



FCC LISTED, REGISTRATION
NUMBER: 2764.01

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NUMBER: 23595-1

Test report No:
4184ERM.001

Test report

**USA FCC Part 96
CITIZENS BROADBAND RADIO SERVICE DEVICES OPERATING WITHIN THE
BAND 3500-3700 MHz.**

(*) Identification of item tested	LTE Cat-4
(*) Trademark	Sequans Communications
(*) Model and /or type reference tested	CA410
Other identification of the product	FCC ID: 2AAGMCA410A IC ID: 12732A-CA410A HW version: V1 SW version: LR4.1.6.0-CBRSA-59334
(*) Features	LTE Cat-4
(*) Manufacturer	SEQUANS COMMUNICATIONS 55 Boulevard Charles de Gaulle, 92700 Colombes
Test method requested, standard	USA FCC Part 96 CITIZENS BROADBAND RADIO SERVICE DEVICES OPERATING WITHIN THE BAND 3550-3700 MHz. FCC KDB 940660 D01 Part 96 CBSD v01: Certification and Test Procedures for Citizens Broadband Radio Service Devices Authorized Under Part 96 of the Rules FCC KDB 662911 D01 Multiple Transmitter Output v02r01: Emissions Testing of Transmitters with Multiple Outputs in the Same Band ANSI TIA-603D: Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Domingo Galvez EMC&RF Lab Manager
Date of issue	10-20-2023
Report template No	FDT08_23 (*) "Data provided by the client"

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Competences and guarantees

DEKRA Certification Inc. is a testing laboratory accredited by A2LA (The American Association for Laboratory Accreditation), to perform the tests indicated in the Certificate 2764.01

DEKRA Certification Inc. is a testing laboratory competent to carry out the tests described in this report.

To assure the traceability to other national and international laboratories, DEKRA Certification Inc. has a calibration and maintenance program for its measurement equipment.

DEKRA Certification Inc. guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at DEKRA Certification at the time of performance of the test.

DEKRA Certification Inc. is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the item under test established in this document.

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General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA Certification Inc.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Certification Inc. and the Accreditation Bodies.

Uncertainty

Uncertainty (factor k=2) was calculated according to the DEKRA Certification internal document PODT000.

Test case	Frequency (MHz)	U(k=2)	Units
RF Power and PSD	3500-3700	0.88	dB
Occupied Bandwidth and 26dB Bandwidth		1.87	%
Out-of-band		0.64	dB
Frequency Error		147.42	Hz
Conducted Spurious Emission	30 - 1000	0.48	dB
	1000 - 40000	0.94	dB
Radiated Spurious Emission	30-180	4.27	dB
	180-1000	3.14	dB
	1000-18000	3.30	dB
	18000-40000	3.49	dB

Data provided by the client

CA410 is ideal for adding LTE connectivity to electronics devices for industrial Internet of Things (IoT), Machine-to-Machine (M2M) and broadband consumer applications. CA410 is compliant with CBRS networks operating on LTE band 48 in USA, with US B8 – known as Anterix band - and with other US MNO bands: bands 2/4/5/12/13/66 as well as Firstnet LTE band 14 and band 26 used in private networks..

DEKRA declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

Usage of samples

Samples undergoing test have been selected by: The client.

Sample S/01 is composed of the following elements:

Id	Control Number	Description	Model	Serial N°	Date of Reception	Application
S/01	4184/02	Multi-band communications module	CA410	FOX-23-26-0659	8/9/2023	Element Under Test
S/01	4184/05	Antenna	-	-	8/9/2023	Element Under Test
S/01	4184/06	Antenna	-	-	8/9/2023	Element Under Test
S/01	4184/03	USB type A (male) to USB mini A cable	-	-	8/9/2023	Accessory

1. Sample S/01 has undergone following test(s):
All Conducted and Radiated tests indicated in appendix A..

Test sample description

Ports..... :	Port name and description	Cable					
		Specified max length [m]	Attached during test	Shielded	Coupled to patient ⁽³⁾		
	USB		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
Supplementary information to the ports..... :	Data not provided						
Rated power supply	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	<input type="checkbox"/>	AC:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	AC:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input checked="" type="checkbox"/>	DC: 3.3 Power supply					
<input type="checkbox"/>	DC:						
Rated Power	Data not provided						
Clock frequencies..... :	Data not provided						
Other parameters	Data not provided						
Software version	LR4.1.6.0-CBRSA-59334						
Hardware version	V1						
Dimensions in cm (W x H x D)	Data not provided						
Mounting position	<input checked="" type="checkbox"/>	Table top equipment					
	<input type="checkbox"/>	Wall/Ceiling mounted equipment					
	<input type="checkbox"/>	Floor standing equipment					
	<input type="checkbox"/>	Hand-held equipment					
	<input type="checkbox"/>	Other: Variable equipment					

Modules/parts.....:	Module/parts of test item	Type	Manufacturer
	USB cable	USB	
	Antenna	Antenna	
Accessories (not part of the test item)	Description	Type	Manufacturer
	Data not provided		
Documents as provided by the applicant.....:	Description	File name	Issue date
	FDT30 information	FDT30_19 Declaration Equipment Data_CA410_75462C.pdf	08-14-2023
Copy of marking plate:			
No marking plate found			

Identification of the client

SEQUANS COMMUNICATIONS
 55 Boulevard Charles de Gaulle, 92700 Colombes.

Testing period and place

Test Location	DEKRA Certification Inc.
Date (start)	08-25-2023
Date (finish)	09-18-2023

Document history

Report number	Date	Description
4184ERM.001	09-20-2023	First release

Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

In the semi anechoic chamber, the following limits were not exceeded during the test.

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

In the chamber for conducted measurements, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 60 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

Remarks and comments

The tests have been performed by the technical personnel: Sravani Gollamudi and Koji Nishimoto.

Testing verdicts

Not applicable :	N/A
Pass :	P
Fail :	F
Not measured :	N/M

Summary

FCC Part 96 Paragraph				
Section	Part 96. Spec Clause	Test Description	Verdict	Remark
A.1	§ 96.41 (b)	Maximum Effective Isotropic Radiated Power (EIRP)	P	N/A
A.2	§ 2.1046 6 dB Bandwidth	Conducted Output Power	P	N/A
A.3	§ 2.1049	99% OBW and -26db Bandwidth	P	N/A
-	§ 96.41 (b)	Maximum Power Spectral Density (PSD)	N/A	Refer Note 1
A.4	§ 96.41 (g)	Peak to Average Power Ratio (PAPR)	P	N/A
A.5	§ 2.1051, 96.41 (e)	3.5 GHz Emission and Interference limits	P	N/A
A.6	§ 2.1051, 96.41 (e)	Spurious Emissions at Antenna Terminals	P	N/A
A.7	§ 2.1053	Radiated Spurious Emission	P	N/A
A.8	§ 2.1055	Frequency Stability	P	N/A
<p><u>Note:</u></p> <p>1. The device is declared as an End User device.</p>				

List of equipment used during the test

Conducted Measurements

Control Number	Description	Serial No	Last Calibration	Next Calibration
1014	FSV40 Signal Analyzer 40ghz	101626	2022-08-01	2024-08-01
1149	CMW500 BT/WIFI Wireless Communication Tester	101976	N/A	N/A
1374	ESR7 EMI TEST RECEIVER	102390	2022-05-26	2024-05-26
1472	Ethernet SNMP Thermometer	60038038794	2022-10-24	2024-10-24
1488	Climatic chamber T10-F40-C	-	2022-12-13	2023-12-13

Radiated Measurements

Control Number	DESCRIPTION	Serial No	Last Calibration	Next Calibration
878	Power supply (AMETEK / PROG-DC-PS)	1707A01783	N/A	N/A
982	Low Noise Preamplifier (18-40GHz)	1711156C	2023-10-03	2025-10-03
1012	ESR26 EMI Test Receiver	101478	2022-04-12	2024-04-12
1014	FSV40 Signal Analyzer 40 GHz	101626	2022-08-01	2024-08-01
1058	3115 Double-Ridged Waveguide Horn Antenna 1-18 GHz	211373	2023-06-26	2026-06-26
1056	3116c Double-Ridged Waveguide Horn Antenna (18-40 GHz)	213179	2023-02-23	2026-02-23
1064	3142E Biconilog Antenna	208600	2021-12-13	2024-12-13
1108	Ethernet SNMP Thermometer- CR Room	60038026954	2022-10-18	2024-10-18
1111	Ethernet SNMP Thermometer	60038026577	2022-10-18	2024-10-18
1149	CMW500 BT/WIFI Wireless Communication Tester	101976	N/A	N/A
1179	SEMI-ANECHOIC CHAMBER	F169021	N/A	N/A
1314	Wireless Measurement Software R&S Emc32	1040-OT102236	N/A	N/A
1461	Low Noise Preamplifier (1-18GHz)	2213857B	2022-06-01	2024-06-01

Appendix A: Test results

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PRODUCT INFORMATION

The following information is provided by the client:

Product specification	Description	Yes/No
Base Station Class	Wide area Base Station (Macro Cell)	No
	Medium Range Base Stations (Micro Cell)	No
	Local area Base Station (Picocell)	No
	Home Base Station (Femtocell)	No
Category of CBSD	Category A	No
	Category B	No
	End User	Yes
Type of Installation	Professional Installation	No
RF Test Tool Software of CBS	N/A	
TX Frequency	5 MHz: 3552.2MHz — 3697.5 MHz 10 MHz: 3555 MHz — 3695 MHz 15 MHz: 3557.5 MHz — 3692.5 MHz 20 MHz: 3560 MHz — 3690 MHz	
RX Frequency	5 MHz: 3552.2MHz — 3697.5 MHz 10 MHz: 3555 MHz — 3695 MHz 15 MHz: 3557.5 MHz — 3692.5 MHz 20 MHz: 3560 MHz — 3690 MHz	
Maximum Output Power to Antenna (dBm)	22.5 dBm	
Maximum 99% Occupied Bandwidth (MHz)	5 MHz, 10 MHz, 15 MHz, 20 MHz	
Type of Modulation	QPSK	Yes
	16QAM	Yes
	64QAM	No
	256QAM	No
Antenna Information	Model: 2J Antenna ref 2JW1183-C952B	
	Gain: 0.3 dBi	

Test modes available:

1. Band 48:

- 5 MHz Bandwidth (25 RB):
 - . Lowest Channel (3552.5 MHz) / Middle Channel (3625 MHz) / Highest Channel (3697.5 MHz)
- 10 MHz Bandwidth (50 RB):
 - . Lowest Channel (3555 MHz) / Middle Channel (3625 MHz) / Highest Channel (3695 MHz)
- 15 MHz Bandwidth (75 RB):
 - . Lowest Channel (3557.5 MHz) / Middle Channel (3625 MHz) / Highest Channel (3692.5 MHz)
- 20 MHz Bandwidth (100 RB):
 - . Lowest Channel (3560 MHz) / Middle Channel (3625 MHz) / Highest Channel (3690 MHz)

DESCRIPTION OF TEST CONDITIONS

TEST CONDITIONS	DESCRIPTION
<p>TC#01 LTE Band 48</p>	<p><u>Power supply (V):</u> $V_{\text{nominal}} = 3.3 \text{ Vdc}$</p> <p><u>Type of power supply:</u> DC voltage from power supply.</p> <p><u>Temperature (°C):</u> $T_{\text{nom}} = +15 \text{ to } +35$ $T_{\text{min}} = -40 (*)$ $T_{\text{max}} = +65 (*)$</p> <p>The subscript nom indicates normal test conditions. The subscripts min and max indicate extreme test conditions (minimum and maximum respectively). (*) Declared by applicant.</p> <p>The minimum, half, and maximum numbers of RBs for all BWs were evaluated, and full RB configuration was identified as worst case. All the tests were performed by using the full RB configuration.</p> <p>All supported modulations were evaluated and QPSK was identified as worst case. All the test results and plots are shown for QPSK modulation only except for A.1, A.2, and A.3 tests.</p> <p><u>Test Frequencies for Conducted tests:</u> -5 MHz Bandwidth (25 RB): Lowest Channel (3552.5 MHz) Middle Channel (3625 MHz) Highest Channel (3697.5 MHz) -10 MHz Bandwidth (50 RB): Lowest Channel (3555 MHz) Middle Channel (3625 MHz) Highest Channel (3695 MHz)</p>

	<p>-15 MHz Bandwidth (75 RB):</p> <ul style="list-style-type: none">Lowest Channel (3557.5 MHz)Middle Channel (3625 MHz)Highest Channel (3692.5 MHz) <p>-20 MHz Bandwidth (100 RB):</p> <ul style="list-style-type: none">Lowest Channel (3560 MHz)Middle Channel (3625 MHz)Highest Channel (3690 MHz) <p><u>Test Frequencies for Radiated tests:</u></p> <p>5 MHz Bandwidth (25 RB):</p> <ul style="list-style-type: none">Lowest Channel (3552.5 MHz)Middle Channel (3625 MHz)Highest Channel (3697.5 MHz) <p>-10 MHz Bandwidth (50 RB):</p> <ul style="list-style-type: none">Lowest Channel (3555 MHz)Middle Channel (3625 MHz)Highest Channel (3695 MHz) <p>-15 MHz Bandwidth (75 RB):</p> <ul style="list-style-type: none">Lowest Channel (3557.5 MHz)Middle Channel (3625 MHz)Highest Channel (3692.5 MHz) <p>-20 MHz Bandwidth (100 RB):</p> <ul style="list-style-type: none">Lowest Channel (3560 MHz)Middle Channel (3625 MHz)Highest Channel (3690 MHz)
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**TEST A.1: MAXIMUM EFFECTIVE ISOTROPIC RADIATED POWER (EIRP)
 TEST A.2: CONDUCTED OUTPUT POWER**

LIMITS:	Product standard:	Part 96.41 Subclause (b)
	Test standard:	ANSI C63.26-2015

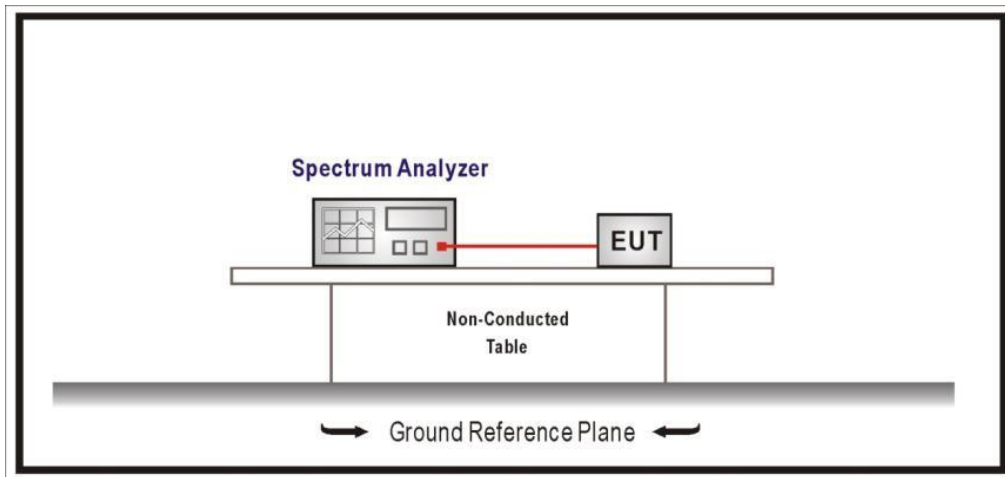
LIMITS

The maximum effective isotropic radiated power (EIRP) and maximum Power Spectral Density (PSD) of any CBSD and End User Device must comply with the limits shown in the following table.

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

TEST SETUP:

The procedure in Section 5.2 of ANSI C63.26-2015 is acceptable for performing power measurements. Measurements can be made using either a peak or average (RMS) detector if the appropriate procedure is followed. The RMS detector was used for the measurement at each frequency with following the procedure stated in the Section 5.2.4.4.2 of ANSI C63.26-2015.



EIRP was tested with a minimum, half, and maximum number of RBs for all the BWs and identified that the worst case is using full RBs. All the tests were performed by using the full RBs.

The maximum equivalent isotropically radiated power (e.i.r.p.) is calculated by adding the declared maximum antenna gain (dBi) and 10 log (1/duty cycle) was added in RF level offset to get the accurate measured power level in the average power measurement.

The duty cycle correction = $10 \log (1/0.40) = 4.01 \text{ (dB)}$

TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01 (Band 48)
TEST RESULTS:	PASS

Results:

5 MHz BW

QPSK

	Lowest frequency 3552.5 MHz	Middle frequency 3625 MHz	Highest frequency 3697.5 MHz
Measured Power (dBm/10 MHz)	20.73	20.72	21.33
Maximum declared Antenna gain (dBi)	0.30	0.30	0.30
Maximum EIRP (dBm/10 MHz)	21.03	21.02	21.63

16QAM

	Lowest frequency 3552.5 MHz	Middle frequency 3625 MHz	Highest frequency 3697.5 MHz
Measured Power (dBm/10 MHz)	20.05	19.96	20.00
Maximum declared Antenna gain (dBi)	0.30	0.30	0.30
Maximum EIRP (dBm/10 MHz)	20.35	20.26	20.30

10 MHz BW

QPSK

	Lowest frequency 3555 MHz	Middle frequency 3625 MHz	Highest frequency 3695 MHz
Measured Power (dBm/10 MHz)	21.11	21.11	21.76
Maximum declared Antenna gain (dBi)	0.30	0.30	0.30
Maximum EIRP (dBm/10 MHz)	21.41	21.41	22.06

TEST RESULTS (Cont.):

16QAM

	Lowest frequency 3555 MHz	Middle frequency 3625 MHz	Highest frequency 3695 MHz
Measured Power (dBm/10 MHz)	20.99	20.93	21.07
Maximum declared Antenna gain (dBi)	0.30	0.30	0.30
Maximum EIRP (dBm/10 MHz)	21.29	21.23	21.37

15 MHz BW

QPSK

	Lowest frequency 3557.5 MHz	Middle frequency 3625 MHz	Highest frequency 3692.5 MHz
Measured Power (dBm/10 MHz)	19.41	19.93	19.98
Maximum declared Antenna gain (dBi)	0.30	0.30	0.30
Maximum EIRP (dBm/10 MHz)	19.71	20.23	20.28

16QAM

	Lowest frequency 3557.5 MHz	Middle frequency 3625 MHz	Highest frequency 3692.5 MHz
Measured Power (dBm/10 MHz)	18.83	18.84	18.78
Maximum declared Antenna gain (dBi)	0.30	0.30	0.30
Maximum EIRP (dBm/10 MHz)	19.13	19.14	19.08

TEST RESULTS (Cont.):

20 MHz BW

QPSK

	Lowest frequency 3560 MHz	Middle frequency 3625 MHz	Highest frequency 3690 MHz
Measured Power (dBm/10 MHz)	18.56	18.63	19.32
Maximum declared Antenna gain (dBi)	0.30	0.30	0.30
Maximum EIRP (dBm/10 MHz)	18.87	18.93	19.62

16QAM

	Lowest frequency 3560 MHz	Middle frequency 3625 MHz	Highest frequency 3690 MHz
Measured Power (dBm/10 MHz)	17.75	17.63	18.21
Maximum declared Antenna gain (dBi)	0.30	0.30	0.30
Maximum EIRP (dBm/10 MHz)	18.05	17.93	18.51

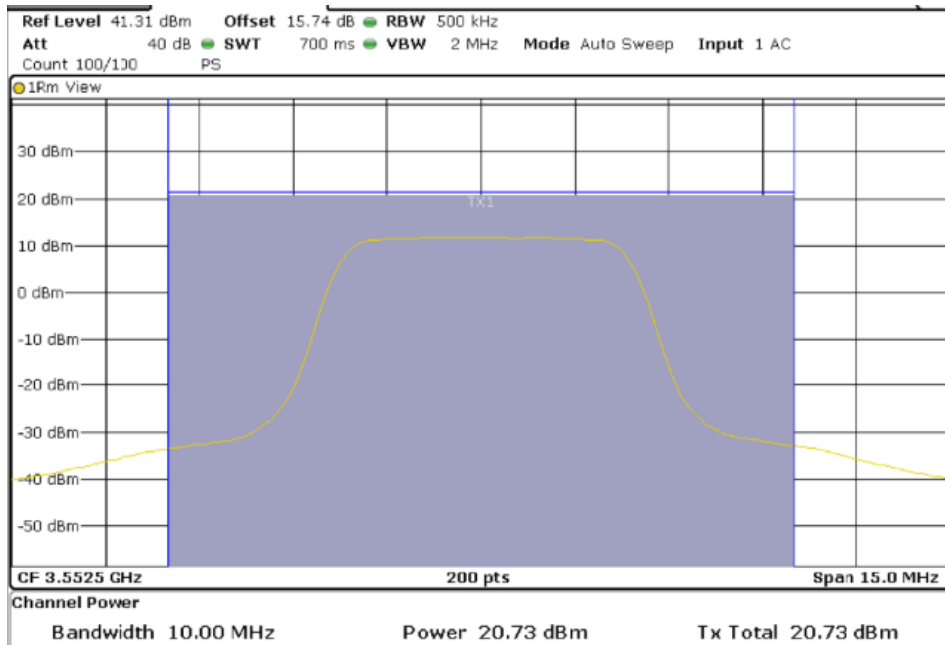
Verdict: PASS

(See next plots)

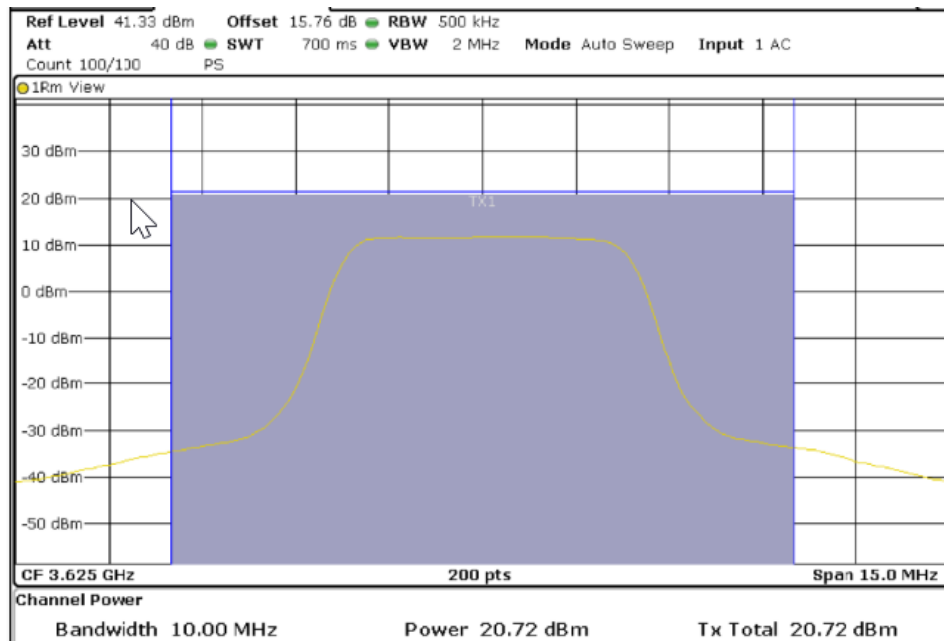
TEST RESULTS (Cont.):

5 MHz BW(QPSK only)

Lowest Channel (3552.5 MHz)

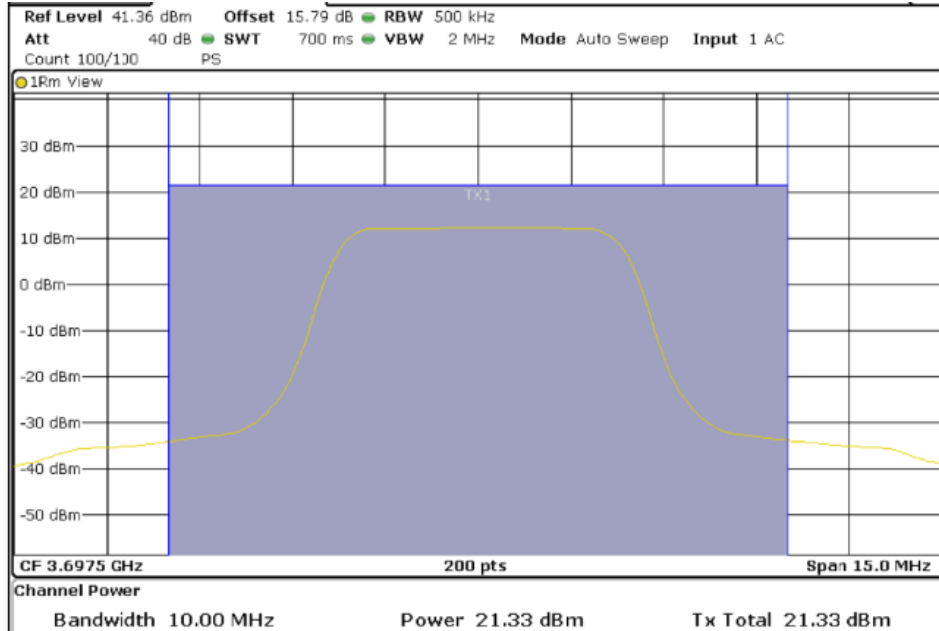


Middle Channel (3625 MHz)



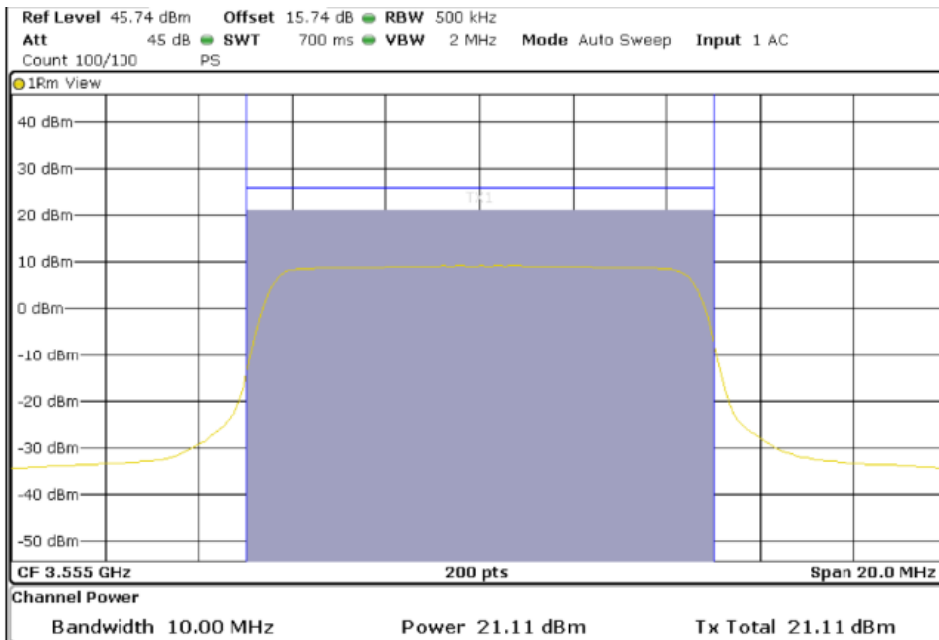
TEST RESULTS (Cont.):

Highest Channel (3697.5 MHz)



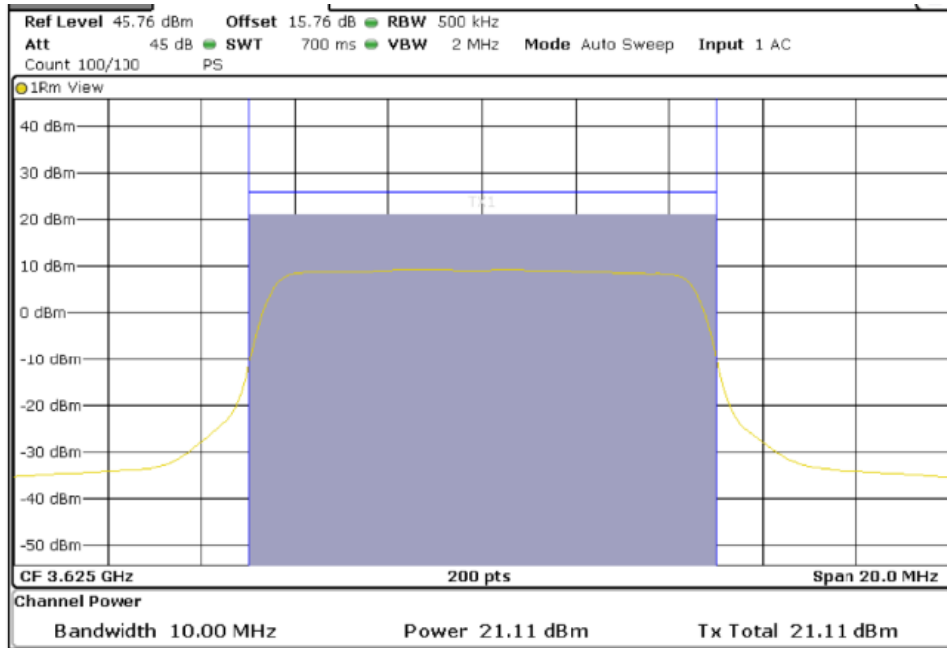
10 MHz BW(QPSK only)

Lowest Channel (3555 MHz)

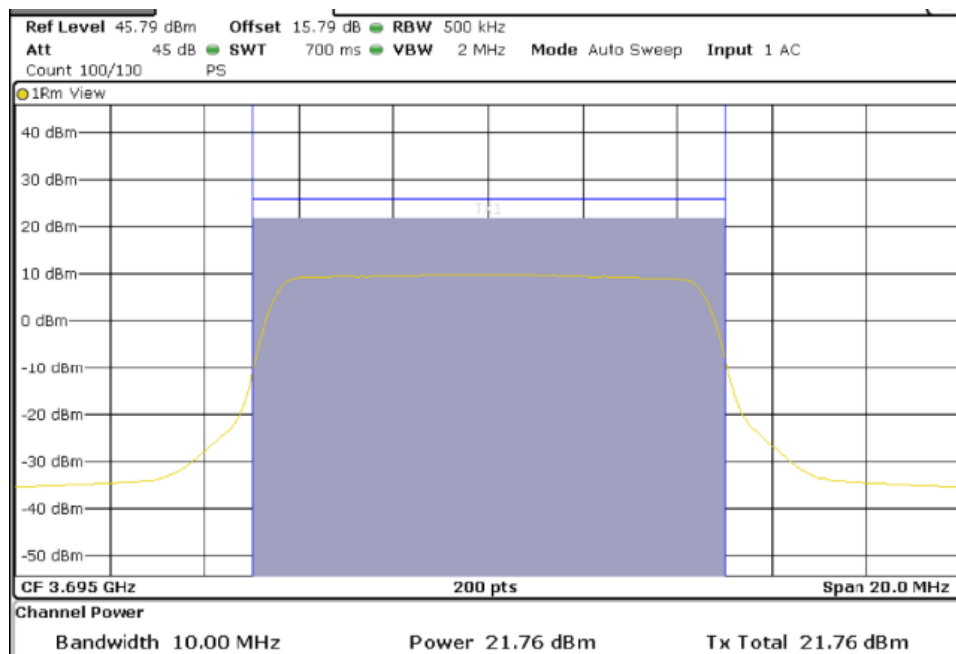


TEST RESULTS (Cont.):

Middle Channel (3625 MHz)



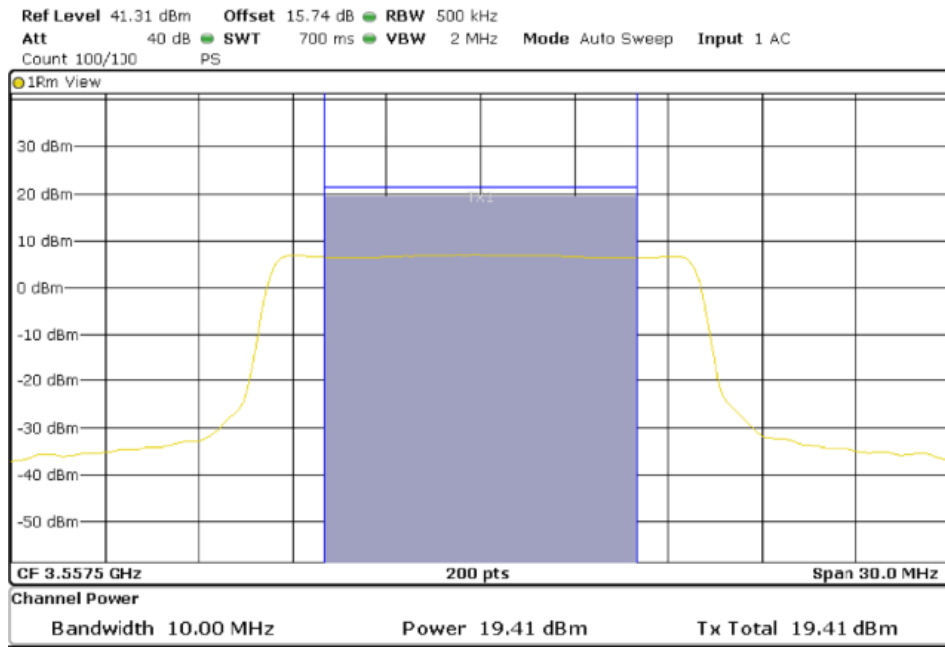
Highest Channel (3695 MHz)



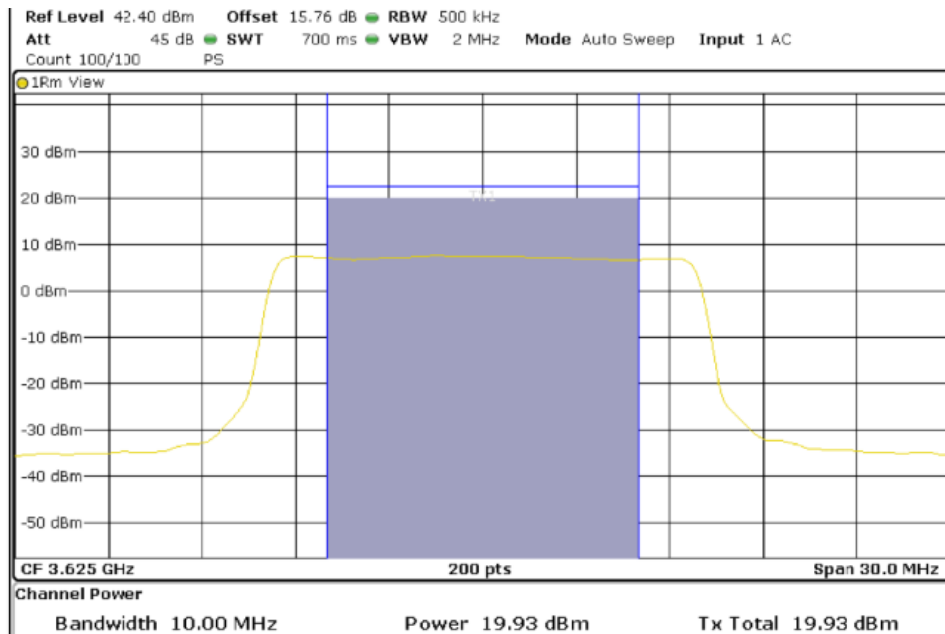
TEST RESULTS (Cont.):

15 MHz BW (QPSK only)

Lowest Channel (3557.5 MHz)

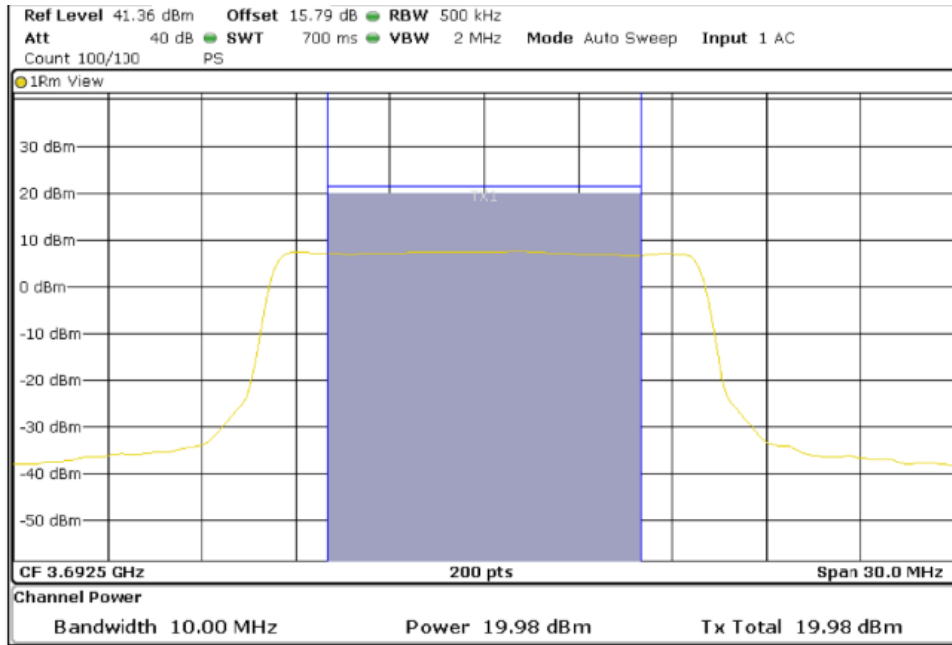


Middle Channel (3625 MHz)



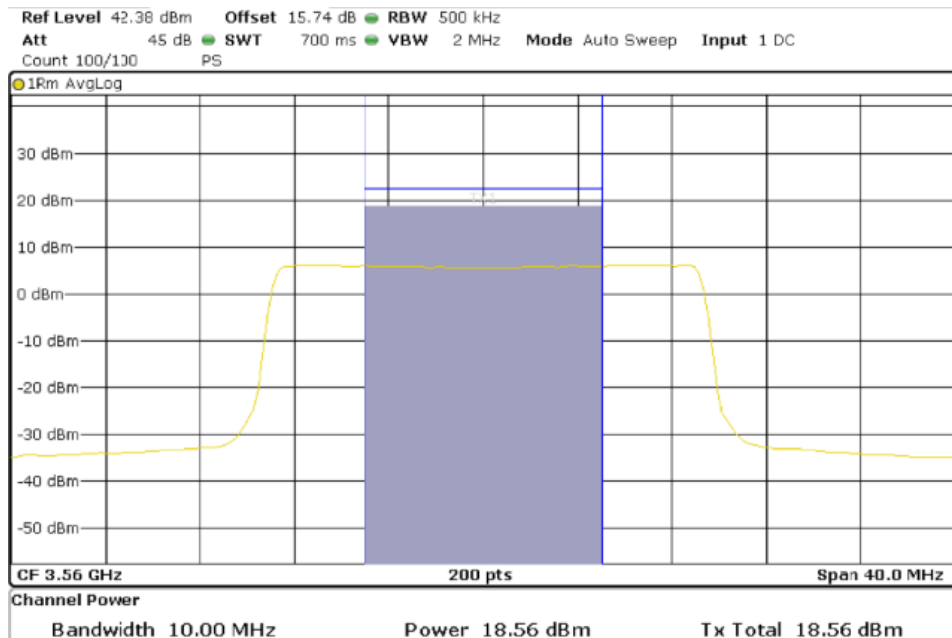
TEST RESULTS (Cont.):

Highest Channel (3692.5 MHz)



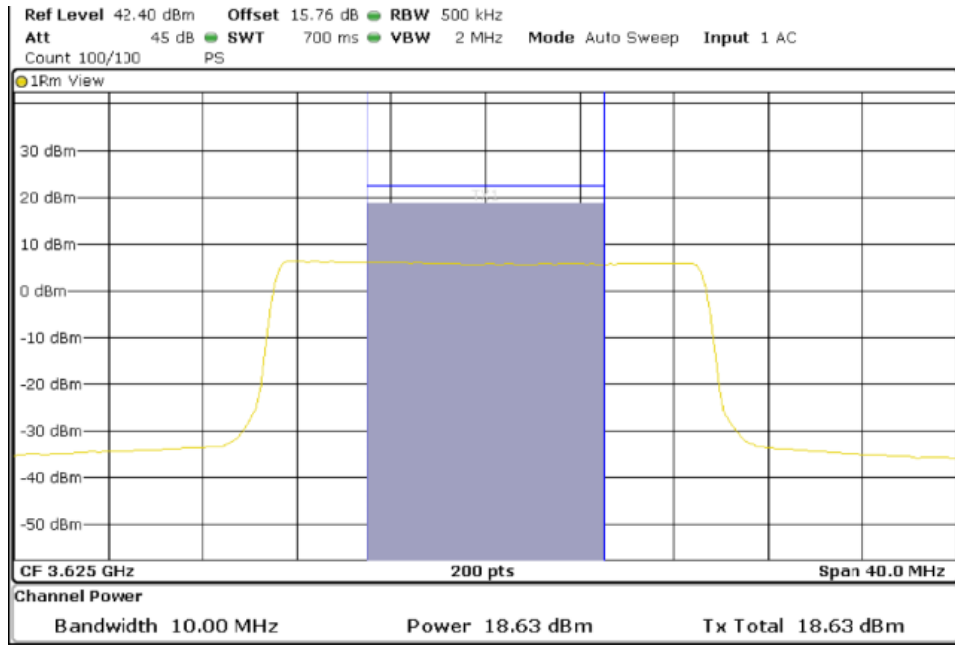
20 MHz BW (QPSK only)

Lowest Channel (3560 MHz)

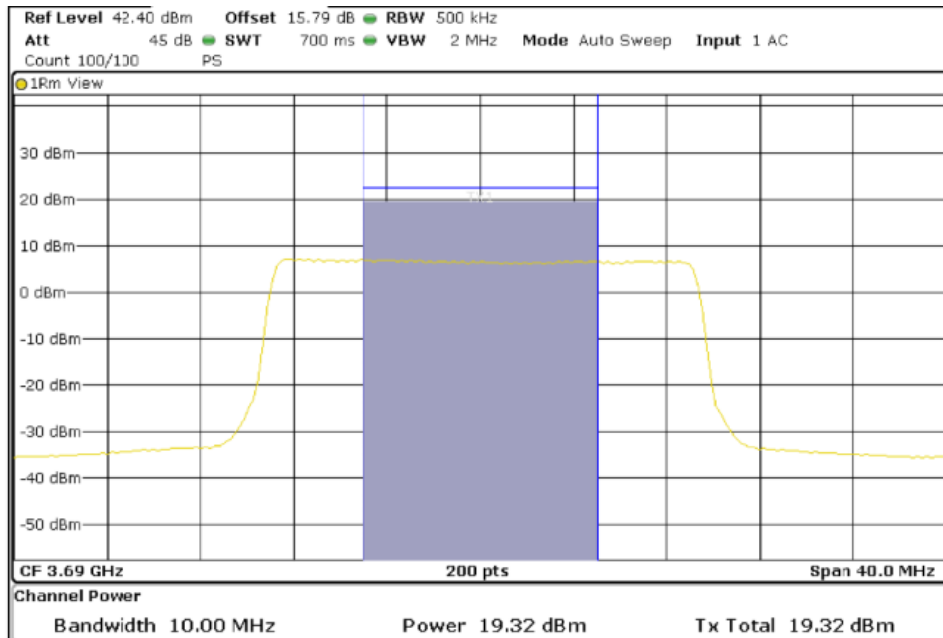


TEST RESULTS (Cont.):

Middle Channel (3625 MHz)



Highest Channel (3690 MHz)



TEST A.3: 99% OBW AND -26 DB BANDWIDTH

LIMITS:	Product standard:	Part 2.1049
	Test standard:	ANSI C63.26-2015

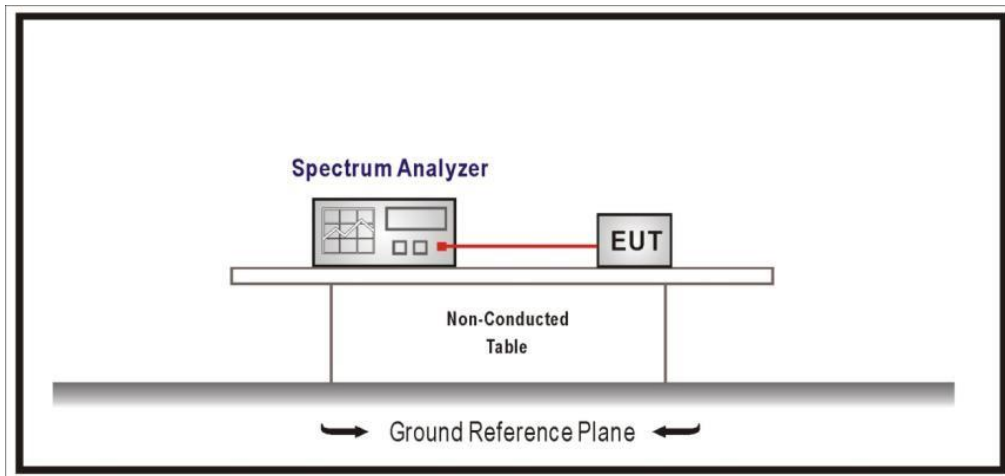
LIMITS

The 99% 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.

The -26 dB Bandwidth is the bandwidth of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB from the peak of the carrier.

TEST SETUP:

The 99% occupied bandwidth and the -26dB bandwidth were measured directly using the built-in bandwidth measuring option of signal analyzer with following the procedure stated in the section 5.4.3 and 5.4.4 of ANSI C63.26-2015 and the section 4.2 and 4.3 of FCC KDB 971168 D01 v03 r01.



TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01 (Band 48)
TEST RESULTS:	PASS

Results:

5 MHz BW

QPSK

	Lowest frequency 3552.5 MHz	Middle frequency 3625 MHz	Highest frequency 3697.5 MHz
99% OBW (MHz)	4.92	5.18	4.99
-26 dB Bandwidth (MHz)	6.60	6.80	6.59

16QAM

	Lowest frequency 3552.5 MHz	Middle frequency 3625 MHz	Highest frequency 3697.5 MHz
99% OBW (MHz)	5.19	5.04	5.28
-26 dB Bandwidth (MHz)	6.50	6.37	6.56

10 MHz BW

QPSK

	Lowest frequency 3555 MHz	Middle frequency 3625 MHz	Highest frequency 3695 MHz
99% OBW (MHz)	9.48	9.10	9.18
-26 dB Bandwidth (MHz)	12.07	11.49	11.69

16QAM

	Lowest frequency 3555 MHz	Middle frequency 3625 MHz	Highest frequency 3695 MHz
99% OBW (MHz)	9.32	9.06	9.00
-26 dB Bandwidth (MHz)	12.07	11.72	11.95

TEST RESULTS (Cont.):

15 MHz BW

QPSK

	Lowest frequency 3557.5 MHz	Middle frequency 3625 MHz	Highest frequency 3692.5 MHz
99% OBW (MHz)	13.83	13.80	13.46
-26 dB Bandwidth (MHz)	16.90	16.60	16.69

16QAM

	Lowest frequency 3557.5 MHz	Middle frequency 3625 MHz	Highest frequency 3692.5 MHz
99% OBW (MHz)	13.62	13.80	13.89
-26 dB Bandwidth (MHz)	16.86	16.72	16.73

20 MHz BW

QPSK

	Lowest frequency 3560 MHz	Middle frequency 3625 MHz	Highest frequency 3690 MHz
99% OBW (MHz)	18.24	18.24	18.24
-26 dB Bandwidth (MHz)	21.16	20.92	21.04

16QAM

	Lowest frequency 3560 MHz	Middle frequency 3625 MHz	Highest frequency 3690 MHz
99% OBW (MHz)	18.28	18.28	18.16
-26 dB Bandwidth (MHz)	21.28	20.92	20.72

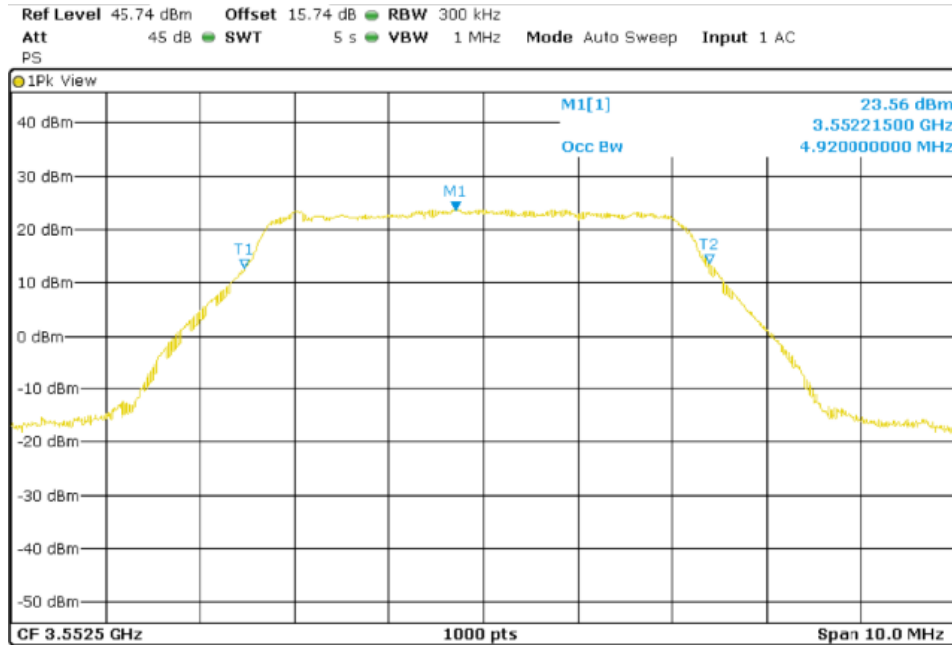
Verdict: PASS
 (See next plots)

TEST RESULTS (Cont.):

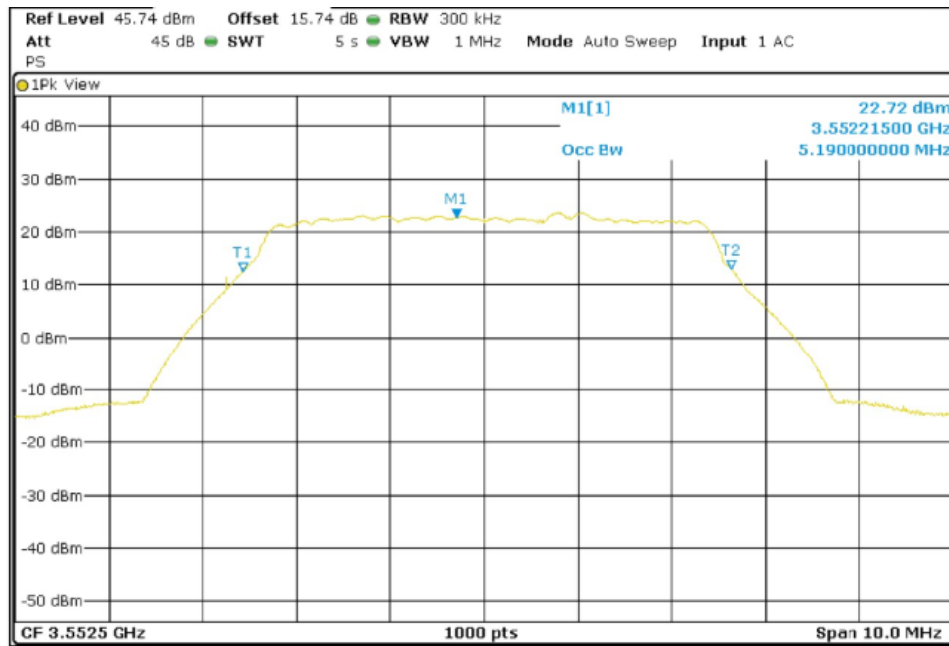
OBW

5 MHz BW

Lowest Channel (3552.5 MHz) QPSK

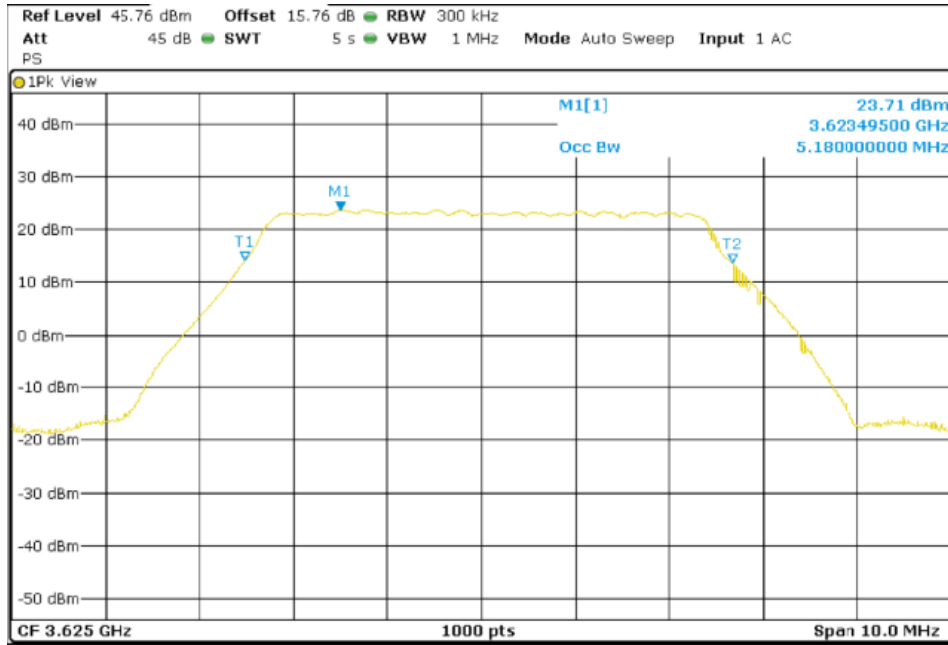


Lowest Channel (3552.5 MHz) 16QAM

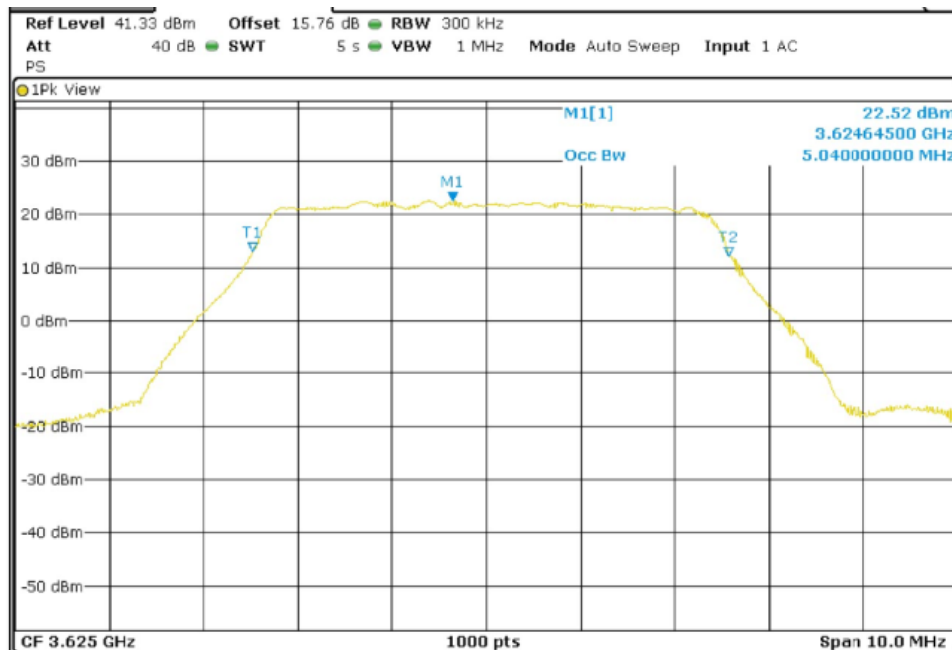


TEST RESULTS (Cont.):

Middle Channel (3625 MHz) QPSK

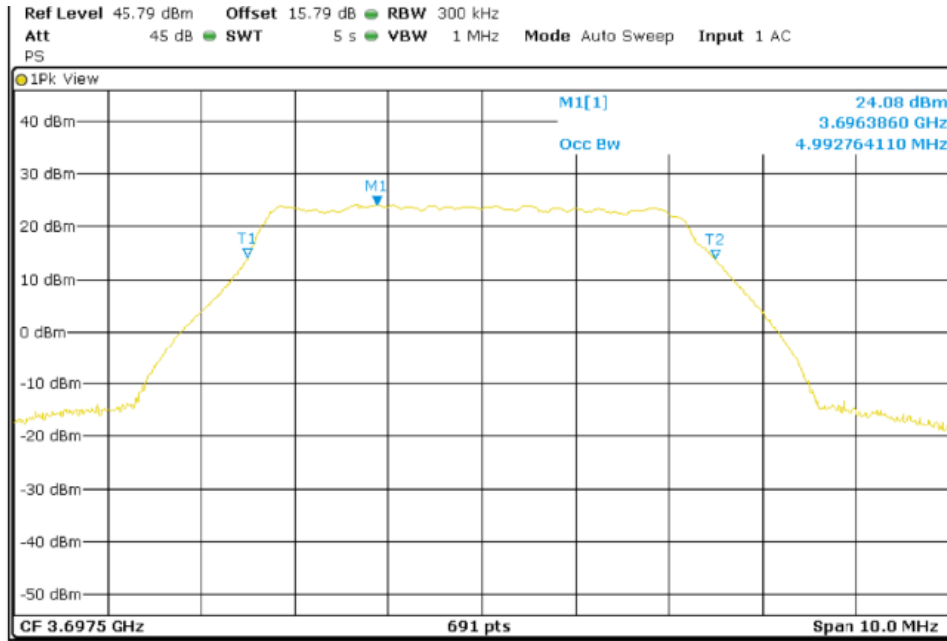


Middle Channel (3625 MHz) 16QAM

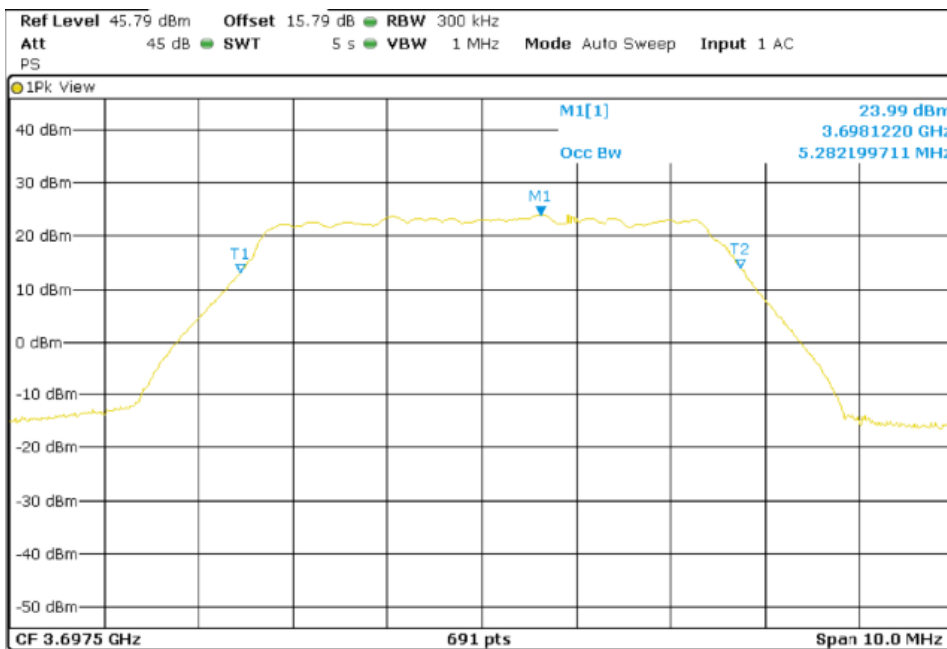


TEST RESULTS (Cont.):

Highest Channel (3697.5 MHz) QPSK



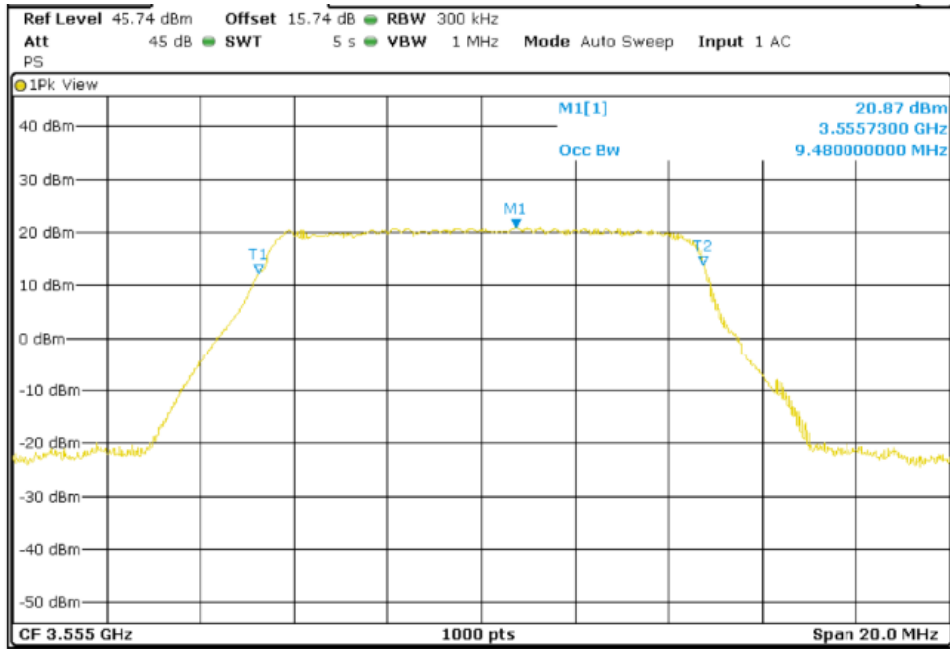
Highest Channel (3697.5 MHz) 16QAM



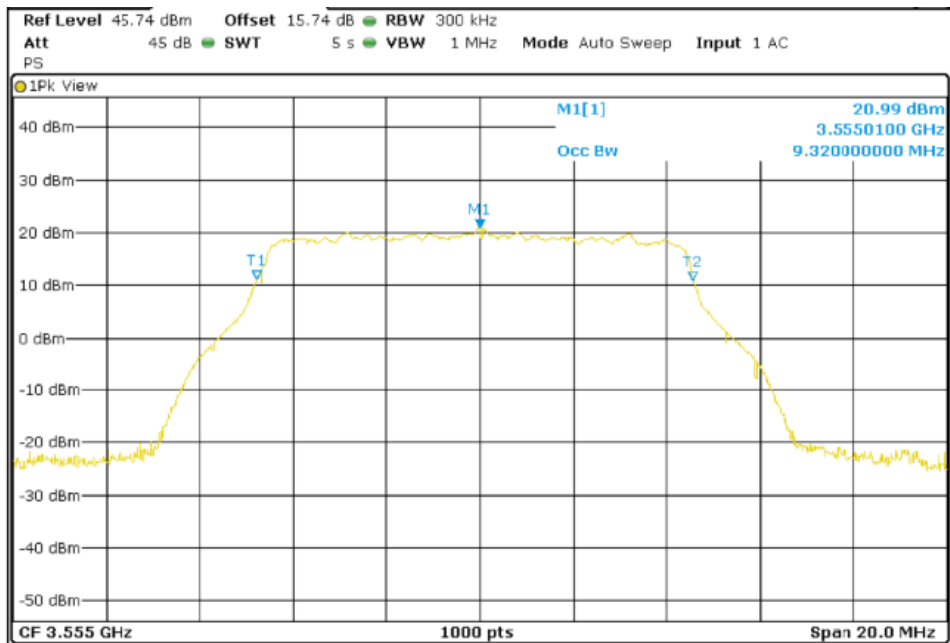
TEST RESULTS (Cont.):

10 MHz BW

Lowest Channel (3555 MHz) QPSK

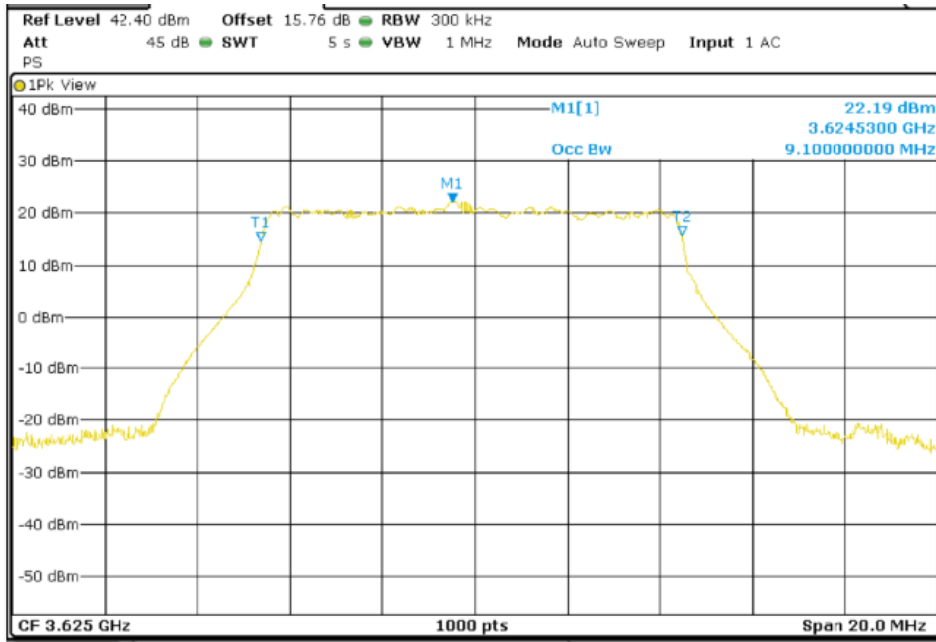


Lowest Channel (3555 MHz) 16QAM

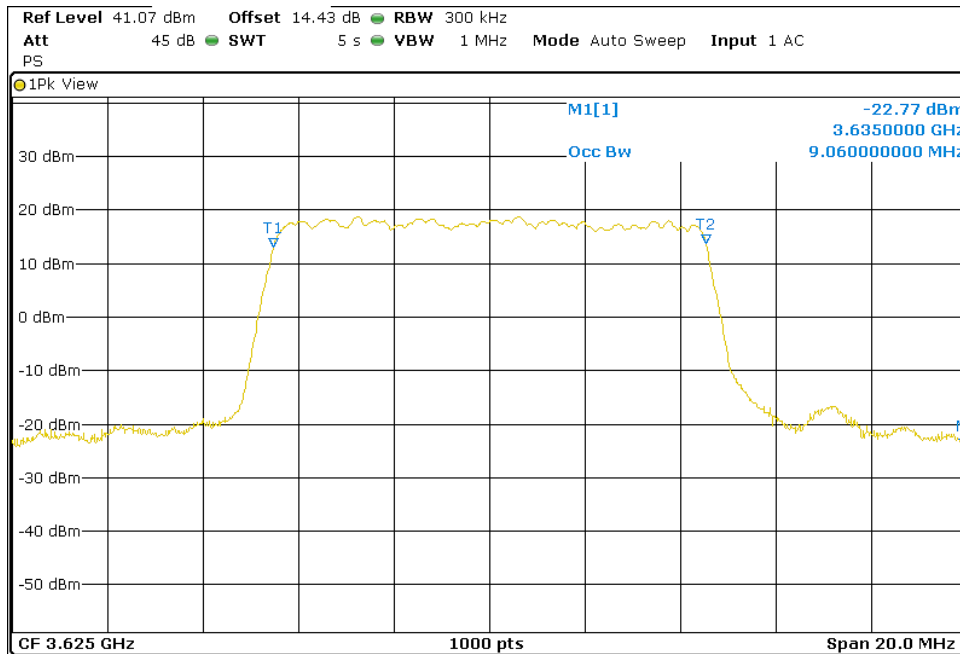


TEST RESULTS (Cont.):

Middle Channel (3625 MHz) QPSK

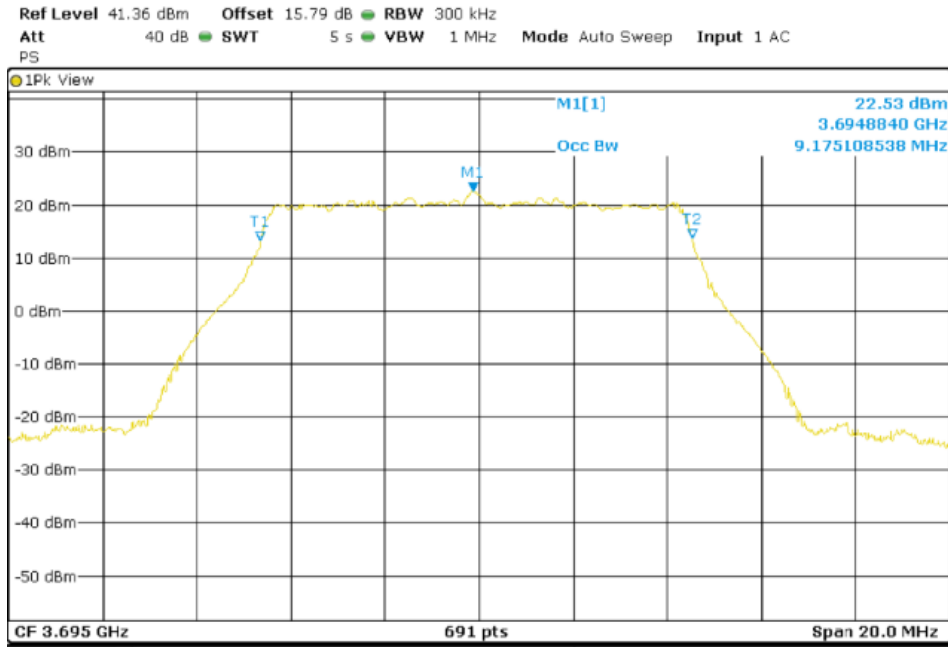


Middle Channel (3625 MHz) 16QAM

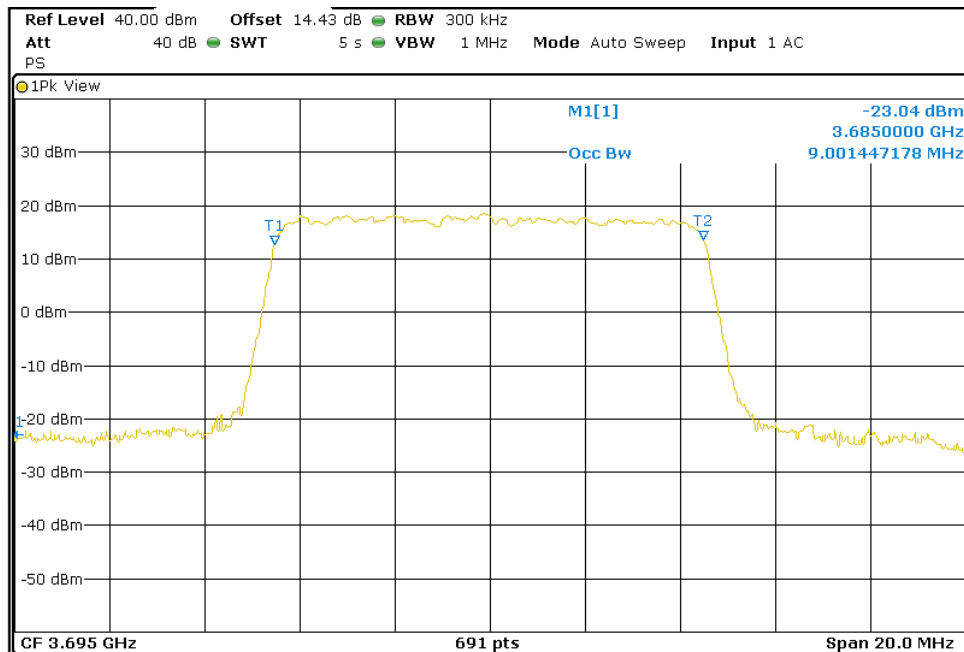


TEST RESULTS (Cont.):

High Channel (3695 MHz) QPSK



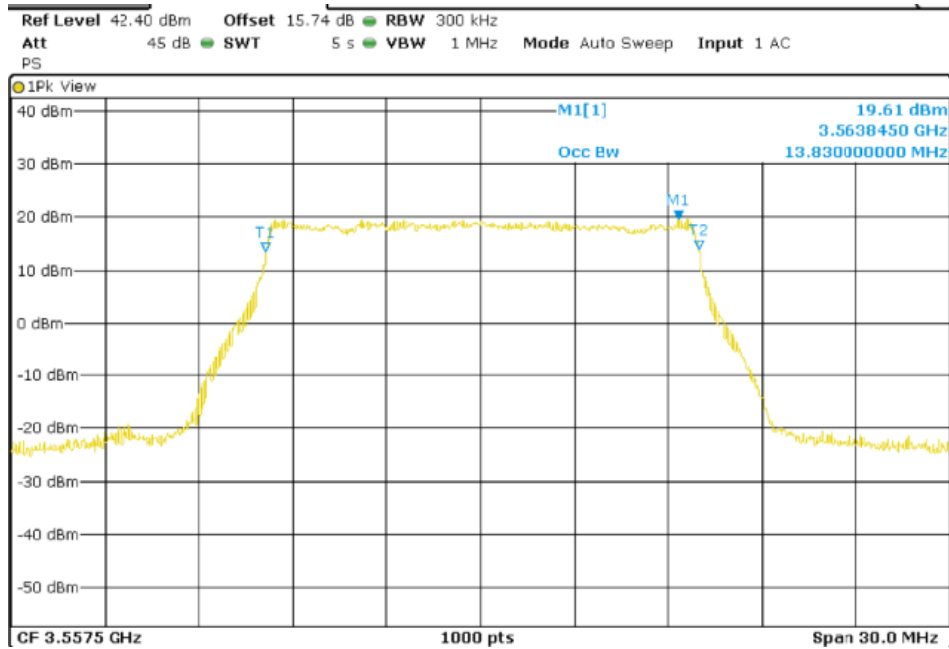
High Channel (3695 MHz) 16QAM



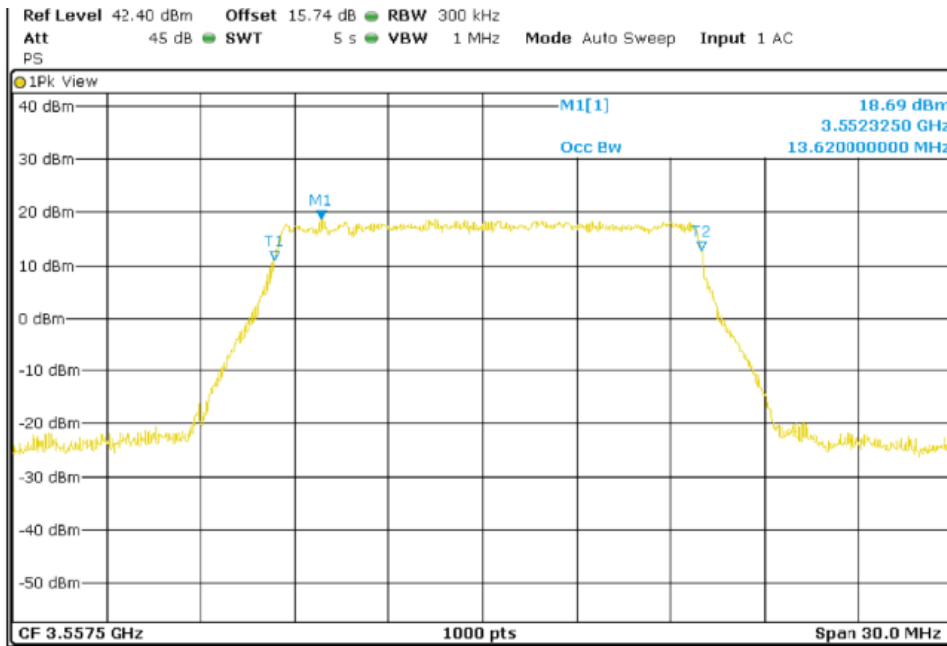
TEST RESULTS (Cont.):

15 MHz BW

Lowest Channel (3557.5 MHz) QPSK

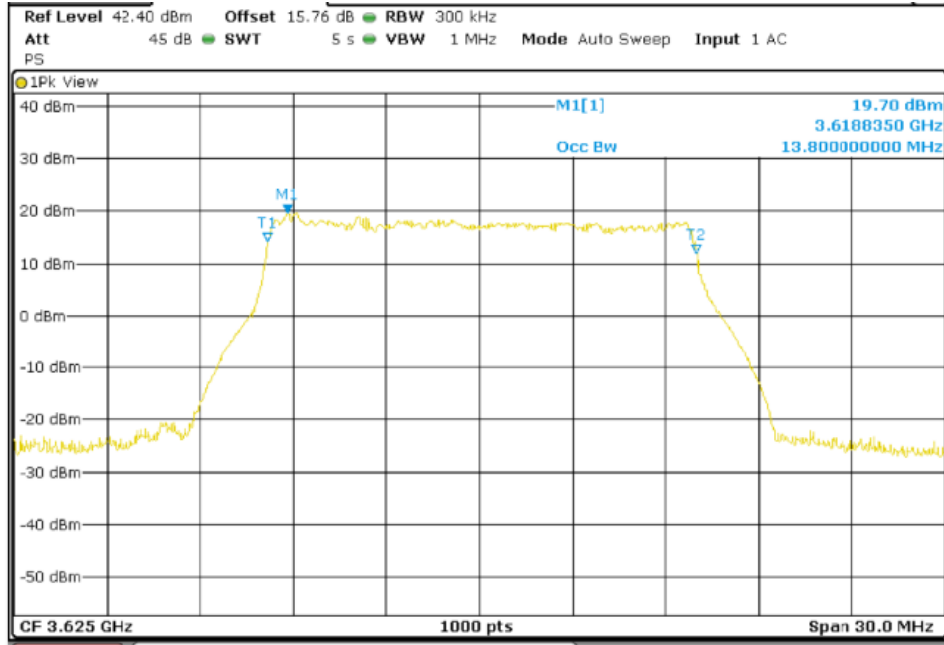


Lowest Channel (3557.5 MHz) 16QAM

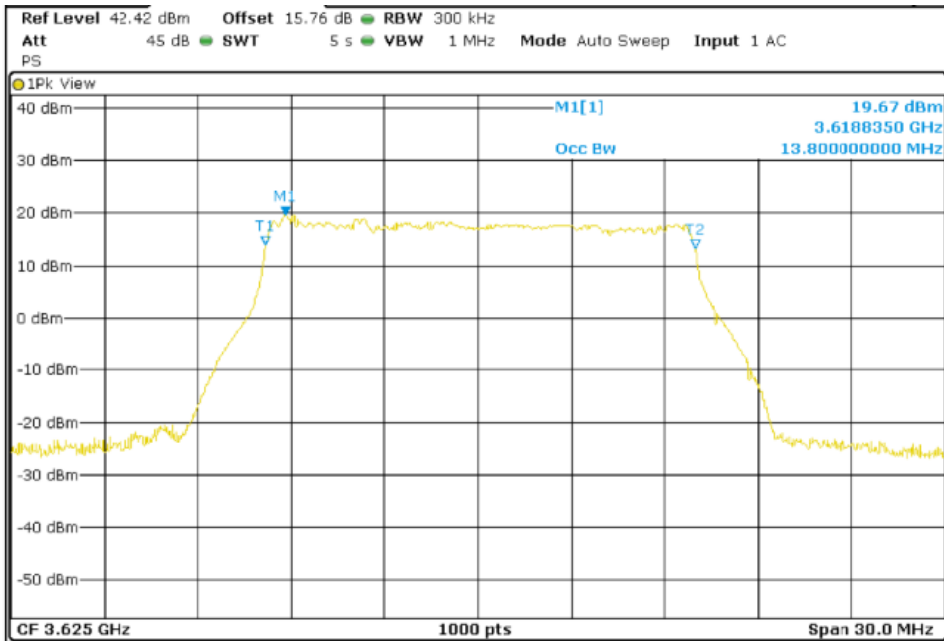


TEST RESULTS (Cont.):

Middle Channel (3625 MHz) QPSK

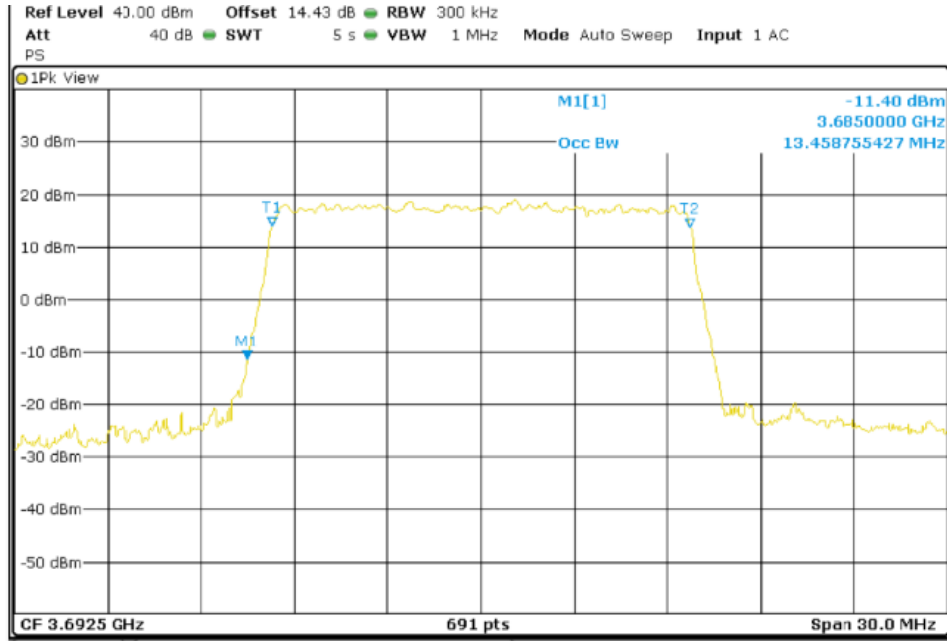


Middle Channel (3625 MHz) 16QAM

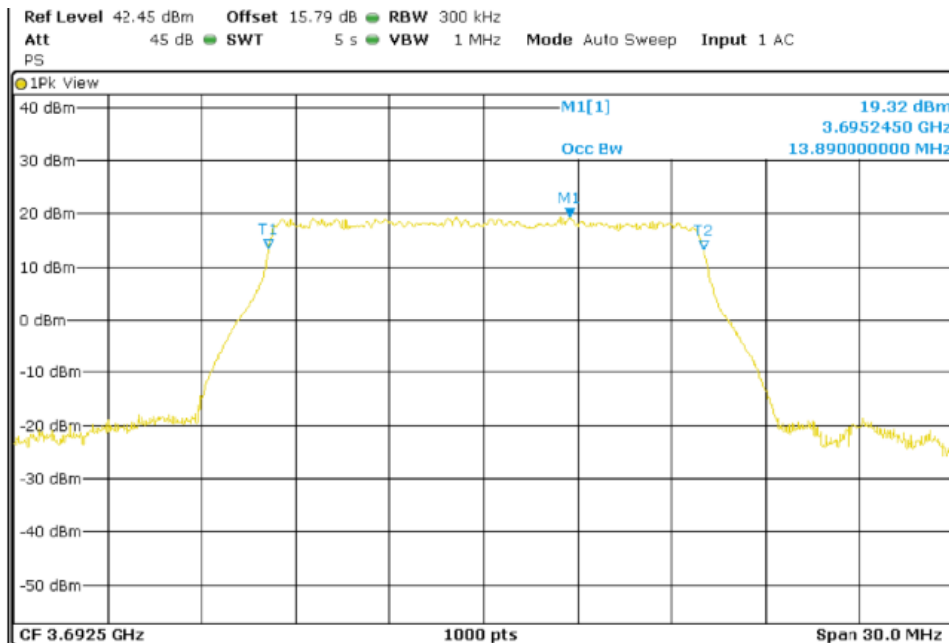


TEST RESULTS (Cont.):

Highest Channel (3692.5 MHz) QPSK



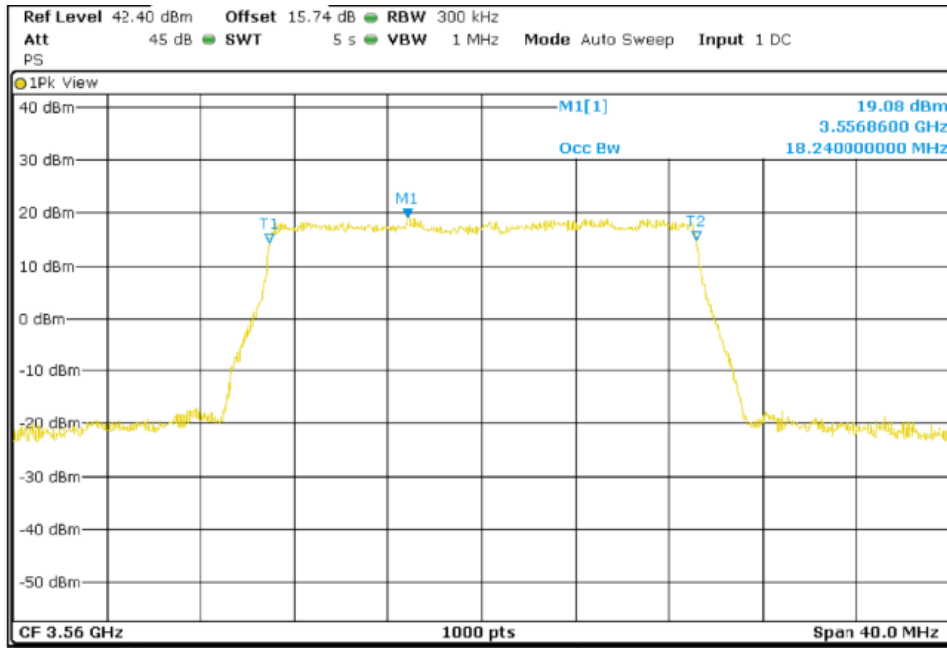
Highest Channel (3692.5 MHz) 16QAM



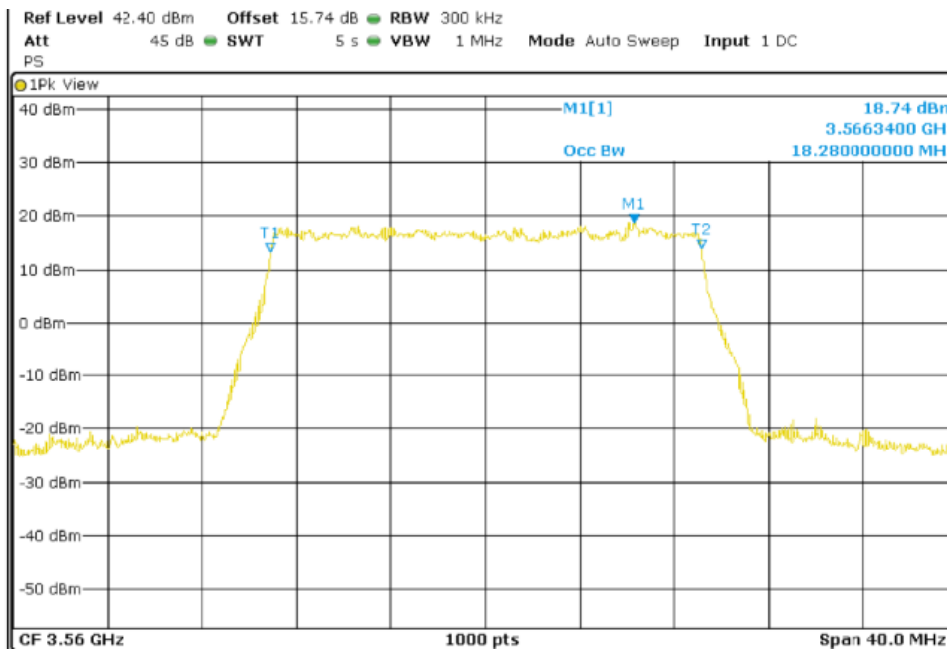
TEST RESULTS (Cont.):

20 MHz BW

Lowest Channel (3560 MHz) QPSK

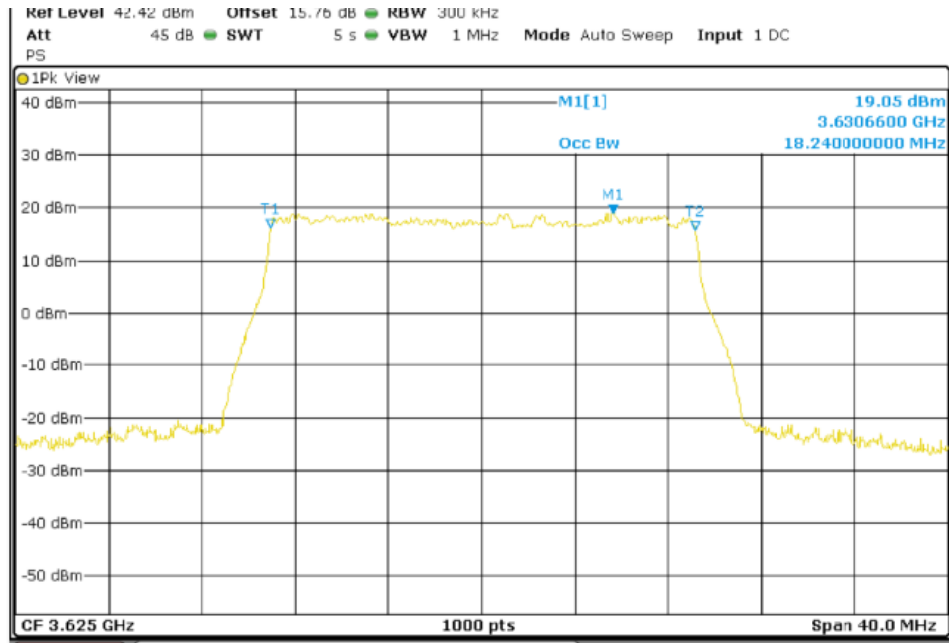


Lowest Channel (3560 MHz) 16QAM

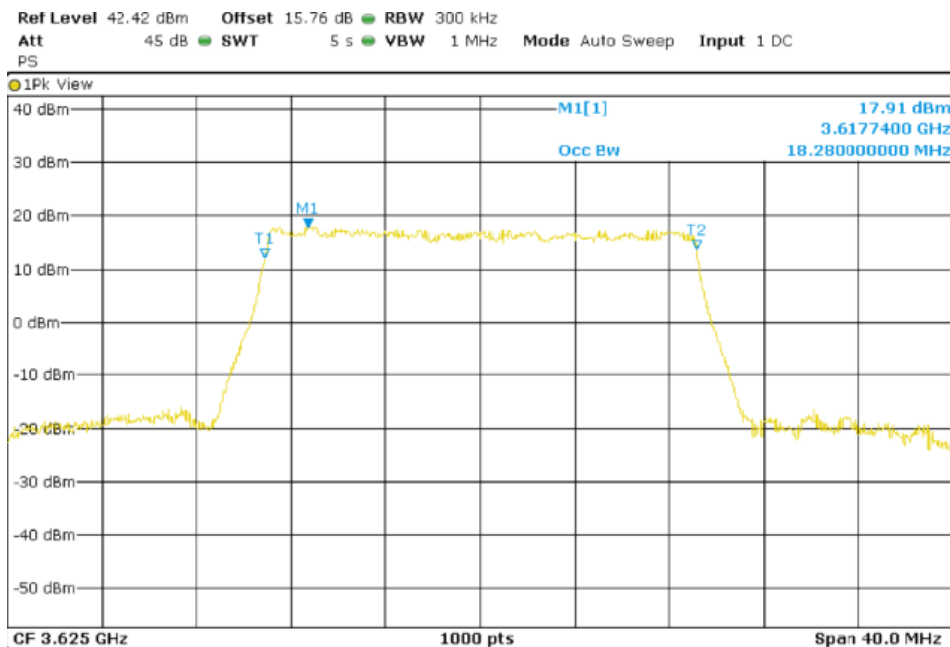


TEST RESULTS (Cont.):

Middle Channel (3625 MHz) QPSK

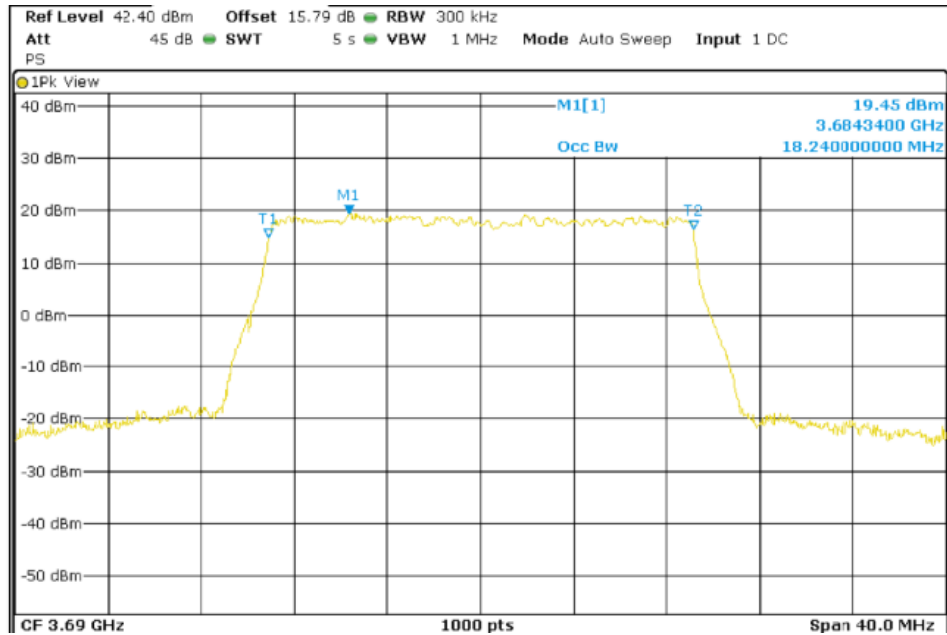


Middle Channel (3625 MHz) 16QAM

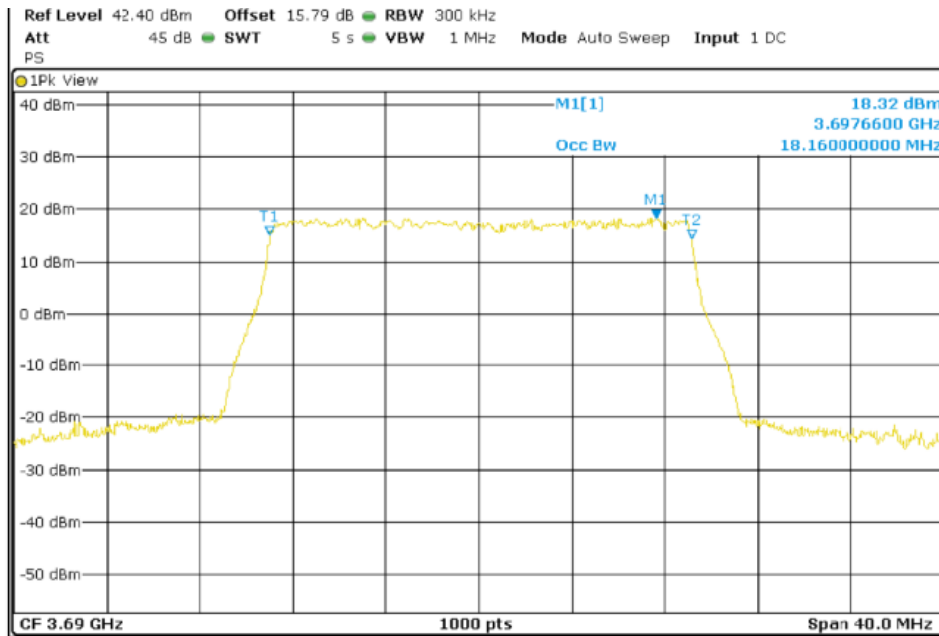


TEST RESULTS (Cont.):

High Channel (3690 MHz) QPSK



High Channel (3690 MHz) 16QAM

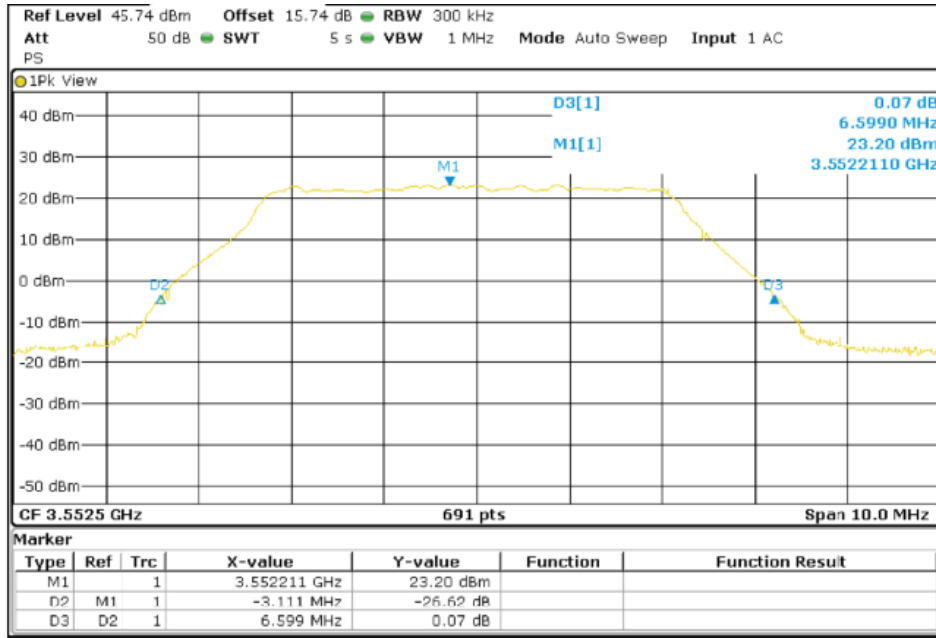


TEST RESULTS (Cont.):

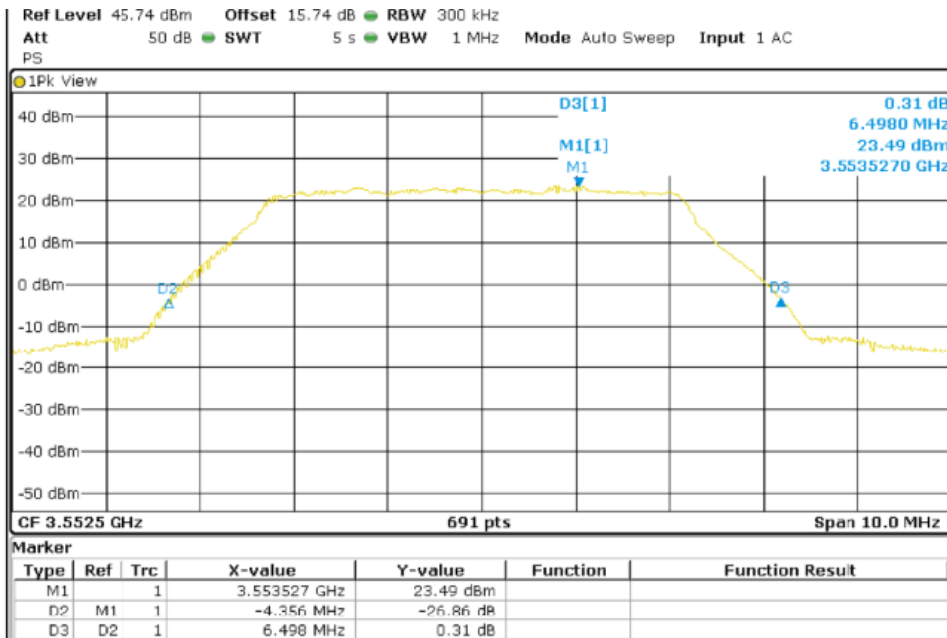
-26dB Bandwidth

5 MHz BW

Lowest Channel (3552.5 MHz) QPSK

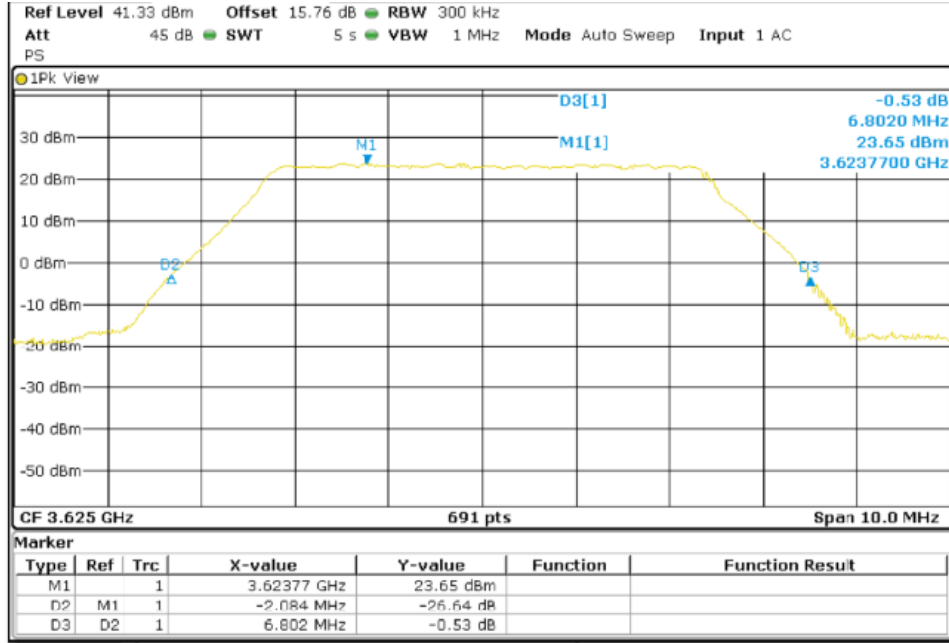


Lowest Channel (3552.5 MHz) 16QAM

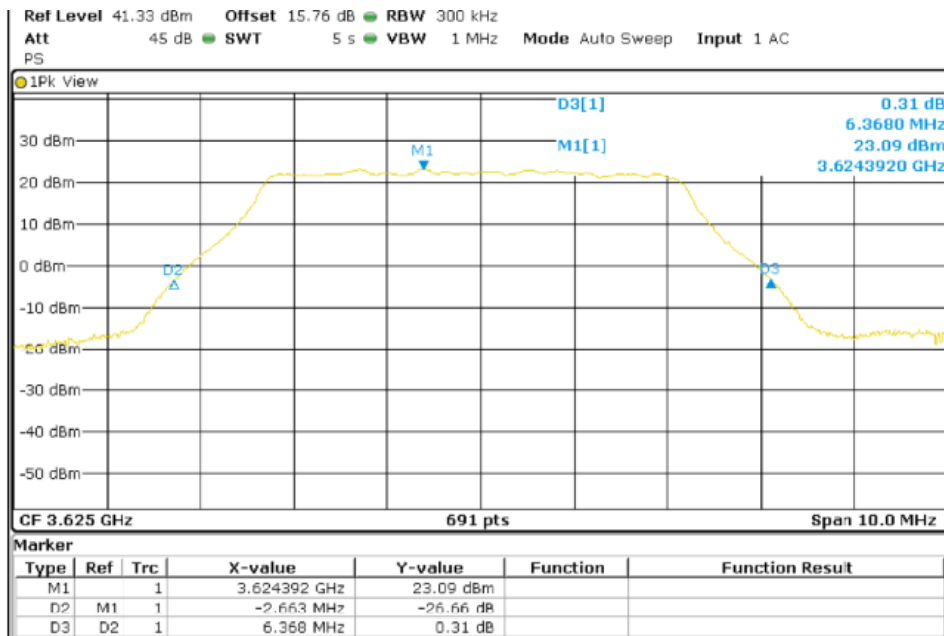


TEST RESULTS (Cont.):

Middle Channel (3625 MHz) QPSK

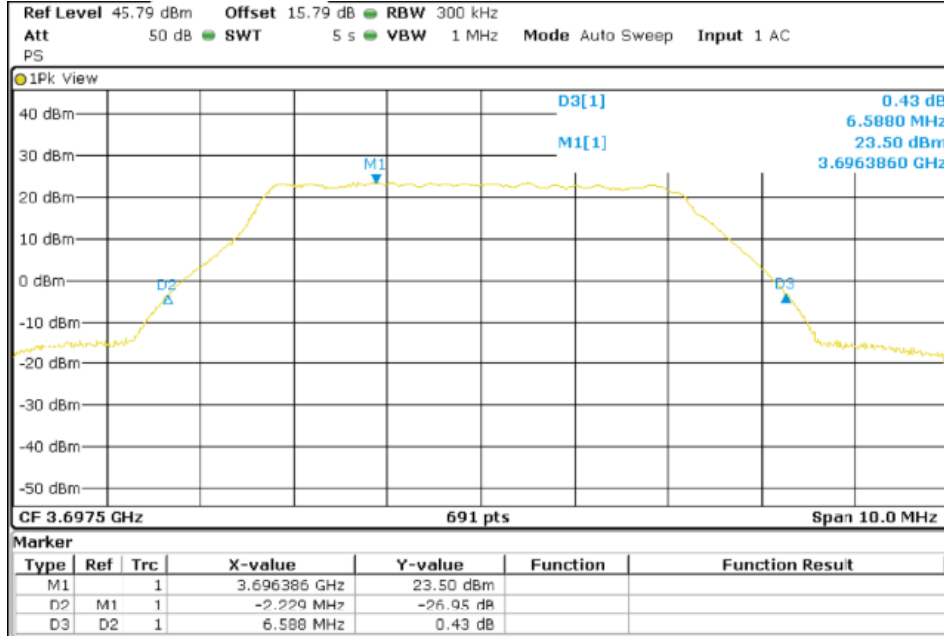


Middle Channel (3625 MHz) 16QAM

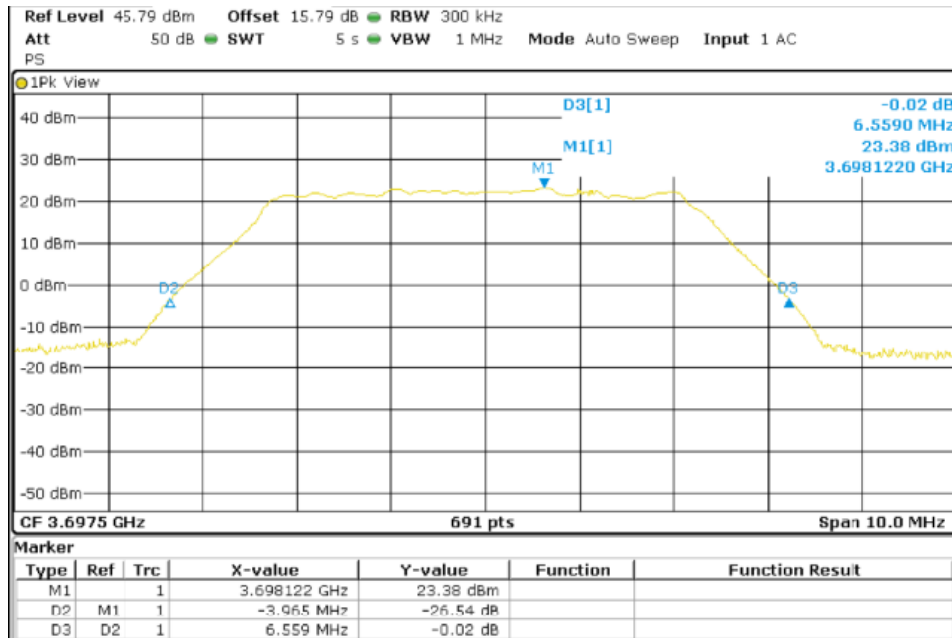


TEST RESULTS (Cont.):

Highest Channel (3697.5 MHz) QPSK



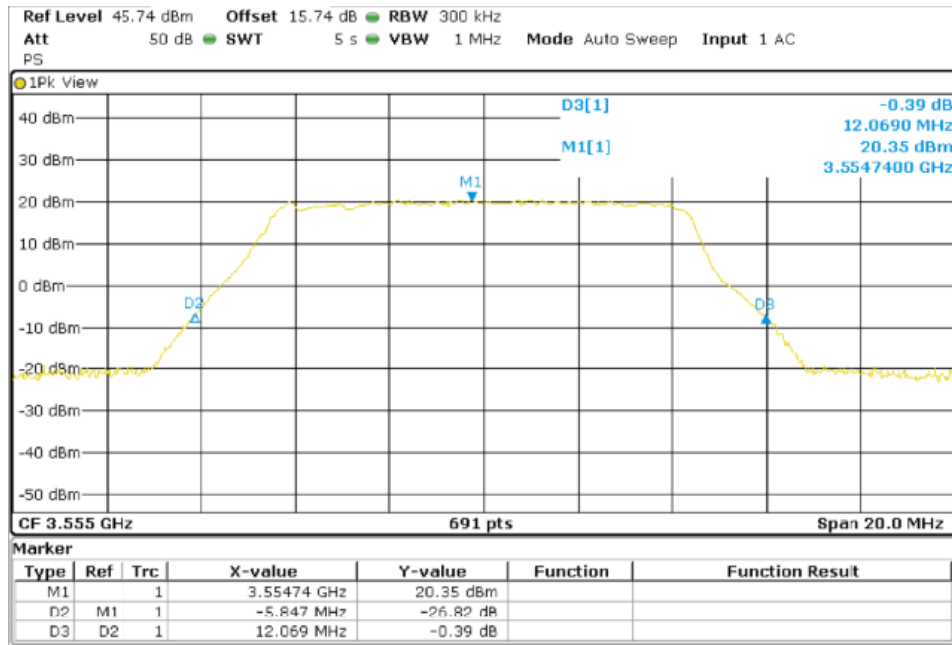
Highest Channel (3697.5 MHz) 16QAM



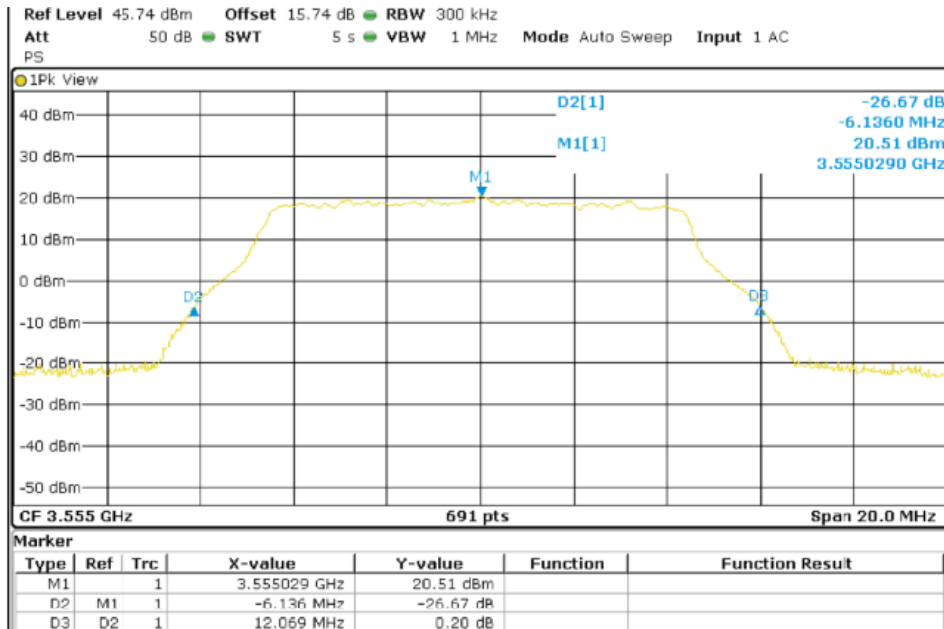
TEST RESULTS (Cont.):

10 MHz BW

Lowest Channel (3555 MHz) QPSK

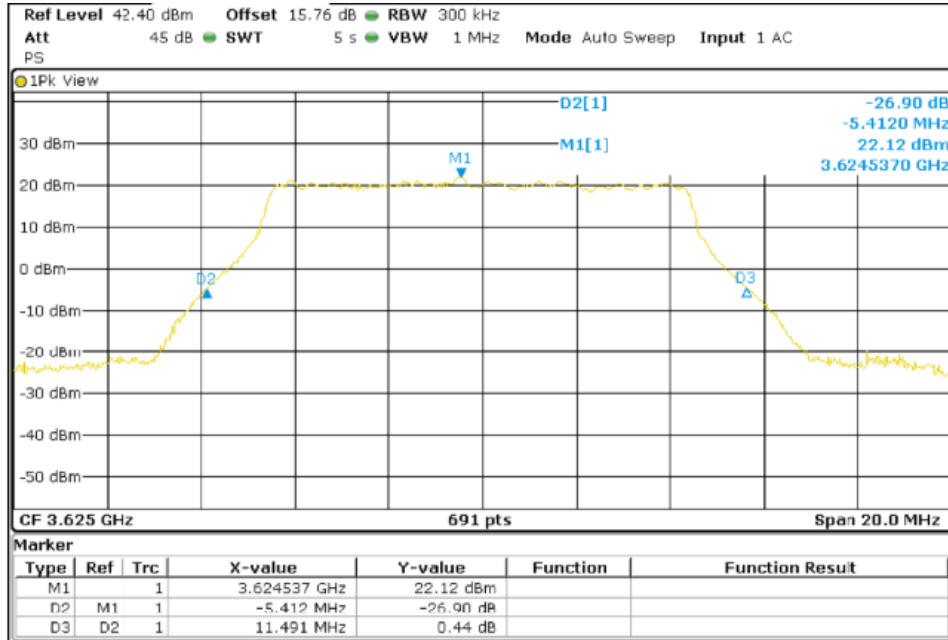


Lowest Channel (3555 MHz) 16QAM

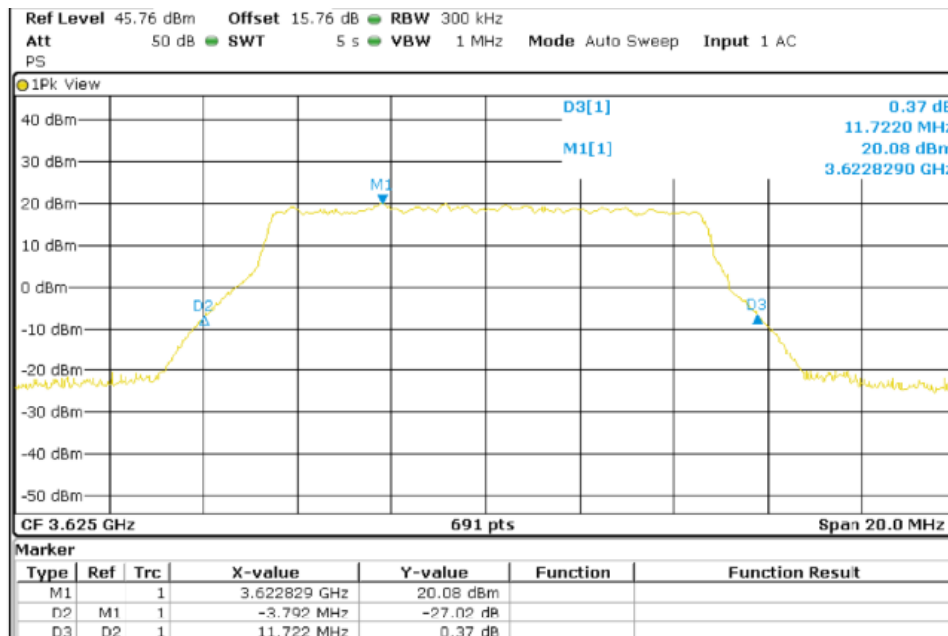


TEST RESULTS (Cont.):

Middle Channel (3625 MHz) QPSK

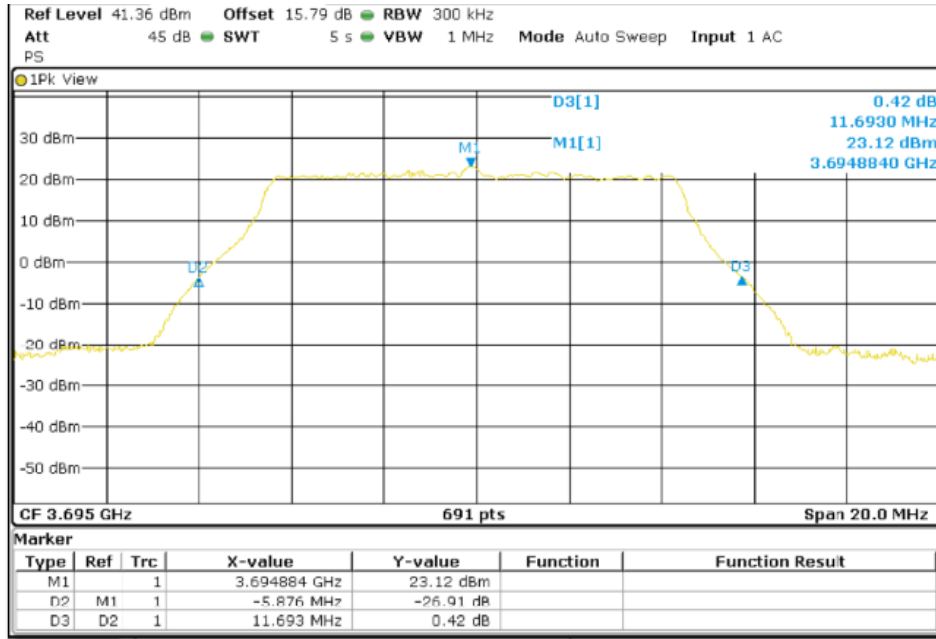


Middle Channel (3625 MHz) 16QAM

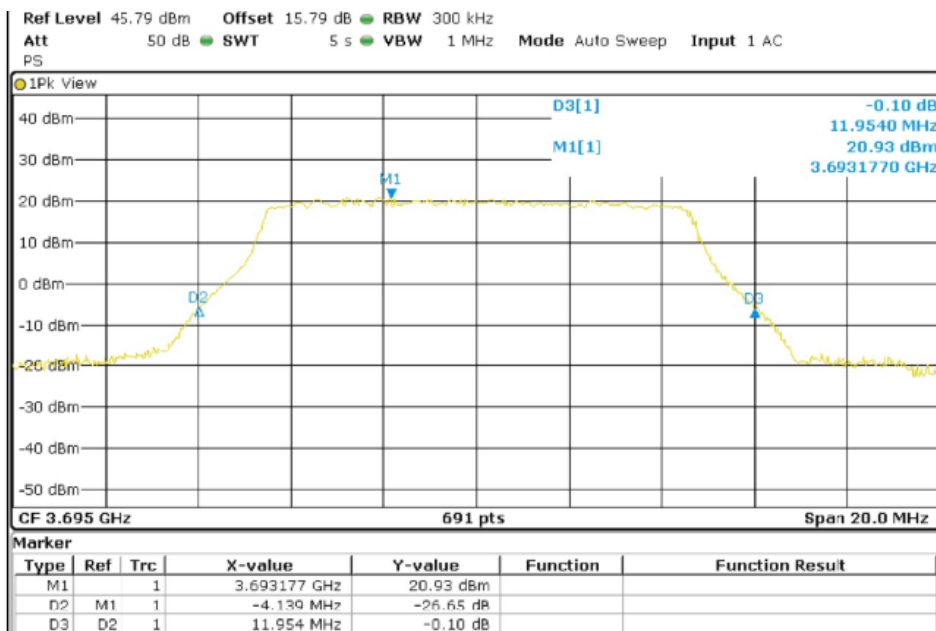


TEST RESULTS (Cont.):

High Channel (3695 MHz) QPSK



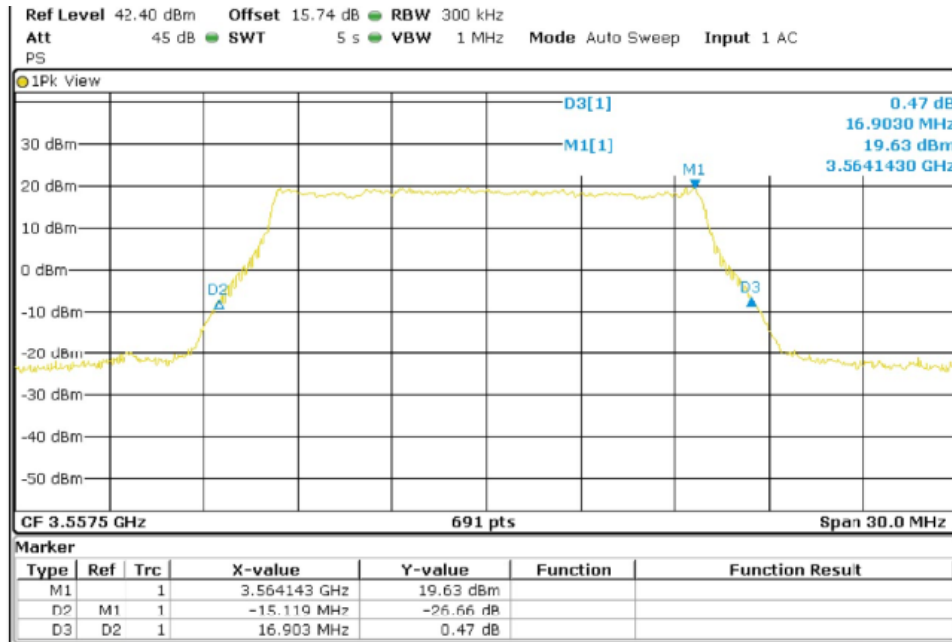
High Channel (3695 MHz) 16QAM



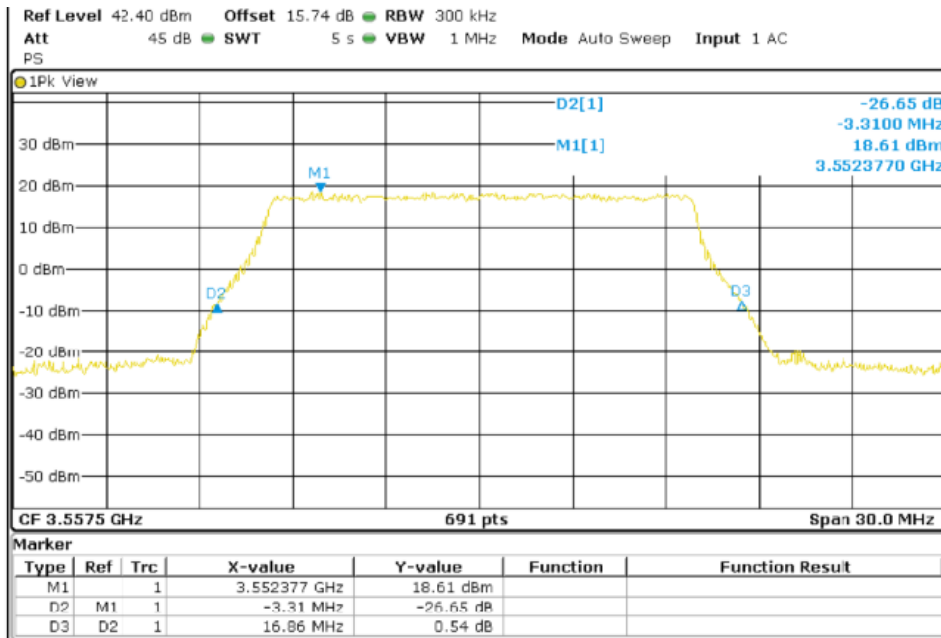
TEST RESULTS (Cont.):

15 MHz BW

Lowest Channel (3557.5 MHz) QPSK

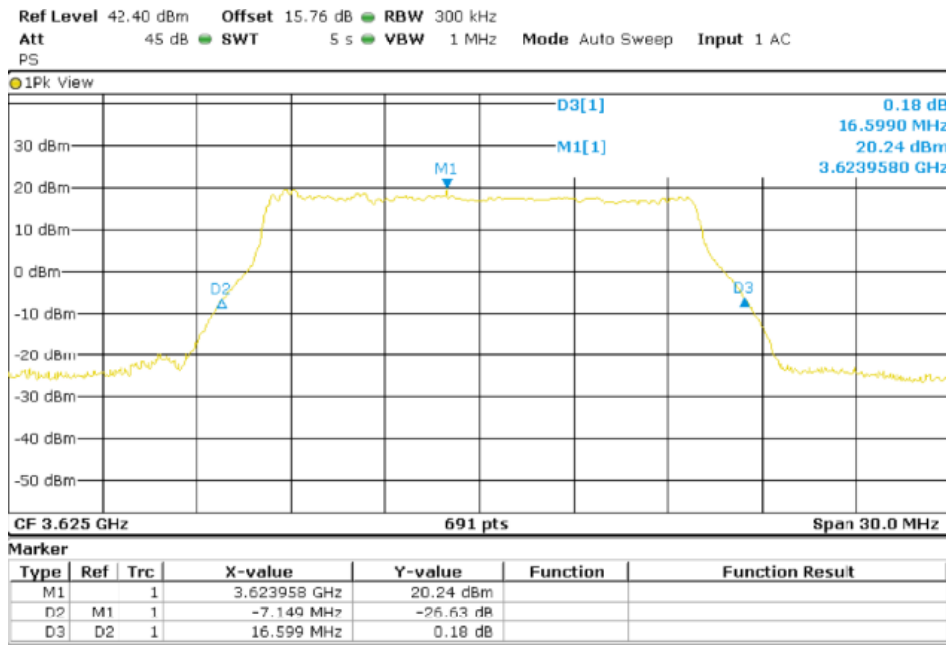


Lowest Channel (3557.5 MHz) 16QAM

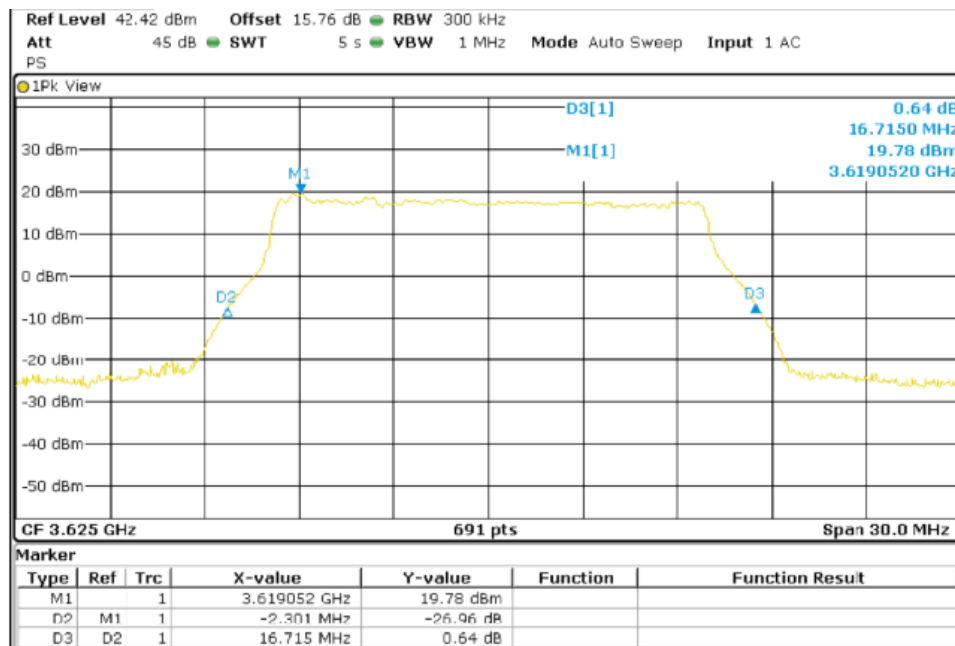


TEST RESULTS (Cont.):

Middle Channel (3625 MHz) QPSK

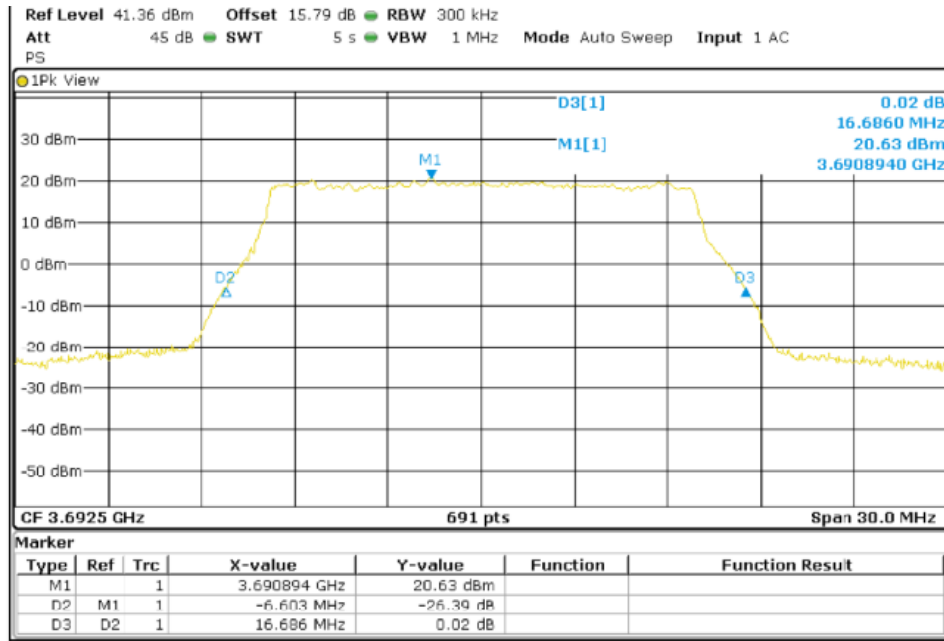


Middle Channel (3625 MHz) 16QAM

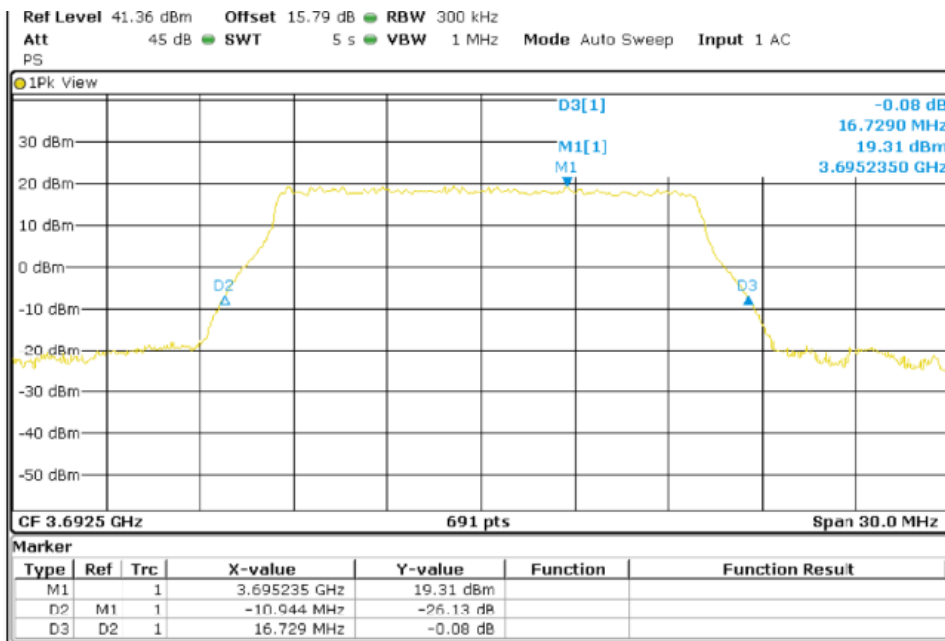


TEST RESULTS (Cont.):

Highest Channel (3692.5 MHz) QPSK



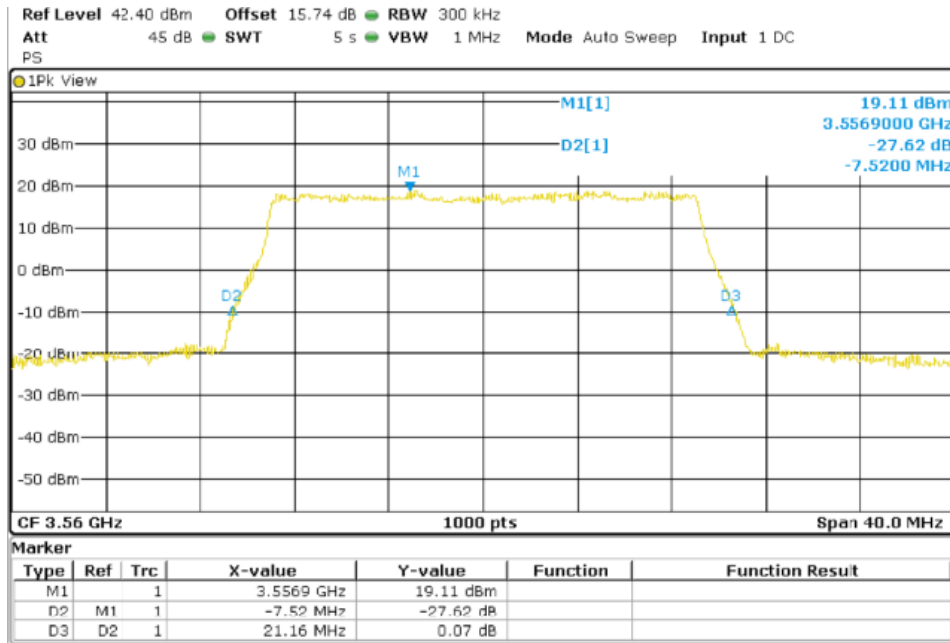
Highest Channel (3692.5 MHz) 16QAM



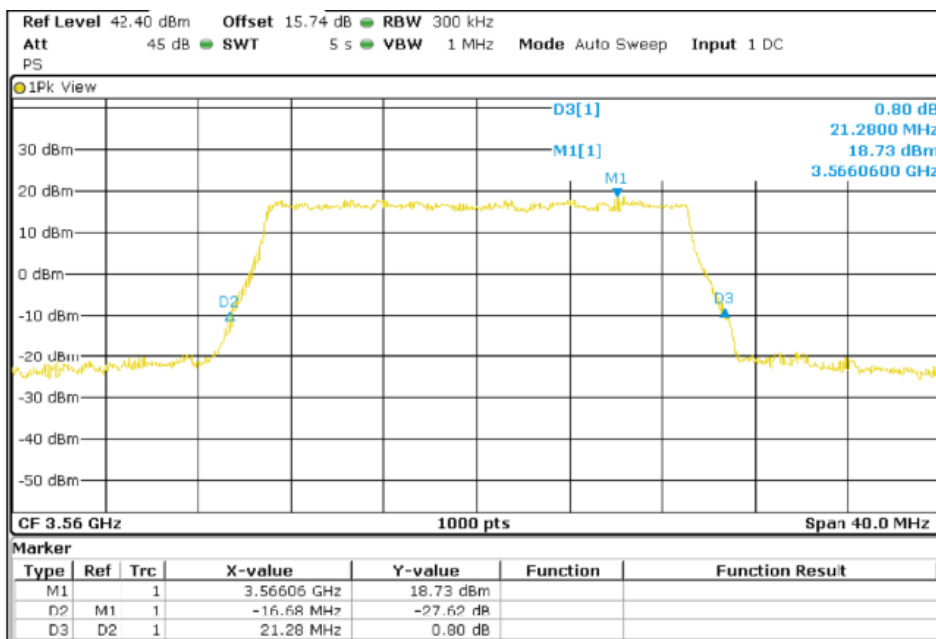
TEST RESULTS (Cont.):

20 MHz BW

Lowest Channel (3560 MHz) QPSK

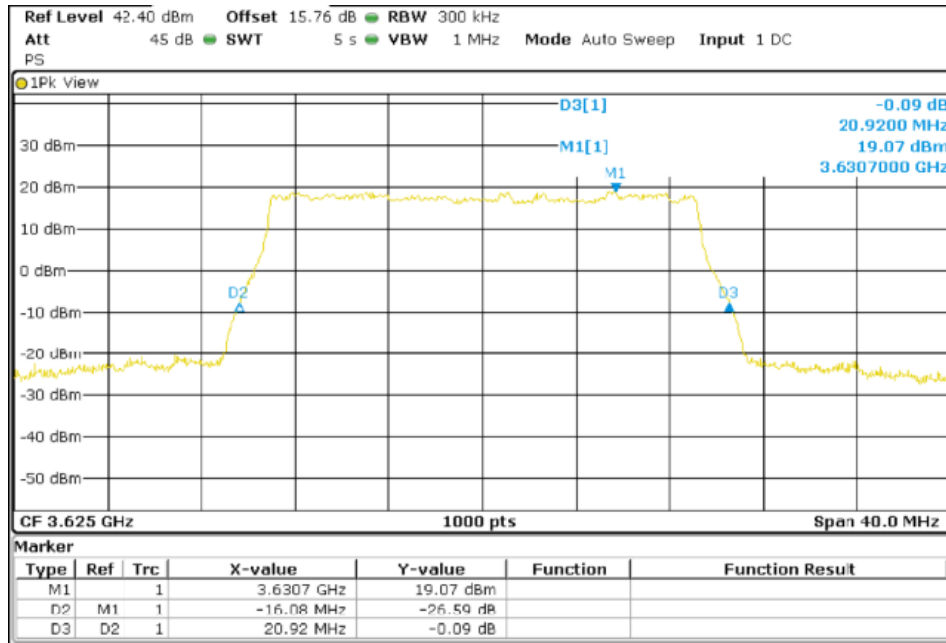


Lowest Channel (3560 MHz) 16QAM

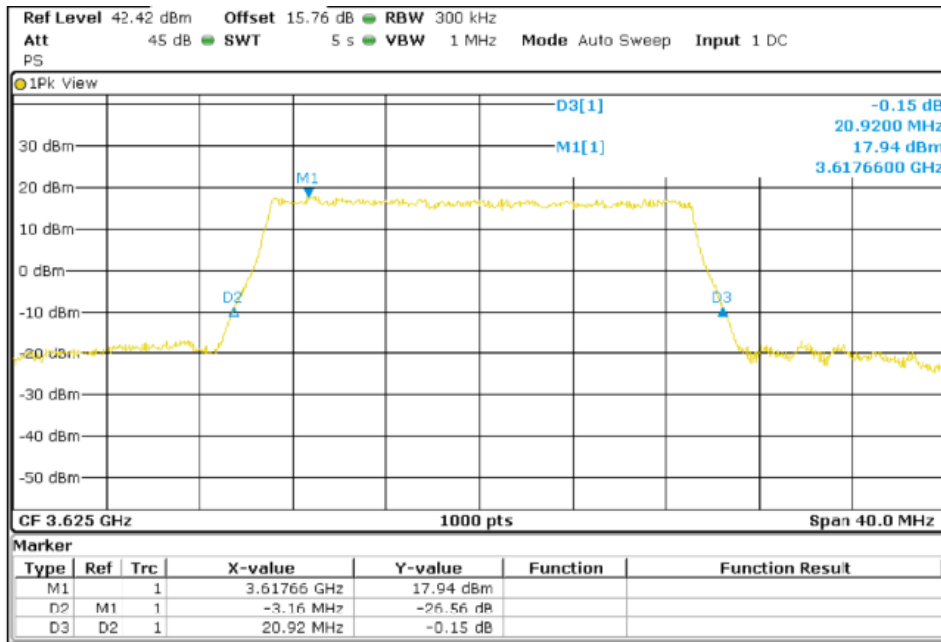


TEST RESULTS (Cont.):

Middle Channel (3625 MHz) QPSK

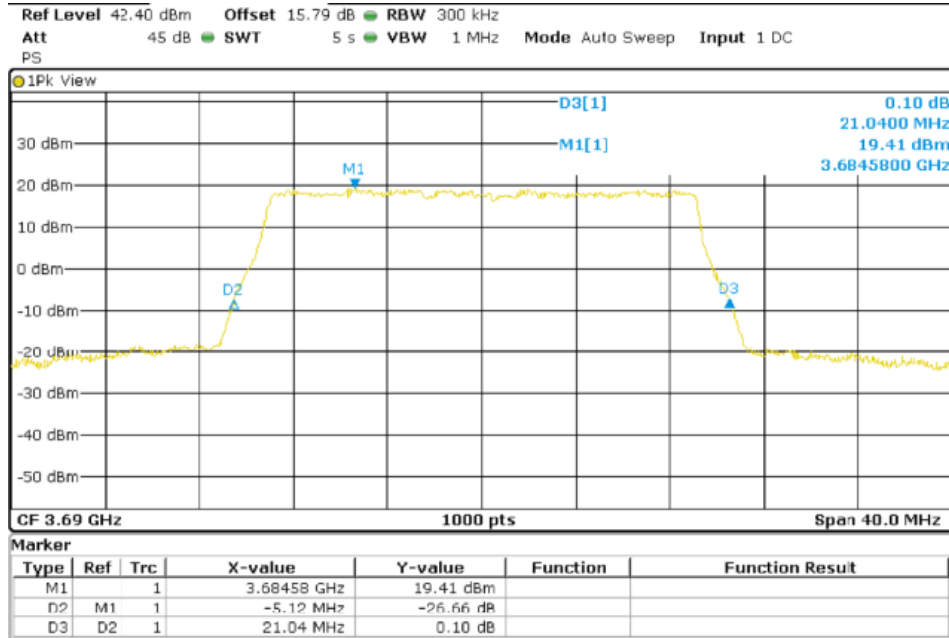


Middle Channel (3625 MHz) 16QAM

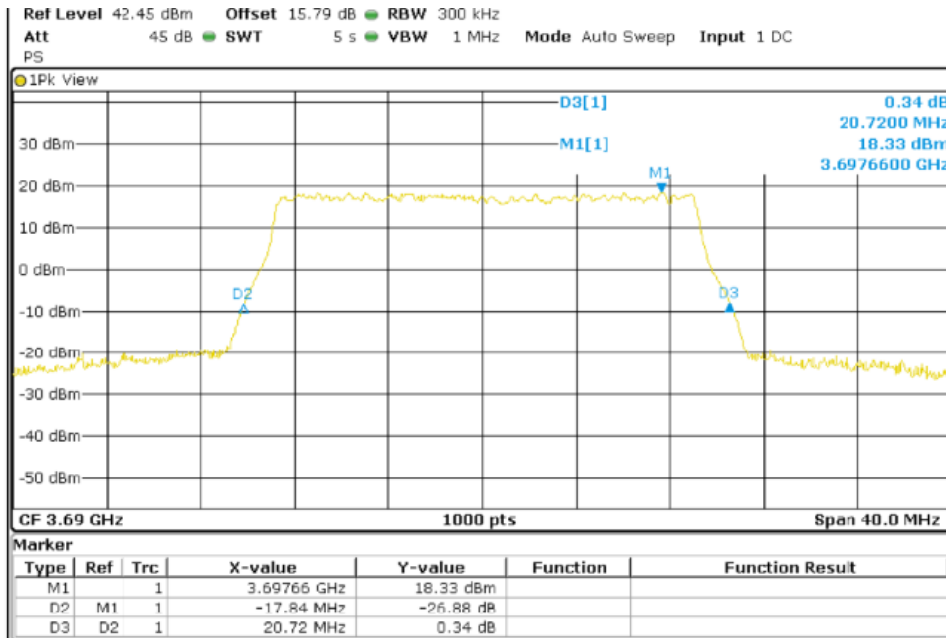


TEST RESULTS (Cont.):

High Channel (3690 MHz) QPSK



High Channel (3690 MHz) 16QAM



TEST A.4: PEAK-TO-AVERAGE POWER RATIO (PAPR)

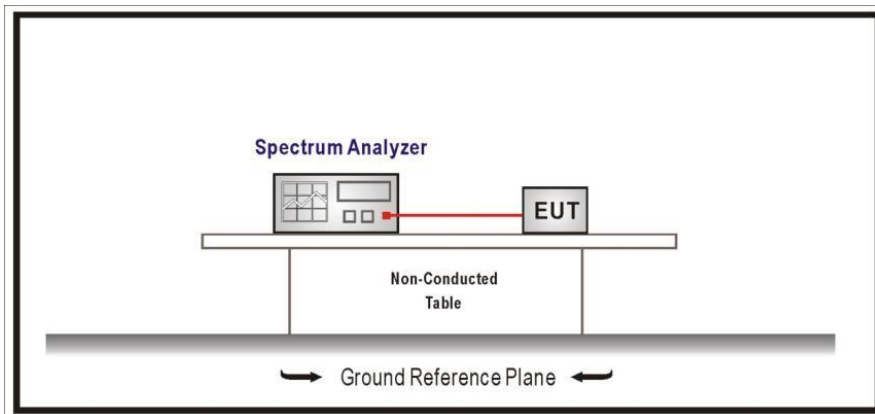
LIMITS:	Product standard:	Part 96.41 Subclause (g)
	Test standard:	ANSI C63.26-2015

LIMITS

In addition to the power limits in Section 96.41, CBSDs need to meet a PAPR limit. For this measurement, the procedure in Section 5.2.6 of ANSI C63.26-2015 is acceptable. CCDF (Complementary Cumulative Distribution Function) measurement was utilized in the spectrum analyzer and the maximum PAPR level with 0.1 % probability values were recorded.

The peak-to-average power ratio (PAPR) of any CBSD transmitter output power must not exceed 13 db.

TEST SETUP



TESTED SAMPLES:	S/01
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TESTED CONDITIONS MODES:	TC#01 (Band 48)
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TEST RESULTS:	PASS
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Results:

5 MHz BW

	Lowest frequency 3552.5 MHz	Middle frequency 3625 MHz	Highest frequency 3697.5 MHz
Peak (dBm)	31.38	31.38	31.80
Mean (dBm)	23.32	23.32	23.78
PAPR at 0.1% probability (dB)	6.90	6.90	7.10

TEST RESULTS (Cont.):

10 MHz BW

	Lowest frequency 3555 MHz	Middle frequency 3625 MHz	Highest frequency 3695 MHz
Peak (dBm)	49.03	30.83	31.16
Mean (dBm)	40.53	21.27	23.69
PAPR at 0.1% probability (dB)	7.54	8.38	6.41

15 MHz BW

	Lowest frequency 3557.5 MHz	Middle frequency 3625 MHz	Highest frequency 3692.5 MHz
Peak (dBm)	29.43	29.25	30.01
Mean (dBm)	21.64	20.24	21.35
PAPR at 0.1% probability (dB)	7.16	8.20	8.06

20 MHz BW

	Lowest frequency 3560 MHz	Middle frequency 3625 MHz	Highest frequency 3690 MHz
Peak (dBm)	27.57	27.58	28.21
Mean (dBm)	18.52	18.37	18.76
PAPR at 0.1% probability (dB)	8.67	8.75	8.99

Verdict: PASS
 (See next plots)

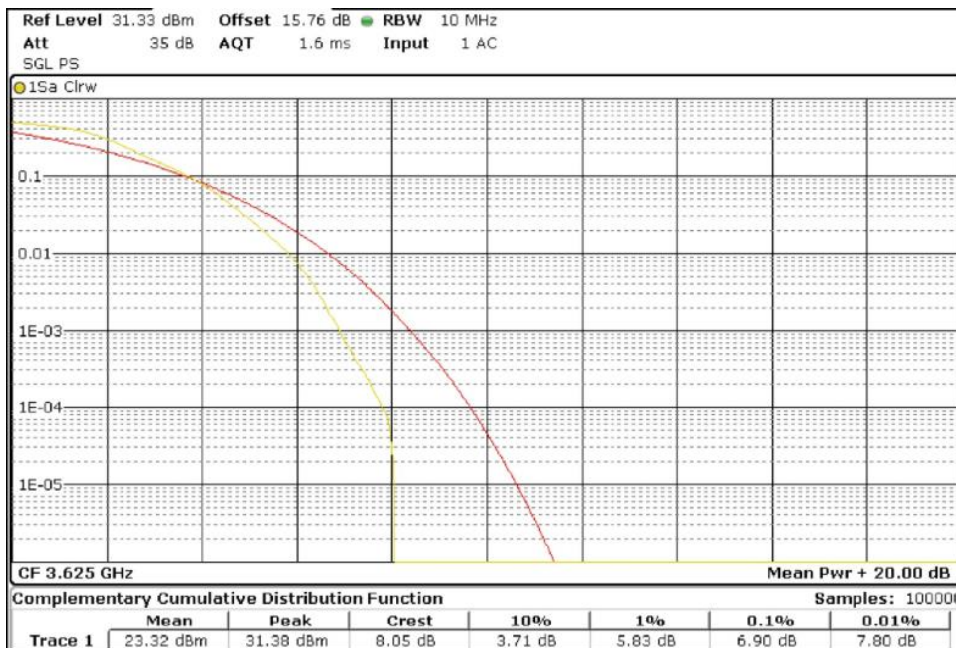
TEST RESULTS (Cont.):

5 MHz BW

Lowest Channel (3552.5 MHz)

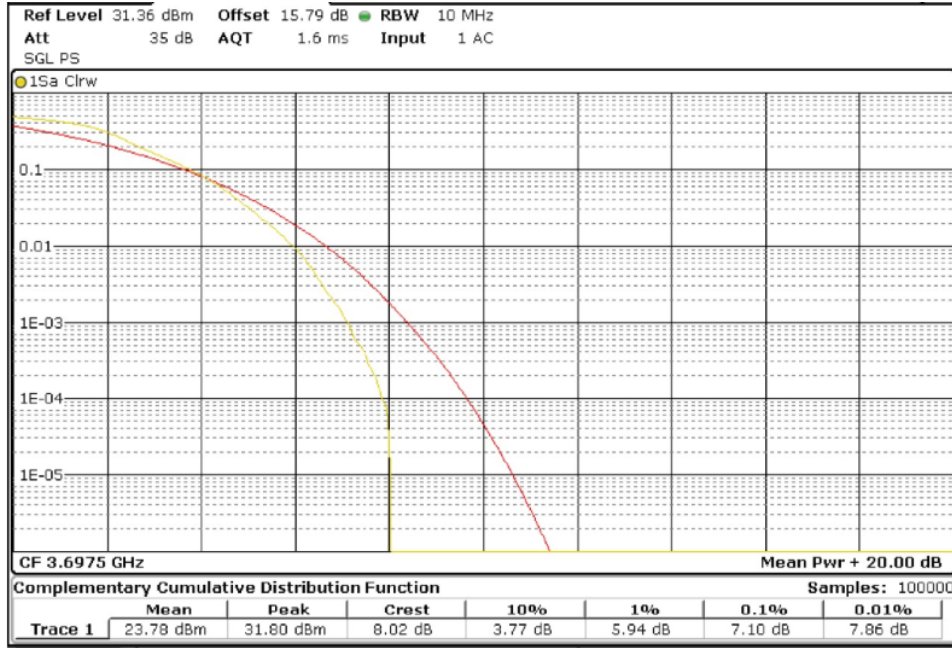


Middle Channel (3625 MHz)



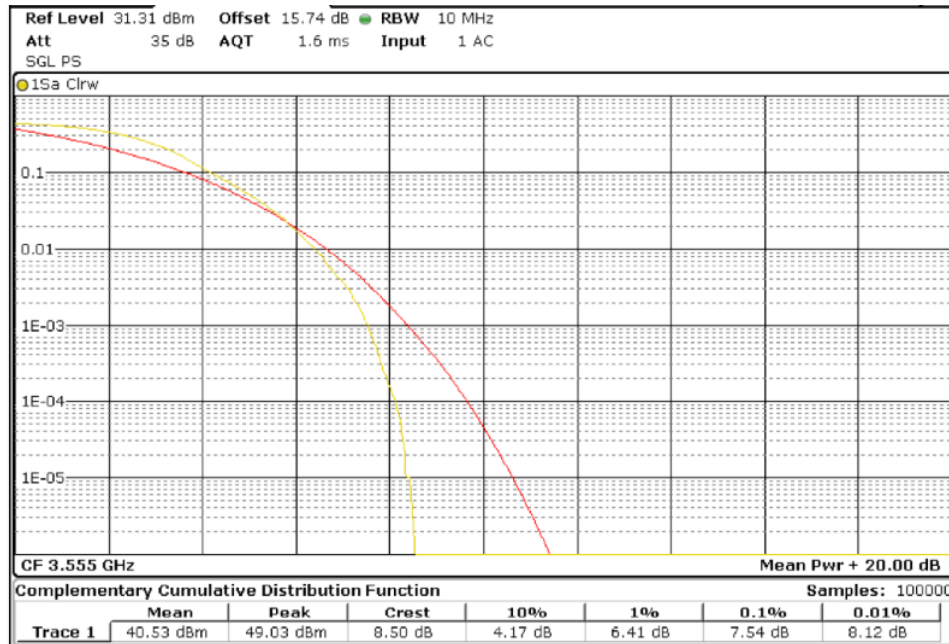
TEST RESULTS (Cont.):

Highest Channel (3697.5 MHz)



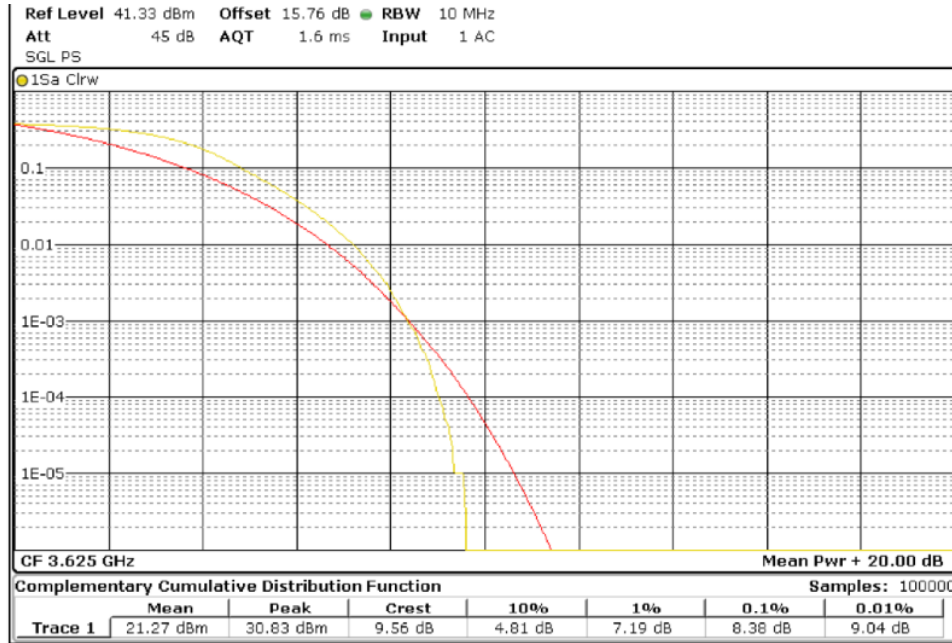
10 MHz BW

Lowest Channel (3555 MHz)

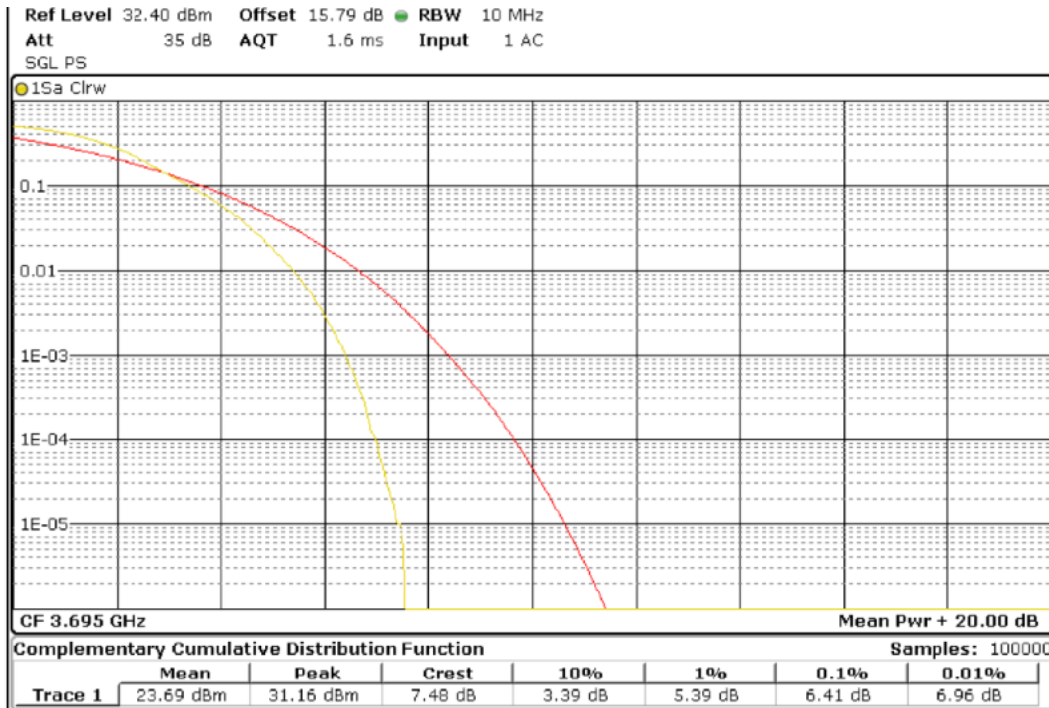


TEST RESULTS (Cont.):

Middle Channel (3625 MHz)



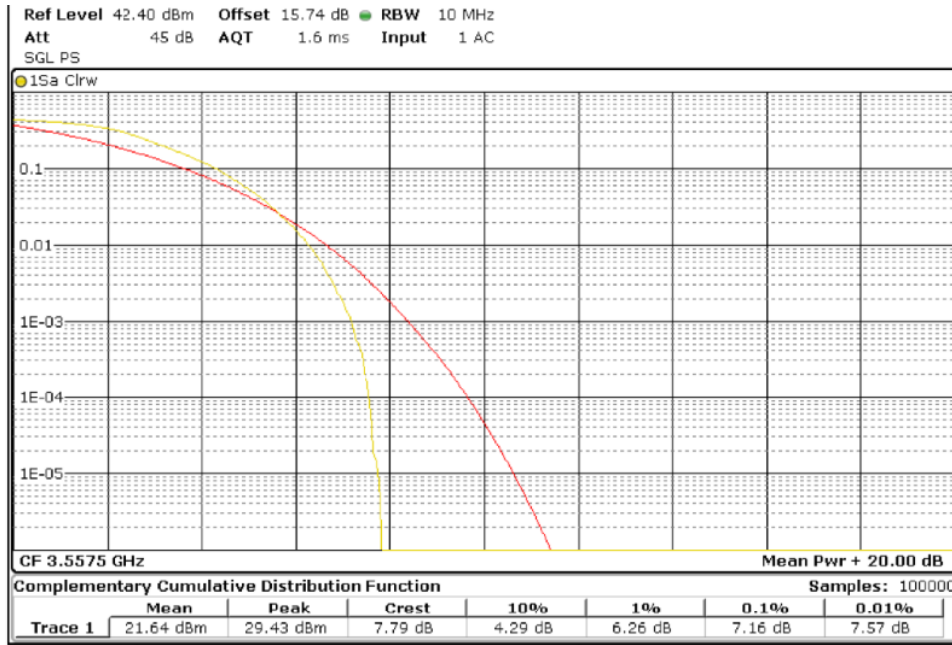
Highest Channel (3695 MHz)



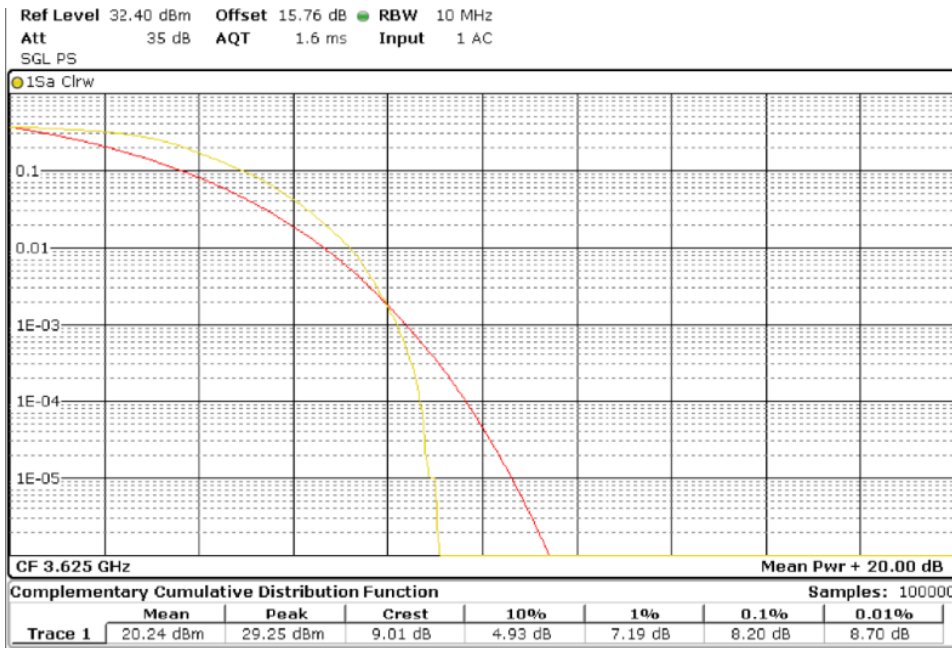
TEST RESULTS (Cont.):

15 MHz BW

Lowest Channel (3557.5 MHz)

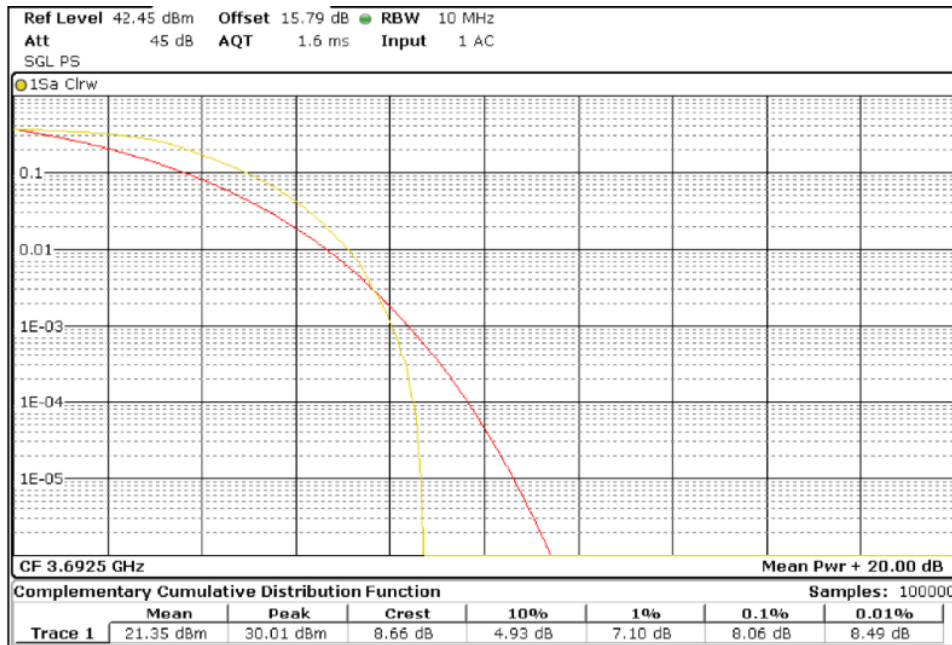


Middle Channel (3625 MHz)



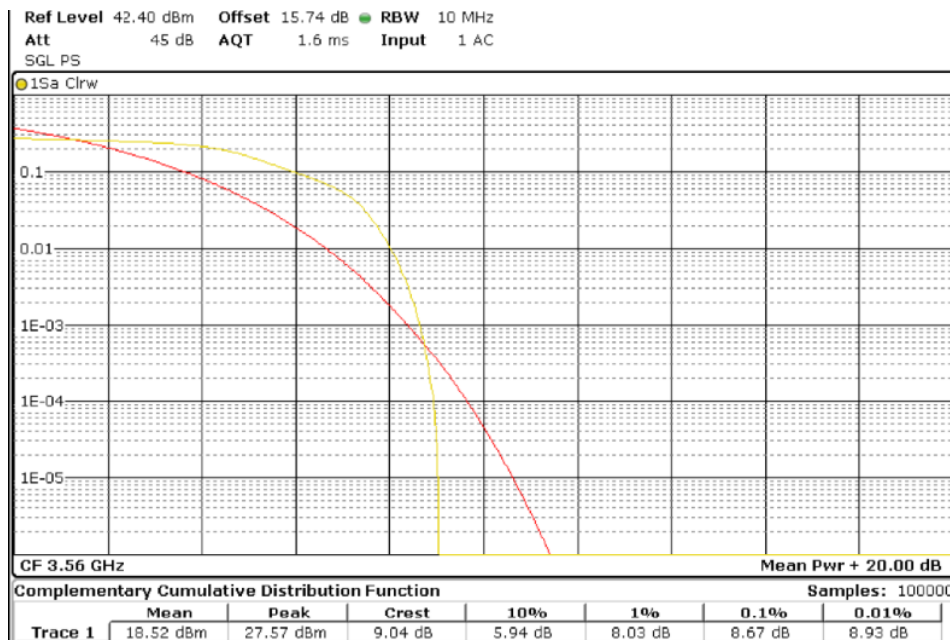
TEST RESULTS (Cont.):

Highest Channel (3692.5 MHz)



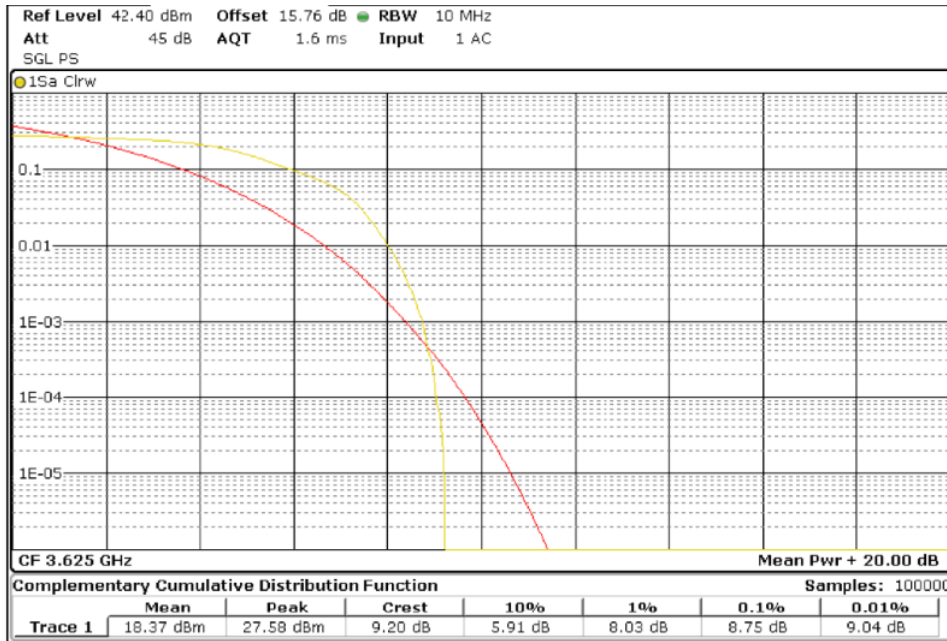
20 MHz BW

Lowest Channel (3560 MHz)

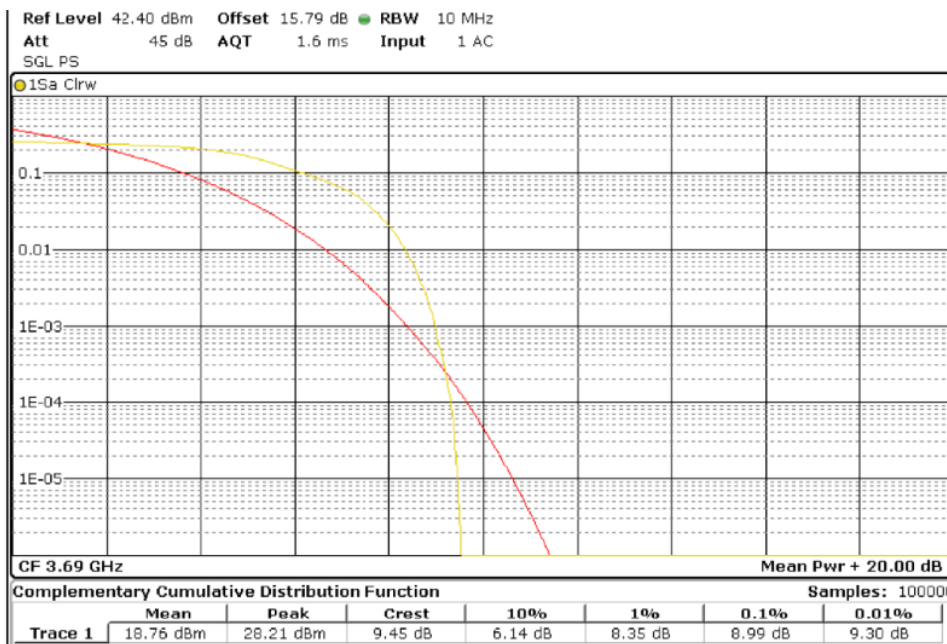


TEST RESULTS (Cont.):

Middle Channel (3625 MHz)



Highest Channel (3690 MHz)



TEST A.5: 3.5 GHZ EMISSION AND INTERFERENCE LIMITS

LIMITS:	Product standard:	Part 96.41 Subclause (e)
	Test standard:	ANSI C63.26-2015

LIMITS

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in § 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

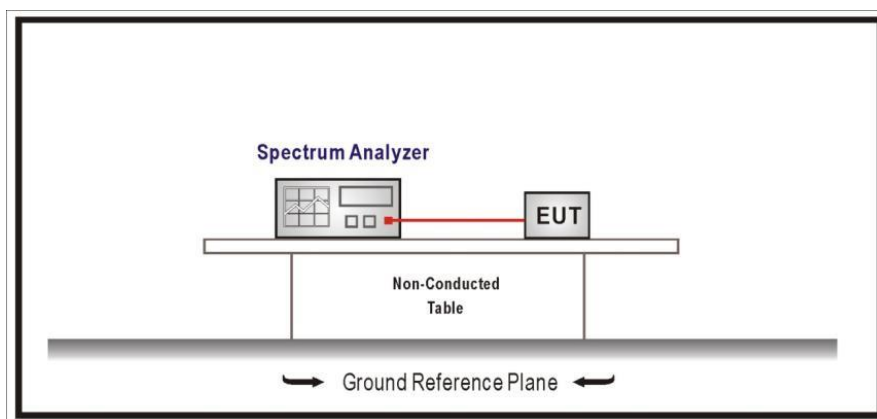
Confirm that the device satisfies the emission limits specified in Section 96.41(e) for all declared channel sizes, at the lowest and highest edges of the band, and in the middle of the band. The RMS detector was used for the measurement at each frequency with 400 MHz span.

A narrower RBW is permitted in all cases to improve measurement accuracy, provided the measured power is integrated over the full reference bandwidth.

The limits for emission outside the fundamental are stated below.

- within 0-10 MHz above and below the assigned channel ≤ -13 dBm/MHz
- greater than 10 MHz above and below the assigned channel ≤ -25 dBm/MHz
- any emission below 3530 MHz and above 3720 MHz ≤ -40 dBm/MHz

TEST SETUP



The following duty cycle correction was added in RF level offset to get the accurate measured emission level in the average power measurement.

The duty cycle correction = $10 \log (1/0.40) = 4.01$ (dB)

TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01 (Band 48)
TEST RESULTS:	PASS

Results:

5 MHz BW

Lowest 3552.5 MHz		Middle 3625 MHz		Highest 3697.5 MHz	
Spurious Frequency (MHz)	Emission Level (dBm/MHz)	Spurious Frequency (MHz)	Emission Level (dBm/MHz)	Spurious Frequency (MHz)	Emission Level (dBm/MHz)
3548.80	-15.15	3628.70	-19.97	3701.20	-17.49

10 MHz BW

Lowest 3555 MHz		Middle 3625 MHz		Highest 3695 MHz	
Spurious Frequency (MHz)	Emission Level (dBm/MHz)	Spurious Frequency (MHz)	Emission Level (dBm/MHz)	Spurious Frequency (MHz)	Emission Level (dBm/MHz)
3561.02	-16.23	3631.02	-16.68	3701.02	-15.62

15 MHz BW

Lowest 3557.5 MHz		Middle 3625 MHz		Highest 3692.5 MHz	
Spurious Frequency (MHz)	Emission Level (dBm/MHz)	Spurious Frequency (MHz)	Emission Level (dBm/MHz)	Spurious Frequency (MHz)	Emission Level (dBm/MHz)
3527.99	-47.80	3640.40	-37.00	3720.40	-49.10

20 MHz BW

Lowest 3560 MHz		Middle 3625 MHz		Highest 3690 MHz	
Spurious Frequency (MHz)	Emission Level (dBm/MHz)	Spurious Frequency (MHz)	Emission Level (dBm/MHz)	Spurious Frequency (MHz)	Emission Level (dBm/MHz)
3529.60	-44.68	3604.80	-34.53	3727.62	-41.09

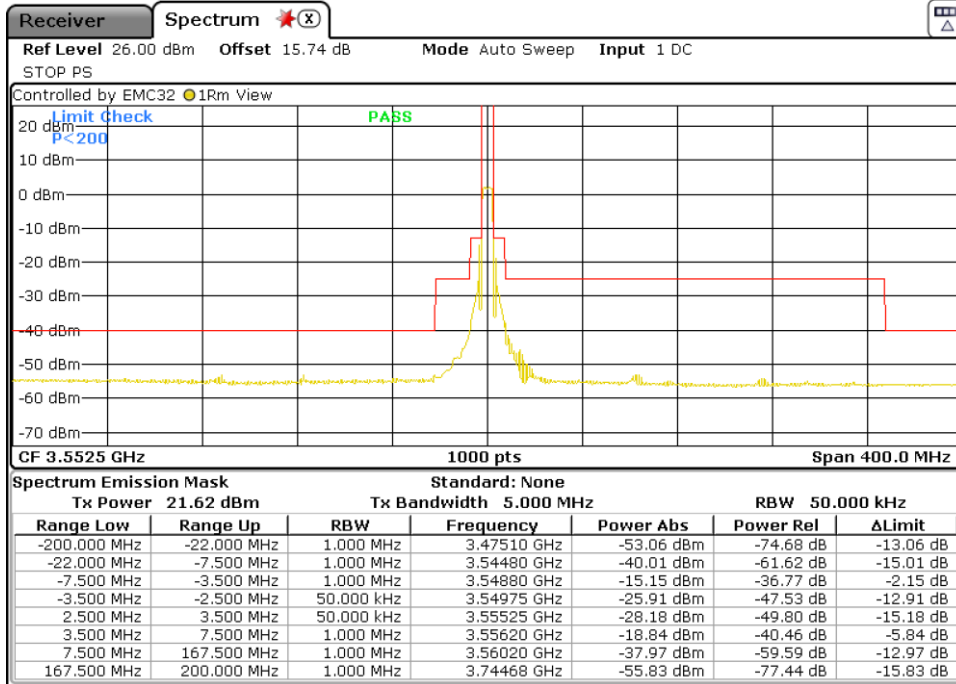
Verdict: PASS

(See next plots)

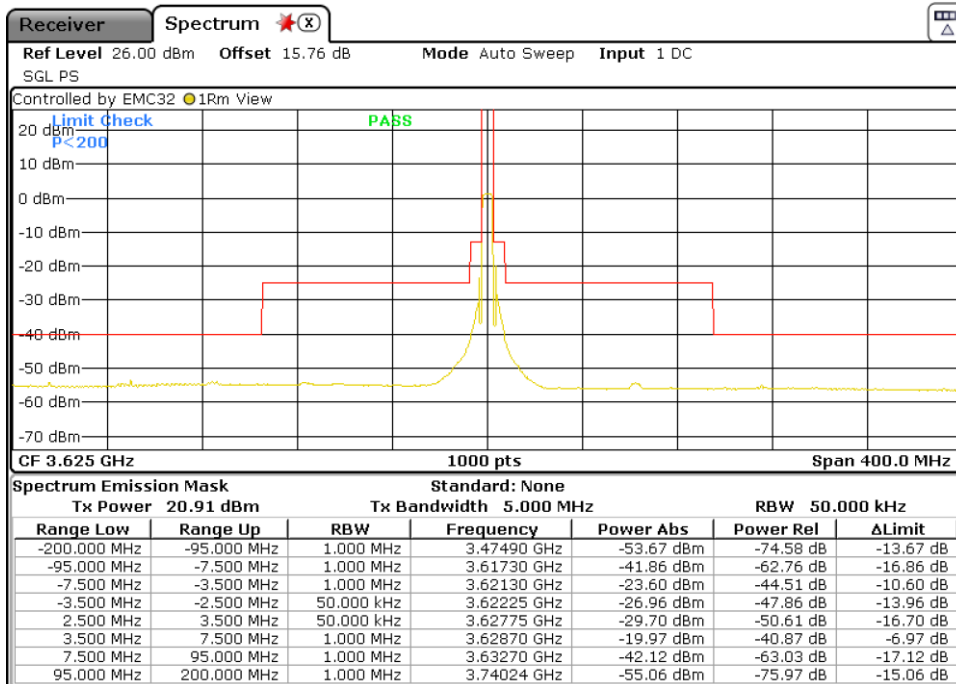
TEST RESULTS (Cont.):

5 MHz BW

Lowest Channel (3552.5 MHz)

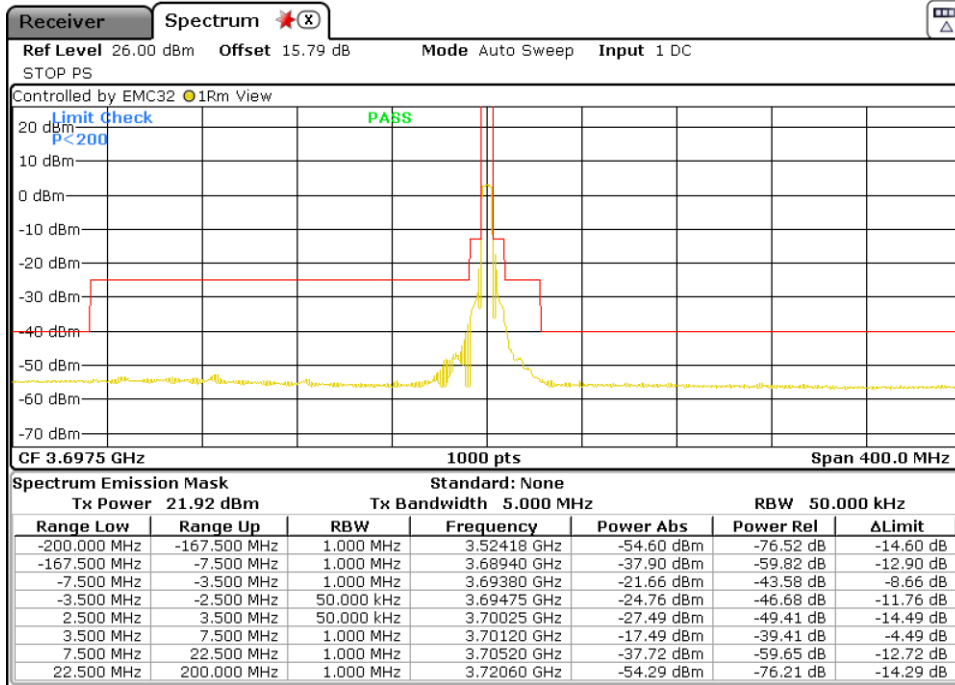


Middle Channel (3625 MHz)



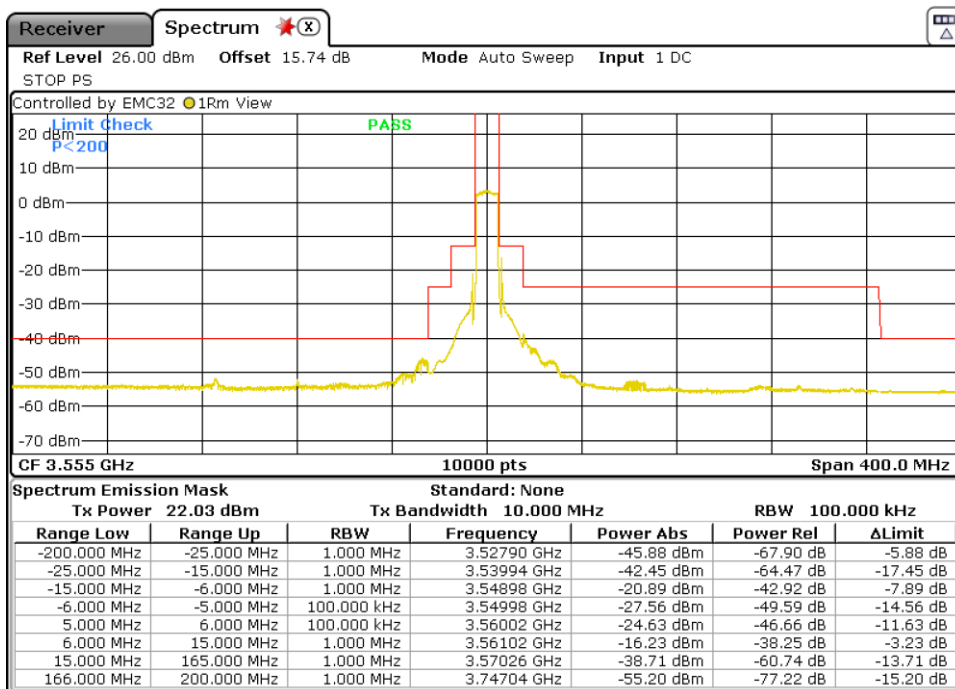
TEST RESULTS (Cont.):

Highest Channel (3697.5 MHz)



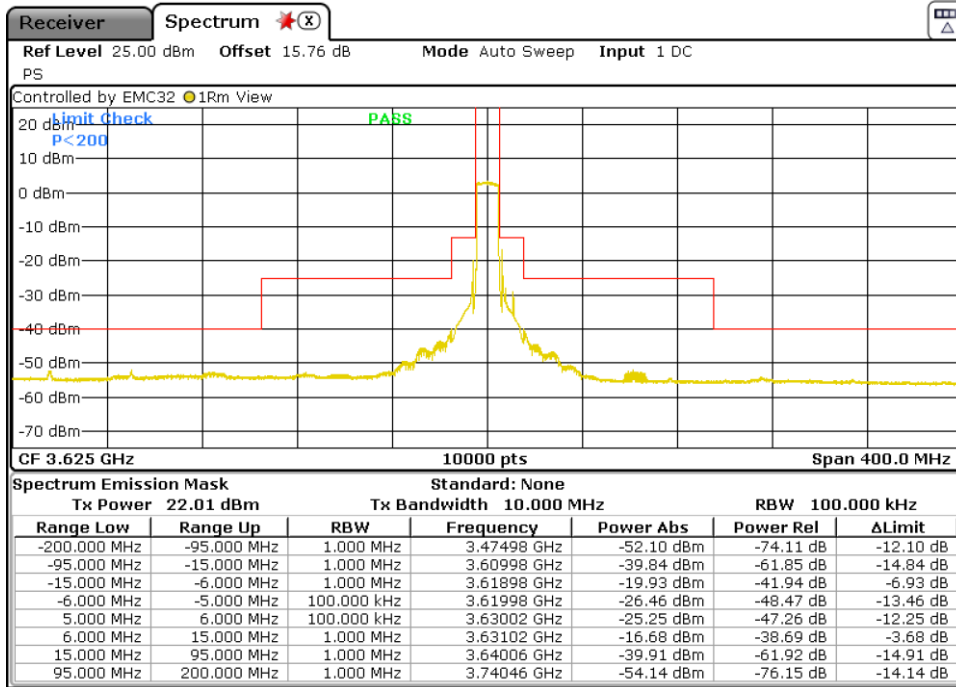
10 MHz BW

Lowest Channel (3555 MHz)

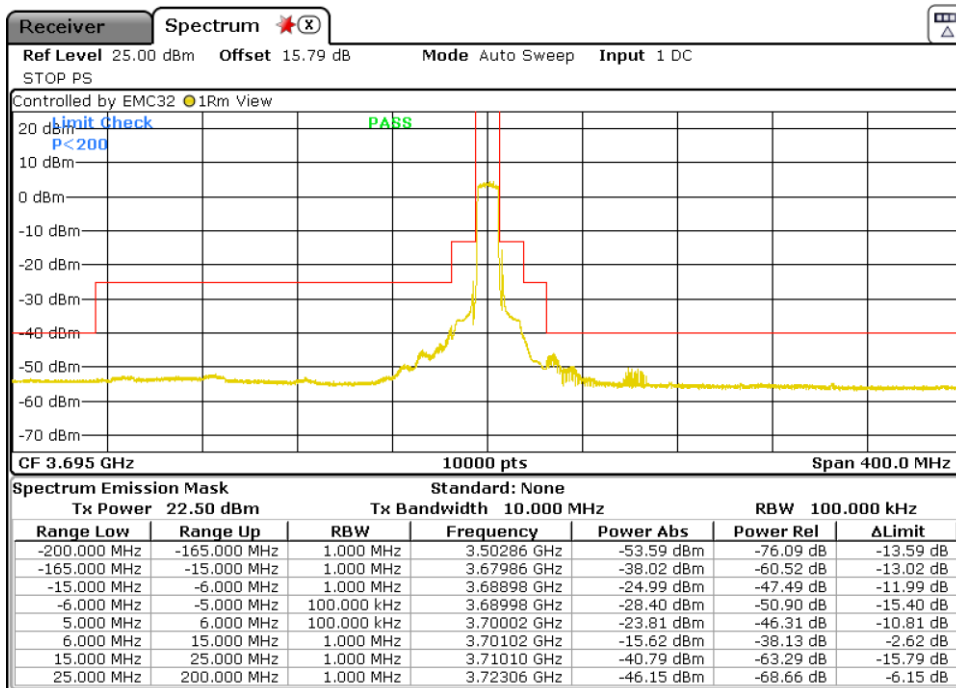


TEST RESULTS (Cont.):

Middle Channel (3625 MHz)



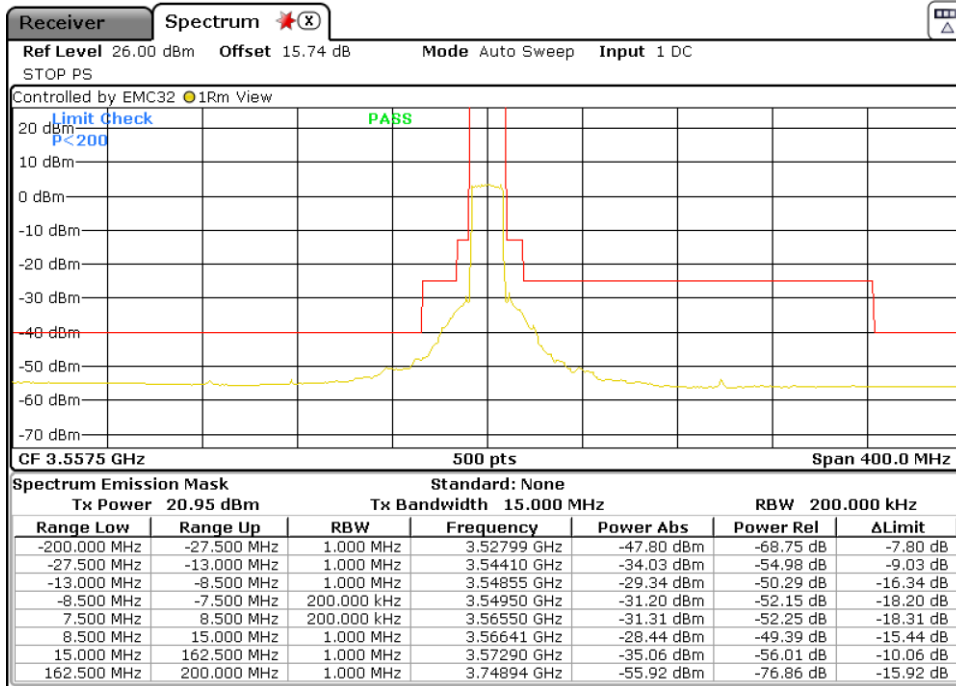
Highest Channel (3695 MHz)



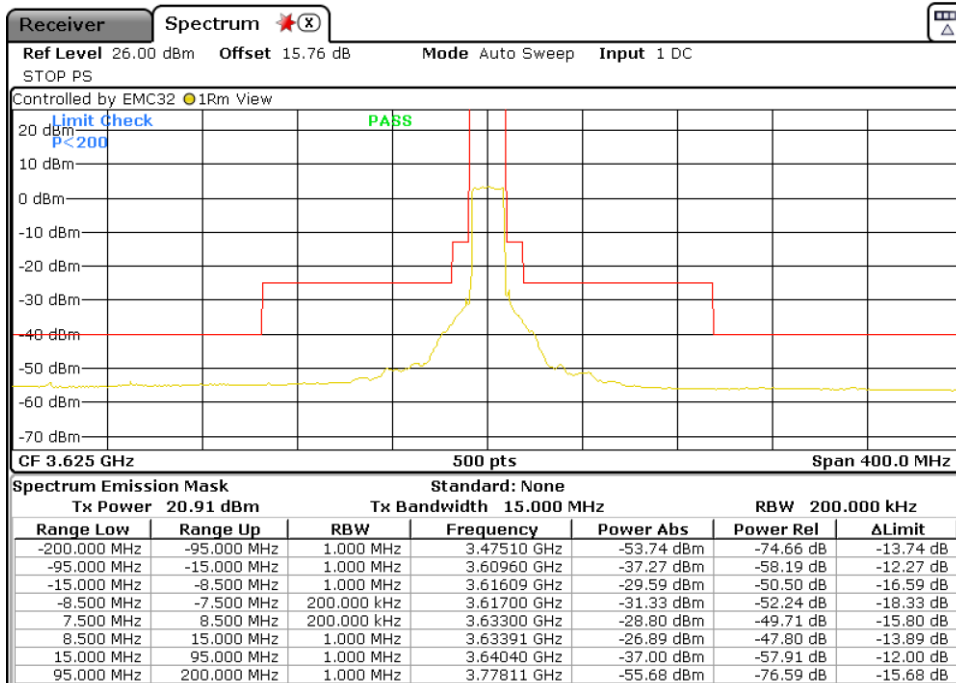
TEST RESULTS (Cont.):

15 MHz BW

Lowest Channel (3557.5 MHz)

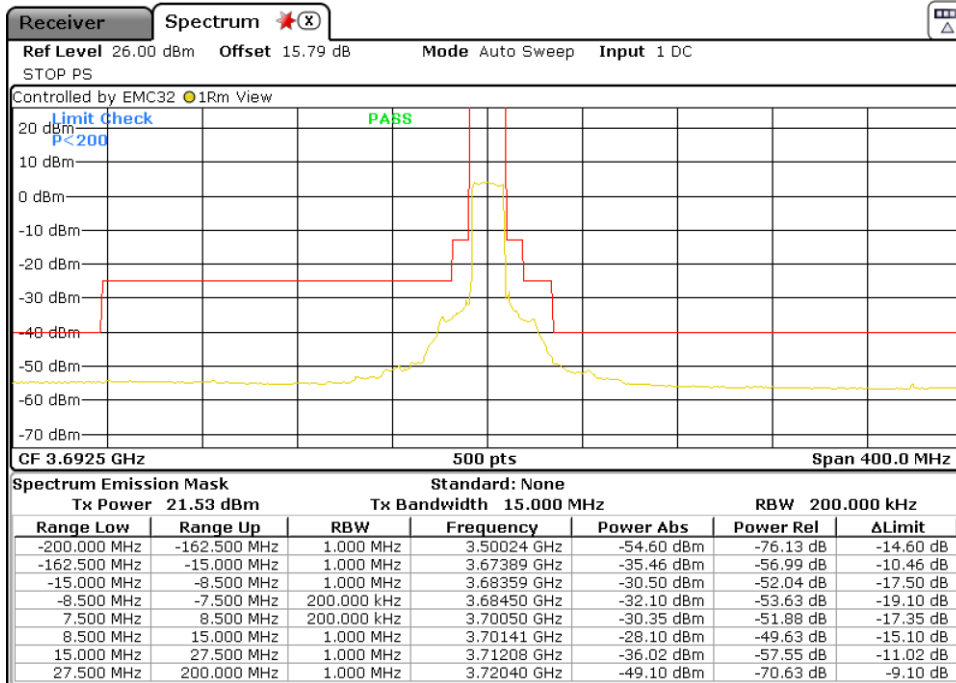


Middle Channel (3625 MHz)



TEST RESULTS (Cont.):

Highest Channel (3692.5 MHz)



20 MHz BW

Lowest Channel (3560 MHz)

