DEKRA Certification, Inc.
405, Glenn Drive Suite 12
Sterling, Virginia, USA.

DEKRA

Test Lab
Cert 2764.01

FCC LISTED, REGISTRATION NUMBER: 2764.01

ISED LISTED REGISTRATION NUMBER: 23595-1

Test report No:

2209ERM.003A8

Test report

USA FCC Part 96

CITIZENS BROADBAND RADIO SERVICE DEVICES OPERATING WITHIN THE BAND 3550-3700 MHz

Identification of item tested ..... :	Breeze Compact Base Station
Trademark ..... :	Not provided
Model and /or type reference ..... :	CMP.XT-BS-3.X
Other identification of the product ..... :	TBD
Final HW version ..... :	004-002-00
Final SW version ..... :	0700.07617
Features ..... :	CBSD, Domain Proxy, LTE-TDD 48
Manufacturer ..... :	Telrad Networks Ltd. 1 Bat Sheva Street, P.O.B. 6118, Lod 711600, Israel
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 Digitally signed by Domingo Galvez DN: cn=Domingo Galvez, o=DEKRA Certification Inc., ou=Regulatory Lab, email=dgalvez@dekra.com, c=US Date: 2018.12.03 17:22:21 -05'00'
Date of issue ..... :	12/03/2018
Report template No. ..... :	FDT08_20

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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 laboratory with a measurement facility in compliance with the requirements of Section 2.948 of the FCC rules and has been added to the list of facilities whose measurements data will be accepted in conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Registration Number: 2764.01.

DEKRA Certification Inc. is a laboratory with a measurement site in compliance with the requirements of RSS 212, Issue 1 (Provisional) and has been added to the list of filed sites of the Canadian Certification and Engineering Bureau. Reference File Number: 23595-1.

In order 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 Inc. 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 particular 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 Inc. internal document PODT000.

Usage of samples

Samples undergoing test have been selected by: **the client**

Sample S/01 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
02209.003	Breeze Compact Base Station	CMP.XT-BS-3.X	95035519	05/11/2018

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

   All Conducted tests indicated in appendix A.

   All Radiated tests indicated in appendix A.

Test sample description

3.5GHz CBSD base station with supporting LTE band 48.

Product specification	Description	Yes/No
Base Station Class	Wide area Base Station (Macro Cell)	Yes
	Medium Range Base Stations (Micro Cell)	Yes
	Local area Base Station (Picocell)	No
	Home Base Station (Ferntocell)	No
Category of CBSD	Category A	No
	Category B	Yes
Type of Installation	Professional Installation	Yes
RF Test Tool Software of CBS	Vendor Access CLI	
TX Frequency	10MHz: 3555 MHz — 3695 MHz 20MHz: 3560 MHz — 3690 MHz	
RAC Frequency	10MHz: 3555 MHz — 3695 MHz 20MHz: 3560 MHz — 3690 MHz	
Maximum Output Power to Antenna (dBm)	26.5 dBm	
Maximum 99% Occupied Bandwidth (MHz)	20 MHz	
Type of Modulation	QPSK	Yes
	16QAM	Yes
	64QAM	Yes
	256QAM	Yes
Antenna Information	Gain:17.5 dBi	

Identification of the client

Telrad Networks Ltd.

1 Bat Sheva Street, P.O.B. 6118, Lod 711600, Israel

Testing period

The performed test started on 05/14/2018 and finished on 11/01/2018.

The tests have been performed at DEKRA Certification, Inc.

Environmental conditions

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

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 20 % Max. = 75 %

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

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 20 % 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 ºC Max. = 35 ºC
Relative humidity	Min. = 20 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

Modifications to the reference test report

It was introduced the following modifications in respect to the test report number 2209ERM.003A7 related with the same samples, in the next clauses and sub-clauses:

Clauses / Sub-clauses	Modification	Justification
Appendix A/ Section 96.41 Subclause (b). Maximum effective isotropic radiated power (EIRP) and Section 2.1046. Conducted Output Power	The Measurement unit was changed according to the requirements.	As per FCC requirement, the unit of the output signal level must be in dBm/10 MHz.
Appendix A/ Section 96.41 Subclause(b). Maximum Power Spectral Density (PSD)	The Measurement unit was changed according to the requirements.	As per FCC requirement, the unit of the output signal level must be in dBm/MHz
Appendix A/ Section 2.1051, 96.41 Subclause(e) 3.5 GHz Emissions and Interference Limits/	The Measurement unit was changed according to the requirements.	As per FCC requirement, the unit of the output signal level must be in dBm/MHz
Appendix A/ Section 2.1051, 96.41 Subclause (e) Spurious Emissions at Antenna Terminals	The Measurement unit was changed according to the requirements.	As per FCC requirement, the unit of the output signal level must be in dBm/MHz

This modification test report cancels and replaces the test report 2209ERM.003A7.

Remarks and comments

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

2: Used instrumentation:

Conducted Measurements

No.	Description	Last Cal. Date	Cal. Due date
1.	EMI Test Receiver Rohde & Schwarz ESR7	2017/03	2019/03
2.	Spectrum analyzer Rohde & Schwarz FSV40	2017/03	2019/03

Radiated Measurements

No.	Description	Last Cal. date	Cal. due date
1.	Semi anechoic Absorber Lined Chamber Franconia SAC 3 plus "L"	N/A	N/A
2.	Biconical Log antenna ETS LINDGREN 3142E	2017/03	2020/03
3.	Double-ridge Waveguide Horn antenna 750 MHz-18 GHz	2017/03	2019/03
4.	Spectrum analyzer Rohde & Schwarz FSV40	2017/03	2019/03
5.	Double Ridge Horn Antenna 18 – 40 GHz	2016/12	2018/12
6.	RF pre-amplifier 30 MHz-6 GHz Bonn Elektronik BLMA 0360-01N	2017/05	2019/05
7.	RF pre-amplifier 1-18 GHz Bonn Elektronik BLMA 0118-2A	2017/05	2019/05
8.	RF Pre-amplifier 18-40 GHz Bonn Elektronik BLMA1840-1M	2017/05	2019/05
9.	Rohde & Schwarz EMC32 software	N/A	N/A

Testing verdicts

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

1. CBSD

FCC PART 96 PARAGRAPH		VERDICT
Section 96.41 Subclause (b)	Maximum effective isotropic radiated power (EIRP)	P
Section 2.1046	Conducted output power	P
Section 2.1049	99% OBW and -26 dB Bandwidth	P
Section 96.41 Subclause (b)	Maximum Power Spectral Density (PSD)	P
Section 96.41 Subclause (g)	Peak-to-Average Power Ratio (PAPR)	P
Section 2.1051, 96.41 Subclause(e) 3.5 GHz Emissions and Interference Limits		P
Section 2.1051, 96.41 Subclause (e) Spurious Emissions at Antenna Terminals		P
Section 2.1053	Radiated Spurious Emission	P
Section 2.1055	Frequency Stability	P

Appendix A – Test result (CBSD as per FCC Part 96)

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TEST CONDITIONS

Power supply (V):

$V_{nominal}$ = 48 Vdc

Type of power supply = DC voltage from DC power supply.

Type of antenna = External antenna

Declared Gain for antenna (maximum) = +17.5 dBi

TEST FREQUENCIES:

10 MHz BW (50 RB):

Lowest Channel (3555 MHz) / Middle Channel (3625 MHz) / Highest Channel (3695 MHz)

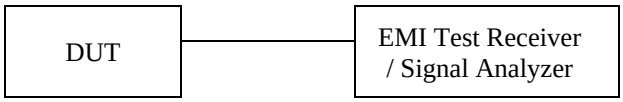
20 MHz BW (100 RB):

Lowest Channel (3560 MHz) / Middle Channel (3625 MHz) / Highest Channel (3690 MHz)

CONDUCTED MEASUREMENTS

The equipment under test was set up in a shielded room.

The results and plots below show the worst results obtained for the different modulations.



RADIATED MEASUREMENTS

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at 3 m for the frequency range 30-1000 MHz (Bilog antenna) and at 1m for the frequency range 1-40 GHz (1 GHz-18 GHz and 18 GHz-40 GHz Double ridge horn antennas).

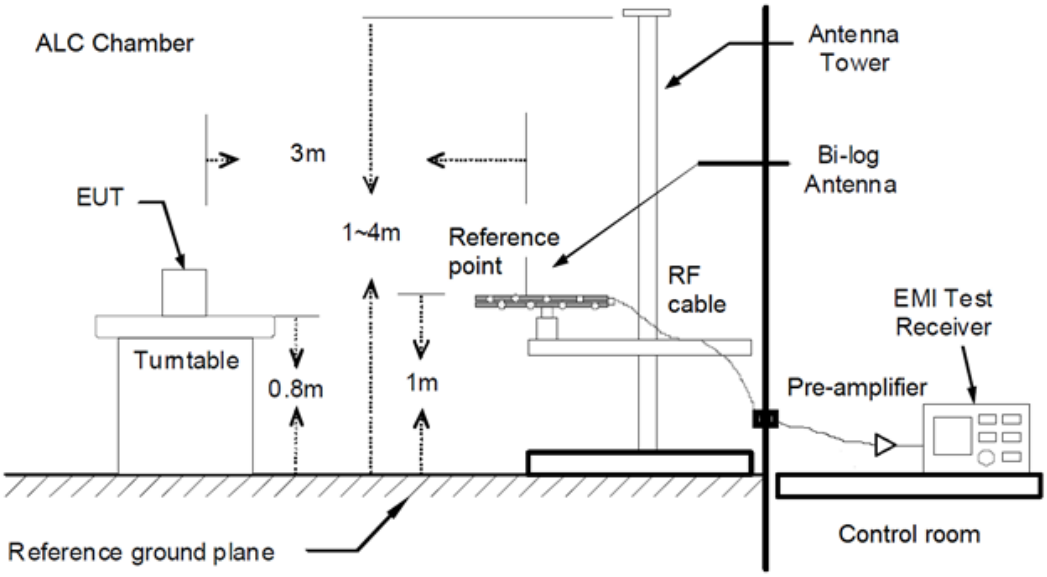
For radiated emissions in the range 1-40 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

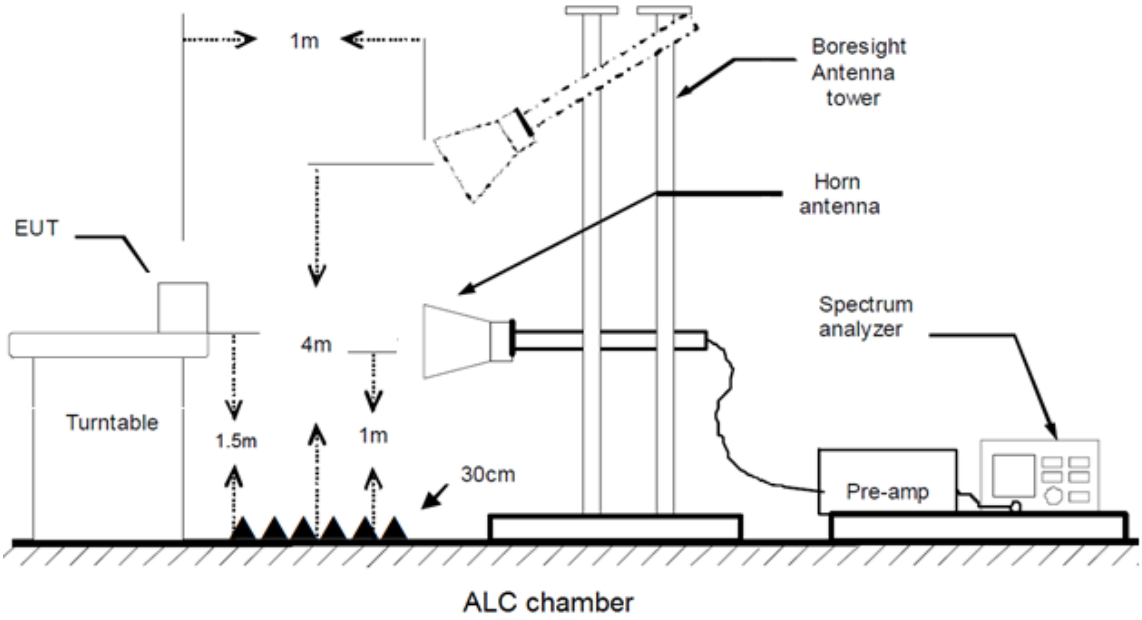
Measurements were made in both horizontal and vertical planes of polarization.

The results and plots below show the worst results obtained for the different modulations.

Radiated measurements setup f < 1 GHz



Radiated measurements setup f > 1 GHz



Section 96.41 Subclause (b). Maximum effective isotropic radiated power (EIRP)

Section 2.1046. Conducted Output Power

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.

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

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 (1/0.74) = 1.31 (dB)

The measured values from the two ports were summed by using the measure-and-sum technique in E) 1) of KDB 662911 D01 Multiple Transmitter Output v02r01 and based on two ports, port 1 and 3 (or port 2 and 4) transmitting at the same time in the 2X2 MIMO mode.

RESULTS

2X2 MIMO

10MHz BW

Port 1 and 3

	Lowest frequency 3555 MHz	Middle frequency 3625 MHz	Highest frequency 3695 MHz
Power at Port 1 (dBm/10 MHz)	25.31	25.46	25.62
Power at Port 3 (dBm/10 MHz)	25.57	25.67	25.09
Summed Power (dBm/10 MHz)	28.45	28.58	28.37
Maximum declared antenna gain (dBi)	17.50	17.50	17.50
Maximum EIRP (dBm/10 MHz)	45.95	46.08	45.87
Measurement uncertainty (dB)	< ± 0.95		

Port 2 and 4

	Lowest frequency 3555 MHz	Middle frequency 3625 MHz	Highest frequency 3695 MHz
Power at Port 2 (dBm/10 MHz)	25.41	25.14	25.38
Power at Port 4 (dBm/10 MHz)	25.48	25.42	25.43
Summed Power (dBm/10 MHz)	28.46	28.29	28.42
Maximum declared antenna gain (dBi)	17.50	17.50	17.50
Maximum EIRP (dBm/10 MHz)	45.96	45.79	45.92
Measurement uncertainty (dB)	< ± 0.95		

20MHz BW

Port 1 and 3

	Lowest frequency 3560 MHz	Middle frequency 3625 MHz	Highest frequency 3690 MHz
Power at Port 1 (dBm/10 MHz)	22.37	23.40	22.93
Power at Port 3 (dBm/10 MHz)	22.23	24.31	23.69
Summed Power (dBm/10 MHz)	25.31	26.89	26.34
Maximum declared antenna gain (dBi)	17.50	17.50	17.50
Maximum EIRP (dBm/10 MHz)	42.81	44.39	43.84
Measurement uncertainty (dB)	< ± 0.95		

Reference table with 20 MHz integration

	Lowest frequency 3560 MHz	Middle frequency 3625 MHz	Highest frequency 3690 MHz
Power at Port 1 (dBm/20 MHz)	24.69	25.97	25.44
Power at Port 3 (dBm/20 MHz)	24.67	25.84	25.86
Summed Power (dBm/20 MHz)	27.69	28.92	28.67
Maximum declared antenna gain (dBi)	17.50	17.50	17.50
Maximum EIRP (dBm/20 MHz)	45.19	46.42	46.17
Measurement uncertainty (dB)	< ± 0.95		

Port 2 and 4

	Lowest frequency 3560 MHz	Middle frequency 3625 MHz	Highest frequency 3690 MHz
Power at Port 1 (dBm/10 MHz)	22.45	23.82	23.25
Power at Port 3 (dBm/10 MHz)	22.51	24.10	23.90
Summed Power (dBm/10 MHz)	25.49	26.97	26.60
Maximum declared antenna gain (dBi)	17.50	17.50	17.50
Maximum EIRP (dBm/10 MHz)	42.99	44.47	44.10
Measurement uncertainty (dB)	< ± 0.95		

Reference table with 20 MHz integration

	Lowest frequency 3560 MHz	Middle frequency 3625 MHz	Highest frequency 3690 MHz
Power at Port 1 (dBm/20 MHz)	24.23	25.58	25.62
Power at Port 3 (dBm/20 MHz)	24.25	25.94	25.53
Summed Power (dBm/20 MHz)	27.25	28.77	28.59
Maximum declared antenna gain (dBi)	17.50	17.50	17.50
Maximum EIRP (dBm/20 MHz)	44.75	46.27	46.09
Measurement uncertainty (dB)	< ± 0.95		

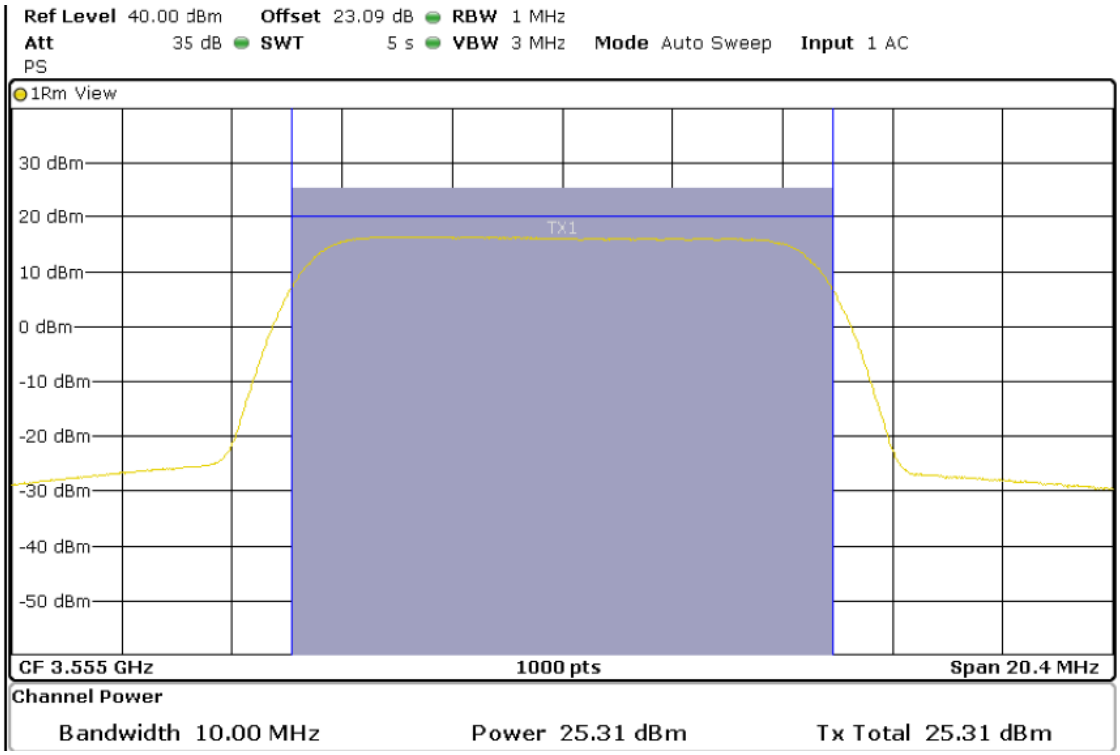
VERDICT: PASS

(See next plots)

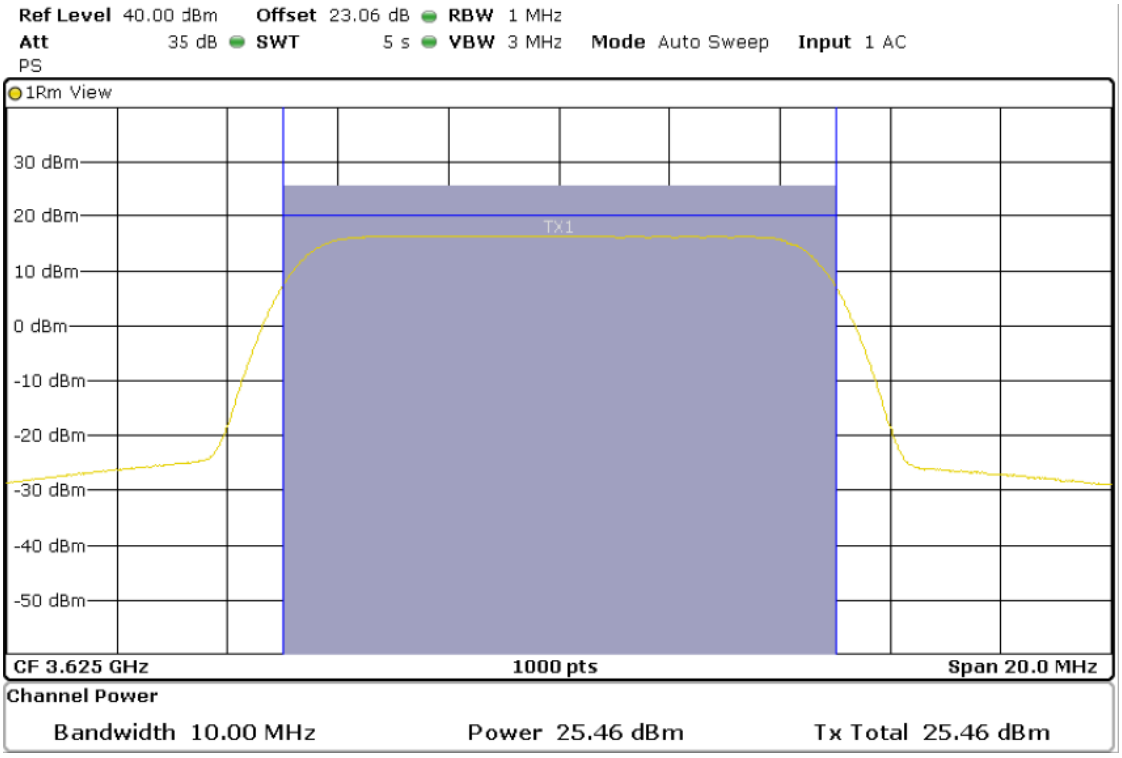
2X2 MIMO mode

10MHz BW

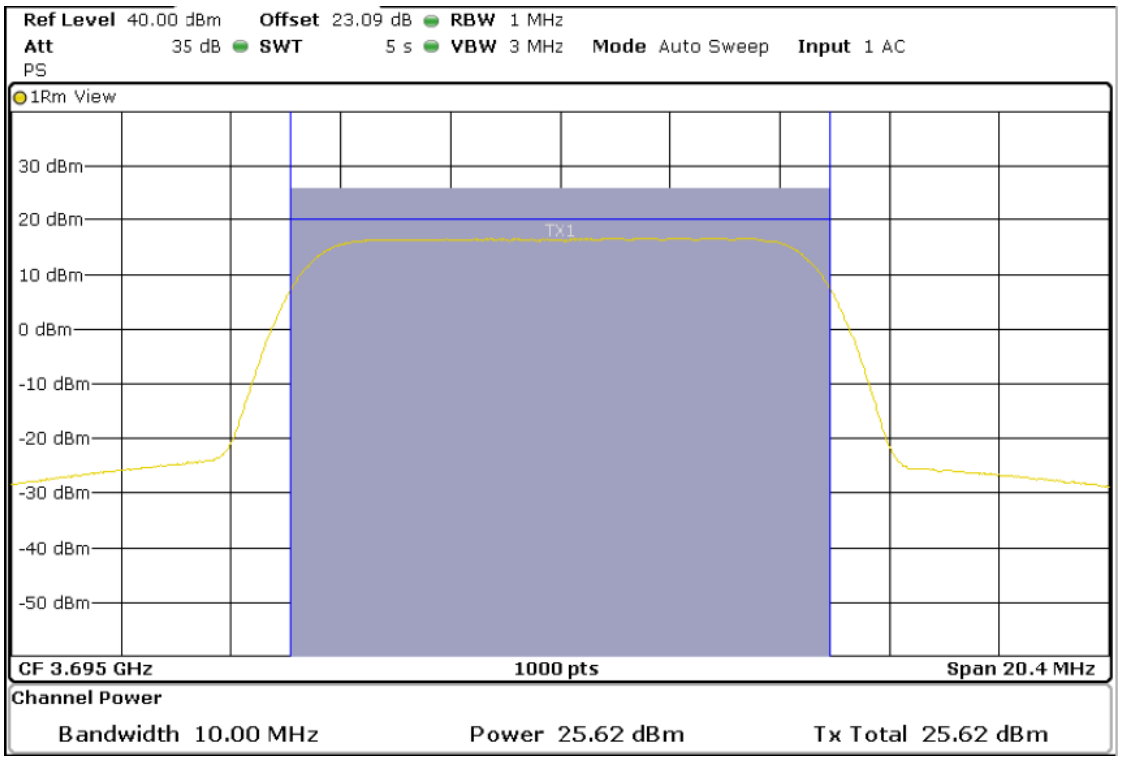
Port 1
Lowest Channel (3555 MHz)



Middle Channel (3625 MHz)

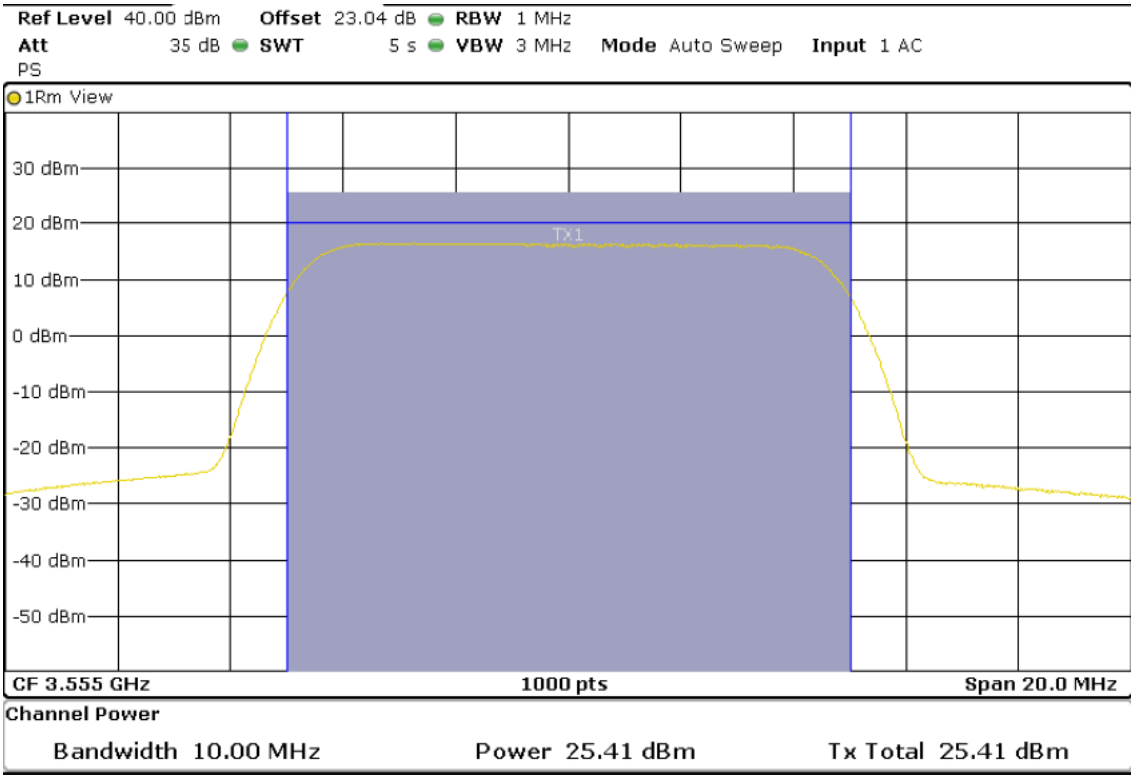


Highest Channel (3695 MHz)

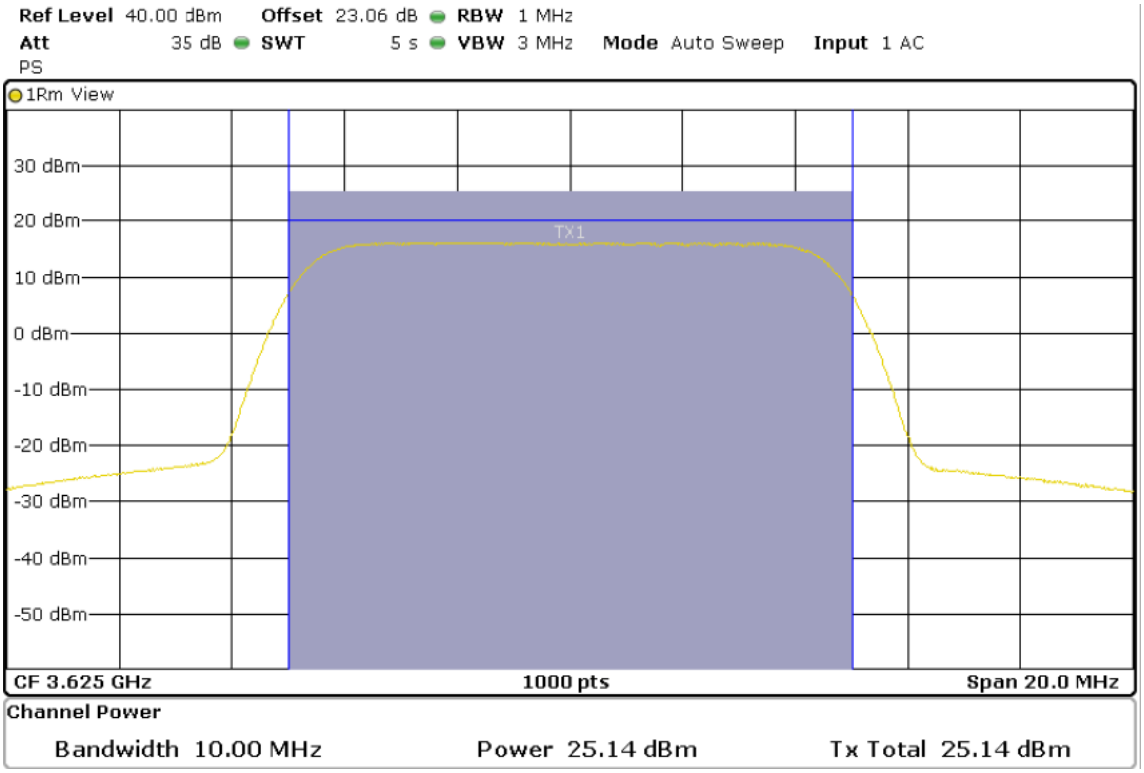


<u>Port 2</u>

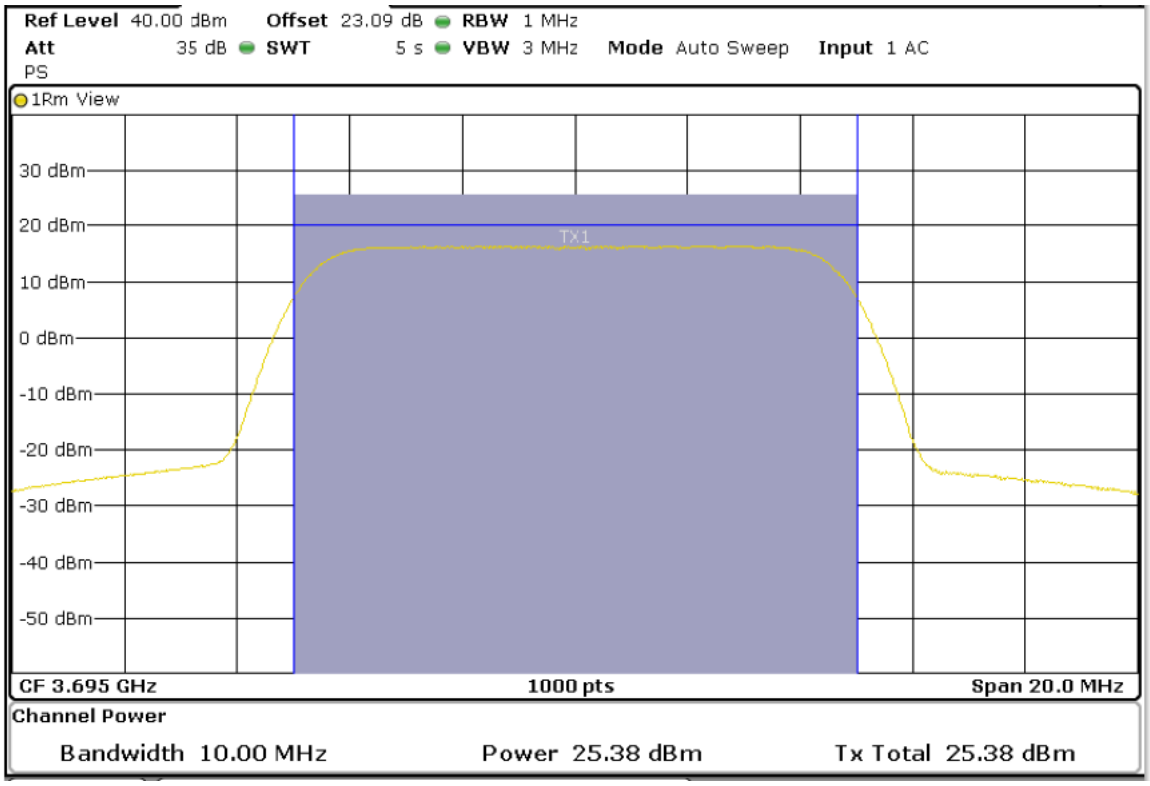
Lowest Channel (3555 MHz)



Middle Channel (3625 MHz)

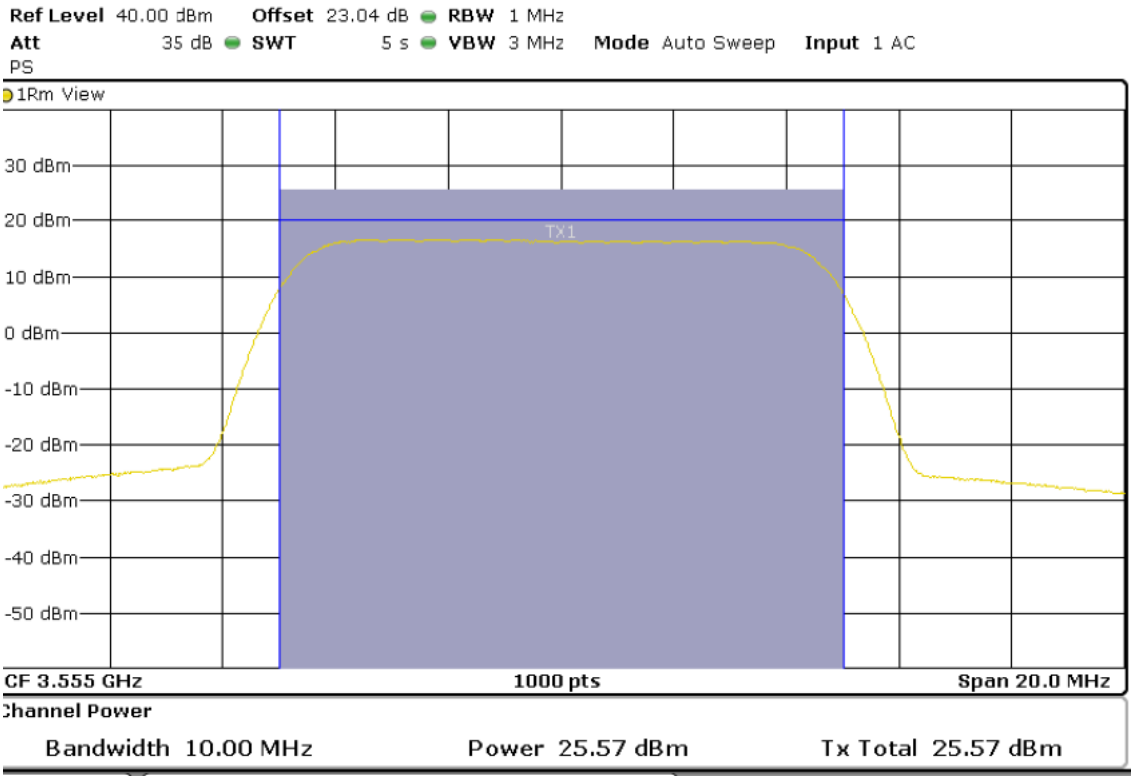


Highest Channel (3695 MHz)

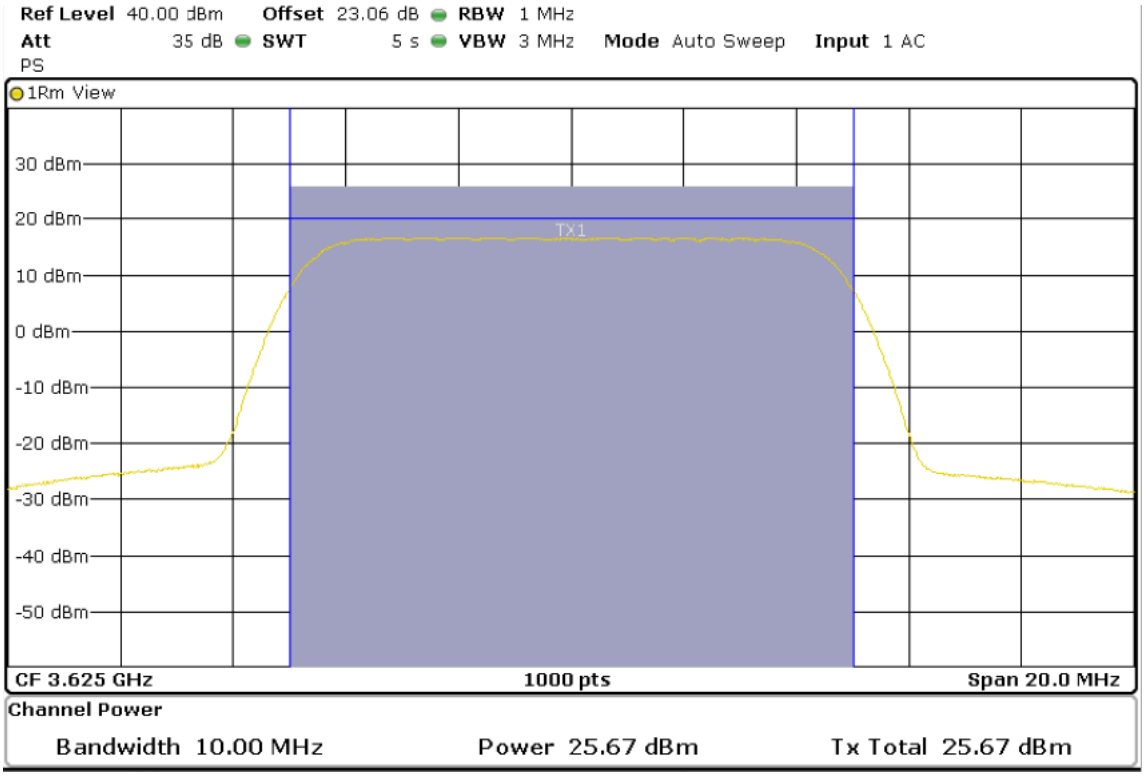


Port 3

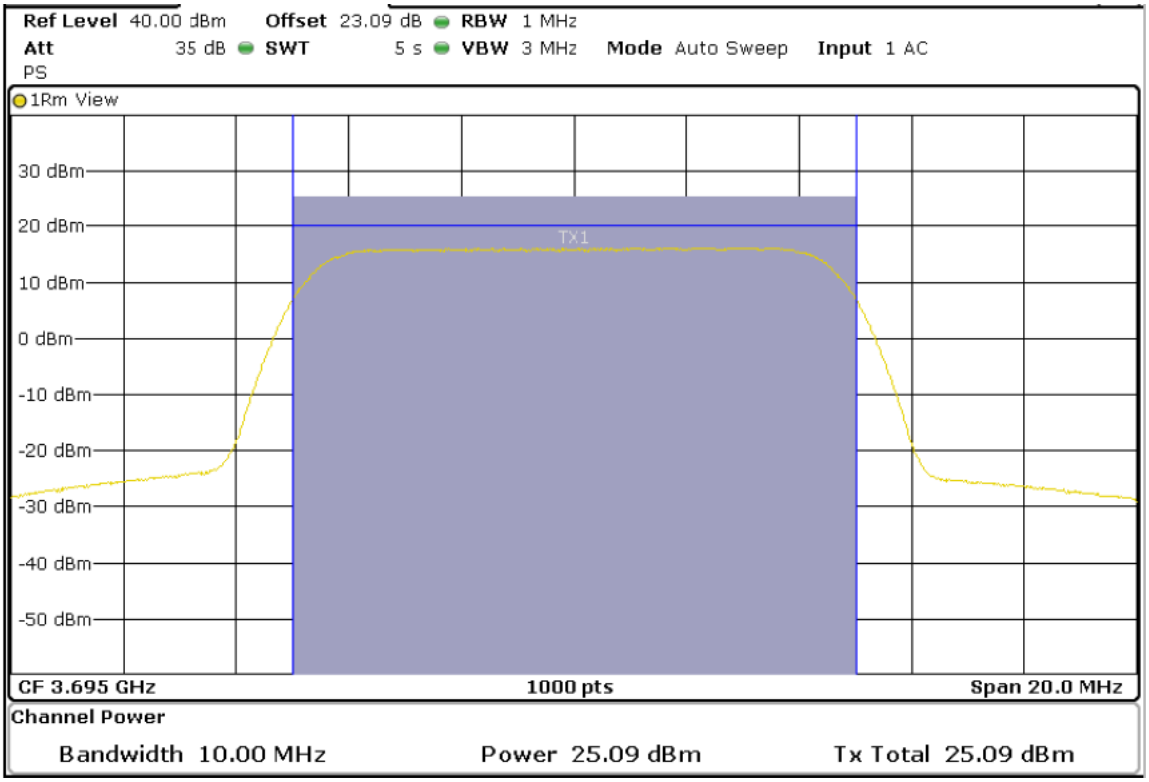
Lowest Channel (3555 MHz)



Middle Channel (3625 MHz)

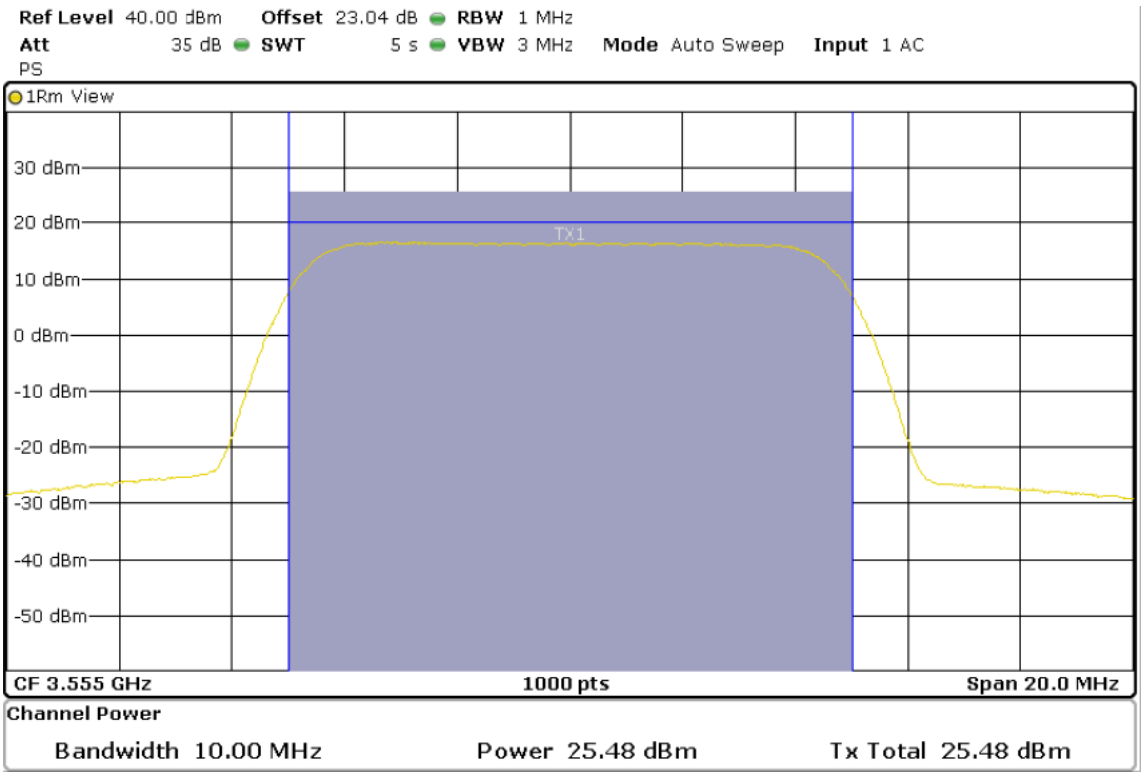


Highest Channel (3695 MHz)

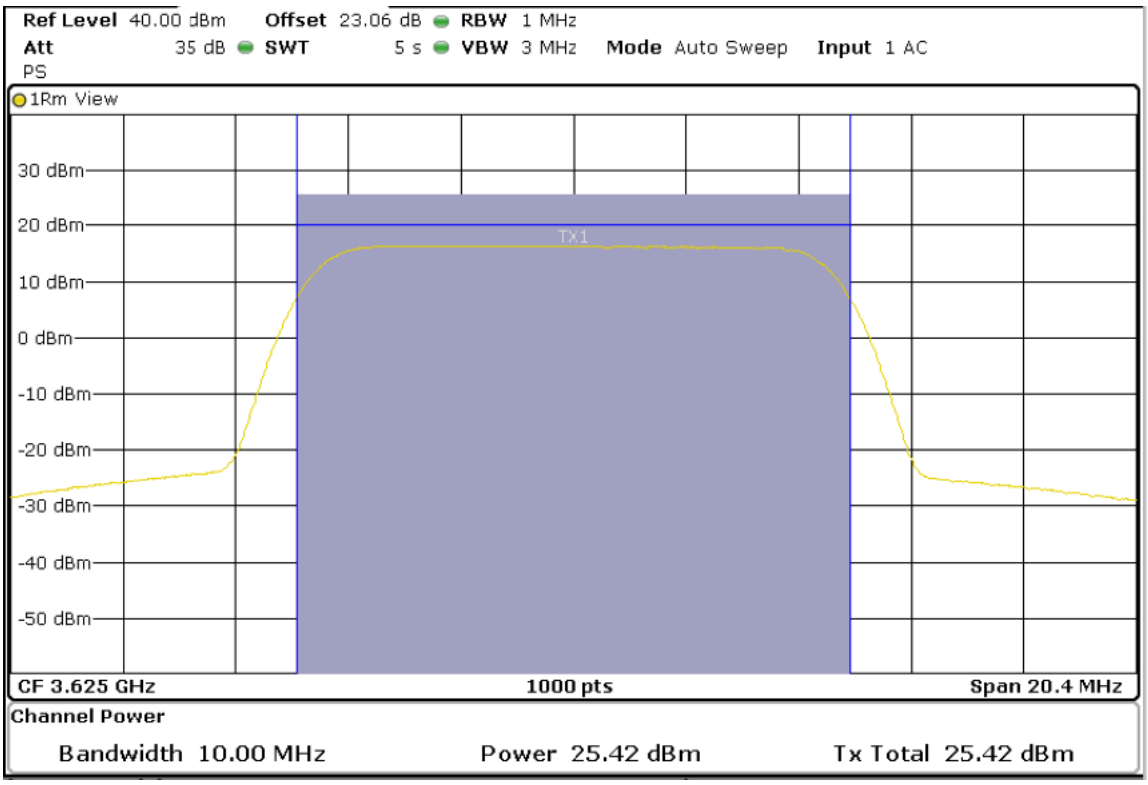


Port 4

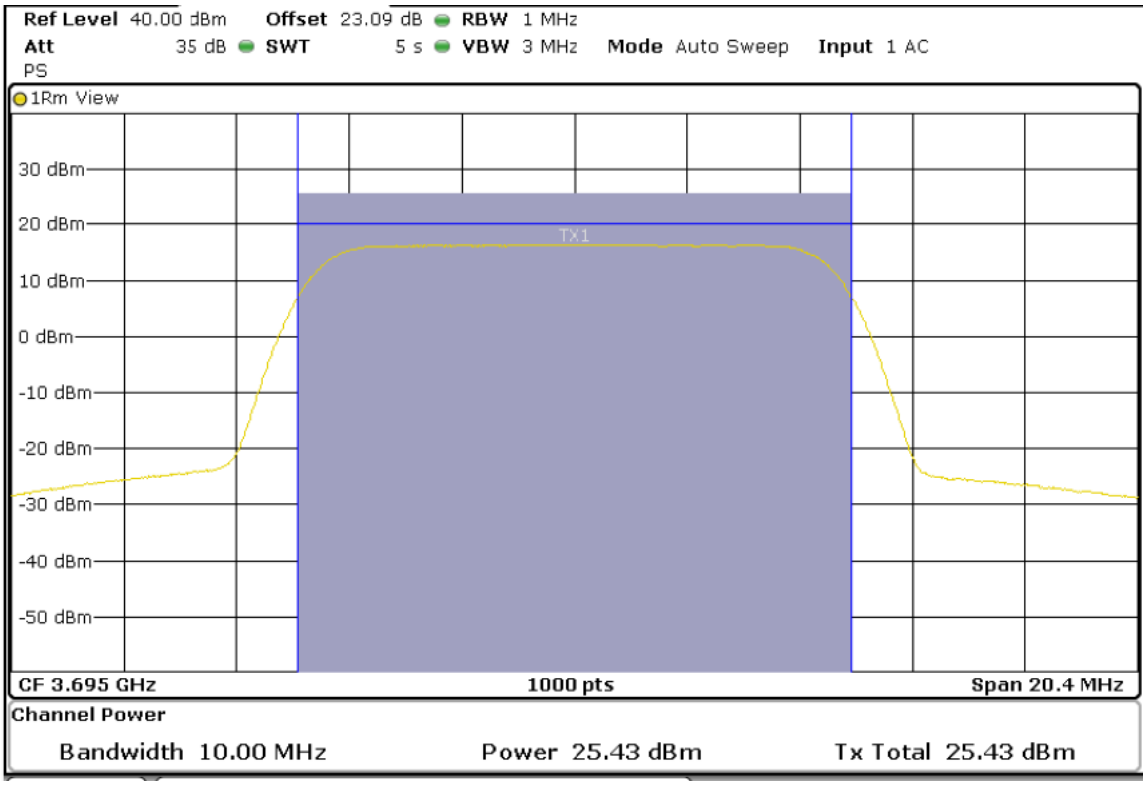
Lowest Channel (3555 MHz)



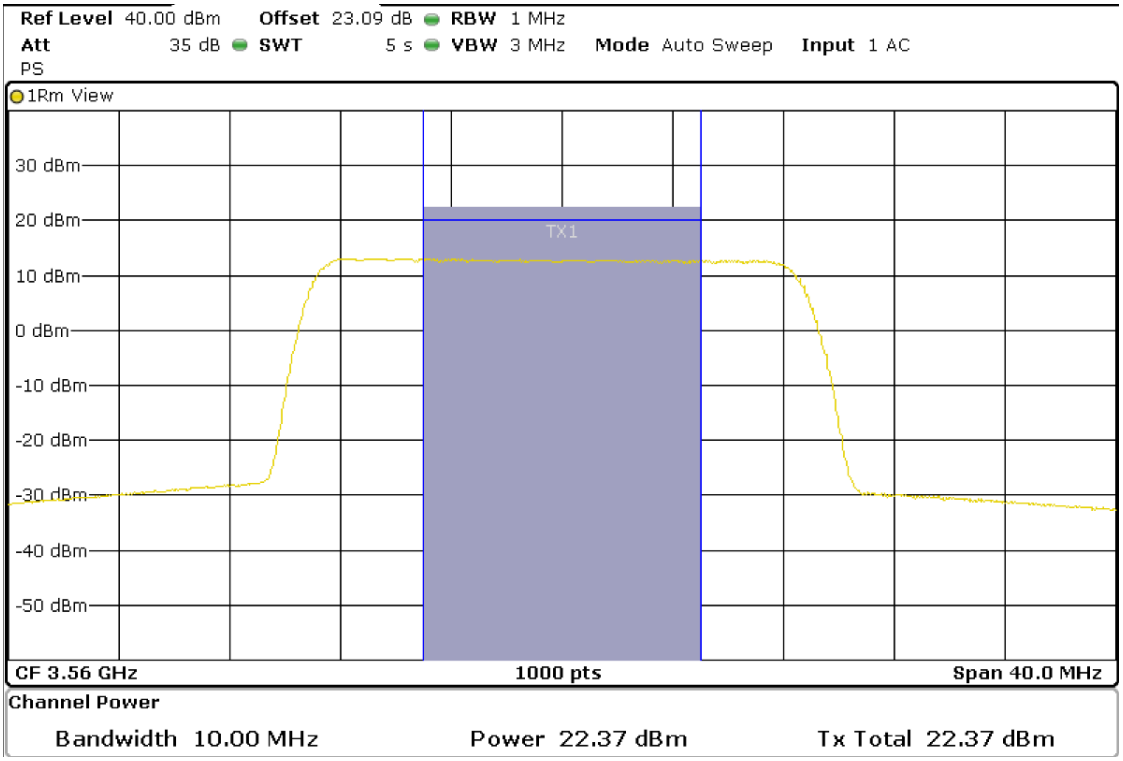
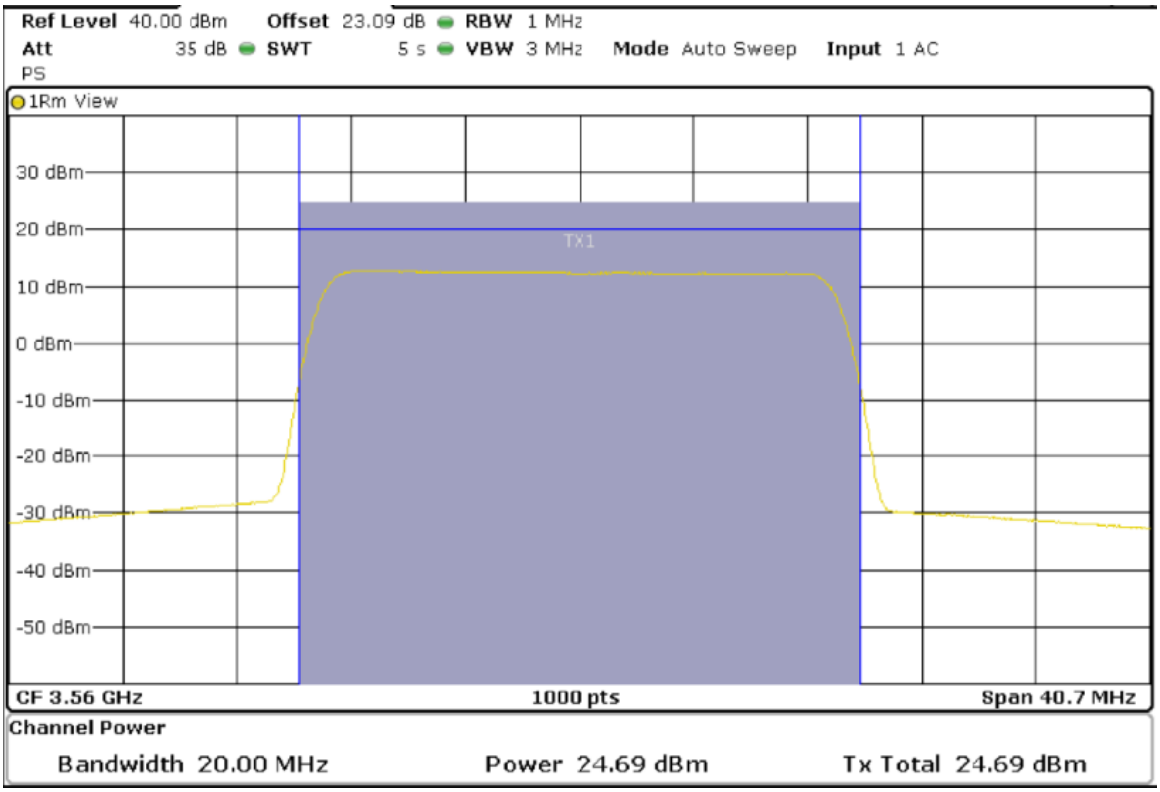
Middle Channel (3625 MHz)



Highest Channel (3695 MHz)



20MHz BW

Port 1

Lowest Channel (3560 MHz)