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### 3 Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTS20S07050 354W001	2020-06-16	2020-06-18 to 2020-06-30	2020-06-31	original	-	Valid

## 4 General Information

### 4.1 General Description of E.U.T.

Product:	LTE Base Station
Model(s):	mBS1105
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:	18.5dBi
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: 2AG32MBS110596, reducing the power level and updating the antenna gain value.
- 2, The duty cycle correction =  $10 \log (1/0.68) = 1.67$  (dB)  
Offset factory=ATT loss + Cable loss + Duty cycle correction=10+0.5+1.67=12.17(dB)

Pass\*: The device (FCC ID: 2AG32MBS110596N) is based on the original device (FCC ID: 2AG32MBS110596) 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.005.

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	$\pm 0.42$ dB
RF Power Density	$\pm 0.7$ 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:	51.2 % RH
Atmospheric Pressure:	101.3kPa

### 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

#### Transmit Output Power

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	25.43	25.24	28.35	18.5	46.85	47
		Middle	25.26	25.12	28.20	18.5	46.70	
		High	24.87	24.73	27.81	18.5	46.31	
	64QAM	Low	25.23	25.10	28.18	18.5	46.68	
		Middle	24.97	25.19	28.09	18.5	46.59	
		High	24.60	24.72	27.67	18.5	46.17	
20	QPSK	Low	21.16	20.92	24.05	18.5	42.55	47
		Middle	20.09	20.07	23.09	18.5	41.59	
		High	20.18	19.94	23.07	18.5	41.57	
	64QAM	Low	20.97	20.99	23.99	18.5	42.49	
		Middle	19.75	19.88	22.83	18.5	41.33	
		High	19.58	19.71	22.66	18.5	41.16	

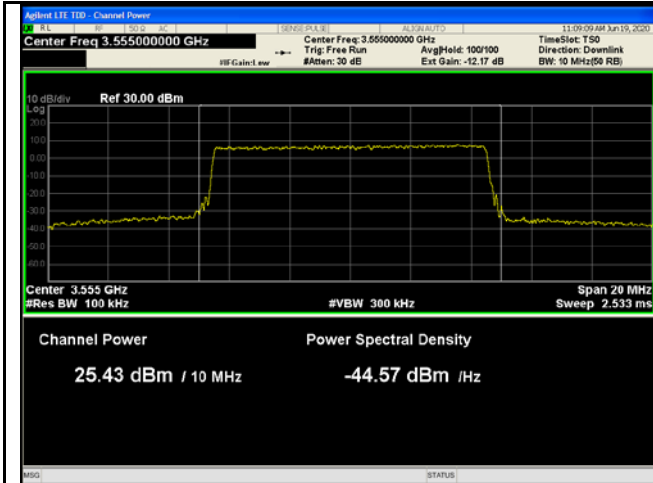
Transmit Output Power								
Bandwidth (MHz)	Modulation	Test Channel	Port1 Output Power (dBm/20MHz)	Port2 Output Power (dBm/20MHz)	Total Power (dBm/20MHz)	Antenna Gain (dBi)	EIRP (dBm/20MHz)	EIRP Limit (dBm/10MHz)
20 Full Transmit	QPSK	Low	23.08	23.13	26.12	18.5	44.62	-
		Middle	23.17	22.77	25.98	18.5	44.48	
		High	22.76	23.13	25.96	18.5	44.46	
	64QAM	Low	22.81	22.75	25.79	18.5	44.29	
		Middle	22.55	22.53	25.55	18.5	44.05	
		High	22.32	22.51	25.43	18.5	43.93	

#### PSD

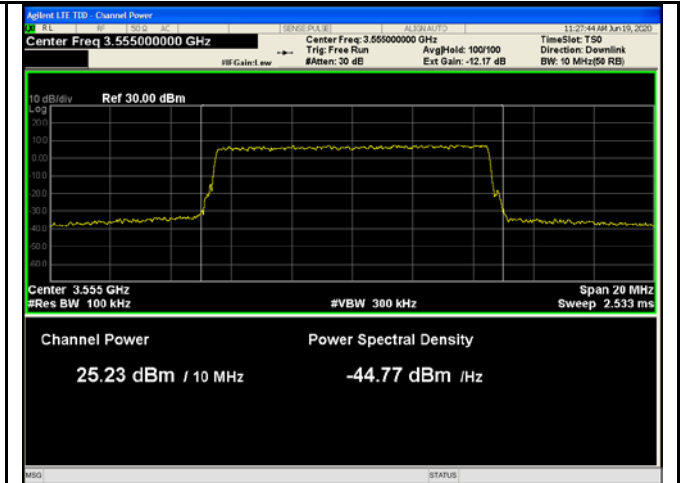
PSD								
Bandwidth (MHz)	Modulation	Test Channel	Port1 PSD (dBm/MHz)	Port2 PSD (dBm/MHz)	Total PSD (dBm/MHz)	Antenna Gain (dBi)	EIRP density (dBm/MHz)	EIRP density Limit (dBm/MHz)
10	QPSK	Low	15.376	15.226	18.312	18.5	36.812	37
		Middle	14.967	15.220	18.106	18.5	36.606	
		High	14.956	14.810	17.894	18.5	36.394	
	64QAM	Low	14.970	14.882	17.937	18.5	36.437	
		Middle	14.825	14.761	17.803	18.5	36.303	
		High	14.408	15.097	17.776	18.5	36.276	
20	QPSK	Low	11.896	12.069	14.994	18.5	33.494	37
		Middle	11.382	11.785	14.598	18.5	33.098	

		High	12.240	12.035	15.149	18.5	33.649	
	64QAM	Low	12.149	12.067	15.118	18.5	33.618	
		Middle	11.535	11.402	14.479	18.5	32.979	
		High	12.055	12.090	15.083	18.5	33.583	

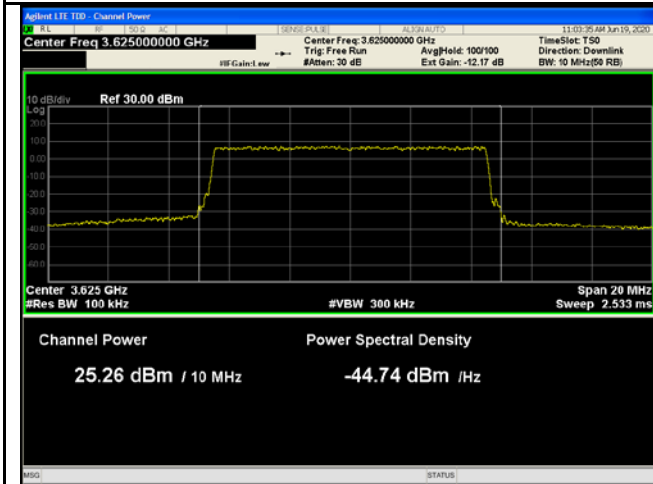
**Test Plots**  
**Transmit Output Power**  
**Port1**



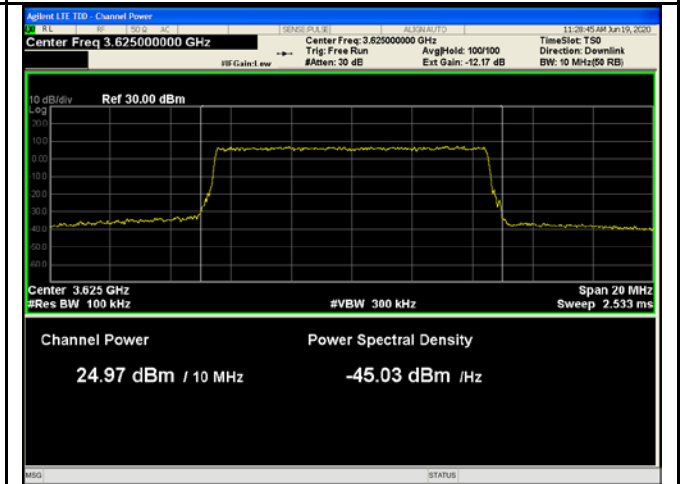
10MHz - Low CH QPSK



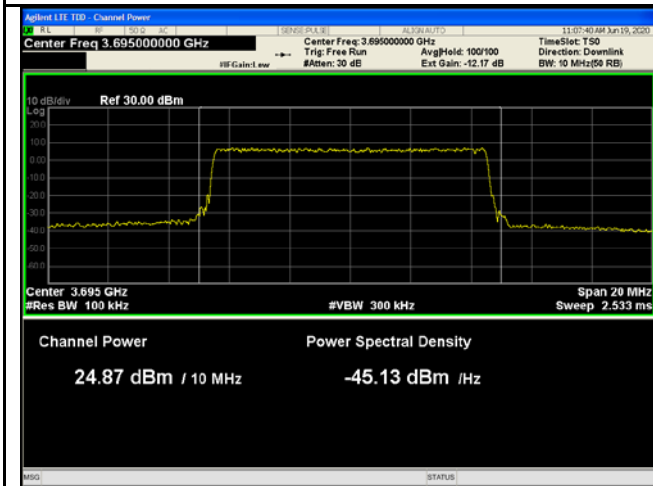
10MHz - Low CH 64QAM



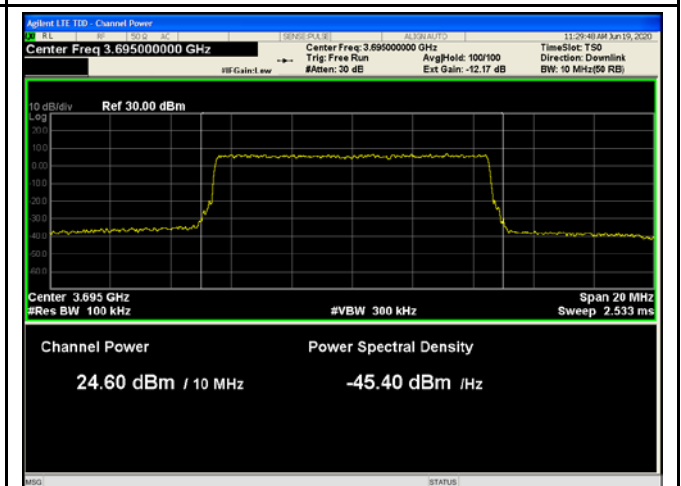
10MHz - Middle CH QPSK



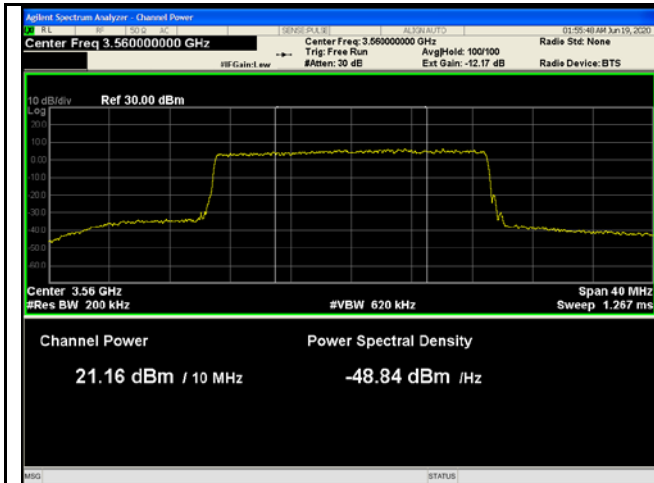
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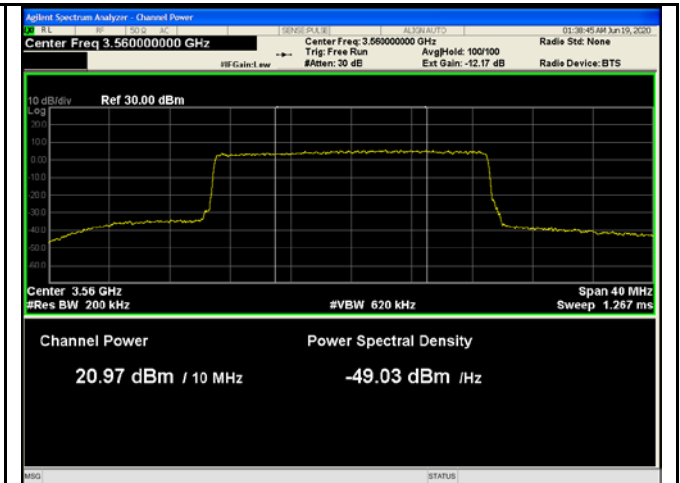
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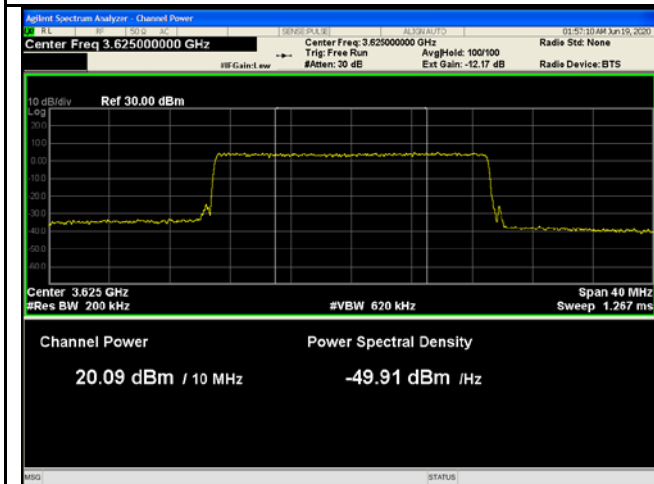
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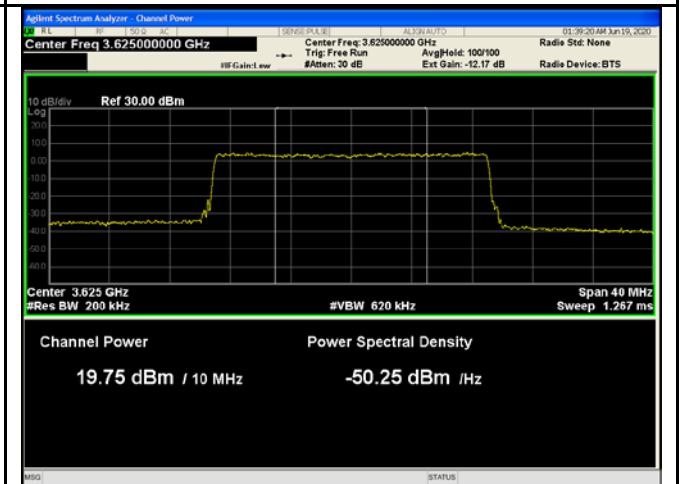
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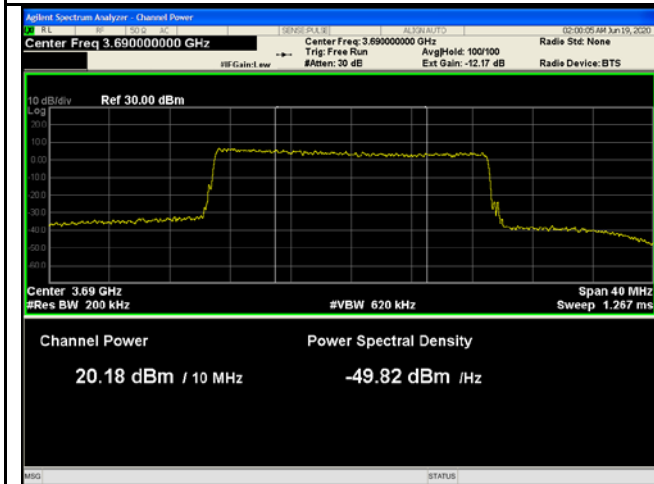
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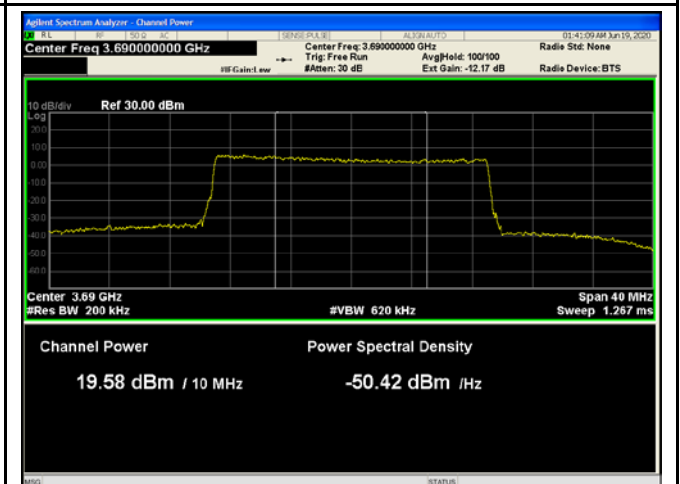
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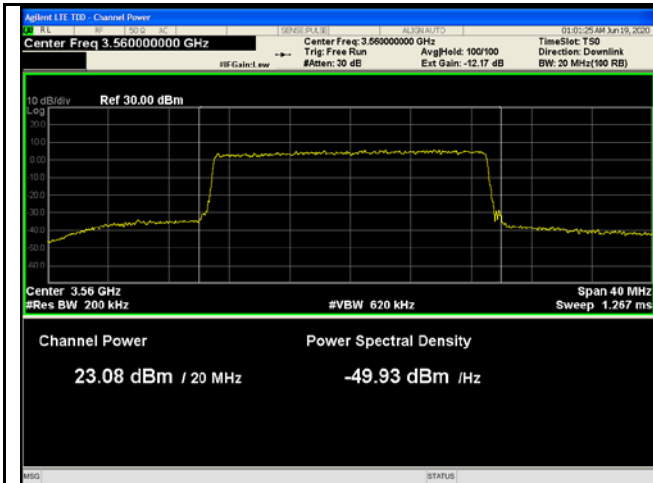
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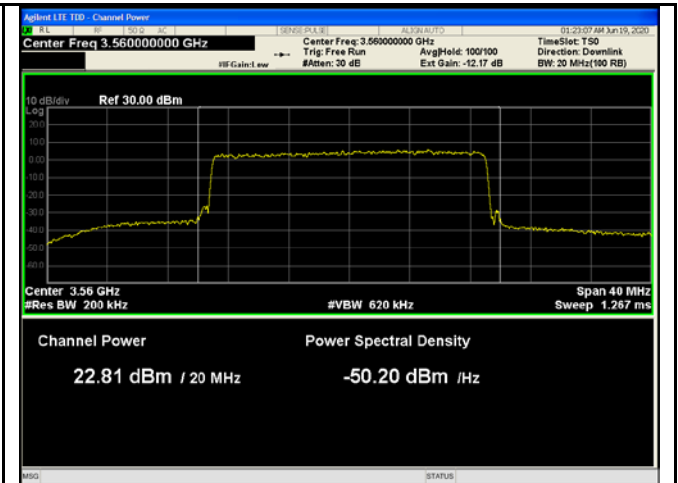
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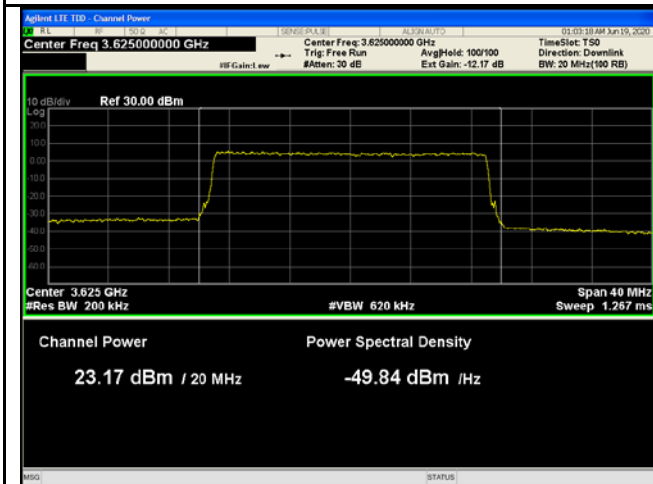
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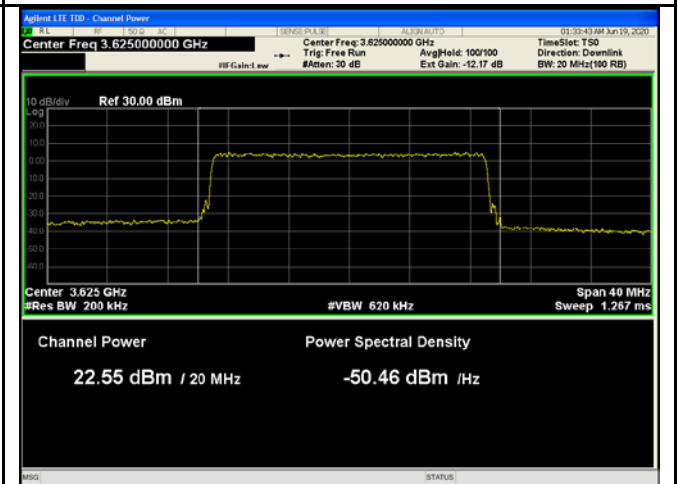
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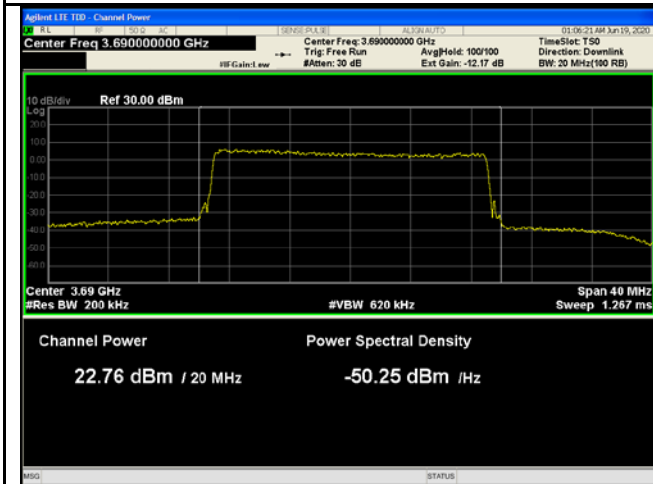
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20MHz Full - Middle CH QPSK



20MHz Full - Middle CH 64QAM

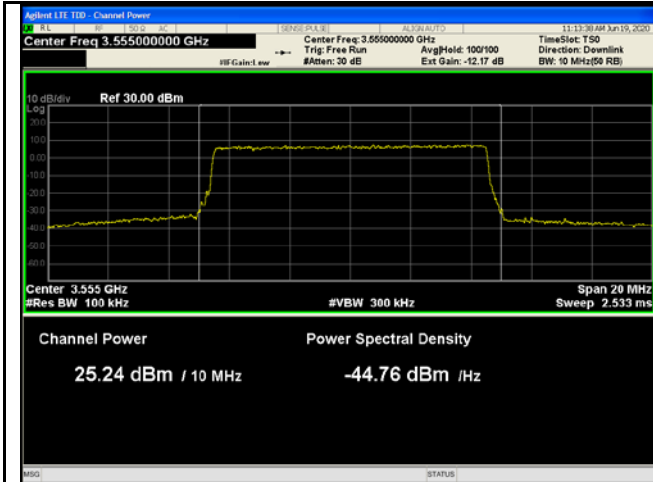


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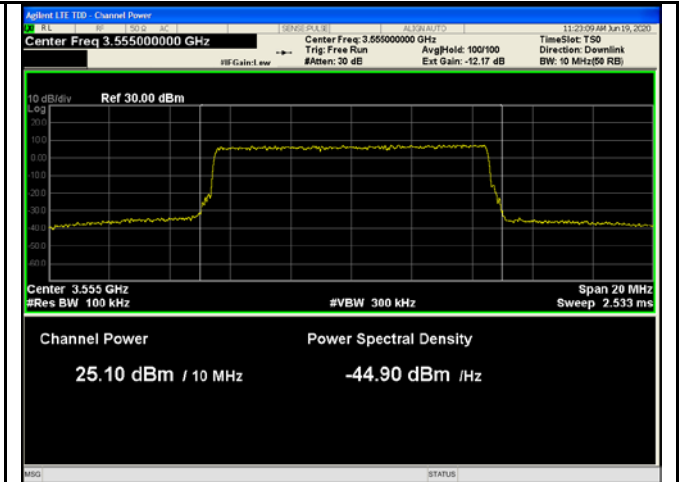


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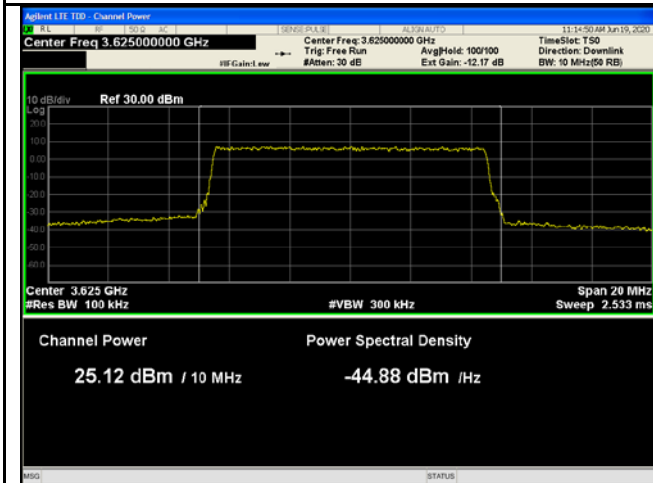
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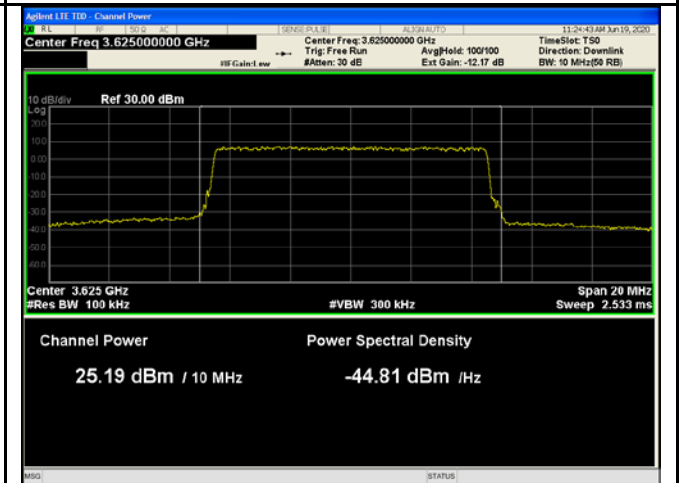
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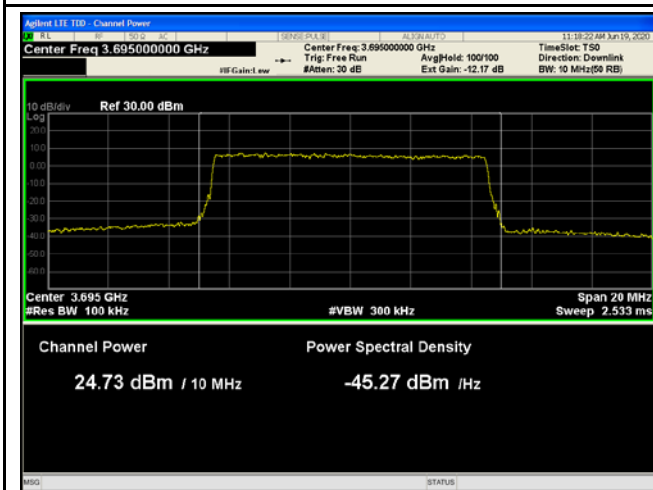
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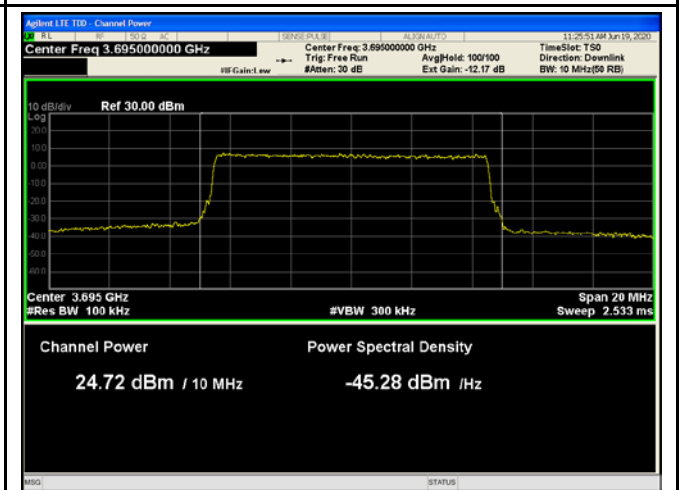
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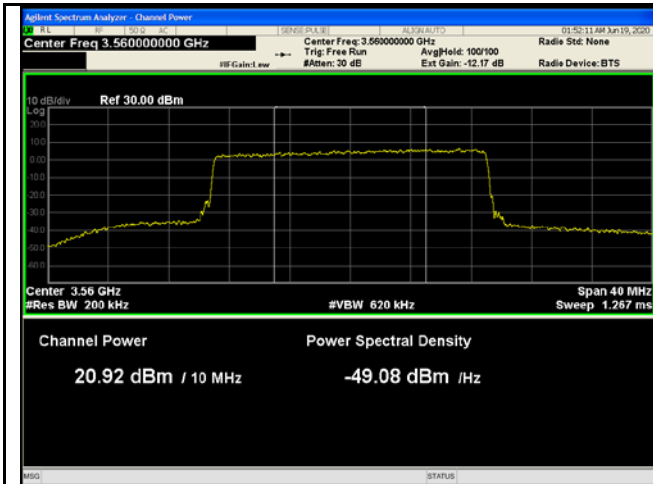
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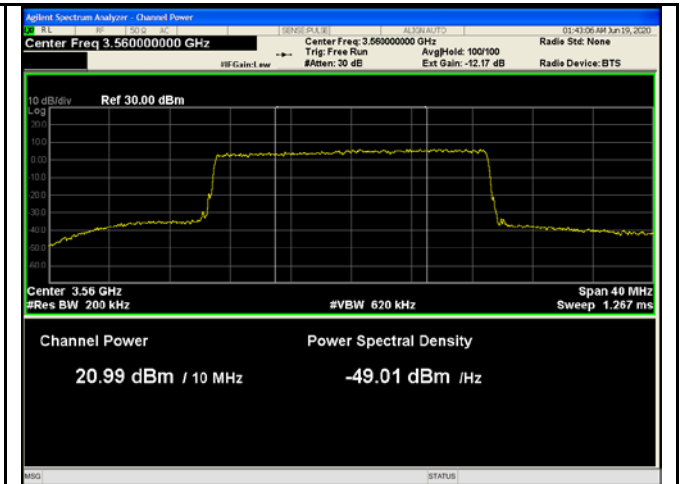
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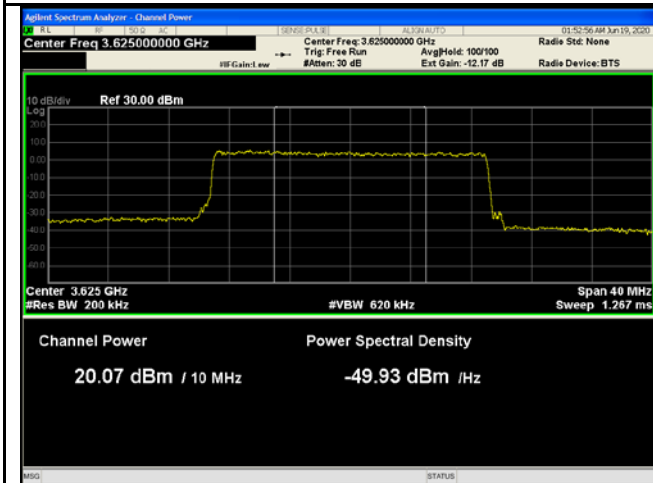
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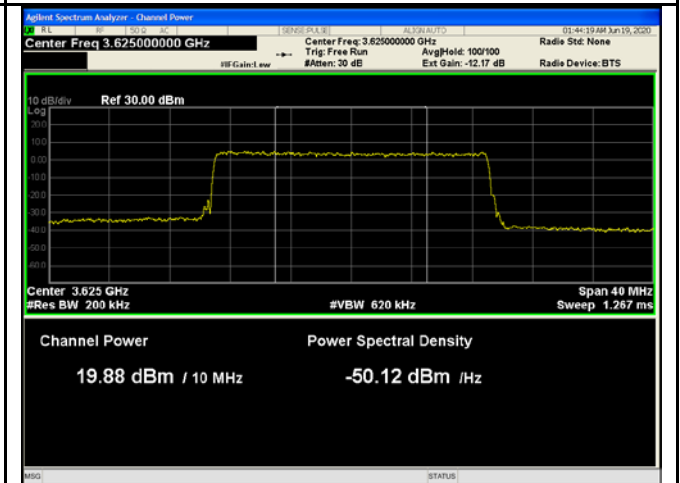
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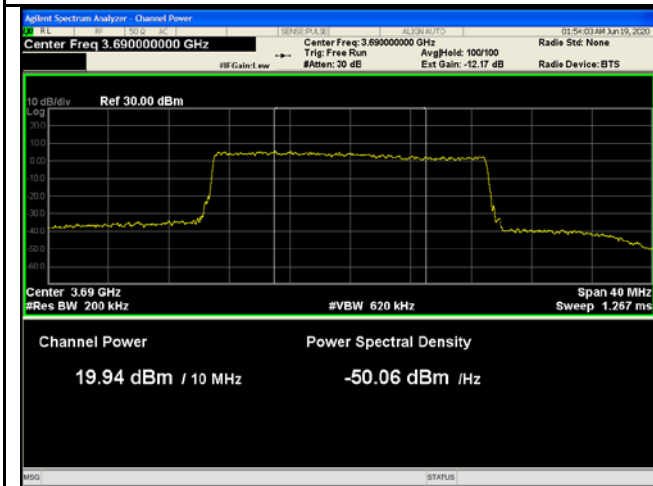
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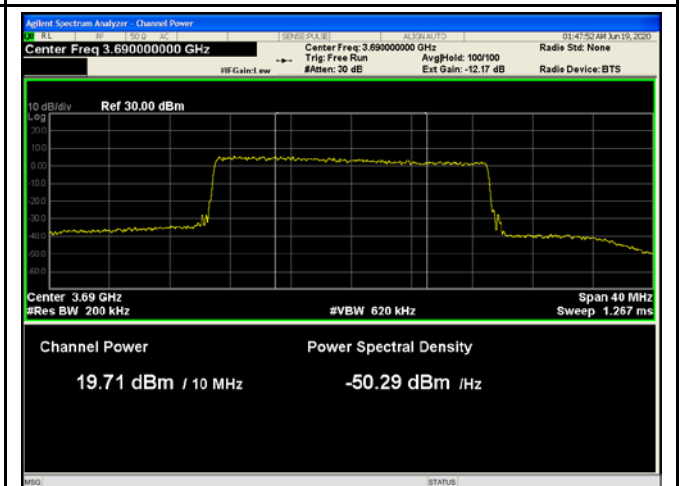
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20MHz - Middle CH 64QAM

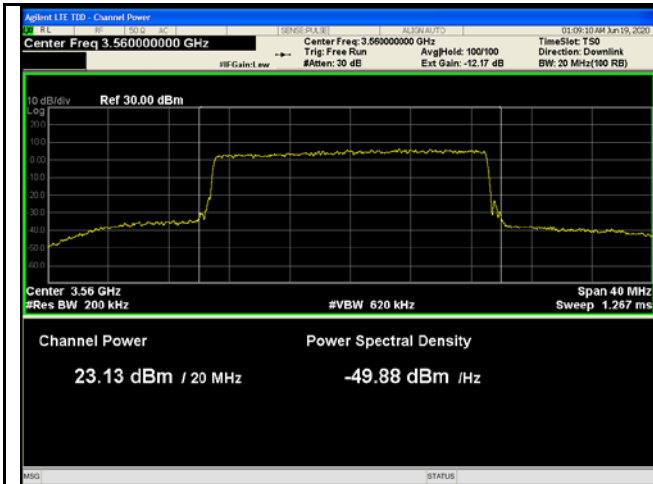


20MHz - High CH QPSK

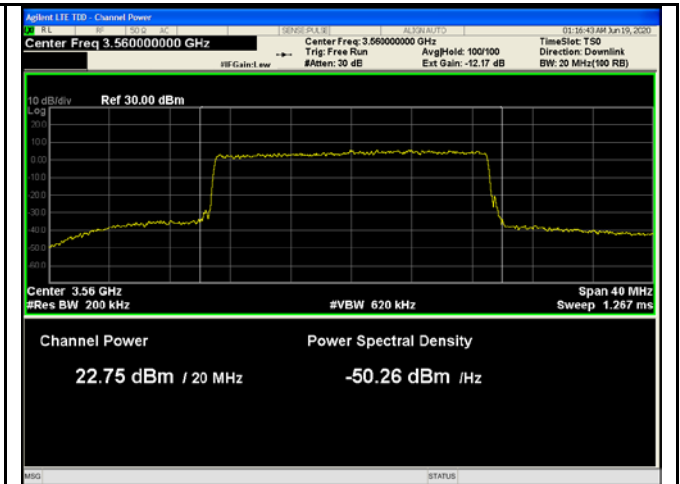


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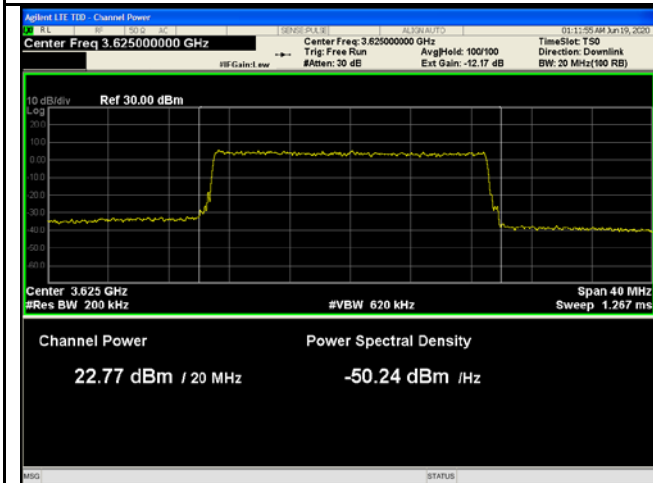




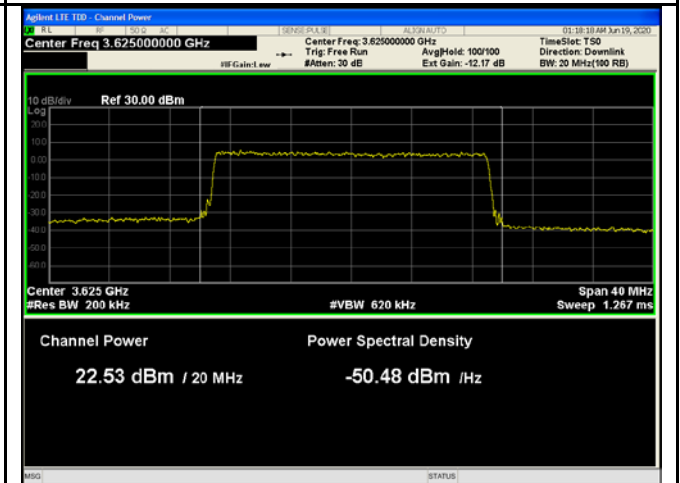
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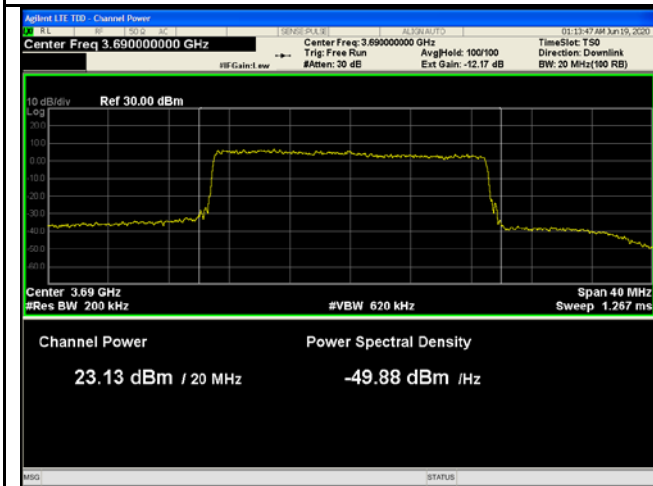
20MHz Full - Low CH 64QAM



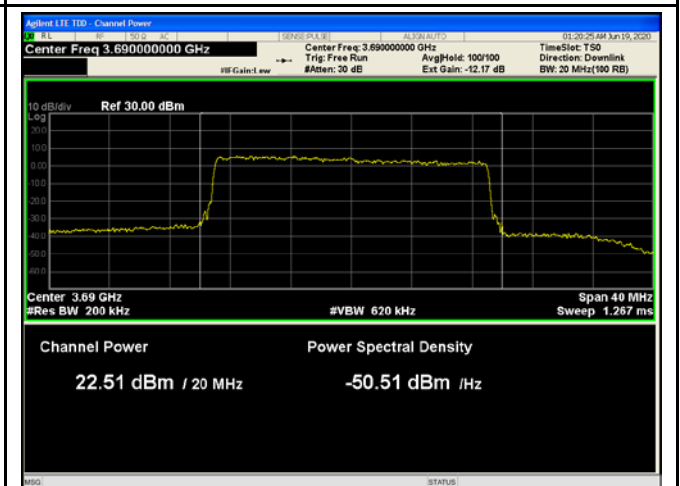
20MHz Full - Middle CH QPSK



20MHz Full - Middle CH 64QAM

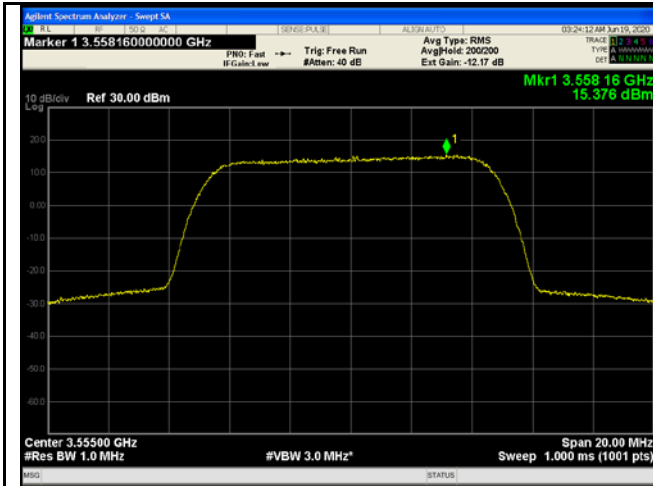


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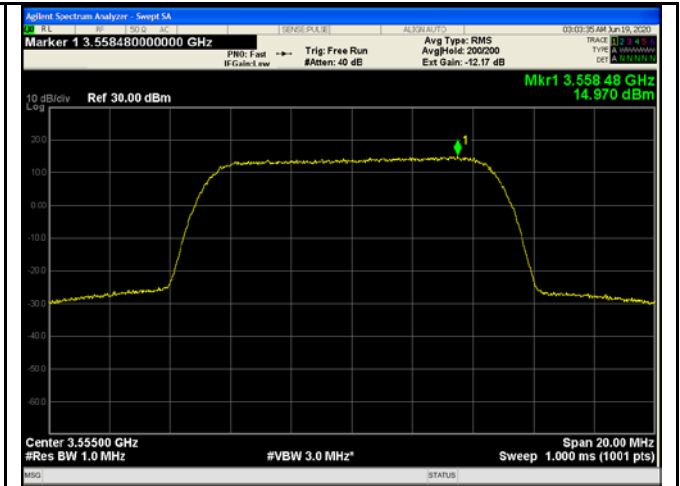


20MHz Full - High CH 64QAM

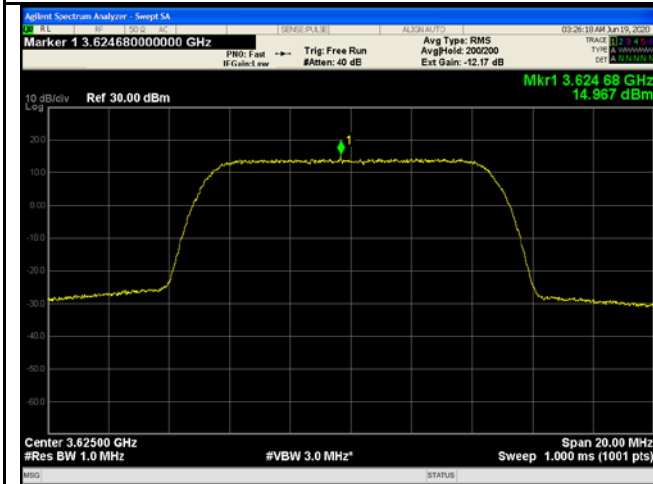
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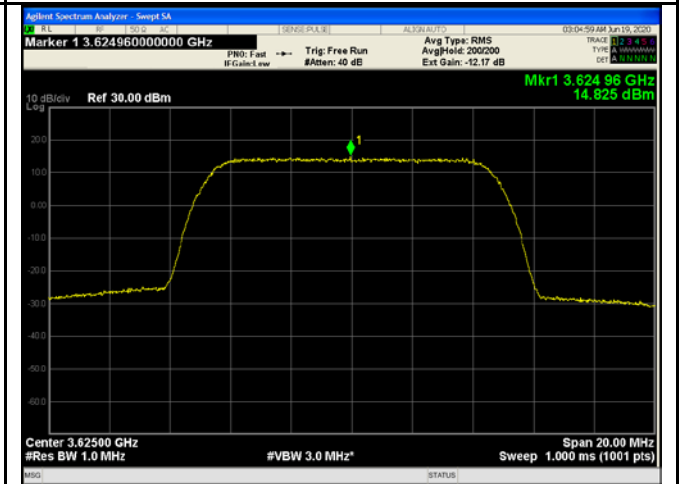
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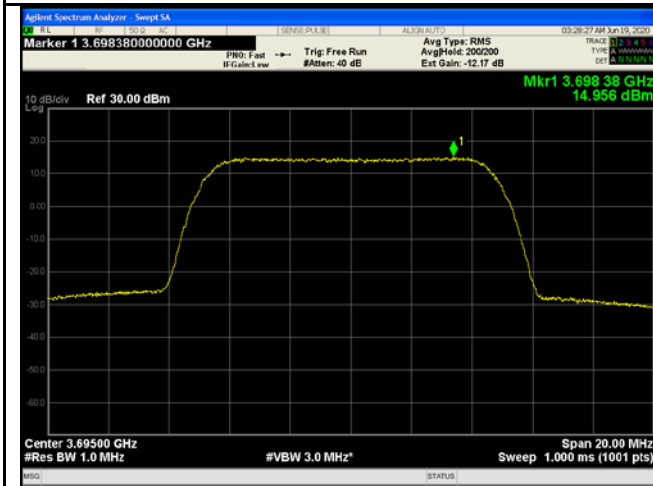
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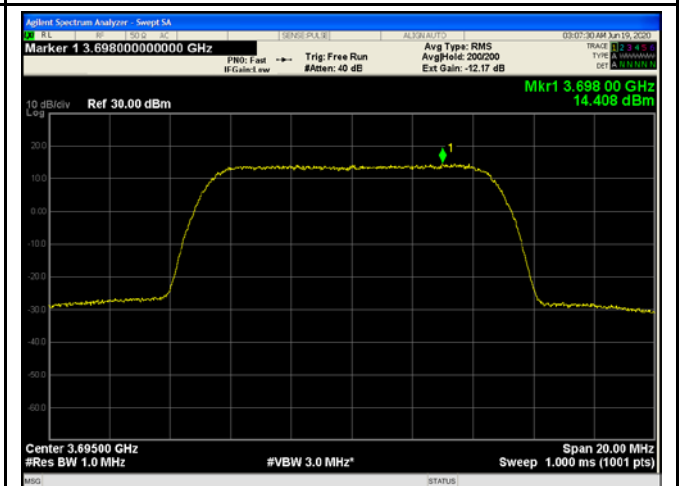
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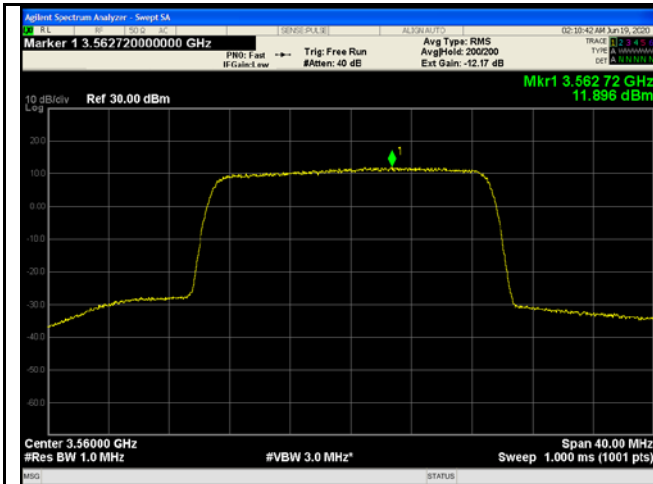
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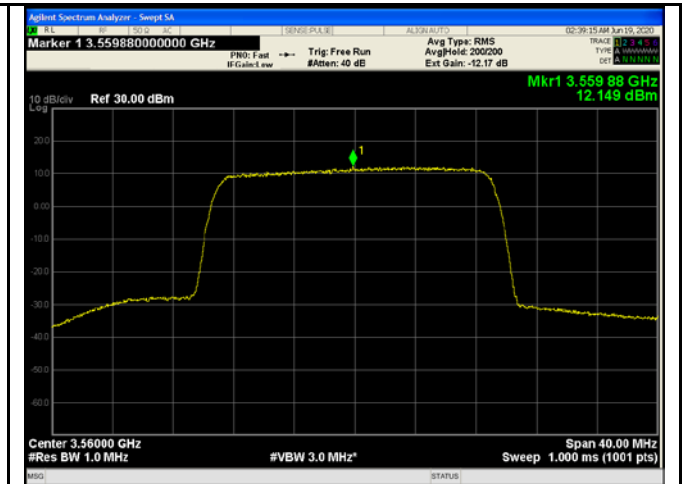
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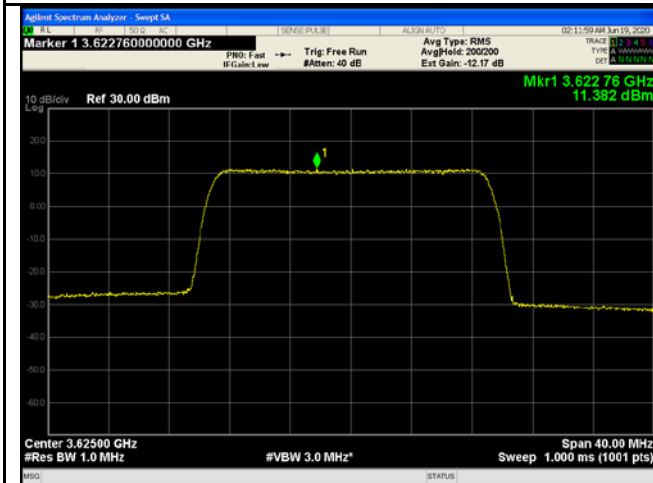
10MHz - High CH 64QAM



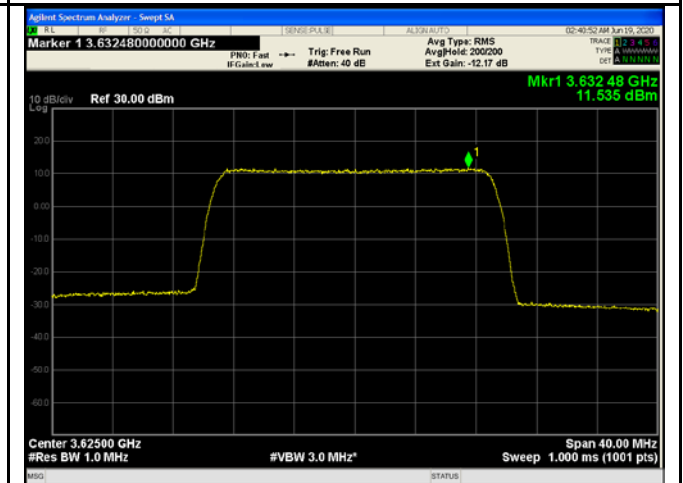
20MHz - Low CH QPSK



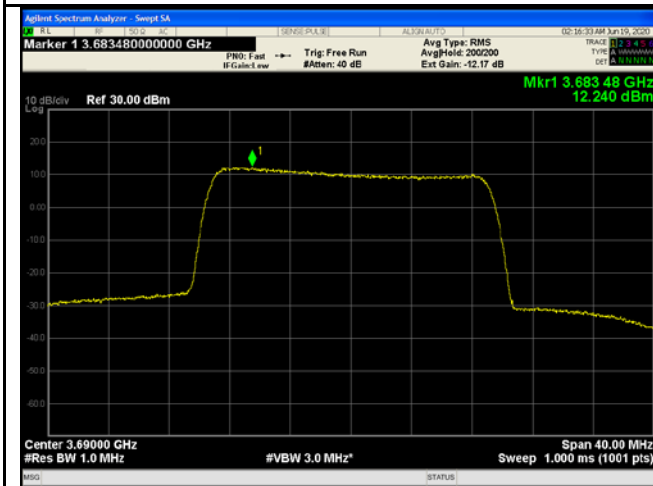
20MHz - Low CH 64QAM



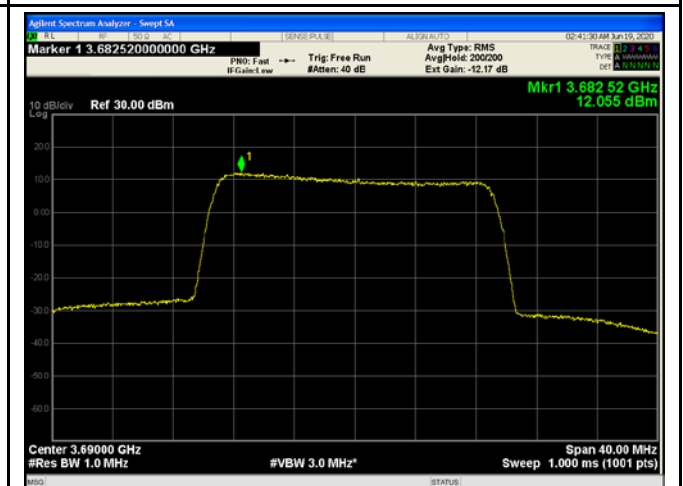
20MHz - Middle CH QPSK



20MHz - Middle CH 64QAM

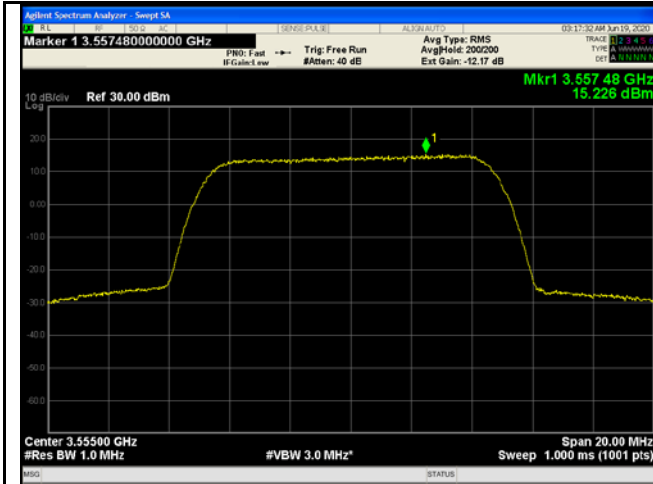


20MHz - High CH QPSK

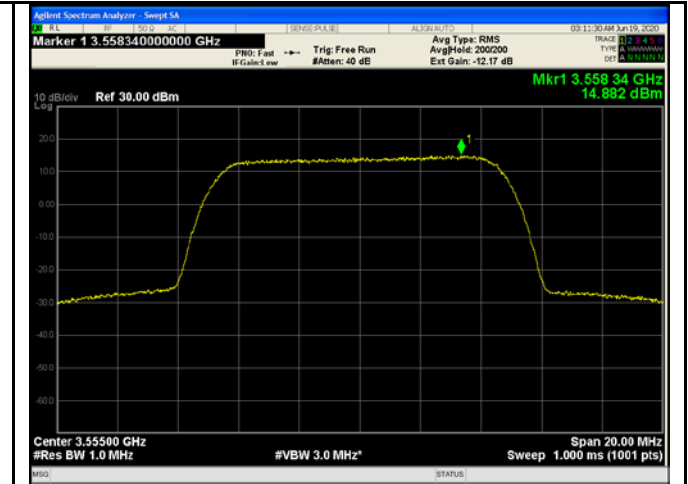


20MHz - High CH 64QAM

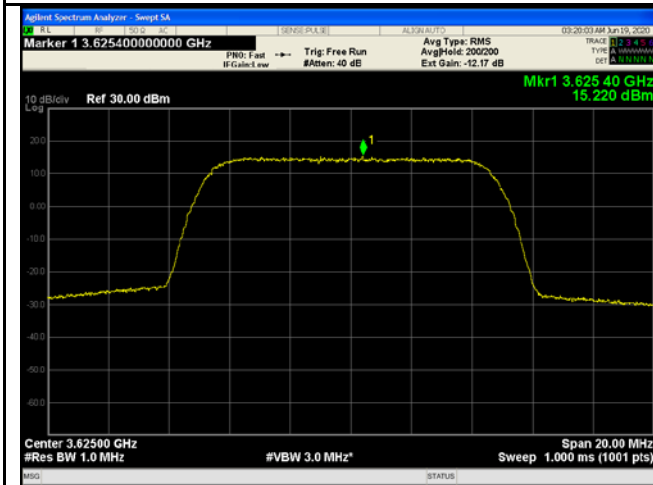
Port2



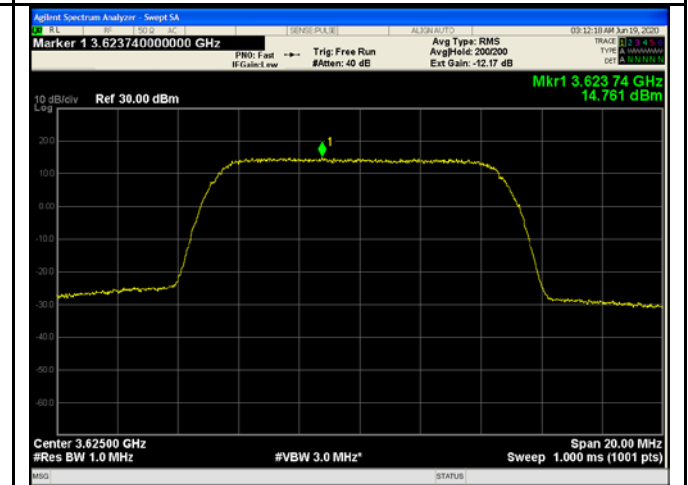
10MHz - Low CH QPSK



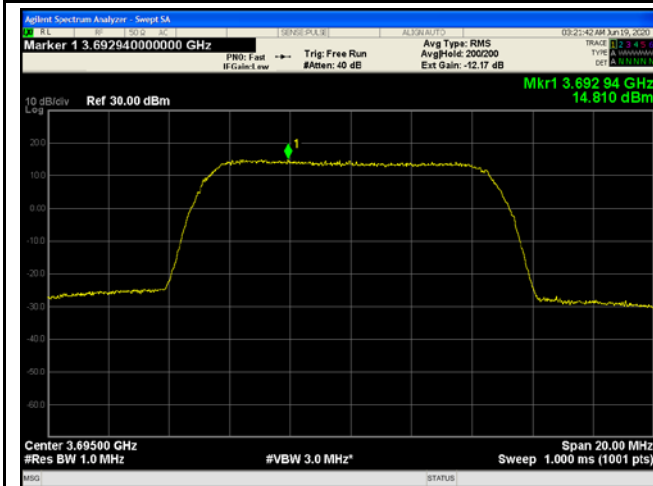
10MHz - Low CH 64QAM



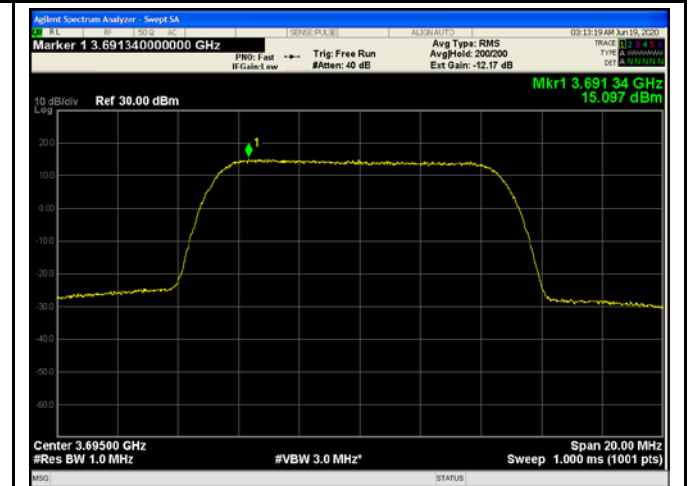
10MHz - Middle CH QPSK



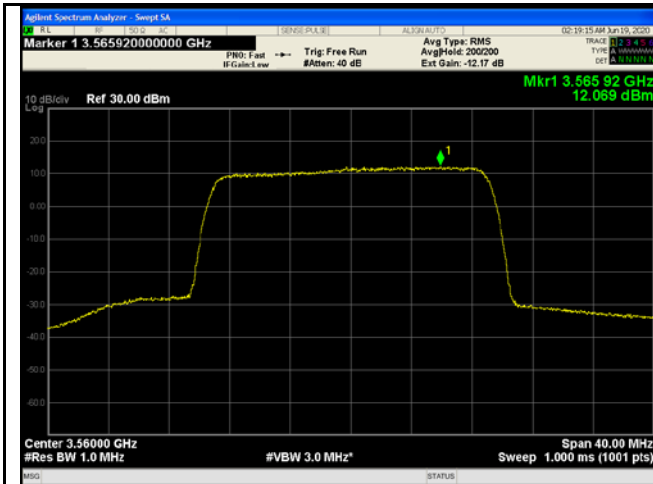
10MHz - Middle CH 64QAM



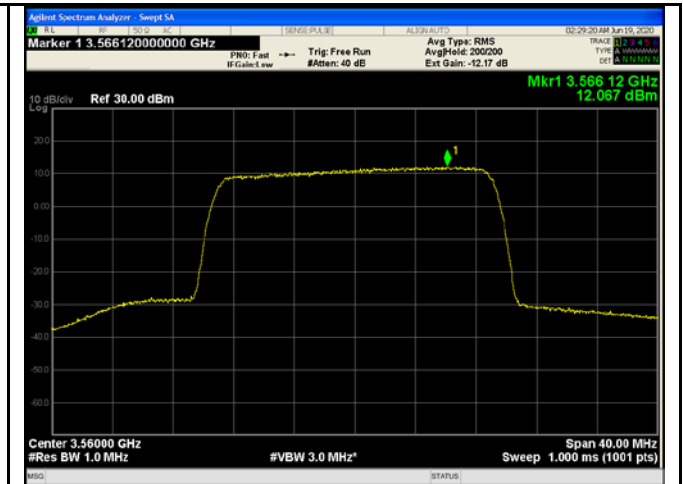
10MHz - High CH QPSK



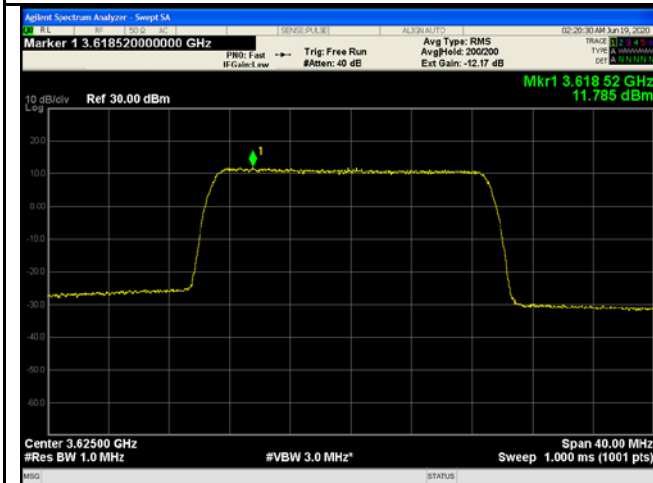
10MHz - High CH 64QAM



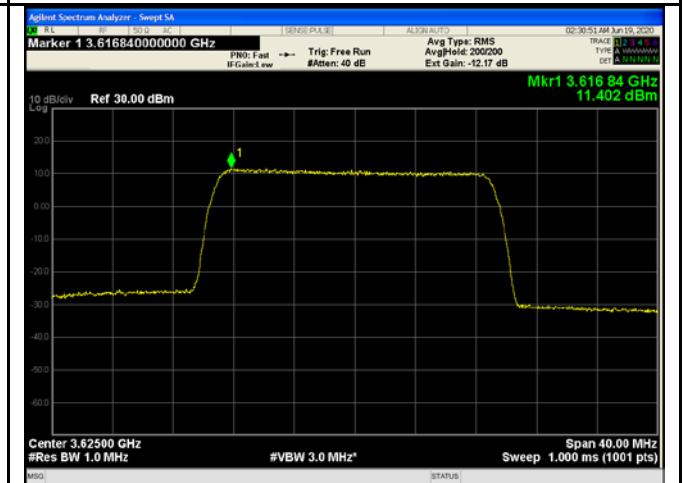
20MHz - Low CH QPSK



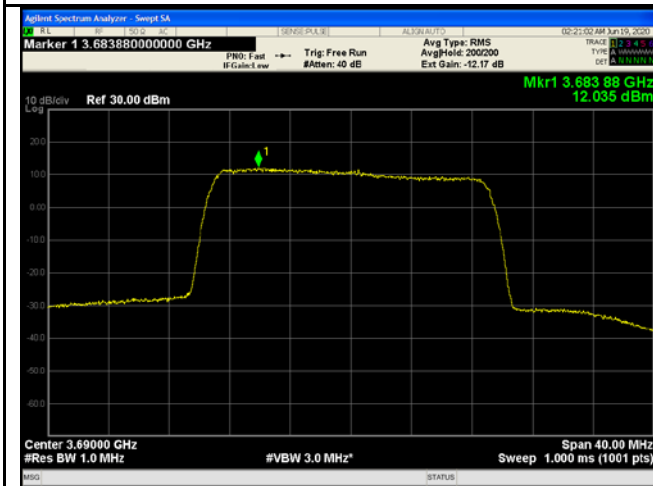
20MHz - Low CH 64QAM



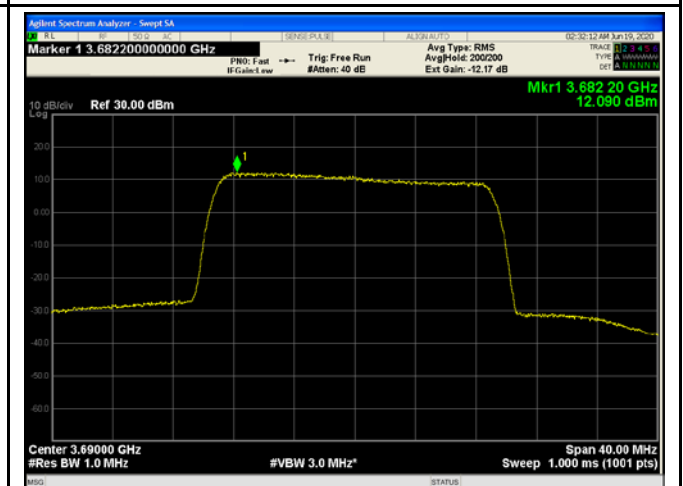
20MHz - Middle CH QPSK



20MHz - Middle CH 64QAM



20MHz - High CH QPSK



20MHz - High CH 64QAM

## 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:	51.3 % RH
Atmospheric Pressure:	101.3kPa

### 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: 2AG32MBS110596 test report 2477ERM.005.  
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:	51.3 % RH
Atmospheric Pressure:	101.3kPa

### 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

Remark: Refer to the original FCC ID: 2AG32MBS110596 test report 2477ERM.005.

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:	<ul style="list-style-type: none"><li>•within 0 MHz to 10 MHz above and below the assigned channel <math>\leq</math> -13 dBm/MHz</li><li>• greater than 10 MHz above and below the assigned channel <math>\leq</math> -25 dBm/MHz</li><li>• any emission below 3530 MHz and above 3720 MHz <math>\leq</math> -40 dBm/MHz</li></ul>

### 10.1 EUT Operation

Operating Environment :	
Temperature:	23.5 °C
Humidity:	51.3 % RH
Atmospheric Pressure:	101.3kPa

### 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



Spot-check test data Plots  
Port1



Spot-check test data Plots  
Port1

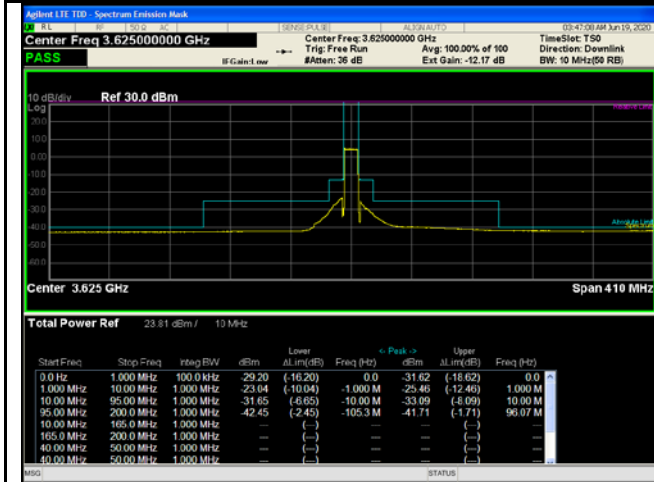
Waltek Services (Shenzhen) Co.,Ltd.  
<http://www.waltek.com.cn>



10MHz - Low CH QPSK



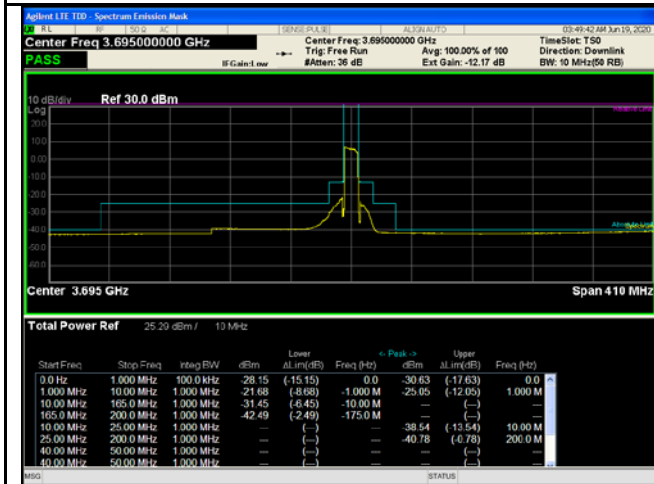
20MHz - Low CH QPSK



10MHz - Middle CH QPSK



20MHz - Middle CH QPSK



10MHz - High CH QPSK



20MHz - High CH QPSK

## 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: 2AG32MBS110596 test report 2477ERM.005.

TEST A.7: SPURIOUS EMISSIONS AT ANTENNA TERMINALS.

## 12 Field strength of spurious radiation measurement

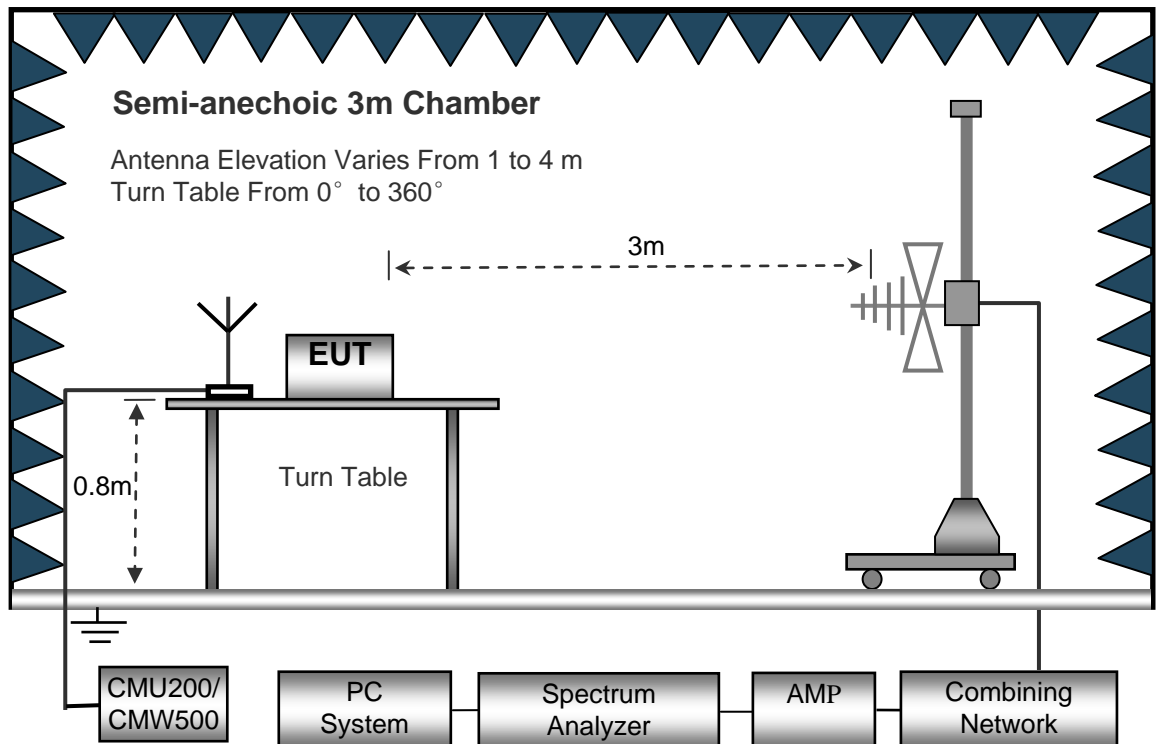
Test Requirement:	FCC part 96.41(e)
Test Method:	ANSI/TIA-603-E:2016, ANSI C63.26:2015
Test Mode:	Data communicating mode
Limit:	-40dBm

### 12.1 EUT Operation

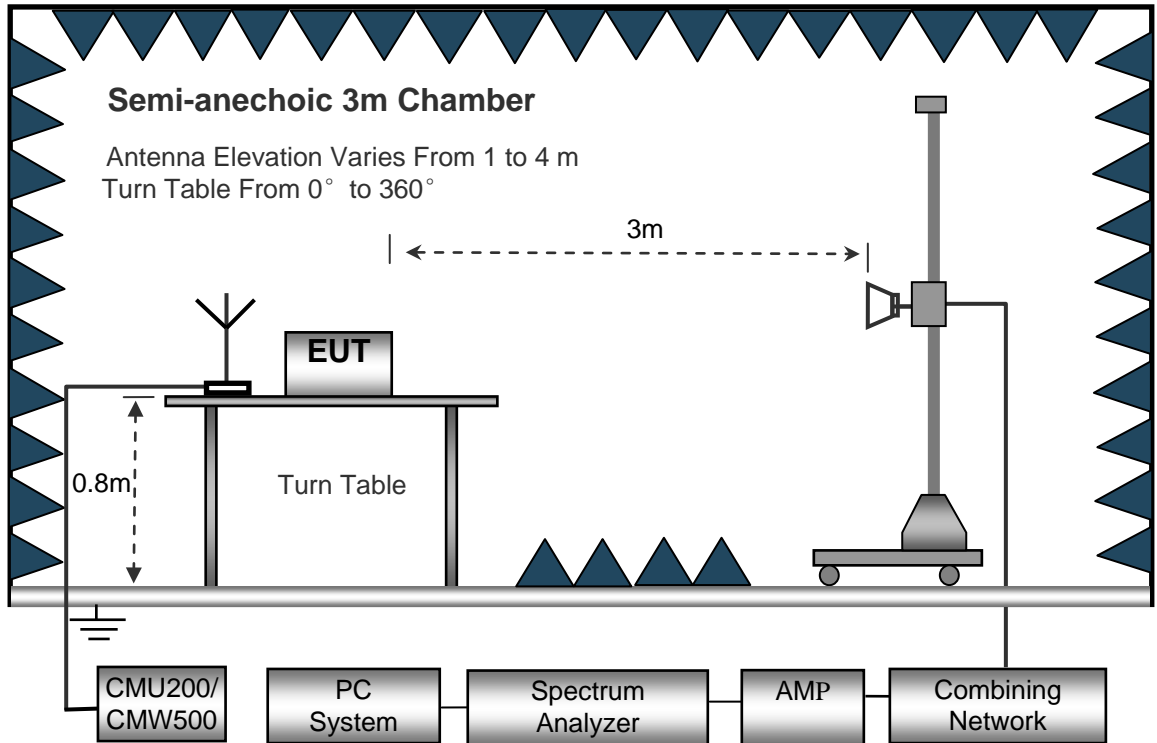
Operating Environment :	
Temperature:	23.5 °C
Humidity:	52.1 % RH
Atmospheric Pressure:	101.2kPa

### 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: 2AG32MBS110596 test report 2477ERM.005.

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			

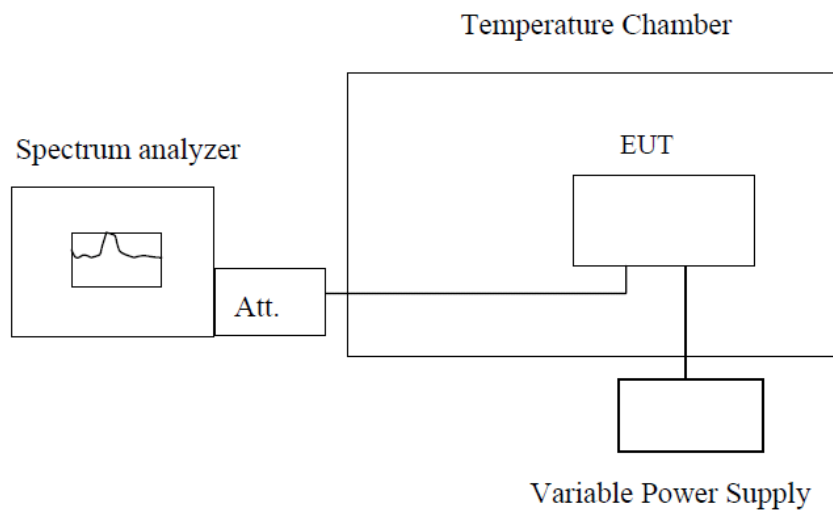
### 13.1 EUT Operation

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: 2AG32MBS110596 test report 2477ERM.005.

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:

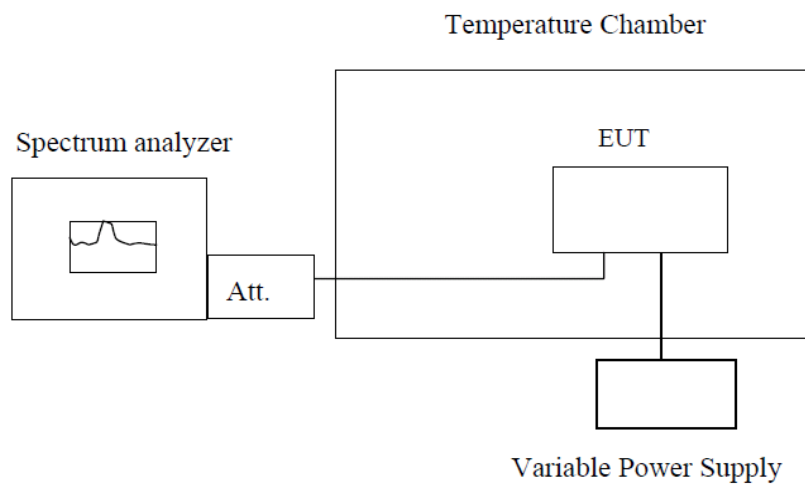
Frequency range (MHz)	Fixed and base stations (±ppm)	Mobile stations (±ppm)	
		Over 2 watts output power	2 watts or less output power
Below 25	100	100	200
25-50	20	20	50
72-76	5		50
150-174	5	5	50
216-220	1.0		1.0
220-222	0.1	1.5	1.5
421-512	2.5	5	5
806-808	1.0	1.5	1.5
809-824	1.5	2.5	2.5
851-854	1.0	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
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: 2AG32MBS110596 test report 2477ERM.005.

TEST A.9: FREQUENCY STABILITY.

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