulation	Bandwidth (MHz)	RB Size/Offset	Channels	Frequency (MHz)	Average Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Compliance
QPSK	5	1 / 0	55265	3552.5	19.45	2.9	22.35	23 ± 2	Yes
		1 / 0	55740	3600	20.04	2.9	22.94	23 ± 2	Yes
		1 / 0	56215	3647.5	19.63	2.9	22.53	23 ± 2	Yes
	10	1 / 0	55290	3555	19.39	2.9	22.29	23 ± 2	Yes
		1 / 0	55740	3600	20.09	2.9	22.99	23 ± 2	Yes
		1 / 0	56190	3645	19.6	2.9	22.5	23 ± 2	Yes
	15	1 / 0	55315	3557.5	19.52	2.9	22.42	23 ± 2	Yes
		1 / 0	55740	3600	20.26	2.9	23.16	23 ± 2	Yes
		1 / 0	56165	3642.5	19.88	2.9	22.78	23 ± 2	Yes
	20	1 / 0	55340	3560	19.59	2.9	22.49	23 ± 2	Yes
		1 / 0	55740	3600	20.03	2.9	22.93	23 ± 2	Yes
		1 / 0	56140	3640	20.03	2.9	22.93	23 ± 2	Yes
16QAM	5	1 / 0	55265	3552.5	18.74	2.9	21.64	23 ± 2	Yes
		1 / 0	55740	3600	19.35	2.9	22.25	23 ± 2	Yes
		1 / 0	56215	3647.5	18.91	2.9	21.81	23 ± 2	Yes
	10	1 / 0	55290	3555	18.43	2.9	21.33	23 ± 2	Yes
		1 / 0	55740	3600	19.3	2.9	22.2	23 ± 2	Yes
		1 / 0	56190	3645	18.81	2.9	21.71	23 ± 2	Yes
	15	1 / 0	55315	3557.5	18.89	2.9	21.79	23 ± 2	Yes
		1 / 0	55740	3600	19.35	2.9	22.25	23 ± 2	Yes
		1 / 0	56165	3642.5	18.97	2.9	21.87	23 ± 2	Yes
	20	1 / 0	55340	3560	18.64	2.9	21.54	23 ± 2	Yes
		1 / 0	55740	3600	19.39	2.9	22.29	23 ± 2	Yes
		1 / 0	56140	3640	19.15	2.9	22.05	23 ± 2	Yes
64QAM	5	1 / 0	55265	3552.5	17.67	2.9	20.57	23 ± 2	Yes
		1 / 0	55740	3600	18.46	2.9	21.36	23 ± 2	Yes
		1 / 0	56215	3647.5	17.88	2.9	20.78	23 ± 2	Yes
	10	1 / 0	55290	3555	17.71	2.9	20.61	23 ± 2	Yes
		1 / 0	55740	3600	18.31	2.9	21.21	23 ± 2	Yes
		1 / 0	56190	3645	17.71	2.9	20.61	23 ± 2	Yes
	15	1 / 0	55315	3557.5	17.75	2.9	20.65	23 ± 2	Yes
		1 / 0	55740	3600	18.33	2.9	21.23	23 ± 2	Yes
		1 / 0	56165	3642.5	18.26	2.9	21.16	23 ± 2	Yes
	20	1 / 0	55340	3560	17.89	2.9	20.79	23 ± 2	Yes
		1 / 0	55740	3600	18.34	2.9	21.24	23 ± 2	Yes
		1 / 0	56140	3640	18.26	2.9	21.16	23 ± 2	Yes



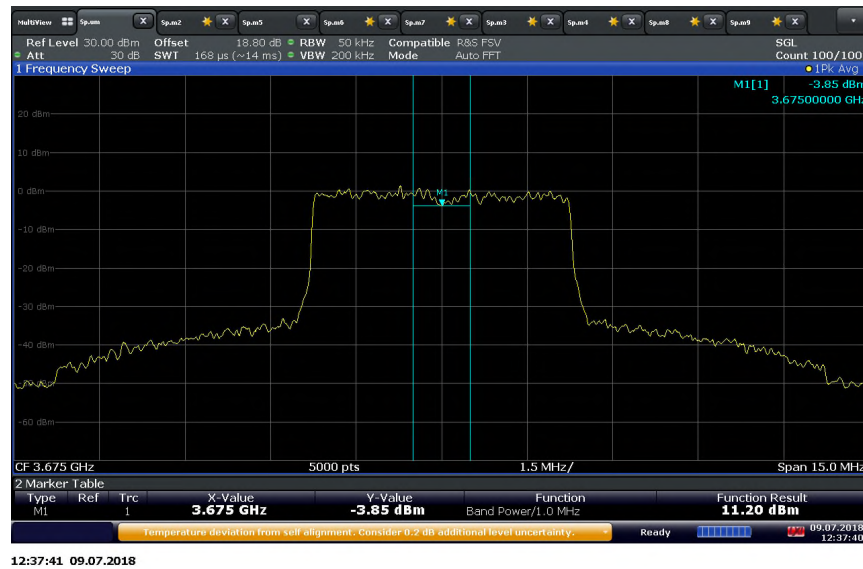
LTE Band 48 (3550 – 3650 MHz) EIRP/10 MHz according to FCC Part 96 / RSS-192								
Modulation	Bandwidth (MHz)	Channels	Frequency (MHz)	Peak Power (dBm)	Antenna Gain (dBi)	EIRP (dBm/10 MHz)	Limit (dBm/10 MHz)	Margin (dBm)
QPSK	5	55265	3552.5	18.53	2.9	21.43	23	1.57
		55740	3600	19.08	2.9	21.98	23	1.02
		56215	3647.5	18.44	2.9	21.34	23	1.66
	10	55290	3555	18.38	2.9	21.28	23	1.72
		55740	3600	19.01	2.9	21.91	23	1.09
		56190	3645	18.48	2.9	21.38	23	1.62
	15	55315	3557.5	18.36	2.9	19.98	23	3.02
		55740	3600	19.1	2.9	20.72	23	2.28
		56165	3642.5	18.59	2.9	20.21	23	2.79
	20	55340	3560	18.34	2.9	18.72	23	4.28
		55740	3600	18.81	2.9	19.19	23	3.81
		56140	3640	18.72	2.9	19.10	23	3.90
16QAM	5	55265	3552.5	17.46	2.9	20.36	23	2.64
		55740	3600	18.1	2.9	21.0	23	2
		56215	3647.5	17.62	2.9	20.52	23	2.48
	10	55290	3555	17.34	2.9	20.24	23	2.76
		55740	3600	17.96	2.9	20.86	23	2.14
		56190	3645	17.62	2.9	20.52	23	2.48
	15	55315	3557.5	17.55	2.9	19.16	23	3.84
		55740	3600	18.02	2.9	19.63	23	3.37
		56165	3642.5	17.69	2.9	19.3	23	3.7
	20	55340	3560	17.62	2.9	17.99	23	5.01
		55740	3600	17.81	2.9	18.18	23	4.82
		56140	3640	17.84	2.9	18.21	23	4.79
64QAM	5	55265	3552.5	16.52	2.9	19.42	23	3.58
		55740	3600	17.24	2.9	20.14	23	2.86
		56215	3647.5	16.64	2.9	19.54	23	3.46
	10	55290	3555	16.5	2.9	19.4	23	3.6
		55740	3600	17.16	2.9	20.06	23	2.94
		56190	3645	16.55	2.9	19.45	23	3.55
	15	55315	3557.5	16.51	2.9	18.13	23	4.87
		55740	3600	17.15	2.9	18.77	23	4.23
		56165	3642.5	16.73	2.9	18.35	23	4.65
	20	55340	3560	16.6	2.9	16.97	23	6.03
		55740	3600	16.96	2.9	17.33	23	5.67
		56140	3640	16.86	2.9	17.23	23	5.77



LTE Band 48 (3650 – 3700 MHz) EIRP according to FCC Part 90 / RSS-197									
Modulation	Bandwidth (MHz)	RB Size/Offset	Channels	Frequency (MHz)	Tx Average Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dBm)
QPSK	5	1 / 0	56265	3652.5	19.63	2.9	22.53	30	7.47
		1 / 0	56490	3675	19.88	2.9	22.78	30	7.22
		1 / 0	56715	3697.5	19.7	2.9	22.6	30	7.4
	10	1 / 0	56290	3655	19.66	2.9	22.56	30	7.44
		1 / 0	56490	3675	20.0	2.9	22.9	30	7.1
		1 / 0	56690	3695	19.89	2.9	22.79	30	7.21
	15	1 / 0	56315	3675.5	19.73	2.9	22.63	30	7.37
		1 / 0	56490	3675	19.96	2.9	22.86	30	7.14
		1 / 0	56665	3692.5	19.81	2.9	22.71	30	7.29
	20	1 / 0	56340	3660	19.81	2.9	22.71	30	7.29
		1 / 0	56490	3675	20.03	2.9	22.93	30	7.07
		1 / 0	56640	3690	20.07	2.9	22.97	30	7.03
16QAM	5	1 / 0	56265	3652.5	18.94	2.9	21.84	30	8.16
		1 / 0	56490	3675	19.17	2.9	22.07	30	7.93
		1 / 0	56715	3697.5	19.02	2.9	21.92	30	8.08
	10	1 / 0	56290	3655	18.92	2.9	21.82	30	8.18
		1 / 0	56490	3675	19.15	2.9	22.05	30	7.95
		1 / 0	56690	3695	18.79	2.9	21.69	30	8.31
	15	1 / 0	56315	3675.5	18.84	2.9	21.74	30	8.26
		1 / 0	56490	3675	19.11	2.9	22.01	30	7.99
		1 / 0	56665	3692.5	18.99	2.9	21.89	30	8.11
	20	1 / 0	56340	3660	18.98	2.9	21.88	30	8.12
		1 / 0	56490	3675	19.27	2.9	22.17	30	7.83
		1 / 0	56640	3690	19.17	2.9	21.84	30	8.16
64QAM	5	1 / 0	56265	3652.5	17.94	2.9	20.84	30	9.16
		1 / 0	56490	3675	18.18	2.9	21.08	30	8.92
		1 / 0	56715	3697.5	18.07	2.9	20.97	30	9.03
	10	1 / 0	56290	3655	17.91	2.9	20.81	30	9.19
		1 / 0	56490	3675	18.13	2.9	21.03	30	8.97
		1 / 0	56690	3695	18.25	2.9	21.15	30	8.85
	15	1 / 0	56315	3675.5	18.08	2.9	20.98	30	9.02
		1 / 0	56490	3675	18.07	2.9	20.97	30	9.03
		1 / 0	56665	3692.5	18.07	2.9	20.97	30	9.03
	20	1 / 0	56340	3660	18.05	2.9	20.95	30	9.05
		1 / 0	56490	3675	18.3	2.9	21.2	30	8.8
		1 / 0	56640	3690	18.19	2.9	21.09	30	8.91

LTE Band 48 (3650 – 3700 MHz) EIRP Density according to FCC Part 90 / RSS-197								
Modulation	Bandwidth (MHz)	Channels	Frequency (MHz)	Peak Power Density (dBm / 1 MHz)	Antenna Gain (dBi)	EIRP Density (dBm / 1 MHz)	Limit (dBm)	Margin (dBm)
QPSK	5	56265	3652.5	11.29	2.9	14.19	16.02	1.83
		56490	3675	11.2	2.9	14.1	16.02	1.92
		56715	3697.5	11.79	2.9	14.69	16.02	1.33
	10	56290	3655	8.79	2.9	11.69	16.02	4.33
		56490	3675	8.3	2.9	11.2	16.02	4.82
		56690	3695	8.97	2.9	11.87	16.02	4.15
	15	56315	3675.5	6.37	2.9	9.27	16.02	6.75
		56490	3675	6.11	2.9	9.01	16.02	7.01
		56665	3692.5	6.47	2.9	9.37	16.02	6.65
	20	56340	3660	6.77	2.9	9.67	16.02	6.35
		56490	3675	6.5	2.9	9.4	16.02	6.62
		56640	3690	6.48	2.9	9.38	16.02	6.64
16QAM	5	56265	3652.5	10.36	2.9	13.26	16.02	2.76
		56490	3675	10.13	2.9	13.03	16.02	2.99
		56715	3697.5	10.75	2.9	13.65	16.02	2.37
	10	56290	3655	7.52	2.9	10.42	16.02	5.6
		56490	3675	7.81	2.9	10.71	16.02	5.31
		56690	3695	7.9	2.9	10.8	16.02	5.22
	15	56315	3675.5	5.61	2.9	8.51	16.02	7.51
		56490	3675	5.3	2.9	8.2	16.02	7.82
		56665	3692.5	5.71	2.9	8.61	16.02	7.41
	20	56340	3660	5.82	2.9	8.72	16.02	7.3
		56490	3675	5.83	2.9	8.73	16.02	7.29
		56640	3690	5.89	2.9	8.79	16.02	7.23
64QAM	5	56265	3652.5	9.15	2.9	12.05	16.02	3.97
		56490	3675	9.68	2.9	12.58	16.02	3.44
		56715	3697.5	9.22	2.9	12.12	16.02	3.9
	10	56290	3655	6.82	2.9	9.72	16.02	6.3
		56490	3675	6.13	2.9	9.03	16.02	6.99
		56690	3695	5.13	2.9	8.03	16.02	7.99
	15	56315	3675.5	4.74	2.9	7.64	16.02	8.38
		56490	3675	4.16	2.9	7.06	16.02	8.96
		56665	3692.5	4.77	2.9	7.67	16.02	8.35
	20	56340	3660	4.66	2.9	7.56	16.02	8.46
		56490	3675	4.74	2.9	7.64	16.02	8.38
		56640	3690	4.75	2.9	7.65	16.02	8.37

2.2.9 Sample Test Measurement Screen



LTE Band 48 (3650 – 3700 MHz) 5 MHz Bandwidth Middle Channel 3675 MHz QPSK Power Spectral Density



2.3 OCCUPIED BANDWIDTH

2.3.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1049
FCC 47 CFR Part 96, Clause 96.41 (e)(3)
FCC 47 CFR Part 90, Clause 90.1323 (a)
RSS-GEN 6.7

2.3.2 Standard Applicable

The transmitted signal bandwidth shall be reported as the 99% emission bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.

26dB 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 by at least 26 dB below the transmitter power.

Using the occupied bandwidth measurement function in the spectrum analyzer, the 99% occupied bandwidth was measured.

In addition, the 26dB bandwidth was measured in accordance with FCC KDB 971168 D01 v03r01 Clause 4.1 using the ndB measurement function in the spectrum analyzer.

2.3.3 Equipment Under Test and Modification State

Serial No: AZ280418A00132 / Test Configuration A

2.3.4 Date of Test/Initial of test personnel who performed the test

June 25 and 30, 2018 / XYZ

2.3.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	25.3 - 27.1°C
Relative Humidity	46.2 - 49.0%
ATM Pressure	98.8 - 98.9 kPa

2.3.7 Additional Observations

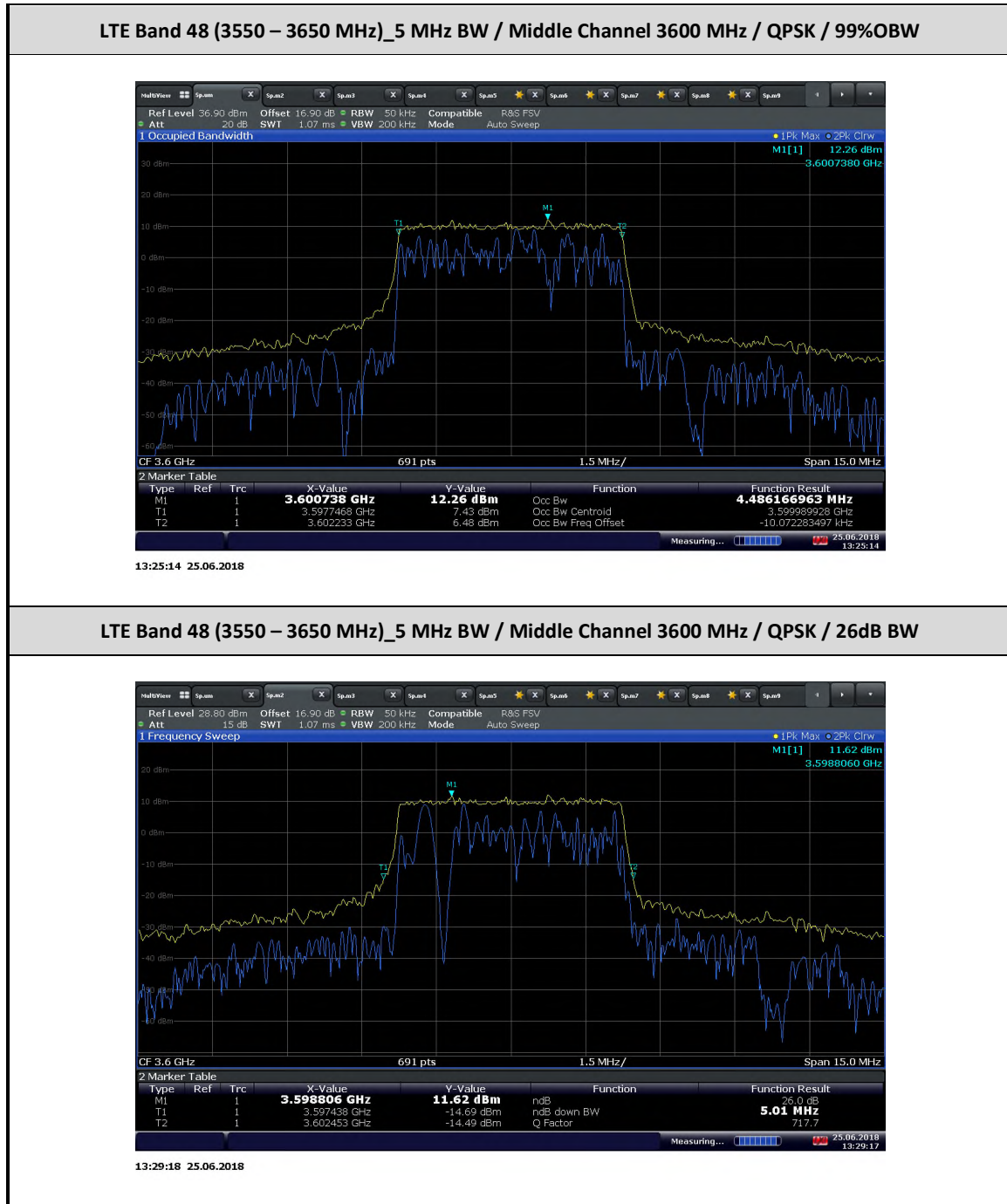
- This is a conducted test. Both 26dB bandwidth and 99% bandwidth presented.
- Using the occupied bandwidth measurement function in the spectrum analyzer, the 99% occupied bandwidth was measured.
- The 26dB bandwidth was measured in accordance with ANSI C63.26 clause 5.4.3 using the ndB measurement function in the spectrum analyzer.
- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

2.3.8 Test Results

LTE Band 48 (3550 – 3650 MHz)					
Modulation	Bandwidth (MHz)	Channel	Frequency (MHz)	99% OBW (MHz)	26dB BW (MHz)
QPSK	5	55740	3600	4.49	5.01
	10			8.96	9.72
	15			13.44	14.59
	20			17.88	19.28
16QAM	5	55740	3600	4.47	4.88
	10			8.96	9.6
	15			13.46	14.65
	20			17.91	19.19
64QAM	5	55740	3600	4.47	5.08
	10			8.96	9.68
	15			13.43	14.59
	20			17.9	19.28

LTE Band 48 (3650 – 3700 MHz)					
Modulation	Bandwidth (MHz)	Channel	Frequency (MHz)	99% OBW (MHz)	26dB BW (MHz)
QPSK	5	56490	3675	4.48	5.01
	10			8.96	9.81
	15			13.44	14.65
	20			17.95	19.28
16QAM	5	56490	3675	4.48	4.91
	10			8.97	9.68
	15			13.46	14.65
	20			17.89	19.28
64QAM	5	56490	3675	4.49	5.08
	10			8.97	9.81
	15			13.43	14.46
	20			17.91	19.28

2.3.9 Example Test Plots



LTE Band 48 (3650 – 3700 MHz)_5 MHz BW / Middle Channel 3675 MHz / QPSK / 99%OBW



14:21:02 25.06.2018

LTE Band 48 (3650 – 3700 MHz)_5 MHz BW / Middle Channel 3675 MHz / QPSK / 26dB BW



14:21:40 25.06.2018



2.4 BAND EDGE

2.4.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1051
FCC 47 CFR Part 96, Clause 96.41(e)(1)(3)
FCC 47 CFR Part 90, Clause 90.1323(a)
RSS-192, Clause 5.5
RSS-197, Clause 5.7

2.4.2 Standard Applicable

FCC 47 CFR Part 96.41:

(e) 3.5 GHz Emissions and Interference Limits - (1) General protection levels. Except as otherwise specified in paragraph (e)(2) of this section, for channel and frequency assignments made by the SAS to CBSDs, the conducted power of any emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed -13 dBm/MHz within 0-10 megahertz above the upper SAS-assigned channel edge and within 0-10 megahertz below the lower SAS-assigned channel edge. At all frequencies greater than 10 megahertz above the upper SAS assigned channel edge and less than 10 MHz below the lower SAS assigned channel edge, the conducted power of any emission shall not exceed -25 dBm/MHz. The upper and lower SAS assigned channel edges are the upper and lower limits of any channel assigned to a CBSD by an SAS, or in the case of multiple contiguous channels, the upper and lower limits of the combined contiguous channels.

RSS-192, Clause 5.5:

The unwanted emissions shall comply with the following limits:

(i) In any 30 kHz bandwidth, the unwanted emission spectral density that is relative to the inband spectral density shall be attenuated at least to the limits shown in Table 1 according to the equipment modulation. The attenuation shall be linearly interpolated between the turning point attenuation limits.

Table 1: Attenuation of Unwanted Emission Limits for Various Access Schemes

Orthogonal Frequency Division Multiple Access (OFDMA)

Turning Point (F/ChS)	0	0.21	0.56	1.5	2
EMO = 2	8 dB	25 dB	27 dB	50 dB	50 dB
EMO = 4	8 dB	27 dB	32 dB	50 dB	50 dB
EMO = 6	8 dB	32 dB	38 dB	50 dB	50 dB

Code Division Multiple Access (CDMA)

Turning Point (F/ChS)	0	0.3	0.5	1	2
EMO Not applicable	0 dB	25 dB	25 dB	45 dB	45 dB

Frequency Division Multiple Access (FDMA)

Turning Point (F/ChS)	0	0.1	0.35	1	2
EMO = 2	23 dB	25 dB	25 dB	45 dB	45 dB
EMO = 3	27 dB	29 dB	29 dB	45 dB	45 dB
EMO = 4 or 6	31 dB	33 dB	33 dB	45 dB	45 dB

Time Division Multiple Access (TDMA)

Turning Point (F/ChS)	0	0.3	0.56	1.5	2
EMO = 2	Not applicable	25 dB	25 dB	45 dB	45 dB
EMO = 4	Not applicable	32 dB	37 dB	45 dB	45 dB
EMO = 6	13 dB	34 dB	42 dB	45 dB	45 dB

The offset frequency from the block edge, F, at each turning point can be determined as follows:
 $F = \text{ChS} * (\text{Turning Point})$; where ChS is defined as the frequency spacing between the centre frequencies of two adjacent channels.

EMO is the equivalent modulation order of the transmitter, defined as $\log_2(\text{number of discrete states which may be assigned to each symbol})$. For example, for quadrature amplitude modulation (QAM):

- 2 = 4 QAM
- 4 = 16 QAM
- 6 = 64 QAM

(ii) In any 1.0 MHz band that is removed from the assigned centre frequency by more than $\pm 250\%$ of the necessary bandwidth, the power of any emission must be attenuated below P_{mean} by at least $43 + 10 \log_{10}(P_{\text{mean}})$ dB, or 70 dB, whichever is less stringent. P_{mean} is the mean output power of the transmitter in watts.



FCC 47 CFR Part 90.1323:

(a) The power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log (P)$ dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or less, but at least one percent of the emission bandwidth of the fundamental emission of the transmitter, provided the measured energy is integrated over a 1 MHz bandwidth.

RSS-197, Clause 5.7:

The unwanted emissions shall be measured at the frequencies of the highest and lowest channel of all bandwidths and types of modulation that the equipment can operate with a resolution bandwidth of 1 MHz or less, but at least 1% of the occupied bandwidth of the transmitter, provided that the measured power is integrated over a 1 MHz bandwidth.

The power of any emissions outside the frequency band 3650-3700 MHz shall be attenuated below the channel transmitter power P (dBW) by $43 + 10 \log (p)$, where p is measured in watts.

2.4.3 Equipment Under Test and Modification State

Serial No: AZ280418A00132 / Test Configuration A

2.4.4 Date of Test/Initial of test personnel who performed the test

July 01 and 10, 2018 / XYZ

2.4.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	25.2 - 26.8 °C
Relative Humidity	44.4 - 49.3 %
ATM Pressure	99.0 - 99.1 kPa

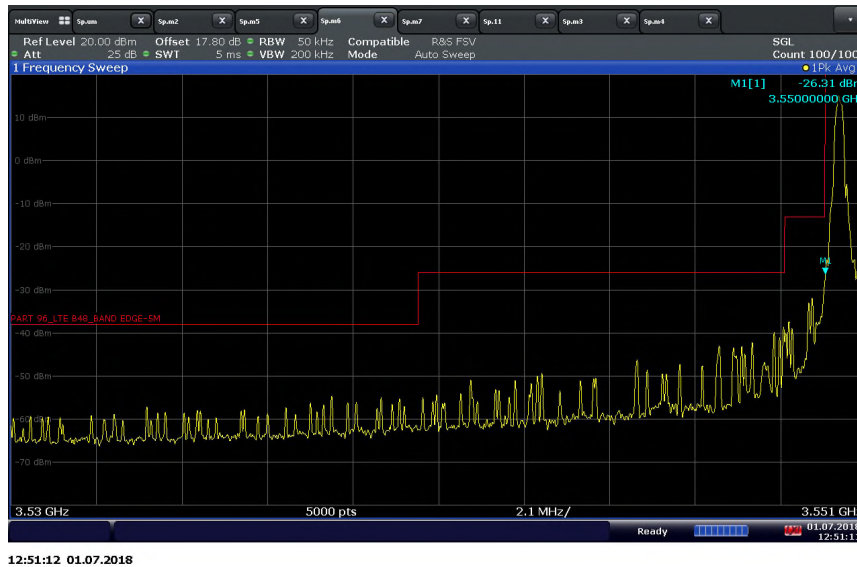
2.4.7 Additional Observations

- This is a conducted test.
- The path loss were measured and entered as a level offset.
- All channel bandwidth, RB Size and offset and modulation are verified. Only the worst case modulation (QPSK) for band edge verification presented in this test report.

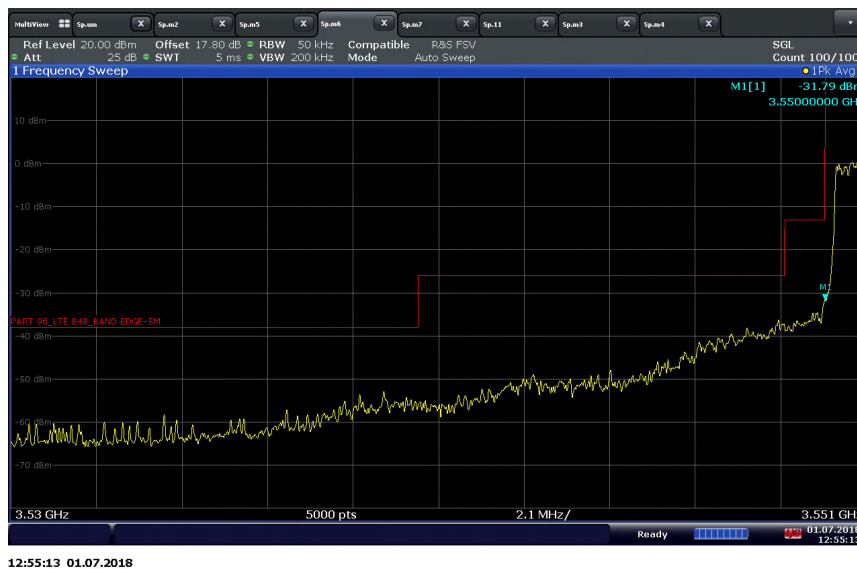
2.4.8 Test Results

See attached test plots.

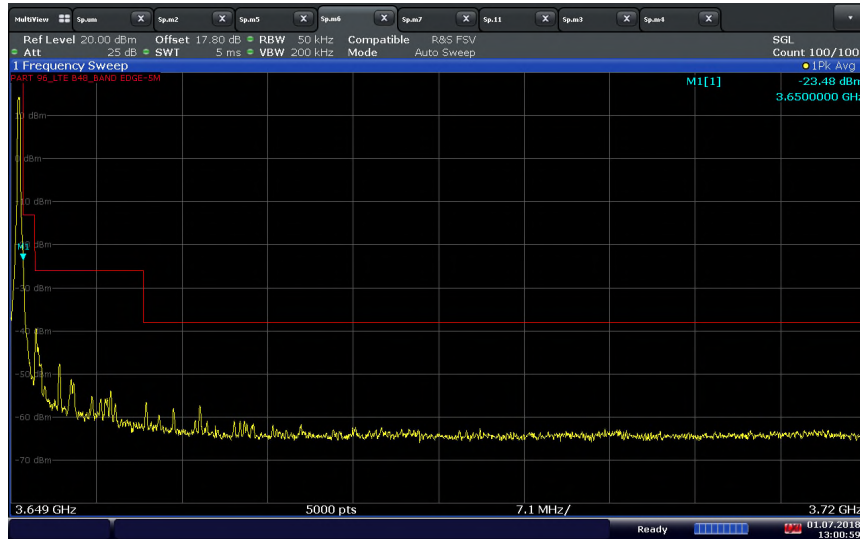
LTE Band 48 (3550 – 3650 MHz)_5 MHz BW / QPSK / Low Channel 3552.5 MHz 1 RB 0 offset
Low Band Edge



LTE Band 48 (3550 – 3650 MHz)_5 MHz BW / QPSK / Low Channel 3552.5 MHz Full RB
Low Band Edge

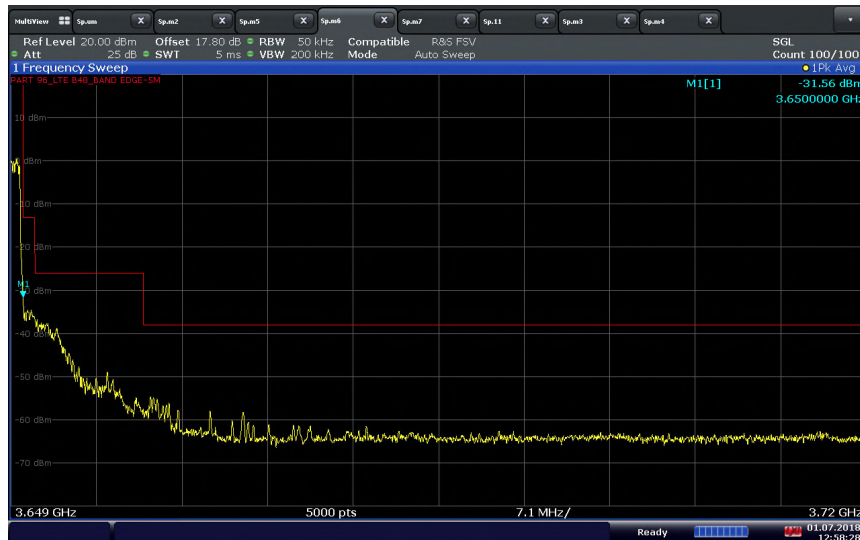


**LTE Band 48 (3550 – 3650 MHz)_5 MHz BW / QPSK / High Channel 3647.5 MHz 1 RB 24 offset
 High Band Edge**



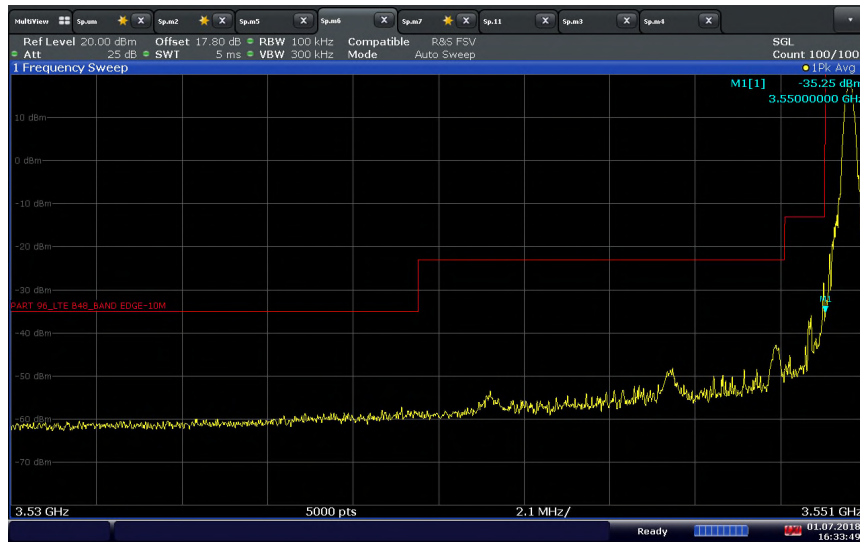
13:00:59 01.07.2018

**LTE Band 48 (3550 – 3650 MHz)_5 MHz BW / QPSK / High Channel 3647.5 MHz Full RB
 High Band Edge**



12:58:29 01.07.2018

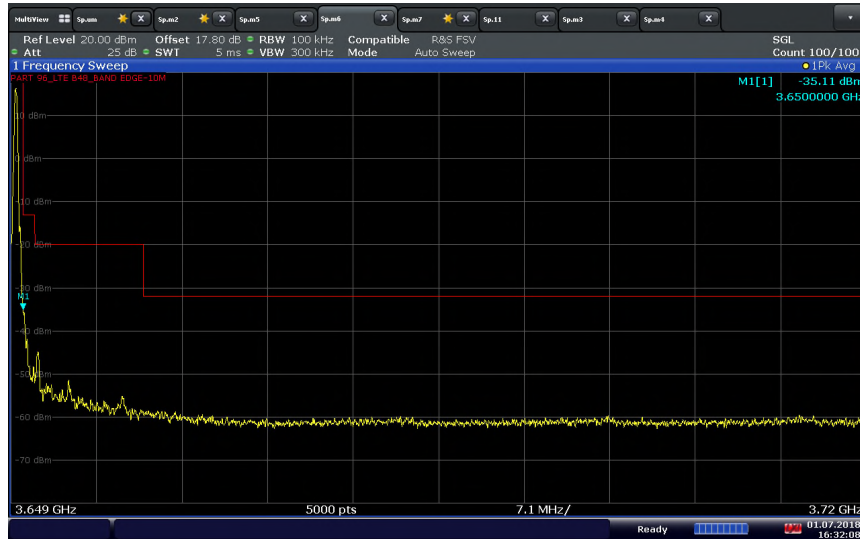
LTE Band 48 (3550 – 3650 MHz)_10 MHz BW / QPSK / Low Channel 3555 MHz 1 RB 0 offset
Low Band Edge



LTE Band 48 (3550 – 3650 MHz)_10 MHz BW / QPSK / Low Channel 3555 MHz Full RB
Low Band Edge

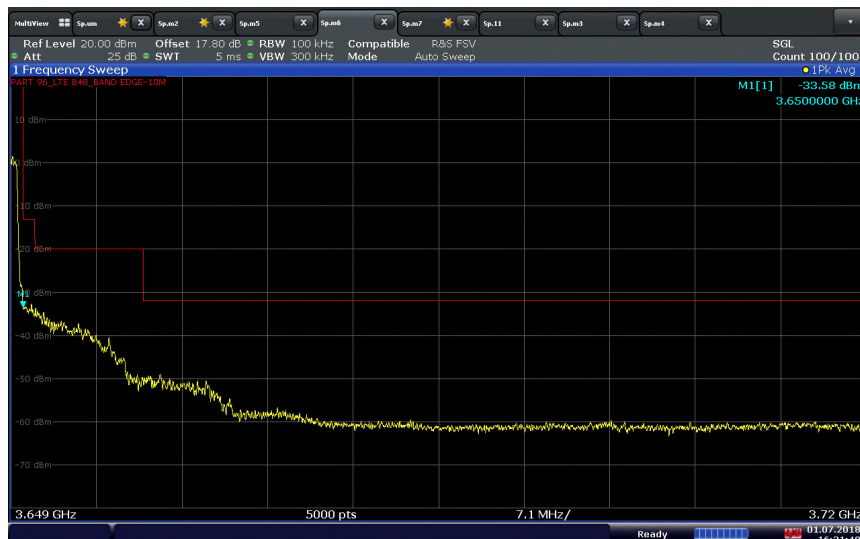


LTE Band 48 (3550 – 3650 MHz)_10 MHz BW / QPSK / High Channel 3645 MHz 1 RB 49 offset
High Band Edge



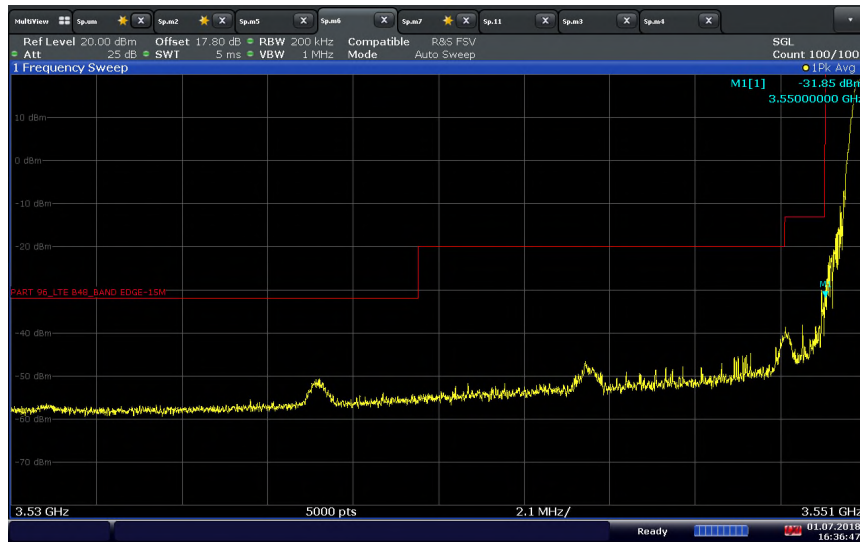
16:32:09 01.07.2018

LTE Band 48 (3550 – 3650 MHz)_10 MHz BW / QPSK / High Channel 3645 MHz Full RB
High Band Edge



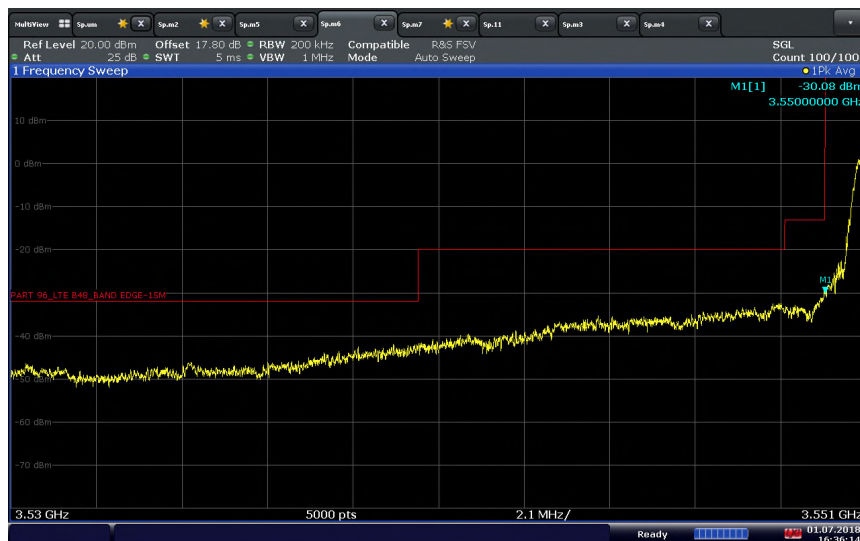
16:31:40 01.07.2018

LTE Band 48 (3550 – 3650 MHz)_15 MHz BW / QPSK / Low Channel 3557.5 MHz 1 RB 0 offset
Low Band Edge



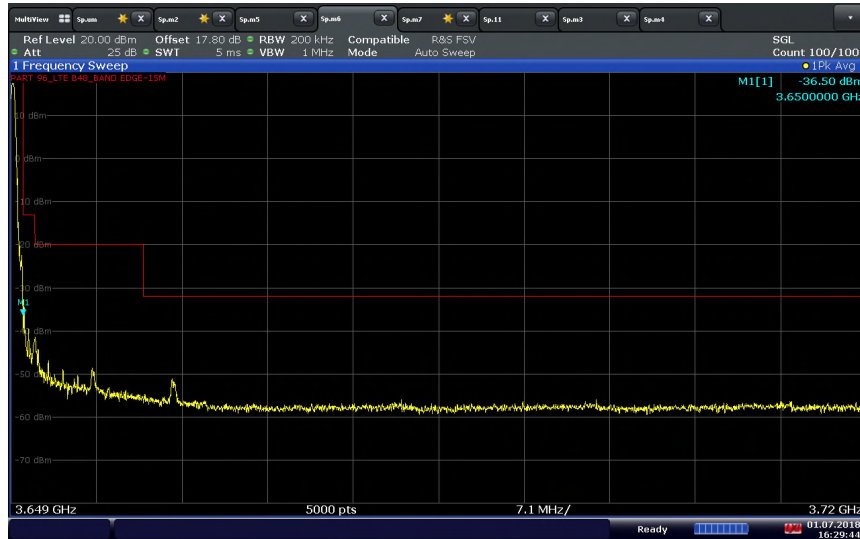
16:36:48 01.07.2018

LTE Band 48 (3550 – 3650 MHz)_15 MHz BW / QPSK / Low Channel 3557.5 MHz Full RB
Low Band Edge



16:36:15 01.07.2018

**LTE Band 48 (3550 – 3650 MHz)_15 MHz BW / QPSK / High Channel 3642.5 MHz 1 RB 74 offset
 High Band Edge**



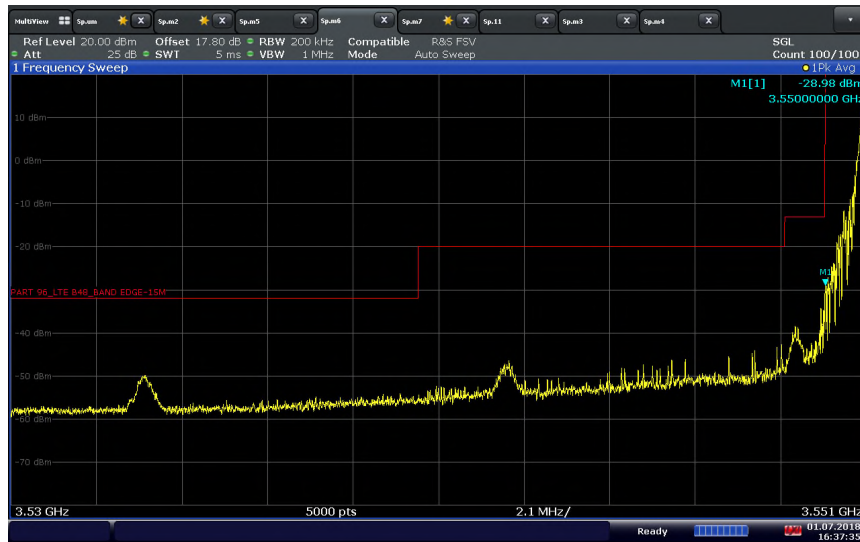
16:29:44 01.07.2018

**LTE Band 48 (3550 – 3650 MHz)_15 MHz BW / QPSK / High Channel 3642.5 MHz Full RB
 High Band Edge**



16:30:19 01.07.2018

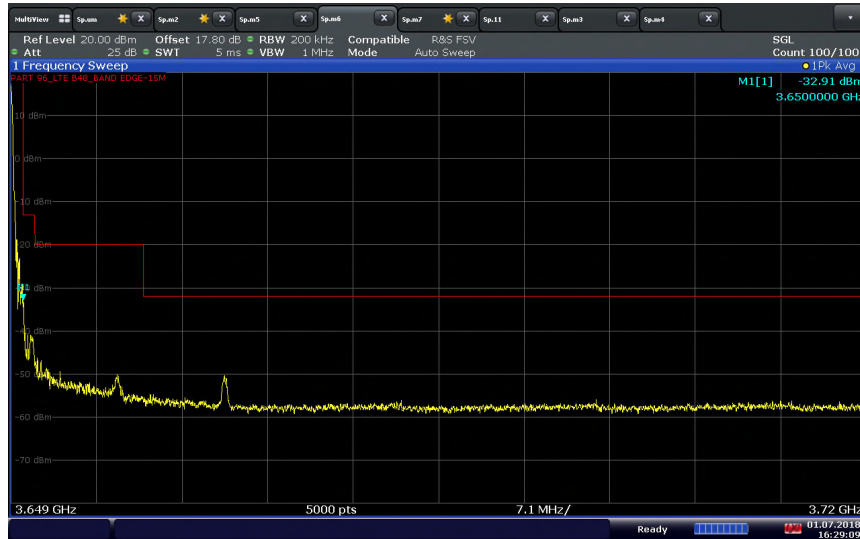
LTE Band 48 (3550 – 3650 MHz)_20 MHz BW / QPSK / Low Channel 3560 MHz 1 RB 0 offset
Low Band Edge



LTE Band 48 (3550 – 3650 MHz)_20 MHz BW / QPSK / Low Channel 3560 MHz Full RB
Low Band Edge



LTE Band 48 (3550 – 3650 MHz)_20 MHz BW / QPSK / High Channel 3640 MHz 1 RB 99 offset
High Band Edge



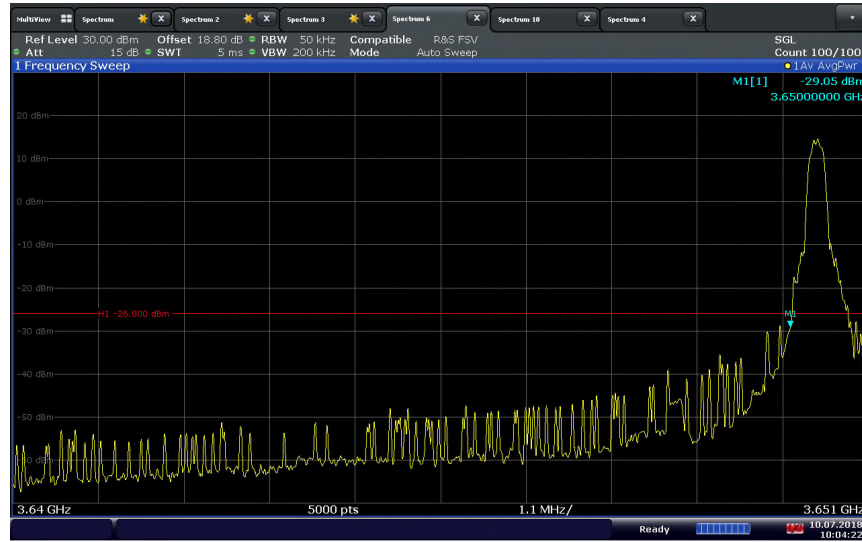
16:29:09 01.07.2018

LTE Band 48 (3550 – 3650 MHz)_20 MHz BW / QPSK / High Channel 3640 MHz Full RB
High Band Edge

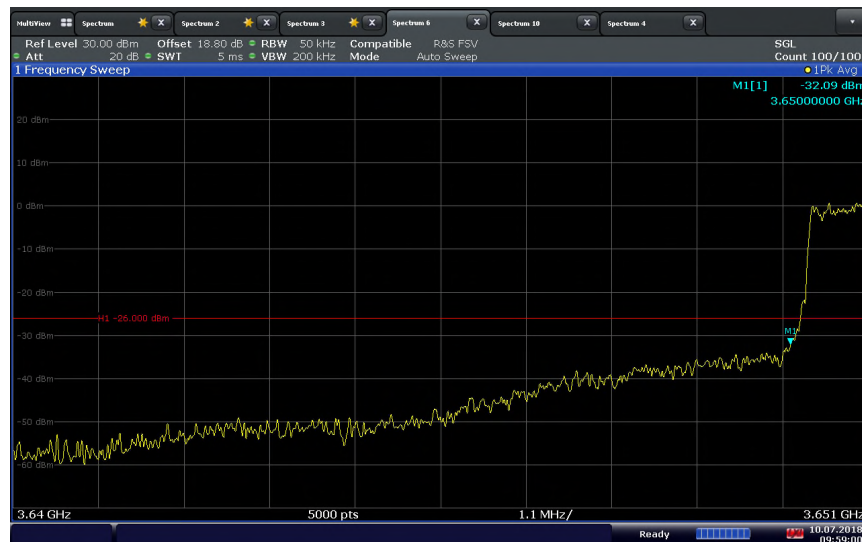


16:28:19 01.07.2018

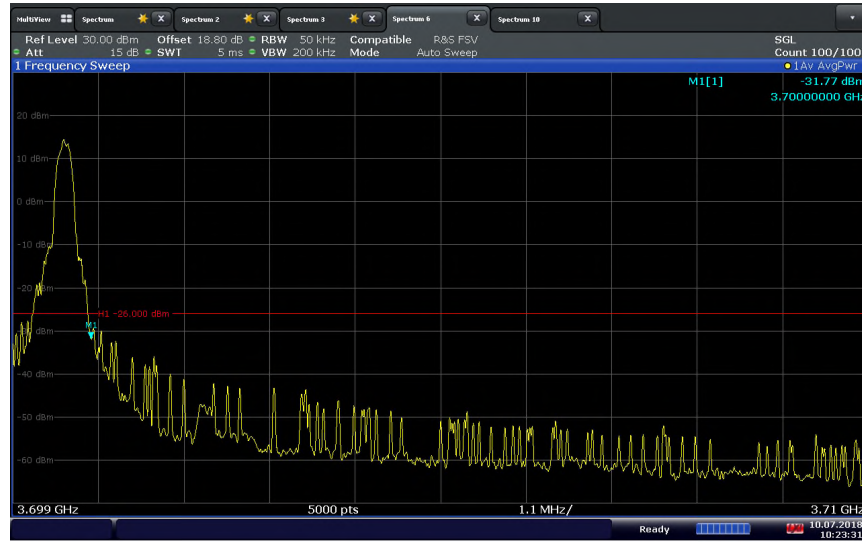
LTE Band 48 (3650 – 3700 MHz)_5 MHz BW / QPSK / High Channel 3652.5 MHz 1 RB 0 offset
Low Band Edge



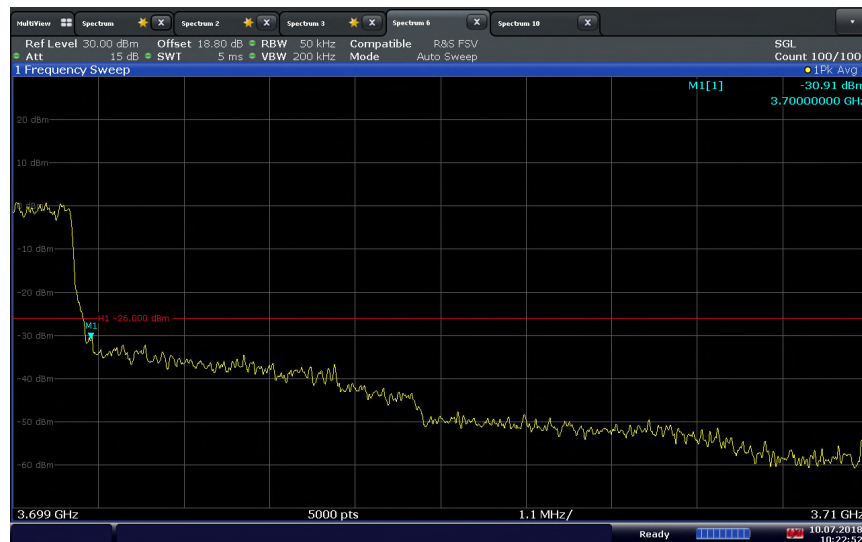
LTE Band 48 (3650 – 3700 MHz)_5 MHz BW / QPSK / Low Channel 3652.5 MHz Full RB
Low Band Edge



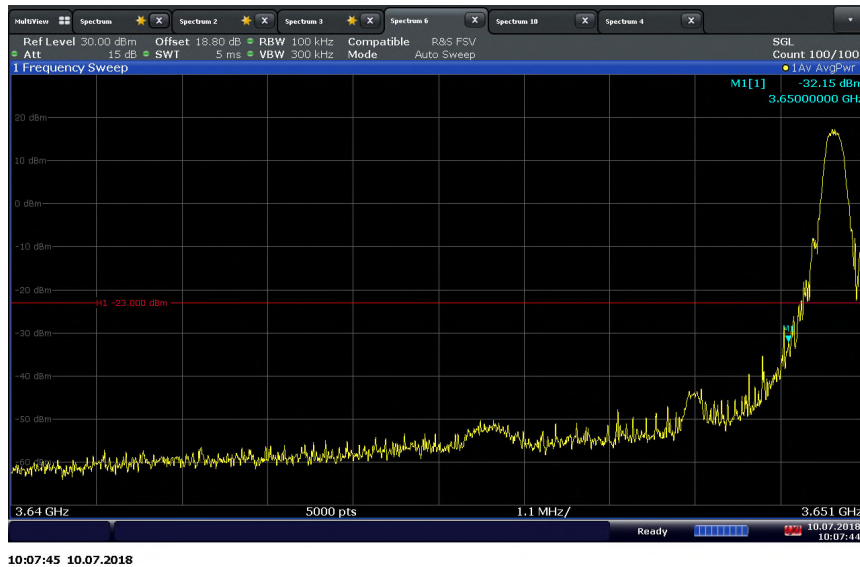
LTE Band 48 (3650 – 3700 MHz)_5 MHz BW / QPSK / High Channel 3697.5 MHz 1 RB 24 offset
High Band Edge



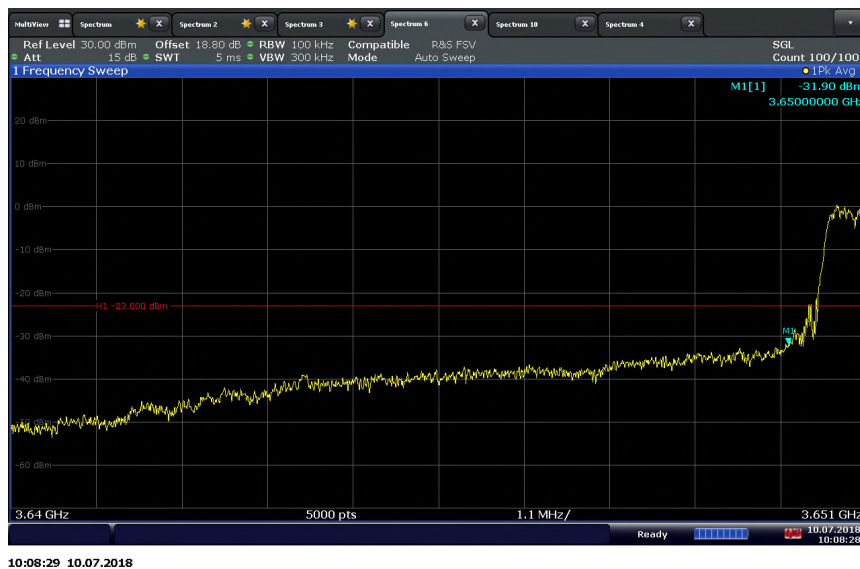
LTE Band 48 (3650 – 3700 MHz)_5 MHz BW / QPSK / High Channel 3697.5 MHz Full RB
High Band Edge



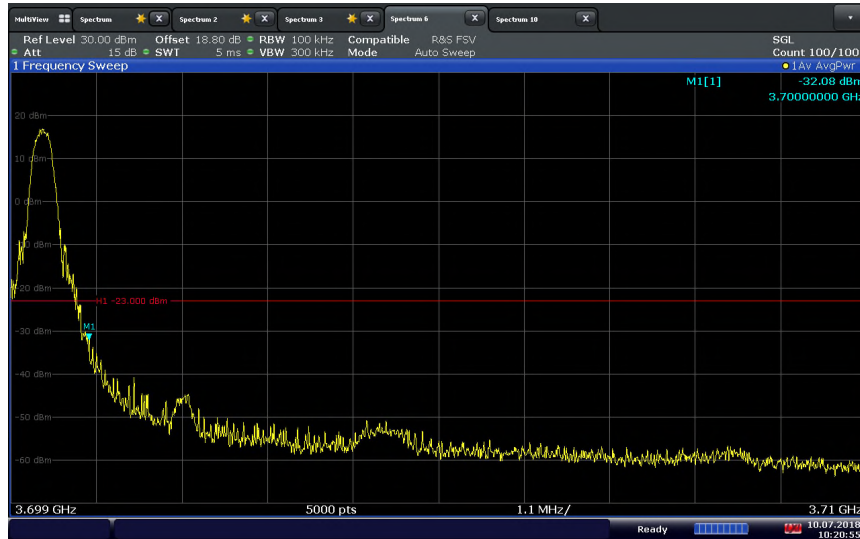
LTE Band 48 (3650 – 3700 MHz)_10 MHz BW / QPSK / Low Channel 3655 MHz 1 RB 0 offset
Low Band Edge



LTE Band 48 (3650 – 3700 MHz)_10 MHz BW / QPSK / Low Channel 3655 MHz Full RB
Low Band Edge

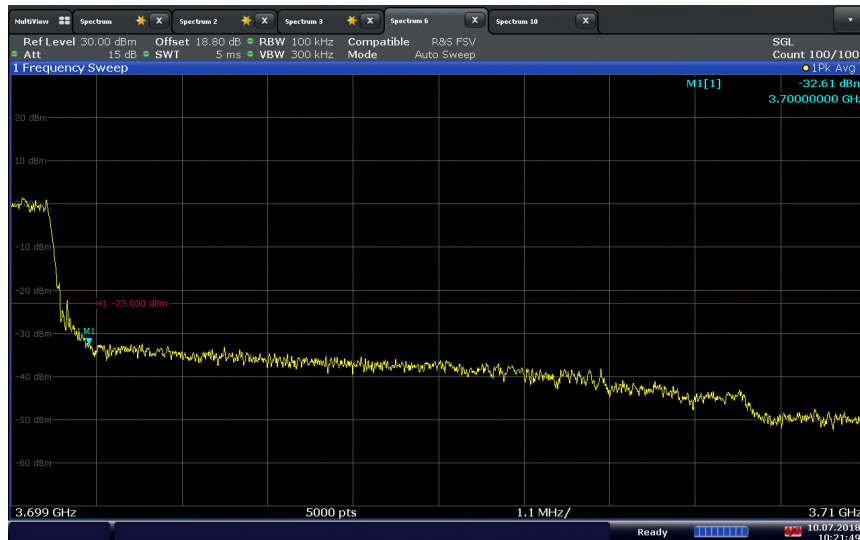


LTE Band 48 (3650 – 3700 MHz)_10 MHz BW / QPSK / High Channel 3695 MHz 1 RB 49 offset
High Band Edge



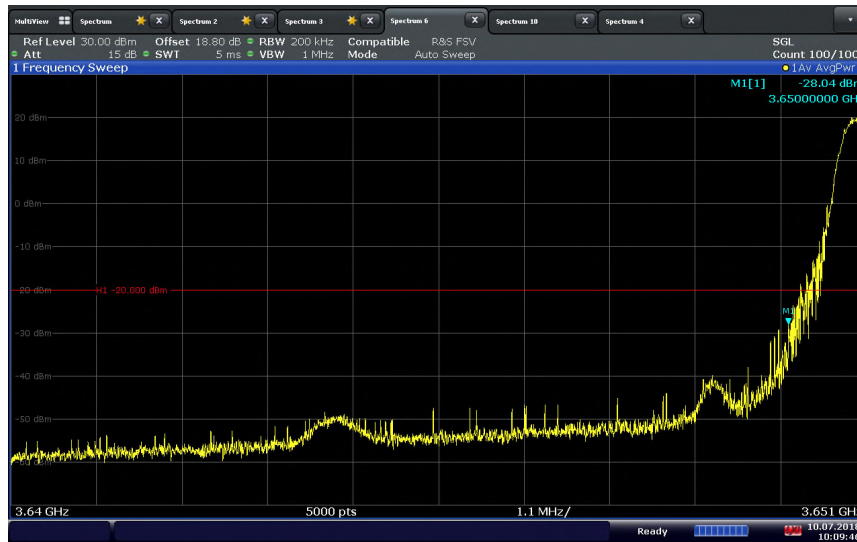
10:20:56 10.07.2018

LTE Band 48 (3650 – 3700 MHz)_10 MHz BW / QPSK / High Channel 3695 MHz Full RB
High Band Edge

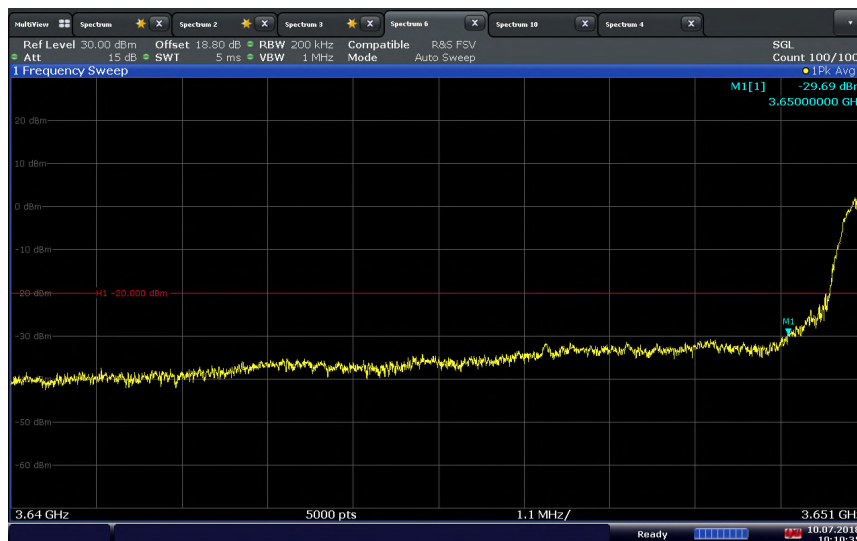


10:21:50 10.07.2018

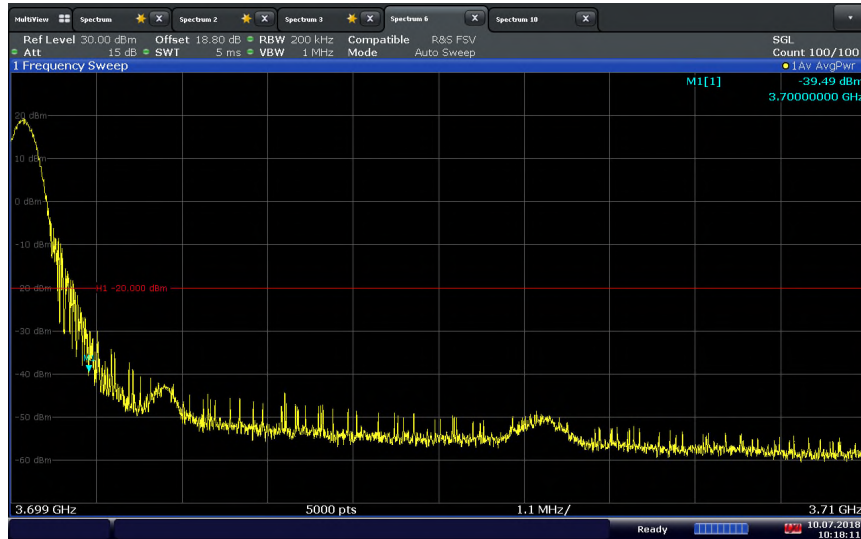
LTE Band 48 (3650 – 3700 MHz)_15 MHz BW / QPSK / Low Channel 3657.5 MHz 1 RB 0 offset
Low Band Edge



LTE Band 48 (3650 – 3700 MHz)_15 MHz BW / QPSK / Low Channel 3657.5 MHz Full RB
Low Band Edge



LTE Band 48 (3650 – 3700 MHz)_15 MHz BW / QPSK / High Channel 3692.5 MHz 1 RB 74 offset
High Band Edge



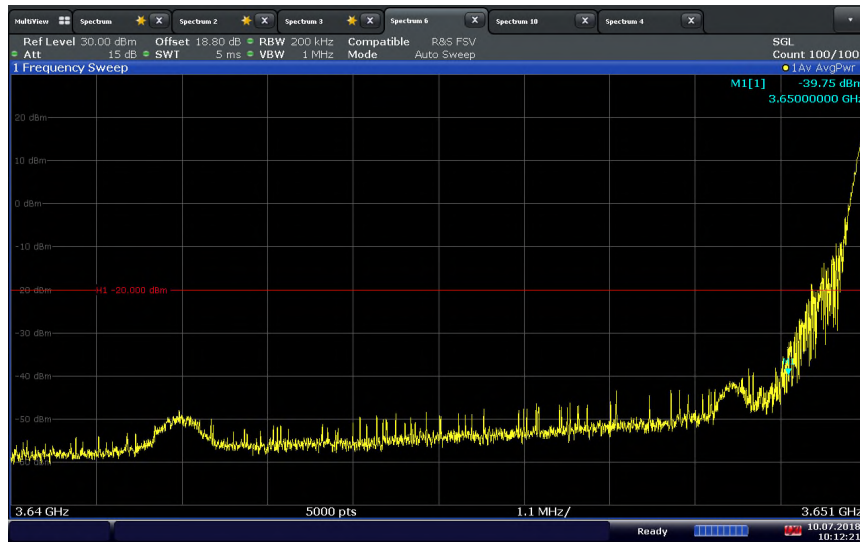
10:18:11 10.07.2018

LTE Band 48 (3650 – 3700 MHz)_15 MHz BW / QPSK / High Channel 3692.5 MHz Full RB
High Band Edge



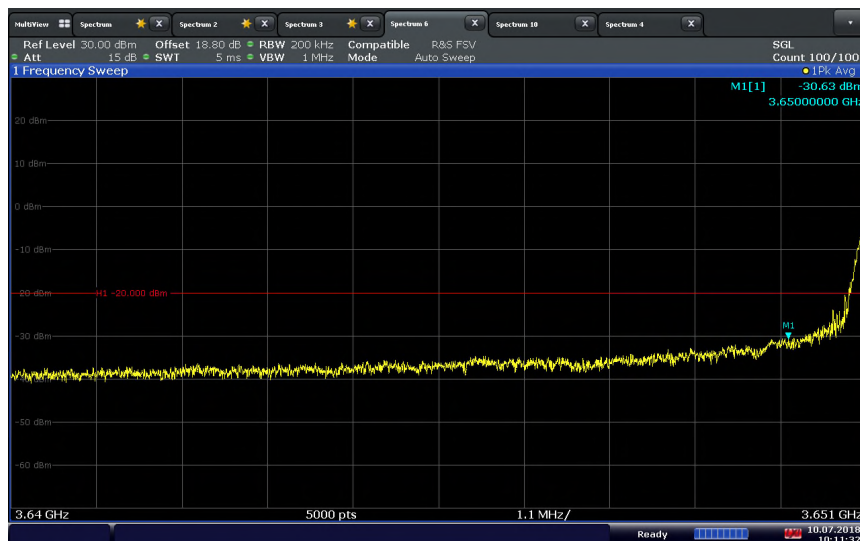
10:17:21 10.07.2018

LTE Band 48 (3650 – 3700 MHz)_20 MHz BW / QPSK / Low Channel 3660 MHz 1 RB 0 offset
Low Band Edge



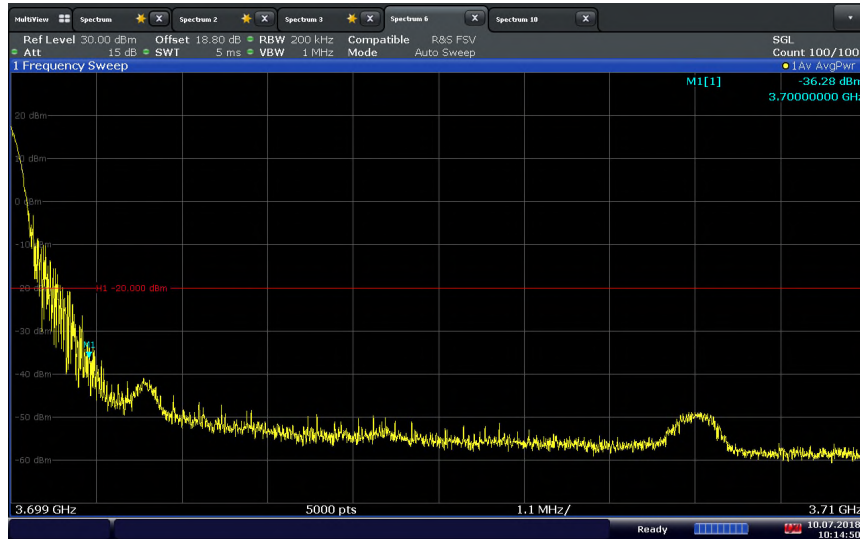
10:12:22 10.07.2018

LTE Band 48 (3650 – 3700 MHz)_20 MHz BW / QPSK / Low Channel 3660 MHz Full RB
Low Band Edge



10:11:33 10.07.2018

LTE Band 48 (3650 – 3700 MHz)_20 MHz BW / QPSK / High Channel 3690 MHz 1 RB 99 offset
High Band Edge



LTE Band 48 (3650 – 3700 MHz)_20 MHz BW / QPSK / High Channel 3690 MHz Full RB
High Band Edge

