11. SPURIOUS AND HARMONIC EMISSION AT ANTENNA TERMINAL

FCC Rules

Test Requirements:

§ 2.1051 Measurements required: Spurious emissions at antenna terminals:

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.

§ 90.219 Use of signal boosters.

(e) *Device Specifications.* In addition to the general rules for equipment certification in §90.203(a)(2) and part 2, subpart J of this chapter, a signal booster must also meet the rules in this paragraph.

(3) Spurious emissions from a signal booster must not exceed −13 dBm within any 100 kHz measurement bandwidth.

§ 90.543 Emission limitations.

Transmitters designed to operate in 769-775 MHz and 799-805 MHz frequency bands must meet the emission limitations in paragraphs (a) through (d) of this section. Class A and Class B signal boosters retransmitting signals in the 769-775 MHz and 799-805 MHz frequency bands are exempt from the limits listed in paragraph (a) of this section when simultaneously retransmitting multiple signals and instead shall be subject to the limit listed in paragraph (c) of this section when operating in this manner. Transmitters operating in 758-768 MHz and 788-798 MHz bands must meet the emission limitations in (e) of this section.

(a) The adjacent channel power (ACP) requirements for transmitters designed for various channel sizes are shown in the following tables. Mobile station requirements apply to handheld, car mounted and control station units. The tables specify a value for the ACP as a function of the displacement from the channel center frequency and measurement bandwidth. In the following tables, "(s)" indicates a swept measurement may be used.

6.25 kHz Mobile Transmitter ACP Requirements

Offset from center frequency (kHz)	Measurement bandwidth (kHz)	Maximum ACP relative (dBc)
6.25	6.25	−40
12.5	6.25	−60

18.75	6.25	−60
25.00	6.25	−65
37.50	25.00	−65
62.50	25.00	−65
87.50	25.00	−65
150.00	100.00	−65
250.00	100.00	−65
350.00	100.00	−65
>400 kHz to 12 MHz	30 (s)	−75
12 MHz to paired receive band	30 (s)	−75
In the paired receive band	30 (s)	−100

12.5 kHz Mobile Transmitter ACP Requirements

Offset from center frequency (kHz)	Measurement bandwidth (kHz)	Maximum ACP relative (dBc)
9.375	6.25	−40
15.625	6.25	−60
21.875	6.25	−60
37.50	25.00	−60
62.50	25.00	−65
87.50	25.00	−65
150.00	100	−65
250.00	100	−65
350.00	100	−65
>400 to 12 MHz	30 (s)	−75
12 MHz to paired receive band	30 (s)	−75
In the paired receive band	30 (s)	−100

25 kHz Mobile Transmitter ACP Requirements

Offset from center frequency (kHz)	Measurement bandwidth (kHz)	Maximum ACP relative (dBc)
15.625	6.25	−40
21.875	6.25	−60
37.50	25	−60

62.50	25	−65
87.50	25	−65
150.00	100	−65
250.00	100	−65
350.00	100	−65
>400 kHz to 12 MHz	30 (s)	−75
12 MHz to paired receive band	30 (s)	−75
In the paired receive band	30 (s)	−100

6.25 kHz Base Transmitter ACP Requirements

Offset from center frequency (kHz)	Measurement bandwidth (kHz)	Maximum ACP (dBc)
6.25	6.25	−40
12.50	6.25	−60
18.75	6.25	−60
25.00	6.25	−65
37.50	25	−65
62.50	25	−65
87.50	25	−65
150.00	100	−65
250.00	100	−65
350.00	100	−65
>400 to 12 MHz	30 (s)	−80
12 MHz to paired receive band	30 (s)	−80
In the paired receive band	30 (s)	[1]-85

[1]Although we permit individual base transmitters to radiate a maximum ACP of −85 dBc in the paired receive band, licensees deploying these transmitters may not exceed an ACP of −100 dBc in the paired receive band when measured at either the transmitting antenna input port or the output of the transmitter combining network. Consequently, licensees deploying these transmitters may need to use external filters to comply with the more restrictive ACP limit.

12.5 kHz Base Transmitter ACP Requirements

Offset from center frequency (kHz)	Measurement bandwidth (kHz)	Maximum ACP (dBc)

9.375	6.25	−40
15.625	6.25	−60
21.875	6.25	−60
37.5	25	−60
62.5	25	−65
87.5	25	−65
150	100	−65
250	100	−65
350.00	100	−65
>400 kHz to 12 MHz	30 (s)	−80
12 MHz to paired receive band	30 (s)	−80
In the paired receive band	30 (s)	[1]-85

[1]Although we permit individual base transmitters to radiate a maximum ACP of −85 dBc in the paired receive band, licensees deploying these transmitters may not exceed an ACP of −100 dBc in the paired receive band when measured at either the transmitting antenna input port or the output of the transmitter combining network. Consequently, licensees deploying these transmitters may need to use external filters to comply with the more restrictive ACP limit.

25 kHz Base Transmitter ACP Requirements

Offset from center frequency (kHz)	Measurement bandwidth (kHz)	Maximum ACP (dBc)
15.625	6.25	−40
21.875	6.25	−60
37.5	25	−60
62.5	25	−65
87.5	25	−65
150	100	−65
250	100	−65
350	100.00	−65
>400 kHz to 12 MHz	30 (s)	−80
12 MHz to paired receive band	30 (s)	−80
In the paired receive band	30 (s)	[1]-85

[1]Although we permit individual base transmitters to radiate a maximum ACP of −85 dBc in the paired receive band, licensees deploying these transmitters may not exceed an ACP of −100 dBc in the paired receive band when measured at either the transmitting antenna input port or

the output of the transmitter combining network. Consequently, licensees deploying these transmitters may need to use external filters to comply with the more restrictive ACP limit.

(b) *ACP measurement procedure.* The following are the procedures for making the transmitter ACP measurements. For all measurements modulate the transmitter as it would be modulated in normal operating conditions. For time division multiple access (TDMA) systems, the measurements are to be made under TDMA operation only during time slots when the transmitter is active. All measurements are made at the transmitter's output port. If a transmitter has an integral antenna, a suitable power coupling device shall be used to couple the RF signal to the measurement instrument. The coupling device shall substantially maintain the proper transmitter load impedance. The ACP measurements may be made with a spectrum analyzer capable of making direct ACP measurements. "Measurement bandwidth", as used for non-swept measurements, implies an instrument that measures the power in many narrow bandwidths equal to the nominal resolution bandwidth and integrates these powers to determine the total power in the specified measurement bandwidth.

(1) *Setting reference level.* Set transmitter to maximum output power. Using a spectrum analyzer capable of ACP measurements, set the measurement bandwidth to the channel size. For example, for a 6.25 kHz transmitter set the measurement bandwidth to 6.25 kHz. Set the frequency offset of the measurement bandwidth to zero and adjust the center frequency of the instrument to the assigned center frequency to measure the average power level of the transmitter. Record this power level in dBm as the "reference power level."

(2) *Non-swept power measurement.* Using a spectrum analyzer capable of ACP measurements, set the mesurement bandwidth and frequency offset from the assigned center frequency as shown in the tables in §90.543 (a) above. Any value of resolution bandwidth may be used as long as it does not exceed 2 percent of the specified measurement bandwidth. Measure the power level in dBm. These measurements should be made at maximum power. Calculate ACP by substracting the reference power level measured in (b)(1) from the measurements made in this step. The absolute value of the calculated ACP must be greater than or equal to the absolute value of the ACP given in the table for each condition above.

(3) *Swept power measurement.* Set a spectrum analyzer to 30 kHz resolution bandwidth, 1 MHz video bandwidth and average, sample, or RMS detection. Set the reference level of the spectrum analyzer to the RMS value of the transmitter power. Sweep above and below the carrier frequency to the limits defined in the tables. Calculate ACP by substracting the reference power level measured in (b)(1) from the measurements made in this step. The absolute value of the calculated ACP must be greater than or equal to the absolute value of the ACP given in the table for each condition above.

(c) *Out-of-band emission limit.* On any frequency outside of the frequency ranges covered by the ACP tables in this section, the power of any emission must be reduced below the mean output power (P) by at least 43 + 10log (P) dB measured in a 100 kHz bandwidth for frequencies less than 1 GHz, and in a 1 MHz bandwidth for frequencies greater than 1 GHz.

(d) *Authorized bandwidth.* Provided that the ACP requirements of this section are met, applicants may request any authorized bandwidth that does not exceed the channel size.

(e) For operations in the 758-768 MHz and the 788-798 MHz bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations.

(2) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations.

(3) On any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, by at least 43 + 10 log (P) dB.

(4) Compliance with the provisions of paragraphs (e)(1) and (2) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

(5) Compliance with the provisions of paragraph (e)(3) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of 30 kHz may be employed.

(f) For operations in the 758-775 MHz and 788-805 MHz bands, all emissions including harmonics in the band 1559-1610 MHz shall be limited to −70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

IC Rules

Test Requirements:

RSS-119

5. Transmitter and Receiver Specifications

5.8 Transmitter Unwanted Emissions

5.8.9 Emission Mask for Equipment in the Bands 768-776 MHz and 798-806 MHz

5.8.9.1 Adjacent Channel Power (ACP)

The ACP of transmitters operating in the bands 768-776 MHz and 798-806 MHz shall comply with the requirements for various transmitter channel sizes provided in tables 13 to 16. Mobile station requirements apply to handheld, car-mounted and control station units. The tables specify a maximum value for the ACP relative to the maximum output power as a function of the displacement f_d from the channel centre frequency. In the tables, “s” indicates that a swept measurement may be used.

Table 13 — ACP Requirements for 6.25 kHz Bandwidth Transmitters

Displacement Frequency, fd (kHz)	Maximum Relative ACP (dBc)		Measurement Bandwidth (kHz)
	Mobile Station	Base Station	
6.25	−40	−40	6.25
12.5	−60	−60	
18.75			
25	−65	−65	
37.5	−65	−65	25
62.5			
87.5			
150	−65	−65	100
250			
350			
400 < fd ≤ 12 MHz	−75	−80	30(s)
12 MHz < fd ≤paired receive band			
In the paired receive band	−100	−85	

Table 14 — ACP Requirements for 12.5 kHz Bandwidth Transmitters

Displacement Frequency, fd (kHz)	Maximum Relative ACP (dBc)		Measurement Bandwidth (kHz)
	Mobile Station	Base Station	
9.375	−40	−40	6.25
15.625	−60	−60	
21.875			
37.5	−60	−60	25
62.5	−65	−65	25

87.5			
150	−65	−65	100
250			
350			
400 < fd ≤ 12 MHz	−75	−80	30(s)
12 MHz > fd ≤ paired receive band			
In the paired receive band	−100	−85	

Table 15 — ACP Requirements for 25 kHz Bandwidth Transmitters

Displacement Frequency, fd (kHz)	Maximum Relative ACP (dBc)		Measurement Bandwidth (kHz)
	Mobile Station	Base Station	
15.625	−40	−40	6.25
21.875	−60	−60	6.25
37.5	−60	−60	25
62.5	−65	−65	25
87.5			25
150	−65	−65	100
250			
350			
400 ≤ fd ≤ 12 MHz	−75	−80	30(s)
12 MHz ≤ fd ≤ paired receive band			
In the paired receive band	−100	−85	

Table 16 — ACP Requirements for 50 kHz Bandwidth Transmitters

Displacement Frequency, fd (kHz)	Maximum Relative ACP (dBc)		Measurement Bandwidth (kHz)
	Mobile Station	Base Station	
50	−40	−40	50

100	−50	−50	
150			
200			
250			
300		−55	
350			
400		−60	
450			
500			
550			
600 ≤ fd < 1000	−60	−65	30(s)
1000 ≤ fd < 2000	−65	−70	
2000 ≤ fd < 9000	−70	−75	
9000 ≤ fd ≤ paired receive band			
In the paired receive band	−100	−85	

5.8.9.2 Out-of-Band Emission Limit

On any frequency outside of the ranges specified in the ACP tables 13 to 16, the power of any emission shall be attenuated below the mean output power P (dBW) by at least 43 + 10 $\log_{10}(p)$, measured in a 100 kHz bandwidth for frequencies less than or equal to 1 GHz, and in a 1 MHz bandwidth for frequencies greater than 1 GHz.

In addition, for operations in the bands 768-776 MHz and 798-806 MHz, all emissions (including harmonics in the band 1559-1610 MHz), shall not exceed:

−70 dBW/MHz equivalent isotropically radiated power (e.i.r.p.) for wideband emissions, and

−80 dBW/kHz e.i.r.p. for discrete emissions of less than 700 Hz bandwidth.

RSS-131

6. Equipment standard specifications for zone enhancers working with equipment certified under RSS-119

6.5 Spurious emissions

The spurious emissions of a zone enhancer shall not exceed −13 dBm in any 100 kHz measurement bandwidth.

Test Procedures:

Measurements were in accordance with the test methods section 3.6 and 4.7 of KDB 935210 D05 v01r01.

3.6.1. General

Spurious emissions shall be measured using a single test signal sequentially tuned to the low, middle and high channels or frequencies within each authorized frequency band of operation. Out-of-band/block emissions (including intermodulation products) shall be measured under each of the following two stimulus conditions:

a) two adjacent test signals sequentially tuned to the lower and upper frequency band/block edges;

b) a single test signal, sequentially tuned to the lowest and highest frequencies or channels within the frequency band/block under examination.

NOTE—Single channel boosters that cannot accommodate two simultaneous signals within the passband, can be excluded from the test stipulated in step a).

3.6.2. EUT out-of-band/block emissions conducted measurement

a) Connect a signal generator to the input of the EUT.

NOTE—If the signal generator is not capable of generating two modulated carriers simultaneously, then two discrete signal generators can be connected with an appropriate combining network to support the two-tone test.

b) Set the signal generator to produce two AWGN signals as previously described (e.g., 4.1 MHz OBW).

c) Set the center frequencies such that the AWGN signals occupy adjacent channels, as defined by industry standards such as 3GPP or 3GPP2, at the upper edge of the frequency band or block of interest.

d) Set the composite power levels such that the input signal is just below the AGC threshold (see 3.2), but not more than 0.5 dB below. The composite power can be measured using the procedures provided in KDB Publication 971168, but it will be necessary to expand the power integration bandwidth so as to include both of the transmit channels. Alternatively, the composite power can be measured using an average power meter as described in KDB Publication 971168.

e) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation as necessary.

f) Set the RBW = reference bandwidth in the applicable rule section for the supported frequency band (typically 1 % of the emission bandwidth, 100 kHz, or 1 MHz)

g) Set the VBW = 3 × RBW.

h) Set the detector to power averaging (rms) detector.

i) Set the Sweep time = auto-couple.

j) Set the analyzer start frequency to the upper block edge frequency and the stop frequency to the upper block edge frequency plus 300 kHz or 3 MHz for frequencies below and above 1 GHz, respectively.

k) Trace average at least 100 traces in power averaging (i.e., rms) mode.

l) Use the marker function to find the maximum power level.

m) Capture the spectrum analyzer trace of the power level for inclusion in the test report.

n) Repeat the procedure with the composite input power level set to 3 dB above the AGC threshold.

o) Reset the input signals frequencies to the lower edge of the frequency block or band under examination.

p) Reset the spectrum analyzer start frequency to the lower block edge frequency minus 300 kHz, or 3 MHz (for frequencies below and above 1 GHz, respectively), and the stop frequency to the lower band or block edge frequency.

q) Repeat steps k) to n).

r) Repeat steps a) to q) with the signal generator configured for a single test signal tuned as close as possible to the block edges.

s) Repeat steps a) to r) with the narrowband test signal.

t) Repeat steps a) to s) for all authorized frequency bands or blocks used by the EUT.

3.6.3. EUT spurious emissions conducted measurement

a) Connect a signal generator to the input of the EUT.

b) Set the signal generator to produce the broadband test signal as previously described (e.g., 4.1 MHz OBW AWGN).

c) Set the center frequency of the test signal to the lowest available channel within the frequency band or block.

d) Set the EUT input power to a level that is just below the AGC threshold (see 3.2), but not more than 0.5 dB below.

e) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation as necessary.

f) Set the RBW = reference bandwidth in the applicable rule section for the supported frequency band of operation (e.g., reference bandwidth is typically 100 kHz or 1 MHz).

g) Set the VBW ≥ 3 × RBW.

h) Set the Sweep time = auto-couple.

i) Set the analyzer start frequency to the lowest radio frequency signal generated in the equipment, without going below 9 kHz, and the stop frequency to the lower band/block edge frequency minus 100 kHz or 1 MHz, as specified in the applicable rule part.

NOTE—The number of measurement points in each sweep must be ≥ (2 × span/RBW) which may require that the measurement range defined by the start and stop frequencies be subdivided, depending on the available number of measurement points provided by the spectrum analyzer.

j) Select the power averaging (rms) detector function.

k) Trace average at least 10 traces in power averaging (i.e., rms) mode.

l) Use the peak marker function to identify the highest amplitude level over each measured frequency range. Record the frequency and amplitude and capture a plot for inclusion in the test report.

m) Reset the analyzer start frequency to the upper band/block edge frequency plus 100 kHz or 1 MHz, as specified in the applicable rule part, and the analyzer stop frequency to 10 times the highest frequency of the fundamental emission (see §2.1057). Note that the number of measurement points in each sweep must be ≥ (2 × span/RBW) which may require that the measurement range defined by the start and stop frequencies be subdivided, depending on the available number of measurement points provided by the spectrum analyzer.

n) Trace average at least 10 traces in power averaging (i.e., rms) mode.

o) Use the peak marker function to identify the highest amplitude level over each of the measured frequency ranges. Record the frequency and amplitude and capture a plot for inclusion in the test report and provide tabular data, if required.

p) Repeat the procedure with the input test signals tuned to a middle band/block frequency/channel and then a high band/block frequency/channel.

q) Repeat entire procedure with the narrowband test signal.

r) Repeat for all authorized frequency bands/blocks used by the EUT.

4.7.2 EUT out-of-band/block emissions conducted measurement

Intermodulation products shall be measured while applying two CW tones spaced in frequency ±12.5 kHz relative to the center frequency (f0) as determined from 4.4.

a) Connect a signal generator to the input of the EUT.

NOTE—If the signal generator is not capable of producing two independent modulated carriers simultaneously, then two discrete signal generators can be connected with an appropriate combining network to support the two-tone test.

b) Configure the two signal generators to produce CW tones on frequencies spaced at ± 12.5 kHz relative to f0 with amplitude levels set just below the AGC threshold (see 4.2).

c) Connect a spectrum analyzer to the EUT output.

d) Set the span to 100 kHz.

e) Set the resolution bandwidth to 300 Hz with a video bandwidth ≥ 3 × RBW.

f) Set the detector to power average (rms).

g) Place a marker on highest intermodulation product amplitude.

h) Capture the plot for inclusion in the test report.

i) Repeat the procedure with the composite input power level set to 3 dB above the AGC threshold.

j) Repeat steps b) to h) for all operational bands.

4.7.3 EUT spurious emissions conducted measurement

a) Connect a signal generator to the input of the EUT.

b) Configure the signal generator to produce a CW signal.

c) Set the frequency of the CW signal to the center channel of the pass band.

d) Set the output power level so that the resultant signal is just below the AGC threshold (see 4.2).

e) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation as necessary.

f) Set the RBW to 100 kHz.

g) Set the VBW = 3 × RBW.

h) Set the Sweep time = auto-couple.

i) Set the detector to PEAK.

j) Set the analyzer start frequency to 30 MHz (or the lowest radio frequency signal generated in the equipment, without going below 9 kHz if the EUT has internal clock frequencies) and the stop frequency to 10 × the highest allowable frequency of the pass band.

k) Select MAX HOLD and use the marker peak function to find the highest emission(s) outside the pass band. (This could be either at a frequency lesser or greater than the pass band.)

l) Capture a plot for inclusion in the test report.

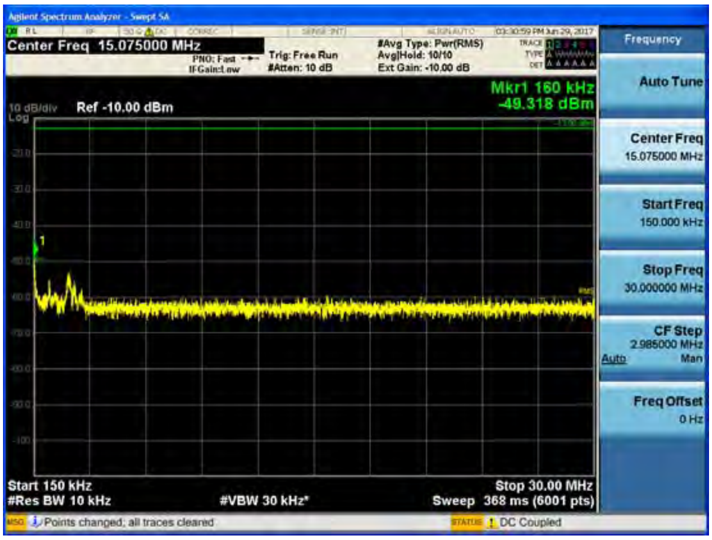
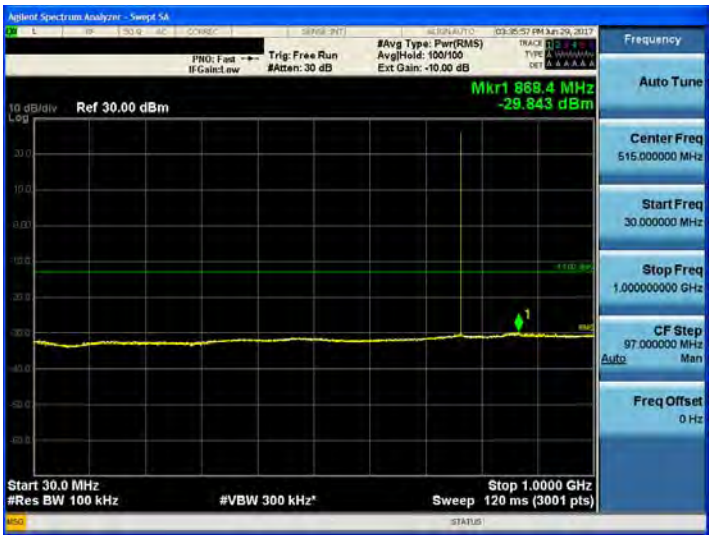
m) Repeat steps c) to l) for each authorized frequency band/block of operation.

Notes: In 9 KHz-150 KHz and 150 KHz-30 MHz bands, RBW was reduced to 1% and 10% of the reference bandwidth for measuring unwanted emission level(typically, 100KHz if the authorized frequency band is below 1GHz) and power was integrated. (1% = +20 dB, 10% = +10 dB)

Single channel Enhancer Plots of Spurious Emission

700 P25(12.5 kHz)_DL

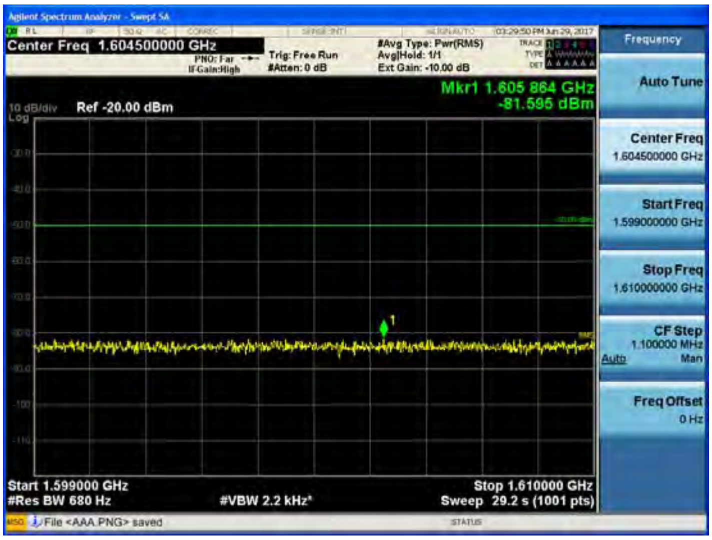
[Downlink_Low]

9 ㎑ ~ 150 ㎑	150 ㎑ ~ 30 ㎒
	
30 ㎒ ~ 1 ㎓	1 ㎓ ~ 3 ㎓
	

3 ㎓ ~ 12.75 ㎓

1599 ㎒ ~ 1610 ㎒ (1)

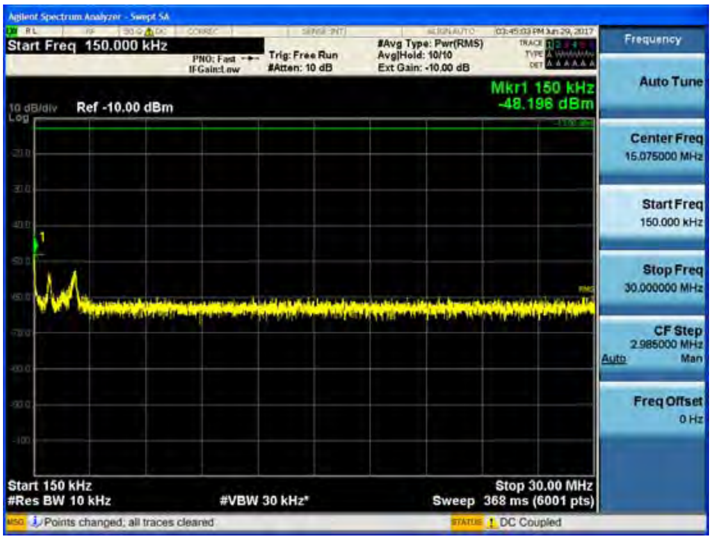
1599 ㎒ ~ 1610 ㎒ (2)



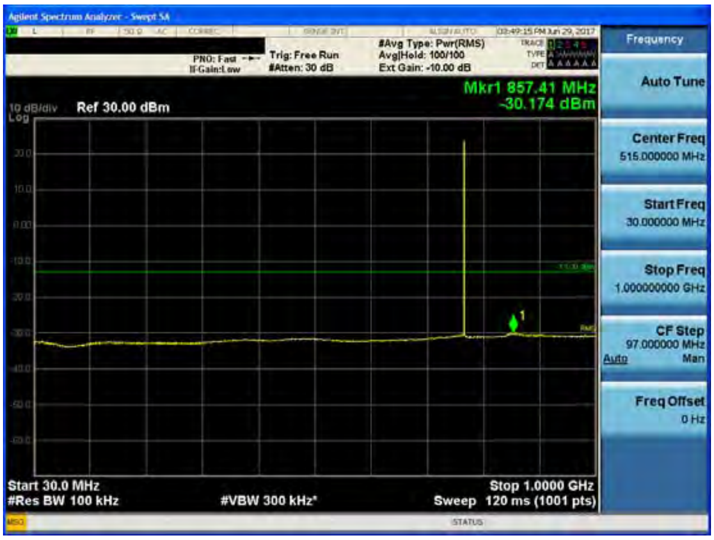
[Downlink_Middle]

9 ㎑ ~ 150 ㎑

150 ㎑ ~ 30 ㎒



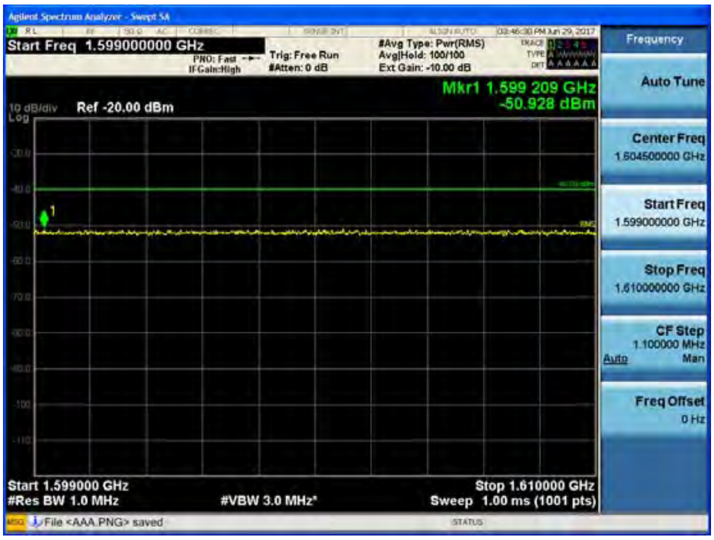
30 ㎒ ~ 1 ㎓



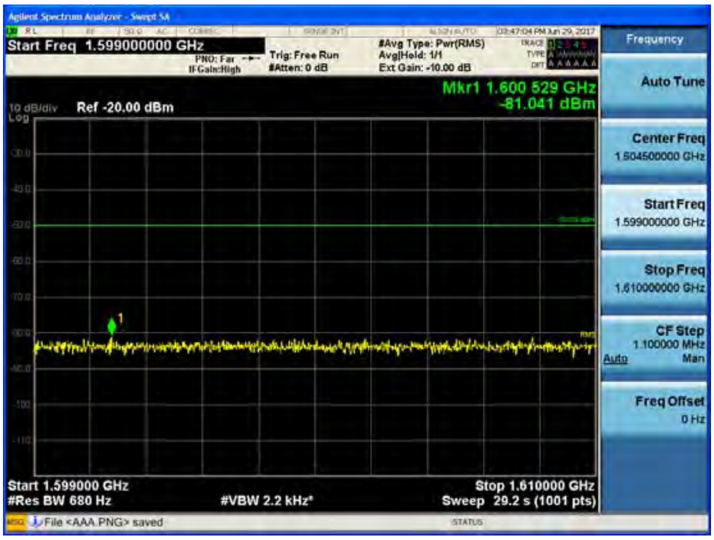
1 ㎓ ~ 3 ㎓

3 ㎓ ~ 12.75 ㎓

1599 ㎒ ~ 1610 ㎒ (1)



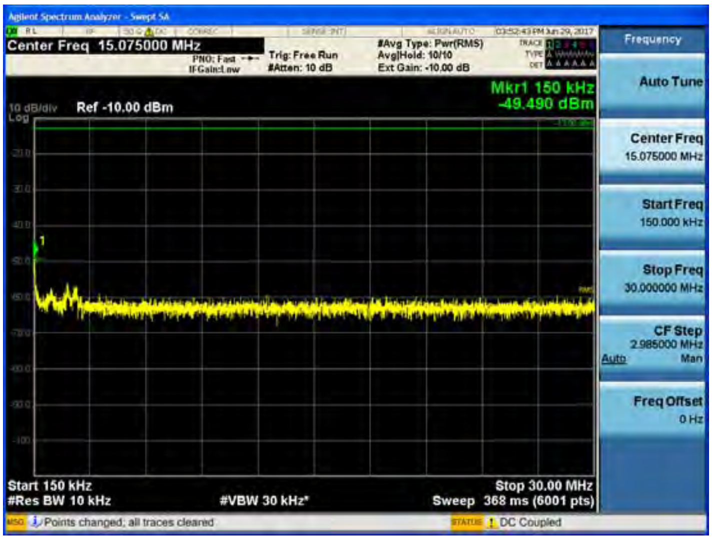
1599 ㎒ ~ 1610 ㎒ (2)



[Downlink_High]

9 ㎑ ~ 150 ㎑

150 ㎑ ~ 30 ㎒



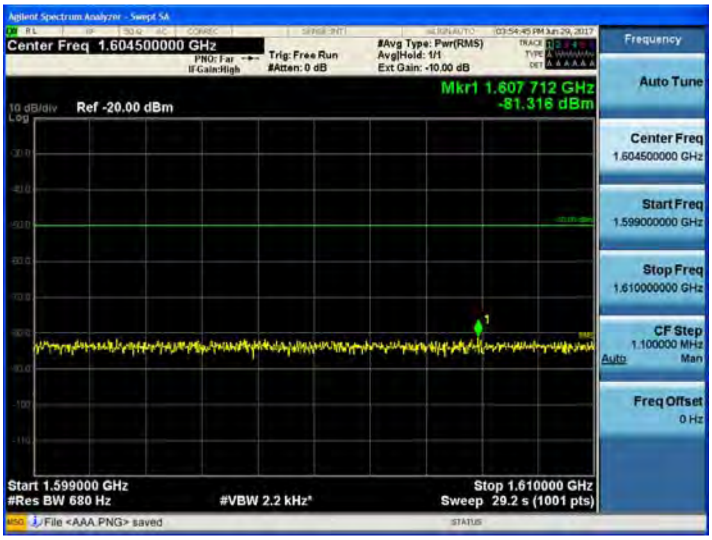
30 ㎒ ~ 1 ㎓

1 ㎓ ~ 3 ㎓

3 ㎓ ~ 12.75 ㎓

1599 ㎒ ~ 1610 ㎒ (1)

1599 ㎒ ~ 1610 ㎒ (2)

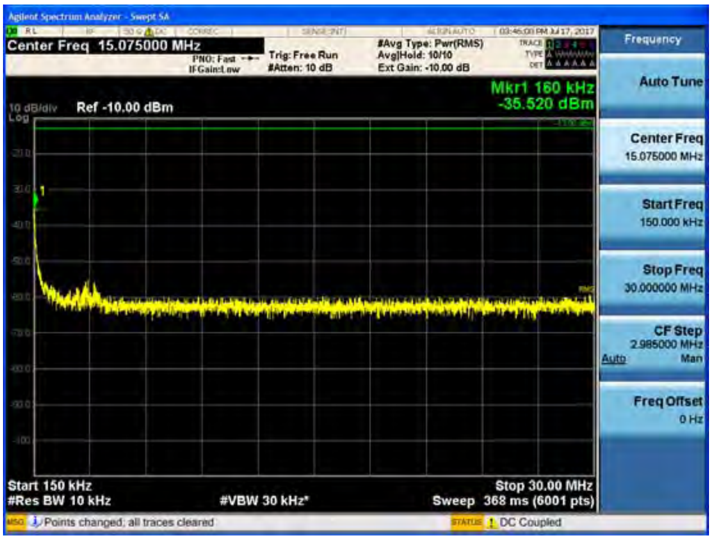


700 P25(12.5 kHz)_UL

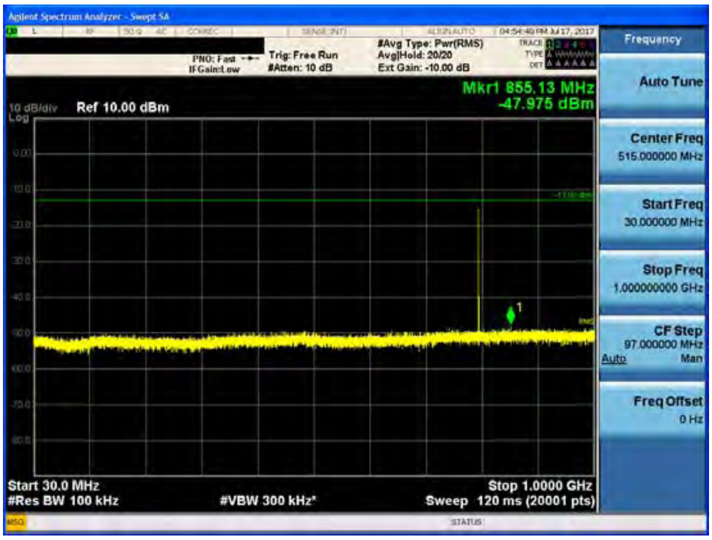
[Uplink_Low]

9 kHz ~ 150 kHz

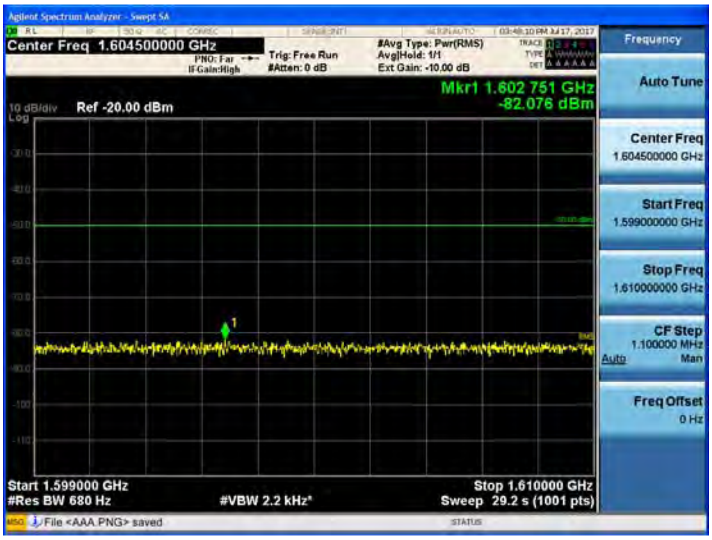
150 kHz ~ 30 MHz



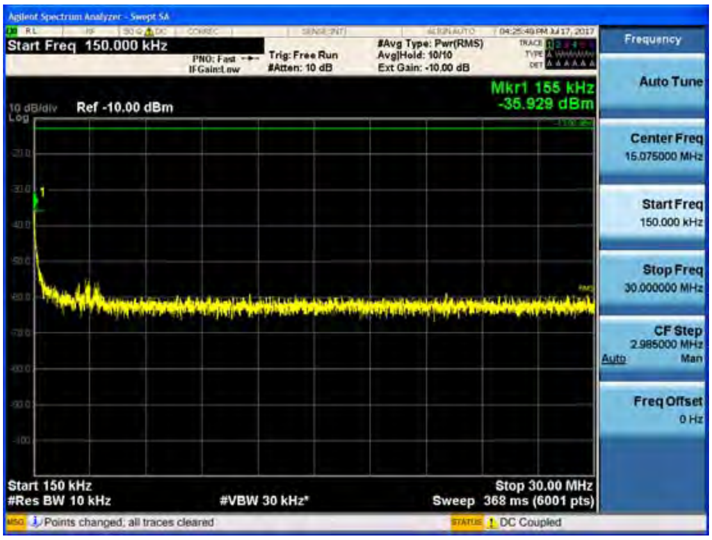
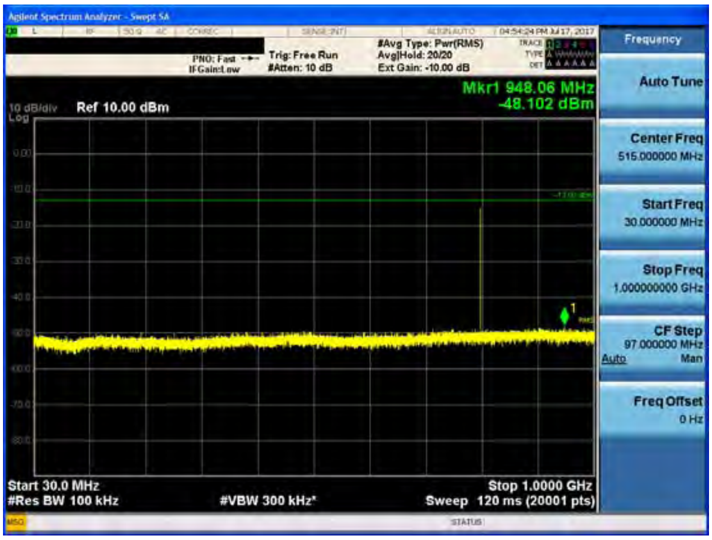
30 MHz ~ 1 GHz

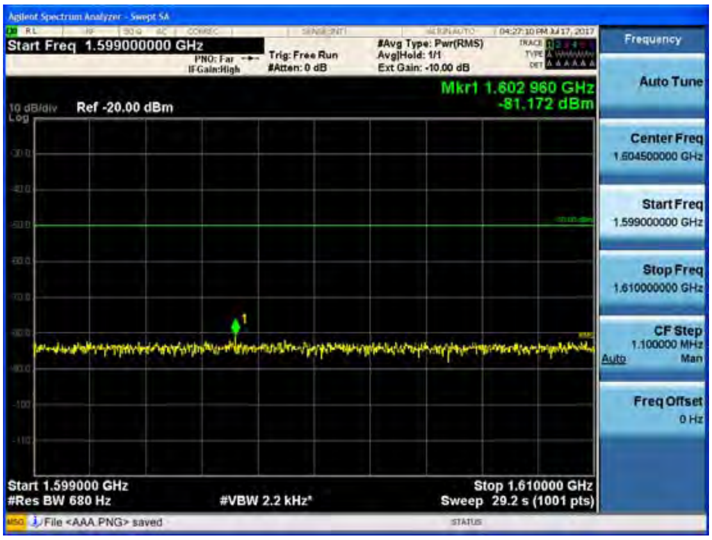


1 GHz ~ 3 GHz

3 GHz ~ 12.75 GHz	
	
1599 MHz ~ 1610 MHz (1)	**1599 MHz ~ 1610 MHz (2)**
	

[Uplink_Middle]

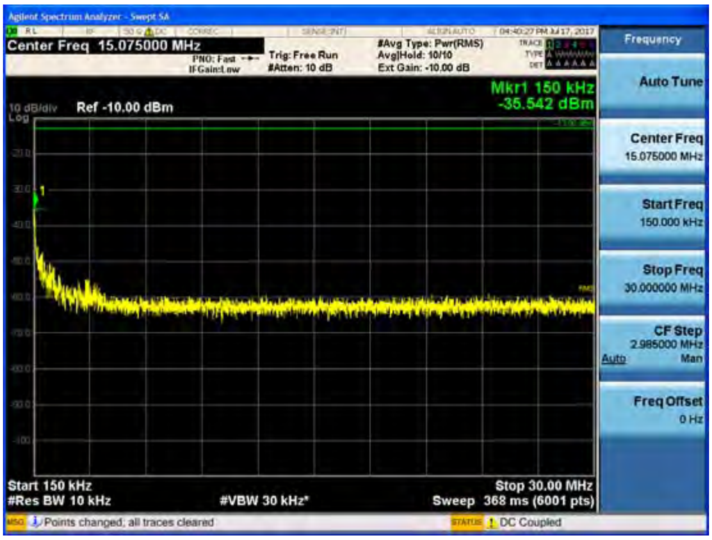
9 ㎑ ~ 150 ㎑	150 ㎑ ~ 30 ㎒
	
30 ㎒ ~ 1 ㎓	**1 ㎓ ~ 3 ㎓**
	

3 ㎓ ~ 12.75 ㎓	
	
1599 ㎒ ~ 1610 ㎒ (1)	**1599 ㎒ ~ 1610 ㎒ (2)**
	

[Uplink_High]

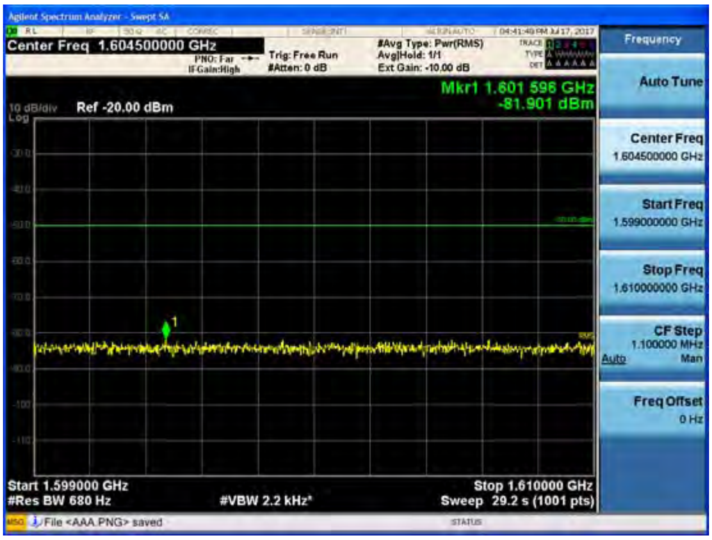
9 ㎑ ~ 150 ㎑

150 ㎑ ~ 30 ㎒



30 ㎒ ~ 1 ㎓

1 ㎓ ~ 3 ㎓

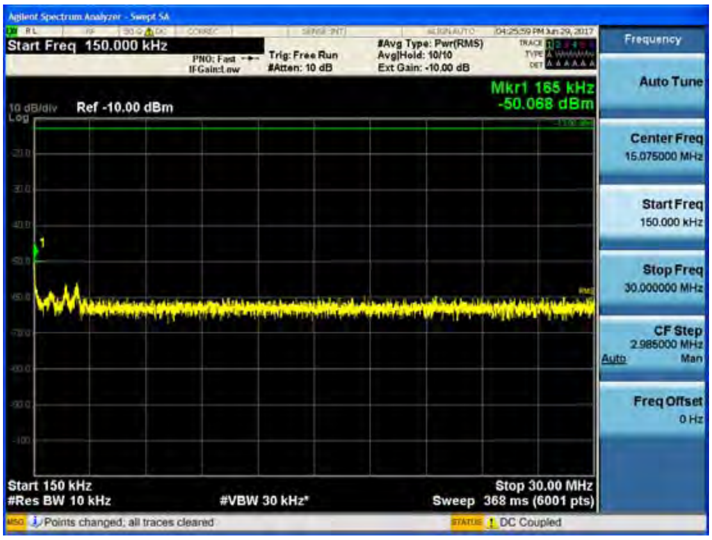
3 ㎓ ~ 12.75 ㎓	
	
1599 ㎒ ~ 1610 ㎒ (1)	1599 ㎒ ~ 1610 ㎒ (2)
	

800 P25(12.5 kHz)_DL

[Downlink_Low]

9 ㎑ ~ 150 ㎑

150 ㎑ ~ 30 ㎒



30 ㎒ ~ 1 ㎓

1 ㎓ ~ 3 ㎓

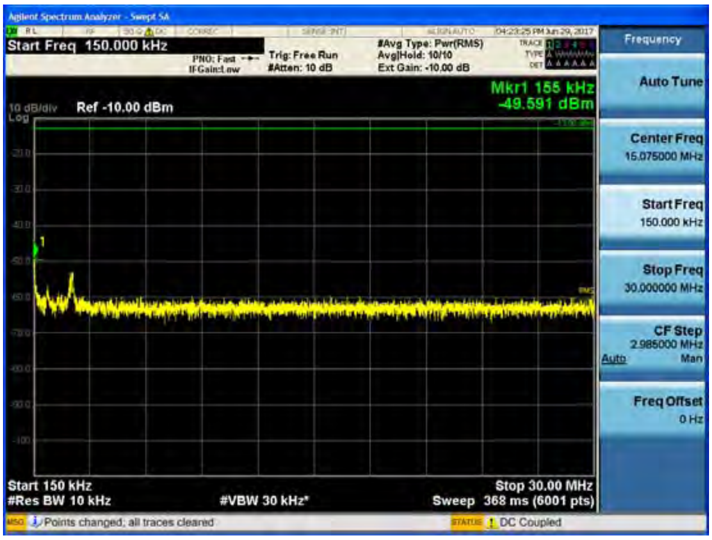
3 ㎓ ~ 12.75 ㎓


Center Freq 7.875000000 GHz
Trig: Free Run
#Atten: 10 dB
#Avg Type: Pwr(RMS)
Avg|Hold: 10/10
Ext Gain: -10.00 dB
Mkr1 12.526 7 GHz
-26.523 dBm
10 dB/div
Log
Ref -10.00 dBm
Start 3.000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz*
Stop 12.750 GHz
Sweep 17.3 ms (20001 pts)
Points changed; all traces cleared
Frequency
Auto Tune
Center Freq
7.875000000 GHz
Start Freq
3.000000000 GHz
Stop Freq
12.750000000 GHz
CF Step
975.000000 MHz
Auto
Man
Freq Offset
0 Hz

[Downlink_Middle]

9 ㎑ ~ 150 ㎑

150 ㎑ ~ 30 ㎒



30 ㎒ ~ 1 ㎓

1 ㎓ ~ 3 ㎓

3 ㎓ ~ 12.75 ㎓


Start Freq 3.000000000 GHz
Trig: Free Run
#Atten: 10 dB
#Avg Type: Pwr(RMS)
Avg|Hold: 10/10
Ext Gain: -10.00 dB
Mkr1 12.555 0 GHz
-26.338 dBm
10 dB/div
Ref -10.00 dBm
Start 3.000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz*
Stop 12.750 GHz
Sweep 17.3 ms (20001 pts)
Frequency
Auto Tune
Center Freq
7.875000000 GHz
Start Freq
3.000000000 GHz
Stop Freq
12.750000000 GHz
CF Step
975.000000 MHz
Auto
Man
Freq Offset
0 Hz
Points changed; all traces cleared

[Downlink_High]

<table>
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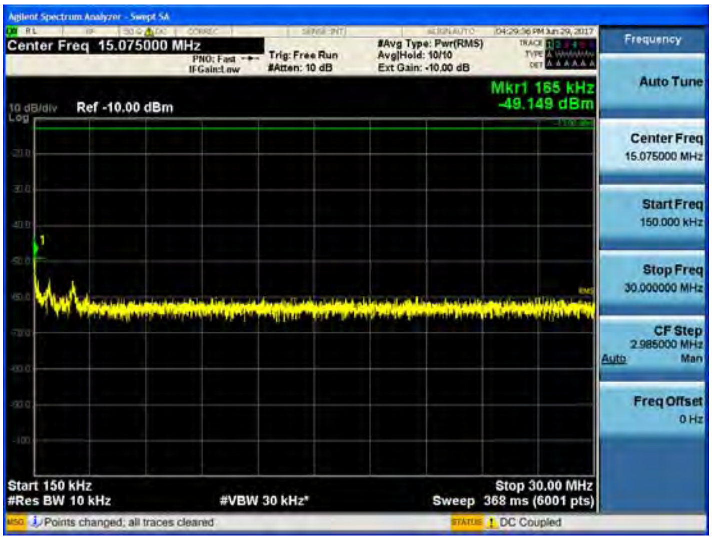
<td>
</td></tr>
<tr><th>30 ㎒ ~ 1 ㎓</th><th>1 ㎓ ~ 3 ㎓</th></tr>
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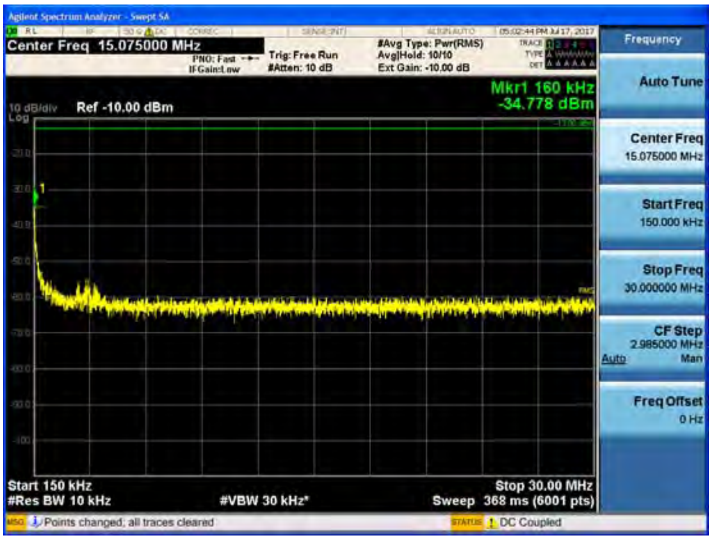
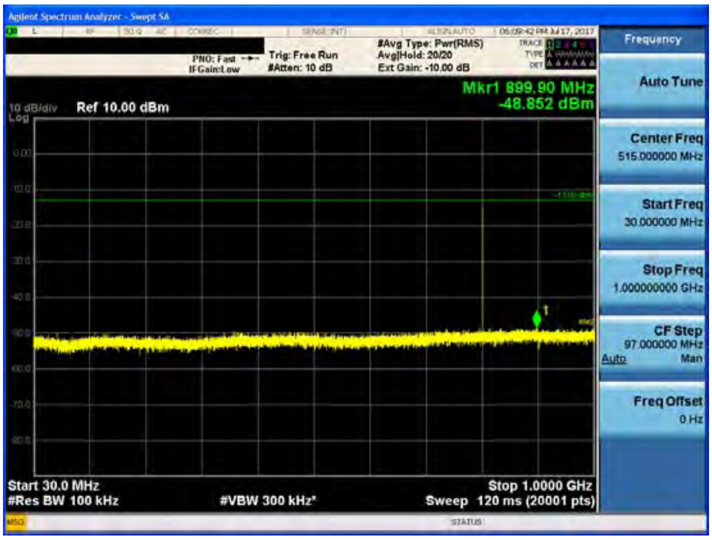
3 ㎓ ~ 12.75 ㎓


800 P25(12.5 kHz)_UL

[Uplink_Low]

9 ㎑ ~ 150 ㎑	150 ㎑ ~ 30 ㎒
	
30 ㎒ ~ 1 ㎓	**1 ㎓ ~ 3 ㎓**
	

3 ㎓ ~ 12.75 ㎓


[Uplink_Middle]

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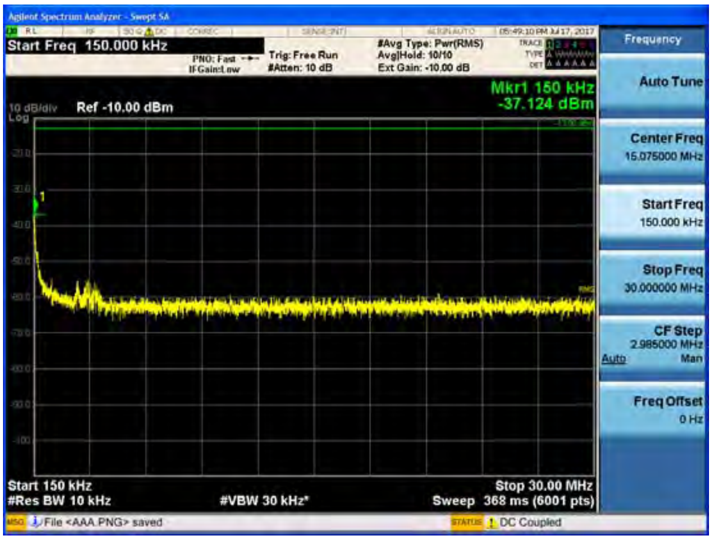
<td>
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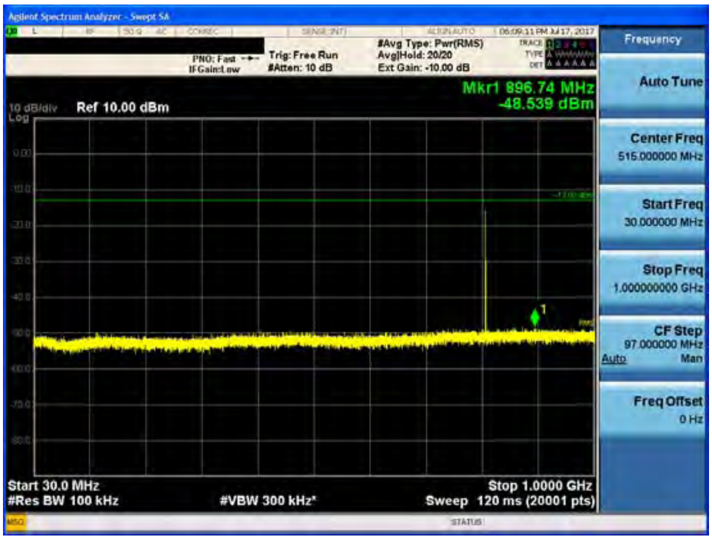
<tr><th>30 ㎒ ~ 1 ㎓</th><th>1 ㎓ ~ 3 ㎓</th></tr>
<tr><td>
</td>
<td>
</td></tr>
</table>

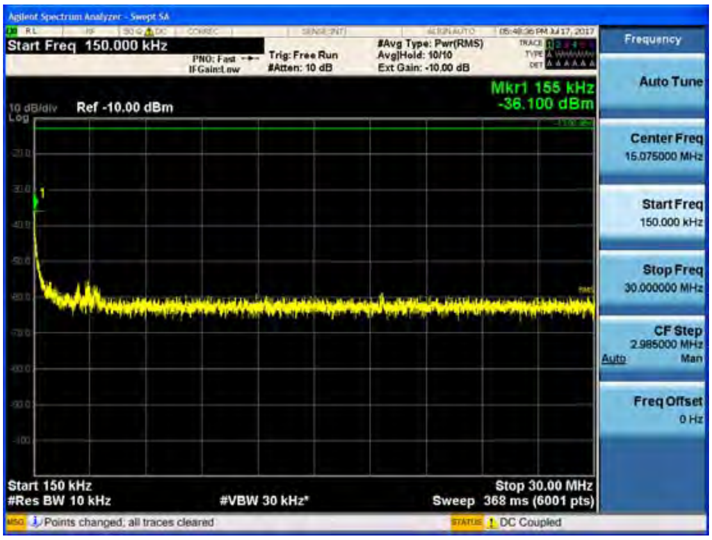
3 ㎓ ~ 12.75 ㎓


Start Freq 3.000000000 GHz
Trig: Free Run
#Atten: 10 dB
#Avg Type: Pwr(RMS)
Avg|Hold: 10/10
Ext Gain: -10.00 dB
Mkr1 12.612 5 GHz
-27.741 dBm
10 dB/div
Ref -10.00 dBm
Frequency
Auto Tune
Center Freq
7.875000000 GHz
Start Freq
3.000000000 GHz
Stop Freq
12.750000000 GHz
CF Step
975.000000 MHz
Auto
Man
Freq Offset
0 Hz
Start 3.000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz*
Stop 12.750 GHz
Sweep 17.3 ms (20001 pts)
Points changed; all traces cleared

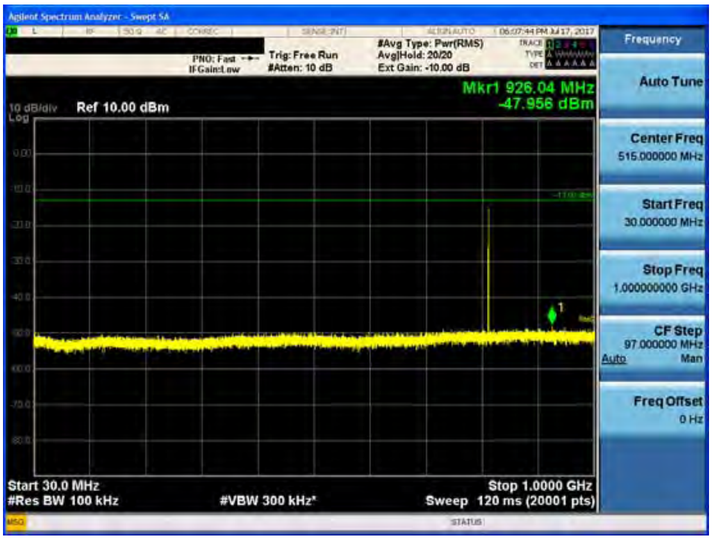
[Uplink_High]

9 ㎑ ~ 150 ㎑

150 ㎑ ~ 30 ㎒



30 ㎒ ~ 1 ㎓



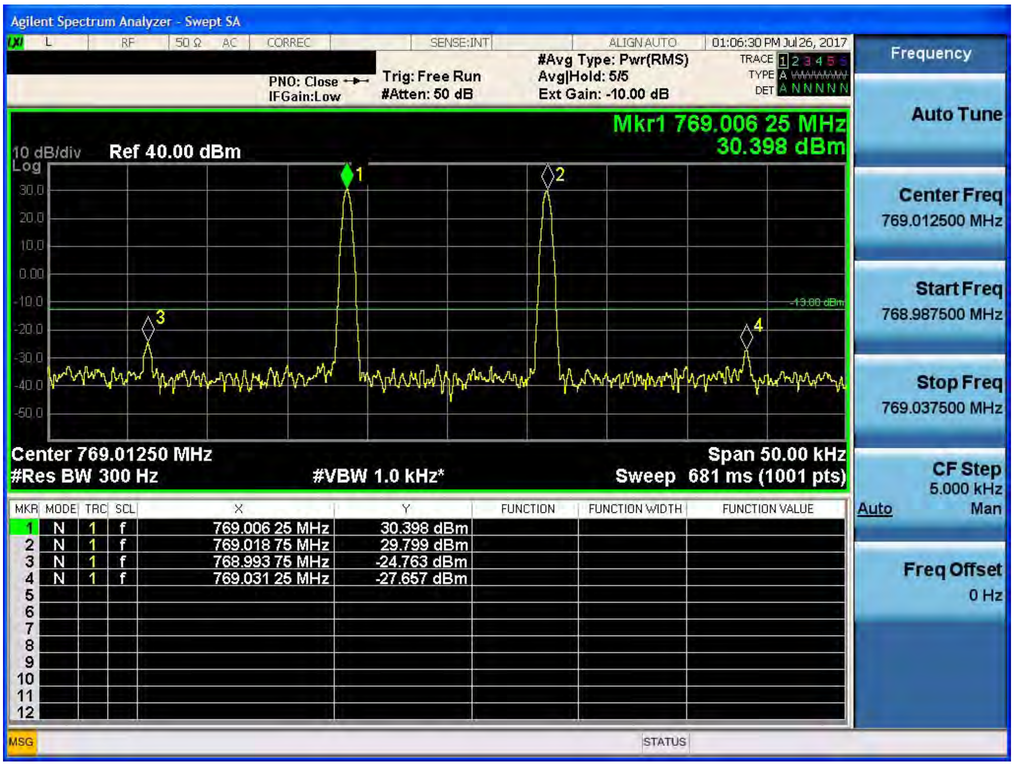
1 ㎓ ~ 3 ㎓

3 ㎓ ~ 12.75 ㎓
Center Freq 7.875000000 GHz Trig: Free Run #Atten: 10 dB #Avg Type: Pwr(RMS) Avg|Hold: 10/10 Ext Gain: -10.00 dB Mkr1 12.562 8 GHz -27.684 dBm 10 dB/div Log Ref -10.00 dBm Start 3.000 GHz #Res BW 1.0 MHz #VBW 3.0 MHz* Stop 12.750 GHz Sweep 17.3 ms (20001 pts) Points changed; all traces cleared Frequency Auto Tune Center Freq 7.875000000 GHz Start Freq 3.000000000 GHz Stop Freq 12.750000000 GHz CF Step 975.000000 MHz Auto Man Freq Offset 0 Hz

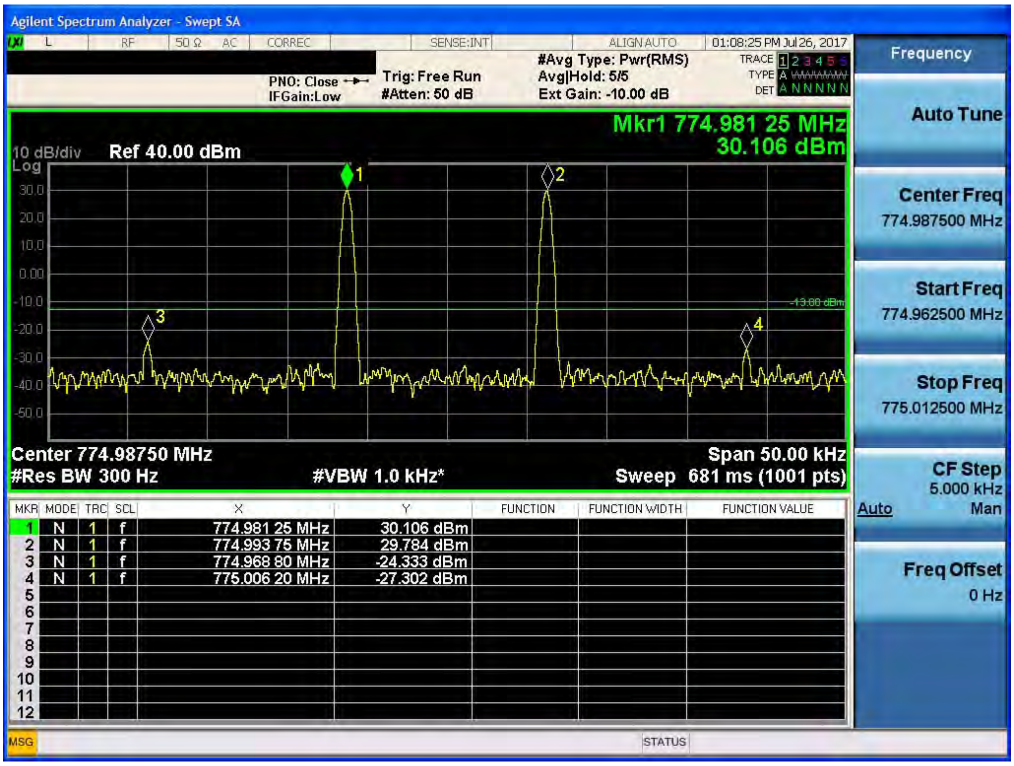
Intermodulation Spurious Emissions

700 P25(12.5 kHz)_DL

[Downlink - Low]

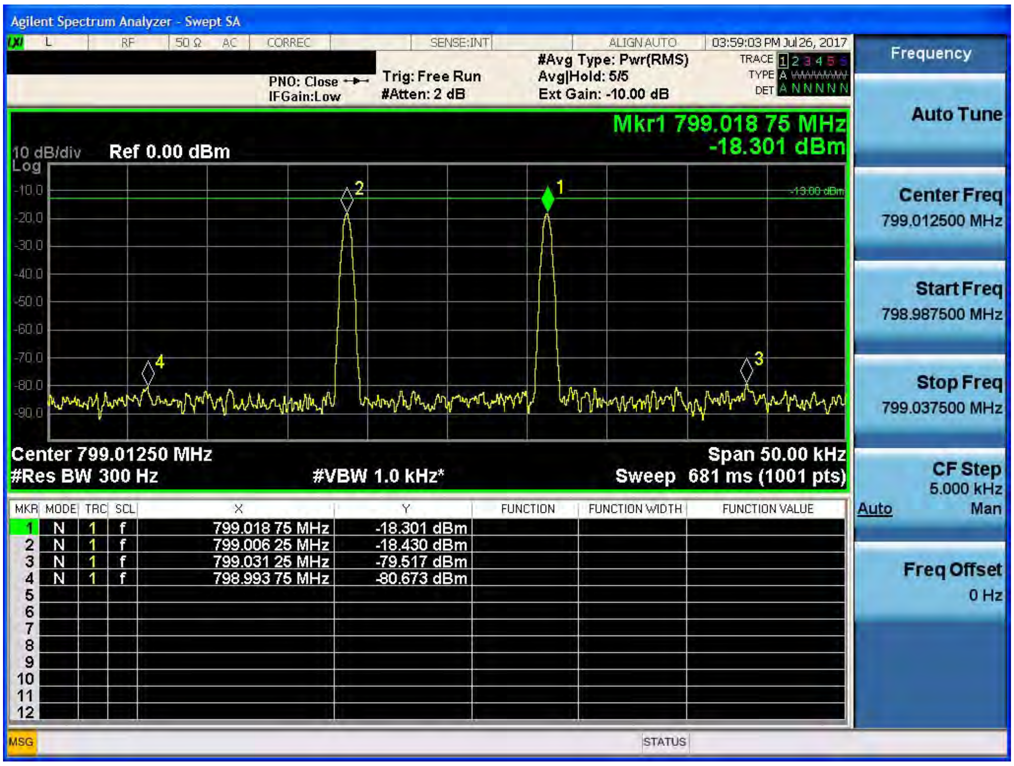


[Downlink - High]

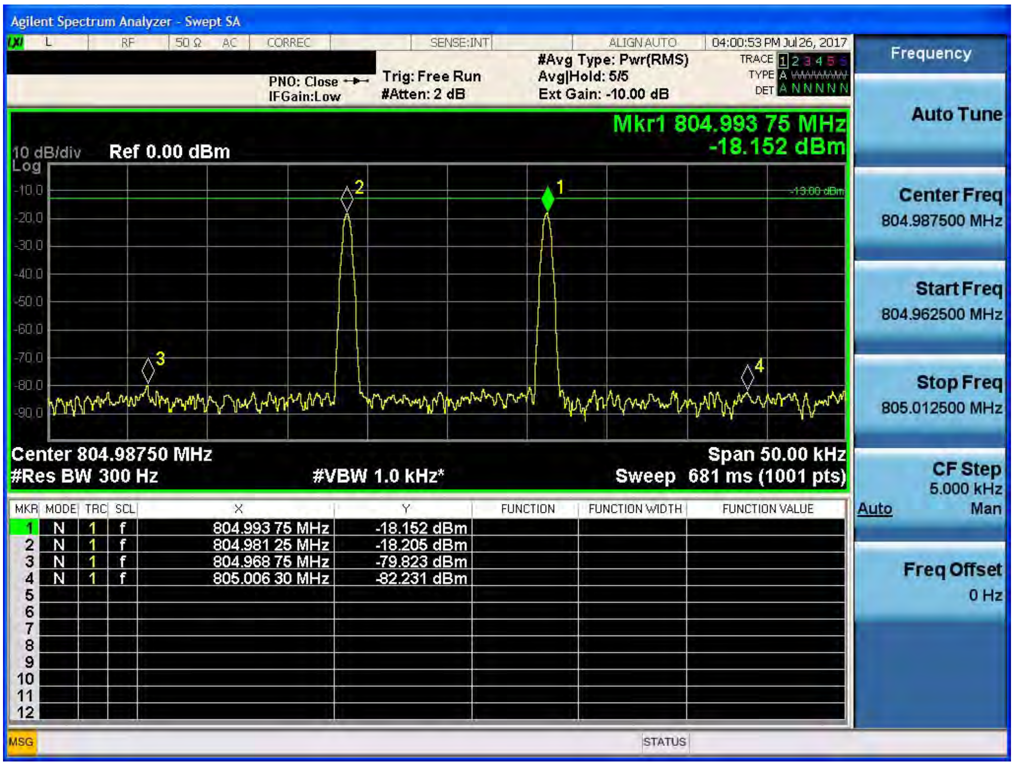


700 P25(12.5 kHz)_UL

[Uplink - Low]

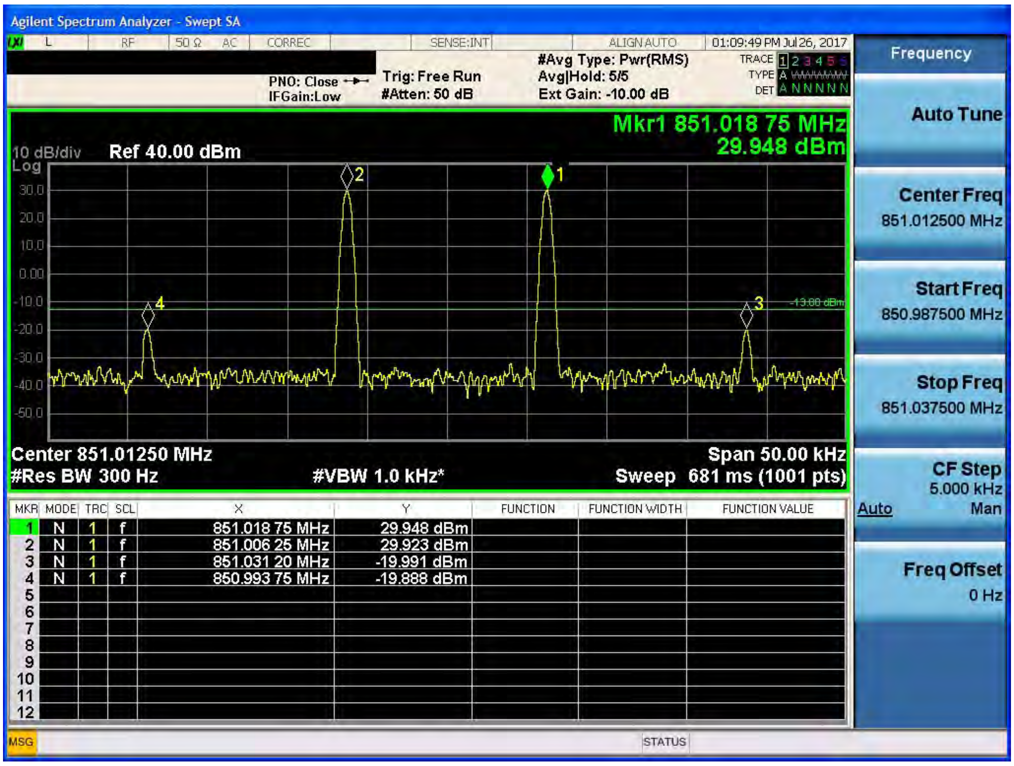


[Uplink - High]

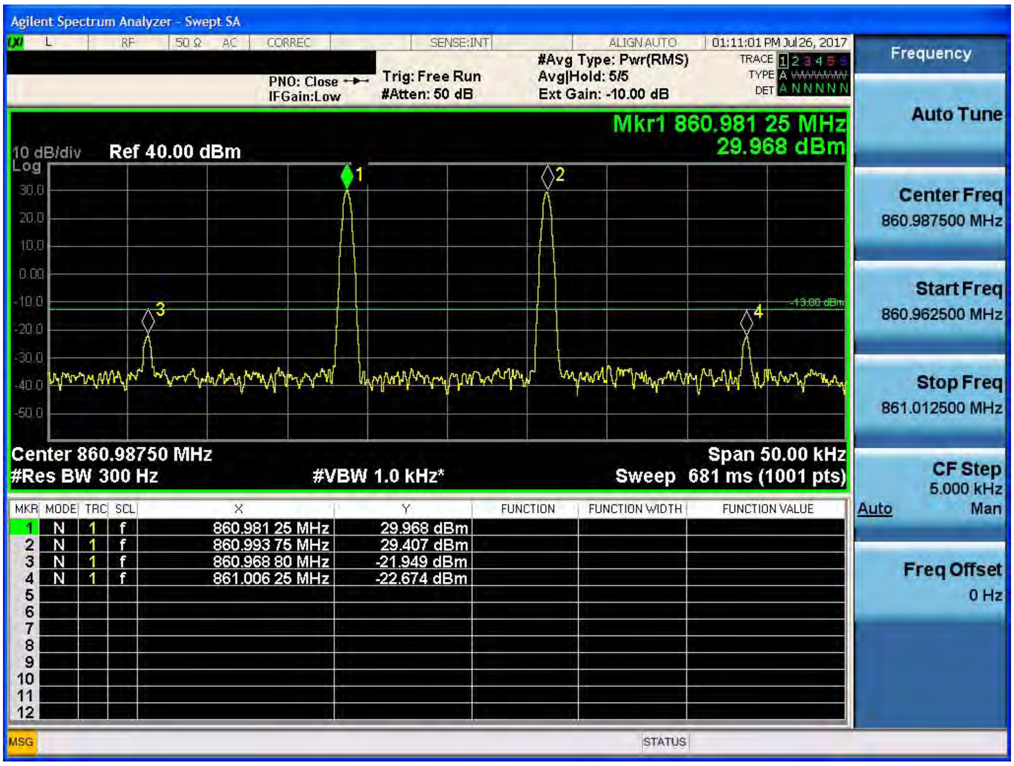


800 P25(12.5 kHz)_DL

[Downlink - Low]

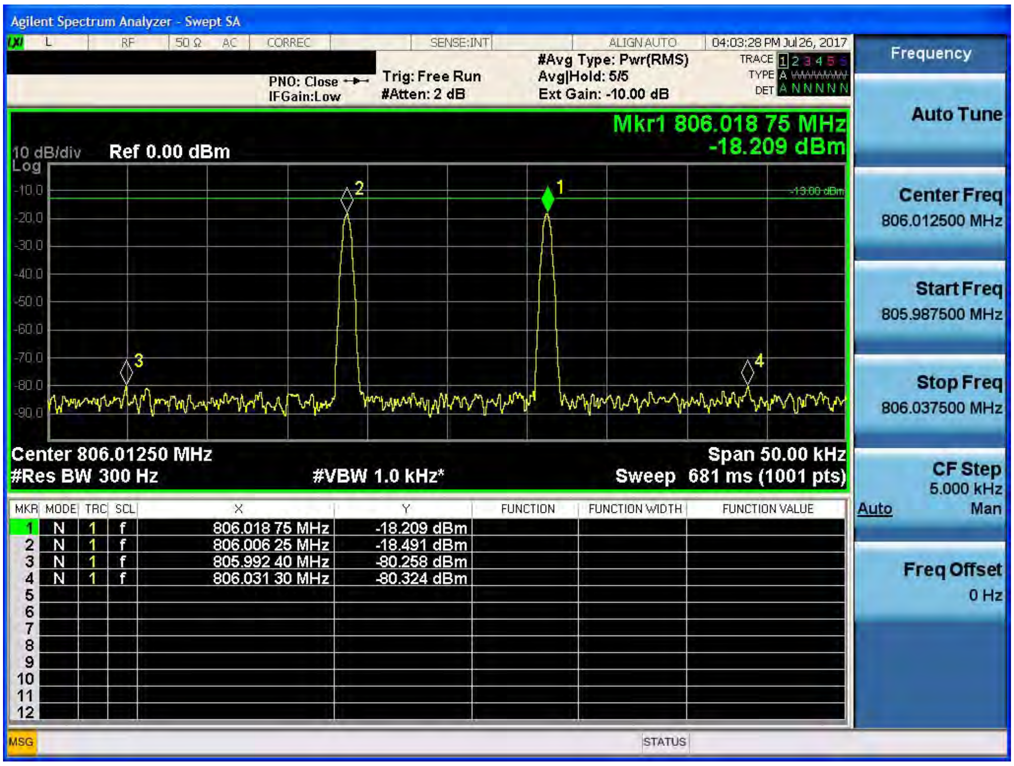


[Downlink - High]

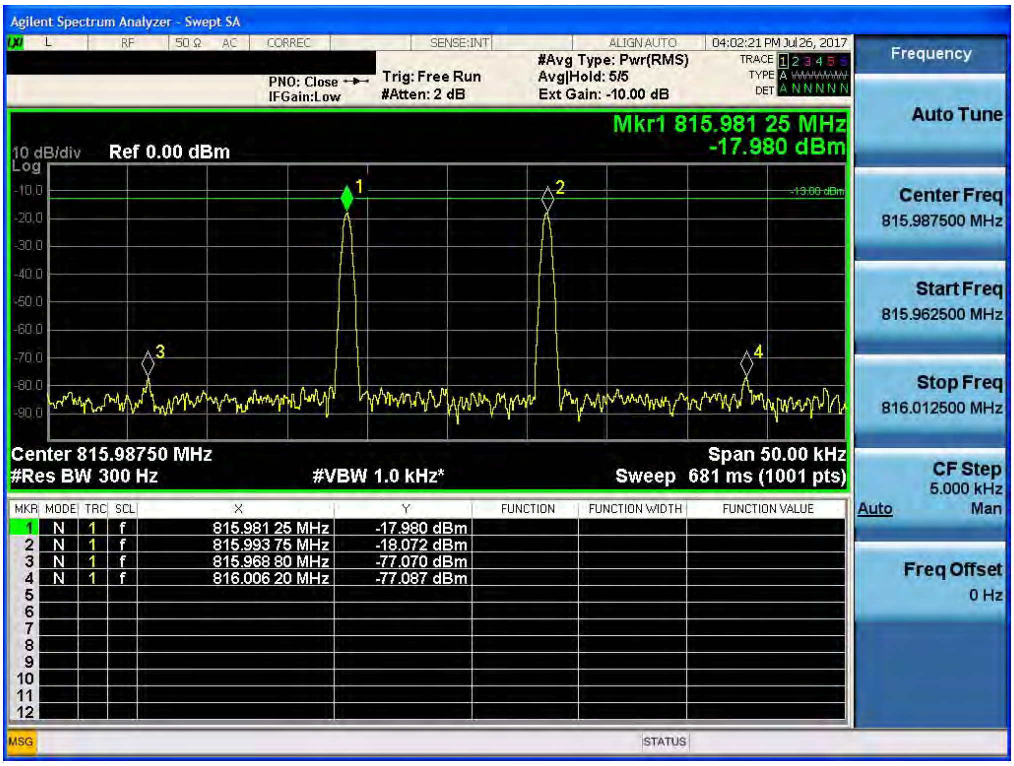


800 P25(12.5 kHz)_UL

[Uplink - Low]



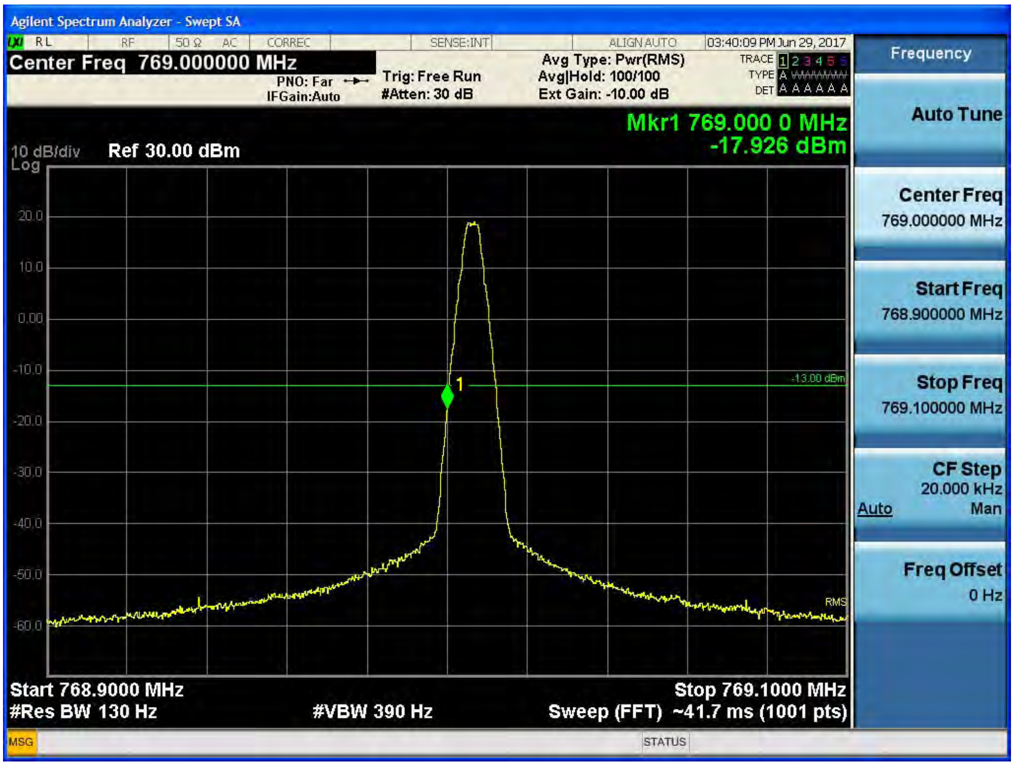
[Uplink - High]



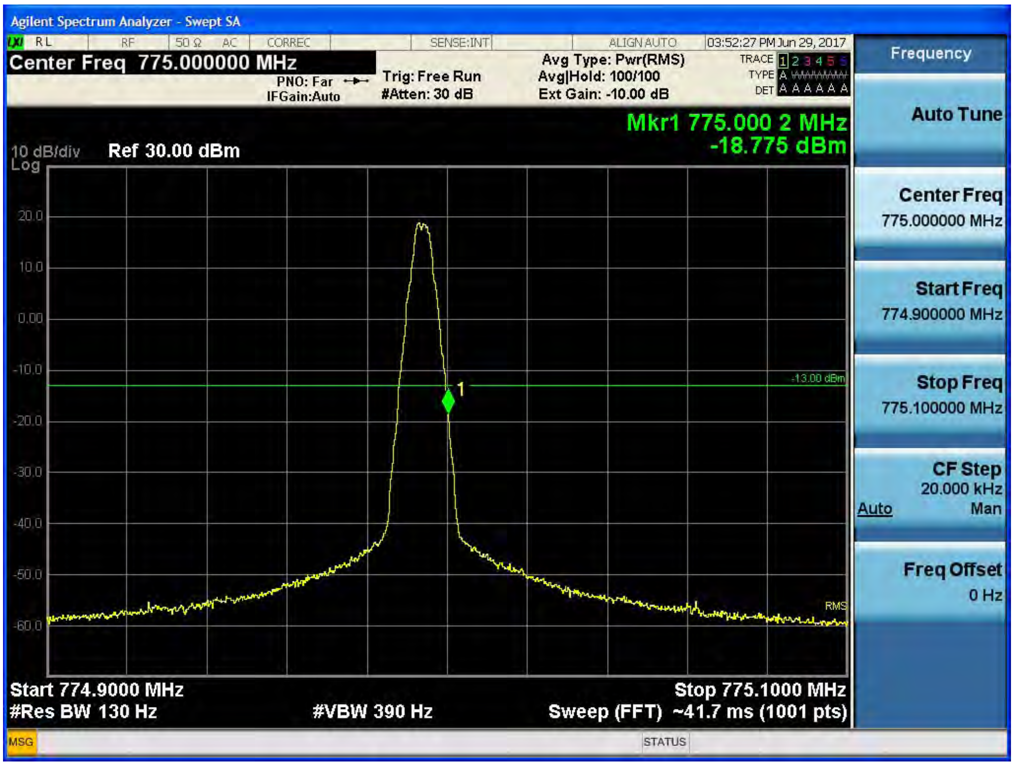
BAND EDGE

700 P25(12.5 kHz)_DL

[Downlink - Low]

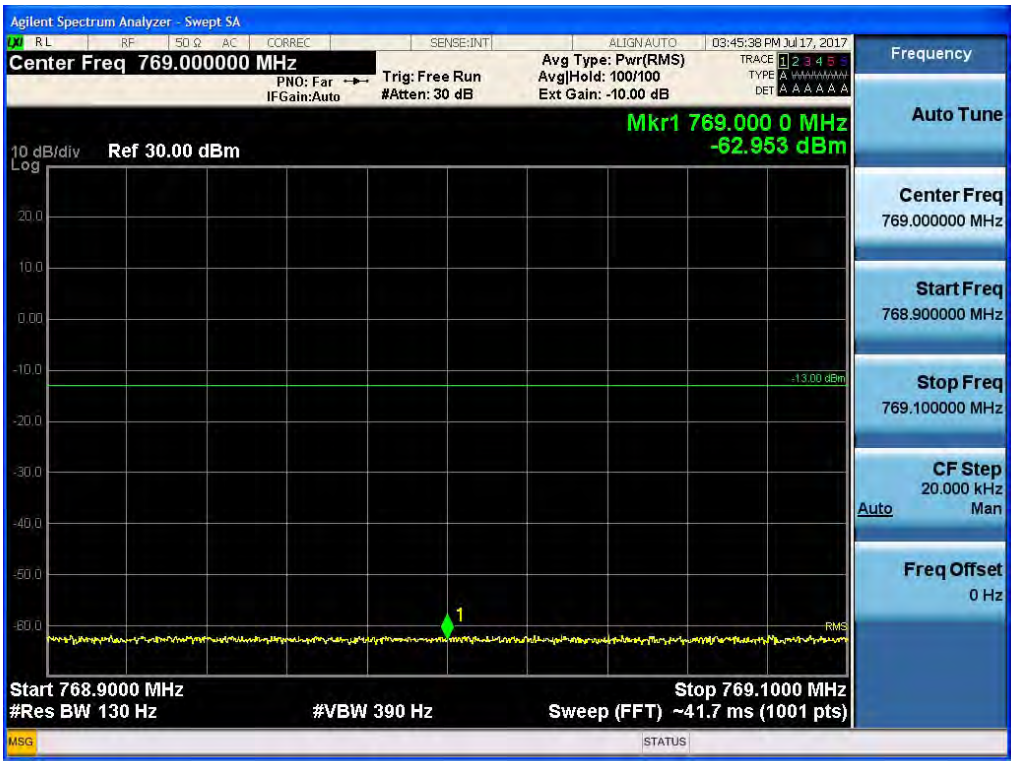


[Downlink - High]

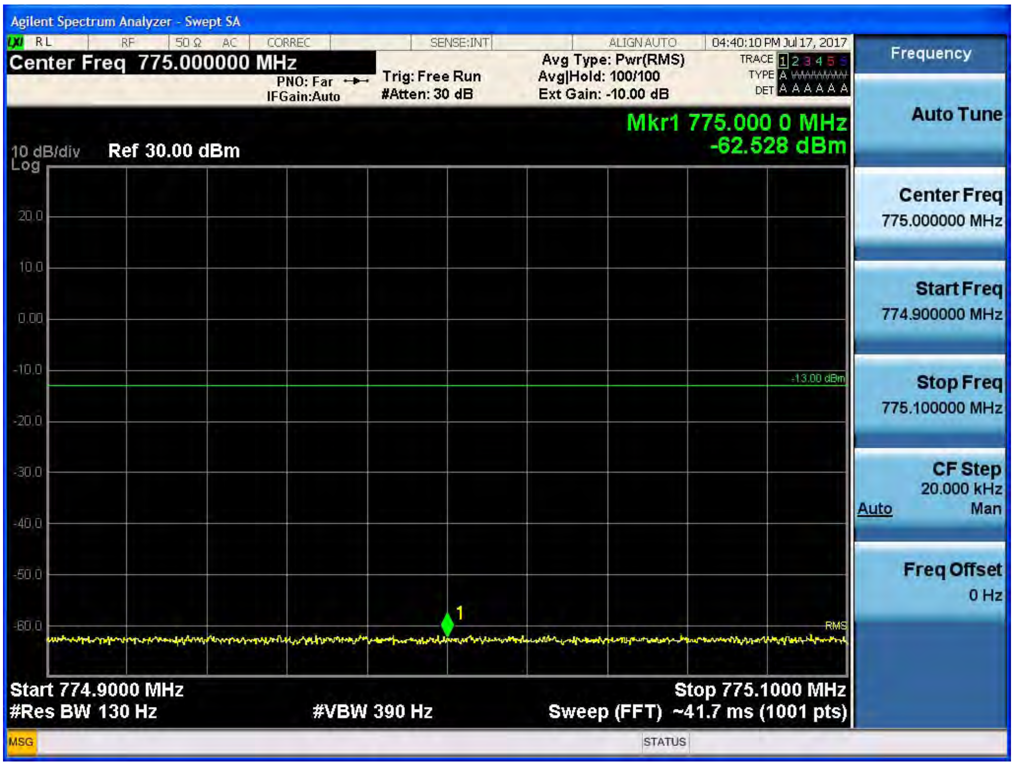


700 P25(12.5 kHz)_UL

[Uplink - Low]

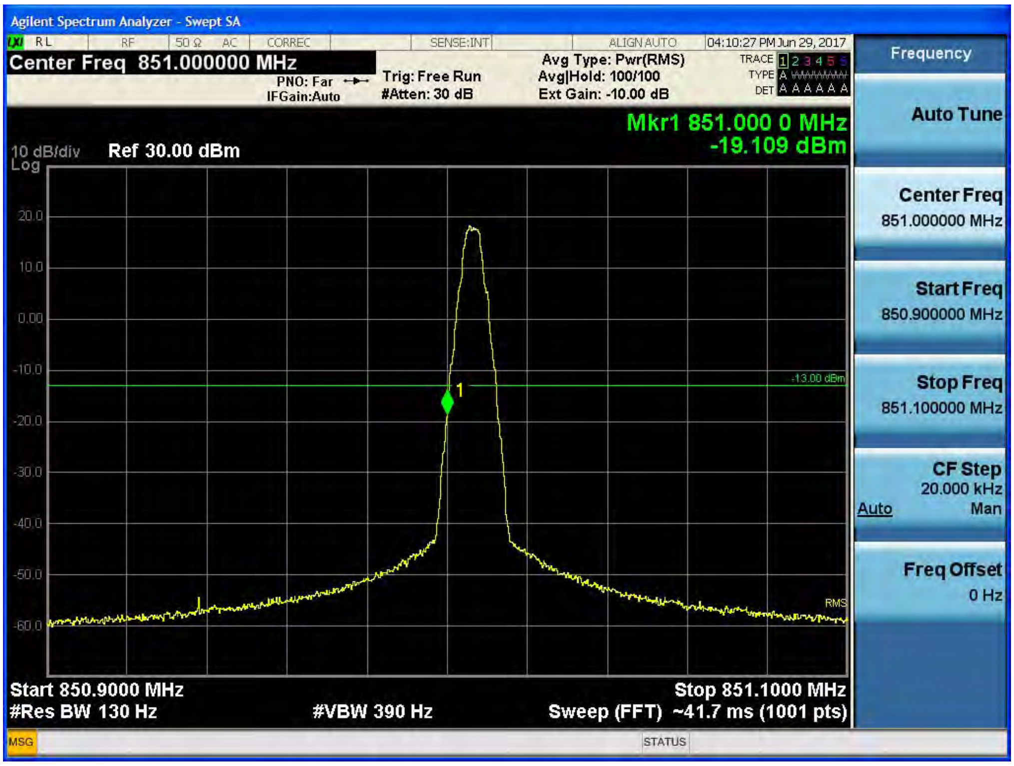


[Uplink - High]

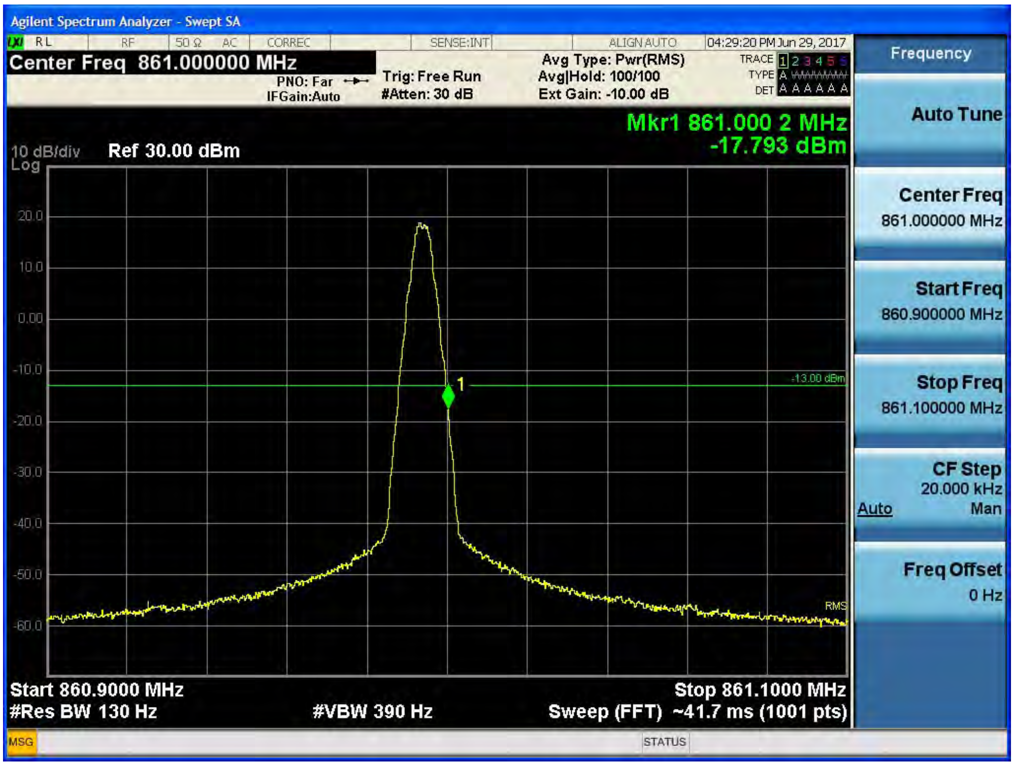


800 P25(12.5 kHz)_DL

[Downlink - Low]

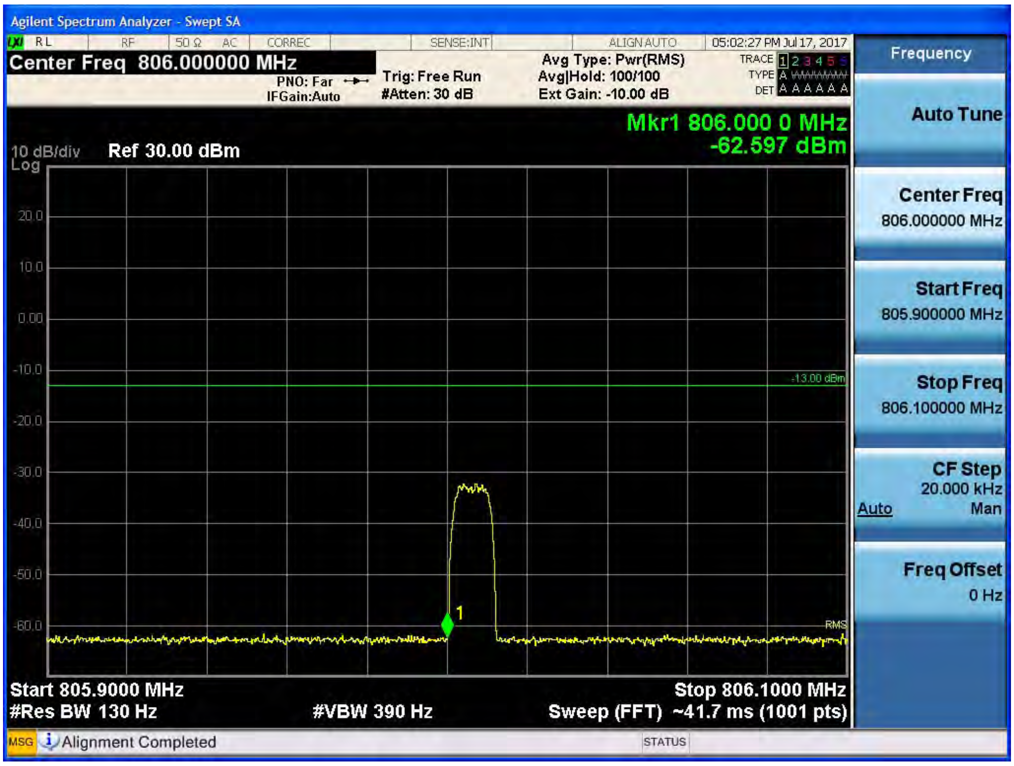


[Downlink - High]

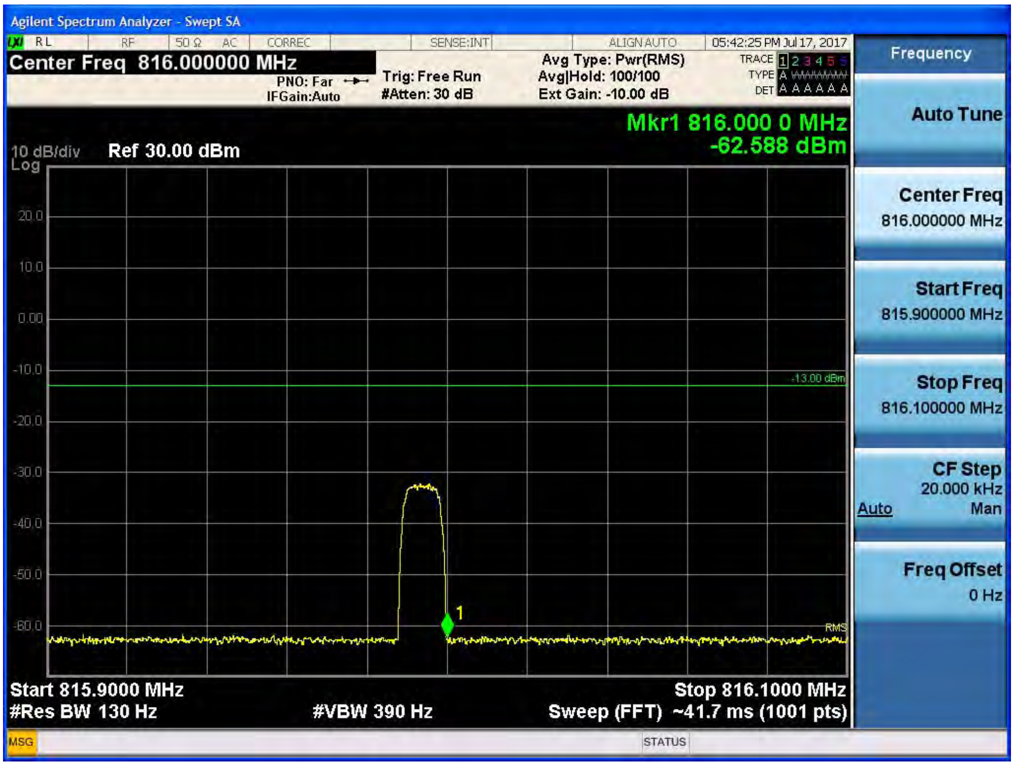


800 P25(12.5 kHz)_UL

[Uplink - Low]



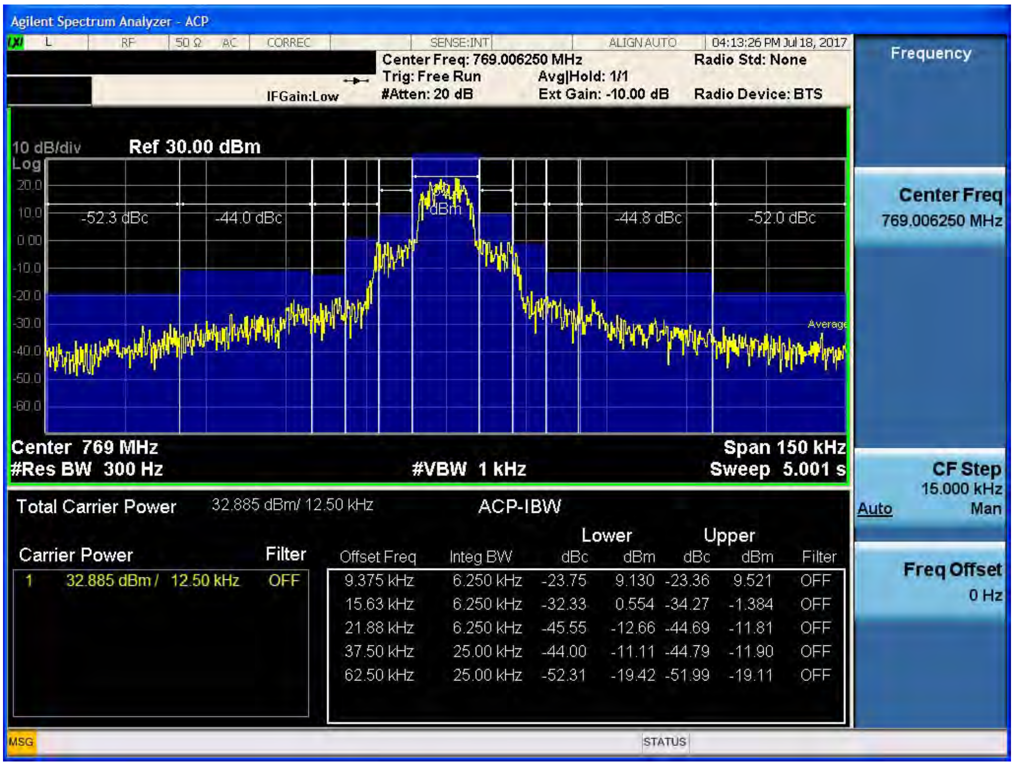
[Uplink - High]

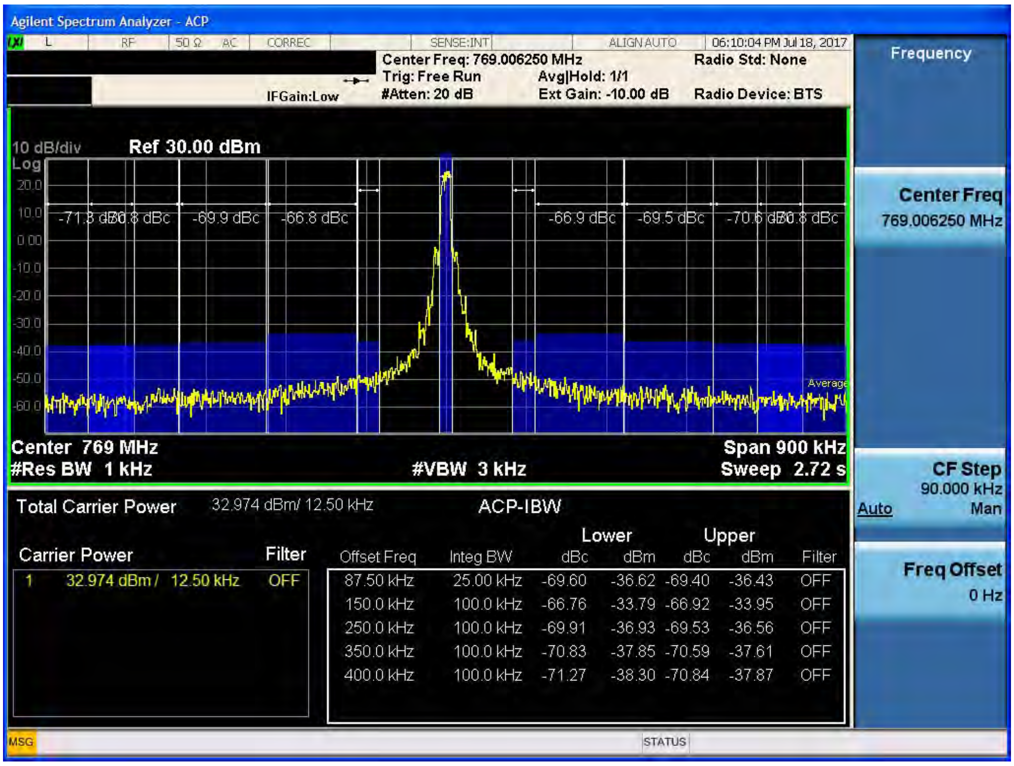


ACP

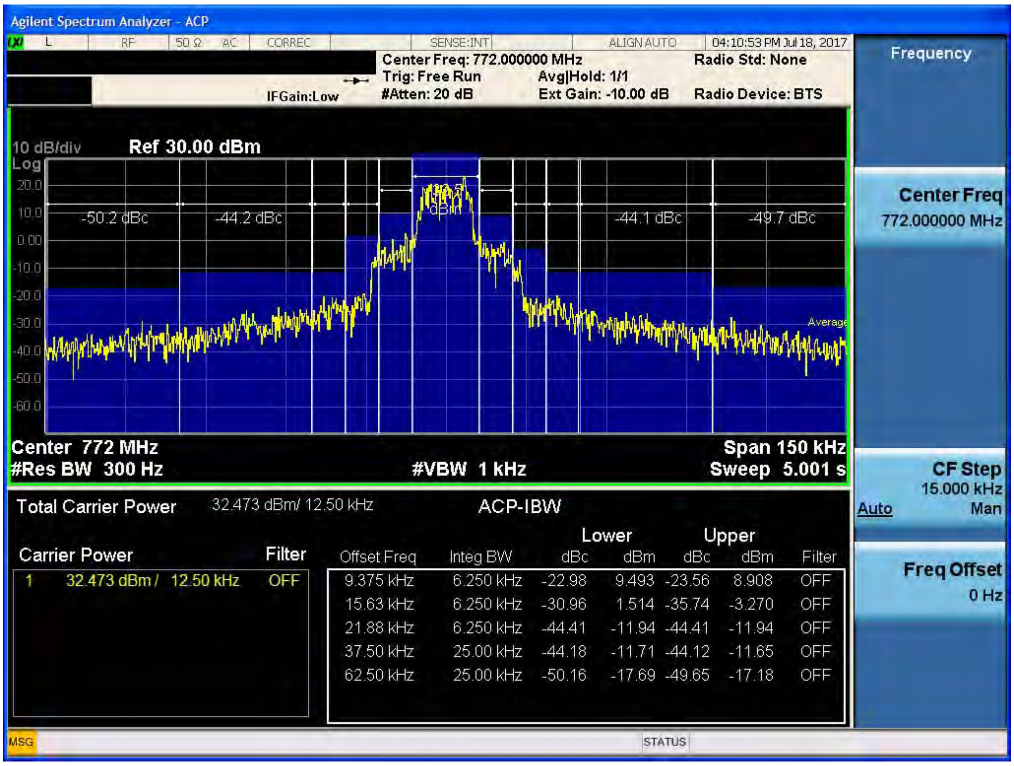
700 P25(12.5 kHz)_DL

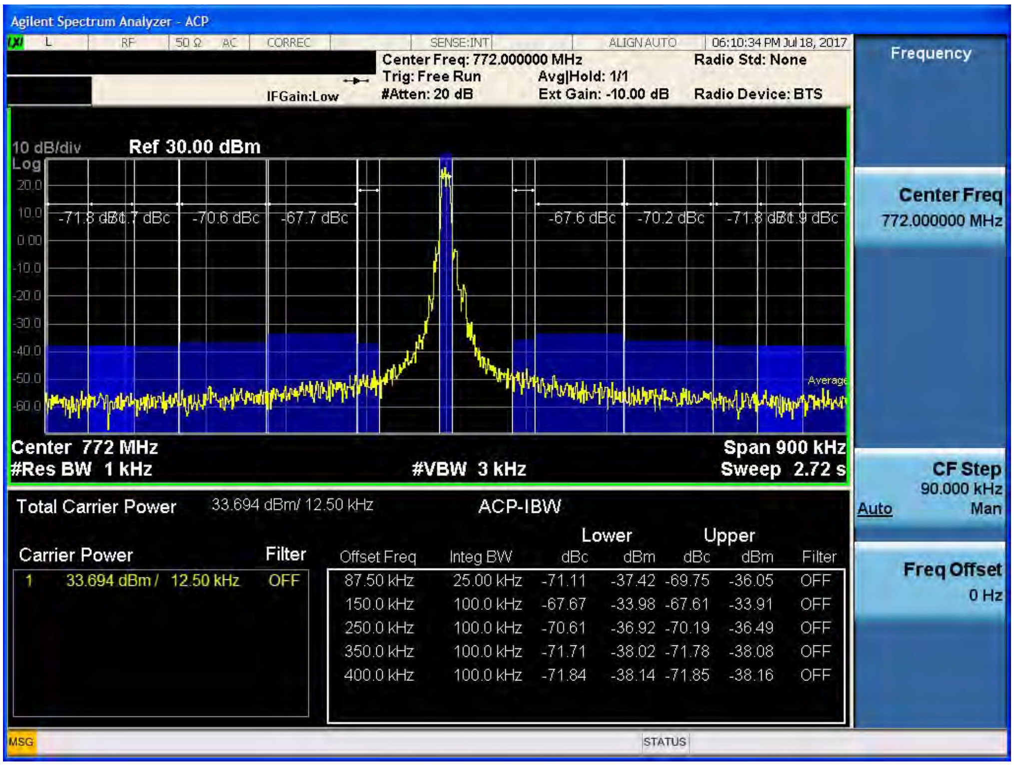
[Low]



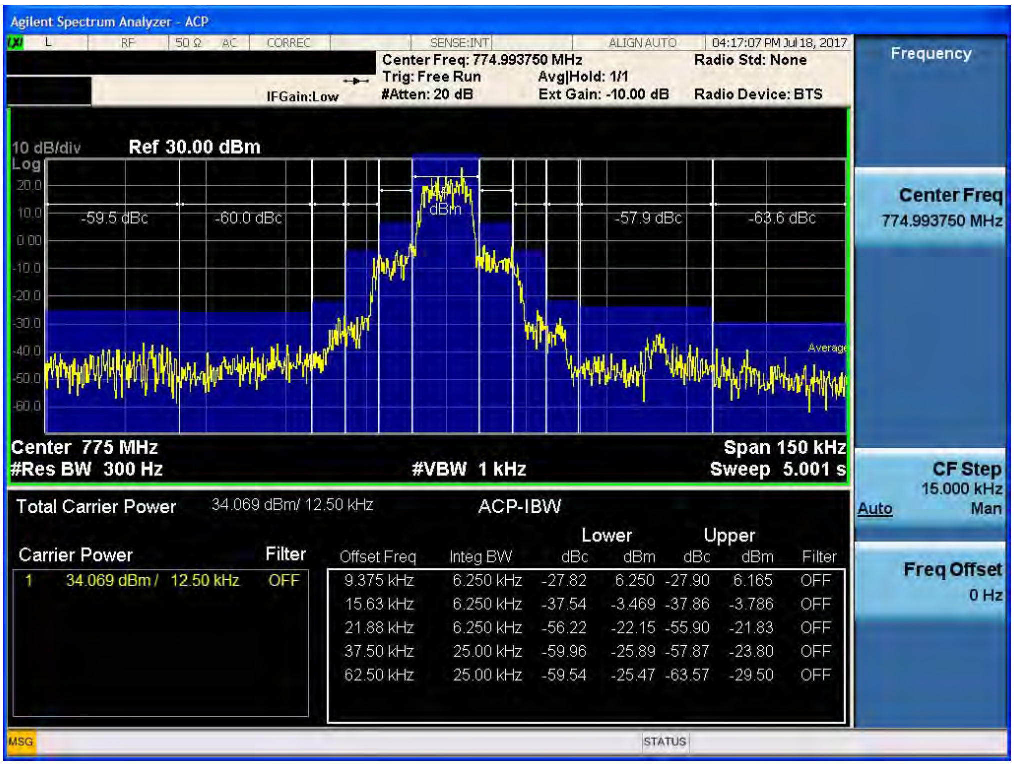


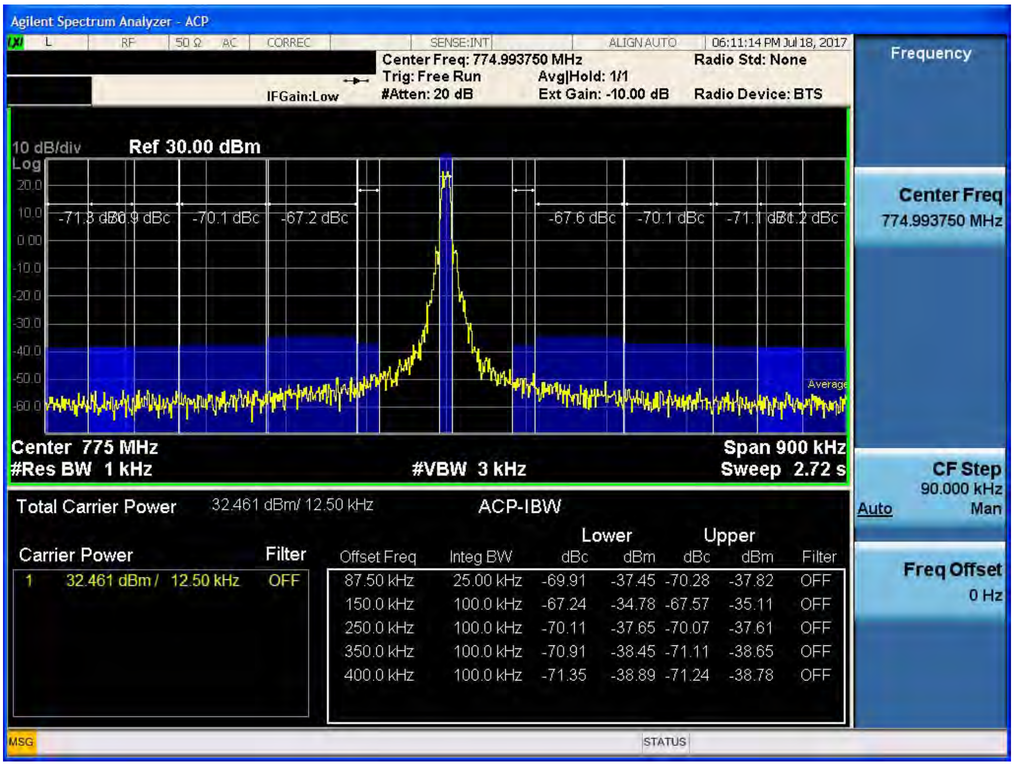
[Middle]


Agilent Spectrum Analyzer - ACP
Center Freq: 772.000000 MHz
Trig: Free Run
Avg|Hold: 1/1
#Atten: 20 dB
Ext Gain: -10.00 dB
Radio Std: None
Radio Device: BTS
IFGain:Low
04:10:53 PM Jul 18, 2017
10 dB/div Ref 30.00 dBm
-50.2 dBc
-44.2 dBc
-44.1 dBc
-49.7 dBc
Center 772 MHz
#Res BW 300 Hz
#VBW 1 kHz
Span 150 kHz
Sweep 5.001 s
Total Carrier Power 32.473 dBm/ 12.50 kHz
ACP-IBW
Carrier Power Filter
1 32.473 dBm / 12.50 kHz OFF
Offset Freq Integ BW Lower dBc dBm Upper dBc dBm Filter
9.375 kHz 6.250 kHz -22.98 9.493 -23.56 8.908 OFF
15.63 kHz 6.250 kHz -30.96 1.514 -35.74 -3.270 OFF
21.88 kHz 6.250 kHz -44.41 -11.94 -44.41 -11.94 OFF
37.50 kHz 25.00 kHz -44.18 -11.71 -44.12 -11.65 OFF
62.50 kHz 25.00 kHz -50.16 -17.69 -49.65 -17.18 OFF
Frequency
Center Freq 772.000000 MHz
CF Step 15.000 kHz
Auto Man
Freq Offset 0 Hz
MSG
STATUS


Agilent Spectrum Analyzer - ACP
Center Freq: 772.000000 MHz
Trig: Free Run
Avg|Hold: 1/1
#Atten: 20 dB
Ext Gain: -10.00 dB
Radio Std: None
Radio Device: BTS
IFGain:Low
06:10:34 PM Jul 18, 2017
10 dB/div Ref 30.00 dBm
-70.6 dBc
-67.7 dBc
-67.6 dBc
-70.2 dBc
Center 772 MHz
#Res BW 1 kHz
#VBW 3 kHz
Span 900 kHz
Sweep 2.72 s
Total Carrier Power 33.694 dBm/ 12.50 kHz
ACP-IBW
Carrier Power Filter
1 33.694 dBm / 12.50 kHz OFF
Offset Freq Integ BW Lower dBc dBm Upper dBc dBm Filter
87.50 kHz 25.00 kHz -71.11 -37.42 -69.75 -36.05 OFF
150.0 kHz 100.0 kHz -67.67 -33.98 -67.61 -33.91 OFF
250.0 kHz 100.0 kHz -70.61 -36.92 -70.19 -36.49 OFF
350.0 kHz 100.0 kHz -71.71 -38.02 -71.78 -38.08 OFF
400.0 kHz 100.0 kHz -71.84 -38.14 -71.85 -38.16 OFF
Frequency
Center Freq 772.000000 MHz
CF Step 90.000 kHz
Auto Man
Freq Offset 0 Hz
MSG
STATUS

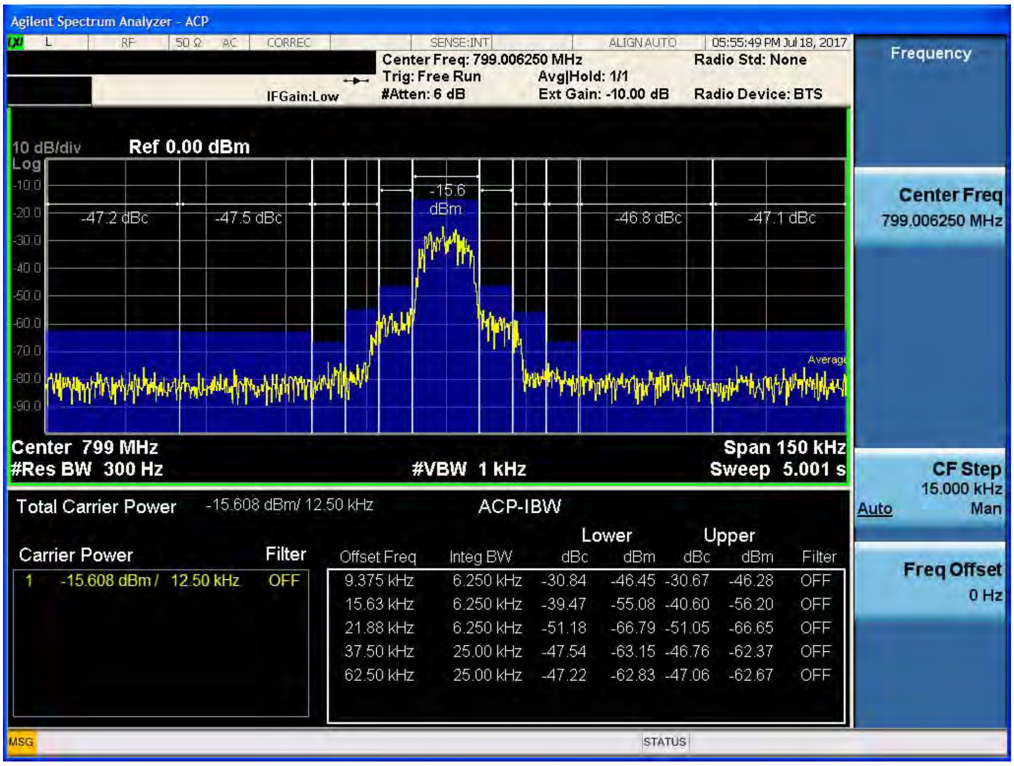
[High]

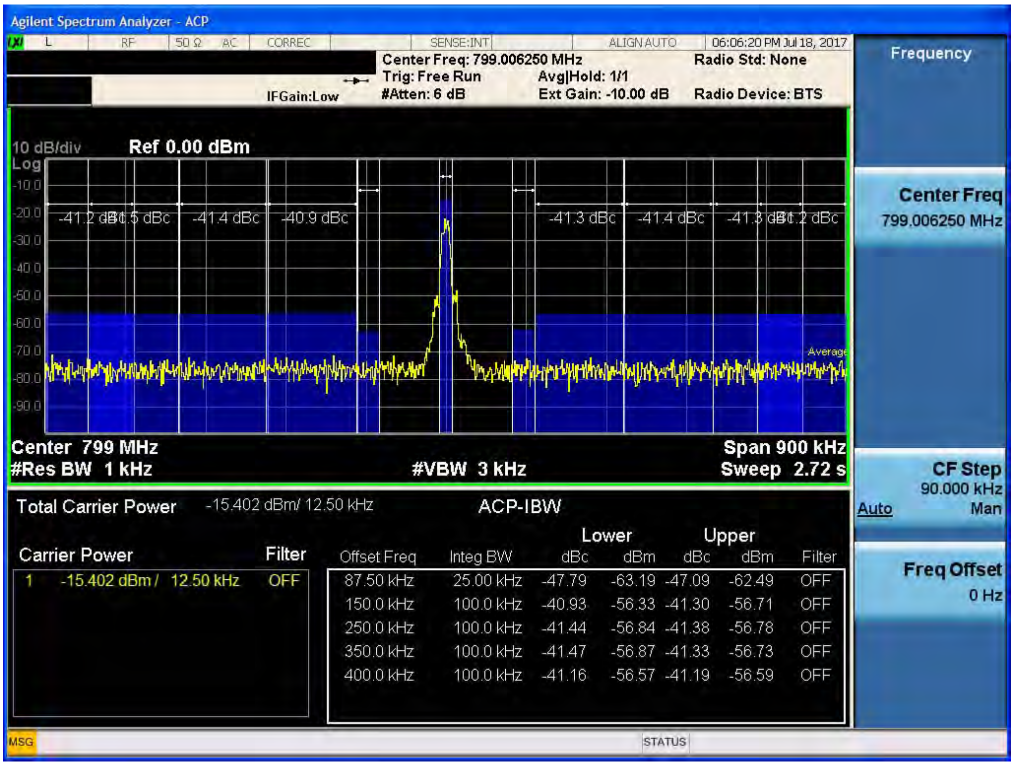




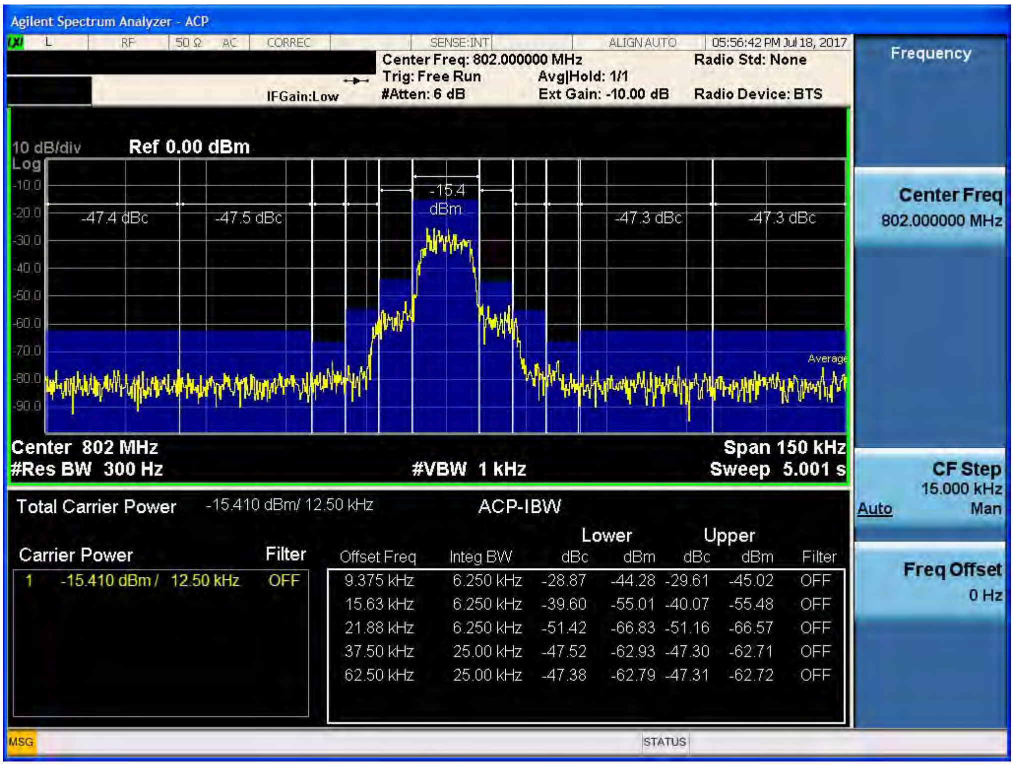
700 P25(12.5 kHz)_UL

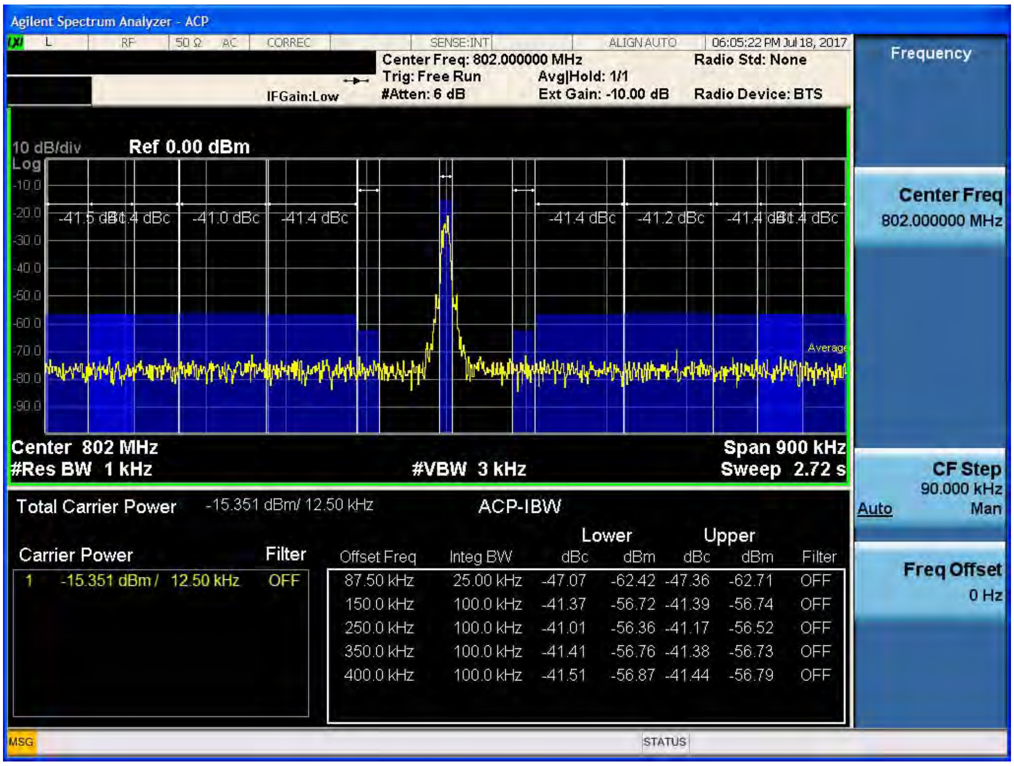
[Low]



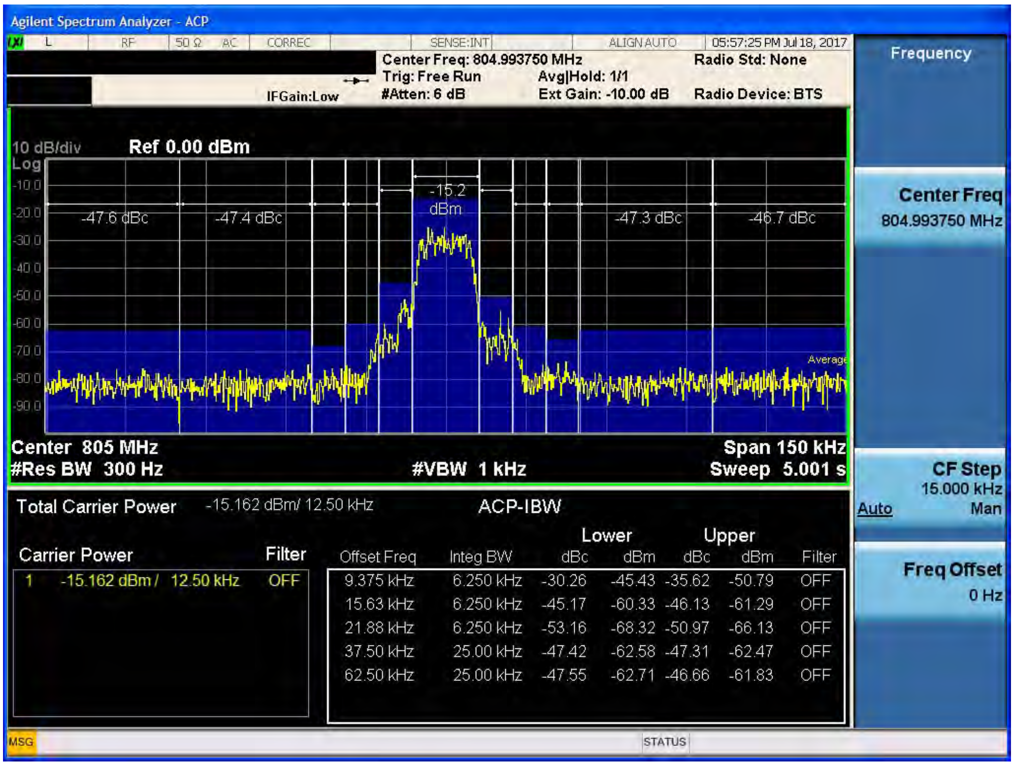


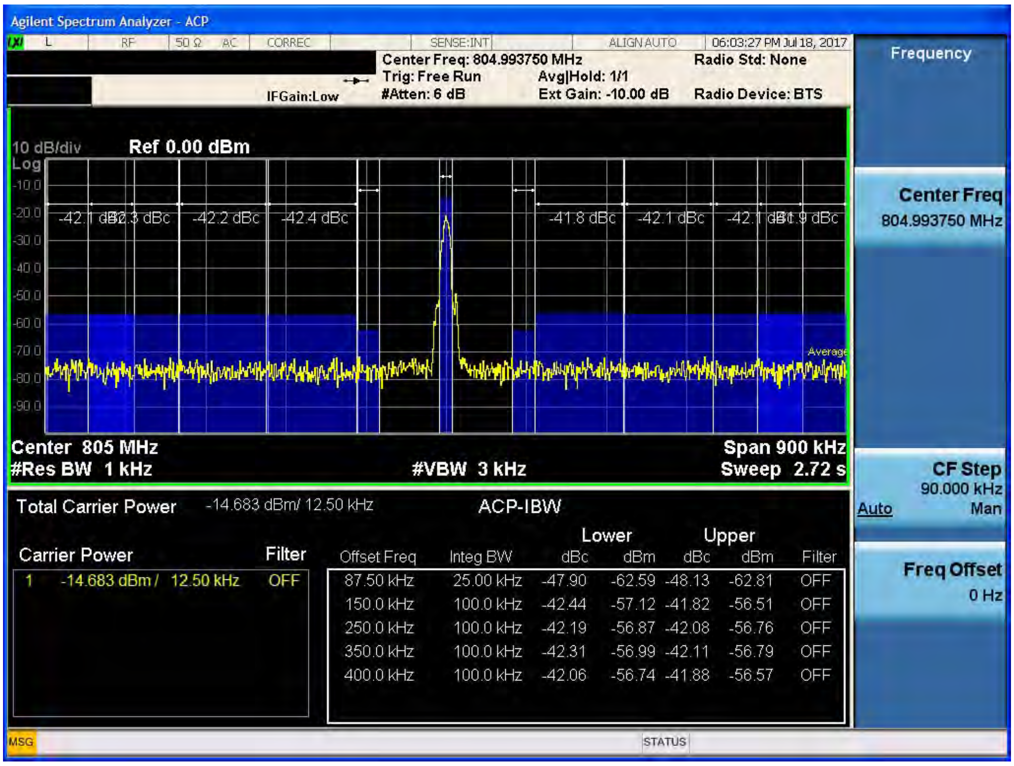
[Middle]


Agilent Spectrum Analyzer - ACP
05:56:42 PM Jul 18, 2017
Center Freq: 802.000000 MHz
Trig: Free Run
#Atten: 6 dB
Avg|Hold: 1/1
Ext Gain: -10.00 dB
Radio Std: None
Radio Device: BTS
IFGain:Low
Frequency
10 dB/div Ref 0.00 dBm
Log
-47.4 dBc
-47.5 dBc
-15.4 dBm
-47.3 dBc
-47.3 dBc
Center 802 MHz
#Res BW 300 Hz
#VBW 1 kHz
Span 150 kHz
Sweep 5.001 s
Center Freq
802.000000 MHz
CF Step
15.000 kHz
Auto Man
Freq Offset
0 Hz
Total Carrier Power -15.410 dBm/ 12.50 kHz
ACP-IBW
Carrier Power Filter
1 -15.410 dBm / 12.50 kHz OFF
Offset Freq | Integ BW | Lower dBc | Lower dBm | Upper dBc | Upper dBm | Filter
9.375 kHz | 6.250 kHz | -28.87 | -44.28 | -29.61 | -45.02 | OFF
15.63 kHz | 6.250 kHz | -39.60 | -55.01 | -40.07 | -55.48 | OFF
21.88 kHz | 6.250 kHz | -51.42 | -66.83 | -51.16 | -66.57 | OFF
37.50 kHz | 25.00 kHz | -47.52 | -62.93 | -47.30 | -62.71 | OFF
62.50 kHz | 25.00 kHz | -47.38 | -62.79 | -47.31 | -62.72 | OFF
MSG
STATUS


Agilent Spectrum Analyzer - ACP
06:05:22 PM Jul 18, 2017
Center Freq: 802.000000 MHz
Trig: Free Run
#Atten: 6 dB
Avg|Hold: 1/1
Ext Gain: -10.00 dB
Radio Std: None
Radio Device: BTS
IFGain:Low
Frequency
10 dB/div Ref 0.00 dBm
Log
-41.0 dBc
-41.4 dBc
-41.4 dBc
-41.2 dBc
Center 802 MHz
#Res BW 1 kHz
#VBW 3 kHz
Span 900 kHz
Sweep 2.72 s
Center Freq
802.000000 MHz
CF Step
90.000 kHz
Auto Man
Freq Offset
0 Hz
Total Carrier Power -15.351 dBm/ 12.50 kHz
ACP-IBW
Carrier Power Filter
1 -15.351 dBm / 12.50 kHz OFF
Offset Freq | Integ BW | Lower dBc | Lower dBm | Upper dBc | Upper dBm | Filter
87.50 kHz | 25.00 kHz | -47.07 | -62.42 | -47.36 | -62.71 | OFF
150.0 kHz | 100.0 kHz | -41.37 | -56.72 | -41.39 | -56.74 | OFF
250.0 kHz | 100.0 kHz | -41.01 | -56.36 | -41.17 | -56.52 | OFF
350.0 kHz | 100.0 kHz | -41.41 | -56.76 | -41.38 | -56.73 | OFF
400.0 kHz | 100.0 kHz | -41.51 | -56.87 | -41.44 | -56.79 | OFF
MSG
STATUS

[High]


Agilent Spectrum Analyzer - ACP
Center Freq: 804.993750 MHz
Trig: Free Run
Avg|Hold: 1/1
#Atten: 6 dB
Ext Gain: -10.00 dB
Radio Std: None
Radio Device: BTS
05:57:25 PM Jul 18, 2017
10 dB/div
Ref 0.00 dBm
Center 805 MHz
#Res BW 300 Hz
#VBW 1 kHz
Span 150 kHz
Sweep 5.001 s
Total Carrier Power -15.162 dBm/ 12.50 kHz
ACP-IBW
Carrier Power
Filter
1 -15.162 dBm / 12.50 kHz OFF
Offset Freq Integ BW Lower dBc dBm Upper dBc dBm Filter
9.375 kHz 6.250 kHz -30.26 -45.43 -35.62 -50.79 OFF
15.63 kHz 6.250 kHz -45.17 -60.33 -46.13 -61.29 OFF
21.88 kHz 6.250 kHz -53.16 -68.32 -50.97 -66.13 OFF
37.50 kHz 25.00 kHz -47.42 -62.58 -47.31 -62.47 OFF
62.50 kHz 25.00 kHz -47.55 -62.71 -46.66 -61.83 OFF
Frequency
Center Freq
804.993750 MHz
CF Step
15.000 kHz
Auto Man
Freq Offset
0 Hz


Agilent Spectrum Analyzer - ACP
Center Freq: 804.993750 MHz
Trig: Free Run
Avg|Hold: 1/1
#Atten: 6 dB
Ext Gain: -10.00 dB
Radio Std: None
Radio Device: BTS
06:03:27 PM Jul 18, 2017
10 dB/div
Ref 0.00 dBm
Center 805 MHz
#Res BW 1 kHz
#VBW 3 kHz
Span 900 kHz
Sweep 2.72 s
Total Carrier Power -14.683 dBm/ 12.50 kHz
ACP-IBW
Carrier Power
Filter
1 -14.683 dBm / 12.50 kHz OFF
Offset Freq Integ BW Lower dBc dBm Upper dBc dBm Filter
87.50 kHz 25.00 kHz -47.90 -62.59 -48.13 -62.81 OFF
150.0 kHz 100.0 kHz -42.44 -57.12 -41.82 -56.51 OFF
250.0 kHz 100.0 kHz -42.19 -56.87 -42.08 -56.76 OFF
350.0 kHz 100.0 kHz -42.31 -56.99 -42.11 -56.79 OFF
400.0 kHz 100.0 kHz -42.06 -56.74 -41.88 -56.57 OFF
Frequency
Center Freq
804.993750 MHz
CF Step
90.000 kHz
Auto Man
Freq Offset
0 Hz

12. RADIATED SPURIOUS EMISSIONS

FCC Rules

Test Requirements:

§ 2.1053 Measurements required: Field strength of spurious radiation.

(a) 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. For equipment operating on frequencies below 890 MHz, an open field test is normally required, with the measuring instrument antenna located in the far-field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurements will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from halfwave dipole antennas.

(b) The measurements specified in paragraph (a) of this section shall be made for the following equipment:

(1) Those in which the spurious emissions are required to be 60 dB or more below the mean power of the transmitter.

(2) All equipment operating on frequencies higher than 25 MHz.

(3) All equipment where the antenna is an integral part of, and attached directly to the transmitter.

(4) Other types of equipment as required, when deemed necessary by the Commission.

IC Rules

Test Requirements:

RSS-Gen

7. Receiver Limits

7.1 Receiver Emission Limits

7.1.2 Receiver Radiated Limits

Radiated emission measurements shall be performed with the receiver antenna connected to the receiver antenna terminals. The search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is higher, to at least 5x the highest tunable or local oscillator frequency, whichever is higher, without exceeding 40 GHz.

Spurious emissions from receivers shall not exceed the radiated limits shown in Table 2 below:

Table 2 – Receiver Radiated Limits	
Frequency (MHz)	**Field Strength (μv/m at 3 metres)***
30-88	100
88-216	150
216-960	200
Above 960	500

Footnote *

Measurements for compliance with limits in the above table may be performed at distances other than 3 meters, in accordance with Section 6.5.

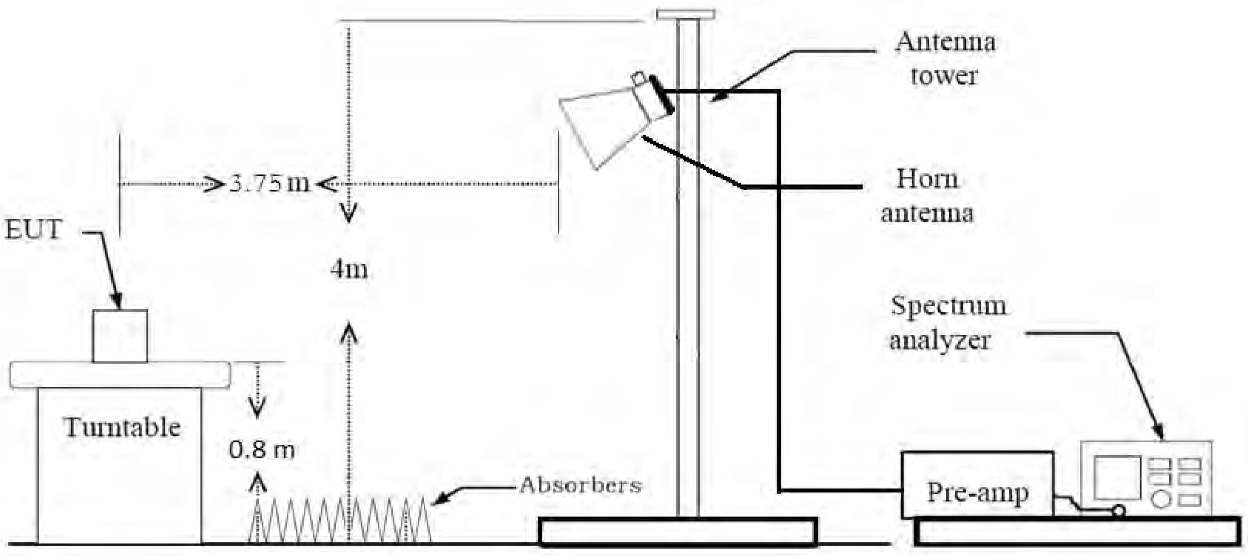
Test Procedures:

As required by 47 CFR 2.1053, *field strength of radiated spurious measurements* were made in accordance with the procedures of ANSI/TIA-603-C-2004 "Land Mobile FM or PM Communications Equipment Measurement and Performance Standards".

Radiated emission measurements were performed inside a 3 meter semi-anechoic chamber.

The EUT was set at a distance of 3m from the receiving antenna. The EUT's RF ports were terminated to 50ohm load. The EUT was set to transmit at the low, mid and high channels of the transmitter frequency range at its maximum power level. The EUT was rotated about 360and the receiving antenna scanned from 1-3m in order to capture the maximum emission. A calibrated antenna source was positioned in place of the EUT and the previously recorded signal was duplicated. The maximum EIRP of the emission was calculated by adding the forward power to the calibrated source plus its appropriate gain value. These steps were carried. out with the receiving antenna in both vertical and horizontal polarization. Harmonic emissions up to the 10th or 40GHz, whichever was the lesser, were investigated.

Radiated Spurious Emissions Test Setup



Note :

1. According to SVSWR requirement in ANSI 63.4-2014, We performed the radiated test at 3.75 m distance from center of turn table. So, we applied the distance factor(reference distance : 3 m).
2. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)

Receiver Spurious Emissions Test Result:

ISED Rule(s):	**RSS-Gen**
Test Requirements:	**Blow the table**
Operating conditions:	**Under normal test conditions**
Method of testing:	**Radiated**
S/A. Settings:	**F < 1 GHz: RBW: 120 kHz, VBW: 300 kHz (Quasi Peak)** **F > 1 GHz: RBW: 1 MHz, VBW: 1 MHz (Peak)**
Mode of operation:	**Receive**

Frequency (MHz)	**Field Strength (microvolts/m at 3 meters)**
30 – 88	100
88 - 216	150
216 – 960	200
Above 960	500

Operation Mode: Receive:

30 MHz ~ 1 GHz

Frequency	**Reading**	**Ant. factor**	**Cable loss**	**Ant. POL**	**Total**	**Limit**	**Margin**
MHz	dBμV	dB /m	dB	(H/V)	dBμV/m	dBμV/m	dB
No critical peaks found							

Above 1 GHz

Frequency	**Reading**	**Ant. factor**	**Cable loss**	**Ant. POL**	**Total**	**Limit**	**Margin**
MHz	dBμV	dB /m	dB	(H/V)	dBμV/m	dBμV/m	dB
No critical peaks found							

Radiated Spurious Emissions Test Result:

PS 700

[Downlink]

Ch.	Freq.(MHz)	Measured Level [dBuV/m]	Measured Power [dBm]	Ant. Factor [dB/m]	C.L [dB]	A.G. [dB]	H.P.F.. [dB]	D.F. [dB]	Pol.	Result [dBm]
No Critical Peaks Found										

* C.L.: Cable Loss / A.G.: Ant. Gain / H.P.F.: High Pass Filter / D.F.: Distance Factor (3.75 m)

[Uplink]

Ch.	Freq.(MHz)	Measured Level [dBuV/m]	Measured Power [dBm]	Ant. Factor [dB/m]	C.L [dB]	A.G. [dB]	H.P.F.. [dB]	D.F. [dB]	Pol.	Result [dBm]
No Critical Peaks Found										

* C.L.: Cable Loss / A.G.: Ant. Gain / H.P.F.: High Pass Filter / D.F.: Distance Factor (3.75 m)

PS 800

[Downlink]

Ch.	Freq.(MHz)	Measured Level [dBuV/m]	Measured Power [dBm]	Ant. Factor [dB/m]	C.L [dB]	A.G. [dB]	H.P.F.. [dB]	D.F. [dB]	Pol.	Result [dBm]
No Critical Peaks Found										

* C.L.: Cable Loss / A.G.: Ant. Gain / H.P.F.: High Pass Filter / D.F.: Distance Factor (3.75 m)

[Uplink]

Ch.	Freq.(MHz)	Measured Level [dBuV/m]	Measured Power [dBm]	Ant. Factor [dB/m]	C.L [dB]	A.G. [dB]	H.P.F.. [dB]	D.F. [dB]	Pol.	Result [dBm]
No Critical Peaks Found										

* C.L.: Cable Loss / A.G.: Ant. Gain / H.P.F.: High Pass Filter / D.F.: Distance Factor (3.75 m)

13. FREQUENCY STABILITY OVER TEMPERATURE AND VOLTAGE VARIATIONS

FCC Rules

Test Requirements:

§ 2.1055 Measurements required: Frequency stability.

(a) The frequency stability shall be measured with variation of ambient temperature as follows:

(1) From −30° to + 50° centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.

§ 90.213 Frequency stability.

(a) Unless noted elsewhere, transmitters used in the services governed by this part must have a minimum frequency stability as specified in the following table.

Minimum Frequency Stability [Parts per million (ppm)]

Frequency range (MHz)	**Fixed and base stations**	**Mobile stations**	
		Over 2 watts output	**2 watts or less output**
Below 25	100	100	200
25-50	20	20	50
72-76	5		50
150-174	5	5	[4]50
216-220	1.0		1.0
220-222[12]	0.1	1.5	1.5
421-512	2.5	5	5
806-809	1.0	1.5	1.5
809-824	1.5	2.5	2.5
851-854	1.0	1.5	1.5
854-869	1.5	2.5	2.5
896-901	0.1	1.5	1.5
902-928	2.5	2.5	2.5
902-928[13]	2.5	2.5	2.5
929-930	1.5		
935-940	0.1	1.5	1.5
1427-1435	300	300	300
Above 2450			

(b) For the purpose of determining the frequency stability limits, the power of a transmitter is considered to be the maximum rated output power as specified by the manufacturer.

§ 90.539 Frequency stability.

Transmitters designed to operate in 769-775 MHz and 799-805 MHz frequency bands must meet the frequency stability requirements in this section.

(a) Mobile, portable and control transmitters must normally use automatic frequency control (AFC) to lock on to the base station signal.

(b) The frequency stability of base transmitters operating in the narrowband segment must be 100 parts per billion or better.

(c) The frequency stability of mobile, portable, and control transmitters operating in the narrowband segment must be 400 parts per billion or better when AFC is locked to the base station. When AFC is not locked to the base station, the frequency stability must be at least 1.0 ppm for 6.25 kHz, 1.5 ppm for 12.5 kHz (2 channel aggregate), and 2.5 ppm for 25 kHz (4 channel aggregate).

(d) The frequency stability of base transmitters operating in the wideband segment must be 1 part per million or better.

(e) The frequency stability of mobile, portable and control transmitters operating in the wideband segment must be 1.25 parts per million or better when AFC is locked to a base station, and 5 parts per million or better when AFC is not locked.

IC Rules

Test Requirements:

5. Transmitter and Receiver Specifications

5.3 Transmitter Frequency Stability

The carrier frequency shall not depart from the reference frequency in excess of the values given in Table 1. For transmitters that have an output power of less than 120 mW, the frequency stability shall comply with the limits listed in Table 1 or, alternatively, with the conditions in Section 5.10.

For fixed and base station equipment, in lieu of meeting the frequency stability limit specified in Table 1, the test report can show that the frequency stability is met by demonstrating that the unwanted emission limits, related to the equipment's nominal carrier frequency measured under normal operation, are met when the equipment is tested at the temperature and supply voltage variations specified for the frequency stability measurement in RSS-Gen.

Table 1 — Transmitter Frequency Stability				
Frequency Band (MHz)	**Channel Bandwidth (kHz)**	**Frequency Stability (ppm)**		
		Base/Fixed	**Mobile Station**	
			Output Power >2 W	**Output Power ≤2 W**

27.41-28 and 29.7-50	20	20	20	50
72-76	20	5	20	50
138-174	30	5	5	5
	15	2.5	5	5
	7.5	1	2	5
217-218 and 219-220	12.5	1	5	5
220-222	5	0.1	1.5	1.5
406.1-430 and 450-470	25	0.5	1	1
	25	2.5	5	5
	12.5	1.5	2.5	2.5
	6.25	0.5	1	1
768-776 and 798-806	25	0.1	0.4	0.4
	12.5			
	6.25			
	50	1	1.25	1.25
806-821/851-866 and 821-824/866- 869	25	0.1	0.1	0.1
	25	1.5	2.5	2.5
	12.5	1	1.5	1.5
	6.25	0.1	0.4	0.4
896-901/935-940	12.5	0.1	1.5	1.5
929-930/931-932	25	1.5	N/A	N/A
928-929/952-953 and 932-932.5/941- 941.5	25	1.5	N/A	N/A
	12.5	1	3 (for remote station)	N/A
932.5-935/941.5-944	25	2.5	N/A	N/A
	12.5	2.5	N/A	N/A

Test Procedures:

As required by 47 CFR 2.1055, *Frequency Stability measurements* were made at the RF output terminals using a Spectrum Analyzer.

The EUT was placed in the Environmental Chamber.

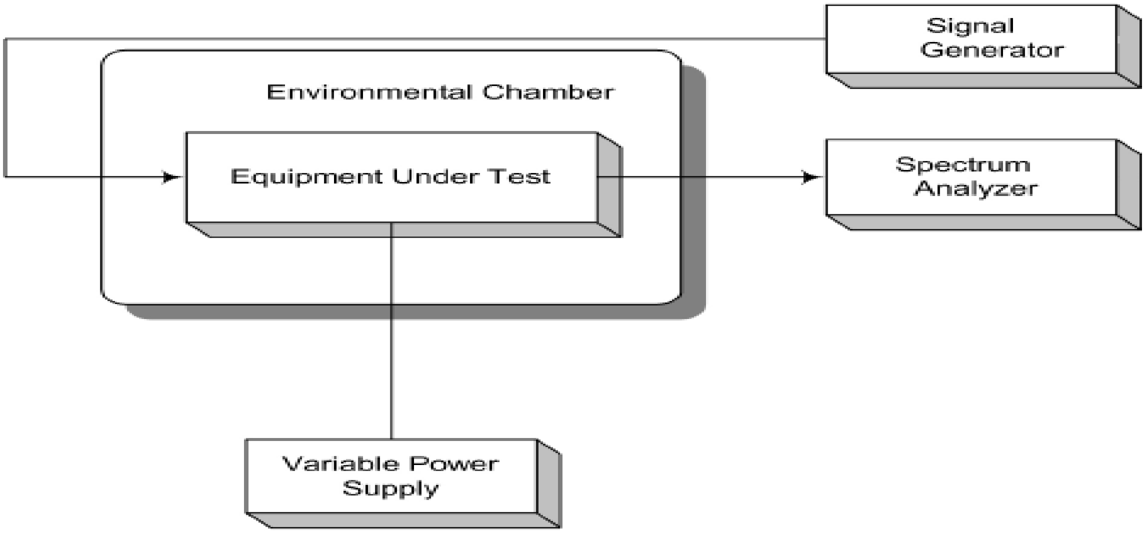
A CW signal was injected into the EUT at the appropriate RF level. The frequency counter option on the Spectrum Analyzer was used to measure frequency deviations.

The frequency drift was investigated for every 10 °C increment until the unit is stabilized then recorded the reading in tabular format with the temperature range of -30 to 50 °C.

Voltage supplied to EUT is 110 Vac reference temperature was done at 20°C.

The voltage was varied by ± 15 % of nominal

Test Setup:



* Note: This EUT is supported power supply both of AC and DC. Test results are only attached worst cases.

Frequency Stability and Voltage Test Results

PS 700

[Downlink]

Reference: 120 Vac at 20°C **Freq.** = 772.0 MHz

Voltage (%)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (Hz)	ppm
100%	+20(Ref)	772 000 000	0.172	0.000	0.00000
	-30	772 000 000	-0.090	-0.262	-0.00034
	-20	772 000 001	0.904	0.733	0.00095
	-10	772 000 000	-0.452	-0.624	-0.00081
	0	771 999 999	-0.755	-0.927	-0.00120
	+10	772 000 001	0.831	0.660	0.00085
	+30	771 999 999	-0.625	-0.796	-0.00103
	+40	772 000 000	-0.412	-0.583	-0.00076
	+50	772 000 000	0.321	0.149	0.00019
High	+20	771 999 999	-0.937	-1.109	-0.00144
Low	+20	772 000 000	0.119	-0.053	-0.00007

[Uplink]

Reference: 120 Vac at 20°C **Freq.** = 802.0 MHz

Voltage (%)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (Hz)	ppm
100%	+20(Ref)	802 000 000	-0.401	0.000	0.00000
	-30	801 999 999	-0.658	-0.257	-0.00033
	-20	802 000 000	-0.181	0.220	0.00028
	-10	801 999 999	-0.854	-0.454	-0.00059
	0	801 999 999	-0.849	-0.448	-0.00058
	+10	801 999 999	-0.757	-0.357	-0.00046
	+30	801 999 999	-0.802	-0.401	-0.00052
	+40	802 000 000	-0.392	0.008	0.00001
	+50	802 000 000	-0.268	0.133	0.00017
High	+20	802 000 000	-0.115	0.286	0.00037
Low	+20	802 000 001	0.848	1.249	0.00162

PS 800

[Downlink]

Reference: 110 Vac at 20°C **Freq.** = 856.0 MHz

Voltage (%)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (Hz)	ppm
100%	+20(Ref)	856 000 000	0.445	0.000	0.00000
	-30	856 000 000	-0.175	-0.620	-0.00080
	-20	856 000 000	0.487	0.042	0.00005
	-10	856 000 000	-0.437	-0.882	-0.00114
	0	856 000 000	-0.151	-0.596	-0.00077
	+10	856 000 001	0.935	0.490	0.00064
	+30	856 000 000	-0.459	-0.904	-0.00117
	+40	856 000 000	-0.159	-0.604	-0.00078
	+50	856 000 000	0.254	-0.191	-0.00025
High	+20	856 000 000	-0.371	-0.816	-0.00106
Low	+20	856 000 000	0.190	-0.255	-0.00033

[Uplink]

Reference: 110 Vac at 20°C **Freq.** = 811.0 MHz

Voltage (%)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (Hz)	ppm
100%	+20(Ref)	811 000 000	0.305	0.000	0.00000
	-30	811 000 000	-0.243	-0.547	-0.00071
	-20	811 000 000	0.384	0.079	0.00010
	-10	811 000 000	-0.192	-0.497	-0.00064
	0	811 000 000	-0.154	-0.459	-0.00059
	+10	811 000 000	0.001	-0.303	-0.00039
	+30	811 000 000	-0.436	-0.740	-0.00096
	+40	811 000 000	-0.024	-0.329	-0.00043
	+50	811 000 001	0.946	0.641	0.00083
High	+20	811 000 000	-0.355	-0.659	-0.00085
Low	+20	811 000 000	0.080	-0.224	-0.00029