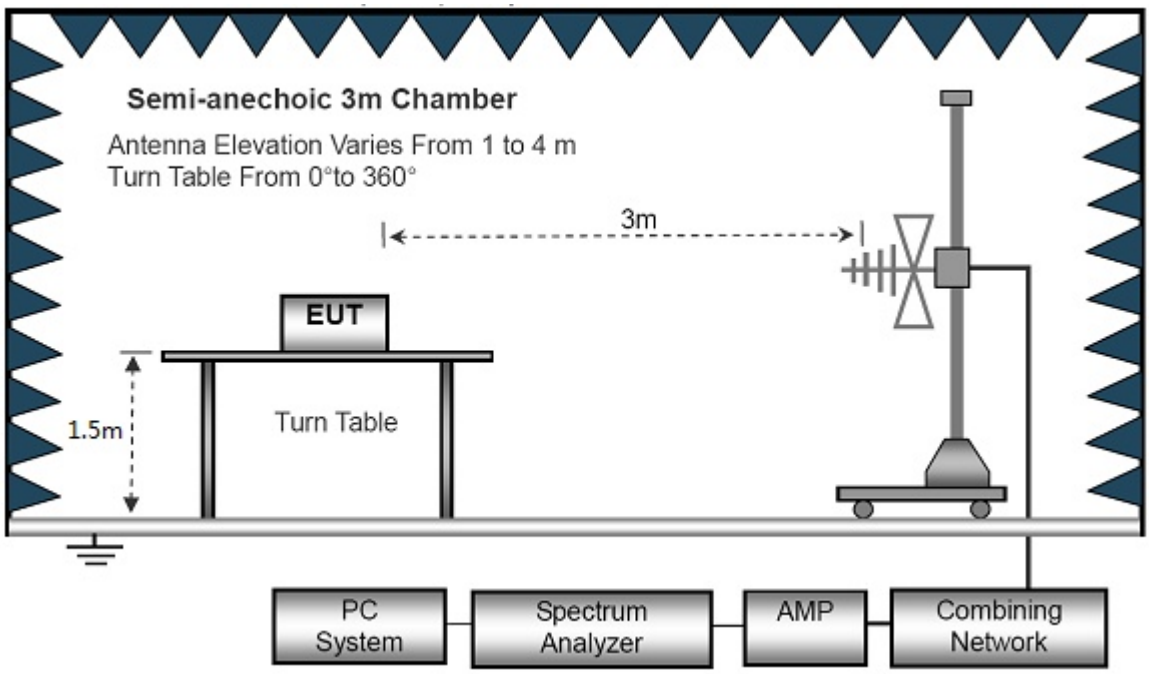
7.2.1 Radiated method

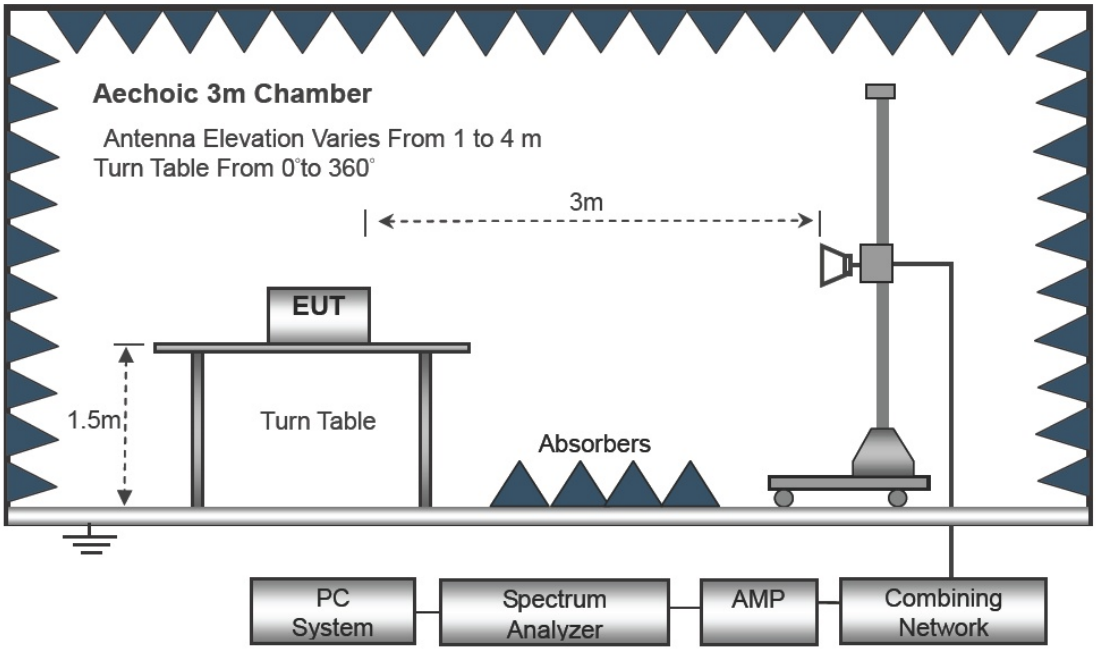
Test Requirement:	FCC Part 2.1053, 22.917, 24.238, 27.53(h), 27.53(m)(4)
Test Method:	TIA/EIA-603-D:2010
	KDB971168 D01 v02r02
Test Mode:	TX transmitting

7.2.1 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.



7.2.2 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

7.2.3 Test Procedure

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions. The spectrum was investigated from 30MHz up to the tenth harmonic of the highest fundamental frequency.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the Z position. So the data shown was the Z position only.
7. Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.
   Spurious emissions in dB = 10 lg (TXpwr in Watts/0.001) – the absolute level
   Spurious attenuation limit in dB = 43 + 10 Log10 (power out in Watts)
8. Repeat above procedures until the measurements for all frequencies are completed.

Note:

1, Below 30MHz no Spurious found.

2, UE is poistioned at 3 axis at the pre-scan stage, and only the measurement of the worst case(bandwidth:20MHz /Full RB /QPSK) is reported in this part.

7.2.4 Test Result

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)
LTE BAND 41 Channel 39675										
199.38	40.66	300	1.7	H	-69.85	0.15	0.00	-70.00	-25.00	-45.00
199.38	30.80	124	1.9	V	-76.79	0.15	0.00	-76.94	-25.00	-51.94
5010.00	65.95	176	1.5	H	-43.29	2.79	12.70	-33.38	-25.00	-8.38
5010.00	59.98	191	1.2	V	-48.79	2.79	12.70	-38.88	-25.00	-13.88
7515.00	53.58	33	1.3	H	-52.96	3.12	11.50	-44.58	-25.00	-19.58
7515.00	44.73	272	1.7	V	-60.70	3.12	11.50	-52.32	-25.00	-27.32
LTE BAND 41 Channel 40620										
199.38	41.42	102	1.2	H	-69.09	0.15	0.00	-69.24	-25.00	-44.24
199.38	31.18	34	2.0	V	-76.41	0.15	0.00	-76.56	-25.00	-51.56
5070.00	59.85	64	1.3	H	-49.39	2.37	12.50	-39.26	-25.00	-14.26
5070.00	53.68	351	1.4	V	-55.09	2.37	12.50	-44.96	-25.00	-19.96
7605.00	47.29	337	2.2	H	-59.25	3.12	11.50	-50.87	-25.00	-25.87
7605.00	37.81	301	1.6	V	-67.62	3.12	11.50	-59.24	-25.00	-34.24
LTE BAND 41 Channel 41565										
199.38	42.08	172	1.8	H	-68.43	0.15	0.00	-68.58	-25.00	-43.58
199.38	30.62	120	1.7	V	-76.97	0.15	0.00	-77.12	-25.00	-52.12
5135.00	52.06	131	1.7	H	-57.35	2.37	12.50	-47.22	-25.00	-22.22
5135.00	47.65	120	1.2	V	-61.12	2.37	12.50	-50.99	-25.00	-25.99
7702.50	39.87	17	1.2	H	-65.36	3.12	11.50	-56.98	-25.00	-31.98
7702.50	31.09	277	1.1	V	-73.80	3.12	11.50	-65.42	-25.00	-40.42

Note: 1) Absolute Level = SG Level - Cable loss + Antenna Gain
2) Margin = Absolute Level - Limit

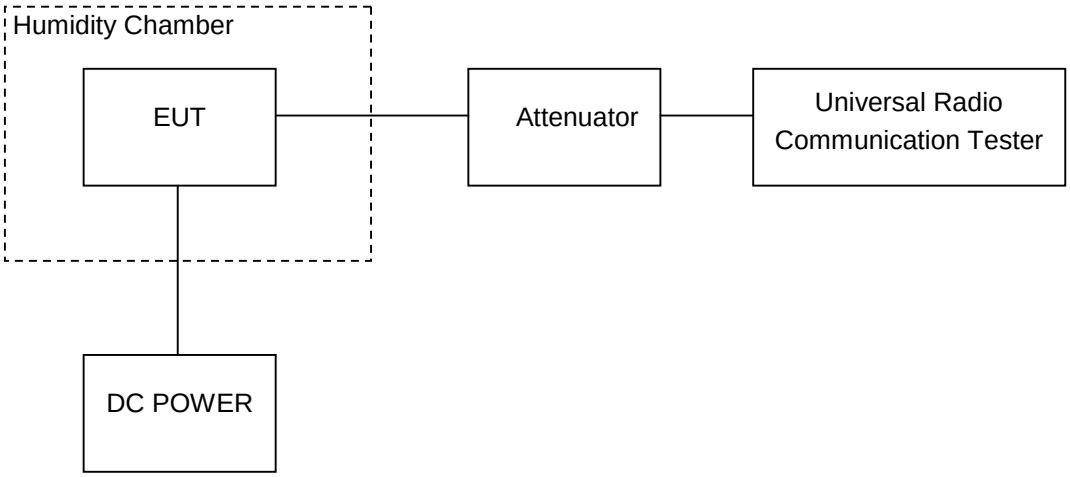
4.5. Frequency Stability

4.5.1. Limit

Test Requirement:	FCC Part 2.1055, 22.355, 24.235, 27.5(h),27.54
Test Method:	TIA/EIA-603-D:2010 KDB971168 D01 v02r02
Test Mode:	TX transmitting

4.5.2. Test Setup

Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to communication test set via feed-through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.
After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the communication test set.
Frequency Stability vs. Voltage: For hand carried, battery powered equipment; reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.



4.5.3. Test Result

LTE Band 41

Test Frequency:2593MHz QPSK 5MHz				
Temperature (℃)	Power Supply (VDC)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
50	3.7	-6	-0.0023	2.5
40		-10	-0.0039	2.5
30		-12	-0.0046	2.5
20		-4	-0.0015	2.5
10		-12	-0.0046	2.5
0		-11	-0.0042	2.5
-10		0	0.0000	2.5
-20		-8	-0.0031	2.5
-30		-6	-0.0023	2.5
20	3.3	-6	-0.0023	2.5
20	4.2	4	0.0015	2.5

Test Frequency:2593MHz 16QAM 5MHz				
Temperature (℃)	Power Supply (VDC)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
50	3.7	6	0.0024	2.5
40		4	0.0016	2.5
30		-6	-0.0024	2.5
20		3	0.0012	2.5
10		11	0.0043	2.5
0		-3	-0.0012	2.5
-10		-5	-0.0020	2.5
-20		4	0.0016	2.5
-30		8	0.0032	2.5
20	3.3	-1	-0.0004	2.5
20	4.2	-5	-0.0020	2.5

Test Frequency:2593MHz QPSK 10MHz				
Temperature (℃)	Power Supply (VDC)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
50	3.7	1	0.0004	2.5
40		7	0.0028	2.5
30		10	0.0039	2.5
20		1	0.0004	2.5
10		7	0.0028	2.5
0		7	0.0028	2.5
-10		5	0.0020	2.5
-20		-8	-0.0032	2.5
-30		-4	-0.0016	2.5
20	3.3	7	0.0028	2.5
20	4.2	-4	-0.0016	2.5

Test Frequency:2593MHz 16QAM 10MHz				
Temperature (℃)	Power Supply (VDC)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
50	3.7	4	0.0016	2.5
40		0	0.0000	2.5
30		-5	-0.0020	2.5
20		3	0.0012	2.5
10		11	0.0043	2.5
0		-5	-0.0020	2.5
-10		4	0.0016	2.5
-20		-4	-0.0016	2.5
-30		11	0.0043	2.5
20	3.3	-5	-0.0020	2.5
20	4.2	9	0.0036	2.5

Test Frequency:2593MHz QPSK 15MHz				
Temperature (℃)	Power Supply (VDC)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
50	3.7	4	0.0016	2.5
40		4	0.0016	2.5
30		0	0.0000	2.5
20		3	0.0012	2.5
10		4	0.0016	2.5
0		6	0.0024	2.5
-10		7	0.0028	2.5
-20		1	0.0004	2.5
-30		6	0.0024	2.5
20	3.3	-5	-0.0020	2.5
20	4.2	9	0.0036	2.5

Test Frequency:2593MHz 16QAM 15MHz				
Temperature (℃)	Power Supply (VDC)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
50	3.7	3	0.0012	2.5
40		8	0.0032	2.5
30		5	0.0020	2.5
20		6	0.0024	2.5
10		-1	-0.0004	2.5
0		13	0.0051	2.5
-10		6	0.0024	2.5
-20		-1	-0.0004	2.5
-30		12	0.0047	2.5
20	3.3	5	0.0020	2.5
20	4.2	14	0.0055	2.5

Test Frequency:2593MHz QPSK 20MHz				
Temperature (℃)	Power Supply (VDC)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
50	3.7	10	0.0039	2.5
40		-6	-0.0024	2.5
30		11	0.0043	2.5
20		3	0.0012	2.5
10		6	0.0024	2.5
0		-2	-0.0008	2.5
-10		12	0.0047	2.5
-20		9	0.0036	2.5
-30		4	0.0016	2.5
20	3.3	-5	-0.0020	2.5
20	4.2	10	0.0039	2.5

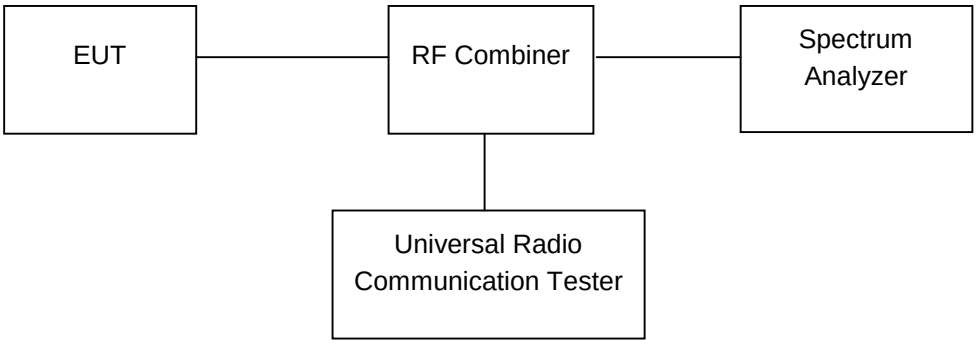
Test Frequency:2593MHz 16QAM 20MHz				
Temperature (℃)	Power Supply (VDC)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
50	3.7	6	0.0024	2.5
40		-5	-0.0020	2.5
30		-7	-0.0028	2.5
20		-2	-0.0008	2.5
10		0	0.0000	2.5
0		-1	-0.0004	2.5
-10		-3	-0.0012	2.5
-20		0	0.0000	2.5
-30		0	0.0000	2.5
20	3.3	-10	-0.0039	2.5
20	4.2	-1	-0.0004	2.5

4.6. Conducted Out of Band Emissions

4.6.1. Limit

According to FCC section 22.917(b) and FCC section 24.238(b), 27.53(g)(h) in the 1MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth (26dB emission bandwidth) of the fundamental emission of the transmitter may be employed.

4.6.2. Test Setup

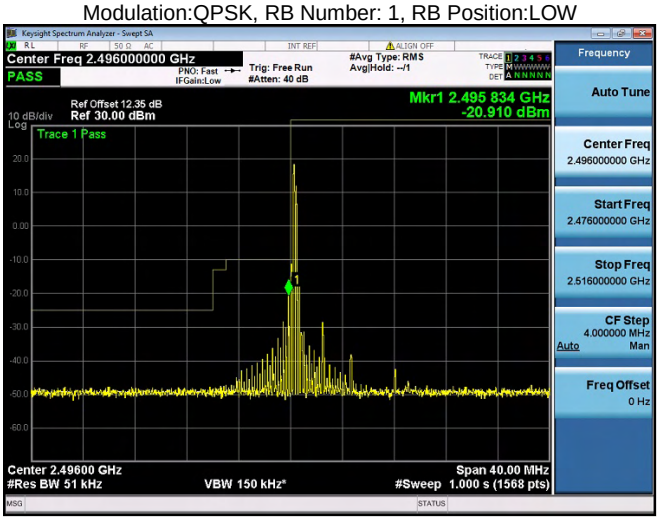


The RF output of the transceiver was connected to a spectrum analyzer and simulator through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 1MHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonics.

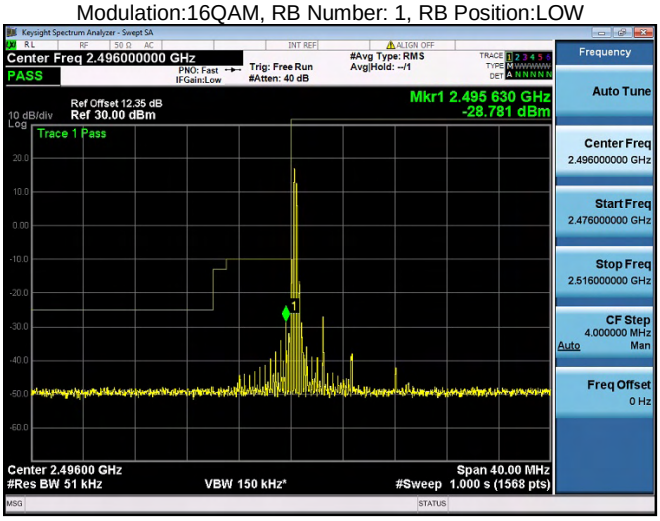
4.6.3. Test Result

Test plot as follows:

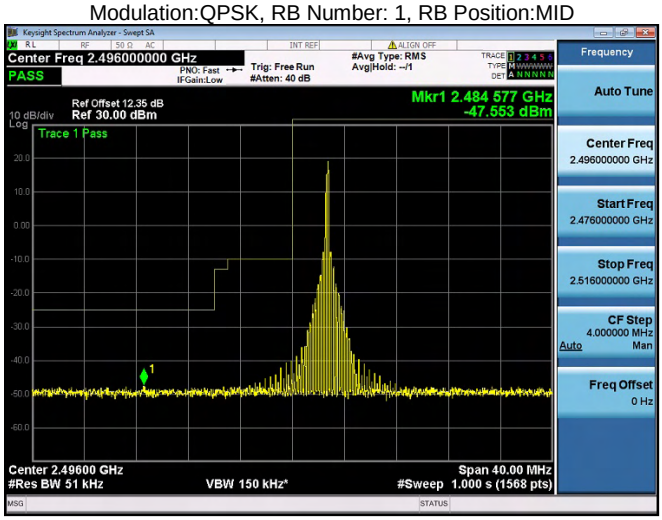
Subtest:1,Channel:39675, Bandwidth:5,
Modulation:QPSK, RB Number: 1, RB Position:LOW



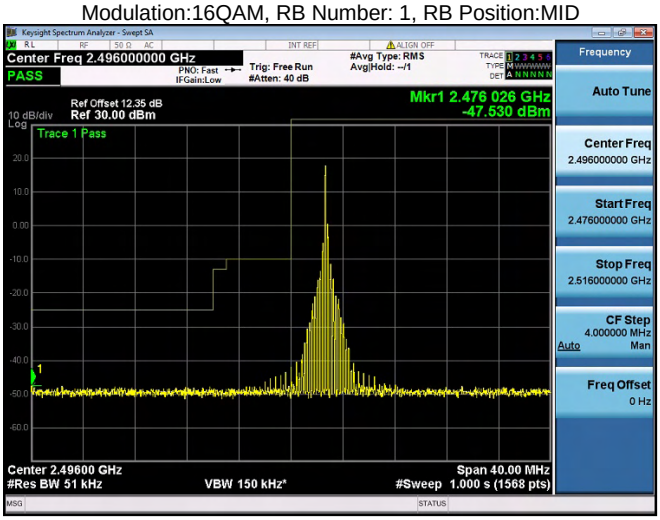
Subtest:4, Channel:39675, Bandwidth:5,
Modulation:16QAM, RB Number: 1, RB Position:LOW



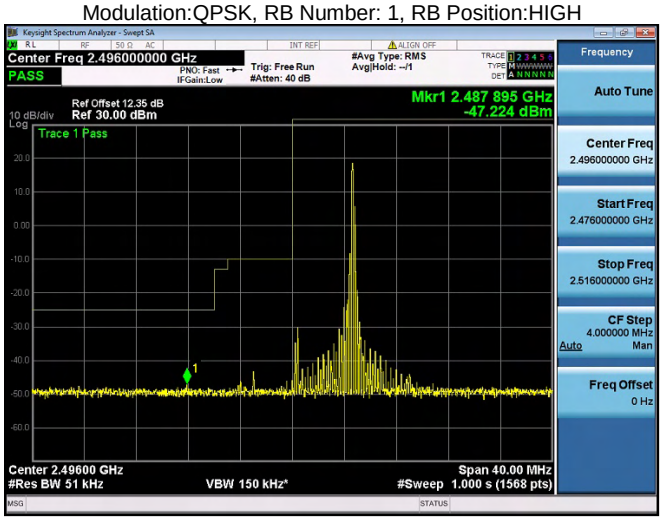
Subtest:2,Channel:39675, Bandwidth:5,
Modulation:QPSK, RB Number: 1, RB Position:MID



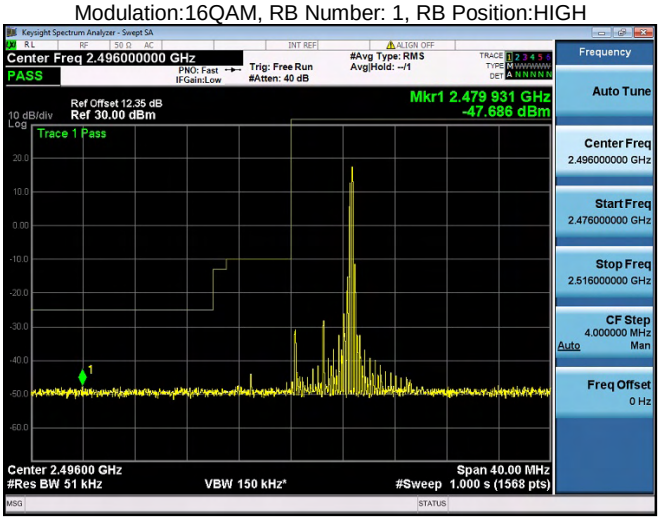
Subtest:5, Channel:39675, Bandwidth:5,
Modulation:16QAM, RB Number: 1, RB Position:MID



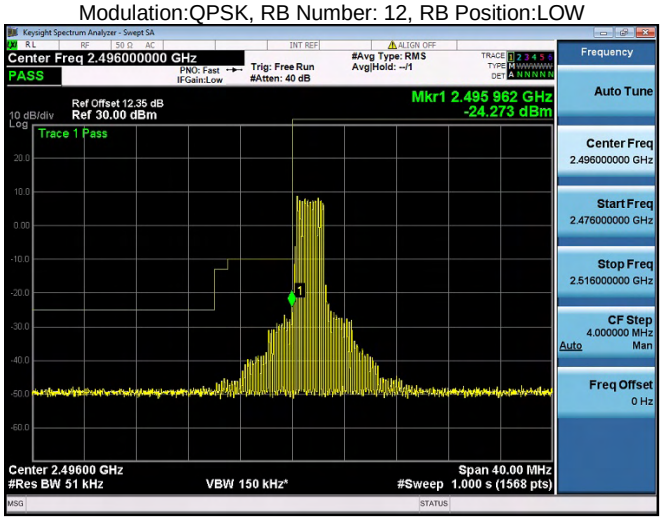
Subtest:3, Channel:39675, Bandwidth:5,
Modulation:QPSK, RB Number: 1, RB Position:HIGH



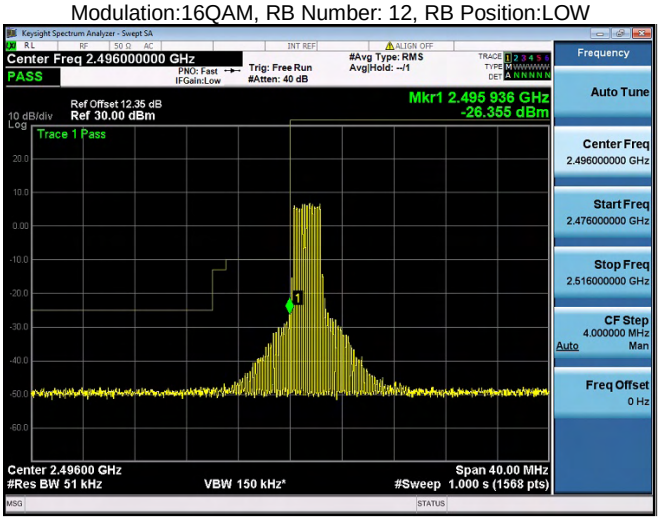
Subtest:6, Channel:39675, Bandwidth:5,
Modulation:16QAM, RB Number: 1, RB Position:HIGH



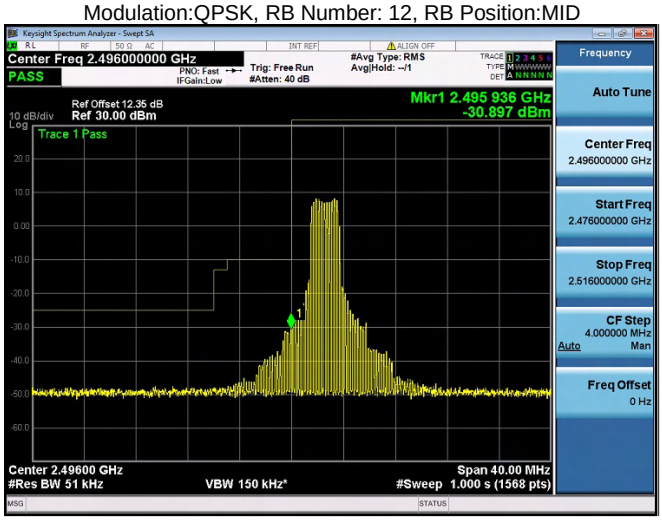
Subtest:7, Channel:39675, Bandwidth:5,
Modulation:QPSK, RB Number: 12, RB Position:LOW



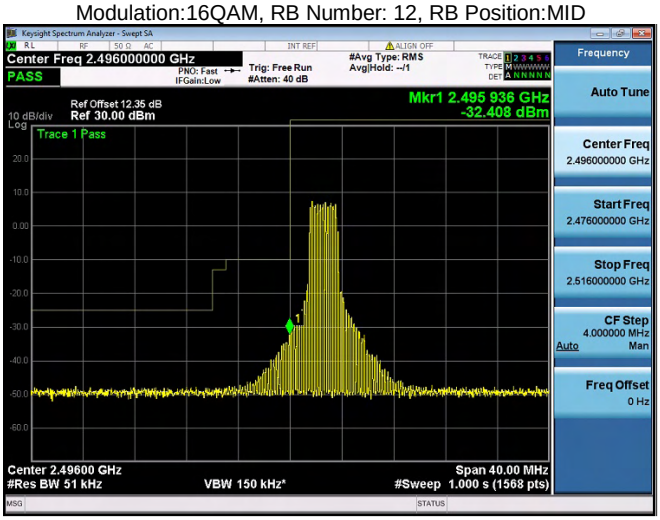
Subtest:10, Channel:39675, Bandwidth:5,
Modulation:16QAM, RB Number: 12, RB Position:LOW



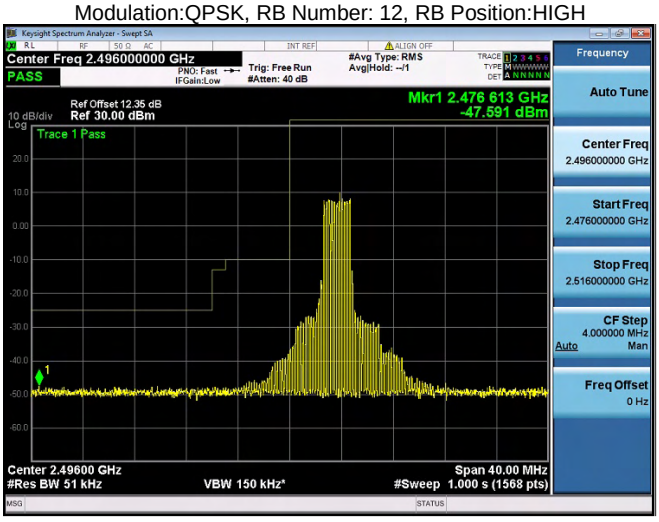
Subtest:8, Channel:39675, Bandwidth:5,
Modulation:QPSK, RB Number: 12, RB Position:MID



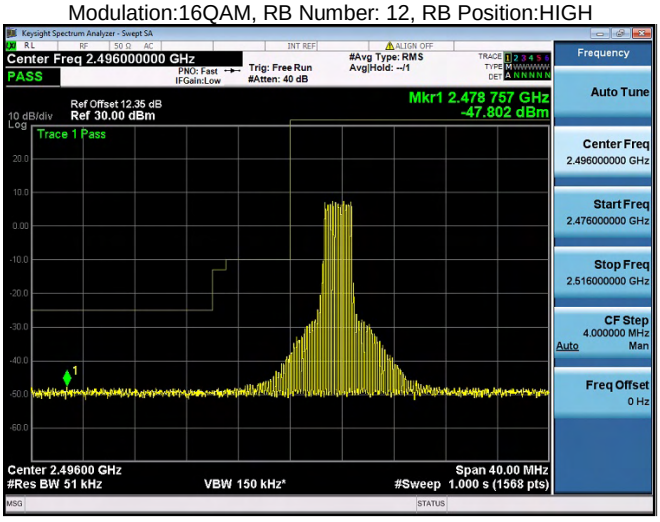
Subtest:11, Channel:39675, Bandwidth:5,
Modulation:16QAM, RB Number: 12, RB Position:MID



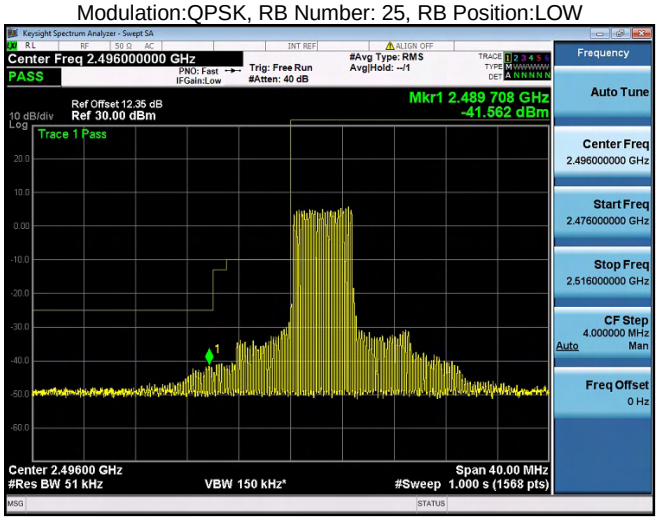
Subtest:9, Channel:39675, Bandwidth:5,
Modulation:QPSK, RB Number: 12, RB Position:HIGH



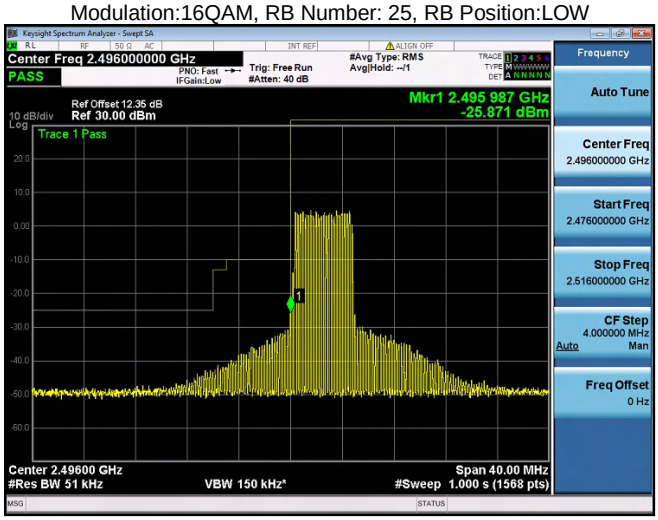
Subtest:12, Channel:39675, Bandwidth:5,
Modulation:16QAM, RB Number: 12, RB Position:HIGH



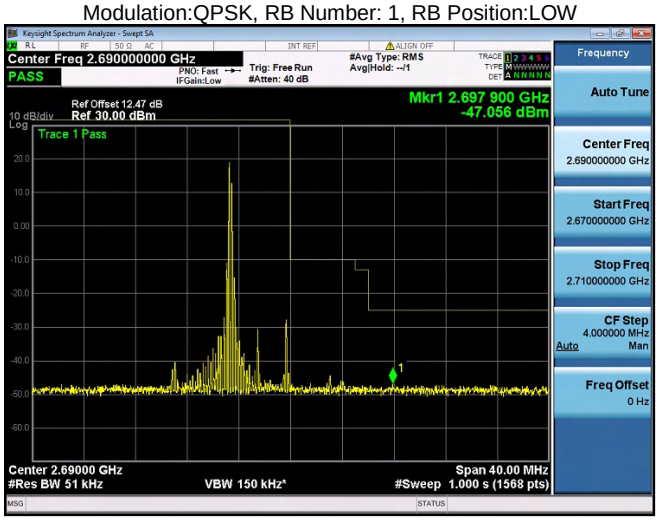
Subtest:13, Channel:39675, Bandwidth:5,
Modulation:QPSK, RB Number: 25, RB Position:LOW



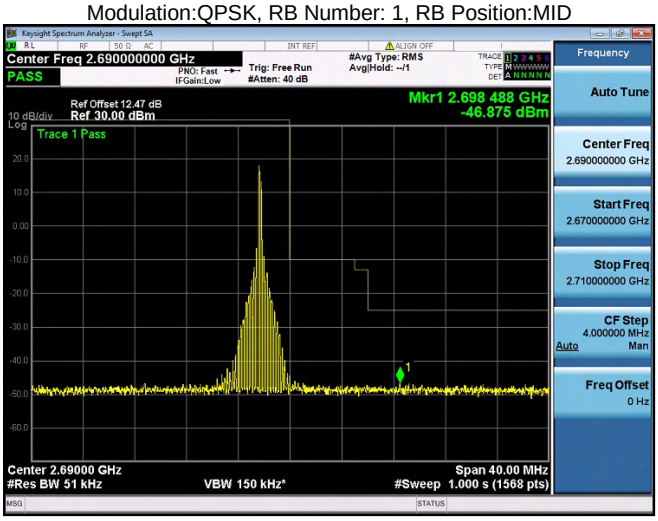
Subtest:14, Channel:39675, Bandwidth:5,
Modulation:16QAM, RB Number: 25, RB Position:LOW



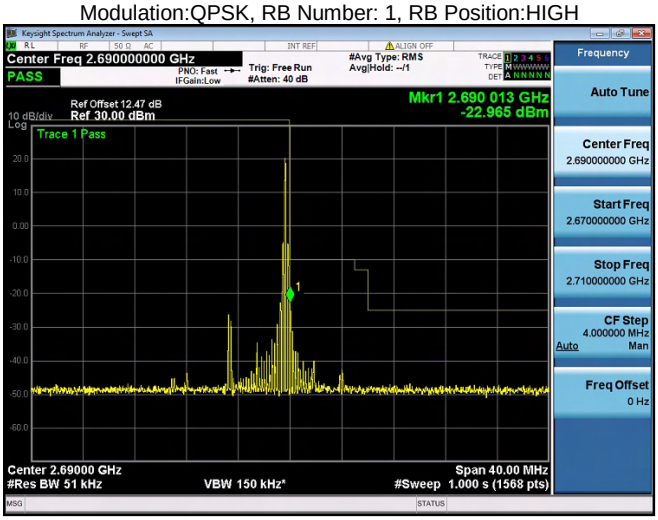
Subtest:15, Channel:41565, Bandwidth:5,
Modulation:QPSK, RB Number: 1, RB Position:LOW



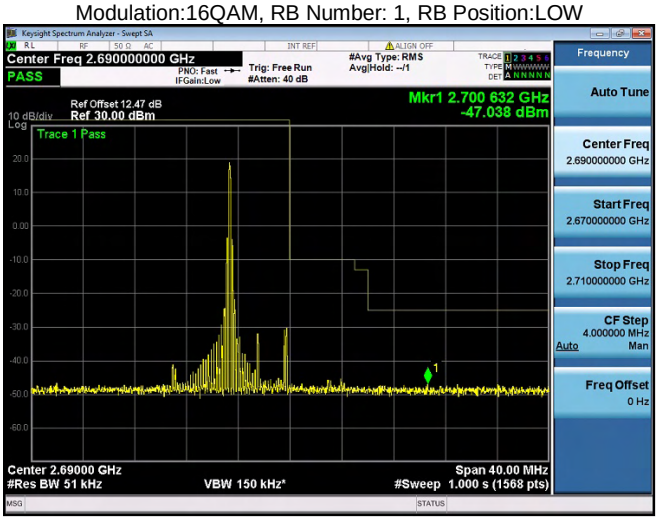
Subtest:16, Channel:41565, Bandwidth:5,
Modulation:QPSK, RB Number: 1, RB Position:MID



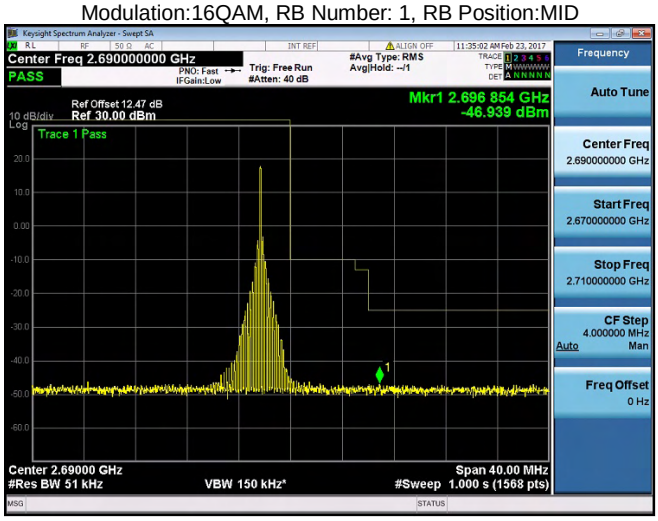
Subtest:17, Channel:41565, Bandwidth:5,
Modulation:QPSK, RB Number: 1, RB Position:HIGH



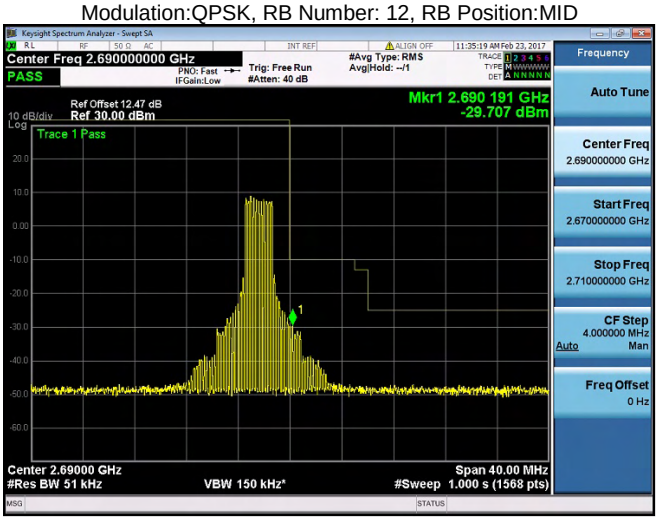
Subtest:18, Channel:41565, Bandwidth:5,
Modulation:16QAM, RB Number: 1, RB Position:LOW



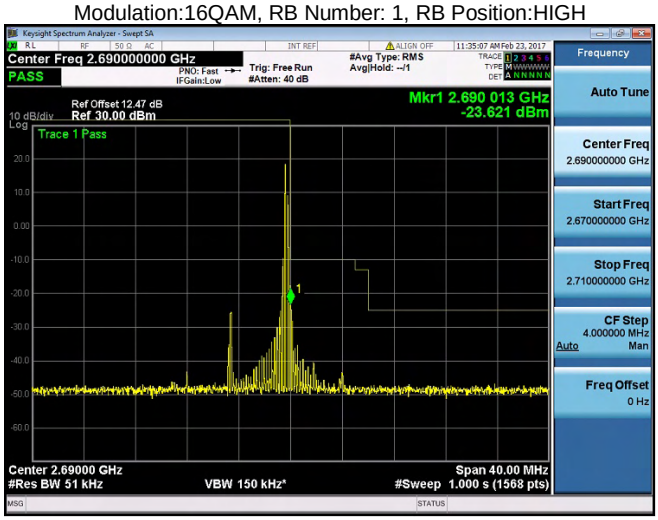
Subtest:19, Channel:41565, Bandwidth:5,
Modulation:16QAM, RB Number: 1, RB Position:MID



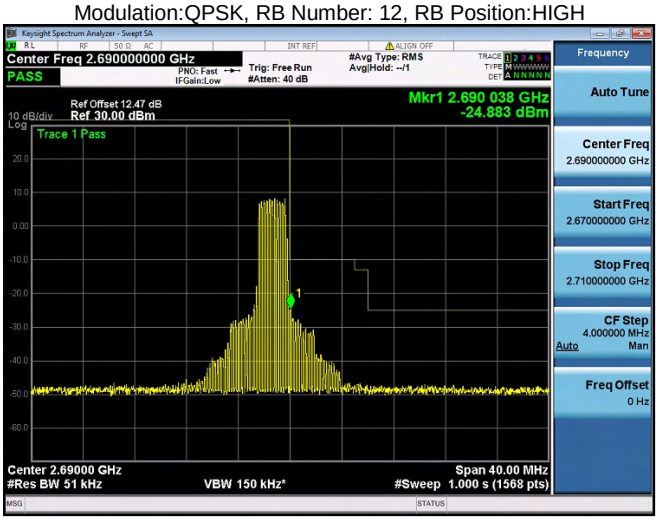
Subtest:22, Channel:41565, Bandwidth:5,
Modulation:QPSK, RB Number: 12, RB Position:MID



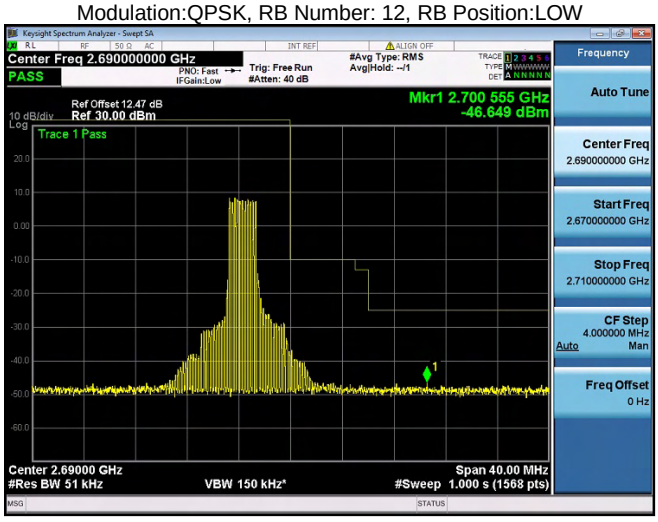
Subtest:20, Channel:41565, Bandwidth:5,
Modulation:16QAM, RB Number: 1, RB Position:HIGH



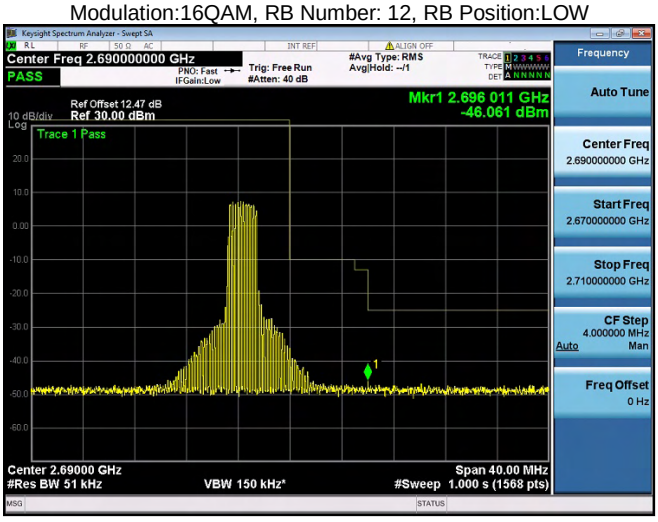
Subtest:23, Channel:41565, Bandwidth:5,
Modulation:QPSK, RB Number: 12, RB Position:HIGH



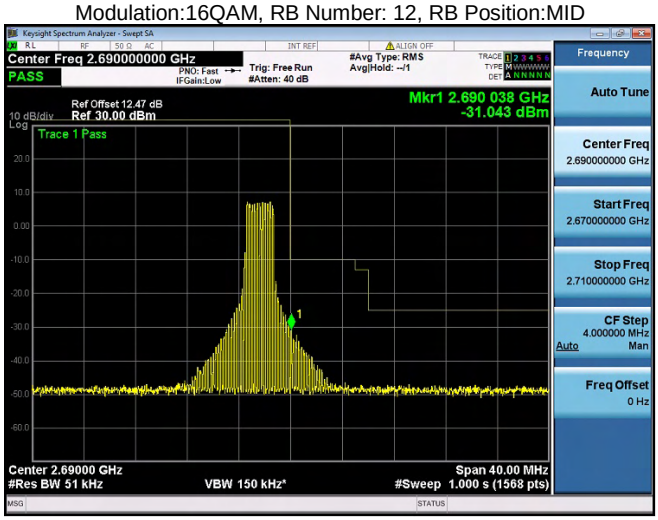
Subtest:21, Channel:41565, Bandwidth:5,
Modulation:QPSK, RB Number: 12, RB Position:LOW



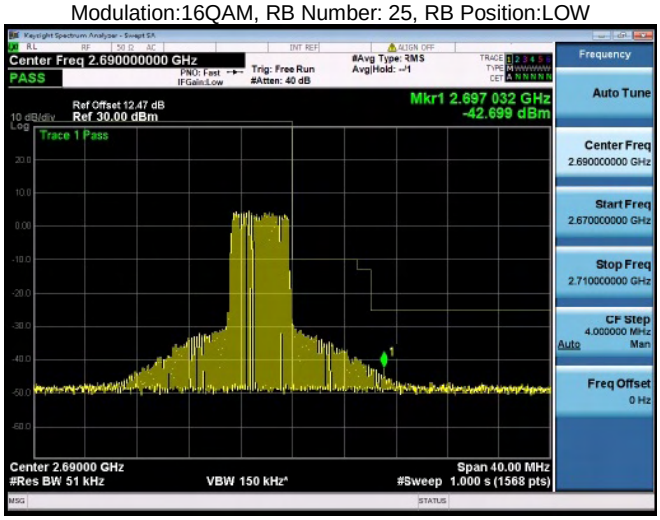
Subtest:24, Channel:41565, Bandwidth:5,
Modulation:16QAM, RB Number: 12, RB Position:LOW



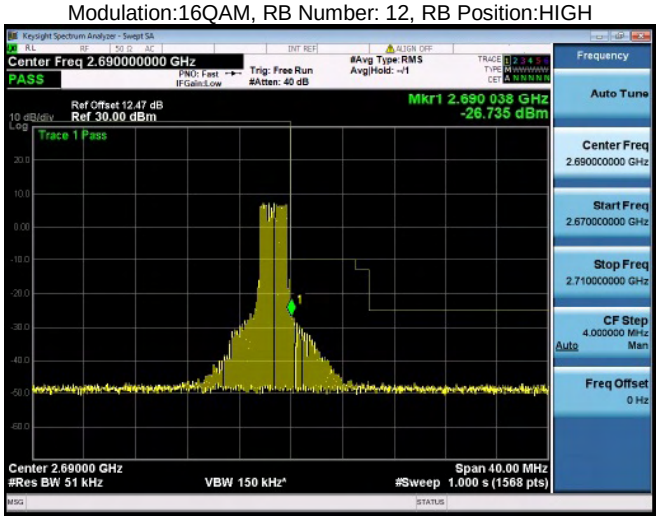
Subtest:25, Channel:41565, Bandwidth:5,
Modulation:16QAM, RB Number: 12, RB Position:MID



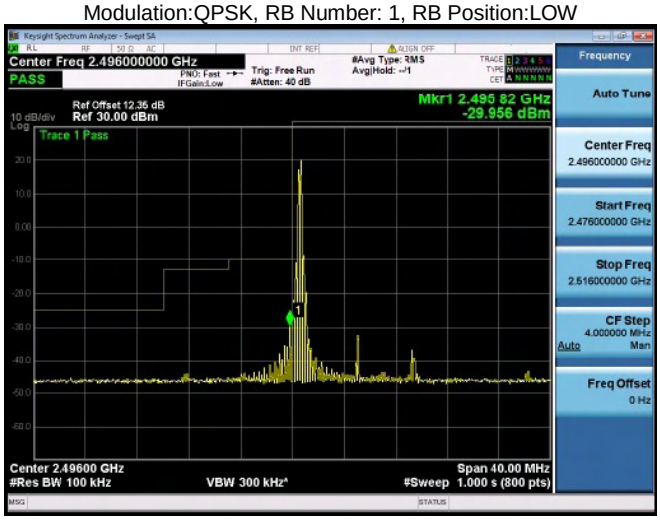
Subtest:28, Channel:41565, Bandwidth:5,
Modulation:16QAM, RB Number: 25, RB Position:LOW



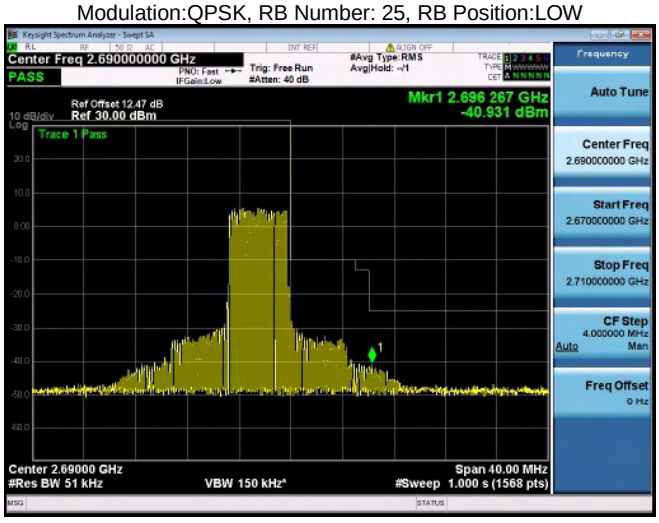
Subtest:26, Channel:41565, Bandwidth:5,
Modulation:16QAM, RB Number: 12, RB Position:HIGH



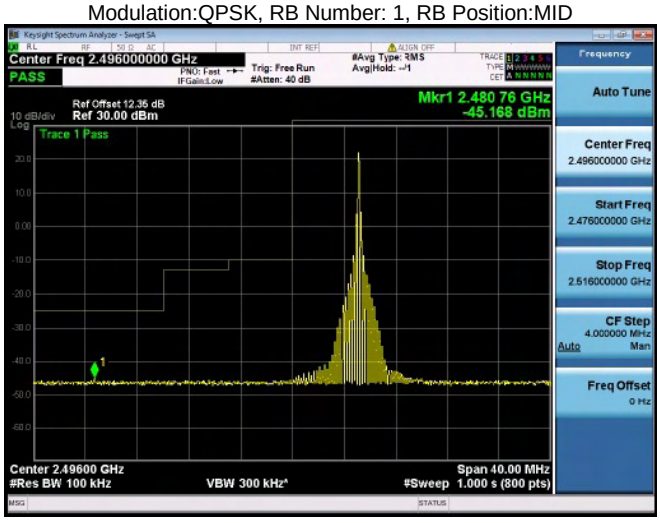
Subtest:29, Channel:39700, Bandwidth:10,
Modulation:QPSK, RB Number: 1, RB Position:LOW



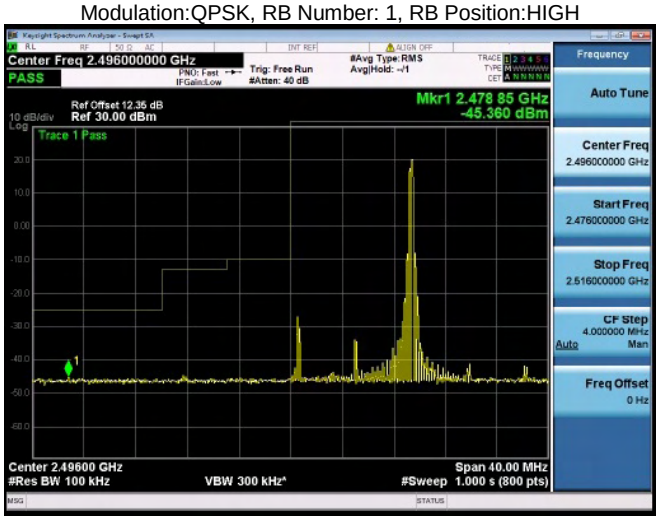
Subtest:27, Channel:41565, Bandwidth:5,
Modulation:QPSK, RB Number: 25, RB Position:LOW



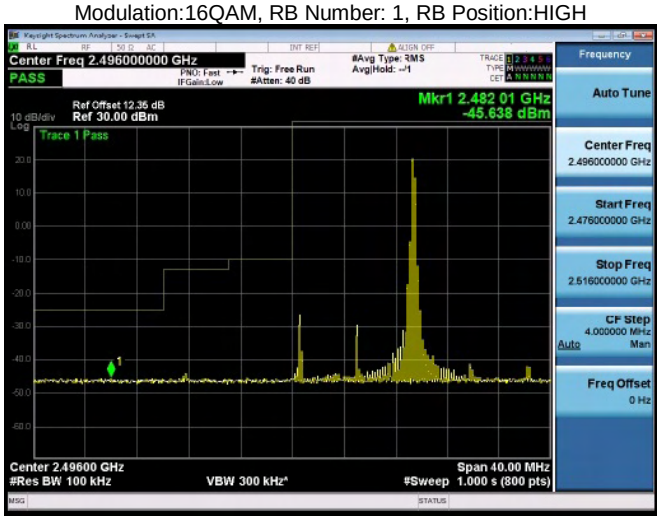
Subtest:30, Channel:39700, Bandwidth:10,
Modulation:QPSK, RB Number: 1, RB Position:MID



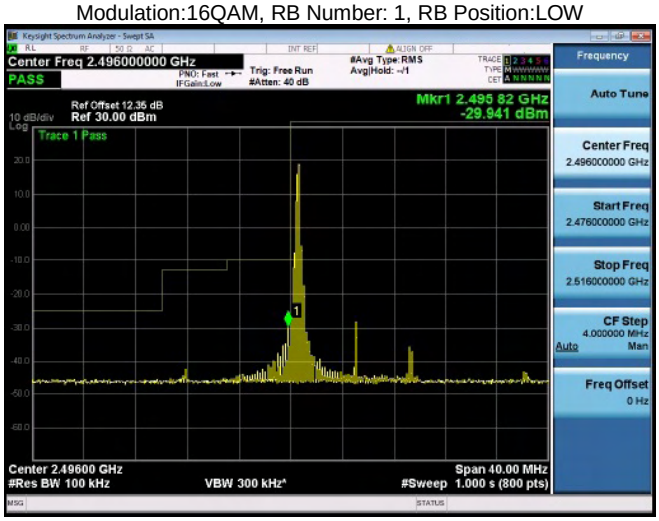
Subtest:31, Channel:39700, Bandwidth:10,
Modulation:QPSK, RB Number: 1, RB Position:HIGH



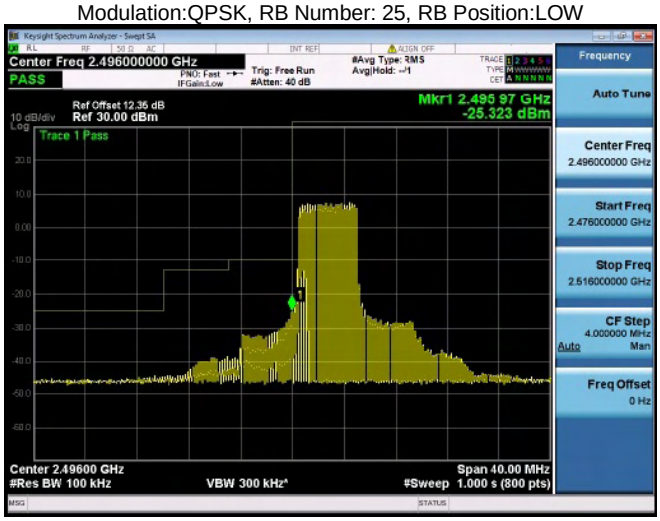
Subtest:34, Channel:39700, Bandwidth:10,
Modulation:16QAM, RB Number: 1, RB Position:HIGH



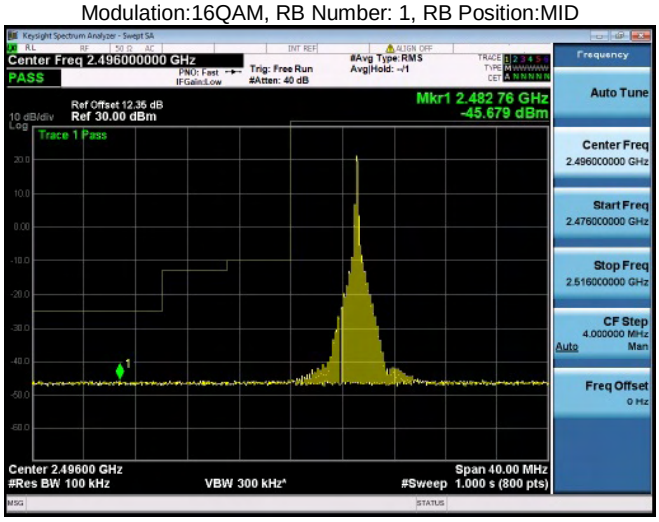
Subtest:32, Channel:39700, Bandwidth:10,
Modulation:16QAM, RB Number: 1, RB Position:LOW



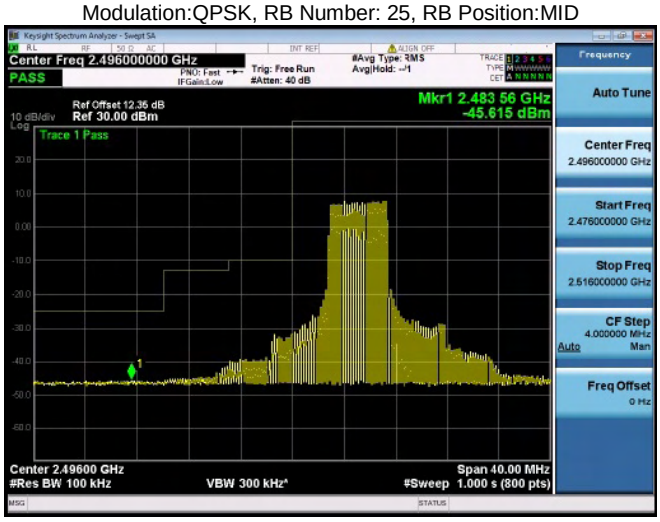
Subtest:35, Channel:39700, Bandwidth:10,
Modulation:QPSK, RB Number: 25, RB Position:LOW



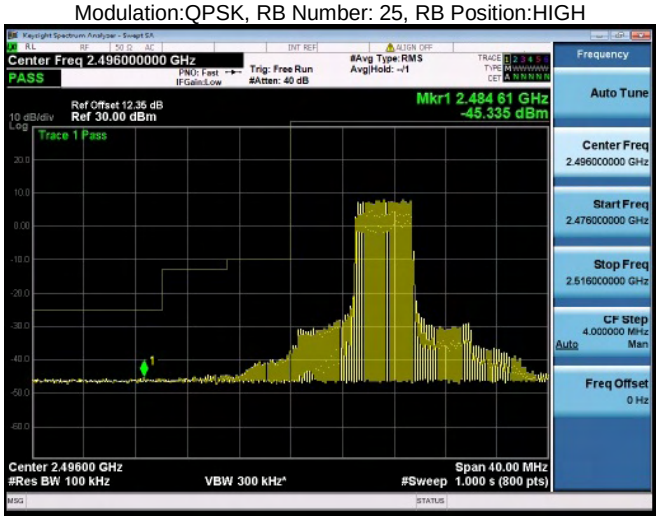
Subtest:33, Channel:39700, Bandwidth:10,
Modulation:16QAM, RB Number: 1, RB Position:MID



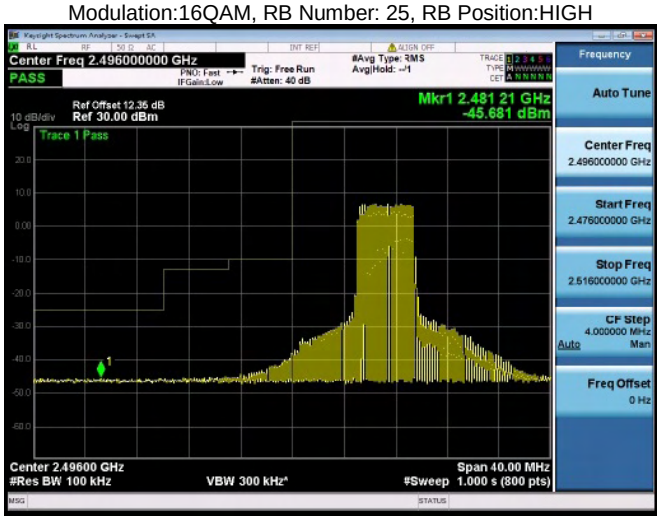
Subtest:36, Channel:39700, Bandwidth:10,
Modulation:QPSK, RB Number: 25, RB Position:MID



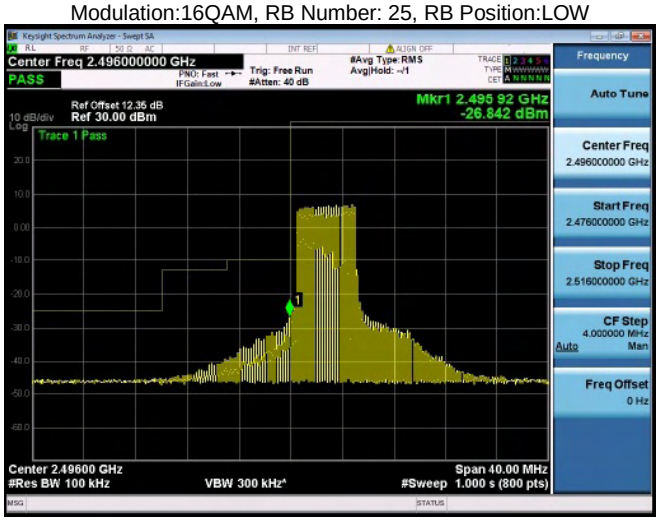
Subtest:37, Channel:39700, Bandwidth:10,
Modulation:QPSK, RB Number: 25, RB Position:HIGH



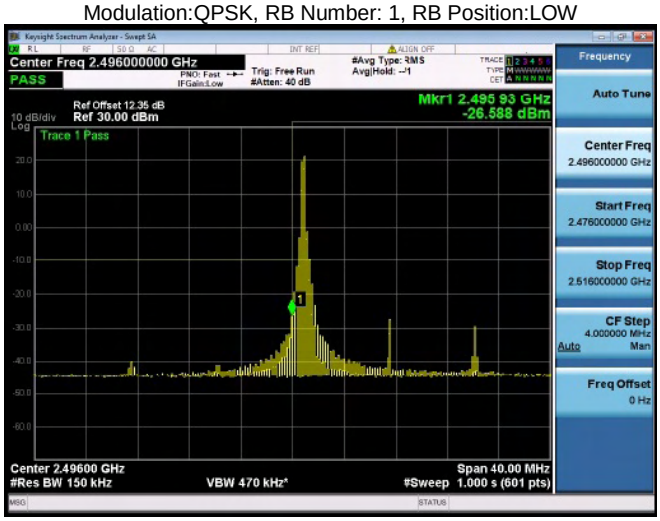
Subtest:40, Channel:39700, Bandwidth:10,
Modulation:16QAM, RB Number: 25, RB Position:HIGH



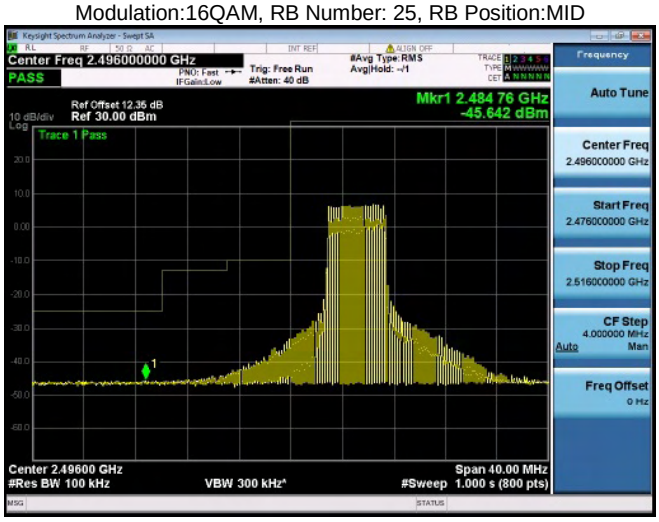
Subtest:38, Channel:39700, Bandwidth:10,
Modulation:16QAM, RB Number: 25, RB Position:LOW



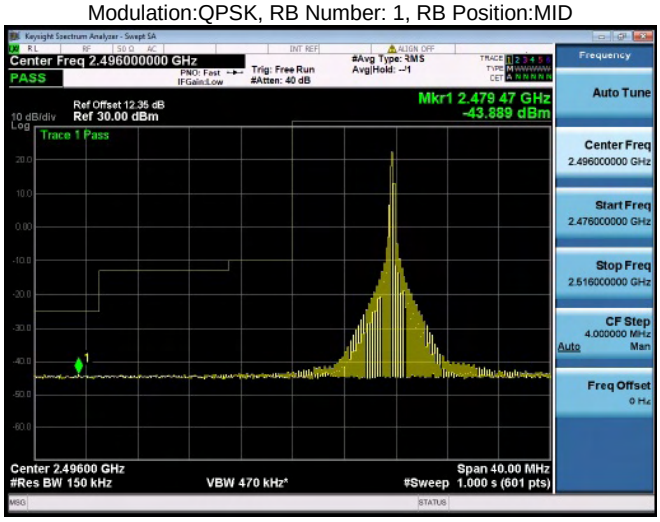
Subtest:41, Channel:39725, Bandwidth:15,
Modulation:QPSK, RB Number: 1, RB Position:LOW



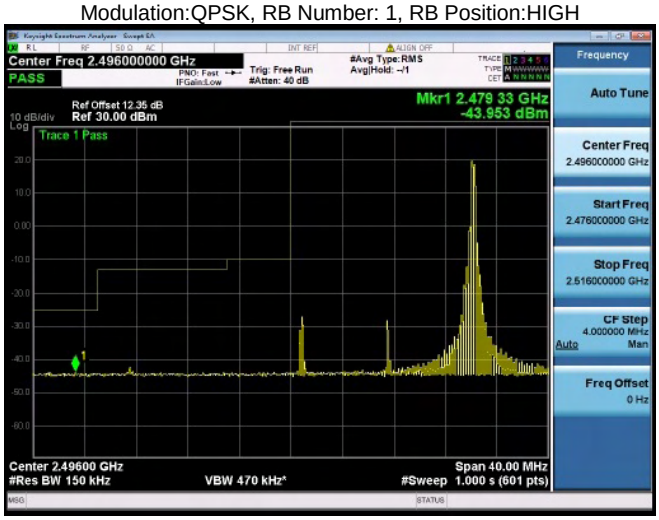
Subtest:39, Channel:39700, Bandwidth:10,
Modulation:16QAM, RB Number: 25, RB Position:MID



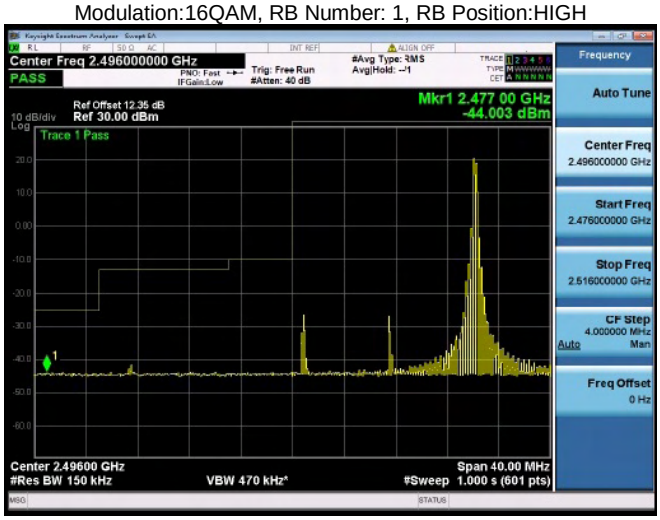
Subtest:42, Channel:39725, Bandwidth:15,
Modulation:QPSK, RB Number: 1, RB Position:MID



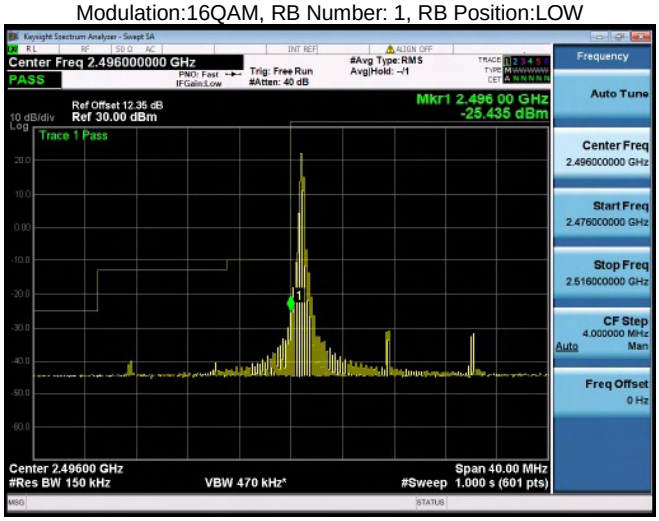
Subtest:43, Channel:39725, Bandwidth:15,
Modulation:QPSK, RB Number: 1, RB Position:HIGH



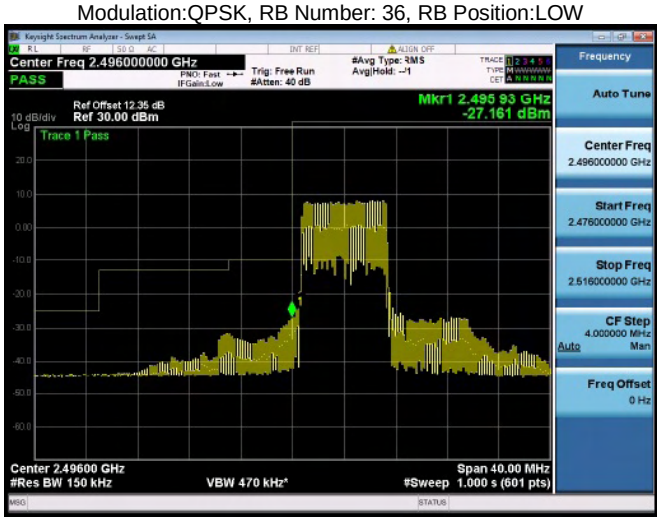
Subtest:46, Channel:39725, Bandwidth:15,
Modulation:16QAM, RB Number: 1, RB Position:HIGH



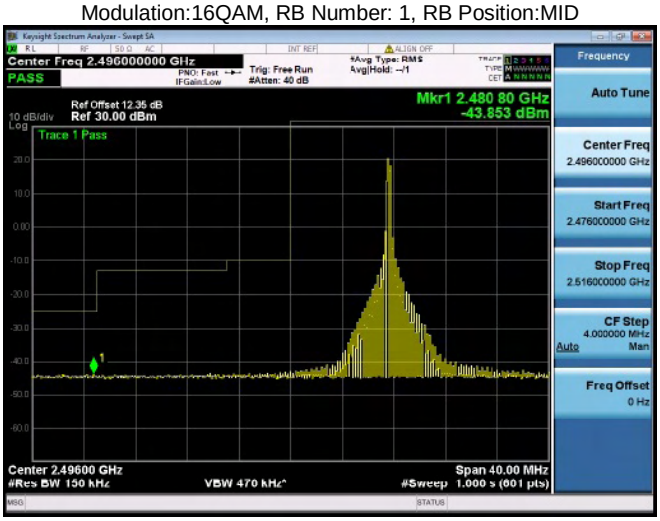
Subtest:44, Channel:39725, Bandwidth:15,
Modulation:16QAM, RB Number: 1, RB Position:LOW



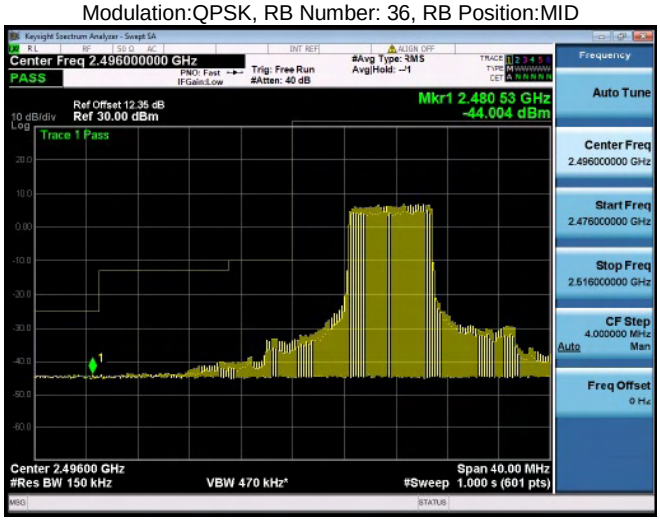
Subtest:47, Channel:39725, Bandwidth:15,
Modulation:QPSK, RB Number: 36, RB Position:LOW



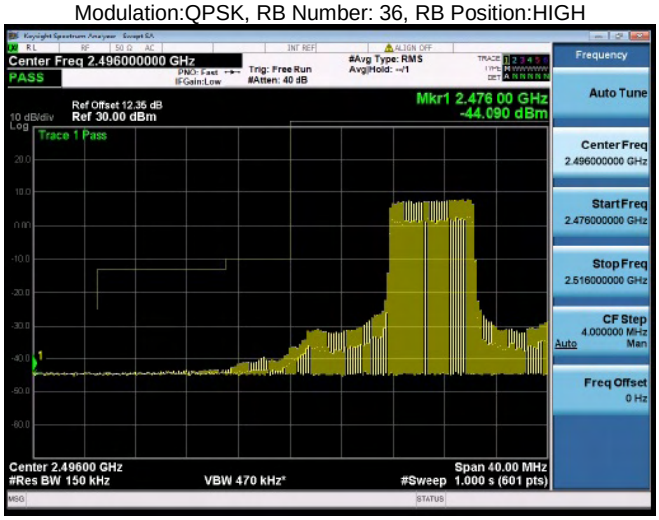
Subtest:45, Channel:39725, Bandwidth:15,
Modulation:16QAM, RB Number: 1, RB Position:MID



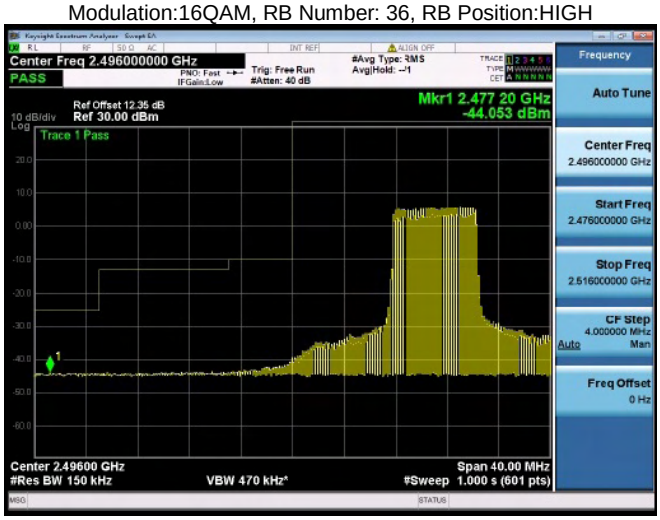
Subtest:48, Channel:39725, Bandwidth:15,
Modulation:QPSK, RB Number: 36, RB Position:MID



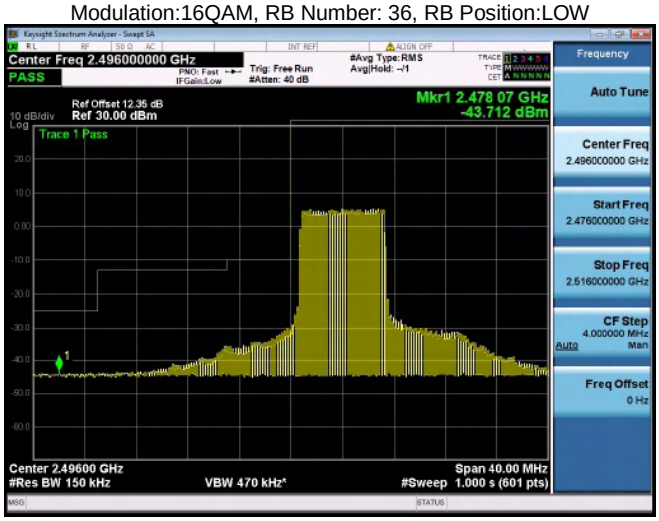
Subtest:49, Channel:39725, Bandwidth:15,
Modulation:QPSK, RB Number: 36, RB Position:HIGH



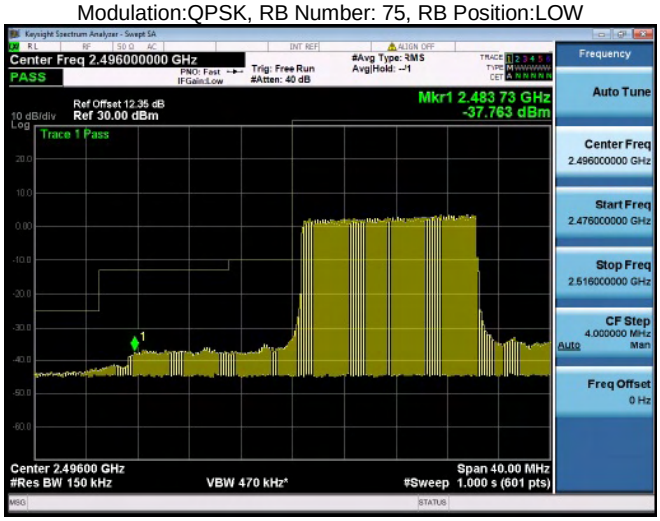
Subtest:52, Channel:39725, Bandwidth:15,
Modulation:16QAM, RB Number: 36, RB Position:HIGH



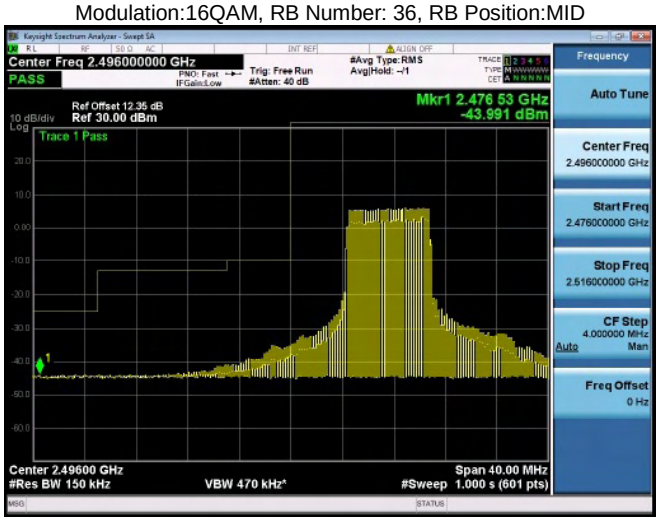
Subtest:50, Channel:39725, Bandwidth:15,
Modulation:16QAM, RB Number: 36, RB Position:LOW



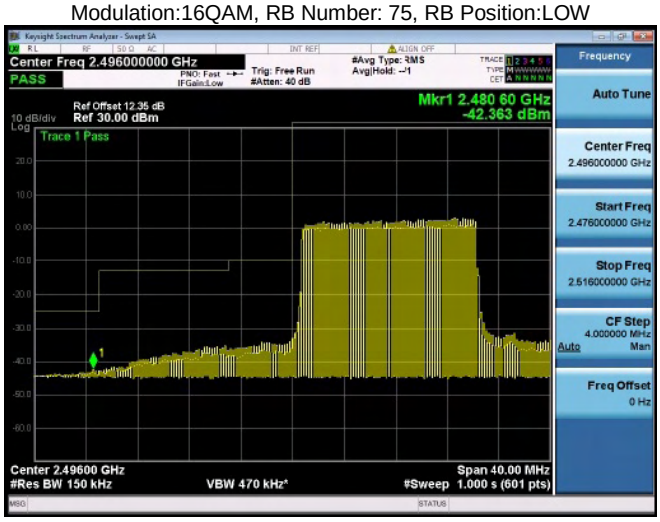
Subtest:53, Channel:39725, Bandwidth:15,
Modulation:QPSK, RB Number: 75, RB Position:LOW



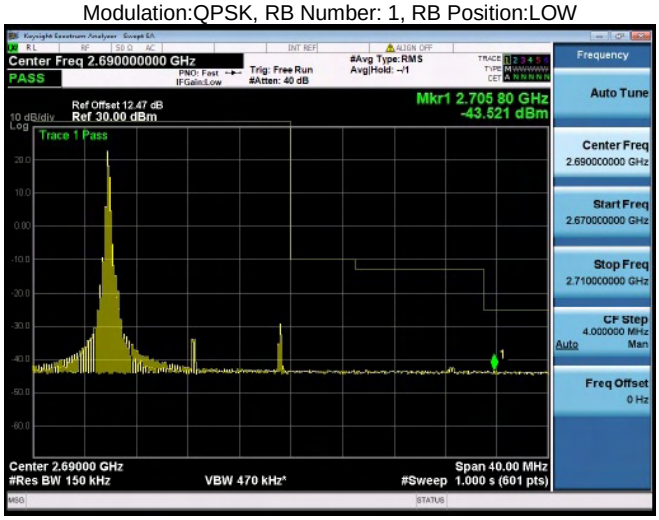
Subtest:51, Channel:39725, Bandwidth:15,
Modulation:16QAM, RB Number: 36, RB Position:MID



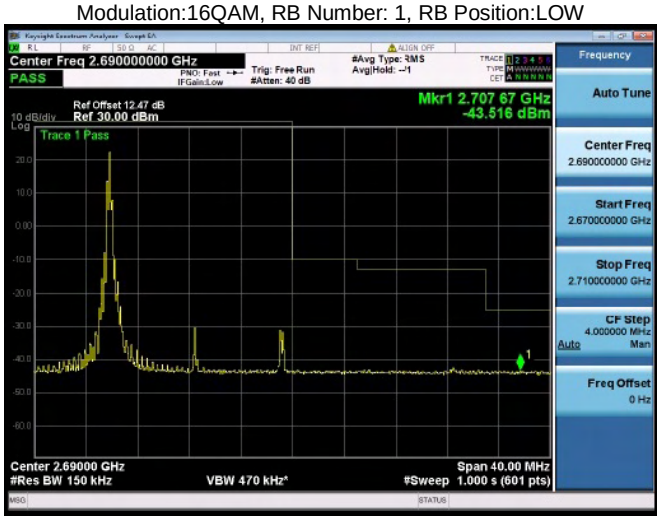
Subtest:54, Channel:39725, Bandwidth:15,
Modulation:16QAM, RB Number: 75, RB Position:LOW



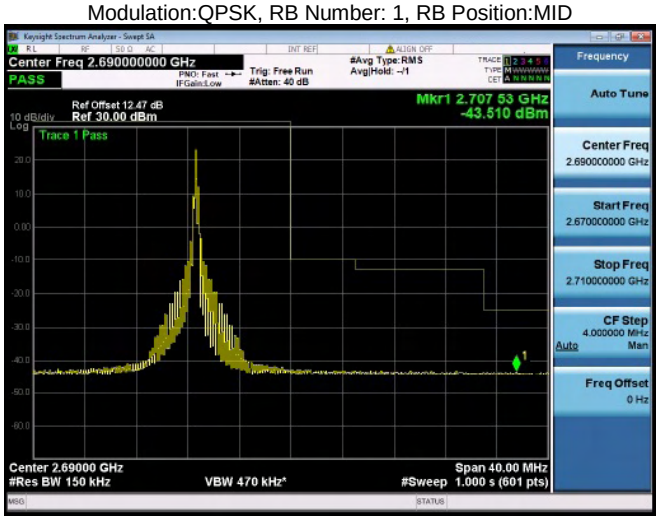
Subtest:55, Channel:41515, Bandwidth:15,
Modulation:QPSK, RB Number: 1, RB Position:LOW



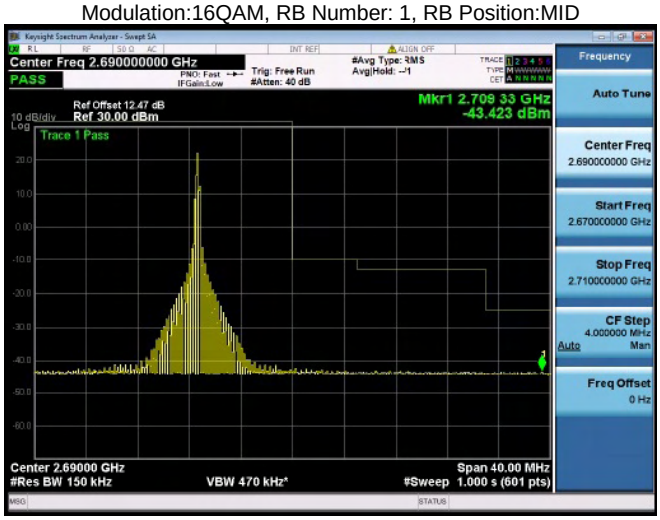
Subtest:58, Channel:41515, Bandwidth:15,
Modulation:16QAM, RB Number: 1, RB Position:LOW



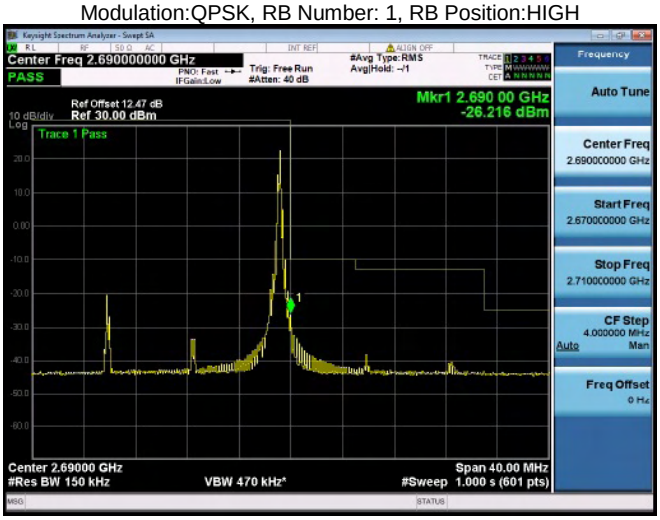
Subtest:56, Channel:41515, Bandwidth:15,
Modulation:QPSK, RB Number: 1, RB Position:MID



Subtest:59, Channel:41515, Bandwidth:15,
Modulation:16QAM, RB Number: 1, RB Position:MID



Subtest:57, Channel:41515, Bandwidth:15,
Modulation:QPSK, RB Number: 1, RB Position:HIGH



Subtest:60, Channel:41515, Bandwidth:15,
Modulation:16QAM, RB Number: 1, RB Position:HIGH