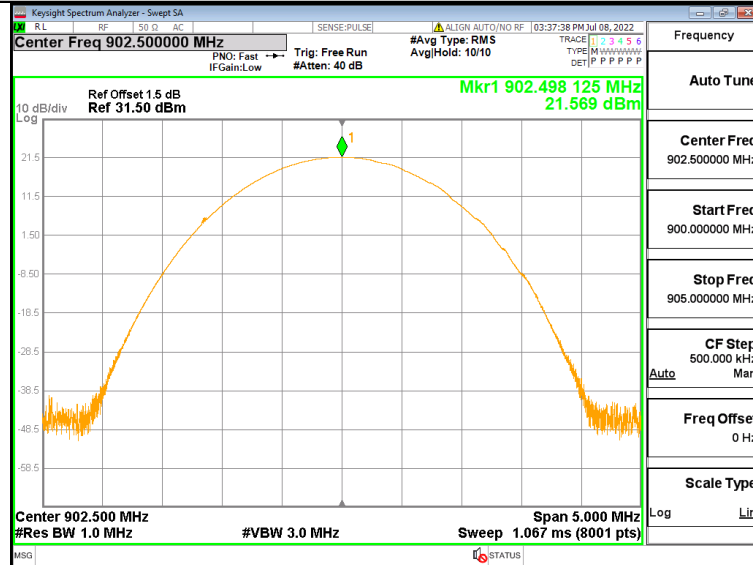
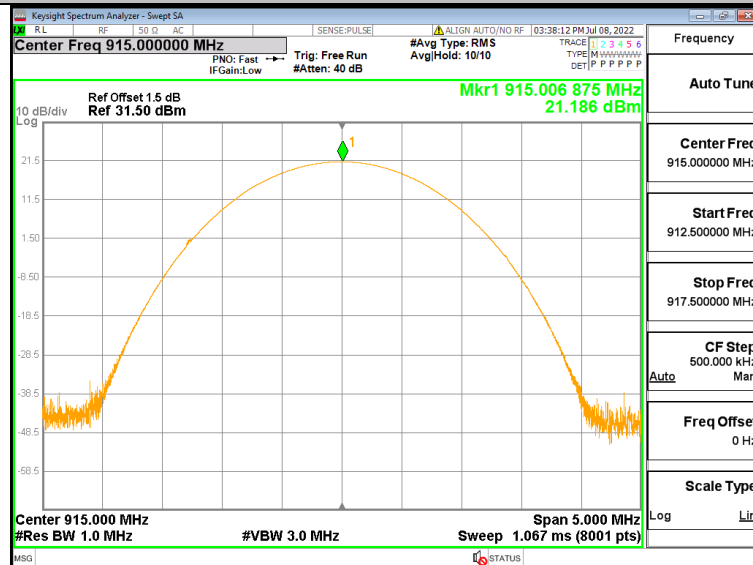


Antenna 4

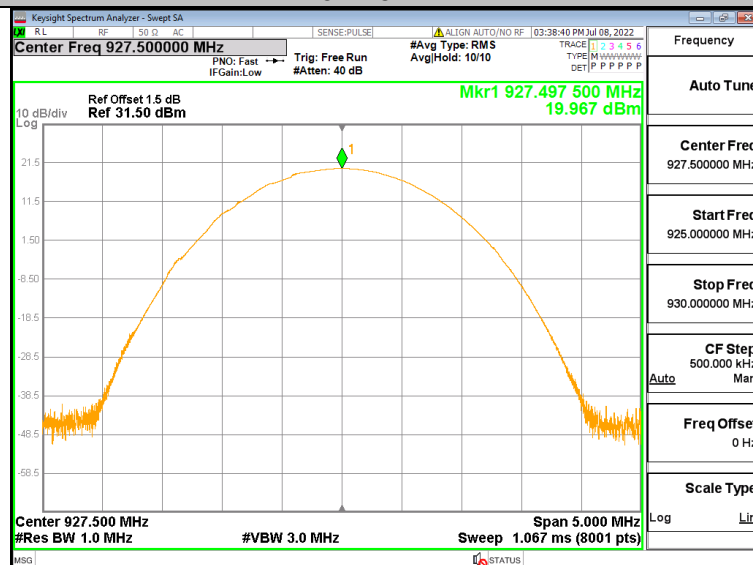
902.5MHz



915MHz

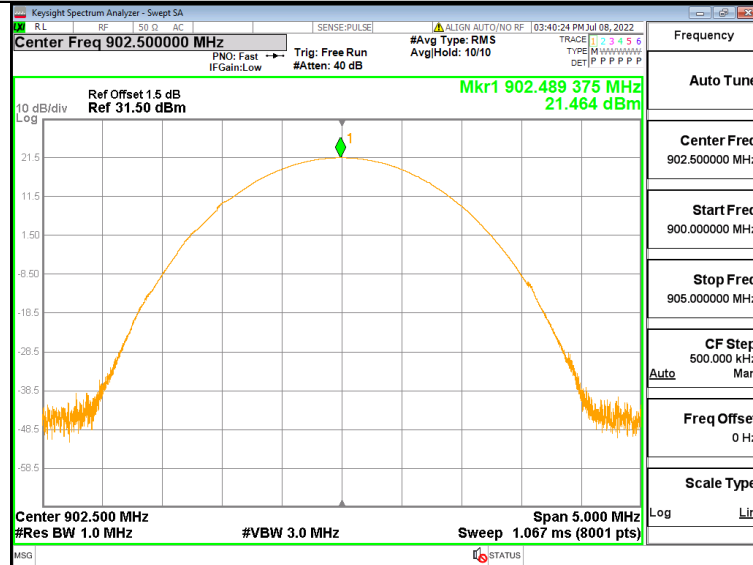


927.5MHz

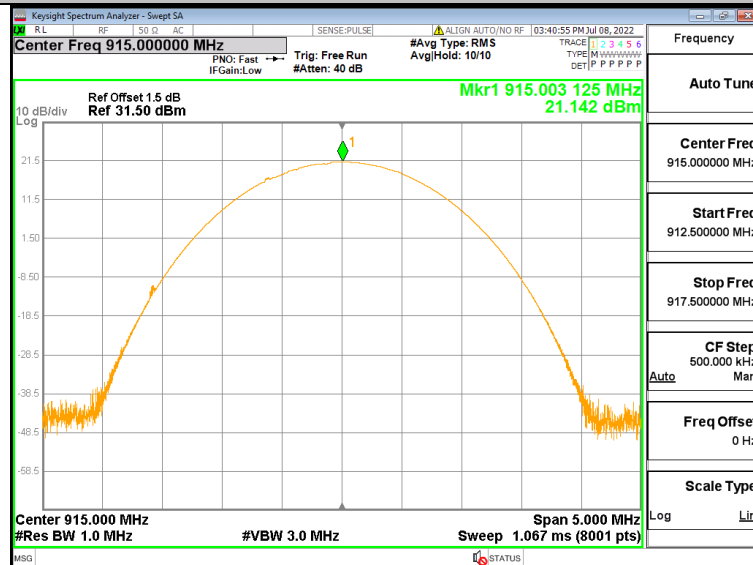


Antenna 5

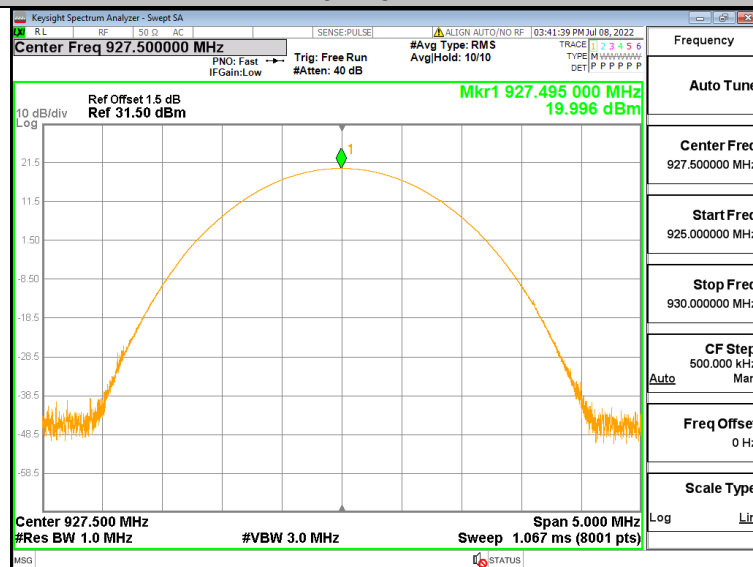
902.5MHz



915MHz

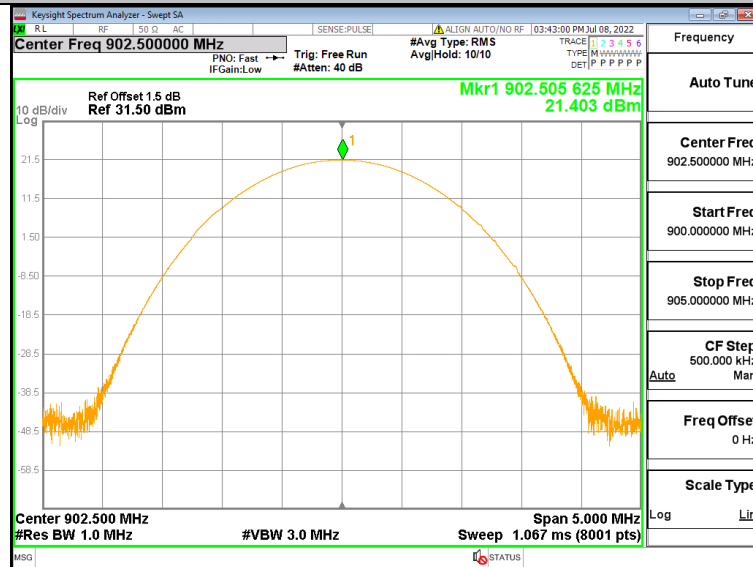


927.5MHz

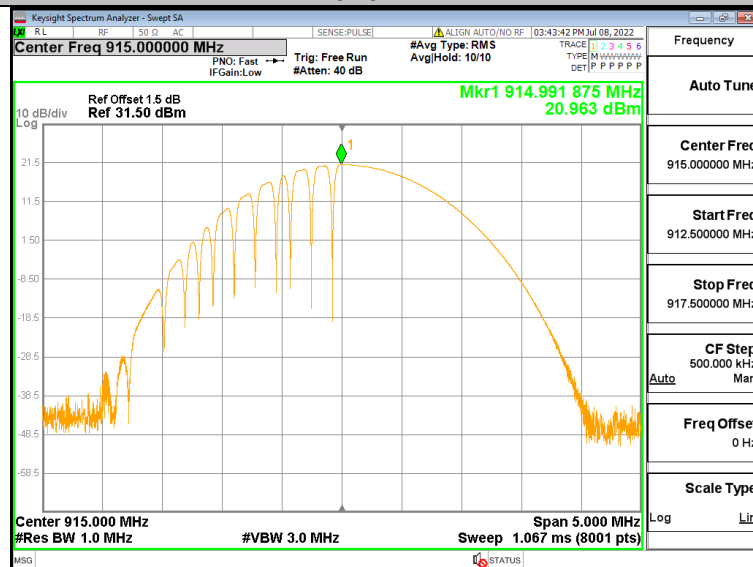


Antenna 6

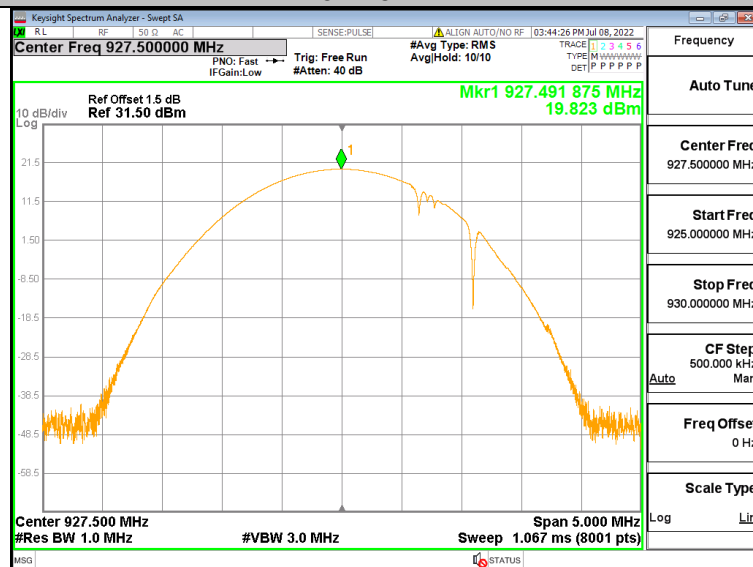
902.5MHz

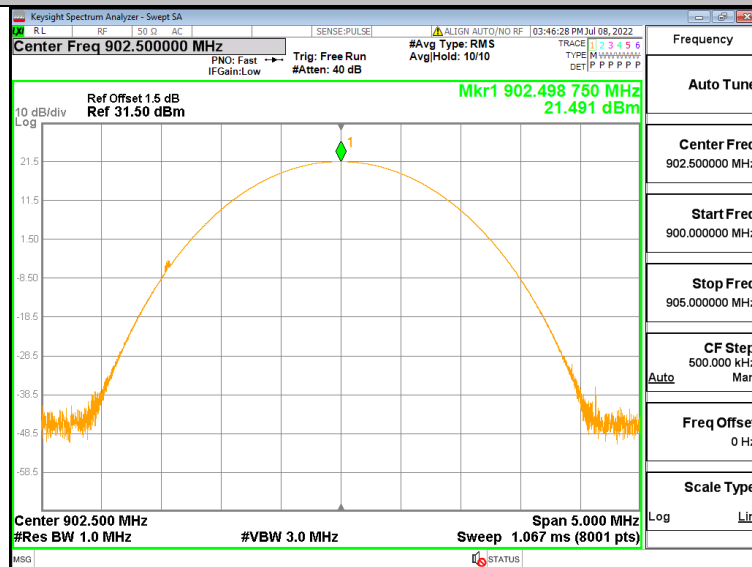


915MHz

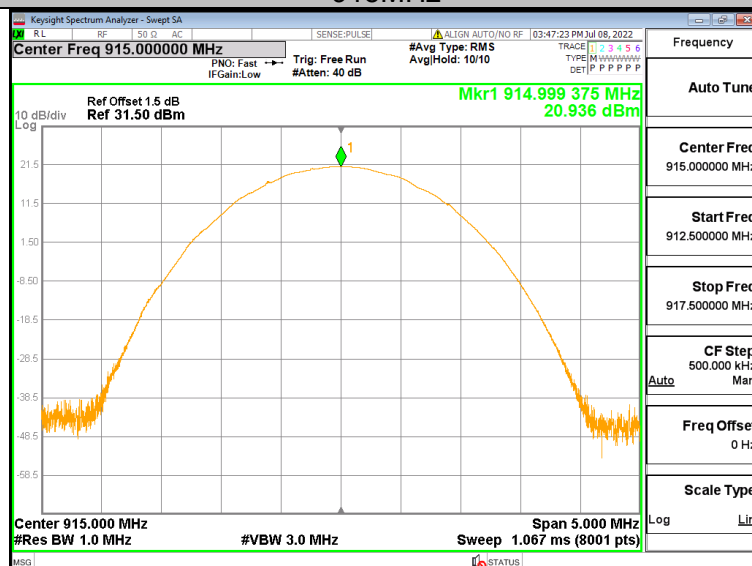


927.5MHz

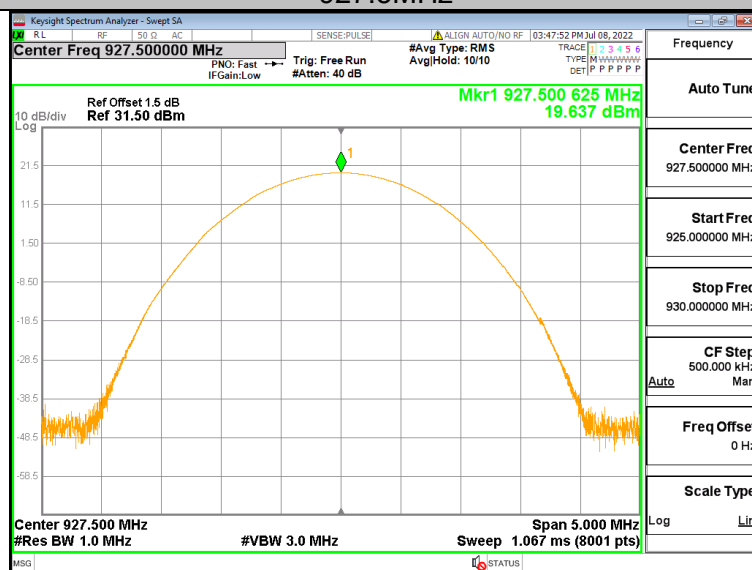


Antenna 7
902.5MHz

915MHz

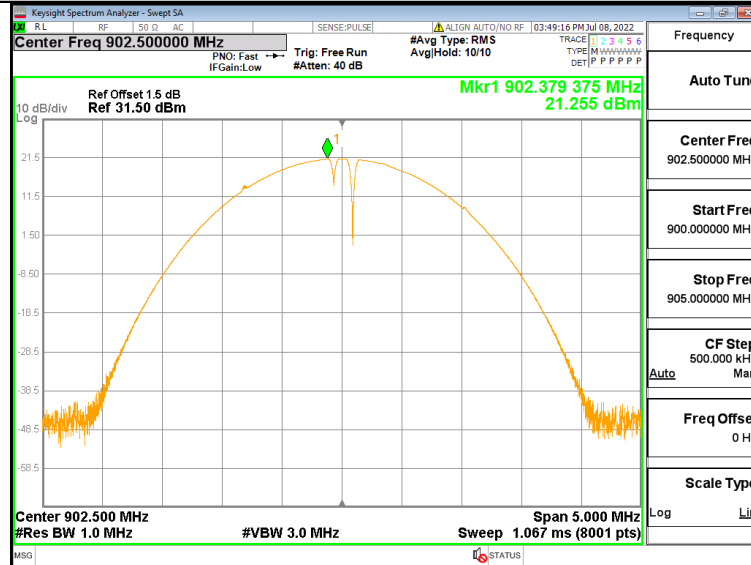


927.5MHz

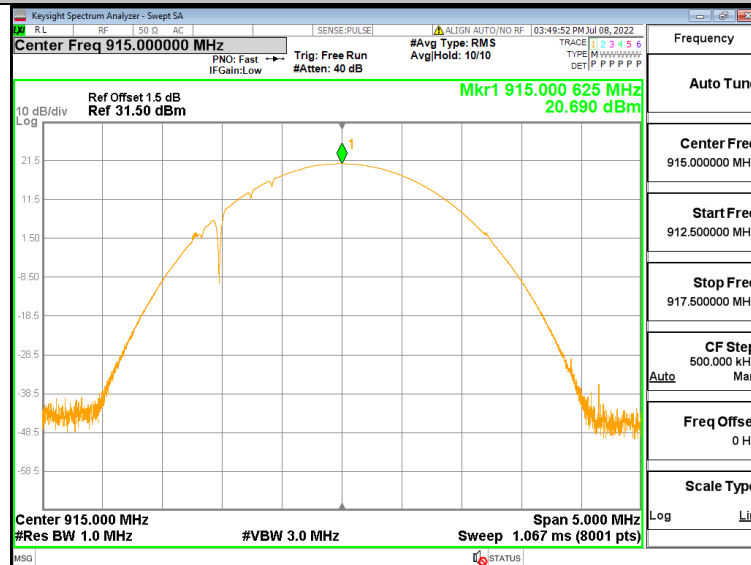


Antenna 8

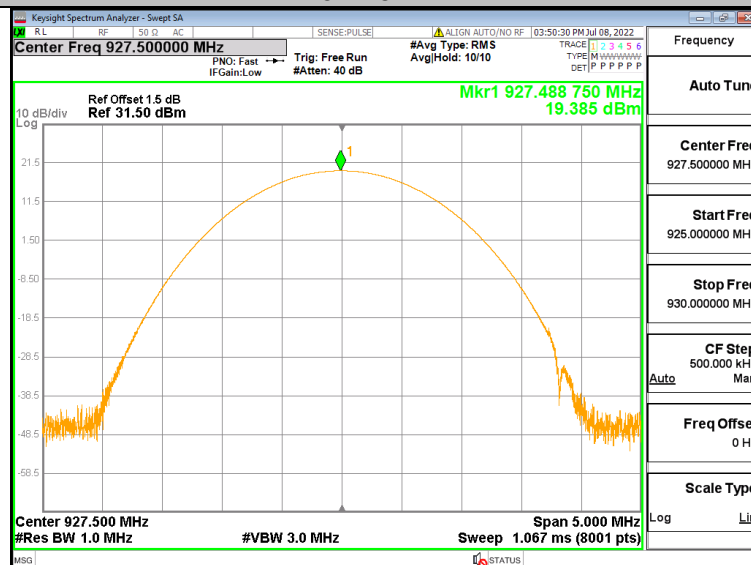
902.5MHz



915MHz



927.5MHz



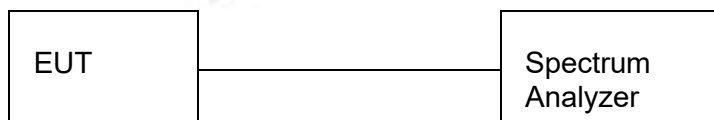
3.4. 20dB Bandwidth

Test Procedure

According to ANSI C63.10: 2013. Use the following spectrum analyzer settings: Span = approximately 2 to 3 times the 20dB bandwidth, centered on a hopping channel RBW $\geq$ 1% of the 20dB bandwidth, VBW $\geq$ RBW, Sweep = auto, Detector function = peak, Trace = max hold. The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize.

Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation..

Test Configuration



Test Results

Antenna 1

Channel Frequency (MHz)	20dB Bandwidth (KHz)	Limit (KHz)	Result
902.5	61.94	/	PASS
915.0	61.95	/	PASS
927.5	70.68	/	PASS

Antenna 2

Channel Frequency (MHz)	20dB Bandwidth (KHz)	Limit (KHz)	Result
902.5	58.85	/	PASS
915.0	61.50	/	PASS
927.5	75.04	/	PASS

Antenna 3

Channel Frequency (MHz)	20dB Bandwidth (KHz)	Limit (KHz)	Result
902.5	60.17	/	PASS
915.0	67.23	/	PASS
927.5	79.52	/	PASS

Antenna 4

Channel Frequency (MHz)	20dB Bandwidth (KHz)	Limit (KHz)	Result
902.5	59.82	/	PASS
915.0	67.22	/	PASS
927.5	76.31	/	PASS

Antenna 5

Channel Frequency (MHz)	20dB Bandwidth (KHz)	Limit (KHz)	Result
902.5	59.74	/	PASS
915.0	61.00	/	PASS
927.5	79.85	/	PASS

Antenna 6

Channel Frequency (MHz)	20dB Bandwidth (KHz)	Limit (KHz)	Result
902.5	62.47	/	PASS
915.0	61.02	/	PASS
927.5	72.86	/	PASS

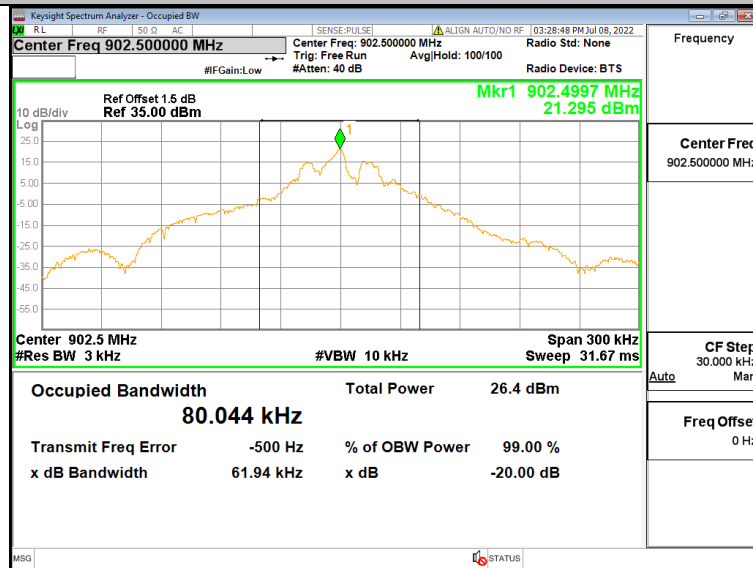
Antenna 7

Channel Frequency (MHz)	20dB Bandwidth (KHz)	Limit (KHz)	Result
902.5	60.16	/	PASS
915.0	69.11	/	PASS
927.5	71.91	/	PASS

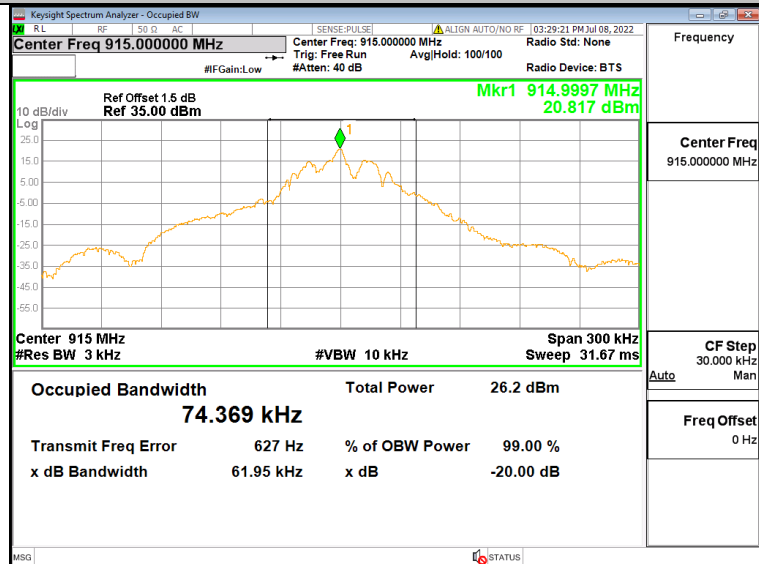
Antenna 8

Channel Frequency (MHz)	20dB Bandwidth (KHz)	Limit (KHz)	Result
902.5	59.39	/	PASS
915.0	59.37	/	PASS
927.5	78.61	/	PASS

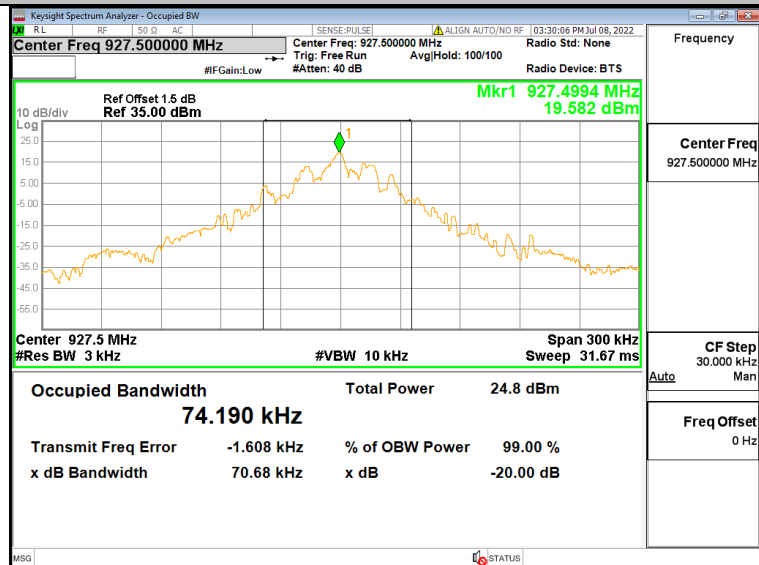
Test Graphs

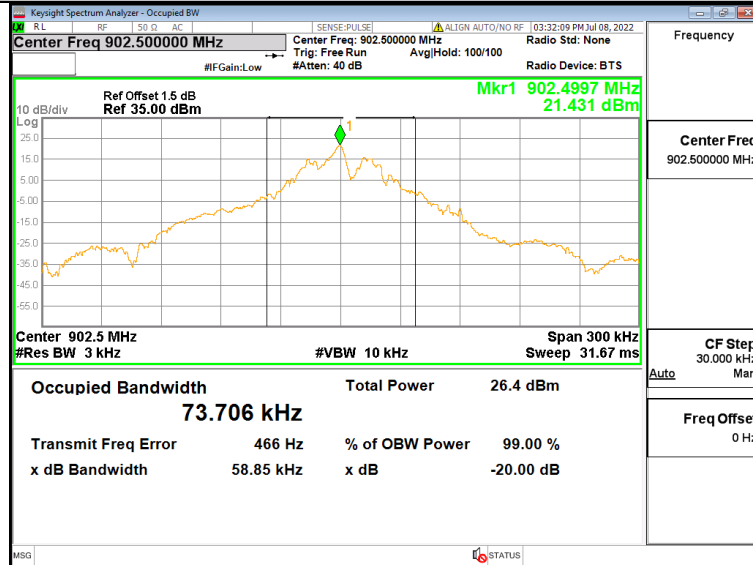
Antenna 1
902.5MHz

915MHz

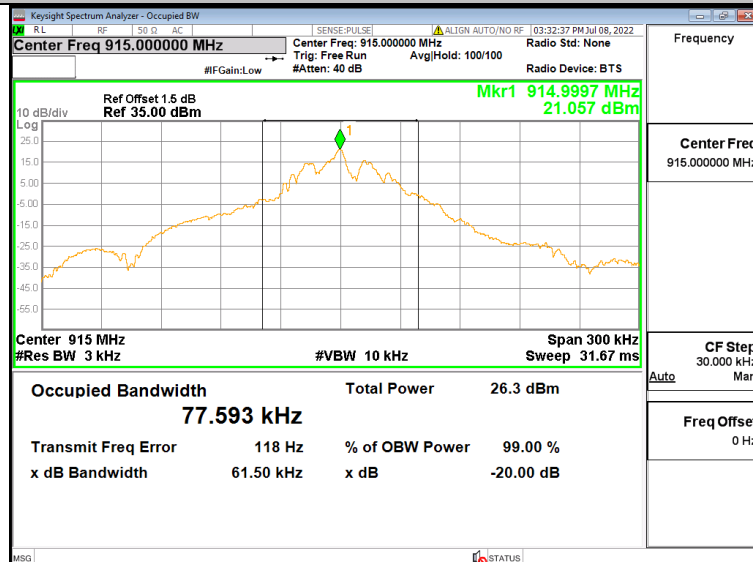


927.5MHz

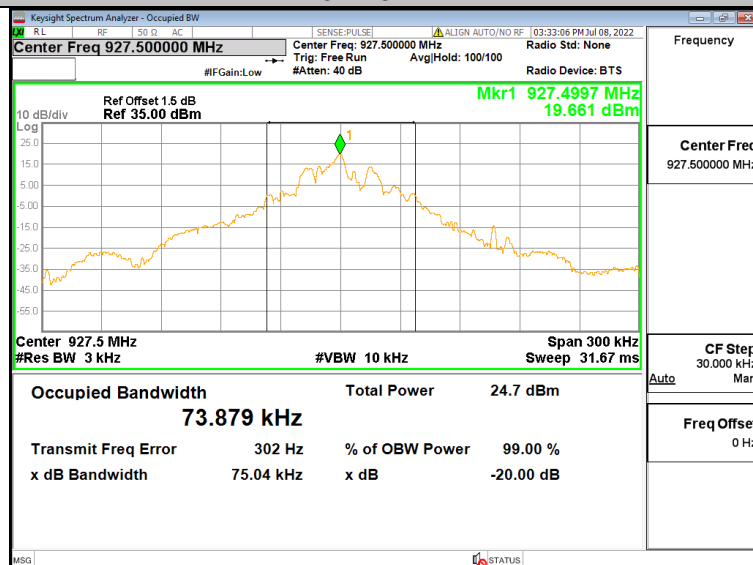


Antenna 2
902.5MHz

915MHz

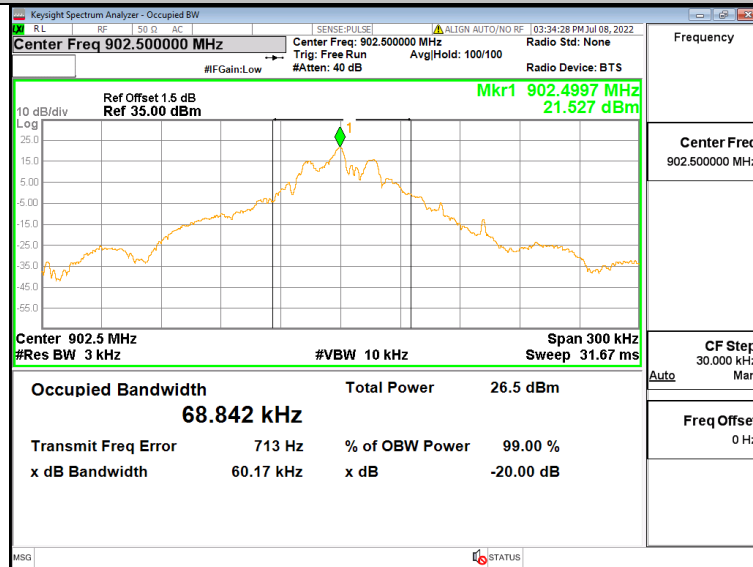


927.5MHz

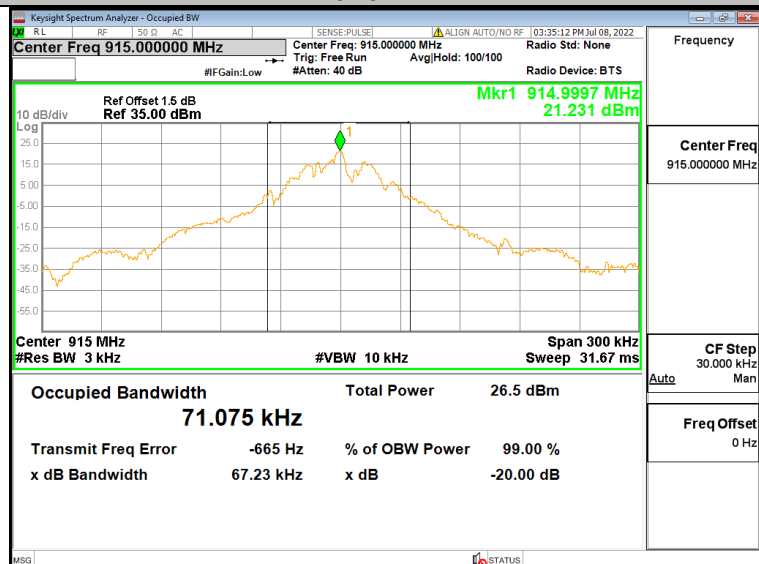


Antenna 3

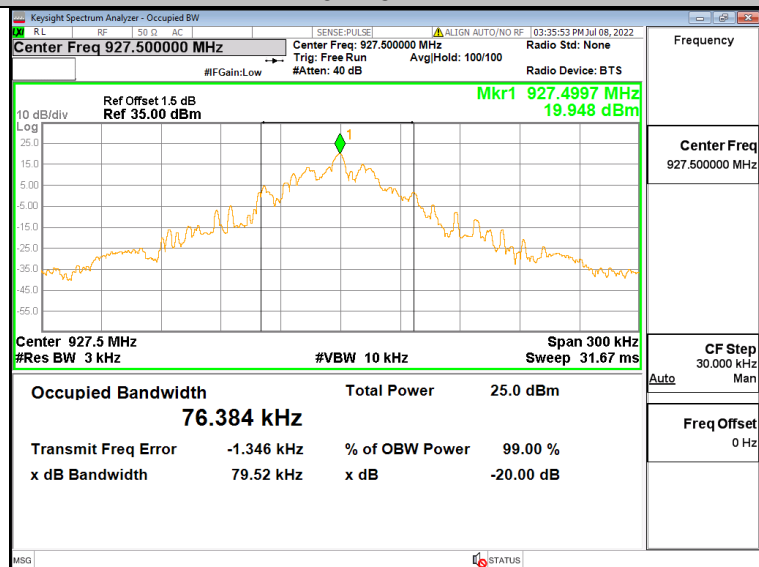
902.5MHz



915MHz

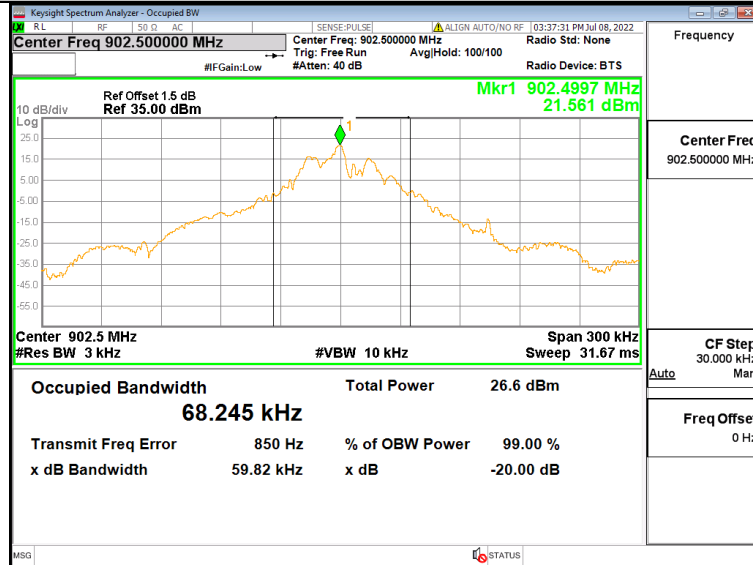


927.5MHz

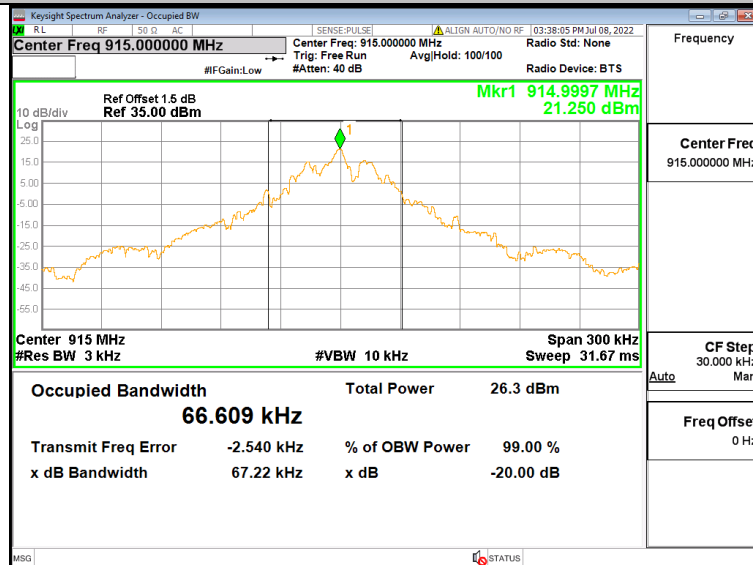


Antenna 4

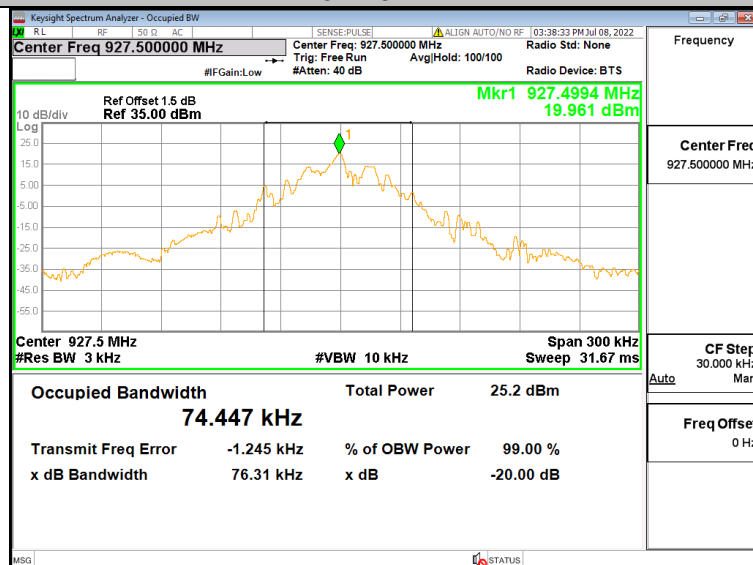
902.5MHz



915MHz

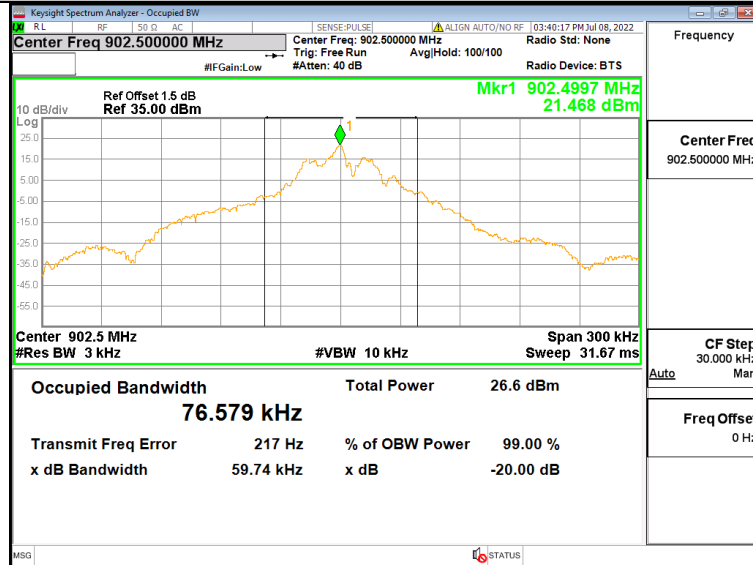


927.5MHz

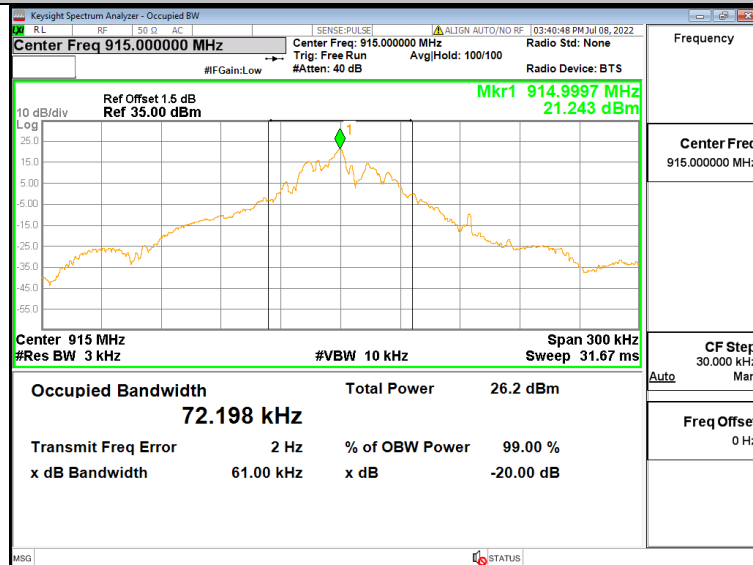


Antenna 5

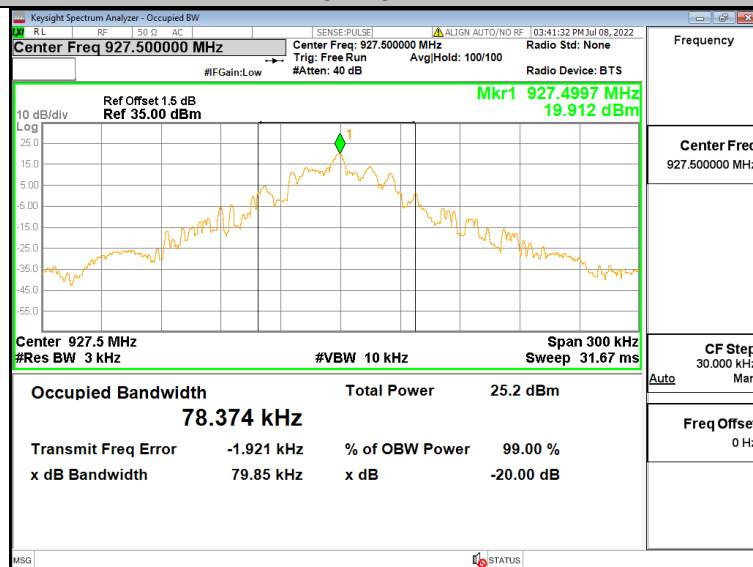
902.5MHz



915MHz

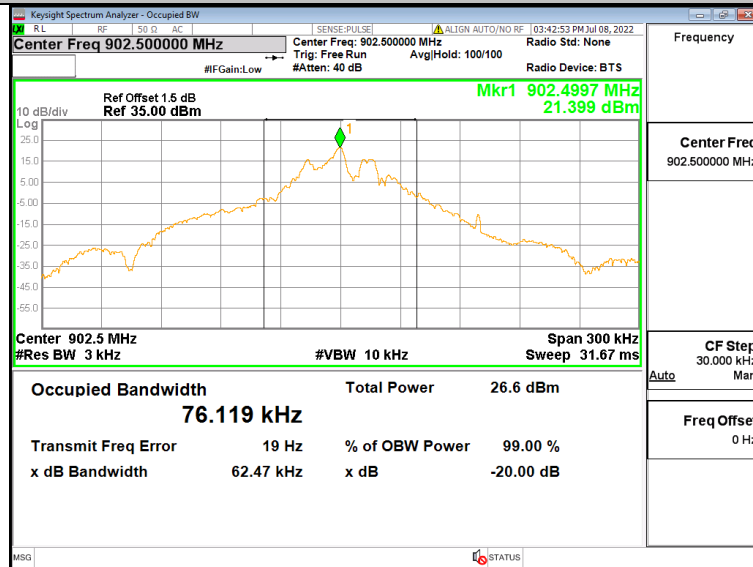


927.5MHz

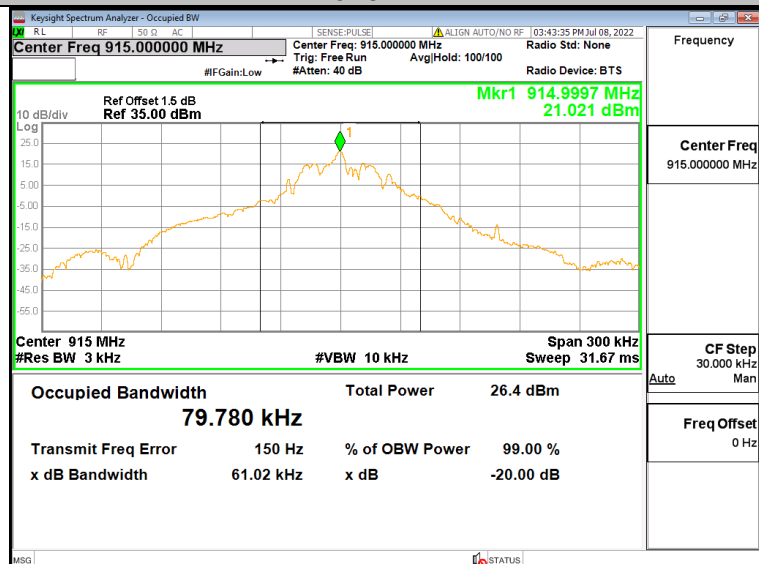


Antenna 6

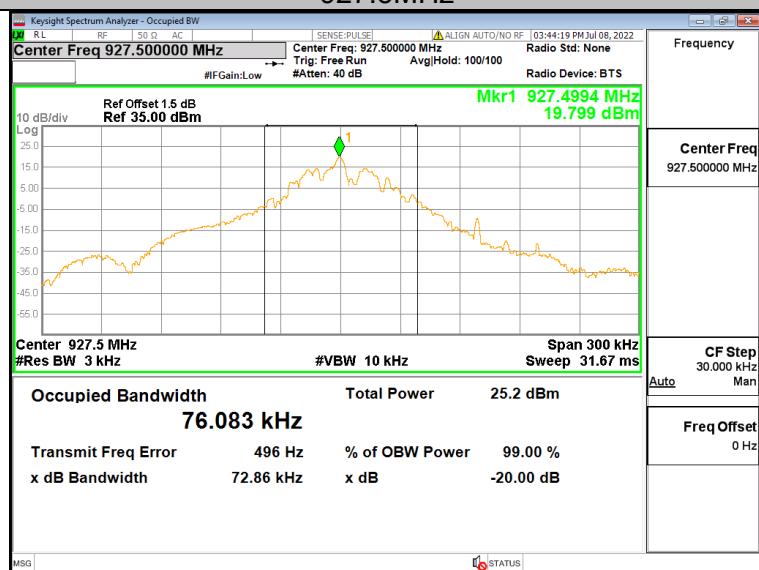
902.5MHz

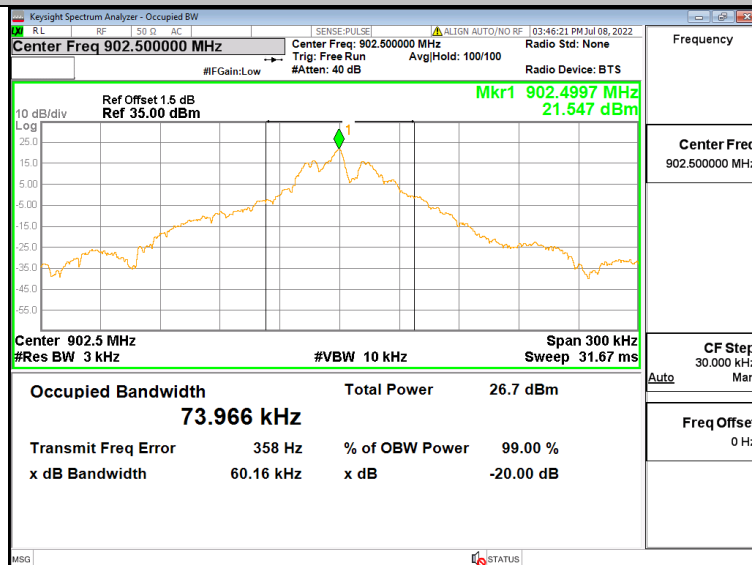


915MHz

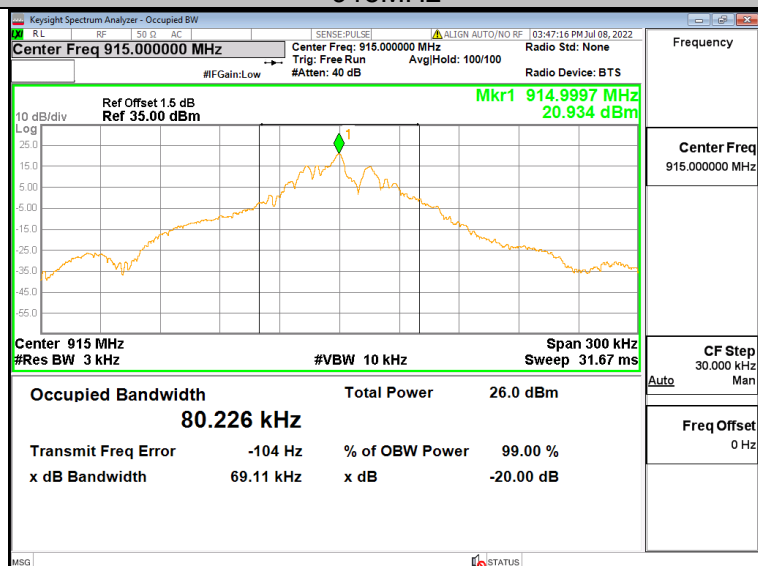


927.5MHz

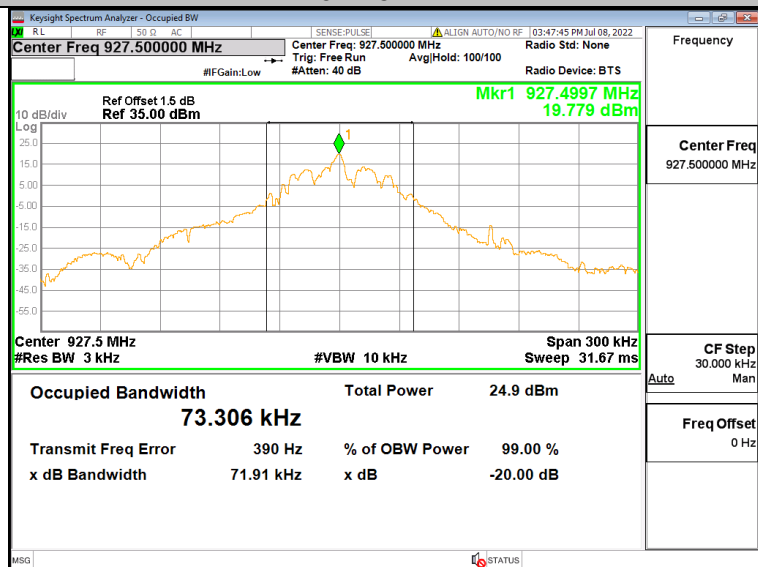


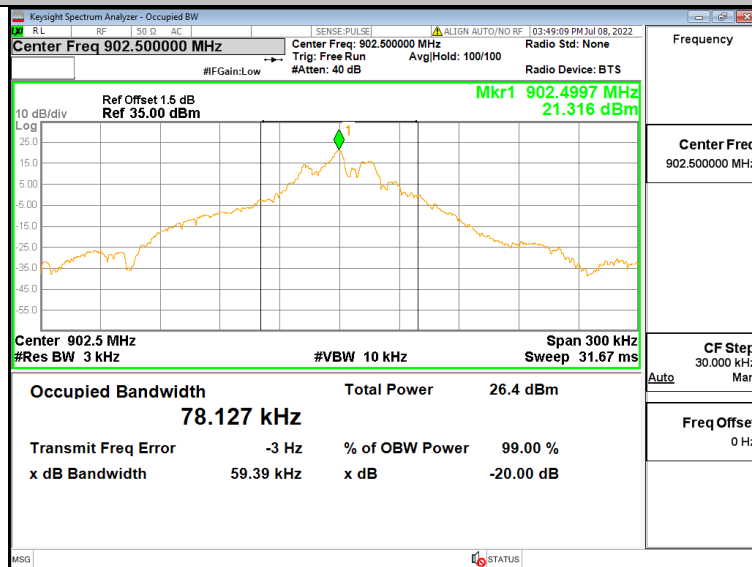
Antenna 7
902.5MHz

915MHz

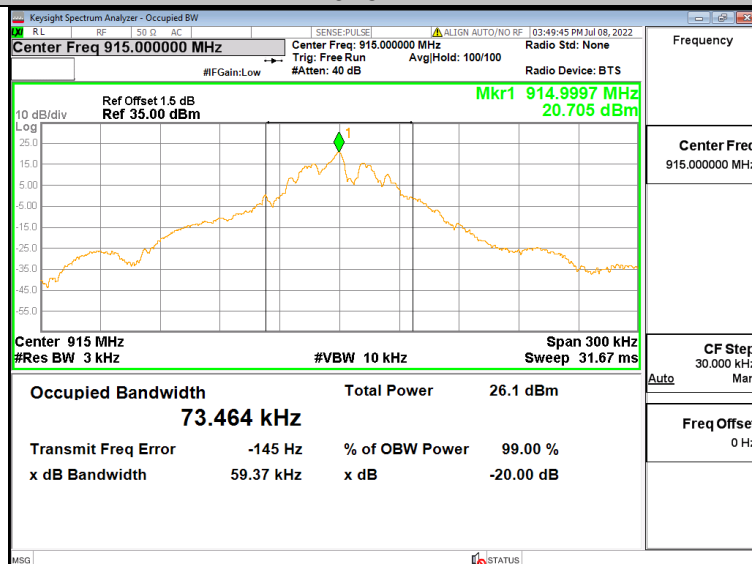


927.5MHz

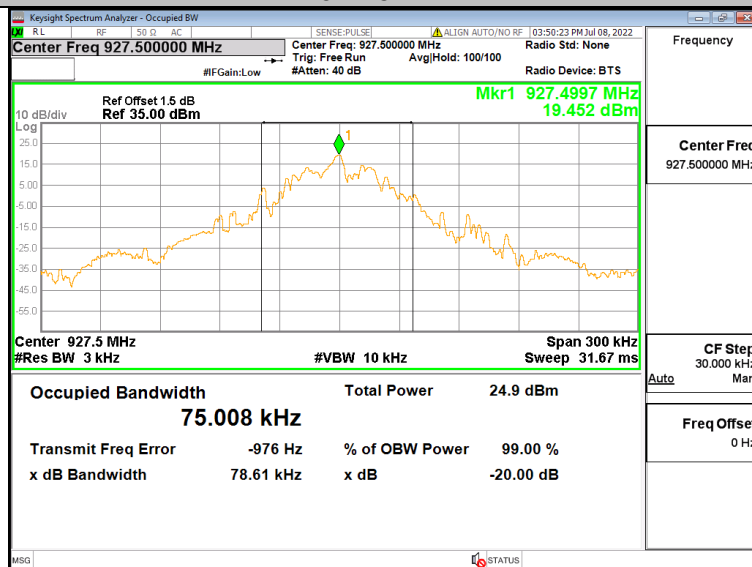


Antenna 8
902.5MHz

915MHz



927.5MHz



3.5. Frequency Separation

Limit

Per 15.247 (a)(1) At least 25 KHz or 20 dB bandwidth of the hopping Channel, whichever is greater.

Test Procedure

According to ANSI C63.10: 2013.

The EUT must have its hopping function enabled.

Use the following spectrum analyzer settings:

Span = wide enough to capture the peaks of two adjacent channels

Resolution (or IF) Bandwidth (RBW) $\geq$ 1% of the span

Video (or Average) Bandwidth VBW $\geq$ RBW

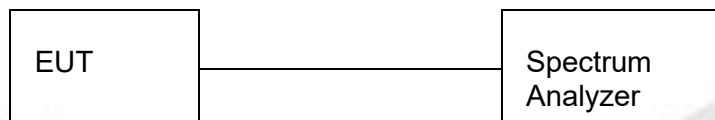
Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

Test Configuration



Test Results

Antenna 1

Channel	Channel Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
Low Channel	902.5	0.500	0.025MHz or 20dB bandwidth	Pass
Adjacency Channel	903.0			
Middle Channel	915.0	0.500	0.025MHz or 20dB bandwidth	Pass
Adjacency Channel	914.5			
High Channel	927.5	0.500	0.025MHz or 20dB bandwidth	Pass
Adjacency Channel	927.0			

Antenna 2

Channel	Channel Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
Low Channel	902.5	0.500	0.025MHz or 20dB bandwidth	Pass
Adjacency Channel	903.0			
Middle Channel	915.0	0.500	0.025MHz or 20dB bandwidth	Pass
Adjacency Channel	914.5			
High Channel	927.5	0.500	0.025MHz or 20dB bandwidth	Pass
Adjacency Channel	927.0			

Antenna 3

Channel	Channel Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
Low Channel	902.5	0.500	0.025MHz or 20dB bandwidth	Pass
Adjacency Channel	903.0			
Middle Channel	915.0	0.500	0.025MHz or 20dB bandwidth	Pass
Adjacency Channel	914.5			
High Channel	927.5	0.500	0.025MHz or 20dB bandwidth	Pass
Adjacency Channel	927.0			

Antenna 4

Channel	Channel Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
Low Channel	902.5	0.500	0.025MHz or 20dB bandwidth	Pass
Adjacency Channel	903.0			
Middle Channel	915.0	0.500	0.025MHz or 20dB bandwidth	Pass
Adjacency Channel	914.5			
High Channel	927.5	0.500	0.025MHz or 20dB bandwidth	Pass
Adjacency Channel	927.0			

Antenna 5

Channel	Channel Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
Low Channel	902.5	0.500	0.025MHz or 20dB bandwidth	Pass
Adjacency Channel	903.0			
Middle Channel	915.0	0.500	0.025MHz or 20dB bandwidth	Pass
Adjacency Channel	914.5			
High Channel	927.5	0.500	0.025MHz or 20dB bandwidth	Pass
Adjacency Channel	927.0			

Antenna 6

Channel	Channel Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
Low Channel	902.5	0.500	0.025MHz or 20dB bandwidth	Pass
Adjacency Channel	903.0			
Middle Channel	915.0	0.500	0.025MHz or 20dB bandwidth	Pass
Adjacency Channel	914.5			
High Channel	927.5	0.500	0.025MHz or 20dB bandwidth	Pass
Adjacency Channel	927.0			

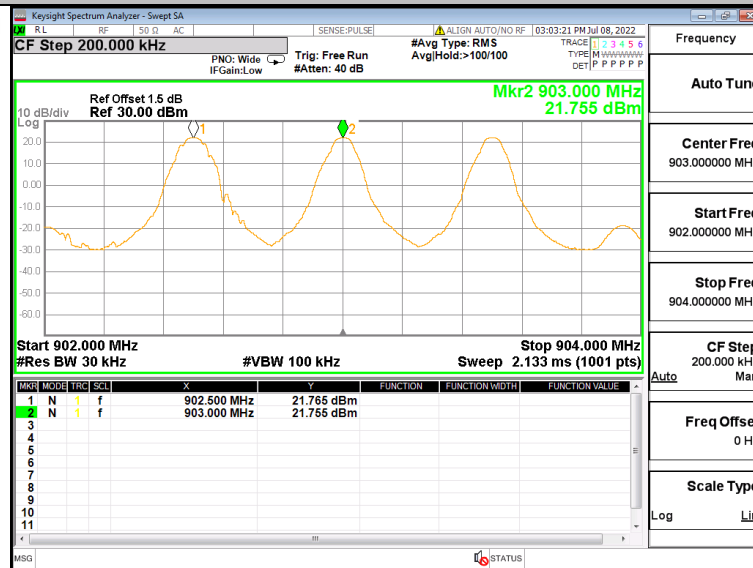
Antenna 7

Channel	Channel Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
Low Channel	902.5	0.500	0.025MHz or 20dB bandwidth	Pass
Adjacency Channel	903.0			
Middle Channel	915.0	0.500	0.025MHz or 20dB bandwidth	Pass
Adjacency Channel	914.5			
High Channel	927.5	0.500	0.025MHz or 20dB bandwidth	Pass
Adjacency Channel	927.0			

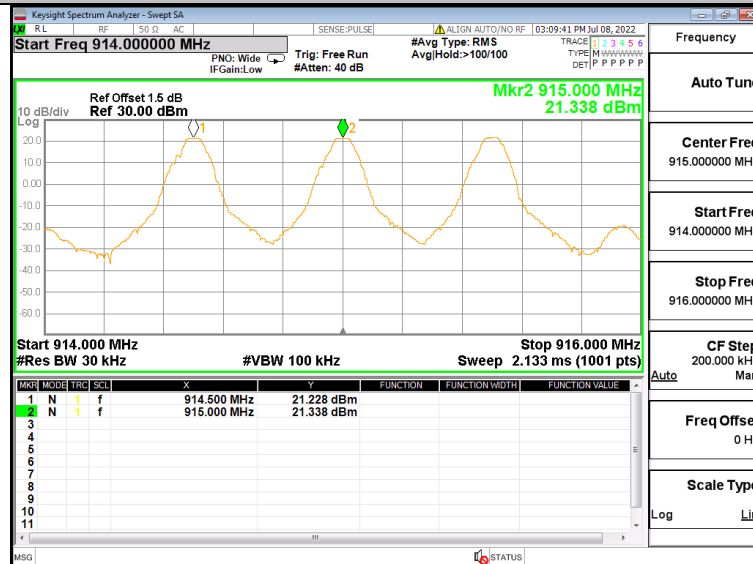
Antenna 8

Channel	Channel Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
Low Channel	902.5	0.500	0.025MHz or 20dB bandwidth	Pass
Adjacency Channel	903.0			
Middle Channel	915.0	0.500	0.025MHz or 20dB bandwidth	Pass
Adjacency Channel	914.5			
High Channel	927.5	0.500	0.025MHz or 20dB bandwidth	Pass
Adjacency Channel	927.0			

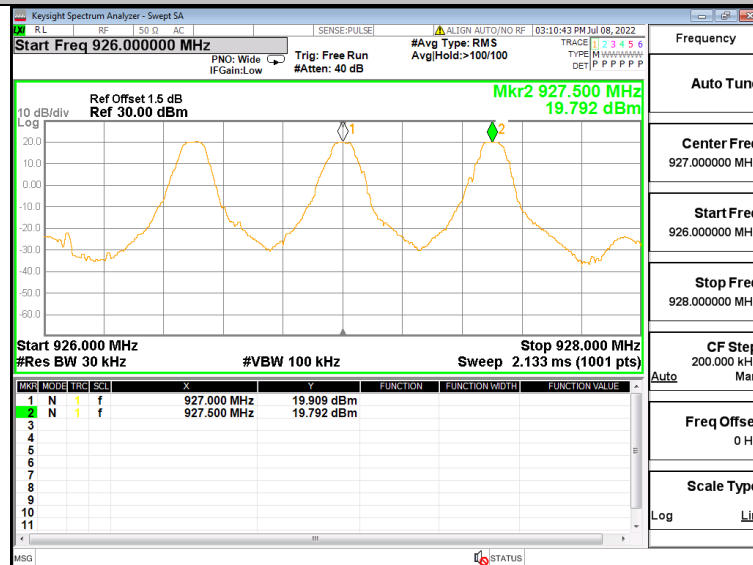
Test Graphs

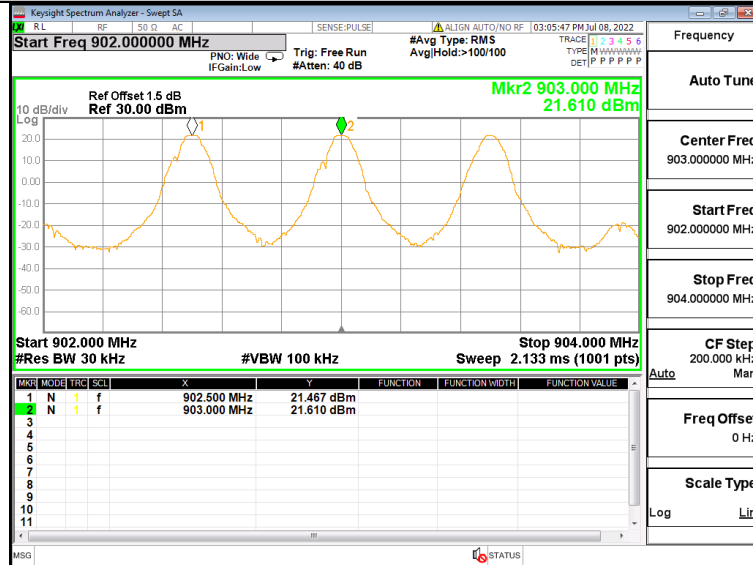
Antenna 1
902.5MHz

915MHz

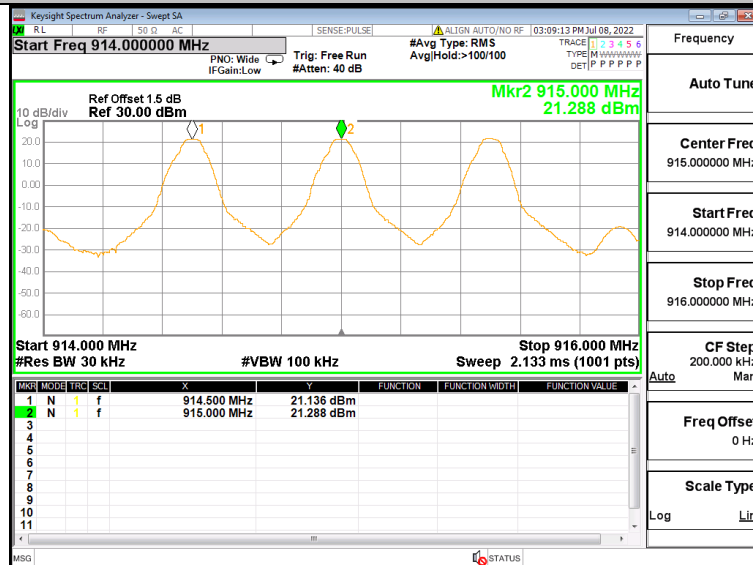


927.5MHz

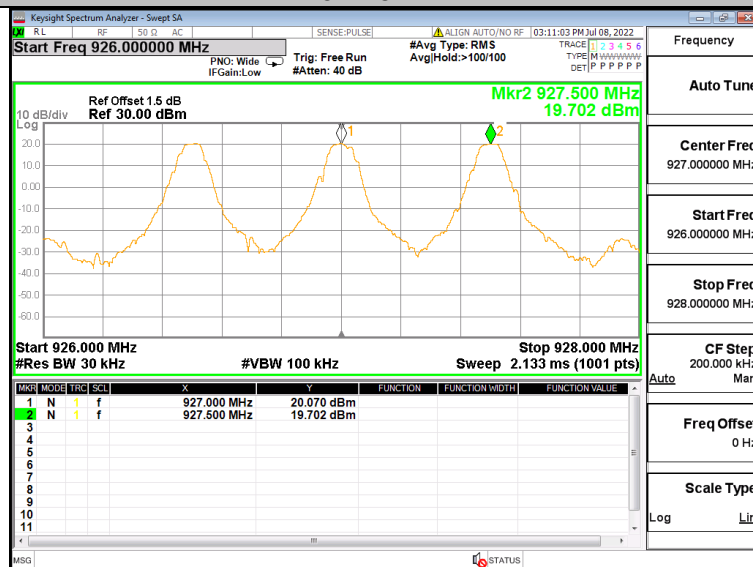


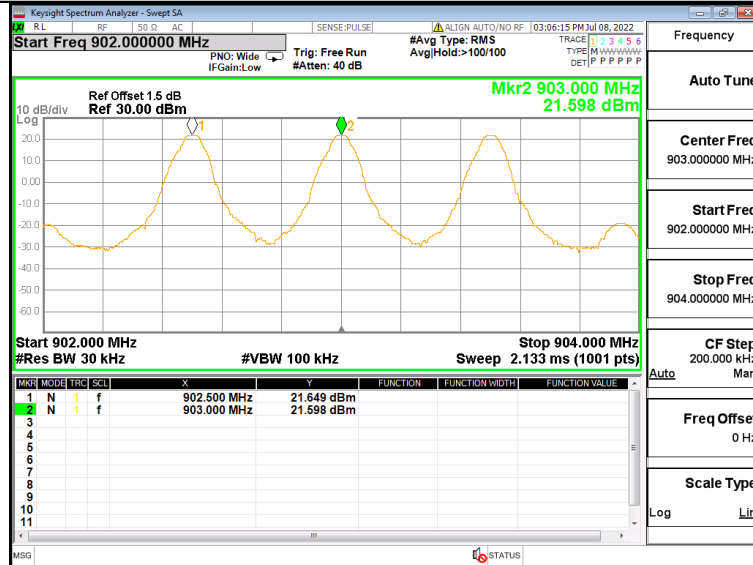
Antenna 2
902.5MHz

915MHz

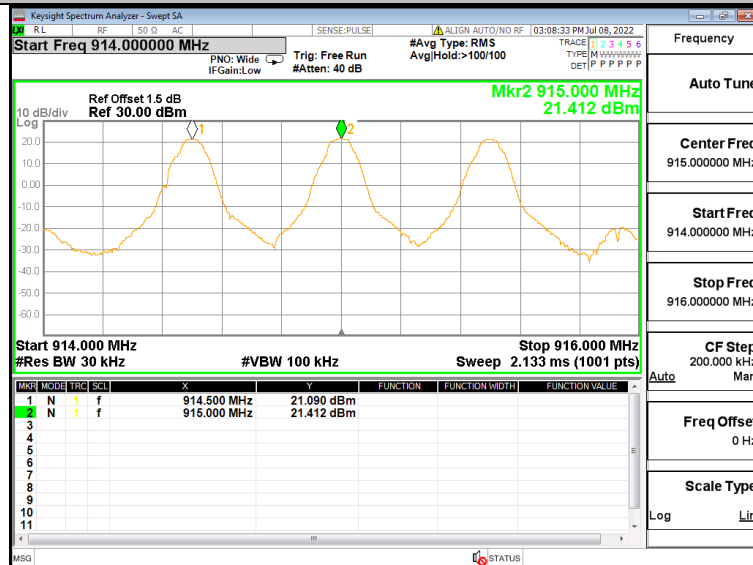


927.5MHz

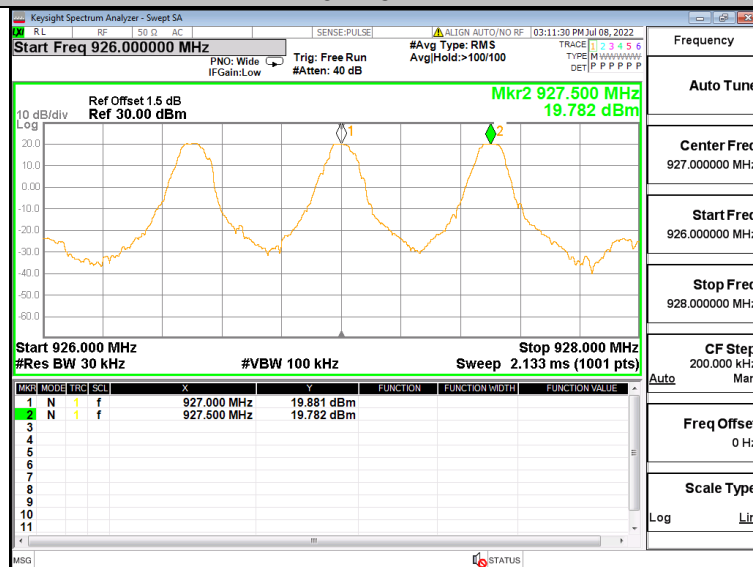


Antenna 3
902.5MHz

915MHz

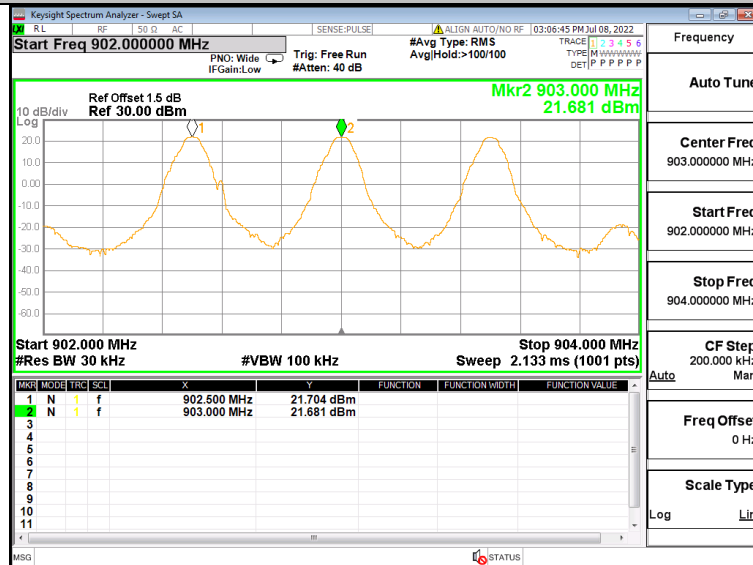


927.5MHz

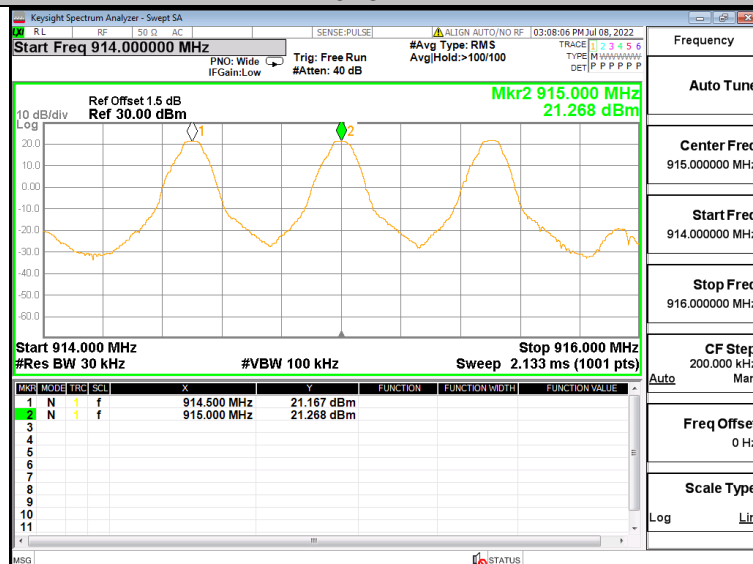


Antenna 4

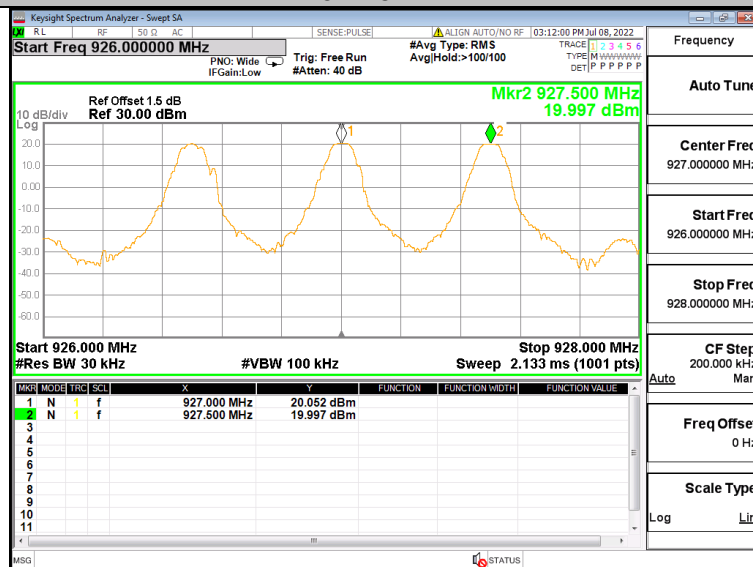
902.5MHz

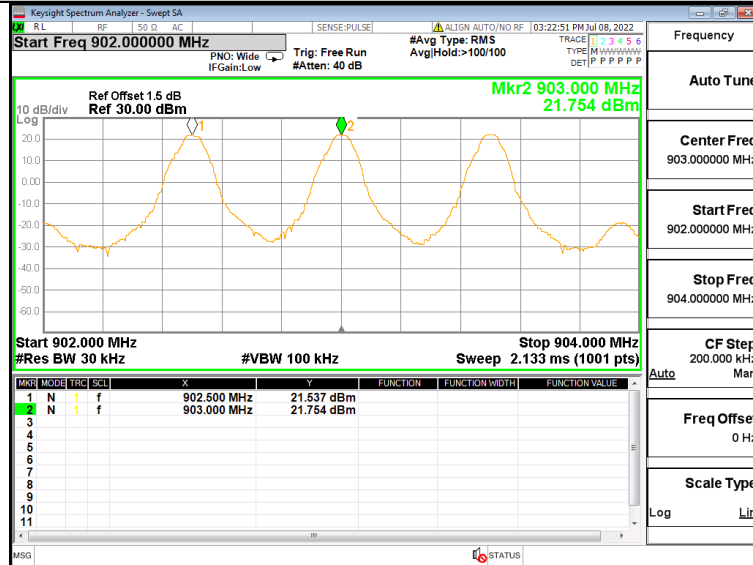


915MHz

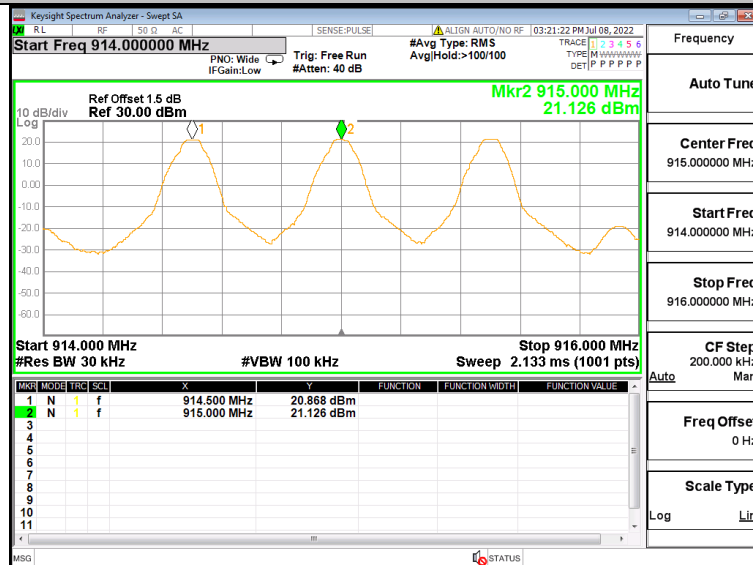


927.5MHz

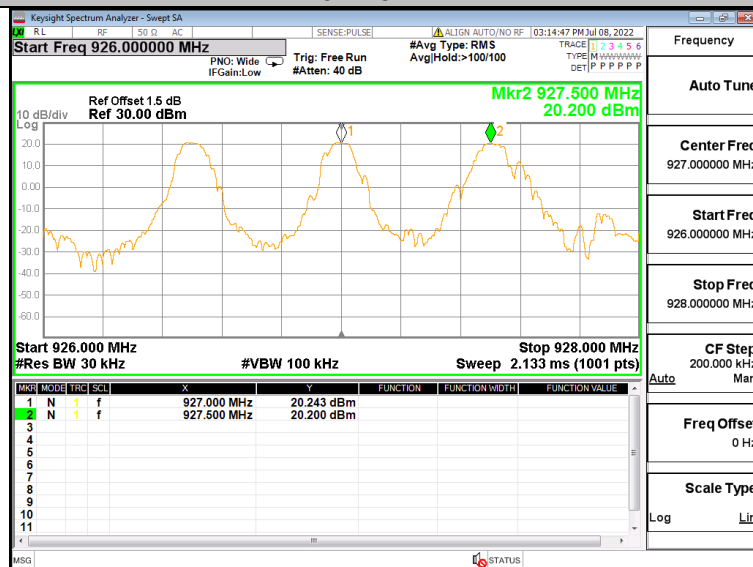


Antenna 5
902.5MHz

915MHz

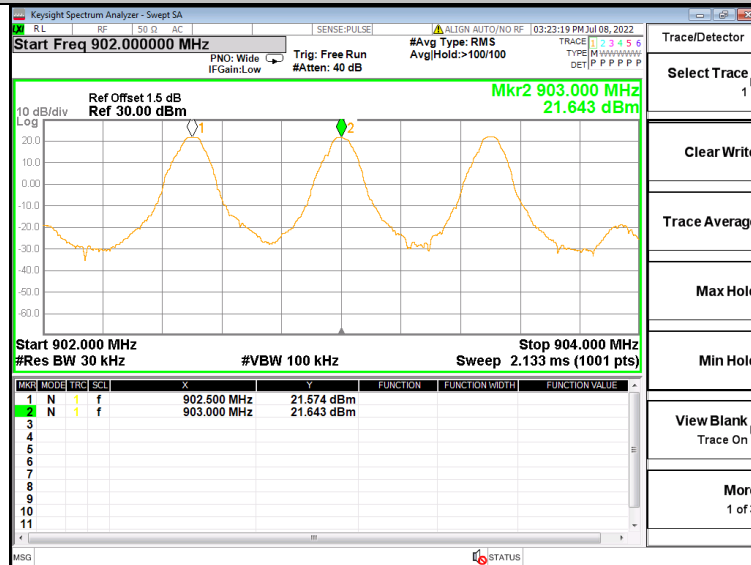


927.5MHz

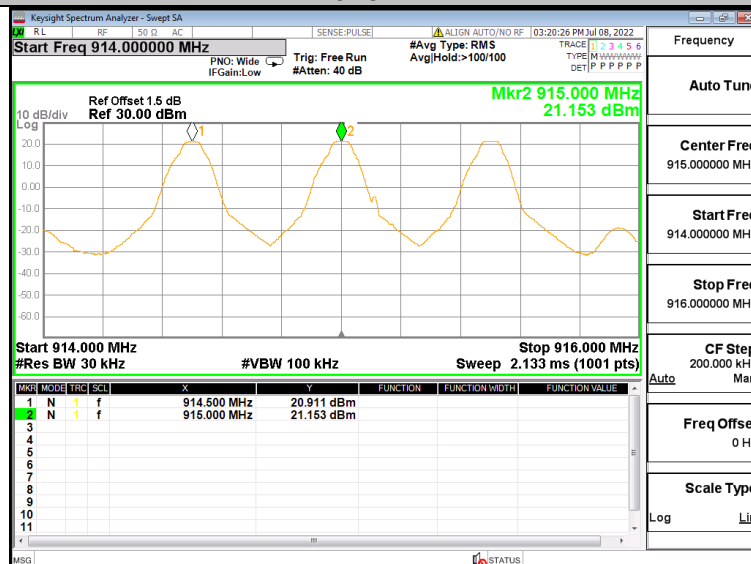


Antenna 6

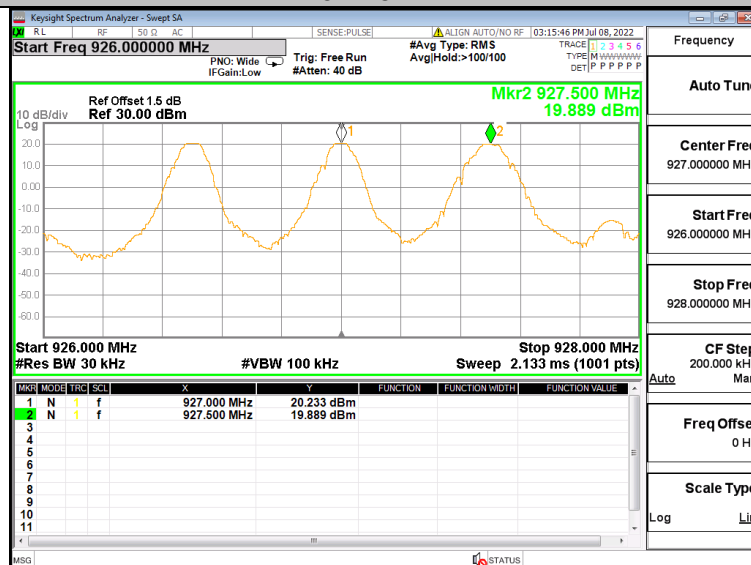
902.5MHz



915MHz

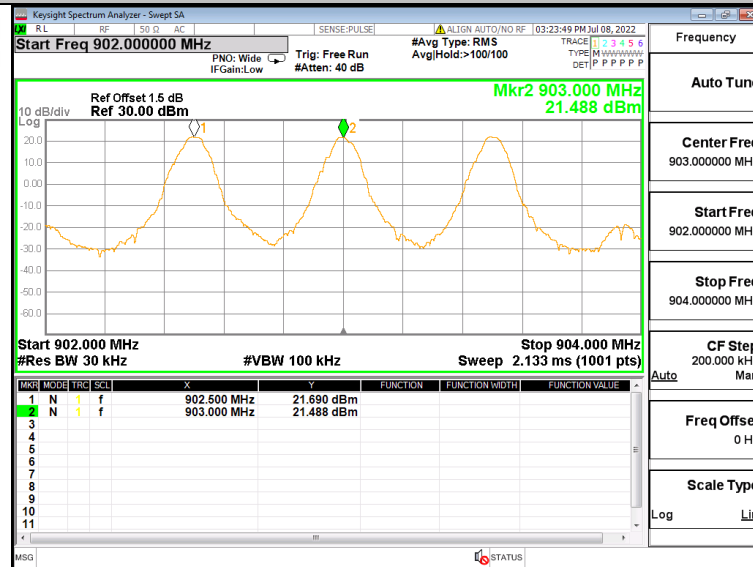


927.5MHz

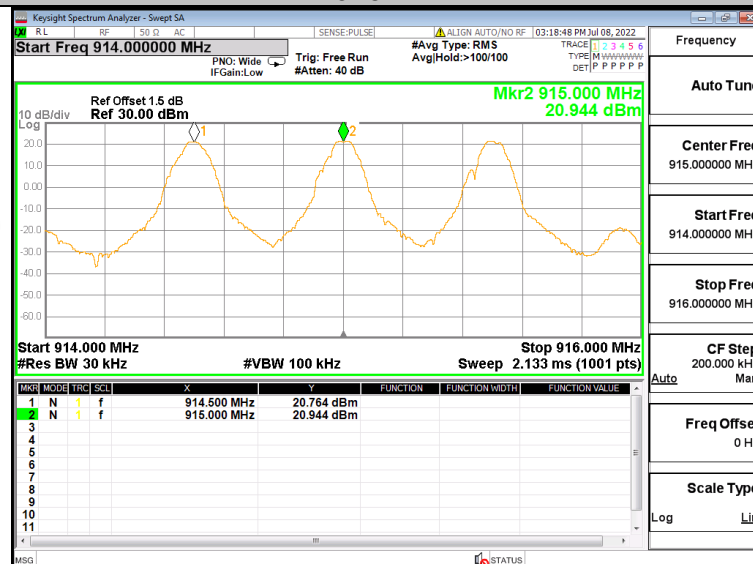


Antenna 7

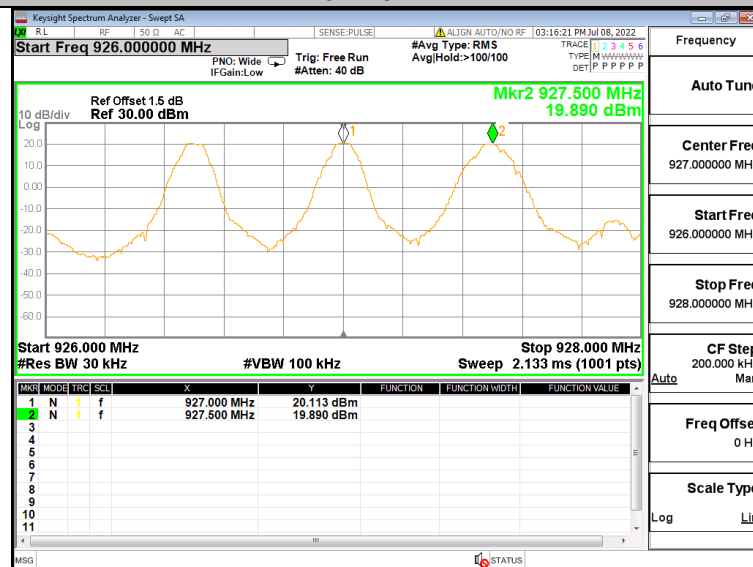
902.5MHz



915MHz

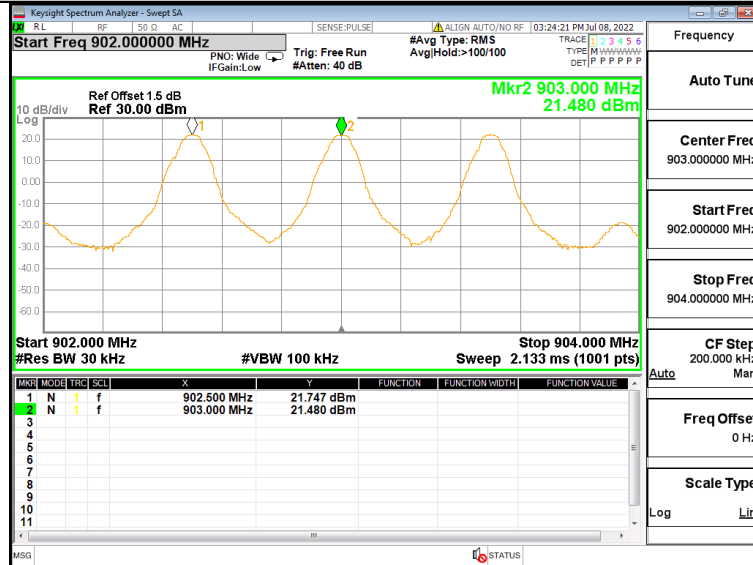


927.5MHz

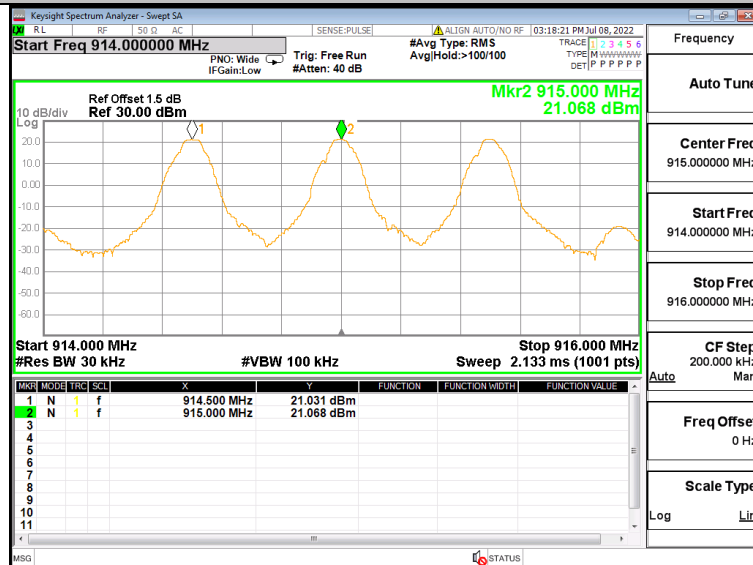


Antenna 8

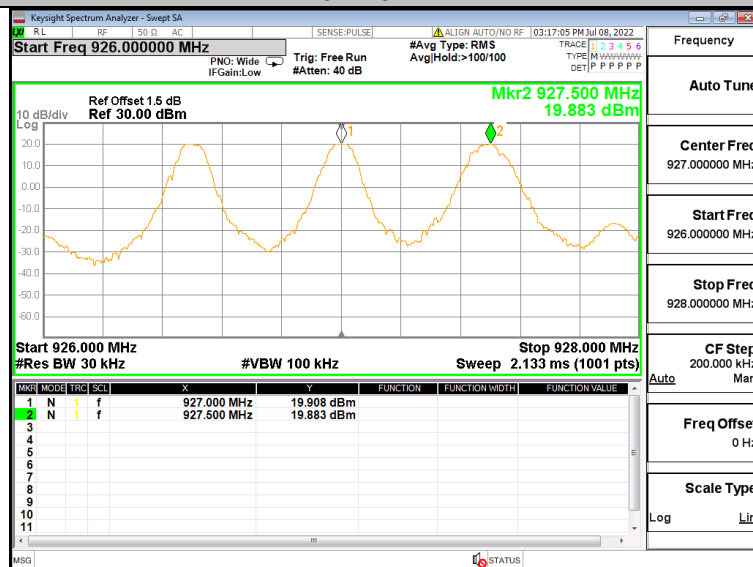
902.5MHz



915MHz



927.5MHz



3.6. Number of hopping frequency

Limit

if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period.

Test Procedure

According to ANSI C63.10: 2013.

The EUT must have its hopping function enabled.

Use the following spectrum analyzer settings:

Span = the frequency band of operation

RBW $\geq$ 1% of the span

VBW $\geq$ RBW

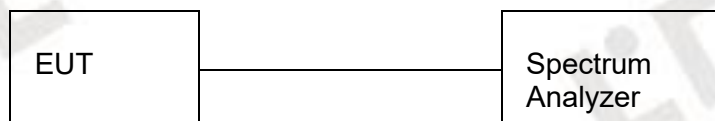
Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize. It may prove necessary to bread the span up to sections, in order to clearly show all of the hopping frequencies.

Test Configuration

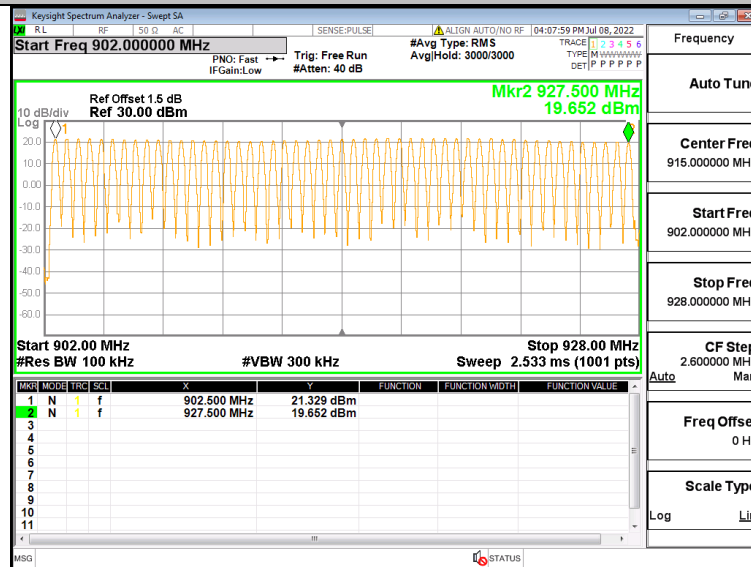


Test Results

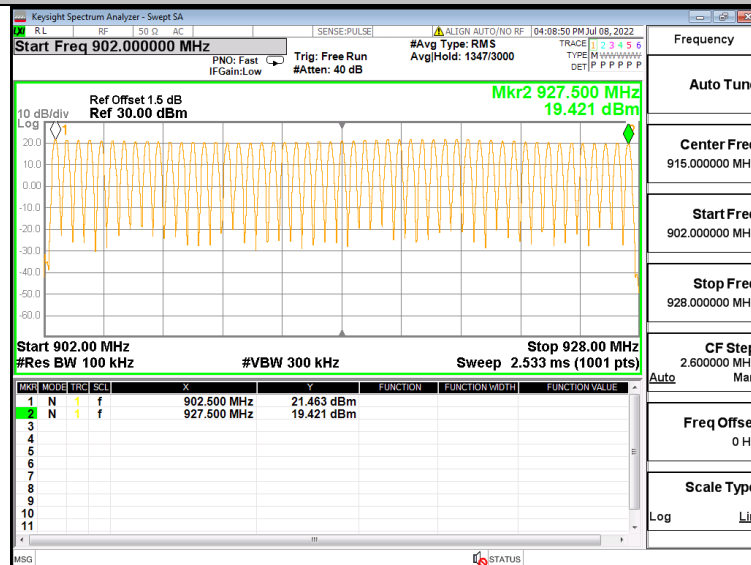
Antenna	Hopping Channel Frequency Range (MHz)	Number of Hopping Channel	Limit
1	902-928	51	≥ 50
2	902-928	51	≥ 50
3	902-928	51	≥ 50
4	902-928	51	≥ 50
5	902-928	51	≥ 50
6	902-928	51	≥ 50
7	902-928	51	≥ 50
8	902-928	51	≥ 50

Test Graphs

Antenna 1



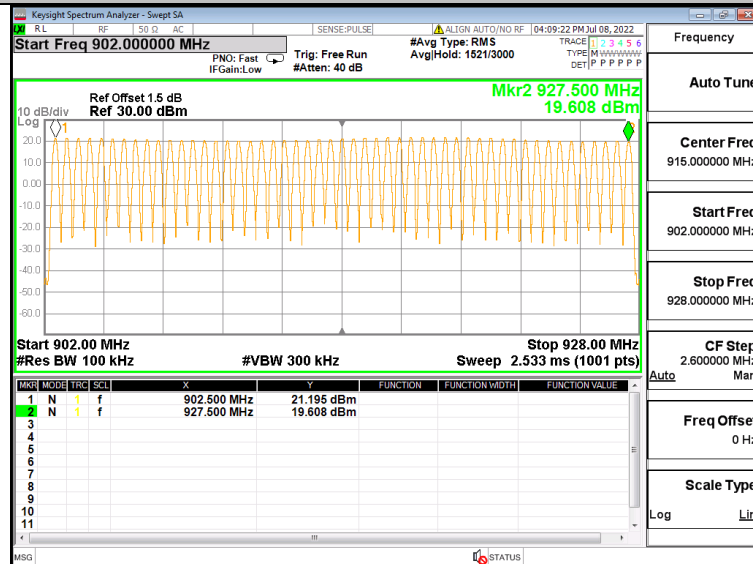
Antenna 2



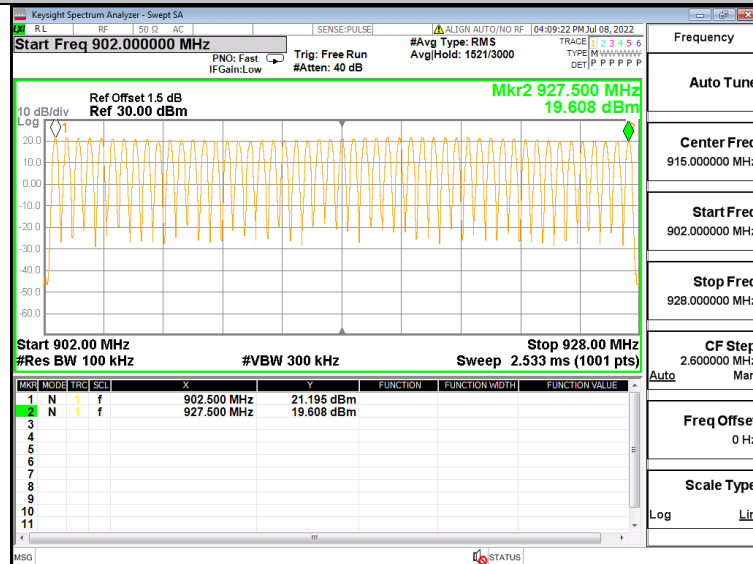
Antenna 3



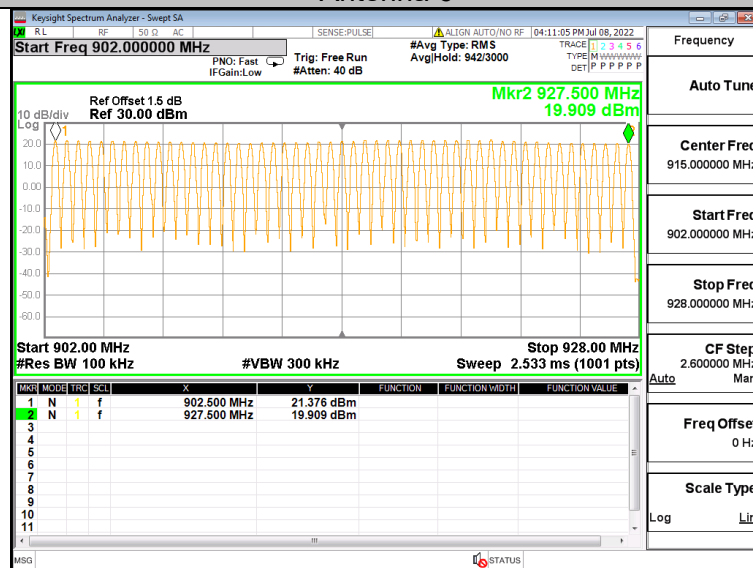
Antenna 4



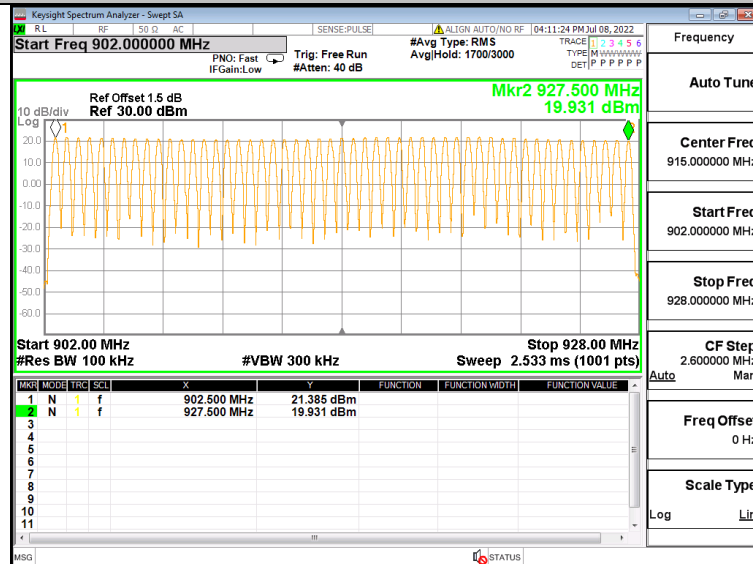
Antenna 5



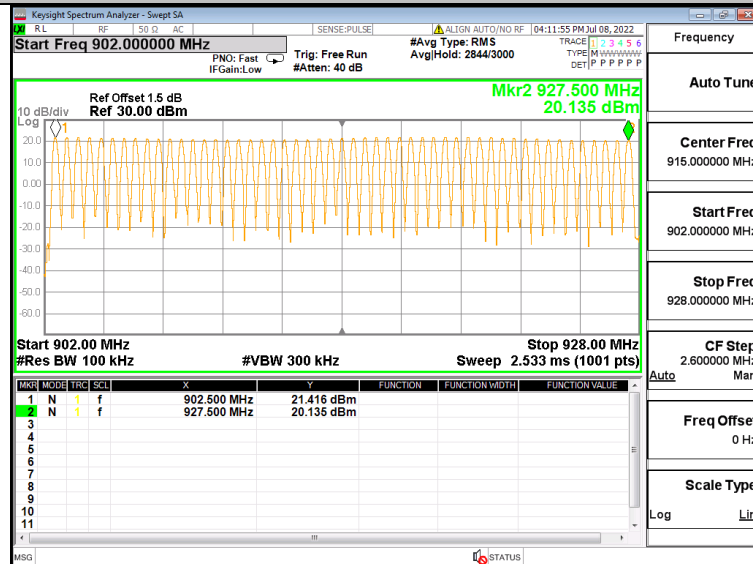
Antenna 6



Antenna 7



Antenna 8



3.7. Time Of Occupancy(Dwell Time)

Limit

if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period.

Test Procedure

According to ANSI C63.10: 2013.

The EUT must have its hopping function enabled.

Use the following spectrum analyzer settings:

Span = zero span, centered on a hopping channel

RBW = 1MHz

VBW $\geq$ RBW

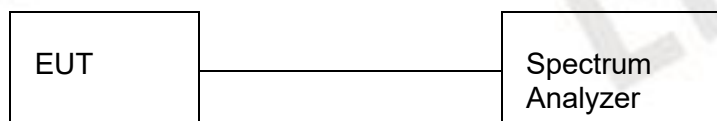
Sweep = as necessary to capture the entire dwell time per hopping channel

Detector function = peak

Trace = max hold

If possible, use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation.

Test Configuration

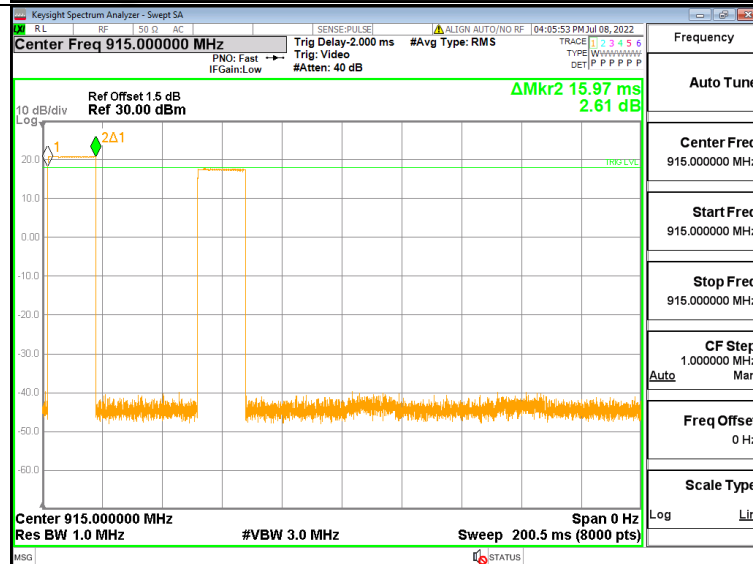
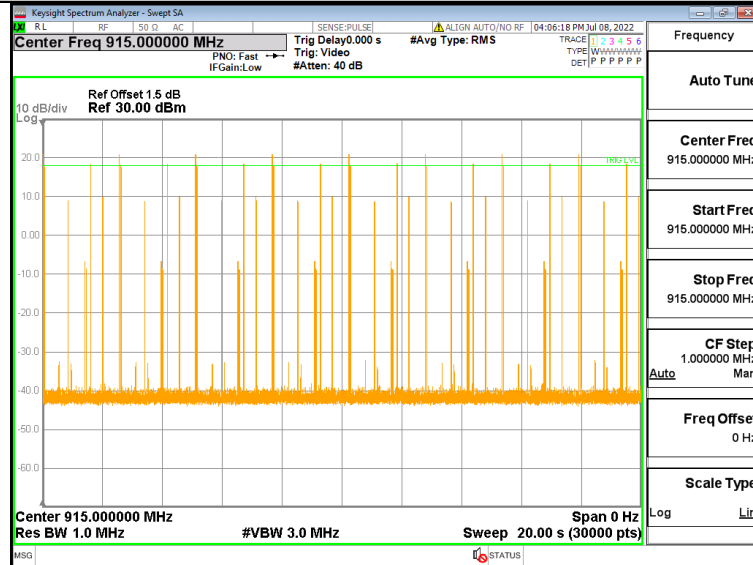


Test Results

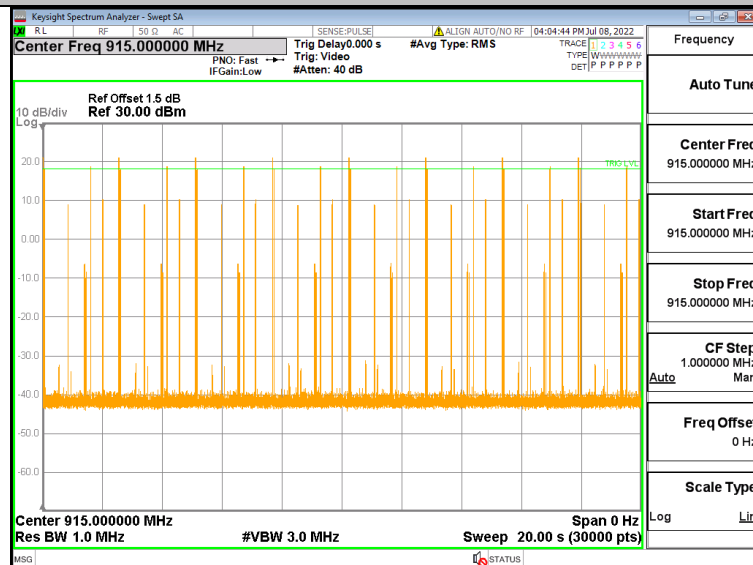
Antenna	Frequency (MHz)	No. of burst	Pulse Width (ms)	Dwell Time (ms)	Limit (ms)	Result
1	915	16	15.97	255.52	400	Pass
2	915	16	15.97	255.52	400	Pass
3	915	16	16.19	259.04	400	Pass
4	915	16	16.12	257.92	400	Pass
5	915	16	15.94	255.04	400	Pass
6	915	16	15.94	255.04	400	Pass
7	915	16	15.97	255.52	400	Pass
8	915	16	16.09	257.44	400	Pass

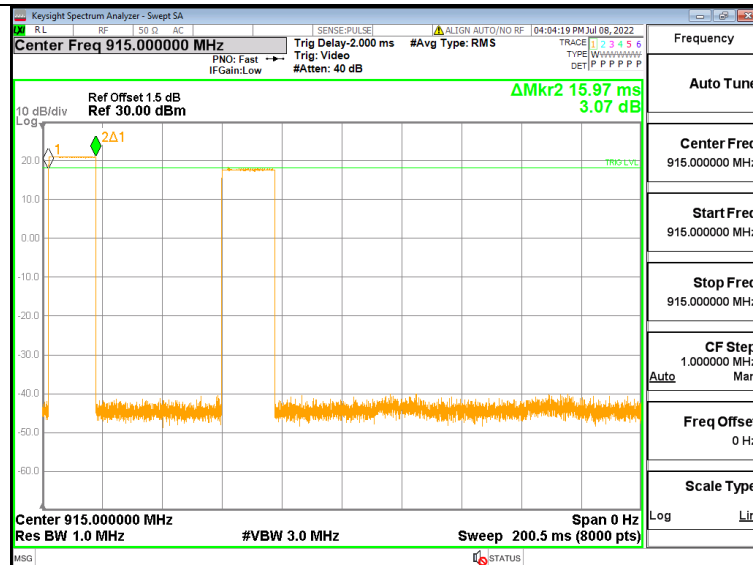
Test Graphs

Antenna 1

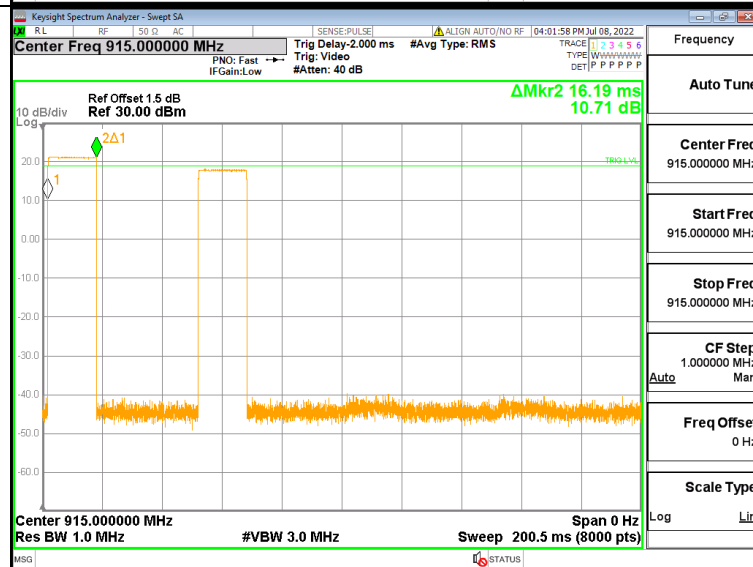
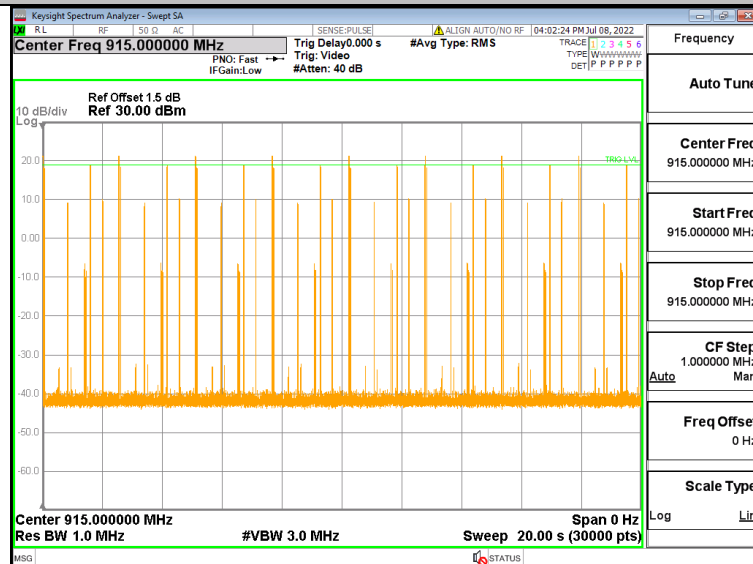


Antenna 2

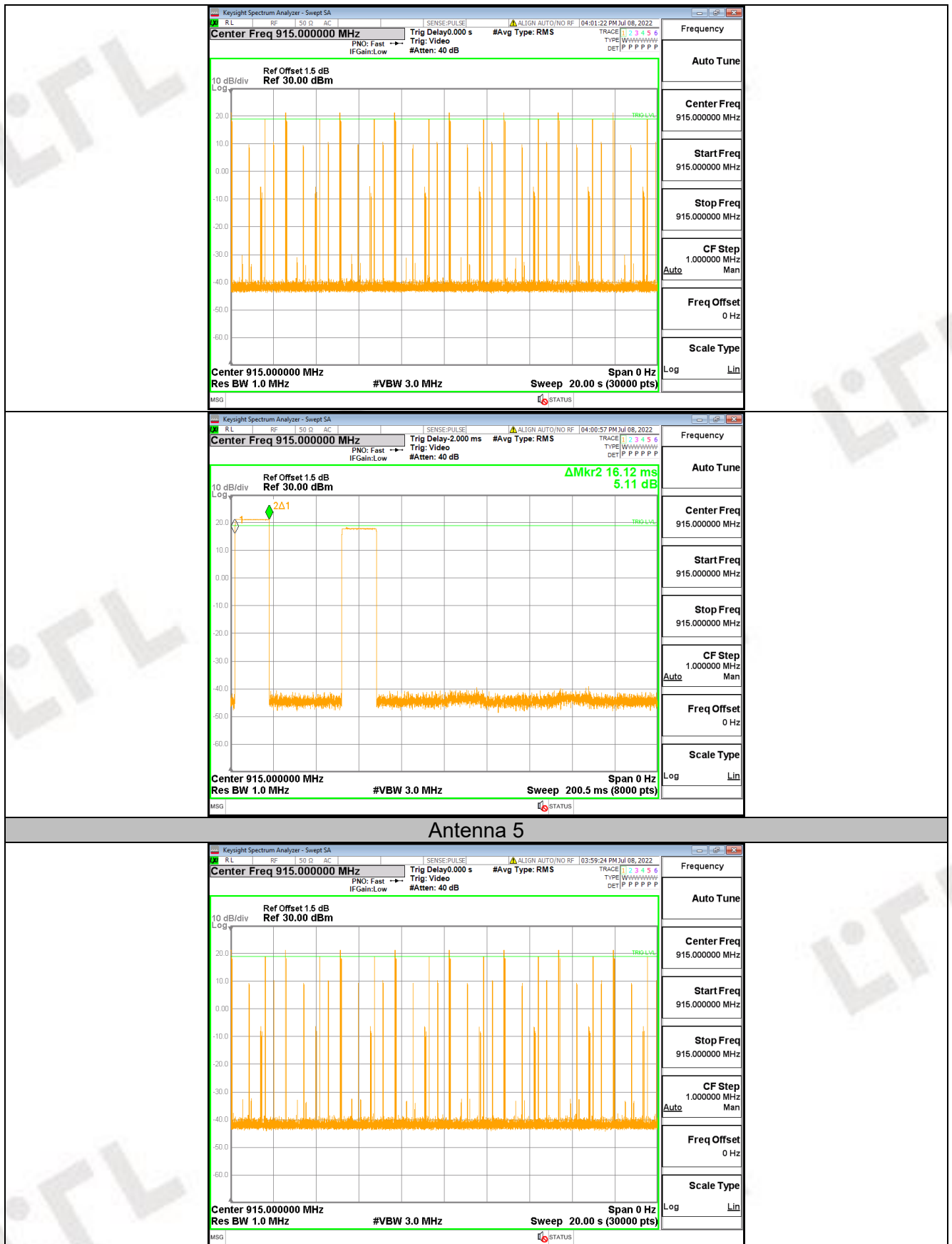


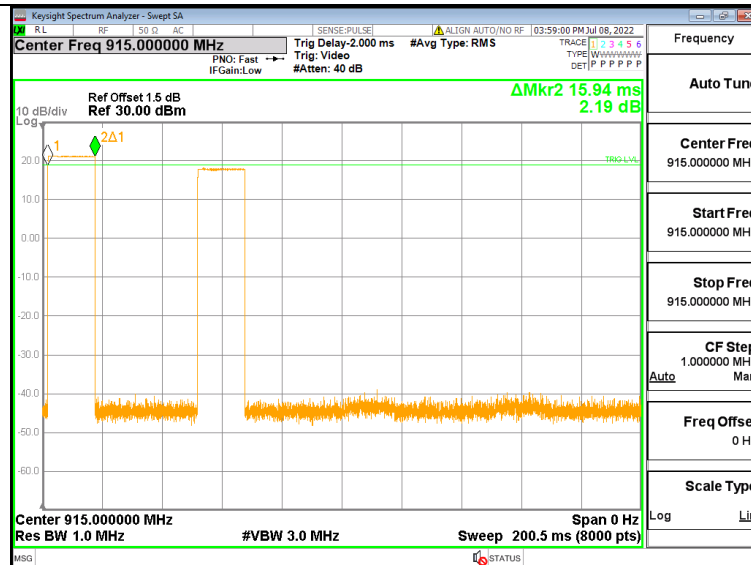


Antenna 3

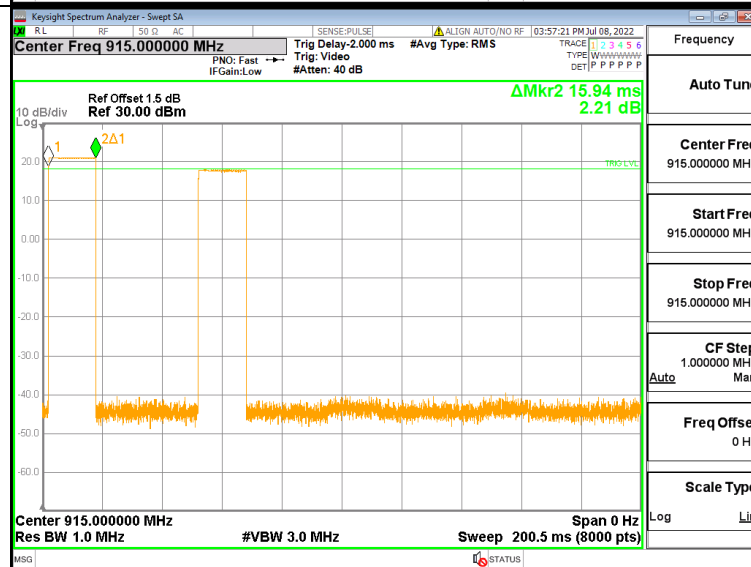
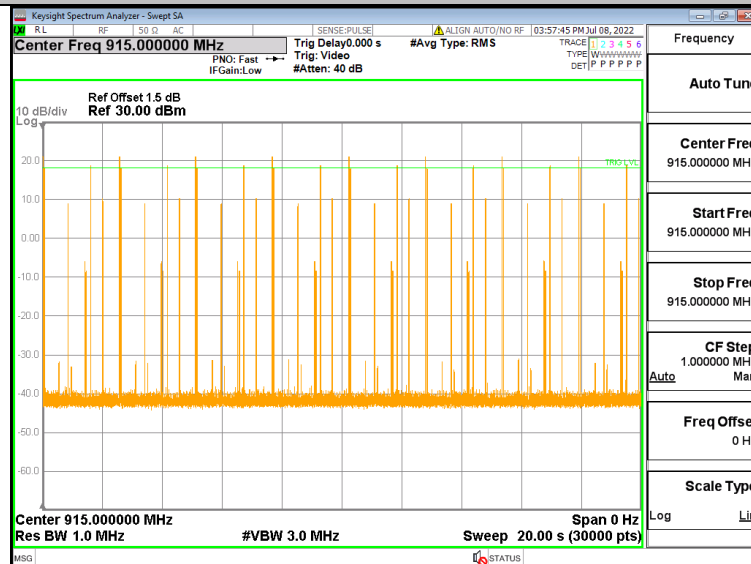


Antenna 4

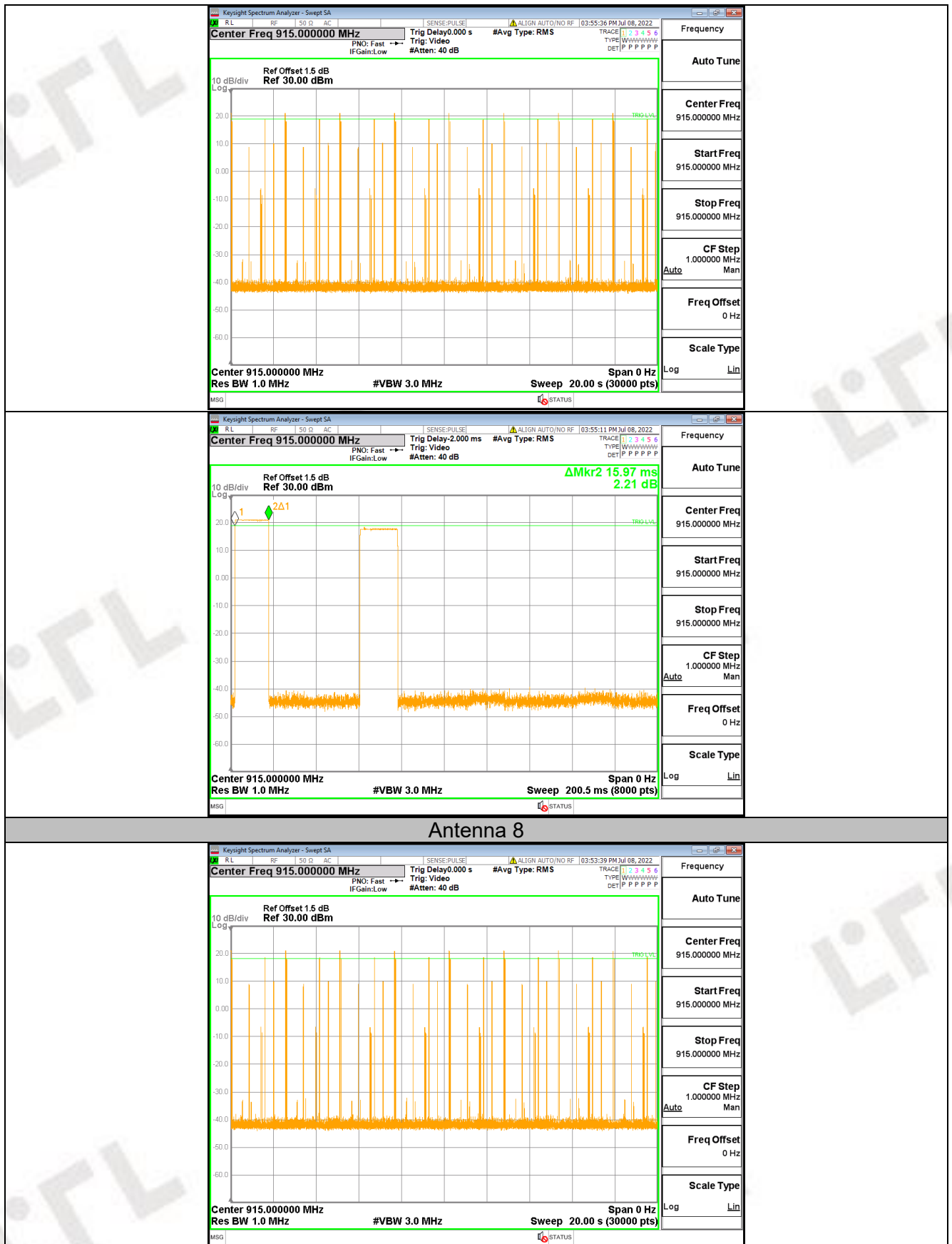


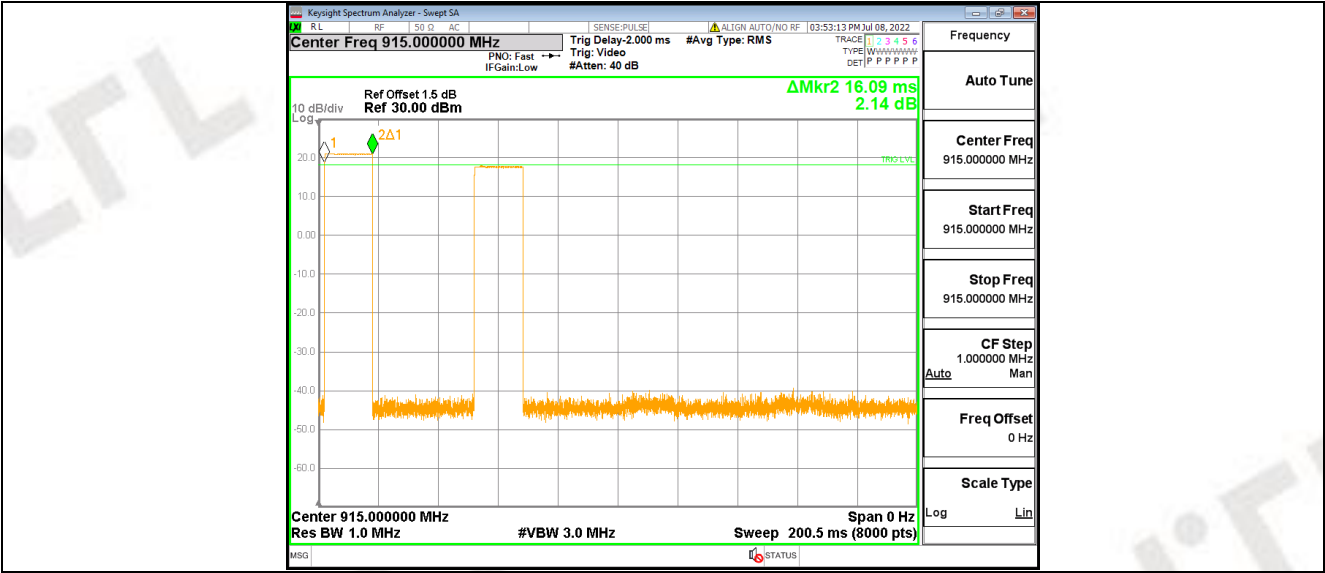


Antenna 6



Antenna 7





3.8. Spurious RF Conducted Emissions and bandedge

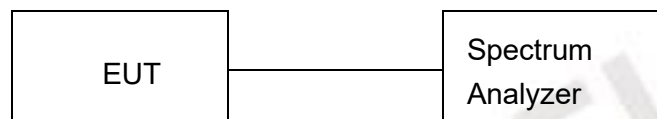
Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

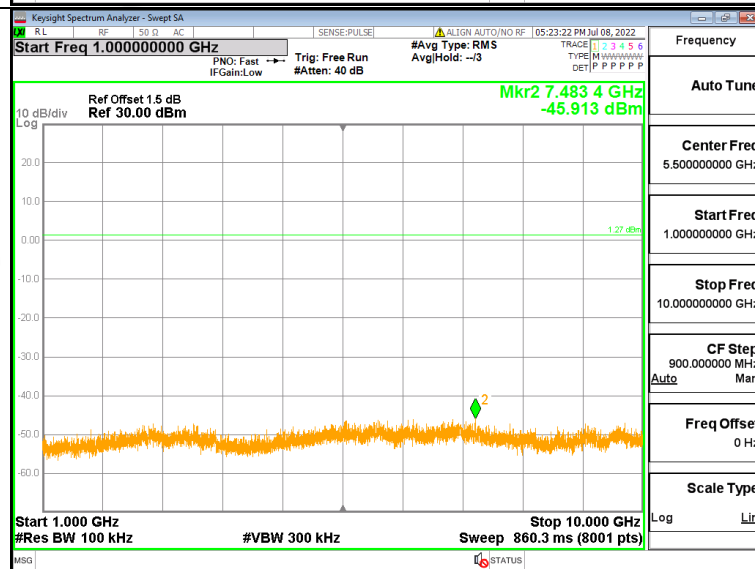
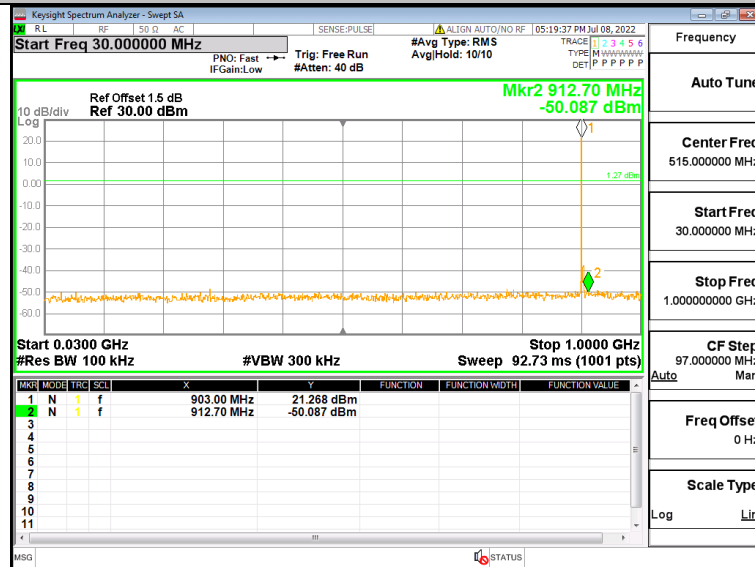
Test Procedure

Connect the transmitter output to spectrum analyzer using a low loss RF cable, and set the spectrum analyzer to RBW=100 kHz, VBW= 300 kHz, peak detector, and max hold. Measurements utilizing these settings are made of the in-band reference level, bandedge and out-of-band emissions.

Test Configuration



Test Results

Antenna 1
902.5MHz

915MHz

