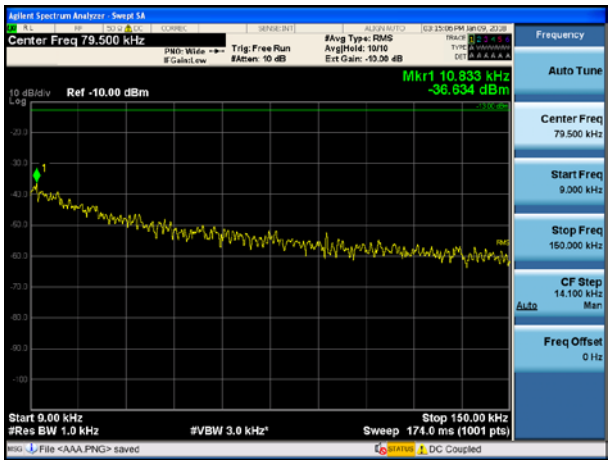
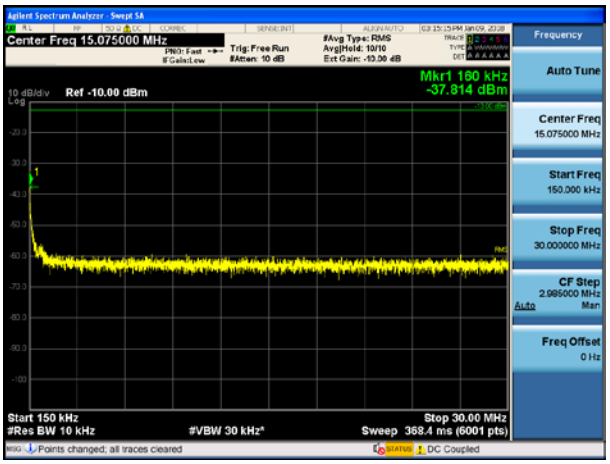
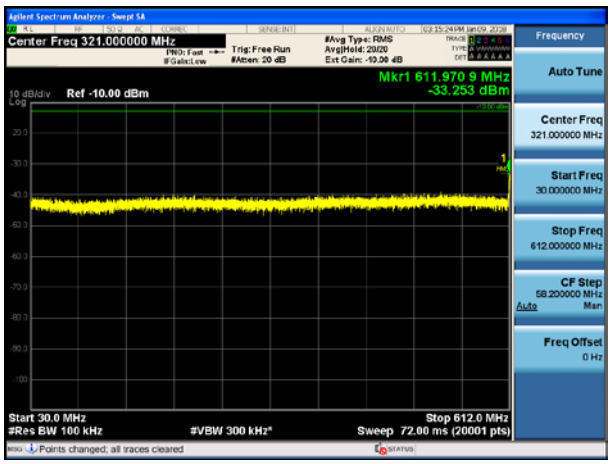
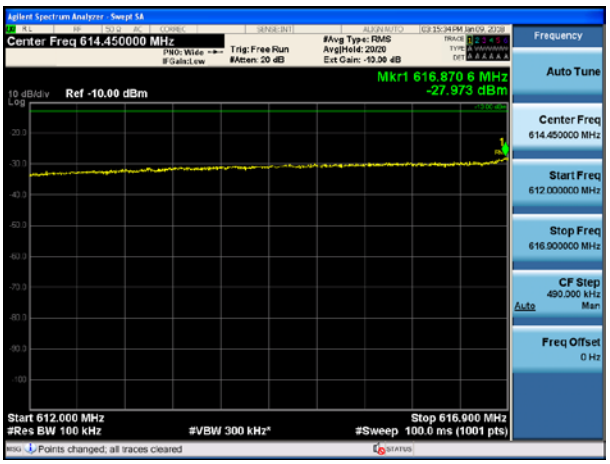
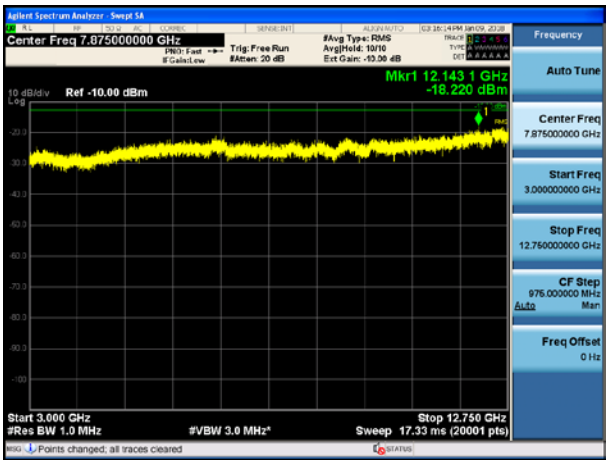
Single channel Enhancer Plots of Spurious Emission

600 MHz_LTE 20 MHz_DL

[Downlink - Low]

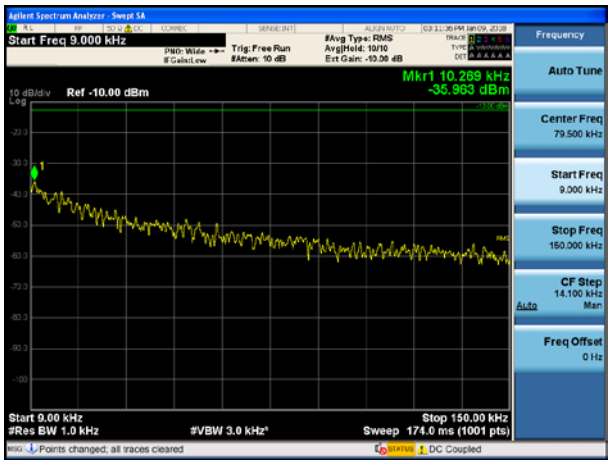
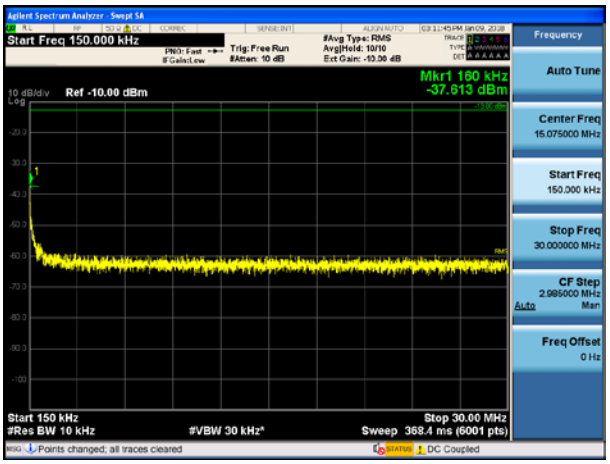
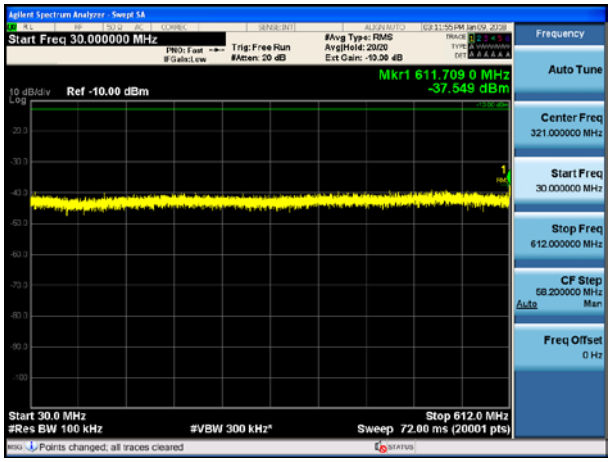
9 ㎑ ~ 150 ㎑	150 ㎑ ~ 30 ㎒
	
30 ㎒ ~ 612 ㎒	**612 ㎒ ~ 616.9 ㎒**
	
652.1 ㎒ ~ 657 ㎒	**657 ㎒ ~ 1 ㎓**
	

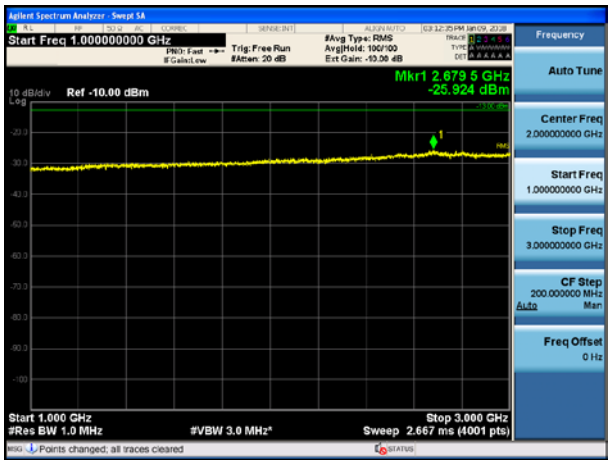
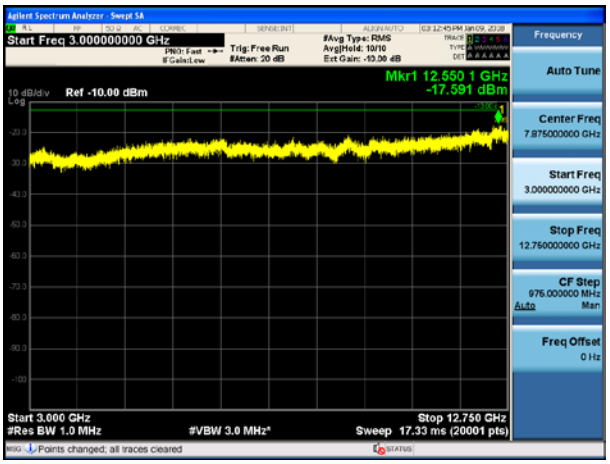
1 ㎓ ~ 3 ㎓	3 ㎓ ~ 12.75 ㎓
	

Agilent Spectrum Analyzer - Swept SA
Center Freq 2.000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
#Avg Type: RMS
Avg|Hold: 100/100
Ext Gain: -10.00 dB
Mkr1 2.677 5 GHz
-26.050 dBm
10 dB/div
Log
Ref -10.00 dBm
Start 1.000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz*
Stop 3.000 GHz
Sweep 2.667 ms (4001 pts)
Points changed; all traces cleared
Frequency
Auto Tune
Center Freq
2.000000000 GHz
Start Freq
1.000000000 GHz
Stop Freq
3.000000000 GHz
CF Step
200.000000 MHz
Auto
Man
Freq Offset
0 Hz

Agilent Spectrum Analyzer - Swept SA
Center Freq 7.875000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
#Avg Type: RMS
Avg|Hold: 10/10
Ext Gain: -10.00 dB
Mkr1 12.143 1 GHz
-18.220 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 17.33 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]

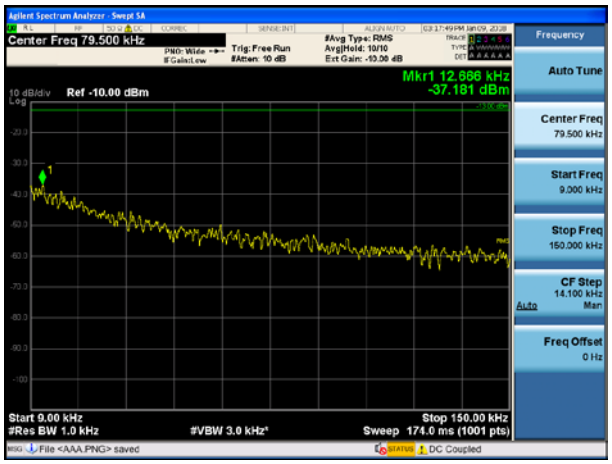
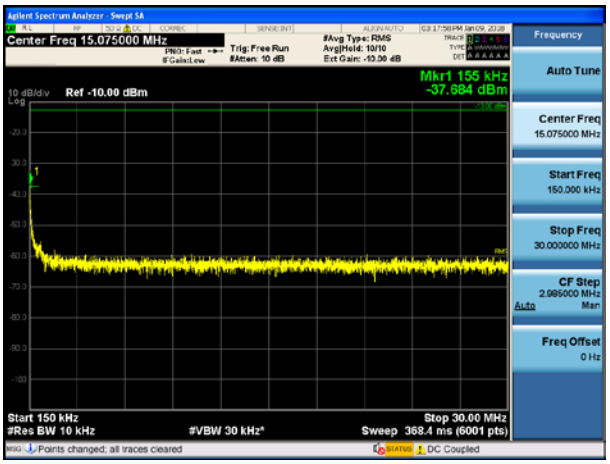
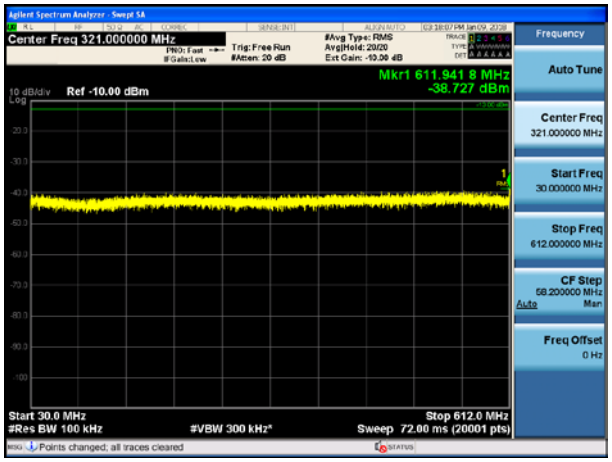
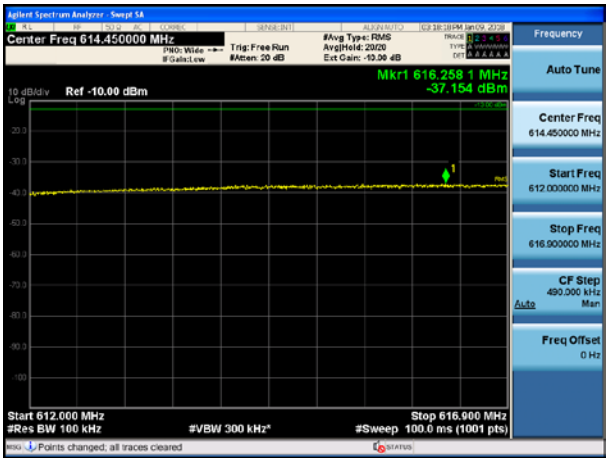
9 ㎑ ~ 150 ㎑	150 ㎑ ~ 30 ㎒
	
30 ㎒ ~ 612 ㎒	**612 ㎒ ~ 616.9 ㎒**
	
652.1 ㎒ ~ 657 ㎒	**657 ㎒ ~ 1 ㎓**
	

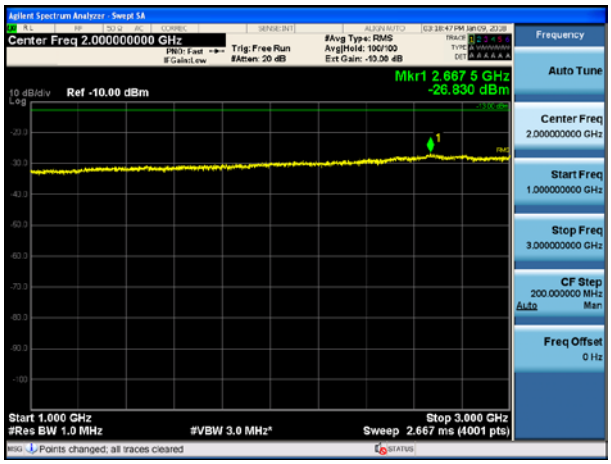
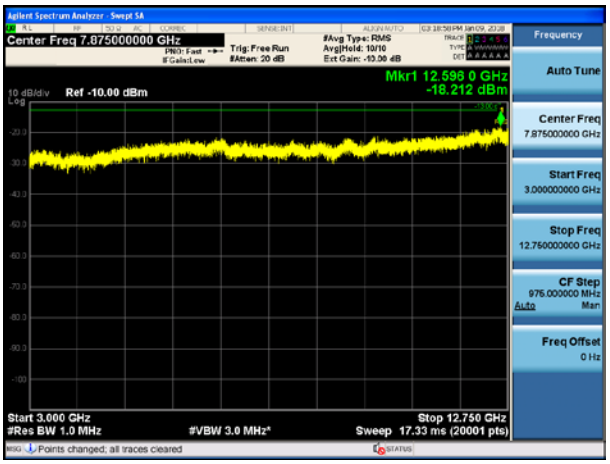
1 ㎓ ~ 3 ㎓	3 ㎓ ~ 12.75 ㎓
	

Agilent Spectrum Analyzer - Swept SA
Start Freq 1.000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
#Avg Type: RMS
Avg|Hold: 100/100
Ext Gain: -10.00 dB
Mkr1 2.679 5 GHz
-25.924 dBm
10 dB/div
Log
Ref -10.00 dBm
Start 1.000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz*
Stop 3.000 GHz
Sweep 2.667 ms (4001 pts)
Points changed; all traces cleared
Frequency
Auto Tune
Center Freq
2.000000000 GHz
Start Freq
1.000000000 GHz
Stop Freq
3.000000000 GHz
CF Step
200.000000 MHz
Auto
Man
Freq Offset
0 Hz

Agilent Spectrum Analyzer - Swept SA
Start Freq 3.000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
#Avg Type: RMS
Avg|Hold: 10/10
Ext Gain: -10.00 dB
Mkr1 12.550 1 GHz
-17.591 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 17.33 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_High]

9 ㎑ ~ 150 ㎑	150 ㎑ ~ 30 ㎒
	
30 ㎒ ~ 612 ㎒	**612 ㎒ ~ 616.9 ㎒**
	
652.1 ㎒ ~ 657 ㎒	**657 ㎒ ~ 1 ㎓**
	

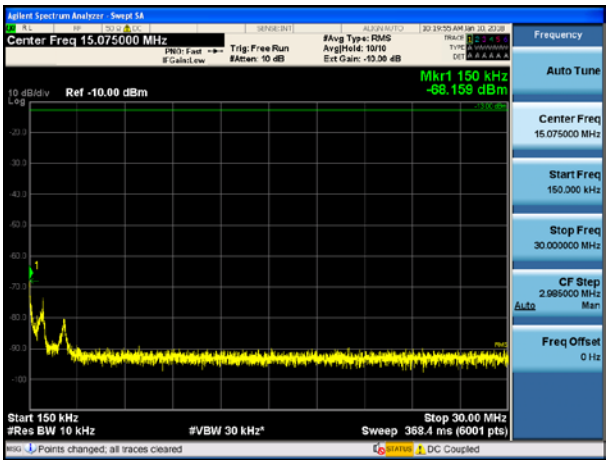
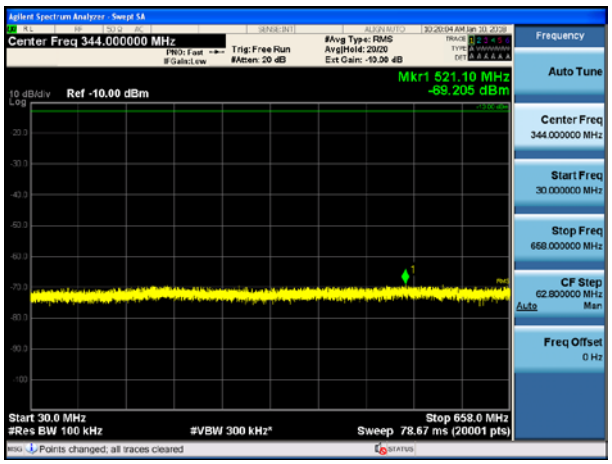
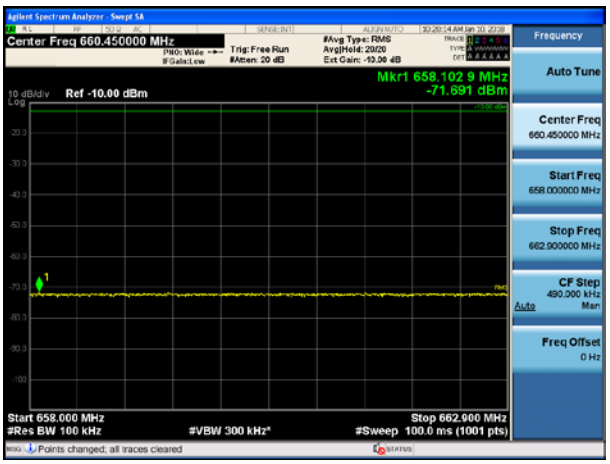
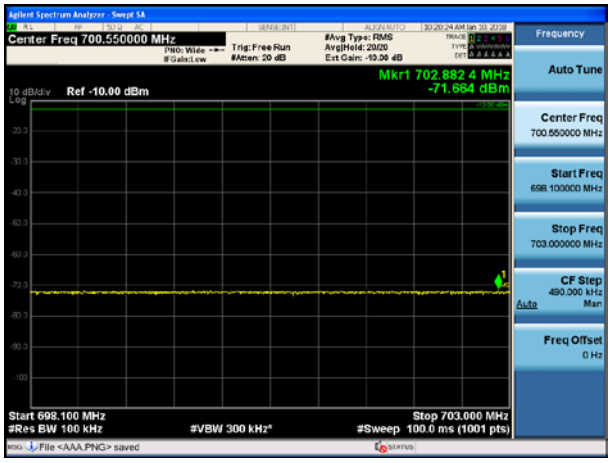
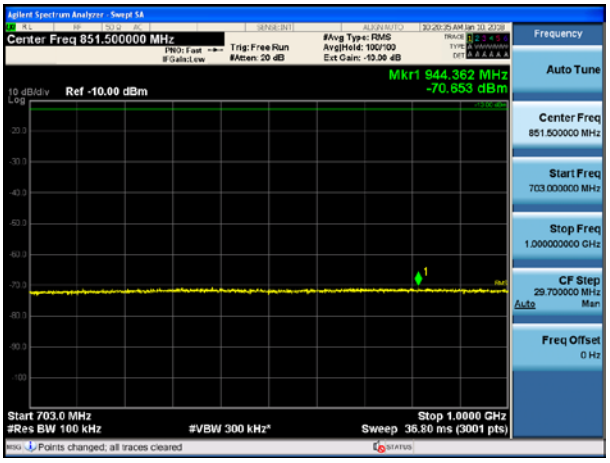
1 ㎓ ~ 3 ㎓	3 ㎓ ~ 12.75 ㎓
	

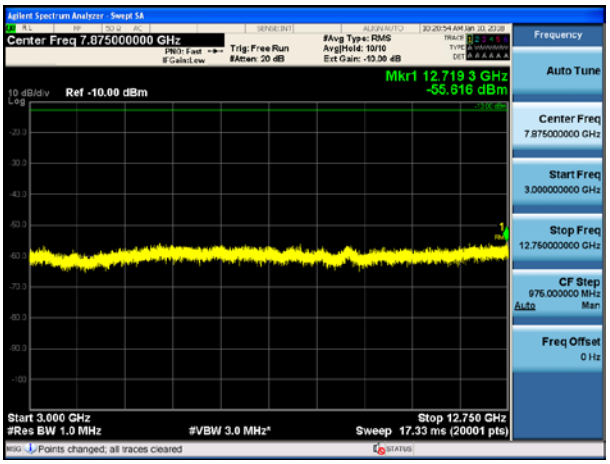
Agilent Spectrum Analyzer - Swept SA
Center Freq 2.000000000 GHz
Trig: Free Run
#Atten: 20 dB
#Avg Type: RMS
Avg|Hold: 100/100
Ext Gain: -10.00 dB
Mkr1 2.667 5 GHz
-26.830 dBm
10 dB/div
Log
Ref -10.00 dBm
Start 1.000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz*
Stop 3.000 GHz
Sweep 2.667 ms (4001 pts)
Points changed; all traces cleared
Frequency
Auto Tune
Center Freq
2.000000000 GHz
Start Freq
1.000000000 GHz
Stop Freq
3.000000000 GHz
CF Step
200.000000 MHz
Auto
Man
Freq Offset
0 Hz

Agilent Spectrum Analyzer - Swept SA
Center Freq 7.875000000 GHz
Trig: Free Run
#Atten: 20 dB
#Avg Type: RMS
Avg|Hold: 10/10
Ext Gain: -10.00 dB
Mkr1 12.598 0 GHz
-18.212 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 17.33 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

600 MHz_LTE 20 MHz_UL

[Uplink - Low]

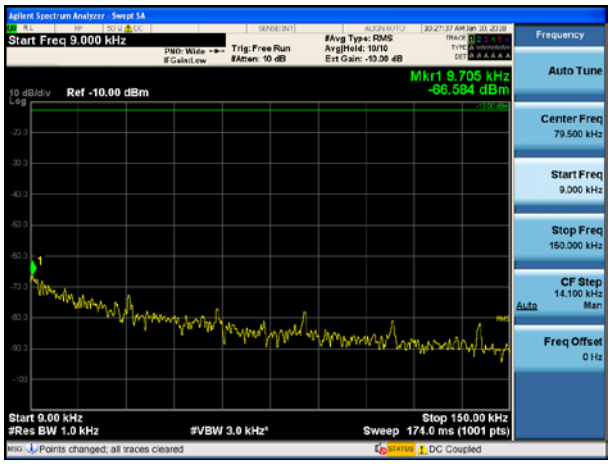
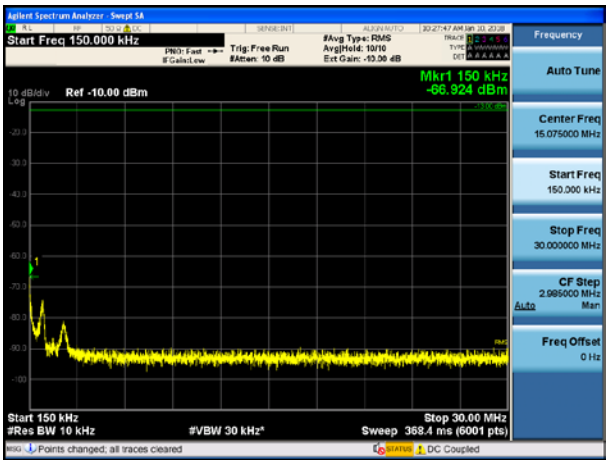
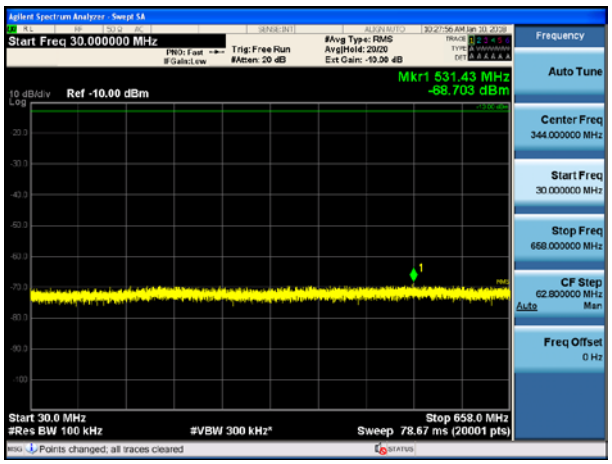
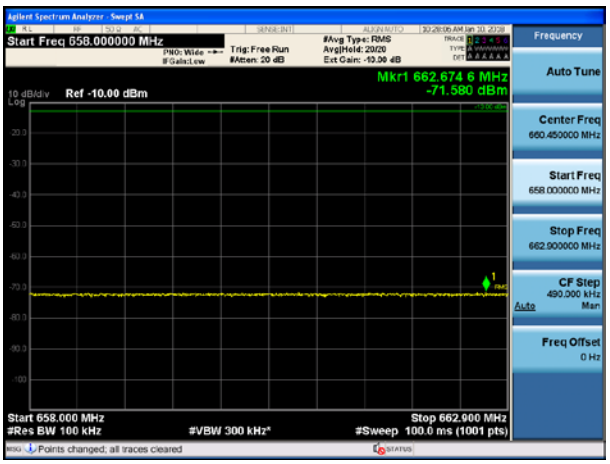
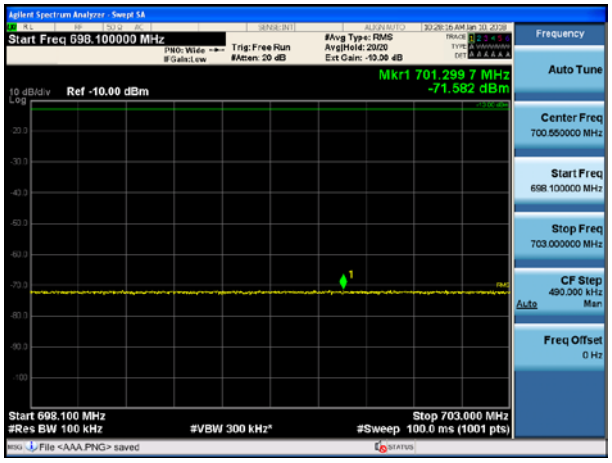
9 ㎑ ~ 150 ㎑	150 ㎑ ~ 30 ㎒
	
30 ㎒ ~ 658 ㎒	**658 ㎒ ~ 662.9 ㎒**
	
698.1 ㎒ ~ 703 ㎒	**703 ㎒ ~ 1 ㎓**
	

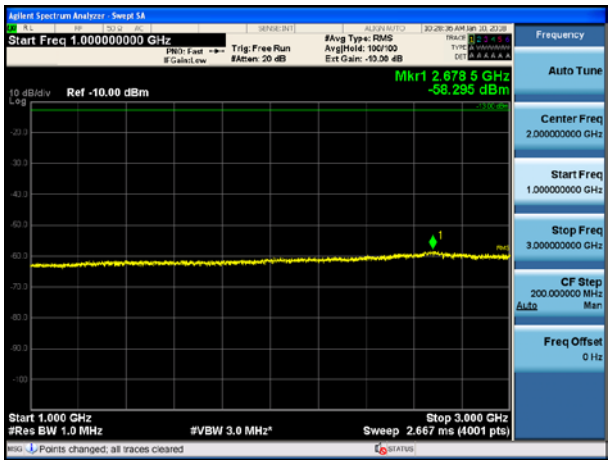
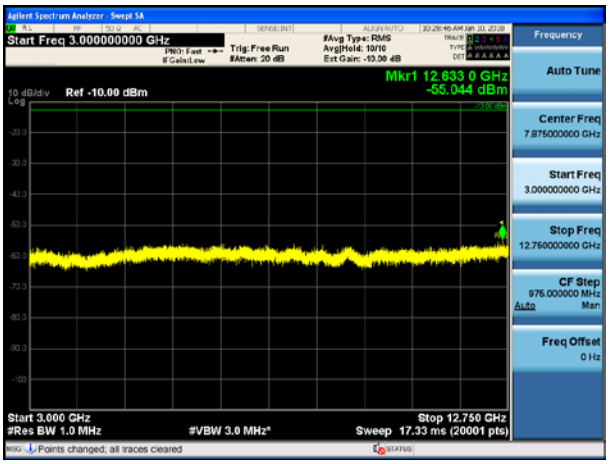
1 ㎓ ~ 3 ㎓	3 ㎓ ~ 12.75 ㎓
	

Agilent Spectrum Analyzer - Swept SA
Center Freq 2.000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
#Avg Type: RMS
Avg|Hold: 100/100
Ext Gain: -10.00 dB
Mkr1 2.669 5 GHz
-58.403 dBm
10 dB/div
Log
Ref -10.00 dBm
Start 1.000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz*
Stop 3.000 GHz
Sweep 2.667 ms (4001 pts)
Points changed; all traces cleared
Frequency
Auto Tune
Center Freq
2.000000000 GHz
Start Freq
1.000000000 GHz
Stop Freq
3.000000000 GHz
CF Step
200.000000 MHz
Auto
Man
Freq Offset
0 Hz

Agilent Spectrum Analyzer - Swept SA
Center Freq 7.875000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
#Avg Type: RMS
Avg|Hold: 10/10
Ext Gain: -10.00 dB
Mkr1 12.719 3 GHz
-55.616 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 17.33 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

[Uplink_Middle]

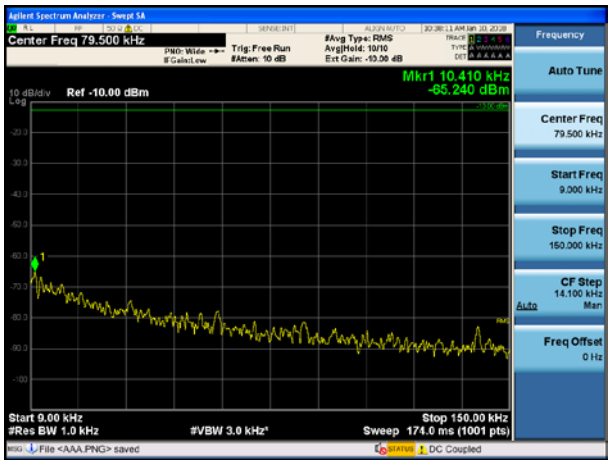
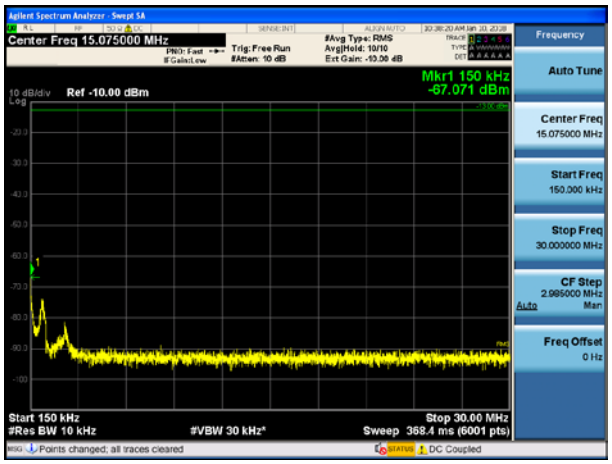
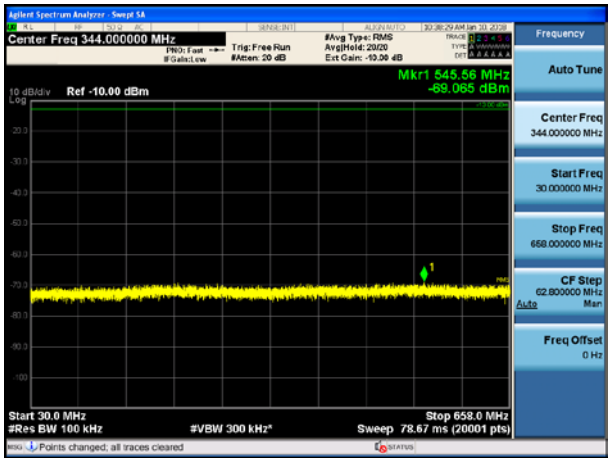
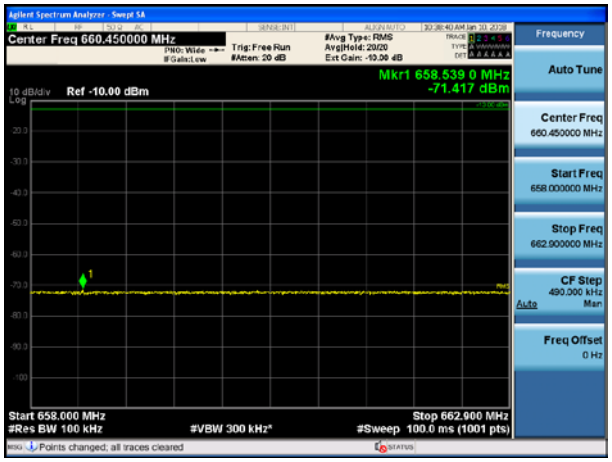
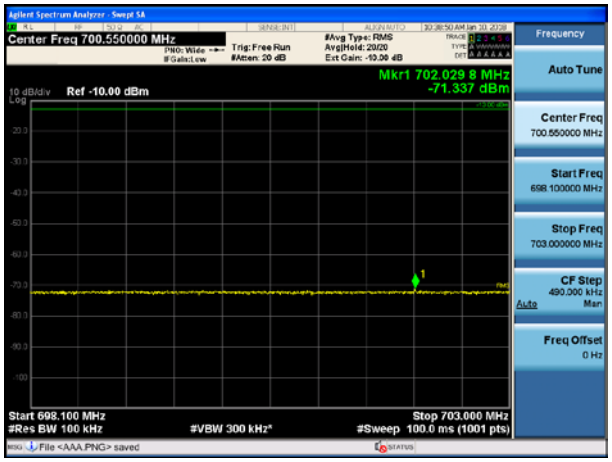
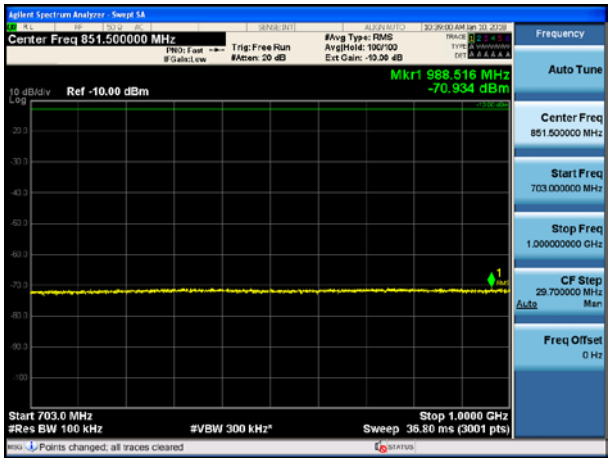
9 ㎑ ~ 150 ㎑	150 ㎑ ~ 30 ㎒
	
30 ㎒ ~ 658 ㎒	**658 ㎒ ~ 662.9 ㎒**
	
698.1 ㎒ ~ 703 ㎒	**703 ㎒ ~ 1 ㎓**
	

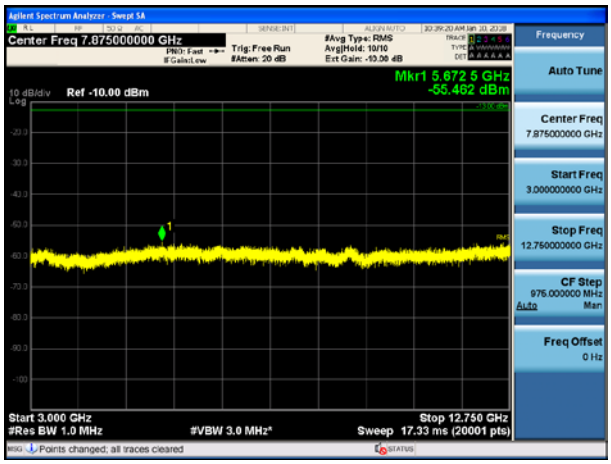
1 ㎓ ~ 3 ㎓	3 ㎓ ~ 12.75 ㎓
	

Agilent Spectrum Analyzer - Swept SA
Start Freq 1.000000000 GHz
Trig: Free Run
#Atten: 20 dB
#Avg Type: RMS
Avg|Hold: 100/100
Ext Gain: -10.00 dB
Mkr1 2.678 5 GHz
-58.295 dBm
10 dB/div
Log
Ref -10.00 dBm
Start 1.000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz*
Stop 3.000 GHz
Sweep 2.667 ms (4001 pts)
Points changed; all traces cleared
Frequency
Auto Tune
Center Freq
2.000000000 GHz
Start Freq
1.000000000 GHz
Stop Freq
3.000000000 GHz
CF Step
200.000000 MHz
Auto
Man
Freq Offset
0 Hz

Agilent Spectrum Analyzer - Swept SA
Start Freq 3.000000000 GHz
Trig: Free Run
#Atten: 20 dB
#Avg Type: RMS
Avg|Hold: 10/10
Ext Gain: -10.00 dB
Mkr1 12.633 0 GHz
-55.044 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 17.33 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

[Uplink_High]

9 ㎑ ~ 150 ㎑	150 ㎑ ~ 30 ㎒
	
30 ㎒ ~ 658 ㎒	**658 ㎒ ~ 662.9 ㎒**
	
698.1 ㎒ ~ 703 ㎒	**703 ㎒ ~ 1 ㎓**
	

1 ㎓ ~ 3 ㎓	3 ㎓ ~ 12.75 ㎓
	

Agilent Spectrum Analyzer - Swept SA
Center Freq 2.000000000 GHz
PNO: Fast
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Trig: Free Run
#Atten: 20 dB
#Avg Type: RMS
Avg|Hold: 100/100
Ext Gain: -10.00 dB
Mkr1 2.678 0 GHz
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#Res BW 1.0 MHz
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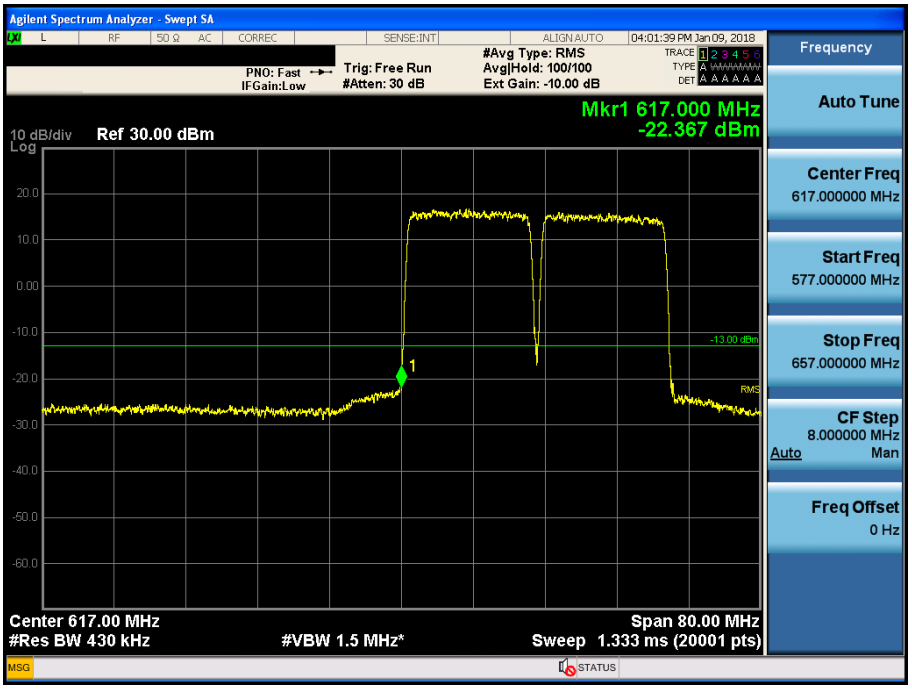
200.000000 MHz
Auto
Man
Freq Offset
0 Hz

Agilent Spectrum Analyzer - Swept SA
Center Freq 7.875000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
#Avg Type: RMS
Avg|Hold: 10/10
Ext Gain: -10.00 dB
Mkr1 5.672 5 GHz
-55.462 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 17.33 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

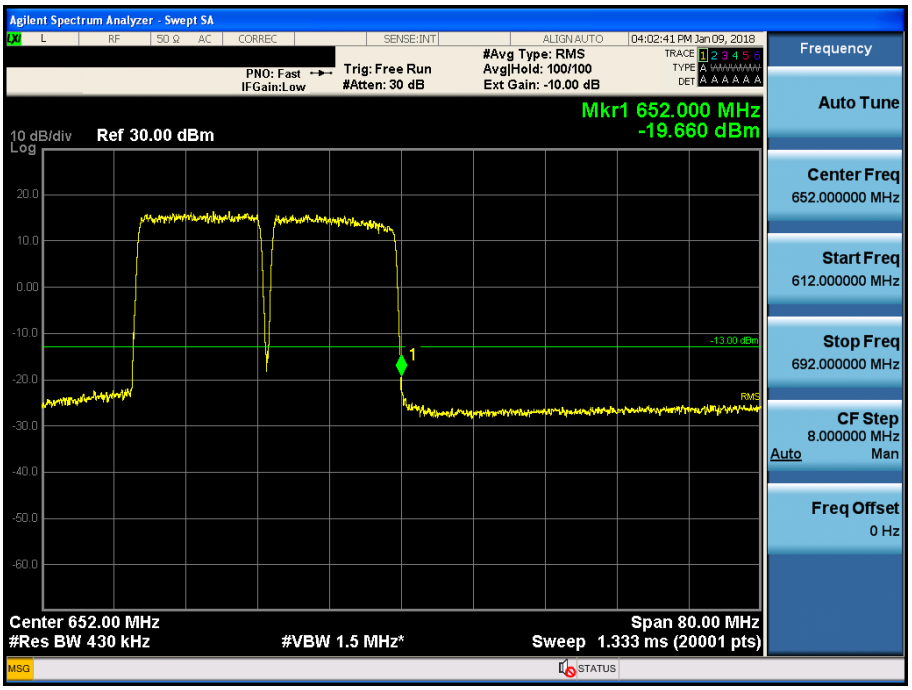
Intermodulation Spurious Emissions

600 MHz_LTE 20 MHz_DL

[Downlink - Low]

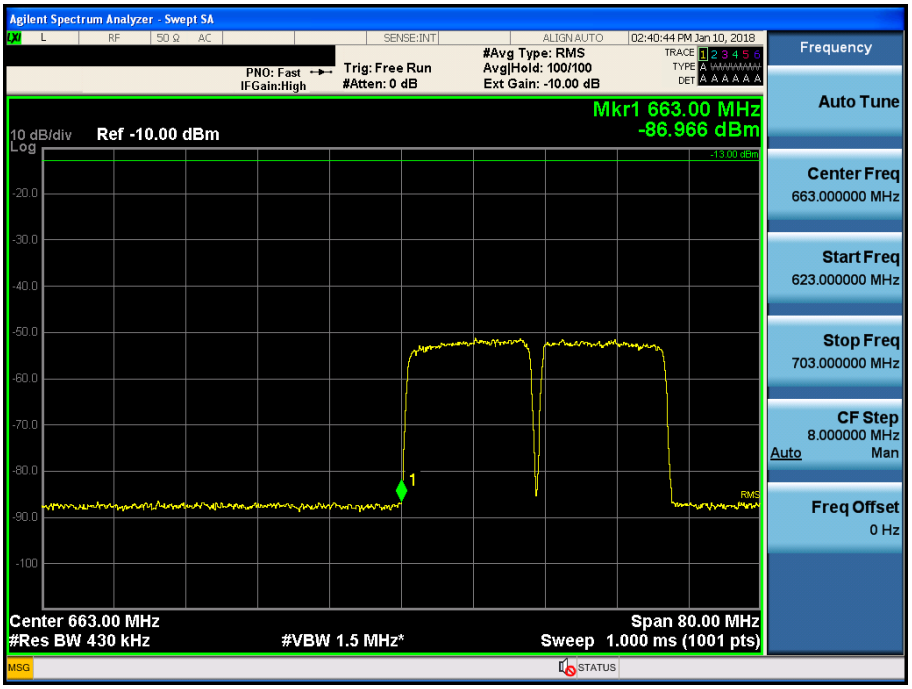


[Downlink - High]

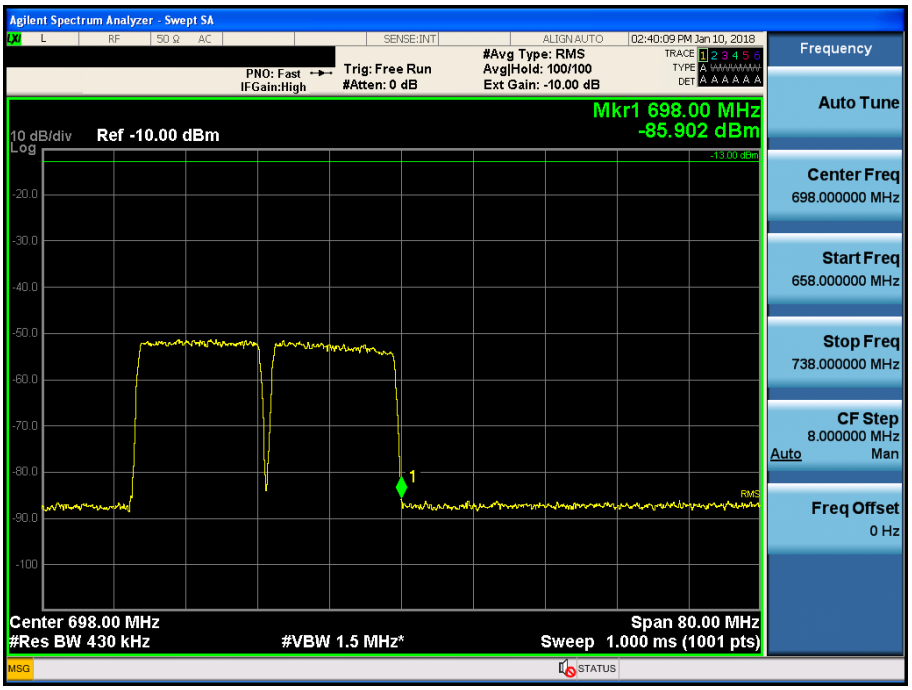


600 MHz_LTE 20 MHz_UL

[Uplink - Low]



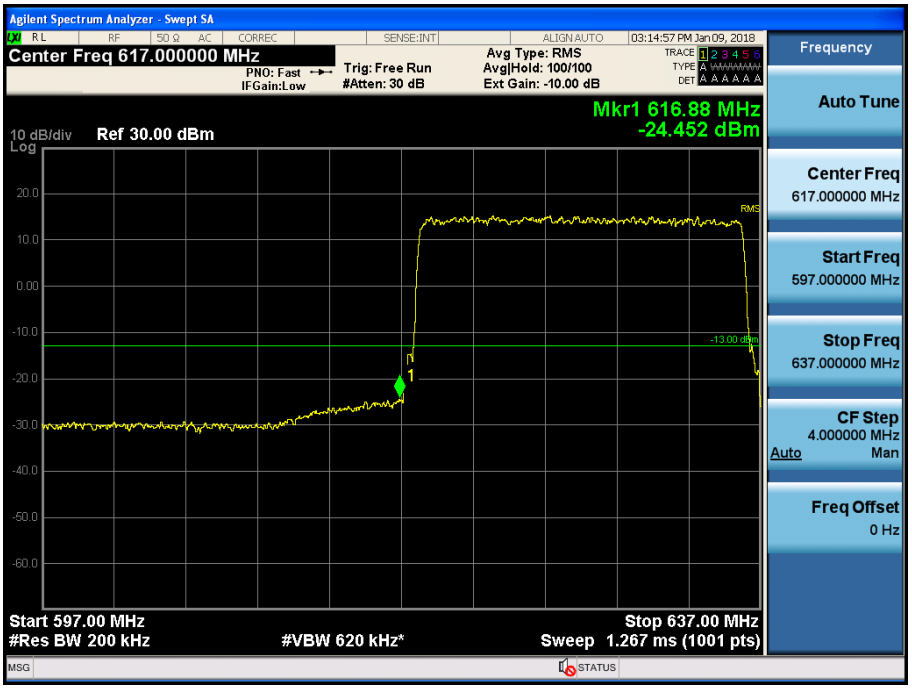
[Uplink - High]



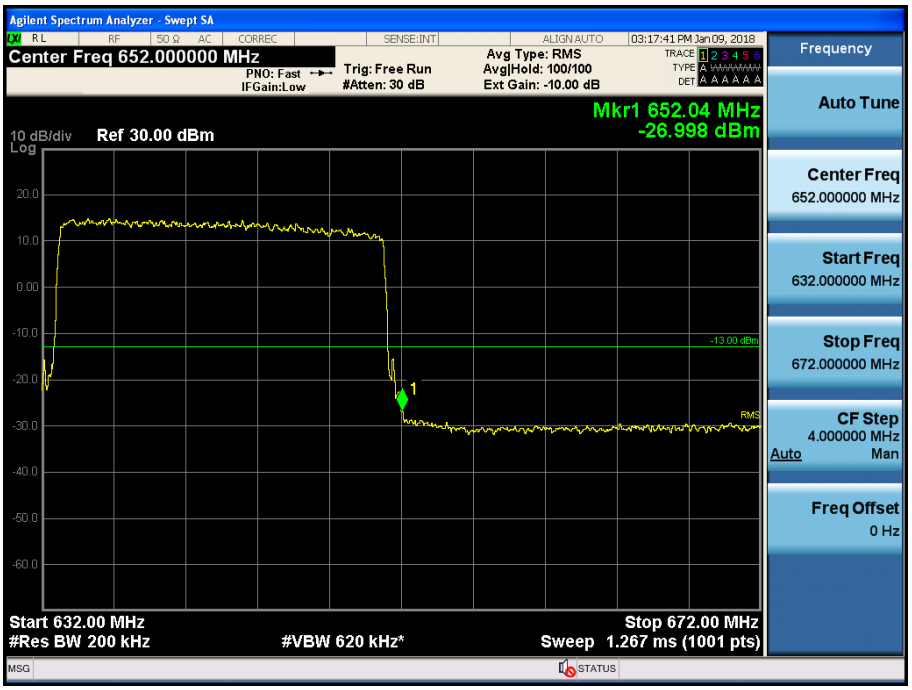
BAND EDGE

600 MHz_LTE 20 MHz_DL

[Downlink - Low]

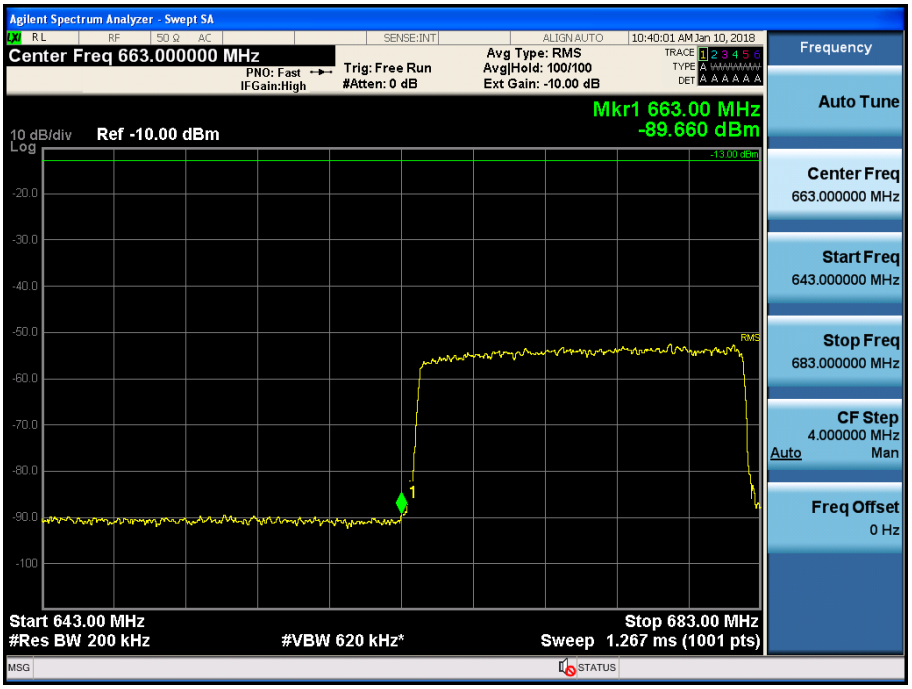


[Downlink - High]

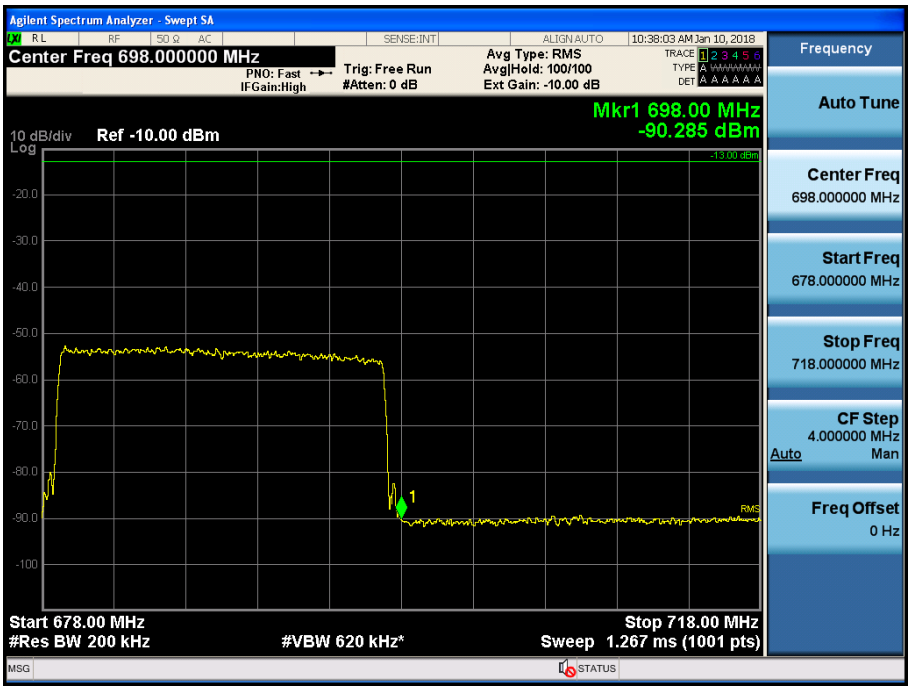


600 MHz_LTE 20 MHz_UL

[Uplink - Low]



[Uplink - High]



10. 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.

Test Procedures:

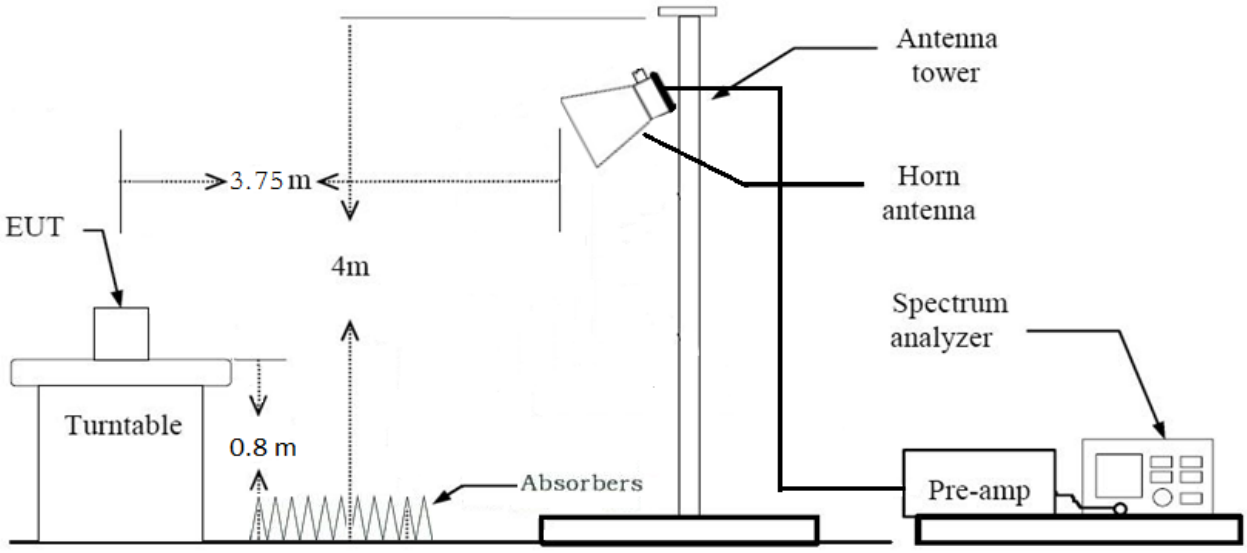
As required by 47 CFR 2.1053, *field strength of radiated spurious measurements* were made in accordance with the procedures of ANSI/TIA-603-E-2016 "Land Mobile FM or PM Communications Equipment Measurement and Performance Standards".

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)

Radiated Spurious Emissions Test Result:

600 MHz_LTE 20 MHz

[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)

11. 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.

§27.54 Frequency stability.

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

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

Frequency Stability and Voltage Test Results

600 MHz_LTE 20 MHz

[Downlink]

Reference: 120 Vac at 20°C **Freq.** = 634.5 MHz

Voltage (%)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (Hz)	ppm
100%	+20(Ref)	634 500 001	0.622	0.000	0.00000
	-30	634 499 999	-0.782	-1.404	-0.00066
	-20	634 500 000	0.296	-0.326	-0.00015
	-10	634 500 000	0.261	-0.361	-0.00017
	0	634 500 001	0.622	0.000	0.00000
	+10	634 500 000	0.149	-0.474	-0.00022
	+30	634 499 999	-0.819	-1.442	-0.00068
	+40	634 499 999	-0.897	-1.519	-0.00071
	+50	634 500 000	0.030	-0.592	-0.00028
High	+20	634 500 000	0.221	-0.402	-0.00019
Low	+20	634 500 001	0.721	0.099	0.00005

[Uplink]

Reference: 120 Vac at 20°C **Freq.** = 680.5 MHz

Voltage (%)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (Hz)	ppm
100%	+20(Ref)	680 500 001	0.945	0.000	0.00000
	-30	680 500 000	0.277	-0.667	-0.00098
	-20	680 500 001	0.574	-0.371	-0.00054
	-10	680 500 000	0.485	-0.460	-0.00068
	0	680 499 999	-0.627	-1.572	-0.00231
	+10	680 500 001	0.827	-0.118	-0.00017
	+30	680 499 999	-0.569	-1.514	-0.00222
	+40	680 500 000	-0.410	-1.355	-0.00199
	+50	680 500 001	0.951	0.006	0.00001
High	+20	680 499 999	-0.627	-1.572	-0.00231
Low	+20	680 499 999	-0.813	-1.758	-0.00258