

5. NUMBER OF HOPPING FREQUENCY

5.1 LIMIT

Section	Test Item	Limit
FCC 15.247(a)(1)(iii)	Number of Hopping Frequency	15

5.2 TEST PROCEDURE

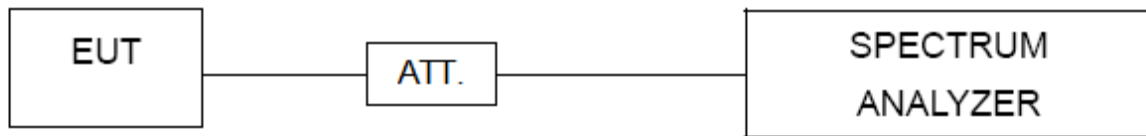
- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- The following table is the setting of the spectrum analyzer:

Spectrum Parameters	Setting
Span Frequency	> Operating Frequency Range
RBW	100 kHz
VBW	100 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

5.3 DEVIATION FROM STANDARD

No deviation.

5.4 TEST SETUP



5.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

5.6 TEST RESULTS

Please refer to the APPENDIX E.

6. AVERAGE TIME OF OCCUPANCY

6.1 LIMIT

Section	Test Item	Limit
FCC 15.247(a)(1)(iii)	Average Time of Occupancy	0.4sec

6.2 TEST PROCEDURE

- Set the EUT for DH1, DH3 and DH5 packet transmitting.
- Measure the maximum time duration of one single pulse.
- DH1 Packet permit maximum $1600 / 79 / 2 = 10.12$ hops per second in each channel (1 time slot TX, 1 time slot RX). So, the dwell time is the time duration of the pulse times $10.12 \times 31.6 = 320$ within 31.6 seconds.
- DH3 Packet permit maximum $1600 / 79 / 4 = 5.06$ hops per second in each channel (3 time slots TX, 1 time slot RX). So, the dwell time is the time duration of the pulse times $5.06 \times 31.6 = 160$ within 31.6 seconds.
- DH5 Packet permit maximum $1600 / 79 / 6 = 3.37$ hops per second in each channel (5 time slots TX, 1 time slot RX). So, the dwell time is the time duration of the pulse times $3.37 \times 31.6 = 106.6$ within 31.6 seconds.
- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- The following table is the setting of the spectrum analyzer:

Spectrum Parameters	Setting
Span Frequency	0 MHz
RBW	1 MHz
VBW	1 MHz
Detector	Peak
Trace	Max Hold
Sweep Time	As necessary to capture the entire dwell time per hopping channel

6.3 DEVIATION FROM STANDARD

No deviation.

6.4 TEST SETUP



6.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

6.6 TEST RESULTS

Please refer to the APPENDIX F.

7. HOPPING CHANNEL SEPARATION

7.1 LIMIT

Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

7.2 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- The following table is the setting of the spectrum analyzer:

Spectrum Parameters	Setting
Span Frequency	Wide enough to capture the peaks of two adjacent channels
RBW	30 kHz
VBW	100 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

7.3 DEVIATION FROM STANDARD

No deviation.

7.4 TEST SETUP



7.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

7.6 TEST RESULTS

Please refer to the APPENDIX G.

8. BANDWIDTH

8.1 LIMIT

Section	Test Item
FCC 15.247(a)(1)	Bandwidth

8.2 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- The following table is the setting of the spectrum analyzer:

Spectrum Parameters	Setting
Span Frequency	> Measurement Bandwidth
RBW	30 kHz
VBW	100 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

8.3 DEVIATION FROM STANDARD

No deviation.

8.4 TEST SETUP



8.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

8.6 TEST RESULTS

Please refer to the APPENDIX H.

9. MAXIMUM OUTPUT POWER

9.1 LIMIT

Section	Test Item	Limit
FCC 15.247(a)(1)	Maximum Output Power	0.1250 Watt or 20.97 dBm

Note: Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

9.2 TEST PROCEDURE

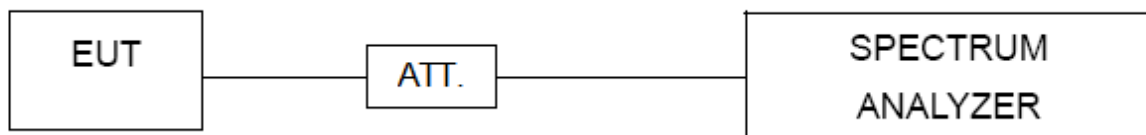
- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- The following table is the setting of the spectrum analyzer:

Spectrum Parameters	Setting
Span Frequency	Approximately five times the 20 dB bandwidth, centered on a hopping channel.
RBW	3 MHz
VBW	3 MHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

9.3 DEVIATION FROM STANDARD

No deviation.

9.4 TEST SETUP



9.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

9.6 TEST RESULTS

Please refer to the APPENDIX I.

10. CONDUCTED SPURIOUS EMISSION

10.1 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 Output Power limits. If the transmitter complies with the Output 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 Section 15.209(a) is not required.

10.2 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- The following table is the setting of the spectrum analyzer:

Spectrum Parameters	Setting
Start Frequency	30 MHz
Stop Frequency	26.5 GHz
RBW	100 kHz
VBW	100 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

10.3 DEVIATION FROM STANDARD

No deviation.

10.4 TEST SETUP



10.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

10.6 TEST RESULTS

Please refer to the APPENDIX J.

11. MEASUREMENT INSTRUMENTS LIST

No.	Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	EMI Receiver	Rohde&Schwarz	ESCI	1166.5950.03	2022/11/16
2	AMN	Rohde&Schwarz	ENV216	3560.6550.05	2022/11/09
3	AMN	Schwarzbeck	NSLK8127	#829	2022/11/09
4	ECSI RF IN RF Cable	Rohde&Schwarz	RP-X1	\	2022/11/18
5	ECSI RF IN RF Cable	Rohde&Schwarz	Sapre sm	\	2022/11/09
6	EMI Receiver	Rohde&Schwarz	ESR7	102013	2022/11/09
7	Spectrum analyzer	Rohde&Schwarz	FSV30	103741	2022/11/09
8	EMI receiver	Rohde&Schwarz	ESU	100184	2023/07/20
9	Spectrum analyzer	KEYSIGHT	N9010A-44	MY51440158	2022/11/09
10	Loop Antenna*	Schwarzbeck	FMZB1519B	00029	2025/07/03
11	Integral Antenna	Schwarzbeck	VULB 9163	VULB 9163-361	2022/11/09
12	Integral Antenna	Schwarzbeck	BBHA 9120D	BBHA 9120D 1201	2022/11/09
13	Integral Antenna	Schwarzbeck	BBHA 9170	9170#685	2022/11/09
14	Preamplifier	CD Systems Inc	PAP-03036-30	85060000	2022/11/09
15	Preamplifier	Schwarzbeck	BBV9721	9721-019	2022/11/09
16	Preamplifier	emci	EMC012645 SE	980417	2022/11/09
17	ECSI RF IN RF Cable	Rohde&Schwarz	AP-X1	\	2022/11/09
18	Spectrum Analyzer	Agilent	N9010A	MY52221119	2022/11/09
19	Power Collection Unit	Tonscend	JS0806-2	188060134	2022/11/09
20	Tonscend Test System	Tonscend	2.6.77.0518	NA	NA
21	10dB Attenuator	Tonscend	10dB	NA	NA
22	Temp&Humidity Recorder	Anymetre	JR900	NA	2022/11/03
23	Temp&Humidity Chamber	ETOMA	NTH1100-30 A	16080628	2022/11/03
24	Filter	STI	STI15-9845	N/A	N/A
25	Filter	STI	5.1G	N/A	N/A
26	Filter	STI	STI15-9845	N/A	N/A
27	Testing Software	EZ-EMC	TW-03A2	N/A	N/A

Remark "N/A" denotes no model name, serial no. or calibration specified.

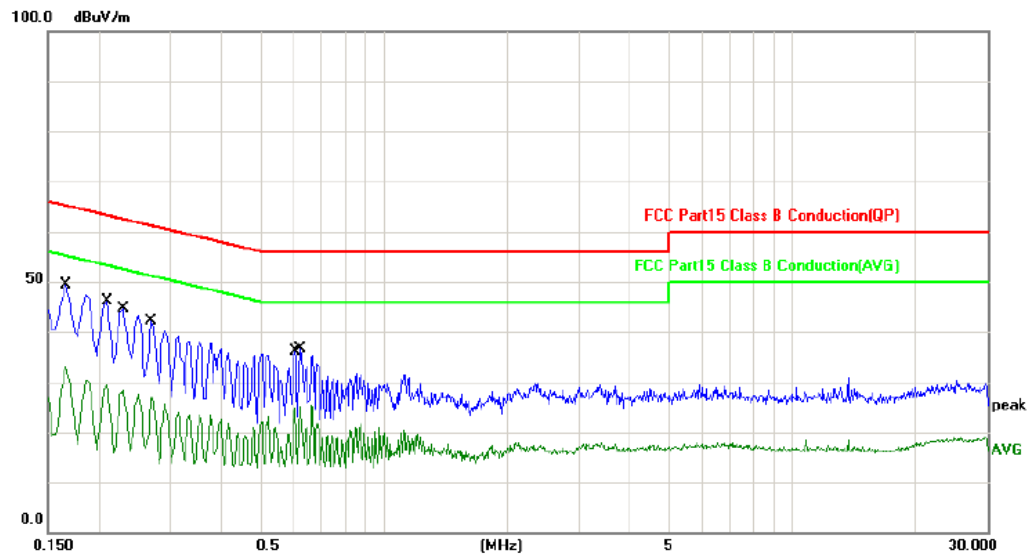
"**" calibration period of equipment list is three year.

Except * item, all calibration period of equipment list is one year.

APPENDIX A - AC POWER LINE CONDUCTED EMISSIONS

Test Mode	TX Mode_3Mbps Channel 00	Phase	Line
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Conducted Emission Measurement



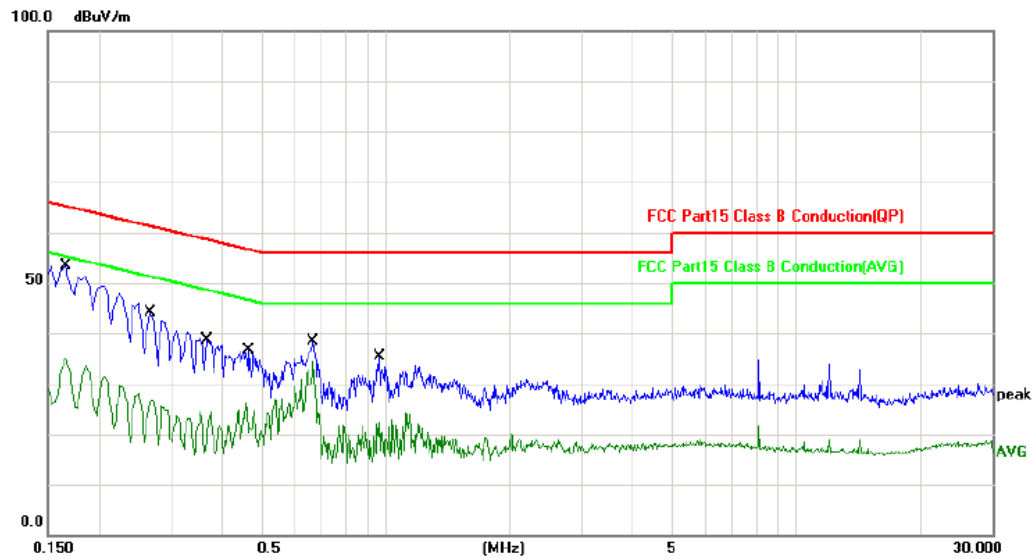
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	0.1660	28.52	19.52	48.04	65.16	-17.12	QP	
2		0.1660	12.99	19.52	32.51	55.16	-22.65	AVG	
3		0.2100	24.87	19.53	44.40	63.21	-18.81	QP	
4		0.2100	9.28	19.53	28.81	53.21	-24.40	AVG	
5		0.2300	23.64	19.53	43.17	62.45	-19.28	QP	
6		0.2300	7.91	19.53	27.44	52.45	-25.01	AVG	
7		0.2700	20.46	19.53	39.99	61.12	-21.13	QP	
8		0.2700	5.42	19.53	24.95	51.12	-26.17	AVG	
9		0.6060	14.02	19.53	33.55	56.00	-22.45	QP	
10		0.6060	3.51	19.53	23.04	46.00	-22.96	AVG	
11		0.6260	14.10	19.55	33.65	56.00	-22.35	QP	
12		0.6260	5.13	19.55	24.68	46.00	-21.32	AVG	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	TX Mode_3Mbps Channel 00	Phase	Neutral
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Conducted Emission Measurement



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV/m	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		0.1660	29.93	19.70	49.63	65.16	-15.53	QP	
2		0.1660	14.18	19.70	33.88	55.16	-21.28	AVG	
3		0.2660	15.37	19.69	35.06	61.24	-26.18	QP	
4		0.2660	1.91	19.69	21.60	51.24	-29.64	AVG	
5		0.3660	0.54	19.70	20.24	58.59	-38.35	QP	
6		0.3660	-5.88	19.70	13.82	48.59	-34.77	AVG	
7		0.4660	1.05	19.73	20.78	56.58	-35.80	QP	
8		0.4660	-5.32	19.73	14.41	46.58	-32.17	AVG	
9		0.6660	15.95	19.78	35.73	56.00	-20.27	QP	
10	*	0.6660	14.61	19.78	34.39	46.00	-11.61	AVG	
11		0.9660	4.19	19.87	24.06	56.00	-31.94	QP	
12		0.9660	-5.15	19.87	14.72	46.00	-31.28	AVG	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

APPENDIX B - RADIATED EMISSION - 9 KHZ TO 30 MHZ

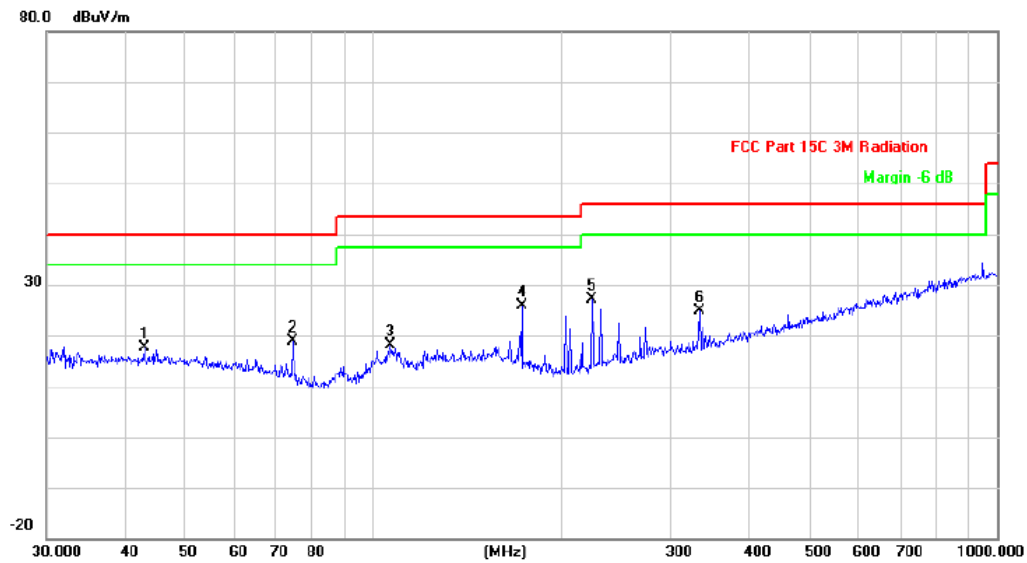
The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

APPENDIX C - RADIATED EMISSION - 30 MHZ TO 1000 MHZ

Test Mode	TX Mode_3Mbps Channel 00	Polarization	Vertical
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Radiated Emission



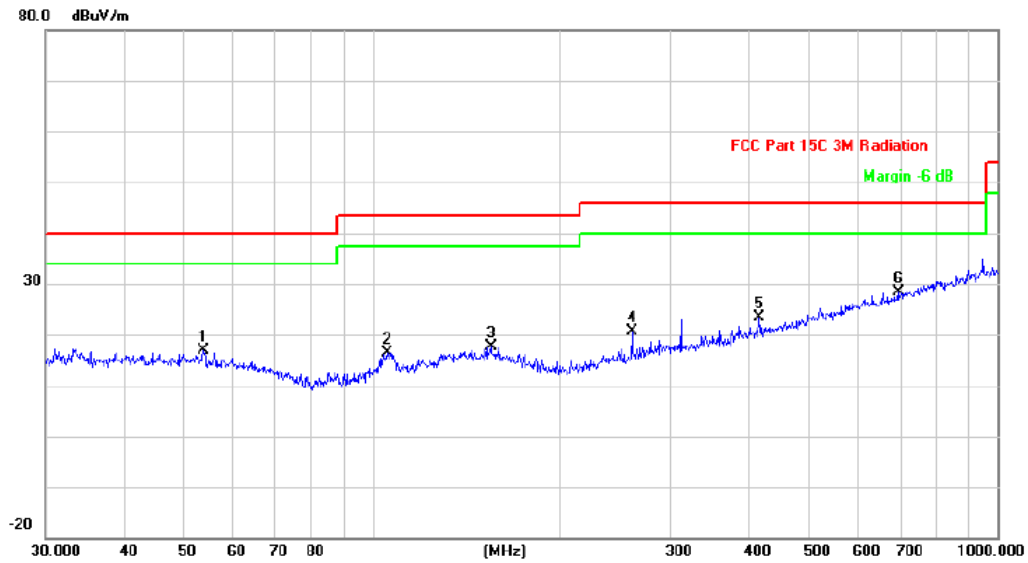
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB/m	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		43.0505	27.74	-9.99	17.75	40.00	-22.25	peak	
2		74.3955	32.28	-13.35	18.93	40.00	-21.07	peak	
3		106.7587	31.26	-13.03	18.23	43.50	-25.27	peak	
4	*	173.2051	36.86	-10.89	25.97	43.50	-17.53	peak	
5		224.5193	38.65	-11.63	27.02	46.00	-18.98	peak	
6		333.6867	32.73	-7.95	24.78	46.00	-21.22	peak	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Over = Measurement - Limit.

Test Mode	TX Mode_3Mbps Channel 00	Polarization	Horizontal
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Radiated Emission



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB/m	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		53.6932	27.42	-10.55	16.87	40.00	-23.13	peak	
2		105.6415	29.42	-13.14	16.28	43.50	-27.22	peak	
3		154.8204	27.27	-9.75	17.52	43.50	-25.98	peak	
4		260.1444	30.82	-10.16	20.66	46.00	-25.34	peak	
5		416.1791	29.23	-5.80	23.43	46.00	-22.57	peak	
6 *		694.4174	28.09	0.22	28.31	46.00	-17.69	peak	

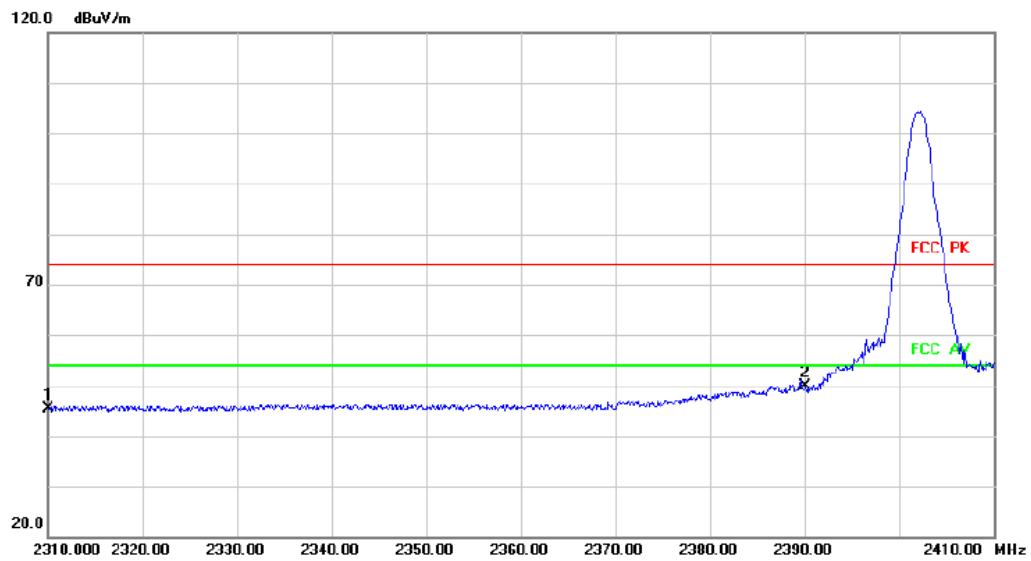
REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Over = Measurement - Limit.

APPENDIX D - RADIATED EMISSION - ABOVE 1000 MHZ

Test Mode	TX 2402 MHz _CH00_3Mbps	Polarization	Vertical
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Radiated Emission

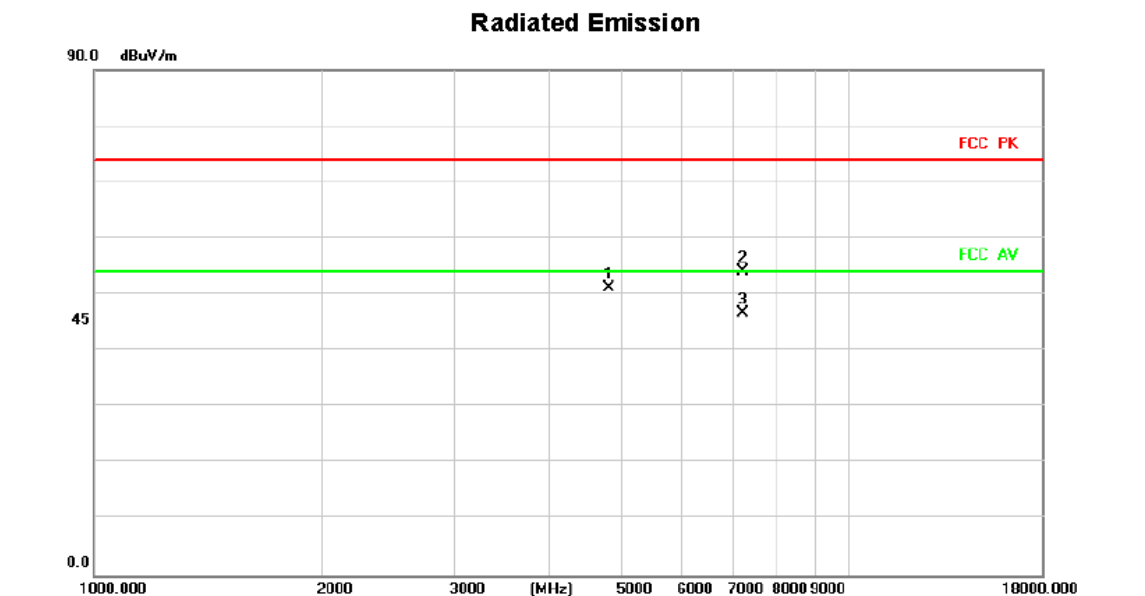


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB/m	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		2310.000	47.31	-1.92	45.39	74.00	-28.61	peak	
2	*	2390.000	51.56	-1.67	49.89	74.00	-24.11	peak	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
(2) Over = Measurement - Limit.

Test Mode	TX 2402 MHz _CH00_3Mbps	Polarization	Vertical
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No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	Comment
1		4804.000	53.10	-1.99	51.11	74.00	-22.89	peak	
2		7206.000	50.18	3.87	54.05	74.00	-19.95	peak	
3 *		7206.000	42.86	3.87	46.73	54.00	-7.27	AVG	

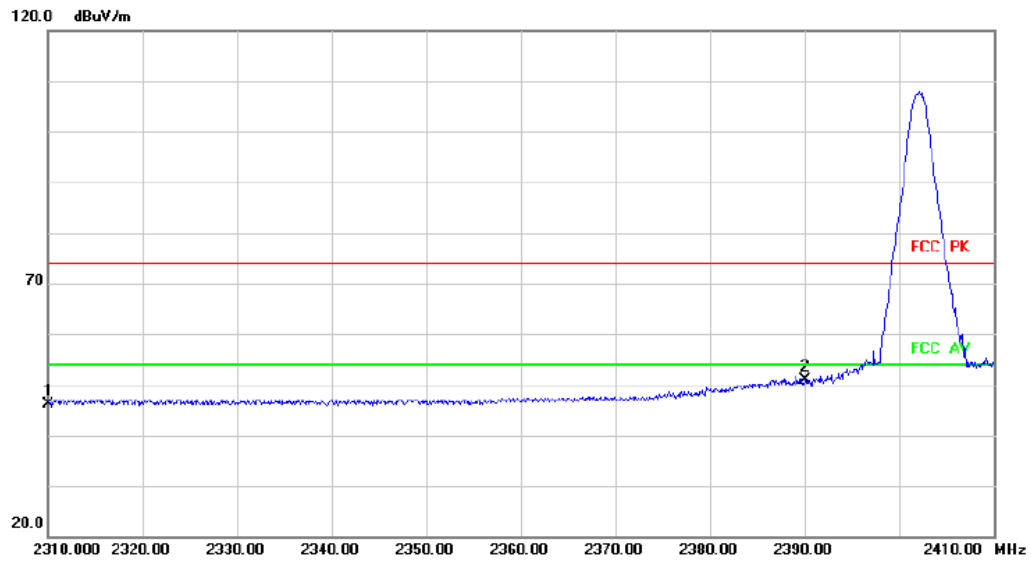
REMARKS:

(1) Measurement Value = Reading Level + Correct Factor.

(2) Over = Measurement - Limit.

Test Mode	TX 2402 MHz _CH00_3Mbps	Polarization	Horizontal
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Radiated Emission

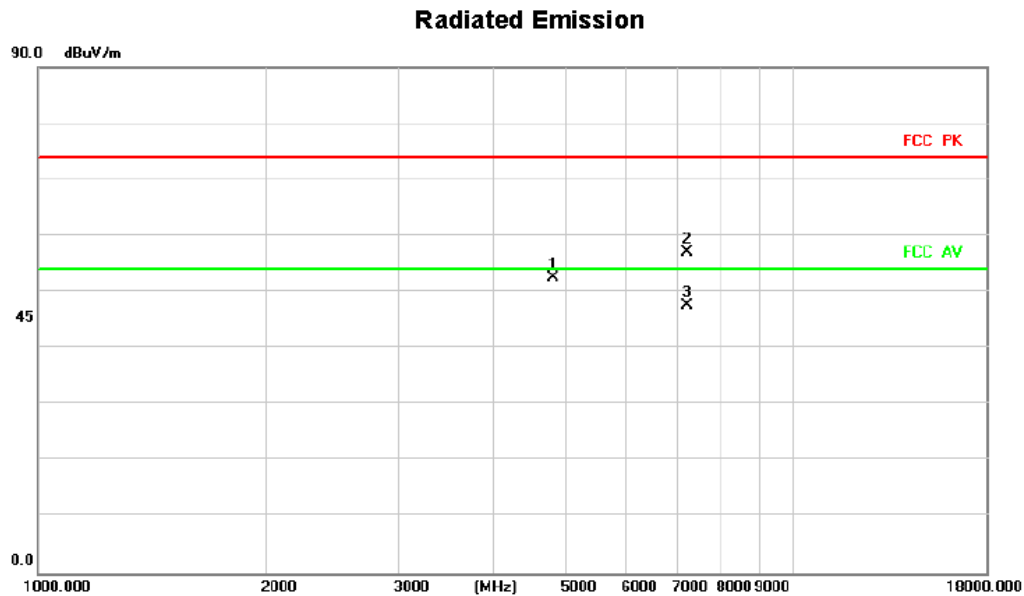


No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	Comment
1		2310.000	48.08	-1.92	46.16	74.00	-27.84	peak	
2	*	2390.000	52.45	-1.67	50.78	74.00	-23.22	peak	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Over = Measurement - Limit.

Test Mode	TX 2402 MHz _CH00_3Mbps	Polarization	Horizontal
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No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	Comment
1		4804.000	54.44	-1.99	52.45	74.00	-21.55	peak	
2		7206.000	53.20	3.87	57.07	74.00	-16.93	peak	
3	*	7206.000	43.71	3.87	47.58	54.00	-6.42	AVG	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
(2) Over = Measurement - Limit.