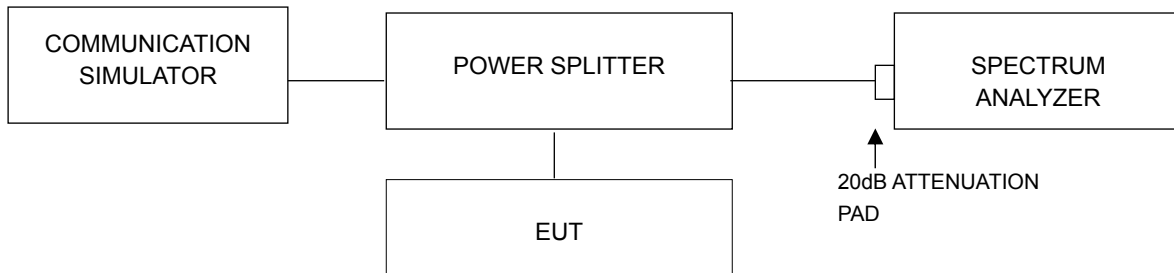


## 4.6 Peak to Average Ratio

### 4.6.1 Limits of Peak to Average Ratio Measurement

In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13 dB

### 4.6.2 Test Setup



### 4.6.3 Test Procedures

- Set resolution/measurement bandwidth  $\geq$  signal's occupied bandwidth;
- Set the number of counts to a value that stabilizes the measured CCDF curve;
- Record the maximum PAPR level associated with a probability of 0.1%.

#### 4.6.4 Test Results

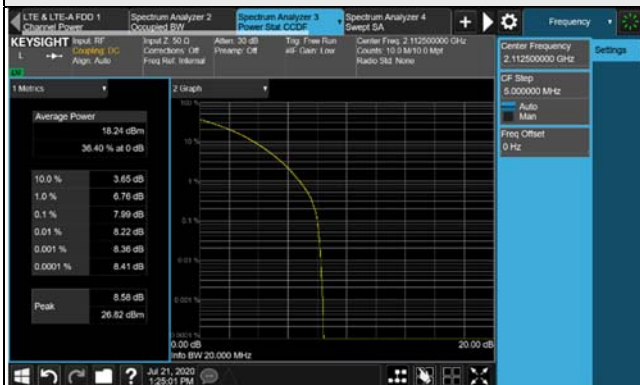
LTE Band 4

Chain 0

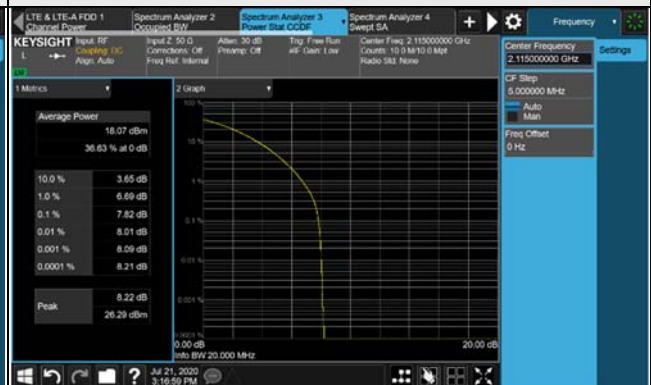
LTE Band 4, Channel Bandwidth 5MHz				
Channel	Frequency (MHz)	Peak To Average Ratio (dB)		
		QPSK	16QAM	64QAM
1975	2112.5	7.99	7.99	7.99
2175	2132.5	7.70	7.71	7.72
2375	2152.5	7.93	7.92	7.92
LTE Band 4, Channel Bandwidth 10MHz				
Channel	Frequency (MHz)	Peak To Average Ratio (dB)		
		QPSK	16QAM	64QAM
2000	2115.0	7.82	7.81	7.81
2175	2132.5	7.61	7.61	7.61
2350	2150.0	7.80	7.81	7.80
LTE Band 4, Channel Bandwidth 15MHz				
Channel	Frequency (MHz)	Peak To Average Ratio (dB)		
		QPSK	16QAM	64QAM
2025	2117.5	7.62	7.62	7.62
2175	2132.5	7.47	7.47	7.47
2325	2147.5	7.63	7.63	7.63
LTE Band 4, Channel Bandwidth 20MHz				
Channel	Frequency (MHz)	Peak To Average Ratio (dB)		
		QPSK	16QAM	64QAM
2050	2120.0	7.51	7.51	7.51
2175	2132.5	7.45	7.45	7.45
2300	2145.0	7.53	7.54	7.54

### Spectrum Plot of Worst Value

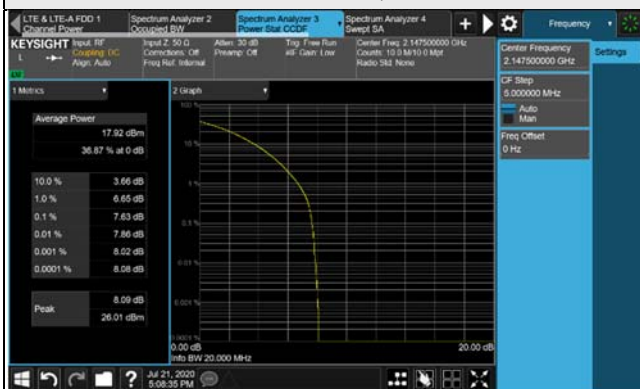
5MHz / 64QAM



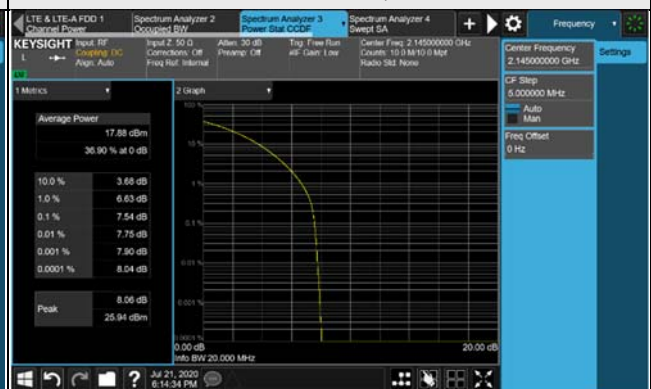
10MHz / QPSK



15MHz / 64QAM



20MHz / 64QAM

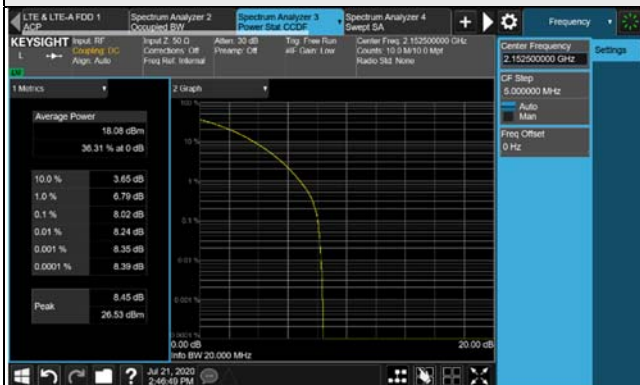


Chain 1

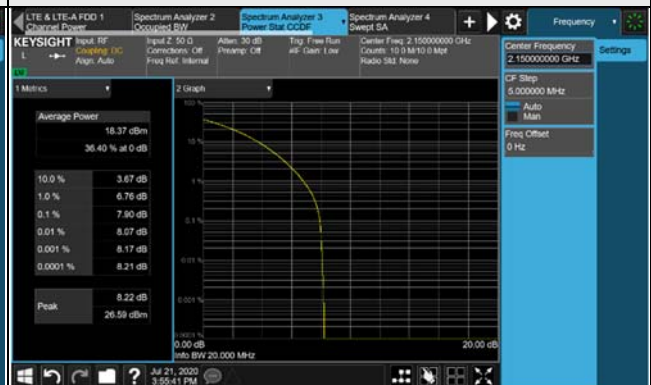
LTE Band 4, Channel Bandwidth 5MHz				
Channel	Frequency (MHz)	Peak To Average Ratio (dB)		
		QPSK	16QAM	64QAM
1975	2112.5	7.92	7.91	7.92
2175	2132.5	7.95	7.94	7.92
2375	2152.5	8.02	8.01	8.00
LTE Band 4, Channel Bandwidth 10MHz				
Channel	Frequency (MHz)	Peak To Average Ratio (dB)		
		QPSK	16QAM	64QAM
2000	2115.0	7.80	7.80	7.80
2175	2132.5	7.78	7.80	7.79
2350	2150.0	7.90	7.88	7.87
LTE Band 4, Channel Bandwidth 15MHz				
Channel	Frequency (MHz)	Peak To Average Ratio (dB)		
		QPSK	16QAM	64QAM
2025	2117.5	7.62	7.63	7.63
2175	2132.5	7.66	7.66	7.65
2325	2147.5	7.68	7.68	7.67
LTE Band 4, Channel Bandwidth 20MHz				
Channel	Frequency (MHz)	Peak To Average Ratio (dB)		
		QPSK	16QAM	64QAM
2050	2120.0	7.56	7.57	7.57
2175	2132.5	7.56	7.57	7.56
2300	2145.0	7.61	7.60	7.61

### Spectrum Plot of Worst Value

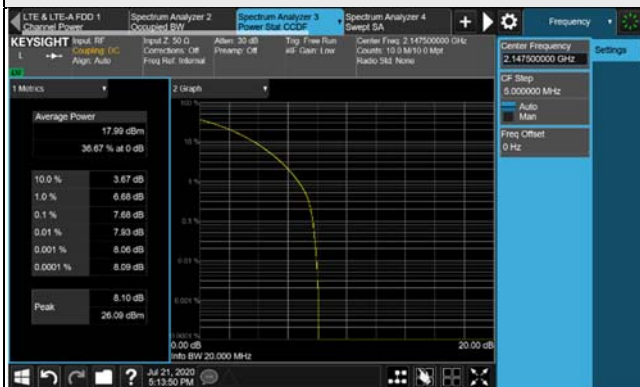
**5MHz / QPSK**



**10MHz / QPSK**



**15MHz / QPSK**



**20MHz / 64QAM**

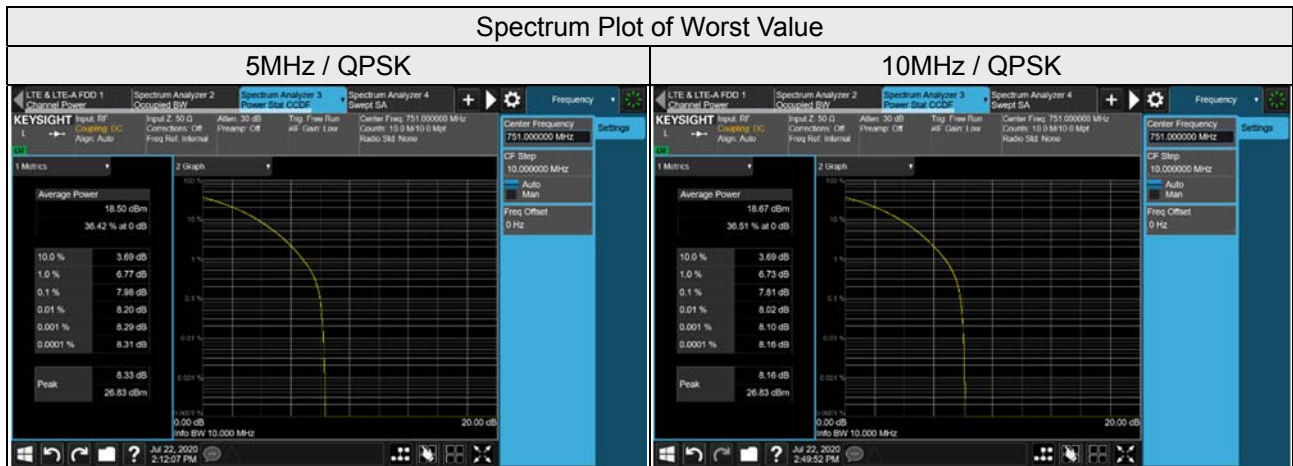


LTE Band 13  
Chain 0

LTE Band 13, Channel Bandwidth 5MHz				
Channel	Frequency (MHz)	Peak To Average Ratio (dB)		
		QPSK	16QAM	64QAM
5205	748.5	7.94	7.95	7.95
5230	751.0	7.98	7.96	7.97
5255	753.5	7.98	7.96	7.97

LTE Band 13, Channel Bandwidth 10MHz				
Channel	Frequency (MHz)	Peak To Average Ratio (dB)		
		QPSK	16QAM	64QAM
5230	751.0	7.81	7.80	7.80

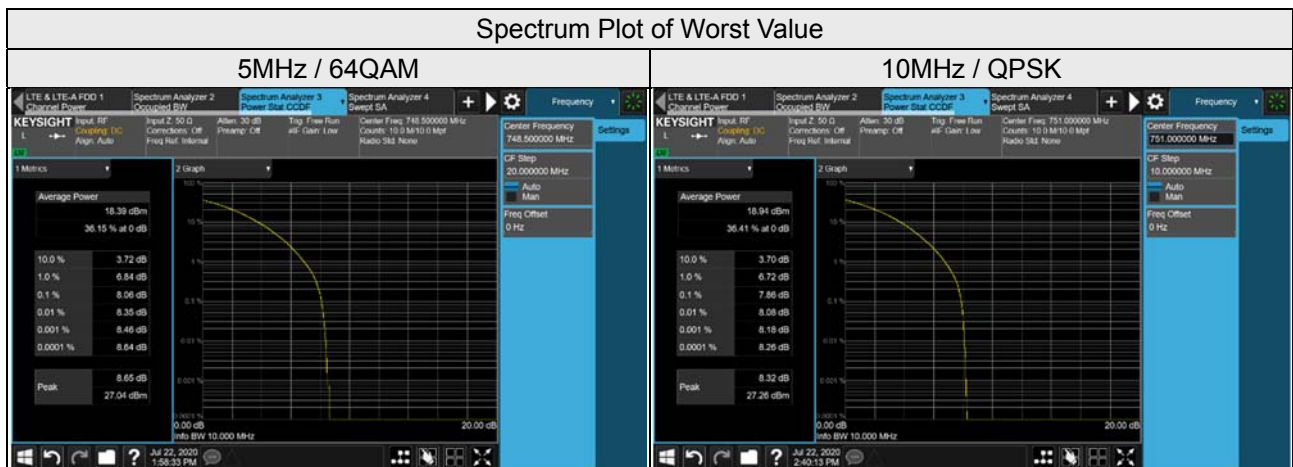


Chain 1

LTE Band 13, Channel Bandwidth 5MHz				
Channel	Frequency (MHz)	Peak To Average Ratio (dB)		
		QPSK	16QAM	64QAM
5205	748.5	8.04	8.06	8.06
5230	751.0	8.00	8.02	8.00
5255	753.5	7.94	7.97	7.96

LTE Band 13, Channel Bandwidth 10MHz				
Channel	Frequency (MHz)	Peak To Average Ratio (dB)		
		QPSK	16QAM	64QAM
5230	751.0	7.86	7.85	7.85



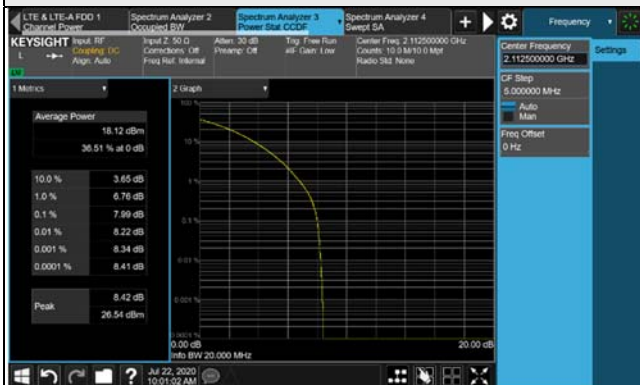
LTE Band 66  
Chain 0

LTE Band 66, Channel Bandwidth 5MHz				
Channel	Frequency (MHz)	Peak To Average Ratio (dB)		
		QPSK	16QAM	64QAM
66461	2112.5	7.99	7.98	7.98
66786	2145.0	7.87	7.86	7.88
67111	2177.5	7.86	7.66	7.86
LTE Band 66, Channel Bandwidth 10MHz				
Channel	Frequency (MHz)	Peak To Average Ratio (dB)		
		QPSK	16QAM	64QAM
66486	2115.0	7.86	7.83	7.83
66786	2145.0	7.79	7.79	7.79
67086	2175.0	7.67	7.65	7.65
LTE Band 66, Channel Bandwidth 15MHz				
Channel	Frequency (MHz)	Peak To Average Ratio (dB)		
		QPSK	16QAM	64QAM
66511	2117.5	7.85	7.85	7.85
66786	2145.0	7.90	7.89	7.89
67061	2172.5	7.78	7.79	7.79
LTE Band 66, Channel Bandwidth 20MHz				
Channel	Frequency (MHz)	Peak To Average Ratio (dB)		
		QPSK	16QAM	64QAM
66536	2120.0	7.53	7.52	7.54
66786	2145.0	7.56	7.55	7.55
67036	2170.0	7.55	7.54	7.54

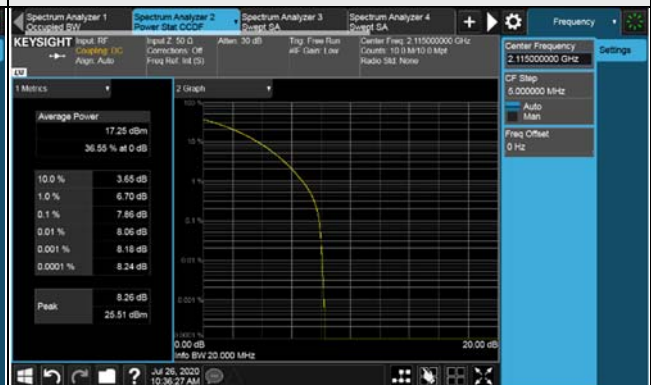


### Spectrum Plot of Worst Value

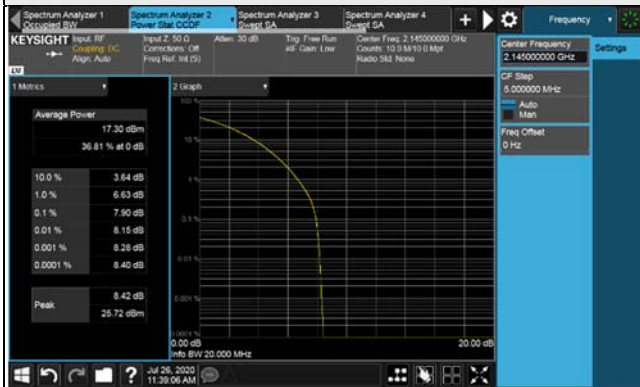
#### 5MHz / QPSK



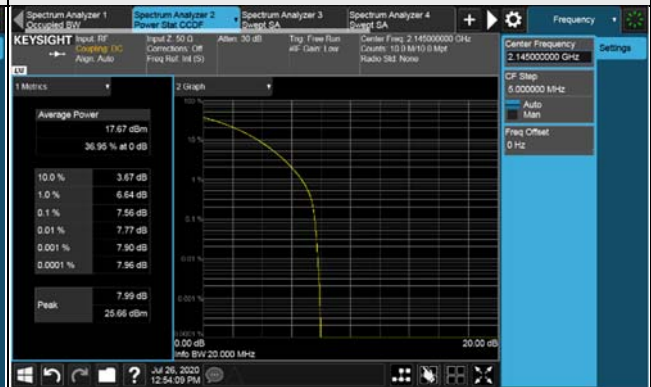
#### 10MHz / QPSK



#### 15MHz / QPSK



#### 20MHz / QPSK

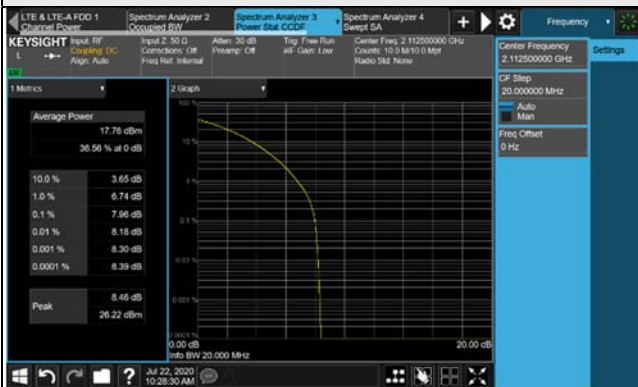


Chain 1

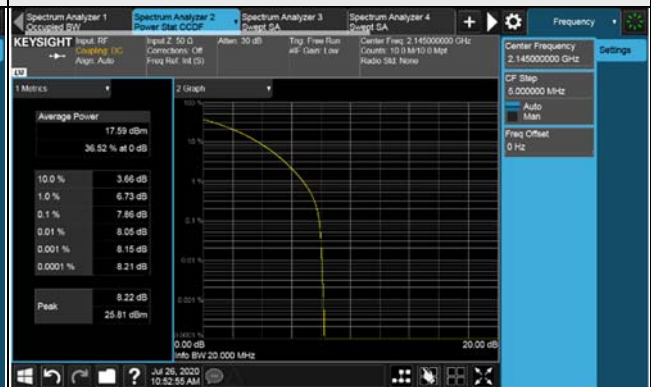
LTE Band 66, Channel Bandwidth 5MHz				
Channel	Frequency (MHz)	Peak To Average Ratio (dB)		
		QPSK	16QAM	64QAM
66461	2112.5	7.92	7.96	7.89
66786	2145.0	7.92	7.93	7.93
67111	2177.5	7.93	7.92	7.89
LTE Band 66, Channel Bandwidth 10MHz				
Channel	Frequency (MHz)	Peak To Average Ratio (dB)		
		QPSK	16QAM	64QAM
66486	2115.0	7.79	7.81	7.79
66786	2145.0	7.86	7.86	7.86
67086	2175.0	7.82	7.82	7.81
LTE Band 66, Channel Bandwidth 15MHz				
Channel	Frequency (MHz)	Peak To Average Ratio (dB)		
		QPSK	16QAM	64QAM
66511	2117.5	7.88	7.89	7.89
66786	2145.0	7.94	7.92	7.95
67061	2172.5	7.81	7.91	7.91
LTE Band 66, Channel Bandwidth 20MHz				
Channel	Frequency (MHz)	Peak To Average Ratio (dB)		
		QPSK	16QAM	64QAM
66536	2120.0	7.57	7.57	7.57
66786	2145.0	7.62	7.60	7.62
67036	2170.0	7.57	7.58	7.58

### Spectrum Plot of Worst Value

**5MHz / 16QAM**



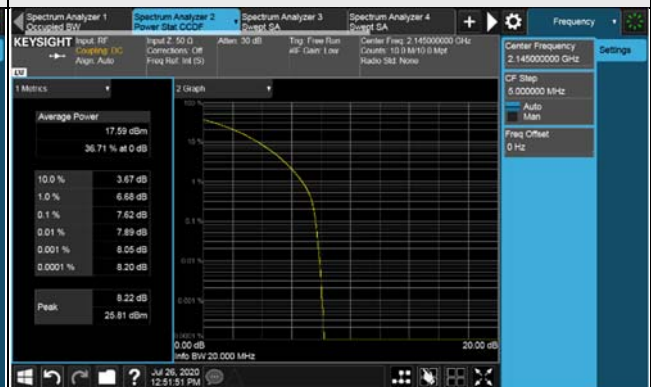
**10MHz / 64QAM**



**15MHz / 64QAM**



**20MHz / 64QAM**



## 4.7 Conducted Spurious Emissions

### 4.7.1 Limits of Conducted Spurious Emissions Measurement

LTE Band 4/LTE Band 66

In the FCC 27.53(h), On any frequency outside a licensee's frequency block, The power of any emission shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB, the emission limit equal to  $-13\text{dBm}$ .

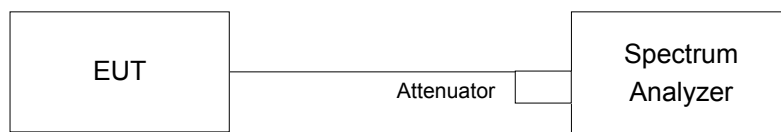
For LTE Band 13

According to FCC 27.53(c) For operations in the 746-758 MHz band and the 776-788 MHz band, 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 any frequency outside the 746-758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB;
- (2) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than  $76 + 10 \log (P)$  dB in a 6.25 kHz band segment, for base and fixed stations;

Emissions in the band 1559-1610 MHz shall be limited to  $-70$  dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and  $-80\text{dBW}$  EIRP for discrete emission of less than 700Hz bandwidth.

### 4.7.2 Test Setup

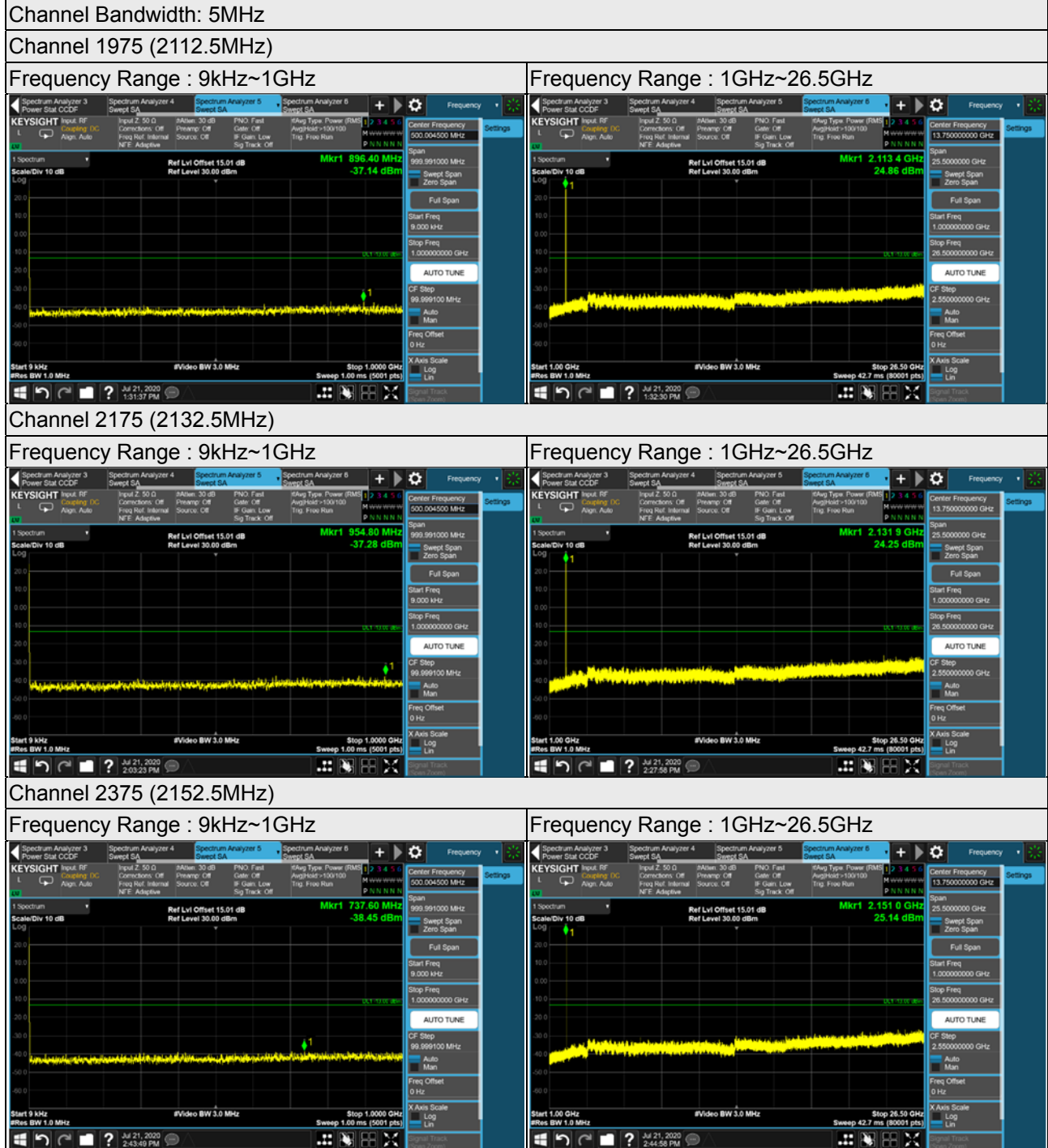


### 4.7.3 Test Procedure

- a. All measurements were done at 3 channels: low, middle and high operational frequency range.
- b. When the spectrum scanned from 9kHz to 10GHz / 26.5GHz, it shall be connected to the attenuator with the carried frequency.
- c.  $\text{Offset} = 12(\text{Cable loss}) + 3.01(2\text{TX directional}) = 15.01$  dB

#### 4.7.4 Test Results

LTE Band 4  
Chain 0

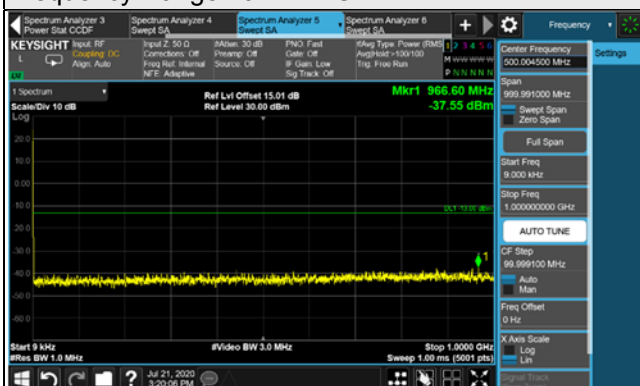


\*The 9kHz signal over the limit is from Spectrum.

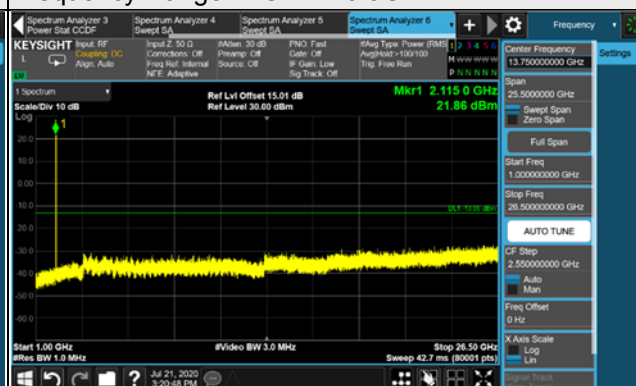
Channel Bandwidth: 10MHz

Channel 2000 (2115.0MHz)

Frequency Range : 9kHz~1GHz

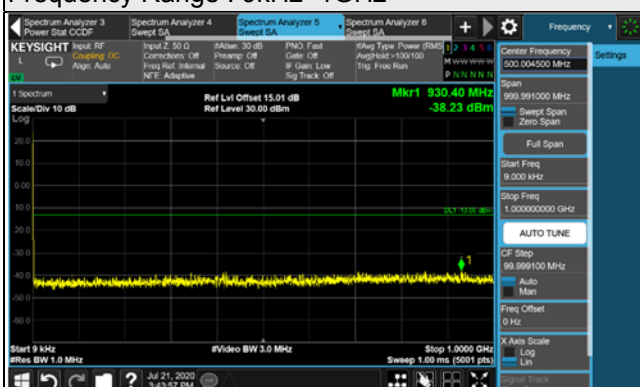


Frequency Range : 1GHz~26.5GHz

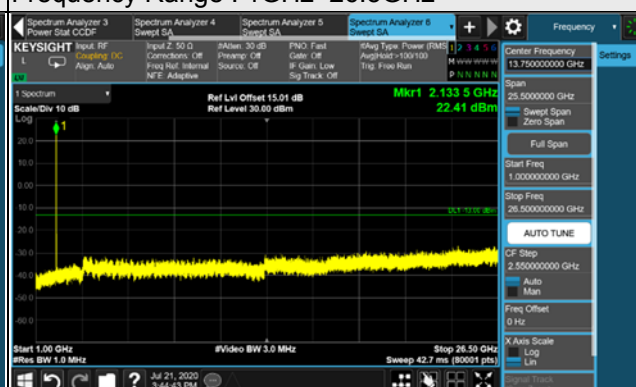


Channel 2175 (2132.5MHz)

Frequency Range : 9kHz~1GHz

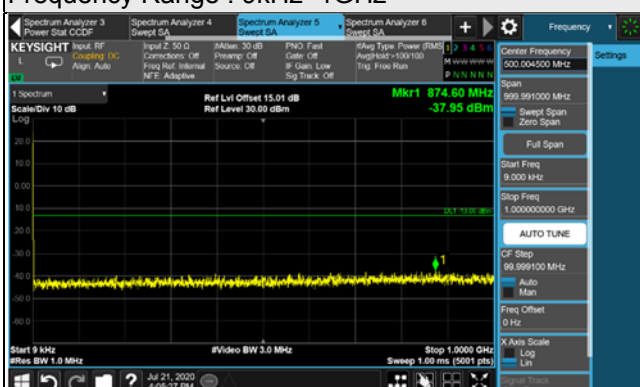


Frequency Range : 1GHz~26.5GHz

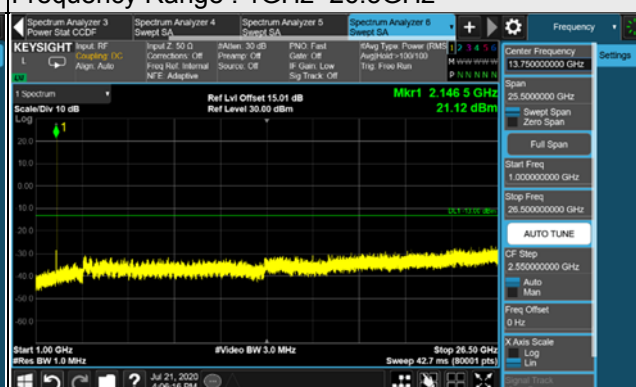


Channel 2350 (2150.0MHz)

Frequency Range : 9kHz~1GHz



Frequency Range : 1GHz~26.5GHz

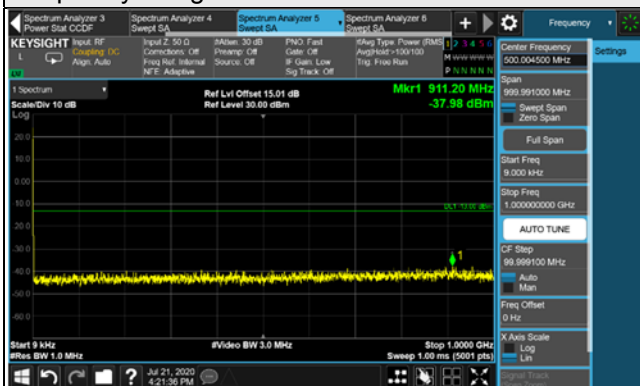


\*The 9kHz signal over the limit is from Spectrum.

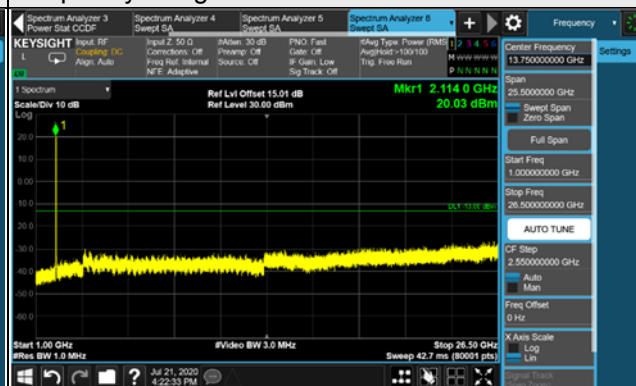
Channel Bandwidth: 15MHz

Channel 2025 (2117.5MHz)

Frequency Range : 9kHz~1GHz

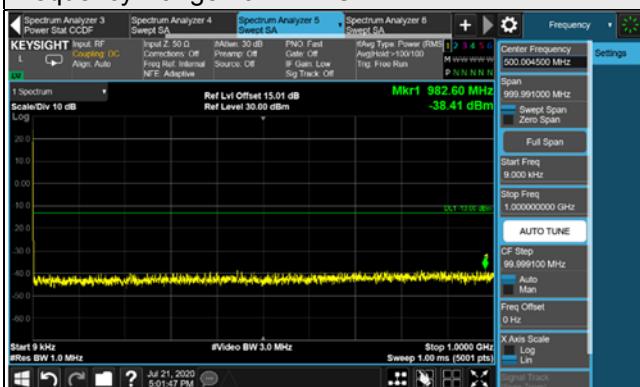


Frequency Range : 1GHz~26.5GHz

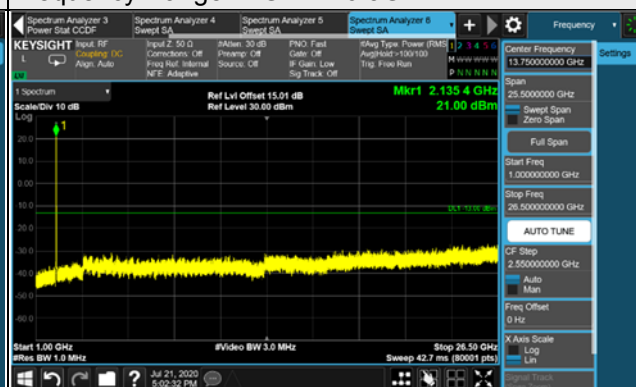


Channel 2175 (2132.5MHz)

Frequency Range : 9kHz~1GHz



Frequency Range : 1GHz~26.5GHz

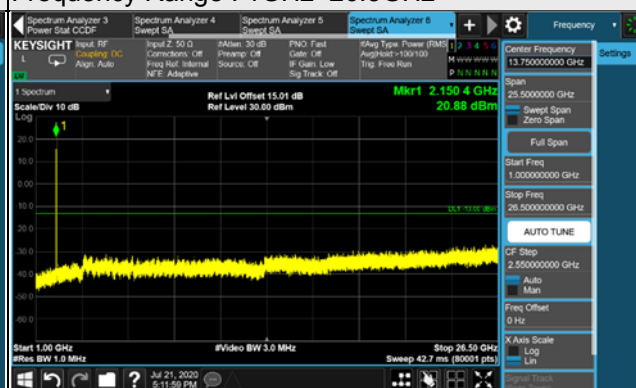


Channel 2325 (2147.5MHz)

Frequency Range : 9kHz~1GHz



Frequency Range : 1GHz~26.5GHz

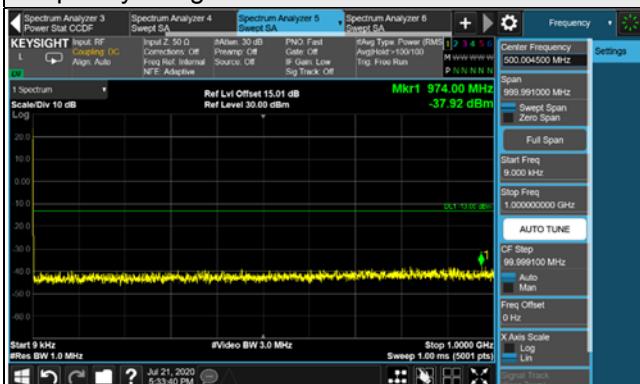


\*The 9kHz signal over the limit is from Spectrum.

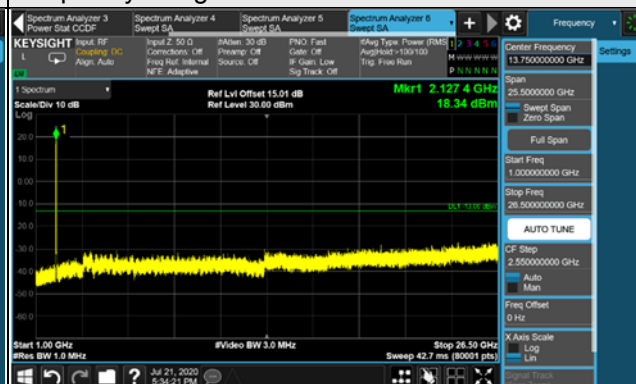
Channel Bandwidth: 20MHz

Channel 2050 (2120.0MHz)

Frequency Range : 9kHz~1GHz

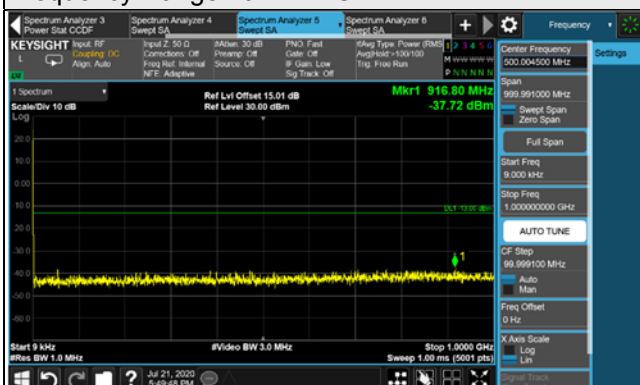


Frequency Range : 1GHz~26.5GHz

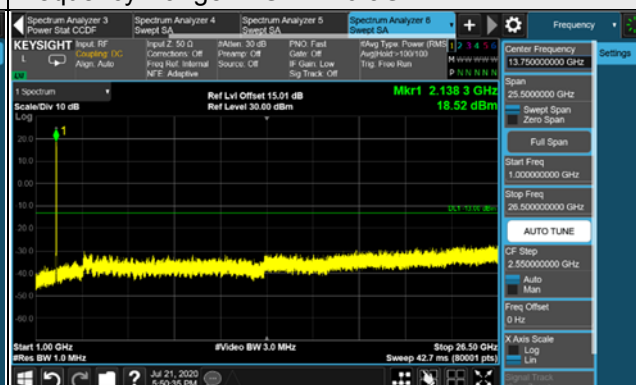


Channel 2175 (2132.5MHz)

Frequency Range : 9kHz~1GHz

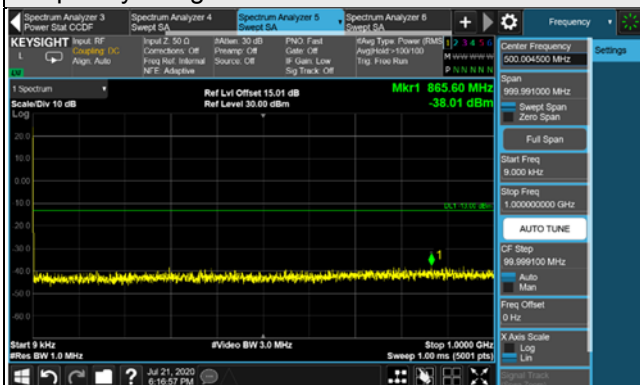


Frequency Range : 1GHz~26.5GHz

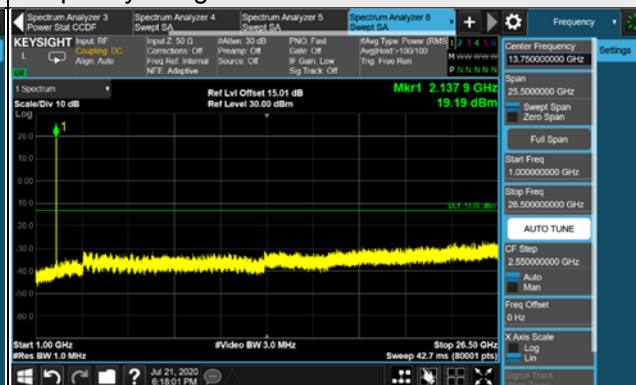


Channel 2300 (2145.0MHz)

Frequency Range : 9kHz~1GHz



Frequency Range : 1GHz~26.5GHz



\*The 9kHz signal over the limit is from Spectrum.

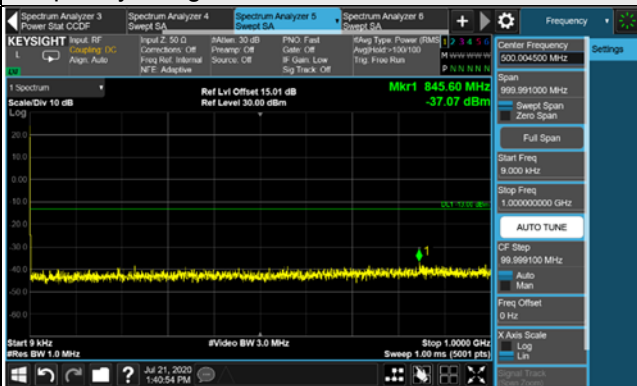


Chain 1

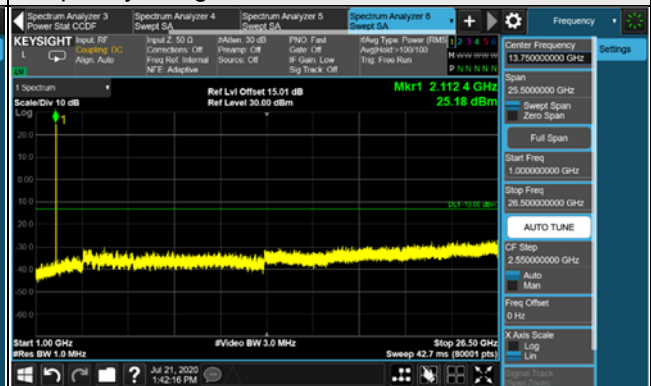
Channel Bandwidth: 5MHz

Channel 1975 (2112.5MHz)

Frequency Range : 9kHz~1GHz



Frequency Range : 1GHz~26.5GHz

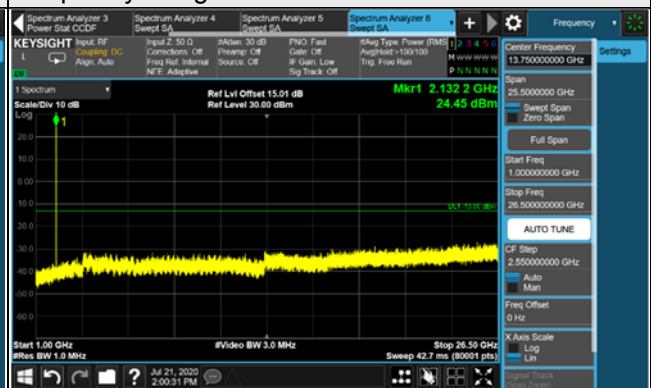


Channel 2175 (2132.5MHz)

Frequency Range : 9kHz~1GHz



Frequency Range : 1GHz~26.5GHz

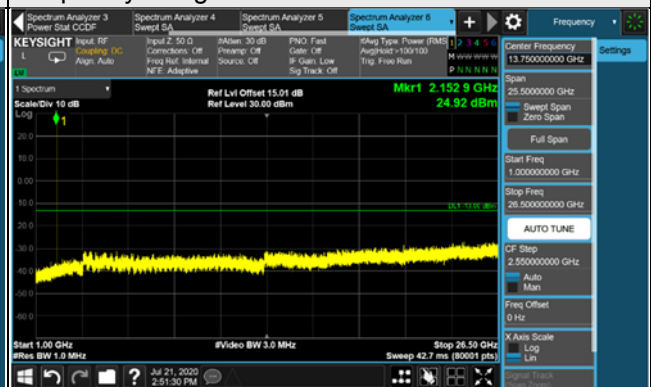


Channel 2375 (2152.5MHz)

Frequency Range : 9kHz~1GHz



Frequency Range : 1GHz~26.5GHz

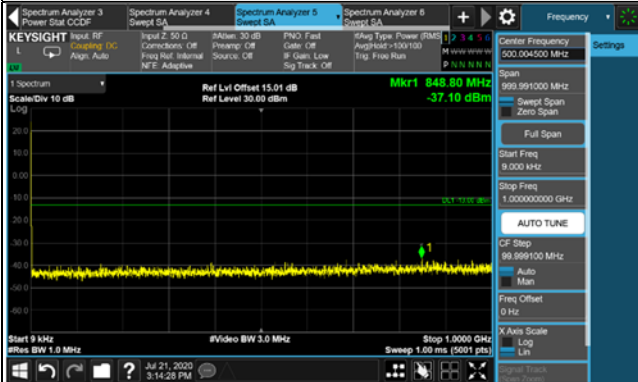


\*The 9kHz signal over the limit is from Spectrum.

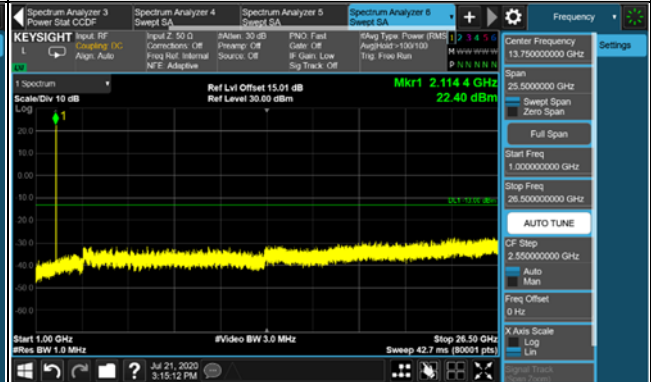
Channel Bandwidth: 10MHz

Channel 2000 (2115.0MHz)

Frequency Range : 9kHz~1GHz

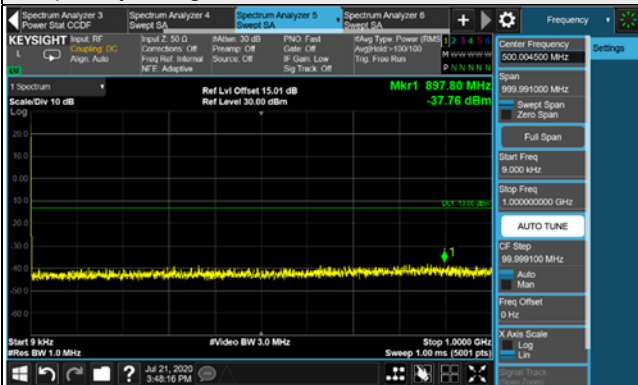


Frequency Range : 1GHz~26.5GHz

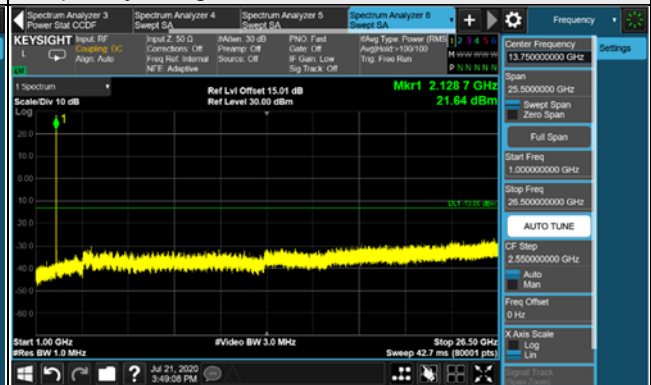


Channel 2175 (2132.5MHz)

Frequency Range : 9kHz~1GHz

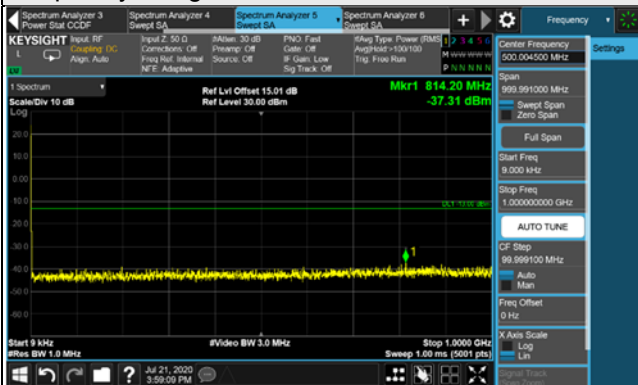


Frequency Range : 1GHz~26.5GHz

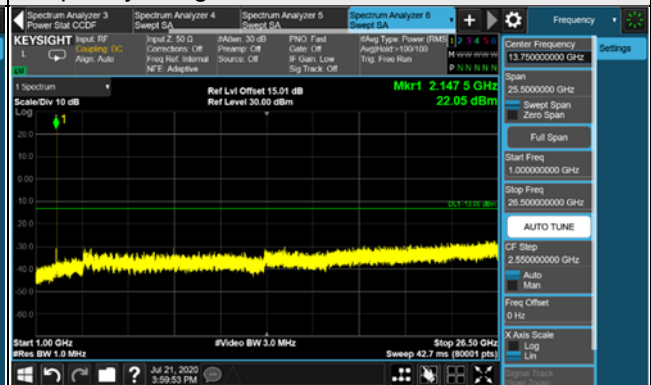


Channel 2350 (2150.0MHz)

Frequency Range : 9kHz~1GHz



Frequency Range : 1GHz~26.5GHz

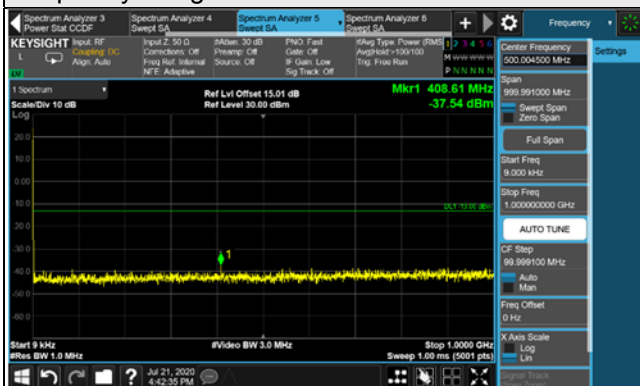


\*The 9kHz signal over the limit is from Spectrum.

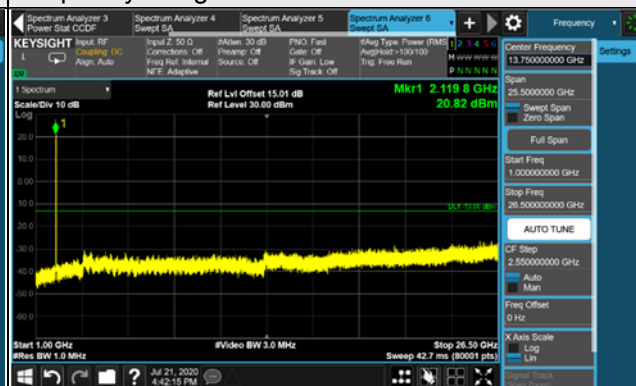
Channel Bandwidth: 15MHz

Channel 2025 (2117.5MHz)

Frequency Range : 9kHz~1GHz

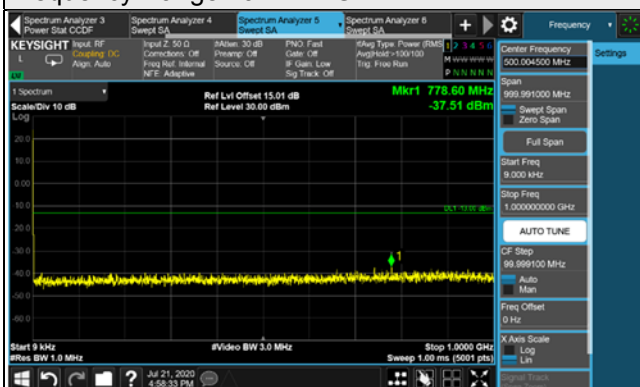


Frequency Range : 1GHz~26.5GHz

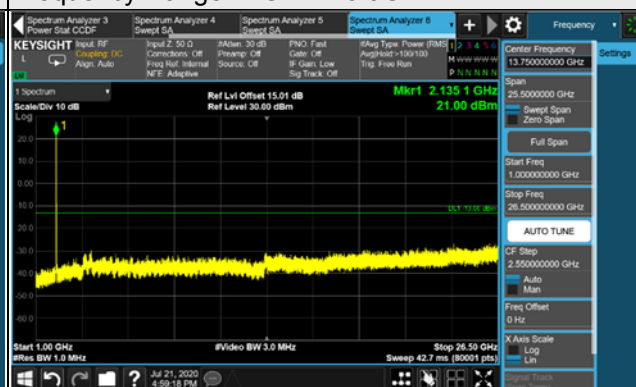


Channel 2175 (2132.5MHz)

Frequency Range : 9kHz~1GHz



Frequency Range : 1GHz~26.5GHz

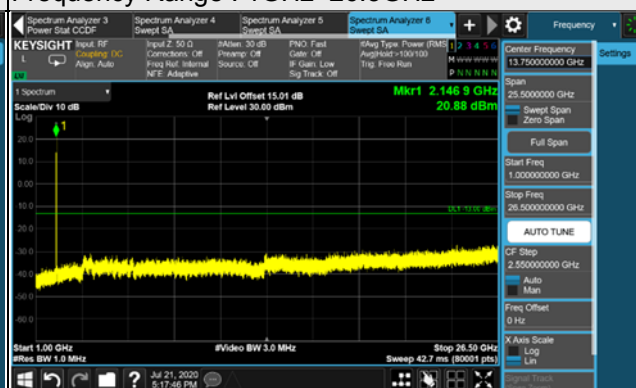


Channel 2325 (2147.5MHz)

Frequency Range : 9kHz~1GHz



Frequency Range : 1GHz~26.5GHz

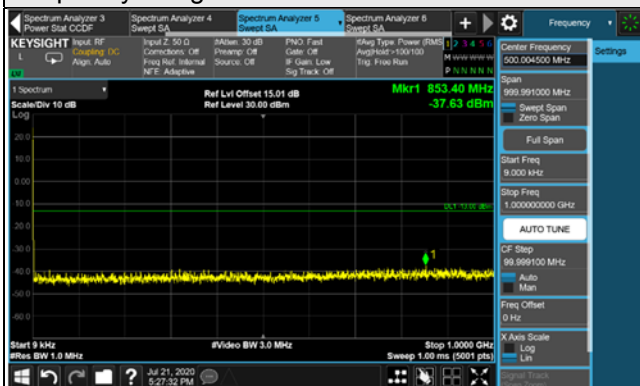


\*The 9kHz signal over the limit is from Spectrum.

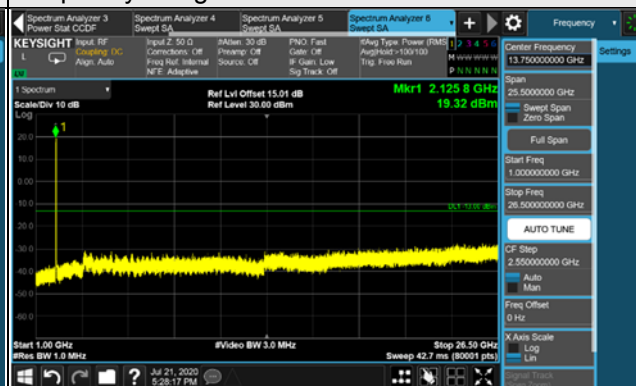
Channel Bandwidth: 20MHz

Channel 2050 (2120.0MHz)

Frequency Range : 9kHz~1GHz

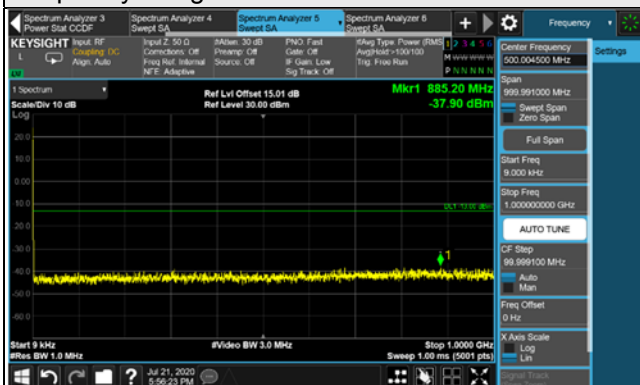


Frequency Range : 1GHz~26.5GHz

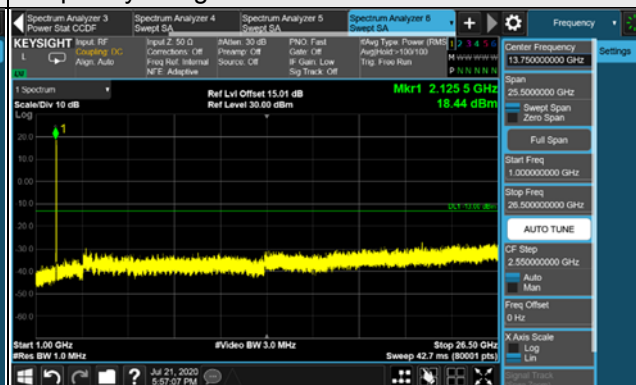


Channel 2175 (2132.5MHz)

Frequency Range : 9kHz~1GHz

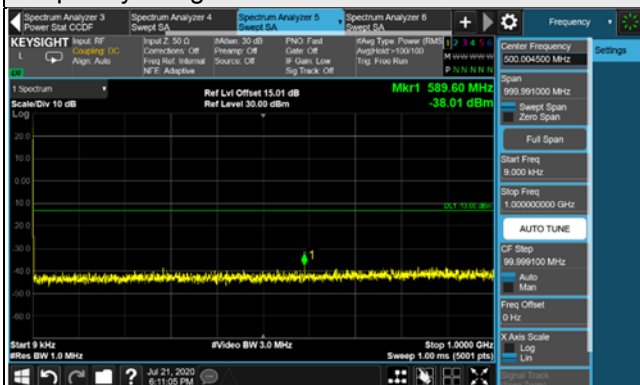


Frequency Range : 1GHz~26.5GHz

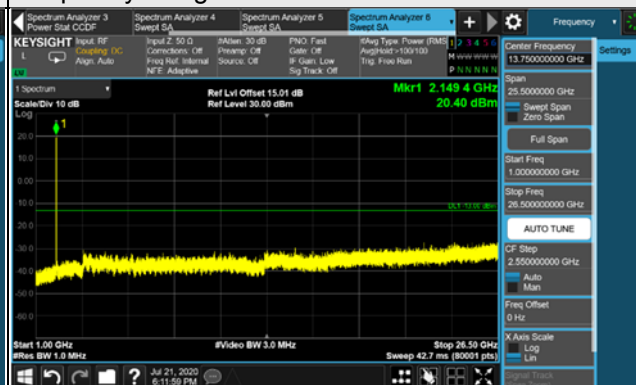


Channel 2300 (2145.0MHz)

Frequency Range : 9kHz~1GHz



Frequency Range : 1GHz~26.5GHz



\*The 9kHz signal over the limit is from Spectrum.

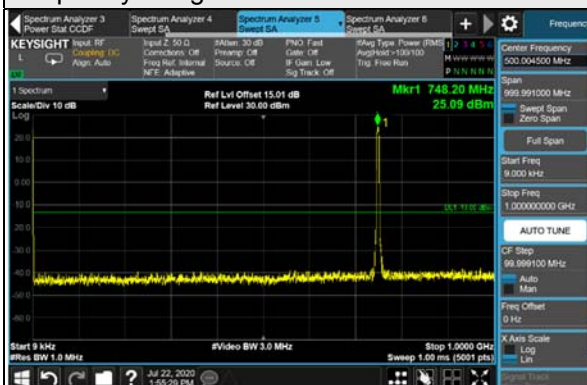
LTE Band 13

Chain 0

Channel Bandwidth: 5MHz

Channel 5205 (748.5MHz)

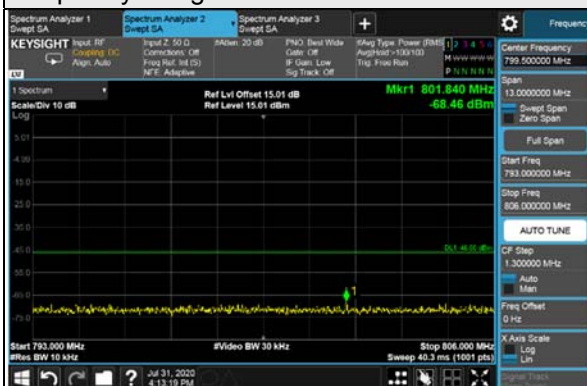
Frequency Range : 9kHz~1GHz



Frequency Range : 1GHz~10GHz



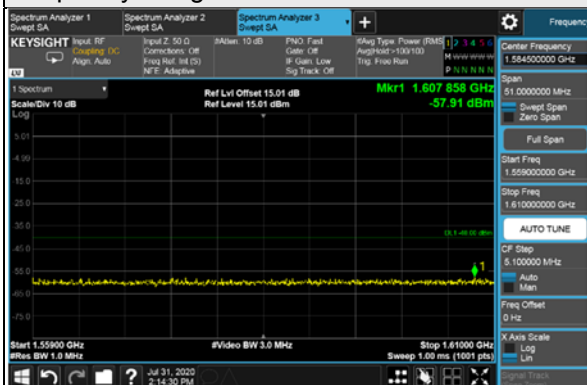
Frequency Range : 763MHz~775MHz



Frequency Range : 793MHz~806MHz

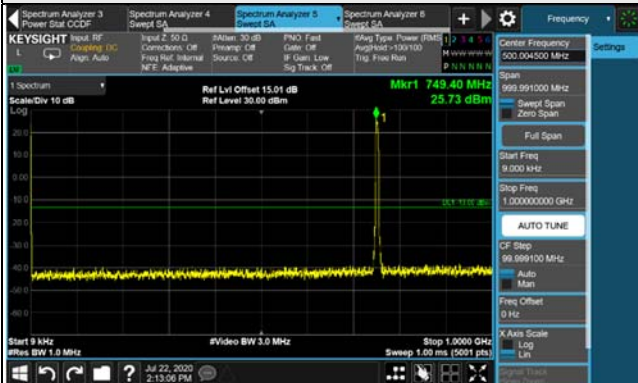


Frequency Range : 1.559GHz~1.161GHz



### Channel 5230 (751.0MHz)

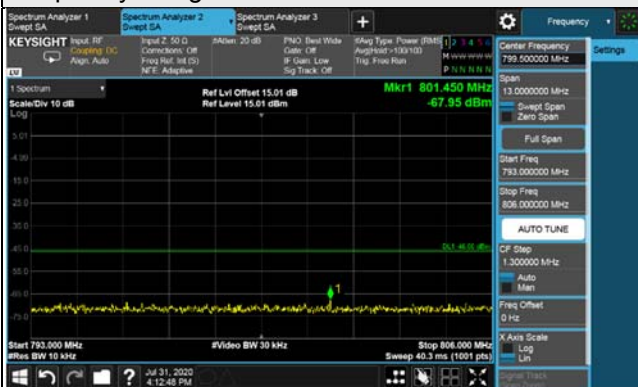
Frequency Range : 9kHz~1GHz



Frequency Range : 1GHz~10GHz



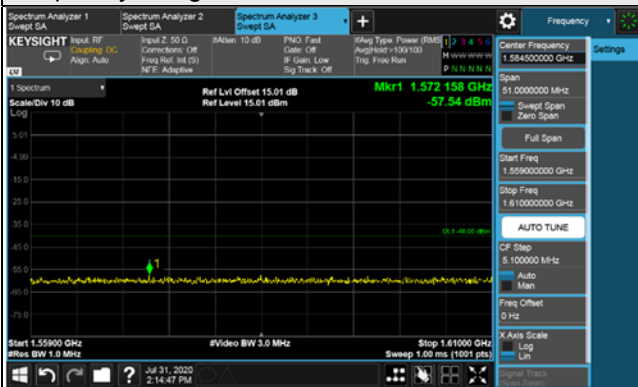
Frequency Range : 763MHz~775MHz



Frequency Range : 793MHz~806MHz

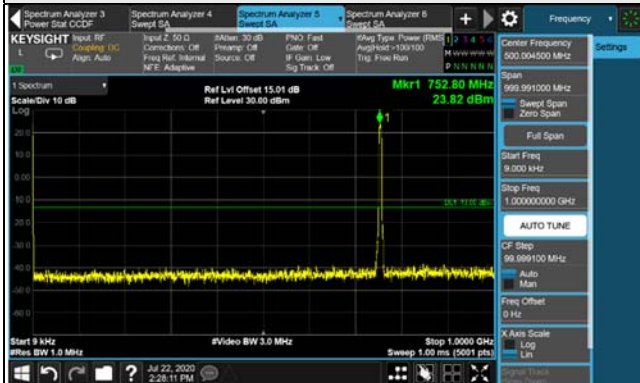


Frequency Range : 1.559GHz~1.161GHz



### Channel 5255 (753.5MHz)

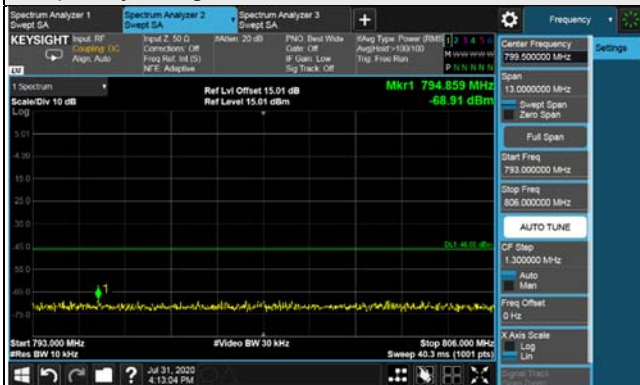
Frequency Range : 9kHz~1GHz



Frequency Range : 1GHz~10GHz



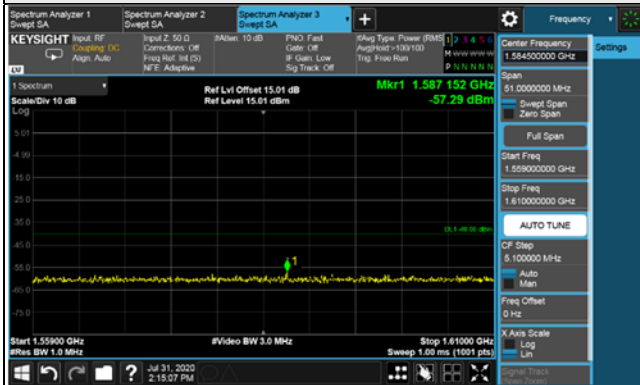
Frequency Range : 763MHz~775MHz



Frequency Range : 793MHz~806MHz



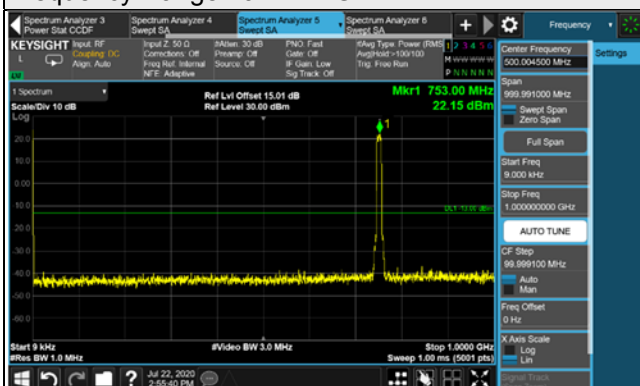
Frequency Range : 1.559GHz~1.161GHz



Channel Bandwidth: 10MHz

Channel 5230 (751.0MHz)

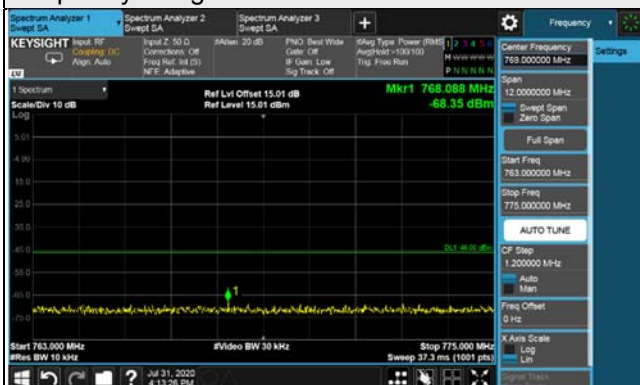
Frequency Range : 9kHz~1GHz



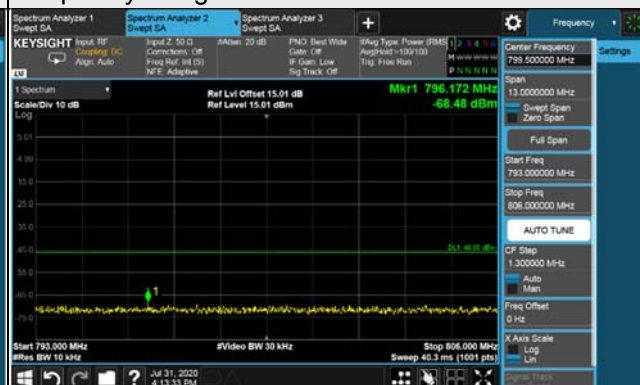
Frequency Range : 1GHz~10GHz



Frequency Range : 763MHz~775MHz



Frequency Range : 793MHz~806MHz



Frequency Range : 1.559GHz~1.161GHz

