

TEST REPORT

Reference No...... : WTS20S06037570W001 V1
FCC ID : 2AG32MBS3100196N
Applicant..... : Baicells Technologies Co., Ltd.
Address..... : 3F, Hui Yuan Development Building, No.1 Shangdi Information
Industry Base, Haidian Dist., Beijing, China
Manufacturer : Baicells Technologies Co., Ltd.
Address..... : 3F, Hui Yuan Development Building, No.1 Shangdi Information
Industry Base, Haidian Dist., Beijing, China
Product..... : LTE Base Station
Model(s)..... : mBS31001
Brand Name..... : Baicells
Standards..... : FCC CFR Title 47 Part 2
FCC CFR Title 47 Part 96
Date of Receipt sample : 2020-06-16
Date of Test : 2020-06-18 to 2020-06-30
Date of Issue..... : 2020-07-03
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:

Waltek Services (Shenzhen) Co., Ltd.

Address: 1/F., Fukangtai Building, West Baima Road, Songgang Street, Baoan District, Shenzhen,
Guangdong, China

Tel :+86-755-83551033

Fax:+86-755-83552400

Compiled by:

Ford Wang

Ford Wang / Project Engineer

Approved by:



Philo Zhang

Philo Zhang / Manager

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 TEST FACILITY	6
5 TEST SUMMARY	7
6 EQUIPMENT USED DURING TEST	8
6.1 EQUIPMENTS LIST	8
6.2 MEASUREMENT UNCERTAINTY	8
6.3 TEST EQUIPMENT CALIBRATION	8
7 MAX EIRP AND MAXIMUM SPECTRAL DENSITY	9
7.1 EUT OPERATION.....	9
7.2 TEST PROCEDURE	9
7.3 TEST RESULT	10
8 PEAK-TO-AVERAGE POWER RADIO	35
8.1 EUT OPERATION.....	35
8.2 TEST PROCEDURE	35
8.3 TEST RESULT	35
9 99% & -26 DB OCCUPIED BANDWIDTH.....	36
9.1 EUT OPERATION.....	36
9.2 TEST PROCEDURE	36
9.3 TEST RESULT	36
10 EMISSION MASK	37
10.1 EUT OPERATION.....	37
10.2 TEST PROCEDURE.....	37
10.3 TEST RESULT	37
11 SPURIOUS EMISSIONS AT ANTENNA TERMINAL.....	42
11.1 EUT OPERATION.....	42
11.2 TEST PROCEDURE.....	42
11.3 TEST RESULT	42
12 FIELD STRENGTH OF SPURIOUS RADIATION MEASUREMENT	43
12.1 EUT OPERATION.....	43
12.2 TEST SETUP	43
12.3 SPECTRUM ANALYZER SETUP	44
12.4 TEST PROCEDURE.....	45
12.5 TEST RESULT	45
13 FREQUENCY STABILITY V.S. TEMPERATURE MEASUREMENT.....	46
13.1 EUT OPERATION.....	46
13.2 TEST PROCEDURE.....	46
13.3 TEST RESULT	47

14 FREQUENCY STABILITY V.S. VOLTAGE MEASUREMENT..... 48

14.1 EUT OPERATION 48

14.2 TEST PROCEDURE..... 48

14.3 TEST RESULT 49

3 Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTS20S06037 570W001	2020-06-16	2020-06-18 to 2020-06-30	2020-07-01	original	-	Replaced
WTS20S06037 570W001 V1	2020-06-16	2020-06-18 to 2020-06-30	2020-07-03	Version1	Updated	Valid

4 General Information

4.1 General Description of E.U.T.

Product:	LTE Base Station
Model(s):	mBS31001
Model Description:	N/A
Storage Location:	Internal Storage
Category of CBSD:	Category B

4.2 Details of E.U.T.

Operation Frequency:	LTE Band 48:3550MHz-3700MHz
Type of Modulation:	QPSK, 16QAM, 64QAM
Antenna installation:	Directional antenna
Antenna Gain:	15dBi
Ratings:	48V AC/DC Adaptor

4.3 Channel List

Normal

10MHz		20MHz	
Channel	Frequency (MHz)	Channel	Frequency (MHz)
Low	3555	Low	3560
Middle	3625	Middle	3625
High	3695	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, 20MHz)
Data Mode (64QAM)	Keep the EUT in data communicating mode (64QAM). (10MHz, 20MHz)

4.5 Test Facility

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

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

Waltek Services(Shenzhen) 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 Services(Shenzhen) 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	Tested Channel (MHz)	Channel Bandwidth	Modulation	Result
Max EIRP and maximum spectral density	3555 to 3695	10MHz	QPSK, 64QAM	Pass
	3560 to 3690	20MHz	QPSK, 64QAM	
Peak-to-average power radio	3555 to 3695	10MHz	QPSK, 64QAM	Pass*
	3560 to 3690	20MHz	QPSK, 64QAM	
99% & -26 dB Occupied Bandwidth	3555 to 3695	10MHz	QPSK, 64QAM	Pass*
	3560 to 3690	20MHz	QPSK, 64QAM	
Emission Mask	3555 to 3695	10MHz	QPSK	Pass**
	3560 to 3690	20MHz	QPSK	
Spurious Emissions at Antenna Terminal	3555 to 3695	10MHz	QPSK, 64QAM	Pass*
	3560 to 3690	20MHz	QPSK, 64QAM	
Field Strength of Spurious Radiation	3555 to 3695	10MHz	QPSK, 64QAM	Pass*
	3560 to 3690	20MHz	QPSK, 64QAM	
Frequency stability vs. temperature	3555 to 3695	10MHz	QPSK, 64QAM	Pass*
	3560 to 3690	20MHz	QPSK, 64QAM	
Frequency stability vs. voltage	3555 to 3695	10MHz	QPSK, 64QAM	Pass*
	3560 to 3690	20MHz	QPSK, 64QAM	

Pass: The EUT complies with the essential requirements in the standard.

Note:

- 1, The device is based on the original FCC ID: 2AG32MBS31001, reducing the power level and updating the antenna gain value.
- 2, The duty cycle correction = $10 \log (1/0.68) = 1.67 \text{ (dB)}$
 Offset factory=ATT loss + Cable loss + Duty cycle correction=10+0.5+1.67=12.17(dB)

Pass*: The device (FCC ID: 2AG32MBS3100196N) is based on the original device (FCC ID: 2AG32MBS31001) to reduce the power level, according to KDB484596 D01 Referencing Test Data v01, the data of these test programs can be reference, including 99% OBW and -26dB Bandwidth, Peak to Average Radio, 3.5GHz Emission and Interference Limits , spurious emissions at antenna terminals, radiated spurious emissions and Frequency stability from the original report 2477ERM.001A2.

Pass**: The spot-check test data is better than the original test data. So it demonstrate compliance with the requirements.

6 Equipment Used during Test

6.1 Equipments List

RF Conducted Testing						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EXA Signal Analyzer	Malaysia Keysight	N9010A	MY50520207	2020-04-20	2021-04-19

6.2 Measurement Uncertainty

Parameter	Uncertainty
RF Power	± 0.42 dB
RF Power Density	± 0.7 dB
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:	23.5 °C
Humidity:	51.1 % RH
Atmospheric Pressure:	101.2kPa

7.2 Test Procedure

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. $EIRP = P_{Meas} + G_T$.

P_{Meas} measured transmitter output power or PSD.
 G_T gain of the transmitting antenna.

For Maximum PSD

The PSD is measured following the same procedures described for measuring the maximum EIRP but with the RBW set to the reference bandwidth specified(eg.1MHz) by the applicable regulatory requirement, and by using the marker function to identify the maximum PSD instead of summing the power across the OBW.

7.3 Test Result

Port1 and Port2

Transmit Output Power								
Bandwidth (MHz)	Modulation	Test Channel	Port1 Output Power (dBm/10MHz)	Port2 Output Power (dBm/10MHz)	Total Power (dBm/10MHz)	Antenna Gain (dBi)	EIRP (dBm/10MHz)	EIRP Limit (dBm/10MHz)
10	QPSK	Low	25.69	25.17	28.45	15	43.45	47
		Middle	25.74	25.43	28.60	15	43.60	
		High	25.44	25.46	28.46	15	43.46	
	64QAM	Low	25.66	25.08	28.39	15	43.39	
		Middle	25.63	25.42	28.54	15	43.54	
		High	25.60	25.43	28.53	15	43.53	

Port3 and Port4

Transmit Output Power								
Bandwidth (MHz)	Modulation	Test Channel	Port3 Output Power (dBm/10MHz)	Port4 Output Power (dBm/10MHz)	Total Power (dBm/10MHz)	Antenna Gain (dBi)	EIRP (dBm/10MHz)	EIRP Limit (dBm/10MHz)
10	QPSK	Low	25.74	26.20	28.99	15	43.99	47
		Middle	25.79	26.46	29.15	15	44.15	
		High	25.55	26.04	28.81	15	43.81	
	64QAM	Low	25.73	26.16	28.96	15	43.96	
		Middle	25.77	26.34	29.07	15	44.07	
		High	25.53	25.95	28.76	15	43.76	

Port1, 2,3 and Port4

Transmit Output Power								
Bandwidth (MHz)	Modulation	Test Channel	Port1&Port2 Output Power (dBm/10MHz)	Port3&Port4 Output Power (dBm/10MHz)	Total Power (dBm/10MHz)	Antenna Gain (dBi)	EIRP (dBm/10MHz)	EIRP Limit (dBm/10MHz)
10	QPSK	Low	28.45	28.99	31.74	15	46.74	47
		Middle	28.60	29.15	31.89	15	46.89	
		High	28.46	28.81	31.65	15	46.65	
	64QAM	Low	28.39	28.96	31.69	15	46.69	
		Middle	28.54	29.07	31.82	15	46.82	
		High	28.53	28.76	31.66	15	46.66	

Port1 and Port2

Transmit Output Power								
Bandwidth (MHz)	Modulation	Test Channel	Port1 Output Power (dBm/10MHz)	Port2 Output Power (dBm/10MHz)	Total Power (dBm/10MHz)	Antenna Gain (dBi)	EIRP (dBm/10MHz)	EIRP Limit (dBm/10MHz)
20	QPSK	Low	23.15	23.03	26.10	15	41.10	47
		Middle	23.27	23.12	26.21	15	41.21	
		High	23.42	23.00	26.23	15	41.23	
	64QAM	Low	23.06	22.75	25.92	15	40.92	
		Middle	22.78	22.94	25.87	15	40.87	
		High	22.92	22.84	25.89	15	40.89	

Port3 and Port4

Transmit Output Power								
Bandwidth (MHz)	Modulation	Test Channel	Port3 Output Power (dBm/10MHz)	Port4 Output Power (dBm/10MHz)	Total Power (dBm/10MHz)	Antenna Gain (dBi)	EIRP (dBm/10MHz)	EIRP Limit (dBm/10MHz)
20	QPSK	Low	23.19	23.48	26.35	15	41.35	47
		Middle	23.39	23.42	26.42	15	41.42	
		High	23.38	23.38	26.39	15	41.39	
	64QAM	Low	23.04	23.27	26.17	15	41.17	
		Middle	22.99	23.14	26.08	15	41.08	
		High	23.03	23.10	26.08	15	41.08	

Port1, 2,3 and Port4

Transmit Output Power								
Bandwidth (MHz)	Modulation	Test Channel	Port1&Port2 Output Power (dBm/10MHz)	Port3&Port4 Output Power (dBm/10MHz)	Total Power (dBm/10MHz)	Antenna Gain (dBi)	EIRP (dBm/10MHz)	EIRP Limit (dBm/10MHz)
20	QPSK	Low	28.42	28.75	29.24	15	44.24	47
		Middle	28.57	29.05	29.33	15	44.33	
		High	28.43	28.86	29.32	15	44.32	
	64QAM	Low	28.37	28.68	29.06	15	44.06	
		Middle	28.42	28.75	28.99	15	43.99	
		High	28.23	28.61	29.00	15	44.00	

Port1 and Port2

Transmit Output Power								
Bandwidth (MHz)	Modulation	Test Channel	Port1 Output Power (dBm/20MHz)	Port2 Output Power (dBm/20MHz)	Total Power (dBm/20MHz)	Antenna Gain (dBi)	EIRP (dBm/20MHz)	EIRP Limit (dBm/10MHz)
20 Full Transmit	QPSK	Low	25.53	25.29	28.42	15	43.42	-
		Middle	25.75	25.36	28.57	15	43.57	
		High	25.63	25.19	28.43	15	43.43	
	64QAM	Low	25.46	25.26	28.37	15	43.37	
		Middle	25.43	25.39	28.42	15	43.42	
		High	25.26	25.18	28.23	15	43.23	

Port3 and Port4

Transmit Output Power								
Bandwidth (MHz)	Modulation	Test Channel	Port3 Output Power (dBm/20MHz)	Port4 Output Power (dBm/20MHz)	Total Power (dBm/20MHz)	Antenna Gain (dBi)	EIRP (dBm/20MHz)	EIRP Limit (dBm/10MHz)
20 Full Transmit	QPSK	Low	25.40	26.05	28.75	15	43.75	-
		Middle	25.84	26.24	29.05	15	44.05	
		High	25.61	26.07	28.86	15	43.86	
	64QAM	Low	25.45	25.88	28.68	15	43.68	
		Middle	25.60	25.87	28.75	15	43.75	
		High	25.42	25.78	28.61	15	43.61	

Port1, 2,3 and Port4

Transmit Output Power								
Bandwidth (MHz)	Modulation	Test Channel	Port1&Port2 Output Power (dBm/20MHz)	Port3&Port4 Output Power (dBm/20MHz)	Total Power (dBm/20MHz)	Antenna Gain (dBi)	EIRP (dBm/20MHz)	EIRP Limit (dBm/10MHz)
20 Full Transmit	QPSK	Low	28.42	28.75	31.60	15	46.60	-
		Middle	28.57	29.05	31.83	15	46.83	
		High	28.43	28.86	31.66	15	46.66	
	64QAM	Low	28.37	28.68	31.54	15	46.54	
		Middle	28.42	28.75	31.60	15	46.60	
		High	28.23	28.61	31.43	15	46.43	

Port1 and Port2

PSD								
Bandwidth (MHz)	Modulation	Test Channel	Port1 PSD (dBm/MHz)	Port2 PSD (dBm/MHz)	Total PSD (dBm/MHz)	Antenna Gain (dBi)	EIRP density (dBm/MHz)	EIRP density Limit (dBm/MHz)
10	QPSK	Low	15.782	15.423	18.617	15	33.617	37
		Middle	15.702	15.526	18.625	15	33.625	
		High	15.842	15.517	18.693	15	33.693	
	64QAM	Low	15.706	15.124	18.435	15	33.435	
		Middle	15.810	15.352	18.597	15	33.597	
		High	15.657	15.142	18.417	15	33.417	

Port3 and Port4

PSD								
Bandwidth (MHz)	Modulation	Test Channel	Port3 PSD (dBm/MHz)	Port4 PSD (dBm/MHz)	Total PSD (dBm/MHz)	Antenna Gain (dBi)	EIRP density (dBm/MHz)	EIRP density Limit (dBm/MHz)
10	QPSK	Low	16.047	16.220	19.145	15	34.145	37
		Middle	15.945	16.141	19.054	15	34.054	
		High	15.546	16.154	18.871	15	33.871	
	64QAM	Low	15.829	16.051	18.952	15	33.952	
		Middle	15.773	16.040	18.919	15	33.919	
		High	15.402	16.143	18.799	15	33.799	

Port1,2, 3 and Port4

PSD								
Bandwidth (MHz)	Modulation	Test Channel	Port1&Port2 PSD (dBm/MHz)	Port3&Port4 PSD (dBm/MHz)	Total PSD (dBm/MHz)	Antenna Gain (dBi)	EIRP density (dBm/MHz)	EIRP density Limit (dBm/MHz)
10	QPSK	Low	18.617	19.145	21.899	15	36.899	37
		Middle	18.625	19.054	21.855	15	36.855	
		High	18.693	18.871	21.793	15	36.793	
	64QAM	Low	18.435	18.952	21.711	15	36.711	
		Middle	18.597	18.919	21.771	15	36.771	
		High	18.417	18.799	21.622	15	36.622	

Port1 and Port2

PSD								
Bandwidth (MHz)	Modulation	Test Channel	Port1 PSD (dBm/MHz)	Port2 PSD (dBm/MHz)	Total PSD (dBm/MHz)	Antenna Gain (dBi)	EIRP density (dBm/MHz)	EIRP density Limit (dBm/MHz)
20	QPSK	Low	12.795	12.631	15.724	15	30.724	37
		Middle	13.745	12.745	16.284	15	31.284	
		High	13.379	12.314	15.889	15	30.889	
	64QAM	Low	12.842	12.490	15.680	15	30.680	
		Middle	12.900	12.577	15.752	15	30.752	
		High	12.868	12.318	15.612	15	30.612	

Port3 and Port4

PSD								
Bandwidth (MHz)	Modulation	Test Channel	Port3 PSD (dBm/MHz)	Port4 PSD (dBm/MHz)	Total PSD (dBm/MHz)	Antenna Gain (dBi)	EIRP density (dBm/MHz)	EIRP density Limit (dBm/MHz)
20	QPSK	Low	13.030	13.331	16.193	15	31.193	37
		Middle	13.421	13.561	16.502	15	31.502	
		High	13.239	13.828	16.554	15	31.554	
	64QAM	Low	12.790	13.281	16.053	15	31.053	
		Middle	13.239	13.334	16.297	15	31.297	
		High	12.834	13.608	16.249	15	31.249	

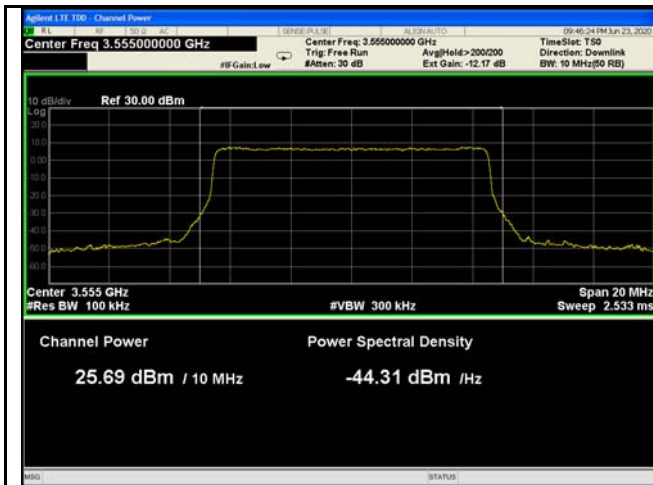
Port1,2, 3 and Port4

PSD								
Bandwidth (MHz)	Modulation	Test Channel	Port1&Port2 PSD (dBm/MHz)	Port3&Port4 PSD (dBm/MHz)	Total PSD (dBm/MHz)	Antenna Gain (dBi)	EIRP density (dBm/MHz)	EIRP density Limit (dBm/MHz)
20	QPSK	Low	15.724	16.193	18.975	15	33.975	37
		Middle	16.284	16.502	19.405	15	34.405	
		High	15.889	16.554	19.245	15	34.245	
	64QAM	Low	15.680	16.053	18.881	15	33.881	
		Middle	15.752	16.297	19.043	15	34.043	
		High	15.612	16.249	18.952	15	33.952	

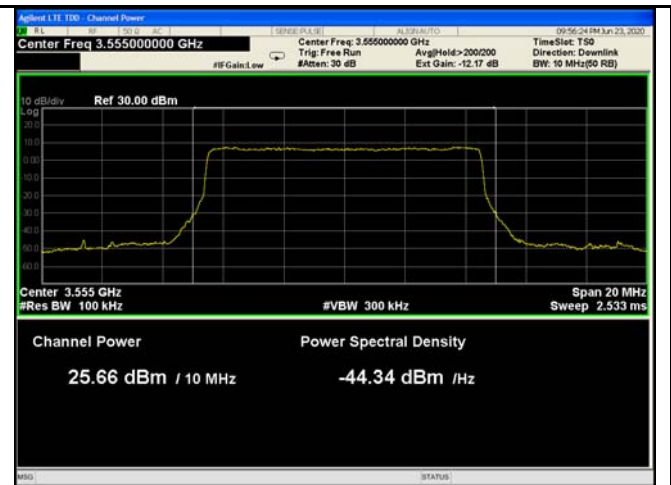
Test Plots

Transmit Output Power

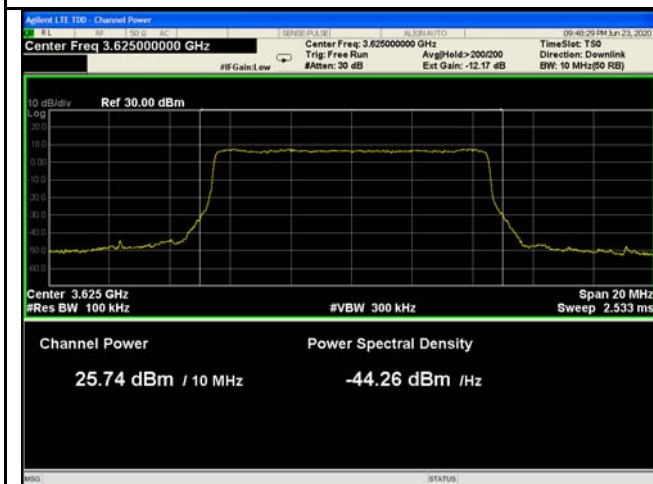
Port1



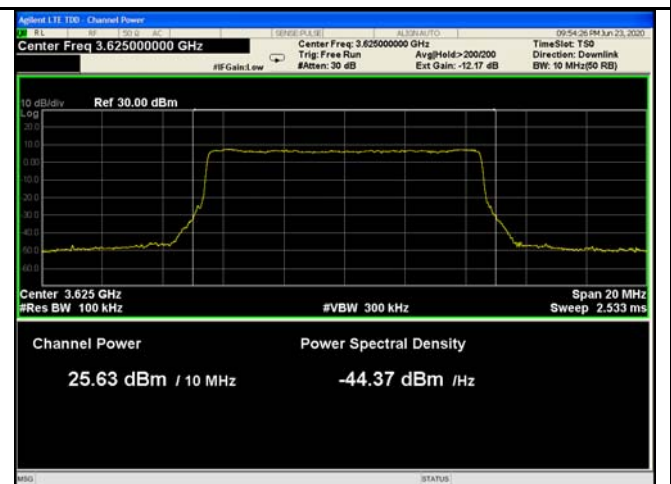
10MHz - Low CH QPSK



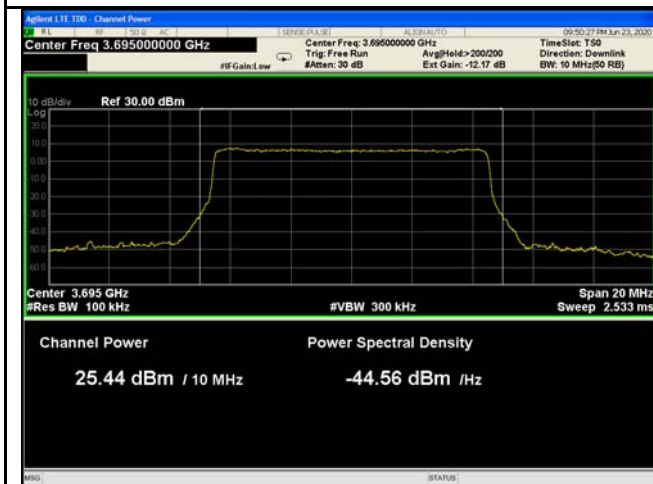
10MHz - Low CH 64QAM



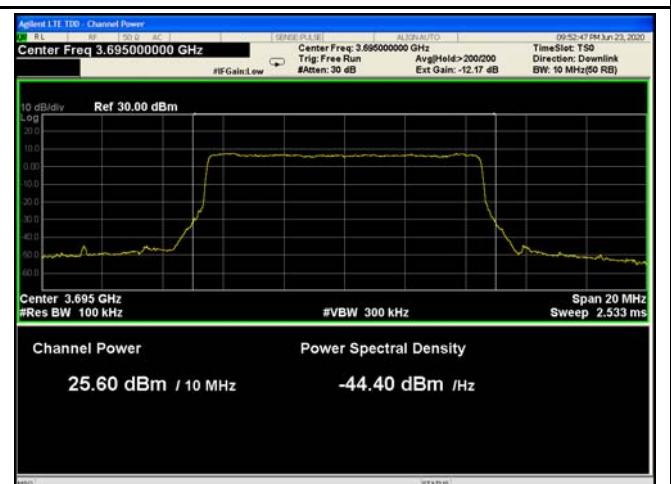
10MHz - Middle CH QPSK



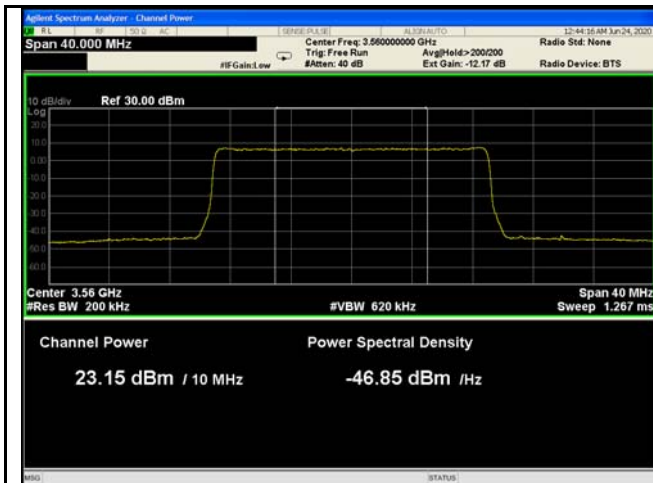
10MHz - Middle CH 64QAM



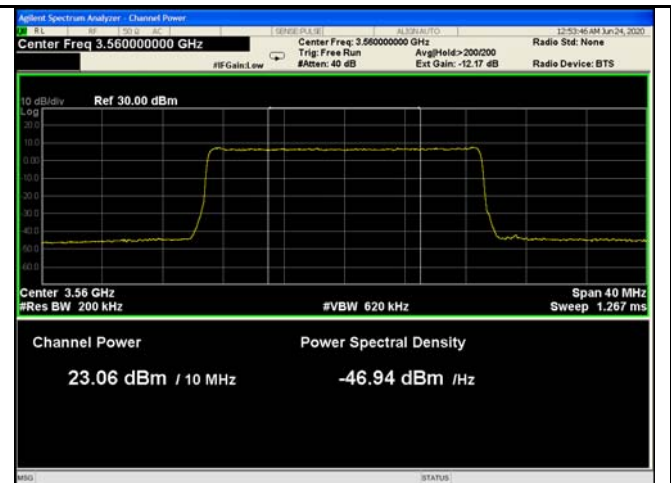
10MHz - High CH QPSK



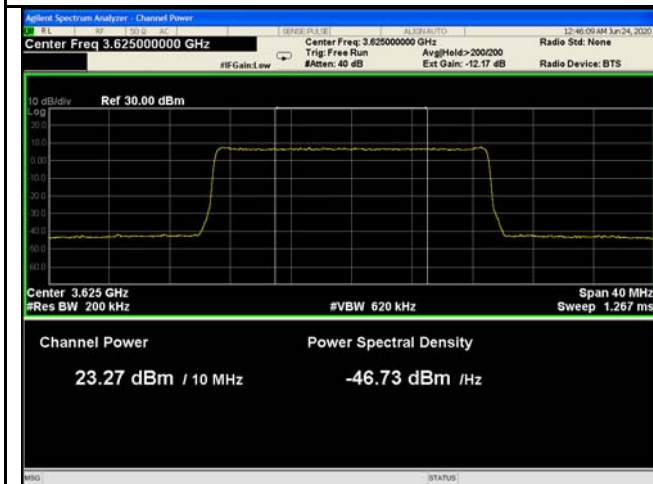
10MHz - High CH 64QAM



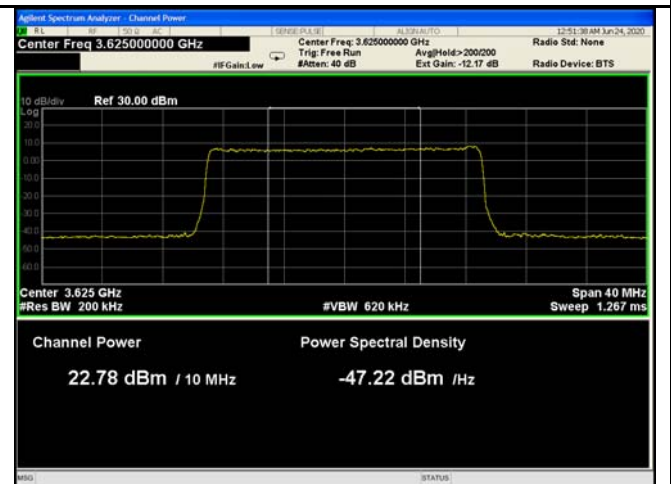
20MHz - Low CH QPSK



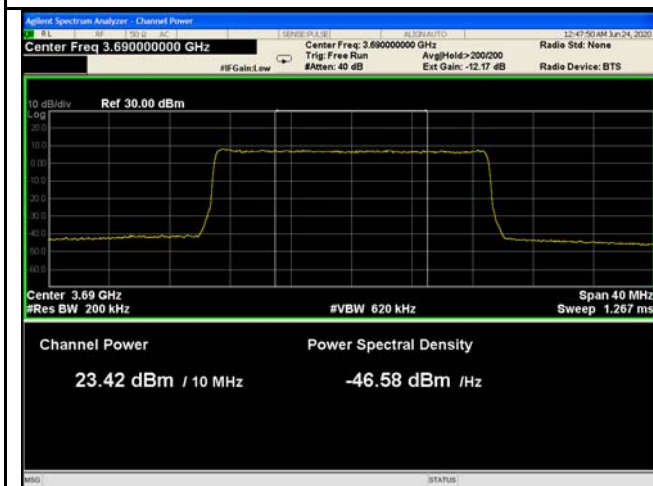
20MHz - Low CH 64QAM



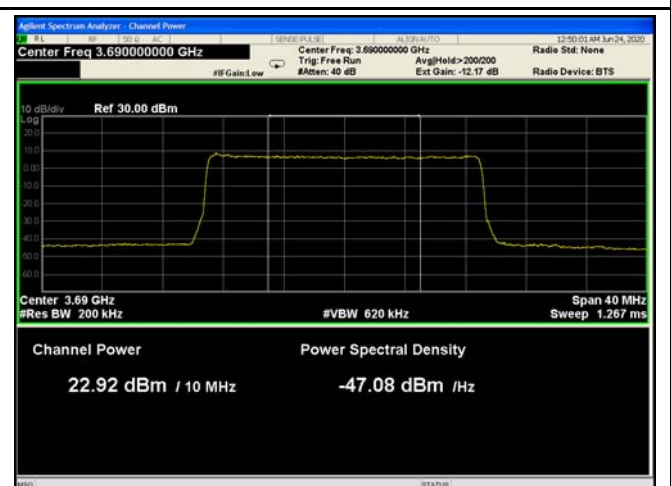
20MHz - Middle CH QPSK



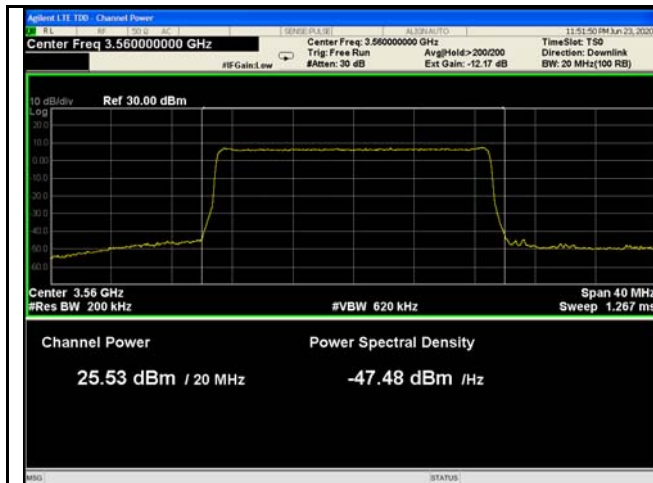
20MHz - Middle CH 64QAM



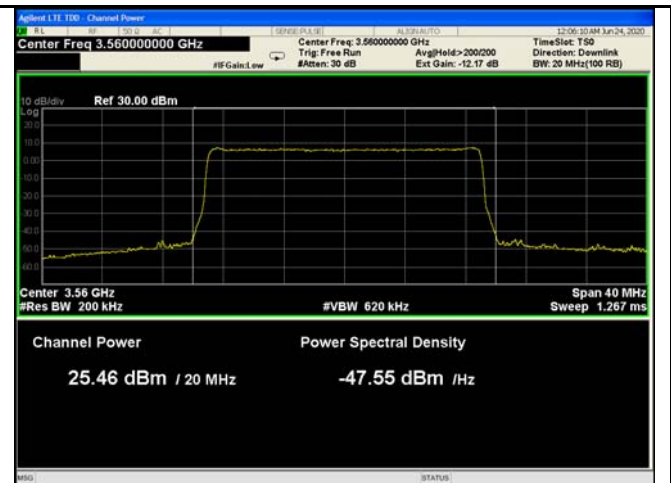
20MHz - High CH QPSK



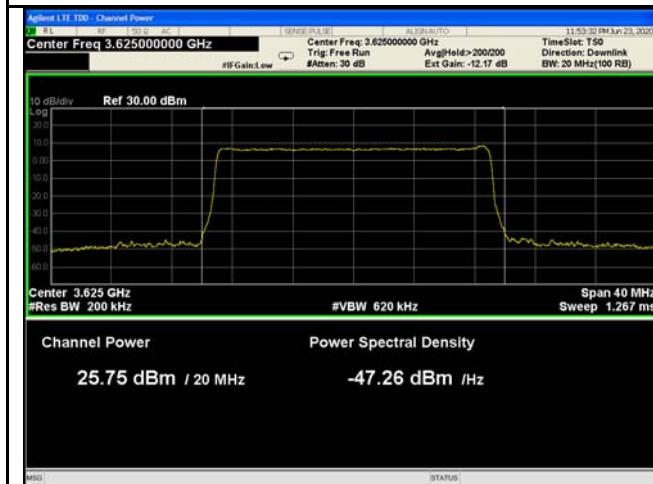
20MHz - High CH 64QAM



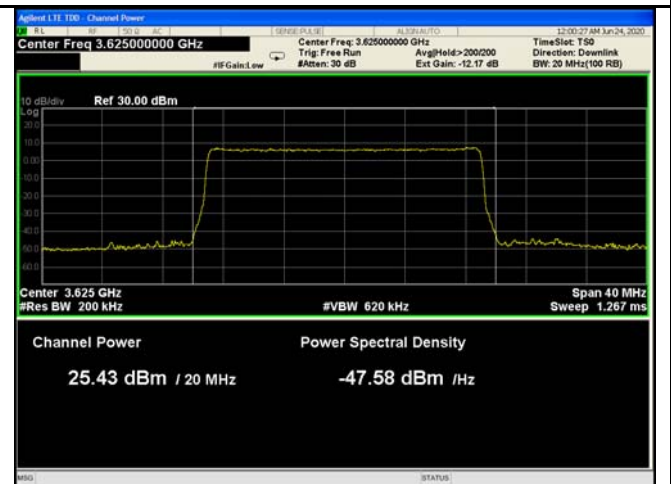
20MHz Full - Low CH QPSK



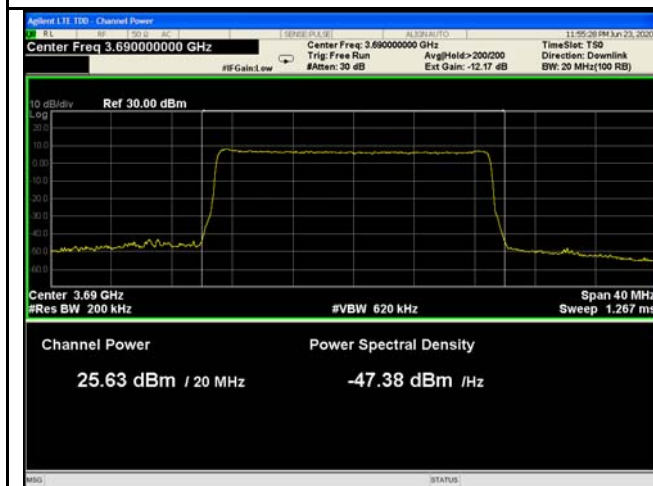
20MHz Full - Low CH 64QAM



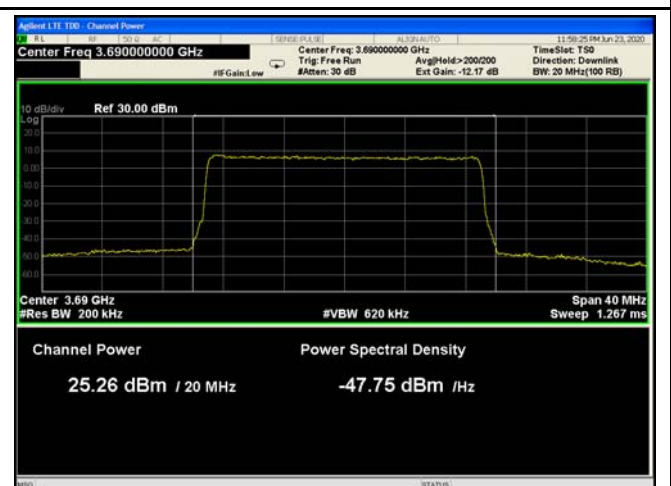
20MHz Full - Middle CH QPSK



20MHz Full - Middle CH 64QAM

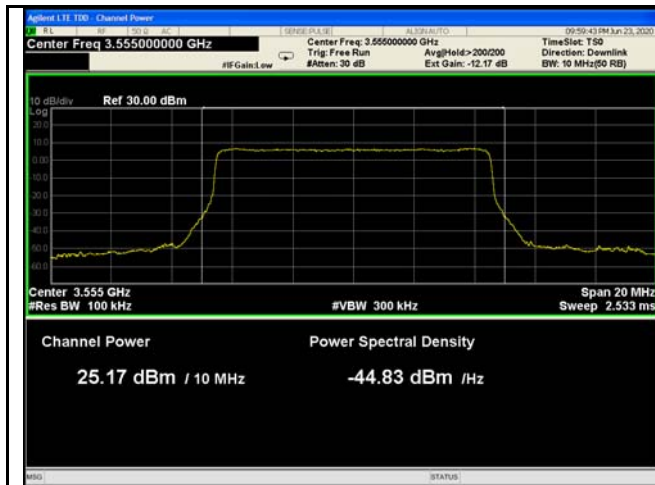


20MHz Full - High CH QPSK

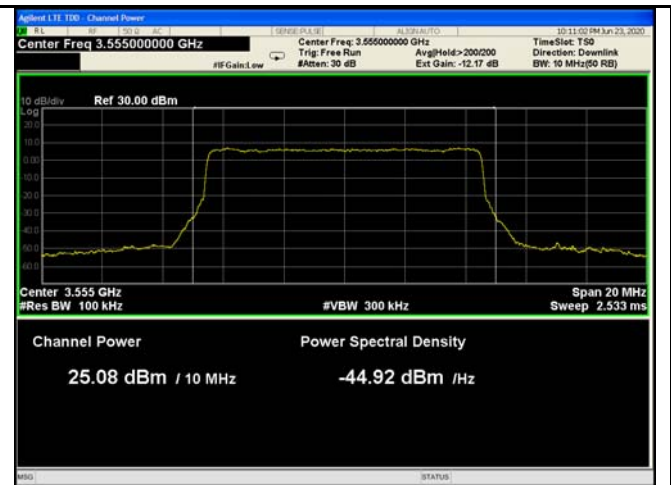


20MHz Full - High CH 64QAM

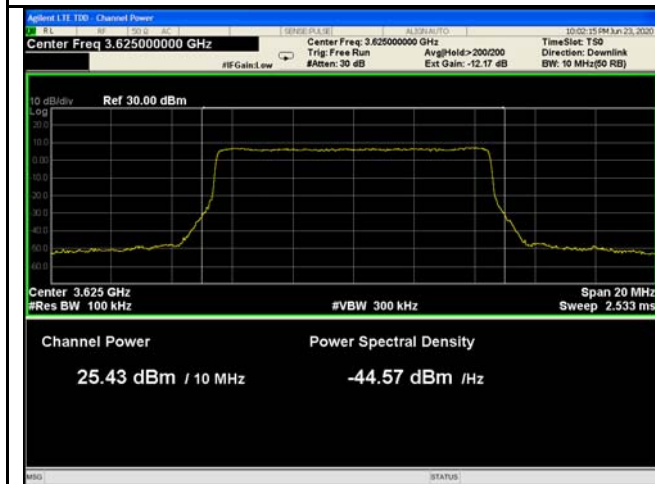
Port2



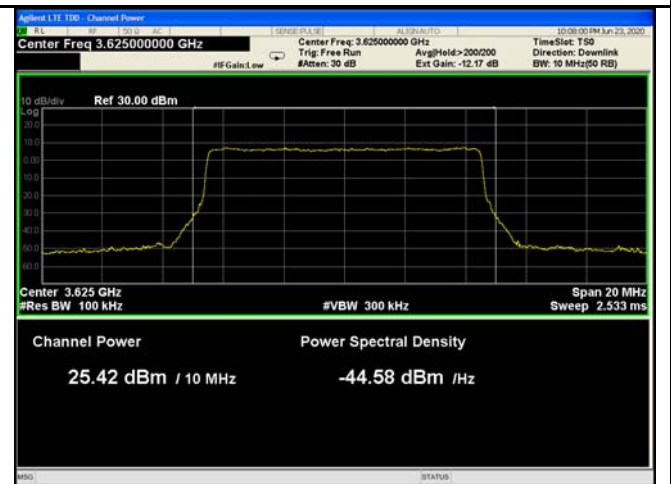
10MHz - Low CH QPSK



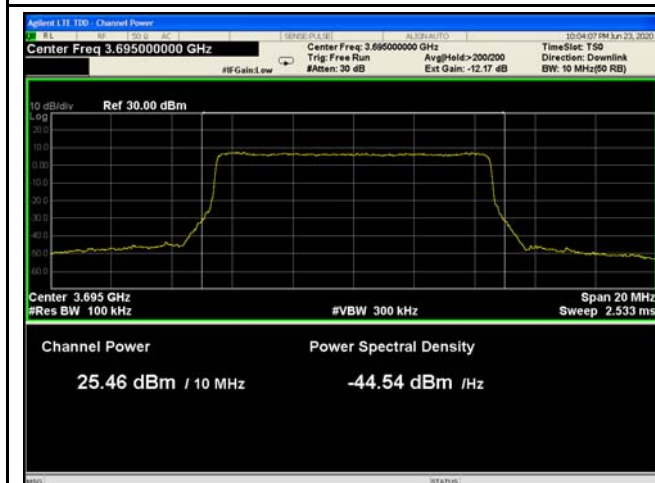
10MHz - Low CH 64QAM



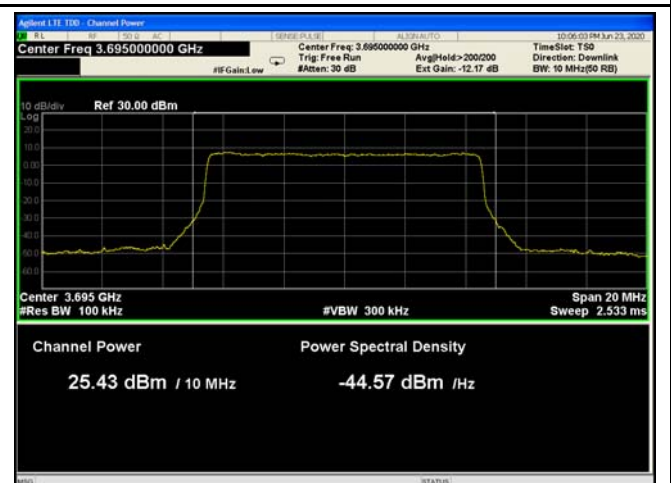
10MHz - Middle CH QPSK



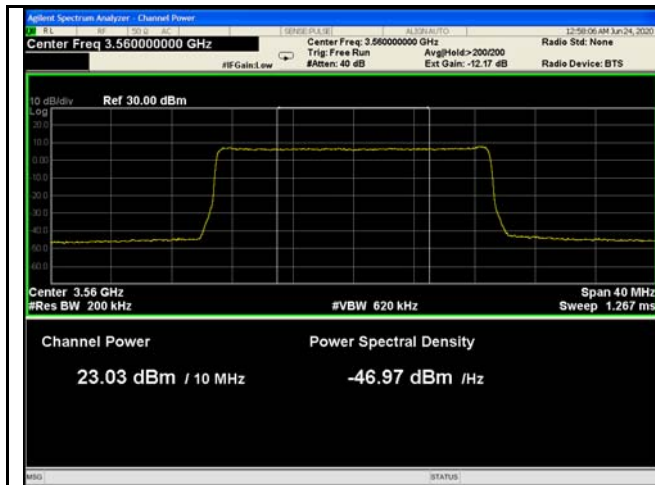
10MHz - Middle CH 64QAM



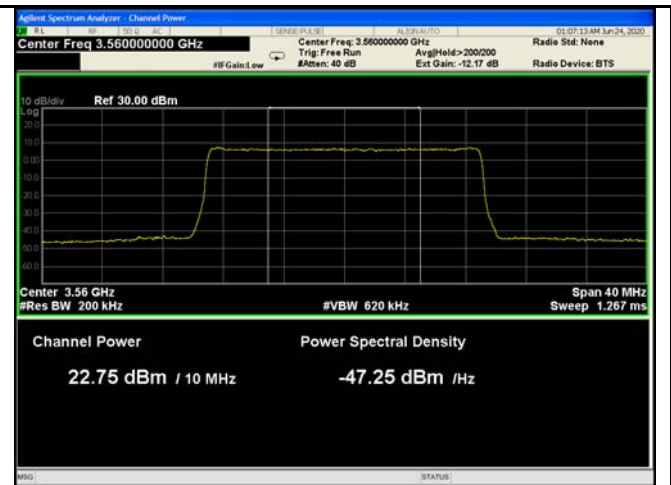
10MHz - High CH QPSK



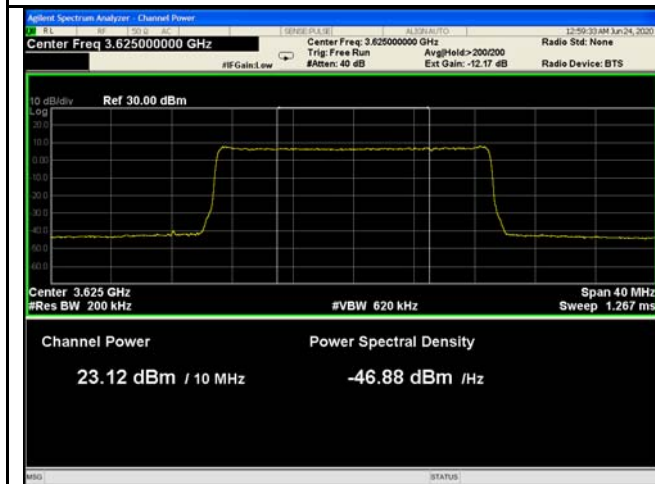
10MHz - High CH 64QAM



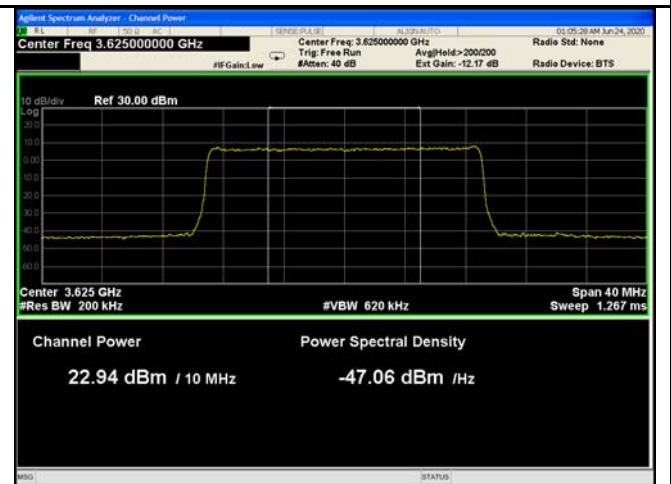
20MHz - Low CH QPSK



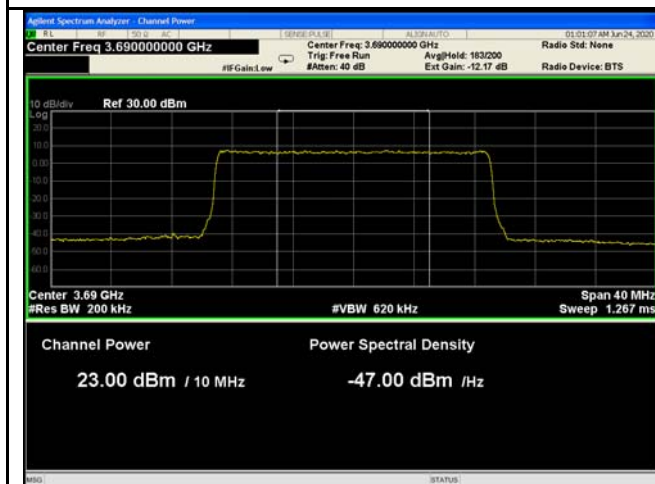
20MHz - Low CH 64QAM



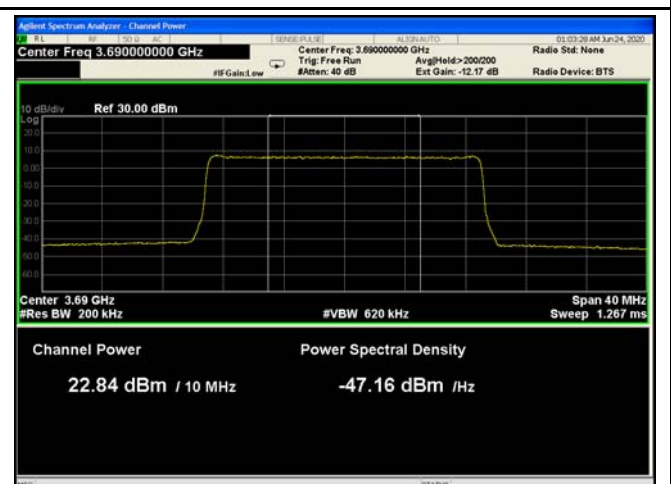
20MHz - Middle CH QPSK



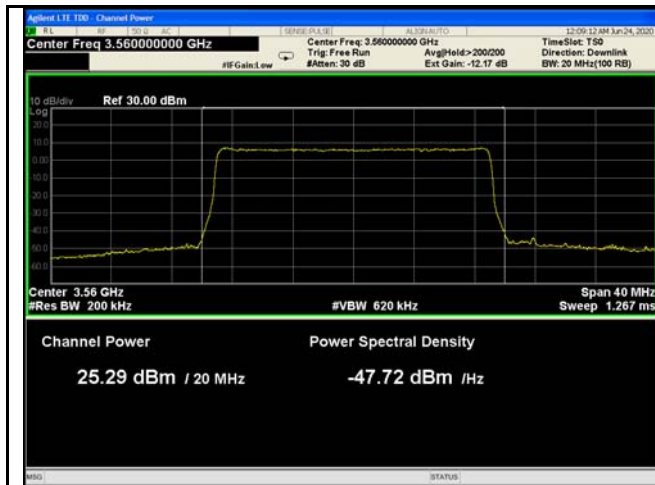
20MHz - Middle CH 64QAM



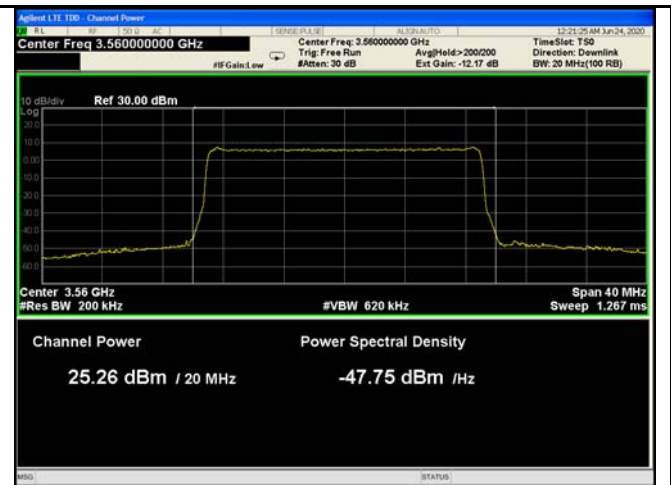
20MHz - High CH QPSK



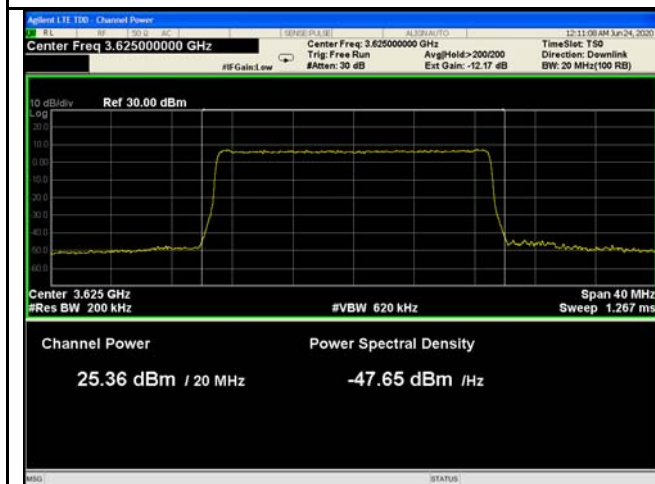
20MHz - High CH 64QAM



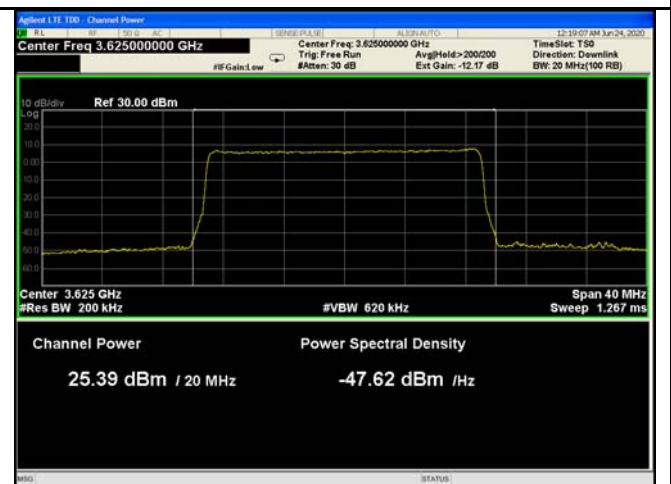
20MHz Full - Low CH QPSK



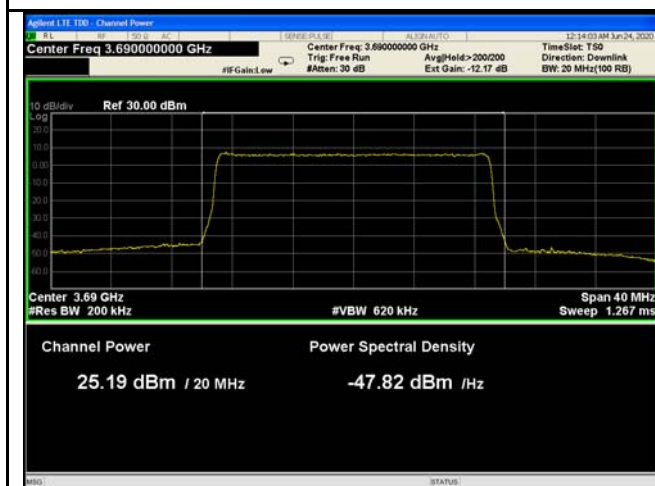
20MHz Full - Low CH 64QAM



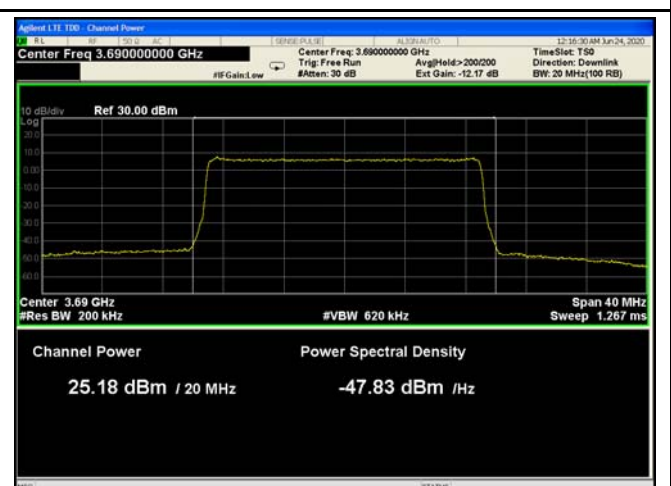
20MHz Full - Middle CH QPSK



20MHz Full - Middle CH 64QAM

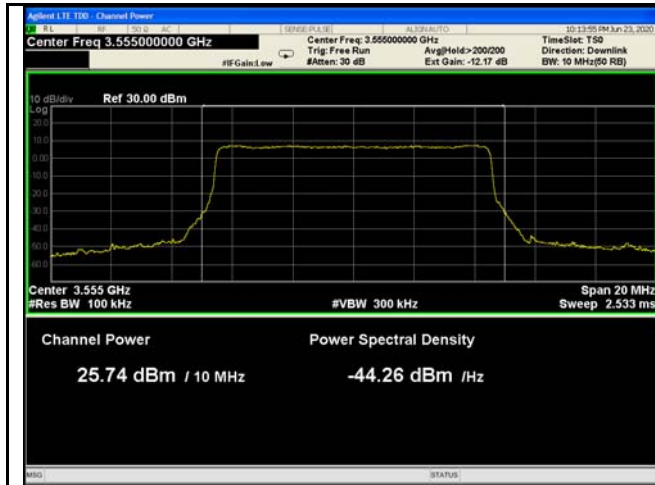


20MHz Full - High CH QPSK

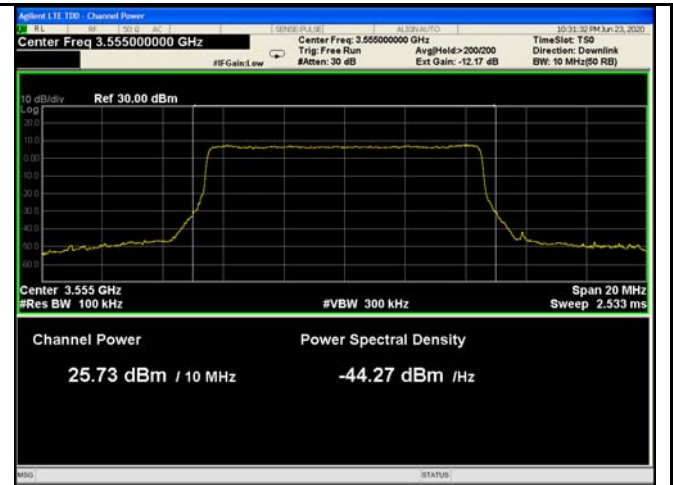


20MHz Full - High CH 64QAM

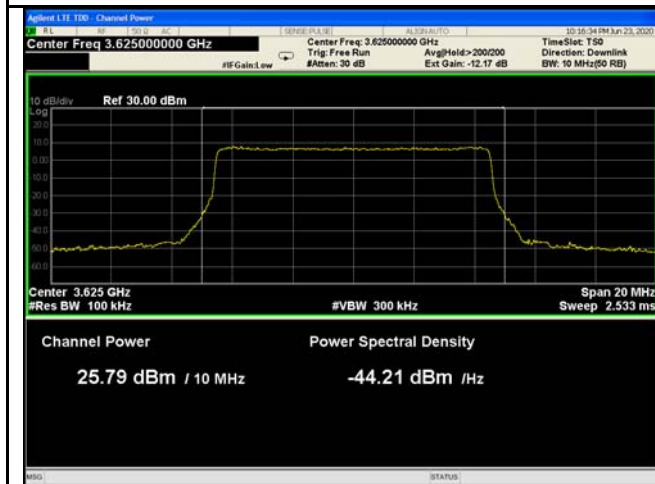
Port3



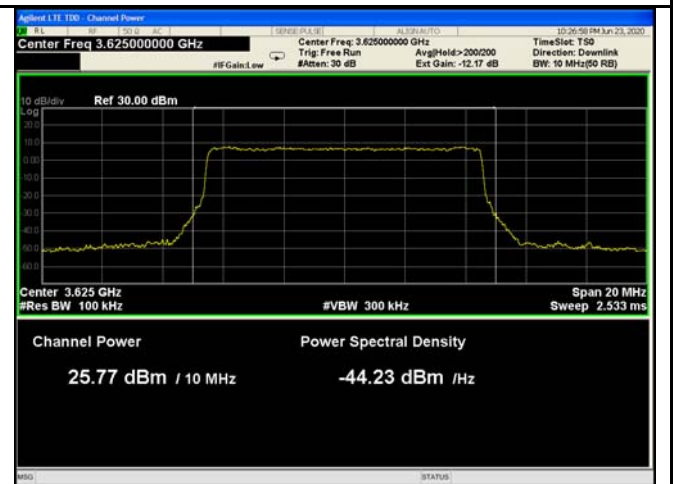
10MHz - Low CH QPSK



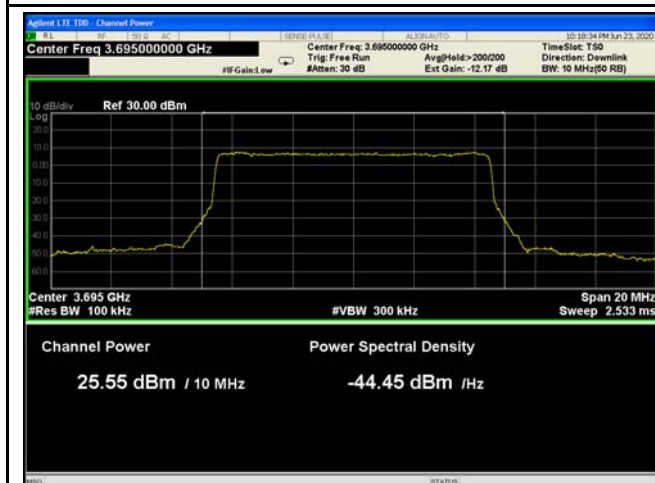
10MHz - Low CH 64QAM



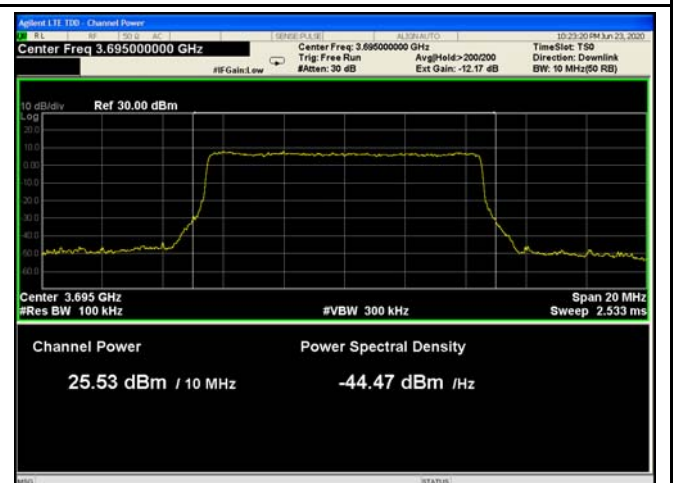
10MHz - Middle CH QPSK



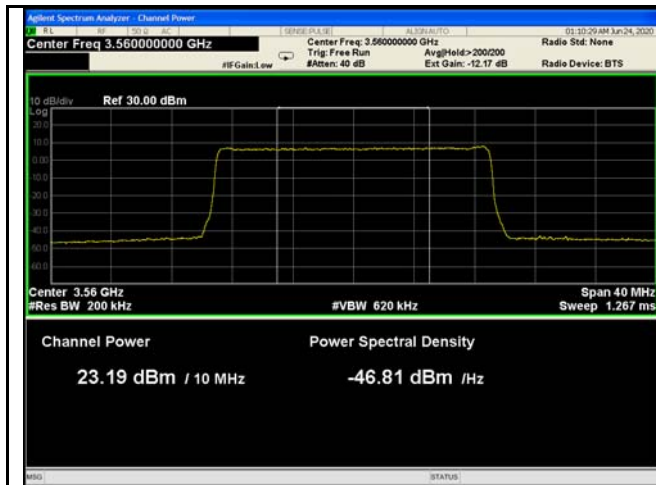
10MHz - Middle CH 64QAM



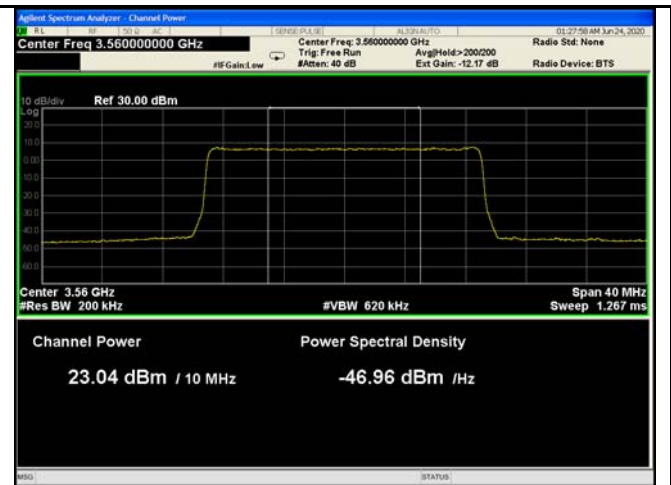
10MHz - High CH QPSK



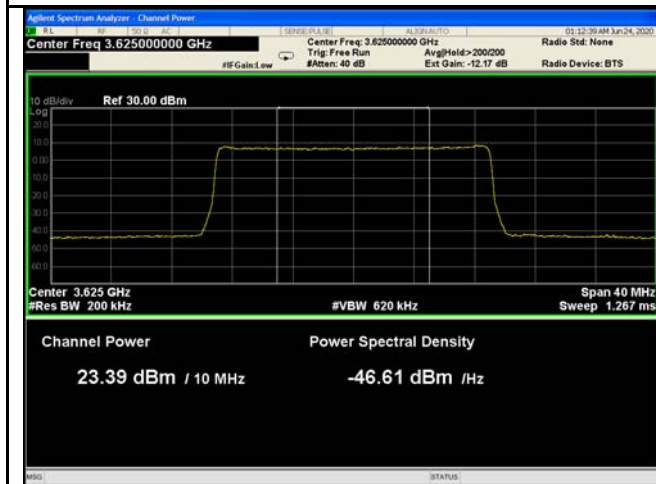
10MHz - High CH 64QAM



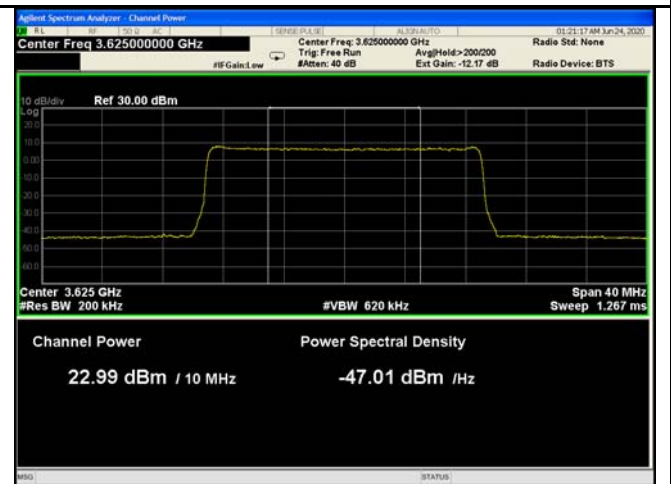
20MHz - Low CH QPSK



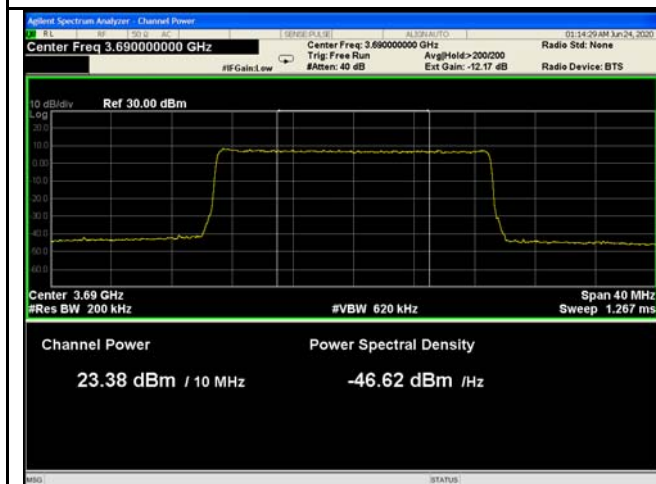
20MHz - Low CH 64QAM



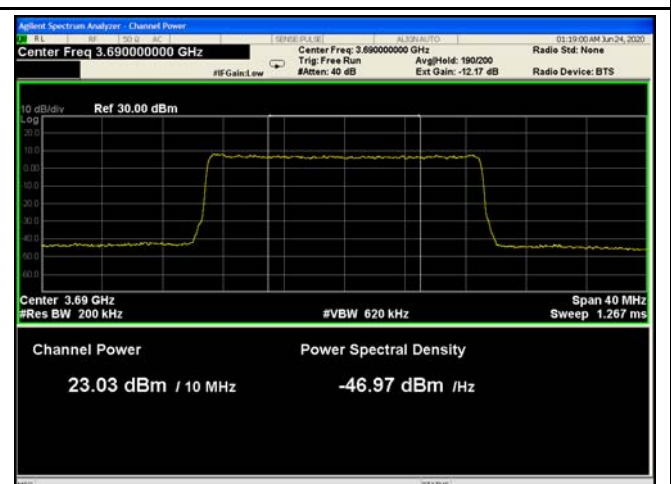
20MHz - Middle CH QPSK



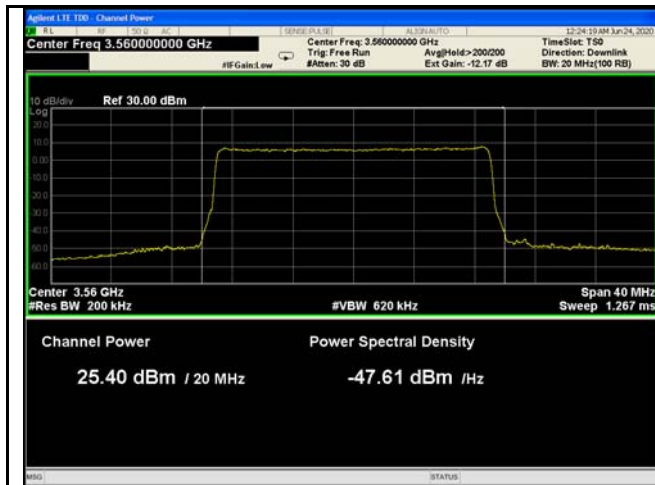
20MHz - Middle CH 64QAM



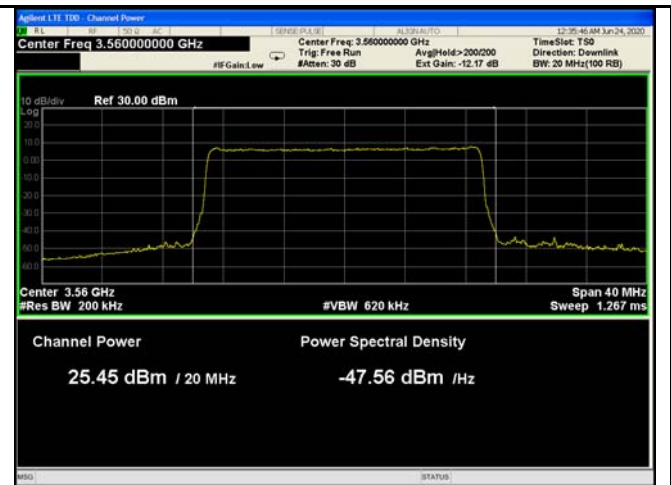
20MHz - High CH QPSK



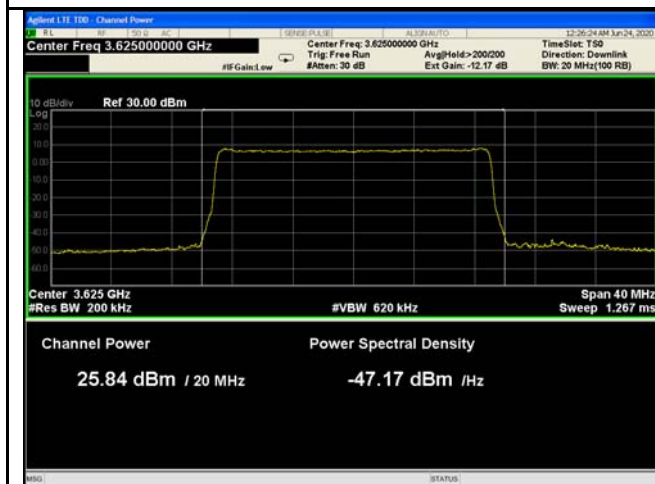
20MHz - High CH 64QAM



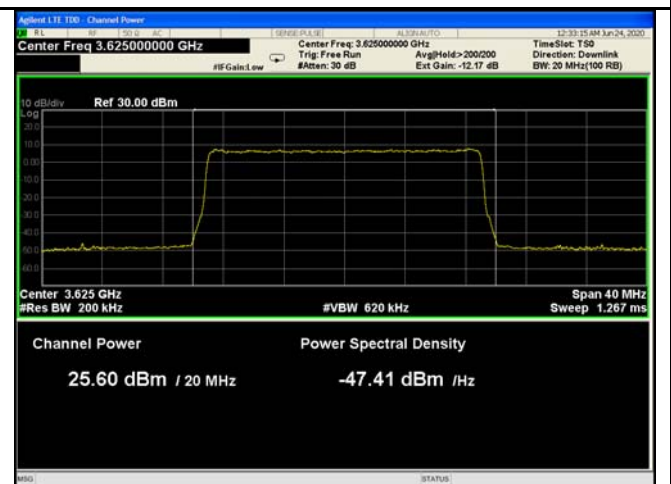
20MHz Full - Low CH QPSK



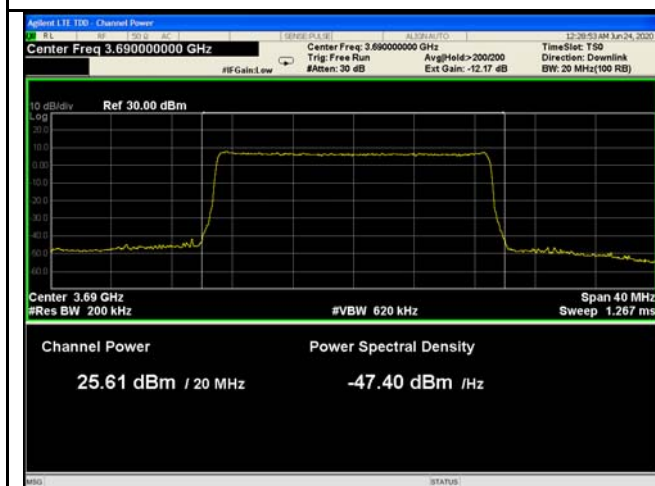
20MHz Full - Low CH 64QAM



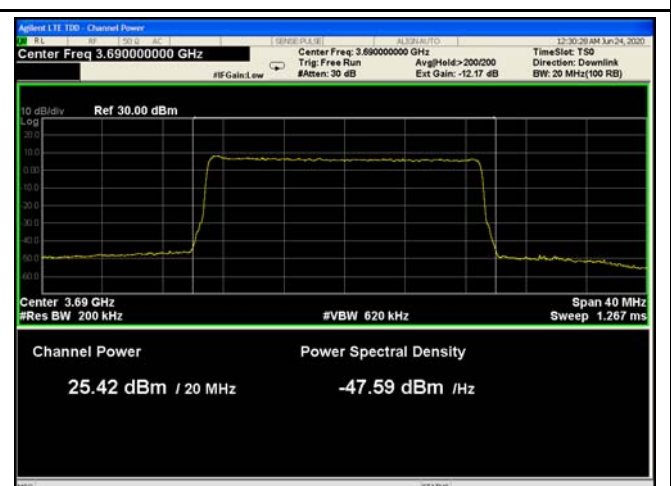
20MHz Full - Middle CH QPSK



20MHz Full - Middle CH 64QAM

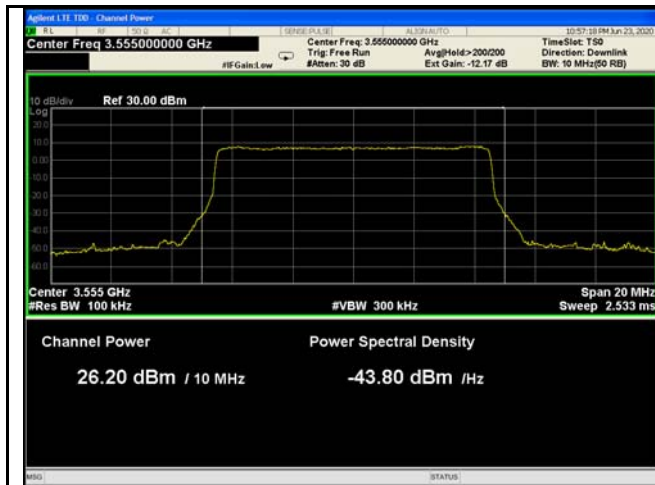


20MHz Full - High CH QPSK

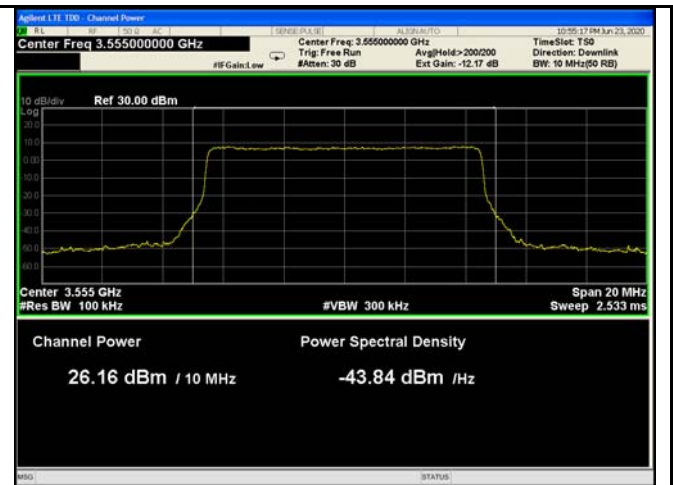


20MHz Full - High CH 64QAM

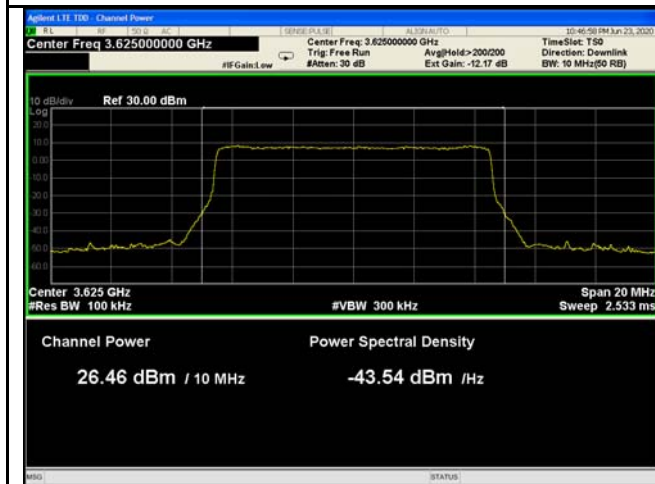
Port4



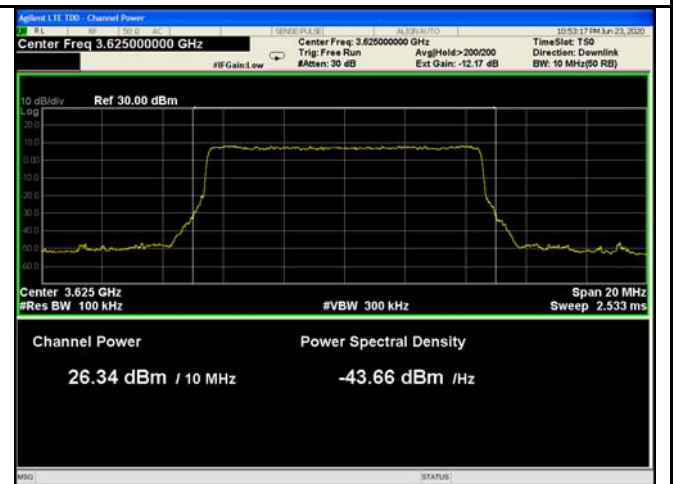
10MHz - Low CH QPSK



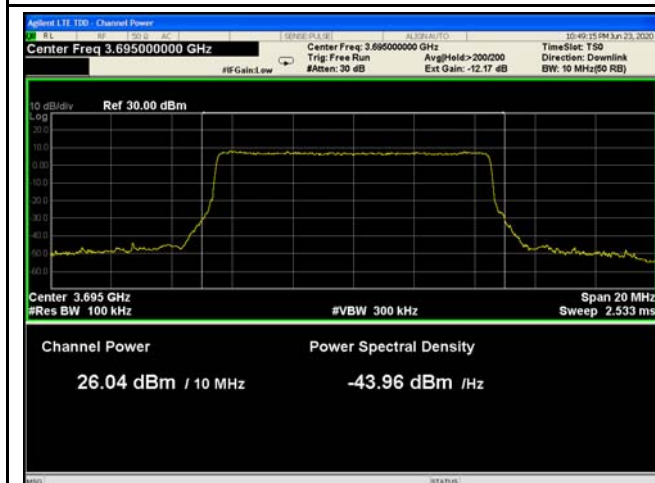
10MHz - Low CH 64QAM



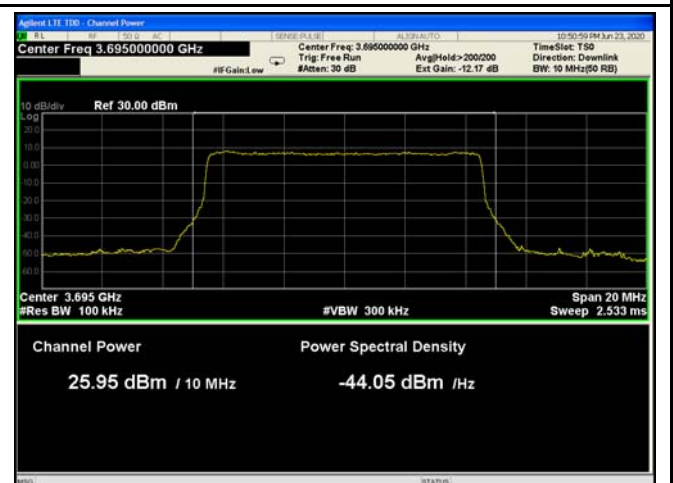
10MHz - Middle CH QPSK



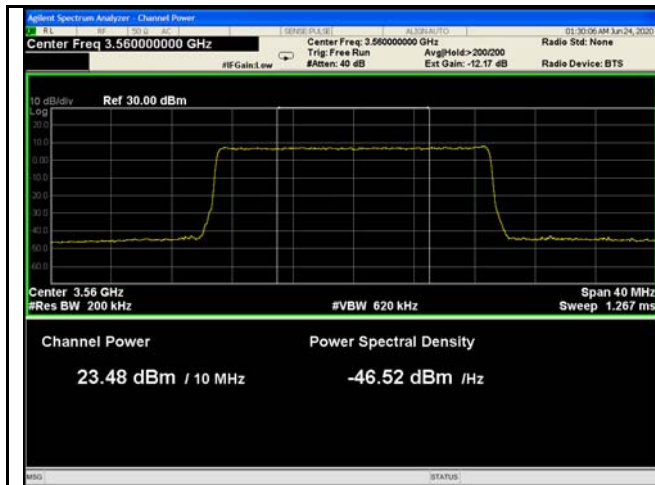
10MHz - Middle CH 64QAM



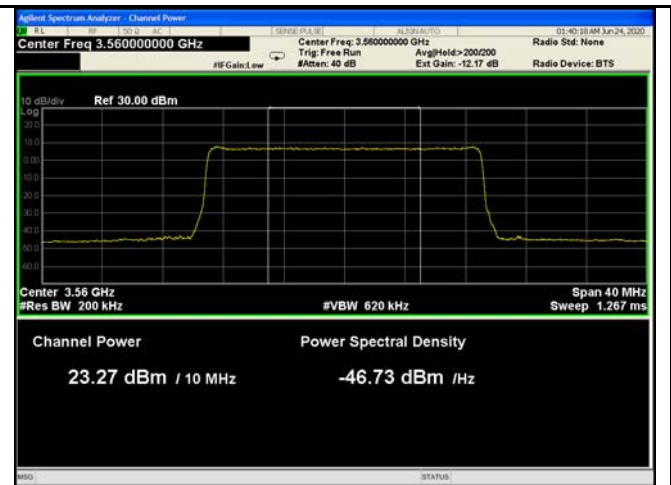
10MHz - High CH QPSK



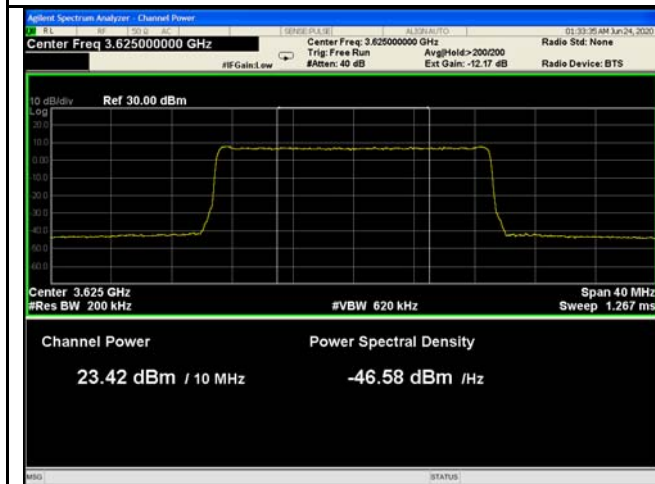
10MHz - High CH 64QAM



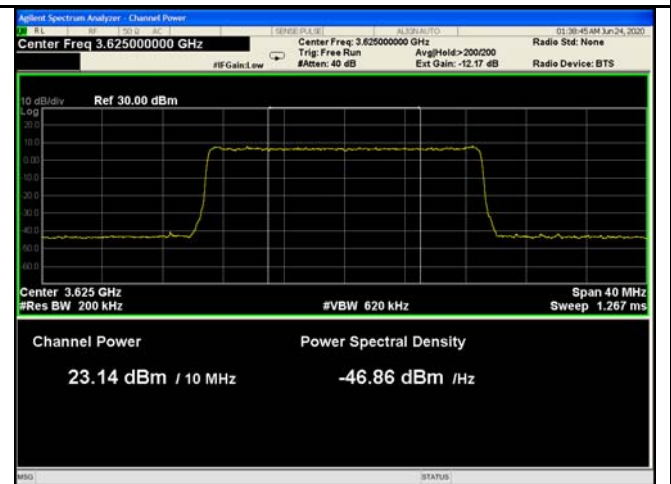
20MHz - Low CH QPSK



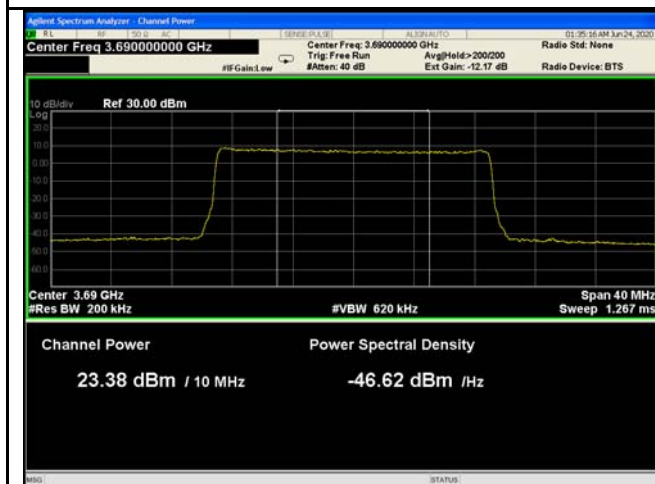
20MHz - Low CH 64QAM



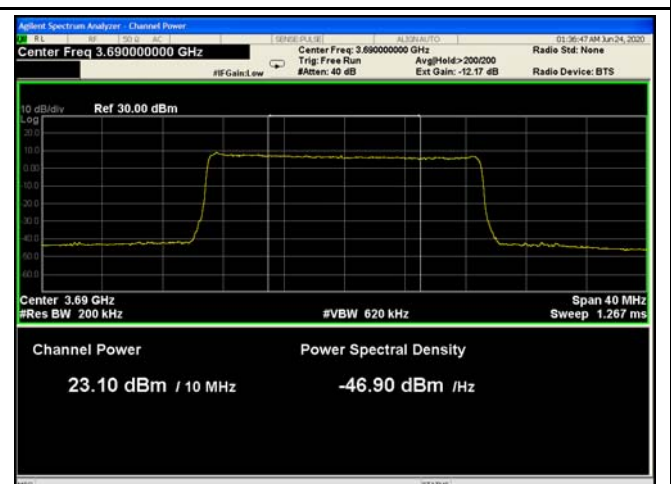
20MHz - Middle CH QPSK



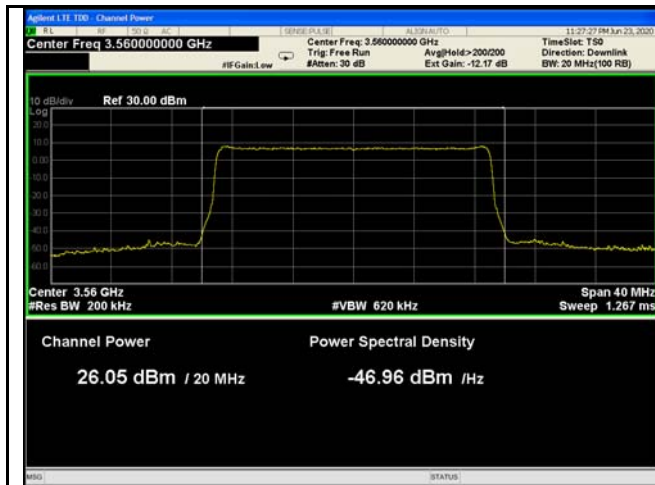
20MHz - Middle CH 64QAM



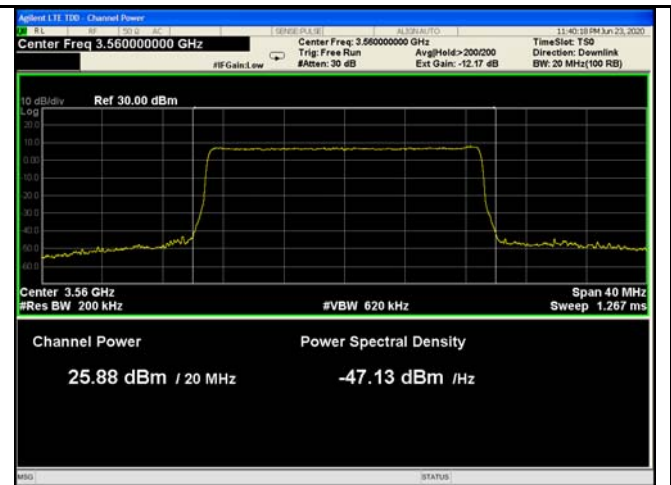
20MHz - High CH QPSK



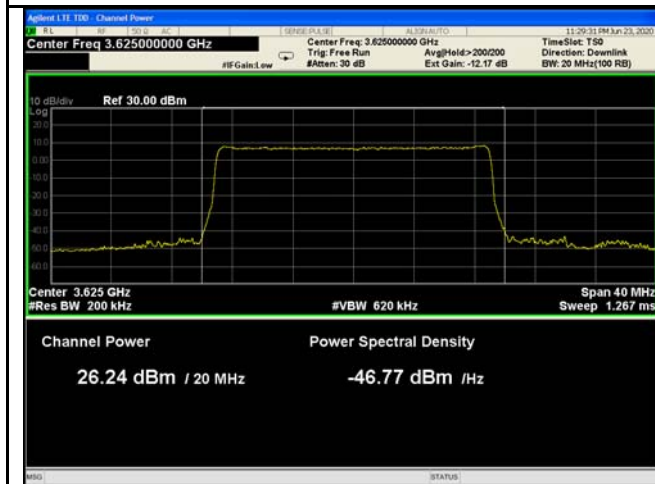
20MHz - High CH 64QAM



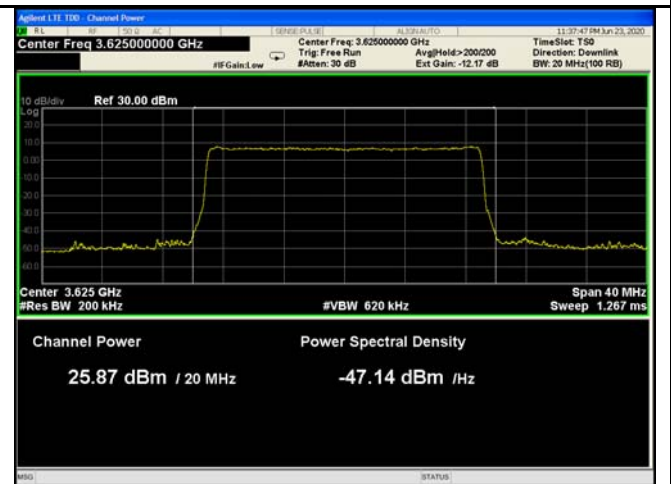
20MHz Full - Low CH QPSK



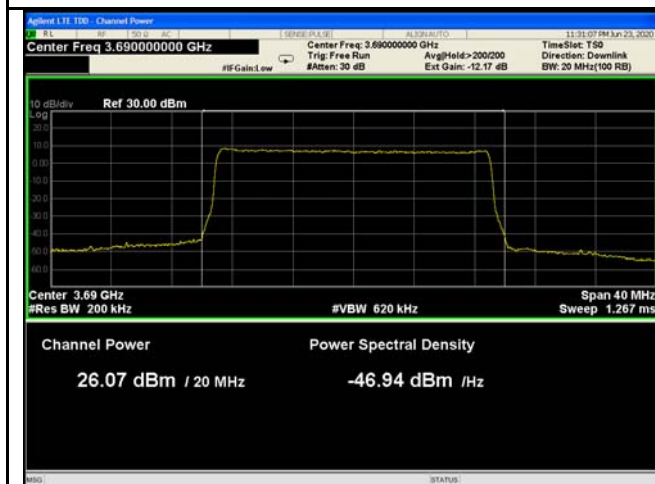
20MHz Full - Low CH 64QAM



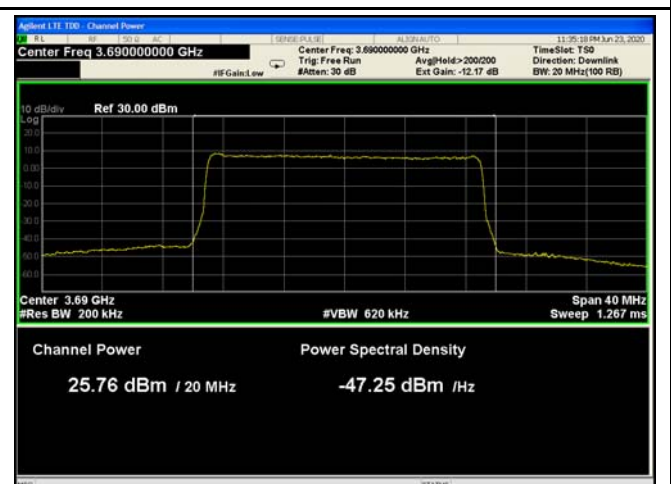
20MHz Full - Middle CH QPSK



20MHz Full - Middle CH 64QAM

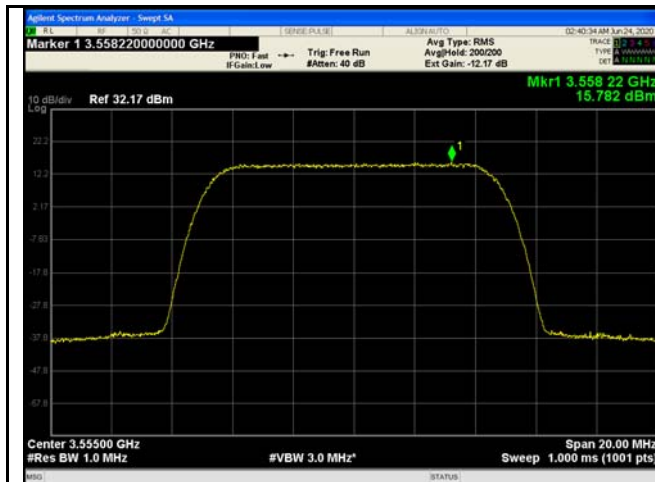


20MHz Full - High CH QPSK

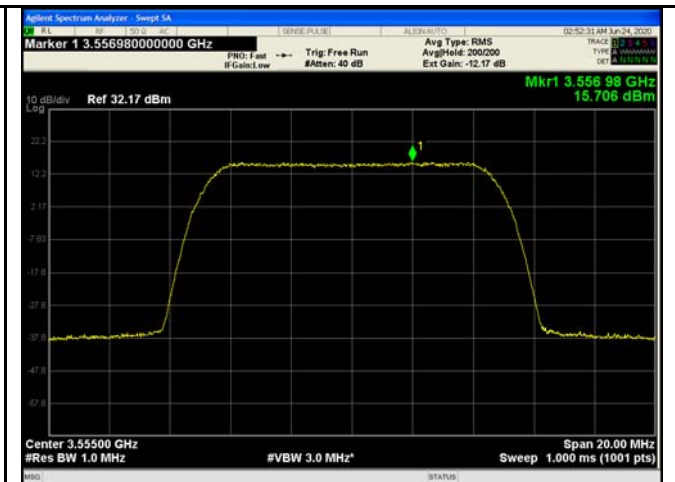


20MHz Full - High CH 64QAM

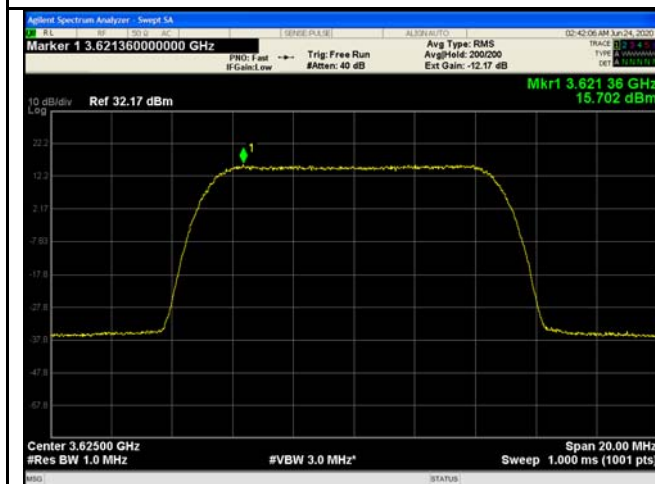
PSD Port1



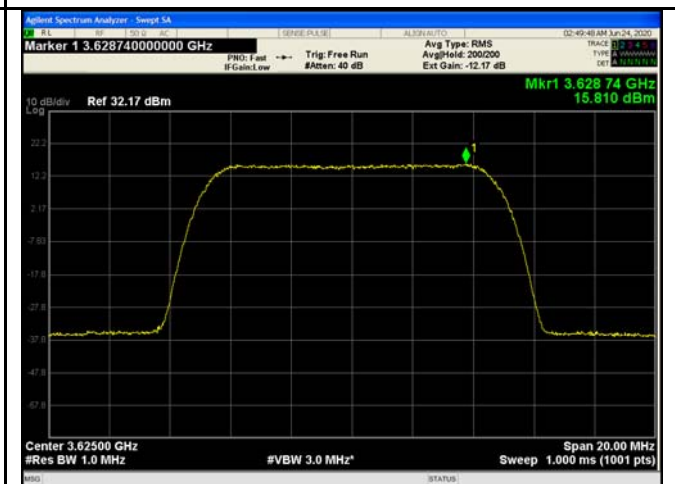
10MHz - Low CH QPSK



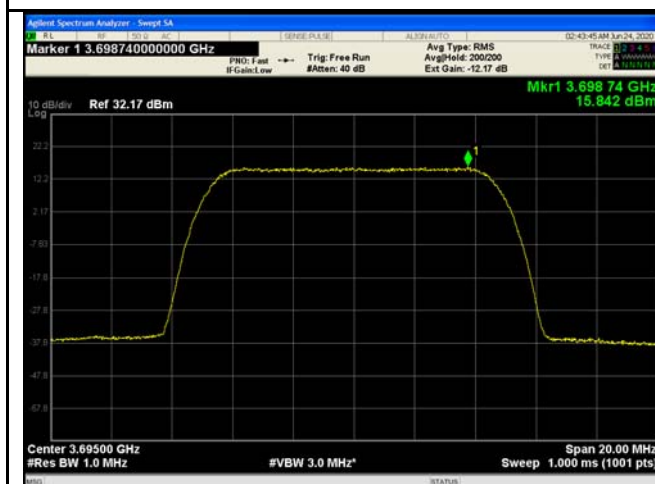
10MHz - Low CH 64QAM



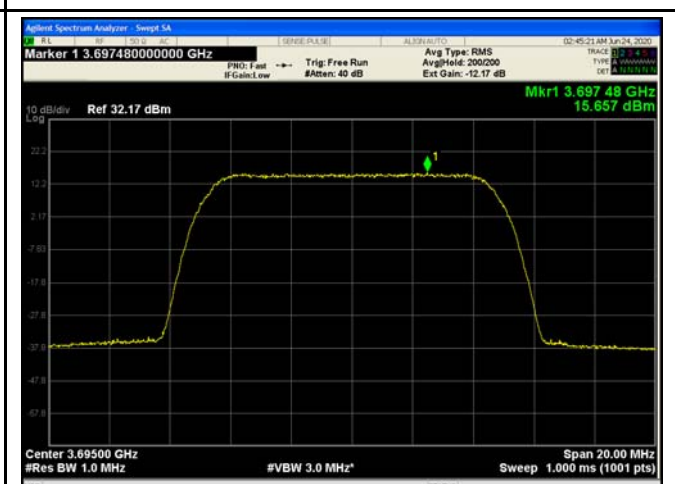
10MHz - Middle CH QPSK



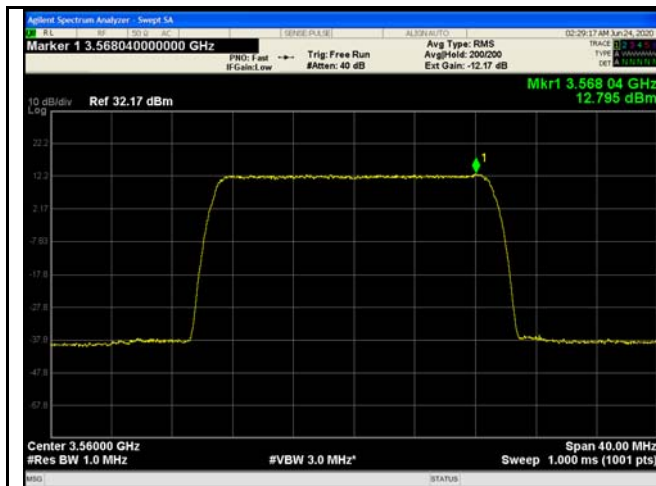
10MHz - Middle CH 64QAM



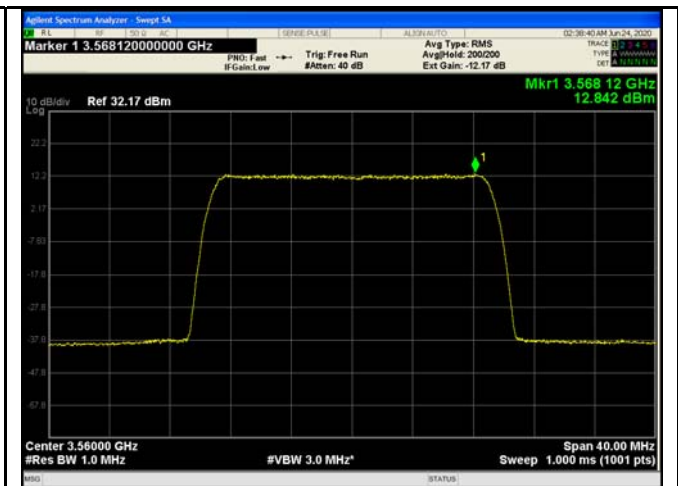
10MHz - High CH QPSK



10MHz - High CH 64QAM



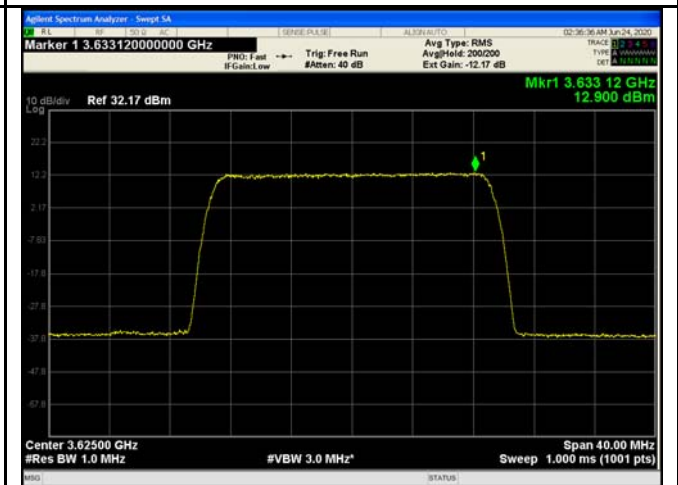
20MHz - Low CH QPSK



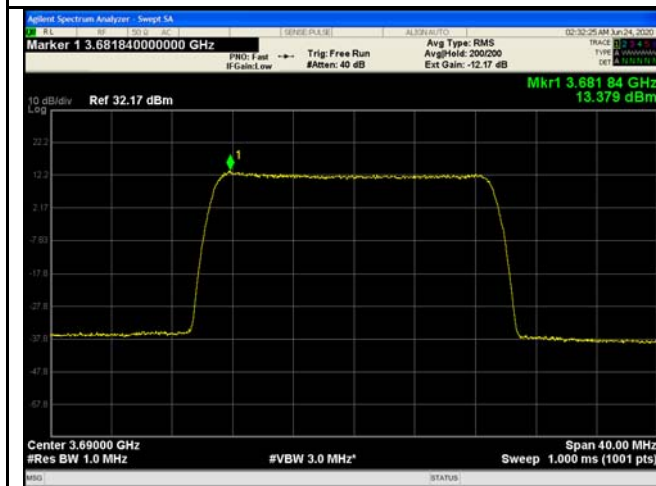
20MHz - Low CH 64QAM



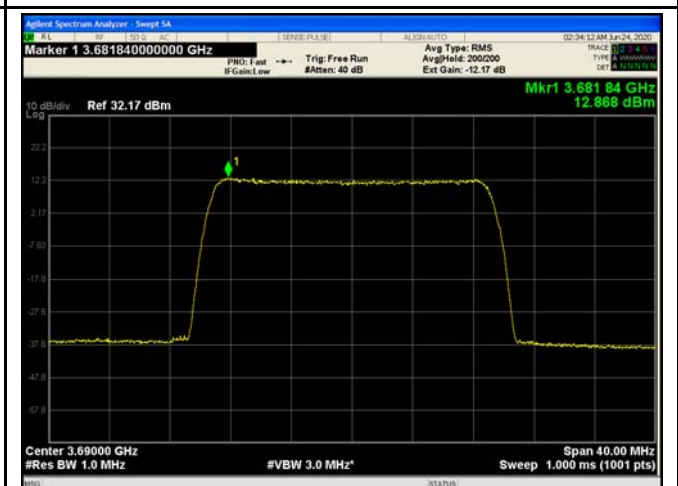
20MHz - Middle CH QPSK



20MHz - Middle CH 64QAM

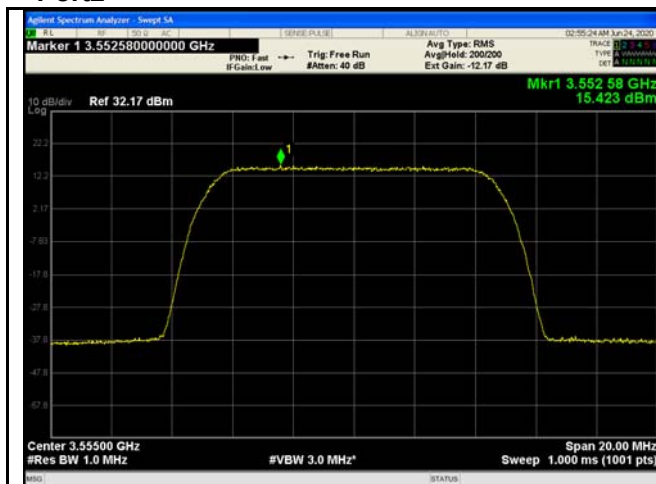


20MHz - High CH QPSK

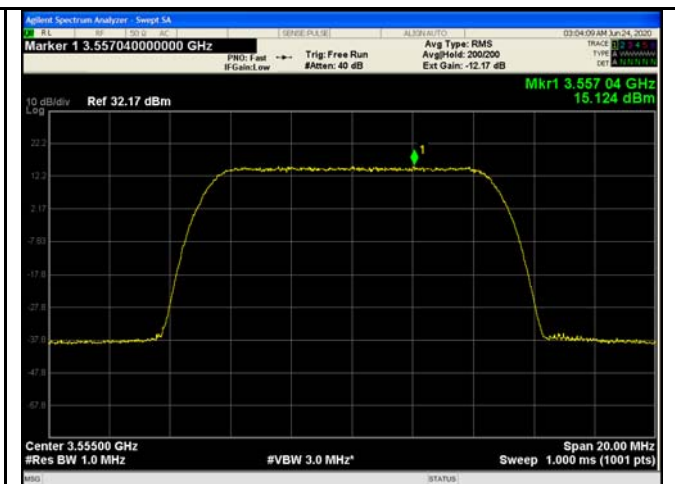


20MHz - High CH 64QAM

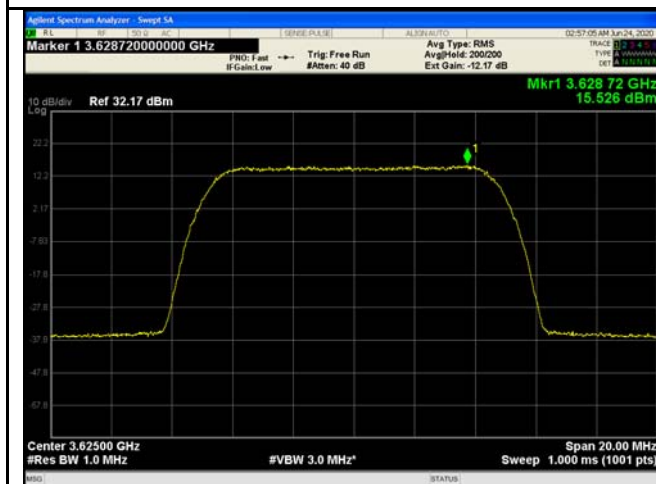
Port2



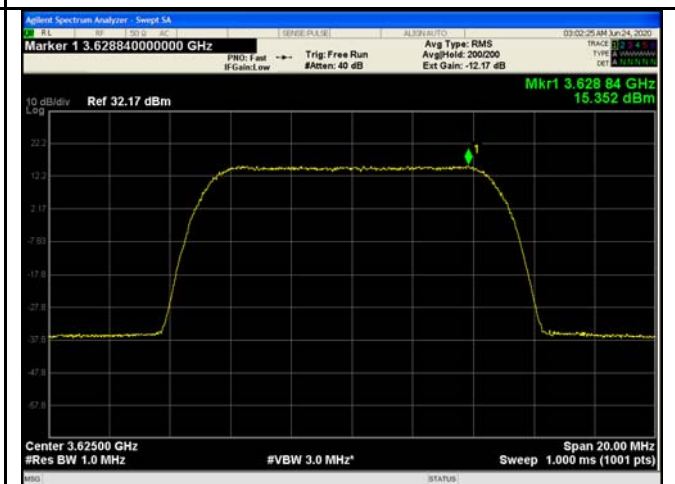
10MHz - Low CH QPSK



10MHz - Low CH 64QAM



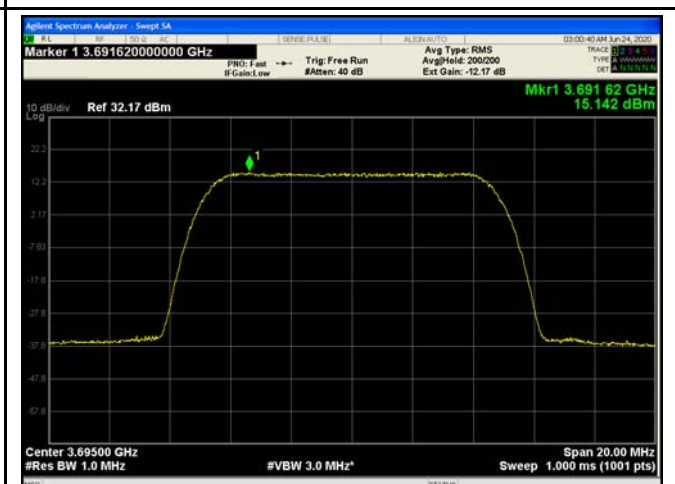
10MHz - Middle CH QPSK



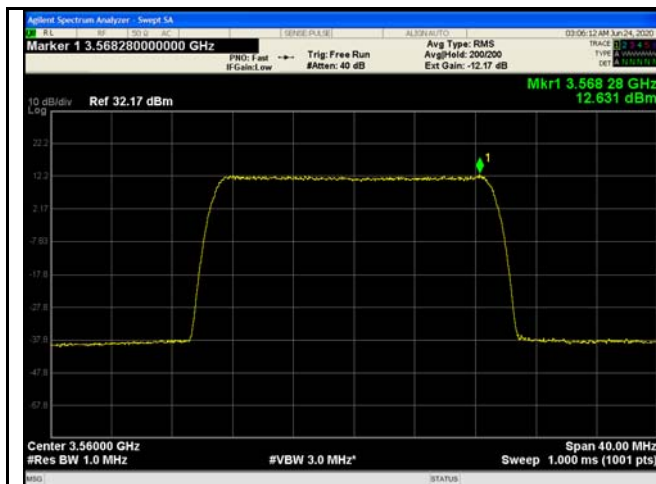
10MHz - Middle CH 64QAM



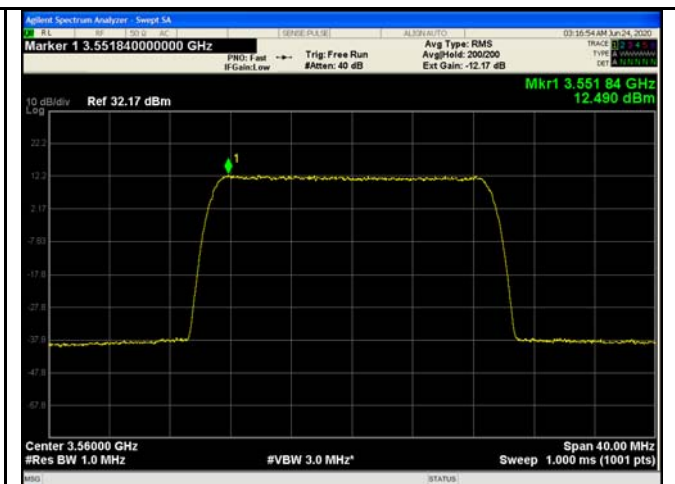
10MHz - High CH QPSK



10MHz - High CH 64QAM



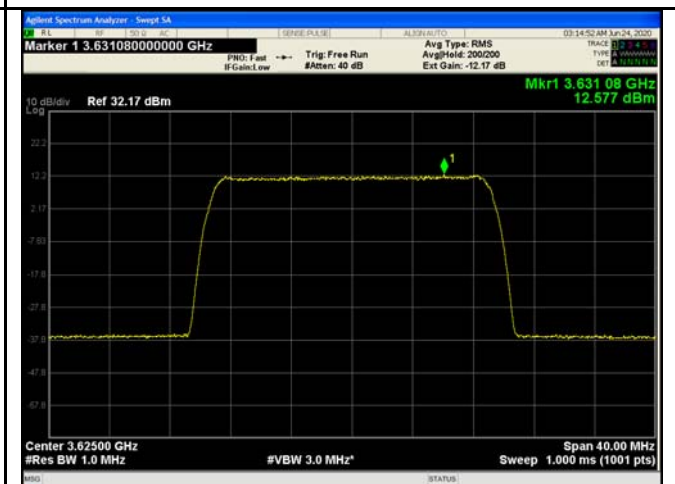
20MHz - Low CH QPSK



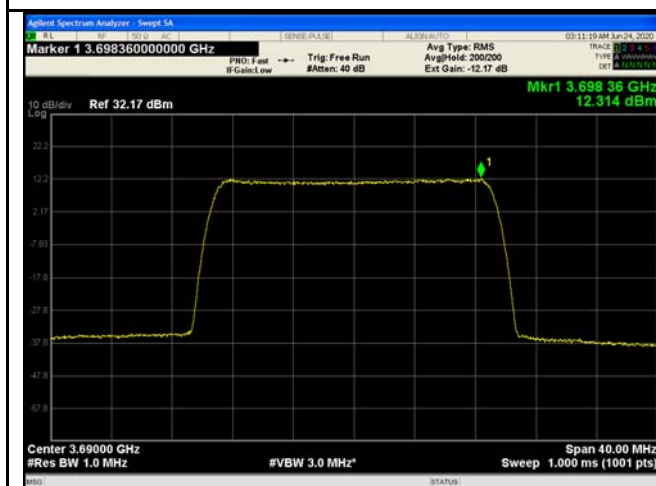
20MHz - Low CH 64QAM



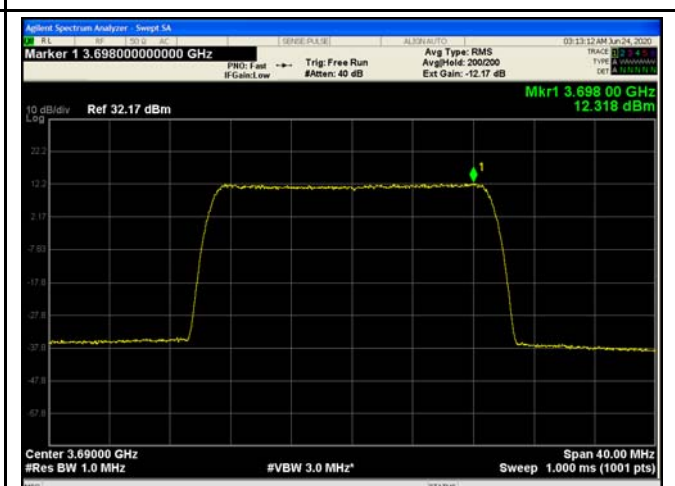
20MHz - Middle CH QPSK



20MHz - Middle CH 64QAM

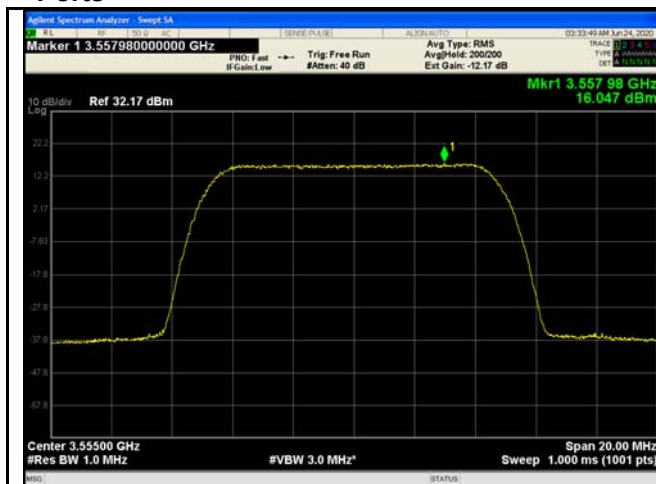


20MHz - High CH QPSK

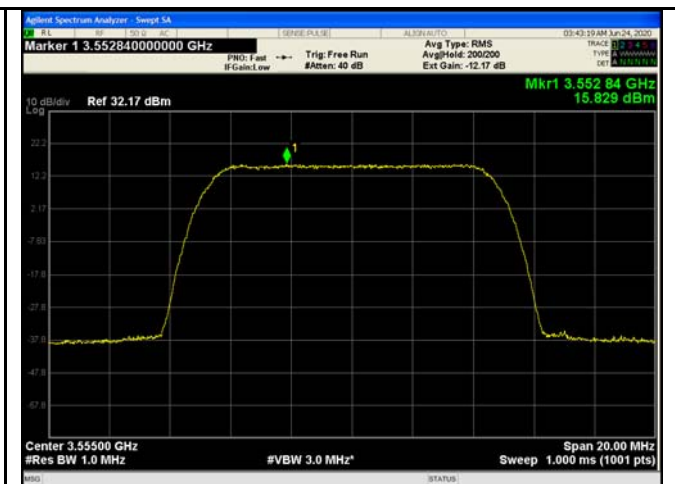


20MHz - High CH 64QAM

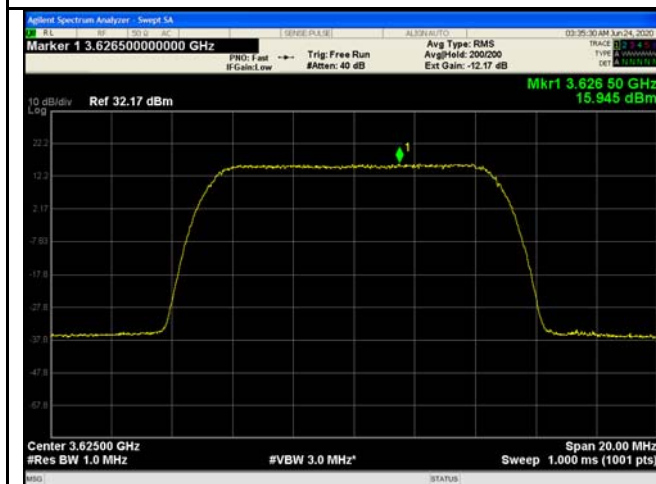
Port3



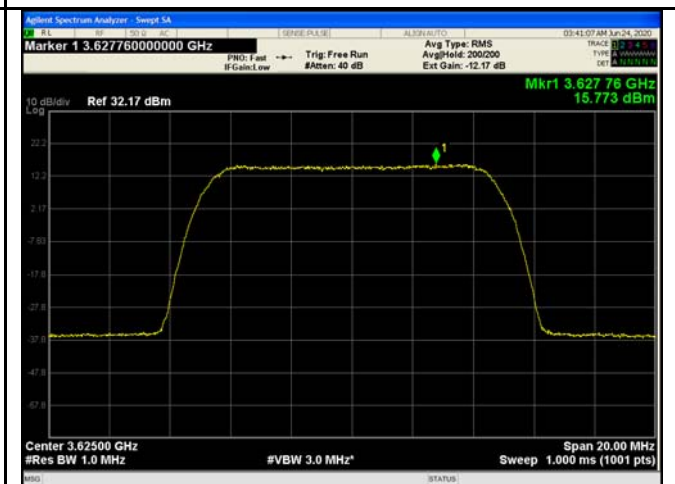
10MHz - Low CH QPSK



10MHz - Low CH 64QAM



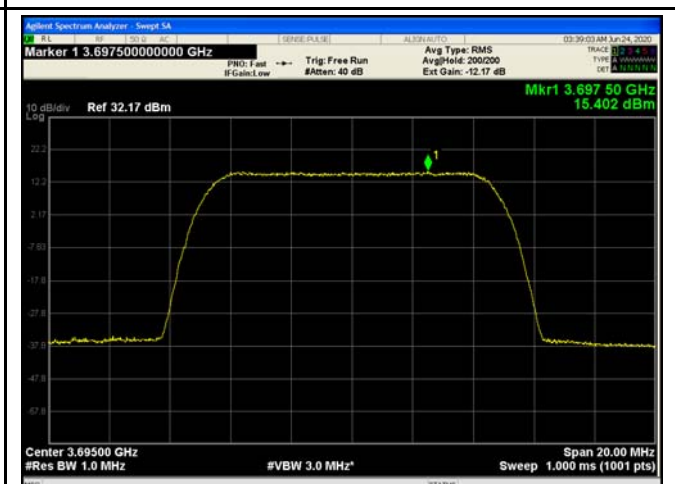
10MHz - Middle CH QPSK



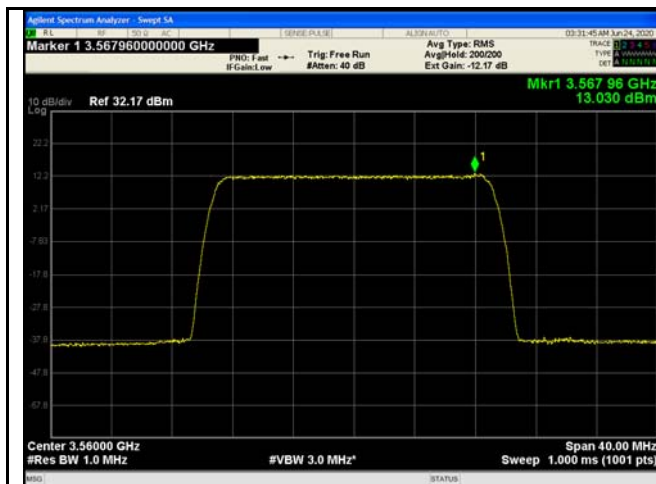
10MHz - Middle CH 64QAM



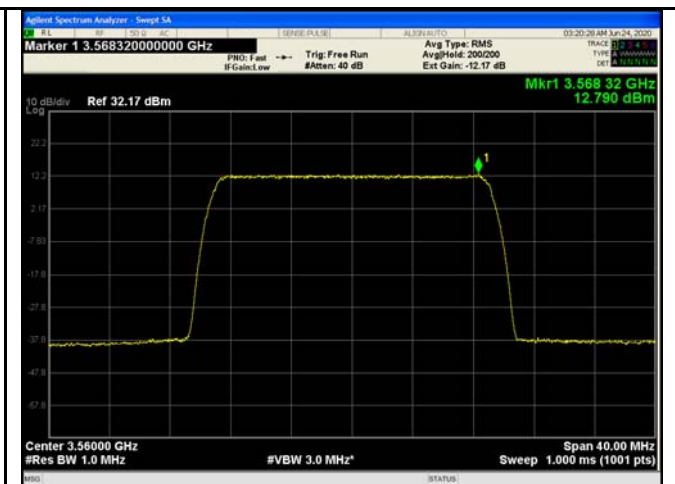
10MHz - High CH QPSK



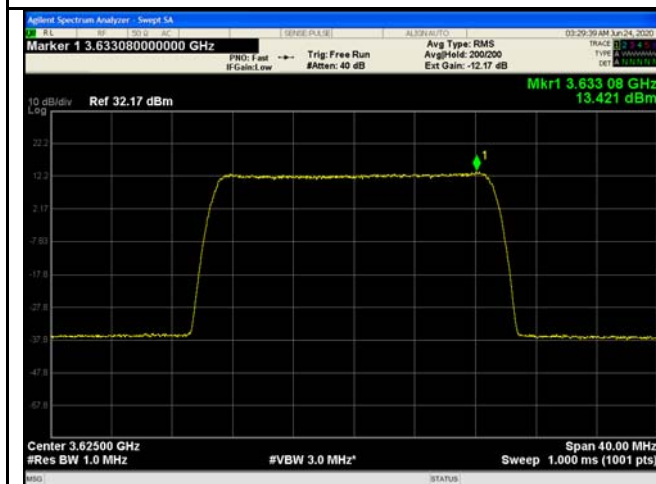
10MHz - High CH 64QAM



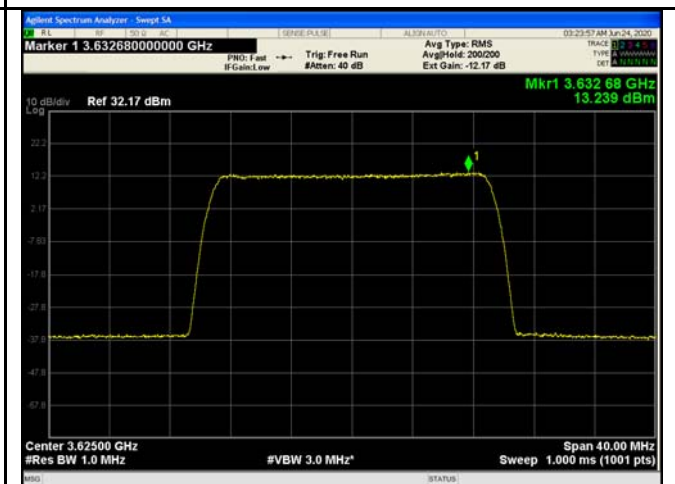
20MHz - Low CH QPSK



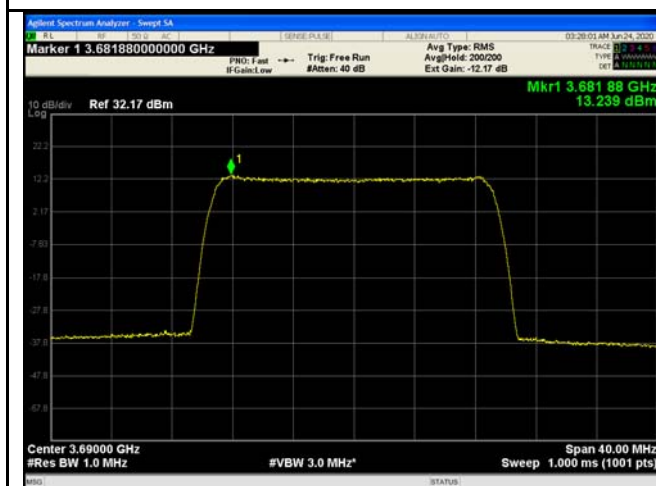
20MHz - Low CH 64QAM



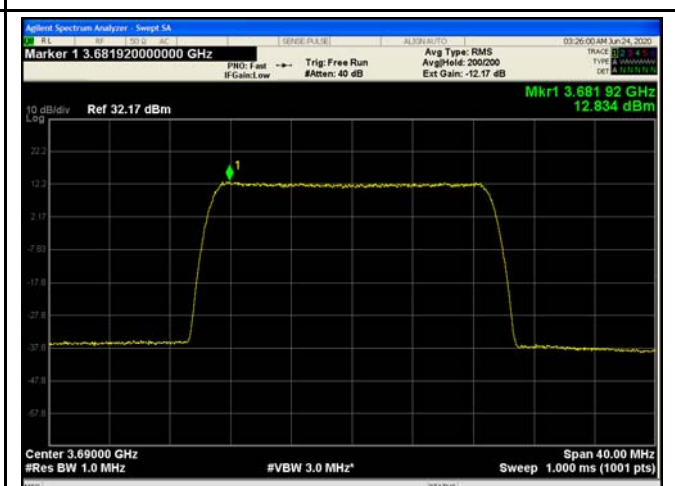
20MHz - Middle CH QPSK



20MHz - Middle CH 64QAM

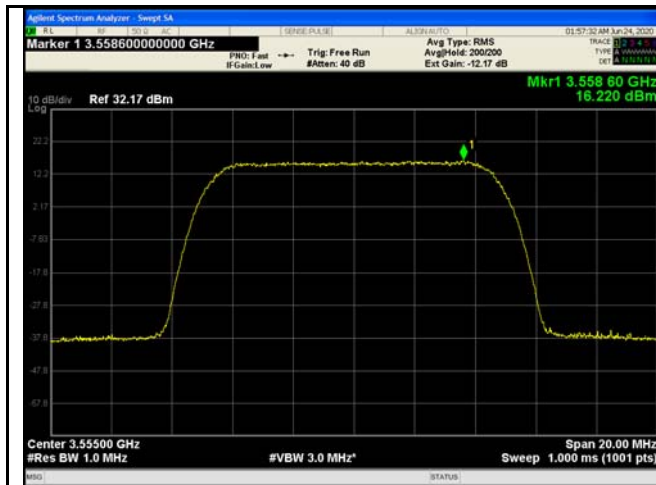


20MHz - High CH QPSK

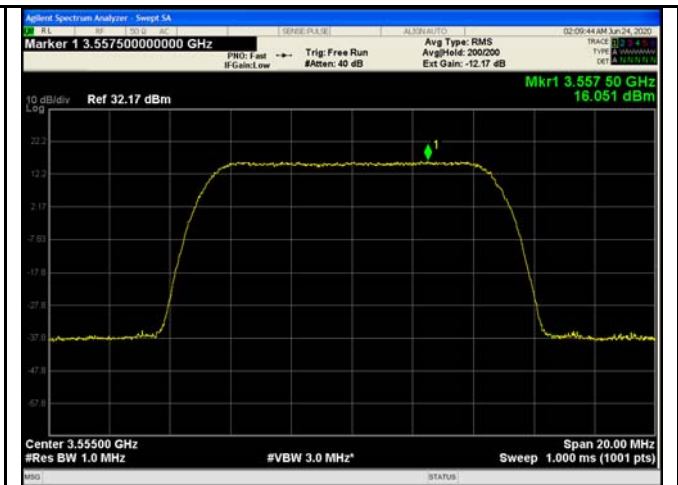


20MHz - High CH 64QAM

Port4



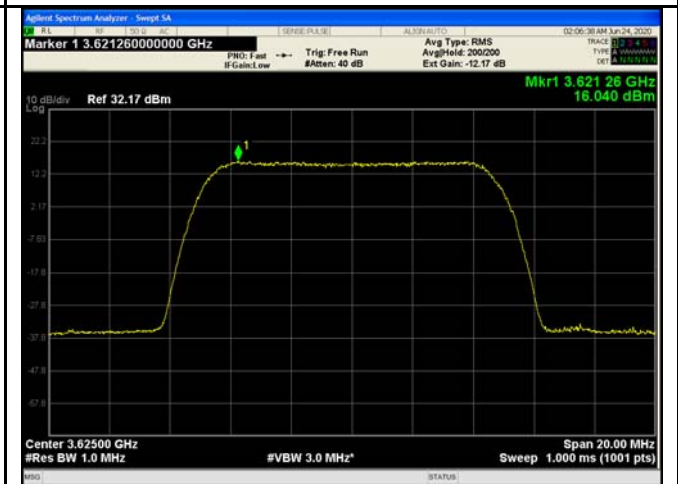
10MHz - Low CH QPSK



10MHz - Low CH 64QAM



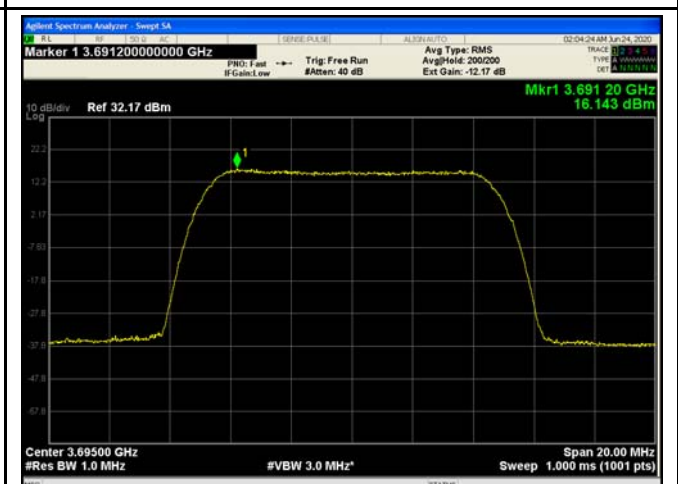
10MHz - Middle CH QPSK



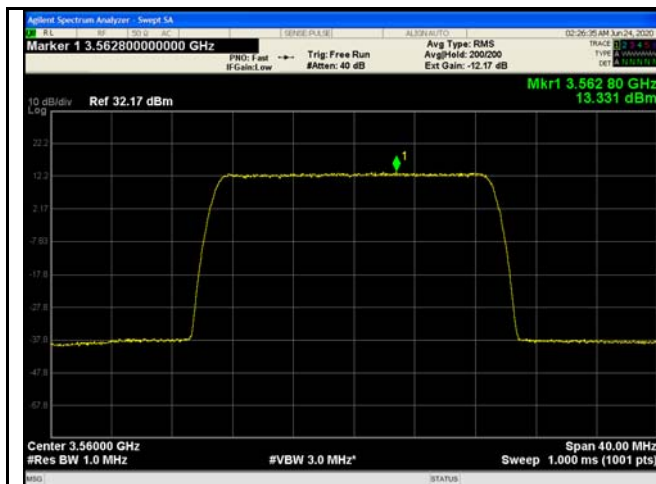
10MHz - Middle CH 64QAM



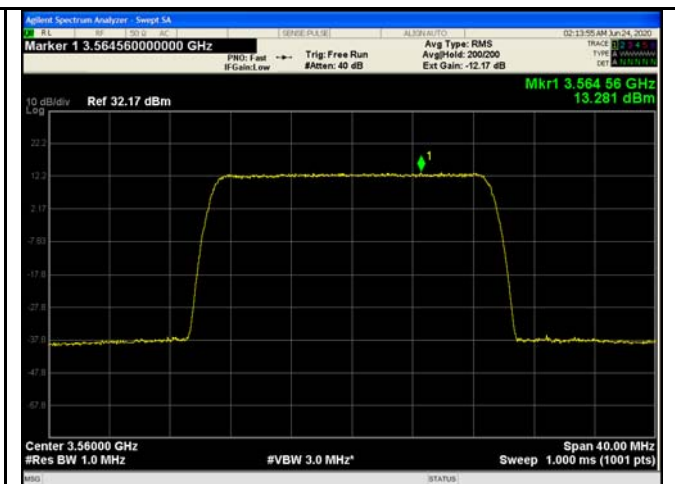
10MHz - High CH QPSK



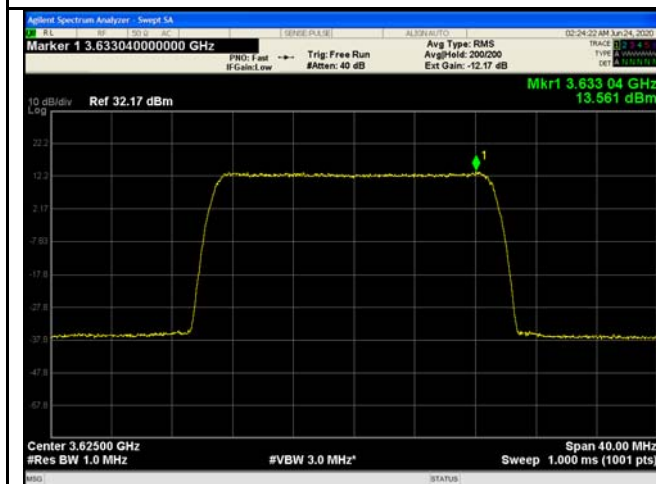
10MHz - High CH 64QAM



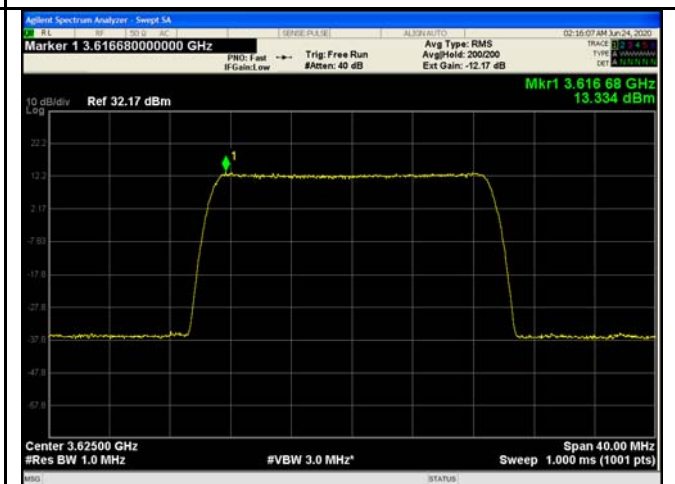
20MHz - Low CH QPSK



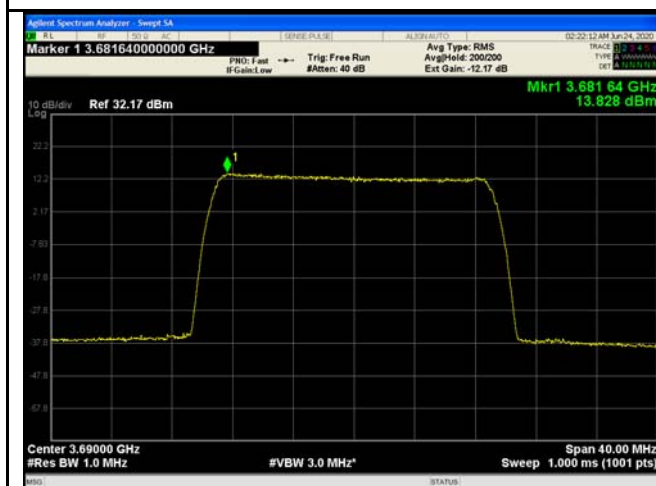
20MHz - Low CH 64QAM



20MHz - Middle CH QPSK



20MHz - Middle CH 64QAM



20MHz - High CH QPSK



20MHz - High CH 64QAM

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:	23.5 °C
Humidity:	51.1 % RH
Atmospheric Pressure:	101.2kPa

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

Remark: Refer to the original FCC ID: 2AG32MBS31001 test report 2477ERM.001A2.

TEST A.5: PEAK-TO-AVERAGE POWER RATIO (PAPR).

9 99% & -26 dB Occupied 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:	23.5 °C
Humidity:	51.1 % RH
Atmospheric Pressure:	101.2kPa

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

Remark: Refer to the original FCC ID: 2AG32MBS31001 test report 2477ERM.001A2.

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

10 Emission Mask

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

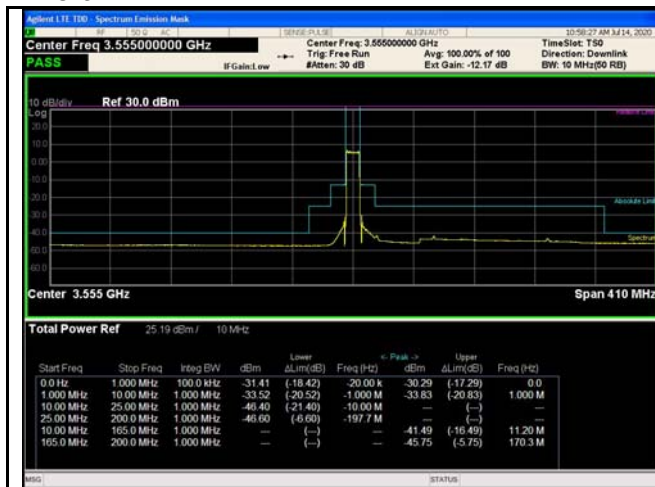
Operating Environment :	
Temperature:	23.5 °C
Humidity:	51.1 % RH
Atmospheric Pressure:	101.2kPa

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

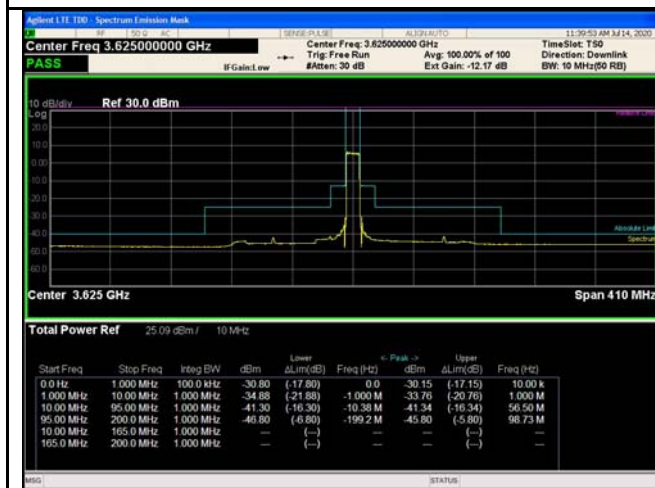
Spot-check test data Plots Port1



10MHz - Low CH QPSK



20MHz - Low CH QPSK



10MHz - Middle CH QPSK



20MHz - Middle CH QPSK

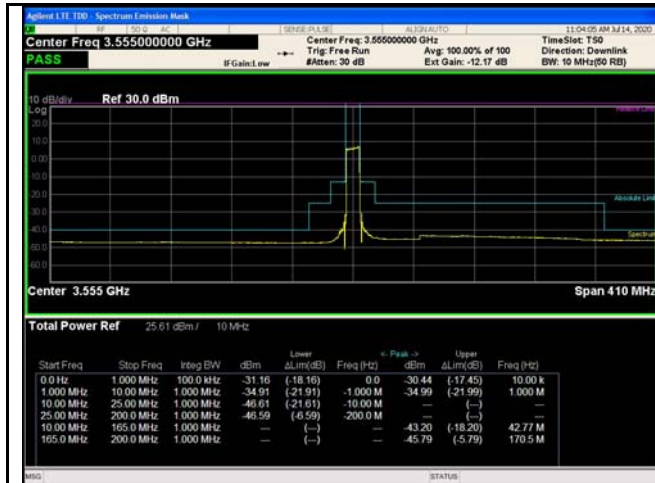


10MHz - High CH QPSK



20MHz - High CH QPSK

Port2



10MHz - Low CH QPSK



20MHz - Low CH QPSK



10MHz - Middle CH QPSK



20MHz - Middle CH QPSK

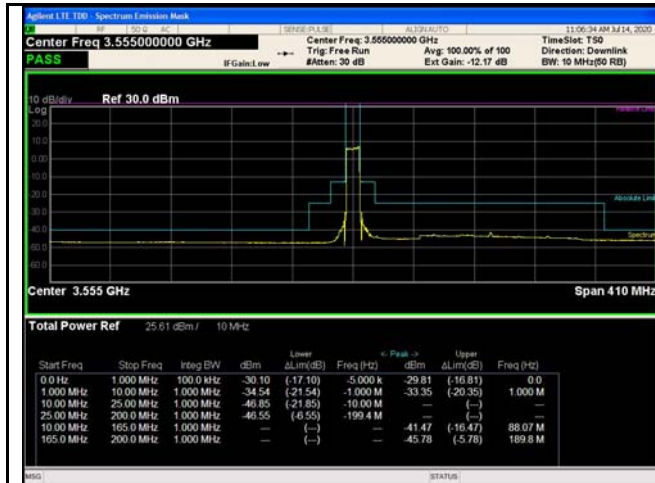


10MHz - High CH QPSK



20MHz - High CH QPSK

Port3



10MHz - Low CH QPSK



20MHz - Low CH QPSK



10MHz - Middle CH QPSK



20MHz - Middle CH QPSK



10MHz - High CH QPSK



20MHz - High CH QPSK

Port4



11 Spurious Emissions at Antenna Terminal

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 set at 100 kHz when below 1GHz, 1MHz when above 1 GHz; sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic.
3. For the out of band: Set the RBW=100 kHz, VBW=300 kHz when below 1 GHz, RBW =1 MHz, VBW=3 MHz when above 1 GHz, Start=30MHz, Stop= 10th harmonic.
4. Band Edge Requirements: In the 1 MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 1 percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to measure the out of band Emissions.

11.3 Test Result

Remark: Refer to the original FCC ID: 2AG32MBS31001 test report 2477ERM.001A2.

TEST A.7: SPURIOUS EMISSIONS AT ANTENNA TERMINALS.

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

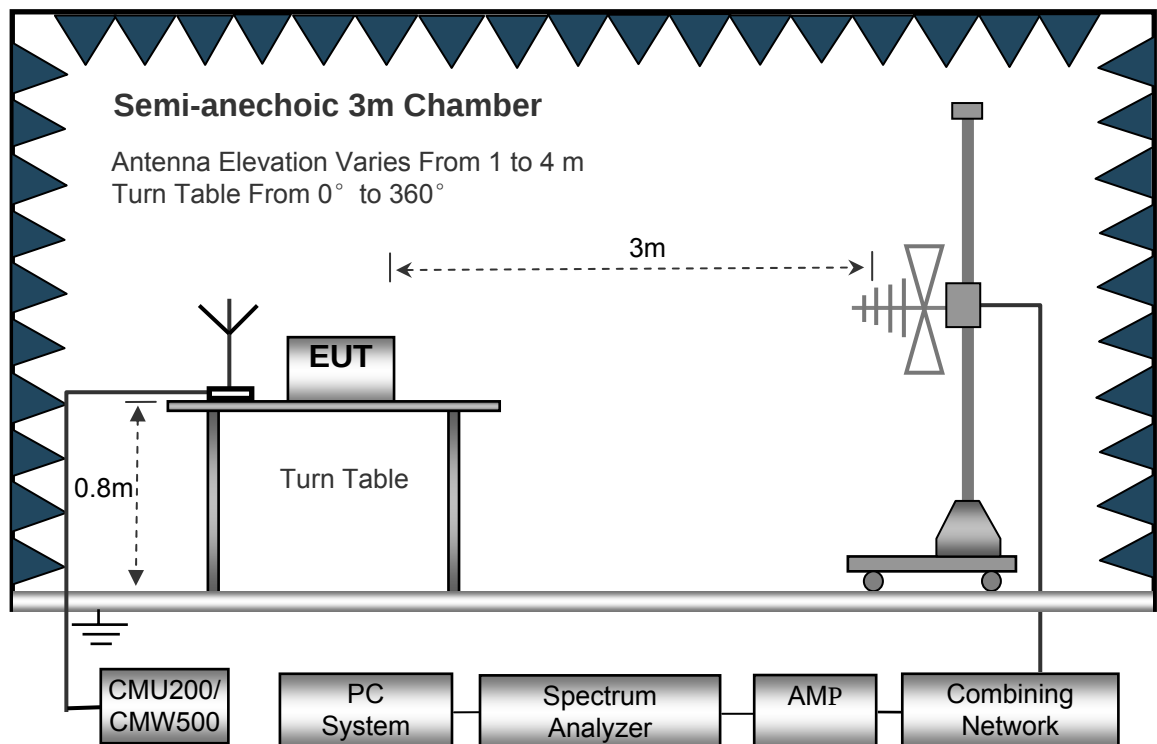
12.1 EUT Operation

Operating Environment :

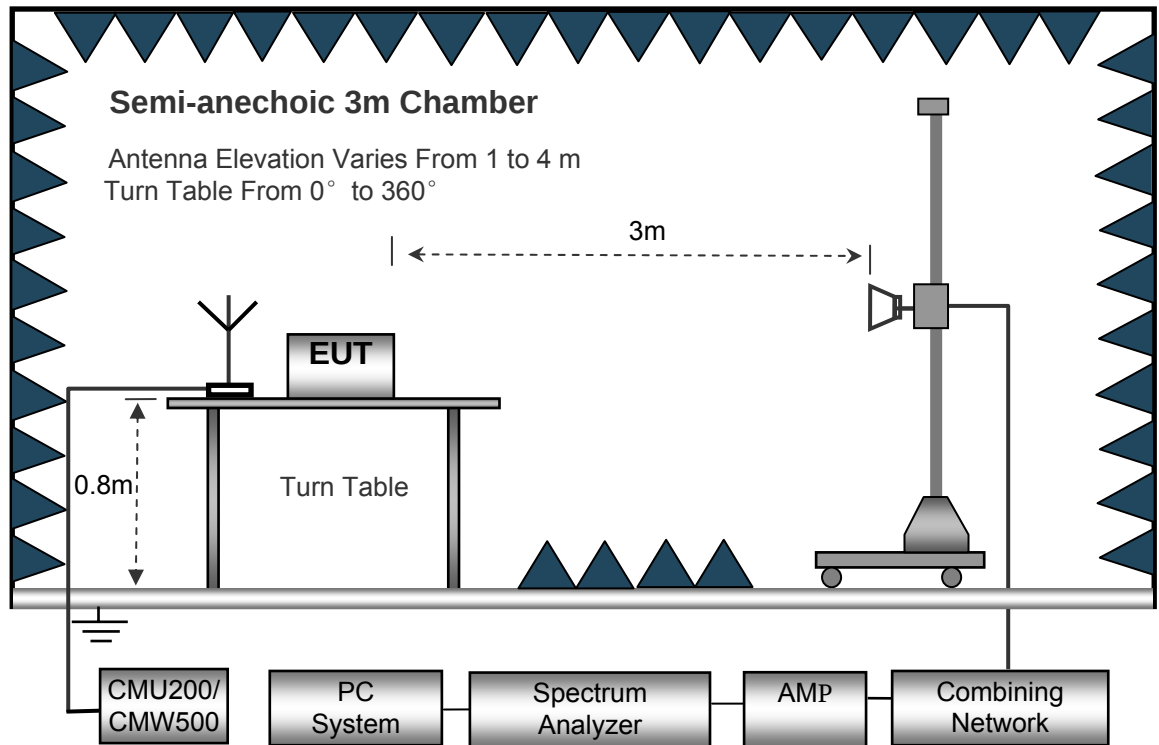
Temperature:	23.5 °C
Humidity:	52.1 % RH
Atmospheric Pressure:	101.2kPa

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..... 100kHz
 Video Bandwidth..... 300kHz

Above 1GHz

Sweep Speed Auto
 Detector PK
 Resolution Bandwidth..... 1MHz
 Video Bandwidth..... 3MHz
 Detector Ave.
 Resolution Bandwidth..... 1MHz
 Video Bandwidth..... 10Hz

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

Remark: Refer to the original FCC ID: 2AG32MBS31001 test report 2477ERM.001A2.

TEST A.8: RADIATED SPURIOUS EMISSION.

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 :

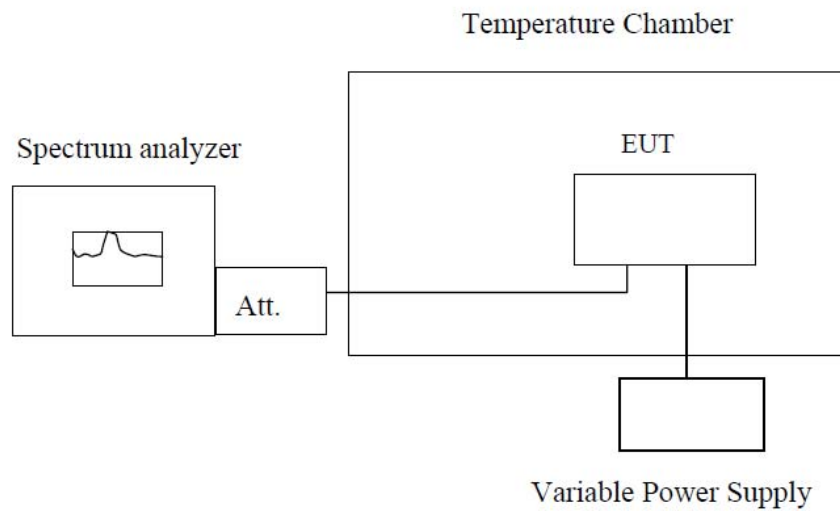
Temperature: 23.5 °C

Humidity: 51.1 % RH

Atmospheric Pressure: 101.2kPa

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: Refer to the original FCC ID: 2AG32MBS31001 2477ERM.001A2.

TEST A.9: FREQUENCY STABILITY.

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			

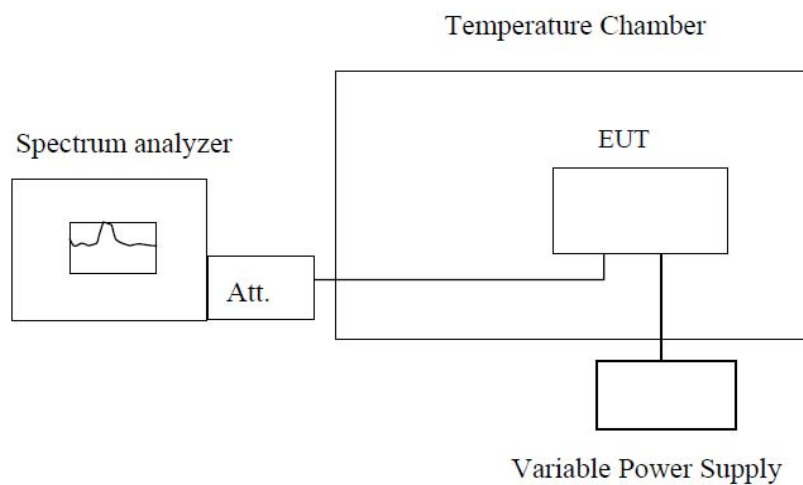
14.1 EUT Operation

Operating Environment :

Temperature: 23.5 °C
 Humidity: 51.1 % RH
 Atmospheric Pressure: 101.2kPa

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: Refer to the original FCC ID: 2AG32MBS31001 2477ERM.001A2.

TEST A.9: FREQUENCY STABILITY.

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