

TEST REPORT

Reference No...... : WTD21D11119033X1W001
FCC ID : 2AG328015GM11HPEUD
Applicant..... : Baicells Technologies Co., Ltd.
Address..... : 9-10F, 1st Bldg., No.81 Beiqing Road, Haidian District, Beijing, China
Manufacturer : Baicells Technologies Co., Ltd.
Address..... : 9-10F, 1st Bldg., No.81 Beiqing Road, Haidian District, Beijing, China
Product..... : LTE Outdoor CPE
Model(s) : EG8015G-M11-HP-EUD
Brand Name..... : **Baicells**
Standards..... : FCC CFR Title 47 Part 2
FCC CFR Title 47 Part 96
Date of Receipt sample : 2021-11-04
Date of Test : 2021-11-05 to 2021-11-10
Date of Issue..... : 2022-07-01
Test Result..... : **Pass**

Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

Prepared By:

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2 Contents

	Page
1 COVER PAGE.....	1
2 CONTENTS	2
3 REVISION HISTORY	4
4 GENERAL INFORMATION.....	5
4.1 GENERAL DESCRIPTION OF E.U.T.	5
4.2 DETAILS OF E.U.T.	5
4.3 CHANNEL LIST	5
4.4 TEST MODE	5
4.5 GENERAL DESCRIPTION OF APPLIED STANDARDS.....	5
4.6 TEST FACILITY	6
5 TEST SUMMARY	7
6 EQUIPMENT USED DURING TEST	8
6.1 EQUIPMENTS LIST	8
6.2 MEASUREMENT UNCERTAINTY	9
6.3 TEST EQUIPMENT CALIBRATION	9
7 MAX EIRP AND MAXIMUM SPECTRAL DENSITY	10
7.1 EUT OPERATION.....	10
7.2 TEST PROCEDURE	10
7.3 TEST RESULT	11
8 PEAK-TO-AVERAGE POWER RADIO	23
8.1 EUT OPERATION.....	23
8.2 TEST PROCEDURE	23
8.3 TEST RESULT	23
9 OCCUPY BANDWIDTH.....	31
9.1 EUT OPERATION.....	31
9.2 TEST PROCEDURE	31
9.3 TEST RESULT	32
10 EMISSION OUTSIDE THE FUNDAMENTAL	40
10.1 EUT OPERATION.....	40
10.2 TEST PROCEDURE.....	40
10.3 TEST RESULT	41
11 OUT OF BAND EMISSION AT ANTENNA TERMINALS.....	44
11.1 EUT OPERATION.....	44
11.2 TEST PROCEDURE.....	44
11.3 TEST RESULT	44
12 FIELD STRENGTH OF SPURIOUS RADIATION MEASUREMENT	50
12.1 EUT OPERATION.....	50
12.2 TEST SETUP	50
12.3 SPECTRUM ANALYZER SETUP	51
12.4 TEST PROCEDURE.....	52
12.5 TEST RESULT	53
13 FREQUENCY STABILITY V.S. TEMPERATURE MEASUREMENT.....	54
13.1 EUT OPERATION.....	54
13.2 TEST PROCEDURE.....	54
13.3 TEST RESULT	56

14 FREQUENCY STABILITY V.S. VOLTAGE MEASUREMENT..... 59

 14.1 EUT OPERATION..... 59

 14.2 TEST PROCEDURE..... 59

 14.3 TEST RESULT 61

15 PHOTOGRAPHS OF TEST SETUP AND EUT..... 63

3 Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTD21D11119 033X1W001	2021-11-04	2021-11-05 to 2021-11-10	2022-07-01	original	-	Valid

4 General Information

4.1 General Description of E.U.T.

Product:	LTE Outdoor CPE
Model(s):	EG8015G-M11-HP-EUD
Model Description:	N/A
Storage Location:	Internal Storage
Device type:	End User Device

4.2 Details of E.U.T.

Operation Frequency:	LTE Band 48:3550MHz-3700MHz
Type of Modulation:	LTE: Uplink: QPSK, 16QAM, 64QAM;Downlink: QPSK, 16QAM, 64QAM
Antenna installation:	LTE: Internal antenna
Antenna Gain:	18dBi
Ratings:	DC 24V 0.5A

4.3 Channel List

Normal

10MHz		15MHz	
Channel	Frequency (MHz)	Channel	Frequency (MHz)
Low	3555	Low	3557.5
Middle	3625	Middle	3625
High	3695	High	3692.5
20MHz			
Channel	Frequency (MHz)		
Low	3560		
Middle	3625		
High	3690		

4.4 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

Test Mode	Description
Data Mode (QPSK)	Keep the EUT in data communicating mode (QPSK). (10MHz, 15MHz, 20MHz)
Data Mode (64QAM)	Keep the EUT in data communicating mode (64QAM). (10MHz, 15MHz, 20MHz)

4.5 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

47 CFR FCC Part 96
 KDB 971168 D01 Power Meas License Digital Systems v03r01
 KDB 662911 D01 Multiple Transmitter Output v02r01
 KDB 940660 D01 Part 96 CBRS Eqpt v03
 ANSI/TIA/EIA-603-E 2016
 ANSI C63.26-2015

4.6 Test Facility

The test facility has a test site registered with the following organizations:

ISED CAB identifier: CN0013. Test Firm Registration No.: 7760A.

Waltek Testing Group Co., Ltd. Has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files. Registration number 7760A, October 15, 2016.

FCC Designation No.: CN1201. Test Firm Registration No.: 523476.

Waltek Testing Group Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration number 523476, September 10, 2019.

5 Test Summary

Test Items	Available Channel (MHz)	Tested Channel (MHz)	Channel Bandwidth	Modulation
EIRP	3555 to 3695	3555 to 3695	10MHz	QPSK, 64QAM
	3557.5 to 3692.5	3557.5 to 3692.5	15MHz	QPSK, 64QAM
	3560 to 3690	3560 to 3690	20MHz	QPSK, 64QAM
Frequency stability	3555 to 3695	3625	10MHz	QPSK
	3557.5 to 3692.5	3625	15MHz	QPSK
	3560 to 3690	3625	20MHz	QPSK
Occupied Bandwidth	3555 to 3695	3555, 3625, 3695	10MHz	QPSK, 64QAM
	3557.5 to 3692.5	3557.5, 3625, 3692.5	15MHz	QPSK, 64QAM
	3560 to 3690	3560, 3625, 3690	20MHz	QPSK, 64QAM
Peak to Average Ratio	3555 to 3695	3555, 3625, 3695	10MHz	QPSK
	3557.5 to 3692.5	3557.5, 3625, 3692.5	15MHz	QPSK
	3560 to 3690	3560, 3625, 3690	20MHz	QPSK
Emission outside the fundamental	3555 to 3695	3555, 3625, 3695	10MHz	QPSK
	3557.5 to 3692.5	3557.5, 3625, 3692.5	15MHz	QPSK
	3560 to 3690	3560, 3625, 3690	20MHz	QPSK
Out of band emission at antenna terminals	3555 to 3695	3555, 3625, 3695	10MHz	QPSK
	3557.5 to 3692.5	3557.5, 3625, 3692.5	15MHz	QPSK
	3560 to 3690	3560, 3625, 3690	20MHz	QPSK
Field Strength of Spurious Radiation	3555 to 3695	3555, 3625, 3695	10MHz	QPSK
	3557.5 to 3692.5	3557.5, 3625, 3692.5	15MHz	QPSK
	3560 to 3690	3560, 3625, 3690	20MHz	QPSK

NOTE 1: All supported modulation types were evaluated. The Worst case of QPSK was selected. Therefore, the Frequency Stability, Peak to Average Ratio, Emission outside the fundamental, Out of band emission at antenna terminals and Field Strength of Spurious Radiation were presented under QPSK mode only.

NOTE 2: The duty cycle correction= $10 \log(1/\text{duty cycle})=10 \log(1/(1.999/5.0))=3.98(\text{dB})$

Offset factory=ATT loss+Cable loss+Duty cycle correction= $5.04+0.98+3.98=10(\text{dB})$

6 Equipment Used during Test

6.1 Equipments List

3m Semi-anechoic Chamber for Radiation Emissions Test site 1#						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	Spectrum Analyzer	R&S	FSP30	100091	2021-04-20	2022-04-19
2	Amplifier	Agilent	8447D	2944A10178	2021-04-20	2022-04-19
3	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	2021-08-22	2022-08-21
4	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	2021-04-20	2022-04-19
5	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	2021-04-25	2022-04-24
6	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	335	2021-04-20	2022-04-19
7	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	2021-04-20	2022-04-19
8	Coaxial Cable (above 1GHz)	ZT26-NJ-NJ-8M/FA	1GHz-18GHz	NA	2021-04-20	2022-04-19
3m Semi-anechoic Chamber for Radiation Emissions Test site 2#						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	Test Receiver	R&S	ESCI	101296	2021-04-20	2022-04-19
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	2021-04-25	2022-04-24
3	Active Loop Antenna	Com-Power Corp.	AL-130R	10160007	2021-05-06	2022-05-05
4	Amplifier	ANRITSU	MH648A	M43381	2021-04-20	2022-04-19
5	Cable	HUBER+SUHNER	CBL2	525178	2021-04-20	2022-04-19
RF Conducted Testing						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EMC Analyzer (9k~26.5GHz)	Agilent	E7405A	MY45114943	2021-04-20	2022-04-19
2.	Spectrum Analyzer	R&S	FSP30	100091	2021-04-20	2022-04-19
3.	EXA Signal Analyzer	Malaysia Keysight	N9010A	MY50520207	2021-04-20	2022-04-19

6.2 Measurement Uncertainty

Parameter	Uncertainty
Conducted Emission	± 3.64 dB(AC mains 150KHz~30MHz)
Radiated Spurious Emissions	± 5.08 dB (Bilog antenna 30M~1000MHz)
	± 5.47 dB (Horn antenna 1000M~25000MHz)
Radio Frequency	$\pm 1 \times 10^{-7}$ Hz
RF Power	± 0.42 dB
RF Power Density	± 0.7 dB
Conducted Spurious Emissions	± 2.76 dB (9kHz~26500MHz)
Confidence interval: 95%. Confidence factor:k=2	

6.3 Test Equipment Calibration

All the test equipments used are valid and calibrated by CEPREI Certification Body that address is No.110 Dongguan Zhuang RD. Guangzhou, P.R.China.

7 Max EIRP and maximum spectral density

Test Requirement:	FCC part96.41(b)
Test Method:	ANSI/TIA-603-E:2016, ANSI C63.26:2015
Test Mode:	Data communicating mode
Limit:	

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

7.1 EUT Operation

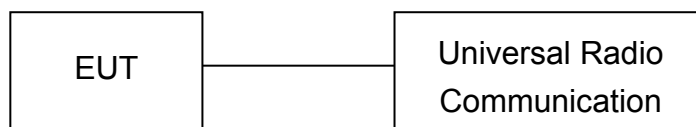
Operating Environment :

Temperature:	22.4 °C
Humidity:	52.2 % RH
Atmospheric Pressure:	101.3kPa

7.2 Test Procedure

Conducted method for 10M&15M&20M bandwidth:

The RF output of the transmitter was connected to the wireless test set and the spectrum analyzer through sufficient attenuation.



For Maximum EIRP

1. Connect the transmitter to the spectrum analyzer via coaxial cable while ensuring proper impedance matching.
 2. Set span to 2 × to 3 × the OBW.
 3. Set RBW = 1% to 5% of the OBW.
 4. Set VBW ≥ 3 × RBW.
 5. Set number of measurement points in sweep ≥ 2 × span / RBW.
 6. Sweep time:
 - 1) Set = auto-couple, or
 - 2) Set ≥ [10 × (number of points in sweep) × (transmission symbol period)] for single sweep (automation-compatible) measurement.
 7. Detector = power averaging (rms).
 8. Set sweep trigger to "free run."
 9. Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple. To accurately determine the average power over the on and off time of the transmitter, it can be necessary to increase the number of traces to be averaged above 100, or if using a manually configured sweep time, increase the sweep time.
 10. Compute power by integrating the spectrum across the OBW(10MHz) of the signal using the instrument's band or channel power measurement function with band/channel limits set equal to the OBW(10MHz) band edges.
 11. Add 10 log (1/duty cycle) to the measured power level to compute the average power during continuous transmission.
 12. EIRP = P_{Meas} + GT.
- P_{Meas} measured transmitter output power
GT gain of the transmitting antenna.

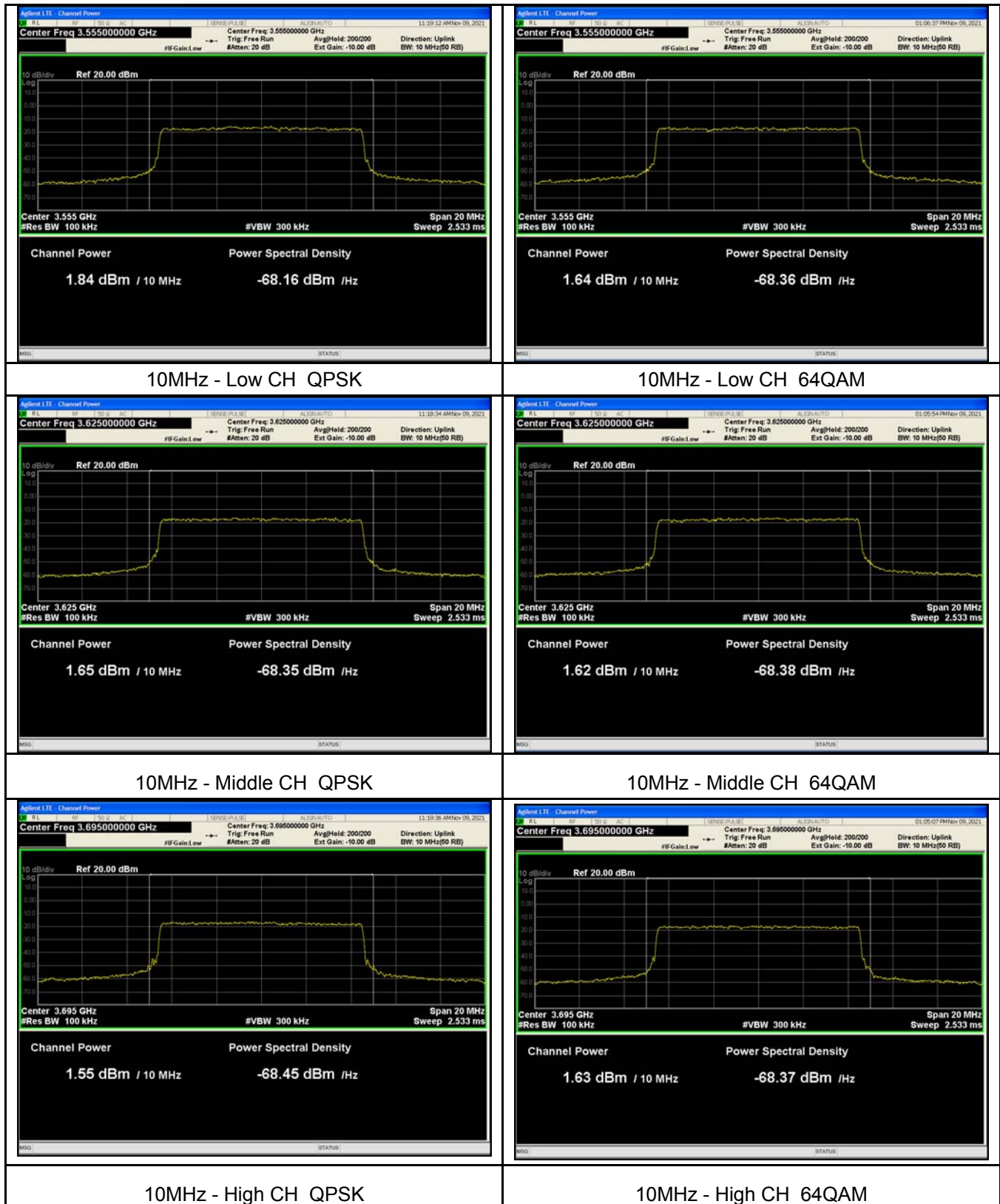
7.3 Test Result

Transmit Output Power								
Bandwidth (MHz)	Modulation	Test Channel	Chain 0 Output Power (dBm/10MHz)	Chain 1 Output Power (dBm/10MHz)	Total Power (dBm/10MHz)	Antenna Gain (dBi)	EIRP (dBm/10MHz)	EIRP Limit (dBm/10MHz)
10	QPSK	Low	1.84	1.66	4.76	18.00	22.76	23
		Middle	1.65	1.82	4.75	18.00	22.75	
		High	1.55	1.74	4.66	18.00	22.66	
	64QAM	Low	1.64	1.65	4.66	18.00	22.66	
		Middle	1.62	1.60	4.62	18.00	22.62	
		High	1.63	1.52	4.59	18.00	22.59	

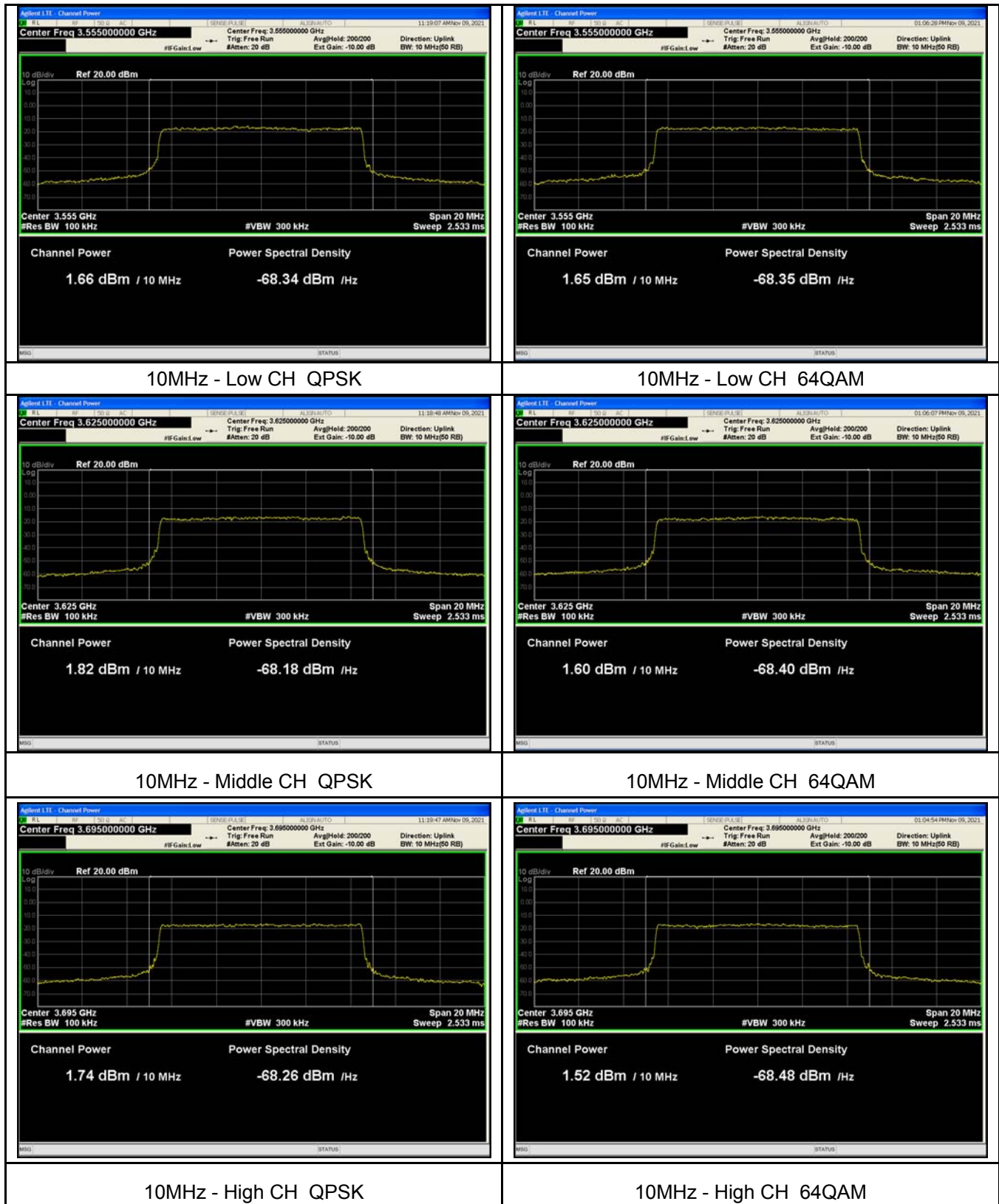
Transmit Output Power								
Bandwidth (MHz)	Modulation	Test Channel	Chain 0 Output Power (dBm/10MHz)	Chain 1 Output Power (dBm/10MHz)	Total Power (dBm/10MHz)	Antenna Gain (dBi)	EIRP (dBm/10MHz)	EIRP Limit (dBm/10MHz)
15	QPSK	Low	0.54	0.16	3.36	18.00	21.36	23
		Middle	0.18	0.54	3.37	18.00	21.37	
		High	0.67	0.09	3.40	18.00	21.40	
	64QAM	Low	0.02	0.12	3.08	18.00	21.08	
		Middle	0.89	0.35	3.64	18.00	21.64	
		High	0.48	0.53	3.52	18.00	21.52	
Full Transmit Output Power								
Bandwidth (MHz)	Modulation	Test Channel	Chain 0 Output Power (dBm/15MHz)	Chain 1 Output Power (dBm/15MHz)	Total Power (dBm/15MHz)	Antenna Gain (dBi)	EIRP (dBm/15MHz)	EIRP Limit (dBm/15MHz)
15	QPSK	Low	1.28	1.38	4.34	18.00	22.34	-
		Middle	1.74	1.62	4.69	18.00	22.69	
		High	1.59	1.63	4.62	18.00	22.62	
	64QAM	Low	1.74	1.61	4.69	18.00	22.69	
		Middle	1.83	1.86	4.86	18.00	22.86	
		High	1.60	1.35	4.49	18.00	22.49	

Transmit Output Power								
Bandwidth (MHz)	Modulation	Test Channel	Chain 0 Output Power (dBm/10MHz)	Chain 1 Output Power (dBm/10MHz)	Total Power (dBm/10MHz)	Antenna Gain (dBi)	EIRP (dBm/10MHz)	EIRP Limit (dBm/10MHz)
20	QPSK	Low	0.32	0.28	3.31	18.00	21.31	23
		Middle	0.22	0.13	3.19	18.00	21.19	
		High	0.63	0.47	3.56	18.00	21.56	
	64QAM	Low	0.77	0.74	3.77	18.00	21.77	
		Middle	0.52	0.89	3.72	18.00	21.72	
		High	0.15	0.34	3.26	18.00	21.26	
Full Transmit Output Power								
Bandwidth (MHz)	Modulation	Test Channel	Chain 0 Output Power (dBm/20MHz)	Chain 1 Output Power (dBm/20MHz)	Total Power (dBm/20MHz)	Antenna Gain (dBi)	EIRP (dBm/20MHz)	EIRP Limit (dBm/20MHz)
20	QPSK	Low	1.41	1.78	4.61	18.00	22.61	-
		Middle	1.39	1.58	4.50	18.00	22.50	
		High	1.49	1.52	4.52	18.00	22.52	
	64QAM	Low	1.70	1.61	4.67	18.00	22.67	
		Middle	1.92	1.43	4.69	18.00	22.69	
		High	1.46	1.89	4.69	18.00	22.69	

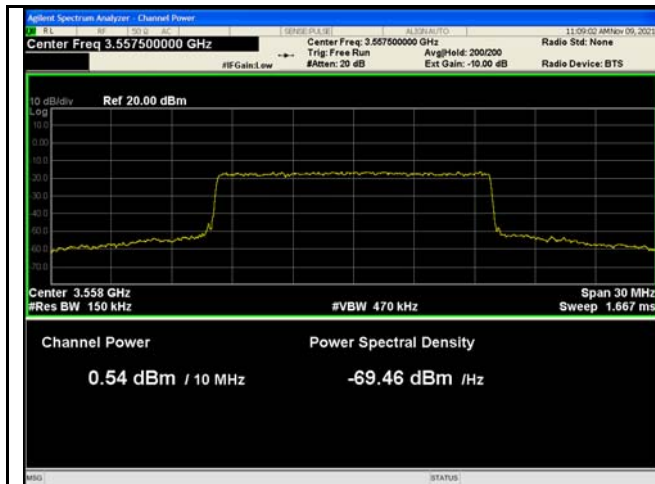
Transmit Output Power Test Plots Chain 0



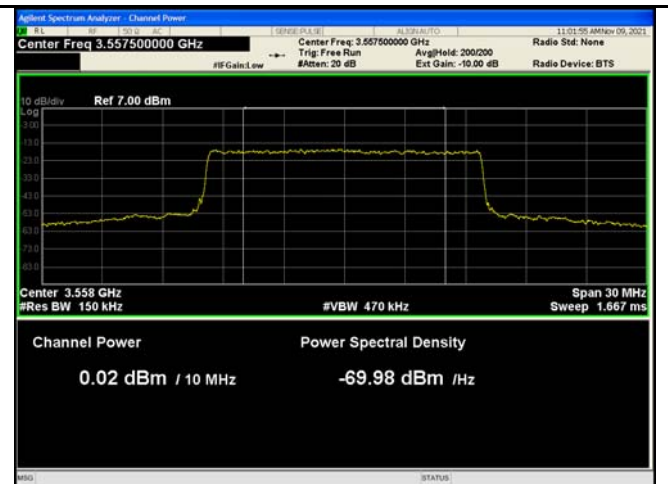
Chain 1



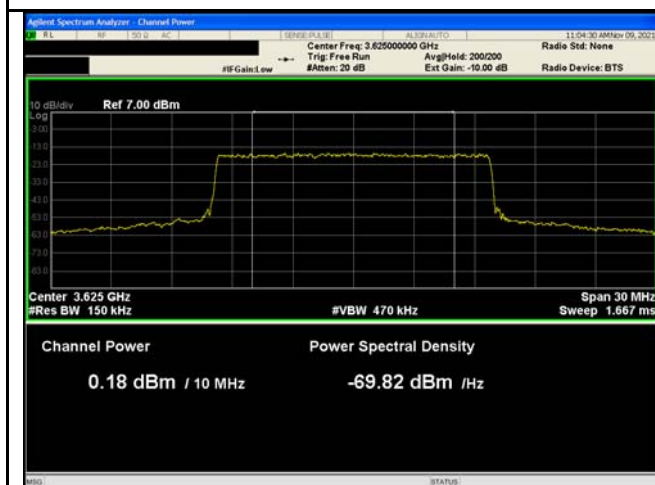
Chain 0



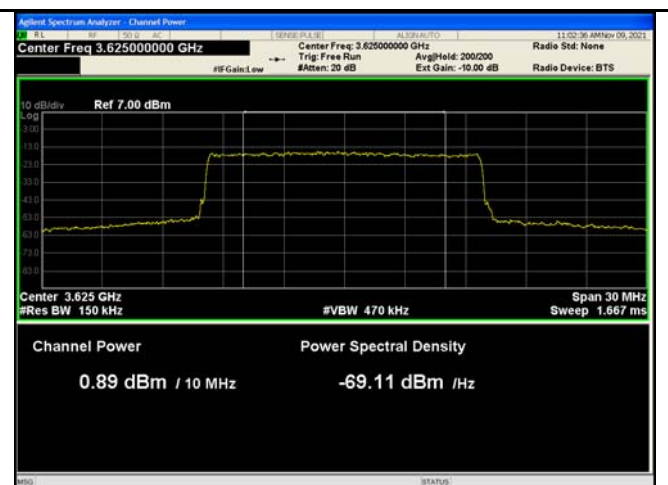
15MHz - Low CH QPSK



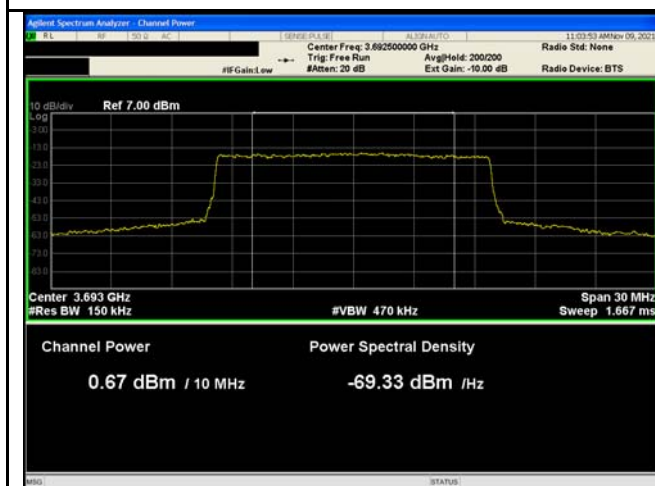
15MHz - Low CH 64QAM



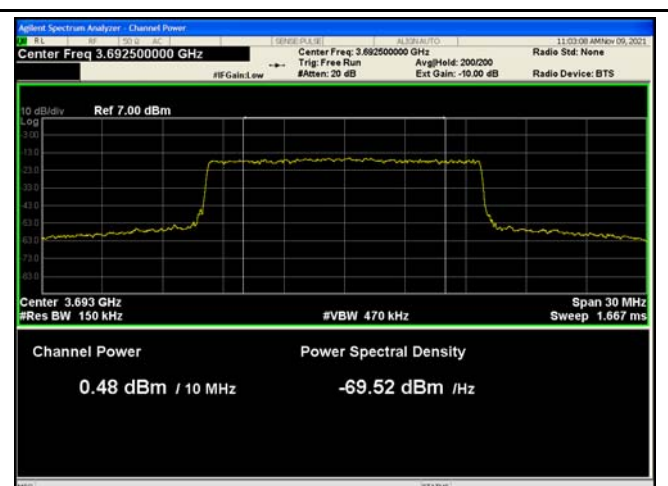
15MHz - Middle CH QPSK



15MHz - Middle CH 64QAM

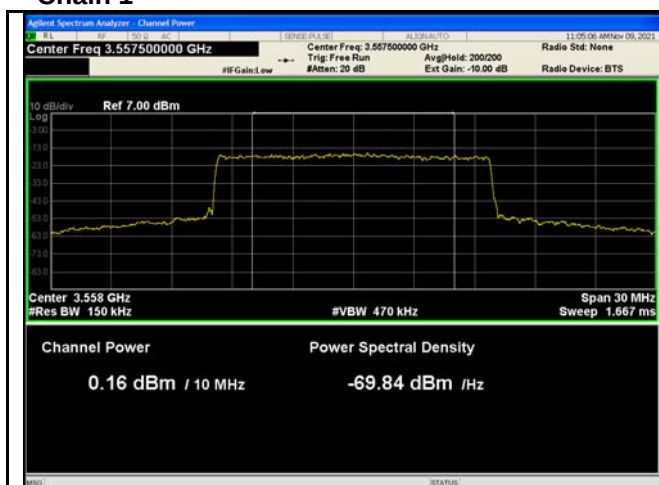


15MHz - High CH QPSK

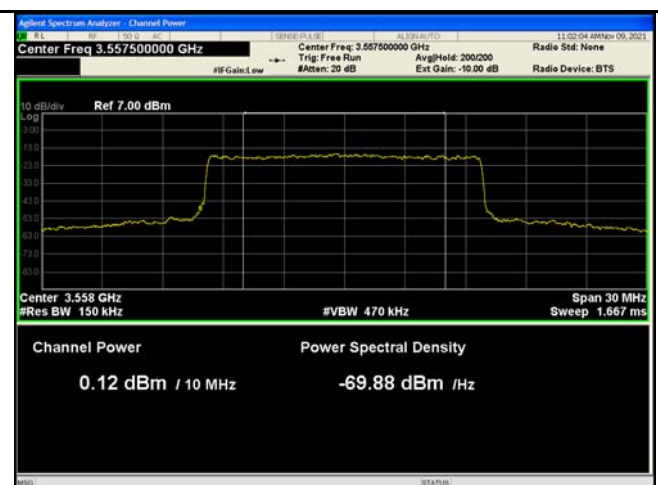


15MHz - High CH 64QAM

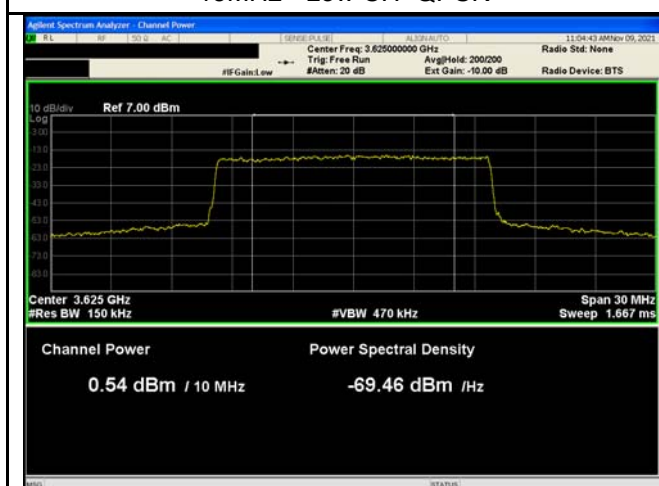
Chain 1



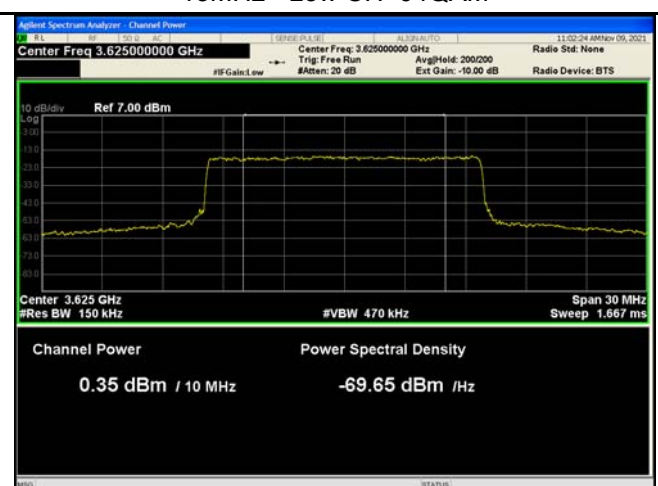
15MHz - Low CH QPSK



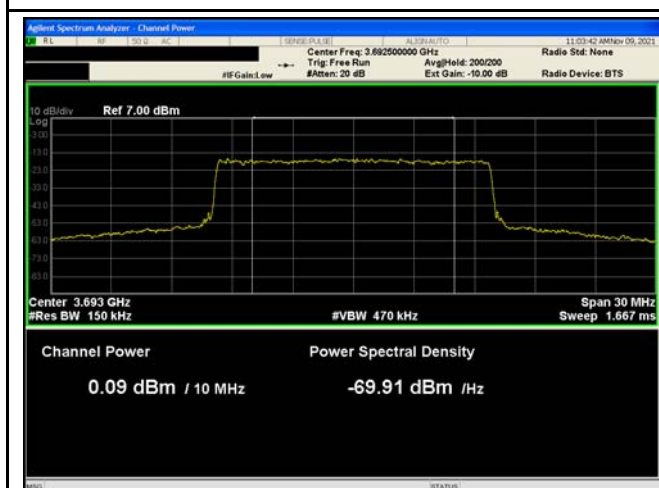
15MHz - Low CH 64QAM



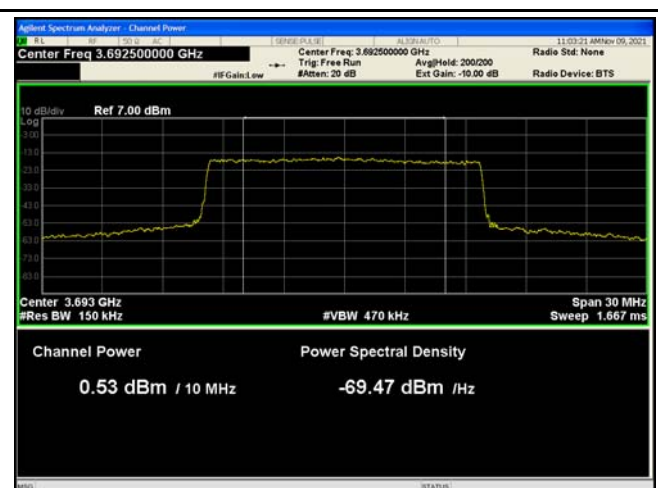
15MHz - Middle CH QPSK



15MHz - Middle CH 64QAM

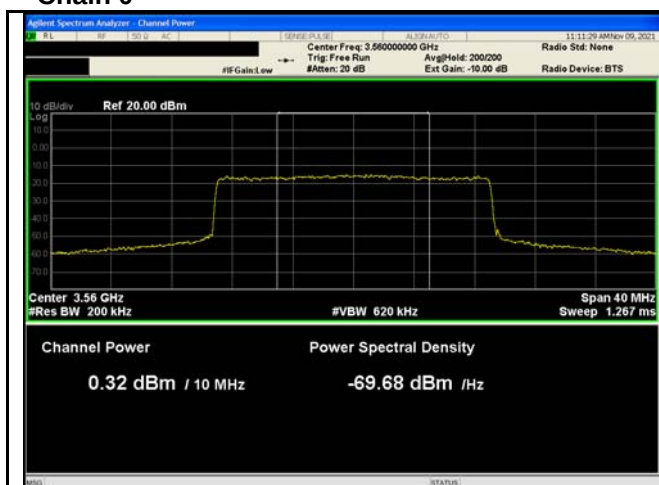


15MHz - High CH QPSK

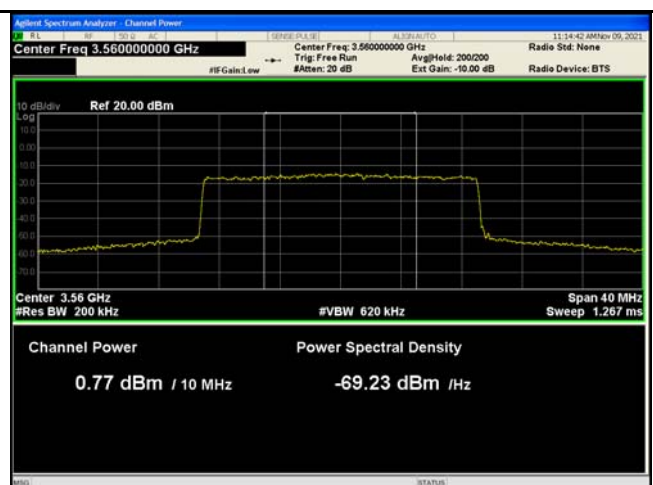


15MHz - High CH 64QAM

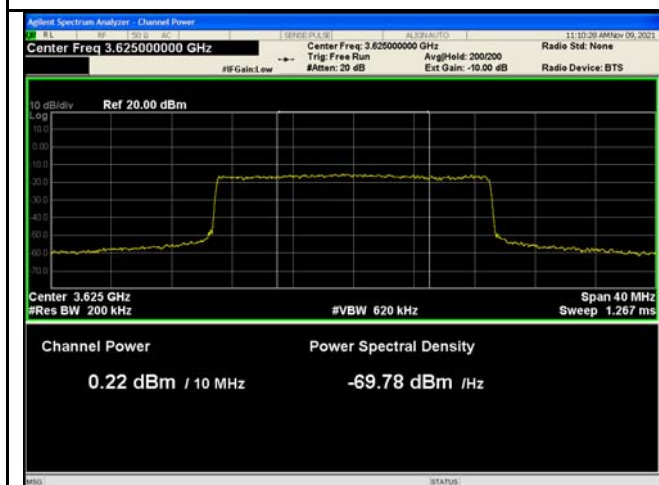
Chain 0



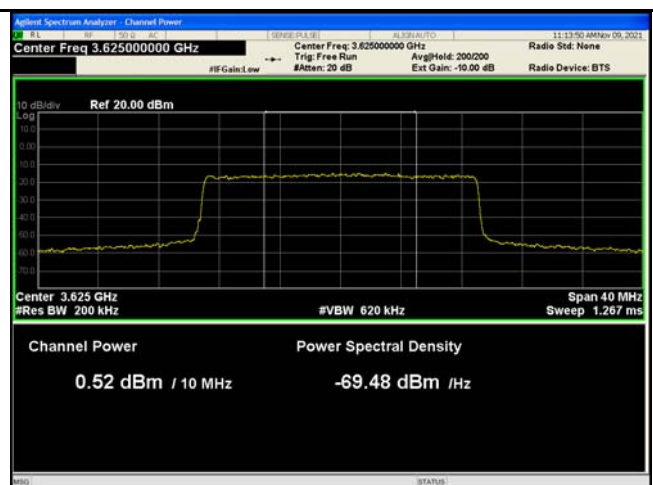
20MHz - Low CH QPSK



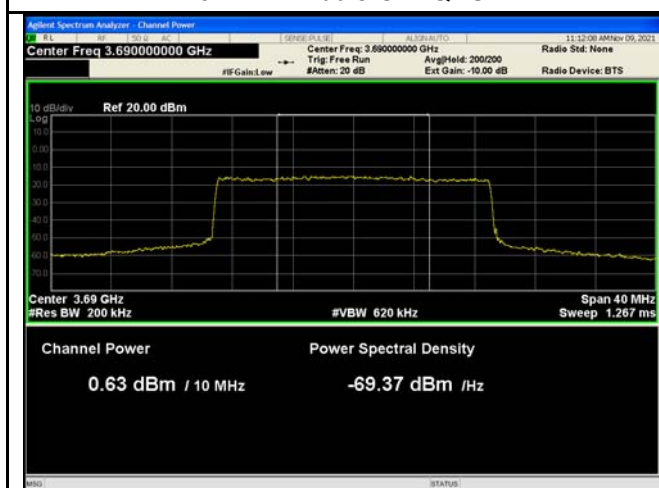
20MHz - Low CH 64QAM



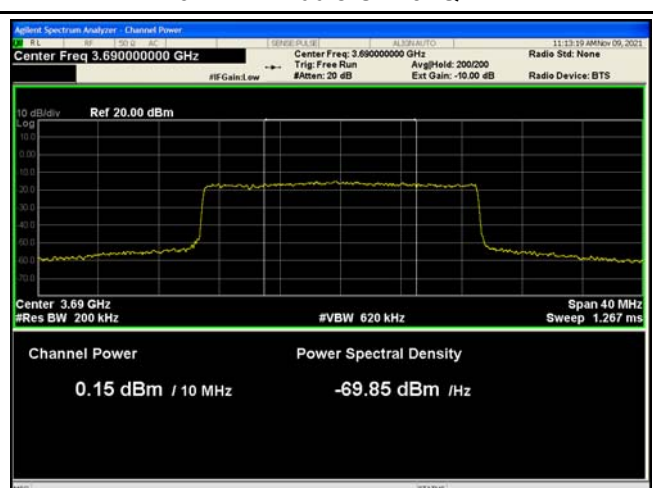
20MHz - Middle CH QPSK



20MHz - Middle CH 64QAM

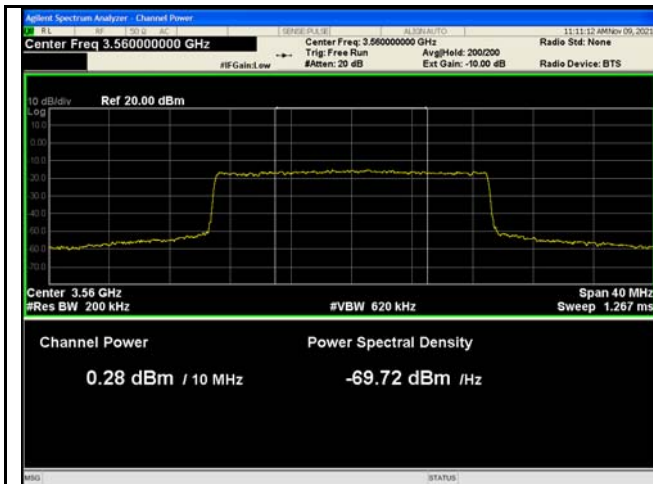


20MHz - High CH QPSK

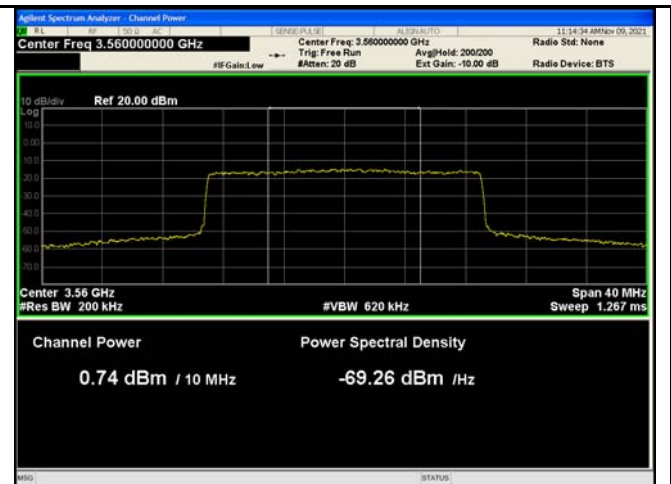


20MHz - High CH 64QAM

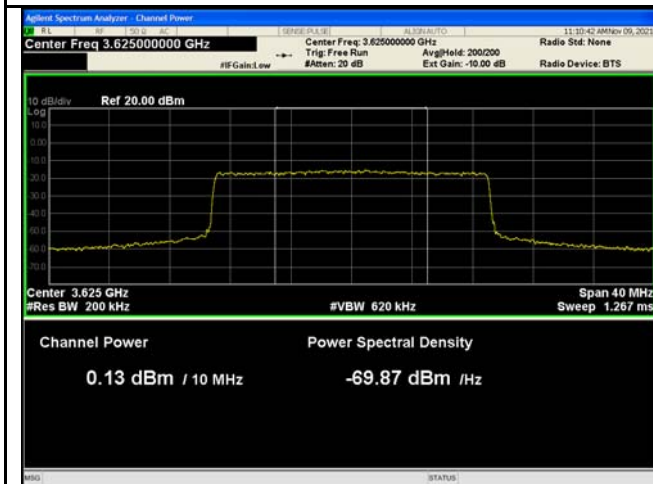
Chain 1



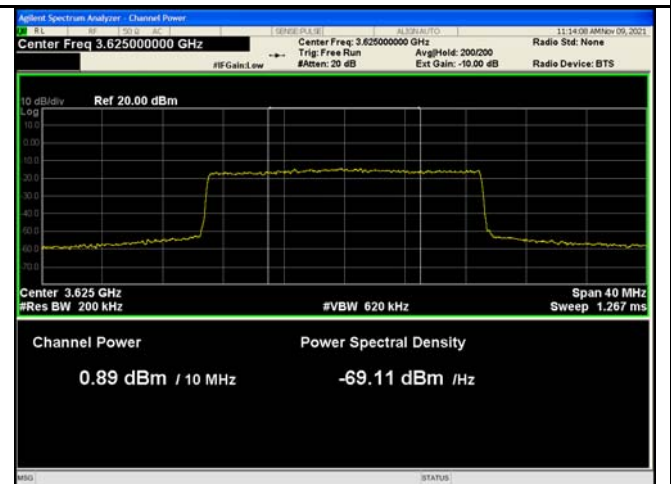
20MHz - Low CH QPSK



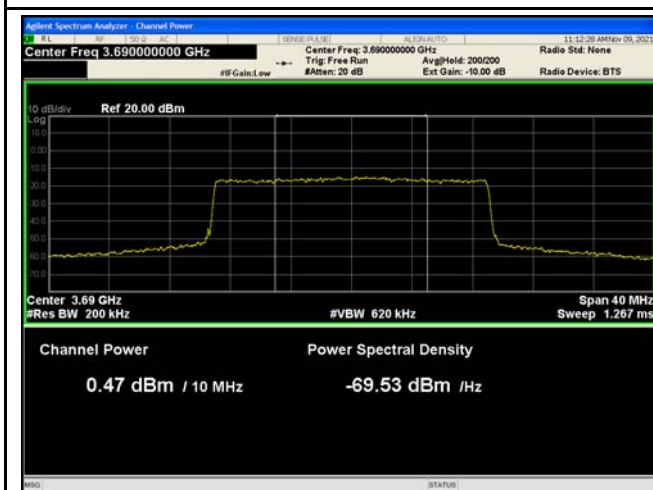
20MHz - Low CH 64QAM



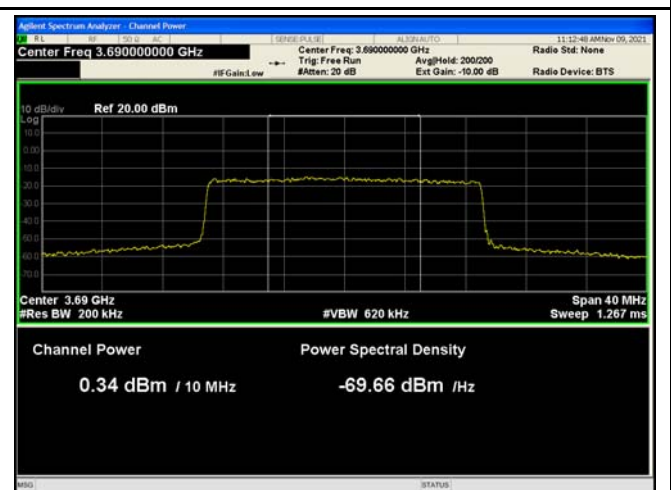
20MHz - Middle CH QPSK



20MHz - Middle CH 64QAM

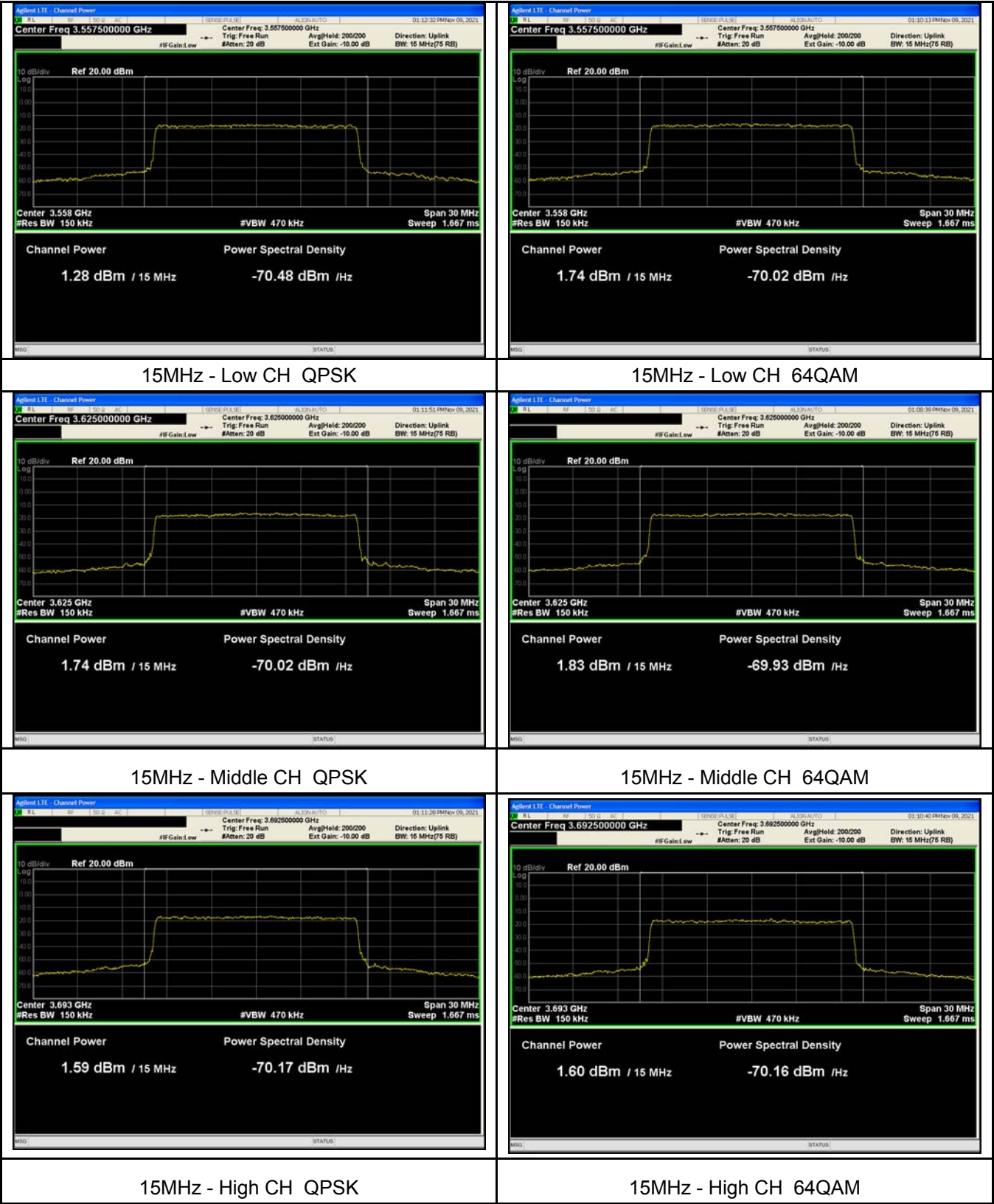


20MHz - High CH QPSK

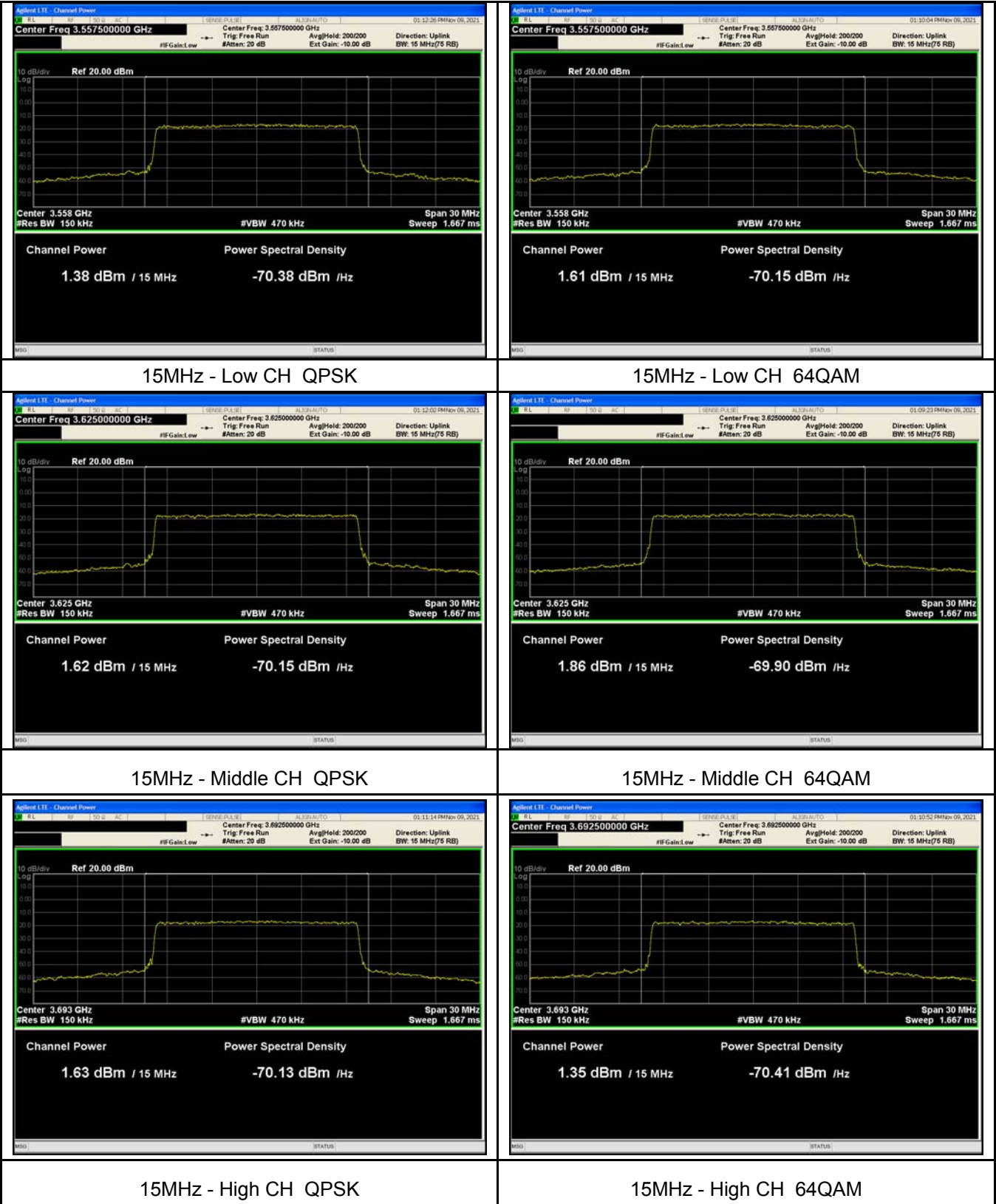


20MHz - High CH 64QAM

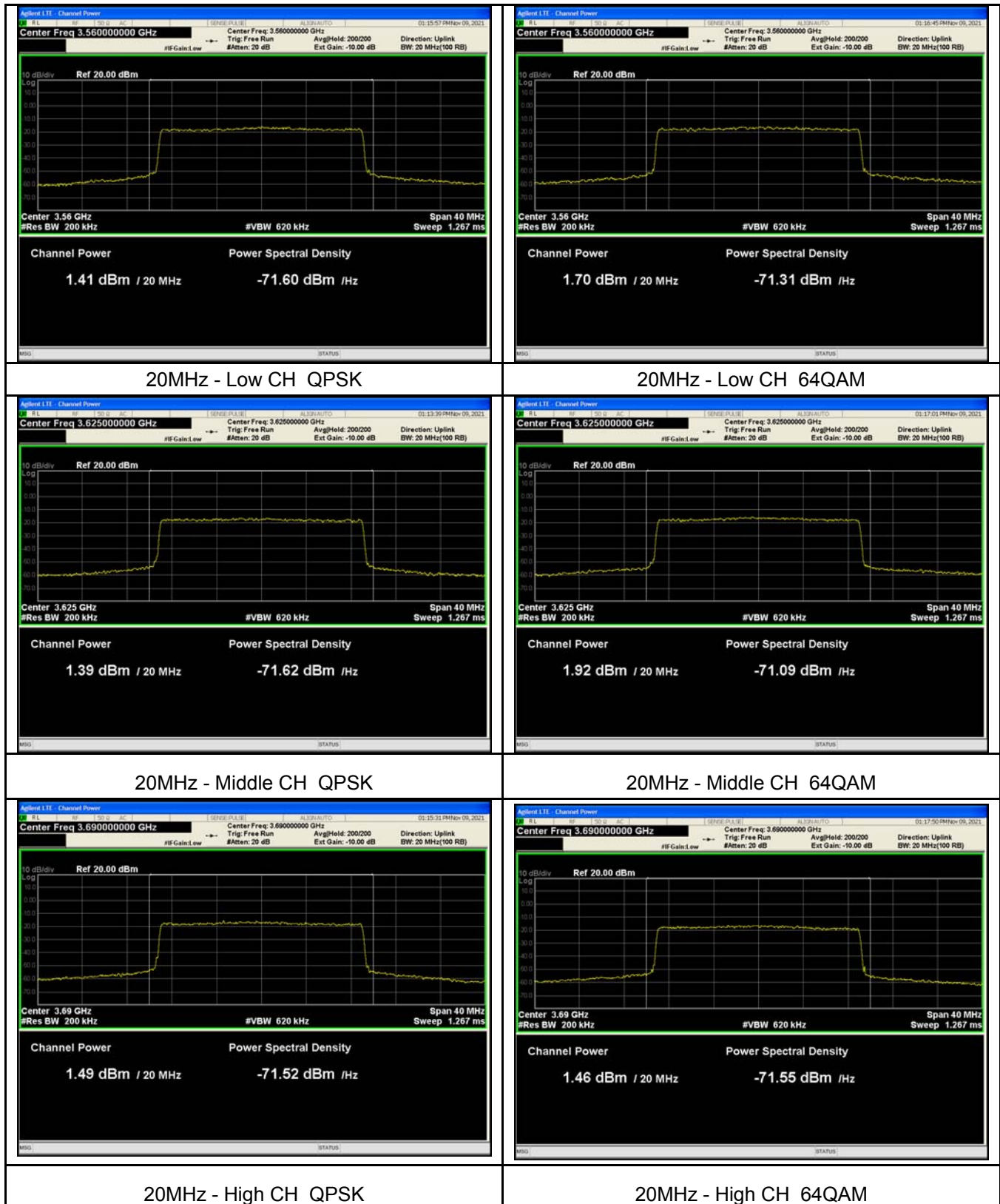
Full Transmit Output Power Test Plots
Chain 0



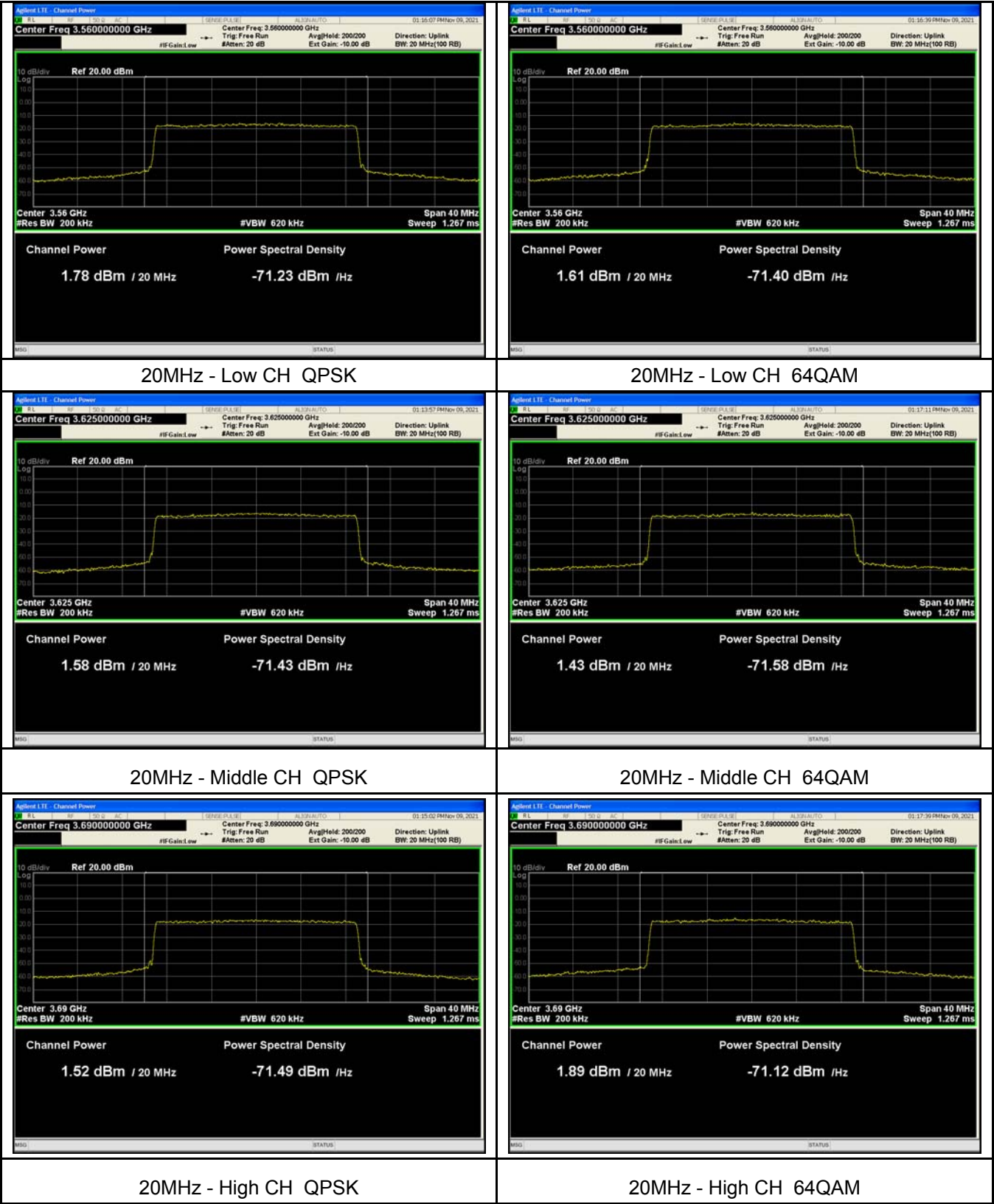
Chain 1



Chain 0



Chain 1



8 Peak-to-average power ratio

Test Requirement:	FCC part96.41(g)
Test Method:	ANSI/TIA-603-E:2016, ANSI C63.26:2015
Test Mode:	Data communicating mode
Limit:	

Probability, %	dB
0.1	13

8.1 EUT Operation

Operating Environment :

Temperature:	22.5 °C
Humidity:	52.1 % RH
Atmospheric Pressure:	102.3kPa

Note: Data that only reflects the worst mode is reported

8.2 Test Procedure

1. The EUT was connected to spectrum analyzer and system simulator via a power divider.
2. Set EUT to transmit at maximum output power.
3. When the duty cycle is less than 98%, then signal gating will be implemented on the spectrum analyzer by triggering from the system simulator.
4. Set the CCDF (Complementary Cumulative Distribution Function) option of the spectrum analyzer. Record the maximum PAPR level associated with a probability of 0.1%.

8.3 Test Result

10MHz bandwidth

Mode	Chain 0			Chain 1			Limit (dB)
Channel	Low	Middle	High	Low	Middle	High	
Peak-to-Average Ratio (dB)	8.90	9.54	8.58	8.98	8.32	8.15	13

15MHz bandwidth

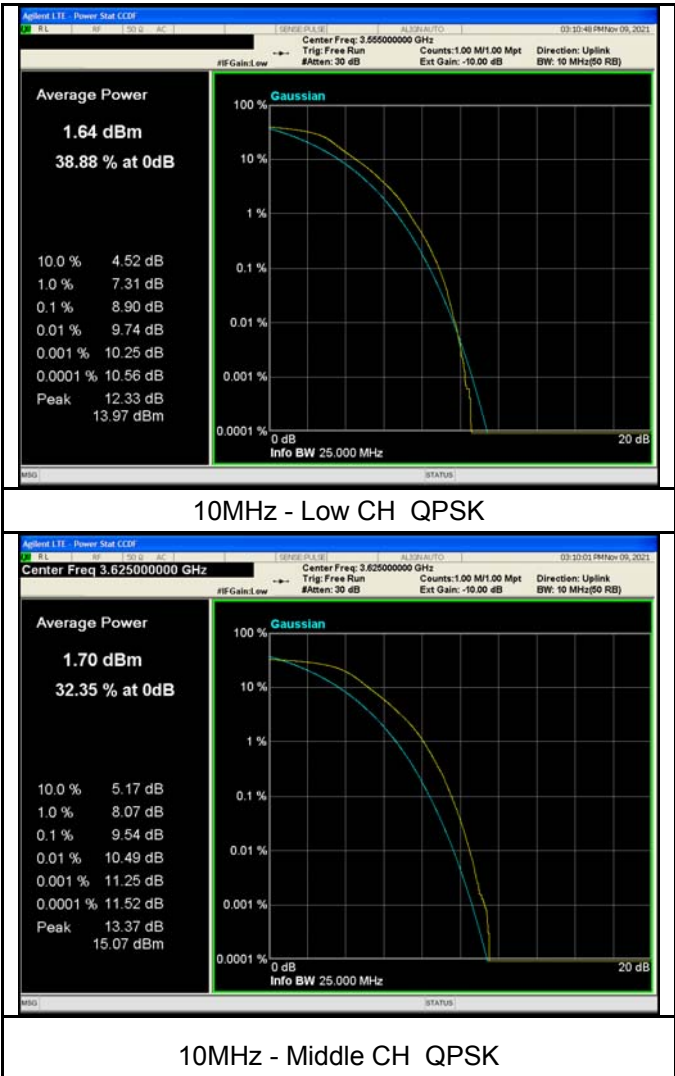
Mode	Chain 0			Chain 1			Limit (dB)
Channel	Low	Middle	High	Low	Middle	High	
Peak-to-Average Ratio (dB)	9.53	9.56	10.37	10.90	9.62	9.37	13

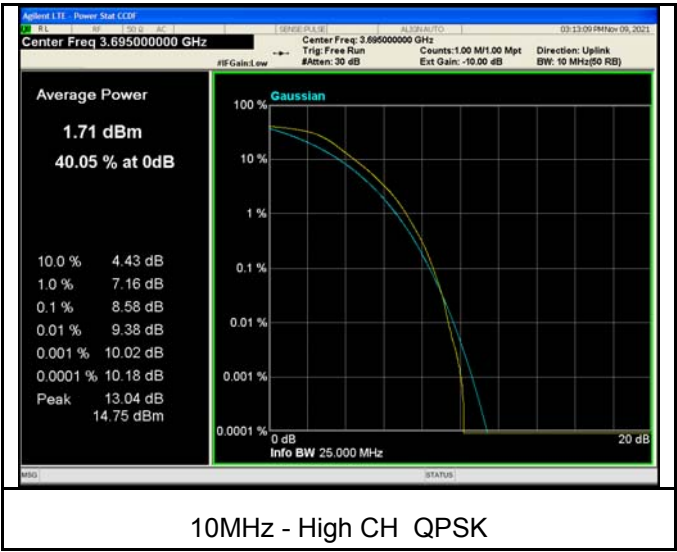
20MHz bandwidth

Mode	Chain 0			Chain 1			Limit (dB)
Channel	Low	Middle	High	Low	Middle	High	
Peak-to-Average Ratio (dB)	9.80	8.98	7.75	9.38	9.13	9.39	13

Test Plots

10M Chain 0

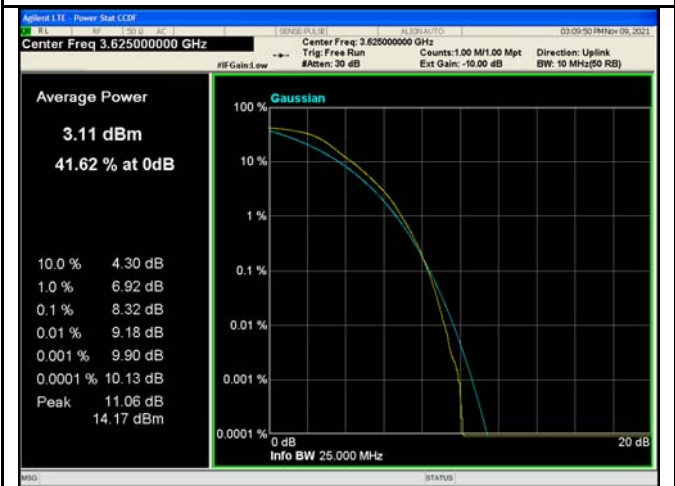




10M Chain 1



10MHz - Low CH QPSK



10MHz - Middle CH QPSK



10MHz - High CH QPSK

15M Chain 0



15MHz - Low CH QPSK



15MHz - Middle CH QPSK



15MHz - High CH QPSK

15M Chain 1



15MHz - Low CH QPSK



15MHz - Middle CH QPSK



15MHz - High CH QPSK

20M Chain 0



20MHz - Low CH QPSK



20MHz - Middle CH QPSK



20MHz - High CH QPSK

20M Chain 1



20MHz - Low CH QPSK



20MHz - Middle CH QPSK



20MHz - High CH QPSK

9 Occupy Bandwidth

Test Requirement:	FCC part 2.1049
Test Method:	ANSI/TIA-603-E:2016, ANSI C63.26:2015
Test Mode:	Data communicating mode

9.1 EUT Operation

Operating Environment :

Temperature:	22.6 °C
Humidity:	52.4 % RH
Atmospheric Pressure:	103.3kPa

9.2 Test Procedure

1. The EUT's output RF connector was connected with a short cable to the spectrum analyzer.
2. The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
3. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.
4. The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3x RBW.

9.3 Test Result

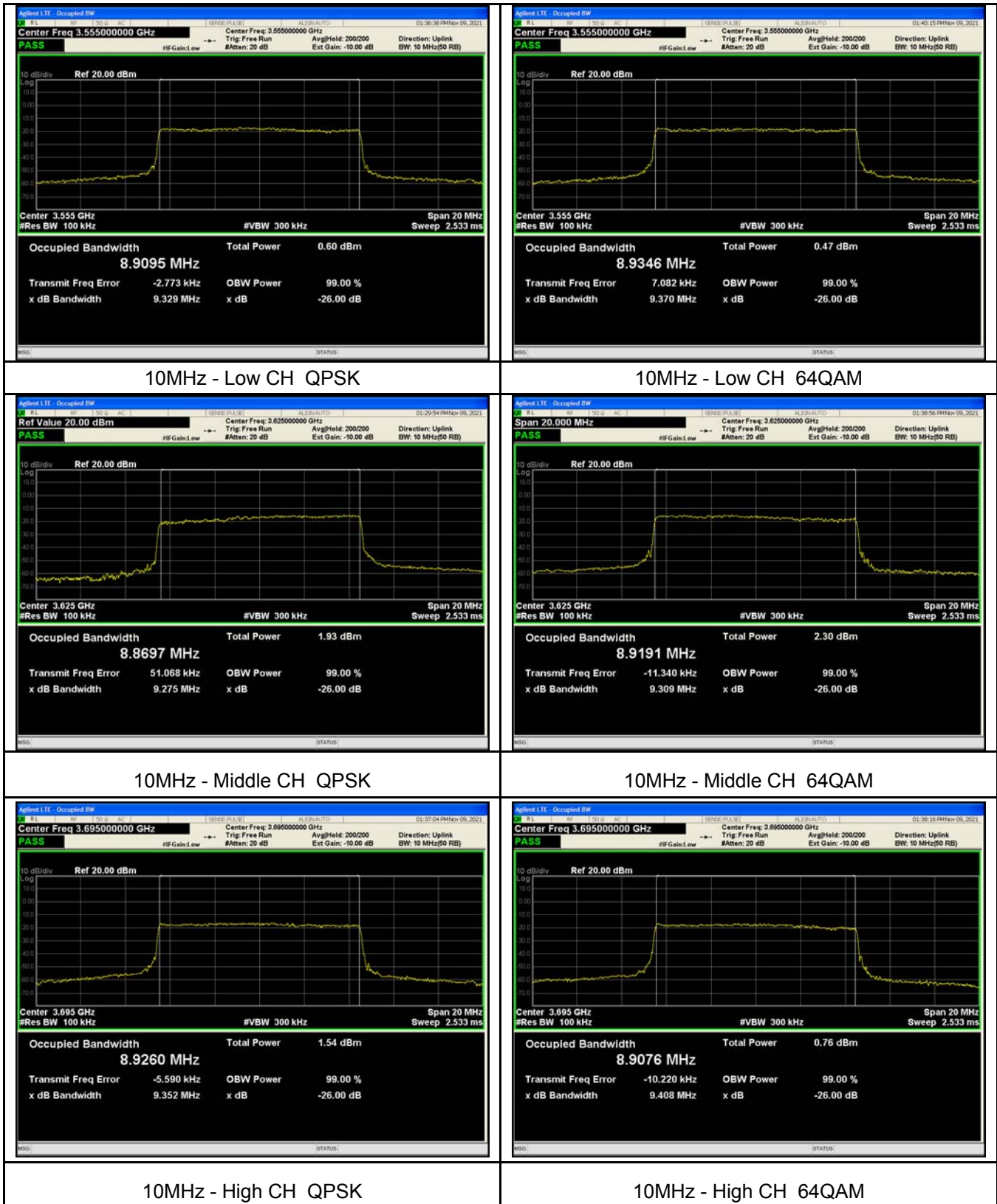
Chain 0

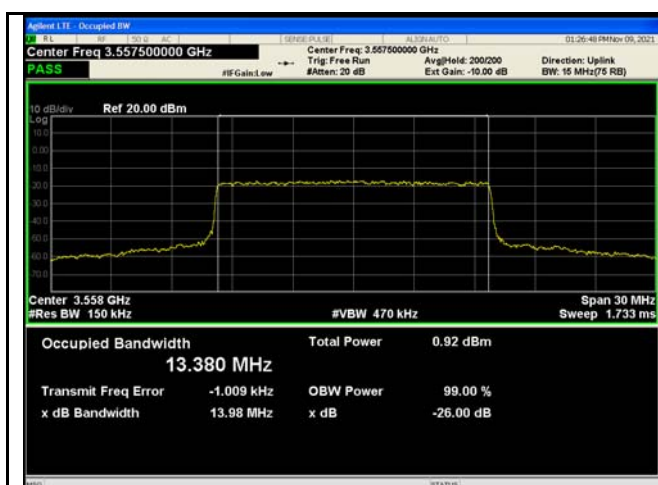
Bandwidth (MHz)	Modulation	Test Channel	26dB Down Bandwidth	99% Occupy bandwidth (MHz)
10	QPSK	Low	9.329	8.9095
		Middle	9.275	8.8697
		High	9.352	8.9260
	64QAM	Low	9.370	8.9346
		Middle	9.309	8.9191
		High	9.408	8.9076
Bandwidth (MHz)	Modulation	Test Channel	26dB Down Bandwidth	99% Occupy bandwidth (MHz)
15	QPSK	Low	13.98	13.380
		Middle	13.89	13.408
		High	13.89	13.378
	64QAM	Low	13.92	13.382
		Middle	13.89	13.396
		High	13.88	13.362
Bandwidth (MHz)	Modulation	Test Channel	26dB Down Bandwidth	99% Occupy bandwidth (MHz)
20	QPSK	Low	18.49	17.785
		Middle	18.50	17.836
		High	18.47	17.817
	64QAM	Low	18.54	17.843
		Middle	18.50	17.816
		High	18.52	17.811

Chain 1

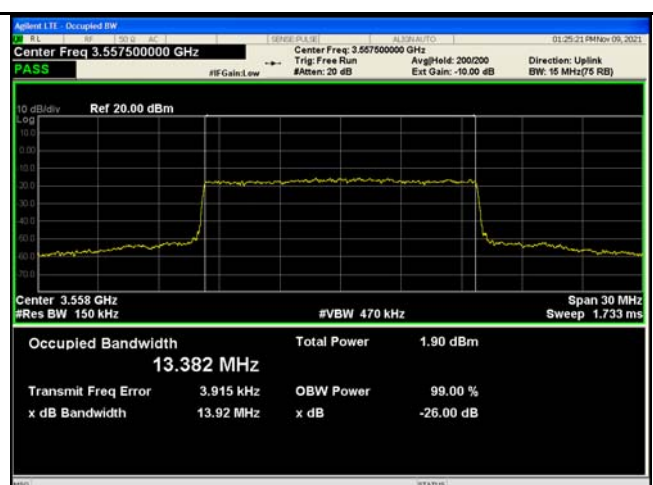
Bandwidth (MHz)	Modulation	Test Channel	26dB Down Bandwidth	99% Occupy bandwidth (MHz)
10	QPSK	Low	9.323	8.8904
		Middle	9.273	8.9175
		High	9.349	8.9039
	64QAM	Low	9.373	8.9100
		Middle	9.347	8.9259
		High	9.392	8.9208
Bandwidth (MHz)	Modulation	Test Channel	26dB Down Bandwidth	99% Occupy bandwidth (MHz)
15	QPSK	Low	13.95	13.362
		Middle	13.91	13.348
		High	13.89	13.367
	64QAM	Low	13.96	13.368
		Middle	13.90	13.389
		High	14.01	13.375
Bandwidth (MHz)	Modulation	Test Channel	26dB Down Bandwidth	99% Occupy bandwidth (MHz)
20	QPSK	Low	18.47	17.793
		Middle	18.51	17.843
		High	18.52	17.818
	64QAM	Low	18.49	17.798
		Middle	18.52	17.837
		High	18.54	17.804

Test Plots Chain 0

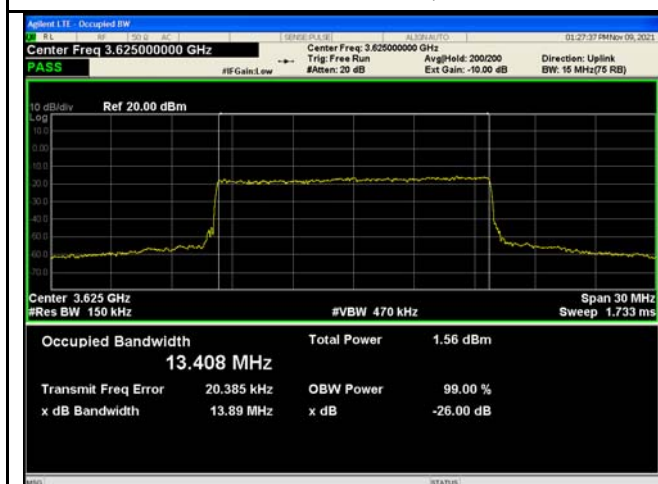




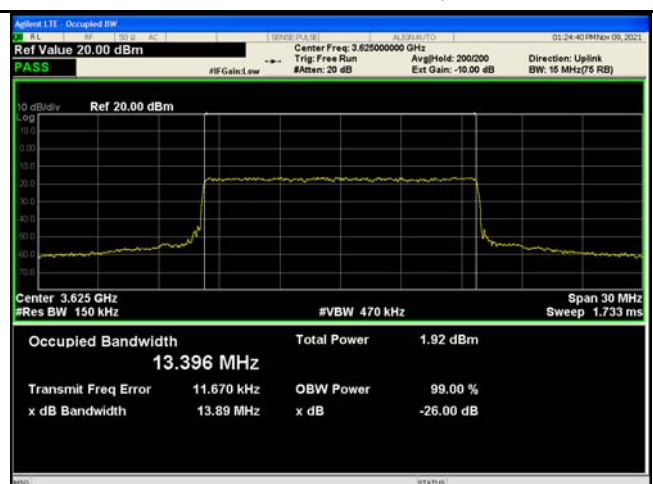
15MHz - Low CH QPSK



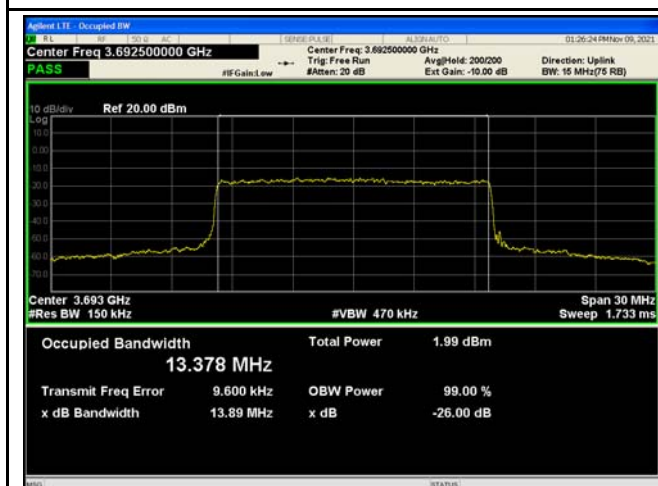
15MHz - Low CH 64QAM



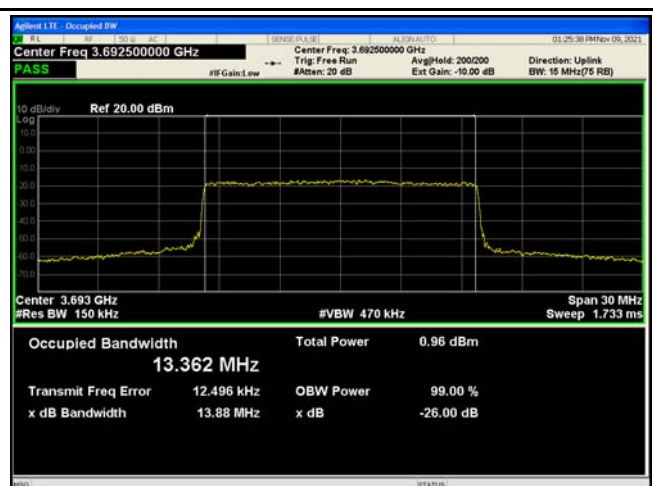
15MHz - Middle CH QPSK



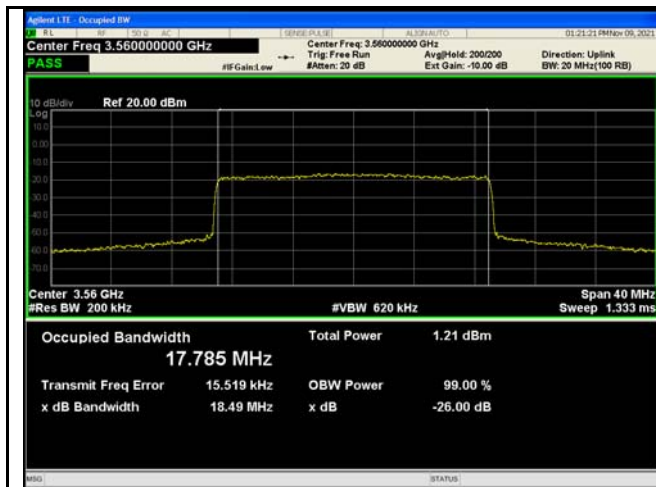
15MHz - Middle CH 64QAM



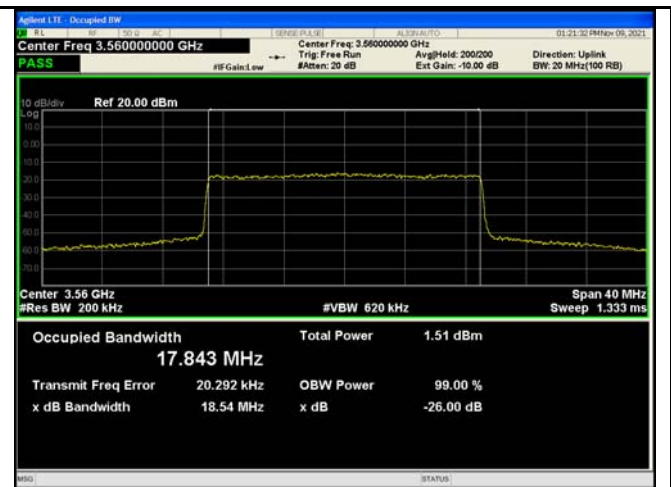
15MHz - High CH QPSK



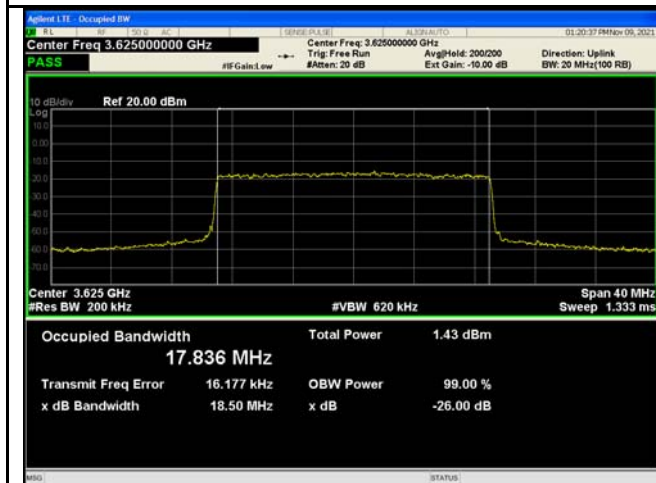
15MHz - High CH 64QAM



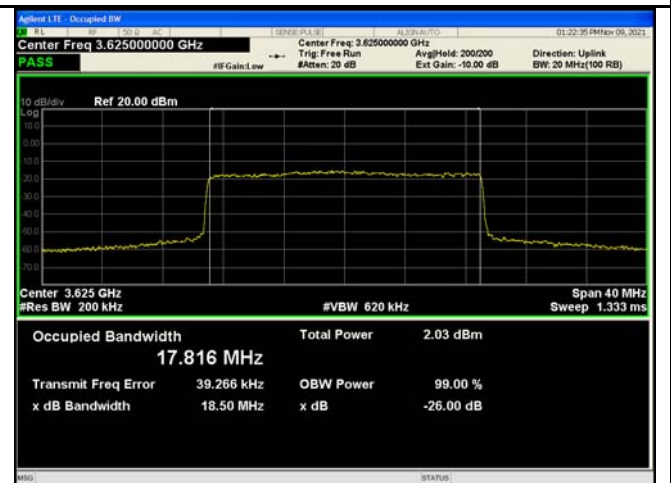
20MHz - Low CH QPSK



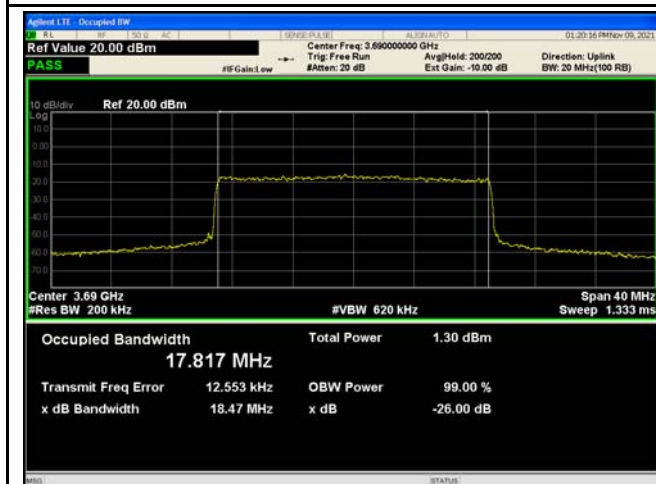
20MHz - Low CH 64QAM



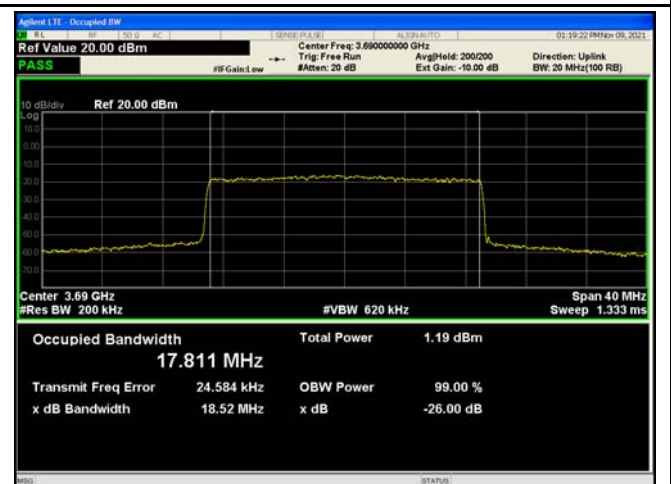
20MHz - Middle CH QPSK



20MHz - Middle CH 64QAM

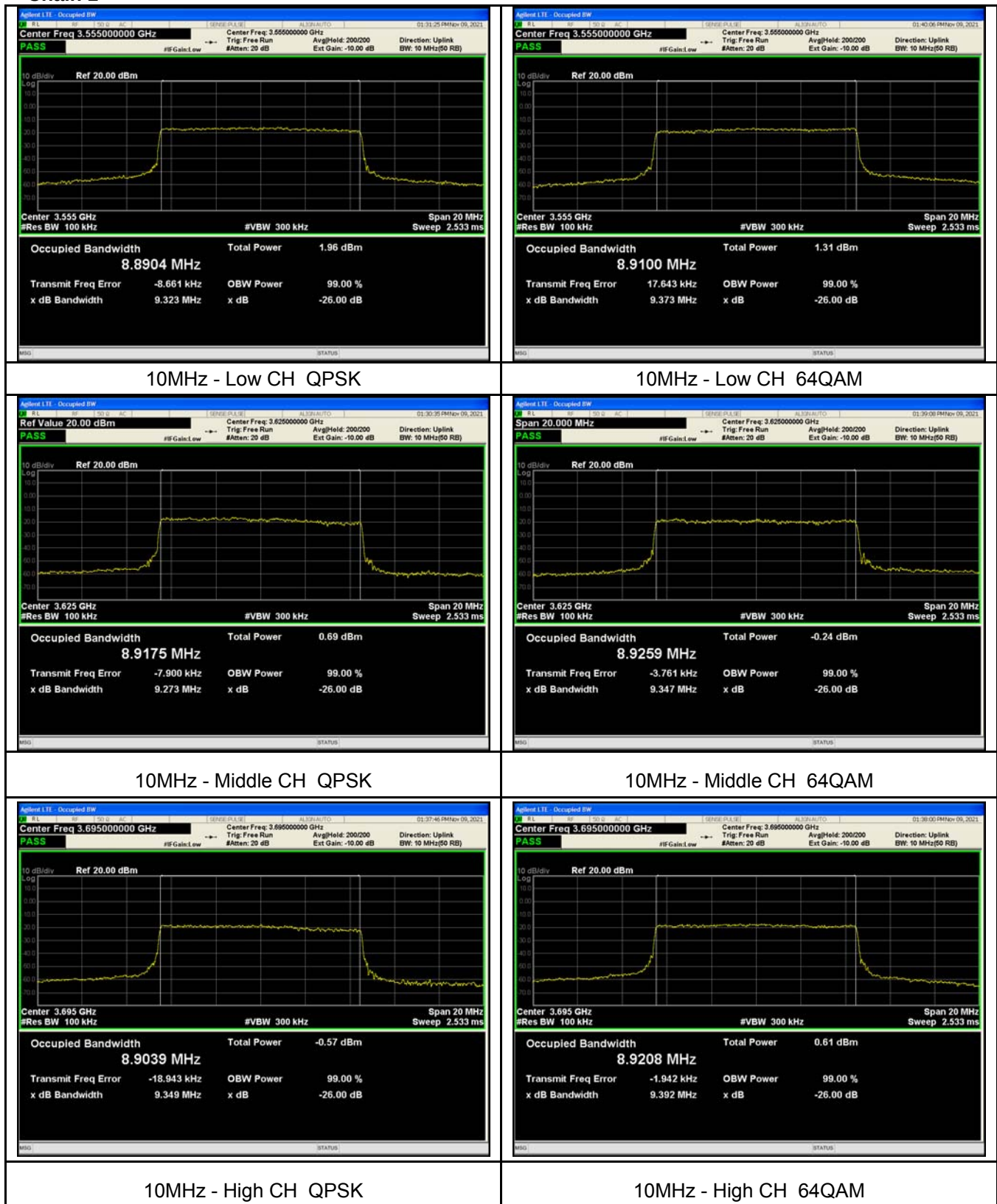


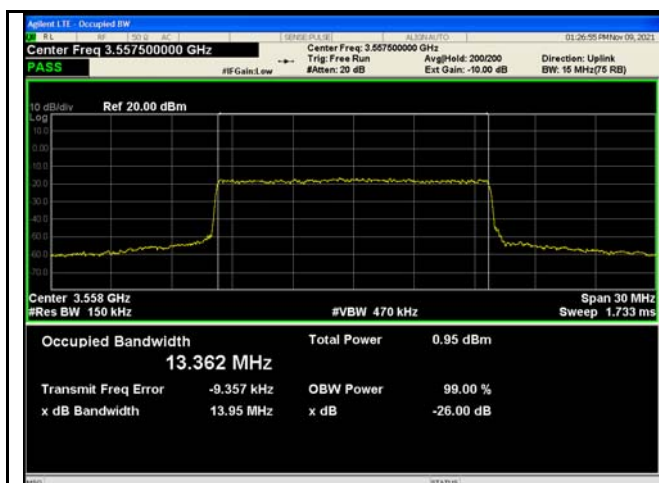
20MHz - High CH QPSK



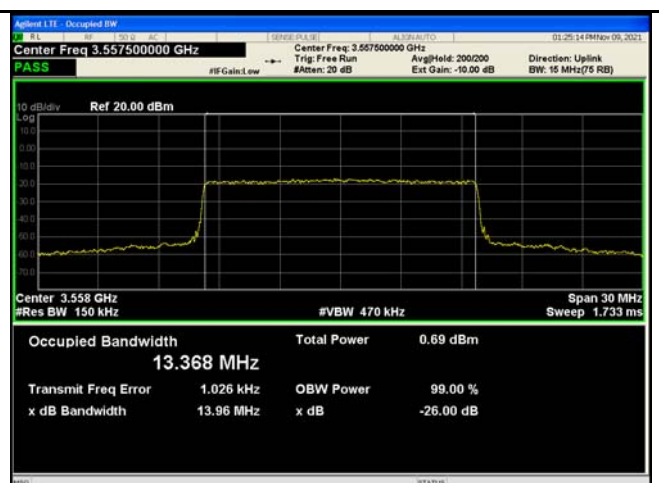
20MHz - High CH 64QAM

Chain 1

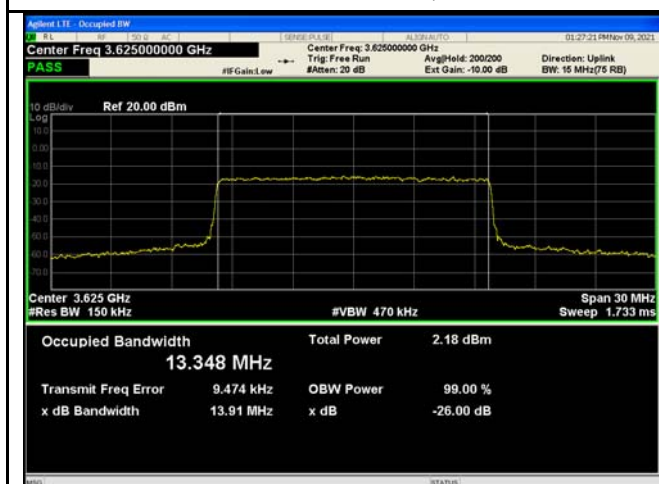




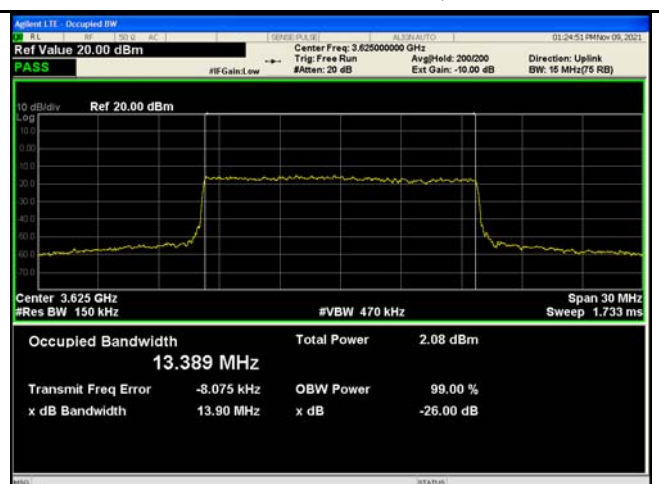
15MHz - Low CH QPSK



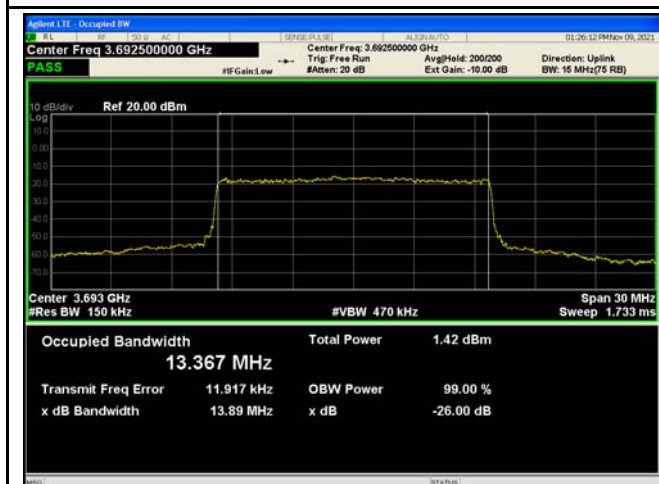
15MHz - Low CH 64QAM



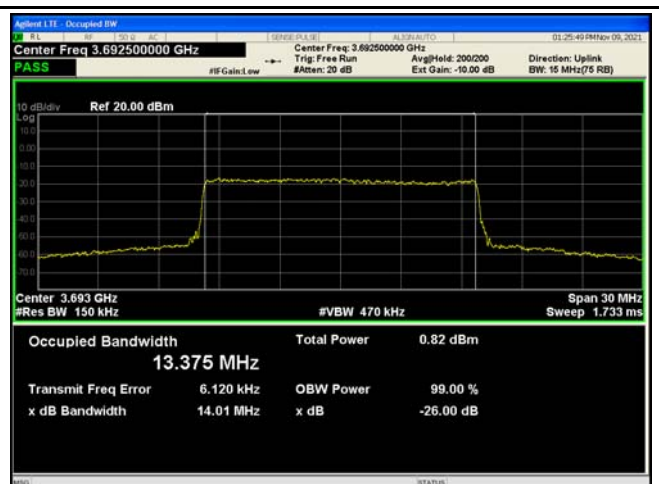
15MHz - Middle CH QPSK



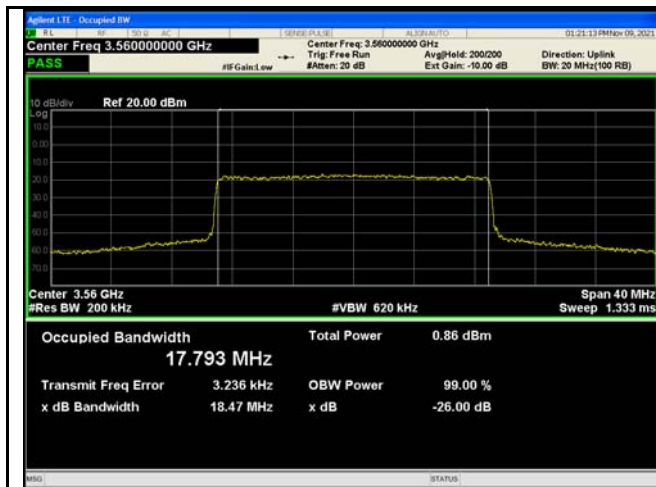
15MHz - Middle CH 64QAM



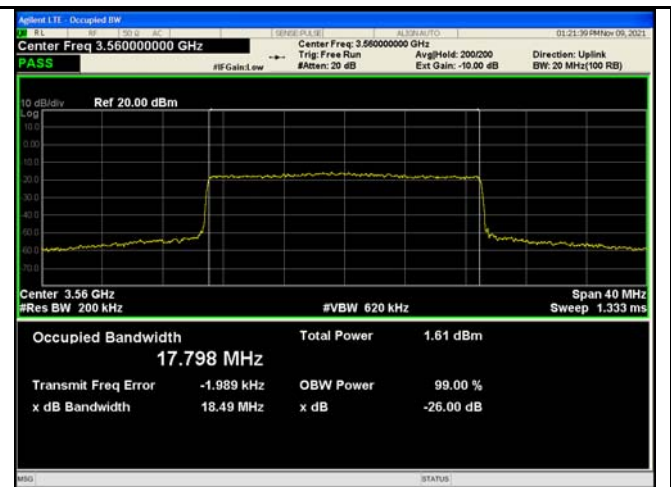
15MHz - High CH QPSK



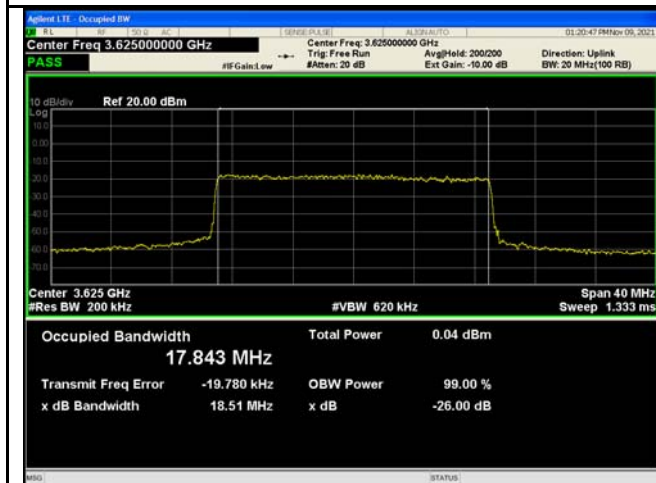
15MHz - High CH 64QAM



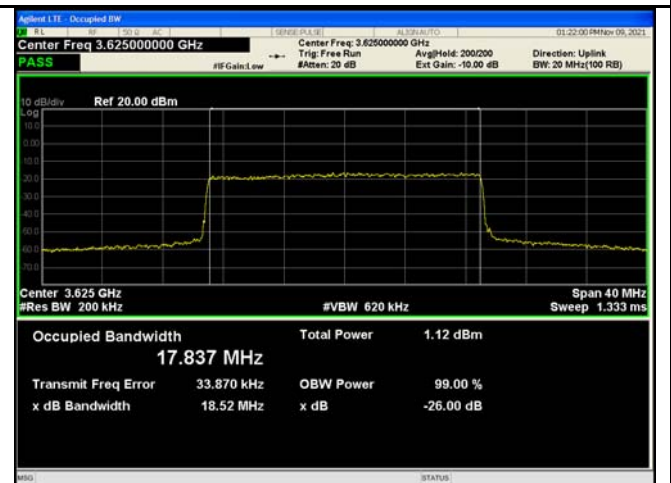
20MHz - Low CH QPSK



20MHz - Low CH 64QAM



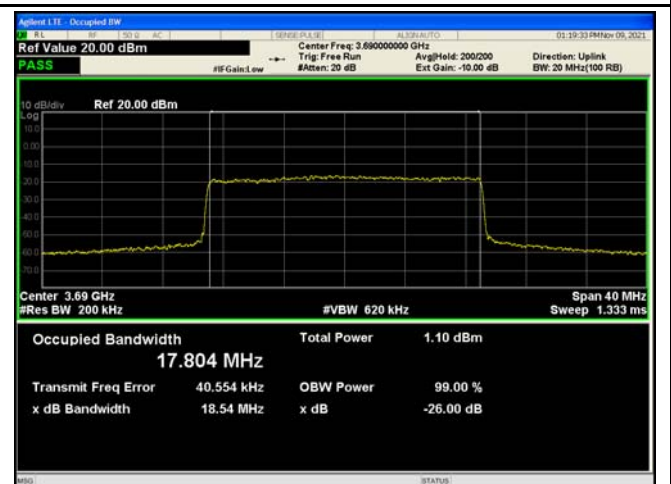
20MHz - Middle CH QPSK



20MHz - Middle CH 64QAM



20MHz - High CH QPSK



20MHz - High CH 64QAM

10 Emission outside the fundamental

Test Requirement:	FCC part 96.41(e)
Test Method:	ANSI/TIA-603-E:2016, ANSI C63.26:2015
Test Mode:	Data communicating mode
Limit:	• within 0 MHz to 10 MHz above and below the assigned channel ≤ -13 dBm/MHz • greater than 10 MHz above and below the assigned channel ≤ -25 dBm/MHz • any emission below 3530 MHz and above 3720 MHz ≤ -40 dBm/MHz

10.1 EUT Operation

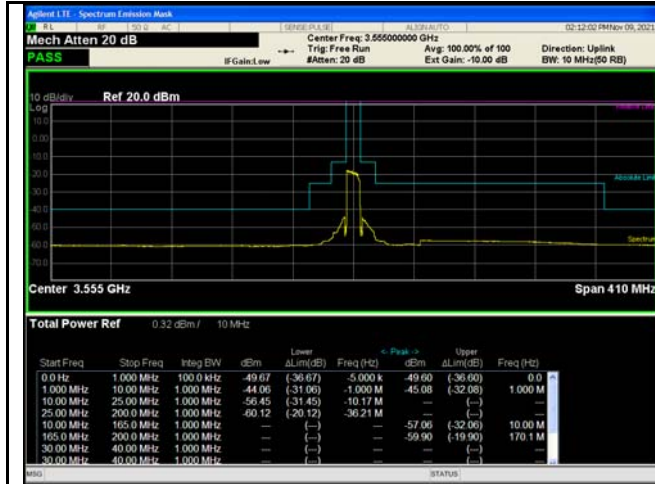
Operating Environment :	
Temperature:	22.7 °C
Humidity:	52.1 % RH
Atmospheric Pressure:	102.3kPa

10.2 Test Procedure

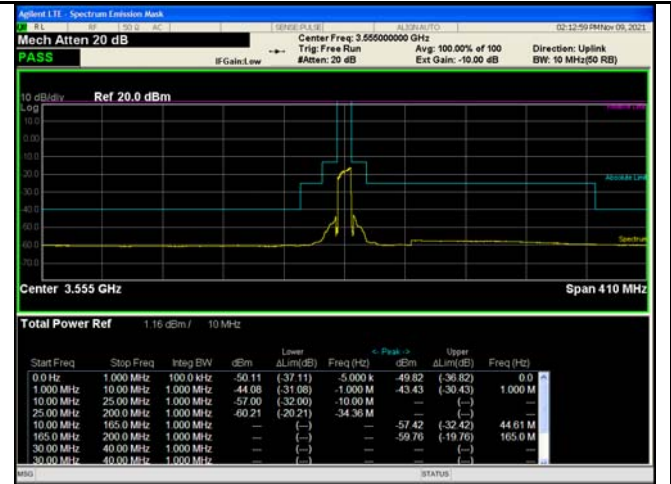
1. The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation.
2. Measurements must be performed for low, mid, and high channels.
3. RBW=1% of fundamental for measurements within 1 MHz immediately outside the authorized channel; and 1 MHz for beyond 1 MHz outside the authorized channel. (eg. For 5MHz, RBW=51KHz within 1 MHz immediately outside the authorized channel)
4. Trace average at least 100 traces

10.3 Test Result

Test Plots



10MHz - Low CH QPSK- Chain 0



10MHz - Low CH QPSK - Chain 1



10MHz - Middle CH QPSK- Chain 0



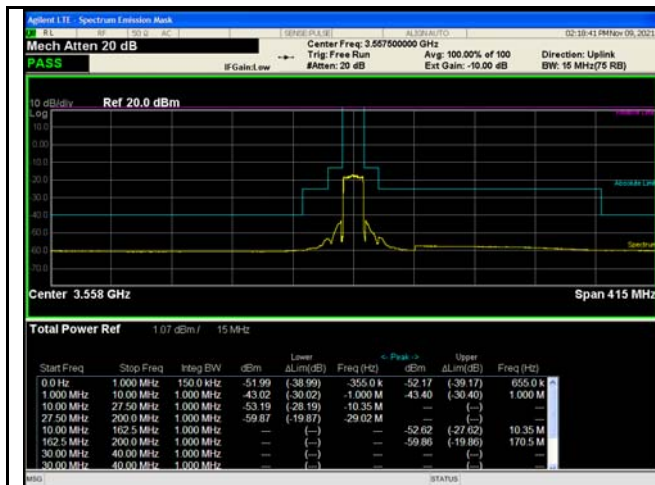
10MHz - Middle CH QPSK - Chain 1



10MHz - High CH QPSK- Chain 0



10MHz - High CH QPSK - Chain 1



15MHz - Low CH QPSK- Chain 0



15MHz - Low CH QPSK - Chain 1



15MHz - Middle CH QPSK- Chain 0



15MHz - Middle CH QPSK - Chain 1



15MHz - High CH QPSK- Chain 0



15MHz - High CH QPSK - Chain 1



20MHz - Low CH QPSK- Chain 0



20MHz - Low CH QPSK - Chain 1



20MHz - Middle CH QPSK- Chain 0



20MHz - Middle CH QPSK - Chain 1



20MHz - High CH QPSK- Chain 0



20MHz - High CH QPSK - Chain 1

11 Out of band emission at antenna terminals

Test Requirement:	FCC part 96.41(e)
Test Method:	ANSI/TIA-603-E:2016, ANSI C63.26:2015
Test Mode:	Data communicating mode
Limit:	below 3530 MHz and above 3720 MHz $\leq$ -40dBm

11.1 EUT Operation

Operating Environment :

Temperature:	23.5 °C
Humidity:	52.1 % RH
Atmospheric Pressure:	101.3kPa

11.2 Test Procedure

1. The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation.
2. The resolution bandwidth of the spectrum analyzer was 1MHz; sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic.

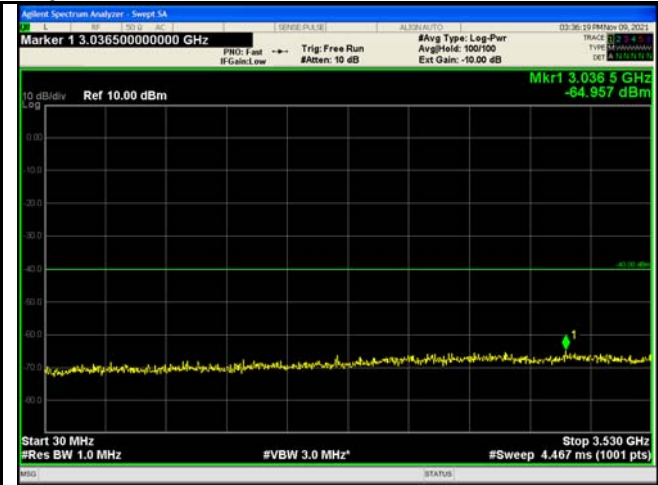
11.3 Test Result

Remark: During the test, pre-scan the QPSK, 64QAM modulation, and found the QPSK modulation(10MHz/15MHz/20MHz) is the worst case.

The permit frequency range of Part 96 is from 3550-3700MHz. Notes as below:

Note 1: This device can be implement MIMO function, so the limit of spurious emissions needs to be reduced by $10\log(\text{Numbers}_{\text{ANT}})$ according to KDB 662911
The general limit = -40dBm
For 2x2 MIMO, the limit = -40dBm - $10\log 2$ = -43dBm.

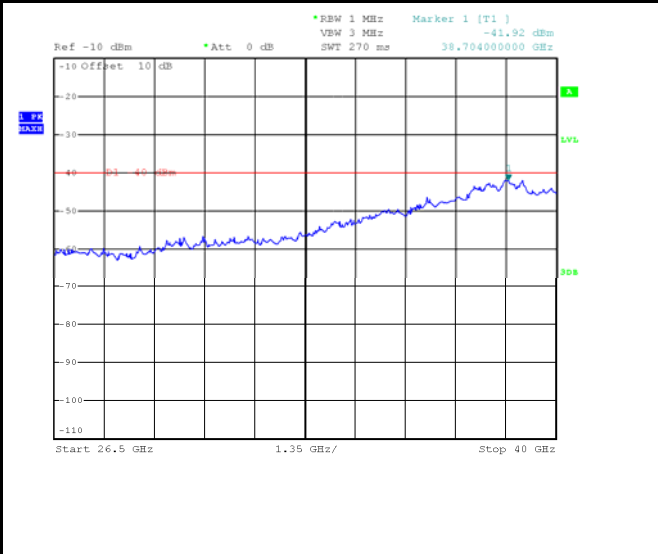
Test Plots (Worst case Chain 0)
Spurious emission



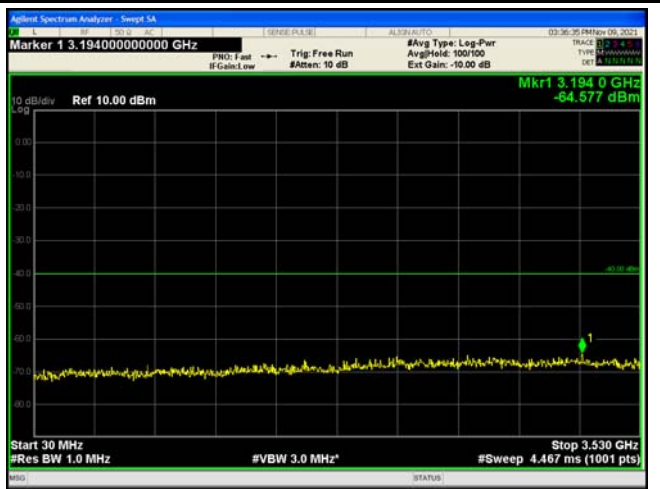
10MHz - Low CH 30MHz~3.53GHz



10MHz - Low CH 3.72GHz~26.5GHz



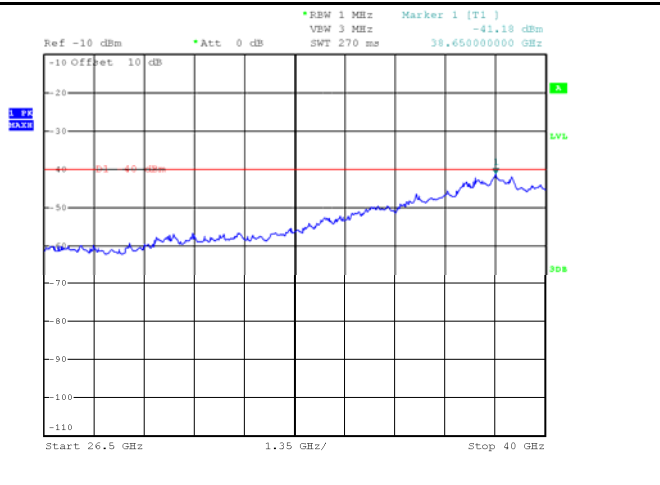
10MHz - Low CH 26.5GHz~40GHz



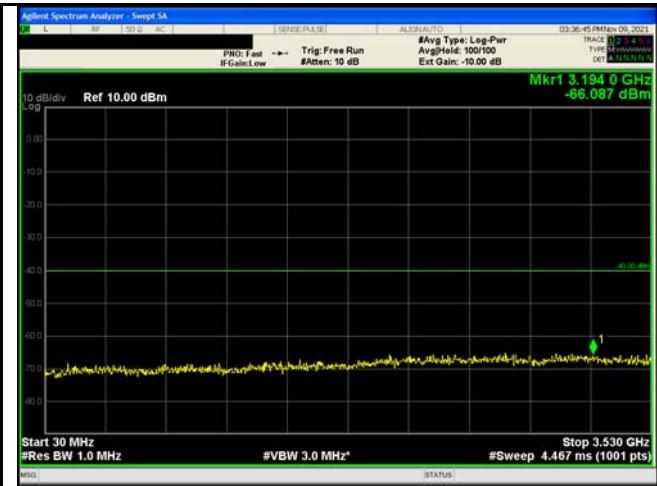
10MHz - Middle CH 30MHz~3.53GHz



10MHz - Middle CH 3.72GHz~26.5GHz



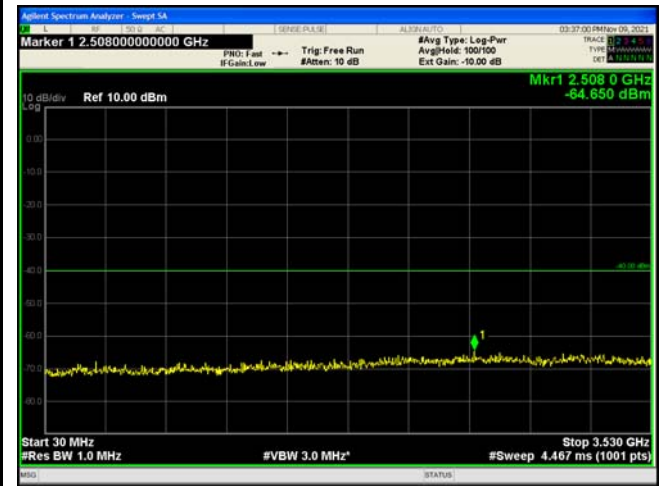
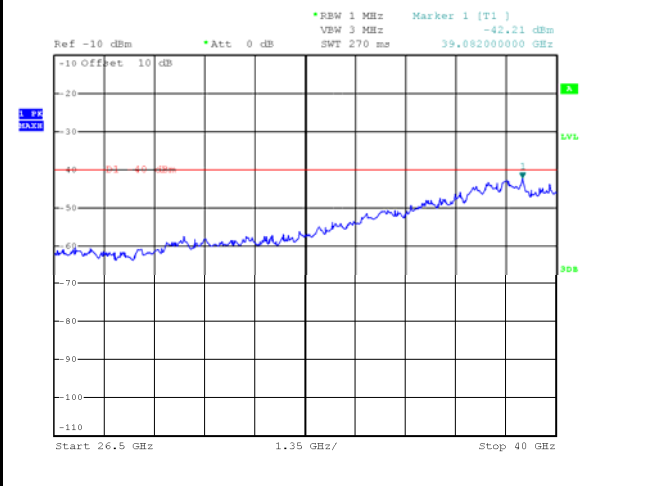
10MHz - Middle CH 26.5GHz~40GHz



10MHz - High CH 30MHz~3.53GHz



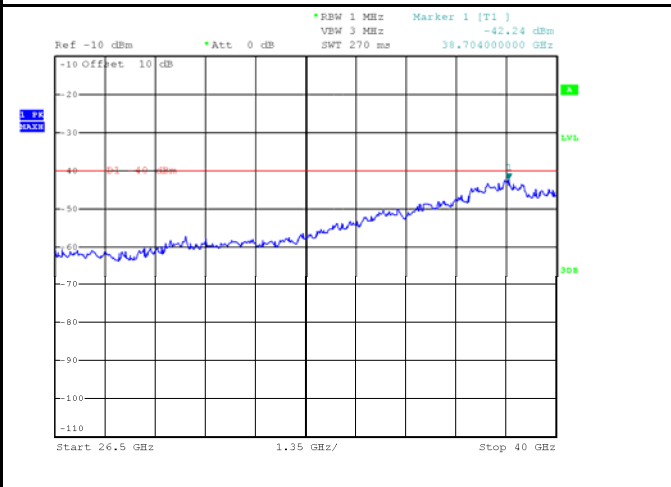
10MHz - High CH 3.72GHz~26.5GHz



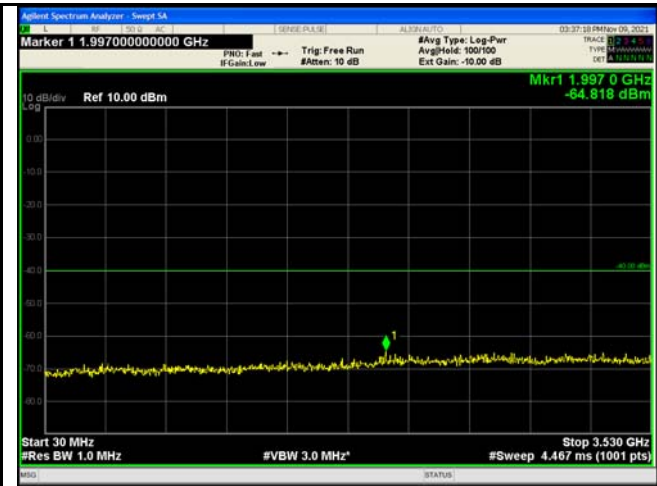
10MHz - High CH 26.5GHz~40GHz



15MHz - Low CH 3.72GHz~26.5GHz



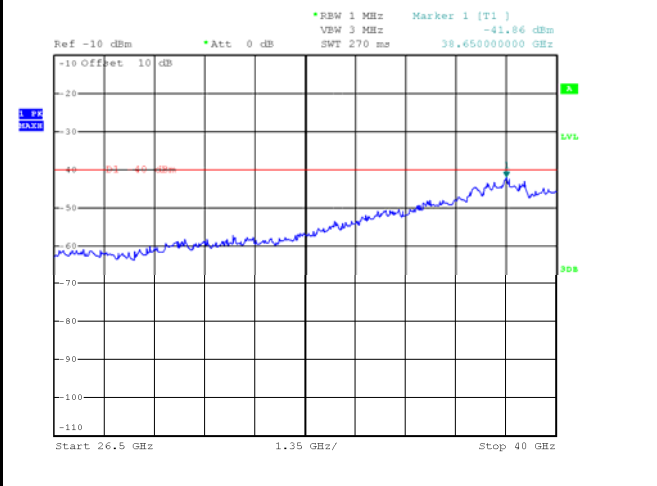
15MHz - Low CH 26.5GHz~40GHz



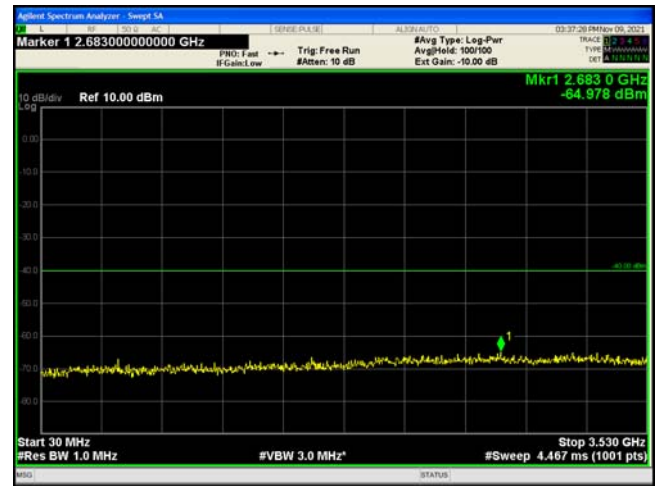
15MHz - Middle CH 30MHz~3.53GHz



15MHz - Middle CH 3.72GHz~26.5GHz



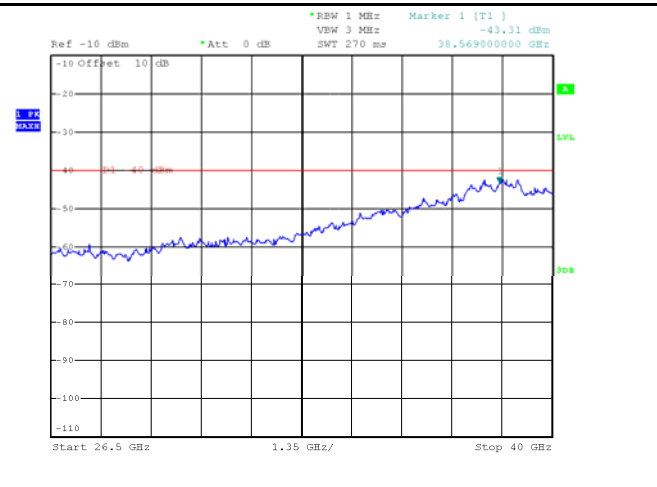
15MHz - Middle CH 26.5GHz~40GHz



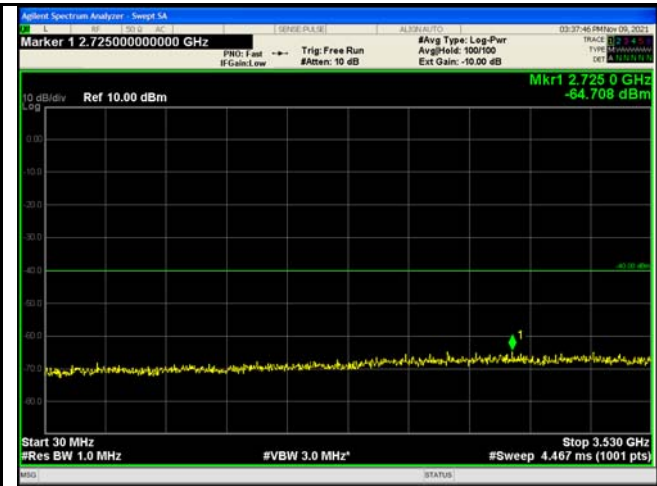
15MHz - High CH 30MHz~3.53GHz



15MHz - High CH 3.72GHz~26.5GHz



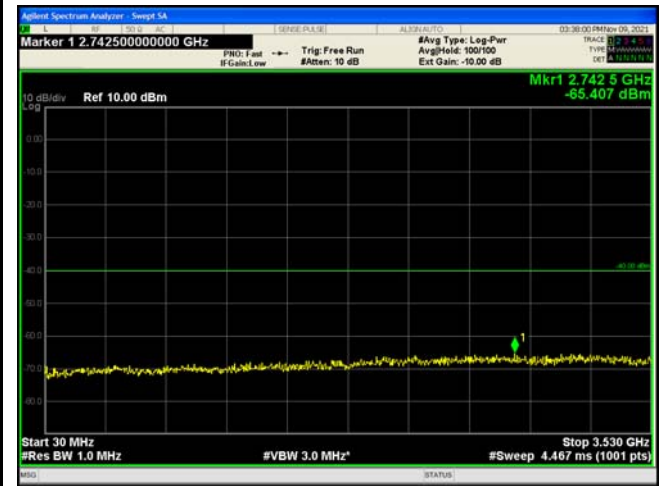
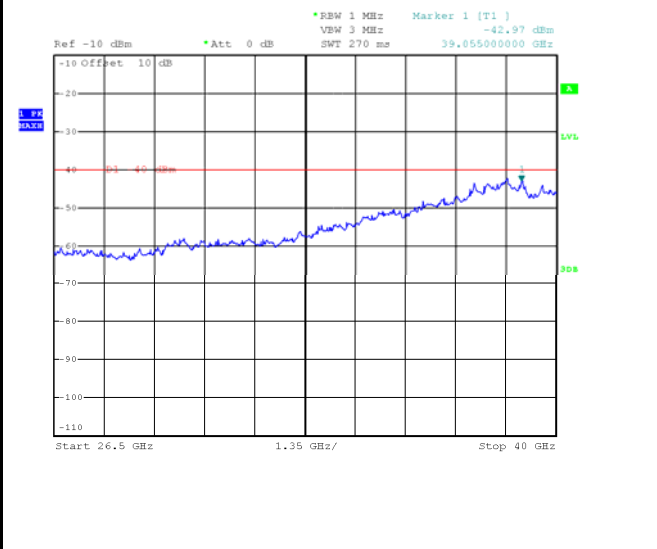
15MHz - High CH 26.5GHz~40GHz



20MHz - Low CH 30MHz~3.53GHz

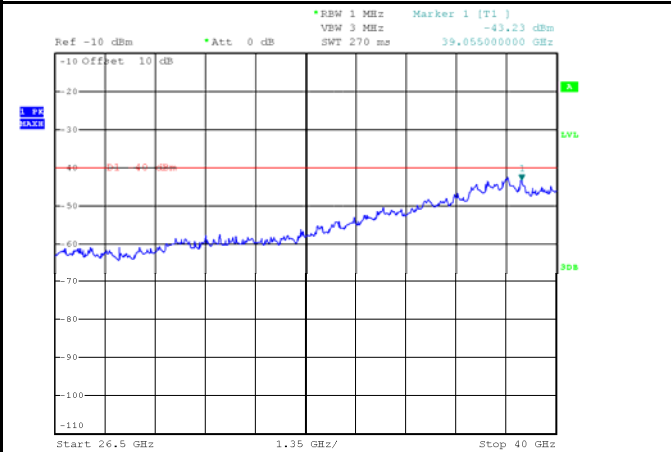


20MHz - Low CH 3.72GHz~26.5GHz



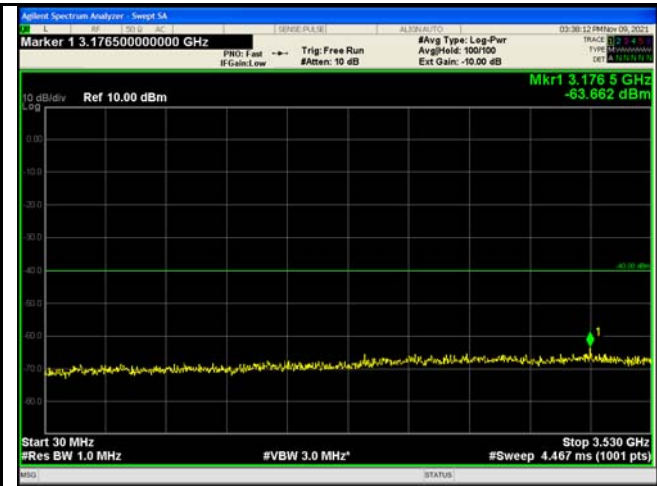
20MHz - Low CH 26.5GHz~40GHz

20MHz - Middle CH 30MHz~3.53GHz



20MHz - Middle CH 3.72GHz~26.5GHz

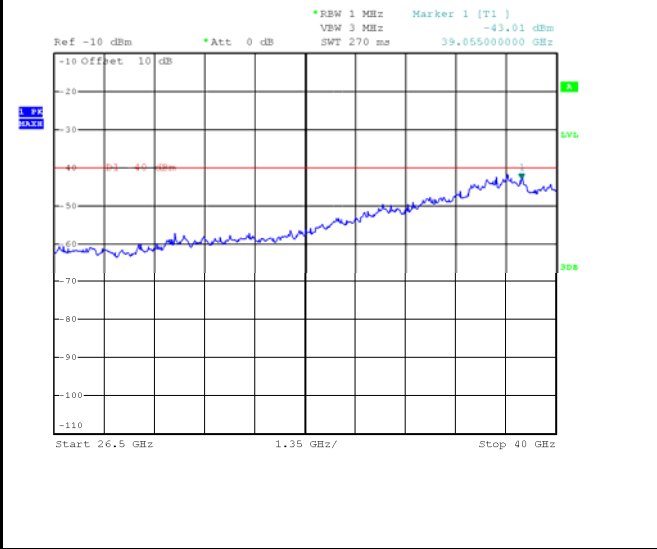
20MHz - Middle CH 26.5GHz~40GHz



20MHz - High CH 30MHz~3.53GHz



20MHz - High CH 3.72GHz~26.5GHz



20MHz - High CH 26.5GHz~40GHz

12 Field strength of spurious radiation measurement

Test Requirement:	FCC part 96.41(e)
Test Method:	ANSI/TIA-603-E:2016, ANSI C63.26:2015
Test Mode:	Data communicating mode
Limit:	-40dBm

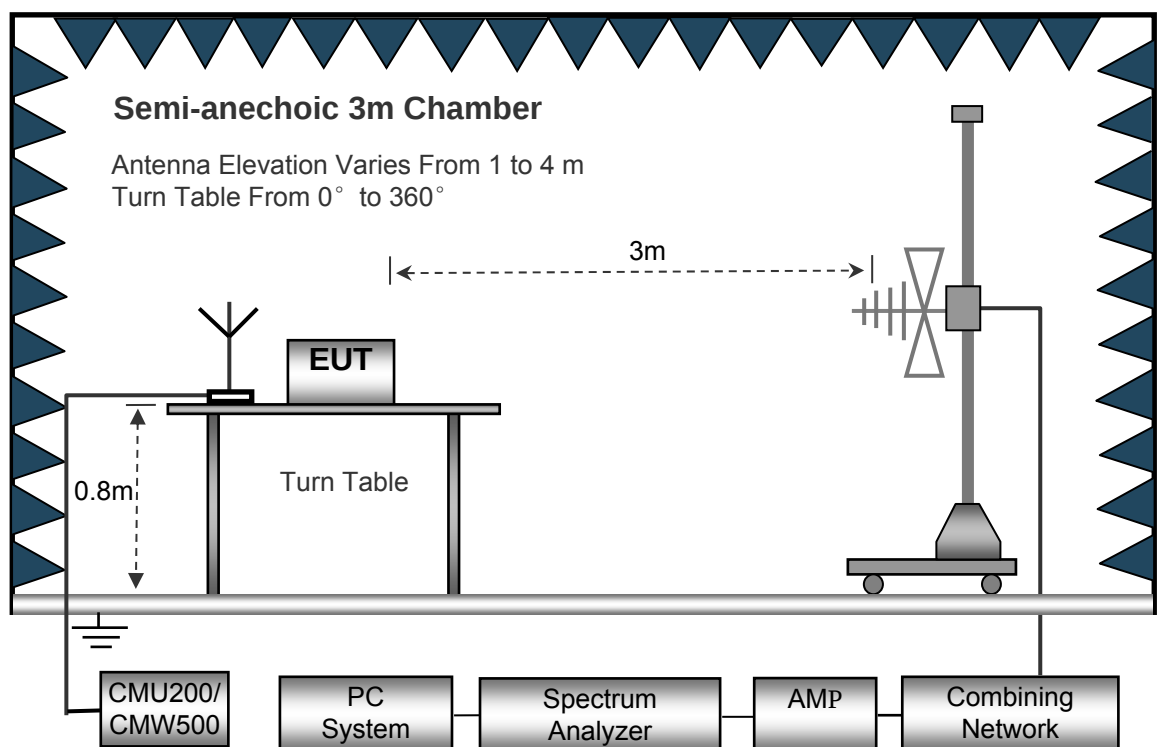
12.1 EUT Operation

Operating Environment :

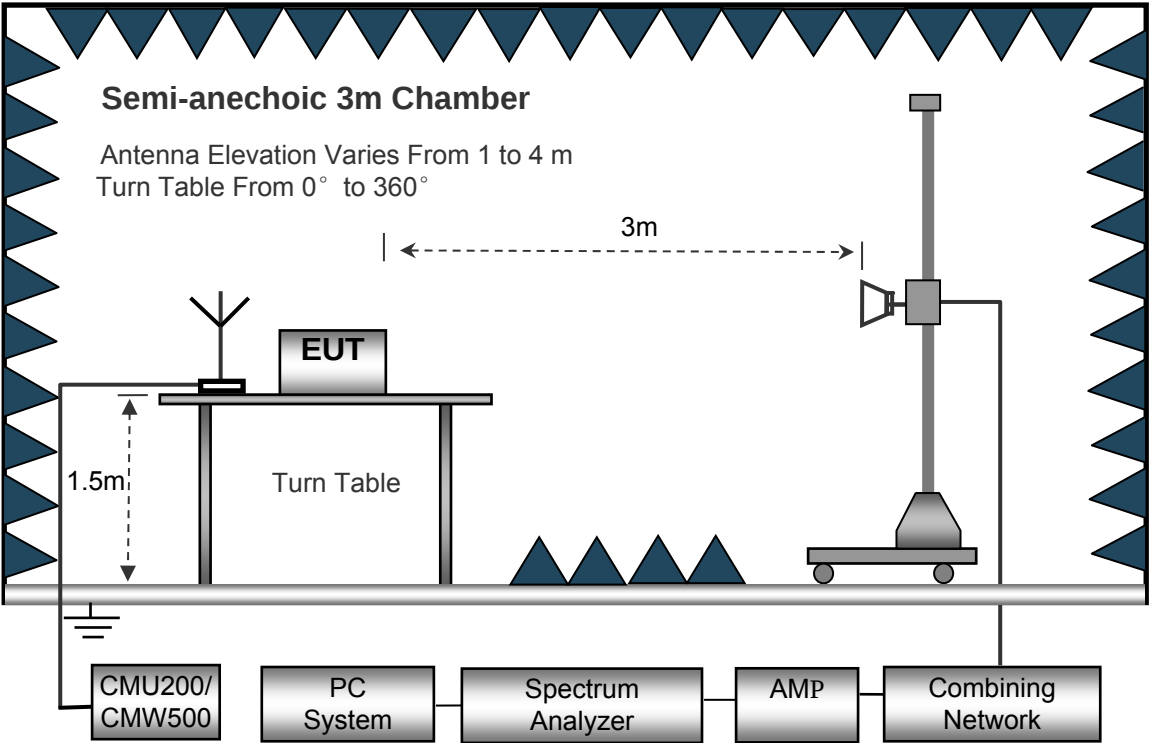
Temperature:	23.5 °C
Humidity:	52.1 % RH
Atmospheric Pressure:	101.2kPa

12.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site. The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.



12.3 Spectrum Analyzer Setup

30MHz ~ 1GHz

Sweep Speed Auto
Detector PK
Resolution Bandwidth..... 1MHz
Video Bandwidth..... 3MHz

Above 1GHz

Sweep Speed Auto
Detector PK
Resolution Bandwidth..... 1MHz
Video Bandwidth..... 3MHz

12.4 Test Procedure

1. The EUT was placed on a non-conductive turntable using a non-conductive support. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and EMI spectrum analyzer.
2. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.
3. The frequency range up to tenth harmonic was investigated for each of three fundamental frequency (low, middle and high channels). Once spurious emission was identified, the power of the emission was determined using the substitution method.
4. The spurious emissions attenuation was calculated as the difference between radiated power at the fundamental frequency and the spurious emissions frequency.

$$\text{ERP / EIRP} = \text{S.G. output (dBm)} + \text{Antenna Gain(dB/dBi)} - \text{Cable Loss (dB)}$$

12.5 Test Result

30MHz-18GHz

Remark: During the test, pre-scan the QPSK, 64QAM modulation, and found the QPSK modulation and 20MHz bandwidth is the worst case.

Frequency	Receiver Reading	Turn table Angle	RX Antenna		Substituted			Absolute Level	Result	
			Height	Polar	SG Level	Cable	Antenna Gain		Limit	Margin
(MHz)	(dBμV)	Degree	(m)	(H/V)	(dBm)	(dB)	(dB)	(dBm)	(dBm)	(dB)
Low channel										
223.12	58.94	64	1.5	H	-51.57	0.15	0.00	-51.72	-40.00	-11.72
223.12	59.16	348	1.9	V	-48.43	0.15	0.00	-48.58	-40.00	-8.58
1247.30	57.60	216	1.6	H	-53.94	2.37	12.50	-43.81	-40.00	-3.81
1247.30	55.80	289	1.2	V	-54.01	2.37	12.50	-43.88	-40.00	-3.88
5553.75	53.58	343	1.1	H	-56.03	2.86	12.90	-45.99	-40.00	-5.99
5553.75	44.73	359	1.6	V	-64.15	2.86	12.90	-54.11	-40.00	-14.11
Middle channel										
223.12	57.76	337	1.8	H	-52.75	0.15	0.00	-52.90	-40.00	-12.90
223.12	58.38	109	1.0	V	-49.21	0.15	0.00	-49.36	-40.00	-9.36
1251.50	55.30	175	2.0	H	-56.24	2.37	12.50	-46.11	-40.00	-6.11
1251.50	56.30	298	1.3	V	-53.51	2.37	12.50	-43.38	-40.00	-3.38
5640.00	53.58	217	2.0	H	-56.03	2.86	12.90	-45.99	-40.00	-5.99
5640.00	44.73	27	1.5	V	-64.15	2.86	12.90	-54.11	-40.00	-14.11
High channel										
223.12	59.13	144	1.1	H	-51.38	0.15	0.00	-51.53	-40.00	-11.53
223.12	58.65	11	2.1	V	-48.94	0.15	0.00	-49.09	-40.00	-9.09
1250.50	53.90	189	1.9	H	-57.64	2.37	12.50	-47.51	-40.00	-7.51
1250.50	50.90	327	1.1	V	-58.91	2.37	12.50	-48.78	-40.00	-8.78
5726.25	53.58	1	1.1	H	-56.03	2.86	12.90	-45.99	-40.00	-5.99
5726.25	44.73	233	1.9	V	-64.15	2.86	12.90	-54.11	-40.00	-14.11

Remark:

Test Frequency: 18GHz~40GHz

The measurements were more than 20 dB below the limit and not recorded.

13 Frequency stability V.S. Temperature measurement

Test Requirement: FCC Part2.1055
 Test Method: FCC Part2.1055
 Test Mode: Data communicating mode
 Limit:

Frequency range (MHz)	Fixed and base stations (ppm)	Mobile stations (ppm)	
		Over 2 watts output power	2 watts or less output power
Below 25	100	100	200
25-50	20	20	50
72-76	5		50
150-174	5	5	50
216-220	1.0		1.0
220-222	0.1	1.5	1.5
421-512	2.5	5	5
806-809	1.0	1.5	1.5
809-824	1.5	2.5	2.5
851-854	1.0	1.5	1.5
854-869	1.5	2.5	2.5
896-901	0.1	1.5	1.5
902-928	2.5	2.5	2.5
902-928	2.5	2.5	2.5
929-930	1.5		
935-940	0.1	1.5	1.5
1427-1435	300	300	300
Above 2450			

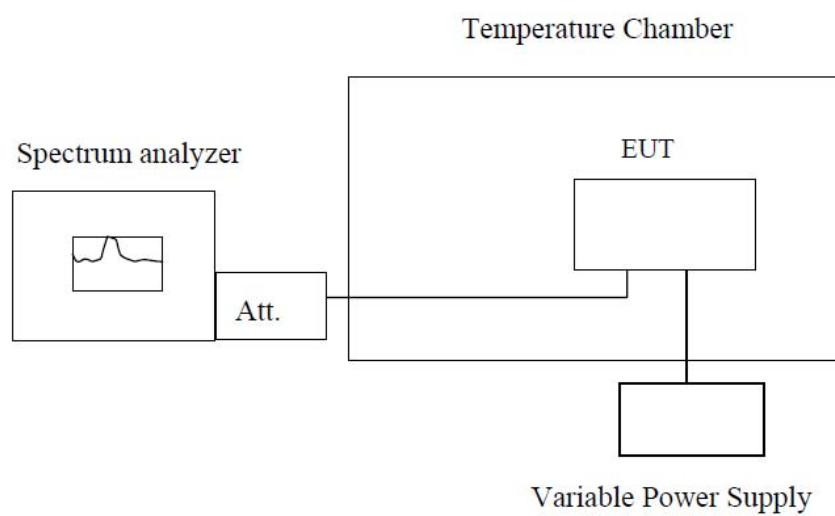
13.1 EUT Operation

Operating Environment :

Temperature: 23.6 °C
 Humidity: 52.2 % RH
 Atmospheric Pressure: 101.3kPa

13.2 Test Procedure

1. The equipment under test was connected to an external DC power supply and input rated voltage.
2. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators.
3. The EUT was placed inside the temperature chamber.
4. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 25°C operating frequency as reference frequency.
5. Turn EUT off and set the chamber temperature to -30°C. After the temperature stabilized for approximately 30 minutes recorded the frequency.
6. Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached.



Note : Measurement setup for testing on Antenna connector

13.3 Test Result

Remark: All three channels of all modulations have been tested, but only the worst channel and the worst modulation show in this test item.

Chain 0

Test Frequency: 3555MHz QPSK 10MHz			
Temperature (°C)	Power Supply (VAC)	Frequency Error (Hz)	Frequency Error (ppm)
-30	120	97	0.0273
-20		100	0.0281
-10		99	0.0278
0		102	0.0287
10		101	0.0284
20		100	0.0281
30		104	0.0293
40		96	0.0270
50		101	0.0284

Test Frequency: 3557.5MHz QPSK 15MHz			
Temperature (°C)	Power Supply (VAC)	Frequency Error (Hz)	Frequency Error (ppm)
-30	120	108	0.0304
-20		102	0.0287
-10		105	0.0295
0		105	0.0295
10		108	0.0304
20		107	0.0301
30		105	0.0295
40		97	0.0273
50		105	0.0295

Test Frequency: 3560MHz QPSK 20MHz			
Temperature (°C)	Power Supply (VAC)	Frequency Error (Hz)	Frequency Error (ppm)
-30	120	107	0.0301
-20		103	0.0289
-10		99	0.0278
0		103	0.0289
10		94	0.0264
20		107	0.0301
30		104	0.0292
40		106	0.0298
50		103	0.0289

Chain 1

Test Frequency: 3555MHz QPSK 10MHz			
Temperature (°C)	Power Supply (VAC)	Frequency Error (Hz)	Frequency Error (ppm)
-30	120	107	0.0301
-20		105	0.0295
-10		102	0.0287
0		104	0.0293
10		110	0.0309
20		108	0.0304
30		108	0.0304
40		106	0.0298
50		111	0.0312

Test Frequency: 3557.5MHz QPSK 15MHz			
Temperature (°C)	Power Supply (VAC)	Frequency Error (Hz)	Frequency Error (ppm)
-30	120	109	0.0306
-20		105	0.0295
-10		97	0.0273
0		101	0.0284
10		98	0.0275
20		105	0.0295
30		94	0.0264
40		100	0.0281
50		101	0.0284

Test Frequency: 3560MHz QPSK 20MHz			
Temperature (°C)	Power Supply (VAC)	Frequency Error (Hz)	Frequency Error (ppm)
-30	120	109	0.0306
-20		110	0.0309
-10		106	0.0298
0		106	0.0298
10		106	0.0298
20		108	0.0303
30		113	0.0317
40		105	0.0295
50		99	0.0278

14 Frequency stability V.S. Voltage measurement

Test Requirement: FCC Part2.1055
 Test Method: FCC Part2.1055
 Test Mode: Data communicating mode
 Limit: FCC:

Frequency range (MHz)	Fixed and base stations (±ppm)	Mobile stations (±ppm)	
		Over 2 watts output power	2 watts or less output power
Below 25	100	100	200
25-50	20	20	50
72-76	5		50
150-174	5	5	50
216-220	1.0		1.0
220-222	0.1	1.5	1.5
421-512	2.5	5	5
806-809	1.0	1.5	1.5
809-824	1.5	2.5	2.5
851-854	1.0	1.5	1.5
854-869	1.5	2.5	2.5
896-901	0.1	1.5	1.5
902-928	2.5	2.5	2.5
902-928	2.5	2.5	2.5
929-930	1.5		
935-940	0.1	1.5	1.5
1427-1435	300	300	300
Above 2450			

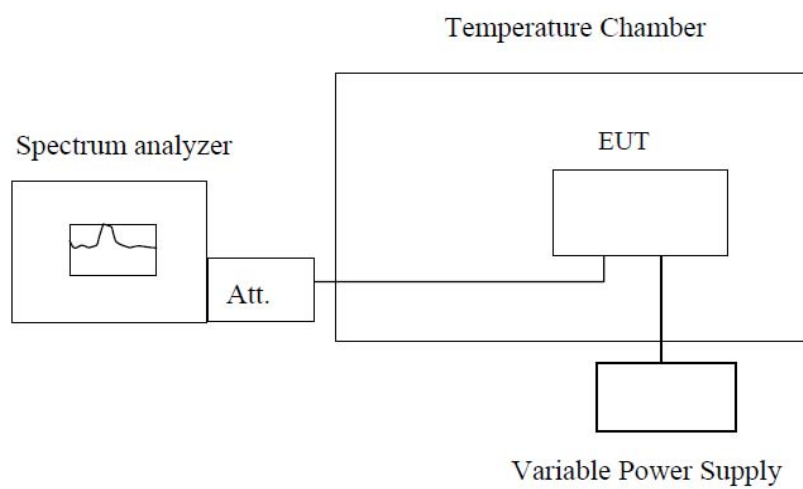
14.1 EUT Operation

Operating Environment :

Temperature: 23.7 °C
 Humidity: 52.9 % RH
 Atmospheric Pressure: 101.4kPa

14.2 Test Procedure

1. Set chamber temperature to 25°C. Use a variable DC power source to power the EUT and set the voltage to rated voltage.
2. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.
3. Reduce the input voltage to specify extreme voltage variation (+/- 15%) and endpoint, record the maximum frequency change.



Note : Measurement setup for testing on Antenna connector

14.3 Test Result

Remark: All three channels of all modulations have been tested, but only the worst channel and the worst modulation show in this test item.

Chain 0

Test Frequency: 3555MHz QPSK 10MHz			
Temperature (°C)	Power Supply (VAC)	Frequency Error (Hz)	Frequency Error (ppm)
25	102	110	0.0309
	120	112	0.0315
	138	104	0.0293

Test Frequency: 3557.5MHz QPSK 15MHz			
Temperature (°C)	Power Supply (VAC)	Frequency Error (Hz)	Frequency Error (ppm)
25	102	110	0.0309
	120	109	0.0306
	138	106	0.0298

Test Frequency: 3560MHz QPSK 20MHz			
Temperature (°C)	Power Supply (VAC)	Frequency Error (Hz)	Frequency Error (ppm)
25	102	103	0.0289
	120	116	0.0326
	138	110	0.0309

Chain 1

Test Frequency: 3555MHz QPSK 10MHz			
Temperature (°C)	Power Supply (VAC)	Frequency Error (Hz)	Frequency Error (ppm)
25	102	116	0.0326
	120	108	0.0304
	138	105	0.0295

Test Frequency: 3557.5MHz QPSK 15MHz			
Temperature (°C)	Power Supply (VAC)	Frequency Error (Hz)	Frequency Error (ppm)
25	102	102	0.0287
	120	105	0.0295
	138	106	0.0298

Test Frequency: 3560MHz QPSK 20MHz			
Temperature (°C)	Power Supply (VAC)	Frequency Error (Hz)	Frequency Error (ppm)
25	102	107	0.0301
	120	106	0.0298
	138	107	0.0301

15 Photographs of test setup and EUT.

Note: Please refer to appendix: EG8015G-M11-HP-EUD_Photos.

===== End of Report =====