

Appendix A: 20dB Emission Bandwidth

Test Result

TestMode	Antenna	Frequency[MHz]	20db EBW[MHz]	Limit[MHz]	Verdict
GFSK	Ant1	2402	0.924	---	PASS
		2440	0.942	---	PASS
		2480	0.945	---	PASS

Test Graphs



Spectrum Analyzer 1
Swept SA

KEYSIGHT Input: RF
RL Coupling: DC
Align: Auto

Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)

#Atten: 30 dB

PNO: Best Wide
Gate: Off
IF Gain: Low
Sig Track: Off

#Avg Type: Power (RMS)
Trig: Free Run

1 2 3 4 5 6
M WWWWWW
P P P P P P

Frequency

Center Frequency
2.44000000 GHz

Span
3.00000000 MHz

Swept Span
Zero Span

Full Span

Start Freq
2.438500000 GHz

Stop Freq
2.441500000 GHz

AUTO TUNE

CF Step
300.000 kHz

Auto
Man

Freq Offset
0 Hz

X Axis Scale
Log
Lin

Signal Track
(Span Zoom)

1 Spectrum

Scale/Div 10 dB

Ref Lvl Offset 8.82 dB
Ref Level 28.82 dBm

Δ Mkr3 942 kHz
-0.29 dB

DL1 -9.21 dBm

Center 2.440000 GHz
#Res BW 30 kHz
#Video BW 100 kHz
Span 3.000 MHz
#Sweep 1.00 ms (1001 pts)

5 Marker Table

	Mode	Trace	Scale	X	Y	Function	Function Width	Function Value
1	N	1	f	2.439535 GHz	-9.238 dBm			
2	N	1	f	2.439850 GHz	10.79 dBm			
3	Δ 1	1	f	(Δ)	942 kHz (Δ)	-0.2907 dB		
4								
5								
6								

Jan 04, 2022
8:11:14 AM



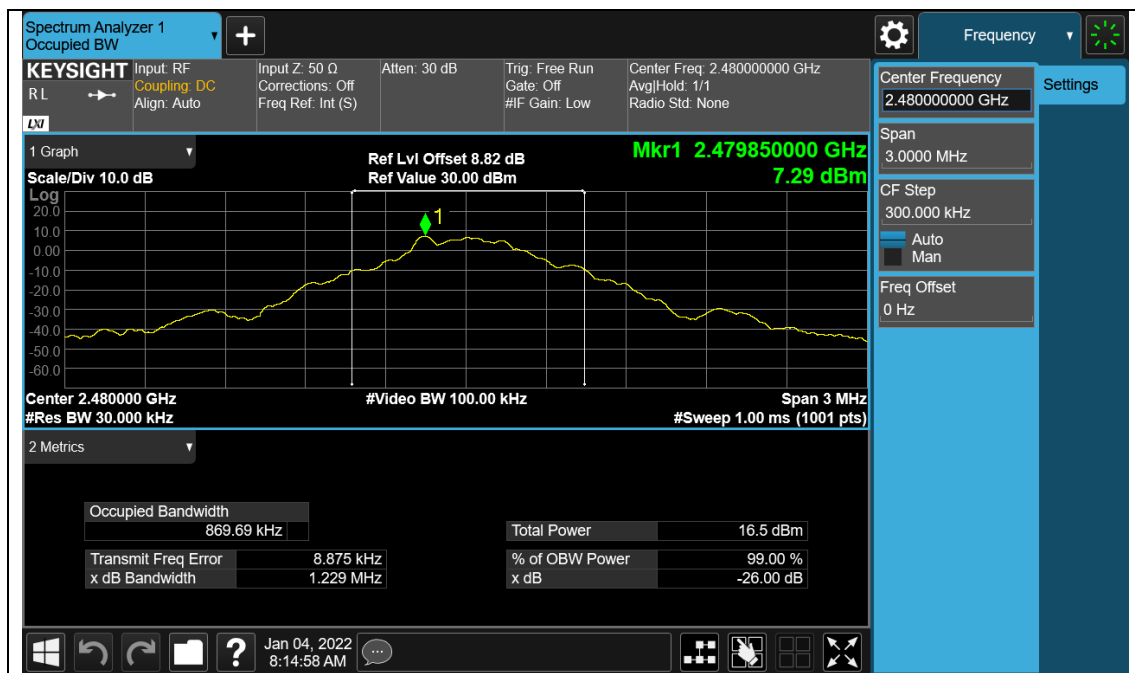
Appendix B: Occupied Channel Bandwidth

Test Result

TestMode	Antenna	Frequency[MHz]	OCB [MHz]	Limit[MHz]	Verdict
GFSK	Ant1	2402	0.86780	---	PASS
		2440	0.87469	---	PASS
		2480	0.86969	---	PASS

Test Graphs





Appendix C: Maximum conducted output power

Test Result

Test Mode	Antenna	Frequency[MHz]	Result [dBm]	Conducted Limit[dBm]	Verdict
GFSK	Ant1	2402	11.6	≤20.97	PASS
		2440	10.57	≤20.97	PASS
		2480	9.62	≤20.97	PASS

Appendix D: Carrier frequency separation

Test Result

TestMode	Antenna	Frequency[MHz]	Result[MHz]	Limit[MHz]	Verdict
GFSK	Ant1	Hop	0.996	≥ 0.945	PASS

Test Graphs

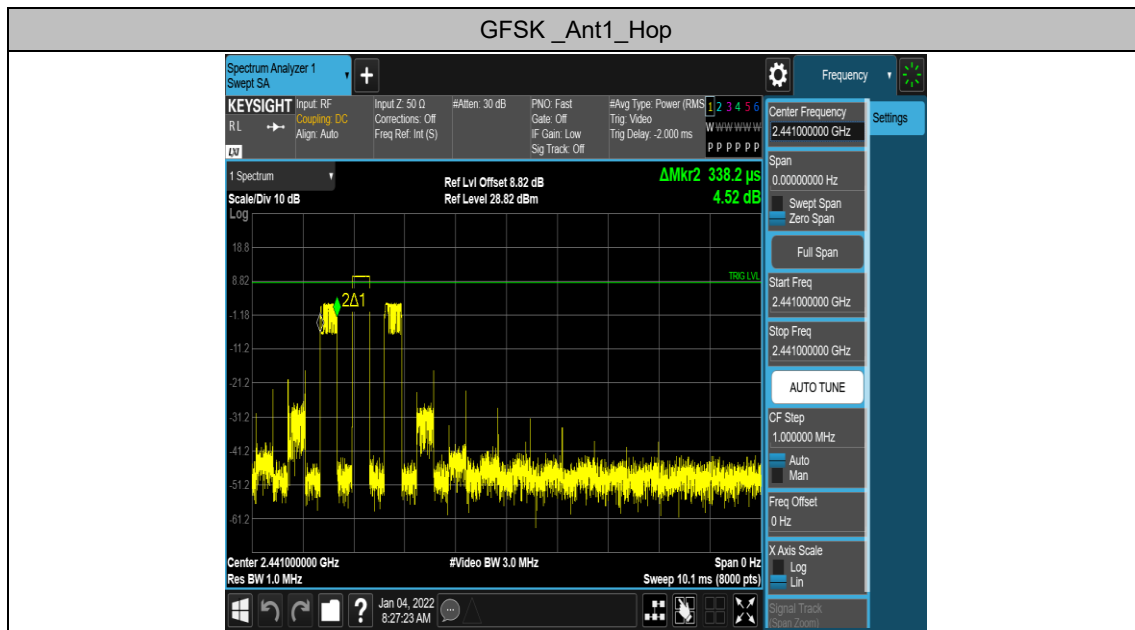


Appendix E: Time of occupancy

Test Result

TestMode	Antenna	Frequency[MHz]	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
GFSK	Ant1	Hop	0.34	106.67	0.036	≤0.4	PASS

Test Graphs



Appendix F: Number of hopping channels

Test Result

TestMode	Antenna	Frequency[MHz]	Result[Num]	Limit[Num]	Verdict
GFSK	Ant1	Hop	79	≥15	PASS

Test Graphs



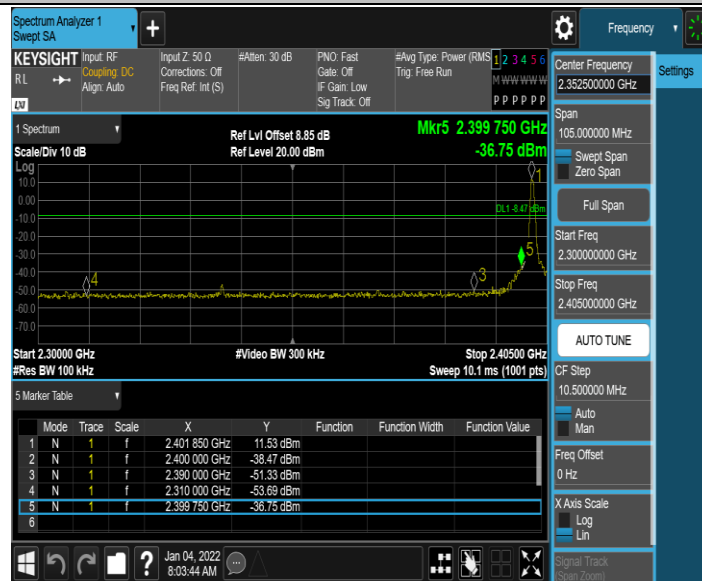
Appendix G: Band edge measurements

Test Result

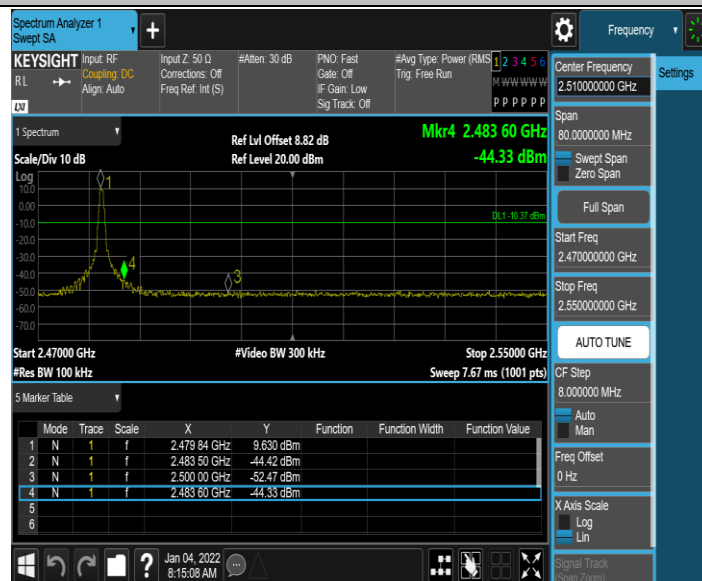
TestMode	Antenna	ChName	Frequency[MHz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
GFSK	Ant1	Low	2402	11.53	-36.75	≤-8.47	PASS
		High	2480	9.63	-44.33	≤-10.37	PASS
		Low	Hop_2402	11.36	-48	≤-8.64	PASS
		High	Hop_2480	9.65	-49.6	≤-10.35	PASS

Test Graphs

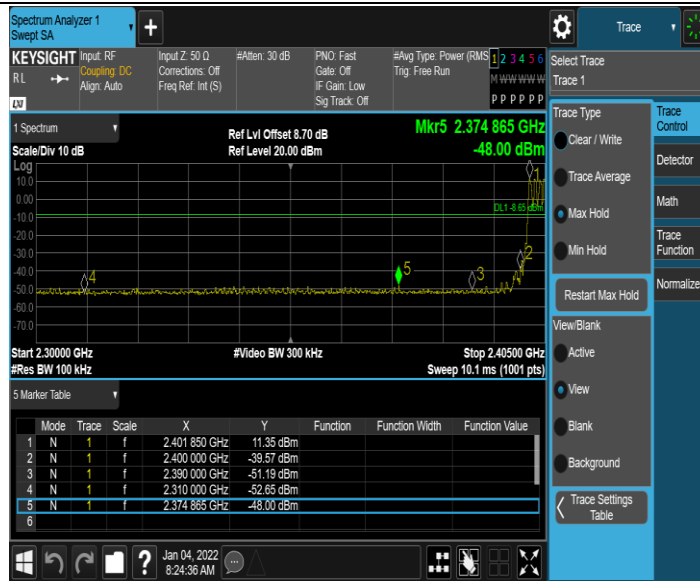
GFSK_Ant1_Low_2402



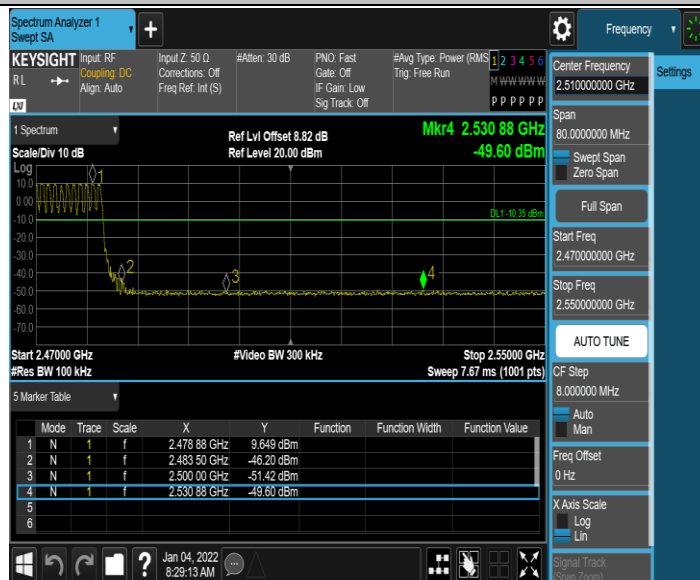
GFSK_Ant1_High_2480



GFSK_Ant1_Low_Hop_2402



GFSK_Ant1_High_Hop_2480



Appendix H: Conducted Spurious Emission

Test Result

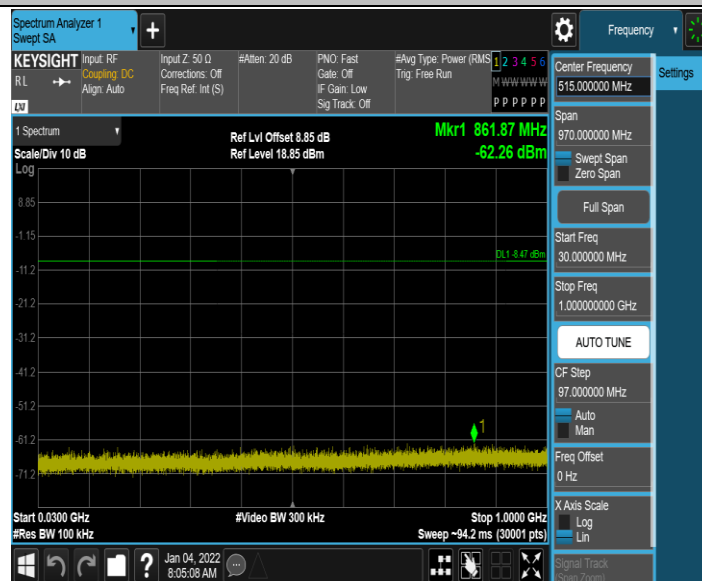
TestMode	Antenna	Frequency[MHz]	FreqRange [MHz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
GFSK	Ant1	2402	Reference	11.53	11.53	---	PASS
			30~1000	11.53	-62.26	≤-8.47	PASS
			1000~26500	11.53	-52.71	≤-8.47	PASS
		2440	Reference	10.42	10.42	---	PASS
			30~1000	10.42	-62.07	≤-9.58	PASS
			1000~26500	10.42	-53.14	≤-9.58	PASS
		2480	Reference	9.45	9.45	---	PASS
			30~1000	9.45	-61.93	≤-10.55	PASS
			1000~26500	9.45	-50.33	≤-10.55	PASS

Test Graphs

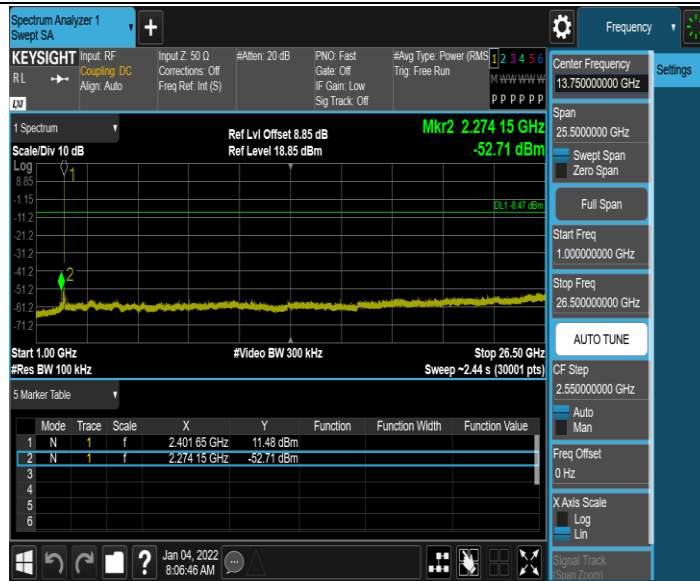
GFSK_Ant1_2402_0~Reference



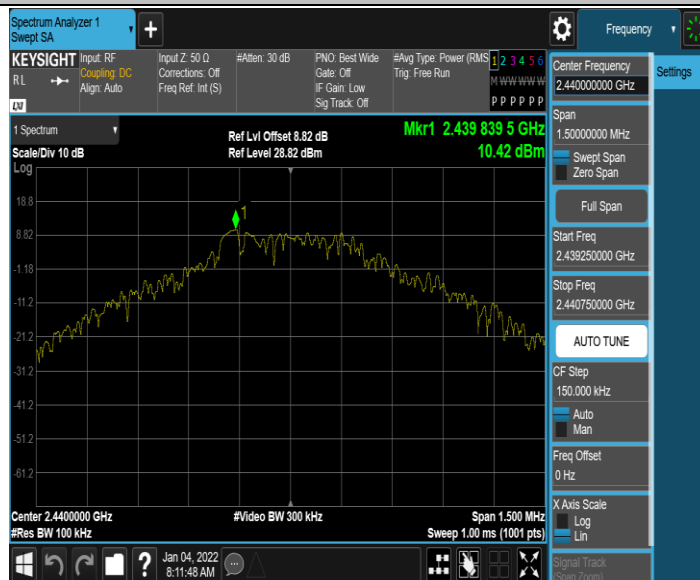
GFSK_Ant1_2402_30~1000



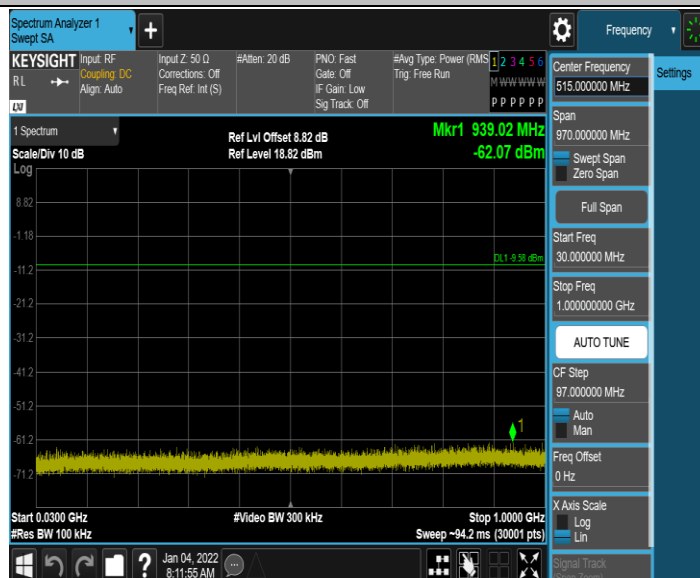
GFSK_Ant1_2402_1000~26500



GFSK_Ant1_2440_0~Reference



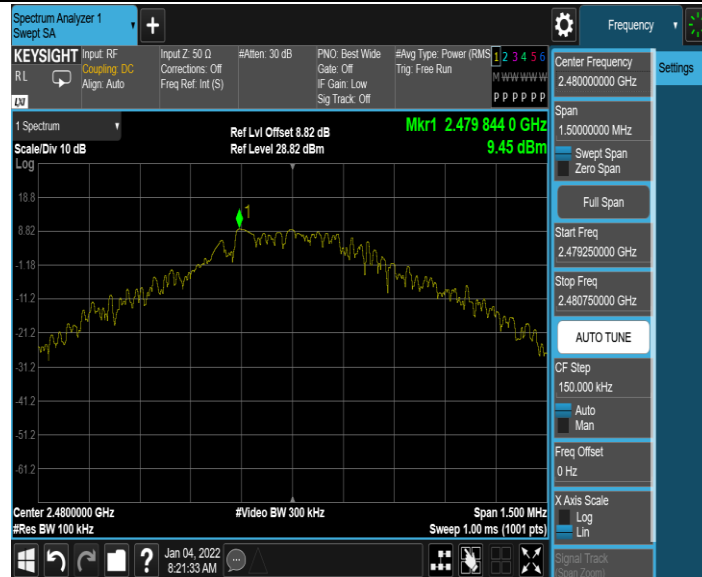
GFSK_Ant1_2440_30~1000



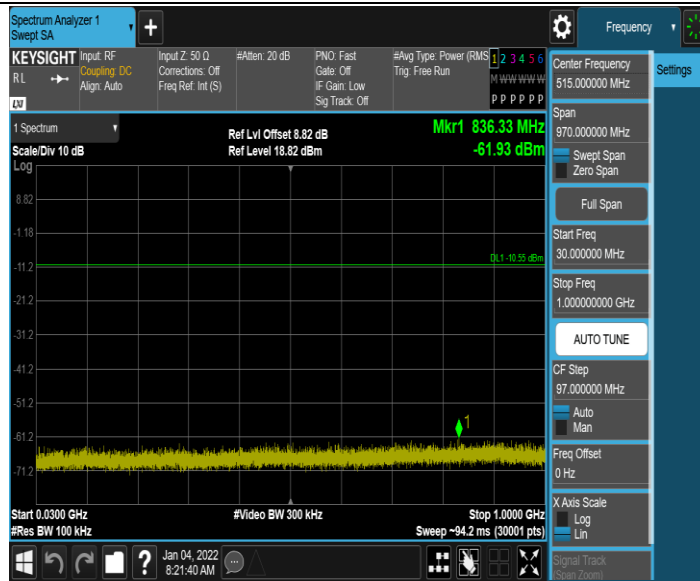
GFSK_Ant1_2440_1000~26500



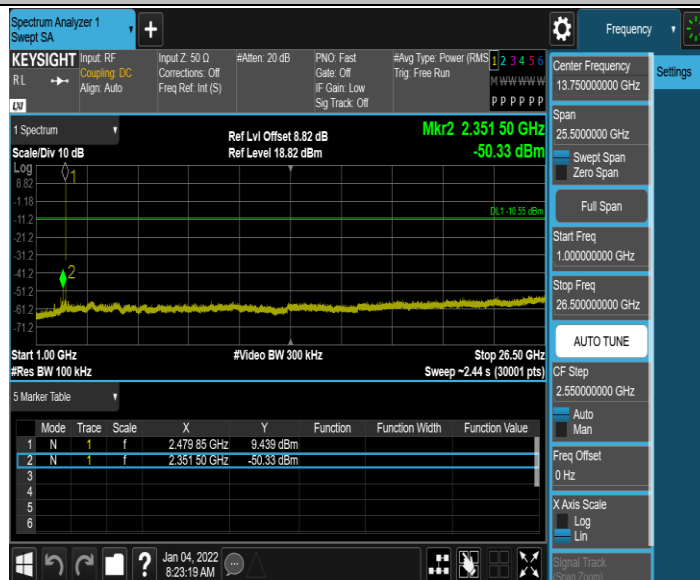
GFSK_Ant1_2480_0~Reference



GFSK_Ant1_2480_30~1000



GFSK_Ant1_2480_1000~26500



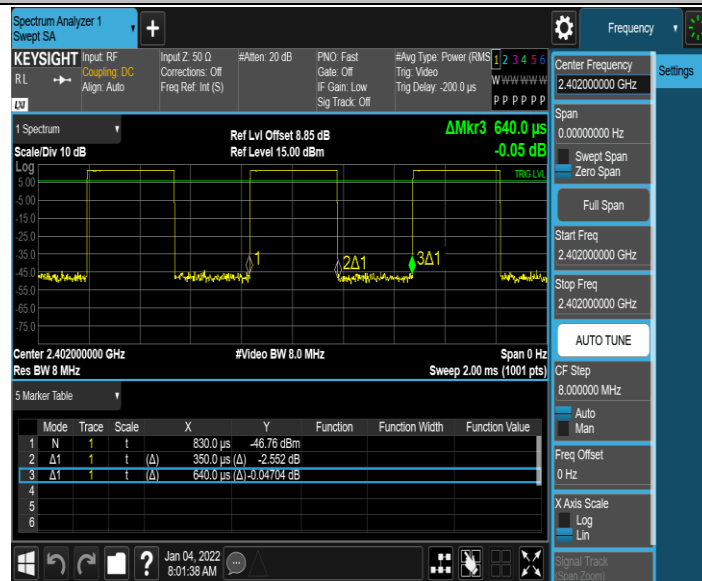
Appendix I: Duty Cycle

Test Result

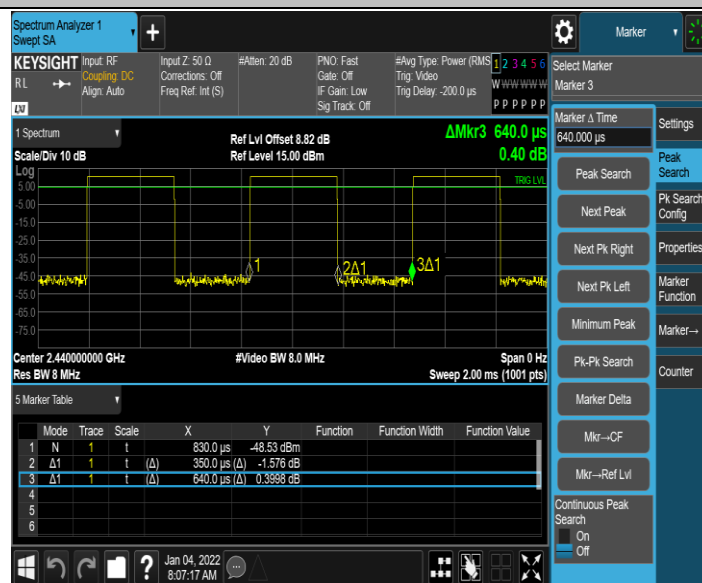
TestMode	Antenna	Channel	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]	Limit	Verdict
GFSK	Ant1	2402	0.35	0.64	54.69	---	PASS
		2440	0.35	0.64	54.69	---	PASS
		2480	0.35	0.64	54.69	---	PASS

Test Graphs

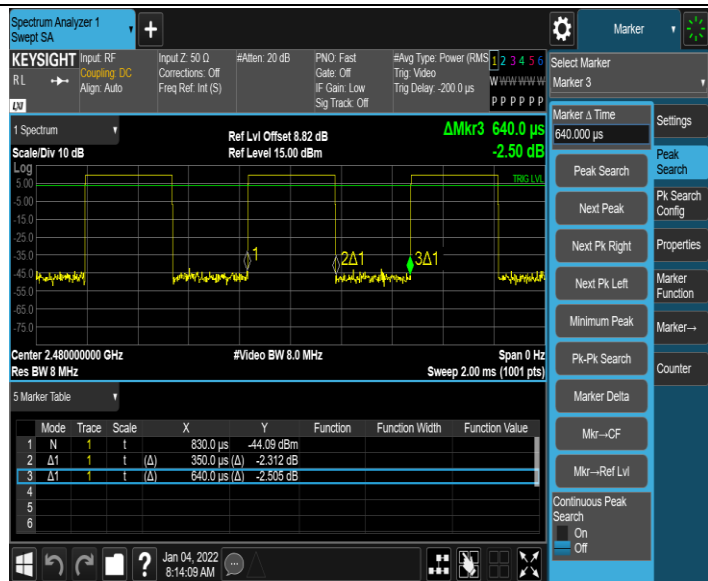
GFSK_Ant1_2402



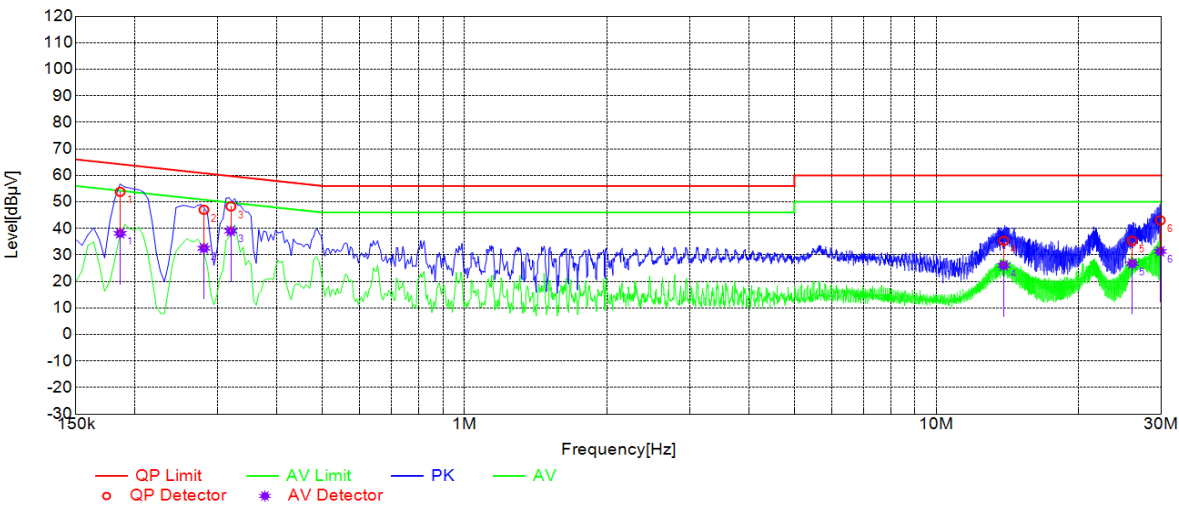
GFSK_Ant1_2440



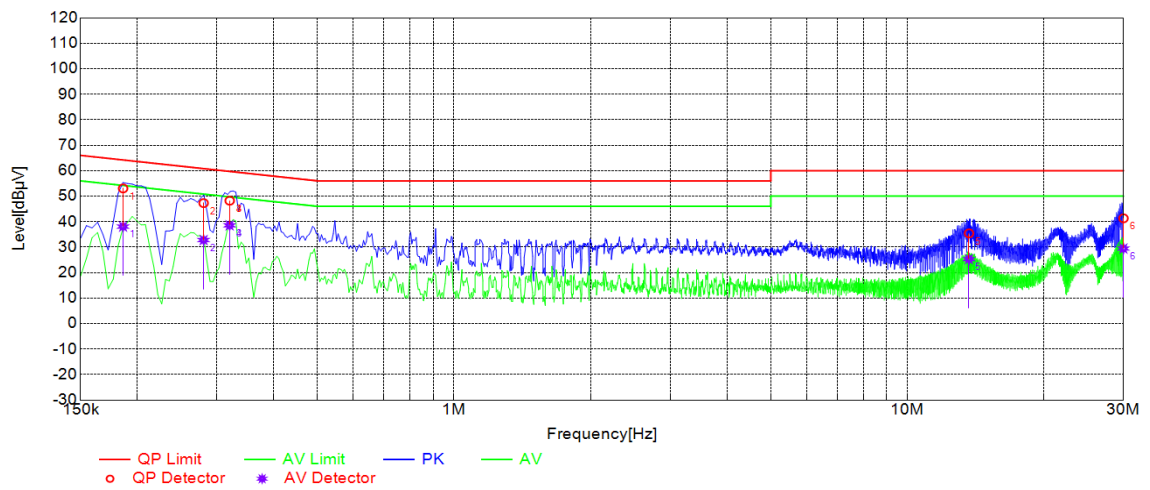
GFSK_Ant1_2480



Appendix J: Conducted emission AC power port



NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]	Type	Verdict
1	0.1861	10.24	53.79	64.21	10.42	38.13	54.21	16.08	N	PASS
2	0.2801	10.25	47.02	60.81	13.79	32.54	50.81	18.27	N	PASS
3	0.3195	10.25	48.31	59.72	11.41	39.03	49.72	10.69	N	PASS
4	13.8919	10.59	35.32	60.00	24.68	26.05	50.00	23.95	N	PASS
5	26.0229	10.78	35.33	60.00	24.67	26.73	50.00	23.27	N	PASS
6	29.8297	10.84	43.03	60.00	16.97	31.35	50.00	18.65	N	PASS



NO.	Freq. [MHz]	Factor [dB]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]	Type	Verdict
1	0.1861	10.24	53.05	64.21	11.16	38.06	54.21	16.15	L	PASS
2	0.2802	10.25	47.28	60.81	13.53	32.77	50.81	18.04	L	PASS
3	0.3198	10.25	48.23	59.71	11.48	38.55	49.71	11.16	L	PASS
4	0.3199	10.25	48.20	59.71	11.51	38.66	49.71	11.05	L	PASS
5	13.6848	10.63	35.40	60.00	24.60	25.29	50.00	24.71	L	PASS
6	29.9989	10.85	41.31	60.00	18.69	29.45	50.00	20.55	L	PASS

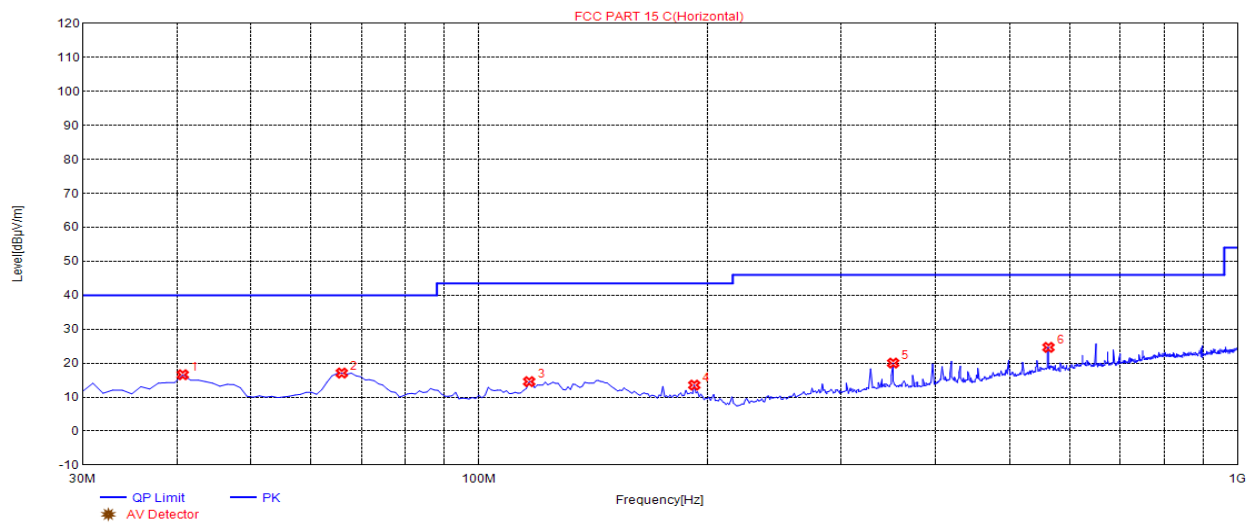
Appendix K: Radiated emissions for transmitter

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

Above 1GHz, The emission level with margin less than 20db is recorded.

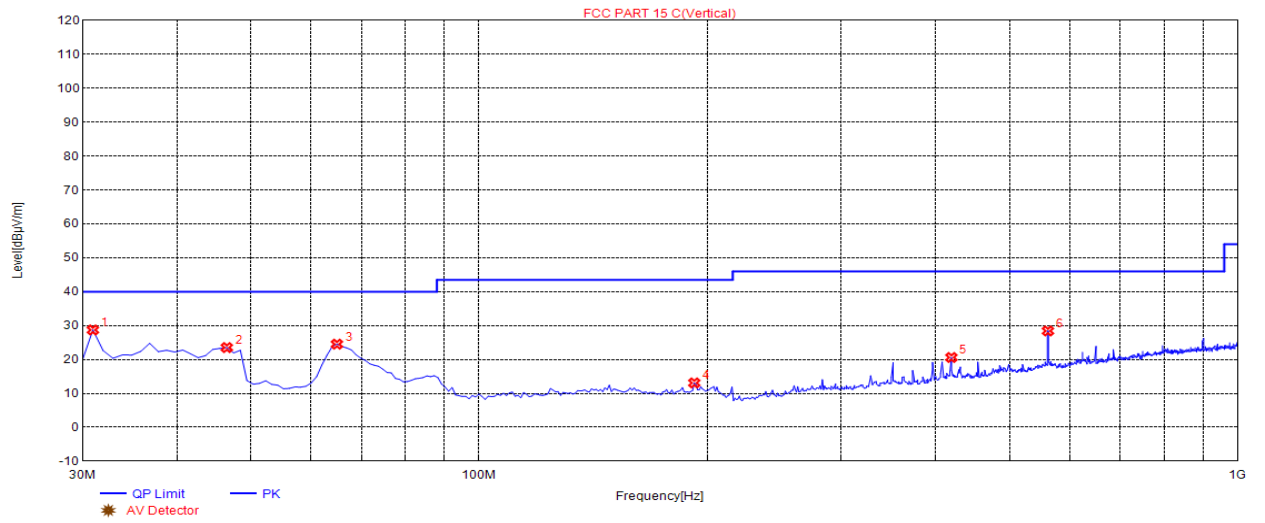
According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

Mode:	2402	Voltage:	120V
-------	------	----------	------



Suspected Data List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	40.6807	16.61	-16.25	40.00	23.39	150	218	Horizontal
2	65.9259	17.10	-17.14	40.00	22.90	150	28	Horizontal
3	116.416	14.57	-18.55	43.50	28.93	150	287	Horizontal
4	192.152	13.54	-18.32	43.50	29.96	150	94	Horizontal
5	351.391	20.04	-14.47	46.00	25.96	150	236	Horizontal
6	563.063	24.65	-9.81	46.00	21.35	150	180	Horizontal

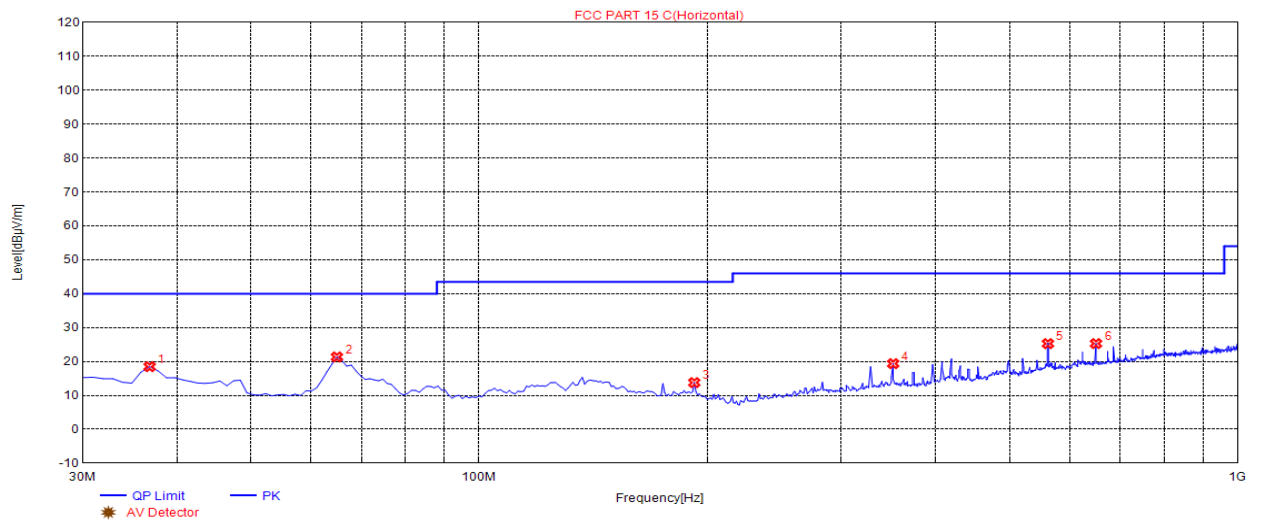
Mode:	2402	Voltage:	120V
-------	------	----------	------



Suspected Data List

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	30.9710	28.72	-17.27	40.00	11.28	150	56	Vertical
2	46.5065	23.52	-15.90	40.00	16.48	150	260	Vertical
3	64.9550	24.53	-16.98	40.00	15.47	150	182	Vertical
4	192.152	13.10	-18.32	43.50	30.40	150	161	Vertical
5	419.359	20.60	-13.00	46.00	25.40	150	281	Vertical
6	562.092	28.42	-9.83	46.00	17.58	150	343	Vertical

Mode:	2440	Voltage:	120V
-------	------	----------	------

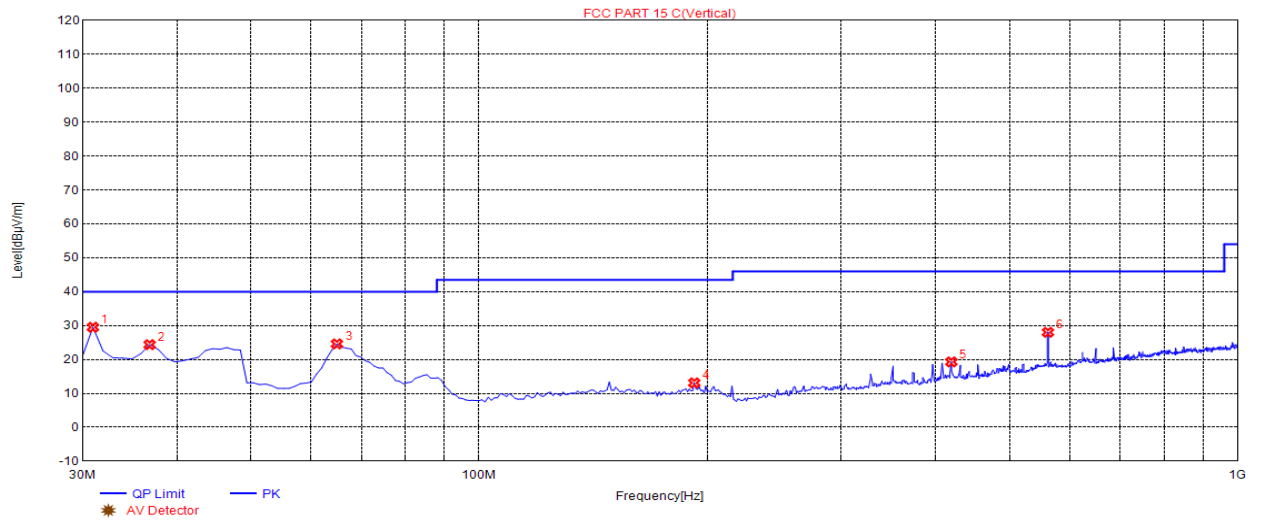


Suspected Data List

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	36.7968	18.48	-16.63	40.00	21.52	150	18	Horizontal
2	64.9550	21.35	-16.98	40.00	18.65	150	18	Horizontal
3	192.152	13.78	-18.32	43.50	29.72	150	105	Horizontal
4	351.391	19.37	-14.47	46.00	26.63	150	242	Horizontal
5	562.092	25.28	-9.83	46.00	20.72	150	177	Horizontal
6	650.450	25.30	-8.41	46.00	20.70	150	105	Horizontal

Mode:	2440	Voltage:	120V
-------	------	----------	------

Test Graph

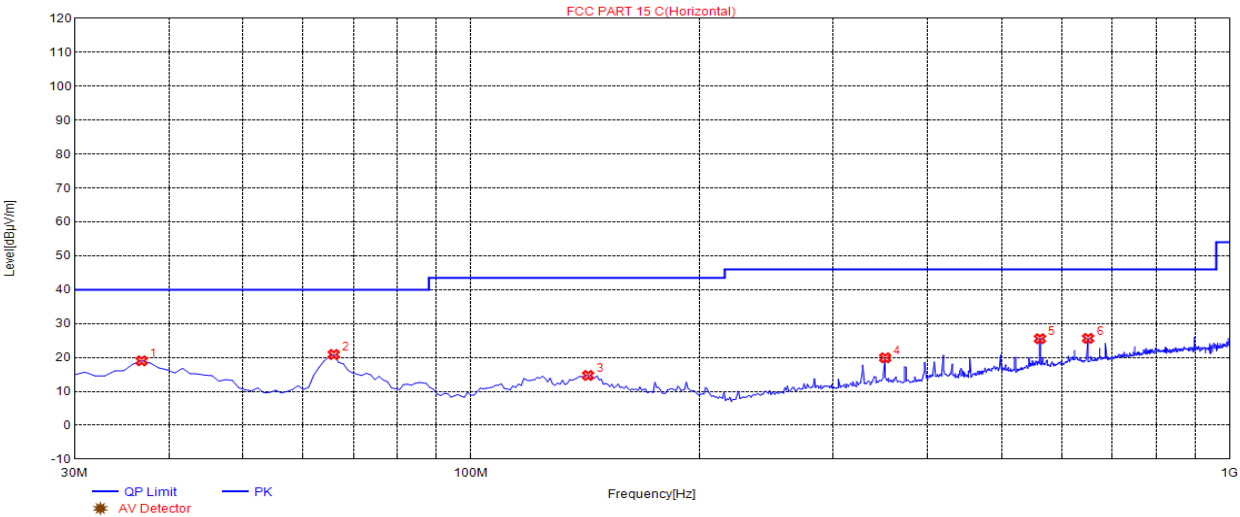


Suspected Data List

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	30.9710	29.51	-17.27	40.00	10.49	150	48	Vertical
2	36.7968	24.38	-16.63	40.00	15.62	150	216	Vertical
3	64.9550	24.61	-16.98	40.00	15.39	150	262	Vertical
4	192.152	13.11	-18.32	43.50	30.39	150	174	Vertical
5	419.359	19.30	-13.00	46.00	26.70	150	280	Vertical
6	562.092	28.02	-9.83	46.00	17.98	150	342	Vertical

Mode:	2480	Voltage:	120V
-------	------	----------	------

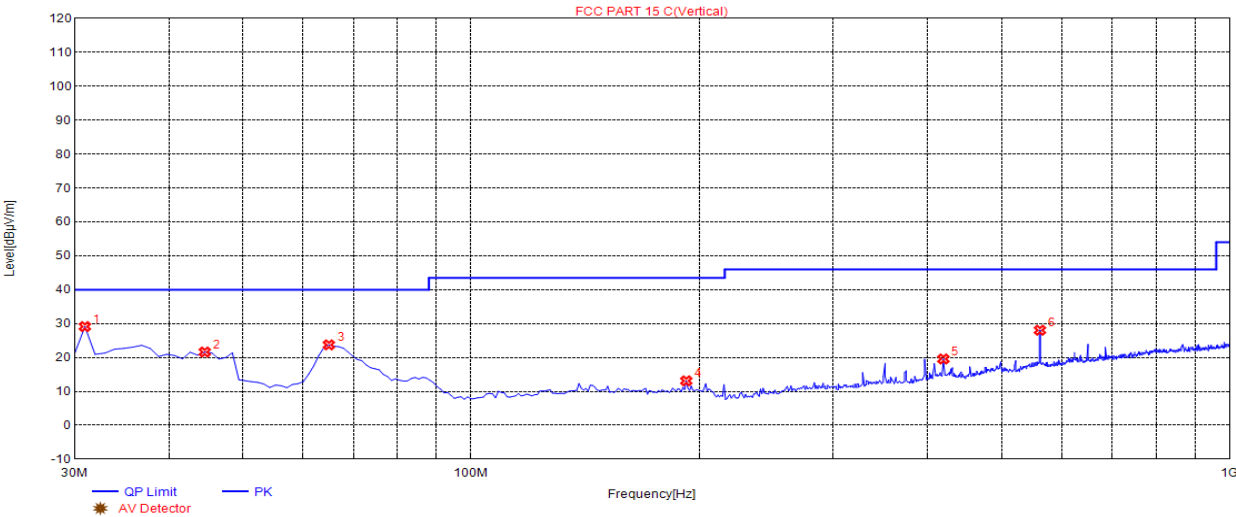
Test Graph



Suspected Data List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	36.7968	19.02	-16.63	40.00	20.98	150	24	Horizontal
2	65.9259	20.89	-17.14	40.00	19.11	150	24	Horizontal
3	142.632	14.71	-16.03	43.50	28.79	150	299	Horizontal
4	351.391	19.92	-14.47	46.00	26.08	150	352	Horizontal
5	562.092	25.54	-9.83	46.00	20.46	150	186	Horizontal
6	650.450	25.65	-8.41	46.00	20.35	150	269	Horizontal

Mode:	2480	Voltage:	120V
-------	------	----------	------

Test Graph



Suspected Data List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	30.9710	29.12	-17.27	40.00	10.88	150	54	Vertical
2	44.5646	21.62	-16.02	40.00	18.38	150	336	Vertical
3	64.9550	23.73	-16.98	40.00	16.27	150	170	Vertical
4	192.152	13.12	-18.32	43.50	30.38	150	148	Vertical
5	419.359	19.57	-13.00	46.00	26.43	150	264	Vertical
6	562.092	28.05	-9.83	46.00	17.95	150	163	Vertical

Above 1GHz

Mode:	2402	Voltage:	120V/60Hz
-------	------	----------	-----------

PK Final Data List								
NO.	Freq. [MHz]	PK Reading [dBµV/m]	Factor [dB/m]	PK Value [dBµV/m]	PK Limit [dBµV/m]	PK Margin [dB]	Polarity	Verdict
1	4803.9838	67.86	-16.47	51.39	74.00	22.61	Horizontal	PASS
2	7219.3922	64.77	-12.74	52.03	74.00	21.97	Horizontal	PASS
3	9607.6804	66.58	-9.83	56.75	74.00	17.25	Horizontal	PASS

AV Final Data List								
NO.	Freq. [MHz]	AV Reading [dBµV/m]	Factor [dB/m]	AV Value [dBµV/m]	AV Limit [dBµV/m]	AV Margin [dB]	Polarity	Verdict
1	4803.9838	54.79	-16.47	38.32	54.00	15.68	Horizontal	PASS
2	7219.3922	52.12	-12.74	39.38	54.00	14.62	Horizontal	PASS
3	9607.6804	55.72	-9.83	45.89	54.00	8.11	Horizontal	PASS

PK Final Data List								
NO.	Freq. [MHz]	PK Reading [dBµV/m]	Factor [dB/m]	PK Value [dBµV/m]	PK Limit [dBµV/m]	PK Margin [dB]	Polarity	Verdict
1	4804.0449	67.64	-16.47	51.17	74.00	22.83	Vertical	PASS
2	7223.9682	64.19	-12.73	51.46	74.00	22.54	Vertical	PASS
3	9607.7174	69.72	-9.83	59.89	74.00	14.11	Vertical	PASS

AV Final Data List								
NO.	Freq. [MHz]	AV Reading [dBµV/m]	Factor [dB/m]	AV Value [dBµV/m]	AV Limit [dBµV/m]	AV Margin [dB]	Polarity	Verdict
1	4804.0449	54.49	-16.47	38.02	54.00	15.98	Vertical	PASS
2	7223.9682	52.46	-12.73	39.73	54.00	14.27	Vertical	PASS
3	9607.7174	62.20	-9.83	52.37	54.00	1.63	Vertical	PASS

Mode:	2440	Voltage:	120V/60Hz
-------	------	----------	-----------

PK Final Data List								
NO.	Freq. [MHz]	PK Reading [dBμV/m]	Factor [dB/m]	PK Value [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	Polarity	Verdict
1	4880.1028	66.89	-16.32	50.57	74.00	23.43	Horizontal	PASS
2	7307.1850	64.04	-12.97	51.07	74.00	22.93	Horizontal	PASS
3	9759.8095	64.68	-9.38	55.30	74.00	18.70	Horizontal	PASS

AV Final Data List								
NO.	Freq. [MHz]	AV Reading [dBμV/m]	Factor [dB/m]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Polarity	Verdict
1	4880.1028	54.19	-16.32	37.87	54.00	16.13	Horizontal	PASS
2	7307.1850	52.15	-12.97	39.18	54.00	14.82	Horizontal	PASS
3	9759.8095	53.17	-9.38	43.79	54.00	10.21	Horizontal	PASS

PK Final Data List								
NO.	Freq. [MHz]	PK Reading [dBμV/m]	Factor [dB/m]	PK Value [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	Polarity	Verdict
1	4880.4444	66.96	-16.32	50.64	74.00	23.36	Vertical	PASS
2	7321.8595	63.81	-12.88	50.93	74.00	23.07	Vertical	PASS
3	9759.4808	68.36	-9.38	58.98	74.00	15.02	Vertical	PASS

AV Final Data List								
NO.	Freq. [MHz]	AV Reading [dBμV/m]	Factor [dB/m]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Polarity	Verdict
1	4880.4444	53.57	-16.32	37.25	54.00	16.75	Vertical	PASS
2	7321.8595	52.43	-12.88	39.55	54.00	14.45	Vertical	PASS
3	9759.4808	58.78	-9.38	49.40	54.00	4.60	Vertical	PASS

Mode:	2480	Voltage:	120V/60Hz
-------	------	----------	-----------

PK Final Data List								
NO.	Freq. [MHz]	PK Reading [dBμV/m]	Factor [dB/m]	PK Value [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	Polarity	Verdict
1	4960.2000	66.87	-16.34	50.53	74.00	23.47	Horizontal	PASS
2	7431.4783	63.93	-12.69	51.24	74.00	22.76	Horizontal	PASS

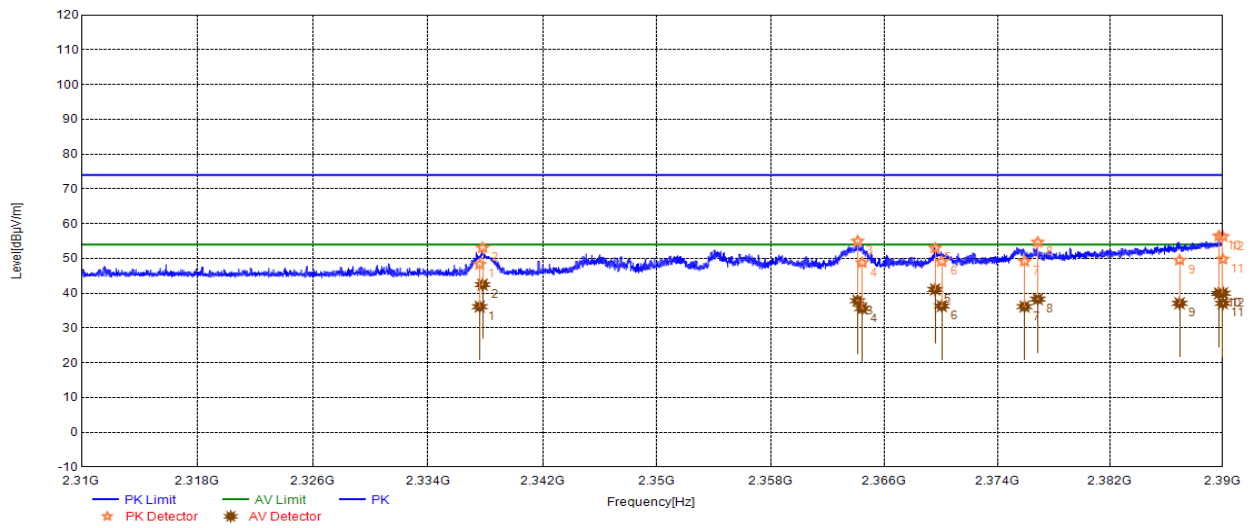
AV Final Data List								
NO.	Freq. [MHz]	AV Reading [dBμV/m]	Factor [dB/m]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Polarity	Verdict
1	4960.2000	53.02	-16.34	36.68	54.00	17.32	Horizontal	PASS
2	7431.4783	52.25	-12.69	39.56	54.00	14.44	Horizontal	PASS

PK Final Data List								
NO.	Freq. [MHz]	PK Reading [dBμV/m]	Factor [dB/m]	PK Value [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	Polarity	Verdict
1	4959.6670	66.56	-16.35	50.21	74.00	23.79	Vertical	PASS
2	7436.4025	64.07	-12.71	51.36	74.00	22.64	Vertical	PASS

AV Final Data List								
NO.	Freq. [MHz]	AV Reading [dBμV/m]	Factor [dB/m]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Polarity	Verdict
1	4959.6670	53.25	-16.35	36.90	54.00	17.10	Vertical	PASS
2	7436.4025	52.26	-12.71	39.55	54.00	14.45	Vertical	PASS

Mode:	2402	Voltage:	120V/60Hz
-------	------	----------	-----------

Test Graph



PK Final Data List

NO.	Freq. [MHz]	PK Reading [dBμV/m]	Factor [dB/m]	PK Value [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	Polarity	Verdict
1	2337.6108	68.04	-19.74	48.30	74.00	25.70	Vertical	PASS
2	2337.8108	72.81	-19.74	53.07	74.00	20.93	Horizontal	PASS
3	2364.1094	73.96	-18.96	55.00	74.00	19.00	Horizontal	PASS
4	2364.4294	67.71	-18.94	48.77	74.00	25.23	Vertical	PASS
5	2369.5820	71.65	-18.67	52.98	74.00	21.02	Horizontal	PASS
6	2370.0540	67.73	-18.64	49.09	74.00	24.91	Vertical	PASS
7	2375.9106	67.48	-18.33	49.15	74.00	24.85	Vertical	PASS
8	2376.8467	72.97	-18.28	54.69	74.00	19.31	Horizontal	PASS
9	2386.9277	67.26	-17.74	49.52	74.00	24.48	Vertical	PASS
10	2389.7360	74.06	-17.58	56.48	74.00	17.52	Horizontal	PASS
11	2390.0000	67.35	-17.57	49.78	74.00	24.22	Vertical	PASS
12	2390.0000	73.89	-17.57	56.32	74.00	17.68	Horizontal	PASS

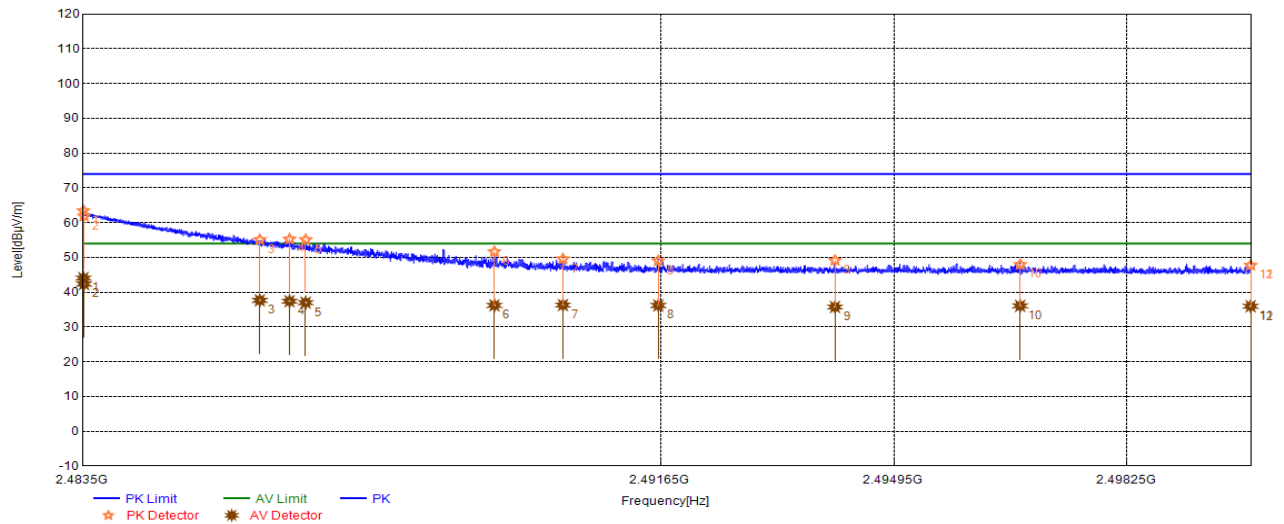
AV Final Data List

NO.	Freq. [MHz]	AV Reading [dBμV/m]	Factor [dB/m]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Polarity	Verdict
1	2337.6108	55.88	-19.74	36.14	54.00	17.86	Vertical	PASS
2	2337.8108	62.20	-19.74	42.46	54.00	11.54	Horizontal	PASS
3	2364.1094	56.80	-18.96	37.84	54.00	16.16	Horizontal	PASS
4	2364.4294	54.54	-18.94	35.60	54.00	18.40	Vertical	PASS

5	2369.5820	59.76	-18.67	41.09	54.00	12.91	Horizontal	PASS
6	2370.0540	54.96	-18.64	36.32	54.00	17.68	Vertical	PASS
7	2375.9106	54.48	-18.33	36.15	54.00	17.85	Vertical	PASS
8	2376.8467	56.57	-18.28	38.29	54.00	15.71	Horizontal	PASS
9	2386.9277	54.85	-17.74	37.11	54.00	16.89	Vertical	PASS
10	2389.7360	57.52	-17.58	39.94	54.00	14.06	Horizontal	PASS
11	2390.0000	54.68	-17.57	37.11	54.00	16.89	Vertical	PASS
12	2390.0000	57.57	-17.57	40.00	54.00	14.00	Horizontal	PASS

Mode:	2480	Voltage:	120V/60Hz
-------	------	----------	-----------

Test Graph



PK Final Data List

NO.	Freq. [MHz]	PK Reading [dBμV/m]	Factor [dB/m]	PK Value [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	Polarity	Verdict
1	2483.5149	81.48	-18.03	63.45	74.00	10.55	Horizontal	PASS
2	2483.5231	79.92	-18.03	61.89	74.00	12.11	Vertical	PASS
3	2485.9984	73.62	-18.52	55.10	74.00	18.90	Vertical	PASS
4	2486.4175	73.85	-18.57	55.28	74.00	18.72	Horizontal	PASS
5	2486.6452	73.72	-18.60	55.12	74.00	18.88	Horizontal	PASS
6	2489.3069	70.53	-18.89	51.64	74.00	22.36	Horizontal	PASS
7	2490.2739	68.56	-18.97	49.59	74.00	24.41	Vertical	PASS
8	2491.6205	67.98	-18.95	49.03	74.00	24.97	Vertical	PASS
9	2494.1172	68.08	-18.93	49.15	74.00	24.85	Horizontal	PASS
10	2496.7360	66.87	-18.90	47.97	74.00	26.03	Vertical	PASS
11	2500.0000	66.60	-18.85	47.75	74.00	26.25	Vertical	PASS
12	2500.0000	66.55	-18.85	47.70	74.00	26.30	Horizontal	PASS

AV Final Data List

NO.	Freq. [MHz]	AV Reading [dBμV/m]	Factor [dB/m]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Polarity	Verdict
1	2483.5149	62.10	-18.03	44.07	54.00	9.93	Horizontal	PASS
2	2483.5231	60.39	-18.03	42.36	54.00	11.64	Vertical	PASS
3	2485.9984	56.18	-18.52	37.66	54.00	16.34	Vertical	PASS
4	2486.4175	55.99	-18.57	37.42	54.00	16.58	Horizontal	PASS
5	2486.6452	55.61	-18.60	37.01	54.00	16.99	Horizontal	PASS

6	2489.3069	55.11	-18.89	36.22	54.00	17.78	Horizontal	PASS
7	2490.2739	55.28	-18.97	36.31	54.00	17.69	Vertical	PASS
8	2491.6205	55.15	-18.95	36.20	54.00	17.80	Vertical	PASS
9	2494.1172	54.68	-18.93	35.75	54.00	18.25	Horizontal	PASS
10	2496.7360	54.98	-18.90	36.08	54.00	17.92	Vertical	PASS
11	2500.0000	54.82	-18.85	35.97	54.00	18.03	Vertical	PASS
12	2500.0000	54.49	-18.85	35.64	54.00	18.36	Horizontal	PASS