

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 (dBμV)	
	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.

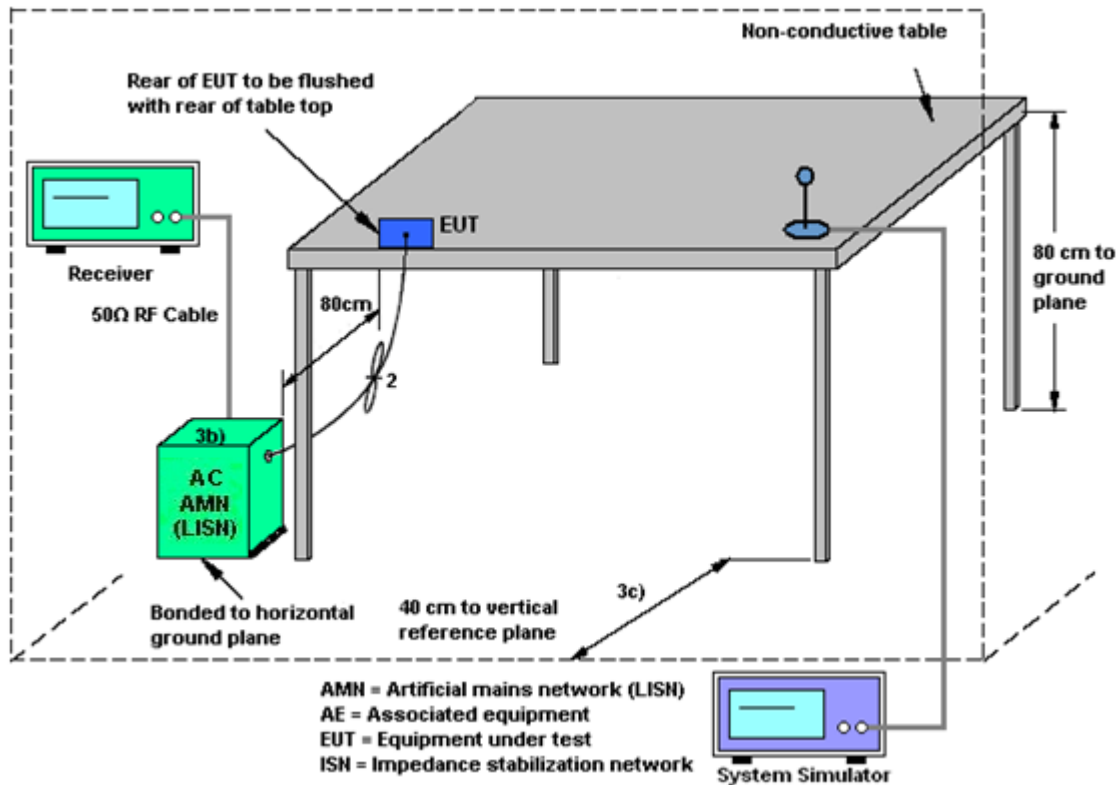
3.9.2 Measuring Instruments

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	Feb. 04, 2023~ Apr. 21, 2023	Apr. 06, 2023	Conducted (TH01-SZ)
Spectrum Analyzer	R&S	FSV40	101078	10Hz~40GHz	Apr. 06, 2023		Apr. 05, 2024	Conducted (TH01-SZ)
Pulse Power Sensor	Anritsu	MA2411B	1339473	30MHz~40GHz	Dec. 27, 2022	Feb. 04, 2023~ Apr. 21, 2023	Dec. 26, 2023	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1542004	50MHz Bandwidth	Dec. 27, 2022	Feb. 04, 2023~ Apr. 21, 2023	Dec. 26, 2023	Conducted (TH01-SZ)
EMI Receiver	R&S	ESR7	101630	9kHz~7GHz;	Jul. 07, 2022	Feb. 06, 2023	Jul. 06, 2023	Conduction (CO01-SZ)
AC LISN	R&S	ENV216	100063	9kHz~30MHz	Sep. 15, 2022	Feb. 06, 2023	Sep. 14, 2023	Conduction (CO01-SZ)
AC LISN (for auxiliary equipment)	EMCO	3816/2SH	00103892	9kHz~30MHz	Oct. 17, 2022	Feb. 06, 2023	Oct. 16, 2023	Conduction (CO01-SZ)
AC Power Source	Chroma	61602	616020000891	100Vac~250Vac	Jul.07, 2022	Feb. 06, 2023	Jul. 06, 2023	Conduction (CO01-SZ)
Thermo meter	Anymetre	JR593	#5	- 10℃ ~ 50℃ 10%RH~99%RH	Apr.08.2022	Feb. 06, 2023	Apr.07.2023	Conduction (CO01-SZ)
EMI Test Receiver&SA	KEYSIGHT	N9038A	MY54450083	20Hz~8.4GHz	Apr. 04, 2023	Apr. 19, 2023~ Apr. 27, 2023	Apr. 03, 2024	Radiation (03CH03-SZ)
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY55150246	10Hz~44GHz;	Apr. 04, 2023	Apr. 19, 2023~ Apr. 27, 2023	Apr. 03, 2024	Radiation (03CH03-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	Jul. 28, 2022	Apr. 19, 2023~ Apr. 27, 2023	Jul. 27, 2024	Radiation (03CH03-SZ)
Bilog Antenna	TeseQ	CBL6112D	35408	30MHz~2GHz	Aug. 09, 2021	Apr. 19, 2023~ Apr. 27, 2023	Aug. 08, 2023	Radiation (03CH03-SZ)
Double Ridge Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-1355	1GHz~18GHz	Apr. 08, 2023	Apr. 19, 2023~ Apr. 27, 2023	Apr. 07, 2024	Radiation (03CH03-SZ)
HF Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz	Jul. 06, 2022	Apr. 19, 2023~ Apr. 27, 2023	Jul.05.2023	Radiation (03CH03-SZ)
SHF-EHF Horn	com-power	AH-840	101071	18GHz~40GHz	Apr. 08, 2023	Apr. 19, 2023~ Apr. 27, 2023	Apr. 07, 2024	Radiation (03CH03-SZ)
Amplifier	Burgeon	BPA-530	102211	0.01Hz~3000MHz	Oct. 19, 2022	Apr. 19, 2023~ Apr. 27, 2023	Oct. 18, 2023	Radiation (03CH03-SZ)
HF Amplifier	MITEQ	AMF-7D-00101800-30-10P-R	1943528	1GHz~18GHz	Oct. 19, 2022	Apr. 19, 2023~ Apr. 27, 2023	Oct. 18, 2023	Radiation (03CH03-SZ)
Amplifier	Agilent Technologies	83017A	MY39501302	500MHz~26.5GHz	Dec. 26, 2022	Apr. 19, 2023~ Apr. 27, 2023	Dec. 25, 2023	Radiation (03CH03-SZ)
AC Power Source	Chroma	61601	616010002729	1 N/A	Nov.10,2022	Apr. 19, 2023~ Apr. 27, 2023	Nov.09,2023	Radiation (03CH03-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	Apr. 19, 2023~ Apr. 27, 2023	NCR	Radiation (03CH03-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	Apr. 19, 2023~ Apr. 27, 2023	NCR	Radiation (03CH03-SZ)
laser range finder	Dingxin Yi	D-40	#03	N/A	Oct. 09, 2022	Apr. 19, 2023~ Apr. 27, 2023	Oct. 08, 2023	Radiation (03CH03-SZ)
Thermo meter	Anymetre	JR593	#11	- 10℃ ~ 50℃ 10%RH~99%RH	Oct. 20, 2022	Apr. 19, 2023~ Apr. 27, 2023	Oct. 19, 2023	Radiation (03CH03-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	±0.012 %

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.7 dB
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(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 = 2Uc(y))	4.9 dB
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Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.0 dB
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Appendix A. Conducted Test Results

Bluetooth ANT5

Test Engineer:	Chen Ran	Temperature:	21~25	°C
Test Date:	2023/2/4~2023/4/21	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	0.941	0.839	0.999	0.6271	Pass
DH	1Mbps	1	39	2441	0.941	0.839	0.999	0.6271	Pass
DH	1Mbps	1	78	2480	0.941	0.839	0.999	0.6271	Pass
2DH	2Mbps	1	0	2402	1.316	1.175	0.999	0.8770	Pass
2DH	2Mbps	1	39	2441	1.316	1.181	1.003	0.8770	Pass
2DH	2Mbps	1	78	2480	1.316	1.172	0.999	0.8770	Pass
3DH	3Mbps	1	0	2402	1.298	1.178	0.999	0.8654	Pass
3DH	3Mbps	1	39	2441	1.303	1.181	0.999	0.8683	Pass
3DH	3Mbps	1	78	2480	1.298	1.184	0.999	0.8654	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
Normal	79	106.67	2.885500	0.31	0.4	Pass
AFH	20	53.33	2.885500	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	8.03	20.97	Pass
	39	1	8.89	20.97	Pass
	78	1	7.23	20.97	Pass
2DH	CH.	NTX	Peak Power (dBm)	Power Limit (dBm)	Test Result
2DH3	0	1	8.06	20.97	Pass
	39	1	9.26	20.97	Pass
	78	1	7.24	20.97	Pass
3DH	CH.	NTX	Peak Power (dBm)	Power Limit (dBm)	Test Result
3DH5	0	1	8.35	20.97	Pass
	39	1	9.37	20.97	Pass
	78	1	7.78	20.97	Pass

TEST RESULTS DATA**Number of Hopping Frequency**

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

Bluetooth ANT6**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	0.938	0.836	0.999	0.6252	Pass
DH	1Mbps	1	39	2441	0.938	0.836	0.999	0.6252	Pass
DH	1Mbps	1	78	2480	0.938	0.836	0.999	0.6252	Pass
2DH	2Mbps	1	0	2402	1.311	1.181	1.003	0.8741	Pass
2DH	2Mbps	1	39	2441	1.311	1.178	1.003	0.8741	Pass
2DH	2Mbps	1	78	2480	1.311	1.175	1.003	0.8741	Pass
3DH	3Mbps	1	0	2402	1.298	1.181	0.999	0.8654	Pass
3DH	3Mbps	1	39	2441	1.298	1.184	1.003	0.8654	Pass
3DH	3Mbps	1	78	2480	1.303	1.181	0.999	0.8683	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
Normal	79	106.67	2.885500	0.31	0.4	Pass
AFH	20	53.33	2.885500	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	7.14	20.97	Pass
	39	1	7.96	20.97	Pass
	78	1	6.14	20.97	Pass
2DH	CH.	NTX	Peak Power (dBm)	Power Limit (dBm)	Test Result
2DH5	0	1	7.78	20.97	Pass
	39	1	8.67	20.97	Pass
	78	1	6.44	20.97	Pass
3DH	CH.	NTX	Peak Power (dBm)	Power Limit (dBm)	Test Result
3DH5	0	1	8.13	20.97	Pass
	39	1	8.94	20.97	Pass
	78	1	6.80	20.97	Pass

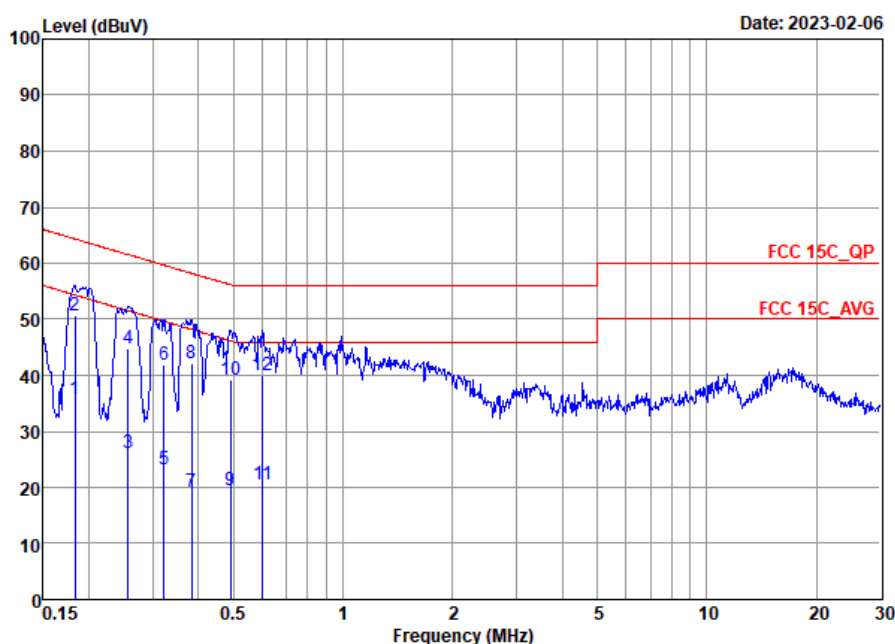
TEST RESULTS DATA**Number of Hopping Frequency**

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



Appendix B. AC Conducted Emission Test Results

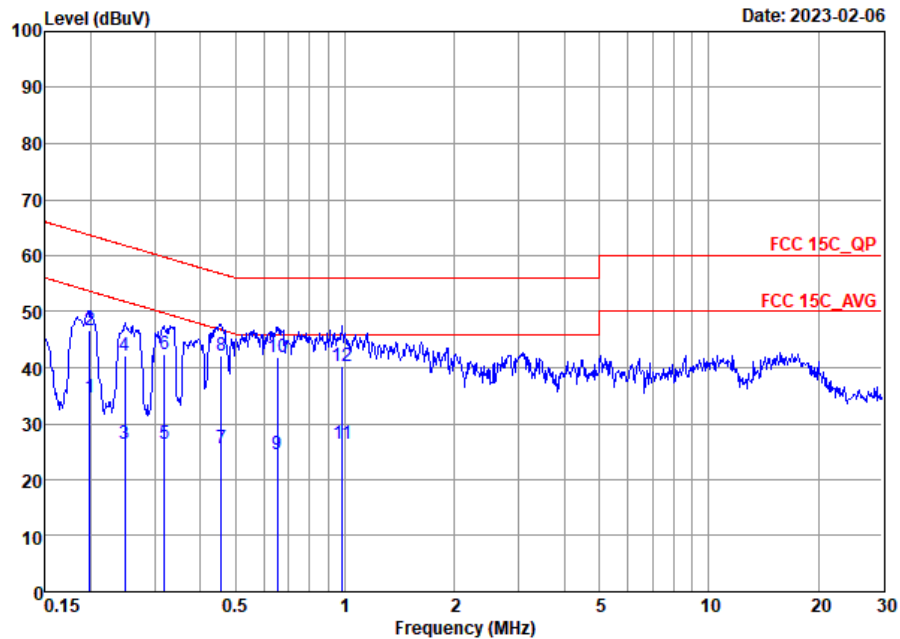
Test Engineer :	Lily Qiu	Temperature :	22~24°C
		Relative Humidity :	44~50%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : COOL-SZ
Condition: FCC 15C_QP LISN_20220811_ L LINE

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.18	35.65	-18.68	54.33	15.10	10.20	10.35	Average
2 *	0.18	50.55	-13.78	64.33	30.00	10.20	10.35	QP
3	0.26	26.20	-25.36	51.56	5.40	10.18	10.62	Average
4	0.26	44.70	-16.86	61.56	23.90	10.18	10.62	QP
5	0.32	23.27	-26.39	49.66	2.11	10.12	11.04	Average
6	0.32	41.77	-17.89	59.66	20.61	10.12	11.04	QP
7	0.38	19.15	-29.06	48.21	-2.30	10.09	11.36	Average
8	0.38	42.25	-15.96	58.21	20.80	10.09	11.36	QP
9	0.49	19.55	-26.59	46.14	-2.40	10.12	11.83	Average
10	0.49	39.15	-16.99	56.14	17.20	10.12	11.83	QP
11	0.60	20.62	-25.38	46.00	-0.90	10.10	11.42	Average
12	0.60	40.02	-15.98	56.00	18.50	10.10	11.42	QP

Test Engineer :	Lily Qiu	Temperature :	22~24°C
		Relative Humidity :	44~50%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : C001-SZ
Condition: FCC 15C_QP LISN_20220811_ N NEUTRAL

	Freq	Level	Over	Limit	Read	LISN	Cable	
	MHz	dBuV	Limit	Line	Level	Factor	Loss	Remark
			dB	dBuV	dBuV	dB	dB	
1	0.20	34.75	-18.92	53.67	14.30	10.28	10.17	Average
2	0.20	46.55	-17.12	63.67	26.10	10.28	10.17	QP
3	0.25	26.51	-25.31	51.82	5.70	10.25	10.56	Average
4	0.25	42.21	-19.61	61.82	21.40	10.25	10.56	QP
5	0.32	26.52	-23.23	49.75	5.30	10.19	11.03	Average
6	0.32	42.52	-17.23	59.75	21.30	10.19	11.03	QP
7	0.46	25.58	-21.18	46.76	3.70	10.19	11.69	Average
8	0.46	42.18	-14.58	56.76	20.30	10.19	11.69	QP
9	0.65	24.66	-21.34	46.00	3.20	10.23	11.23	Average
10 *	0.65	41.96	-14.04	56.00	20.50	10.23	11.23	QP
11	0.98	26.27	-19.73	46.00	5.80	10.20	10.27	Average
12	0.98	40.17	-15.83	56.00	19.70	10.20	10.27	QP

Note:

- Level(dBμV) = Read Level(dBμV) + LISN Factor(dB) + Cable Loss(dB)
- Over Limit(dB) = Level(dBμV) – Limit Line(dBμV)



Appendix C. Radiated Spurious Emission

<Ant5>

2.4GHz 2400~2483.5MHz

BT (Band Edge @ 3m)

BT	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
ANT					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
5		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BT CH00 2402MHz		2389.8	44.97	-29.03	74	41.61	32.21	4.81	33.66	152	24	P	H
		2389.8	20.18	-33.82	54	-	-	-	-	-	-	A	H
	*	2402	94	-	-	90.6	32.25	4.81	33.66	152	24	P	H
	*	2402	69.21	-	-	-	-	-	-	-	-	A	H
		2382.45	44.43	-29.57	74	41.15	32.19	4.77	33.68	282	308	P	V
		2382.45	19.64	-34.36	54	-	-	-	-	-	-	A	V
	*	2402	95.04	-	-	91.64	32.25	4.81	33.66	282	308	P	V
	*	2402	70.25	-	-	-	-	-	-	-	-	A	V
BT CH 78 2480MHz	*	2480	91.16	-	-	87.41	32.45	4.92	33.62	100	19	P	H
	*	2480	66.37	-	-	-	-	-	-	-	-	A	H
		2498.2	45.13	-28.87	74	41.31	32.5	4.92	33.6	100	19	P	H
		2498.2	20.34	-33.66	54	-	-	-	-	-	-	A	H
	*	2480	96.04	-	-	92.29	32.45	4.92	33.62	311	301	P	V
	*	2480	71.25	-	-	-	-	-	-	-	-	A	V
		2493.56	46.2	-27.8	74	42.4	32.48	4.92	33.6	311	301	P	V
		2493.56	21.41	-32.59	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 ANT	Note	Frequency	Level	Margin	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
5		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BT CH 00 2402MHz		4804	44.56	-29.44	74	55.06	34.68	7.75	52.93	-	-	P	H
		4804	19.77	-34.23	54	-	-	-	-	-	-	A	H
		4804	44.26	-29.74	74	54.76	34.68	7.75	52.93	-	-	P	V
		4804	19.47	-34.53	54	-	-	-	-	-	-	A	V
BT CH 39 2441MHz		4882	43.97	-30.03	74	54.38	34.65	7.78	52.84	-	-	P	H
		4882	19.18	-34.82	54	-	-	-	-	-	-	A	H
		7323	44.64	-29.36	74	53.38	36.42	8.95	54.11	-	-	P	H
		7323	19.85	-34.15	54					-	-	A	H
		4882	44.67	-29.33	74	55.08	34.65	7.78	52.84	-	-	P	V
		4882	19.88	-34.12	54	-	-	-	-	-	-	A	V
		7323	44.73	-29.27	74	53.47	36.42	8.95	54.11	-	-	P	V
		7323	19.94	-34.06	54					-	-	A	V
BT CH 78 2480MHz		4960	43.18	-30.82	74	53.49	34.62	7.81	52.74	-	-	P	H
		4960	18.39	-35.61	54	-	-	-	-	-	-	A	H
		7440	44.83	-29.17	74	53.14	36.54	9.19	54.04	-	-	P	H
		7440	20.04	-33.96	54	-	-	-	-	-	-	A	H
		4960	42.77	-31.23	74	53.08	34.62	7.81	52.74	-	-	P	V
		4960	17.98	-36.02	54	-	-	-	-	-	-	A	V
		7440	44.74	-29.26	74	53.05	36.54	9.19	54.04	-	-	P	V
		7440	19.95	-34.05	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.
ANT					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
5		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz BT LF		54.25	18.52	-21.48	40	32.38	19.42	1.68	34.96	-	-	P	H
		154.16	27.63	-15.87	43.5	41.23	18.75	2.35	34.7	-	-	P	H
		202.66	25.5	-18	43.5	41.35	16.08	2.77	34.7	-	-	P	H
		347.19	34	-12	46	45.01	20.16	3.43	34.6	-	-	P	H
		473.29	25.08	-20.92	46	33.12	23.03	3.43	34.5	-	-	P	H
		698.33	27.16	-18.84	46	30.75	27.07	3.74	34.4	-	-	P	H
		58.13	27.81	-12.19	40	41.95	19.05	1.73	34.92	-	-	P	V
		163.86	30.72	-12.78	43.5	44.86	18.16	2.4	34.7	-	-	P	V
		202.66	30.47	-13.03	43.5	46.32	16.08	2.77	34.7	-	-	P	V
		347.19	32.47	-13.53	46	43.48	20.16	3.43	34.6	-	-	P	V
		434.49	29.14	-16.86	46	37.88	22.34	3.42	34.5	-	-	P	V
		617.82	26.59	-19.41	46	31.38	26.15	3.62	34.56	-	-	p	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												



<Ant6>

2.4GHz 2400~2483.5MHz

BT (Band Edge @ 3m)

BT	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
ANT					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
6		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BT CH00 2402MHz		2327.64	46.35	-27.65	74	39.63	32.33	6.3	31.91	328	58	P	H
		2327.64	21.56	-32.44	54	-	-	-	-	-	-	A	H
	*	2402	95.8	-	-	88.73	32.36	6.44	31.73	328	58	P	H
	*	2402	71.01	-	-	-	-	-	-	-	-	A	H
		2328.48	46.84	-27.16	74	40.12	32.33	6.3	31.91	144	95	P	V
		2328.48	22.05	-31.95	54	-	-	-	-			A	V
	*	2402	97.87	-	-	90.8	32.36	6.44	31.73	144	95	P	V
	*	2402	73.08	-	-	-	-	-	-	-	-	A	V
BT CH00 2402MHz (sku3)		2324.385	44.41	-29.59	74	41.35	32.04	4.73	33.71	261	307	P	H
		2324.385	19.62	-34.38	54	-	-	-	-	-	-	A	H
	*	2402	92.25	-	-	88.85	32.25	4.81	33.66	261	307	P	H
	*	2402	67.46	-	-	-	-	-	-	-	-	A	H
		2321.655	44.75	-29.25	74	41.69	32.04	4.73	33.71	302	249	P	V
		2321.655	19.96	-34.04	54	-	-	-	-	-	-	A	V
	*	2402	93.86	-	-	90.46	32.25	4.81	33.66	302	249	P	V
	*	2402	69.07	-	-	-	-	-	-	-	-	A	V
BT CH 78 2480MHz	*	2480	95.55	-	-	88.19	32.39	6.53	31.56	344	62	P	H
	*	2480	70.76	-	-	-	-	-	-	-	-	A	H
		2486	46.38	-27.62	74	39.02	32.39	6.53	31.56	344	62	P	H
		2486	21.59	-32.41	54	-	-	-	-	-	-	A	H
	*	2480	97.7	-	-	90.34	32.39	6.53	31.56	170	313	P	V
	*	2480	72.91	-	-	-	-	-	-	-	-	A	V
		2489.68	46.46	-27.54	74	39.03	32.4	6.53	31.5	170	313	P	V
		2489.68	21.67	-32.33	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 ANT	Note	Frequency	Level	Margin	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
6		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BT CH 00 2402MHz		4804	43.61	-30.39	74	57.63	34.41	9.47	57.9	-	-	P	H
		4804	18.82	-35.18	54	-	-	-	-	-	-	A	H
		4804	44.16	-29.84	74	58.18	34.41	9.47	57.9	-	-	P	V
		4804	19.37	-34.63	54	-	-	-	-	-	-	A	V
BT CH 00 2402MHz (sku3)		4804	43.22	-30.78	74	53.72	34.68	7.75	52.93	-	-	P	H
		4804	18.43	-35.57	54	-	-	-	-	-	-	A	H
		4804	43	-31	74	53.5	34.68	7.75	52.93	-	-	P	V
		4804	18.21	-35.79	54	-	-	-	-	-	-	A	V
BT CH 39 2441MHz		4882	43.76	-30.24	74	57.76	34.37	9.53	57.9	-	-	P	H
		4882	18.97	-35.03	54	-	-	-	-	-	-	A	H
		7323	45.5	-28.5	74	57.74	36.04	11.24	59.52	-	-	P	H
		7323	20.71	-33.29	54	-	-	-	-	-	-	A	H
		4882	44.06	-29.94	74	58.06	34.37	9.53	57.9	-	-	P	V
		4882	19.27	-34.73	54	-	-	-	-	-	-	A	V
		7323	45.49	-28.51	74	57.73	36.04	11.24	59.52	-	-	P	V
		7323	20.7	-33.3	54	-	-	-	-	-	-	A	V
BT CH 78 2480MHz		4960	44.36	-29.64	74	58.35	34.32	9.59	57.9	-	-	P	H
		4960	19.57	-34.43	54	-	-	-	-	-	-	P	H
		7440	44.7	-29.3	74	57.33	35.94	11.29	59.86	-	-	P	H
		7440	19.91	-34.09	54	-	-	-	-	-	-	A	H
		4960	43.96	-30.04	74	57.95	34.32	9.59	57.9	-	-	P	V
		4960	19.17	-34.83	54	-	-	-	-	-	-	P	V
		7440	45.79	-28.21	74	58.42	35.94	11.29	59.86	-	--	P	V
		7440	21	-33	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.
ANT					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
6		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz BT LF		48.43	18.46	-21.54	40	32.19	19.62	1.63	34.98	-	-	P	H
		159.98	28.52	-14.98	43.5	42.45	18.39	2.38	34.7	-	-	P	H
		202.66	27.56	-15.94	43.5	43.41	16.08	2.77	34.7	-	-	P	H
		347.19	32.89	-13.11	46	43.9	20.16	3.43	34.6	-	-	P	H
		453.89	24.81	-21.19	46	33.05	22.8	3.46	34.5	-	-	P	H
		652.74	27.34	-18.66	46	31.86	26.3	3.67	34.49	-	-	P	H
		58.13	28.4	-11.6	40	42.54	19.05	1.73	34.92	-	-	P	H
		163.86	31.13	-12.37	43.5	45.27	18.16	2.4	34.7	-	-	P	H
		202.66	32.26	-11.24	43.5	48.11	16.08	2.77	34.7	-	-	P	H
		327.79	33.25	-12.75	46	44.78	19.73	3.34	34.6	-	-	P	H
		453.89	28.47	-17.53	46	36.71	22.8	3.46	34.5	-	-	P	V
		637.22	27.19	-18.81	46	31.86	26.21	3.65	34.53	-	-	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”.

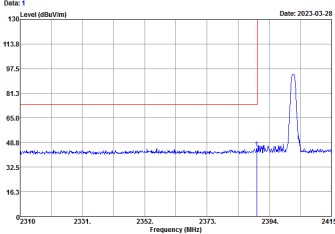
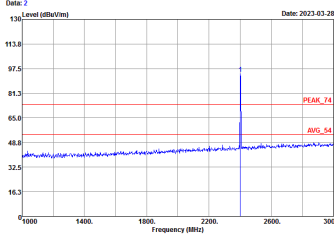


Appendix D. Radiated Spurious Emission Plots

<Ant5>

2.4GHz 2400~2483.5MHz

BT (Band Edge @ 3m)

BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH00 2402MHz	
5	Horizontal	Fundamental
Peak	Site : 03CH03-SZ Condition : PEAK_BE_74 3m ANT3117_0057 HORIZONTAL Project : 200705 Mode : Mode 29 SN : 05delta Plane : Y with Accessories Plane : 3CH5 	Site : 03CH03-SZ Condition : PEAK_74 3m ANT3117_0057 HORIZONTAL Project : 200705 Mode : Mode 29 SN : 05delta Plane : Y with Accessories Plane : 3CH5 



BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH00 2402MHz	
5	Vertical	Fundamental
Peak	Date: 3 Level (dBuV/m) Date: 2023-03-28 Site : 03CH03-SZ Condition : PEAK_BE_74 3m ANT3117_0057 VERTICAL Project : 200705 Mode : Mode 29 SN : 055eda Plane : Y with Accessories 3CH5	Date: 4 Level (dBuV/m) Date: 2023-03-28 Site : 03CH03-SZ Condition : PEAK_74 3m ANT3117_0057 VERTICAL Project : 200705 Mode : Mode 29 SN : 055eda Plane : Y with Accessories 3CH5
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH78 2480MHz	
5	Horizontal	Fundamental
Peak	Date: 2 Level (dBuV/m) Date: 2023-03-28 Site : 03CH03-SZ Condition : PEAK_BE_74 3m ANT3117_0057 HORIZONTAL Project : 200705 Mode : Mode 31 SN : 055eda Plane : Y with Accessories 3CH5	Date: 1 Level (dBuV/m) Date: 2023-03-28 Site : 03CH03-SZ Condition : PEAK_74 3m ANT3117_0057 HORIZONTAL Project : 200705 Mode : Mode 31 SN : 055eda Plane : Y with Accessories 3CH5

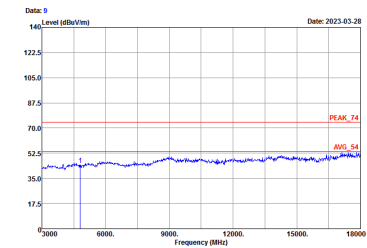
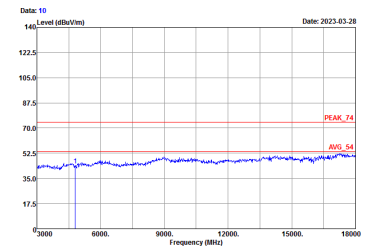


BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH78 2480MHz	
5	Vertical	Fundamental
Peak	Date: 4 Site : 03CH03-S2 Condition : PEAK_BE_74 3m ANT3117_0057 VERTICAL Project : 200705 Mode : Mode 31 SN : 05Seda Plane : Y with Accessories Plane : 3CH5	Date: 3 Site : 03CH03-S2 Condition : PEAK_74 3m ANT3117_0057 VERTICAL Project : 200705 Mode : Mode 31 SN : 05Seda Plane : Y with Accessories Plane : 3CH5



2.4GHz 2400~2483.5MHz

BT (Harmonic @ 3m)

BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BT CH00 2402MHz	
5	Horizontal	Vertical
Peak Avg.	Date: 9  Site : 02CH03-S2 Condition : PEAK_74 3m ANT3117_0057 HORIZONTAL Project : 200705 Mode : Mode 29 SN : 0954eda Plane : Y with Accessories Plane : 3CH5	Date: 10  Site : 02CH03-S2 Condition : PEAK_74 3m ANT3117_0057 VERTICAL Project : 200705 Mode : Mode 29 SN : 0954eda Plane : Y with Accessories Plane : 3CH5



BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BT CH39 2441MHz	
5	Horizontal	Vertical
Peak Avg.	Date: 5 Level (dBuV/m) PEAK_74 AVG_54 Site : 03CH03-S2 Condition : PEAK_74 3m ANT3117_0057 HORIZONTAL Project : 200705 Mode : Mode 30 SN : 055eda Plane : Y with Accessories : 3CH5	Date: 6 Level (dBuV/m) PEAK_74 AVG_54 Site : 03CH03-S2 Condition : PEAK_74 3m ANT3117_0057 VERTICAL Project : 200705 Mode : Mode 30 SN : 055eda Plane : Y with Accessories : 3CH5
BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BT CH78 2480MHz	
5	Horizontal	Vertical
Peak Avg.	Date: 13 Level (dBuV/m) PEAK_74 AVG_54 Site : 03CH03-S2 Condition : PEAK_74 3m ANT3117_0057 HORIZONTAL Project : 200705 Mode : Mode 31 SN : 055eda Plane : Y with Accessories : 3CH5	Date: 14 Level (dBuV/m) PEAK_74 AVG_54 Site : 03CH03-S2 Condition : PEAK_74 3m ANT3117_0057 VERTICAL Project : 200705 Mode : Mode 31 SN : 055eda Plane : Y with Accessories : 3CH5



Emission below 1GHz

2.4GHz BT (LF)

BT	2.4GHz 2400~2483.5MHz	
ANT	BT LF	
5	Horizontal	Vertical
Peak	Date: 1 Level (dBuV/m) Frequency (MHz) Site : 03CH3-S2 Condition : FCC CLASS-B 3m VULB9168-01003 HORIZONTAL Project : 200705 Mode : Mode 32 SN : 30a7a52 Plane : Y with Accessories Plane : 30H5	Date: 2 Level (dBuV/m) Frequency (MHz) Site : 03CH3-S2 Condition : FCC CLASS-B 3m VULB9168-01003 VERTICAL Project : 200705 Mode : Mode 32 SN : 30a7a52 Plane : Y with Accessories Plane : 30H5



<Ant6>

2.4GHz 2400~2483.5MHz

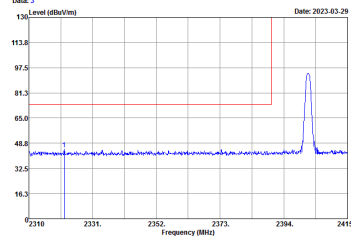
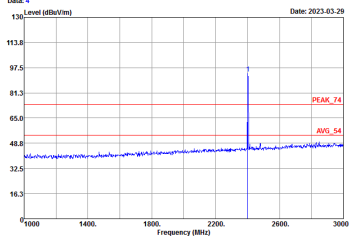
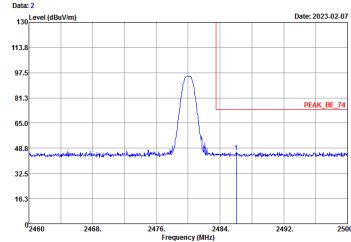
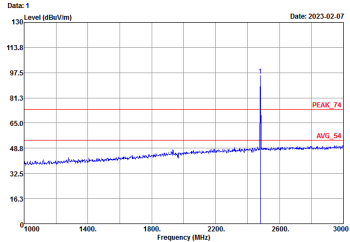
BT (Band Edge @ 3m)

BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH00 2402MHz	
6	Horizontal	Fundamental
Peak	Date: 1 Date: 2023-02-07 Site: 03CH02-S2 Condition: PEAK_BE_74 3m HF_ANT_3117_0107 HORIZONTAL Project: 200705 Mode: Mode 1 SN: 31260d7 Plane: Z with Accessories Plane: 3CH5	Date: 2 Date: 2023-03-29 Site: 03CH02-S2 Condition: PEAK_74 3m HF_ANT_3117_0107 HORIZONTAL Project: 200705 Mode: Mode 1 SN: 31260d7 Plane: Z with Accessories Plane: 3CH5



BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH00 2402MHz	
6	Vertical	Fundamental
Peak	Date: 3 Level (dBuV/m) Date: 2023-02-07 Site : 03CH02-S2 Condition : PEAK_BE_74 3m HF_ANT_3117_0107 VERTICAL Project : 200705 Mode : Mode 1 SN : 31260cf Plane : Z with Accessories Plane : 3CH5	Date: 4 Level (dBuV/m) Date: 2023-02-07 Site : 03CH02-S2 Condition : PEAK_74 3m HF_ANT_3117_0107 VERTICAL Project : 200705 Mode : Mode 1 SN : 31260cf Plane : Z with Accessories Plane : 3CH5
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH00 2402MHz (sku3)	
6	Horizontal	Fundamental
Peak	Date: 1 Level (dBuV/m) Date: 2023-03-29 Site : 03CH03-S2 Condition : PEAK_BE_74 3m ANT3117_0057 HORIZONTAL Project : 200705 Mode : Mode 41 SN : 8718ac5 Plane : Z with Accessories Plane : 3CH5	Date: 2 Level (dBuV/m) Date: 2023-03-29 Site : 03CH03-S2 Condition : PEAK_74 3m ANT3117_0057 HORIZONTAL Project : 200705 Mode : Mode 41 SN : 8718ac5 Plane : Z with Accessories Plane : 3CH5



BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH00 2402MHz (sku3)	
6	Vertical	Fundamental
Peak	Site : 03CH03-S2 Condition : PEAK_BE_74 3m ANT3117_0057 VERTICAL Project : 200705 Mode : Mode 41 SN : 8918ac5 Plane : Z with Accessories Date: 2023-03-29 	Site : 03CH03-S2 Condition : PEAK_74 3m ANT3117_0057 VERTICAL Project : 200705 Mode : Mode 41 SN : 8918ac5 Plane : Z with Accessories Date: 2023-03-29 
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH78 2480MHz	
6	Horizontal	Fundamental
Peak	Site : 03CH02-S2 Condition : PEAK_BE_74 3m HF_ANT_3117_0107 HORIZONTAL Project : 200705 Mode : Mode 3 SN : 31090af Plane : Z with Accessories Date: 2023-02-07 	Site : 03CH02-S2 Condition : PEAK_74 3m HF_ANT_3117_0107 HORIZONTAL Project : 200705 Mode : Mode 3 SN : 31090af Plane : Z with Accessories Date: 2023-02-07 



BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH78 2480MHz	
6	Vertical	Fundamental
Peak	Date: 4 Level (dBuV/m) Frequency (MHz) Site : 03CH02-S2 Condition : PEAK_BE_74 3m HF_ANT_3117_0107 VERTICAL Project : 200705 Mode : Mode 3 SN : 31260cf Plane : 2 with Accessories Plane : 3CH5	Date: 3 Level (dBuV/m) Frequency (MHz) Site : 03CH02-S2 Condition : PEAK_74 3m HF_ANT_3117_0107 VERTICAL Project : 200705 Mode : Mode 3 SN : 31260cf Plane : 2 with Accessories Plane : 3CH5



2.4GHz 2400~2483.5MHz

BT (Harmonic @ 3m)

BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BT CH00 2402MHz	
6	Horizontal	Vertical
Peak Avg.	Date: 11 Date: 2023-02-07 Site : 03CH02-S2 Condition : PEAK_74 3m HF_ANT_3117_0107 HORIZONTAL Project : 200705 Mode : Mode 1 SN : 31260cf Plane : Z with Accessories Plane : 30HS	Date: 12 Date: 2023-02-07 Site : 03CH02-S2 Condition : PEAK_74 3m HF_ANT_3117_0107 VERTICAL Project : 200705 Mode : Mode 1 SN : 31260cf Plane : Z with Accessories Plane : 30HS



BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BT CH00 2402MHz (sku3)	
6	Horizontal	Vertical
Peak Avg.	Date: 9 Level (dBuV/m) Frequency (MHz) Site : 03CH03-S2 Condition : PEAK_74 3m ANT3117_0057 HORIZONTAL Project : 200705 Mode : Mode 41 SN : 8918ac5 Plane : Z with Accessories 3CH5	Date: 10 Level (dBuV/m) Frequency (MHz) Site : 03CH03-S2 Condition : PEAK_74 3m ANT3117_0057 VERTICAL Project : 200705 Mode : Mode 41 SN : 8918ac5 Plane : Z with Accessories 3CH5
BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BT CH39 2441MHz	
6	Horizontal	Vertical
Peak Avg.	Date: 5 Level (dBuV/m) Frequency (MHz) Site : 03CH02-S2 Condition : PEAK_74 3m HF_ANT_3117_0107 HORIZONTAL Project : 200705 Mode : Mode 2 SN : 31050d4 Plane : Z with Accessories 3CH5	Date: 6 Level (dBuV/m) Frequency (MHz) Site : 03CH02-S2 Condition : PEAK_74 3m HF_ANT_3117_0107 VERTICAL Project : 200705 Mode : Mode 2 SN : 31050d4 Plane : Z with Accessories 3CH5

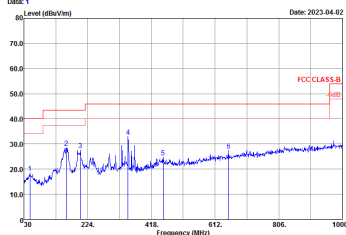
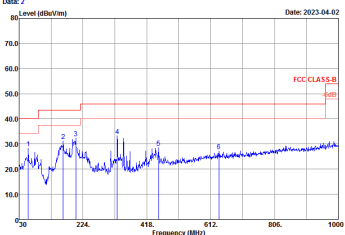


BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BT CH78 2480MHz	
6	Horizontal	Vertical
Peak Avg.	Date: 9 Level (dBuV/m) PEAK_74 AVG_54 Frequency (MHz) Site : 03CH02-S2 Condition : PEAK_74 3m HF_ANT_3117_0107 HORIZONTAL Project : 200705 Mode : Mode 3 SN : 31260cf Plane : 2 with Accessories Plane : 3CH5	Date: 10 Level (dBuV/m) PEAK_74 AVG_54 Frequency (MHz) Site : 03CH02-S2 Condition : PEAK_74 3m HF_ANT_3117_0107 VERTICAL Project : 200705 Mode : Mode 3 SN : 31260cf Plane : 2 with Accessories Plane : 3CH5



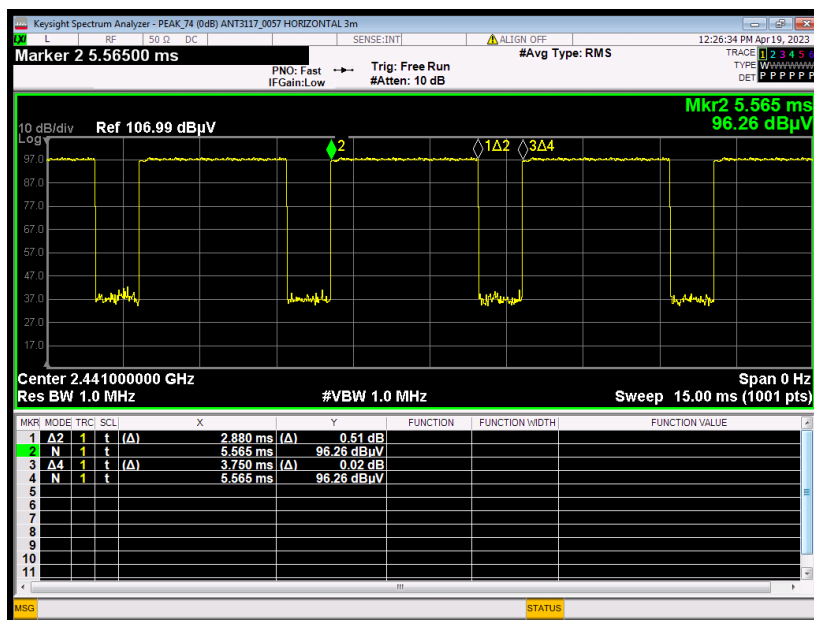
Emission below 1GHz

2.4GHz BT (LF)

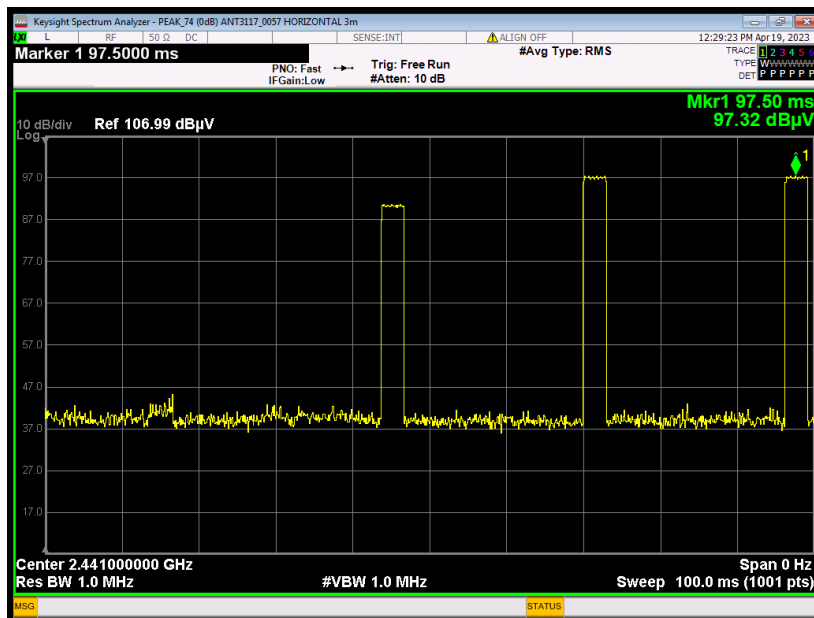
BT	2.4GHz 2400~2483.5MHz	
ANT	BT LF	
6	Horizontal	Vertical
Peak	Date: 1 Level (dBuV/m)  Frequency (MHz) Site : 03CH03-S2 Condition : FCC CLASS-B 3m VULB9168-01003 HORIZONTAL Project : 200705 Mode : Mode 4 SN : 3267a62 Plane : Z with Accessories Plane : 30HS	Date: 2 Level (dBuV/m)  Frequency (MHz) Site : 03CH03-S2 Condition : FCC CLASS-B 3m VULB9168-01003 VERTICAL Project : 200705 Mode : Mode 4 SN : 3267a62 Plane : Z with Accessories Plane : 30HS

Appendix E. Duty Cycle Plots <Ant5>

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



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

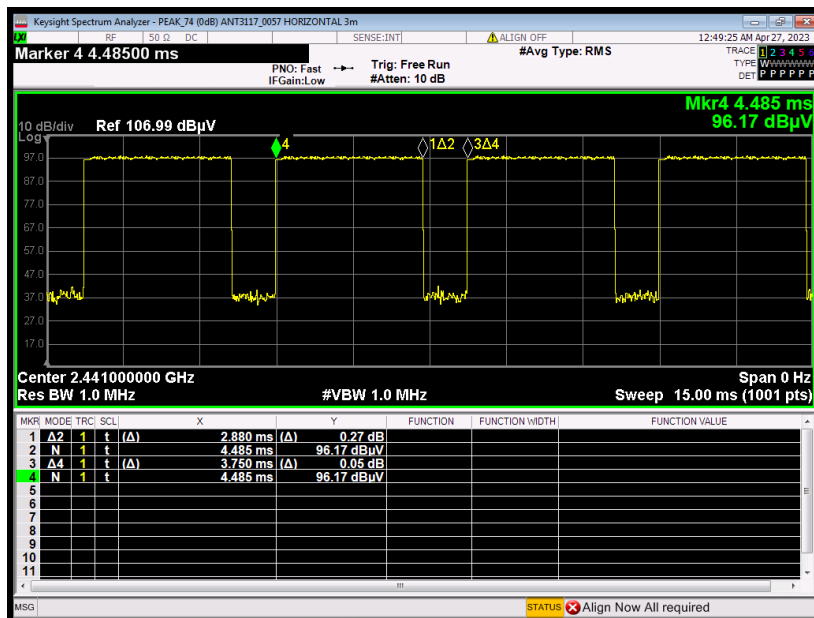


Note:

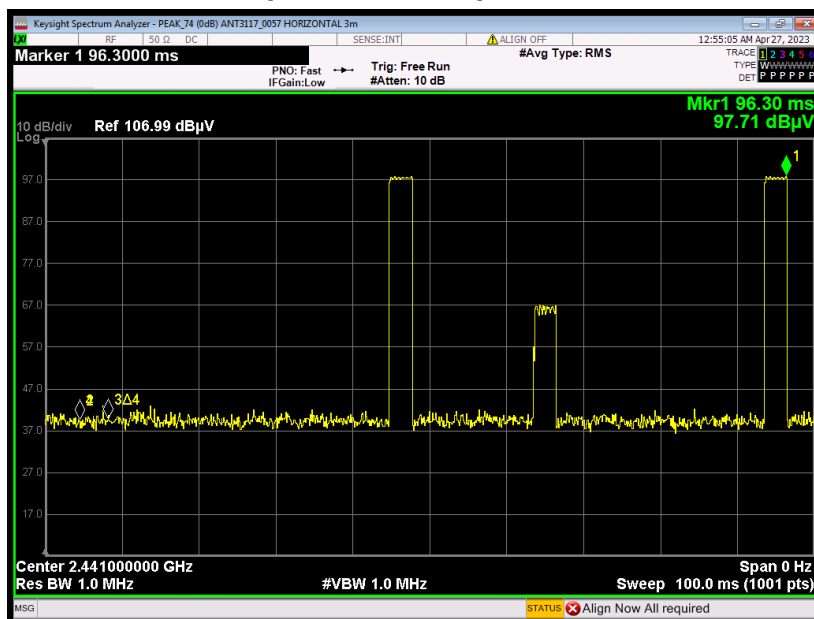
1. Worst case Duty cycle = on time/100 milliseconds = $2 * 2.88 / 100 = 5.76 \%$
2. Worst case Duty cycle correction factor = $20 * \log(\text{Duty cycle}) = -24.79 \text{ dB}$
3. 3DH5 has the highest duty cycle worst case and is reported.

<Ant6>

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.