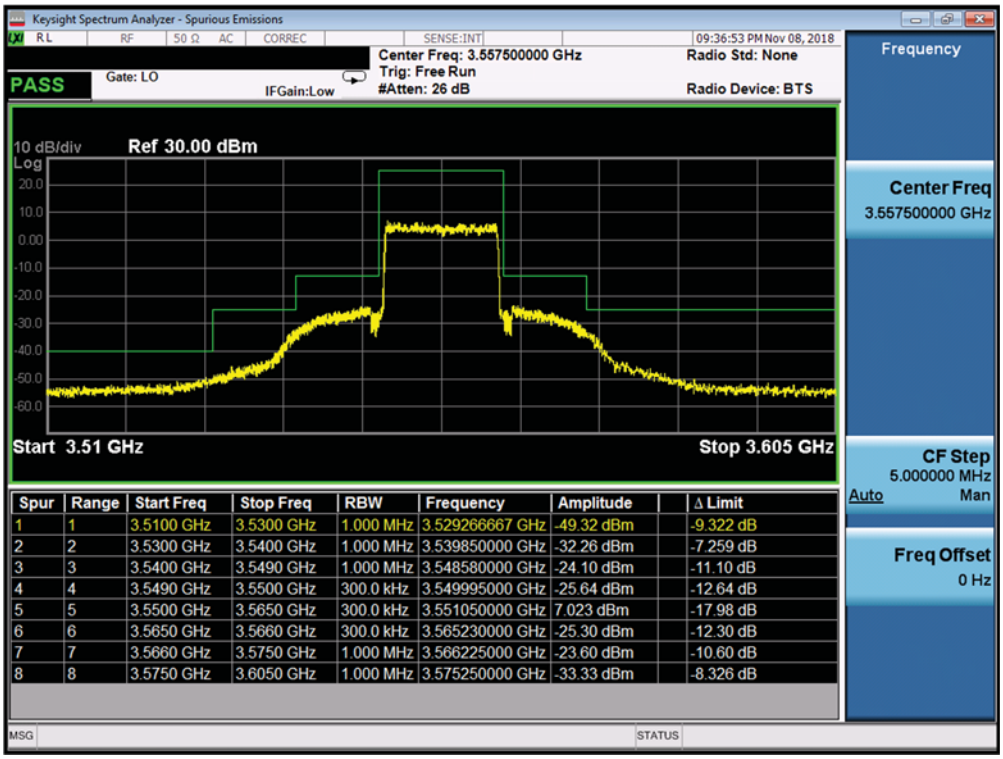
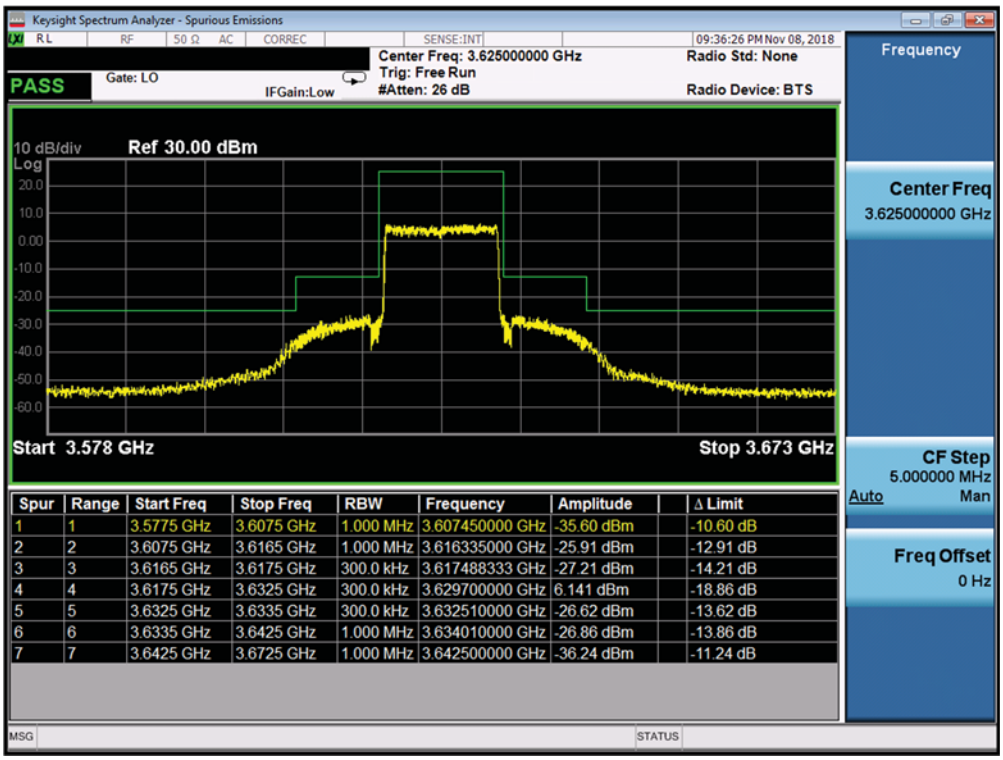
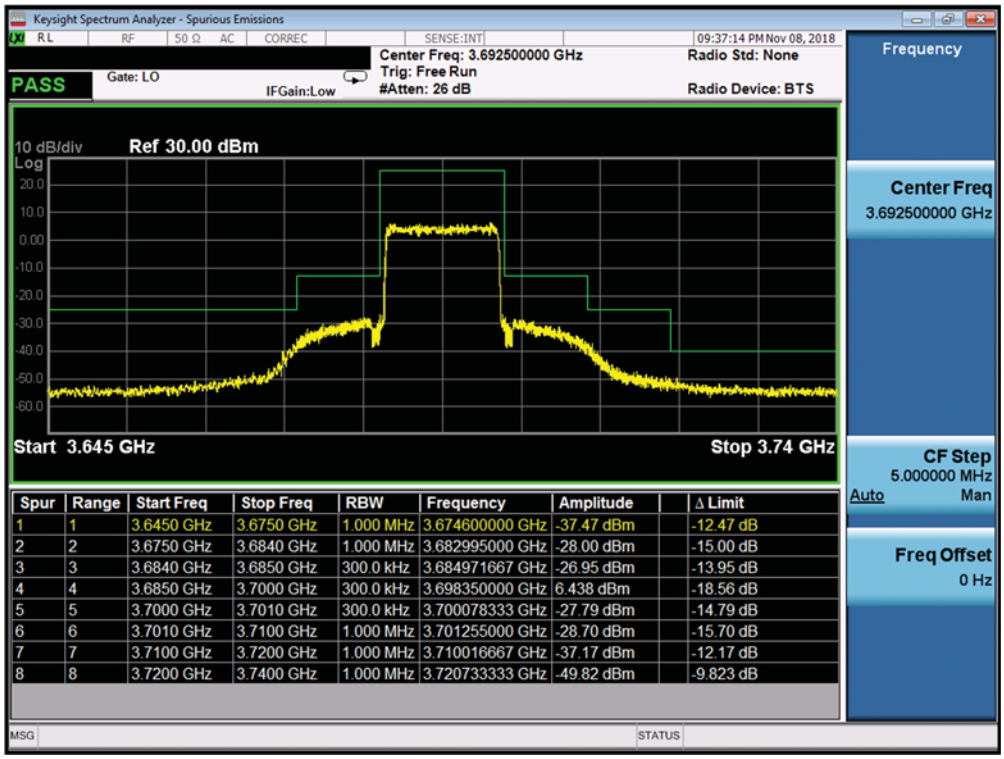


Plot 7-32. Lower Channel Edge Plot (Band 48 - 15.0MHz QPSK - Full RB Configuration)

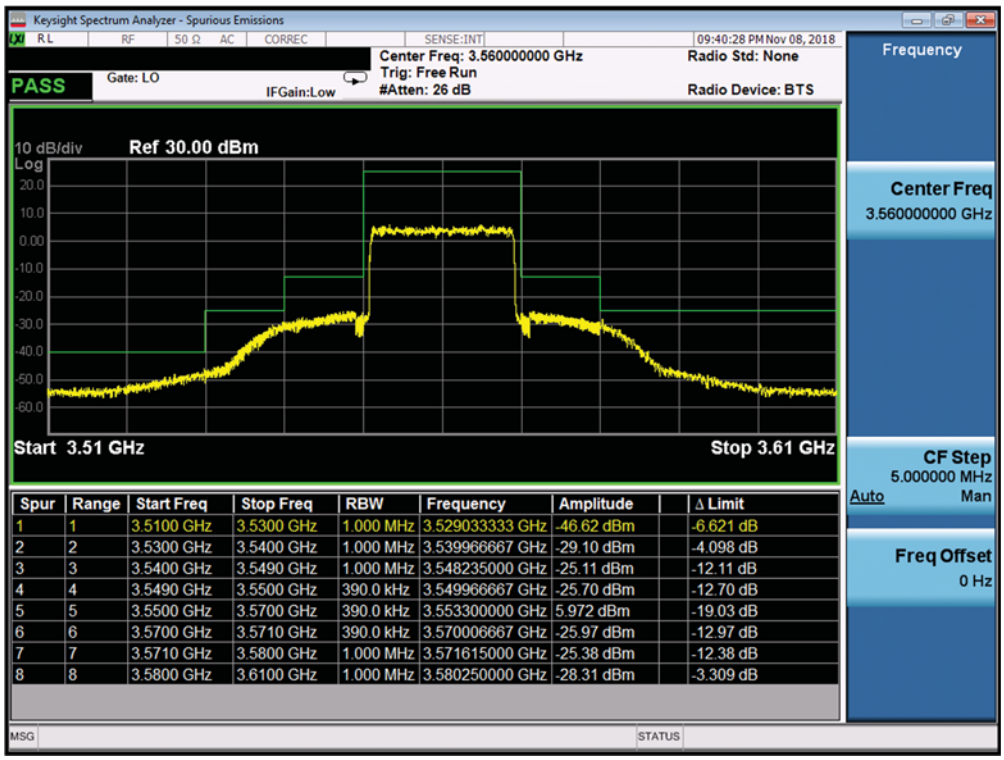


Plot 7-33. Mid Channel Edge Plot (Band 48 - 15.0MHz QPSK - Full RB Configuration)



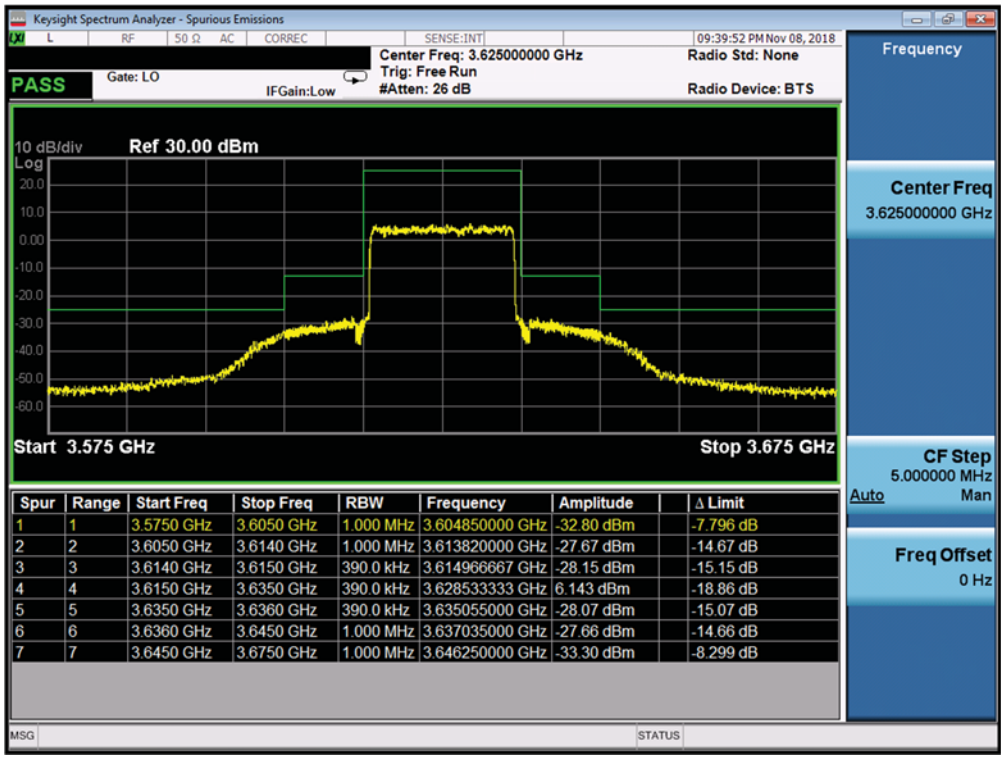
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.6450 GHz	3.6750 GHz	1.000 MHz	3.674600000 GHz	-37.47 dBm	-12.47 dB
2	2	3.6750 GHz	3.6840 GHz	1.000 MHz	3.682995000 GHz	-28.00 dBm	-15.00 dB
3	3	3.6840 GHz	3.6850 GHz	300.0 kHz	3.684971667 GHz	-26.95 dBm	-13.95 dB
4	4	3.6850 GHz	3.7000 GHz	300.0 kHz	3.698350000 GHz	6.438 dBm	-18.56 dB
5	5	3.7000 GHz	3.7010 GHz	300.0 kHz	3.700078333 GHz	-27.79 dBm	-14.79 dB
6	6	3.7010 GHz	3.7100 GHz	1.000 MHz	3.701255000 GHz	-28.70 dBm	-15.70 dB
7	7	3.7100 GHz	3.7200 GHz	1.000 MHz	3.710016667 GHz	-37.17 dBm	-12.17 dB
8	8	3.7200 GHz	3.7400 GHz	1.000 MHz	3.720733333 GHz	-49.82 dBm	-9.823 dB

Plot 7-34. Upper Channel Edge Plot (Band 48 - 15.0MHz QPSK - Full RB Configuration)



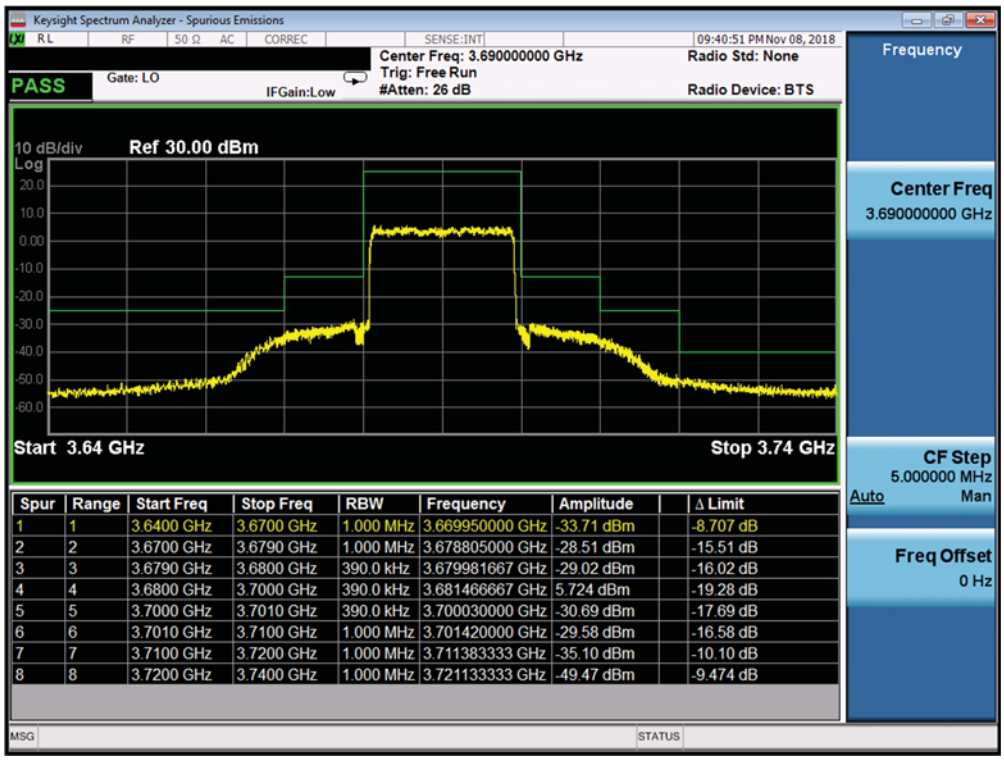
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.5100 GHz	3.5300 GHz	1.000 MHz	3.529033333 GHz	-46.62 dBm	-6.621 dB
2	2	3.5300 GHz	3.5400 GHz	1.000 MHz	3.539966667 GHz	-29.10 dBm	-4.098 dB
3	3	3.5400 GHz	3.5490 GHz	1.000 MHz	3.548235000 GHz	-25.11 dBm	-12.11 dB
4	4	3.5490 GHz	3.5500 GHz	390.0 kHz	3.549966667 GHz	-25.70 dBm	-12.70 dB
5	5	3.5500 GHz	3.5700 GHz	390.0 kHz	3.553300000 GHz	5.972 dBm	-19.03 dB
6	6	3.5700 GHz	3.5710 GHz	390.0 kHz	3.570006667 GHz	-25.97 dBm	-12.97 dB
7	7	3.5710 GHz	3.5800 GHz	1.000 MHz	3.571615000 GHz	-25.38 dBm	-12.38 dB
8	8	3.5800 GHz	3.6100 GHz	1.000 MHz	3.580250000 GHz	-28.31 dBm	-3.309 dB

Plot 7-35. Lower Channel Edge Plot (Band 48 - 20.0MHz QPSK - Full RB Configuration)



Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.5750 GHz	3.6050 GHz	1.000 MHz	3.604850000 GHz	-32.80 dBm	-7.796 dB
2	2	3.6050 GHz	3.6140 GHz	1.000 MHz	3.613820000 GHz	-27.67 dBm	-14.67 dB
3	3	3.6140 GHz	3.6150 GHz	390.0 kHz	3.614966667 GHz	-28.15 dBm	-15.15 dB
4	4	3.6150 GHz	3.6350 GHz	390.0 kHz	3.628533333 GHz	6.143 dBm	-18.86 dB
5	5	3.6350 GHz	3.6360 GHz	390.0 kHz	3.635055000 GHz	-28.07 dBm	-15.07 dB
6	6	3.6360 GHz	3.6450 GHz	1.000 MHz	3.637035000 GHz	-27.66 dBm	-14.66 dB
7	7	3.6450 GHz	3.6750 GHz	1.000 MHz	3.646250000 GHz	-33.30 dBm	-8.299 dB

Plot 7-36. Mid Channel Edge Plot (Band 48 - 20.0MHz QPSK - Full RB Configuration)



Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.6400 GHz	3.6700 GHz	1.000 MHz	3.669950000 GHz	-33.71 dBm	-8.707 dB
2	2	3.6700 GHz	3.6790 GHz	1.000 MHz	3.678805000 GHz	-28.51 dBm	-15.51 dB
3	3	3.6790 GHz	3.6800 GHz	390.0 kHz	3.679981667 GHz	-29.02 dBm	-16.02 dB
4	4	3.6800 GHz	3.7000 GHz	390.0 kHz	3.681466667 GHz	5.724 dBm	-19.28 dB
5	5	3.7000 GHz	3.7010 GHz	390.0 kHz	3.700030000 GHz	-30.69 dBm	-17.69 dB
6	6	3.7010 GHz	3.7100 GHz	1.000 MHz	3.701420000 GHz	-29.58 dBm	-16.58 dB
7	7	3.7100 GHz	3.7200 GHz	1.000 MHz	3.711383333 GHz	-35.10 dBm	-10.10 dB
8	8	3.7200 GHz	3.7400 GHz	1.000 MHz	3.721133333 GHz	-49.47 dBm	-9.474 dB

Plot 7-37. Upper Channel Edge Plot (Band 48 - 20.0MHz QPSK - Full RB Configuration)

7.5 Radiated Power (EIRP)

§96.41(b)

Test Overview

Equivalent Isotropic Radiated Power (EIRP) 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 above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. 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

ANSI/TIA-603-E-2016 – Section 2.2.17

Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
3. VBW ≥ 3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points ≥ 2 x span / RBW
6. Detector = RMS
7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto".
8. The integration bandwidth was set equal to 10MHz.
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

Test Setup

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

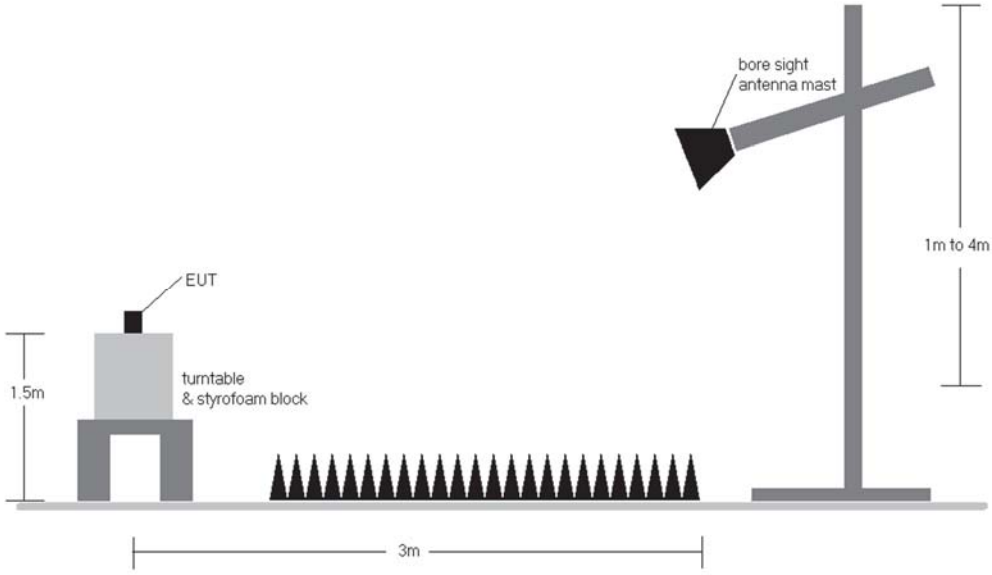


Figure 7-4. Radiated Test Setup >1GHz

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 with its standard battery.

3) The worst case EIRP shown in this section is found with LTE operating only using 1RB. As such, the EIRP/10MHz and full channel EIRP values will be identical since 1RB is fully contained within all available channel bandwidths for LTE Band 48 (i.e. 5, 10, 15, 20MHz).

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm/10MHz]	EIRP [Watts]	EIRP Limit [dBm/10MHz]	Margin [dB]
3552.50	5	QPSK	H	114	208	1 / 0	10.54	6.59	**17.13**	0.052	23.00	-5.87
3625.00	5	QPSK	H	114	208	1 / 0	10.71	6.03	16.74	0.047	23.00	-6.26
3697.50	5	QPSK	H	114	208	1 / 0	9.95	5.49	15.44	0.035	23.00	-7.56
3552.50	5	16-QAM	H	114	208	1 / 0	9.60	6.59	**16.19**	0.042	23.00	-6.81
3552.50	5	64-QAM	H	114	208	1 / 0	9.28	6.59	**15.87**	0.039	23.00	-7.13
3552.50	5	256-QAM	H	114	208	1 / 0	7.56	6.59	**14.15**	**0.026**	23.00	-8.85
3555.00	10	QPSK	H	110	210	1 / 49	10.50	6.57	**17.07**	0.051	23.00	-5.93
3625.00	10	QPSK	H	110	210	1 / 0	10.46	6.03	16.49	0.045	23.00	-6.51
3695.00	10	QPSK	H	110	210	1 / 0	9.41	5.51	14.92	0.031	23.00	-8.08
3555.00	10	16-QAM	H	110	210	1 / 49	9.64	6.57	**16.21**	0.042	23.00	-6.79
3555.00	10	64-QAM	H	110	210	1 / 49	8.51	6.57	**15.08**	0.032	23.00	-7.92
3555.00	10	256-QAM	H	110	210	1 / 49	5.80	6.57	**12.37**	**0.017**	23.00	-10.63
3557.50	15	QPSK	H	104	208	1 / 0	9.66	7.85	17.51	0.056	23.00	-5.49
3625.00	15	QPSK	H	104	208	1 / 0	10.58	7.80	**18.38**	0.069	23.00	-4.62
3692.50	15	QPSK	H	104	208	1 / 0	10.62	7.75	18.37	0.069	23.00	-4.63
3625.00	15	16-QAM	H	104	208	1 / 0	9.65	7.80	**17.45**	0.056	23.00	-5.55
3625.00	15	64-QAM	H	104	208	1 / 0	8.40	7.80	**16.20**	0.042	23.00	-6.80
3625.00	15	256-QAM	H	104	208	1 / 0	5.68	7.80	**13.48**	**0.022**	23.00	-9.52
3560.00	20	QPSK	H	106	203	1 / 99	10.35	7.85	18.20	0.066	23.00	-4.80
3625.00	20	QPSK	H	106	203	1 / 0	11.21	7.80	**19.01**	**0.080**	23.00	-3.99
3690.00	20	QPSK	H	106	203	1 / 0	10.14	7.75	17.89	0.061	23.00	-5.11
3625.00	20	16-QAM	H	106	203	1 / 0	10.21	6.03	**16.24**	0.042	23.00	-6.76
3625.00	20	64-QAM	H	106	203	1 / 99	9.12	6.03	**15.15**	0.033	23.00	-7.85
3625.00	20	256-QAM	H	106	203	1 / 99	7.21	6.03	**13.24**	**0.021**	23.00	-9.76
3625.00	20	QPSK	V	114	112	1 / 0	9.63	7.80	17.43	0.055	23.00	-5.57
3625.00	20 (WCP)	QPSK	H	121	333	1 / 0	10.03	7.80	17.83	0.061	23.00	-5.17

Table 7-3. EIRP Data (Band 48)

7.6 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 ≥ 3 x RBW
3. Span = 1.5 times the OBW
4. No. of sweep points ≥ 2 x span / RBW
5. Detector = RMS
6. Trace mode = Average (Max Hold for pulsed emissions)
7. The trace was allowed to stabilize

Test Setup

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

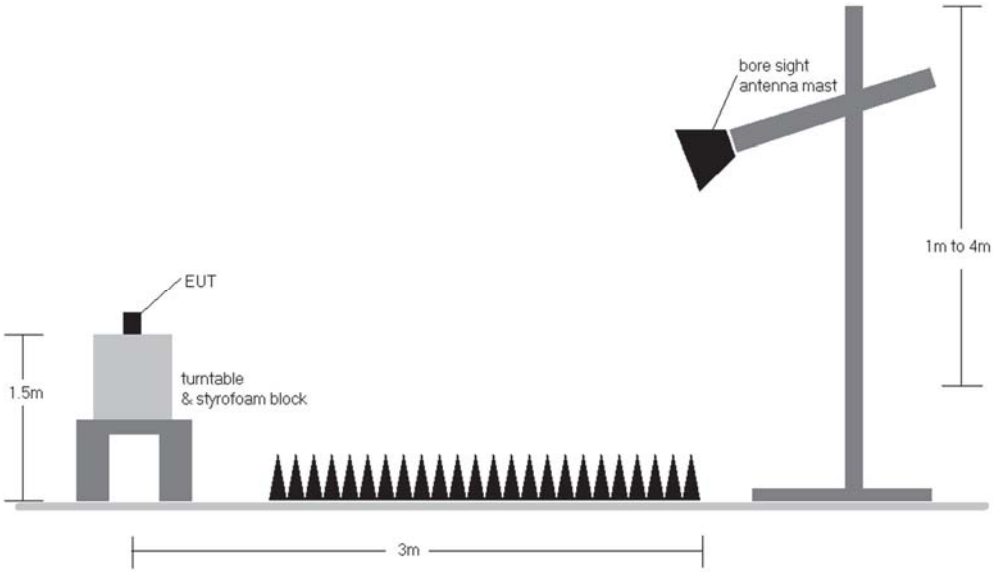


Figure 7-5. Test Instrument & Measurement Setup

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.

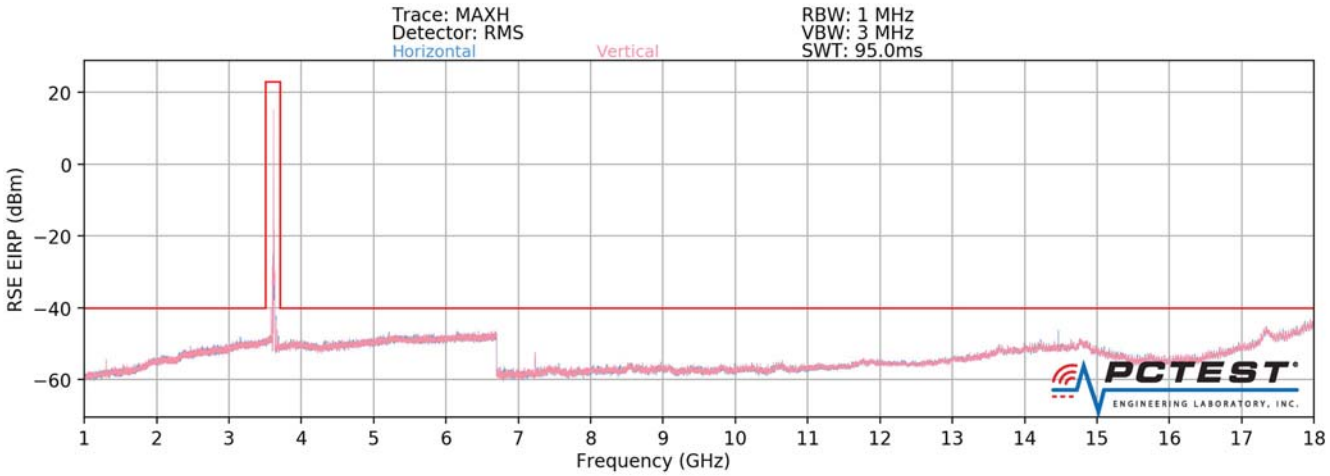
2) This unit was tested with its standard battery.

3) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.

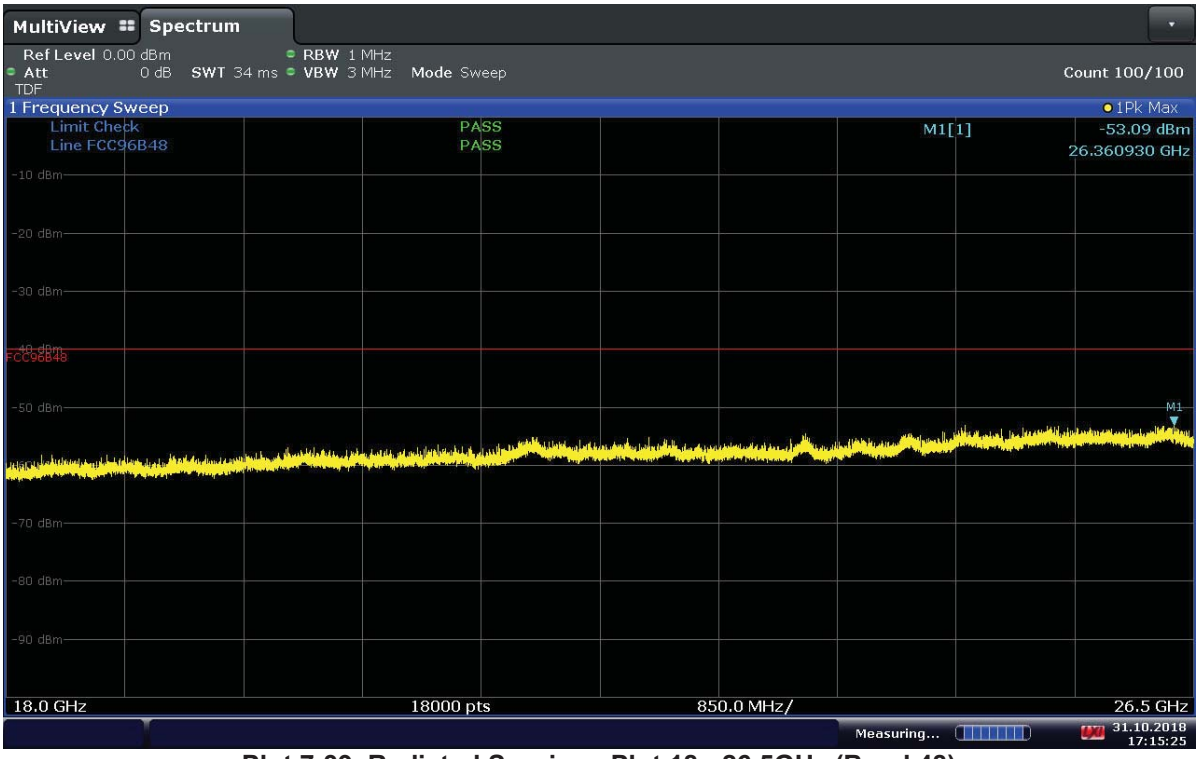
4) Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.

5) The "-" shown in the following RSE tables are used to denote a noise floor measurement.

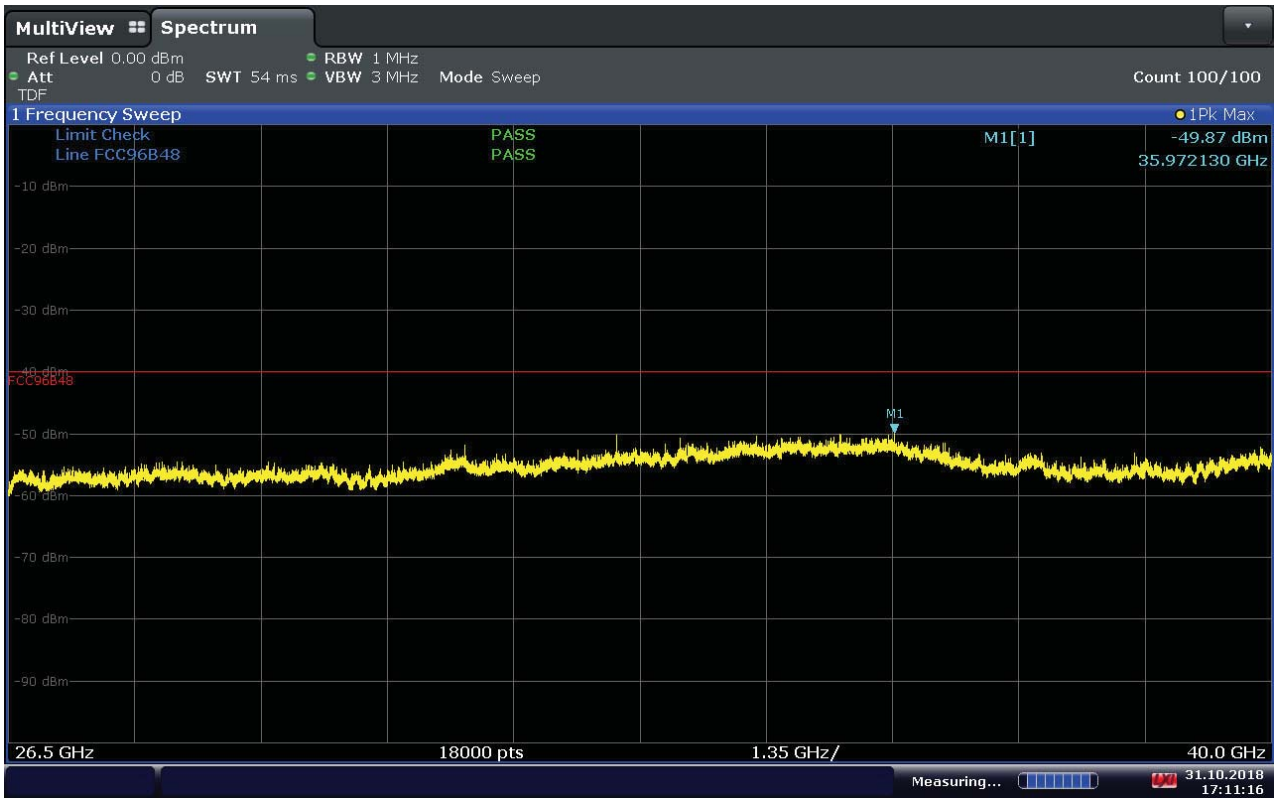
Band 48



Plot 7-38. Radiated Spurious Plot 1 - 18GHz (Band 48)



Plot 7-39. Radiated Spurious Plot 18 - 26.5GHz (Band 48)



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

OPERATING FREQUENCY:	3560.00	MHz
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	331	311	-61.16	11.71	-49.46	-9.5
10680.00	H	268	320	-62.31	12.55	-49.76	-9.8
14240.00	V	266	9	-55.29	8.82	-46.47	-6.5
17800.00	V	-	-	-53.10	10.01	-43.08	-3.1

Table 7-4. Radiated Spurious Data (Band 48 – Low Channel)

OPERATING FREQUENCY:	3625.00	MHz
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	139	314	-57.99	11.32	-46.68	-6.7
10875.00	H	324	347	-62.93	12.71	-50.22	-10.2
14500.00	V	250	37	-52.69	8.84	-43.85	-3.8

Table 7-5. Radiated Spurious Data (Band 48 – Mid Channel)

OPERATING FREQUENCY:	3690.00	MHz
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	147	60	-56.45	10.96	-45.49	-5.5
11070.00	H	112	349	-63.97	12.72	-51.24	-11.2
14760.00	V	101	36	-53.64	8.72	-44.92	-4.9

Table 7-6. Radiated Spurious Data (Band 48 – High Channel)

OPERATING FREQUENCY:	3625.00	MHz
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	V	133	91	-65.10	11.32	-53.79	-13.8
10875.00	V	264	352	-65.31	12.71	-52.60	-12.6
14500.00	V	324	286	-55.55	8.84	-46.71	-6.7

Table 7-7. Radiated Spurious Data with WCP (Band 48 – Mid Channel)

7.7 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

Band 48 Frequency Stability Measurements

OPERATING FREQUENCY:	3,625,000,000	Hz
CHANNEL:	55990	
REFERENCE VOLTAGE:	4.34	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.34	+ 20 (Ref)	3,625,000,029	0	0.0000000
100 %		- 30	3,624,999,810	-219	-0.0000060
100 %		- 20	3,624,999,885	-144	-0.0000040
100 %		- 10	3,624,999,650	-379	-0.0000105
100 %		0	3,625,000,198	169	0.0000047
100 %		+ 10	3,624,999,757	-272	-0.0000075
100 %		+ 20	3,625,000,032	3	0.0000001
100 %		+ 30	3,624,999,790	-239	-0.0000066
100 %		+ 40	3,624,999,999	-30	-0.0000008
100 %		+ 50	3,624,999,956	-73	-0.0000020
BATT. ENDPOINT	3.49	+ 20	3,624,999,821	-208	-0.0000057

Table 7-8. 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.

Band 48 Frequency Stability Measurements

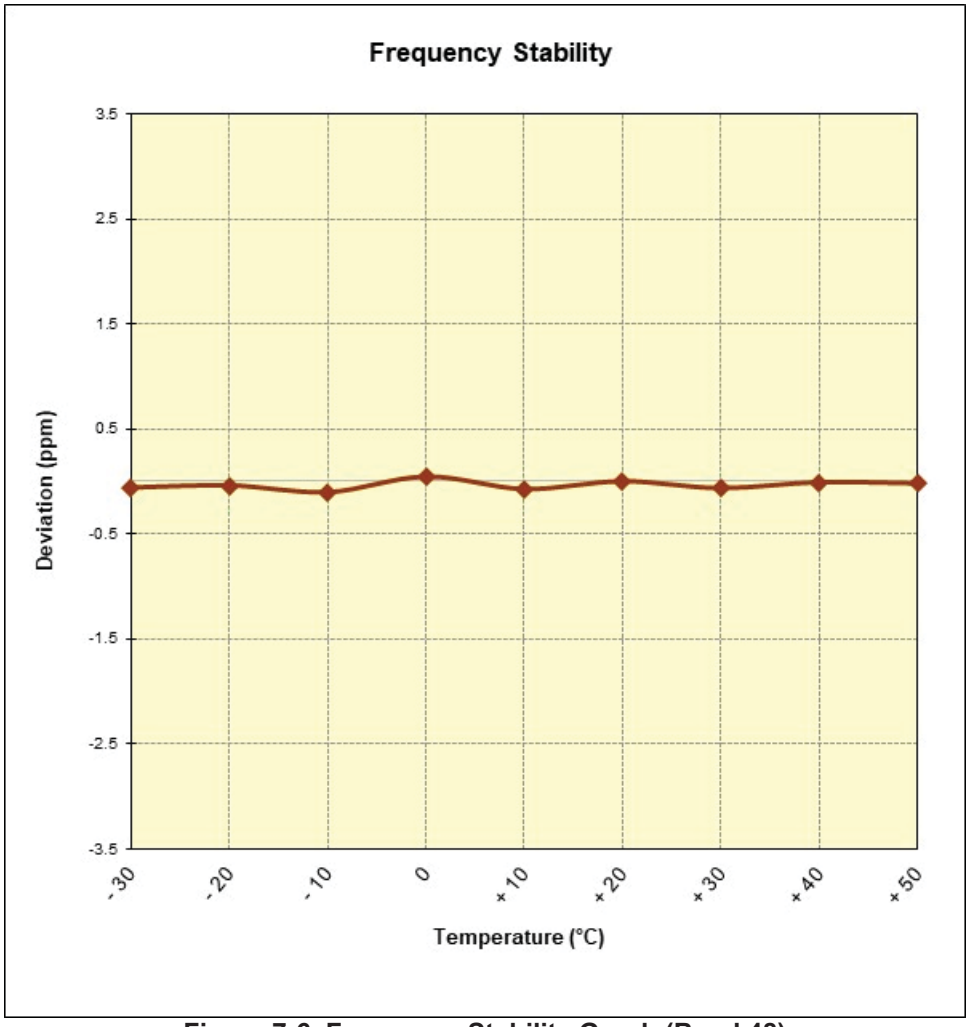


Figure 7-6. Frequency Stability Graph (Band 48)

7.8 End User Device Additional Requirement (CBSD Protocol)

§96.47

Test Overview and Limit

End user device additional requirements (CBSD Protocol) are tested per the test procedures listed below. During testing, the EUT is connected to a certified CBSD (Ruckus FCC ID: S9GQ910US00) as a companion device to show compliance with Part 96.47.

End User Devices may operate only if they can positively receive and decode an authorization signal transmitted by a CBSD, including the frequencies and power limits for their operation.

An End User Device must discontinue operations, change frequencies, or change its operational power level within 10 seconds of receiving instructions from its associated CBSD.

Test Procedure Used

KDB 940660 D01 v01, WINNF-TS-0122 V1.0.0.

Test Setup/Method

The EUT was connected via an RF cable to a certified CBSD and spectrum analyzer. The following procedure is performed by applying WINNF-TS-0122 CBRS CBSD Test Specification.

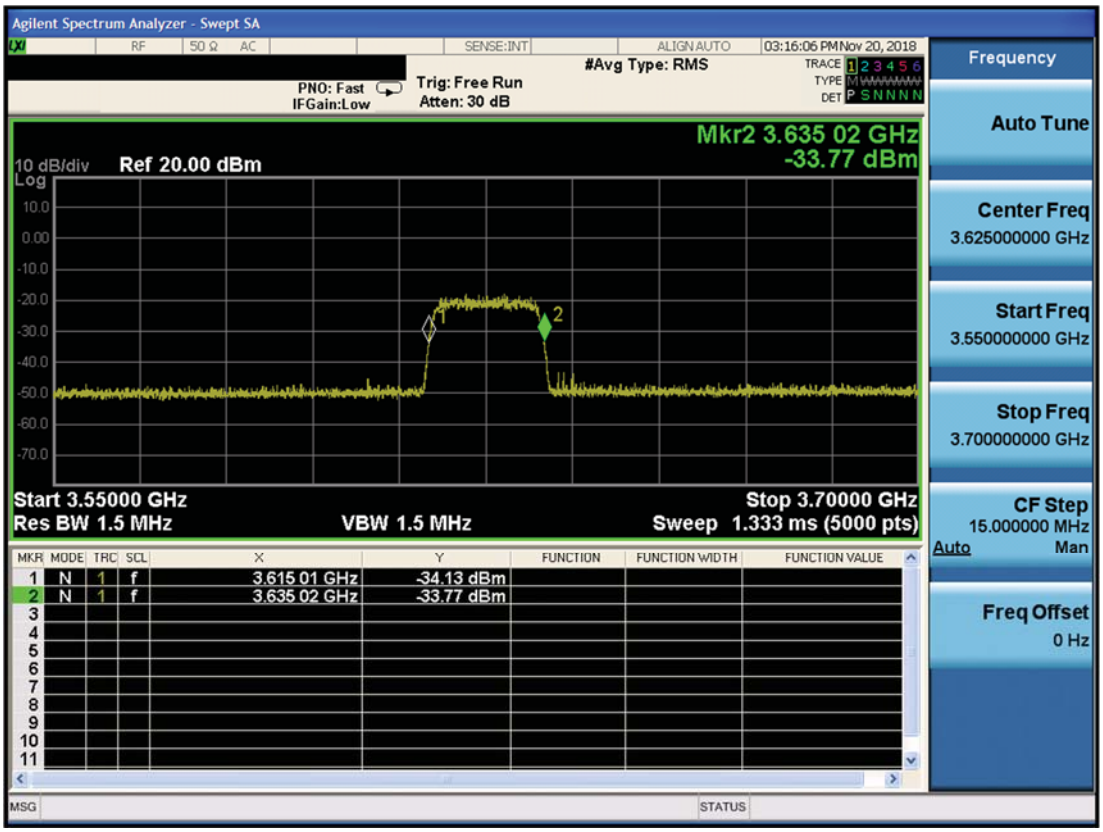
1. Run#1:
    a. Setup WINNF.PT.C.HBT.1 with 3615MHz – 3635MHz and power level at 13 dBm/MHz.
    b. Enable AP service from Ruckus Cloud management.
    c. Check EUT Tx frequency and power.
    d. Disable AP service from Ruckus Cloud management and check EUT stop transmission within 10s.
2. Run#2:
    a. Setup WINNF.PT.C.HBT.1 with 3660MHz – 3670MHz and power level at 8 dBm/MHz.
    b. Enable AP service from Ruckus Cloud management.
    c. Check EUT Tx frequency and power.
    d. Disable AP service from Ruckus Cloud management and check EUT stop transmission within 10s.

Test Notes

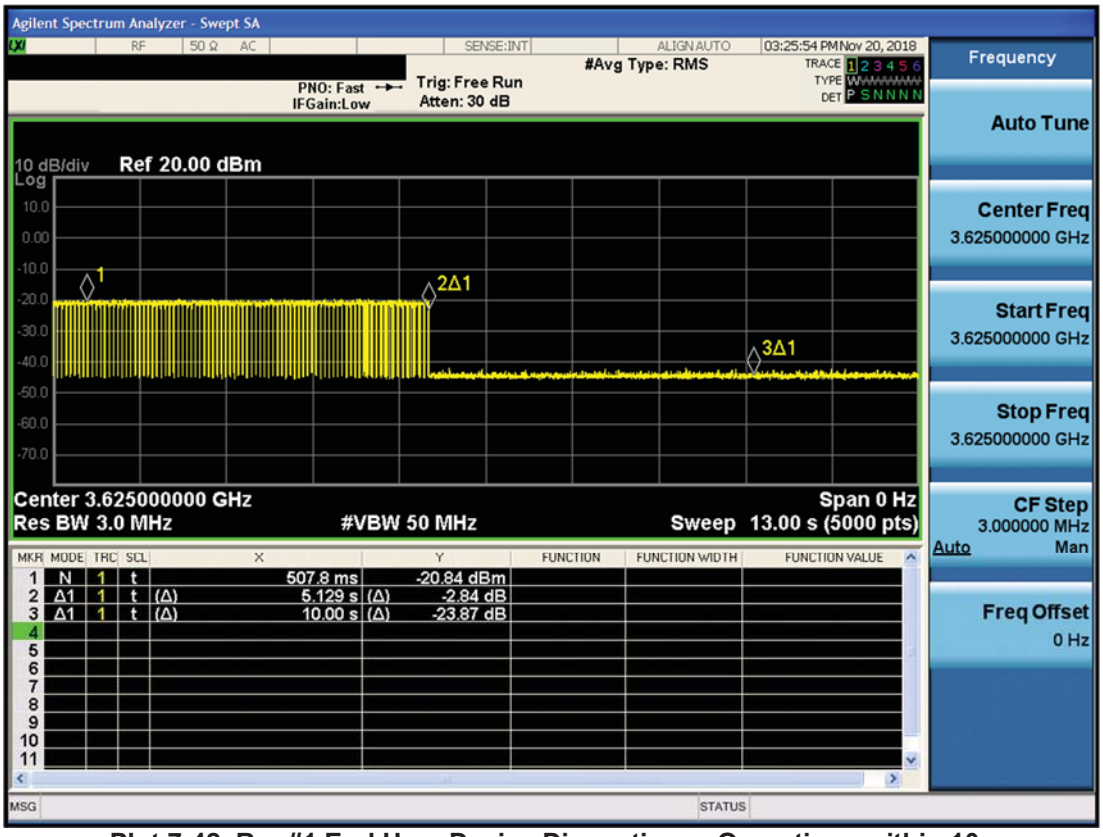
The EUT is an End User Device.

Run#1:

- Tx frequency set: 3615 – 3635MHz.
- MaxEIRP set: 13dBm/MHz



Plot 7-41. Run#1 End User Device Frequency of Operations



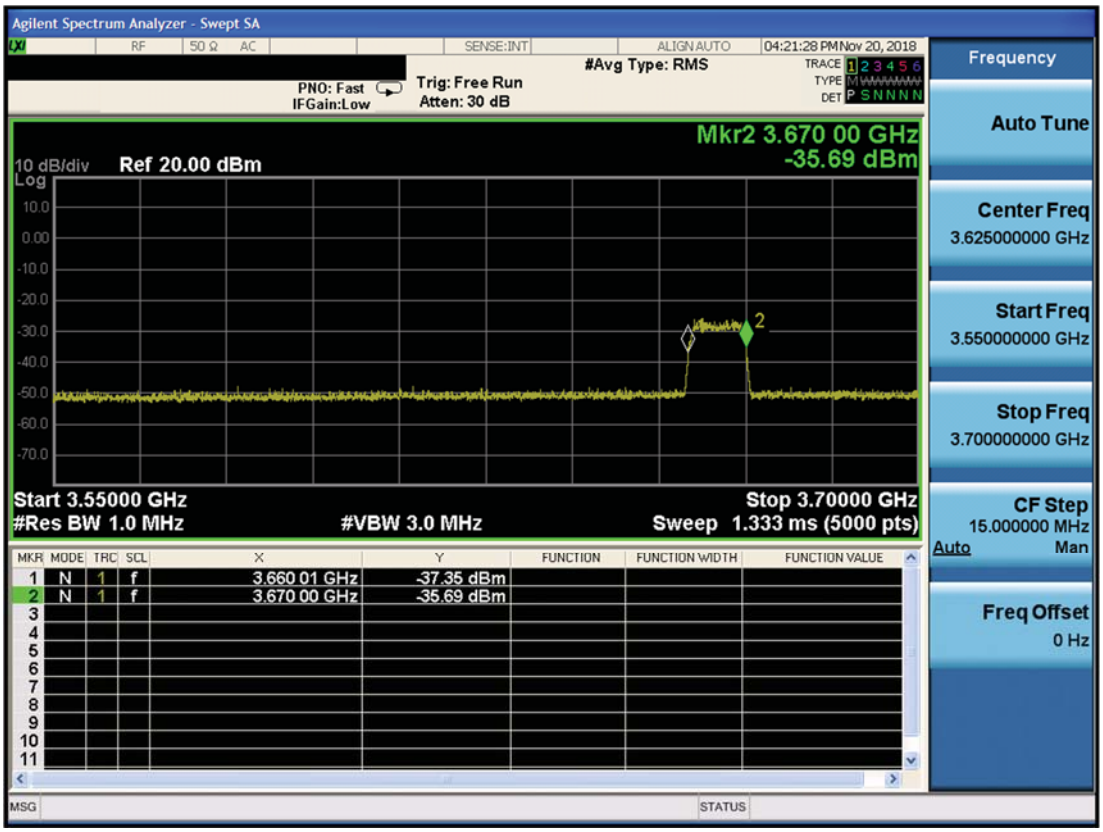
Plot 7-42. Run#1 End User Device Discontinues Operations within 10s

Note:

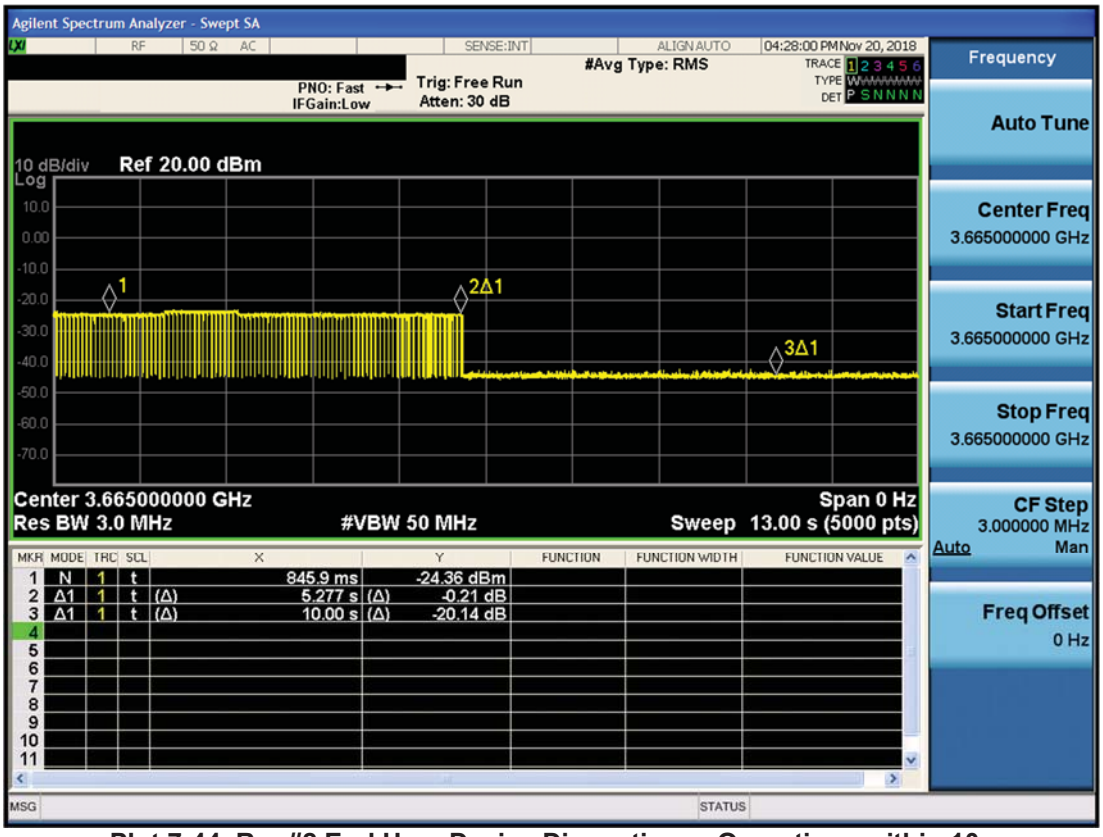
Marker 1: CBSD sends instructions to discontinue LTE operations.
Marker 2: EUT discontinues operation.
Marker 3: 10 seconds elapsed time from CBSD sending instructions to EUT.

Run#2:

- Tx frequency set: 3660– 3670MHz.
- MaxEIRP set: 8dBm/MHz



Plot 7-43. Run#2 End User Device Frequency of Operations



Plot 7-44. Run#2 End User Device Discontinues Operations within 10s

Note:

Marker 1: CBSD sends instructions to discontinue LTE operations.
Marker 2: EUT discontinues operation.
Marker 3: 10 seconds elapsed time from CBSD sending instructions to EUT.

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSMG970U** complies with all of the End User Device requirements of Part 96 of the FCC Rules for LTE operation only.