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FCC Testing of the Octasic Portable MIMO System in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 27C

COMMERCIAL-IN-CONFIDENCE

FCC: 2AQSOCBRSYS4450

PREPARED BY

Jose Martinez

APPROVED BY

DATED Nov. 5, 21

Scott Drysdale

5-Nov-21

Page 1 of 54

Report Issued: 11/5/2021 Report File #: TR-7169009211R-CBRSYS4450- Band 71-Issue-03



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SECTION 1: REPORT INFORMATION

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1.1 REPORT DETAILS

Manufacturer	Octasic inc.
Manufacturer Description	CBRSYS4450
Address	2901 Rachel St. East, Suite 30. Montreal, QC, H1W 4A4
Product Name	Portable MIMO System
Product Number	CBRSYS4450
Serial Number(s)	F-01150
Hardware Version(s)	Version 1
Software Version(s)	BSP CBRBTS-BSP-02.07.03.02-B454
Test Specification/Issue/Date	FCC CFR 47 Part 2: August 18,2021 FCC CFR 47 Part 27: August 18, 2021
Max Antenna Gain	5dBi
Start of Test	May 27 th , 2021
Finish of Test	November 5, 2021
Name of Test Personnel(s)	Jose Martinez
Related Document(s)	KDB 971168 D01 v02r02: April 2018 KDB 662911 D01 v02r01: October 2013
Test report revision history	 2021-09-22. Issue 000. Initial release. 2021-10-06. Issue 01. ISED Clauses added 2021-10-20. Issue 02. Modifications: ISED clauses removed Section 2.1. Power table arranged properly Section 2.3.5. Update RBW selection 2021-11-05. Issue 03. Modifications: Section 2.3 – Refined graph of Band edge



1.2 BRIEF SUMMARY OF RESULTS

A summary of results for each configuration, in accordance with FCC CFR 47 Part 2 and \underline{FCC} CFR 47 Part 27C is shown below.

	Table 1 – Test Summary						
Section	FCC CFR 47 Part 2	FCC CFR 47 Part 27	Test Description	Result			
2.1	2.1046	§ <u>27.50c(1)</u>	Maximum Peak Output Power and Peak to Average Ratio - Conducted	Pass			
2.2	2.1049	<u>§27.53</u>	Occupied Bandwidth	Pass			
2.3	2.1051	§ <u>27.53 (g)</u>	Band Edge	Pass			
2.4	2.1051	§2 <u>7.53 (g)</u>	Transceiver Spurious Emissions	Pass			
2.5	2.1055	<u>§27.54</u>	Frequency Stability	Pass			
2.7	2.1053	§ <u>27.55(a)(2)</u>	Field Strength of Spurious Emissions - Radiated	Pass			
-	-	<u>§15.109</u>	Receiver Spurious Emissions	<note 1=""></note>			
Note 1. N	lot applicable	e as this is a transceiver					

		-
Table	1 –Test	t Summarv



1.3 **PRODUCT INFORMATION**

1.3.1 Technical Description

The EUT, hereafter referred as the Equipment Under Test (EUT) is a MIMO Station unit CBRSYS4450 of Octasic Inc capable of trasmitting in the LTE-, UTMS-, CDMA- and GSM-Bands.

1.3.1.1 The Transmission in the Band 71

The EUT is transmitting in the 617-652 MHz spectrum range as per $\frac{27.1(b)(14)}{1}$. The transmission are in Block A: 617-622 MHz; Block D: 632-637MHz and Block G: 647-652MHz as per $\frac{§ 27.5 (I)}{1}$. The channel configuration is as follows:

Channels	Frequency (MHz)	Target Power	Power (dBm)		
Bottom Channel	619.5	29	28.9 <note 1=""></note>		
Middle	634.5	29	28.87 <note 2=""></note>		
Тор	649.5	29	28.93 <note 3=""></note>		
Note 1. See Table 3 in Section 2.1.6.1 (Port TX1B) Note 2. See Table 4 in Section 2.1.6.2 (Port TX1A) Note 3. See Table 5 in Section 2.1.6.3.(Port TX1A)					

A full technical description can be found in the Manufacturer's documentation guide and datasheet CBRSYS4450-User_Guide.pdf and CBRSYS4450-Datasheet.pdf, respectively.



1.3.2 Configuration Description

The EUT supports single mode operation having four transmitting ports (see Figure 3)

TX test cases: Maximum Conducted Output Power, Spurious Emissions at Antenna Terminals (\pm 1MHz) and Conducted Spurious Emissions, measurements were performed on the four RF Port. The test limits shown are representative of the worst case. All testing was performed with the EUT transmitting at maximum RF power unless as designated setting by client, otherwise stated.

The EUT was powered via a 120V/60Hz power AC/DC Adapter.

Channel Configurations:

LTE	No. Of		Corrier		er Frequend juration (Mi	-
Band	Carriers	Modulation	Carrier Bandwidth	Bottom/B _R FBW (MHz)	Middle/ M _{RFBW} (MHz)	Top/ T _{RFBW} (MHz)
71	1	QPSK	5 MHz	619.5	634.5	649.5

Table 2 – Channel C	onfiguration
---------------------	--------------



1.4 DECLARATION OF BUILD STATUS

	MAIN EUT
MANUFACTURING DESCRIPTION	CBRSYS4450
MANUFACTURER	Octasic inc.
TYPE	Portable Transportable Amplification Unit (TAU)
PART NUMBER(S)	CBRSYS4450
SERIAL NUMBER(S)	F-01150
HARDWARE VERSION(S)	Version 1
SOFTWARE VERSIONS(S)	CBRBTS-BSP-02.07
TRANSMITTER OPERATING RANGE (Band 12)	619.5MHz – 649.5MHz
RECEIVER OPERATING RANGE(MHz)	663 to 2690
EMISSION DESIGNATOR(S): (i.e. G1D, GXW)	194M
Country of Origin	Bangalore, India
MODULATION TYPES: (i.e. GMSK, QPSK)	QPSK
HIGHEST INTERNALLY GENERATED FREQUENCY	2.7GHz
OUTPUT POWER (W or dBm)	30dBm
FCC ID:	FCC: 2AQSOCBRSYS4450
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	The CBRSYS4450 is a base station solution build for the particular needs of application like search and Rescue (SRR), Network in Box (NiB) and Disaster Recovery. It integrates four transreceiver cellular base station (BTS) with all necessary RF, GPS and Wi-Fi antennas. The control is through an easy-to-use Android app on a smartphone or table for convenient on-the-go operation



Equipment Under Test (EUT)



Figure 3. Top view of CBRSYS4450

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1.5 GENERAL TEST SETUP

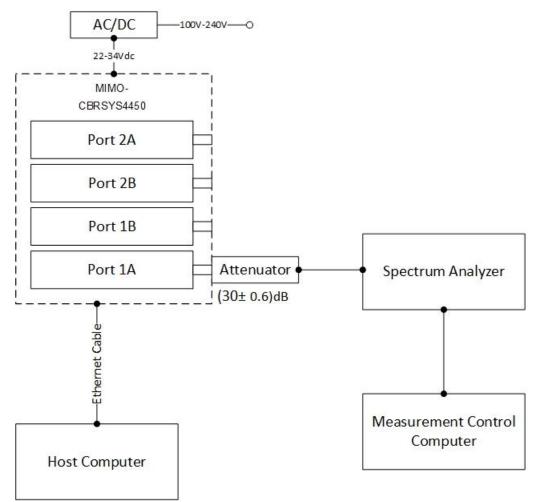


Figure 2. Block Diagram of Conducted Measurement Setup.



1.6 TEST CONDITIONS

For all tests the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated as described in the Test Method for each Test.

The EUT was powered using the AC/DC adapter.

1.7 DEVIATION FROM THE STANDARD

No deviations from the applicable test standards or test plan were made during testing.

1.8 MODIFICATION RECORD

No modifications were made to the EUT during testing.

1.9 TEST FACILITY

FCC Measurement Facility Registration Number: CA4810

Under our group A2LA Accreditation, TÜV SÜD conducted the following tests at Kanata, Test Laboratory.

Test Name	Name of Test Specialist(s)
Maximum Peak Output Power and Peak to Average Ratio - Conducted	Jose Martinez
Occupied Bandwidth	Jose Martinez
Band Edge	Jose Martinez
Transmitter Spurious Emissions	Jose Martinez
Frequency Stability	Jose Martinez
Field Strength of Spurious Emissions - Radiated	Jose Martinez



SECTION 2: TEST DETAILS



2.1 MAXIMUM PEAK OUTPUT POWER AND PEAK TO AVERAGE RATIO - CONDUCTED

2.1.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1046 FCC CFR 47 Part 27, Clause 27.50(a)(12)(c)(1) 662911 D01 Multiple Transmitter Output v02r01:2013 412172 D01 Determining ERP and EIRP v01r01 :2015-08.

2.1.2 Date of Test and Modification State

27 May 2021 - Modification State 0

2.1.3 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.4 Environmental Conditions

Ambient Temperature25.1°CRelative Humidity20.4%

2.1.5 Test Method

All measurements were made in accordance with FCC KDB 971168 D01, clause 5.2.1. The attenuation value in Figure 4 and used throughout is (30±0.6) dB.

Measurements were performed with a Spectrum Analyser using the Band Power measurement function. The detector was set to RMS with an RBW of at least 1 % of the carrier bandwidth and a VBW of at least 3 times the RBW. The integration bandwidth was configured to be wider than the total bandwidth of the carrier or combinations of carriers, (multi-carrier). Using a sweep time of auto, measurements were performed over 200 samples, with the average measurement recorded.

Due to Average measurements being recorded, an additional Peak to Average power ratio (PAPR) measurement was made. This was achieved using the CCDF function of the Spectrum Analyser with the RBW being set to a value wider than the largest signal being measured – in this case – 20MHz.

The EUT was configured to transmit on maximum power on the configurations defined in the tables below.

The peak to average ratio measurement was performed at the conducted ports of the EUT. The spectrum analyzer's Complementary Cumulative Distribution Function (CCDF) was used, and 0.1% probability value recorded.

The RMS Power and Peak to Average Ratio were measured and recorded with the results being compared with the limits.

Measurements presented are the worst-case of measurements conducted in the four ports: TX1A, TX1B, Tx2A and Tx2B, respectively.



2.1.6 Test Results

2.1.6.1 Bottom Channel – 619.5MHz

Maximum Target Output Power: 29 dBm

	Peak to Average Ratio (PAPR) / Output Power						
Antenna	PAPR	Conducted Average Power		ERP <note 2=""></note>	Limit <note 3=""></note>	Results	
	(@.1%)	(dBm)	(mW)	(dBm)	(kW)		
TX1A	7.23	28.8	758.58	25.22			
TX1B	7.28	28.9 <note 1=""></note>	776.25	25.42			
TX2A	7.29	28.75	749.89	25.24	1	Pass	
TX2B	7.34	28.77	753.36	25.07			
Total 33.83 3038.07 -							
Note 1. See C	Note 1. See Graph 1.						
	=EIRP -2.15 dB F <u>CC CFR 47 2</u>		<u>201</u>				

Table 3 – Max Peak Output Power – Bottom Channel



2.1.6.1.1 Worst Case – Port 1B

Carrier Power Modulation QPSK - Carrier Bandwidth 5.0 MHz – Channel Position: 619.5 MHz

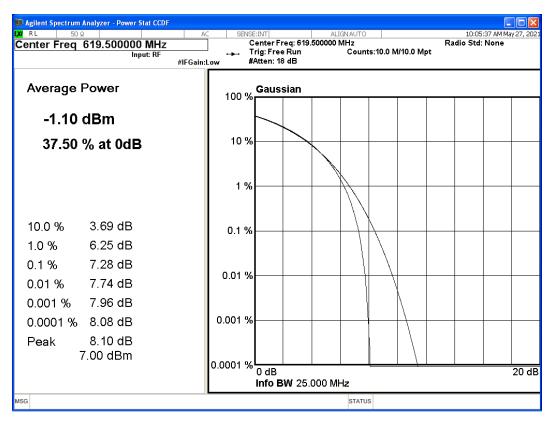
rker 1 620.79 MHz Radio Std: None Input: RF #IFGain:Low Tig:Free Run Avg Hold: 200/200 #Atten: 18 dB Avg Hold: 200/200 Radio Device: BTS dB/div Ref 4.27 dBm a a a b b b b b b b b b b b	RL 50Ω		AC	SENSE:INT	ALIGN AUTO			36 AM May 27,
Input with the second secon	rker 1 620.7					200/200	Radio Std: I	None
hter 619.5 MHz sBW 51 kHz -1.10 dBm/ 7.5 MHz -1.10 dBm/ 7.5 MHz -69.85 dBm/Hz		Input: RF			Arghivia.	200/200	Radio Devi	e: BTS
hter 619.5 MHz sBW 51 kHz -1.10 dBm/ 7.5 MHz -1.10 dBm/ 7.5 MHz -69.85 dBm/Hz								
hter 619.5 MHz BW 51 KHz Channel Power -1.10 dBm/ 7.5 MHz -1.10 dBm/ 7.5 MHz		-4.27 dBm						
hter 619.5 MHz BW 51 kHz Channel Power -1.10 dBm/ 7.5 MHz -2.10 dBm/ 7.5 MHz -69.85 dBm/Hz								
hter 619.5 MHz s BW 51 kHz Channel Power -1.10 dBm/ 7.5 MHz -1.10 dBm/ 7.5 MHz -69.85 dBm/Hz			man			may		
Let 619.5 MHz s BW 51 kHz Channel Power -1.10 dBm/ 7.5 MHz -69.85 dBm/Hz								
ter 619.5 MHz se BW 51 kHz Channel Power -1.10 dBm/ 7.5 MHz -69.85 dBm/Hz						+		
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ter 619.5 MHz se BW 51 kHz Channel Power -1.10 dBm/ 7.5 MHz -69.85 dBm/Hz		mannend				~~~	marine	
Image: Span 10 Image: Span 10 Image: Span 10 Image: Span 1								
s BW 51 kHz #VBW 160 kHz Sweep 4.79 Channel Power Power Spectral Density -1.10 dBm/ 7.5 MHz -69.85 dBm/Hz								
 BW 51 kHz #VBW 160 kHz Sweep 4.79 Channel Power Power Spectral Density -1.10 dBm/ 7.5 MHz -69.85 dBm/Hz 								
 BW 51 kHz #VBW 160 kHz Sweep 4.79 Channel Power Power Spectral Density -1.10 dBm/ 7.5 MHz -69.85 dBm/Hz 								+
 BW 51 kHz #VBW 160 kHz Sweep 4.79 Channel Power Power Spectral Density -1.10 dBm/ 7.5 MHz -69.85 dBm/Hz 								
BW 51 kHz #VBW 160 kHz Sweep 4.79 Channel Power Power Spectral Density -1.10 dBm/ 7.5 MHz -69.85 dBm/Hz								
-1.10 dBm/ 7.5 MHz -69.85 dBm/Hz				#VBW 16	60 kHz			
-1.10 dBm/ 7.5 MHz -69.85 dBm/Hz								•
	hannel Po	wer		Power Spe	ctral Density	/		
	_1	10 dBm/	75 MU-7	-6	9 85 dem	' Ll -		
				-0		114		
i File <26DBBW.STATE> saved status		STATES saved			STATUS			

Graph 1: Output Power – Port 1B – Bottom Channel

Calculation: 30dB - 1.10 dBm = 28.9 dBm.



Pk-Av Ratio - Modulation QPSK - Carrier Bandwidth 5.0 MHz - Channel Position: 619.5 MHz



Calculation: Limit (13 dB) – 0.1% (7.28 dB) = 5.72 dB: Pass.



<mark>III Agilent Sp</mark> XII RL	ectrum Ana 50 Ω	lyzer - Swept	SA	AC	SENSE:INT		ALIGN AUTO		10:05:4	5 AM May 27, 202
		9.50000 II	0 MHz nput: RF	PNO: Fast IFGain:Low	Atten: 30			Pwr(RMS) 200/200	TF	TYPE A WWWW DET A A A A A
10 dB/div Log		set 29.42 c 9 .12 dB m							Mkr1 620. 22.	347 MH 919 dBr
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29.1							l			
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20.9										
30.9										
40.9										
Center 6 #Res BW			1	#1	/BW	<u> </u>		Swe	Span Span ep 1.04 ms	10.00 MH (1200 pt
ISG							STATUS		-	

PSD - Modulation QPSK - Carrier Bandwidth 5 MHz - Channel Position: 619.5 MHz



2.1.6.2 Middle Channel: 634.5MHz

Maximum Target Output Power: 29 dBm

	Peak to Average Ratio (PAPR) / Output Power									
Antenna	PAPR	Conducted Average Power		ERP <note 2=""></note>	Limit <note 3=""></note>	Results				
	(@.1%)	(dBm)	(dBm) (mW) (dB		(kW)					
TX1A 7.45		28.87 <note 1=""></note>	770.90	25.34						
TX1B	TX1B 7.52		756.83	25.2						
TX2A	7.46	25.23	1	Pass						
TX2B 7.51 28.79 756.83 25.37										
Total 34.83 ^{3041.40} -										
Note 1. See Graph 2.										
Note 2. ERP	Note 2. ERP =EIRP -2.15 dB as per <u>412172 D01</u>									

Table 4 – Max Peak Output Power – Middle Channel

Note 3 As per FCC CFR 47 27.50(c)(1)



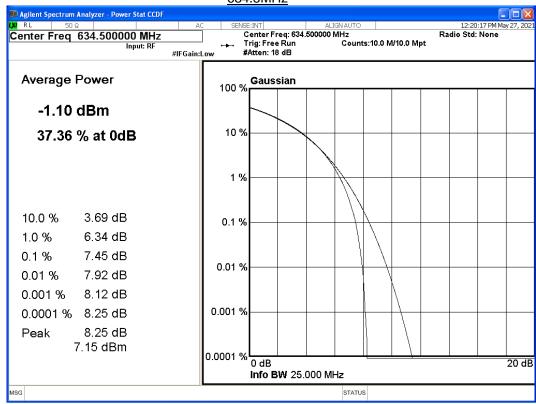
2.1.6.2.1 Worst Case – Port 1A

🛚 Agilent Spectrum Analyzer - Ch	unnel Power	<u>634.5MHz</u>		
RL 50 Ω larker 1 636.28 MHz	Input: RF #IFGain:Low	SENSE:INT Center Freq: 634.5000 	ALIGNAUTO DOO MHz Avg Hold: 200/200	12:19:52 PM May 27, Radio Std: None Radio Device: BTS
OdB/div Ref -4.48 og	dBm			
74.5				
enter 634.5 MHz Res BW 51 kHz		#VBW 1601	kHz	Span 10 M Sweep 4.796
Channel Power		Power Spect	ral Density	
-1.13	dBm/ 7.5 MHz	-69.	89 dBm/Hz	
G 🗼 File <26DBBW.STATE	> saved		STATUS	
Gr	aph 2: Output Po	wer – Port 1A – I	Middle Channel	

Carrier Power - Modulation QPSK - Carrier Bandwidth 5.0 MHz – Channel Position:

Calculation: 30 dB - 1.13 dBm = 28.87 dBm.

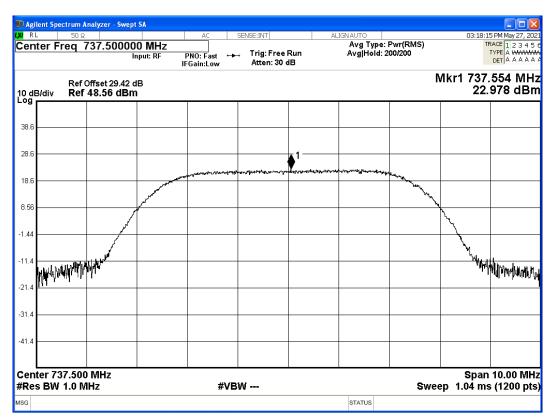




Pk-Av Ratio - Modulation QPSK - Carrier Bandwidth 5.0 MHz - Channel Position: 634.5MHz

Calculation: Limit (13 dB) - 0.1% (7.45 dB) = 5.55 dB: Pass





PSD – Modulation QPSK - Carrier Bandwidth 5.0 MHz – Channel Position: 634.5MHz



2.1.6.3 Top Channel: 649.5MHz

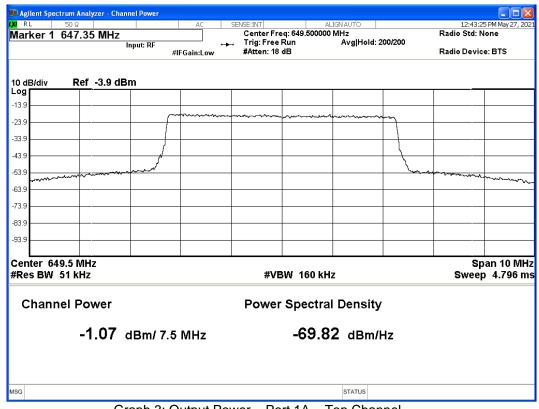
Maximum Target Output Power: 29dBm

	Peak to Average Ratio (PAPR) / Output Power									
Antenna	PAPR	Conducted Powe	Average er	ERP <note 2=""></note>	Limit <note 3=""></note>	Results				
	(@.1%)	(dBm)	(dBm) (mW) ((kW)					
TX1A 7.52		28.93 <note 1=""></note>	781.63	25.44						
TX1B	TX1B 7.54		776.25	25.31						
TX2A	7.55	28.87	770.90	25.66	1	Pass				
TX2B 7.55 28.84 765.60 25.5										
Total 34.91 ^{3094.37} -										
Note 1. See Graph 3.										
Note 2. ERP	Note 2. ERP =EIRP -2.15 dB as per <u>412172 D01</u>									

Note 3 As per FCC CFR 47 27.50(c)(1)



2.1.6.3.1 Worst Case – Port 1A

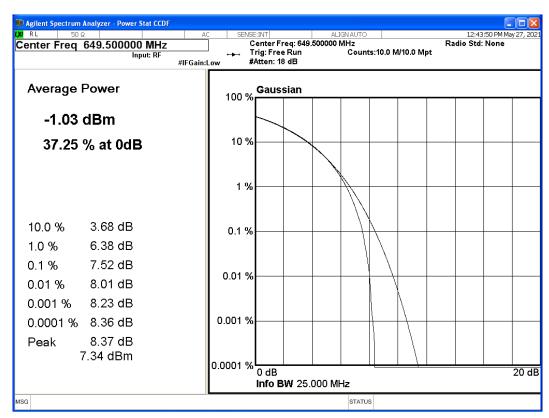


Carrier Power - Modulation QPSK - Carrier Bandwidth 5.0 MHz – Channel Position: 649.5MHz

Graph 3: Output Power – Port 1A – Top Channel

Calculation. 30dB - 1.07 dBm = 28.93 dBm.





Pk-Av Ratio - Modulation QPSK - Carrier Bandwidth 5.0 MHz - Channel Position: 649.5MHz

Calculation. Limit (13 dB) - 0.1% (7.52 dB) = 5.48 dB: Pass



RL	50 Ω	nalyzer - Swept		AC	SENSE:INT		ALIGN AUTO			9 PM May 27, 2
ent	er Freq 6	549.50000	O MHz nput: RF	PNO: Fast IFGain:Low	→→ Trig: Free Atten: 30		Avg Type Avg Hold:	: Pwr(RMS) 200/200	т	TYPE A WWWM DET A A A A
0 dB/		Offset 29.42 o 48.65 dBm			1		1		Mkr1 648 22.	.587 MI 939 dB
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28.7 -					1					
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1.4 -										
41.4 -				_						
	er 649.500 BW 1.0 M				/BW			Swe	Span ep 1.04 ms	 ⊨10.00 M s (1200 r
G				"			STATUS			- 1,1200 P

PSD - Modulation QPSK - Carrier Bandwidth 10.0 MHz - Channel Position: 649.5MHz



2.2 OCCUPIED BANDWIDTH

2.2.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1049 FCC CFR 47 Part 27, <u>Clause 27.53</u>

2.2.2 Date of Test and Modification State

27 May 2021 - Modification State 0

2.2.3 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.4 Environmental Conditions

Ambient Temperature22.1°CRelative Humidity16.4%

2.2.5 Test Method

All measurements were made in accordance with FCC KDB 971168 D01.



2.2.6 Test Results

Maximum Output Power for Bottom– Middle– and Top– channels is 29dBm. The worstcase scenario of all channels is provided below.

2.2.6.1 Bottom Channel – 619.5 MHz

2.2.6.1.1 Worst Case – Port 2B

		Result (MHz)		
Modulation	Carrier Bandwidth	Channel Bandwidth		
		Occupied Bandwidth	-26 dB Bandwidth	
QPSK	5.0 MHz	4.5	4.82	

Bandwidth 5.0MHz - Modulation: QPSK - Channel B: 619.5 MHz

Marker 1 621.57 MHz Center Freq: 619.500000 MHz Radio Std: None Input: RF #IFGain:Low Trig: Freq Run Avg Hold: 200/200 Radio Device: BTS 10 dB/div Ref -3.92 dBm	💭 Agilent Spectrum Analyzer - Oco	cupied BW			
Input: RF Trig: Free Run #Atten: 18 dB Avg Hold: 200/200 Radio Device: BTS 10 dB/div Ref -3.92 dBm					10:25:29 AM May 27, 202
Implified Impli	Marker 1 621.57 MHz		'		Radio Std: None
Log Image: Constraint of the second seco				Avg Hold: 200/200	Radio Device: BTS
13.9 13.9 14.4798 MHz 14.4798 MHz 14.4798 MHz 14.4798 MHz 14.23 dBm		dBm			
23.9	-				
33.9			and an	manun	
43.9	-23.9				
-539	-33.9				
-63.9 -63.9	-43.9			<u>_</u>	
-63.9 -63.9	-53.9	manum		burk	man man man
-73.9 -73.9 - <	www.www.ww				and the second second
-83.9 -83.9 -83.9 -83.9 -10.0					
-33.9 Image: Constraint of the second seco	-73.9				
Center 619.5 MHz Span 10 MHz #Res BW 51 kHz #VBW 160 kHz Sweep 4.733 m Occupied Bandwidth Total Power -1.23 dBm 4.4798 MHz Transmit Freq Error 6.901 kHz OBW Power 99.00 %	-83.9				
#Res BW 51 kHz #VBW 160 kHz Sweep 4.733 m Occupied Bandwidth Total Power -1.23 dBm 4.4798 MHz -1.23 mm -1.23 mm Transmit Freq Error 6.901 kHz OBW Power 99.00 %	-93.9				
#Res BW 51 kHz #VBW 160 kHz Sweep 4.733 m Occupied Bandwidth Total Power -1.23 dBm 4.4798 MHz -1.23 mm -1.23 mm Transmit Freq Error 6.901 kHz OBW Power 99.00 %					
4.4798 MHz Transmit Freq Error 6.901 kHz OBW Power 99.00 %			#VBW 160 k	(Hz	Span 10 MHz Sweep 4.733 ms
Transmit Freq Error 6.901 kHz OBW Power 99.00 %	Occupied Bandw	/idth	Total Power	-1.23 dBm	
		4.4798 MHz			
x dB Bandwidth 4.815 MHz x dB -26.00 dB	Transmit Freq Erro	r 6.901 kHz	OBW Power	99.00 %	
	x dB Bandwidth	4 815 MHz	x dB	-26 00 dB	
			~ ==	u	
MSG STATUS	MSG			STATUS	



2.2.6.2 Middle Channel: 634.5MHz

2.2.6.2.1 Worst Case – Port 1B

		Result (MHz)		
Modulation	Carrier Bandwidth	Channel Bandwidth		
		Occupied Bandwidth	-26 dB Bandwidth	
QPSK	5.0 MHz	4.5	4.8	

Bandwidth 5.0MHz - Modulation: QPSK - Channel Middle: 634.5MHz

gilent Spectrum Analyzer - Occupied RL 50 Ω	AC	SENSE:INT	ALIGNAUTO	12:06:24 PM May 27,
rker 1 632.56 MHz		Center Freq: 634.5000	00 MHz	Radio Std: None
Input	t: RF #IFGain:Low	▶ Trig: Free Run #Atten: 18 dB	Avg Hold: 200/200	Radio Device: BTS
IB/div Ref -4.2 dBm				
2				
		uman and a second s	man	
			\\\\\\	
	not		- how	
mannener				
nter 634.5 MHz es BW 51 kHz		#VBW 160 k	Hz	Span 10 N Sweep 4.733
Occupied Bandwidth	า	Total Power	-1.22 dBm	
4.4	4864 MHz			
ransmit Freq Error	1.741 kHz	OBW Power	99.00 %	
dB Bandwidth	4.840 MHz	x dB	-26.00 dB	
			STATUS	



2.2.6.1 Top Channel – 649.5MHz

2.2.6.1.1 Worst Case - Port 1A

		Result (MHz)			
Modulation	Carrier Bandwidth	Channel Bandwidth			
		Occupied Bandwidth	-26 dB Bandwidth		
QPSK	5.0 MHz	4.5	4.8		

Bandwidth 5.0MHz – Modulation: QPSK – Channel Top: 649.5MHz

Agilent Spectrum Analyzer - Occupied				
RL 50Ω	AC	SENSE:INT Center Freg: 649.5000		12:44:20 PM May 27, 20 Radio Std: None
Marker 1 647.48 MHz	• DC		Avg Hold: 200/200	Radio Std: Norie
inpu	#IFGain:Low	#Atten: 18 dB		Radio Device: BTS
0 dB/div Ref -3.76 dBm	<u> </u>			
.og 13.8				
23.8				
33.8				
43.8				
53.8	- mark		have been and the second	
- manufactor and a second				all and the second and and a second and as second and a
3.8				
73.8				
33.8				
93.8				
enter 649.5 MHz Res BW 51 kHz		#VBW 160 k	U-7	Span 10 MH Sweep 4.733 n
		#VBVV 100K	Π2	Sweep 4.755 II
Occupied Bandwidth	า	Total Power	-1.09 dBm	
4.4	4839 MHz			
Transmit Freq Error	-3036 Hz	OBW Power	99.00 %	
x dB Bandwidth	4.796 MHz	x dB	-26.00 dB	
5G			STATUS	



2.3 BAND EDGE

2.3.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1051 FCC CFR 47 Part 27, Clause §27.53 (g)

2.3.2 Date of Test and Modification State

14 July 2021 - Modification State 0 05 November 2021 – Modification State 0

2.3.3 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.4 Environmental Conditions

Ambient Temperature24.1°CRelative Humidity25.4%

2.3.5 Test Method

All measurements were made in accordance with FCC KDB 971168 D01, clause 6. The EUT was connected to a Spectrum Analyser via an attenuator and switching box. The pathloss between the EUT and the Spectrum Analyser was measured using a Network Analyser. The measured path loss was entered as a Reference Level Offset in the Spectrum Analyser. The Spectrum Analyser RBW was adjusted to be at least 1% of the measured 26dB Bandwidth. Using an RMS detector, the frequency spectrum up to 1MHz away from the Band Edge was Investigated.

The Spectrum Analyser RBW was adjusted to be at least 1% of the measured 26dB Bandwidth. Using an RMS detector, the frequency spectrum up to 1MHz from the band edge was investigated. The worst-case path loss in the measured ranges was entered as a reference level offset. Over the measured ranges, the RBW was set to 10kHz, however the band power function of the SA was used with an integration of 50kHz bandwidth. All measurement results are specified as average with an RMS detector being used in conjunction with a trace setting of Max Hold or clear write if representative. Measurements were performed in configurations of the EUT as reported below.

The EUT has four transmit ports, testing was performed in all ports with a test limit of:

 $43+10x\log_{10}(P) +10xLog_{10}(4) = -19 \text{ dBm}$



2.3.6 Test Results

Maximum Output Power for Bottom– Middle– and Top– channels is 29dBm. The worstcase scenario of all channels is provided below.

2.3.6.1 Bottom/Top Channel - 619.5 MHz

2.3.6.1.1 Worst Case – Port 2B

Maximum	Target	output	Power [.]	30dBm
maximum	rarget	output	I OWCI.	JUUDIN

	Carrier	Ba	and Edge (MHz))	Band	Power
Modulation	Bandwidth	Channel Position:	Lower Band	Upper Band	100kHz	100kHz
LTE	5.0 MHz	Bottom	617	600	-20.54	-19.74
LIC	5.0 MHZ	Тор	017	622	-21.15	-19.90

<u>Modulation QPSK - Carrier Bandwidth 5.0 MHz – Bottom – Channel Position: 619.5 MHz</u> (Band Power 100kHz)

			alyzer - Swep	t SA											
Marker		50 Ω 16.	9500000	Input: RF	AC PNO: Far ↔ Gain:High		g: F	ree F :0dE		AI	ALIGNAUTO 04:55:11 PM/Nov 05, 2021 Avg Type: Pwr(RMS) Trace 1 2 3 4 5 6 Type Wrowwww Det A NNNN Mkr1 616.950 MHz Band Power -20.54 dBm -19.02 dBm -19.02 dBm -19.02 dBm Span 2.000 MHz #Sweep 5.00 s (1001 pts)				
10 dB/div												Ва	N Nd F	/lkr1 6′ Power	16.950 MH -20.54 dBr
-0.58															
-10.6		_						⊼ 1₿	2		/				-19.02 dB
-30.6	-~-						•	YY		-					
-50.6								_							
-60.6 -70.6															
-80.6															
Center #Res Bi					#VE	3W							#Sw	Sp eep 5.0	an 2.000 MH 0 s (1001 pt
MKR MODE 1 N 2 N 3 4	1	SCL f f		× 616.950 MHz 616.985 MHz		dBm dBm	Ba	FUNC and F and F	, ome	r 1			FU	NCTION VALU	-20.54 dBn -19.74 dBn
5 6 7 8															
9 10 11 12															



Modulation QPSK - Carrier Bandwidth 5.0 MHz – Top – Channel Position: 619.5 MHz (Band Power 100kHz)

				+	Balla i ellei								
🛙 Agilen	nt Sp	ectru	im A	nalyzer - Swept SA									
RL			iΟ Ω		AC SENSE	INT			AL	.IGN AUTO		02	:49:28 PM Nov 05,
Band	Sp	an	1			ig: Free Atten: 0 d				Avg Ty	pe: Pwr(RMS)		TRACE 1 2 3 4 TYPE WWWW DET A N N I
0 dB/c	div			0ffset 29.42 dB 9.42 dBm									2.015 0 M -19.90 dE
.69 0.58		hartown	~										
							l,						
10.6 —							λ.						-19.02
20.6									jt⁼				
80.6 —								¥¥	-				
40.6 —									-				
50.6													
50.6													
70.6													
30.6 —									t				
tart 6 Res I					#VBW						#\$	Stop Sweep 5.0) 624.000 M)0 s (1001 p
ikr Mol				×	Y			Fl		TION WIDTH		FUNCTION VAL	
1 N 2 N			f f	622.050 0 MHz 622.015 0 MHz	-31.49 dBm -30.40 dBm			\vdash		00.0 kHz 00.0 kHz			-21.15 d -19.90 d
3				022.015 0 MIHZ	-50.40 üBili	Danu	Fower						-19.90 ui
4 5			_					-					
6													
7			-					\vdash					
9													
10													
11 12			-					\vdash					



2.3.6.2 Bottom/Top Channel: 634.5MHz

Maximum Target output Power: 29 dBm

2.3.6.2.1 Worst Case – Port 1B

	Carrier	Ba	and Edge (MHz)		Band	Power
Modulation	Bandwidth	Channel Position:	Lower Band	Upper Band	100kHz	d Power 100kHz 20.54 -19.20
LTE	5.0 MHz	Bottom	632	637	-21.73	20.54
LIE	5.0 MHZ	Тор	032	037	-20.36	-19.20

<u>Modulation QPSK - Carrier Bandwidth 5.0 MHz – Bottom – Channel Position: 634.5MHz</u> (Band Power 100kHz)

D Ag	🖫 Agilent Spectrum Analyzer - Swept SA 📃 🗗 🔀															
l XI R			50 \$			AC	SENSE:1	INT			Al	.IGN AUTO				8 PM Nov 05, 2021
Bar	nd S	pa	n 1	00.0000	00 kHz		-					Avg Ty	pe: Pwr(RMS)	т	RACE 1 2 3 4 5 6
						PNO: Far 🕞			ree R : 0 dE							DET A N N N N N
					IF	Gain:High	#4	tten	: U ac							
			Ref	Offset 29.4	2 dB								_			.985 MHz
	B/div Ref 9.42 dBm												Ban	d Po	ver -2	0.54 dBm
Log -0.58																
												1		-		
-10.6																-19.02 dBm
-20.6								-	1	-	\checkmark					-19.02 dBm
-30.6									Q 7	-						
		~		-		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			1							
-40.6																
-50.6																
-60.6																
-70.6																
-80.6																
Con	tor	633	00	0 MHz	^										Enan	2.000 MHz
#Re						#VB	w						;	#Swee		s (1001 pts)
NPD.	MODE	тос	eci		×	V			FUNCT	ION	ELINIC	TION WIDTH			ON VALUE	(, , ,
1	N	1	f		631.950 MHz	-31.71	dBm	B	and F			00.0 kHz		TONCH		-21.73 dBm
2	Ň	1	f		631.985 MHz	-30.51			and F			00.0 kHz				-20.54 dBm
3											_					
4																
6																
7																
8																
10																
11																
12																



Modulation QPSK - Carrier Bandwidth 5.0 MHz – Top – Channel Position: 634.5MHz (Band Power 100kHz)

			7.			100Ki 12 <u>)</u>							
🎾 Agilent Sp	ectrum /	Analyzer - Swept S	5A										- 7 🛛
(XIRL	50 Ω			AC	BENSE:IN	Т	ALI	GN AUTO					
Marker 1	637	.05000000 Ing	out: RF F	PNO: Far ↔ Gain:High		: Free Run en: 0 dB		Avg T _i	ype: Pw	03:44:09 PMN00 05, 202 Pwr(RMS) TRACE [1 2 3 4 5. TYPE [1 2 3 4.			
10 dB/div		Offset 29.42 dE 9.42 dBm	3						Ban	Mkr2 d Pov	637.0′ ver -19	15 0 MHz 9.20 dBm	
Log -0.58		n non man de		-									
						•		- 1					
-10.6													40.00 JP-
-20.6									╲╢┟	d 1=			-19.02 dBm
-30.6										8			
										11-			. Aughter and the second second
-40.6													
-50.6													
-60.6													
-70.6													
-80.6													
Start 634	500 0											Stop 63	8 000 MHz
#Res BW				#VB	w					i			
MKR MODE T	RC SCL	×		Y		FUNCTION	FUNCTI	ON WIDTH			FUNCTI	DN VALUE	
	1 f		.050 0 MHz	-30.28		Band Power		10.0 kHz					-20.36 dBm
	1 f	637	.015 0 MHz	-29.08	dBm	Band Power	10	10.0 kHz					-19.20 dBm
3													
5													
6													
7 8													
9													
10													
11													
12							1						



2.3.6.1 Bottom/Top Channel: 649.5MHz

Maximum Target output Power: 29 dBm

2.3.6.1.1 Worst Case – Port 1A

ſ		Carrier	Ba	and Edge (MHz)		Band	1 Power 100kHz -19.89
	Modulation	Bandwidth	Channel Position:	Lower Band	Upper Band	100kHz	100kHz
ĺ		5.0 MHz	Bottom	647	652	-21.15	-19.89
	LTE	5.0 MHZ	Тор	647	652	-29.49	-21.11

<u>Modulation QPSK - Carrier Bandwidth 5.0 MHz – Bottom – Channel Position: 649.5MHz</u> (Band Power 100kHz)

	🔎 Agilent Spectrum Analyzer - Swept SA 📃 🗃 🔀														
-	RL		50 9		AC	SENSE:I	NT				ALIG	NAUTO		04:	09:06 PM Nov 05, 2021
Ma	rkei	r 1	646	5.950000000 MHz			_		_			Avg Typ	e: Pwr(RMS)		TRACE 123456
				Input: RF	PNO: Far 🔾			reeF :0dl		1					DET A N N N N N
					IFGain:High	#At	ten	: 0 ai	-						
			Ref	Offset 29.42 dB											46.985 MHz
10 c Log	dB/di	٧	Re	<u>f 9.42 dBm</u>									Band	Power	-19.89 dBm
-0.5	· I											~~~~~~		·	
-10.	-											/			
-20.									~		\checkmark	/			-19.02 dBm
							H	6 1/	4	_					
-30.	-~-	~~~	~~~~				+1								
-40.	6														
-50.	6 –							_							
-60.	6							_							
-70.	6							_							
-80.	6												_	_	
	nter es B			0 MHz	#\/E	3W							#6		an 2.000 MHz 0 s (1001 pts)
	_	_			#VE	244			_				#3	-	
	MOD	TRC			Y			FUNC				N WIDTH		FUNCTION VALU	
1	N	1	f	646.950 M		dBm		and F				0.0 kHz			-21.15 dBm
2	Ν	1	f	646.985 M	Hz -30.10	dBm	Bá	and F	201	ver	100).0 kHz			-19.89 dBm
3															
45		-													
6		+													
7															
8															
9															
10															
11															
12		1					_								



Modulation QPSK - Carrier Bandwidth 5.0 MHz – Top – Channel Position: 649.5MHz (Band Power 100kHz)

_					<u>(Build Fe</u>	-			2				
	gilent S	Spect	rum	Analyzer - Swept SA									- 7 🛛
LXI F	۹L		50 \$	2	AC	SENSE:1	INT			ALIGN AUTO		04:13	:22 PM Nov 05, 2021
Ma	rker	1	652	2.050000000 MHz Input: RF	PNO: Far ↔ IFGain:High		ig: Free tten: 0			Avg Ty	pe: Pwr(RMS)		TRACE 1 2 3 4 5 6 TYPE WWWWWWW DET A N N N N N
10 c Log	B/div	,		Offset 29.42 dB 9.42 dBm									2.050 MHz 22.49 dBm
-0.58													
-10.6													
					1	×~-							-19.02 dBm
-20.6							~~	6					
-30.6	5 -							44					
-40.6	i								-				· ·
-50.6	i –												
-60.6	5 –												
-70.8													
-80.6													
-00.0	1												
	nter es Bl			0 MHz Hz	#VE	3W					#Si	Spa weep 5.00	n 2.000 MHz s (1001 pts)
MKR	MODE	TRC	SCL	×	Y		FUN	ICTION	FU	NCTION WIDTH		FUNCTION VALUE	1
1	NN	1	f	652.050 N		dBm		Powe		100.0 kHz			-22.49 dBm
2	N	1	Т	652.015 N	1HZ -31.1U	dBm	Band	Powe	-	100.0 kHz			-21.11 dBm
4													
5 6													
7													
7 8 9													
10													
11													



2.4 TRANSCEIVER SPURIOUS EMISSIONS

2.4.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1051 FCC CFR 47 Part 27, Clause §27.53 (g)

2.4.2 Date of Test and Modification State

27 May 2021- Modification State 0 16 August 2021- Modification State 0

2.4.3 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.4 Environmental Conditions

Ambient Temperature25.1°CRelative Humidity16.4%

2.4.5 Test Method

All measurements were made in accordance with FCC KDB 971168 D01.

All measurements were made in accordance with FCC KDB 971168 D01 Clause 6. The EUT was connected to a Spectrum Analyser via an attenuator and switching box. Prior to testing, a Network Analyser was used to calibrate the path loss between the EUT and the Spectrum Analyser. The worst-case path loss in the measured ranges was entered as a reference level offset. Over the measured ranges, the RBW was set to 1MHz with a VBW of 3MHz. All measurement results are specified as average with an RMS detector being used in conjunction with a trace setting of Max Hold. Measurements were performed in configurations of the EUT as reported below.

Testing was performed on all ports and the worst-case scenario from of $43+10x\log_{10}(P)$ +10xLog₁₀(4) = -19 dBm is presented.



2.4.6 Test Results

Range Frequency	Limit (dBm)	Result						
9kHz to 1GHz	-19	Pass						
1GHz to 5G	-19	Pass						
5G to 26GHz	-19	Pass						
26GHz to 40GHz	-19	Pass <note 1=""></note>						
Note 1. The device was scanned up to 40Ghz with no emission (peak values less than 6Bd from the limit)								

2.4.6.1.1 Worst Case – Port 2A

🗊 Agilent S	pectrun	n Analyzer - S	Swept SA										
LXI T	50					SENSE:INT		AL:	IGN AUTO			03:09:5	4 PM Aug 16, 2021
Marker	1 2.	0109659	66 MHz Input: F	RE PI	NO: Fast 🔸	. Trig: Fi #Atten:	ree Run 0 dB		#Avg Ty	pe: Pwr(Ri	AS)	T	TYPE WWWWWW DET A N N N N
10 dB/div		f Offset 30 ef 10.00 d										Mkr1 -6′	2.0 MHz 1.15 dBm
-10.0													
-20.0													-19.02 dBm
-30.0													
-40.0													
-50.0 - 1													
-60.0													
-70.0					and the second								
-80.0													
Start 9 k #Res BV		kHz			#VB	w					#Swee	Stop ep 1.00 s	500.0 MHz (1000 pts
MKR MODE	TRC SO		×		ү -61.15		FUNCTION	FUNCT	ION WIDTH		FUNC	TION VALUE	
2	1 1			2.0 MHz	-01.15	авт							
3 4													
5													
7													
8													
10													
12													

Modulation QPSK - Carrier Bandwidth 5.0 MHz – Range 9kHz to 500MHz



				MHZ				
	um Analyzer - Swep	t SA						
	50 Ω 19.61961962 I	nput: RF	▲DC PNO: Fast ↔	SENSE:INT Trig: Free Ru #Atten: 0 dB	GNAUTO #Avg Type	: Pwr(RMS)	TF	2 AM May 27, 20 RACE 1 2 3 4 5 TYPE WWWWWW DET A N N N N
	Ref Offset 50 dB Ref 30.00 dBn	n					0 Mkr1 28	19.6 MH 3.70 dB
20.0								
10.0								
0.00								
10.0								
20.0								-19.02
30.0			may here					
40.0			Turner		 			
50.0								
60.0								
Start 500.0 #Res BW 1.			#VE	3W		#Sv	Stop 1 veep 1.00 s	.0000 GI (1000 p

Modulation QPSK - Carrier Bandwidth 5.0 MHz – Range 500MHz to 1GHz: 619.5 MHz

Modulation QPSK - Carrier Bandwidth 5.0 MHz - Range 500MHz to 1GHz: 634.5

			<u>MHz</u>					
Agilent Spectrum Analyzer RL 50 Ω	- Swept SA	A Inc					11-22-20	AM May 27, 20
	34635 MHz Input: RF P IFC	ADC S NO:Fast ↔ Gain:High	ENSE:INT Trig: Free F #Atten: 0 df	Run	IGNAUTO #Avg Type:	Pwr(RMS)	TF	TYPE WWWWWW DET A N N N
Ref Offset 5 0 dB/div Ref 30.00							Mkr1 63 28	34.6 MI 3.05 dB
20.0								
0.0								
00								
D.0								-19.02
).0		<u>_</u>						
),0			<u></u>	an a	uge and a second and	<u> </u>		
0.0								
).0								
tart 500.0 MHz Res BW 1.0 MHz	1	#VB\	∾		1	#Sw	Stop 1 veep 1.00 s	i.0000 G s (1000 p



ef Offset 50 dB		ft 1		Mkr1 64 28	I9.6 M⊦ 84 dB
	+				-19.03
	hard	+			
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		- horan	 	 	·····
	Hz MHz	Hz MHz			

# Modulation QPSK - Carrier Bandwidth 5.0 MHz - Channel Position M: 649.5 MHz: Range 500MHz to 1GHz



🗩 Agi	lent S	pect	rum i	Analyzer - Swept	SA												
LXI	Т		-50 Ω			<u>≜</u> DC	SENSE:	INT		AL	IGN AUTO					3 PM Aug 1	
Mar	ker	2	1.7	329829829			-	_	_		#Avg T	ype: Pw	r(RMS)		TR	ACE 1 2	3456
				In		PNO:Fast ↔ Gain:High		ig: Free tten: 0 d								DET A N	
					IF	-Gain:High	#6	tten. o u	0								
10 dE	3/div			Offset 30 dB 10.00 dBm	1									Mk	r2 1. -48	.733 ( 3.99 c	GHz IBm
Log																	
0.00																	
-10.0																	
-20.0																-19	9.02 dBm
-30.0		/	\1														
		~	(														
-40.0		2-															
-50.0	ΗŤ										~		~	~~	0.000	$\sim$	$\sim \sim$
-60.0	har	~~	hm		~ <del>~~~</del> ~~~	~~~~			~~~~~			$-\uparrow$	~~~~				
-70.0																	
-80.0																	
00.0																	
Star	t 1.0	)0 (	GHZ												Stop	26.25	GHz
#Re:	s BV	N 1	.0 N	/IHz		#VE	SW						#Sv	veep 1	1.00 s	(1000	) pts)
MKR	annel	TRC	eri I	×	/			EUNI	CTION	EUNCT	ION WIDTH		3	JNCTION V	ALLIE		
1	N	1	f		2.618 GHz	-34.24	dBm		SHOR					SHENORY	MED'E		
2	N	1	f		1.733 GHz												
3																	
5		-															
6																	
7		_								-							
8																	
10																	
11 12																	
12																	

#### Modulation QPSK - Carrier Bandwidth 5.0 MHz - Range 1G to 26GHz



### 2.5 FREQUENCY STABILITY

#### 2.5.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1055 FCC CFR 47 Part 27, Clause <u>§27.54</u>

#### 2.5.2 Date of Test and Modification State

22 June 2021 - Modification State 0

#### 2.5.3 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

#### 2.5.4 Environmental Conditions

Ambient Temperature26.7°CRelative Humidity32.2%

#### 2.5.5 Test Method

All measurements were made in accordance with FCC KDB 971168 D01.

#### 2.5.6 Test Results

Maximum Target Output Power 30dBm

#### 2.5.6.1.1 Worst Case – Port 1A

Temperature	Voltage (AC)	Frequency Error (Hz)	Limit ppm	Error/Freq ppm	Result <note 1=""></note>			
-30°C	115	Note 1	±1	N/A	<note 1=""></note>			
-20°C	115	87.24	±1	0.13	Pass			
-10°C	115	34.21	±1	0.05	Pass			
0°C	115	31.0	±1	0.05	Pass			
+10°C	115	20.50	±1	0.03	Pass			
+20°C	115	22.7	±1	0.03	Pass			
+20°C	90	21.22	±1	0.03	Pass			
+20°C	132	13.17	±1	0.02	Pass			
+30°C	115	16.34	±1	0.03	Pass			
+40°C	115	18.30	±1	0.03	Pass			
+55°C 115 4.62 ±1 0.007 Pass								
Note 1. EUT stop the operation and no transmission was recorded: Pass The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation								



#### 2.6 FIELD STRENGTH OF SPURIOUS EMISSION- RADIATED

#### 2.6.1 Specification Reference

FCC CFR 47 Part C Clause <u>§27.55(a)(2)</u> FCC CFR 47 Part 2.1053

#### 2.6.2 Date of Test and Modification State

June 23rd, 2021 – Modification State 0 July 5th, 2021 – Modification State 0

#### 2.6.3 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

#### 2.6.4 Environmental Conditions

Ambient Temperature23.1°CRelative Humidity13.4%

#### 2.6.5 Test Method

All measurements were made in accordance with:

- 971168 D01 Power Meas License Digital Systems v03r01 Clause 5.6
- 971168 D01 Power Meas License Digital Systems v03r01 Clause 7

From Clause 5:6, the field strength of the EUT can be calculated by:

 $EIRP = P_{meas} + A_{gain} = 29dBm + 5dBi = 36dBm (or 131.23 dB\muV/m at 3m)$ 

Measurements were performed in configurations of the EUT as reported below. Testing was performed with RF on (Port TX1A) with a test limit of FCC 15 Subpart B Class B of 40 dB $\mu$ V/m, which is more restricted than -19 dBm or 76.23 dB $\mu$ V/m at 3m.

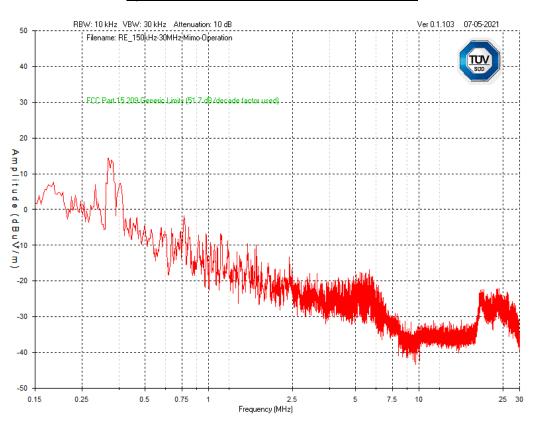


# 2.6.6 Test Results

A summary of the test result is depicted in the table below.

Range Frequency	Test Limit (dBµV/m)	Limit <note 1=""> dBµV/m</note>	Result						
9kHz to 150kHz	40.0	76.23	Pass <note 2=""></note>						
150kHz to 30MHz	40.0	76.23	Pass						
30MHz to 1GHz	33.06	76.23	Pass						
1GHz to 10GHz	53.96	76.23	Pass						
10GHz to 18GHz	53.96	76.23	Pass						
18GHz to 40GHz	53.96	76.23	Pass <note 3=""></note>						
Note 1. As per CFR 47 27.55(a)(1) Note 2. No significant emission (> 20dB margin below the limit) was recorded according to FCC 15 Subpart B. Note 3. The device was scanned up to 40Ghz with no emission (peak values less than 6Bd from the limit)									





<u>Spurious Radiation</u> Spurious Radiation Emission – 150kHz to 30MHz

Note 1. The spurious emissions comply with the limit of 76.23 dBµV/m at 3m.

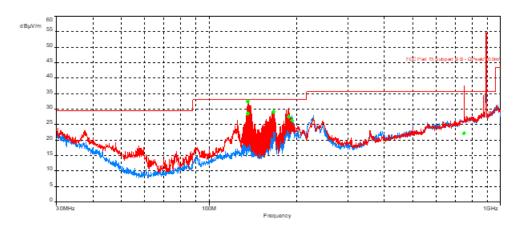
Frequency (MHz)	Detector	Raw Reading	Cable 27 - 10m LMR4 00 Factor	Loop - EM687 2 100k to 30M Factor	Pream p- LNA14 50 Factor	Level	FCC Part 15.209 Generic Limits (51.7 dB/decad e factor used) Limit	FCC Part 15.209 Generic Limits (51.7 dB/decade factor used) Margin
0.7642	PEAK	31.4	0	-2.3	-31	-1.9	93.3	95.2
1.6872	PEAK	28.5	0.1	-7.4	-31.1	-9.9	86.4	96.3
1.1427	PEAK	28.7	0.1	-4.5	-31	-6.7	89.8	96.5
1.5378	PEAK	28	0.1	-6.6	-31	-9.5	87.2	96.7



#### Spurious Radiation Emission –30MHz to 1GHz

"TÜV SÜD, by release of this raw data, does not imply that the tested product has demonstrated compliance to any standard. The raw data provided may not be complete and may require additional processing. If raw data provided includes engineering data, testing may not have been done according to a standard test method. "

Emi CC test:RE_30-1000 MHz 10	m - FCC- Class B Number:122 Execution date: 6/22/2021 1:42:24 PM					
Limit	FCC Part 15 Subpart B					
Class	Class : B					
Test Plan Number	7169009211					
Configuration Information	Mode: Operating: Band:891.5MHz (30dBm)					
Results	Pass					
Model	CBRSYS4450					
Tested by	KP and SM					
Comments	Port activated: TX1A					



Red=Vertical, Blue=Horizontal

# **Finals**

	Quasi-Peak Delector (6)												
Frequency	S	Level	Limit	Margin	Height (m)	Azimuth	Polarization	Correctio					
(MHz)	R	(dBµV/m)	(dBµV/m)	(dB)	(dB)	(°) (dB)	(dB)	n (dB)					
135.8700672	1	32.42	33.06	-0.64	1.00	117.75	Vertical	-9.37					
166.2925738	1	29.15	33.06	-3.91	1.11	175.25	Vertical	-10.68					
187.5651795	1	27.54	33.06	-5.52	1.06	119.75	Vertical	-11.92					
749.9822821	1	22.16	35.56	-13.40	1.84	220.75	Vertical	3.69					
135.8608141	2	28.49	33.06	-4.57	4.00	112.75	Horizontal	-9.37					
192.6622692	2	26.30	33.06	-6.76	3.40	127.25	Horizontal	-11.80					

uasi-Peak Detector (6)

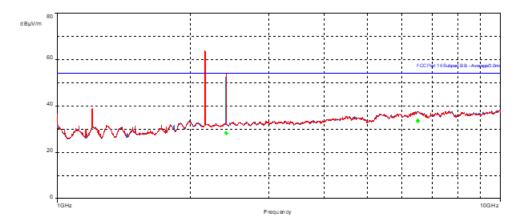
Note 1. The spurious emissions comply with the limit of 76.23  $dB\mu V/m$  at 3m. Note 2. Operating at 891.5MHz, thus emission excluded from FCC limit.

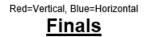


#### Spurious Radiation Emission –1GHz to 10GHz

"TÜV SÜD, by release of this raw data, does not imply that the tested product has demonstrated compliance to any standard. The raw data provided may not be complete and may require additional processing. If raw data provided includes engineering data, testing may not have been done according to a standard test method. "

Emi CC test:RE_1-10 GHz 3m - MIMO- FCC Class B Number:129 Execution date: 6/22/2021 3:15:43 PM					
Limit	FCC Part 15 Subpart B				
Class	Class: B				
Test Plan Number	7169009211				
Configuration Information	Mode: Operating				
Results	Pass				
Model	CBRSYS4450				
Tested by	KP and SM				
Comments	Port activated: TX1A				





AVG (4)								
Frequency	SR	Level	Limit	Margin	Height (m)	Azimuth	Polarizatio	Correction
(MHz)		(dBµV/m)	(dBµV/m)	(dB)	(dB)	(°) (dB)	n (dB)	(dB)
2405.726603	1	28.27	53.96	-25.69	3.69	9.50	Vertical	-5.79
6492.401603	1	33.47	53.96	-20.49	2.08	343.00	Vertical	1.37
2403.416346	2	28.38	53.96	-25.58	1.00	356.75	Horizontal	-5.81
6513.693269	2	33.56	53.96	-20.40	2.42	2.25	Horizontal	1.35

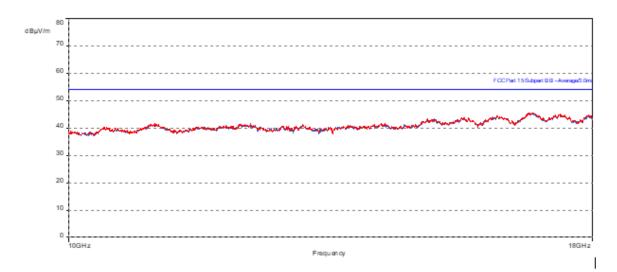
Note 1. The spurious emissions comply with the limit of 76.23  $dB\mu V/m$  at 3m. Note 2. Operating at 891.5MHz, thus emission excluded from FCC limit.



### Spurious Radiation Emission -10GHz to 18GHz

"TÜV SÜD, by release of this raw data, does not imply that the tested product has demonstrated compliance to any standard. The raw data provided may not be complete and may require additional processing. If raw data provided includes engineering data, testing may not have been done according to a standard test method. "

Emi CC test:RE_10-18 GHz 3m - MIMO - FCC Class B Number:135 Execution date: 6/23/2021 8:42:04 AM					
Limit FCC Part 15 Subpart B					
Class Class: B					
Test Plan Number	7169009211				
Configuration Information	Operation: Band:891.5MHz (30dBm)				
Results	Pass				
Model	CBRSYS4450				
Tested by	KP and SM				
Comments	Port activated: TX1A				



Red=Vertical, Blue=Horizontal

# <u>Finals</u>

AVG Detector (4)								
Frequency	S	Level	Limit	Margin	Height (m)	Azimuth	Polarizatio	Correction
(MHz)	R	(dBµV/m)	(dBµV/m)	(dB)	(dB)	(°) (dB)	n (dB)	(dB)
16750.52277	2	41.61	53.96	-12.35	1.00	10.50	Horizontal	14.25
16753.59519	1	41.97	53.96	-11.99	4.00	271.50	Vertical	14.29
17898.35513	2	41.39	53.96	-12.57	3.86	16.75	Horizontal	14.87
17916.38559	1	41.10	53.96	-12.86	1.00	0.00	Vertical	14.82

Note 1. The spurious emissions comply with the limit of 76.23 dB $\mu$ V/m at 3m.

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# **SECTION 3: TEST EQUIPMENT USED**

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# 3.1 TEST EQUIPMENT USED

Instrument	Manufacturer	Type No.	Serial No.	Calibration Period (months)	Calibration Due	
Bilog Antenna	TESEQ	CBL 6111D	SSG013965	2021-05-04	2022-05-04	
Horn Antenna 3MCH 00003	ETS	3117	LAVE04211	2021-03-30	2022-03-30	
EMI Receiver	Rohde & Schwarz	ESU26	SSG013729	2021-03-31	2022-03-31	
EMI Receiver	Rohde & Schwarz	ESU40	SSG013672	2020-10-29	2021-10-29	
Coaxial Cable	Huber & Suhner	106A	SSG012455	2021-01-05	2022-01-05	
Coaxial Cable	Huber & Suhner	106A	SSG012711	2021-01-05	2022-01-05	
Coaxial Cable	Huber & Suhner	104PEA	SSG012041	2021-01-05	2022-01-05	
Coaxial Cable	Huber & Suhner	ST18/Nm/Nm/36	SSG012785	2021-01-06	2022-01-06	
Coaxial Cable	Micro-Coax	UFA 210B-1- 1500-504504	SSG012376	2021-01-06	2022-01-06	
Pre-Amplifier	Нр	8447D	LAVE04346	2020-09-10	2021-09-10	
Pre-Amplifier	BNR	LNA	SSG012360	2020-11-16	2021-11-16	
Power Supply	Power Supply Hewlett Packard		SSG013063	not required	not required	
N/A: No applicable O/P Mon – Output monitored with Calibrated Equipment						

List of absolute measurements and other principal items of test equipment.



# 3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:

Test Discipline	Frequency / Parameter	MU
Conducted Maximum Peak Output Power	30 MHz to 20 GHz Amplitude	± 0.1 dB
Conducted Emissions	30 MHz to 20 GHz Amplitude	± 2.3 dB
Frequency Stability	30 MHz to 2 GHz	± 5.0 Hz
Occupied Bandwidth	Up to 20 MHz Bandwidth	± 1.1 Hz
Band Edge	30 MHz to 20 GHz Amplitude	± 2.3 dB

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**SECTION 5** 

# ACCREDITATION, DISCLAIMERS AND COPYRIGHT



## 4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



Testing Laboratory Certificate #2955.19

This report relates only to the actual item/items tested.

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This report relates only to the actual item/items tested.

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