RF TEST REPORT

SIEMIC
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Report No.: FCC_RF_SL16031001-SPC-003_0412
Supersede Report No.:

Applicant	SpiderCloud Wireless, Inc.
Product Name	Universal Small Cell 8818 LTE/LTE Module
Model No.	USC8818-C412-K9
Test Standard	47CFR Part27
Test Method	TIA-603-D: 2010
FCC ID	Y478818C412
Date of test	10/26/2015 - 11/02/2015 04/12/2016 - 04/15/2016
Issue Date	04/18/2016
Test Result	Pass Fail
Equipment complied with the specification	[x]
Equipment did not comply with the specification	[ ]

Gary Chou	Chen Ge
Gary Chou	Chen Ge
Test Engineer	Engineer 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

ilac-MRA
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 & R&TTE Directive
Japan	MIC (RCB 208)	RF , Telecom
HongKong	OFTA (US002)	RF , Telecom

CONTENTS

1 REPORT REVISION HISTORY 4
2 EXECUTIVE SUMMARY 5
3 CUSTOMER INFORMATION 5
4 TEST SITE INFORMATION 5
5 MODIFICATION 5
6 EUT INFORMATION 6
6.1 EUT Description 6
6.2 Radio Description 7
6.3 EUT test modes/configuration Description 8
6.4 EUT Photos - External 9
6.5 EUT Photos - Internal 10
6.6 EUT Test Setup Photos 12
7 SUPPORTING EQUIPMENT/SOFTWARE AND CABLING DESCRIPTION 13
7.1 Supporting Equipment 13
7.2 Test Software Description 13
8 TEST SUMMARY 14
9 MEASUREMENT UNCERTAINTY 15
10 MEASUREMENTS, EXAMINATION AND DERIVED RESULTS 16
10.1 RF Output Power 16
10.2 Peak-Average Ratio 31
10.3 Occupied Bandwidth 42
10.4 Band Edge 51
10.5 Radiated Spurious Emission below 1GHz 59
10.6 Radiated Spurious Emissions above 1GHz 62
10.7 Frequency Stability 65
ANNEX A. TEST INSTRUMENT 67
ANNEX B. SIEMIC ACCREDITATION 68

1 Report Revision History

Report No.	Report Version	Description	Issue Date
FCC_RF_SL16031001-SPC-003_0412	None	Original	04/18/2016

2 Executive Summary

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

Company: SpiderCloud Wireless, Inc.
Product: Universal Small Cell 8818 LTE/LTE Module
Model: USC8818-C412-K9

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, Inc.
Applicant Address	475 Sycamore Dr, Milpitas, CA 95035
Manufacturer Name	SpiderCloud Wireless, Inc.
Manufacturer Address	475 Sycamore Dr, Milpitas, CA 95035

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	Universal Small Cell 8818 LTE/LTE Module
Model No.	USC8818-C412-K9
Trade Name	SpiderCloud
Serial No.	FOC1910NMSY
Input Power	48VDC
Power Adapter Manu/Model	N/A
Power Adapter SN	-
Hardware version	-
Software version	-
Date of EUT received	10/20/2015
Equipment Class/ Category	PCB, TNB
Operating Frequencies	LTE: TX (729 MHz to 746 MHz), LTE: RX (699 MHz to 716 MHz) LTE: TX (2110 MHz to 2155 MHz), LTE: RX (1710 MHz to 1755 MHz)
Port/Connectors	N/A
Remark	NONE

6.2 Radio Description

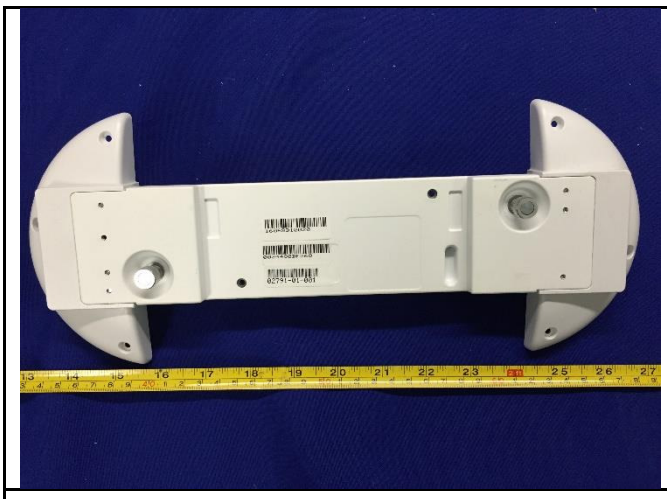
Item	LTE	LTE
Operating Band /Radio Type	LTE Band 4	LTE Band 12
Bandwidth	5MHz, 10MHz, 15MHz, 20MHz	5MHz, 10MHz
Modulation	QPSK/16QAM/64QAM	QPSK/16QAM/64QAM
Antenna Type	Internal Omni-directional antenna	Internal Omni-directional antenna
Antenna Gain	2 dBi	2 dBi
Frequency TX(MHz)	TX: 2110 MHz to 2155 MHz RX: 1710 MHz to 1755 MHz	TX: 729 MHz to 746 MHz RX: 699 MHz to 716 MHz

6.3 EUT test modes/configuration Description

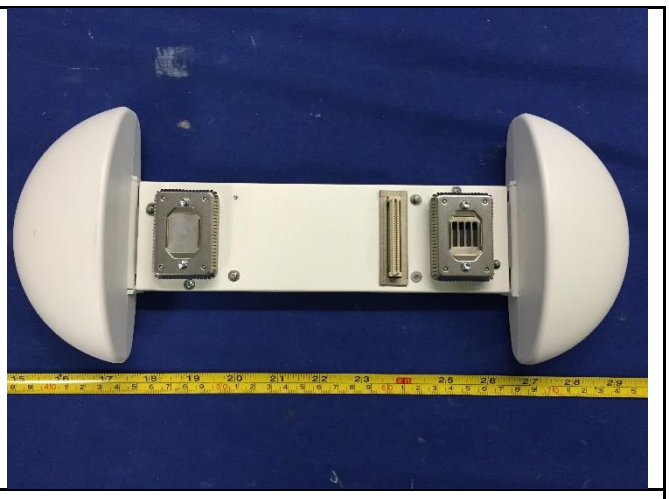
Test mode

Final Test Mode		Note
Final_test_mode_1	Continuous transmission, band 4	LTE
Final_test_mode_2	Continuous transmission, band 12	LTE
Remark: LTE band 12 and LTE band 4 are evaluated.		

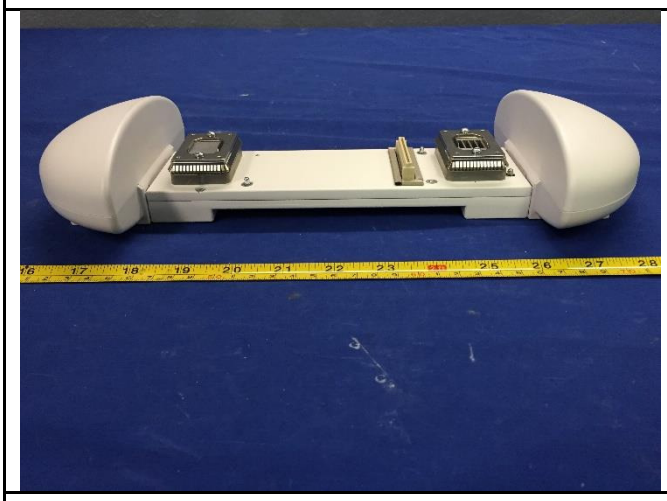
6.4 EUT Photos - External



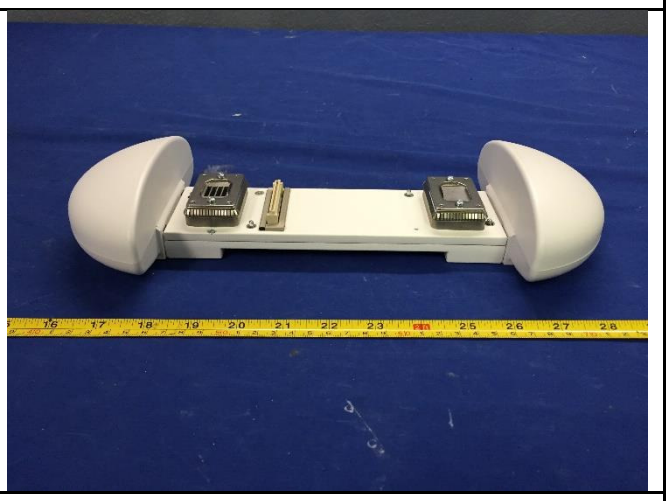
Top View



Bottom View



Front View

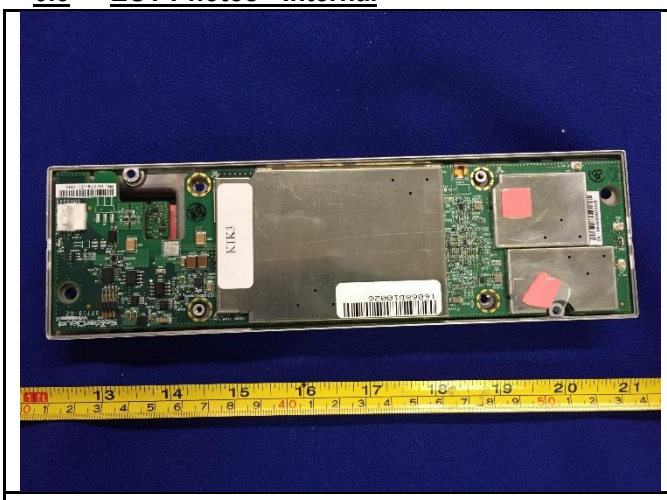


Rear View

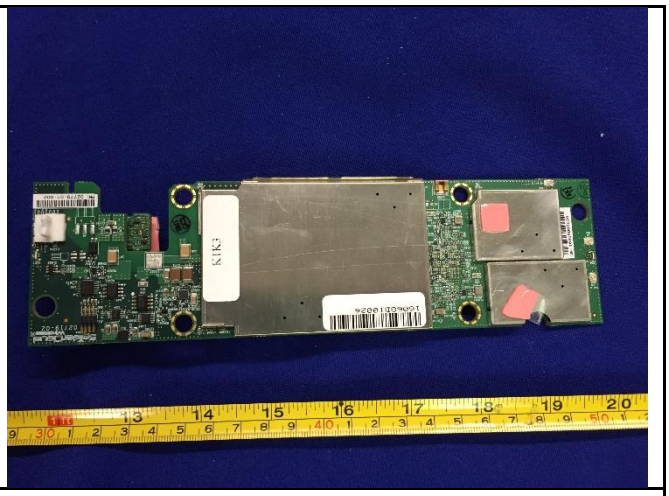
Left Side View

Right Side View

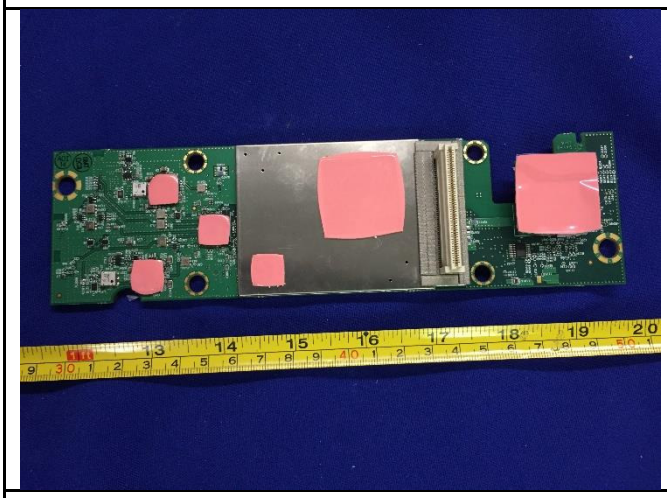
6.5 EUT Photos - Internal



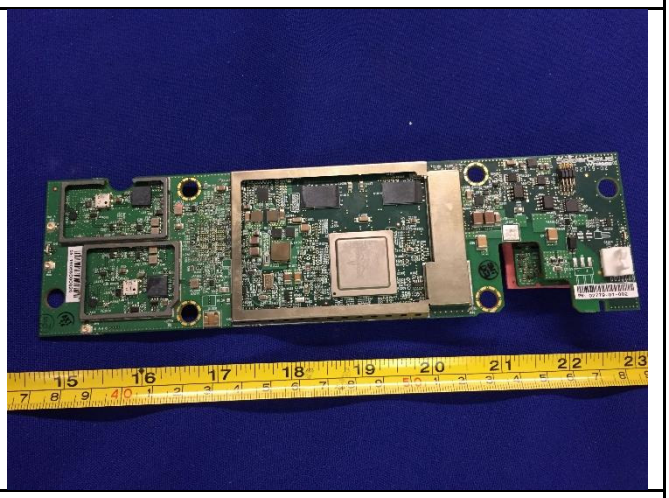
EUT - Open Case View



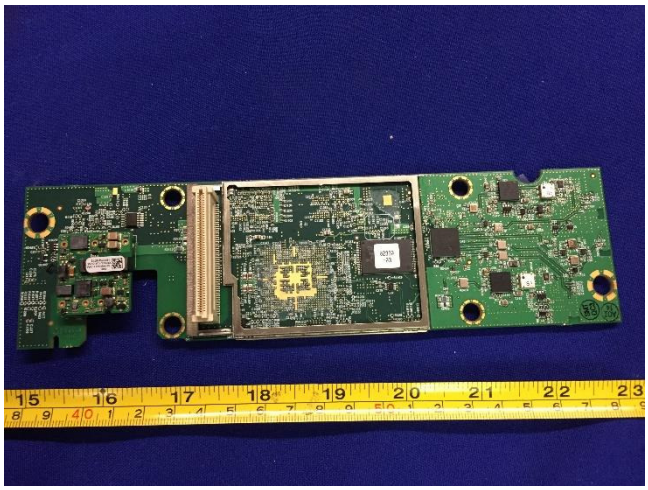
Main PCB - Top View



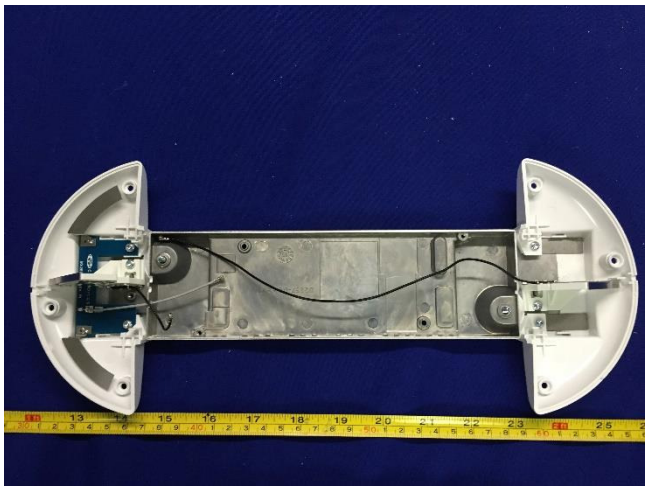
Main PCB - Bottom View



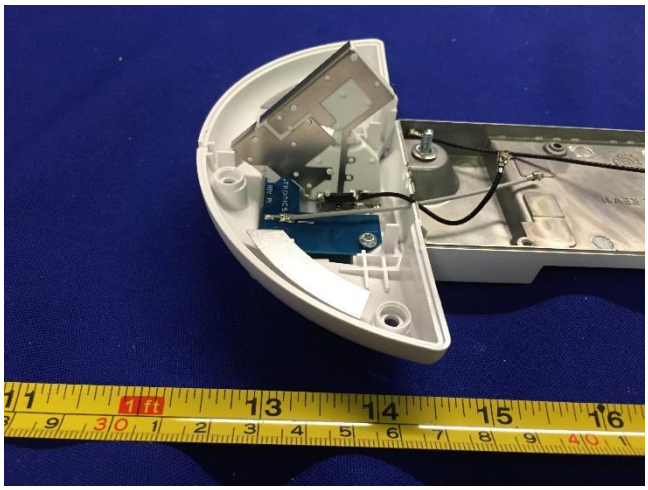
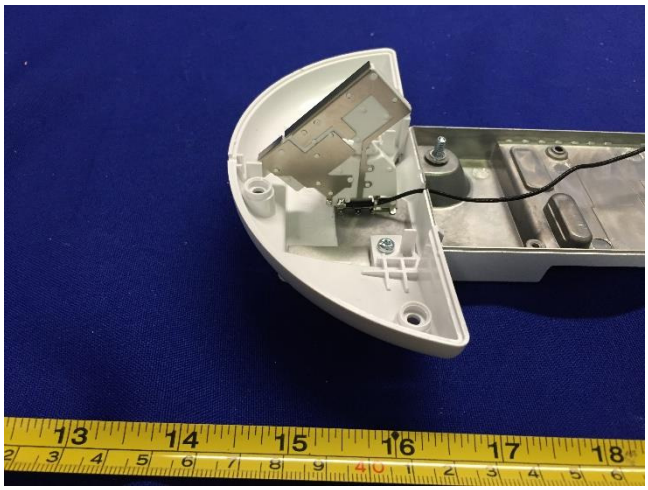
Main PCB - Top View without shielding



Main PCB - Bottom View without shielding



Antenna View

	
Antenna 1	**Antenna 2**

6.6 EUT Test Setup Photos

Radiated Emissions (<1GHz) – Front View

Radiated Emissions (<1GHz) – Rear View

Radiated Emissions (>1GHz) – Front View

Radiated Emissions (>1GHz) – Rear View

Note: The spurious emission in different EUT orientation was investigated, including the EUT standing up position and the laying down position. The EUT orientation shown in above setup photo is the worst case position.

7 Supporting Equipment/Software and cabling Description

7.1 Supporting Equipment

Item	Supporting Equipment Description	Model	Serial Number	Manufacturer	Note
1	PoE Adatper	POE36U-1AT-R	P90212324A1	Phihong	-
2	Service Node	SCSN-9000	14193C26505	SpiderCloud	-
3	Access Point	AIR-CAP3702I-A-K9	FTX1848RA30	Cisco	-

7.2 Test Software Description

Test Item	Software	Description
RF testing	ePeview	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.				

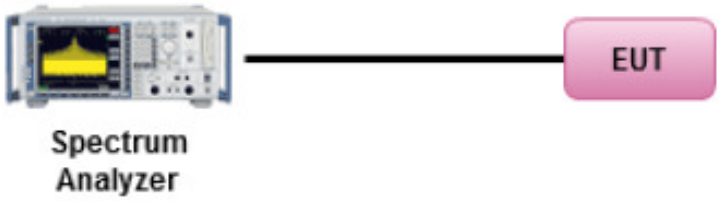
9 Measurement Uncertainty

Test Item	Frequency Range	Description	Uncertainty
Band Edge and Radiated Spurious Emissions	30MHz – 1GHz	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	+5.6dB/-4.5dB
Band Edge and Radiated Spurious Emissions	1GHz – 40GHz	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	+4.3dB/-4.1dB

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	10/26/2015 – 11/02/2015 04/12/2016 – 04/15/2016	Environmental condition	Temperature 22°C Relative Humidity 48% Atmospheric Pressure 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 2 dBi. So the directional gain = 5 dBi		
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test was done by *Chen Ge* at *RF test site*.

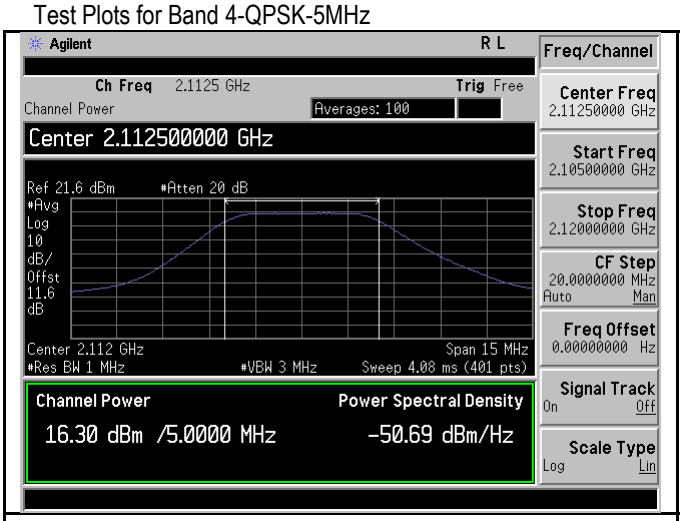
Test Data for LTE band 4:

Type	Channel	Frequency (MHz)	Measured PW –Port 1(dBm)	Measured PW –Port 2(dBm)	Combined Power (dBm)	Antenna Gain (dBi)	E.I.R.P (dBm)
5MHz BW, QPSK	Low	2112.5	16.30	18.15	20.33	5	25.33
	Mid	2132.5	17.04	17.13	20.10	5	25.10
	High	2152.5	17.13	17.67	20.42	5	25.42
5MHz BW, 64QAM	Low	2112.5	16.33	18.13	20.33	5	25.33
	Mid	2132.5	17.16	17.31	20.25	5	25.25
	High	2152.5	16.62	17.01	19.83	5	24.83
10MHz BW, QPSK	Low	2115.0	15.40	16.91	19.23	5	24.23
	Mid	2132.5	16.72	16.73	19.74	5	24.74
	High	2150.0	17.25	17.27	20.27	5	25.27
10MHz BW, 64QAM	Low	2115.0	15.46	17.23	19.44	5	24.44
	Mid	2132.5	17.01	17.36	20.20	5	25.20
	High	2150.0	17.37	17.62	20.51	5	25.51
15MHz BW, QPSK	Low	2117.5	15.24	16.95	19.19	5	24.19
	Mid	2132.5	17.02	17.09	20.07	5	25.07
	High	2147.5	16.78	17.44	20.13	5	25.13
15MHz BW, 64QAM	Low	2117.5	15.53	16.75	19.19	5	24.19
	Mid	2132.5	16.95	17.26	20.12	5	25.12
	High	2147.5	17.52	17.86	20.70	5	25.70
20MHz BW, QPSK	Low	2120.0	16.57	17.58	20.11	5	25.11
	Mid	2132.5	17.74	17.78	20.77	5	25.77
	High	2145.0	17.67	17.70	20.70	5	25.70
20MHz BW, 64QAM	Low	2120.0	16.72	17.90	20.36	5	25.36
	Mid	2132.5	17.09	17.40	20.26	5	25.26
	High	2145.0	17.78	17.77	20.79	5	25.79

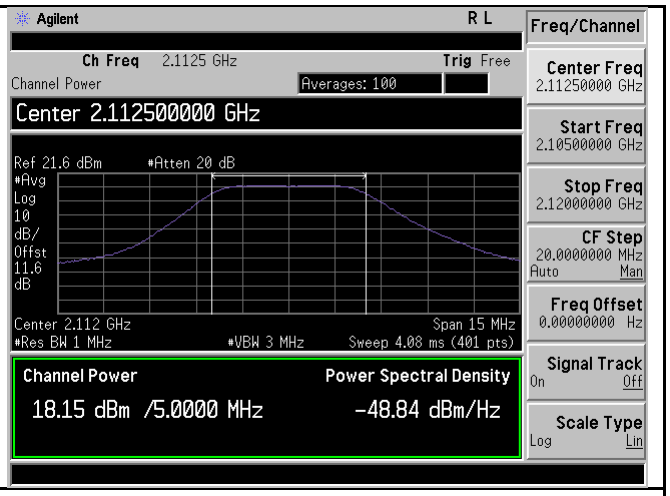
Test Data for LTE band 12:

Type	Channel	Frequency (MHz)	Measured PW –Port 1(dBm)	Measured PW –Port 2(dBm)	Combined Power (dBm)	Antenna Gain (dBi)	E.I.R.P (dBm)
5MHz BW, QPSK	Low	731.5	17.21	17.28	20.26	5	25.26
	Mid	737.5	17.16	17.18	20.18	5	25.18
	High	743.5	17.26	17.29	20.29	5	25.29
5MHz BW, 64QAM	Low	731.5	17.12	17.10	20.12	5	25.12
	Mid	737.5	17.11	17.26	20.20	5	25.20
	High	743.5	17.30	17.36	20.34	5	25.34
10MHz BW, QPSK	Low	734.0	17.41	17.40	20.42	5	25.42
	Mid	737.5	17.54	17.42	20.49	5	25.49
	High	741.0	17.58	17.53	20.57	5	25.57
10MHz BW, 64QAM	Low	734.0	17.19	17.23	20.22	5	25.22
	Mid	737.5	17.53	17.45	20.50	5	25.05
	High	741.0	17.52	17.52	20.53	5	25.53

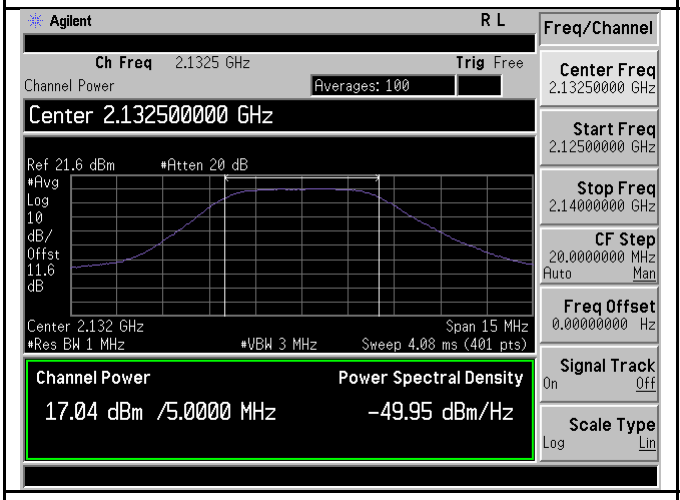
Test Plots for Band 4-QPSK-5MHz



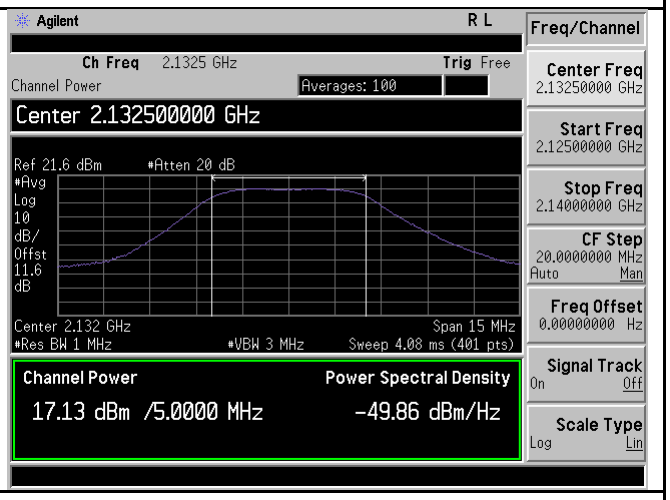
PWR-Band4-QPSK-5M BW-Low CH-Port1



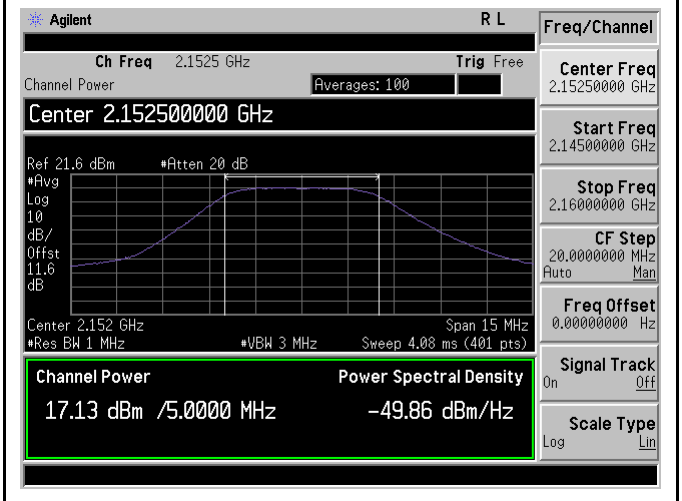
PWR-Band4-QPSK-5M BW-Low CH-Port2



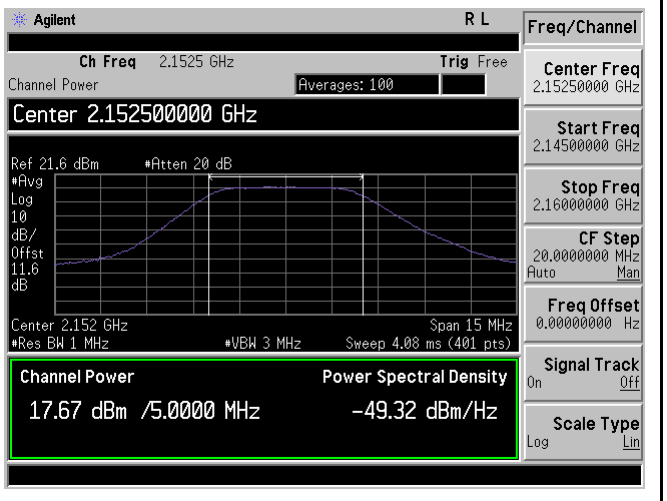
PWR-Band4-QPSK-5M BW-Mid CH-Port1



PWR-Band4-QPSK-5M BW-Mid CH-Port2

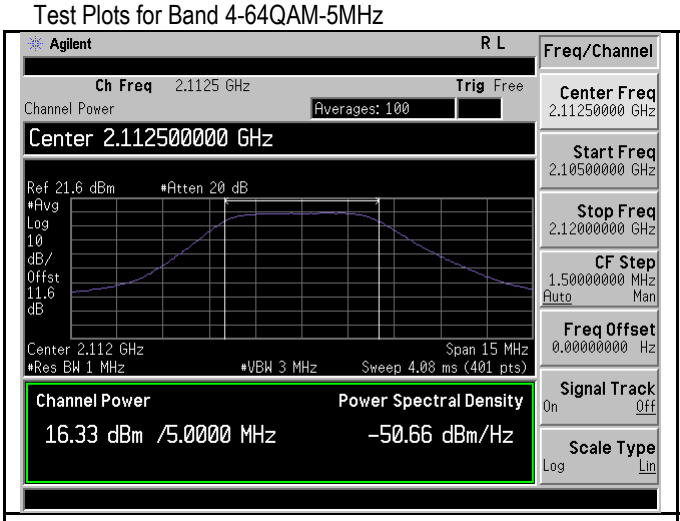


PWR-Band4-QPSK-5M BW-High CH-Port1

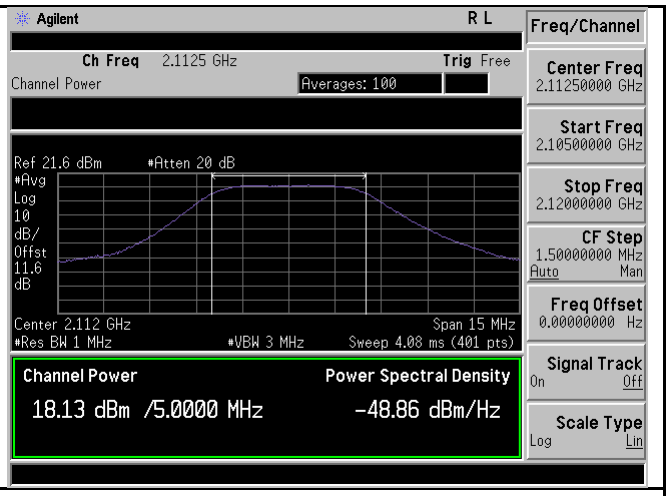


PWR-Band4-QPSK-5M BW-High CH-Port2

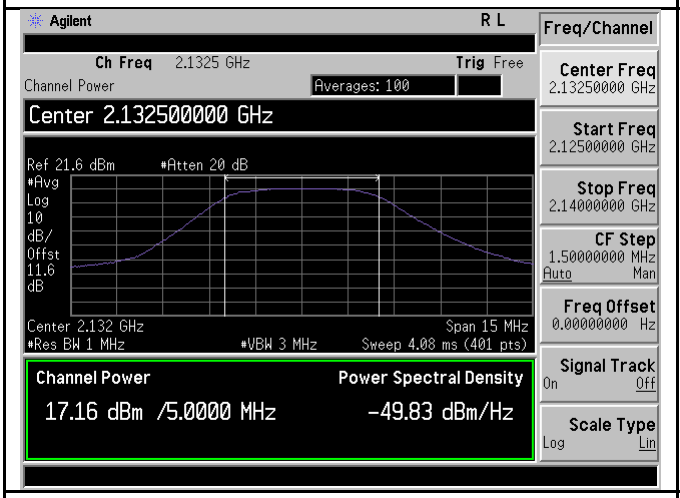
Test Plots for Band 4-64QAM-5MHz



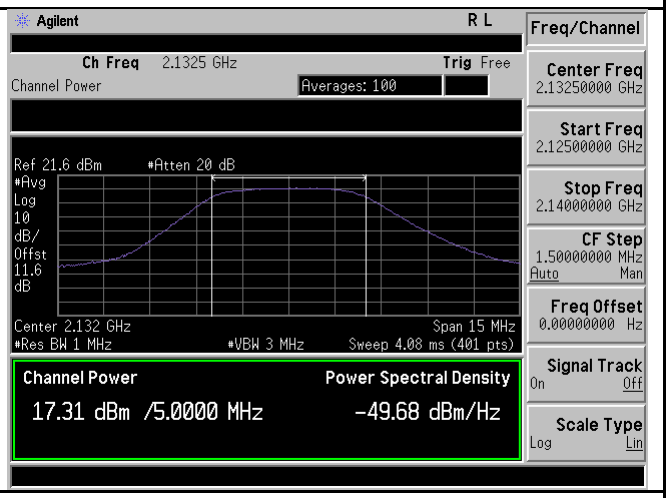
PWR-Band4-64QAM-5M BW-Low CH-Port1



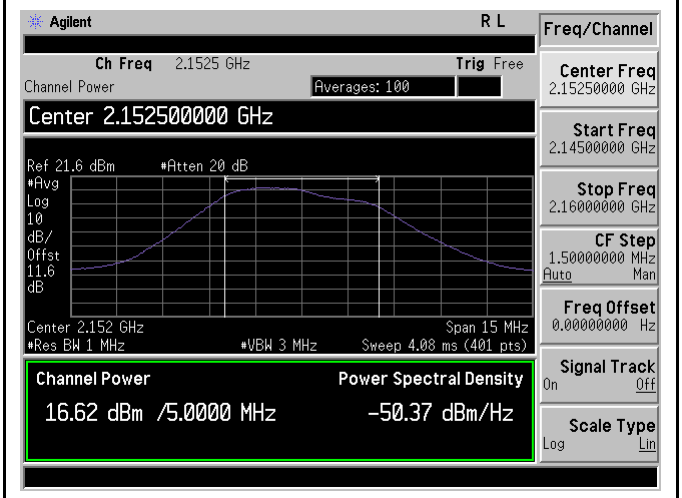
PWR-Band4-64QAM-5M BW-Low CH-Port2



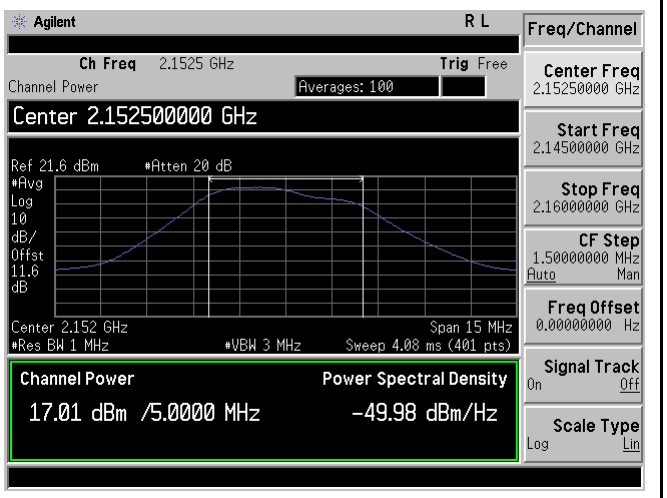
PWR-Band4-64QAM-5M BW-Mid CH-Port1



PWR-Band4-64QAM-5M BW-Mid CH-Port2

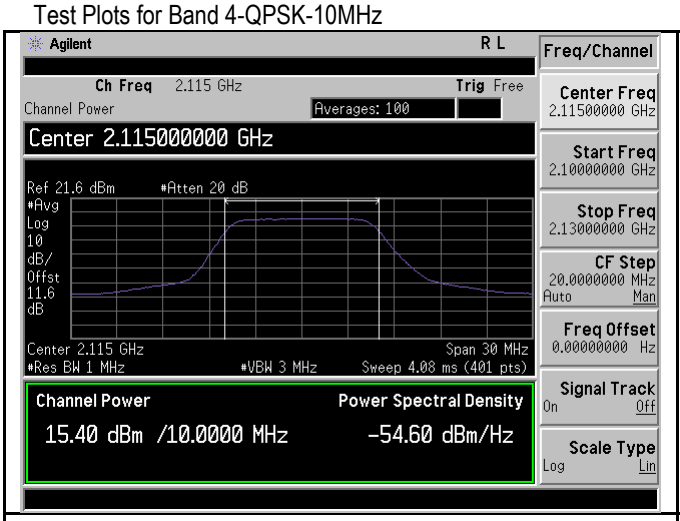


PWR-Band4-64QAM-5M BW-High CH-Port1

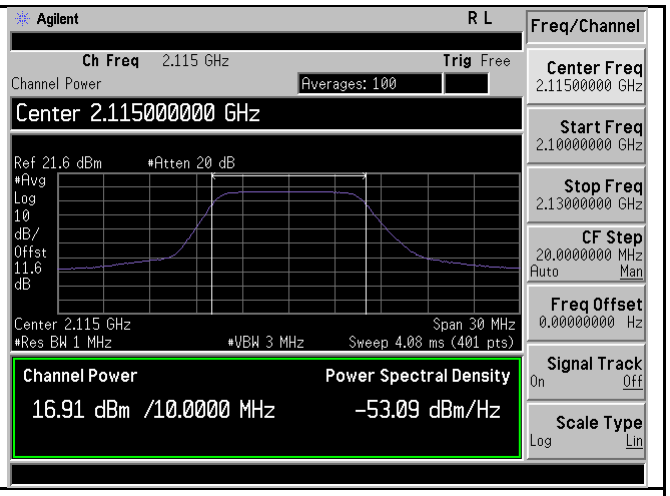


PWR-Band4-64QAM-5M BW-High CH-Port2

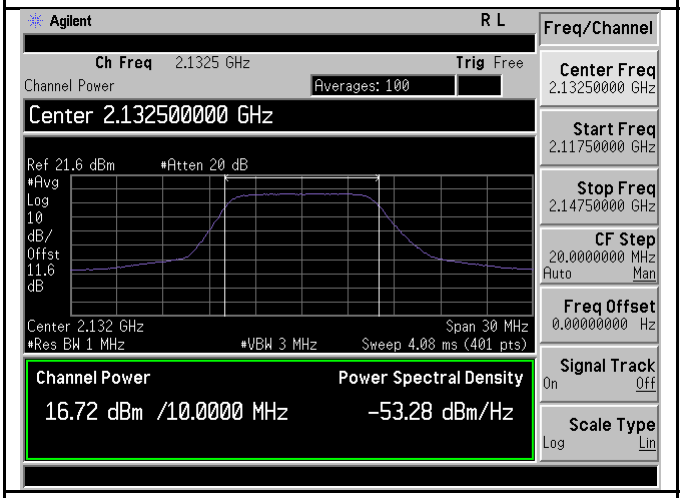
Test Plots for Band 4-QPSK-10MHz



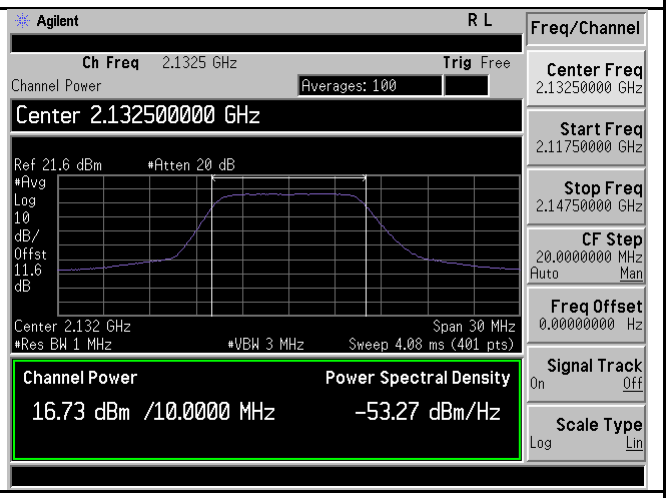
PWR-Band4-QPSK-10M BW-Low CH-Port1



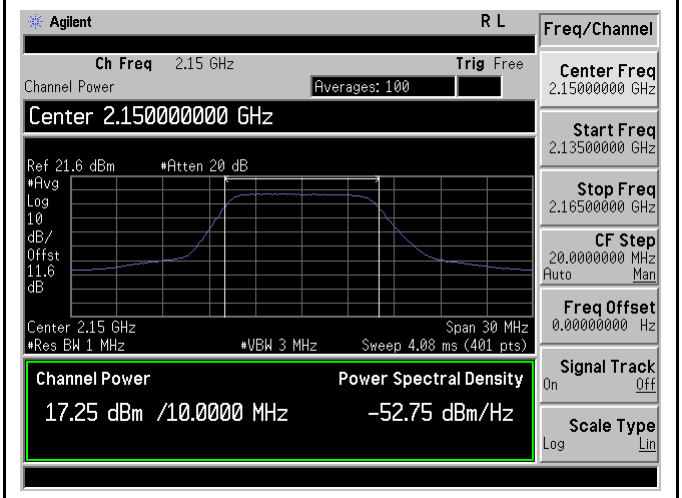
PWR-Band4-QPSK-10M BW-Low CH-Port2



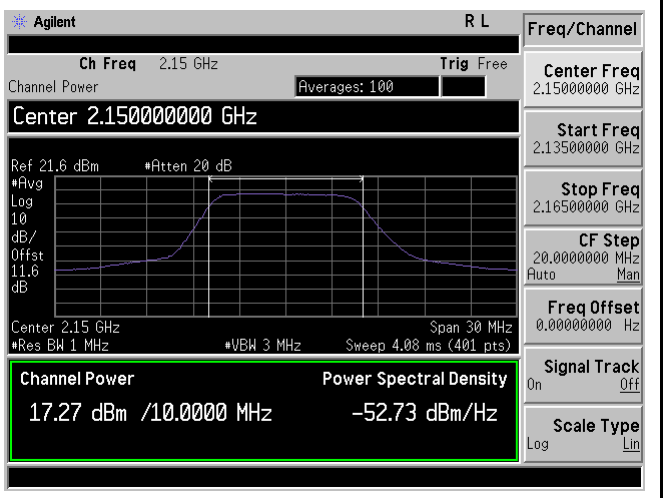
PWR-Band4-QPSK-10M BW-Mid CH-Port1



PWR-Band4-QPSK-10M BW-Mid CH-Port2

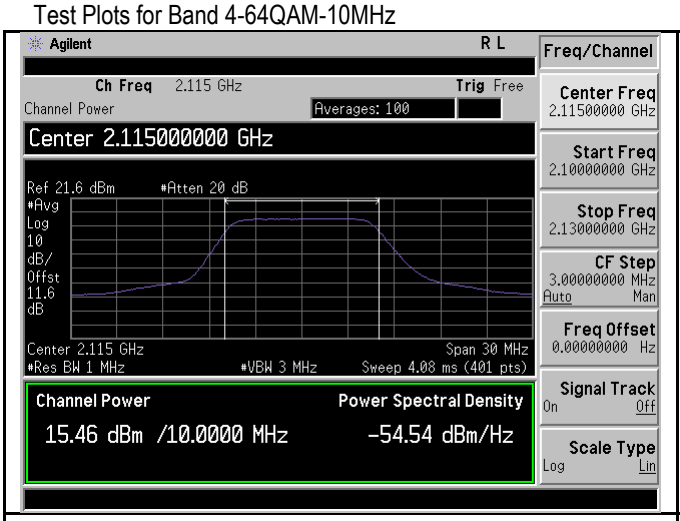


PWR-Band4-QPSK-10M BW-High CH-Port1

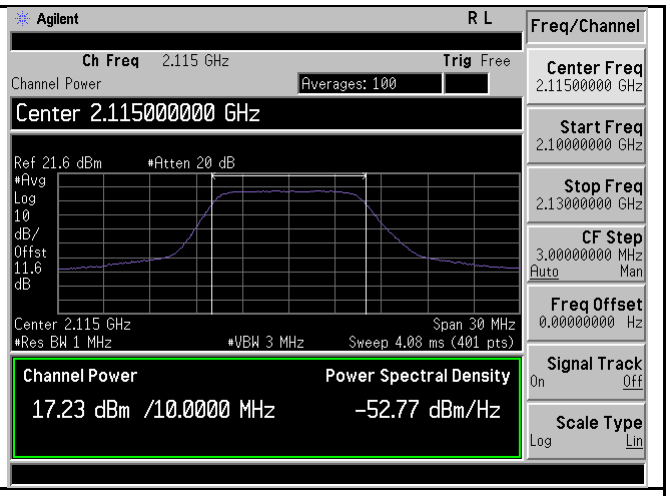


PWR-Band4-QPSK-10M BW-High CH-Port2

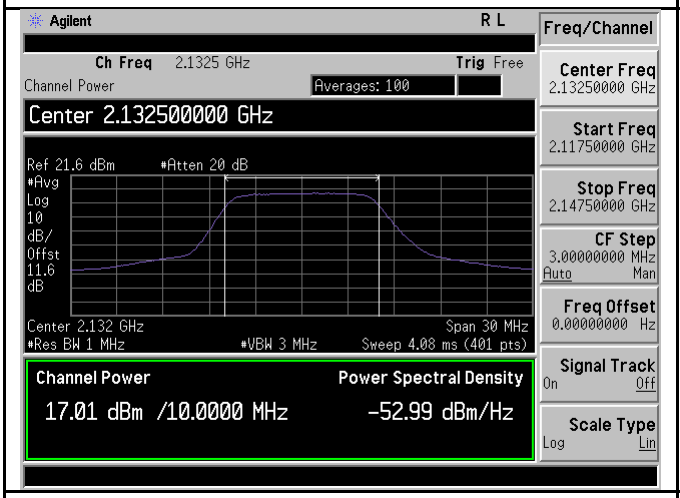
Test Plots for Band 4-64QAM-10MHz



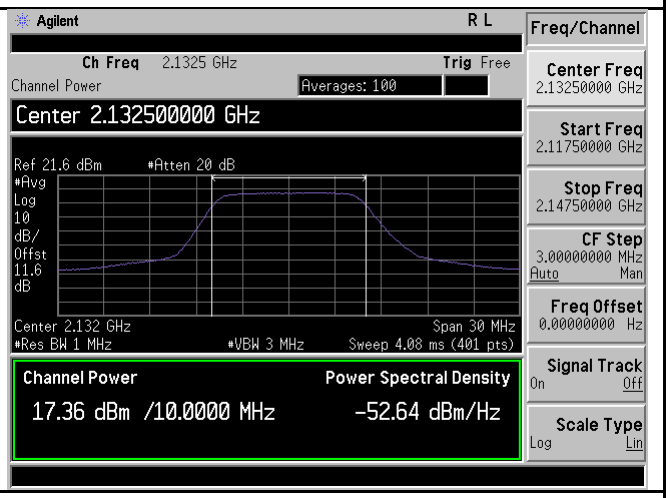
PWR-Band4-64QAM-10M BW-Low CH-Port1



PWR-Band4-64QAM-10M BW-Low CH-Port2



PWR-Band4-64QAM-10M BW-Mid CH-Port1



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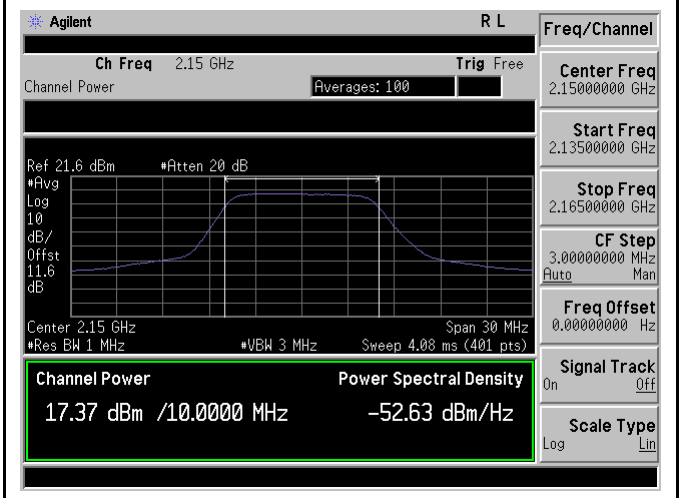
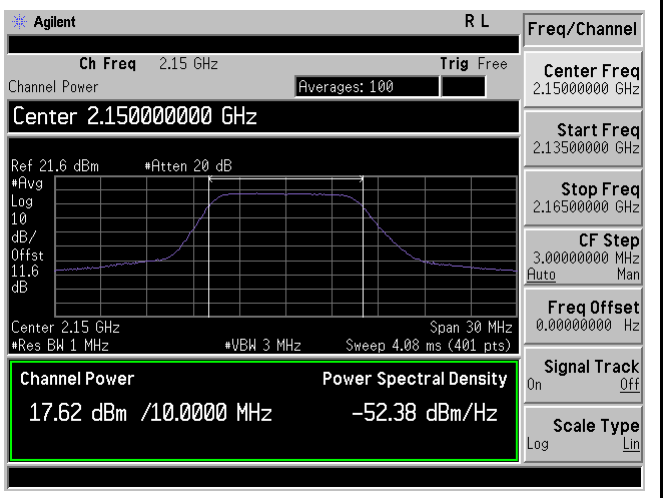
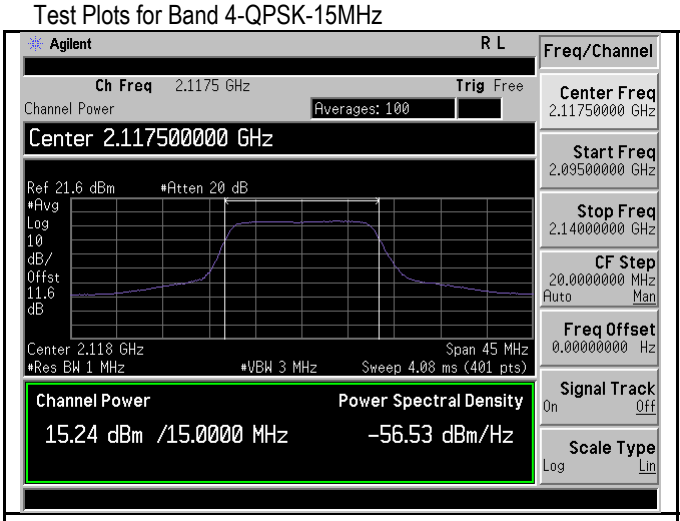


PWR-Band4-64QAM-10M BW-High CH-Port1

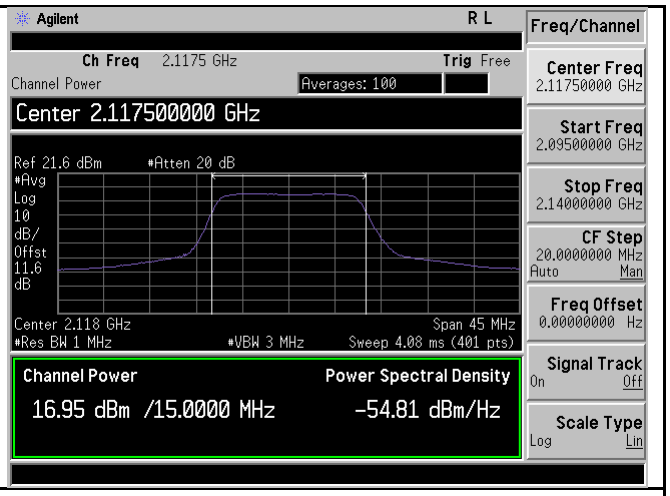


PWR-Band4-64QAM-10M BW-High CH-Port2

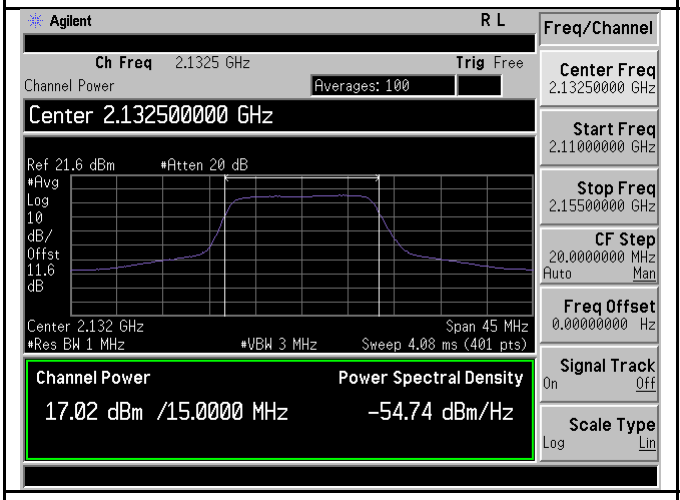
Test Plots for Band 4-QPSK-15MHz



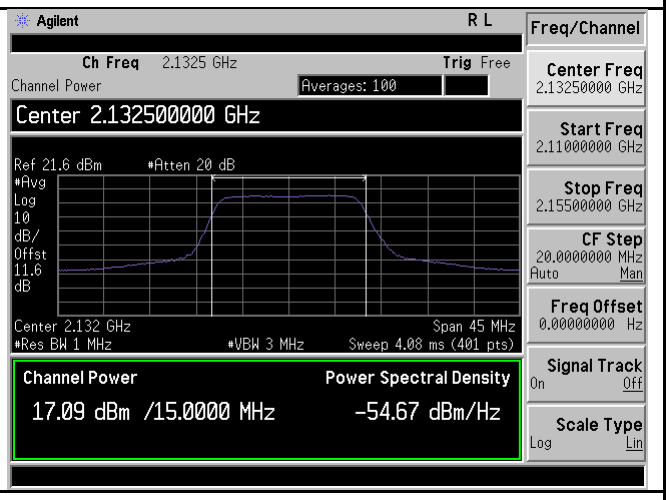
PWR-Band4-QPSK-15M BW-Low CH-Port1



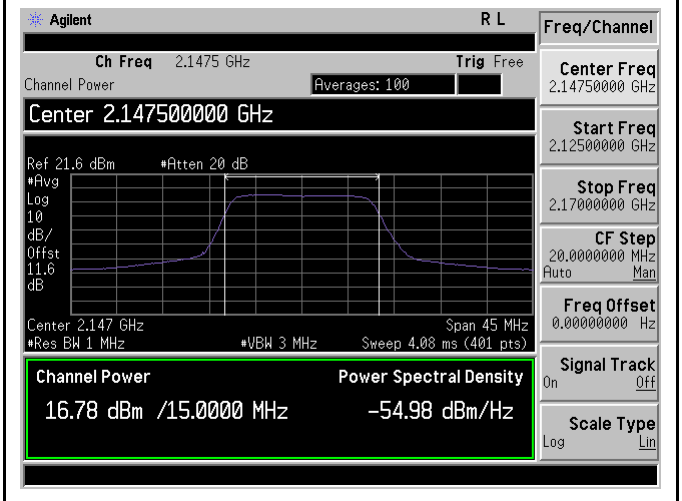
PWR-Band4-QPSK-15M BW-Low CH-Port2



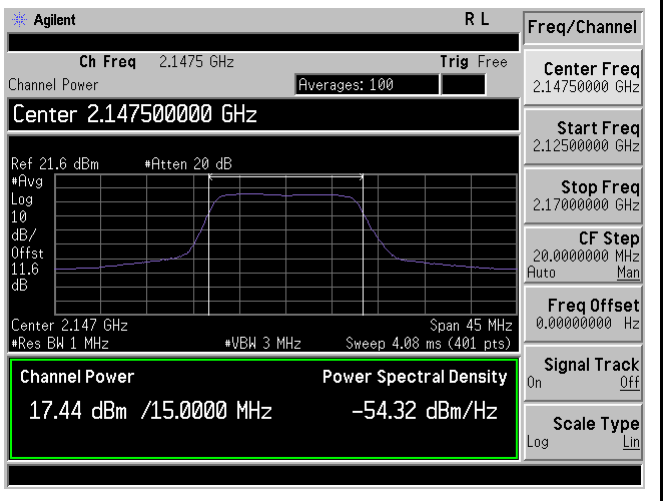
PWR-Band4-QPSK-15M BW-Mid CH-Port1



PWR-Band4-QPSK-15M BW-Mid CH-Port2

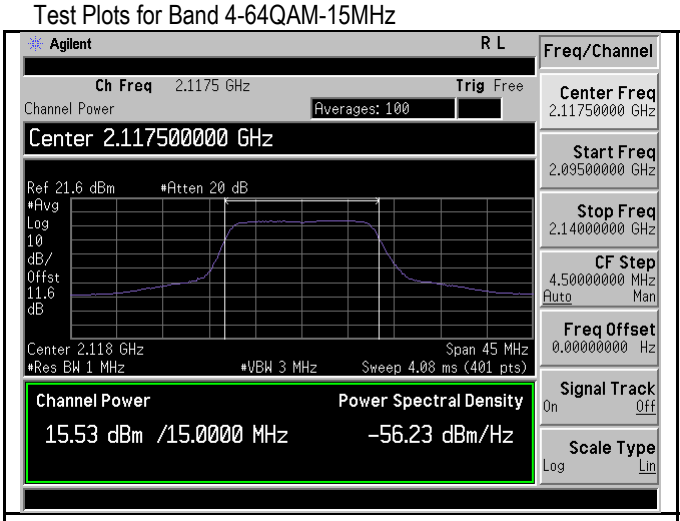


PWR-Band4-QPSK-15M BW-High CH-Port1

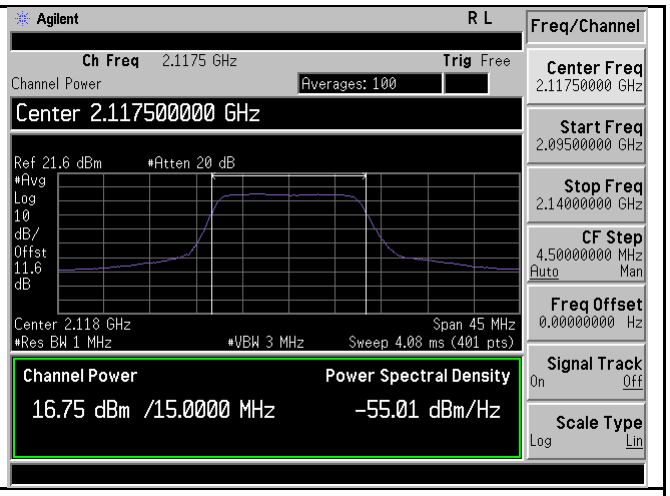


PWR-Band4-QPSK-15M BW-High CH-Port2

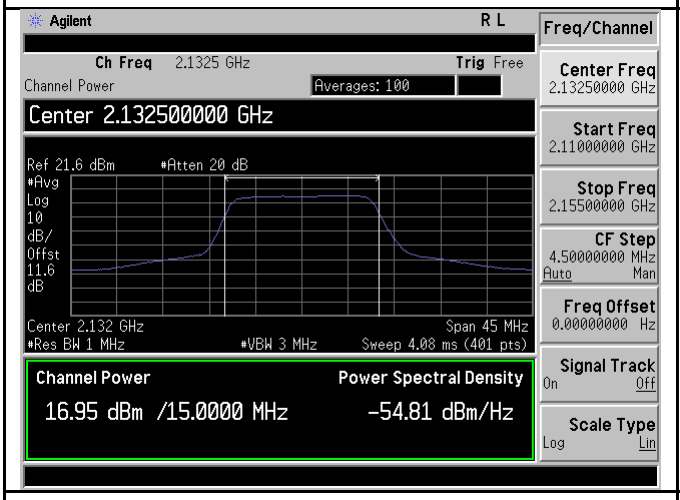
Test Plots for Band 4-64QAM-15MHz



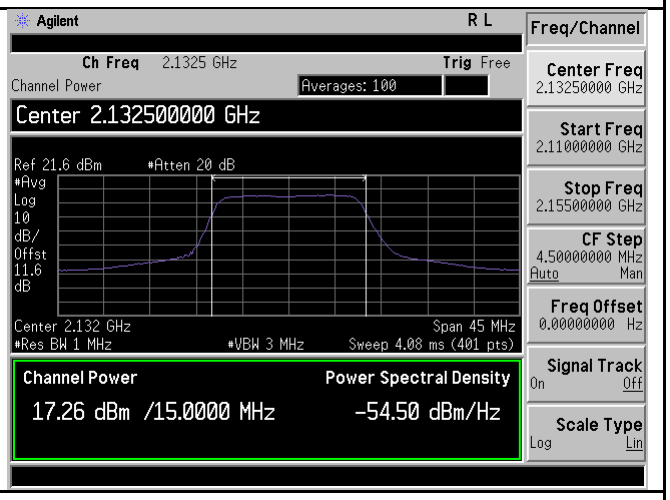
PWR-Band4-64QAM-15M BW-Low CH-Port1



PWR-Band4-64QAM-15M BW-Low CH-Port2



PWR-Band4-64QAM-15M BW-Mid CH-Port1



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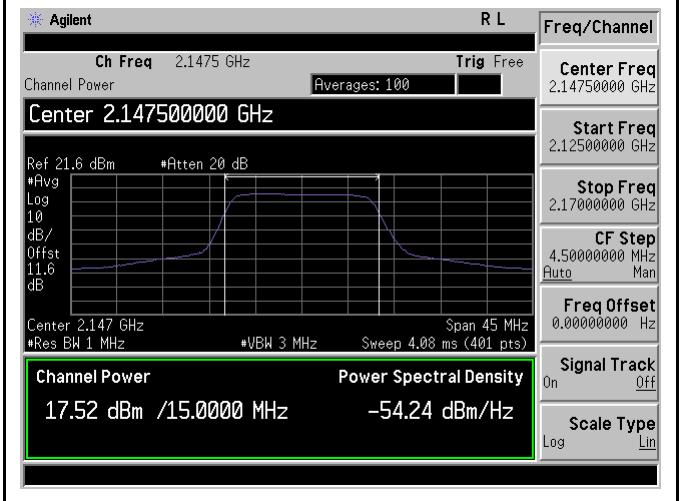
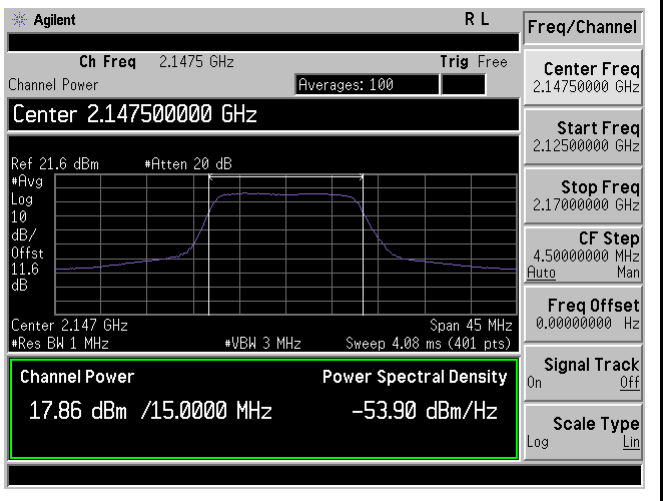
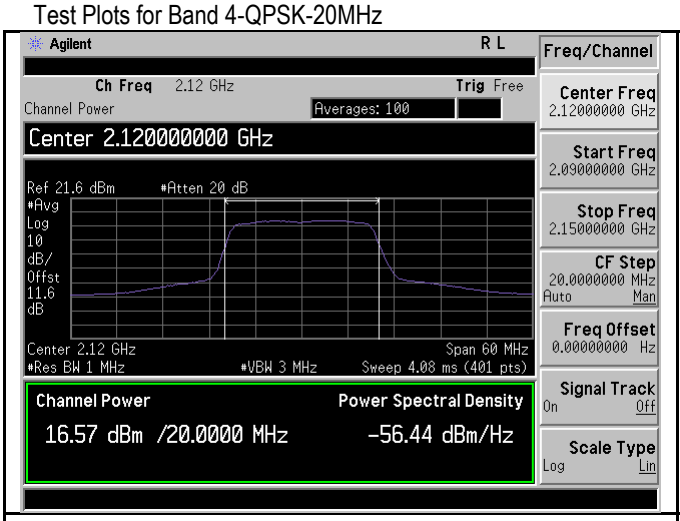


PWR-Band4-64QAM-15M BW-High CH-Port1

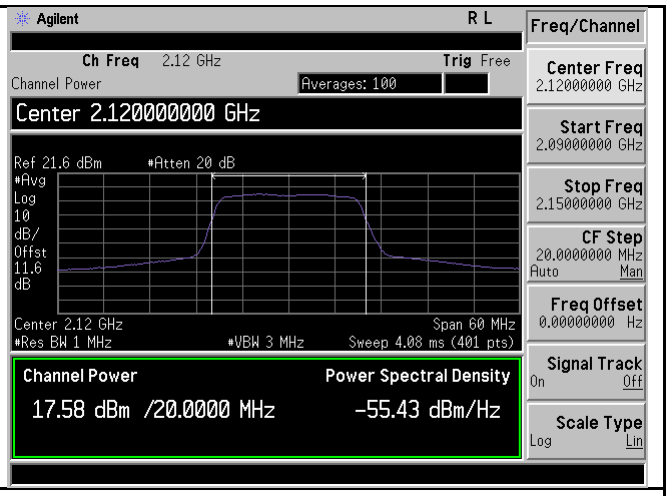


PWR-Band4-64QAM-15M BW-High CH-Port2

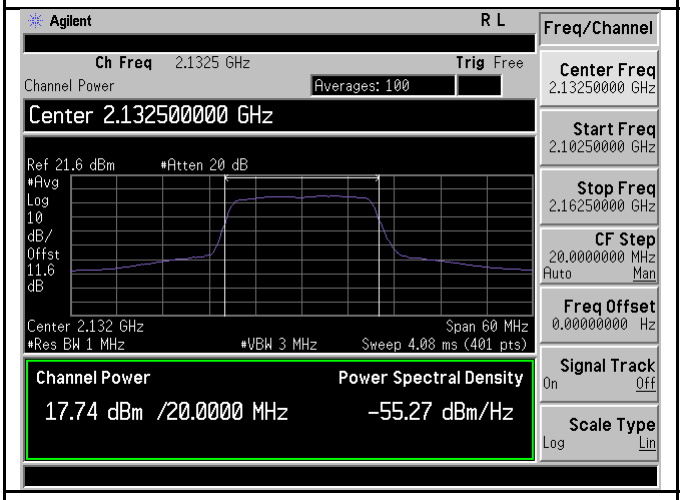
Test Plots for Band 4-QPSK-20MHz



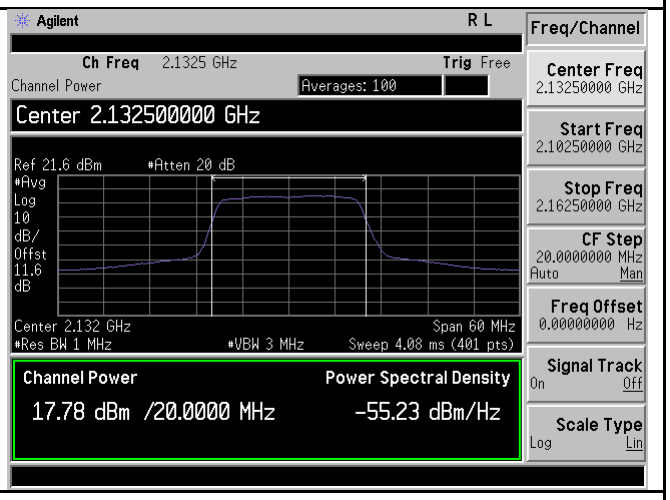
PWR-Band4-QPSK-20M BW-Low CH-Port1



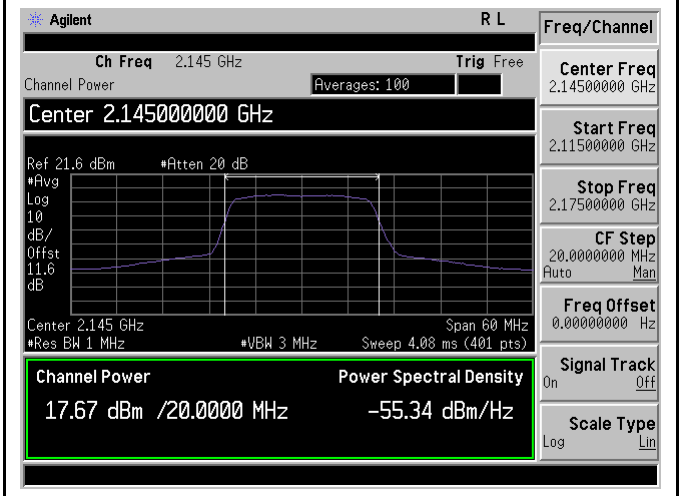
PWR-Band4-QPSK-20M BW-Low CH-Port2



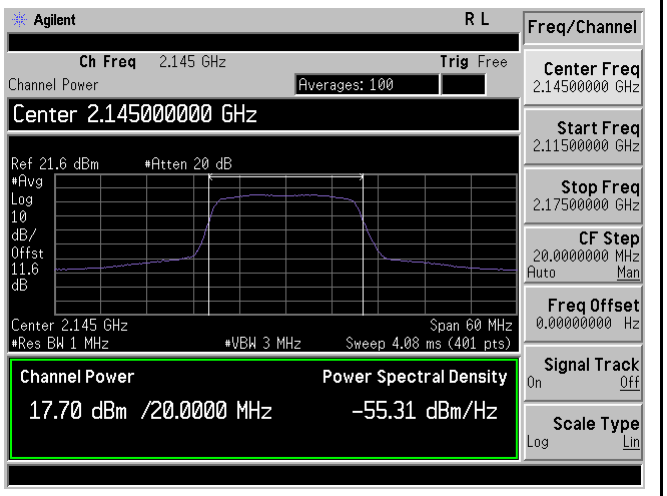
PWR-Band4-QPSK-20M BW-Mid CH-Port1



PWR-Band4-QPSK-20M BW-Mid CH-Port2

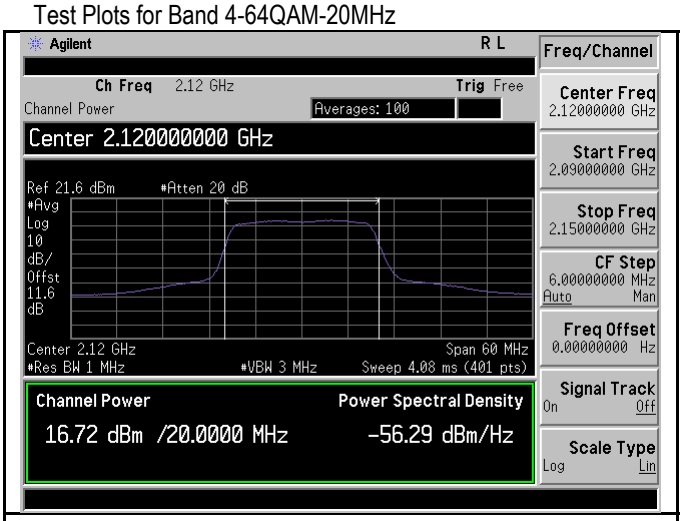


PWR-Band4-QPSK-20M BW-High CH-Port1

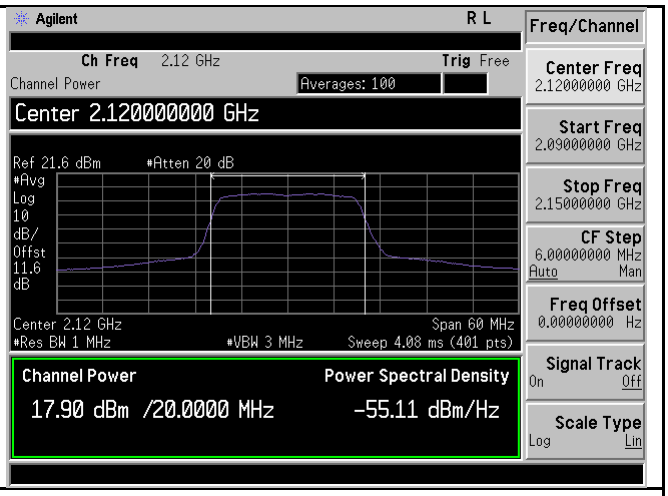


PWR-Band4-QPSK-20M BW-High CH-Port2

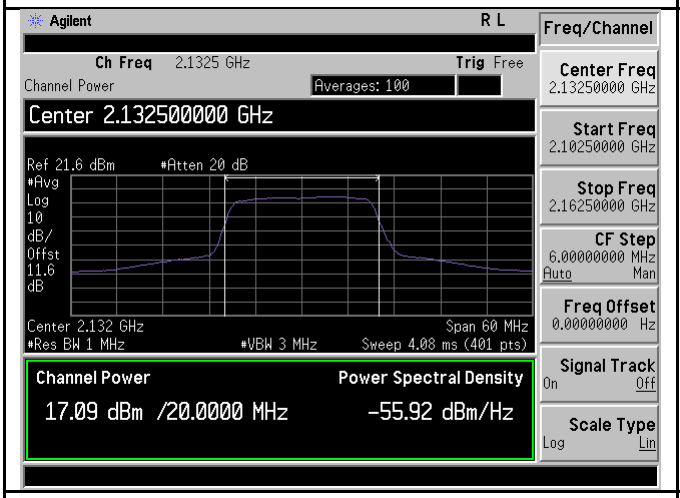
Test Plots for Band 4-64QAM-20MHz



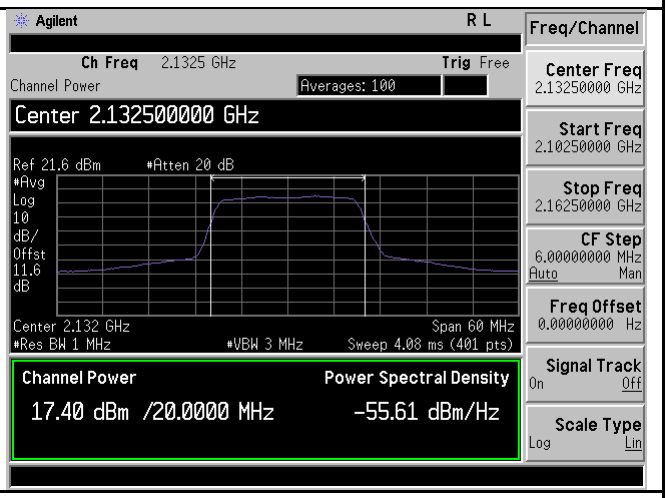
PWR-Band4-64QAM-20M BW-Low CH-Port1



PWR-Band4-64QAM-20M BW-Low CH-Port2



PWR-Band4-64QAM-20M BW-Mid CH-Port1



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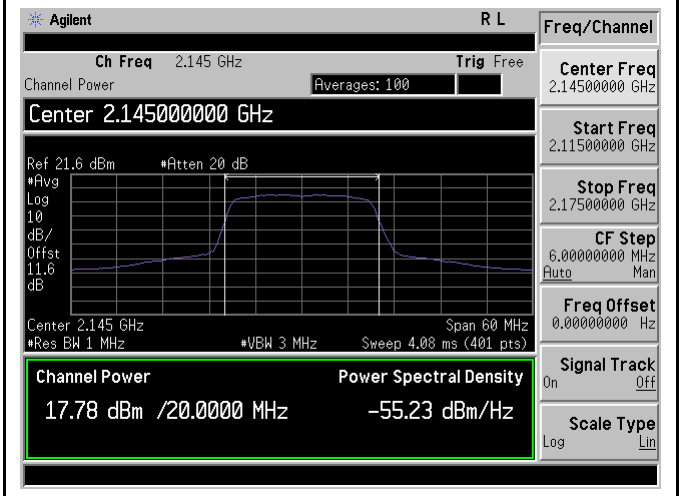
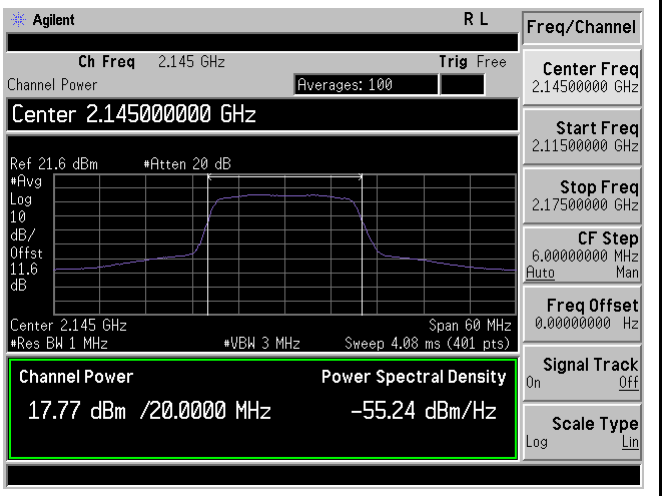


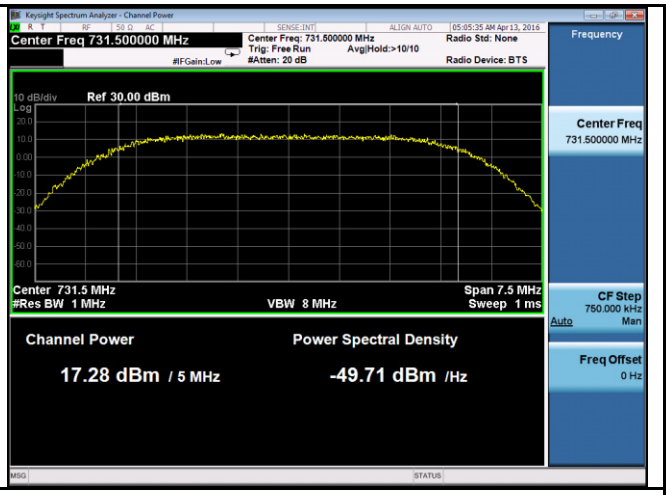
PWR-Band4-64QAM-20M BW-High CH-Port1



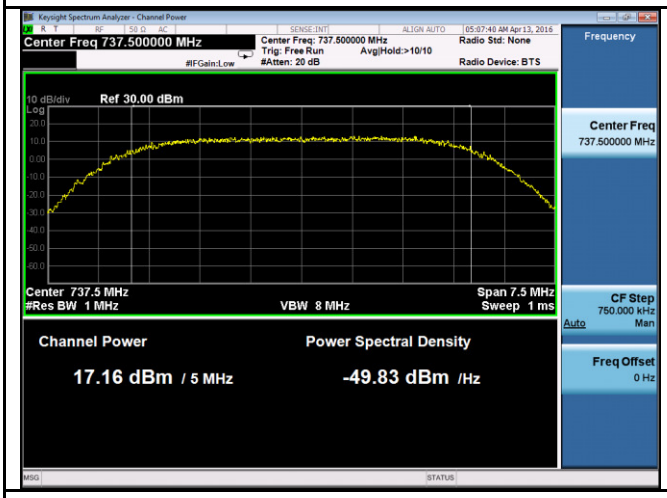
PWR-Band4-64QAM-20M BW-High CH-Port2

Test Plots for Band 12-QPSK-5MHz

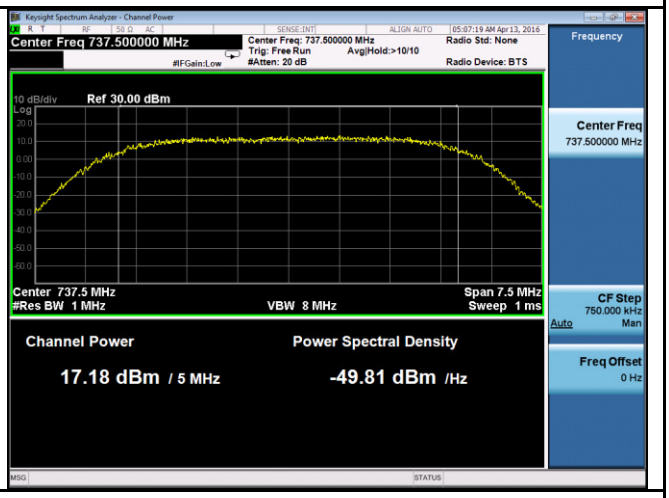
PWR-Band12-QPSK-5M BW-Low CH-Port1



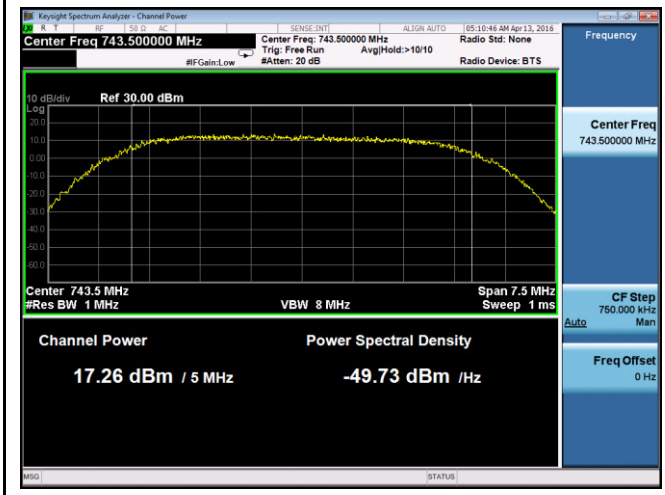
PWR- Band12-QPSK-5M BW-Low CH-Port2



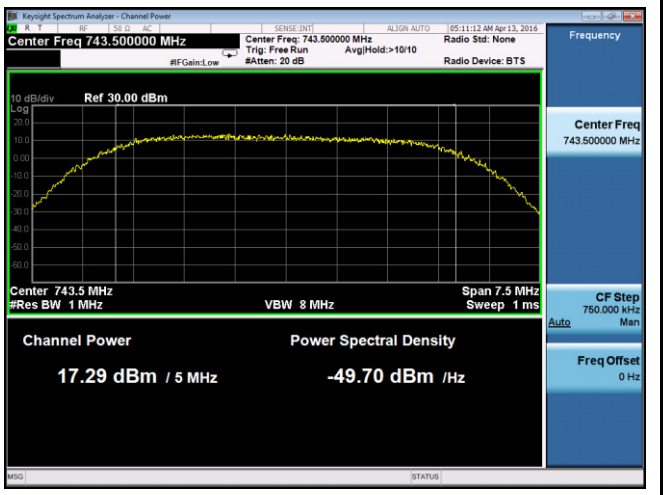
PWR- Band12-QPSK-5M BW-Mid CH-Port1



PWR- Band12-QPSK-5M BW-Mid CH-Port2

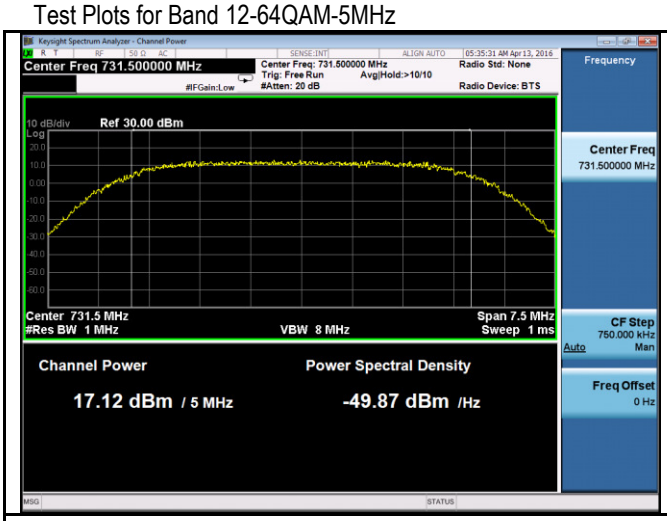


PWR- Band12-QPSK-5M BW-High CH-Port1

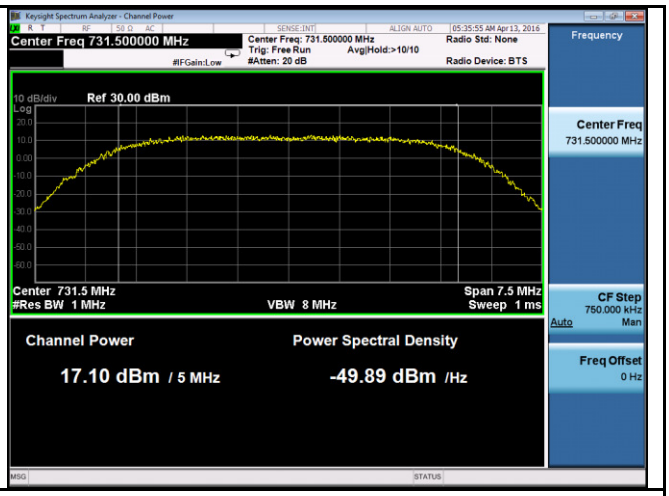


PWR- Band12-QPSK-5M BW-High CH-Port2

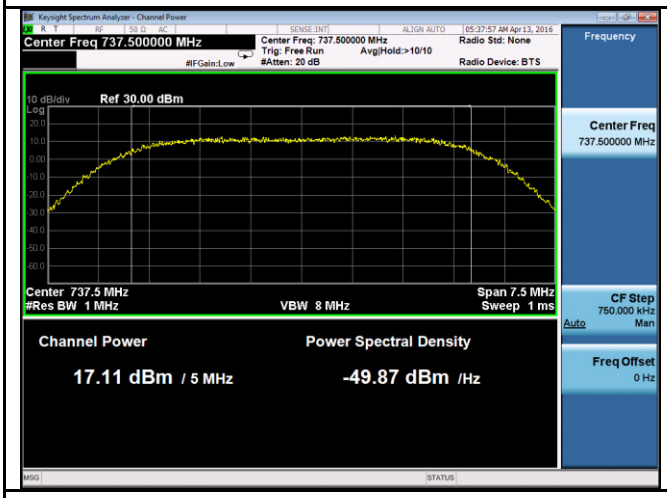
Test Plots for Band 12-64QAM-5MHz



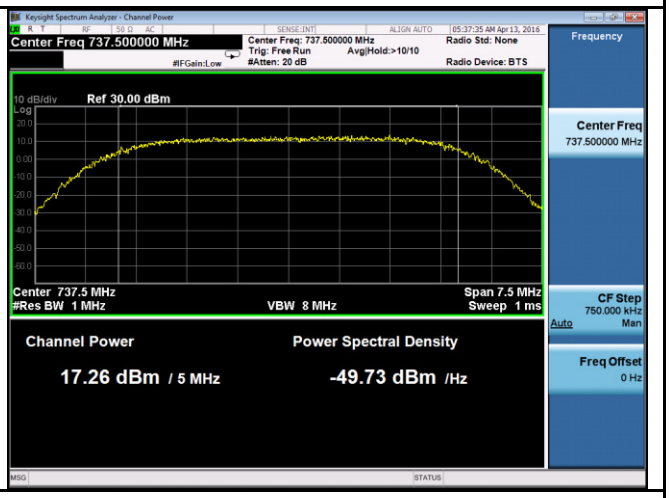
PWR-Band12-64QAM-5M BW-Low CH-Port1



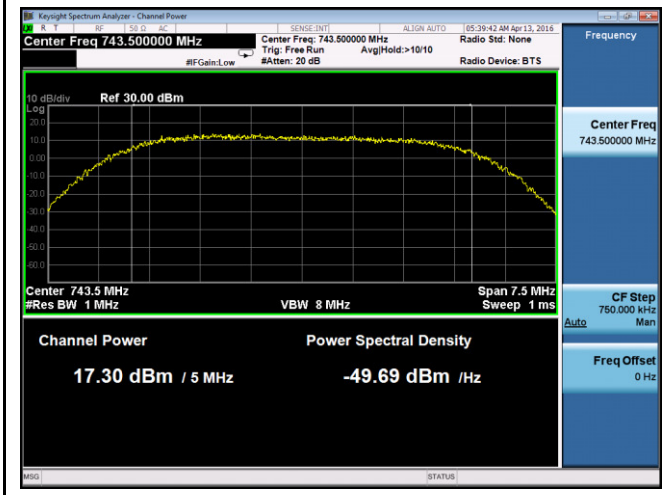
PWR- Band12-64QAM-5M BW-Low CH-Port2



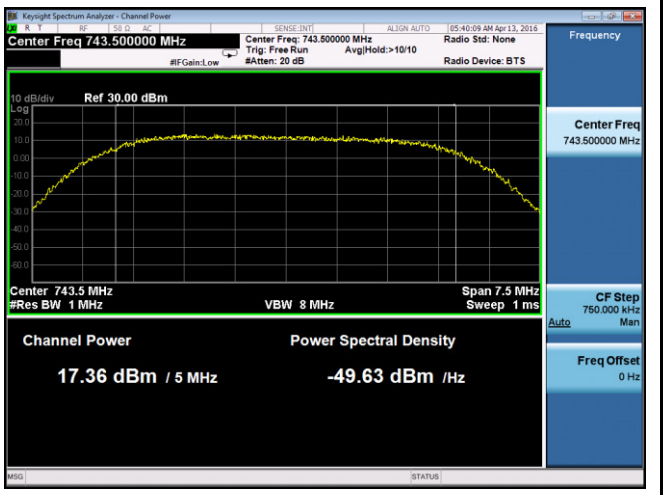
PWR- Band12-64QAM-5M BW-Mid CH-Port1



PWR- Band12-64QAM-5M BW-Mid CH-Port2

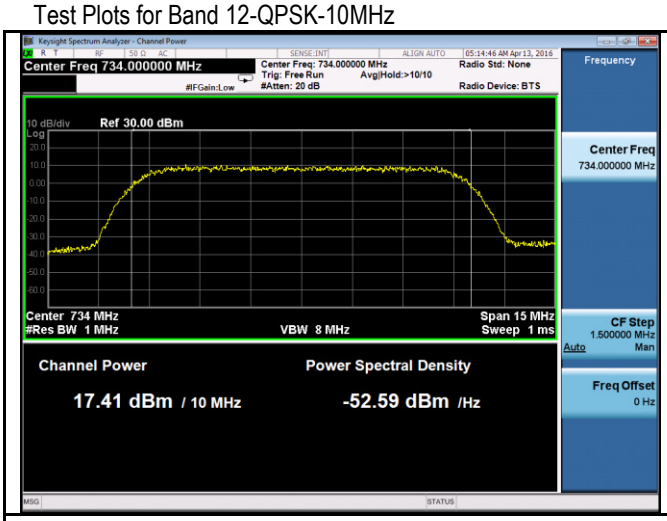


PWR- Band12-64QAM-5M BW-High CH-Port1

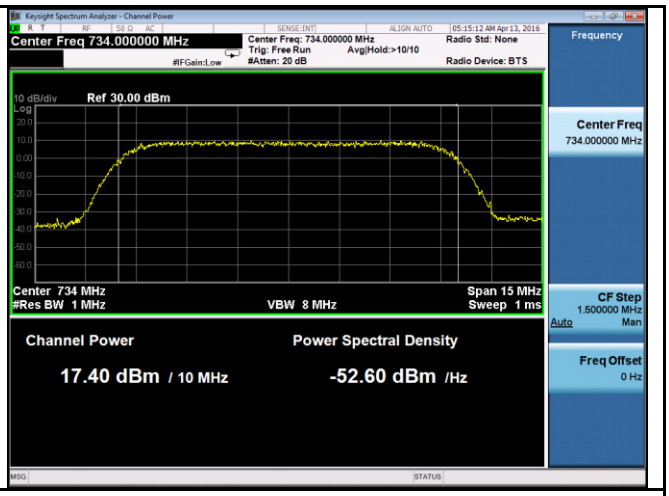


PWR- Band12-64QAM-5M BW-High CH-Port2

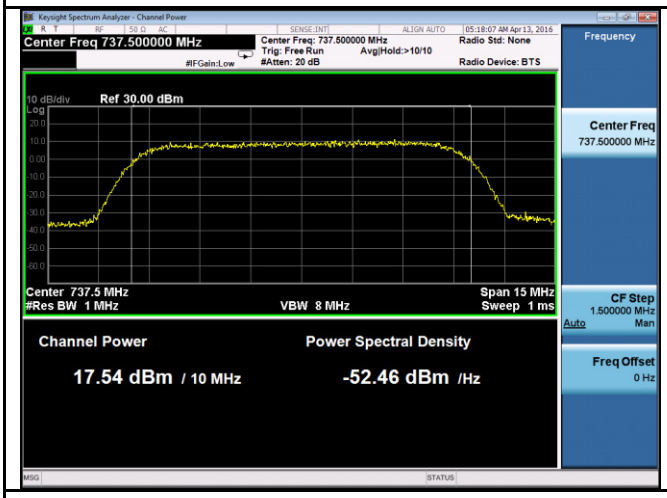
Test Plots for Band 12-QPSK-10MHz



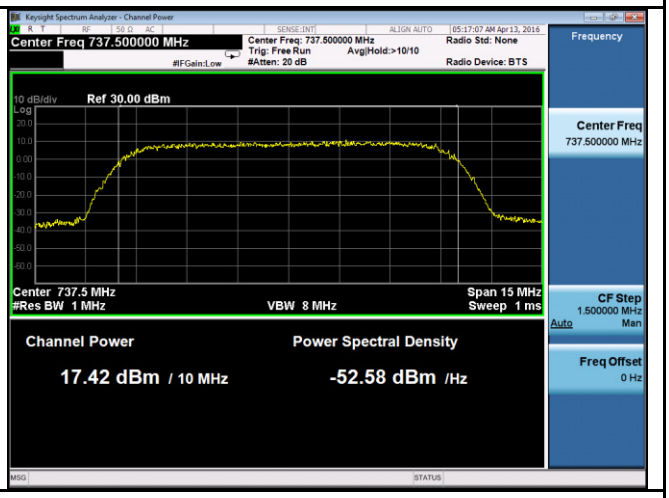
PWR-Band12-QPSK-10M BW-Low CH-Port1



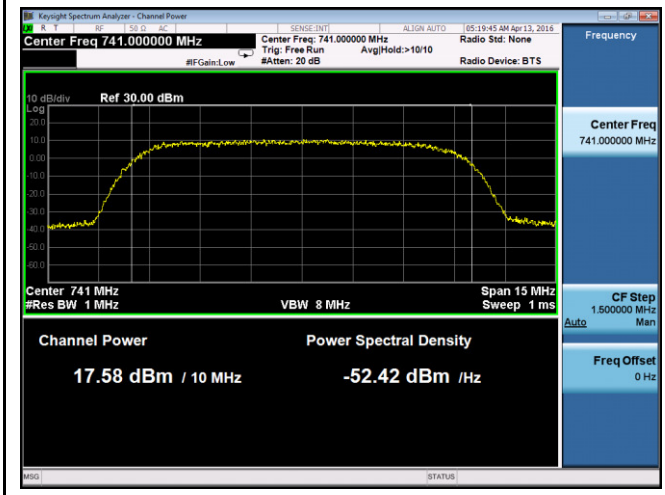
PWR- Band12-QPSK-10M BW-Low CH-Port2



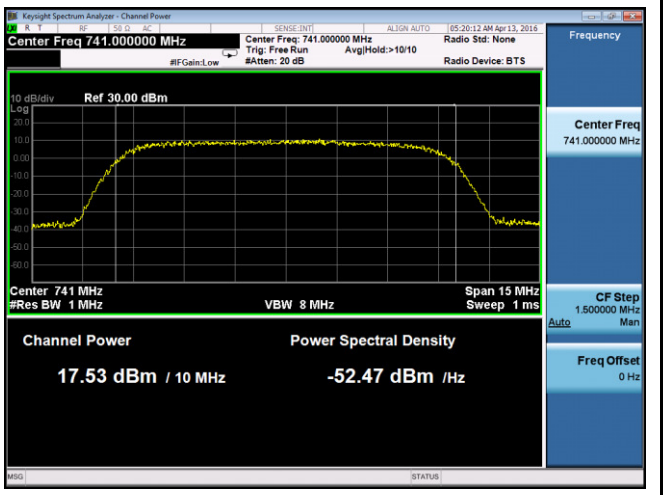
PWR- Band12-QPSK-10M BW-Mid CH-Port1



PWR- Band12-QPSK-10M BW-Mid CH-Port2

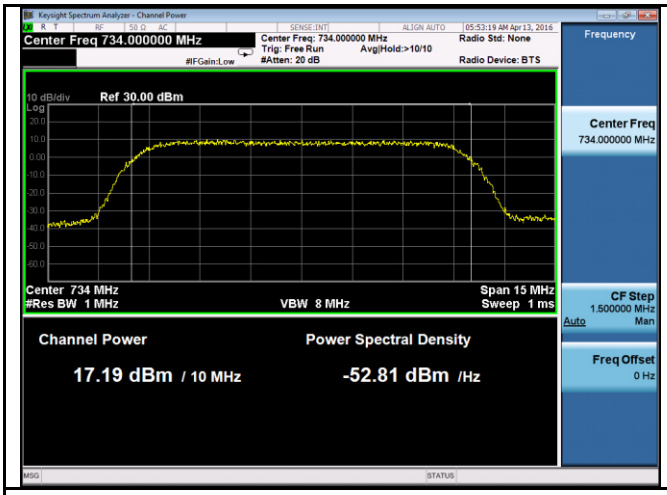


PWR- Band12-QPSK-10M BW-High CH-Port1

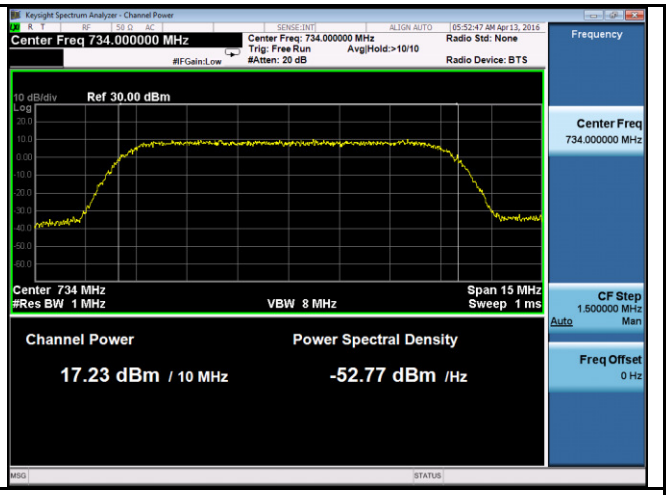


PWR- Band12-QPSK-10M BW-High CH-Port2

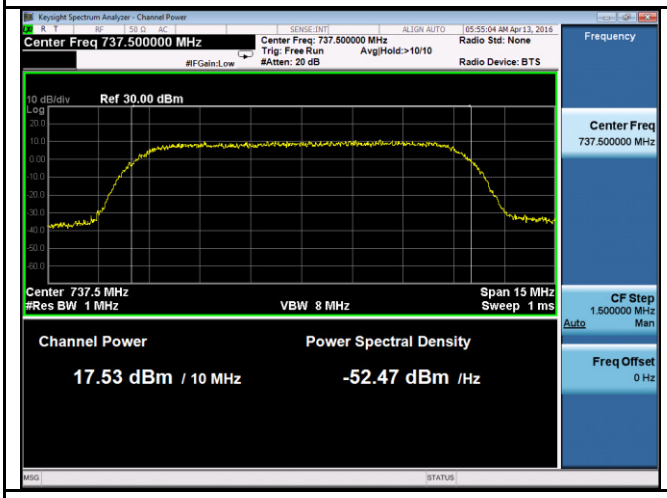
Test Plots for Band 12-64QAM-10MHz



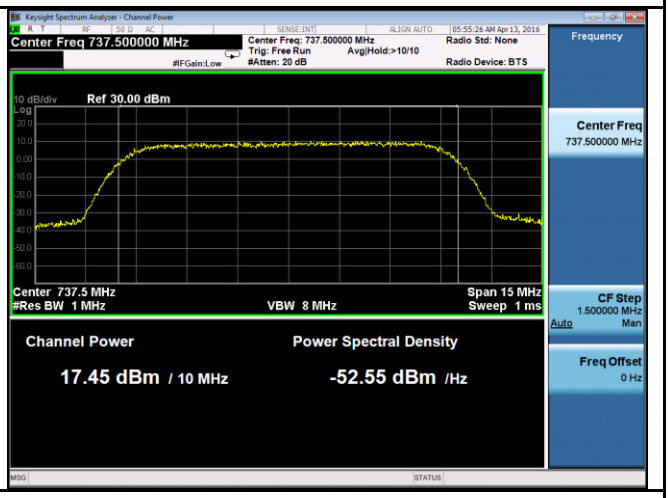
PWR- Band12-64QAM-10M BW-Low CH-Port1



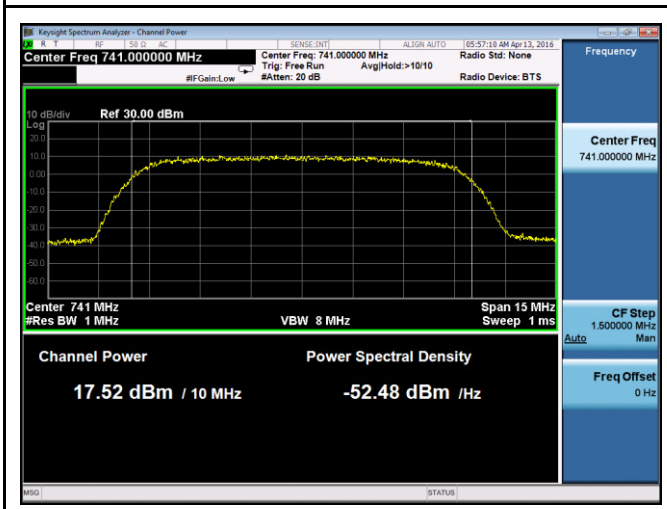
PWR- Band12-64QAM-10M BW-Low CH-Port2



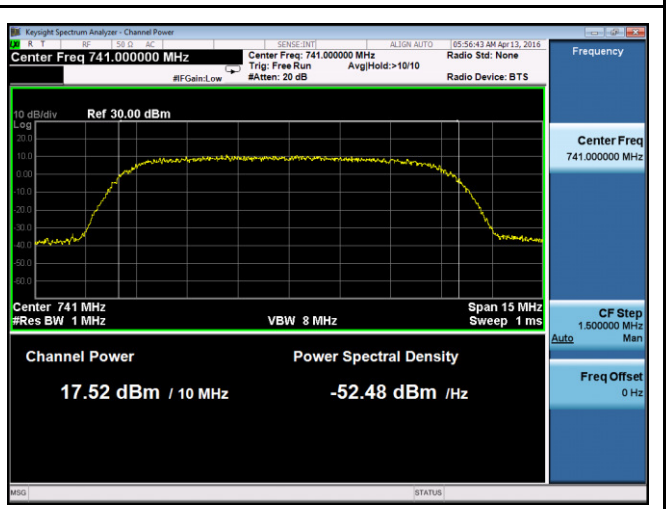
PWR- Band12-64QAM-10M BW-Mid CH-Port1



PWR- Band12-64QAM-10M BW-Mid CH-Port2



PWR- Band12-64QAM-10M BW-High CH-Port1

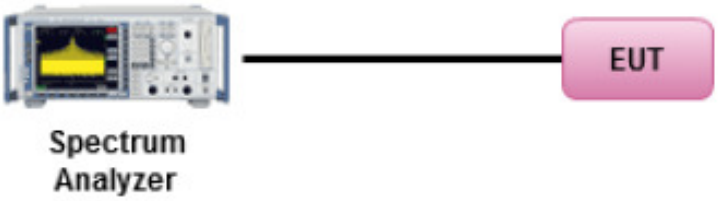


PWR- Band12-64QAM-10M BW-High CH-Port2

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	10/26/2015 – 11/02/2015 04/11/2016 – 04/15/2016	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 *Chen Ge* at *RF test site*.

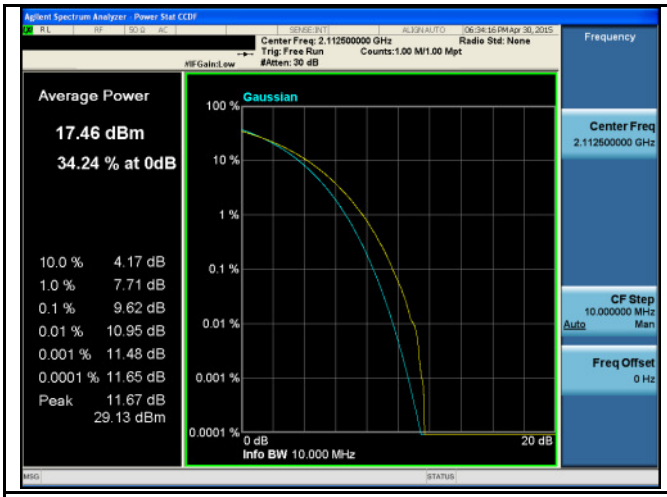
Test Data for LTE band 4:

Type	Channel	Frequency (MHz)	Peak-Average Ratio (dB)	Peak-Average Ratio (dB)
5MHz BW, QPSK	Low	2112.5	9.62	13
	Mid	2132.5	9.53	13
	High	2152.5	9.53	13
5MHz BW, 16QAM	Low	2112.5	9.54	13
	Mid	2132.5	9.95	13
	High	2152.5	9.51	13
5MHz BW, 64QAM	Low	2112.5	9.65	13
	Mid	2132.5	9.52	13
	High	2152.5	9.49	13
10MHz BW, QPSK	Low	2115.0	8.94	13
	Mid	2132.5	8.93	13
	High	2150.0	8.87	13
10MHz BW, 16QAM	Low	2115.0	8.98	13
	Mid	2132.5	8.93	13
	High	2150.0	8.93	13
10MHz BW, 64QAM	Low	2115.0	8.94	13
	Mid	2132.5	8.94	13
	High	2150.0	8.91	13
15MHz BW, QPSK	Low	2117.5	9.11	13
	Mid	2132.5	9.01	13
	High	2147.5	9.01	13
15MHz BW, 16QAM	Low	2117.5	8.94	13
	Mid	2132.5	8.82	13
	High	2147.5	8.88	13
15MHz BW, 64QAM	Low	2117.5	9.09	13
	Mid	2132.5	9.02	13
	High	2147.5	9.00	13
20MHz BW, QPSK	Low	2120.0	8.98	13
	Mid	2132.5	8.90	13
	High	2145.0	8.87	13
20MHz BW, 16QAM	Low	2120.0	8.95	13
	Mid	2132.5	8.91	13
	High	2145.0	8.88	13
20MHz BW, 64QAM	Low	2120.0	8.95	13
	Mid	2132.5	8.88	13
	High	2145.0	8.85	13

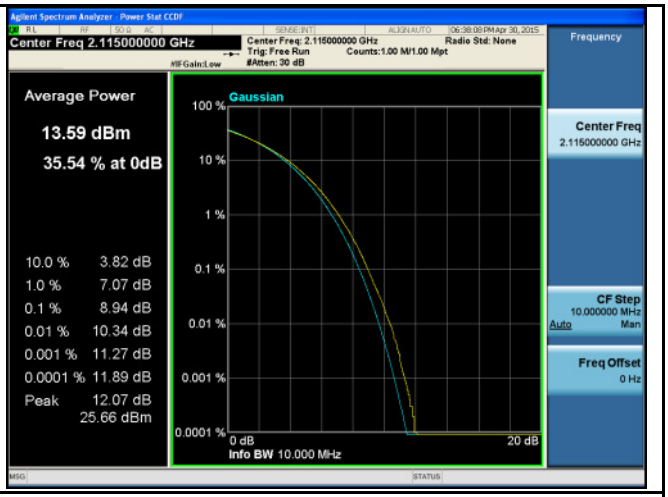
Test Data for LTE band 12:

Type	Channel	Frequency (MHz)	Peak-Average Ratio (dB)	Peak-Average Ratio (dB)
5MHz BW, QPSK	Low	731.5	10.12	13
	Mid	737.5	10.08	13
	High	743.5	9.97	13
5MHz BW, 64QAM	Low	731.5	9.91	13
	Mid	737.5	9.83	13
	High	743.5	9.75	13
10MHz BW, QPSK	Low	734.0	9.87	13
	Mid	737.5	9.72	13
	High	741.0	9.87	13
10MHz BW, 64QAM	Low	734.0	10.02	13
	Mid	737.5	10.02	13
	High	741.0	9.89	13

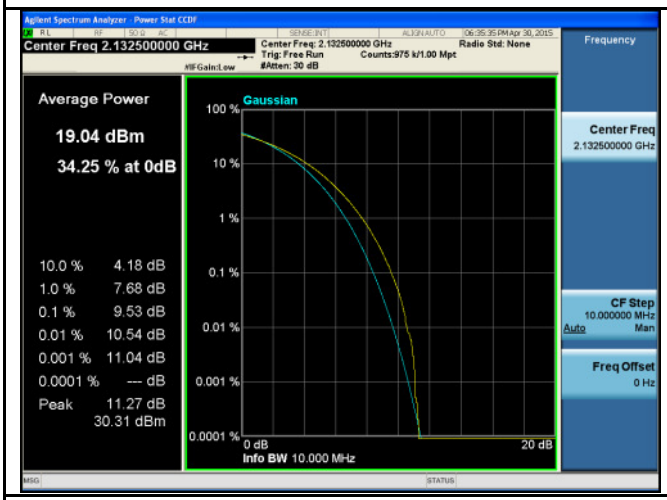
Test Plots for LTE band 4:



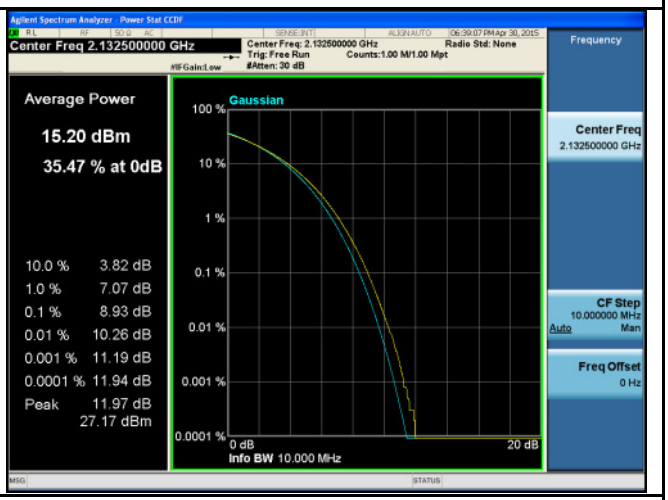
PK-AV-Ratio-Band4-QPSK-5M BW-Low



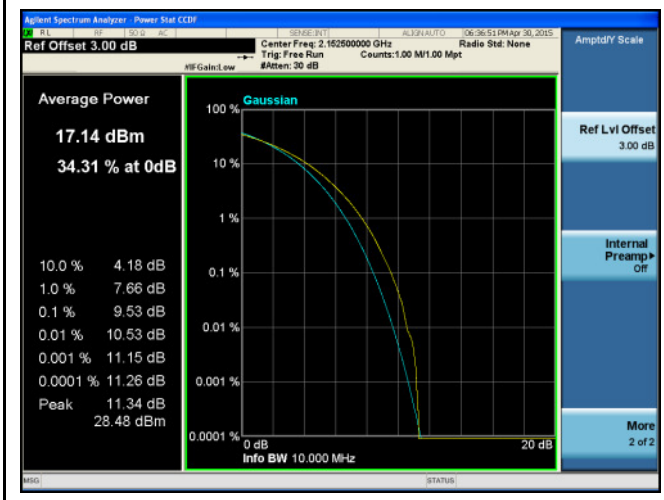
PK-AV-Ratio-Band4-QPSK-10M BW-Low



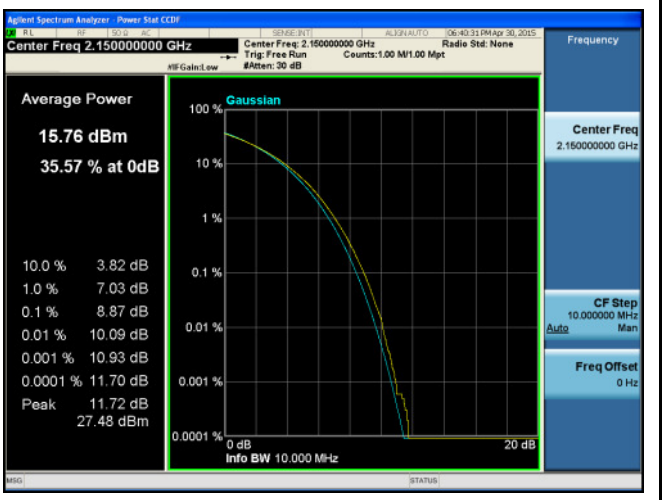
PK-AV-Ratio-Band4-QPSK-5M BW-Mid



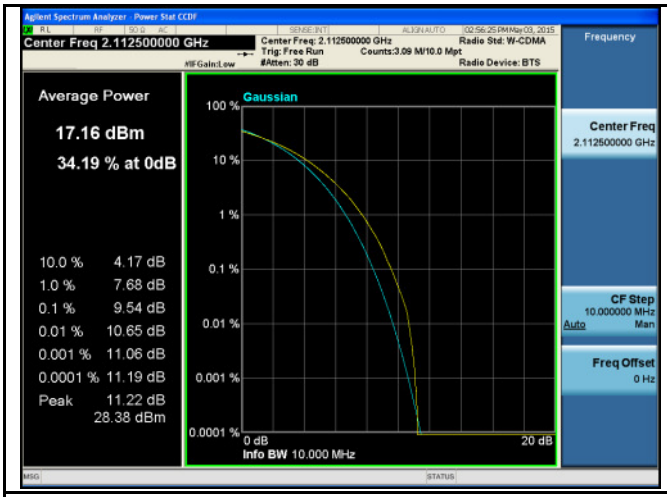
PK-AV-Ratio-Band4-QPSK-10M BW-Mid



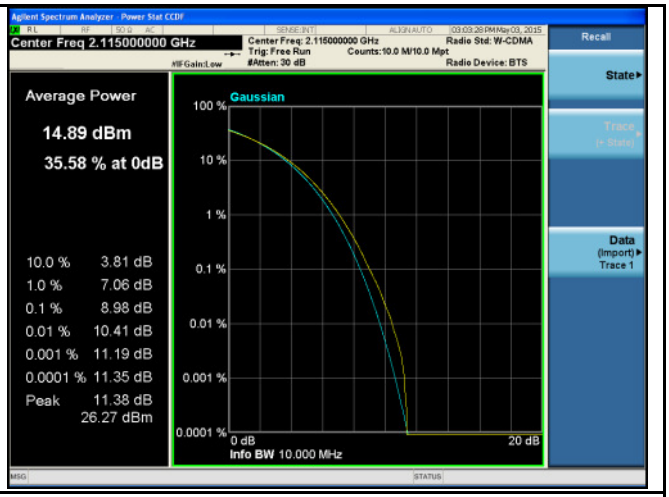
PK-AV-Ratio-Band4-QPSK-5M BW-High



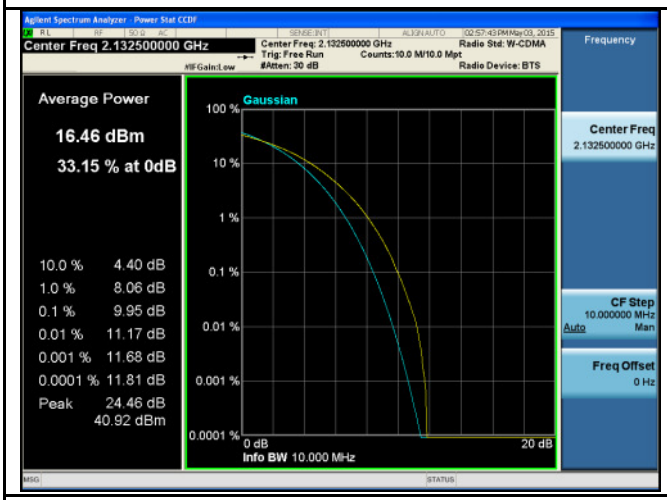
PK-AV-Ratio-Band4-QPSK-10M BW-High



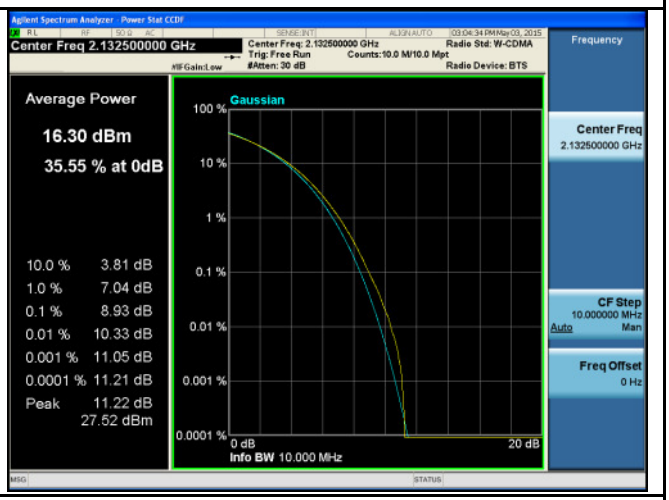
PK-AV-Ratio-Band4-16QAM-5M BW-Low



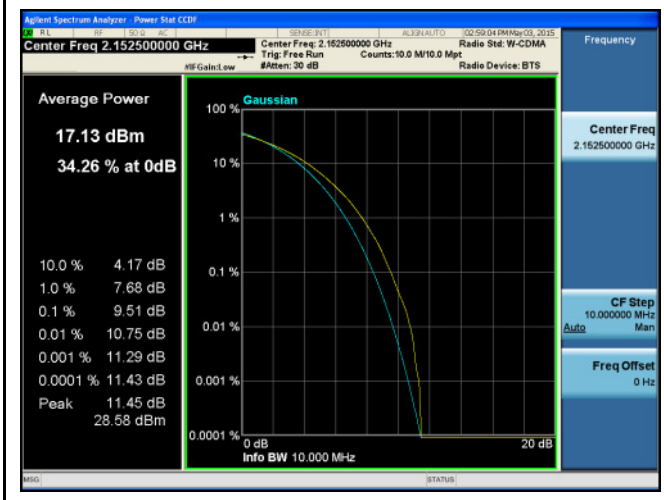
PK-AV-Ratio-Band4-16QAM-10M BW-Low



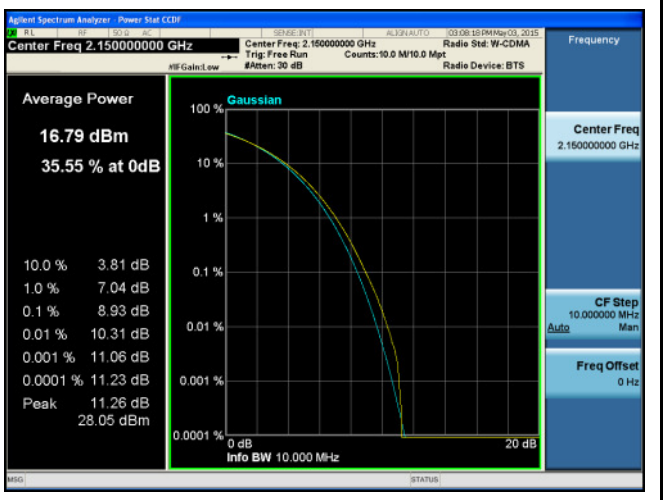
PK-AV-Ratio-Band4-16QAM-5M BW-Mid



PK-AV-Ratio-Band4-16QAM-10M BW-Mid



PK-AV-Ratio-Band4-16QAM-5M BW-High



PK-AV-Ratio-Band4-16QAM-10M BW-High