RF TEST REPORT

SIEMIC
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Report No.: FCC_RF_SL15083101-SPC-042_0413
Supersede Report No.: NONE

Applicant	SpiderCloud Wireless, Inc.
Product Name	SpiderCloud Radio Node
Model No.	SCRN-310-0413-E
Test Standard	47CFR Part27
Test Method	TIA-603-D: 2009
FCC ID	Y47RN310B4B13L
Date of test	02/13/2014 - 04/13/2015
Issue Date	09/23/2015
Test Result	Pass Fail
Equipment complied with the specification	[x]
Equipment did not comply with the specification	[ ]

Nima Molaei	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.

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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

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1 Report Revision History

Report No.	Report Version	Description	Issue Date
FCC_RF_SL15083101-SPC-042_0413	None	Original	09/23/2015

2 Executive Summary

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

Company: SpiderCloud Wireless, Inc.
Product: SpiderCloud Radio Node
Model: SCRN-310-0413-E

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	408 E. Plumeria Drive,San Jose, CA 95134
Manufacturer Name	SpiderCloud Wireless, Inc.
Manufacturer Address	408 E. Plumeria Drive,San Jose, CA 95134

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 Radio Node
Model No.	SCRN-310-0413-E
Trade Name	SpiderCloud
Serial No.	13338A10454
Input Power	56VDC (PoE)
Power Adapter Manu/Model	POE36U-1AT-R
Power Adapter SN	-
Hardware version	-
Software version	-
Date of EUT received	2/10/2014
Equipment Class/ Category	PCB, TNB
Operating Frequencies	LTE: TX (746 MHz to 756 MHz), LTE: RX (777 MHz to 787 MHz) LTE: TX (2110 MHz to 2155 MHz), LTE: RX (1710 MHz to 1755 MHz)
Port/Connectors	RJ45 (PoE)
Remark	NONE

6.2 Radio Description

Item	LTE	LTE
Operating Band /Radio Type	LTE Band 4	LTE Band 13
Bandwidth	5MHz, 10 MHz, 15MHz, 20 MHz	10 MHz
Modulation	QPSK/16QAM/64QAM	QPSK/16QAM/64QAM
Antenna Type	External Omni-directional antenna	External 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: 746 MHz to 756 MHz RX: 777 MHz to 787 MHz
Note: Only 1 single channel is used on LTE Band 13. It's mid channel with TX frequency at 751MHz.		

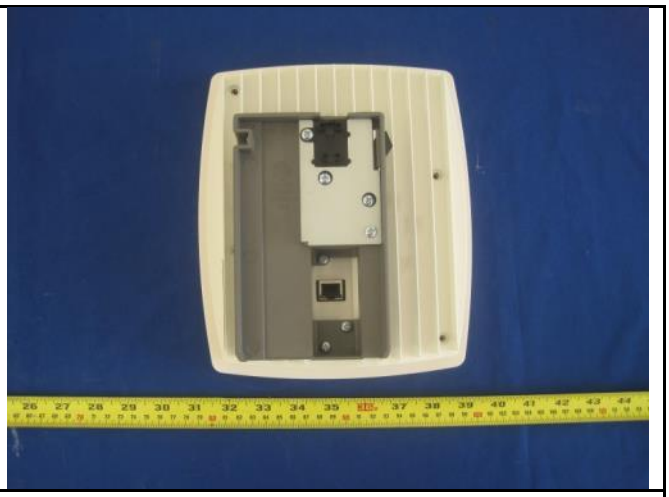
6.3 EUT test modes/configuration Description

Test mode

Final Test Mode		Note
Final_test_mode_1	Continuous transmission, 5MHz, QPSK, Low CH	LTE-Band4
Final_test_mode_2	Continuous transmission, 5MHz, QPSK, Mid CH	LTE-Band4
Final_test_mode_3	Continuous transmission, 5MHz, QPSK, High CH	LTE-Band4
Final_test_mode_4	Continuous transmission, 10MHz, QPSK, Low CH	LTE-Band4
Final_test_mode_5	Continuous transmission, 10MHz, QPSK, Mid CH	LTE-Band4
Final_test_mode_6	Continuous transmission, 10MHz, QPSK, High CH	LTE-Band4
Final_test_mode_7	Continuous transmission, 15MHz, QPSK, Low CH	LTE-Band4
Final_test_mode_8	Continuous transmission, 15MHz, QPSK, Mid CH	LTE-Band4
Final_test_mode_9	Continuous transmission, 15MHz, QPSK, High CH	LTE-Band4
Final_test_mode_10	Continuous transmission, 20MHz, QPSK, Low CH	LTE-Band4
Final_test_mode_11	Continuous transmission, 20MHz, QPSK, Mid CH	LTE-Band4
Final_test_mode_12	Continuous transmission, 20MHz, QPSK, High CH	LTE-Band4
Final_test_mode_13	Continuous transmission, 5MHz, 64QAM, Low CH	LTE-Band4
Final_test_mode_14	Continuous transmission, 5MHz, 64QAM, Mid CH	LTE-Band4
Final_test_mode_15	Continuous transmission, 5MHz, 64QAM, High CH	LTE-Band4
Final_test_mode_16	Continuous transmission, 10MHz, 64QAM, Low CH	LTE-Band4
Final_test_mode_17	Continuous transmission, 10MHz, 64QAM, Mid CH	LTE-Band4
Final_test_mode_18	Continuous transmission, 10MHz, 64QAM, High CH	LTE-Band4
Final_test_mode_19	Continuous transmission, 15MHz, 64QAM, Low CH	LTE-Band4
Final_test_mode_20	Continuous transmission, 15MHz, 64QAM, Mid CH	LTE-Band4
Final_test_mode_21	Continuous transmission, 15MHz, 64QAM, High CH	LTE-Band4
Final_test_mode_22	Continuous transmission, 20MHz, 64QAM, Low CH	LTE-Band4
Final_test_mode_23	Continuous transmission, 20MHz, 64QAM, Mid CH	LTE-Band4
Final_test_mode_24	Continuous transmission, 20MHz, 64QAM, High CH	LTE-Band4
Final_test_mode_25	Continuous transmission, 10MHz, QPSK, Mid CH	LTE-Band13
Final_test_mode_26	Continuous transmission, 10MHz, 16QAM, Mid CH	LTE-Band13
Final_test_mode_27	Continuous transmission, 10MHz, 64QAM, Mid CH	LTE-Band13
Remark: NONE		

6.4 EUT Photos – External

Top View



Bottom View

Front View

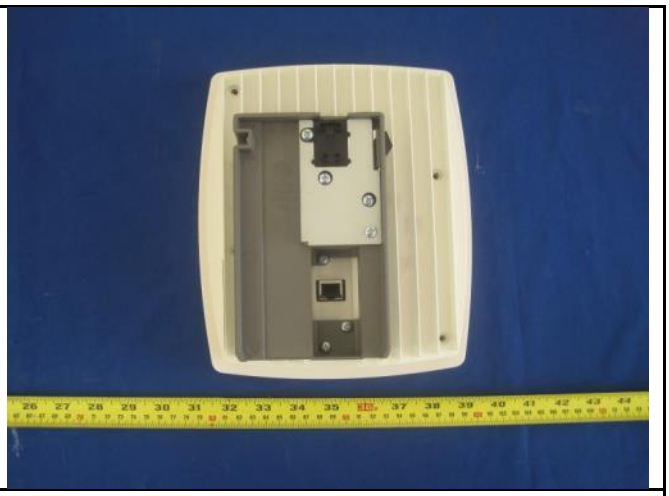
Rear View

Left Side View

Right Side View

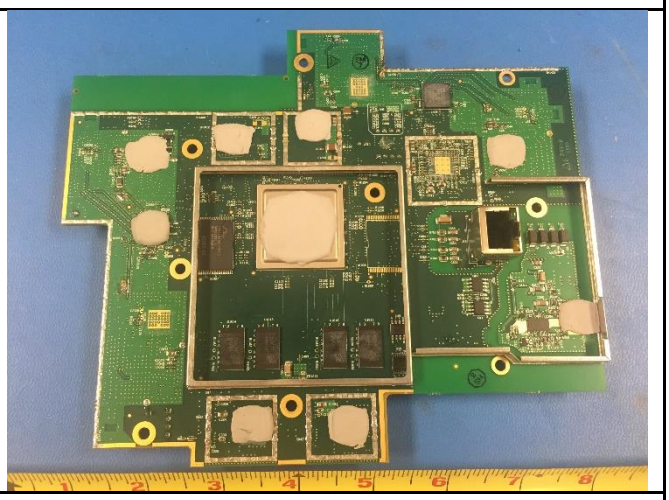
6.5 EUT Photos - Internal

Top View Cover Open



Rear View Top Cover Off

Main PCB - Top View

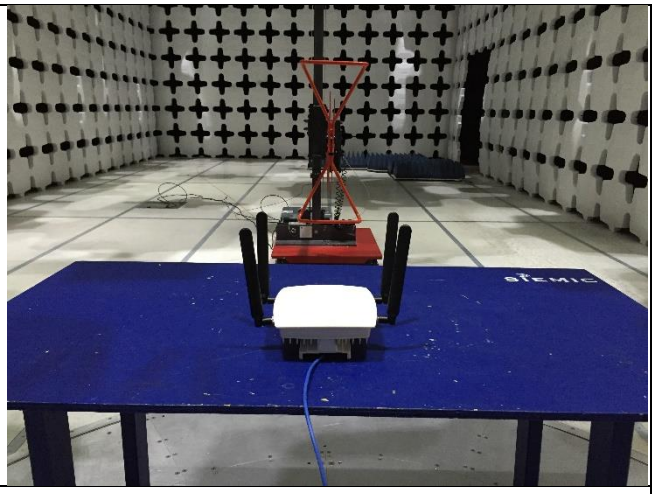


Main PCB - Bottom View

Antenna View

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	-

7.2 Test Software Description

Test Item	Software	Description
RF testing	ePview	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	47CFR24.232, 47CFR27.50	FCC	TIA-603-D: 2009	☒ Pass ☐ N/A
Occupied Bandwidth	FCC	47CFR24.238(a), 47CFR27.53	FCC	TIA-603-D: 2009	☒ Pass ☐ N/A
Peak-Average Ratio	FCC	47CFR24.232, 47CFR27.50	FCC	TIA-603-D: 2009	☒ Pass ☐ N/A
Spurious and harmonic Emission at antenna port	FCC	47CFR2.1051,47CFR24.238, 47CFR27.53	FCC	TIA-603-D: 2009	☒ Pass ☐ N/A
Band Edge	FCC	47CFR2.1053,47CFR24.238, 47CFR27.53	FCC	TIA-603-D: 2009	☒ Pass ☐ N/A
Radiated spurious and harmonic emission	FCC	47CFR2.1053,47CFR24.238, 47CFR27.53	FCC	TIA-603-D: 2009	☒ Pass ☐ N/A
Frequency stability	FCC	47CFR2.1055, 47CFR24.135, 47CFR27.54	FCC	TIA-603-D: 2009	☒ 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

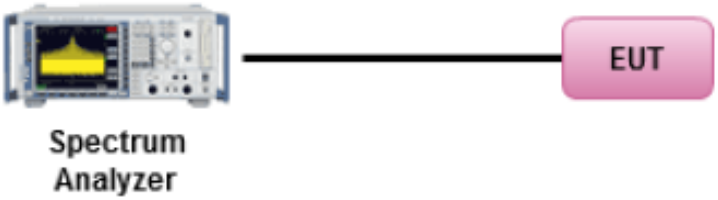
Test Item	Frequency Range	Description	Uncertainty
Band Edge and Radiated Spurious Emissions	30MHz – 1GHz	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	+5.6dB/-4.5dB
Band Edge and Radiated Spurious Emissions	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
47CFR 22.913(a)	-	The maximum effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 Watts.	☐
47CFR24.232	-	Mobile/portable stations are limited to 2 watts EIRP peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.	☐
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	03/03/2014 – 03/10/2014 03/03/2015 – 04/13/2015	Environmental condition	Temperature Relative Humidity Atmospheric Pressure	22°C 48% 1008mbar
Remark	NONE			
Result	☒ Pass ☐ Fail			

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test Data for LTE band 4

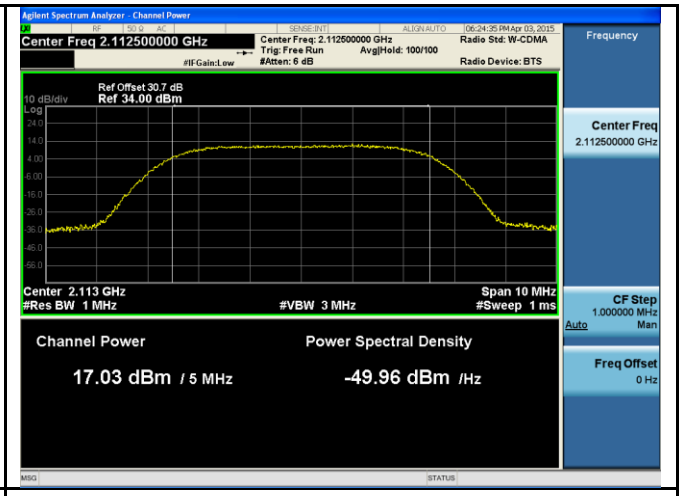
Type	Channel	Frequency (MHz)	Measured PW –Port 1(dBm)	Measured PW –Port 2(dBm)	Combined Power (dBm)	Antenna Gain (dBi)	E.I.R.P (dBm)
5MHz BW, QPSK	Low	2112.5	18.87	17.03	21.06	2	23.06
	Mid	2132.5	20.42	20.72	23.58	2	25.58
	High	2152.5	20.79	19.13	23.05	2	25.05
5MHz BW, 64QAM	Low	2112.5	18.81	17.07	21.04	2	23.04
	Mid	2132.5	20.48	20.81	23.66	2	25.66
	High	2152.5	20.67	19.18	23.00	2	25.00
10MHz BW, QPSK	Low	2115	20.58	20.69	23.65	2	25.65
	Mid	2132	20.87	21.09	23.99	2	25.99
	High	2150	21.23	20.97	24.11	2	26.11
10MHz BW, 64QAM	Low	2115	21.18	21.25	24.23	2	26.23
	Mid	2132	21.06	21.19	24.14	2	26.14
	High	2150	20.97	20.69	23.84	2	25.84
15MHz BW, QPSK	Low	2117.5	19.56	18.83	22.22	2	24.22
	Mid	2132.5	21.11	21.25	24.19	2	26.19
	High	2147.5	22.14	20.49	24.40	2	26.40
15MHz BW, 64QAM	Low	2117.5	19.47	18.71	22.12	2	24.12
	Mid	2132.5	21.13	21.29	24.22	2	26.22
	High	2147.5	22.13	20.49	24.40	2	26.40
20MHz BW, QPSK	Low	2120	20.81	21.13	23.98	2	25.98
	Mid	2132	21.27	21.40	24.35	2	26.35
	High	2145	21.00	20.61	23.82	2	25.82
20MHz BW, 64QAM	Low	2120	20.93	21.26	24.11	2	26.11
	Mid	2132	20.87	21.01	23.95	2	25.95
	High	2145	21.06	20.62	23.86	2	25.86

Test Data for LTE band 13

Type	Channel	Frequency (MHz)	Measured PW –Port 1(dBm)	Measured PW –Port 2(dBm)	Max Power (dBm)	Antenna Gain (dBi)	E.I.R.P (dBm)
10M BW, QPSK	Mid	751	20.89	20.64	23.78	2	25.78
10M BW, 16QAM	Mid	751	21.14	20.88	24.02	2	26.02
10M BW, 64QAM	Mid	751	21.15	20.87	24.02	2	26.02

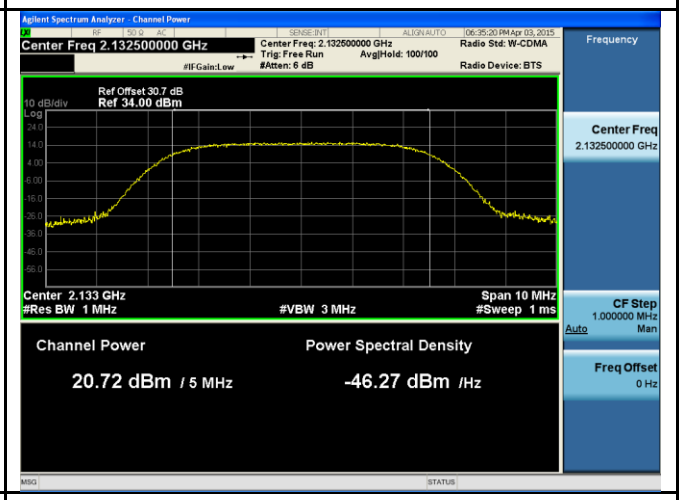
Test Plots for Band 4-QPSK-5MHz

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

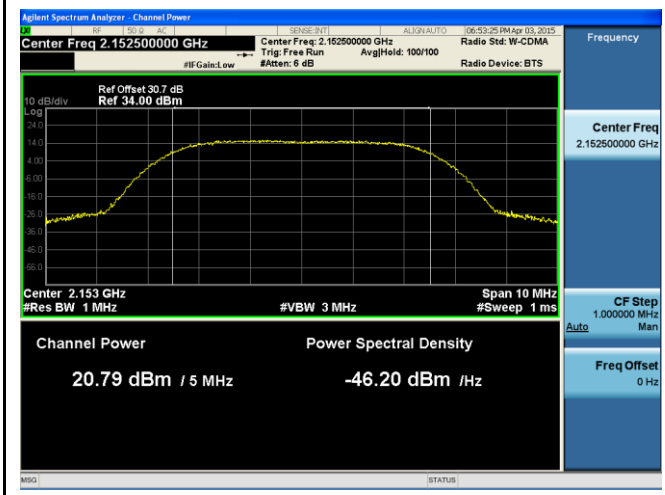


PWR-Band4-QPSK-5M BW-Low CH-Port2

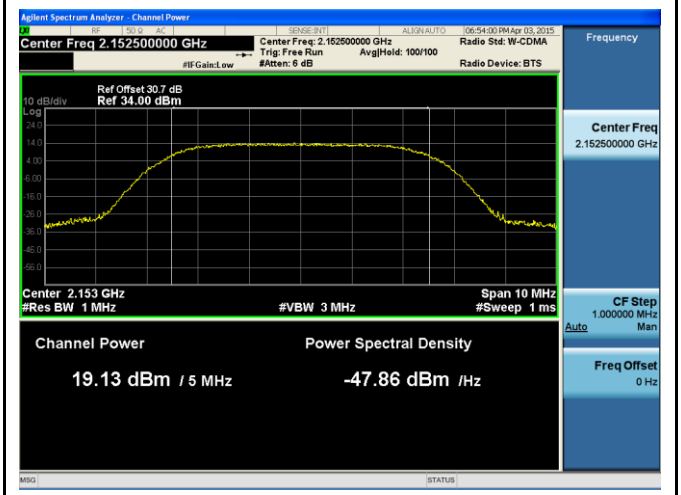
PWR-Band4-QPSK-5M BW-Mid CH-Port1



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

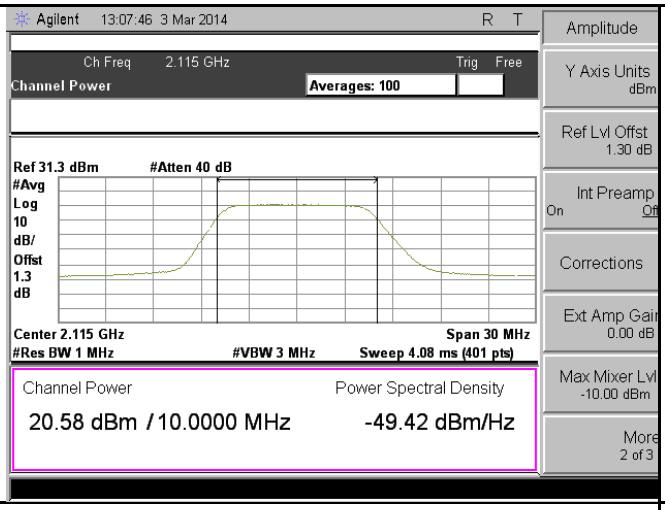


PWR-Band4-QPSK-5M BW-High CH-Port1

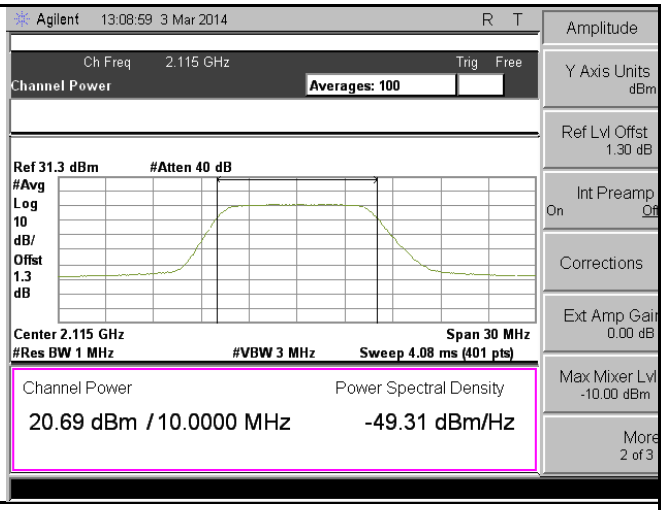


PWR-Band4-QPSK-5M BW-High CH-Port2

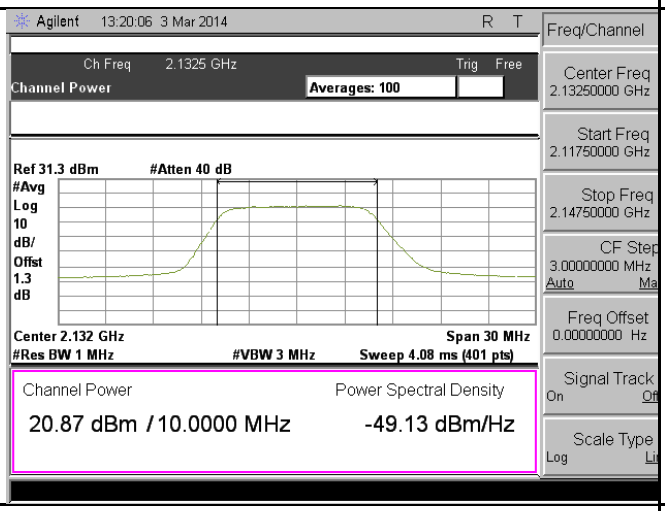
Test Plots for Band 4-QPSK-10MHz



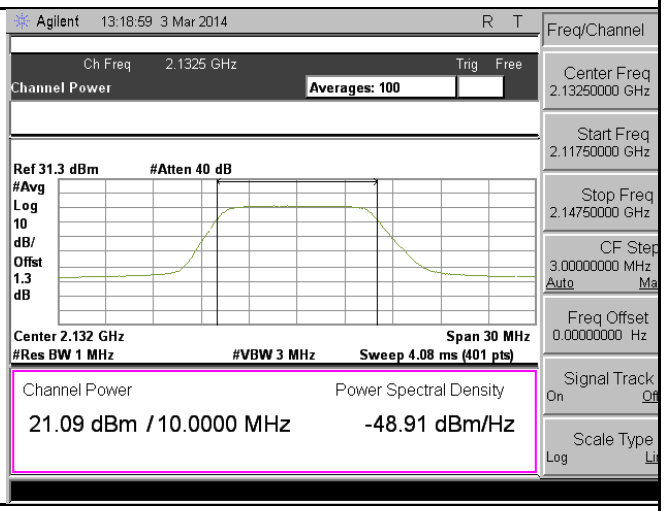
PWR-Band4-QPSK-10M BW-Low CH-Port1



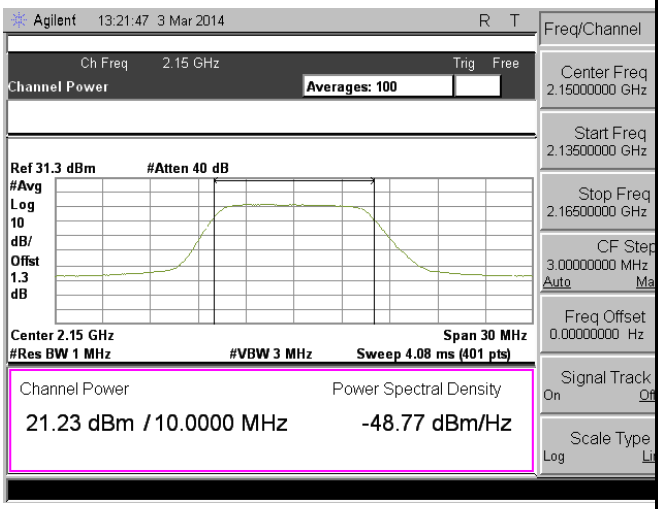
PWR-Band4-QPSK-10M BW-Low CH-Port2



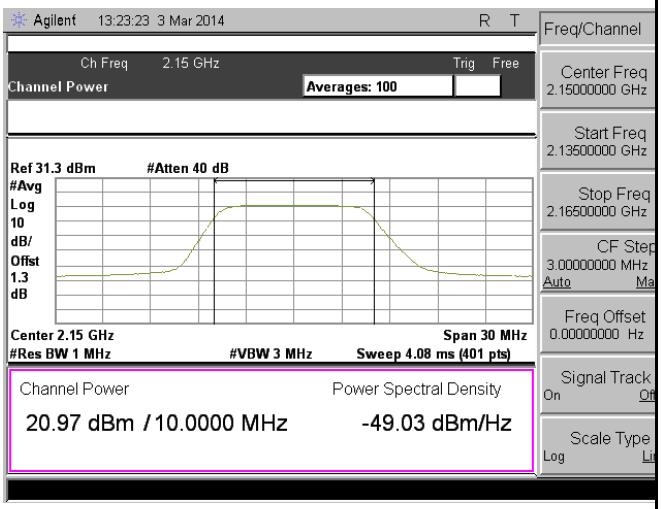
PWR-Band4-QPSK-10M BW-Mid CH-Port1



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

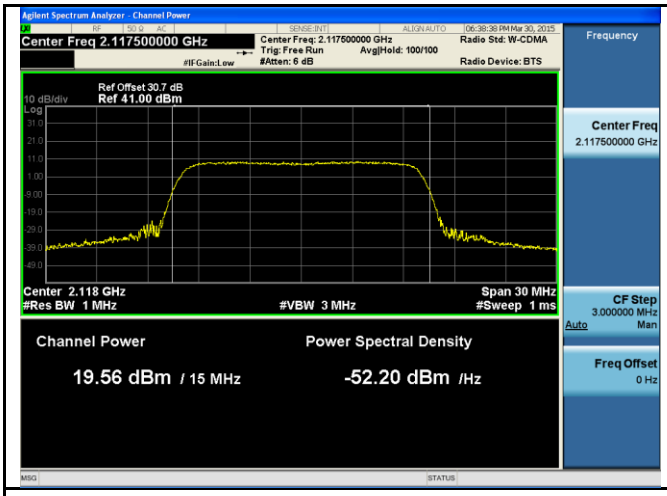


PWR-Band4-QPSK-10M BW-High CH-Port1

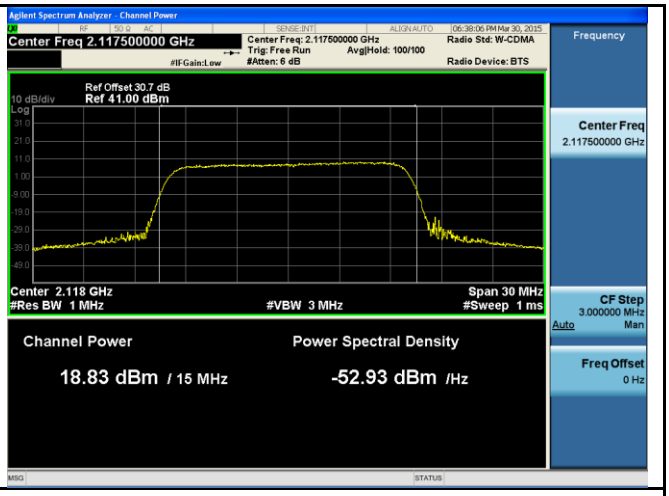


PWR-Band4-QPSK-10M BW-High CH-Port2

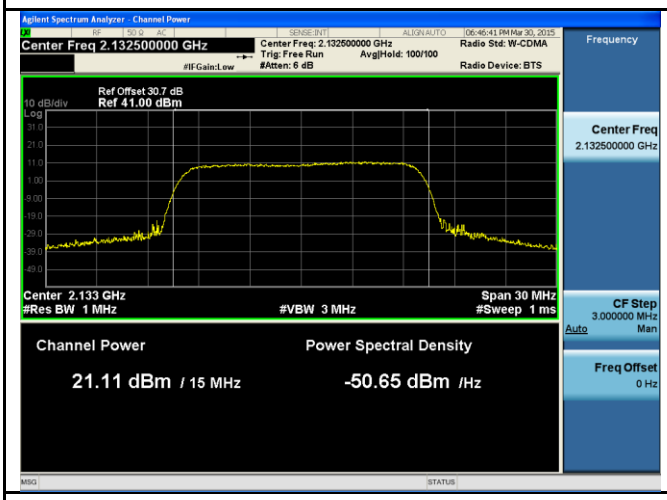
Test Plots for Band 4-QPSK-15MHz



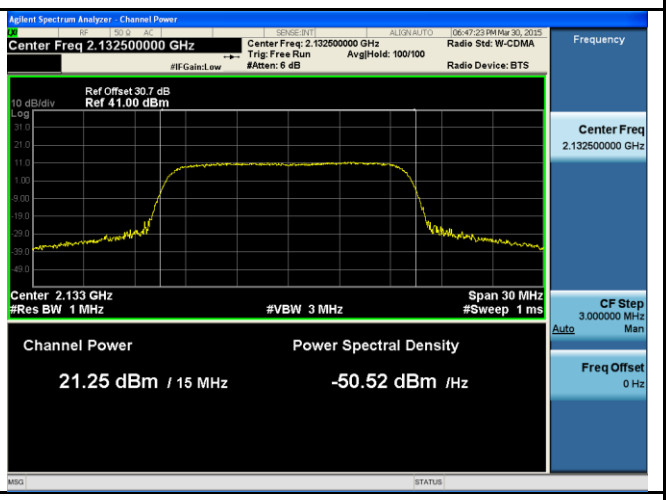
PWR-Band4-QPSK-15M BW-Low CH-Port1



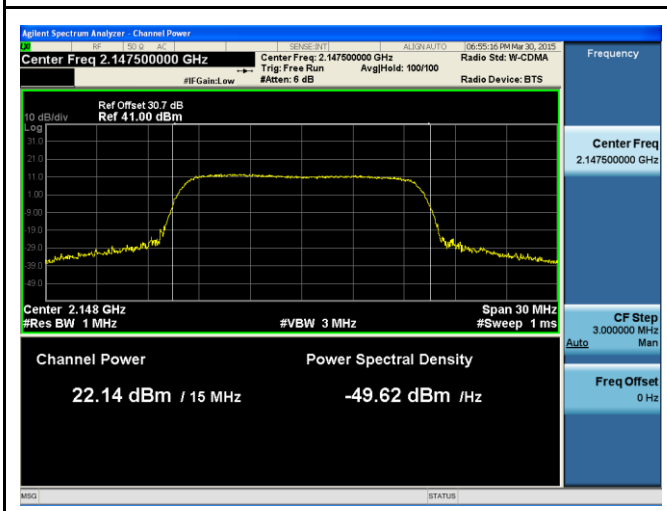
PWR-Band4-QPSK-15M BW-Low CH-Port2



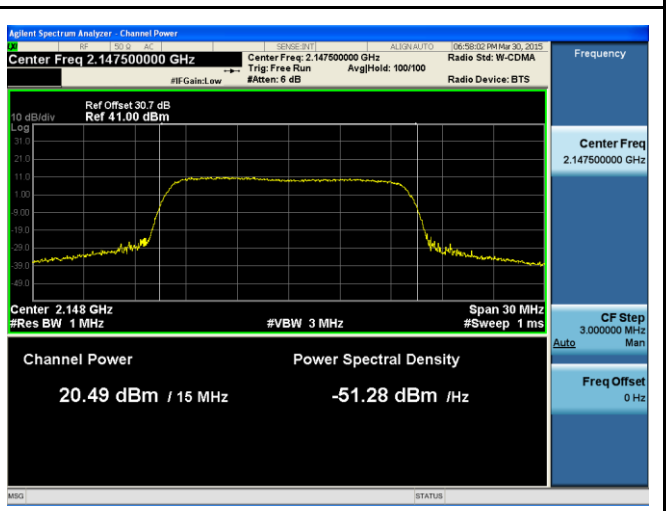
PWR-Band4-QPSK-15M BW-Mid CH-Port1



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

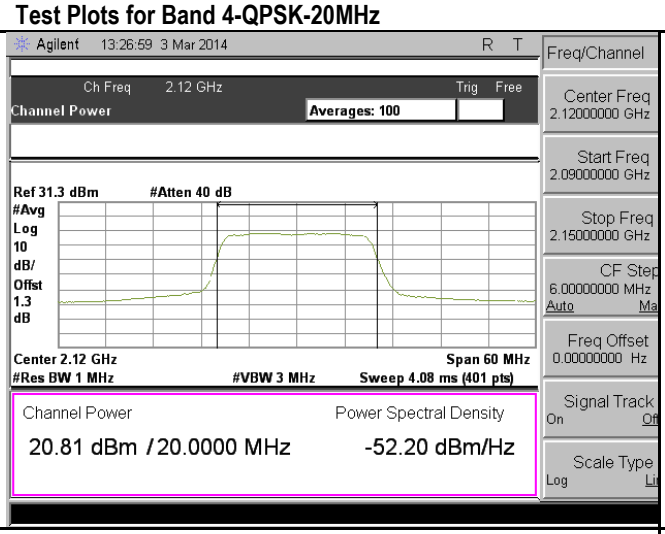


PWR-Band4-QPSK-15M BW-High CH-Port1

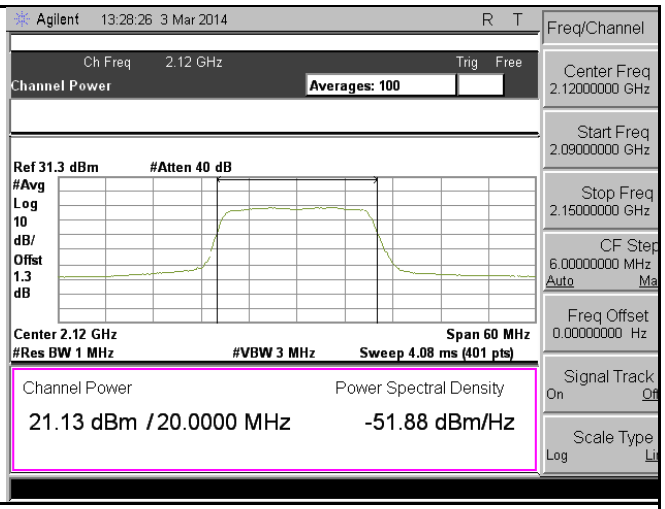


PWR-Band4-QPSK-15M BW-High CH-Port2

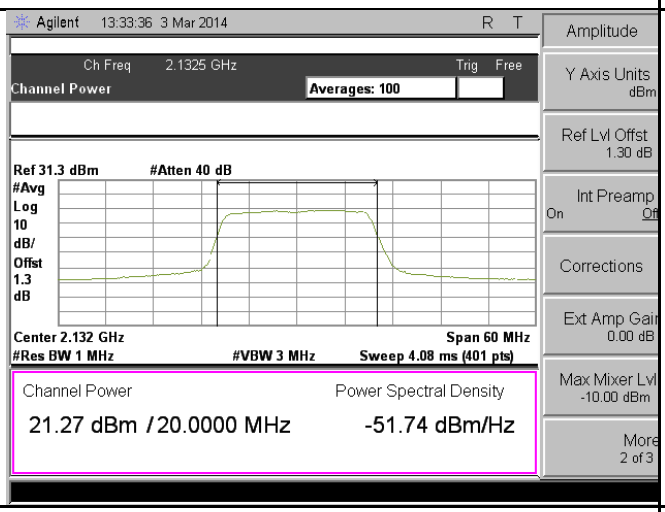
Test Plots for Band 4-QPSK-20MHz



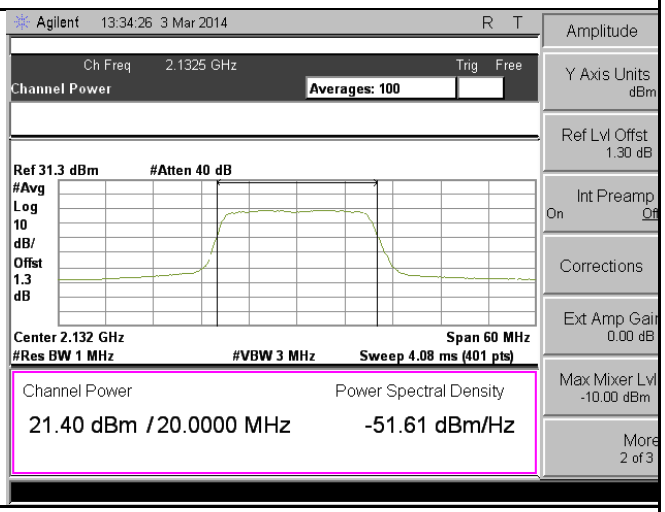
PWR-Band4-QPSK-20M BW-Low CH-Port1



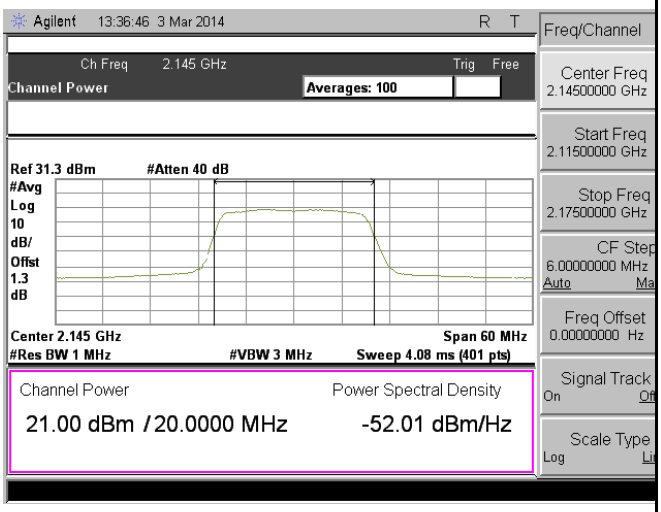
PWR-Band4-QPSK-20M BW-Low CH-Port2



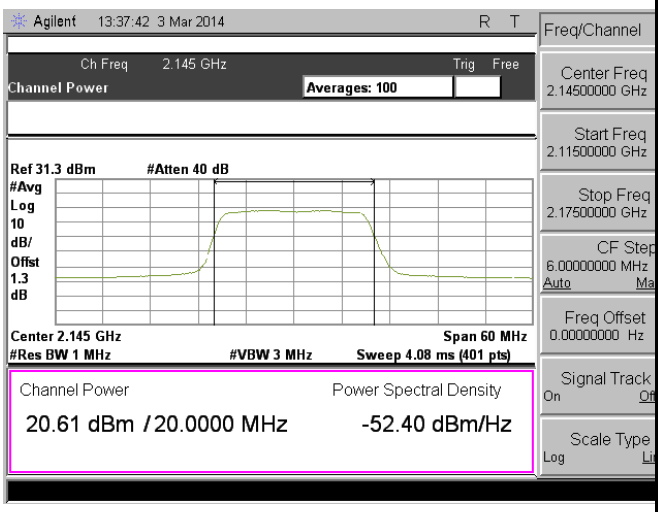
PWR-Band4-QPSK-20M BW-Mid CH-Port1



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

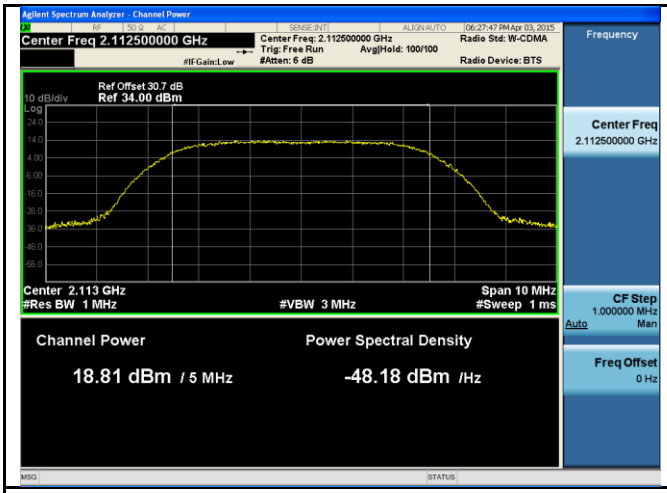


PWR-Band4-QPSK-20M BW-High CH-Port1

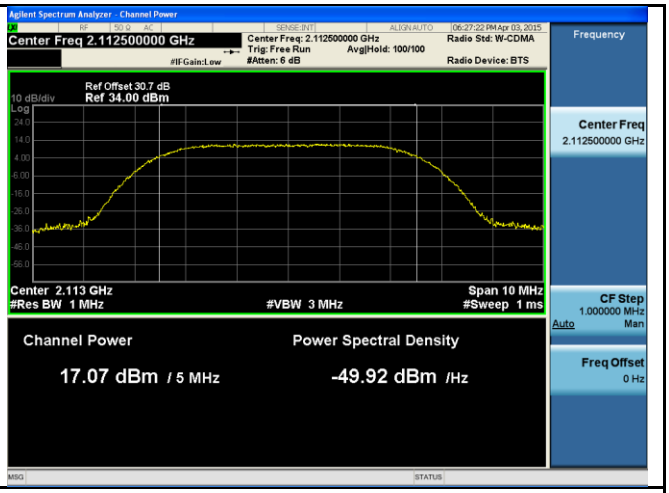


PWR-Band4-QPSK-20M BW-High CH-Port2

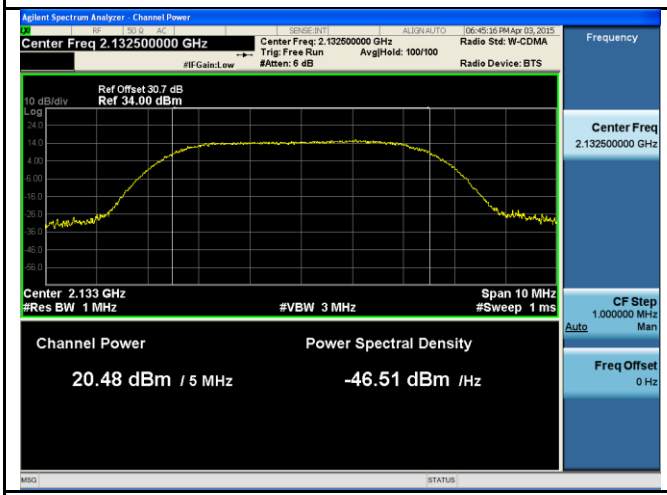
Test Plots for Band 4-64QAM-5MHz



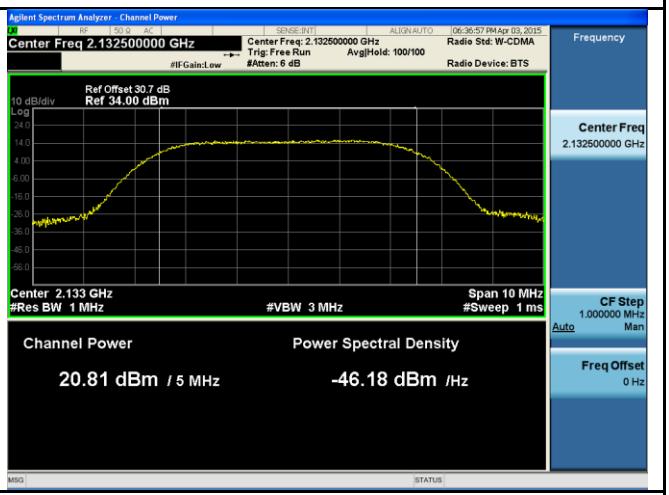
PWR-Band4-64QAM-5M BW-Low CH-Port1



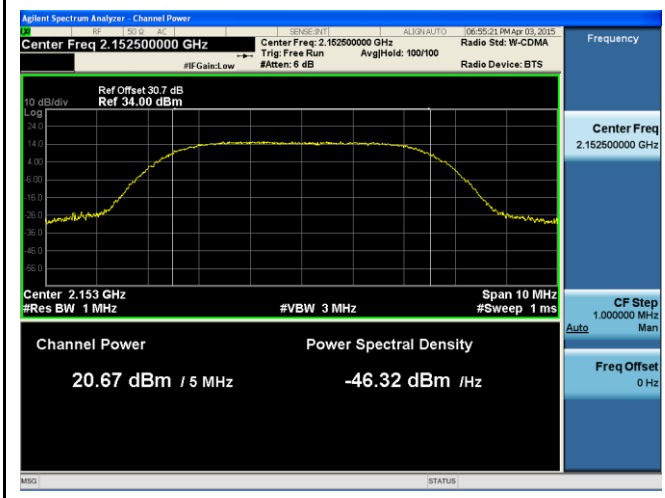
PWR-Band4-64QAM-5M BW-Low CH-Port2



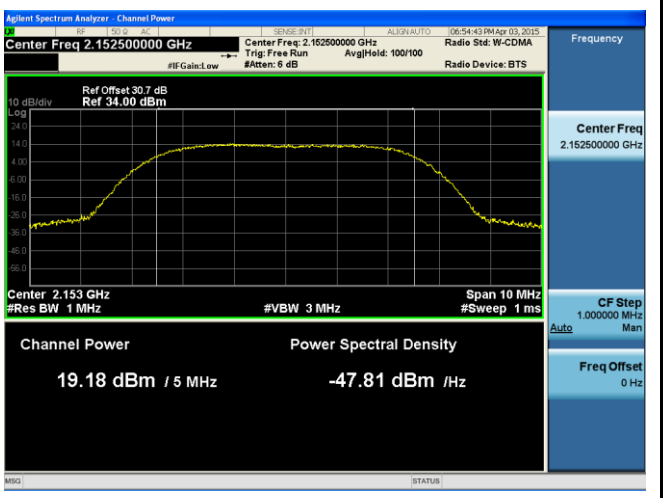
PWR-Band4-64QAM-5M BW-Mid CH-Port1



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

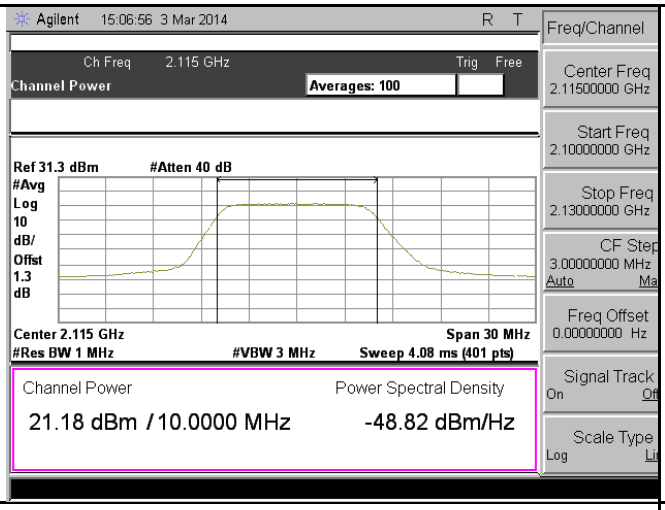


PWR-Band4-64QAM-5M BW-High CH-Port1

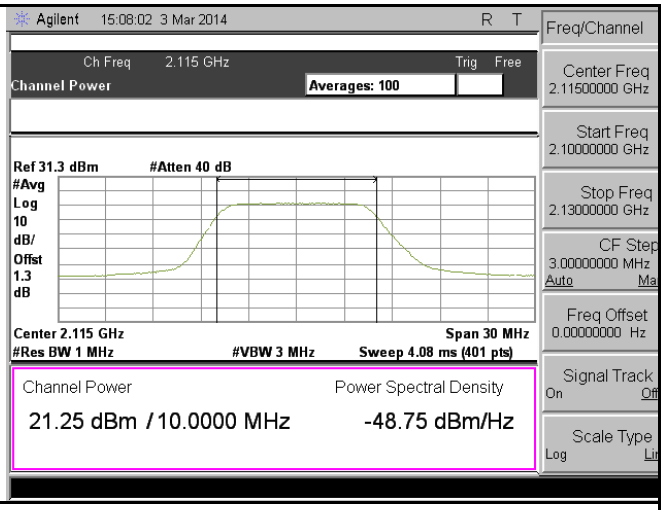


PWR-Band4-64QAM-5M BW-High CH-Port2

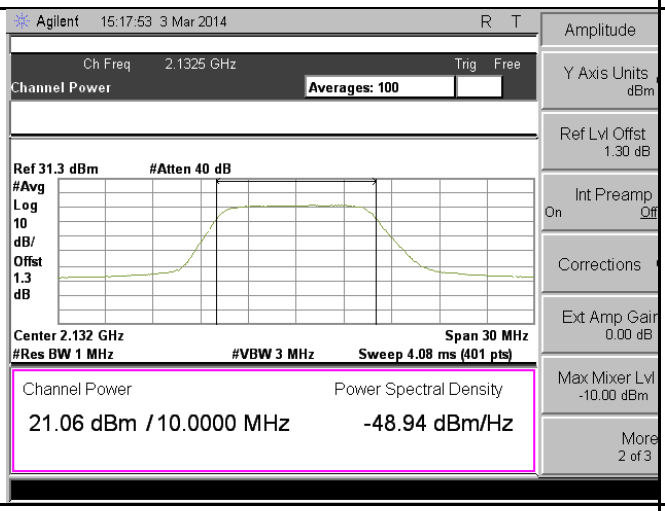
Test Plots for Band 4-64QAM-10MHz



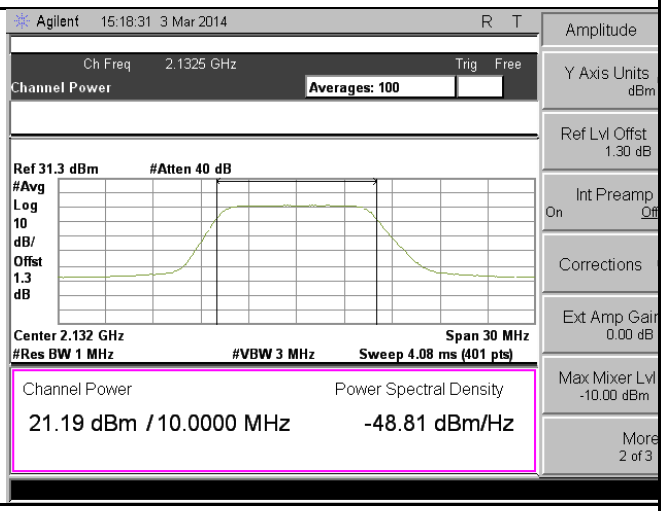
PWR-Band4-64QAM-10M BW-Low CH-Port1



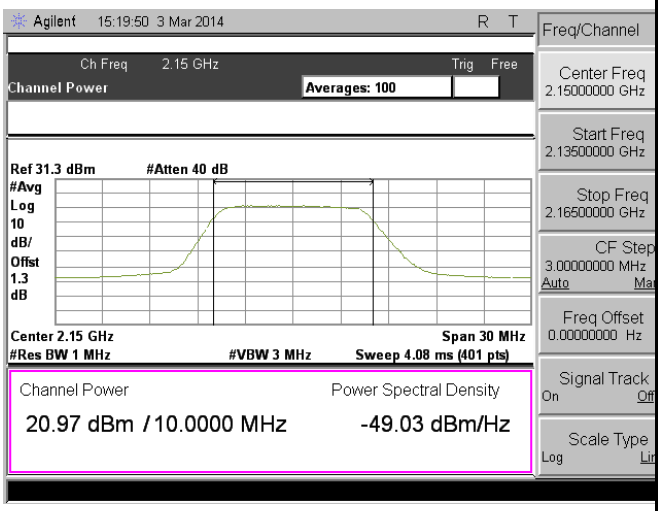
PWR-Band4-64QAM-10M BW-Low CH-Port2



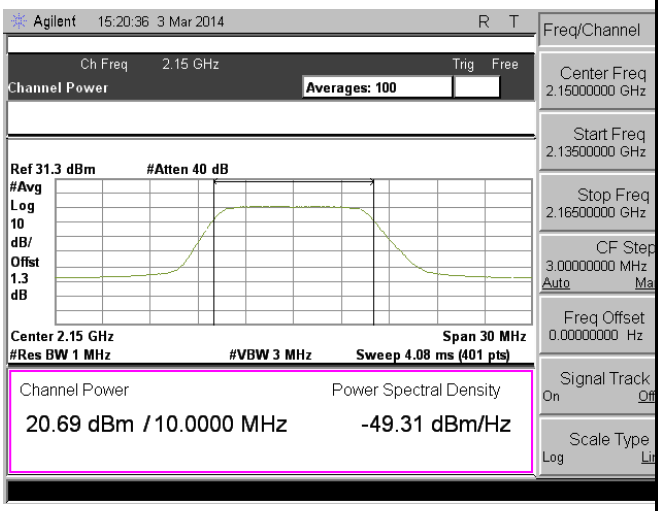
PWR-Band4-64QAM-10M BW-Mid CH-Port1



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

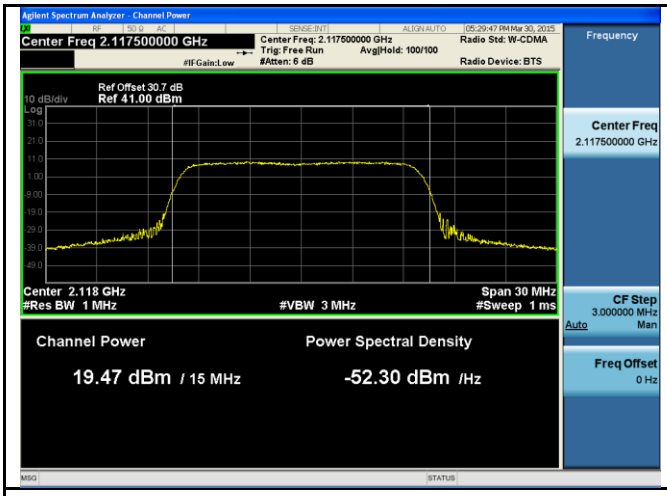


PWR-Band4-64QAM-10M BW-High CH-Port1

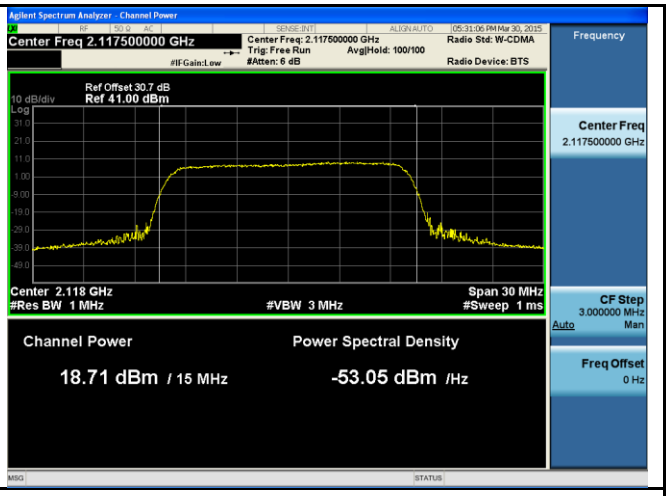


PWR-Band4-64QAM-10M BW-High CH-Port2

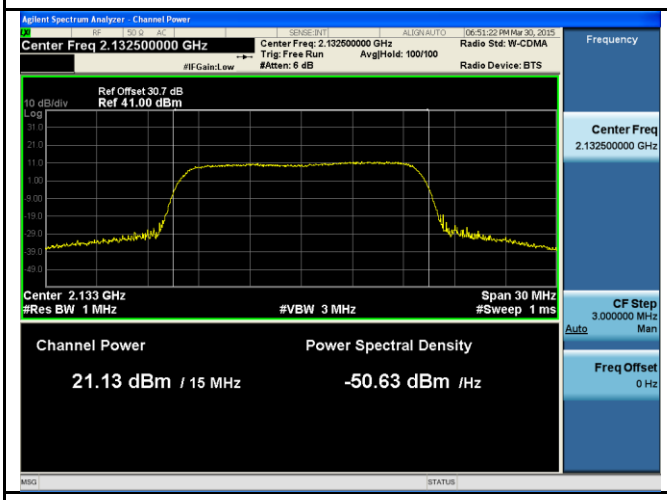
Test Plots for Band 4-64QAM-15MHz



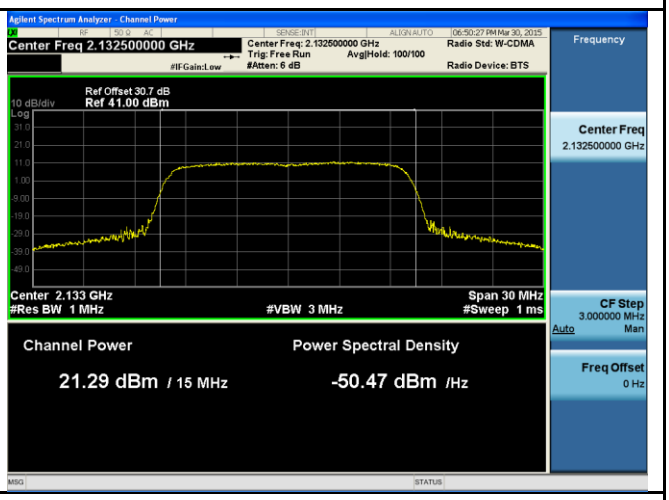
PWR-Band4-64QAM-15M BW-Low CH-Port1



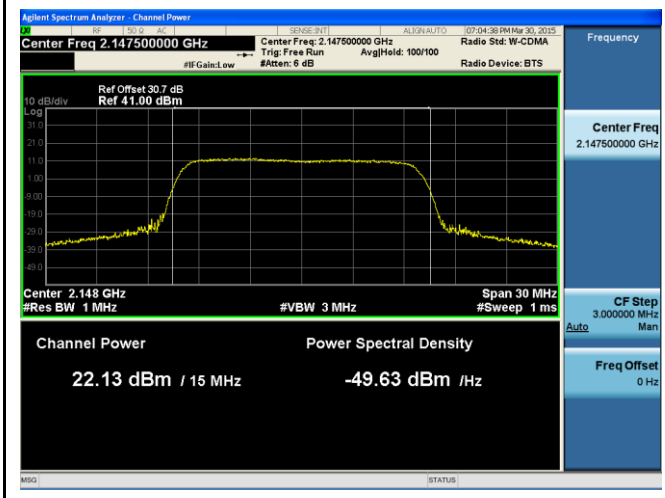
PWR-Band4-64QAM-15M BW-Low CH-Port2



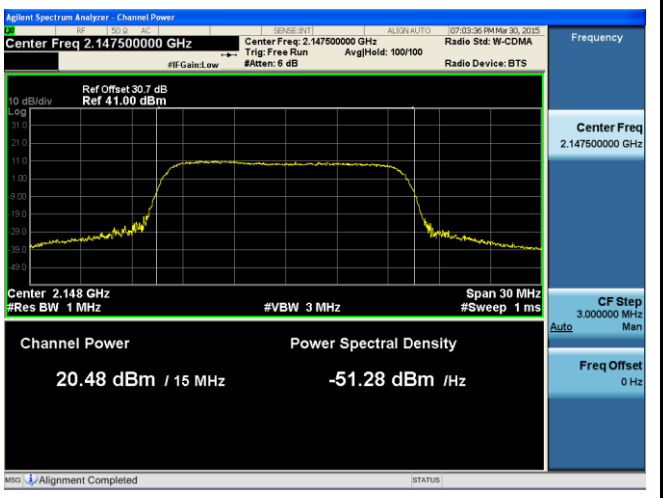
PWR-Band4-64QAM-15M BW-Mid CH-Port1



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

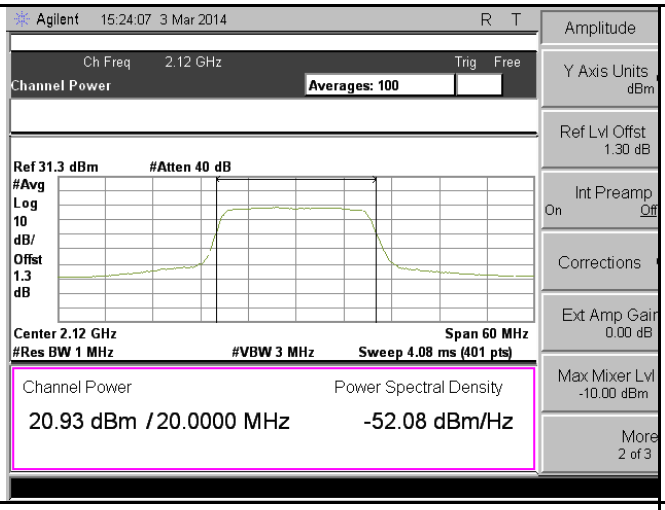


PWR-Band4-64QAM-15M BW-High CH-Port1

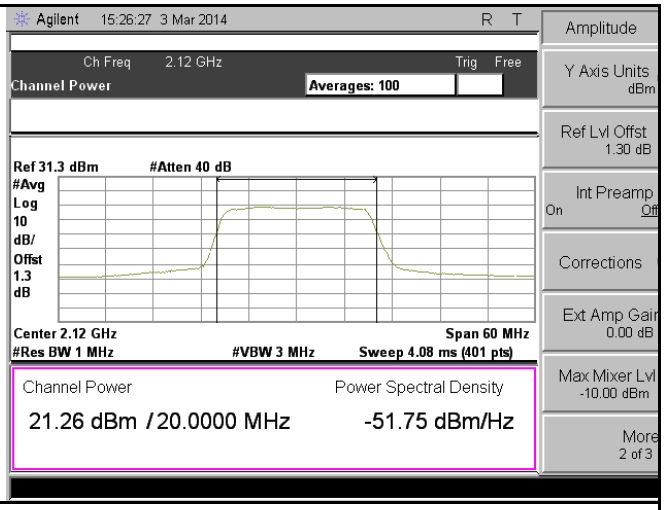


PWR-Band4-64QAM-15M BW-High CH-Port2

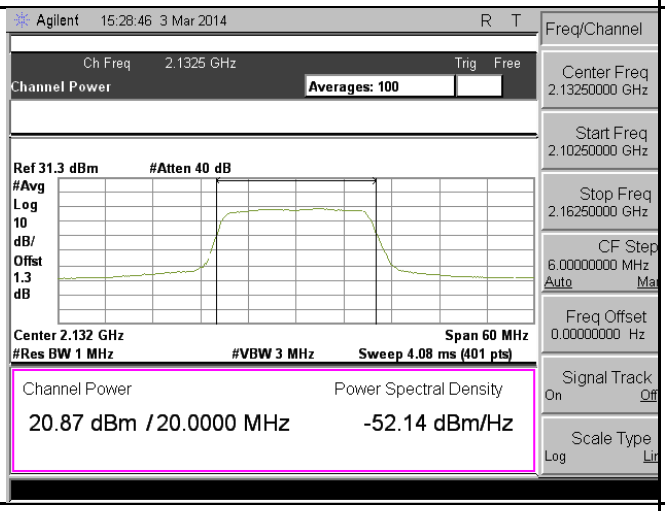
Test Plots for Band 4-64QAM-20MHz



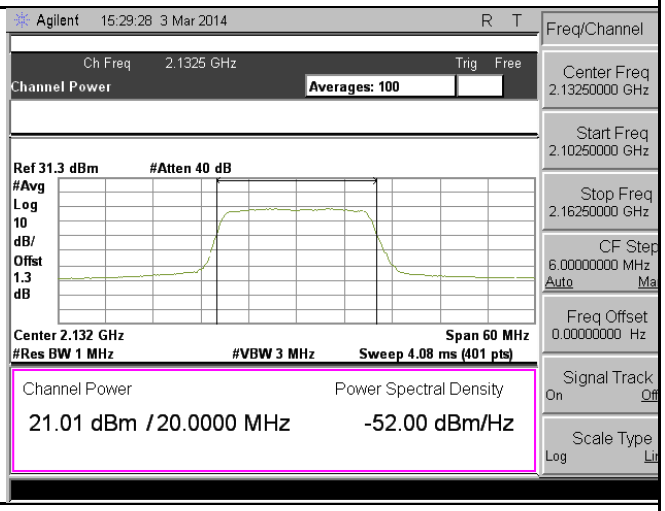
PWR-Band4-64QAM-20M BW-Low CH-Port1



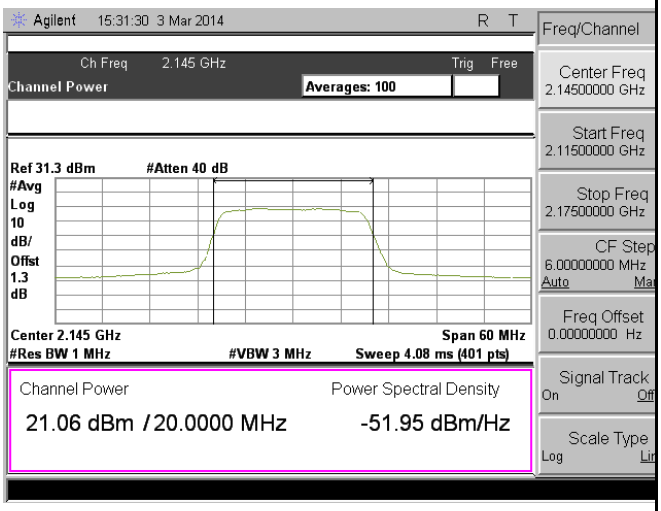
PWR-Band4-64QAM-20M BW-Low CH-Port2



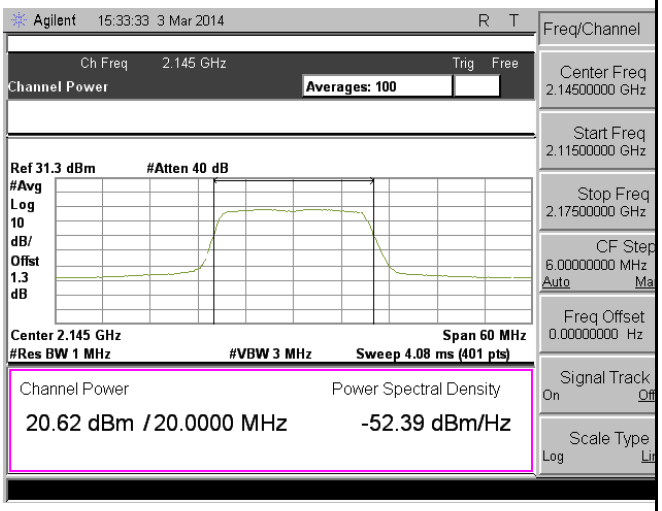
PWR-Band4-64QAM-20M BW-Mid CH-Port1



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

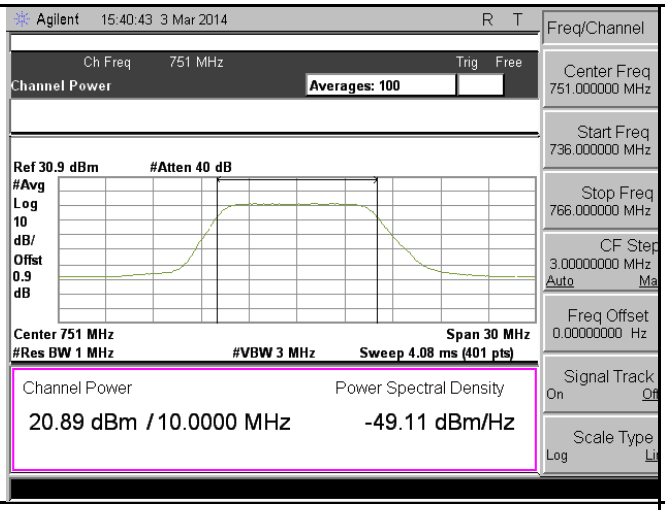


PWR-Band4-64QAM-20M BW-High CH-Port1

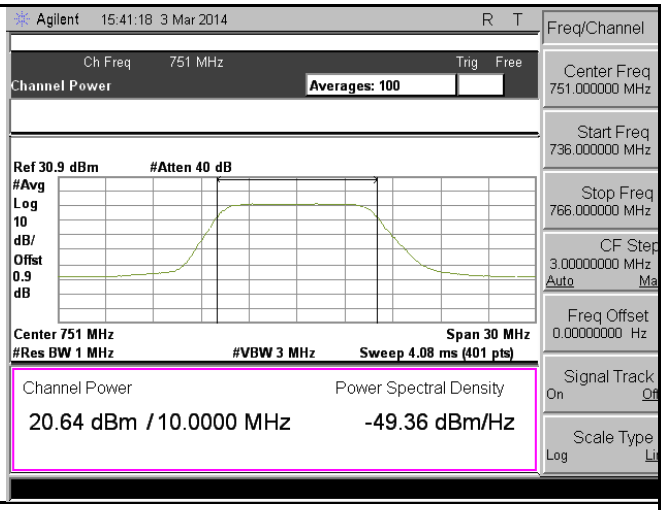


PWR-Band4-64QAM-20M BW-High CH-Port2

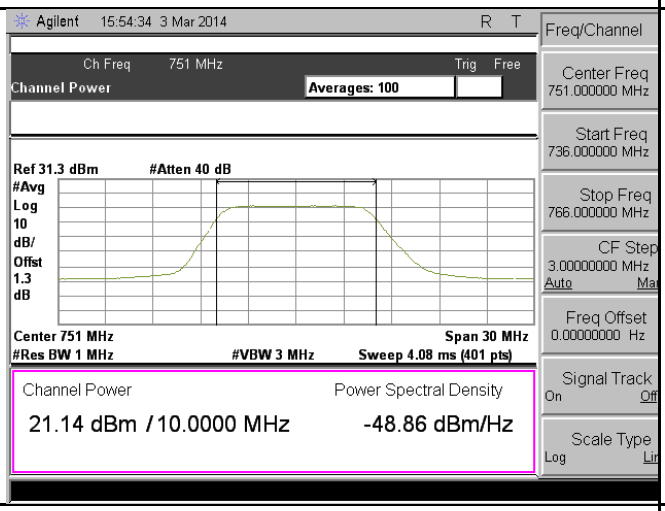
Test Plots for LTE Band 13



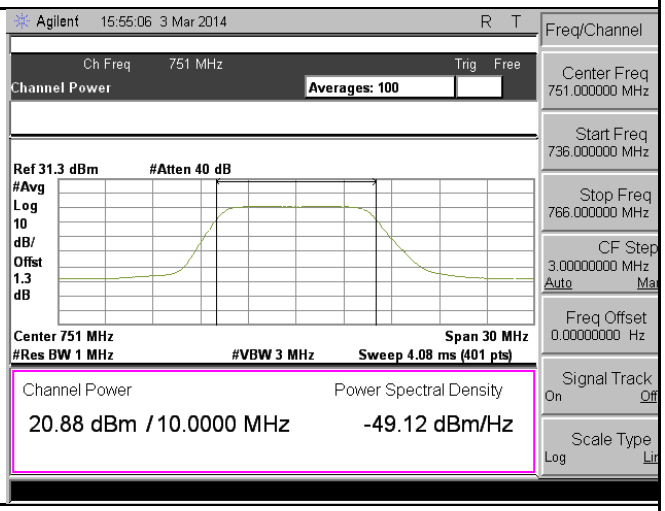
PWR-Band13-QPSK-10M BW-Mid CH-Port1



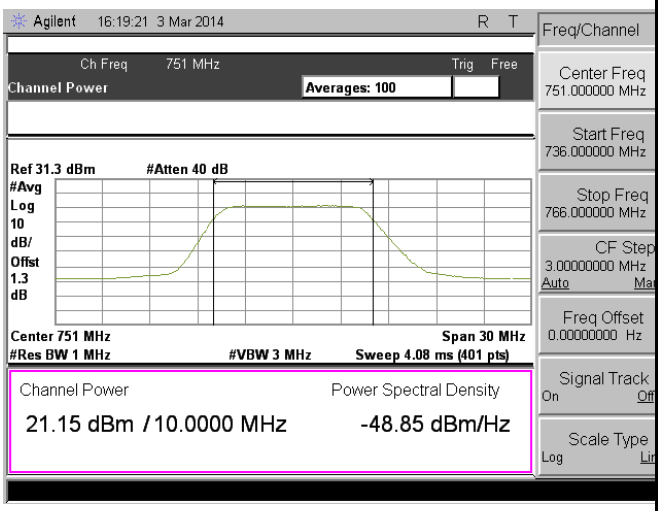
PWR-Band13-QPSK-10M BW-Mid CH-Port2



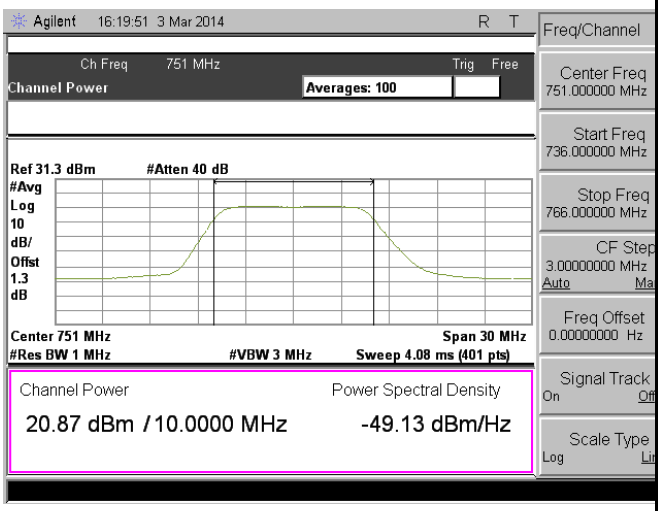
PWR-Band13-16QAM-10M BW-Mid CH-Port1



PWR-Band13-16QAM-10M BW-Mid CH-Port2



PWR-Band13-64QAM-10M BW-Mid CH-Port1

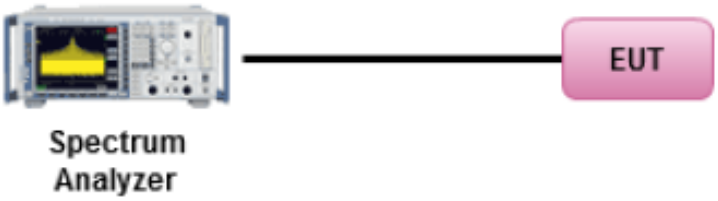


PWR-Band13-64QAM-10M BW-Mid CH-Port2

10.2 Peak-Average Ratio

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR24.232	(d)	Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of §24.51. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.	☐
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	03/10/2014 03/03/2015 – 04/13/2015	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 Data for LTE band 4

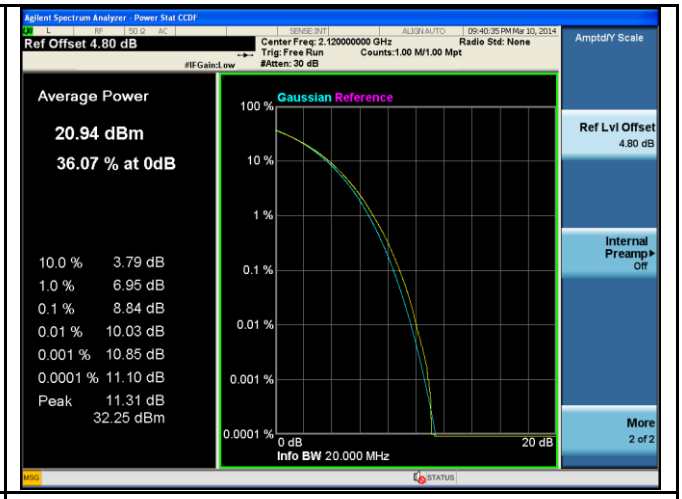
Type	Channel	Frequency (MHz)	Peak-Average Ratio (dB)	Peak-Average Ratio (dB)
5MHz BW, QPSK	Low	2112.5	9.16	13
	Mid	2132.5	9.06	13
	High	2152.5	8.86	13
5MHz BW, 64QAM	Low	2112.5	9.19	13
	Mid	2132.5	9.02	13
	High	2152.5	8.87	13
10MHz BW, QPSK	Low	2115	8.88	13
	Mid	2132	8.89	13
	High	2150	8.85	13
10MHz BW, 64QAM	Low	2115	8.77	13
	Mid	2132	8.76	13
	High	2150	8.76	13
15MHz BW, QPSK	Low	2117.5	8.73	13
	Mid	2132.5	8.53	13
	High	2147.5	8.57	13
15MHz BW, 64QAM	Low	2117.5	8.67	13
	Mid	2132.5	8.50	13
	High	2147.5	8.51	13
20MHz BW, QPSK	Low	2120	8.84	13
	Mid	2132	8.84	13
	High	2145	8.83	13
20MHz BW, 64QAM	Low	2120	9.36	13
	Mid	2132	9.33	13
	High	2145	9.36	13

Test Data for LTE band 13

Type	Channel	Frequency (MHz)	Peak-Average Ratio (dB)	Peak-Average Ratio (dB)
10MHz, QPSK	Mid	751	8.63	13
10MHz, 16QAM	Mid	751	8.63	13
10MHz, 64QAM	Mid	751	8.64	13

Test Plots

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

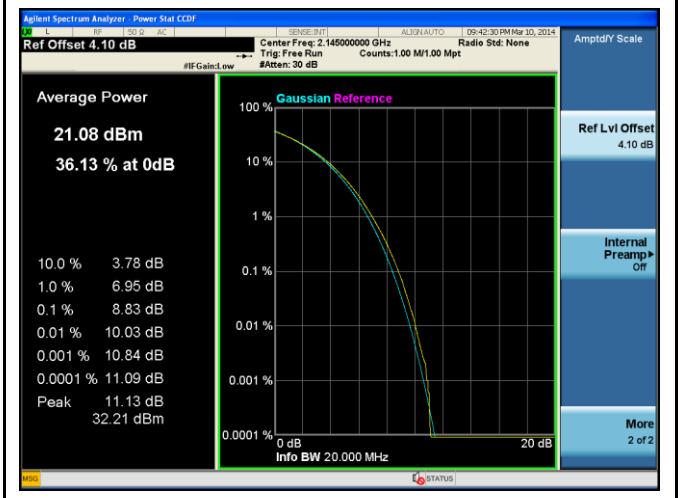


PK-AV-Ratio-Band4-QPSK-20M BW-Low

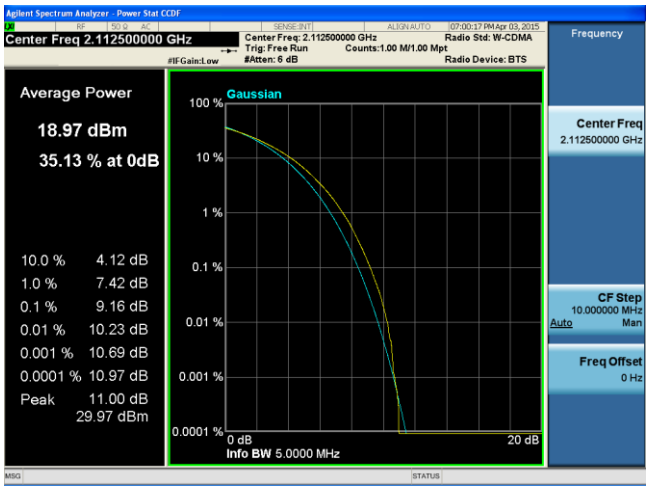
PK-AV-Ratio-Band4-QPSK-10M BW-Mid

PK-AV-Ratio-Band4-QPSK-20M BW-Mid

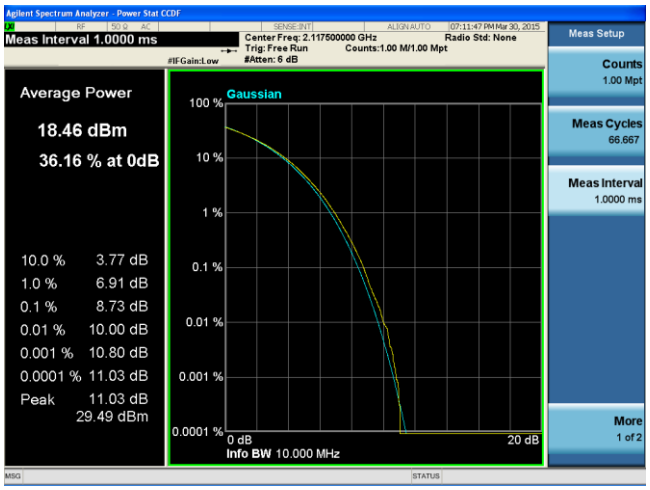
PK-AV-Ratio-Band4-QPSK-10M BW-High



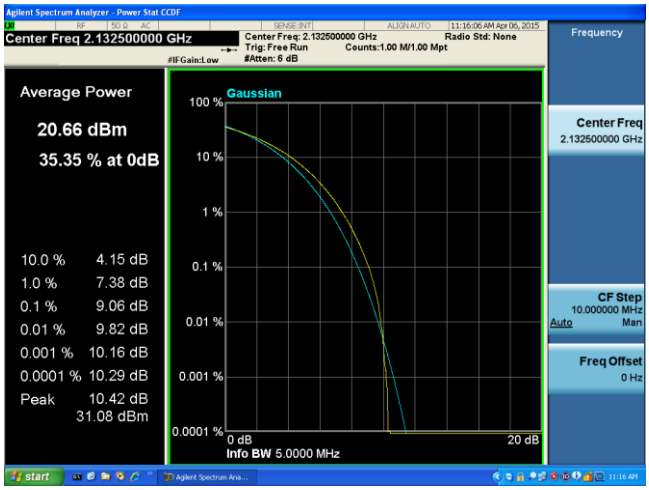
PK-AV-Ratio-Band4-QPSK-20M BW-High



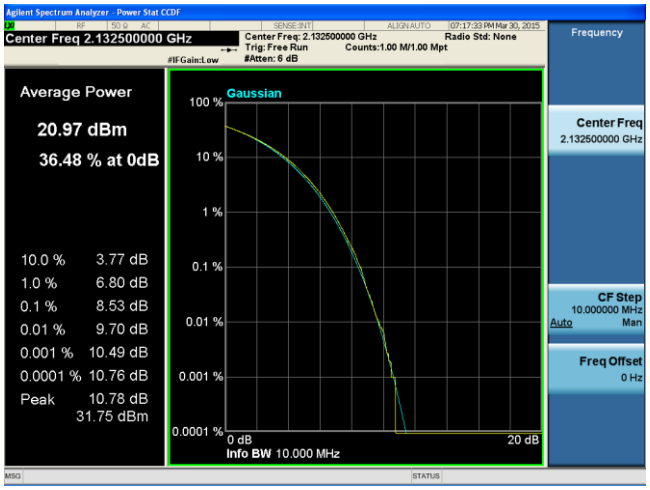
PK-AV-Ratio-Band4-QPSK-5M BW-Low



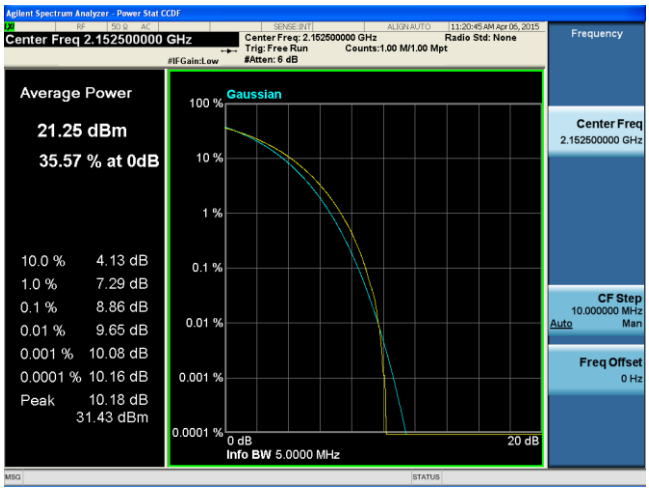
PK-AV-Ratio-Band4-QPSK-15M BW-Low



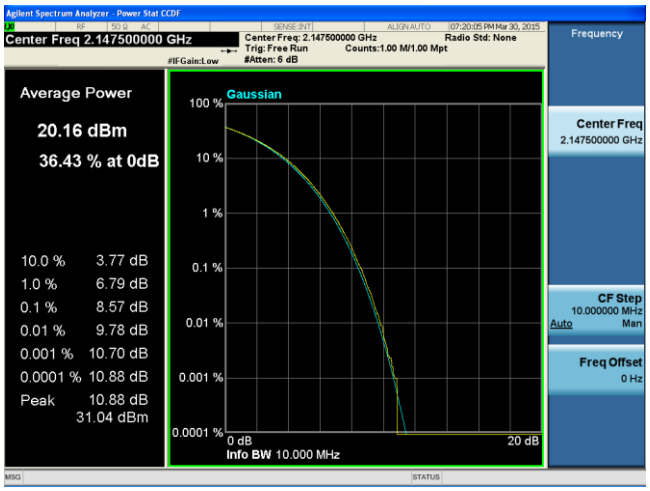
PK-AV-Ratio-Band4-QPSK-5M BW-Mid



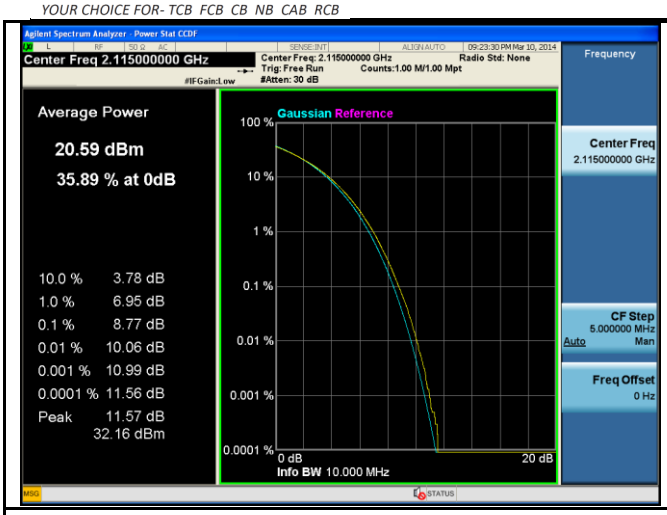
PK-AV-Ratio-Band4-QPSK-15M BW-Mid



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



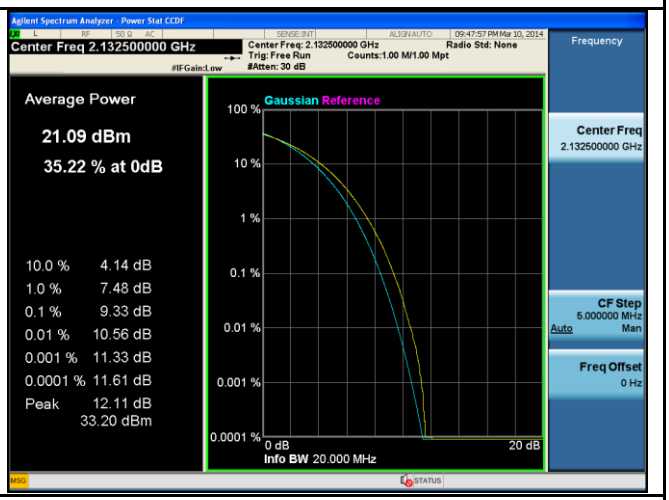
PK-AV-Ratio-Band4-QPSK-15M BW-High



PK-AV-Ratio-Band4-64QAM-10M BW-Low

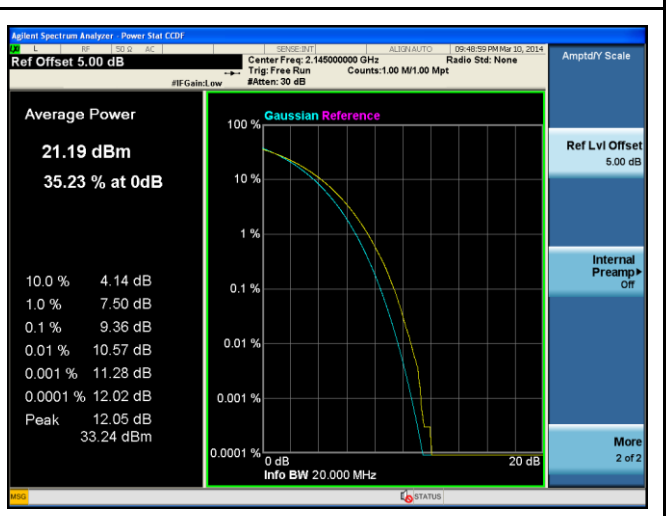
PK-AV-Ratio-Band4-64QAM-20M BW-Low

PK-AV-Ratio-Band4-64QAM-10M BW-Mid



PK-AV-Ratio-Band4-64QAM-20M BW-Mid

PK-AV-Ratio-Band4-64QAM-10M BW-High



PK-AV-Ratio-Band4-64QAM-20M BW-High