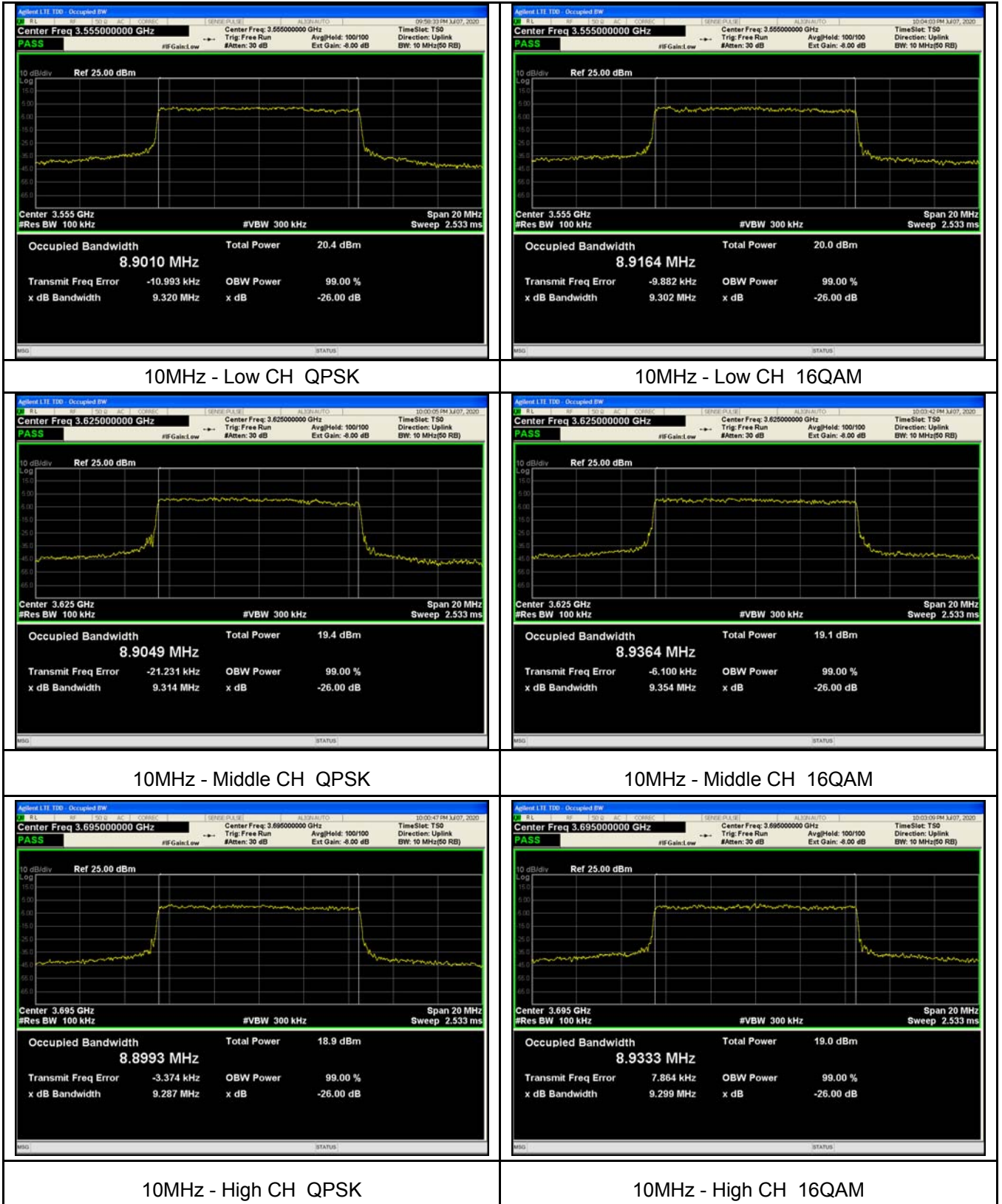
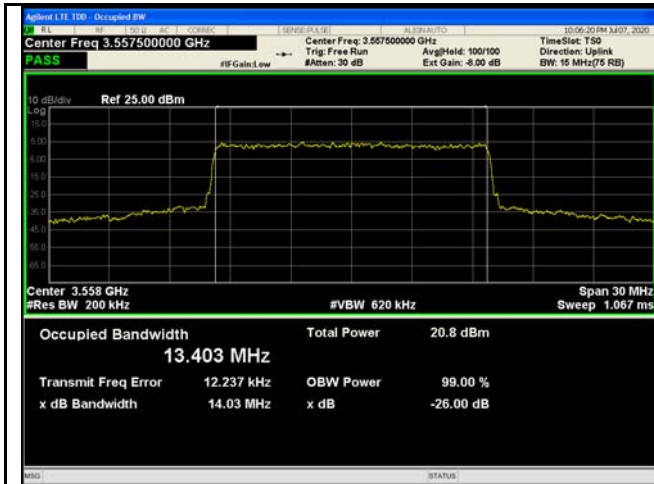
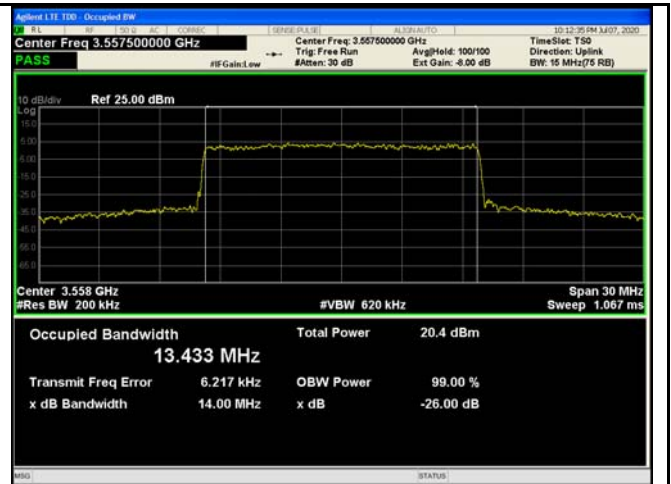


Test Plots
Port1

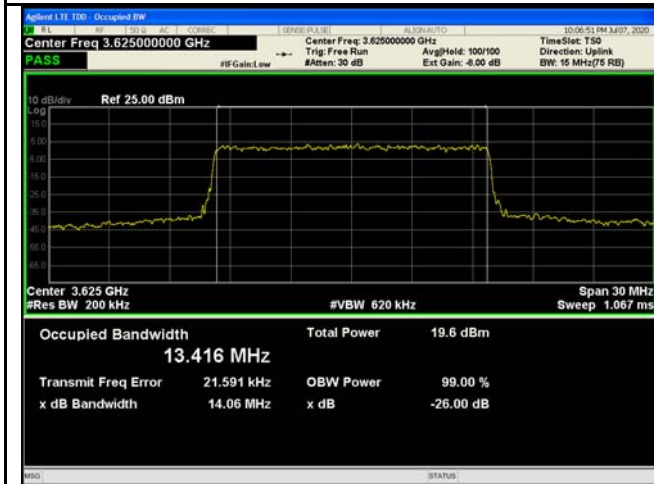




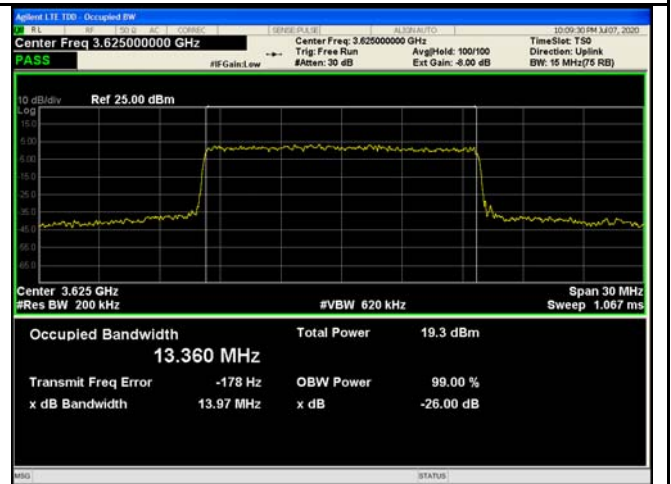
15MHz - Low CH QPSK



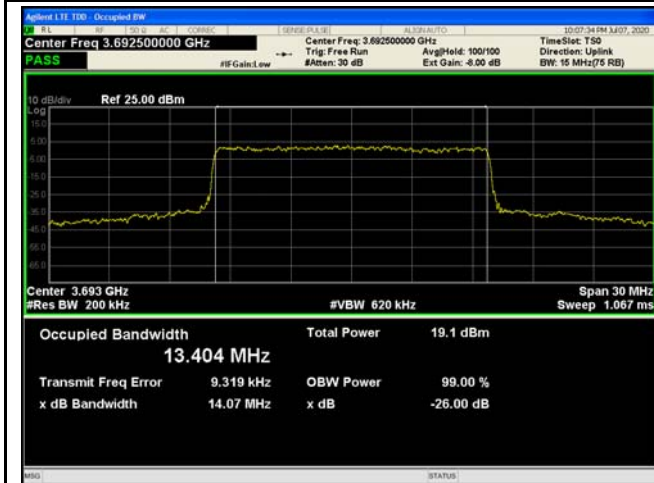
15MHz - Low CH 16QAM



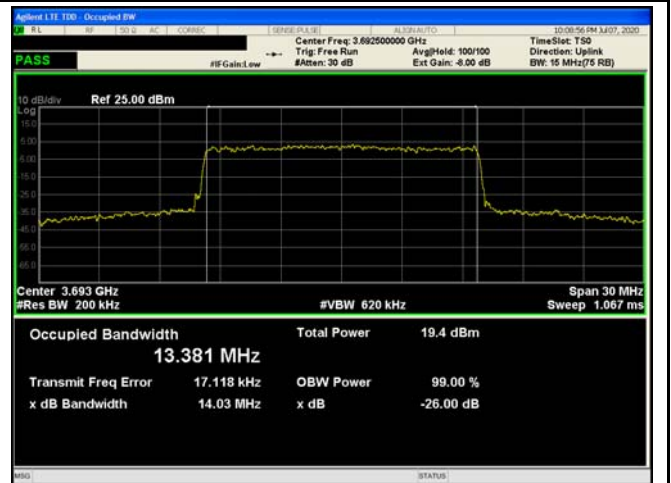
15MHz - Middle CH QPSK



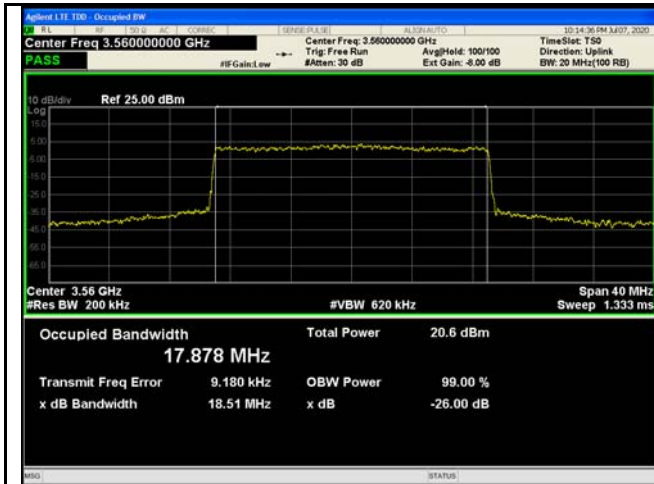
15MHz - Middle CH 16QAM



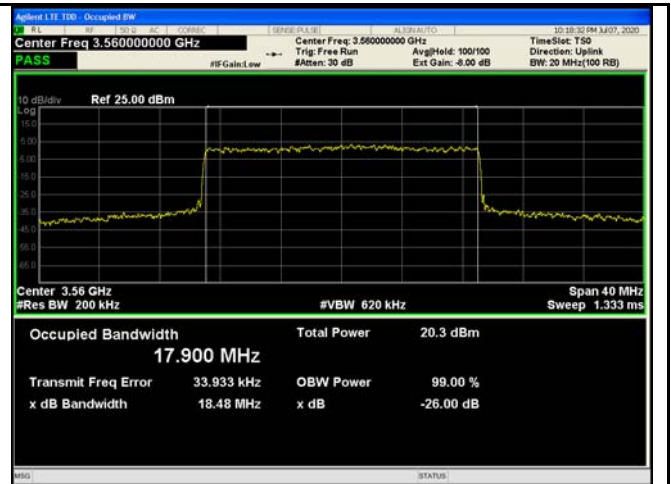
15MHz - High CH QPSK



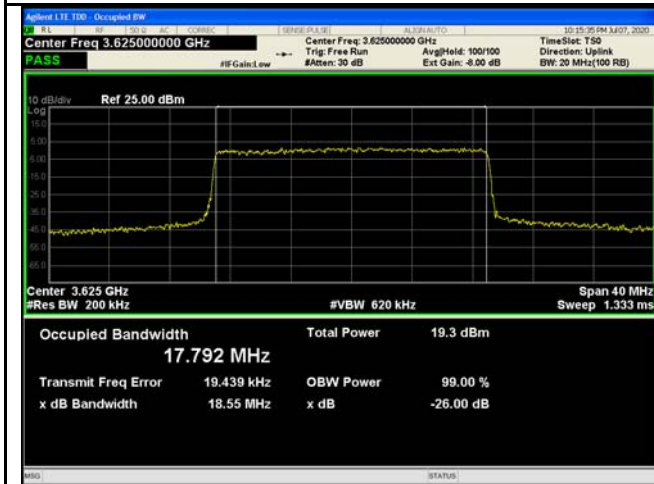
15MHz - High CH 16QAM



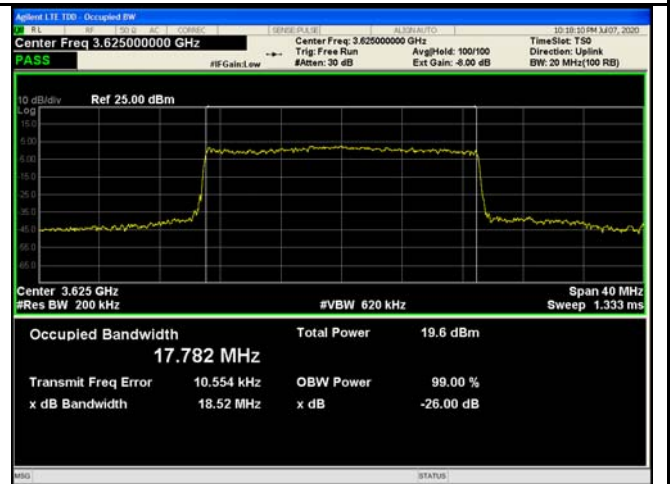
20MHz - Low CH QPSK



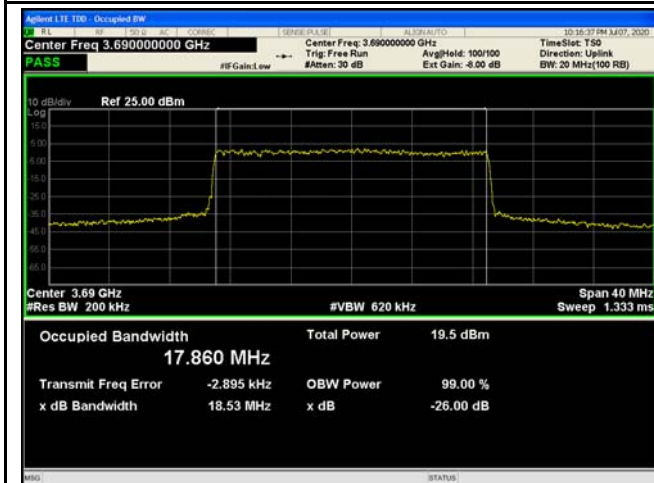
20MHz - Low CH 16QAM



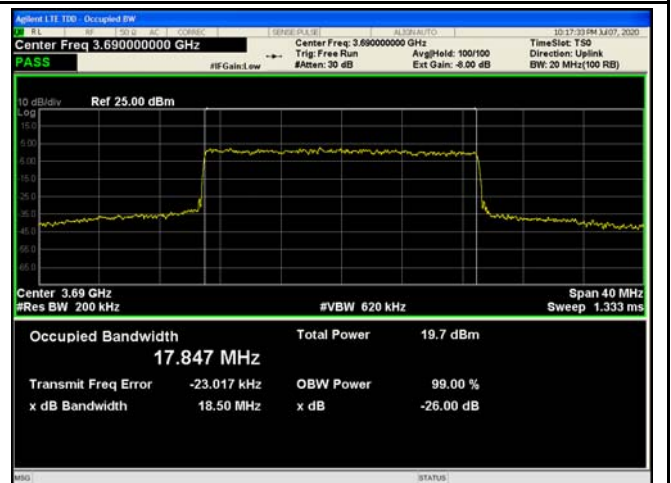
20MHz - Middle CH QPSK



20MHz - Middle CH 16QAM

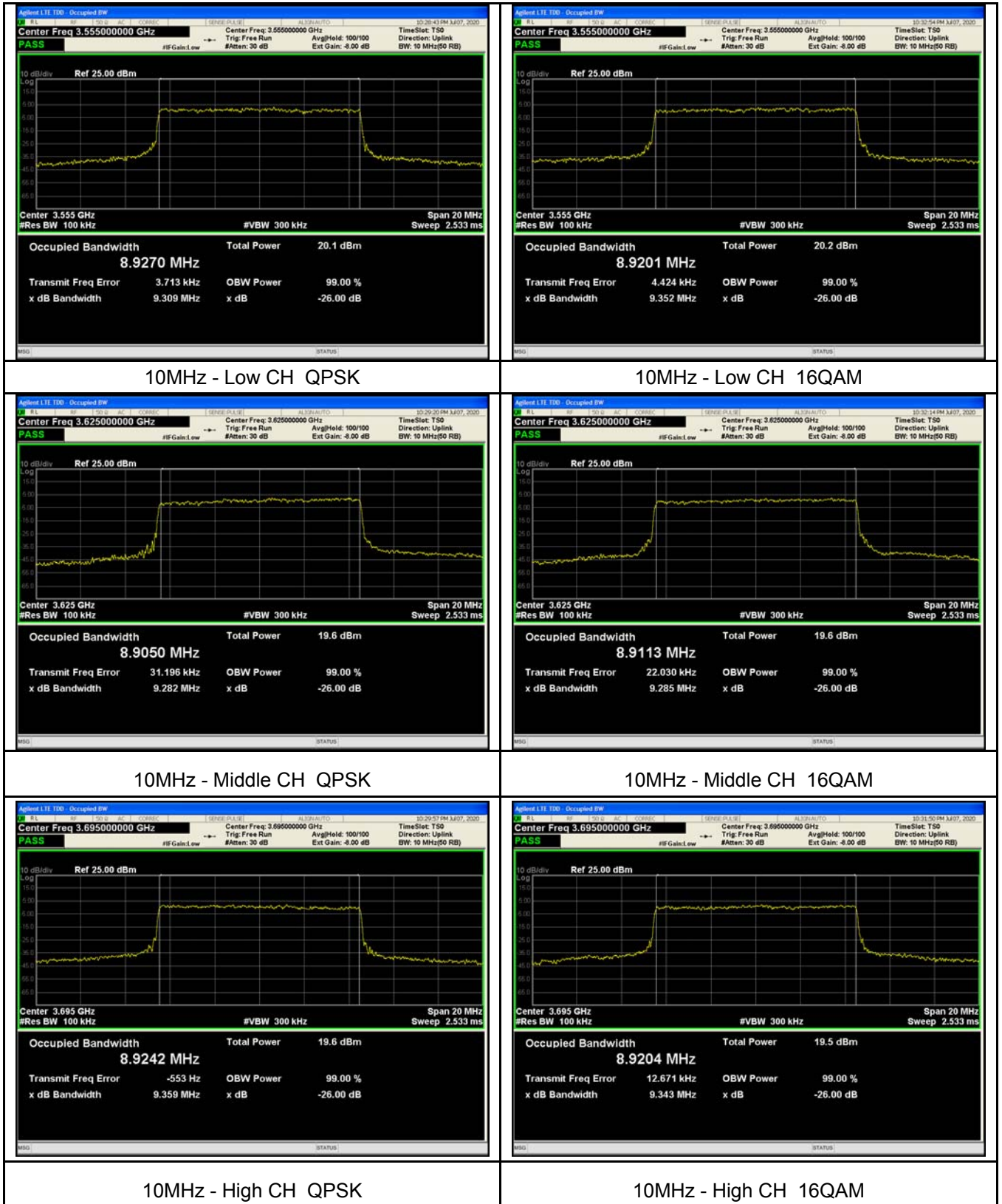


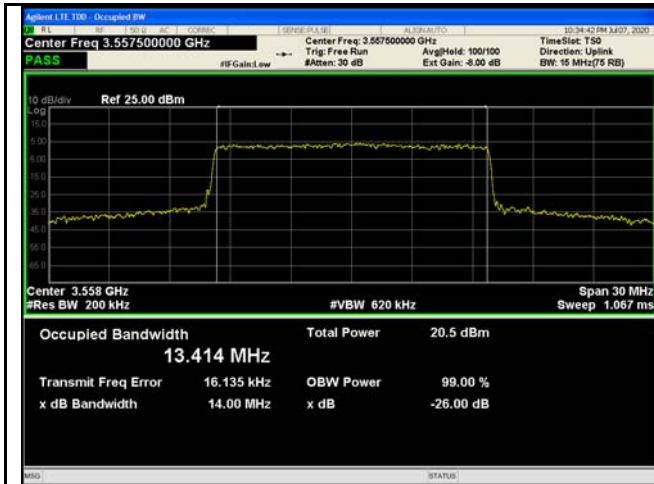
20MHz - High CH QPSK



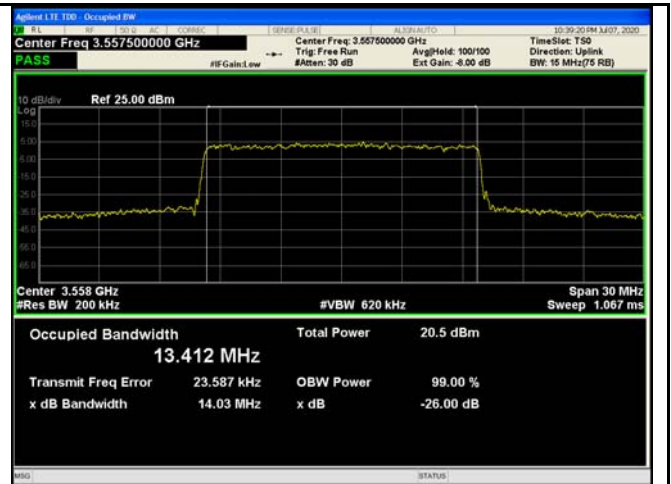
20MHz - High CH 16QAM

Port2

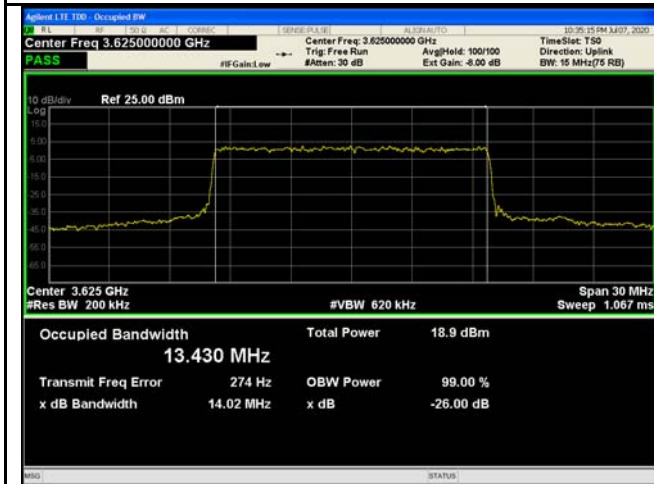




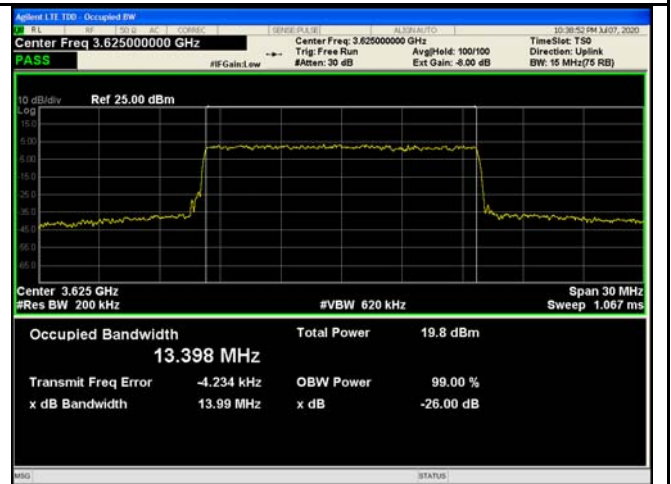
15MHz - Low CH QPSK



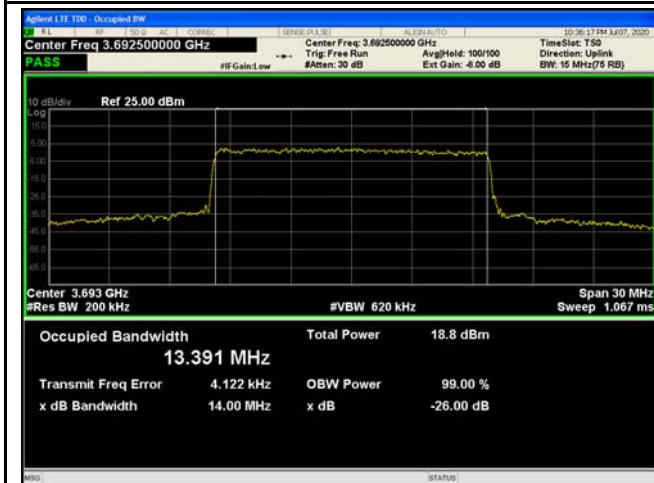
15MHz - Low CH 16QAM



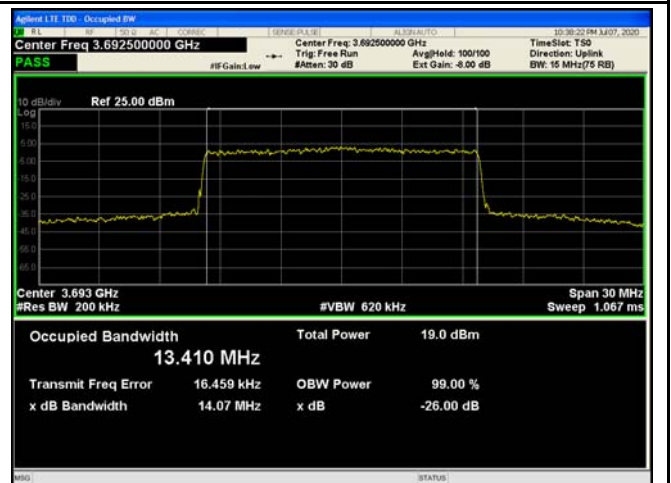
15MHz - Middle CH QPSK



15MHz - Middle CH 16QAM



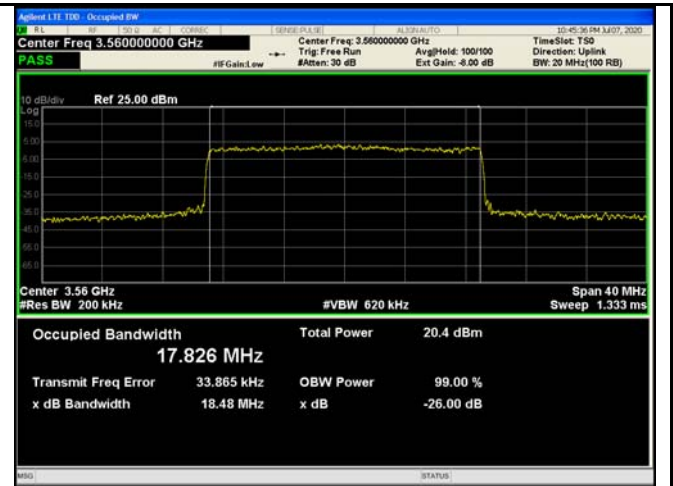
15MHz - High CH QPSK



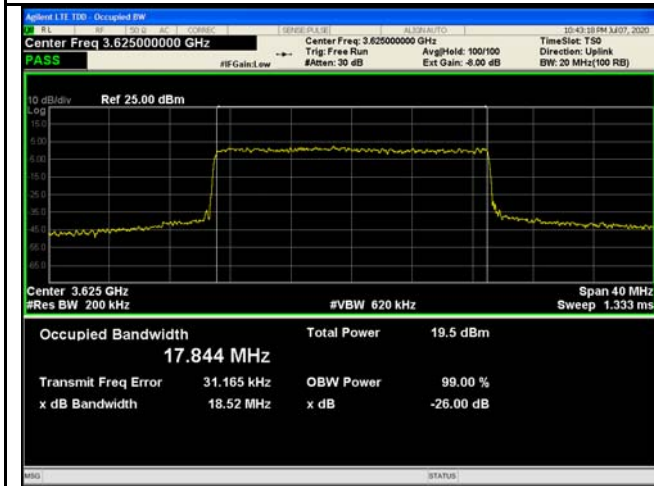
15MHz - High CH 16QAM



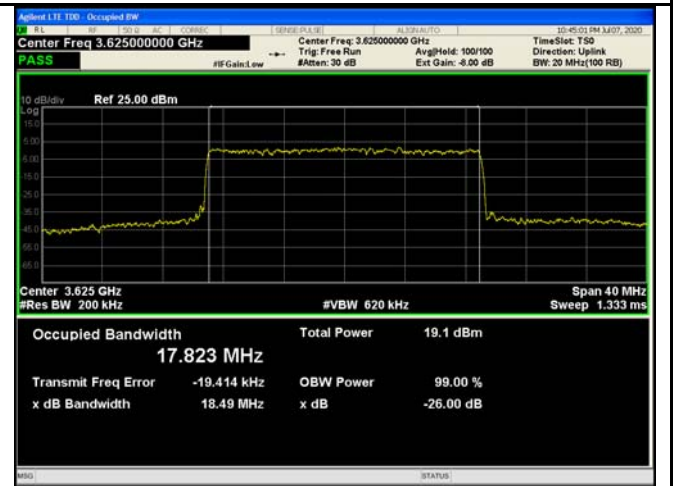
20MHz - Low CH QPSK



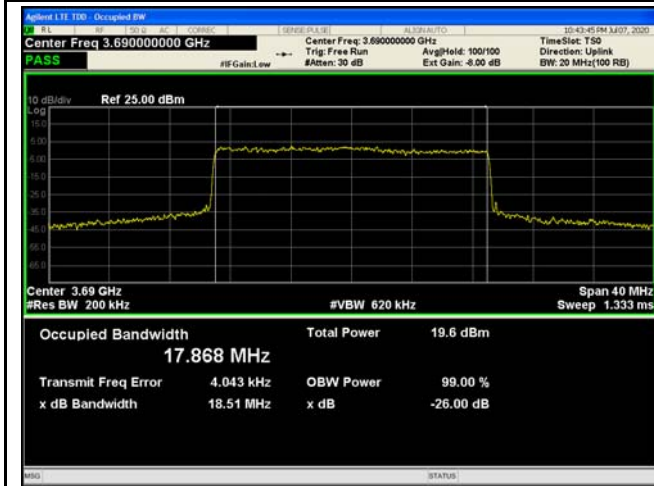
20MHz - Low CH 16QAM



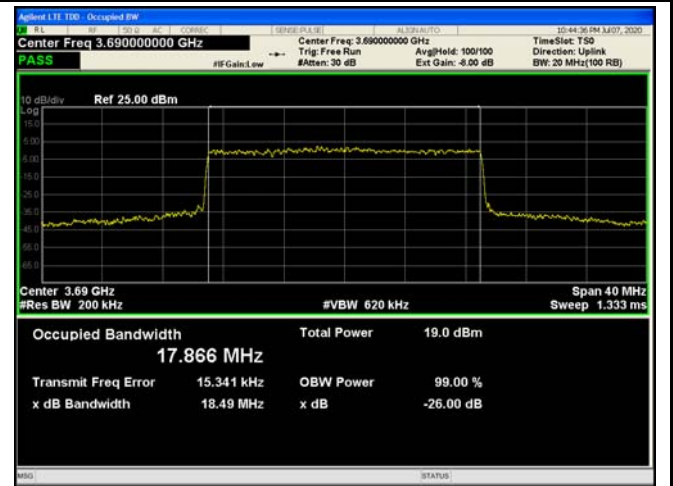
20MHz - Middle CH QPSK



20MHz - Middle CH 16QAM



20MHz - High CH QPSK



20MHz - High CH 16QAM

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

10.1 EUT Operation

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

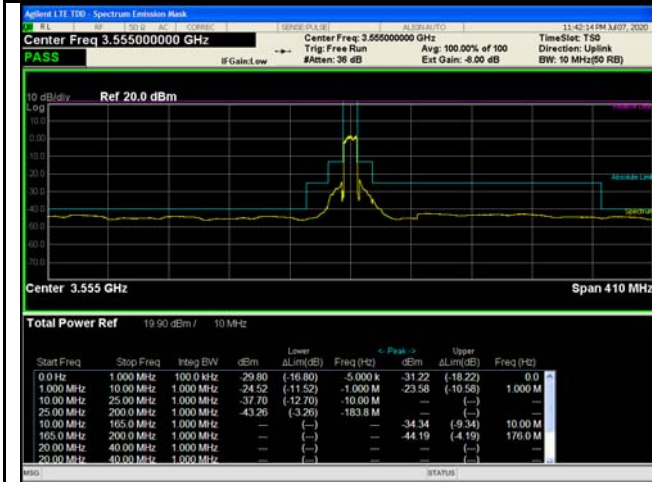
10.2 Test Procedure

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

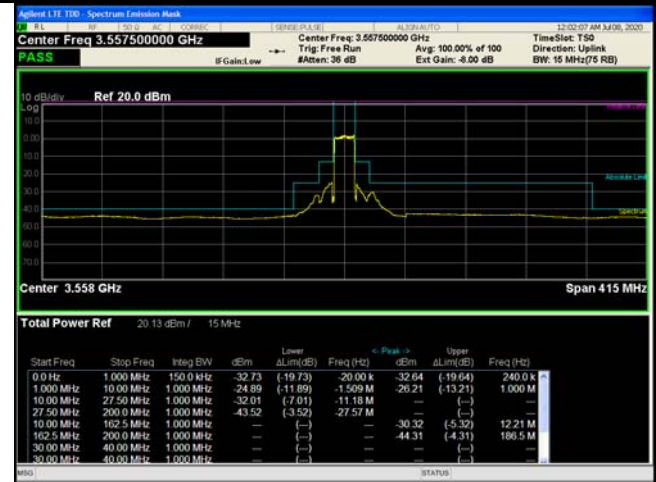
10.3 Test Result

Test Plots

Port1



10MHz - Low CH QPSK



15MHz - Low CH QPSK



10MHz - Middle CH QPSK



15MHz - Middle CH QPSK



10MHz - High CH QPSK



15MHz - High CH QPSK



20MHz - Low CH QPSK



20MHz - Middle CH QPSK



20MHz - High CH QPSK

Port2



10MHz - Low CH QPSK



15MHz - Low CH QPSK



10MHz - Middle CH QPSK



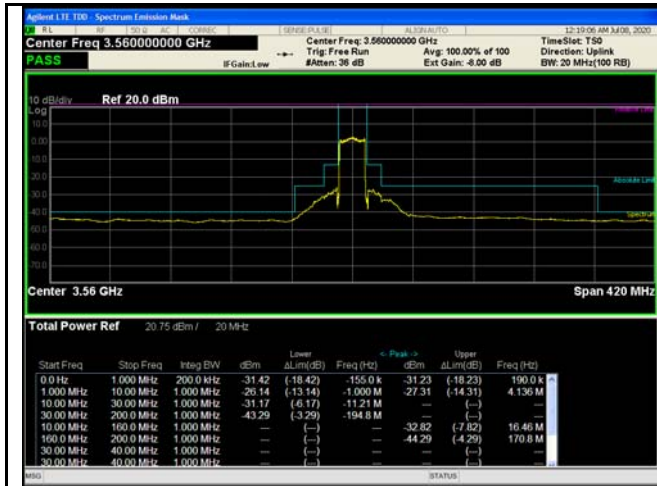
15MHz - Middle CH QPSK



10MHz - High CH QPSK



15MHz - High CH QPSK



20MHz - Low CH QPSK



20MHz - Middle CH QPSK



20MHz - High CH QPSK

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.

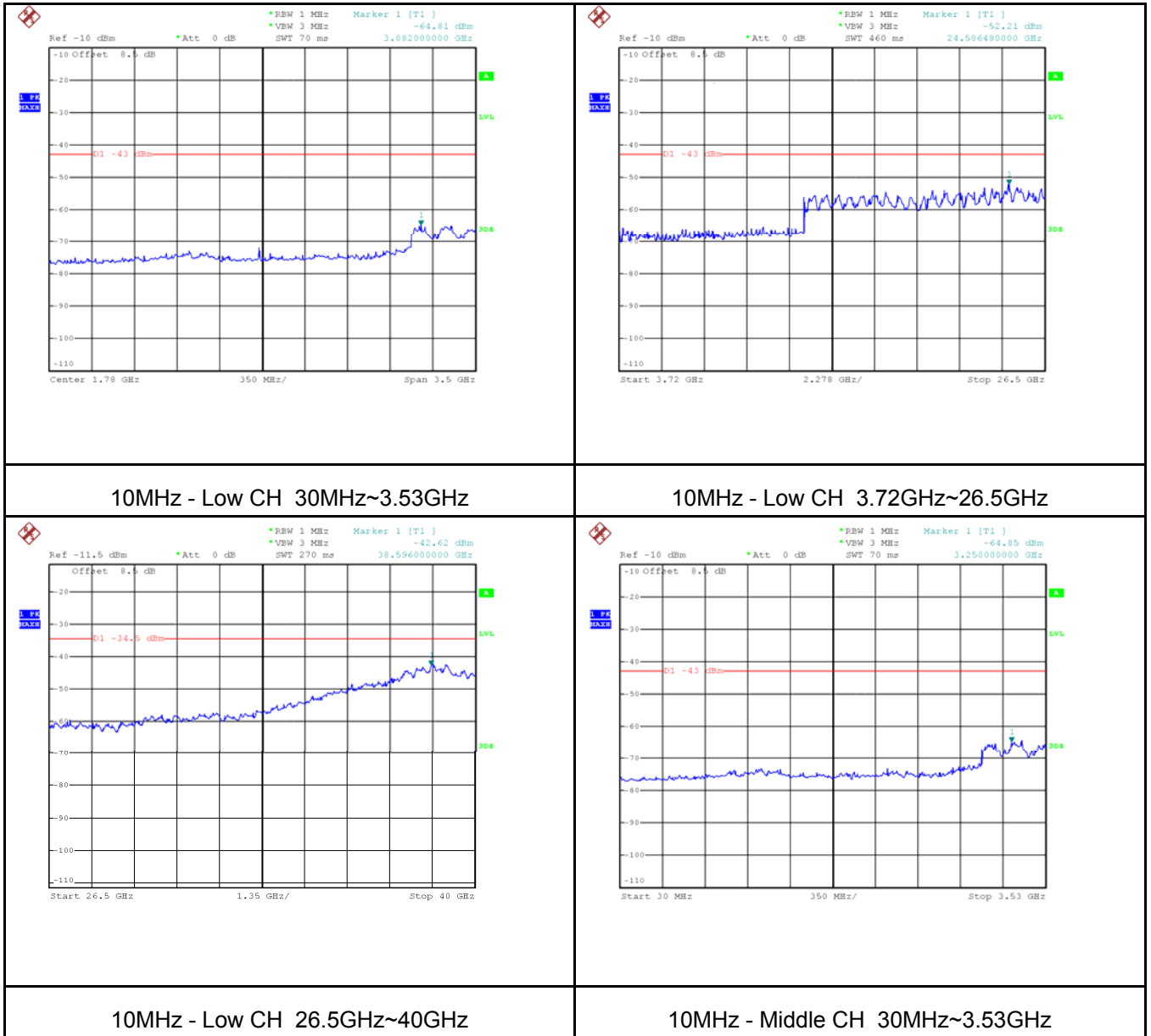
11.3 Test Result

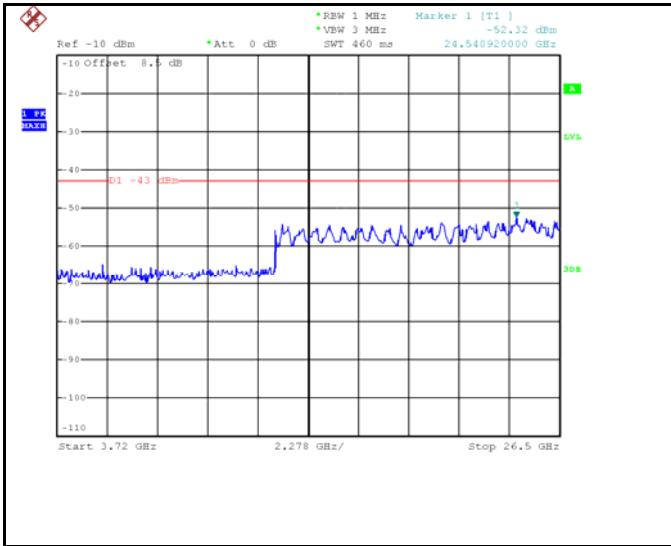
Remark: During the test, pre-scan the QPSK, 16QAM modulation, and found the QPSK modulation(5MHz/10MHz/15MHz/20MHz) is the worst case.

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

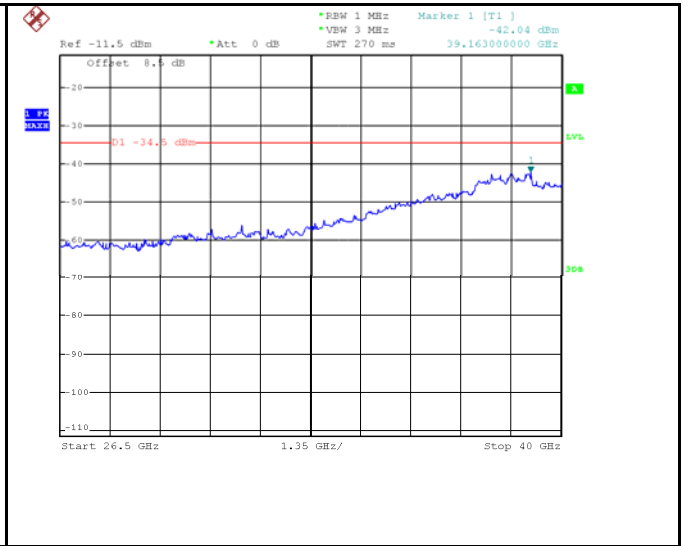
Test Plots

**Spurious emission
Port1+Port2**

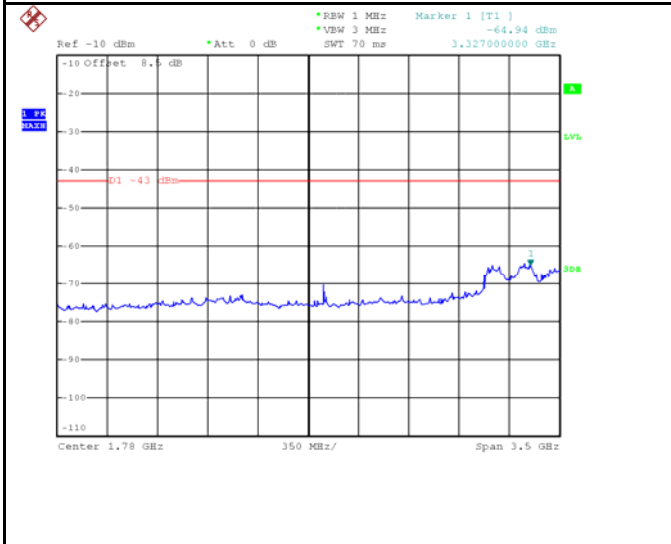




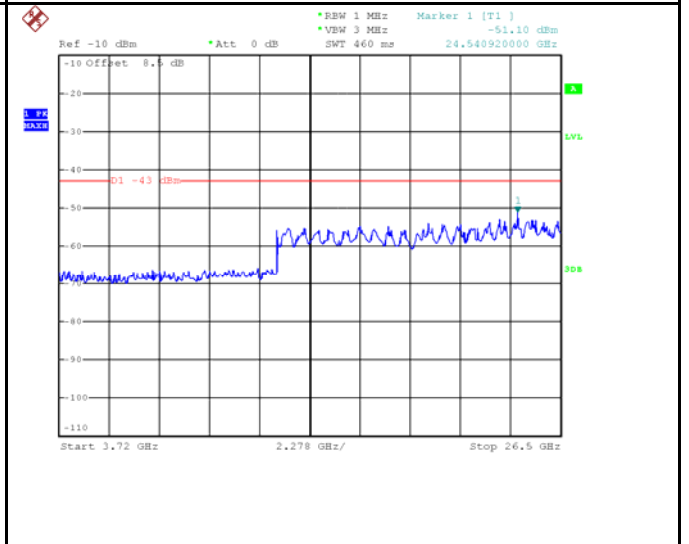
10MHz - Middle CH 3.72GHz~26.5GHz



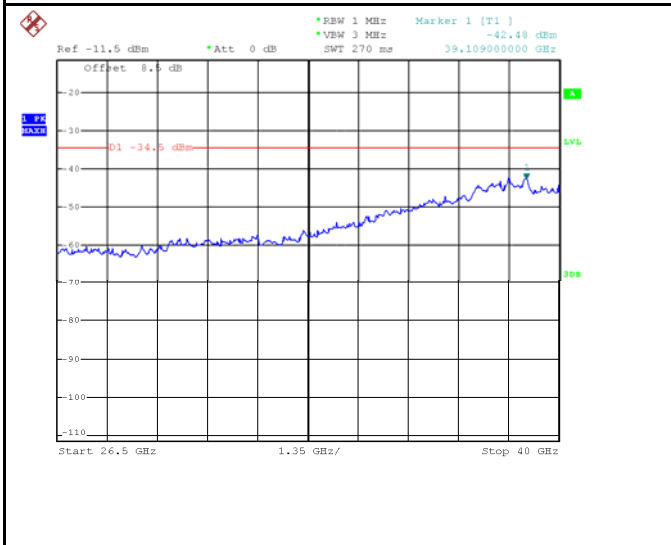
10MHz - Middle CH 26.5GHz~40GHz



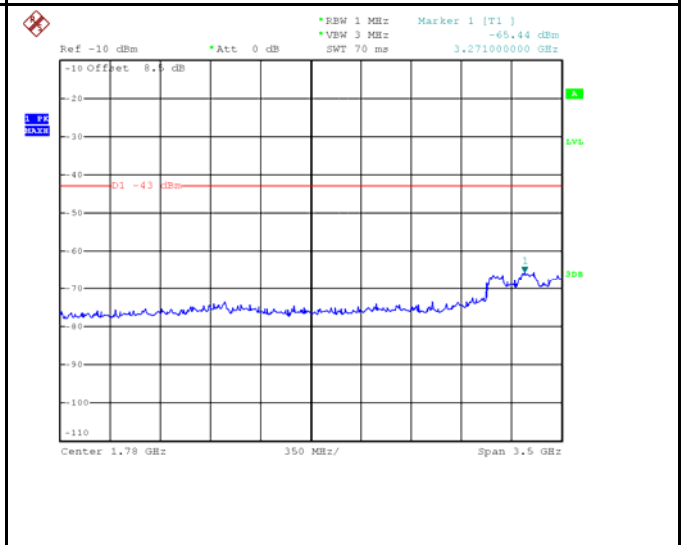
10MHz - High CH 30MHz~3.53GHz



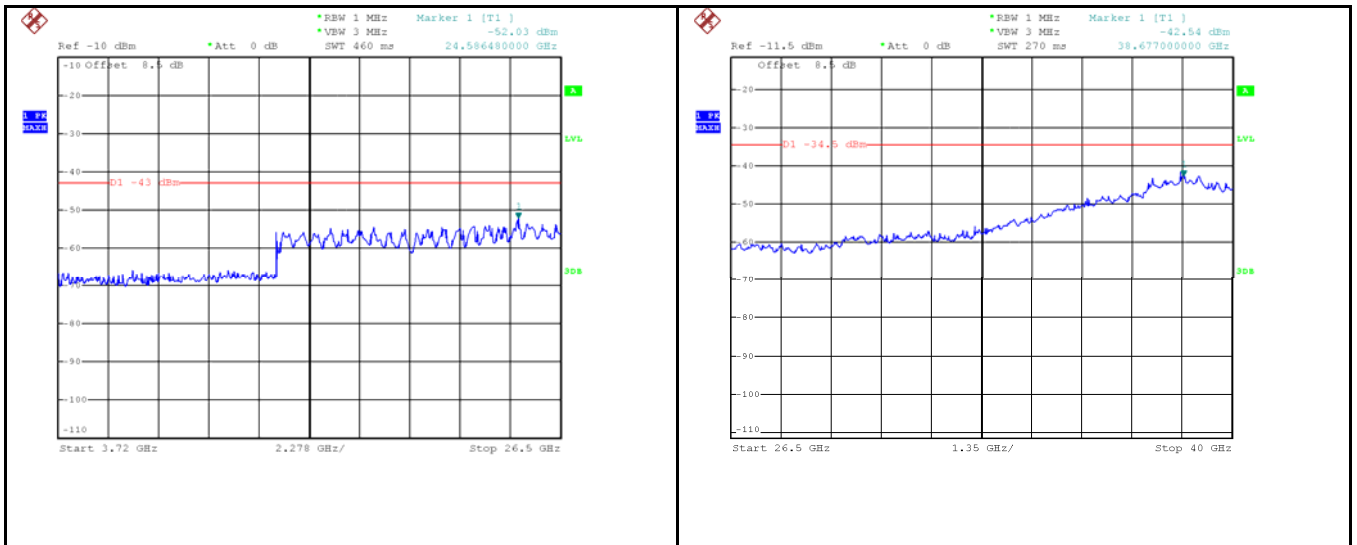
10MHz - High CH 3.72GHz~26.5GHz



10MHz - High CH 26.5GHz~40GHz

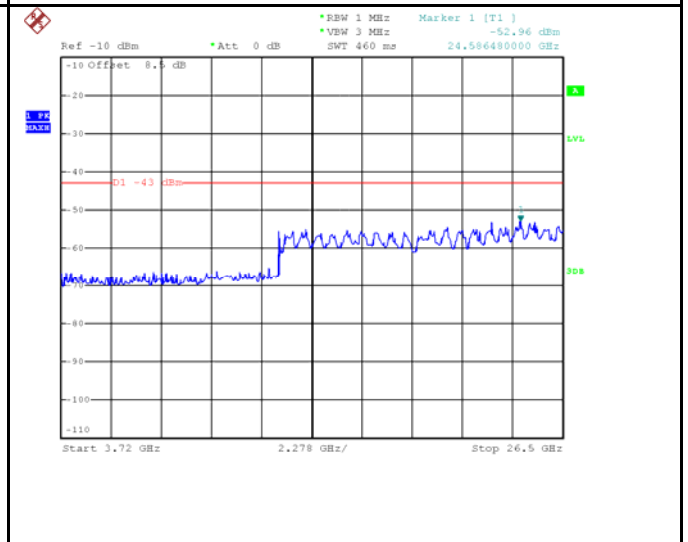
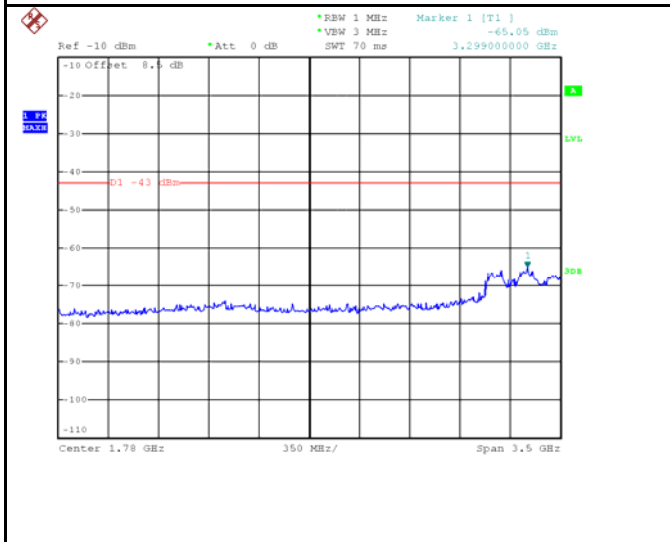


15MHz - Low CH 30MHz~3.53GHz



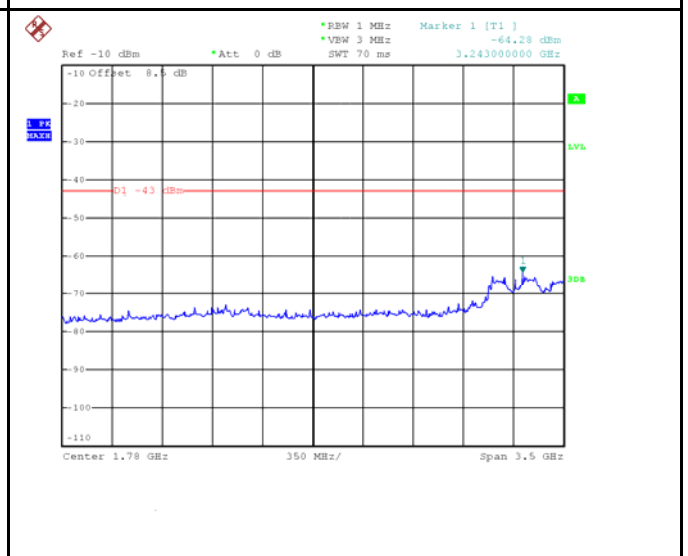
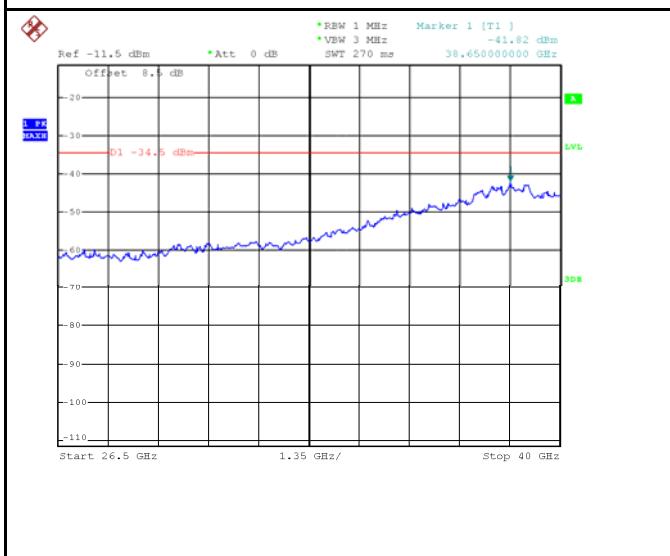
15MHz - Low CH 3.72GHz~26.5GHz

15MHz - Low CH 26.5GHz~40GHz



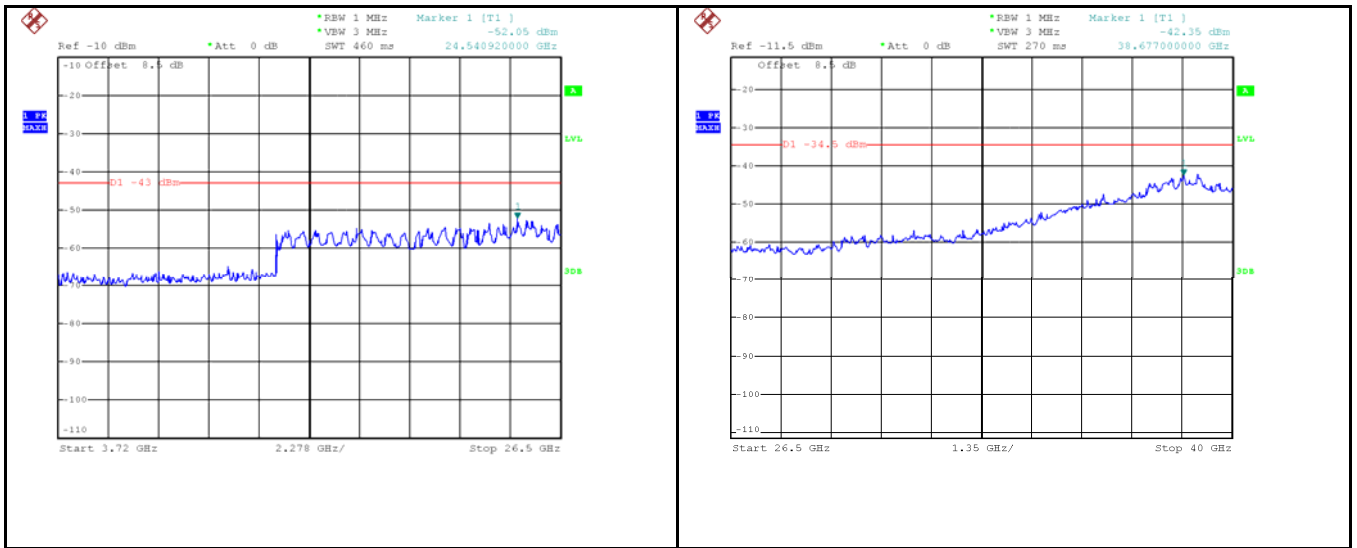
15MHz - Middle CH 30MHz~3.53GHz

15MHz - Middle CH 3.72GHz~26.5GHz



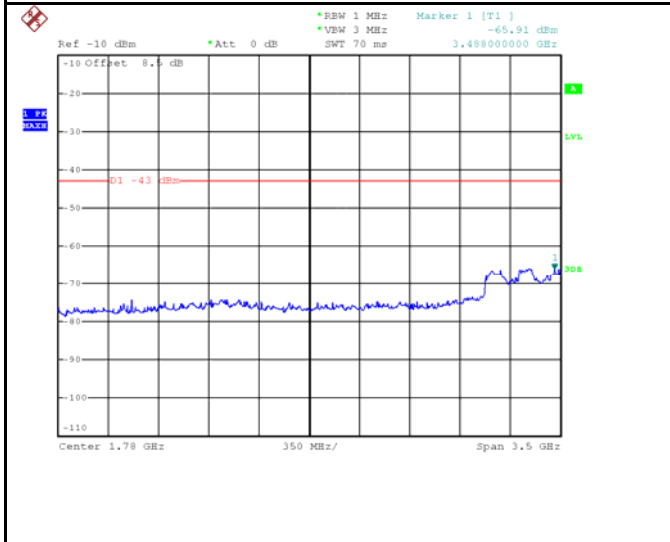
15MHz - Middle CH 26.5GHz~40GHz

15MHz - High CH 30MHz~3.53GHz



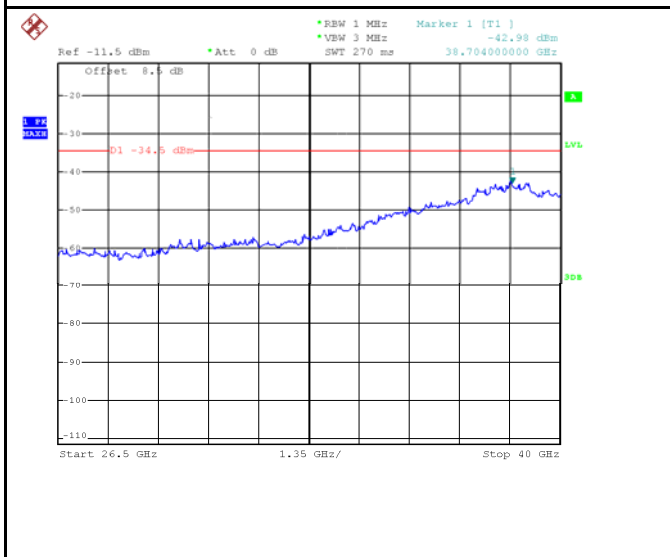
15MHz - High CH 3.72GHz~26.5GHz

15MHz - High CH 26.5GHz~40GHz



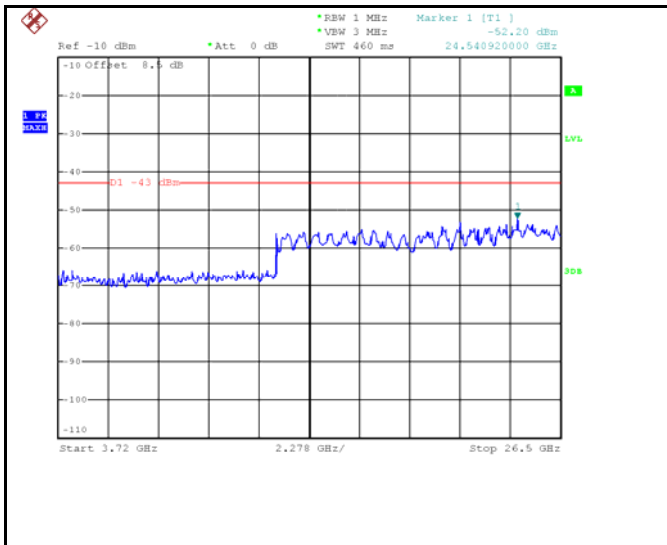
20MHz - Low CH 30MHz~3.53GHz

20MHz - Low CH 3.72GHz~26.5GHz

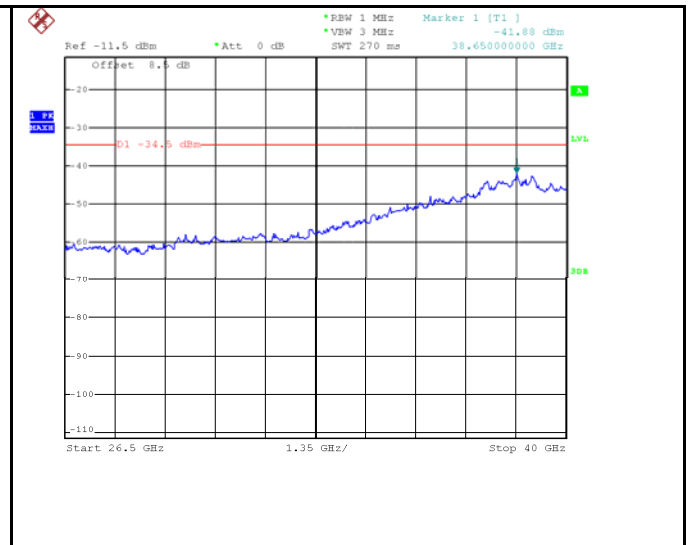


20MHz - Low CH 26.5GHz~40GHz

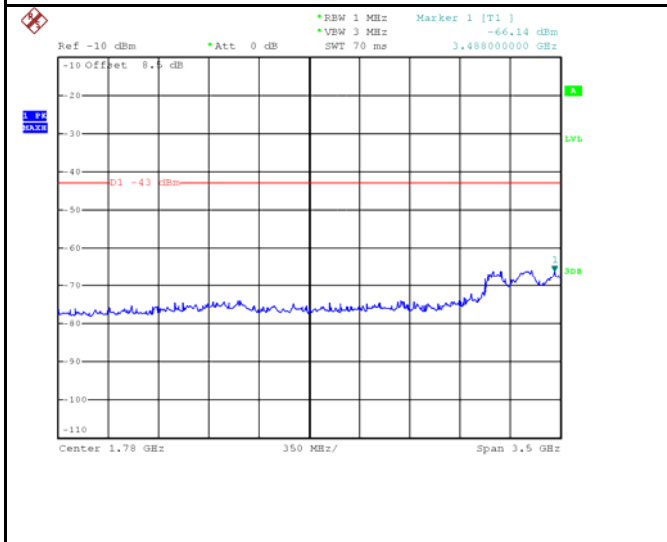
20MHz - Middle CH 30MHz~3.53GHz



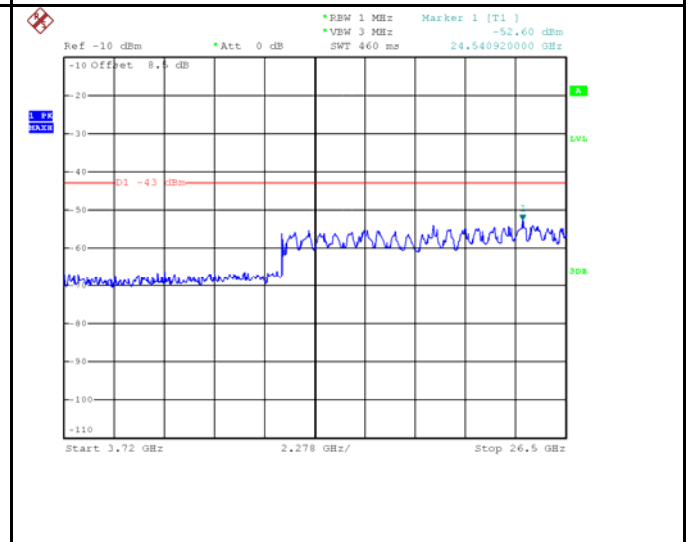
20MHz – Middle CH 3.72GHz~26.5GHz



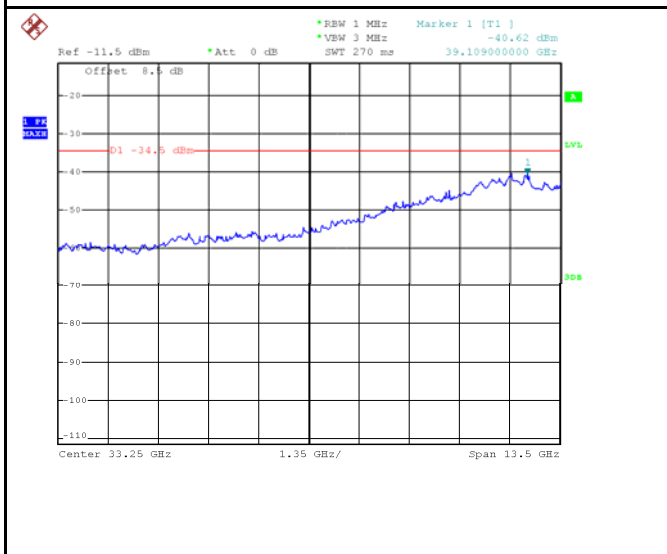
20MHz - Middle CH 26.5GHz~40GHz



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

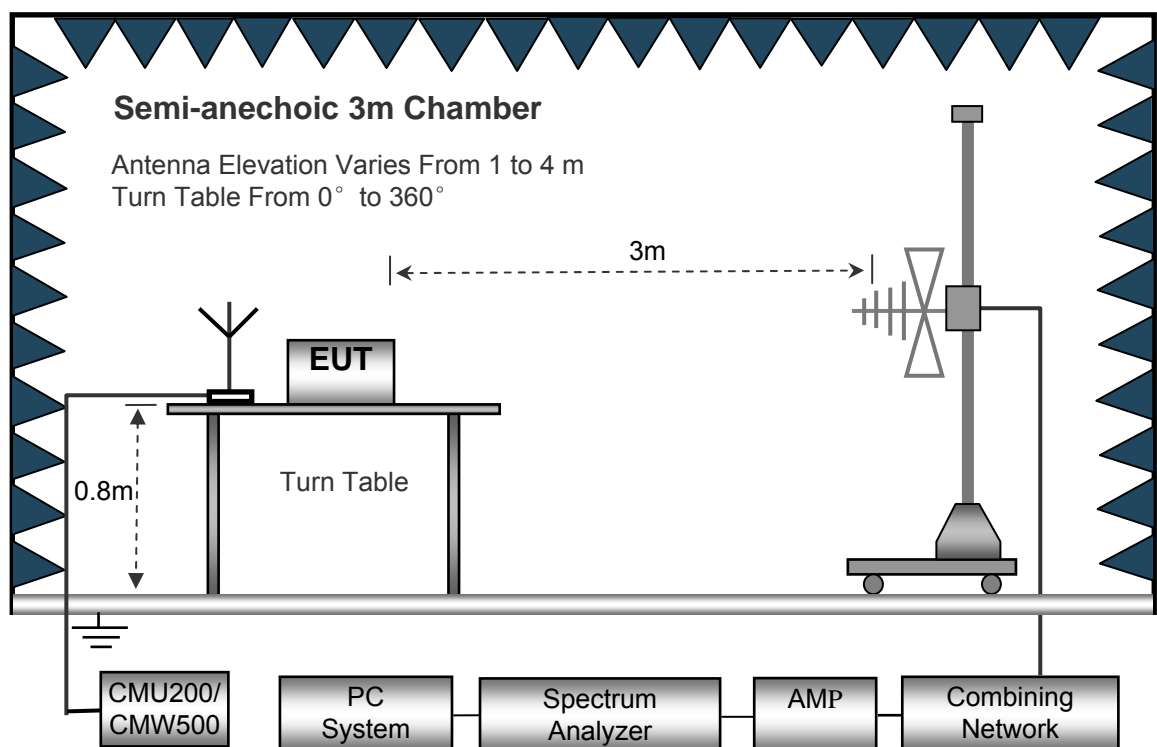
12.1 EUT Operation

Operating Environment :

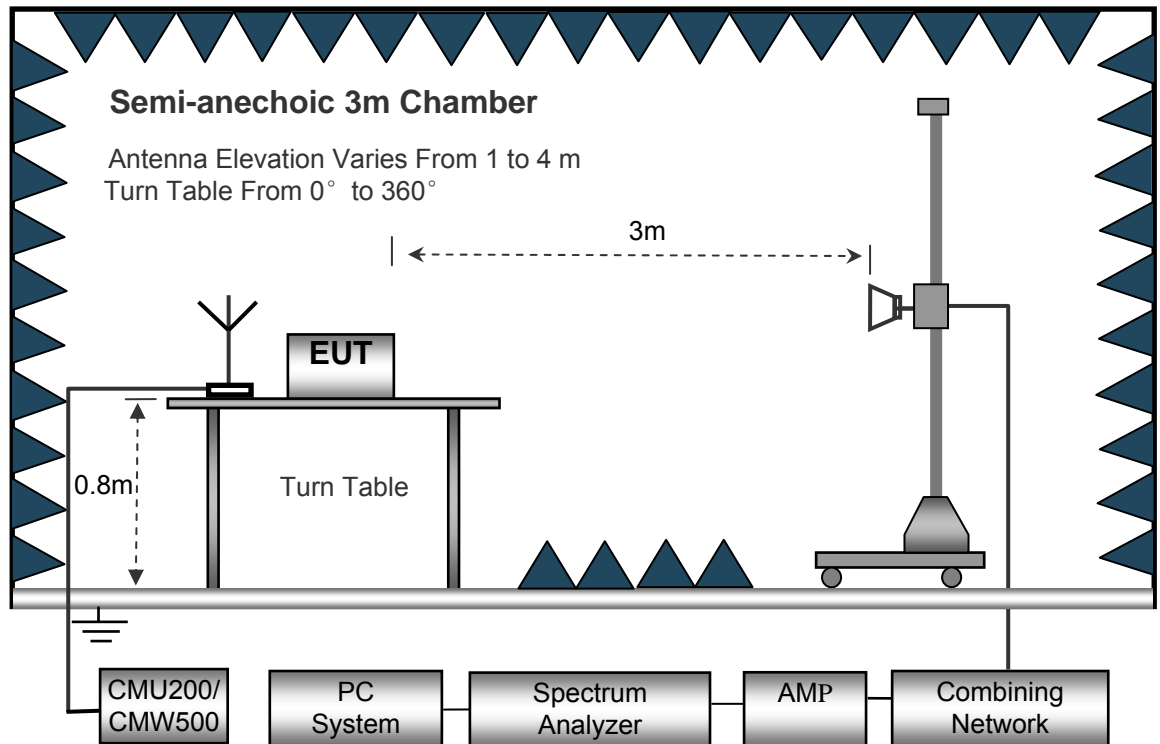
Temperature:	23.5 °C
Humidity:	52.1 % RH
Atmospheric Pressure:	101.2kPa

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, 16QAM 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)
Port1+ Port2 Low channel										
223.37	49.00	46	1.0	H	-61.51	0.15	0.00	-61.66	-40.00	-21.66
223.37	47.00	226	1.3	V	-60.59	0.15	0.00	-60.74	-40.00	-20.74
7110.00	55.14	329	1.6	H	-54.10	2.79	12.70	-44.19	-40.00	-4.19
7110.00	55.48	98	1.3	V	-53.29	2.79	12.70	-43.38	-40.00	-3.38
10665.00	49.85	341	1.6	H	-56.69	3.12	11.50	-48.31	-40.00	-8.31
10665.00	44.73	285	2.1	V	-60.70	3.12	11.50	-52.32	-40.00	-12.32
Port1+ Port2 Middle channel										
223.37	48.06	283	1.0	H	-62.45	0.15	0.00	-62.60	-40.00	-22.60
223.37	47.50	205	1.2	V	-60.09	0.15	0.00	-60.24	-40.00	-20.24
7250.00	54.12	260	1.7	H	-55.12	2.37	12.50	-44.99	-40.00	-4.99
7250.00	50.47	168	2.1	V	-58.30	2.37	12.50	-48.17	-40.00	-8.17
10875.00	55.26	300	1.9	H	-51.28	3.12	11.50	-42.90	-40.00	-2.90
10875.00	47.36	175	1.6	V	-58.07	3.12	11.50	-49.69	-40.00	-9.69
Port1+ Port2 High channel										
223.37	48.70	359	1.5	H	-61.81	0.15	0.00	-61.96	-40.00	-21.96
223.37	47.94	81	1.1	V	-59.65	0.15	0.00	-59.80	-40.00	-19.80
7390.00	56.15	229	2.1	H	-53.26	2.37	12.50	-43.13	-40.00	-3.13
7390.00	56.14	225	2.1	V	-52.63	2.37	12.50	-42.50	-40.00	-2.50
11085.00	47.41	205	1.2	H	-57.82	3.12	11.50	-49.44	-40.00	-9.44
11085.00	50.01	56	1.7	V	-54.88	3.12	11.50	-46.50	-40.00	-6.50

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			

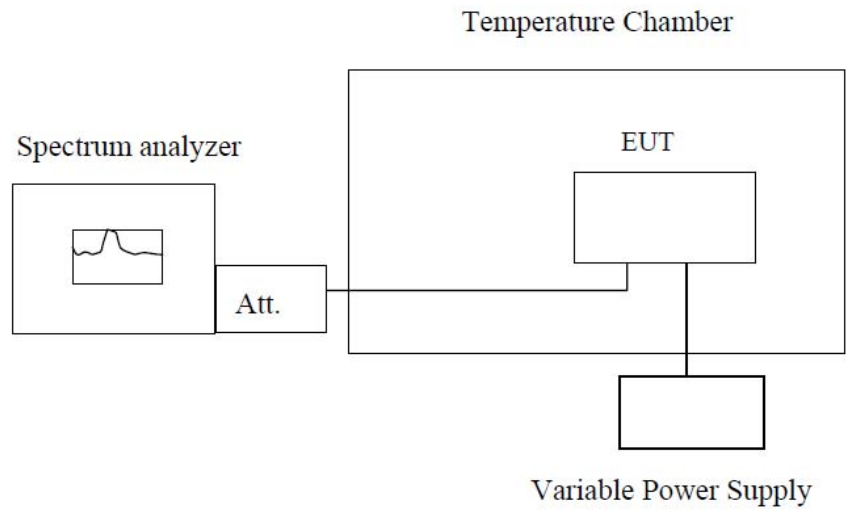
13.1 EUT Operation

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.

Port1

Test Frequency: 3555MHz QPSK 10MHz			
Temperature (°C)	Power Supply (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
-30	120	101	0.0284
-25		113	0.0318
-10		101	0.0284
0		108	0.0304
10		104	0.0293
20		108	0.0304
30		102	0.0287
40		104	0.0293
50		104	0.0293

Test Frequency: 3557.5MHz QPSK 15MHz			
Temperature (°C)	Power Supply (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
-30	120	102	0.0287
-25		106	0.0298
-10		102	0.0287
0		102	0.0287
10		109	0.0306
20		95	0.0267
30		100	0.0281
40		106	0.0298
50		108	0.0304

Test Frequency: 3560MHz QPSK 20MHz			
Temperature (°C)	Power Supply (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
-30	120	111	0.0312
-25		95	0.0267
-10		108	0.0303
0		103	0.0289
10		104	0.0292
20		95	0.0267
30		98	0.0275
40		104	0.0292
50		110	0.0309

Port2

Test Frequency: 3555MHz QPSK 10MHz			
Temperature (°C)	Power Supply (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
-30	120	109	0.0307
-25		109	0.0307
-10		118	0.0332
0		111	0.0312
10		114	0.0321
20		106	0.0298
30		120	0.0338
40		108	0.0304
50		114	0.0321

Test Frequency: 3557.5MHz QPSK 15MHz			
Temperature (°C)	Power Supply (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
-30	120	112	0.0315
-25		100	0.0281
-10		113	0.0318
0		107	0.0301
10		100	0.0281
20		111	0.0312
30		101	0.0284
40		100	0.0281
50		109	0.0306

Test Frequency: 3560MHz QPSK 20MHz			
Temperature (°C)	Power Supply (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
-30	120	99	0.0278
-25		112	0.0315
-10		97	0.0272
0		105	0.0295
10		109	0.0306
20		107	0.0301
30		108	0.0303
40		99	0.0278
50		111	0.0312

14 Frequency stability V.S. Voltage measurement

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

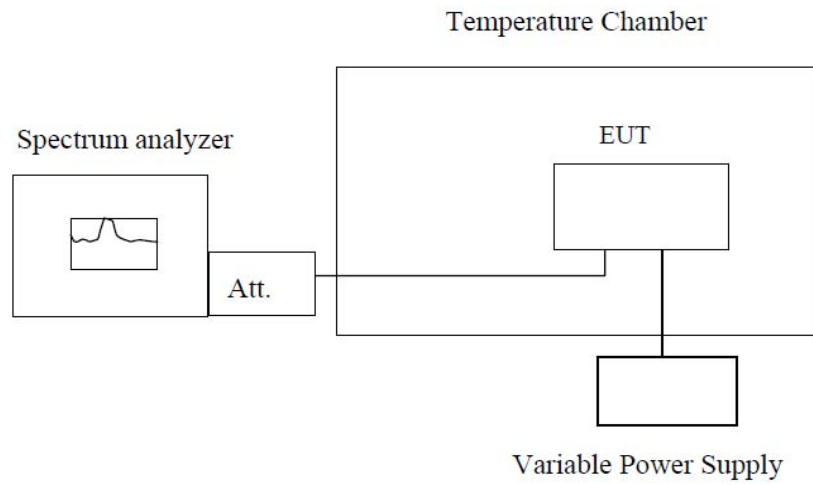
Frequency range (MHz)	Fixed and base stations (ppm)	Mobile stations (ppm)	
		Over 2 watts output power	2 watts or less output power
Below 25	100	100	200
25-50	20	20	50
72-76	5		50
150-174	5	5	50
216-220	1.0		1.0
220-222	0.1	1.5	1.5
421-512	2.5	5	5
806-809	1.0	1.5	1.5
809-824	1.5	2.5	2.5
851-854	1.0	1.5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

Port1:

Test Frequency: 3555MHz QPSK 10MHz			
Temperature (°C)	Power Supply (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
25	105	98	0.0276
	120	90	0.0253
	144	101	0.0284

Test Frequency: 3557.5MHz QPSK 15MHz			
Temperature (°C)	Power Supply (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
25	105	97	0.0273
	120	94	0.0264
	144	98	0.0276

Test Frequency: 3560MHz QPSK 20MHz			
Temperature (°C)	Power Supply (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
25	106	106	0.0298
	93	93	0.0261
	96	96	0.0270

Port2:

Test Frequency: 3555MHz QPSK 10MHz			
Temperature (°C)	Power Supply (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
25	105	99	0.0278
	120	96	0.0270
	144	95	0.0267

Test Frequency: 3557.5MHz QPSK 15MHz			
Temperature (°C)	Power Supply (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
25	105	91	0.0256
	120	90	0.0253
	144	104	0.0292

Test Frequency: 3560MHz QPSK 20MHz			
Temperature (°C)	Power Supply (VDC)	Frequency Error (Hz)	Frequency Error (ppm)
25	105	99	0.0278
	120	99	0.0278
	144	91	0.0256

