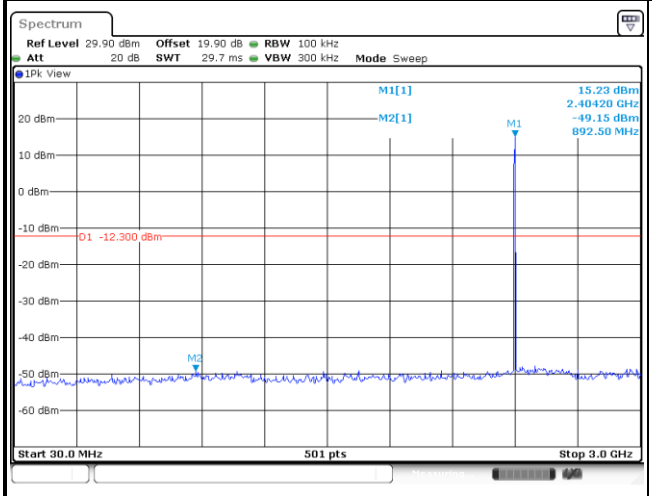
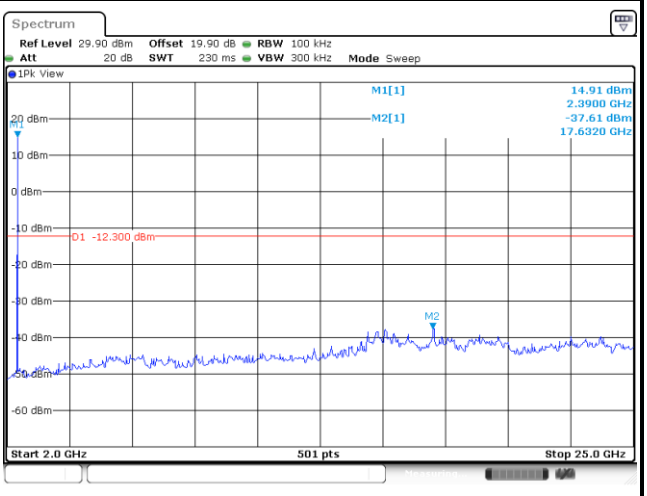
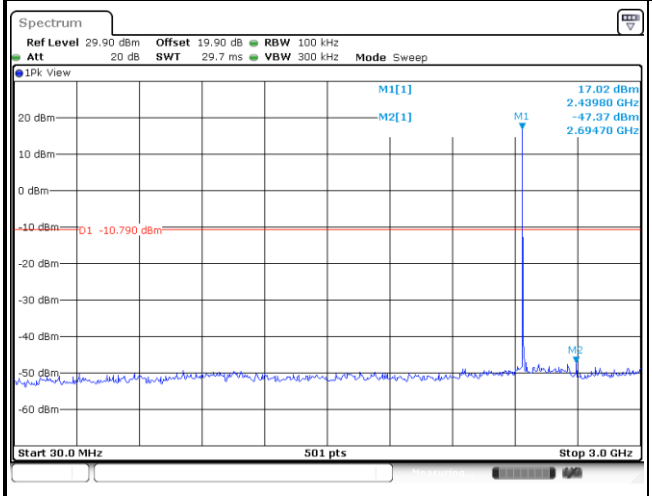
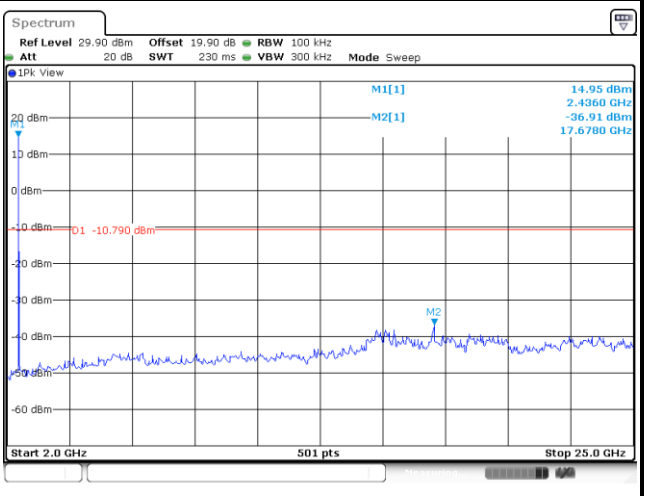
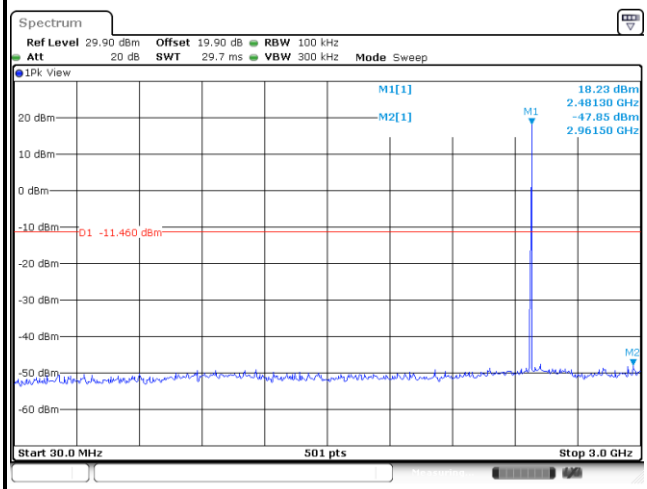
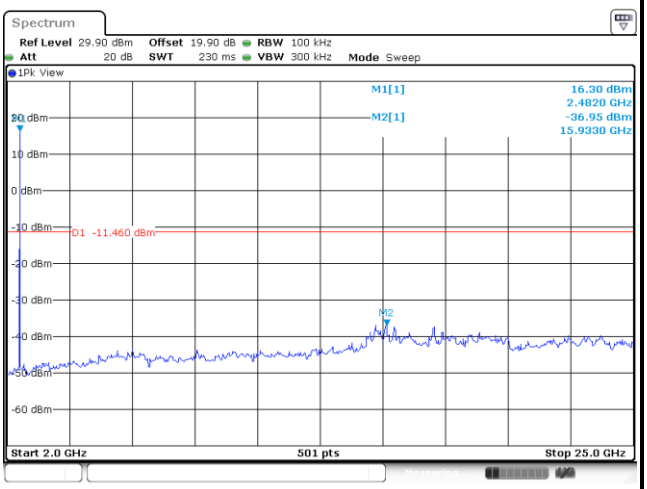
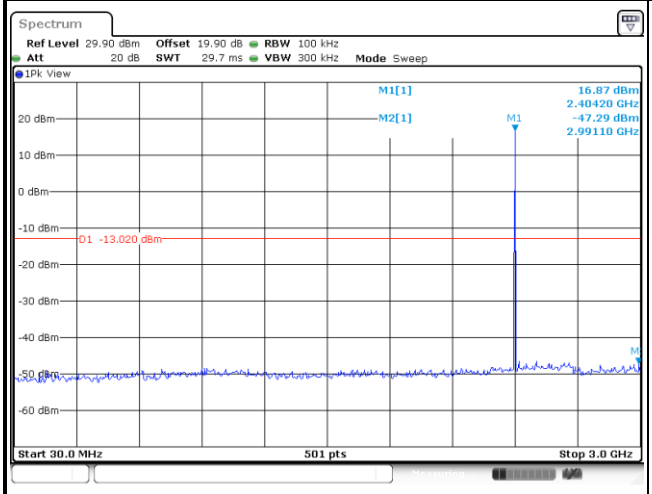
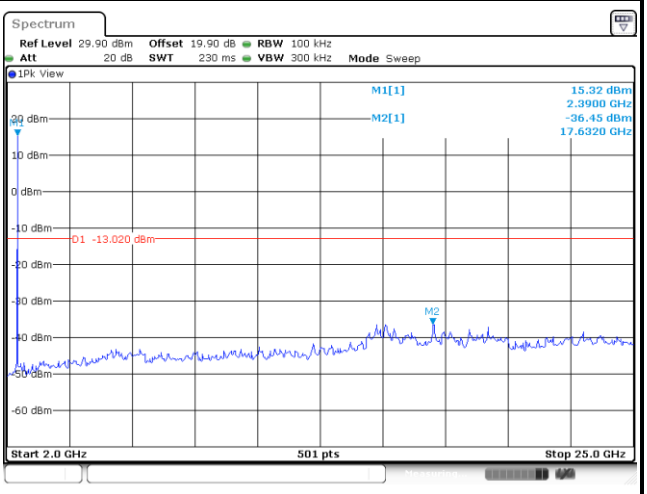
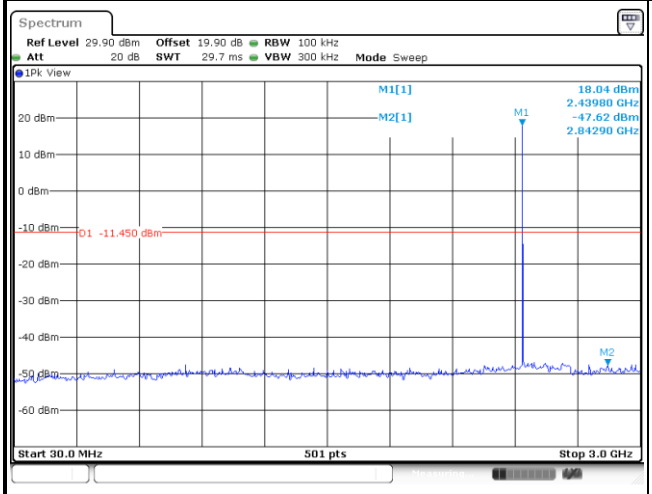
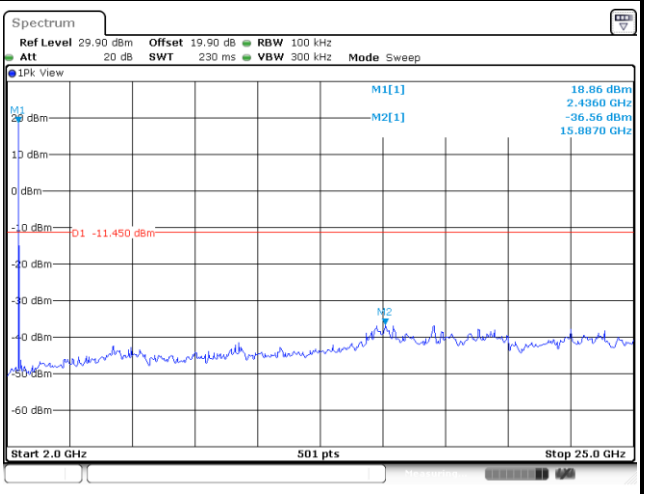
<2Mbps>

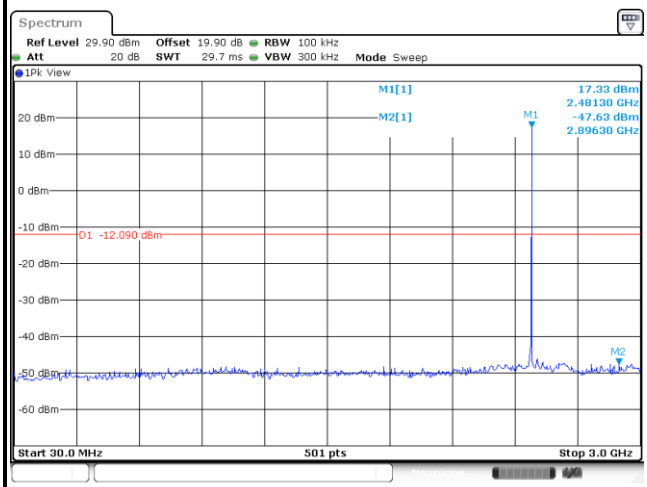
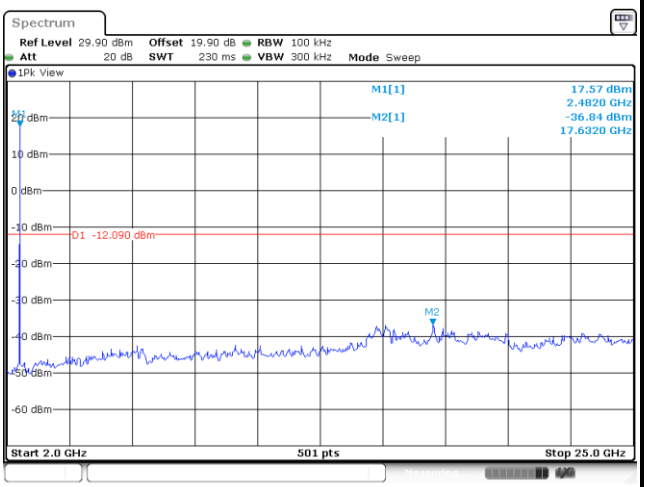
Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 00	Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 00
	
Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 19	**Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 19**
	

Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 39	Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 39
	

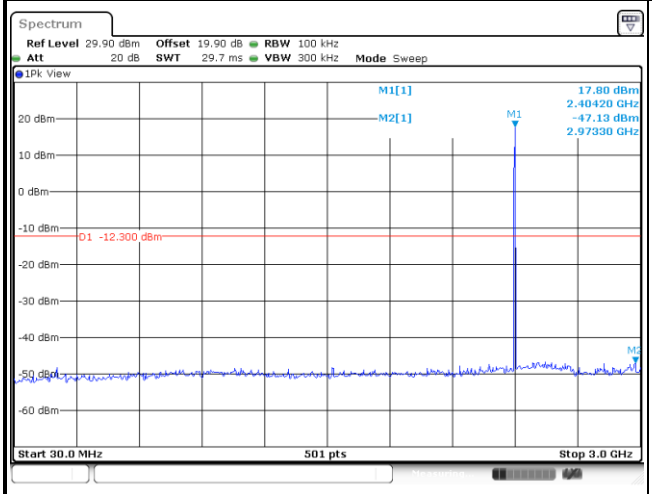
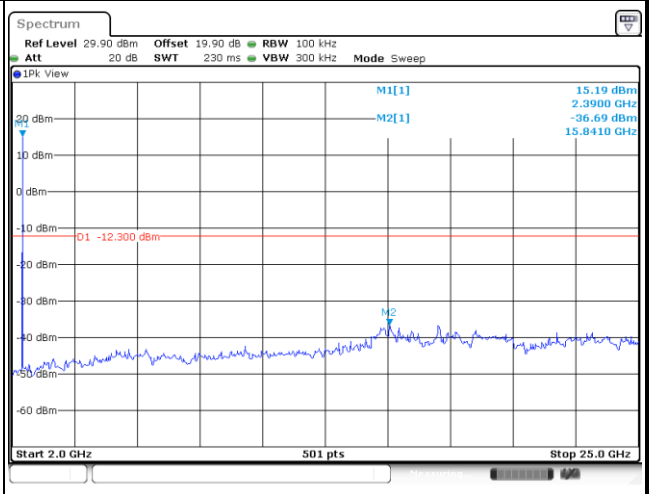
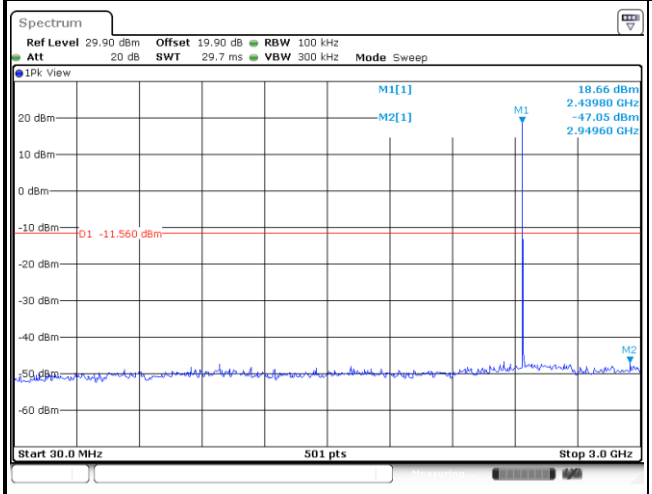
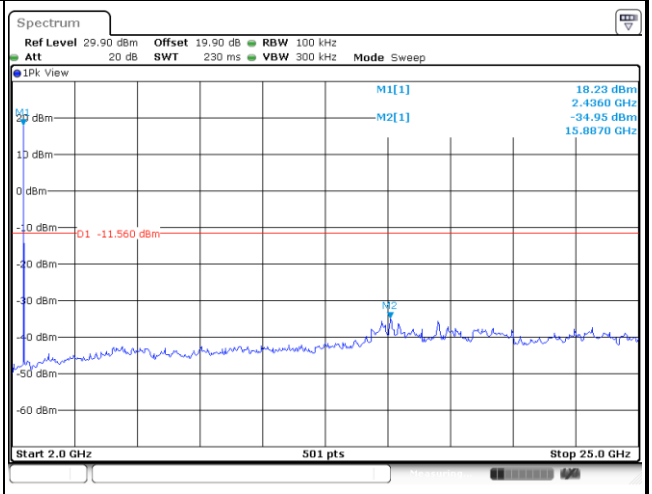
MIMO<Ant.3>

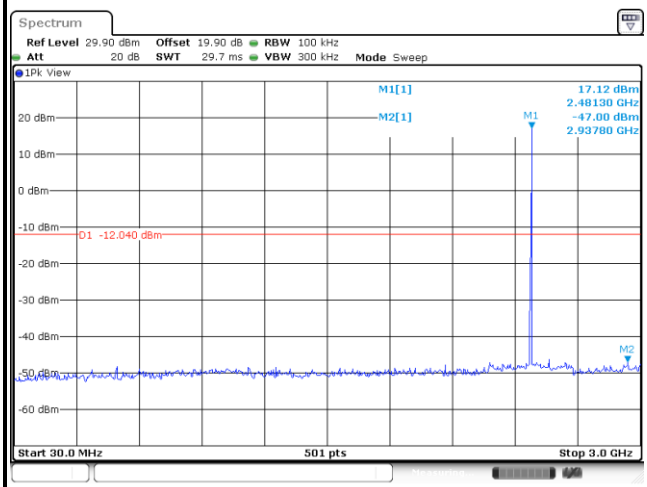
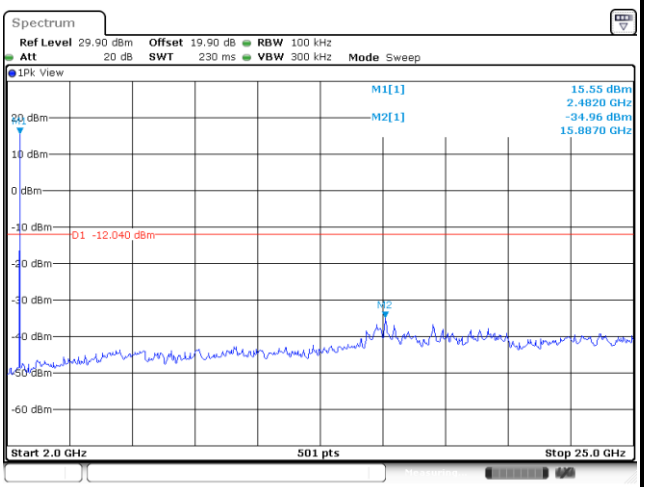
<1Mbps>

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 00	Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 00
	
Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 19	**Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 19**
	

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 39	Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 39
	

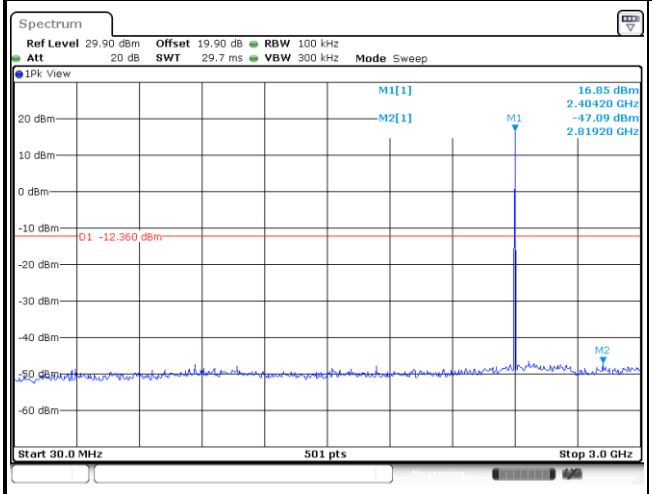
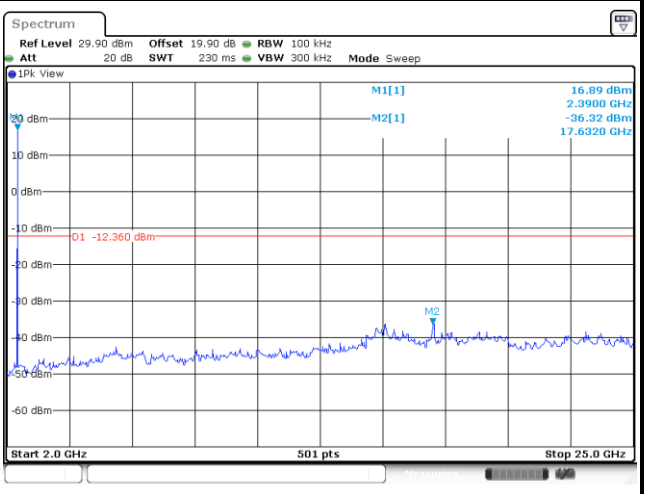
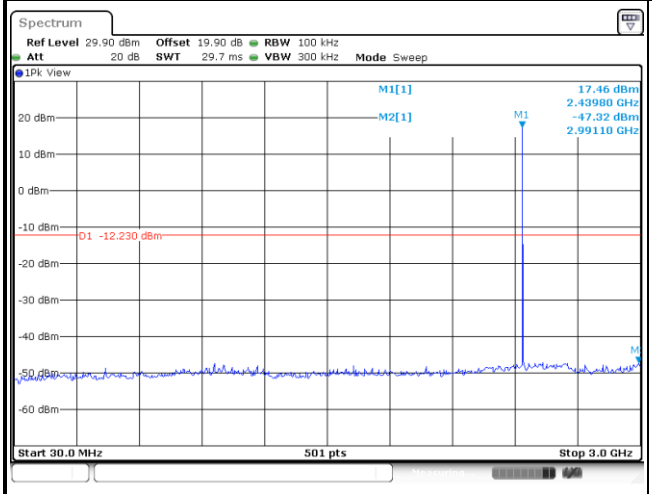
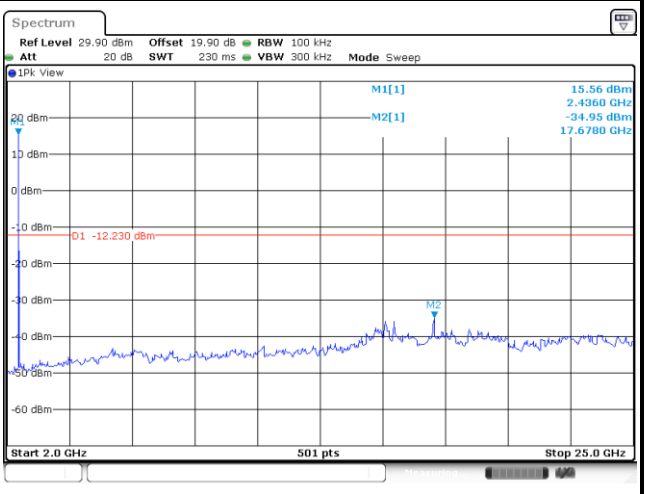
<2Mbps>

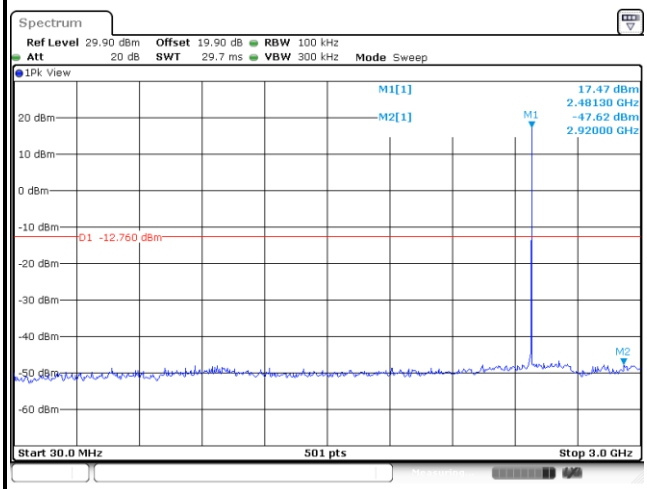
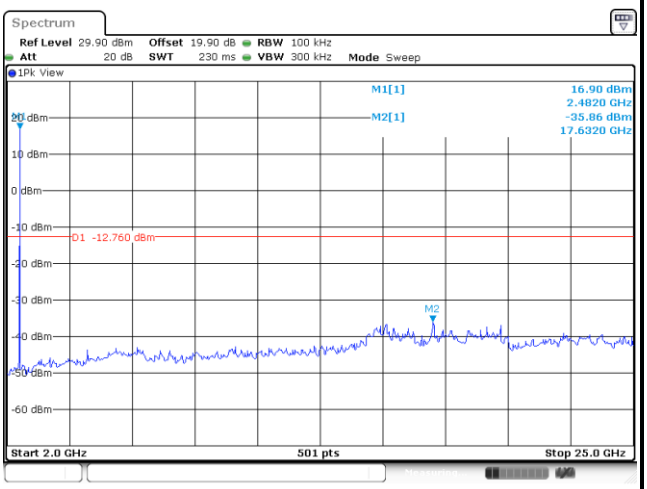
Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 00	Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 00
	
Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 19	**Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 19**
	

Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 39	Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 39
	

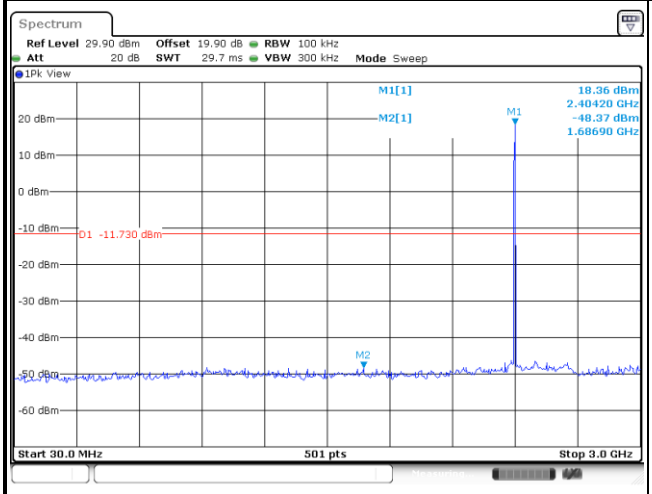
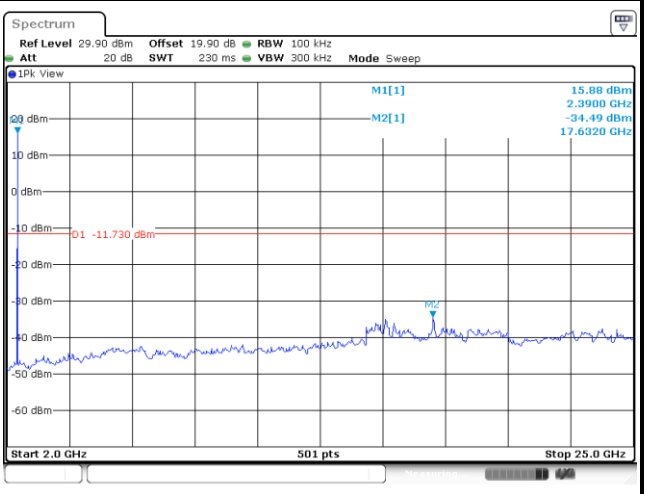
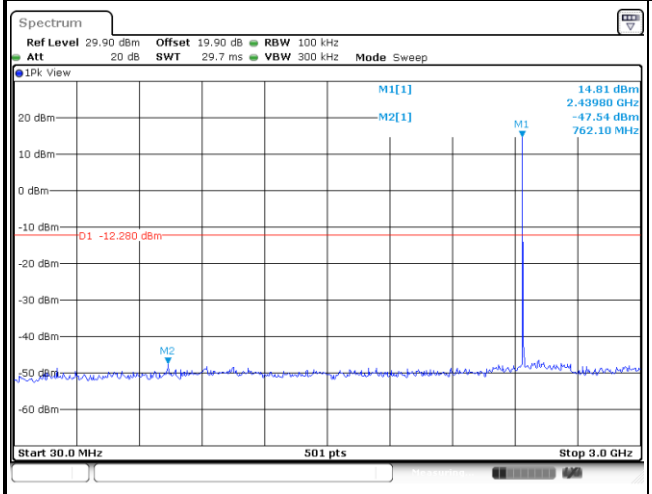
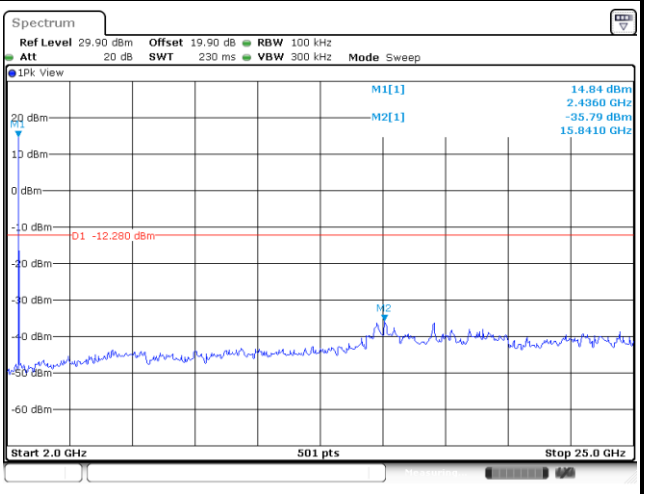
MIMO<Ant.4>

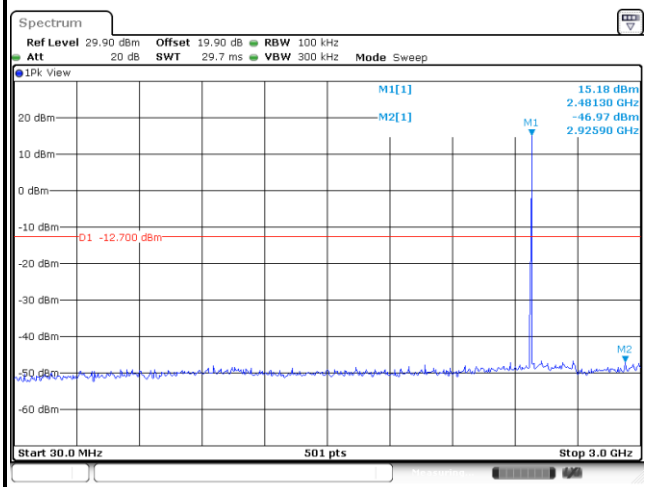
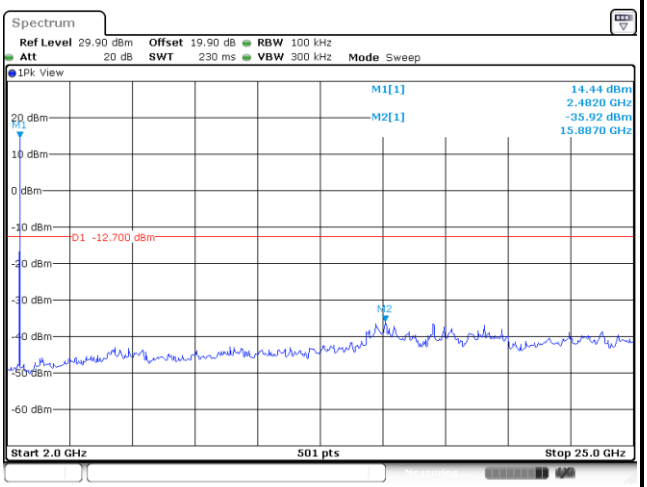
<1Mbps>

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 00	Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 00
	
Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 19	**Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 19**
	

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 39	Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 39
	

<2Mbps>

Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 00	Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 00
	
Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 19	**Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 19**
	

Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 39	Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 39
	

3.5 Radiated Band Edges and Spurious Emission Measurement

3.5.1 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. If the output power of this device is measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. 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

3.5.2 Measuring Instruments

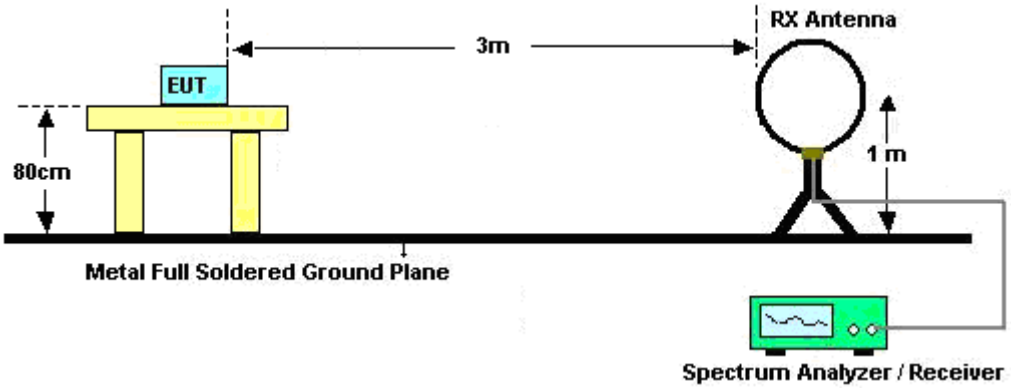
Please refer to the measuring equipment list in this test report.

3.5.3 Test Procedures

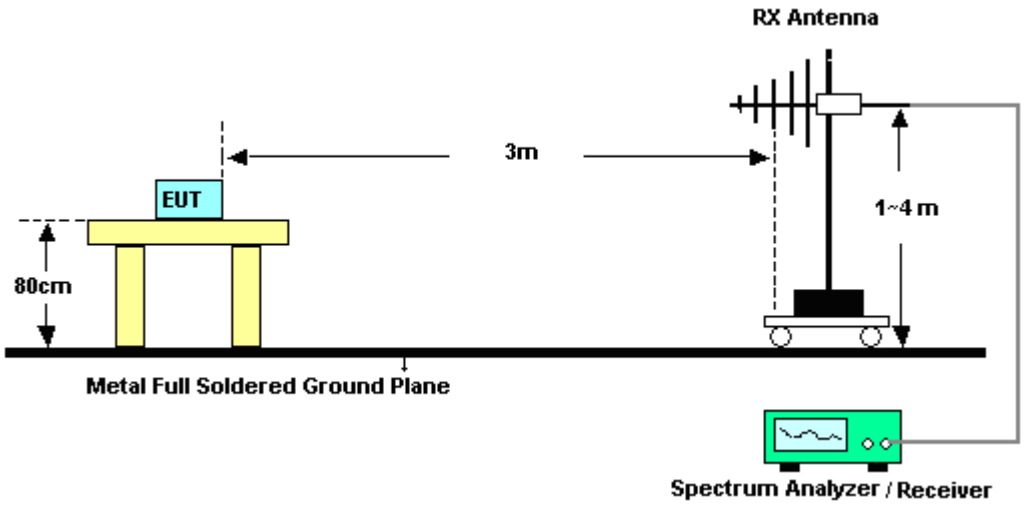
1. The testing follows the ANSI C63.10 Section 11.12.1 Radiated emission measurements.
2. The EUT is arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT is placed on a turntable with 0.8 meter for frequency below 1 GHz and 1.5 meter for frequency above 1 GHz respectively above ground.
4. The EUT is set 3 meters away from the receiving antenna, which is mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. Radiated testing below 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading. When there is no suspected emission found and the emission level is with at least 6 dB margin against QP limit line, the position is marked as "-".
7. Radiated testing above 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading for scanning all frequencies. When there is no suspected emission found and the harmonic emission level is with at least 6 dB margin against average limit line, the position is marked as "-".
8. 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; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
   (3) Set RBW = 1 MHz, VBW = 3 MHz for f ≥ 1 GHz for peak measurement.
   For average measurement:
   - VBW = 10 Hz, when duty cycle is no less than 98 percent.
   - VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

3.5.4 Test Setup

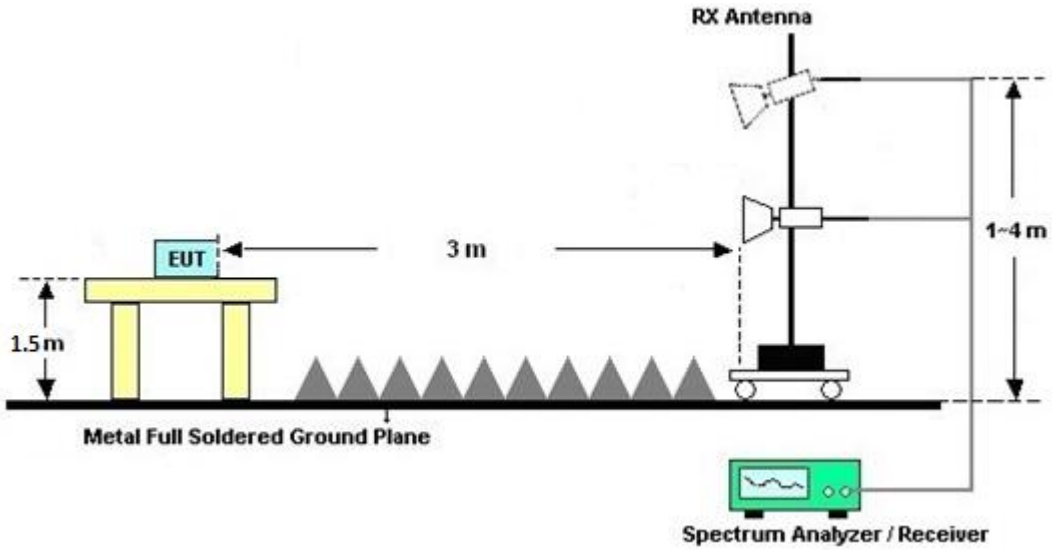
For radiated test below 30MHz



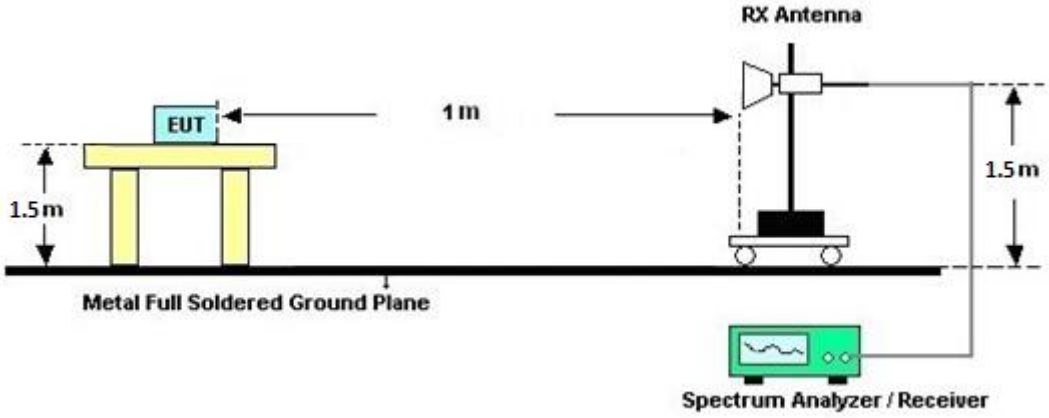
For radiated test from 30MHz to 1GHz



For radiated test from 1GHz to 18GHz



For radiated test above 18GHz



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

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

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

3.5.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C and D.

3.5.7 Duty Cycle

Please refer to Appendix E.

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

Please refer to Appendix C and D.

3.6 AC Conducted Emission Measurement

3.6.1 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.

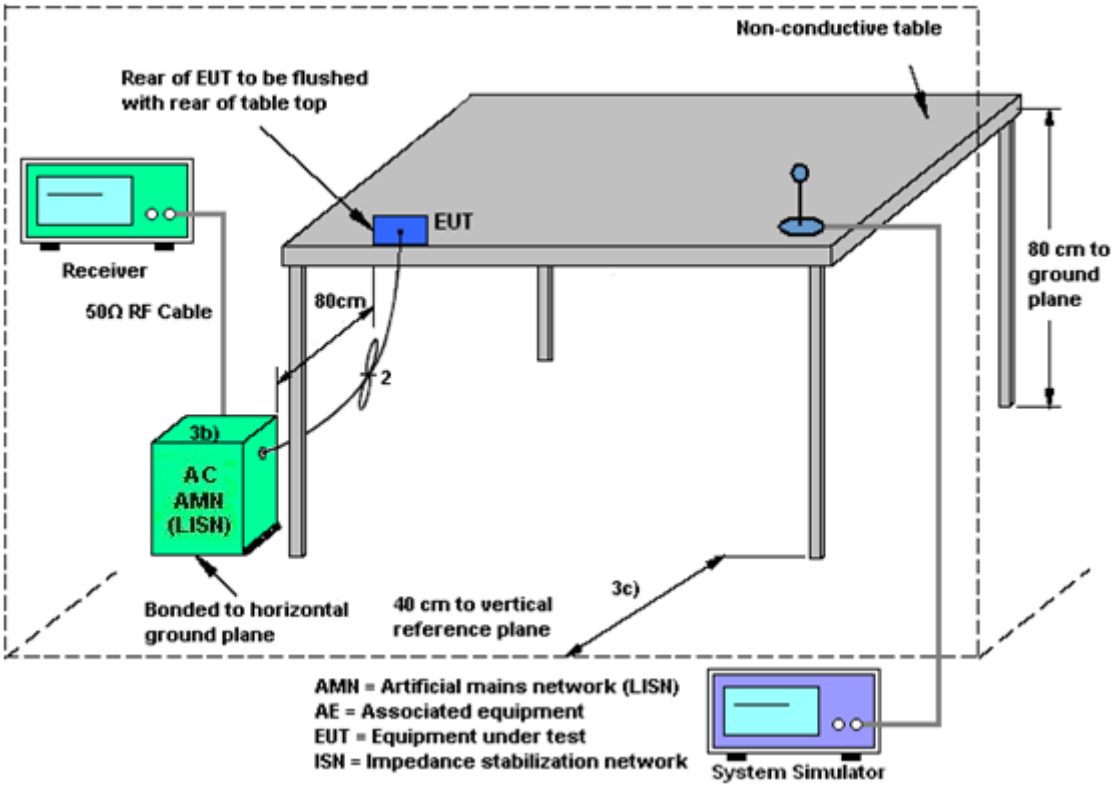
3.6.2 Measuring Instruments

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

3.6.3 Test Procedures

1. The EUT is placed 0.4 meter away from the conducting wall of the shielding room, and is 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 shall be used.
6. Both Line and Neutral shall be tested in order to find out the maximum conducted emission.
7. The frequency range from 150 kHz to 30 MHz is scanned.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9 kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

3.6.4 Test Setup



3.6.5 Test Result of AC Conducted Emission

Please refer to Appendix B.

3.7 Antenna Requirements

3.7.1 Standard Applicable

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

3.7.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

4 List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Sep. 20, 2022	Nov. 27, 2022~ Dec. 22, 2022	Sep. 19, 2023	Radiation (03CH16-HY)
Preamplifier	EMEC	EM18G40G	060715	18GHz~40GHz	Dec. 24, 2021	Nov. 27, 2022~ Dec. 22, 2022	Dec. 23, 2022	Radiation (03CH16-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA9170	00993	18GHz-40GHz	Nov. 24, 2022	Nov. 27, 2022~ Dec. 22, 2022	Nov. 23, 2023	Radiation (03CH16-HY)
Amplifier	SONOMA	310N	371607	9kHz~1GHz	Jul. 04, 2022	Nov. 27, 2022~ Dec. 22, 2022	Jul. 03, 2023	Radiation (03CH16-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00802N1D01N-06	47020 & 06	30MHz~1GHz	Oct. 08, 2022	Nov. 27, 2022~ Dec. 22, 2022	Oct. 07, 2023	Radiation (03CH16-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY57290111	3Hz~26.5GHz	Dec. 15, 2021	Nov. 27, 2022~ Dec. 13, 2022	Dec. 14, 2022	Radiation (03CH16-HY)
Signal Analyzer	Keysight	N9010B	MY62170278	10Hz~44GHz	Sep. 11, 2022	Nov. 27, 2022~ Dec. 22, 2022	Sep. 10, 2023	Radiation (03CH16-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1522	1GHz~18GHz	Mar. 10, 2022	Nov. 27, 2022~ Dec. 22, 2022	Mar. 09, 2023	Radiation (03CH16-HY)
Preamplifier	Keysight	83017A	MY53270264	1GHz~26.5GHz	Dec. 09, 2021	Nov. 27, 2022~ Dec. 07, 2022	Dec. 08, 2022	Radiation (03CH16-HY)
Preamplifier	EMEC	EM1G18G	060812	1GHz~18GHz	Dec. 27, 2021	Nov. 27, 2022~ Dec. 22, 2022	Dec. 26, 2022	Radiation (03CH16-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	805935/4	N/A	Aug. 09, 2022	Nov. 27, 2022~ Dec. 22, 2022	Aug. 08, 2023	Radiation (03CH16-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	802434/4	N/A	Aug. 09, 2022	Nov. 27, 2022~ Dec. 22, 2022	Aug. 08, 2023	Radiation (03CH16-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	EC-A5-300-5757	N/A	Aug. 09, 2022	Nov. 27, 2022~ Dec. 22, 2022	Aug. 08, 2023	Radiation (03CH16-HY)
Controller	ChainTek	3000-1	N/A	Control Turn table & Ant Mast	N/A	Nov. 27, 2022~ Dec. 22, 2022	N/A	Radiation (03CH16-HY)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Nov. 27, 2022~ Dec. 22, 2022	N/A	Radiation (03CH16-HY)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Nov. 27, 2022~ Dec. 22, 2022	N/A	Radiation (03CH16-HY)
Software	Audix	E3 6.2009-8-24	RK-001136	N/A	N/A	Nov. 27, 2022~ Dec. 22, 2022	N/A	Radiation (03CH16-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Dec. 07, 2022	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9kHz~3.6GHz	Dec. 01, 2022	Dec. 07, 2022	Nov. 30, 2023	Conduction (CO05-HY)
Hygrometer	Testo	608-H1	34913912	N/A	Nov. 17, 2022	Dec. 07, 2022	Nov. 16, 2023	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz~30MHz	Nov. 17, 2022	Dec. 07, 2022	Nov. 16, 2023	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32	N/A	N/A	N/A	Dec. 07, 2022	N/A	Conduction (CO05-HY)
Pulse Limiter	SCHWARZBECK	VTSD 9561-F N	00691	N/A	Aug. 01, 2022	Dec. 07, 2022	Jul. 31, 2023	Conduction (CO05-HY)
LISN Cable	MVE	RG-400	260260	N/A	Dec. 30, 2021	Dec. 07, 2022	Dec. 29, 2022	Conduction (CO05-HY)
Hygrometer	TECPEL	DTM-303A	TP201996	N/A	Nov. 17, 2022	Dec. 16, 2022~ Dec. 30, 2022	Nov. 16, 2023	Conducted (TH05-HY)
Power Sensor	DARE	RPR3006W	15I00041SNO10 (NO:248)	10MHz~6GHz	Dec. 29, 2021	Dec. 16, 2022~ Dec. 27, 2022	Dec. 28, 2022	Conducted (TH05-HY)
Power Sensor	DARE	RPR3006W	17I00015SNO36 (NO:35)	10MHz~6GHz	Sep. 04, 2022	Dec. 28, 2022~ Dec. 30, 2022	Sep. 03, 2023	Conducted (TH05-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101905	10Hz - 40GHz(amp)	Aug. 03, 2022	Dec. 16, 2022~ Dec. 30, 2022	Aug. 02, 2023	Conducted (TH05-HY)

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	3.50 dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	6.50 dB

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 6000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.60 dB

Uncertainty of Radiated Emission Measurement (6000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.50 dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.60 dB

Appendix A. Test Result of Conducted Test Items

Test Engineer:	Hank Hsu	Temperature:	21~25	°C
Test Date:	2022/12/16~2022/12/30	Relative Humidity:	51~54	%

<Ant.3>

TEST RESULTS DATA
6dB and 99% Occupied Bandwidth

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Occupied BW (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail
BLE	1Mbps	1	0	2402	1.035	0.714	0.50	Pass
BLE	1Mbps	1	19	2440	1.035	0.718	0.50	Pass
BLE	1Mbps	1	39	2480	1.035	0.718	0.50	Pass

TEST RESULTS DATA
Average Power Table

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
BLE	1Mbps	1	0	2402	20.20	30.00	-3.20	17.00	36.00	Pass
BLE	1Mbps	1	19	2440	20.40	30.00	-3.20	17.20	36.00	Pass
BLE	1Mbps	1	39	2480	20.20	30.00	-3.20	17.00	36.00	Pass

TEST RESULTS DATA
Peak Power Density

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak PSD (dBm /100kHz)	Peak PSD (dBm /3kHz)	DG (dBi)	Peak PSD Limit (dBm /3kHz)	Pass/Fail
BLE	1Mbps	1	0	2402	18.30	3.53	-3.20	8.00	Pass
BLE	1Mbps	1	19	2440	18.30	3.64	-3.20	8.00	Pass
BLE	1Mbps	1	39	2480	18.64	4.06	-3.20	8.00	Pass

Note: PSD (dBm/ 100kHz) is a reference level used for Conducted Band Edges and Conducted Spurious Emission 30dBc limit.

TEST RESULTS DATA
6dB and 99% Occupied Bandwidth

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Occupied BW (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail
BLE	2Mbps	1	0	2402	2.042	1.192	0.50	Pass
BLE	2Mbps	1	19	2440	2.046	1.244	0.50	Pass
BLE	2Mbps	1	39	2480	2.042	1.248	0.50	Pass

TEST RESULTS DATA
Average Power Table

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
BLE	2Mbps	1	0	2402	20.60	30.00	-3.20	17.40	36.00	Pass
BLE	2Mbps	1	19	2440	20.60	30.00	-3.20	17.40	36.00	Pass
BLE	2Mbps	1	39	2480	20.30	30.00	-3.20	17.10	36.00	Pass

TEST RESULTS DATA
Peak Power Density

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak PSD (dBm /100kHz)	Peak PSD (dBm /3kHz)	DG (dBi)	Peak PSD Limit (dBm /3kHz)	Pass/Fail
BLE	2Mbps	1	0	2402	18.33	0.04	-3.20	8.00	Pass
BLE	2Mbps	1	19	2440	18.34	0.08	-3.20	8.00	Pass
BLE	2Mbps	1	39	2480	18.53	0.33	-3.20	8.00	Pass

Note: PSD (dBm/ 100kHz) is a reference level used for Conducted Band Edges and Conducted Spurious Emission 30dBc limit.

<Ant.4>

TEST RESULTS DATA
6dB and 99% Occupied Bandwidth

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Occupied BW (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail
BLE	1Mbps	1	0	2402	1.033	0.712	0.50	Pass
BLE	1Mbps	1	19	2440	1.035	0.712	0.50	Pass
BLE	1Mbps	1	39	2480	1.035	0.718	0.50	Pass

TEST RESULTS DATA
Average Power Table

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
BLE	1Mbps	1	0	2402	20.70	30.00	-2.10	18.60	36.00	Pass
BLE	1Mbps	1	19	2440	20.80	30.00	-2.10	18.70	36.00	Pass
BLE	1Mbps	1	39	2480	19.90	30.00	-2.10	17.80	36.00	Pass

TEST RESULTS DATA
Peak Power Density

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak PSD (dBm /100kHz)	Peak PSD (dBm /3kHz)	DG (dBi)	Peak PSD Limit (dBm /3kHz)	Pass/Fail
BLE	1Mbps	1	0	2402	18.35	3.67	-2.10	8.00	Pass
BLE	1Mbps	1	19	2440	19.27	4.65	-2.10	8.00	Pass
BLE	1Mbps	1	39	2480	18.60	3.99	-2.10	8.00	Pass

Note: PSD (dBm/ 100kHz) is a reference level used for Conducted Band Edges and Conducted Spurious Emission 30dBc limit.

TEST RESULTS DATA
6dB and 99% Occupied Bandwidth

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Occupied BW (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail
BLE	2Mbps	1	0	2402	2.046	1.196	0.50	Pass
BLE	2Mbps	1	19	2440	2.046	1.236	0.50	Pass
BLE	2Mbps	1	39	2480	2.042	1.244	0.50	Pass

TEST RESULTS DATA
Average Power Table

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
BLE	2Mbps	1	0	2402	21.00	30.00	-2.10	18.90	36.00	Pass
BLE	2Mbps	1	19	2440	20.90	30.00	-2.10	18.80	36.00	Pass
BLE	2Mbps	1	39	2480	20.00	30.00	-2.10	17.90	36.00	Pass

TEST RESULTS DATA
Peak Power Density

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak PSD (dBm /100kHz)	Peak PSD (dBm /3kHz)	DG (dBi)	Peak PSD Limit (dBm /3kHz)	Pass/Fail
BLE	2Mbps	1	0	2402	17.70	-0.54	-2.10	8.00	Pass
BLE	2Mbps	1	19	2440	19.21	1.03	-2.10	8.00	Pass
BLE	2Mbps	1	39	2480	18.54	0.38	-2.10	8.00	Pass

Note: PSD (dBm/ 100kHz) is a reference level used for Conducted Band Edges and Conducted Spurious Emission 30dBc limit.

MIMO<Ant.3+4>

TEST RESULTS DATA
6dB and 99% Occupied Bandwidth

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Occupied BW Ant 3 (MHz)	99% Occupied BW Ant 4 (MHz)	6dB BW Ant 3 (MHz)	6dB BW Ant 4 (MHz)	6dB BW Limit (MHz)	Pass/Fail
BLE	1Mbps	2	0	2402	1.037	1.031	0.714	0.710	0.50	Pass
BLE	1Mbps	2	19	2440	1.037	1.035	0.716	0.720	0.50	Pass
BLE	1Mbps	2	39	2480	1.035	1.035	0.718	0.722	0.50	Pass

TEST RESULTS DATA
Average Power Table

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power Ant 3 (dBm)	Average Conducted Power Ant 4 (dBm)	Total Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	Total EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
BLE	1Mbps	2	0	2402	17.70	18.40	21.07	30.00	-2.10	18.97	36.00	Pass
BLE	1Mbps	2	19	2440	19.40	18.70	22.07	30.00	-2.10	19.97	36.00	Pass
BLE	1Mbps	2	39	2480	18.60	17.90	21.27	30.00	-2.10	19.17	36.00	Pass

TEST RESULTS DATA
Peak Power Density

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak PSD Ant 3 (dBm /100kHz)	Peak PSD Ant 3 (dBm /3kHz)	Peak PSD Ant 4 (dBm /100kHz)	Peak PSD Ant 4 (dBm /3kHz)	Peak PSD Worst +3.01 (dBm /3kHz)	DG (dBi)	Peak PSD Limit (dBm /3kHz)	Pass/Fail
BLE	1Mbps	2	0	2402	16.98	2.23	17.64	2.98	5.99	0.38	8.00	Pass
BLE	1Mbps	2	19	2440	18.55	3.85	17.77	3.12	6.86	0.38	8.00	Pass
BLE	1Mbps	2	39	2480	17.91	3.46	17.24	2.62	6.47	0.38	8.00	Pass

Note: PSD (dBm/ 100kHz) is a reference level used for Conducted Band Edges and Conducted Spurious Emission 30dBc limit.

TEST RESULTS DATA
6dB and 99% Occupied Bandwidth

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Occupied BW Ant 3 (MHz)	99% Occupied BW Ant 4 (MHz)	6dB BW Ant 3 (MHz)	6dB BW Ant 4 (MHz)	6dB BW Limit (MHz)	Pass/Fail
BLE	2Mbps	2	0	2402	2.046	2.038	1.188	1.192	0.50	Pass
BLE	2Mbps	2	19	2440	2.046	2.046	1.204	1.244	0.50	Pass
BLE	2Mbps	2	39	2480	2.046	2.046	1.240	1.244	0.50	Pass

TEST RESULTS DATA
Average Power Table

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power Ant 3 (dBm)	Average Conducted Power Ant 4 (dBm)	Total Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	Total EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
BLE	2Mbps	2	0	2402	18.50	19.10	21.82	30.00	-2.10	19.72	36.00	Pass
BLE	2Mbps	2	19	2440	20.10	19.40	22.77	30.00	2.10	24.87	36.00	Pass
BLE	2Mbps	2	39	2480	18.80	18.20	21.52	30.00	-2.10	19.42	36.00	Pass

TEST RESULTS DATA
Peak Power Density

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak PSD Ant 3 (dBm /100kHz)	Peak PSD Ant 3 (dBm /3kHz)	Peak PSD Ant 4 (dBm /100kHz)	Peak PSD Ant 4 (dBm /3kHz)	Peak PSD Worst +3.01 (dBm /3kHz)	DG (dBi)	Peak PSD Limit (dBm /3kHz)	Pass/Fail
BLE	2Mbps	2	0	2402	17.70	18.27	-0.63	0.12	3.13	0.38	8.00	Pass
BLE	2Mbps	2	19	2440	18.44	17.72	0.32	-0.52	3.33	0.38	8.00	Pass
BLE	2Mbps	2	39	2480	17.96	17.30	-0.21	-0.92	2.80	0.38	8.00	Pass

Note: PSD (dBm/ 100kHz) is a reference level used for Conducted Band Edges and Conducted Spurious Emission 30dBc limit.

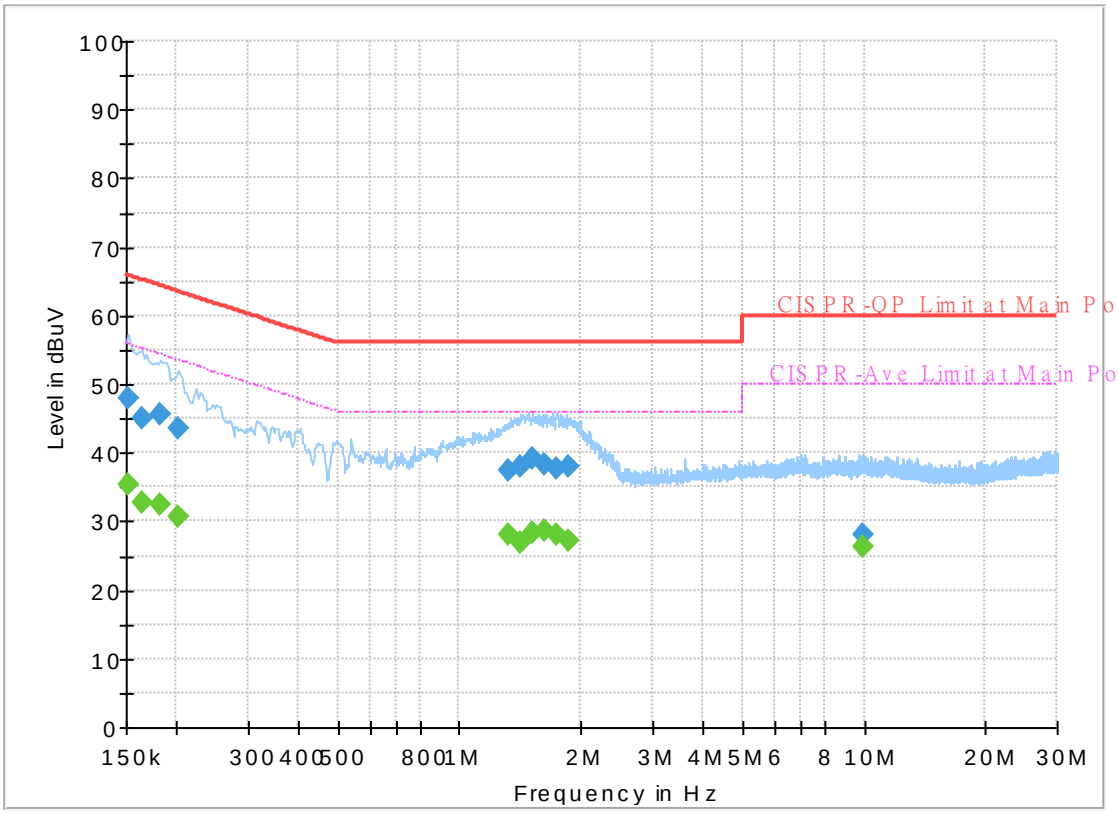
Appendix B. AC Conducted Emission Test Results

Test Engineer :	Tom Lee	**Temperature :**	23~26℃
		Relative Humidity :	45~55%

EUT Information

Report NO :	262403-04
Test Mode :	Mode 1
Test Voltage :	120Vac/60Hz
Phase :	Line

Full Spectrum



Final_Result

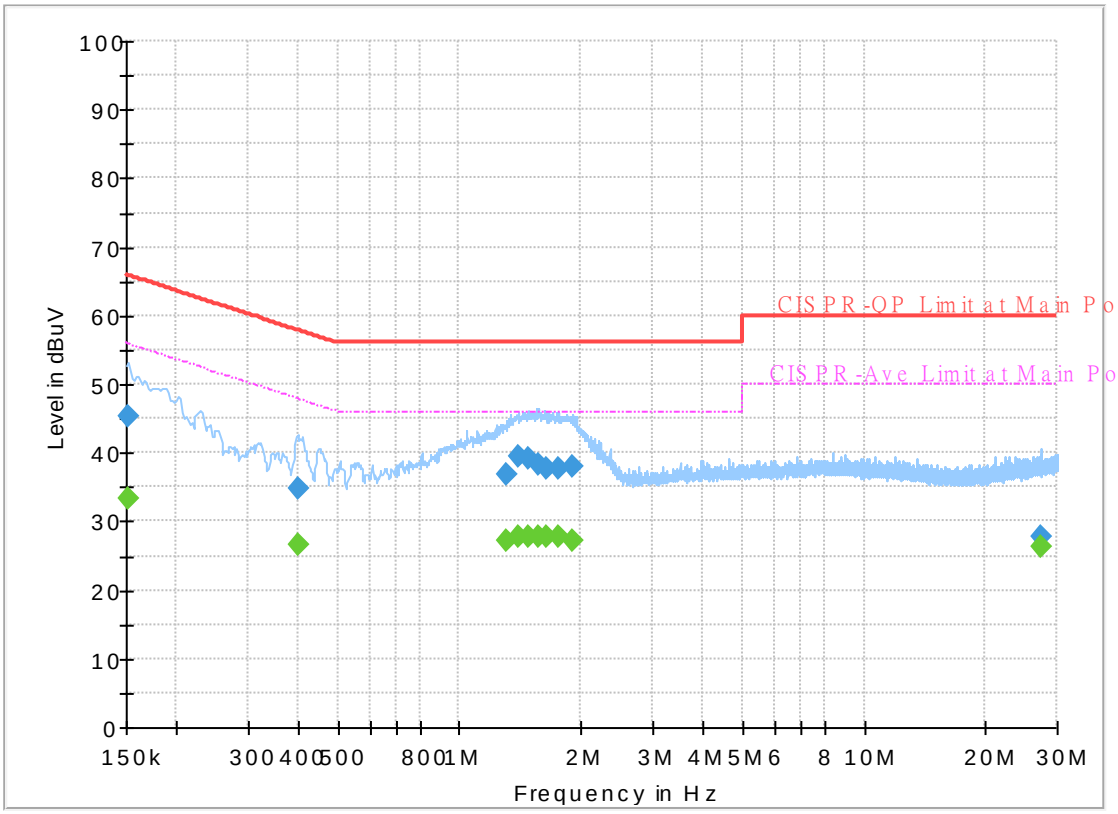
Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.152250	---	35.44	55.88	20.44	L1	OFF	19.8
0.152250	48.02	---	65.88	17.86	L1	OFF	19.8
0.163500	---	32.62	55.28	22.66	L1	OFF	19.8
0.163500	45.06	---	65.28	20.22	L1	OFF	19.8
0.181500	---	32.53	54.42	21.89	L1	OFF	19.8
0.181500	45.49	---	64.42	18.93	L1	OFF	19.8
0.201750	---	30.57	53.54	22.97	L1	OFF	19.8
0.201750	43.55	---	63.54	19.99	L1	OFF	19.8
1.322250	---	28.00	46.00	18.00	L1	OFF	19.8
1.322250	37.52	---	56.00	18.48	L1	OFF	19.8
1.410000	---	26.95	46.00	19.05	L1	OFF	19.9
1.410000	38.11	---	56.00	17.89	L1	OFF	19.9
1.515750	---	28.44	46.00	17.56	L1	OFF	19.9
1.515750	39.20	---	56.00	16.80	L1	OFF	19.9
1.623750	---	28.68	46.00	17.32	L1	OFF	19.9
1.623750	38.27	---	56.00	17.73	L1	OFF	19.9
1.747500	---	27.97	46.00	18.03	L1	OFF	19.9
1.747500	37.76	---	56.00	18.24	L1	OFF	19.9
1.864500	---	27.33	46.00	18.67	L1	OFF	19.9
1.864500	37.88	---	56.00	18.12	L1	OFF	19.9
9.980250	---	26.42	50.00	23.58	L1	OFF	20.2

9.980250	**28.16**	**---**	**60.00**	**31.84**	**L1**	**OFF**	**20.2**

EUT Information

Report NO :	262403-04
Test Mode :	Mode 1
Test Voltage :	120Vac/60Hz
Phase :	Neutral

Full Spectrum



Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.152250	---	33.31	55.88	22.57	N	OFF	19.8
0.152250	45.38	---	65.88	20.50	N	OFF	19.8
0.397500	---	26.60	47.91	21.31	N	OFF	19.8
0.397500	34.84	---	57.91	23.07	N	OFF	19.8
1.302000	---	27.08	46.00	18.92	N	OFF	19.8
1.302000	36.98	---	56.00	19.02	N	OFF	19.8
1.394250	---	27.65	46.00	18.35	N	OFF	19.8
1.394250	39.51	---	56.00	16.49	N	OFF	19.8
1.475250	---	27.82	46.00	18.18	N	OFF	19.8
1.475250	39.14	---	56.00	16.86	N	OFF	19.8
1.567500	---	27.88	46.00	18.12	N	OFF	19.8
1.567500	38.29	---	56.00	17.71	N	OFF	19.8
1.648500	---	27.84	46.00	18.16	N	OFF	19.8
1.648500	37.81	---	56.00	18.19	N	OFF	19.8
1.756500	---	27.73	46.00	18.27	N	OFF	19.8
1.756500	37.73	---	56.00	18.27	N	OFF	19.8
1.902750	---	27.22	46.00	18.78	N	OFF	19.8
1.902750	38.08	---	56.00	17.92	N	OFF	19.8
27.435750	---	26.21	50.00	23.79	N	OFF	20.9
27.435750	27.77	---	60.00	32.23	N	OFF	20.9

Appendix C. Radiated Spurious Emission

Test Engineer :	Andy Yang, Karl Hou and Steven Wu	**Temperature :**	18~23°C
		Relative Humidity :	50~65%

<Open Mode >

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE Ant	Note	Frequency	Level	Margin	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
3		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BLE CH 00 2402MHz		2337.825	54.83	-19.17	74	40.86	27.2	17.25	30.48	144	146	P	H
		2387.175	45.07	-8.93	54	30.84	27.35	17.35	30.47	144	146	A	H
	*	2402	113.12	-	-	98.79	27.41	17.38	30.46	144	146	P	H
	*	2402	112.54	-	-	98.21	27.41	17.38	30.46	144	146	A	H
													H
													H
		2386.86	54.47	-19.53	74	40.24	27.35	17.35	30.47	388	38	P	V
		2387.805	44.99	-9.01	54	30.76	27.35	17.35	30.47	388	38	A	V
	*	2402	109.07	-	-	94.74	27.41	17.38	30.46	388	38	P	V
	*	2402	108.36	-	-	94.03	27.41	17.38	30.46	388	38	A	V
													V
													V
BLE CH 19 2440MHz		2323.44	54.66	-19.34	74	40.73	27.2	17.22	30.49	166	147	P	H
		2387.84	45.04	-8.96	54	30.81	27.35	17.35	30.47	166	147	A	H
	*	2440	114.96	-	-	100.33	27.64	17.44	30.45	166	147	P	H
	*	2440	114.41	-	-	99.78	27.64	17.44	30.45	166	147	A	H
		2491.18	56.24	-17.76	74	41.29	27.86	17.52	30.43	166	147	P	H
		2486.07	46.08	-7.92	54	31.16	27.84	17.51	30.43	166	147	A	H
		2361.8	54.95	-19.05	74	40.87	27.25	17.3	30.47	378	52	P	V
		2364.74	45.02	-8.98	54	30.92	27.26	17.31	30.47	378	52	A	V
	*	2440	112.62	-	-	97.99	27.64	17.44	30.45	378	52	P	V
	*	2440	112.04	-	-	97.41	27.64	17.44	30.45	378	52	A	V
		2496.78	55.7	-18.3	74	40.71	27.89	17.53	30.43	378	52	P	V
		2499.51	46.44	-7.56	54	31.44	27.9	17.53	30.43	378	52	A	V

BLE CH 39 2480MHz	*	2480	114.56	-	-	99.68	27.82	17.5	30.44	100	143	P	H
	*	2480	114	-	-	99.12	27.82	17.5	30.44	100	143	A	H
		2485.56	56.83	-17.17	74	41.91	27.84	17.51	30.43	100	143	P	H
		2485.4	46.75	-7.25	54	31.83	27.84	17.51	30.43	100	143	A	H
													H
													H
	*	2480	112.7	-	-	97.82	27.82	17.5	30.44	400	48	P	V
	*	2480	112.05	-	-	97.17	27.82	17.5	30.44	400	48	A	V
		2487.12	56.48	-17.52	74	41.55	27.85	17.51	30.43	400	48	P	V
		2483.56	46.16	-7.84	54	31.26	27.83	17.51	30.44	400	48	A	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

BLE (Harmonic @ 3m)

BLE Ant 3	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)
		4804	40.17	-33.83	74	62.72	32.32	11.3	66.17	400	0	P	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
BLE CH 00 2402MHz		4804	40.97	-33.03	74	63.52	32.32	11.3	66.17	100	0	P	V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V

BLE Ant 3	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)
		4880	41.43	-32.57	74	63.48	32.72	11.35	66.12	400	0	P	H
		7320	44.48	-29.52	74	59.63	37.08	13.49	65.72	400	0	P	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
BLE CH 19 2440MHz													H
		4880	40.85	-33.15	74	62.9	32.72	11.35	66.12	100	0	P	V
		7320	44.08	-29.92	74	59.23	37.08	13.49	65.72	100	0	P	V
													V
													V
													V
													V
													V
													V
													V
													V
													V

BLE Ant 3	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)
		4960	44.57	-29.43	74	66.1	33.12	11.41	66.06	400	0	P	H
		7440	44.06	-29.94	74	59.9	36.46	13.49	65.79	400	0	P	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
BLE CH 39 2480MHz		4960	42.71	-31.29	74	64.24	33.12	11.41	66.06	-	-	P	V
		7440	44.03	-29.97	74	59.87	36.46	13.49	65.79	-	-	P	V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line. 3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.												

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE Ant 4	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)
BLE CH 00 2402MHz		2349.585	55.71	-18.29	74	41.72	27.2	17.27	30.48	142	303	P	H
		2375.73	45.39	-8.61	54	31.23	27.3	17.33	30.47	142	303	A	H
	*	2402	111.09	-	-	96.76	27.41	17.38	30.46	142	303	P	H
	*	2402	110.47	-	-	96.14	27.41	17.38	30.46	142	303	A	H
													H
													H
		2375.94	56.52	-17.48	74	42.36	27.3	17.33	30.47	384	148	P	V
		2386.965	45.28	-8.72	54	31.05	27.35	17.35	30.47	384	148	A	V
	*	2402	105.64	-	-	91.31	27.41	17.38	30.46	384	148	P	V
	*	2402	104.96	-	-	90.63	27.41	17.38	30.46	384	148	A	V
													V
													V
BLE CH 19 2440MHz		2342.9	55.08	-18.92	74	41.1	27.2	17.26	30.48	100	302	P	H
		2385.18	45.18	-8.82	54	30.96	27.34	17.35	30.47	100	302	A	H
	*	2440	113.62	-	-	98.99	27.64	17.44	30.45	100	302	P	H
	*	2440	113	-	-	98.37	27.64	17.44	30.45	100	302	A	H
		2493.84	55.89	-18.11	74	40.92	27.88	17.52	30.43	100	302	P	H
		2491.11	46.41	-7.59	54	31.46	27.86	17.52	30.43	100	302	A	H
		2384.9	54.87	-19.13	74	40.65	27.34	17.35	30.47	374	146	P	V
		2387.42	45.23	-8.77	54	31	27.35	17.35	30.47	374	146	A	V
	*	2440	108.23	-	-	93.6	27.64	17.44	30.45	374	146	P	V
	*	2440	107.66	-	-	93.03	27.64	17.44	30.45	374	146	A	V
		2498.18	56.47	-17.53	74	41.48	27.89	17.53	30.43	374	146	P	V
		2483.5	45.87	-8.13	54	30.97	27.83	17.51	30.44	374	146	A	V

BLE CH 39 2480MHz	*	2480	113.33	-	-	98.45	27.82	17.5	30.44	100	305	P	H
	*	2480	112.75	-	-	97.87	27.82	17.5	30.44	100	305	A	H
		2488.4	55.35	-18.65	74	40.42	27.85	17.51	30.43	100	305	P	H
		2483.72	46.42	-7.58	54	31.52	27.83	17.51	30.44	100	305	A	H
													H
													H
	*	2480	109.6	-	-	94.72	27.82	17.5	30.44	400	163	P	V
	*	2480	109.04	-	-	94.16	27.82	17.5	30.44	400	163	A	V
		2489.28	56.57	-17.43	74	41.63	27.86	17.51	30.43	400	163	P	V
		2484	46.08	-7.92	54	31.17	27.84	17.51	30.44	400	163	A	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

BLE (Harmonic @ 3m)

BLE Ant 4	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)
BLE CH 00 2402MHz		4804	45.12	-28.88	74	67.67	32.32	11.3	66.17	-	-	P	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
		4804	44.18	-29.82	74	66.73	32.32	11.3	66.17	-	-	P	V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V

BLE Ant 4	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)
		4880	46.04	-27.96	74	68.09	32.72	11.35	66.12	-	-	P	H
		7320	45.22	-28.78	74	60.37	37.08	13.49	65.72	-	-	P	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
BLE CH 19 2440MHz		4880	44.79	-29.21	74	66.84	32.72	11.35	66.12	-	-	P	V
		7320	45.64	-28.36	74	60.79	37.08	13.49	65.72	-	-	P	V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V

BLE Ant 4	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)
		4960	43.69	-30.31	74	65.22	33.12	11.41	66.06	-	-	P	H
		7440	45.87	-28.13	74	61.71	36.46	13.49	65.79	-	-	P	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
BLE CH 39 2480MHz													H
		4960	41.57	-32.43	74	63.1	33.12	11.41	66.06	-	-	P	V
		7440	45.68	-28.32	74	61.52	36.46	13.49	65.79	-	-	P	V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against Peak and Average limit line.
3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
3+4		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BLE CH 00 2402MHz		2351.16	55.04	-18.96	74	41.04	27.2	17.28	30.48	144	153	P	H
		2370.06	46.02	-7.98	54	31.89	27.28	17.32	30.47	144	153	A	H
	*	2402	113.22	-	-	98.89	27.41	17.38	30.46	144	153	P	H
	*	2402	112.39	-	-	98.06	27.41	17.38	30.46	144	153	A	H
													H
													H
		2378.88	55.05	-18.95	74	40.86	27.32	17.34	30.47	388	64	P	V
		2383.71	46.05	-7.95	54	31.84	27.33	17.35	30.47	388	64	A	V
	*	2402	110.01	-	-	95.68	27.41	17.38	30.46	388	64	P	V
	*	2402	109.34	-	-	95.01	27.41	17.38	30.46	388	64	A	V
													V
													V
BLE CH 19 2440MHz		2384.62	55.08	-18.92	74	40.86	27.34	17.35	30.47	165	151	P	H
		2379.3	46	-8	54	31.81	27.32	17.34	30.47	165	151	A	H
	*	2440	114.07	-	-	99.44	27.64	17.44	30.45	165	151	P	H
	*	2440	113.45	-	-	98.82	27.64	17.44	30.45	165	151	A	H
		2496.78	56.7	-17.3	74	41.71	27.89	17.53	30.43	165	151	P	H
		2484.81	46.9	-7.1	54	31.98	27.84	17.51	30.43	165	151	A	H
		2353.26	55.5	-18.5	74	41.49	27.21	17.28	30.48	374	51	P	V
		2383.36	46.13	-7.87	54	31.92	27.33	17.35	30.47	374	51	A	V
	*	2440	112.1	-	-	97.47	27.64	17.44	30.45	374	51	P	V
	*	2440	111.54	-	-	96.91	27.64	17.44	30.45	374	51	A	V
		2485.16	56.32	-17.68	74	41.4	27.84	17.51	30.43	374	51	P	V
		2494.54	46.8	-7.2	54	31.83	27.88	17.52	30.43	374	51	A	V

BLE CH 39 2480MHz	*	2480	113.47	-	-	98.59	27.82	17.5	30.44	163	147	P	H
	*	2480	112.71	-	-	97.83	27.82	17.5	30.44	163	147	A	H
		2483.56	56.8	-17.2	74	41.9	27.83	17.51	30.44	163	147	P	H
		2483.56	47.02	-6.98	54	32.12	27.83	17.51	30.44	163	147	A	H
													H
													H
	*	2480	111.61	-	-	96.73	27.82	17.5	30.44	367	46	P	V
	*	2480	110.97	-	-	96.09	27.82	17.5	30.44	367	46	A	V
		2493.4	56.09	-17.91	74	41.13	27.87	17.52	30.43	367	46	P	V
		2485.6	46.92	-7.08	54	32	27.84	17.51	30.43	367	46	A	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

BLE (Harmonic @ 3m)

BLE Ant 3+4	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)
BLE CH 00 2402MHz		4804	39.44	-34.56	74	61.99	32.32	11.3	66.17	-	-	P	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
		4804	41	-33	74	63.55	32.32	11.3	66.17	-	-	P	V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V

BLE Ant 3+4	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)
		4880	42.4	-31.6	74	64.45	32.72	11.35	66.12	-	-	P	H
		7320	44.28	-29.72	74	59.43	37.08	13.49	65.72	-	-	P	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
BLE CH 19 2440MHz													H
		4880	40.08	-33.92	74	62.13	32.72	11.35	66.12	-	-	P	V
		7320	44.17	-29.83	74	59.32	37.08	13.49	65.72	-	-	P	V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V

BLE Ant 3+4	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)
		4960	42.61	-31.39	74	64.14	33.12	11.41	66.06	-	-	P	H
		7440	43.8	-30.2	74	59.64	36.46	13.49	65.79	-	-	P	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
BLE CH 39 2480MHz													H
		4960	41.39	-32.61	74	62.92	33.12	11.41	66.06	-	-	P	V
		7440	43	-31	74	58.84	36.46	13.49	65.79	-	-	P	V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against Peak and Average limit line.
3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.

Emission above 18GHz

2.4GHz BLE (SHF)

BLE	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
3+4		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz BLE SHF		19864	39.46	-34.54	74	59.61	37.69	-2.89	54.95	-	-	P	H
		33672	43.17	-45.03	88.2	61.24	40.89	-1.25	57.71	-	-	P	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
		23224	41.79	-46.41	88.2	59.89	38.8	-2.68	54.22	-	-	P	V
		34876	47	-41.2	88.2	64.99	41.55	-0.99	58.55	-	-	P	V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against limit line.
3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.

Emission below 1GHz

2.4GHz BLE (LF)

BLE	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
3+4		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz BLE LF		31.62	21.97	-18.03	40	29.96	23.64	0.56	32.19	-	-	P	H
		94.8	29.94	-13.56	43.5	45.52	15.18	1.5	32.26	-	-	P	H
		272.19	21.18	-24.82	46	32.1	18.9	2.52	32.34	-	-	P	H
		489.7	25.53	-20.47	46	30.94	23.73	3.39	32.53	-	-	P	H
		690.6	28.16	-17.84	46	30.62	26.06	4.05	32.57	-	-	P	H
		943.3	33.66	-12.34	46	30.24	30.02	4.79	31.39	-	-	P	H
													H
													H
													H
													H
													H
													H
		72.93	25.83	-14.17	40	44.37	12.48	1.26	32.28	-	-	P	V
		169.32	27.28	-16.22	43.5	41.88	15.68	2.02	32.3	-	-	P	V
		282.72	20.39	-25.61	46	31.16	18.99	2.57	32.33	-	-	P	V
		457.5	25.57	-20.43	46	31.53	23.21	3.31	32.48	-	-	P	V
		661.2	28.16	-17.84	46	30.83	25.95	3.98	32.6	-	-	P	V
		950.3	33.4	-12.6	46	29.78	30.16	4.8	31.34	-	-	P	V
													V
													V
													V
													V
													V
													V

Remark

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

Note symbol

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

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

BLE	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
ANT					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
3+4		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BLE 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

Test Engineer :	Andy Yang, Karl Hou and Steven Wu	**Temperature :**	18~23°C
		Relative Humidity :	50~65%

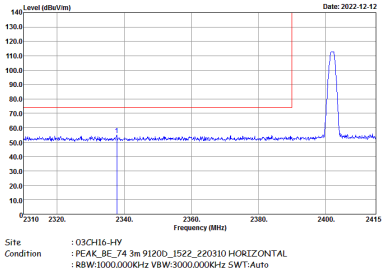
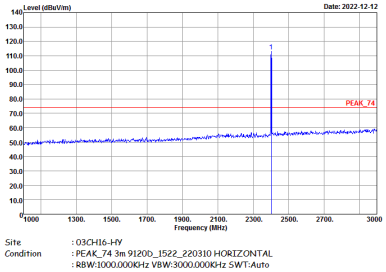
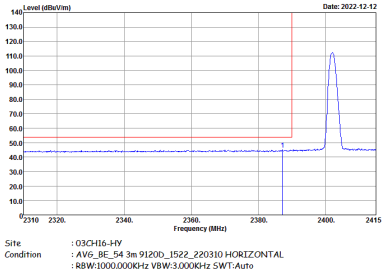
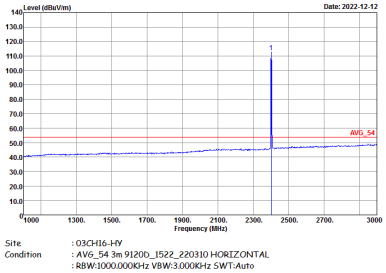
Note symbol

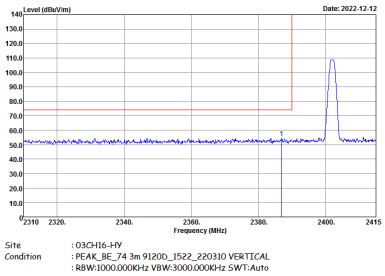
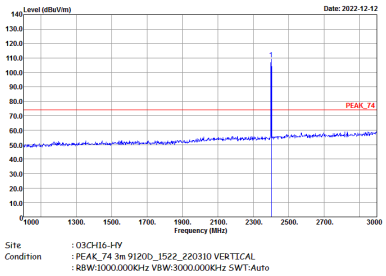
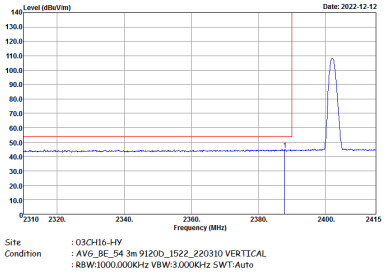
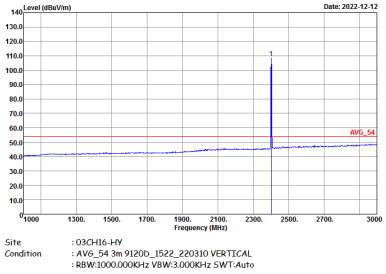
-L	**Low channel location**
-R	**High channel location**

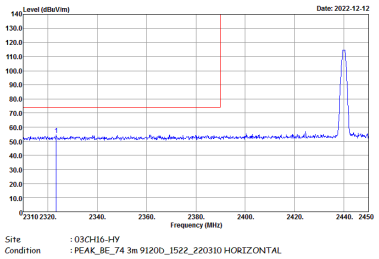
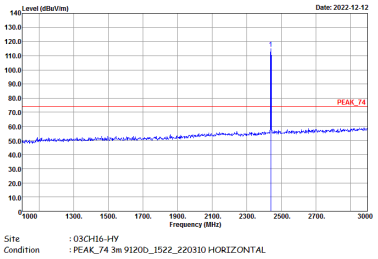
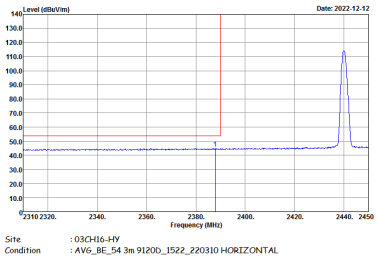
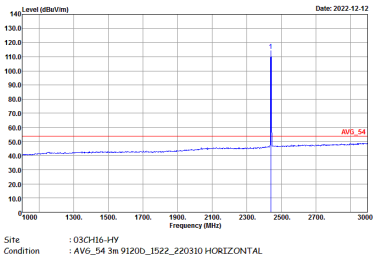
<Open Mode>

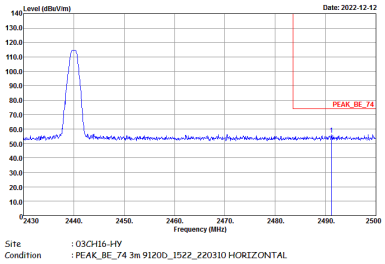
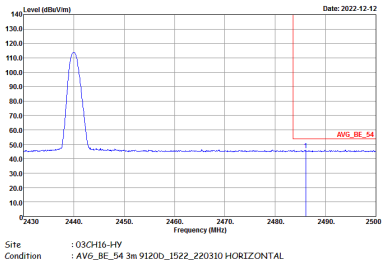
2.4GHz 2400~2483.5MHz

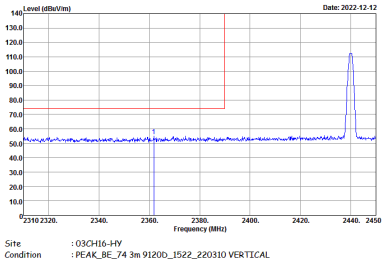
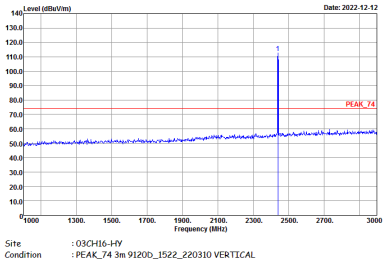
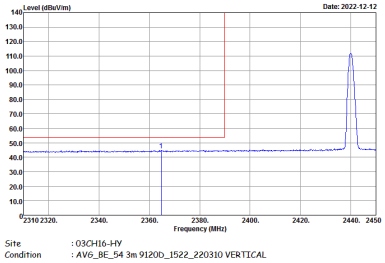
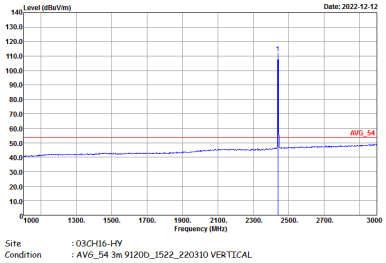
BLE (Band Edge @ 3m)

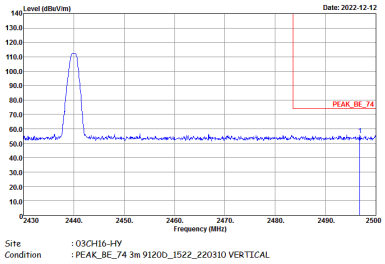
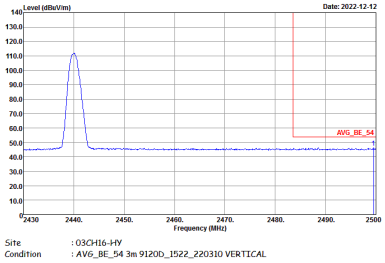
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH00 2402MHz	
3	Horizontal	Fundamental
Peak		
Avg.		

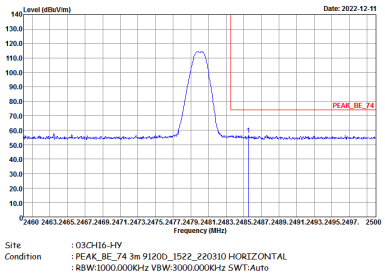
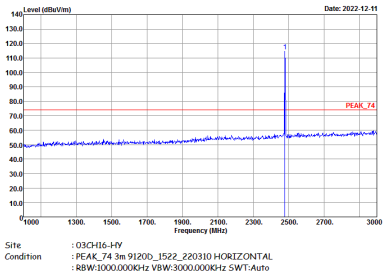
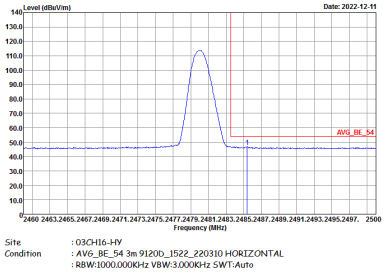
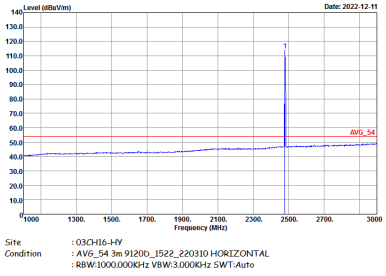
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH00 2402MHz	
3	Vertical	Fundamental
Peak		
Avg		

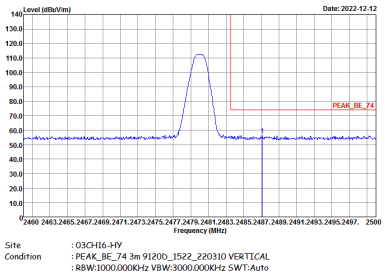
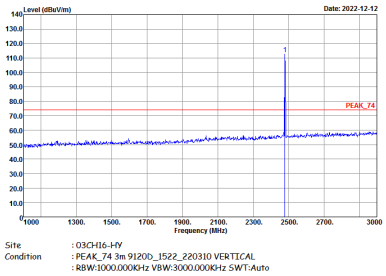
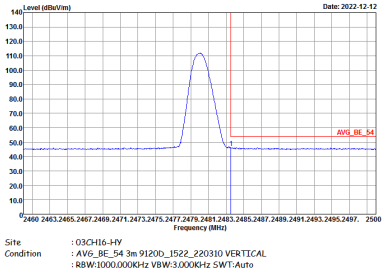
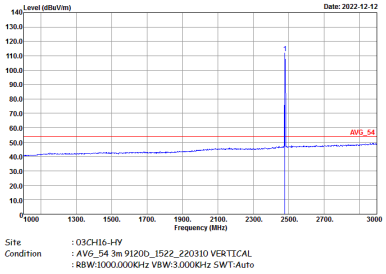
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - L	
3	Horizontal	Fundamental
Peak		
Avg.		

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - R	
3	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - L	
3	Vertical	Fundamental
Peak		
Avg.		

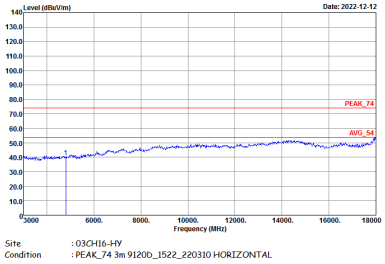
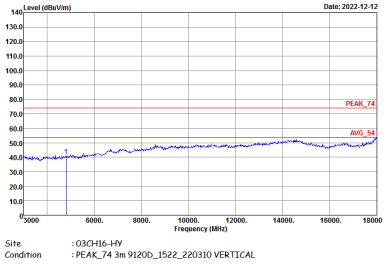
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - R	
3	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

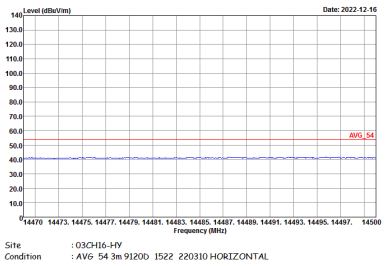
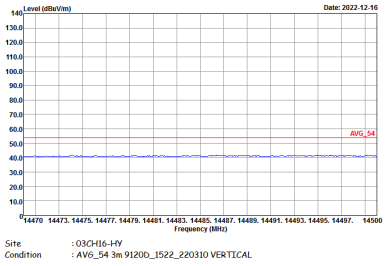
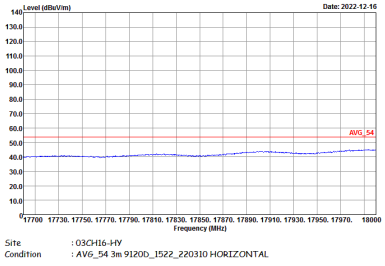
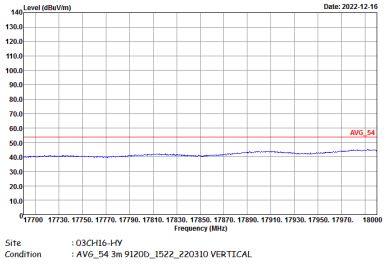
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH39 2480MHz	
3	Horizontal	Fundamental
Peak	 Site : 03CH16-HY Condition : PEAK_BE_74 3m 9120D_1522_220310 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH16-HY Condition : PEAK_74 3m 9120D_1522_220310 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH16-HY Condition : AVG_BE_54 3m 9120D_1522_220310 HORIZONTAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto	 Site : 03CH16-HY Condition : AVG_54 3m 9120D_1522_220310 HORIZONTAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto

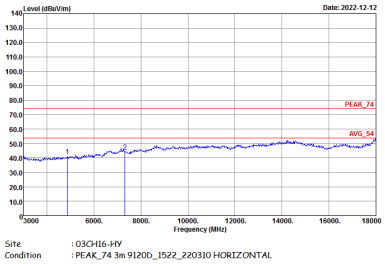
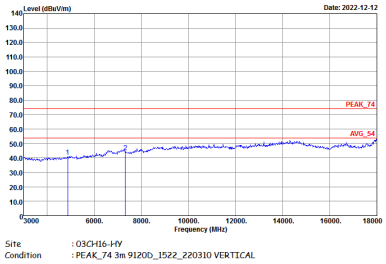
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH39 2480MHz	
3	Vertical	Fundamental
Peak		
Avg.		

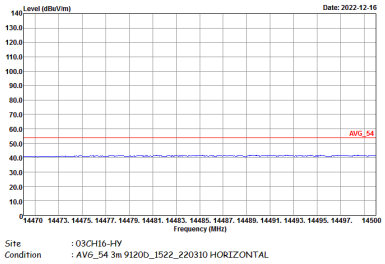
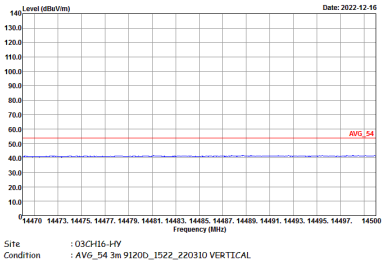
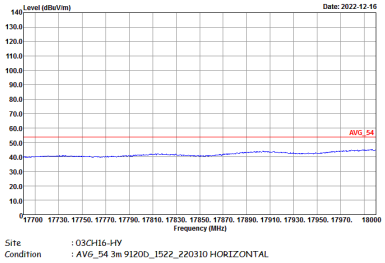
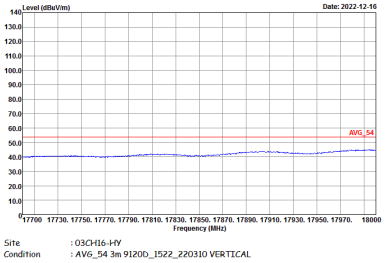
2.4GHz 2400~2483.5MHz

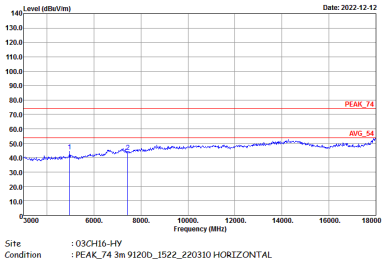
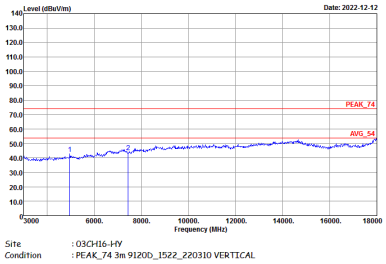
BLE (Harmonic @ 3m)

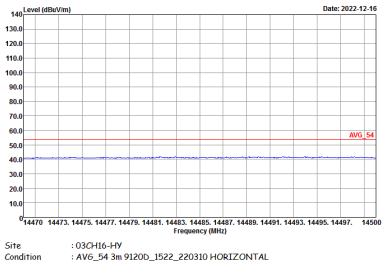
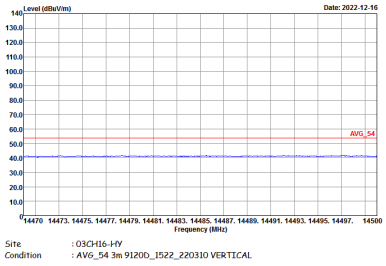
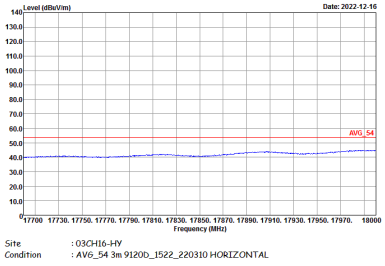
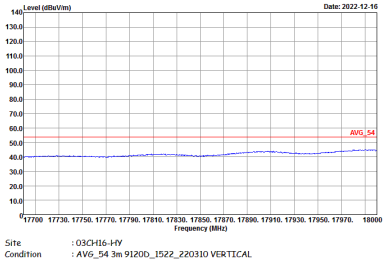
BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH00 2402MHz	
3	Horizontal	Vertical
Peak Avg.		

BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH00 2402MHz	
3	Horizontal	Vertical
14.47G ~14.5G Avg.		
17.7G ~18G Avg		

BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH19 2440MHz	
3	Horizontal	Vertical
Peak Avg.		

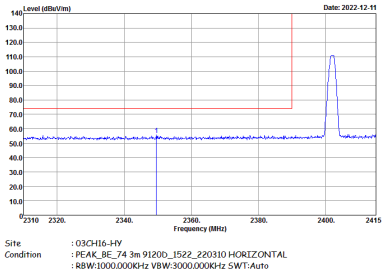
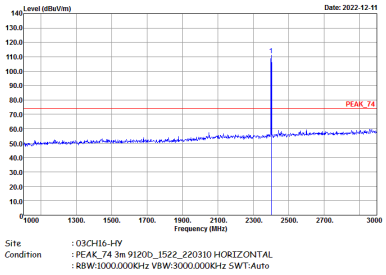
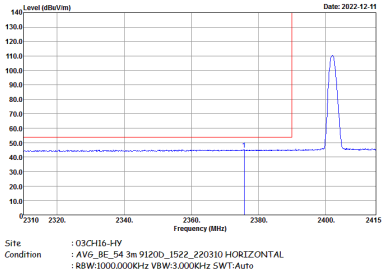
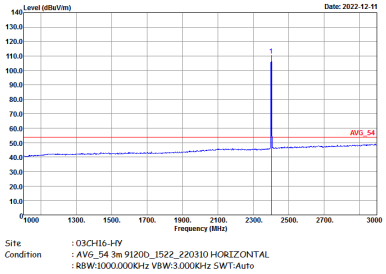
BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH19 2440MHz	
3	Horizontal	Vertical
14.47G ~14.5G Avg.		
17.7G ~18G Avg		

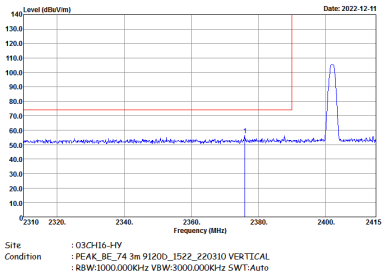
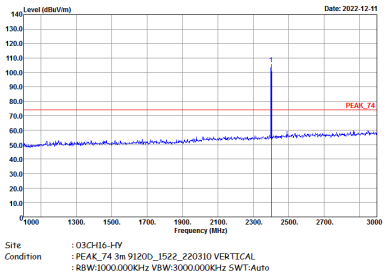
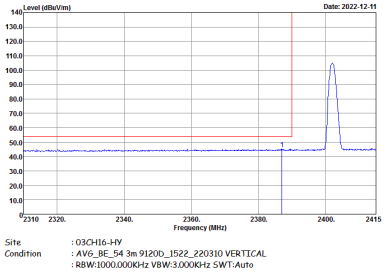
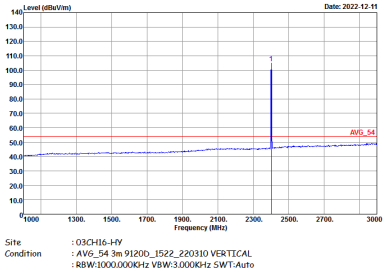
BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH39 2480MHz	
3	Horizontal	Vertical
Peak		

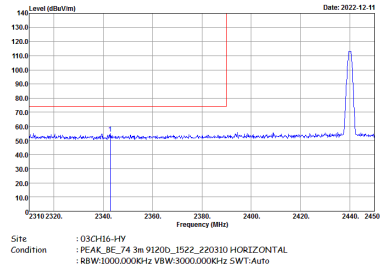
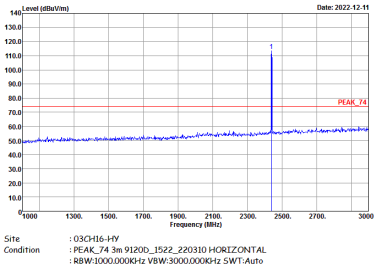
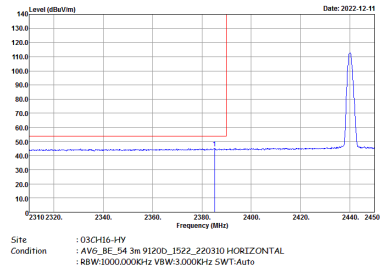
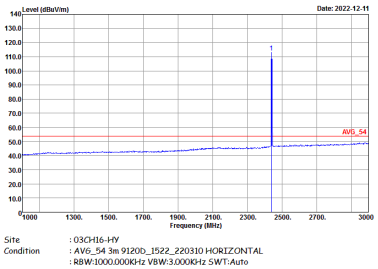
BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH39 2480MHz	
3	Horizontal	Vertical
14.47G ~14.5G Avg.		
17.7G ~18G Avg		

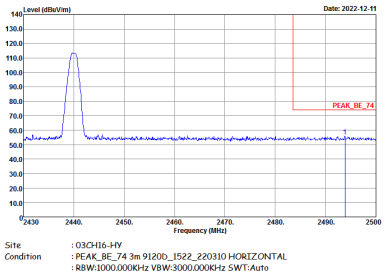
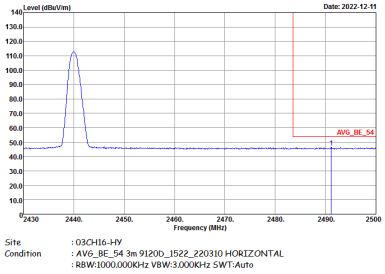
2.4GHz 2400~2483.5MHz

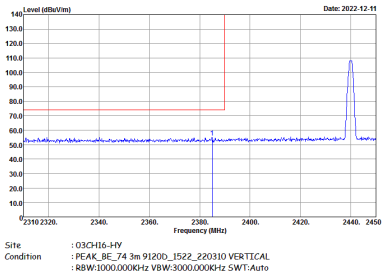
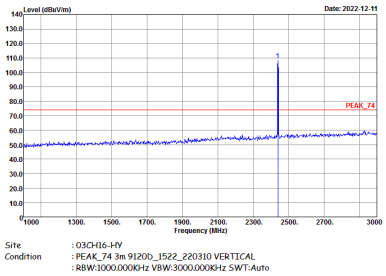
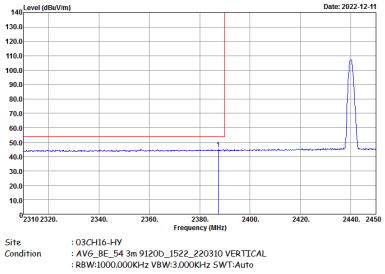
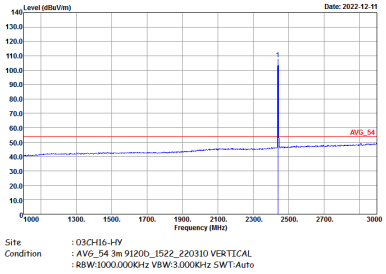
BLE (Band Edge @ 3m)

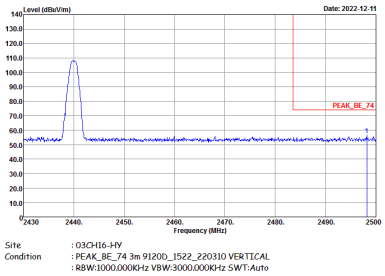
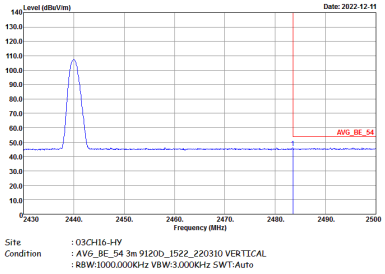
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH00 2402MHz	
4	Horizontal	Fundamental
Peak		
Avg.		

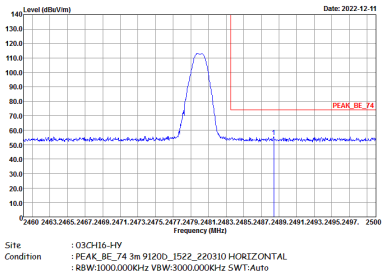
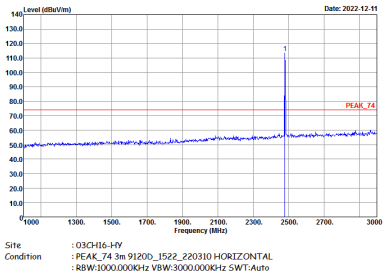
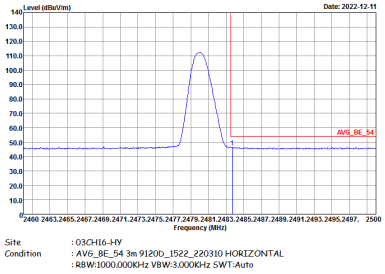
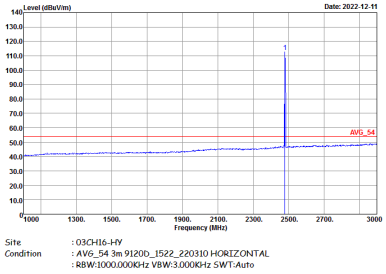
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH00 2402MHz	
4	Vertical	Fundamental
Peak		
Avg		

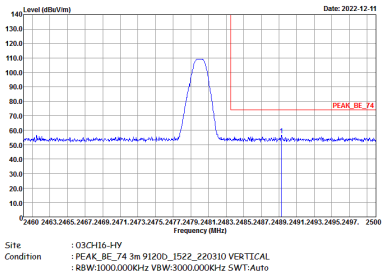
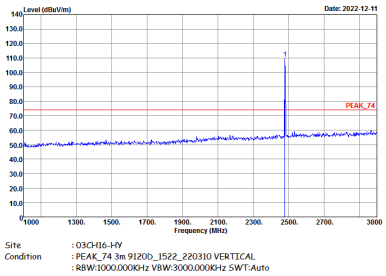
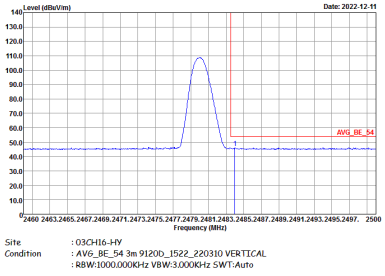
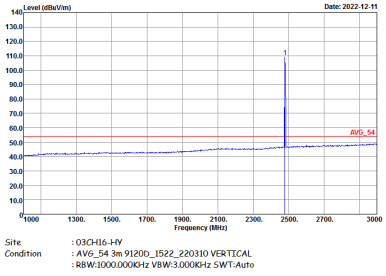
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - L	
4	Horizontal	Fundamental
Peak		
Avg.		

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - R	
4	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - L	
4	Vertical	Fundamental
Peak		
Avg.		

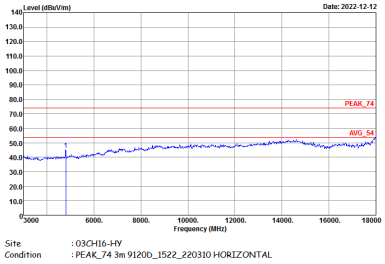
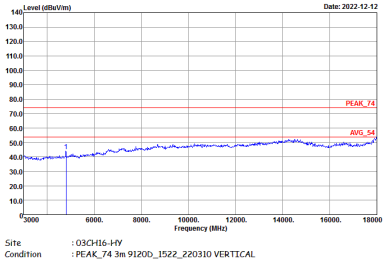
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - R	
4	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

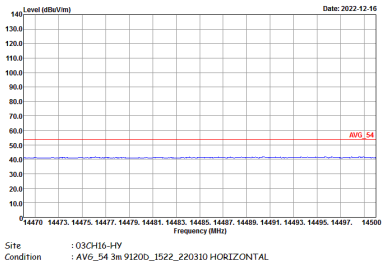
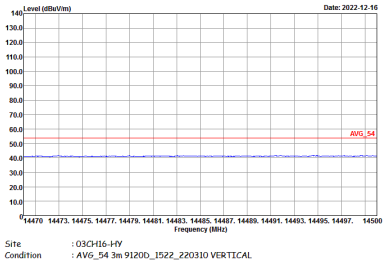
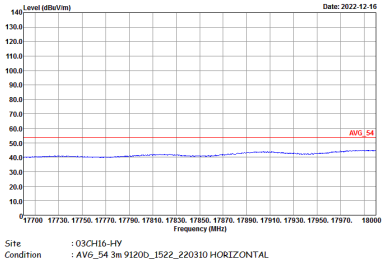
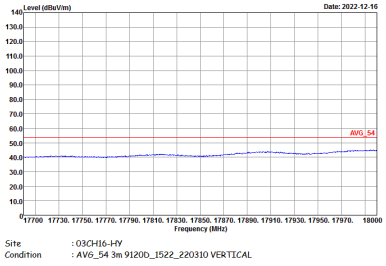
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH39 2480MHz	
4	Horizontal	Fundamental
Peak		
Avg.		

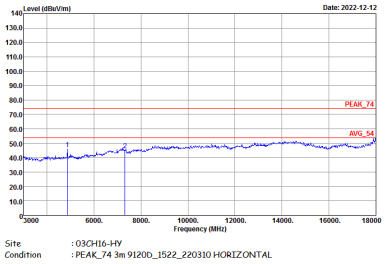
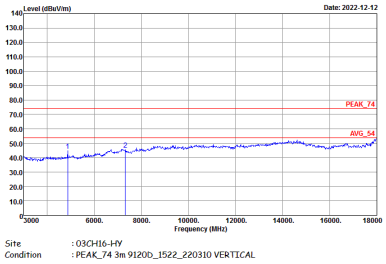
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH39 2480MHz	
4	Vertical	Fundamental
Peak	 Site : 03CH16-HY Condition : PEAK_BE_74 3m 9120D_1522_220310 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH16-HY Condition : PEAK_74 3m 9120D_1522_220310 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH16-HY Condition : AVG_BE_54 3m 9120D_1522_220310 VERTICAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto	 Site : 03CH16-HY Condition : AVG_54 3m 9120D_1522_220310 VERTICAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto

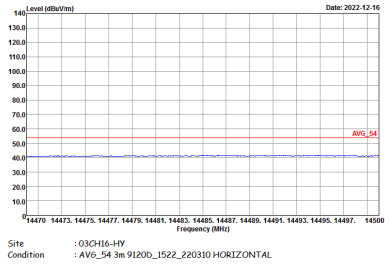
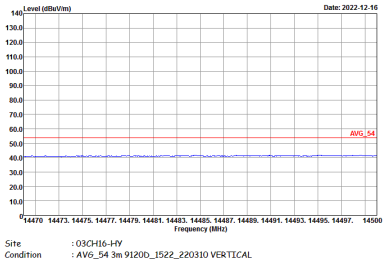
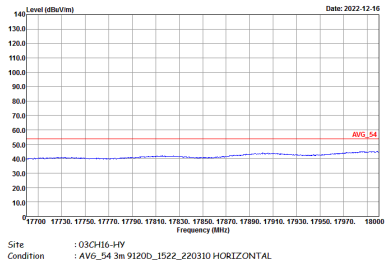
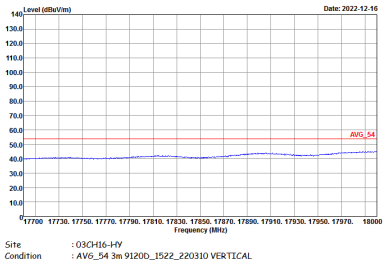
2.4GHz 2400~2483.5MHz

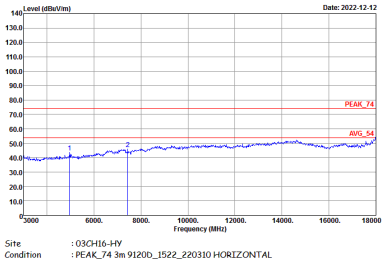
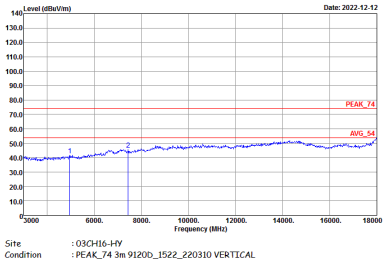
BLE (Harmonic @ 3m)

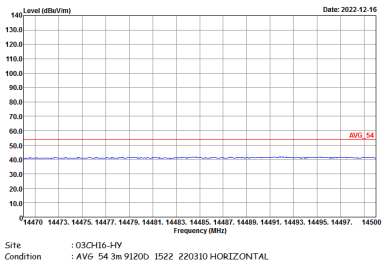
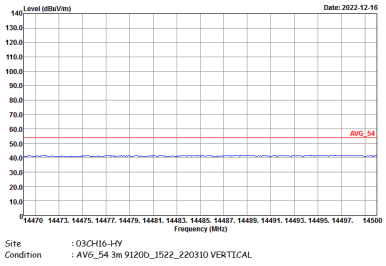
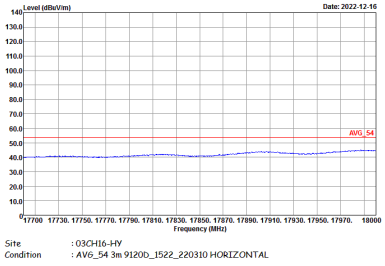
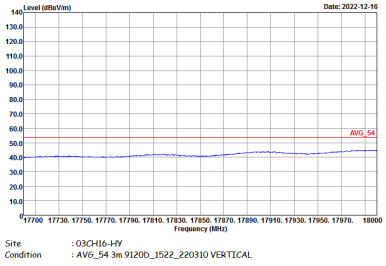
BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH00 2402MHz	
4	Horizontal	Vertical
Peak Avg.		

BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH00 2402MHz	
4	Horizontal	Vertical
14.47G ~14.5G Avg.		
17.7G ~18G Avg		

BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH19 2440MHz	
4	Horizontal	Vertical
Peak Avg.		

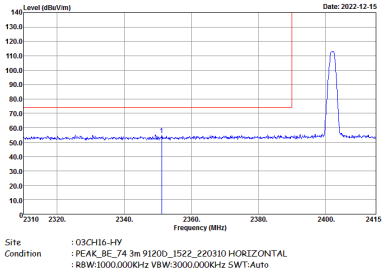
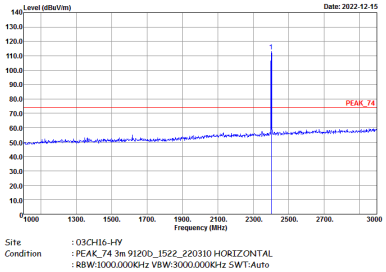
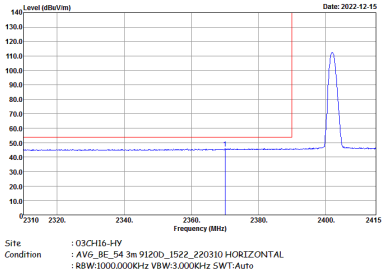
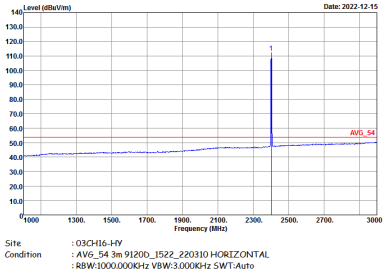
BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH19 2440MHz	
4	Horizontal	Vertical
14.47G ~14.5G Avg.		
17.7G ~18G Avg		

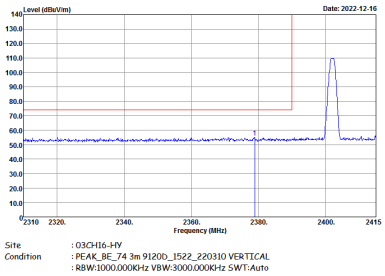
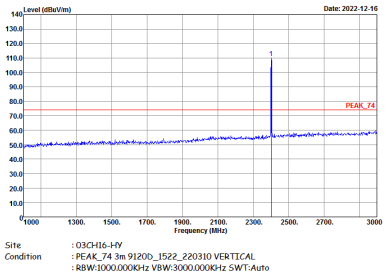
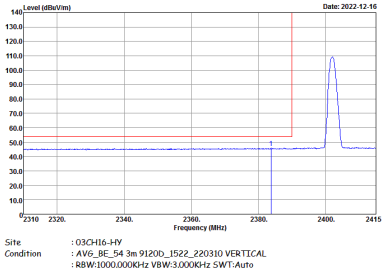
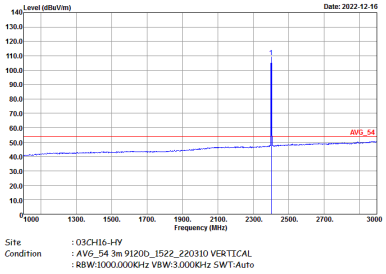
BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH39 2480MHz	
4	Horizontal	Vertical
Peak		

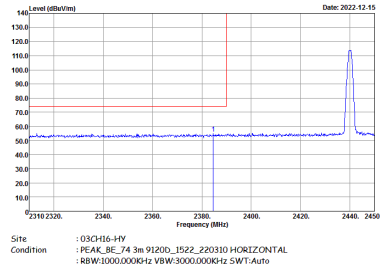
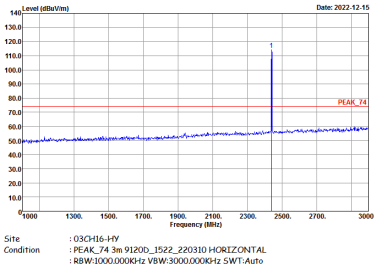
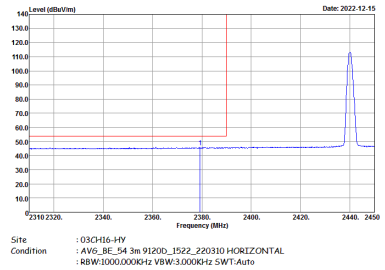
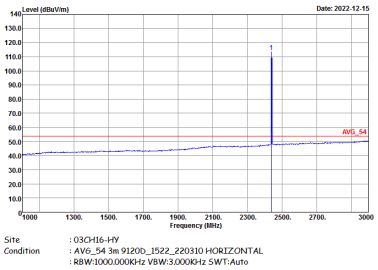
BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH39 2480MHz	
4	Horizontal	Vertical
14.47G ~14.5G Avg.		
17.7G ~18G Avg		

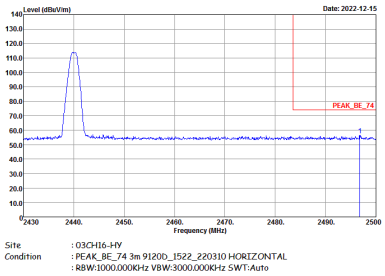
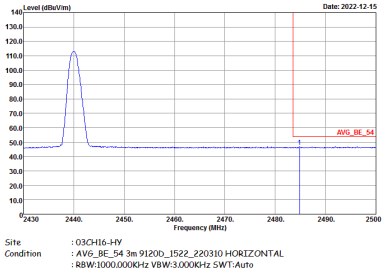
2.4GHz 2400~2483.5MHz

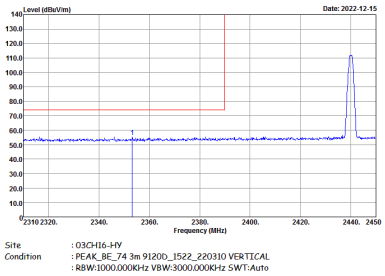
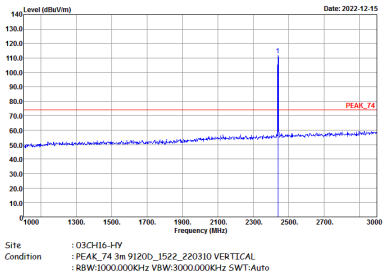
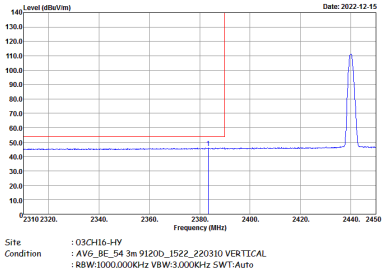
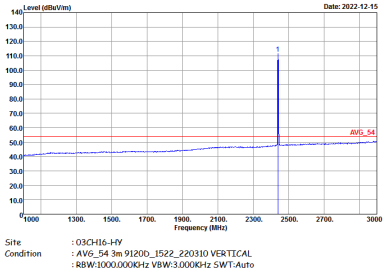
BLE (Band Edge @ 3m)

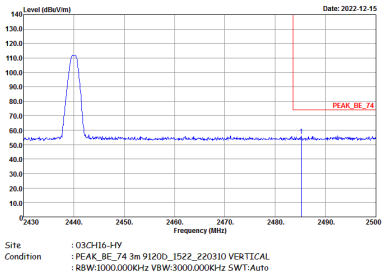
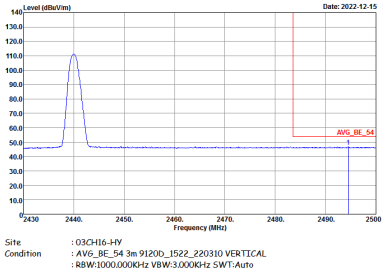
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH00 2402MHz	
3+4	Horizontal	Fundamental
Peak		
Avg.		

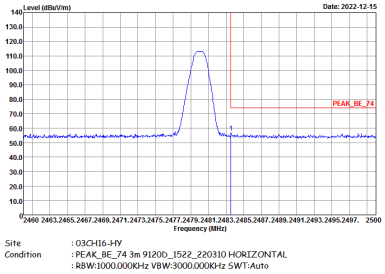
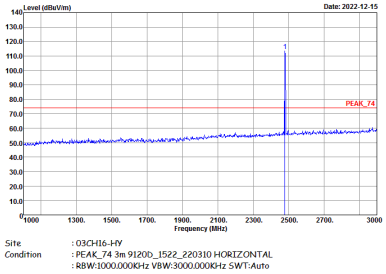
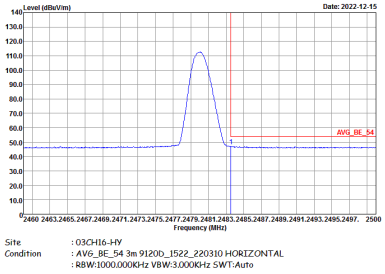
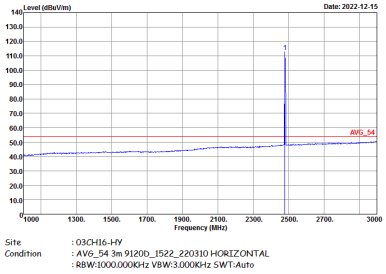
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH00 2402MHz	
3+4	Vertical	Fundamental
Peak		
Avg		

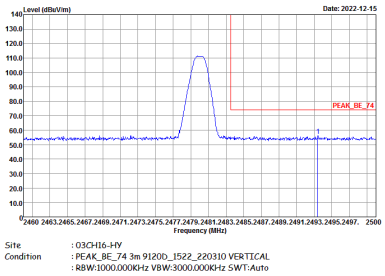
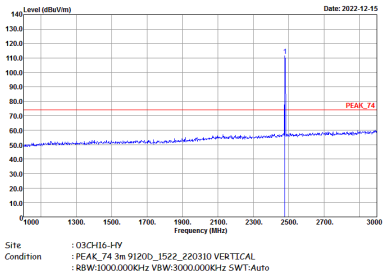
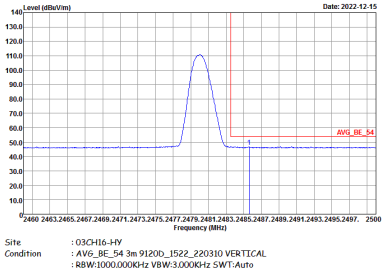
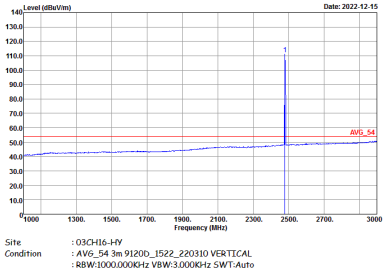
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - L	
3+4	Horizontal	Fundamental
Peak		
Avg.		

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - R	
3+4	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - L	
3+4	Vertical	Fundamental
Peak		
Avg.		

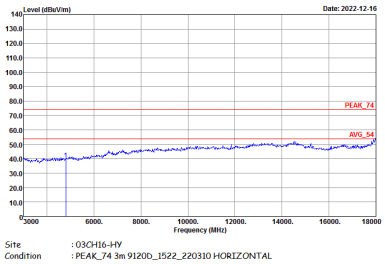
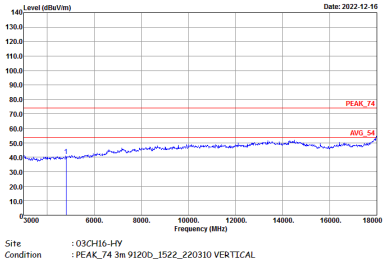
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - R	
3+4	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

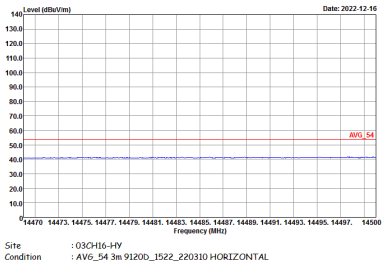
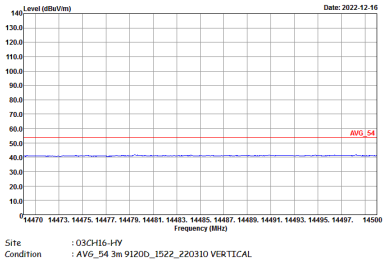
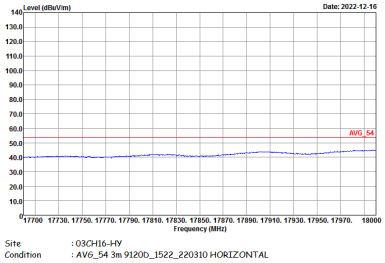
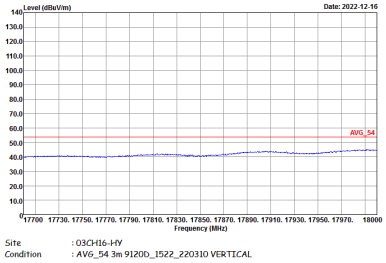
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH39 2480MHz	
3+4	Horizontal	Fundamental
Peak	 Site : 03CH16-HY Condition : PEAK_BE_74 3m 9120D_1522_220310 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH16-HY Condition : PEAK_74 3m 9120D_1522_220310 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH16-HY Condition : AVG_BE_54 3m 9120D_1522_220310 HORIZONTAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto	 Site : 03CH16-HY Condition : AVG_54 3m 9120D_1522_220310 HORIZONTAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto

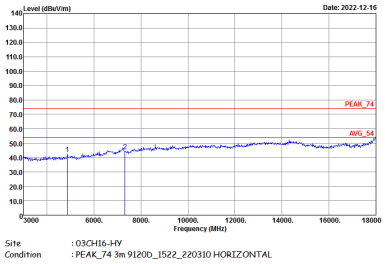
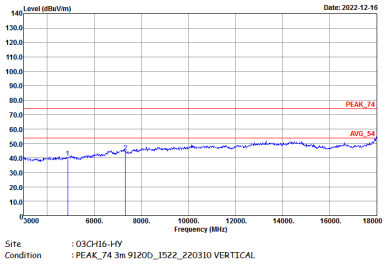
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH39 2480MHz	
3+4	Vertical	Fundamental
Peak	 Site : 03CH16-HY Condition : PEAK_BE_74 3m 9120D_1522_220310 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH16-HY Condition : PEAK_74 3m 9120D_1522_220310 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH16-HY Condition : AVG_BE_54 3m 9120D_1522_220310 VERTICAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto	 Site : 03CH16-HY Condition : AVG_54 3m 9120D_1522_220310 VERTICAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto

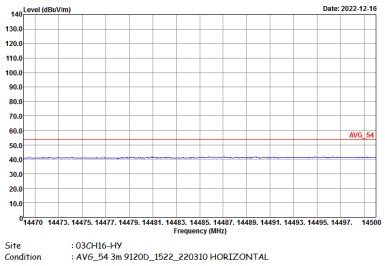
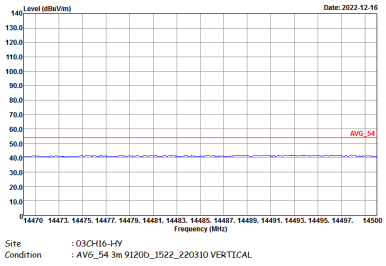
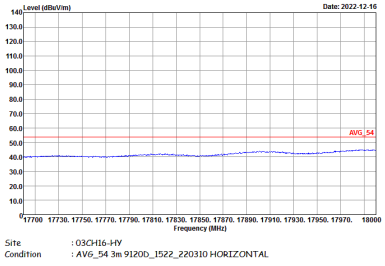
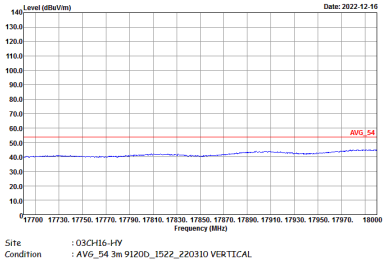
2.4GHz 2400~2483.5MHz

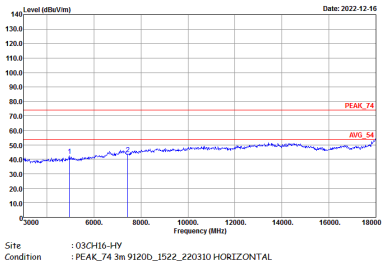
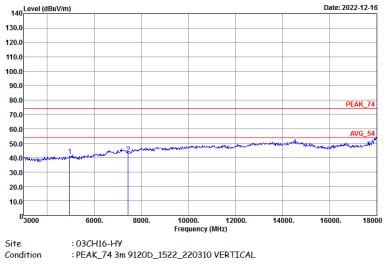
BLE (Harmonic @ 3m)

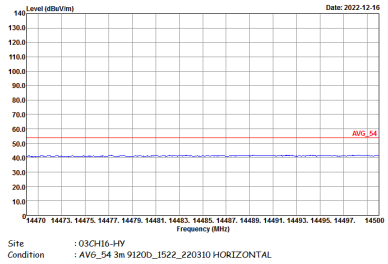
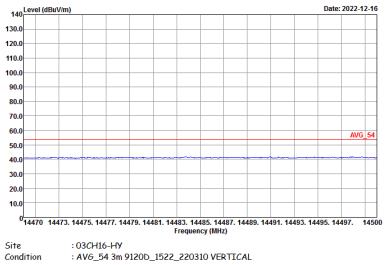
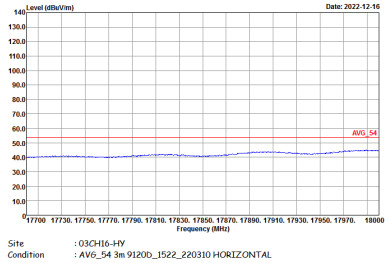
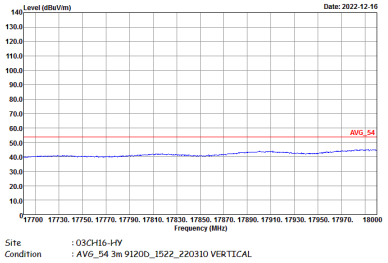
BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH00 2402MHz	
3+4	Horizontal	Vertical
Peak Avg.		

BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH00 2402MHz	
3+4	Horizontal	Vertical
14.47G ~14.5G Avg.		
17.7G ~18G Avg		

BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH19 2440MHz	
3+4	Horizontal	Vertical
Peak Avg.		

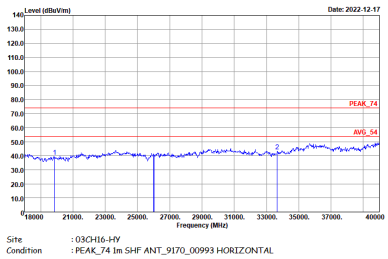
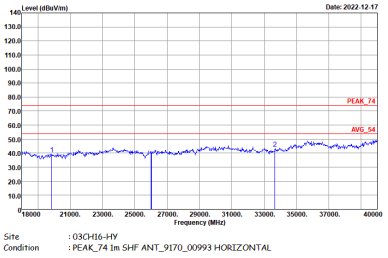
BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH19 2440MHz	
3+4	Horizontal	Vertical
14.47G ~14.5G Avg.		
17.7G ~18G Avg		

BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH39 2480MHz	
3+4	Horizontal	Vertical
Peak		

BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH39 2480MHz	
3+4	Horizontal	Vertical
14.47G ~14.5G Avg.		
17.7G ~18G Avg		

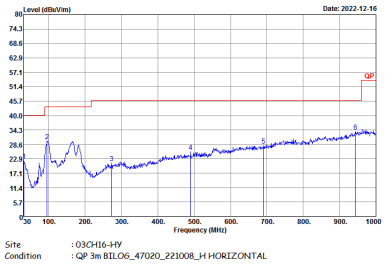
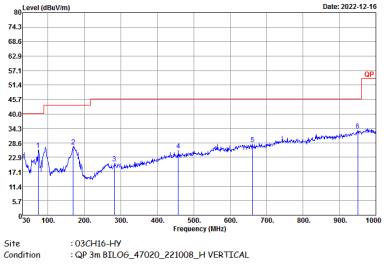
Emission above 18GHz

2.4GHz BLE (SHF @ 1m)

BLE	2.4GHz 2400~2483.5MHz	
ANT	BLE SHF	
3+4	Horizontal	Vertical
Peak Avg.		

Emission below 1GHz

2.4GHz BLE (LF)

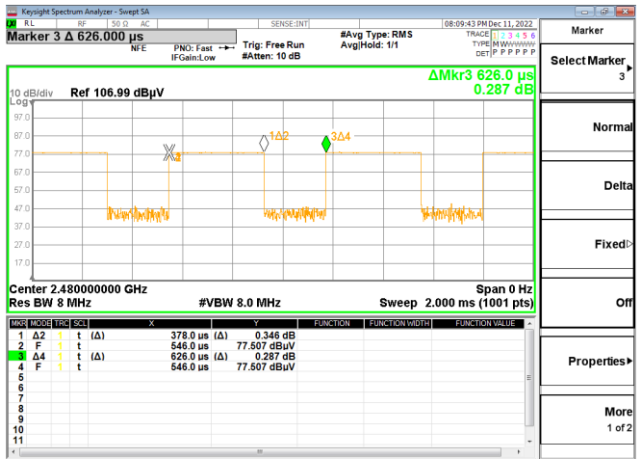
BLE	2.4GHz 2400~2483.5MHz	
ANT	BLE LF	
3+4	Horizontal	Vertical
QP / Peak		

Appendix E. Duty Cycle Plots

Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
4	Bluetooth - LE for 1Mbps	60.38	378	2.65	3kHz
3	Bluetooth - LE for 1Mbps	60.58	378	2.65	3kHz
3+4	Bluetooth - LE for 1Mbps	60.38	378	2.65	3kHz

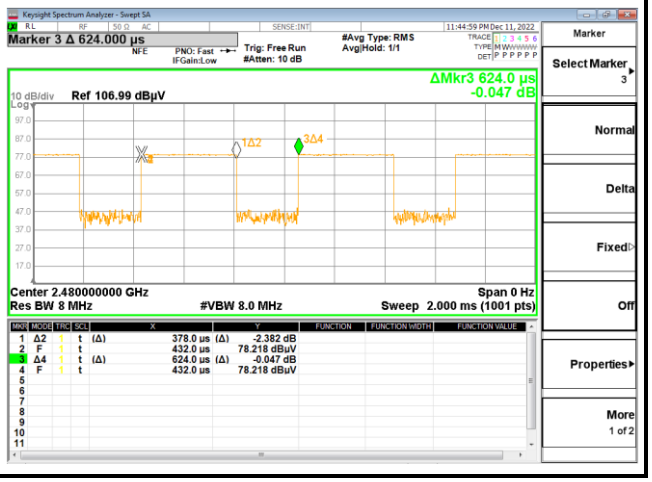
<Ant. 4>

Bluetooth – LE for 1Mbps



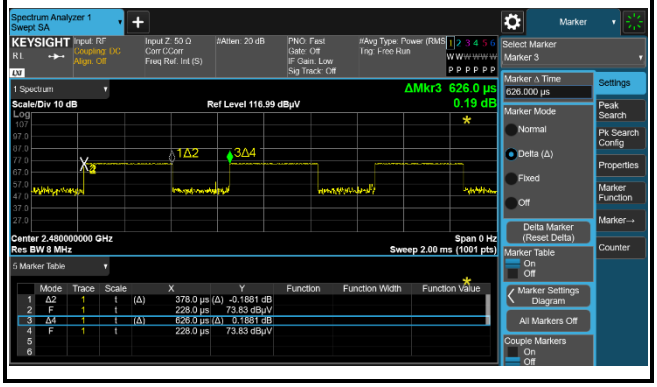
<Ant. 3>

Bluetooth – LE for 1Mbps



MIMO <Ant. 3+4>

Bluetooth – LE for 1Mbps



———THE END———