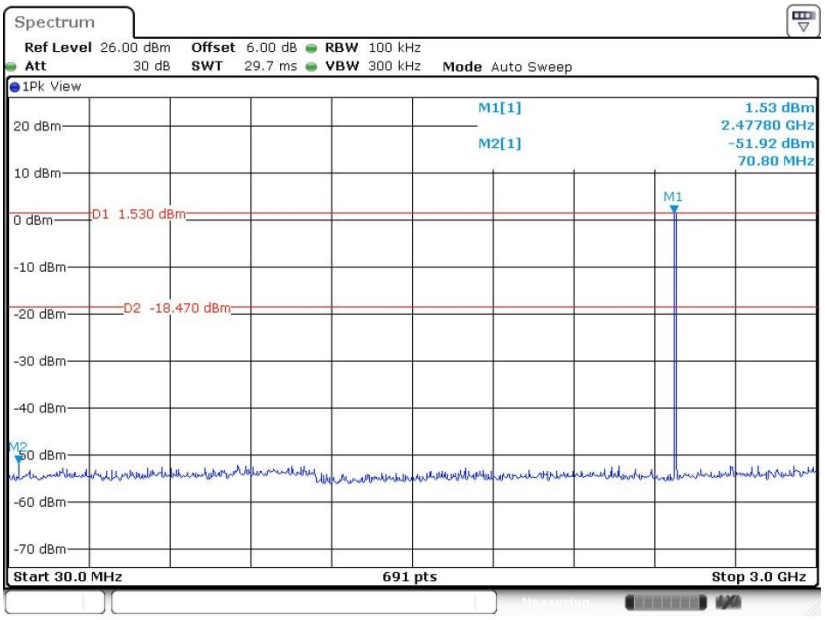
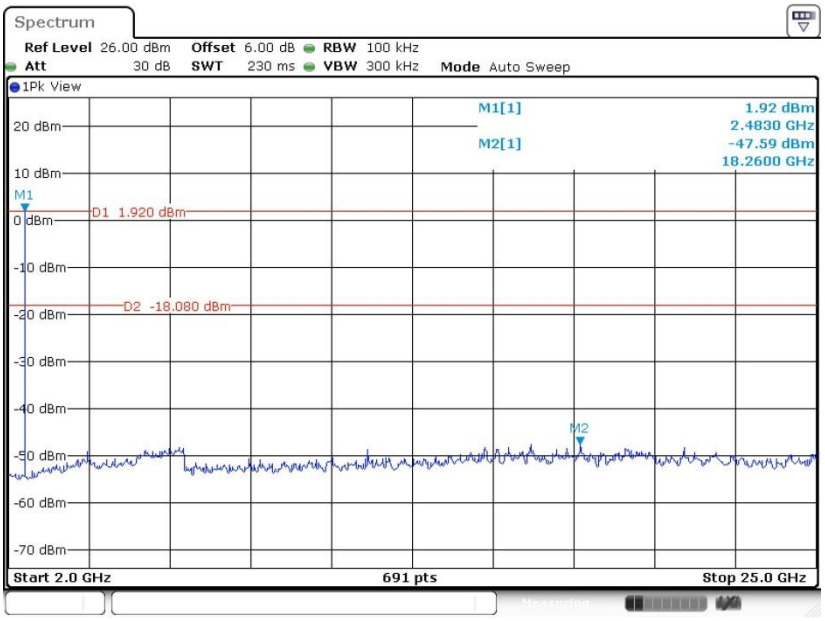
CSE Plot on Ch 78 between 30MHz ~ 3 GHz



Date: 18.JUN.2022 00:03:31

CSE Plot on Ch 78 between 2 GHz ~ 25 GHz



Date: 18.JUN.2022 00:03:59

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.

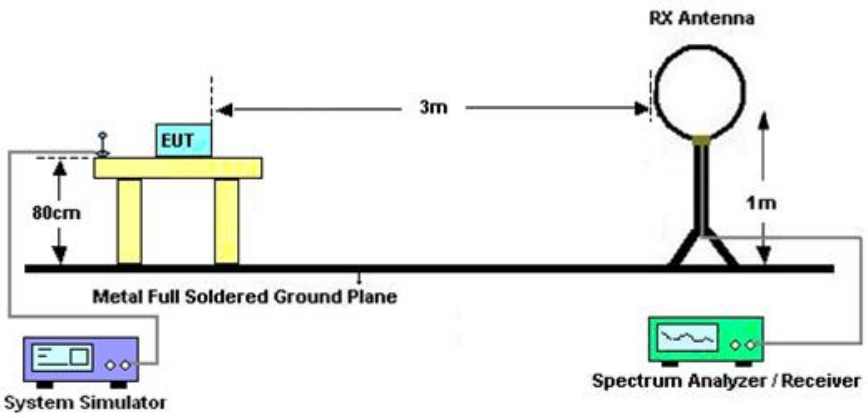
3.8.3 Test Procedures

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>1GHz ; 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. 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.

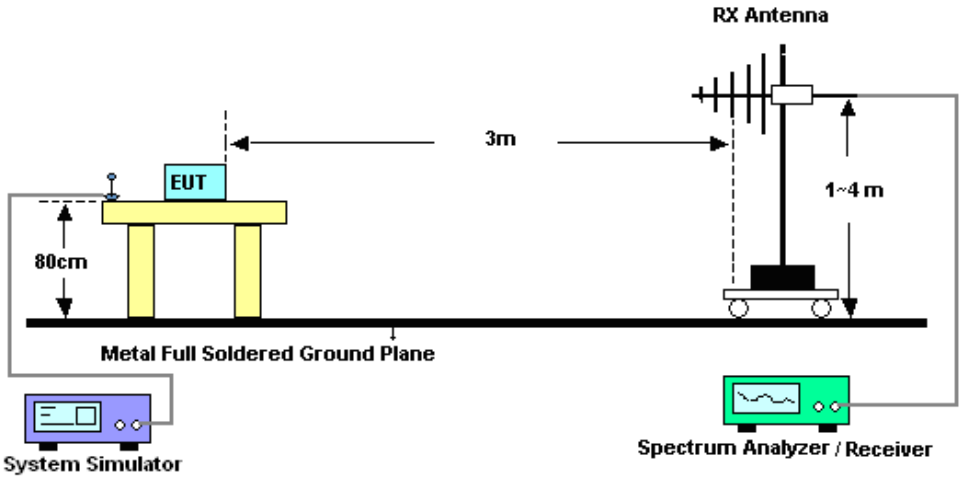
Note: The average levels were calculated from the peak level corrected with duty cycle correction factor (-24.76dB) derived from 20log (dwell time/100ms). This correction is only for signals that hop with the fundamental signal, such as band-edge and harmonic. Other spurious signals that are independent of the hopping signal would not use this correction.

3.8.4 Test Setup

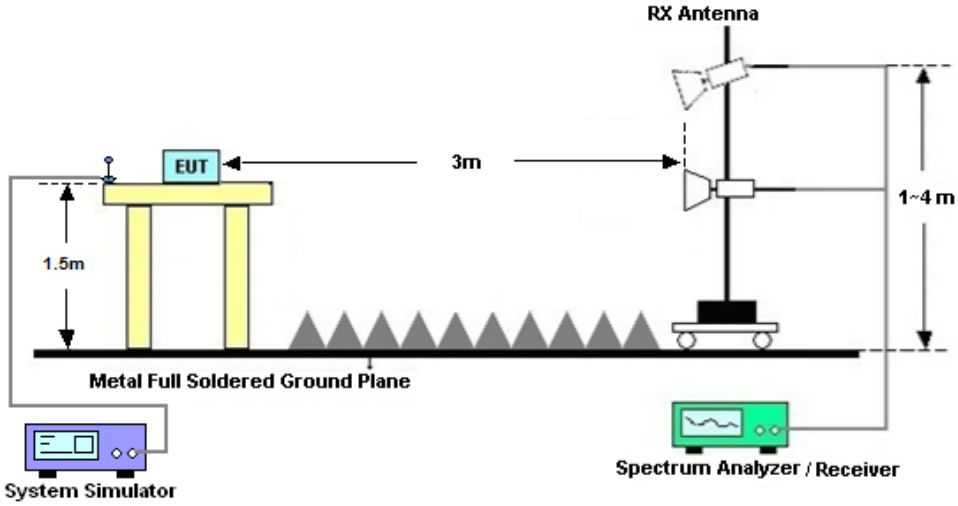
For radiated emissions below 30MHz



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 B&C.

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

Please refer to Appendix B&C.

3.8.8 Duty cycle correction factor for average measurement

Please refer to Appendix D.

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.

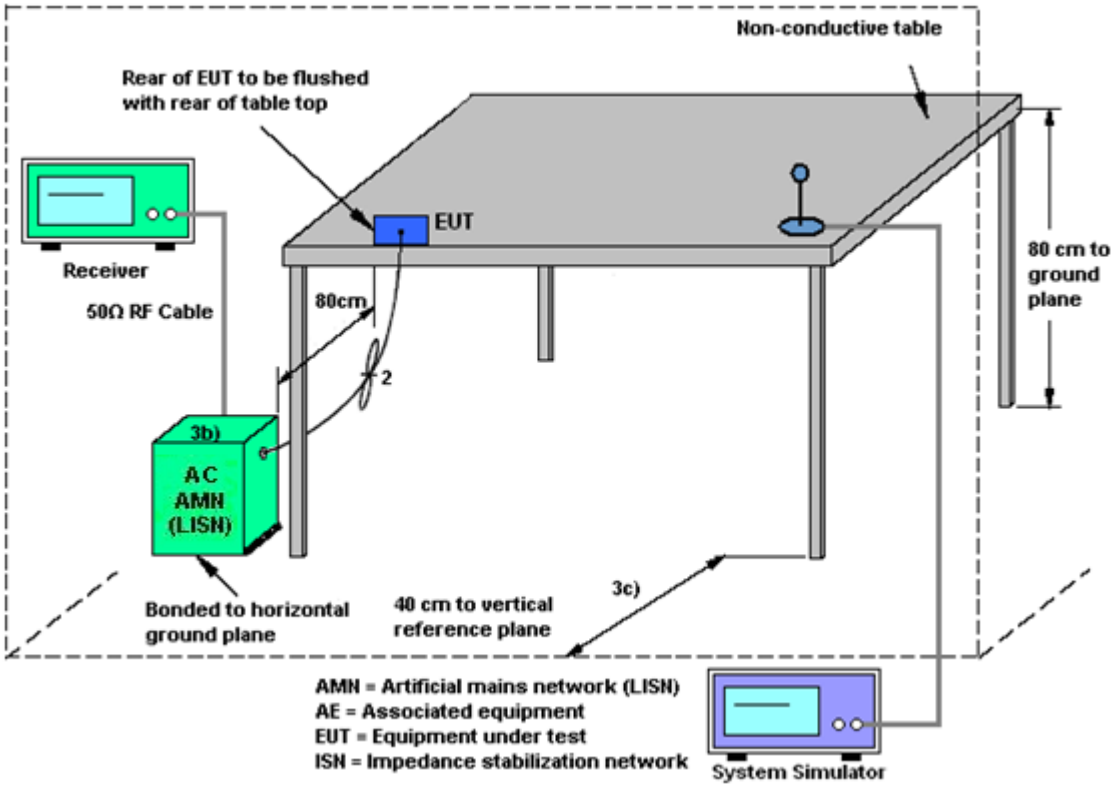
3.9.2 Measuring Instruments

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	101040	10Hz~40GHz	Oct. 14, 2021	May 18, 2022~ Jun. 18, 2022	Oct. 13, 2022	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 05, 2022	May 18, 2022~ Jun. 18, 2022	Jan. 04, 2023	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 05, 2022	May 18, 2022~ Jun. 18, 2022	Jan. 04, 2023	Conducted (TH01-KS)
EMI Test Receiver	Keysight	N9038A	MY56400004	3Hz~8.5GHz;Max 30dBm	Oct. 16, 2021	Jul. 17, 2022	Oct. 15, 2022	Radiation (03CH05-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55150244	10Hz-44G,MAX 30dB	Mar. 24, 2022	Jul. 17, 2022	Mar. 23, 2023	Radiation (03CH05-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 30, 2021	Jul. 17, 2022	Oct. 29, 2022	Radiation (03CH05-KS)
Bilog Antenna	TeseQ	CBL6111D	49922	30MHz-1GHz	Jun. 03 ,2022	Jul. 17, 2022	Jun. 02, 2023	Radiation (03CH05-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75957	1GHz~18GHz	Nov. 08, 2021	Jul. 17, 2022	Nov. 07, 2022	Radiation (03CH05-KS)
SHF-EHF Horn	Com-power	AH-840	101070	18GHz~40GHz	Jan. 05, 2022	Jul. 17, 2022	Jan. 04, 2023	Radiation (03CH05-KS)
Amplifier	SONOMA	310N	380826	9KHz-1GHz	Jul. 11, 2022	Jul. 17, 2022	Jul. 10, 2023	Radiation (03CH05-KS)
Amplifier	MITEQ	EM18G40GGA	060728	18~40GHz	Jan. 05, 2022	Jul. 17, 2022	Jan. 04, 2023	Radiation (03CH05-KS)
high gain Amplifier	MITEQ	AMF-7D-00101800-30-10P	2012228	1Ghz-18Ghz	Oct. 16, 2021	Jul. 17, 2022	Oct. 15, 2022	Radiation (03CH05-KS)
Amplifier	Keysight	83017A	MY53270316	500MHz~26.5GHz	Oct. 16, 2021	Jul. 17, 2022	Oct. 15, 2022	Radiation (03CH05-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Jul. 17, 2022	NCR	Radiation (03CH05-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Jul. 17, 2022	NCR	Radiation (03CH05-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Jul. 17, 2022	NCR	Radiation (03CH05-KS)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	Apr. 20, 2022	Jul. 26, 2022	Apr. 19, 2023	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060103	9kHz~30MHz	Oct. 14, 2021	Jul. 26, 2022	Oct. 13, 2022	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060105	9kHz~30MHz	Apr. 20, 2022	Jul. 26, 2022	Apr. 19, 2023	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP000000811	AC 0V~300V, 45Hz~1000Hz	Oct. 14, 2021	Jul. 26, 2022	Oct. 13, 2022	Conduction (CO01-KS)

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	±0.56 dB
Conducted Emissions	±0.92 dB
Occupied Channel Bandwidth	±0.03 %

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.94dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.0dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.0dB

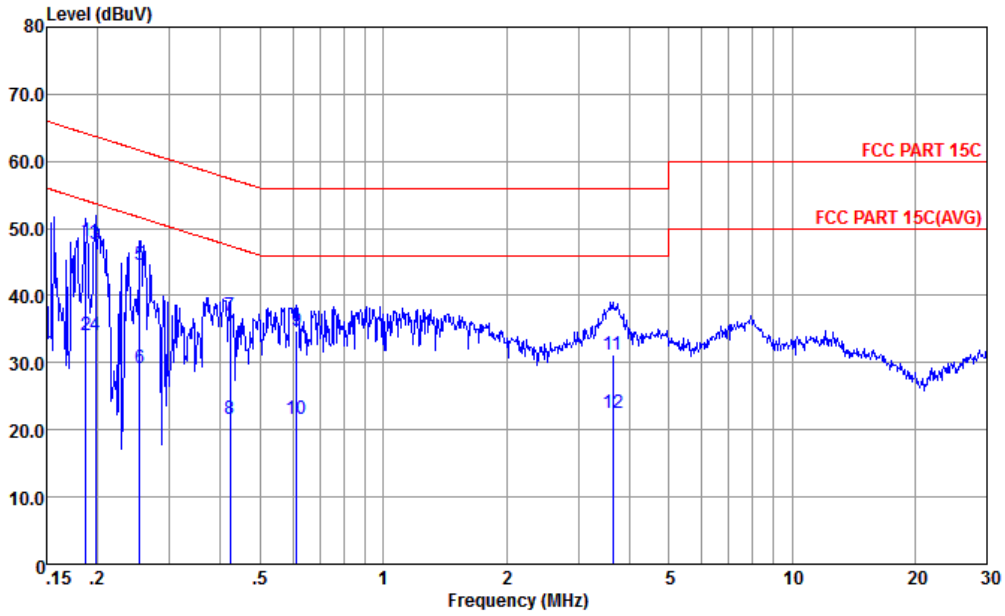
Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.0dB

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

Appendix A. AC Conducted Emission Test Results

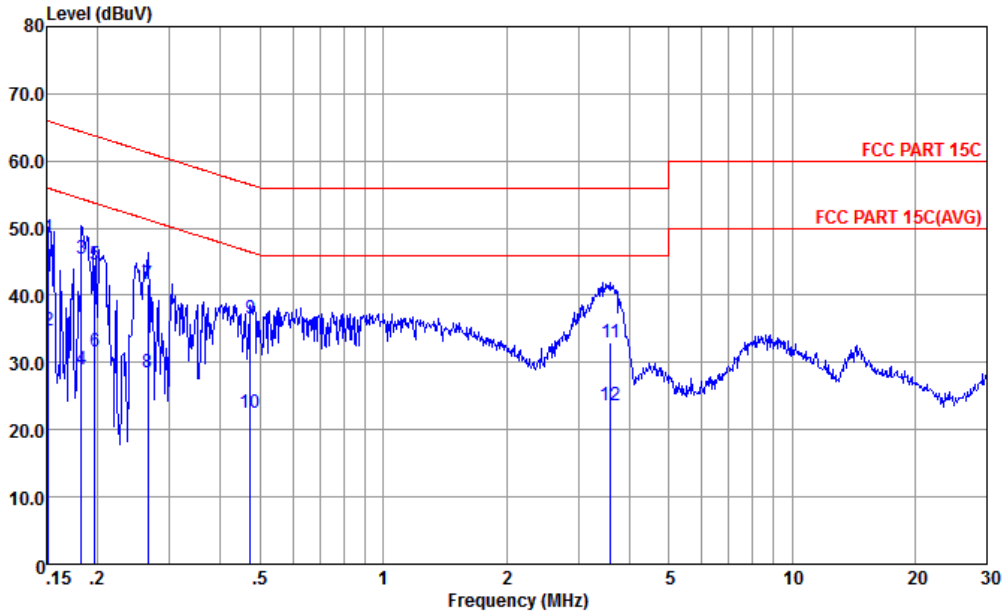
Test Engineer :	Amos Zhang	**Temperature :**	25.3~26.2℃
		Relative Humidity :	38~40%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : CO01-KS
Condition : FCC PART 15C LISN-060105-L LINE

	Freq MHz	Level dBuV	Over Limit dB	Limit Line dBuV	Read Level dBuV	LISN Factor dB	Cable Loss dB	Remark
1 *	0.187	48.23	-15.92	64.15	37.80	0.04	10.39	QP
2	0.187	34.03	-20.12	54.15	23.60	0.04	10.39	Average
3	0.198	47.61	-16.10	63.71	37.20	0.04	10.37	QP
4	0.198	34.01	-19.70	53.71	23.60	0.04	10.37	Average
5	0.253	44.59	-17.05	61.64	34.20	0.06	10.33	QP
6	0.253	29.29	-22.35	51.64	18.90	0.06	10.33	Average
7	0.421	36.95	-20.47	57.42	26.60	0.09	10.26	QP
8	0.421	21.65	-25.77	47.42	11.30	0.09	10.26	Average
9	0.614	34.84	-21.16	56.00	24.49	0.11	10.24	QP
10	0.614	21.54	-24.46	46.00	11.19	0.11	10.24	Average
11	3.642	31.21	-24.79	56.00	20.80	0.16	10.25	QP
12	3.642	22.61	-23.39	46.00	12.20	0.16	10.25	Average

Test Engineer :	Amos Zhang	**Temperature :**	25.3~26.2℃
		Relative Humidity :	38~40%
Test Voltage :	120Vac / 60Hz	**Phase :**	Neutral
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : CO01-KS
Condition : FCC PART 15C LISN-060105-N NEUTRAL

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1 *	0.152	48.49	-17.42	65.91	37.90	0.11	10.48	QP
2	0.152	34.69	-21.22	55.91	24.10	0.11	10.48	Average
3	0.182	45.40	-18.97	64.37	34.90	0.10	10.40	QP
4	0.182	29.00	-25.37	54.37	18.50	0.10	10.40	Average
5	0.197	44.57	-19.19	63.76	34.10	0.10	10.37	QP
6	0.197	31.67	-22.09	53.76	21.20	0.10	10.37	Average
7	0.266	41.62	-19.63	61.25	31.20	0.10	10.32	QP
8	0.266	28.62	-22.63	51.25	18.20	0.10	10.32	Average
9	0.474	36.55	-19.90	56.45	26.20	0.11	10.24	QP
10	0.474	22.55	-23.90	46.45	12.20	0.11	10.24	Average
11	3.603	33.01	-22.99	56.00	22.60	0.16	10.25	QP
12	3.603	23.71	-22.29	46.00	13.30	0.16	10.25	Average

Note:

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

Appendix B. Radiated Spurious Emission

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		2342.11	49.34	-24.66	74	46.38	32.81	7.04	36.89	307	228	P	H
	*	2342.11	24.58	-29.42	54	-	-	-	-	-	-	A	H
		2402	97.63	-	-	94.48	32.88	7.13	36.86	307	228	P	H
		2402	72.87	-	-	-	-	-	-	-	-	A	H
		2340.16	47.95	-26.05	74	44.99	32.81	7.04	36.89	100	270	P	V
	*	2340.16	23.19	-30.81	54	-	-	-	-	-	-	A	V
		2402	97.02	-	-	93.87	32.88	7.13	36.86	100	270	P	V
		2402	72.26	-	-	-	-	-	-	-	-	A	V
BT CH 39 2441MHz		2357.06	48.08	-25.92	74	45.09	32.83	7.04	36.88	273	310	P	H
		2357.06	23.32	-30.68	54	-	-	-	-	-	-	A	H
	*	2489.22	48.46	-25.54	74	45.02	33	7.25	36.81	273	310	P	H
		2489.22	23.70	-30.30	54	-	-	-	-	-	-	A	H
		2442	93.90	-	-	90.61	32.94	7.19	36.84	273	310	P	H
		2442	69.14	-	-	-	-	-	-	-	-	A	H
		2363.95	48.35	-25.65	74	45.33	32.83	7.07	36.88	100	283	P	V
		2363.95	23.59	-30.41	54	-	-	-	-	-	-	A	V
	*	2493.98	48.34	-25.66	74	44.87	33	7.28	36.81	100	283	P	V
		2493.98	23.58	-30.42	54	-	-	-	-	-	-	A	V
		2442	94.06	-	-	90.77	32.94	7.19	36.84	100	283	P	V
		2442	69.30	-	-	-	-	-	-	-	-	A	V

BT CH 78 2480MHz		2497.24	49.09	-24.91	74	45.62	33	7.28	36.81	297	304	P	H
	*	2497.24	24.33	-29.67	54	-	-	-	-	-	-	A	H
		2480	97.77	-	-	94.36	32.98	7.25	36.82	297	304	P	H
		2480	73.01	-	-	-	-	-	-	-	-	A	H
		2483.98	49.15	-24.85	74	45.74	32.98	7.25	36.82	304	141	P	V
	*	2483.98	24.39	-29.61	54	-	-	-	-	-	-	A	V
		2480	92.79	-	-	89.38	32.98	7.25	36.82	304	141	P	V
		2480	68.03	-	-	-	-	-	-	-	-	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		4800	39.83	-34.17	74	60.81	34.19	10.2	65.37	300	0	P	H
		4800	39.36	-34.64	74	60.34	34.19	10.2	65.37	100	0	P	V
BT CH 39 2441MHz		4875	39.66	-34.34	74	60.56	34.23	10.29	65.42	300	0	P	H
		7320	42.02	-31.98	74	59.39	35.87	12.72	65.96	300	0	P	H
		4875	39.77	-34.23	74	60.67	34.23	10.29	65.42	100	0	P	V
		7320	41.96	-32.04	74	59.33	35.87	12.72	65.96	100	0	P	V
BT CH 78 2480MHz		4965	39.8	-34.2	74	60.58	34.28	10.41	65.47	300	0	P	H
		7440	42.05	-31.95	74	59.68	35.89	12.79	66.31	300	0	P	H
		4965	40.71	-33.29	74	61.49	34.28	10.41	65.47	100	0	P	V
		7440	41.7	-32.3	74	59.33	35.89	12.79	66.31	100	0	P	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	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)
2.4GHz BT LF		46.49	24	-16	40	39.37	16.53	1.03	32.93	-	-	P	H
		84.32	23.92	-16.08	40	40.55	14.8	1.39	32.82	-	-	P	H
		151.25	28.01	-15.49	43.5	41.48	17.48	1.86	32.81	-	-	P	H
		250.19	20.44	-25.56	46	31.72	19.4	2.42	33.1	-	-	P	H
		641.1	26.4	-19.6	46	29.37	25.83	3.86	32.66	-	-	P	H
		868.08	29.2	-16.8	46	29.99	27.27	4.5	32.56	-	-	P	H
		45.52	32.98	-7.02	40	47.95	16.92	1.03	32.92	-	-	P	V
		83.35	25.91	-14.09	40	42.77	14.6	1.38	32.84	-	-	P	V
		152.22	27.26	-16.24	43.5	40.75	17.45	1.87	32.81	-	-	P	V
		416.06	21.69	-24.31	46	28.36	22.99	3.11	32.77	-	-	P	V
		607.15	25.02	-20.98	46	28.24	25.55	3.76	32.53	-	-	P	V
		825.4	30.7	-15.3	46	31.81	27.05	4.39	32.55	-	-	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 **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	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)
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)

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. Over Limit(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”.

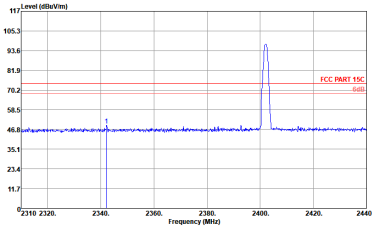
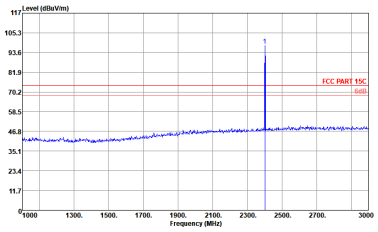
Appendix C. Radiated Spurious Emission Plots

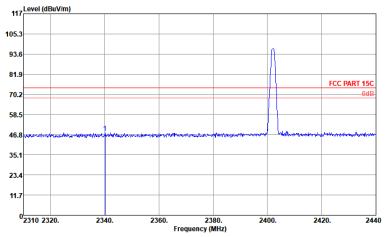
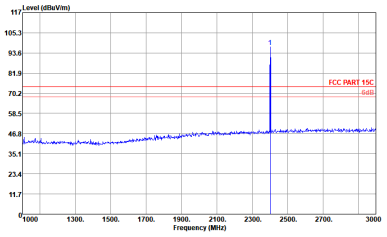
Note symbol

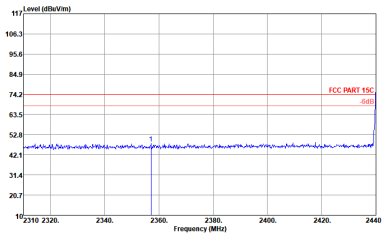
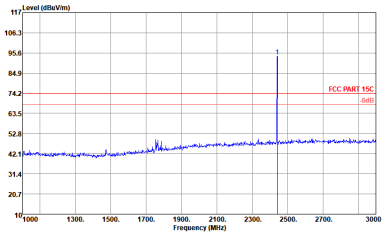
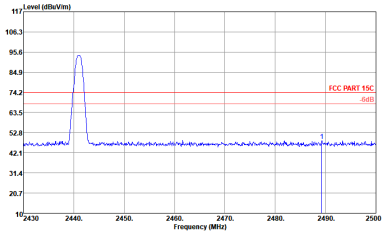
-L	**Low channel location**
-R	**High channel location**

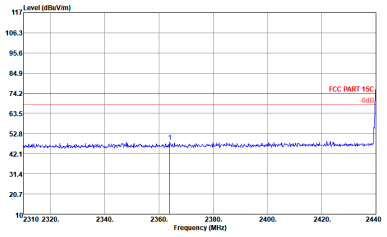
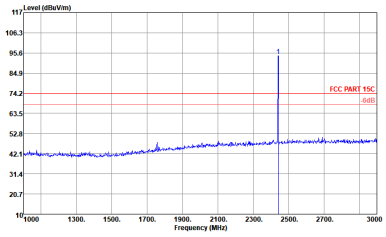
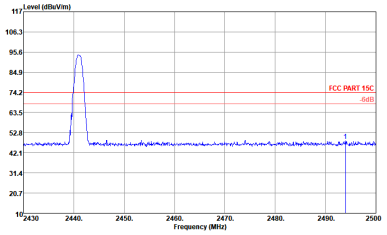
2.4GHz 2400~2483.5MHz

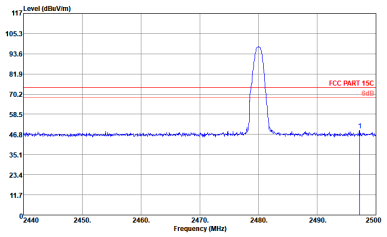
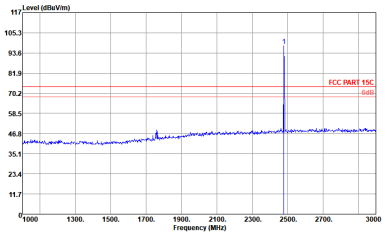
BT (Band Edge @ 3m)

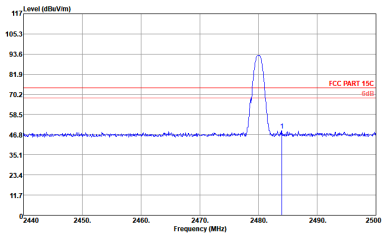
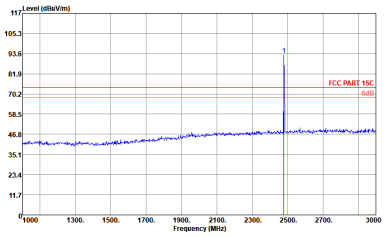
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH00 2402MHz	
6	Horizontal	Fundamental
Peak	 Site : a Condition : FCC PART 15C 3m 3317 SN 75957 HORIZONTAL : RBW:1000.000KHz VBW:1000.000KHz SWT:Auto Project : (FR)230405 Mode : 1 Plane : Y : Full-directivity IMEI : #14 Freq Level Over Limit Limit Read Antenna Level Factor Cable Loss Preamp Factor A/Pos T/Pos Remark Pol/Phas MHz dBuV/m dB dBuV/m dBuV dB/m dB dB cm deg 1 2342.11 49.34 -24.66 74.00 46.38 32.81 7.04 36.89 307 228 Peak HORIZONT	 Site : a Condition : FCC PART 15C 3m 3317 SN 75957 HORIZONTAL : RBW:1000.000KHz VBW:1000.000KHz SWT:Auto Project : (FR)230405 Mode : 1 Plane : Y : Full-directivity IMEI : #14 Freq Level Over Limit Limit Read Antenna Level Factor Cable Loss Preamp Factor A/Pos T/Pos Remark Pol/Phas MHz dBuV/m dB dBuV/m dBuV dB/m dB dB cm deg 1 * 2402.00 97.63 23.63 74.00 94.48 32.88 7.13 36.86 307 228 Peak HORIZONT

BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH00 2402MHz	
6	Vertical	Fundamental
Peak	 Site : a Condition : FCC PART 15C 3m 3317 SN 75957 VERTICAL : RBW:1000.000KHz VBW:1000.000KHz SWT:Auto Project : (FR)230405 Mode : 1 Plane : Y : Full-directivity IMEI : #14 Freq Level Over Limit Limit Line ReadAntenna Level Factor Cable Loss Factor Preamp Factor A/Pos Remark T/Pos Pol/Phas MHz dBuV/m dB dBuV/m dBuV dB/m dB dB cm deg 1 2340.16 47.95 -26.05 74.00 44.99 32.81 7.04 36.89 100 270 Peak VERTICAL	 Site : a Condition : FCC PART 15C 3m 3317 SN 75957 VERTICAL : RBW:1000.000KHz VBW:1000.000KHz SWT:Auto Project : (FR)230405 Mode : 1 Plane : Y : Full-directivity IMEI : #14 Freq Level Over Limit Limit Line ReadAntenna Level Factor Cable Loss Factor Preamp Factor A/Pos Remark T/Pos Pol/Phas MHz dBuV/m dB dBuV/m dBuV dB/m dB dB cm deg 1 * 2402.00 97.02 23.02 74.00 93.87 32.88 7.13 36.86 100 270 Peak VERTICAL

BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH39 2441MHz	
6	Horizontal	Fundamental
Peak	 Site : a Condition : FCC PART 15C 3m 3317 SN 75957 HORIZONTAL : RBW:1000.000KHz VBW:1000.000KHz SWT:Auto Project : (FR)230405 Mode : 2 Plane : Y : Full-directivity IMEI : #14 Freq Level Over Limit Limit Line ReadAntenna Level Factor Cable Loss Preamp Factor A/Pos T/Pos Remark Pol/Phas MHz dBuV/m dB dBuV/m dBuV dB/m dB dB cm deg 1 2357.06 48.08 -25.92 74.00 45.09 32.83 7.04 36.88 273 310 Peak HORIZONT	 Site : a Condition : FCC PART 15C 3m 3317 SN 75957 HORIZONTAL : RBW:1000.000KHz VBW:1000.000KHz SWT:Auto Project : (FR)230405 Mode : 2 Plane : Y : Full-directivity IMEI : #14 Freq Level Over Limit Limit Line ReadAntenna Level Factor Cable Loss Preamp Factor A/Pos T/Pos Remark Pol/Phas MHz dBuV/m dB dBuV/m dBuV dB/m dB dB cm deg 1 * 2442.00 93.90 19.90 74.00 90.61 32.94 7.19 36.84 273 310 Peak HORIZONT
Peak	 Site : a Condition : FCC PART 15C 3m 3317 SN 75957 HORIZONTAL : RBW:1000.000KHz VBW:1000.000KHz SWT:Auto Project : (FR)230405 Mode : 2 Plane : Y : Full-directivity IMEI : #14 Freq Level Over Limit Limit Line ReadAntenna Level Factor Cable Loss Preamp Factor A/Pos T/Pos Remark Pol/Phas MHz dBuV/m dB dBuV/m dBuV dB/m dB dB cm deg 1 2489.22 48.46 -25.54 74.00 45.02 33.00 7.25 36.81 273 310 Peak HORIZONT	Left blank

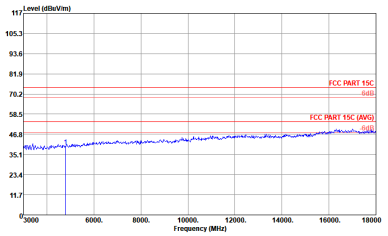
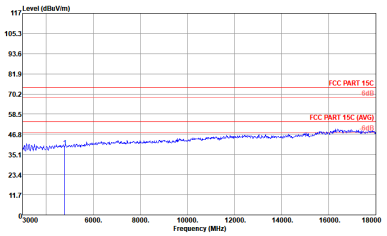
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH39 2441MHz	
6	Vertical	Fundamental
Peak	 Site : a Condition : FCC PART 15C 3m 3317 SN 75957 VERTICAL : RBW:1000.000KHz VBW:1000.000KHz SWT:Auto Project : (FR)230405 Mode : 2 Plane : Y : Full-directivity IMEI : #14 Freq Level Over Limit Limit Line ReadAntenna Level Factor Cable Loss Factor Preamp Factor A/Pos T/Pos Remark Pol/Phas MHz dBuV/m dB dBuV/m dBuV dB/m dB dB cm deg 1 2363.95 48.35 -25.65 74.00 45.33 32.83 7.07 36.88 100 283 Peak VERTICAL	 Site : a Condition : FCC PART 15C 3m 3317 SN 75957 VERTICAL : RBW:1000.000KHz VBW:1000.000KHz SWT:Auto Project : (FR)230405 Mode : 2 Plane : Y : Full-directivity IMEI : #14 Freq Level Over Limit Limit Line ReadAntenna Level Factor Cable Loss Factor Preamp Factor A/Pos T/Pos Remark Pol/Phas MHz dBuV/m dB dBuV/m dBuV dB/m dB dB cm deg 1 * 2442.00 94.06 20.06 74.00 90.77 32.94 7.19 36.84 100 283 Peak VERTICAL
Peak	 Site : a Condition : FCC PART 15C 3m 3317 SN 75957 VERTICAL : RBW:1000.000KHz VBW:1000.000KHz SWT:Auto Project : (FR)230405 Mode : 2 Plane : Y : Full-directivity IMEI : #14 Freq Level Over Limit Limit Line ReadAntenna Level Factor Cable Loss Factor Preamp Factor A/Pos T/Pos Remark Pol/Phas MHz dBuV/m dB dBuV/m dBuV dB/m dB dB cm deg 1 2493.98 48.34 -25.66 74.00 44.87 33.00 7.28 36.81 100 283 Peak VERTICAL	Left blank

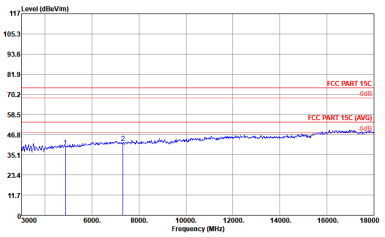
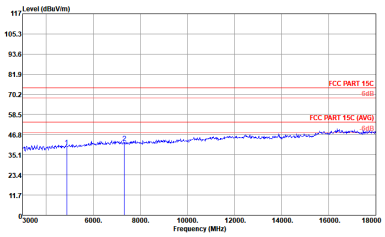
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH78 2480MHz	
6	Horizontal	Fundamental
Peak	 Site : a Condition : FCC PART 15C 3m 3317 SN 75957 HORIZONTAL : RBW:1000.000KHz VBW:1000.000KHz SWT:Auto Project : (FR)230405 Mode : 3 Plane : Y : Full-directivity+Earphone IMEI : #14 Freq Level Over Limit Limit Line ReadAntenna Level Factor Cable Loss Preamp Factor A/Pos T/Pos Remark Pol/Phas MHz dBuV/m dB dBuV/m dBuV dB/m dB dB cm deg 1 2497.24 49.09 -24.91 74.00 45.62 33.00 7.28 36.81 297 304 Peak HORIZONT	 Site : a Condition : FCC PART 15C 3m 3317 SN 75957 HORIZONTAL : RBW:1000.000KHz VBW:1000.000KHz SWT:Auto Project : (FR)230405 Mode : 3 Plane : Y : Full-directivity+Earphone IMEI : #14 Freq Level Over Limit Limit Line ReadAntenna Level Factor Cable Loss Preamp Factor A/Pos T/Pos Remark Pol/Phas MHz dBuV/m dB dBuV/m dBuV dB/m dB dB cm deg 1 * 2480.00 97.77 23.77 74.00 94.36 32.98 7.25 36.82 297 304 Peak HORIZONT

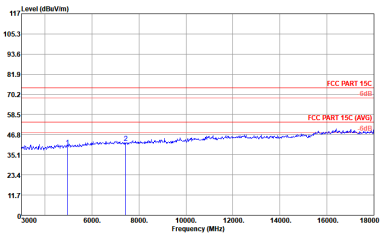
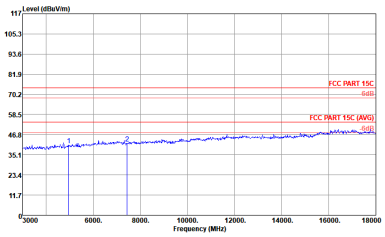
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH78 2480MHz	
6	Vertical	Fundamental
Peak	 Site : a Condition : FCC PART 15C 3m 3317 SN 75957 VERTICAL : RBW:1000.000KHz VBW:1000.000KHz SWT:Auto Project : (FR)230405 Mode : 3 Plane : Y : Full-directivity+Earphone IMEI : #14 Freq Level Over Limit Limit Line ReadAntenna Level Factor Cable Loss Preamp Factor A/Pos T/Pos Remark Pol/Phas MHz dBuV/m dB dBuV/m dBuV dB/m dB dB cm deg 1 2483.98 49.15 -24.85 74.00 45.74 32.98 7.25 36.82 304 141 Peak VERTICAL	 Site : a Condition : FCC PART 15C 3m 3317 SN 75957 VERTICAL : RBW:1000.000KHz VBW:1000.000KHz SWT:Auto Project : (FR)230405 Mode : 3 Plane : Y : Full-directivity+Earphone IMEI : #14 Freq Level Over Limit Limit Line ReadAntenna Level Factor Cable Loss Preamp Factor A/Pos T/Pos Remark Pol/Phas MHz dBuV/m dB dBuV/m dBuV dB/m dB dB cm deg 1 * 2480.00 92.79 18.79 74.00 89.38 32.98 7.25 36.82 304 141 Peak VERTICAL

2.4GHz 2400~2483.5MHz

BT (Harmonic @ 3m)

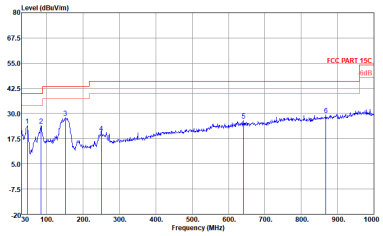
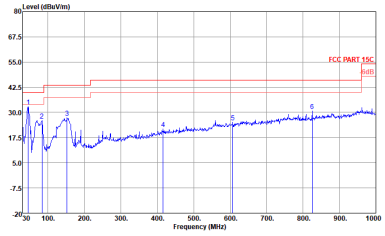
BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BT CH00 2402MHz	
6	Horizontal	Vertical
Peak Avg.	 Site : # Condition : FCC PART 15C 3m 3317 SN 75957 HORIZONTAL : RBW:1000.000KHz VBW:1000.000KHz SWT:Auto Project : (FR)230405 Mode : 1 Plane : Y IMEI : Full-directivity : #14 Freq Level Over Limit Limit Read Level Antenna Factor Cable Loss Preamp Factor A/Pos T/Pos Remark Pol/Phas MHz dBuV/m dB dBuV/m dBuV dB/m dB dB cm deg 1 4800.00 39.83 -34.17 74.00 60.81 34.19 10.20 65.37 300 0 Peak HORIZONT	 Site : # Condition : FCC PART 15C 3m 3317 SN 75957 VERTICAL : RBW:1000.000KHz VBW:1000.000KHz SWT:Auto Project : (FR)230405 Mode : 1 Plane : Y IMEI : Full-directivity : #14 Freq Level Over Limit Limit Read Level Antenna Factor Cable Loss Preamp Factor A/Pos T/Pos Remark Pol/Phas MHz dBuV/m dB dBuV/m dBuV dB/m dB dB cm deg 1 4800.00 39.36 -34.64 74.00 60.34 34.19 10.20 65.37 100 0 Peak VERTICAL

BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BT CH39 2441MHz	
6	Horizontal	Vertical
Peak Avg.	 Site : a Condition : FCC PART 15C 3m 3317 SN 75957 HORIZONTAL : RBW:1000.000KHz VBW:1000.000KHz SWT:Auto Project : (FR)230405 Mode : 2 Plane : Y : Full-directivity IMEI : #14 Freq Level Over Limit Limit Line ReadAntenna Level Factor Cable Loss Preamp Factor A/Pos T/Pos Remark Pol/Phas MHz dBuV/m dB dBuV/m dBuV dB/m dB dB cm deg 1 4875.00 39.66 -34.34 74.00 60.56 34.23 10.29 65.42 300 0 Peak HORIZONT 2 7320.00 42.02 -31.98 74.00 59.39 35.87 12.72 65.96 300 0 Peak HORIZONT	 Site : a Condition : FCC PART 15C 3m 3317 SN 75957 VERTICAL : RBW:1000.000KHz VBW:1000.000KHz SWT:Auto Project : (FR)230405 Mode : 2 Plane : Y : Full-directivity IMEI : #14 Freq Level Over Limit Limit Line ReadAntenna Level Factor Cable Loss Preamp Factor A/Pos T/Pos Remark Pol/Phas MHz dBuV/m dB dBuV/m dBuV dB/m dB dB cm deg 1 4875.00 39.77 -34.23 74.00 60.67 34.23 10.29 65.42 100 0 Peak VERTICAL 2 7320.00 41.96 -32.04 74.00 59.33 35.87 12.72 65.96 100 0 Peak VERTICAL

BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BT CH78 2480MHz	
6	Horizontal	Vertical
Peak Avg.	 Site : a Condition : FCC PART 15C 3m 3317 SN 75957 HORIZONTAL : RBW:1000.000KHz VBW:1000.000KHz SWT:Auto Project : (FR)230405 Mode : 3 Plane : Y : Full-directivity+Earphone IMEI : #14 Freq Level Over Limit Limit Line ReadAntenna Level Cable Loss Preamp Factor A/Pos T/Pos Remark Pol/Phas MHz dBuV/m dB dBuV/m dBuV dB/m dB dB cm deg 1 4965.00 39.80 -34.20 74.00 60.58 34.28 10.41 65.47 300 0 Peak HORIZONT 2 7440.00 42.05 -31.95 74.00 59.68 35.89 12.79 66.31 300 0 Peak HORIZONT	 Site : a Condition : FCC PART 15C 3m 3317 SN 75957 VERTICAL : RBW:1000.000KHz VBW:1000.000KHz SWT:Auto Project : (FR)230405 Mode : 3 Plane : Y : Full-directivity+Earphone IMEI : #14 Freq Level Over Limit Limit Line ReadAntenna Level Cable Loss Preamp Factor A/Pos T/Pos Remark Pol/Phas MHz dBuV/m dB dBuV/m dBuV dB/m dB dB cm deg 1 4965.00 40.71 -33.29 74.00 61.49 34.28 10.41 65.47 100 0 Peak VERTICAL 2 7440.00 41.70 -32.30 74.00 59.33 35.89 12.79 66.31 100 0 Peak VERTICAL

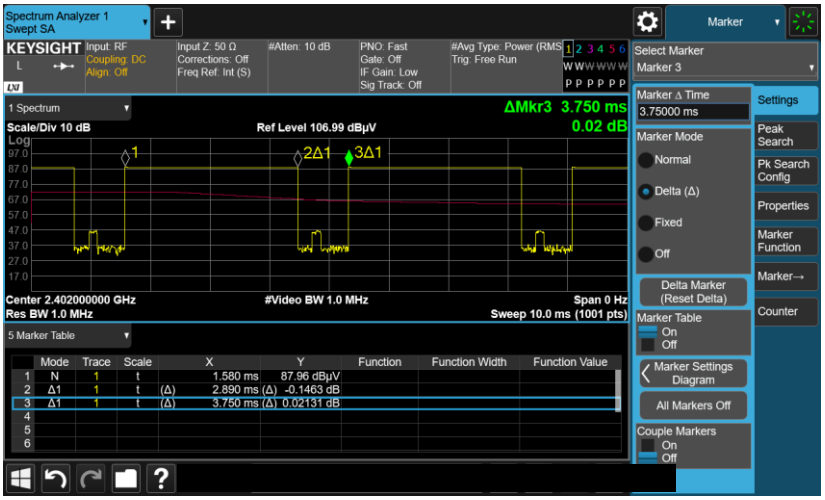
Emission below 1GHz

2.4GHz BT (LF)

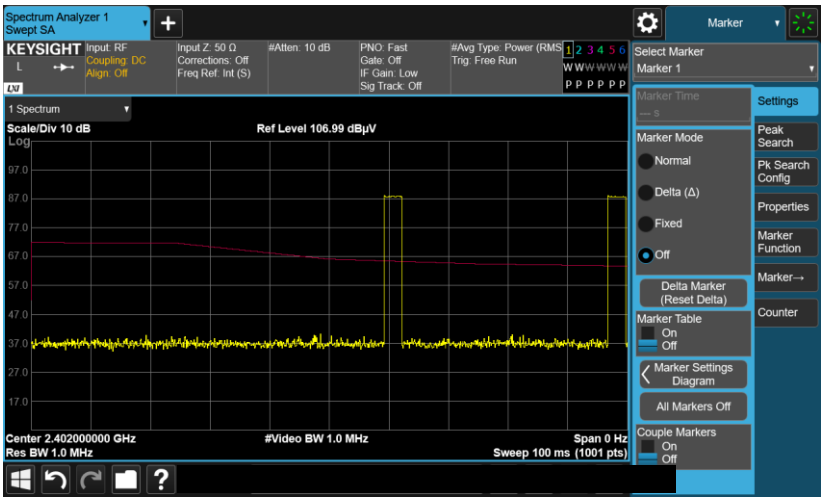
BT	2.4GHz 2400~2483.5MHz	
ANT	BT LF	
6	Horizontal	Vertical
QP / Peak	 Site : 03CH05-KS Condition : FCC PART 15C 3m CBL6111D SN23188 HORIZONTAL RBW:100.000KHz VBW:300.000KHz SWT:Auto Project : (FR)230405 mode : 1 : 7 : Full-directivity IMEI : #14 1 46.49 24.00 -16.00 40.00 39.37 16.53 1.03 32.93 --- --- Peak HORIZONT 2 84.32 23.92 -16.08 40.00 40.55 14.80 1.39 32.82 --- --- Peak HORIZONT 3 151.25 28.01 -15.49 43.50 41.48 17.48 1.86 32.81 --- --- Peak HORIZONT 4 250.19 20.44 -25.56 46.00 31.72 19.40 2.42 33.10 --- --- Peak HORIZONT 5 641.10 26.40 -19.60 46.00 29.37 25.83 3.86 32.56 --- --- Peak HORIZONT 6 868.08 29.20 -16.80 46.00 29.99 27.27 4.50 32.56 --- --- Peak HORIZONT	 Site : 03CH05-KS Condition : FCC PART 15C 3m CBL6111D SN23188 VERTICAL RBW:100.000KHz VBW:300.000KHz SWT:Auto Project : (FR)230405 mode : 1 : 7 : Full-directivity IMEI : #14 1 45.52 32.98 -7.02 40.00 47.95 16.92 1.03 32.92 --- --- Peak VERTICAL 2 83.35 25.91 -14.09 40.00 42.77 14.60 1.38 32.84 --- --- Peak VERTICAL 3 152.22 27.26 -16.24 43.50 40.75 17.45 1.87 32.81 --- --- Peak VERTICAL 4 416.06 21.69 -24.31 46.00 28.36 22.99 3.11 32.77 --- --- Peak VERTICAL 5 607.15 25.02 -20.98 46.00 28.24 25.55 3.76 32.53 --- --- Peak VERTICAL 6 825.40 30.70 -15.30 46.00 31.81 27.05 4.39 32.55 --- --- Peak VERTICAL

Appendix D. 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 * 2.89 / 100 = 5.78 %
2. Worst case Duty cycle correction factor = 20*log(Duty cycle) = -24.76 dB
3. 3DH5 has the highest duty cycle worst case and is reported.