3.7.5 Test Result of Conducted Spurious Emission

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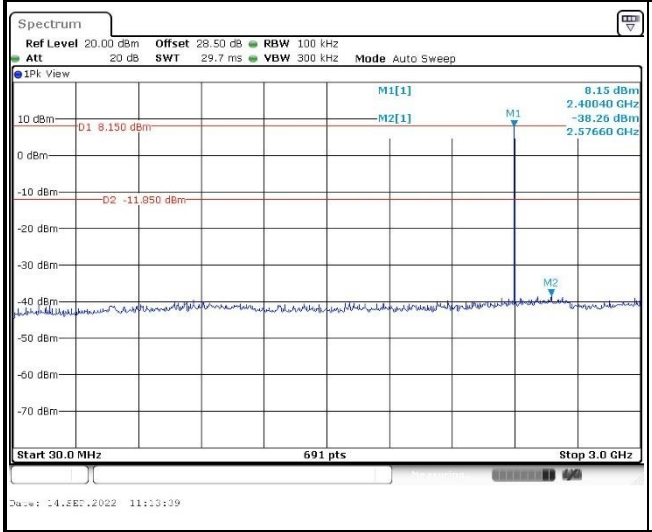
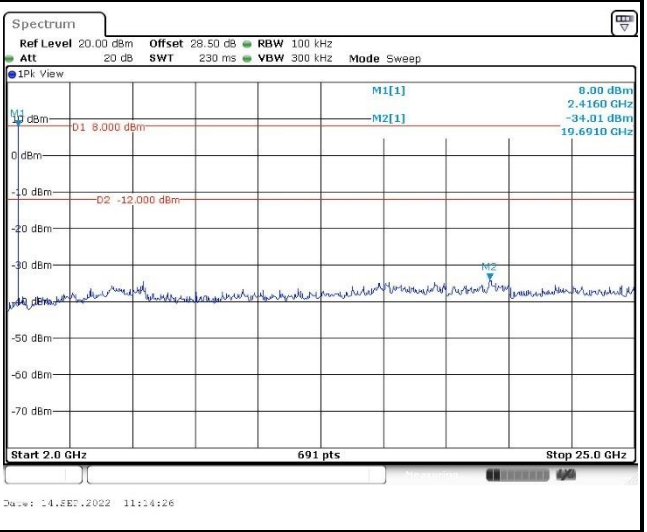
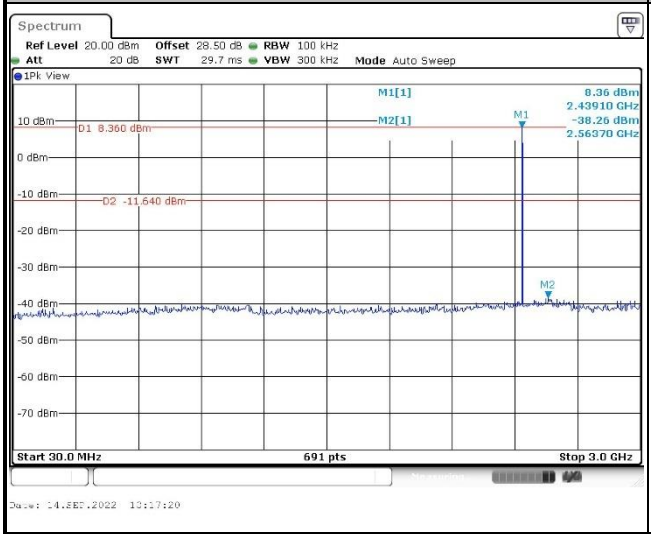
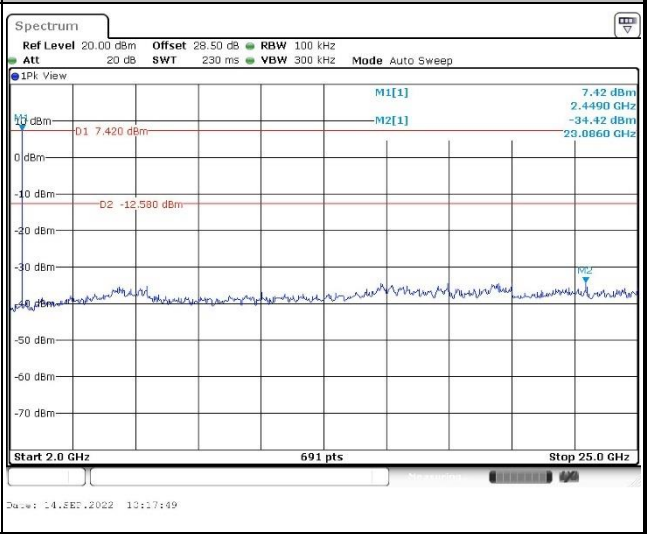
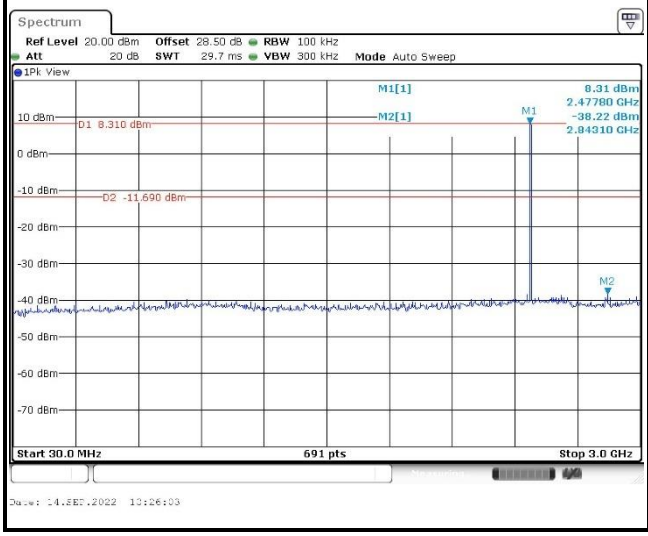
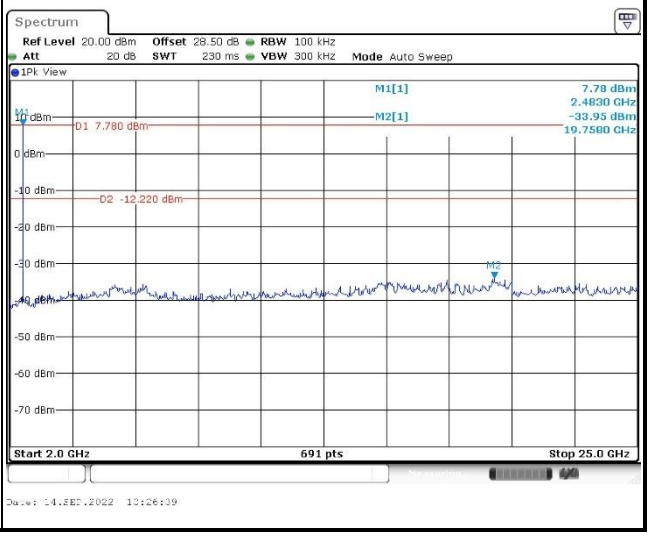
CSE Plot on CH 00 between 30 MHz ~ 3 GHz	CSE Plot on CH 00 between 2 GHz ~ 25 GHz
	
CSE Plot on CH 39 between 30 MHz ~ 3 GHz	**CSE Plot on CH 39 between 2 GHz ~ 25 GHz**
	

CSE Plot on CH 78 between 30 MHz ~ 3 GHz	CSE Plot on CH 78 between 2 GHz ~ 25 GHz
	

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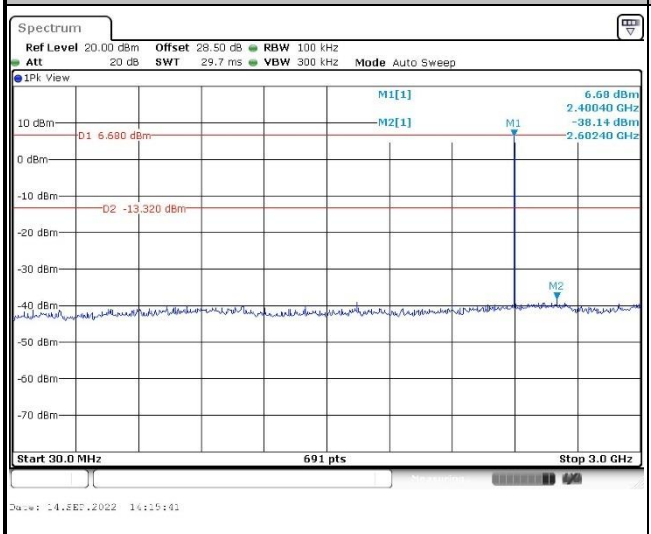	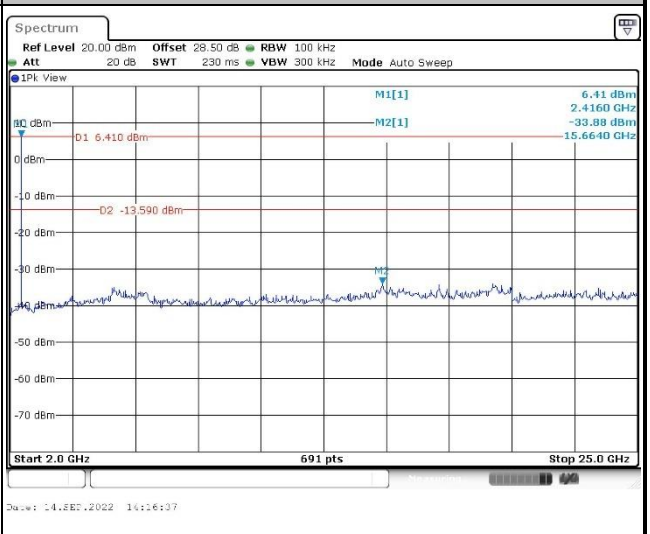
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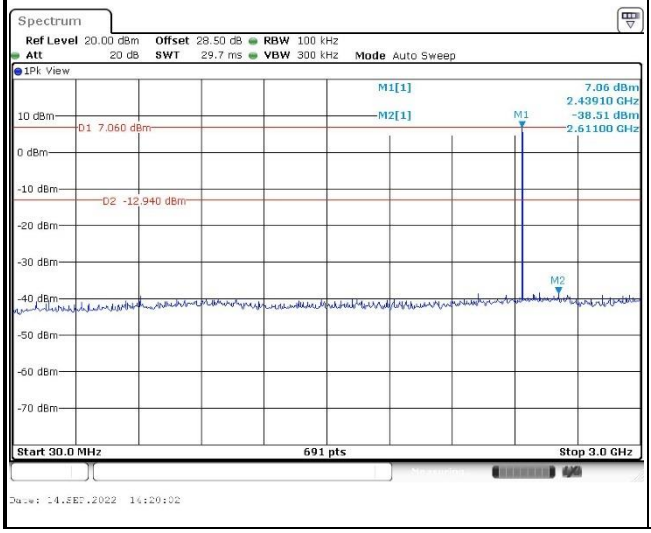
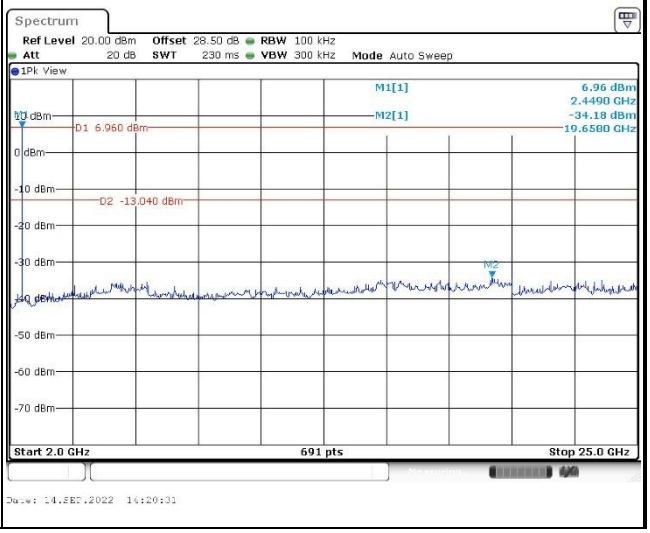
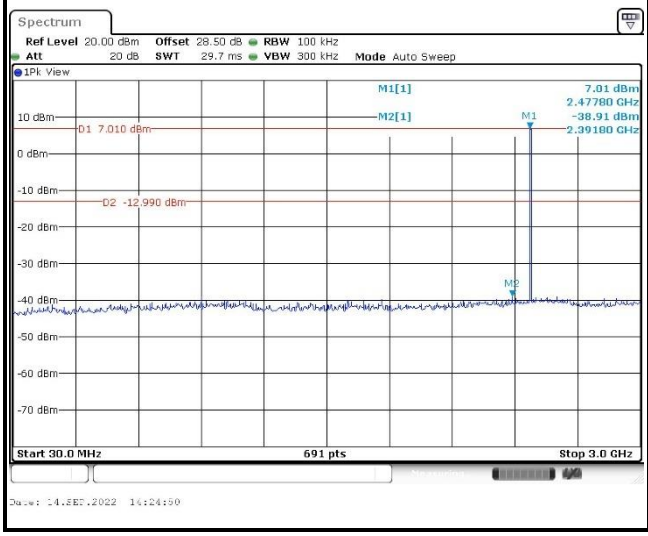
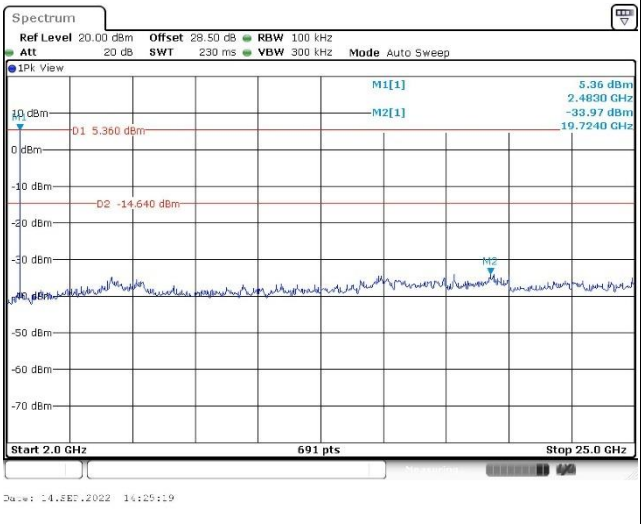
	

CSE Plot on CH 78 between 30 MHz ~ 3 GHz	CSE Plot on CH 78 between 2 GHz ~ 25 GHz
	

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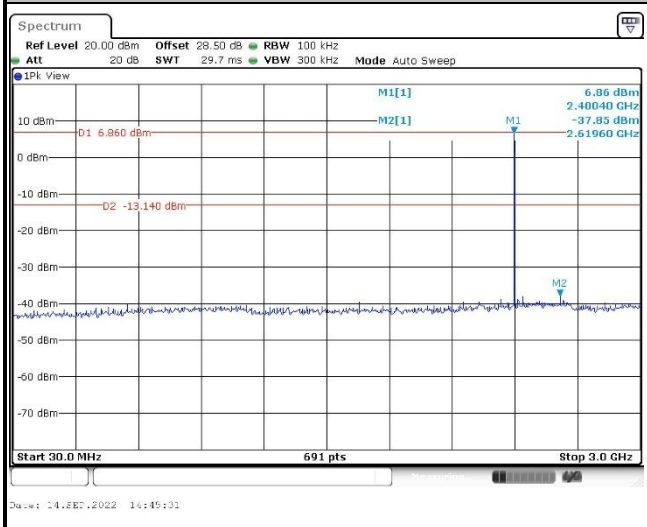
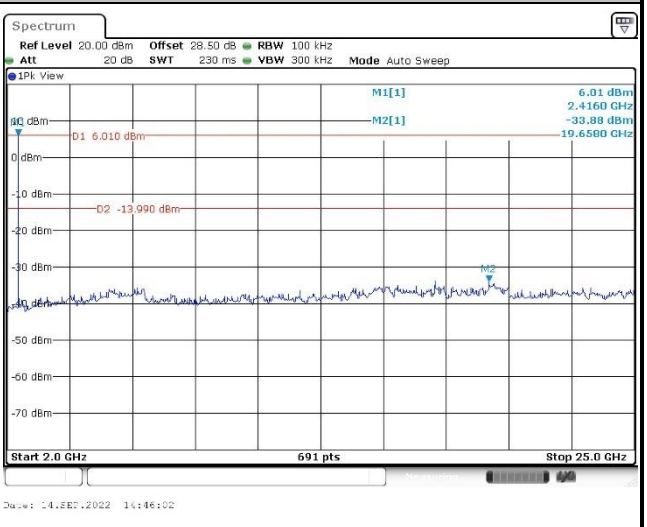
CSE Plot on CH 00 between 30 MHz ~ 3 GHz	CSE Plot on CH 00 between 2 GHz ~ 25 GHz
	
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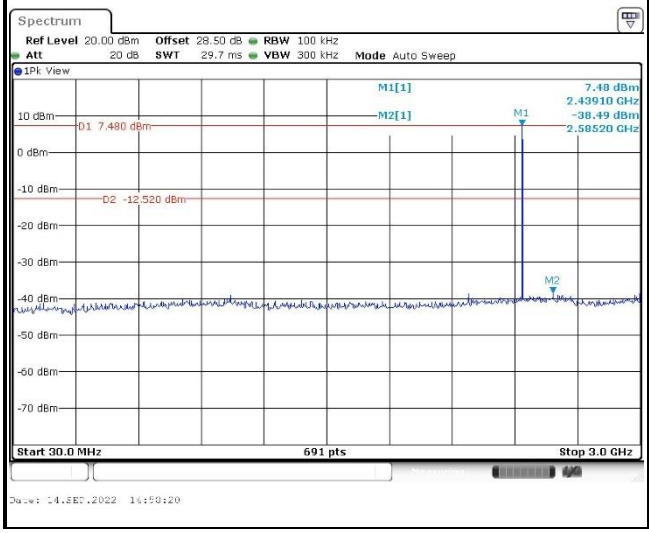
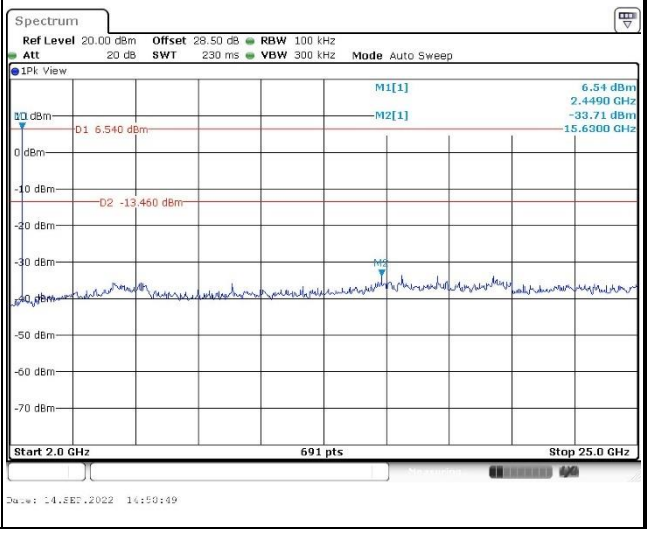
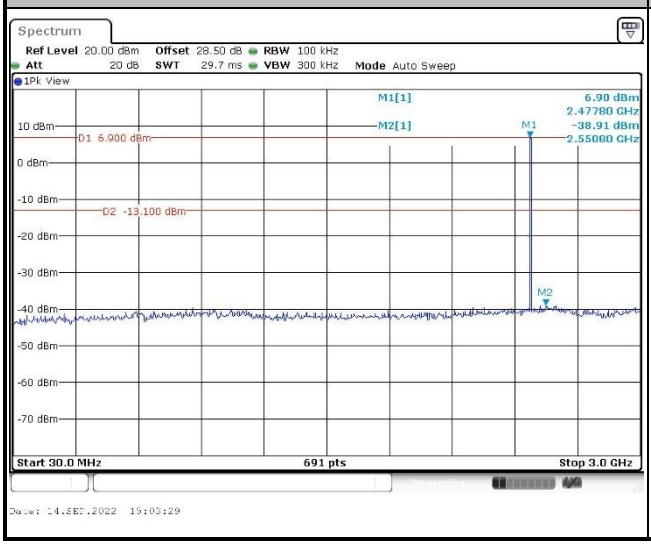
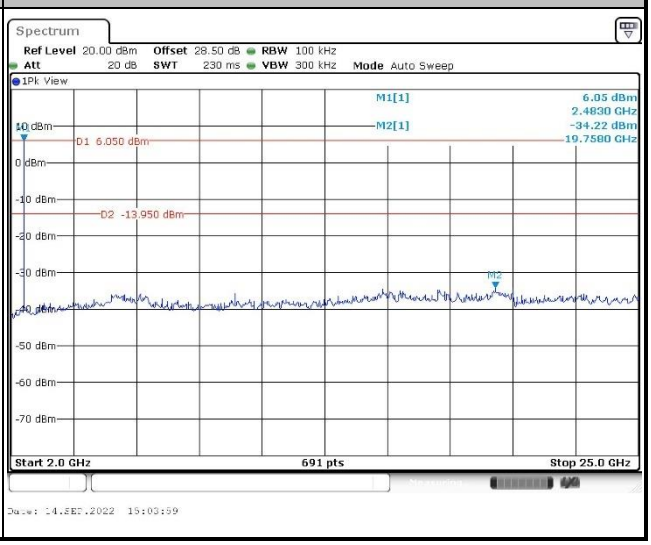
	

CSE Plot on CH 78 between 30 MHz ~ 3 GHz	CSE Plot on CH 78 between 2 GHz ~ 25 GHz
	

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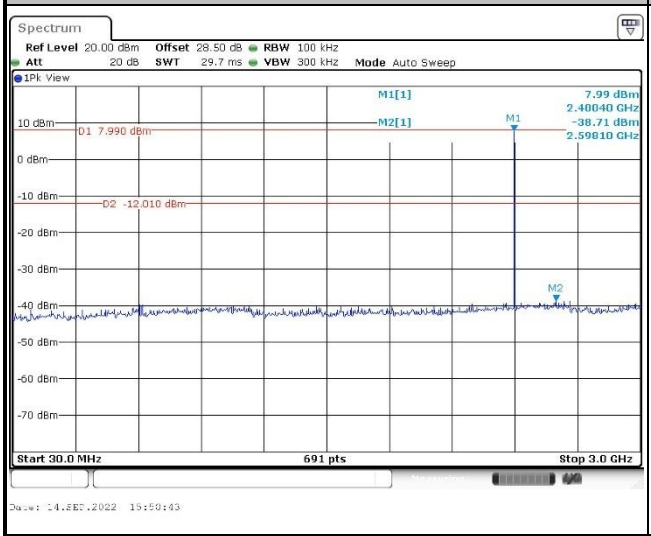
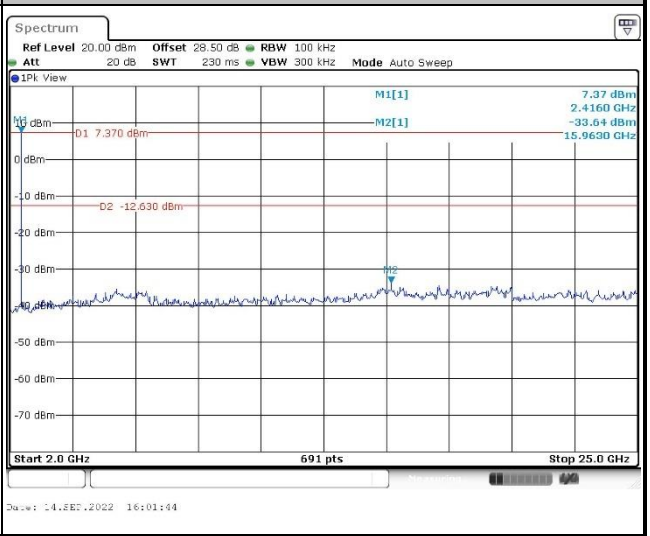
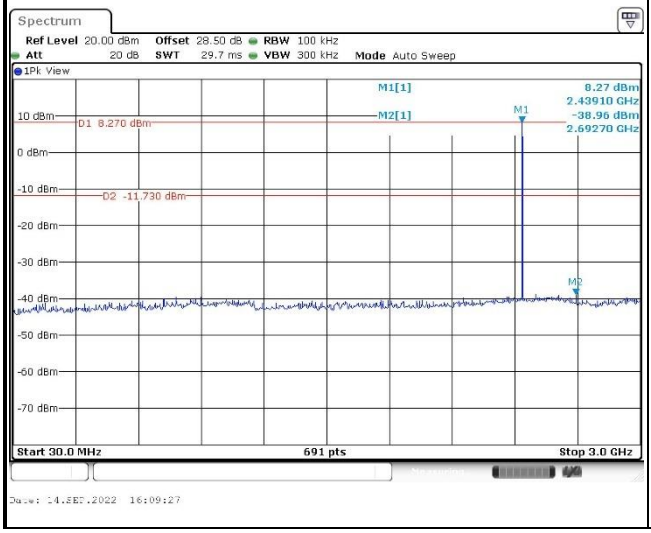
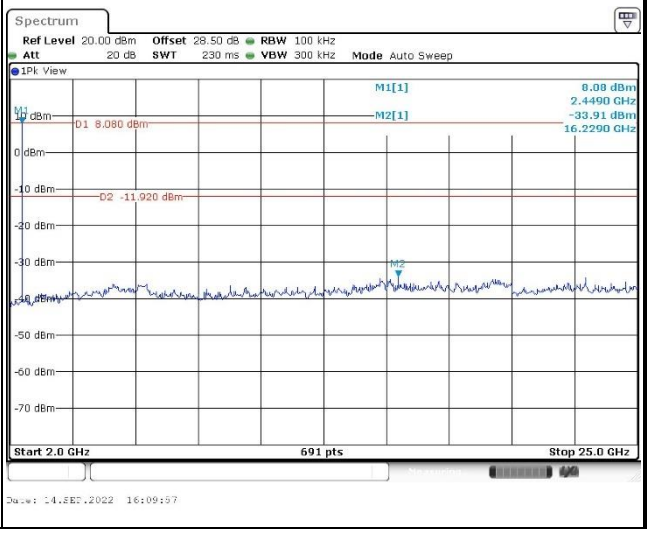
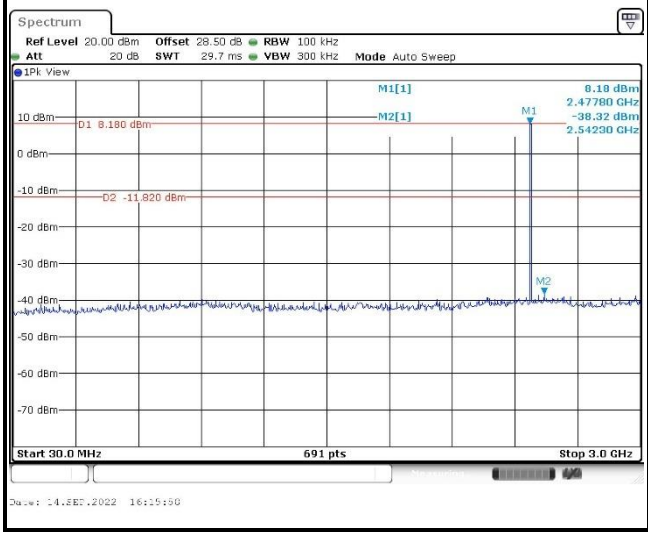
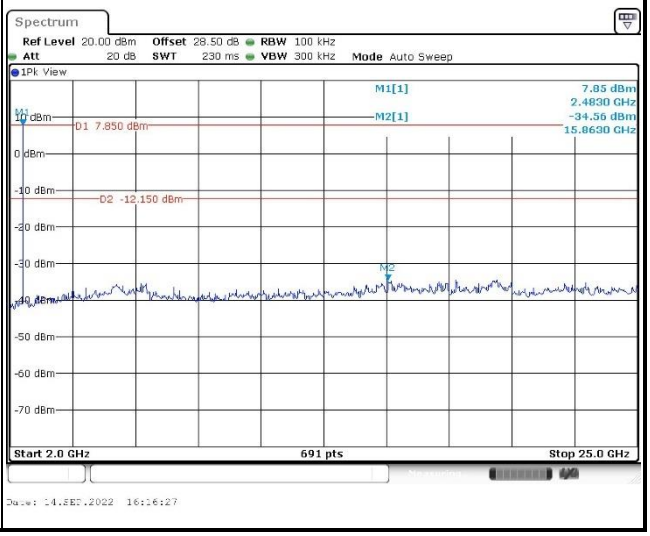
CSE Plot on CH 00 between 30 MHz ~ 3 GHz	CSE Plot on CH 00 between 2 GHz ~ 25 GHz
	
CSE Plot on CH 39 between 30 MHz ~ 3 GHz	**CSE Plot on CH 39 between 2 GHz ~ 25 GHz**
	

CSE Plot on CH 78 between 30 MHz ~ 3 GHz	CSE Plot on CH 78 between 2 GHz ~ 25 GHz
	

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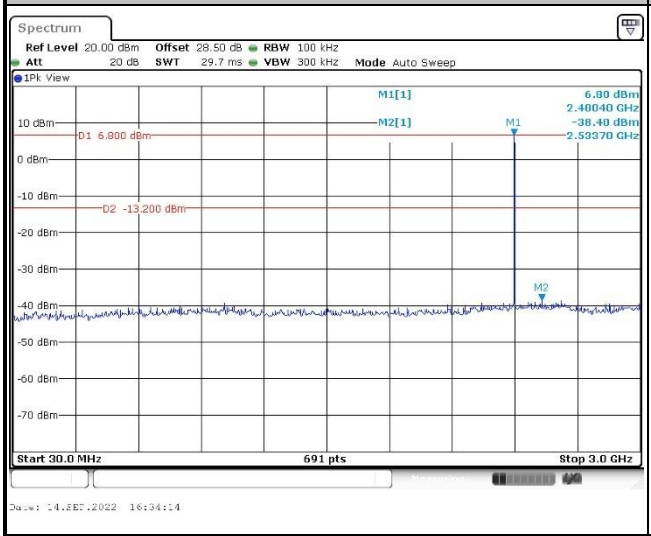
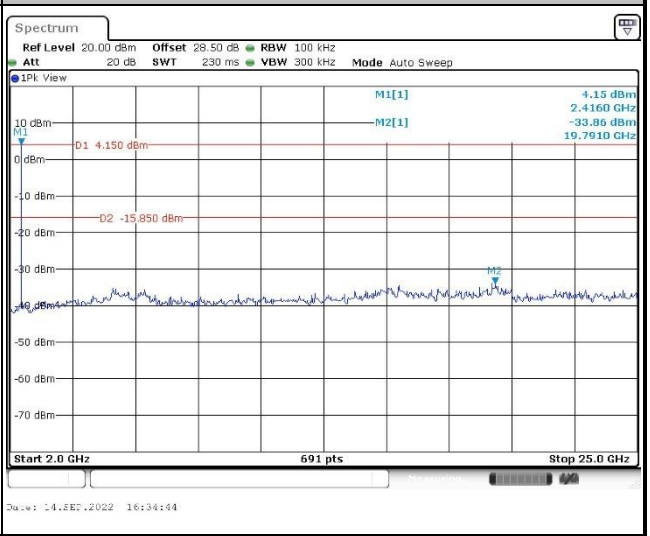
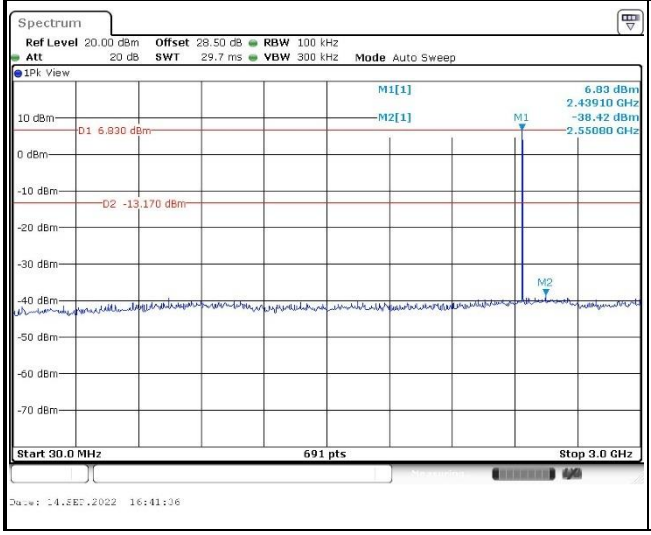
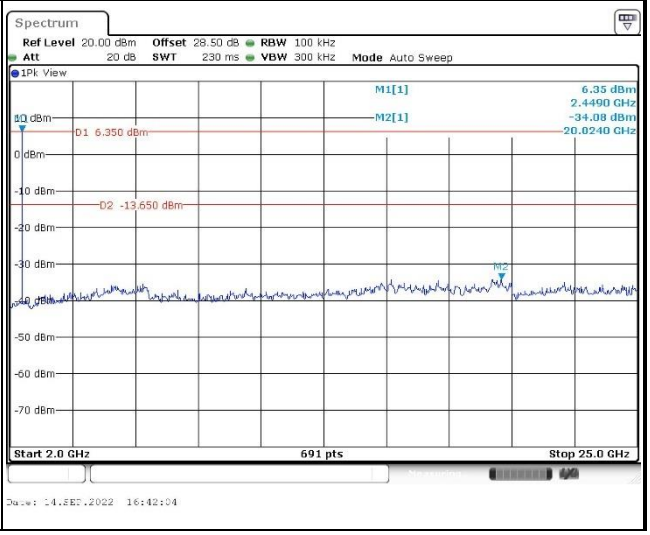
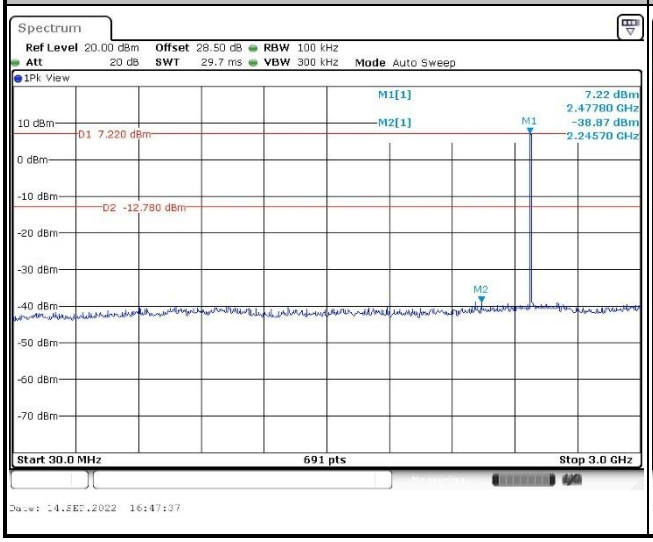
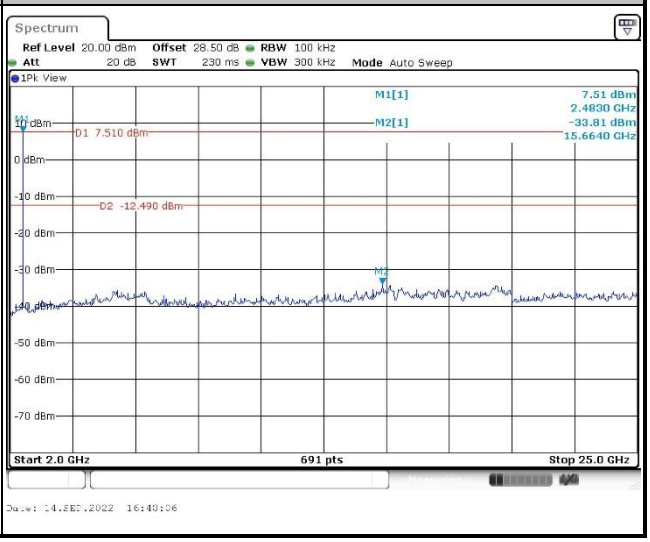
CSE Plot on CH 00 between 30 MHz ~ 3 GHz	CSE Plot on CH 00 between 2 GHz ~ 25 GHz
	
CSE Plot on CH 39 between 30 MHz ~ 3 GHz	**CSE Plot on CH 39 between 2 GHz ~ 25 GHz**
	

CSE Plot on CH 78 between 30 MHz ~ 3 GHz	CSE Plot on CH 78 between 2 GHz ~ 25 GHz
	

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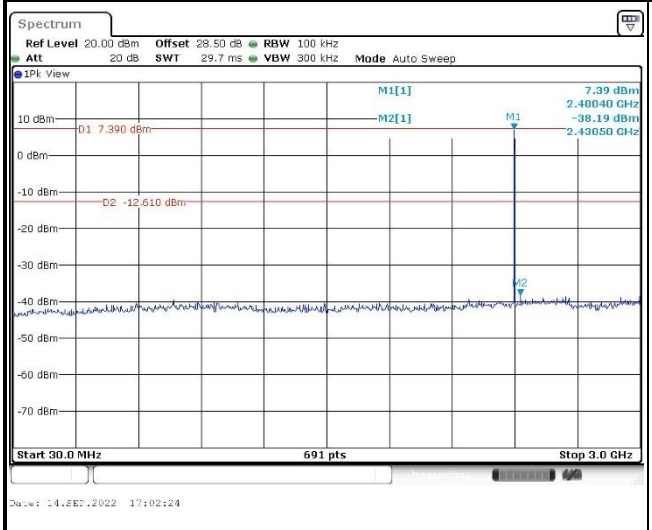
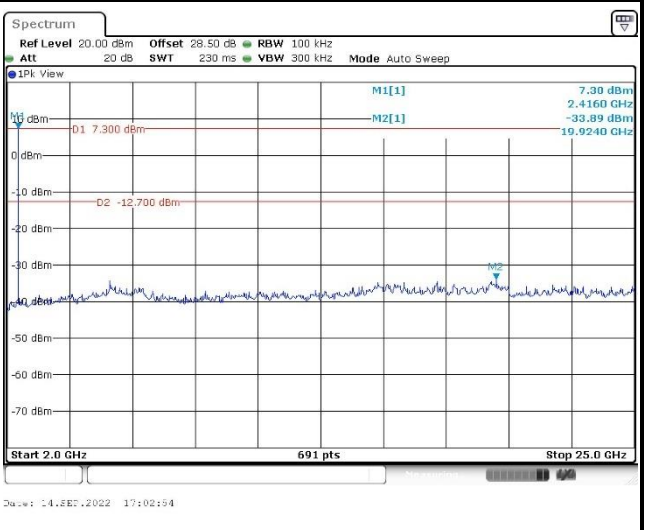
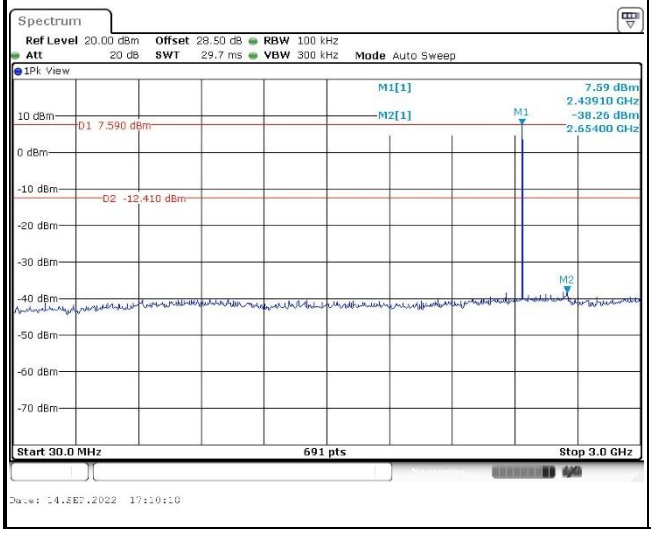
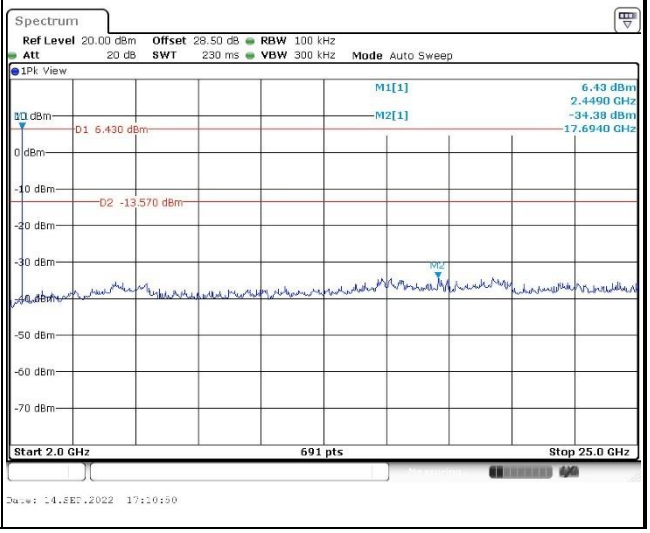
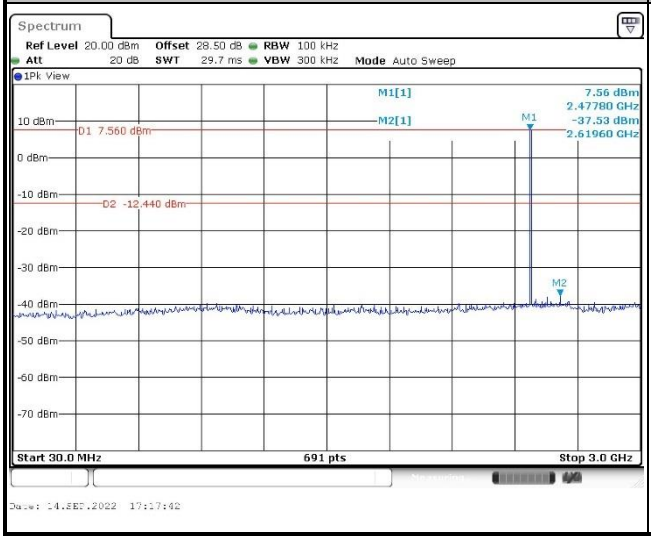
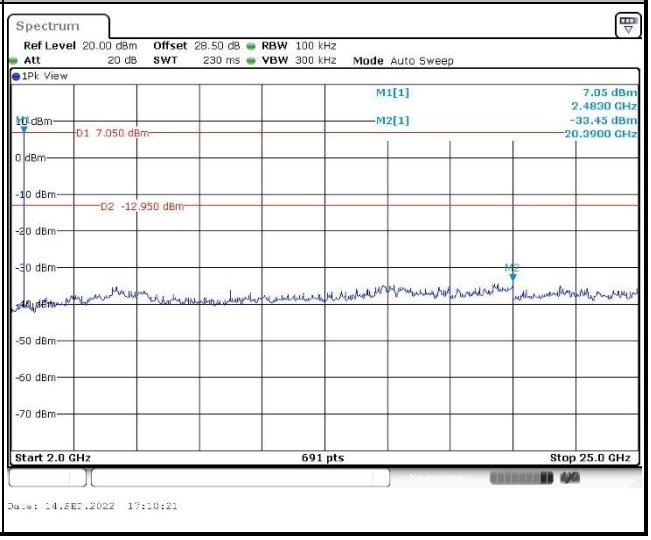
CSE Plot on CH 00 between 30 MHz ~ 3 GHz	CSE Plot on CH 00 between 2 GHz ~ 25 GHz
	
CSE Plot on CH 39 between 30 MHz ~ 3 GHz	**CSE Plot on CH 39 between 2 GHz ~ 25 GHz**
	

CSE Plot on CH 78 between 30 MHz ~ 3 GHz	CSE Plot on CH 78 between 2 GHz ~ 25 GHz
	

3.8 Radiated Band Edges and Spurious Emission Measurement

3.8.1 Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics / spurious must be at least 20 dB below the highest emission level within the authorized band. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.8.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

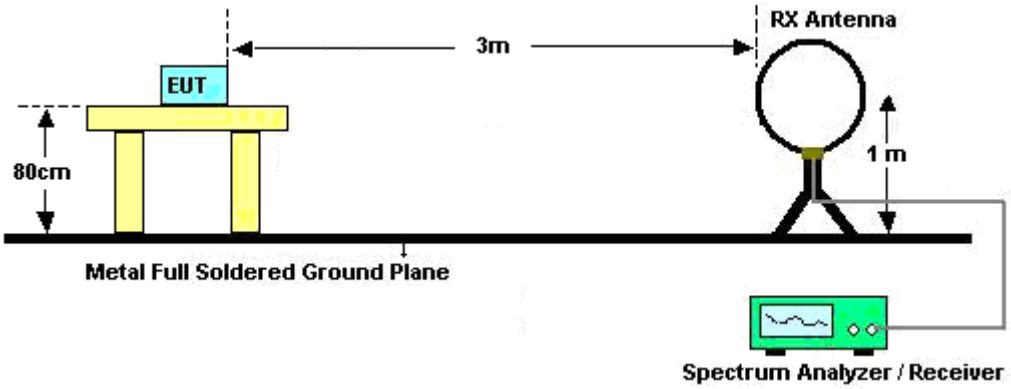
3.8.3 Test Procedures

1. The EUT is placed on a turntable with 0.8 meter for frequency below 1 GHz and 1.5 meter for frequency above 1 GHz respectively above ground.
2. The EUT is set 3 meters away from the receiving antenna, which is mounted on the top of a variable height antenna tower.
3. For each suspected emission, the EUT is arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
4. Set the maximum power setting and enable the EUT to transmit continuously.
5. Use the following spectrum analyzer settings:
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Set RBW = 100 kHz for f < 1 GHz, RBW = 1 MHz for f>1 GHz ; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak
   (3) For average measurement: use duty cycle correction factor method per 15.35(c).
   Duty cycle = On time/100 milliseconds
   On time = $N_1*L_1+N_2*L_2+...+N_{n-1}*LN_{n-1}+N_n*L_n$
   Where N_1 is number of type 1 pulses, L_1 is length of type 1 pulses, etc.
   Average Emission Level = Peak Emission Level + 20*log (Duty cycle)
6. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
7. Radiated testing below 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading. When there is no suspected emission found and the emission level is with at least 6 dB margin against QP limit line, the position is marked as "-".
8. Radiated testing above 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading for scanning all frequencies. When there is no suspected emission found and the harmonic emission level is with at least 6 dB margin against average limit line, the position is marked as "-".

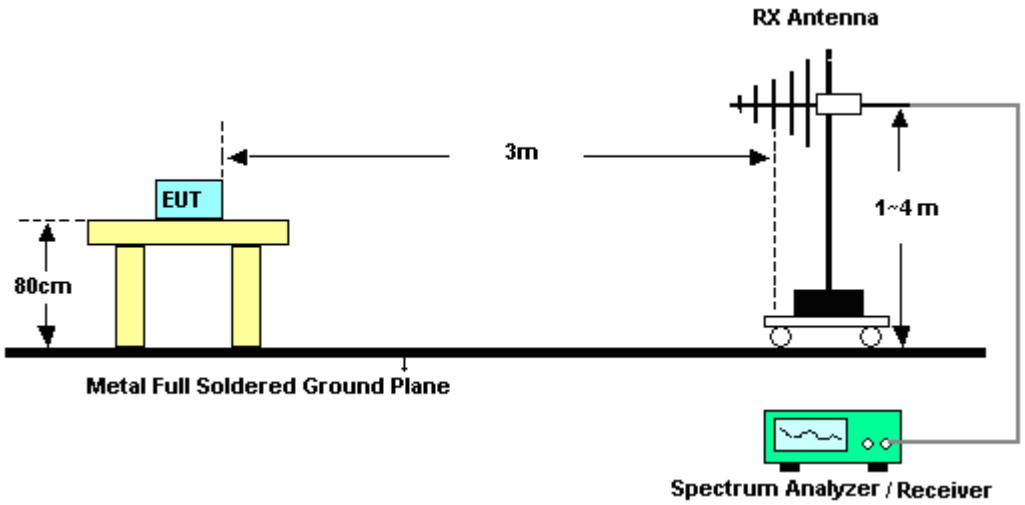
Note: The average levels are calculated from the peak level corrected with duty cycle correction factor (-24.79dB) derived from 20log (dwell time/100ms). This correction is only for signals that hop with the fundamental signal, such as band-edge and harmonic. Other spurious signals that are independent of the hopping signal would not use this correction.

3.8.4 Test Setup

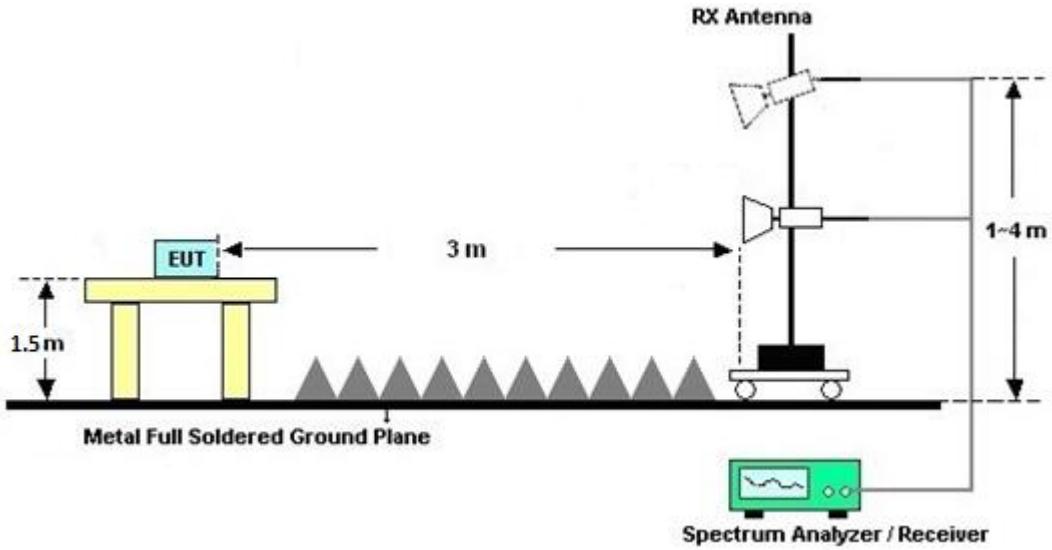
For radiated test below 30MHz



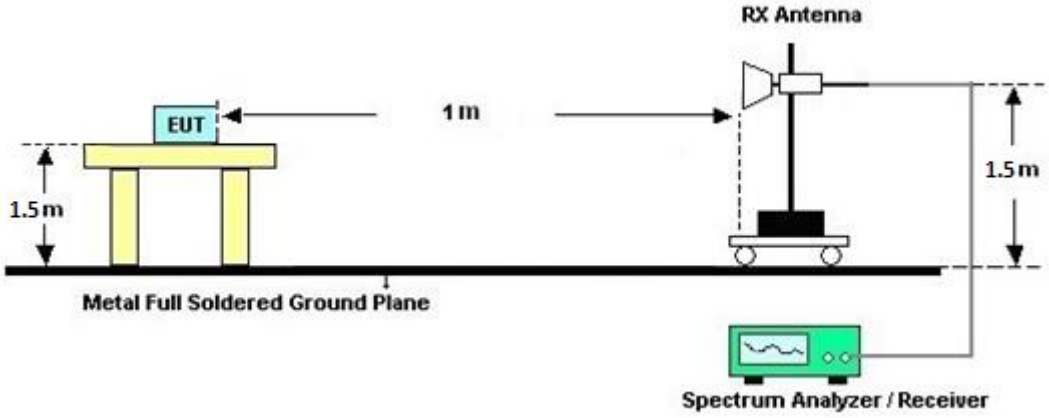
For radiated test from 30MHz to 1GHz



For radiated test from 1GHz to 18GHz



For radiated test above 18GHz



3.8.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

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

There is adequate comparison measurement of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result comes out very similar.

3.8.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix B and C.

3.8.7 Duty Cycle

Please refer to Appendix D.

3.8.8 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic)

Please refer to Appendix B and C.

3.9 Antenna Requirements

3.9.1 Standard Applicable

The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the rule.

3.9.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

4 List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Hygrometer	Testo	608-H1	45141354	N/A	Jul. 27, 2022	Sep. 12, 2022~ Sep. 15, 2022	Jul. 26, 2023	Conducted (TH02-CA)
Power Meter	Anritsu	ML2495A	1804004	N/A	May 10, 2022	Sep. 12, 2022~ Sep. 15, 2022	May 09, 2023	Conducted (TH02-CA)
Switch Box	EM Electronics	EMSW18	SW1070902	N/A	Aug. 01, 2022	Sep. 12, 2022~ Sep. 15, 2022	Jul. 31, 2023	Conducted (TH02-CA)
Spectrum Analyzer	Rohde & Schwarz	FSV40	101545	10Hz-40GHz	May 31, 2022	Sep. 12, 2022~ Sep. 15, 2022	May 30, 2023	Conducted (TH02-CA)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100840	9kHz~30MHz	Jul. 05, 2022	Sep. 19, 2022~ Oct. 07, 2022	Jul. 04, 2023	Radiation (03CH02-CA)
Bilog Antenna	TESEQ	6111D	50392	30MHz~1GHz	Jul. 11, 2022	Sep. 19, 2022~ Oct. 07, 2022	Jul. 10, 2023	Radiation (03CH02-CA)
Horn Antenna	SCHWARZBECK	BBHA 9120D	02113	1GHz~18GHz	Jun. 22, 2022	Sep. 19, 2022~ Oct. 07, 2022	Jun. 21, 2023	Radiation (03CH02-CA)
Horn Antenna	SCHWARZBECK	BBHA 9170D	00842	18GHz~40GHz	Aug. 16, 2022	Sep. 19, 2022~ Oct. 07, 2022	Aug. 15, 2023	Radiation (03CH02-CA)
Amplifier	SONOMA	310N	372240	N/A	May 10, 2022	Sep. 19, 2022~ Oct. 07, 2022	May 09, 2023	Radiation (03CH02-CA)
Preamplifier	Keysight	83017A	MY53270323	1GHz~26.5GHz	May 11, 2022	Sep. 19, 2022~ Oct. 07, 2022	May 10, 2023	Radiation (03CH02-CA)
Preamplifier	E-instrument	ERA-100M-18G-56-01-A70	EC1900251	1GHz~18GHz	May 10, 2022	Sep. 19, 2022~ Oct. 07, 2022	May 09, 2023	Radiation (03CH02-CA)
Preamplifier	EMEC	EMC18G40G	060726	18GHz-40GHz	Feb. 10, 2022	Sep. 19, 2022~ Oct. 07, 2022	Feb. 09, 2023	Radiation (03CH02-CA)
RF Cable	HUBER+SUHNER	SUCOFLEX 102	8024032/2, 802406/2, 802875/2	N/A	Jun. 22, 2022	Sep. 19, 2022~ Oct. 07, 2022	Jun. 21, 2023	Radiation (03CH02-CA)
Spectrum Analyzer	Keysight	N9010A	MY57420221	10Hz~44GHz	Aug. 30, 2022	Sep. 19, 2022~ Oct. 07, 2022	Aug. 29, 2023	Radiation (03CH02-CA)
Filter	Wainwright	WHKX12-2700-3000-18000-60ST	SN10	3GHz High Pass Filter	Jul. 21, 2022	Sep. 19, 2022~ Oct. 07, 2022	Jul. 20, 2023	Radiation (03CH02-CA)
Filter	Wainwright	WLK12-1200-1272-11000-40SS	SN1	1.2GHz Low Pass Filter	Jul. 21, 2022	Sep. 19, 2022~ Oct. 07, 2022	Jul. 20, 2023	Radiation (03CH02-CA)
Hygrometer	TESEO	608-H1	45142602	N/A	Sep. 12, 2022	Sep. 19, 2022~ Oct. 07, 2022	Sep. 11, 2023	Radiation (03CH02-CA)
Controller	ChainTek	EM-1000	060876	NA	N/A	Sep. 19, 2022~ Oct. 07, 2022	N/A	Radiation (03CH02-CA)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Sep. 19, 2022~ Oct. 07, 2022	N/A	Radiation (03CH02-CA)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Sep. 19, 2022~ Oct. 07, 2022	N/A	Radiation (03CH02-CA)
Software	Audix	E3	N/A	N/A	N/A	Sep. 19, 2022~ Oct. 07, 2022	N/A	Radiation (03CH02-CA)

5 Uncertainty of Evaluation

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.70 dB**

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**6.20 dB**

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**6.40 dB**

Appendix A. Test Result of Conducted Test Items

Test Engineer:	Venkata Kondepudi	Temperature:	19.5~24.9	°C
Test Date:	2022/09/13~2022/09/15	Relative Humidity:	48.7~53.1	%

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TEST RESULTS DATA
20dB and 99% Occupied Bandwidth and Hopping Channel Separation

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	20db BW (MHz)	99% Bandwidth (MHz)	Hopping Channel Separation Measurement (MHz)	Hopping Channel Separation Measurement Limit (MHz)	Pass/Fail
DH	1Mbps	1	0	2402	0.967	0.868	1.003	0.6445	Pass
DH	1Mbps	1	39	2441	0.961	0.865	1.007	0.6406	Pass
DH	1Mbps	1	78	2480	0.952	0.860	0.999	0.6348	Pass
2DH	2Mbps	1	0	2402	1.350	1.178	1.003	0.9001	Pass
2DH	2Mbps	1	39	2441	1.350	1.178	1.003	0.9001	Pass
2DH	2Mbps	1	78	2480	1.346	1.181	1.025	0.8973	Pass
3DH	3Mbps	1	0	2402	1.307	1.166	0.999	0.8712	Pass
3DH	3Mbps	1	39	2441	1.306	1.169	1.003	0.8707	Pass
3DH	3Mbps	1	78	2480	1.311	1.169	1.007	0.8741	Pass

TEST RESULTS DATA
Dwell Time

Mod.	Hopping Channel Number	Hops Over Occupancy Time (hops)	Package Transfer Time (msec)	Dwell Time (sec)	Limits (sec)	Pass/Fail
2DH5	79	106.667	2.88	0.31	0.4	Pass

TEST RESULTS DATA
Peak Power Table

DH	CH.	NTX	Peak Power (dBm)	Power Limit (dBm)	Test Result
DH1	0	1	**8.55**	30.00	Pass
	39	1	8.45	30.00	Pass
	78	1	8.44	30.00	Pass
2DH1	0	1	9.76	20.97	Pass
	39	1	9.76	20.97	Pass
	78	1	**9.77**	20.97	Pass
3DH1	0	1	10.13	20.97	Pass
	39	1	**10.14**	20.97	Pass
	78	1	**10.14**	20.97	Pass

TEST RESULTS DATA
Average Power Table
(Reporting Only)

DH	CH.	NTX	Average Power (dBm)	Duty Factor (dB)
DH1	0	1	**8.44**	5.22
	39	1	8.34	5.22
	78	1	8.33	5.22
2DH1	0	1	**7.35**	5.08
	39	1	7.28	5.08
	78	1	7.26	5.08
3DH1	0	1	**7.43**	5.16
	39	1	7.38	5.16
	78	1	7.30	5.16

TEST RESULTS DATA
Number of Hopping Frequency

Number of Hopping (Channel)	Limits (Channel)	Pass/Fail
79	> 15	Pass

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TEST RESULTS DATA
20dB and 99% Occupied Bandwidth and Hopping Channel Separation

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	20db BW (MHz)	99% Bandwidth (MHz)	Hopping Channel Separation Measurement (MHz)	Hopping Channel Separation Measurement Limit (MHz)	Pass/Fail
DH	1Mbps	1	0	2402	0.961	0.863	0.999	0.6406	Pass
DH	1Mbps	1	39	2441	0.961	0.863	1.007	0.6406	Pass
DH	1Mbps	1	78	2480	0.958	0.860	1.003	0.6387	Pass
2DH	2Mbps	1	0	2402	1.346	1.181	1.090	0.8973	Pass
2DH	2Mbps	1	39	2441	1.346	1.178	1.003	0.8973	Pass
2DH	2Mbps	1	78	2480	1.346	1.178	1.111	0.8973	Pass
3DH	3Mbps	1	0	2402	1.307	1.169	0.999	0.8712	Pass
3DH	3Mbps	1	39	2441	1.307	1.169	0.999	0.8712	Pass
3DH	3Mbps	1	78	2480	1.307	1.169	1.020	0.8712	Pass

TEST RESULTS DATA
Dwell Time

Mod.	Hopping Channel Number Rate	Hops Over Occupancy Time (hops)	Package Transfer Time (msec)	Dwell Time (sec)	Limits (sec)	Pass/Fail
3DH5	79	106.667	2.90	0.31	0.4	Pass

TEST RESULTS DATA
Peak Power Table

DH	CH.	NTX	Peak Power (dBm)	Power Limit (dBm)	Test Result
DH1	0	1	8.34	30.00	Pass
	39	1	8.36	30.00	Pass
	78	1	**8.41**	30.00	Pass
2DH1	0	1	9.76	20.97	Pass
	39	1	9.77	20.97	Pass
	78	1	**9.86**	20.97	Pass
3DH1	0	1	10.22	20.97	Pass
	39	1	10.24	20.97	Pass
	78	1	**10.32**	20.97	Pass

TEST RESULTS DATA
Average Power Table
(Reporting Only)

DH	CH.	NTX	Average Power (dBm)	Duty Factor (dB)
DH1	0	1	8.18	5.22
	39	1	8.27	5.22
	78	1	**8.36**	5.22
2DH1	0	1	**7.51**	5.22
	39	1	7.44	5.22
	78	1	7.46	5.22
3DH1	0	1	**7.36**	5.08
	39	1	7.33	5.08
	78	1	7.31	5.08

TEST RESULTS DATA
Number of Hopping Frequency

Number of Hopping (Channel)	Limits (Channel)	Pass/Fail
79	> 15	Pass

Appendix B. Radiated Spurious Emission

Test Engineer :	Daniel Lee	Temperature :	22.2 ~ 24.3°C
		Relative Humidity :	46.8 ~ 50.7%

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2.4GHz 2400~2483.5MHz

BT (Band Edge @ 3m)

BT	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BT CH00 2402MHz		2388.12	45.93	-28.07	74	42.71	27.28	7.44	31.5	330	322	P	H
		2388.12	21.14	-32.86	54	-	-	-	-	-	-	A	H
	*	2402	102.7	-	-	99.35	27.38	7.46	31.49	330	322	P	H
	*	2402	77.91	-	-	-	-	-	-	-	-	A	H
		2387.49	44.98	-29.02	74	41.77	27.28	7.44	31.51	383	269	P	V
		2387.49	20.19	-33.81	54	-	-	-	-	-	-	A	V
	*	2402	99.67	-	-	96.32	27.38	7.46	31.49	383	269	P	V
	*	2402	74.88	-	-	-	-	-	-	-	-	A	V
BT CH 39 2441MHz		2386.58	45.28	-28.72	74	42.07	27.28	7.44	31.51	256	319	P	H
		2386.58	20.49	-33.51	54	-	-	-	-	-	-	A	H
	*	2441	103.21	-	-	99.68	27.47	7.53	31.47	256	319	P	H
	*	2441	78.42	-	-	-	-	-	-	-	-	A	H
		2497.34	45.32	-28.68	74	41.35	27.8	7.62	31.45	256	319	P	H
		2497.34	20.53	-33.47	54	-	-	-	-	-	-	A	H
		2314.2	44.54	-29.46	74	41.67	27.09	7.32	31.54	380	90	P	V
		2314.2	19.75	-34.25	54	-	-	-	-	-	-	A	V
	*	2441	99.63	-	-	96.1	27.47	7.53	31.47	380	90	P	V
	*	2441	74.84	-	-	-	-	-	-	-	-	A	V
		2494.82	44.97	-29.03	74	41.05	27.77	7.61	31.46	380	90	P	V
		2494.82	20.18	-33.82	54	-	-	-	-	-	-	A	V

BT CH 78 2480MHz	*	2480	103.18	-	-	99.37	27.68	7.59	31.46	276	320	P	H
	*	2480	78.39	-	-	-	-	-	-	-	-	A	H
		2483.6	58.59	-15.41	74	54.76	27.7	7.59	31.46	276	320	P	H
		2483.6	33.8	-20.2	54	-	-	-	-	-	-	A	H
	*	2480	99.95	-	-	96.14	27.68	7.59	31.46	400	272	P	V
	*	2480	75.16	-	-	-	-	-	-	-	-	A	V
		2483.64	56.2	-17.8	74	52.37	27.7	7.59	31.46	400	272	P	V
		2483.64	31.41	-22.59	54	-	-	-	-	-	-	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

BT (Harmonic @ 3m)

BT	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
BT CH 00 2402MHz		4804	41.6	-32.4	74	65.48	32.43	11.57	67.88	-	-	P	H
		4804	16.81	-37.19	54	-	-	-	-	-	-	A	H
		4804	40.41	-33.59	74	64.29	32.43	11.57	67.88	-	-	P	V
		4804	15.62	-38.38	54	-	-	-	-	-	-	A	V
BT CH 39 2441MHz		4882	40.55	-33.45	74	64.16	32.74	11.57	67.92	-	-	P	H
		4882	15.76	-38.24	54	-	-	-	-	-	-	A	H
		7323	45.61	-28.39	74	61.81	36.8	14.1	67.1	-	-	P	H
		7323	20.82	-33.18	54	-	-	-	-	-	-	A	H
		4882	41.57	-32.43	74	65.18	32.74	11.57	67.92	-	-	P	V
		4882	16.78	-37.22	54	-	-	-	-	-	-	A	V
		7323	44.48	-29.52	74	60.68	36.8	14.1	67.1	-	-	P	V
		7323	19.69	-34.31	54	-	-	-	-	-	-	A	V
BT CH 78 2480MHz		4960	41.63	-32.37	74	65.03	33.08	11.58	68.06	-	-	P	H
		4960	16.84	-37.16	54	-	-	-	-	-	-	A	H
		7440	43.51	-30.49	74	60.21	36.33	14.2	67.23	-	-	P	H
		7440	18.72	-35.28	54	-	-	-	-	-	-	A	H
		4960	40.56	-33.44	74	63.96	33.08	11.58	68.06	-	-	P	V
		4960	15.77	-38.23	54	-	-	-	-	-	-	A	V
		7440	44.43	-29.57	74	61.13	36.33	14.2	67.23	-	-	P	V
		7440	19.64	-34.36	54	-	-	-	-	-	-	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line. 3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.												

Emission above 18GHz

2.4GHz BT (SHF)

BT	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz BT SHF		23145	38.94	-35.06	74	37.86	38.64	14.69	52.25	-	-	P	H
		24104	38.38	-35.62	74	36.89	38.54	15.37	52.42	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line. 3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.												

Emission below 1GHz

2.4GHz BT (LF)

BT	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz BT LF		98.87	18.47	-25.03	43.5	33.26	15.89	1.73	32.41	-	-	P	H
		562.53	26.3	-19.7	46	28.92	26.15	3.85	32.62	-	-	P	H
		640.13	27.38	-18.62	46	29.35	26.5	4.13	32.6	-	-	P	H
		730.34	30.6	-15.4	46	30.99	27.52	4.55	32.46	-	-	P	H
		864.2	31.36	-14.64	46	29.24	29.1	4.88	31.86	-	-	P	H
		938.89	33.53	-12.47	46	29.37	30.43	5.04	31.31	-	-	P	H
		98.87	23.61	-19.89	43.5	38.4	15.89	1.73	32.41	-	-	P	V
		478.14	25.31	-20.69	46	30.83	23.46	3.59	32.57	-	-	P	V
		551.86	26.18	-19.82	46	29.36	25.62	3.82	32.62	-	-	P	V
		639.16	27.57	-18.43	46	29.55	26.5	4.12	32.6	-	-	P	V
		762.35	29.87	-16.13	46	29.42	28.2	4.62	32.37	-	-	P	V
		913.67	32.2	-13.8	46	29.5	29.27	4.95	31.52	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line. 3. The emission position marked as “-” means no suspected emission found and emission level has at least 6dB margin against limit or noise floor only.												

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2.4GHz 2400~2483.5MHz

BT (Band Edge @ 3m)

BT	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BT CH00 2402MHz		2389.065	45.45	-28.55	74	42.22	27.29	7.44	31.5	298	218	P	H
		2389.065	20.69	-33.31	54	-	-	-	-	-	-	A	H
	*	2402	102.56	-	-	99.21	27.38	7.46	31.49	298	218	P	H
	*	2402	77.8	-	-	-	-	-	-	-	-	A	H
		2389.065	45.19	-28.81	74	41.96	27.29	7.44	31.5	385	269	P	V
		2389.065	20.43	-33.57	54	-	-	-	-	-	-	A	V
	*	2402	98.27	-	-	94.92	27.38	7.46	31.49	385	269	P	V
	*	2402	73.51	-	-	-	-	-	-	-	-	A	V
BT CH 39 2441MHz		2384.2	44.49	-29.51	74	41.3	27.27	7.43	31.51	221	223	P	H
		2384.2	19.73	-34.27	54	-	-	-	-	-	-	A	H
	*	2441	102.62	-	-	99.09	27.47	7.53	31.47	221	223	P	H
	*	2441	77.86	-	-	-	-	-	-	-	-	A	H
		2485.65	45.36	-28.64	74	41.51	27.71	7.6	31.46	221	223	P	H
		2485.65	20.6	-33.4	54	-	-	-	-	-	-	A	H
		2366.98	44.55	-29.45	74	41.47	27.19	7.41	31.52	394	270	P	V
		2366.98	19.79	-34.21	54	-	-	-	-	-	-	A	V
	*	2441	101.12	-	-	97.59	27.47	7.53	31.47	394	270	P	V
	*	2441	76.36	-	-	-	-	-	-	-	-	A	V
		2496.85	45.55	-28.45	74	41.6	27.79	7.61	31.45	394	270	P	V
		2496.85	20.79	-33.21	54	-	-	-	-	-	-	A	V

BT CH 78 2480MHz	*	2480	102.59	-	-	98.78	27.68	7.59	31.46	198	218	P	H
	*	2480	77.83	-	-	-	-	-	-	-	-	A	H
		2483.6	58.34	-15.66	74	54.51	27.7	7.59	31.46	198	218	P	H
		2483.6	33.58	-20.42	54	-	-	-	-	-	-	A	H
	*	2480	98.48	-	-	94.67	27.68	7.59	31.46	400	272	P	V
	*	2480	73.72	-	-	-	-	-	-	-	-	A	V
		2483.52	54.5	-19.5	74	50.67	27.7	7.59	31.46	400	272	P	V
		2483.52	29.74	-24.26	54	-	-	-	-	-	-	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

BT (Harmonic @ 3m)

BT	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
BT CH 00 2402MHz		4804	41.38	-32.62	74	65.26	32.43	11.57	67.88	-	-	P	H
		4804	16.62	-37.38	54	-	-	-	-	-	-	A	H
		4804	41	-33	74	64.88	32.43	11.57	67.88	-	-	P	V
		4804	16.24	-37.76	54	-	-	-	-	-	-	A	V
BT CH 39 2441MHz		4882	40.54	-33.46	74	64.15	32.74	11.57	67.92	-	-	P	H
		4882	15.78	-38.22	54	-	-	-	-	-	-	A	H
		7323	45.52	-28.48	74	61.72	36.8	14.1	67.1	-	-	P	H
		7323	20.76	-33.24	54	-	-	-	-	-	-	A	H
		4882	40.33	-33.67	74	63.94	32.74	11.57	67.92	-	-	P	V
		4882	15.57	-38.43	54	-	-	-	-	-	-	A	V
		7323	44.86	-29.14	74	61.06	36.8	14.1	67.1	-	-	P	V
		7323	20.1	-33.9	54	-	-	-	-	-	-	A	V
BT CH 78 2480MHz		4960	41.39	-32.61	74	64.79	33.08	11.58	68.06	-	-	P	H
		4960	16.63	-37.37	54	-	-	-	-	-	-	A	H
		7440	44.11	-29.89	74	60.81	36.33	14.2	67.23	-	-	P	H
		7440	19.35	-34.65	54	-	-	-	-	-	-	A	H
		4960	41.21	-32.79	74	64.61	33.08	11.58	68.06	-	-	P	V
		4960	16.45	-37.55	54	-	-	-	-	-	-	A	V
		7440	43.58	-30.42	74	60.28	36.33	14.2	67.23	-	-	P	V
		7440	18.82	-35.18	54	-	-	-	-	-	-	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line. 3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.												

Emission above 18GHz

2.4GHz BT (SHF)

BT	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz BT SHF		23978	38.46	-35.54	74	37.03	38.47	15.3	52.34	-	-	P	H
		22886	38.35	-35.65	74	37.48	38.57	14.5	52.2	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line. 3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.												

Emission below 1GHz

2.4GHz BT (LF)

BT	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz BT LF		105.66	21.09	-22.41	43.5	35.18	16.57	1.75	32.41	-	-	P	H
		556.71	26.36	-19.64	46	29.08	26.07	3.83	32.62	-	-	P	H
		645.95	27.74	-18.26	46	29.68	26.5	4.16	32.6	-	-	P	H
		785.63	30.45	-15.55	46	30.21	27.9	4.62	32.28	-	-	P	H
		878.75	31.4	-14.6	46	29.27	29.02	4.88	31.77	-	-	P	H
		940.83	32.5	-13.5	46	28.22	30.53	5.04	31.29	-	-	P	H
		98.87	23.34	-20.16	43.5	38.13	15.89	1.73	32.41	-	-	P	V
		577.08	26.29	-19.71	46	29.22	25.8	3.89	32.62	-	-	P	V
		647.89	26.97	-19.03	46	28.9	26.5	4.16	32.59	-	-	P	V
		733.25	30.31	-15.69	46	30.51	27.69	4.56	32.45	-	-	P	V
		858.38	31.37	-14.63	46	29.29	29.1	4.87	31.89	-	-	P	V
		944.71	32.87	-13.13	46	28.38	30.69	5.06	31.26	-	-	P	V

Remark

1. No other spurious found.
2. All results are PASS against limit line.
3. The emission position marked as “-” means no suspected emission found and emission level has at least 6dB margin against limit or noise floor only.

Note symbol

*	**Fundamental Frequency** which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is **over limit** line.
P/A	**P**eak or **A**verage
H/V	**H**orizontal or **V**ertical

A calculation example for radiated spurious emission is shown as below:

BT	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BT CH 00 2402MHz		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)
2. Level(dBμV/m) =

Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

3. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

Peak measured complies with the limit line, so test result is “PASS”.

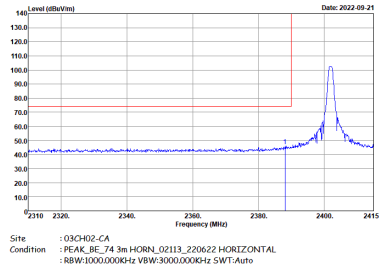
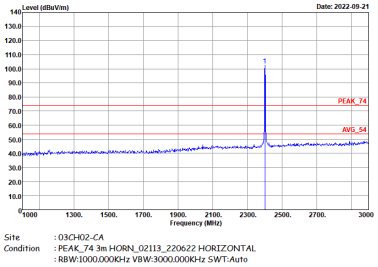
Appendix C. Radiated Spurious Emission Plots

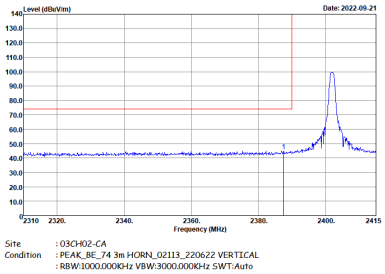
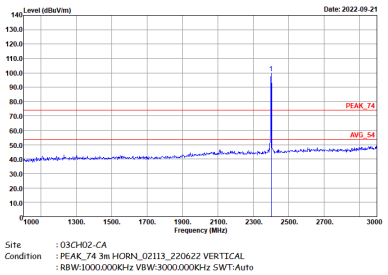
Test Engineer :	Daniel Lee	Temperature :	22.2 ~ 24.3°C
		Relative Humidity :	46.8 ~ 50.7%

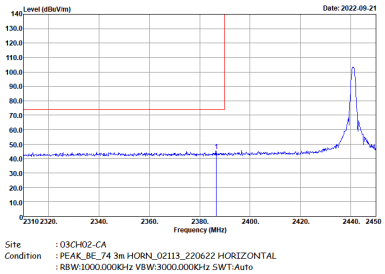
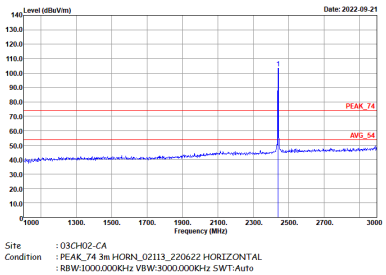
<Left>

2.4GHz 2400~2483.5MHz

BT (Band Edge @ 3m)

BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH00 2402MHz	
	Horizontal	Fundamental
Peak		

BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH00 2402MHz	
	Vertical	Fundamental
Peak		

<table>
<tr><td>BT</td><td colspan="2">2.4GHz 2400~2483.5MHz Band Edge @ 3m</td></tr>
<tr><td></td><td colspan="2">BT CH39 2441MHz</td></tr>
<tr><td></td><td>Horizontal</td><td>Fundamental</td></tr>
<tr><td>Peak</td><td> 
</td><td> 
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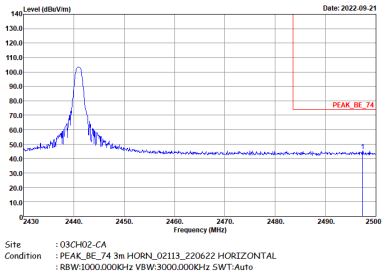
<tr><td>Peak</td><td> 
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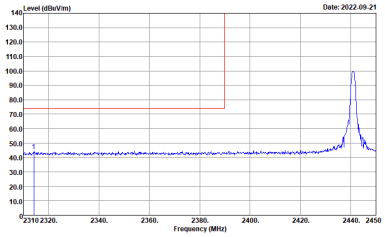
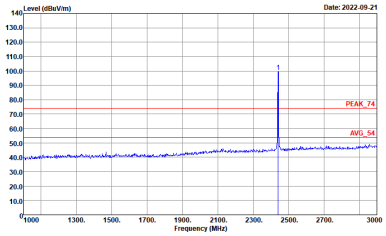
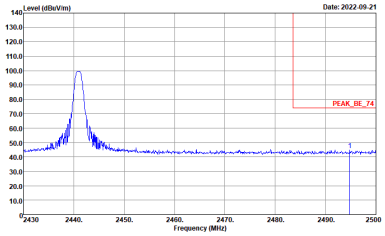
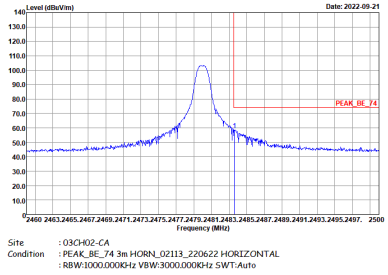
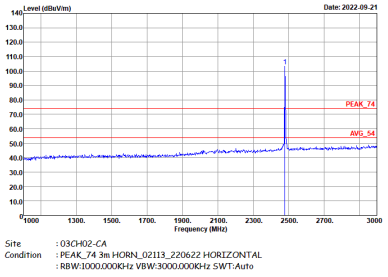
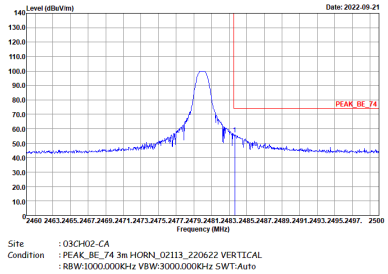
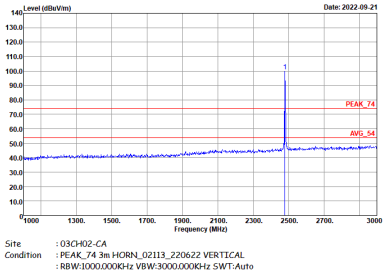
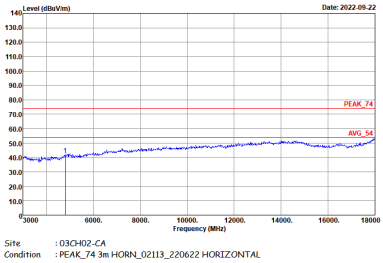
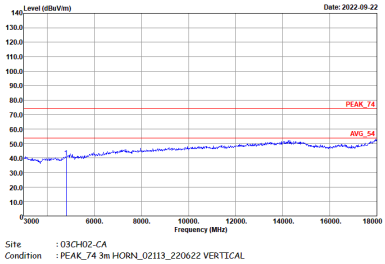
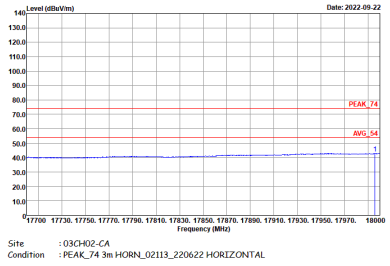
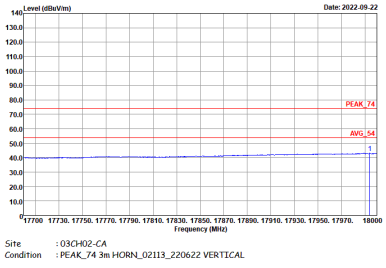
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH39 2441MHz	
	Vertical	Fundamental
Peak	 Site : 03CH02-CA Condition : PEAK_BE_74 3m HORN_02113_220622 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH02-CA Condition : PEAK_74 3m HORN_02113_220622 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Peak	 Site : 03CH02-CA Condition : PEAK_BE_74 3m HORN_02113_220622 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Left blank

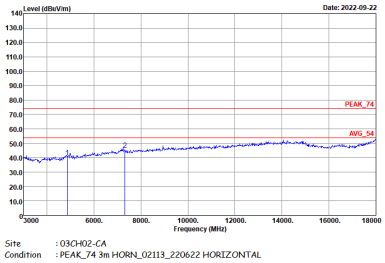
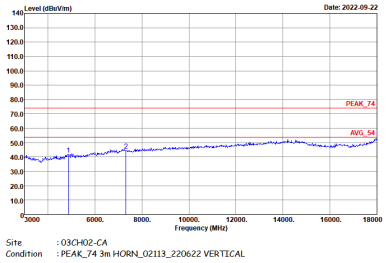
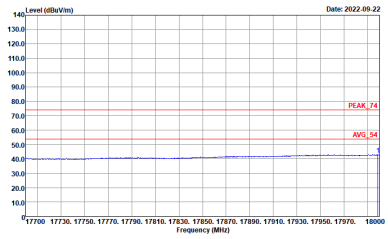
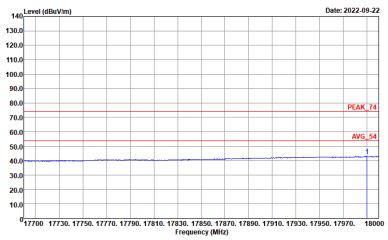
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH78 2480MHz	
	Horizontal	Fundamental
Peak		

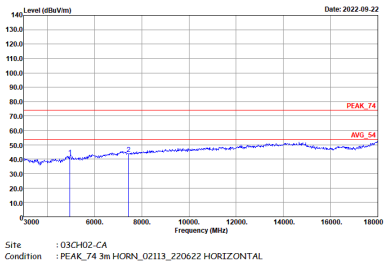
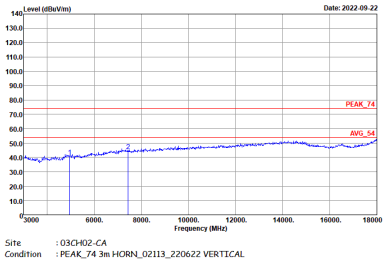
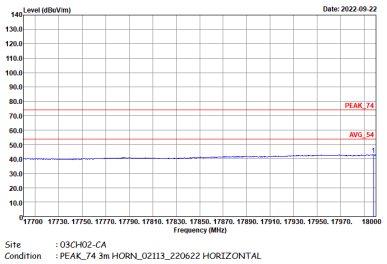
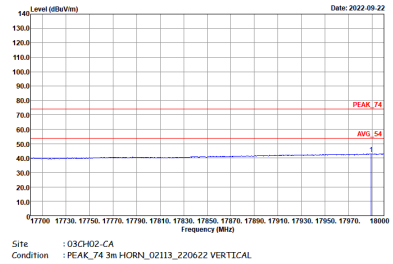
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH78 2480MHz	
	Vertical	Fundamental
Peak		

2.4GHz 2400~2483.5MHz

BT (Harmonic @ 3m)

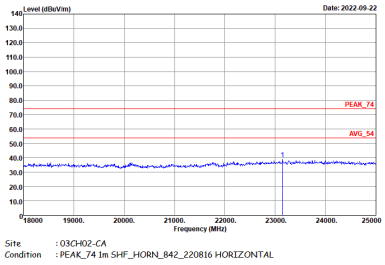
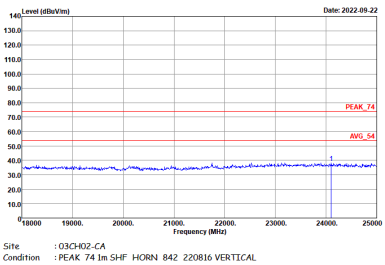
BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BT CH00 2402MHz	
	Horizontal	Vertical
Peak Avg.		
Avg.		

BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BT CH39 2441MHz	
	Horizontal	Vertical
Peak Avg.	 Site : 03CH02-CA Condition : PEAK_74 3m HORN_02113_220622 HORIZONTAL	 Site : 03CH02-CA Condition : PEAK_74 3m HORN_02113_220622 VERTICAL
Avg.	 Site : 03CH02-CA Condition : PEAK_74 3m HORN_02113_220622 HORIZONTAL	 Site : 03CH02-CA Condition : PEAK_74 3m HORN_02113_220622 VERTICAL

BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BT CH78 2480MHz	
	Horizontal	Vertical
Peak Avg.		
Avg.		

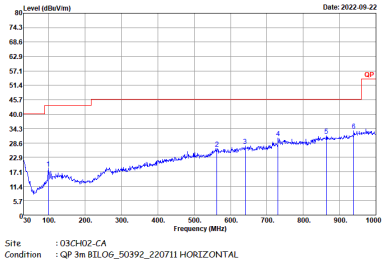
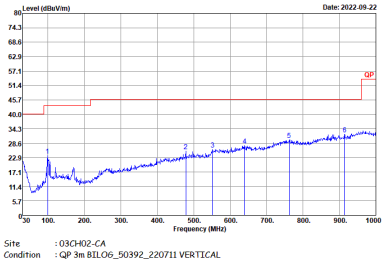
Emission above 18GHz

2.4GHz BT (SHF @ 1m)

BT	2.4GHz 2400~2483.5MHz	
	BT SHF	
	Horizontal	Vertical
Peak Avg.		

Emission below 1GHz

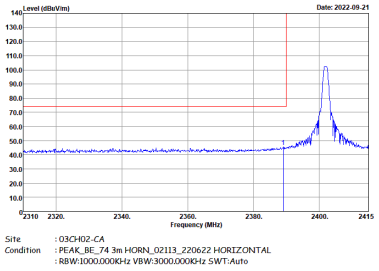
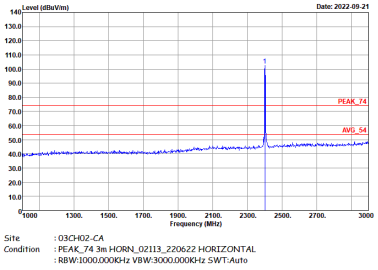
2.4GHz BT (LF)

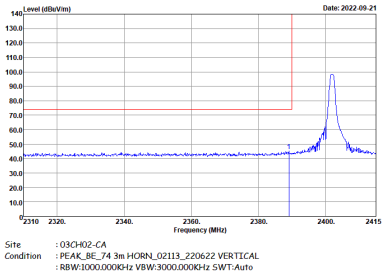
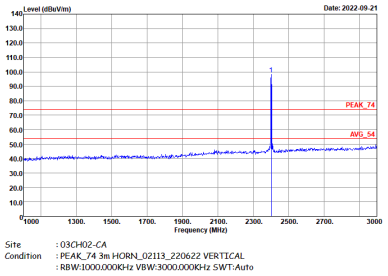
BT	2.4GHz 2400~2483.5MHz	
	BT LF	
	Horizontal	Vertical
QP / Peak		

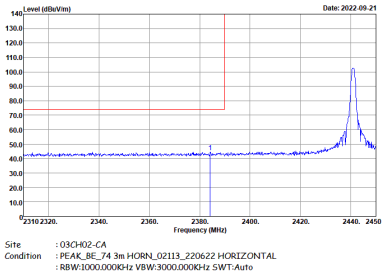
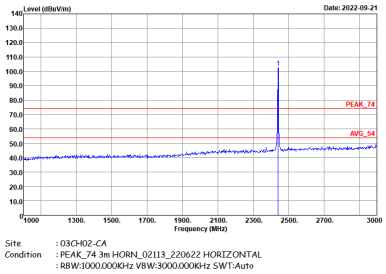
<Right>

2.4GHz 2400~2483.5MHz

BT (Band Edge @ 3m)

BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH00 2402MHz	
	Horizontal	Fundamental
Peak		

BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH00 2402MHz	
	Vertical	Fundamental
Peak		

<table>
<tr><td>BT</td><td colspan="2">2.4GHz 2400~2483.5MHz Band Edge @ 3m</td></tr>
<tr><td></td><td colspan="2">BT CH39 2441MHz</td></tr>
<tr><td></td><td>Horizontal</td><td>Fundamental</td></tr>
<tr><td>Peak</td><td> 
</td><td> 
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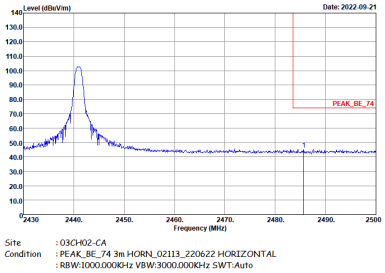
<tr><td>Peak</td><td> 
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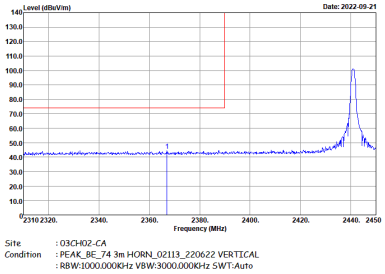
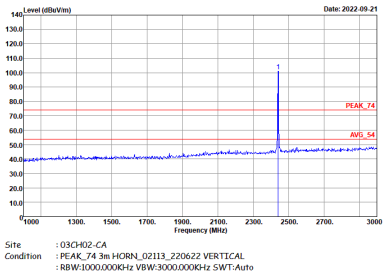
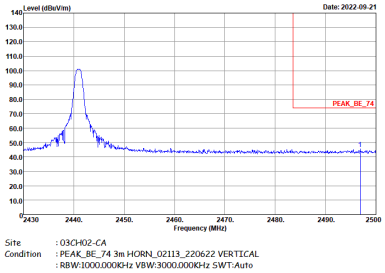
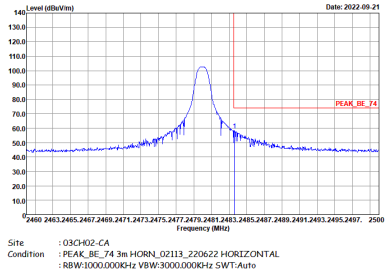
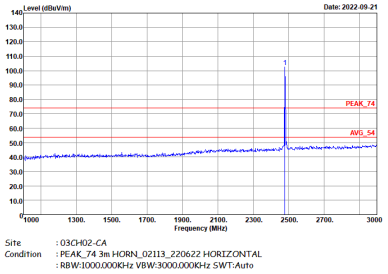
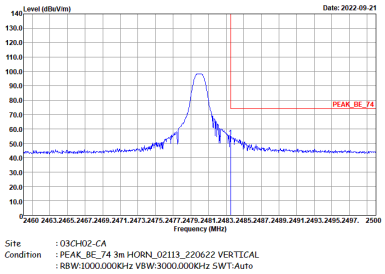
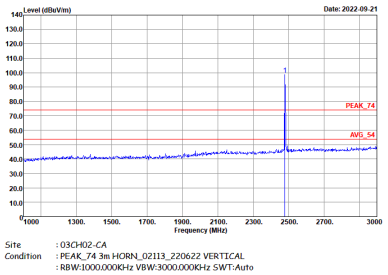
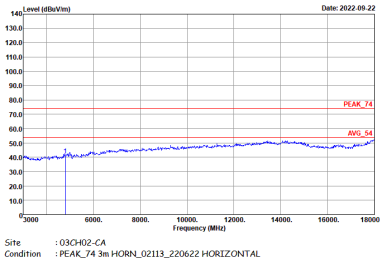
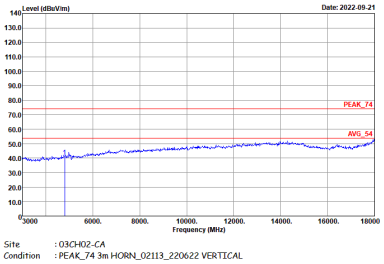
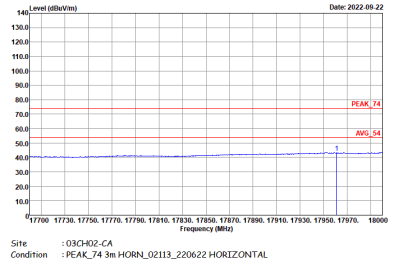
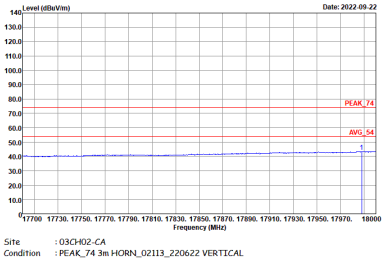
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH39 2441MHz	
	Vertical	Fundamental
Peak		
Peak		Left blank

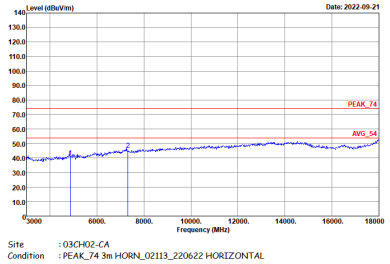
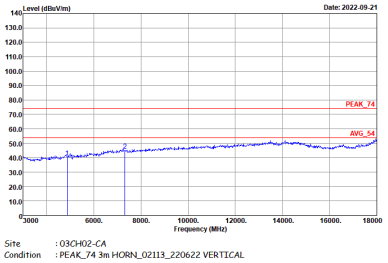
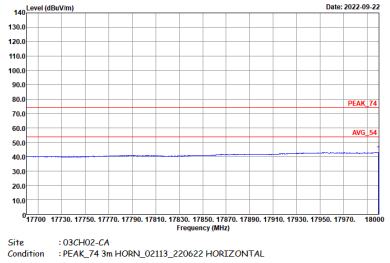
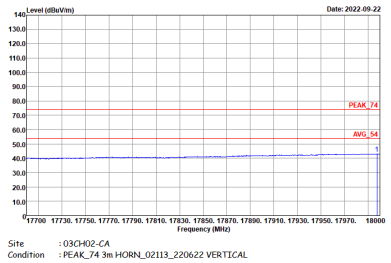
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH78 2480MHz	
	Horizontal	Fundamental
Peak		

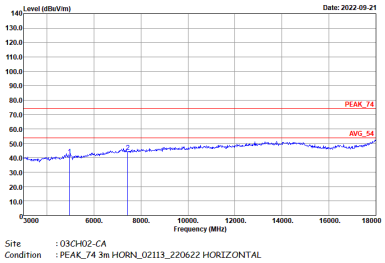
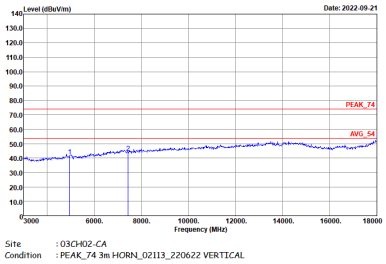
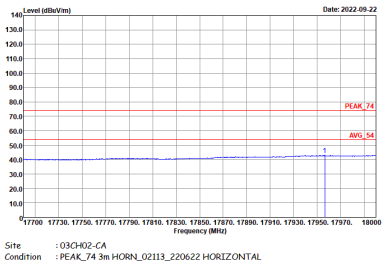
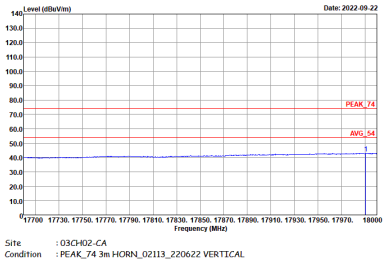
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH78 2480MHz	
	Vertical	Fundamental
Peak		

2.4GHz 2400~2483.5MHz

BT (Harmonic @ 3m)

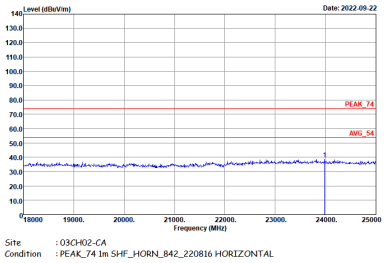
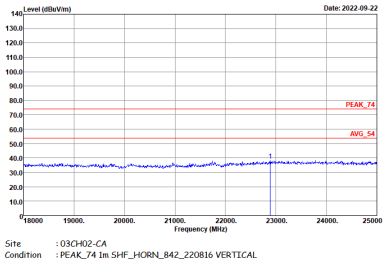
BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BT CH00 2402MHz	
	Horizontal	Vertical
Peak Avg.		
Avg.		

BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BT CH39 2441MHz	
	Horizontal	Vertical
Peak Avg.		
Avg.		

BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BT CH78 2480MHz	
	Horizontal	Vertical
Peak Avg.		
Avg.		

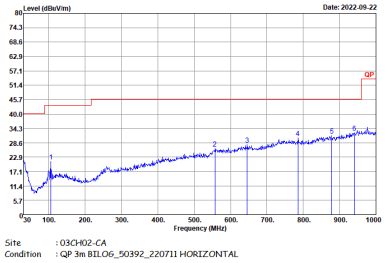
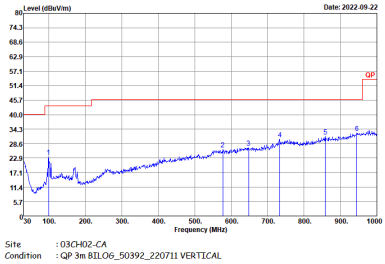
Emission above 18GHz

2.4GHz BT (SHF @ 1m)

BT	2.4GHz 2400~2483.5MHz	
	BT SHF	
	Horizontal	Vertical
Peak Avg.		

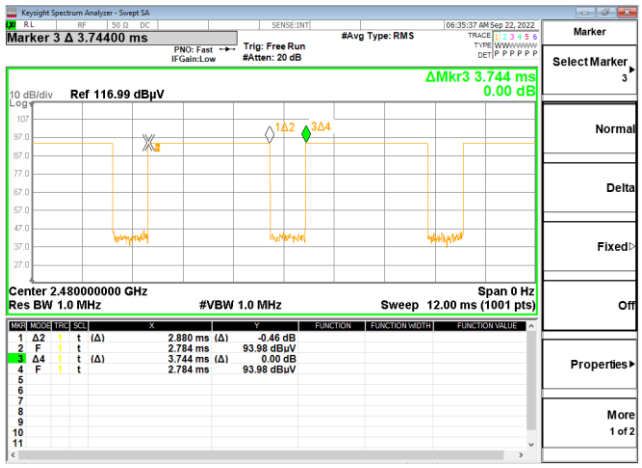
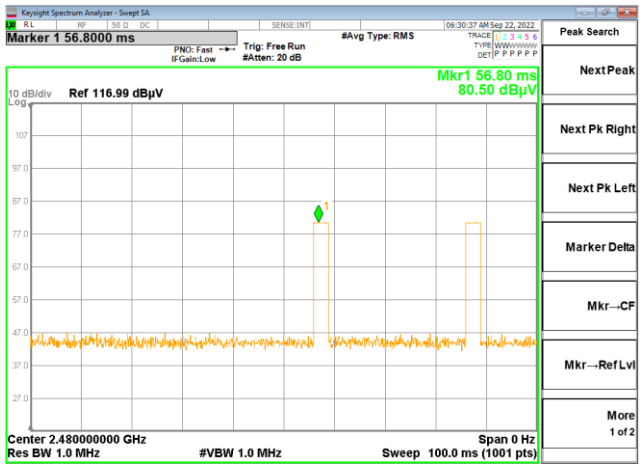
Emission below 1GHz

2.4GHz BT (LF)

BT	2.4GHz 2400~2483.5MHz	
	BT LF	
	Horizontal	Vertical
QP / Peak		

Appendix D. Duty Cycle Plots

<Left>

DH5 on time (One Pulse) Plot on Channel 78	on time (Count Pulses) Plot on Channel 78
	

Note:

1. Worst case Duty cycle = on time/100 milliseconds = 2 * 2.88 / 100 = 5.76 %
2. Worst case Duty cycle correction factor = 20*log(Duty cycle) = -24.79 dB
3. DH5 has the highest duty cycle worst case and is reported.

Duty Cycle Correction Factor Consideration for AFH mode:

Bluetooth normal hopping rate is 1600Hz and reduced to 800Hz in AFH mode; due to the reduced number of hopping frequencies, with the same packet configuration the dwell time in each channel frequency within 100msec period is longer in AFH mode than normal mode.

In AFH mode, the minimum hopping frequencies are 20, to get the longest dwell time DH5 packet is observed; the on time period to have DH5 packet completing one hopping sequence is

2.88 ms x 20 channels = 57.6 ms

There cannot be 2 complete hopping sequences within 100ms period, considering the random hopping behavior, maximum 2 hops can be possibly observed within the period. [100 ms / 57.6 ms] = 2 hops

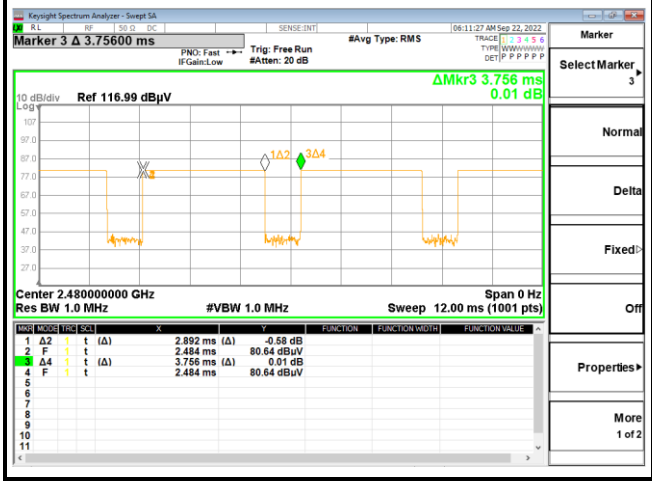
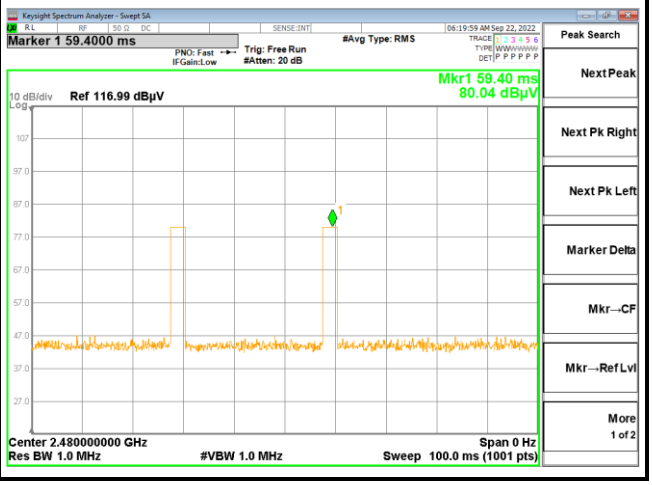
Thus, the maximum possible ON time:

2.88 ms x 2 = 5.76 ms

Worst case Duty Cycle Correction factor, which is derived from the maximum possible ON time,

20 x log(5.76 ms/100 ms) = -24.79 dB

<Right>

DH5 on time (One Pulse) Plot on Channel 78	on time (Count Pulses) Plot on Channel 78
	

Note:

1. Worst case Duty cycle = on time/100 milliseconds = 2 * 2.88 / 100 = 5.76 %
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Thus, the maximum possible ON time:

2.88 ms x 2 = 5.76 ms

Worst case Duty Cycle Correction factor, which is derived from the maximum possible ON time,

20 x log(5.76 ms/100 ms) = -24.79 dB

———THE END———