FCC CO-LOCATION RADIO TEST REPORT

FCC ID	:	**A4RGB62Z**
Equipment	:	**Phone**
Model Name	:	**GB62Z**
Applicant	:	**Google LLC** **1600 Amphitheatre Parkway,** **Mountain View, California, 94043 USA**
Standard	:	**FCC Part 15 Subpart E §15.407**

The product was received on Nov. 11, 2021 and testing was started from Nov. 12, 2021 and completed on Jan. 10, 2022. We, Sporton International Inc. Wensan Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. Wensan Laboratory, the test report shall not be reproduced except in full.

Louis Wu

Reviewed by: Louis Wu

Sporton International Inc. Wensan Laboratory
No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.)

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History of this test report

Report No.	Version	Description	Issued Date
FR161608-03G	01	Initial issue of report	Jan. 24, 2022
FR161608-03G	02	Revise appendix A	Feb. 17, 2022
FR161608-03G	03	Revise description in section 2	Feb. 22, 2022

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.407(b)	Unwanted Emissions	Pass	4.86 dB under the limit at 4943.000 MHz
3.2	15.203 15.407(a)	Antenna Requirement	Pass	-

Declaration of Conformity:
1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers. It's means measurement values may risk exceeding the limit of regulation standards, if measurement uncertainty is include in test results. 2. The measurement uncertainty please refer to this report "Uncertainty of Evaluation".
Comments and Explanations:
The product specifications of the EUT presented in the report are declared by the manufacturer who shall take full responsibility for the authenticity.

Reviewed by: William Chen

Report Producer: Amy Chen

1 General Description

1.1 Product Feature of Equipment Under Test

Product Feature	
Equipment	Phone
Model Name	GB62Z
FCC ID	A4RGB62Z
EUT supports Radios application	GSM/EGPRS/WCDMA/HSPA/LTE/5G NR/NFC/GNSS WLAN 11b/g/n HT20 WLAN 11a/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80/VHT160 WLAN 11ax HE20/HE40/HE80/HE160 Bluetooth BR/EDR/LE

Remark: The above EUT's information was declared by manufacturer.

EUT Information List	
S/N	Performed Test Item
1B011FQGR00008	Radiated Spurious Emission

1.2 Product Specification of Equipment Under Test

<table>
<tr><th colspan="2">Product Specification is subject to this standard</th></tr>
<tr><td>Tx/Rx Channel Frequency Range</td><td>2400 MHz ~ 2483.5 MHz
5470 MHz ~ 5725 MHz
6525 MHz ~ 6875 MHz</td></tr>
<tr><td>Antenna Type / Gain</td><td><2400 MHz ~ 2483.5 MHz>
<Ant. 4>: IFA Antenna with gain -2.7 dBi
<Ant. 3>: IFA Antenna with gain -0.2 dBi
<5500 MHz ~ 5720 MHz>
<Ant. 4>: IFA Antenna with gain -1.8 dBi
<Ant. 3>: IFA Antenna with gain -2.2 dBi
<6525 MHz ~ 6875 MHz>
<Ant. 4>: IFA Antenna with gain -5.6 dBi
<Ant. 3>: IFA Antenna with gain -5.7 dBi</td></tr>
<tr><td>Type of Modulation</td><td>Bluetooth EDR (3Mbps) : 8-DPSK
Bluetooth LE : GFSK
802.11g/a : OFDM (BPSK / QPSK / 16QAM / 64QAM)
802.11ax : OFDMA (BPSK / QPSK / 16QAM / 64QAM / 256QAM / 1024QAM)</td></tr>
<tr><td>Antenna Function for Transmitter</td><td><table><tr><th></th><th>Ant. 4</th><th>Ant. 3</th></tr><tr><td>Bluetooth-LE</td><td>V</td><td>-</td></tr><tr><td>802.11 g/a/ax/ Bluetooth MIMO</td><td>V</td><td>V</td></tr></table></td></tr>
</table>

Remark:

1. MIMO Ant. 4+3 is a calculated result from sum of the power MIMO Ant. 4 and MIMO Ant. 3.
2. The above EUT's information was declared by manufacturer. Please refer to Comments and Explanations in report summary.

1.3 Modification of EUT

No modifications are made to the EUT during all test items.

1.4 Testing Location

Test Site	Sporton International Inc. Wensan Laboratory
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	**Sporton Site No.**
	03CH16-HY

Note: The test site complies with ANSI C63.4 2014 requirement.

FCC designation No.: TW3786

1.5 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart E
- FCC Part 15 Subpart C §15.247
- FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05r02
- FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
- FCC KDB 987594 D02 U-NII 6 GHz EMC Measurement v01
- FCC KDB 414788 D01 Radiated Test Site v01r01.
- FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- ANSI C63.10-2013

Remark:

1. All the test items were validated and recorded in accordance with the standards without any modification during the testing.
2. The TAF code is not including all the FCC KDB listed without accreditation.
3. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

2 Test Configuration of Equipment Under Test

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). The measured emission level of the EUT was maximized by rotating the EUT on a turntable, adjusting the orientation of the EUT and EUT antenna in three orthogonal axis (X: flat, Y: portrait, Z: landscape) and accessory (Adapter or Earphone), and adjusting the measurement antenna orientation, following C63.10 exploratory test procedures and find (Y Plane with adapter for Bluetooth MIMO <Ant. 4+3> + 802.11a MIMO <Ant. 4+3>, Bluetooth-LE Ant. 4 + 802.11a MIMO <Ant. 4+3>, 802.11g MIMO <Ant. 4+3> + 802.11a MIMO <Ant. 4+3>; X Plane with adapter for Bluetooth MIMO <Ant. 4+3> + 802.11ax HE160 MIMO <Ant. 4+3>, Bluetooth-LE Ant. 4 + 802.11ax HE160 MIMO <Ant. 4+3>, 802.11g MIMO <Ant. 4+3> + 802.11ax HE160 MIMO <Ant. 4+3>) as worst plane.

2.1 Carrier Frequency and Channel

2400-2483.5 MHz					
Bluetooth EDR		Bluetooth – LE		802.11g	
Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
78	2480	39	2480	12	2467

5470-5725 MHz		6525-6875 MHz	
802.11a		802.11ax HE160	
Channel	Freq. (MHz)	Channel	Freq. (MHz)
100	5500	143	6665

2.2 Test Mode

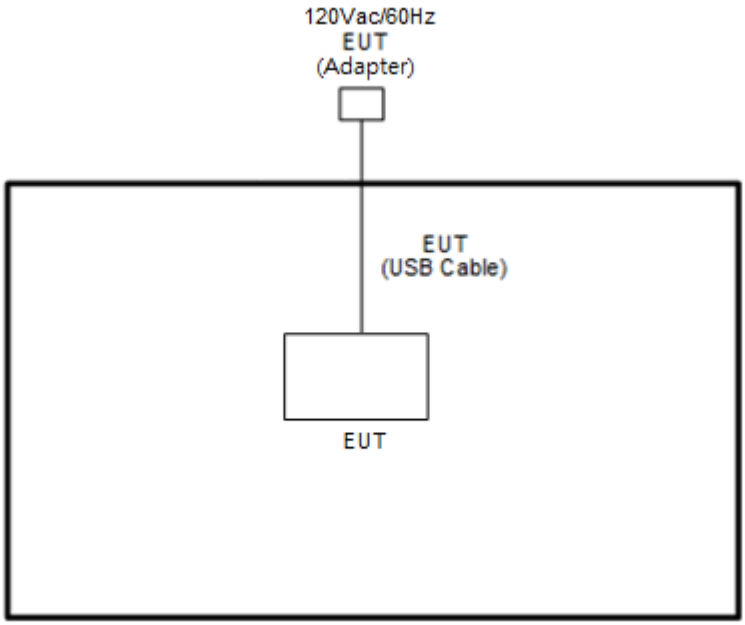
Final test modes are considering the modulation and worse data rates as below table.

<Co-Location>

Modulation	Data Rate
Bluetooth for MIMO <Ant. 4+3> + WLAN 5GHz 802.11a for MIMO <Ant. 4 + 3>	3Mbps + MCS0
Bluetooth-LE for Ant. 4 + WLAN 5GHz 802.11a for MIMO <Ant. 4 + 3>	2Mbps + MCS0
WLAN 2.4GHz 802.11g for MIMO <Ant. 4+3> + WLAN 5GHz 802.11a for MIMO <Ant. 4 + 3>	6Mbps + MCS0
Bluetooth for MIMO <Ant. 4+3> + WLAN 6GHz 802.11ax HE160 for MIMO <Ant. 4 + 3>	3Mbps + MCS0
Bluetooth-LE for Ant. 4 + WLAN 6GHz 802.11ax HE160 for MIMO <Ant. 4 + 3>	2Mbps + MCS0
WLAN 2.4GHz 802.11g for MIMO <Ant. 4+3> + WLAN 6GHz 802.11ax HE160 for MIMO <Ant. 4 + 3>	6Mbps + MCS0

Remark: For Radiated Test Cases, the tests were performed with Adapter 1 and USB Cable 2.

2.3 Connection Diagram of Test System



2.4 EUT Operation Test Setup

The RF test items, utility “Command v10.0.17134.134” was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

3 Test Result

3.1 Unwanted Emissions Measurement

This section is to measure unwanted emissions through radiated measurement for band edge spurious emissions and out of band emissions measurement.

<Limit of Unwanted Emissions>

(1) Unwanted spurious emissions fallen in restricted bands shall comply with the general field strength limits as below table:

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

Note: The following formula is used to convert the EIRP to field strength.

$$E=\frac{1000000\sqrt{30P}}{3}$$ μV/m, where P is the eirp (Watts)

EIRP (dBm)	Field Strength at 3m (dBμV/m)
- 27	68.3

(2) KDB789033 D02 v02r01 G)2)c)

(i) Sections 15.407(b)(1-3) specifies the unwanted emissions limit for the U-NII-1 and U-NII-2 bands. As specified, emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit of −27 dBm/MHz.

(ii) Section 15.407(b)(4) specifies the unwanted emissions limit for the U-NII-3 band. A band emissions mask is specified in Section 15.407(b)(4)(i). The emission limits are based on the use of a peak detector.

(3) For transmitters operating within the 5.925-7.125 GHz band: Any emissions outside of the 5.925-7.125 GHz band must not exceed an e.i.r.p. of −27 dBm/MHz.

EIRP (dBm)	Field Strength at 3m (dBμV/m)
- 27 (RMS)	68.3
- 7 (Peak)	88.3

According 987594 D02 U-NII 6GHz EMC Measurement v01 section G:
Unwanted emissions outside of restricted bands are measured with a RMS detector.
In addition, 15.35(b) applies where the peak emissions must be limited to no more than 20 dB above the average limit

3.1.1 Measuring Instruments

See list of measuring equipment of this test report.

3.1.2 Test Procedures

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01. Section G) Unwanted emissions measurement.

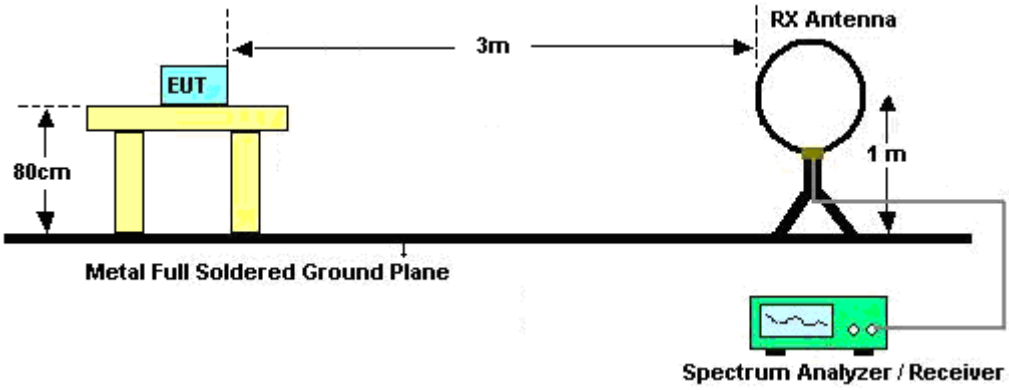
   (1) Procedure for Unwanted Emissions Measurements Below 1000 MHz
   - RBW = 120 kHz
   - VBW = 300 kHz
   - Detector = Peak
   - Trace mode = max hold

   (2) Procedure for Peak Unwanted Emissions Measurements Above 1000 MHz
   - RBW = 1 MHz
   - VBW ≥ 3 MHz
   - Detector = Peak
   - Sweep time = auto
   - Trace mode = max hold

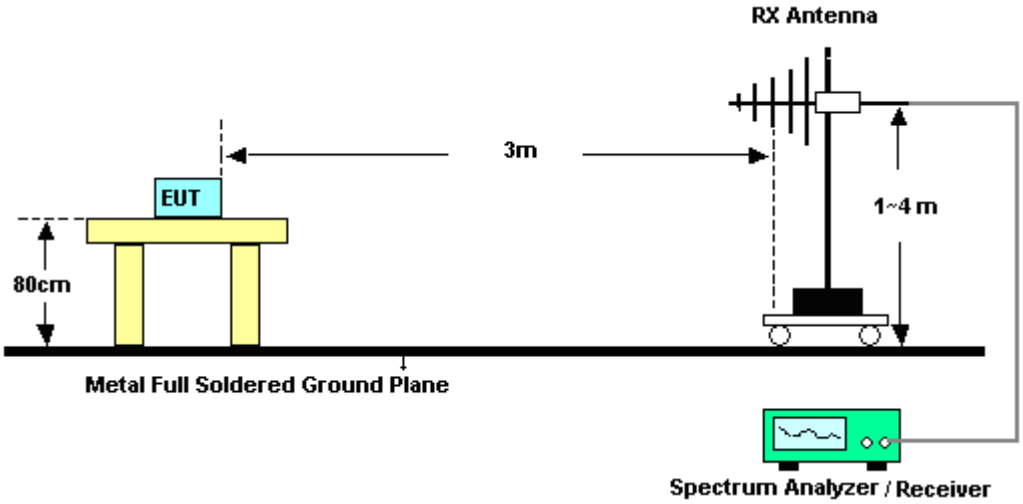
   (3) Procedures for Average Unwanted Emissions Measurements Above 1000 MHz
   - RBW = 1 MHz
   - VBW = 10 Hz, when duty cycle is no less than 98 percent.
   - VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.
2. 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.
3. The EUT is set 3 meters away from the receiving antenna which is mounted on the top of a variable height antenna tower.
4. The antenna is a broadband antenna and its height is adjusted between one meter and four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT is arranged to its worst case and then adjust the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
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 “-“.

3.1.3 Test Setup

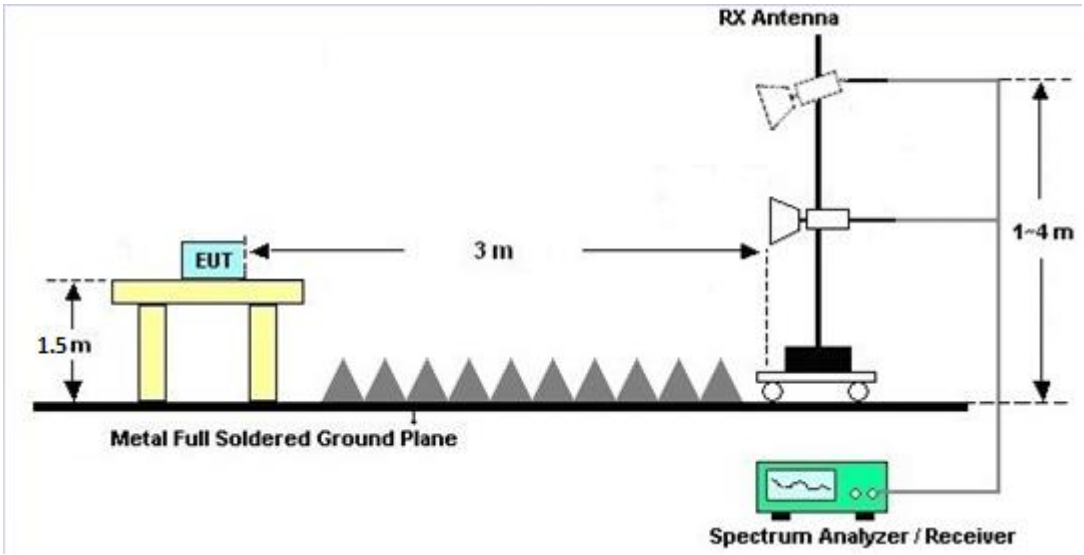
For radiated emissions below 30MHz



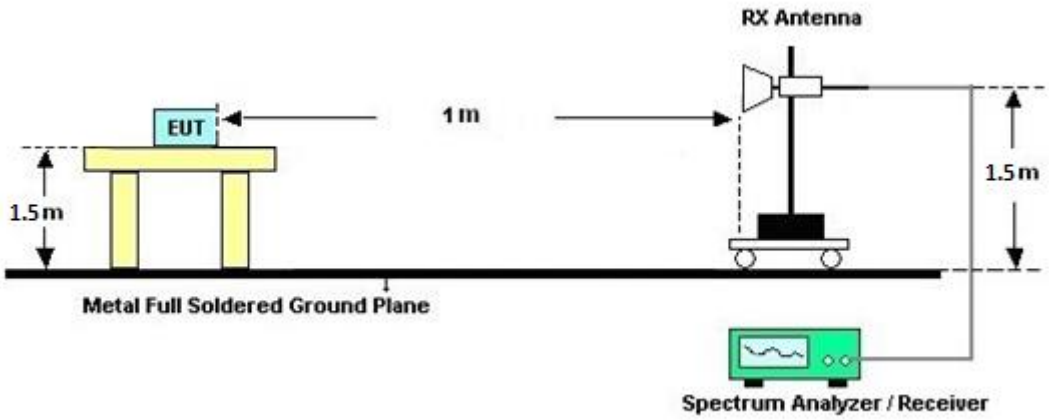
For radiated emissions from 30MHz to 1GHz



For radiated test from 1GHz to 18GHz



For radiated test above 18GHz



3.1.4 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 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 came out very similar.

3.1.5 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix A and B.

3.1.6 Duty Cycle

Please refer to Appendix C.

3.1.7 Test Result of Radiated Spurious Emissions (30MHz ~ 10th Harmonic)

Please refer to Appendix A and B.

3.2 Antenna Requirements

3.2.1 Standard Applicable

<Bluetooth, Bluetooth-LE, WLAN 2.4GHz and WLAN 5GHz>

If directional gain of transmitting antennas is greater than 6dBi, the power and the peak power spectral density 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.

<WLAN 6GHz>

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.

3.2.2 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. 07, 2021	Nov. 12, 2021~ Dec. 15, 2021	Sep. 06, 2022	Radiation (03CH16-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00802N1D01 N-06	47020 & 06	30MHz to 1GHz	Oct. 09, 2021	Nov. 12, 2021~ Dec. 15, 2021	Oct. 08, 2022	Radiation (03CH16-HY)
Horn Antenna	SCHWARZBE CK	BBHA 9120 D	9120D-1522	1G~18GHz	Oct. 12, 2021	Nov. 12, 2021~ Dec. 15, 2021	Oct. 11, 2022	Radiation (03CH16-HY)
SHF-EHF Horn Antenna	SCHWARZBE CK	BBHA 9170	00991	18GHz ~40GHz	May 12, 2021	Nov. 12, 2021~ Dec. 15, 2021	May 11, 2022	Radiation (03CH16-HY)
Amplifier	SONOMA	310N	371607	9kHz~1GHz	Jul. 05, 2021	Nov. 12, 2021~ Dec. 15, 2021	Jul. 04, 2022	Radiation (03CH16-HY)
Preamplifier	Jet-Power	JPA0118-55-3 03	1710001800054 001	1-18GHz	Jun. 16, 2021	Nov. 12, 2021~ Jan. 10, 2022	Jun. 15, 2022	Radiation (03CH16-HY)
Preamplifier	Keysight	83017A	MY53270264	1GHz~26.5GHz	Dec. 10, 2020	Nov. 12, 2021~ Dec. 08, 2021	Dec. 09, 2021	Radiation (03CH16-HY)
Preamplifier	Keysight	83017A	MY53270264	1GHz~26.5GHz	Dec. 09, 2021	Dec. 09, 2021~ Jan. 10, 2022	Dec. 08, 2022	Radiation (03CH16-HY)
Preamplifier	EMEC	EM18G40G	060801	18GHz~40GHz	Jun. 22, 2021	Nov. 12, 2021~ Jan. 10, 2022	Jun. 21, 2022	Radiation (03CH16-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY57290111	3Hz~26.5GHz	Dec. 11, 2020	Nov. 12, 2021~ Dec. 09, 2021	Dec. 10, 2021	Radiation (03CH16-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY59053012	3Hz~26.5GHz	Nov. 18, 2021	Nov. 19, 2021~ Jan. 10, 2022	Nov. 17, 2022	Radiation (03CH16-HY)
EMI Test Receiver	Keysight	N9010A	MY54200485	3Hz ~40GHz	Mar. 05, 2021	Nov. 12, 2021~ Jan. 10, 2022	Mar. 04, 2022	Radiation (03CH16-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY11680/4PE	NA	Aug. 28, 2021	Nov. 12, 2021~ Jan. 10, 2022	Aug. 27, 2022	Radiation (03CH16-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY11688/4PE	NA	Aug. 28, 2021	Nov. 12, 2021~ Jan. 10, 2022	Aug. 27, 2022	Radiation (03CH16-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	EC-A5-300-5757	NA	Aug. 28, 2021	Nov. 12, 2021~ Jan. 10, 2022	Aug. 27, 2022	Radiation (03CH16-HY)
Hygrometer	TECPEL	DTM-303B	TP200881	QA-3-031	Sep. 30, 2021	Nov. 12, 2021~ Jan. 10, 2022	Sep. 29, 2022	Radiation (03CH16-HY)
Software	Audix	E3 6.2009-8-24	RK-001136	N/A	N/A	Nov. 12, 2021~ Jan. 10, 2022	N/A	Radiation (03CH16-HY)
Controller	ChainTek	3000-1	N/A	Control Turn table & Ant Mast	N/A	Nov. 12, 2021~ Jan. 10, 2022	N/A	Radiation (03CH16-HY)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Nov. 12, 2021~ Jan. 10, 2022	N/A	Radiation (03CH16-HY)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Nov. 12, 2021~ Jan. 10, 2022	N/A	Radiation (03CH16-HY)

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.8 dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.2 dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.8 dB**

Appendix A. Radiated Spurious Emission

Test Engineer :	Karl Hou and Andy Yang	**Temperature :**	20~25°C
		Relative Humidity :	50~60%

2.4GHz 2400~2483.5MHz + Band 3 - 5470~5725MHz

MIMO <Ant. 4+3>_BT_Tx_Ch78 + MIMO <Ant. 4+3>_802.11a_Tx_Ch100 (Harmonic @ 3 m)

WIFI Ant. Simultaneously	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 78 2480MHz + 802.11a CH 100 5500MHz		4960	60.25	-13.75	74	46.41	31.44	11.81	29.41	-	-	P	H
		4960	35.5	-18.5	54	-	-	-	-	-	-	A	H
		7440	49.18	-24.82	74	54.28	36.44	16.45	57.99	-	-	P	H
		7440	24.43	-29.57	54	-	-	-	-	-	-	A	H
		10762	52.26	-21.74	74	55.03	39.99	18.97	61.73	-	-	P	H
		10762	42.19	-11.81	54	44.96	39.99	18.97	61.73	-	-	A	H
		11000	55.83	-18.17	74	57.82	40.4	19.01	61.4	299	299	P	H
		11000	45.8	-8.2	54	47.79	40.4	19.01	61.4	299	299	A	H
		14491	53.62	-20.38	74	50.68	42	21.75	60.81	-	-	P	H
		14491	43.53	-10.47	54	40.59	42	21.75	60.81	-	-	A	H
		16500	51.96	-16.24	68.2	48.58	39	23.98	59.6	-	-	P	H
		4960	58.49	-15.51	74	44.65	31.44	11.81	29.41	-	-	P	V
		4960	33.74	-20.26	54	-	-	-	-	-	-	A	V
		7440	49.32	-24.68	74	54.42	36.44	15.56	57.99	-	-	P	V
		7440	24.57	-29.43	54	-	-	-	-	-	-	A	V
		10927	52.91	-21.09	74	55.02	40.4	18.99	61.5	-	-	P	V
		10927	42.93	-11.07	54	45.04	40.4	18.99	61.5	-	-	A	V
		11000	53.35	-20.65	74	55.34	40.4	19.01	61.4	304	330	P	V
		11000	43.45	-10.55	54	45.44	40.4	19.01	61.4	304	330	A	V
		14491	52.95	-21.05	74	50.01	42	21.75	60.81	-	-	P	V
		14491	42.92	-11.08	54	39.98	42	21.75	60.81	-	-	A	V
		16500	51.98	-16.22	68.2	48.6	39	23.98	59.6	-	-	P	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 below 1GHz

MIMO <Ant. 4+3>_BT_Tx_Ch78 + MIMO <Ant. 4+3>_11ax HE160_Tx_Ch50 (LF)

WIFI Ant. Simultaneously	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 78 2480MHz + 802.11ax HE160_Ch50 5250MHz		95.96	30.95	-12.55	43.5	46.08	15.41	1.77	32.31	-	-	P	H
		160.95	25.9	-17.6	43.5	39.42	16.42	2.31	32.25	-	-	P	H
		640.13	28.48	-17.52	46	30.25	26.3	4.44	32.51	-	-	P	H
		770.11	31.23	-14.77	46	30.61	28.09	4.83	32.3	-	-	P	H
		895.24	33.48	-12.52	46	30.87	28.92	5.27	31.58	-	-	P	H
		950.53	34.58	-11.42	46	29.75	30.57	5.46	31.2	-	-	P	H
													H
													H
													H
													H
													H
													H
		34.85	31.24	-8.76	40	40.36	22.27	0.92	32.31	-	-	P	V
		94.99	28.11	-15.39	43.5	43.46	15.2	1.76	32.31	-	-	P	V
		556.71	27.71	-18.29	46	30.09	25.92	4.13	32.43	-	-	P	V
		704.15	29.57	-16.43	46	30.81	26.54	4.61	32.39	-	-	P	V
		854.5	32.43	-13.57	46	30.07	29.13	5.14	31.91	-	-	P	V
		943.74	34.07	-11.93	46	29.53	30.34	5.44	31.24	-	-	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 level is with at least 6 dB margin against limit line, the position is marked as “-“.												

2.4GHz 2400~2483.5MHz + Band 3 - 5470~5725MHz

Ant. 4_BLE_Tx_Ch39 + MIMO <Ant. 4+3>_802.11a_Tx_Ch100 (Harmonic @ 3 m)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
Simultaneously		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BLE CH 39 2480MHz + 802.11a CH 100 5500MHz		4960	54.78	-19.22	74	40.94	31.44	11.81	29.41	206	16	P	H
		4960	42.68	-11.32	54	28.84	31.44	11.81	29.41	206	16	A	H
		7440	48.82	-25.18	74	53.92	36.44	16.45	57.99	-	-	P	H
		11000	55.8	-18.2	74	57.79	40.4	19.01	61.4	298	295	P	H
		11000	45.65	-8.35	54	47.64	40.4	19.01	61.4	298	295	A	H
		11400	53	-21	74	54.47	40.1	19.19	60.76	-	-	P	H
		11400	42.92	-11.08	54	44.39	40.1	19.19	60.76	-	-	A	H
		14480	53.4	-20.6	74	50.48	42	21.74	60.82	-	-	P	H
		14480	43.35	-10.65	54	40.43	42	21.74	60.82	-	-	A	H
		16504	51.29	-16.91	68.2	47.91	38.99	23.99	59.6	-	-	P	H
		17978	63.34	-10.66	74	46.01	48.69	25.47	56.83	-	-	P	H
		17978	48.54	-5.46	54	31.21	48.69	25.47	56.83	-	-	A	H
		4960	54.39	-19.61	74	40.55	31.44	11.81	29.41	248	104	P	V
		4960	41.89	-12.11	54	28.05	31.44	11.81	29.41	248	104	A	V
		7440	48.95	-25.05	74	54.05	36.44	16.45	57.99	-	-	P	V
		10916	52.85	-21.15	74	54.97	40.4	19	61.52	-	-	P	V
		10916	42.77	-11.23	54	44.89	40.4	19	61.52	-	-	A	V
		11000	53.75	-20.25	74	55.74	40.4	19.01	61.4	303	329	P	V
		11000	43.46	-10.54	54	45.45	40.4	19.01	61.4	303	329	A	V
		14480	53.83	-20.17	74	50.91	42	21.74	60.82	-	-	P	V
		14480	43.78	-10.22	54	40.86	42	21.74	60.82	-	-	A	V
		16500	52.08	-16.12	68.2	48.7	39	23.98	59.6	-	-	P	V
		18000	63.1	-10.9	74	45.22	49.2	25.48	56.8	-	-	P	V
		18000	48.18	-5.82	54	30.3	49.2	25.48	56.8	-	-	A	V

Remark

1. No other spurious found.
2. All results are PASS against Peak and Average limit line.
3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.
4. The emission level close to 18GHz is checked that the average emission level is noise floor only.

2.4GHz 2400~2483.5MHz + Band 3 - 5470~5725MHz

MIMO <Ant. 4+3>_802.11g_Tx_Ch12 + MIMO <Ant. 4+3>_802.11a_Tx_Ch100 (Harmonic @ 3 m)

WIFI Ant. Simultaneously	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)	Ta11g Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11g CH 12 2467MHz + 802.11a CH 100 5500MHz		4934	55.65	-18.35	74	41.88	31.37	11.82	29.42	207	15	P	H
		4934	45.47	-8.53	54	31.7	31.37	11.82	29.42	207	15	A	H
		7401	49.05	-24.95	74	54.22	36.21	16.6	57.98	-	-	P	H
		10916	53.48	-20.52	74	55.6	40.4	19	61.52	-	-	P	H
		10916	43.45	-10.55	54	45.57	40.4	19	61.52	-	-	A	H
		11000	55.71	-18.29	74	57.7	40.4	19.01	61.4	298	297	P	H
		11000	45.64	-8.36	54	47.63	40.4	19.01	61.4	298	297	A	H
		14480	53.49	-20.51	74	50.57	42	21.74	60.82	-	-	P	H
		14480	43.45	-10.55	54	40.53	42	21.74	60.82	-	-	A	H
		16500	52.84	-15.36	68.2	49.46	39	23.98	59.6	-	-	P	H
		18000	63.2	-10.8	74	45.32	49.2	25.48	56.8	-	-	P	H
		18000	48.16	-5.84	54	30.28	49.2	25.48	56.8	-	-	A	H
		4934	59.77	-14.23	74	46	31.37	11.82	29.42	268	87	P	V
		4934	49.14	-4.86	54	35.37	31.37	11.82	29.42	268	87	A	V
		7401	49.09	-24.91	74	54.26	36.21	16.6	57.98	-	-	P	V
		10938	53.31	-20.69	74	55.4	40.4	19	61.49	-	-	P	V
		10938	43.2	-10.8	54	45.29	40.4	19	61.49	-	-	A	V
		11000	54.34	-19.66	74	56.33	40.4	19.01	61.4	304	330	P	V
		11000	43.62	-10.38	54	45.61	40.4	19.01	61.4	304	330	A	V
		14480	53.34	-20.66	74	50.42	42	21.74	60.82	-	-	P	V
		14480	43.29	-10.71	54	40.37	42	21.74	60.82	-	-	A	V
		16500	52.05	-16.15	68.2	48.67	39	23.98	59.6	-	-	P	V
		17989	63.34	-10.66	74	45.72	48.95	25.48	56.81	-	-	P	V
		17989	48.3	-5.7	54	30.68	48.95	25.48	56.81	-	-	A	V

Remark

1. No other spurious found.
2. All results are PASS against Peak and Average limit line.
3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.
4. The emission level close to 18GHz is checked that the average emission level is noise floor only.

2.4GHz 2400~2483.5MHz + Band 7 6525~6875MHz

MIMO <Ant. 4+3>_BT_Tx_Ch78 + MIMO <Ant. 4+3>_802.11ax_HE160_Ch143 (Band Edge @ 3m)

WIFI Ant. Simultaneously	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 78 2480MHz	*	2480	111.5	-	-	105.69	27.4	8.46	30.05	102	306	P	H
	*	2480	86.75	-	-	-	-	-	-	-	-	P	H
		2484.24	50.69	-23.31	74	44.86	27.4	8.47	30.04	102	306	P	H
		2484.24	25.94	-28.06	54	-	-	-	-	-	-	A	H
												P	H
												A	H
	*	2480	108.14	-	-	102.33	27.4	8.46	30.05	400	34	P	V
	*	2480	83.39	-	-	-	-	-	-	-	-	P	V
		2484.28	49.29	-24.71	74	43.46	27.4	8.47	30.04	400	34	P	V
		2484.28	24.54	-29.46	54	-	-	-	-	-	-	A	V
												P	V
												A	V

MIMO <Ant. 4+3>_BT_Tx_Ch78 + MIMO <Ant. 4+3>_802.11ax_HE160_Ch143 (Harmonic @ 3 m)

WIFI Ant. Simultaneously	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 78 2480MHz + 802.11ax HE160 CH 143 6665MHz		4960	43.62	-30.38	74	56.92	31.44	13.28	58.02	-	-	P	H
		4960	37.3	-16.7	54	-	-	-	-	-	-	A	H
		7440	51.02	-22.98	74	55.21	36.44	17.36	57.99	-	-	P	H
		7440	22.73	-31.27	54	-	-	-	-	-	-	A	H
		10880	52.01	-21.99	74	54.52	40.34	18.72	61.57	-	-	P	H
		10880	41.57	-12.43	54	44.08	40.34	18.72	61.57	-	-	A	H
		13330	49.08	-24.92	74	50.07	39.45	20.69	61.13	100	290	P	H
		13330	41.35	-12.65	54	42.34	39.45	20.69	61.13	100	290	A	H
		14491	53.83	-20.17	74	50.87	42	21.77	60.81	-	-	P	H
		14491	43.1	-10.9	54	40.14	42	21.77	60.81	-	-	A	H
		17944	61.58	-12.42	74	45.59	47.91	24.95	56.87	-	-	P	H
		17944	47.73	-6.27	54	31.74	47.91	24.95	56.87	-	-	A	H
		19995	41.47	-32.53	74	62.2	37.7	-3.53	54.9	-	-	P	H
		17944	47.73	-6.27	54	31.74	47.91	24.95	56.87	-	-	A	H
		4960	42.89	-31.11	74	56.19	31.44	13.28	58.02	-	-	P	V
		4960	-24.75	-78.75	54	-	-	-	-	-	-	A	V
		7440	51.72	-22.28	74	55.91	36.44	17.36	57.99	-	-	P	V
		7440	-24.75	-78.75	54	-	-	-	-	-	-	A	V
		10880	51.48	-22.52	74	53.99	40.34	18.72	61.57	-	-	P	V
		10880	41.42	-12.58	54	43.93	40.34	18.72	61.57	-	-	A	V
		13330	50.15	-23.85	74	51.14	39.45	20.69	61.13	100	140	P	V
		13330	41.67	-12.33	54	42.66	39.45	20.69	61.13	100	140	A	V
		14491	53.57	-20.43	74	50.61	42	21.77	60.81	-	-	P	V
		14491	43.13	-10.87	54	40.17	42	21.77	60.81	-	-	A	V
		18000	62.05	-11.95	74	44.68	49.2	24.97	56.8	-	-	P	V
		18000	47.53	-6.47	54	30.16	49.2	24.97	56.8	-	-	A	V
		19995	47.48	-26.52	74	68.21	37.7	-3.53	54.9	-	-	P	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.
4. The emission level close to 18GHz is checked that the average emission level is noise floor only.

Emission below 1GHz

MIMO <Ant. 4+3>_BT_Tx_Ch78 + MIMO <Ant. 4+3>_802.11ax_HE160_Ch143 (LF)

WIFI Ant. Simultaneously	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 78 2480MHz + 802.11ax HE160 CH 143 6665MHz		95.96	31.22	-12.28	43.5	46.35	15.41	1.67	32.31	-	-	P	H
		159.01	25.54	-17.96	43.5	38.82	16.67	2.19	32.25	-	-	P	H
		494.63	25.5	-20.5	46	29.95	23.95	3.77	32.36	-	-	P	H
		692.51	28.65	-17.35	46	30.11	26.36	4.42	32.4	-	-	P	H
		855.47	32.51	-13.49	46	30.15	29.13	4.93	31.91	-	-	P	H
		950.53	34.26	-11.74	46	29.43	30.57	5.2	31.2	-	-	P	H
													H
													H
													H
													H
													H
													H
		34.85	30.57	-9.43	40	39.69	22.27	0.86	32.31	-	-	P	V
		95.96	27.65	-15.85	43.5	42.78	15.41	1.67	32.31	-	-	P	V
		543.13	26.07	-19.93	46	29.95	24.43	3.95	32.39	-	-	P	V
		754.59	30.58	-15.42	46	30.02	28.12	4.61	32.33	-	-	P	V
		866.14	33.1	-12.9	46	30.74	29	4.96	31.82	-	-	P	V
		951.5	35.38	-10.62	46	30.51	30.6	5.2	31.19	-	-	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 level is with at least 6 dB margin against limit line, the position is marked as “-“.												

2.4GHz 2400~2483.5MHz + Band 7 6525~6875MHz

Ant. 4_BLE_Tx_Ch39 + MIMO <Ant. 4+3>_802.11ax_HE160_Ch143 (Band Edge @ 3m)

WIFI Ant. Simultaneously	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)
BLE CH 39 2480MHz	*	2480	109.48	-	-	93.75	27.4	8.46	30.05	100	298	P	H
	*	2480	107.85	-	-	92.12	27.4	8.46	30.05	100	298	A	H
		2492	56.26	-17.74	74	40.49	27.4	8.49	30.04	100	298	P	H
		2483.6	46.25	-7.75	54	30.5	27.4	8.47	30.04	100	298	A	H
													H
													H
	*	2480	106.37	-	-	90.64	27.4	8.46	30.05	400	42	P	V
	*	2480	104.68	-	-	88.95	27.4	8.46	30.05	400	42	A	V
		2485.72	56.25	-17.75	74	40.5	27.4	8.47	30.04	400	42	P	V
		2487.12	45.81	-8.19	54	30.05	27.4	8.48	30.04	400	42	A	V
													V
													V

Ant. 4_BLE_Tx_Ch39 + MIMO <Ant. 4+3>_802.11ax_HE160_Ch143 (Harmonic @ 3 m)

WIFI Ant. Simultaneously	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)
BLE CH 39 2480MHz + 802.11ax HE160 CH 143 6665MHz		4960	43.86	-30.14	74	57.16	31.44	13.28	58.02	-	-	P	H
		7440	52.54	-21.46	74	56.73	36.44	17.36	57.99	100	111	P	H
		7440	42.1	-11.9	54	46.29	36.44	17.36	57.99	100	111	A	H
		10880	50.97	-23.03	74	53.48	40.34	18.72	61.57	-	-	P	H
		10880	41.61	-12.39	54	44.12	40.34	18.72	61.57	-	-	A	H
		13330	49.66	-24.34	74	50.65	39.45	20.69	61.13	100	288	P	H
		13330	41.31	-12.69	54	42.3	39.45	20.69	61.13	100	288	A	H
		14491	52.66	-21.34	74	49.7	42	21.77	60.81	-	-	P	H
		14491	42.65	-11.35	54	39.69	42	21.77	60.81	-	-	A	H
		17992	62.28	-11.72	74	45.1	49.02	24.97	56.81	-	-	P	H
		17992	47.6	-6.4	54	30.42	49.02	24.97	56.81	-	-	A	H
		19995	40.85	-33.15	74	61.58	37.7	-3.53	54.9	-	-	P	H
													H
													H
		4960	42.92	-31.08	74	56.22	31.44	13.28	58.02	-	-	P	V
		7440	51.11	-22.89	74	55.3	36.44	17.36	57.99	100	78	P	V
		7440	41.59	-12.41	54	45.78	36.44	17.36	57.99	100	78	A	V
		10880	51.79	-22.21	74	54.3	40.34	18.72	61.57	-	-	P	V
		10880	42	-12	54	44.51	40.34	18.72	61.57	-	-	A	V
		13330	50.3	-23.7	74	51.29	39.45	20.69	61.13	100	142	P	V
		13330	41.74	-12.26	54	42.73	39.45	20.69	61.13	100	142	A	V
		14491	53.43	-20.57	74	50.47	42	21.77	60.81	-	-	P	V
		14491	43.58	-10.42	54	40.62	42	21.77	60.81	-	-	A	V
		17992	62.23	-11.77	74	45.05	49.02	24.97	56.81	-	-	P	V
		17992	47.68	-6.32	54	30.5	49.02	24.97	56.81	-	-	A	V
		19995	47.5	-26.5	74	68.23	37.7	-3.53	54.9	-	-	P	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.
4. The emission level close to 18GHz is checked that the average emission level is noise floor only.

2.4GHz 2400~2483.5MHz + Band 7 6525~6875MHz

MIMO <Ant. 4+3>_802.11g_Tx_Ch12 + MIMO <Ant. 4+3>_802.11ax_HE160_Ch143 (Band Edge @ 3m)

WIFI Ant. Simultaneously	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)	Ta11g Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11g CH 12 2467MHz	*	2467	108.85	-	-	93.14	27.4	8.44	30.05	108	25	P	H
	*	2467	101.43	-	-	85.72	27.4	8.44	30.05	108	25	A	H
		2483.72	58.66	-15.34	74	42.91	27.4	8.47	30.04	108	25	P	H
		2483.52	47.87	-6.13	54	32.12	27.4	8.47	30.04	108	25	A	H
													H
													H
	*	2467	106.14	-	-	90.43	27.4	8.44	30.05	400	109	P	V
	*	2467	97.77	-	-	82.06	27.4	8.44	30.05	400	109	A	V
		2484.08	57.21	-16.79	74	41.46	27.4	8.47	30.04	400	109	P	V
		2483.52	46.46	-7.54	54	30.71	27.4	8.47	30.04	400	109	A	V
													V
													V

MIMO <Ant. 4+3>_802.11g_Tx_Ch12 + MIMO <Ant. 4+3>_802.11ax_HE160_Ch143 (Harmonic @ 3 m)

WIFI Ant. Simultaneously	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)	Ta11g Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11g CH 12 2467MHz + 802.11ax HE160 CH 143 6665MHz		4934	42.05	-31.95	74	55.43	31.37	13.28	58.03	-	-	P	H
		7401	48.87	-25.13	74	53.22	36.21	17.42	57.98	100	35	P	H
		7401	39.88	-14.12	54	44.23	36.21	17.42	57.98	100	35	A	H
		10880	52.19	-21.81	74	54.7	40.34	18.72	61.57	-	-	P	H
		10880	41.76	-12.24	54	44.27	40.34	18.72	61.57	-	-	A	H
		13330	49.56	-24.44	74	50.55	39.45	20.69	61.13	100	290	P	H
		13330	41.69	-12.31	54	42.68	39.45	20.69	61.13	100	290	A	H
		14491	53.7	-20.3	74	50.74	42	21.77	60.81	-	-	P	H
		14491	42.84	-11.16	54	39.88	42	21.77	60.81	-	-	A	H
		18000	61.73	-12.27	74	44.36	49.2	24.97	56.8	-	-	P	H
		18000	47.71	-6.29	54	30.34	49.2	24.97	56.8	-	-	A	H
		19995	42.36	-31.64	74	63.09	37.7	-3.53	54.9	-	-	P	H
		4934	41.97	-32.03	74	55.35	31.37	13.28	58.03	-	-	P	V
		7401	49.07	-24.93	74	53.42	36.21	17.42	57.98	100	126	P	V
		7401	40.25	-13.75	54	44.6	36.21	17.42	57.98	100	126	A	V
		10880	52.3	-21.7	74	54.81	40.34	18.72	61.57	-	-	P	V
		10880	41.67	-12.33	54	44.18	40.34	18.72	61.57	-	-	A	V
		13330	50.17	-23.83	74	51.16	39.45	20.69	61.13	100	139	P	V
		13330	41.36	-12.64	54	42.35	39.45	20.69	61.13	100	139	A	V
		14491	53.9	-20.1	74	50.94	42	21.77	60.81	-	-	P	V
		14491	43.26	-10.74	54	40.3	42	21.77	60.81	-	-	A	V
		18000	61.93	-12.07	74	44.56	49.2	24.97	56.8	-	-	P	V
		18000	47.63	-6.37	54	30.26	49.2	24.97	56.8	-	-	A	V
		19995	47.72	-26.28	74	68.45	37.7	-3.53	54.9	-	-	P	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. 4. The emission level close to 18GHz is checked that the average emission level 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.
-	The signal is **Unintentional Radiators**.
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:

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
Simultaneously		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		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 B. Radiated Spurious Emission Plots

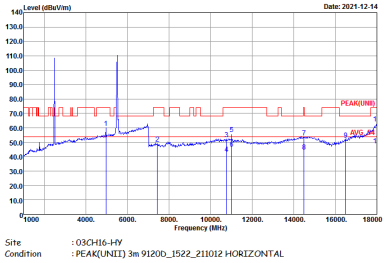
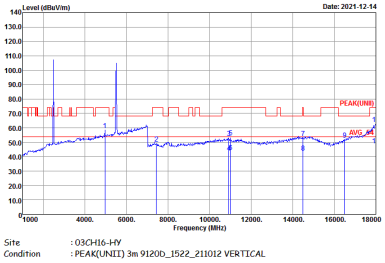
Test Engineer :	Karl Hou and Andy Yang	**Temperature :**	20~25°C
		Relative Humidity :	50~60%

Note symbol

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

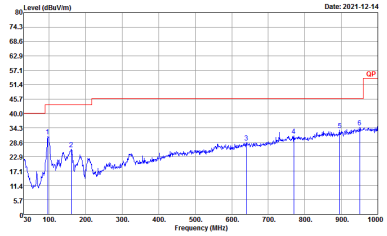
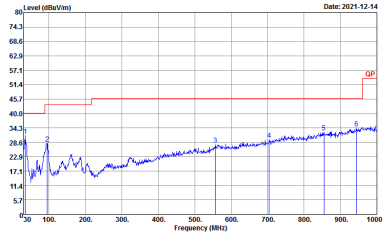
2.4GHz 2400~2483.5MHz + Band 3 - 5470~5725MHz

MIMO <Ant. 4+3>_BT_Tx_Ch78 + MIMO <Ant. 4+3>_802.11a_Tx_Ch100 (Harmonic @ 3m)

ANT	**BT_Ch78 + 802.11a_Ch100**	
Simultaneously	**Horizontal**	**Vertical**
Peak **Avg.**		

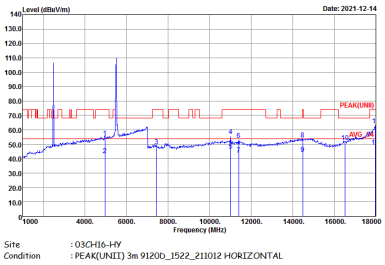
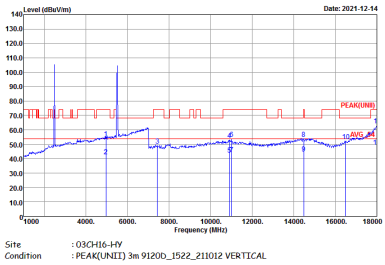
Emission below 1GHz

MIMO <Ant. 4+3>_BT_Tx_Ch78 + MIMO <Ant. 4+3>_802.11a_Tx_Ch100 (LF)

ANT	BT_Ch78 + 802.11a_Ch100	
Simultaneously	Horizontal	Vertical
QP / Peak		

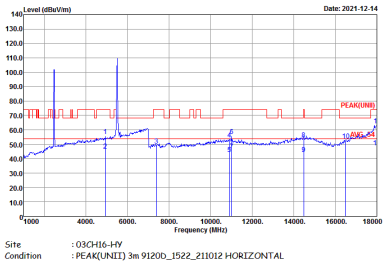
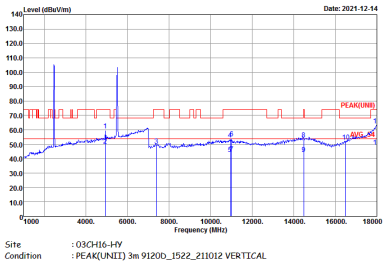
2.4GHz 2400~2483.5MHz + Band 3 - 5470~5725MHz

Ant. 4_BLE_Tx_Ch39 + MIMO <Ant. 4+3>_802.11a_Tx_Ch100 (Harmonic @ 3m)

ANT	BLE_Ch39 + 802.11a_Ch100	
Simultaneously	Horizontal	Vertical
Peak Avg.		

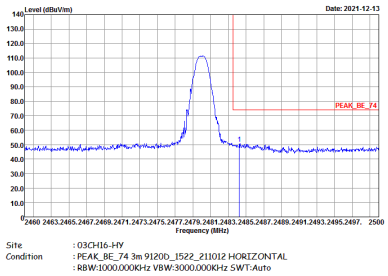
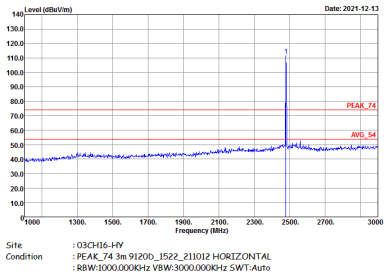
2.4GHz 2400~2483.5MHz + Band 3 - 5470~5725MHz

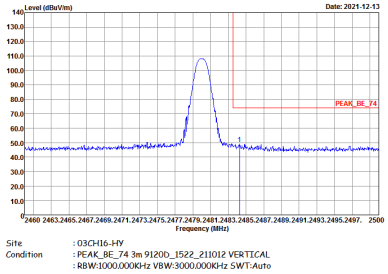
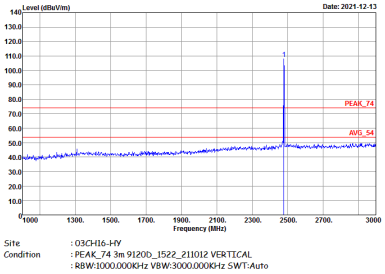
MIMO <Ant. 4+3>_802.11g_Tx_Ch12 + MIMO <Ant. 4+3>_802.11a_Tx_Ch100 (Harmonic @ 3m)

ANT	802.11g_Ch12 + 802.11a_Ch100	
Simultaneously	Horizontal	Vertical
Peak Avg.		

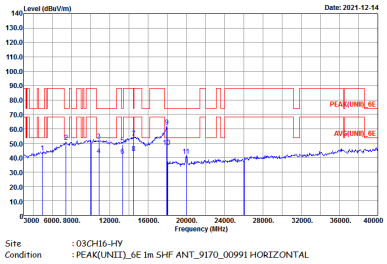
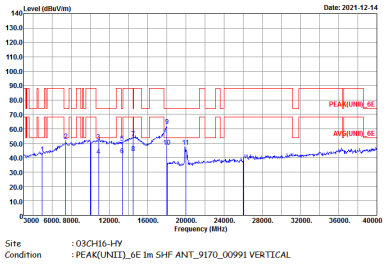
2.4GHz 2400~2483.5MHz + Band 7 6525~6875MHz

MIMO <Ant. 4+3>_BT_Tx_Ch78 + MIMO <Ant. 4+3>_802.11ax_HE160_Ch143 (Band Edge @ 3m)

ANT	BT_Ch78 + 802.11ax HE160_Ch143	
Simultaneously	Horizontal	Fundamental
Peak		

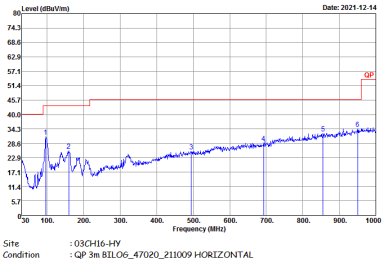
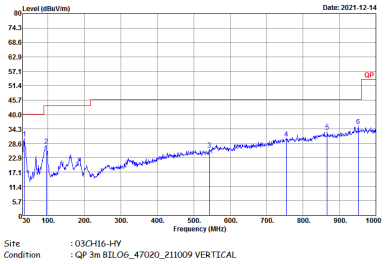
ANT	BT_Ch78 + 802.11ax HE160_Ch143	
Simultaneously	Vertical	Fundamental
Peak		

MIMO <Ant. 4+3>_BT_Tx_Ch78 + MIMO <Ant. 4+3>_802.11ax_HE160_Ch143 (Harmonic @ 3m)

ANT	BT_Ch78 + 802.11ax HE160_Ch143	
Simultaneously	Horizontal	Vertical
Peak Avg.		

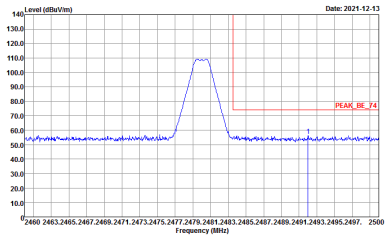
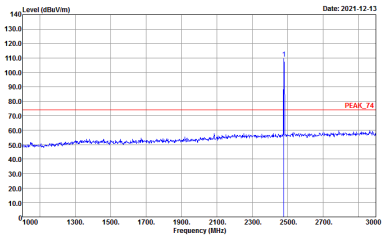
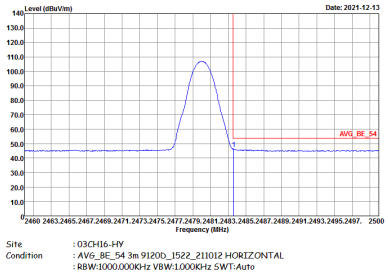
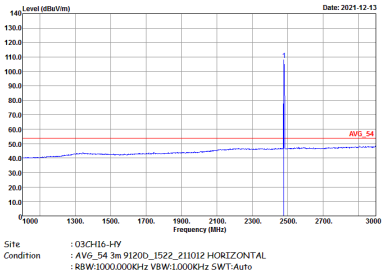
Emission below 1GHz

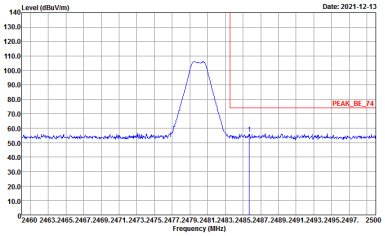
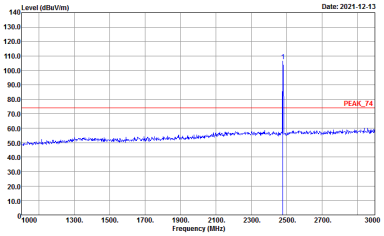
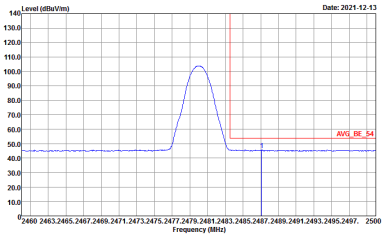
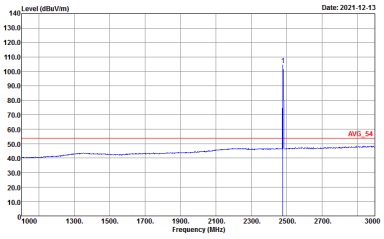
MIMO <Ant. 4+3>_BT_Tx_Ch78 + MIMO <Ant. 4+3>_802.11ax_HE160_Ch143 (LF)

ANT	BT_Ch78 + 802.11ax HE160_Ch143	
Simultaneously	Horizontal	Vertical
QP / Peak		

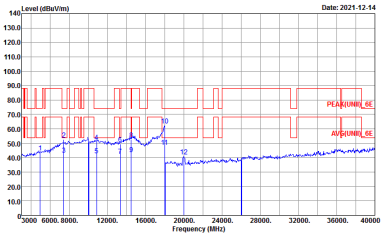
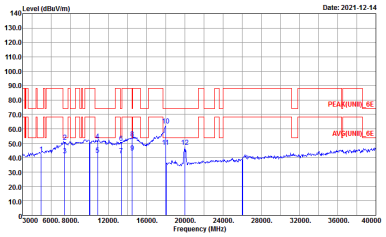
2.4GHz 2400~2483.5MHz + Band 7 6525~6875MHz

Ant. 4_BLE_Tx_Ch39 + MIMO <Ant. 4+3>_802.11ax_HE160_Ch143 (Band Edge @ 3m)

ANT	BLE_Ch39 + 802.11ax HE160_Ch143	
Simultaneously	Horizontal	Fundamental
Peak		
Avg.		

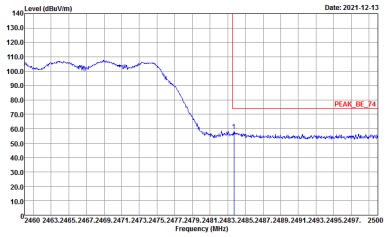
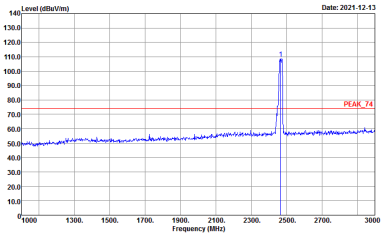
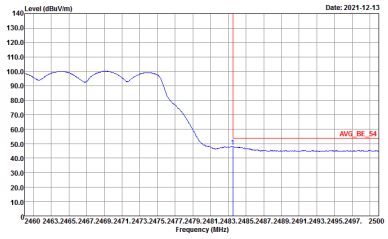
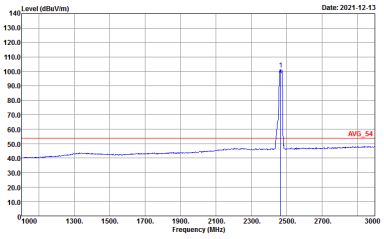
ANT	BLE_Ch39 + 802.11ax HE160_Ch143	
Simultaneously	Vertical	Fundamental
Peak	 Site : 03CH16-HY Condition : PEAK_BE_74 3m 9120D_1522_211012 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH16-HY Condition : PEAK_74 3m 9120D_1522_211012 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg	 Site : 03CH16-HY Condition : AVG_BE_54 3m 9120D_1522_211012 VERTICAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto	 Site : 03CH16-HY Condition : AVG_54 3m 9120D_1522_211012 VERTICAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto

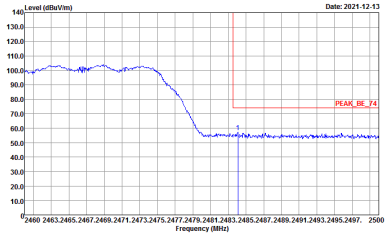
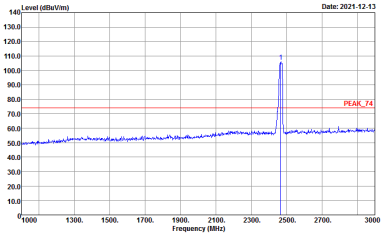
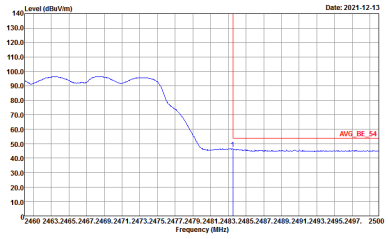
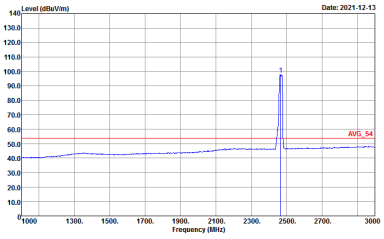
Ant. 4_BLE_Tx_Ch39 + MIMO <Ant. 4+3>_802.11ax_HE160_Ch143 (Harmonic @ 3m)

ANT	BLE_Ch39 + 802.11ax HE160_Ch143	
Simultaneously	Horizontal	Vertical
Peak Avg.		

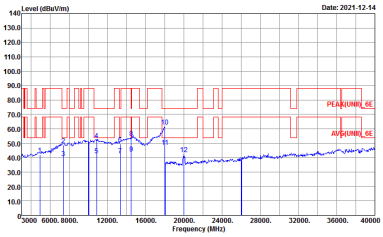
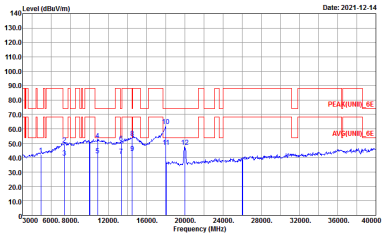
2.4GHz 2400~2483.5MHz + Band 7 6525~6875MHz

MIMO <Ant. 4+3>_802.11g _Tx_Ch12 + MIMO <Ant. 4+3>_802.11ax_HE160_Ch143 (Band Edge @ 3m)

ANT	802.11g_CH12 + 802.11ax HE160_Ch143	
Simultaneously	Horizontal	Fundamental
Peak	 Site : 03CH16-HY Condition : PEAK_BE_74 3m 9120D_1522_211012 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH16-HY Condition : PEAK_74 3m 9120D_1522_211012 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH16-HY Condition : AVG_BE_54 3m 9120D_1522_211012 HORIZONTAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto	 Site : 03CH16-HY Condition : AVG_54 3m 9120D_1522_211012 HORIZONTAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto

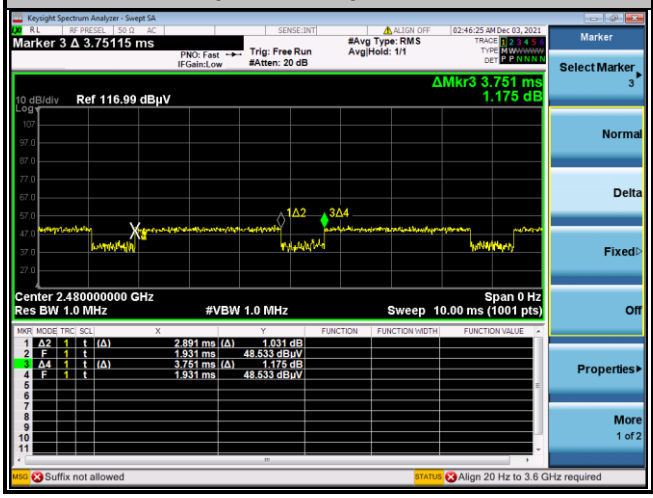
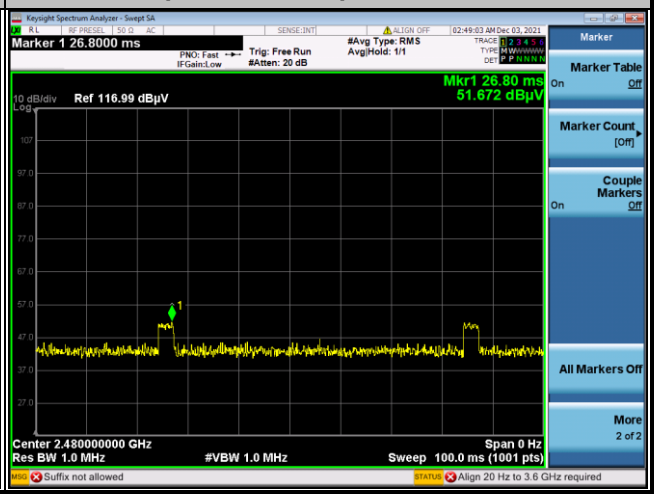
ANT	802.11g_CH12 + 802.11ax HE160_Ch143	
Simultaneously	Vertical	Fundamental
Peak	 Site : 03CH16-HY Condition : PEAK_BE_74 3m 9120D_1522_211012 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH16-HY Condition : PEAK_74 3m 9120D_1522_211012 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg	 Site : 03CH16-HY Condition : AVG_BE_54 3m 9120D_1522_211012 VERTICAL : RBW:1000.000KHz VBW:1000KHz SWT:Auto	 Site : 03CH16-HY Condition : AVG_54 3m 9120D_1522_211012 VERTICAL : RBW:1000.000KHz VBW:1000KHz SWT:Auto

MIMO <Ant. 4+3>_802.11g _Tx_Ch12 + MIMO <Ant. 4+3>_802.11ax_HE160_Ch143 (Harmonic @ 3m)

ANT	802.11g_Ch12 + 802.11ax HE160_Ch143	
Simultaneously	Horizontal	Vertical
Peak Avg.		

Appendix C. Duty Cycle Plots

MIMO <Ant. 4+3>

DH5 on time (One Pulse) Plot on Channel 39	on time (Count Pulses) Plot on Channel 39
	

Note:

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

Duty Cycle Correction Factor Consideration for AFH mode:

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

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

2.88 ms x 20 channels = 57.6 ms

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

Thus, the maximum possible ON time:

2.88 ms x 2 = 5.76 ms

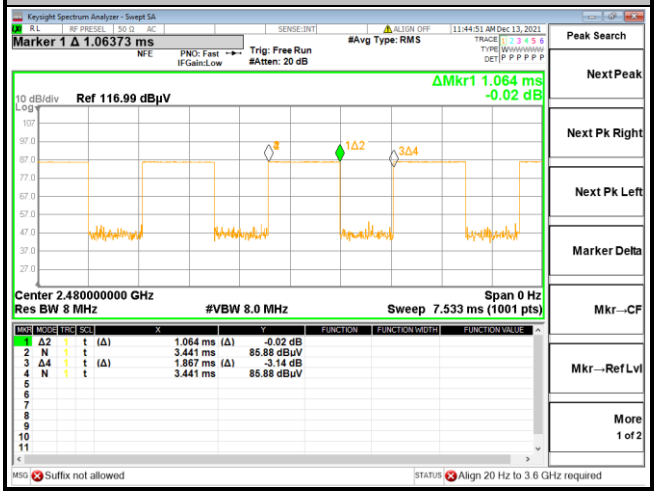
Worst case Duty Cycle Correction factor, which is derived from the maximum possible ON time,

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

Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
4	Bluetooth – LE for 2Mbps	56.99	1064	0.94	1kHz
4+3	2.4GHz 802.11g	93.44	1425	0.70	1kHz
4+3	5GHz 802.11a	93.44	1425	0.70	1kHz
4+3	6GHz 802.11ax HE160 Full RU	86.31	624	1.60	3kHz

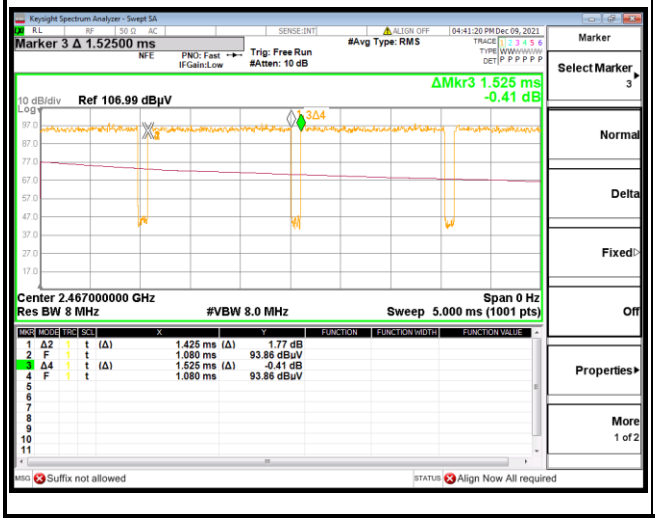
<Ant. 4>

Bluetooth – LE for 2Mbps



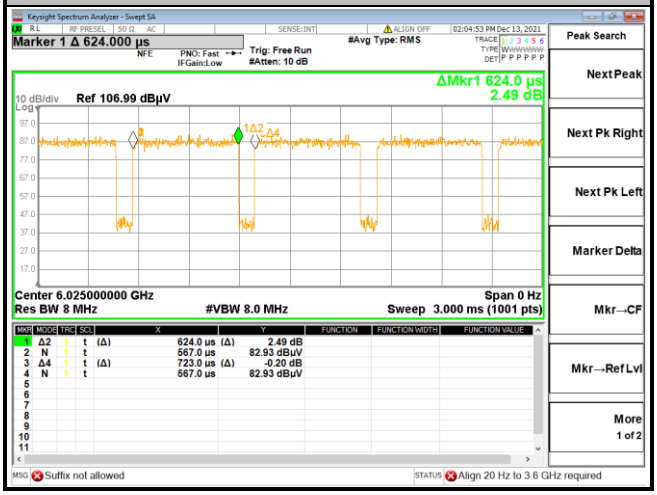
MIMO <Ant. 4+3>

2.4GHz 802.11g



5GHz 802.11a

6GHz 802.11ax HE160 Full RU



——THE END——