

TEST A.5: PEAK-TO-AVERAGE POWER RATIO (PAPR)

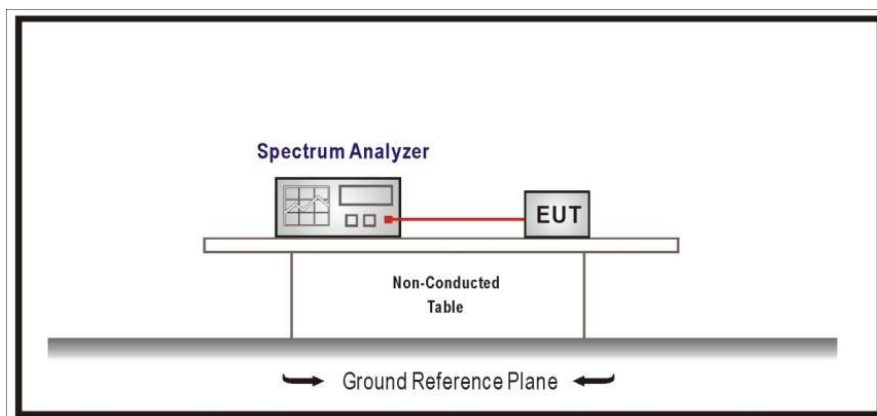
LIMITS:	Product standard:	Part 96.41 Subclause (g)
	Test standard:	ANSI C63.26-2015

LIMITS

In addition to the power limits in Section 96.41, CBSDs need to meet a PAPR limit. For this measurement, the procedure in Section 5.2.6 of ANSI C63.26-2015 is acceptable. CCDF (Complementary Cumulative Distribution Function) measurement was utilized in the spectrum analyzer and the maximum PAPR level with 0.1 % probability values were recorded.

The peak-to-average power ratio (PAPR) of any CBSD transmitter output power must not exceed 13 db.

TEST SETUP



TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01 (Band 48)
TEST RESULTS:	PASS

10 MHz BW

	Lowest frequency 3555 MHz	Middle frequency 3625 MHz	Highest frequency 3695 MHz
Peak (dBm)	29.40	29.71	29.68
Mean (dBm)	18.36	19.24	18.43
PAPR at 0.1% probability (dB)	9.86	9.22	10.14
Measurement uncertainty (dB)	<±1.11		

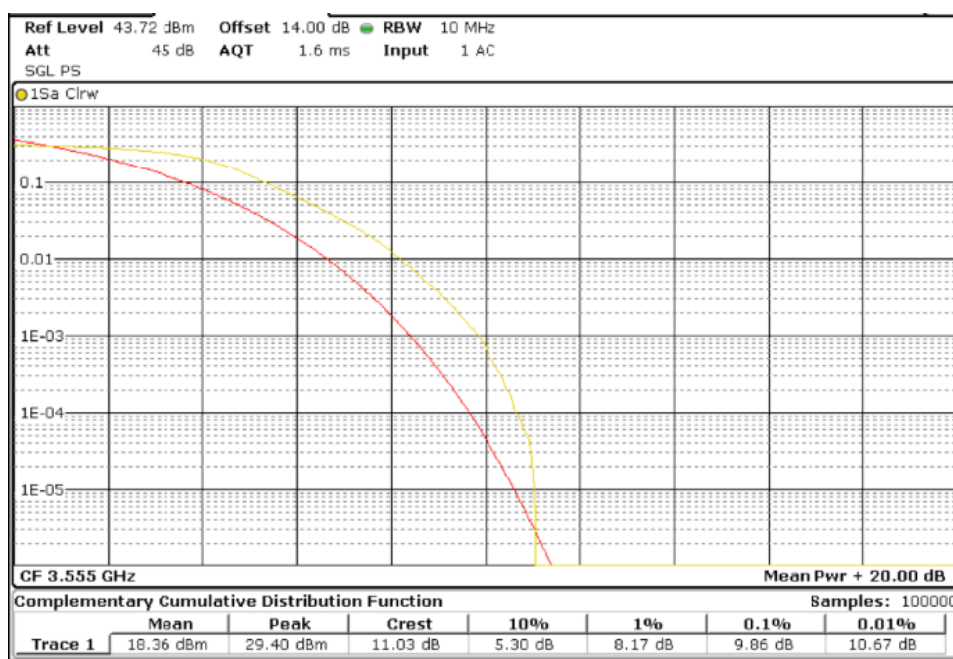
TEST RESULTS (Cont.):

20MHz BW

	Lowest frequency 3560 MHz	Middle frequency 3625 MHz	Highest frequency 3690 MHz
Peak (dBm)	27.11	26.43	26.48
Mean (dBm)	15.33	15.24	15.90
PAPR at 0.1% probability (dB)	10.64	10.20	9.80
Measurement uncertainty (dB)	<±1.11		

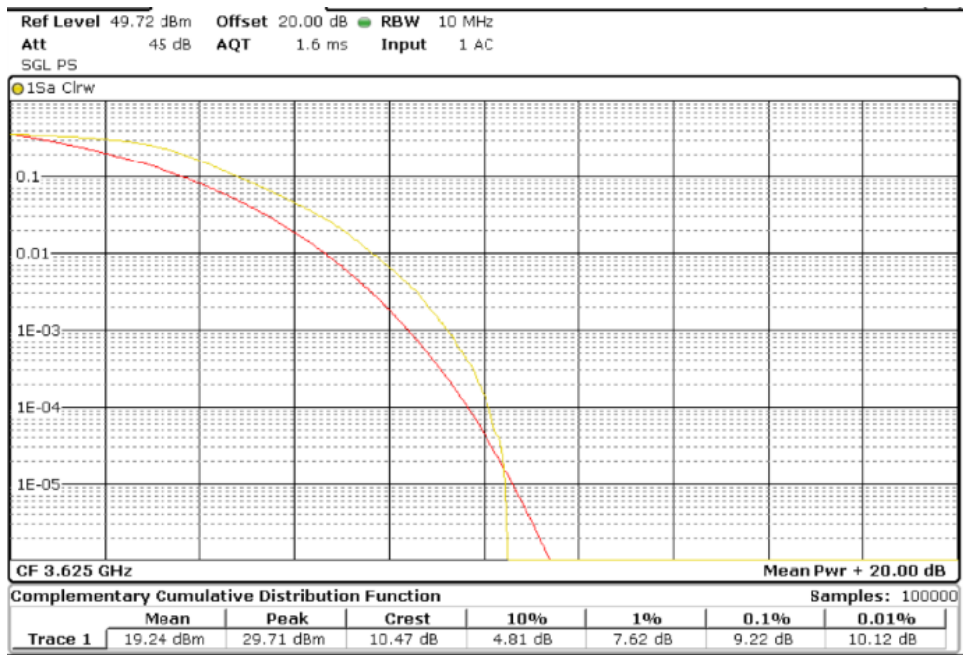
10 MHz BW

Lowest Channel (3555 MHz)

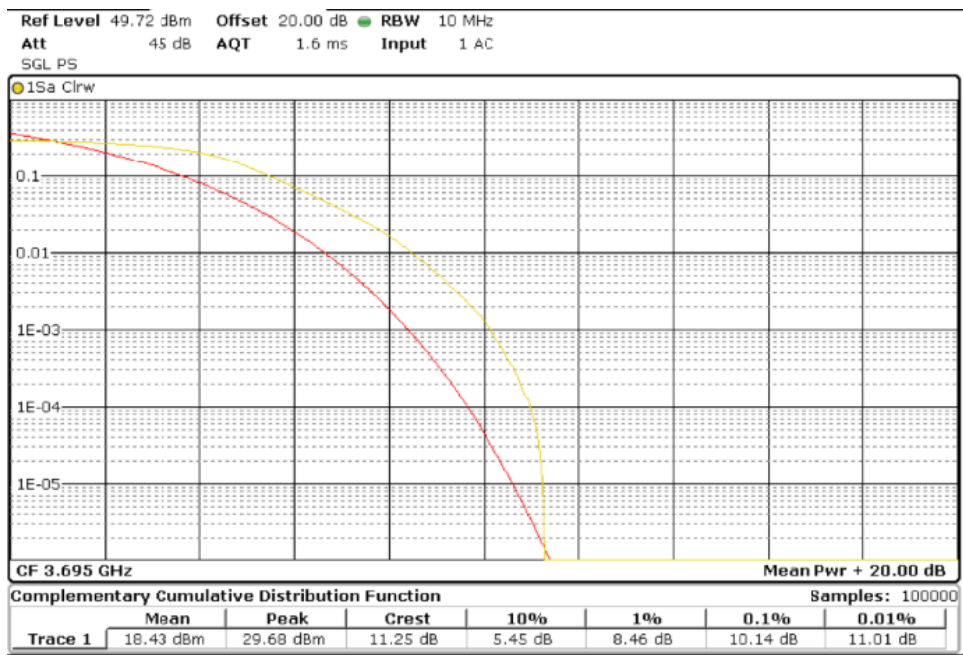


TEST RESULTS (Cont.):

Middle Channel (3625 MHz)



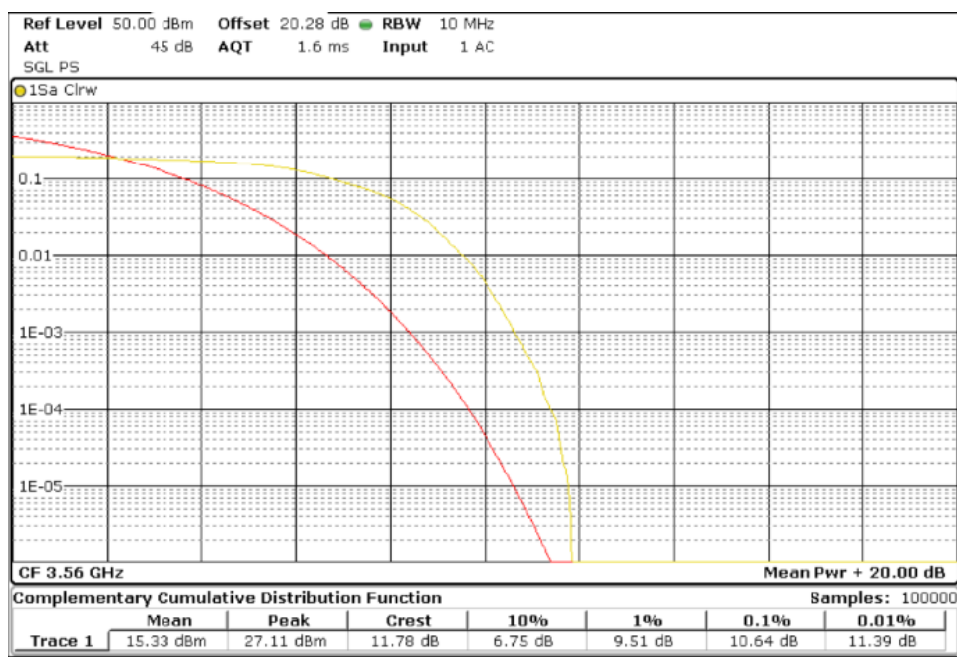
Highest Channel (3695 MHz)



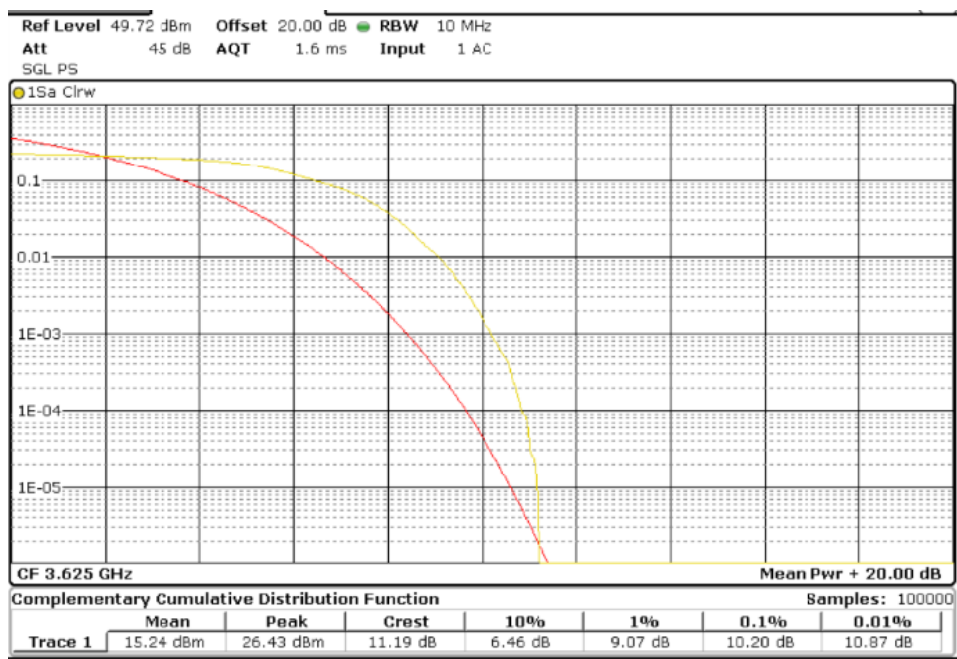
TEST RESULTS (Cont.):

20 MHz BW

Lowest Channel (3560 MHz)

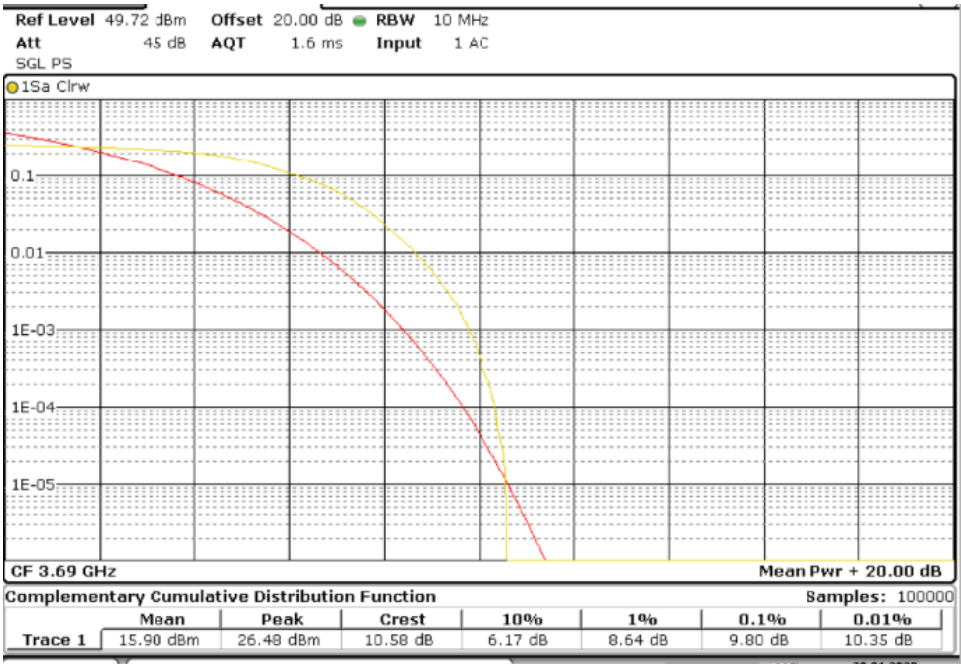


Middle Channel (3625 MHz)



TEST RESULTS (Cont.):

Highest Channel (3690 MHz)



TEST A.6: 3.5 GHZ EMISSION AND INTERFERENCE LIMITS

LIMITS:	Product standard:	Part 96.41 Subclause (e)
	Test standard:	ANSI C63.26-2015

LIMITS

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in § 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

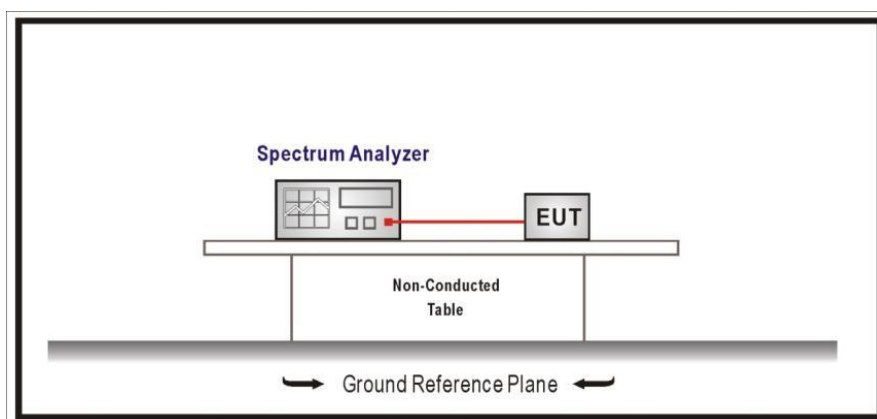
Confirm that the device satisfies the emission limits specified in Section 96.41(e) for all declared channel sizes, at the lowest and highest edges of the band, and in the middle of the band. The RMS detector was used for the measurement at each frequency with 400 MHz span.

A narrower RBW is permitted in all cases to improve measurement accuracy, provided the measured power is integrated over the full reference bandwidth.

The limits for emission outside the fundamental are stated below.

- within 0-10 MHz above and below the assigned channel ≤ -13 dBm/MHz
- greater than 10 MHz above and below the assigned channel ≤ -25 dBm/MHz
- any emission below 3530 MHz and above 3720 MHz ≤ -40 dBm/MHz

TEST SETUP



The maximum equivalent isotropically radiated power (e.i.r.p.) is calculated by adding the declared maximum antenna gain (dBi) and 10 log (1/duty cycle) was added in RF level offset to get the accurate measured power level in the average power measurement.

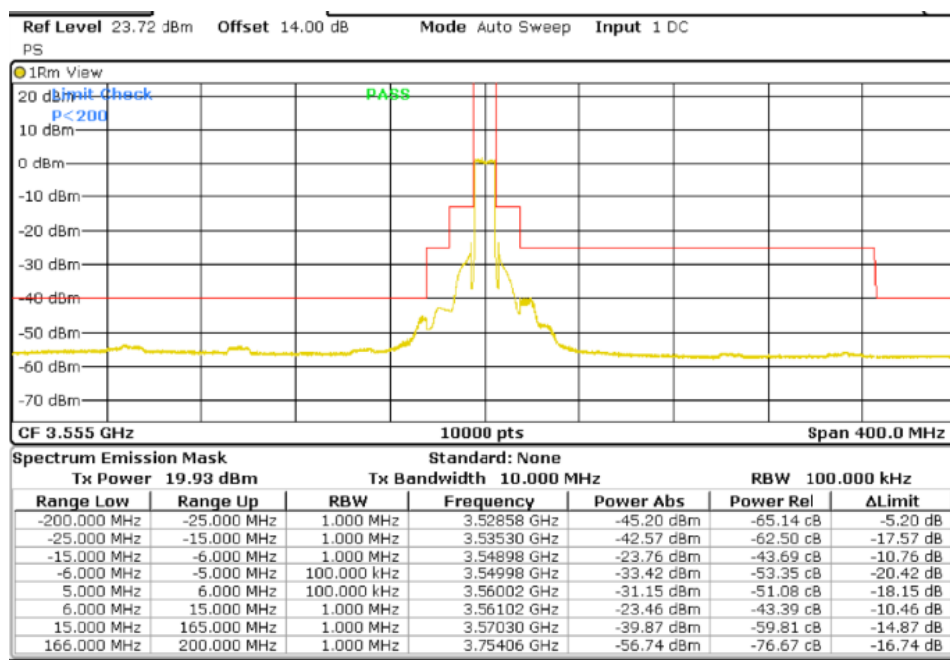
The duty cycle correction = $10 \log (1/0.5) = 3.01$ (dB)

TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01 (Band 48)
TEST RESULTS:	PASS
<u>10 MHz BW</u> The spurious signals detected were more than 10 dB below the reference limit for the lowest, middle and highest operating channels were shown in the plots. <u>20 MHz BW</u> The spurious signals detected were more than 10 dB below the reference limit for the lowest, middle and highest operating channels were shown in the plots. (See Plots below)	

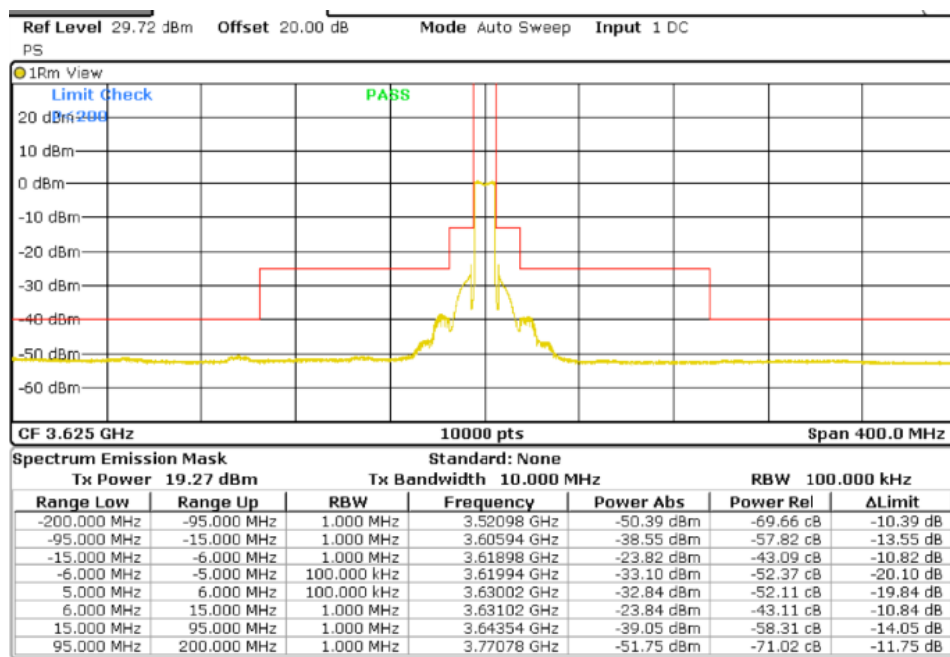
TEST RESULTS (Cont.):

10 MHz BW

Lowest Channel (3555 MHz)

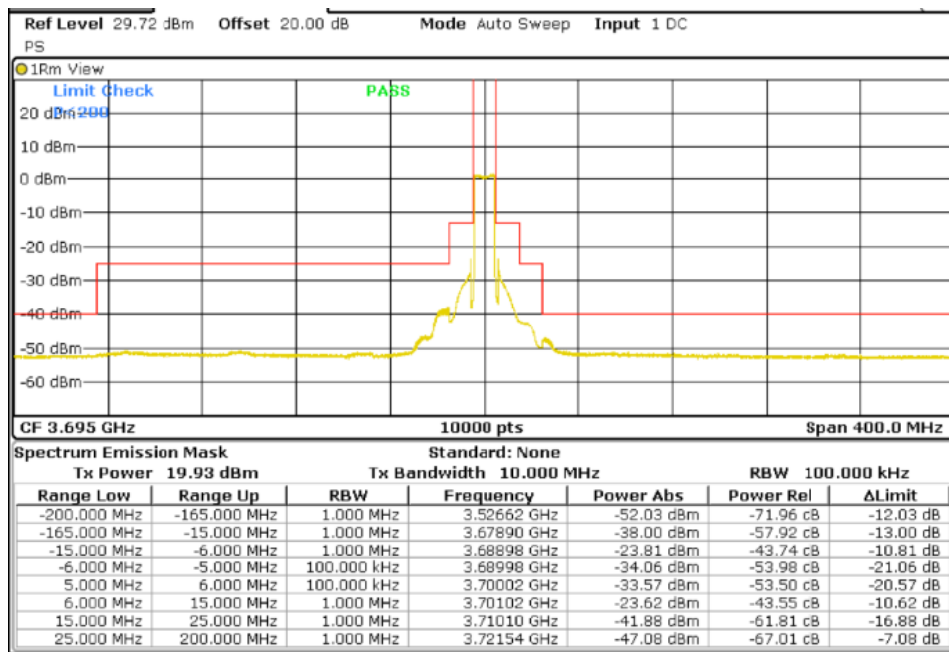


Middle Channel (3625 MHz)



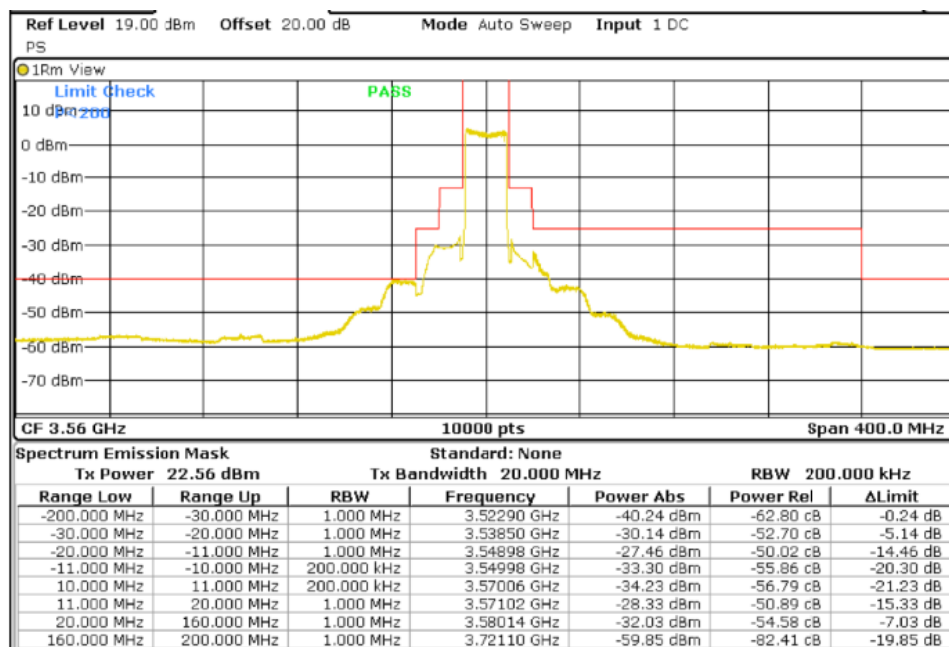
TEST RESULTS (Cont.):

Highest Channel (3695 MHz)



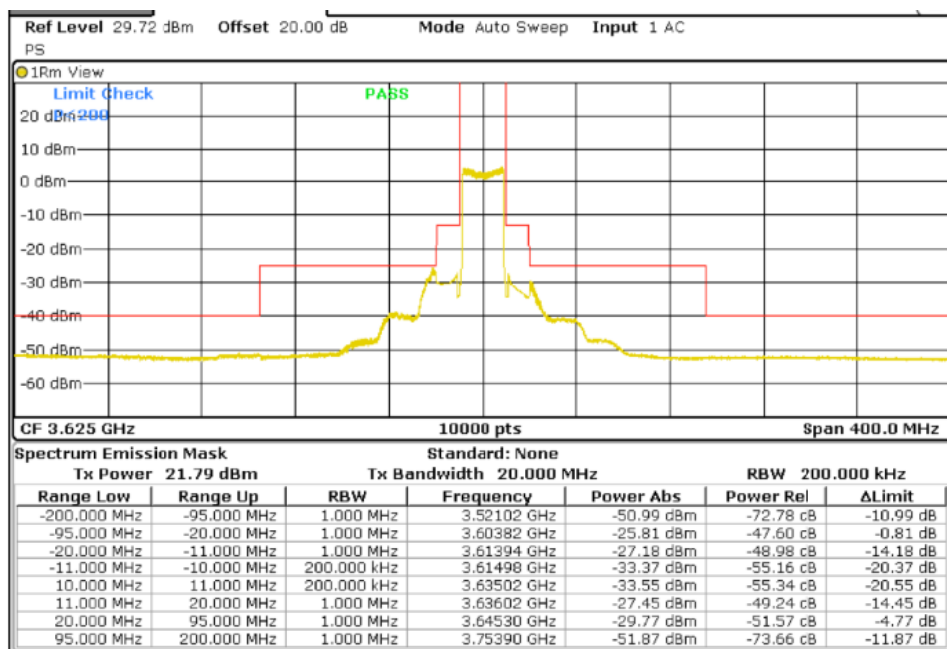
20 MHz BW

Lowest Channel (3560 MHz)

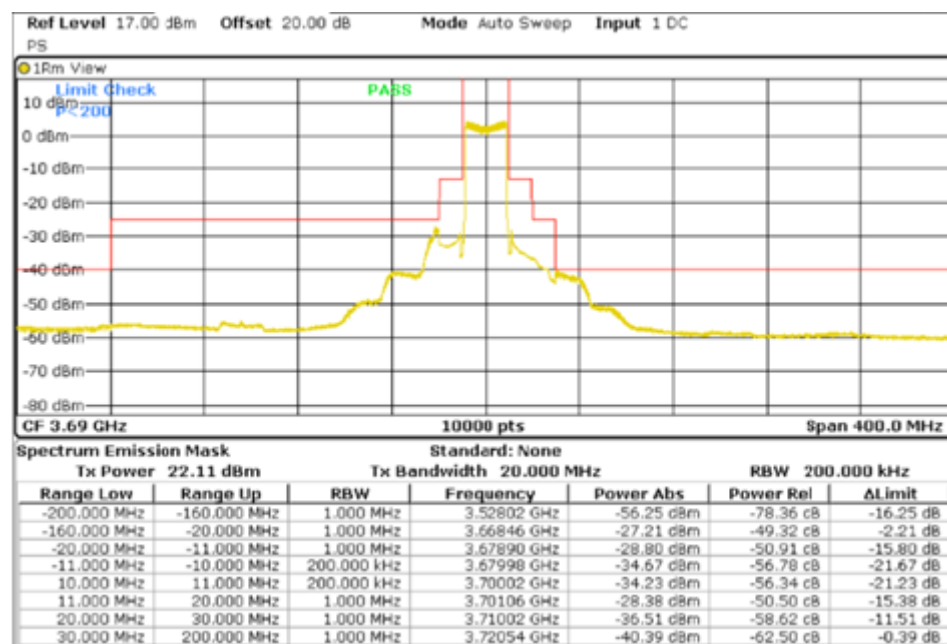


TEST RESULTS (Cont.):

Middle Channel (3625 MHz)



Highest Channel (3690 MHz)



TEST A.7: SPURIOUS EMISSIONS AT ANTENNA TERMINALS

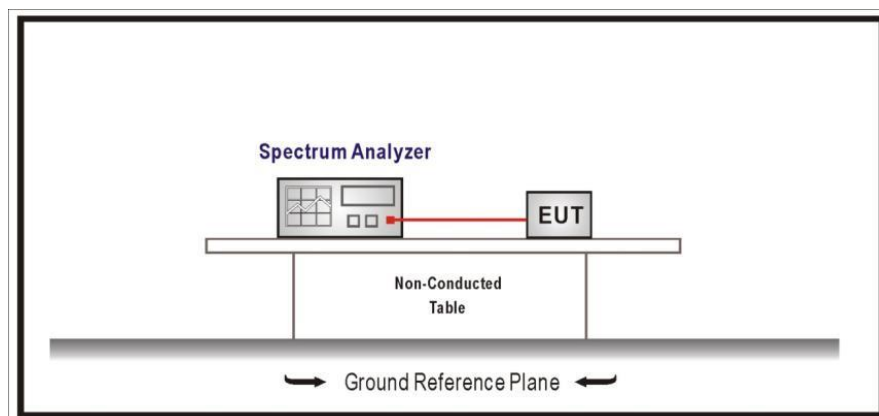
LIMITS:	Product standard:	Part 2.1051 and 96.41 Subclause (e)
	Test standard:	ANSI C63.26-2015

LIMITS

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in § 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

The limits for emission outside the fundamental for any emission below 3530 MHz and above 3720 MHz are -40 dBm/MHz.

TEST SETUP



The maximum equivalent isotropically radiated power (e.i.r.p.) is calculated by adding the declared maximum antenna gain (dBi) and 10 log (1/duty cycle) was added in RF level offset to get the accurate measured power level in the average power measurement.

The duty cycle correction = $10 \log (1/0.5) = 3.01 \text{ (dB)}$

TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01 (Band 48)
TEST RESULTS:	PASS

10 MHz BW

The spurious signals detected were more than 10 dB below the reference limit for the lowest, middle and highest operating channels were shown in the plots.

20 MHz BW

The spurious signals detected were more than 10 dB below the reference limit for the lowest, middle and highest operating channels were shown in the plots.

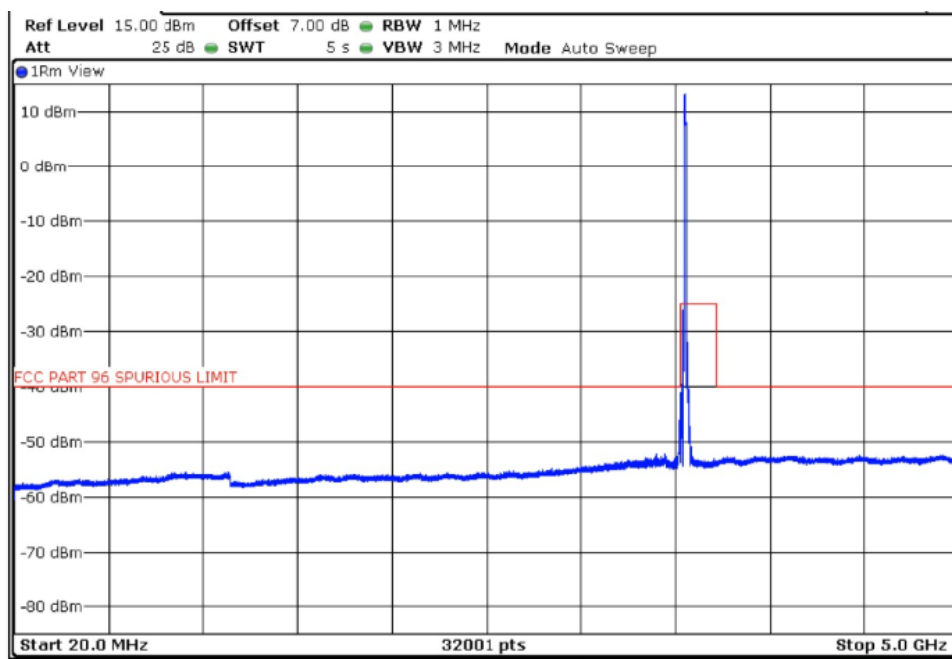
(See Plots below)

TEST RESULTS (Cont.):

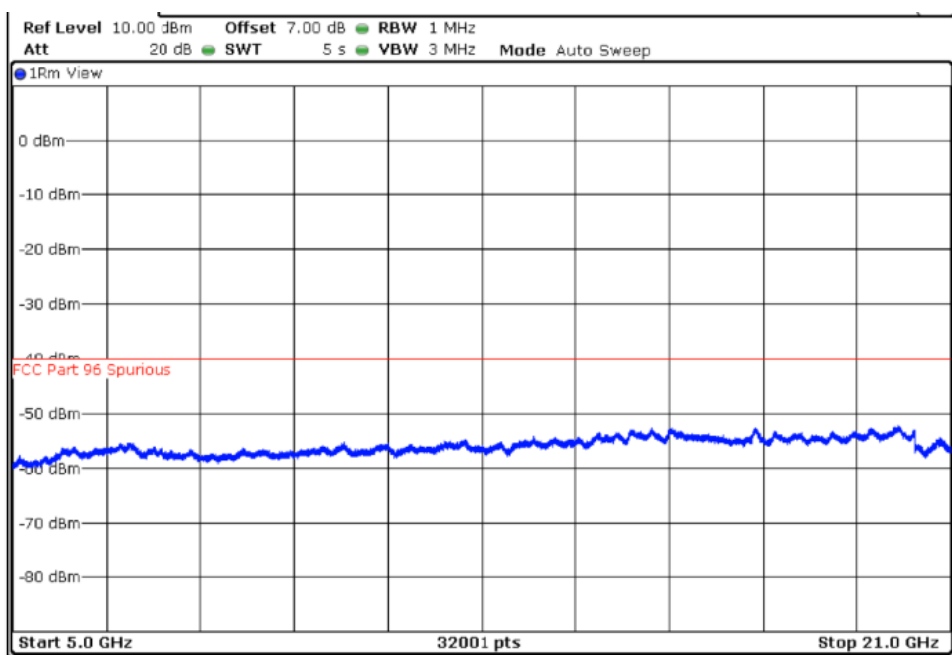
10MHz BW

Lowest Channel (3555 MHz)

FREQUENCY RANGE 20 MHz-5 GHz

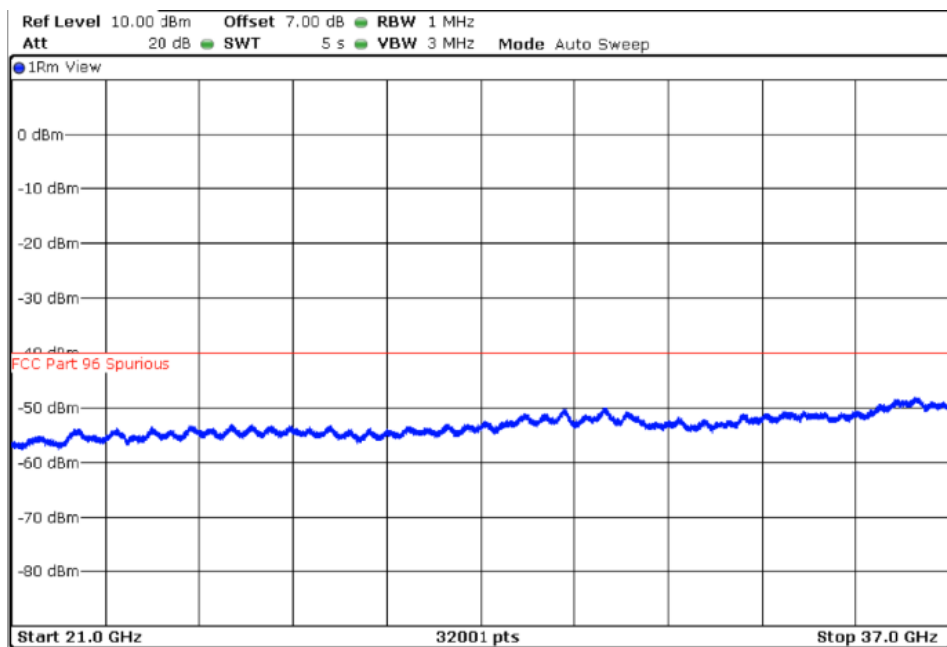


FREQUENCY RANGE 5-21 GHz



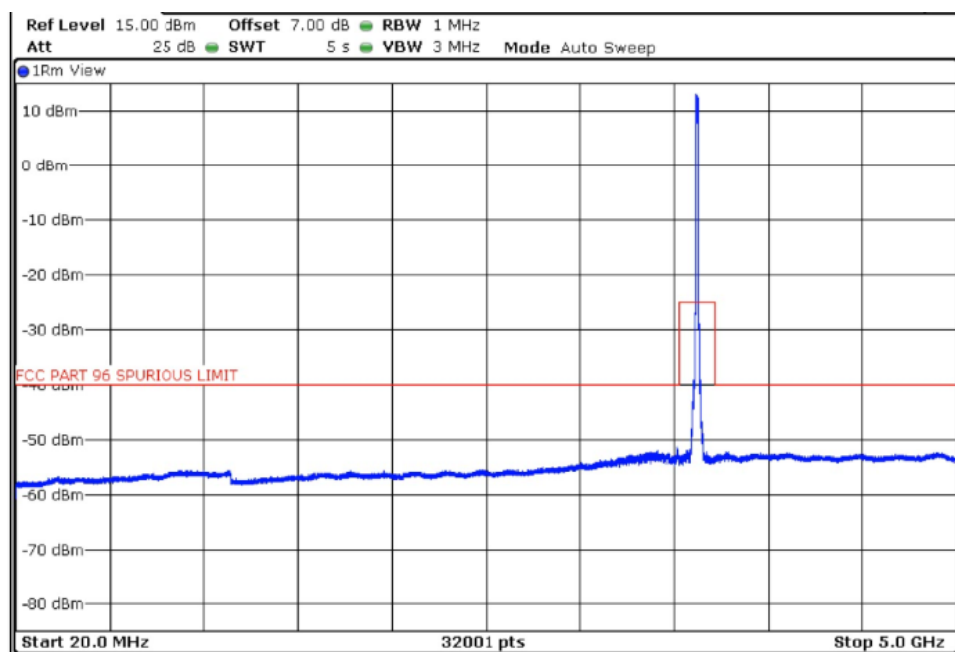
TEST RESULTS (Cont.):

FREQUENCY RANGE 21-37 GHz



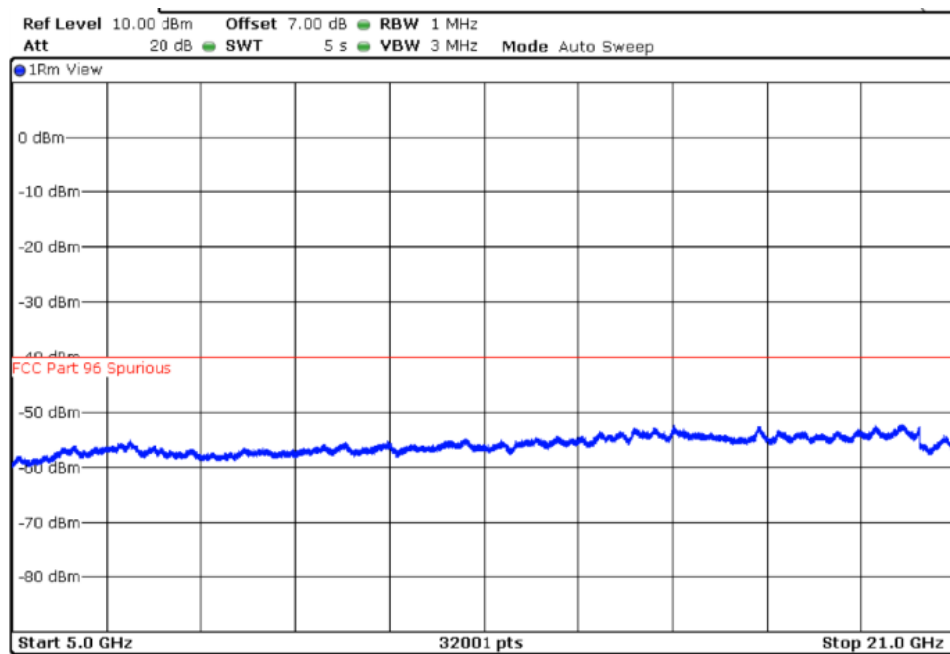
Middle Channel (3625 MHz)

FREQUENCY RANGE 20 MHz-5 GHz

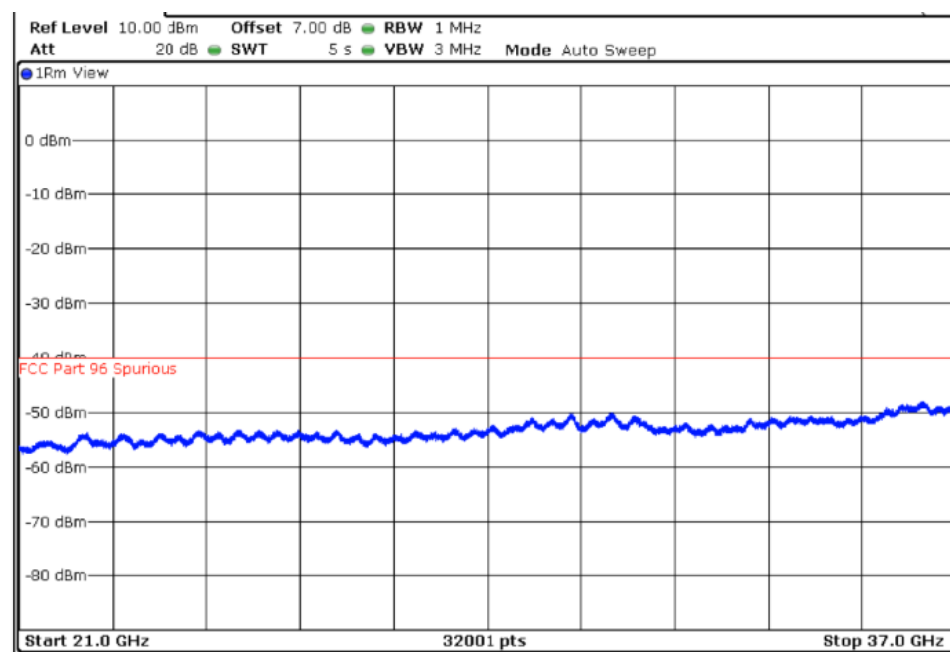


TEST RESULTS (Cont.):

FREQUENCY RANGE 5-21 GHz



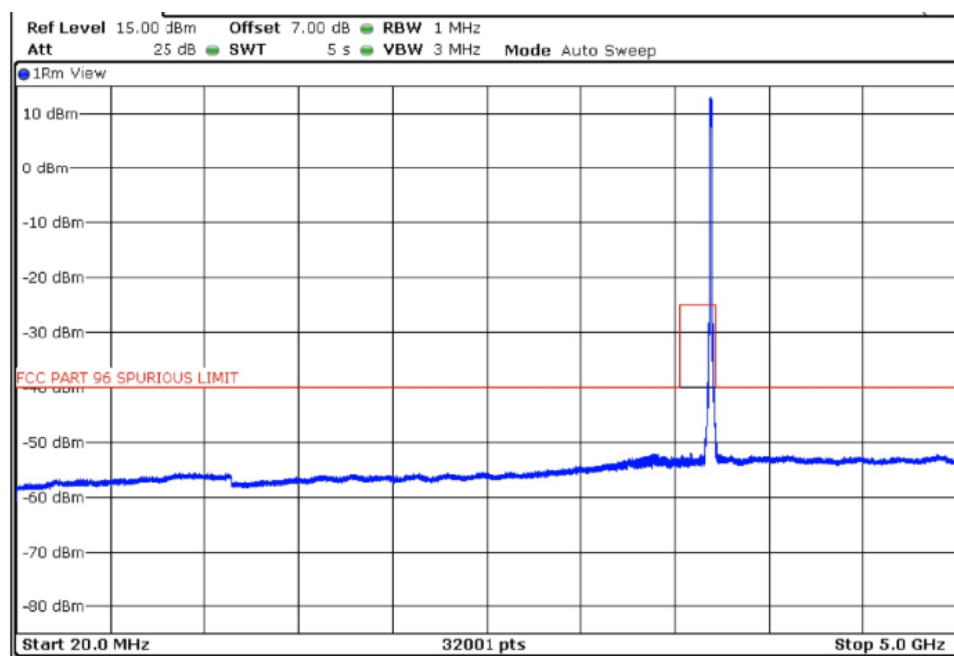
FREQUENCY RANGE 21-37 GHz



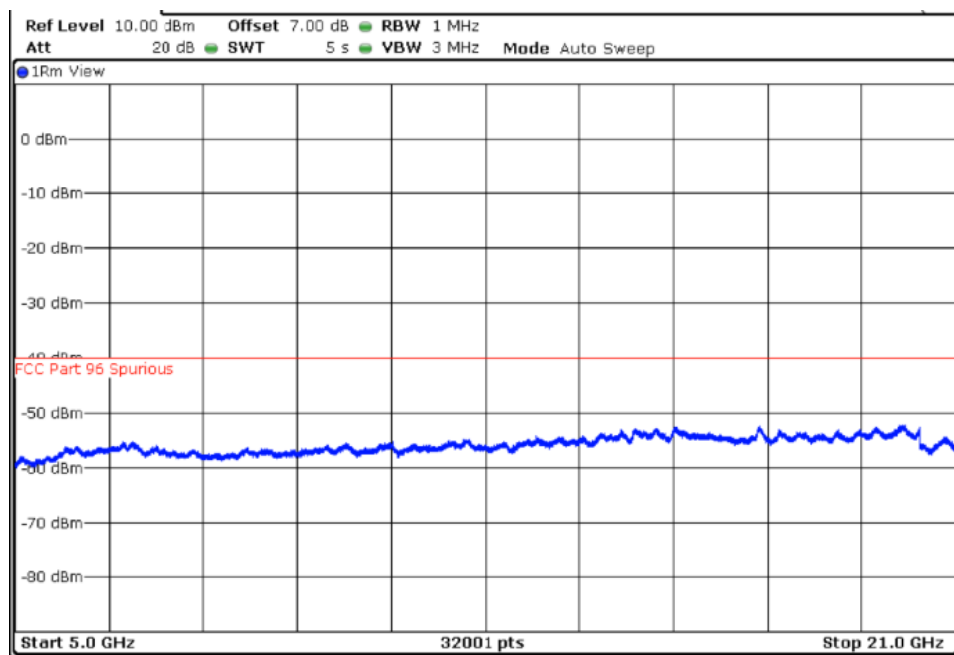
TEST RESULTS (Cont.):

Highest Channel (3695 MHz)

FREQUENCY RANGE 20 MHz-5 GHz

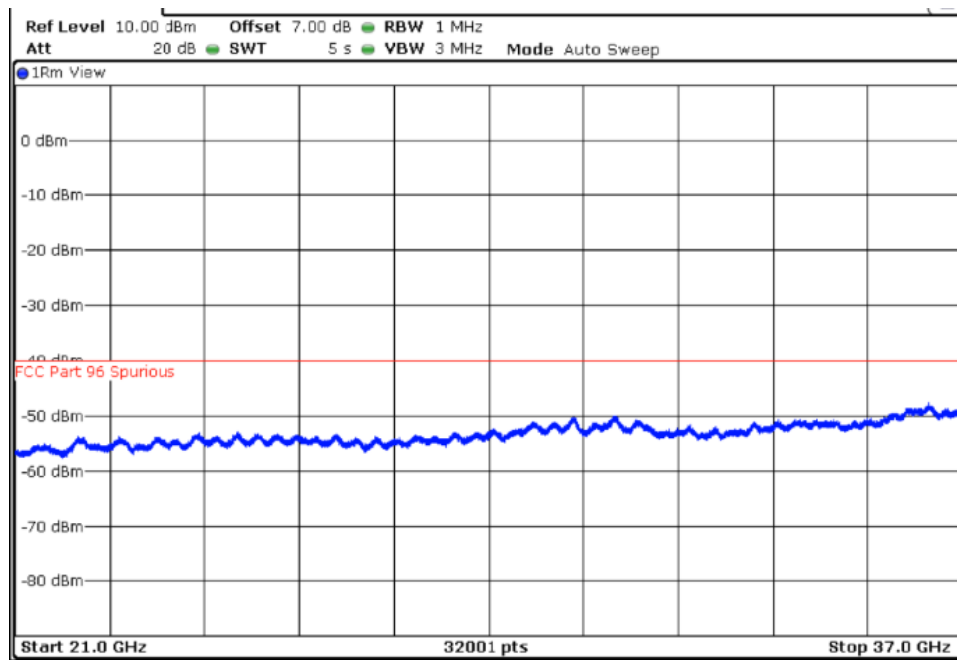


FREQUENCY RANGE 5-21 GHz



TEST RESULTS (Cont.):

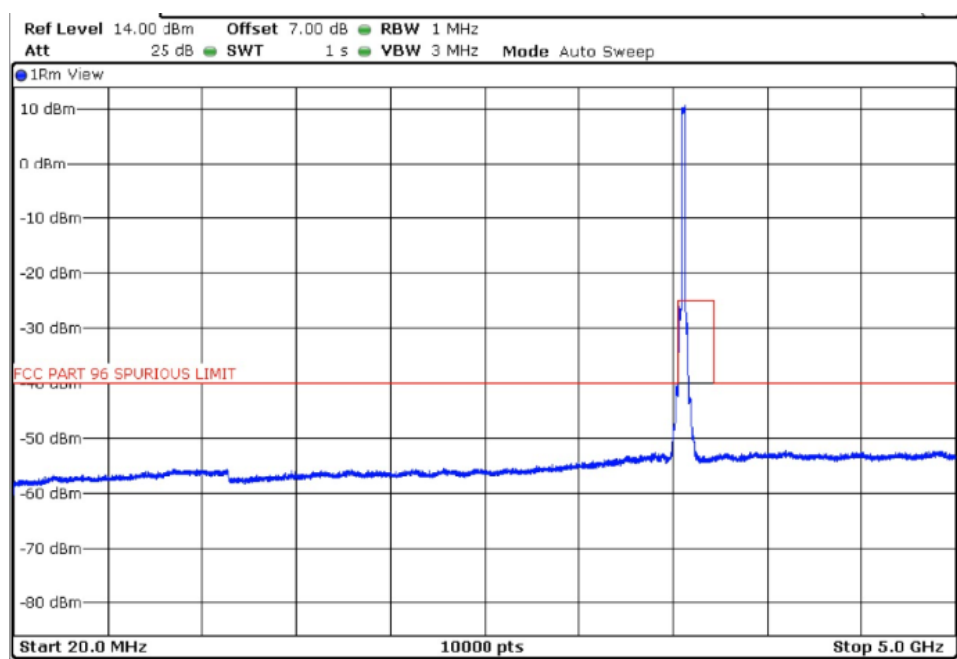
FREQUENCY RANGE 21-37 GHz



20 MHz BW

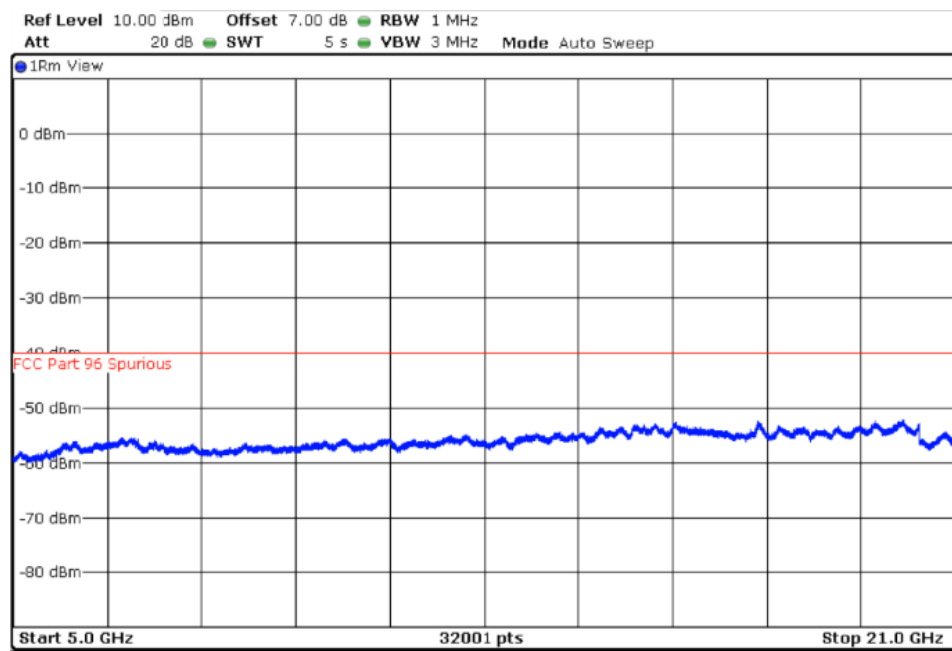
Lowest Channel (3560 MHz)

FREQUENCY RANGE 20 MHz-5 GHz

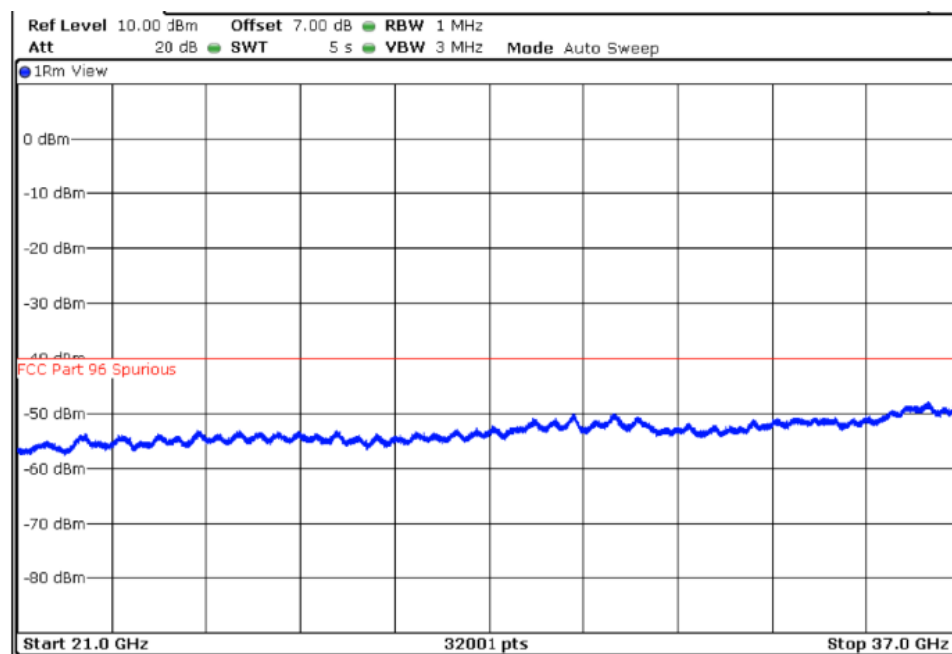


TEST RESULTS (Cont.):

FREQUENCY RANGE 5-21 GHz



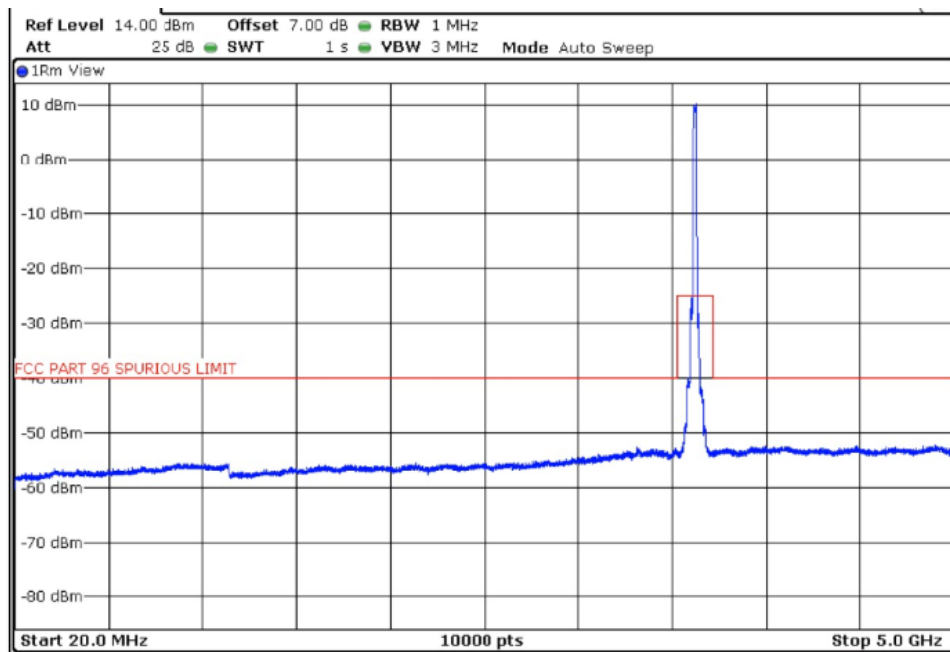
FREQUENCY RANGE 21-37 GHz



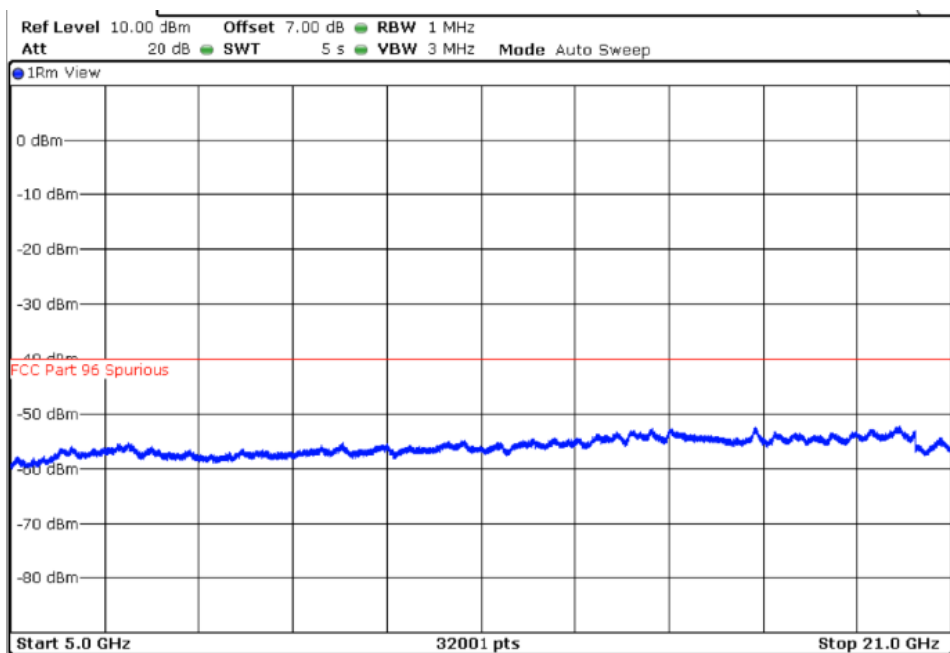
TEST RESULTS (Cont.):

Middle Channel (3625 MHz)

FREQUENCY RANGE 20 MHz-5 GHz

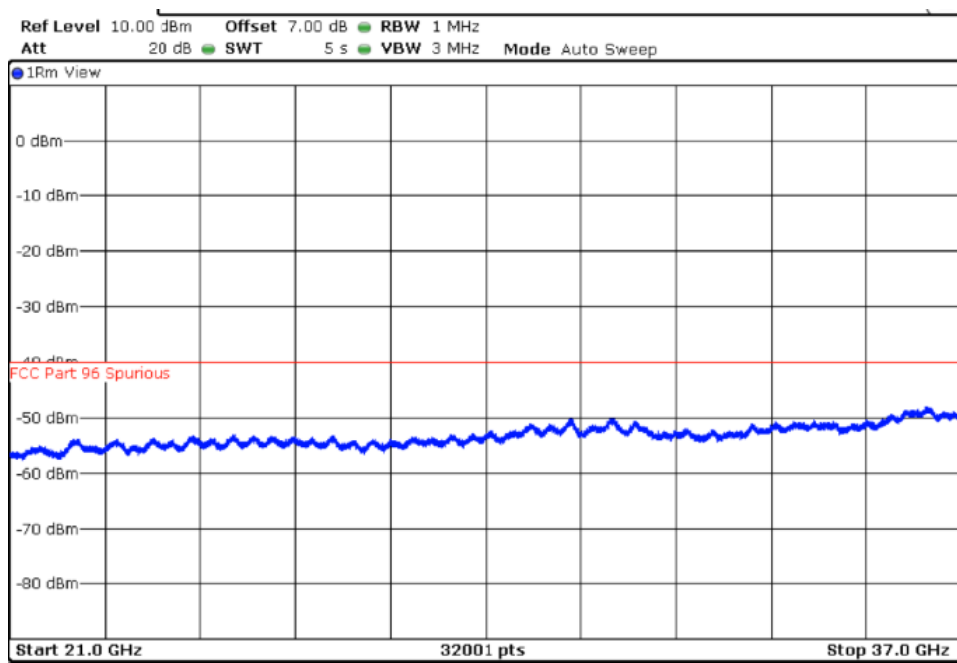


FREQUENCY RANGE 5-21 GHz



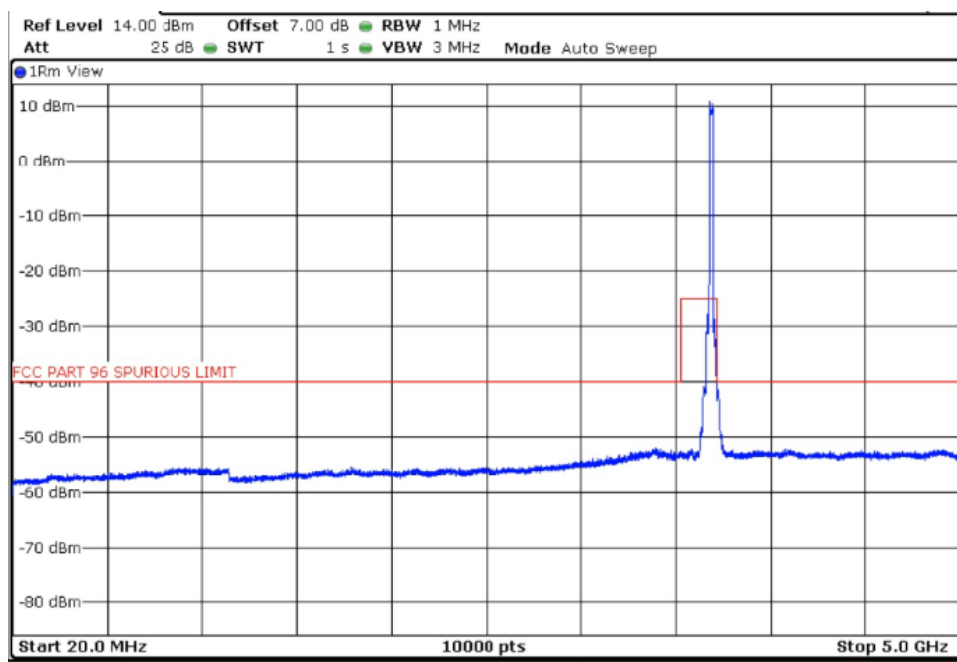
TEST RESULTS (Cont.):

FREQUENCY RANGE 21-37 GHz



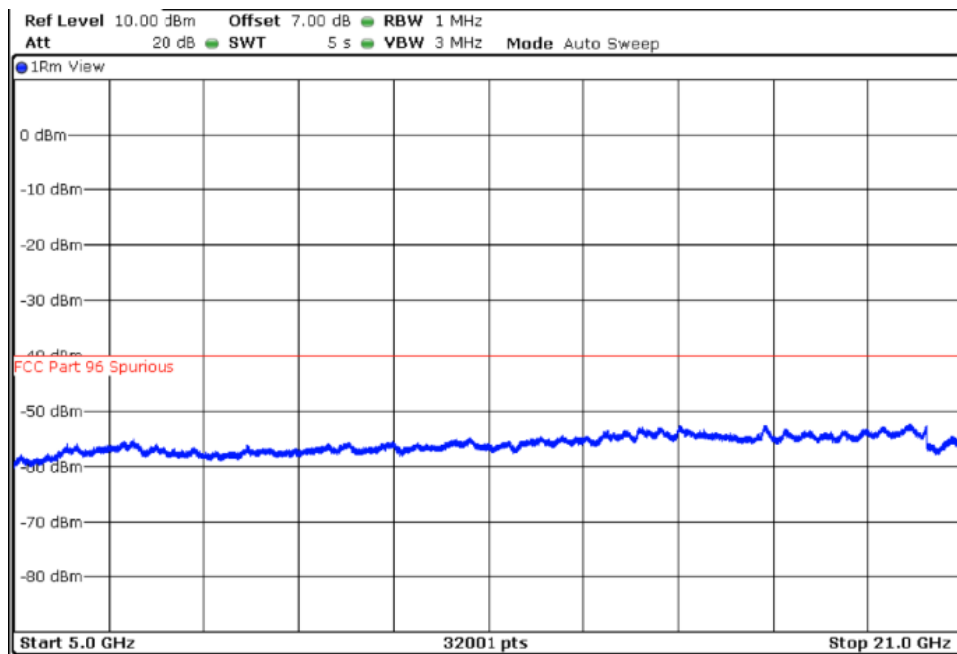
Highest Channel (3690 MHz)

FREQUENCY RANGE 20 MHz-5 GHz

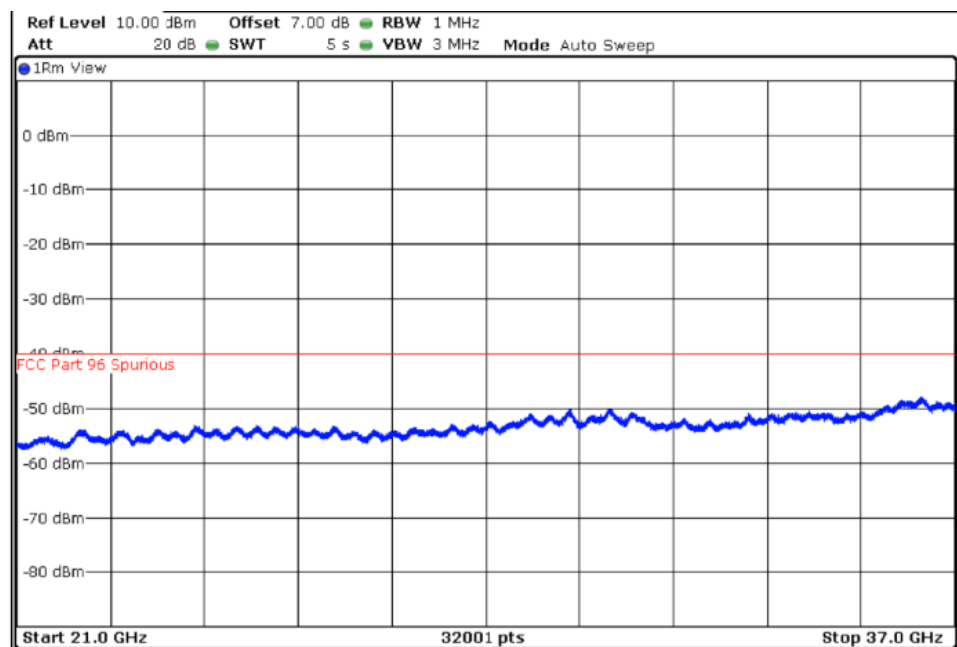


TEST RESULTS (Cont.):

FREQUENCY RANGE 5-21 GHz



FREQUENCY RANGE 21-37 GHz



TEST A.8: RADIATED SPURIOUS EMISSION

LIMITS:	Product standard:	Part 2.1053
	Test standard:	ANSI C63.26-2015

LIMITS

Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation.

Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of § 2.1049, as appropriate.

The limits for radiated emissions are stated below.

- greater than 10 MHz above and below the assigned channel $\leq 70.2 \text{ dB}\mu\text{V/m}$ (-25 dBm/MHz: conducted limit)
- any emission below 3530 MHz and above 3720 MHz $\leq 55.2 \text{ dB}\mu\text{V/m}$ (-40 dBm/MHz: conducted limit)

TEST SETUP

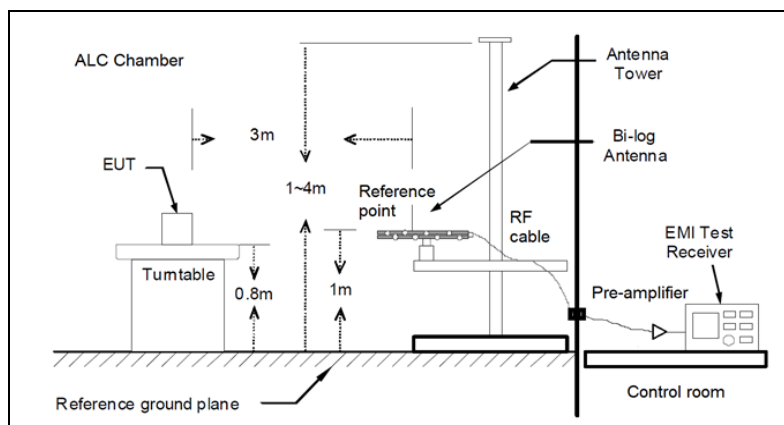
All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at 3 m for the frequency range 30-1000 MHz (Bilog antenna) and at 1m for the frequency range 1-40 GHz (1 GHz-18 GHz and 18 GHz-40 GHz Double ridge horn antennas).

For radiated emissions in the range 1-40 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance

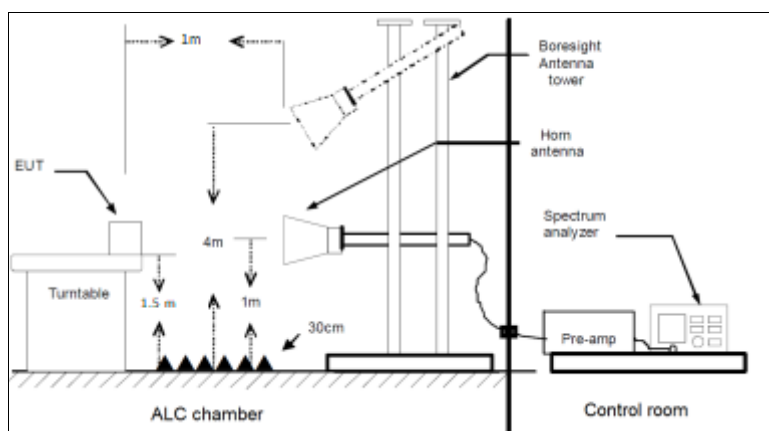
Detected emissions were maximized at each frequency by rotating the EUT and adjusting the measuring antenna height and polarization. The maximum meter reading was recorded. The radiated emissions were measured with RMS detector.

TEST SETUP (Cont.)

Radiated measurements setup $f < 1$ GHz



Radiated measurements setup $f > 1$ GHz



The maximum equivalent isotropically radiated power (e.i.r.p.) is calculated by adding the declared maximum antenna gain (dBi) and $10 \log (1/\text{duty cycle})$ was added in RF level offset to get the accurate measured power level in the average power measurement.

The duty cycle correction = $10 \log (1/0.5) = 3.01$ (dB)

TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01 (Band 48)
TEST RESULTS:	PASS

Frequency range 30 MHz – 1000 MHz

10 MHz BW

Radiated spurious signals detected were more than 20 dB below the reference limit for the lowest, middle and highest channels in 10MHz BW.

20 MHz BW

Radiated spurious signals detected were more than 20 dB below the reference limit for the lowest, middle and highest channels in 20MHz BW.

Frequency range 1GHz – 18GHz

10 MHz BW

Lowest Channel (3555 MHz)

Spurious Frequency (MHz)	Detector	Emission Level (dBμV/m)	Polarization	Measurement Uncertainty (dB)
10662.750000	RMS	42.60	V	± 4.87

Middle Channel (3625 MHz)

Spurious Frequency (MHz)	Detector	Emission Level (dBμV/m)	Polarization	Measurement Uncertainty (dB)
10871.035714	RMS	41.40	H	± 4.87

High Channel (3695 MHz)

Spurious Frequency (MHz)	Detector	Emission Level (dBμV/m)	Polarization	Measurement Uncertainty (dB)
7393.339286	RMS	37.40	H	± 4.87
11082.214286	RMS	40.20	H	± 4.87

TEST RESULTS (Cont.):

20 MHz BW

Lowest Channel (3560 MHz)

Spurious Frequency (MHz)	Detector	Emission Level (dBμV/m)	Polarization	Measurement Uncertainty (dB)
10682.517857	RMS	41.00	H	± 4.87

Middle Channel (3625 MHz)

Spurious Frequency (MHz)	Detector	Emission Level (dBμV/m)	Polarization	Measurement Uncertainty (dB)
10874.892857	RMS	41.30	H	± 4.87

High Channel (3690 MHz)

Spurious Frequency (MHz)	Detector	Emission Level (dBμV/m)	Polarization	Measurement Uncertainty (dB)
7377.910714	RMS	37.30	H	± 4.87
11052.803572	RMS	41.30	V	

Frequency range 18 GHz – 40 GHz

Radiated spurious signals detected were more than 20 dB below the reference limit for the lowest, middle and highest channels in all two BWs.

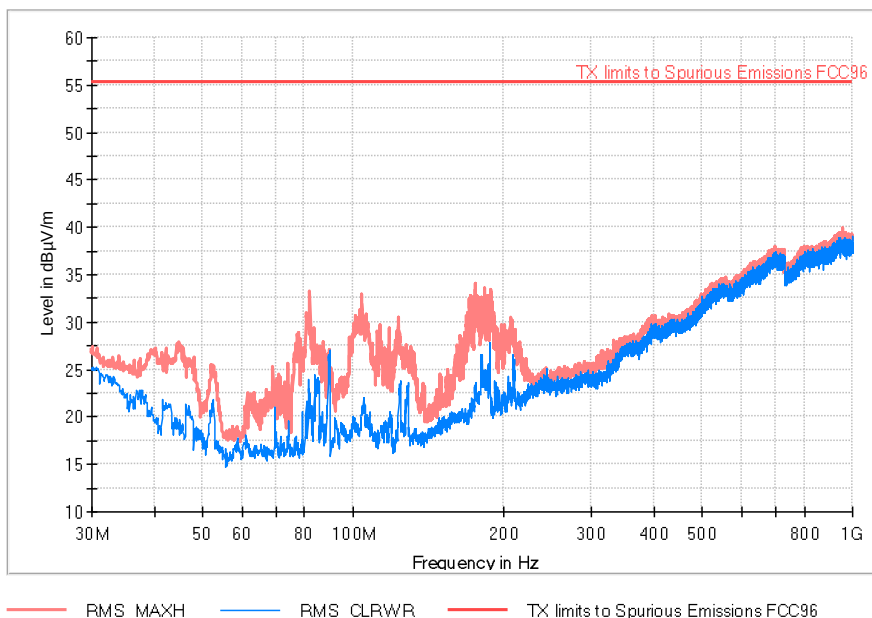
(See next plots)

TEST RESULTS (Cont.):

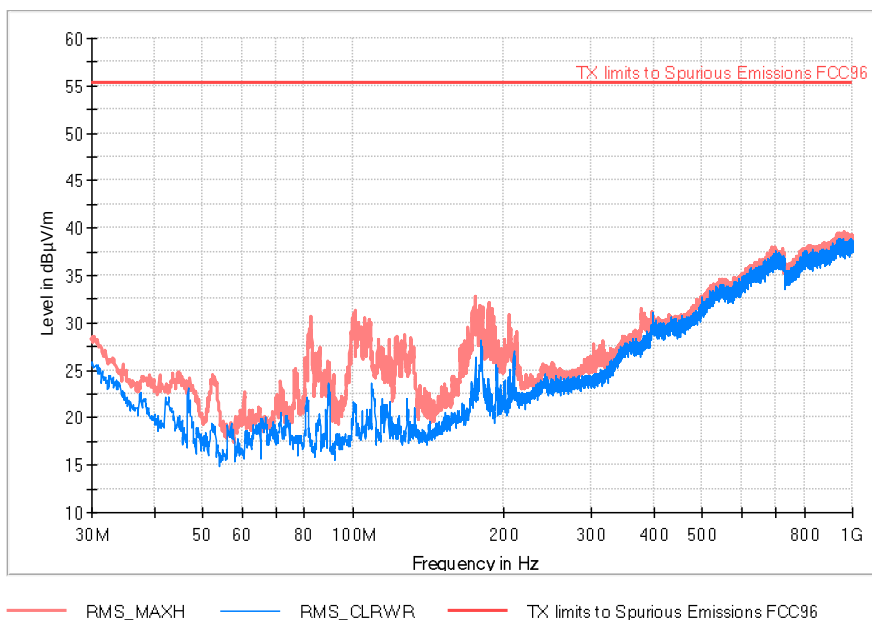
FREQUENCY RANGE 30 MHz-1 GHz

10 MHz BW

Lowest Channel (3555 MHz)

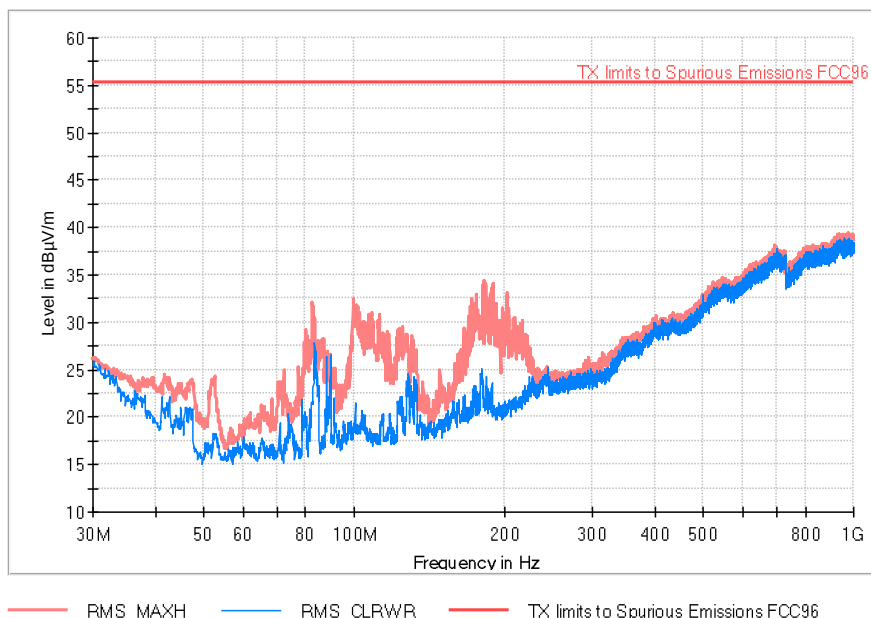


Middle Channel (3625 MHz)



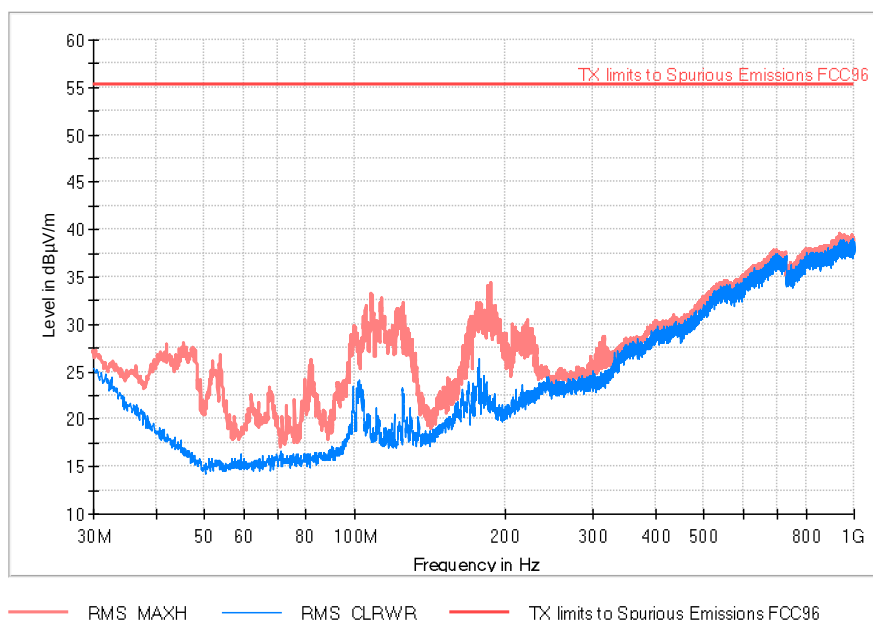
TEST RESULTS (Cont.):

Highest Channel (3695 MHz)



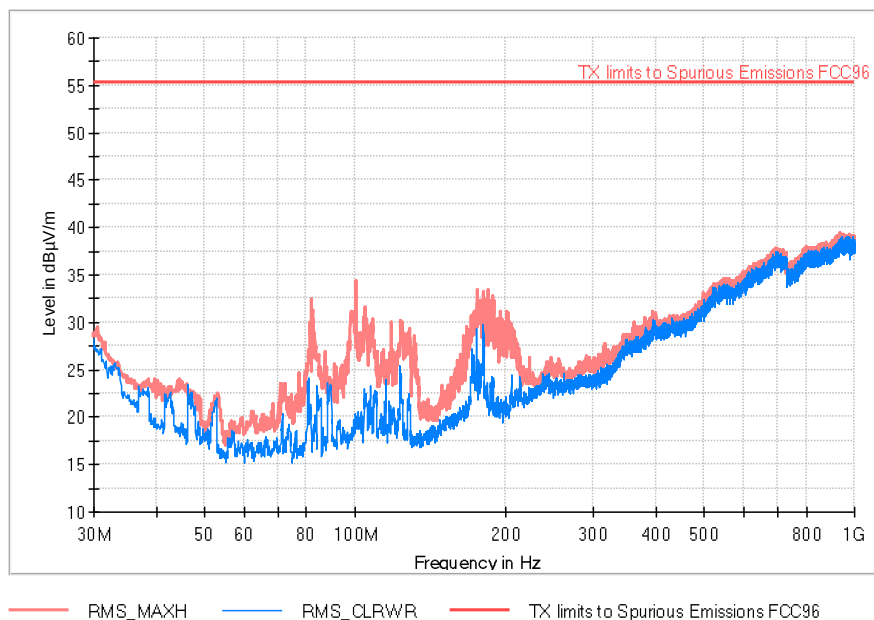
20 MHz BW

Lowest Channel (3560 MHz)

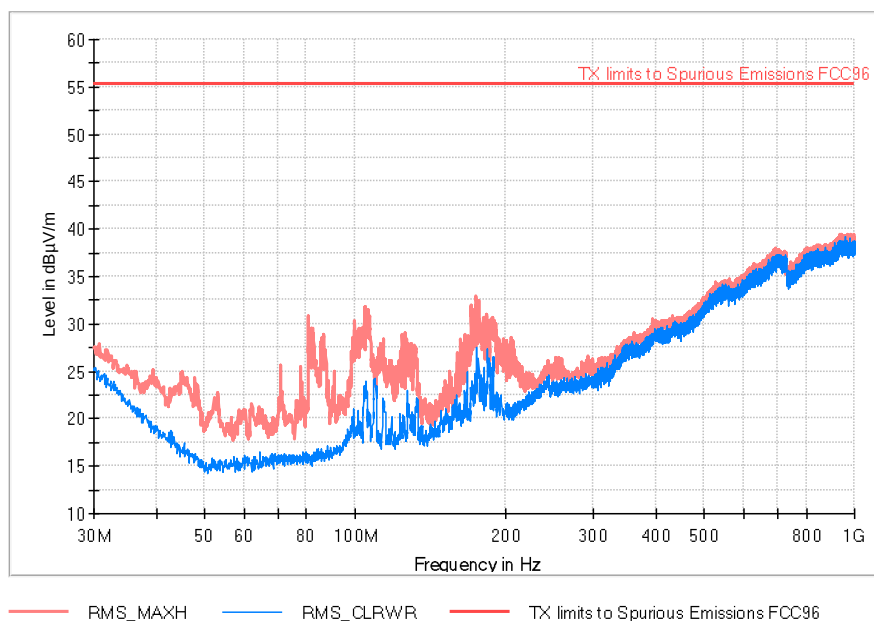


TEST RESULTS (Cont.):

Middle Channel (3625 MHz)



Highest Channel (3690 MHz)

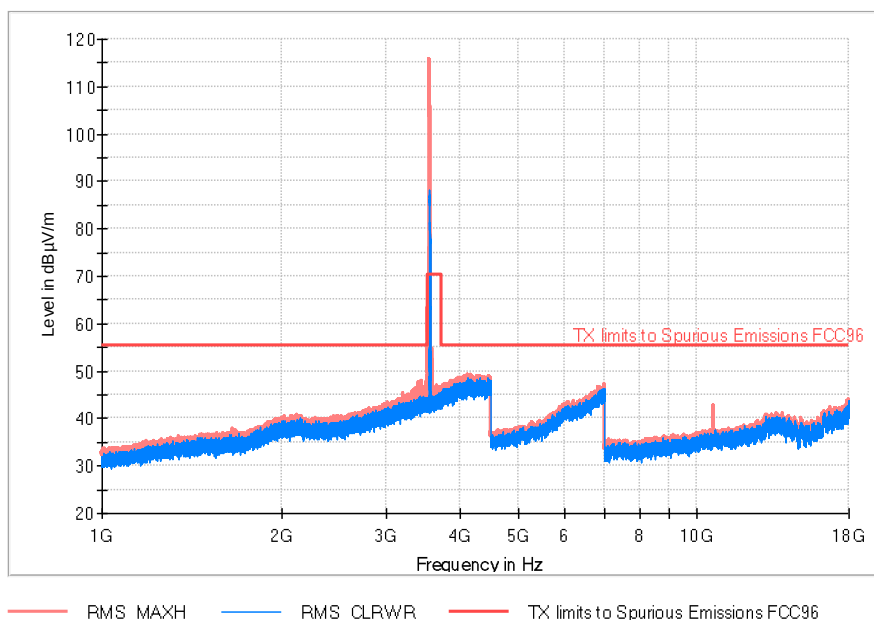


TEST RESULTS (Cont.):

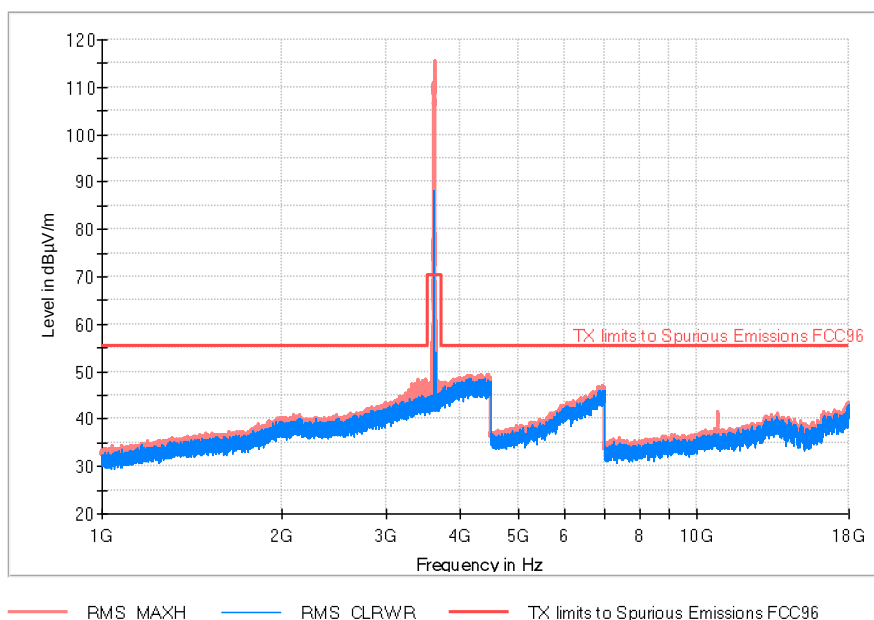
FREQUENCY RANGE 1-18 GHz

10 MHz BW

Lowest Channel (3555 MHz)

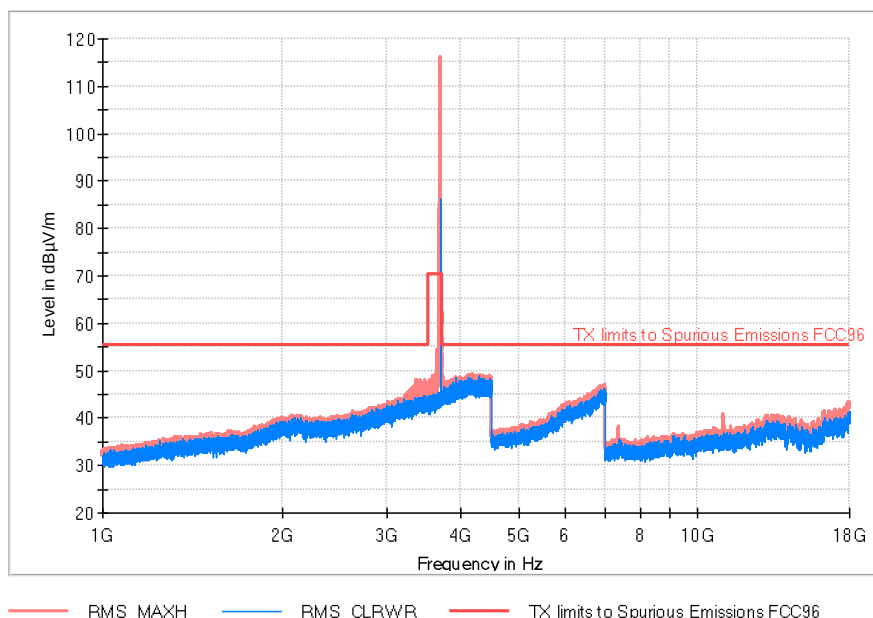


Middle Channel (3625 MHz)



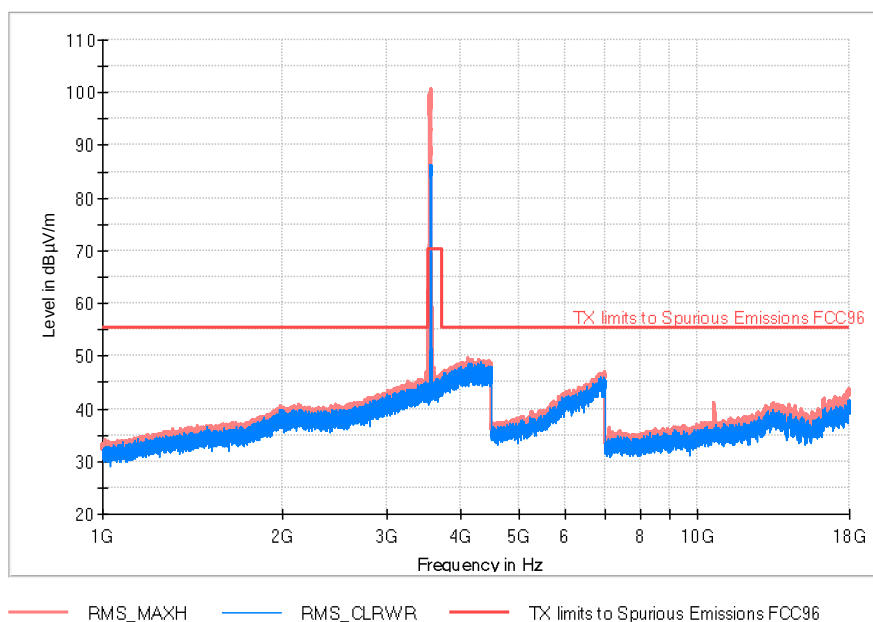
TEST RESULTS (Cont.):

High Channel (3695 MHz)



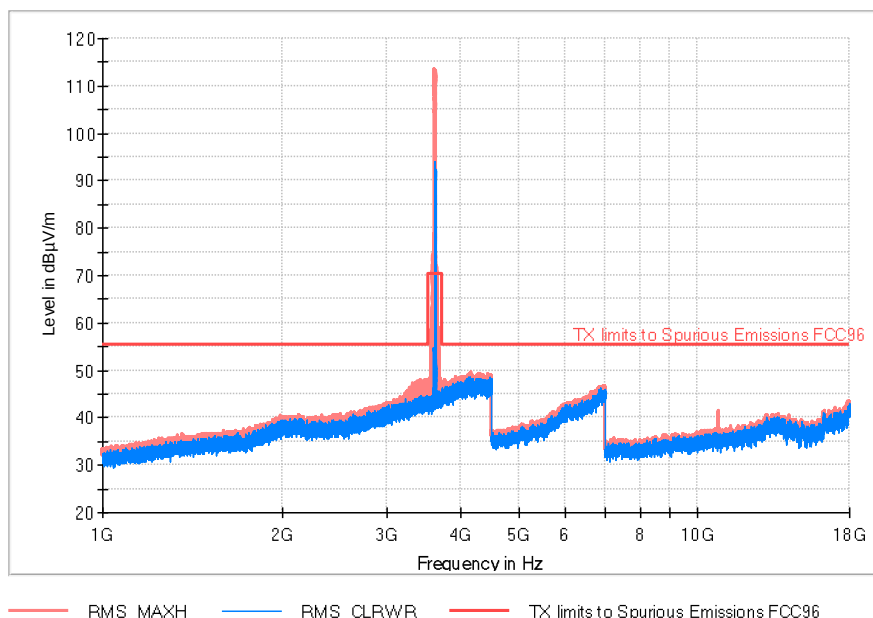
20 MHz BW

Lowest Channel (3560 MHz)

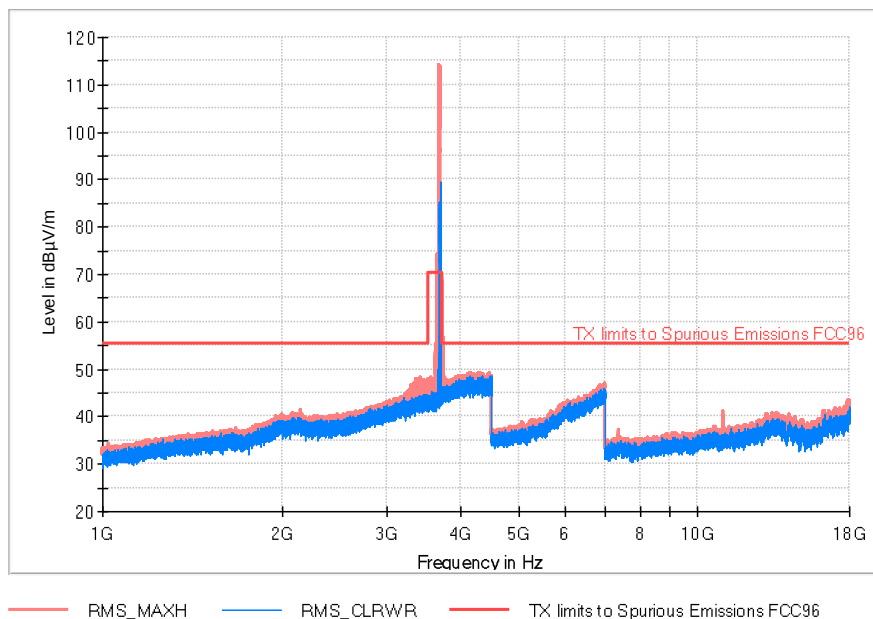


TEST RESULTS (Cont.):

Middle Channel (3625 MHz)



High Channel (3690 MHz)

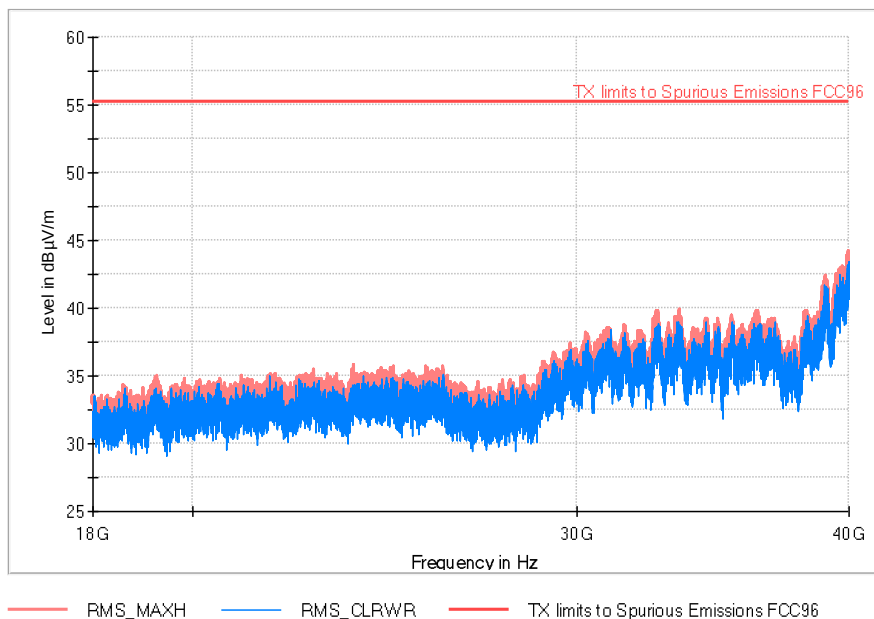


TEST RESULTS (Cont.):

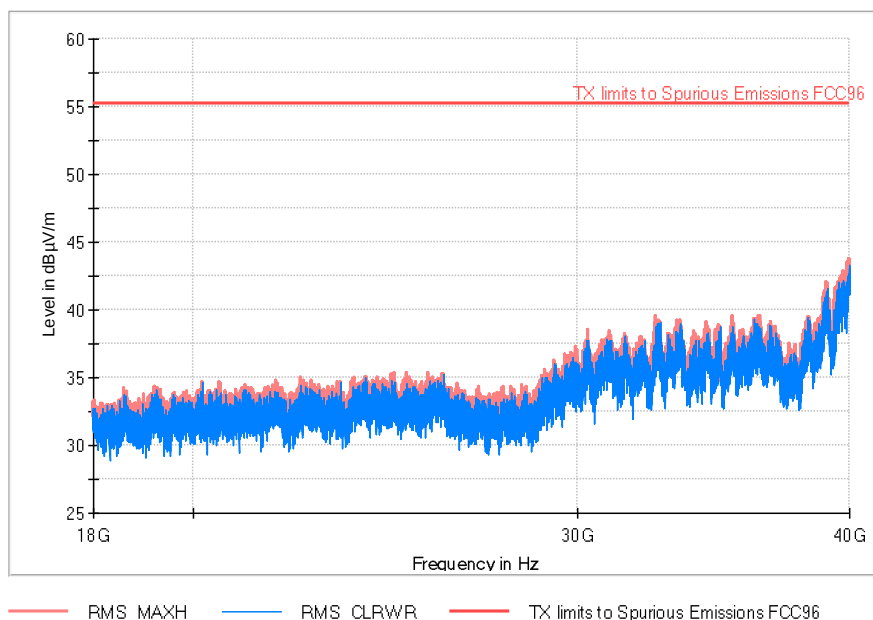
FREQUENCY RANGE 18-40 GHz

10 MHz BW

Lowest Channel (3555 MHz)

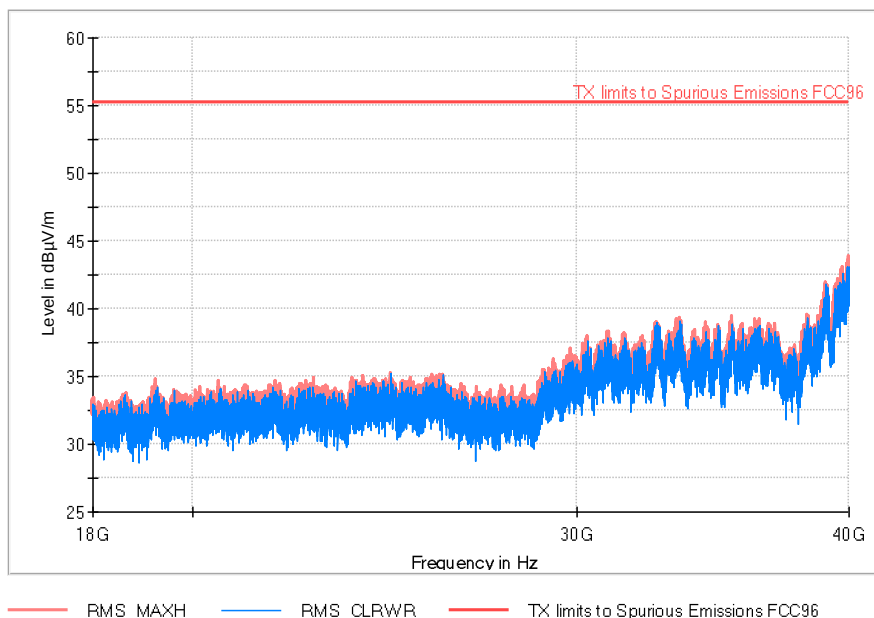


Middle Channel (3625 MHz)



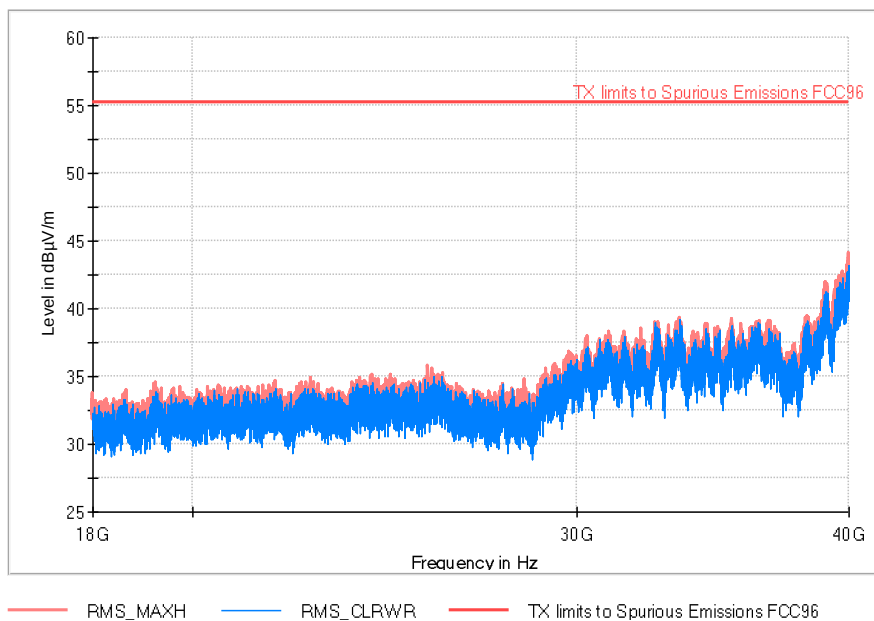
TEST RESULTS (Cont.):

High Channel (3695 MHz)



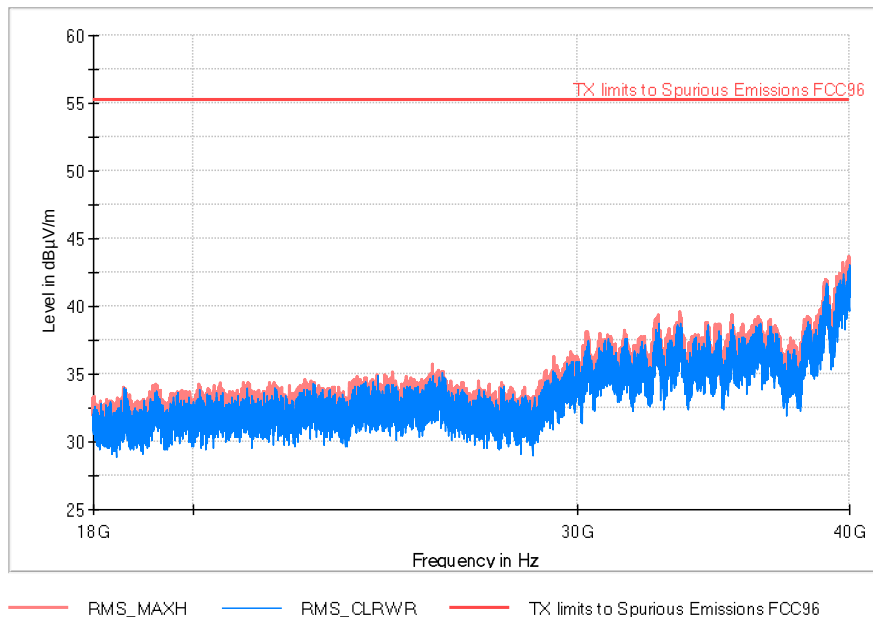
20 MHz BW

Lowest Channel (3560 MHz)

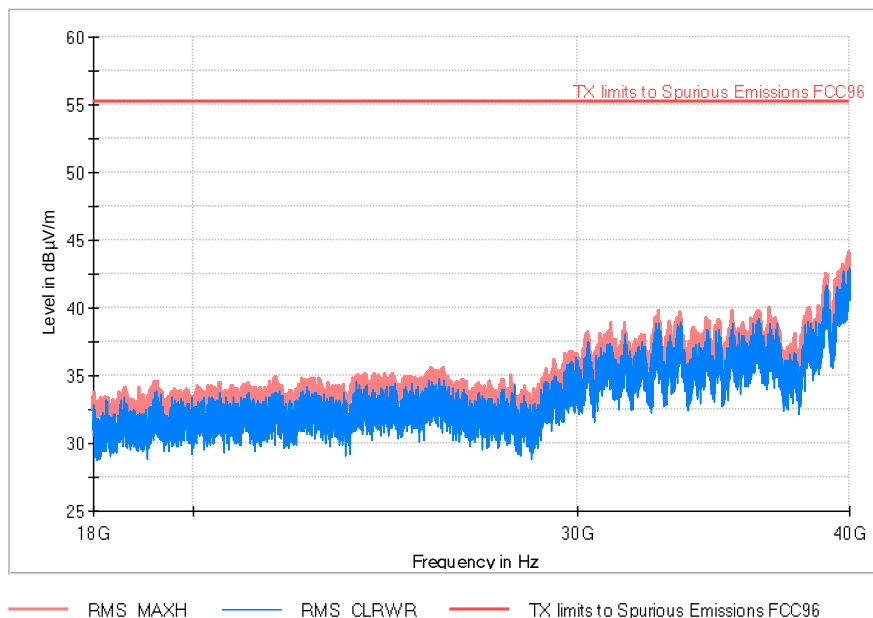


TEST RESULTS (Cont.):

Middle Channel (3625 MHz)



High Channel (3690 MHz)



TEST A.9: FREQUENCY STABILITY

LIMITS:	Product standard:	Part 2.1055
	Test standard:	ANSI C63.26-2015

LIMITS

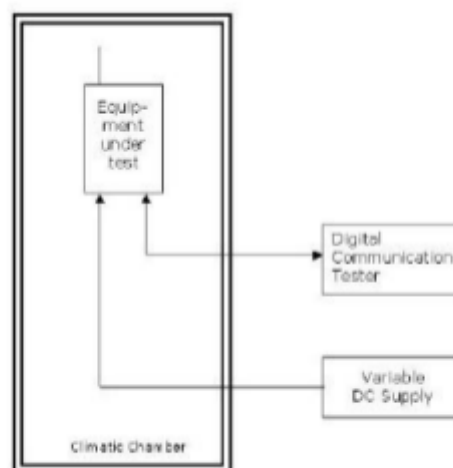
The frequency stability shall be measured with variation of ambient temperature from -30° to +50° centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.

The frequency stability was measured under the following conditions:

- a) At 10°C intervals of temperatures between -30°C and +50°C at the manufacturer's rated supply voltage, and
- b) At +20°C temperature and ±15% supply voltage variations. If a product is specified to operate over a range of input voltage, then the -15% variation is applied to the lowermost voltage and the +15% is applied to the uppermost voltage.

TEST SETUP

The frequency stability was measured by following the procedure stated in the section 5.6 of ANSI C63.26-2015 and the section 9 of FCC KDB 971168 D01 v03 r01.



TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01 (Band 48)
TEST RESULTS:	PASS

10 MHz BW

Temperature (°C)	Input Voltage (V)	Lowest Frequency 3555 MHz			
		Frequency Low (MHz)	Delta to Tnom-Vnom (%)	Frequency High (MHz)	Delta to Tnom-Vnom (%)
50	48	3550.630	0.001690	3559.410	-0.001124
40	48	3550.650	0.002253	3559.390	-0.001686
30	48	3550.510	-0.001690	3559.510	0.001686
20 (Tnom)	48	3550.570	----	3559.450	----
20	40.8(Vmin)	3550.550	-0.000563	3559.470	0.000562
20	55.2(Vmax)	3550.530	-0.001127	3559.430	-0.000562
10	48	3550.490	-0.002253	3559.530	0.002248
0	48	3550.510	-0.001690	3559.490	0.001124
-10	48	3550.530	-0.001127	3559.470	0.000562
-20	48	3550.530	-0.001127	3559.430	-0.000562
-30	48	3550.550	-0.000563	3559.470	0.000562

TEST RESULTS (Cont.):

10 MHz BW

Temperature (°C)	Input Voltage (V)	Highest Frequency 3695 MHz			
		Frequency Low (MHz)	Delta to Tnom-Vnom (%)	Frequency High (MHz)	Delta to Tnom-Vnom (%)
50	48	3690.670	0.003252	3699.430	-0.001081
40	48	3690.590	0.001084	3699.390	0.002162
30	48	3690.610	0.001626	3699.370	-0.002703
20 (Tnom)	48	3690.550	----	3699.470	----
20	40.8(Vmin)	3690.570	0.000542	3699.450	-0.000541
20	55.2(Vmax)	3690.630	0.002168	3699.410	-0.001622
10	48	3690.590	0.001084	3699.390	-0.002162
0	48	3690.530	-0.000542	3699.530	0.001622
-10	48	3690.650	0.002710	3699.430	-0.001081
-20	48	3690.510	-0.001084	3699.490	0.000541
-30	48	3690.490	-0.001626	3699.510	0.001081