

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

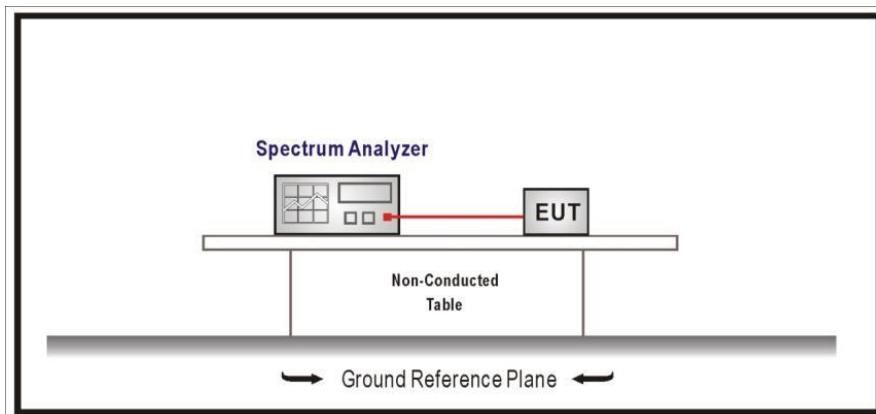
LIMITS:	Product standard:	Part 96.41 Subclause (g)
	Test standard:	ANSI C63.26-2015

### 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

#### Port 1

	Lowest frequency 3555 MHz	Middle frequency 3625 MHz	Highest frequency 3695 MHz
Peak (dBm)	38.17	37.01	38.34
Mean (dBm)	27.20	25.10	26.65
PAPR at 0.1% probability (dB)	9.10	10.43	9.77
Measurement uncertainty (dB)	<±1.11		

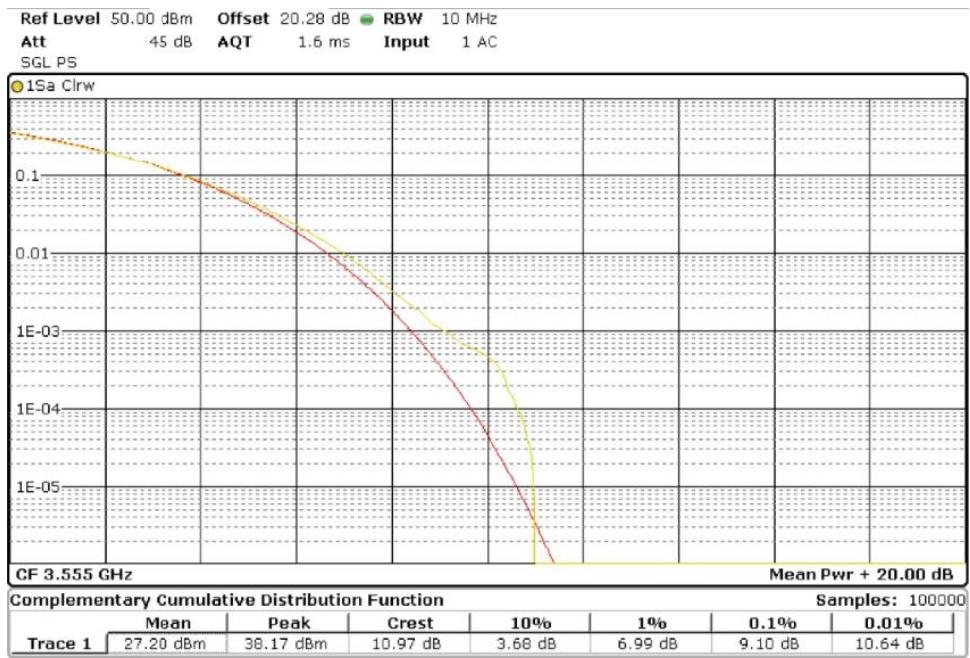
<b>TEST RESULTS (Cont.):</b>							
<b>Port 2</b>							
		Lowest frequency 3555 MHz	Middle frequency 3625 MHz	Highest frequency 3695 MHz			
Peak (dBm)	36.80	37.09	37.45				
Mean (dBm)	25.84	25.22	25.13				
PAPR at 0.1% probability (dB)	9.83	10.49	10.12				
Measurement uncertainty (dB)		<±1.11					
<b>20MHz BW</b>							
<b>Port 1</b>							
		Lowest frequency 3560 MHz	Middle frequency 3625 MHz	Highest frequency 3690 MHz			
Peak (dBm)	36.71	34.43	34.26				
Mean (dBm)	24.13	22.20	22.61				
PAPR at 0.1% probability (dB)	9.30	10.43	9.57				
Measurement uncertainty (dB)		<±1.11					
<b>Port 2</b>							
		Lowest frequency 3560 MHz	Middle frequency 3625 MHz	Highest frequency 3690 MHz			
Peak (dBm)	34.65	34.34	33.89				
Mean (dBm)	22.08	21.71	21.62				
PAPR at 0.1% probability (dB)	10.64	10.75	10.43				
Measurement uncertainty (dB)		<±1.11					
See plots below							

### TEST RESULTS (Cont.):

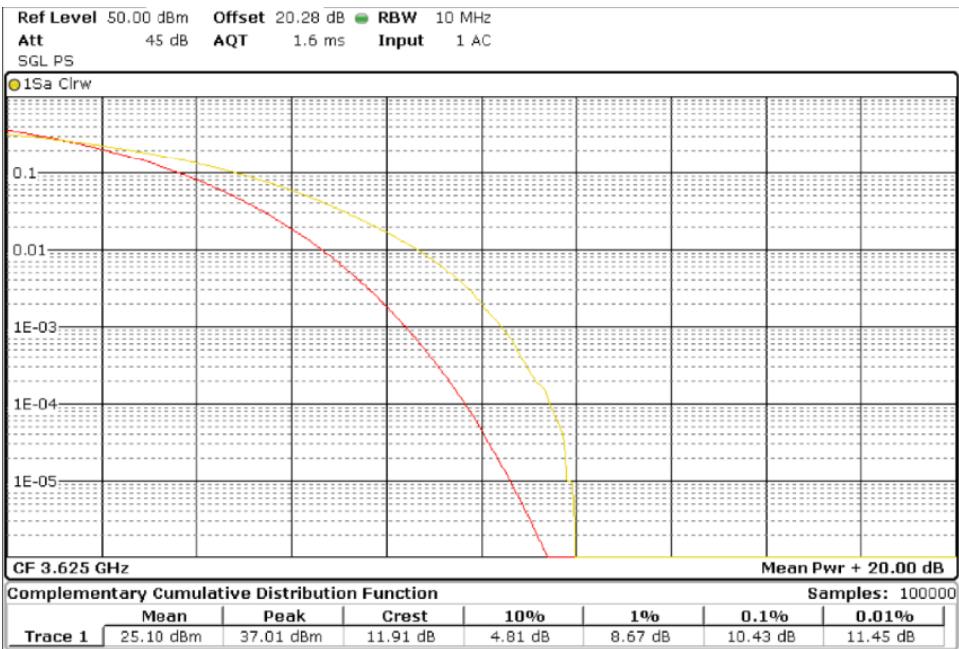
#### Port 1:

##### 10 MHz BW

##### Lowest Channel (3555 MHz)

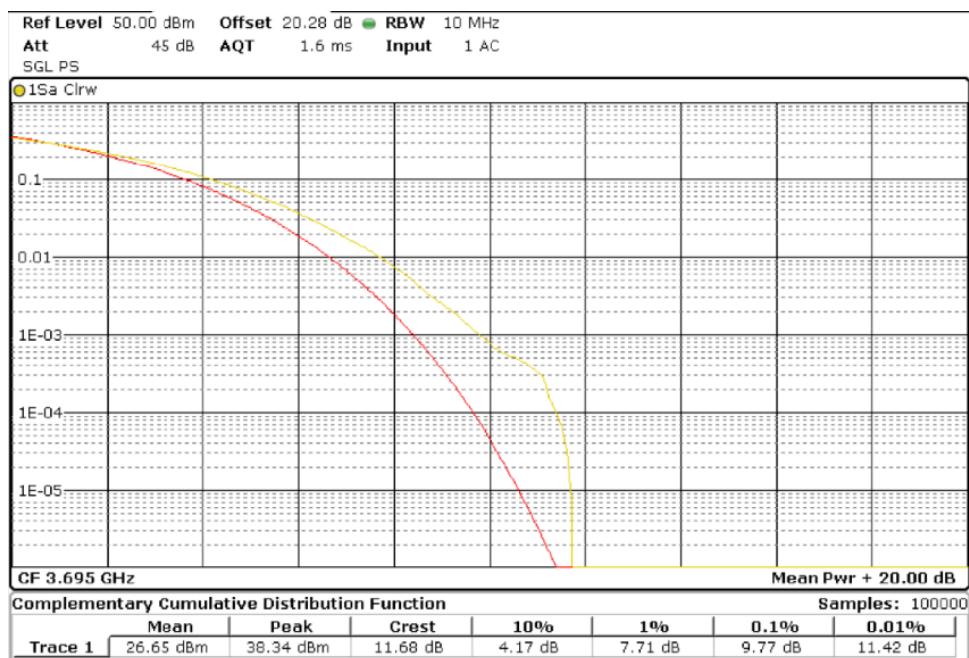


##### Middle Channel (3625 MHz)



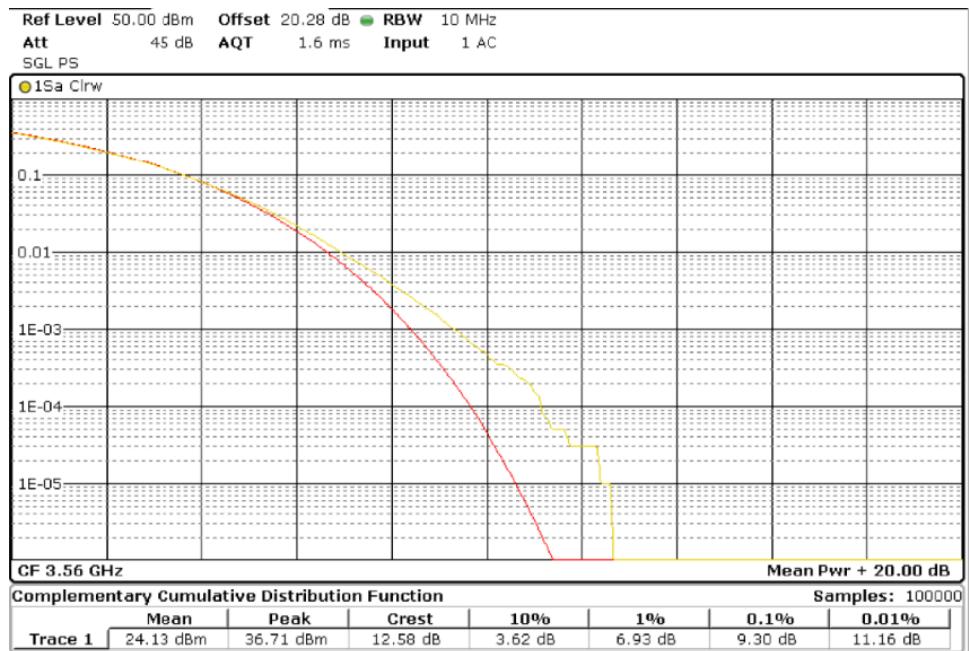
### TEST RESULTS (Cont.):

#### Highest Channel (3695 MHz)



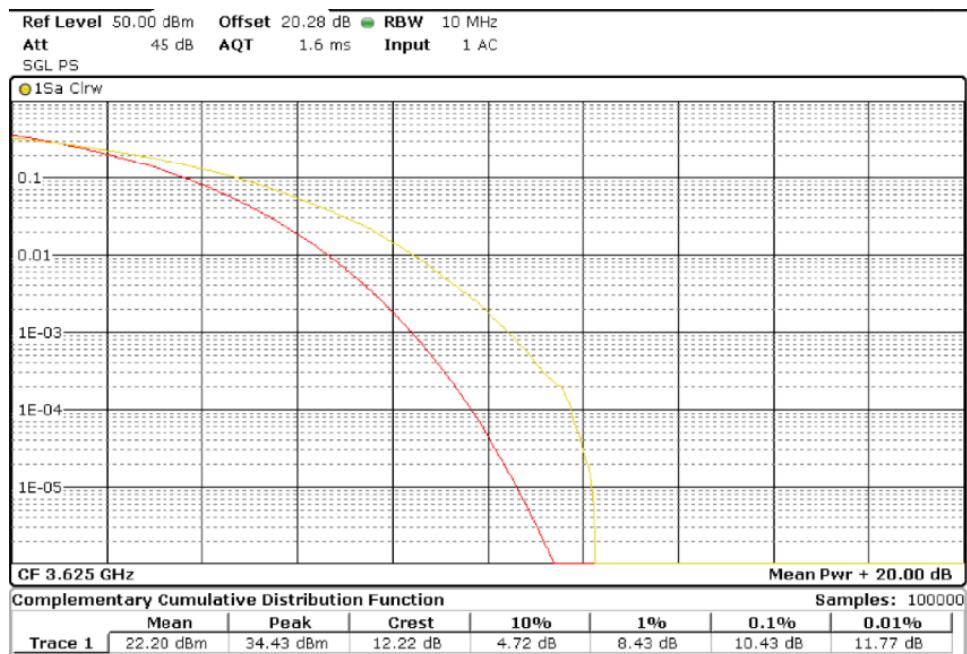
#### 20 MHz BW

#### Lowest Channel (3560 MHz)



TEST RESULTS (Cont.):

Middle Channel (3625 MHz)



Highest Channel (3690 MHz)



### TEST RESULTS (Cont.):

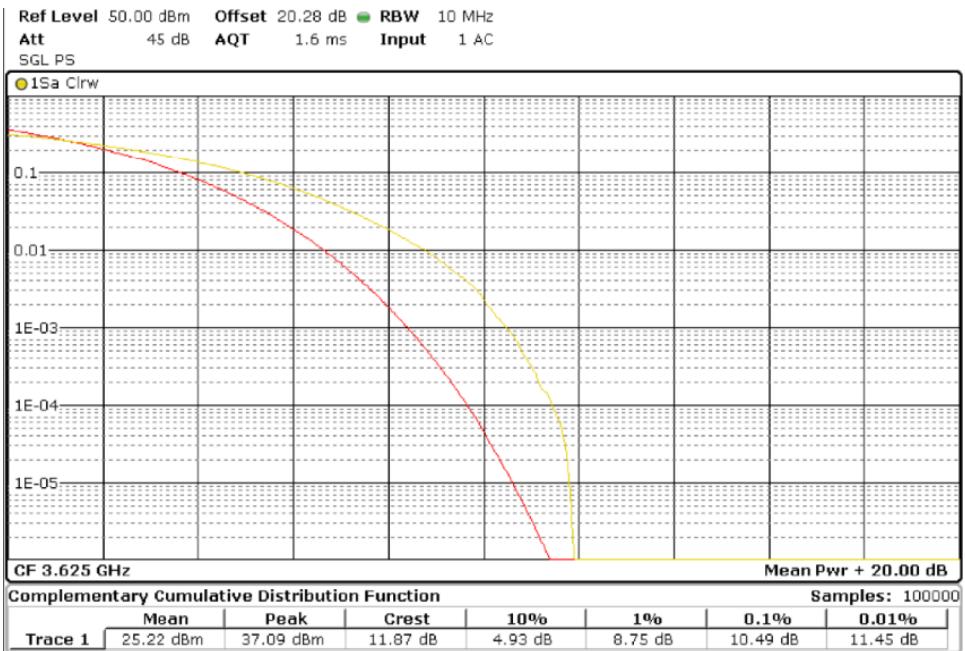
#### Port 2:

##### 10 MHz BW

##### Lowest Channel (3555 MHz)

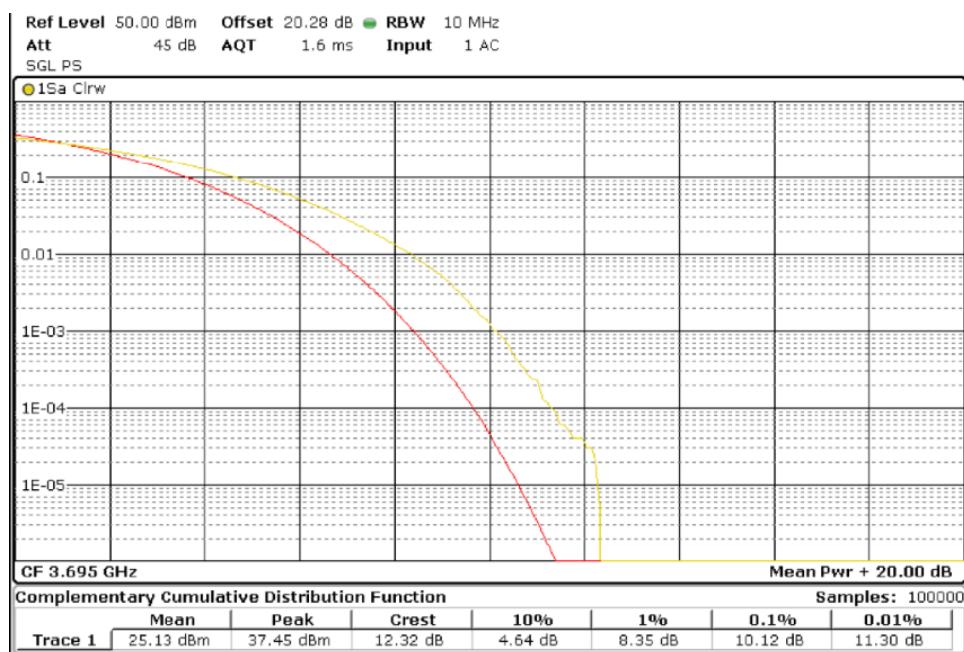


##### Middle Channel (3625 MHz)



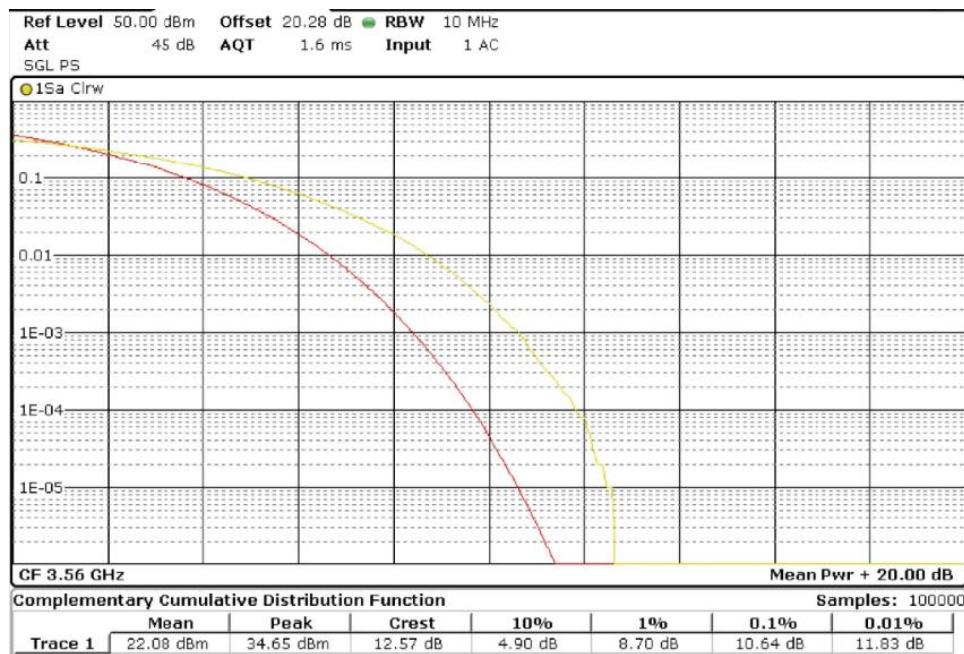
## TEST RESULTS (Cont.):

### Highest Channel (3695 MHz)



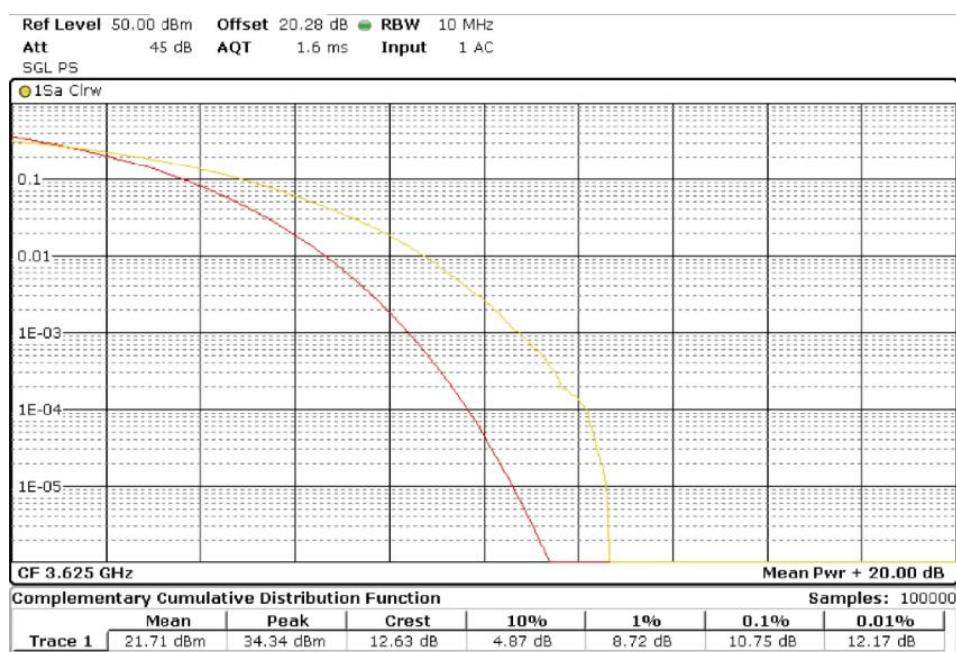
### 20 MHz BW

### Lowest Channel (3560 MHz)



**TEST RESULTS (Cont.):**

**Middle Channel (3625 MHz)**



**Highest Channel (3690 MHz)**



## TEST A.6: 3.5 GHZ EMISSION AND INTERFERENCE LIMITS

<b>LIMITS:</b>	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.

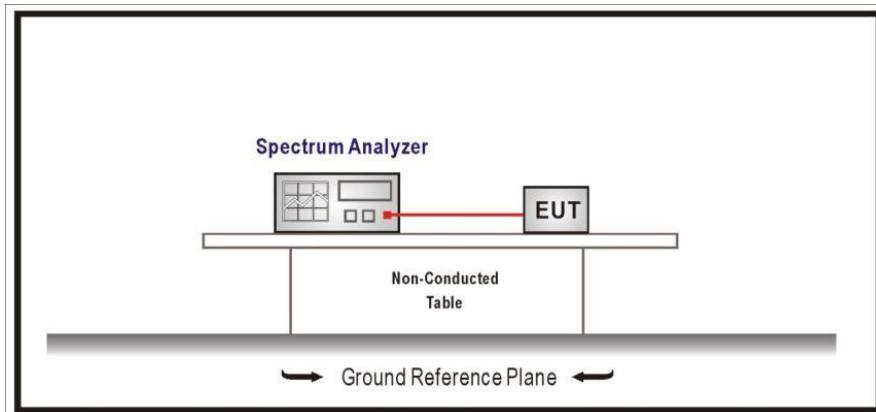
Confirm that the device satisfies the emission limits specified in Section 96.41(e) for all declared channel sizes, at the lowest and highest edges of the band, and in the middle of the band. The RMS detector was used for the measurement at each frequency with 400 MHz span.

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  $\leq$  -13 dBm/MHz
- greater than 10 MHz above and below the assigned channel  $\leq$  -25 dBm/MHz
- any emission below 3530 MHz and above 3720 MHz  $\leq$  -40 dBm/MHz

### **TEST SETUP**



The following duty cycle correction was added in RF level offset to get the accurate measured emission level in the average power measurement.

The duty cycle correction =  $10 \log (1/0.67) = 1.67$  (dB)

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

**2x2 MIMO**

**Port 1 and 2:**

**10 MHz BW**

**Lowest Channel**

The spurious signals detected were more than 12 dB below the reference limit for the lowest channel were shown in the plots.

**Middle Channel**

The spurious signals detected were more than 20 dB below the reference limit for the middle channel were shown in the plots.

**Highest Channel**

The spurious signals detected were more than 12 dB below the reference limit for the Highest channel were shown in the plots.

**20 MHz BW**

**Lowest Channel**

The spurious signals detected were more than 12 dB below the reference limit for the lowest channel were shown in the plots.

**Middle Channel**

The spurious signals detected were more than 12 dB below the reference limit for the middle channel were shown in the plots.

**Highest Channel**

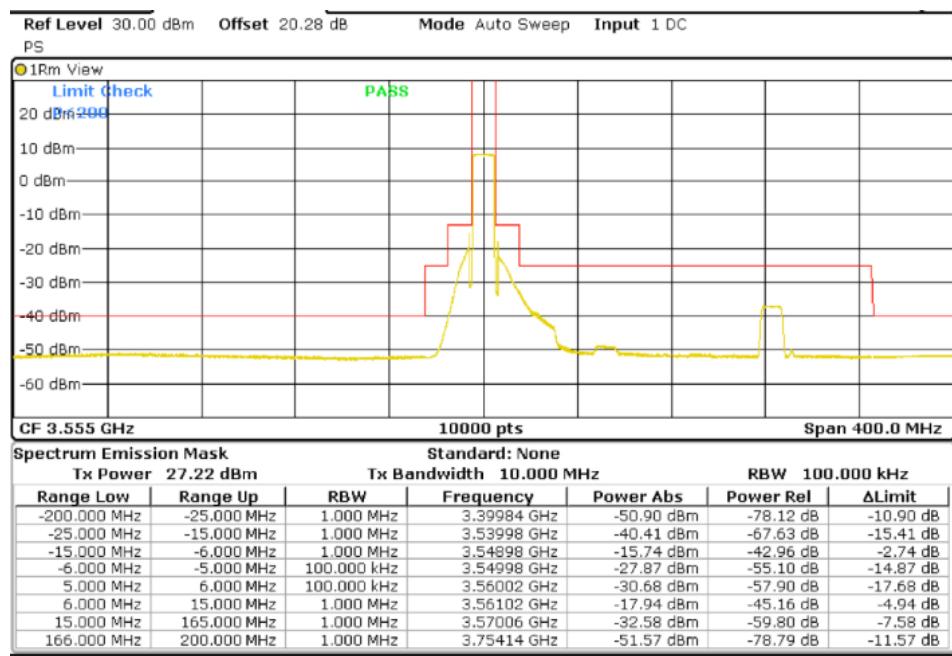
The spurious signals detected were more than 12 dB below the reference limit for the Highest channel were shown in the plots.

## TEST RESULTS (Cont.):

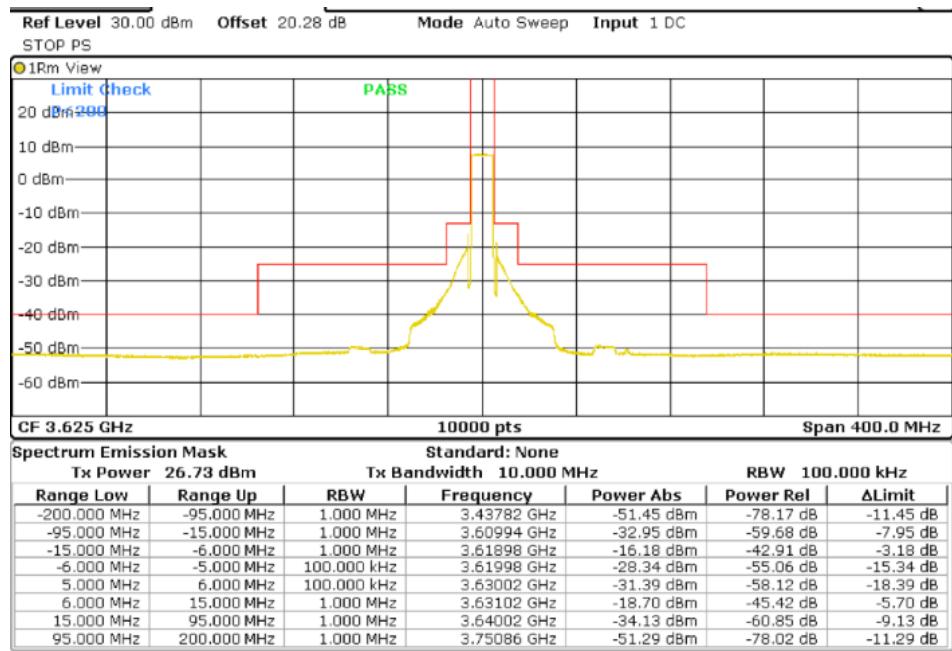
### Port 1:

#### 10 MHz BW

##### Lowest Channel (3555 MHz)

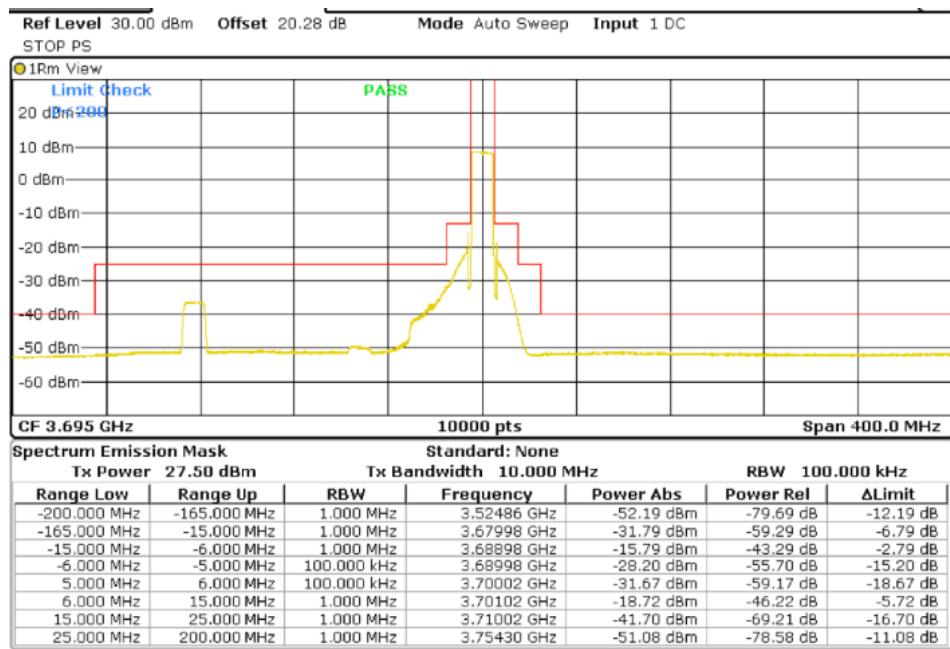


##### Middle Channel (3625 MHz)



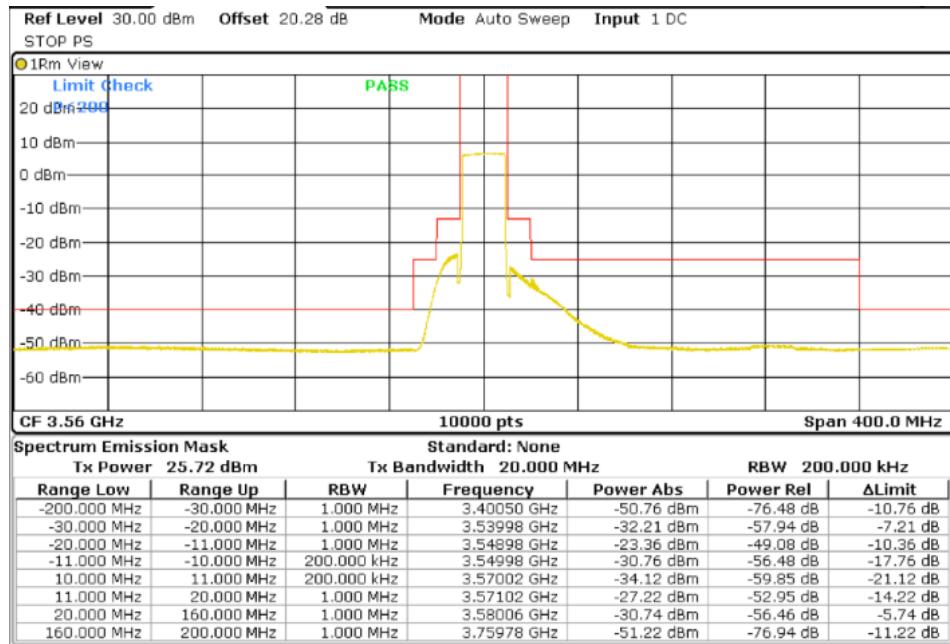
### TEST RESULTS (Cont.):

#### Highest Channel (3695 MHz)



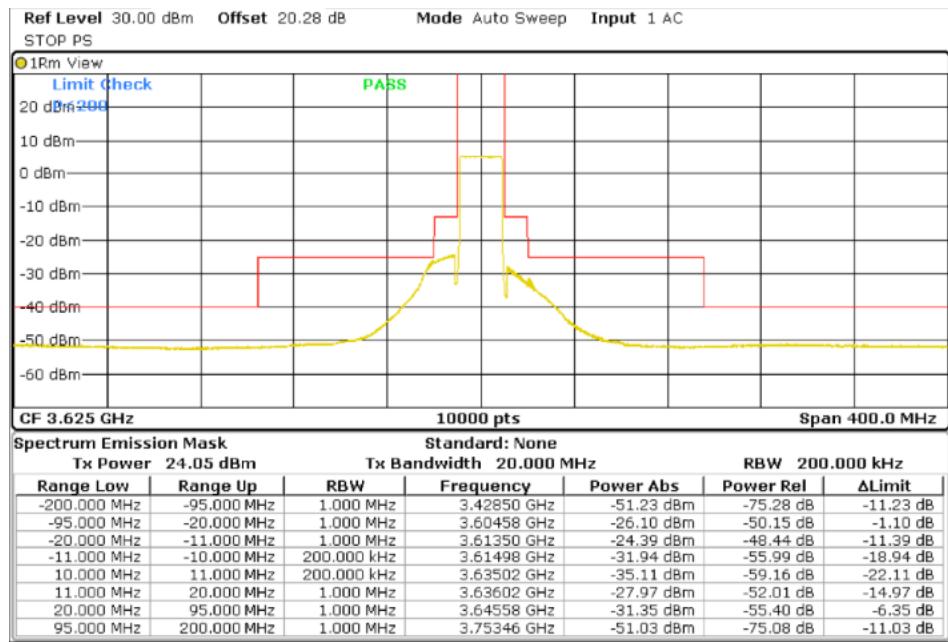
#### 20 MHz BW

#### Lowest Channel (3560 MHz)

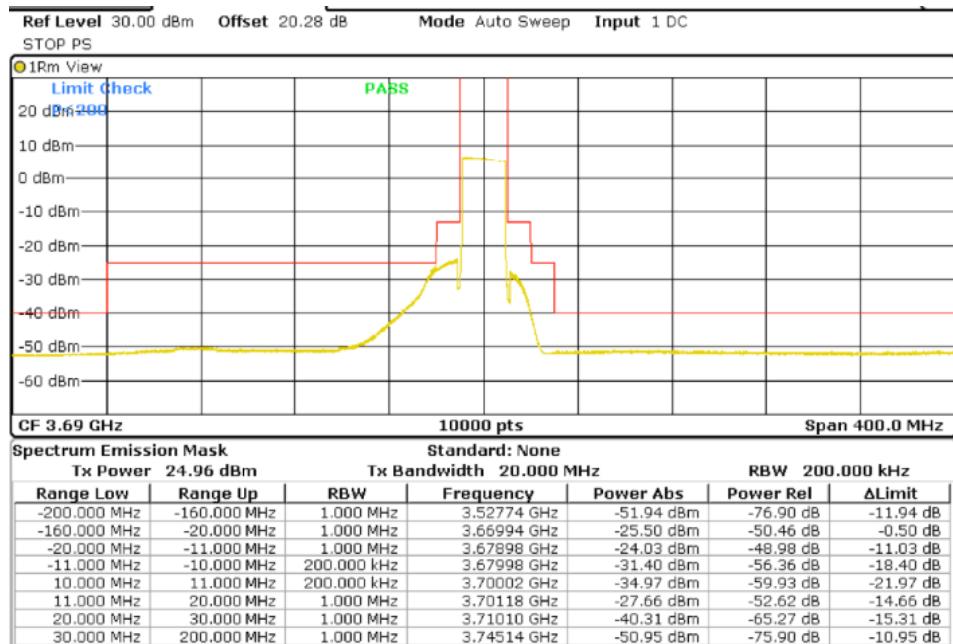


### TEST RESULTS (Cont.):

#### Middle Channel (3625 MHz)



#### Highest Channel (3690 MHz)

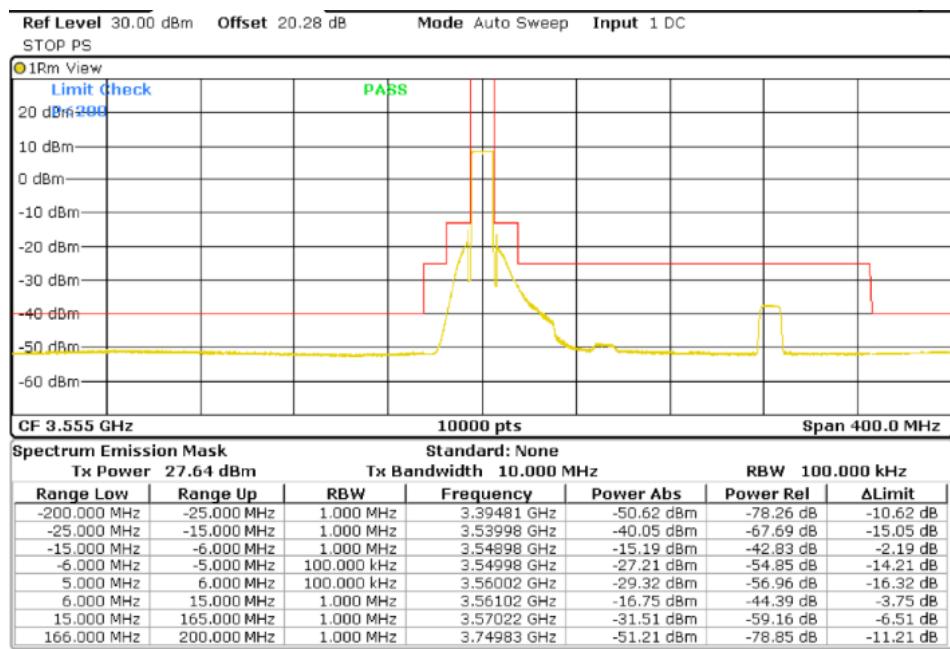


### TEST RESULTS (Cont.):

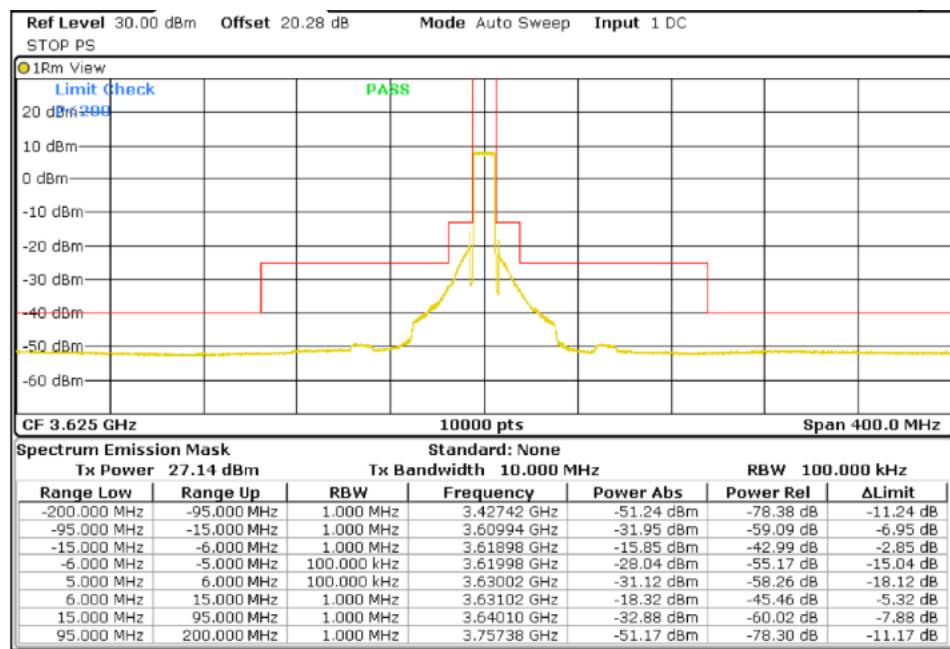
#### Port 2:

##### 10 MHz BW

##### Lowest Channel (3555 MHz)

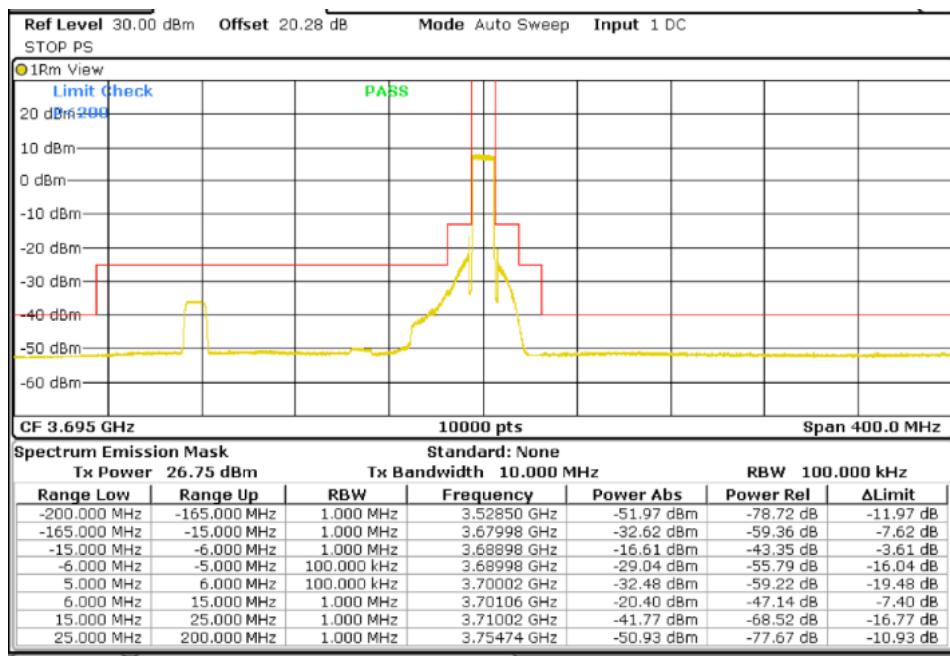


##### Middle Channel (3625 MHz)



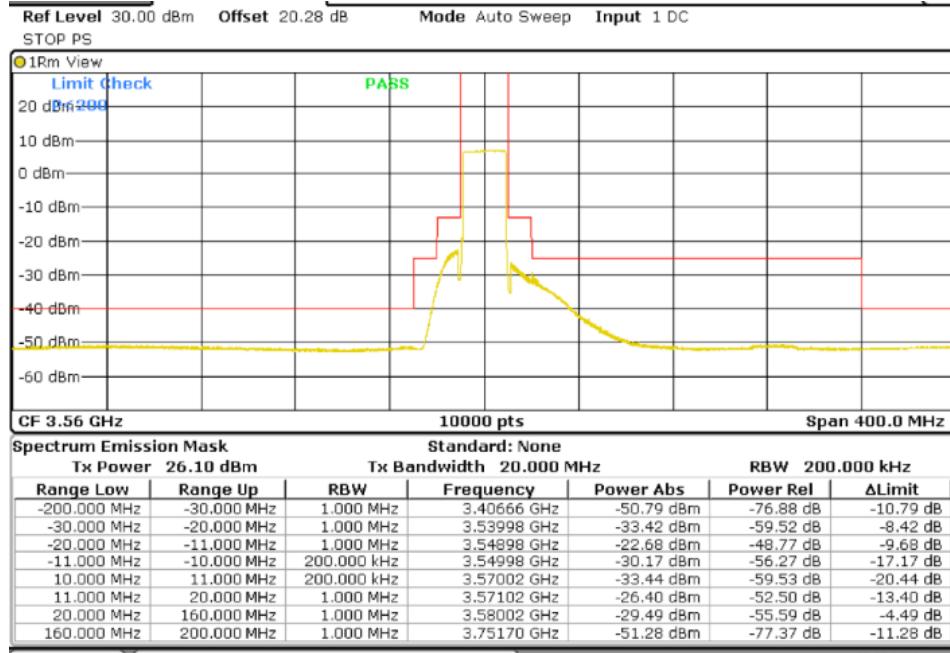
### TEST RESULTS (Cont.):

#### Highest Channel (3695 MHz)



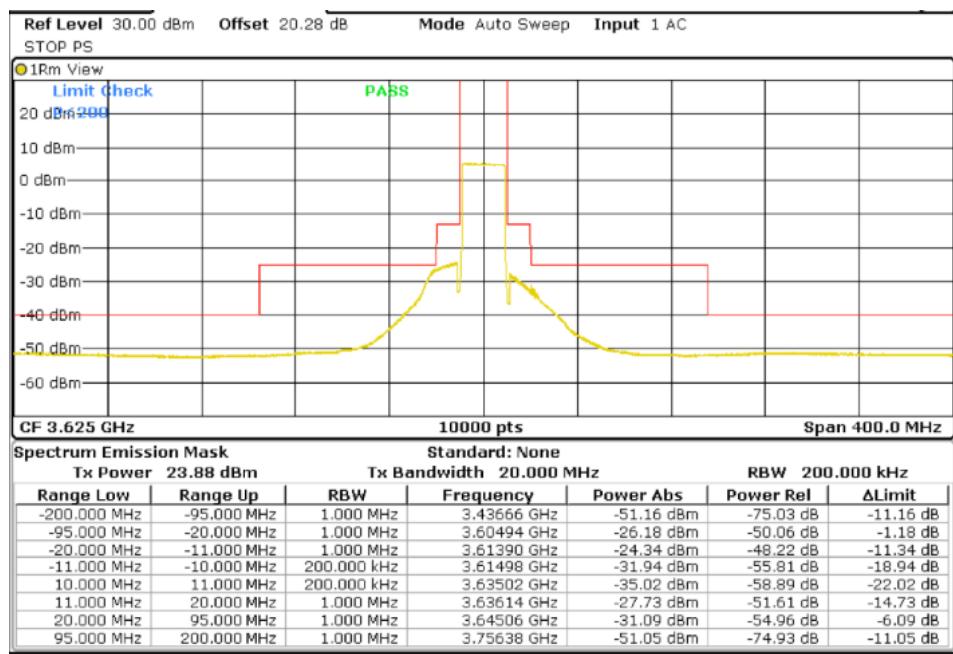
#### 20 MHz BW

#### Lowest Channel (3560 MHz)

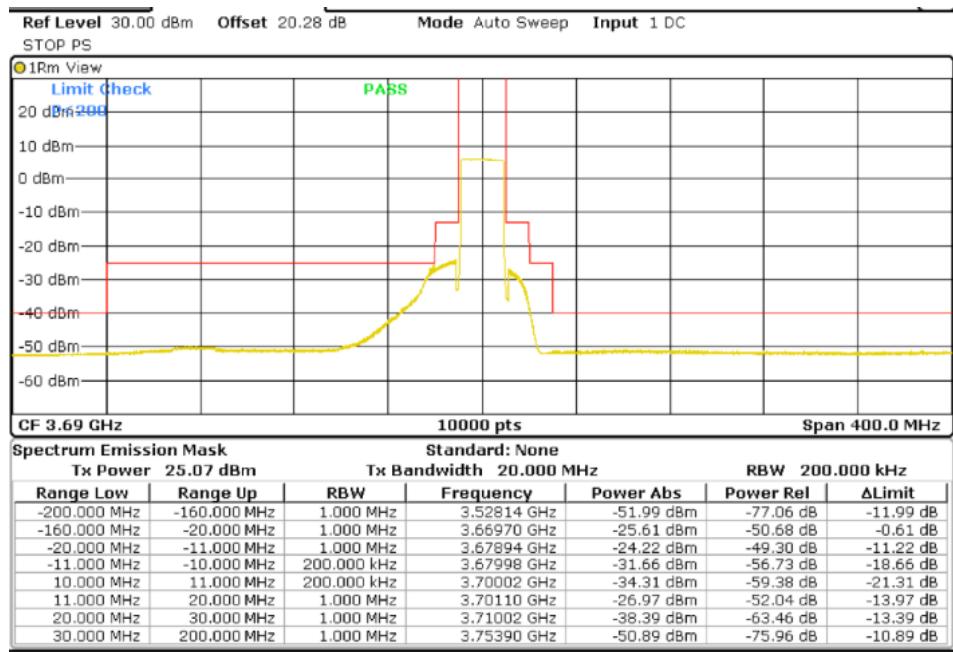


### TEST RESULTS (Cont.):

#### Middle Channel (3625 MHz)



#### Highest Channel (3690 MHz)



## TEST A.7: SPURIOUS EMISSIONS AT ANTENNA TERMINALS

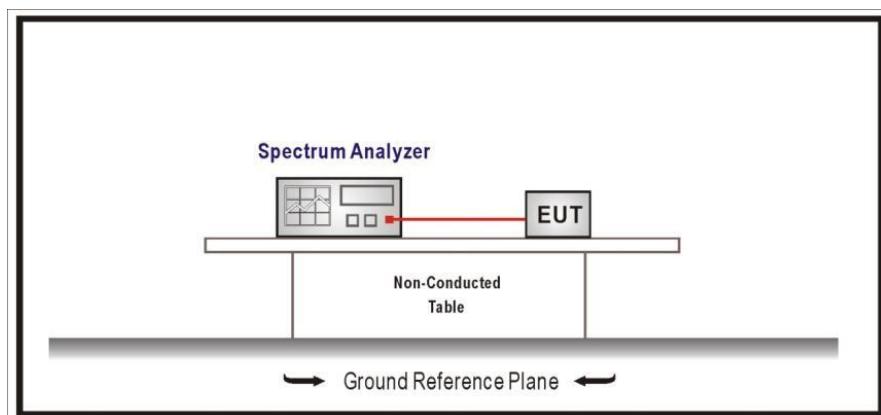
LIMITS:	Product standard:	Part 2.1051 and 96.41 Subclause (e)
	Test standard:	ANSI C63.26-2015

### 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 following duty cycle correction was added in RF level offset to get the accurate measured emission level in the average power measurement.

The duty cycle correction =  $10 \log (1/0.68) = 1.67 (dB)$

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

TEST RESULTS(Cont.):									
<b><u>2x2 MIMO</u></b>									
<b><u>10 MHz BW</u></b>									
<b><u>Port 1 and 2</u></b>									
Lowest 3555 MHz		Middle 3625 MHz		Highest 3695 MHz					
Spurious Frequency (MHz)	Emission Level (dBm/MHz)	Spurious Frequency (MHz)	Emission Level (dBm/MHz)	Spurious Frequency (MHz)	Emission Level (dBm/MHz)				
No Spurious		7251.68	-49.37	7390.18	-47.17				
				7385.68	-51.35				
Measurement uncertainty (dB)				<± 2.03					
<b><u>20 MHz BW</u></b>									
<b><u>Port 1 and 2:</u></b>									
Lowest 3560 MHz		Middle 3625 MHz		Highest 3690 MHz					
Spurious Frequency (MHz)	Emission Level (dBm/MHz)	Spurious Frequency (MHz)	Emission Level (dBm/MHz)	Spurious Frequency (MHz)	Emission Level (dBm/MHz)				
No Spurious		7249.68	-50.42	7381.18	-49.92				
Measurement uncertainty (dB)				<± 2.03					
See plots below									

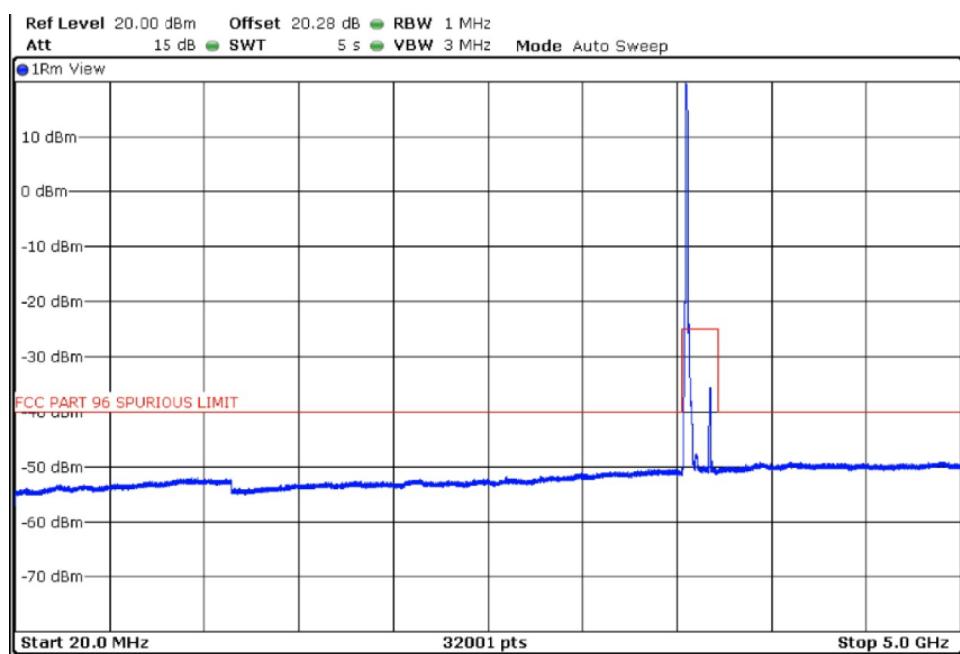
## TEST RESULTS (Cont.):

### Port 1

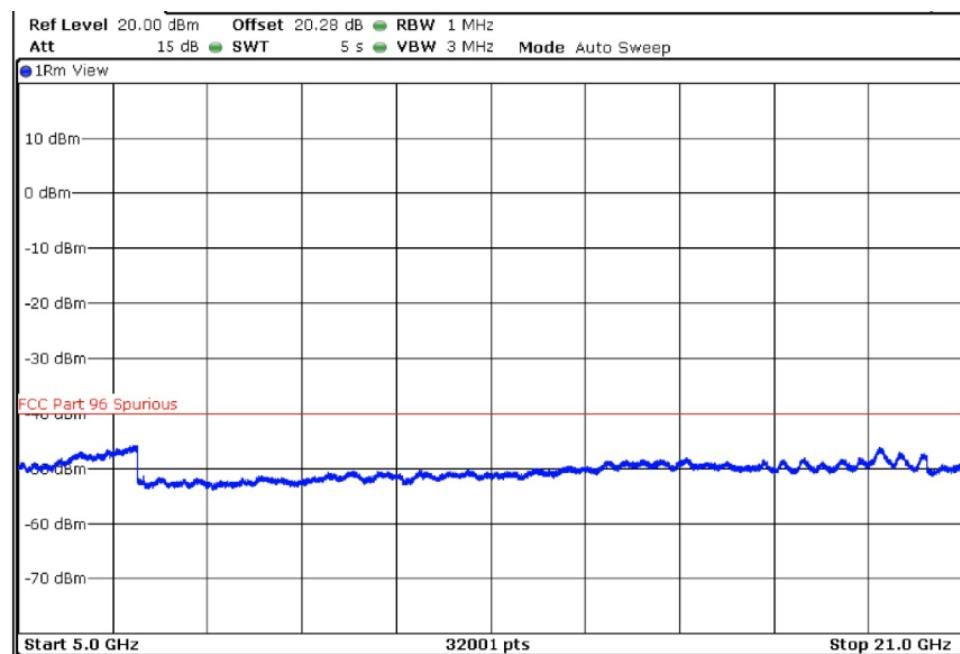
#### 10MHz BW

##### **Lowest Channel (3555 MHz)**

FREQUENCY RANGE 20 MHz-5 GHz

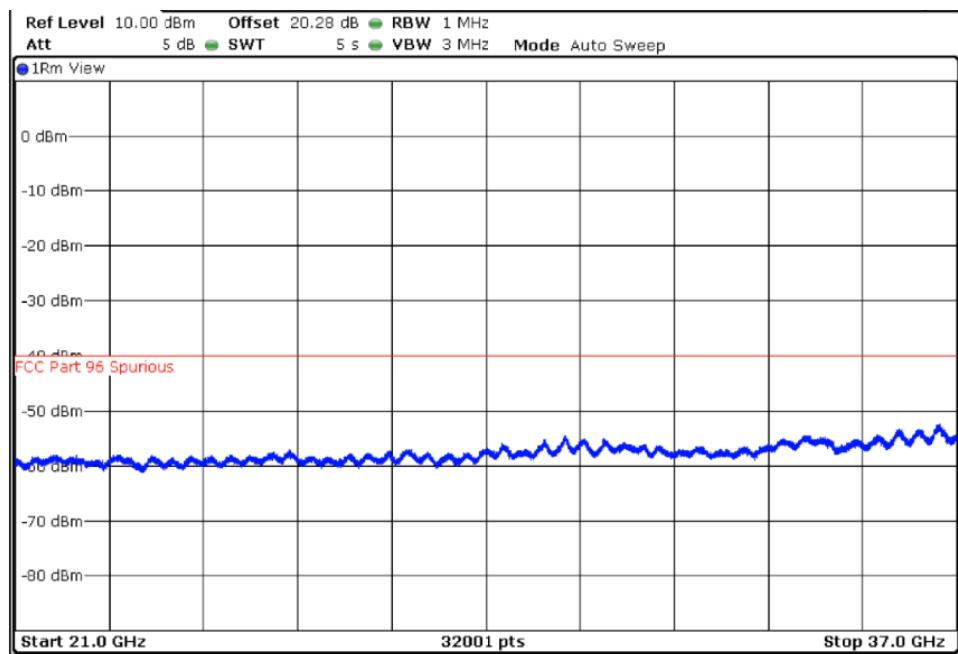


FREQUENCY RANGE 5-21 GHz



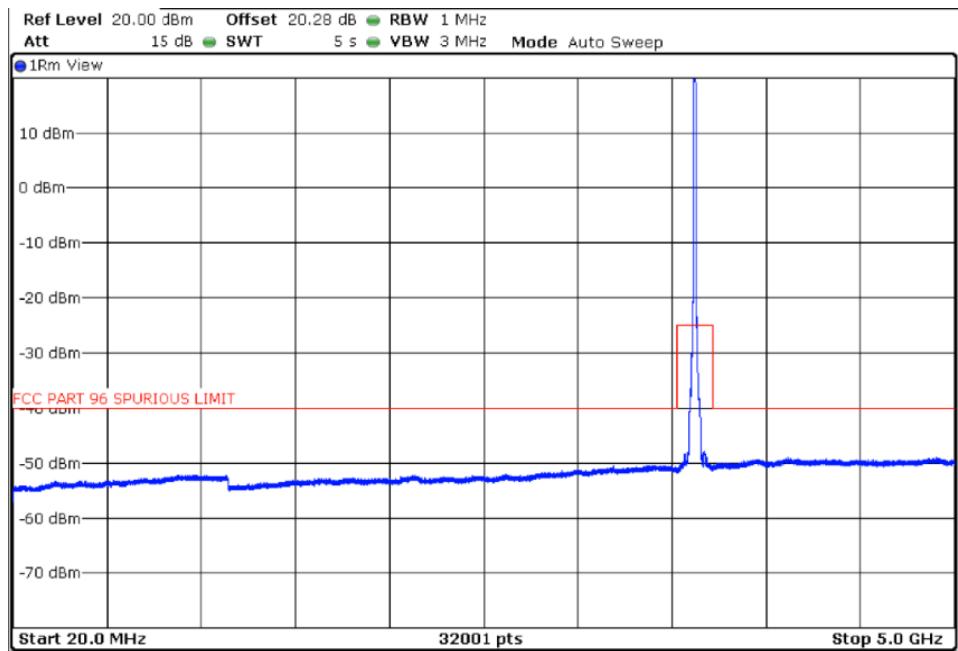
**TEST RESULTS (Cont.):**

FREQUENCY RANGE 21-37 GHz



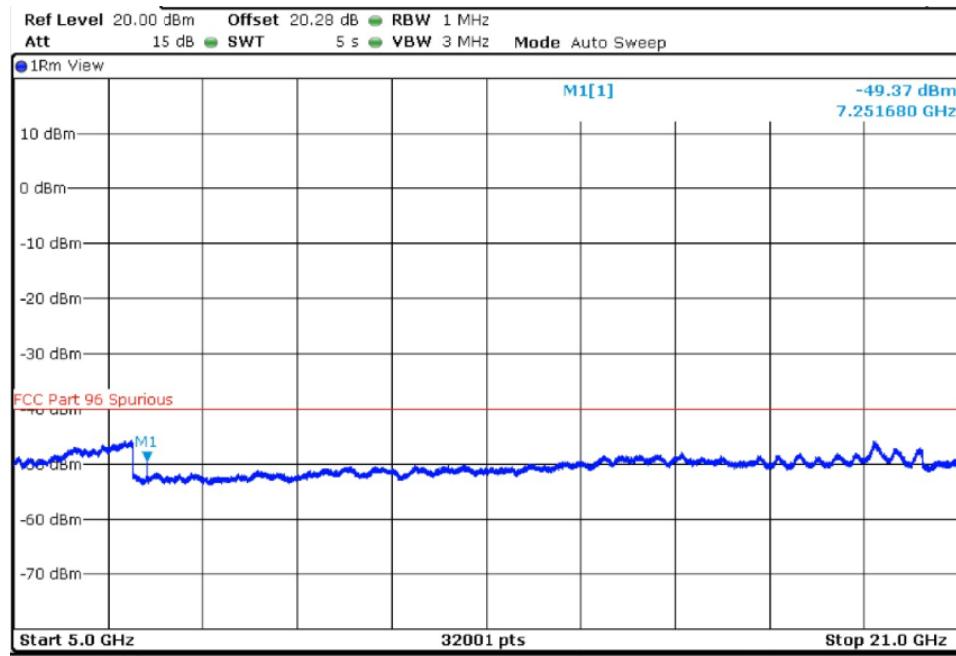
**Middle Channel (3625 MHz)**

FREQUENCY RANGE 20 MHz-5 GHz

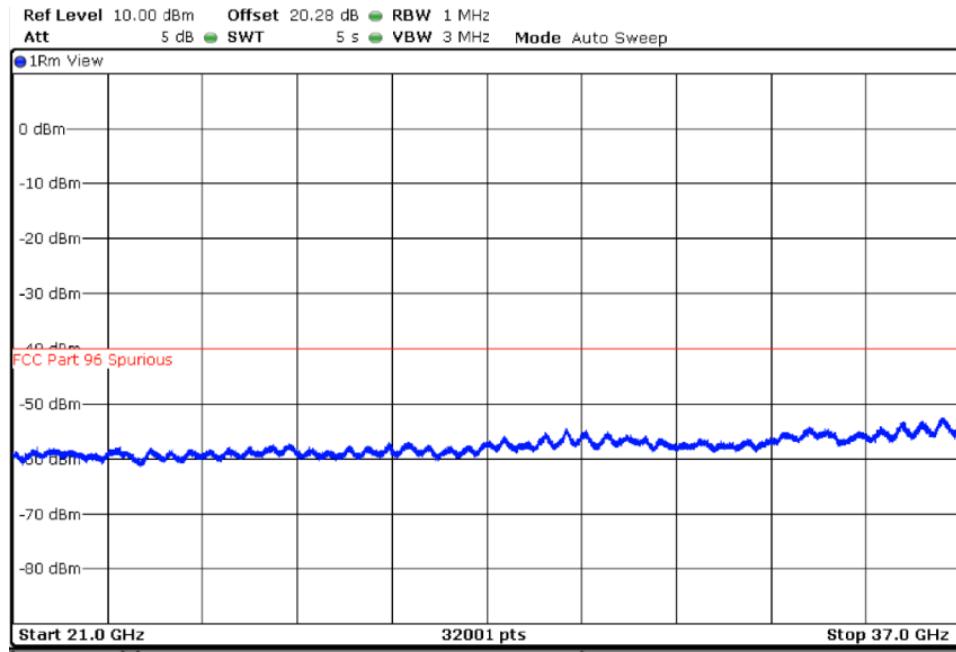


**TEST RESULTS (Cont.):**

**FREQUENCY RANGE 5-21 GHz**



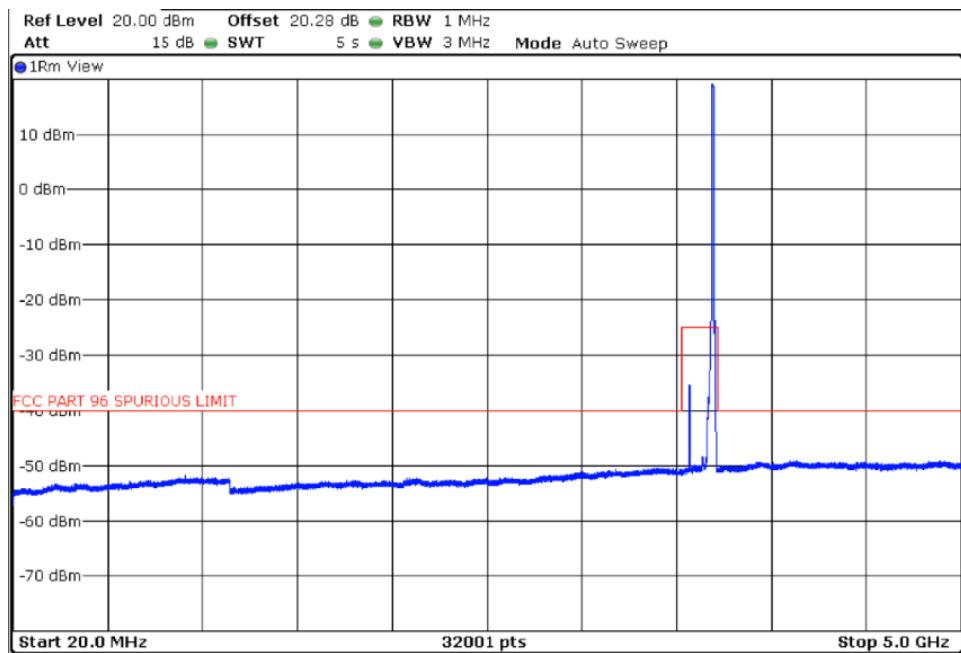
**FREQUENCY RANGE 21-37 GHz**



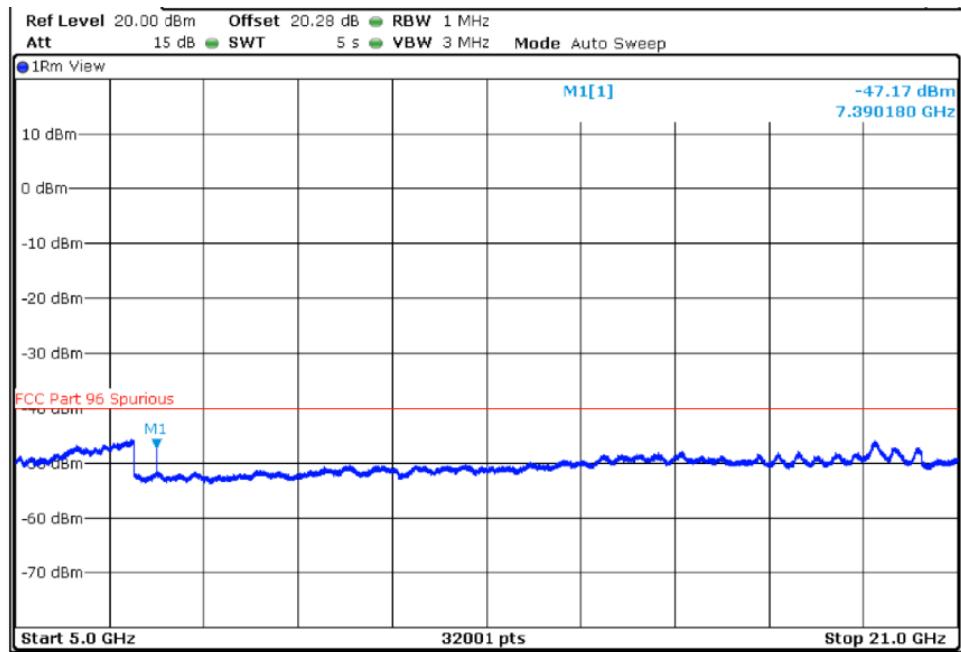
**TEST RESULTS (Cont.):**

**Highest Channel (3695 MHz)**

FREQUENCY RANGE 20 MHz-5 GHz

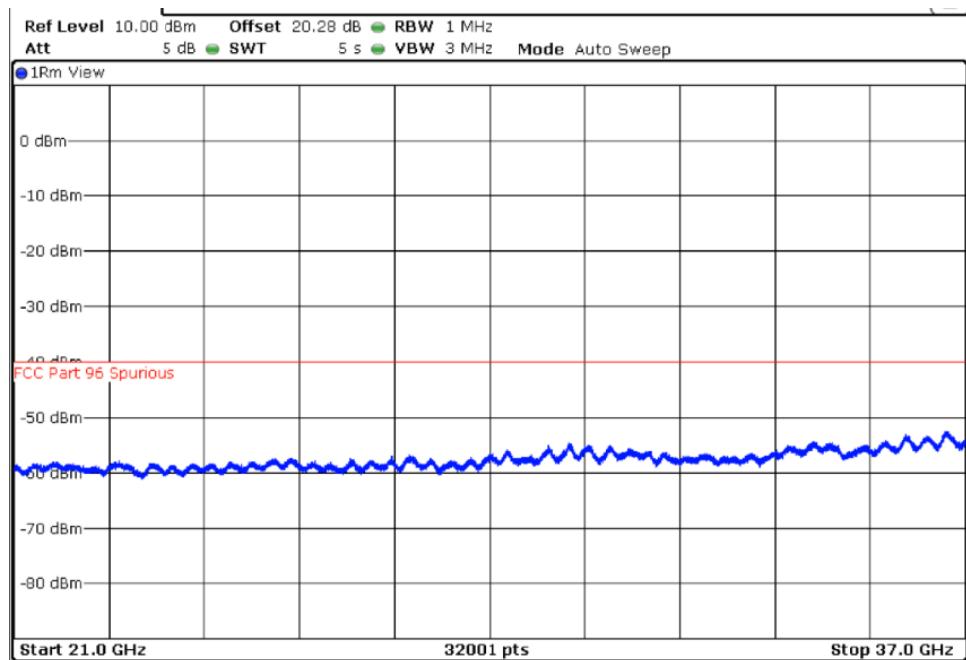


FREQUENCY RANGE 5-21 GHz



**TEST RESULTS (Cont.):**

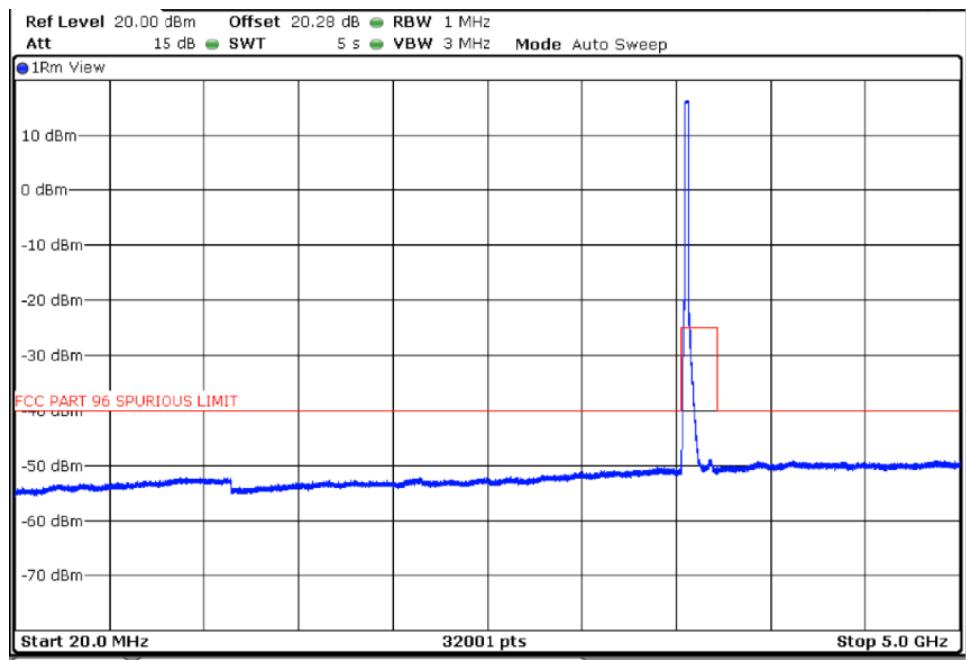
**FREQUENCY RANGE 21-37 GHz**



**20 MHz BW**

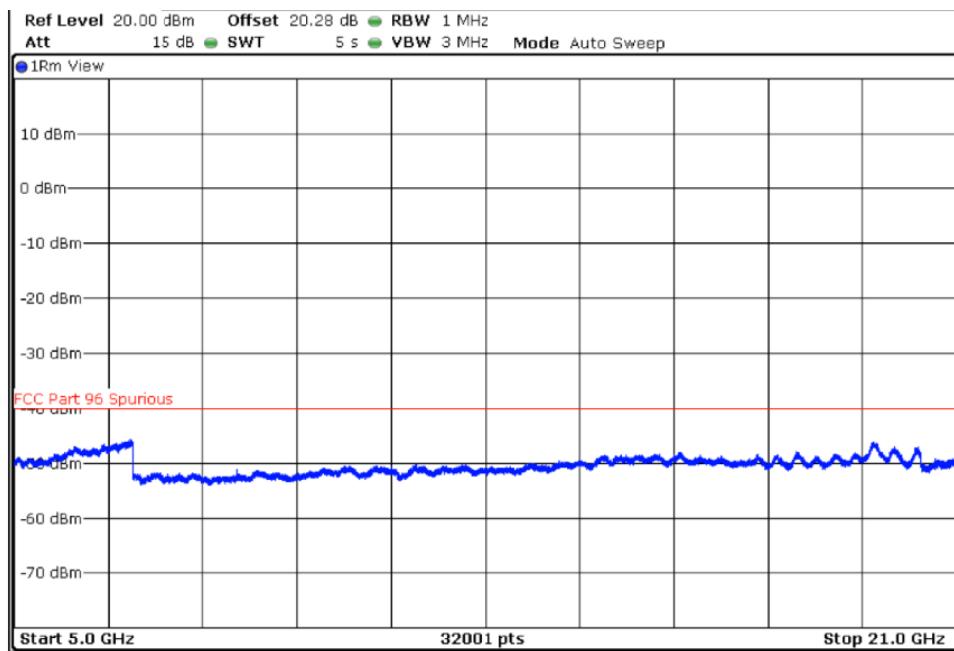
**Lowest Channel (3560 MHz)**

**FREQUENCY RANGE 20 MHz-5 GHz**

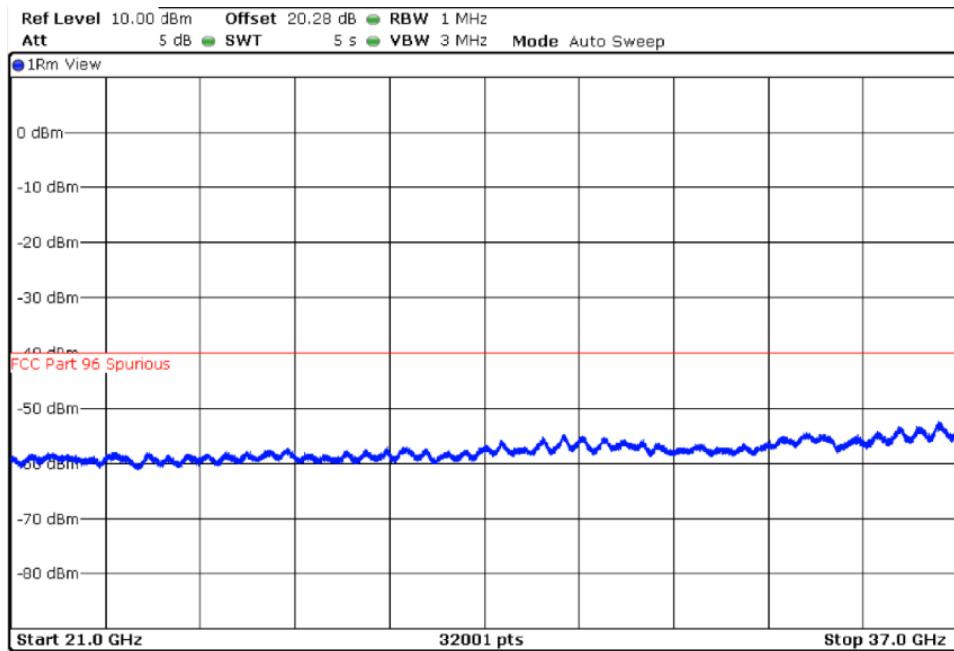


**TEST RESULTS (Cont.):**

**FREQUENCY RANGE 5-21 GHz**



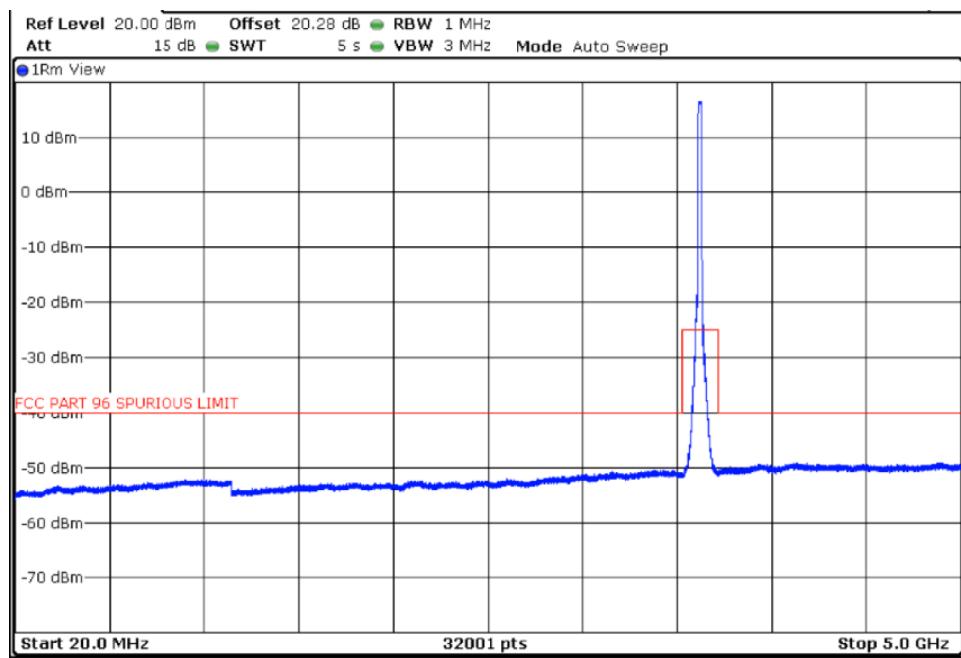
**FREQUENCY RANGE 21-37 GHz**



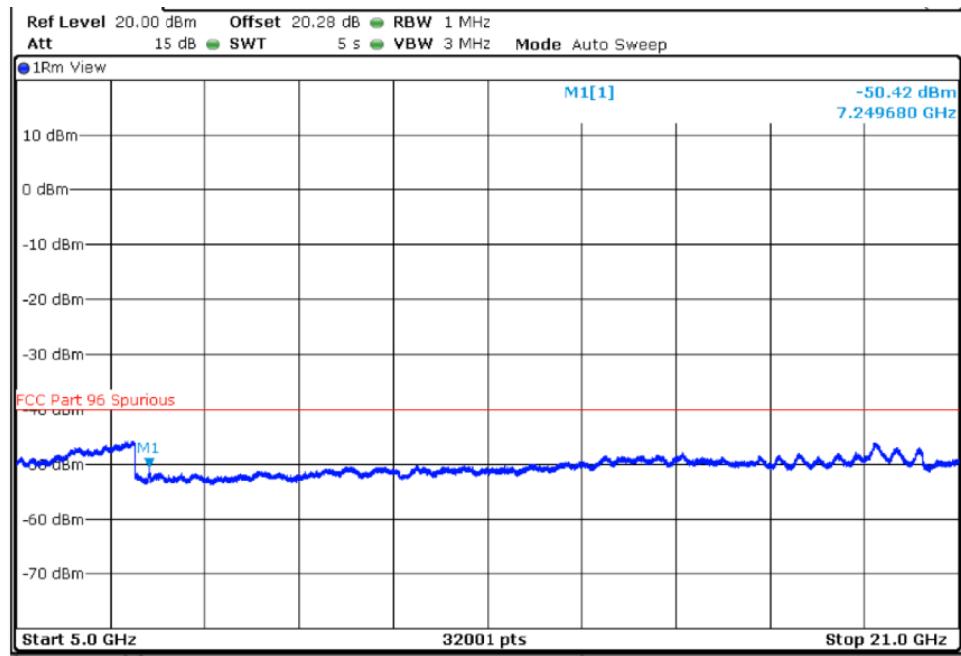
**TEST RESULTS (Cont.):**

**Middle Channel (3625 MHz)**

FREQUENCY RANGE 20 MHz-5 GHz

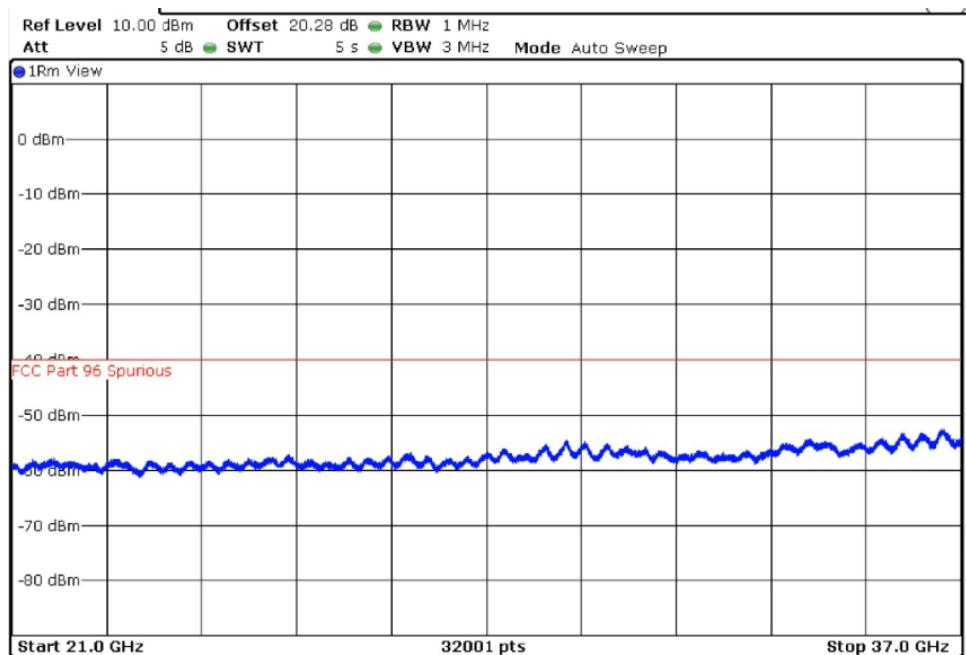


FREQUENCY RANGE 5-21 GHz



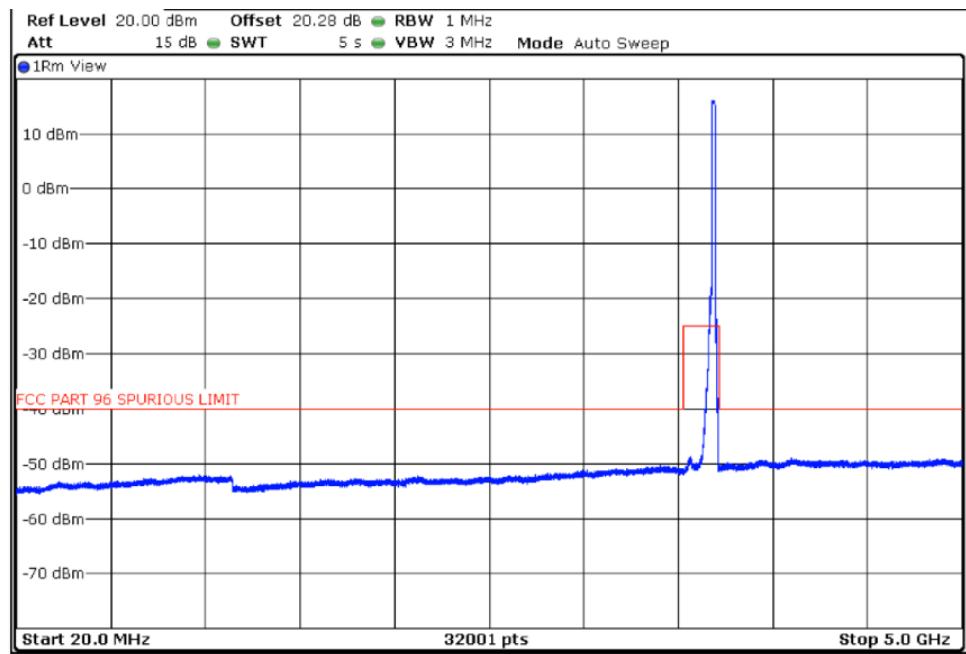
**TEST RESULTS (Cont.):**

**FREQUENCY RANGE 21-37 GHz**



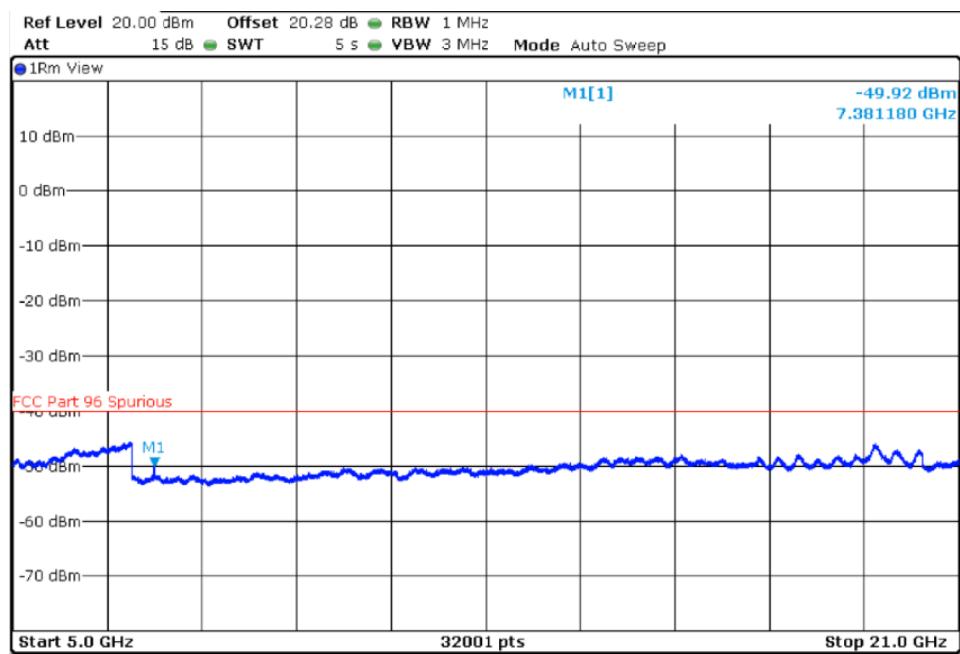
**Highest Channel (3690 MHz)**

**FREQUENCY RANGE 20 MHz-5 GHz**

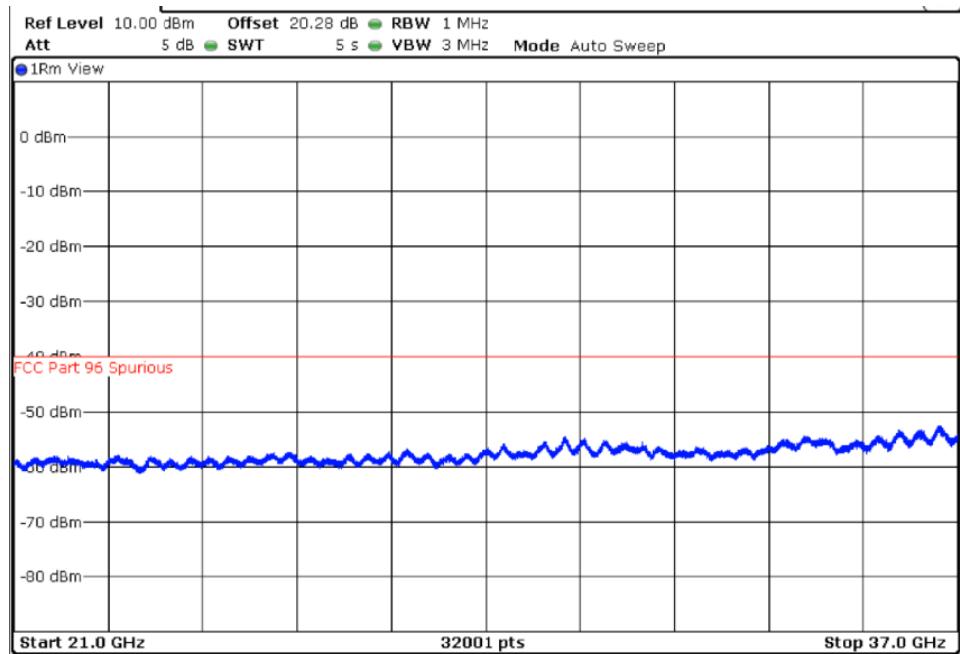


**TEST RESULTS (Cont.):**

**FREQUENCY RANGE 5-21 GHz**



**FREQUENCY RANGE 21-37 GHz**



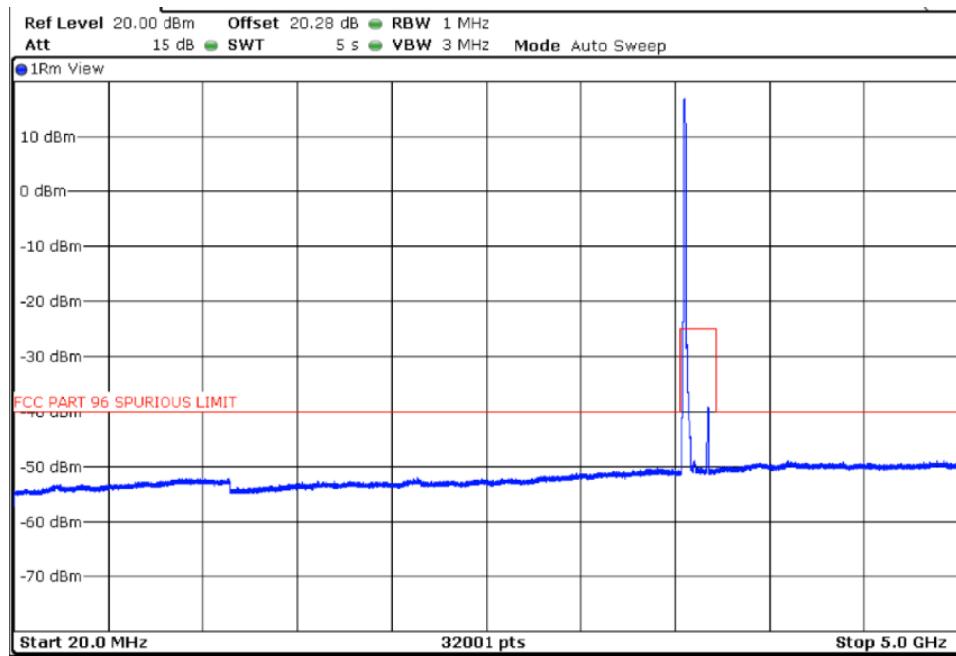
## TEST RESULTS (Cont.):

### Port 2:

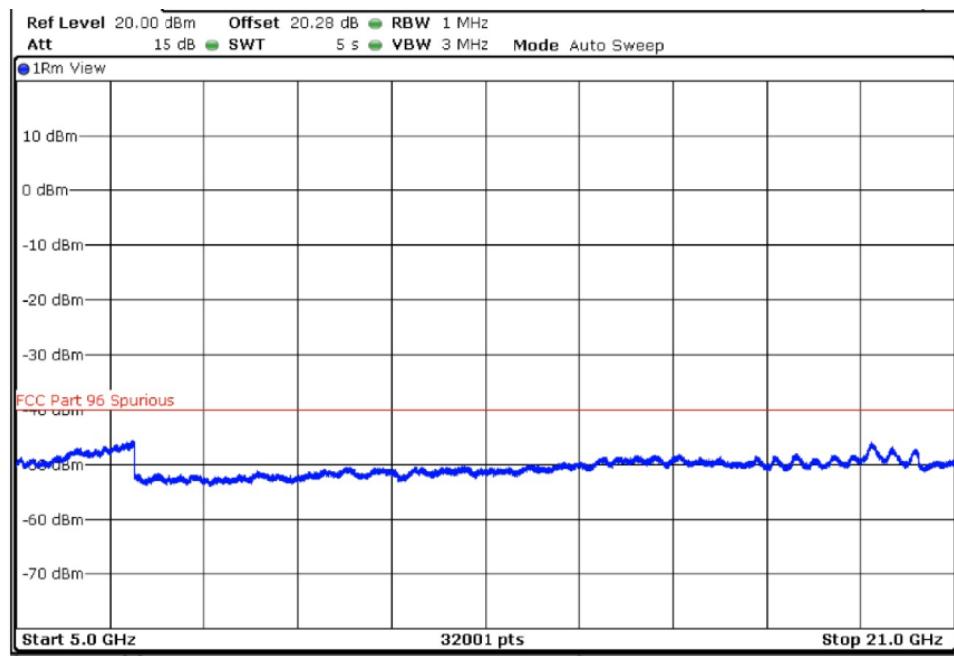
#### 10MHz BW

##### **Lowest Channel (3555 MHz)**

FREQUENCY RANGE 20 MHz-5 GHz

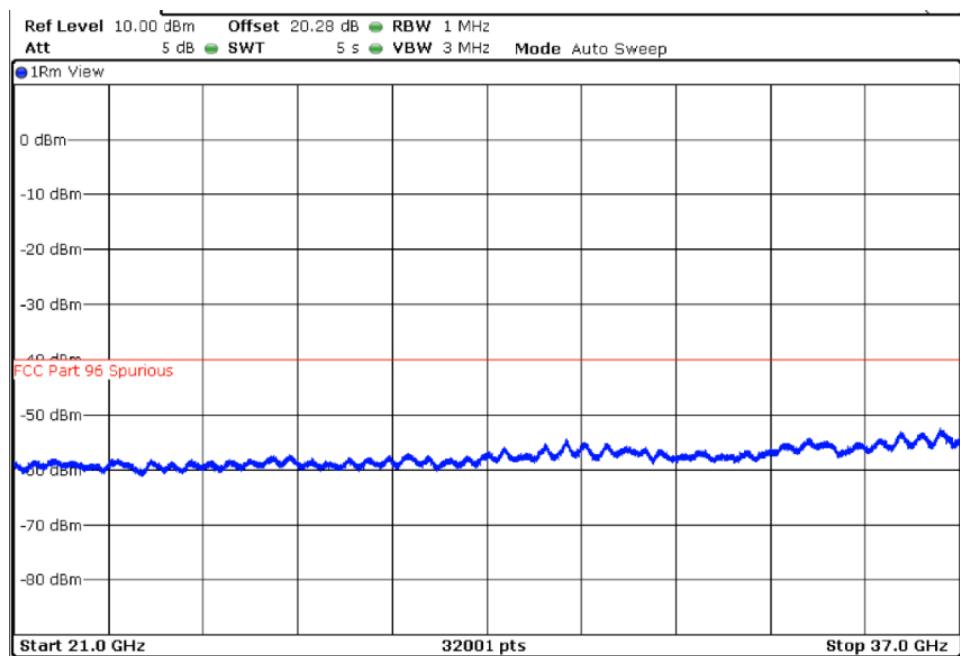


FREQUENCY RANGE 5-21 GHz



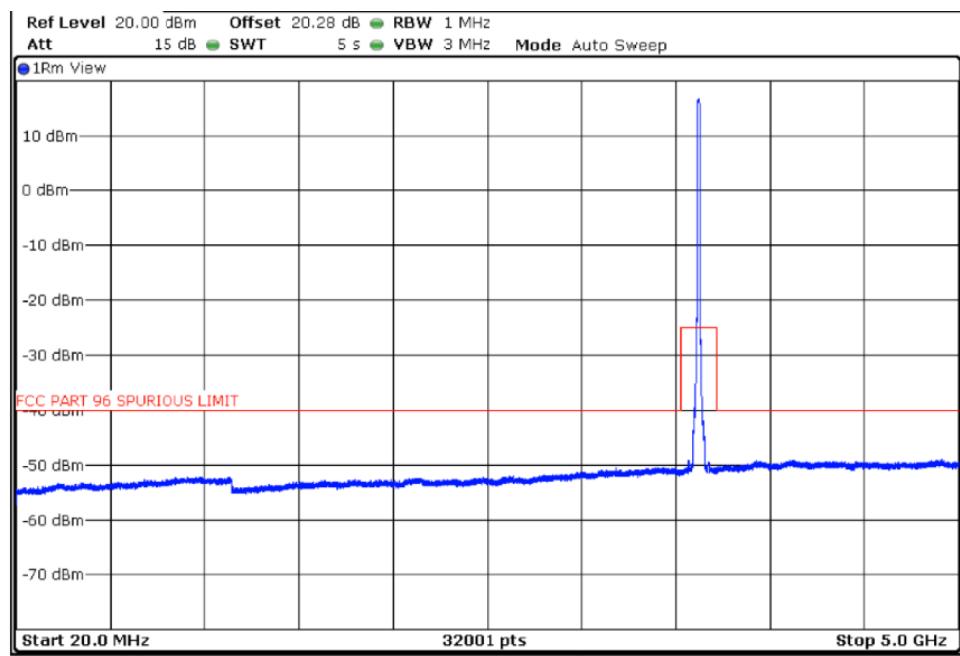
**TEST RESULTS (Cont.):**

FREQUENCY RANGE 21-37 GHz



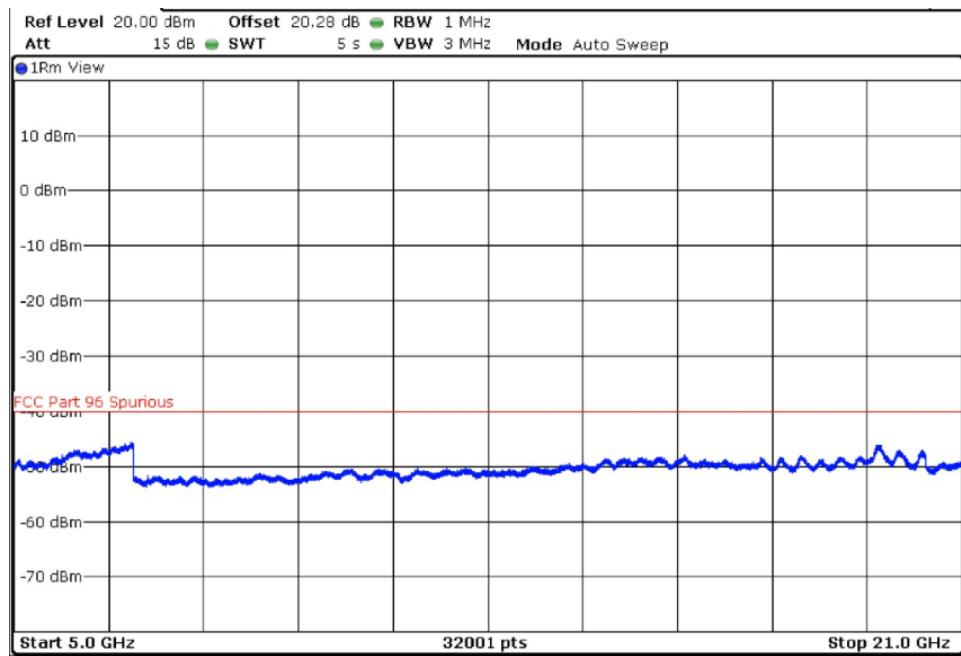
**Middle Channel (3625 MHz)**

FREQUENCY RANGE 20 MHz-5 GHz



**TEST RESULTS (Cont.):**

**FREQUENCY RANGE 5-21 GHz**



**FREQUENCY RANGE 21-37 GHz**

