

FCC Test Report

(Part 24)

Product Name : 4G/LTE Broadband Router with PoE

Model No : MX-210NP-R17AF

FCC ID : QI3BIL-210NPR17AF

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 : 2019/01/07

Issued Date : 2019/01/18

Report No. : 1910066R-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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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-R17AF

EUT Rated Voltage : AC 100-240V/50-60Hz

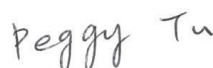
EUT Test Voltage : AC 120V/60Hz

Measurement Standard : FCC CFR Title 47 Part 2 Part24

Measurement Reference : TIA/EIA 603-E, ANSI C63.26 2015

Test Result : Complied

Documented By :



(Adm. Assistant / Peggy Tu)

Tested By :



(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-R17AF
Trade Name	BEC, Billion
IMEI No.	86683404
FCC ID	QI3BIL-210NPR17AF
Modulation	LTE Band 2: QPSK/16-QAM
TX Frequency	LTE Band 2: 1850~1910MHz
Rx Frequency	LTE Band 2: 1930~1990MHz
Bandwidth	LTE Band 2: 1.4MHz/3MHz/5MHz/10MHz/15MHz/20MHz
HW Version	1.010
SW Version	1.04.1.299
Antenna Type	Dipole Antenna

1.2. Antenna List

No	Manufacturer	Part No	Antenna Type	Peak Gain
1	Grand-Tek Technology	OA-L71-05-04-C5-BL TX Mode	Dipole Antenna	2dBi for 1.71 GHz ~2.17 GHz
2	Grand-Tek Technology	OA-L71-05-04-C5-BL (Only RX Mode)	Dipole Antenna	2dBi for 1.71 GHz ~2.17 GHz

1.3. Operational Description

The information contained within this report is intended to show verification of compliance of the 1900MHz to the requirements of FCC 47 CFR Part 2 and 24.

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:

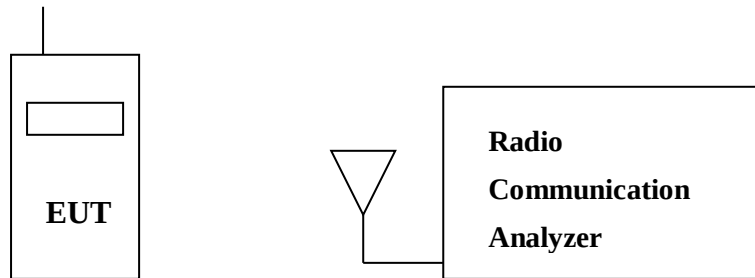
Test Mode:	LTE Band 2 (1.4M)-QPSK/16QAM
	LTE Band 2 (3M)-QPSK/16QAM
	LTE Band 2 (5M)-QPSK/16QAM
	LTE Band 2 (10M)-QPSK/16QAM
	LTE Band 2 (15M)-QPSK/16QAM
	LTE Band 2 (20M)-QPSK/16QAM

Note :

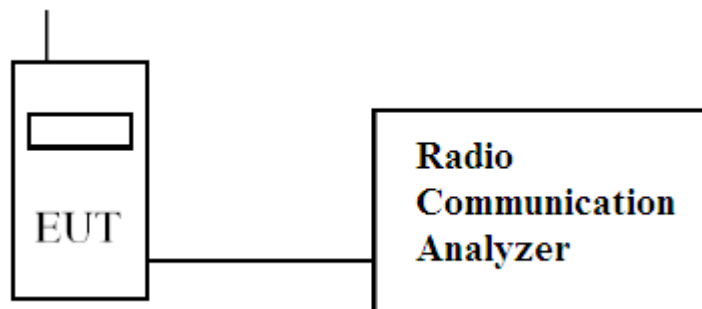
The maximum power levels are chosen in the LTE Band 2, only these modes were used for all tests.

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	21
Humidity (%RH)	25-75	53
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: Accredited by TAF
Accredited Number: 3023

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FCC Accreditation Number: TW3023

1.7. Type of Emission

Band	Bandwidth (MHz)	Modulation	
		QPSK	16QAM
2	1.4	1M10G7D	1M09W7D
2	3	2M73G7D	2M72W7D
2	5	4M51G7D	4M49W7D
2	10	9M03G7D	9M03W7D
2	15	13M4G7D	13M4W7D
2	20	18M5G7D	18M4W7D

1.8. Voltages and AC currents

LTE Band 2 (1.4M)	EUT Transmitting (in maximum power) :	AC voltage : 120V , DC current : 0.11A
	EUT Standby :	AC voltage : 120V , DC current : 0.07A
LTE Band 2 (3M)	EUT Transmitting (in maximum power) :	AC voltage : 120V , DC current : 0.11A
	EUT Standby :	AC voltage : 120V , DC current : 0.07A
LTE Band 2 (5M)	EUT Transmitting (in maximum power) :	AC voltage : 120V , DC current : 0.11A
	EUT Standby :	AC voltage : 120V , DC current : 0.07A
LTE Band 2 (10M)	EUT Transmitting (in maximum power) :	AC voltage : 120V , DC current : 0.11A
	EUT Standby :	AC voltage : 120V , DC current : 0.07A
LTE Band 2 (15M)	EUT Transmitting (in maximum power) :	AC voltage : 120V , DC current : 0.12A
	EUT Standby :	AC voltage : 120V , DC current : 0.07A
LTE Band 2 (20M)	EUT Transmitting (in maximum power) :	AC voltage : 120V , DC current : 0.12A
	EUT Standby :	AC voltage : 120V , DC current : 0.07A

2. Technical Test

2.1. Summary of test result

FCC Standard	Test Item	Result	Note
2.1046	Conducted Output Power	Pass	
24.232(c)			
2.1049	Occupied Bandwidth	Pass	
24.238(b)			
2.1051	Spurious Emission at Antenna Terminals	Pass	
24.238(a)			
2.1051	Conducted Emission	Pass	
24.238(a)			
2.1053	Field Strength of Spurious Radiation	Pass	
24.238(a)			
2.1055	Frequency Stability for Temperature & Voltage	Pass	
24.235			
24.232 (d)	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	2018/12/04
Directional coupler	Agilent	778D-012	50550	2018/12/04
Standard Temperature & Humidity Chamber	WIT	TH-1S-B	EQ-201-00146	2018/02/12
Communication Tester	Agilent	MT8820C	6201465467	2018/07/20

Radiated / Site3

Instrument	Manufacturer	Type No.	Serial No	Cal. Date
Loop Antenna	AMETEK	HLA6121	49611	2018/01/26
Bilog Antenna	Schaffner Chase	CBL6112B	2707	2018/06/24
Horn Antenna	R&S	9120D	556	2018/04/02
Pre-Amplifier	Agilent	87405C	MY55380068	2018/08/10
Spectrum Analyzer	Agilent	N9010A	MY54510317	2018/04/13
Communication Tester	Agilent	MT8820C	6201465467	2018/07/20

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 ± 4.22 dB .

Radiated Emission (Above 1GHz)

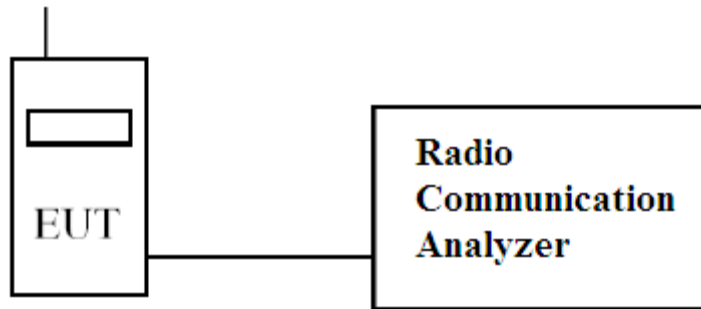
The measurement uncertainty of confidence of 95% is evaluated as ± 4.08 dB

3. Conducted Output Power Measurement

3.1. Test Specification

According to FCC Part 2.1046, 24.232

3.2. Test Setup



3.3. Limits

Band	Limit
LTE Band 2/1900	<2W

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 2 (1900MHz)/1.4MHz	18607 1850.7MHz	QPSK	1	#0	0	21.93	0.1560
			1	#Mid	0	22.00	0.1585
			1	#Max	0	21.91	0.1552
			50%	#0	1	21.84	0.1528
			50%	#Mid	1	21.89	0.1545
			50%	#Max	1	21.81	0.1517
			100%	--	1	20.87	0.1222
		16QAM	1	#0	1	20.67	0.1167
			1	#Mid	1	20.77	0.1194
			1	#Max	1	20.68	0.1169
			50%	#0	2	20.79	0.1199
			50%	#Mid	2	20.91	0.1233
			50%	#Max	2	20.91	0.1233
			100%	--	2	19.93	0.0984
	18900 1880MHz	QPSK	1	#0	0	21.86	0.1535
			1	#Mid	0	21.96	0.1570
			1	#Max	0	21.88	0.1542
			50%	#0	1	21.88	0.1542
			50%	#Mid	1	21.91	0.1552
			50%	#Max	1	21.86	0.1535
			100%	--	1	20.89	0.1227
		16QAM	1	#0	1	20.78	0.1197
			1	#Mid	1	20.87	0.1222
			1	#Max	1	20.87	0.1222
			50%	#0	2	20.97	0.1250
			50%	#Mid	2	21.08	0.1282
			50%	#Max	2	21.03	0.1268
			100%	--	2	19.97	0.0993
	19193 1909.3MHz	QPSK	1	#0	0	21.93	0.1560
			1	#Mid	0	22.01	0.1589
			1	#Max	0	21.88	0.1542
			50%	#0	1	21.97	0.1574
			50%	#Mid	1	21.99	0.1581
			50%	#Max	1	21.89	0.1545
			100%	--	1	20.93	0.1239
		16QAM	1	#0	1	20.76	0.1191
			1	#Mid	1	21.10	0.1288
			1	#Max	1	20.86	0.1219
			50%	#0	2	21.04	0.1271
			50%	#Mid	2	21.03	0.1268
			50%	#Max	2	21.03	0.1268
			100%	--	2	19.99	0.0998

Band	Channel	Modulation	RB No.	RB Offset	MPR	Max Power (Conducted)	Max Power (W)
Band 2 (1900MHz)/3MHz	18615 1851.5MHz	QPSK	1	#0	0	21.88	0.1542
			1	#Mid	0	22.14	0.1637
			1	#Max	0	21.88	0.1542
			50%	#0	1	20.95	0.1245
			50%	#Mid	1	20.92	0.1236
			50%	#Max	1	20.95	0.1245
			100%	--	1	20.90	0.1230
		16QAM	1	#0	1	20.45	0.1109
			1	#Mid	1	20.59	0.1146
			1	#Max	1	20.52	0.1127
			50%	#0	2	19.92	0.0982
			50%	#Mid	2	19.90	0.0977
			50%	#Max	2	19.92	0.0982
			100%	--	2	19.89	0.0975
	18900 1880MHz	QPSK	1	#0	0	22.02	0.1592
			1	#Mid	0	22.00	0.1585
			1	#Max	0	21.99	0.1581
			50%	#0	1	20.91	0.1233
			50%	#Mid	1	20.87	0.1222
			50%	#Max	1	20.90	0.1230
			100%	--	1	20.86	0.1219
		16QAM	1	#0	1	20.79	0.1199
			1	#Mid	1	20.95	0.1245
			1	#Max	1	20.92	0.1236
			50%	#0	2	20.00	0.1000
			50%	#Mid	2	19.98	0.0995
			50%	#Max	2	19.96	0.0991
			100%	--	2	19.98	0.0995
	19185 1908.5MHz	QPSK	1	#0	0	22.02	0.1592
			1	#Mid	0	22.18	0.1652
			1	#Max	0	21.95	0.1567
			50%	#0	1	21.03	0.1268
			50%	#Mid	1	20.99	0.1256
			50%	#Max	1	20.97	0.1250
			100%	--	1	20.95	0.1245
		16QAM	1	#0	1	20.83	0.1211
			1	#Mid	1	21.06	0.1276
			1	#Max	1	20.93	0.1239
			50%	#0	2	20.05	0.1012
			50%	#Mid	2	19.99	0.0998
			50%	#Max	2	20.02	0.1005
			100%	--	2	20.02	0.1005

Band	Channel	Modulation	RB No.	RB Offset	MPR	Max Power (Conducted)	Max Power (W)
Band 2 (1900MHz)/5MHz	18625 1852.5MHz	QPSK	1	#0	0	21.83	0.1524
			1	#Mid	0	22.15	0.1641
			1	#Max	0	21.77	0.1503
			50%	#0	1	20.87	0.1222
			50%	#Mid	1	20.83	0.1211
			50%	#Max	1	20.87	0.1222
			100%	--	1	20.87	0.1222
		16QAM	1	#0	1	20.67	0.1167
			1	#Mid	1	20.89	0.1227
			1	#Max	1	20.80	0.1202
			50%	#0	2	19.98	0.0995
			50%	#Mid	2	19.78	0.0951
			50%	#Max	2	19.72	0.0938
			100%	--	2	19.86	0.0968
	18900 1880MHz	QPSK	1	#0	0	21.89	0.1545
			1	#Mid	0	22.03	0.1596
			1	#Max	0	21.85	0.1531
			50%	#0	1	20.95	0.1245
			50%	#Mid	1	20.81	0.1205
			50%	#Max	1	20.84	0.1213
			100%	--	1	20.85	0.1216
		16QAM	1	#0	1	20.65	0.1161
			1	#Mid	1	20.94	0.1242
			1	#Max	1	20.85	0.1216
			50%	#0	2	19.88	0.0973
			50%	#Mid	2	19.88	0.0973
			50%	#Max	2	19.90	0.0977
			100%	--	2	19.96	0.0991
	19175 1907.5MHz	QPSK	1	#0	0	21.96	0.1570
			1	#Mid	0	22.18	0.1652
			1	#Max	0	21.81	0.1517
			50%	#0	1	20.94	0.1242
			50%	#Mid	1	20.98	0.1253
			50%	#Max	1	20.93	0.1239
			100%	--	1	20.94	0.1242
		16QAM	1	#0	1	20.80	0.1202
			1	#Mid	1	20.79	0.1199
			1	#Max	1	20.71	0.1178
			50%	#0	2	19.89	0.0975
			50%	#Mid	2	20.08	0.1019
			50%	#Max	2	20.11	0.1026
			100%	--	2	19.99	0.0998

Band	Channel	Modulation	RB No.	RB Offset	MPR	Max Power (Conducted)	Max Power (W)
Band 2 (1900MHz)/10MHz	18650 1855MHz	QPSK	1	#0	0	22.02	0.1592
			1	#Mid	0	22.03	0.1596
			1	#Max	0	21.98	0.1578
			50%	#0	1	20.93	0.1239
			50%	#Mid	1	20.91	0.1233
			50%	#Max	1	20.89	0.1227
			100%	--	1	20.96	0.1247
		16QAM	1	#0	1	20.68	0.1169
			1	#Mid	1	20.76	0.1191
			1	#Max	1	20.97	0.1250
			50%	#0	2	19.94	0.0986
			50%	#Mid	2	19.94	0.0986
			50%	#Max	2	19.92	0.0982
			100%	--	2	19.95	0.0989
	18900 1880MHz	QPSK	1	#0	0	21.94	0.1563
			1	#Mid	0	21.95	0.1567
			1	#Max	0	22.05	0.1603
			50%	#0	1	20.87	0.1222
			50%	#Mid	1	20.83	0.1211
			50%	#Max	1	20.82	0.1208
			100%	--	1	20.86	0.1219
		16QAM	1	#0	1	20.82	0.1208
			1	#Mid	1	21.06	0.1276
			1	#Max	1	20.72	0.1180
			50%	#0	2	19.97	0.0993
			50%	#Mid	2	19.86	0.0968
			50%	#Max	2	19.89	0.0975
			100%	--	2	19.85	0.0966
	19150 1905MHz	QPSK	1	#0	0	22.18	0.1652
			1	#Mid	0	22.11	0.1626
			1	#Max	0	22.01	0.1589
			50%	#0	1	21.10	0.1288
			50%	#Mid	1	21.03	0.1268
			50%	#Max	1	20.96	0.1247
			100%	--	1	21.00	0.1259
		16QAM	1	#0	1	20.97	0.1250
			1	#Mid	1	21.01	0.1262
			1	#Max	1	20.68	0.1169
			50%	#0	2	20.12	0.1028
			50%	#Mid	2	19.97	0.0993
			50%	#Max	2	19.98	0.0995
			100%	--	2	20.01	0.1002

Band	Channel	Modulation	RB No.	RB Offset	MPR	Max Power (Conducted)	Max Power (W)
Band 2 (1900MHz)/15MHz	18675 1857.5MHz	QPSK	1	#0	0	22.01	0.1589
			1	#Mid	0	21.94	0.1563
			1	#Max	0	22.07	0.1611
			50%	#0	1	20.91	0.1233
			50%	#Mid	1	20.88	0.1225
			50%	#Max	1	20.98	0.1253
			100%	--	1	20.91	0.1233
		16QAM	1	#0	1	20.72	0.1180
			1	#Mid	1	20.91	0.1233
			1	#Max	1	20.91	0.1233
			50%	#0	2	19.96	0.0991
			50%	#Mid	2	19.90	0.0977
			50%	#Max	2	20.05	0.1012
			100%	--	2	19.97	0.0993
	18900 1880MHz	QPSK	1	#0	0	22.09	0.1618
			1	#Mid	0	21.87	0.1538
			1	#Max	0	22.08	0.1614
			50%	#0	1	20.96	0.1247
			50%	#Mid	1	20.85	0.1216
			50%	#Max	1	20.97	0.1250
			100%	--	1	20.86	0.1219
		16QAM	1	#0	1	20.92	0.1236
			1	#Mid	1	20.80	0.1202
			1	#Max	1	20.77	0.1194
			50%	#0	2	19.98	0.0995
			50%	#Mid	2	19.89	0.0975
			50%	#Max	2	20.00	0.1000
			100%	--	2	19.90	0.0977
	19125 1902.5MHz	QPSK	1	#0	0	22.07	0.1611
			1	#Mid	0	22.05	0.1603
			1	#Max	0	21.97	0.1574
			50%	#0	1	21.08	0.1282
			50%	#Mid	1	21.10	0.1288
			50%	#Max	1	20.94	0.1242
			100%	--	1	21.03	0.1268
		16QAM	1	#0	1	20.89	0.1227
			1	#Mid	1	20.85	0.1216
			1	#Max	1	20.90	0.1230
			50%	#0	2	20.08	0.1019
			50%	#Mid	2	20.11	0.1026
			50%	#Max	2	20.00	0.1000
			100%	--	2	20.13	0.1030

Band	Channel	Modulation	RB No.	RB Offset	MPR	Max Power (Conducted)	Max Power (W)
Band 2 (1900MHz)/20MHz	18700 1860MHz	QPSK	1	#0	0	22.06	0.1607
			1	#Mid	0	22.11	0.1626
			1	#Max	0	21.97	0.1574
			50%	#0	1	20.99	0.1256
			50%	#Mid	1	21.00	0.1259
			50%	#Max	1	21.04	0.1271
			100%	--	1	20.98	0.1253
		16QAM	1	#0	1	20.75	0.1189
			1	#Mid	1	21.09	0.1285
			1	#Max	1	20.88	0.1225
			50%	#0	2	19.99	0.0998
			50%	#Mid	2	20.00	0.1000
			50%	#Max	2	20.11	0.1026
			100%	--	2	19.98	0.0995
	18900 1880MHz	QPSK	1	#0	0	22.08	0.1614
			1	#Mid	0	22.00	0.1585
			1	#Max	0	21.93	0.1560
			50%	#0	1	20.94	0.1242
			50%	#Mid	1	20.83	0.1211
			50%	#Max	1	20.88	0.1225
			100%	--	1	20.87	0.1222
		16QAM	1	#0	1	20.99	0.1256
			1	#Mid	1	20.90	0.1230
			1	#Max	1	20.69	0.1172
			50%	#0	2	19.95	0.0989
			50%	#Mid	2	19.91	0.0979
			50%	#Max	2	19.89	0.0975
			100%	--	2	19.91	0.0979
	19100 1900MHz	QPSK	1	#0	0	22.08	0.1614
			1	#Mid	0	22.23	0.1671
			1	#Max	0	21.96	0.1570
			50%	#0	1	20.99	0.1256
			50%	#Mid	1	21.09	0.1285
			50%	#Max	1	20.97	0.1250
			100%	--	1	21.00	0.1259
		16QAM	1	#0	1	20.78	0.1197
			1	#Mid	1	21.11	0.1291
			1	#Max	1	20.75	0.1189
			50%	#0	2	20.01	0.1002
			50%	#Mid	2	20.13	0.1030
			50%	#Max	2	19.99	0.0998
			100%	--	2	20.00	0.1000

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

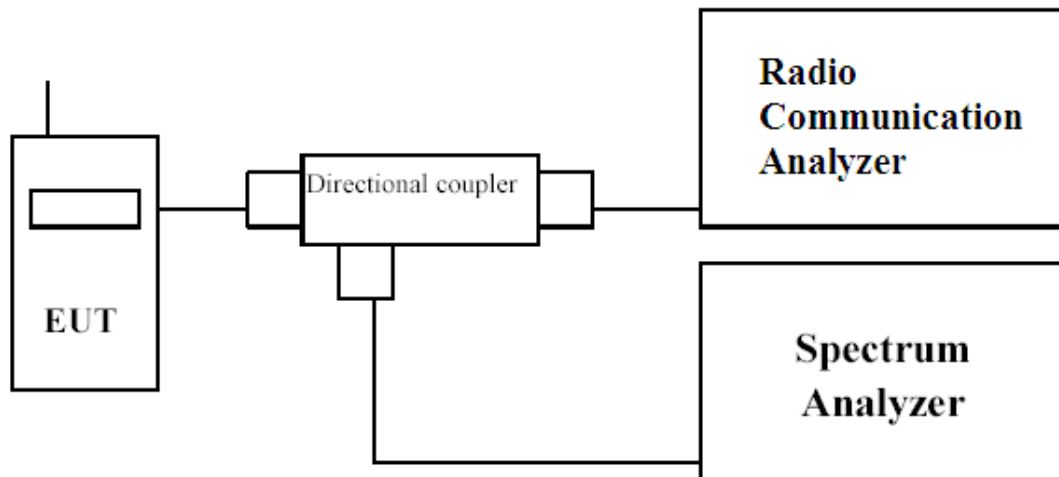
LTE Band	BW	Modulation	Conducted Peak Power (dBm)	Conducted Peak Power (W)	Antenna Gain (dBi)	Maximum EIRP (W)	Maximum EIRP Limit (W)
2	1.4M	QPSK	22.01	0.159	2	0.252	2
		16QAM	21.10	0.129	2	0.204	2
	3M	QPSK	22.18	0.165	2	0.262	2
		16QAM	21.06	0.128	2	0.202	2
	5M	QPSK	22.18	0.165	2	0.262	2
		16QAM	20.94	0.124	2	0.197	2
	10M	QPSK	22.18	0.165	2	0.262	2
		16QAM	21.06	0.128	2	0.202	2
	15M	QPSK	22.09	0.162	2	0.256	2
		16QAM	20.92	0.124	2	0.196	2
	20M	QPSK	22.23	0.167	2	0.265	2
		16QAM	21.11	0.129	2	0.205	2

4. Occupied Bandwidth

4.1. Test Secification

According to FCC Part 2.1049, 24.238

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.

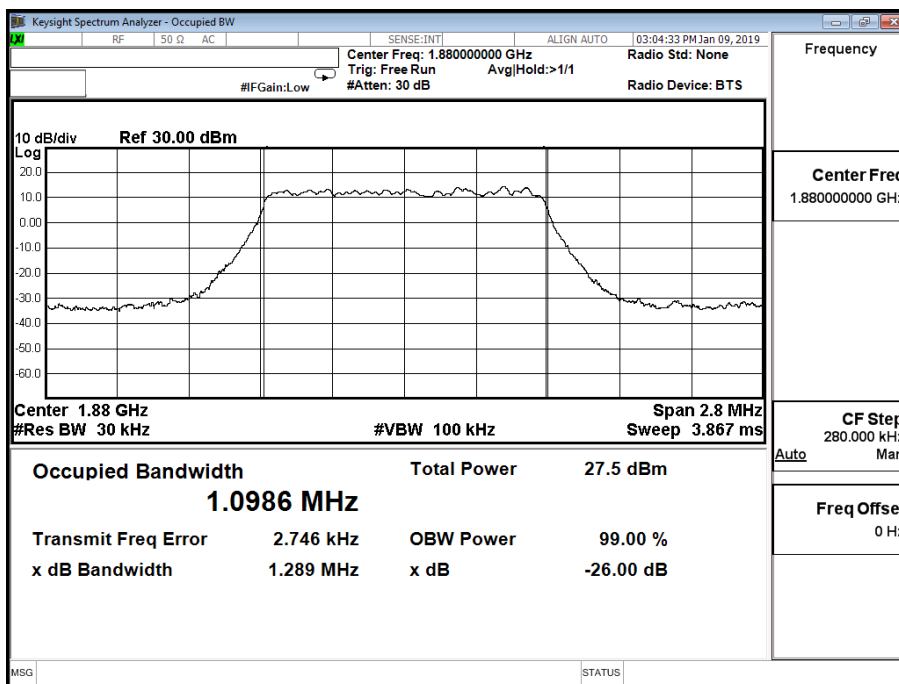
4.4. Test Result of Occupied Bandwidth

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

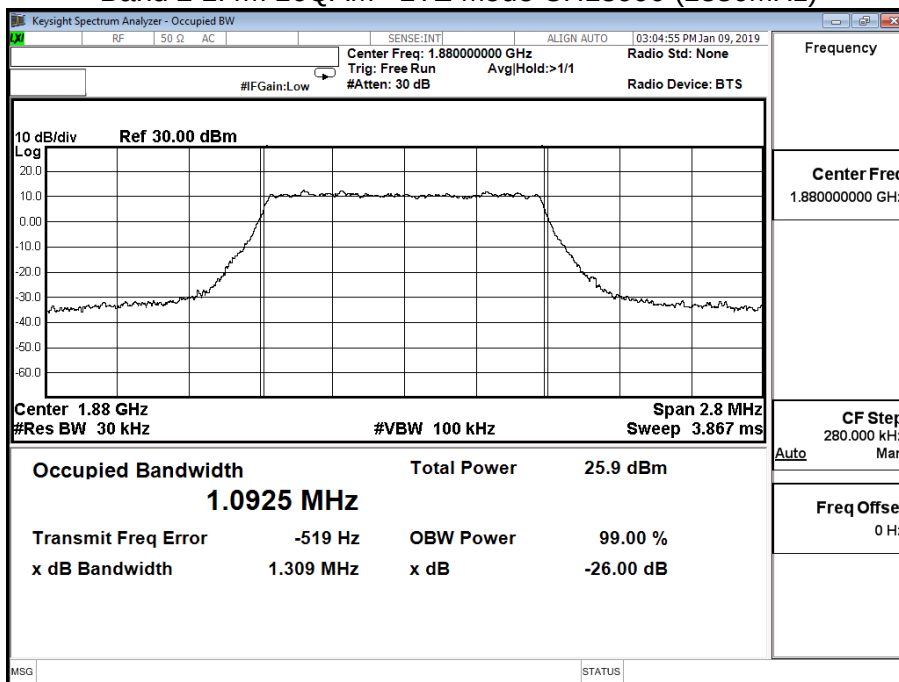
Test Mode	Channel	TX Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB bandwidth (MHz)	Result
Band 2 1.4M QPSK	18900	1880	1.0986	1.289	Pass
Band 2 1.4M 16QAM	18900	1880	1.0925	1.309	Pass
Band 2 3M QPSK	18900	1880	2.7327	3.069	Pass
Band 2 3M 16QAM	18900	1880	2.7193	3.042	Pass
Band 2 5M QPSK	18900	1880	4.5053	5.008	Pass
Band 2 5M 16QAM	18900	1880	4.4857	4.968	Pass
Band 2 10M QPSK	18900	1880	9.0296	10.020	Pass
Band 2 10M 16QAM	18900	1880	9.0274	10.060	Pass
Band 2 15M QPSK	18900	1880	13.4430	14.670	Pass
Band 2 15M 16QAM	18900	1880	13.4280	14.680	Pass
Band 2 20M QPSK	18900	1880	18.4700	20.410	Pass
Band 2 20M 16QAM	18900	1880	18.4310	20.400	Pass

Product	4G/LTE Broadband Router with PoE		
Test Mode	Occupied Bandwidth		
Date of Test	2019/01/09	Test Site	CTR
Test Condition	Band 2 1.4M		

Band 2 1.4M QPSK - LTE Mode CH18900 (1880MHz)

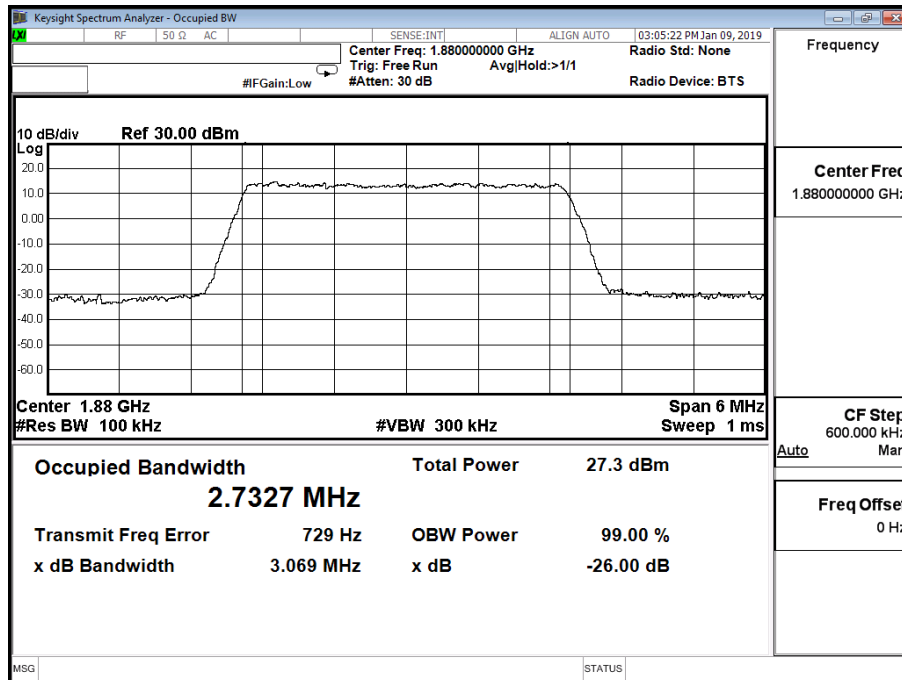


Band 2 1.4M 16QAM - LTE Mode CH18900 (1880MHz)

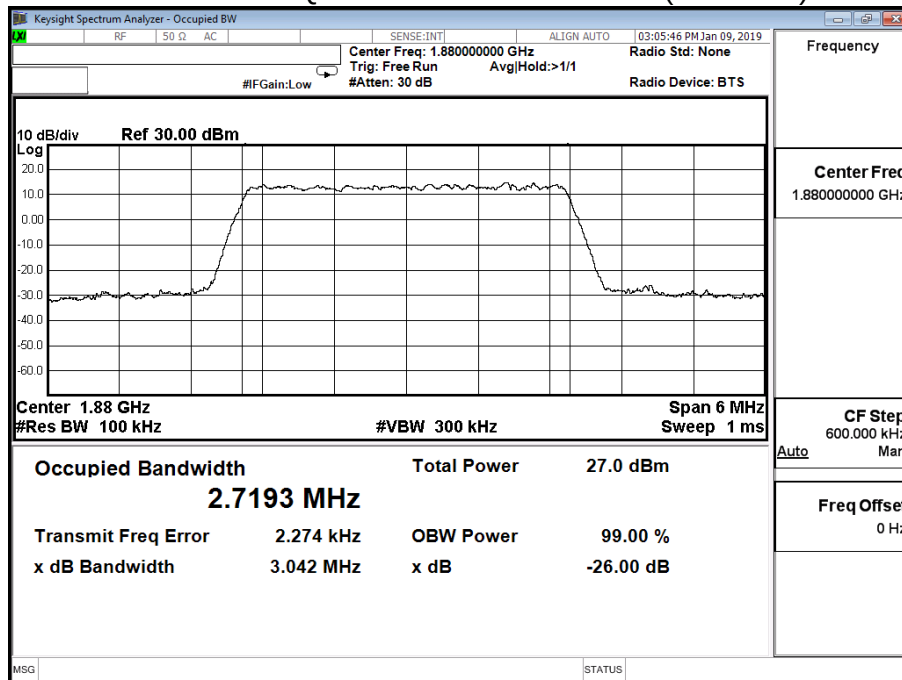


Product	4G/LTE Broadband Router with PoE		
Test Mode	Occupied Bandwidth		
Date of Test	2019/01/09	Test Site	CTR
Test Condition	Band 2 3M		

Band 2 3M QPSK - LTE Mode CH18900 (1880MHz)

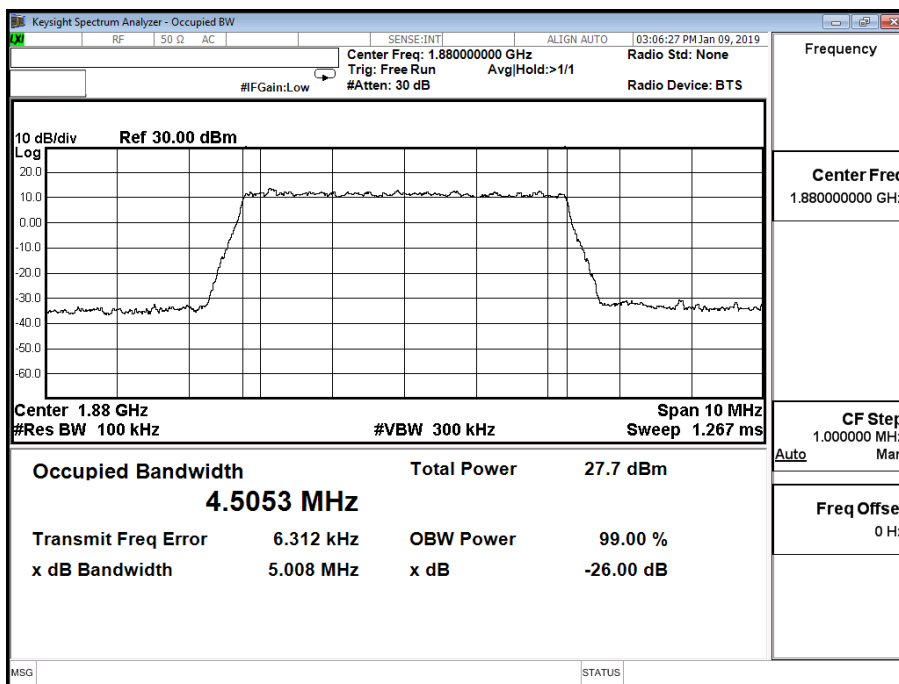


Band 2 3M 16QAM - LTE Mode CH18900 (1880MHz)

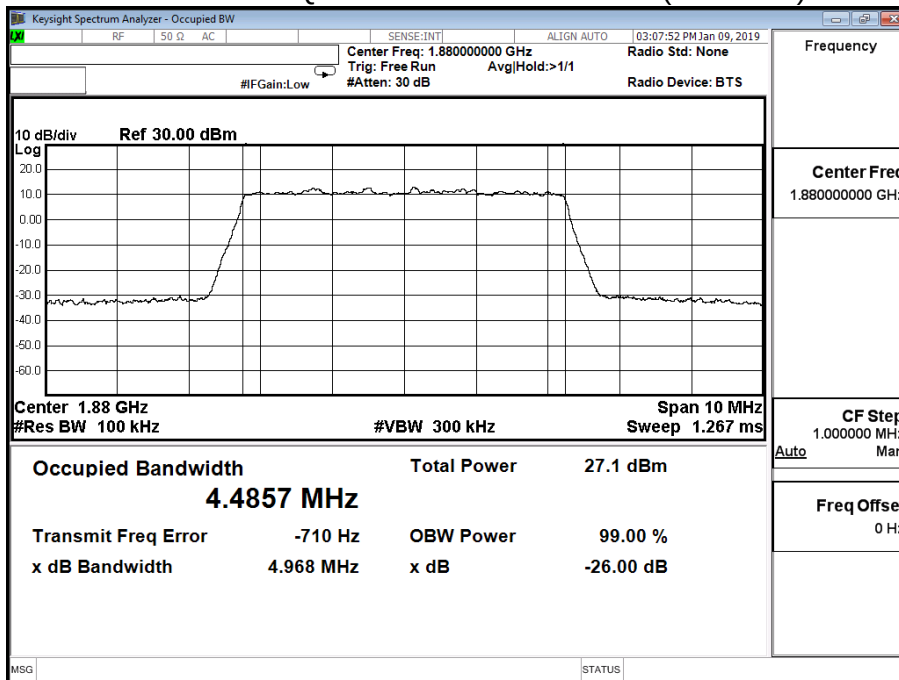


Product	4G/LTE Broadband Router with PoE		
Test Mode	Occupied Bandwidth		
Date of Test	2019/01/09	Test Site	CTR
Test Condition	Band 2 5M		

Band 2 5M QPSK - LTE Mode CH18900 (1880MHz)

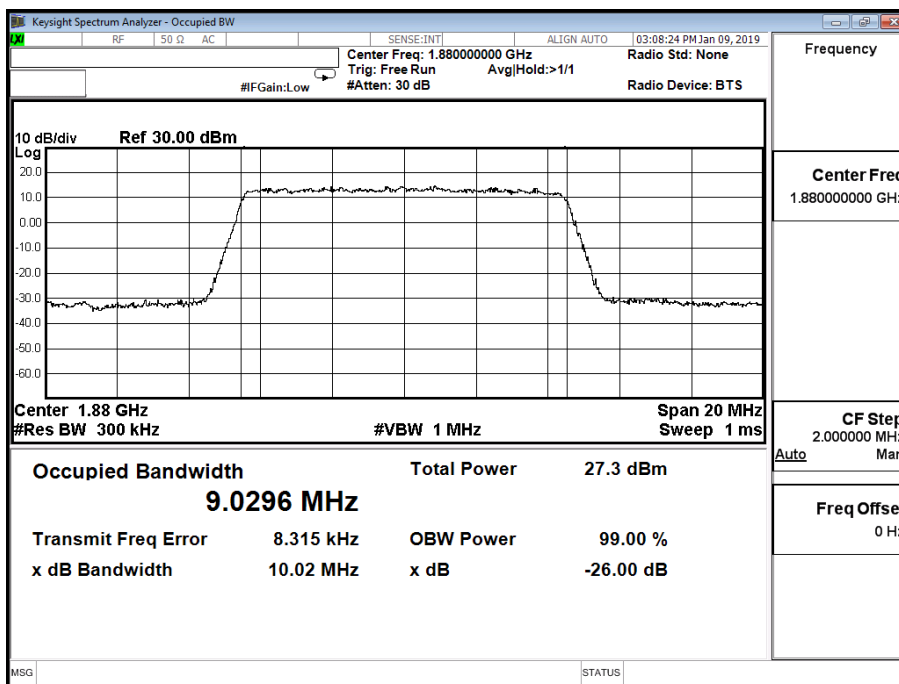


Band 2 5M 16QAM - LTE Mode CH18900 (1880MHz)

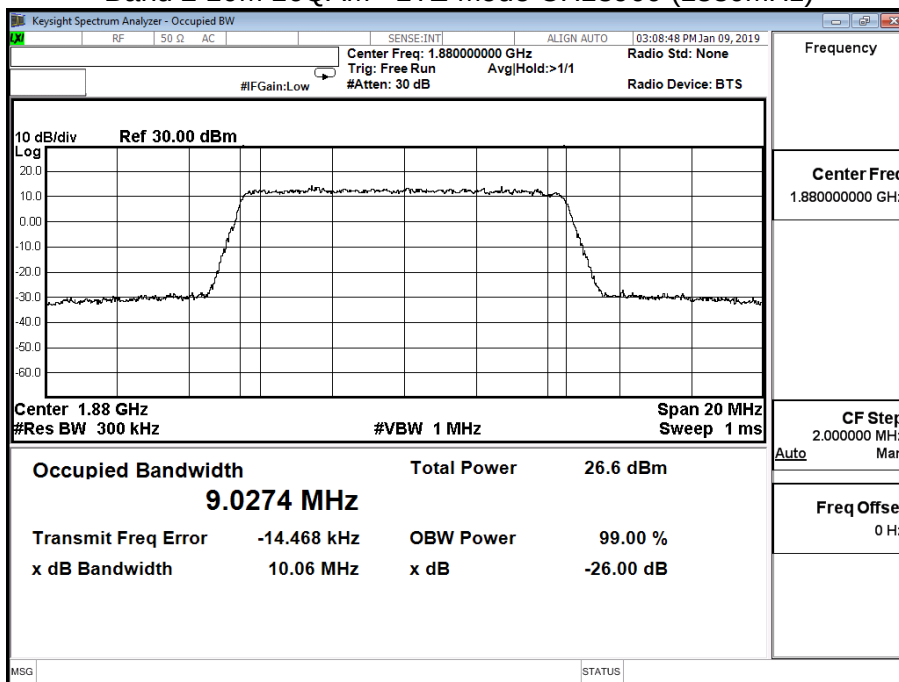


Product	4G/LTE Broadband Router with PoE		
Test Mode	Occupied Bandwidth		
Date of Test	2019/01/09	Test Site	CTR
Test Condition	Band 2 10M		

Band 2 10M QPSK - LTE Mode CH18900 (1880MHz)

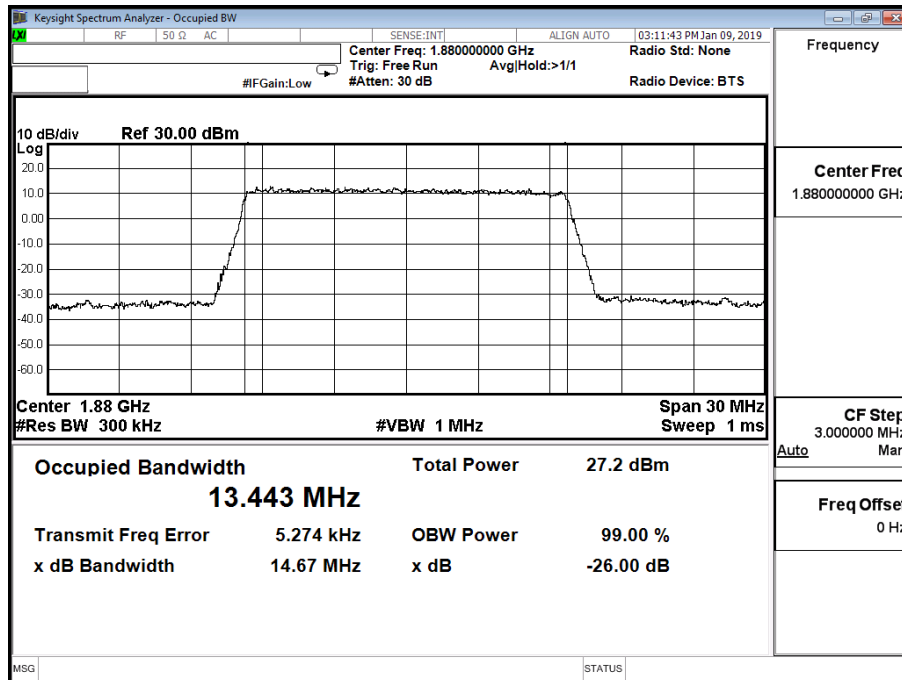


Band 2 10M 16QAM - LTE Mode CH18900 (1880MHz)

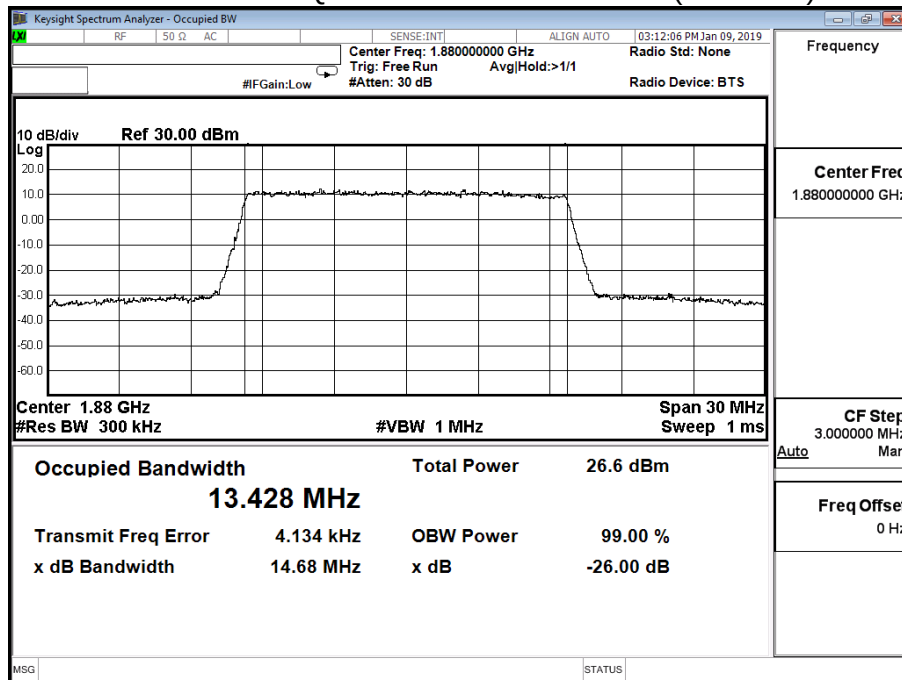


Product	4G/LTE Broadband Router with PoE		
Test Mode	Occupied Bandwidth		
Date of Test	2019/01/09	Test Site	CTR
Test Condition	Band 2 15M		

Band 2 15M QPSK - LTE Mode CH18900 (1880MHz)

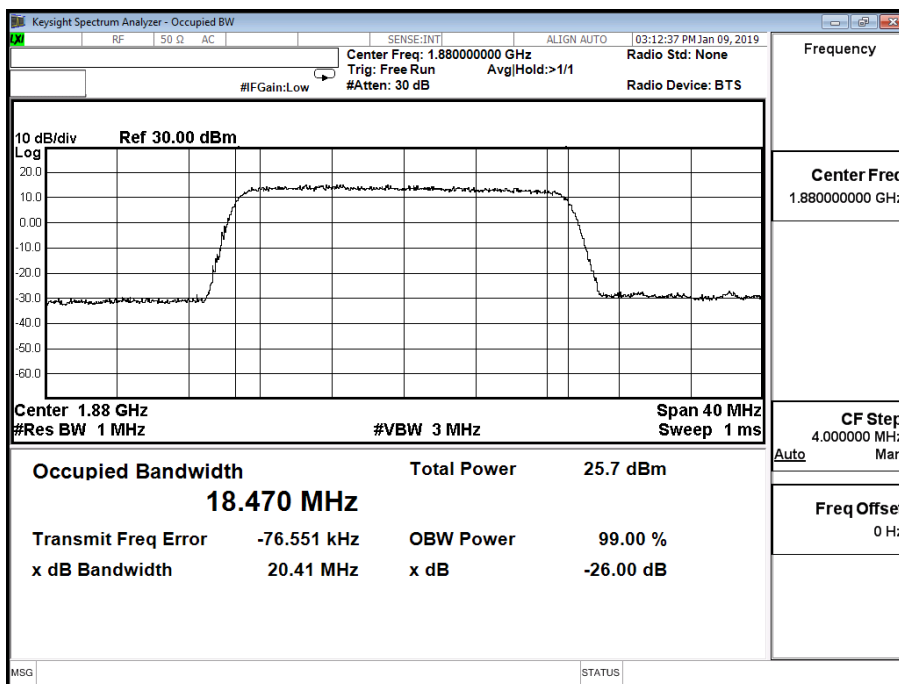


Band 2 15M 16QAM - LTE Mode CH18900 (1880MHz)

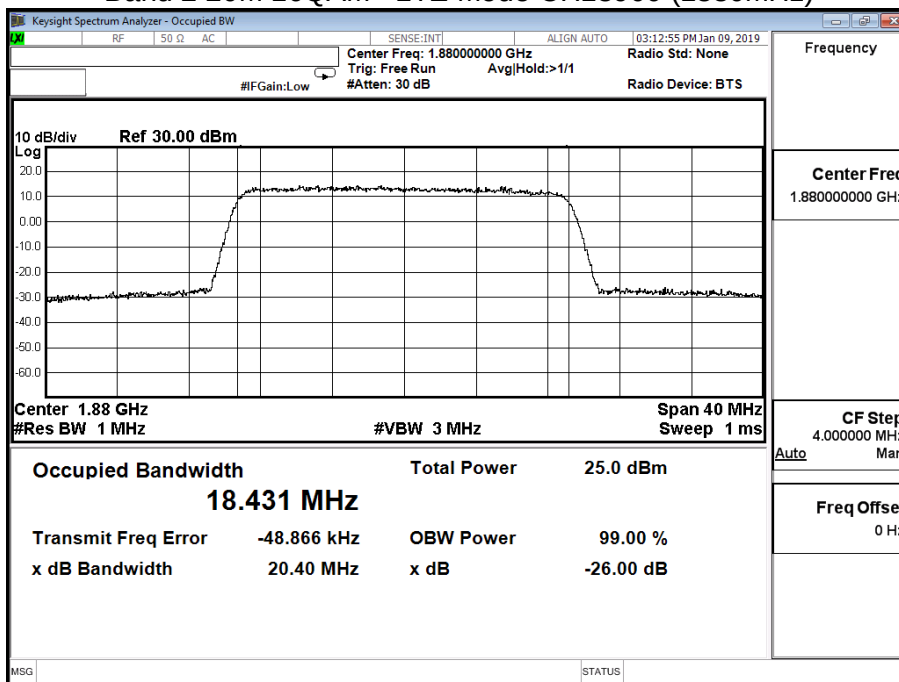


Product	4G/LTE Broadband Router with PoE		
Test Mode	Occupied Bandwidth		
Date of Test	2019/01/09	Test Site	CTR
Test Condition	Band 2 20M		

Band 2 20M QPSK - LTE Mode CH18900 (1880MHz)



Band 2 20M 16QAM - LTE Mode CH18900 (1880MHz)

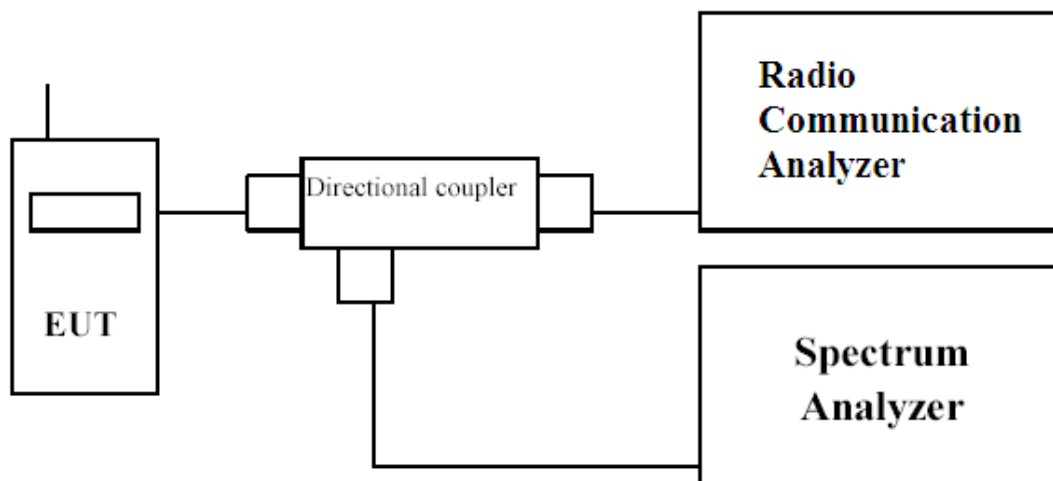


5. Spurious Emission At Antenna Terminals (+/-1MHz)

5.1. Test Specification

According to Part 2.1051, 24.238

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

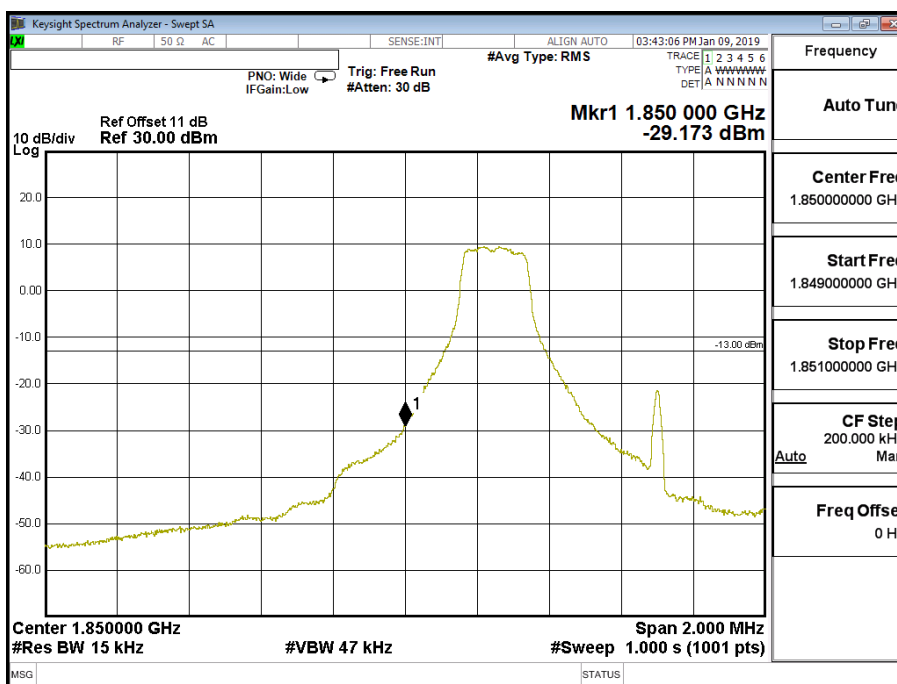
In accordance with Part 27.53 at least 1% of the emission bandwidth was used for the resolution and video bandwidths up to 1MHz away from the Block Edge. At greater than 1MHz, the resolution and video bandwidth were increased to 1MHz/3MHz.

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

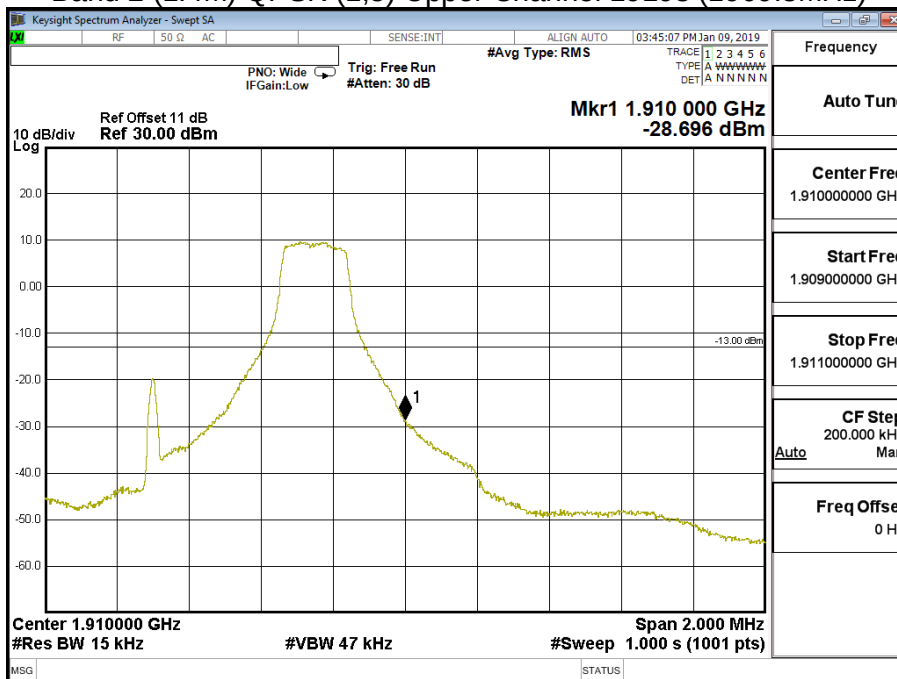
5.5. Test Result of Spurious Emission At Antenna Terminals (+/-1MHz)

Product	4G/LTE Broadband Router with PoE		
Test Mode	Spurious Emission At Antenna Terminals (+/-1MHz)		
Date of Test	2019/01/09	Test Site	CTR
Test Condition	Block Edge Test (Band 2 (1.4M))		

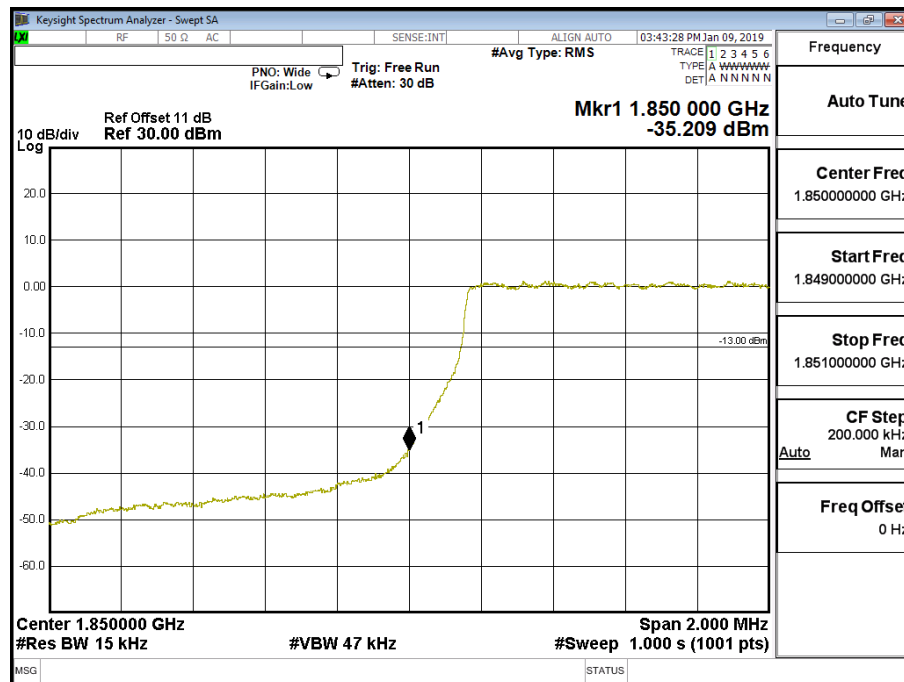
Band 2 (1.4M) QPSK (1,0) Lower Channel 18607 (1850.7MHz)



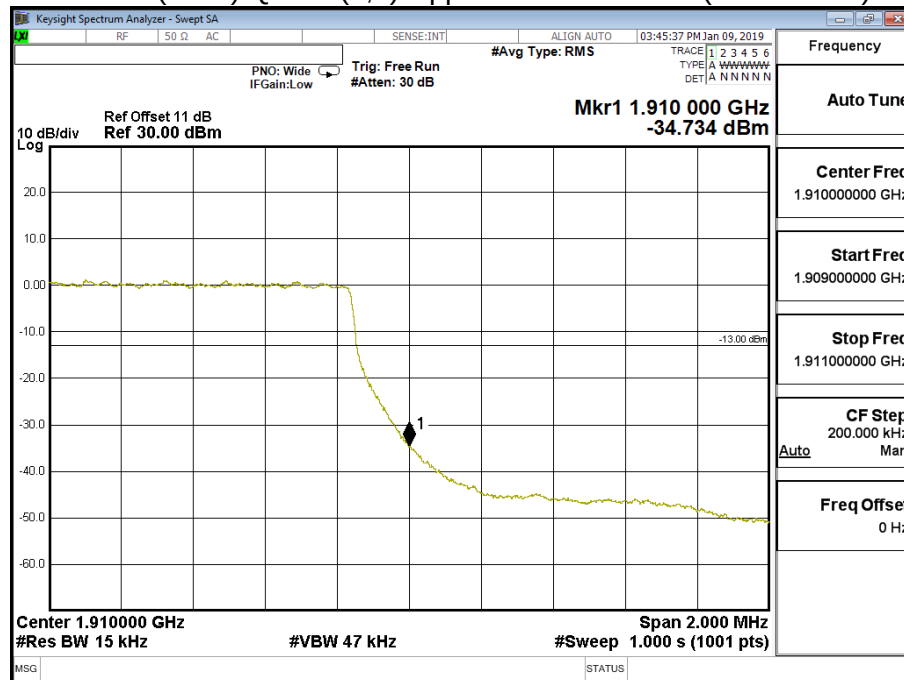
Band 2 (1.4M) QPSK (1,5) Upper Channel 19193 (1909.3MHz)



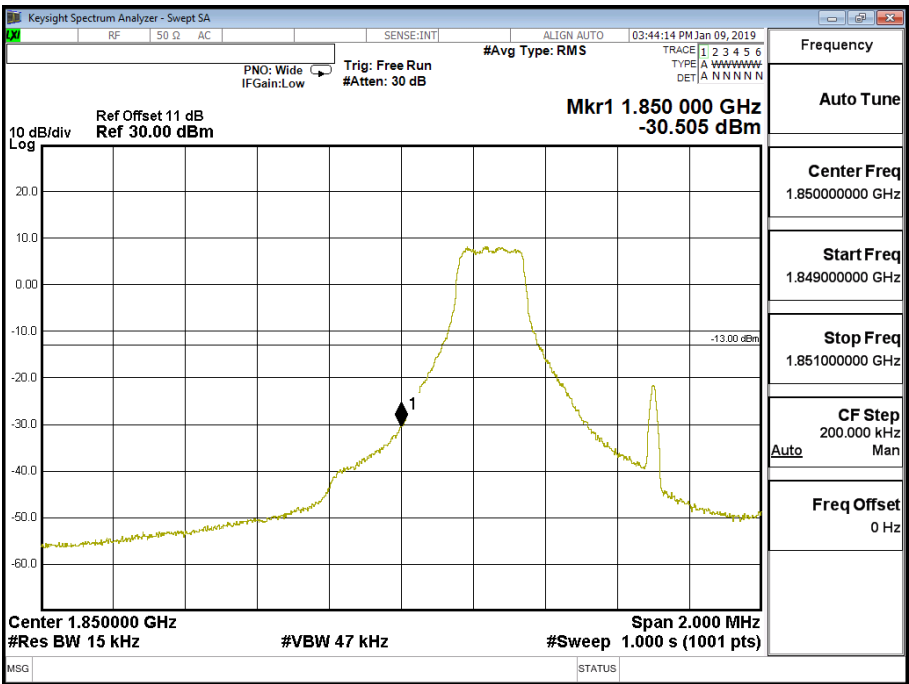
Band 2 (1.4M) QPSK (6,0) Lower Channel 18607 (1850.7MHz)



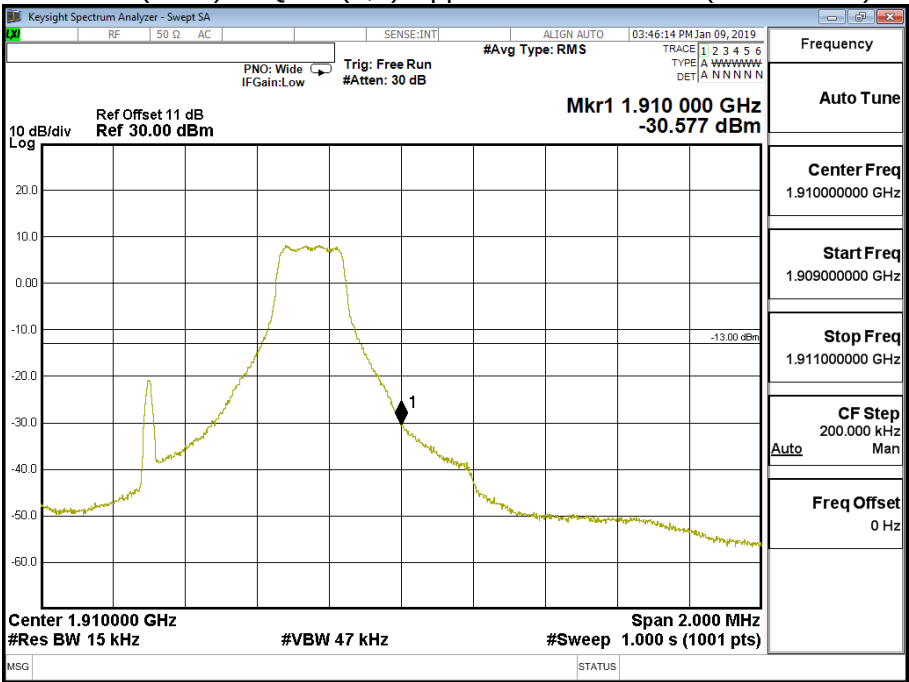
Band 2 (1.4M) QPSK (6,0) Upper Channel 19193 (1909.3MHz)



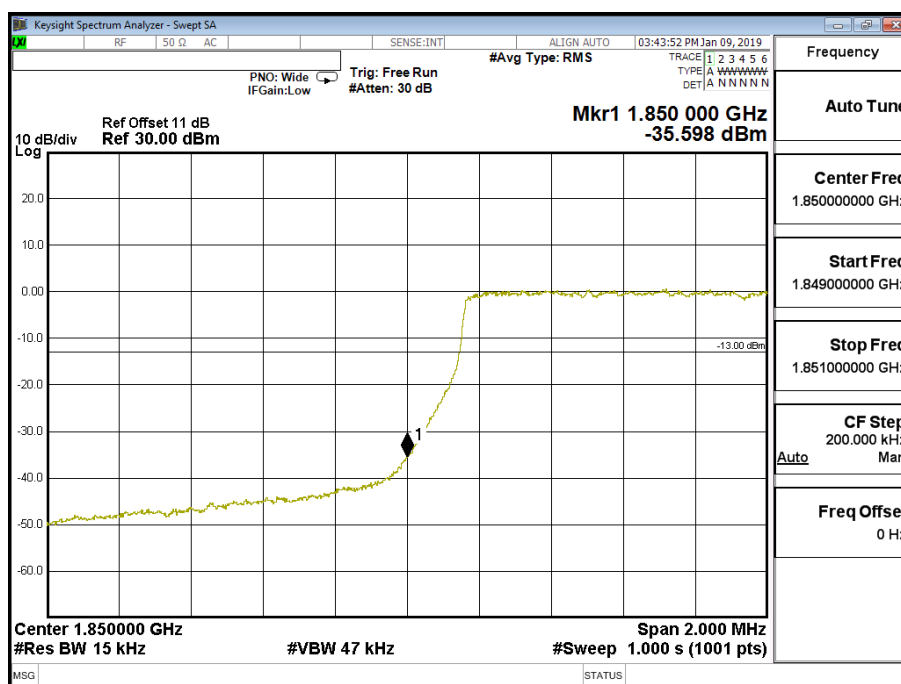
Band 2 (1.4M) 16QAM (1,0) Lower Channel 18607 (1850.7MHz)



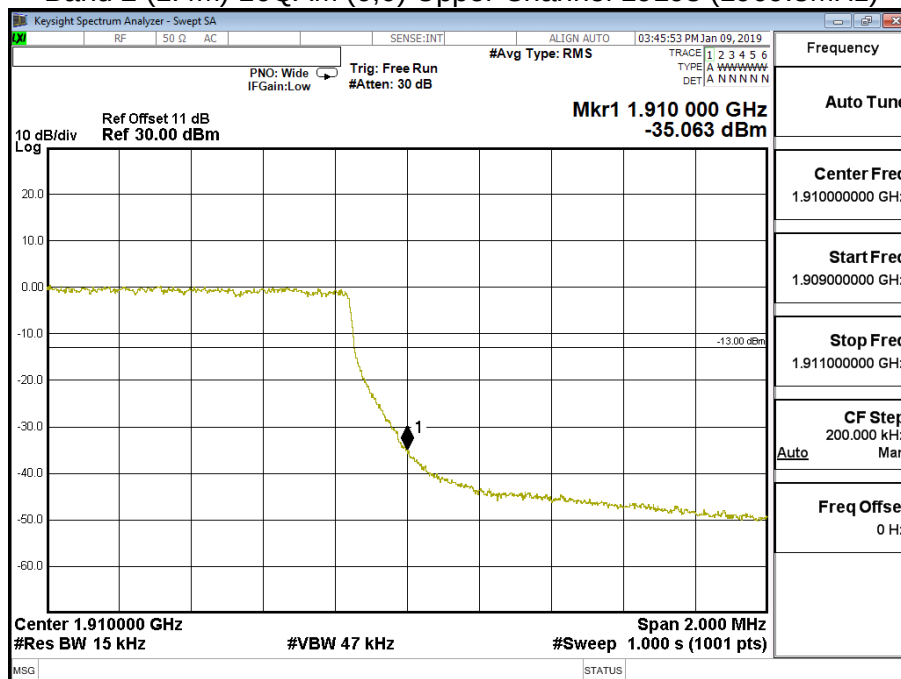
Band 2 (1.4M) 16QAM (1,5) Upper Channel 19193 (1909.3MHz)



Band 2 (1.4M) 16QAM (6,0) Lower Channel 18607 (1850.7MHz)

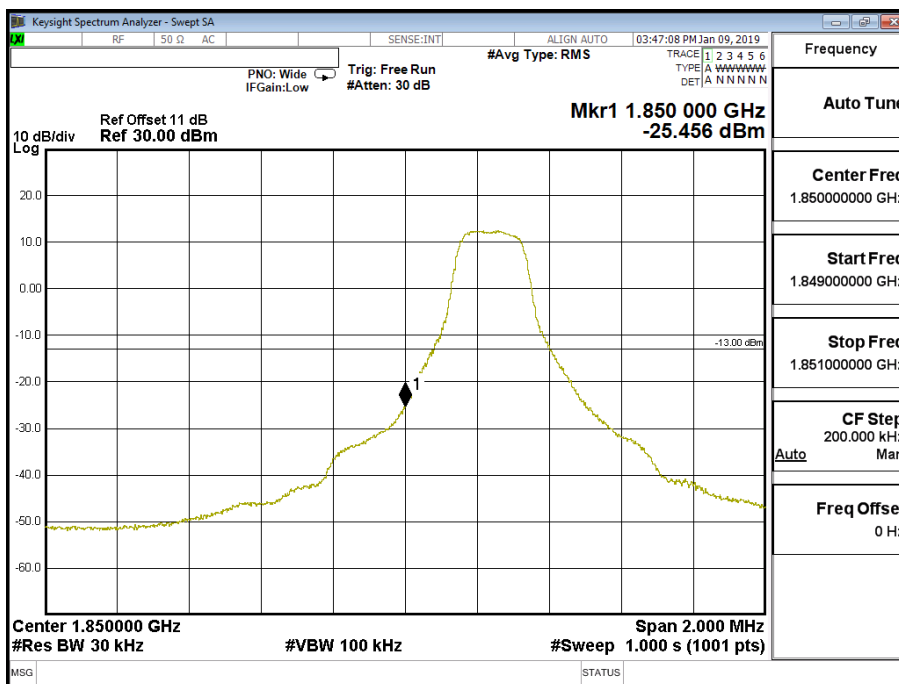


Band 2 (1.4M) 16QAM (6,0) Upper Channel 19193 (1909.3MHz)

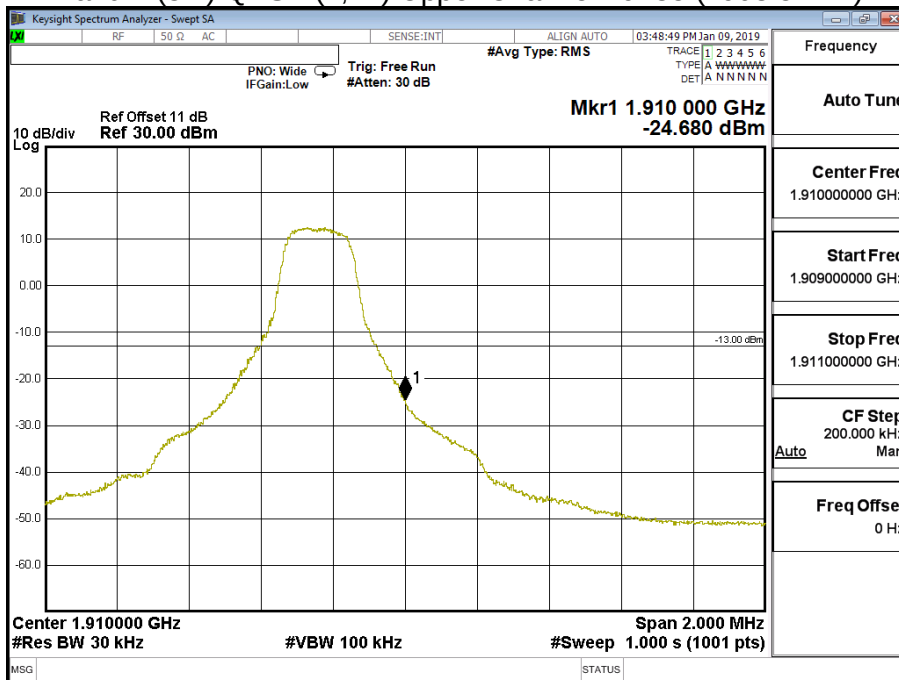


Product	4G/LTE Broadband Router with PoE		
Test Mode	Spurious Emission At Antenna Terminals (+/-1MHz)		
Date of Test	2019/01/09	Test Site	CTR
Test Condition	Block Edge Test (Band 2 (3M))		

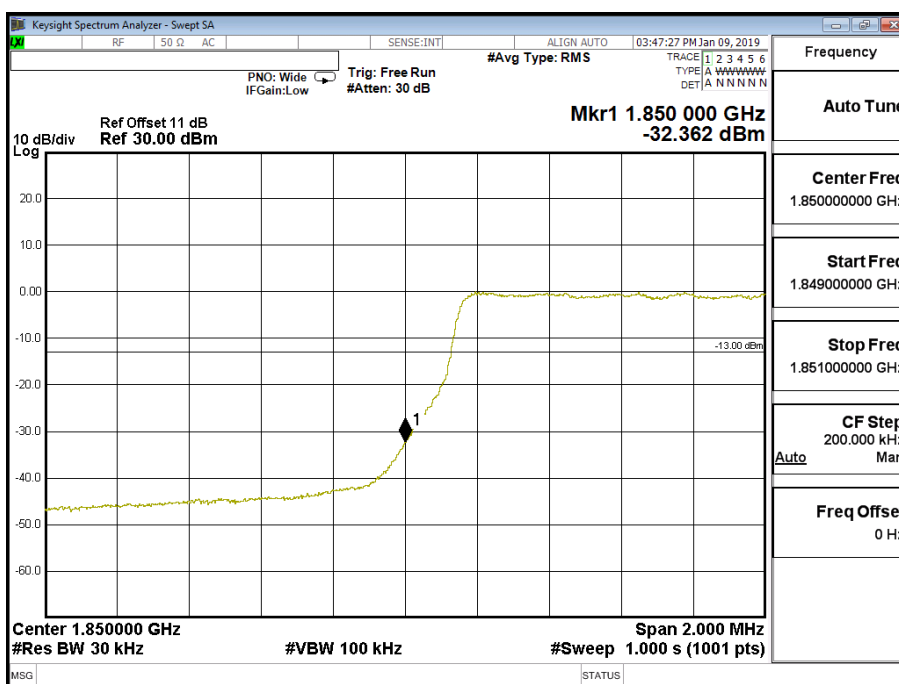
Band 2 (3M) QPSK (1,0) Lower Channel 18615 (1851.5MHz)



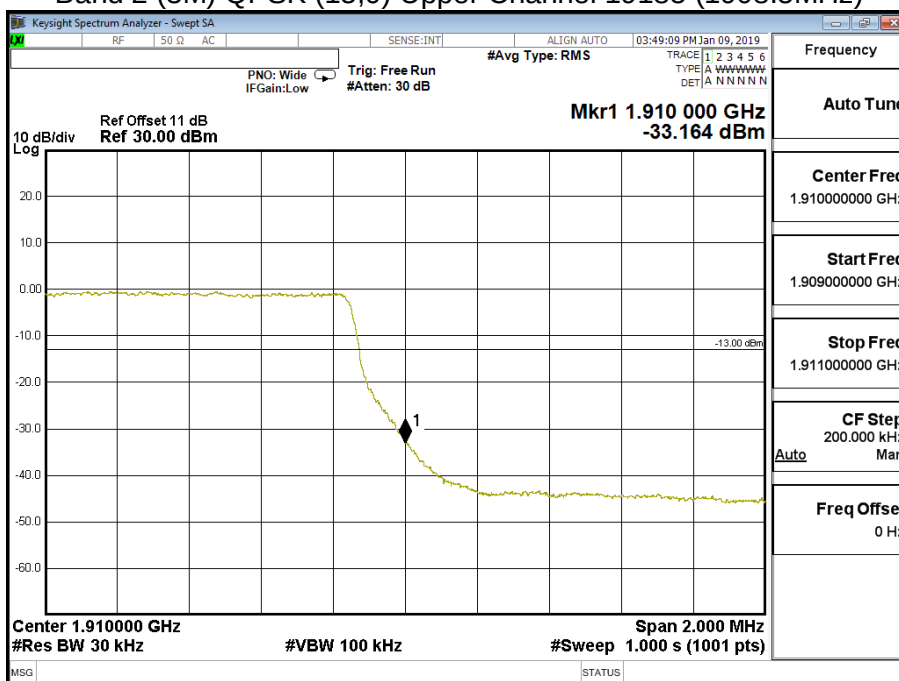
Band 2 (3M) QPSK (1,14) Upper Channel 19185 (1908.5MHz)



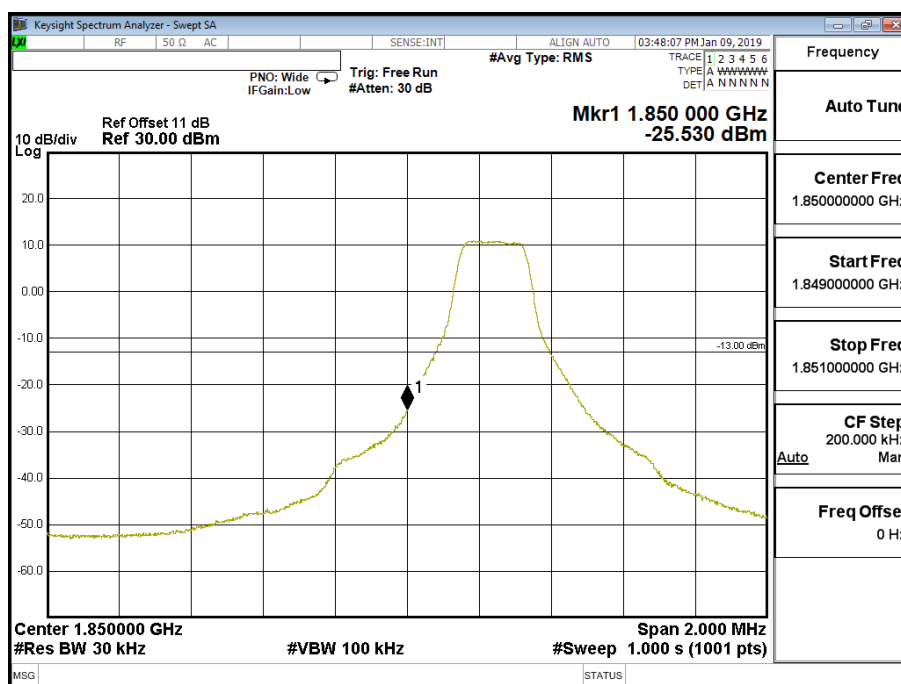
Band 2 (3M) QPSK (15,0) Lower Channel 18615 (1851.5MHz)



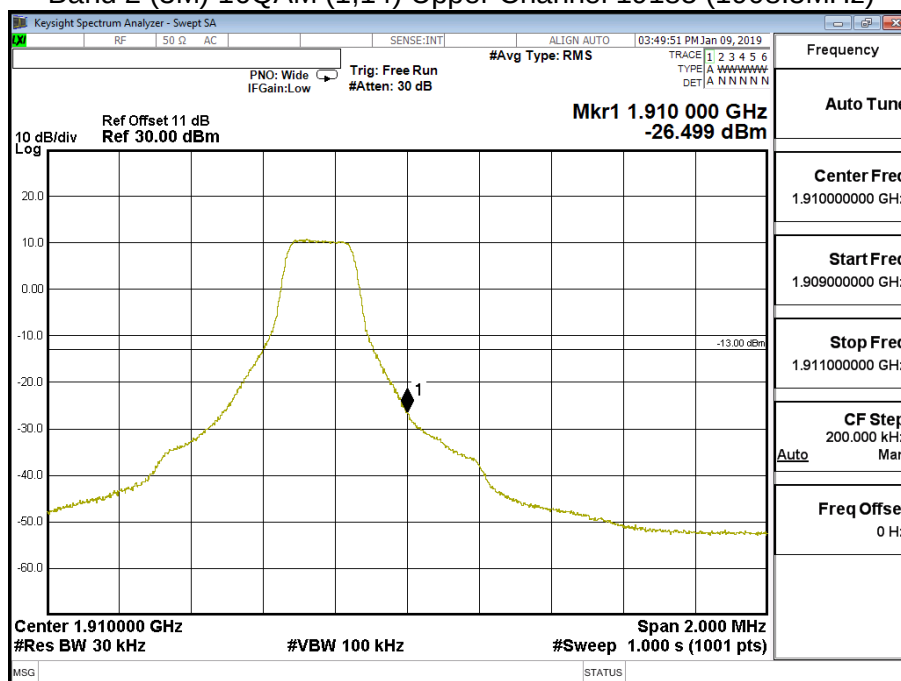
Band 2 (3M) QPSK (15,0) Upper Channel 19185 (1908.5MHz)



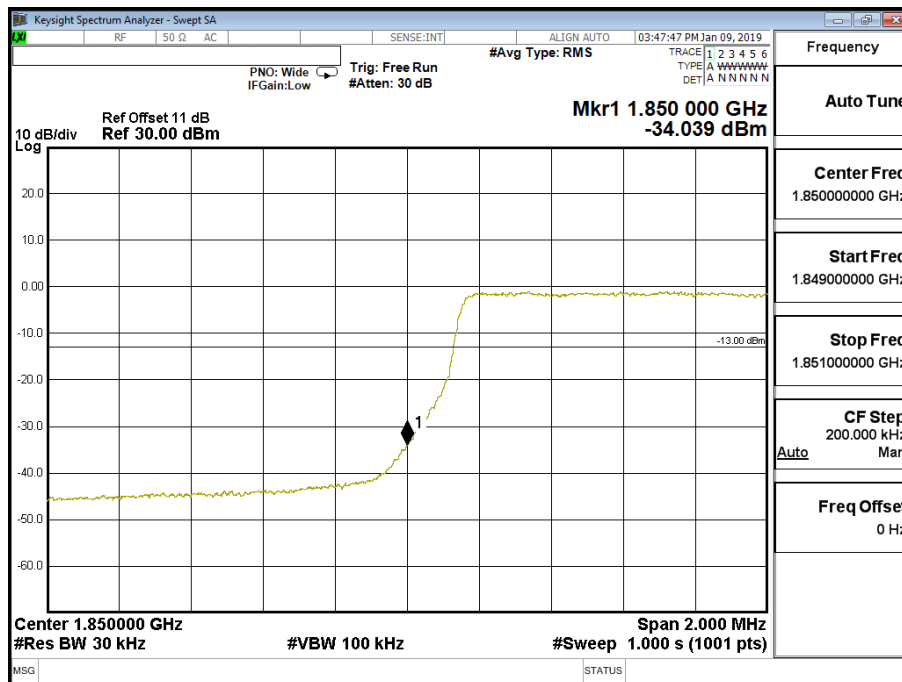
Band 2 (3M) 16QAM (1,0) Lower Channel 18615 (1851.5MHz)



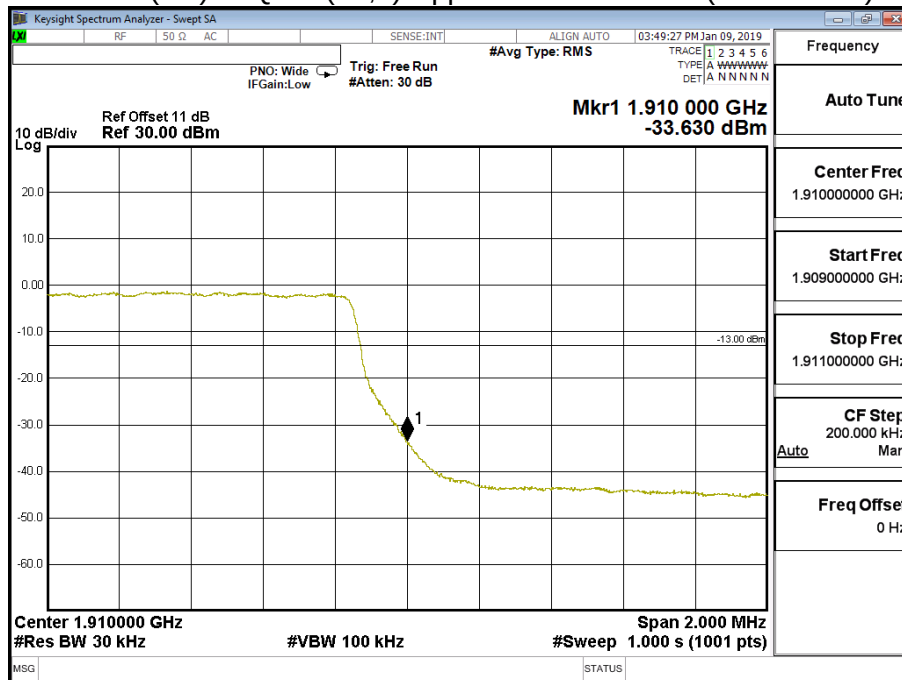
Band 2 (3M) 16QAM (1,14) Upper Channel 19185 (1908.5MHz)



Band 2 (3M) 16QAM (15,0) Lower Channel 18615 (1851.5MHz)

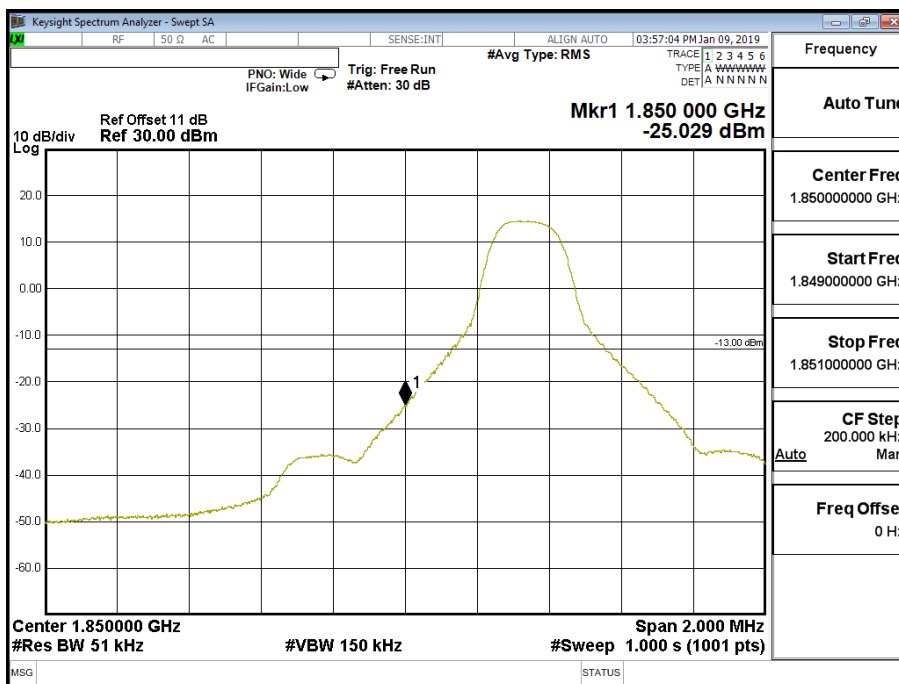


Band 2 (3M) 16QAM (15,0) Upper Channel 19185 (1908.5MHz)

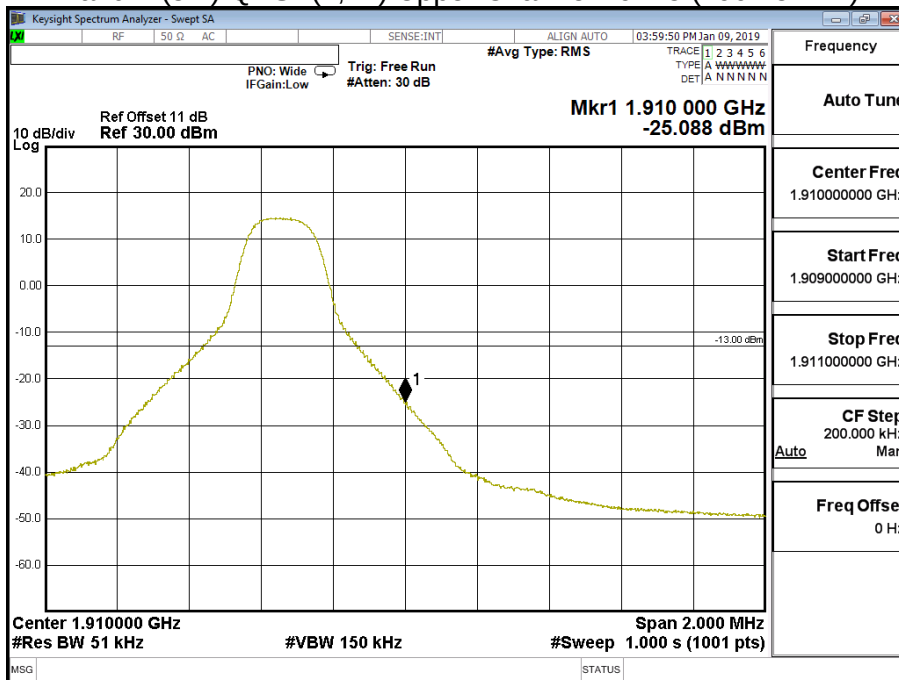


Product	4G/LTE Broadband Router with PoE		
Test Mode	Spurious Emission At Antenna Terminals (+/-1MHz)		
Date of Test	2019/01/10	Test Site	CTR
Test Condition	Block Edge Test (Band 2 (5M))		

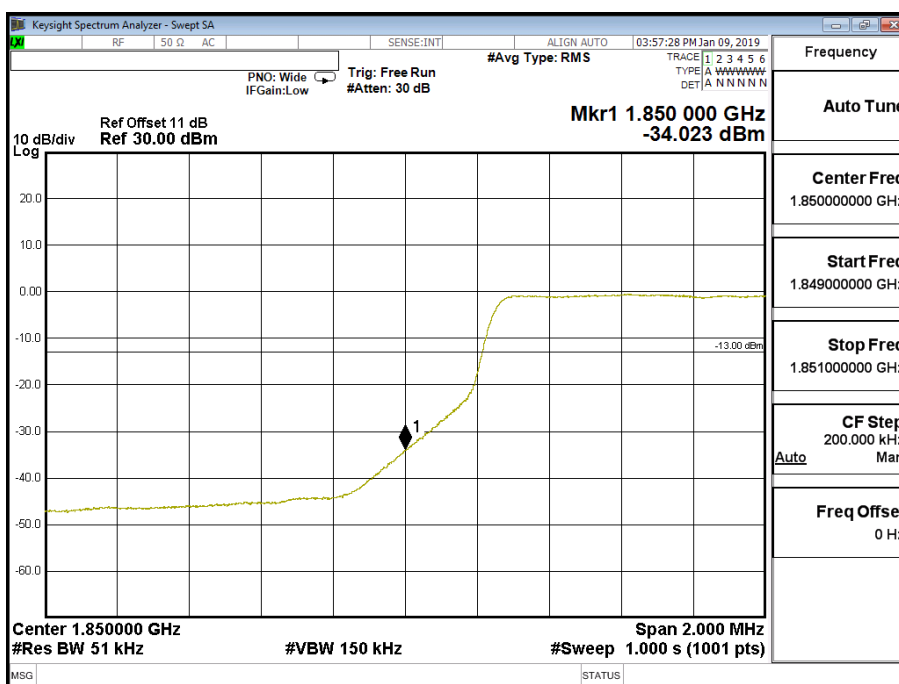
Band 2 (5M) QPSK(1,0) Lower Channel 18625 (1852.5MHz)



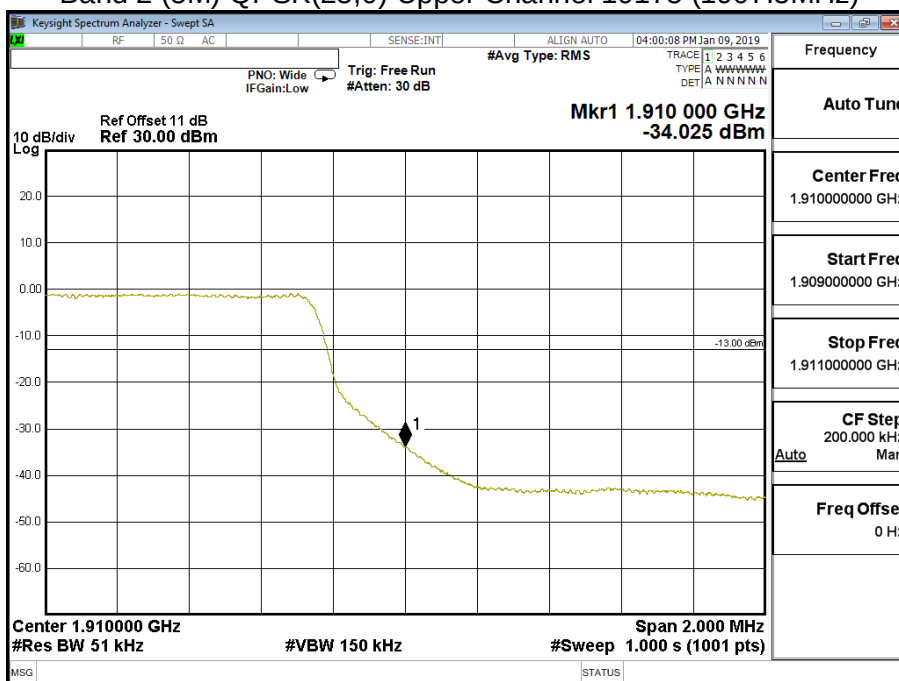
Band 2 (5M) QPSK(1,24) Upper Channel 19175 (1907.5MHz)



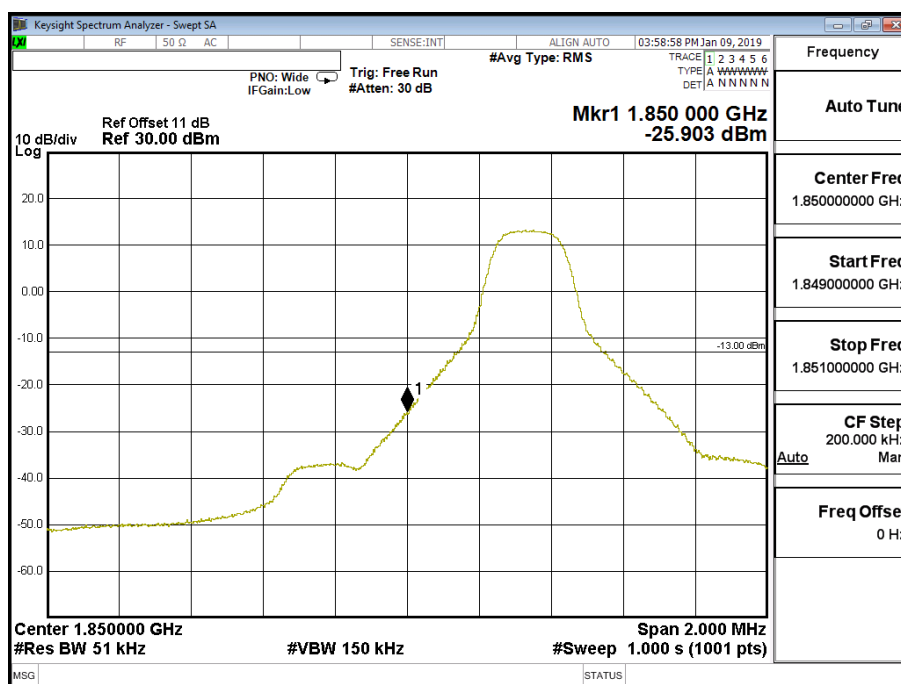
Band 2 (5M) QPSK(25,0) Lower Channel 18625 (1852.5MHz)



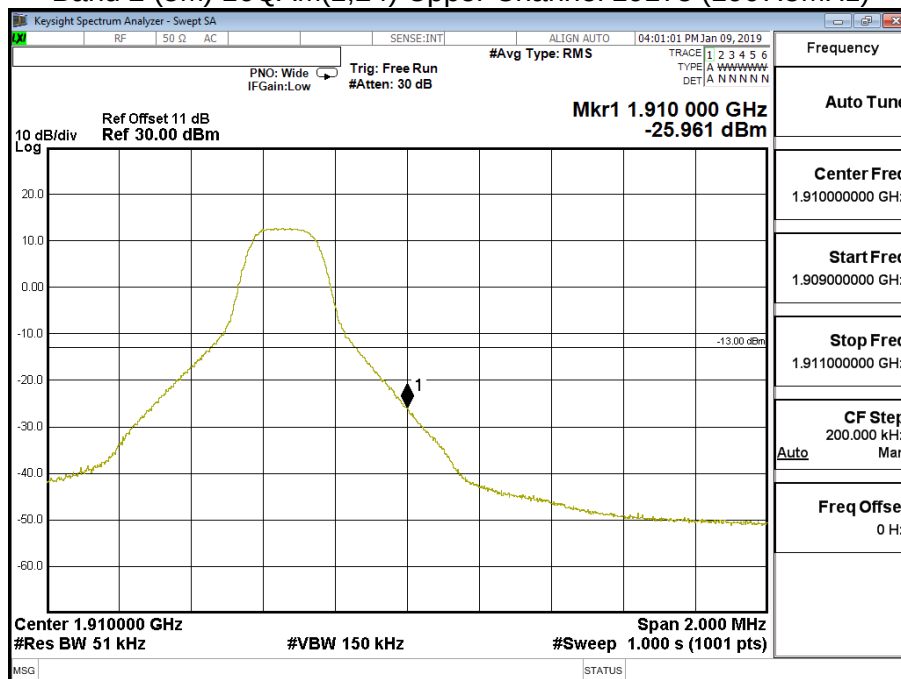
Band 2 (5M) QPSK(25,0) Upper Channel 19175 (1907.5MHz)



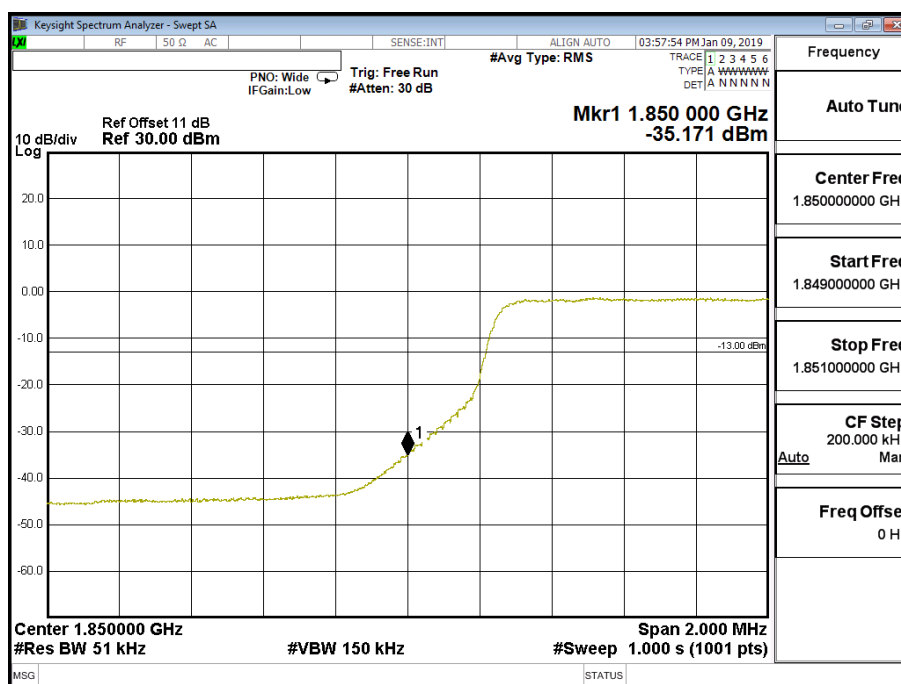
Band 2 (5M) 16QAM(1,0) Lower Channel 18625 (1852.5MHz)



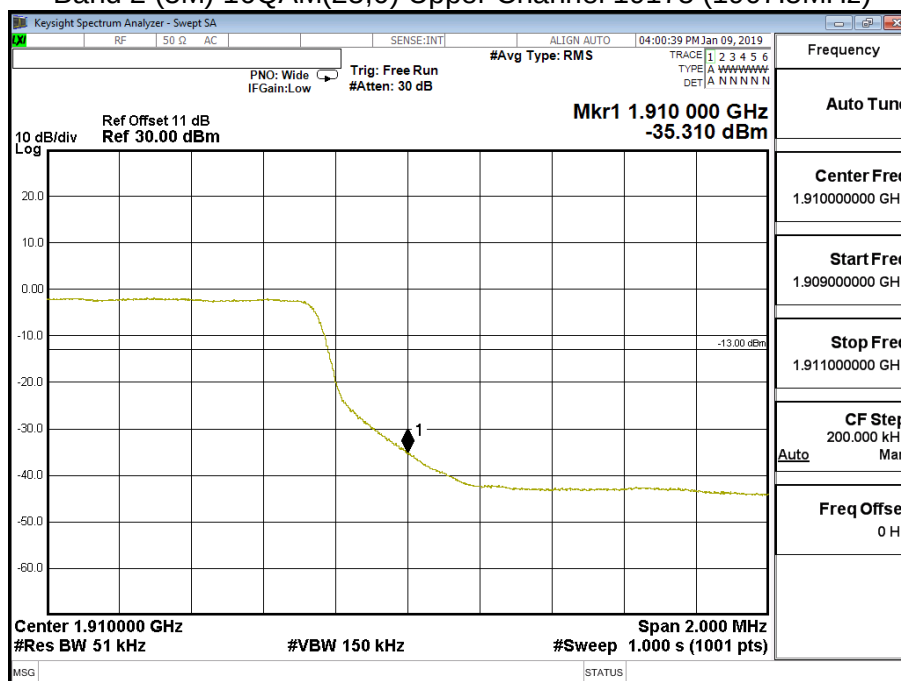
Band 2 (5M) 16QAM(1,24) Upper Channel 19175 (1907.5MHz)



Band 2 (5M) 16QAM(25,0) Lower Channel 18625 (1852.5MHz)

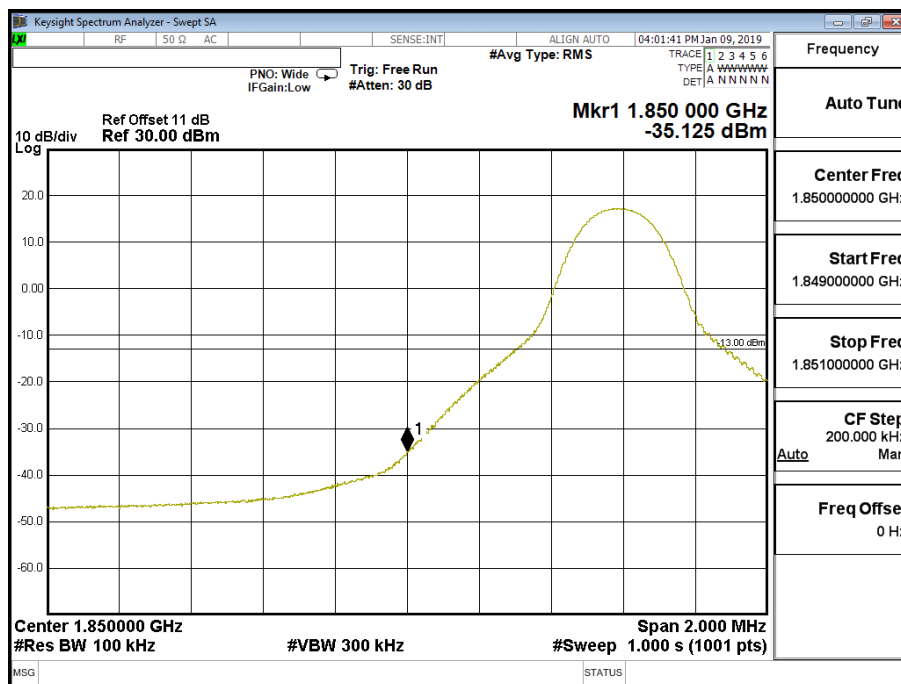


Band 2 (5M) 16QAM(25,0) Upper Channel 19175 (1907.5MHz)

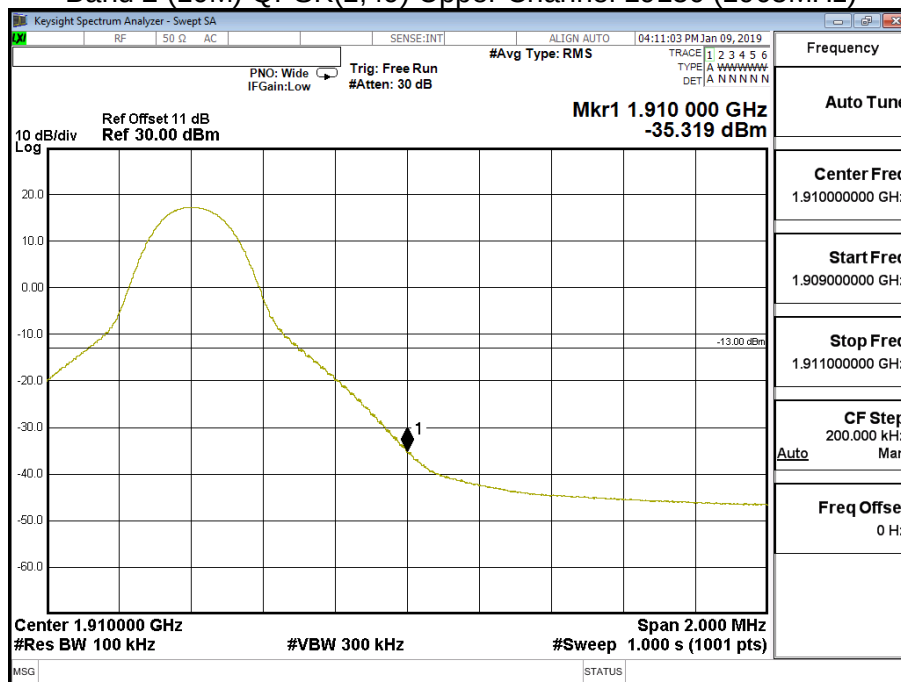


Product	4G/LTE Broadband Router with PoE		
Test Mode	Spurious Emission At Antenna Terminals (+/-1MHz)		
Date of Test	2019/01/09	Test Site	CTR
Test Condition	Block Edge Test (Band 2 (10M))		

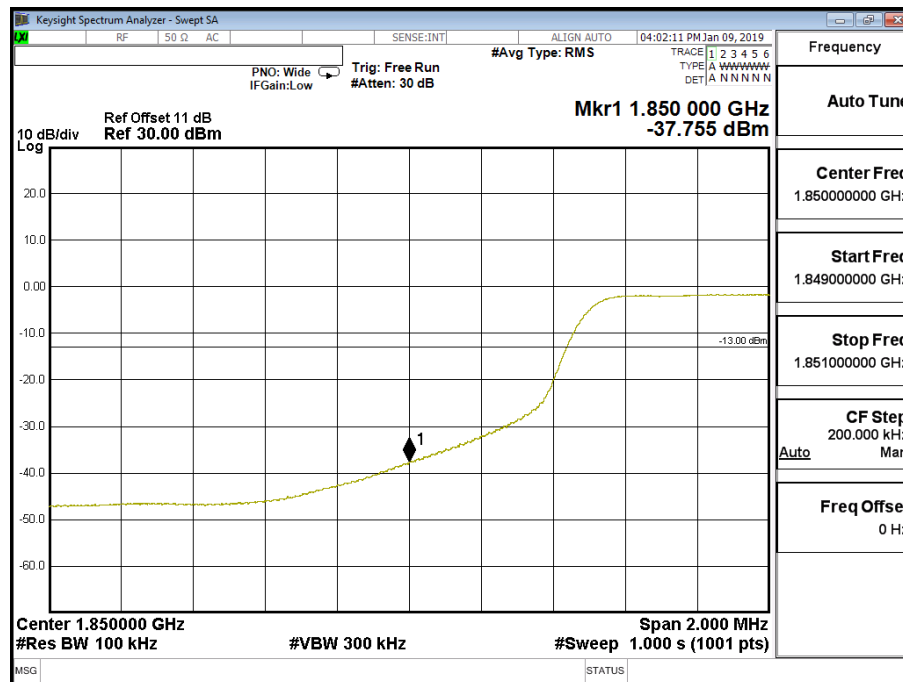
Band 2 (10M) QPSK(1,0) Lower Channel 18650 (1855MHz)



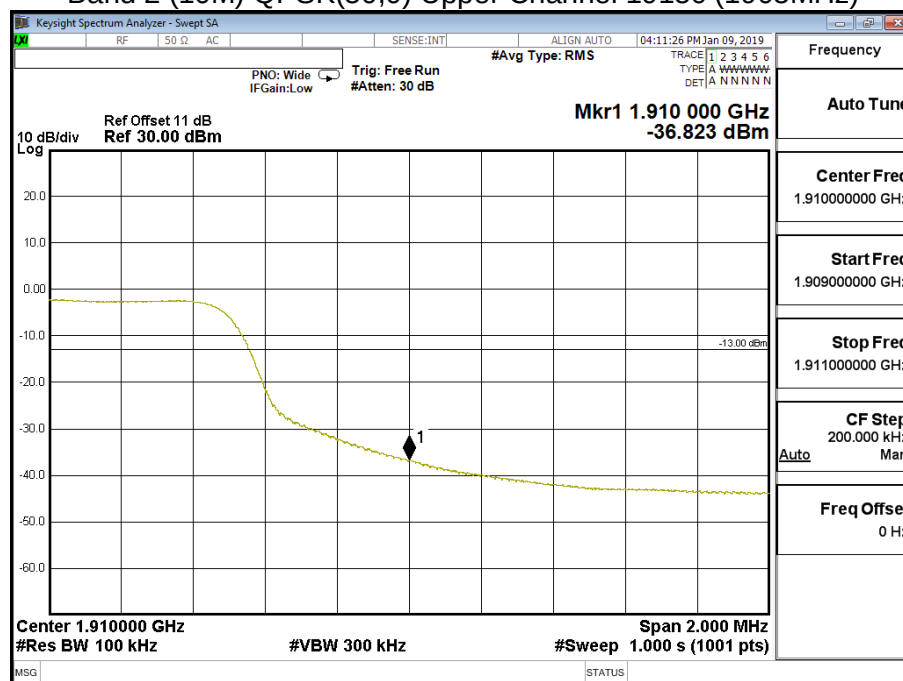
Band 2 (10M) QPSK(1,49) Upper Channel 19150 (1905MHz)



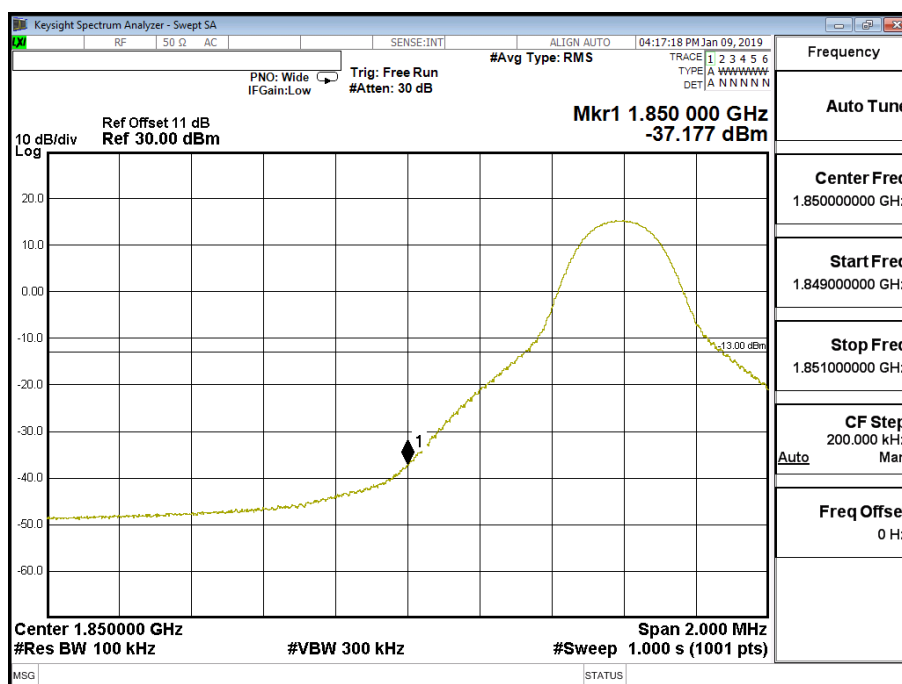
Band 2 (10M) QPSK(50,0) Lower Channel 18650 (1855MHz)



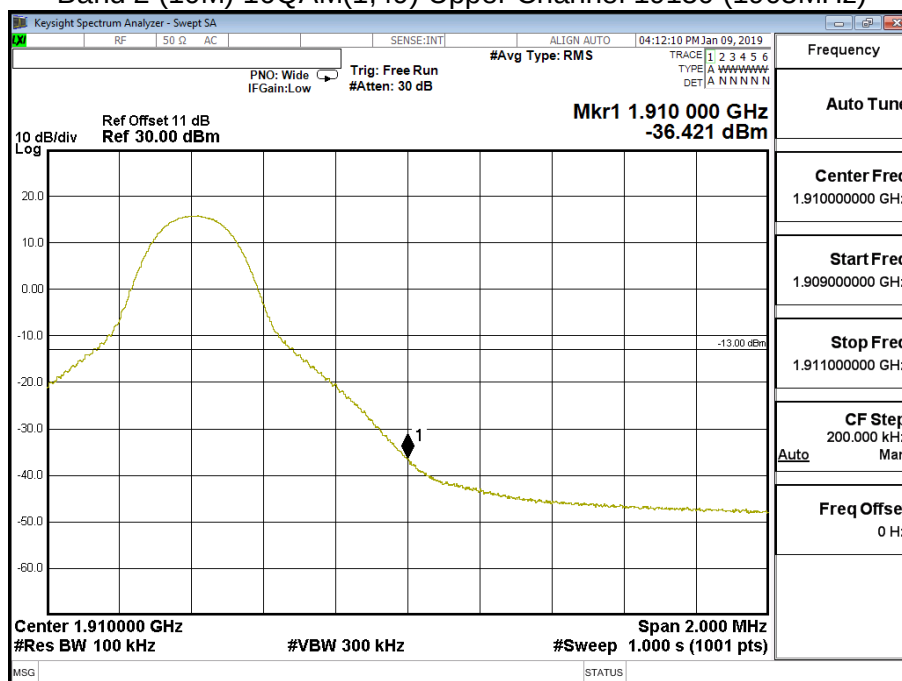
Band 2 (10M) QPSK(50,0) Upper Channel 19150 (1905MHz)



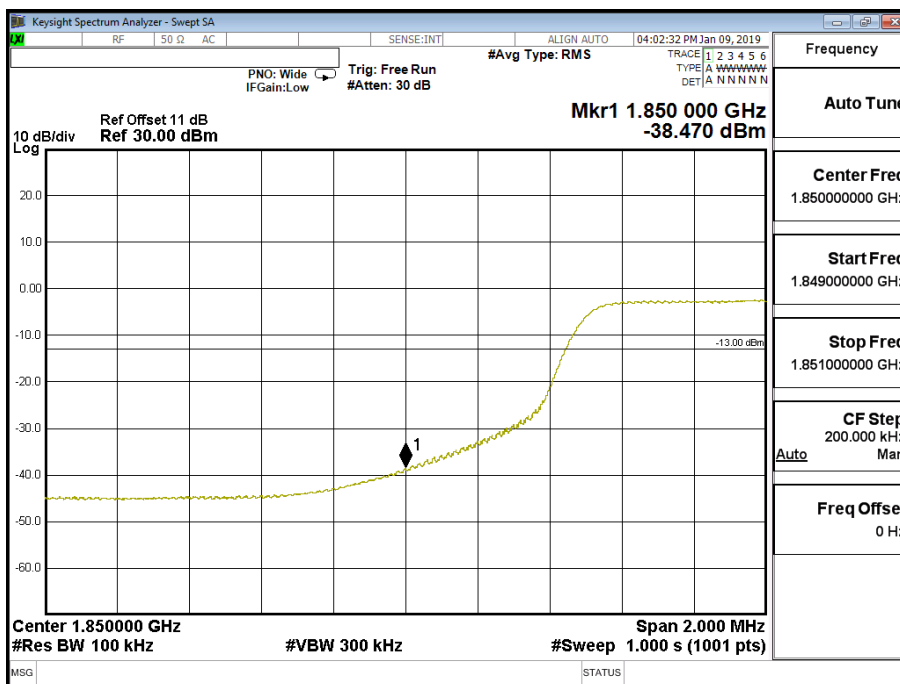
Band 2 (10M) 16QAM(1,0) Lower Channel 18650 (1855MHz)



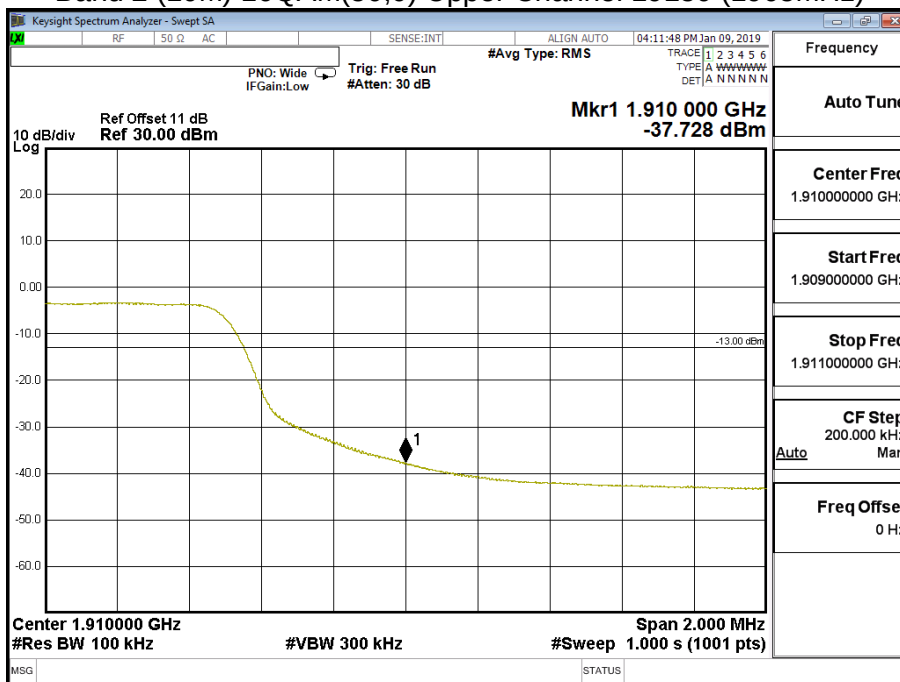
Band 2 (10M) 16QAM(1,49) Upper Channel 19150 (1905MHz)



Band 2 (10M) 16QAM(50,0) Lower Channel 18650 (1855MHz)

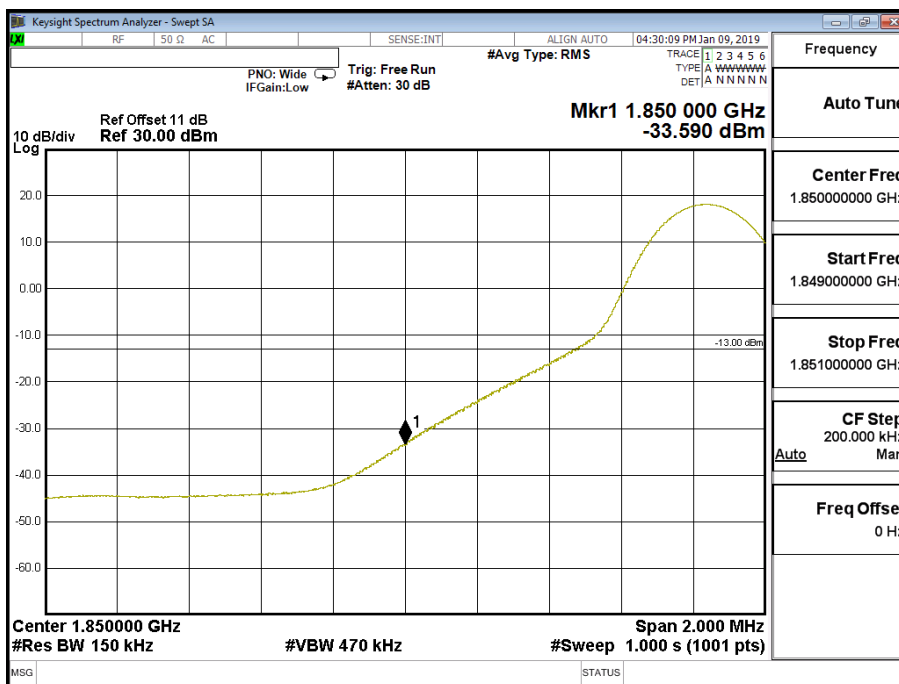


Band 2 (10M) 16QAM(50,0) Upper Channel 19150 (1905MHz)

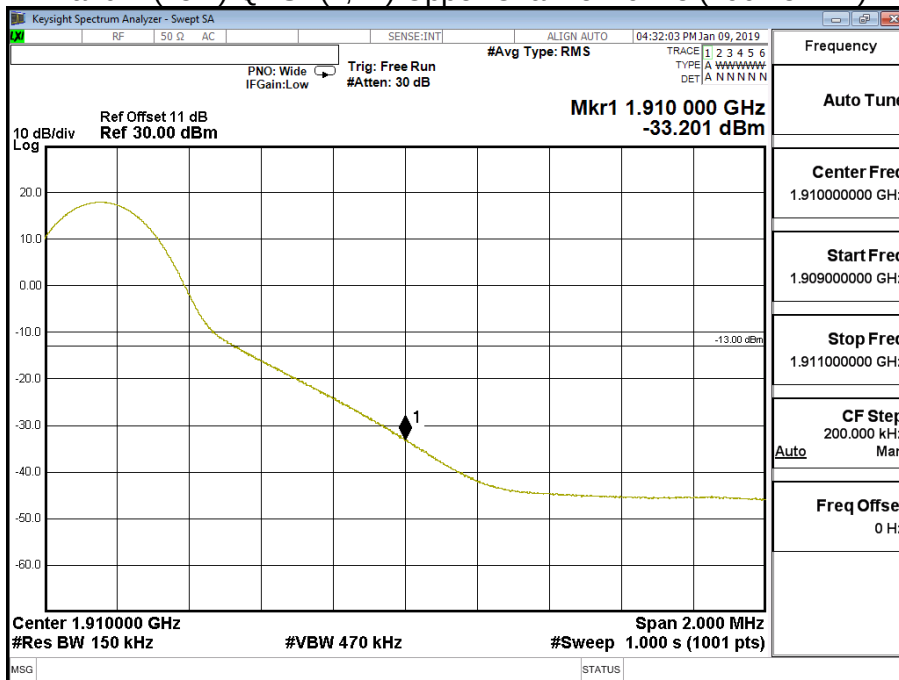


Product	4G/LTE Broadband Router with PoE		
Test Mode	Spurious Emission At Antenna Terminals (+/-1MHz)		
Date of Test	2019/01/09	Test Site	CTR
Test Condition	Block Edge Test (Band 2 (15M))		

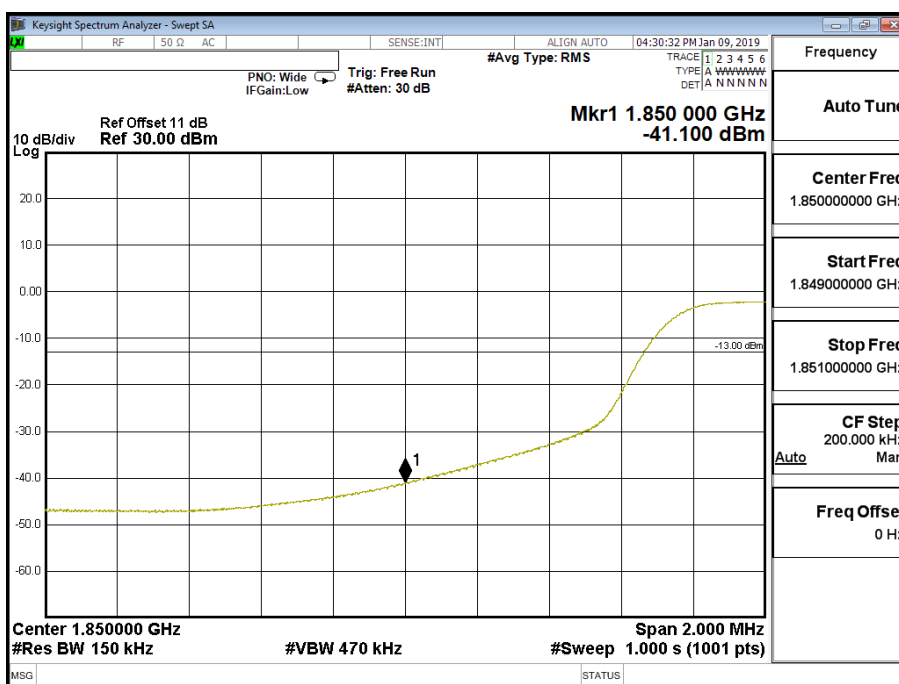
Band 2 (15M)QPSK(1,0) Lower Channel 18675 (1857.5MHz)



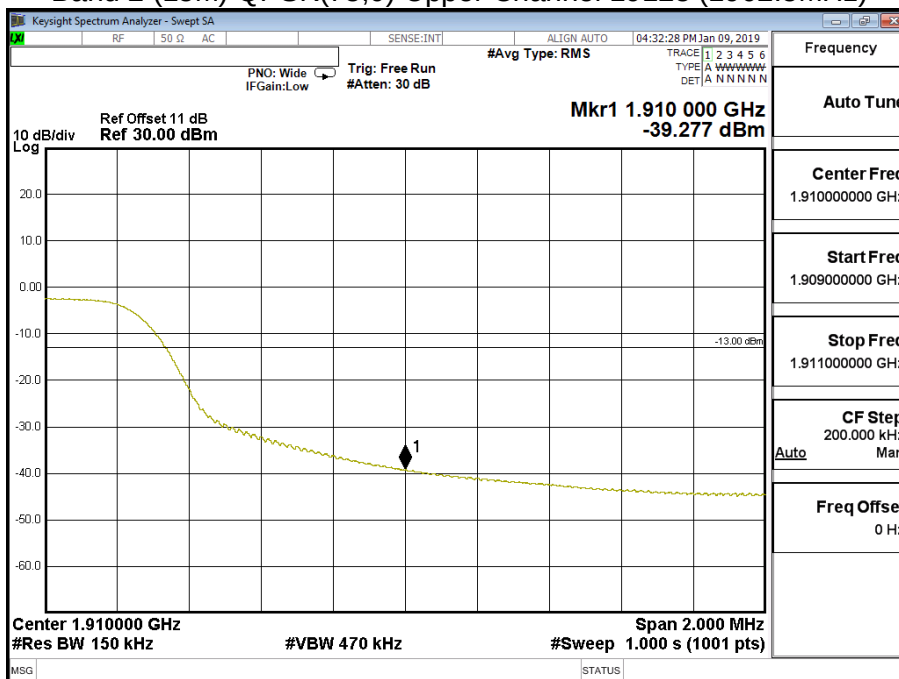
Band 2 (15M) QPSK(1,74) Upper Channel 19125 (1902.5MHz)



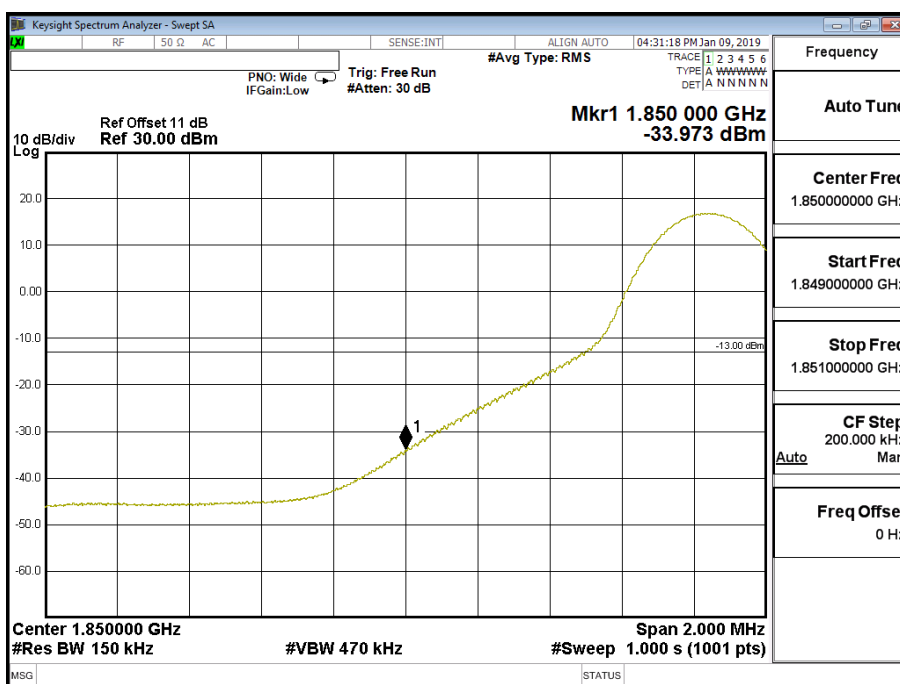
Band 2 (15M) QPSK(75,0) Lower Channel 18675 (1857.5MHz)



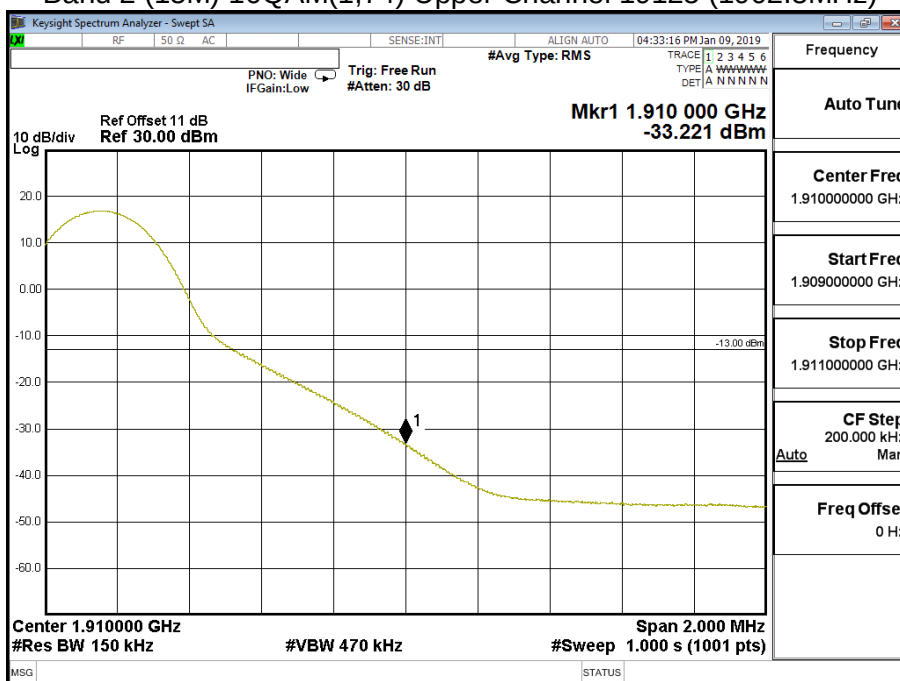
Band 2 (15M) QPSK(75,0) Upper Channel 19125 (1902.5MHz)



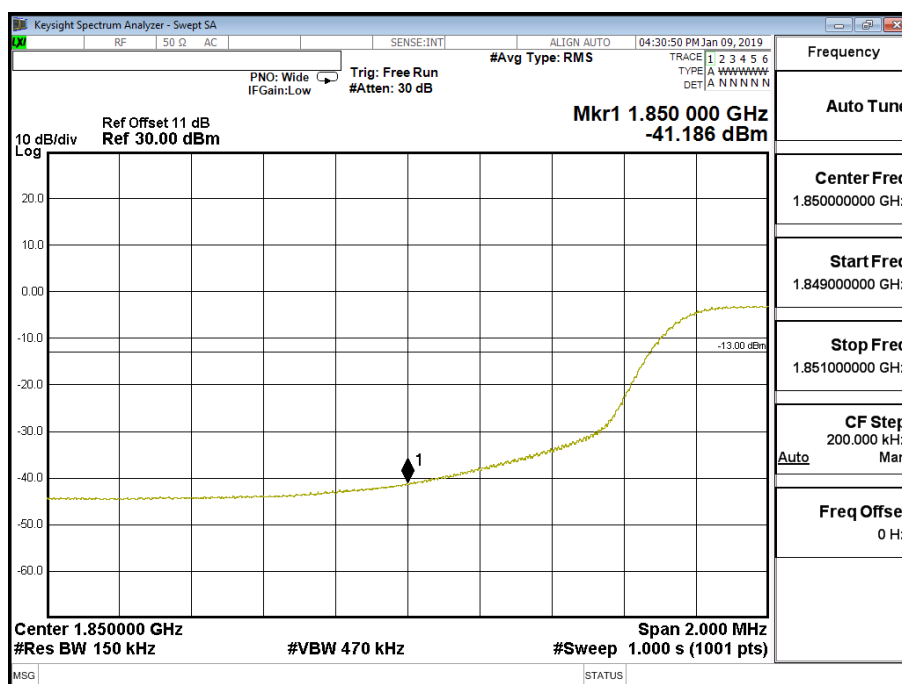
Band 2 (15M) 16QAM(1,0) Lower Channel 18675 (1857.5MHz)



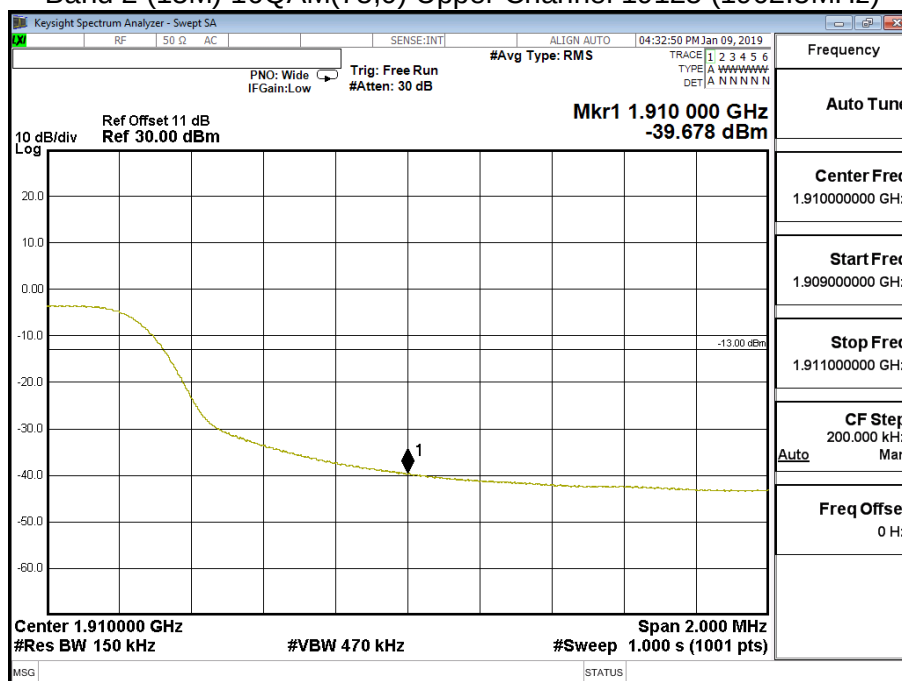
Band 2 (15M) 16QAM(1,74) Upper Channel 19125 (1902.5MHz)



Band 2 (15M) 16QAM(75,0) Lower Channel 18675 (1857.5MHz)

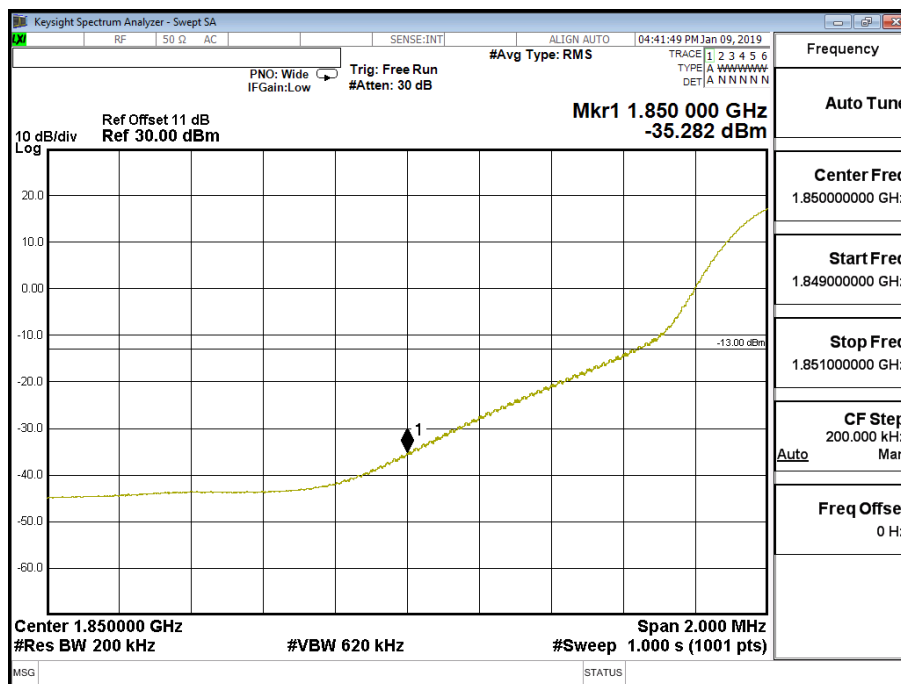


Band 2 (15M) 16QAM(75,0) Upper Channel 19125 (1902.5MHz)

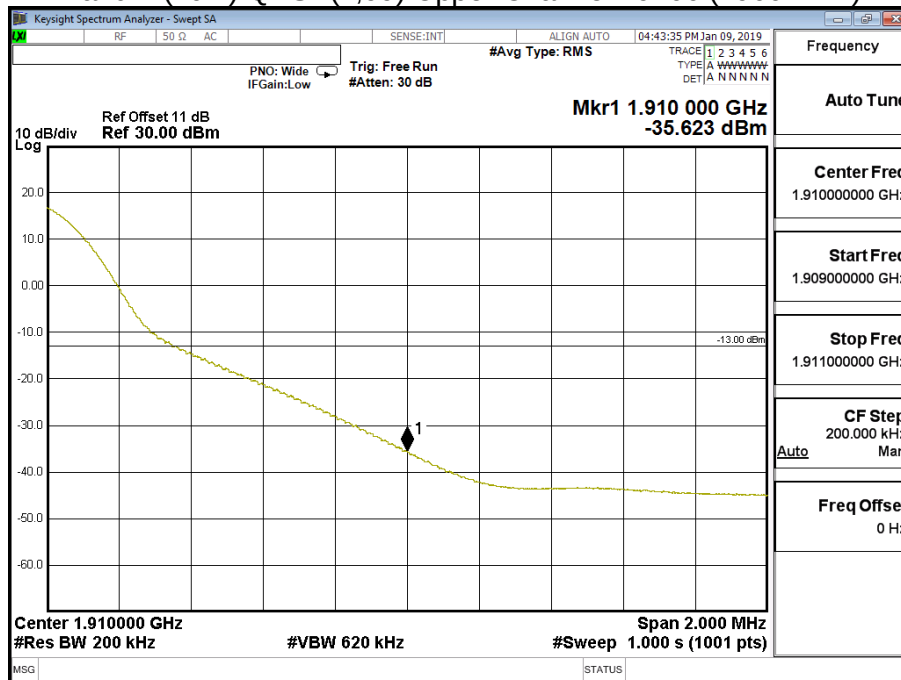


Product	4G/LTE Broadband Router with PoE		
Test Mode	Spurious Emission At Antenna Terminals (+/-1MHz)		
Date of Test	2019/01/09	Test Site	CTR
Test Condition	Block Edge Test (Band 2 (20M))		

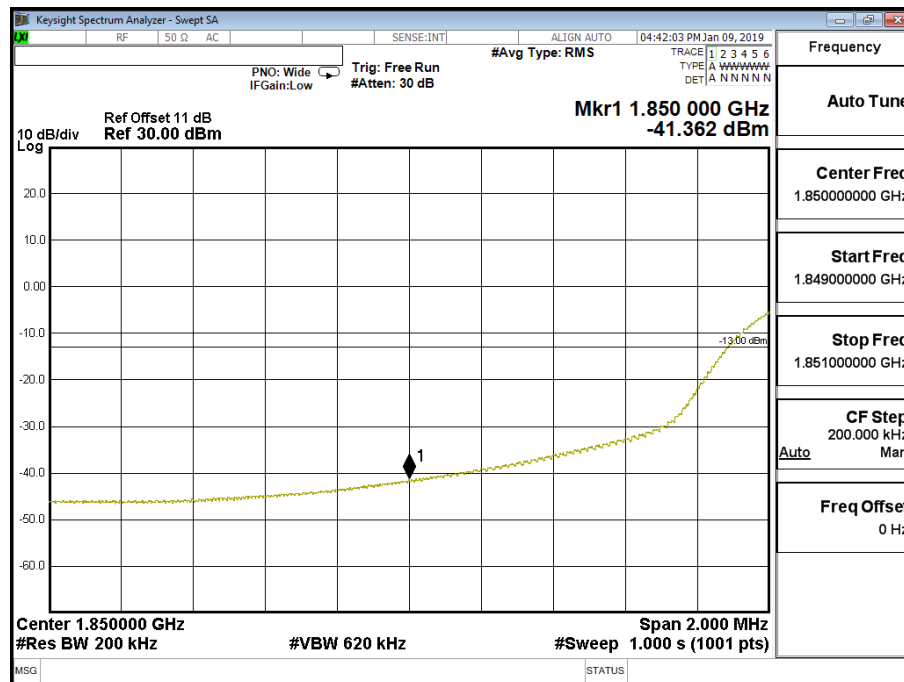
Band 2 (20M) QPSK(1,0) Lower Channel 18700 (1860MHz)



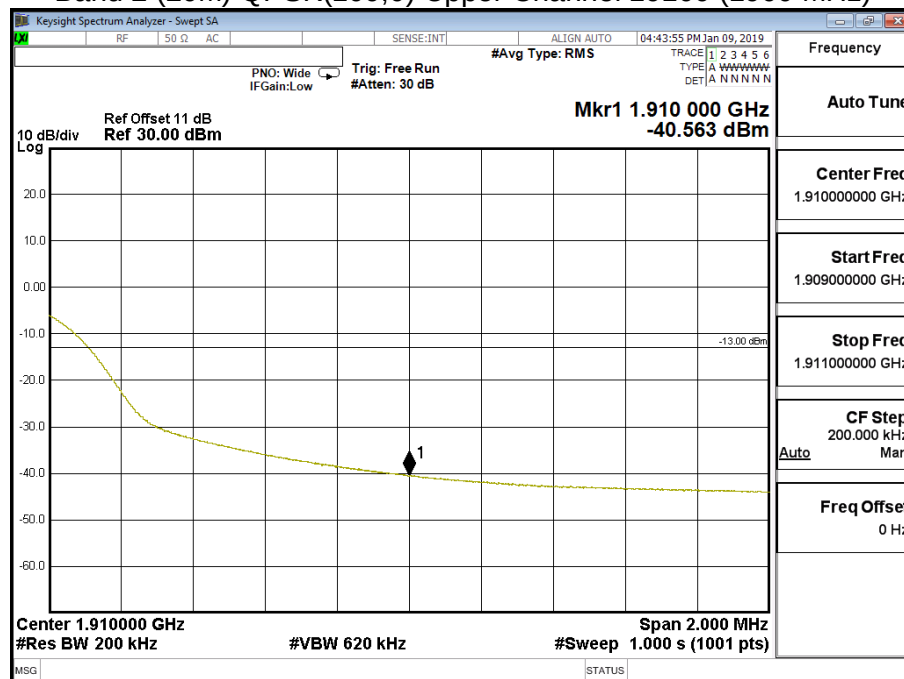
Band 2 (20M) QPSK(1,99) Upper Channel 19100 (1900 MHz)



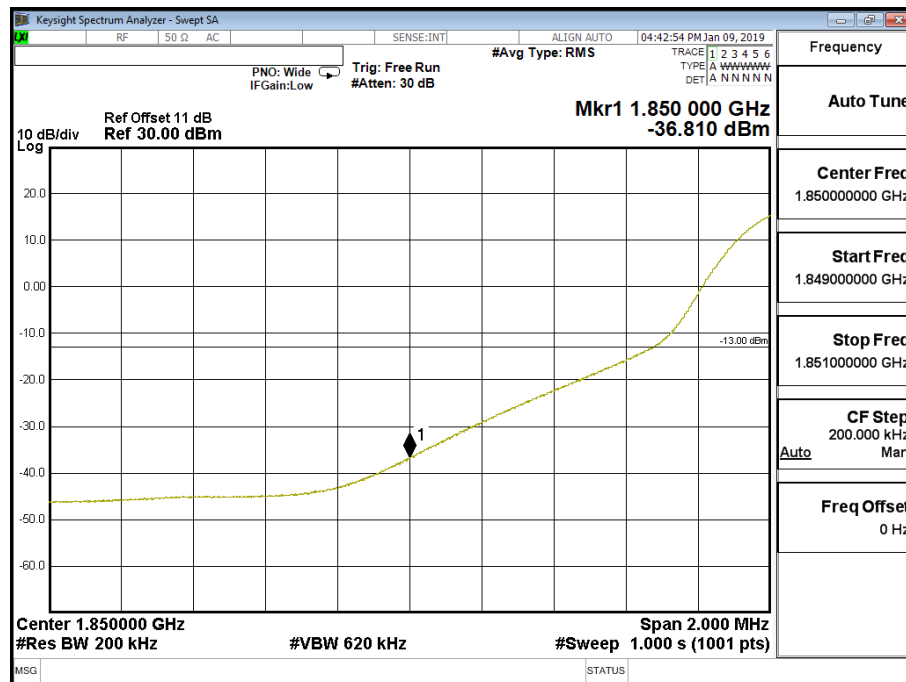
Band 2 (20M) QPSK(100,0) Lower Channel 18700 (1860MHz)



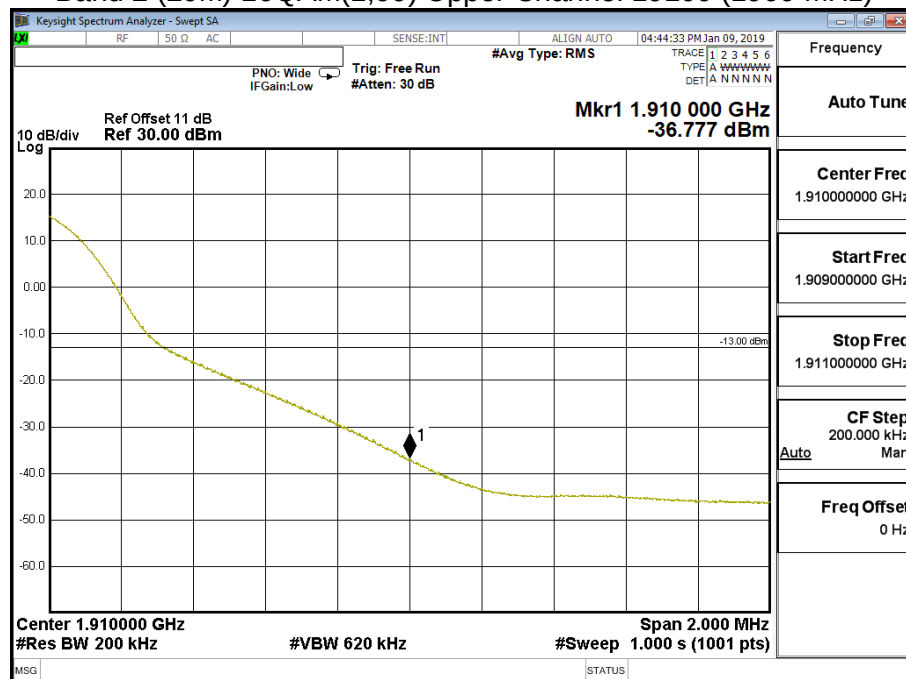
Band 2 (20M) QPSK(100,0) Upper Channel 19100 (1900 MHz)



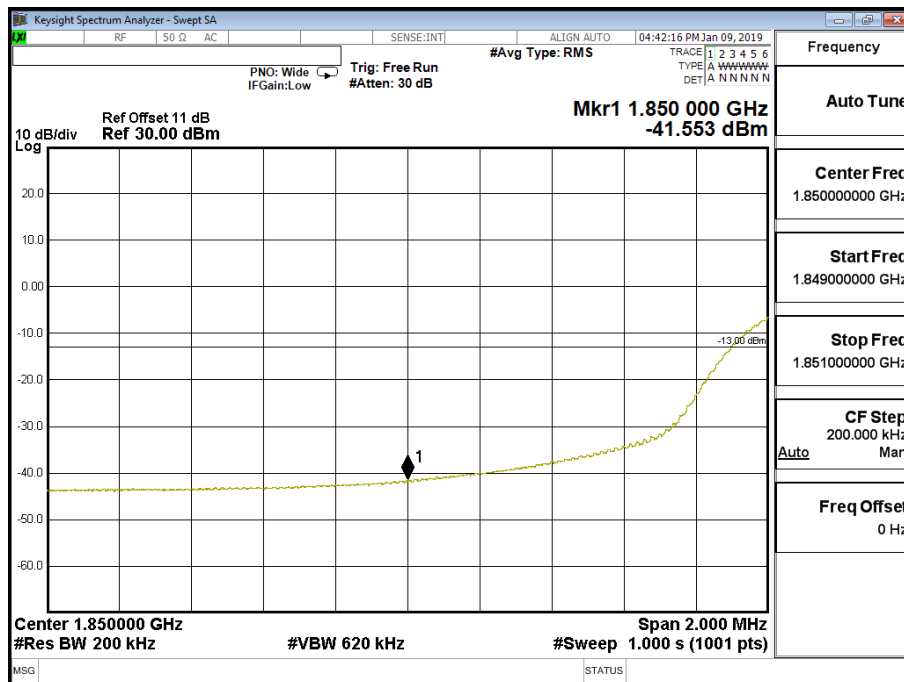
Band 2 (20M) 16QAM(1,0) Lower Channel 18700 (1860MHz)



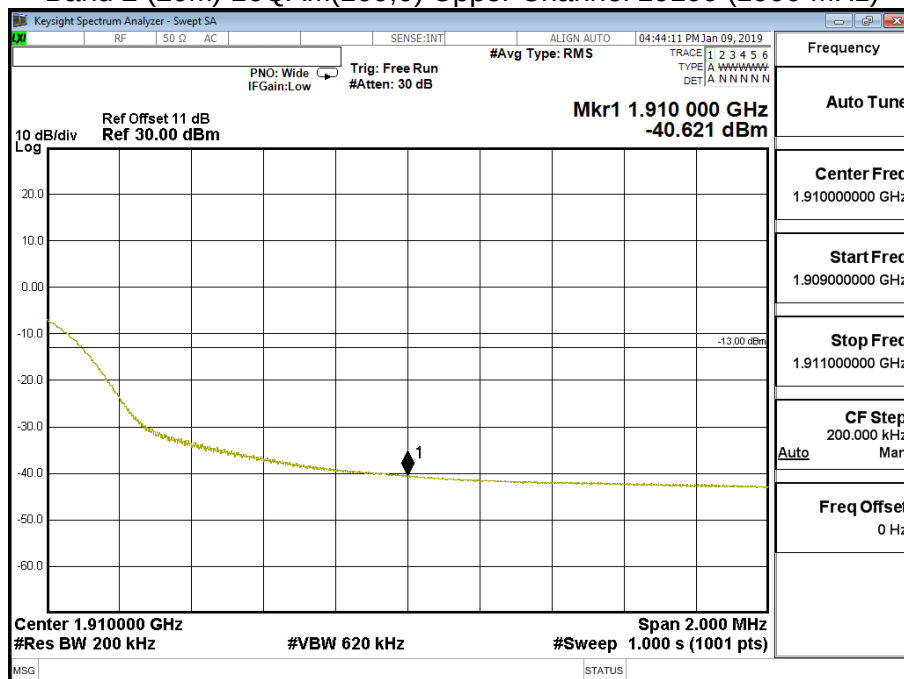
Band 2 (20M) 16QAM(1,99) Upper Channel 19100 (1900 MHz)



Band 2 (20M) 16QAM(100,0) Lower Channel 18700 (1860MHz)



Band 2 (20M) 16QAM(100,0) Upper Channel 19100 (1900 MHz)



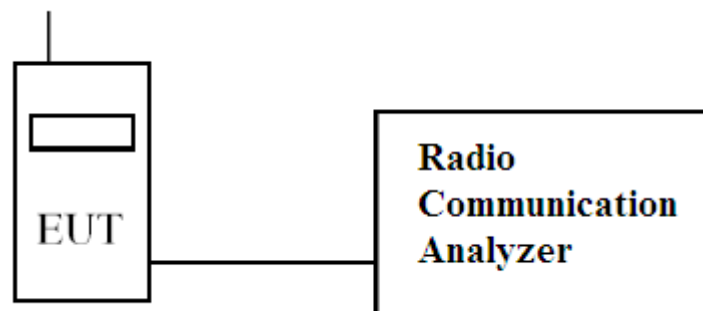
6. Spurious Emission

6.1. Test Specification

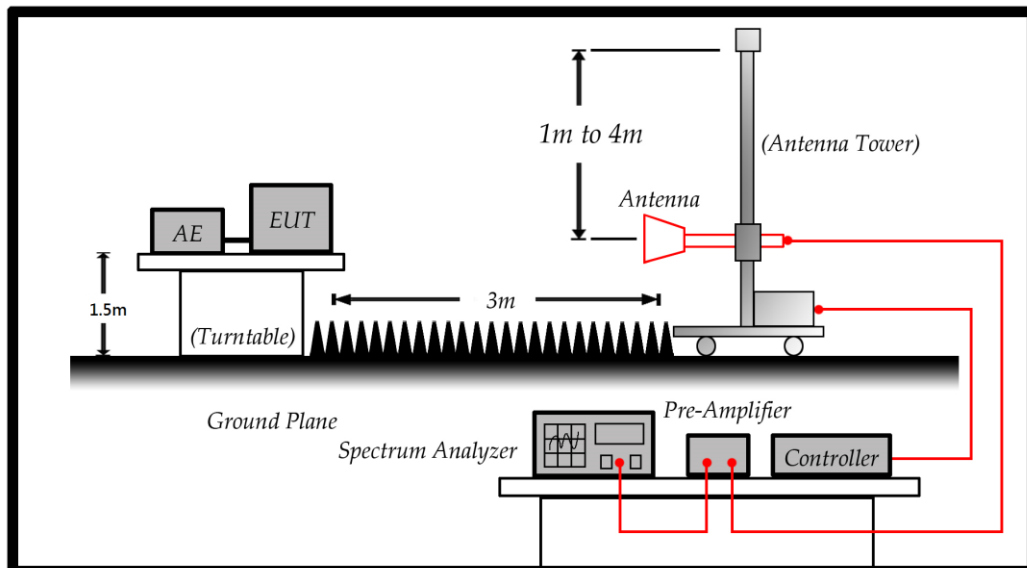
According to Part 2.1051, 2.1053, 24.238

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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$43 + 10\log(P)$ down on the carrier where P is the power in Watts.

6.4. Test Procedure

In accordance with Part 2.1051, 2.1053, 24.238, 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, 24.238. 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.

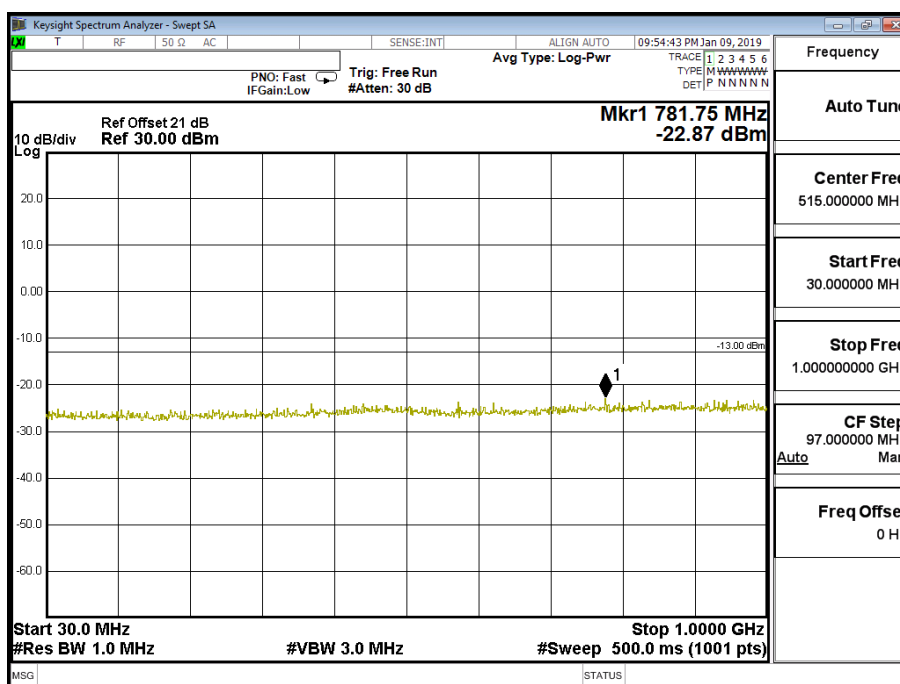
Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to TIA/EIA 603-E on radiated measurement.

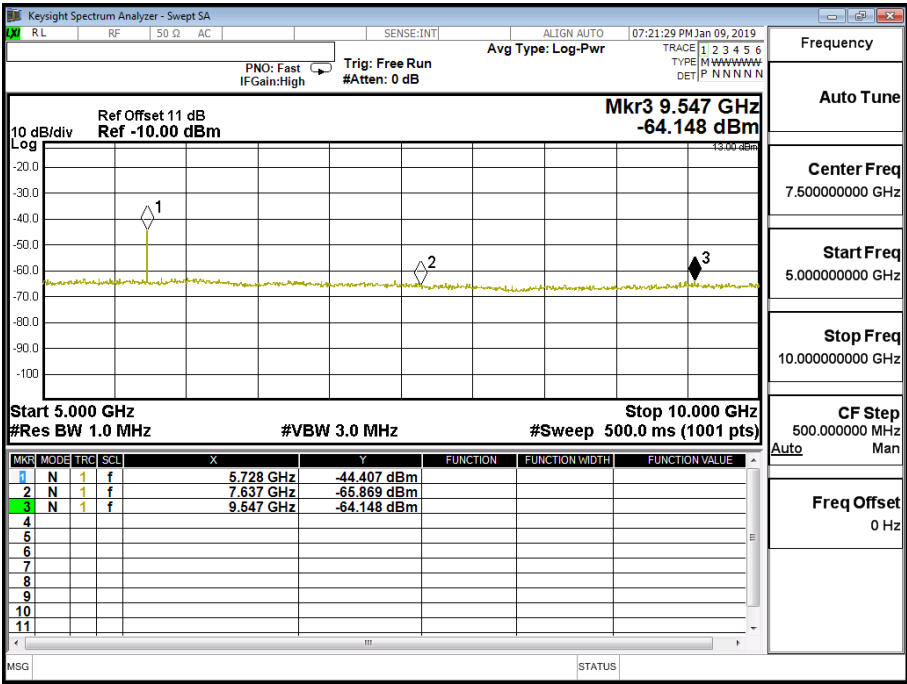
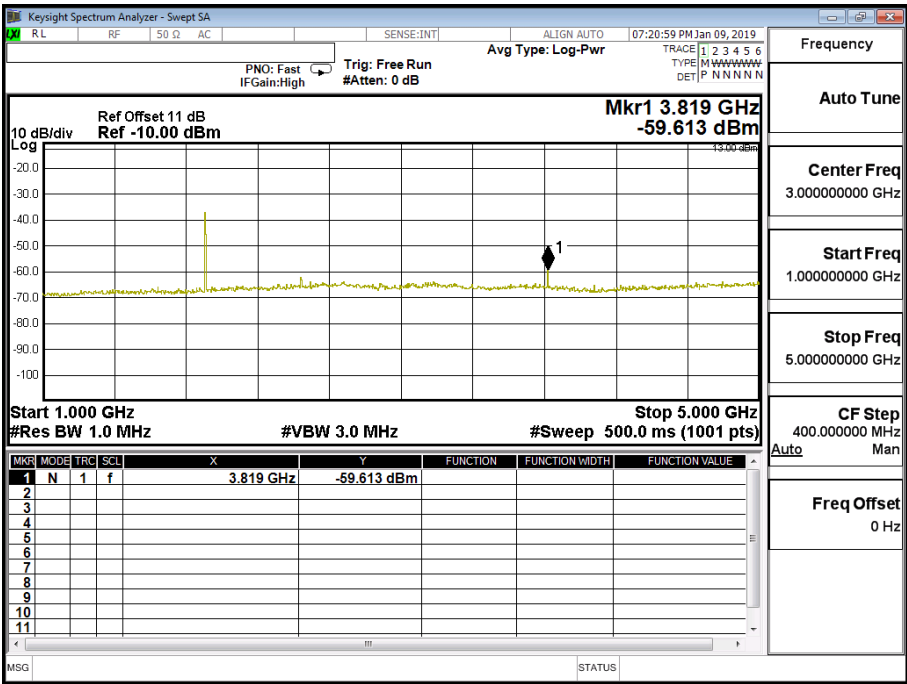
6.5. Test Result of Spurious Emission

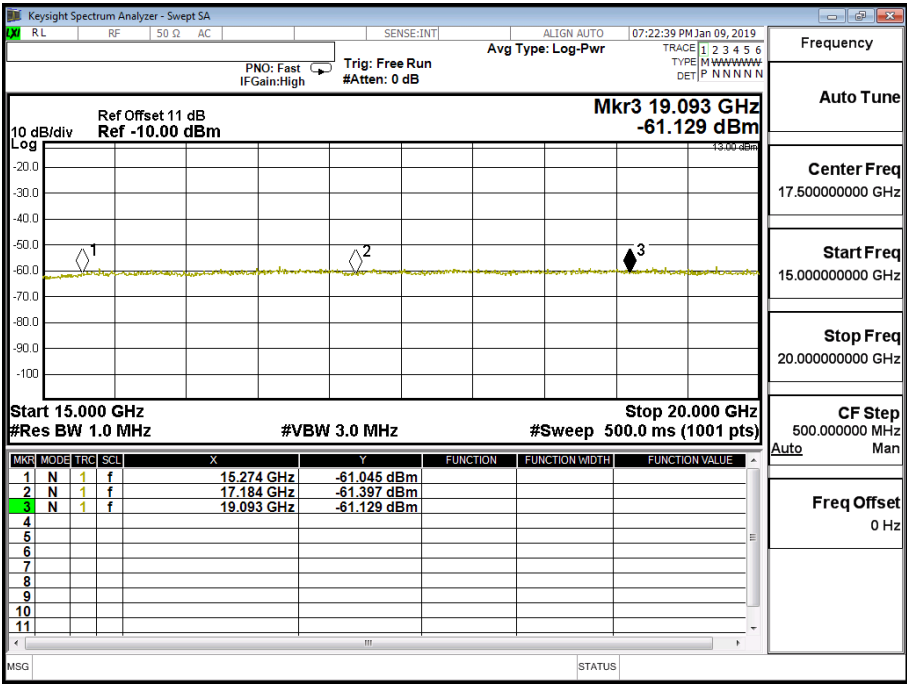
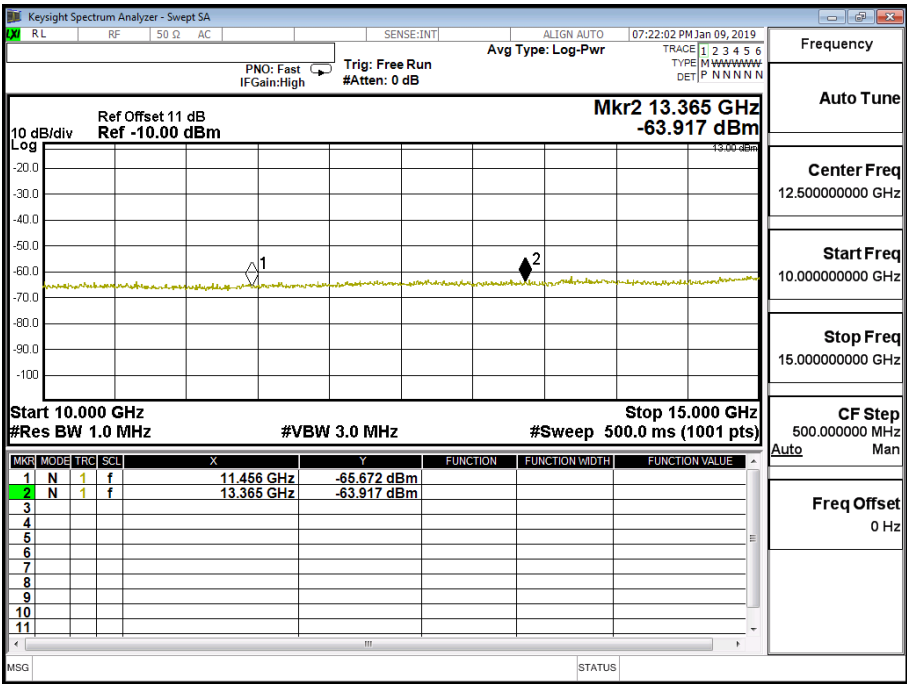
Product	4G/LTE Broadband Router with PoE		
Test Mode	Spurious Emission (Conducted)		
Date of Test	2019/01/10	Test Site	CTR
Test Condition	LTE-Band 2 (1.4M)	Test Range	30MHz~20GHz

LTE-Band 2 (1.4M) QPSK(1,2) CH19193(1909.3 MHz)

Frequency (MHz)	Reading Level (dBm)	Path Loss (dB)	Emission Level (dBm)	Limit (dBm)
3819	-59.613	1.10	-58.513	-13
5728	-44.407	1.23	-43.177	-13
7637	-65.869	1.59	-64.279	-13
9547	-64.148	1.89	-62.258	-13
11456	-65.672	2.07	-63.602	-13
13365	-63.917	2.26	-61.657	-13
15274	-61.045	2.64	-58.405	-13
17184	-61.397	3.50	-57.897	-13
19093	-61.129	3.70	-57.429	-13



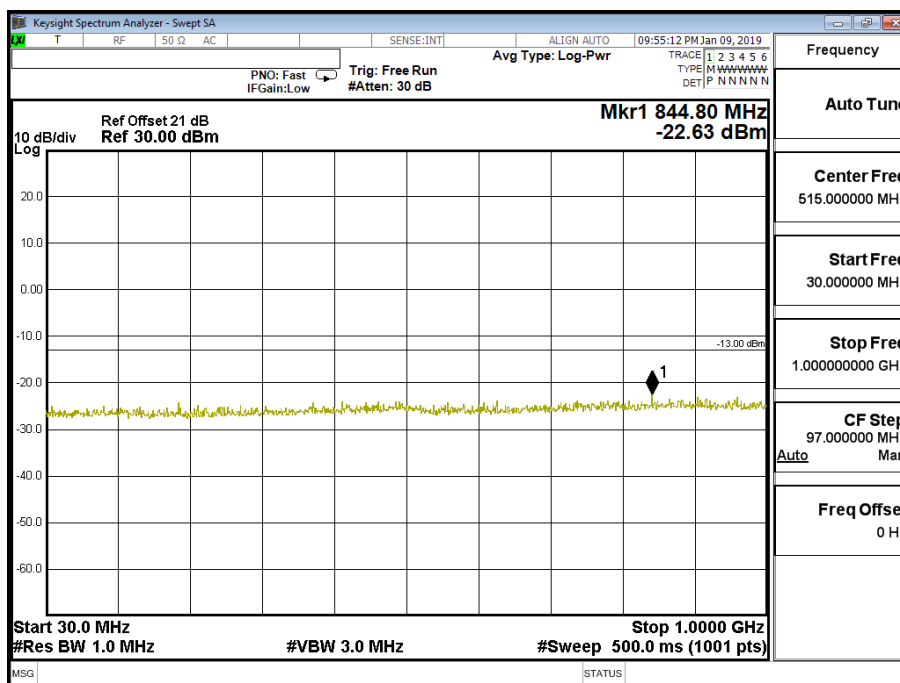


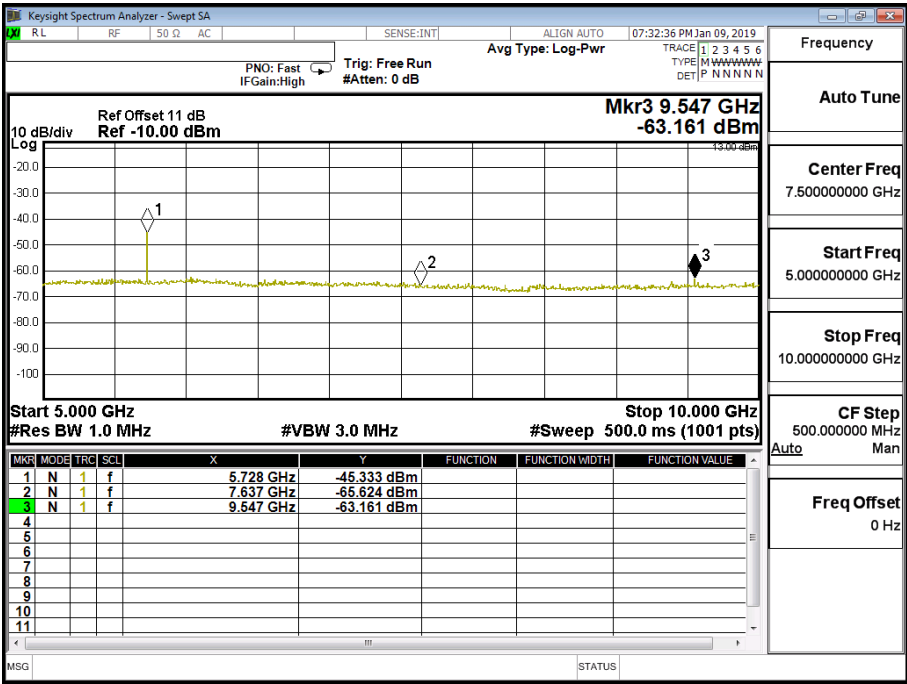
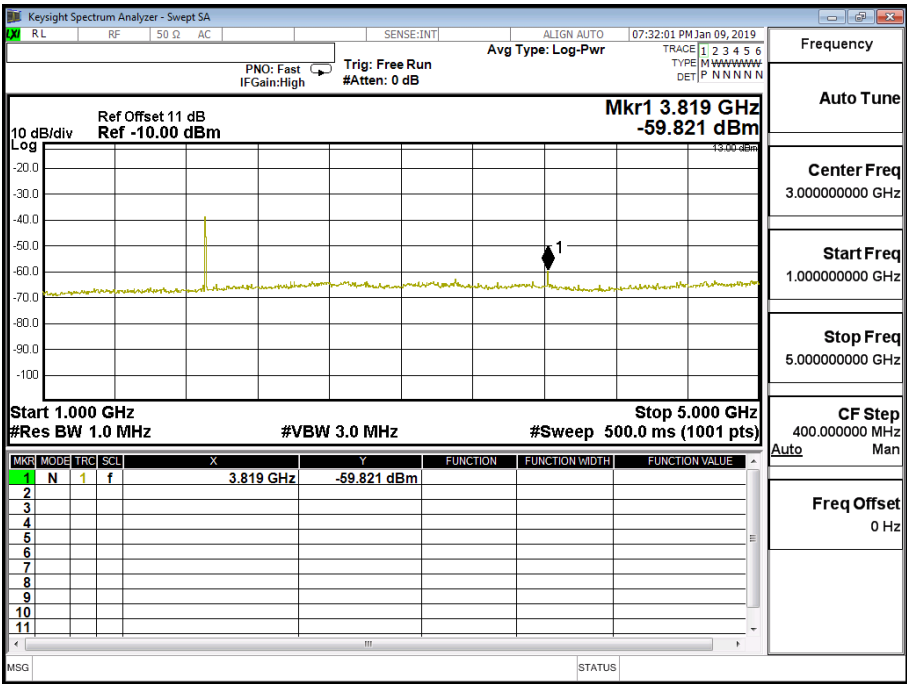


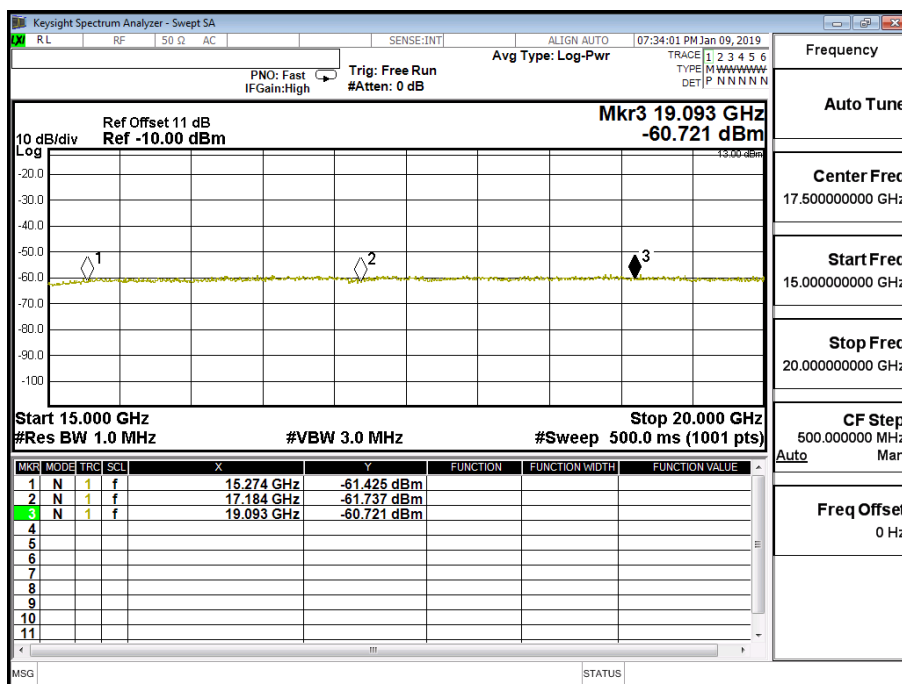
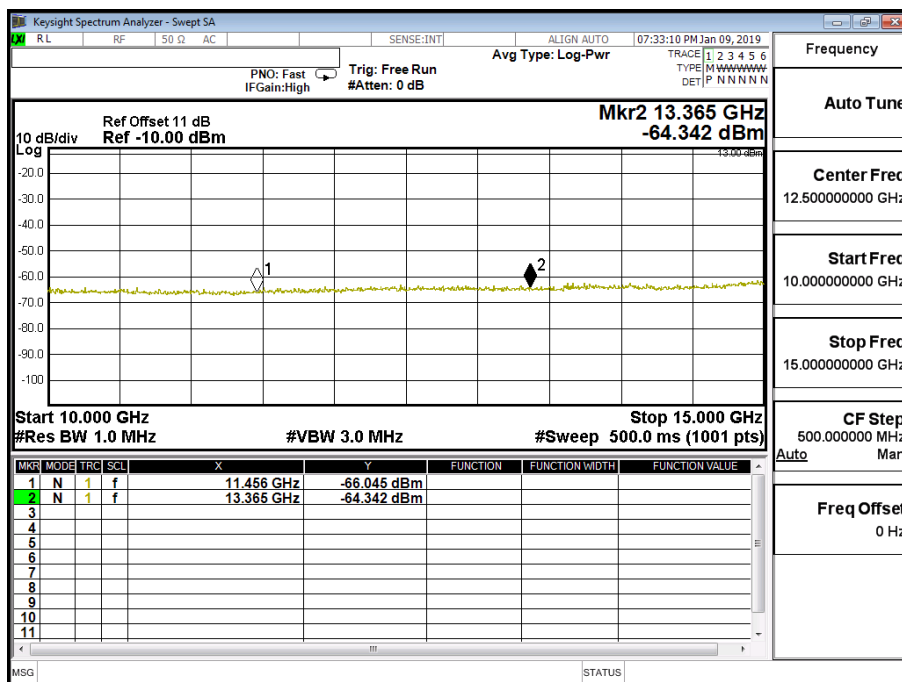
Product	4G/LTE Broadband Router with PoE		
Test Mode	Spurious Emission (Conducted)		
Date of Test	2019/01/10	Test Site	CTR
Test Condition	LTE-Band 2 (1.4M)	Test Range	30MHz~20GHz

LTE-Band 2 (1.4M) 16QAM(1,2) CH19193(1909.3MHz)

Frequency (MHz)	Reading Level (dBm)	Path Loss (dB)	Emission Level (dBm)	Limit (dBm)
3819	-59.821	1.10	-58.721	-13
5728	-45.333	1.23	-44.103	-13
7637	-65.624	1.59	-64.034	-13
9547	-63.161	1.89	-61.271	-13
11456	-66.045	2.07	-63.975	-13
13365	-64.342	2.26	-62.082	-13
15274	-61.425	2.64	-58.785	-13
17184	-61.737	3.50	-58.237	-13
19093	-60.721	3.70	-57.021	-13



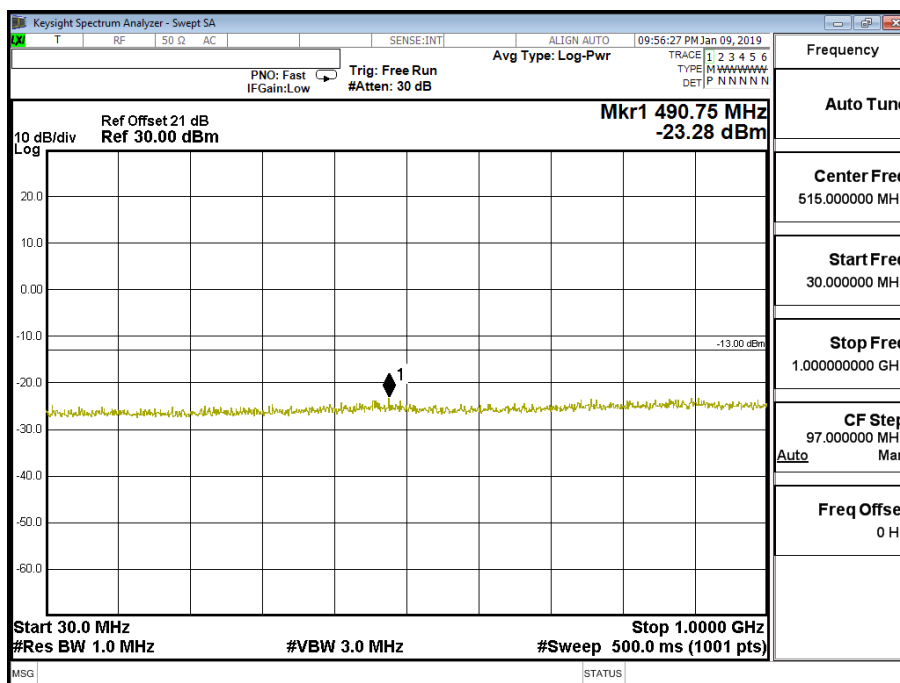


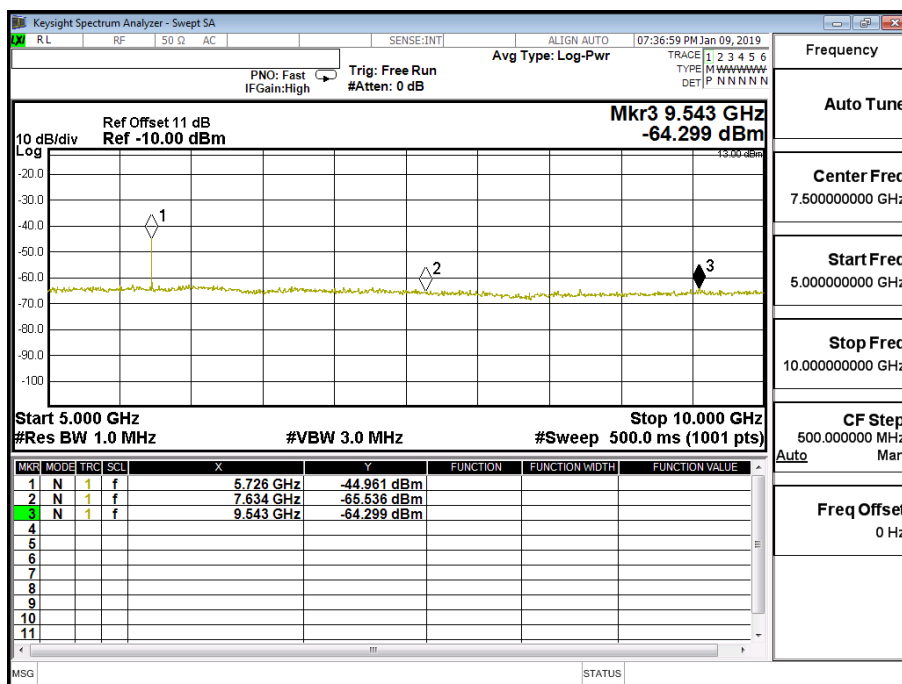
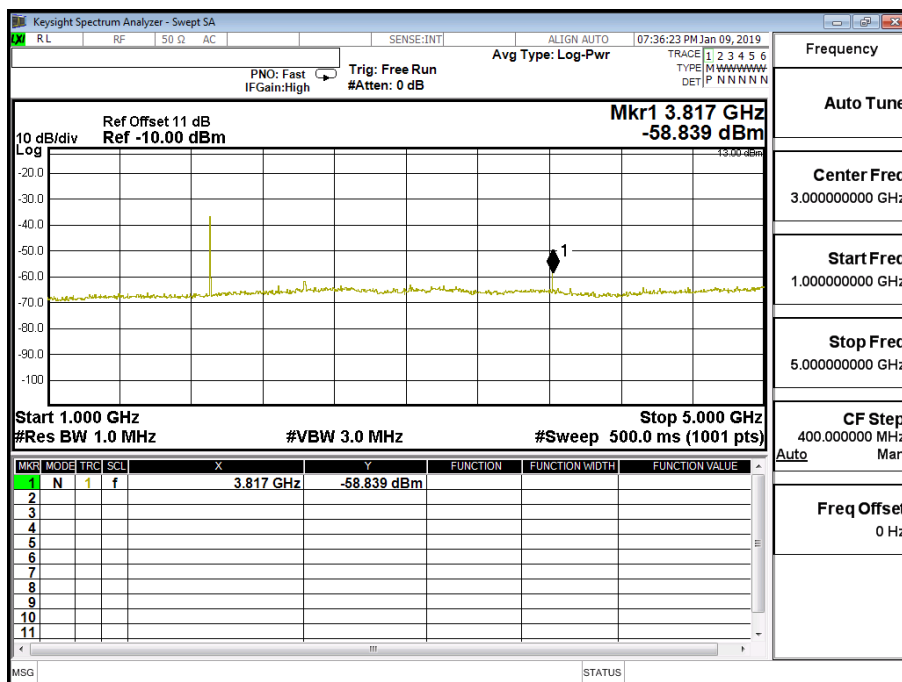


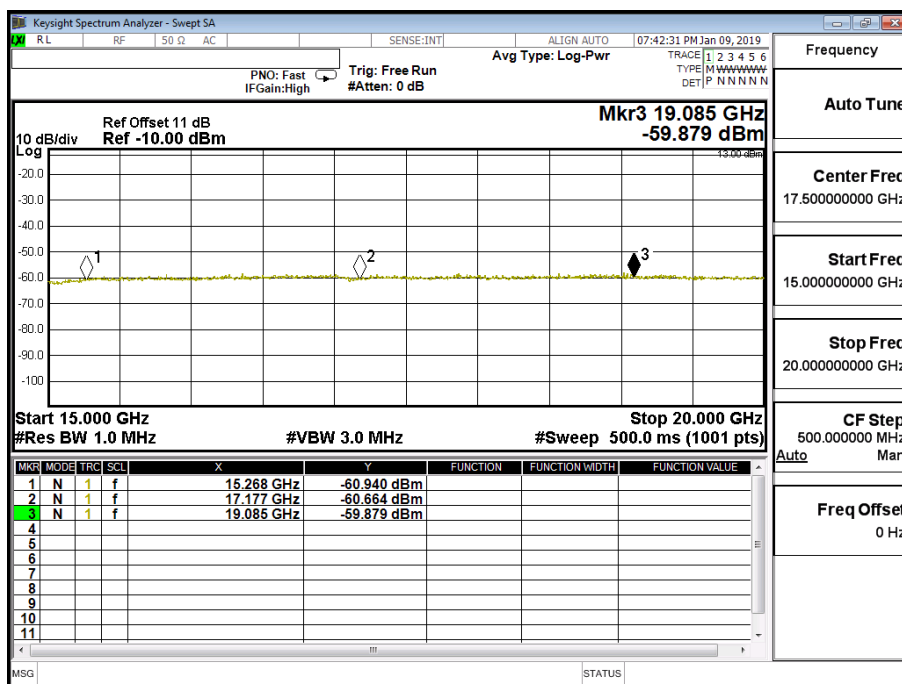
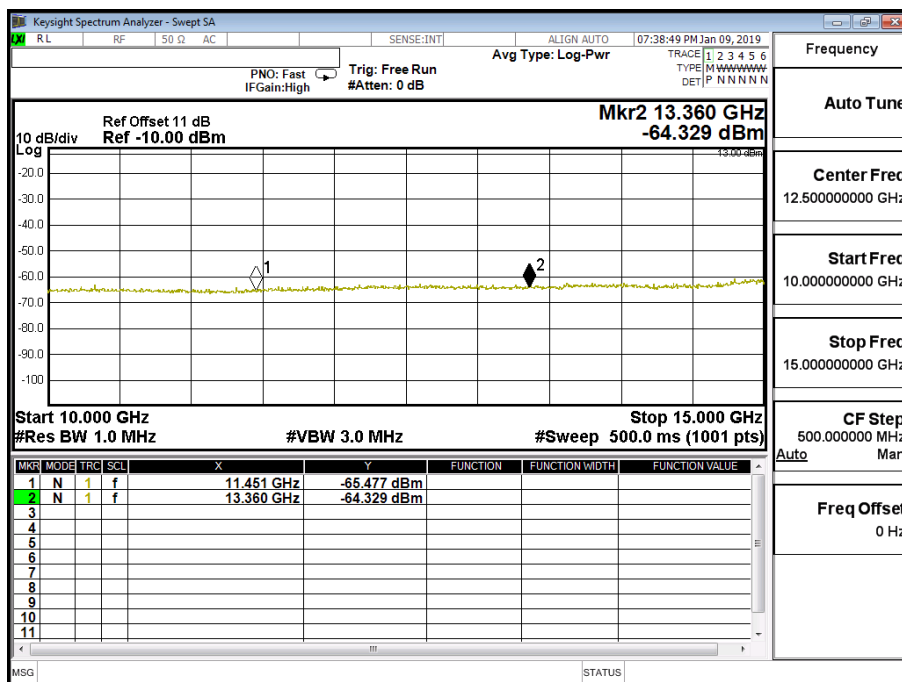
Product	4G/LTE Broadband Router with PoE		
Test Mode	Spurious Emission (Conducted)		
Date of Test	2019/01/10	Test Site	CTR
Test Condition	LTE-Band 2 (3M)	Test Range	30MHz~20GHz

LTE-Band 2 (3M) QPSK(1,7) CH19185 (1908.5MHz)

Frequency (MHz)	Reading Level (dBm)	Path Loss (dB)	Emission Level (dBm)	Limit (dBm)
3817	-58.839	1.10	-57.739	-13
5726	-44.961	1.23	-43.731	-13
7634	-65.536	1.59	-63.946	-13
9543	-64.299	1.89	-62.409	-13
11451	-65.477	2.07	-63.407	-13
13360	-64.329	2.26	-62.069	-13
15268	-60.940	2.64	-58.300	-13
17177	-60.664	3.50	-57.164	-13
19085	-59.879	3.70	-56.179	-13



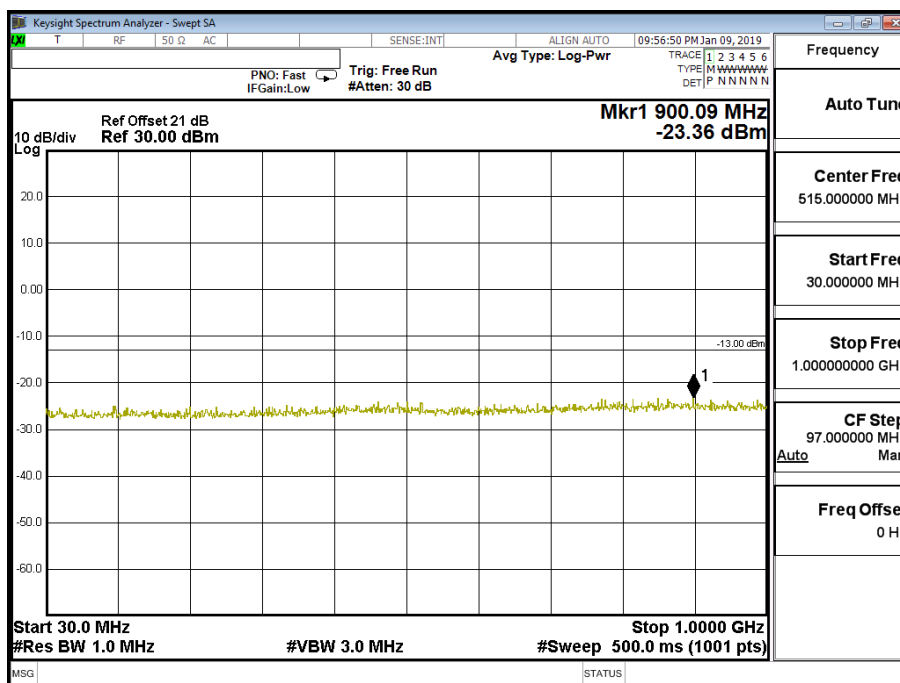


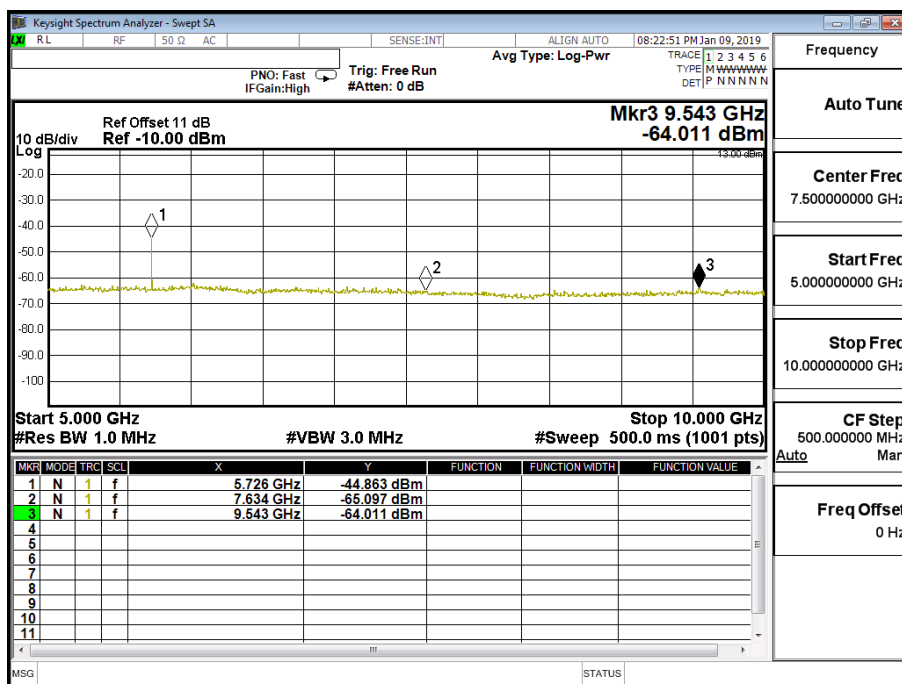
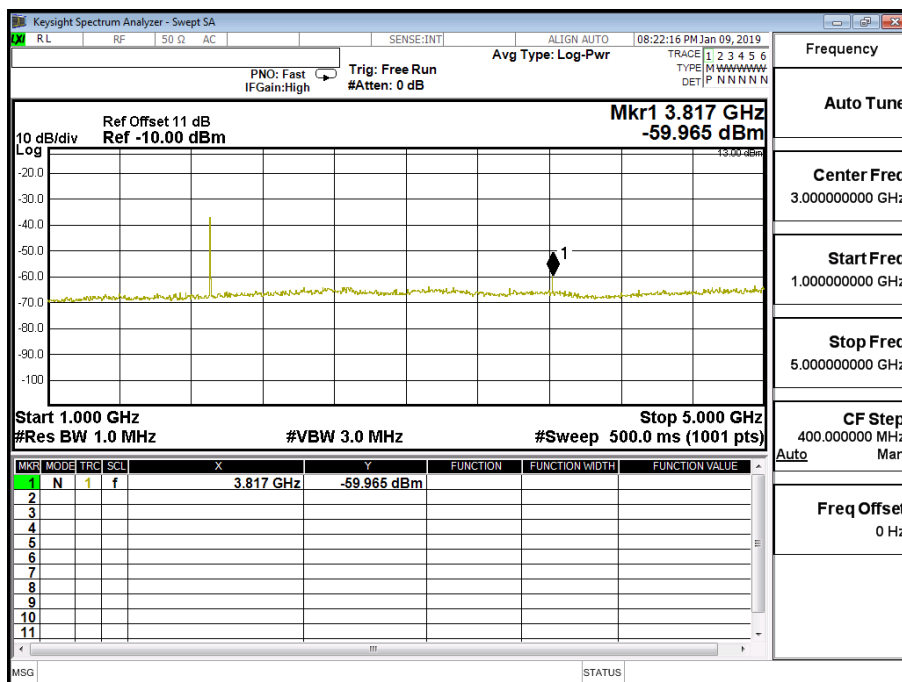


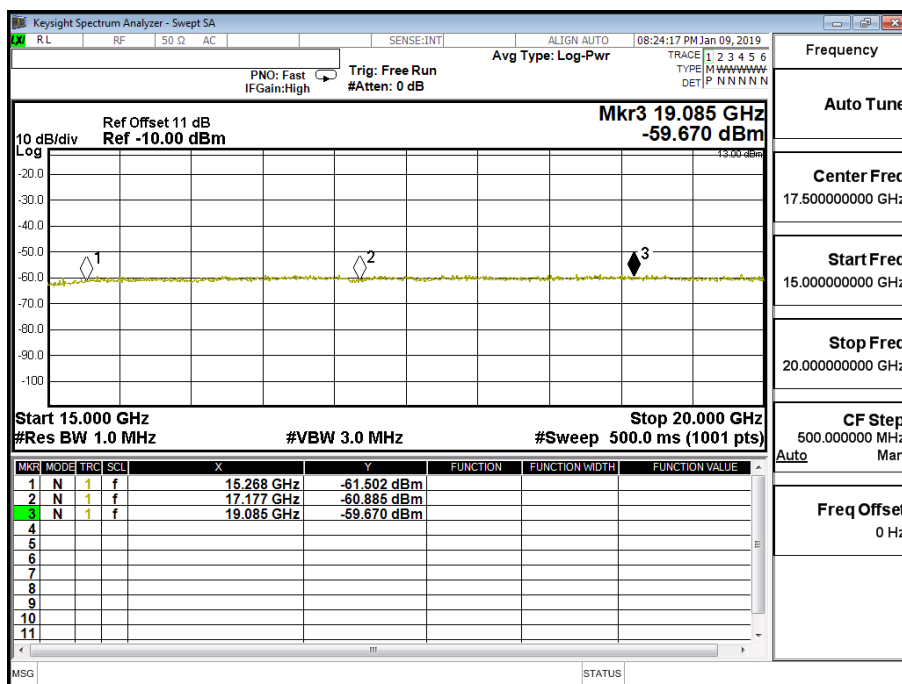
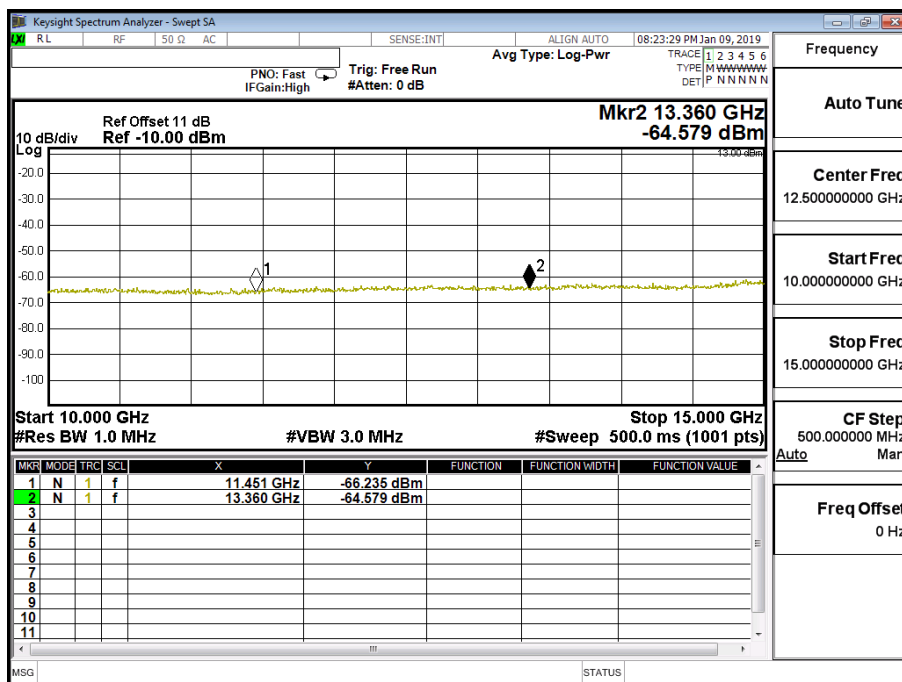
Product	4G/LTE Broadband Router with PoE		
Test Mode	Spurious Emission (Conducted)		
Date of Test	2019/01/10	Test Site	CTR
Test Condition	LTE-Band 2 (3M)	Test Range	30MHz~20GHz

LTE-Band 2 (3M) 16QAM(1,7) CH19185 (1908.5MHz)

Frequency (MHz)	Reading Level (dBm)	Path Loss (dB)	Emission Level (dBm)	Limit (dBm)
3817	-59.965	1.10	-58.865	-13
5726	-44.863	1.23	-43.633	-13
7634	-65.097	1.59	-63.507	-13
9543	-64.011	1.89	-62.121	-13
11451	-66.235	2.07	-64.165	-13
13360	-64.579	2.26	-62.319	-13
15268	-61.502	2.64	-58.862	-13
17177	-60.885	3.50	-57.385	-13
19085	-59.670	3.70	-55.970	-13



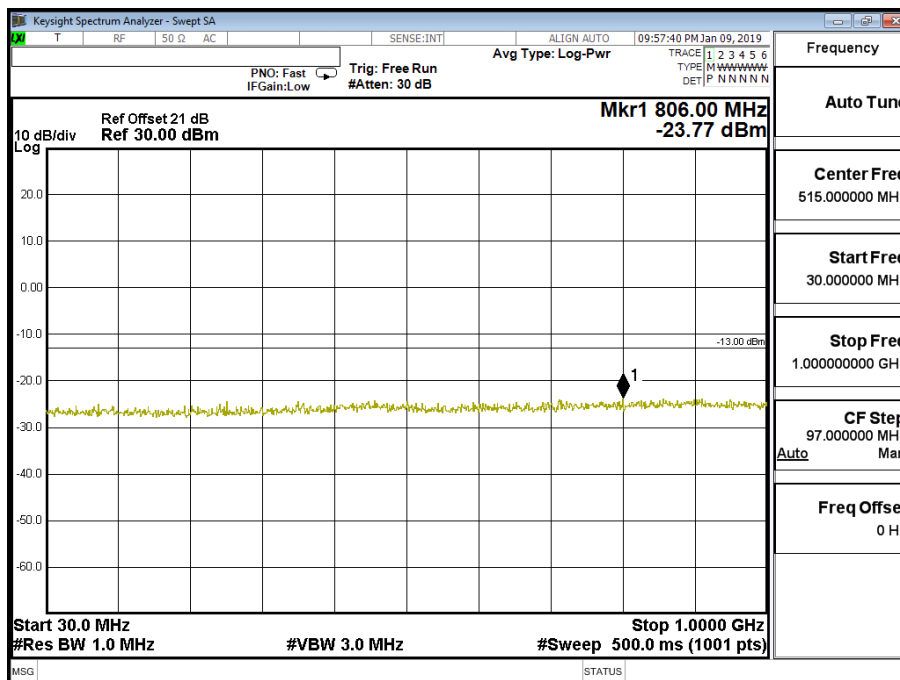


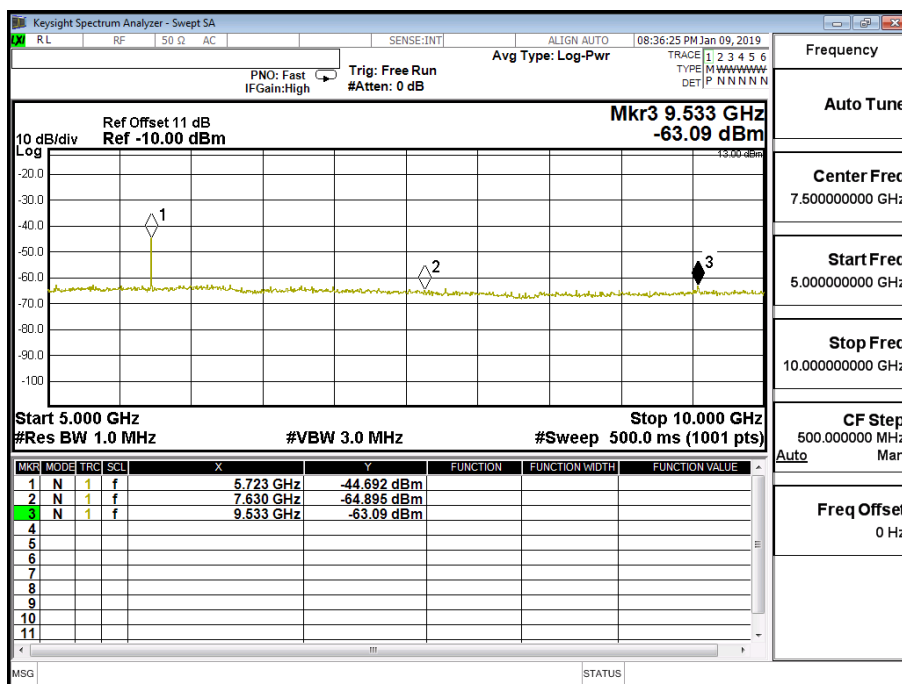
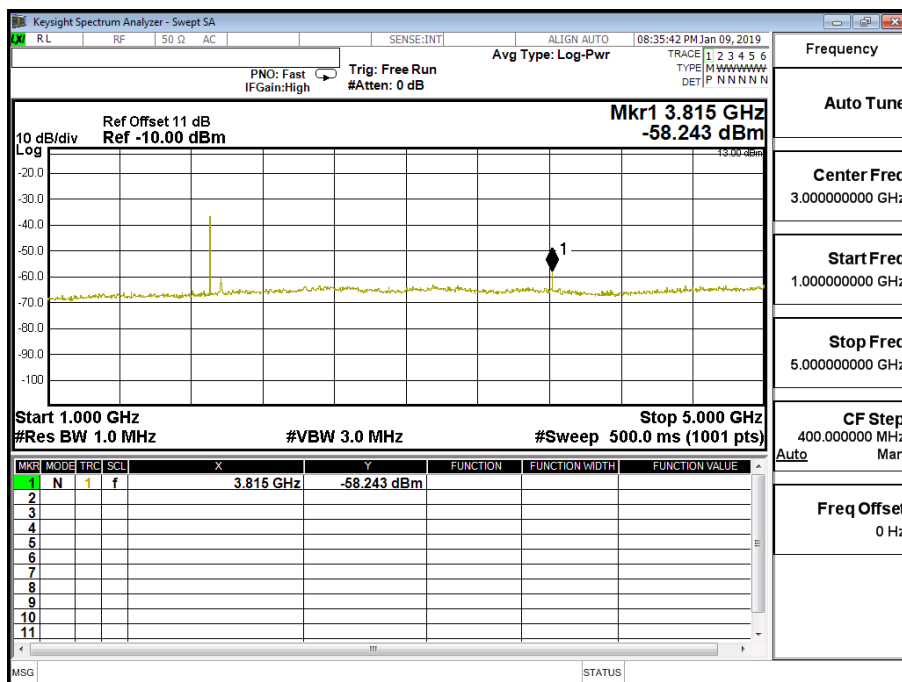


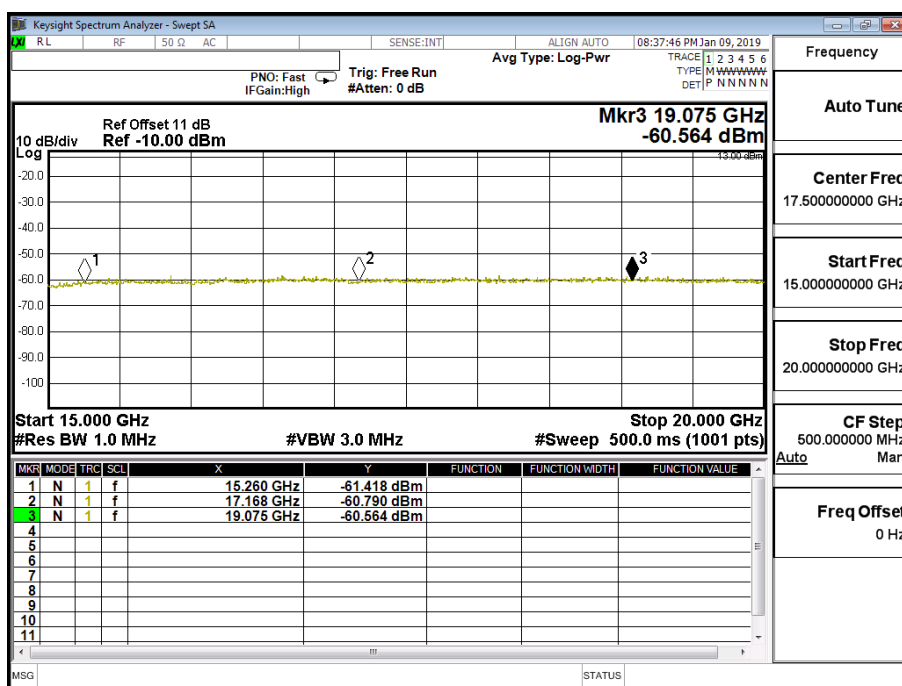
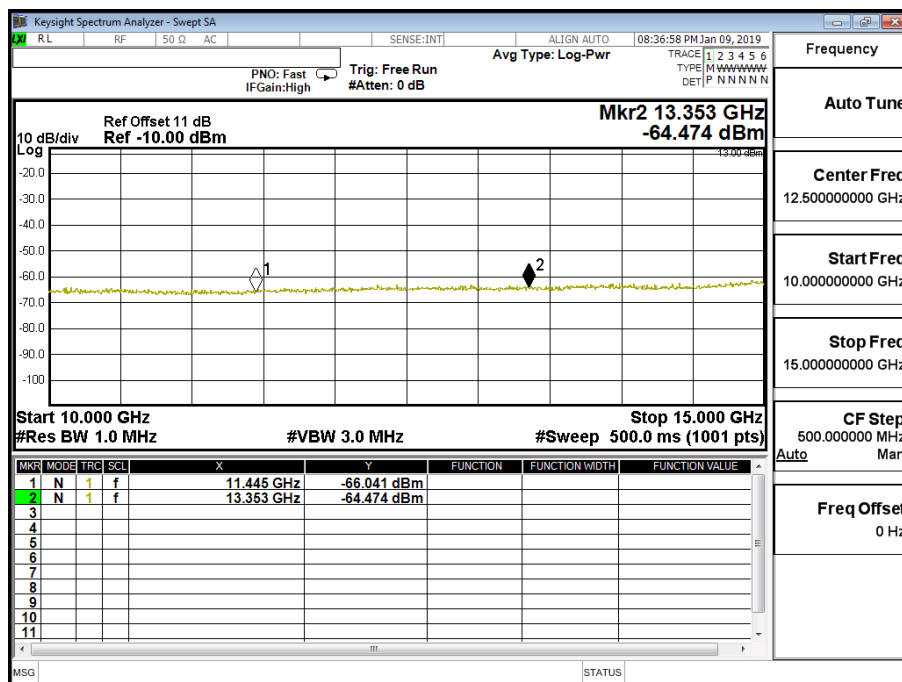
Product	4G/LTE Broadband Router with PoE		
Test Mode	Spurious Emission (Conducted)		
Date of Test	2019/01/10	Test Site	CTR
Test Condition	LTE-Band 2 (5M)	Test Range	30MHz~20GHz

LTE-Band 2 (5M) QPSK(1,12) CH19175 (1907.5MHz)

Frequency (MHz)	Reading Level (dBm)	Path Loss (dB)	Emission Level (dBm)	Limit (dBm)
3815	-58.243	1.10	-57.143	-13
5723	-44.692	1.23	-43.462	-13
7630	-64.895	1.59	-63.305	-13
9533	-63.090	1.89	-61.200	-13
11445	-66.041	2.07	-63.971	-13
13353	-64.474	2.26	-62.214	-13
15260	-61.418	2.64	-58.778	-13
17168	-60.790	3.50	-57.290	-13
19075	-60.564	3.70	-56.864	-13



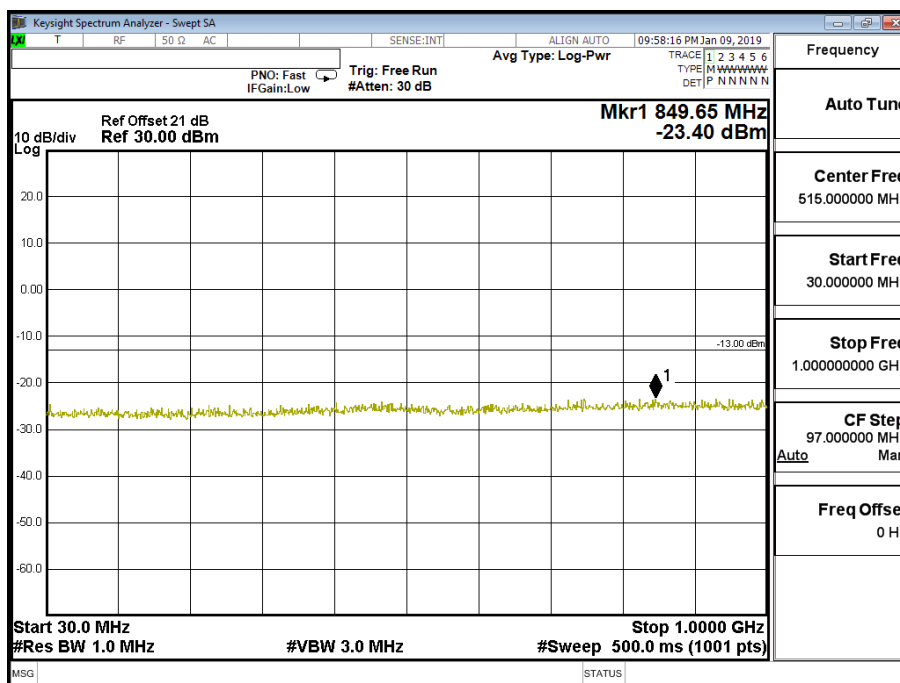


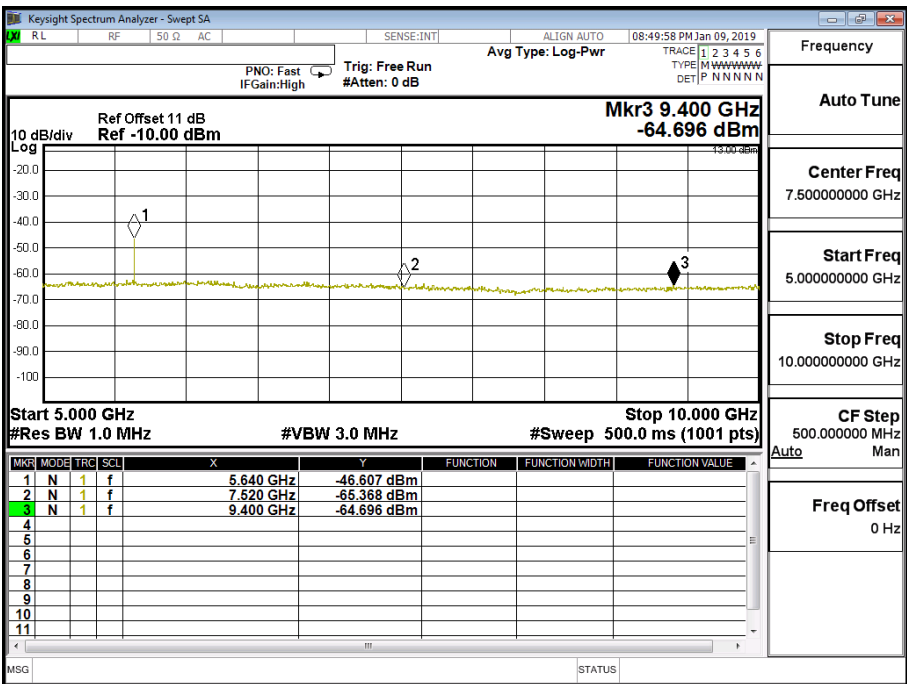
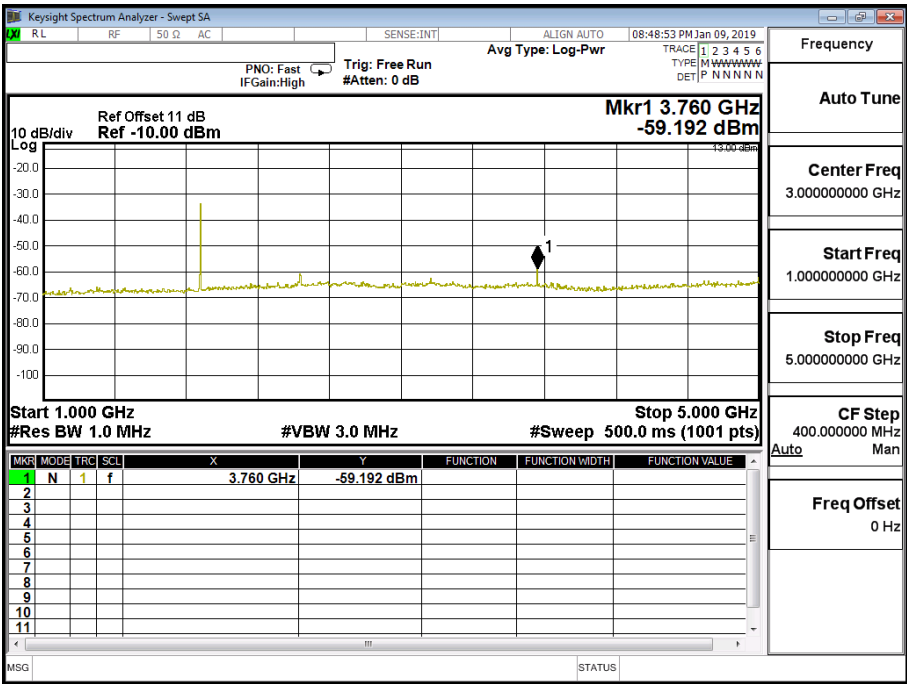


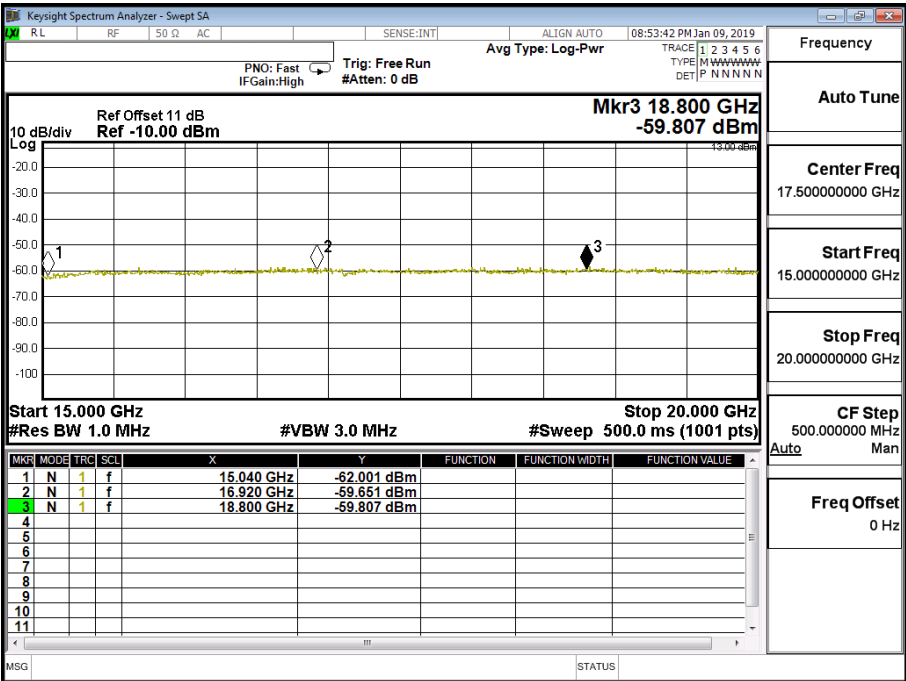
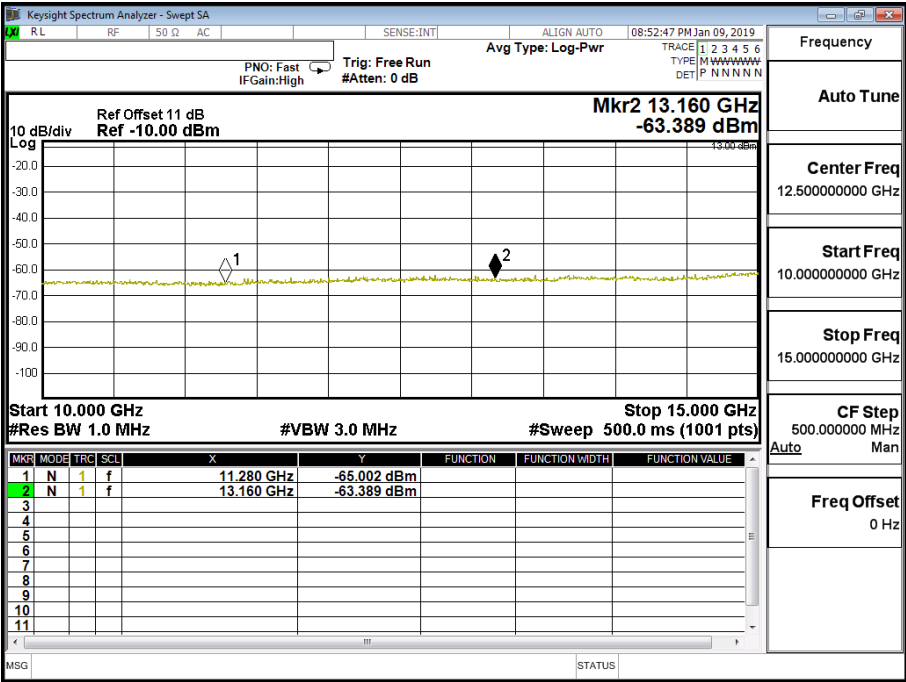
Product	4G/LTE Broadband Router with PoE		
Test Mode	Spurious Emission (Conducted)		
Date of Test	2019/01/10	Test Site	CTR
Test Condition	LTE-Band 2 (5M)	Test Range	30MHz~20GHz

LTE- Band 2 (5M) 16QAM(1,12) CH18900 (1880MHz)

Frequency (MHz)	Reading Level (dBm)	Path Loss (dB)	Emission Level (dBm)	Limit (dBm)
3760	-59.192	1.10	-58.092	-13
5640	-46.607	1.23	-45.377	-13
7520	-65.368	1.59	-63.778	-13
9400	-64.696	1.89	-62.806	-13
11280	-65.002	2.07	-62.932	-13
13160	-63.389	2.26	-61.129	-13
15040	-62.001	2.64	-59.361	-13
16920	-59.651	3.50	-56.151	-13
18800	-59.807	3.70	-56.107	-13



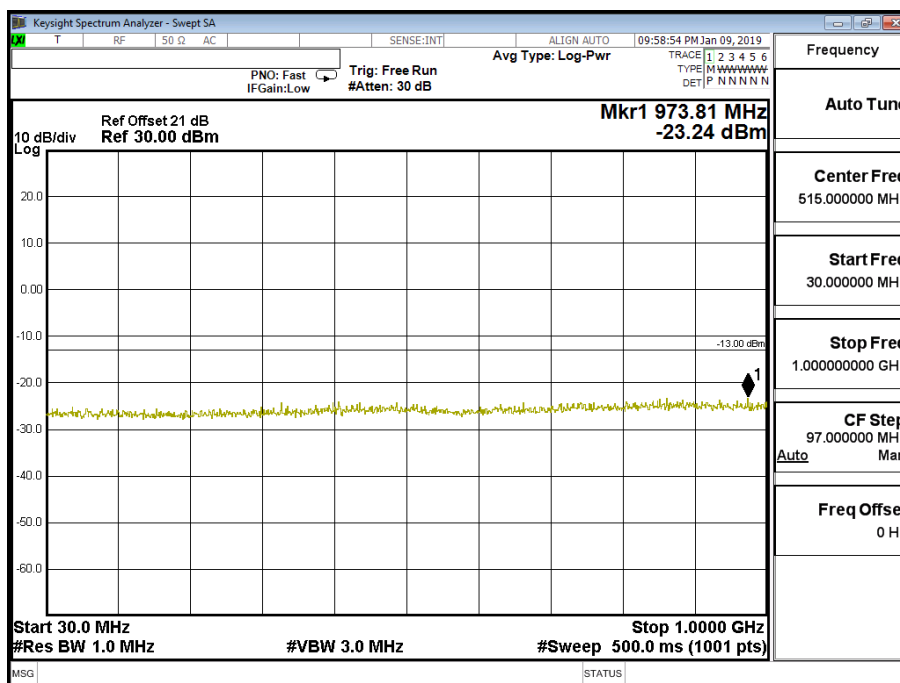


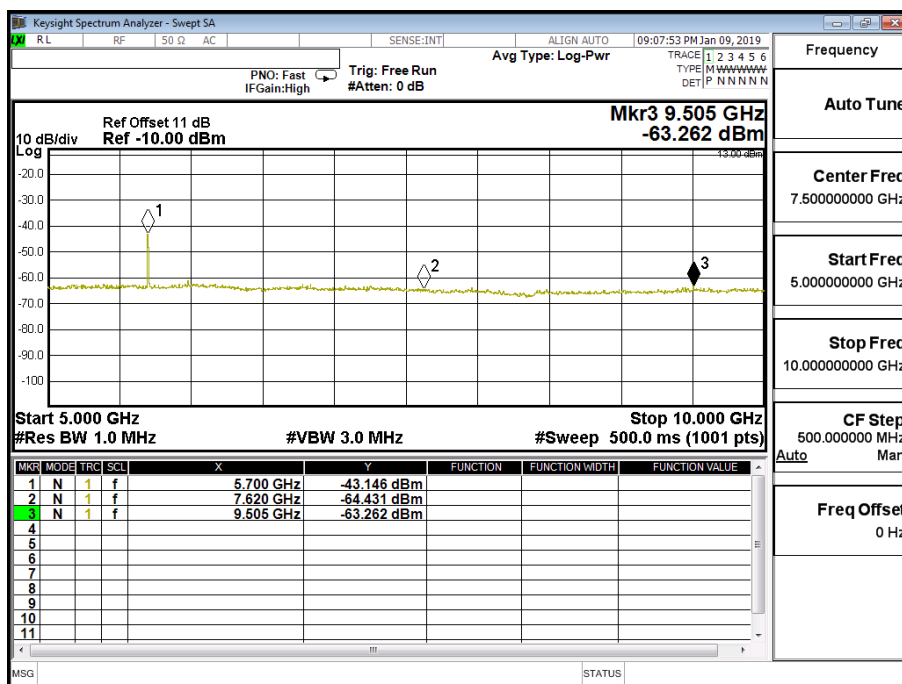
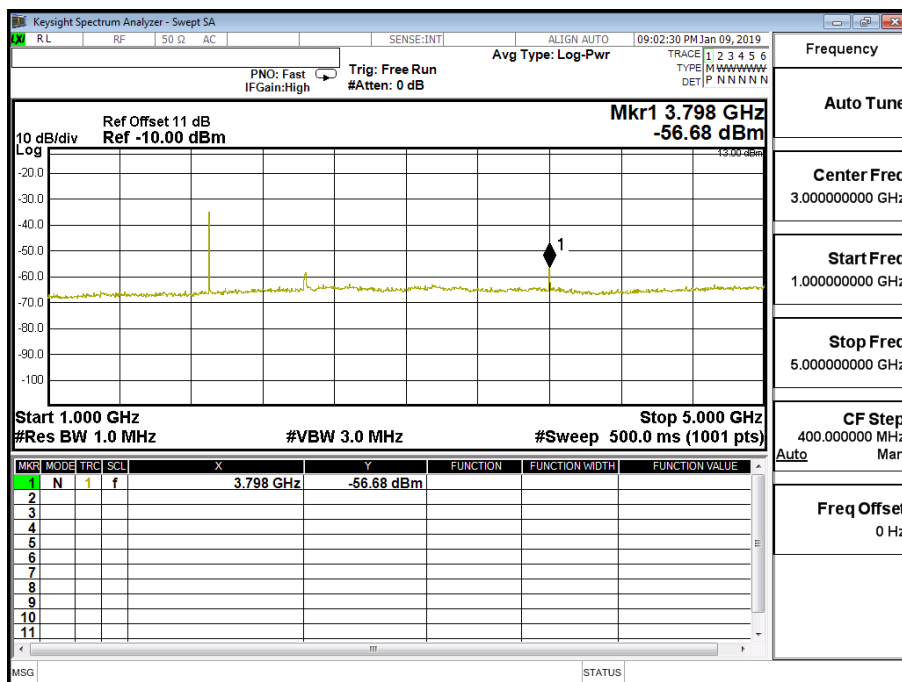


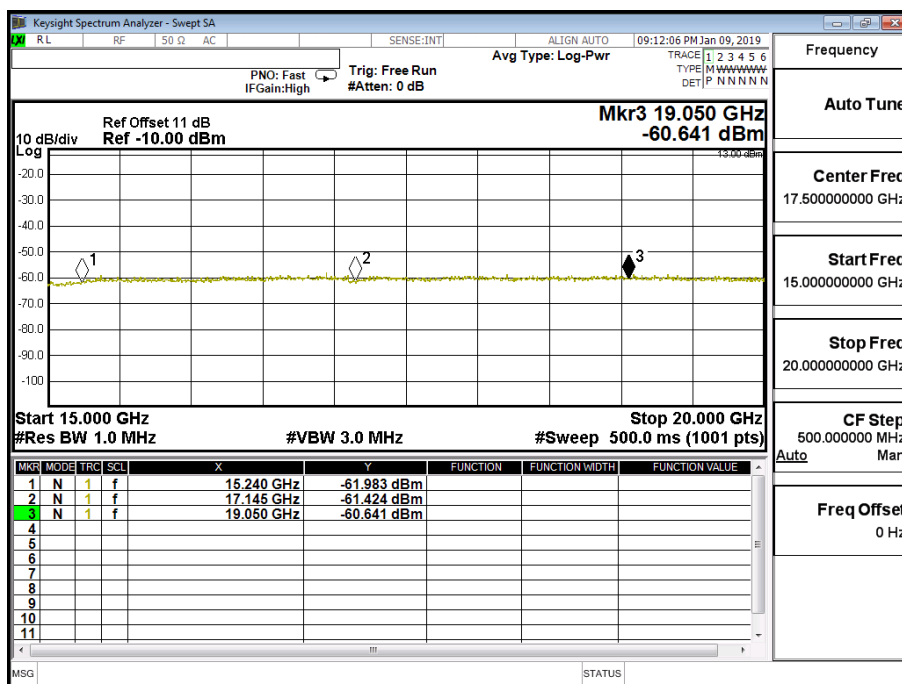
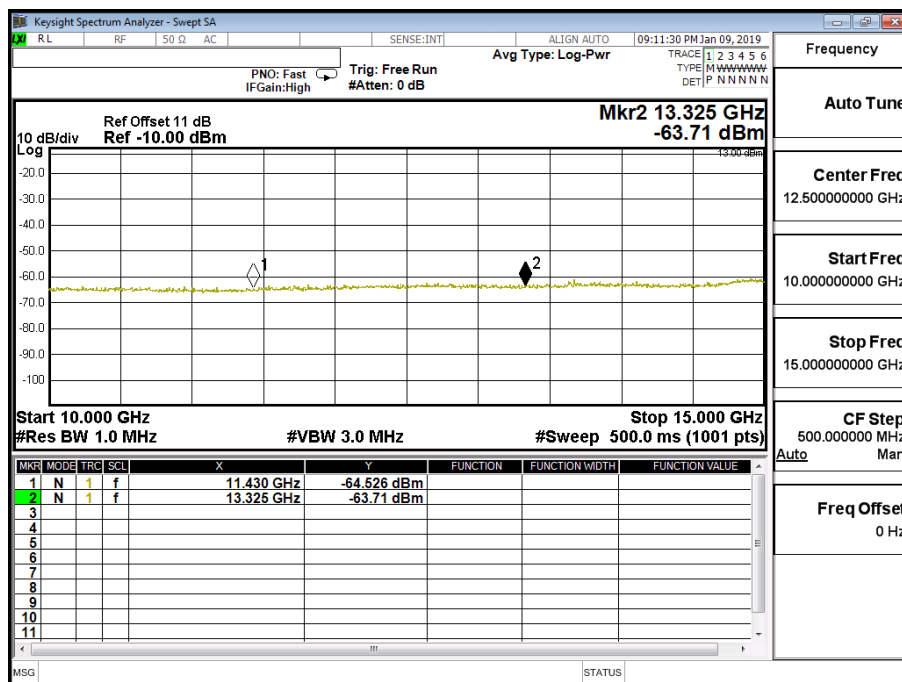
Product	4G/LTE Broadband Router with PoE		
Test Mode	Spurious Emission (Conducted)		
Date of Test	2019/01/10	Test Site	CTR
Test Condition	LTE-Band 2 (10M)	Test Range	30MHz~20GHz

LTE- Band 2 (10M) QPSK(1,0) CH19150 (1905MHz)

Frequency (MHz)	Reading Level (dBm)	Path Loss (dB)	Emission Level (dBm)	Limit (dBm)
3798	-56.680	1.10	-55.580	-13
5700	-43.146	1.23	-41.916	-13
7620	-64.431	1.59	-62.841	-13
9505	-63.262	1.89	-61.372	-13
11430	-64.526	2.07	-62.456	-13
13325	-63.710	2.26	-61.450	-13
15240	-61.983	2.64	-59.343	-13
17145	-61.424	3.50	-57.924	-13
19050	-60.641	3.70	-56.941	-13



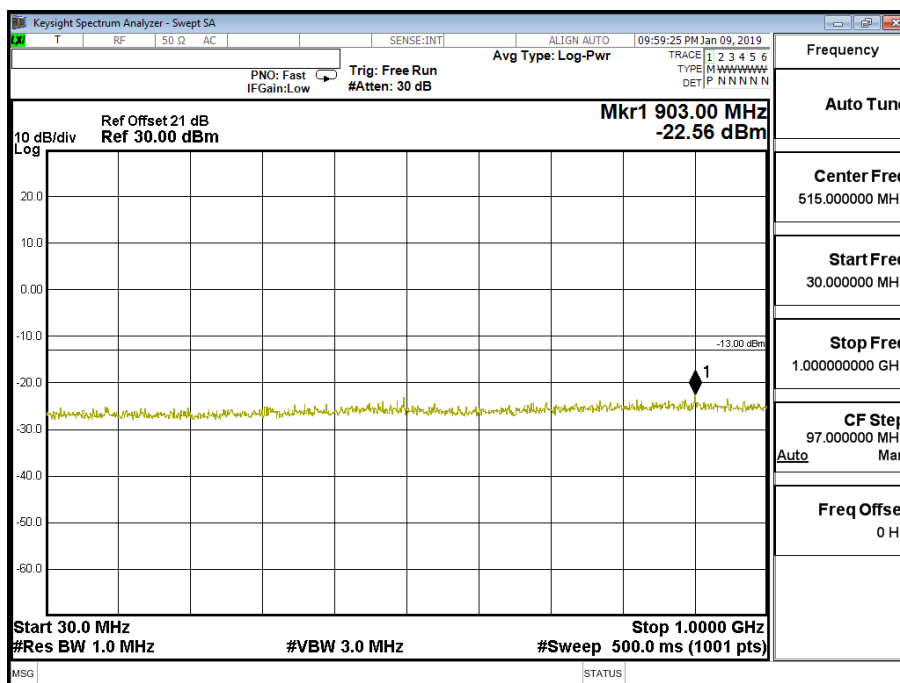


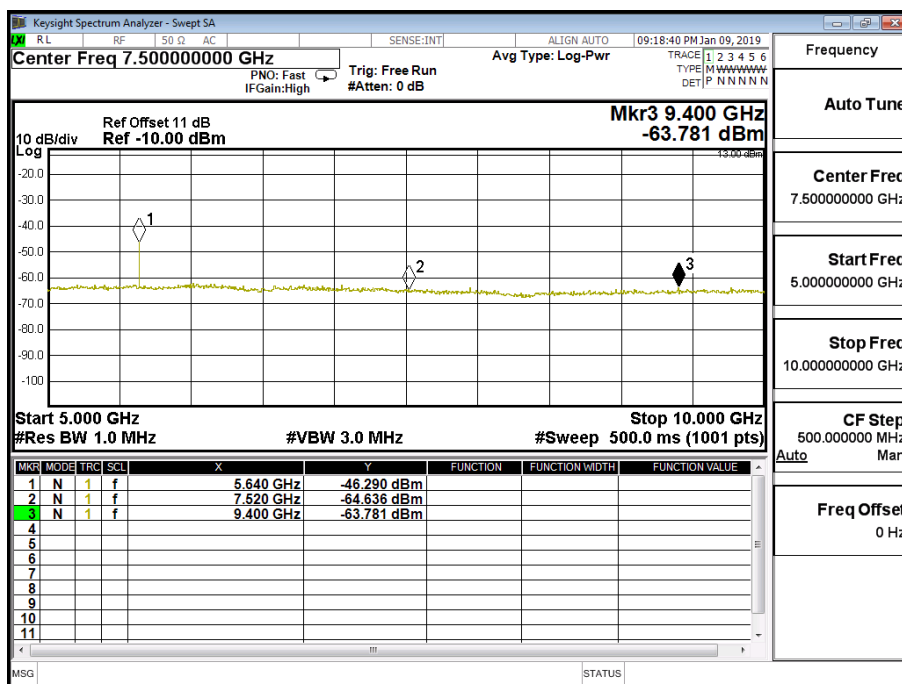
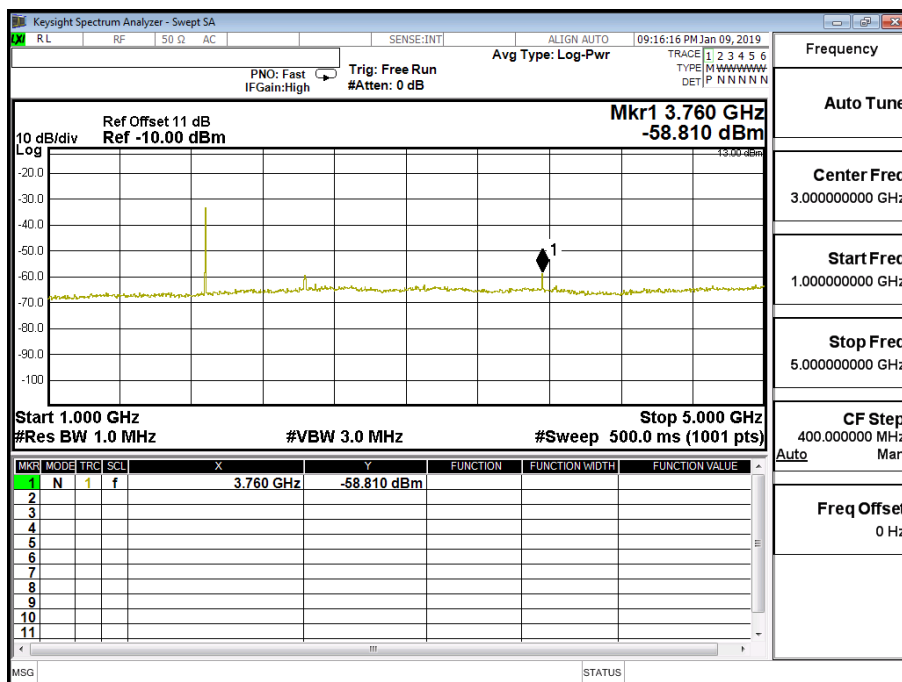


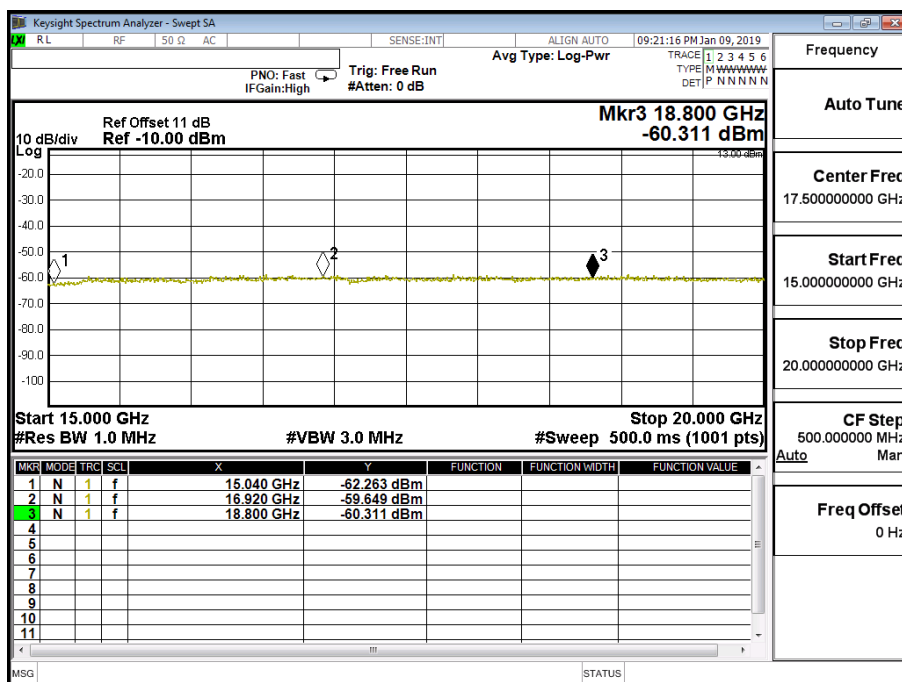
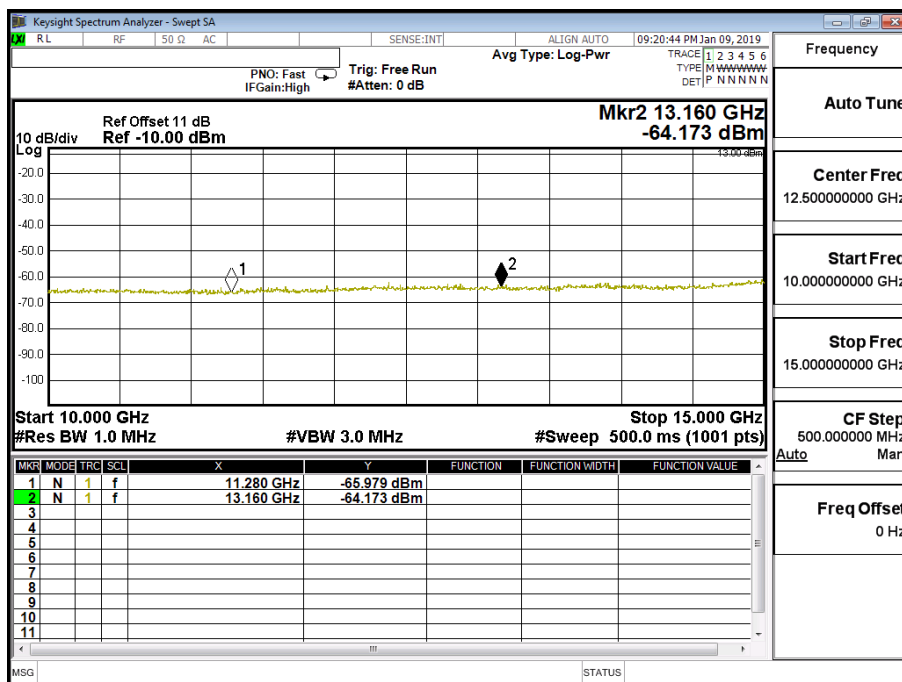
Product	4G/LTE Broadband Router with PoE		
Test Mode	Spurious Emission (Conducted)		
Date of Test	2019/01/10	Test Site	CTR
Test Condition	LTE-Band 2 (10M)	Test Range	30MHz~20GHz

LTE- Band 2 10M 16QAM(1,24) CH18900 (1880MHz)

Frequency (MHz)	Reading Level (dBm)	Path Loss (dB)	Emission Level (dBm)	Limit (dBm)
3760	-58.810	1.10	-57.710	-13
5640	-46.290	1.23	-45.060	-13
7520	-64.636	1.59	-63.046	-13
9400	-63.781	1.89	-61.891	-13
11280	-65.979	2.07	-63.909	-13
13160	-64.173	2.26	-61.913	-13
15040	-62.263	2.64	-59.623	-13
16920	-59.649	3.50	-56.149	-13
18800	-60.311	3.70	-56.611	-13







Product	4G/LTE Broadband Router with PoE		
Test Mode	Spurious Emission (Conducted)		
Date of Test	2019/01/10	Test Site	CTR
Test Condition	LTE-Band 2 15M	Test Range	30MHz~20GHz

LTE-Band 2 15M QPSK(1,0) CH18900 (1880MHz)

Frequency (MHz)	Reading Level (dBm)	Path Loss (dB)	Emission Level (dBm)	Limit (dBm)
3748	-58.526	1.10	-57.426	-13
5620	-48.670	1.23	-47.440	-13
7515	-64.370	1.59	-62.780	-13
9365	-64.390	1.89	-62.500	-13
11280	-66.785	2.07	-64.715	-13
13145	-62.770	2.26	-60.510	-13
15040	-62.688	2.64	-60.048	-13
16920	-59.857	3.50	-56.357	-13
18800	-59.823	3.70	-56.123	-13

