

FCC Test Report

(Part 27)

Product Name : 4G/LTE Broadband Router with PoE
Model No : MX-210NP, MX-210
FCC ID : QI3BIL-MX210NP

Applicant : Billion Electric Co., Ltd.
Address : 8F., No.192, Sec. 2, Zhongxing Rd., Xindian Dist.,
New Taipei City 231, Taiwan (R.O.C.)

Date of Receipt : 2018/02/13
Issued Date : 2018/05/16
Report No. : 1820150R-HPUSP40V00
Report Version : V1.0



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration of the equipment and evaluated measurement uncertainty herein.

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Test Report

Issued Date : 2018/05/16

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Product Name : 4G/LTE Broadband Router with PoE
Applicant : Billion Electric Co., Ltd.
Address : 8F., No.192, Sec. 2, Zhongxing Rd., Xindian Dist., New Taipei
City 231, Taiwan (R.O.C.)
Manufacturer : Billion Electric Co., Ltd.
Trade Name : BEC, Billion
Model No. : MX-210NP, MX-210
EUT Rated Voltage : AC 100-240V/50-60Hz
EUT Test Voltage : AC 120V/60Hz
Measurement Standard : FCC CFR Title 47 Part 2 27
Measurement Reference : TIA/EIA 603-E
Test Result : Complied

Documented By : Elephant Chen
(Adm. Assistant / Elephant Chen)

Tested By : Vorana Chen
(Senior Engineer / Vorana Chen)

Approved By : 
(Director / Vincent Lin)

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1. GENERAL INFORMATION

1.1. EUT Description

Product Name	4G/LTE Broadband Router with PoE
Model No.	MX-210NP, MX-210
Trade Name	BEC, Billion
IMEI No.	86110703
FCC ID	QI3BIL-MX210NP
Modulation	LTE Band 12 : QPSK/16-QAM
TX Frequency	LTE Band 12 : 699MHz~716MHz
Rx Frequency	LTE Band 12 : 729MHz ~746MHz
Bandwidth	LTE Band 12 : 1.4MHz/3MHz/5MHz/10MHz
HW Version	1.010
SW Version	1.04.1.249
Antenna Type	Dipole

Note: The different description of Model

Model	MX-210NP	MX-210
Product Name	4G/LTE Broadband Router with PoE	
Trade Name	BEC, Billion	
LTE antennas(SMA)	Detachable LTE Antenna *2pcs	
SIM slot (2FF)	1	
Ethernet Giga port	2	
802.11b/g/n	Yes	No
Power input from PoE PoE injector	802.3af/at type I (12.95W)	
Power Input: Power adapter	12VDC 1.2A	
External color	Casing: ABS / Dark blue	
Software	without VPN	

1.2. Antenna List

No	Manufacturer	Part No	Antenna Type	Peak Gain
1	Cortec	AN0727-64DP5BSM	Dipole Antenna	0.28 dBi for LTE Band12

1.3. Operational Description

The information contained within this report is intended to show verification of compliance of the 700MHz to the requirements of FCC 47 CFR Part 2 and 27.

The EUT provide all functions described as above. The EUT is tested with maximum rated TX power via the Base Station simulator.

DEKRA has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined

as:

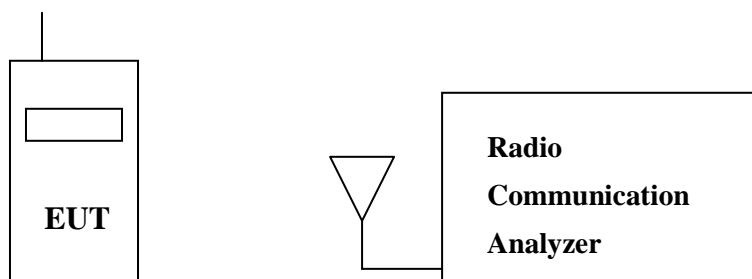
Test Mode:	LTE Band 12 (1.4M)-QPSK/16QAM
	LTE Band 12 (3M)-QPSK/16QAM
	LTE Band 12 (5M)-QPSK/16QAM
	LTE Band 12 (10M)-QPSK/16QAM

Note :

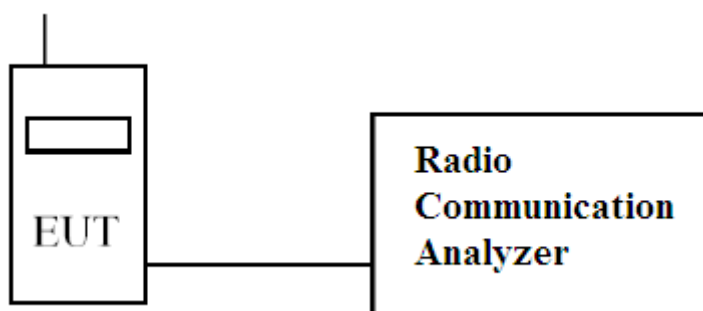
The maximum power levels are chosen in the LTE Band 12, only these modes were used for all tests.

1.4. Configuration of tested System

(a) Configuration of Radiated measurement



(b) Configuration of Conducted measurement



1.5. EUT Setup Procedures

- (1) Setup the EUT and simulators as shown on 1.3
- (2) Turn on the power of all equipments.
- (3) The EUT was set to communicate with MT8820C.
- (4) Repeat the above procedure (3).

1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	23
Humidity (%RH)	25-75	51
Barometric pressure (mbar)	860-1060	986

The related certificate for our laboratories about the test site and management system can be downloaded from DEKRA Testing and Certification Co., Ltd. Web Site:

<http://www.dekra.com.tw/english/about/certificates.aspx?bval=5>

The address and introduction of DEKRA Testing and Certification Co., Ltd. laboratories can be founded in our Web site: http://www.dekra.com.tw/index_en.aspx

Site Description: File on
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FCC Engineering Laboratory
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FCC Accreditation Number: TW3023

1.7. Type of Emission

Band	Bandwidth (MHz)	Modulation	
		QPSK	16QAM
12	1.4	1M10G7D	1M10W7D
12	3	2M73G7D	2M74W7D
12	5	4M50G7D	4M49W7D
12	10	9M05G7D	9M04W7D

1.8. Voltages and AC currents

LTE Band 12 (1.4M)	EUT Transmitting (in maximum power) :	AC voltage : 120V , AC current : 0.11A
	EUT Standby	: AC voltage : 120V , AC current : 0.06A
LTE Band 12 (3M)	EUT Transmitting (in maximum power) :	AC voltage : 120V , AC current : 0.11A
	EUT Standby	: AC voltage : 120V , AC current : 0.06A
LTE Band 12 (5M)	EUT Transmitting (in maximum power) :	AC voltage : 120V , AC current : 0.11A
	EUT Standby	: AC voltage : 120V , AC current : 0.06A
LTE Band 12 (10M)	EUT Transmitting (in maximum power) :	AC voltage : 120V , AC current : 0.11A
	EUT Standby	: AC voltage : 120V , AC current : 0.06A

2. Technical Test

2.1. Summary of test result

FCC Standard	Test Item	Result	Note
2.1046	Conducted Output Power	Pass	
27.5			
2.1049	Occupied Bandwidth	Pass	
27.53 (g)			
2.1051	Spurious Emission at Antenna Terminals	Pass	
27.53 (g)			
2.1051	Conducted Emission	Pass	
27.53 (g)			
2.1053	Field Strength of Spurious Radiation	Pass	
27.53 (g)			
2.1055	Frequency Stability for Temperature & Voltage	Pass	
27.54			
27.50	Peak to Average Ratio	Pass	

2.2. List of test Equipment

Conducted /CTR

Instrument	Manufacturer	Type No.	Serial No	Cal. Date
Spectrum Analyzer	Agilent	N9010A	MY54510317	2018/04/13
Directional coupler	Agilent	87300C	MY44300353	2017/11/30
Directional coupler	Agilent	778D-012	50550	2017/11/23
Standard Temperature & Humidity Chamber	WIT	TH-1S-B	EQ-201-00146	2018/02/12
Communication Tester	Agilent	MT8820C	6201465467	2017/07/10

Radiated / Site3

Instrument	Manufacturer	Type No.	Serial No	Cal. Date
Bilog Antenna	Schaffner Chase	CBL6112B	2707	2017/06/29
Horn Antenna	R&S	9120D	556	2018/04/02
Pre-Amplifier	Agilent	87405C	MY55380068	2017/08/08
Spectrum Analyzer	Agilent	N9010A	MY54510317	2018/04/13
Communication Tester	Agilent	MT8820C	6201465467	2017/07/10

2.3. Measurement Uncertainty

Conducted Emission

The measurement uncertainty of confidence of 95% is evaluated as ± 1.52 dB

Radiated Emission (Below 1GHz)

The measurement uncertainty of confidence of 95% is evaluated as ± 3.44 dB .

Radiated Emission (Above 1GHz)

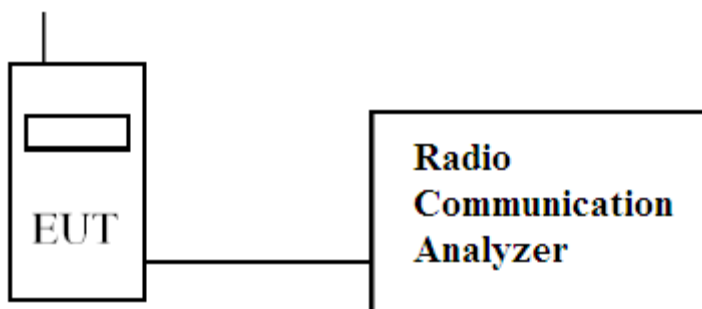
The measurement uncertainty of confidence of 95% is evaluated as ± 4.08 dB

3. Conducted Output Power Measurement

3.1. Test Specification

According to FCC Part 2.1046, 27.50

3.2. Test Setup



3.3. Limits

Band	Limit
LTE Band 12/700	<3W

3.4. Test Procedure

The EUT is tested with maximum rated TX power via the Base Station simulator, and the output power was measured at the antenna terminals of the EUT.

3.5. Test Result of Maximum Power Output

Band	Channel	Modulation	RB No.	RB Offset	MPR	Max Power (Conducted)	Max Power (W)		
Band 12 (700MHz)/1.4MHz	23017 699.7MHz	QPSK	1	#0	0	22.82	0.1914		
			1	#Mid	0	23.12	0.2051		
			1	#Max	0	22.74	0.1879		
			50%	#0	1	23.01	0.2000		
			50%	#Mid	1	23.15	0.2065		
			50%	#Max	1	23.09	0.2037		
			100%	--	1	21.99	0.1581		
		16QAM	1	#0	1	21.78	0.1507		
			1	#Mid	1	21.86	0.1535		
			1	#Max	1	21.90	0.1549		
			50%	#0	2	21.81	0.1517		
			50%	#Mid	2	21.98	0.1578		
			50%	#Max	2	21.90	0.1549		
			100%	--	2	20.79	0.1199		
	23095 707.5MHz	QPSK	1	#0	0	23.05	0.2018		
			1	#Mid	0	23.06	0.2023		
			1	#Max	0	23.26	0.2118		
			50%	#0	1	23.08	0.2032		
			50%	#Mid	1	23.25	0.2113		
			50%	#Max	1	23.24	0.2109		
			100%	--	1	22.20	0.1660		
		16QAM	1	#0	1	21.93	0.1560		
			1	#Mid	1	22.09	0.1618		
			1	#Max	1	22.16	0.1644		
			50%	#0	2	22.22	0.1667		
			50%	#Mid	2	22.30	0.1698		
			50%	#Max	2	22.33	0.1710		
			100%	--	2	21.20	0.1318		
			23173 715.3MHz	QPSK	1	#0	0	23.03	0.2009
					1	#Mid	0	23.22	0.2099
1	#Max	0			23.02	0.2004			
50%	#0	1			23.02	0.2004			
50%	#Mid	1			23.06	0.2023			
50%	#Max	1			23.08	0.2032			
100%	--	1			22.04	0.1600			
16QAM	1	#0		1	21.84	0.1528			
	1	#Mid		1	21.97	0.1574			
	1	#Max		1	21.95	0.1567			
	50%	#0		2	22.13	0.1633			
	50%	#Mid		2	21.99	0.1581			
	50%	#Max		2	22.02	0.1592			
	100%	--		2	20.95	0.1245			

Band	Channel	Modulation	RB No.	RB Offset	MPR	Max Power (Conducted)	Max Power (W)
Band 12 (700MHz)/3MHz	23025 700.5MHz	QPSK	1	#0	0	22.96	0.1977
			1	#Mid	0	23.24	0.2109
			1	#Max	0	22.95	0.1972
			50%	#0	1	22.04	0.1600
			50%	#Mid	1	22.02	0.1592
			50%	#Max	1	22.08	0.1614
			100%	--	1	22.04	0.1600
		16QAM	1	#0	1	21.93	0.1560
			1	#Mid	1	21.99	0.1581
			1	#Max	1	21.77	0.1503
			50%	#0	2	20.96	0.1247
			50%	#Mid	2	20.98	0.1253
			50%	#Max	2	20.97	0.1250
			100%	--	2	20.99	0.1256
	23095 707.5MHz	QPSK	1	#0	0	22.97	0.1982
			1	#Mid	0	23.30	0.2138
			1	#Max	0	23.17	0.2075
			50%	#0	1	22.18	0.1652
			50%	#Mid	1	22.30	0.1698
			50%	#Max	1	22.27	0.1687
			100%	--	1	22.20	0.1660
		16QAM	1	#0	1	21.81	0.1517
			1	#Mid	1	22.09	0.1618
			1	#Max	1	21.81	0.1517
			50%	#0	2	20.96	0.1247
			50%	#Mid	2	21.17	0.1309
			50%	#Max	2	21.06	0.1276
			100%	--	2	21.16	0.1306
	23165 714.5MHz	QPSK	1	#0	0	23.22	0.2099
			1	#Mid	0	23.22	0.2099
			1	#Max	0	23.06	0.2023
			50%	#0	1	22.14	0.1637
			50%	#Mid	1	22.10	0.1622
			50%	#Max	1	22.05	0.1603
			100%	--	1	22.14	0.1637
		16QAM	1	#0	1	21.85	0.1531
1			#Mid	1	22.01	0.1589	
1			#Max	1	22.03	0.1596	
50%			#0	2	21.08	0.1282	
50%			#Mid	2	21.04	0.1271	
50%			#Max	2	20.90	0.1230	
100%			--	2	21.06	0.1276	

Band	Channel	Modulation	RB No.	RB Offset	MPR	Max Power (Conducted)	Max Power (W)
Band 12 (700MHz)/5MHz	23035 701.5MHz	QPSK	1	#0	0	22.88	0.1941
			1	#Mid	0	23.16	0.2070
			1	#Max	0	22.96	0.1977
			50%	#0	1	21.92	0.1556
			50%	#Mid	1	22.02	0.1592
			50%	#Max	1	21.95	0.1567
			100%	--	1	21.96	0.1570
		16QAM	1	#0	1	21.84	0.1528
			1	#Mid	1	21.85	0.1531
			1	#Max	1	21.57	0.1435
			50%	#0	2	20.91	0.1233
			50%	#Mid	2	21.00	0.1259
			50%	#Max	2	20.91	0.1233
			100%	--	2	20.89	0.1227
	23095 707.5MHz	QPSK	1	#0	0	22.85	0.1928
			1	#Mid	0	23.40	0.2188
			1	#Max	0	23.04	0.2014
			50%	#0	1	22.12	0.1629
			50%	#Mid	1	22.20	0.1660
			50%	#Max	1	22.24	0.1675
			100%	--	1	22.11	0.1626
		16QAM	1	#0	1	21.80	0.1514
			1	#Mid	1	22.20	0.1660
			1	#Max	1	21.90	0.1549
			50%	#0	2	21.04	0.1271
			50%	#Mid	2	21.15	0.1303
			50%	#Max	2	21.17	0.1309
			100%	--	2	21.03	0.1268
	23155 713.5MHz	QPSK	1	#0	0	23.04	0.2014
			1	#Mid	0	23.38	0.2178
			1	#Max	0	23.00	0.1995
			50%	#0	1	22.11	0.1626
			50%	#Mid	1	22.08	0.1614
			50%	#Max	1	23.03	0.2009
			100%	--	1	21.98	0.1578
		16QAM	1	#0	1	21.90	0.1549
1			#Mid	1	22.16	0.1644	
1			#Max	1	21.78	0.1507	
50%			#0	2	20.91	0.1233	
50%			#Mid	2	21.08	0.1282	
50%			#Max	2	21.01	0.1262	
100%			--	2	20.94	0.1242	

Band	Channel	Modulation	RB No.	RB Offset	MPR	Max Power (Conducted)	Max Power (W)
Band 12 (700MHz)/10MHz	23060 704MHz	QPSK	1	#0	0	22.86	0.1932
			1	#Mid	0	23.06	0.2023
			1	#Max	0	23.06	0.2023
			50%	#0	1	21.87	0.1538
			50%	#Mid	1	21.88	0.1542
			50%	#Max	1	22.02	0.1592
			100%	--	1	21.95	0.1567
		16QAM	1	#0	1	21.54	0.1426
			1	#Mid	1	22.00	0.1585
			1	#Max	1	21.98	0.1578
			50%	#0	2	20.81	0.1205
			50%	#Mid	2	20.80	0.1202
			50%	#Max	2	21.05	0.1274
			100%	--	2	20.90	0.1230
	23095 707.5MHz	QPSK	1	#0	0	22.81	0.1910
			1	#Mid	0	23.26	0.2118
			1	#Max	0	23.07	0.2028
			50%	#0	1	21.94	0.1563
			50%	#Mid	1	22.07	0.1611
			50%	#Max	1	22.08	0.1614
			100%	--	1	21.93	0.1560
		16QAM	1	#0	1	21.74	0.1493
			1	#Mid	1	22.02	0.1592
			1	#Max	1	21.81	0.1517
			50%	#0	2	20.84	0.1213
			50%	#Mid	2	21.01	0.1262
			50%	#Max	2	21.13	0.1297
			100%	--	2	20.98	0.1253
	23130 711MHz	QPSK	1	#0	0	22.87	0.1936
			1	#Mid	0	23.13	0.2056
			1	#Max	0	23.00	0.1995
			50%	#0	1	22.20	0.1660
			50%	#Mid	1	22.04	0.1600
			50%	#Max	1	22.03	0.1596
			100%	--	1	22.09	0.1618
		16QAM	1	#0	1	21.85	0.1531
1			#Mid	1	22.00	0.1585	
1			#Max	1	21.75	0.1496	
50%			#0	2	21.11	0.1291	
50%			#Mid	2	21.03	0.1268	
50%			#Max	2	21.04	0.1271	
100%			--	2	21.04	0.1271	

3.6. Maximum Conducted Power and ERP/EIRP Power

According to KDB 412172 D01 Section 1.2 Power Approach

$$\text{EIRP} = P_T + G_T - L_C = \text{ERP} + 2.15 \text{ dB}, \text{ERP} = \text{EIRP} - 2.15 \text{ dB}$$

P_T = transmitter output power in dBm

G_T = gain of the transmitting antenna in dBi

L_C = signal attenuation in the connecting cable between the transmitter and antenna in dB

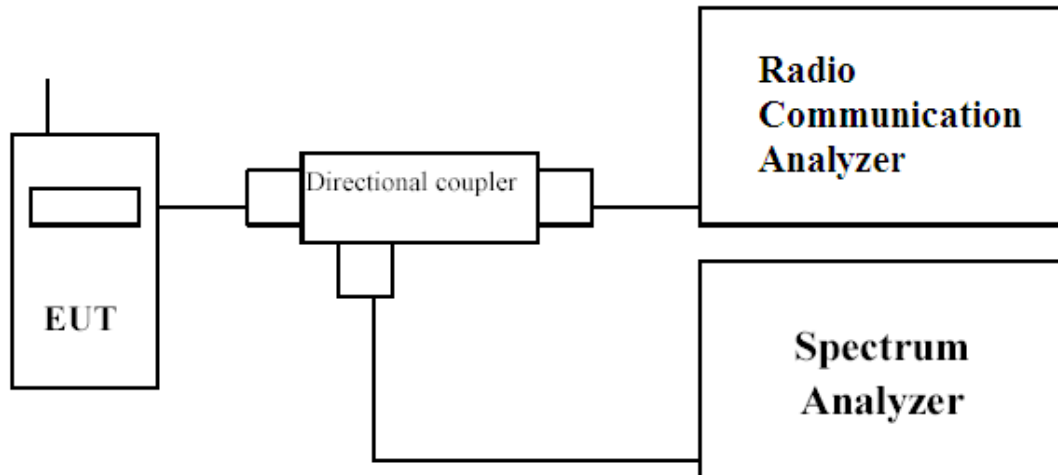
LTE Band	BW	Modulation	Conducted Peak Power (dBm)	Conducted Peak Power (W)	Antenna Gain (dBi)	Maximum ERP (W)	Maximum ERP Limit (W)
12	1.4M	QPSK	23.26	0.212	0.28	0.138	3
		16QAM	22.33	0.171	0.28	0.111	3
	3M	QPSK	23.30	0.214	0.28	0.139	3
		16QAM	22.09	0.162	0.28	0.105	3
	5M	QPSK	23.40	0.219	0.28	0.142	3
		16QAM	22.20	0.166	0.28	0.108	3
	10M	QPSK	23.26	0.212	0.28	0.138	3
		16QAM	22.02	0.159	0.28	0.104	3

4. Occupied Bandwidth

4.1. Test Secification

According to FCC Part 2.1049, 27.53

4.2. Test Setup



4.3. Test Procedure

The EUT is tested with maximum rated TX power via the Base Station simulator, and the occupied bandwidth was measured at the antenna terminals of the EUT.

The Resolution BW of the analyzer is set to 1 %~5% of the emission bandwidth. The EUT's occupied bandwidth is measured as the width of the signal between two points, one below the carrier center frequency and one above the carrier frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

The plots below show the resultant display from the Spectrum Analyser.

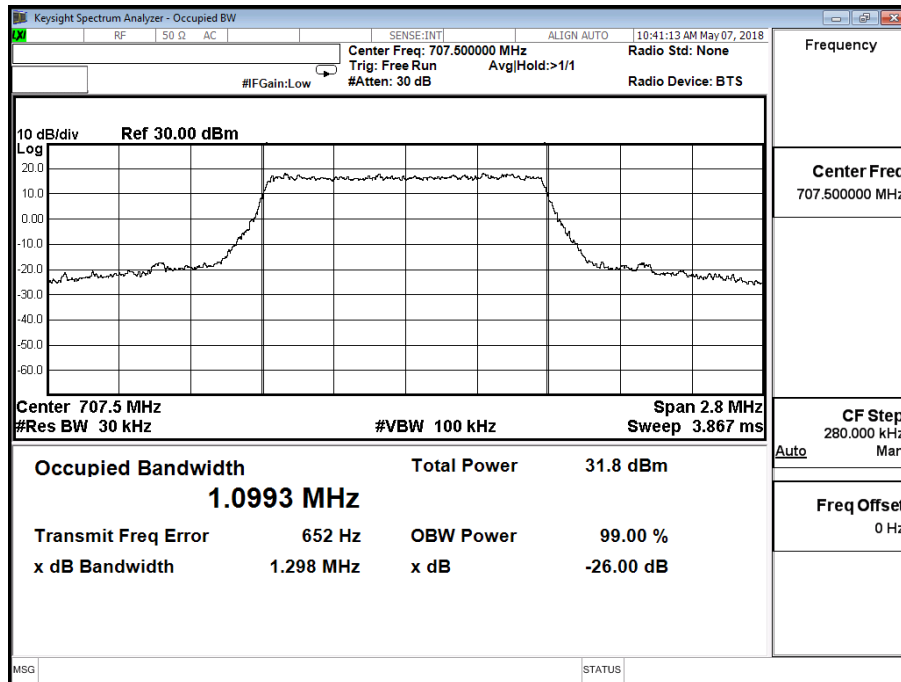
4.4. Test Result of Occupied Bandwidth

Product	4G/LTE Broadband Router with PoE
Test Mode	Occupied Bandwidth
Test Site	CTR

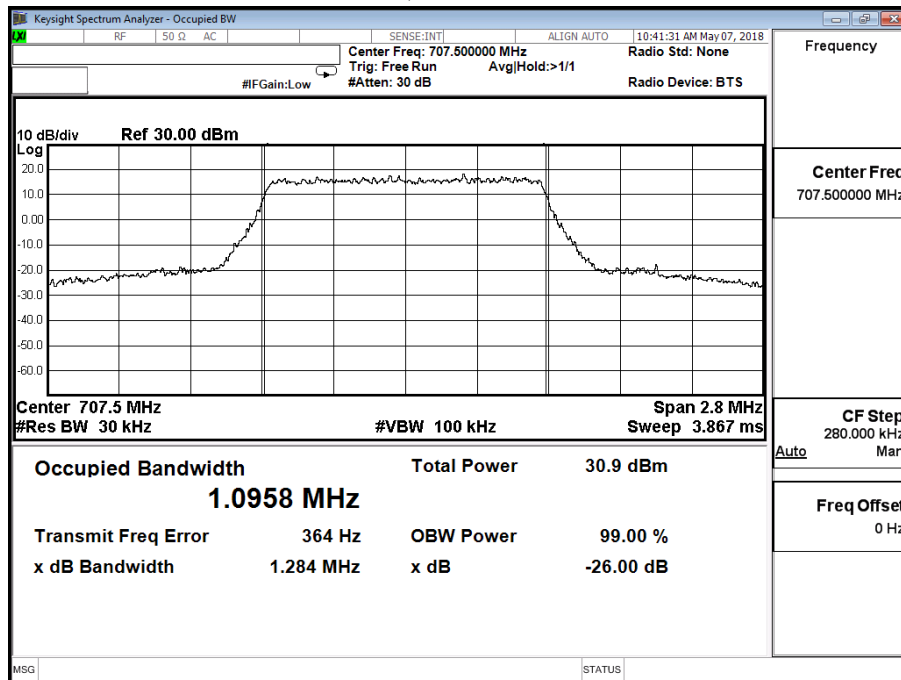
Test Mode	Channel	TX Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB bandwidth (MHz)	Result
Band 12 1.4M QPSK	23095	707.5	1.0993	1.298	Pass
Band 12 1.4M 16QAM	23095	707.5	1.0958	1.284	Pass
Band 12 3M QPSK	23095	707.5	2.7262	3.063	Pass
Band 12 3M 16QAM	23095	707.5	2.7360	3.050	Pass
Band 12 5M QPSK	23095	707.5	4.5009	5.005	Pass
Band 12 5M 16QAM	23095	707.5	4.5008	5.003	Pass
Band 12 10M QPSK	23095	707.5	9.0461	9.968	Pass
Band 12 10M 16QAM	23095	707.5	9.0436	10.020	Pass

Product	4G/LTE Broadband Router with PoE		
Test Mode	Occupied Bandwidth		
Date of Test	2018/05/07	Test Site	CTR
Test Condition	Band 12 1.4M		

Band 12 1.4M QPSK - LTE Mode CH23095

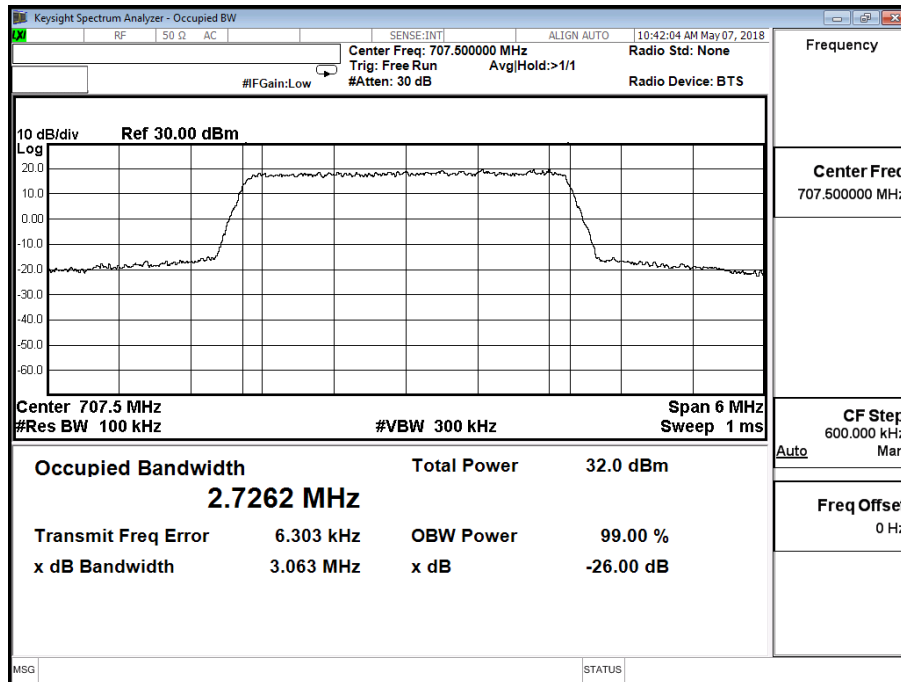


Band 12 1.4M 16QAM - LTE Mode CH 23095

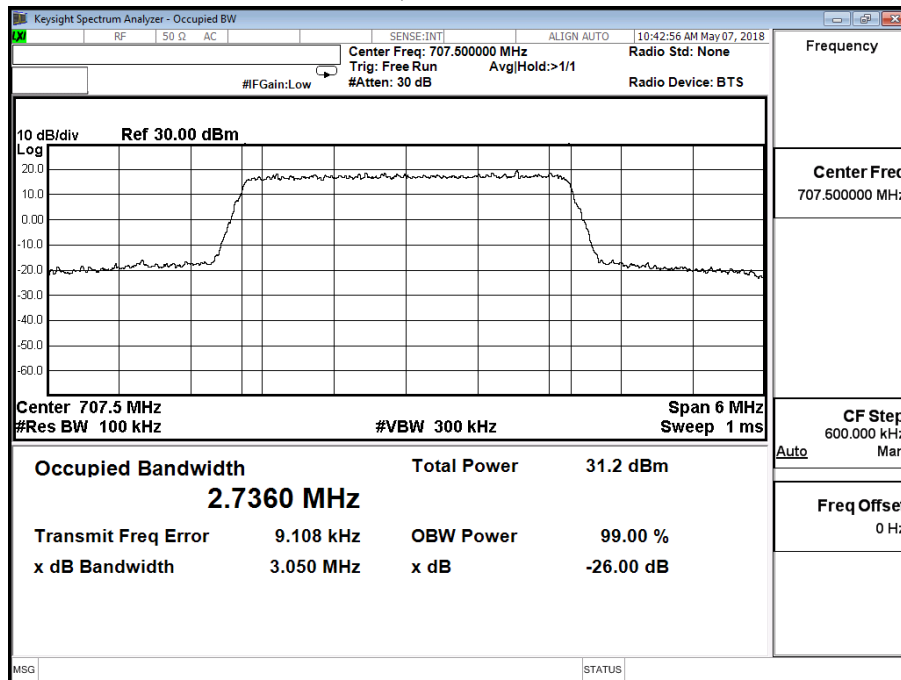


Product	4G/LTE Broadband Router with PoE		
Test Mode	Occupied Bandwidth		
Date of Test	2018/05/07	Test Site	CTR
Test Condition	Band 12 3M		

Band 12 3M QPSK - LTE Mode CH 23095

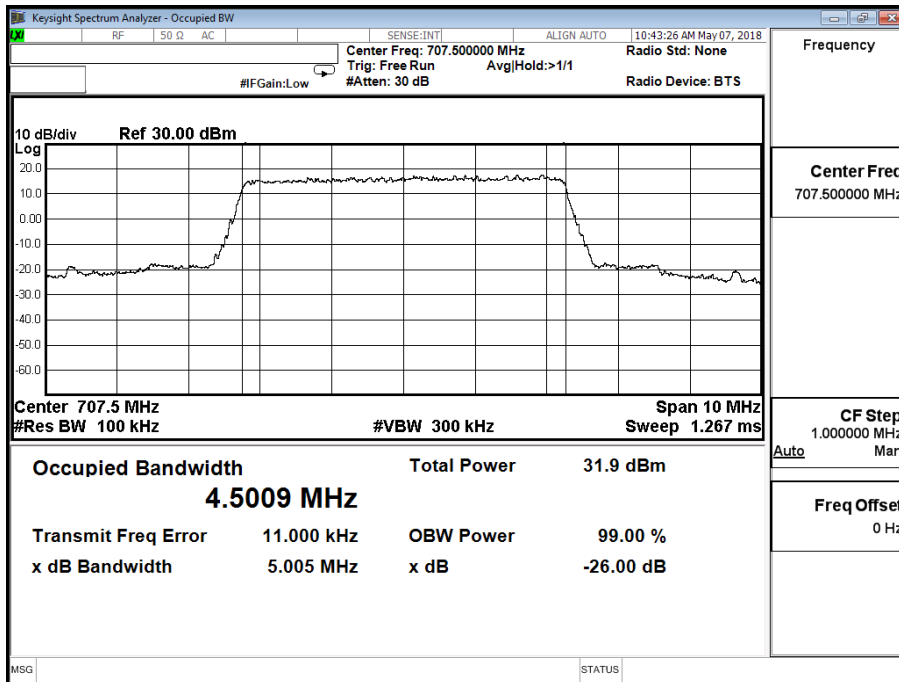


Band 12 3M 16QAM - LTE Mode CH23095

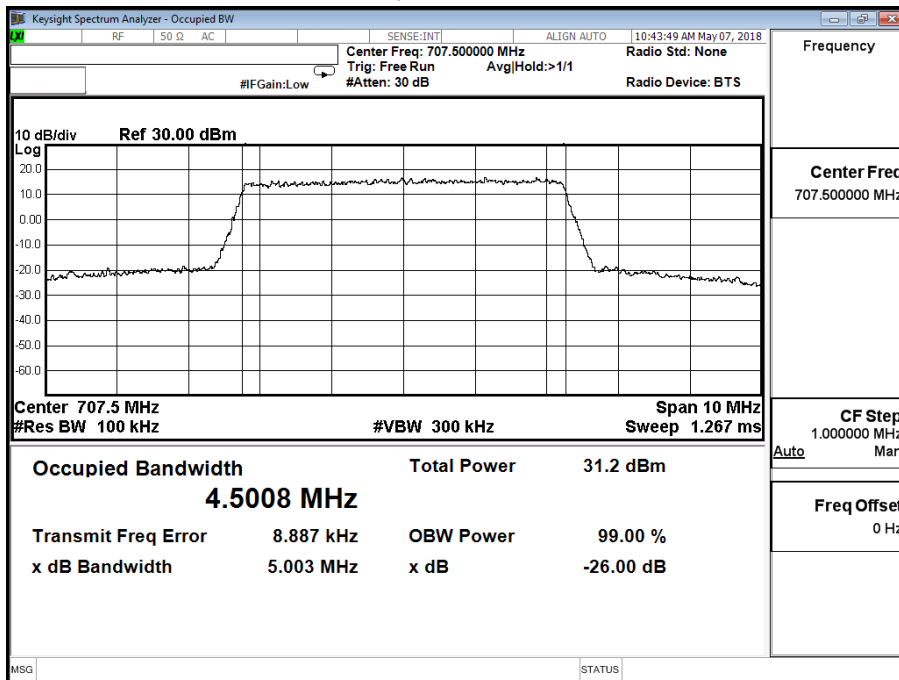


Product	4G/LTE Broadband Router with PoE		
Test Mode	Occupied Bandwidth		
Date of Test	2018/05/07	Test Site	CTR
Test Condition	Band 12 5M		

Band 12 5M QPSK - LTE Mode CH 23095

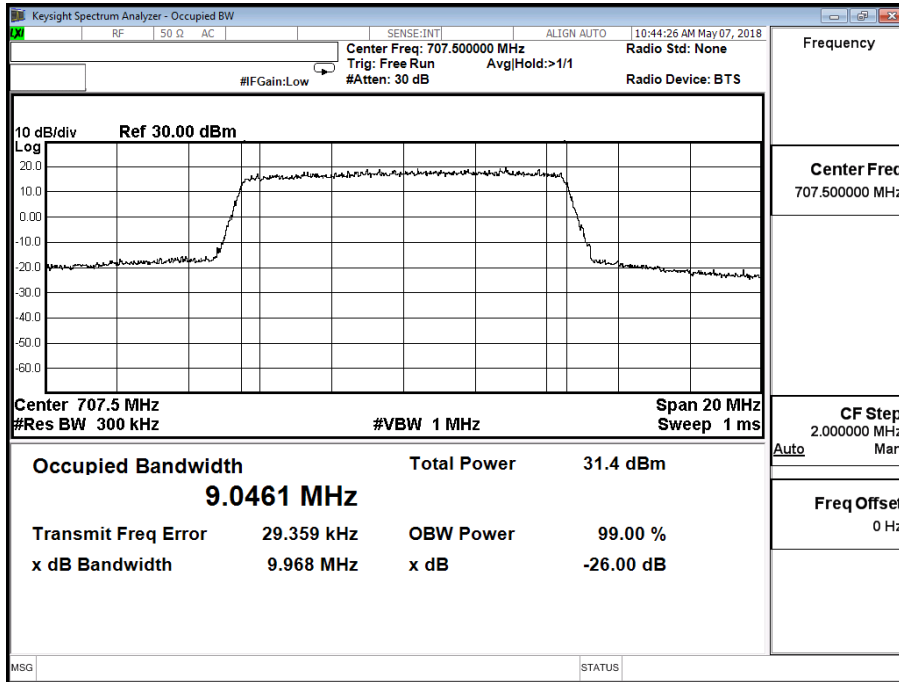


Band 12 5M 16QAM - LTE Mode CH23095

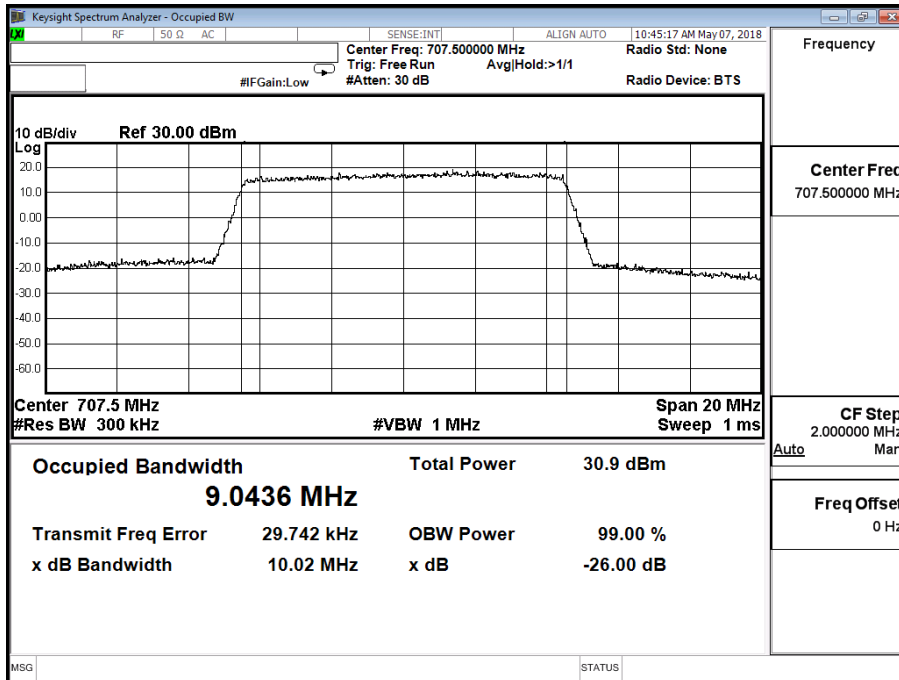


Product	4G/LTE Broadband Router with PoE		
Test Mode	Occupied Bandwidth		
Date of Test	2018/05/07	Test Site	CTR
Test Condition	Band 12 10M		

Band 12 10M QPSK - LTE Mode CH 23095



Band 12 10M 16QAM - LTE Mode CH23095

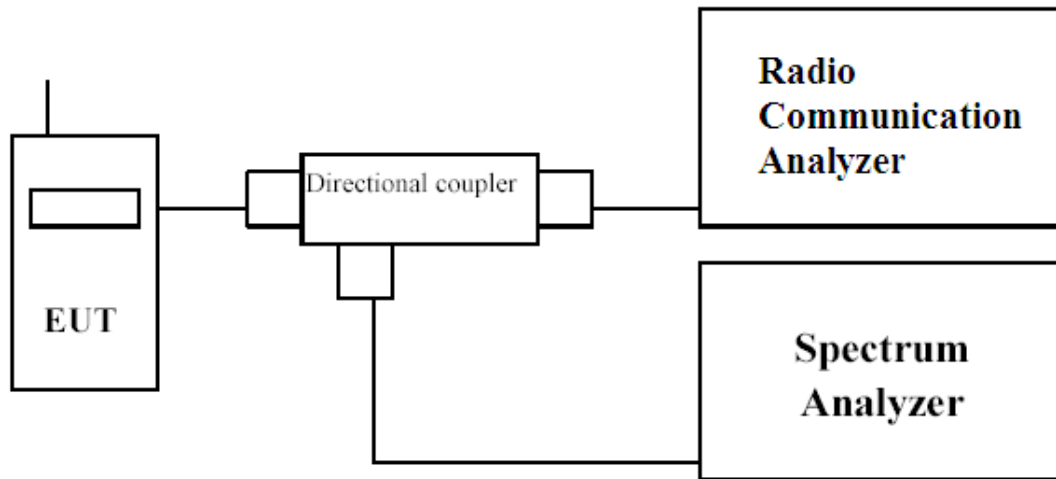


5. Spurious Emission At Antenna Terminals (+/-1MHz)

5.1. Test Specification

According to Part 2.1051, 27.53

5.2. Setup



5.3. Limits

The spurious (unwanted) emission limits specified in the individual FCC rule parts applicable to licensed digital transmitters (typically referred to under the heading 'emission limits') normally apply to any and all emissions that are present outside of the authorized frequency band/block and apply to emissions in both the out-of-band and spurious domains. unwanted emissions are required by the licensed rule parts to be attenuated below the transmitter power by a factor of at least $43 + 10\log(P)$ dB, where P represents the transmitter power expressed in watts

5.4. Test Procedure

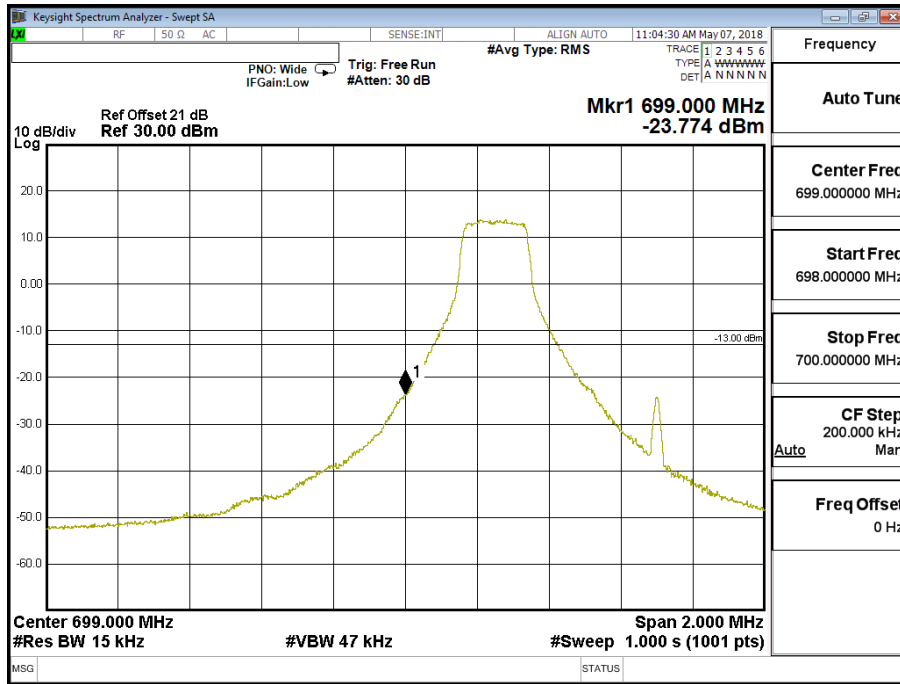
In accordance with Part 27.53 at least 1% of the emission bandwidth was used for the resolution and video bandwidths up to 1MHz away from the Block Edge. At greater than 1MHz, the resolution and video bandwidth were increased to 1MHz/3MHz.

The reference power and path losses of all channels used for testing in each frequency block were measured.

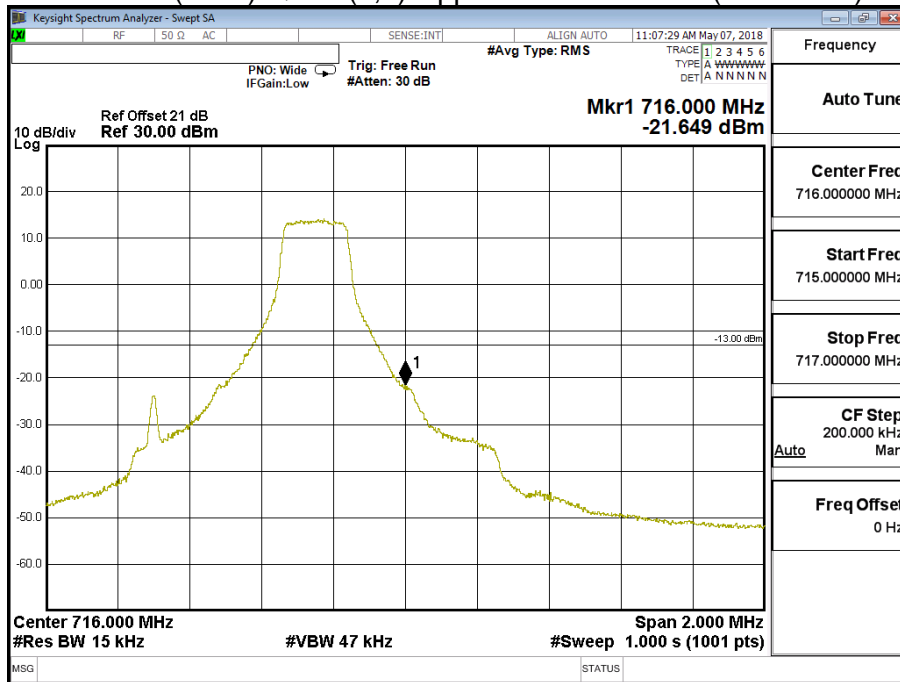
5.5. Test Result of Spurious Emission At Antenna Terminals (+/-1MHz)

Product	4G/LTE Broadband Router with PoE		
Test Mode	Spurious Emission At Antenna Terminals (+/-1MHz)		
Date of Test	2018/05/07	Test Site	CTR
Test Condition	Block Edge Test (Band 12 (1.4M))		

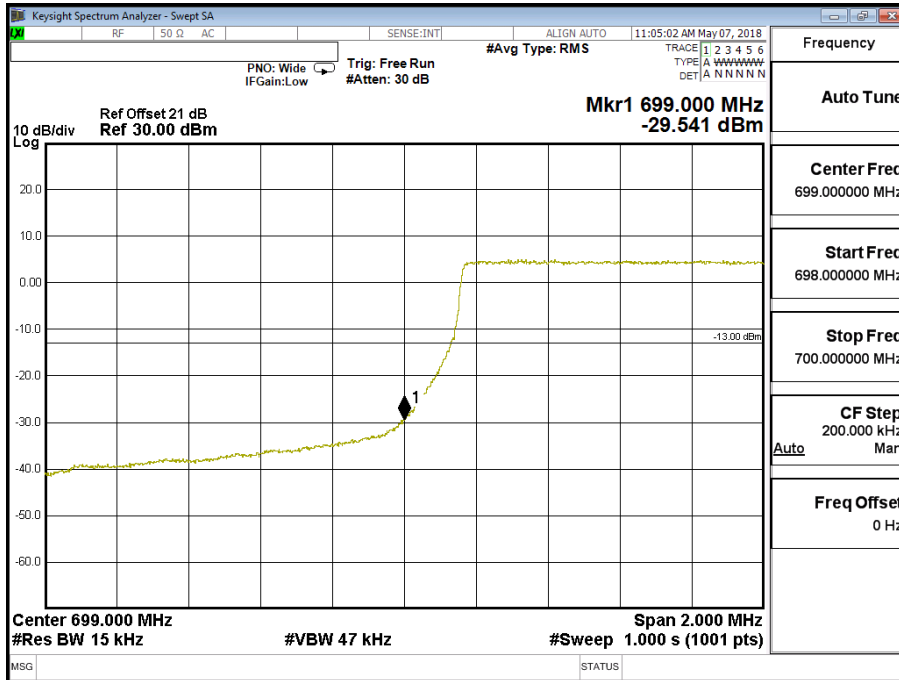
Band 12 (1.4M) QPSK(1,0) Lower Channel 23017 (699.7MHz)



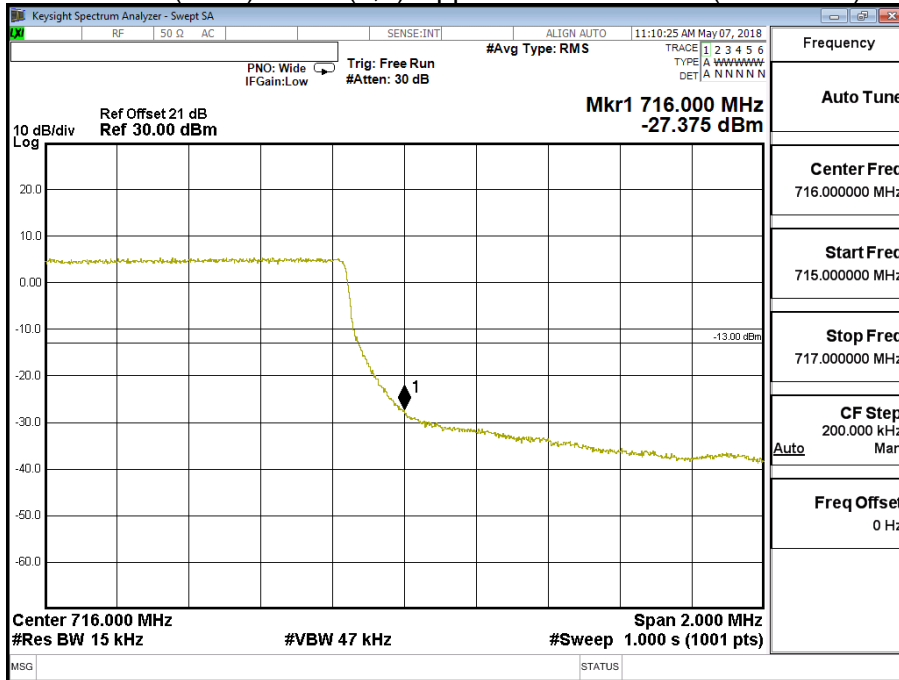
Band 12 (1.4M) QPSK(1,5) Upper Channel 23173 (715.3MHz)



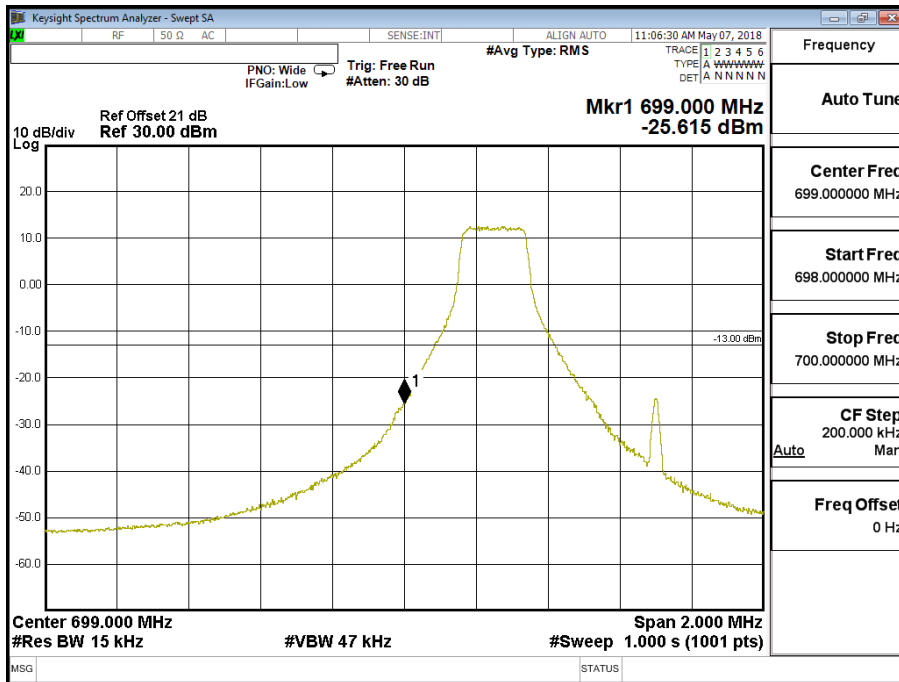
Band 12 (1.4M) QPSK(6,0) Lower Channel 23017 (699.7MHz)



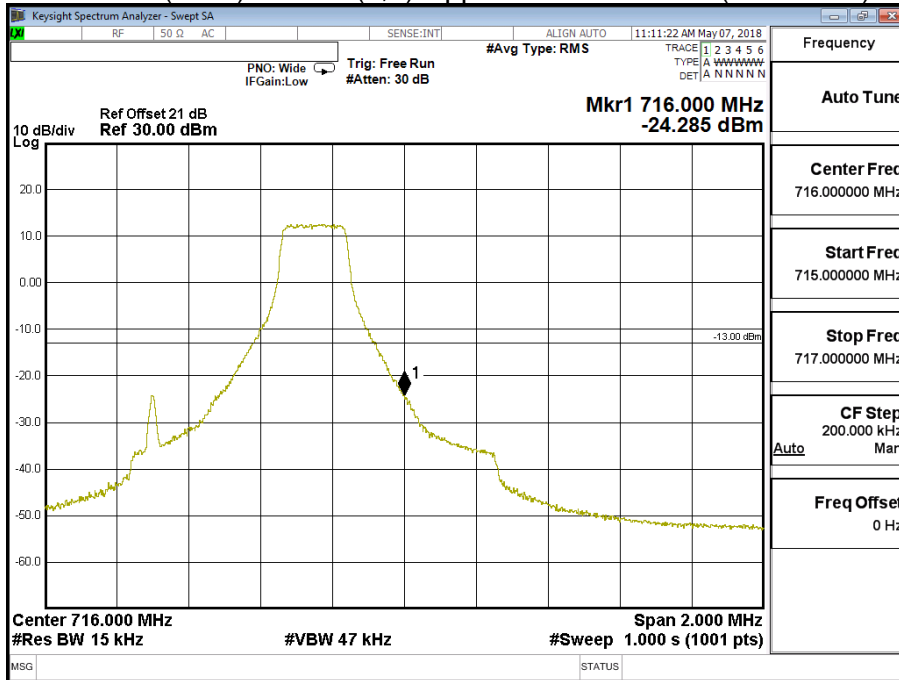
Band 12 (1.4M) QPSK(6,0) Upper Channel 23173 (715.3MHz)



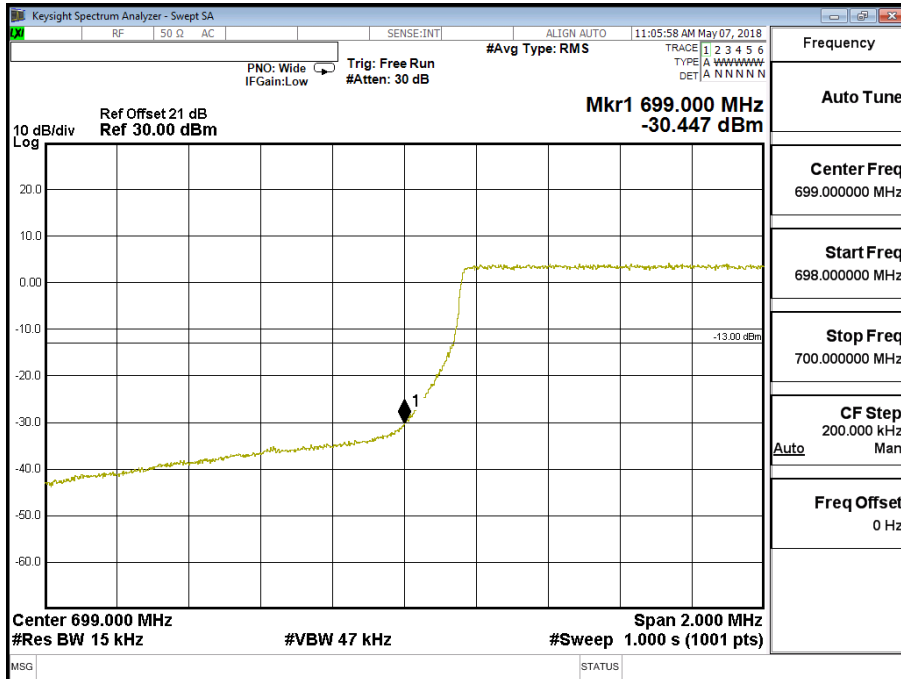
Band 12 (1.4M) 16QAM(1,0) Lower Channel 23017 (699.7MHz)



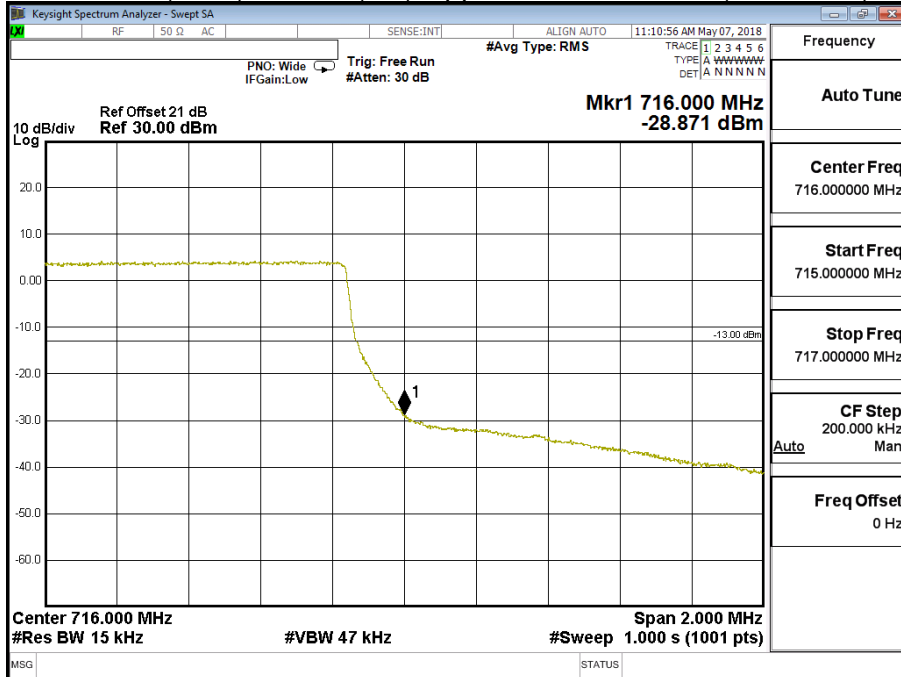
Band 12 (1.4M) 16QAM(1,5) Upper Channel 23173 (715.3MHz)



Band 12 (1.4M) 16QAM(6,0) Lower Channel 23017 (699.7MHz)

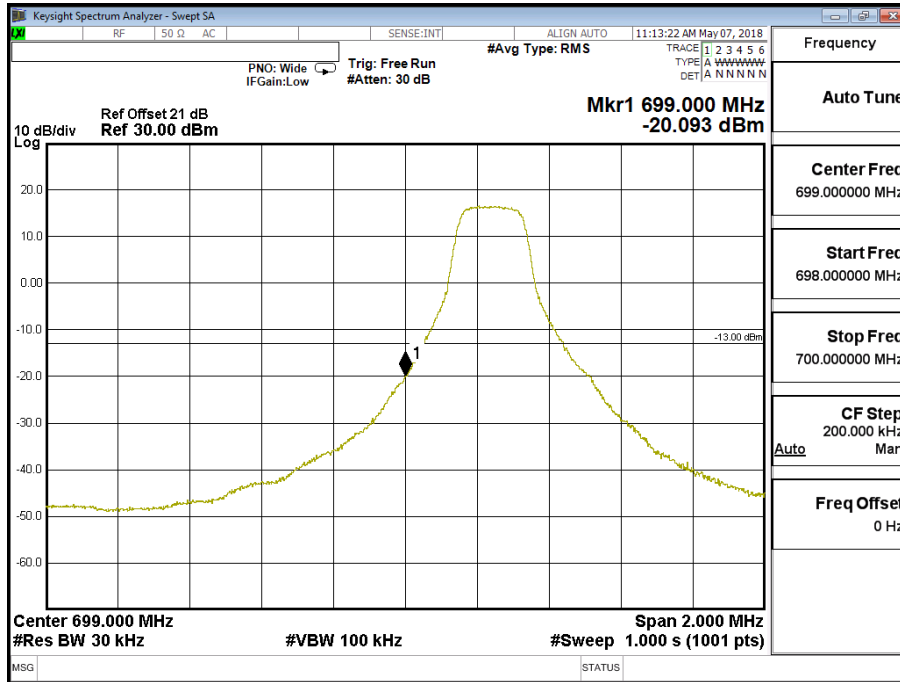


Band 12 (1.4M) 16QAM(6,0) Upper Channel 23173 (715.3MHz)

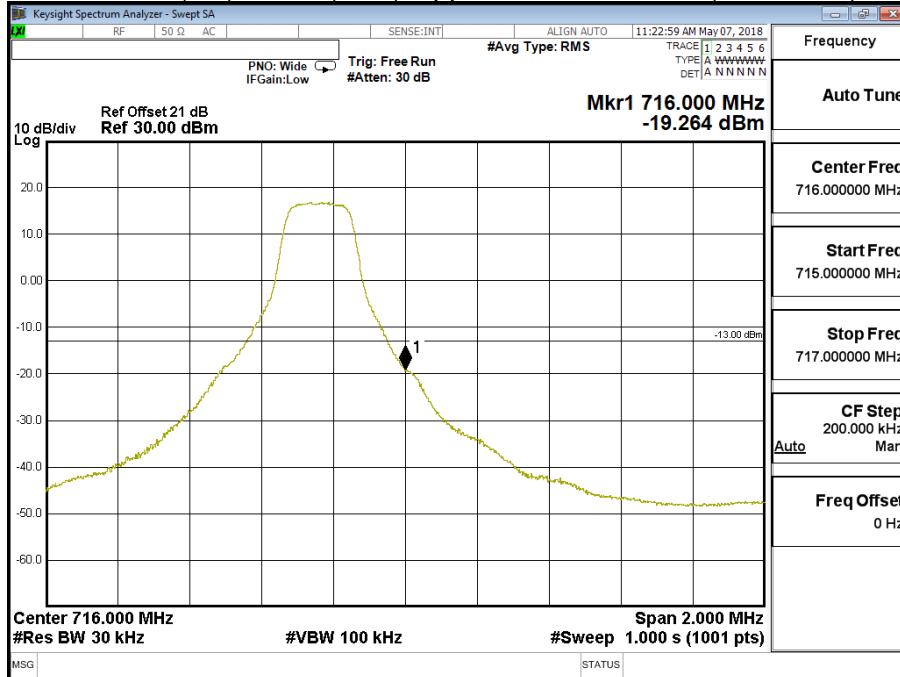


Product	4G/LTE Broadband Router with PoE		
Test Mode	Spurious Emission At Antenna Terminals (+/-1MHz)		
Date of Test	2018/05/07	Test Site	CTR
Test Condition	Block Edge Test (Band 12 (3M))		

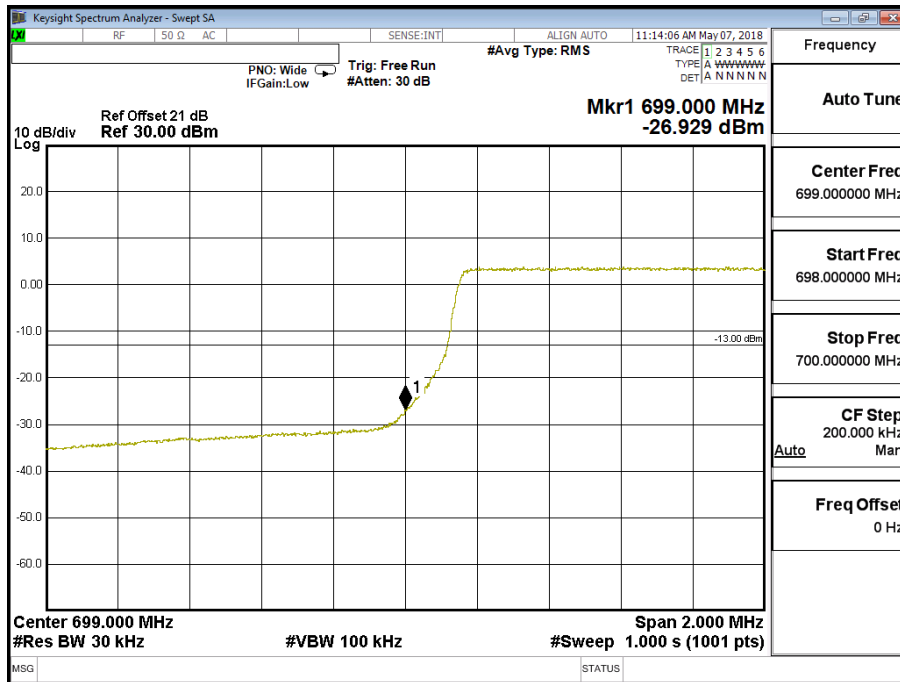
Band 12 (3M) QPSK(1,0) Lower Channel 23025 (700.5MHz)



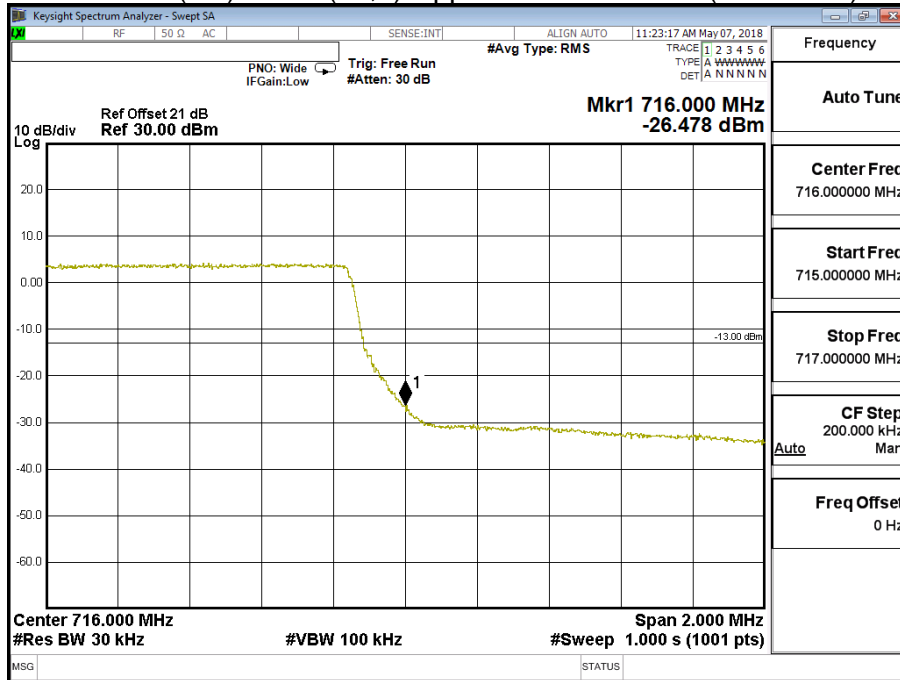
Band 12 (3M) QPSK(1,14) Upper Channel 23165 (714.5MHz)



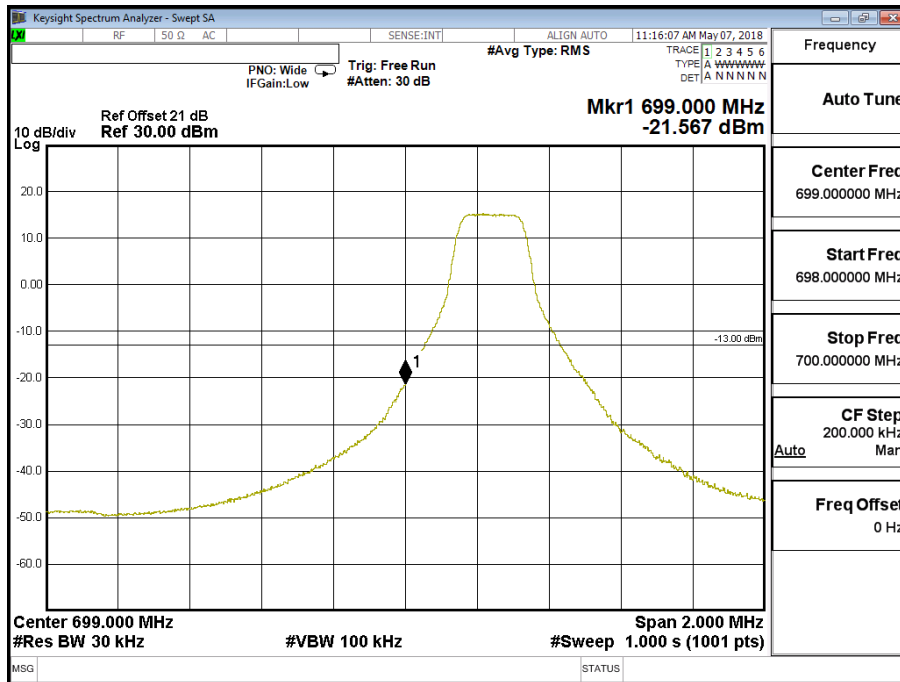
Band 12 (3M) QPSK(15,0) Lower Channel 23025 (700.5MHz)



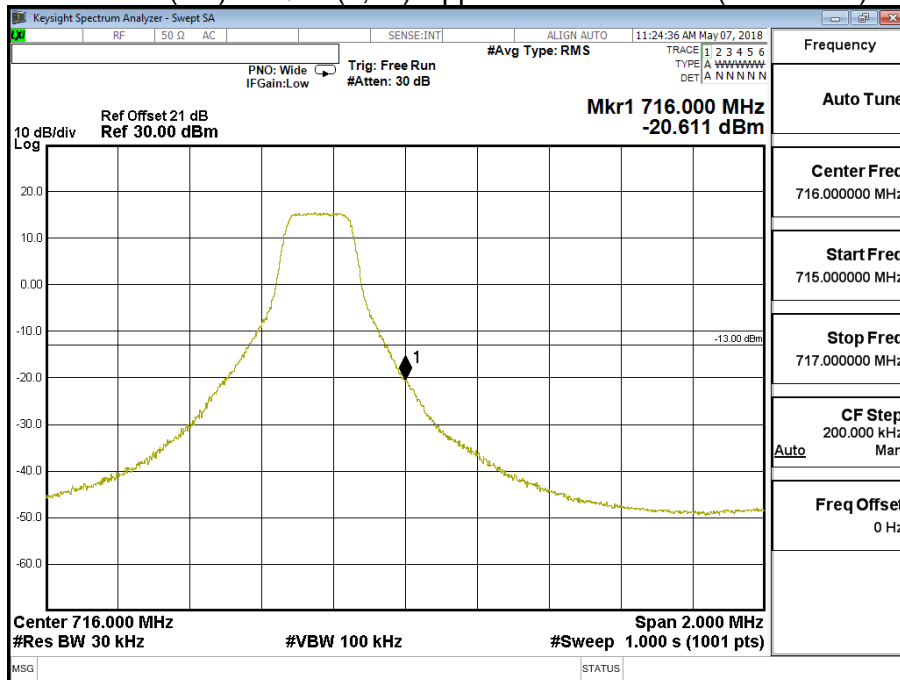
Band 12 (3M) QPSK(15,0) Upper Channel 23165 (714.5MHz)



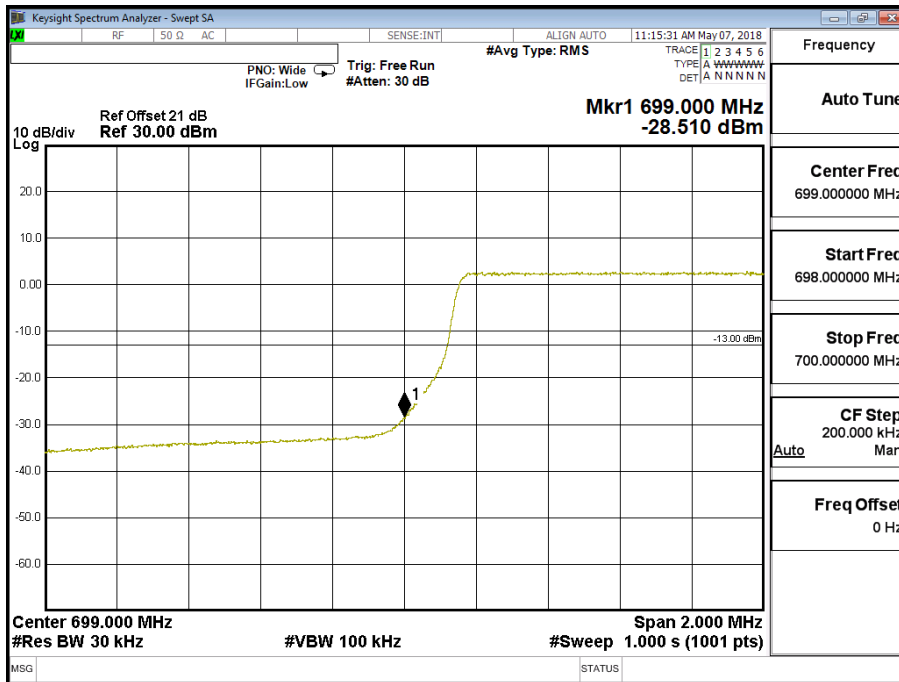
Band 12 (3M) 16QAM(1,0) Lower Channel 23025 (700.5MHz)



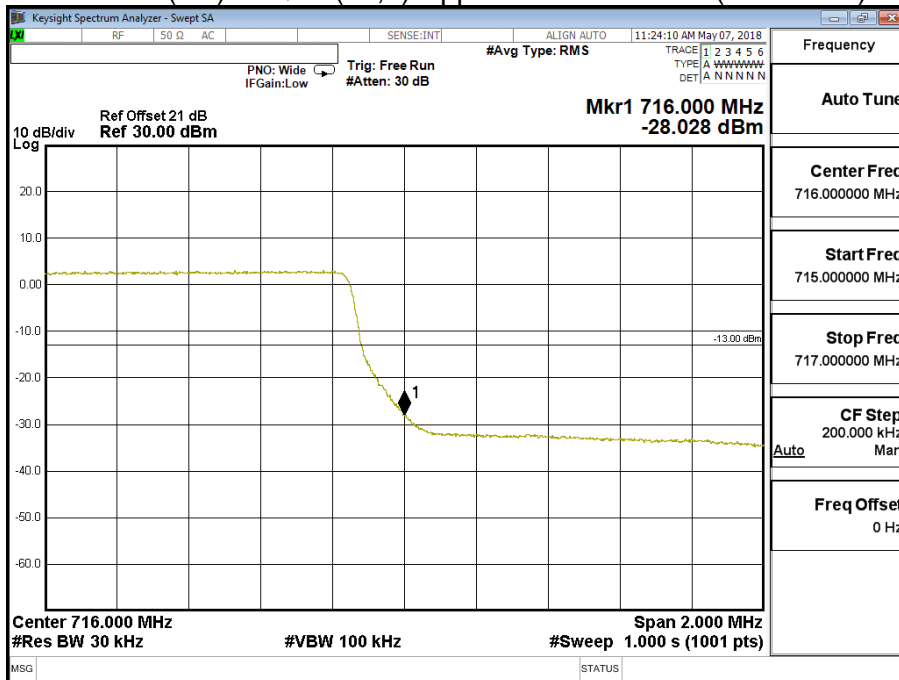
Band 12 (3M) 16QAM(1,14) Upper Channel 23165 (714.5MHz)



Band 12 (3M) 16QAM(15,0) Lower Channel 23025 (700.5MHz)

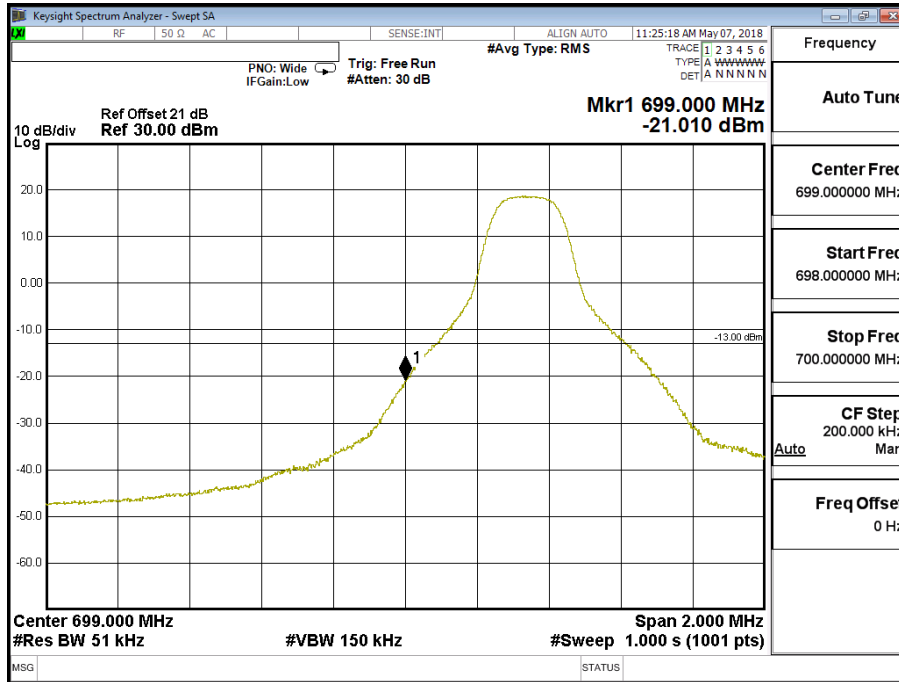


Band 12 (3M) 16QAM(15,0) Upper Channel 23165 (714.5MHz)

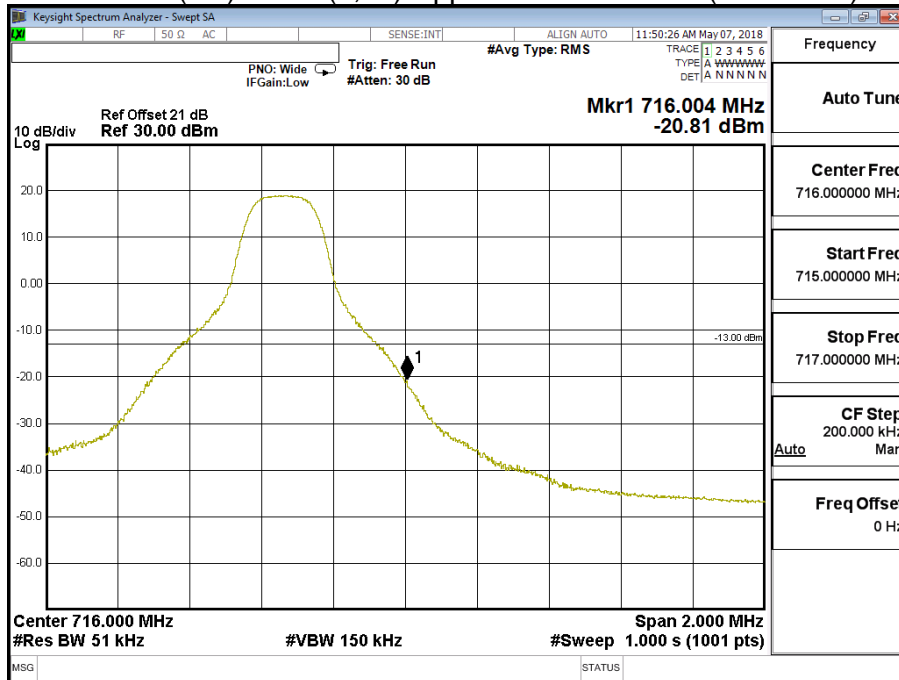


Product	4G/LTE Broadband Router with PoE		
Test Mode	Spurious Emission At Antenna Terminals (+/-1MHz)		
Date of Test	2018/05/07	Test Site	CTR
Test Condition	Block Edge Test (Band 12 (5M))		

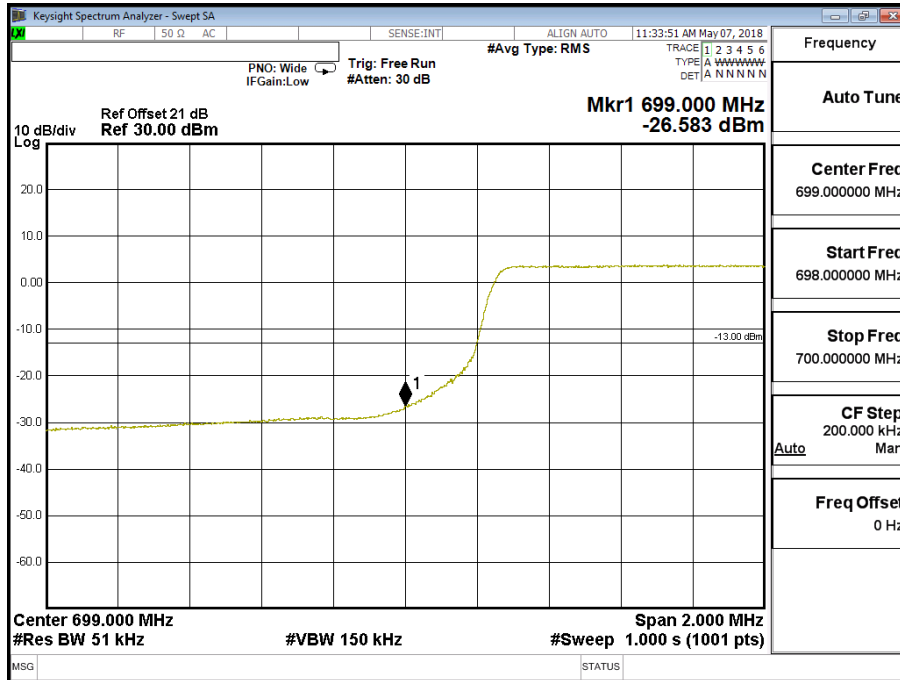
Band 12 (5M) QPSK(1,0) Lower Channel 23035 (701.5MHz)



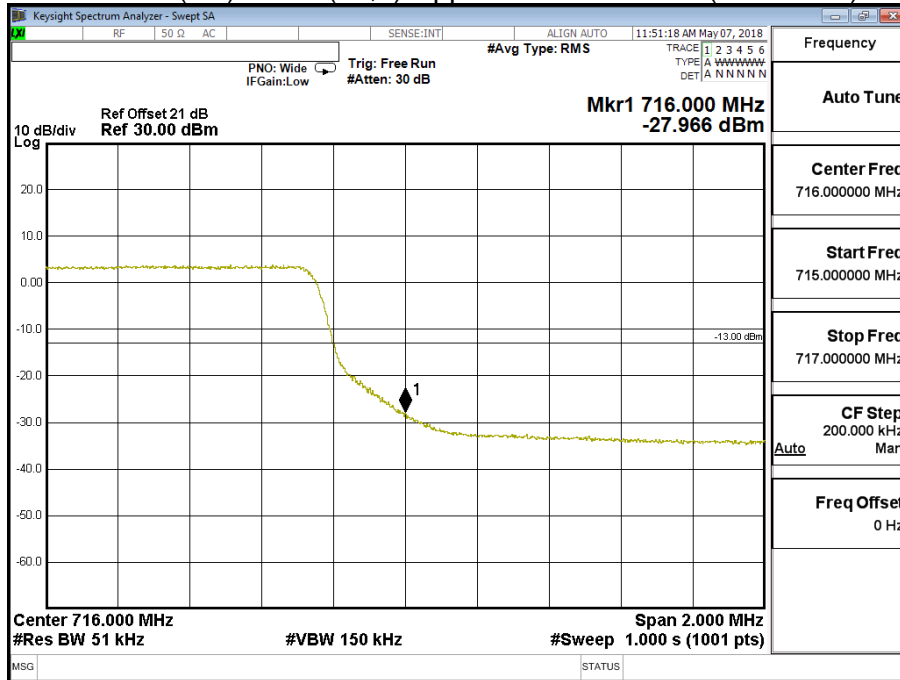
Band 12 (5M) QPSK(1,24) Upper Channel 23155 (713.5MHz)



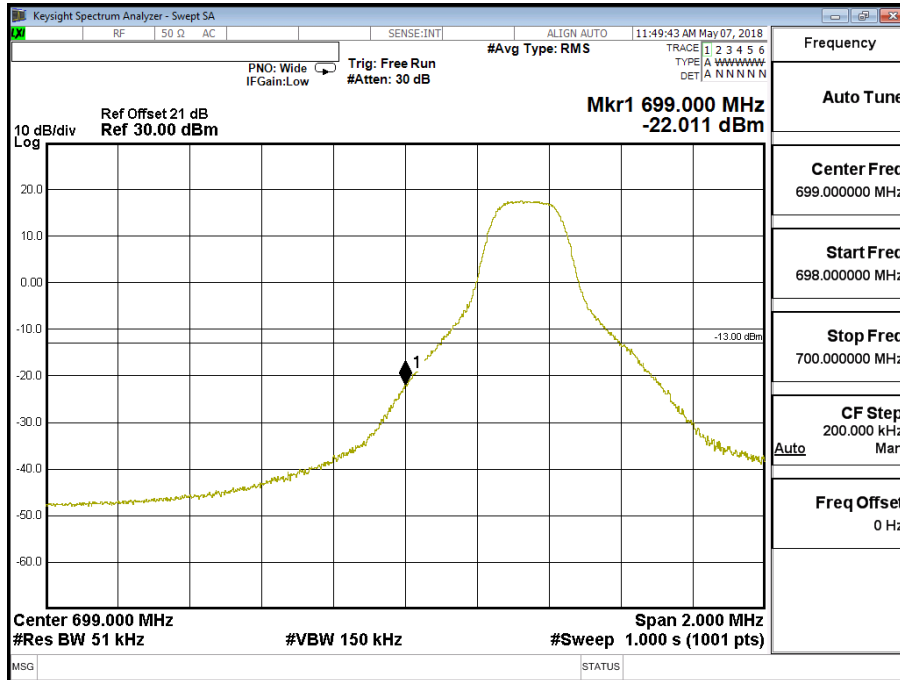
Band 12 (5M) QPSK(25,0) Lower Channel 23035 (701.5MHz)



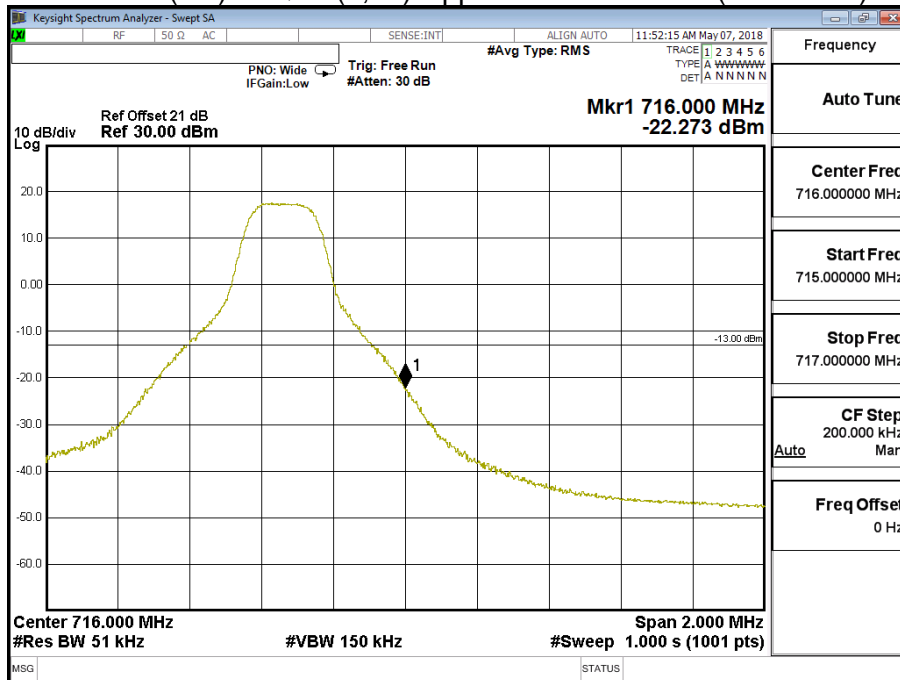
Band 12 (5M) QPSK(25,0) Upper Channel 23155 (713.5MHz)



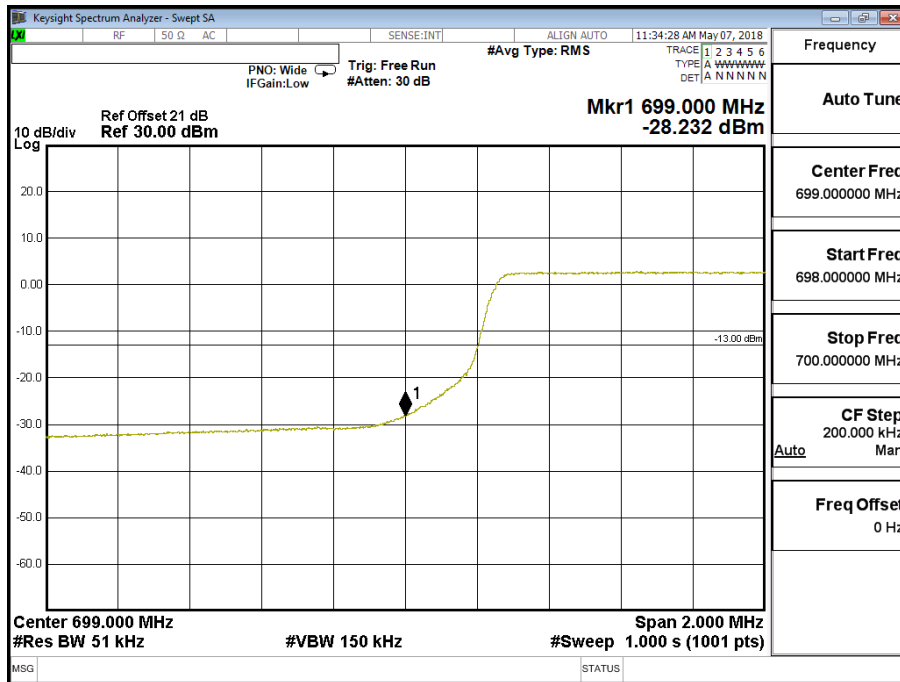
Band 12 (5M) 16QAM(1,0) Lower Channel 23035 (701.5MHz)



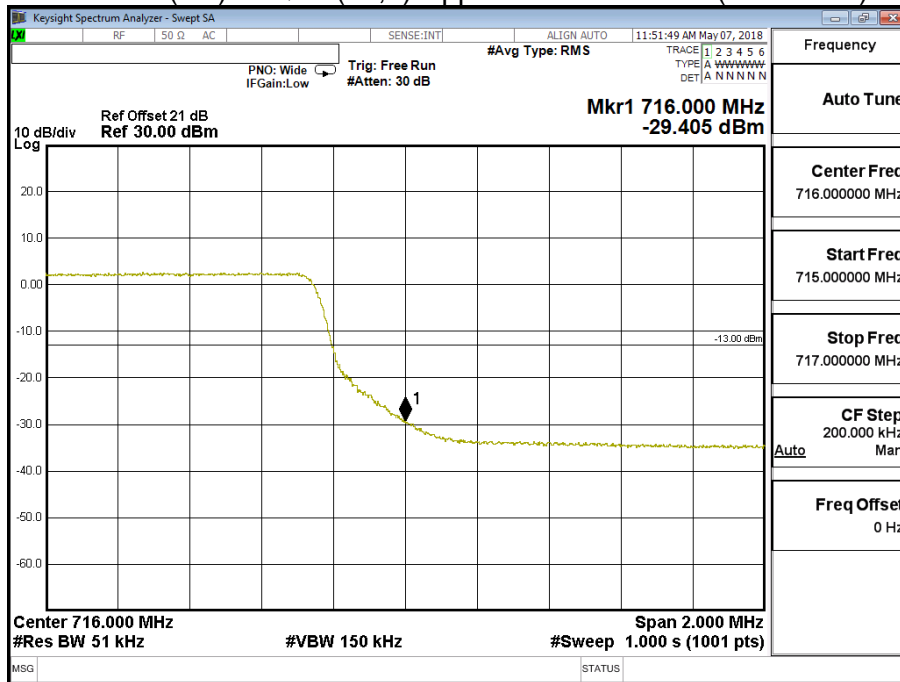
Band 12 (5M) 16QAM(1,24) Upper Channel 23155 (713.5MHz)



Band 12 (5M) 16QAM(25,0) Lower Channel 23035 (701.5MHz)

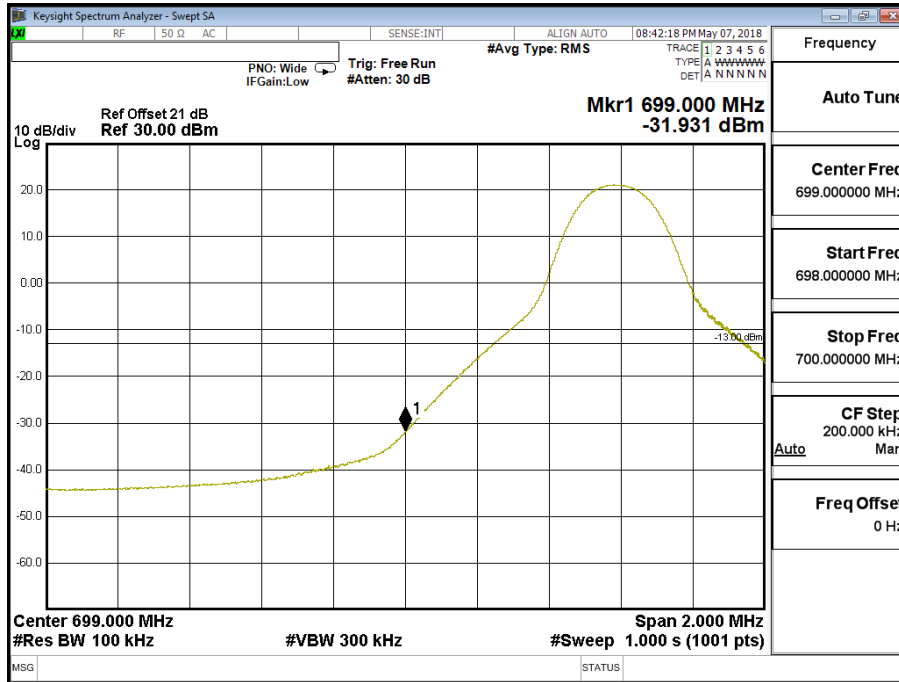


Band 12 (5M) 16QAM(25,0) Upper Channel 23155 (713.5MHz)

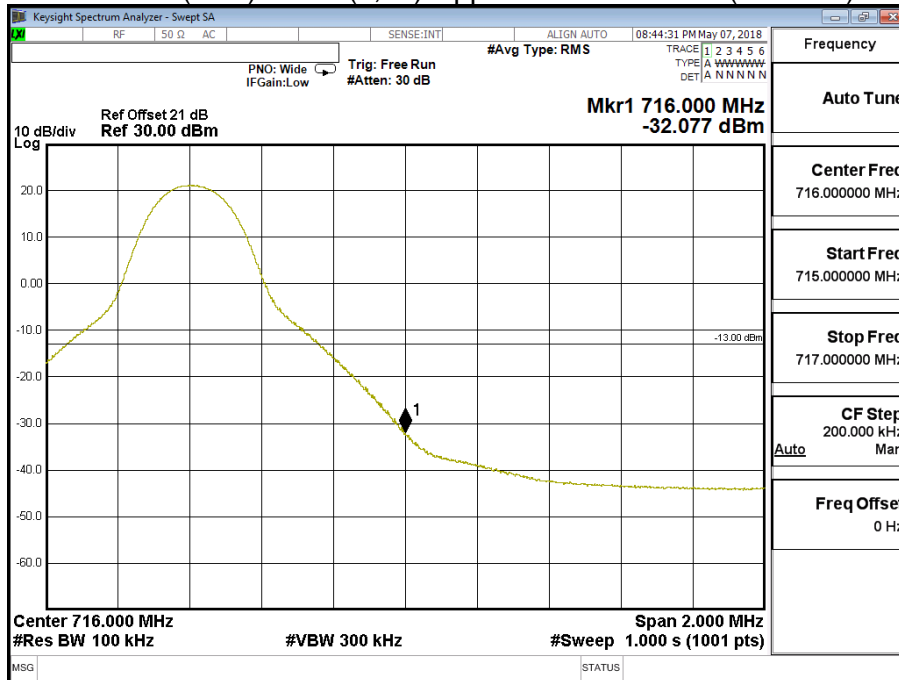


Product	4G/LTE Broadband Router with PoE		
Test Mode	Spurious Emission At Antenna Terminals (+/-1MHz)		
Date of Test	2018/05/07	Test Site	CTR
Test Condition	Block Edge Test (Band 12 (10M))		

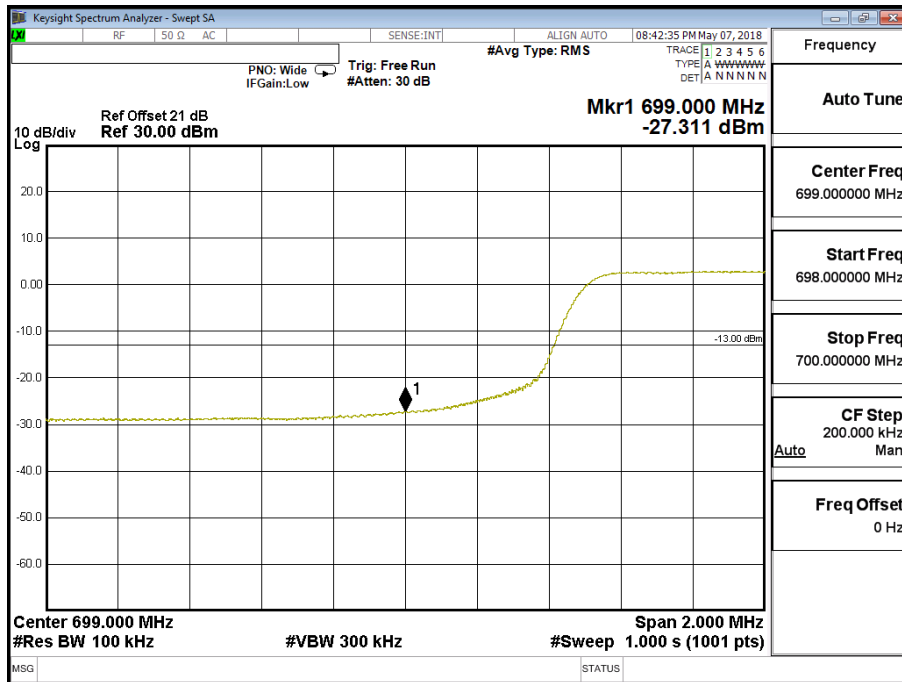
Band 12 (10M) QPSK(1,0) Lower Channel 23060 (704MHz)



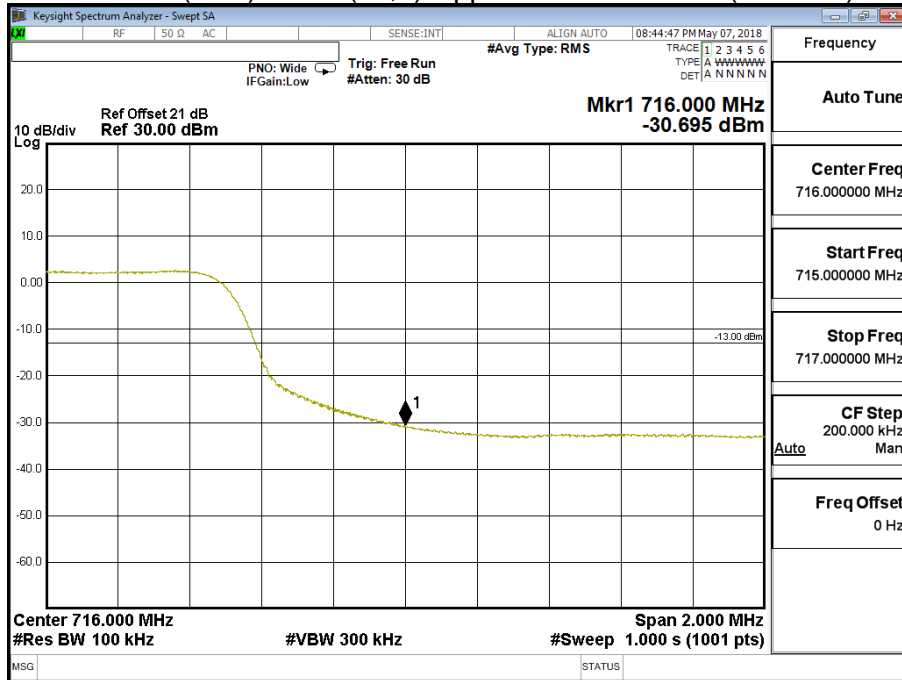
Band 12 (10M) QPSK(1,49) Upper Channel 23130 (711MHz)



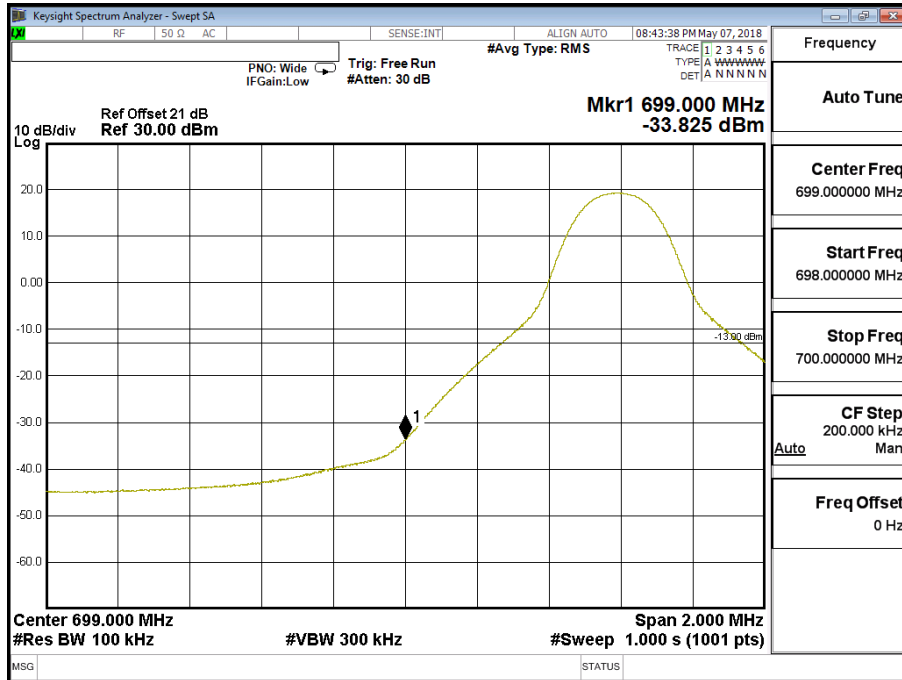
Band 12 (10M) QPSK(50,0) Lower Channel 23060 (704MHz)



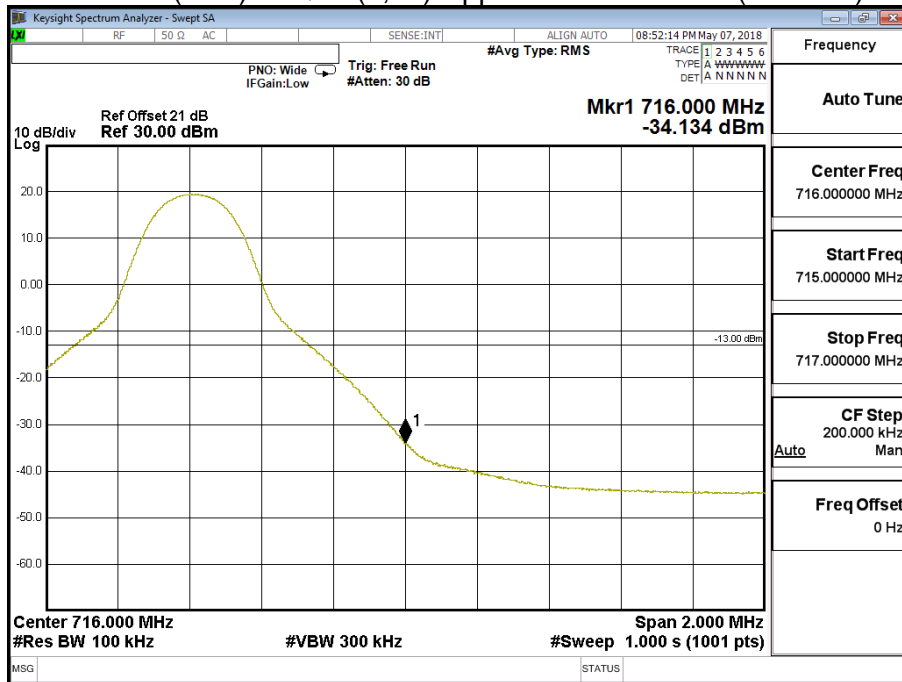
Band 12 (10M) QPSK(50,0) Upper Channel 23130 (711MHz)



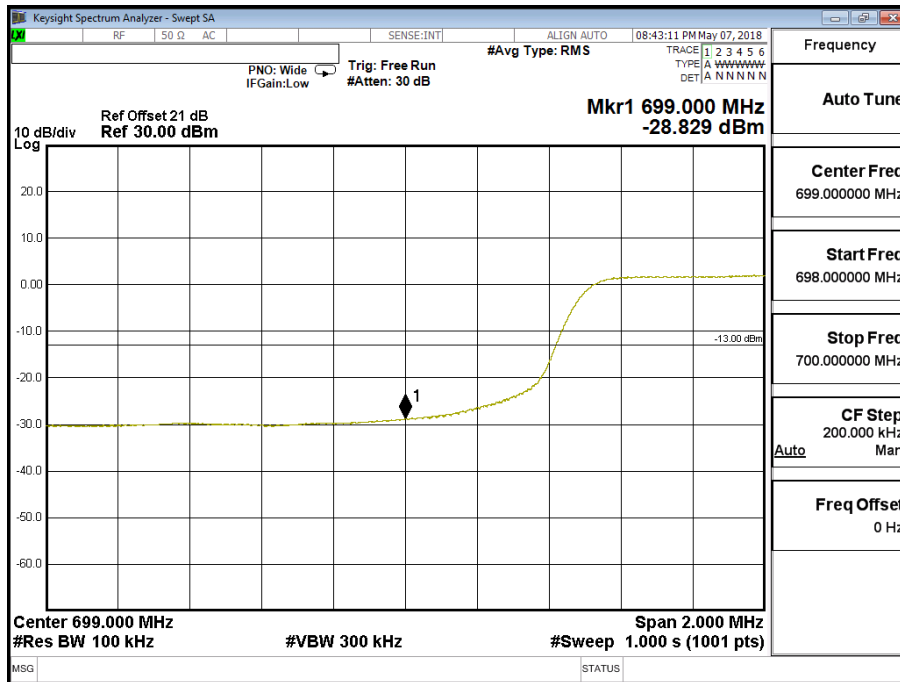
Band 12 (10M) 16QAM(1,0) Lower Channel 23060 (704MHz)



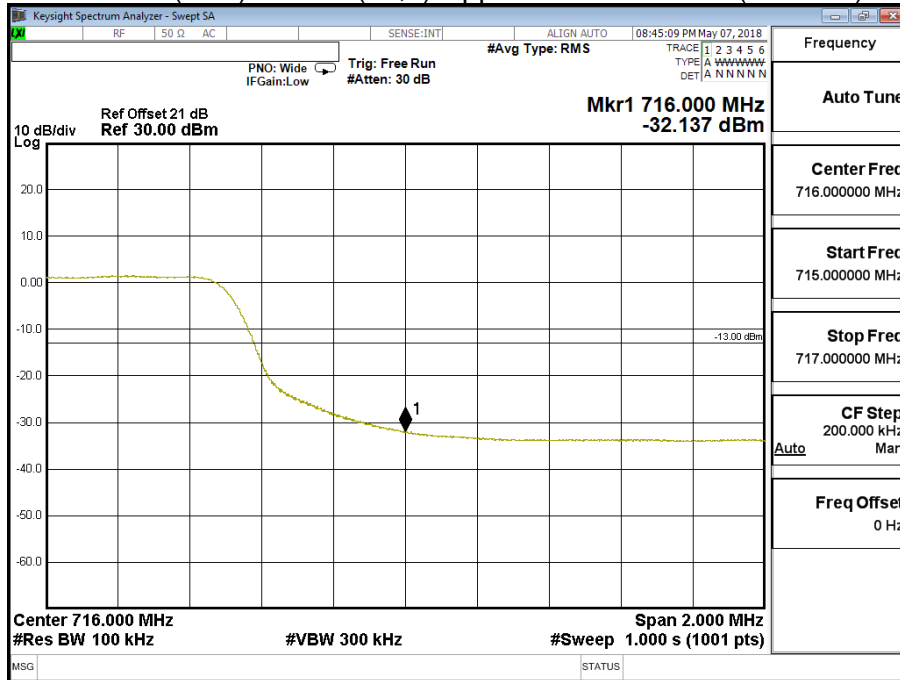
Band 12 (10M) 16QAM(1,49) Upper Channel 23130 (711MHz)



Band 12 (10M) 16QAM(50,0) Lower Channel 23060 (704MHz)



Band 12 (10M) 16QAM(50,0) Upper Channel 23130 (711MHz)



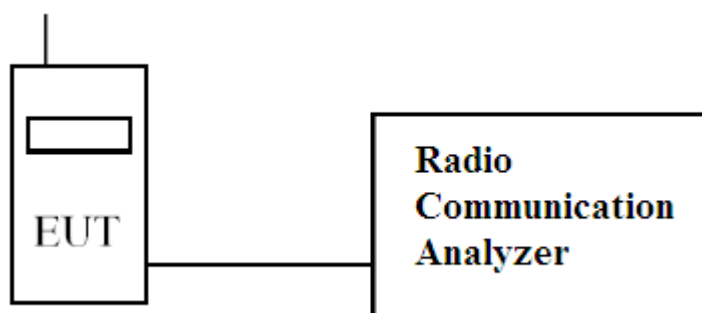
6. Spurious Emission

6.1. Test Specification

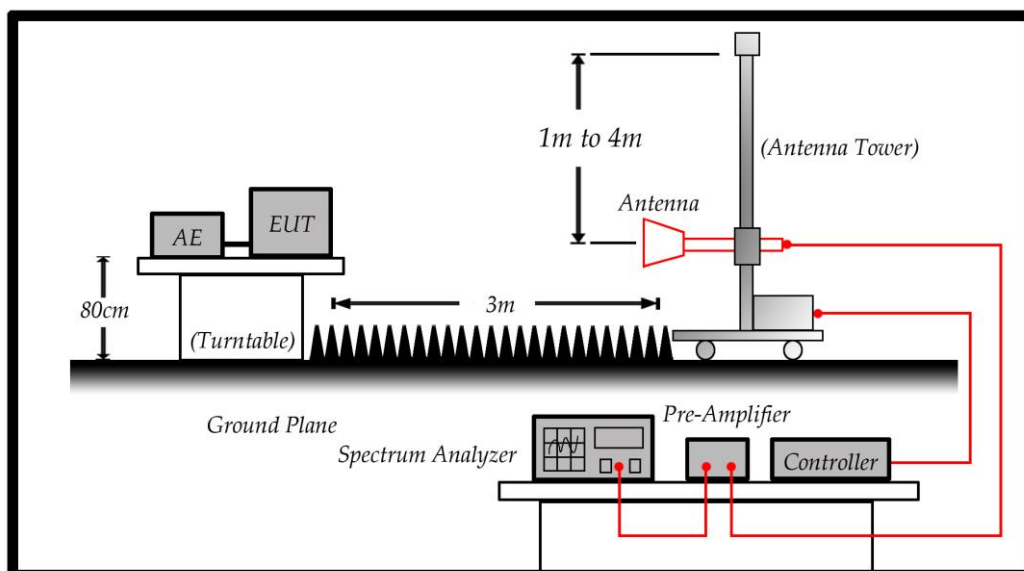
According to Part 2.1051, 2.1053, 27.53

6.2. Test Setup

6.2.1 Spurious emissions at antenna terminals.



6.2.2 Field strength of spurious radiation.



6.3. Limits

Limit	<-13dBm
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43 + 10Log(P) down on the carrier where P is the power in Watts.

6.4. Test Procedure

In accordance with Part 2.1051, 2.1053, 27.53, the spurious emissions from the antenna terminal were measured. The transmitter output power was attenuated using a combination of filters and attenuators and the frequency spectrum investigated from 30MHz to 20GHz. The EUT was set to transmit on full power. The EUT was tested on Low, middle and High channels for both power levels. The resolution and video bandwidth was set to 1MHz/3MHz in accordance with Part 2.1051, 2.1053, 27.53. The spectrum analyzer detector was set to Max Hold. In addition, measurements were made up to the 10th harmonic of the fundamental. The device was then replaced with a substitution antenna, which input signal was adjusted until the received level matched that of the previously detected emission.

- (1) The EUT is tested with maximum rated TX power via the Base Station simulator.
- (2) The EUT is tested in three orthogonal planes, The worst case was showing in this report.

The EUT is placed on a turn table which is 1.5 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

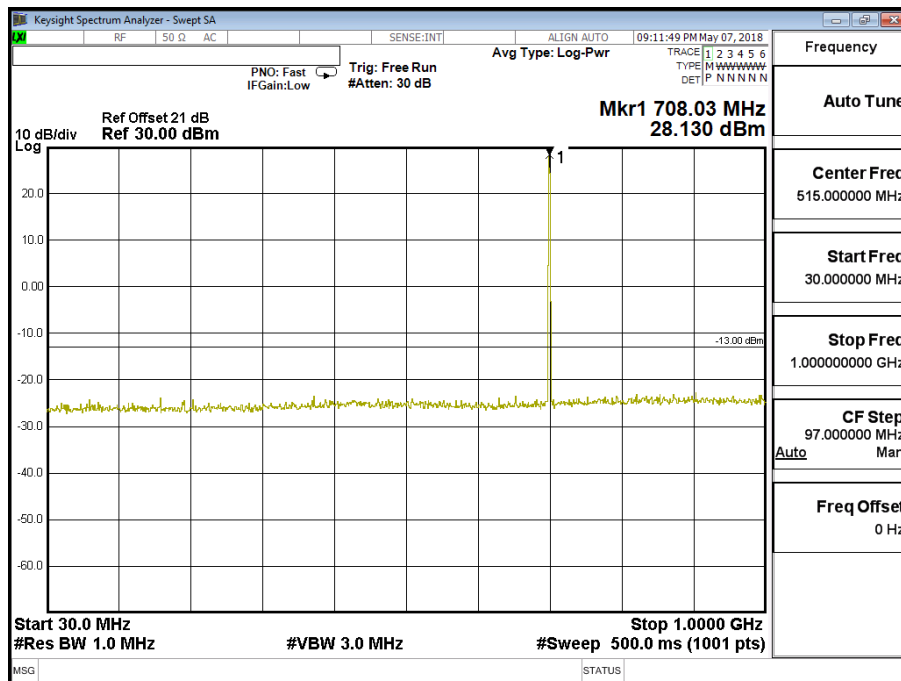
Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to TIA/EIA 603-E on radiated measurement.

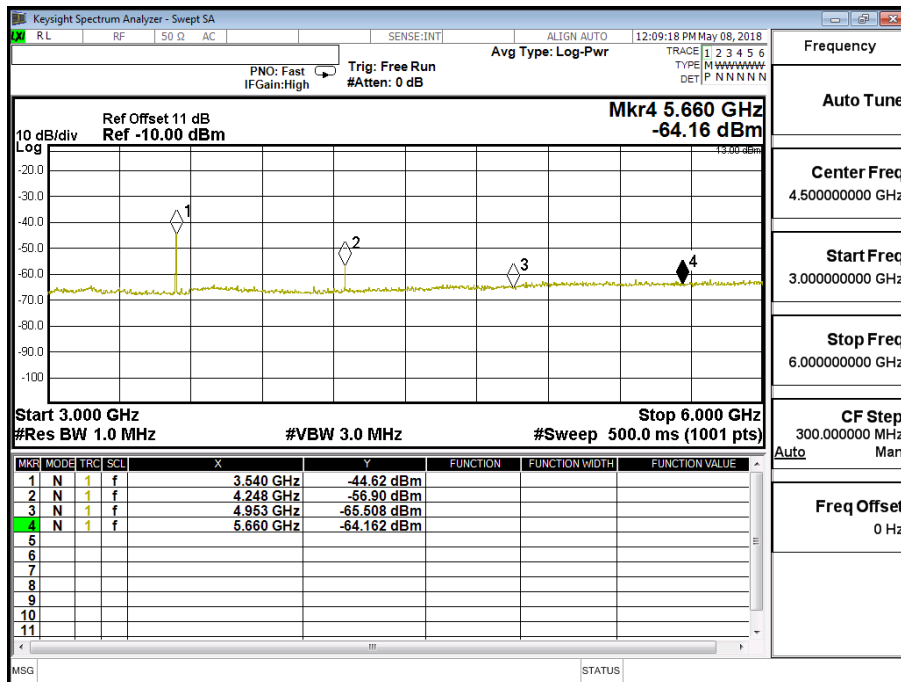
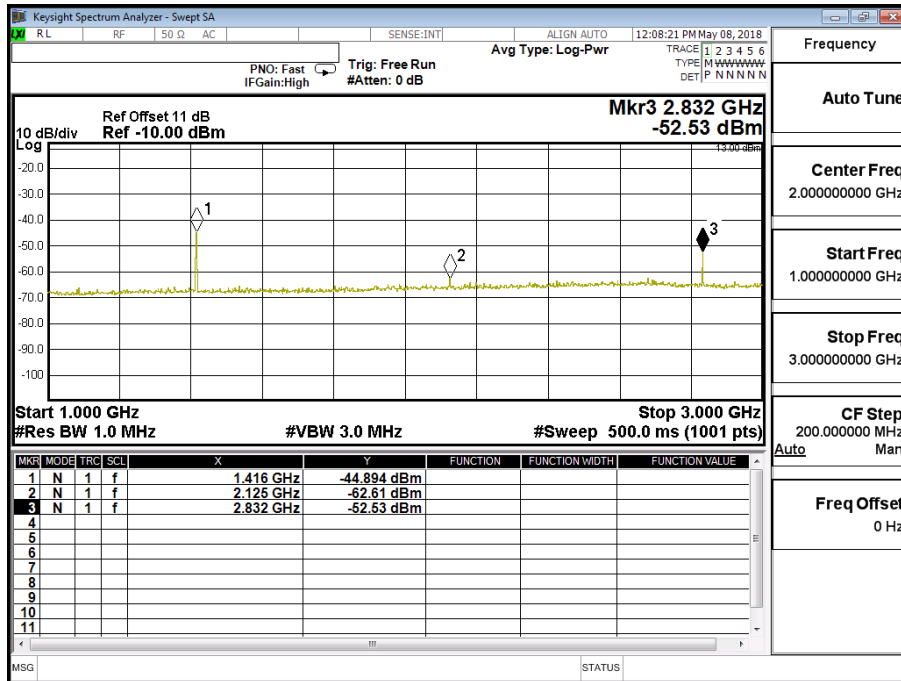
6.5. Test Result of Spurious Emission

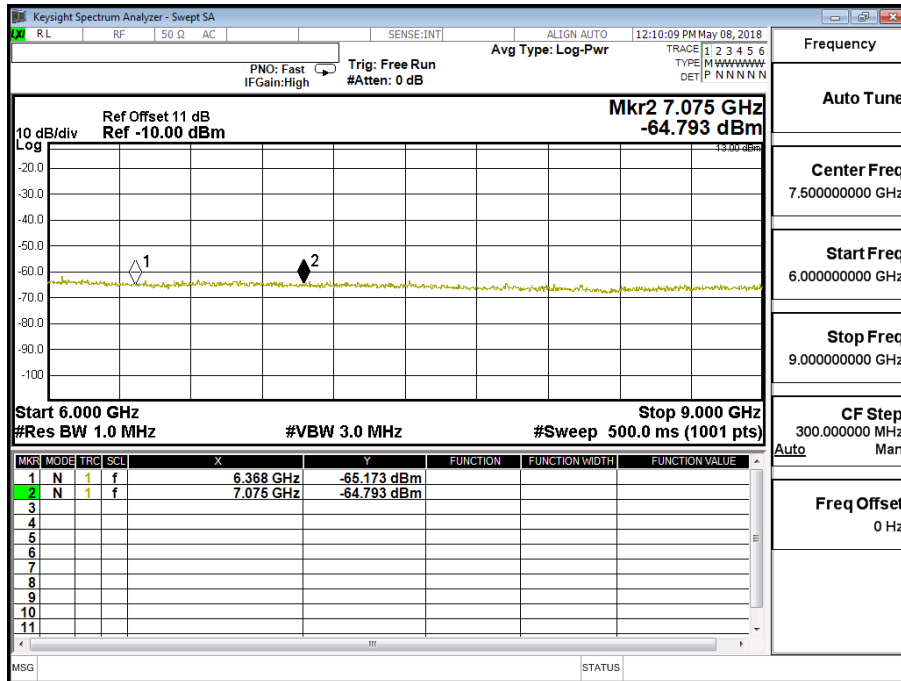
Product	4G/LTE Broadband Router with PoE		
Test Mode	Spurious Emission (Conducted)		
Date of Test	2018/05/15	Test Site	CTR
Test Condition	LTE-Band 12 (1.4M)	Test Range	30MHz~10GHz

LTE-Band 12 (1.4M) QPSK(1,5) CH23095

Frequency (MHz)	Reading Level (dBm)	Path Loss (dB)	Emission Level (dBm)	Limit (dBm)
1416	-44.894	0.58	-44.314	-13
2125	-62.610	0.70	-61.910	-13
2832	-52.530	1.01	-51.520	-13
3540	-44.620	1.18	-43.440	-13
4248	-56.900	1.23	-55.670	-13
4953	-65.508	1.45	-64.058	-13
5660	-64.162	1.56	-62.602	-13
6368	-65.173	1.59	-63.583	-13
7075	-64.793	1.82	-62.973	-13



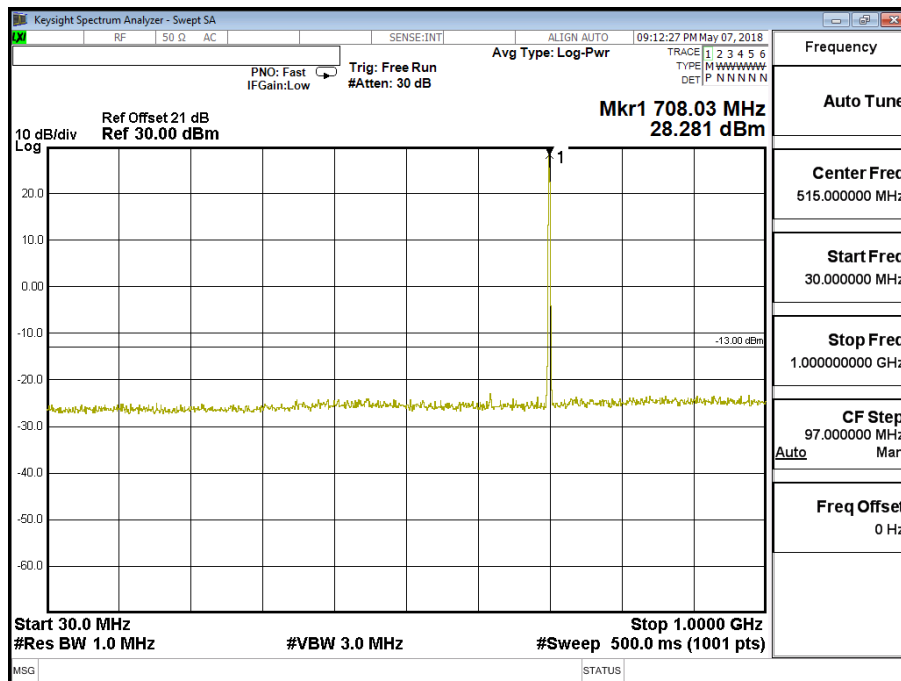


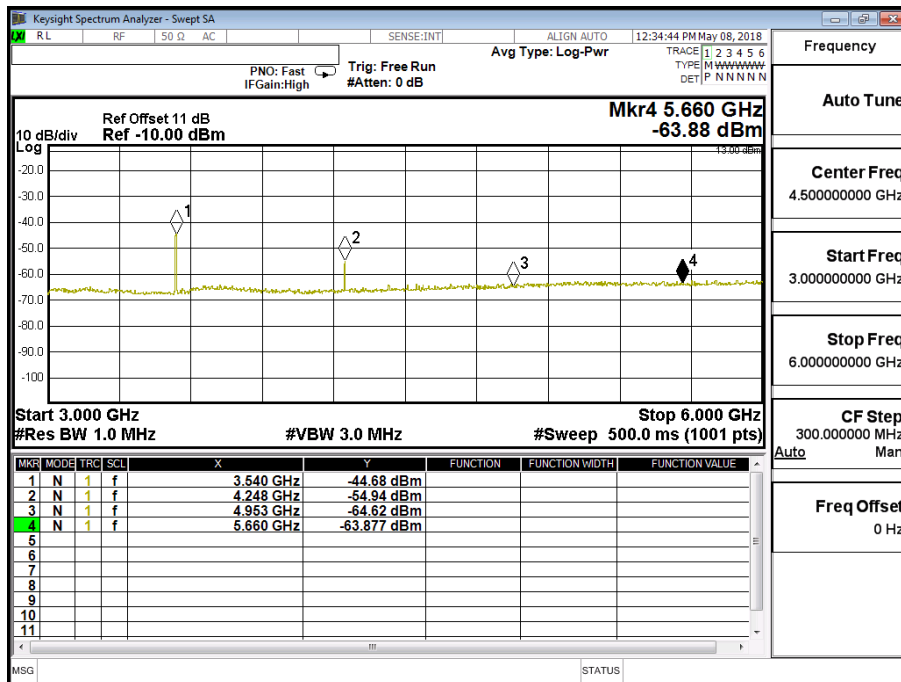
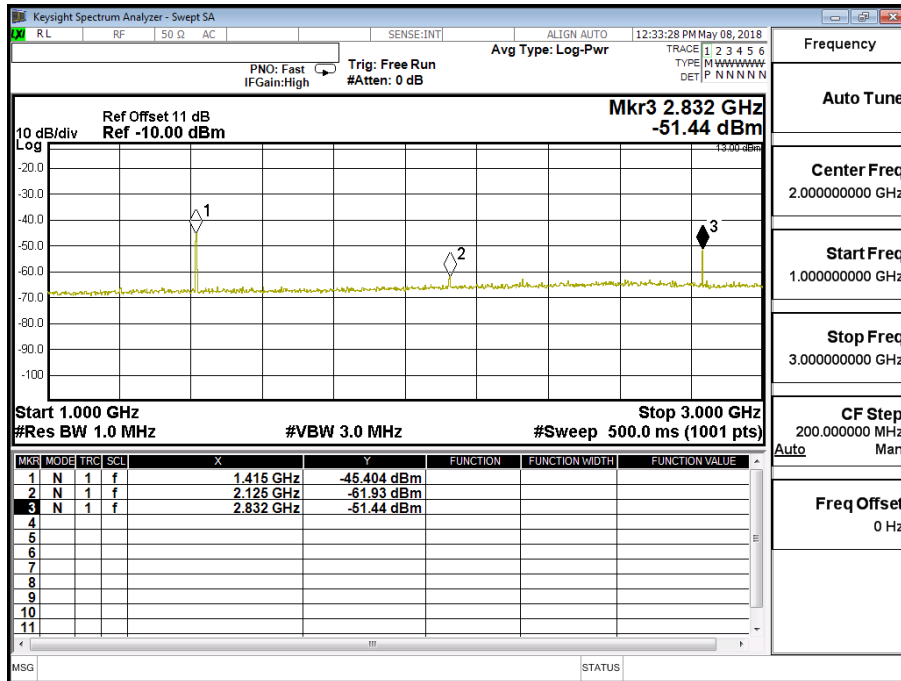


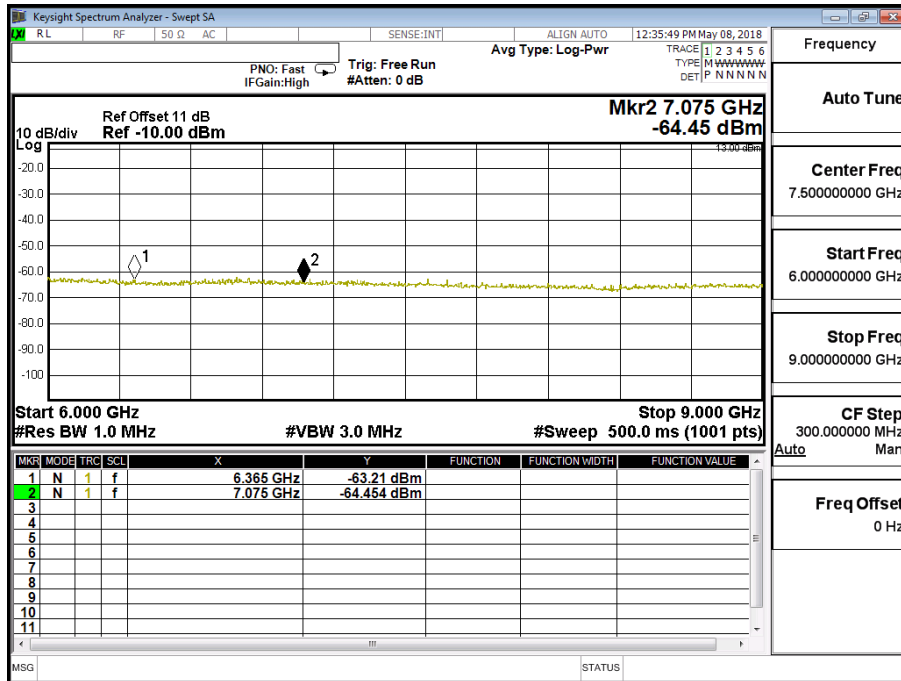
Product	4G/LTE Broadband Router with PoE		
Test Mode	Spurious Emission (Conducted)		
Date of Test	2018/05/15	Test Site	CTR
Test Condition	LTE-Band 12 (1.4M)	Test Range	30MHz~10GHz

LTE-Band 12 (1.4M) 16QAM(3,3) CH23095

Frequency (MHz)	Reading Level (dBm)	Path Loss (dB)	Emission Level (dBm)	Limit (dBm)
1415	-45.404	0.58	-44.824	-13
2125	-61.930	0.70	-61.230	-13
2832	-51.440	1.01	-50.430	-13
3540	-44.680	1.18	-43.500	-13
4248	-54.940	1.23	-53.710	-13
4953	-64.620	1.45	-63.170	-13
5660	-63.877	1.56	-62.317	-13
6365	-63.210	1.59	-61.620	-13
7075	-64.454	1.82	-62.634	-13



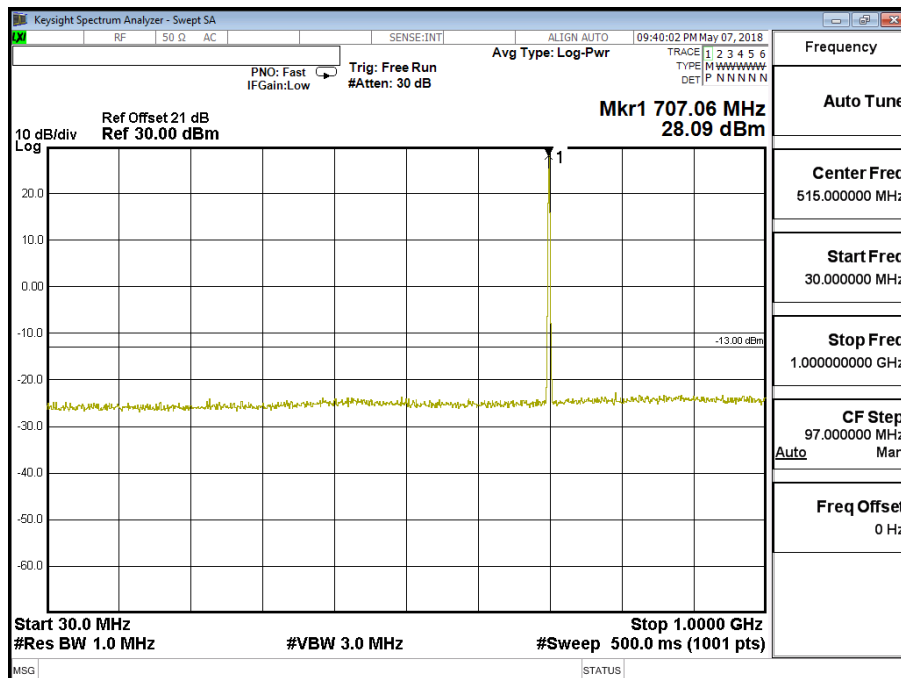


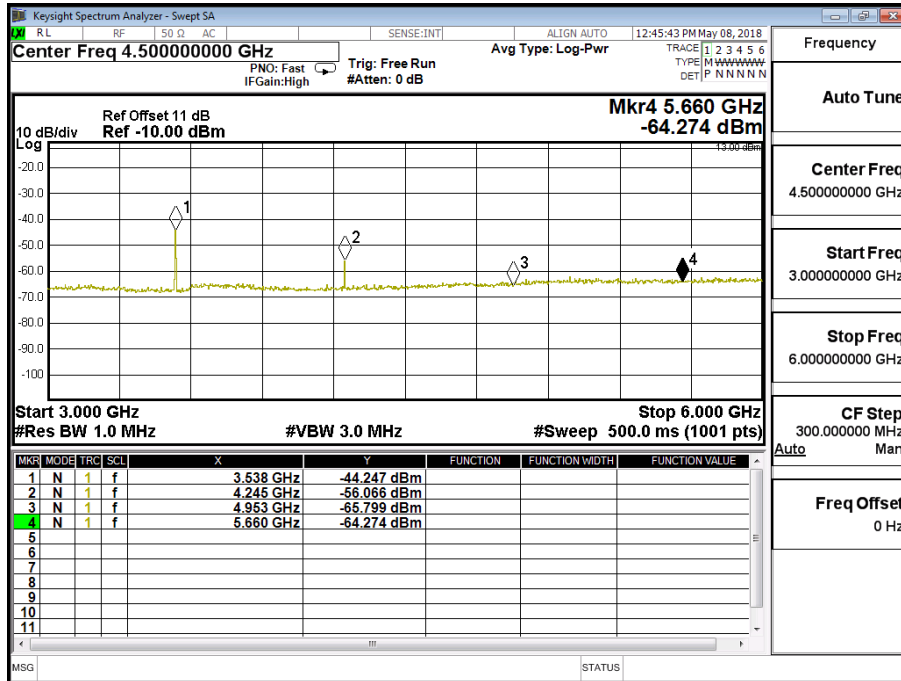
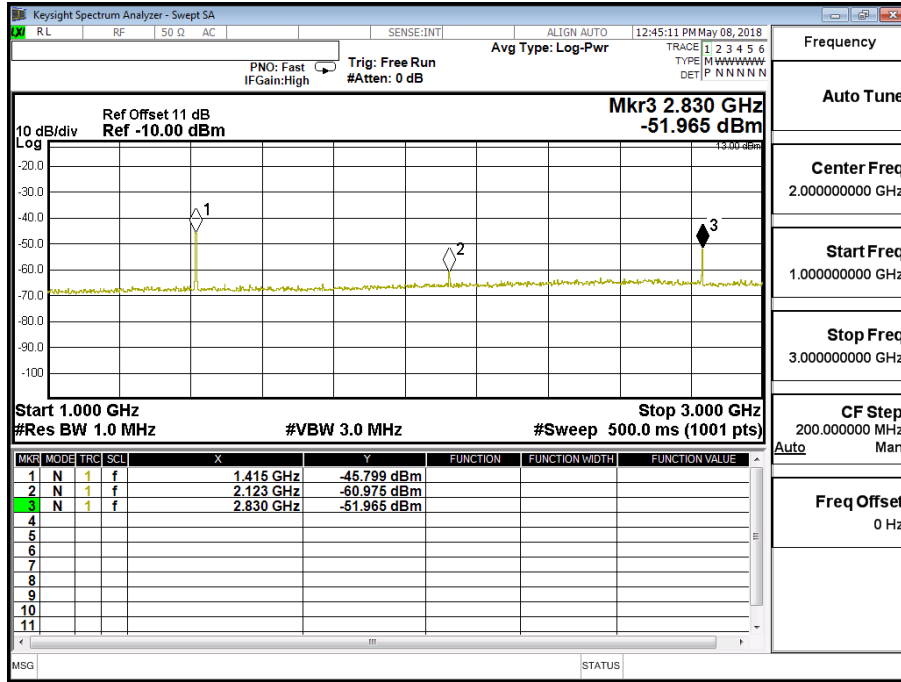


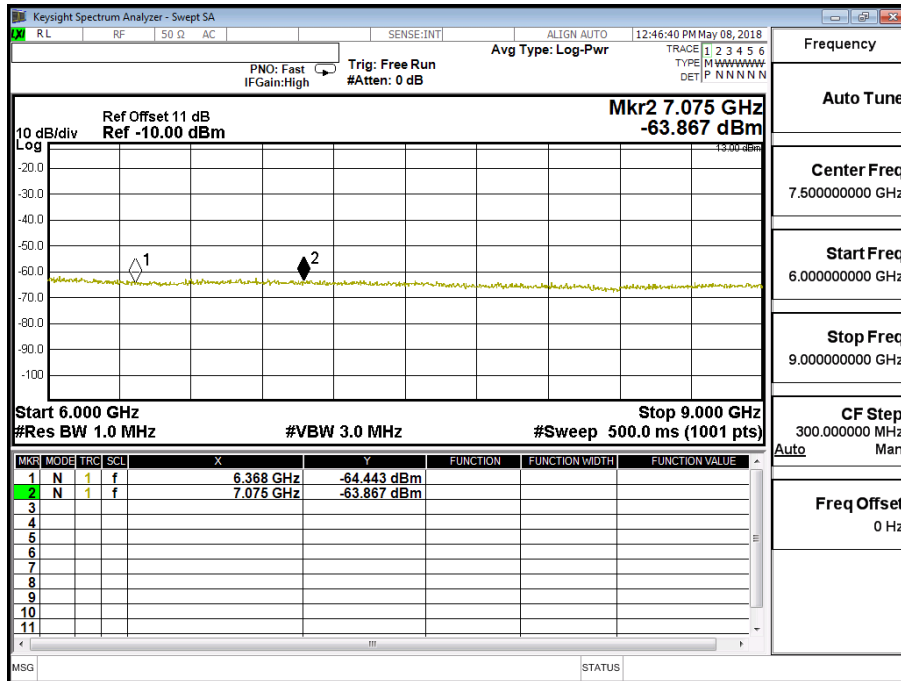
Product	4G/LTE Broadband Router with PoE		
Test Mode	Spurious Emission (Conducted)		
Date of Test	2018/05/15	Test Site	CTR
Test Condition	LTE-Band 12 (3M)	Test Range	30MHz~10GHz

LTE-Band 12 (3M) QPSK(1,7) CH23095

Frequency (MHz)	Reading Level (dBm)	Path Loss (dB)	Emission Level (dBm)	Limit (dBm)
1415	-45.799	0.58	-45.219	-13
2123	-60.975	0.70	-60.275	-13
2830	-51.965	1.01	-50.955	-13
3538	-44.247	1.18	-43.067	-13
4245	-56.066	1.23	-54.836	-13
4953	-65.799	1.45	-64.349	-13
5660	-64.274	1.56	-62.714	-13
6368	-64.443	1.59	-62.853	-13
7075	-63.867	1.82	-62.047	-13



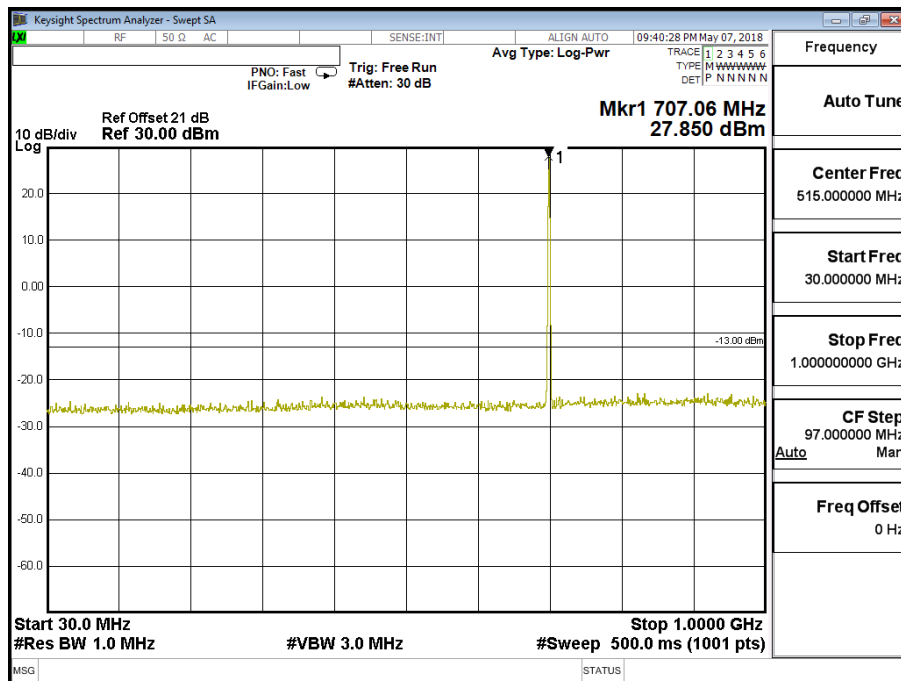


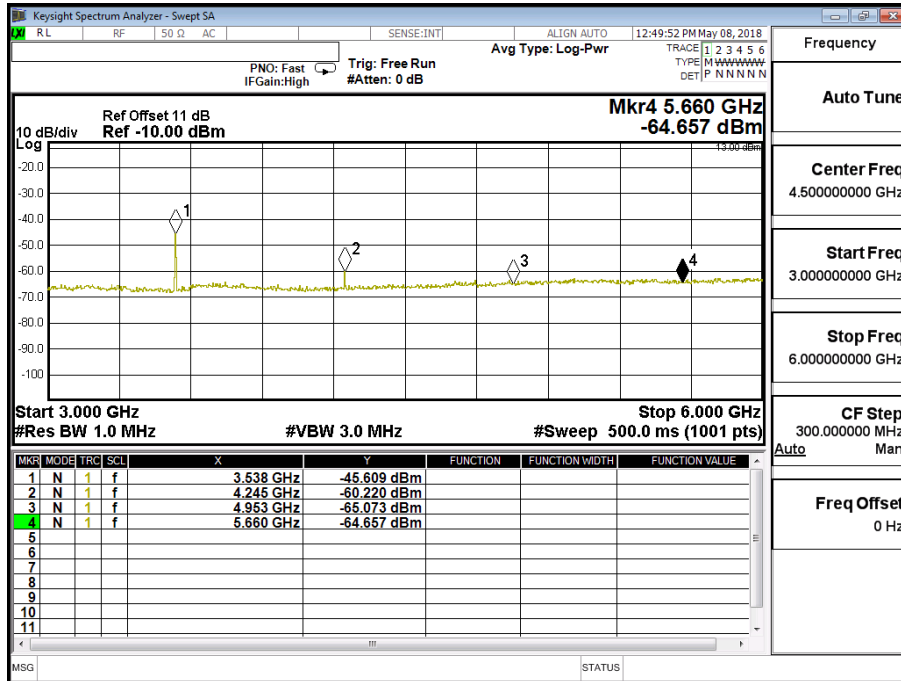
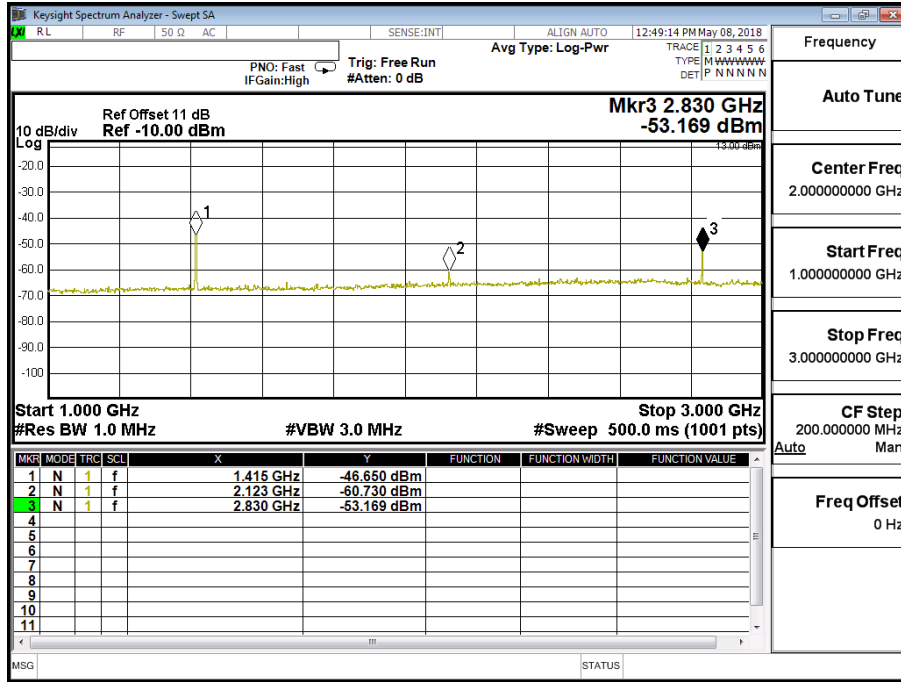


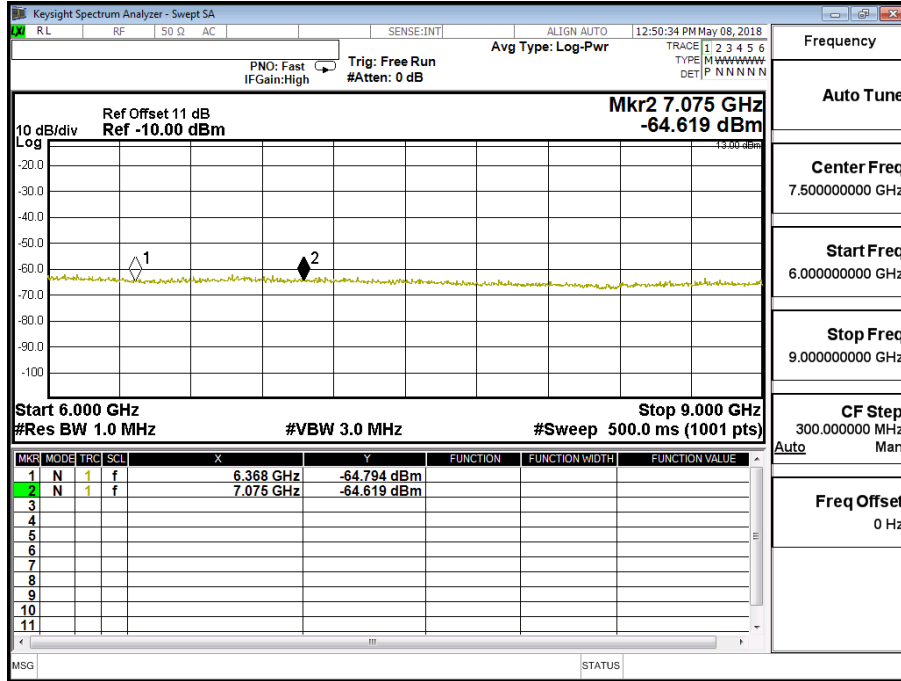
Product	4G/LTE Broadband Router with PoE		
Test Mode	Spurious Emission (Conducted)		
Date of Test	2018/05/15	Test Site	CTR
Test Condition	LTE-Band 12 (3M)	Test Range	30MHz~10GHz

LTE-Band 12 (3M) 16QAM(1,7) CH23095

Frequency (MHz)	Reading Level (dBm)	Path Loss (dB)	Emission Level (dBm)	Limit (dBm)
1415	-46.650	0.58	-46.070	-13
2123	-60.730	0.70	-60.030	-13
2830	-53.169	1.01	-52.159	-13
3538	-45.609	1.18	-44.429	-13
4245	-60.220	1.23	-58.990	-13
4953	-65.073	1.45	-63.623	-13
5660	-64.657	1.56	-63.097	-13
6368	-64.794	1.59	-63.204	-13
7075	-64.619	1.82	-62.799	-13



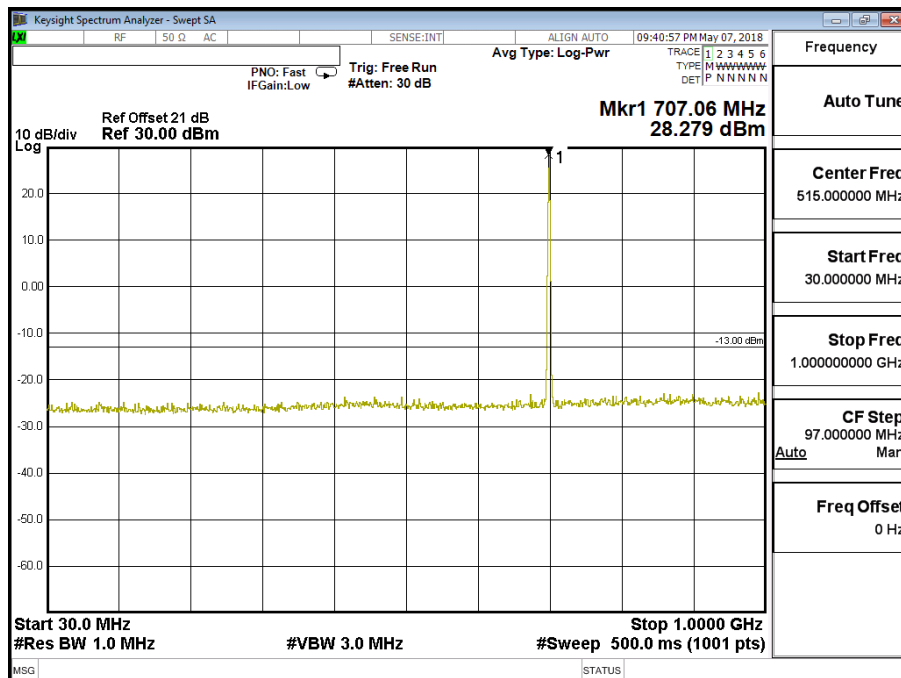


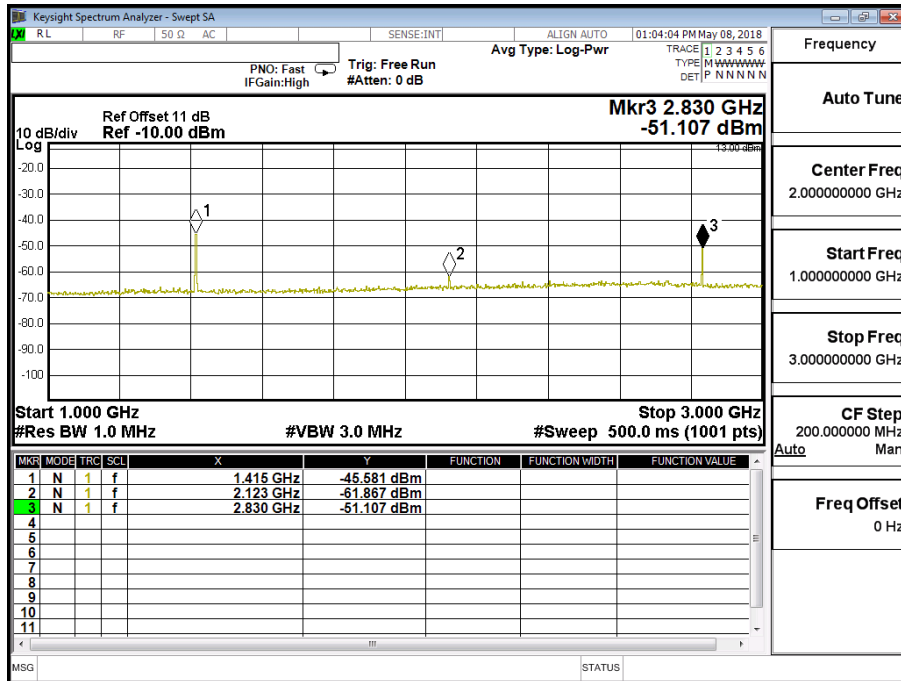


Product	4G/LTE Broadband Router with PoE		
Test Mode	Spurious Emission (Conducted)		
Date of Test	2018/05/15	Test Site	CTR
Test Condition	LTE-Band 12 (5M)	Test Range	30MHz~10GHz

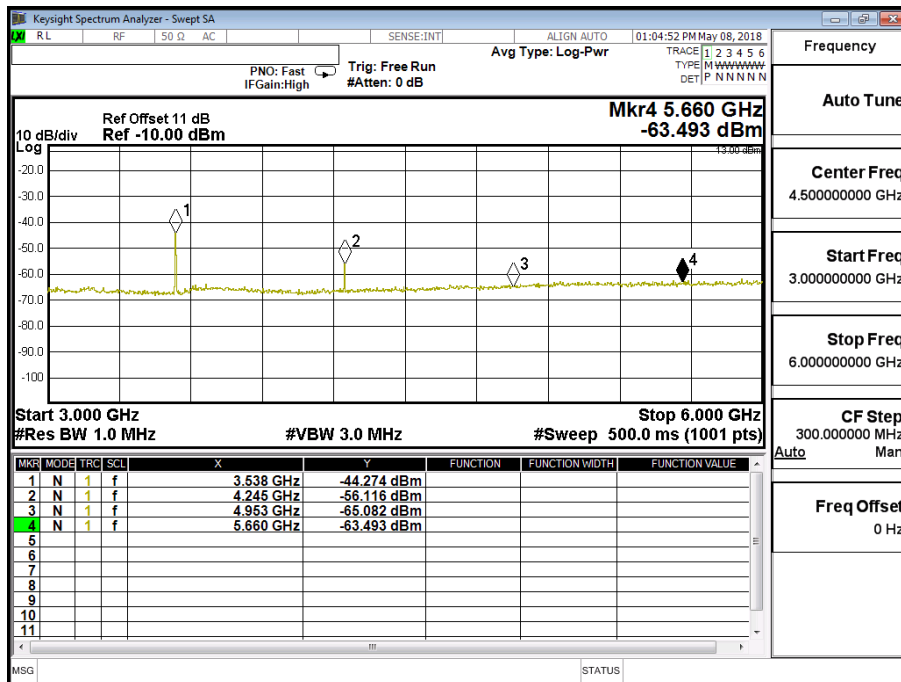
LTE-Band 12 (5M) QPSK(1,12) CH23095

Frequency (MHz)	Reading Level (dBm)	Path Loss (dB)	Emission Level (dBm)	Limit (dBm)
1415	-45.581	0.58	-45.001	-13
2123	-61.867	0.70	-61.167	-13
2830	-51.107	1.01	-50.097	-13
3538	-44.274	1.18	-43.094	-13
4245	-56.116	1.23	-54.886	-13
4953	-65.082	1.45	-63.632	-13
5660	-63.493	1.56	-61.933	-13
6368	-64.729	1.59	-63.139	-13
7075	-64.328	1.82	-62.508	-13

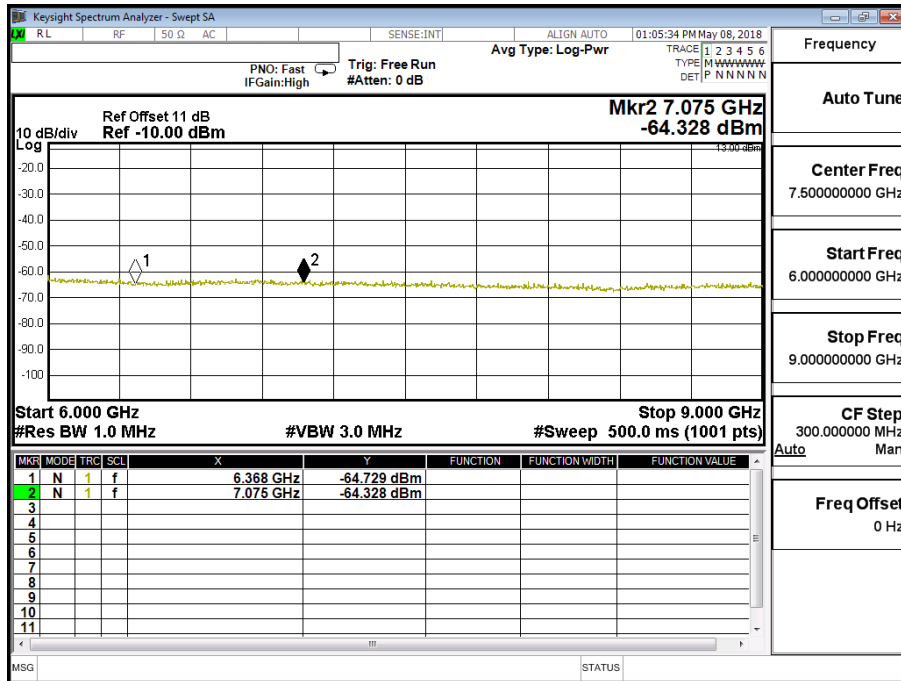




Frequency	
Auto Tune	
Center Freq	2.000000000 GHz
Start Freq	1.000000000 GHz
Stop Freq	3.000000000 GHz
CF Step	200.000000 MHz
Freq Offset	0 Hz



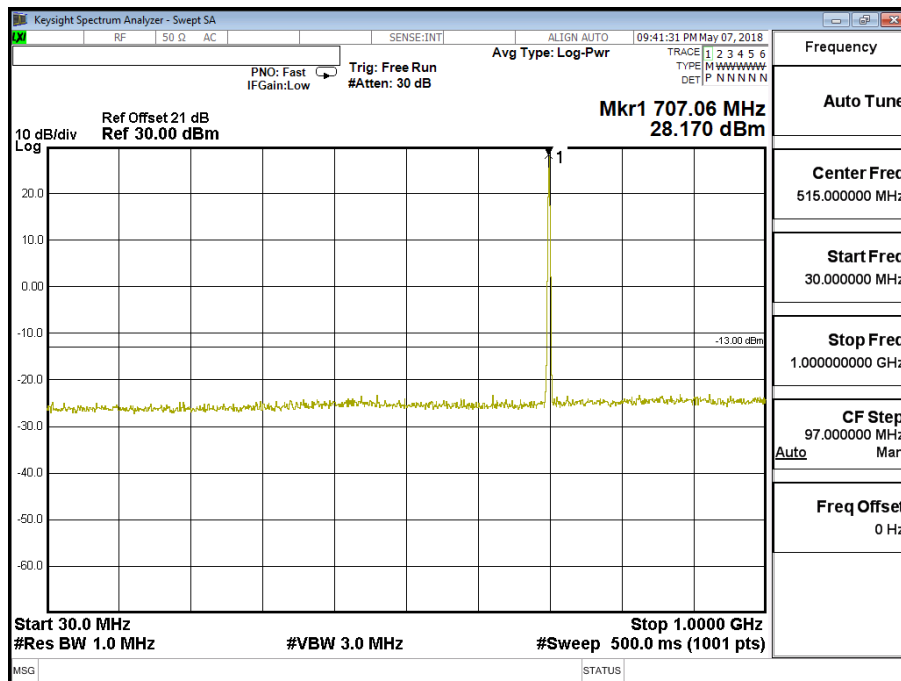
Frequency	
Auto Tune	
Center Freq	4.500000000 GHz
Start Freq	3.000000000 GHz
Stop Freq	6.000000000 GHz
CF Step	300.000000 MHz
Freq Offset	0 Hz

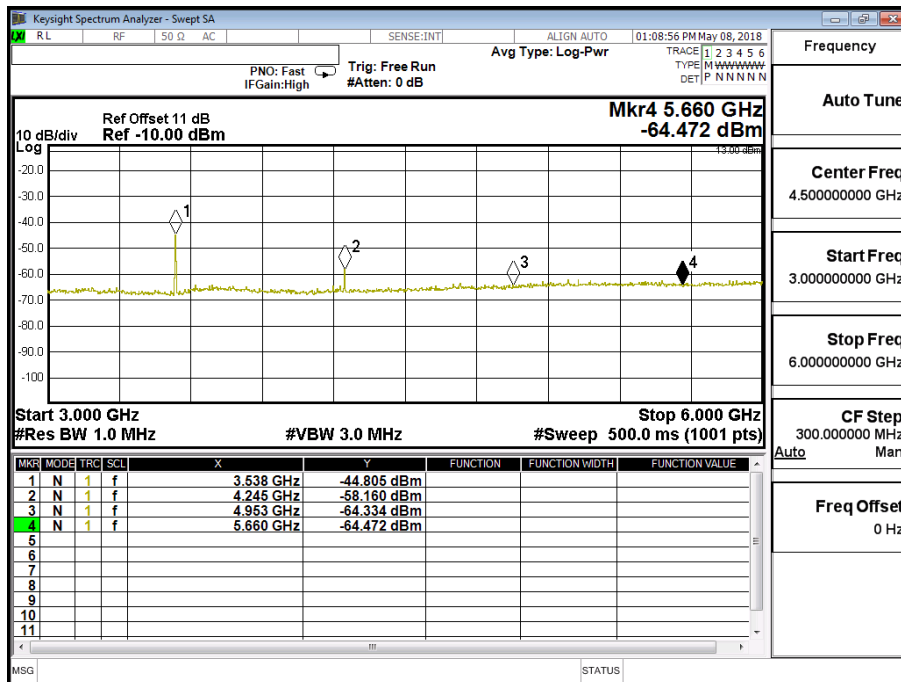
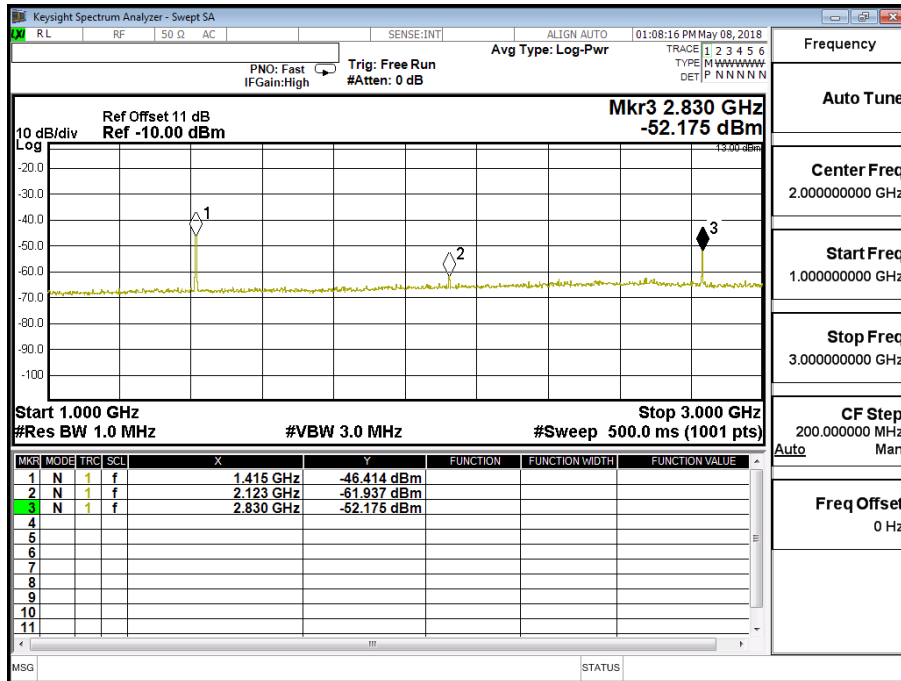


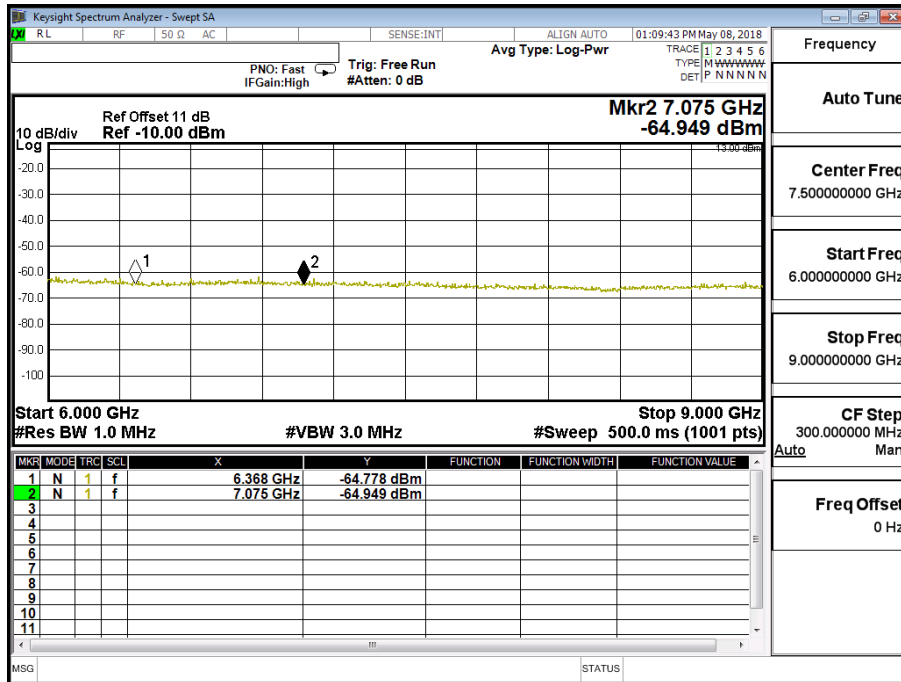
Product	4G/LTE Broadband Router with PoE		
Test Mode	Spurious Emission (Conducted)		
Date of Test	2018/05/15	Test Site	CTR
Test Condition	LTE-Band 12 (5M)	Test Range	30MHz~10GHz

LTE-Band 12 (5M) 16QAM(1,12) CH23095

Frequency (MHz)	Reading Level (dBm)	Path Loss (dB)	Emission Level (dBm)	Limit (dBm)
1415	-46.414	0.58	-45.834	-13
2123	-61.937	0.70	-61.237	-13
2830	-52.175	1.01	-51.165	-13
3538	-44.805	1.18	-43.625	-13
4245	-58.160	1.23	-56.930	-13
4953	-64.334	1.45	-62.884	-13
5660	-64.472	1.56	-62.912	-13
6368	-64.778	1.59	-63.188	-13
7075	-64.949	1.82	-63.129	-13



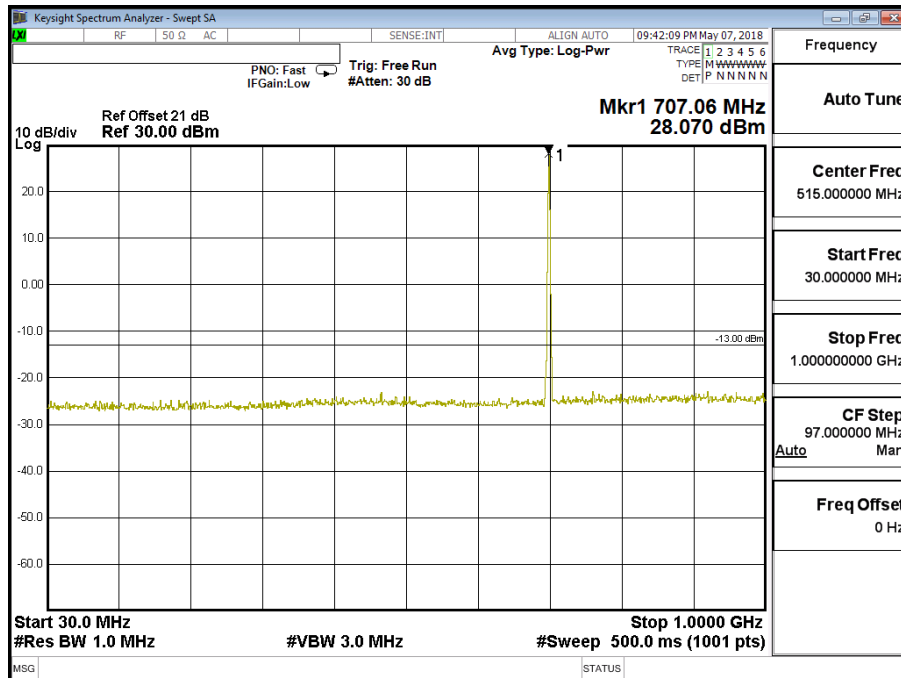


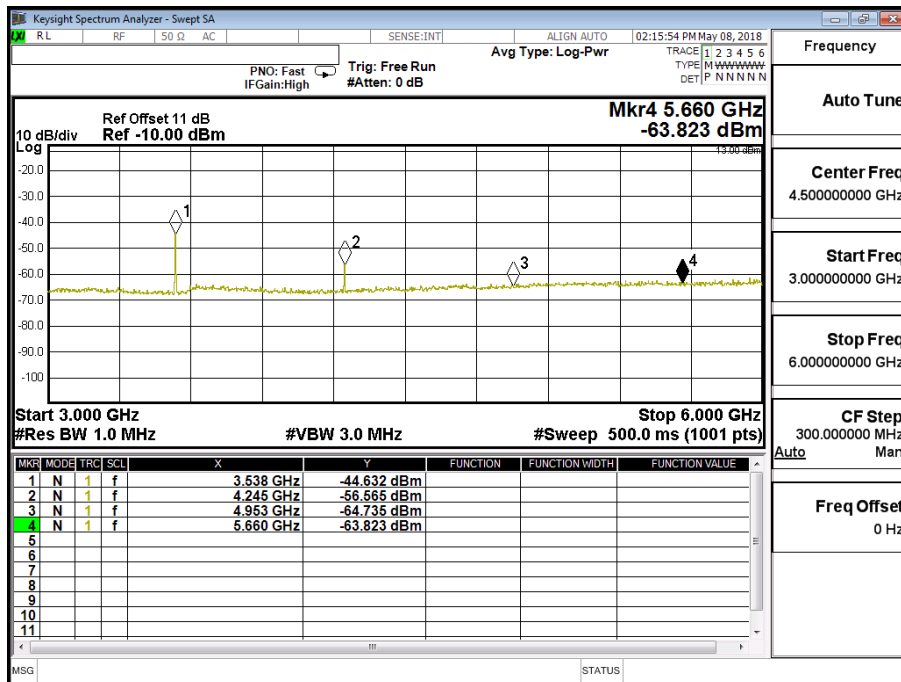
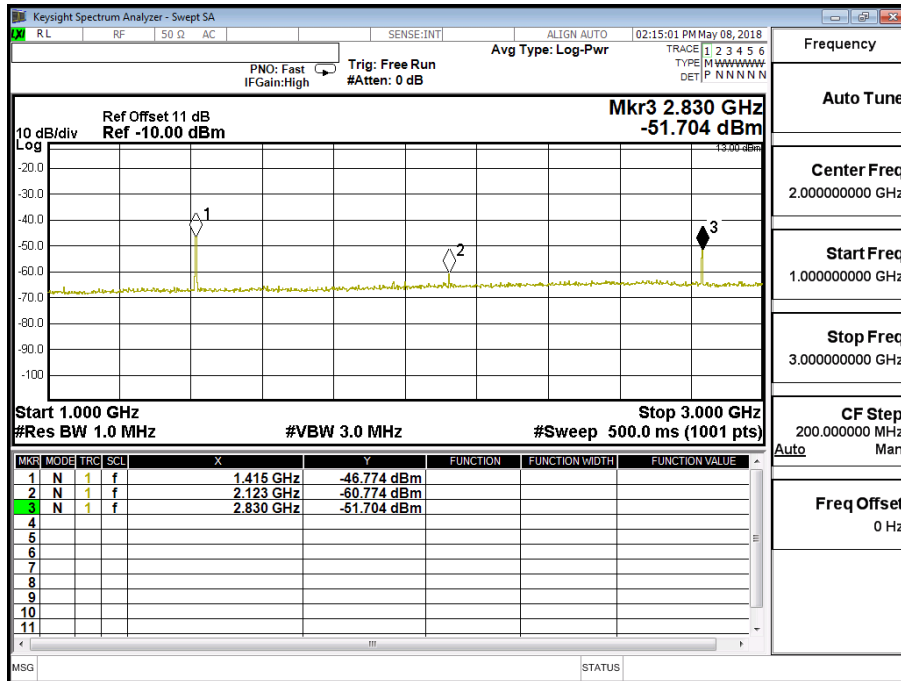


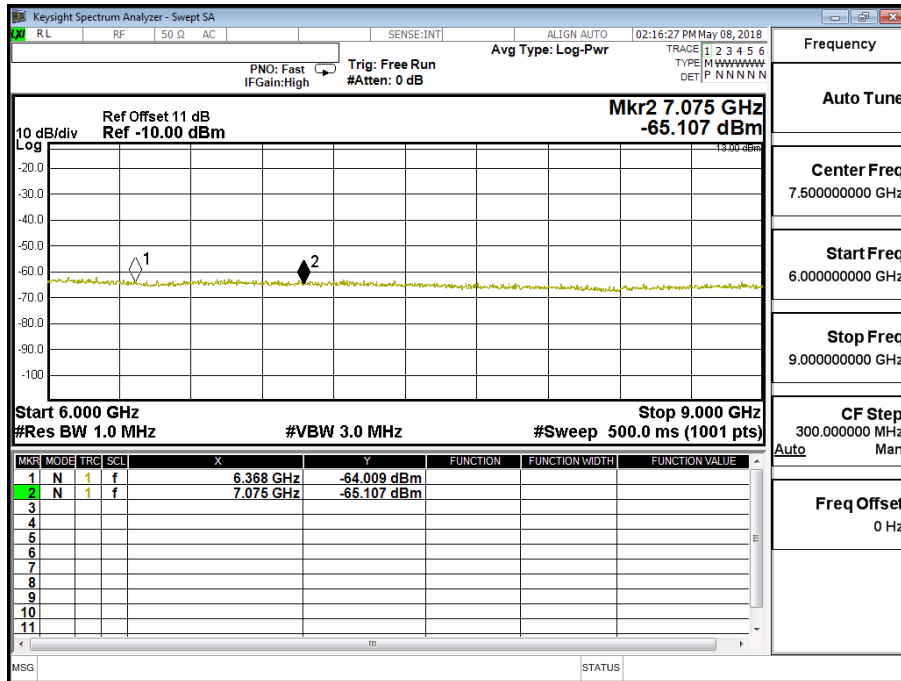
Product	4G/LTE Broadband Router with PoE		
Test Mode	Spurious Emission (Conducted)		
Date of Test	2018/05/15	Test Site	CTR
Test Condition	LTE-Band 12 (10M)	Test Range	30MHz~10GHz

LTE-Band 12 (10M) QPSK(1,24) CH23095

Frequency (MHz)	Reading Level (dBm)	Path Loss (dB)	Emission Level (dBm)	Limit (dBm)
1415	-46.774	0.58	-46.194	-13
2123	-60.774	0.70	-60.074	-13
2830	-51.704	1.01	-50.694	-13
3538	-44.632	1.18	-43.452	-13
4245	-56.565	1.23	-55.335	-13
4953	-64.735	1.45	-63.285	-13
5660	-63.823	1.56	-62.263	-13
6368	-64.009	1.59	-62.419	-13
7075	-65.107	1.82	-63.287	-13



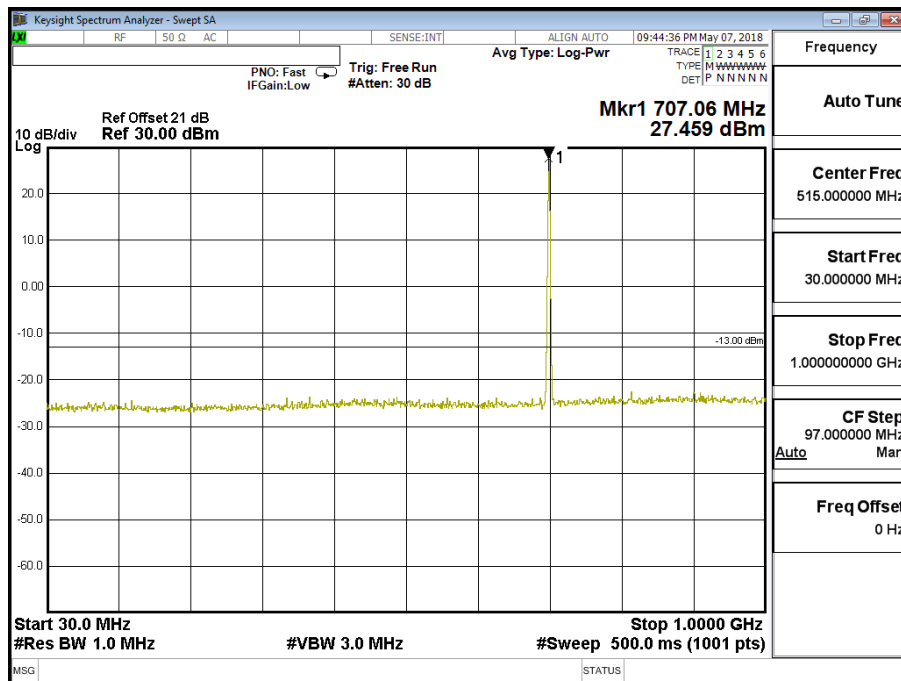


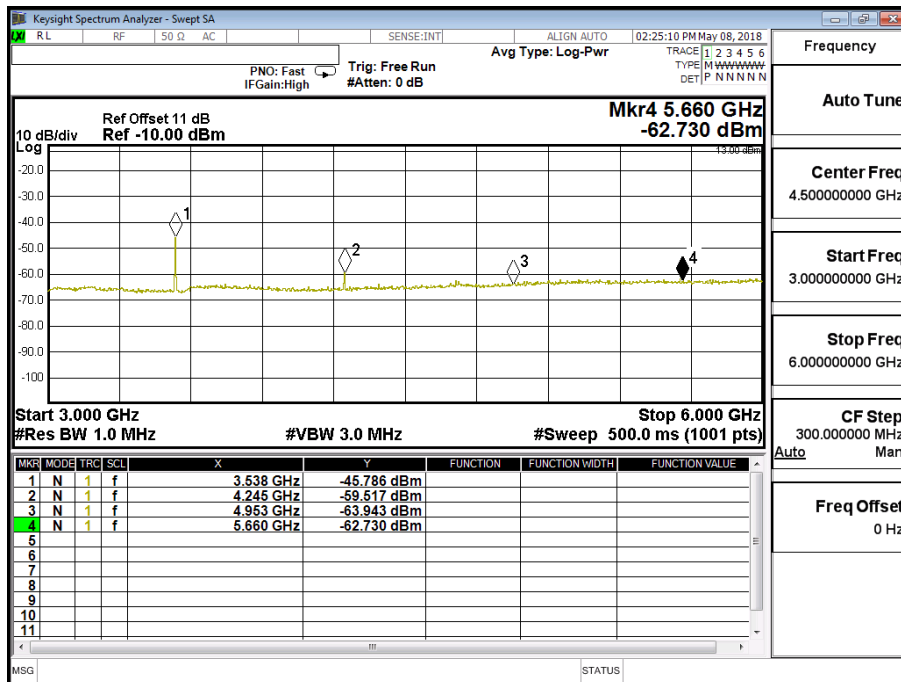
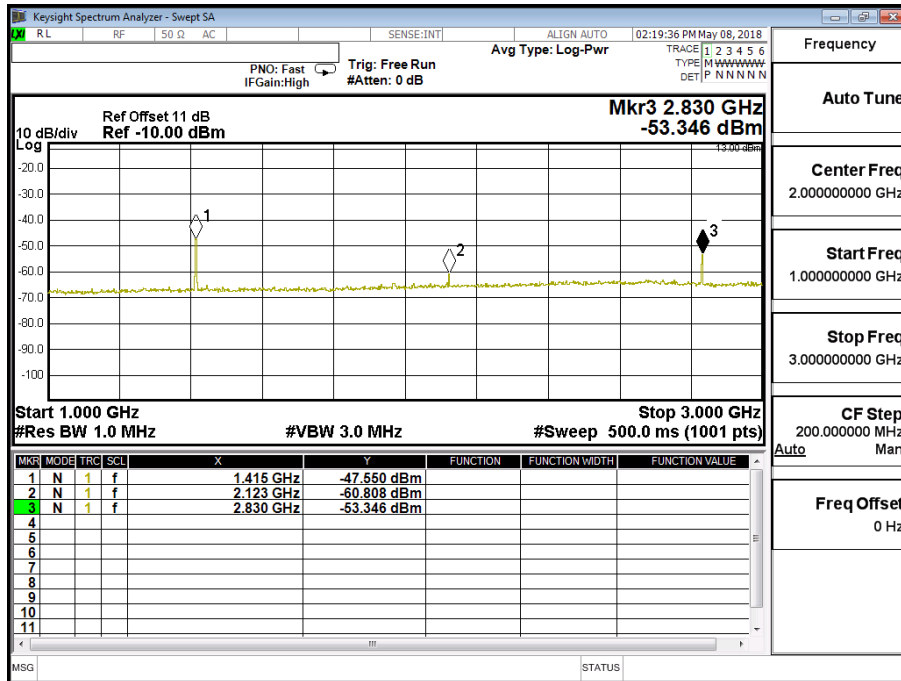


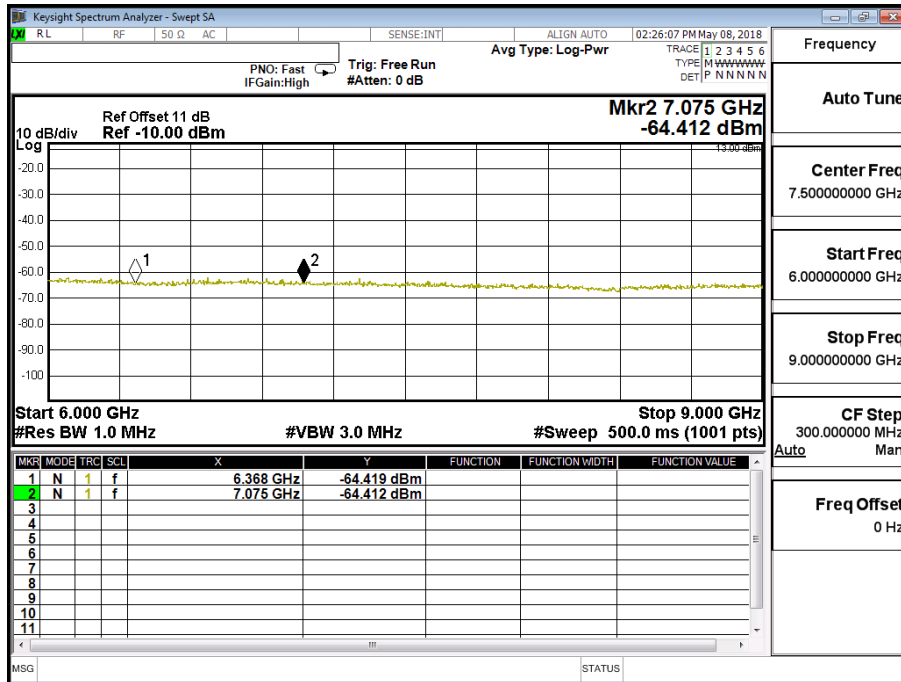
Product	4G/LTE Broadband Router with PoE		
Test Mode	Spurious Emission (Conducted)		
Date of Test	2018/05/15	Test Site	CTR
Test Condition	LTE-Band 12 (10M)	Test Range	30MHz~10GHz

LTE-Band 12 (10M) 16QAM(1,24) CH23095

Frequency (MHz)	Reading Level (dBm)	Path Loss (dB)	Emission Level (dBm)	Limit (dBm)
1415	-47.550	0.58	-46.970	-13
2123	-60.808	0.70	-60.108	-13
2830	-53.346	1.01	-52.336	-13
3538	-45.786	1.18	-44.606	-13
4245	-59.517	1.23	-58.287	-13
4953	-63.943	1.45	-62.493	-13
5660	-62.730	1.56	-61.170	-13
6368	-64.419	1.59	-62.829	-13
7075	-64.412	1.82	-62.592	-13







Product	4G/LTE Broadband Router with PoE		
Test Mode	Spurious Emission (Radiated)		
Date of Test	2018/05/15	Test Site	Site3
Test Condition	Band 12 (1.4M) QPSK(1,5)	Test Range	9KHz ~20GHz

Frequency	Reading Level	Signal Generator Level	Cable Loss	Antenna Gain	EIRP Value	Limit
(GHz)	(dBm)	(dBm)	(dB)	(dBi)	(dBm)	(dBm)

Horizontal Emissions Band 12 (1.4M) QPSK(1,5)

1415	-43.175	-47.633	1.630	9.800	-39.463	-13
2123	-64.598	-65.085	2.100	10.600	-56.585	-13
2830	-64.147	-65.984	2.350	12.300	-56.034	-13
3538	-62.106	-62.550	2.700	12.600	-52.650	-13
4245	-62.156	-60.194	2.830	12.700	-50.324	-13
4953	-63.567	-59.374	3.200	13.000	-49.574	-13

Vertical Emissions Band 12 (1.4M) QPSK(1,5)

1415	-42.777	-46.185	1.630	9.800	-38.015	-13
2123	-62.186	-62.871	2.100	10.600	-54.371	-13
2830	-60.046	-60.618	2.350	12.300	-50.668	-13
3538	-59.677	-58.624	2.700	12.600	-48.724	-13
4245	-63.081	-60.161	2.830	12.700	-50.291	-13
4953	-63.518	-58.744	3.200	13.000	-48.944	-13

Note:

1. Receiver setting (Peak Detector) : RBW:1MHz; VBW:3MHz
2. EIRP Value = Signal Generator Level + Antenna Gain - Cable Loss
3. Spurious emissions past 5 GHz are not shown, due to the magnitude of spurious emissions attenuated more than 20 dB below the limit.

Product	4G/LTE Broadband Router with PoE		
Test Mode	Spurious Emission (Radiated)		
Date of Test	2018/05/15	Test Site	Site3
Test Condition	Band 12 (3M) QPSK(1,7)	Test Range	9KHz ~20GHz

Frequency	Reading Level	Signal Generator Level	Cable Loss	Antenna Gain	EIRP Value	Limit
(GHz)	(dBm)	(dBm)	(dB)	(dBi)	(dBm)	(dBm)

Horizontal Emissions Band 12 (3M) QPSK(1,7)

1415	-44.274	-48.732	1.630	9.800	-40.562	-13
2123	-63.759	-64.246	2.100	10.600	-55.746	-13
2830	-63.546	-65.382	2.350	12.300	-55.432	-13
3538	-61.127	-61.571	2.700	12.600	-51.671	-13
4245	-63.049	-61.272	2.830	12.700	-51.402	-13
4953	-64.465	-60.272	3.200	13.000	-50.472	-13

Vertical Emissions Band 12 (3M) QPSK(1,7)

1415	-43.884	-47.292	1.630	9.800	-39.122	-13
2123	-63.544	-64.229	2.100	10.600	-55.729	-13
2830	-59.032	-59.604	2.350	12.300	-49.654	-13
3538	-59.210	-58.218	2.700	12.600	-48.318	-13
4245	-62.908	-59.989	2.830	12.700	-50.119	-13
4953	-63.888	-59.114	3.200	13.000	-49.314	-13

Note:

1. Receiver setting (Peak Detector) : RBW:1MHz; VBW:3MHz
2. EIRP Value = Signal Generator Level + Antenna Gain - Cable Loss
3. Spurious emissions past 5 GHz are not shown, due to the magnitude of spurious emissions attenuated more than 20 dB below the limit.

Product	4G/LTE Broadband Router with PoE		
Test Mode	Spurious Emission (Radiated)		
Date of Test	2018/05/15	Test Site	Site3
Test Condition	Band 12 (5M) QPSK(1,12)	Test Range	9KHz ~20GHz

Frequency	Reading Level	Signal Generator Level	Cable Loss	Antenna Gain	EIRP Value	Limit
(GHz)	(dBm)	(dBm)	(dB)	(dBi)	(dBm)	(dBm)

Horizontal Emissions Band 12 (5M) QPSK(1,12)

1415	-43.624	-48.082	1.630	9.800	-39.912	-13
2123	-64.040	-64.527	2.100	10.600	-56.027	-13
2830	-62.711	-64.547	2.350	12.300	-54.597	-13
3538	-61.309	-61.753	2.700	12.600	-51.853	-13
4245	-62.849	-61.073	2.830	12.700	-51.203	-13
4953	-63.508	-59.315	3.200	13.000	-49.515	-13

Vertical Emissions Band 12 (5M) QPSK(1,12)

1415	-43.749	-47.157	1.630	9.800	-38.987	-13
2123	-62.509	-63.194	2.100	10.600	-54.694	-13
2830	-59.378	-59.950	2.350	12.300	-50.000	-13
3538	-59.037	-58.046	2.700	12.600	-48.146	-13
4245	-63.041	-60.122	2.830	12.700	-50.252	-13
4953	-63.860	-59.086	3.200	13.000	-49.286	-13

Note:

1. Receiver setting (Peak Detector) : RBW:1MHz; VBW:3MHz
2. EIRP Value = Signal Generator Level + Antenna Gain - Cable Loss
3. Spurious emissions past 5 GHz are not shown, due to the magnitude of spurious emissions attenuated more than 20 dB below the limit.

Product	4G/LTE Broadband Router with PoE		
Test Mode	Spurious Emission (Radiated)		
Date of Test	2018/05/15	Test Site	Site3
Test Condition	Band 12 (10M) QPSK(1,24)	Test Range	9KHz ~20GHz

Frequency	Reading Level	Signal Generator Level	Cable Loss	Antenna Gain	EIRP Value	Limit
(GHz)	(dBm)	(dBm)	(dB)	(dBi)	(dBm)	(dBm)

Horizontal Emissions Band 12 (10M) QPSK(1,24)

1415	-44.441	-48.899	1.630	9.800	-40.729	-13
2123	-63.436	-63.923	2.100	10.600	-55.423	-13
2830	-63.272	-65.108	2.350	12.300	-55.158	-13
3538	-62.126	-62.570	2.700	12.600	-52.670	-13
4245	-62.703	-60.926	2.830	12.700	-51.056	-13
4953	-63.614	-59.421	3.200	13.000	-49.621	-13

Vertical Emissions Band 12 (10M) QPSK(1,24)

1415	-43.996	-47.404	1.630	9.800	-39.234	-13
2123	-63.021	-63.706	2.100	10.600	-55.206	-13
2830	-59.283	-59.855	2.350	12.300	-49.905	-13
3538	-58.837	-57.845	2.700	12.600	-47.945	-13
4245	-62.685	-59.766	2.830	12.700	-49.896	-13
4953	-64.382	-59.608	3.200	13.000	-49.808	-13

Note:

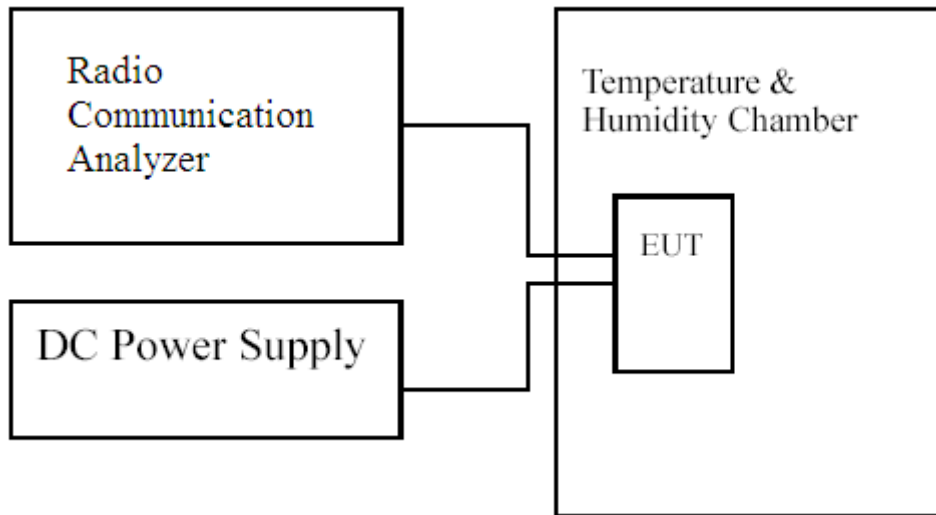
1. Receiver setting (Peak Detector) : RBW:1MHz; VBW:3MHz
2. EIRP Value = Signal Generator Level + Antenna Gain - Cable Loss
3. Spurious emissions past 5 GHz are not shown, due to the magnitude of spurious emissions attenuated more than 20 dB below the limit.

7. Frequency Stability Under Temperature & Voltage Variations

7.1. Test Specification

According to Part 2.1055, 27.54

7.2. Test Setup



7.3. Limits

Limit	$<\pm 2.5\text{ppm}$
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7.4. Test Procedure

The frequency stability of transmitter is measured by:

- Temperature: The temperature is varied from -30°C to 50°C in 10°C increment using a standard temperature & Humidity chamber.
- Primary Supply Voltage: The primary supply voltage is varied 85% to 115% of the nominal value for non hand-carried equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating endpoint which shall be specified by the manufacturer.

The EUT was connected via the base station simulator. Universal Radio Communication Tester, (MT8820C), was used to measure The Frequency Error. The maximum result of measurements was recorded.

7.5. Test Result of Frequency Stability Under Temperature Variations

Product	4G/LTE Broadband Router with PoE		
Test Mode	Frequency Stability Under Temperature Variations & Voltage Variations		
Date of Test	2018/05/15	Test Site	CTR
Test Condition	Band 12 (1.4M) CH23095(707.5MHz)-QPSK	Test Range	-30°C ~+50°C

Frequency Stability Under Temperature Variations

Temperature Interval(°C)	Test Frequency (GHz)	Deviation (kHz)	Limit (kHz)
-30	0.7075	0.0046	±1.77
-20	0.7075	-0.0047	±1.77
-10	0.7075	-0.0044	±1.77
0	0.7075	-0.0045	±1.77
10	0.7075	0.0031	±1.77
20	0.7075	-0.0047	±1.77
30	0.7075	-0.0050	±1.77
40	0.7075	-0.0053	±1.77
50	0.7075	-0.0052	±1.77

Voltage Variations

AC Voltage (V)	Test Frequency (GHz)	Deviation (kHz)	Limit (kHz)
138	0.7075	-0.0041	±1.77
120	0.7075	-0.0047	±1.77
102	0.7075	0.0049	±1.77

Product	4G/LTE Broadband Router with PoE		
Test Mode	Frequency Stability Under Temperature Variations & Voltage Variations		
Date of Test	2018/05/15	Test Site	CTR
Test Condition	Band 12 (1.4M) CH23095(707.5MHz)-16QAM	Test Range	-30°C ~+50°C

Frequency Stability Under Temperature Variations

Temperature Interval(°C)	Test Frequency (GHz)	Deviation (kHz)	Limit (kHz)
-30	0.7075	0.0058	±1.77
-20	0.7075	0.0052	±1.77
-10	0.7075	0.0048	±1.77
0	0.7075	-0.0040	±1.77
10	0.7075	0.0056	±1.77
20	0.7075	0.0040	±1.77
30	0.7075	-0.0049	±1.77
40	0.7075	0.0037	±1.77
50	0.7075	-0.0047	±1.77

Voltage Variations

AC Voltage (V)	Test Frequency (GHz)	Deviation (kHz)	Limit (kHz)
138	0.7075	0.0037	±1.77
120	0.7075	0.0040	±1.77
102	0.7075	-0.0054	±1.77

Product	4G/LTE Broadband Router with PoE		
Test Mode	Frequency Stability Under Temperature Variations & Voltage Variations		
Date of Test	2018/05/15	Test Site	CTR
Test Condition	Band 12 (3M) CH23095(707.5MHz)-QPSK	Test Range	-30°C ~+50°C

Frequency Stability Under Temperature Variations

Temperature Interval(°C)	Test Frequency (GHz)	Deviation (kHz)	Limit (kHz)
-30	0.7075	-0.0041	±1.77
-20	0.7075	0.0047	±1.77
-10	0.7075	0.0048	±1.77
0	0.7075	-0.0063	±1.77
10	0.7075	0.0046	±1.77
20	0.7075	-0.0068	±1.77
30	0.7075	-0.0048	±1.77
40	0.7075	0.0096	±1.77
50	0.7075	0.0041	±1.77

Voltage Variations

AC Voltage (V)	Test Frequency (GHz)	Deviation (kHz)	Limit (kHz)
138	0.7075	-0.0046	±1.77
120	0.7075	-0.0068	±1.77
102	0.7075	-0.0047	±1.77

Product	4G/LTE Broadband Router with PoE		
Test Mode	Frequency Stability Under Temperature Variations & Voltage Variations		
Date of Test	2018/05/15	Test Site	CTR
Test Condition	Band 12 (3M) CH23095(707.5MHz)-16QAM	Test Range	-30°C ~+50°C

Frequency Stability Under Temperature Variations

Temperature Interval(°C)	Test Frequency (GHz)	Deviation (kHz)	Limit (kHz)
-30	0.7075	-0.0049	±1.77
-20	0.7075	-0.0046	±1.77
-10	0.7075	-0.0047	±1.77
0	0.7075	0.0038	±1.77
10	0.7075	-0.0049	±1.77
20	0.7075	-0.0047	±1.77
30	0.7075	-0.0042	±1.77
40	0.7075	0.0087	±1.77
50	0.7075	-0.0042	±1.77

Voltage Variations

AC Voltage (V)	Test Frequency (GHz)	Deviation (kHz)	Limit (kHz)
138	0.7075	0.0052	±1.77
120	0.7075	-0.0047	±1.77
102	0.7075	-0.0045	±1.77

Product	4G/LTE Broadband Router with PoE		
Test Mode	Frequency Stability Under Temperature Variations & Voltage Variations		
Date of Test	2018/05/15	Test Site	CTR
Test Condition	Band 12 (5M) CH23095(707.5MHz)-QPSK	Test Range	-30°C ~+50°C

Frequency Stability Under Temperature Variations

Temperature Interval(°C)	Test Frequency (GHz)	Deviation (kHz)	Limit (kHz)
-30	0.7075	0.0045	±1.77
-20	0.7075	0.0060	±1.77
-10	0.7075	-0.0052	±1.77
0	0.7075	0.0049	±1.77
10	0.7075	0.0030	±1.77
20	0.7075	-0.0041	±1.77
30	0.7075	-0.0058	±1.77
40	0.7075	-0.0039	±1.77
50	0.7075	-0.0034	±1.77

Voltage Variations

AC Voltage (V)	Test Frequency (GHz)	Deviation (kHz)	Limit (kHz)
138	0.7075	-0.0037	±1.77
120	0.7075	-0.0041	±1.77
102	0.7075	-0.0038	±1.77

Product	4G/LTE Broadband Router with PoE		
Test Mode	Frequency Stability Under Temperature Variations & Voltage Variations		
Date of Test	2018/05/15	Test Site	CTR
Test Condition	Band 12 (5M) CH23095(707.5MHz)-16QAM	Test Range	-30°C ~+50°C

Frequency Stability Under Temperature Variations

Temperature Interval(°C)	Test Frequency (GHz)	Deviation (kHz)	Limit (kHz)
-30	0.7075	0.0043	±1.77
-20	0.7075	0.0042	±1.77
-10	0.7075	0.0037	±1.77
0	0.7075	0.0033	±1.77
10	0.7075	0.0041	±1.77
20	0.7075	-0.0035	±1.77
30	0.7075	0.0040	±1.77
40	0.7075	-0.0038	±1.77
50	0.7075	-0.0048	±1.77

Voltage Variations

AC Voltage (V)	Test Frequency (GHz)	Deviation (kHz)	Limit (kHz)
138	0.7075	0.0040	±1.77
120	0.7075	-0.0035	±1.77
102	0.7075	-0.0043	±1.77

Product	4G/LTE Broadband Router with PoE		
Test Mode	Frequency Stability Under Temperature Variations & Voltage Variations		
Date of Test	2018/05/15	Test Site	CTR
Test Condition	Band 12 (10M) CH23095(707.5MHz)-QPSK	Test Range	-30°C ~+50°C

Frequency Stability Under Temperature Variations

Temperature Interval(°C)	Test Frequency (GHz)	Deviation (kHz)	Limit (kHz)
-30	0.7075	-0.0040	±1.77
-20	0.7075	-0.0041	±1.77
-10	0.7075	-0.0033	±1.77
0	0.7075	-0.0031	±1.77
10	0.7075	0.0048	±1.77
20	0.7075	-0.0039	±1.77
30	0.7075	-0.0054	±1.77
40	0.7075	0.0043	±1.77
50	0.7075	-0.0040	±1.77

Voltage Variations

AC Voltage (V)	Test Frequency (GHz)	Deviation (kHz)	Limit (kHz)
138	0.7075	-0.0032	±1.77
120	0.7075	-0.0039	±1.77
102	0.7075	-0.0056	±1.77

Product	4G/LTE Broadband Router with PoE		
Test Mode	Frequency Stability Under Temperature Variations & Voltage Variations		
Date of Test	2018/05/15	Test Site	CTR
Test Condition	Band 12 (10M) CH23095(707.5MHz)-16QAM	Test Range	-30°C ~+50°C

Frequency Stability Under Temperature Variations

Temperature Interval(°C)	Test Frequency (GHz)	Deviation (kHz)	Limit (kHz)
-30	0.7075	0.0031	±1.77
-20	0.7075	-0.0040	±1.77
-10	0.7075	0.0036	±1.77
0	0.7075	0.0050	±1.77
10	0.7075	-0.0070	±1.77
20	0.7075	-0.0033	±1.77
30	0.7075	-0.0029	±1.77
40	0.7075	-0.0037	±1.77
50	0.7075	-0.0047	±1.77

Voltage Variations

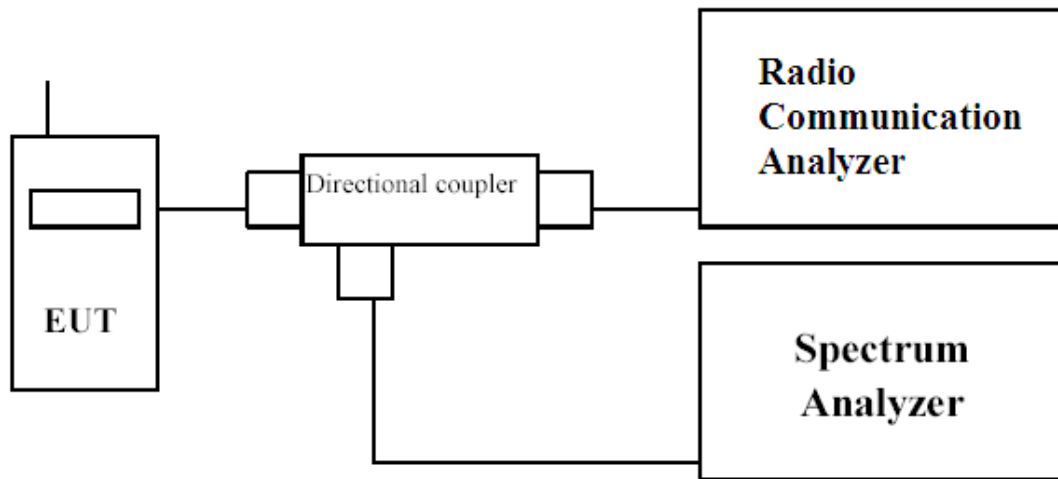
AC Voltage (V)	Test Frequency (GHz)	Deviation (kHz)	Limit (kHz)
138	0.7075	-0.0047	±1.77
120	0.7075	-0.0033	±1.77
102	0.7075	-0.0041	±1.77

8. Peak to Average Ratio

8.1 Test Specification

According to Part 27.50(a)

8.2 Test Setup



8.3 Limits

The peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB. The PAPR measurements should be made using either an instrument with complementary cumulative distribution function (CCDF) capabilities to determine that PAPR will not exceed 13 dB for more than 0.1 percent of the time or other Commission approved procedure.

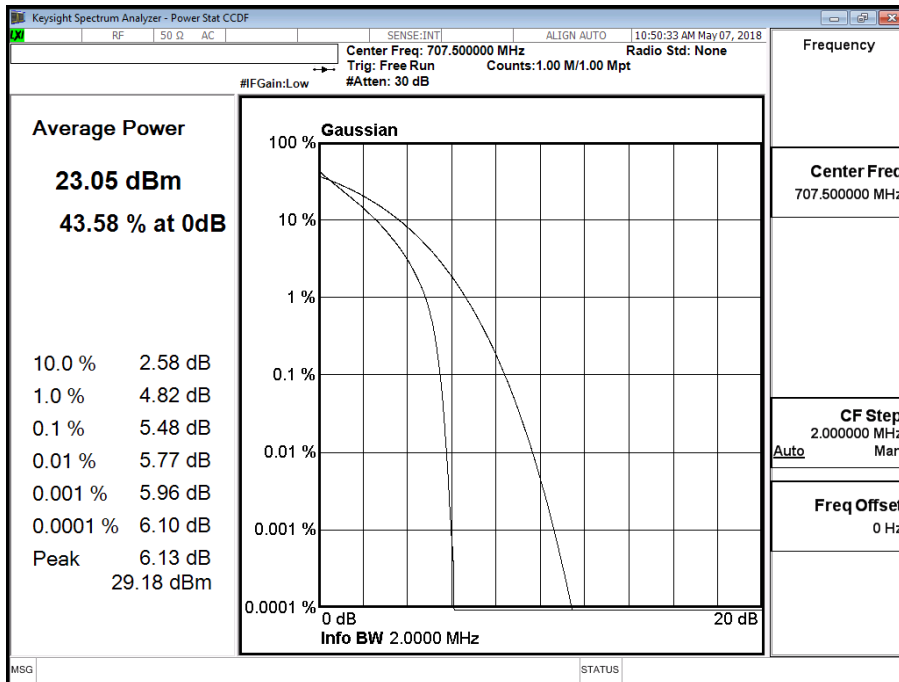
8.4 Test Procedure

- a) Refer to instrument's analyzer instruction manual for details on how to use the power statistics/CCDF function;
- b) Set resolution/measurement bandwidth \geq signal's occupied bandwidth;
- c) Set the number of counts to a value that stabilizes the measured CCDF curve;
- d) Set the measurement interval as follows:
 - 1) for continuous transmissions, set to 1 ms,
 - 2) for burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize and set the measurement interval to a time that is less than or equal to the burst duration.
- e) Record the maximum PAPR level associated with a probability of 0.1%.

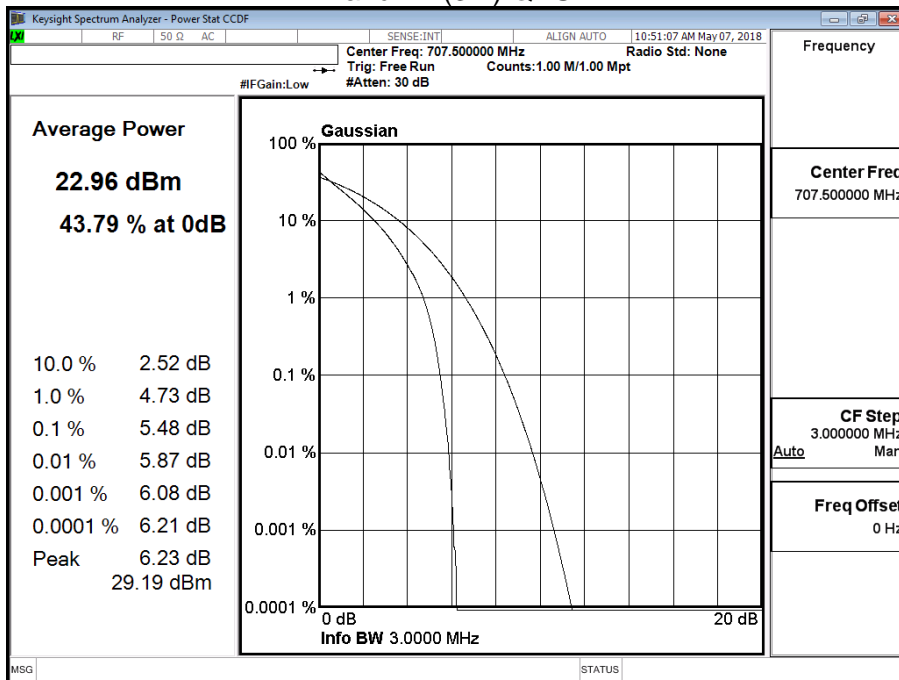
8.5 Test Result of Spurious Emission

Product	4G/LTE Broadband Router with PoE		
Test Mode	Peak to Average Ratio		
Date of Test	2018/05/07	Test Site	CTR
Test Condition	LTE-Band 12		

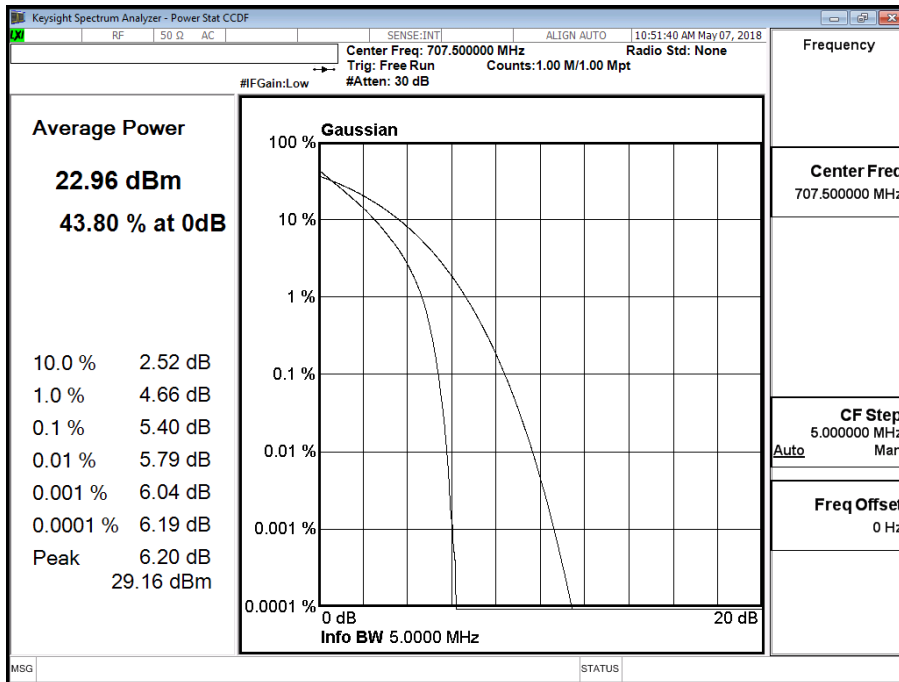
Band 12 (1.4M) QPSK



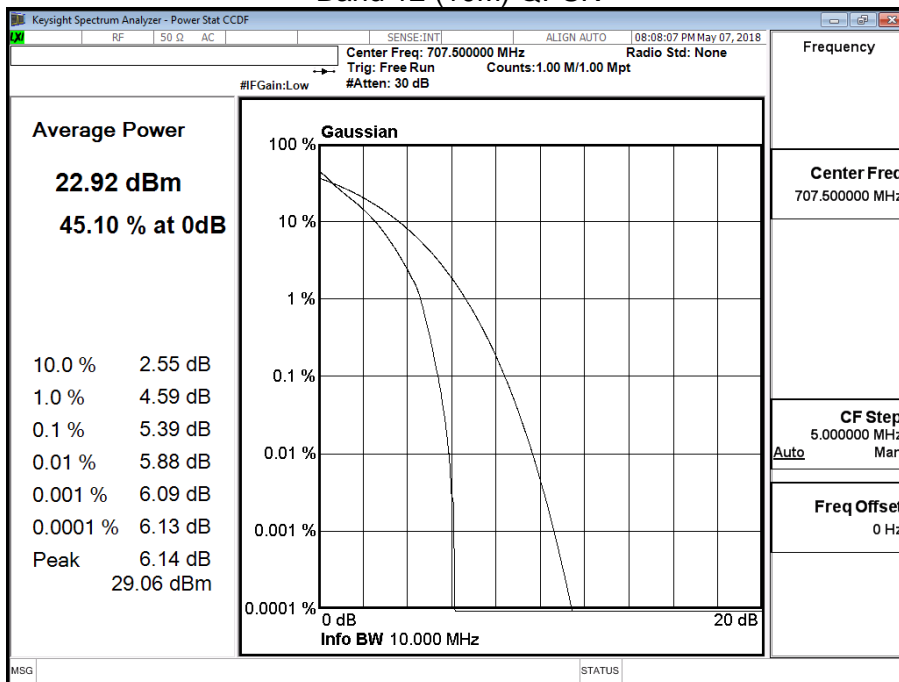
Band 12 (3M) QPSK



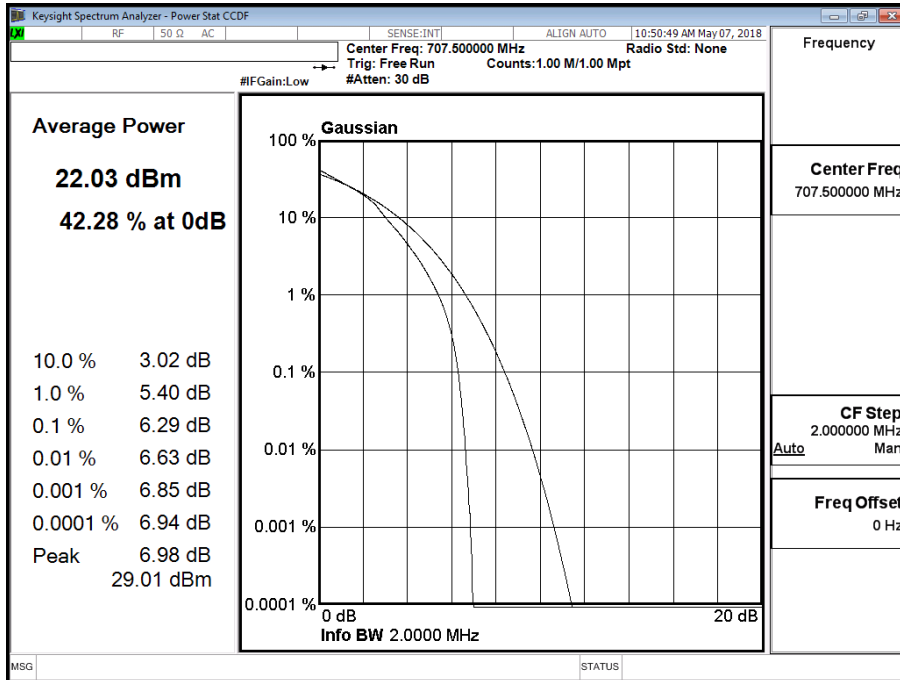
Band 12 (5M) QPSK



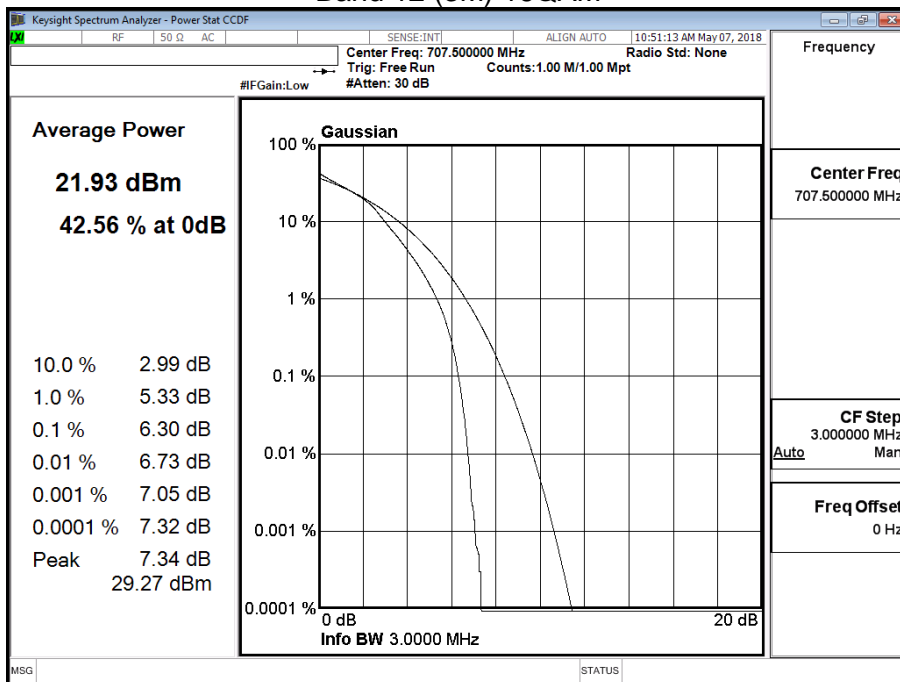
Band 12 (10M) QPSK



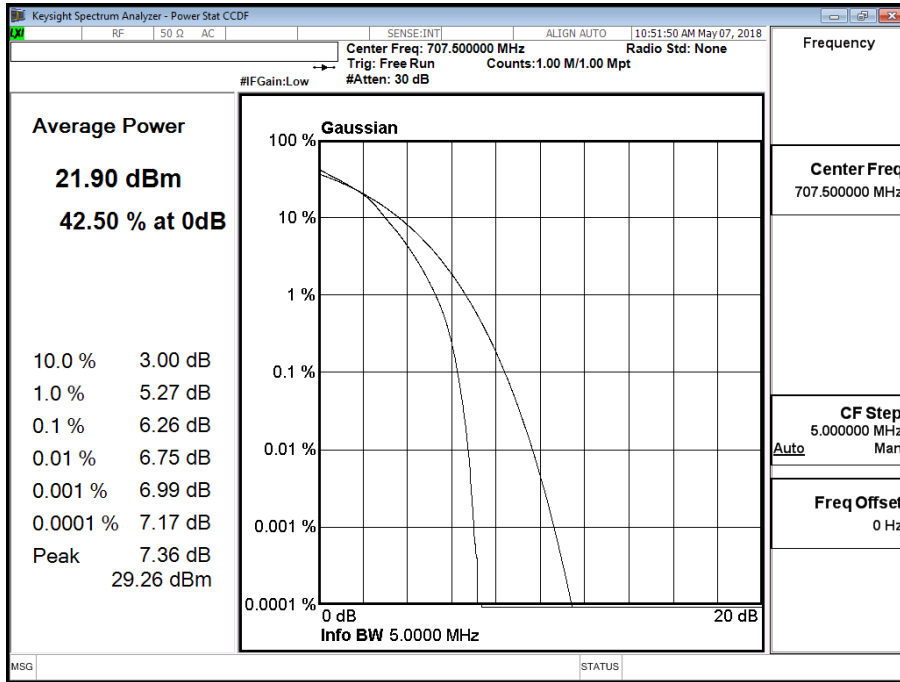
Band 12 (1.4M) 16QAM



Band 12 (3M) 16QAM



Band 12 (5M) 16QAM



Band 12 (10M) 16QAM

