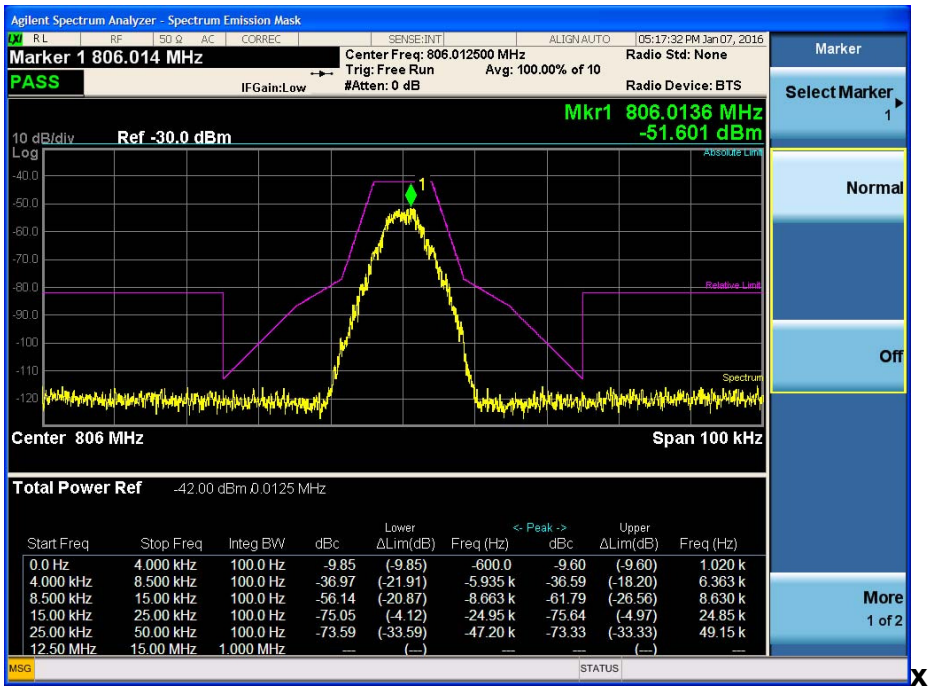
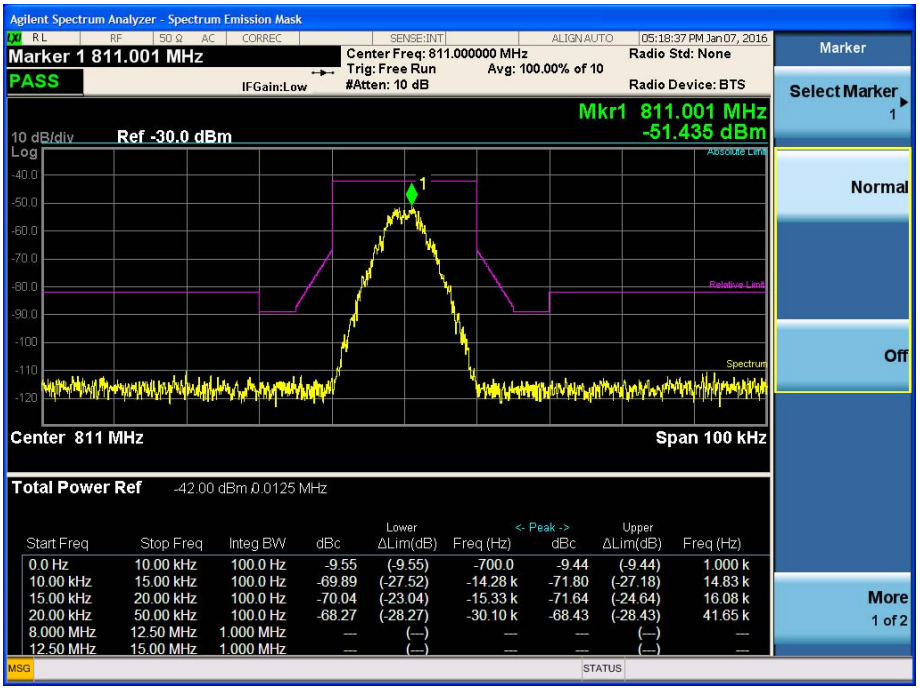
800MHz Band UL

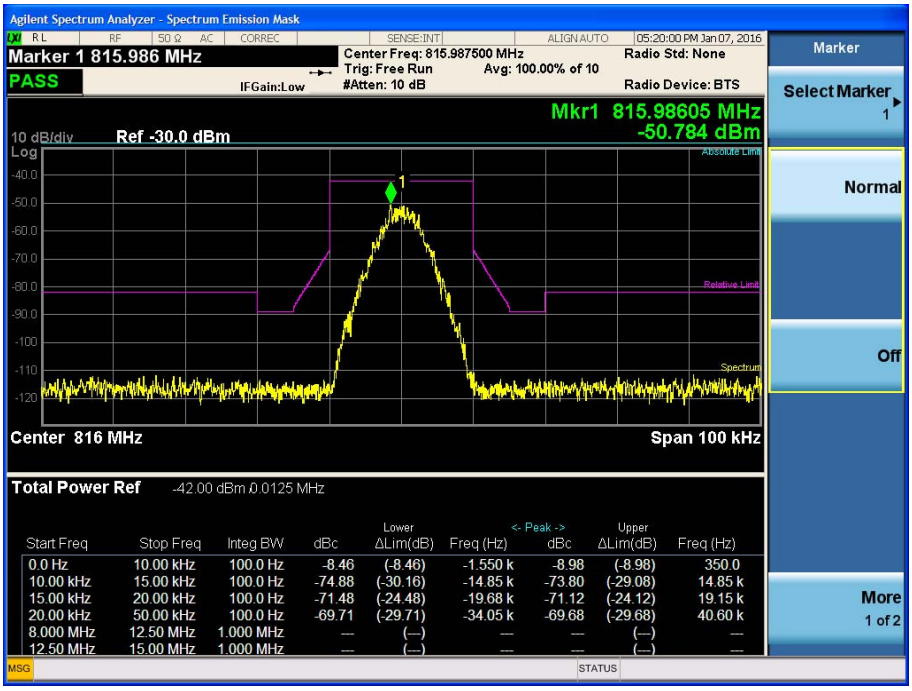
[806 MHz ~ 817 MHz Uplink Input P25 Low Emission Mask H]



[806 MHz ~ 817 MHz Uplink Input P25 Middle Emission Mask G]

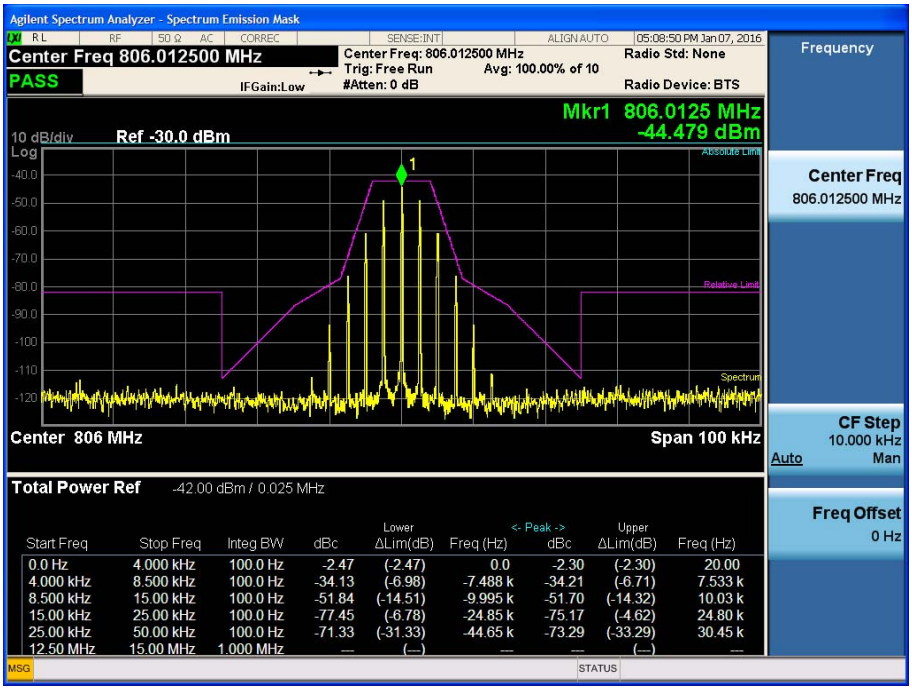


[806 MHz ~ 817 MHz Uplink Input P25 High Emission Mask G]



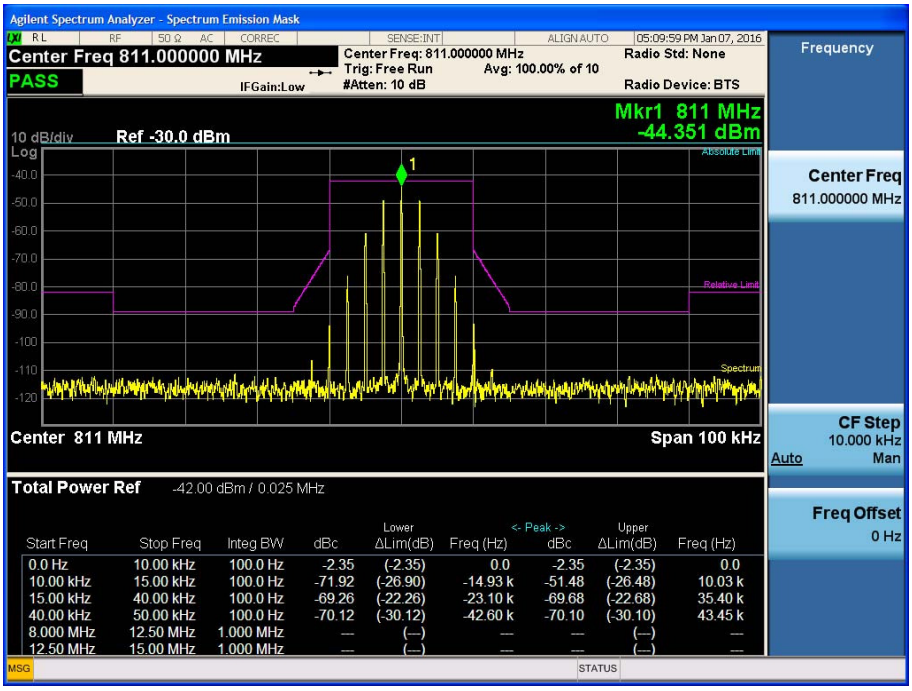
Start Freq	Stop Freq	Integ BW	dBc	Lower ΔLim(dB)	Lower Freq (Hz)	<- Peak -> dBc	Upper ΔLim(dB)	Upper Freq (Hz)
0.0 Hz	10.00 kHz	100.0 Hz	-8.46	(-8.46)	-1.550 k	-8.98	(-8.98)	350.0
10.00 kHz	15.00 kHz	100.0 Hz	-74.88	(-30.16)	-14.85 k	-73.80	(-29.08)	14.85 k
15.00 kHz	20.00 kHz	100.0 Hz	-71.48	(-24.48)	-19.68 k	-71.12	(-24.12)	19.15 k
20.00 kHz	50.00 kHz	100.0 Hz	-69.71	(-29.71)	-34.05 k	-69.68	(-29.68)	40.60 k
8.000 MHz	12.50 MHz	1.000 MHz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---

[806 MHz ~ 817 MHz Uplink Input FM Low Emission Mask H]



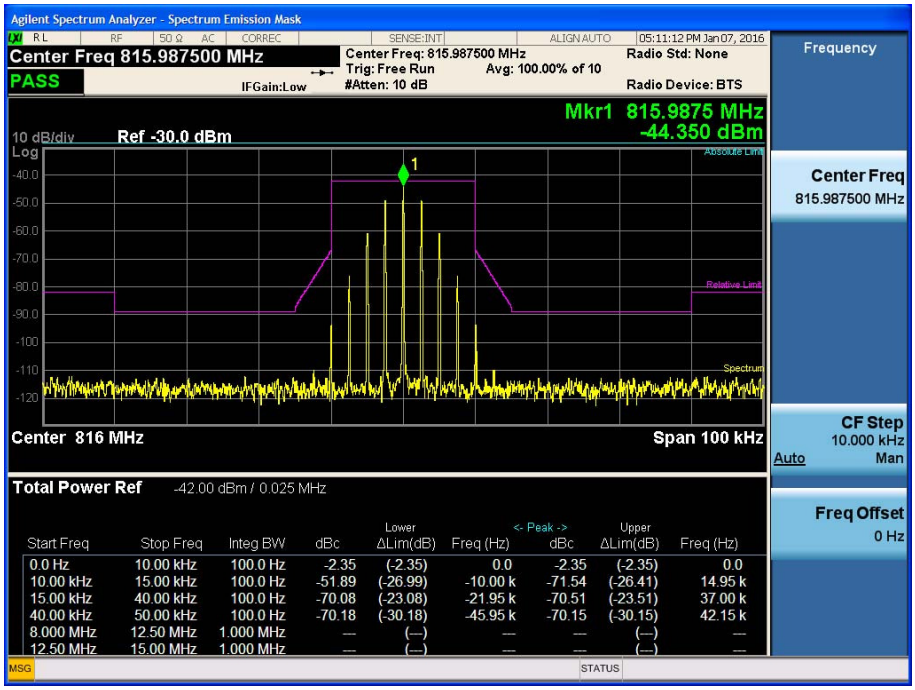
Start Freq	Stop Freq	Integ BW	dBc	Lower ΔLim(dB)	Lower Freq (Hz)	<- Peak -> dBc	Upper ΔLim(dB)	Upper Freq (Hz)
0.0 Hz	4.000 kHz	100.0 Hz	-2.47	(-2.47)	0.0	-2.30	(-2.30)	20.00
4.000 kHz	8.500 kHz	100.0 Hz	-34.13	(-6.98)	-7.488 k	-34.21	(-6.71)	7.533 k
8.500 kHz	15.00 kHz	100.0 Hz	-51.84	(-14.51)	-9.995 k	-51.70	(-14.32)	10.03 k
15.00 kHz	25.00 kHz	100.0 Hz	-77.45	(-6.78)	-24.85 k	-75.17	(-4.62)	24.80 k
25.00 kHz	50.00 kHz	100.0 Hz	-71.33	(-31.33)	-44.65 k	-73.29	(-33.29)	30.45 k
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---

[806 MHz ~ 817 MHz Uplink Input FM Middle Emission Mask G]



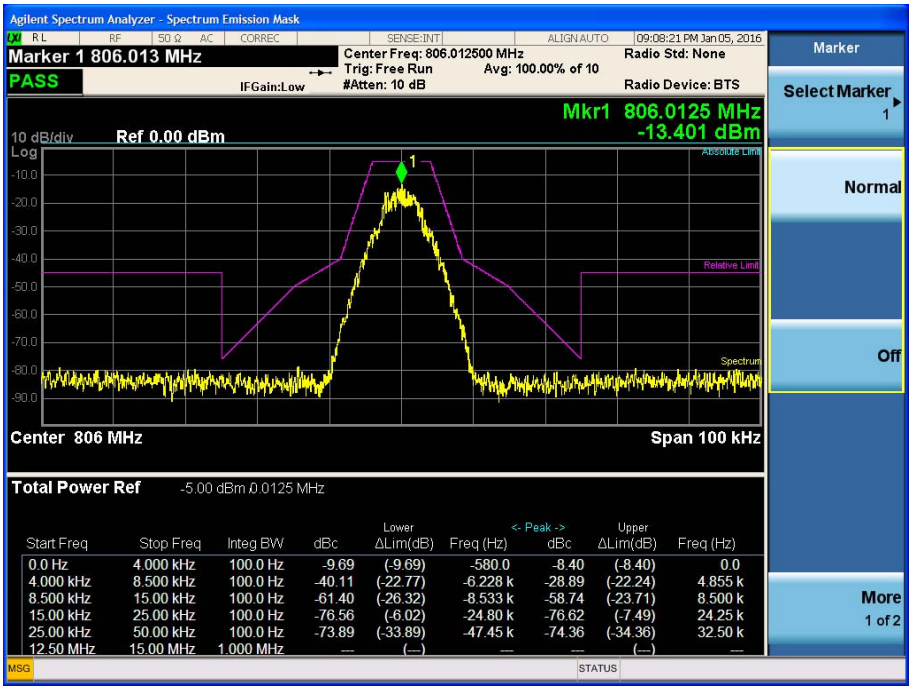
Start Freq	Stop Freq	Integ BW	dBc	Lower ΔLim(dB)	Lower Freq (Hz)	<- Peak -> dBc	Upper ΔLim(dB)	Upper Freq (Hz)
0.0 Hz	10.00 kHz	100.0 Hz	-2.35	(-2.35)	0.0	-2.35	(-2.35)	0.0
10.00 kHz	15.00 kHz	100.0 Hz	-71.92	(-26.90)	-14.93 k	-51.48	(-26.48)	10.03 k
15.00 kHz	40.00 kHz	100.0 Hz	-69.26	(-22.26)	-23.10 k	-69.68	(-22.68)	35.40 k
40.00 kHz	50.00 kHz	100.0 Hz	-70.12	(-30.12)	-42.60 k	-70.10	(-30.10)	43.45 k
8.000 MHz	12.50 MHz	1.000 MHz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---

[806 MHz ~ 817 MHz Uplink Input FM High Emission Mask G]

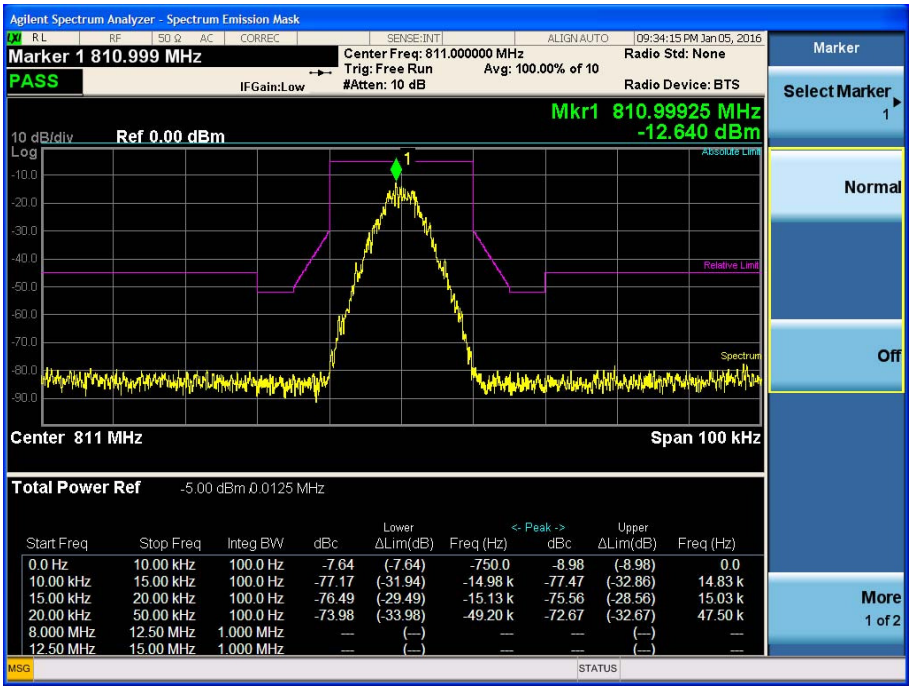


Start Freq	Stop Freq	Integ BW	dBc	Lower ΔLim(dB)	Lower Freq (Hz)	<- Peak -> dBc	Upper ΔLim(dB)	Upper Freq (Hz)
0.0 Hz	10.00 kHz	100.0 Hz	-2.35	(-2.35)	0.0	-2.35	(-2.35)	0.0
10.00 kHz	15.00 kHz	100.0 Hz	-51.89	(-26.99)	-10.00 k	-71.54	(-26.41)	14.95 k
15.00 kHz	40.00 kHz	100.0 Hz	-70.08	(-23.08)	-21.95 k	-70.51	(-23.51)	37.00 k
40.00 kHz	50.00 kHz	100.0 Hz	-70.18	(-30.18)	-45.95 k	-70.15	(-30.15)	42.15 k
8.000 MHz	12.50 MHz	1.000 MHz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---

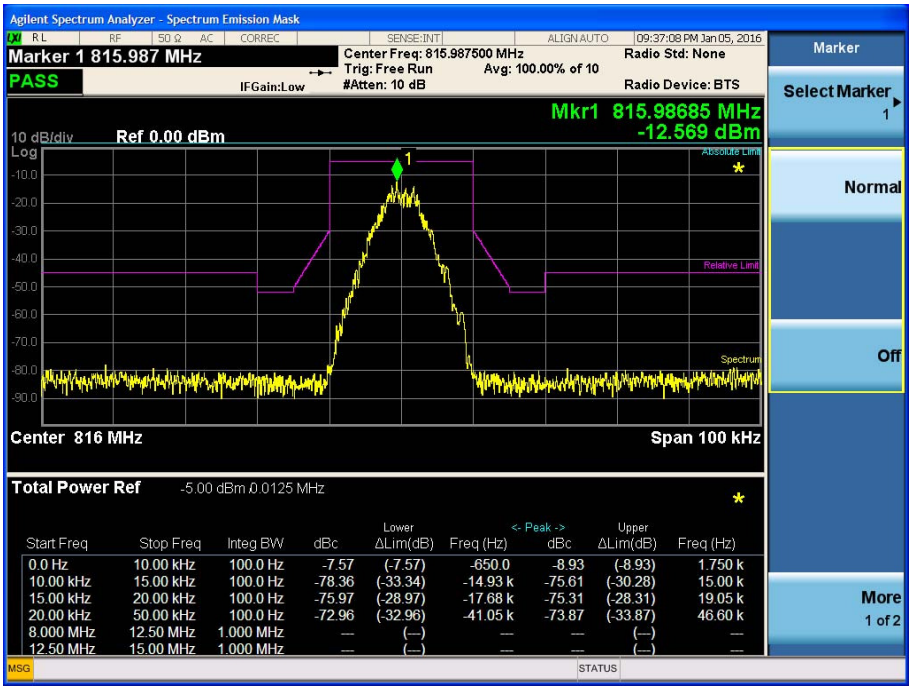
[806 MHz ~ 817 MHz Uplink Output P25 Low Emission Mask H]



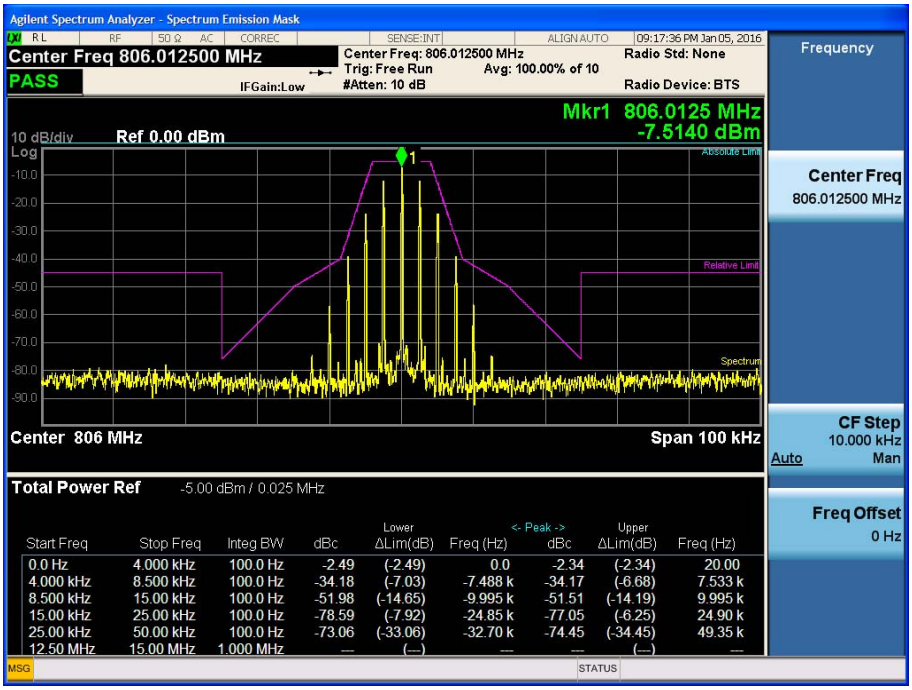
[806 MHz ~ 817 MHz Uplink Output P25 Middle Emission Mask G]



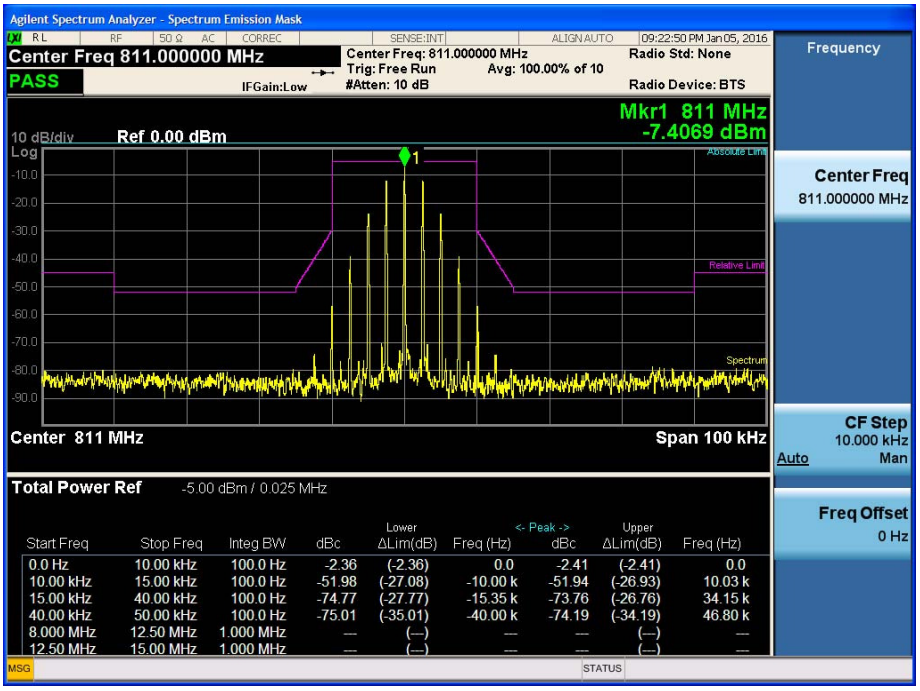
[806 MHz ~ 817 MHz Uplink Output P25 High Emission Mask G]



[806 MHz ~ 817 MHz Uplink Output FM Low Emission Mask H]

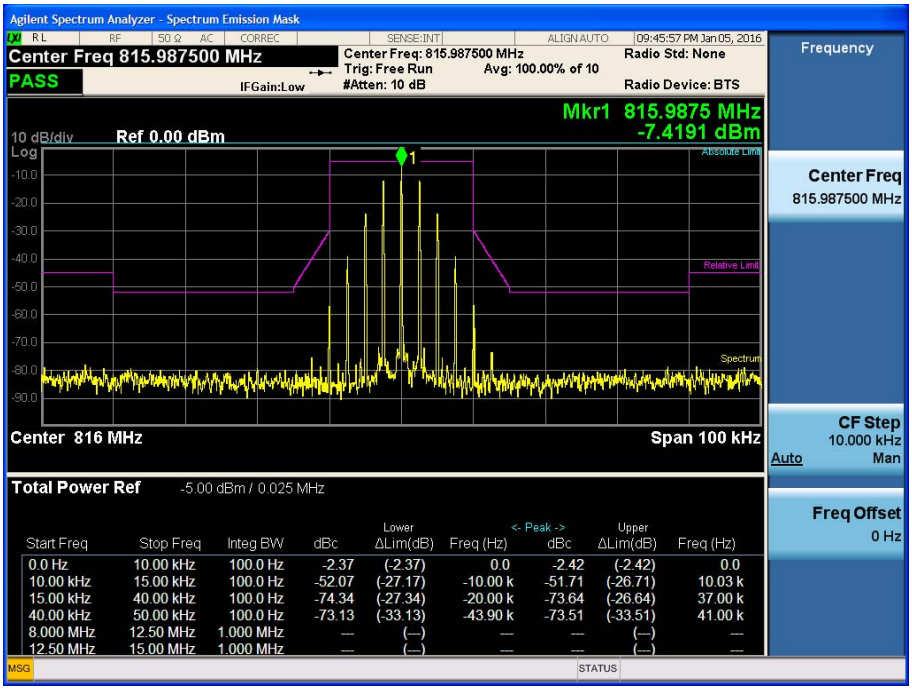


[806 MHz ~ 817 MHz Uplink Output FM Middle Emission Mask G]



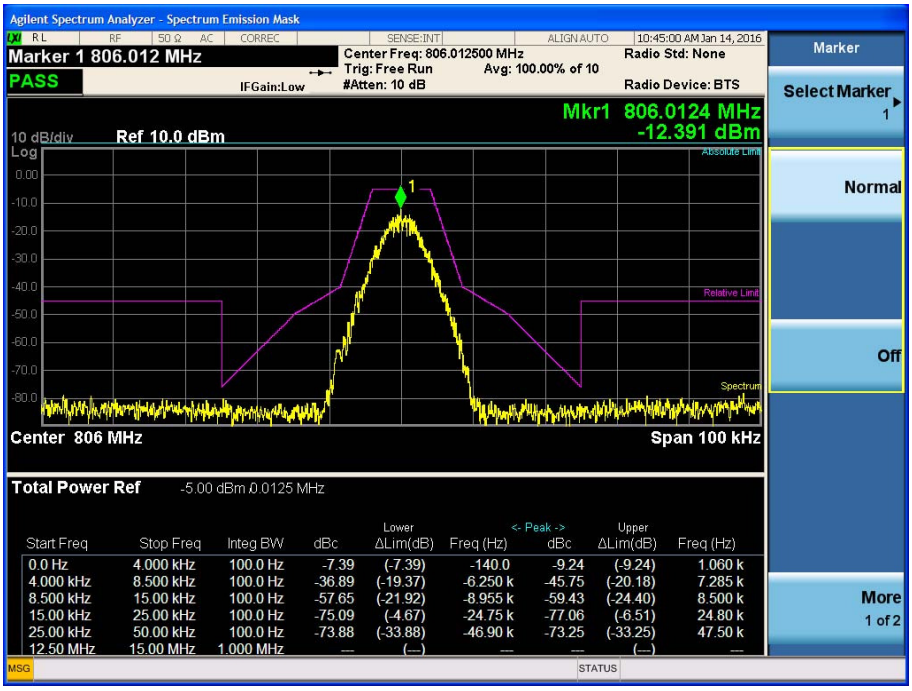
Start Freq	Stop Freq	Integ BW	dBc	Lower ΔLim(dB)	Lower Freq (Hz)	<- Peak -> dBc	Upper ΔLim(dB)	Upper Freq (Hz)
0.0 Hz	10.00 kHz	100.0 Hz	-2.36	(-2.36)	0.0	-2.41	(-2.41)	0.0
10.00 kHz	15.00 kHz	100.0 Hz	-51.98	(-27.08)	-10.00 k	-51.94	(-26.93)	10.03 k
15.00 kHz	40.00 kHz	100.0 Hz	-74.77	(-27.77)	-15.35 k	-73.76	(-26.76)	34.15 k
40.00 kHz	50.00 kHz	100.0 Hz	-75.01	(-35.01)	-40.00 k	-74.19	(-34.19)	46.80 k
8.000 MHz	12.50 MHz	1.000 MHz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---

[806 MHz ~ 817 MHz Uplink Output FM High Emission Mask G]

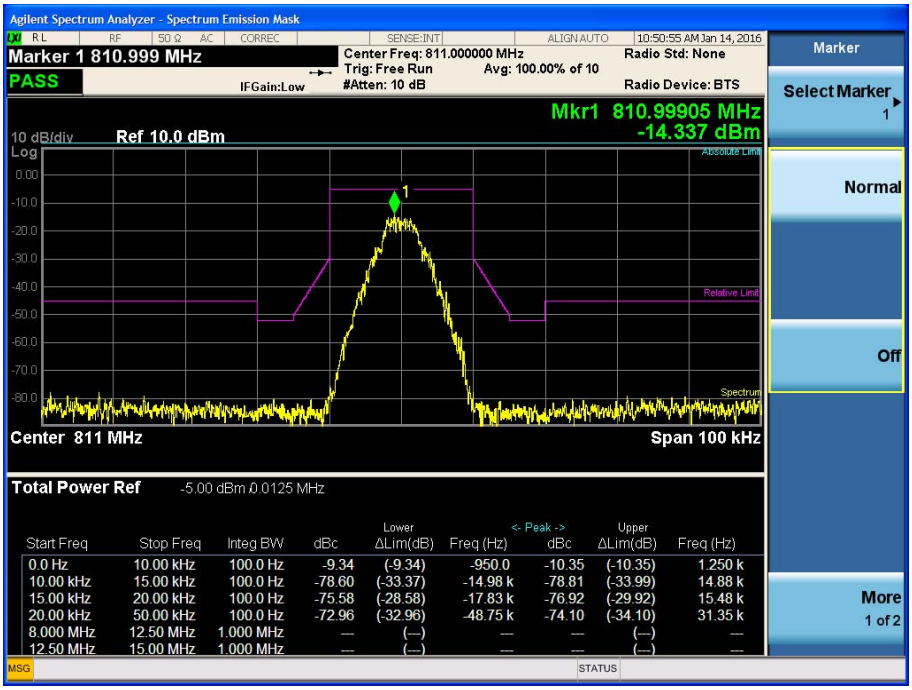


Start Freq	Stop Freq	Integ BW	dBc	Lower ΔLim(dB)	Lower Freq (Hz)	<- Peak -> dBc	Upper ΔLim(dB)	Upper Freq (Hz)
0.0 Hz	10.00 kHz	100.0 Hz	-2.37	(-2.37)	0.0	-2.42	(-2.42)	0.0
10.00 kHz	15.00 kHz	100.0 Hz	-52.07	(-27.17)	-10.00 k	-51.71	(-26.71)	10.03 k
15.00 kHz	40.00 kHz	100.0 Hz	-74.34	(-27.34)	-20.00 k	-73.64	(-26.64)	37.00 k
40.00 kHz	50.00 kHz	100.0 Hz	-73.13	(-33.13)	-43.90 k	-73.51	(-33.51)	41.00 k
8.000 MHz	12.50 MHz	1.000 MHz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---

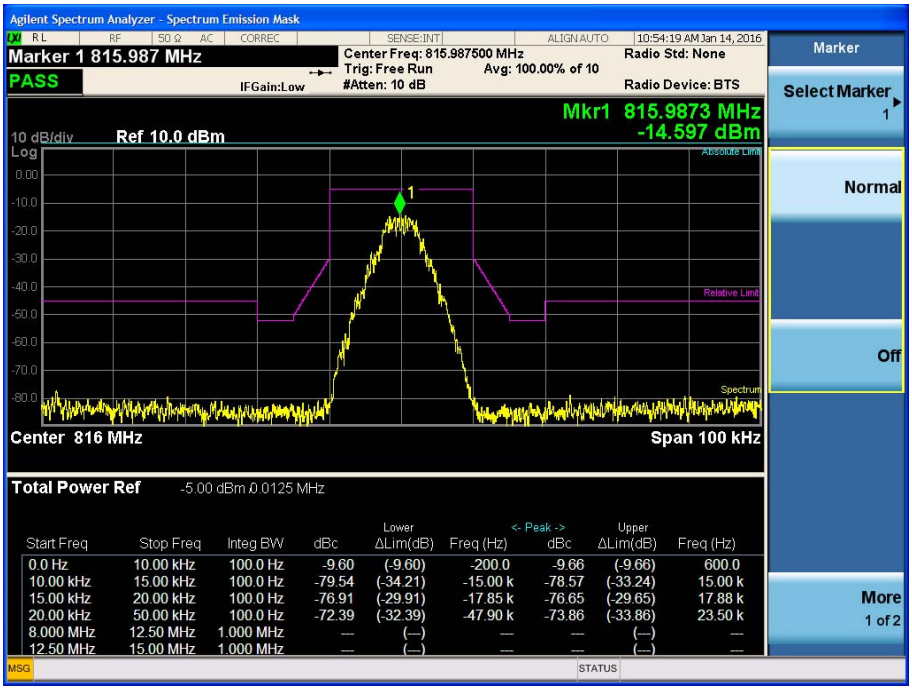
[+3 dB Above the AGC Threshold Uplink Output P25 Low Emission Mask H]



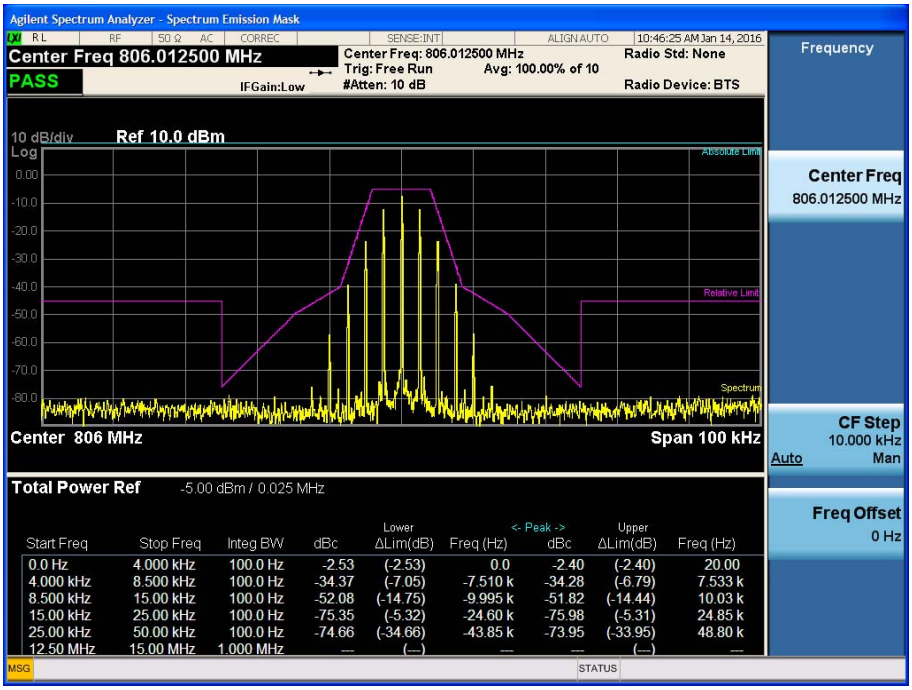
[+3 dB Above the AGC Threshold Uplink Output P25 Middle Emission Mask G]



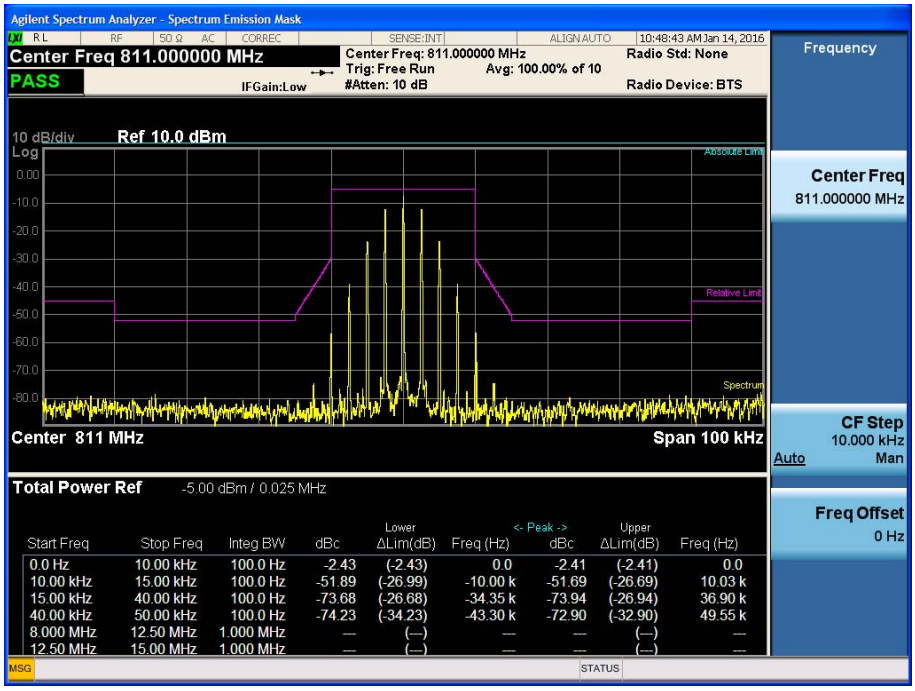
[+3 dB Above the AGC Threshold Uplink Output P25 High Emission Mask G]



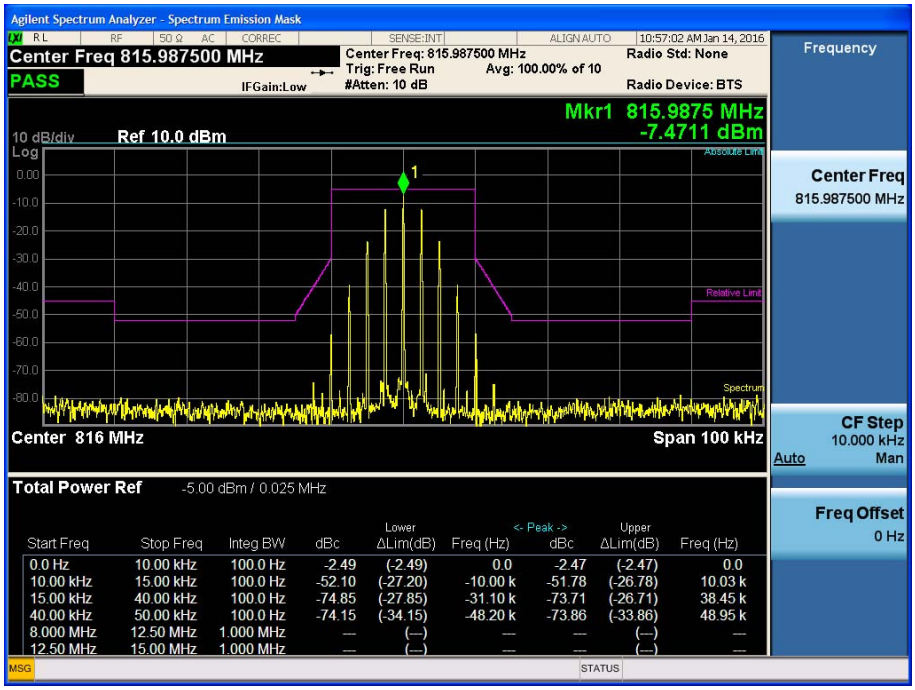
[+3 dB Above the AGC Threshold Uplink Output FM Low Emission Mask H]



[+3 dB Above the AGC Threshold Uplink Output FM Middle Emission Mask G]



[+3 dB Above the AGC Threshold Uplink Output FM High Emission Mask G]



11. SPURIOUS AND HARMONIC EMISSION AT ANTENNA TERMINAL

FCC Rules

Test Requirement(s):

§ 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.

§ 90.543 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.

12.5 kHz Mobile Transmitter ACP Requirements

Offset from center frequency (kHz)	Measurement bandwidth (kHz)	Maximum ACP relative (dBc)
6.375	6.25	−40
15.625	6.25	−60
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

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

(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 measurement 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 subtracting 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 subtracting 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.

(g) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

§ 90.691 Emission mask requirements for EA-based systems.

(a) Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 $Log_{10}(f/6.1)$ decibels or 50 + 10 $Log_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + $10Log_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

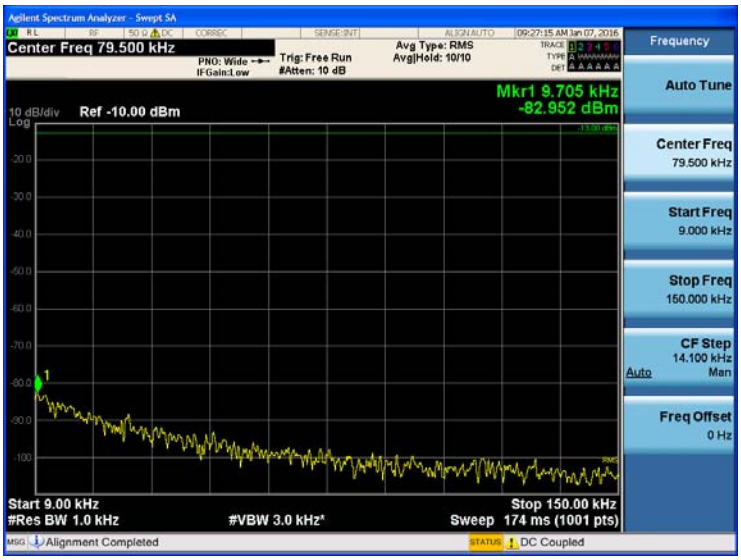
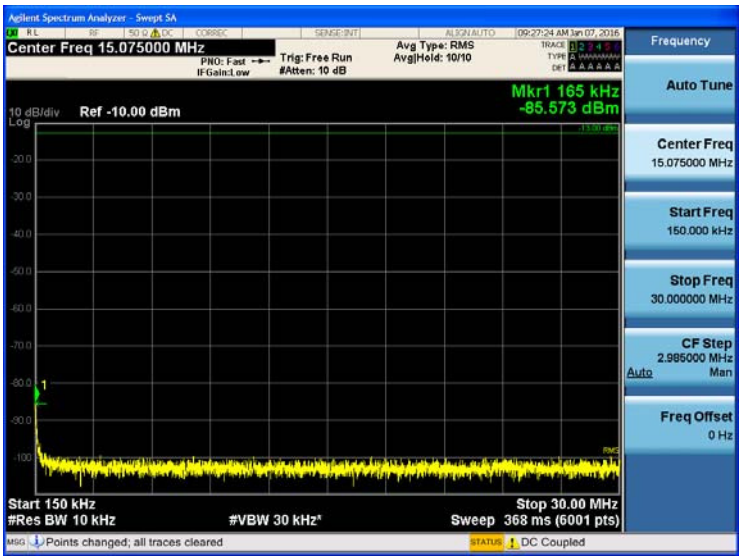
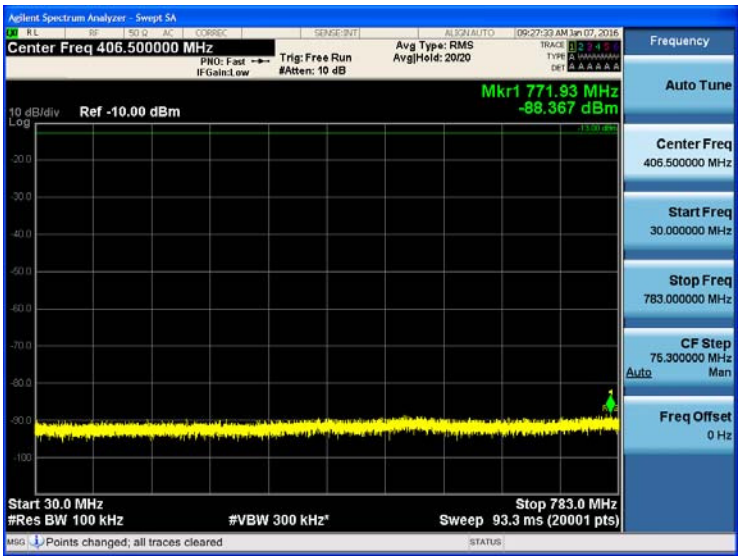
(b) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

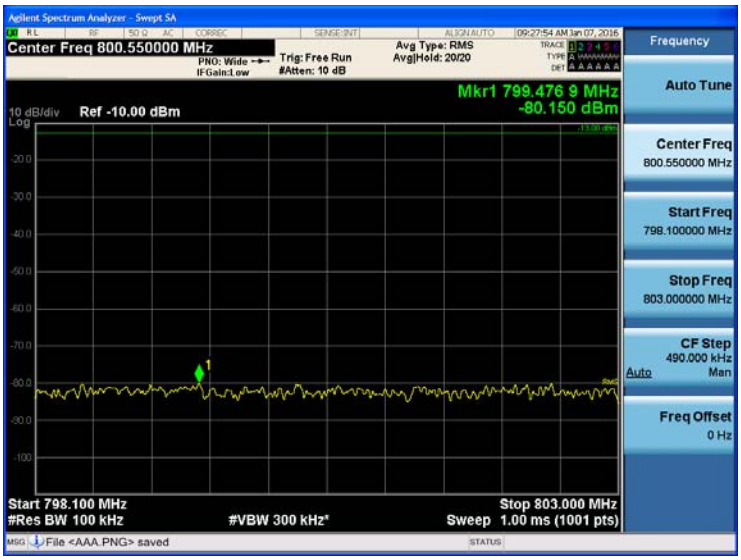
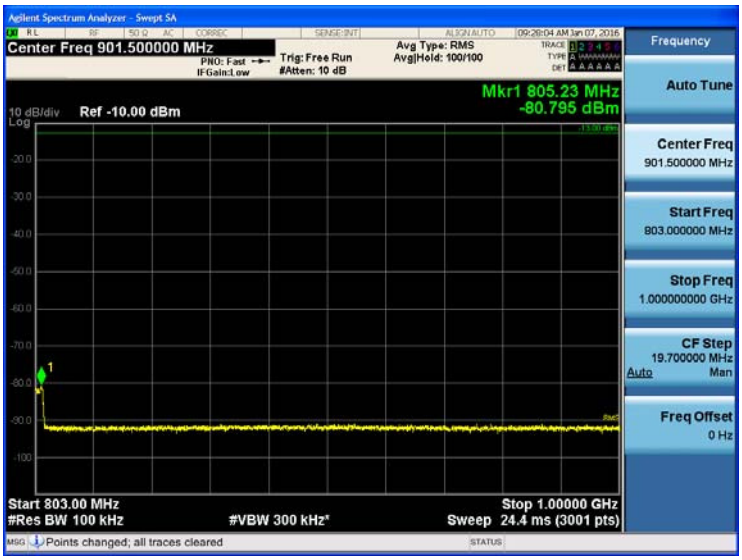
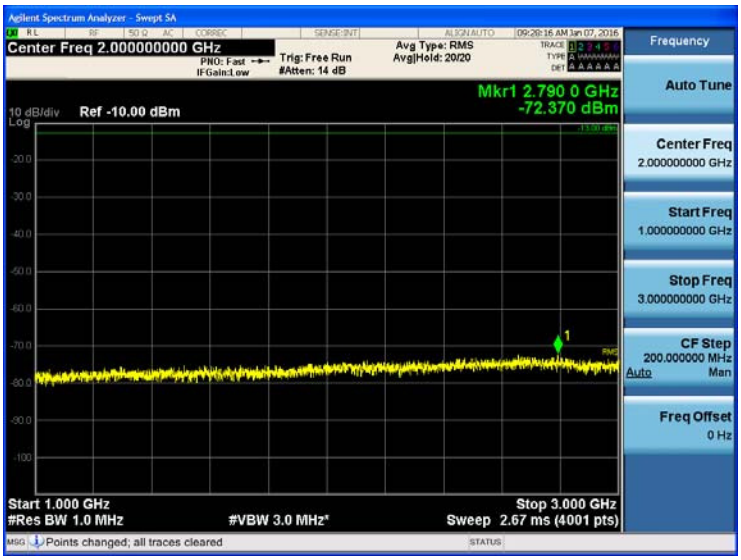
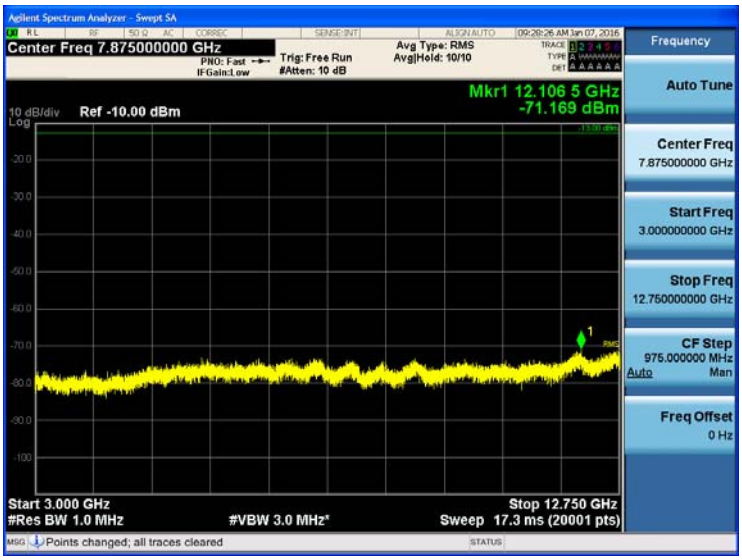
Test Results: The EUT complies with the requirements of this section. There were no Detectable Spurious emissions for this EUT.

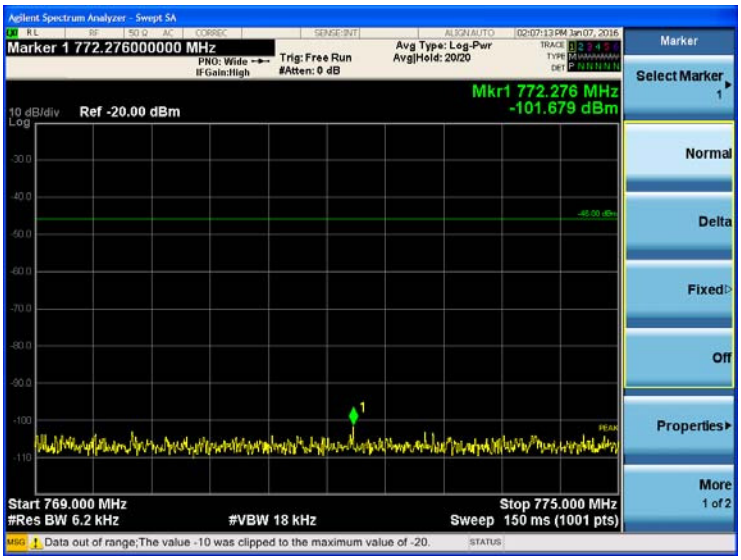
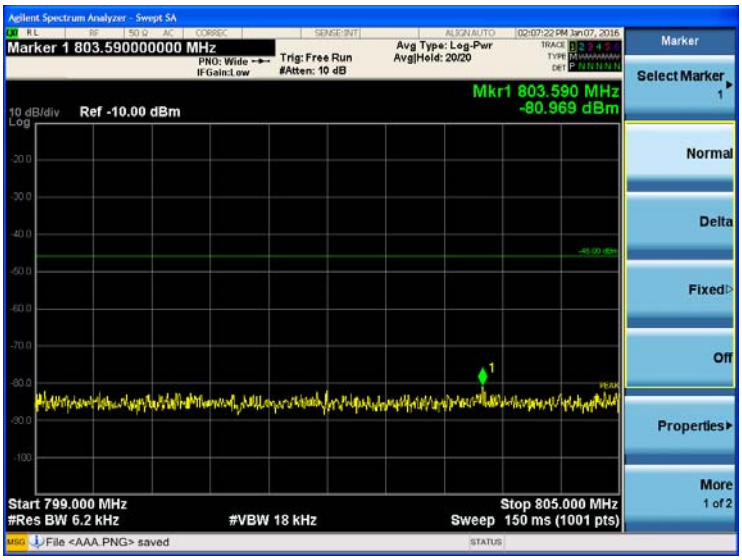
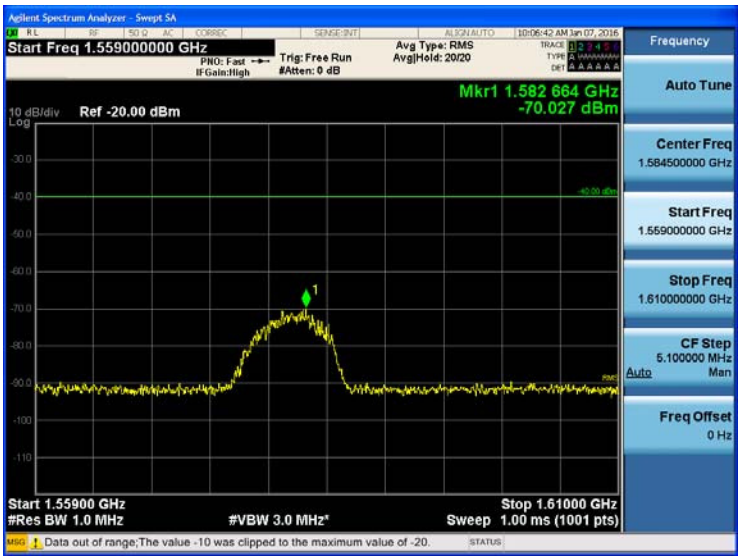
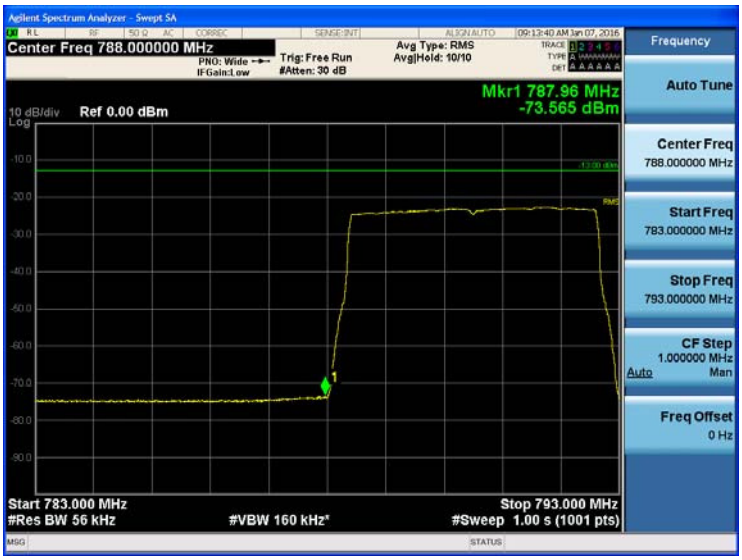
Single channel Enhancer Plots of Spurious Emission

700 MHz Band LTE

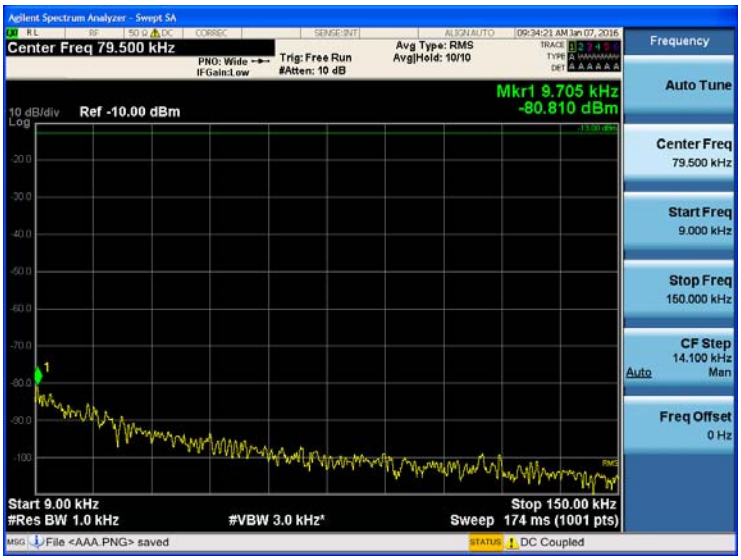
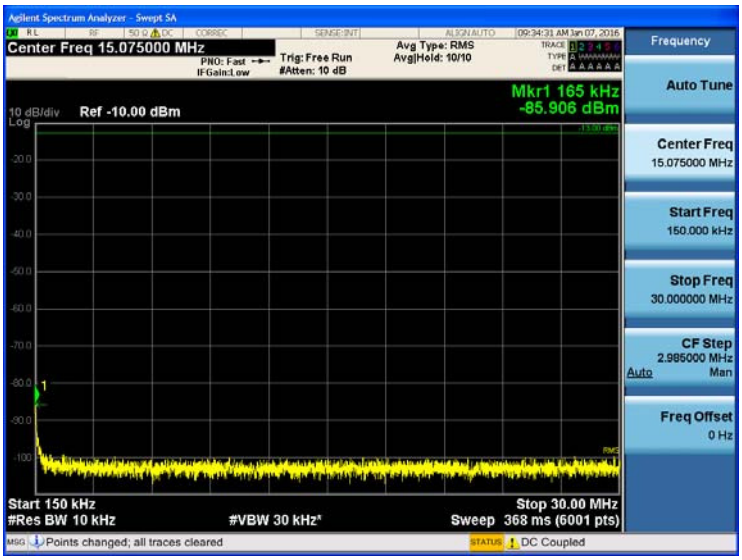
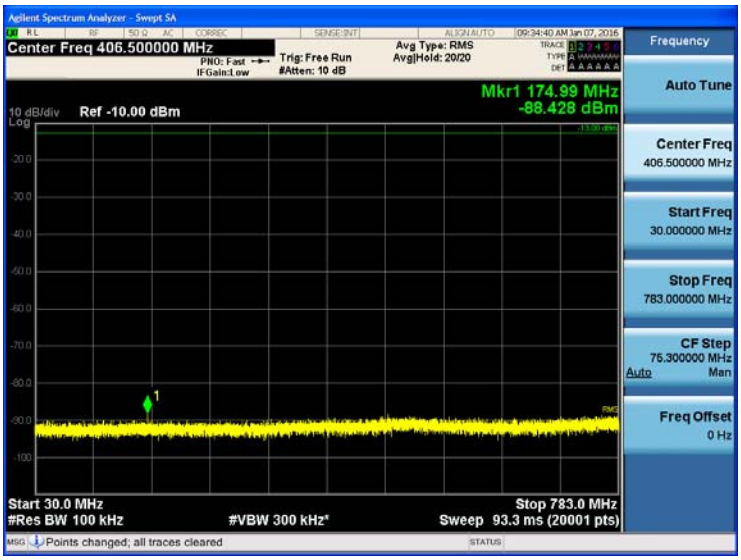
[LTE 5 MHz Uplink Low]

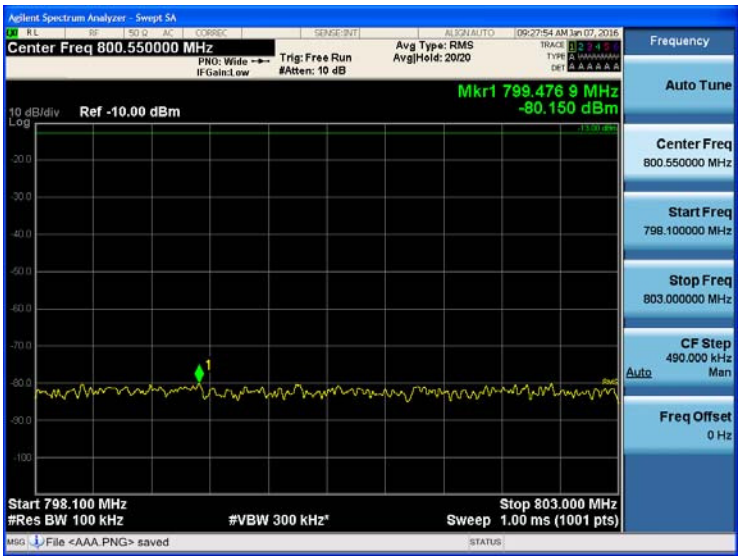
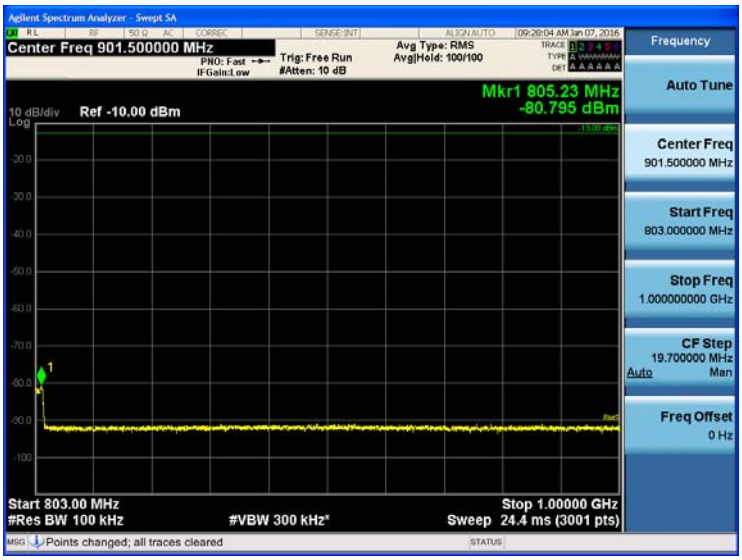
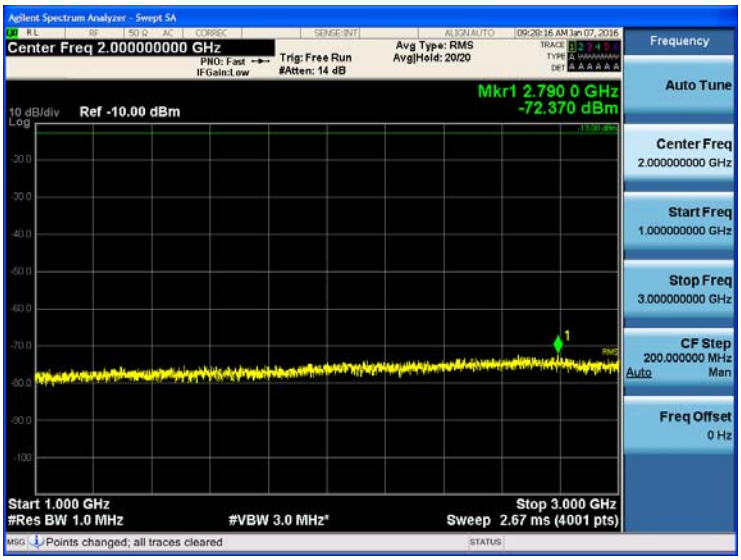
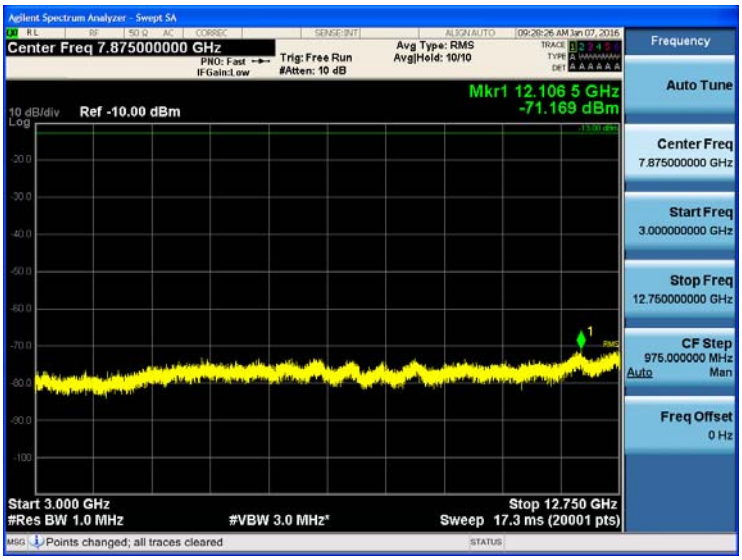
9㎑ ~ 150㎑	150㎑ ~ 30㎒
	
30㎒ ~ 1㎓-1	**30㎒ ~ 1㎓-2**
	

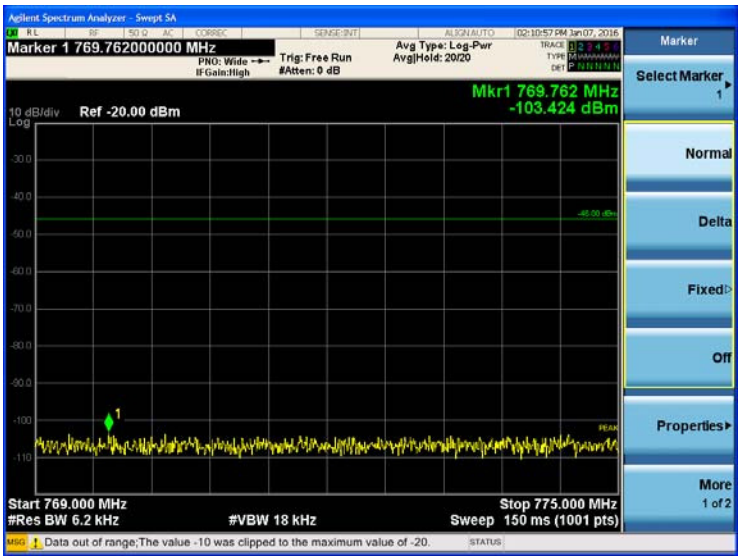
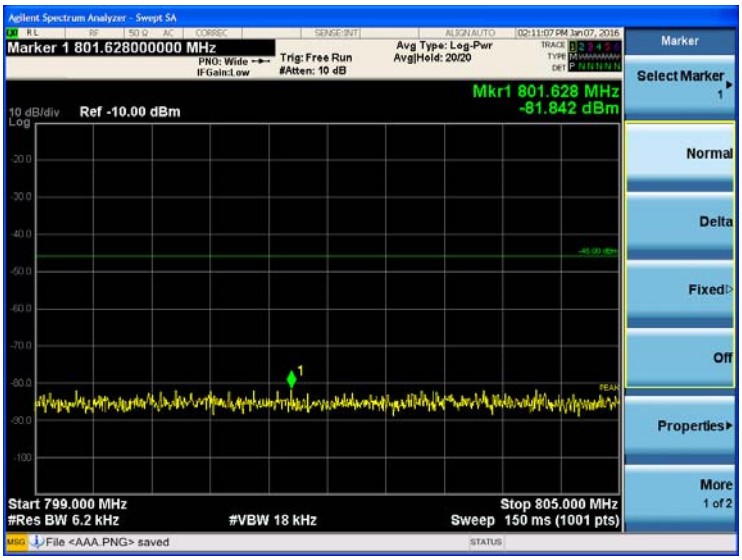
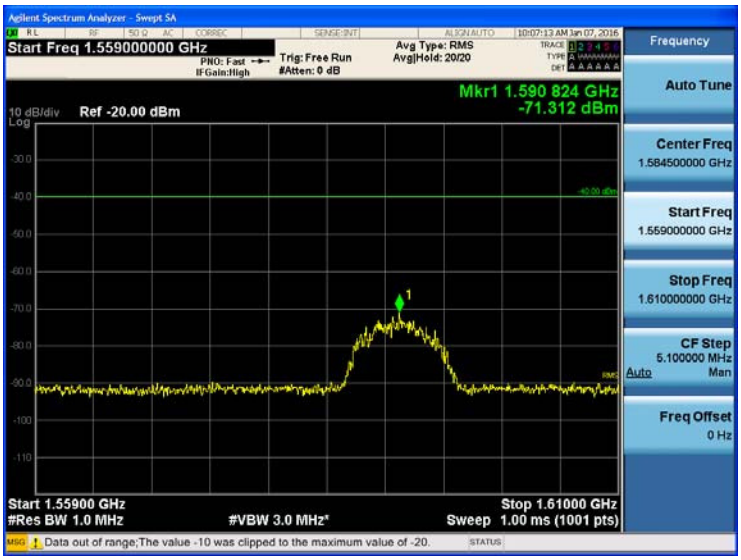
30MHz ~ 1GHz-3	30MHz ~ 1GHz-4
	
1GHz ~ 3GHz	**3GHz ~ 12.75GHz**
	

769㎒ ~ 775㎒	799㎒ ~ 805㎒
	
1559㎒ ~ 1610㎒	**Band Edge**
	

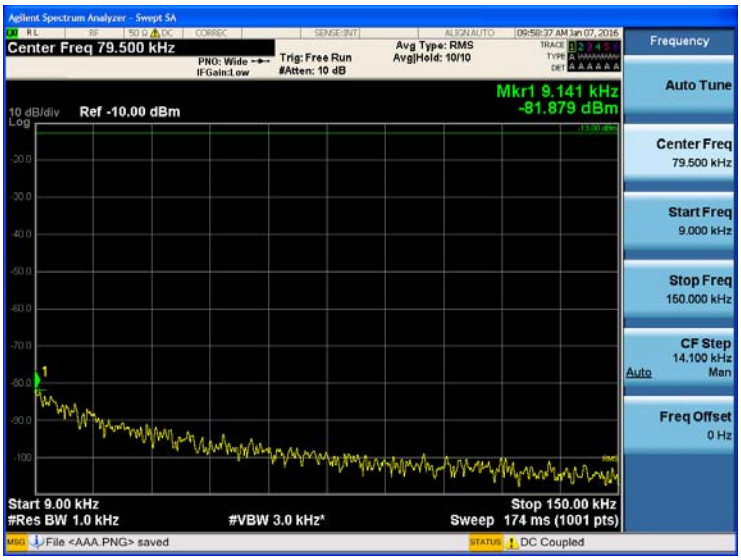
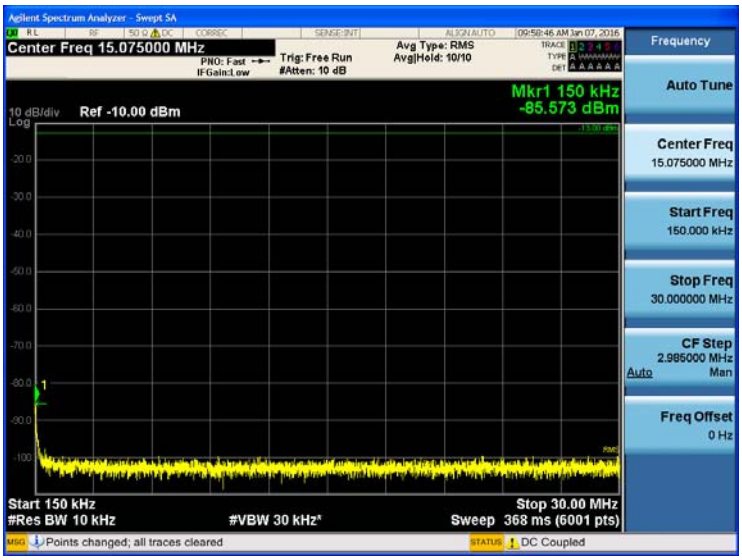
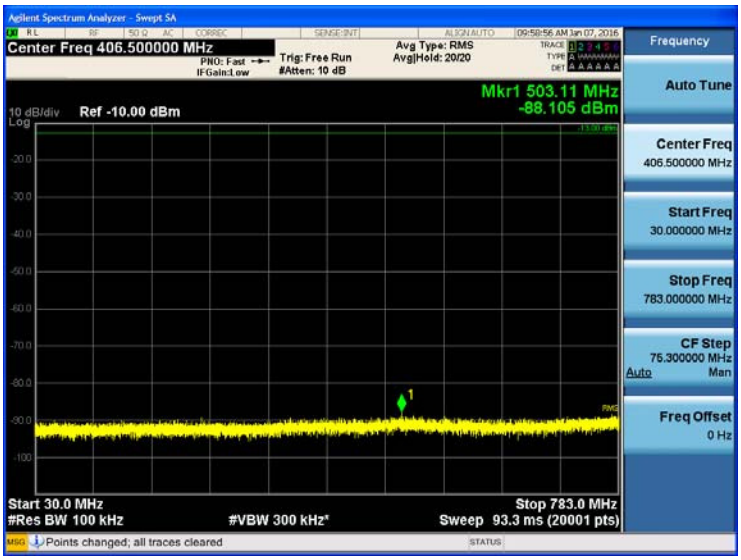
[LTE 5 MHz Uplink High]

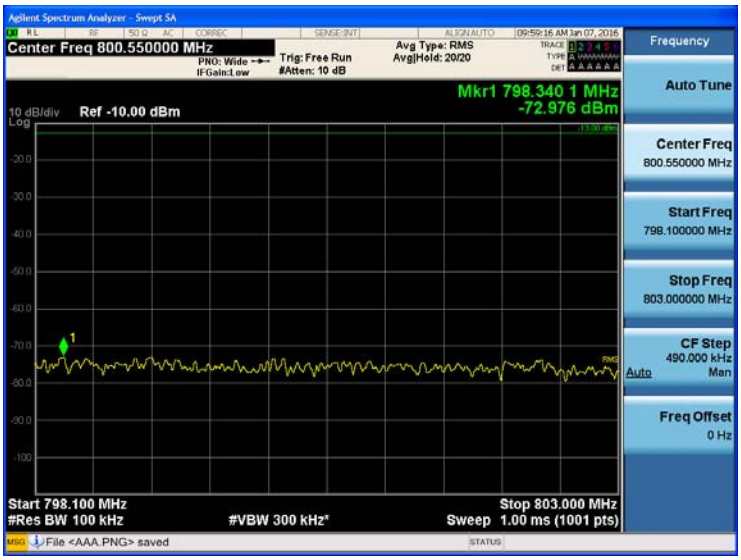
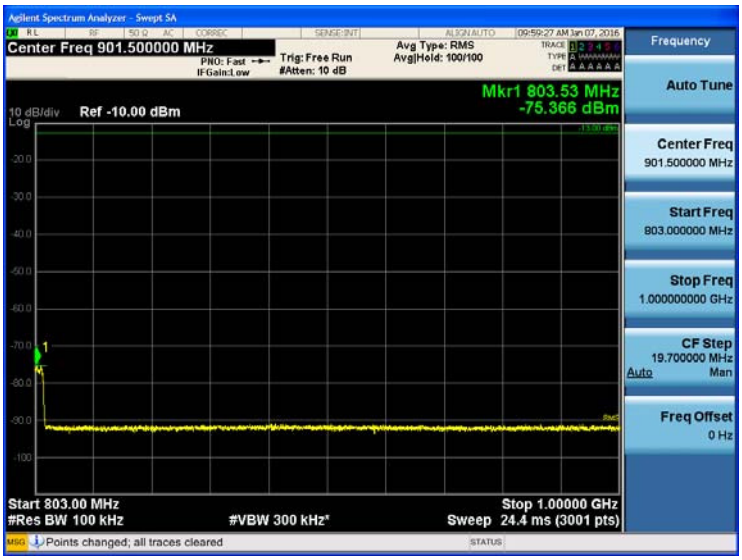
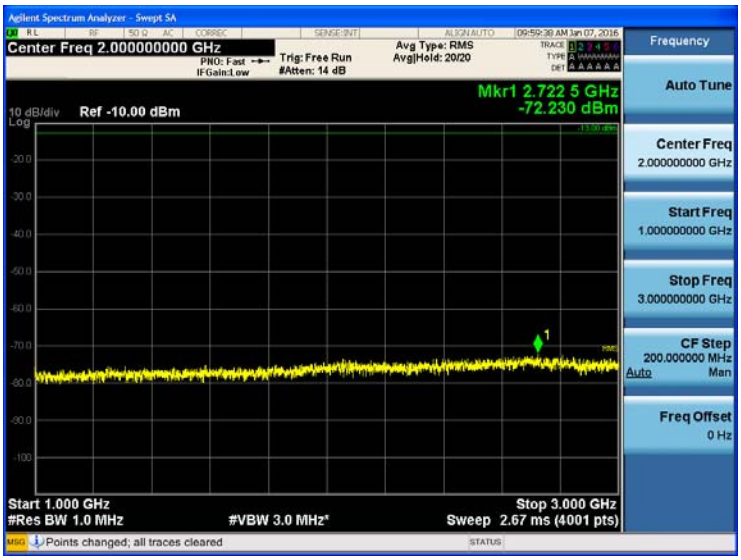
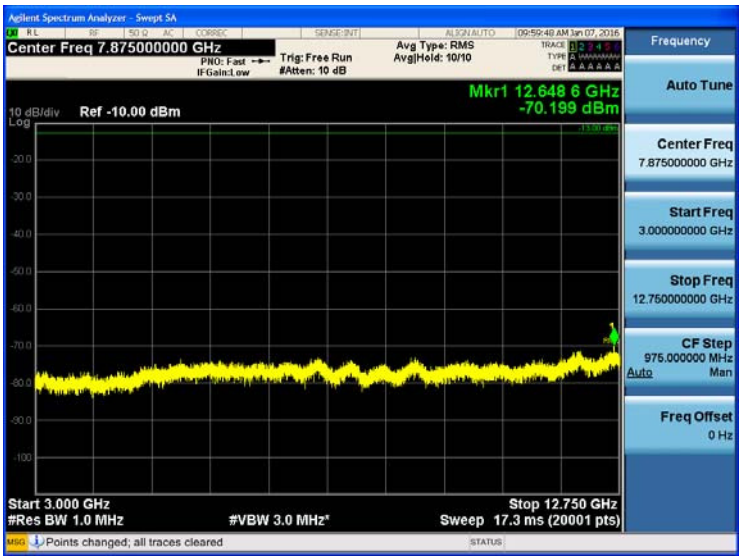
9㎑ ~ 150㎑	150㎑ ~ 30㎒
	
30㎒ ~ 1㎓-1	**30㎒ ~ 1㎓-2**
	

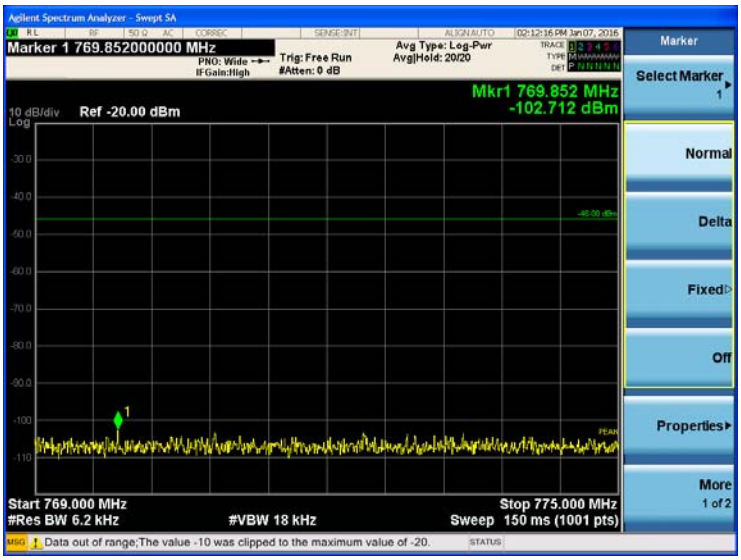
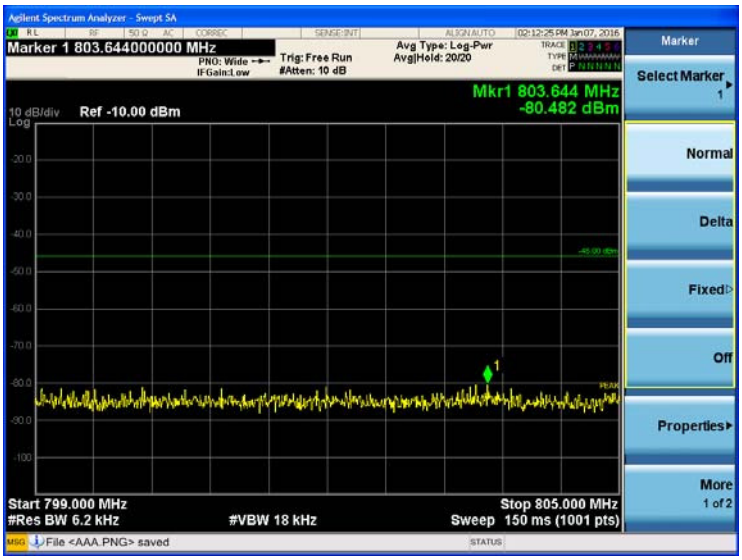
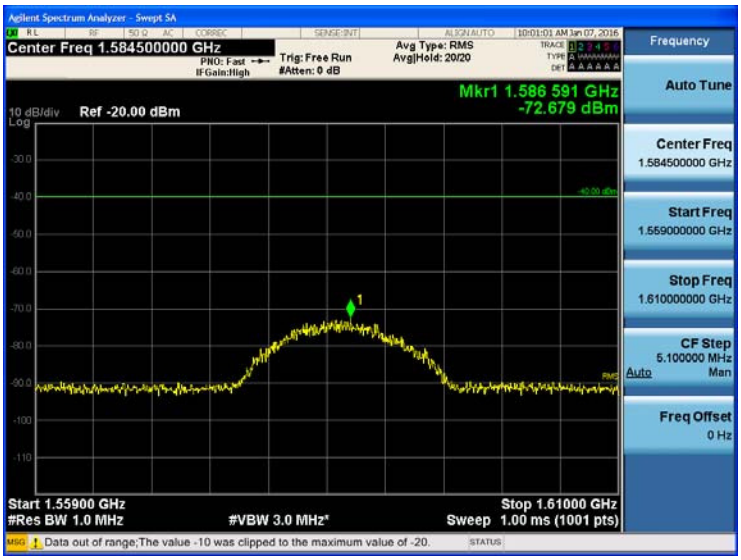
30MHz ~ 1GHz-3	30MHz ~ 1GHz-4
	
1GHz ~ 3GHz	**3GHz ~ 12.75GHz**
	

769㎒ ~ 775㎒	799㎒ ~ 805㎒
	
1559㎒ ~ 1610㎒	**Band Edge**
	

[LTE 10 MHz Uplink Middle]

9㎑ ~ 150㎑	150㎑ ~ 30㎒
	
30㎒ ~ 1㎓-1	**30㎒ ~ 1㎓-2**
	

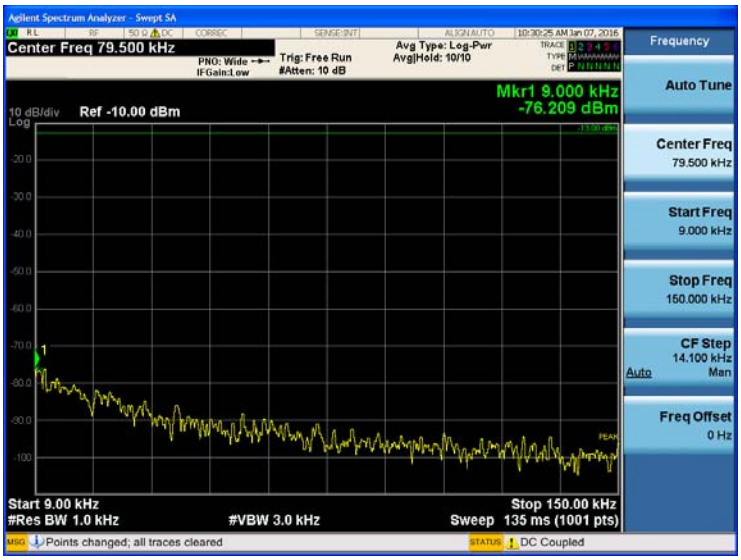
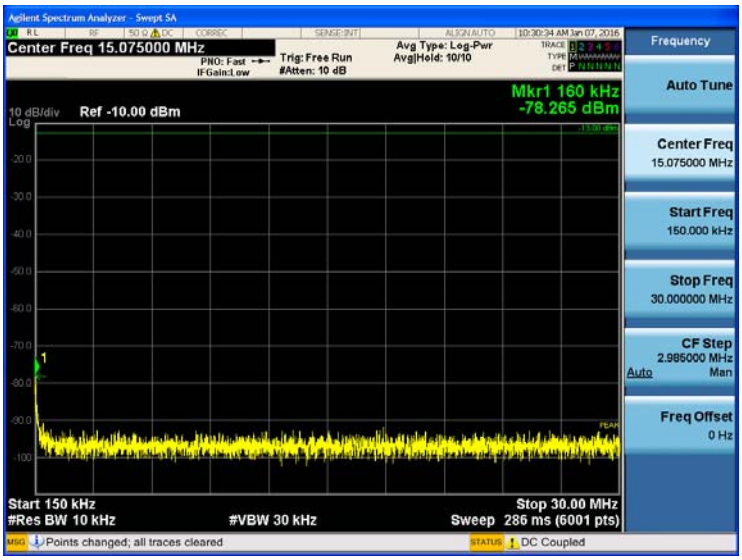
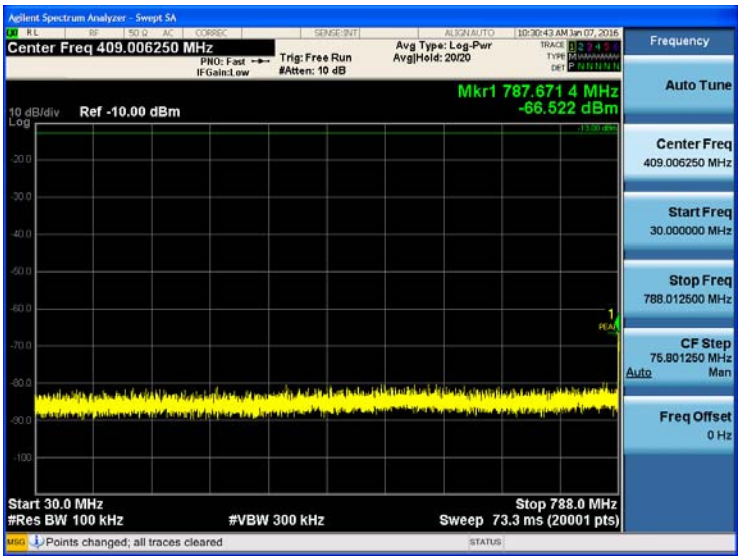
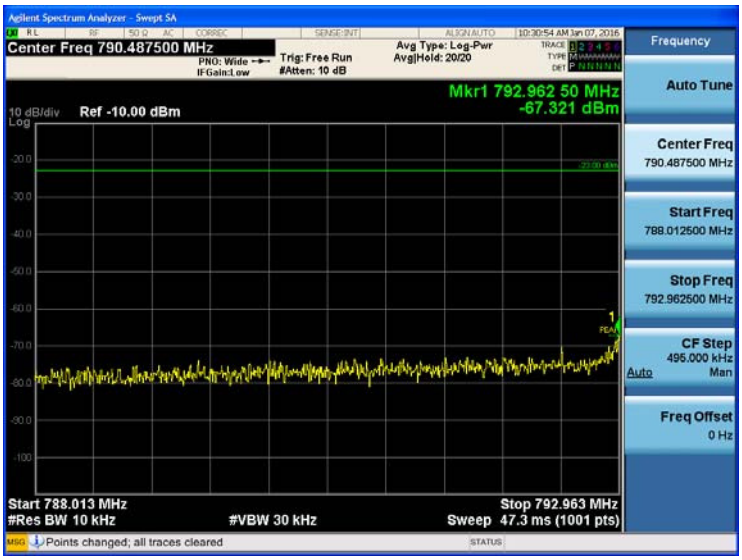
30MHz ~ 1GHz-3	30MHz ~ 1GHz-4
	
1GHz ~ 3GHz	**3GHz ~ 12.75GHz**
	

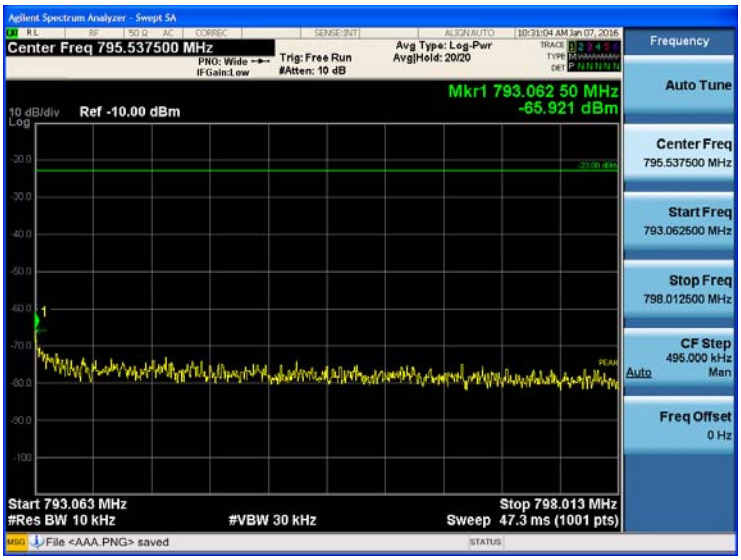
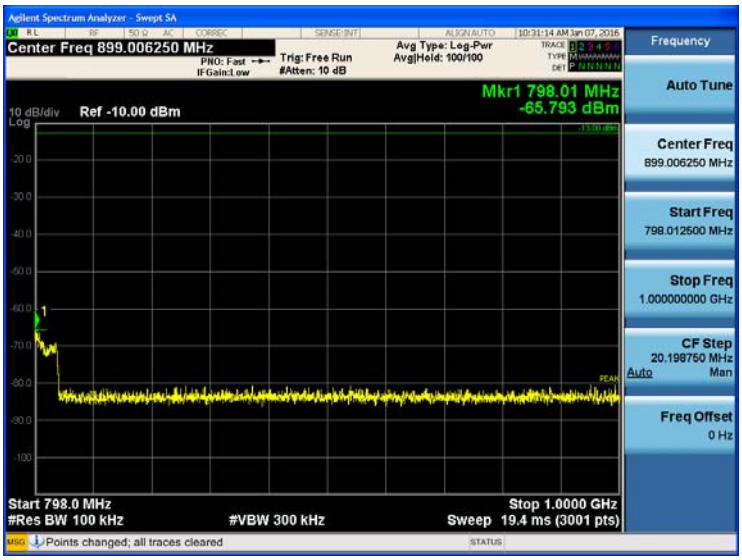
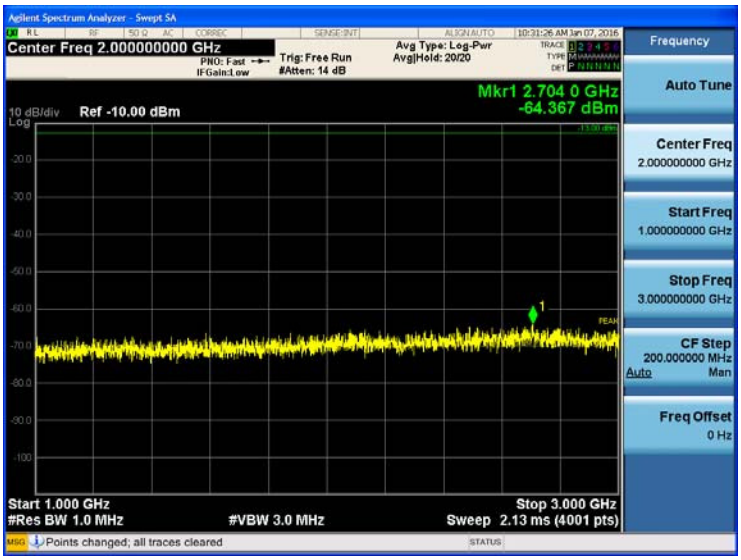
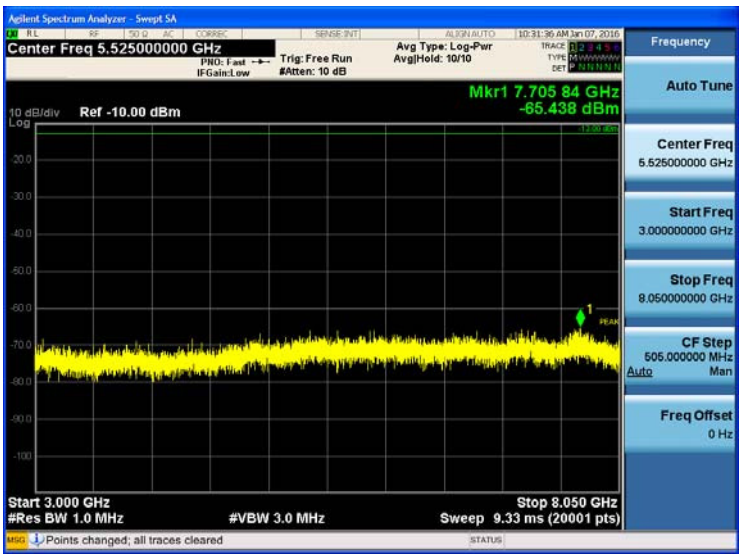
769㎒ ~ 775㎒	799㎒ ~ 805㎒
	
1559㎒ ~ 1610㎒	
	

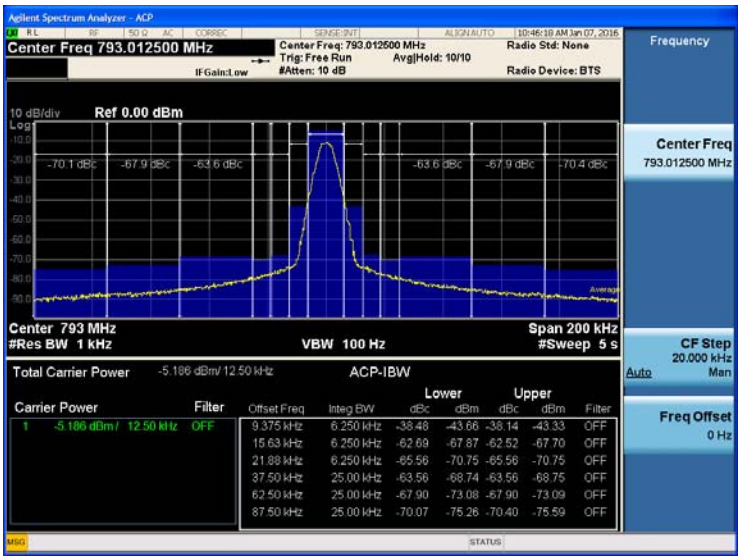
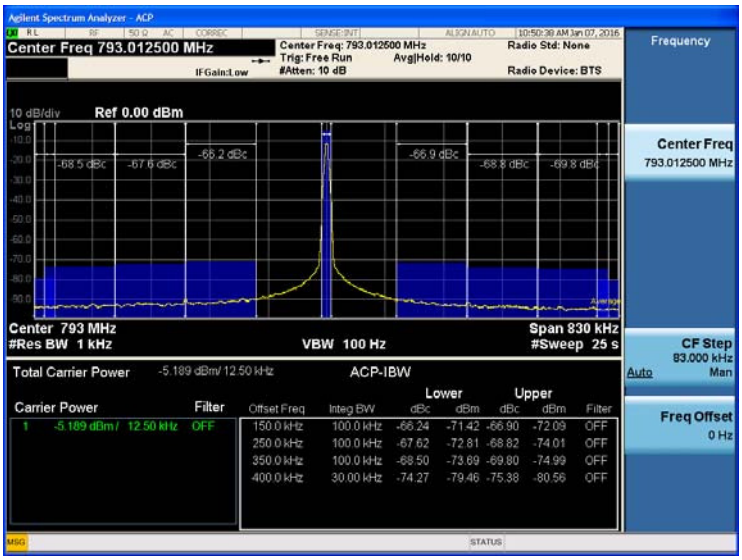
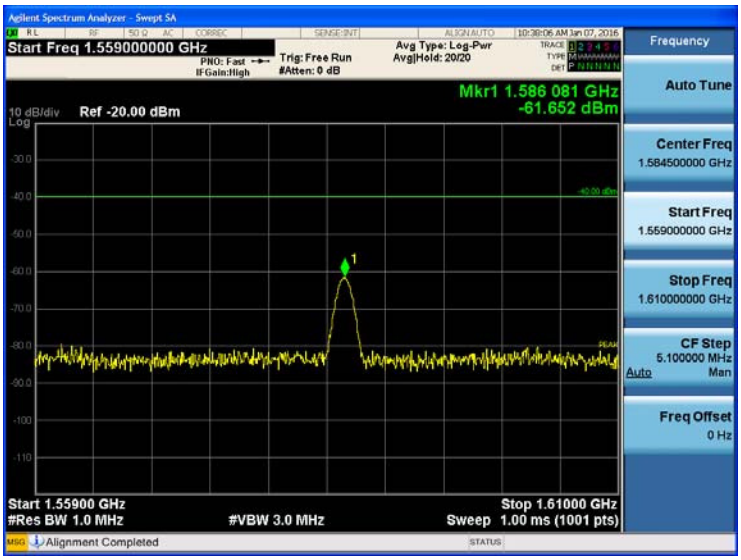
Band Edge_L	Band_Edge_R
	

700 MHz Band_P25, FM

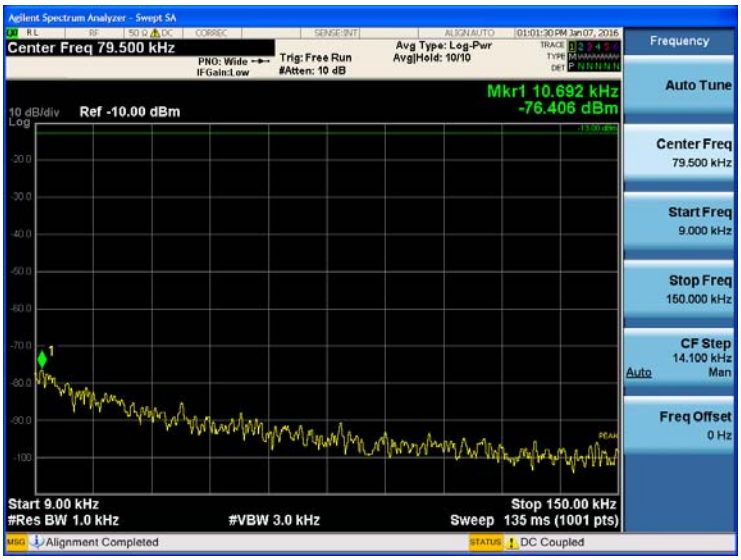
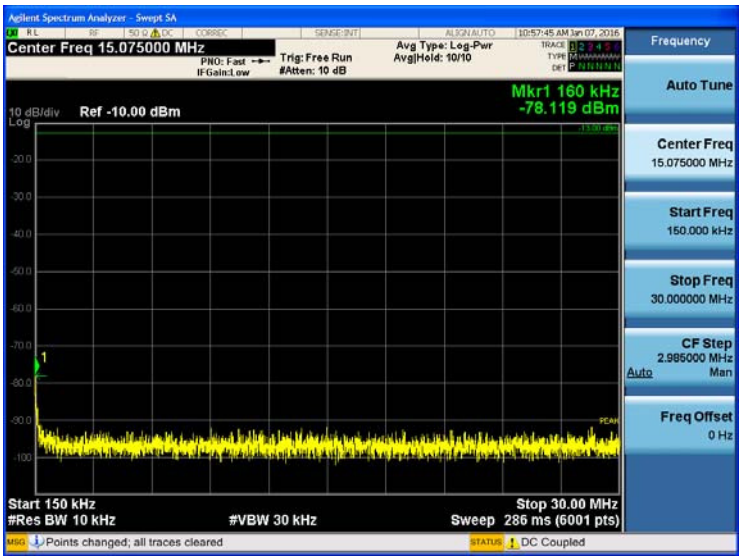
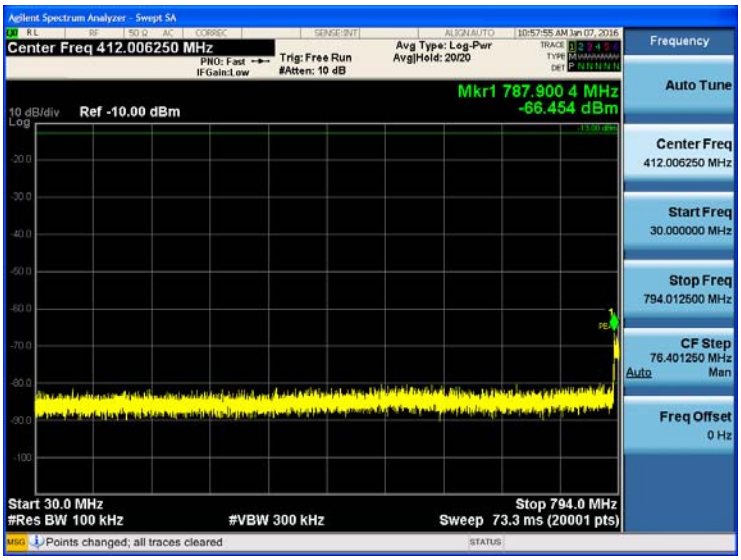
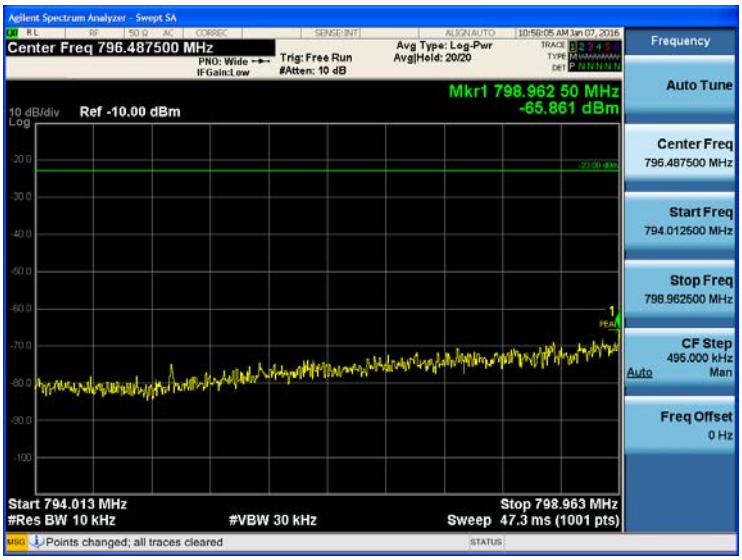
[P25 12.5 kHz Uplink Low]

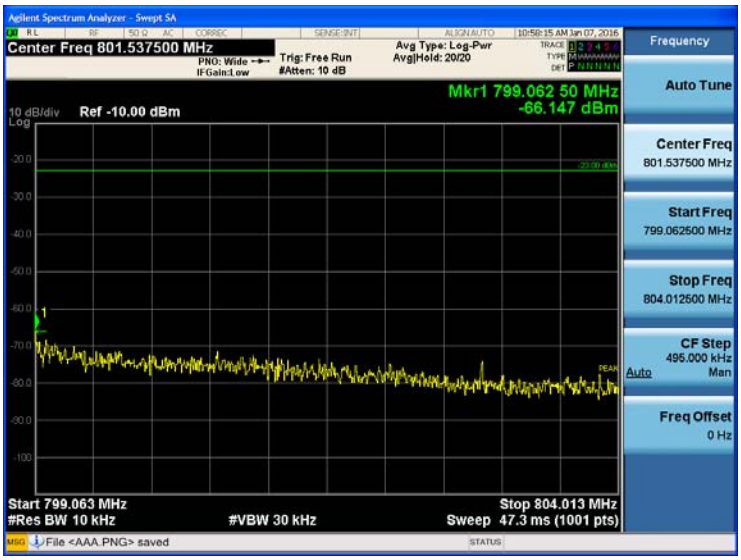
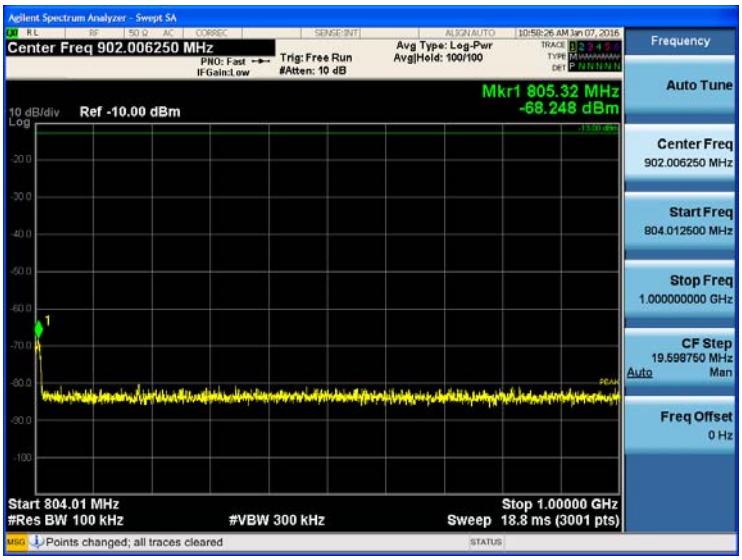
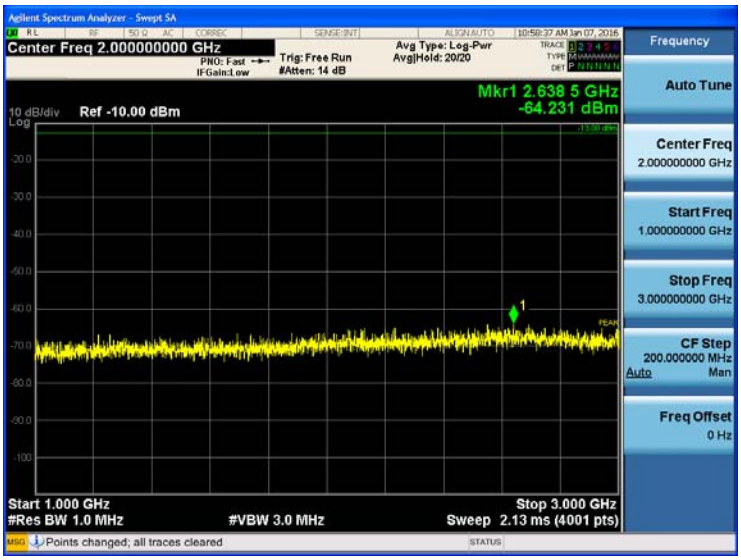
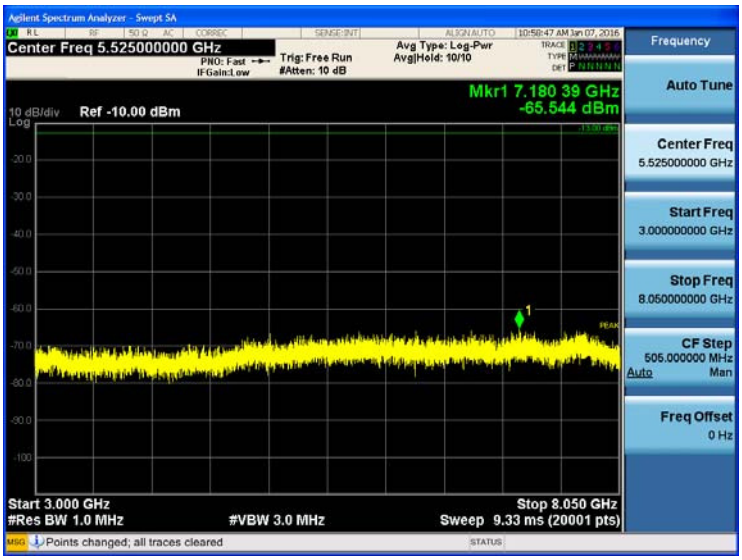
9㎑ ~ 150㎑	150㎑ ~ 30㎒
	
30㎒ ~ 1㎓-1	**30㎒ ~ 1㎓-2**
	

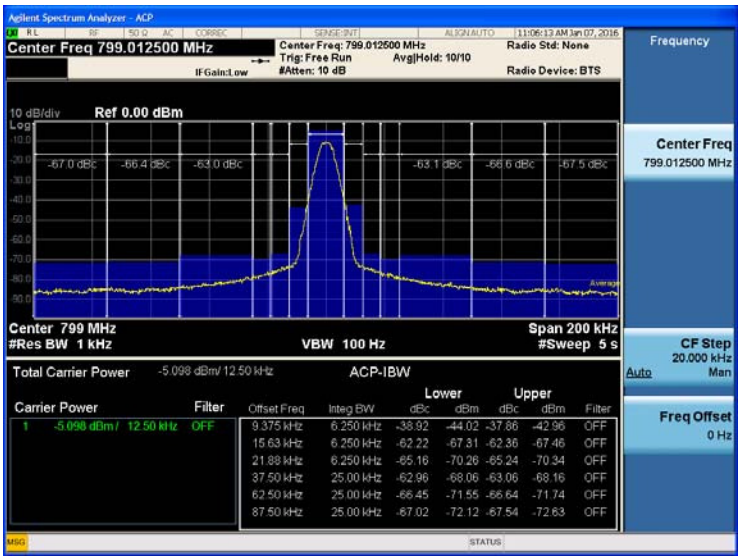
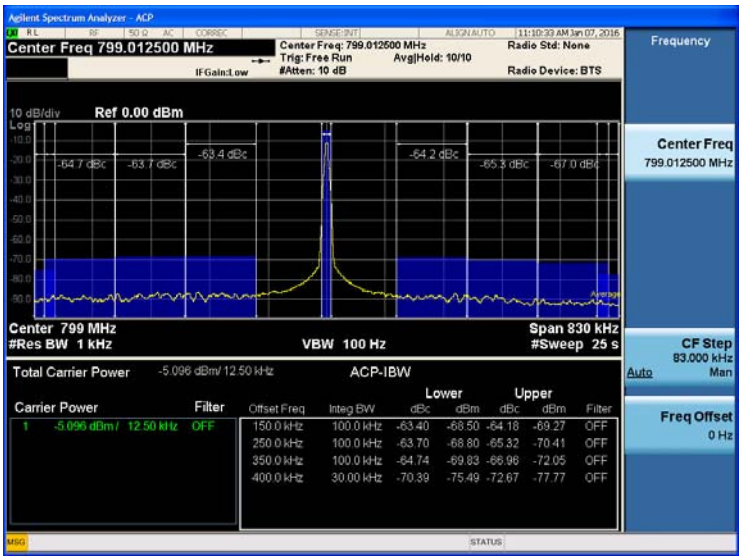
30MHz ~ 1GHz-3	30MHz ~ 1GHz-4
	
1GHz ~ 3GHz	**3GHz ~ 10th Harmonic**
	

ACP1	ACP2
	
1559㎒ ~ 1610㎒	
	

[P25 12.5 kHz Uplink Middle]

9㎑ ~ 150㎑	150㎑ ~ 30㎒
	
30㎒ ~ 1㎓-1	**30㎒ ~ 1㎓-2**
	

30MHz ~ 1GHz-3	30MHz ~ 1GHz-4
	
1GHz ~ 3GHz	**3GHz ~ 10th Harmonic**
	

ACP1	ACP2
	
1559㎒ ~ 1610㎒