RF TEST REPORT

SIEMIC
A Bureau Veritas Group Company

Report No.: FCC_RF_SL18040301-SPC-002_Rev1.0
Supersede Report No.:

Applicant	SpiderCloud Wireless, Inc.
Product Name	SpiderCloud RadioNode
Model No.	SCRN-320-0246
Test Standard	47CFR Part27
Test Method	TIA-603-D: 2010
FCC ID	Y47RN320B246
Date of test	04/16/2018 - 04/27/2018
Issue Date	04/27/2018
Test Result	Pass Fail
Equipment complied with the specification	[x]
Equipment did not comply with the specification	[ ]

	
Rachana Khanduri	Chen Ge
Test Engineer	Engineering Reviewer

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Test result presented in this test report is applicable to the tested sample only

Issued By:
SIEMIC Laboratories
775 Montague Expressway, Milpitas, 95035 CA

ACCREDITED
TESTING CERT # 2742-01

Laboratory Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.

In addition to testing and certification, SIEMIC provides initial design reviews and compliance management throughout a project. Our extensive experience with China, Asia Pacific, North America, European, and International compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

Accreditations for Conformity Assessment

Country/Region	Accreditation Body	Scope
USA	FCC, A2LA	EMC, RF/Wireless, Telecom
Canada	IC, A2LA, NIST	EMC, RF/Wireless, Telecom
Taiwan	BSMI, NCC , NIST	EMC, RF, Telecom, Safety
Hong Kong	OFTA, NIST	RF/Wireless, Telecom
Australia	NATA, NIST	EMC, RF, Telecom, Safety
Korea	KCC/RRA, NIST	EMI, EMS, RF, Telecom, Safety
Japan	VCCI, JATE, TELEC, RFT	EMI, RF/Wireless, Telecom
Mexico	NOM, COFETEL, Caniety	Safety, EMC, RF/Wireless, Telecom
Europe	A2LA, NIST	EMC, RF, Telecom, Safety
Israel	MOC, NIST	EMC, RF, Telecom, Safety

Accreditations for Product Certifications

Country	Accreditation Body	Scope
USA	FCC TCB, NIST	EMC, RF, Telecom
Canada	IC FCB, NIST	EMC, RF, Telecom
Singapore	iDA, NIST	EMC, RF, Telecom
EU	NB	EMC & Radio Equipment Directive (RED)
Japan	MIC (RCB 208)	RF, Telecom
HongKong	OFTA (US002)	RF, Telecom

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1 Report Revision History

Report No.	Report Version	Description	Issue Date
FCC_RF_SL18040301-SPC-002	None	Original	04/23/2018
FCC_RF_SL18040301-SPC-002_Rev1.0	Rev1.0	Added LTE - Band 25	04/27/2018

2 Executive Summary

The purpose of this test program was to demonstrate compliance of following product

Company: SpiderCloud Wireless, Inc.
Product: SpiderCloud RadioNode
Model: SCRN-320-0246

against the current Stipulated Standards. The specified model product stated above has demonstrated compliance with the Stipulated Standard listed on 1st page.

3 Customer information

Applicant Name	SpiderCloud Wireless
Applicant Address	475 Sycamore Dr, Milpitas, CA, 95035, USA
Manufacturer Name	Sanmina-SCI Systems de Mexico SA de CV
Manufacturer Address	Carretera Chapala-Guadalajara 45640 Tlajomulco de Zuniga, Jalisco, Mexico

4 Test site information

Lab performing tests	SIEMIC Laboratories
Lab Address	775 Montague Expressway, Milpitas, CA 95035
FCC Test Site No.	881796
IC Test Site No.	4842D-2
VCCI Test Site No.	A0133

5 Modification

Index	Item	Description	Note
-	-	-	-

6 EUT Information

6.1 EUT Description

Product Name	SpiderCloud RadioNode
Model No.	SCRN-320-0246
Trade Name	SpiderCloud
Serial No.	18066E00066 (Conducted), 18066E00069 (Radiated),
Input Power	56VDC (PoE)
Power Adapter Manu/Model	POE36U-1AT-R (PoE)
Power Adapter SN	N/A
Date of EUT received	04/14/2018
Equipment Class/ Category	PCB, TNB
Operating Frequencies	LTE: TX (1930 MHz to 1995 MHz), RX (1850 MHz to 1915 MHz)
Port/Connectors	PoE, Ethernet
Remark	NONE

6.2 Radio Description

Item	LTE	LTE
Operating Band /Radio Type	LTE Band 2	LTE Band 25
Bandwidth	5MHz, 10MHz, 15MHz, 20MHz	5MHz, 10MHz, 15MHz, 20MHz
Modulation	QPSK/16QAM/64QAM	QPSK/16QAM/64QAM
Antenna Type	Internal Omni-directional antenna	Internal Omni-directional antenna
Antenna Gain	4 dBi	4 dBi
Frequency TX(MHz)	TX: 1930 MHz to 1990 MHz RX: 1850 MHz to 1910 MHz	TX: 1930 MHz to 1995 MHz RX: 1850 MHz to 1915 MHz

6.3 EUT test modes/configuration Description

Test mode

Final Test Mode		Note
Final_test_mode_1	Continuous transmission, 5MHz, QPSK, Low CH	LTE
Final_test_mode_2	Continuous transmission, 5MHz, QPSK, Mid CH	LTE
Final_test_mode_3	Continuous transmission, 5MHz, QPSK, High CH	LTE
Final_test_mode_4	Continuous transmission, 5MHz, 64QAM, Low CH	LTE
Final_test_mode_5	Continuous transmission, 5MHz, 64QAM, Mid CH	LTE
Final_test_mode_5	Continuous transmission, 5MHz, 64QAM, High CH	LTE
Final_test_mode_7	Continuous transmission, 10MHz, QPSK, Low CH	LTE
Final_test_mode_8	Continuous transmission, 10MHz, QPSK, Mid CH	LTE
Final_test_mode_9	Continuous transmission, 10MHz, QPSK, High CH	LTE
Final_test_mode_10	Continuous transmission, 10MHz, 64QAM, Low CH	LTE
Final_test_mode_11	Continuous transmission, 10MHz, 64QAM, Mid CH	LTE
Final_test_mode_12	Continuous transmission, 10MHz, 64QAM, High CH	LTE
Final_test_mode_13	Continuous transmission, 15MHz, QPSK, Low CH	LTE
Final_test_mode_14	Continuous transmission, 15MHz, QPSK, Mid CH	LTE
Final_test_mode_15	Continuous transmission, 15MHz, QPSK, High CH	LTE
Final_test_mode_16	Continuous transmission, 15MHz, 64QAM, Low CH	LTE
Final_test_mode_17	Continuous transmission, 15MHz, 64QAM, Mid CH	LTE
Final_test_mode_18	Continuous transmission, 15MHz, 64QAM, High CH	LTE
Final_test_mode_19	Continuous transmission, 20MHz, QPSK, Low CH	LTE
Final_test_mode_20	Continuous transmission, 20MHz, QPSK, Mid CH	LTE
Final_test_mode_21	Continuous transmission, 20MHz, QPSK, High CH	LTE
Final_test_mode_22	Continuous transmission, 20MHz, 64QAM, Low CH	LTE
Final_test_mode_23	Continuous transmission, 20MHz, 64QAM, Mid CH	LTE
Final_test_mode_24	Continuous transmission, 20MHz, 64QAM, High CH	LTE
Remark: N/A.		

7 Supporting Equipment/Software and cabling Description

7.1 Supporting Equipment

Item	Supporting Equipment Description	Model	Serial Number	Manufacturer	Note
1	10MHz Clock	OX200-SC	140851586710	Metric Test	-
2	POE	POE36U-1AT-R	N/A	PHIHONG	-

7.2 Cabling Description

Name	Connection Start		Connection Stop		Length / shielding Info		Note
	From	I/O Port	To	I/O Port	Length (m)	Shielding	
RJ45	EUT	RJ45	POE	RJ45	2	Unshielded	-
RJ45	POE	RJ45	Laptop	RJ45	3	Unshielded	-

7.3 Test Software Description

Test Item	Software	Description
RF testing	TMciDvtClient	Enable EUT continuous TX mode and change to different channel

8 Test Summary

Test Item	Test standard		Test Method/Procedure		Pass / Fail
E.R.P/ E.I.R.P	FCC	47CFR27.50	FCC	TIA-603-D: 2010	☒ Pass ☐ N/A
Occupied Bandwidth	FCC	47CFR27.53	FCC	TIA-603-D: 2010	☒ Pass ☐ N/A
Peak-Average Ratio	FCC	47CFR27.50	FCC	TIA-603-D: 2010	☒ Pass ☐ N/A
Spurious and harmonic Emission at antenna port	FCC	47CFR2.1051, 47CFR27.53	FCC	TIA-603-D: 2010	☒ Pass ☐ N/A
Band Edge	FCC	47CFR2.1053, 47CFR27.53	FCC	TIA-603-D: 2010	☒ Pass ☐ N/A
Radiated spurious and harmonic emission	FCC	47CFR2.1053, 47CFR27.53	FCC	TIA-603-D: 2010	☒ Pass ☐ N/A
Frequency stability	FCC	47CFR2.1053, 47CFR27.53	FCC	TIA-603-D: 2010	☒ Pass ☐ N/A
Remark	1. All measurement uncertainties do not take into consideration for all presented test results. 2. The applicant shall ensure frequency stability by showing that an emission is maintained within the band of operation under all normal operating conditions as specified in the user's manual.				

9 Measurement Uncertainty

9.1 Conducted Emissions

The test is to measure the conducted emissions to the mains port of the EUT.

Some error sources that can contribute to the total uncertainty:

- Uncertainty of the receiver
- Uncertainty of the LISN
- Uncertainty of cables
- Uncertainty due to the mismatches
- Etc, see the below table for details

Source of Uncertainty	Value (dB)	Probability Distribution	Division	Sensitivity Coefficient	Expanded Uncertainty
Receiver Reading	0.12	Rectangular	1.732	1	0.069284
Cable Insertion Loss	0.21	Normal	2	1	0.105
Filter Insertion Loss	0.25	Normal	2	1	0.125
LISN Insertion Loss	0.40	Normal	2	1	0.20
Receiver CW accuracy	0.5	Rectangular	1.732	1	0.2886836
Pulse Amplitude Response	1.5	Rectangular	1.732	1	0.86605081
PRF Response	1.5	Rectangular	1.732	1	0.86605081
Mismatch LISN - Receiver	0.25	U-Shape	1.414	1	0.1768033
LISN Impedance	2.5	Triangular	2.449	1	1.0208248
Combined Standard Uncertainty					1.928133
Expanded Uncertainty (K=2)					3.856266

The total derived measurement uncertainty is +/- 3.86 dB.

9.2 Radiated Emissions (30MHz to 1GHz)

The test is to measure the radiated emissions of the EUT.

Some error sources that can contribute to the total uncertainty:

- Uncertainty of the receiver
- Uncertainty of the antenna
- Uncertainty of cables
- Uncertainty due to the mismatches
- NSA Calibration
- Etc., details see the below table

Source of Uncertainty	Value (dB)	Probability Distribution	Division	Sensitivity Coefficient	Expanded Uncertainty
Receiver Reading	0.12	Rectangular	1.732	1	0.069284
Cable Insertion Loss	0.21	Normal	2	1	0.105
Filter Insertion Loss	0.25	Normal	2	1	0.125
Antenna Factor	0.65	Normal	2	1	0.325
Receiver CW accuracy	0.5	Rectangular	1.732	1	0.2886836
Pulse Amplitude Response	1.5	Rectangular	1.732	1	0.86605081
PRF Response	1.5	Rectangular	1.732	1	0.86605081
Mismatch Filter - Receiver	0.25	U-Shape	1.414	1	0.1768033
NSA Calibration	4.0	U-Shape	1.414	1	2.8288543
Combined Standard Uncertainty					3.0059131
Expanded Uncertainty (K=2)					6.0118262

The total derived measurement uncertainty is +/- 6.00 dB.

9.3 Radiated Emissions (1GHz to 40GHz)

The test is to measure the radiated emissions of the EUT.

Some error sources that can contribute to the total uncertainty:

- Uncertainty of the receiver
- Uncertainty of the antenna
- Uncertainty of cables
- Uncertainty due to the mismatches
- VSWR Calibration
- Etc., details see the below table

Source of Uncertainty	Value (dB)	Probability Distribution	Division	Sensitivity Coefficient	Expanded Uncertainty
Receiver Reading	0.12	Rectangular	1.732	1	0.0692840
Cable Insertion Loss	0.21	Normal	2	1	0.1050000
Filter Insertion Loss	0.25	Normal	2	1	0.1250000
Antenna Factor	0.65	Normal	2	1	0.3250000
Receiver CW accuracy	0.5	Rectangular	1.732	1	0.2886836
Pulse Amplitude Response	1.5	Rectangular	1.732	1	0.8660508
PRF Response	1.5	Rectangular	1.732	1	0.8660508
Mismatch Filter - Receiver	0.25	U-Shape	1.414	1	0.1768033
VSWR Calibration	2.0	U-Shape	1.414	1	1.4144272
Combined Standard Uncertainty					4.2363
Expanded Uncertainty (K=2)					8.4726

The total derived measurement uncertainty is +/- 8.47 dB.

9.4 RF conducted measurement

The test is to measure the RF output power from the EUT.

Some error sources that can contribute to the total uncertainty:

- Uncertainty of the Reference Level Uncertainty
- Uncertainty of variable attenuators
- Uncertainty of cables
- Uncertainty due to the mismatches

Source of Uncertainty	Value (dB)	Probability Distribution	Division	Sensitivity Coefficient	Expanded Uncertainty
Reference Level	0.12	Rectangular	1.732	1	0.069284
Cable Insertion Loss	0.21	Normal	2	1	0.105
Attenuator	0.25	Normal	2	1	0.125
Mismatch	0.25	U-Shape	1.414	1	0.1768033
Combined Standard Uncertainty					0.476087
Expanded Uncertainty (K=2)					0.952174

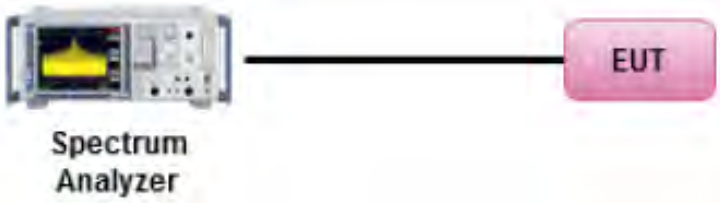
The total derived measurement uncertainty is +/- 0.95 dB.

10 Measurements, Examination and Derived Results

10.1 RF Output Power

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR27.50	-	The maximum effective radiated power (ERP) of fixed and base station must not exceed 1000 Watts.	☒

Test Setup				
Test Procedure	- EUT was set for low, mid, high channel with modulated mode and highest RF output power. - The spectrum analyzer was connected to the antenna terminal.			
Test Date	04/16/2018 – 04/27/2018	Environmental condition	Temperature Relative Humidity Atmospheric Pressure	22°C 48% 1008mbar
Remark	For LTE mode, EUT is using 2x2 MIMO, which has 2 transmit antennas. They are correlated to each other. The directional gain is calculated per the formula at below, Directional gain dBi = Gmax + 10 Log10 N The max gain of single antenna is 4 dBi. So the directional gain = 7 dBi			
Result	☒ Pass ☐ Fail			

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test was done by Rachana Khanduri at RF test site.

Test Data for LTE band 2:

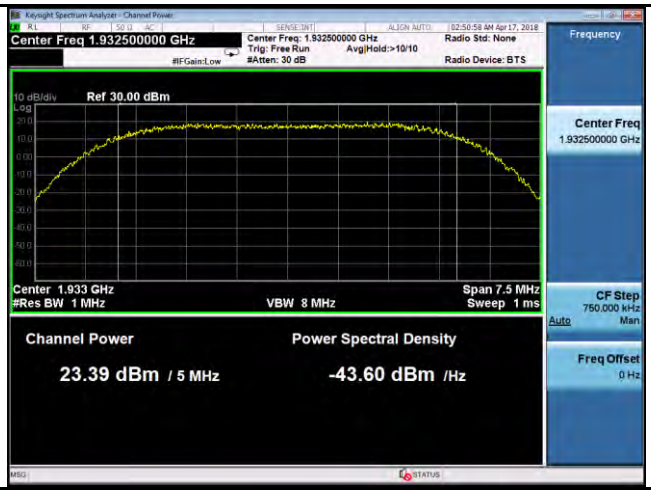
Type	Channel	Frequency (MHz)	Measured PW –Port 1(dBm)	Measured PW –Port 2(dBm)	Combined Power (dBm)	Directional Gain (dBi)	E.I.R.P (dBm)
5MHz BW, QPSK	Low	1932.5	23.35	23.39	26.38	7	33.38
	Mid	1960.0	23.50	23.44	26.48	7	33.48
	High	1987.5	23.39	23.33	26.37	7	33.37
5MHz BW, 64QAM	Low	1932.5	22.97	23.25	26.12	7	33.12
	Mid	1960.0	23.33	23.10	26.23	7	33.23
	High	1987.5	23.36	23.00	26.19	7	33.19
10MHz BW, QPSK	Low	1935.0	23.44	23.34	26.40	7	33.40
	Mid	1960.0	23.49	23.20	26.36	7	33.36
	High	1985.0	23.50	22.91	26.23	7	33.23
10MHz BW, 64QAM	Low	1935.0	23.44	23.09	26.28	7	33.28
	Mid	1960.0	23.41	23.13	26.28	7	33.28
	High	1985.0	23.41	22.93	26.19	7	33.19
15MHz BW, QPSK	Low	1937.5	23.30	23.00	26.16	7	33.16
	Mid	1960.0	22.73	23.26	26.01	7	33.01
	High	1982.5	23.21	23.28	26.26	7	33.26
15MHz BW, 64QAM	Low	1937.5	22.95	22.89	25.93	7	32.93
	Mid	1960.0	22.97	23.07	26.03	7	33.03
	High	1982.5	23.25	23.10	26.19	7	33.19
20MHz BW, QPSK	Low	1940.0	23.67	23.20	26.45	7	33.45
	Mid	1960.0	23.77	23.37	26.58	7	33.58
	High	1980.0	23.72	23.24	26.50	7	33.50
20MHz BW, 64QAM	Low	1940.0	23.56	23.32	26.45	7	33.45
	Mid	1960.0	23.76	23.35	26.57	7	33.57
	High	1980.0	23.57	23.34	26.47	7	33.47

Test Data for LTE band 25:

Type	Channel	Frequency (MHz)	Measured PW –Port 1(dBm)	Measured PW –Port 2(dBm)	Combined Power (dBm)	Directional Gain (dBi)	E.I.R.P (dBm)
5MHz BW, QPSK	High	1992.5	24.00	23.95	26.99	7	33.99
5MHz BW, 64QAM	High	1992.5	24.04	23.91	26.99	7	33.99
10MHz BW, QPSK	High	1990	23.96	23.94	26.96	7	33.96
10MHz BW, 64QAM	High	1990	23.99	23.95	26.98	7	33.98
15MHz BW, QPSK	High	1987.5	23.82	23.82	26.83	7	33.83
15MHz BW, 64QAM	High	1987.5	23.78	23.76	26.78	7	33.78
20MHz BW, QPSK	High	1985	24.00	24.00	27.01	7	34.01
20MHz BW, 64QAM	High	1985	23.99	23.94	26.98	7	33.98

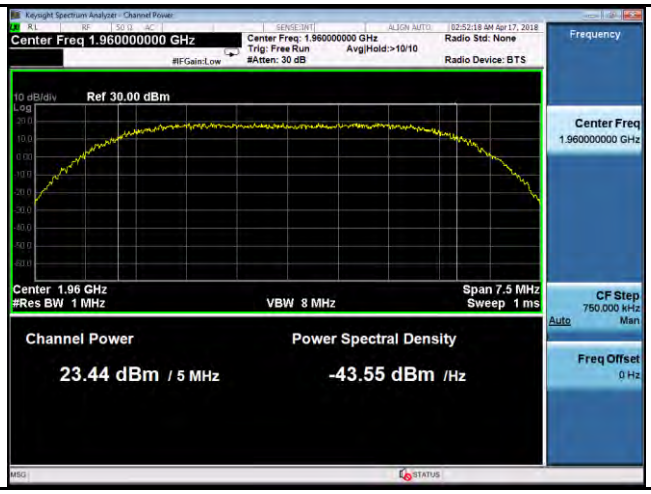
Test Plots for Band 2-QPSK-5MHz

PWR-Band2-QPSK-5M BW-Low CH-Port1

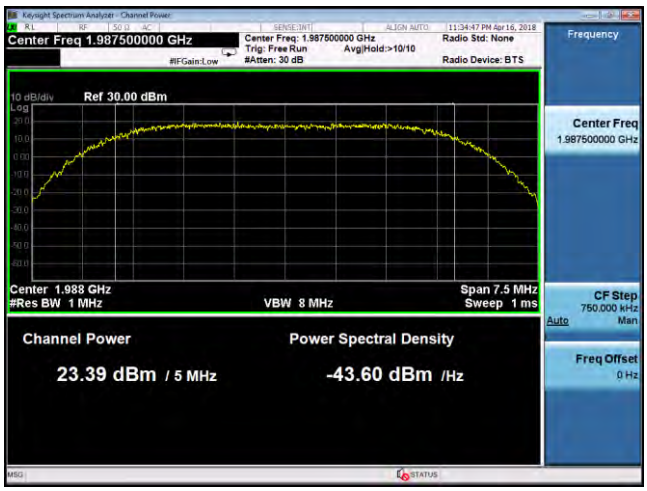


PWR- Band2-QPSK-5M BW-Low CH-Port2

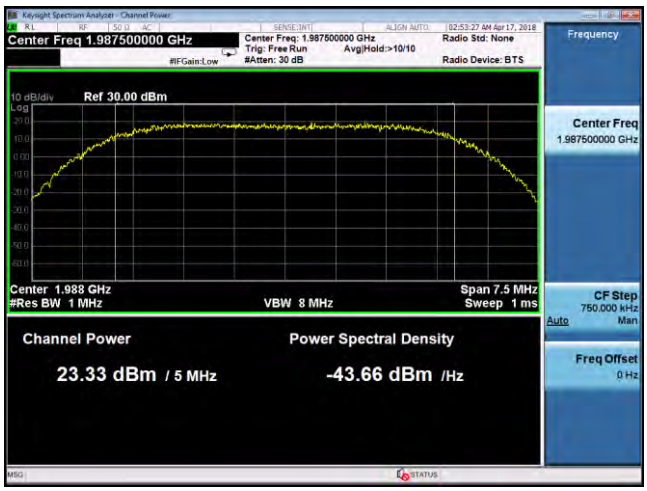
PWR- Band2-QPSK-5M BW-Mid CH-Port1



PWR- Band2-QPSK-5M BW-Mid CH-Port2

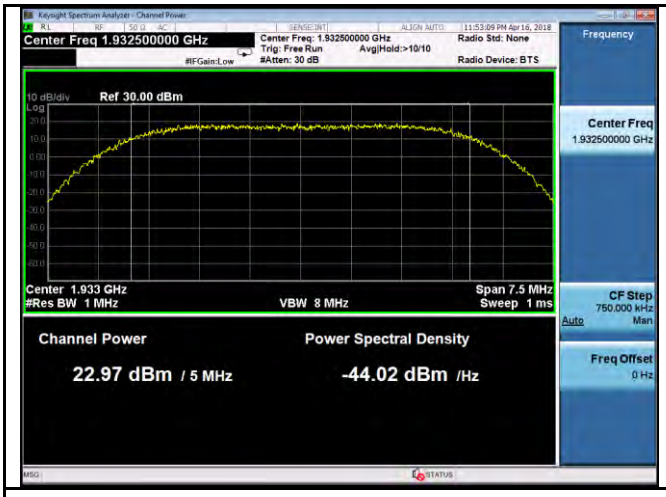


PWR- Band2-QPSK-5M BW-High CH-Port1

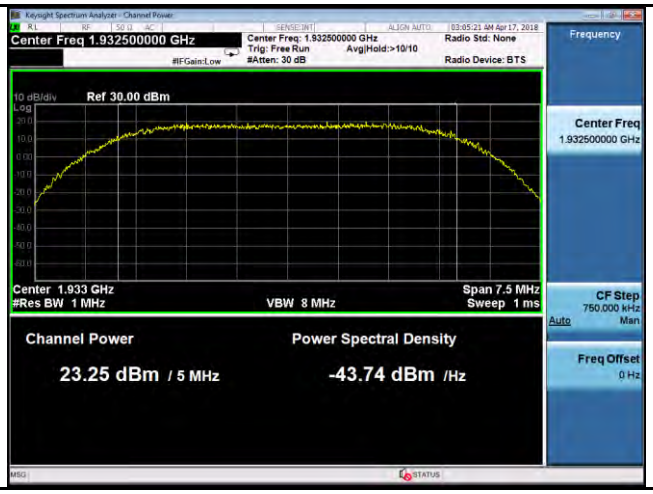


PWR- Band2-QPSK-5M BW-High CH-Port2

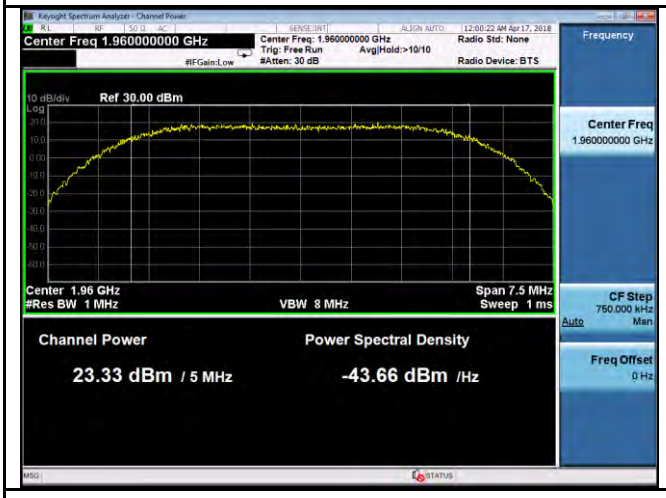
Test Plots for Band 2-64QAM-5MHz



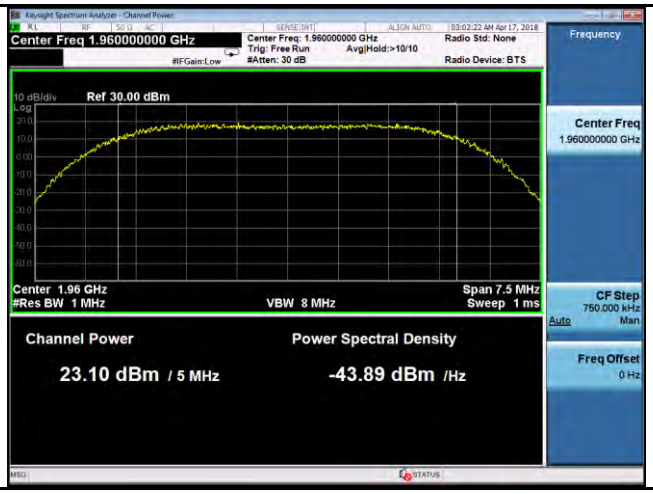
PWR-Band2-64QAM-5M BW-Low CH-Port1



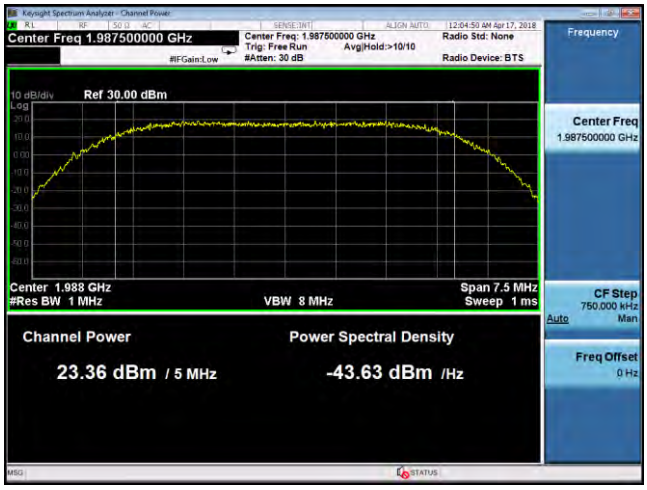
PWR- Band2-64QAM-5M BW-Low CH-Port2



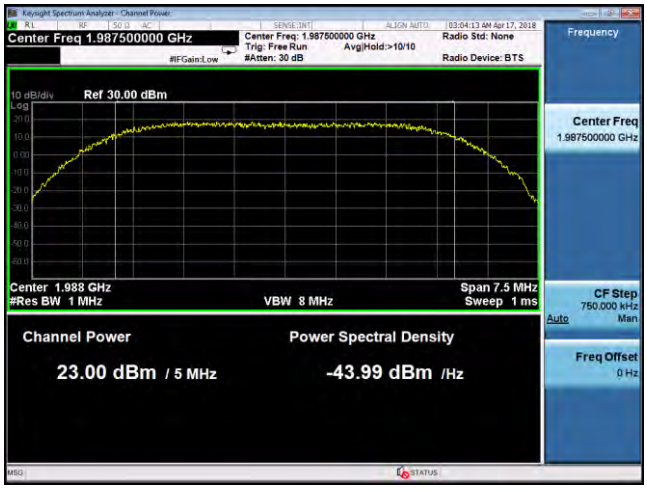
PWR- Band2-64QAM-5M BW-Mid CH-Port1



PWR- Band2-64QAM-5M BW-Mid CH-Port2

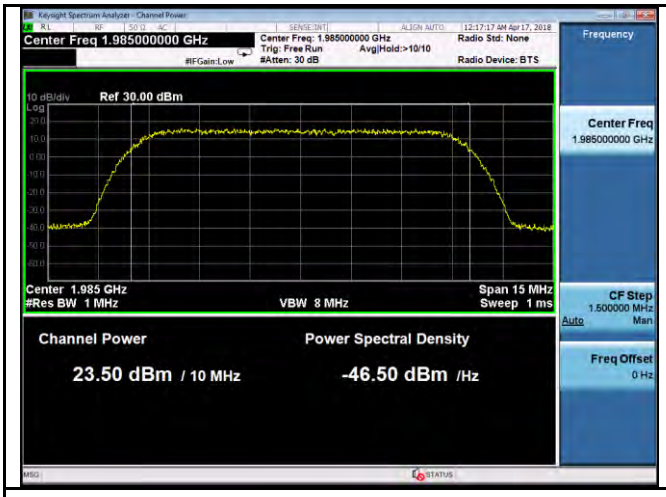


PWR- Band2-64QAM-5M BW-High CH-Port1

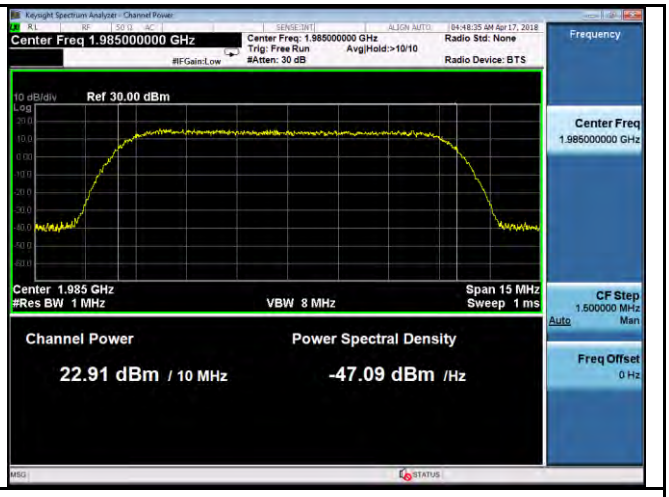


PWR- Band2-64QAM-5M BW-High CH-Port2

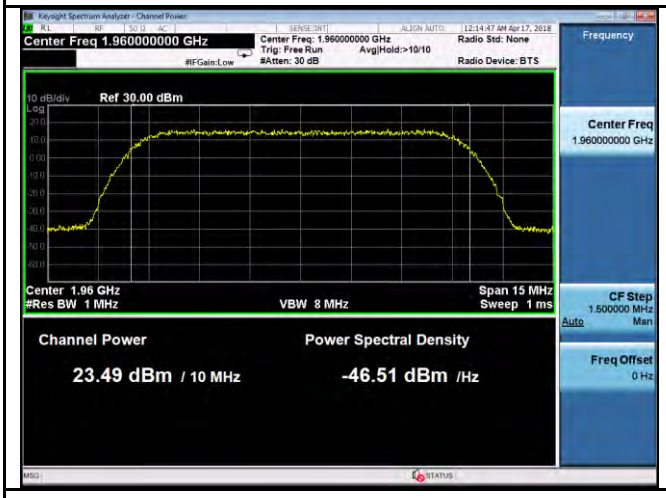
Test Plots for Band 2-QPSK-10MHz



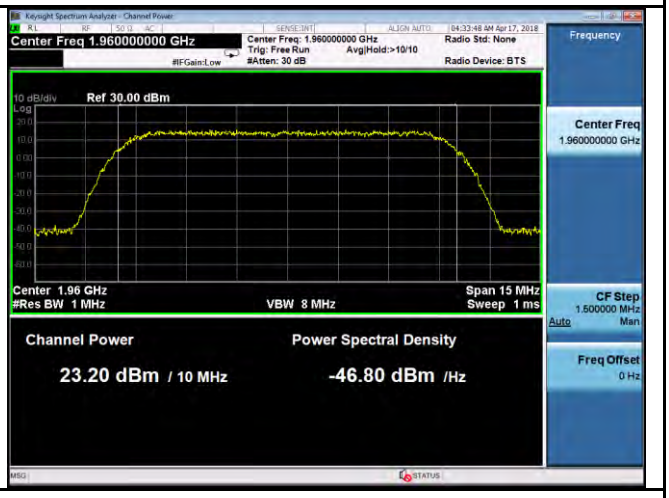
PWR-Band2-QPSK-10M BW-Low CH-Port1



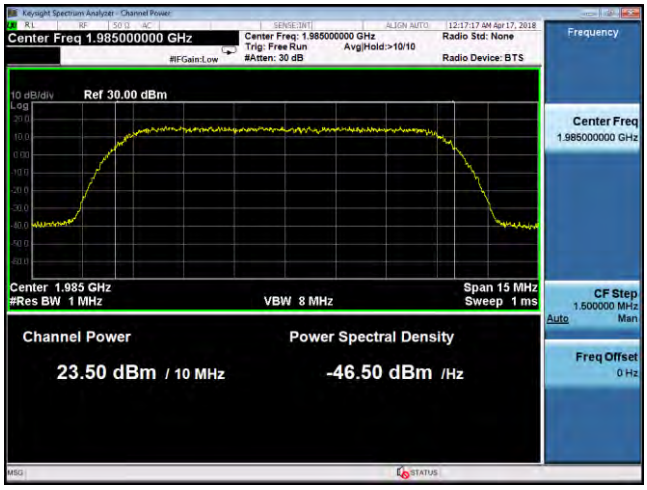
PWR- Band2-QPSK-10M BW-Low CH-Port2



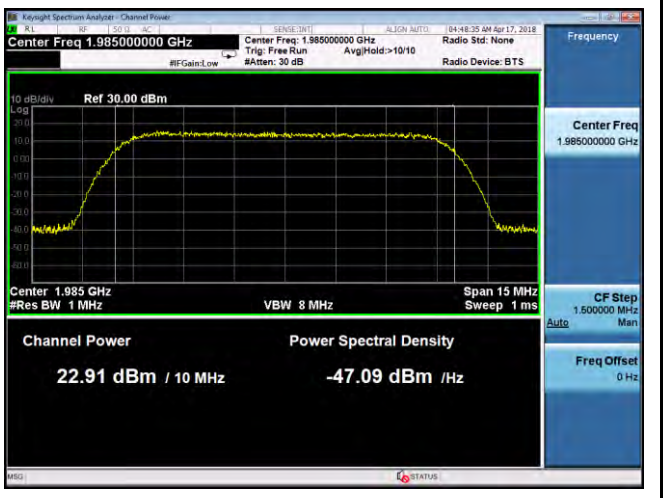
PWR- Band2-QPSK-10M BW-Mid CH-Port1



PWR- Band2-QPSK-10M BW-Mid CH-Port2

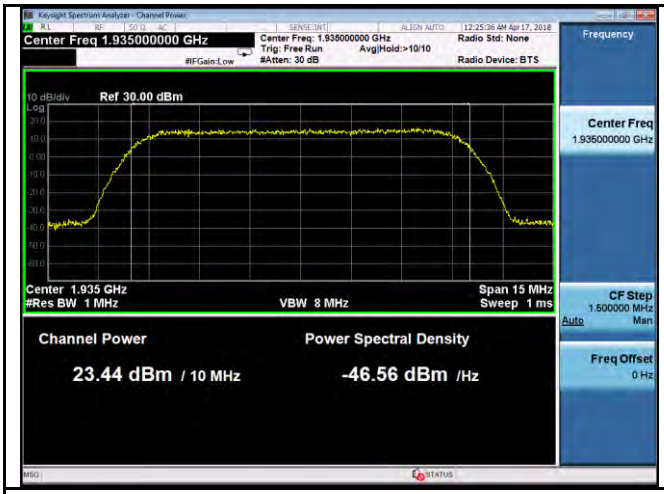


PWR- Band2-QPSK-10M BW-High CH-Port1

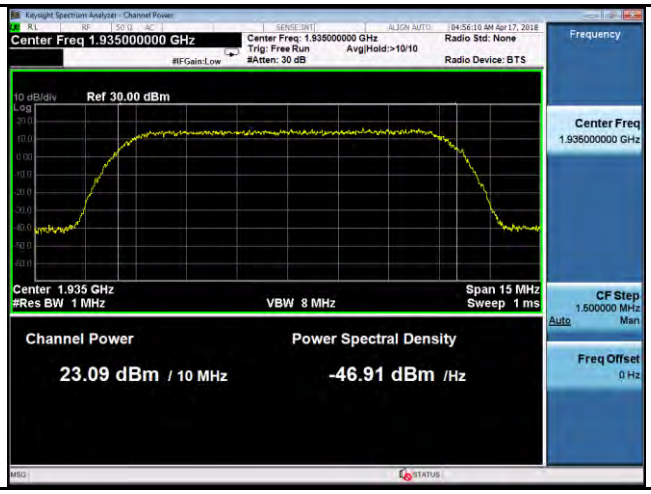


PWR- Band2-QPSK-10M BW-High CH-Port2

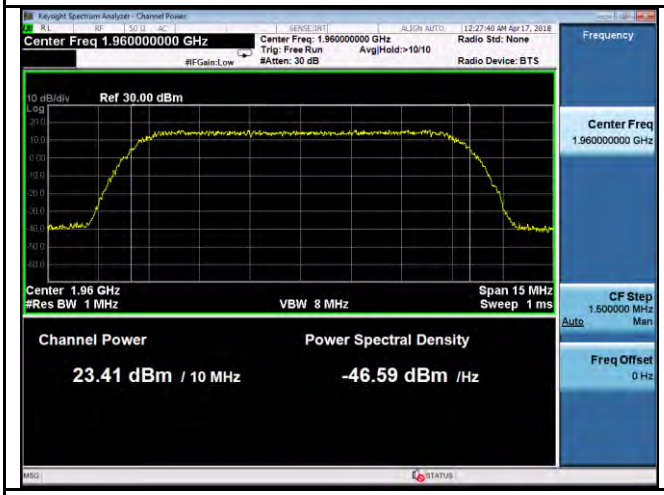
Test Plots for Band 2-64QAM-10MHz



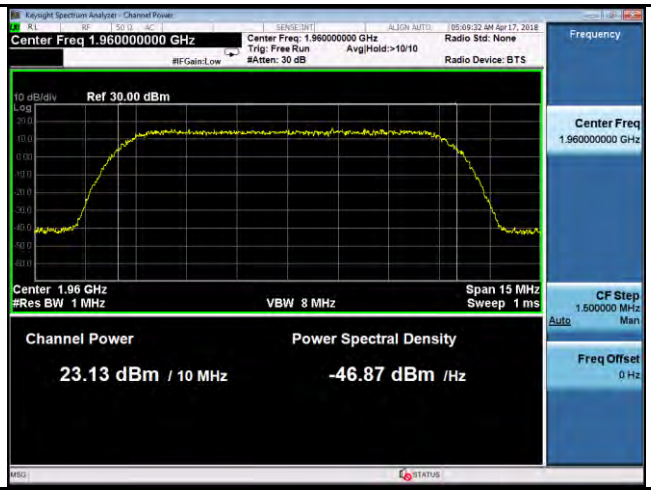
PWR- Band2-64QAM-10M BW-Low CH-Port1



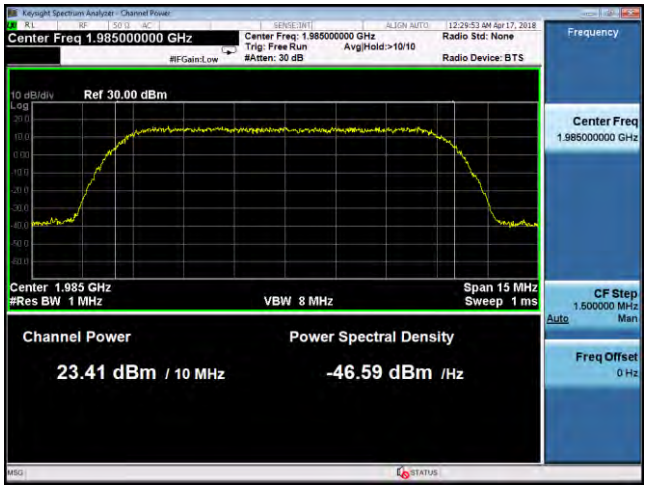
PWR- Band2-64QAM-10M BW-Low CH-Port2



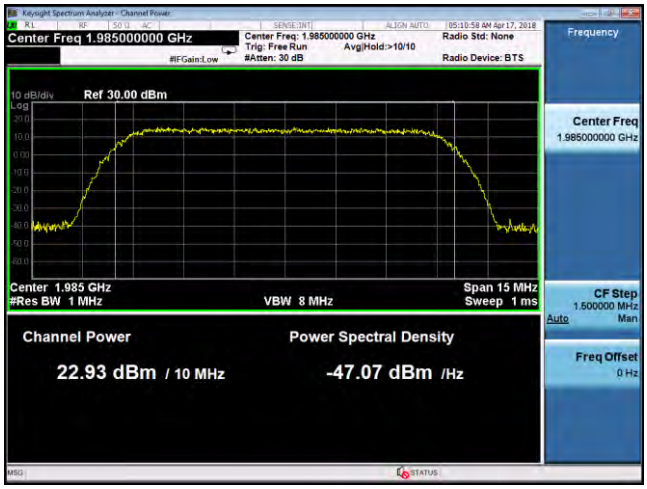
PWR- Band2-64QAM-10M BW-Mid CH-Port1



PWR- Band2-64QAM-10M BW-Mid CH-Port2

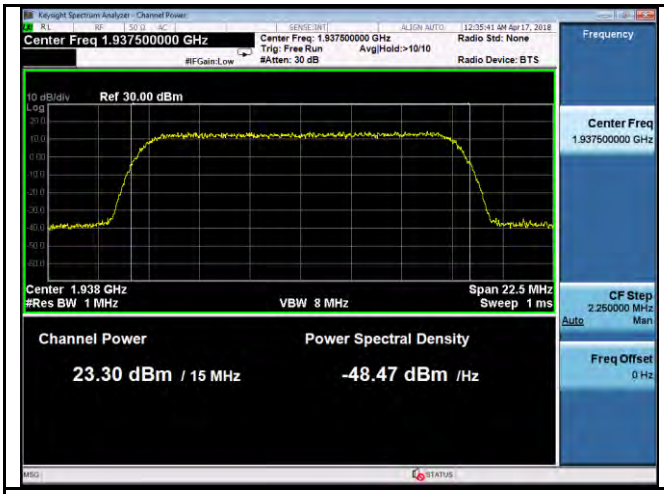


PWR- Band2-64QAM-10M BW-High CH-Port1

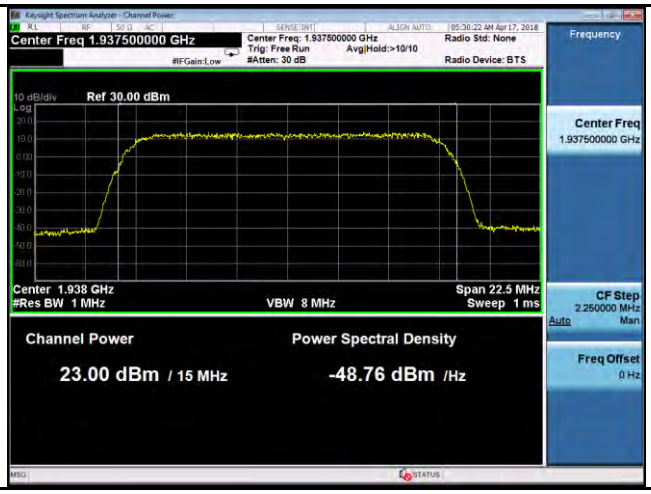


PWR- Band2-64QAM-10M BW-High CH-Port2

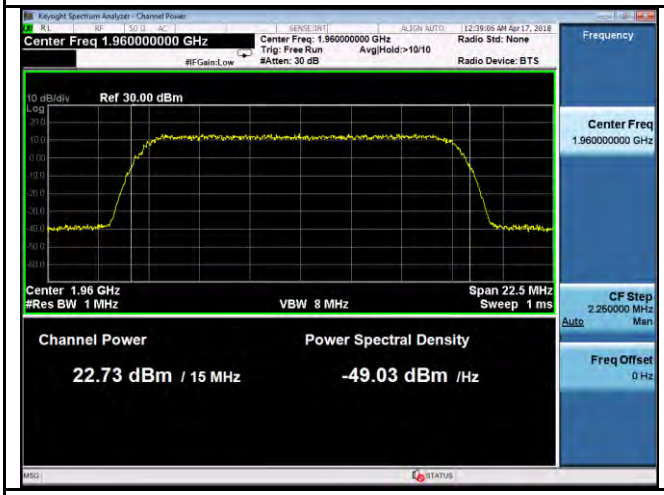
Test Plots for Band 2-QPSK-15MHz



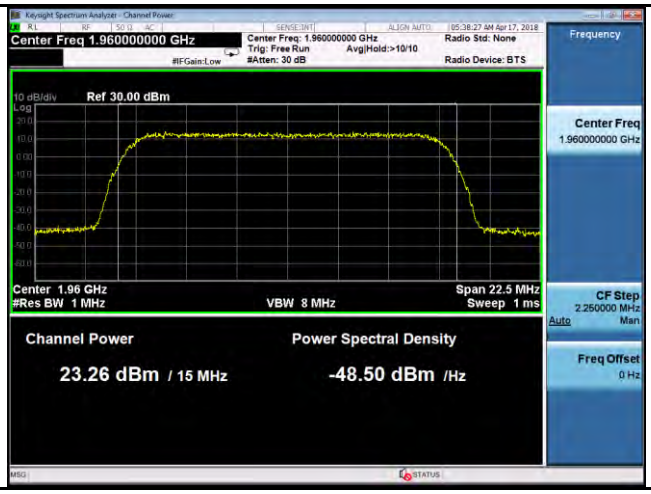
PWR-Band2-QPSK-15M BW-Low CH-Port1



PWR- Band2-QPSK-15M BW-Low CH-Port2



PWR- Band2-QPSK-15M BW-Mid CH-Port1



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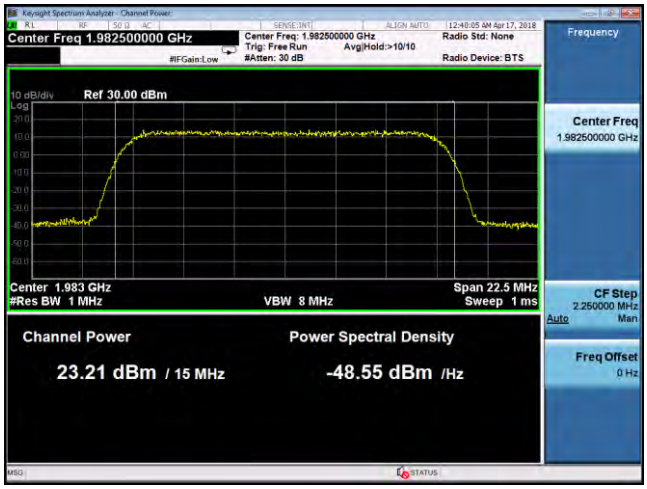
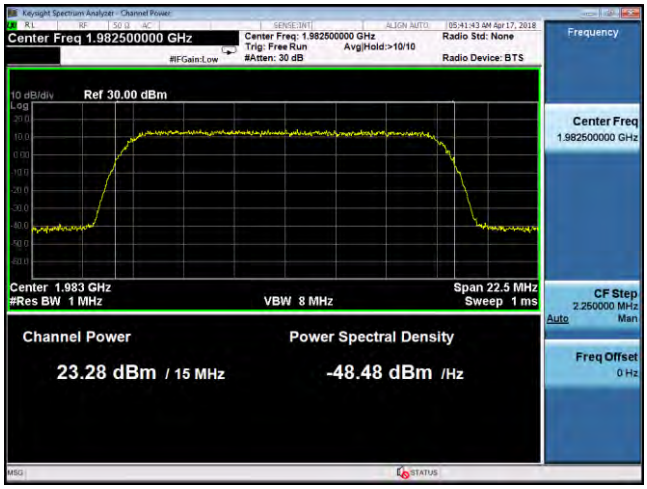
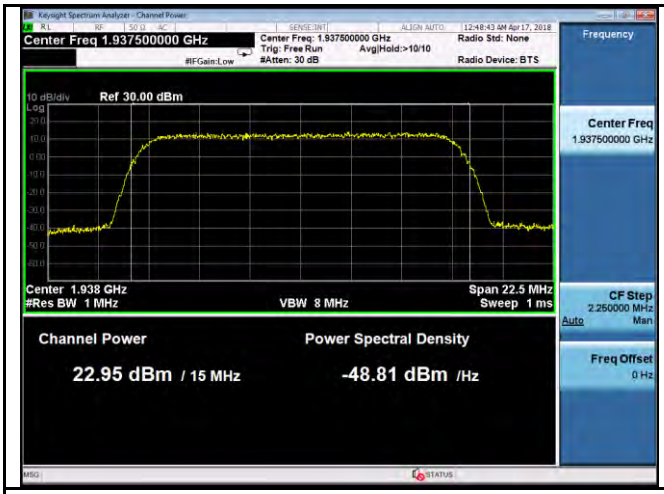


PWR- Band2-QPSK-15M BW-High CH-Port1

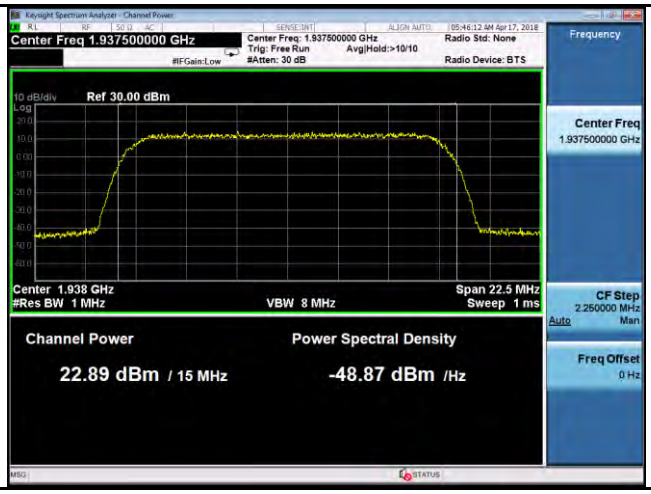


PWR- Band2-QPSK-15M BW-High CH-Port2

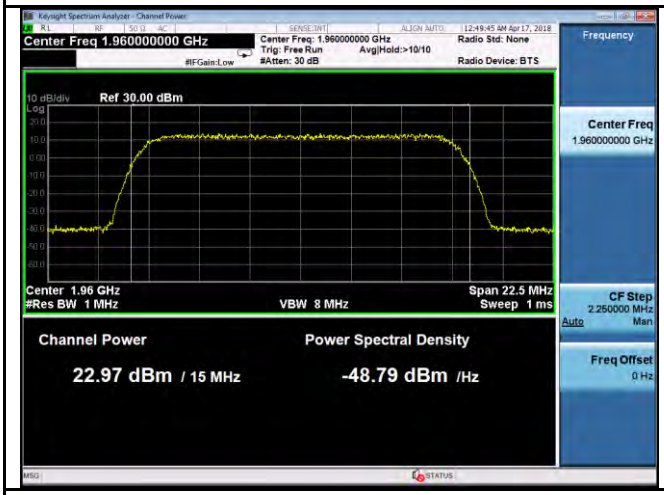
Test Plots for Band 2-64QAM-15MHz



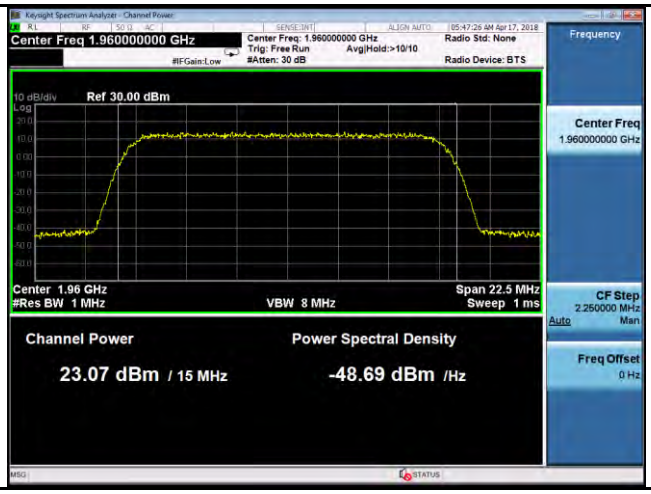
PWR- Band2-64QAM-15M BW-Low CH-Port1



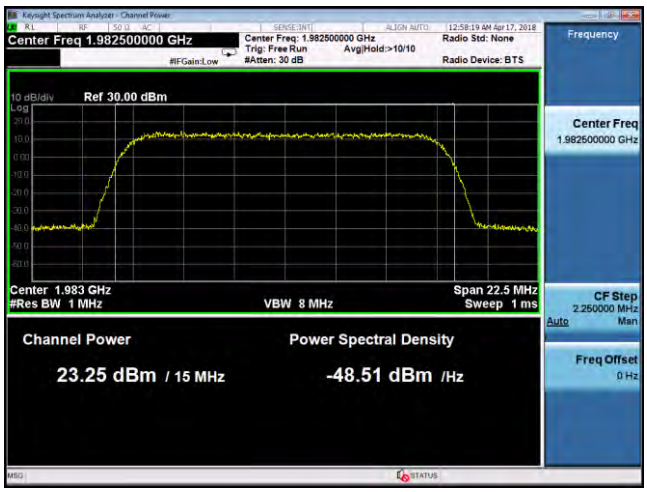
PWR- Band2-64QAM-15M BW-Low CH-Port2



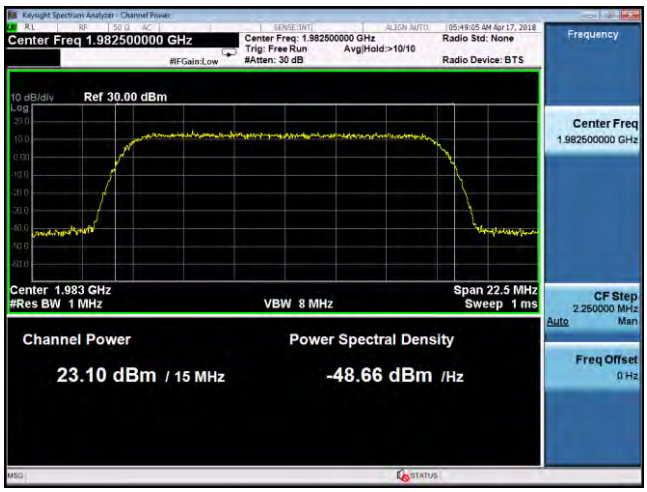
PWR- Band2-64QAM-15M BW-Mid CH-Port1



PWR- Band2-64QAM-15M BW-Mid CH-Port2

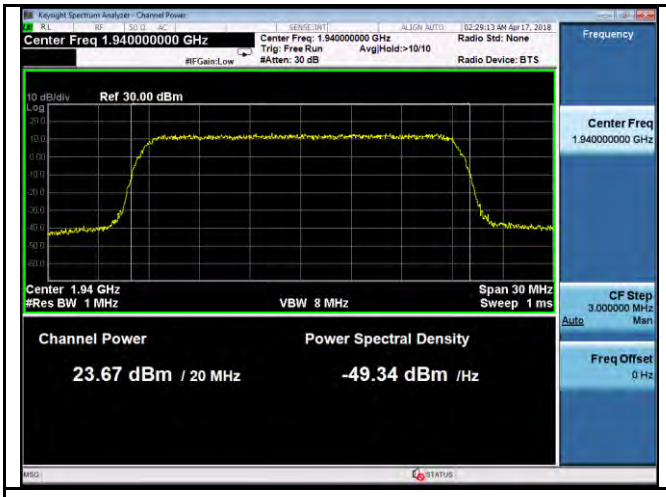


PWR- Band2-64QAM-15M BW-High CH-Port1

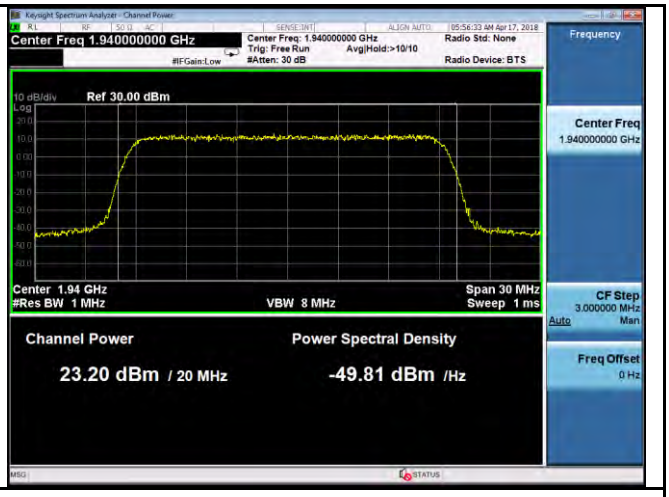


PWR- Band2-64QAM-15M BW-High CH-Port2

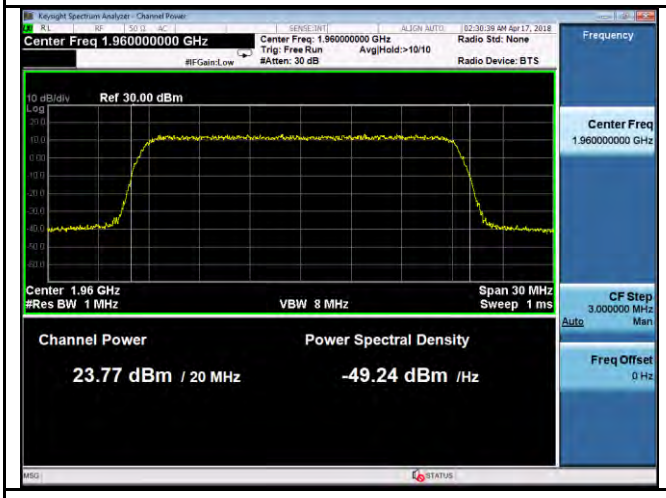
Test Plots for Band 2-QPSK-20MHz



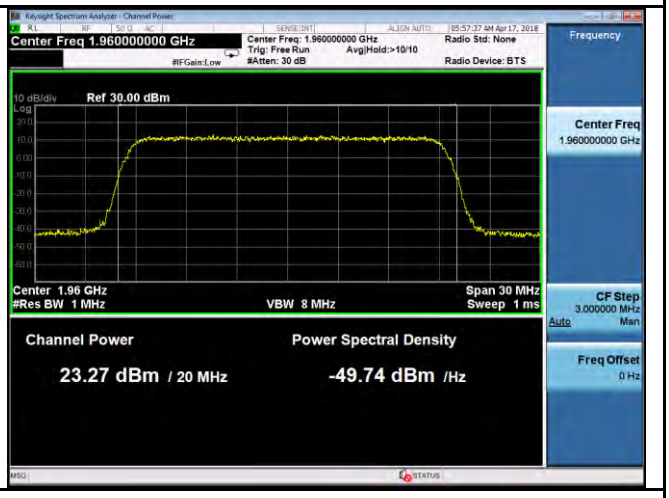
PWR-Band2-QPSK-20M BW-Low CH-Port1



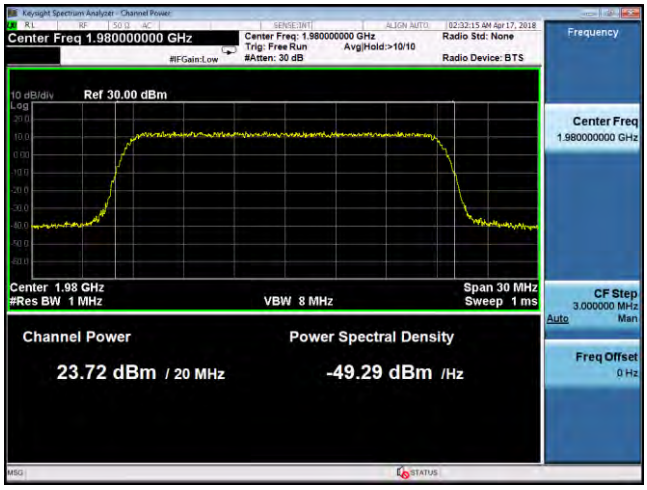
PWR-Band2-QPSK-20M BW-Low CH-Port2



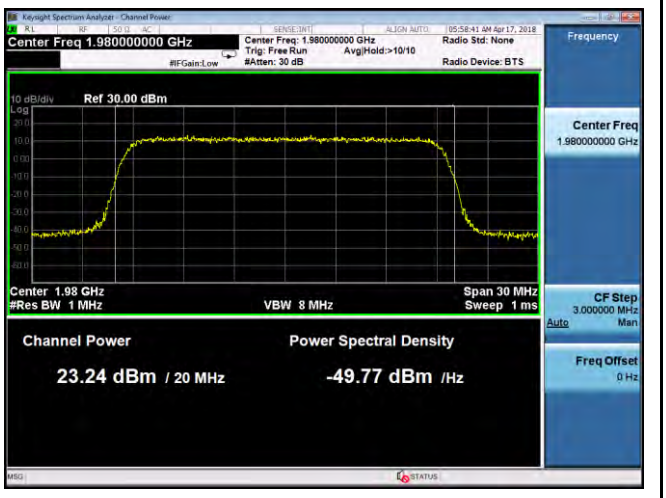
PWR-Band2-QPSK-20M BW-Mid CH-Port1



PWR-Band2-QPSK-20M BW-Mid CH-Port2

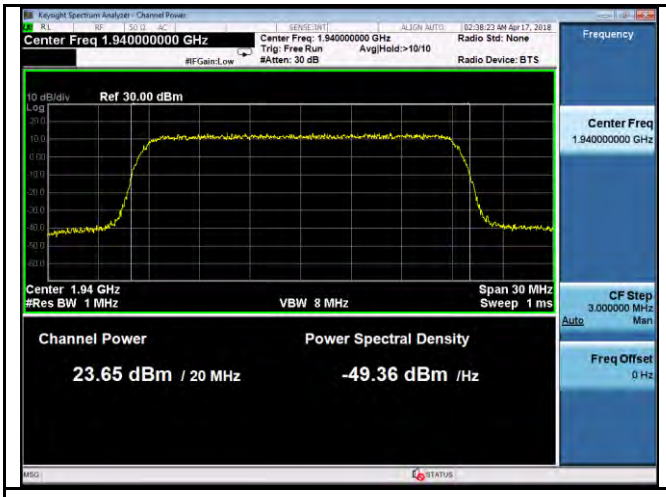


PWR-Band2-QPSK-20M BW-High CH-Port1

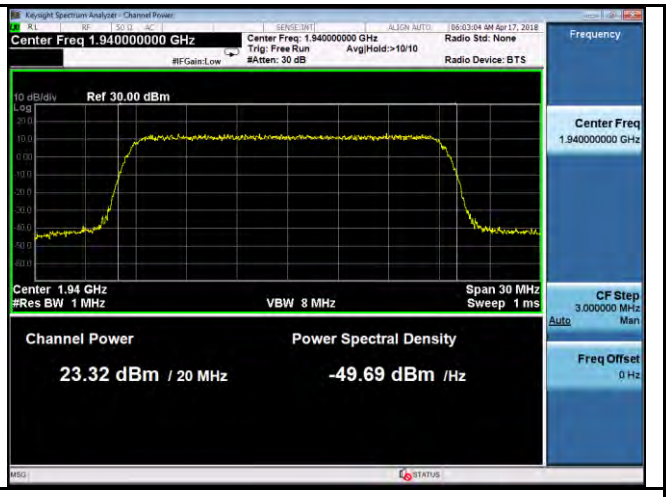


PWR-Band2-QPSK-20M BW-High CH-Port2

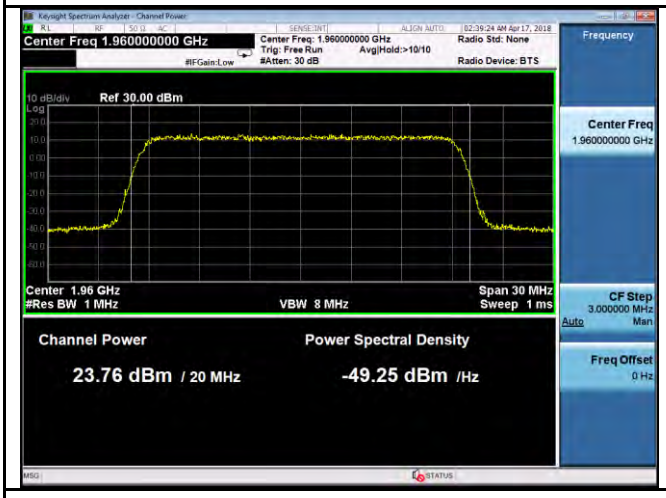
Test Plots for Band 2-64QAM-20MHz



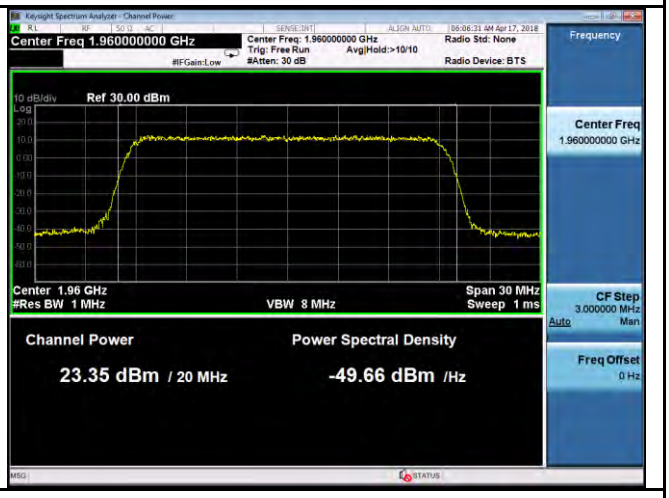
PWR-Band2-64QAM-20M BW-Low CH-Port1



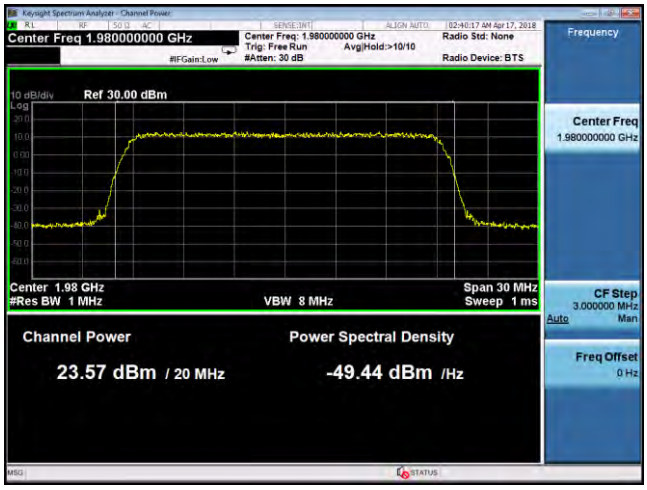
PWR-Band2-64QAM-20M BW-Low CH-Port2



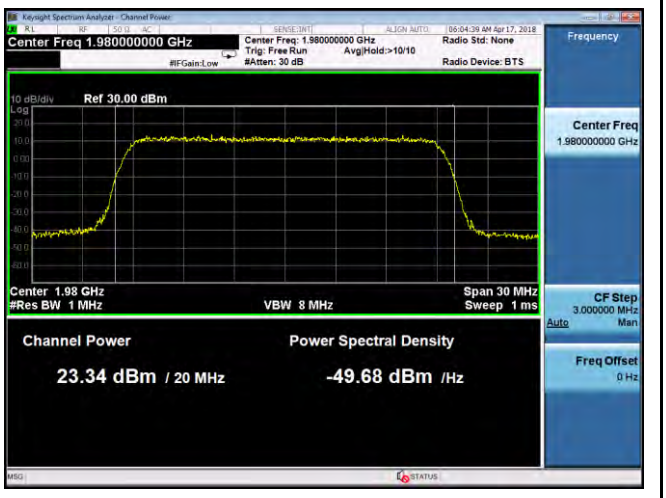
PWR-Band2-64QAM-20M BW-Mid CH-Port1



PWR-Band2-64QAM-20M BW-Mid CH-Port2

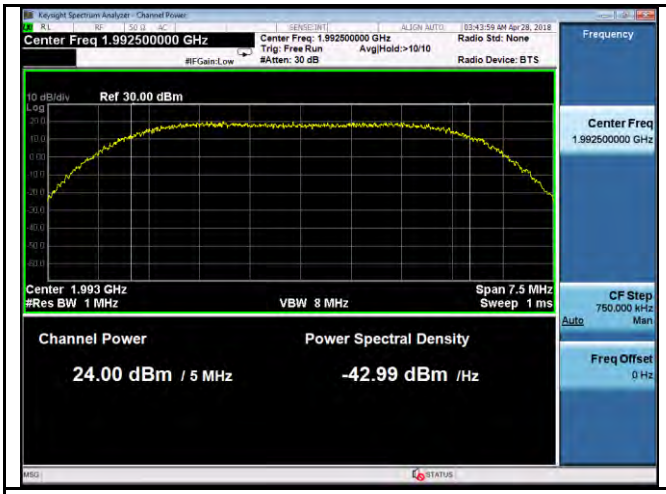


PWR-Band2-64QAM-20M BW-High CH-Port1

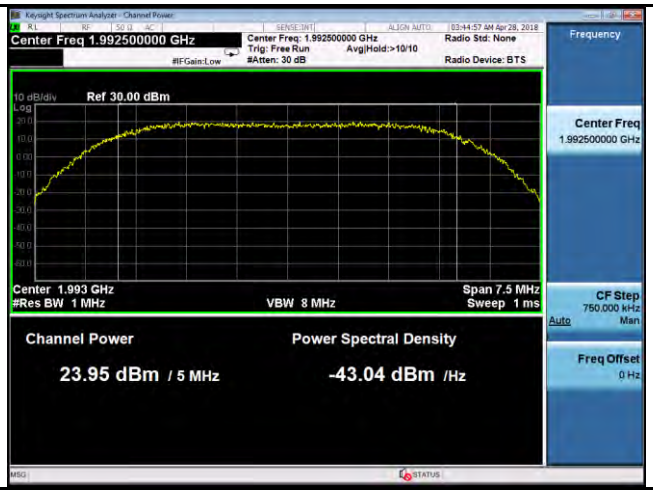


PWR-Band2-64QAM-20M BW-High CH-Port2

Test Plots for Band 25

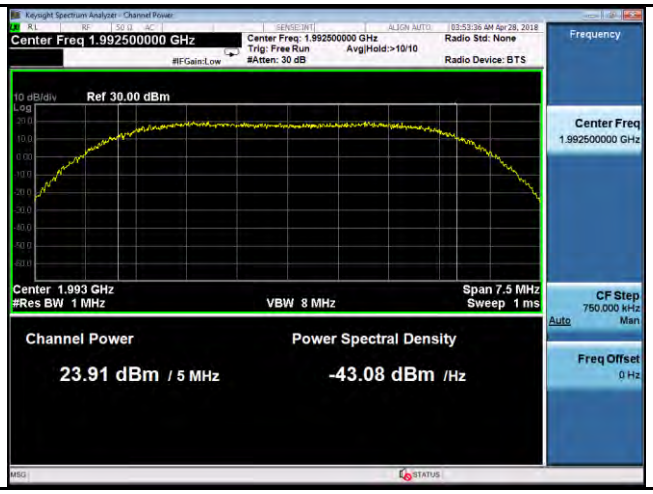


PWR-Band25-QPSK-5M BW-High CH-Port1

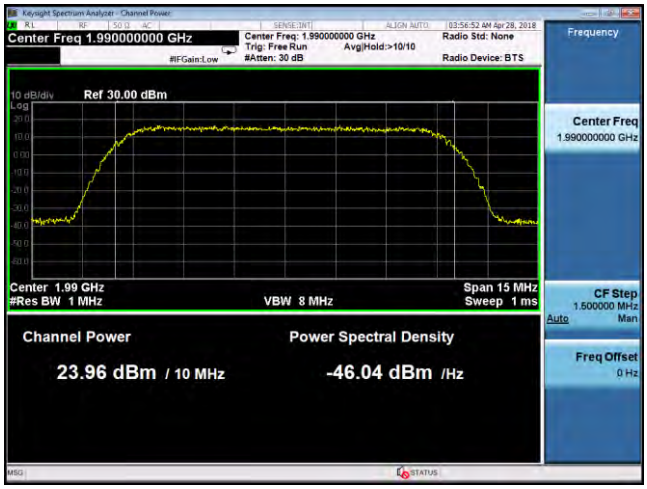


PWR-Band25-QPSK-5M BW-High CH-Port2

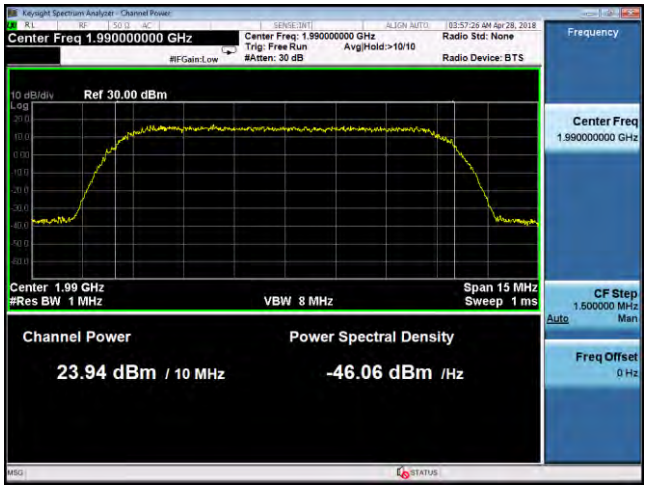
PWR-Band25-64QAM-5M BW-High CH-Port1



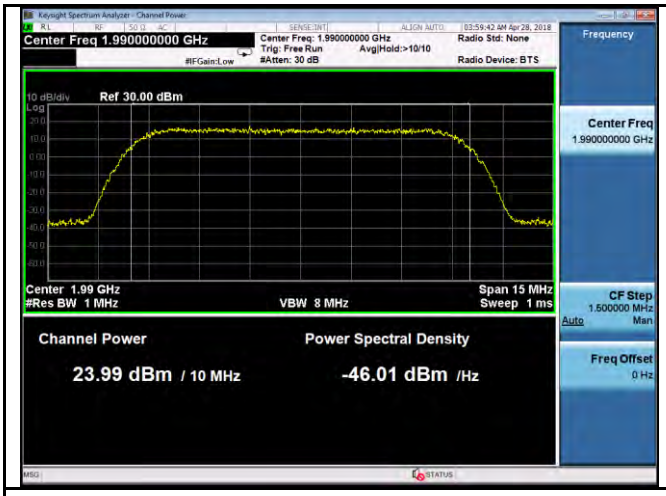
PWR-Band25-64QAM-5M BW-High CH-Port2



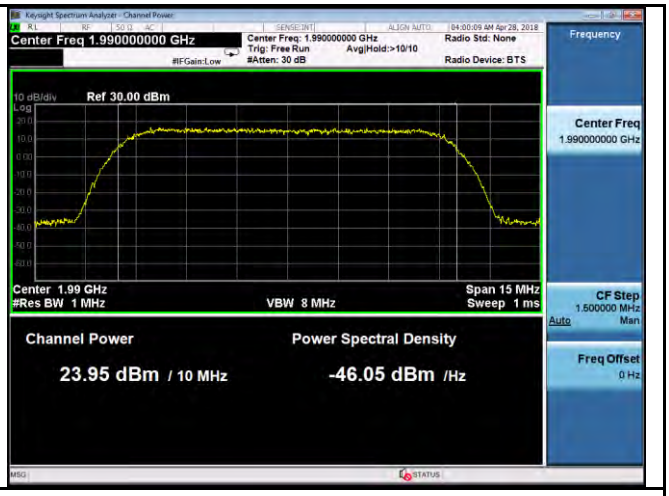
PWR-Band25-QPSK-10M BW-High CH-Port1



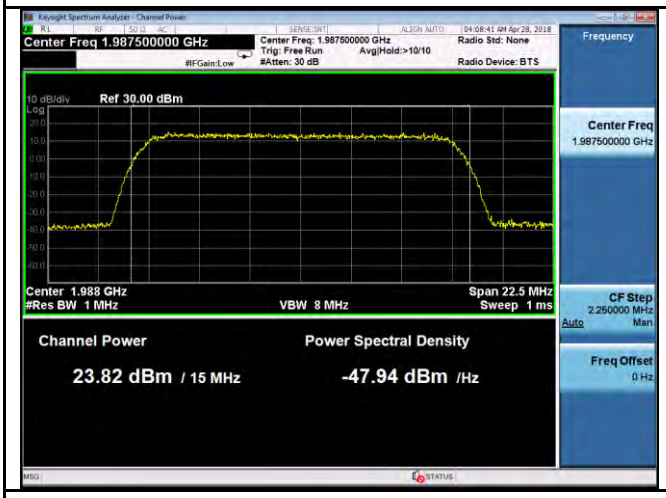
PWR-Band25-QPSK-10M BW-High CH-Port2



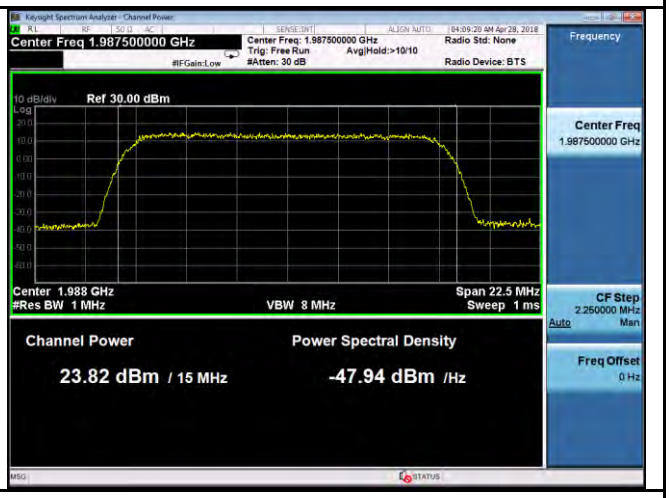
PWR-Band25-64QAM-10M BW-High CH-Port1



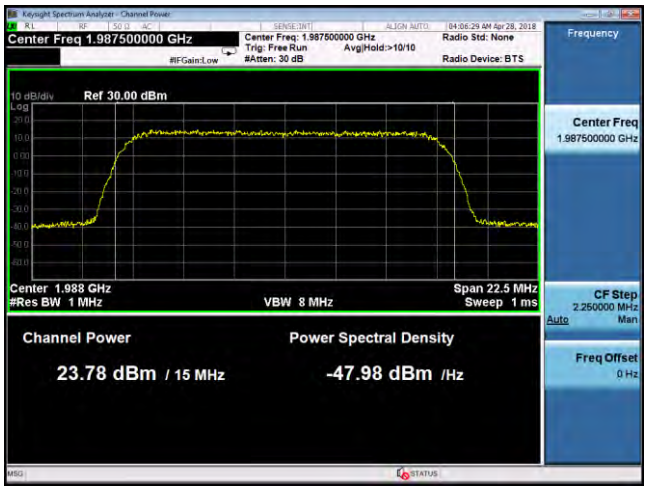
PWR-Band25-64QAM-10M BW-High CH-Port2



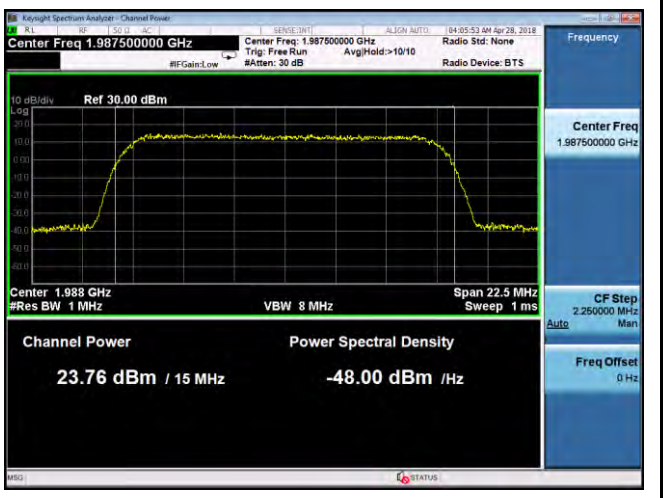
PWR-Band25-QPSK-15M BW-High CH-Port1



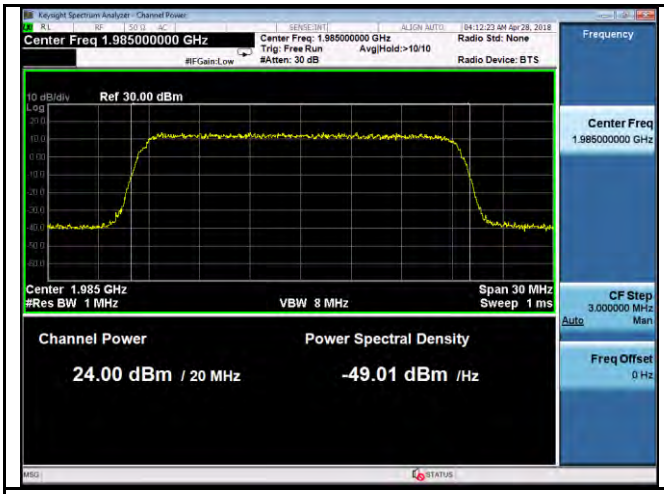
PWR-Band25-QPSK-15M BW-High CH-Port2



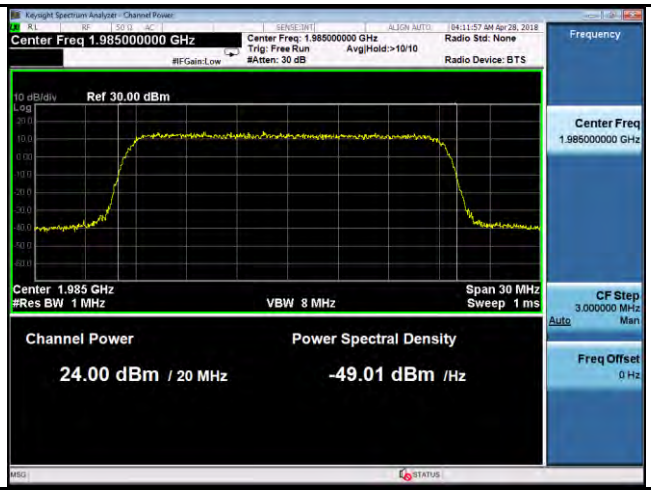
PWR-Band25-64QAM-15M BW-High CH-Port1



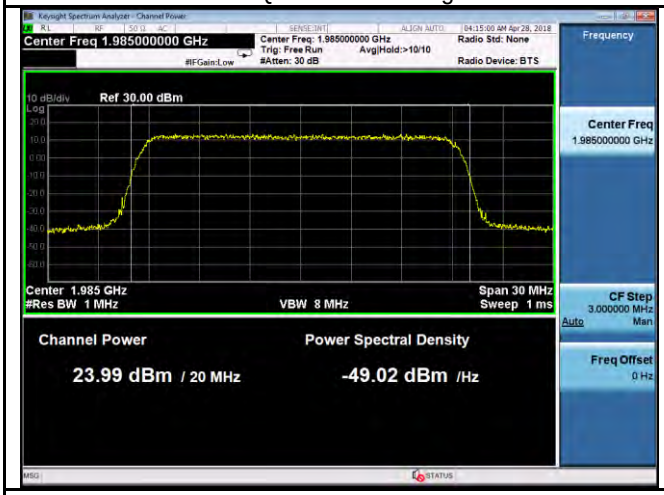
PWR-Band25-64QAM-15M BW-High CH-Port2



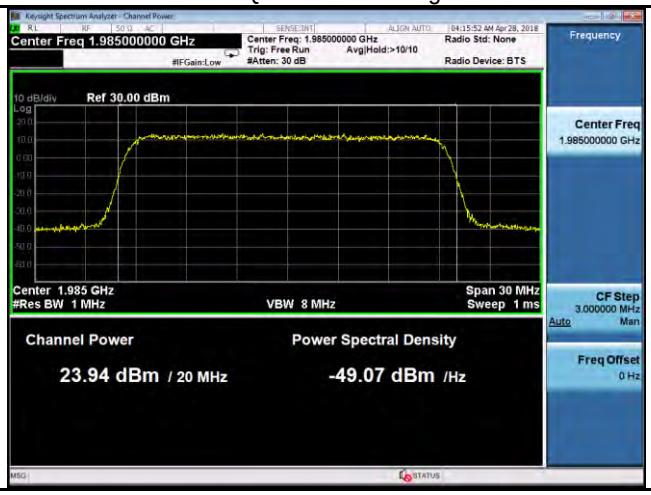
PWR-Band25-QPSK-20M BW-High CH-Port1



PWR-Band25-QPSK-20M BW-High CH-Port2



PWR-Band25-64QAM-20M BW-High CH-Port1

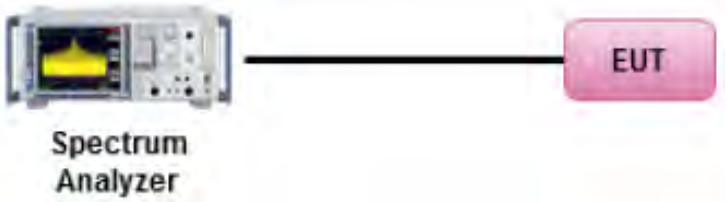


PWR-Band25-64QAM-20M BW-High CH-Port2

10.2 Peak-Average Ratio

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR27.50	(b)	The peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB. The PAPR measurements should be made using either an instrument with complementary cumulative distribution function (CCDF) capabilities to determine that PAPR will not exceed 13 dB for more than 0.1 percent of the time or other Commission approved procedure. The measurement must be performed using a signal corresponding to the highest PAPR expected during periods of continuous transmission.	☒

Test Setup				
Test Procedure	- EUT was set for low, mid, high channel with modulated mode and highest RF output power. - The spectrum analyzer was connected to the antenna terminal.			
Test Date	04/16/2018 – 04/27/2018	Environmental condition	Temperature Relative Humidity Atmospheric Pressure	23°C 48% 1008mbar
Remark	NONE			
Result	☒ Pass ☐ Fail			

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test was done by *Rachana Khanduri* at *RF test site*.

Test Data for LTE band 2:

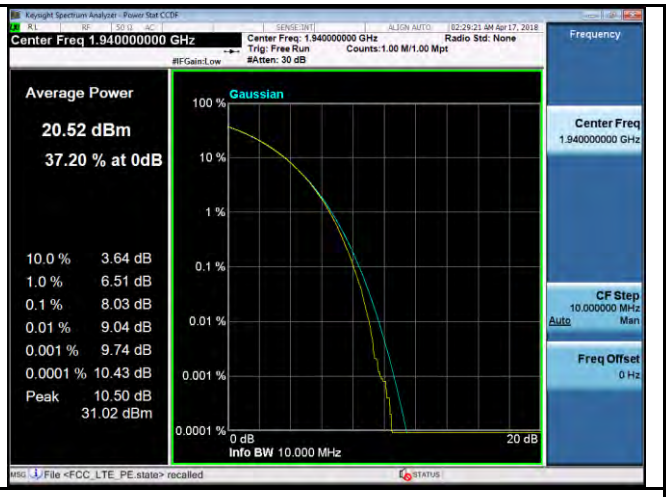
Type	Channel	Frequency (MHz)	Peak-Average Ratio (dB)	Peak-Average Ratio (dB)
5MHz BW, QPSK	Low	1932.5	7.91	13
	Mid	1960.0	7.89	13
	High	1987.5	7.90	13
5MHz BW, 64QAM	Low	1932.5	7.93	13
	Mid	1960.0	8.05	13
	High	1987.5	8.18	13
10MHz BW, QPSK	Low	1935.0	7.54	13
	Mid	1960.0	7.45	13
	High	1985.0	7.45	13
10MHz BW, 64QAM	Low	1935.0	7.79	13
	Mid	1960.0	7.45	13
	High	1985.0	7.44	13
15MHz BW, QPSK	Low	1937.5	9.04	13
	Mid	1960.0	8.84	13
	High	1982.5	9.04	13
15MHz BW, 64QAM	Low	1937.5	8.39	13
	Mid	1960.0	8.36	13
	High	1982.5	8.40	13
20MHz BW, QPSK	Low	1940.0	9.04	13
	Mid	1960.0	8.84	13
	High	1980.0	8.84	13
20MHz BW, 64QAM	Low	1940.0	8.87	13
	Mid	1960.0	8.80	13
	High	1980.0	8.78	13

Test Data for LTE band 25:

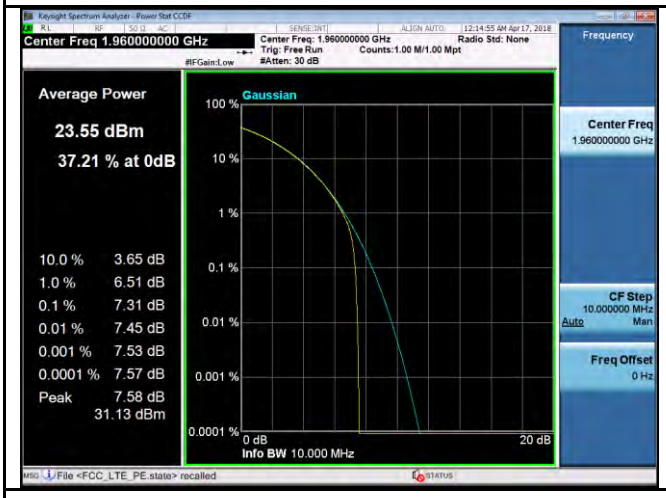
Type	Channel	Frequency (MHz)	Peak-Average Ratio (dB)	Peak-Average Ratio (dB)
5MHz BW, QPSK	High	1992.5	7.92	13
5MHz BW, 64QAM	High	1992.5	7.99	13
10MHz BW, QPSK	High	1990	7.49	13
10MHz BW, 64QAM	High	1990	7.64	13
15MHz BW, QPSK	High	1987.5	8.79	13
15MHz BW, 64QAM	High	1987.5	8.87	13
20MHz BW, QPSK	High	1985	8.97	13
20MHz BW, 64QAM	High	1985	8.89	13

Test Plots for LTE Band 2:

PK-AV-Ratio-Band2-QPSK-10M BW-Low

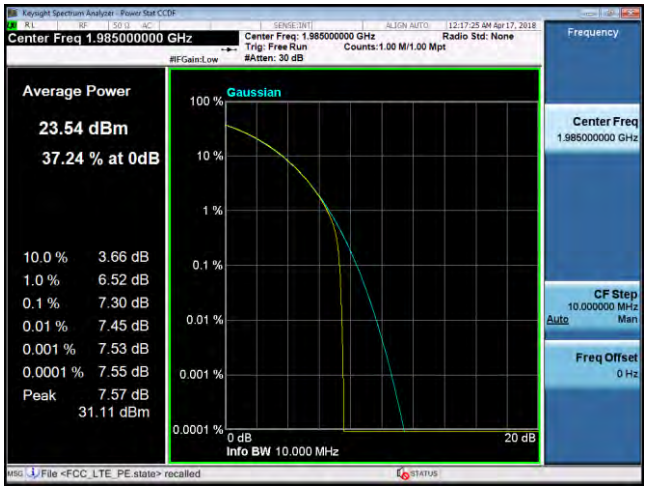


PK-AV-Ratio- Band2-QPSK-20M BW-Low



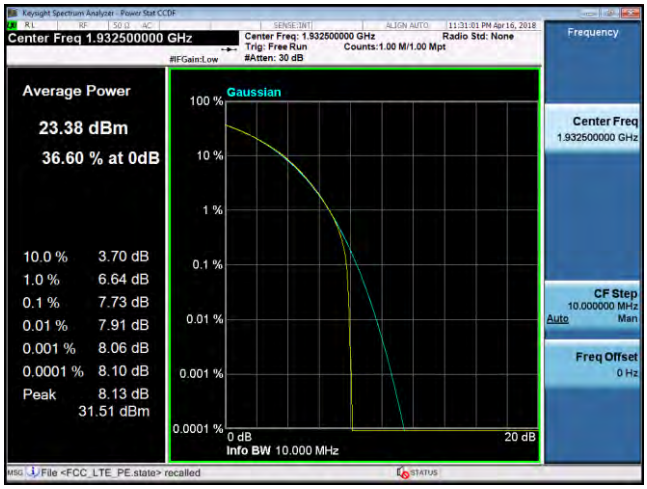
PK-AV-Ratio- Band2-QPSK-10M BW-Mid

PK-AV-Ratio- Band2-QPSK-20M BW-Mid

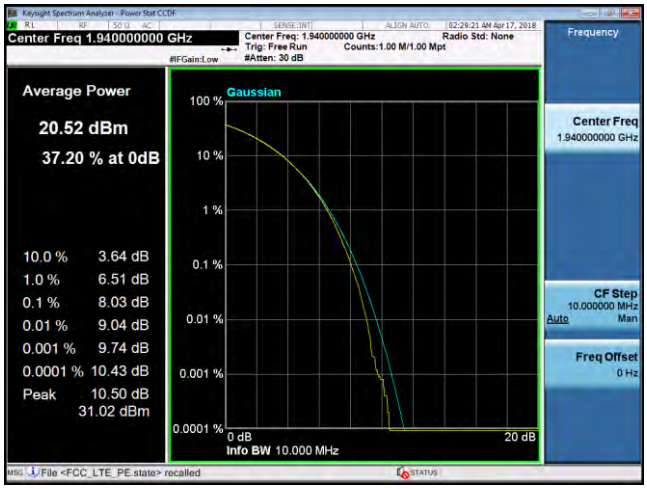


PK-AV-Ratio- Band2-QPSK-10M BW-High

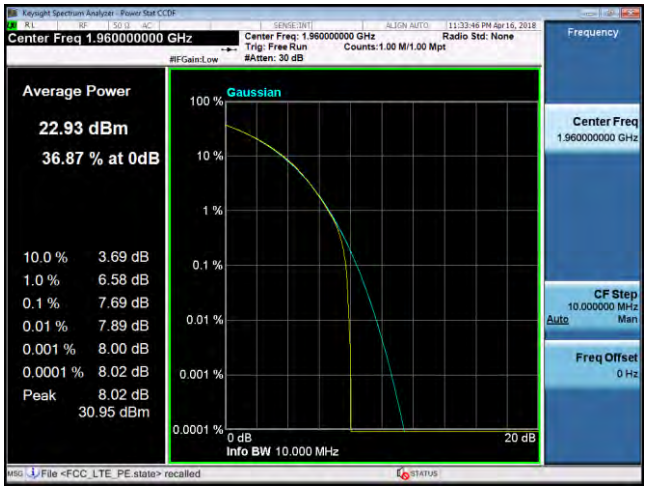
PK-AV-Ratio- Band2-QPSK-20M BW-High



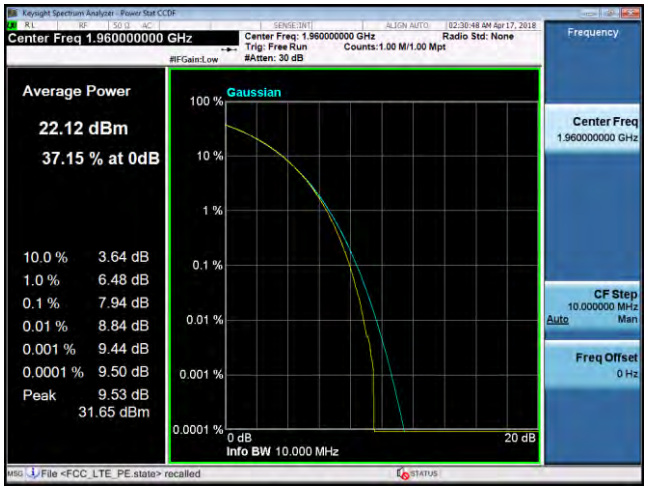
PK-AV-Ratio- Band2-QPSK-5M BW-Low



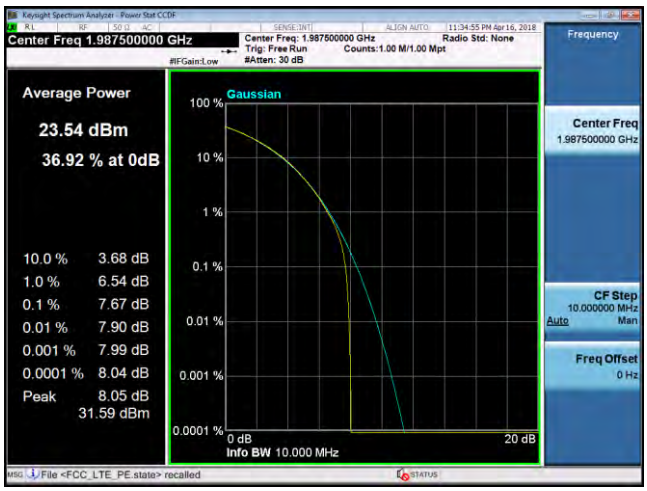
PK-AV-Ratio- Band2-QPSK-15M BW-Low



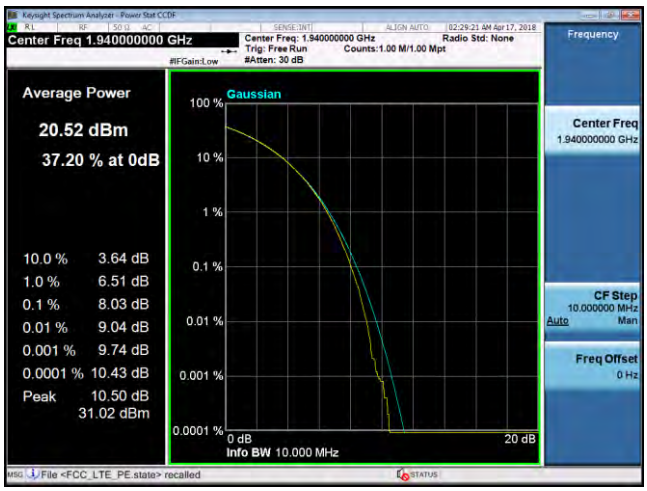
PK-AV-Ratio- Band2-QPSK-5M BW-Mid



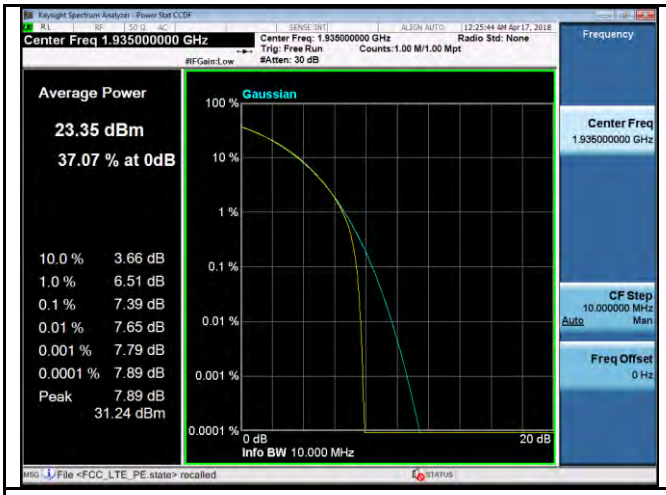
PK-AV-Ratio- Band2-QPSK-15M BW-Mid



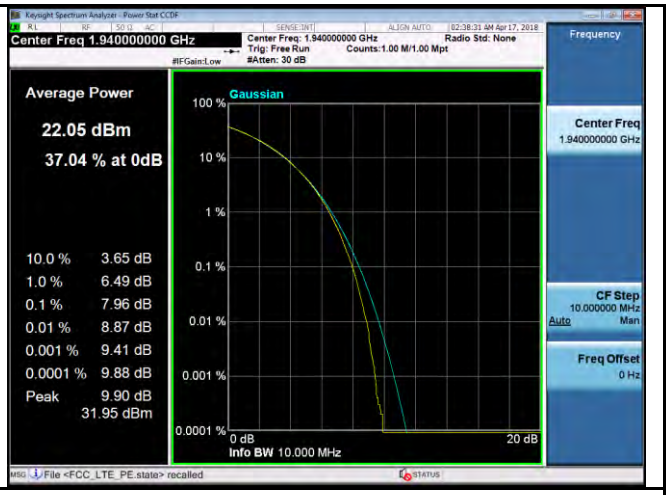
PK-AV-Ratio- Band2-QPSK-5M BW-High



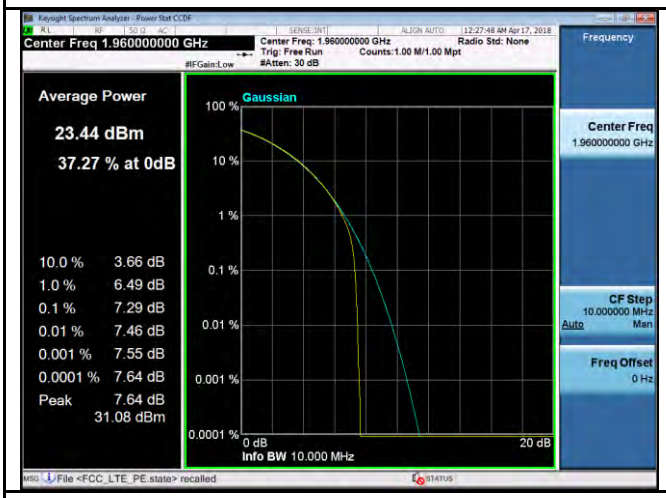
PK-AV-Ratio- Band2-QPSK-15M BW-High



PK-AV-Ratio-Band2-64QAM-10M BW-Low

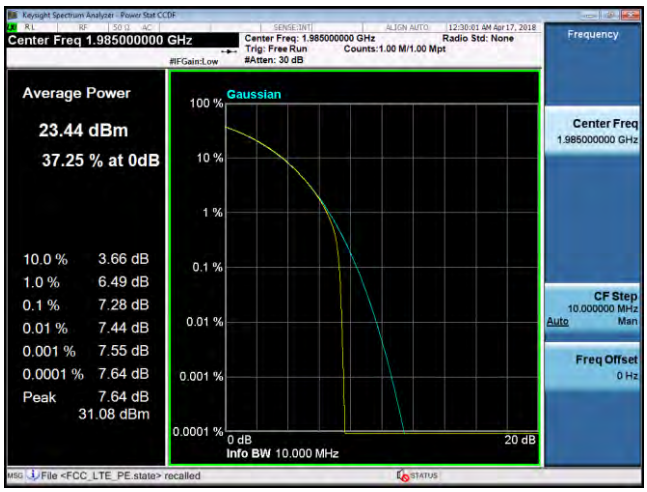


PK-AV-Ratio- Band2-64QAM-20M BW-Low

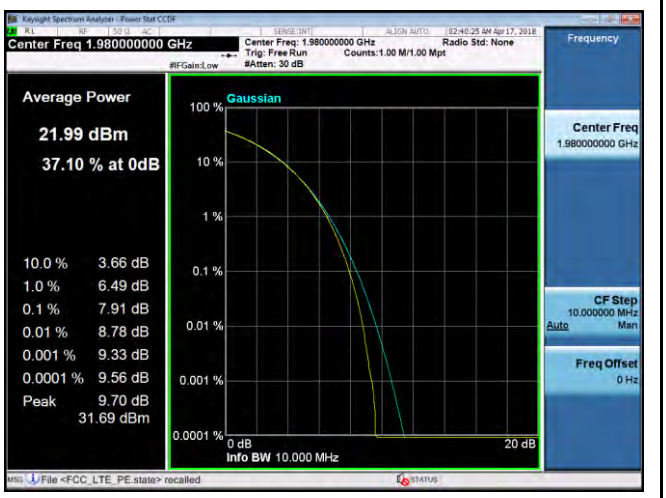


PK-AV-Ratio- Band2-64QAM-10M BW-Mid

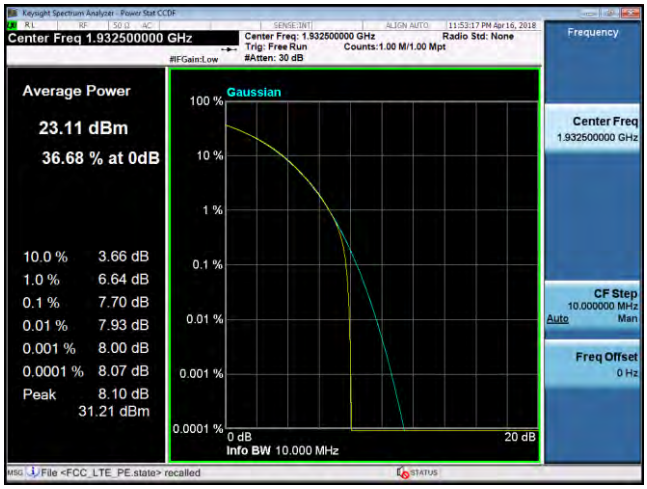
PK-AV-Ratio- Band2-64QAM-20M BW-Mid



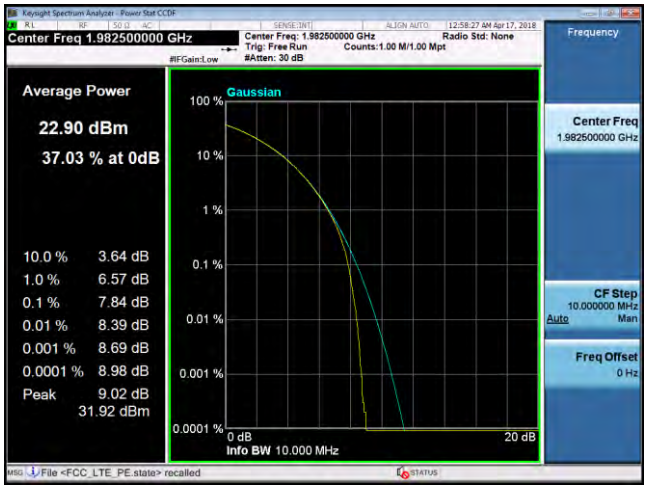
PK-AV-Ratio- Band2-64QAM-10M BW-High



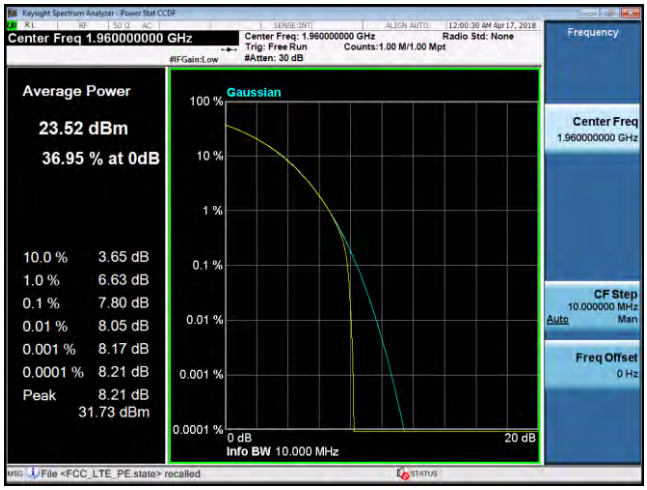
PK-AV-Ratio- Band2-64QAM-20M BW-High



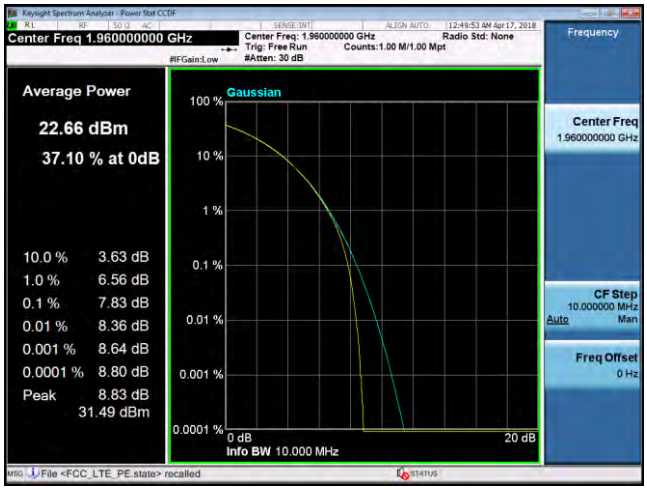
PK-AV-Ratio- Band2-64QAM-5M BW-Low



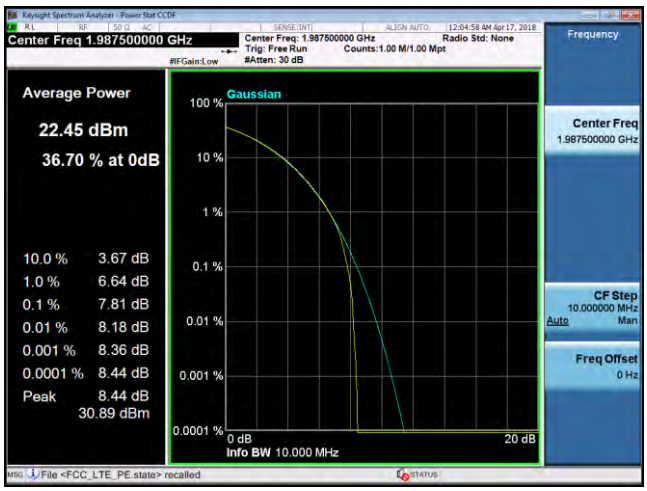
PK-AV-Ratio- Band2-64QAM-15M BW-Low



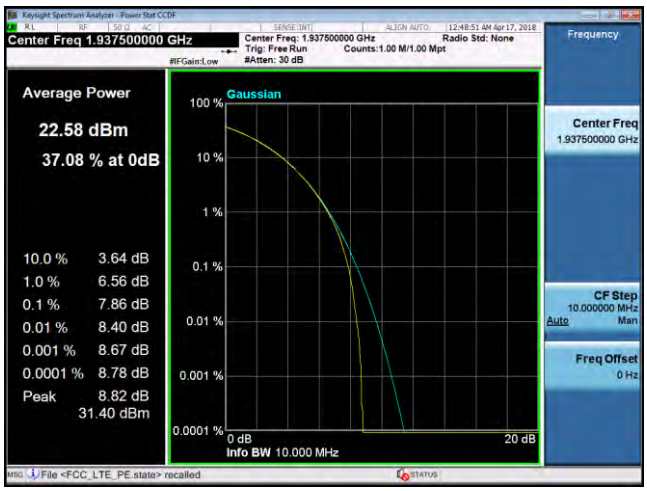
PK-AV-Ratio- Band2-64QAM-5M BW-Mid



PK-AV-Ratio- Band2-64QAM-15M BW-Mid

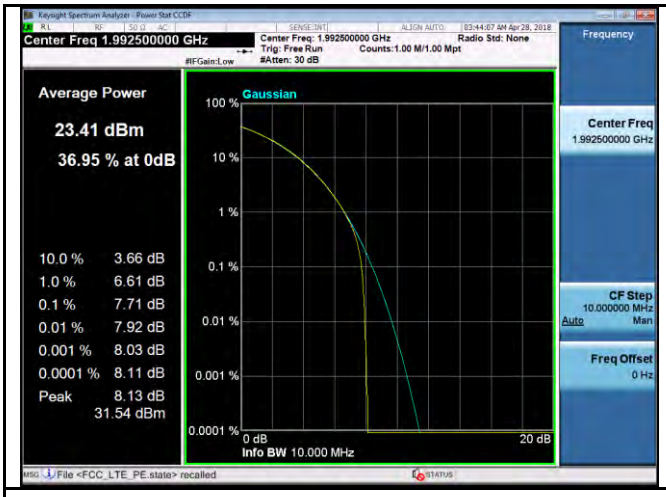


PK-AV-Ratio- Band2-64QAM-5M BW-High



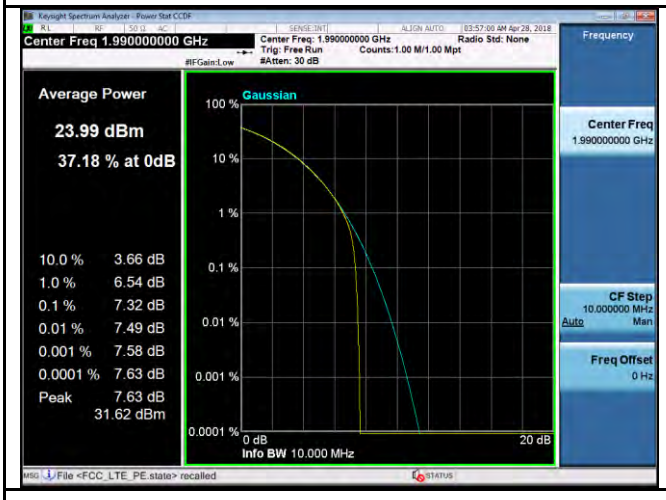
PK-AV-Ratio- Band2-64QAM-15M BW-High

Test Plots for LTE band 25:



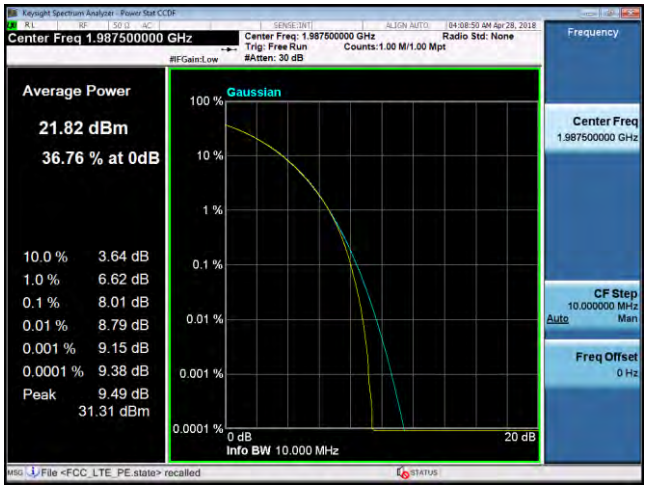
PK-AV-Ratio-Band25-QPSK-5M BW-High

PK-AV-Ratio-Band25-64QAM-5M BW-High



PK-AV-Ratio-Band25-QPSK-10M BW-High

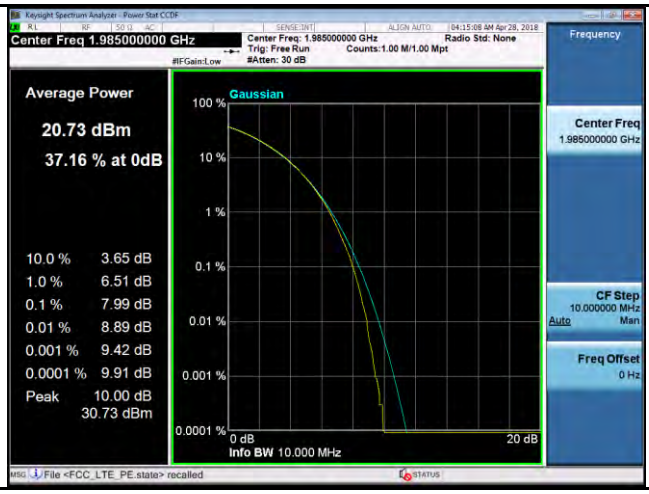
PK-AV-Ratio-Band25-64QAM-10M BW-High



PK-AV-Ratio-Band25-QPSK-15M BW-High

PK-AV-Ratio-Band25-64QAM-15M BW-High

PK-AV-Ratio-Band25-QPSK-20M BW-High



PK-AV-Ratio-Band25-64QAM-20M BW-High

10.3 Occupied Bandwidth

Requirement(s):

Spec	Requirement			Applicable
47 CFR §2.1049	The occupied 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 shall be measured under the following conditions of § 2.1049 (a) through (i)			☒
Test Setup				
Procedure	99% Occupied bandwidth measurement procedure - Allow the trace to stabilize. - Use the spectrum analyzer built-in measurement function to determine the 26-dB bandwidth 99% OBW. o Set RBW = 1% -5% of Emission Bandwidth o Set VBW = approximately 3 x RBW o Detector = Peak o Trace mode = max hold o Sweep = auto couple - Capture the plot. Repeat above steps for different test channel and other modulation type.			
Test Date	04/16/2018 – 04/27/2018	Environmental condition	Temperature Relative Humidity Atmospheric Pressure	23°C 48% 1008mbar
Remark	NONE			
Result	☒ Pass ☐ Fail			

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test was done by *Rachana Khanduri* at *RF test site*.

Test Data

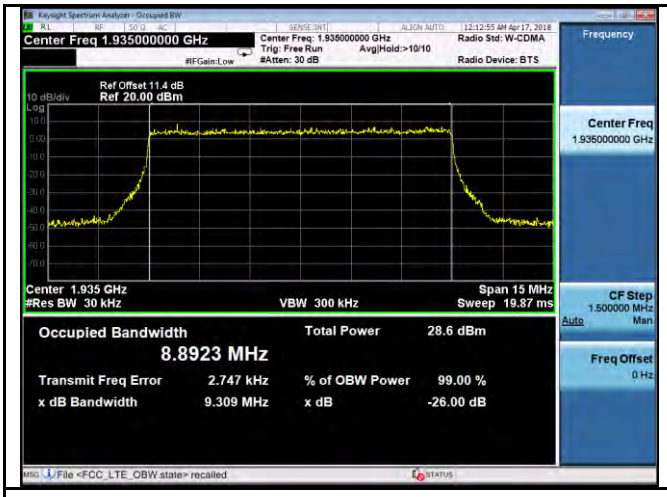
99% Bandwidth measurement result for LTE band 2:

Type	Channel	Channel Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Occupied Bandwidth (MHz)
5MHz BW, QPSK	Low	1932.5	4.42	4.67
	Mid	1960.0	4.43	4.68
	High	1987.5	4.42	4.69
5MHz BW, 64QAM	Low	1932.5	4.42	4.68
	Mid	1960.0	4.43	4.67
	High	1987.5	4.43	4.66
10MHz BW, QPSK	Low	1935.0	8.89	9.31
	Mid	1960.0	8.90	9.35
	High	1985.0	8.90	9.28
10MHz BW, 64QAM	Low	1935.0	8.91	9.37
	Mid	1960.0	8.92	9.38
	High	1985.0	8.91	9.34
15MHz BW, QPSK	Low	1937.5	13.29	13.78
	Mid	1960.0	13.29	13.83
	High	1982.5	13.29	13.76
15MHz BW, 64QAM	Low	1937.5	13.29	13.79
	Mid	1960.0	13.31	13.83
	High	1982.5	13.27	13.83
20MHz BW, QPSK	Low	1940.0	17.81	18.42
	Mid	1960.0	17.83	18.47
	High	1980.0	17.82	18.42
20MHz BW, 64QAM	Low	1940.0	17.81	18.38
	Mid	1960.0	17.79	18.39
	High	1980.0	17.82	18.45

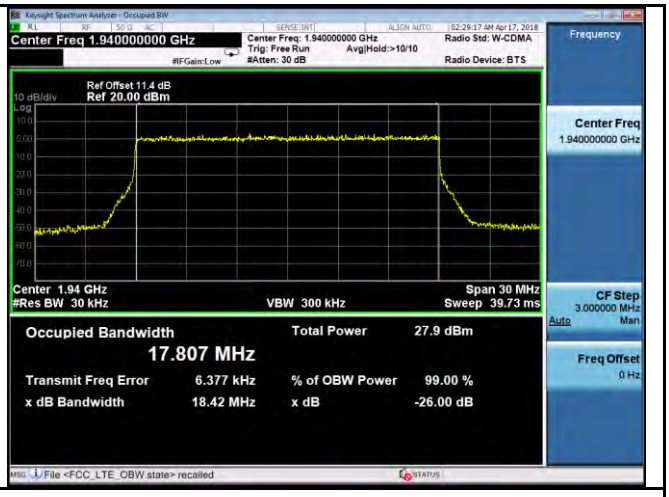
99% Bandwidth measurement result for LTE band 25:

Type	Channel	Channel Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Occupied Bandwidth (MHz)
5MHz BW, QPSK	High	1992.5	4.43	4.66
5MHz BW, 64QAM	High	1992.5	4.43	4.66
10MHz BW, QPSK	High	1990	8.89	9.43
10MHz BW, 64QAM	High	1990	8.92	9.39
15MHz BW, QPSK	High	1987.5	13.28	13.83
15MHz BW, 64QAM	High	1987.5	13.30	13.77
20MHz BW, QPSK	High	1985	17.80	18.43
20MHz BW, 64QAM	High	1985	17.80	18.38

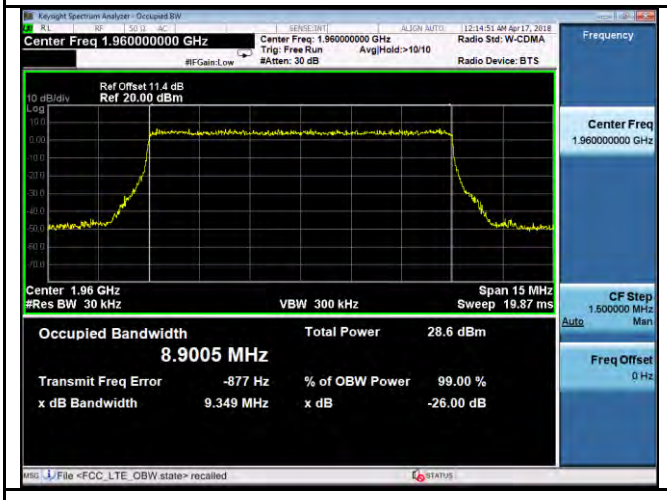
Test Plots for LTE Band2 QPSK



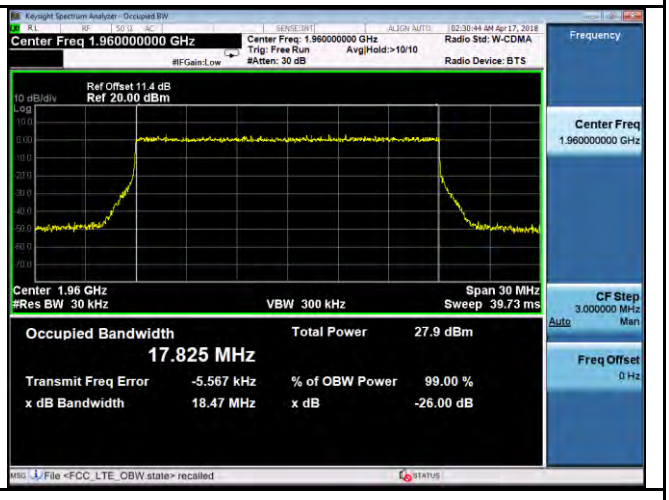
OBW- Band2-10M BW-Low



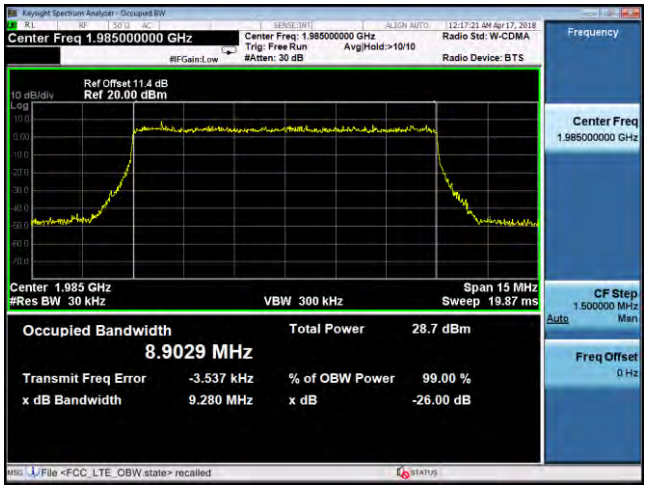
OBW- Band2-20M BW-Low



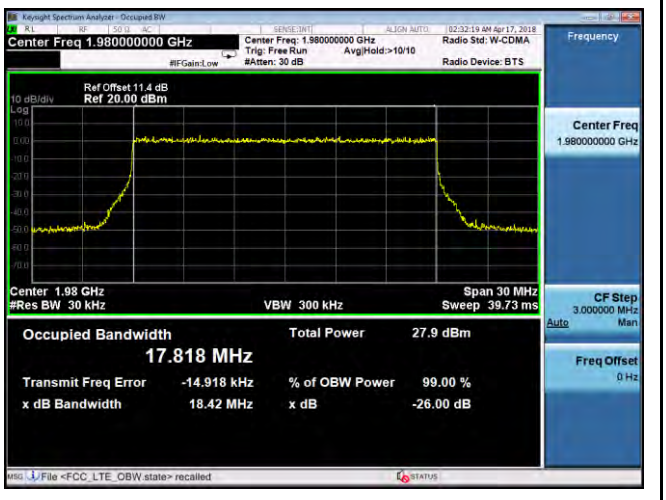
OBW- Band2-10M BW-Mid



OBW- Band2-20M BW-Mid

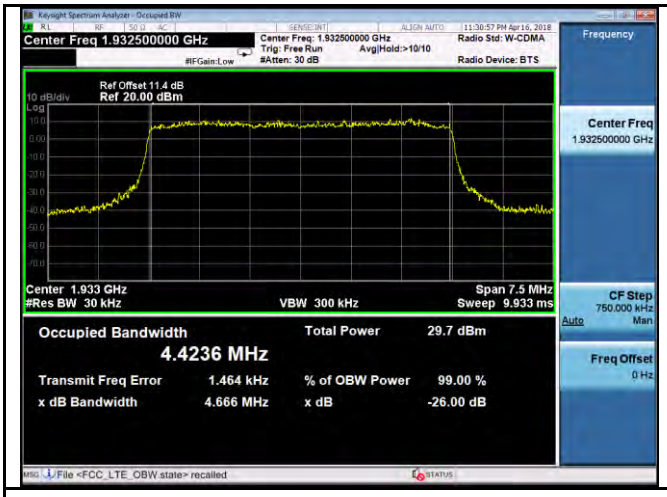


OBW- Band2-10M BW-High

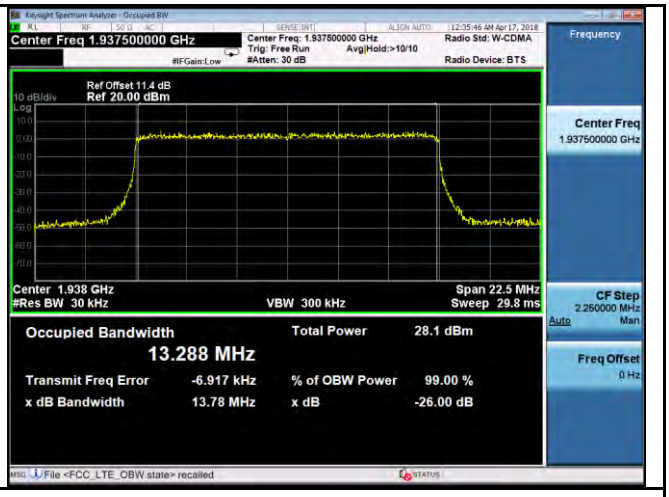


OBW- Band2-20M BW-High

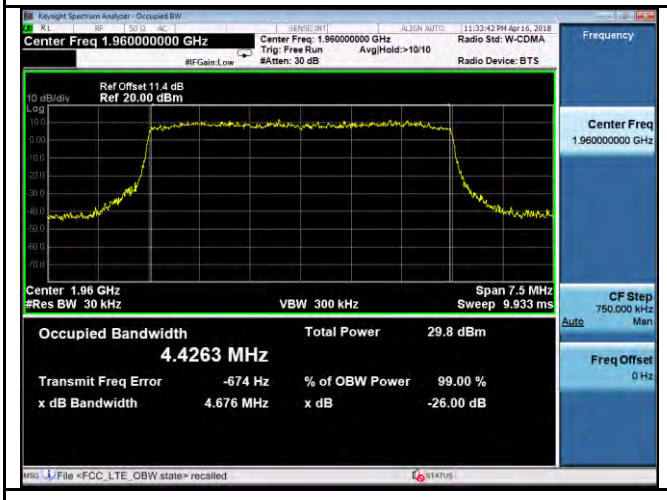
Test Plots for LTE Band2 QPSK



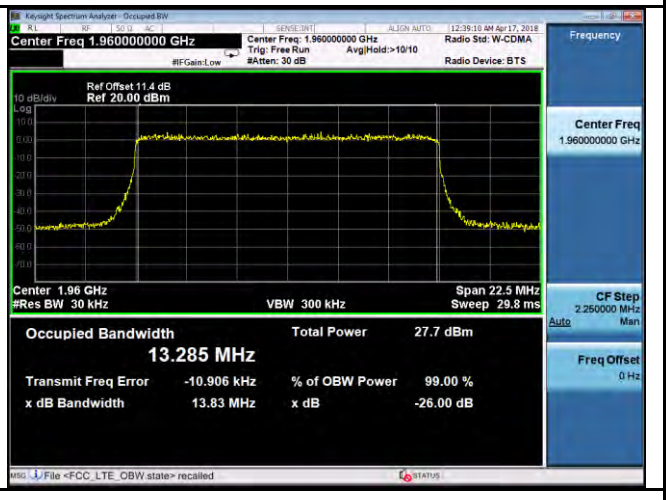
OBW- Band2-5M BW-Low



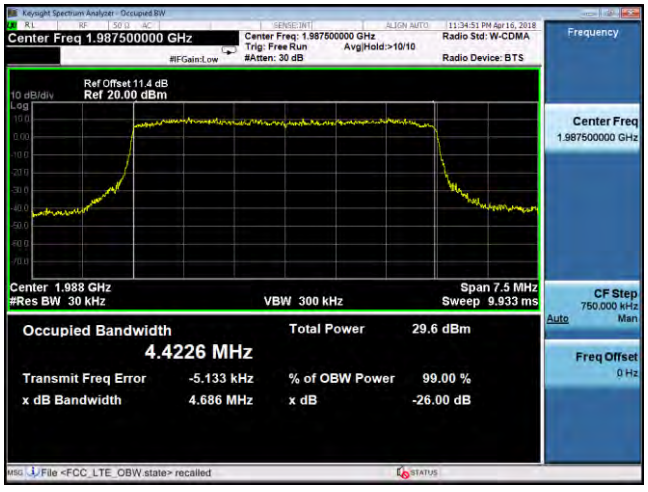
OBW- Band2-15M BW-Low



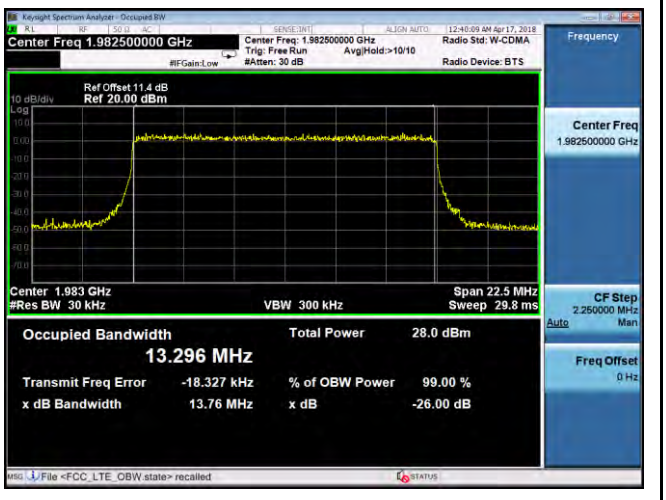
OBW- Band2-5M BW-Mid



OBW- Band2-15M BW-Mid

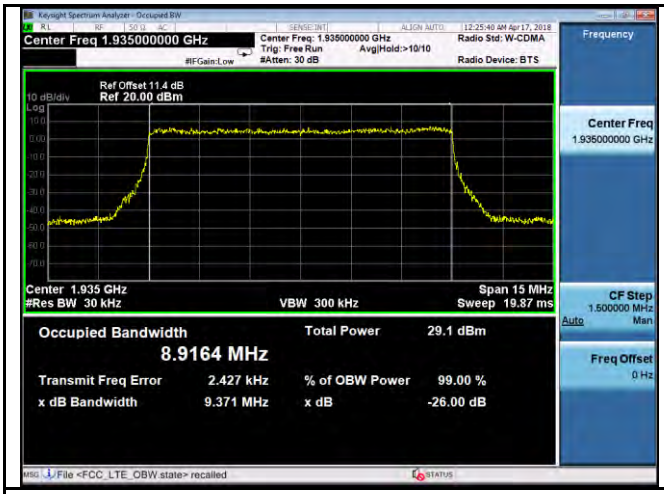


OBW- Band2-5M BW-High

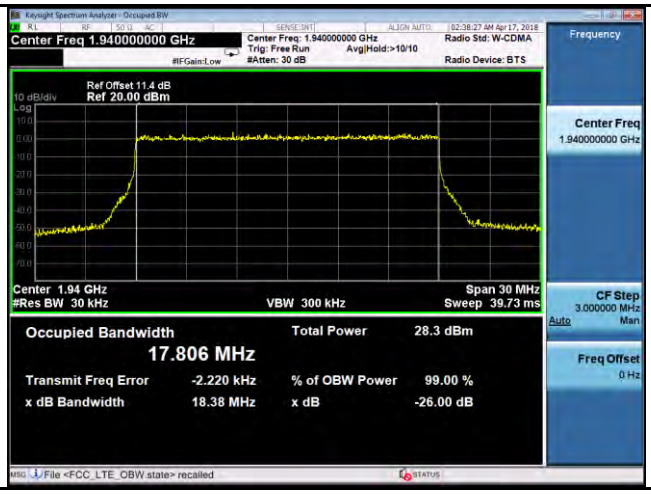


OBW- Band2-15M BW-High

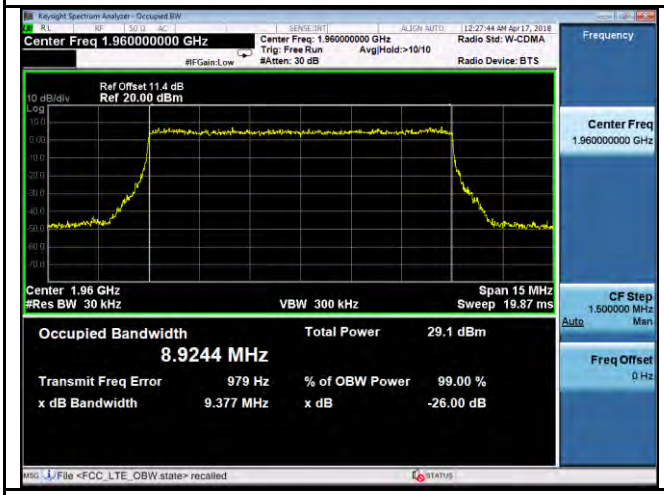
Test Plots for LTE Band2 64QAM



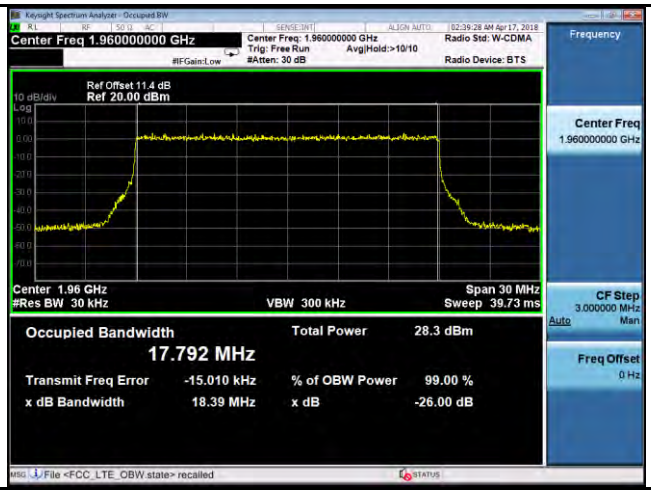
OBW- Band2 -10M BW-Low



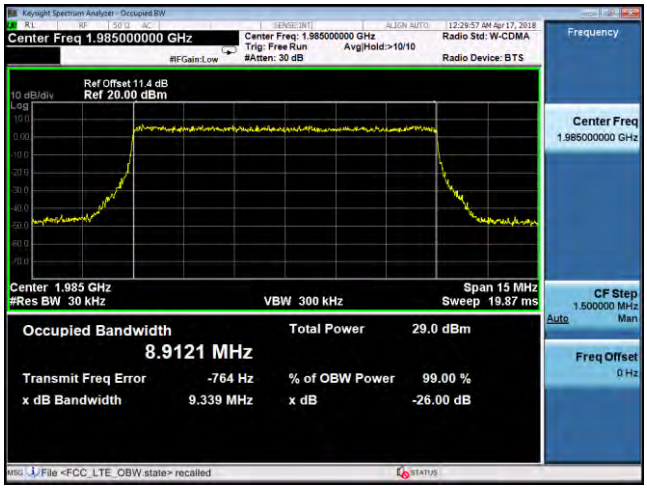
OBW- Band2 -20M BW-Low



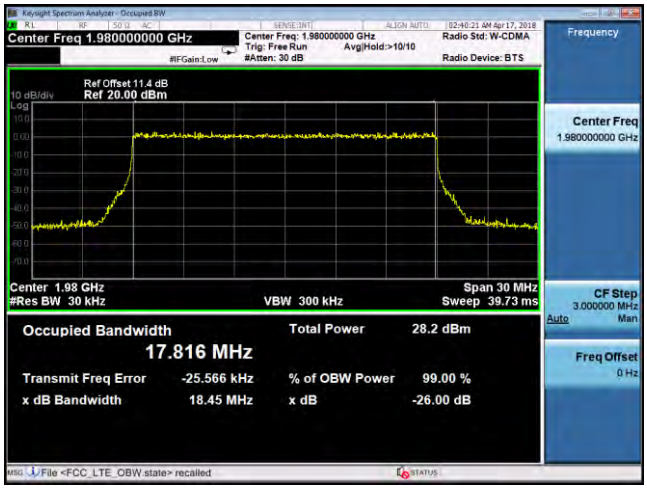
OBW- Band2 -10M BW-Mid



OBW- Band2-20M BW-Mid

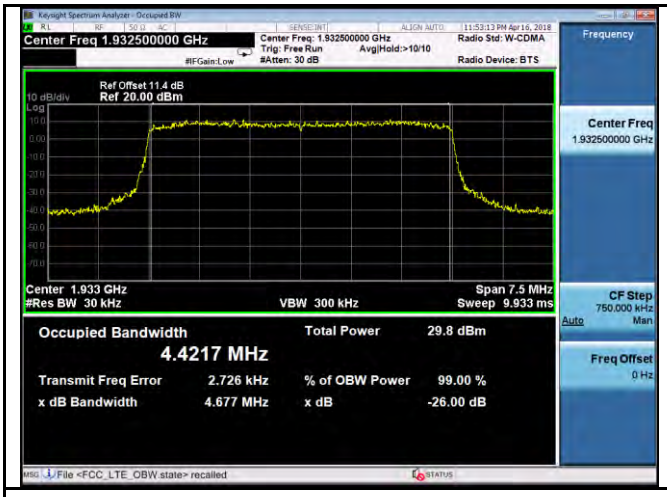


OBW- Band2 -10M BW-High

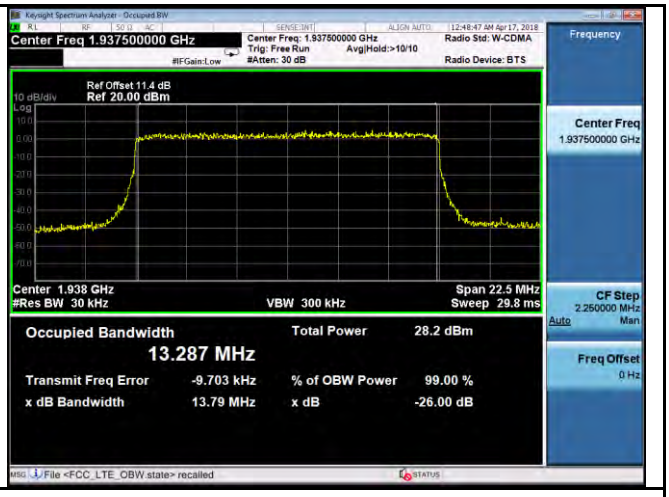


OBW- Band2-20M BW-High

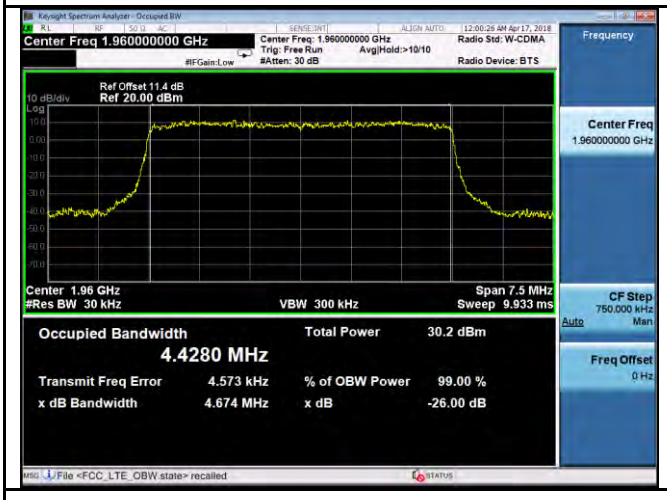
Test Plots for LTE Band2 64QAM



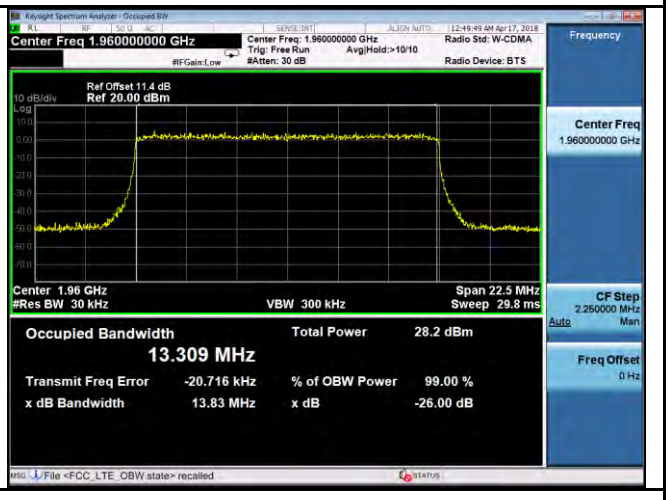
OBW- Band2-5M BW-Low



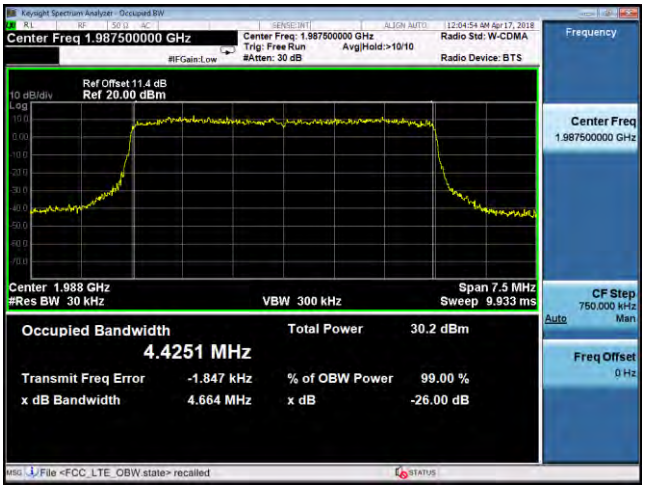
OBW- Band2-15M BW-Low



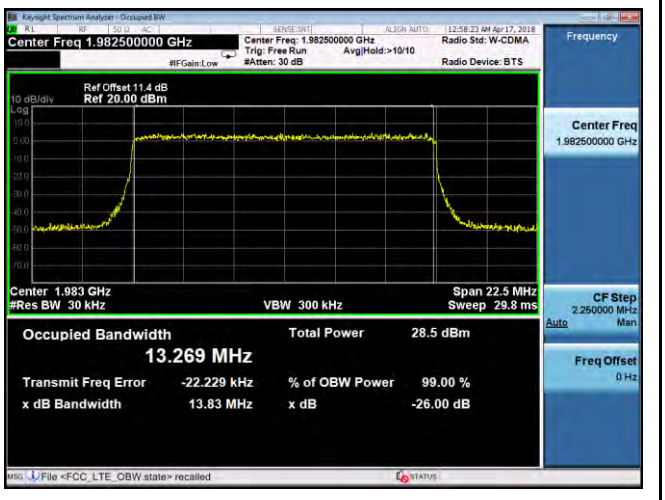
OBW- Band2-5M BW-Mid



OBW- Band2-15M BW-Mid

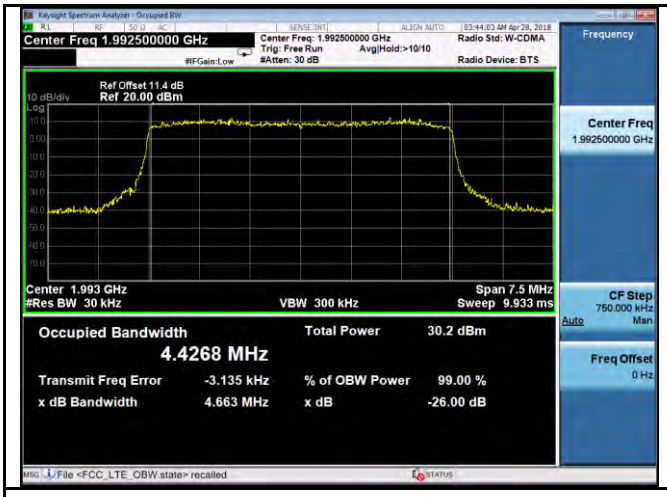


OBW- Band2-5M BW-High

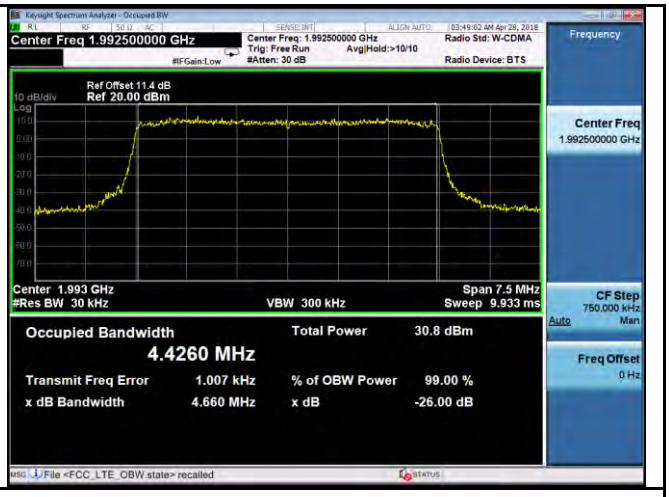


OBW-Band2-15M BW-High

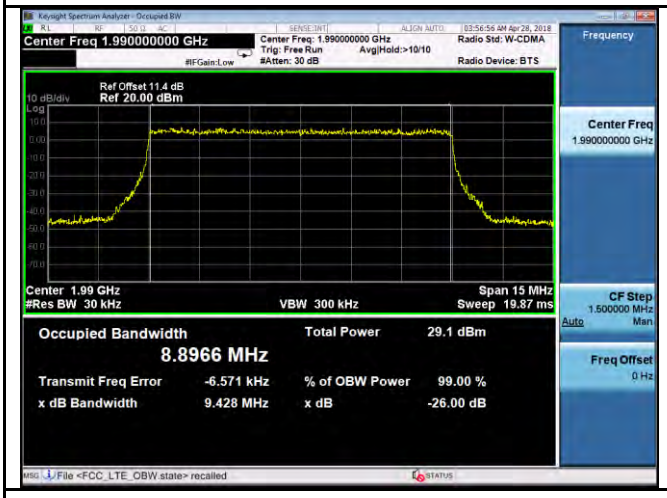
Test Plots for LTE band 25:



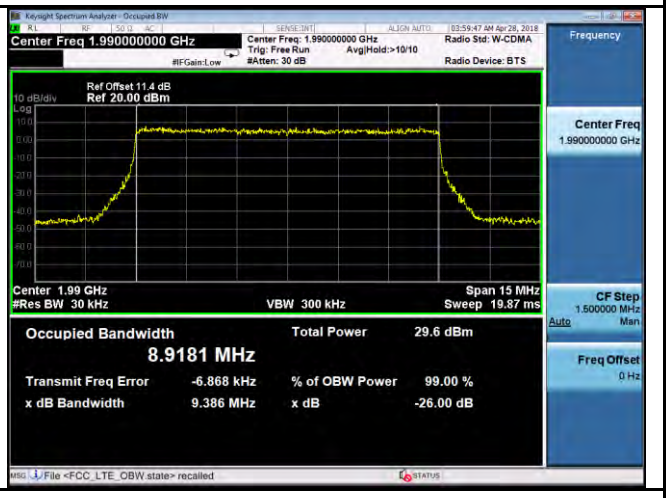
OBW- Band25-QPSK-5M BW-High



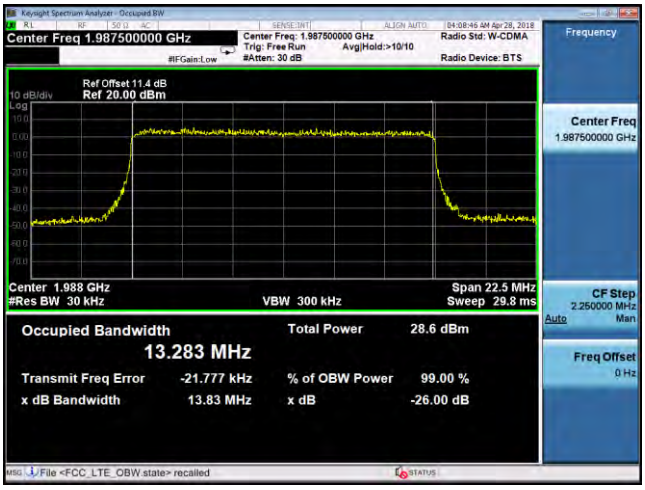
OBW- Band25-64QAM-5M BW-High



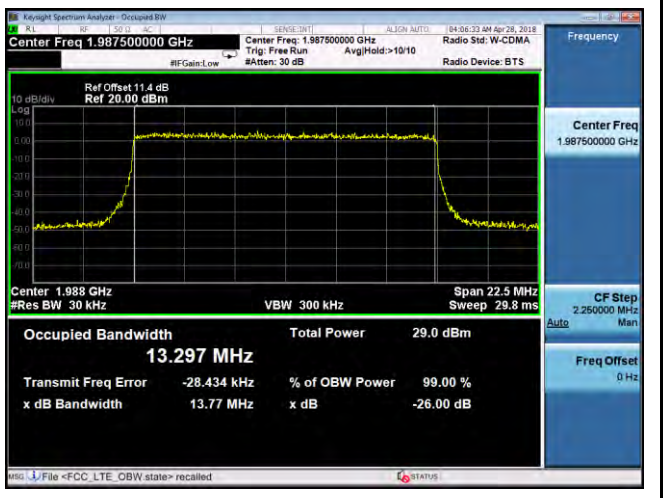
OBW- Band25-QPSK-10M BW-High



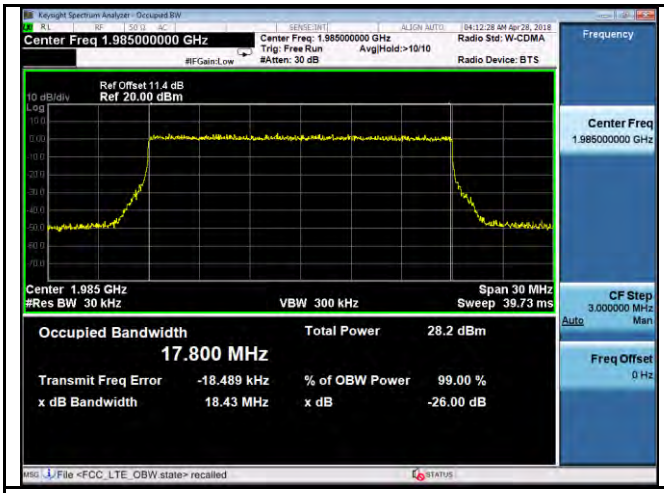
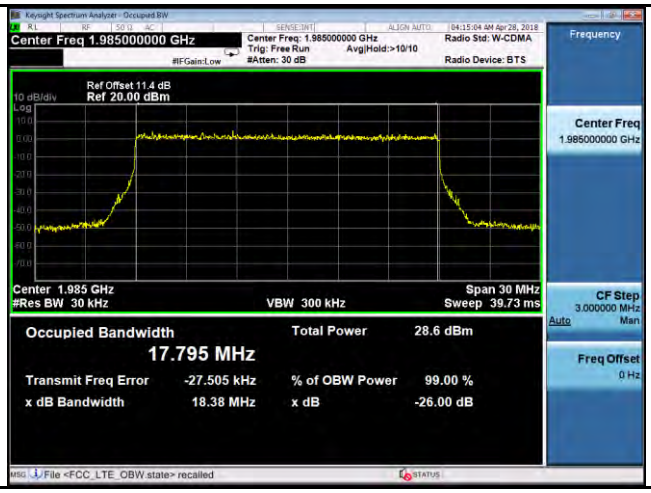
OBW- Band25-64QAM-10M BW-High



OBW- Band25-QPSK-15M BW-High



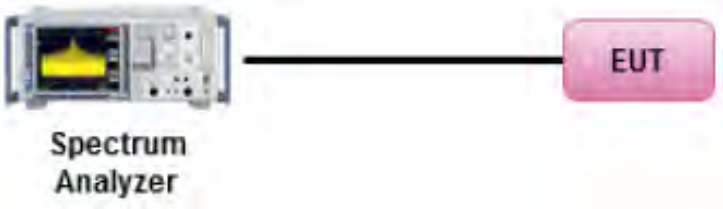
OBW- Band25-64QAM-15M BW-High

	
OBW- Band25-QPSK-20M BW-High	OBW- Band25-64QAM-20M BW-High

10.4 Band Edge

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR27.53	-	Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.	☒

Test Setup				
Test Procedure	1. EUT was set for low , mid, high channel with modulated mode and highest RF output power. 2. The spectrum analyzer was connected to the antenna terminal. 3. A RBW of 1% greater than the 26 dB emission bandwidth should be used for band edge measurement or if narrower RBW is used, a correct factor calculated with formula 10*log (EBW/BW_{meas}) will be added to the result.			
Test Date	04/16/2018 – 04/27/2018	Environmental condition	Temperature Relative Humidity Atmospheric Pressure	22°C 48% 1008mbar
Remark	The EUT was scanned up to 25GHz. Both horizontal and vertical polarities were investigated. The results show only the worst case. Limit calculation: Emission limit = PdBm – [43+ 10 log (PW)] = 10log(1000 x PW) - 43 - 10log(PW) = 30 dBm - 43 = -13 dBm			
Result	☒ Pass ☐ Fail			

Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test was done by *Rachana Khanduri* at *RF test site*.

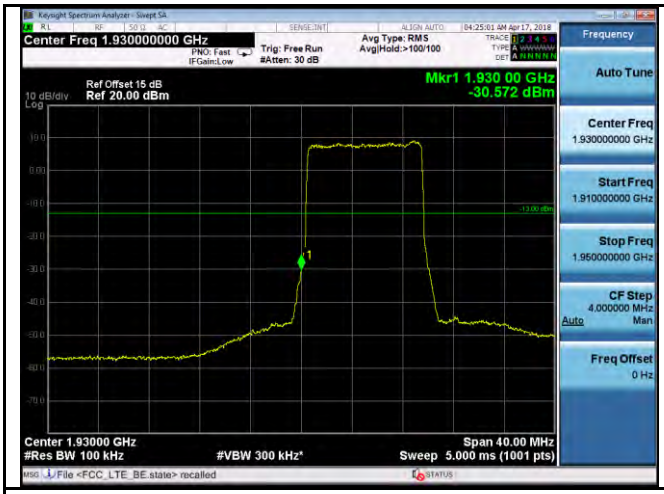
Band Edge Measurement Data for LTE band 2

Type	Channel	Channel Frequency (MHz)	Measurement Band Edge (dBm)	Limit (dBm)
5MHz BW, QPSK	Low	1932.5	-31.12	-13
	High	1987.5	-47.04	-13
5MHz BW, 64QAM	Low	1932.5	-30.57	-13
	High	1987.5	-47.47	-13
10MHz BW, QPSK	Low	1935	-30.57	-13
	High	1985	-47.44	-13
10MHz BW, 64QAM	Low	1935	-30.22	-13
	High	1985	-49.57	-13
15MHz BW, QPSK	Low	1937.5	-39.34	-13
	High	1982.5	-48.51	-13
15MHz BW, 64QAM	Low	1937.5	-41.77	-13
	High	1982.5	-49.36	-13
20MHz BW, QPSK	Low	1940	-33.53	-13
	High	1980	-49.91	-13
20MHz BW, 64QAM	Low	1940	-33.37	-13
	High	1980	-49.96	-13

Band Edge Measurement Data for LTE band 25

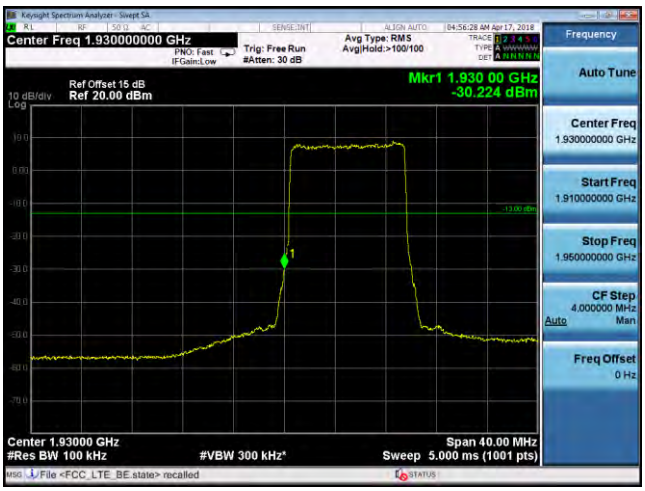
Type	Channel	Frequency (MHz)	Measurement Band Edge (dBm)	Limit (dBm)
5MHz BW, QPSK	High	1992.5	-28.10	-13
5MHz BW, 64QAM	High	1992.5	-30.13	-13
10MHz BW, QPSK	High	1990	-29.39	-13
10MHz BW, 64QAM	High	1990	-30.66	-13
15MHz BW, QPSK	High	1987.5	-37.60	-13
15MHz BW, 64QAM	High	1987.5	-39.60	-13
20MHz BW, QPSK	High	1985	-31.62	-13
20MHz BW, 64QAM	High	1985	-32.95	-13

Test Plots for LTE Band 2:

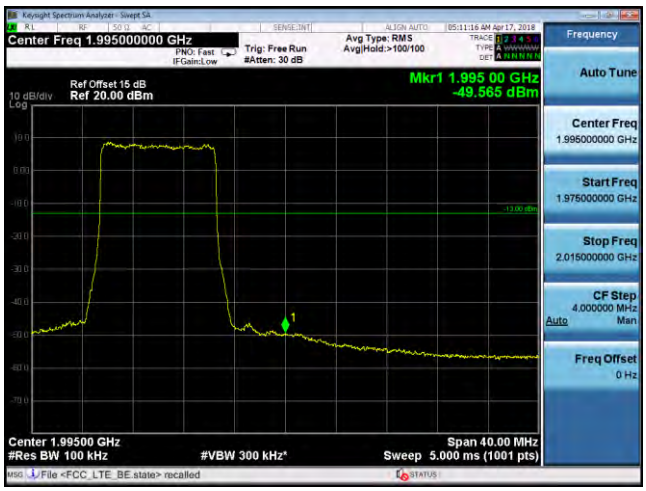


BandEdge-LTE-Band2-10MHz-QPSK-Low

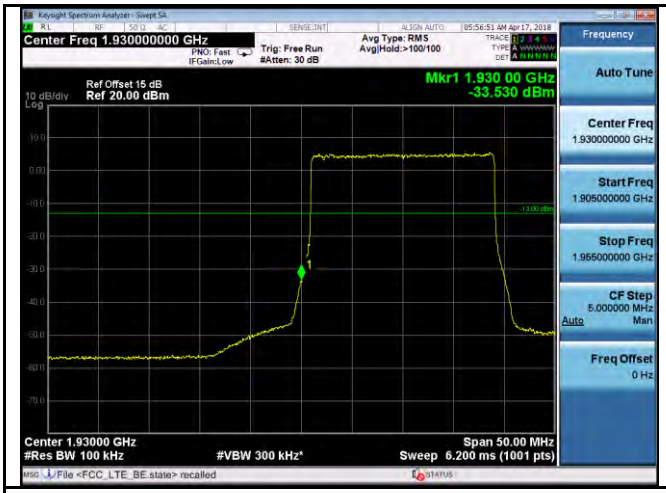
BandEdge-LTE-Band2-10MHz-QPSK-High



BandEdge-LTE- Band2-10MHz-64QAM-Low

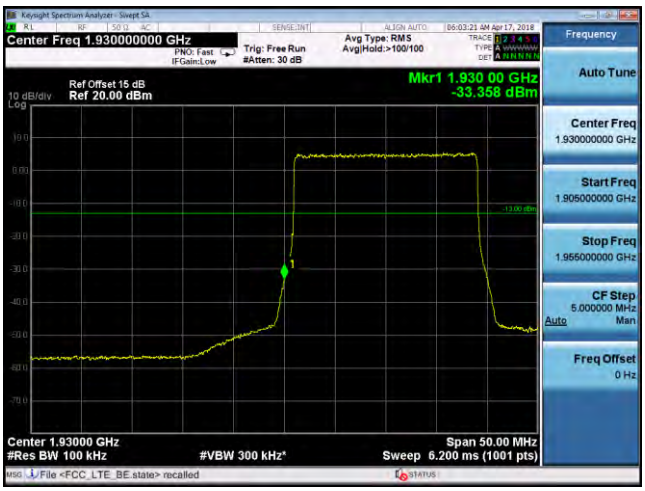


BandEdge-LTE- Band2-10MHz-64QAM-High



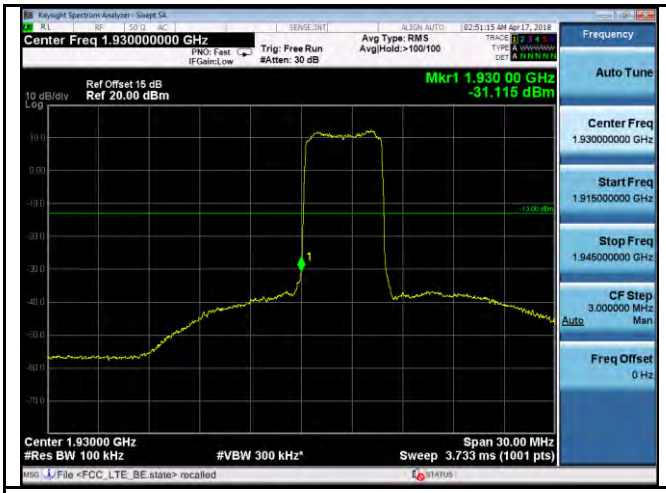
BandEdge-LTE- Band2-20MHz-QPSK-Low

BandEdge-LTE- Band2-20MHz-QPSK-High



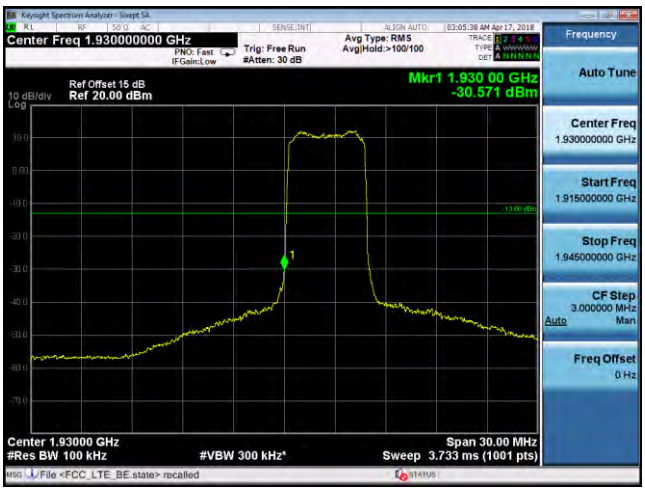
BandEdge-LTE- Band2-20MHz-64QAM-Low

BandEdge-LTE- Band2-20MHz-64QAM-High

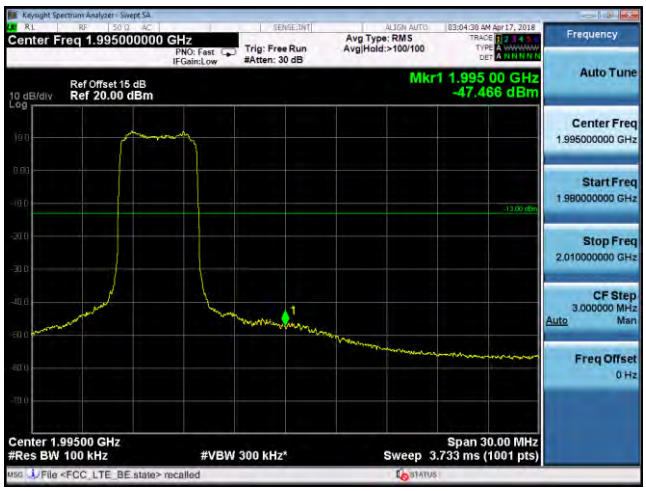


BandEdge-LTE- Band2-5MHz-QPSK-Low

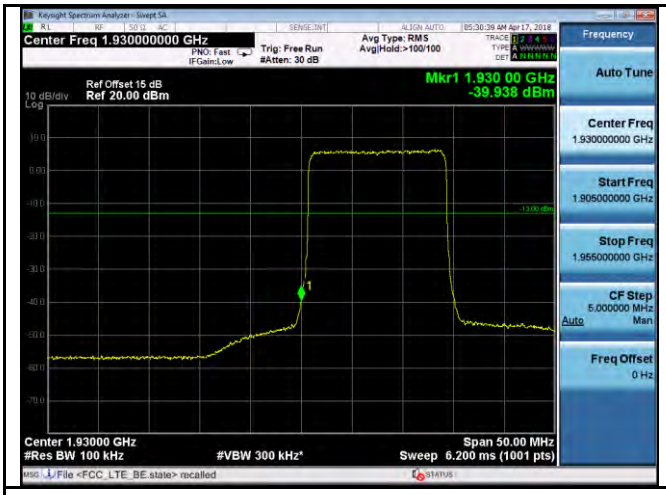
BandEdge-LTE- Band2-5MHz -QPSK-High



BandEdge-LTE- Band2-5MHz -64QAM-Low

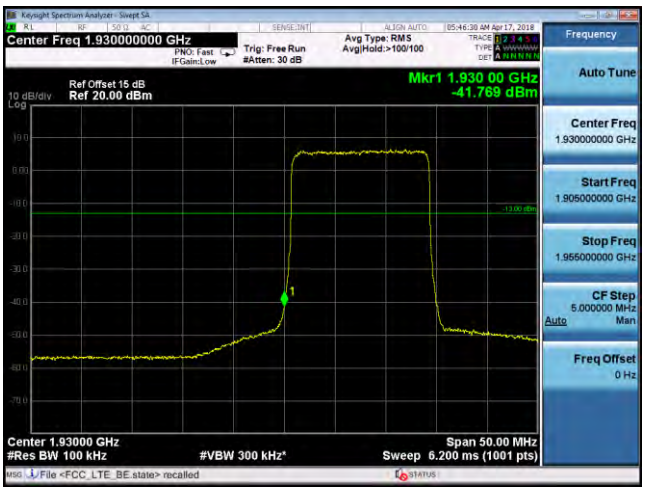


BandEdge-LTE- Band2-5MHz -64QAM-High



BandEdge-LTE- Band2-15MHz-QPSK-Low

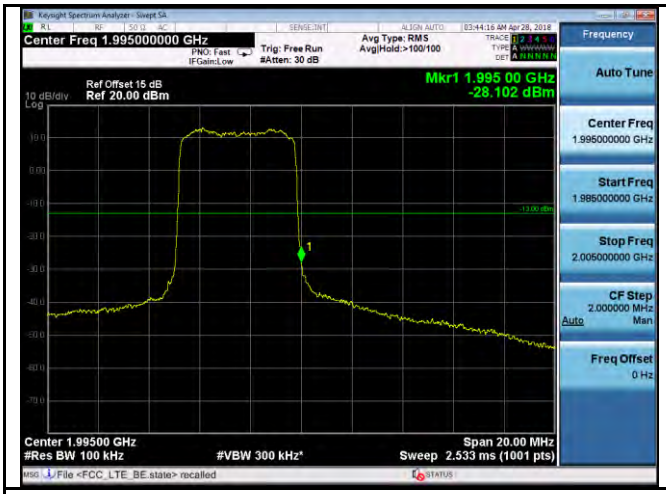
BandEdge-LTE- Band2-15MHz -QPSK-High



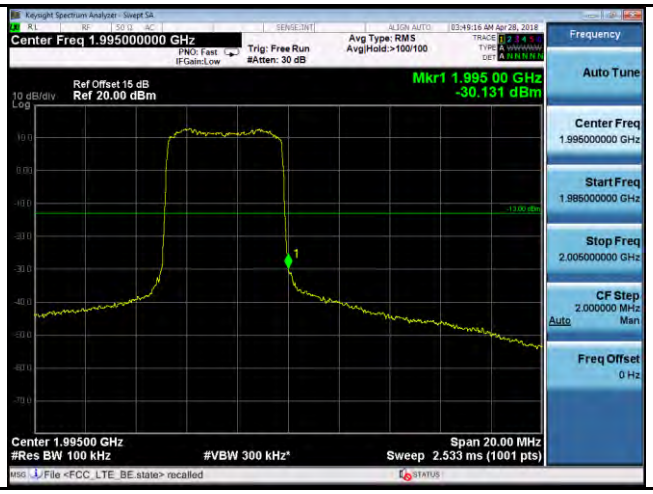
BandEdge-LTE- Band2-15MHz -64QAM-Low

BandEdge-LTE- Band2-15MHz -64QAM-High

Test Plots for LTE band 25:



BandEdge-LTE- Band25-5MHz-QPSK-High



BandEdge-LTE- Band25-5MHz-64QAM-High

BandEdge-LTE- Band25-10MHz-QPSK-High

BandEdge-LTE- Band25-10MHz-64QAM-High

BandEdge-LTE- Band25-15MHz-QPSK-High

BandEdge-LTE- Band25-15MHz-64QAM-High

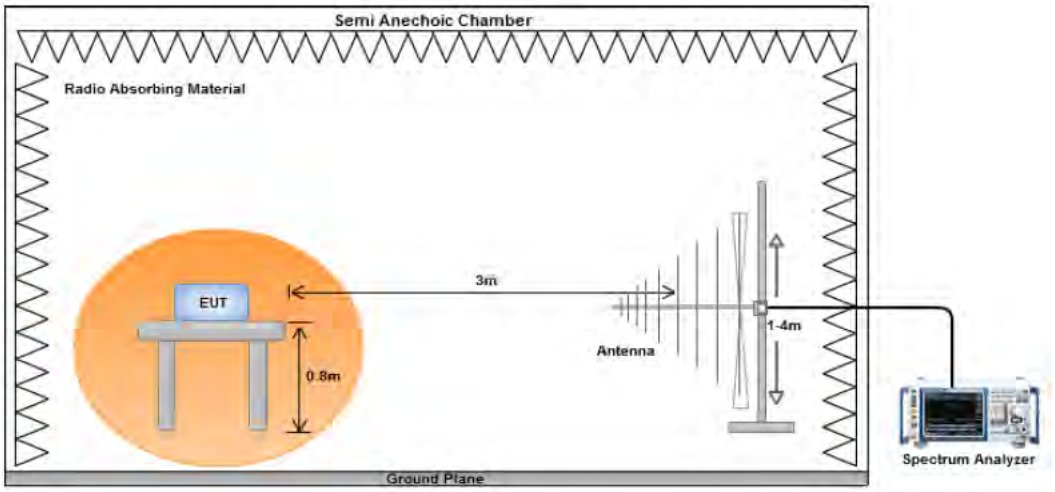
	
BandEdge-LTE- Band25-20MHz-QPSK-High	BandEdge-LTE- Band25-20MHz-64QAM-High

10.5 Radiated Spurious Emission below 1GHz

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR27.53	-	Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.	☒

Test Setup



Test Procedure

Substitution method:

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:
   a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen.
   b. The EUT was then rotated to the direction that gave the maximum emission.
   c. Finally, the antenna height was adjusted to the height that gave the maximum emission.
3. Remove the transmitter and replace it with a substitution antenna (the antenna should be half-wavelength for each frequency involved). The center of the substitution antenna should be approximately at the same location as the center of the transmitter.
4. Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a nonradiating cable. With the antennas at both ends horizontally polarized, and with the signal generator tuned to a particular spurious frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained.
5. Steps 4 were repeated for the next frequency point, until all selected frequency points were measured.

Test Date	04/20/2018	Environmental condition	Temperature	23°C
			Relative Humidity	48%
			Atmospheric Pressure	1008mbar

Remark

The EUT was scanned up to 25GHz. Both horizontal and vertical polarities were investigated. The results show only the worst case.
Limit calculation:
Emission limit = PdBm – [43+ 10 log (PW)] = 10log(1000 x PW) - 43 - 10log(PW) = 30 dBm - 43 = -13 dBm
All different modulation and bandwidth configuration has been verified and only the test data of worst case with QPSK modulation and greatest bandwidth was presented in this report.

Result ☒ Pass ☐ Fail

Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test was done by *Rachana Khanduri* at *10m chamber*.

Radiated Emission Test Results for LTE band 2

Frequency MHz	SG Level dBm	Cable Loss dB	Antenna Gain dBd	Substituted Level dBm	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBm	Margin dB	Pass /Fail
243.62	-47.69	0.17	0	-47.86	RMS Max	H	110	122	-13	-34.86	Pass
389.98	-53.22	0.18	0	-52.40	RMS Max	V	208	120	-13	-39.40	Pass
449.21	-52.22	0.20	0	-51.42	RMS Max	H	135	57	-13	-38.42	Pass
414.27	-51.59	0.20	0	-50.79	RMS Max	V	150	92	-13	-37.79	Pass
533.47	-53.81	0.21	0	-52.02	RMS Max	V	178	100	-13	-39.02	Pass
766.11	-48.23	0.28	0	-45.51	RMS Max	V	155	241	-13	-32.51	Pass

Radiated Emission Test Results for LTE band 25

Frequency MHz	SG Level dBm	Cable Loss dB	Antenna Gain dBd	Substituted Level dBm	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBm	Margin dB	Pass /Fail
243.62	-47.69	0.17	0	-47.69	RMS Max	H	110	122	-13	-34.86	Pass
389.98	-53.17	0.18	0	-52.17	RMS Max	V	208	120	-13	-39.35	Pass
449.21	-52.43	0.20	0	-51.43	RMS Max	H	135	57	-13	-38.63	Pass
414.27	-51.76	0.20	0	-50.76	RMS Max	V	150	92	-13	-37.96	Pass
533.47	-53.81	0.21	0	-51.81	RMS Max	V	178	100	-13	-39.02	Pass
766.11	-48.29	0.28	0	-45.29	RMS Max	V	155	241	-13	-32.57	Pass

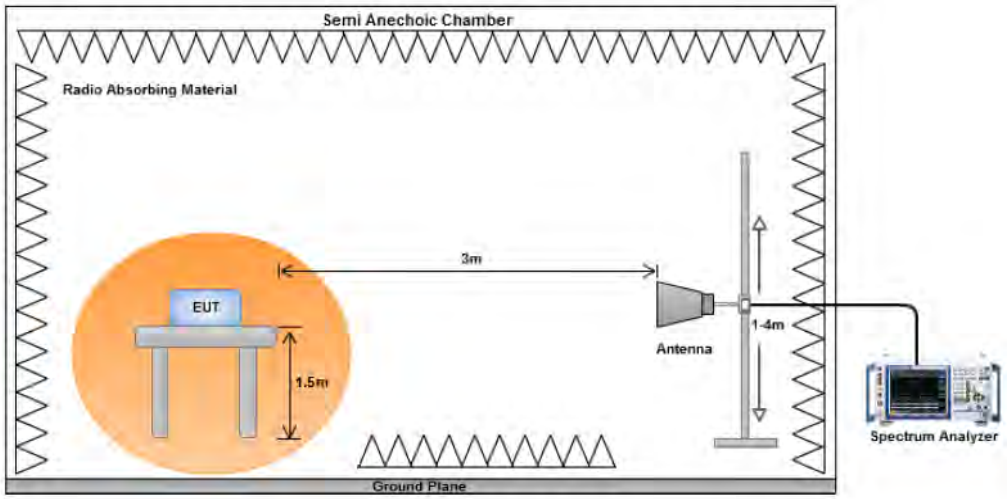
Note: Dipole antenna was used for substitution method.

10.6 Radiated Spurious Emissions above 1GHz

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR27.53	-	Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.	☒

Test Setup



Test Procedure

Substitution method:

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:
   a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen.
   b. The EUT was then rotated to the direction that gave the maximum emission.
   c. Finally, the antenna height was adjusted to the height that gave the maximum emission.
3. Remove the transmitter and replace it with a substitution antenna (the antenna should be half-wavelength for each frequency involved). The center of the substitution antenna should be approximately at the same location as the center of the transmitter.
4. Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a nonradiating cable. With the antennas at both ends horizontally polarized, and with the signal generator tuned to a particular spurious frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained.
5. Steps 4 were repeated for the next frequency point, until all selected frequency points were measured.

Test Date	04/20/2018	Environmental condition	Temperature	23°C
			Relative Humidity	48%
			Atmospheric Pressure	1008mbar

Remark

The EUT was scanned up to 25GHz. Both horizontal and vertical polarities were investigated. The results show only the worst case.
Limit calculation:
Emission limit = PdBm – [43+ 10 log (PW)] = 10log(1000 x PW) - 43 - 10log(PW) = 30 dBm - 43 = -13 dBm

All different modulation and bandwidth configuration has been verified and only the test data of worst case with QPSK modulation and greatest bandwidth was presented in this report.

Result ☒ Pass ☐ Fail

Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☐ Yes (See below) ☒ N/A

Test was done by Rachana Khanduri at 10*m chamber*.

Radiated Emission Test Results (Above 1GHz)

LTE band 2 Low Channel, 20MHz BW, QPSK

Frequency MHz	SG Level dBm	Cable Loss dB	Antenna Gain dBd	Substituted Level dBm	Measurement Type	Pol (V/H)	Hgt cm	Azt Deg	Limit dBm	Margin dB	Pass /Fail
3880.37	-49.11	1.34	10.77	-49.68	Average Max	V	111	128	-13	-36.68	Pass
5819.89	-50.34	2.12	12.35	-50.11	Average Max	V	150	200	-13	-37.11	Pass
7758.99	-54.08	3.28	11.23	-56.13	Average Max	H	208	255	-13	-43.13	Pass

LTE band 2 Mid Channel, 20MHz BW, QPSK

Frequency MHz	SG Level dBm	Cable Loss dB	Antenna Gain dBd	Substituted Level dBm	Measurement Type	Pol (V/H)	Hgt cm	Azt Deg	Limit dBm	Margin dB	Pass /Fail
3920.07	-50.13	1.35	10.78	-50.70	Average Max	V	145	10	-13	-37.70	Pass
5881.11	-51.25	2.12	11.83	-51.54	Average Max	V	168	112	-13	-38.54	Pass
7838.86	-49.17	3.42	10.92	-51.67	Average Max	V	130	230	-13	-38.67	Pass

LTE band 2 High Channel, 20MHz BW, QPSK

Frequency MHz	SG Level dBm	Cable Loss dB	Antenna Gain dBd	Substituted Level dBm	Measurement Type	Pol (V/H)	Hgt cm	Azt Deg	Limit dBm	Margin dB	Pass /Fail
3961.35	-51.93	1.35	10.04	-53.24	Average Max	V	148	213	-13	-40.24	Pass
5928.79	-47.22	2.14	11.81	-47.55	Average Max	V	172	174	-13	-34.55	Pass
7920.43	-46.37	3.43	11.04	-48.76	Average Max	V	159	200	-13	-35.76	Pass

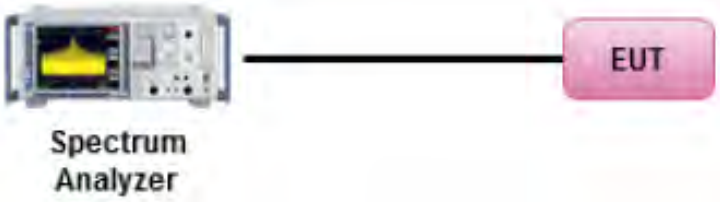
LTE band 25 High Channel, 20MHz BW, QPSK

Frequency MHz	SG Level dBm	Cable Loss dB	Antenna Gain dBd	Substituted Level dBm	Measurement Type	Pol (V/H)	Hgt cm	Azt Deg	Limit dBm	Margin dB	Pass /Fail
3970.05	-51.92	1.35	10.78	-61.92	Average Max	V	150	28	-13	-39.49	Pass
5955.11	-50.77	2.15	11.81	-60.77	Average Max	V	178	180	-13	-38.11	Pass
7940.36	-46.56	3.44	11.04	-56.56	Average Max	V	166	205	-13	-35.96	Pass

10.7 Frequency Stability

Requirement(s):

Spec	Item	Requirement	Applicable
47 CFR 2.1055, 47 CFR	-	The frequency stability of the transmitter shall be maintained within ±0.0001 percent (±1 ppm) of the center frequency over a temperature variation of −30 °Celsius to +50 °Celsius at normal supply voltage, and over a variation in the primary supply voltage of 85 percent to 115 percent of the rated supply voltage at a temperature of 20 °Celsius.	☒
47 CFR 2.1055, 47 CFR 27.54	-	The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.	☒

Test Setup				
Test Procedure	The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference). 1. The equipment is turned on in a "standby" condition for one minute before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter. 2. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one-half hour is provided to allow stabilization of the equipment at each temperature level.			
Test Date	04/17/2018	Environmental condition	Temperature Relative Humidity Atmospheric Pressure	23°C 48% 1008mbar
Remark	NONE			
Result	☒ Pass ☐ Fail			

Test Data ☒ Yes ☐ N/A

Test Plot ☐ Yes (See below) ☒ N/A

Test was done by *Rachana Khanduri* at *RF test site*.

Test Data for LTE Band 2 and Band 25:

Voltage (%)	Power (VDC)	Temp. (°)	Frequency (KHz)	Frequency Error (Hz)	Deviation (ppm)
100%	56	20 (ref)	1960000.014	0	0.000
100%		0	1960000.020	6	0.003
100%		10	1960000.021	7	0.004
100%		30	1960000.021	7	0.004
100%		40	1960000.022	8	0.004
115%	64.4	20	1960000.022	8	0.004
85%	47.6	20	1960000.024	10	0.005

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Cycle	Cal Due	In use
Radiated Emissions						
Keysight EXA 44GHz Spectrum Analyzer	N9030B(PXA)	MY57140374	09/06/2017	1 Year	09/06/2018	☑
Keysight Signal Generator	MXG N5182A	MY47071065	07/12/2017	1 Year	07/12/2018	☑
Pre-Amplifier (1-26.5GHz)	8449B	3008A00715	08/16/2017	1 Year	08/16/2018	☑
RF Preamplifier (100KHz-7GHz)	LPA-6-30	11170602	05/09/2017	1 Year	05/09/2018	☑
Bi-Log antenna (30MHz~2GHz)	JB1	A030702	03/09/2018	2 Year	03/09/2020	☑
Horn Antenna (1GHz~26GHz)	3115	100059	11/09/2017	1 Year	11/09/2018	☑
Horn Antenna (700MHz-18GHz)	SAS-571	411	05/13/2017	1 Year	05/13/2018	☑
Tuned Dipole Antenna 30 - 1000 MHz (4pcs set)	AD-100	40133	10/02/2017	1 Year	10/02/2018	☑
RF Conducted Measurement						
Keysight EXA 44GHz Spectrum Analyzer	N9030B(PXA)	MY57140374	09/06/2017	1 Year	09/06/2018	☑

Annex B. SIEMIC Accreditation

Accreditations	Document	Scope / Remark
ISO 17025 (A2LA)		Please see the documents for the detailed scope
ISO Guide 65 (A2LA)		Please see the documents for the detailed scope
TCB Designation		A1, A2, A3, A4, B1, B2, B3, B4, C
FCC DoC Accreditation		FCC Declaration of Conformity Accreditation
FCC Site Registration		3 meter site
FCC Site Registration		10 meter site
IC Site Registration		3 meter site
IC Site Registration		10 meter site
EU NB		Radio & Telecommunications Terminal Equipment: EN45001 – EN ISO/IEC 17025
		Electromagnetic Compatibility: EN45001 – EN ISO/IEC 17025
Singapore iDA CB(Certification Body)		Phase I, Phase II
Vietnam MIC CAB Accreditation		Please see the document for the detailed scope
HongKong OFCA		(Phase II) OFCA Foreign Certification Body for Radio and Telecom
		(Phase I) Conformity Assessment Body for Radio and Telecom
Industry Canada CAB		Radio: Scope A – All Radio Standard Specification in Category I
		Telecom: CS-03 Part I, II, V, VI, VII, VIII

Japan Recognized Certification Body Designation		Radio : A1. Terminal equipment for purpose of calling Telecom : B1. Specified radio equipment specified in Article 38-2, Paragraph 1, Item 1 of the Radio Law
Korea CAB Accreditation		EMI: KCC Notice 2008-39, RRL Notice 2008-3: CA Procedures for EMI KN22: Test Method for EMIEMS: KCC Notice 2008-38, RRL Notice 2008-4: CA Procedures for EMS KN24, KN61000-4-2, -4-3, -4-4, -4-5, -4-6, -4-8, -4-11: Test Method for EMS
		Radio: RRL Notice 2008-26, RRL Notice 2008-2, RRL Notice 2008-10, RRL Notice 2007-49, RRL Notice 2007-20, RRL Notice 2007-21, RRL Notice 2007-80, RRL Notice 2004-68
		Telecom: President Notice 20664, RRL Notice 2007-30, RRL Notice 2008-7 with attachments 1, 3, 5, 6; President Notice 20664, RRL Notice 2008-7 with attachment 4
Taiwan NCC CAB Recognition		LP0002, PSTN01, ADSL01, ID0002, IS6100, CNS14336, PLMN07, PLMN01, PLMN08
Taiwan BSMI CAB Recognition		CNS 13438
Japan VCCI		R-3083: Radiation 3 meter site C-3421: Main Ports Conducted Interference Measurement T-1597: Telecommunication Ports Conducted Interference Measuremet
Australia CAB Regocnition		EMC: AS/NZS CISPR 11, AS/NZS CISPR 14.1, AS/NZS CISPR22, AS/NZS 61000.6.3, AS/NZS 61000.6.4
		Radiocommunications: AS/NZS 4281, AS/NZS 4268, AS/NZS 4280.1, AS/NZS 4280.2, AS/NZS 4295, AS/NZS 4582, AS/NZS 4583, AS/NZS 4769.1, AS/NZS 4769.2, AS/NZS 4770, AS/NZS 4771
		Telecommunications: AS/ACIF S002:05, AS/ACIF S003:06, AS/ACIF S004:06 AS/ACIF S006:01, AS/ACIF S016:01, AS/ACIF S031:01, AS/ACIF S038:01, AS/ACIF S040:01, AS/ACIF S041:05, AS/ACIF S043.2:06, AS/ACIF S60950.1
Australia NATA Recognition		AS/ACIF S002, AS/ACIF S003, AS/ACIF S004, AS/ACIF S006, AS/ACIF S016,AS/ACIF S031, AS/ACIF S038, AS/ACIF S040, AS/ACIF S041, AS/ACIF S043.2