

5.3.2 Spurious Emissions

Test Requirement: 47 CFR Part 15C Section 15.231(b) and 15.209

Test Method: ANSI C63.10: 2020

Test Site: Measurement Distance: 3m (Semi-Anechoic Chamber)

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

Test Setup:

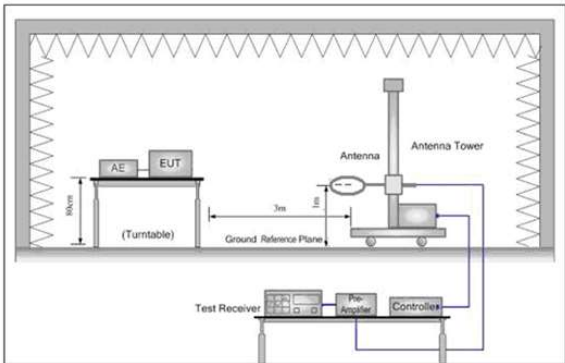


Figure 1. Below 30MHz

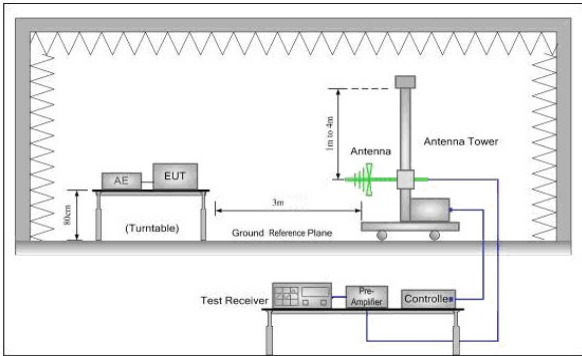


Figure 2. 30MHz to 1GHz

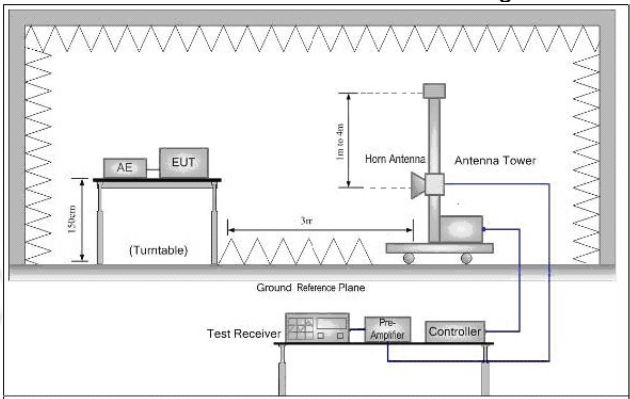


Figure 3. Above 1GHz

Test Procedure:

Below 1GHz test procedure as below:

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Above 1GHz test procedure as below:

- Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 metre to 1.5 metre(Above 18GHz the distance is 1 meter and table is 1.5 metre).
- Test the EUT in the 433MHz channel.
- The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is worse case.
- Repeat above procedures until all frequencies measured was complete.

**Limit:
(Spurious
Emissions)**

Frequency	Field strength (microvolt/meter)	Limit (dBμV/m)	Remark	Measurement distance (m)
0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
1.705MHz-30MHz	30	-	-	30
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1GHz	500	54.0	Average	3

Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

**Limit:
(Field strength of
the fundamental
signal)**

Frequency	Limit (dBμV/m @3m)	Remark
433.92MHz	80.8	Average Value
	100.8	Peak Value

Test Mode:

Transmitting mode

Test Results:

Pass

Test data
Field Strength of the Fundamental Signal

Average value:	
Calculate Formula:	Average value=Peak value + PDCF
	PDCF=20 log(Duty cycle)
	Duty cycle= T on time / T period
Test data:	T on time =31.56ms
	T period =57.391ms
	PDCF= -5.19

Antenna polarization: Horizontal

Frequency (MHz)	Read Level (dBuV)	Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
433.92	29.44	19.77	49.21	108.8	-59.59	Peak
433.92	-	-	44.02	80.8	-36.78	Average

Antenna polarization: Vertical

Frequency (MHz)	Read Level (dBuV)	Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
433.92	34.26	19.77	54.03	108.8	-54.77	Peak
433.92	-	-	48.84	80.8	-31.96	Average

Remark:

The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

Spurious Emissions

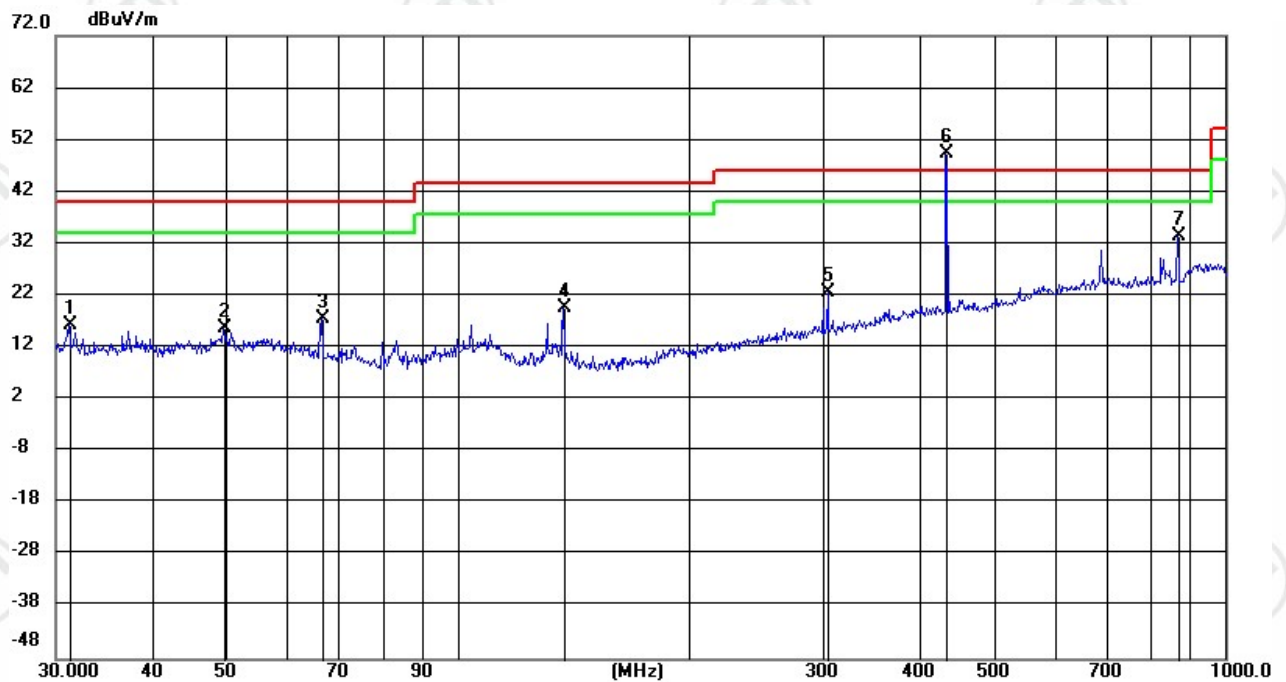
9KHz-30MHz

9 kHz~30 MHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement

The measurements with active loop antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

30MHz-1GHz

Horizontal:

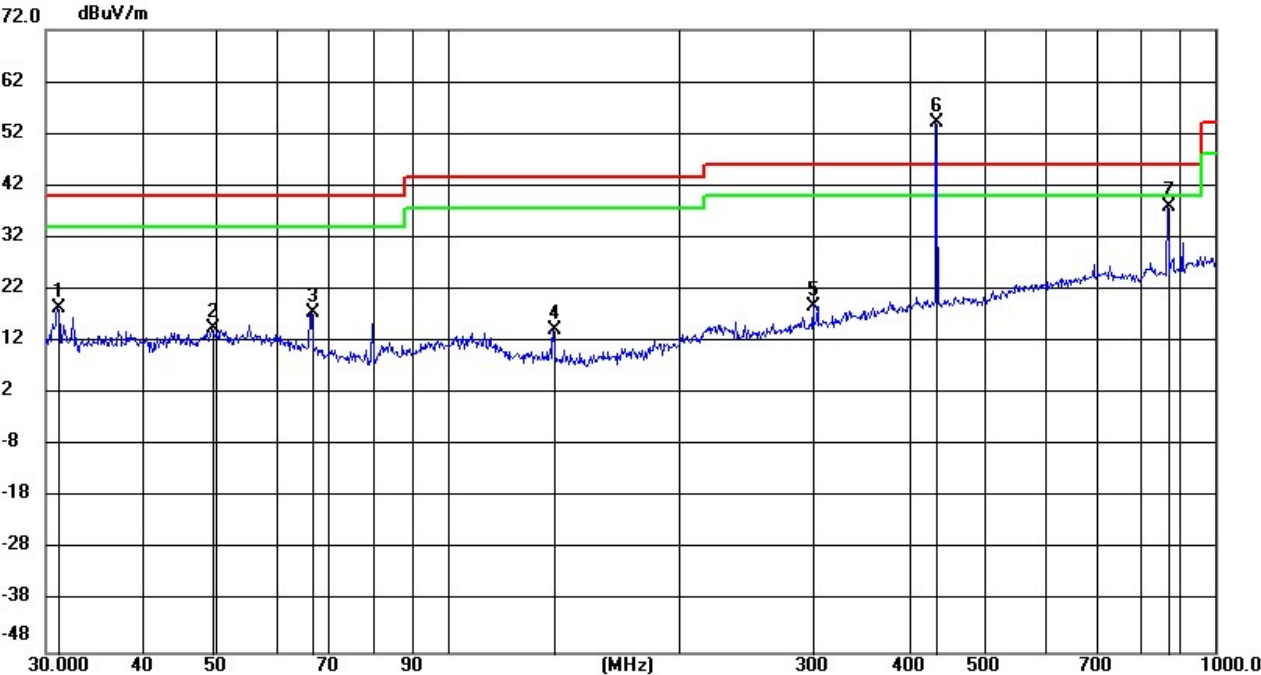


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB/m	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Antenna Height cm	Table Degree	Comment
1		31.2344	3.73	12.55	16.28	40.00	-23.72	QP	100	155
2		49.5849	1.16	14.59	15.75	40.00	-24.25	QP	100	359
3		66.6389	5.70	11.85	17.55	40.00	-22.45	QP	100	299
4		137.4924	9.23	10.47	19.70	43.50	-23.80	QP	100	6
5		304.1830	6.17	16.46	22.63	46.00	-23.37	QP	100	47
6	*	433.9129	29.44	19.77	49.21	46.00	3.21	peak	100	180
7		867.9120	7.20	26.20	33.40	46.00	-12.60	QP	100	273

Remark:

1. $\text{Margin} = \text{Measurement}(\text{Level}) - \text{Limit}$.
2. $\text{Measurement}(\text{Level}) = \text{Reading Level} + \text{Correct Factor}$.
3. In the test results, an asterisk (*) indicates Maximum Data, a cross (X) indicates over Limit, an exclamation mark (!) indicates over -6dB margin Limit.

Vertical:



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	Antenna	Table	
		MHz	Level	Factor	ment			Height	Degree	Comment
			dBuV	dB/m	dBuV/m	dBuV/m	dB	cm	degree	
1		31.1087	5.88	12.55	18.43	40.00	-21.57	QP	100	177
2		49.3853	0.07	14.56	14.63	40.00	-25.37	QP	100	219
3		66.6273	5.59	11.86	17.45	40.00	-22.55	QP	100	177
4		137.5166	3.82	10.47	14.29	43.50	-29.21	QP	100	186
5		299.9988	2.58	16.32	18.90	46.00	-27.10	QP	100	186
6	*	433.9129	34.26	19.77	54.03	46.00	8.03	peak	100	110
7		867.9120	11.86	26.20	38.06	46.00	-7.94	QP	100	135

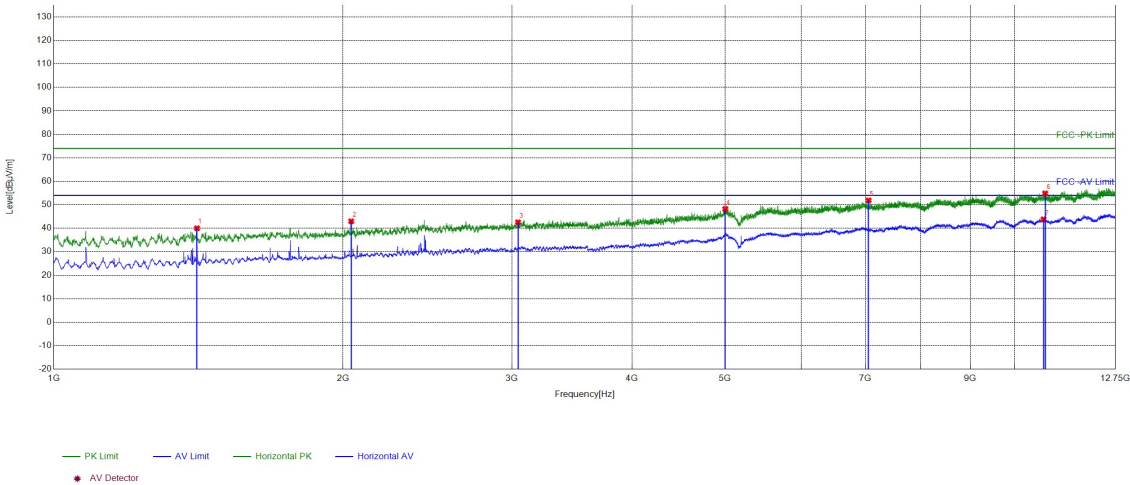
Remark:

1. $\text{Margin} = \text{Measurement(Level)} - \text{Limit}$.
2. $\text{Measurement(Level)} = \text{Reading Level} + \text{Correct Factor}$.
3. In the test results, an asterisk (*) indicates Maximum Data, a cross (X) indicates over Limit, an exclamation mark (!) indicates over -6dB margin Limit.

Above 1GHz:

Test_Mode	\	Test_Frequency	433.92MHz
Remark:	\	Test_Date	2026/7/15

Test Graph

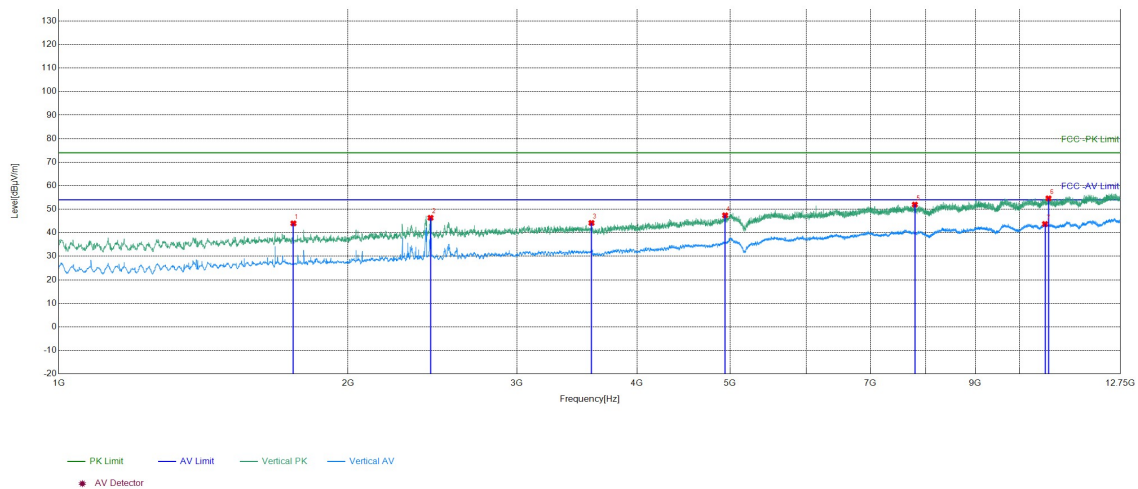


Suspected List

NO	Freq. [MHz]	Factor [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	1409.7106	-21.68	61.69	40.01	74.00	33.99	PASS	Horizontal	PK
2	2040.336	-19.38	62.35	42.97	74.00	31.03	PASS	Horizontal	PK
3	3043.8529	-15.30	57.87	42.57	74.00	31.43	PASS	Horizontal	PK
4	5003.1002	-8.28	56.51	48.23	74.00	25.77	PASS	Horizontal	PK
5	7054.0036	-3.50	55.40	51.90	74.00	22.10	PASS	Horizontal	PK
6	10773.5182	1.88	52.99	54.87	74.00	19.13	PASS	Horizontal	PK
7	10729.6486	2.13	41.69	43.82	54.00	10.18	PASS	Horizontal	AV

Test_Mode	\	Test_Frequency	433.92MHz
Remark:	\	Test_Date	2026/7/15

Test Graph



Suspected List									
NO	Freq. [MHz]	Factor [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	1755.1837	-20.45	64.43	43.98	74.00	30.02	PASS	Vertical	PK
2	2438.2959	-17.71	64.06	46.35	74.00	27.65	PASS	Vertical	PK
3	3586.7391	-13.73	57.89	44.16	74.00	29.84	PASS	Vertical	PK
4	4941.9961	-8.36	55.77	47.41	74.00	26.59	PASS	Vertical	PK
5	7788.0359	-2.21	54.18	51.97	74.00	22.03	PASS	Vertical	PK
6	10731.2154	2.12	52.50	54.62	74.00	19.38	PASS	Vertical	PK
7	10641.1261	2.20	41.52	43.72	54.00	10.28	PASS	Vertical	AV

Remark:

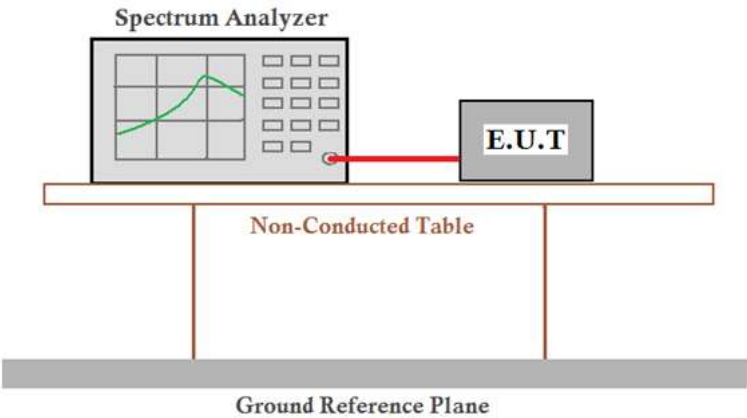
- The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Final Test Level = Receiver Reading - Correct Factor
Correct Factor = Preamplifier Factor - Antenna Factor - Cable Factor
- Scan from 9kHz to 25GHz, the disturbance above 10GHz and below 30MHz was very low. As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. The report records the lowest Peak value. If the Peak value is greater than 54dBμV/m, then the Average value at that time is recorded.

5.4 20dB Bandwidth

Test Requirement: 47 CFR Part 15C Section 15.231 (c)

Test Method: ANSI C63.10:2020

Test Setup:



Limit:

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

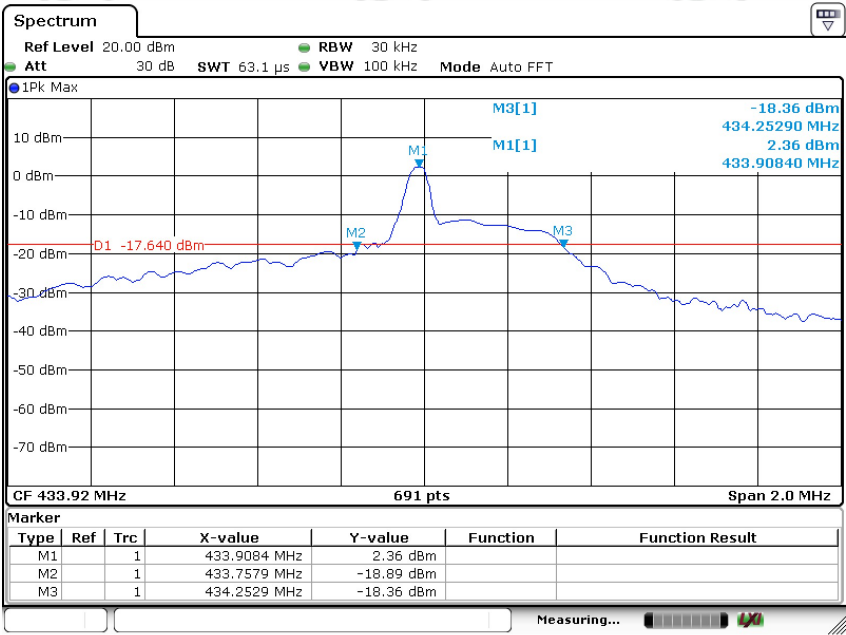
Test Mode: Transmitting mode

Test Results: Pass

Test data

20dB bandwidth (MHz)	Limit (MHz)	Results
0.495	1.0853	PASS

Test plot as follows:

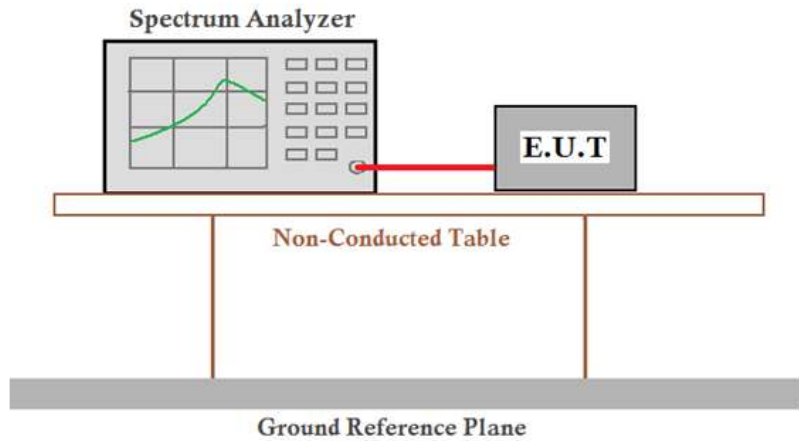


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5.5 Dwell Time

Test Requirement: 47 CFR Part 15C Section 15.231 (a)
Test Method: ANSI C63.10:2020

Test Setup:



Limit: Not more than 5 seconds
Test Mode: Transmitting mode
Test Results: Pass

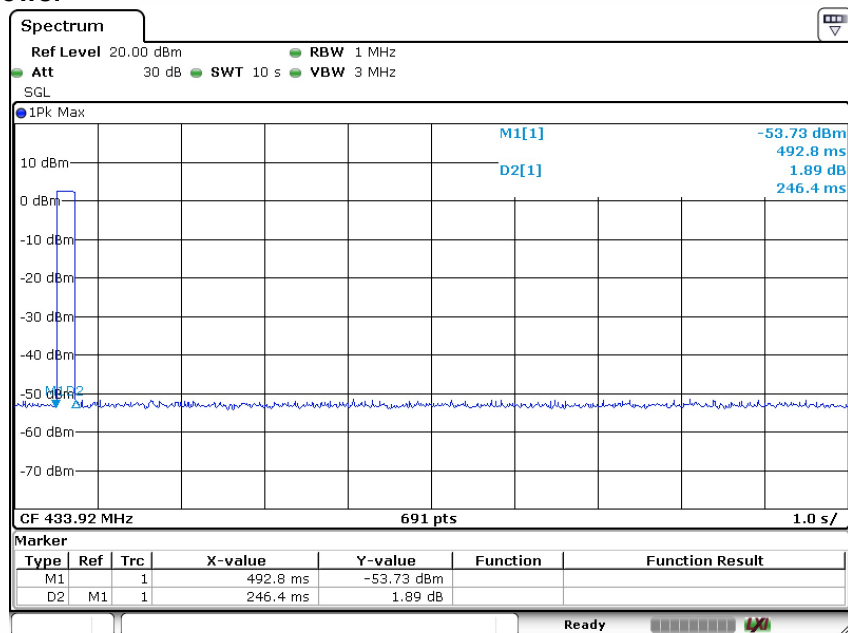
Requirements:

Regulation 15.231 (a1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

Result:

Test item	Limit (MHz)	Results
Transmitting time	≤5S	0.2464S

Test plot as follows:



Date: 10. JUL. 2026 10:34:57