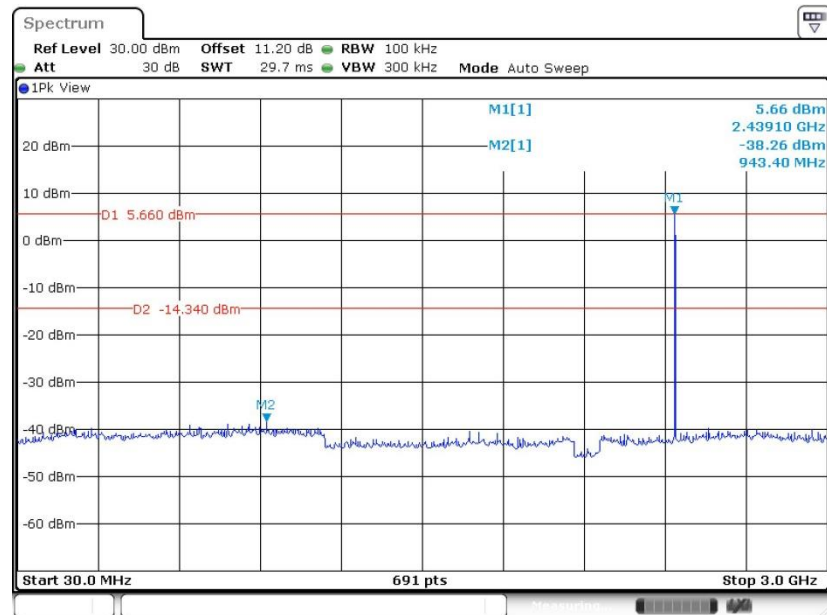


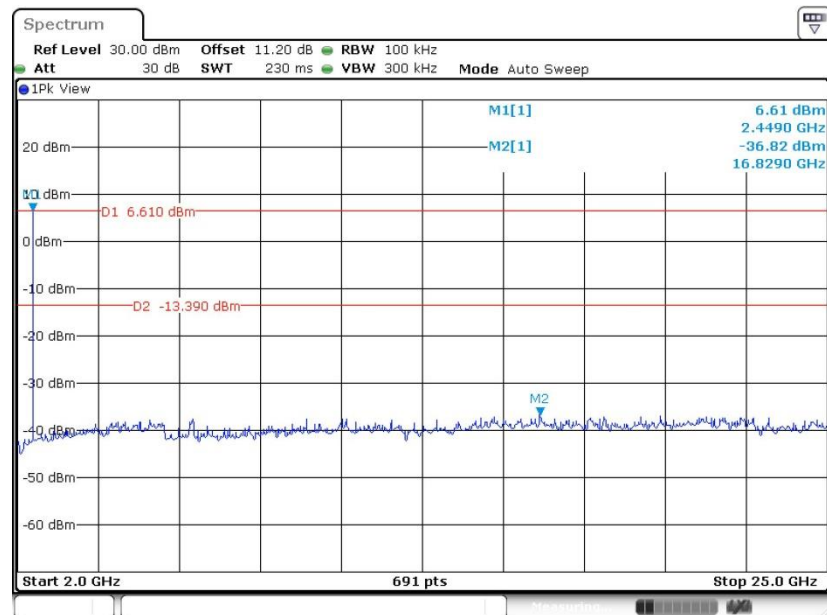


CSE Plot on Ch 39 between 30MHz ~ 3 GHz



Date: 9.NOV.2022 23:53:05

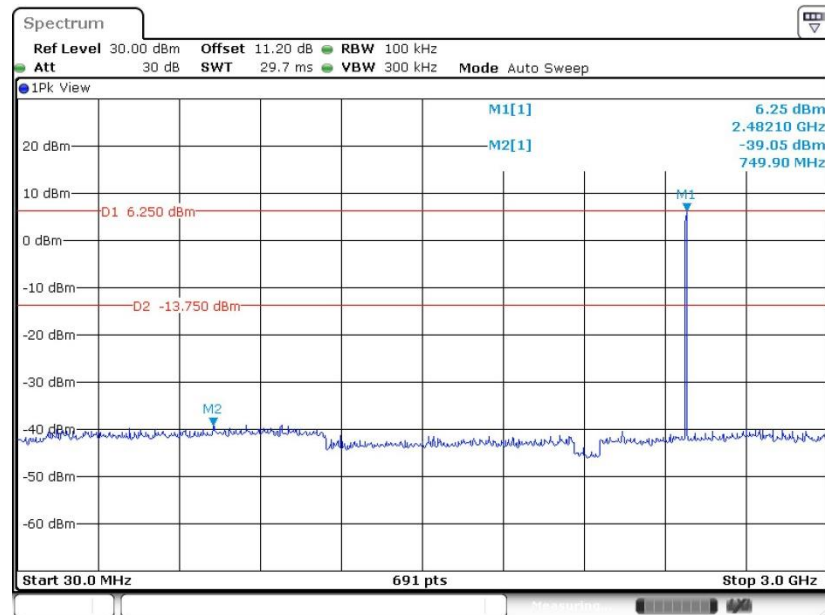
CSE Plot on Ch 39 between 2 GHz ~ 25 GHz



Date: 9.NOV.2022 23:53:34

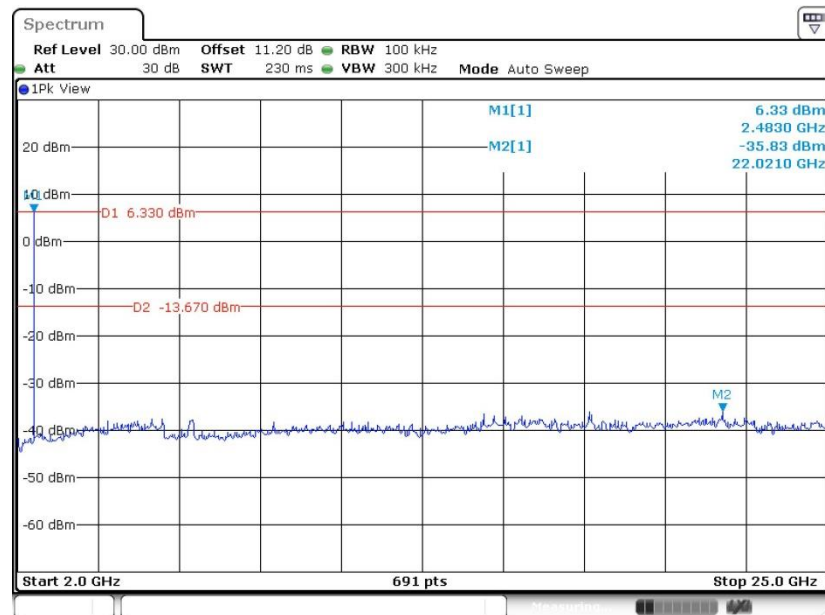


CSE Plot on Ch 78 between 30MHz ~ 3 GHz



Date: 9.NOV.2022 23:56:36

CSE Plot on Ch 78 between 2 GHz ~ 25 GHz



Date: 9.NOV.2022 23:57:07

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

The measuring equipment is listed in the section 4 of this test report.

3.8.3 Test Procedures

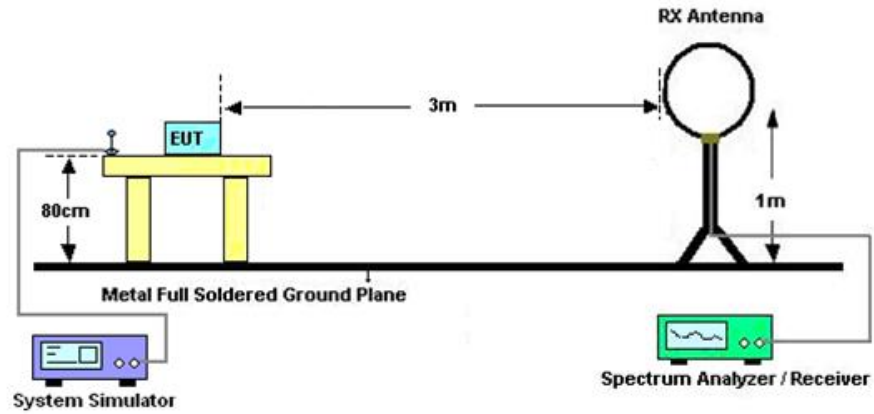
1. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. For each suspected emission, the EUT was 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 to the maximum power setting and enable the EUT 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=1MHz for $f > 1$ GHz ; VBW $\geq$ 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
$$\text{On time} = N_1 * L_1 + N_2 * L_2 + \dots + N_{n-1} * L_{n-1} + N_n * L_n$$

Where N_1 is number of type 1 pulses, L_1 is length of type 1 pulses, etc.
Average Emission Level = Peak Emission Level + $20 * \log(\text{Duty cycle})$
6. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
7. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
8. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than peak limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

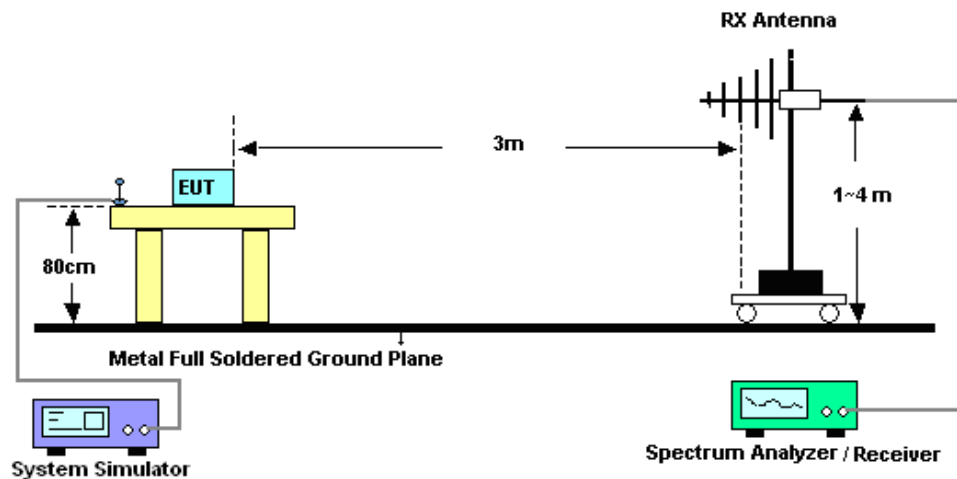
Note: The average levels were calculated from the peak level corrected with duty cycle correction factor (-24.79dB) derived from $20 \log(\text{dwell time}/100\text{ms})$. This correction is only for signals that hop with the fundamental signal, such as band-edge and harmonic. Other spurious signals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

3.8.4 Test Setup

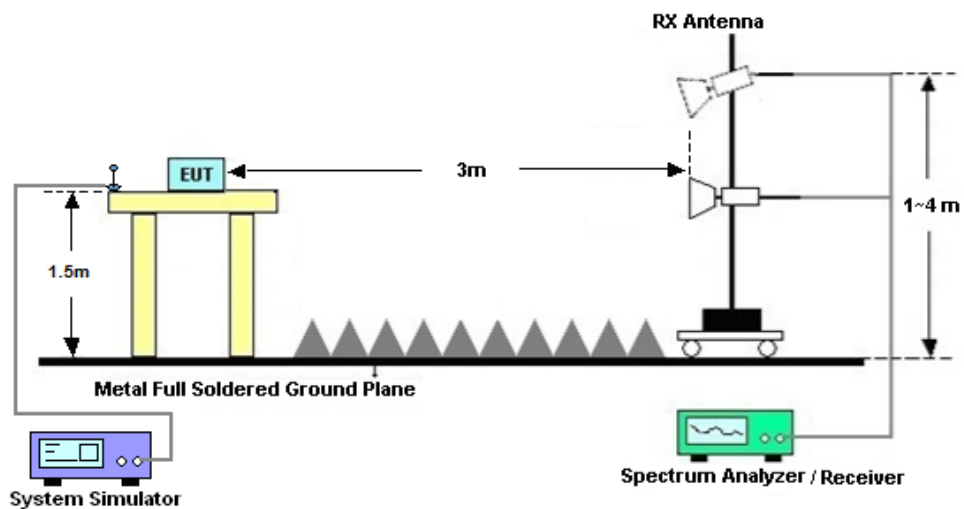
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz





3.8.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 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.

3.8.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C&D.

3.8.7 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic or 40GHz, whichever is lower)

Please refer to Appendix C&D.

3.8.8 Duty cycle correction factor for average measurement

Please refer to Appendix E.

3.9 AC Conducted Emission Measurement

3.9.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

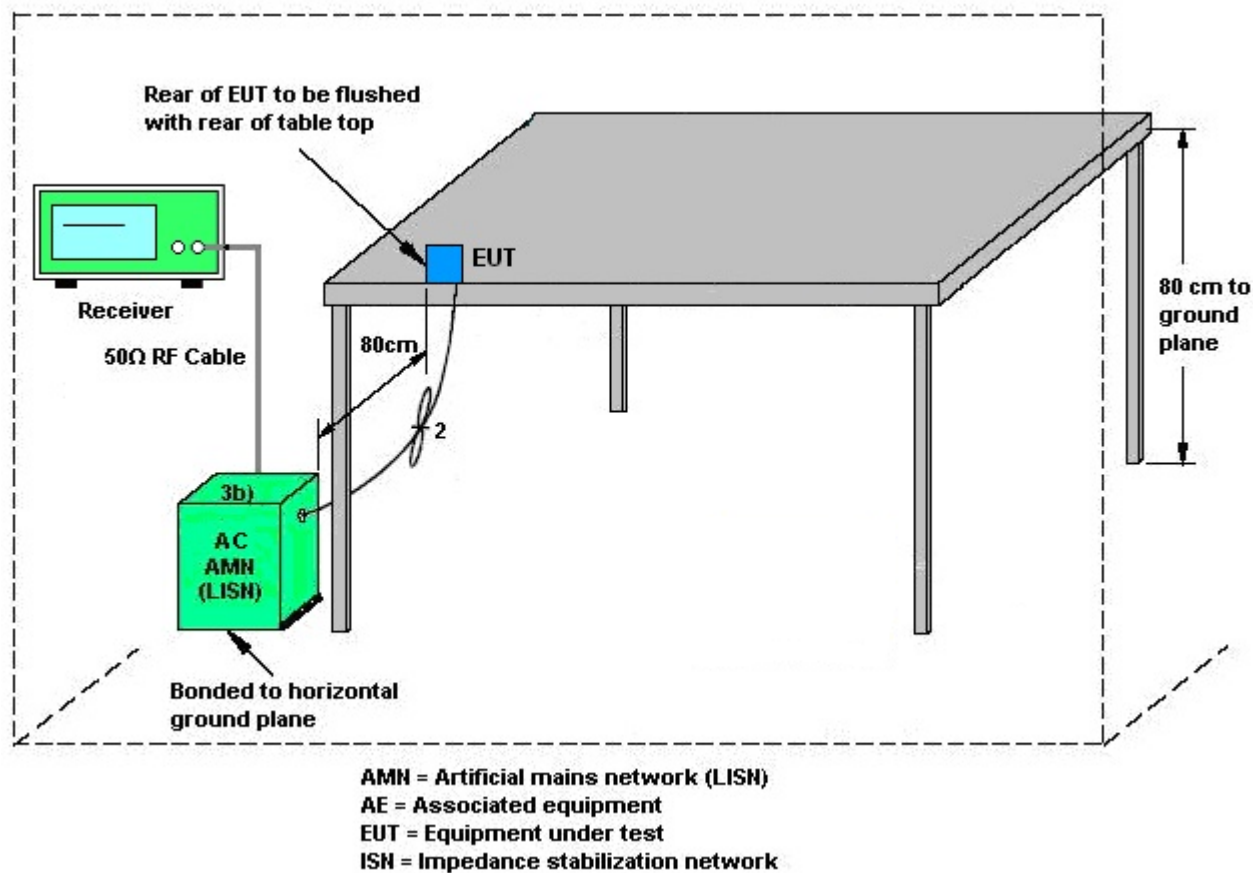
3.9.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.9.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

3.9.4 Test Setup



3.9.5 Test Result of AC Conducted Emission

Please refer to Appendix B.



3.10 Antenna Requirements

3.10.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. 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.

3.10.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.10.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.



4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101078	10Hz~40GHz	Apr. 07, 2022	Nov. 09, 2022~ Nov. 17, 2022	Apr. 08, 2023	Conducted (TH01-SZ)
Pulse Power Sensor	Anritsu	MA2411B	1339473	30MHz~40GHz	Dec. 28, 2021	Nov. 09, 2022~ Nov. 17, 2022	Dec. 27, 2022	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1542004	50MHz Bandwidth	Dec. 28, 2021	Nov. 09, 2022~ Nov. 17, 2022	Dec. 27, 2022	Conducted (TH01-SZ)
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY551502 13	10Hz~44GHz	Jul. 07, 2022	Nov. 15, 2022	Jul. 06, 2023	Radiation (03CH02-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	Jul. 28, 2022	Nov. 15, 2022	Jul. 27, 2024	Radiation (03CH02-SZ)
Bilog Antenna	TeseQ	CBL6112D	35407	30MHz~2GHz	Sep. 28, 2022	Nov. 15, 2022	Sep. 27, 2023	Radiation (03CH02-SZ)
Double Ridge Horn Antenna	ETS-Lindgren	3117	00119436	1GHz~18GHz	Jul. 07, 2022	Nov. 15, 2022	Jul. 06, 2023	Radiation (03CH02-SZ)
HF Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz	Jul. 07, 2022	Nov. 15, 2022	Jul. 06, 2023	Radiation (03CH02-SZ)
SHF-EHF Horn	com-power	AH-840	101071	18GHz~40GHz	Apr. 10, 2022	Nov. 15, 2022	Apr. 10, 2023	Radiation (03CH02-SZ)
LF Amplifier	Burgeon	BPA-530	102211	0.01~3000Mhz	Oct. 19, 2022	Nov. 15, 2022	Oct. 18, 2023	Radiation (03CH02-SZ)
HF Amplifier	MITEQ	AMF-7D-0010 1800-30-10P-R	1943528	1GHz~18GHz	Oct. 19, 2022	Nov. 15, 2022	Oct. 18, 2023	Radiation (03CH02-SZ)
HF Amplifier	KEYSIGHT	83017A	MY532701 05	0.5GHz~26.5GHz	Oct. 19, 2022	Nov. 15, 2022	Oct. 18, 2023	Radiation (03CH02-SZ)
AC Power Source	Chroma	61601	616010003 043	N/A	Nov. 10, 2022	Nov. 15, 2022	Nov. 10, 2023	Radiation (03CH02-SZ)
Turn Table	Chaintek	T-200	N/A	0~360 degree	NCR	Nov. 15, 2022	NCR	Radiation (03CH02-SZ)
Antenna Mast	Chaintek	MBS-400	N/A	1 m~4 m	NCR	Nov. 15, 2022	NCR	Radiation (03CH02-SZ)
EMI Receiver	R&S	ESR7	102297	9kHz~7GHz;	Jul. 06, 2022	Dec. 03, 2022	Jul. 05, 2023	Conduction (CO02-SZ)
AC LISN	R&S	ENV216	101499	9kHz~30MHz	Jul. 06, 2022	Dec. 03, 2022	Jul. 05, 2023	Conduction (CO02-SZ)
AC Power Source	CHROMA	61601	616010002 470	100Vac~250Vac	NCR	Dec. 03, 2022	NCR	Conduction (CO02-SZ)
Thermo meter	Anymetre	JR593	#14	- 10℃ ~ 50℃ 10%RH~99%RH	Jul. 19, 2022	Dec. 03, 2022	Jul. 18, 2023	Conduction (CO02-SZ)

NCR: No Calibration Required

5 Uncertainty of Evaluation

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.10-2013. All the measurement uncertainty value were shown with a coverage K=2 to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

Uncertainty of Conducted Measurement

Test Item	Uncertainty
Conducted Power	± 1.34 dB
Conducted Emissions	± 1.34 dB
Occupied Channel Bandwidth	± 1.2 %

Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	2.2 dB
--	--------

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	5.0 dB
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Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	5.1 dB
--	--------

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	5.1 dB
--	--------

----- THE END -----



Appendix A. Conducted Test Results

Test Engineer:	Liu Qiu Qiu	Temperature:	21~25	°C
Test Date:	2022/11/09~2022/11/17	Relative Humidity:	51~54	%

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	0.851	0.753	1.003	0.5673	Pass
DH	1Mbps	1	39	2441	0.854	0.753	0.999	0.5692	Pass
DH	1Mbps	1	78	2480	0.854	0.755	0.999	0.5692	Pass
2DH	2Mbps	1	0	2402	1.250	1.140	1.003	0.8336	Pass
2DH	2Mbps	1	39	2441	1.250	1.140	0.999	0.8336	Pass
2DH	2Mbps	1	78	2480	1.250	1.140	0.999	0.8336	Pass
3DH	3Mbps	1	0	2402	1.246	1.140	0.999	0.8307	Pass
3DH	3Mbps	1	39	2441	1.246	1.140	0.999	0.8307	Pass
3DH	3Mbps	1	78	2480	1.246	1.140	0.999	0.8307	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
Nomal	79	106.67	2.88	0.31	0.4	Pass
AFH	20	53.33	2.88	0.15	0.4	Pass

TEST RESULTS DATA**Peak Power Table**

DH	CH.	NTX	Peak Power (dBm)	Power Limit (dBm)	Test Result
DH5	0	1	7.82	20.97	Pass
	39	1	7.69	20.97	Pass
	78	1	7.59	20.97	Pass
2DH5	0	1	7.80	20.97	Pass
	39	1	7.78	20.97	Pass
	78	1	7.67	20.97	Pass
3DH5	0	1	8.00	20.97	Pass
	39	1	7.98	20.97	Pass
	78	1	7.88	20.97	Pass

TEST RESULTS DATA**Average Power Table****(Reporting Only)**

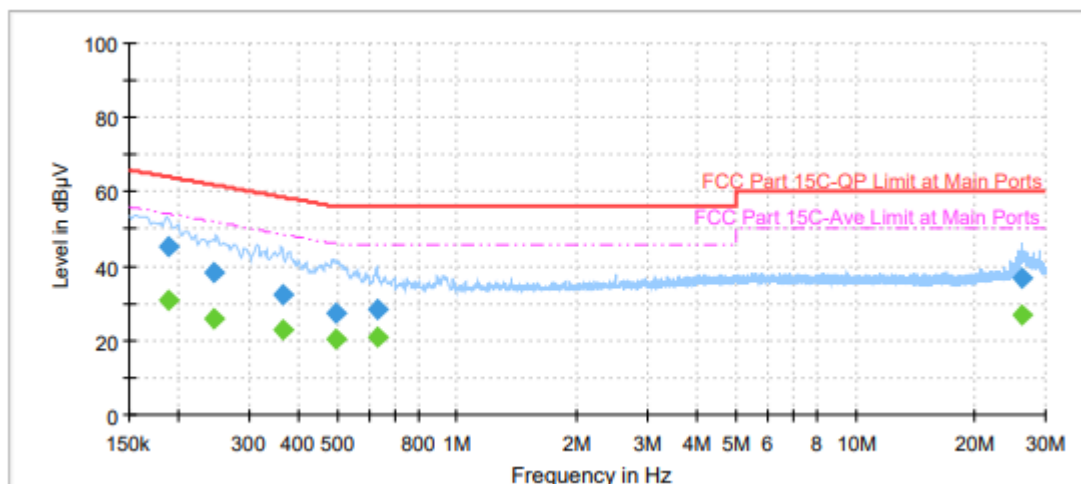
DH	CH.	NTX	Average Power (dBm)	Duty Factor (dB)
DH5	0	1	7.60	2.41
	39	1	7.50	2.41
	78	1	7.30	2.41
2DH5	0	1	5.90	2.39
	39	1	5.80	2.39
	78	1	5.80	2.39
3DH5	0	1	5.90	2.39
	39	1	5.80	2.39
	78	1	5.80	2.39

TEST RESULTS DATA**Number of Hopping Frequency**

Number of Hopping (Channel)	Adaptive Frequency Hopping (Channel)	Limits (Channel)	Pass/Fail
79	20	> 15	Pass

Appendix B. AC Conducted Emission Test Results

Test Engineer :	ZhangTao	Temperature :	22~25°C
		Relative Humidity :	50~55%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		

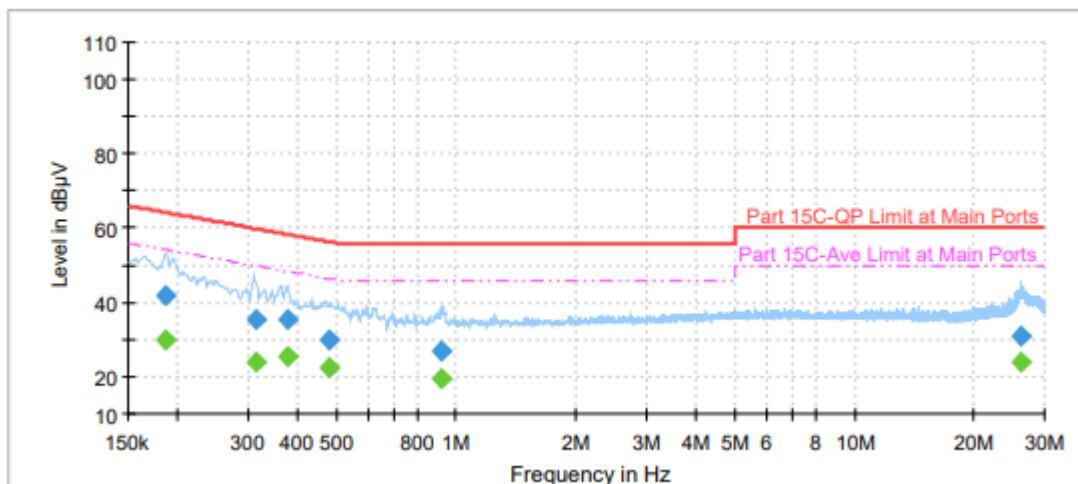


Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Line	Filter	Corr. (dB)
0.187800	45.15	---	64.13	18.98	L1	OFF	19.7
0.187800	---	30.92	54.13	23.21	L1	OFF	19.7
0.245130	38.24	---	61.92	23.68	L1	OFF	19.7
0.245130	---	25.70	51.92	26.22	L1	OFF	19.7
0.365460	32.37	---	58.60	26.23	L1	OFF	19.7
0.365460	---	23.00	48.60	25.60	L1	OFF	19.7
0.494250	27.16	---	56.10	28.94	L1	OFF	19.7
0.494250	---	20.48	46.10	25.62	L1	OFF	19.7
0.629070	28.49	---	56.00	27.51	L1	OFF	19.8
0.629070	---	20.97	46.00	25.03	L1	OFF	19.8
26.232000	36.92	---	60.00	23.08	L1	OFF	20.5
26.232000	---	26.87	50.00	23.13	L1	OFF	20.5



Test Engineer :	ZhangTao	Temperature :	22~25°C
		Relative Humidity :	50~55%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.186990	41.84	---	64.17	22.33	N	OFF	19.7
0.186990	---	29.69	54.17	24.48	N	OFF	19.7
0.314250	35.26	---	59.86	24.60	N	OFF	19.7
0.314250	---	23.70	49.86	26.15	N	OFF	19.7
0.375900	35.18	---	58.37	23.19	N	OFF	19.7
0.375900	---	25.20	48.37	23.17	N	OFF	19.7
0.480390	29.78	---	56.33	26.56	N	OFF	19.7
0.480390	---	22.45	46.33	23.89	N	OFF	19.7
0.919500	26.81	---	56.00	29.19	N	OFF	19.7
0.919500	---	19.41	46.00	26.59	N	OFF	19.7
26.225250	30.84	---	60.00	29.16	N	OFF	20.5
26.225250	---	23.81	50.00	26.19	N	OFF	20.5



Appendix C. Radiated Spurious Emission

Test Engineer :	Reid Huang	Temperature :	24~25°C
		Relative Humidity :	48~49%

2.4GHz 2400~2483.5MHz

BT (Band Edge @ 3m)

BT	Note	Frequency	Level	Margin	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		2388.225	46.47	-27.53	74	40.08	31.7	6.94	32.25	363	125	P	H
		2388.225	21.68	-32.32	54	-	-	-	-	363	125	A	H
	*	2402	101.27	-	-	94.87	31.7	6.94	32.24	363	125	P	H
	*	2402	76.48	-	-	-	-	-	-	363	125	A	H
		2363.025	46.07	-27.93	74	39.76	31.7	6.87	32.26	133	86	P	V
		2363.025	21.28	-32.72	54	-	-	-	-	133	86	A	V
	*	2402	102.82	-	-	96.42	31.7	6.94	32.24	133	86	P	V
	*	2402	78.03	-	-	-	-	-	-	133	86	A	V
BT CH 39 2441MHz		2370.48	46.09	-27.91	74	39.16	32.35	6.37	31.79	111	275	P	H
		2370.48	21.3	-32.7	54	-	-	-	-	111	275	A	H
	*	2442	102.52	-	-	95.28	32.38	6.48	31.62	111	275	P	H
	*	2441	77.73	-	-	-	-	-	-	111	275	A	H
		2494.26	46.96	-27.04	74	39.53	32.4	6.53	31.5	111	275	P	H
		2494.26	22.17	-31.83	54	-	-	-	-	111	275	A	H
		2364.6	46.94	-27.06	74	40.02	32.34	6.37	31.79	101	241	P	V
		2364.6	22.15	-31.85	54	-	-	-	-	101	241	A	V
	*	2442	99.62	-	-	92.38	32.38	6.48	31.62	101	241	P	V
	*	2442	74.83	-	-	-	-	-	-	101	241	A	V
		2495.1	46.73	-27.27	74	39.3	32.4	6.53	31.5	101	241	P	V
		2495.1	21.94	-32.06	54	-	-	-	-	101	241	A	V



BT CH 78 2480MHz	*	2480	102.32	-	-	95.17	32.07	7.03	31.95	100	128	P	H
	*	2480	77.53	-	-	-	-	-	-	100	128	A	H
		2483.64	47.33	-26.67	74	40.18	32.07	7.03	31.95	100	128	P	H
		2483.64	22.54	-31.46	54	-	-	-	-	100	128	A	H
	*	2480	101.78	-	-	94.63	32.07	7.03	31.95	151	89	P	V
	*	2480	76.99	-	-	-	-	-	-	151	89	A	V
		2483.68	47.04	-26.96	74	39.89	32.07	7.03	31.95	151	89	P	V
		2483.68	22.25	-31.75	54	-	-	-	-	151	89	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)	Margin (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	43.86	-30.14	74	57.88	34.41	9.47	57.9	-	-	P	H
		4804	19.07	-34.93	54	-	-	-	-	-	-	A	H
		4804	43.19	-30.81	74	57.21	34.41	9.47	57.9	-	-	P	V
		4804	18.4	-35.6	54	-	-	-	-	-	-	A	V
BT CH 39 2441MHz		4882	42.26	-31.74	74	56.4	33.73	10.03	57.9	-	-	P	H
		4882	17.47	-36.53	54	-	-	-	-	-	-	A	H
		7323	46.09	-27.91	74	57.55	35.73	12.33	59.52	-	-	P	H
		7323	21.3	-32.7	54	-	-	-	-	-	-	A	H
		4882	43.11	-30.89	74	57.25	33.73	10.03	57.9	-	-	P	V
		4882	18.32	-35.68	54	-	-	-	-	-	-	A	V
		7323	45.76	-28.24	74	57.22	35.73	12.33	59.52	-	-	P	V
		7323	20.97	-33.03	54	-	-	-	-	-	-	A	V
BT CH 78 2480MHz		4960	44.08	-29.92	74	58.07	34.32	9.59	57.9	-	-	P	H
		4960	19.29	-34.71	54	-	-	-	-	-	-	A	H
		7440	45.57	-28.43	74	58.2	35.94	11.29	59.86	-	-	P	H
		7440	20.78	-33.22	54	-	-	-	-	-	-	A	H
		4960	43.18	-30.82	74	57.17	34.32	9.59	57.9	-	-	P	V
		4960	18.39	-35.61	54	-	-	-	-	-	-	A	V
		7440	45.66	-28.34	74	58.29	35.94	11.29	59.86	-	-	P	V
		7440	20.87	-33.13	54	-	-	-	-	-	-	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Emission below 1GHz

2.4GHz BT (LF)

BT	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
					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		89.17	20.04	-23.46	43.5	40.2	14.04	0.98	35.18	-	-	P	H
		196.84	23.73	-19.77	43.5	40.87	16.51	1.45	35.1	-	-	P	H
		317.12	25.19	-20.81	46	38.06	20.15	1.88	34.9	-	-	P	H
		681.84	25.57	-20.43	46	30.57	26.67	2.83	34.5	-	-	P	H
		828.31	27.62	-18.38	46	33.5	28.42	0	34.3	-	-	P	H
		974.78	29.12	-24.88	54	29.85	29.99	3.43	34.15	-	-	P	H
		36.79	27.86	-12.14	40	43.48	19.38	0	35	-	-	P	V
		196.84	29.01	-14.49	43.5	46.15	16.51	1.45	35.1	-	-	P	V
		332.64	23.29	-22.71	46	35.64	20.63	1.92	34.9	-	-	P	V
		512.09	24.04	-21.96	46	32.19	24.1	2.43	34.68	-	-	P	V
		842.86	28.45	-17.55	46	30.99	28.57	3.19	34.3	-	-	P	V
		988.36	29.84	-24.16	54	30.37	30.13	3.46	34.12	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												



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 Margin 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	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
					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)
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. Margin (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. Margin (dB)

= Level(dBμV/m) - Limit Line(dBμV/m)

= 55.45(dBμV/m) - 74(dBμV/m)

= - 18.55(dB)

For Average 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) + 42.6(dBμV) - 35.86 (dB)

= 43.54 (dBμV/m)

2. Margin (dB)

= Level(dBμV/m) - Limit Line(dBμV/m)

= 43.54(dBμV/m) - 54(dBμV/m)

= - 10.46(dB)

Both peak and average measured complies with the limit line, so test result is "PASS".



Appendix D. Radiated Spurious Emission Plots

Note symbol

-L	Low channel location
-R	High channel location



2.4GHz 2400~2483.5MHz

BT (Band Edge @ 3m)

BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m																																																													
	BT CH00 2402MHz																																																													
	Horizontal	Fundamental																																																												
Peak	Date: 1 Level (dBuV/m) Date: 2022-09-28 130 113.8 97.5 81.3 65.0 48.8 32.5 16.3 2310 2331. 2352. 2373. 2394. 2415 Frequency (MHz) Site : 03CH02-S2 Condition : PEAK, 74 3m HF_ANT_1117_0107 HORIZONTAL Project : 100301-03 Mode : Mode 1 SN : #22 G092360523870021 Plane : 1 with Accessories setting : 6/2/1 <table><tr><th>Freq</th><th>Level</th><th>Over</th><th>Limit</th><th>ReadAntenna</th><th>Cable</th><th>Preamp</th><th>A/Pus</th><th>T/Pos</th><th>Remark</th></tr><tr><th>MHz</th><th>dBuV/m</th><th>dB</th><th>dBuV/m</th><th>dBuV</th><th>dB/m</th><th>dB</th><th>dB</th><th>cm</th><th>deg</th></tr><tr><td>1 2388.23</td><td>46.47</td><td>-27.53</td><td>74.00</td><td>48.88</td><td>31.78</td><td>6.94</td><td>32.25</td><td>363</td><td>125 Peak</td></tr></table>	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp	A/Pus	T/Pos	Remark	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	1 2388.23	46.47	-27.53	74.00	48.88	31.78	6.94	32.25	363	125 Peak	Date: 2 Level (dBuV/m) Date: 2022-09-28 130 113.8 97.5 81.3 65.0 48.8 32.5 16.3 1000 1400. 1800. 2200. 2600. 3000 Frequency (MHz) Site : 03CH02-S2 Condition : PEAK, 74 3m HF_ANT_1117_0107 HORIZONTAL Project : 100301-03 Mode : Mode 1 SN : #22 G092360523870021 Plane : 1 with Accessories setting : 6/2/1 <table><tr><th>Freq</th><th>Level</th><th>Over</th><th>Limit</th><th>ReadAntenna</th><th>Cable</th><th>Preamp</th><th>A/Pus</th><th>T/Pos</th><th>Remark</th></tr><tr><th>MHz</th><th>dBuV/m</th><th>dB</th><th>dBuV/m</th><th>dBuV</th><th>dB/m</th><th>dB</th><th>dB</th><th>cm</th><th>deg</th></tr><tr><td>1 * 2402.00</td><td>101.27</td><td>27.27</td><td>74.00</td><td>94.87</td><td>31.78</td><td>6.94</td><td>32.24</td><td>363</td><td>125 Peak</td></tr></table>	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp	A/Pus	T/Pos	Remark	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	1 * 2402.00	101.27	27.27	74.00	94.87	31.78	6.94	32.24	363	125 Peak
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BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m																																																													
	BT CH00 2402MHz																																																													
	Vertical	Fundamental																																																												
Peak	Date: 3 Level (dBuV/m) Date: 2022-09-28 Site : 03CH02-S2 Condition : PEAK_BE_74 3m HF_ANT_3117_0107 VERTICAL Project : 100301-03 Mode : Mode 1 SN : #22 G092366523870021 Plane : Y with Accessories setting : 6/21 <table><thead><tr><th>Freq</th><th>Level</th><th>Over</th><th>Limit</th><th>ReadAntenna</th><th>Cable</th><th>Preamp</th><th>A/Pos</th><th>T/Pos</th><th>Remark</th></tr><tr><th>MHz</th><th>dBuV/m</th><th>dB</th><th>dBuV/m</th><th>dBuV</th><th>dB/m</th><th>dB</th><th>cm</th><th>deg</th><th></th></tr></thead><tbody><tr><td>1</td><td>2363.83</td><td>46.87</td><td>-27.93</td><td>74.00</td><td>39.76</td><td>31.70</td><td>6.87</td><td>32.26</td><td>133 86 Peak</td></tr></tbody></table>	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp	A/Pos	T/Pos	Remark	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	cm	deg		1	2363.83	46.87	-27.93	74.00	39.76	31.70	6.87	32.26	133 86 Peak	Date: 4 Level (dBuV/m) Date: 2022-09-28 Site : 03CH02-S2 Condition : PEAK_74 3m HF_ANT_3117_0107 VERTICAL Project : 100301-03 Mode : Mode 1 SN : #22 G092366523870021 Plane : Y with Accessories setting : 6/21 <table><thead><tr><th>Freq</th><th>Level</th><th>Over</th><th>Limit</th><th>ReadAntenna</th><th>Cable</th><th>Preamp</th><th>A/Pos</th><th>T/Pos</th><th>Remark</th></tr><tr><th>MHz</th><th>dBuV/m</th><th>dB</th><th>dBuV/m</th><th>dBuV</th><th>dB/m</th><th>dB</th><th>cm</th><th>deg</th><th></th></tr></thead><tbody><tr><td>1</td><td>2402.00</td><td>102.82</td><td>28.82</td><td>74.00</td><td>96.42</td><td>31.70</td><td>6.94</td><td>32.24</td><td>133 86 Peak</td></tr></tbody></table>	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp	A/Pos	T/Pos	Remark	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	cm	deg		1	2402.00	102.82	28.82	74.00	96.42	31.70	6.94	32.24	133 86 Peak
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BT CH39 2441MHz																																																														
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Peak	Date: 4 Level (dBuV/m) Date: 2022-11-14 Site : 03CH02-SZ Condition : PEAK_BE_74 3m HF_ANT_3117_0107 VERTICAL Project : 100301-03 Mode : Mode 2 SN : #20 G992376523860039 Plane : X with Accessories setting : 6/21 <table><tr><th>Freq</th><th>Level</th><th>Over</th><th>Limit</th><th>ReadAntenna</th><th>Cable</th><th>Preamp</th><th>A/Pos</th><th>T/Pos</th><th>Remark</th></tr><tr><th>MHz</th><th>dBuV/m</th><th>dB</th><th>dBuV/m</th><th>dBuV</th><th>dB</th><th>dB</th><th>cm</th><th>deg</th><th></th></tr><tr><td>1</td><td>2364.68</td><td>46.94</td><td>-27.86</td><td>74.00</td><td>48.82</td><td>32.34</td><td>6.37</td><td>31.79</td><td>181 241 Peak</td></tr></table>	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp	A/Pos	T/Pos	Remark	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	cm	deg		1	2364.68	46.94	-27.86	74.00	48.82	32.34	6.37	31.79	181 241 Peak	Date: 5 Level (dBuV/m) Date: 2022-11-14 Site : 03CH02-SZ Condition : PEAK_74 3m HF_ANT_3117_0107 VERTICAL Project : 100301-03 Mode : Mode 2 SN : #20 G992376523860039 Plane : Y with Accessories setting : 6/21 <table><tr><th>Freq</th><th>Level</th><th>Over</th><th>Limit</th><th>ReadAntenna</th><th>Cable</th><th>Preamp</th><th>A/Pos</th><th>T/Pos</th><th>Remark</th></tr><tr><th>MHz</th><th>dBuV/m</th><th>dB</th><th>dBuV/m</th><th>dBuV</th><th>dB</th><th>dB</th><th>cm</th><th>deg</th><th></th></tr><tr><td>1</td><td>2442.00</td><td>99.62</td><td>25.62</td><td>74.00</td><td>92.38</td><td>32.38</td><td>6.48</td><td>31.62</td><td>181 241 Peak</td></tr></table>	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp	A/Pos	T/Pos	Remark	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	cm	deg		1	2442.00	99.62	25.62	74.00	92.38	32.38	6.48	31.62	181 241 Peak
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Peak	Date: 6 Level (dBuV/m) Date: 2022-11-14 Site : 03CH02-SZ Condition : PEAK_BE_74 3m HF_ANT_3117_0107 VERTICAL Project : 100301-03 Mode : Mode 2 SN : #20 G992376523860039 Plane : X with Accessories setting : 6/21 <table><tr><th>Freq</th><th>Level</th><th>Over</th><th>Limit</th><th>ReadAntenna</th><th>Cable</th><th>Preamp</th><th>A/Pos</th><th>T/Pos</th><th>Remark</th></tr><tr><th>MHz</th><th>dBuV/m</th><th>dB</th><th>dBuV/m</th><th>dBuV</th><th>dB</th><th>dB</th><th>cm</th><th>deg</th><th></th></tr><tr><td>1</td><td>2449.18</td><td>46.73</td><td>-27.27</td><td>74.00</td><td>39.38</td><td>32.40</td><td>6.53</td><td>31.58</td><td>181 241 Peak</td></tr></table>	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp	A/Pos	T/Pos	Remark	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	cm	deg		1	2449.18	46.73	-27.27	74.00	39.38	32.40	6.53	31.58	181 241 Peak	Left blank																														
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2.4GHz 2400~2483.5MHz

BT (Harmonic @ 3m)

BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m																																																													
	BT CH00 2402MHz																																																													
	Horizontal	Vertical																																																												
Peak Avg.	Date: 7 Level (dBuV/m) Date: 2022-11-14 Site : 03CH02-02 Condition : PEAK_74 3m HF_ANT_3117_0107 HORIZONTAL Project : 100301-03 Mode : Mode 1 SN : #20 0192370523860039 Plane : Y with Accessories setting : 6/21 <table><tr><th>Freq</th><th>Level</th><th>Over</th><th>Limit</th><th>ReadAntenna</th><th>Cable</th><th>Preamp</th><th>A/Pos</th><th>T/Pos</th><th>Remark</th></tr><tr><th>MHz</th><th>dBuV/m</th><th>dB</th><th>dBuV/m</th><th>dBuV</th><th>dB</th><th>dB</th><th>cm</th><th>deg</th><th></th></tr><tr><td>1</td><td>4804.00</td><td>43.86</td><td>-30.14</td><td>74.00</td><td>57.88</td><td>34.41</td><td>9.47</td><td>57.90</td><td>--- Peak</td></tr></table>	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp	A/Pos	T/Pos	Remark	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	cm	deg		1	4804.00	43.86	-30.14	74.00	57.88	34.41	9.47	57.90	--- Peak	Date: 8 Level (dBuV/m) Date: 2022-11-14 Site : 03CH02-02 Condition : PEAK_74 3m HF_ANT_3117_0107 VERTICAL Project : 100301-03 Mode : Mode 1 SN : #20 0192370523860039 Plane : Y with Accessories setting : 6/21 <table><tr><th>Freq</th><th>Level</th><th>Over</th><th>Limit</th><th>ReadAntenna</th><th>Cable</th><th>Preamp</th><th>A/Pos</th><th>T/Pos</th><th>Remark</th></tr><tr><th>MHz</th><th>dBuV/m</th><th>dB</th><th>dBuV/m</th><th>dBuV</th><th>dB</th><th>dB</th><th>cm</th><th>deg</th><th></th></tr><tr><td>1</td><td>4804.00</td><td>43.19</td><td>-30.81</td><td>74.00</td><td>57.21</td><td>34.41</td><td>9.47</td><td>57.90</td><td>--- Peak</td></tr></table>	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp	A/Pos	T/Pos	Remark	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	cm	deg		1	4804.00	43.19	-30.81	74.00	57.21	34.41	9.47	57.90	--- Peak
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BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m									
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	Horizontal					Vertical				
Peak Avg.	Date: 5 Level (dBuV/m)									



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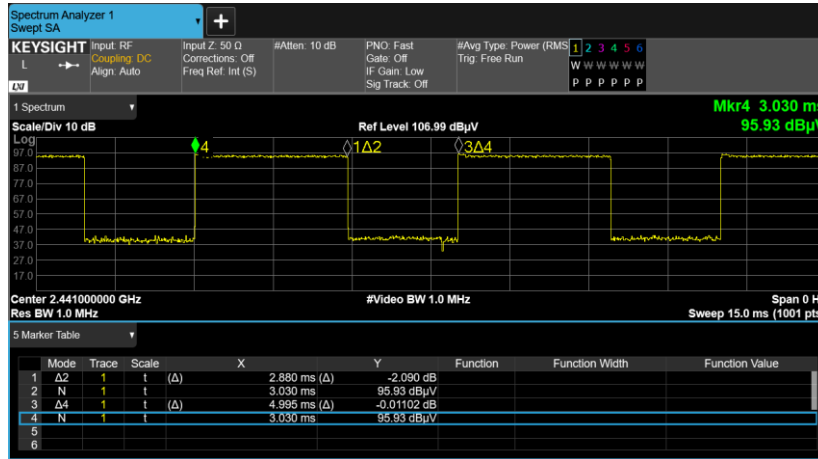
Emission below 1GHz

2.4GHz BT (LF)

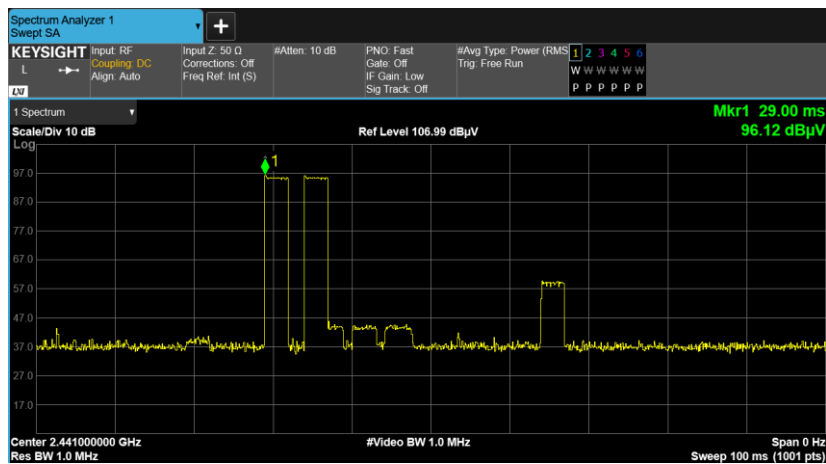
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QP / Peak	Date: 1 Level (dBuV/m) Date: 2022-11-15 Frequency (MHz) Site : 03CH02-02 Condition : FCC CLASS-B 3m VULB9168-01001 HORIZONTAL Project : 100301-03 Mode : Mode 3 IMEI : #20 092370523860039 Plane : X with Accessory 6/2/1 <table><thead><tr><th></th><th>Freq</th><th>Level</th><th>Limit</th><th>ReadAntenna</th><th>Cable</th><th>Preamp</th><th>A/Poss</th><th>T/Poss</th><th>Remark</th></tr><tr><th></th><th>MHz</th><th>dBuV/m</th><th>dB</th><th>dBuV/m</th><th>dBuV</th><th>dB</th><th>dB</th><th>cm</th><th>deg</th></tr></thead><tbody><tr><td>1</td><td>89.17</td><td>28.04</td><td>-23.46</td><td>43.50</td><td>40.20</td><td>14.04</td><td>0.98</td><td>35.18</td><td>---</td></tr><tr><td>2</td><td>196.84</td><td>33.73</td><td>-19.77</td><td>43.50</td><td>40.87</td><td>16.51</td><td>1.45</td><td>35.10</td><td>---</td></tr><tr><td>3</td><td>317.12</td><td>25.19</td><td>-20.41</td><td>46.00</td><td>38.86</td><td>20.15</td><td>1.88</td><td>34.90</td><td>---</td></tr><tr><td>4</td><td>621.84</td><td>25.57</td><td>-20.43</td><td>46.00</td><td>39.57</td><td>20.67</td><td>2.83</td><td>34.50</td><td>---</td></tr><tr><td>5</td><td>828.31</td><td>27.62</td><td>-18.38</td><td>46.00</td><td>33.58</td><td>28.42</td><td>0.60</td><td>34.38</td><td>---</td></tr><tr><td>6</td><td>974.78</td><td>29.12</td><td>-24.08</td><td>54.00</td><td>29.65</td><td>29.99</td><td>3.43</td><td>34.15</td><td>---</td></tr></tbody></table>		Freq	Level	Limit	ReadAntenna	Cable	Preamp	A/Poss	T/Poss	Remark		MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	cm	deg	1	89.17	28.04	-23.46	43.50	40.20	14.04	0.98	35.18	---	2	196.84	33.73	-19.77	43.50	40.87	16.51	1.45	35.10	---	3	317.12	25.19	-20.41	46.00	38.86	20.15	1.88	34.90	---	4	621.84	25.57	-20.43	46.00	39.57	20.67	2.83	34.50	---	5	828.31	27.62	-18.38	46.00	33.58	28.42	0.60	34.38	---	6	974.78	29.12	-24.08	54.00	29.65	29.99	3.43	34.15	---	Date: 2 Level (dBuV/m) Date: 2022-11-15 Frequency (MHz) Site : 03CH02-02 Condition : FCC CLASS-B 3m VULB9168-01001 VERTICAL Project : 100301-03 Mode : Mode 3 IMEI : #20 092370523860039 Plane : X with Accessory 6/2/1 <table><thead><tr><th></th><th>Freq</th><th>Level</th><th>Limit</th><th>ReadAntenna</th><th>Cable</th><th>Preamp</th><th>A/Poss</th><th>T/Poss</th><th>Remark</th></tr><tr><th></th><th>MHz</th><th>dBuV/m</th><th>dB</th><th>dBuV/m</th><th>dBuV</th><th>dB</th><th>dB</th><th>cm</th><th>deg</th></tr></thead><tbody><tr><td>1</td><td>36.79</td><td>27.86</td><td>-12.14</td><td>40.00</td><td>43.48</td><td>19.38</td><td>0.80</td><td>35.80</td><td>---</td></tr><tr><td>2</td><td>196.84</td><td>29.81</td><td>-14.49</td><td>43.50</td><td>46.15</td><td>16.51</td><td>1.45</td><td>35.10</td><td>---</td></tr><tr><td>3</td><td>332.64</td><td>23.29</td><td>-22.71</td><td>46.00</td><td>35.64</td><td>20.43</td><td>1.92</td><td>34.90</td><td>---</td></tr><tr><td>4</td><td>632.89</td><td>24.84</td><td>-21.96</td><td>46.00</td><td>32.19</td><td>24.18</td><td>2.43</td><td>34.68</td><td>---</td></tr><tr><td>5</td><td>842.86</td><td>28.45</td><td>-17.55</td><td>46.00</td><td>28.99</td><td>28.57</td><td>3.19</td><td>34.38</td><td>---</td></tr><tr><td>6</td><td>988.36</td><td>29.84</td><td>-24.16</td><td>54.00</td><td>30.37</td><td>30.13</td><td>3.46</td><td>34.12</td><td>---</td></tr></tbody></table>		Freq	Level	Limit	ReadAntenna	Cable	Preamp	A/Poss	T/Poss	Remark		MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	cm	deg	1	36.79	27.86	-12.14	40.00	43.48	19.38	0.80	35.80	---	2	196.84	29.81	-14.49	43.50	46.15	16.51	1.45	35.10	---	3	332.64	23.29	-22.71	46.00	35.64	20.43	1.92	34.90	---	4	632.89	24.84	-21.96	46.00	32.19	24.18	2.43	34.68	---	5	842.86	28.45	-17.55	46.00	28.99	28.57	3.19	34.38	---	6	988.36	29.84	-24.16	54.00	30.37	30.13	3.46	34.12	---
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2	196.84	29.81	-14.49	43.50	46.15	16.51	1.45	35.10	---																																																																																																																																																									
3	332.64	23.29	-22.71	46.00	35.64	20.43	1.92	34.90	---																																																																																																																																																									
4	632.89	24.84	-21.96	46.00	32.19	24.18	2.43	34.68	---																																																																																																																																																									
5	842.86	28.45	-17.55	46.00	28.99	28.57	3.19	34.38	---																																																																																																																																																									
6	988.36	29.84	-24.16	54.00	30.37	30.13	3.46	34.12	---																																																																																																																																																									

Appendix E. Duty Cycle Plots

3DH5 on time (One Pulse) Plot on Channel 39



3DH5 on time (Count Pulses) Plot on Channel 39



Note:

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