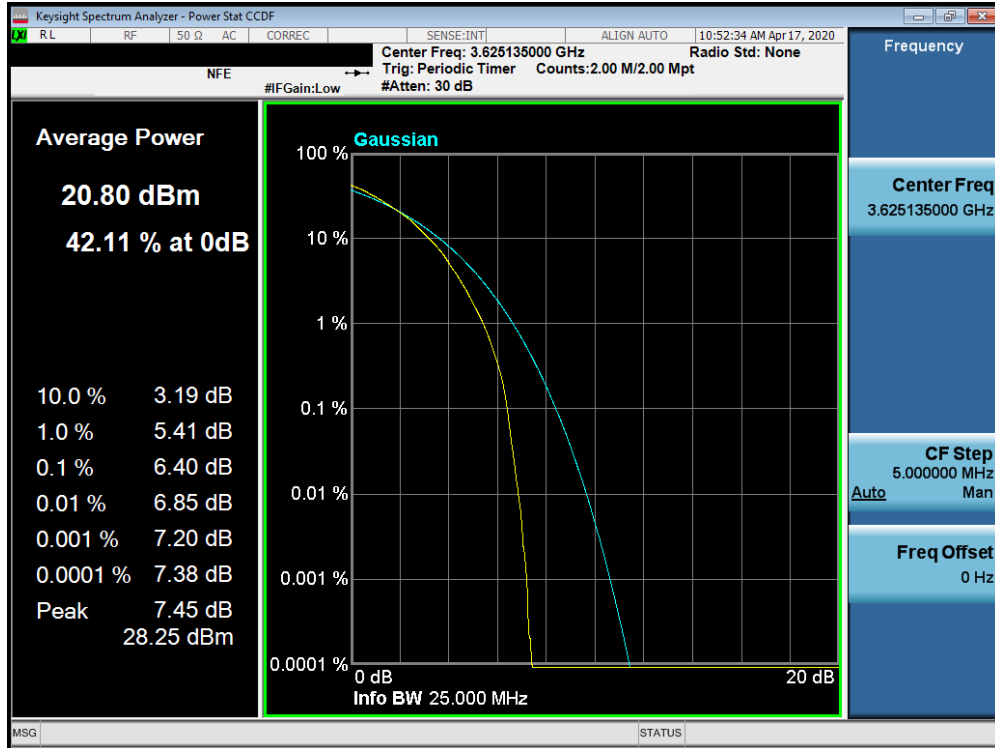
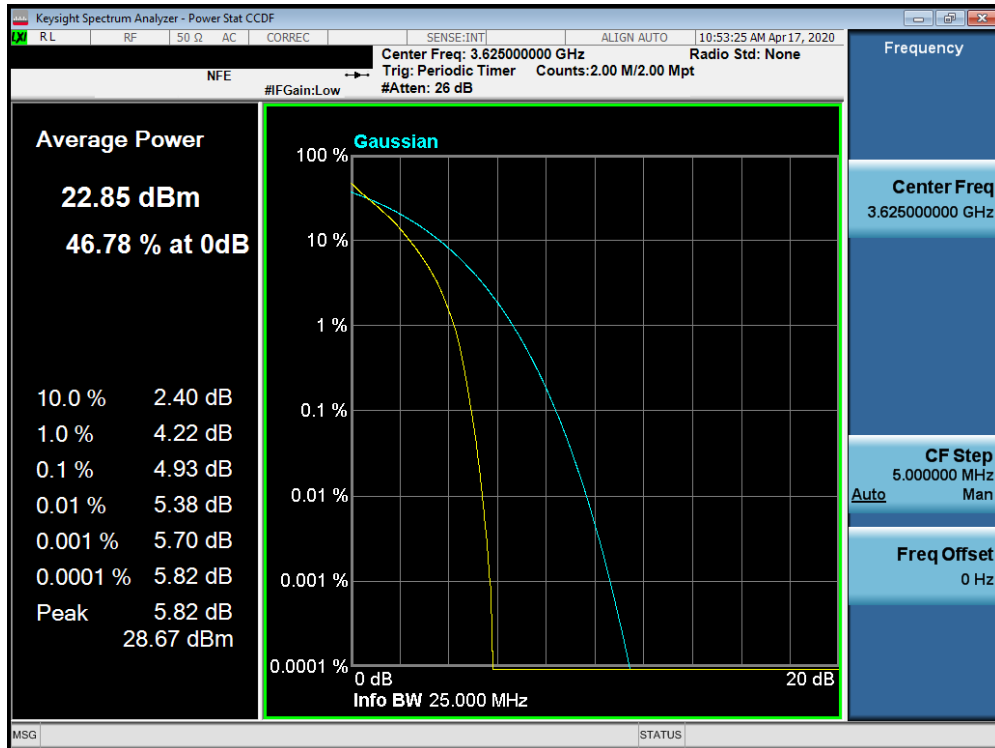




FCC ID: XIA-CFW2132	<b>PCTEST</b> Proud to be part of  element	<b>MEASUREMENT REPORT (CERTIFICATION)</b>	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M2003310053-01-R1.XIA	Test Dates: 3/31 - 5/15/2020	EUT Type: Outdoor LTE Router		Page 68 of 97

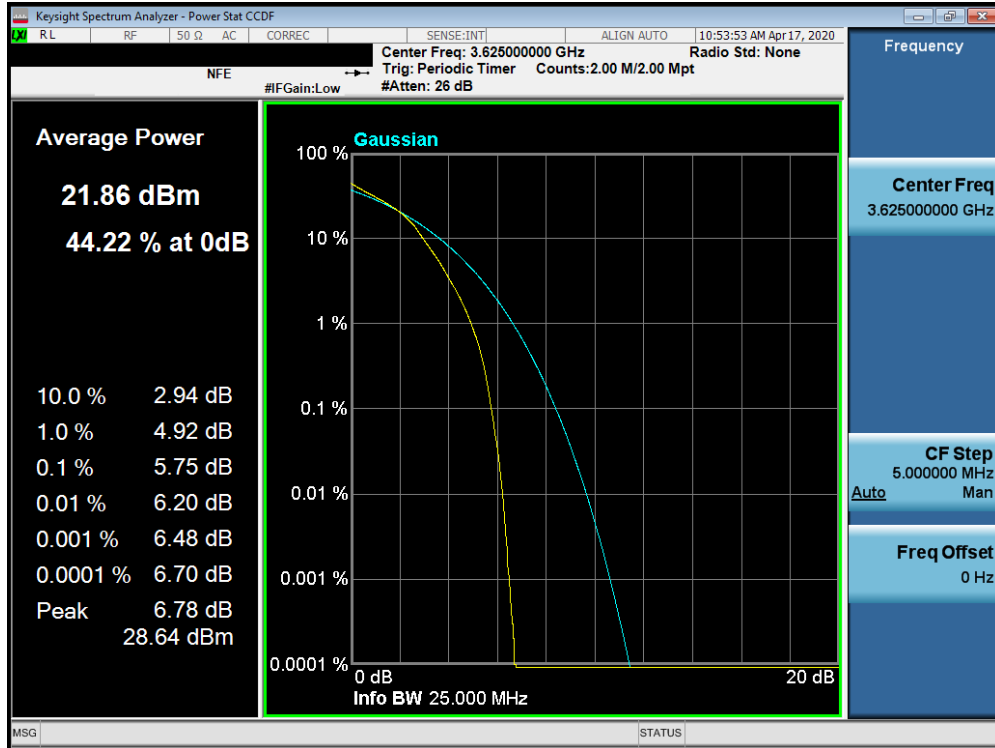


Plot 7-102. PAR Plot (Band 48 – 15.0MHz 64-QAM – Full RB Configuration)

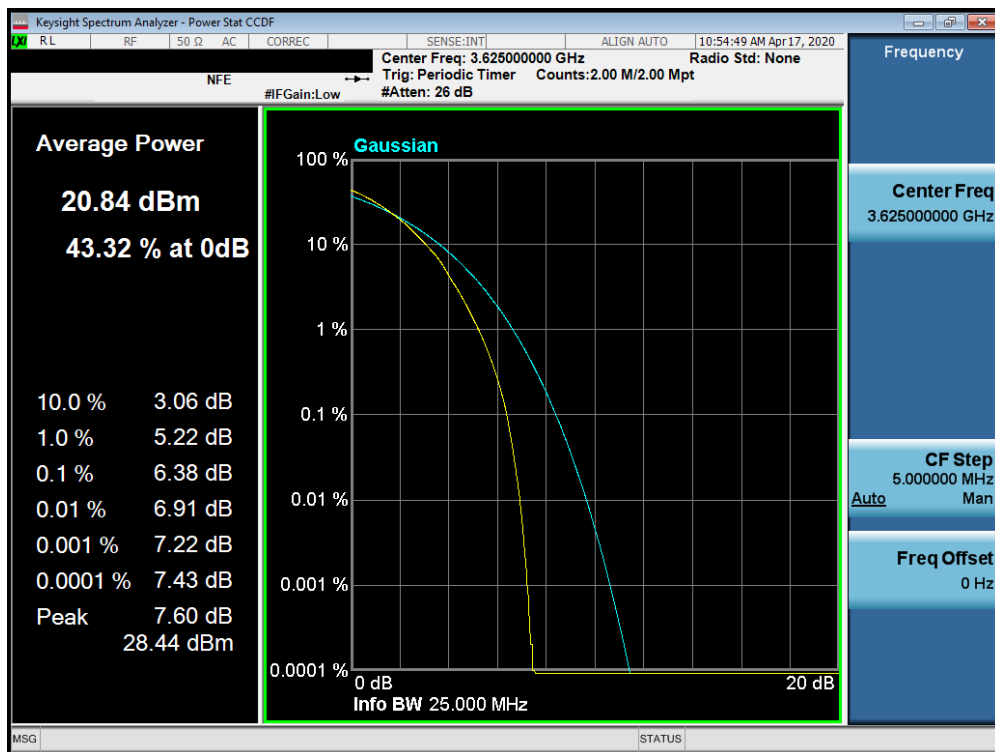


Plot 7-103. PAR Plot (Band 48 – 20.0MHz QPSK – Full RB Configuration)



FCC ID: XIA-CFW2132		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2003310053-01-R1.XIA	Test Dates: 3/31 - 5/15/2020	EUT Type: Outdoor LTE Router		Page 69 of 97



Plot 7-104. PAR Plot (Band 48 – 20.0MHz 16-QAM – Full RB Configuration)



Plot 7-105. PAR Plot (Band 48 – 20.0MHz 64-QAM – Full RB Configuration)

FCC ID: XIA-CFW2132	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2003310053-01-R1.XIA	Test Dates: 3/31 - 5/15/2020	EUT Type: Outdoor LTE Router	Page 70 of 97

## 7.7 Uplink Carrier Aggregation

### \$96.41(e)

#### Test Overview

The EUT is set up to transmit two contiguous LTE channels. The power level of both carriers and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10<sup>th</sup> harmonic. All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

***The conducted power of any emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed -13 dBm/MHz within 0-10 megahertz above the upper SAS-assigned channel edge and within 0-10 megahertz below the lower SAS-assigned channel edge. At all frequencies greater than 10 megahertz above the upper SAS assigned channel edge and less than 10 MHz below the lower SAS assigned channel edge, the conducted power of any emission shall not exceed -25 dBm/MHz.***

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

#### Test Procedure Used

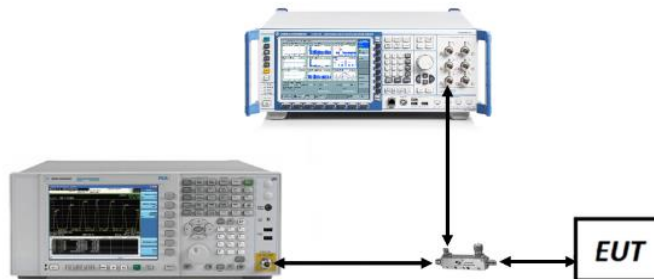
KDB 971168 D01 v03r01 – Section 6.0

#### Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to at least 10 \* the fundamental frequency (separated into at least two plots per channel)
2. Detector = RMS
3. Trace mode = trace average for continuous emissions, max hold for pulse emissions
4. Sweep time = auto couple
5. The trace was allowed to stabilize
6. Please see test notes below for RBW and VBW settings

#### Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.




**Figure 7-6. Test Instrument & Measurement Setup**

FCC ID: XIA-CFW2132		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2003310053-01-R1.XIA	Test Dates: 3/31 - 5/15/2020	EUT Type: Outdoor LTE Router		Page 71 of 97

## Test Notes

1. Conducted power and spurious emissions measurements were evaluated for the two contiguous channels using various combinations of RB size, RB offset, modulation, and channel bandwidth. Channel bandwidth data is shown in the tables below based only on the channel bandwidths that were supported in this device. The worst case (highest) powers were found while operating with QPSK modulation, as shown in Table 7-3 and 7-4 below, with both carriers set to transmit using 1RB.
2. Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and 1 MHz or greater for frequencies greater than 1 GHz. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

FCC ID: XIA-CFW2132	 <p><b>PCTEST</b> Proud to be part of  element</p>	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2003310053-01-R1.XIA	Test Dates: 3/31 - 5/15/2020	EUT Type: Outdoor LTE Router		Page 72 of 97



## Band 48

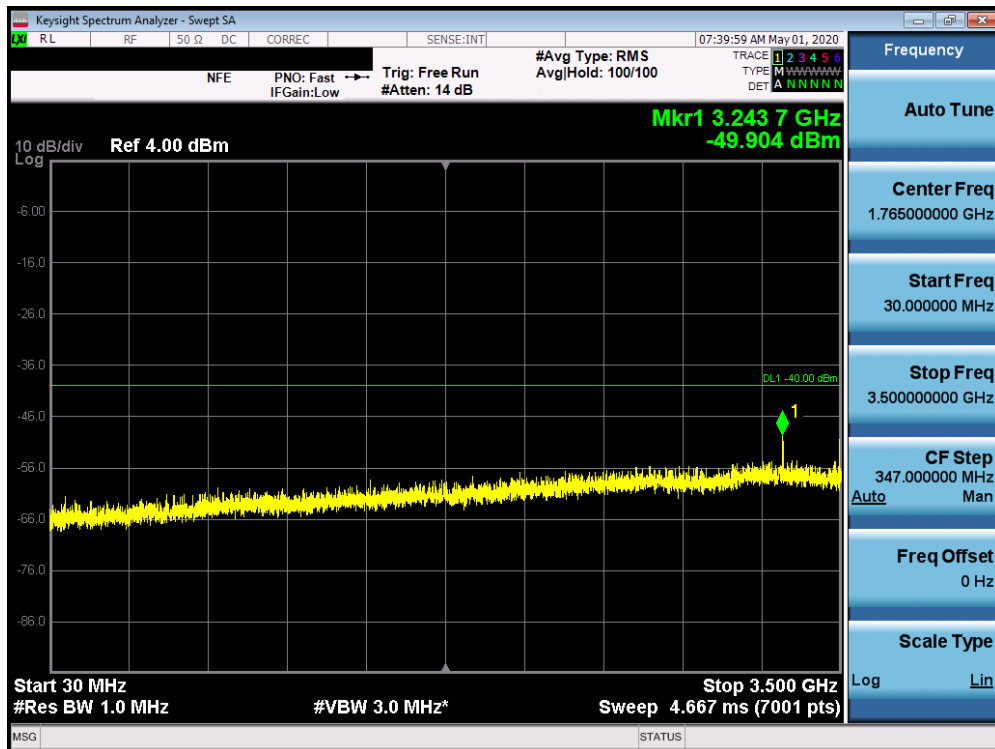
Power State	PCC							SCC							Power
	PCC Band	PCC Bandwidth [MHz]	PCC (UL) Channel	PCC (UL) Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	SCC Band	SCC Bandwidth [MHz]	SCC (UL) Channel	SCC (UL) Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	ULCA Tx.Power (dBm)
Max	LTE B48	5	55265	3552.5	QPSK	1	0	LTE B48	20	55382	3564.2	QPSK	1	0	12.05
Max	LTE B48	10	55290	3555	QPSK	1	0	LTE B48	20	55434	3569.4	QPSK	1	0	11.32
Max	LTE B48	15	55315	3557.5	QPSK	1	0	LTE B48	20	55486	3574.6	QPSK	1	0	12.09
Max	LTE B48	20	55340	3560	QPSK	1	0	LTE B48	20	55538	3579.8	QPSK	1	0	11.91
Max	LTE B48	5	55990	3625	QPSK	1	0	LTE B48	20	56107	3636.7	QPSK	1	0	11.58
Max	LTE B48	10	55990	3625	QPSK	1	0	LTE B48	20	56134	3639.4	QPSK	1	0	10.62
Max	LTE B48	15	55990	3625	QPSK	1	0	LTE B48	20	56161	3642.1	QPSK	1	0	11.87
Max	LTE B48	20	55990	3625	QPSK	1	0	LTE B48	20	56188	3644.8	QPSK	1	0	12.00
Max	LTE B48	20	56640	3690	QPSK	1	0	LTE B48	5	56523	3678.3	QPSK	1	0	10.61
Max	LTE B48	20	56640	3690	QPSK	1	0	LTE B48	10	56496	3675.6	QPSK	1	0	10.25
Max	LTE B48	20	56640	3690	QPSK	1	0	LTE B48	15	56469	3672.9	QPSK	1	0	10.78
Max	LTE B48	20	56640	3690	QPSK	1	0	LTE B48	20	56442	3670.2	QPSK	1	0	10.05

**Table 7-4. Conducted Powers (B48 – Left Carrier: RB Size 1 Offset 0 Right Carrier: RB Size 1 Offset 0)**

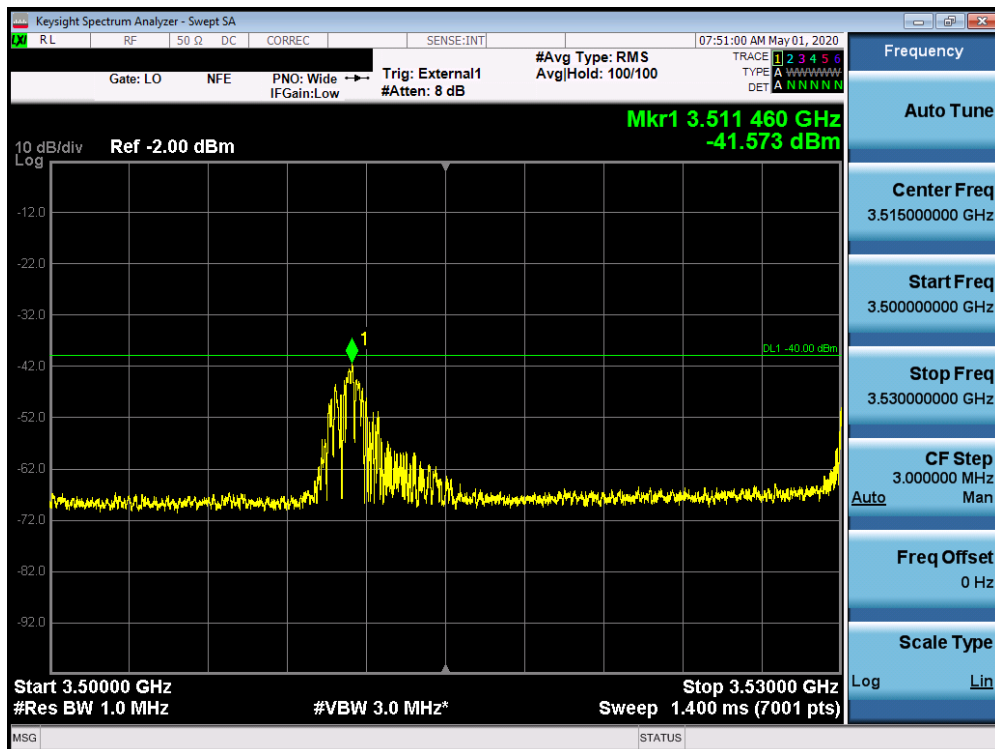
Power State	PCC							SCC							Power
	PCC Band	PCC Bandwidth [MHz]	PCC (UL) Channel	PCC (UL) Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	SCC Band	SCC Bandwidth [MHz]	SCC (UL) Channel	SCC (UL) Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	ULCA Tx.Power (dBm)
Max	LTE B48	20	55340	3560	QPSK	1	0	LTE B48	20	55538	3579.8	QPSK	1	0	12.45
Max	LTE B48	20	55340	3560	QPSK	1	99	LTE B48	20	55538	3579.8	QPSK	1	99	11.90
Max	LTE B48	20	55340	3560	QPSK	1	0	LTE B48	20	55538	3579.8	QPSK	1	99	11.68
Max	LTE B48	20	55340	3560	QPSK	1	50	LTE B48	20	55538	3579.8	QPSK	1	50	11.75
Max	LTE B48	20	55340	3560	QPSK	1	99	LTE B48	20	55538	3579.8	QPSK	1	0	11.53
Max	LTE B48	20	55340	3560	QPSK	100	0	LTE B48	20	55142	3540.2	QPSK	100	0	11.90
Max	LTE B48	20	55340	3560	16-QAM	100	0	LTE B48	20	55142	3540.2	16-QAM	100	0	11.86
Max	LTE B48	20	55340	3560	64-QAM	100	0	LTE B48	20	55142	3540.2	64-QAM	100	0	12.09

**Table 7-5. Conducted Powers (B48 with Various Combinations for 20MHz Channel Bandwidth)**

FCC ID: XIA-CFW2132		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2003310053-01-R1.XIA	Test Dates: 3/31 - 5/15/2020	EUT Type: Outdoor LTE Router	Page 73 of 97	

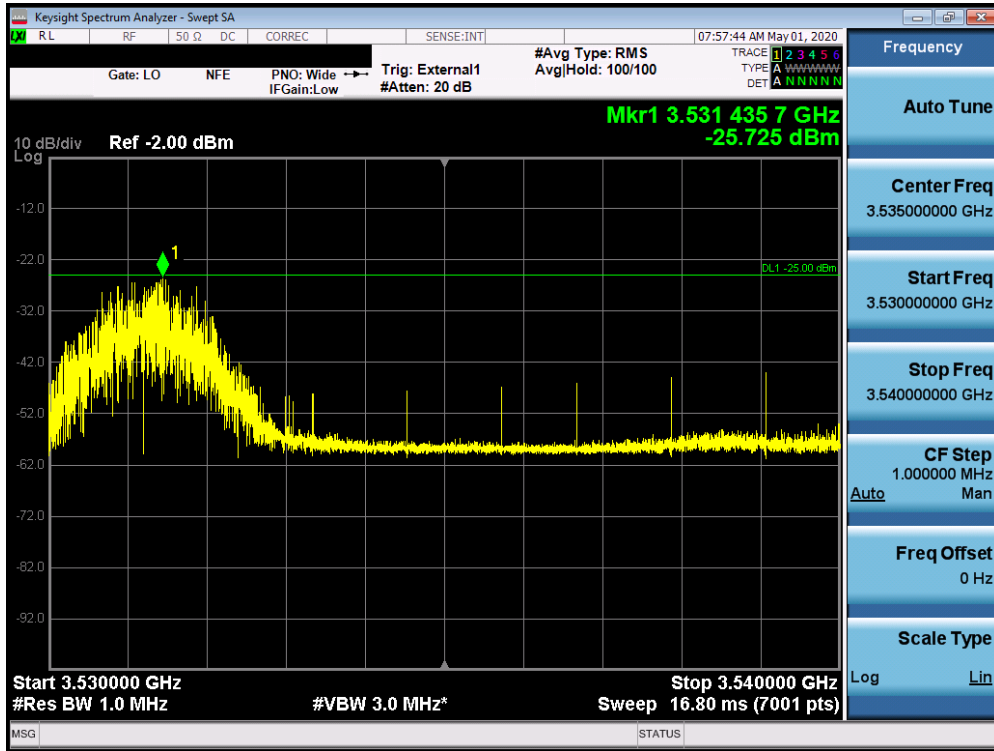


Plot 7-106. Conducted Spurious Plot (Band 48 – 20.0MHz QPSK – Left Carrier 1/0 Right Carrier 1/0 – Low Channel)

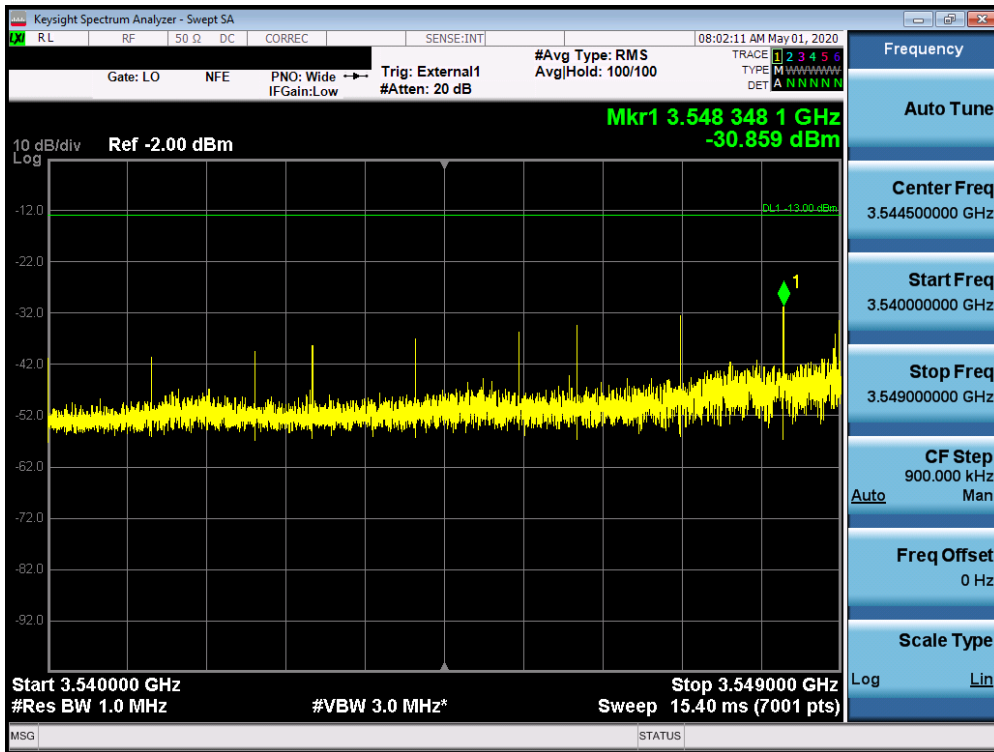


Plot 7-107. Conducted Spurious Plot (Band 48 – 20.0MHz QPSK – Left Carrier 1/0 Right Carrier 1/0 – Low Channel)




FCC ID: XIA-CFW2132	 PCTEST <sup>®</sup> Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	 NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M2003310053-01-R1.XIA	Test Dates: 3/31 - 5/15/2020	EUT Type: Outdoor LTE Router		Page 74 of 97



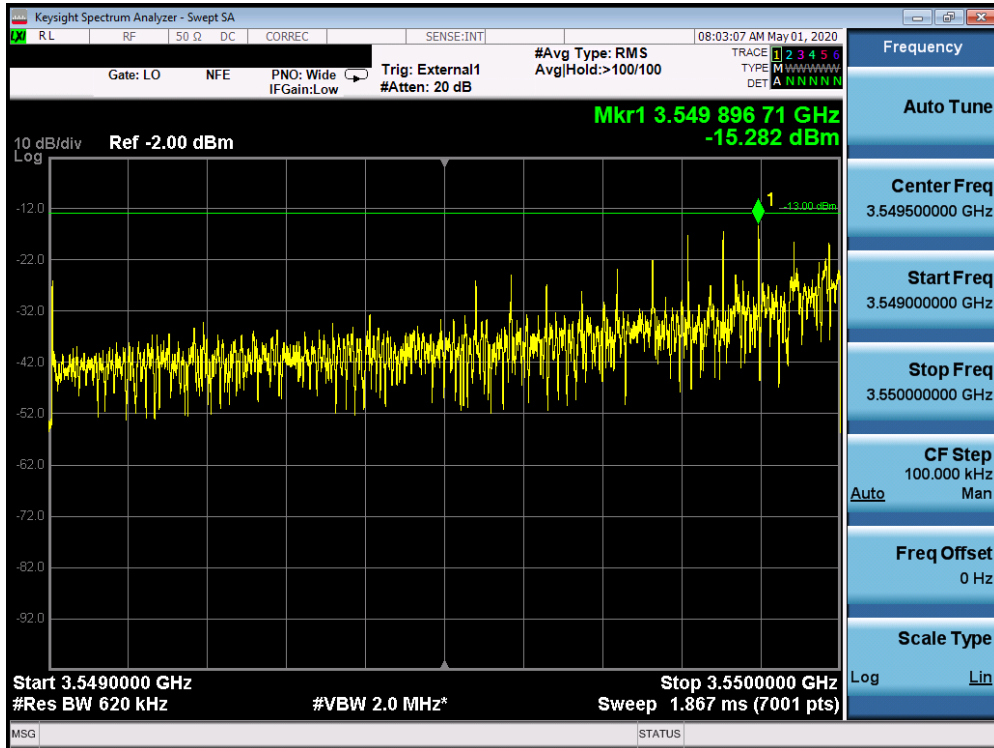
Plot 7-108. Conducted Spurious Plot (Band 48 – 20.0MHz QPSK – Left Carrier 1/0 Right Carrier 1/0 – Low Channel)



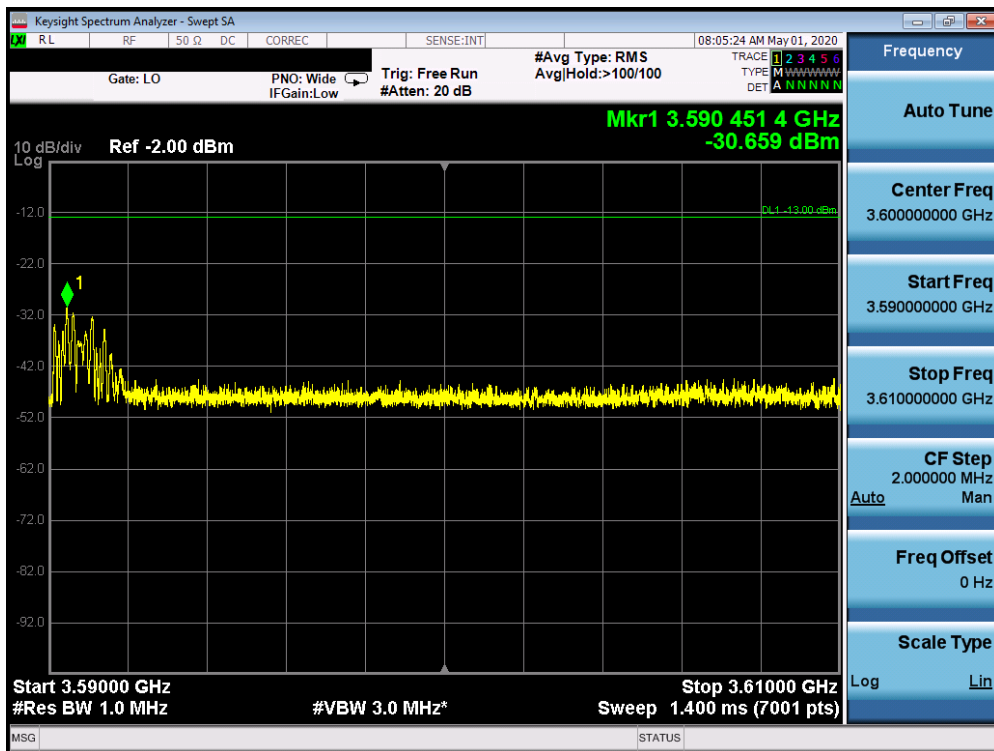
Plot 7-109. Conducted Spurious Plot (Band 48 – 20.0MHz QPSK – Left Carrier 1/0 Right Carrier 1/0 – Low Channel)

FCC ID: XIA-CFW2132	 Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	 NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M2003310053-01-R1.XIA	Test Dates: 3/31 - 5/15/2020	EUT Type: Outdoor LTE Router		Page 75 of 97



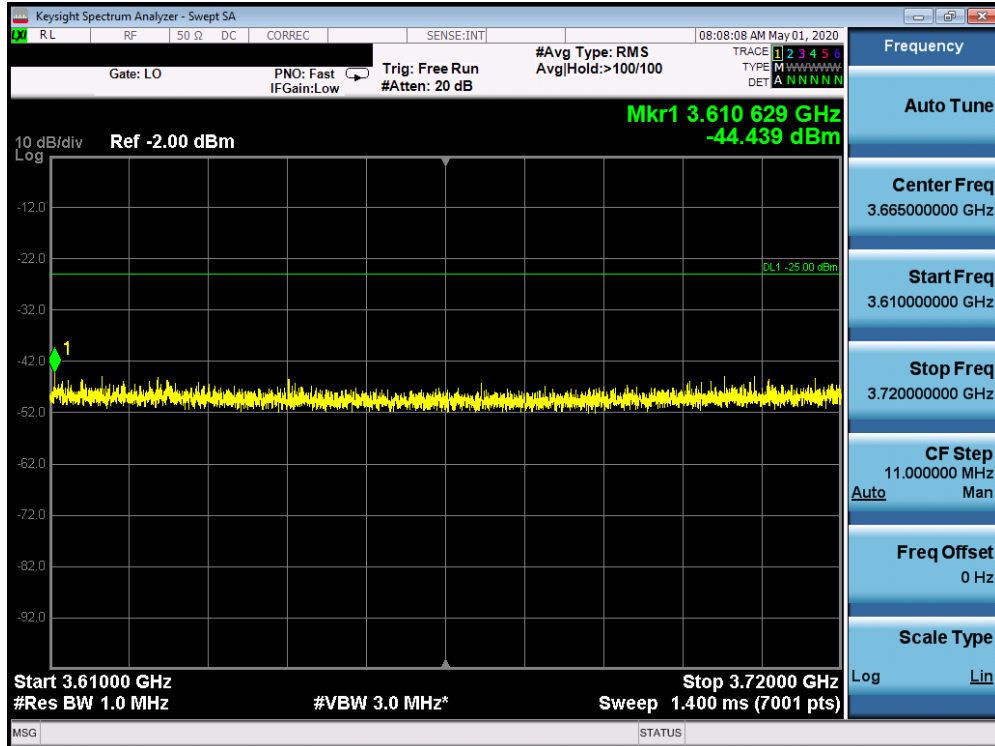


Plot 7-110. Conducted Spurious Plot (Band 48 – 20.0MHz QPSK – Left Carrier 1/0 Right Carrier 1/0 – Low Channel)

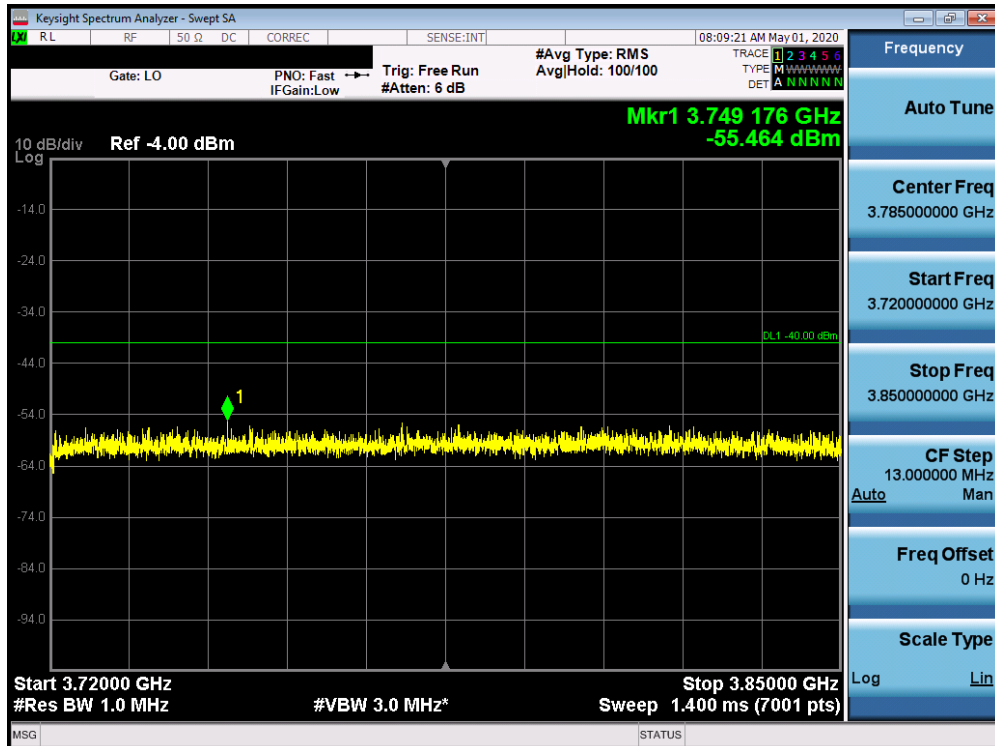


Plot 7-111. Conducted Spurious Plot (Band 48 – 20.0MHz QPSK – Left Carrier 1/0 Right Carrier 1/0 – Low Channel)

FCC ID: XIA-CFW2132	<b>PCTEST</b> Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M2003310053-01-R1.XIA	Test Dates: 3/31 - 5/15/2020	EUT Type: Outdoor LTE Router		Page 76 of 97

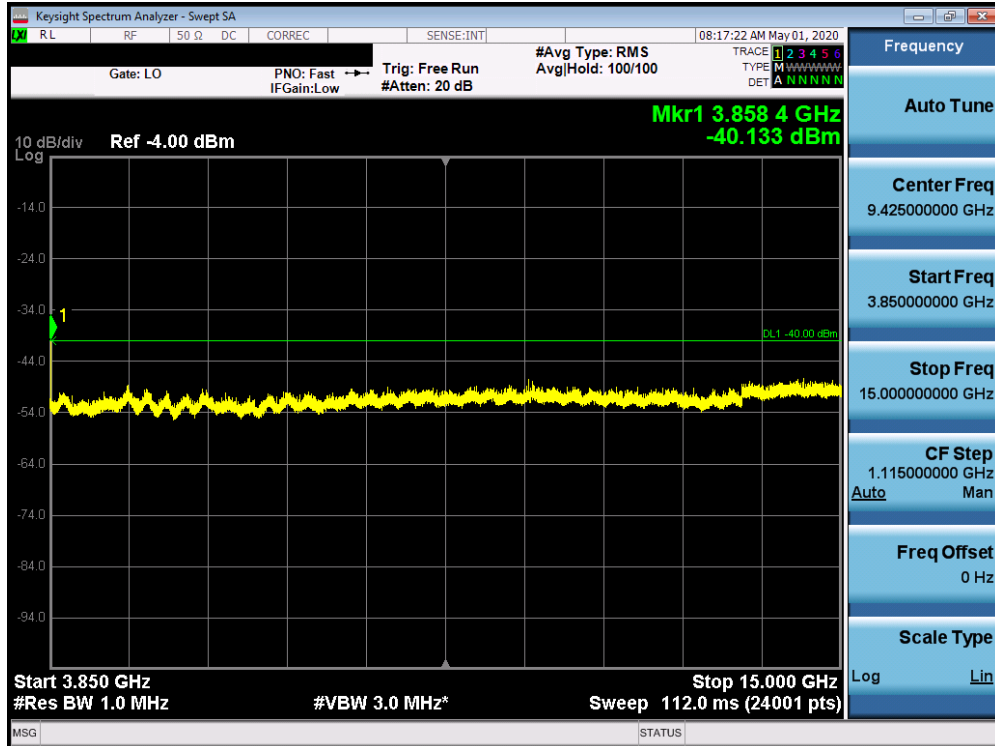


Plot 7-112. Conducted Spurious Plot (Band 48 – 20.0MHz QPSK – Left Carrier 1/0 Right Carrier 1/0 – Low Channel)

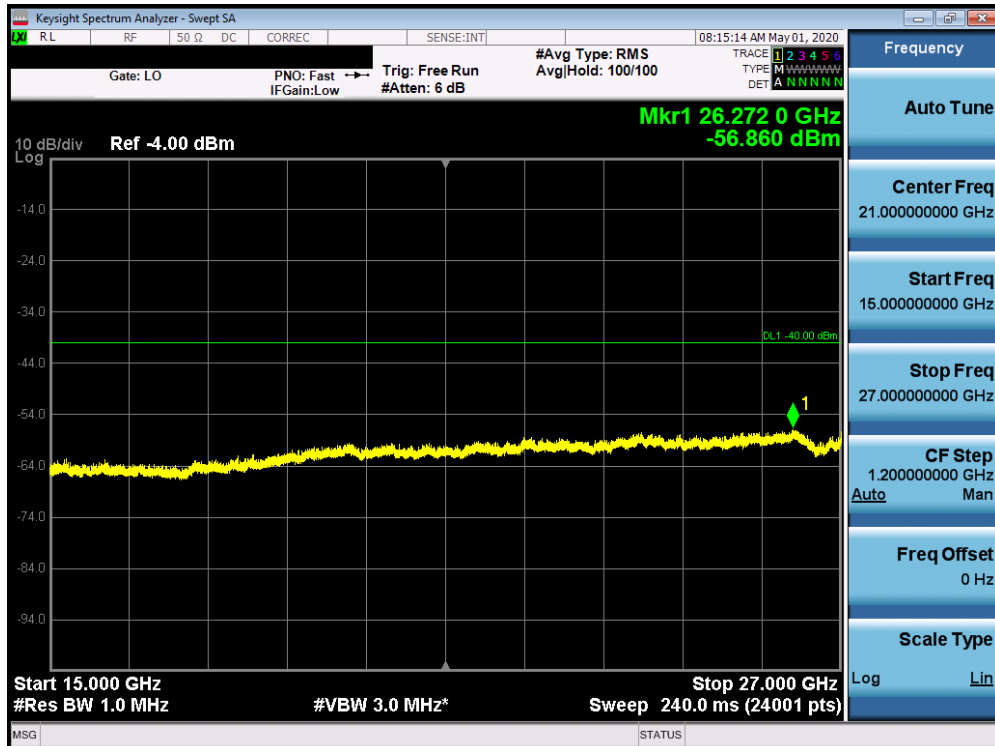


Plot 7-113. Conducted Spurious Plot (Band 48 – 20.0MHz QPSK – Left Carrier 1/0 Right Carrier 1/0 – Low Channel)

FCC ID: XIA-CFW2132	<b>PCTEST</b> Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M2003310053-01-R1.XIA	Test Dates: 3/31 - 5/15/2020	EUT Type: Outdoor LTE Router		Page 77 of 97

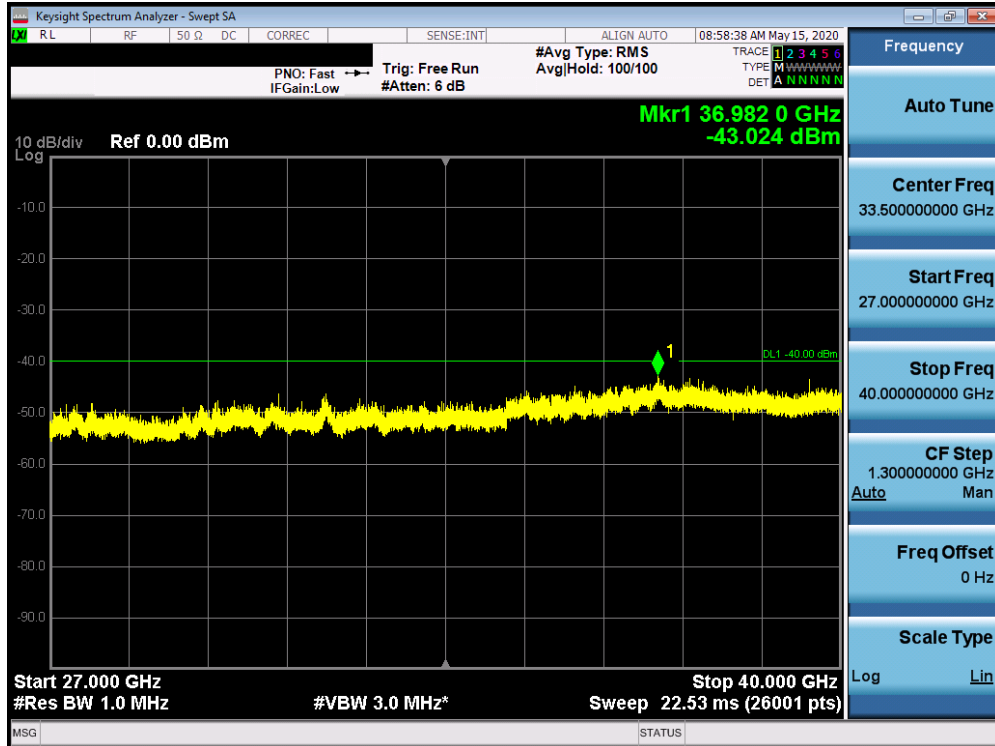


Plot 7-114. Conducted Spurious Plot (Band 48 – 20.0MHz QPSK – Left Carrier 1/0 Right Carrier 1/0 – Low Channel)

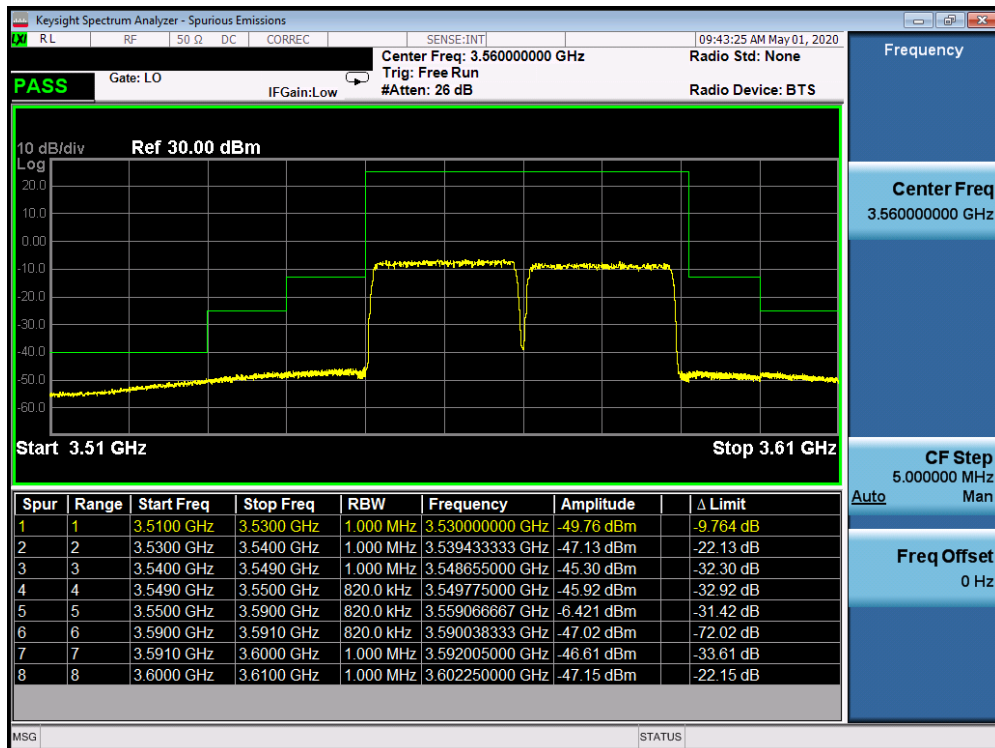


Plot 7-115. Conducted Spurious Plot (Band 48 – 20.0MHz QPSK – Left Carrier 1/0 Right Carrier 1/0 – Low Channel)

FCC ID: XIA-CFW2132	<b>PCTEST</b> Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M2003310053-01-R1.XIA	Test Dates: 3/31 - 5/15/2020	EUT Type: Outdoor LTE Router		Page 78 of 97

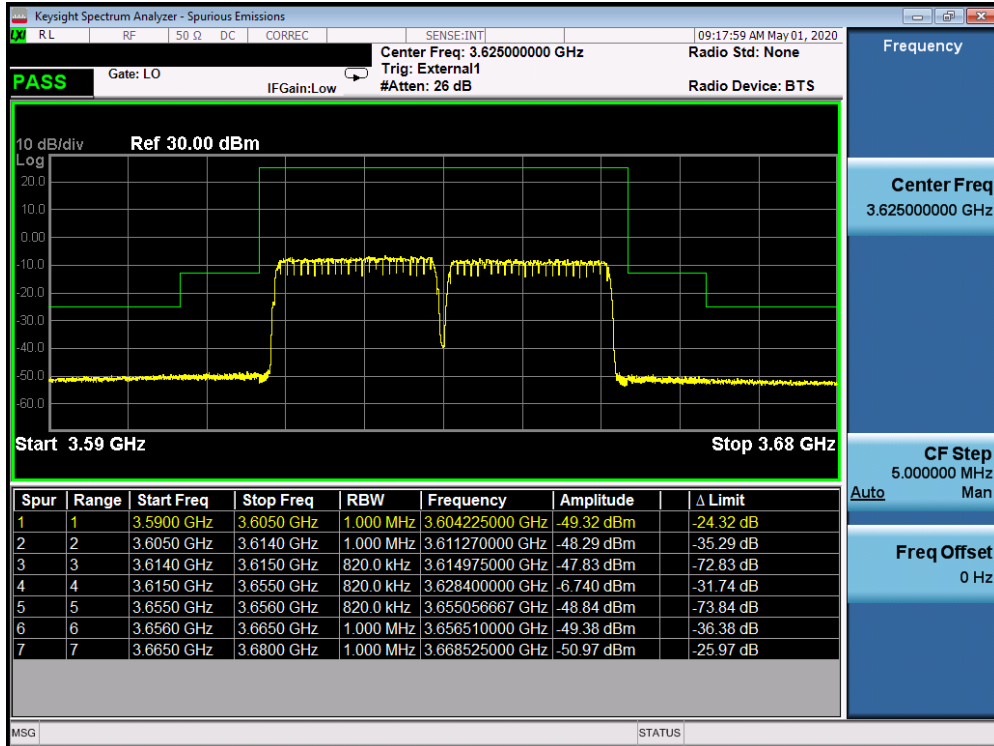


Plot 7-116. Conducted Spurious Plot (Band 48 – 20.0MHz QPSK – Left Carrier 1/0 Right Carrier 1/0 – Low Channel)

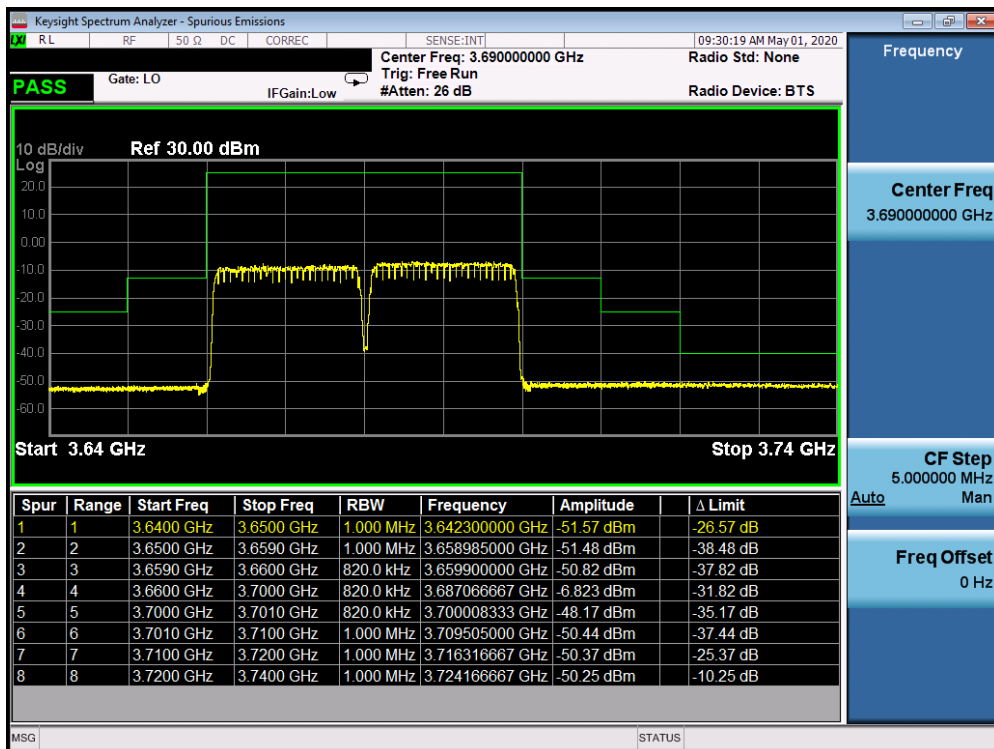


Plot 7-117. Lower ACP Plot (Band 48 QPSK – Left Carrier: 20 MHz Right Carrier: 20 MHz – Full RB)

FCC ID: XIA-CFW2132	<b>PCTEST</b> Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M2003310053-01-R1.XIA	Test Dates: 3/31 - 5/15/2020	EUT Type: Outdoor LTE Router		Page 79 of 97



Plot 7-118. Mid ACP Plot (Band 48 QPSK – Left Carrier: 20 MHz Right Carrier: 20 MHz – Full RB)



Plot 7-119. Upper ACP Plot (Band 48 QPSK – Left Carrier: 20 MHz Right Carrier: 20 MHz – Full RB)

FCC ID: XIA-CFW2132	<b>PCTEST</b> Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M2003310053-01-R1.XIA	Test Dates: 3/31 - 5/15/2020	EUT Type: Outdoor LTE Router		Page 80 of 97

## 7.8 Radiated Power (EIRP)

**§96.41(b)**

### Test Overview

Equivalent Isotropic Radiated Power (EIRP) measurements are performed using the method described in KDB 971168. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

### Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.2.1

### Test Settings

The relevant equation for determining the ERP or EIRP from the conducted RF output power measured is:

$$ERP/EIRP = P_{Meas} - LC + GT$$

Where:

ERP/EIRP = effective or equivalent radiated power, respectively (expressed in the same units as  $P_{Meas}$ , typically dBW or dBm)

$P_{Meas}$  = measured transmitter output power or PSD, in dBW or dBm

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



GT = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)

### Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.



**Figure 7-7. ERP/EIRP Measurement Setup**

FCC ID: XIA-CFW2132	 PCTEST <sup>®</sup> Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	 NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M2003310053-01-R1.XIA	Test Dates: 3/31 - 5/15/2020	EUT Type: Outdoor LTE Router		Page 81 of 97

## Test Notes

- 1) The worst case emissions are reported with the EUT modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.
- 2) This unit was tested while powered by an Power Over Ethernet (POE) power source.
- 3) The worst case EIRP shown in the section below is found with LTE operating in the RB configuration listed. As such, the EIRP/10MHz and full channel EIRP values would be identical since these test configurations are fully contained within all available channel bandwidths for LTE Band 48. EIRP data over the full channel bandwidth is also shown below.




Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	RB Size/Offset	Conducted Power [dBm/10MHz]	Ant. Gain [dBi]	EIRP [dBm/10MHz]	EIRP [Watts/10MHz]	EIRP Limit [dBm/10MHz]	Margin [dB]
3552.50	5	QPSK	12 / 6	22.39	17.50	<b>39.89</b>	9.750	47.00	-7.11
3625.00	5	QPSK	12 / 6	21.85	17.50	39.35	8.610	47.00	-7.65
3697.50	5	QPSK	12 / 6	21.75	17.50	39.25	8.414	47.00	-7.75
3552.50	5	16-QAM	12 / 6	21.38	17.50	<b>38.88</b>	7.727	47.00	-8.12
3552.50	5	64-QAM	12 / 6	20.38	17.50	<b>37.88</b>	6.138	47.00	-9.12
3555.00	10	QPSK	25 / 12	22.42	17.50	<b>39.92</b>	9.817	47.00	-7.08
3625.00	10	QPSK	25 / 12	21.89	17.50	39.39	8.690	47.00	-7.61
3695.00	10	QPSK	25 / 12	21.78	17.50	39.28	8.472	47.00	-7.72
3555.00	10	16-QAM	25 / 12	21.42	17.50	<b>38.92</b>	7.798	47.00	-8.08
3555.00	10	64-QAM	25 / 12	20.42	17.50	<b>37.92</b>	6.194	47.00	-9.08
3557.50	15	QPSK	36 / 18	22.40	17.50	<b>39.90</b>	9.772	47.00	-7.10
3625.00	15	QPSK	36 / 18	21.87	17.50	39.37	8.650	47.00	-7.63
3692.50	15	QPSK	36 / 18	21.77	17.50	39.27	8.453	47.00	-7.73
3557.50	15	16-QAM	36 / 18	21.40	17.50	<b>38.90</b>	7.762	47.00	-8.10
3557.50	15	64-QAM	36 / 18	20.45	17.50	<b>37.95</b>	6.237	47.00	-9.05
3560.00	20	QPSK	50 / 25	22.47	17.50	<b>39.97</b>	<b>9.931</b>	47.00	-7.03
3625.00	20	QPSK	50 / 25	21.92	17.50	39.42	8.750	47.00	-7.58
3690.00	20	QPSK	50 / 25	19.81	17.50	37.31	5.383	47.00	-9.69
3560.00	20	16-QAM	50 / 25	21.44	17.50	<b>38.94</b>	7.834	47.00	-8.06
3560.00	20	64-QAM	50 / 25	20.50	17.50	<b>38.00</b>	6.310	47.00	-9.00

Table 7-6. LTE Band 48 EIRP Data

FCC ID: XIA-CFW2132	 PCTEST <sup>®</sup> Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	 NetCommWireless	Approved by: Quality Manager
Test Report S/N: 1M2003310053-01-R1.XIA	Test Dates: 3/31 - 5/15/2020	EUT Type: Outdoor LTE Router	Page 82 of 97	

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	RB Size/Offset	Conducted Power [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP [Watts]
3625.00	5	QPSK	25/0	21.71	17.50	<b>39.21</b>	<b>8.337</b>
3625.00	10	QPSK	50/0	21.84	17.50	<b>39.34</b>	<b>8.590</b>
3625.00	15	QPSK	75/0	21.80	17.50	<b>39.30</b>	<b>8.511</b>
3625.00	20	QPSK	100/0	21.90	17.50	<b>39.40</b>	<b>8.710</b>

**Table 7-7. LTE Band 48 EIRP Data over full channel bandwidth**

<b>FCC ID:</b> XIA-CFW2132	 <b>PCTEST</b> Proud to be part of  element	<b>MEASUREMENT REPORT (CERTIFICATION)</b>	 <b>NetCommWireless</b>	<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M2003310053-01-R1.XIA	<b>Test Dates:</b> 3/31 - 5/15/2020	<b>EUT Type:</b> Outdoor LTE Router		Page 83 of 97



## 7.9 Radiated Spurious Emissions Measurements

§2.1053 §96.41(e)

### Test Overview

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-E-2016 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically and horizontally polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas.

### Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.8

ANSI/TIA-603-E-2016 – Section 2.2.12

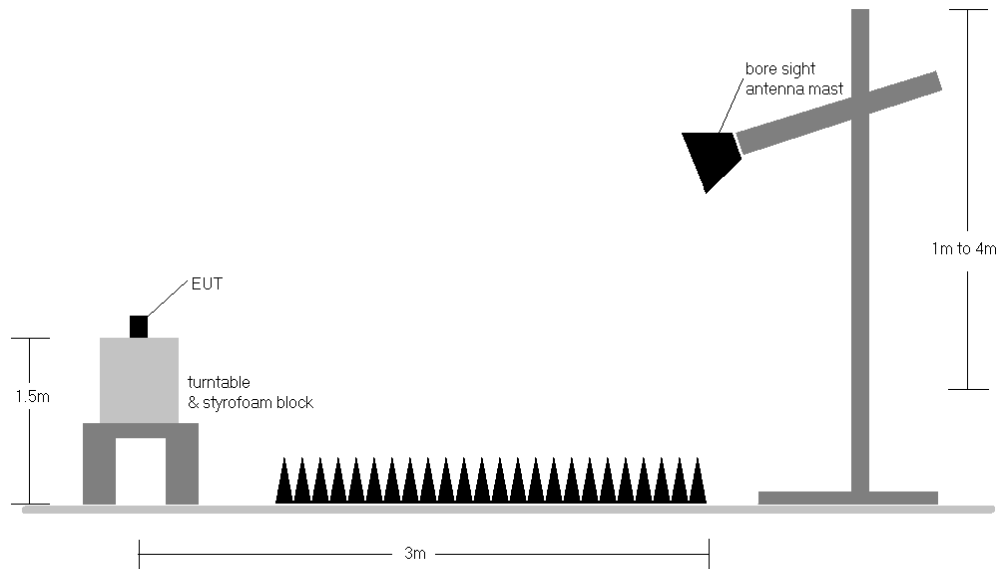
### Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW  $\geq$  3 x RBW
3. Span = 1.5 times the OBW
4. No. of sweep points  $\geq$  2 x span / RBW
5. Detector = RMS
6. Trace mode = Average (Max Hold for pulsed emissions)
7. The trace was allowed to stabilize

FCC ID: XIA-CFW2132		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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## Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.



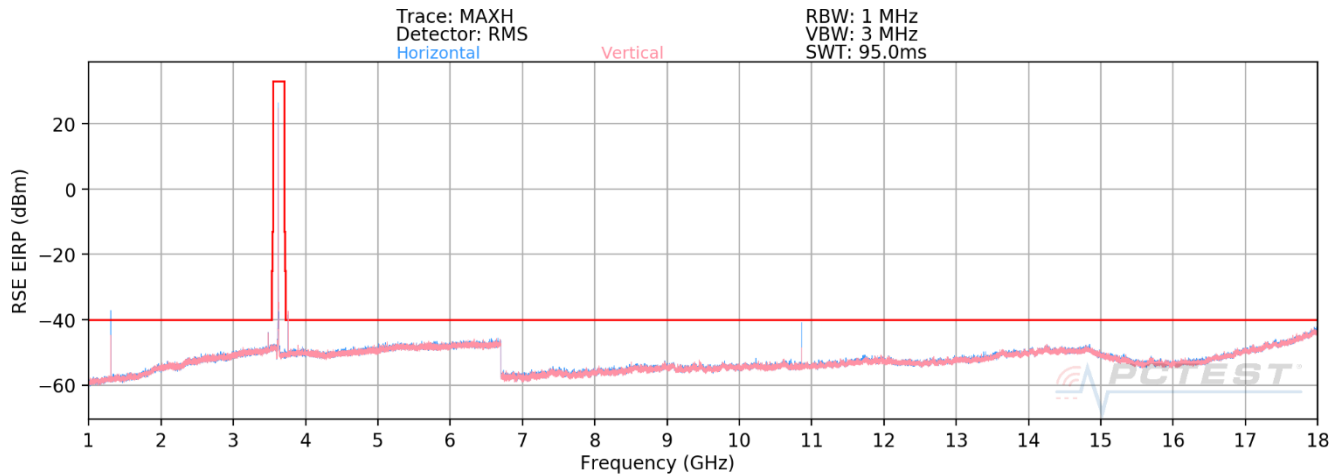
**Figure 7-8. Test Instrument & Measurement Setup**

## Test Notes

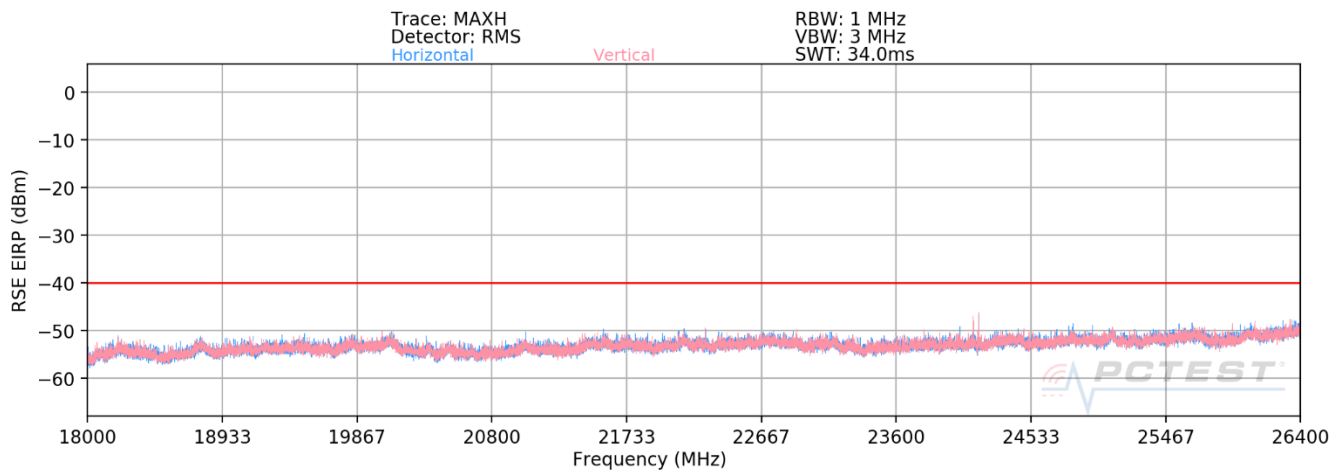
- 1) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.
- 2) This unit was tested while powered by an Power Over Ethernet (POE) power source.
- 3) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.
- 4) Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.
- 5) The "-" shown in the following RSE tables are used to denote a noise floor measurement.

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## Band 48

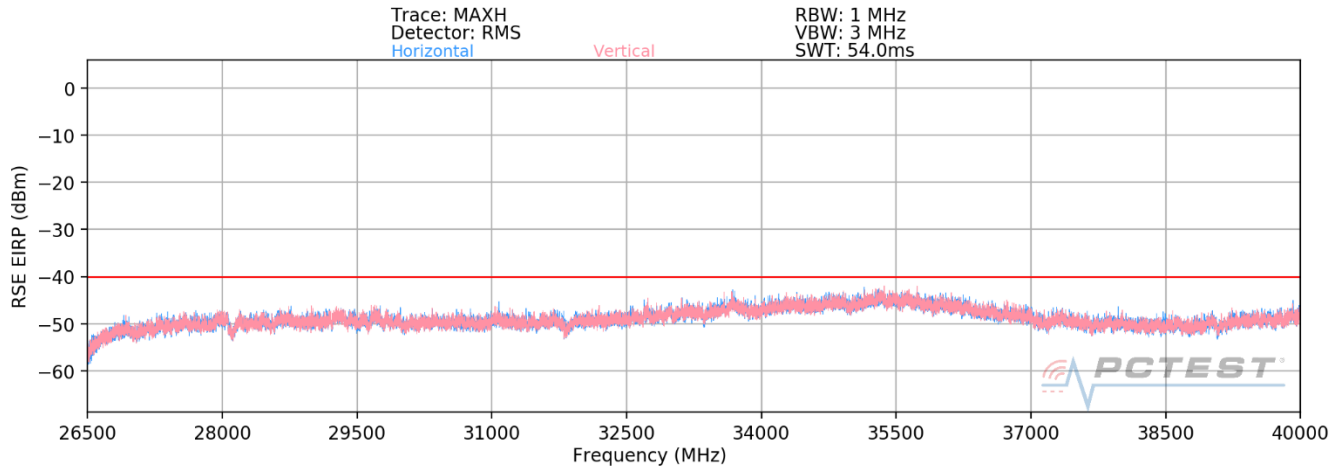


**Plot 7-120. Radiated Spurious Plot 1 - 18GHz (Band 48)**



**Plot 7-121. Radiated Spurious Plot 18 - 26.5GHz (Band 48)**

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**Plot 7-122. Radiated Spurious Plot 26.5 - 40GHz (Band 48)**

**Note:**

The emission that is above the limit for plot 7-120 was investigated using a notch filter (Sangshin Cavity Filter, Model NF3625), and the result is given below

- Noise floor for emission around 1300 MHz

Operating Frequency [MHz]	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3555.00	1236.24	H	-	-	-81.78	6.87	-74.91	-34.9
3625.00	1306.30	H	-	-	-81.51	7.25	-74.27	-34.3
3695.00	1376.60	H	-	-	-81.88	7.49	-74.39	-34.4

- Before and after the LTE Band 48 frequency band were found out to be passing the limit.

Operating Frequency [MHz]	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3555.00	3413.46	H	205	3	-72.14	9.84	-62.29	-22.3
3555.00	3687.80	H	-	-	-121.08	9.68	-111.39	-71.4
3625.00	3483.60	H	213	1	-71.16	9.93	-61.22	-21.2
3625.00	3758.17	H	201	7	-66.27	9.40	-56.87	-16.9
3695.00	3553.13	H	-	-	-112.75	9.92	-102.83	-62.8
3695.00	3828.14	H	195	6	-65.05	9.34	-55.71	-15.7

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OPERATING FREQUENCY: 3555.00 MHz  
 CHANNEL: 3625  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 10.0 MHz  
 DISTANCE: 3 meters  
 LIMIT: -40 dBm



Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
7110.00	H	396	252	-63.81	11.76	-52.05	-12.1
10665.00	H	154	52	-56.76	12.61	-44.15	-4.2
14220.00	H	-	-	-57.64	11.41	-46.23	-6.2

**Table 7-8. Radiated Spurious Data (Band 48 – Low Channel)**

OPERATING FREQUENCY: 3625.00 MHz  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 10.0 MHz  
 DISTANCE: 3 meters  
 LIMIT: -40 dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
7250.00	H	380	247	-62.84	11.35	-51.49	-11.5
10875.00	H	153	51	-55.74	12.77	-42.97	-3.0
14500.00	H	-	-	-61.58	11.64	-49.93	-9.9

**Table 7-9. Radiated Spurious Data (Band 48 – Mid Channel)**

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OPERATING FREQUENCY: 3695.00 MHz

MODULATION SIGNAL: QPSK



BANDWIDTH: 10.0 MHz

DISTANCE: 3 meters

LIMIT: -40 dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
7390.00	H	388	349	-63.72	10.98	-52.73	-12.7
11085.00	H	237	73	-53.74	12.78	-40.96	-1.0
14780.00	H	-	-	-60.21	12.15	-48.06	-8.1

Table 7-10. Radiated Spurious Data (Band 48 – High Channel)

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## 7.10 Uplink Carrier Aggregation Radiated Measurements

§2.1053, §96.41(e)

### Test Overview

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-D-2010 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically and horizontally polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as peak measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

### Test Procedures Used

KDB 971168 D01 v02r02 – Section 5.8

ANSI/TIA-603-D-2010 – Section 2.2.12

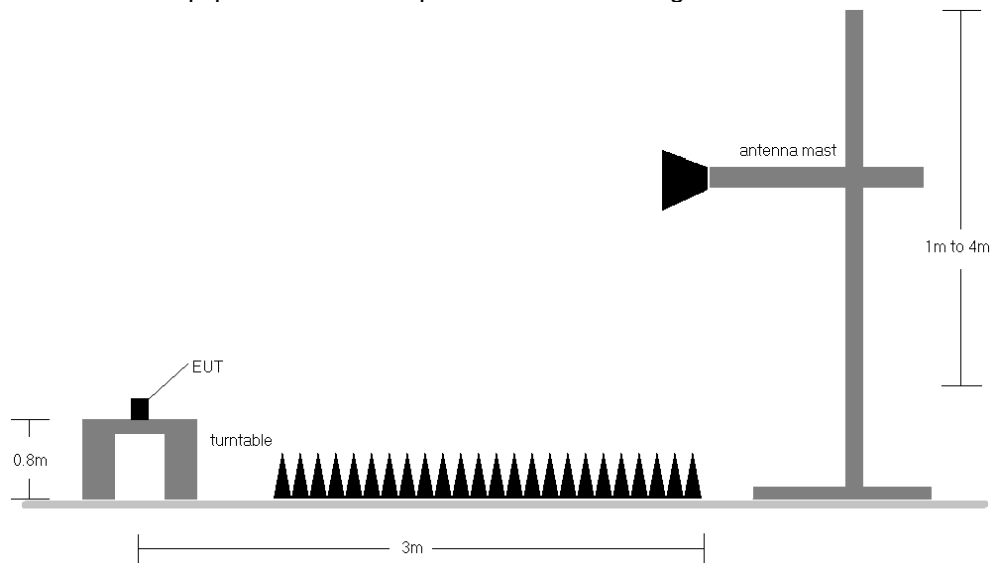
### Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW  $\geq 3 \times$  RBW
3. No. of sweep points  $\geq 2 \times$  span / RBW
4. Detector = RMS
5. Trace mode = trace average for continuous emissions, max hold for pulse emissions
6. The trace was allowed to stabilize

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## Test Setup



The EUT and measurement equipment were set up as shown in the diagram below.



**Figure 7-9. Test Instrument & Measurement Setup**

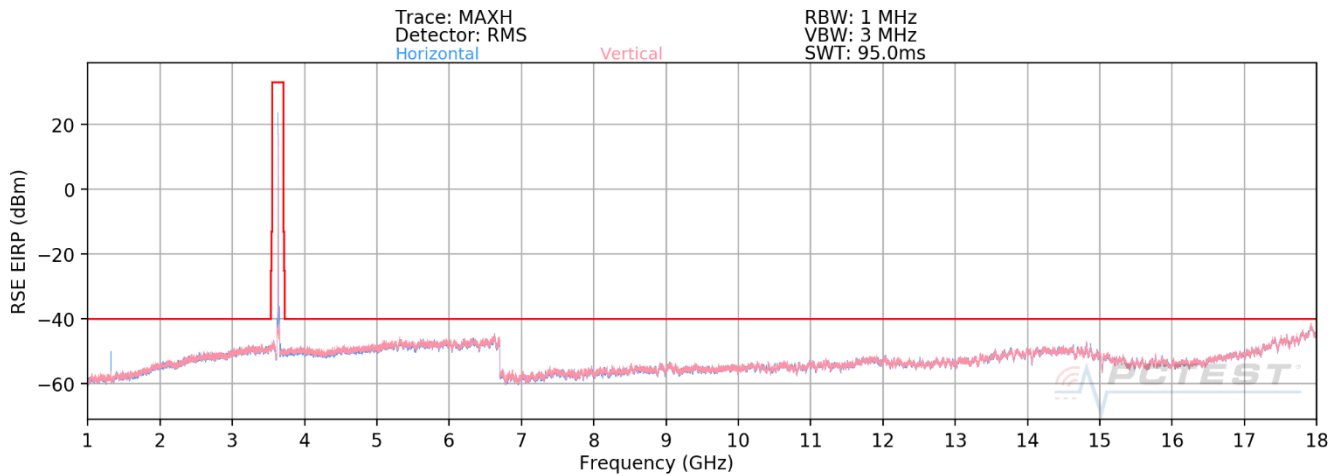
## Test Notes

- 1) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.
- 2) This unit was tested while powered by an Power Over Ethernet (POE) power source.
- 3) Radiated spurious emissions measurements were evaluated for the two contiguous channels using various combinations of RB size, RB offset, modulation, and channel bandwidth. The worst case (highest) emissions were found while operating with QPSK modulation with both carriers set to transmit using 1RB.
- 4) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.
- 5) Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.
- 6) No significant emissions were found as a result of two uplink carriers operating contiguously.

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## ULCA Band 48





Plot 7-123. Radiated Spurious Plot 1GHz - 18GHz (ULCA Band 48 Mid Channel – PCC/SCC: 1RB)

OPERATING FREQUENCY (PCC): 3560.00 MHz  
 OPERATING FREQUENCY (SCC): 3579.80 MHz  
 CHANNEL (PCC): 55340  
 CHANNEL (SCC): 55538  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 20.0 MHz  
 DISTANCE: 3 meters  
 LIMIT: -40 dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
7120.00	H	400	349	-69.32	11.71	-57.62	-17.6
10680.00	H	379	285	-64.65	12.55	-52.10	-12.1
14240.00	H	-	-	-60.02	11.35	-48.66	-8.7
17800.00	H	-	-	-53.25	10.01	-43.24	-3.2

Plot 7-11. Radiated Spurious Data (ULCA BAND 48 PCC: RB 1 Offset 99, SCC: RB 1 Offset 0 – Low Channel)

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OPERATING FREQUENCY (PCC): \_\_\_\_\_ 3625.00 MHz  
 OPERATING FREQUENCY (SCC): \_\_\_\_\_ 3644.80 MHz  
 CHANNEL (PCC): \_\_\_\_\_ 55990  
 CHANNEL (SCC): \_\_\_\_\_ 56188  
 MODULATION SIGNAL: \_\_\_\_\_ QPSK  
 BANDWIDTH: \_\_\_\_\_ 20.0 MHz  
 DISTANCE: \_\_\_\_\_ 3 meters  
 LIMIT: \_\_\_\_\_ -40 dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
7250.00	H	-	-	-67.26	11.32	-55.94	-15.9
10875.00	H	130	283	-65.51	12.71	-52.80	-12.8
14500.00	H	-	-	-59.78	11.61	-48.16	-8.2

Plot 7-12. Radiated Spurious Data (ULCA BAND 48 PCC: RB 1 Offset 99, SCC: RB 1 Offset 0 – Mid Channel)

OPERATING FREQUENCY (PCC): \_\_\_\_\_ 3690.00 MHz  
 OPERATING FREQUENCY (SCC): \_\_\_\_\_ 3670.20 MHz  
 CHANNEL (PCC): \_\_\_\_\_ 56640  
 CHANNEL (SCC): \_\_\_\_\_ 56442  
 MODULATION SIGNAL: \_\_\_\_\_ QPSK  
 BANDWIDTH: \_\_\_\_\_ 20.0 MHz  
 DISTANCE: \_\_\_\_\_ 3 meters  
 LIMIT: \_\_\_\_\_ -40 dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
7380.00	H	400	343	-66.42	10.96	-55.47	-15.5
11070.00	H	400	298	-66.94	12.72	-54.22	-14.2
14760.00	H	-	-	-61.64	12.02	-49.61	-9.6

Plot 7-13. Radiated Spurious Data (ULCA BAND 48 PCC: RB 1 Offset 0, SCC: RB 1 Offset 99 – High Channel)

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## 7.11 Frequency Stability / Temperature Variation

### §2.1055

#### Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-E-2016. The frequency stability of the transmitter is measured by:

- a.) **Temperature:** The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.
- b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

***For Part 96, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.***

#### Test Procedure Used

ANSI/TIA-603-E-2016

#### Test Settings

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a “standby” condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

#### Test Setup

The EUT was connected via an RF cable to a spectrum analyzer with the EUT placed inside an environmental chamber.

#### Test Notes

None

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## Band 48 Frequency Stability Measurements

OPERATING FREQUENCY: 3,625,000,000 Hz  
 CHANNEL: 55990  
 REFERENCE VOLTAGE: 48.00 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	48.00	- 30	3,624,999,824	-176	-0.0000049
100 %		- 20	3,625,000,010	10	0.0000003
100 %		- 10	3,624,999,960	-40	-0.0000011
100 %		0	3,624,999,951	-49	-0.0000014
100 %		+ 10	3,625,000,320	320	0.0000088
100 %		+ 20	3,624,999,894	-106	-0.0000029
100 %		+ 30	3,624,999,724	-276	-0.0000076
100 %		+ 40	3,625,000,122	122	0.0000034
100 %		+ 50	3,625,000,200	200	0.0000055

**Table 7-14. Frequency Stability Data (Band 48)**

**Note:**

Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

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## Band 48 Frequency Stability Measurements

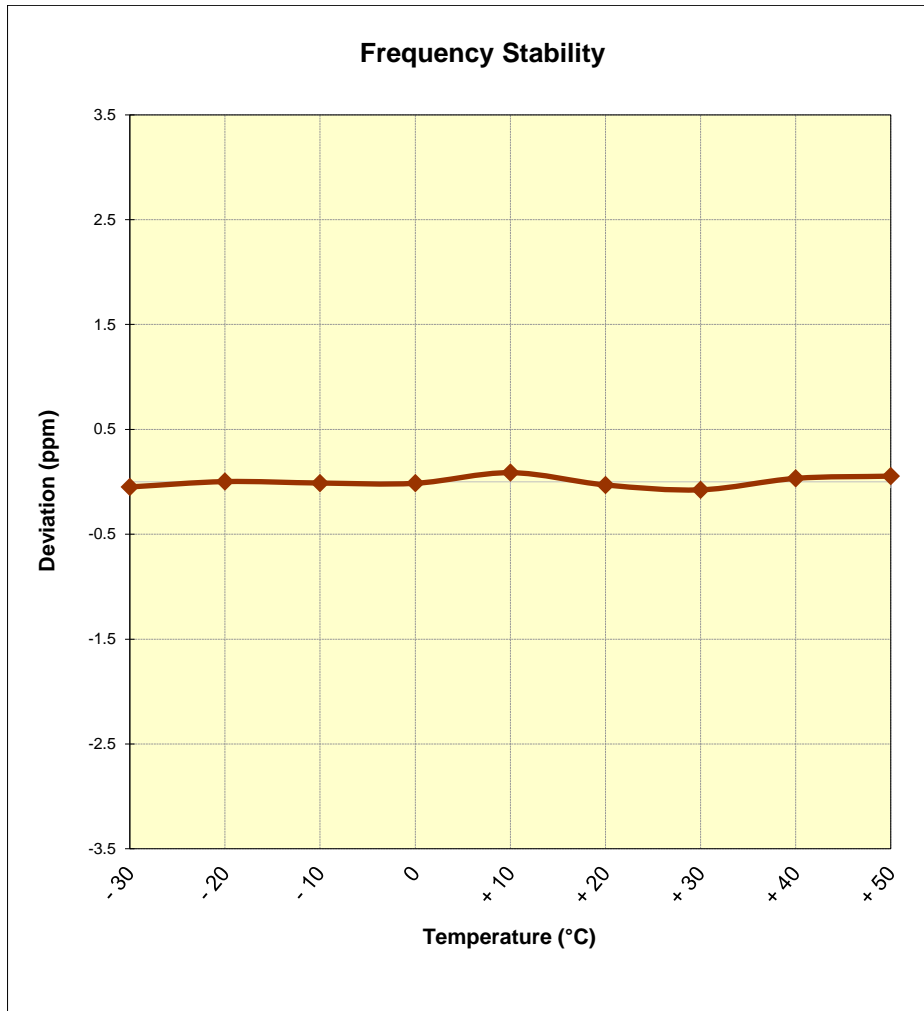






Figure 7-10. Frequency Stability Graph (Band 48)

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## 8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Netcomm Outdoor LTE Router FCC ID: XIA-CFW2132** complies with all of the requirements of Part 96 of the FCC Rules for LTE operation only.

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