



FCC LISTED, REGISTRATION

NUMBER: 2764.01

Test report No: 2647ERM.001A1

ISED LISTED REGISTRATION NUMBER: 23595-1

Test report

USA FCC Part 96 CITIZENS BROADBAND RADIO SERVICE DEVICES OPERATING WITHIN THE BAND 3550-3700 MHz.

Identification of item tested	CPE8000-PRO-1D-3X
Trademark	Telrad
Model and /or type reference	CPE8000-PRO-1D-3X
Other identification of the product	FCC ID: ARA-CPE8KPRO3XA
Features	4G TD LTE
Manufacturer	Telrad Networks Ltd. 1st Bath-Sheva St, Lod Israel 7116002.
Test method requested, standard	USA FCC Part 96 CITIZENS BROADBAND RADIO SERVICE DEVICES OPERATIONG WITHIN THE BAND 3550-3700 MHz.
	FCC KDB 940660 D01 Part 96 CBRS Eqpt v02: Certification and Test Procedures for Citizens Broadband Radio Service Devices Authorized Under Part 96
	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
	ANSI C63.26-2015: American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Domingo Galvez EMC&RF Lab Manager
Date of issue	03-17-2020
Report template No	FDT08_21



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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.

Frequency (MHz)	U(k=2)	Units
30-180	3.82	dB
180-1000	2.61	dB
1000-18000	2.92	dB
18000-40000	2.15	dB



Data provided by the client

The E.U.T is high performance 4G LTE outdoor CPE product designed to enable quick LTE fixed data service deployment to the remote customers. It provides high data throughput and networking features to end users who need both bandwidth and quality service.

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:

Control N⁰	Description	Model	Serial N⁰	Date of reception
2647B.02	Telrad CPE8000	CPE8000-PRO-1D-3X	TLR41D137F841	01/14/2020

Accessory elements used with the sample S/01:

Control Nº	Description	Model	Serial N ^o	Date of reception
2647B.03	POE + Power cable	G0720480	16110002075	01/14/2020

1. Sample S/01 has undergone following test(s):

All conducted and radiated tests indicated in appendix A.



Test sample description

Product specification	Description	Yes/No
Device Name/Model #	CPE8000-PRO-1D-3.x	
	Wide area Base Station (Macro Cell)	Yes
Base Station Class	Medium Range Base Stations (Micro Cell)	No
Base Station Class	Local area Base Station (Picocell)	No
	Home Base Station (Femtocell)	No
Category of CBSD	Category A	No
Category of CBSD	Category B	Yes
Type of Installation	Professional Installation	Yes
DC power supply voltage	48V	
RF Test Tool Software of CBSD	SW Ver: V2.4.4. P8.1202	
TX Frequency	10MHz: 3555-3695MHz	
TA Frequency	20MHz: 3560-3690MHz	
RX Frequency	10MHz: 3555-3695MHz	
KX Flequelicy	20MHz: 3560-3690MHz	
Maximum Output Power	10MHz: 23dBm	
to Antenna	20MHz: 23dBm	
Maximum 99% Occupied	10MHz: 9MHz	
Bandwidth	20MHz: 18MHz	
	QPSK	Yes
Type of Madulation	16QAM	Yes
Type of Modulation	64QAM	Yes
	256QAM	No
Antenna Information	Model: 4000D-F35	
Antenna imormation	Gain (dBi): 15dBi	
Duty Cycle	TX (UL) up to 60%	
MIMO Information	# of output port: TX 1 port # of input port: RX 2 ports # of output ports transmitting simultaneously: 1 port List all MIMO configurations supported: DL MIMO, UL SISO	

DEKRA Certification, Inc. 405 Glenn Dr. Suite 12, Sterling, VA 20164 United States of America



Identification of the client

Telrad Networks Ltd. 1st Bath-Sheva St,

Lod Israel 7116002.

Testing period and place

Test Location	DEKRA Certification Inc.
Date (start)	01-15-2020
Date (finish)	02-11-2020

Document history

Report number	Date	Description
2647ERM.001	02-12-2020	First release
2647ERM.001A1	03-17-2020	Second release

Modifications to the reference test report

It was introduced the following modifications in respect to the test report number 2647ERM.001 related with the same samples, in the next clauses and sub-clauses:

Clauses/ Sub-Clauses	Modification	Justification
TEST Sample Description/ Page 5	Base Station class has been changed to represent the appropriate cell.	To represent Base station as a Wide area base station.

This modification test report cancels and replaces the test report 2647ERM.001.



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, Koji Nishimoto and Poojita Bhattu.

Testing verdicts

Not applicable :	N/A
Pass :	Р
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 Isotopic Radiated Power (EIRP)	Р	N/A	
A.2	§ 2.1046	Conducted Output Power	Р	N/A	
A.3	§ 2.1049	99% OBW and -26db Bandwidth	Р	N/A	
A.4	§ 96.41 (b)	Maximum Power Spectral Density (PSD)	Р	N/A	
A.5	§ 96.41 (g)	Peak to Average Power Ratio (PAPR)	Р	N/A	
A.6	§ 2.1051, 96.41 (e)	3.5 GHz Emission and Interference limits	Р	N/A	
A.7	§ 2.1051, 96.41 (e)	Spurious Emissions at Antenna Terminals	Р	N/A	
A.8	§ 2.1053	Radiated Spurious Emission	Р	N/A	
A.9	§ 2.1055	Frequency Stability	Р	N/A	



List of equipment used during the test

Conducted Measurements

CONTROL NUMBER	DESCRIPTION	MANUFACTURER	MODEL	LAST CALIBRATION	NEXT CALIBRATION
1039	Signal analyzer	Rohde & Schwarz	FSV40	2019/10	2021/10
1010	EMI Test Receiver	Rohde & Schwarz	ESR 7	2019/08	2021/08
1149	WIDEBAND RADIO COMMUNICATION TESTER,	Rohde & Schwarz	CMW500	2019/09	2021/09
0101	Climatic chamber Espec			2019/01	2020/04

Radiated Measurements

CONTROL NUMBER	DESCRIPTION	MANUFACTURER	MODEL	LAST CALIBRATION	NEXT CALIBRATION
1179	Semi anechoic Absorber Lined Chamber	Frankonia	SAC 3 plus "L"	2017/08	2020/08
1064	BiconicalLog antenna	ETS LINDGREN	3142E	2018/01	2021/01
1057	DOUBLE-RIDGED WAVEGUIDE HORN ANTENNAS	ETS LINDGREN	3115	2017/03	2020/03
0982	LOW NOISE PREAMPLIFIER	BONN ELEKTRONIK	BLMA1840- 1M	2018/10	2020/10
1056	DOUBLE-RIDGED WAVEGUIDE HORN ANTENNAS	ETS LINDGREN	3116C	2020/01	2023/01
1014	Spectrum analyzer	Rohde & Schwarz	FSV40	2019/04	2021/04
1012	EMI Test Receiver	Rohde & Schwarz	ESR 26	2018/09	2020/09
1149	WIDEBAND RADIO COMMUNICATION TESTER	Rohde & Schwarz	CMW500	2019/09	2021/09

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Appendix A: Test results



Appendix A Content

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DESCRIPTION OF TEST CONDITIONS

TEST CONDITIONS	DESCRIPTION
	Power supply (V): Vnominal = 48 Vdc Type of power supply: DC voltage from AC/DC power supply. Temperature (°C): Tnom = +15 to +35 Tmin = -40 (*) Tmax = +55 (*) The subscripts min and max indicate extreme test conditions (minimum and maximum respectively). N/A: Not Applicable. (*) Declared by applicant. Conducted output power test was performed by using 1, half and full RB configurations for QPSK and QAM modulations to identify the worst case, and all other tests were performed by using the worst-case configurations for each test. All three orientations (X, Y, and Z) of the DUT were evaluated to determine the worst DUT orientation with the strongest fundamental signal in the radiated emission pre-scan tests. All the radiated emission tests were performed by using the worst-case DUT orientation. Test Frequencies for Conducted and Radiated tests: ->10 MHz Bandwidth (50 RB): Lowest Channel (3555 MHz)
	->10 MHz Bandwidth (50 RB): Lowest Channel (3555 MHz)
	Middle Channel (3625 MHz) Highest Channel (3695 MHz) ->20 MHz Bandwidth (100 RB):
	Lowest Channel (3560 MHz) Middle Channel (3625 MHz) Highest Channel (3690 MHz)



TEST A.1: MAXIMUM EFFECTIVE ISOTOPIC RADIATED POWER (EIRP) TEST A.2: CONDUCTED OUTPUT POWER

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

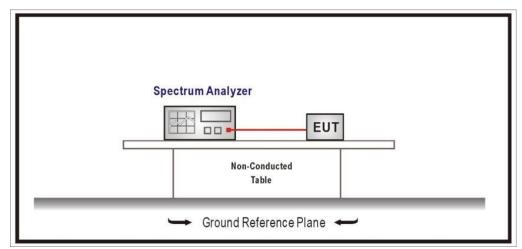
LIMITS

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 procedures stated in the Section 5.2.4.4.2 of ANSI C63.26-2015.



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 = $10 \log (1/0.5) = 3.01 (dB)$

EIRP was tested with a minimum, half, and maximum number of RBs for all the BWs and identified that the worst case is QPSK with full RBs.



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

QPSK

10MHz BW

	Lowest frequency 3555 MHz	Middle frequency 3625 MHz	Highest frequency 3695 MHz
Output Power (dBm/10 MHz)	23.04	22.63	22.89
Maximum declared antenna gain (dBi)	15.00	15.00	15.00
Maximum EIRP (dBm/10 MHz)	38.04	37.63	37.89
Measurement uncertainty (dB)		< ± 0.95	

20MHz BW with 10MHz Integration

	Lowest	Middle	Highest
	frequency	frequency	frequency
	3560 MHz	3625 MHz	3690 MHz
Output Power (dBm/10 MHz)	20.28	19.83	20.03
Maximum declared antenna gain (dBi)	15.00	15.00	15.00
Maximum EIRP (dBm/10 MHz)	35.28	34.83	35.03
Measurement uncertainty (dB)		< ± 0.95	



20MHz BW Reference only

	Lowest	Middle	Highest
	frequency	frequency	frequency
	3560 MHz	3625 MHz	3690 MHz
Output Power (dBm/20 MHz)	23.02	22.66	22.92
Maximum declared antenna gain (dBi)	15.00	15.00	15.00
Maximum EIRP (dBm/20 MHz)	38.02	37.66	37.92
Measurement uncertainty (dB)		< ± 0.95	

<u>16-QAM</u>

10MHz BW

	Lowest frequency 3555 MHz	Middle frequency 3625 MHz	Highest frequency 3695 MHz
Output Power (dBm/10 MHz)	21.72	20.87	22.70
Maximum declared antenna gain (dBi)	15.00	15.00	15.00
Maximum EIRP (dBm/10 MHz)	36.72	35.87	37.70
Measurement uncertainty (dB)	< ± 0.95		

20MHz BW with 10MHz Integration

	Lowest frequency 3560 MHz	Middle frequency 3625 MHz	Highest frequency 3690 MHz
Output Power (dBm/10 MHz)	18.89	19.15	20.06
Maximum declared antenna gain (dBi)	15.00	15.00	15.00
Maximum EIRP (dBm/10 MHz)	33.89	34.15	35.06
Measurement uncertainty (dB)		< ± 0.95	



20MHz BW Reference only

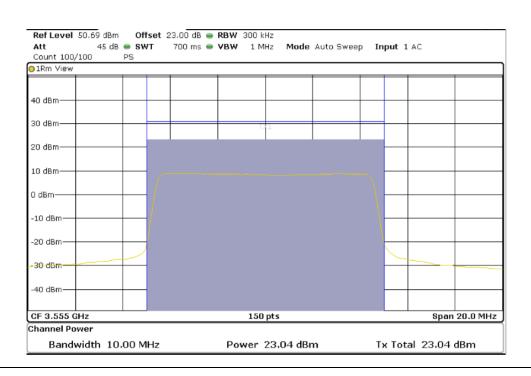
	Lowest frequency 3560 MHz	Middle frequency 3625 MHz	Highest frequency 3690 MHz
Output Power (dBm/20 MHz)	21.68	21.81	22.74
Maximum declared antenna gain (dBi)	15.00	15.00	15.00
Maximum EIRP (dBm/20 MHz)	36.68	36.81	37.74
Measurement uncertainty (dB)		< ± 0.95	

(See plots below)

QPSK

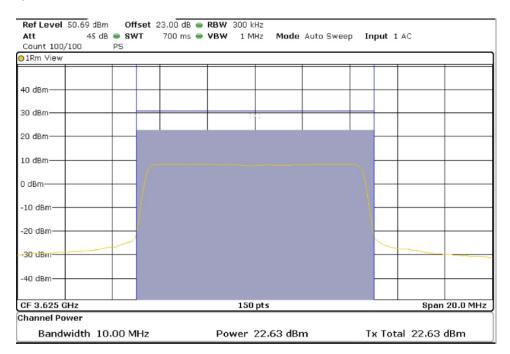
10 MHz BW:

Lowest channel

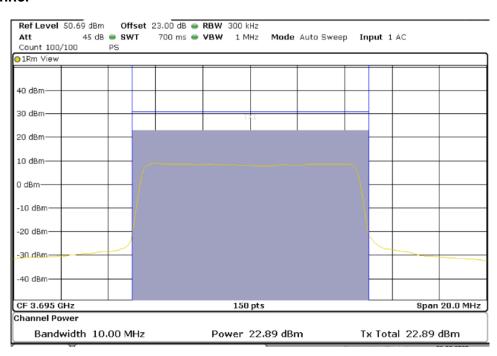




Middle Channel



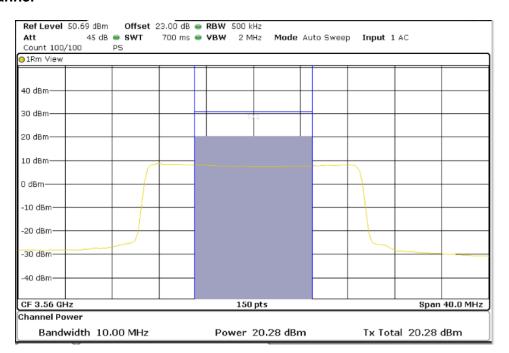
Highest channel



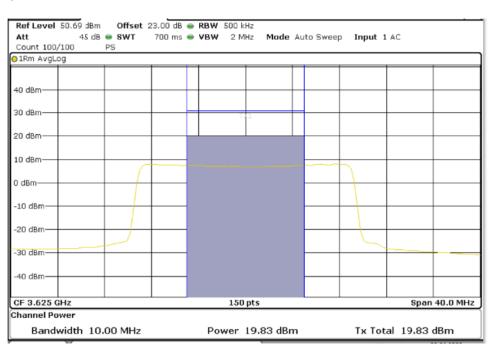


20 MHz BW:

Lowest Channel

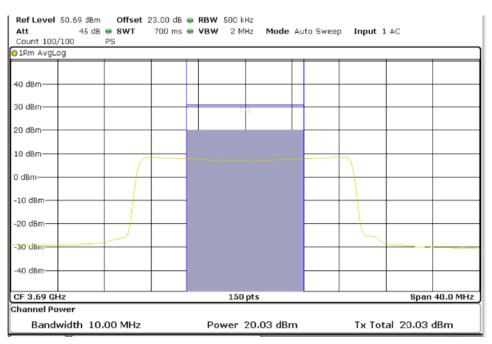


Middle channel



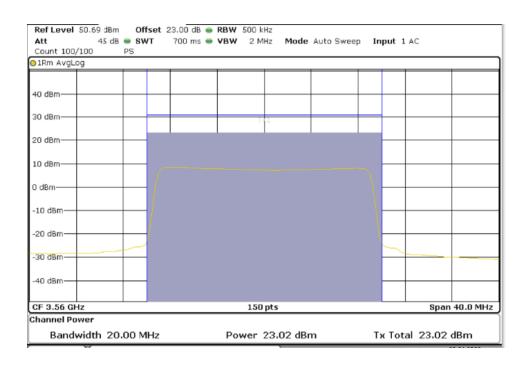


Highest Channel



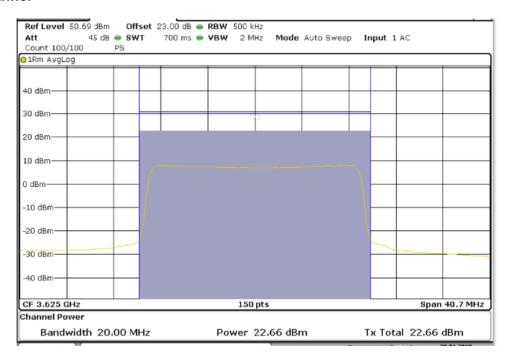
20 MHz BW Reference only:

Lowest channel

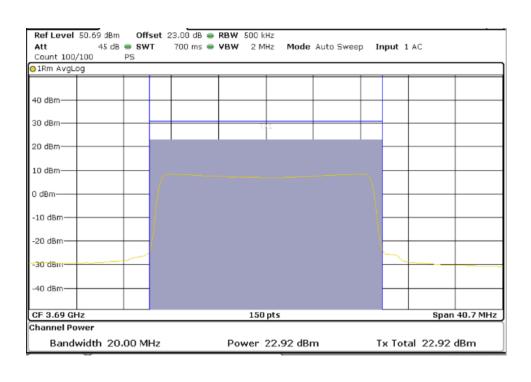




Middle Channel



Highest channel

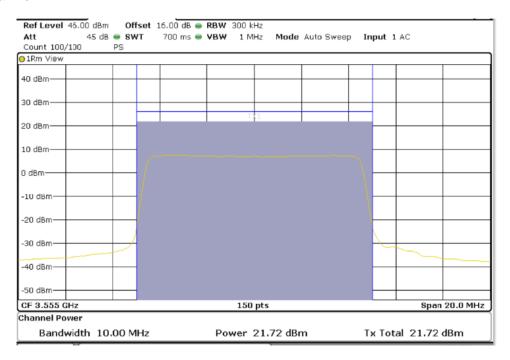




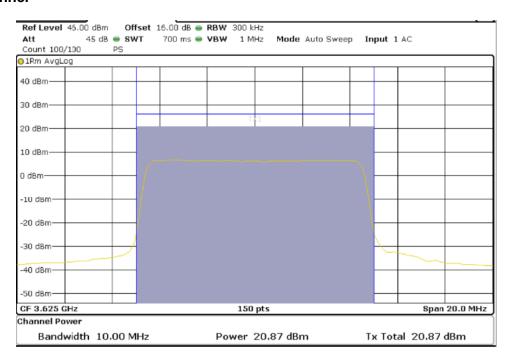
16-QAM

10 MHz BW:

Lowest Channel



Middle channel



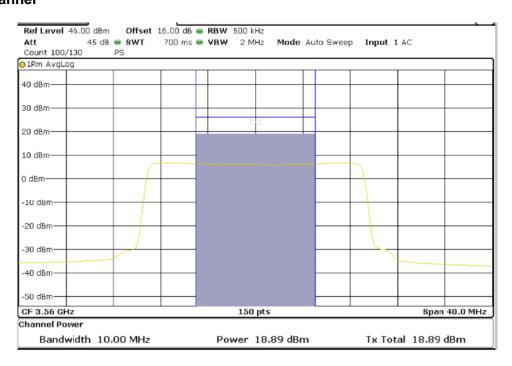


Highest Channel



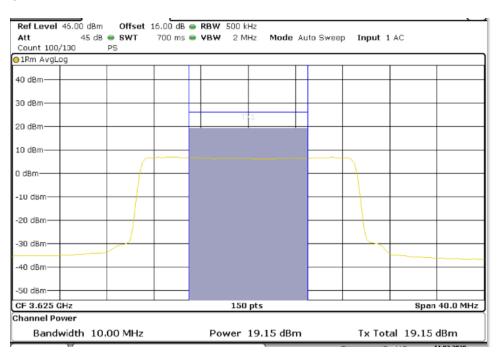
20 MHz BW:

Lowest Channel

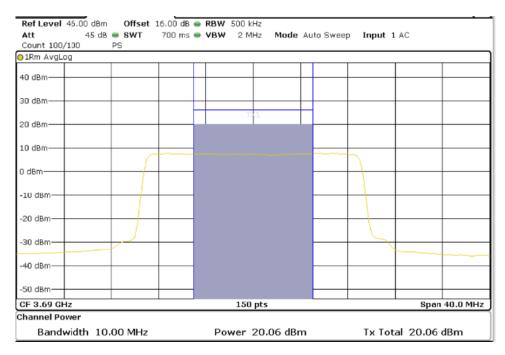




Middle channel



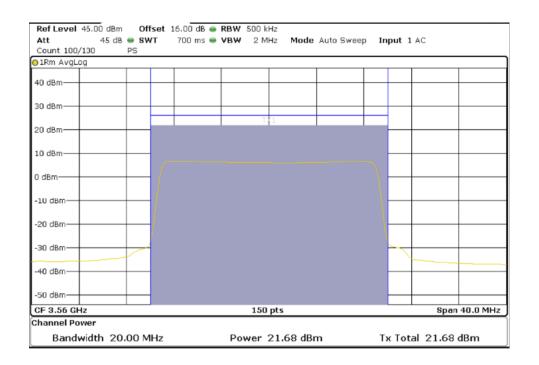
Highest Channel



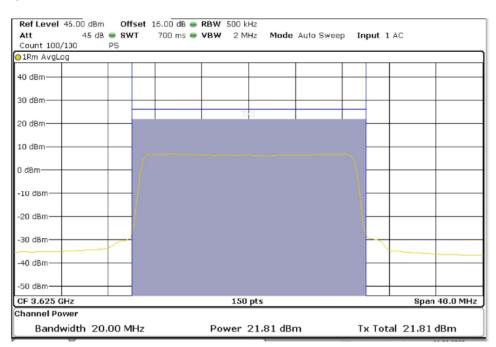


20 MHz BW Reference only:

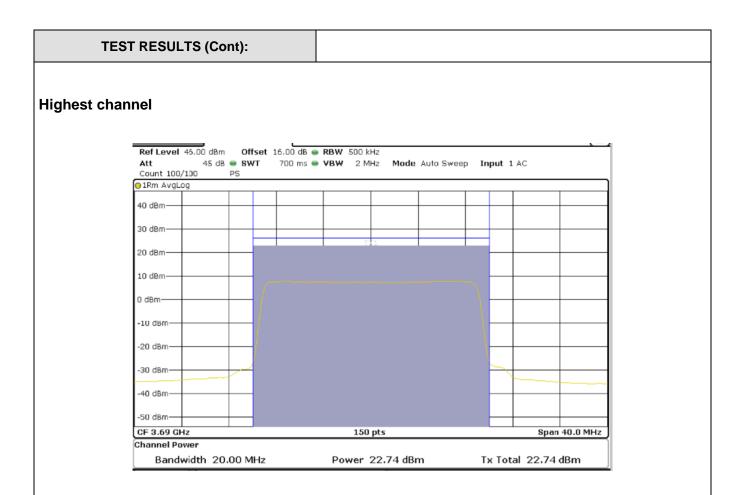
Lowest channel



Middle Channel









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

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

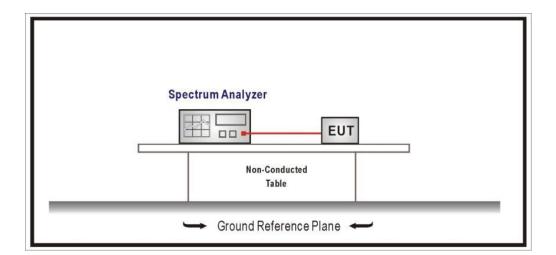
LIMITS

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

QPSK

10 MHz BW

	Lowest	Middle	Highest
	frequency	frequency	frequency
	3555 MHz	3625 MHz	3695 MHz
99% OBW (MHz)	9.47	9.47	9.20
-26 dB Bandwidth (MHz)	12.35	12.80	13.87
Measurement uncertainty (kHz)	<± 8.33		

20MHz BW

	Lowest frequency	Middle frequency	Highest frequency
	3560 MHz	3625 MHz	3690 MHz
99% OBW (MHz)	18.20	18.16	18.12
-26 dB Bandwidth (MHz)	23.32	24.76	25.76
Measurement uncertainty (kHz)		<± 8.33	



<u>16-QAM</u>

10 MHz BW

	Lowest	Middle	Highest
	frequency	frequency	frequency
	3555 MHz	3625 MHz	3695 MHz
99% OBW (MHz)	9.20	9.20	9.20
-26 dB Bandwidth (MHz)	12.42	12.44	13.04
Measurement uncertainty (kHz)	<± 8.33		

20MHz BW

	Lowest	Middle	Highest
	frequency	frequency	frequency
	3560 MHz	3625 MHz	3690 MHz
99% OBW (MHz)	18.04	18.04	18.00
-26 dB Bandwidth (MHz)	25.28	25.08	21.44
Measurement uncertainty (kHz)	<± 8.33		

(See plots below)

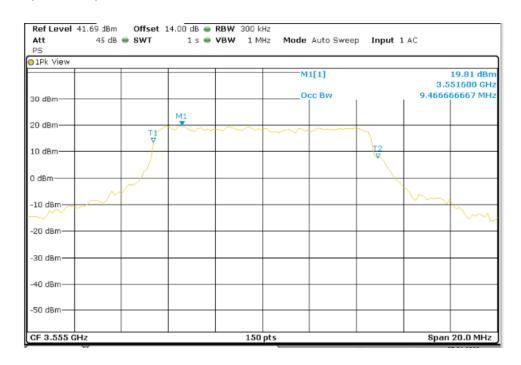


QPSK

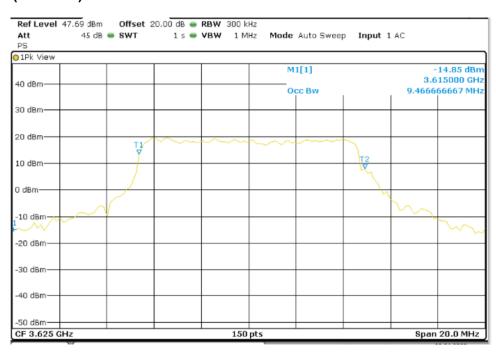
OBW

10 MHz BW

Lowest Channel (3555 MHz)



Middle Channel (3625 MHz)



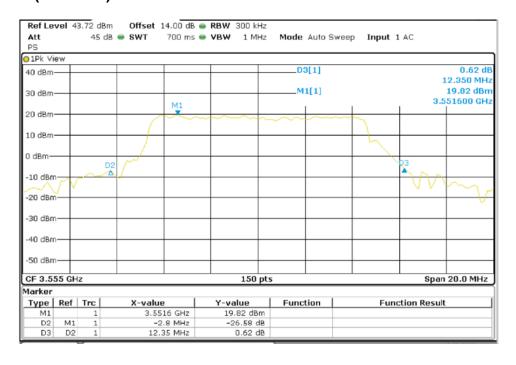


High Channel (3695 MHz)

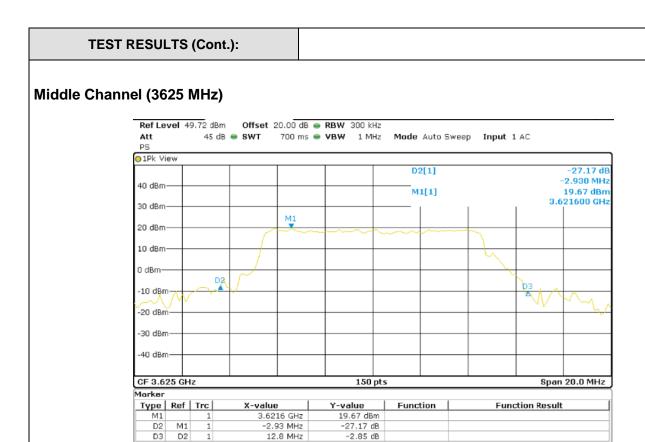


-26 dB Bandwidth

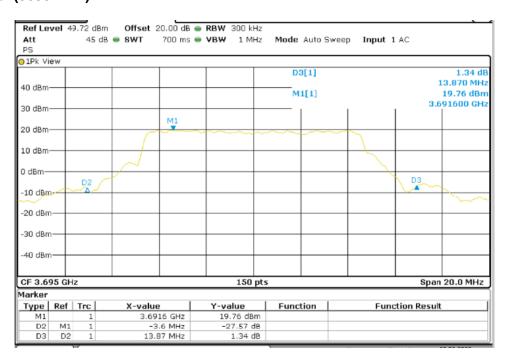
Lowest Channel (3555 MHz)







High Channel (3695 MHz)

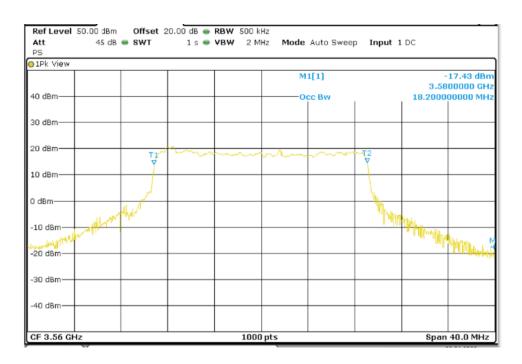




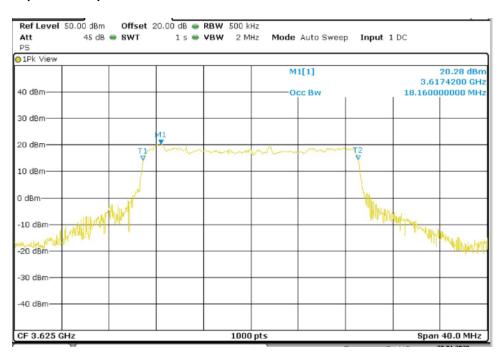
20 MHz BW

<u>OBW</u>

Lowest Channel (3560 MHz)

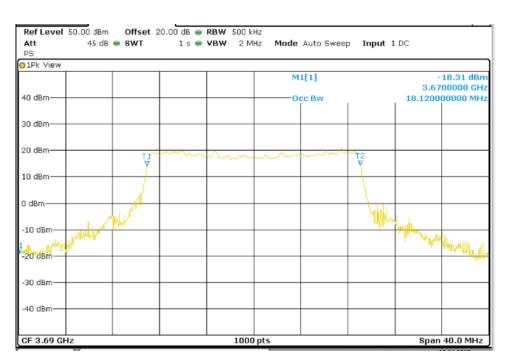


Middle Channel (3625 MHz)



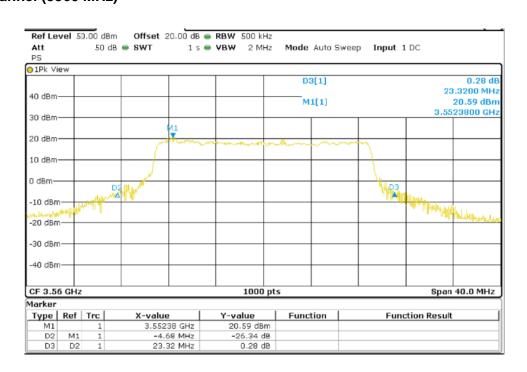


High Channel (3690 MHz)



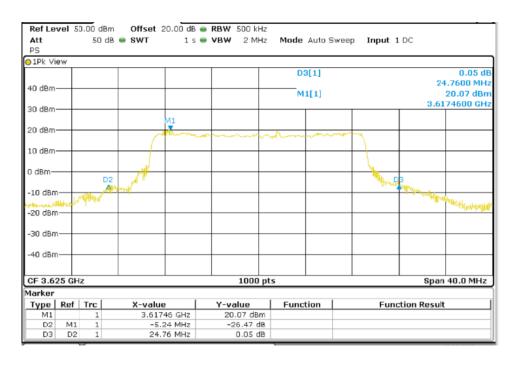
-26 dB Bandwidth

Lowest Channel (3560 MHz)

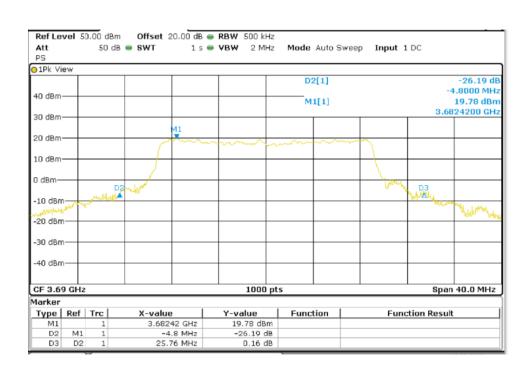




Middle Channel (3625 MHz)



High Channel (3690 MHz)



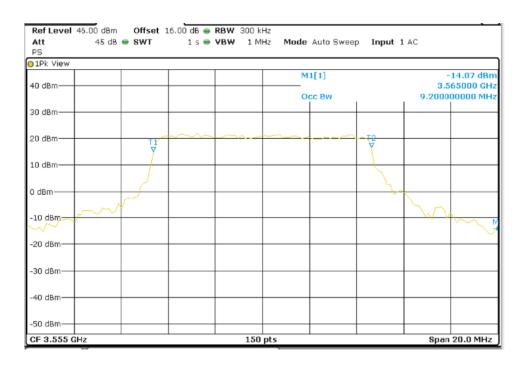


16-QAM

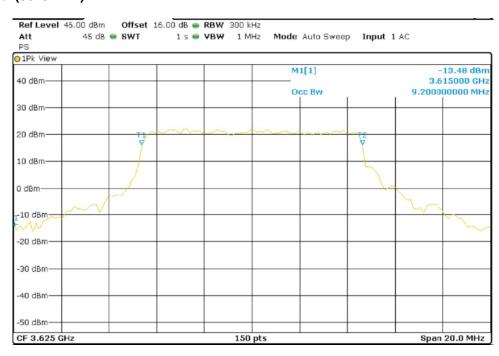
OBW

10 MHz BW

Lowest Channel (3555 MHz)



Middle Channel (3625 MHz)



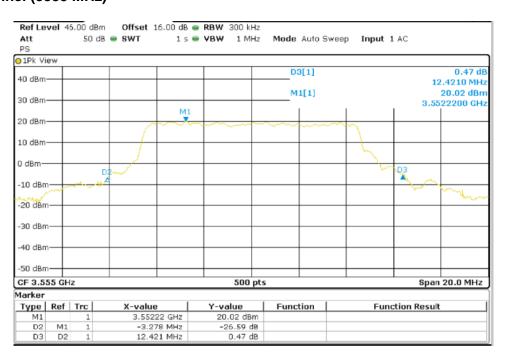


High Channel (3695 MHz)



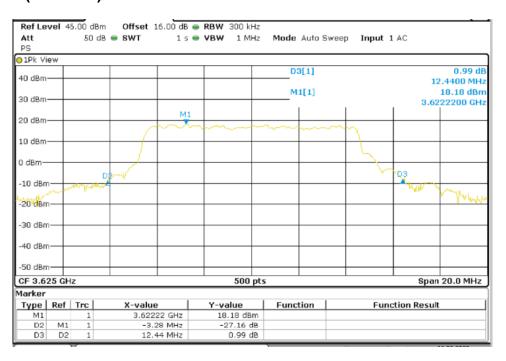
-26 dB Bandwidth

Lowest Channel (3555 MHz)

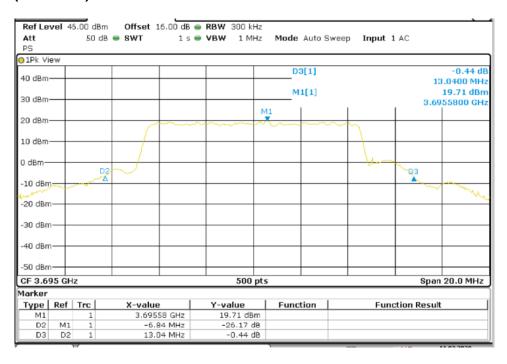




Middle Channel (3625 MHz)



High Channel (3695 MHz)

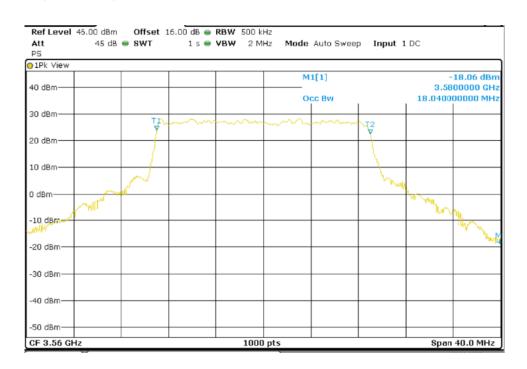




20 MHz BW

<u>OBW</u>

Lowest Channel (3560 MHz)

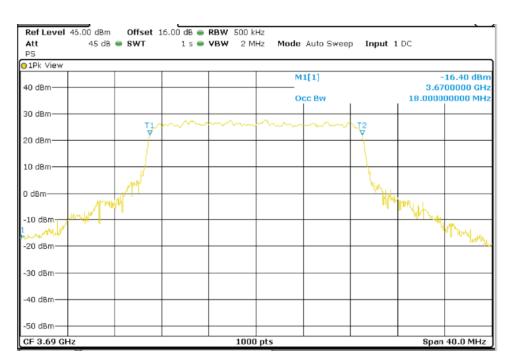


Middle Channel (3625 MHz)



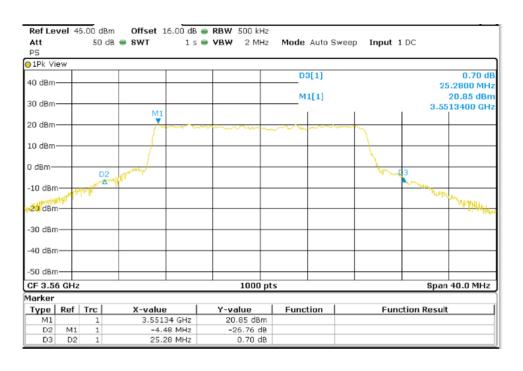


High Channel (3690 MHz)



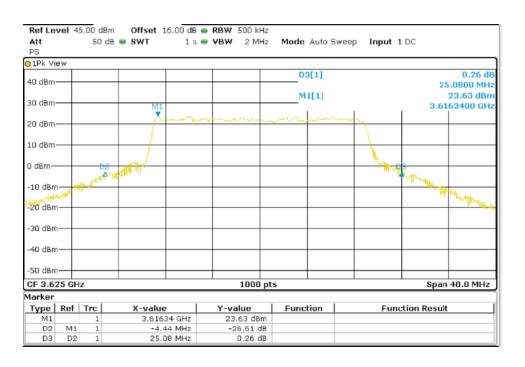
-26 dB Bandwidth

Lowest Channel (3560 MHz)

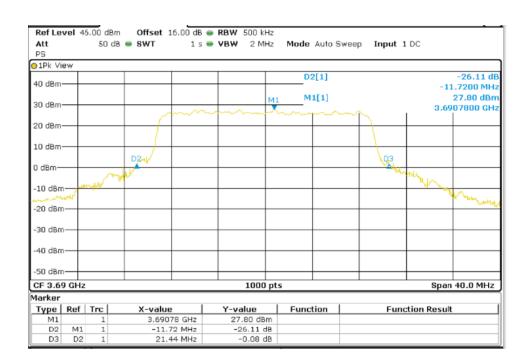




Middle Channel (3625 MHz)



High Channel (3690 MHz)





TEST A.4: MAXIMUM POWER SPECTRAL DENSITY (PSD)

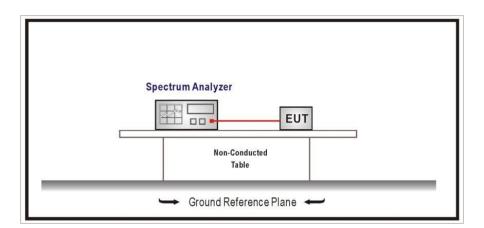
	Product standard:	Part 96.41 SUBCLAUSE (B)
LIMITS:	Test standard:	ANSI C63.26-2015

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 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 = $10 \log (1/0.5) = 3.01 (dB)$



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

10 MHz BW

	Lowest	Middle	Highest
	frequency	frequency	frequency
	3555 MHz	3625 MHz	3695 MHz
PSD (dBm/MHz)	17.25	14.76	14.99
Maximum declared antenna gain (dBi)	15.00	15.00	15.00
Maximum PSD (dBm/MHz)	32.25	29.76	29.99
Measurement Uncertainty		< ± 0.95	

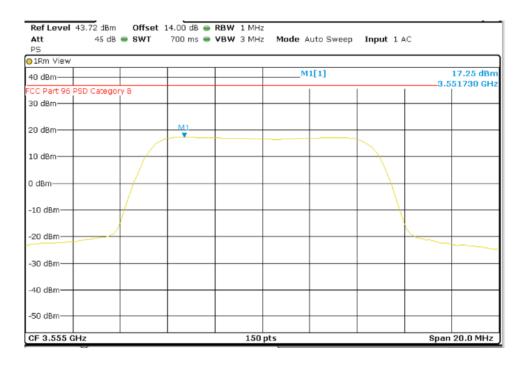
20MHz BW

	Lowest	Middle	Highest
	frequency	frequency	frequency
	3560 MHz	3625 MHz	3690 MHz
PSD (dBm/MHz)	11.33	11.98	12.42
Maximum declared antenna gain (dBi)	15.00	15.00	15.00
Maximum PSD (dBm/MHz)	26.33	26.98	27.42
Measurement Uncertainty		< ± 0.95	

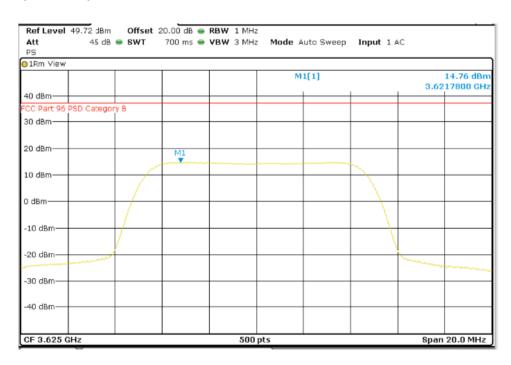


10 MHz BW

Lowest Channel (3555 MHz)

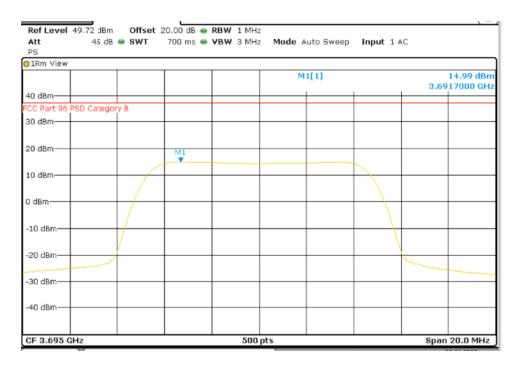


Middle Channel (3625 MHz)



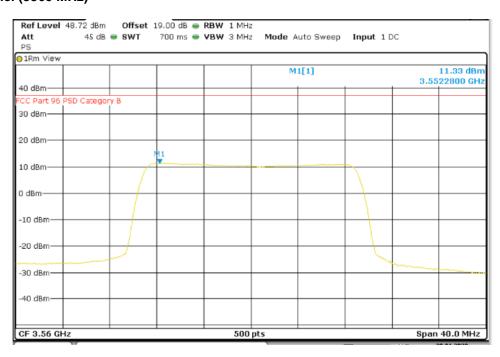


Highest Channel (3695 MHz)



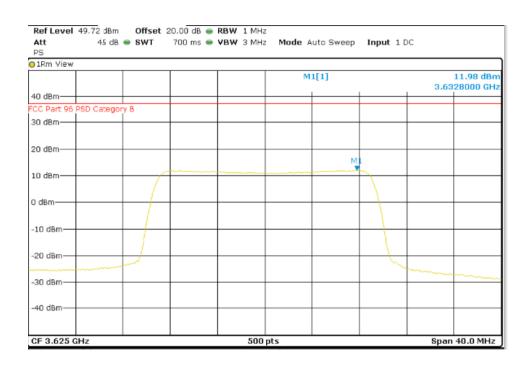
20 MHz BW

Lowest Channel (3560 MHz)





Middle Channel (3625 MHz)



Highest Channel (3690 MHz)

