



TEST REPORT

APPLICANT : Reliance Communications LLC

PRODUCT NAME : Orbic 4G Module

MODEL NAME : RC101ML

BRAND NAME : Orbic

FCC ID : 2ABGH-RC101ML

STANDARD(S) : 47 CFR Part 2
47 CFR Part 96

RECEIPT DATE : 2021-08-19

TEST DATE : 2021-08-26 to 2021-11-05

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DIRECTORY

- 1. Technical Information 3**
- 1.1. Applicant and Manufacturer Information 3**
- 1.2. Equipment Under Test (EUT) Description 3**
- 1.3. Maximum E.R.P./E.I.R.P. and Emission Designator 4**
- 1.4. Test Standards and Results 5**
- 1.5. Environmental Conditions 6**
- 2. 47 CFR Part 2, Part 96 Requirements 7**
- 2.1. Transmitter Conducted Output Power and E.R.P./E.I.R.P. 7**
- 2.2. Occupied Bandwidth 16**
- 2.3. Frequency Stability 24**
- 2.4. Peak to Average Ratio 26**
- 2.5. Conducted Spurious Emissions 34**
- 2.6. Band Edge 47**
- 2.7. Radiated Spurious Emissions 53**
- Annex A Test Uncertainty 59**
- Annex B Testing Laboratory Information 60**

Change History		
Version	Date	Reason for change
1.0	2021-12-27	First edition



1. Technical Information

Note: Provide by applicant.

1.1. Applicant and Manufacturer Information

Applicant:	Reliance Communications LLC
Applicant Address:	91 Colin Drive, Unit 1, HOLBROOK, New York 11741, United States
Manufacturer:	Unimaxcomm
Manufacturer Address:	35F,HBC HuiLong Center Building-II Minzhi Street,Longhua, Shenzhen, P.R. China 518110

1.2. Equipment Under Test (EUT) Description

Product Name:	Orbic 4G Module	
Sample No.:	1#	
Hardware Version:	QMO2_V1.0_0611	
Software Version:	ORB101ML_v1.0.0.9_VZ	
Modulation Type:	QPSK, 16QAM, 64QAM	
Operation Band:	Band 48	
Frequency Range:	LTE Band 48	Tx: 3550MHz–3700MHz
		Rx: 3550MHz–3700MHz
Channel Bandwidth	LTE Band 48	5MHz, 10MHz, 15MHz, 20MHz
Antenna Type:	PIFA Antenna	
Antenna Gain:	LTE Band 48	2.00dBi

Note 1: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.



1.3. Maximum E.R.P./E.I.R.P. and Emission Designator

LTE Band 48	Maximum E.R.P./E.I.R.P. (W)			Emission Designator (99%OBW)		
	BW(MHz)	QPSK	16QAM	64QAM	QPSK	16QAM
20	0.338	0.284	0.197	18M0G7D	18M0W7D	18M0W7D
15	0.336	0.282	0.196	13M5G7D	13M5W7D	13M4W7D
10	0.332	0.279	0.194	8M97G7D	9M00W7D	8M97W7D
5	0.327	0.275	0.191	4M51G7D	4M50W7D	4M50W7D



1.4. Test Standards and Results

The objective of the report is to perform testing according to Part 2 and Part 96 for the EUT FCC ID Certification:

No	Identity	Document Title
1	47 CFR Part 2	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
2	47 CFR Part 96	CITIZENS BROADBAND RADIO SERVICE

Test detailed items/section required by FCC rules and results are as below:

Section	Description	Test Date	Test Engineer	Result	Method Determination /Remark
2.1046, 96.41(b)	Transmitter Conducted Output Power and ERP/EIRP	Dec 03, 2021	Tan Xiaowei Yin Xiaogang	PASS	No deviation
2.1049	Occupied Bandwidth	Sep 08, 2021	Li Huaijie	PASS	No deviation
96.41(g)	Peak -Average Ratio	Sep 08, 2021	Li Huaijie	PASS	No deviation
2.1055	Frequency Stability	Oct 12, 2021	Li Huaijie	PASS	No deviation
2.1051, 96.41(e)	Conducted Spurious Emissions	Sep 08, 2021	Li Huaijie	PASS	No deviation
2.1051, 96.41(e)	Band Edge	Sep 16&28, 2021	Li Huaijie	PASS	No deviation
2.1051, 96.41(e)	Radiated Spurious Emissions	Dec 05, 2021	Gao Jianrou	PASS	No deviation

Note 1: The tests were performed according to the method of measurements prescribed in KDB971168 D01 v03 and ANSI/TIA-603-E-2016.

Note 2: The path loss during the RF test is calibrated to correct the results by the offset setting in the test equipments. The Ref offset 5.5dB means the cable loss is 5.5dB.

Note 3: Additions to, deviation, or exclusions from the method shall be judged in the "method determination" column of add, deviate or exclude from the specific method shall be explained in the "Remark" of the above table.

Note 4: When the test result is a critical value, we will use the measurement uncertainty give the



judgment result based on the 95% confidence intervals.

1.5. Environmental Conditions

During the measurement, the environmental conditions were within the listed ranges:

Temperature (°C):	15-35
Relative Humidity (%):	30-60
Atmospheric Pressure (kPa):	86-106

2.47 CFR Part 2, Part 96 Requirements

2.1. Transmitter Conducted Output Power and E.R.P./E.I.R.P.

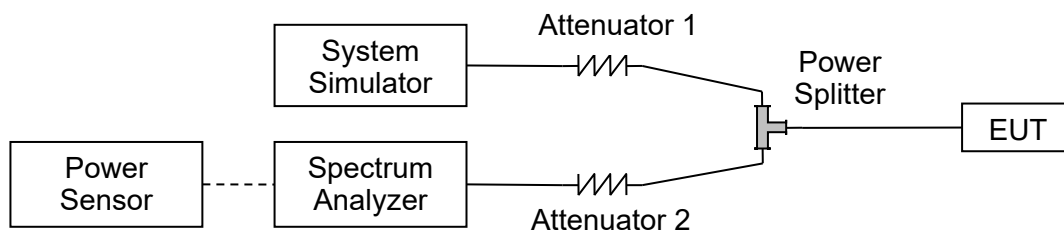
2.1.1. Requirement

According to FCC section 2.1046(a), for transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in FCC section 2.1033(c)(8).

The maximum effective isotropic radiated power (EIRP) and maximum Power Spectral Density (PSD) of any CBSD and End User Device must comply with the limits shown in the table as below paragraph

Device	Maximum EIRP (dBm/10 megahertz)	Maximum PSD (dBm/MHz)
End User Device	23	n/a
Category A CBSD	30	20
Category B CBSD ¹	47	37

2.1.2. Test Description



The EUT is coupled to the Spectrum Analyzer (SA) and the System Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. The EUT is commanded by the SS to operate at the maximum output power. A call is established between the EUT and the SS.



2.1.3.Test procedure

KDB 971168 D01v03 Section 5.2 and ANSI/TIA-603-E-2016.

EIRP (dBm) = Conducted Output Power (dBm) + Antenna Gain (dBi)

ERP (dBm) = EIPR (dBm) - 2.15

2.1.4.Result

Conducted Output Power:

LTE Band 48						
BW [MHz]	Modulation	RB Size	RB Offset	Average Power Low Ch. / Freq.	Average Power Middle Ch. / Freq.	Average Power High Ch. / Freq.
Channel				55340	55990	56640
Frequency (MHz)				3560	3625	3690
20	QPSK	1	0	23.29	22.41	21.47
20	QPSK	1	49	22.98	22.36	21.35
20	QPSK	1	99	22.67	22.18	21.21
20	QPSK	50	0	21.77	21.44	20.73
20	QPSK	50	24	21.56	21.32	20.56
20	QPSK	50	50	21.34	21.23	20.38
20	QPSK	100	0	21.79	21.40	20.66
20	16QAM	1	0	22.42	22.53	20.80
20	16QAM	1	49	22.36	22.35	20.69
20	16QAM	1	99	22.24	22.18	20.35
20	16QAM	50	0	20.86	20.53	19.77
20	16QAM	50	24	20.68	20.36	19.56
20	16QAM	50	50	20.47	20.19	19.39
20	16QAM	100	0	20.85	20.44	19.68
20	64QAM	1	0	20.95	20.52	19.81
20	64QAM	1	49	20.78	20.35	19.67
20	64QAM	1	99	20.63	20.17	19.46
20	64QAM	50	0	19.84	19.48	18.77
20	64QAM	50	24	19.75	19.35	18.58
20	64QAM	50	50	19.59	19.23	18.32
20	64QAM	100	0	19.85	19.44	18.69



LTE Band 48						
BW [MHz]	Modulation	RB Size	RB Offset	Average Power Low Ch. / Freq.	Average Power Middle Ch. / Freq.	Average Power High Ch. / Freq.
Channel				55315	55990	56665
Frequency (MHz)				3557.5	3625	3692.5
15	QPSK	1	0	23.26	22.38	21.44
15	QPSK	1	37	22.95	22.33	21.32
15	QPSK	1	74	22.64	22.15	21.18
15	QPSK	36	0	21.74	21.41	20.70
15	QPSK	36	20	21.53	21.29	20.53
15	QPSK	36	39	21.31	21.20	20.35
15	QPSK	75	0	21.76	21.37	20.63
15	16QAM	1	0	22.39	22.50	20.77
15	16QAM	1	37	22.33	22.32	20.66
15	16QAM	1	74	22.21	22.15	20.32
15	16QAM	36	0	20.83	20.50	19.74
15	16QAM	36	20	20.65	20.33	19.53
15	16QAM	36	39	20.44	20.16	19.36
15	16QAM	75	0	20.82	20.41	19.65
15	64QAM	1	0	20.92	20.49	19.78
15	64QAM	1	37	20.75	20.32	19.64
15	64QAM	1	74	20.60	20.14	19.43
15	64QAM	36	0	19.81	19.45	18.74
15	64QAM	36	20	19.72	19.32	18.55
15	64QAM	36	39	19.56	19.20	18.29
15	64QAM	75	0	19.82	19.41	18.66



LTE Band 48						
BW [MHz]	Modulation	RB Size	RB Offset	Average Power Low Ch. / Freq.	Average Power Middle Ch. / Freq.	Average Power High Ch. / Freq.
Channel				55290	55990	56690
Frequency (MHz)				3555	3625	3695
10	QPSK		0	23.21	22.33	21.39
10	QPSK	1	25	22.90	22.28	21.27
10	QPSK	1	49	22.59	22.10	21.13
10	QPSK	25	0	21.69	21.36	20.65
10	QPSK	25	12	21.48	21.24	20.48
10	QPSK	25	25	21.26	21.15	20.30
10	QPSK	50	0	21.71	21.32	20.58
10	16QAM	1	0	22.34	22.45	20.72
10	16QAM	1	25	22.28	22.27	20.61
10	16QAM	1	49	22.16	22.10	20.27
10	16QAM	25	0	20.78	20.45	19.69
10	16QAM	25	12	20.60	20.28	19.48
10	16QAM	25	25	20.39	20.11	19.31
10	16QAM	50	0	20.77	20.36	19.60
10	64QAM	1	0	20.87	20.44	19.73
10	64QAM	1	25	20.70	20.27	19.59
10	64QAM	1	49	20.55	20.09	19.38
10	64QAM	25	0	19.76	19.40	18.69
10	64QAM	25	12	19.67	19.27	18.50
10	64QAM	25	25	19.51	19.15	18.24
10	64QAM	50	0	19.77	19.36	18.61



LTE Band 48						
BW [MHz]	Modulation	RB Size	RB Offset	Average Power Low Ch. / Freq.	Average Power Middle Ch. / Freq.	Average Power High Ch. / Freq.
Channel				55265	55990	56175
Frequency (MHz)				3552.5	3625	3697.5
5	QPSK	1	0	23.15	22.27	21.33
5	QPSK	1	12	22.84	22.22	21.21
5	QPSK	1	24	22.53	22.04	21.07
5	QPSK	12	0	21.63	21.30	20.59
5	QPSK	12	7	21.42	21.18	20.42
5	QPSK	12	13	21.20	21.09	20.24
5	QPSK	25	0	21.65	21.26	20.52
5	16QAM	1	0	22.28	22.39	20.66
5	16QAM	1	12	22.22	22.21	20.55
5	16QAM	1	24	22.10	22.04	20.21
5	16QAM	12	0	20.72	20.39	19.63
5	16QAM	12	7	20.54	20.22	19.42
5	16QAM	12	13	20.33	20.05	19.25
5	16QAM	25	0	20.71	20.30	19.54
5	64QAM	1	0	20.81	20.38	19.67
5	64QAM	1	12	20.64	20.21	19.53
5	64QAM	1	24	20.49	20.03	19.32
5	64QAM	12	0	19.70	19.34	18.63
5	64QAM	12	7	19.61	19.21	18.44
5	64QAM	12	13	19.45	19.09	18.18
5	64QAM	25	0	19.71	19.30	18.55



Effective Radiated Power and Effective Isotropic Radiated Power:

LTE Band 48				Measured E.I.R.P.					
BW [MHz]	Modulation	RB Size	RB Offset	Low Ch. / Freq.		Middle Ch. / Freq.		High Ch. / Freq.	
Channel				55340		55990		56640	
Frequency (MHz)				3560		3625		3690	
				dBm	W	dBm	W	dBm	W
20	QPSK	1	0	25.29	0.338	24.41	0.276	23.47	0.222
20	QPSK	1	49	24.98	0.315	24.36	0.273	23.35	0.216
20	QPSK	1	99	24.67	0.293	24.18	0.262	23.21	0.209
20	QPSK	50	0	23.77	0.238	23.44	0.221	22.73	0.187
20	QPSK	50	24	23.56	0.227	23.32	0.215	22.56	0.180
20	QPSK	50	50	23.34	0.216	23.23	0.210	22.38	0.173
20	QPSK	100	0	23.79	0.239	23.4	0.219	22.66	0.185
20	16QAM	1	0	24.42	0.277	24.53	0.284	22.8	0.191
20	16QAM	1	49	24.36	0.273	24.35	0.272	22.69	0.186
20	16QAM	1	99	24.24	0.265	24.18	0.262	22.35	0.172
20	16QAM	50	0	22.86	0.193	22.53	0.179	21.77	0.150
20	16QAM	50	24	22.68	0.185	22.36	0.172	21.56	0.143
20	16QAM	50	50	22.47	0.177	22.19	0.166	21.39	0.138
20	16QAM	100	0	22.85	0.193	22.44	0.175	21.68	0.147
20	64QAM	1	0	22.95	0.197	22.52	0.179	21.81	0.152
20	64QAM	1	49	22.78	0.190	22.35	0.172	21.67	0.147
20	64QAM	1	99	22.63	0.183	22.17	0.165	21.46	0.140
20	64QAM	50	0	21.84	0.153	21.48	0.141	20.77	0.119
20	64QAM	50	24	21.75	0.150	21.35	0.136	20.58	0.114
20	64QAM	50	50	21.59	0.144	21.23	0.133	20.32	0.108
20	64QAM	100	0	21.85	0.153	21.44	0.139	20.69	0.117



LTE Band 48				Measured E.I.R.P.					
BW [MHz]	Modulation	RB Size	RB Offset	Low Ch. / Freq.		Middle Ch. / Freq.		High Ch. / Freq.	
Channel				55315		55990		56665	
Frequency (MHz)				3557.5		3625		3692.5	
				dBm	W	dBm	W	dBm	W
15	QPSK	1	0	25.26	0.336	24.38	0.274	23.44	0.221
15	QPSK	1	37	24.95	0.313	24.33	0.271	23.32	0.215
15	QPSK	1	74	24.64	0.291	24.15	0.260	23.18	0.208
15	QPSK	36	0	23.74	0.237	23.41	0.219	22.70	0.186
15	QPSK	36	20	23.53	0.225	23.29	0.213	22.53	0.179
15	QPSK	36	39	23.31	0.214	23.20	0.209	22.35	0.172
15	QPSK	75	0	23.76	0.238	23.37	0.217	22.63	0.183
15	16QAM	1	0	24.39	0.275	24.50	0.282	22.77	0.189
15	16QAM	1	37	24.33	0.271	24.32	0.270	22.66	0.185
15	16QAM	1	74	24.21	0.264	24.15	0.260	22.32	0.171
15	16QAM	36	0	22.83	0.192	22.50	0.178	21.74	0.149
15	16QAM	36	20	22.65	0.184	22.33	0.171	21.53	0.142
15	16QAM	36	39	22.44	0.175	22.16	0.164	21.36	0.137
15	16QAM	75	0	22.82	0.191	22.41	0.174	21.65	0.146
15	64QAM	1	0	22.92	0.196	22.49	0.177	21.78	0.151
15	64QAM	1	37	22.75	0.188	22.32	0.171	21.64	0.146
15	64QAM	1	74	22.60	0.182	22.14	0.164	21.43	0.139
15	64QAM	36	0	21.81	0.152	21.45	0.140	20.74	0.119
15	64QAM	36	20	21.72	0.149	21.32	0.136	20.55	0.114
15	64QAM	36	39	21.56	0.143	21.20	0.132	20.29	0.107
15	64QAM	75	0	21.82	0.152	21.41	0.138	20.66	0.116



LTE Band 48				Measured E.I.R.P.					
BW [MHz]	Modulation	RB Size	RB Offset	Low Ch. / Freq.		Middle Ch. / Freq.		High Ch. / Freq.	
Channel				55290		55990		56690	
Frequency (MHz)				3555		3625		3695	
				dBm	W	dBm	W	dBm	W
10	QPSK	1	0	25.21	0.332	24.33	0.271	23.39	0.218
10	QPSK	1	25	24.9	0.309	24.28	0.268	23.27	0.212
10	QPSK	1	49	24.59	0.288	24.1	0.257	23.13	0.206
10	QPSK	25	0	23.69	0.234	23.36	0.217	22.65	0.184
10	QPSK	25	12	23.48	0.223	23.24	0.211	22.48	0.177
10	QPSK	25	25	23.26	0.212	23.15	0.207	22.3	0.170
10	QPSK	50	0	23.71	0.235	23.32	0.215	22.58	0.181
10	16QAM	1	0	24.34	0.272	24.45	0.279	22.72	0.187
10	16QAM	1	25	24.28	0.268	24.27	0.267	22.61	0.182
10	16QAM	1	49	24.16	0.261	24.1	0.257	22.27	0.169
10	16QAM	25	0	22.78	0.190	22.45	0.176	21.69	0.148
10	16QAM	25	12	22.6	0.182	22.28	0.169	21.48	0.141
10	16QAM	25	25	22.39	0.173	22.11	0.163	21.31	0.135
10	16QAM	50	0	22.77	0.189	22.36	0.172	21.6	0.145
10	64QAM	1	0	22.87	0.194	22.44	0.175	21.73	0.149
10	64QAM	1	25	22.7	0.186	22.27	0.169	21.59	0.144
10	64QAM	1	49	22.55	0.180	22.09	0.162	21.38	0.137
10	64QAM	25	0	21.76	0.150	21.4	0.138	20.69	0.117
10	64QAM	25	12	21.67	0.147	21.27	0.134	20.5	0.112
10	64QAM	25	25	21.51	0.142	21.15	0.130	20.24	0.106
10	64QAM	50	0	21.77	0.150	21.36	0.137	20.61	0.115



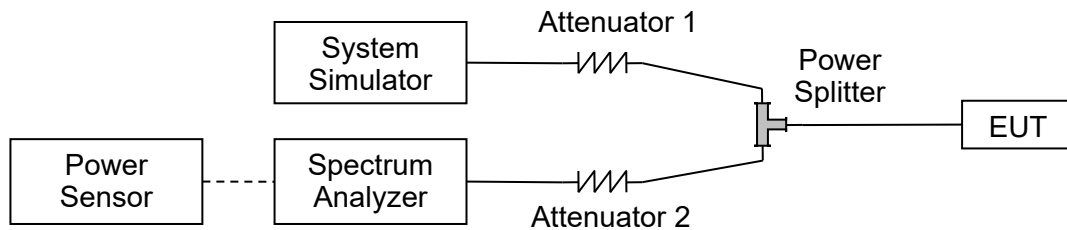
LTE Band 48				Measured E.I.R.P.					
BW [MHz]	Modulation	RB Size	RB Offset	Low Ch. / Freq.		Middle Ch. / Freq.		High Ch. / Freq.	
Channel				55265		55990		56175	
Frequency (MHz)				3552.5		3625		3697.5	
				dBm	W	dBm	W	dBm	W
5	QPSK	1	0	25.15	0.327	24.27	0.267	23.33	0.215
5	QPSK	1	12	24.84	0.305	24.22	0.264	23.21	0.209
5	QPSK	1	24	24.53	0.284	24.04	0.254	23.07	0.203
5	QPSK	12	0	23.63	0.231	23.30	0.214	22.59	0.182
5	QPSK	12	7	23.42	0.220	23.18	0.208	22.42	0.175
5	QPSK	12	13	23.20	0.209	23.09	0.204	22.24	0.167
5	QPSK	25	0	23.65	0.232	23.26	0.212	22.52	0.179
5	16QAM	1	0	24.28	0.268	24.39	0.275	22.66	0.185
5	16QAM	1	12	24.22	0.264	24.21	0.264	22.55	0.180
5	16QAM	1	24	24.10	0.257	24.04	0.254	22.21	0.166
5	16QAM	12	0	22.72	0.187	22.39	0.173	21.63	0.146
5	16QAM	12	7	22.54	0.179	22.22	0.167	21.42	0.139
5	16QAM	12	13	22.33	0.171	22.05	0.160	21.25	0.133
5	16QAM	25	0	22.71	0.187	22.30	0.170	21.54	0.143
5	64QAM	1	0	22.81	0.191	22.38	0.173	21.67	0.147
5	64QAM	1	12	22.64	0.184	22.21	0.166	21.53	0.142
5	64QAM	1	24	22.49	0.177	22.03	0.160	21.32	0.136
5	64QAM	12	0	21.70	0.148	21.34	0.136	20.63	0.116
5	64QAM	12	7	21.61	0.145	21.21	0.132	20.44	0.111
5	64QAM	12	13	21.45	0.140	21.09	0.129	20.18	0.104
5	64QAM	25	0	21.71	0.148	21.30	0.135	20.55	0.114

2.2. Occupied Bandwidth

2.2.1. Requirement

According to FCC section 2.1049, the occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission. Occupied bandwidth is also known as the 99% emission bandwidth.

2.2.2. Test Description



The EUT is coupled to the Spectrum Analyzer (SA) and the System Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. The EUT is commanded by the SS to operate at the maximum output power. A call is established between the EUT and the SS.

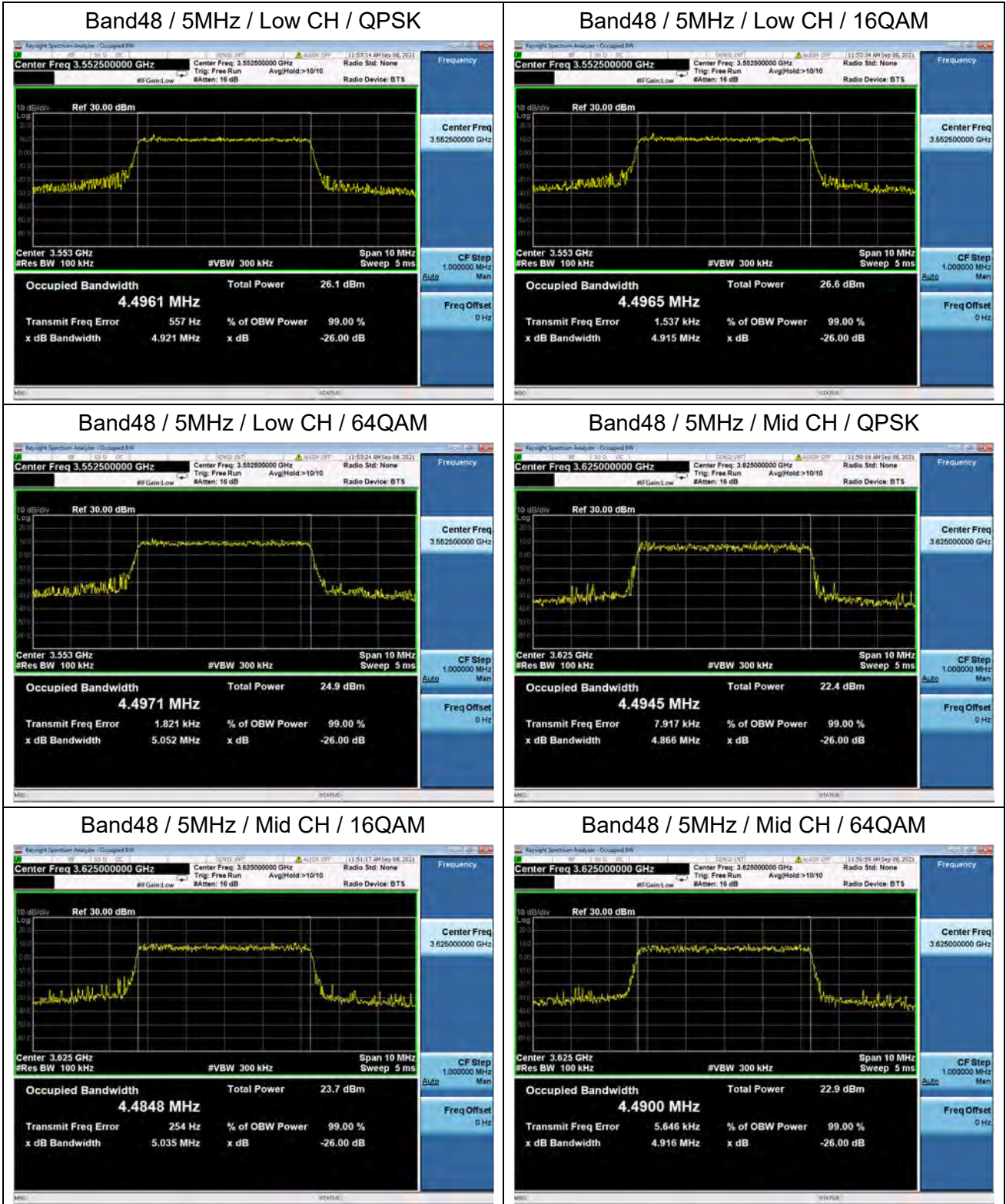
2.2.3. Test procedure

KDB 971168 D01v03 Section 4.1 and ANSI/TIA-603-E-2016.

2.2.4. Test Result



LTE Band 48				
BW(MHz)	Channel Level	Modulation	99% BW(MHz)	26dB BW(MHz)
5	Low	QPSK	4.50	4.92
	Low	16QAM	4.50	4.92
	Low	64QAM	4.50	5.05
	Mid	QPSK	4.49	4.87
	Mid	16QAM	4.48	5.04
	Mid	64QAM	4.49	4.92
	High	QPSK	4.51	4.92
	High	16QAM	4.48	5.09
	High	64QAM	4.49	4.81
10	Low	QPSK	8.96	9.79
	Low	16QAM	8.95	9.71
	Low	64QAM	8.97	9.65
	Mid	QPSK	8.93	9.63
	Mid	16QAM	9.00	9.48
	Mid	64QAM	8.95	9.39
	High	QPSK	8.97	9.52
	High	16QAM	8.89	9.51
	High	64QAM	8.97	9.36
15	Low	QPSK	13.48	14.66
	Low	16QAM	13.49	14.70
	Low	64QAM	13.43	14.66
	Mid	QPSK	13.39	14.15
	Mid	16QAM	13.41	14.52
	Mid	64QAM	13.40	14.11
	High	QPSK	13.45	14.39
	High	16QAM	13.44	14.22
	High	64QAM	13.43	14.18
20	Low	QPSK	17.95	19.54
	Low	16QAM	17.97	19.64
	Low	64QAM	18.01	19.45
	Mid	QPSK	17.81	19.09
	Mid	16QAM	17.97	18.91
	Mid	64QAM	17.71	19.09
	High	QPSK	17.94	18.90
	High	16QAM	17.84	18.94
	High	64QAM	17.92	19.32

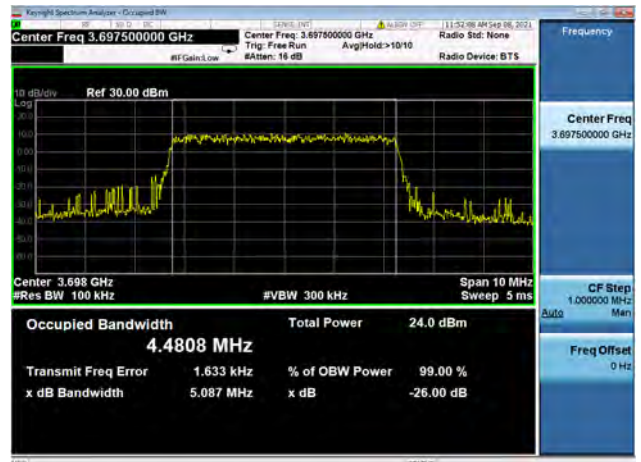




Band48 / 5MHz / High CH / QPSK



Band48 / 5MHz / High CH / 16QAM



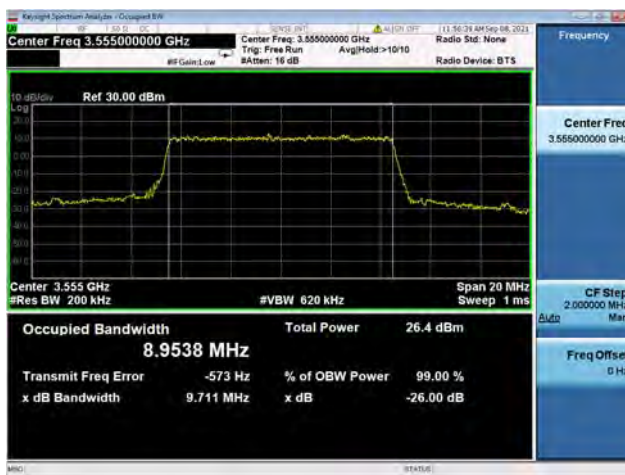
Band48 / 5MHz / High CH / 64QAM



Band48 / 10MHz / Low CH / QPSK

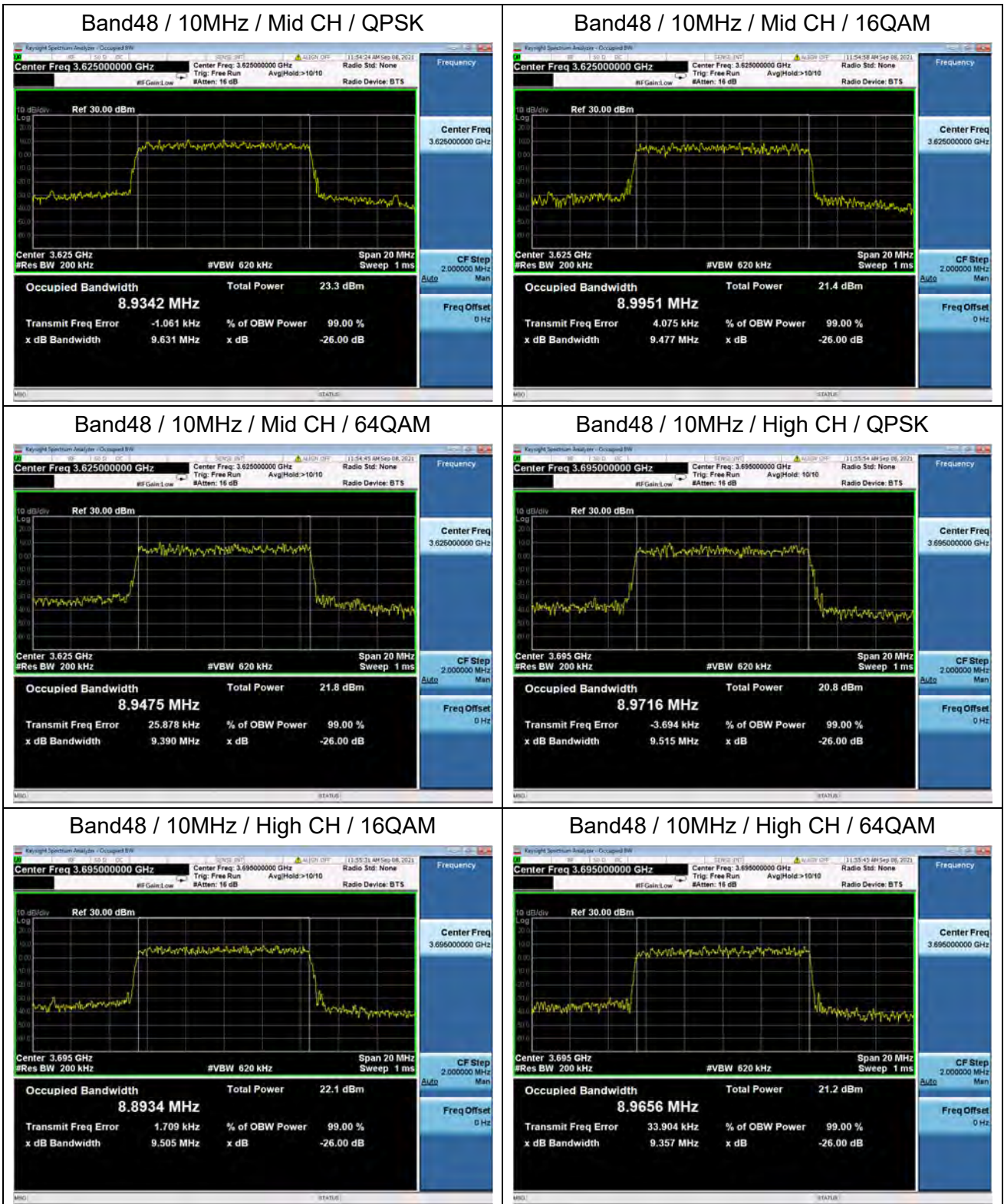


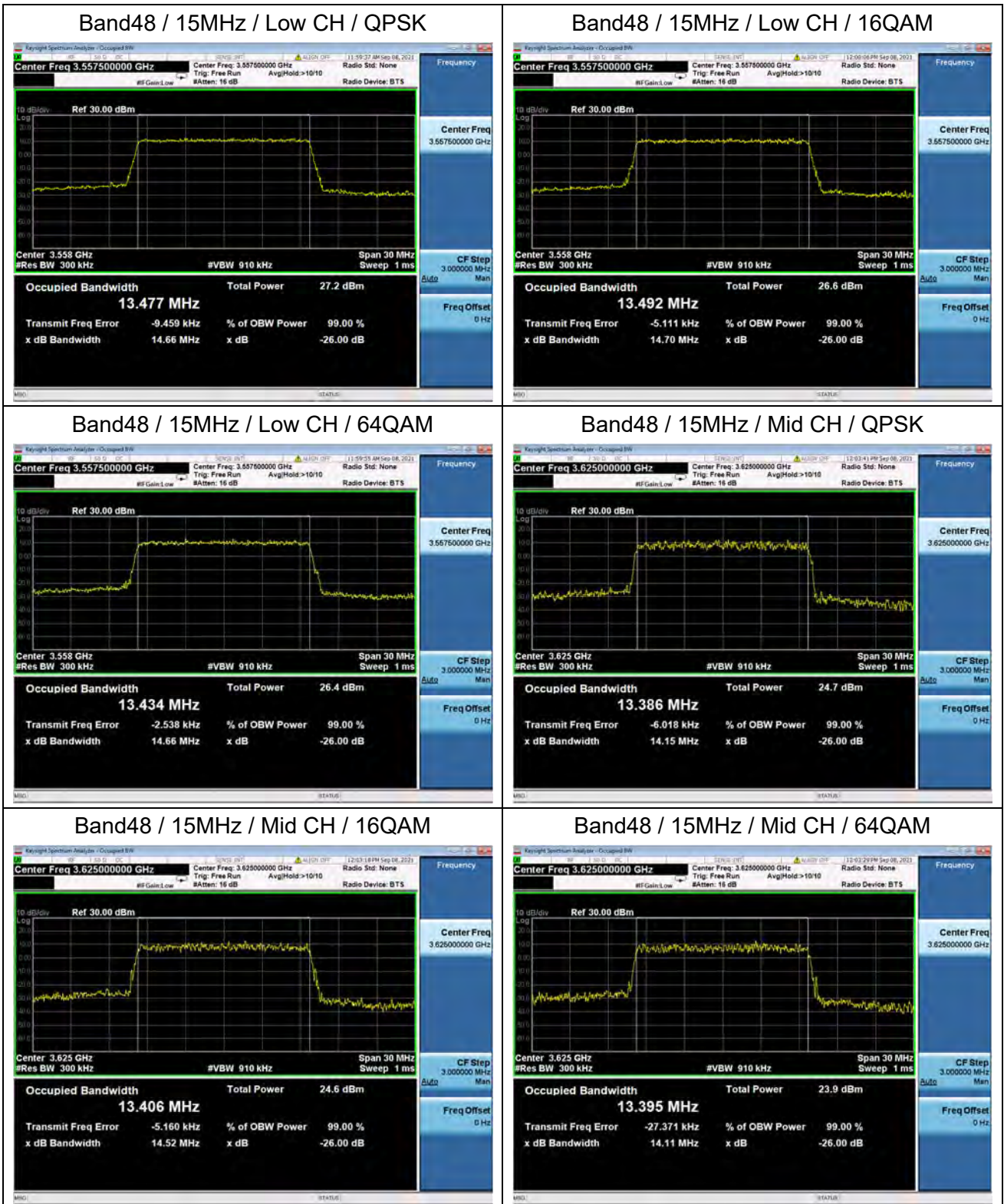
Band48 / 10MHz / Low CH / 16QAM



Band48 / 10MHz / Low CH / 64QAM







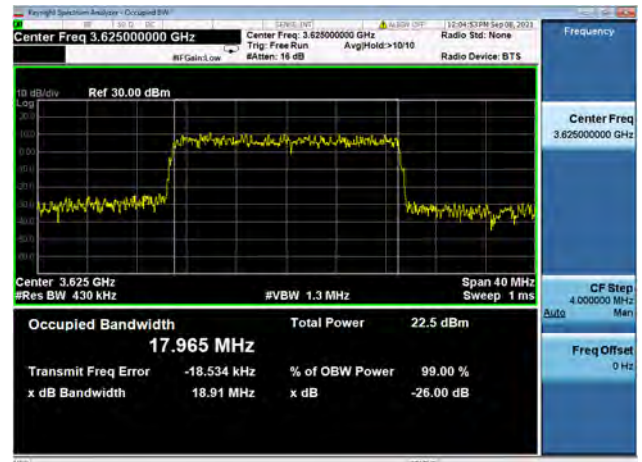




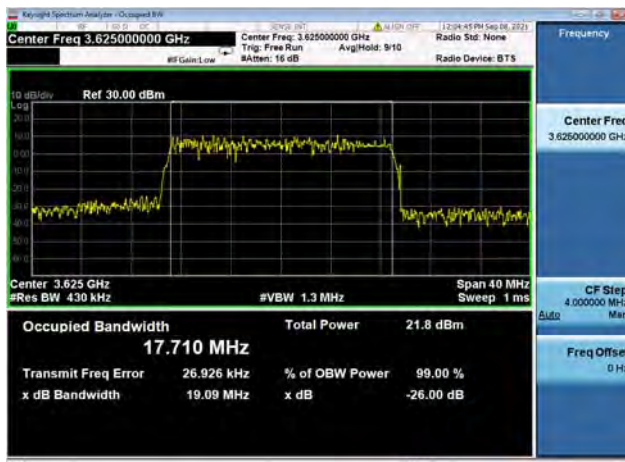
Band48 / 20MHz / Mid CH / QPSK



Band48 / 20MHz / Mid CH / 16QAM



Band48 / 20MHz / Mid CH / 64QAM



Band48 / 20MHz / High CH / QPSK



Band48 / 20MHz / High CH / 16QAM



Band48 / 20MHz / High CH / 64QAM



2.3. Frequency Stability

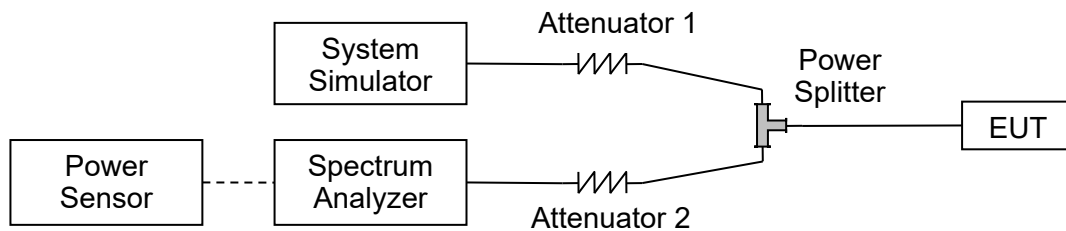
2.3.1. Requirement

According to FCC section 2.1055 & 90.213, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. According to FCC section 2.1055, the test conditions are:

- (a) The temperature is varied from -30°C to $+50^{\circ}\text{C}$ at intervals of not more than 10°C .
- (b) For hand carried battery powered equipment, the primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacture. The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided.

Note: The operating temperature of EUT is from -20°C to 75°C , which are specified by the applicant.

2.3.2. Test Description



The EUT which is powered by the DC Power Supply directly, is located in the Temperature Chamber. The EUT is commanded by the System Simulator (SS) to operate at the maximum output power. A call is established between the EUT and the SS via a Common Antenna.

2.3.3. Test procedure

KDB 971168 D01v03 Section 9.0 and ANSI/TIA-603-E-2016.



2.3.4. Test Result

The nominal, highest and lowest extreme voltages are separately 3.80V, 4.35V and 3.00V, which are specified by the applicant; the normal temperature here used is 20°C.

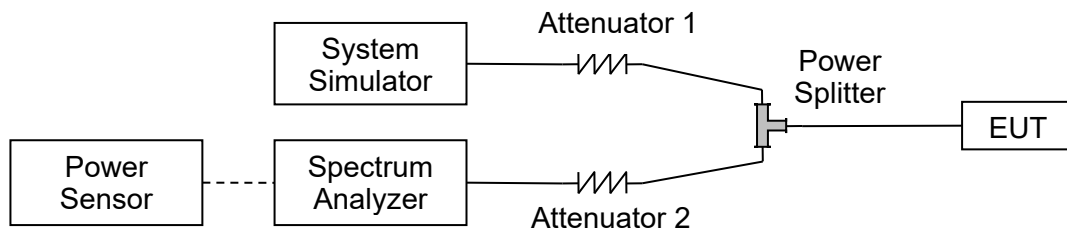
LTE Band 48, QPSK, Channel 55990, Frequency 3625.0MHz					
Limit =Within Authorized Band					
Voltage (%)	Power (VDC)	Temp(°C)	Fre. Dev.(Hz)	Deviation (ppm)	Result
100	3.80	+20(Ref)	-20	-0.006	PASS
100		-20	-21	-0.006	
100		-10	19	0.005	
100		0	17	0.005	
100		+10	24	0.007	
100		+20	19	0.005	
100		+30	-22	-0.006	
100		+40	-24	-0.007	
100		+50	-35	-0.010	
100		+60	44	0.012	
115		4.35	+20	-54	
85	3.00	+20	54	0.015	

2.4. Peak to Average Ratio

2.4.1. Requirement

According to FCC 96.41(g), the peak-to-average power ratio (PAPR) of any CBSD transmitter output power must not exceed 13 dB.

2.4.2. Test Description



The EUT is coupled to the Spectrum Analyzer (SA) and the System Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. The EUT is commanded by the SS to operate at the maximum output power. A call is established between the EUT and the SS.

2.4.3. Test procedure

KDB 971168 D01v03 Section 5.7 and ANSI/TIA-603-E-2016.

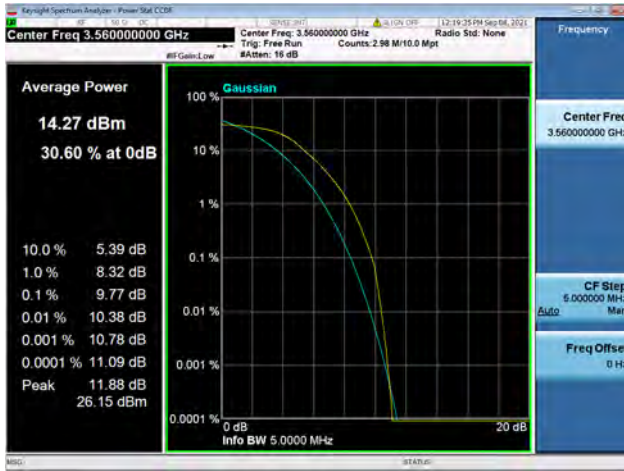
2.4.4. Test Result



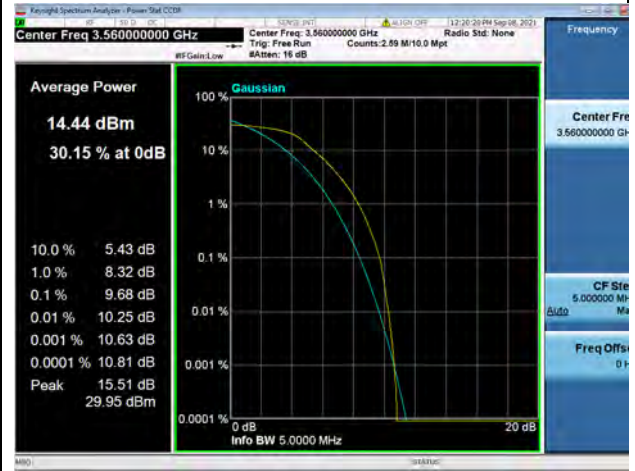
LTE Band 48					
BW(MHz)	Channel Level	Modulation	PAR Radio(dB)	Limit(dB)	Verdict
5	Low	QPSK	9.77	<=13	PASS
	Low	16QAM	9.68	<=13	PASS
	Low	64QAM	9.69	<=13	PASS
	Mid	QPSK	9.77	<=13	PASS
	Mid	16QAM	9.63	<=13	PASS
	Mid	64QAM	8.52	<=13	PASS
	High	QPSK	9.05	<=13	PASS
	High	16QAM	9.56	<=13	PASS
	High	64QAM	9.62	<=13	PASS
10	Low	QPSK	9.08	<=13	PASS
	Low	16QAM	9.22	<=13	PASS
	Low	64QAM	8.64	<=13	PASS
	Mid	QPSK	9.37	<=13	PASS
	Mid	16QAM	10.03	<=13	PASS
	Mid	64QAM	9.49	<=13	PASS
	High	QPSK	9.55	<=13	PASS
	High	16QAM	9.07	<=13	PASS
	High	64QAM	8.90	<=13	PASS
15	Low	QPSK	9.73	<=13	PASS
	Low	16QAM	8.80	<=13	PASS
	Low	64QAM	9.01	<=13	PASS
	Mid	QPSK	10.34	<=13	PASS
	Mid	16QAM	8.80	<=13	PASS
	Mid	64QAM	9.07	<=13	PASS
	High	QPSK	8.46	<=13	PASS
	High	16QAM	8.22	<=13	PASS
	High	64QAM	8.22	<=13	PASS
20	Low	QPSK	9.29	<=13	PASS
	Low	16QAM	8.96	<=13	PASS
	Low	64QAM	10.12	<=13	PASS
	Mid	QPSK	8.60	<=13	PASS
	Mid	16QAM	9.83	<=13	PASS
	Mid	64QAM	9.35	<=13	PASS
	High	QPSK	9.15	<=13	PASS
	High	16QAM	9.22	<=13	PASS
	High	64QAM	9.20	<=13	PASS



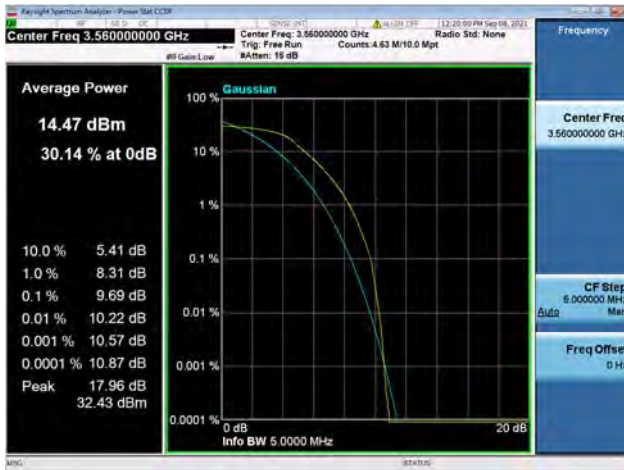
Band48 / 5MHz / Low CH / QPSK



Band48 / 5MHz / Low CH / 16QAM



Band48 / 5MHz / Low CH / 64QAM



Band48 / 5MHz / Mid CH / QPSK

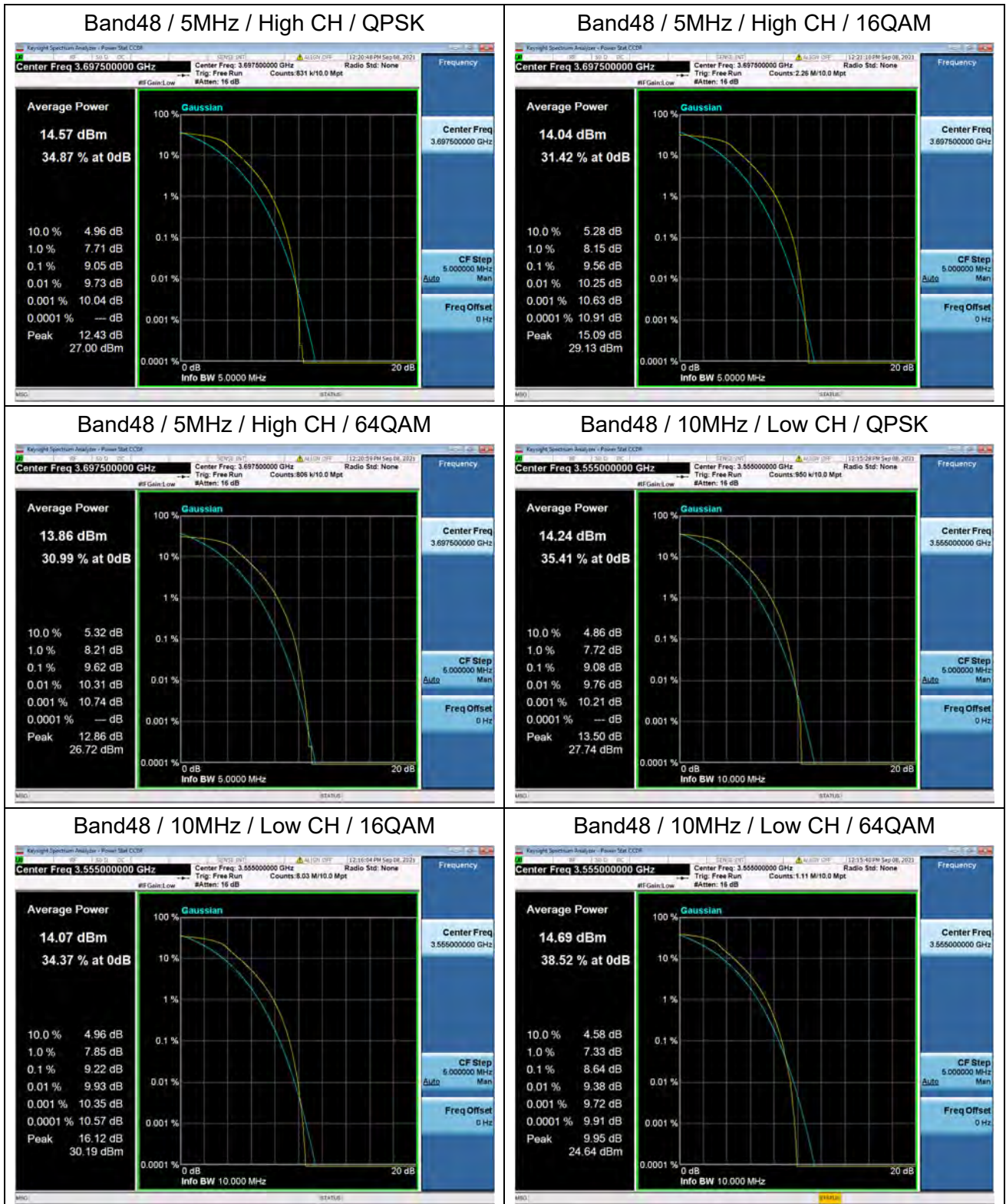


Band48 / 5MHz / Mid CH / 16QAM



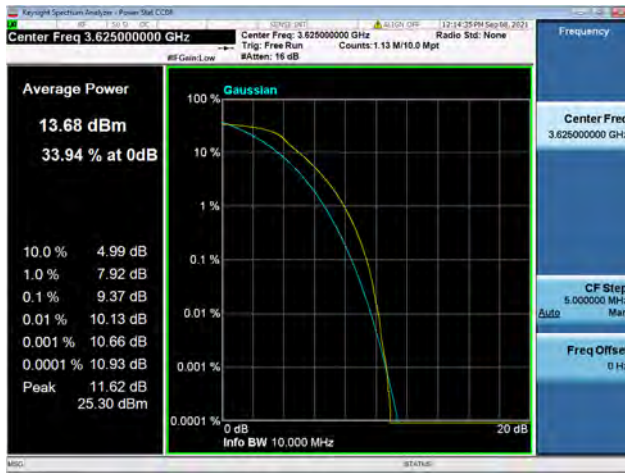
Band48 / 5MHz / Mid CH / 64QAM



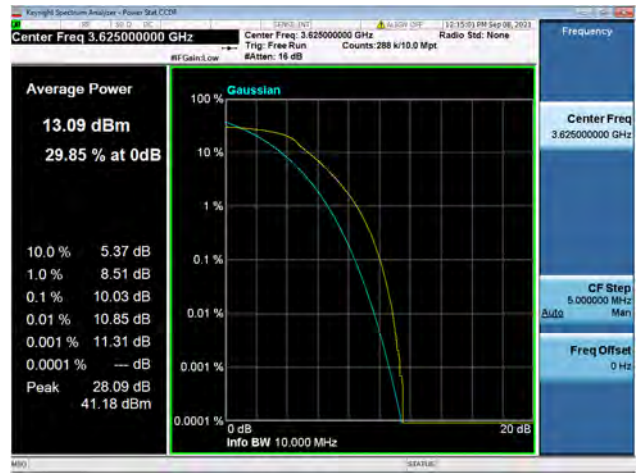




Band48 / 10MHz / Mid CH / QPSK



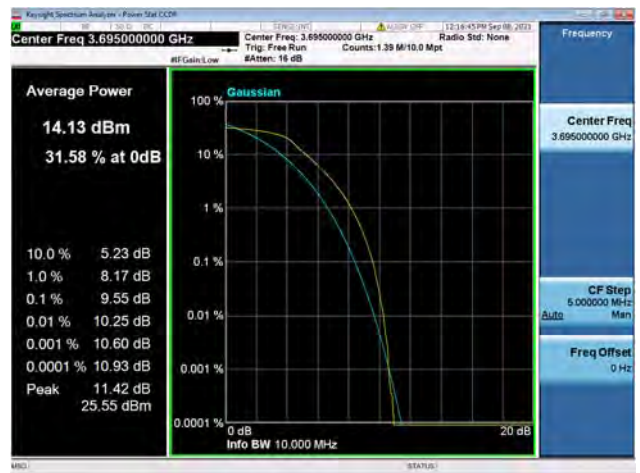
Band48 / 10MHz / Mid CH / 16QAM



Band48 / 10MHz / Mid CH / 64QAM



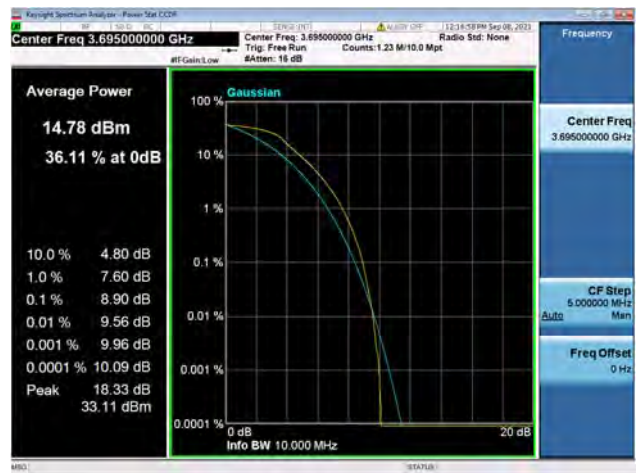
Band48 / 10MHz / High CH / QPSK



Band48 / 10MHz / High CH / 16QAM



Band48 / 10MHz / High CH / 64QAM

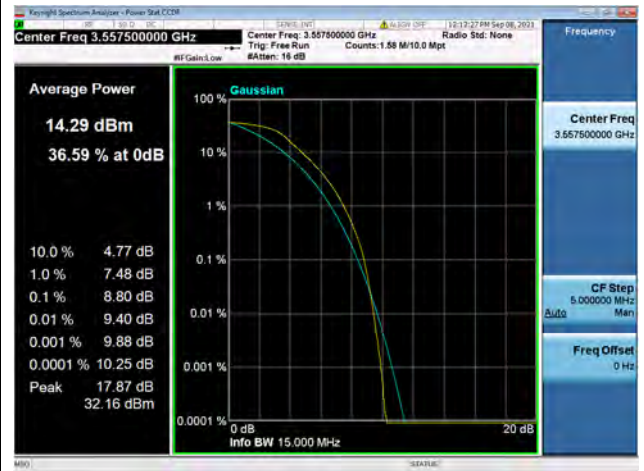




Band48 / 15MHz / Low CH / QPSK



Band48 / 15MHz / Low CH / 16QAM



Band48 / 15MHz / Low CH / 64QAM



Band48 / 15MHz / Mid CH / QPSK



Band48 / 15MHz / Mid CH / 16QAM



Band48 / 15MHz / Mid CH / 64QAM

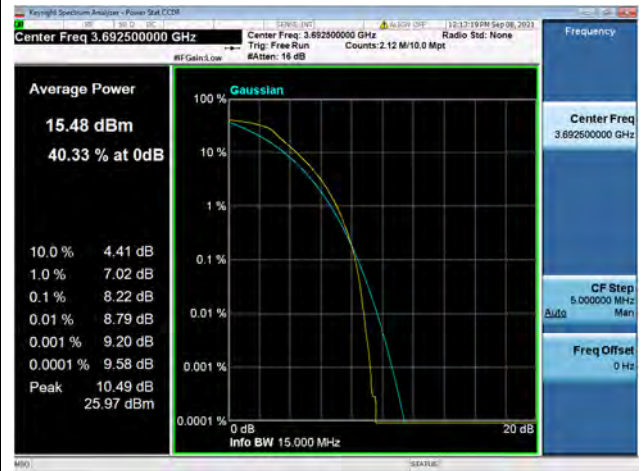




Band48 / 15MHz / High CH / QPSK



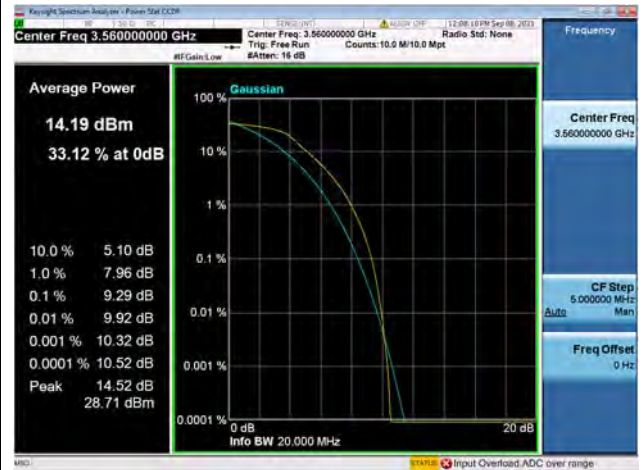
Band48 / 15MHz / High CH / 16QAM



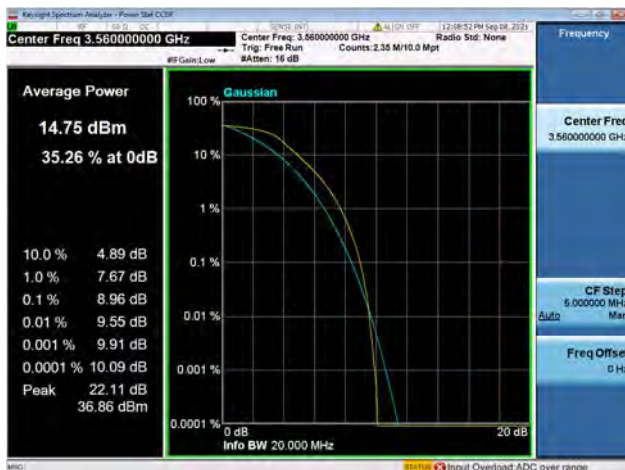
Band48 / 15MHz / High CH / 64QAM



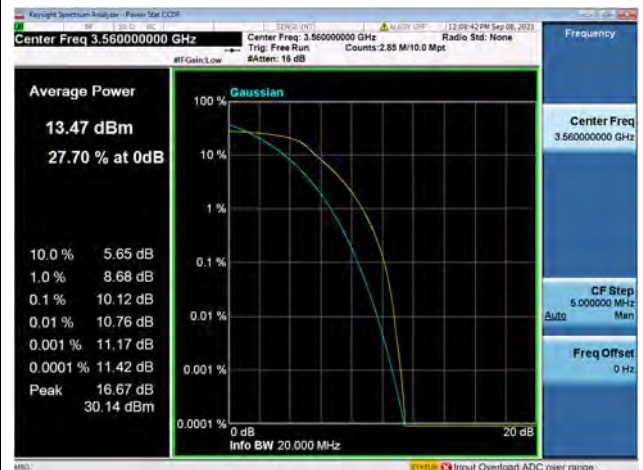
Band48 / 20MHz / Low CH / QPSK



Band48 / 20MHz / Low CH / 16QAM

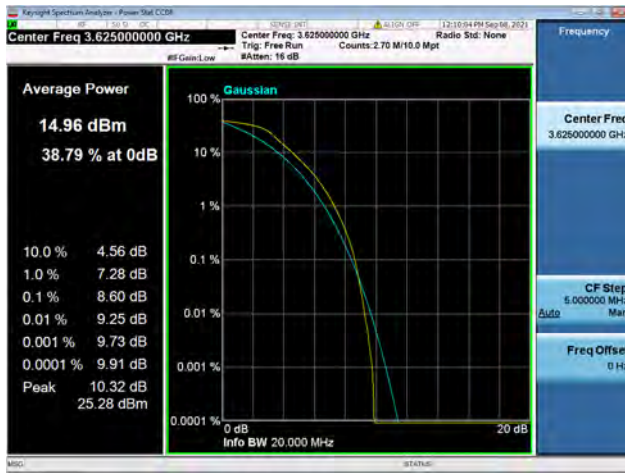


Band48 / 20MHz / Low CH / 64QAM

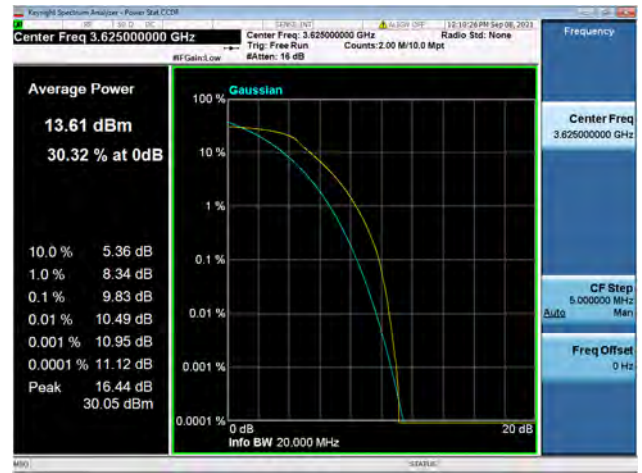




Band48 / 20MHz / Mid CH / QPSK



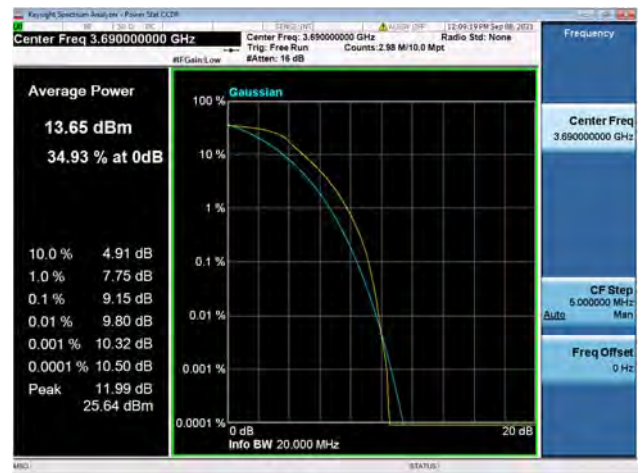
Band48 / 20MHz / Mid CH / 16QAM



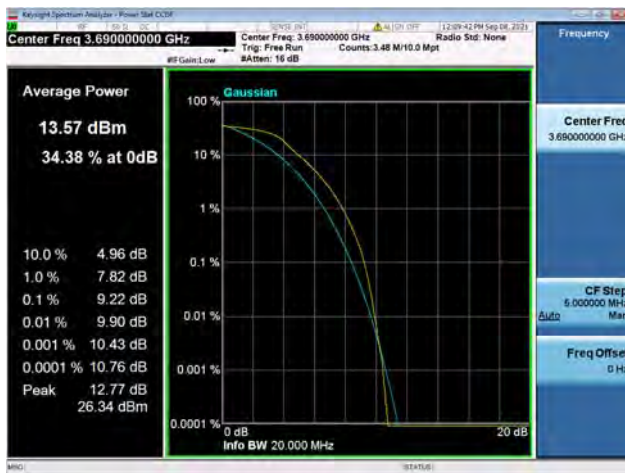
Band48 / 20MHz / Mid CH / 64QAM



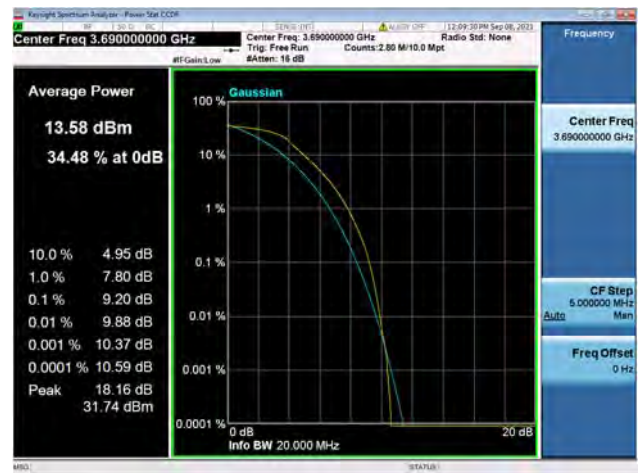
Band48 / 20MHz / High CH / QPSK



Band48 / 20MHz / High CH / 16QAM



Band48 / 20MHz / High CH / 64QAM

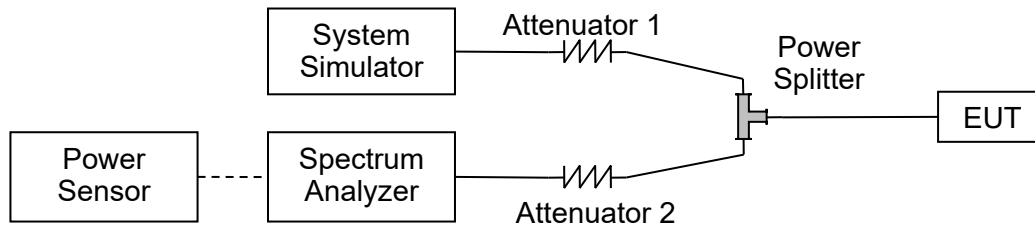


2.5. Conducted Spurious Emissions

2.5.1. Requirement

According to FCC section 96.41(e), the conducted power of emissions below 3530 MHz or above 3720 MHz shall not exceed -40dBm/MHz .

2.5.2. Test Description



The EUT is coupled to the Spectrum Analyzer (SA) and the System Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ω ; the path loss as the factor is calibrated to correct the reading. The EUT is commanded by the SS to operate at the maximum output power. A call is established between the EUT and the SS.

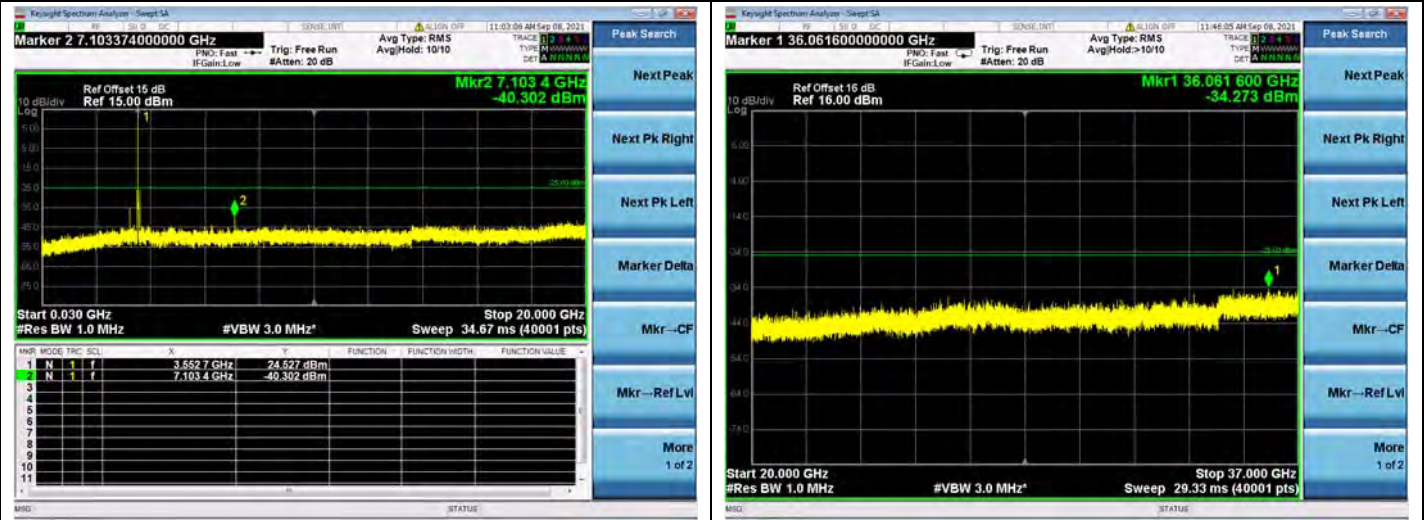
2.5.1. Test procedure

KDB 971168 D01v03 Section 6.0 and ANSI/TIA-603-E-2016.

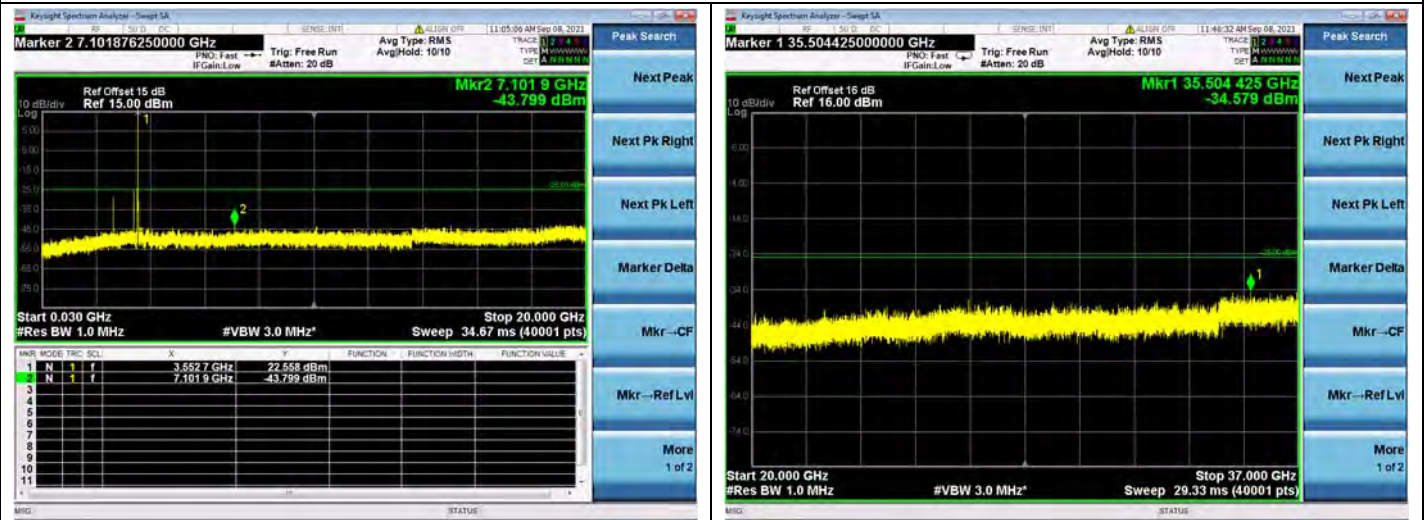
2.5.2. Test Result



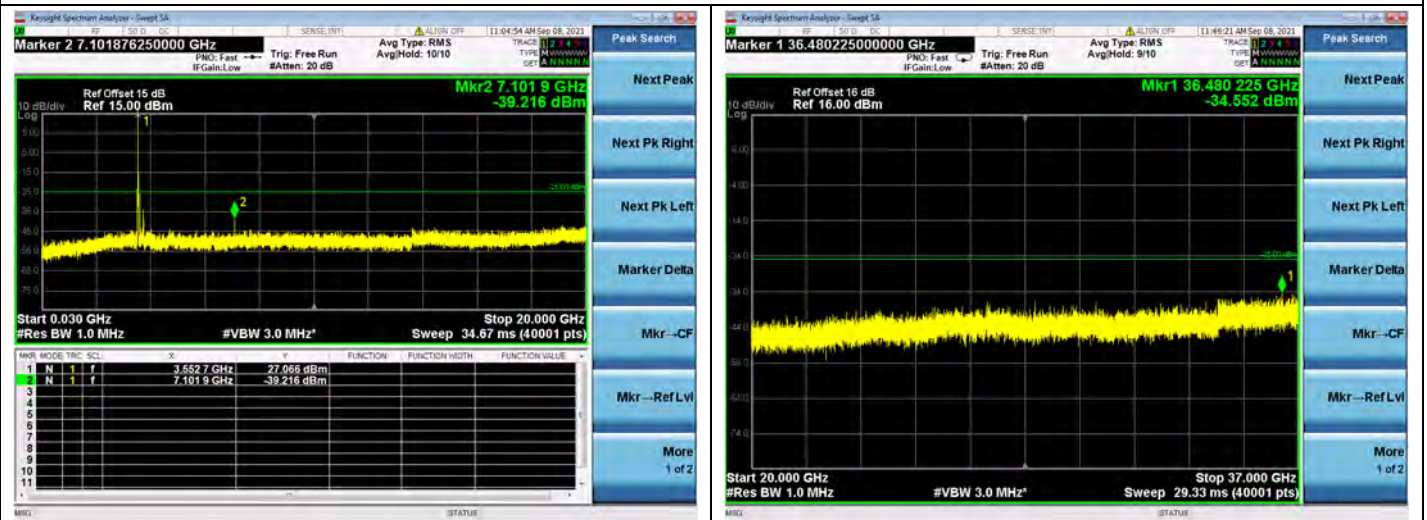
Band 48 / 5MHz / Low CH / QPSK



Band 48 / 5MHz / Low CH / 16QAM

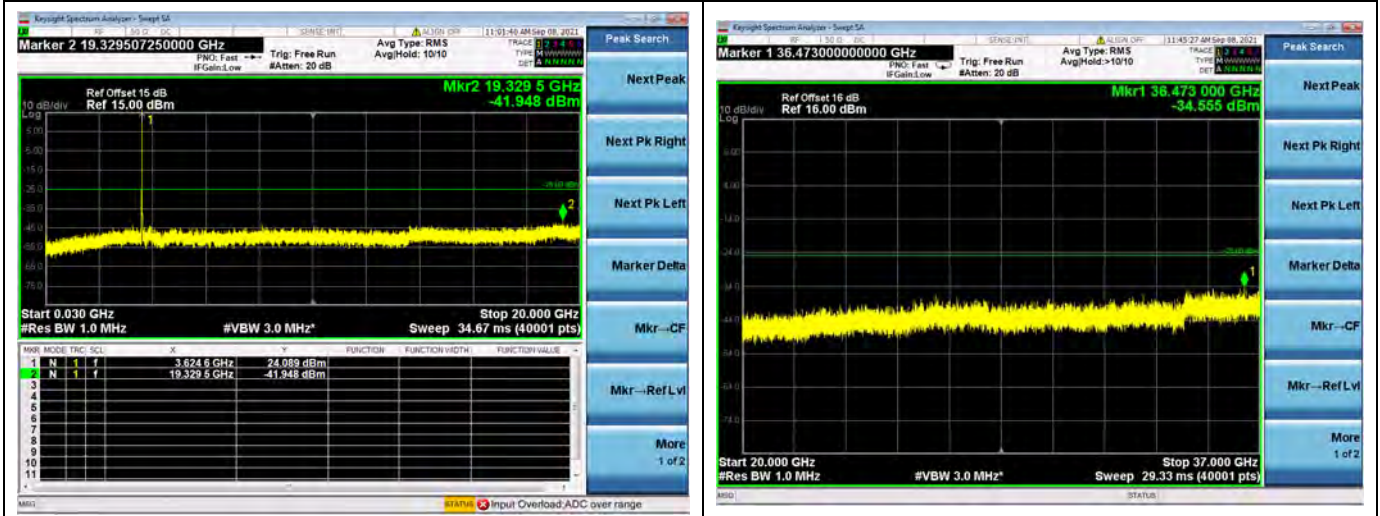


Band 48 / 5MHz / Low CH / 64QAM





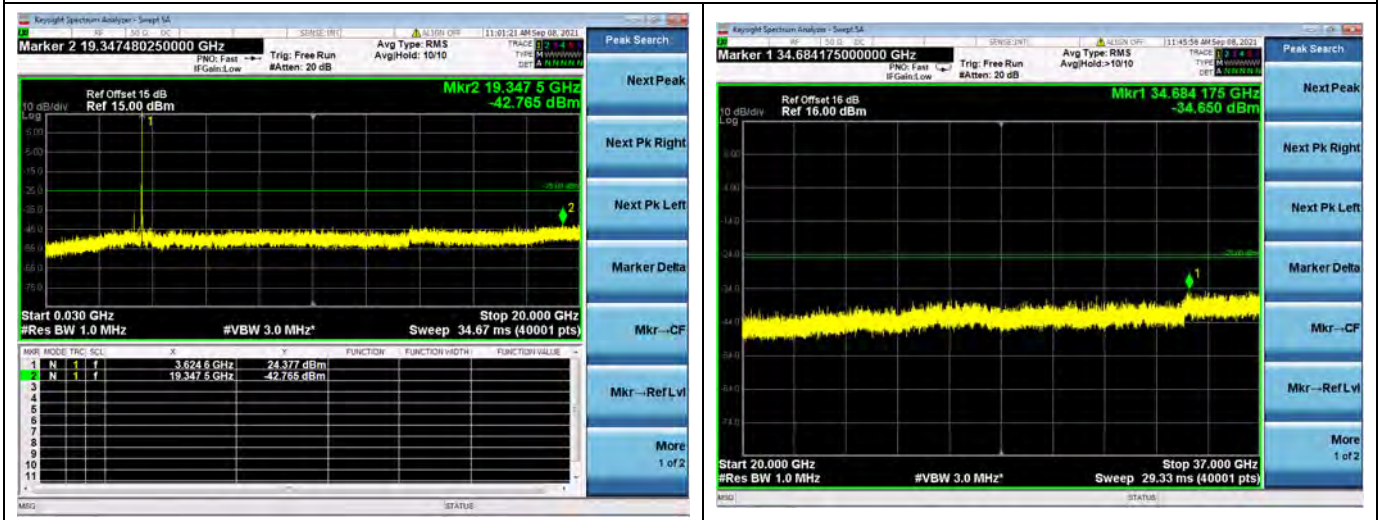
Band 48 / 5MHz / Mid CH / QPSK



Band 48 / 5MHz / Mid CH / 16QAM

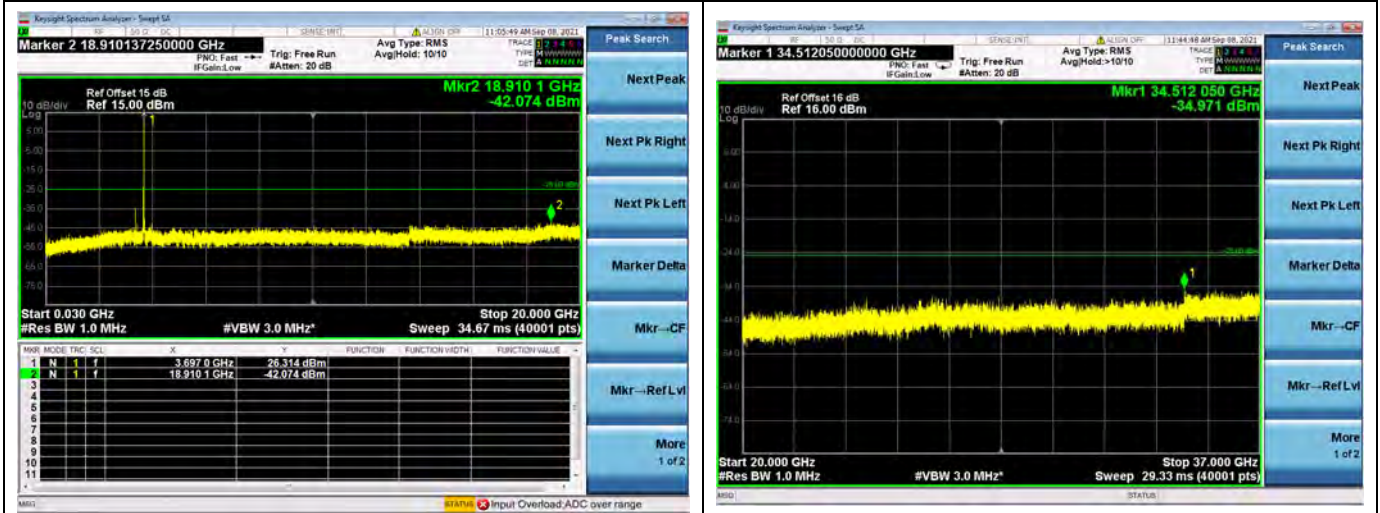


Band 48 / 5MHz / Mid CH / 64QAM

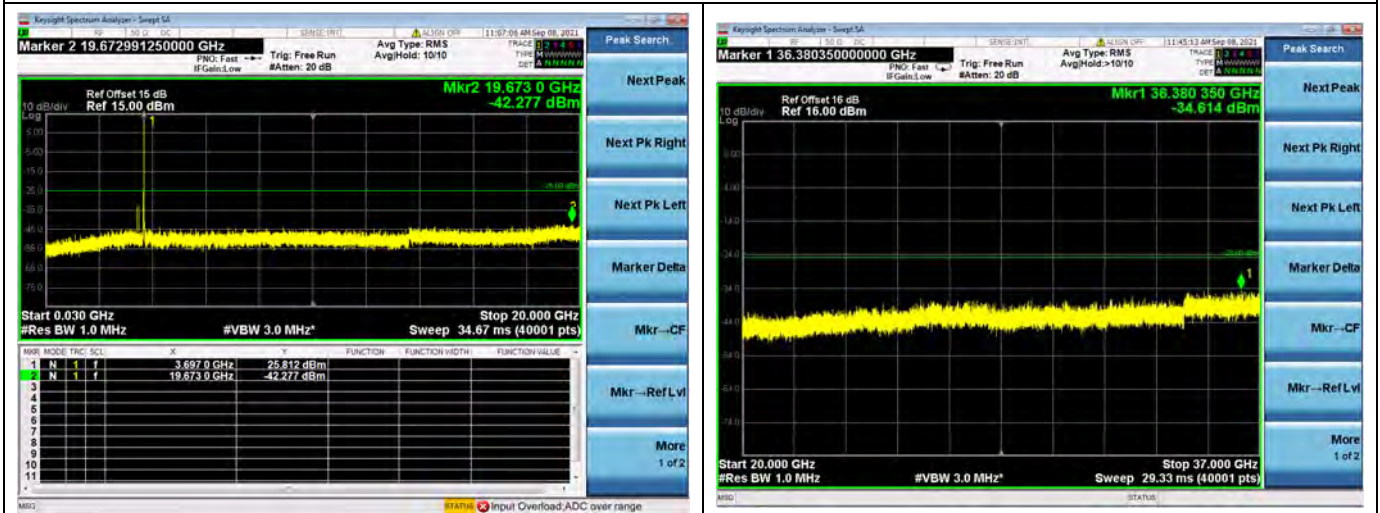




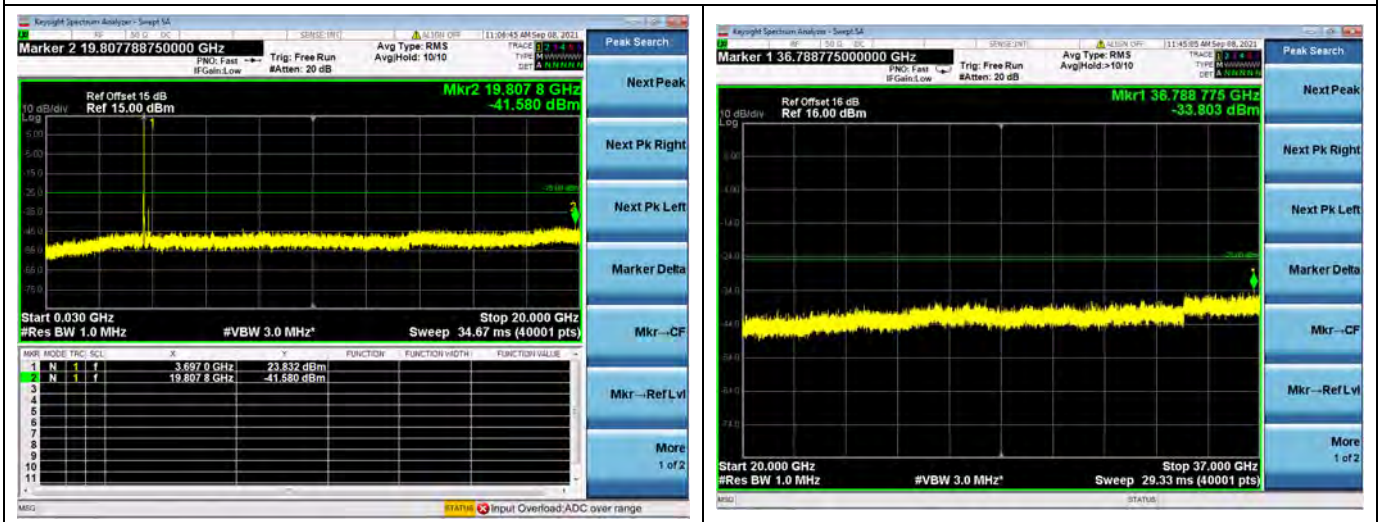
Band 48 / 5MHz / High CH / QPSK



Band 48 / 5MHz / High CH / 16QAM

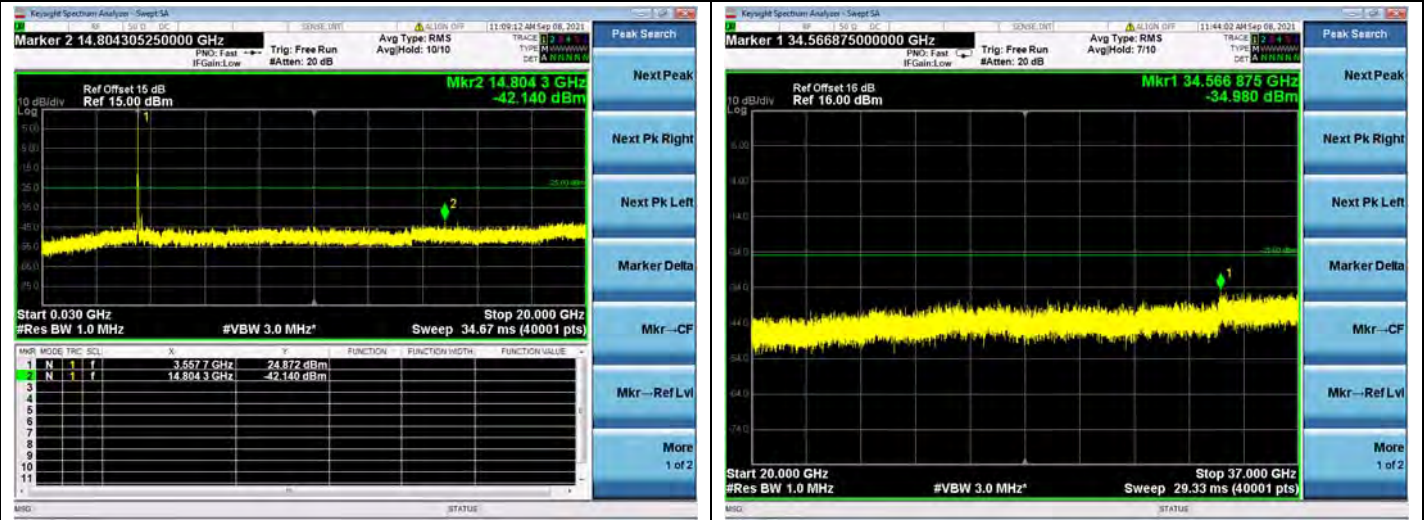


Band 48 / 5MHz / High CH / 64QAM

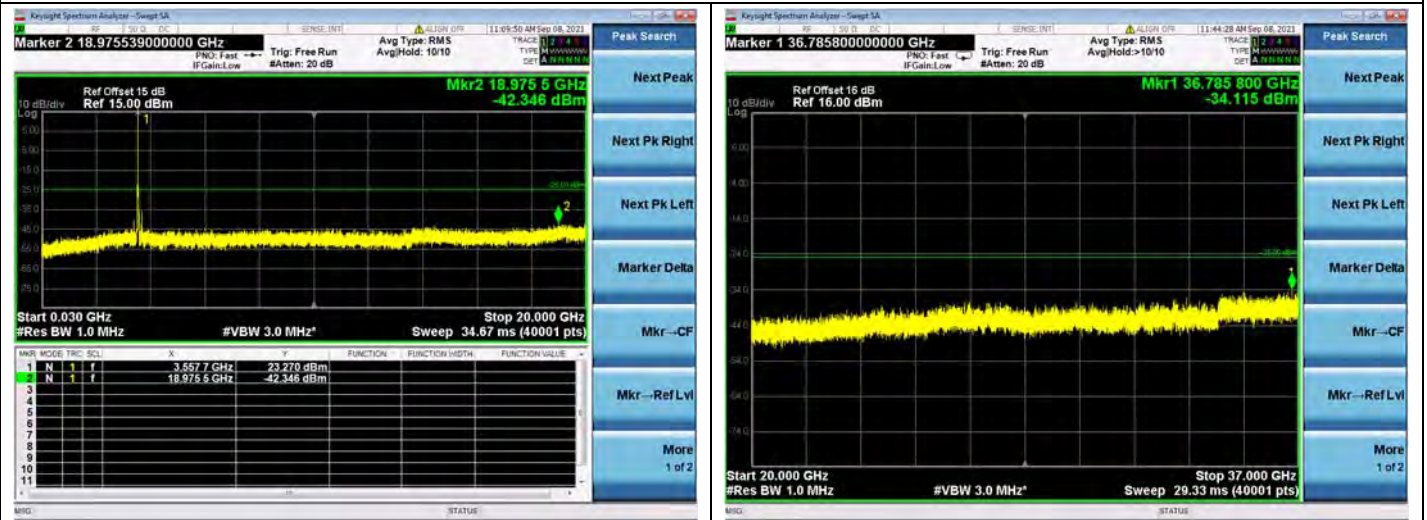




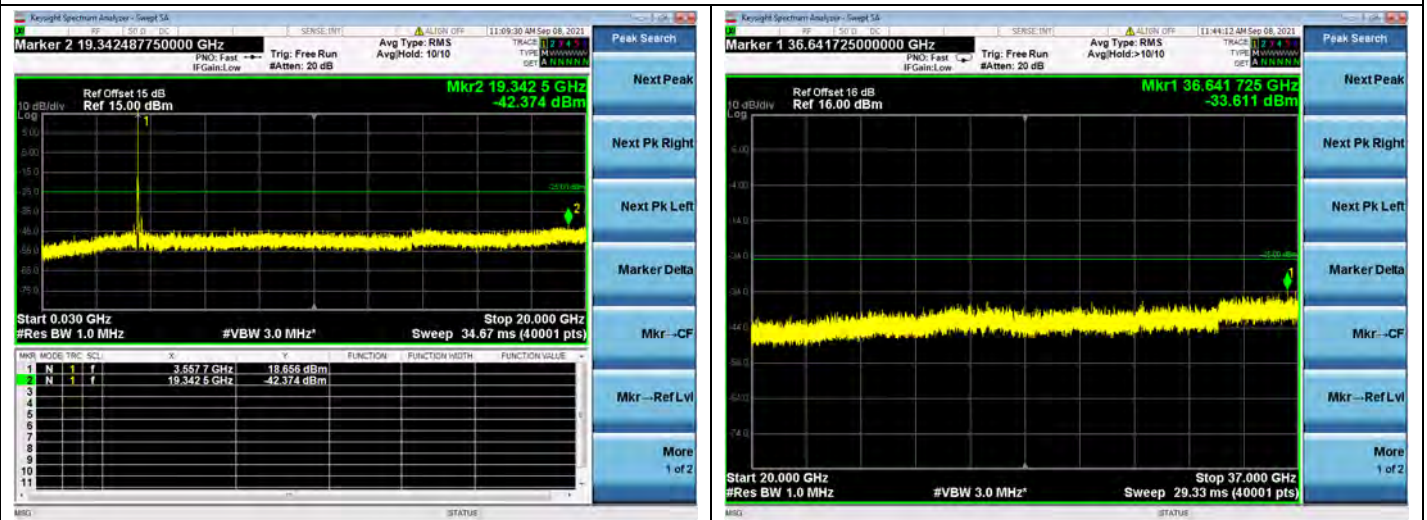
Band 48 / 10MHz / Low CH / QPSK



Band 48 / 10MHz / Low CH / 16QAM

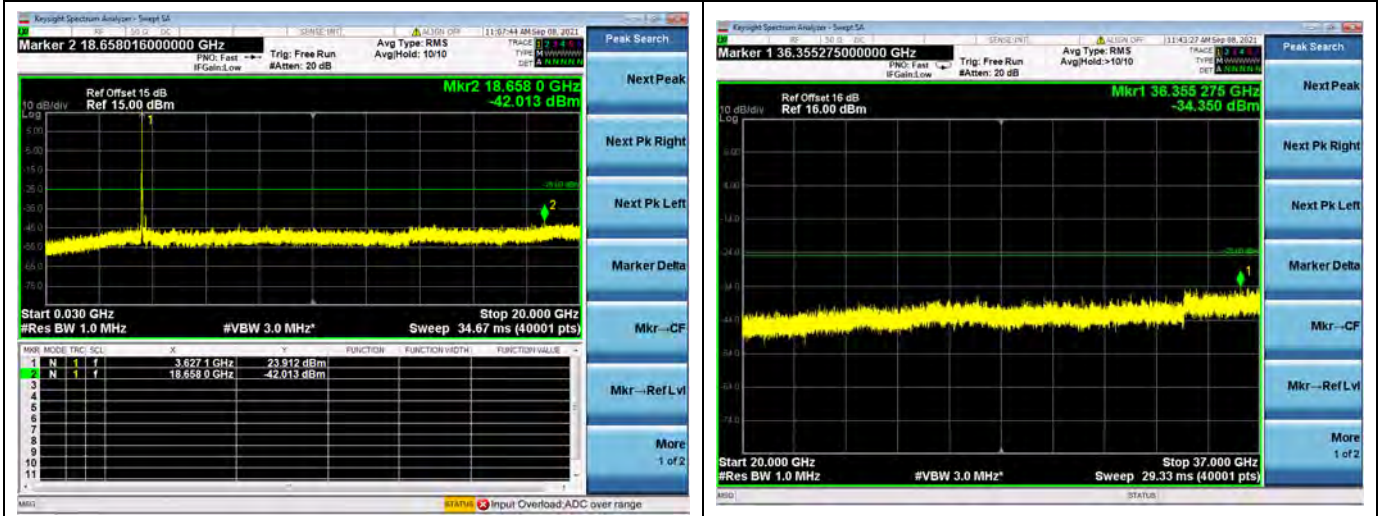


Band 48 / 10MHz / Low CH / 64QAM





Band 48 / 10MHz / Mid CH / QPSK



Band 48 / 10MHz / Mid CH / 16QAM

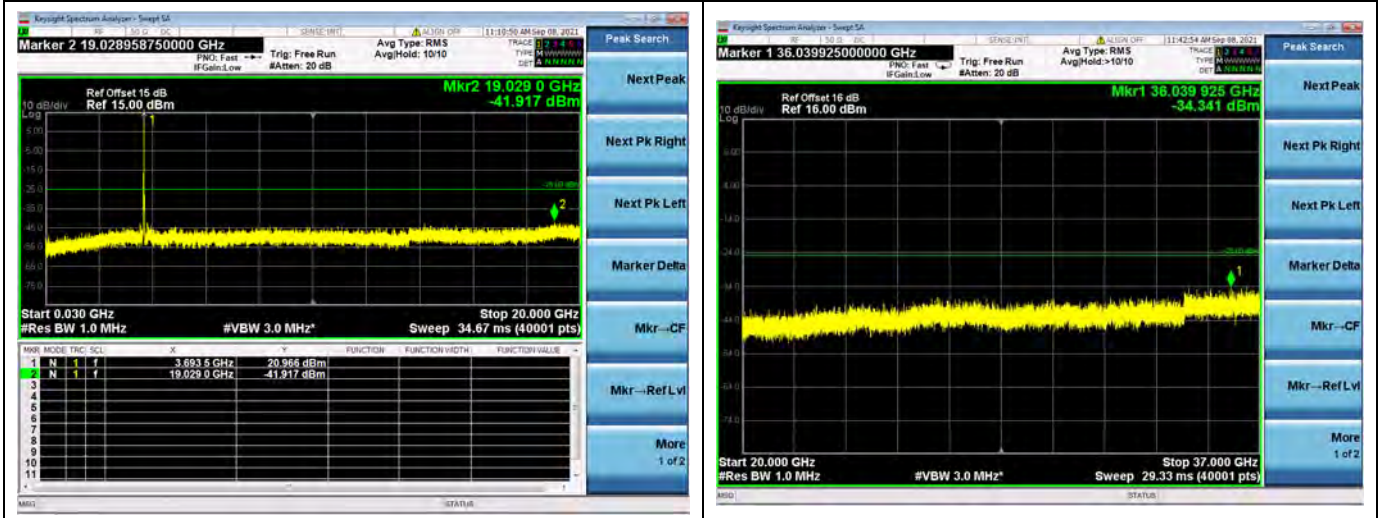


Band 48 / 10MHz / Mid CH / 64QAM

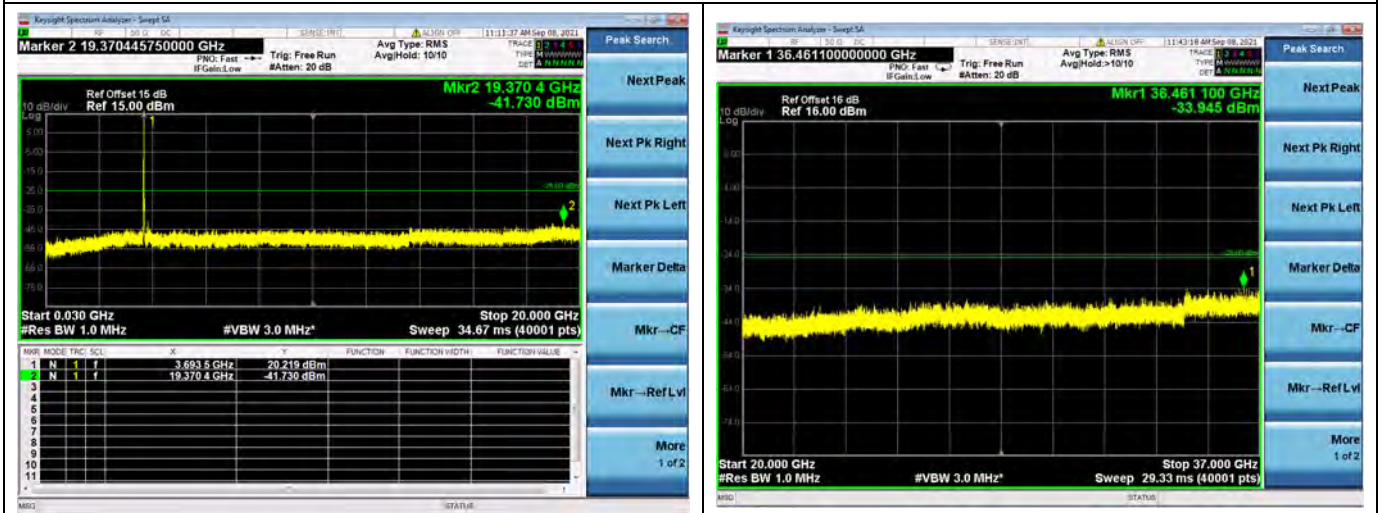




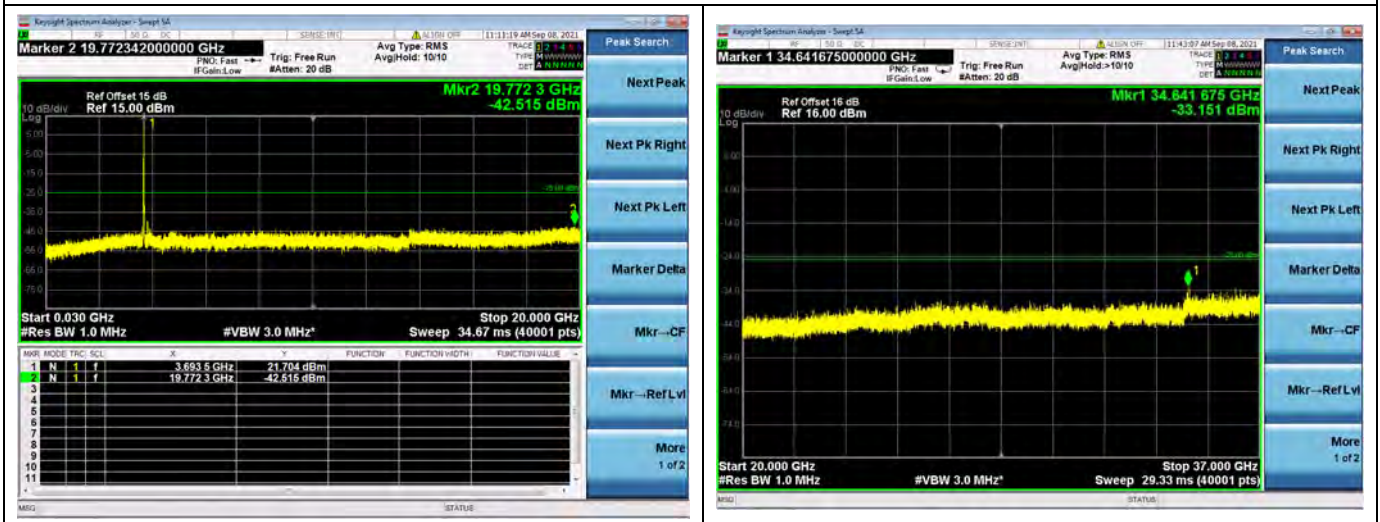
Band 48 / 10MHz / High CH / QPSK



Band 48 / 10MHz / High CH / 16QAM

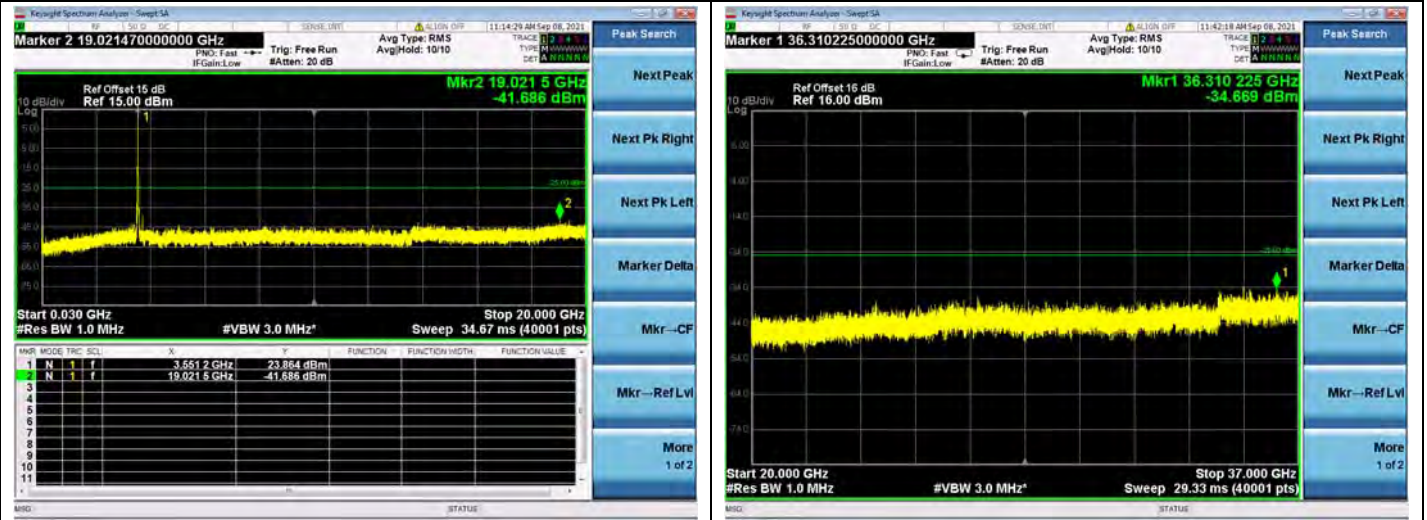


Band 48 / 10MHz / High CH / 64QAM

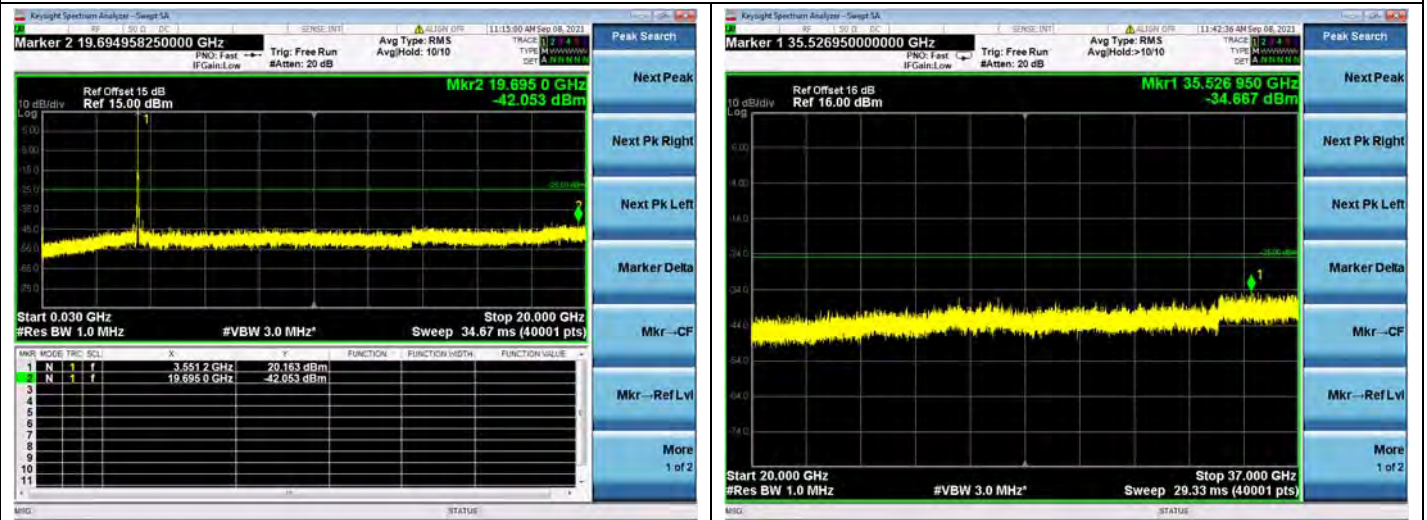




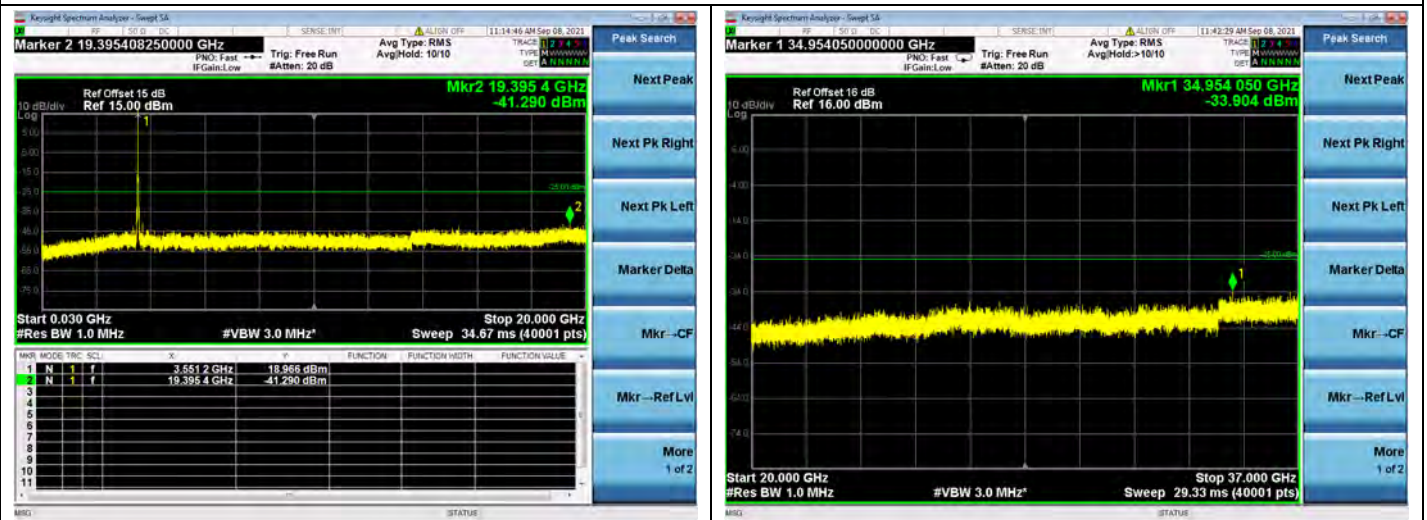
Band 48 / 15MHz / Low CH / QPSK



Band 48 / 15MHz / Low CH / 16QAM

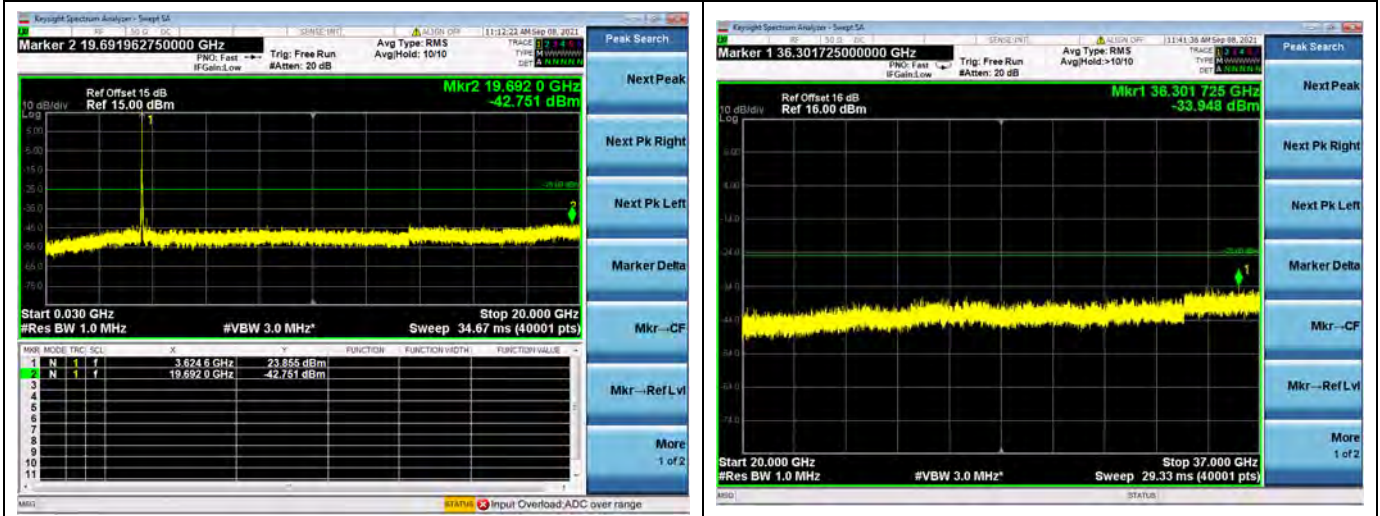


Band 48 / 15MHz / Low CH / 64QAM

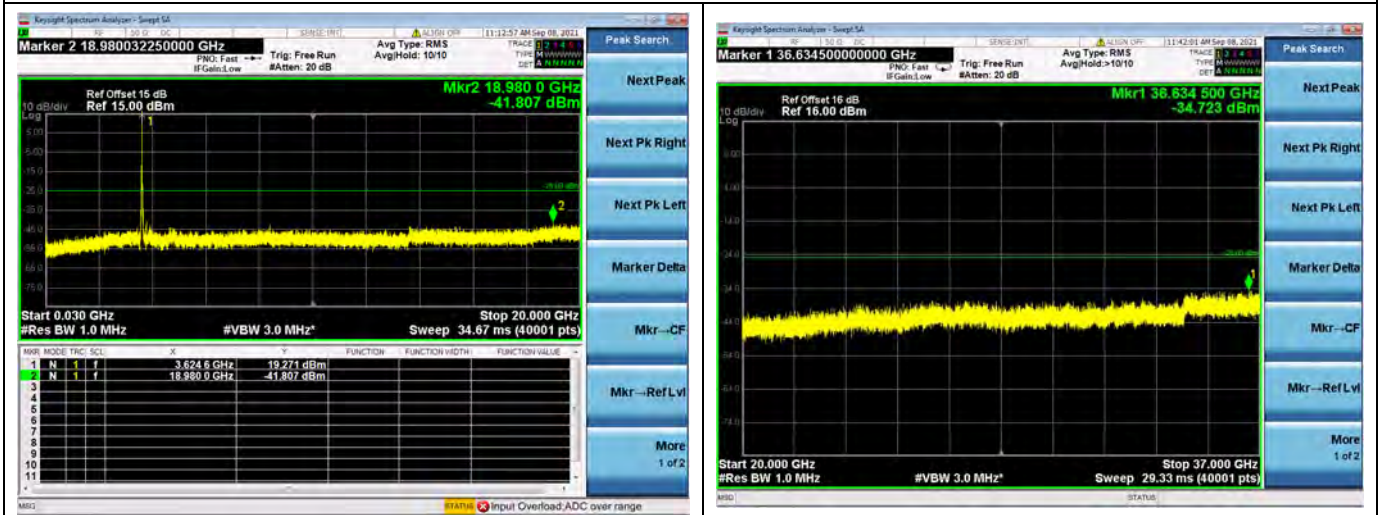




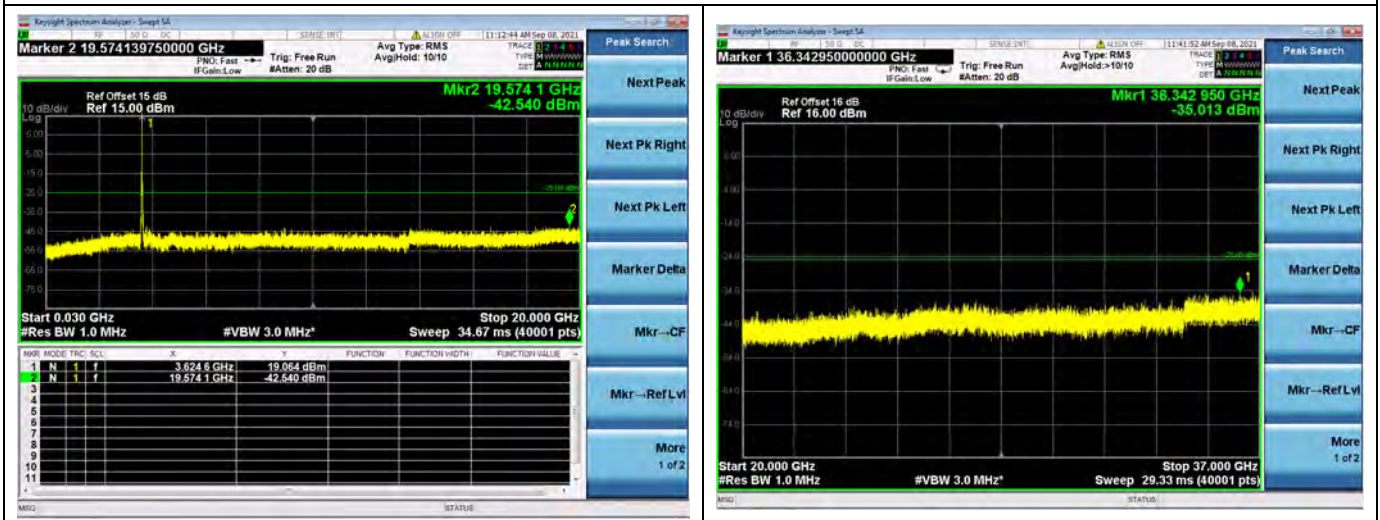
Band 48 / 15MHz / Mid CH / QPSK



Band 48 / 15MHz / Mid CH / 16QAM

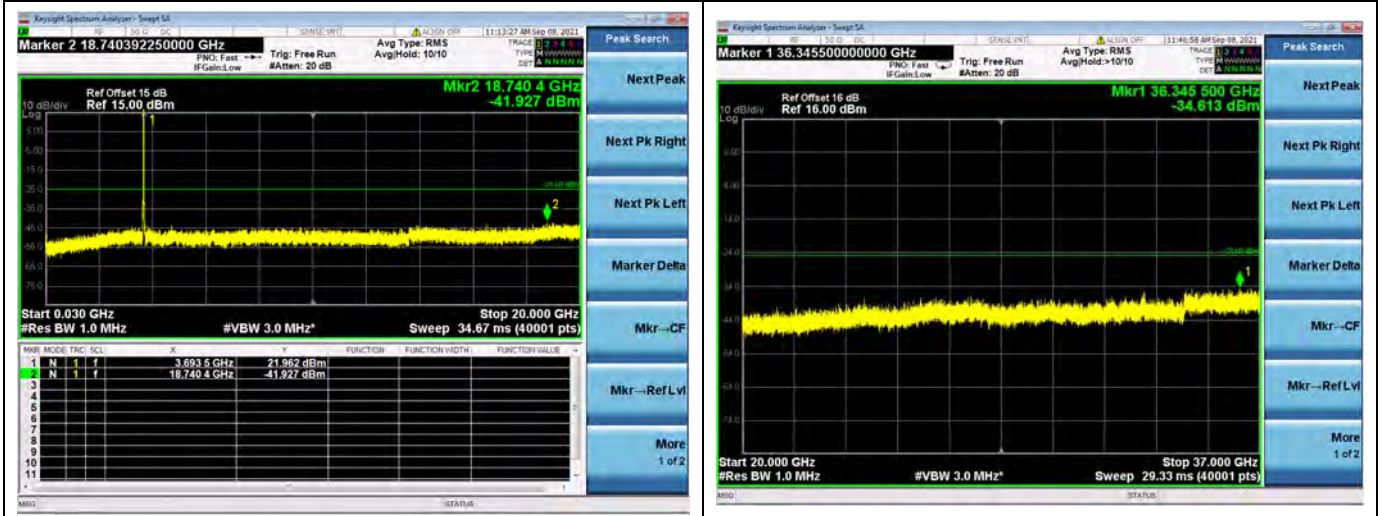


Band 48 / 15MHz / Mid CH / 64QAM

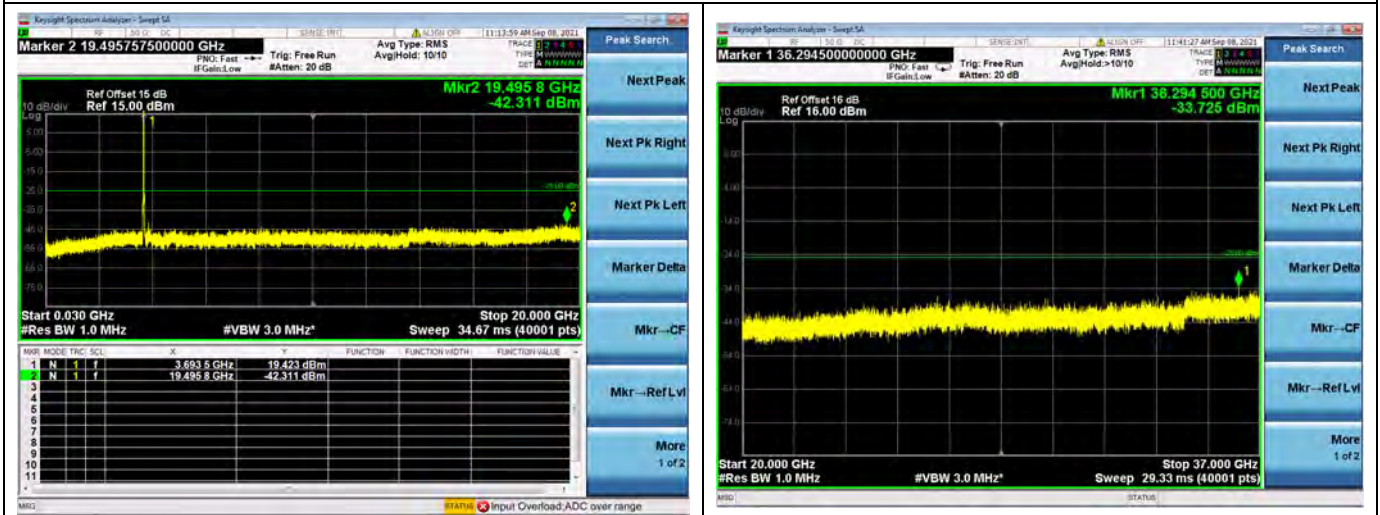




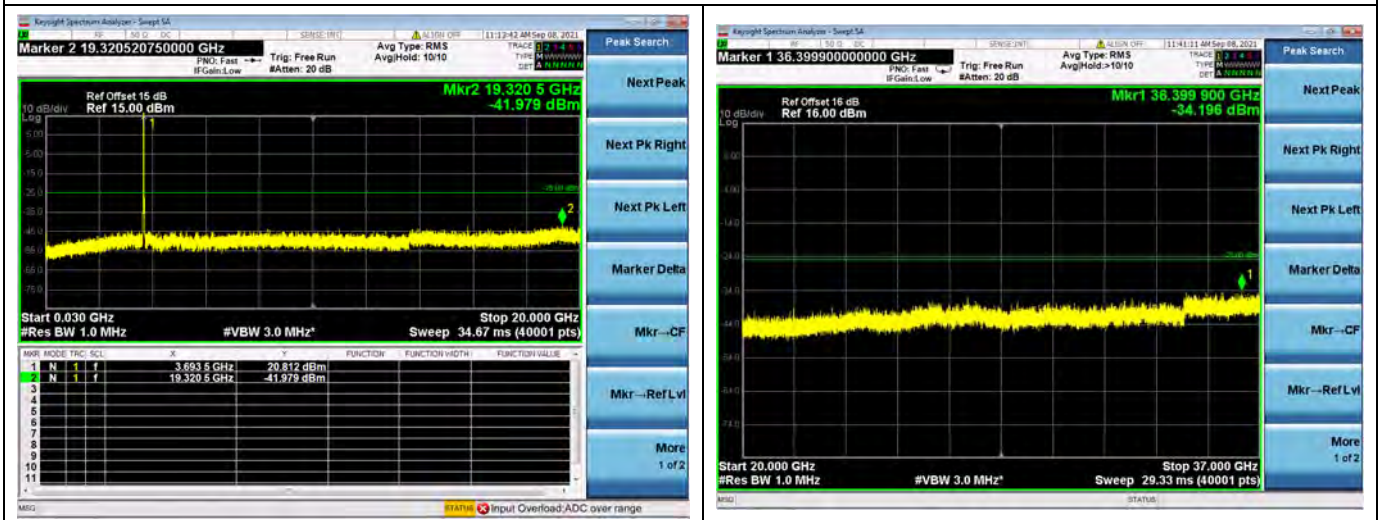
Band 48 / 15MHz / High CH / QPSK



Band 48 / 15MHz / High CH / 16QAM

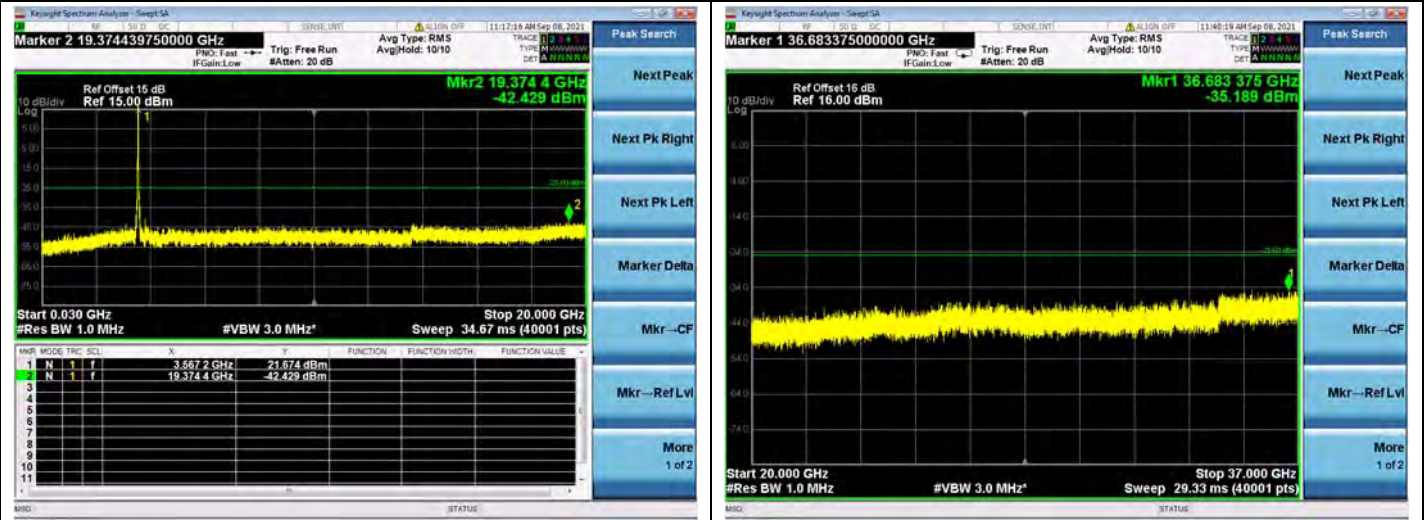


Band 48 / 15MHz / High CH / 64QAM

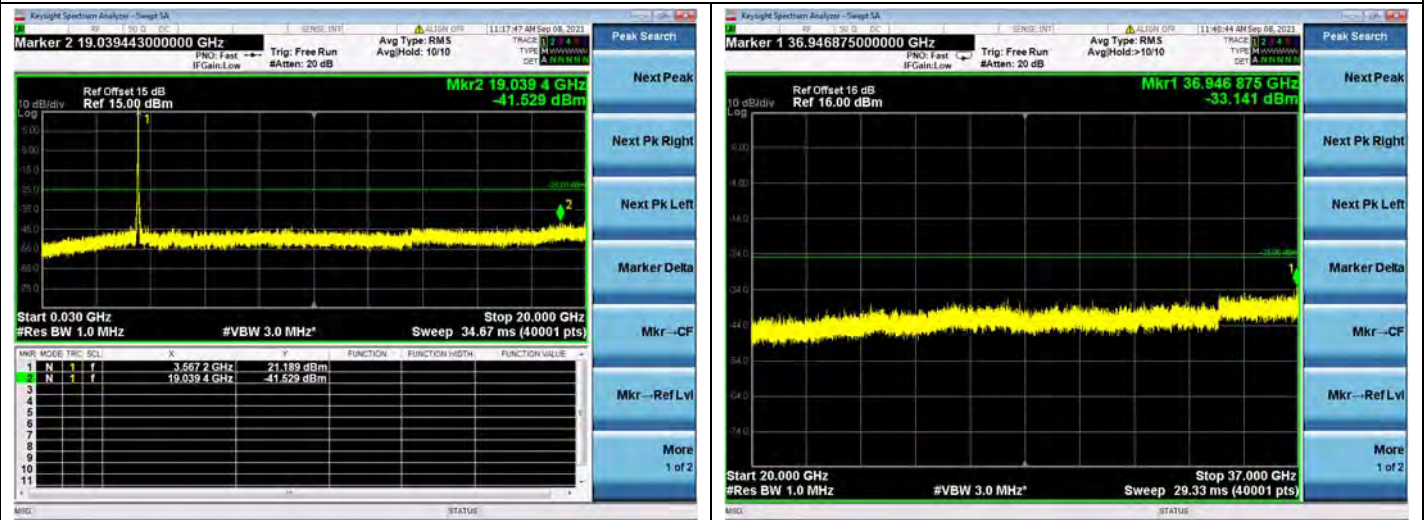




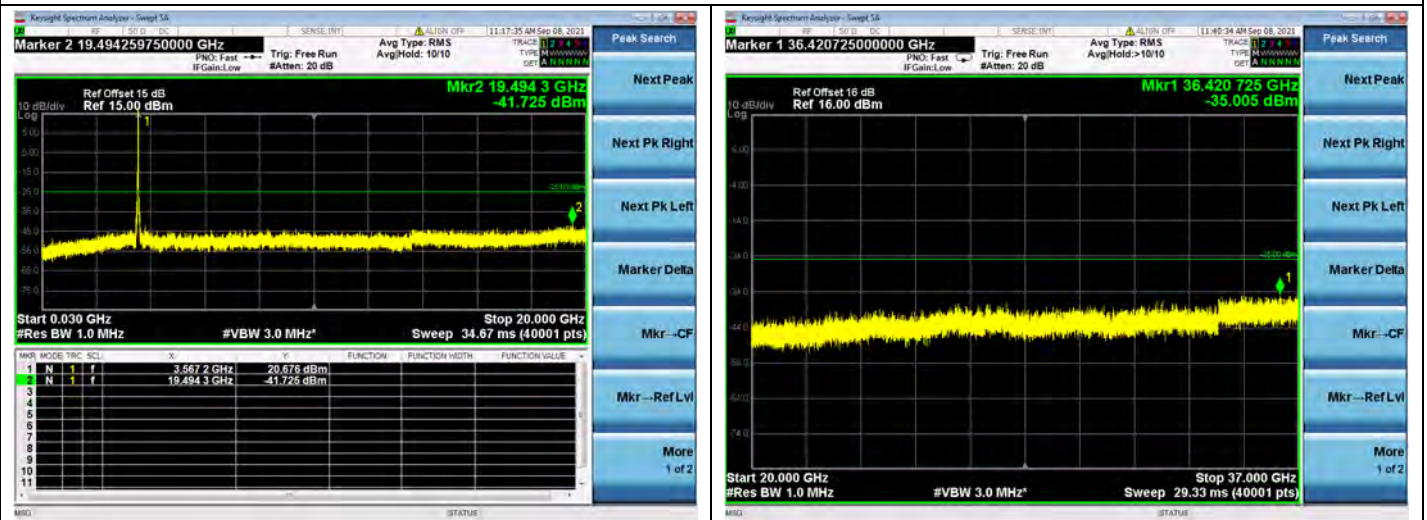
Band 48 / 20MHz / Low CH / QPSK



Band 48 / 20MHz / Low CH / 16QAM

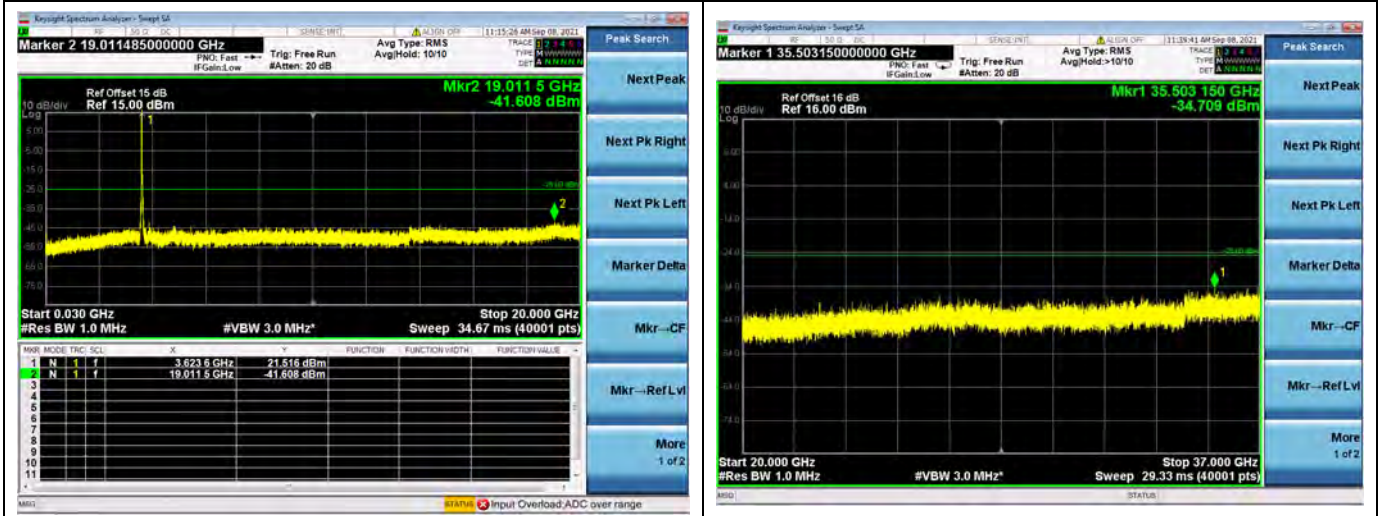


Band 48 / 20MHz / Low CH / 64QAM

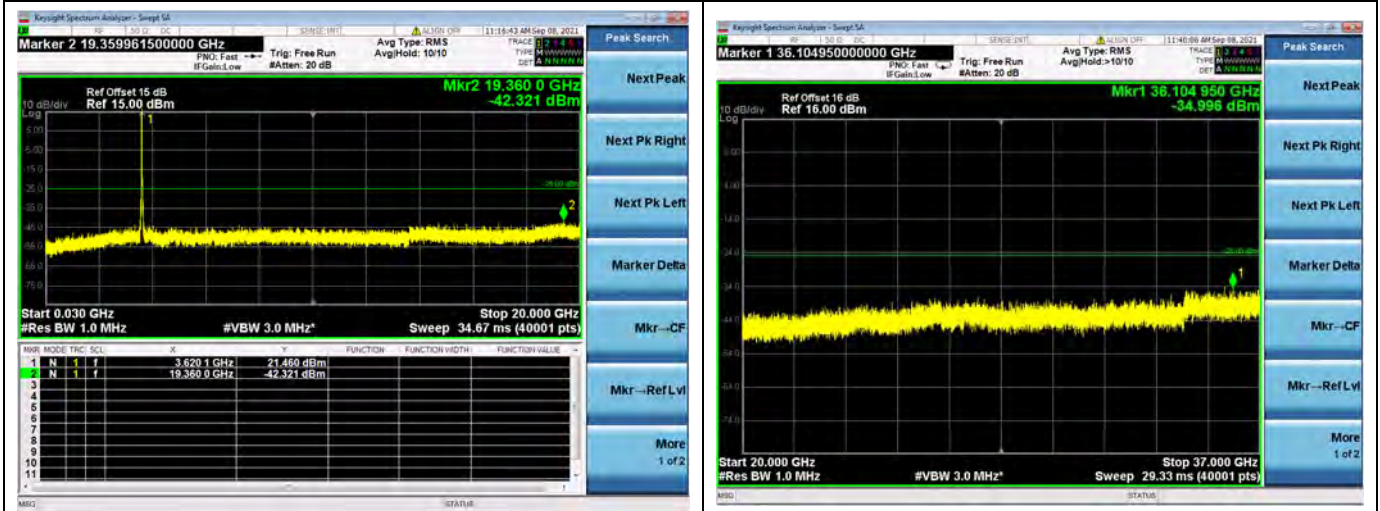




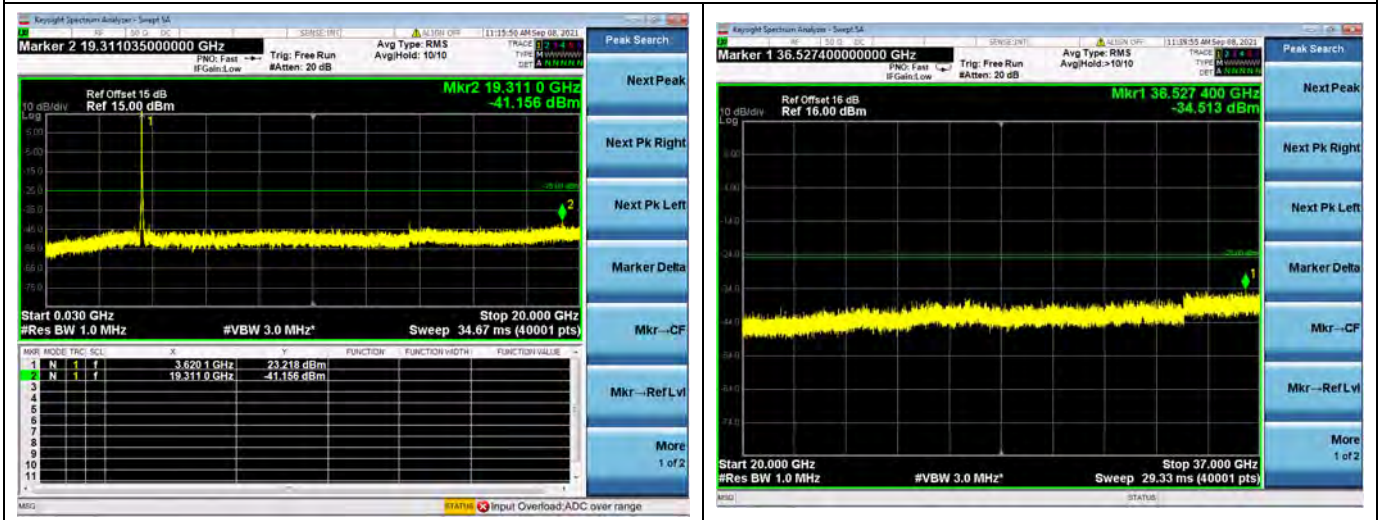
Band 48 / 20MHz / Mid CH / QPSK



Band 48 / 20MHz / Mid CH / 16QAM

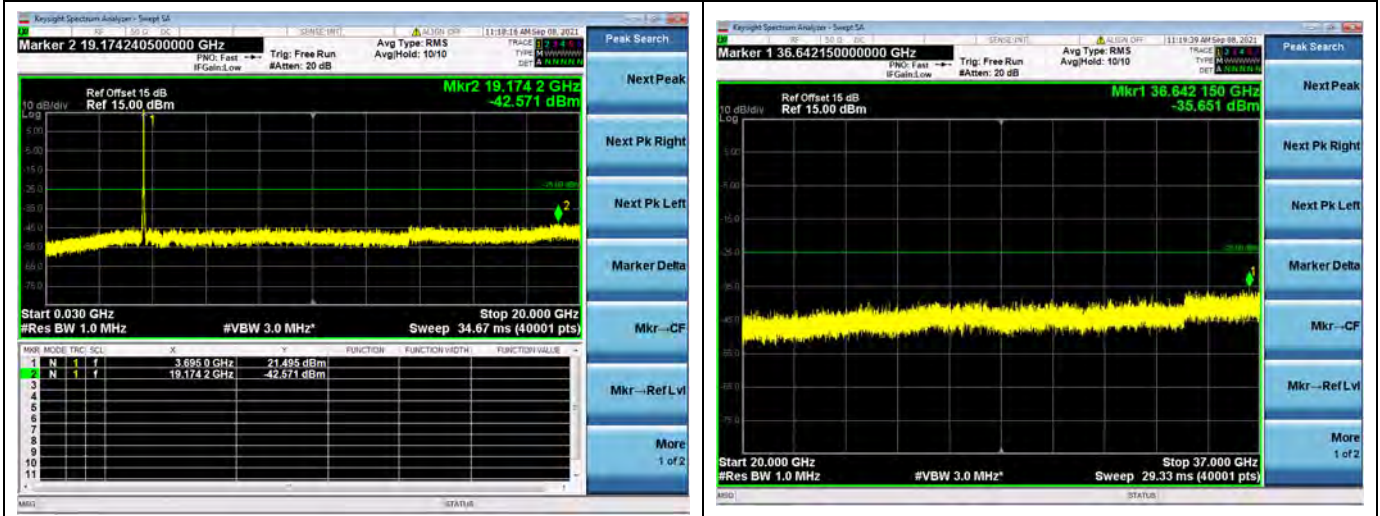


Band 48 / 20MHz / Mid CH / 64QAM

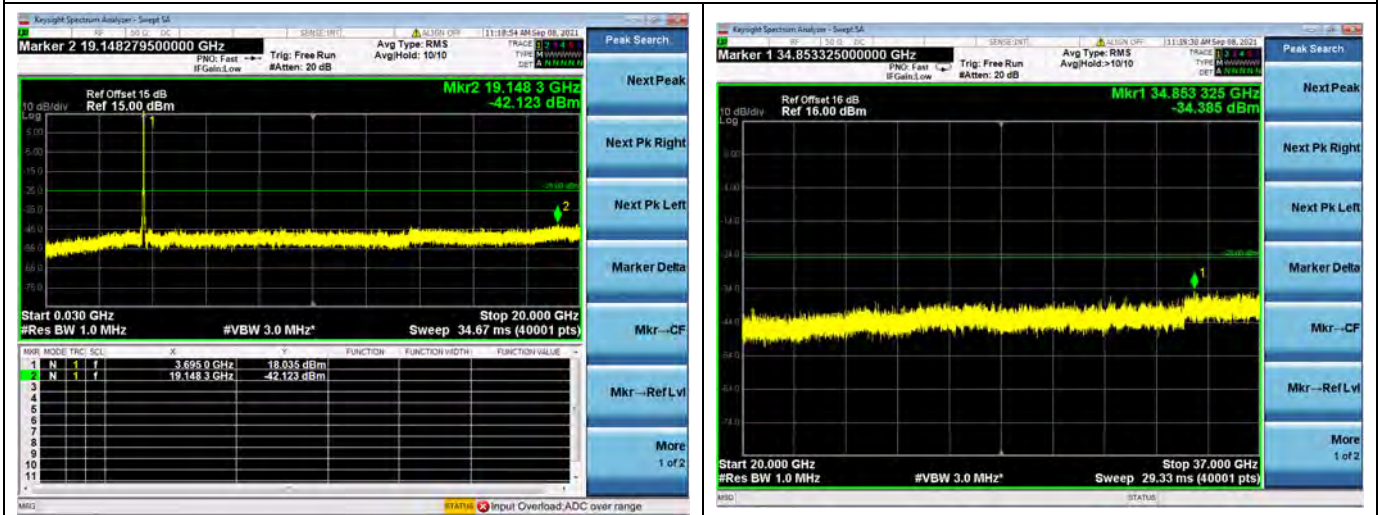




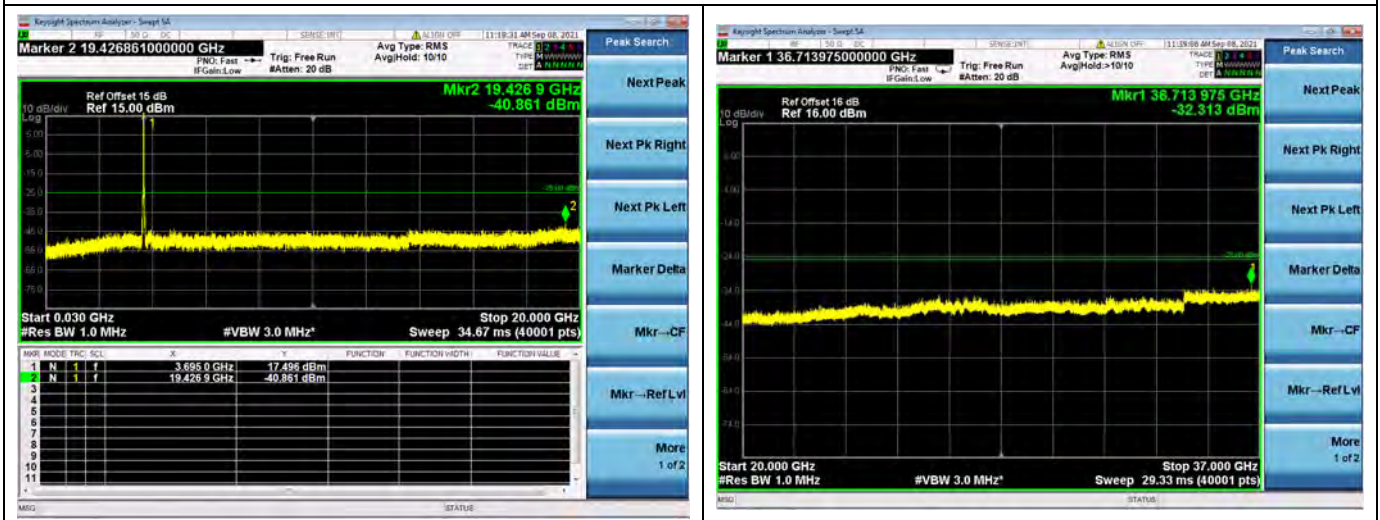
Band 48 / 20MHz / High CH / QPSK



Band 48 / 20MHz / High CH / 16QAM



Band 48 / 20MHz / High CH / 64QAM





2.6. Band Edge

2.6.1. Requirement

Part 96.41(e)(1)(i)

For channel and frequency assignments made by the SAS to CBSDs, the conducted power of any CBSD emission outside the fundamental emission bandwidth as specified in paragraph (e)(3) of this section (whether the emission is inside or outside of the authorized band) shall not exceed -13 dBm/MHz within 0-10 megahertz above the upper SAS-assigned channel edge and within 0-10 megahertz below the lower SAS-assigned channel edge. At all frequencies greater than 10 megahertz above the upper SAS assigned channel edge and less than 10 MHz below the lower SAS assigned channel edge, the conducted power of any CBSD emission shall not exceed -25 dBm/MHz.

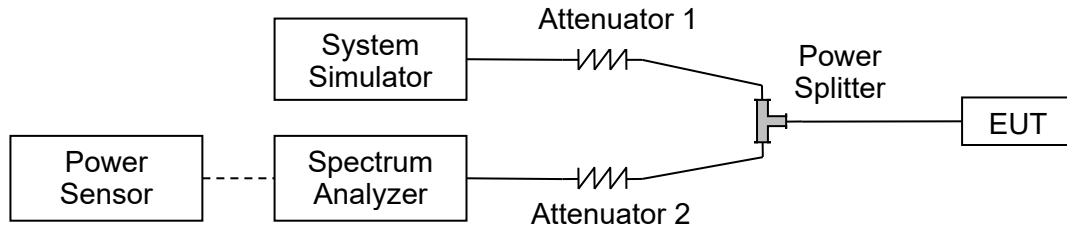
Part 96.41(e)(1)(ii)

For channel and frequency assignments made by a CBSD to End User Devices, the conducted power of any End User Device emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed -13 dBm/MHz within 0 to B megahertz (where B is the bandwidth in megahertz of the assigned channel or multiple contiguous channels of the End User Device) above the upper CBSD-assigned channel edge and within 0 to B megahertz below the lower CBSD-assigned channel edge. At all frequencies greater than B megahertz above the upper CBSD assigned channel edge and less than B megahertz below the lower CBSD-assigned channel edge, the conducted power of any End User Device emission shall not exceed -25 dBm/MHz.

Part 96.41(e)(2)

For CBSDs and End User Devices, the conducted power of emissions below 3540 MHz or above 3710 MHz shall not exceed -25 dBm/MHz, and the conducted power of emissions below 3530 MHz or above 3720 MHz shall not exceed -40 dBm/MHz.

2.6.2. Test Description



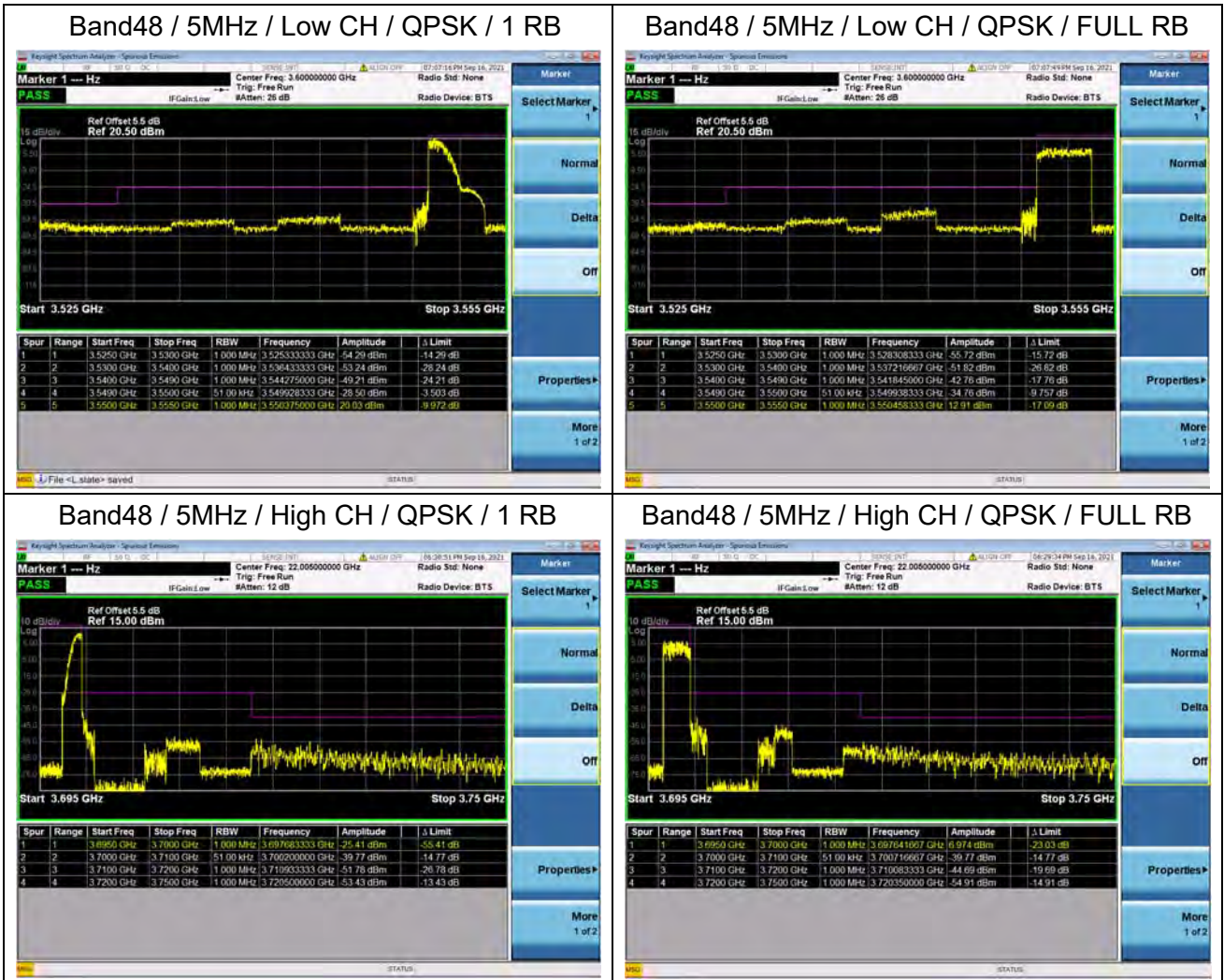
The EUT is coupled to the Spectrum Analyzer (SA) and the System Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. The EUT is commanded by the SS to operate at the maximum output power. A call is established between the EUT and the SS.

2.6.3. Test procedure

KDB 971168 D01v03 Section 6.0 and ANSI/TIA-603-E-2016.



2.6.4. Test Result





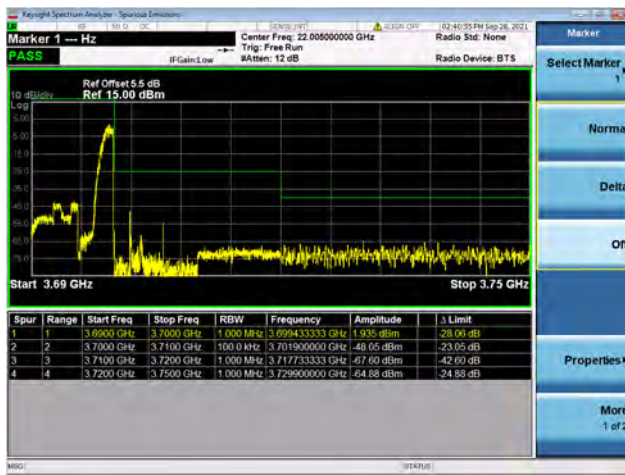
Band48 / 10MHz / Low CH / QPSK / 1 RB



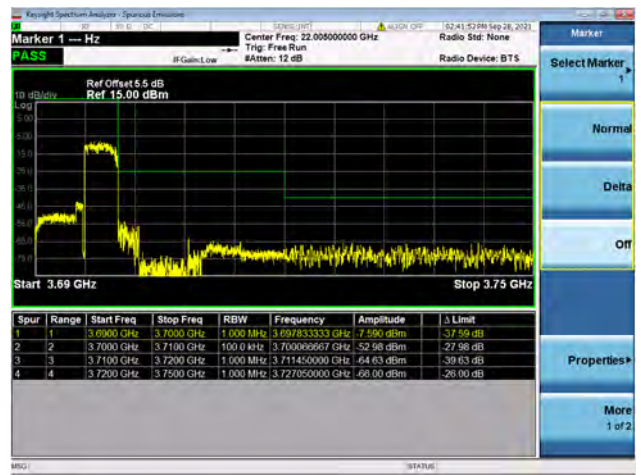
Band48 / 10MHz / Low CH / QPSK / FULL RB



Band48 / 10MHz / High CH / QPSK / 1 RB



Band48 / 10MHz / High CH / QPSK / FULL RB

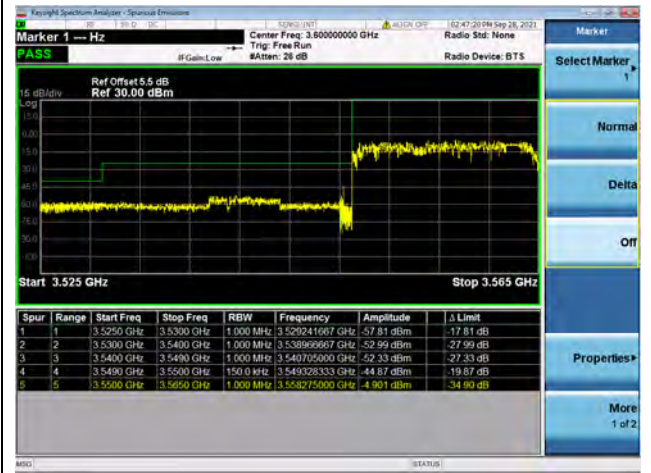




Band48 / 15MHz / Low CH / QPSK / 1 RB



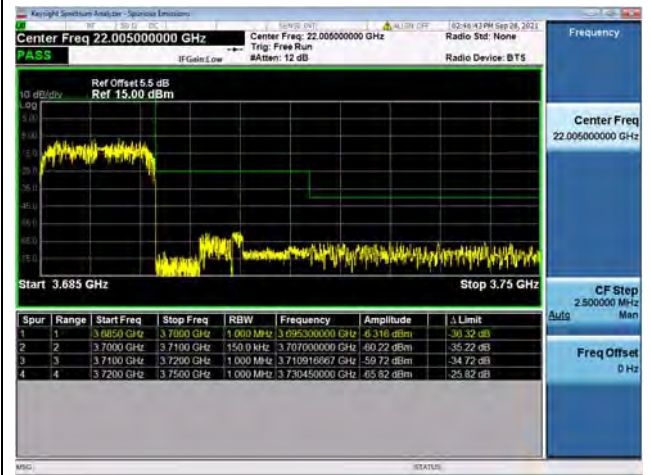
Band48 / 15MHz / Low CH / QPSK / FULL RB



Band48 / 15MHz / High CH / QPSK / 1 RB



Band48 / 15MHz / High CH / QPSK / FULL RB





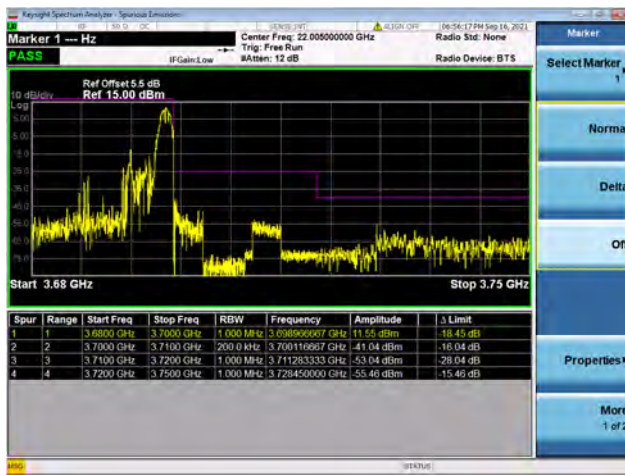
Band48 / 20MHz / Low CH / QPSK / 1 RB



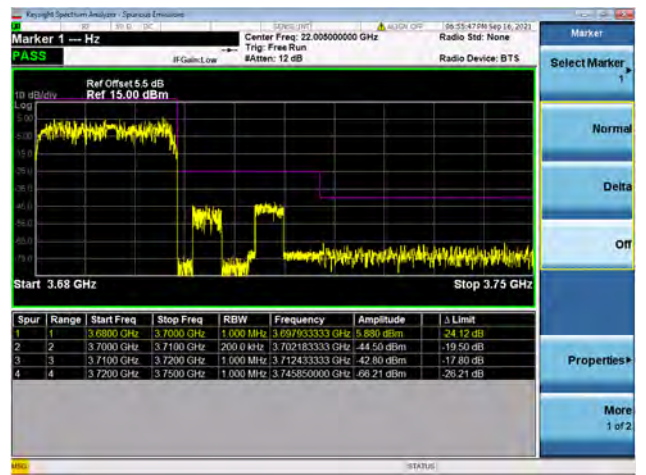
Band48 / 20MHz / Low CH / QPSK / FULL RB



Band48 / 20MHz / High CH / QPSK / 1 RB



Band48 / 20MHz / High CH / QPSK / FULL RB

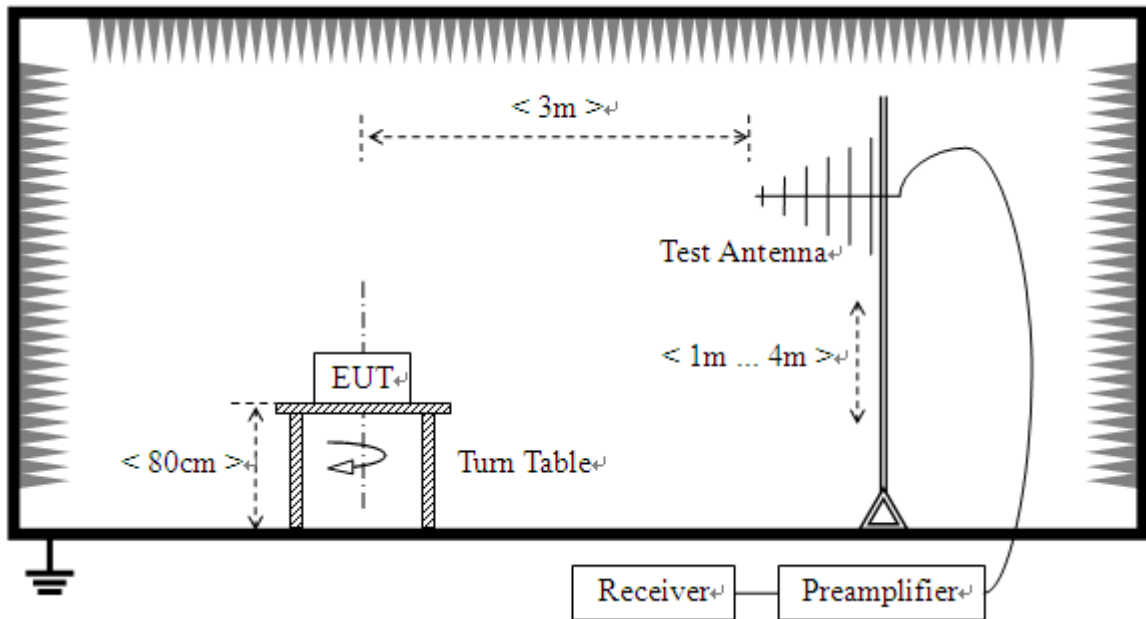


2.7. Radiated Spurious Emissions

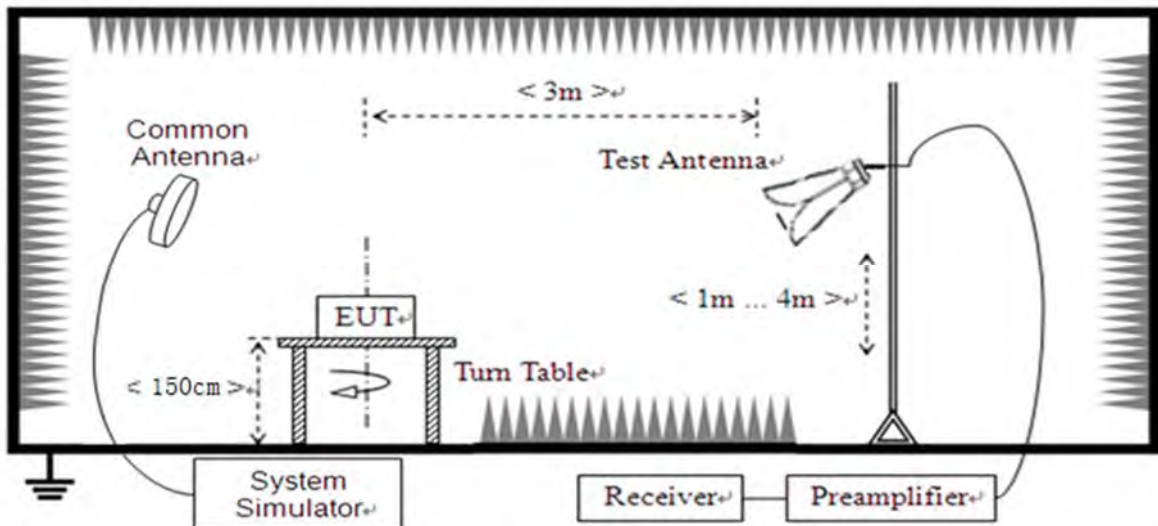
2.7.1. Requirement

The power of any emissions below 3530 MHz or above 3720 MHz shall not exceed -40dBm/MHz .

2.7.2. Test Description



(For the test frequency from 30MHz to 1GHz)



(For the test frequency above 1GHz)



The EUT is located in a 3m Full-Anechoic Chamber, the cable loss, air loss and so on of the site as factors are pre-calibrated using the "Substitution" method, and calculated to correct the reading. A call is established between the EUT and the SS via a Common Antenna. The EUT is commanded by the SS to operate at the maximum and minimum output power, and only the test result of the maximum output power was recorded.

In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) and Horn Test Antenna (above 1GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground and the Turn Table is actuated to turn from 0° to 360° to determine the maximum value of the radiated power. The emission levels at both horizontal and vertical polarizations should be tested. The Filters consists of Notch Filters and High Pass Filter.

Note: when doing measurements above 1GHz, the EUT has been within the 3dB cone width of the horn antenna during horizontal antenna.

2.7.3.Test procedure

KDB 971168 D01v03 Section 5.8 and ANSI/TIA-603-E-2016.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements.

For measurements above 1GHz the resolution bandwidth is set to 1MHz, the video band width is set to 3MHz for peak measurements.



2.7.4. Test Result

The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. The lowest, middle and highest channels are tested to verify the out of band emissions.

The substitution corrections are obtained as described below:

$$A_{\text{SUBST}} = P_{\text{SUBST_TX}} - P_{\text{SUBST_RX}} - L_{\text{SUBST_CABLES}} + G_{\text{SUBST_TX_ANT}}$$

$$A_{\text{TOT}} = L_{\text{CABLES}} + A_{\text{SUBST}}$$

Where A_{SUBST} is the final substitution correction including receive antenna gain.

$P_{\text{SUBST_TX}}$ is signal generator level,

$P_{\text{SUBST_RX}}$ is receiver level,

$L_{\text{SUBST_CABLES}}$ is cable losses including TX cable,

$G_{\text{SUBST_TX_ANT}}$ is substitution antenna gain.

A_{TOT} is total correction factor including cable loss and substitution correction

During the test, the data of A_{TOT} was added in the test spectrum analyze, so spectrum analyze reading is the final values which contain the data of A_{TOT} .

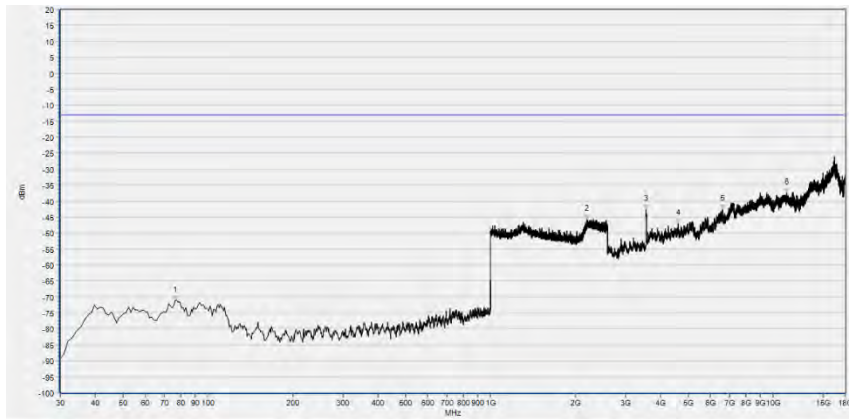
Note1: The power of the EUT transmitting frequency should be ignored.

Note2: All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

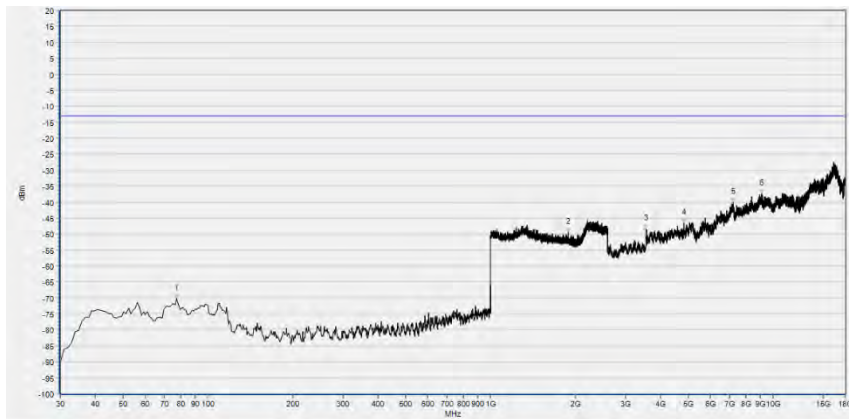
Note3: All bandwidth and modulation were considered and evaluated respectively by performing full test for each band, only the worst cases (Max Bandwidth and QPSK mode) were recorded in this test report.

Note4: N/A means the frequency is the basic frequency or the base station frequency, they are no need to verdict.

LTE Band 48, 20MHz BW, Low Channel, QPSK



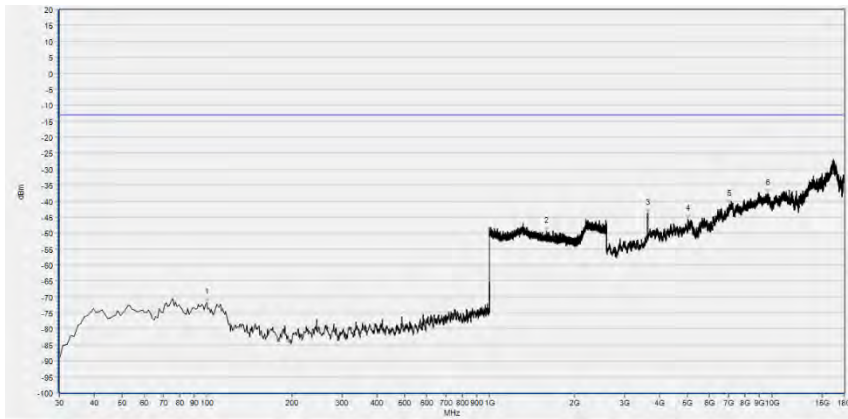
No.	Fre.(MHz)	PK (dBm)	Limit (dBm)	Antenna	Verdict
1	76.560	-71.19	-13.00	Horizontal	PASS
2	2198.559	-45.70	-13.00	Horizontal	PASS
3	3560.575	-42.65	-13.00	Horizontal	N/A
4	4616.367	-47.12	-13.00	Horizontal	PASS
5	6638.334	-42.55	-13.00	Horizontal	PASS
6	11163.957	-37.46	-13.00	Horizontal	PASS



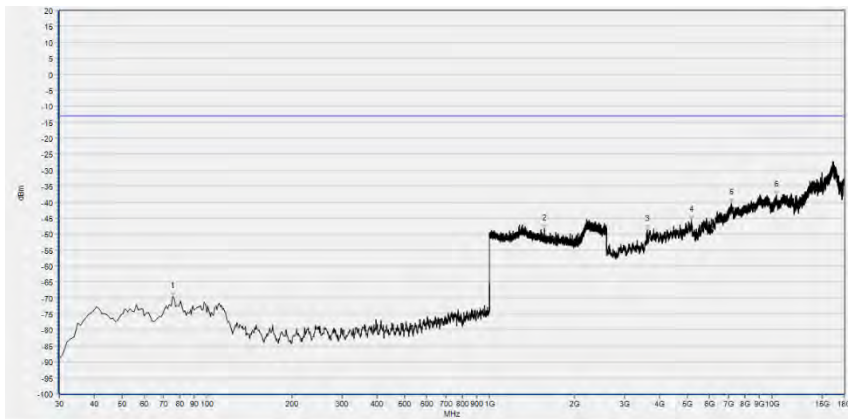
No.	Fre.(MHz)	PK (dBm)	Limit (dBm)	Antenna	Verdict
1	77.530	-70.24	-13.00	Vertical	PASS
2	1884.194	-49.56	-13.00	Vertical	PASS
3	3563.375	-48.36	-13.00	Vertical	N/A
4	4829.205	-46.51	-13.00	Vertical	PASS
5	7240.444	-40.11	-13.00	Vertical	PASS
6	9139.189	-37.53	-13.00	Vertical	PASS



LTE Band 48, 20MHz BW, Mid Channel, QPSK

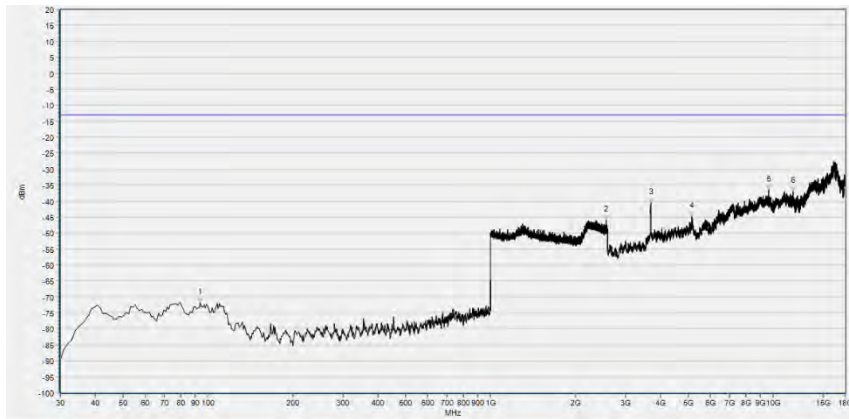


No.	Fre.(MHz)	PK (dBm)	Limit (dBm)	Antenna	Verdict
1	99.840	-71.86	-13.00	Horizontal	PASS
2	1588.395	-49.47	-13.00	Horizontal	PASS
3	3627.787	-43.91	-13.00	Horizontal	N/A
4	5044.845	-45.62	-13.00	Horizontal	PASS
5	7066.812	-40.93	-13.00	Horizontal	PASS
6	9634.879	-37.64	-13.00	Horizontal	PASS

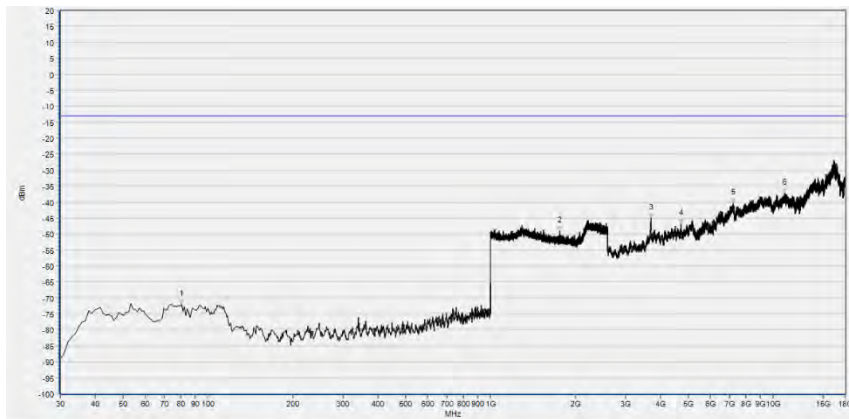


No.	Fre.(MHz)	PK (dBm)	Limit (dBm)	Antenna	Verdict
1	75.590	-69.59	-13.00	Vertical	PASS
2	1566.627	-48.42	-13.00	Vertical	PASS
3	3616.585	-48.70	-13.00	Vertical	PASS
4	5170.867	-45.72	-13.00	Vertical	PASS
5	7181.633	-40.26	-13.00	Vertical	PASS
6	10343.408	-37.90	-13.00	Vertical	PASS

LTE Band 48, 20MHz BW, High Channel, QPSK



No.	Fre.(MHz)	PK (dBm)	Limit (dBm)	Antenna	Verdict
1	94.020	-71.91	-13.00	Horizontal	PASS
2	2567.987	-46.01	-13.00	Horizontal	PASS
3	3694.999	-40.50	-13.00	Horizontal	N/A
4	5154.064	-44.88	-13.00	Horizontal	PASS
5	9634.879	-36.43	-13.00	Horizontal	PASS
6	11766.067	-37.04	-13.00	Horizontal	PASS



No.	Fre.(MHz)	PK (dBm)	Limit (dBm)	Antenna	Verdict
1	80.440	-72.03	-13.00	Vertical	PASS
2	1761.905	-49.14	-13.00	Vertical	PASS
3	3697.800	-45.04	-13.00	Vertical	N/A
4	4722.786	-46.71	-13.00	Vertical	PASS
5	7226.441	-40.30	-13.00	Vertical	PASS
6	10956.719	-37.27	-13.00	Vertical	PASS



Annex A Test Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for test performed on the EUT as specified in CISPR 16-1-2:

Test Items	Uncertainty
Output Power	± 2.22 dB
Bandwidth	$\pm 5\%$
Conducted Spurious Emission	± 2.77 dB
Band Edge	± 2.77 dB
Equivalent Isotropic Radiated Power	± 2.22 dB
Radiated Spurious Emissions	± 6 dB

This uncertainty represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.



Annex B Testing Laboratory Information

1. Identification of the Responsible Testing Laboratory

Laboratory Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Laboratory Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
Telephone:	+86 755 36698555
Facsimile:	+86 755 36698525

2. Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China

3. Facilities and Accreditations

All measurement facilities used to collect the measurement data are located at FL.3, Building A, FeiYang Science Park, Block 67, BaoAn District, Shenzhen, 518101 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.10-2013 and CISPR Publication 22; the FCC designation number is CN1192, the test firm registration number is 226174.



4. Test Equipments Utilized

4.1 Conducted Test Equipments

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Due Date
Power Splitter	NW521	1506A	Weinschel	N/A	N/A
Attenuator 1	(N/A)	10dB	Resnet	N/A	N/A
Attenuator 2	(N/A)	3dB	Resnet	N/A	N/A
EXA Signal Analyzer	MY51511149	N9020A	Agilent	2021.07.26	2022.07.25
USB Power Sensor	MY54210011	U2021XA	Agilent	2020.10.23	2021.10.22
				2021.10.21	2022.10.20
System Simulator	6200995016	MT8820C	Anritsu	2020.10.28	2021.10.27
				2021.10.21	2022.10.20
System Simulator	6261830572	MT8821C	Anritsu	2021.02.25	2022.02.24
RF cable (30MHz-26GHz)	CB01	RF01	Morlab	N/A	N/A
Coaxial cable	CB02	RF02	Morlab	N/A	N/A
SMA connector	CN01	RF03	HUBER-SUHNER	N/A	N/A
Temperature Chamber	20171112102	HZ-2019	Dongguan Lixian Instrument Technology Co., Ltd	2020.10.26	2021.10.25
				2021.10.20	2022.10.19
Computer	T430i	Think Pad	Lenovo	N/A	N/A
Software Version: Morlab FCC Test System V2.8					

4.2 List of Software Used

Description	Manufacturer	Software Version
Morlab FCC Test System	MORLAB	V2.8
MORLAB EMCR V1.2	MORLAB	V1.0

**4.3 Radiated Test Equipments**

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Due Date
System Simulator	152038	CMW500	R&S	2020.11.19	2021.11.18
System Simulator	6200995016	MT8820C	Anritsu	2020.10.28	2021.10.27
				2021.10.21	2022.10.20
Receiver	MY54130016	N9038A	Agilent	2021.07.16	2022.07.15
Test Antenna - Bi-Log	9163-519	VULB 9163	Schwarzbeck	2019.05.24	2022.05.23
Test Antenna - Horn	9170C-531	BBHA9170	Schwarzbeck	2019.07.26	2022.07.25
Test Antenna - Horn	01774	BBHA 9120D	Schwarzbeck	2019.07.26	2022.07.25
Coaxial cable (N male) (9KHz-30MHz)	CB04	EMC04	Morlab	N/A	N/A
Coaxial cable (N male) (30MHz-26GHz)	CB02	EMC02	Morlab	N/A	N/A
Coaxial cable (N male) (30MHz-26GHz)	CB03	EMC03	Morlab	N/A	N/A
Coaxial cable (N male) (30MHz-40GHz)	CB05	EMC05	Morlab	N/A	N/A
1-18GHz pre-Amplifier	61171/61172	S020180L3203	Tonscend	2021.07.15	2022.07.14
18-26.5GHz pre-Amplifier	46732	S10M100L3802	Tonscend	2021.07.15	2022.07.14
26-40GHz pre-Amplifier	56774	S40M400L4002	Tonscend	2021.07.15	2022.07.14
Notch Filter	N/A	WRCGV-LTE B48	Wainwright	2021.07.15	2022.07.14
Anechoic Chamber	N/A	9m*6m*6m	CRT	2019.07.13	2022.07.12

END OF REPORT