

## FCC Test Report (Co-Located)

**Report No.:** RF200427C09-6 R1

**FCC ID:** A4RGUIK2

**Model Name:** GUIK2

**Received Date:** Apr. 27, 2020

**Test Date:** Jun. 03 ~ Jun. 19, 2020

**Issued Date:** Jun. 30, 2020

**Applicant:** Google LLC

**Address:** 1600 Amphitheatre Parkway, Mountain View, CA 94043, USA

**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch  
Lin Kou Laboratories

**Lab Address:** No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

**Test Location:** No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City  
33383, TAIWAN

**FCC Registration /  
Designation Number:** 788550 / TW0003



This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification. The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any government agencies.

## Table of Contents

<b>Release Control Record</b> .....	<b>3</b>
<b>1 Certificate of Conformity</b> .....	<b>4</b>
<b>2 Summary of Test Results</b> .....	<b>5</b>
2.1 Measurement Uncertainty .....	5
2.2 Modification Record .....	5
<b>3 General Information</b> .....	<b>6</b>
3.1 General Description of EUT .....	6
3.2 Description of Test Modes .....	8
3.2.1 Test Mode Applicability and Tested Channel Detail .....	11
3.3 Description of Support Units .....	12
3.3.1 Configuration of System under Test .....	12
3.4 General Description of Applied Standards .....	12
<b>4 Test Types and Results</b> .....	<b>13</b>
4.1 Radiated Emission and Bandedge Measurement .....	13
4.1.1 Limits of Radiated Emission and Bandedge Measurement .....	13
4.1.2 Test Instruments .....	14
4.1.3 Test Procedures .....	15
4.1.4 Deviation from Test Standard .....	15
4.1.5 Test Setup .....	16
4.1.6 EUT Operating Conditions .....	17
4.1.7 Test Results .....	18
4.2 Conducted Out of Band Emission Measurement .....	22
4.2.1 Limits of Conducted Out of Band Emission Measurement .....	22
4.2.2 Test Setup .....	22
4.2.3 Test Instruments .....	22
4.2.4 Test Procedure .....	22
4.2.5 Deviation from Test Standard .....	22
4.2.6 EUT Operating Condition .....	22
4.2.7 Test Results .....	23
<b>5 Pictures of Test Arrangements</b> .....	<b>24</b>
<b>Annex A- Band-edge measurement</b> .....	<b>25</b>
<b>Appendix – Information of the Testing Laboratories</b> .....	<b>27</b>

### Release Control Record

Issue No.	Description	Date Issued
RF200427C09-6	Original Release	Jun. 20, 2020
RF200427C09-6 R1	Updated power supply rating	Jun. 30, 2020

## 1 Certificate of Conformity

**Product:** Interactive Device  
**Model Name:** GUIK2  
**Sample Status:** Engineering Sample  
**Applicant:** Google LLC  
**Test Date:** Jun. 03 ~ Jun. 19, 2020  
**Standards:** 47 CFR FCC Part 15, Subpart C (Section 15.247)  
47 CFR FCC Part 15, Subpart E (Section 15.407)  
ANSI C63.10:2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

**Prepared by :** Gina Liu, **Date:** Jun. 30, 2020  
Gina Liu / Specialist

**Approved by :** Dylan Chiou, **Date:** Jun. 30, 2020  
Dylan Chiou / Senior Project Engineer

## 2 Summary of Test Results

Applied Standard:	47 CFR FCC Part 15, Subpart C (Section 15.247) 47 CFR FCC Part 15, Subpart E (Section 15.407)		
FCC Clause	Test Item	Result	Remarks
15.205 / 15.209 / 15.247(d) 15.407(b) (1/2/3/4(i/ii)/6)	Radiated Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -1.69 dB at 2483.5 MHz.

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

### 2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Radiated Emissions up to 1 GHz	9 kHz ~ 30 MHz	3.04 dB
	30 MHz ~ 200 MHz	2.93 dB
	200 MHz ~ 1000 MHz	2.95 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	2.26 dB
	18 GHz ~ 40 GHz	1.94 dB

### 2.2 Modification Record

There were no modifications required for compliance.

### 3 General Information

#### 3.1 General Description of EUT

Product	Interactive Device	
Model Name	GUIK2	
Status of EUT	Engineering Sample	
Power Supply Rating	14.0 Vdc (adapter)	
Modulation Type	WLAN	256QAM, 64QAM, 16QAM, QPSK, BPSK
	Bluetooth EDR	GFSK, $\pi/4$ -DQPSK, 8DPSK
	Thread	O-QPSK
	60GHz Tx Transmitter	FMCW
Transfer Rate	WLAN	802.11a: 54.0/ 48.0/ 36.0/ 24.0/ 18.0/ 12.0/ 9.0/ 6.0 Mbps 802.11n: up to 150.0 Mbps 802.11ac: up to 433.3 Mbps
	Bluetooth EDR	1/2/3 Mbps
	Thread	250 kbps
	60GHz Tx Transmitter	N/A
Operating Frequency	WLAN	5180 ~ 5240 MHz, 5260 ~ 5320 MHz, 5500 ~ 5720 MHz, 5745 ~ 5825 MHz
	Bluetooth EDR	2402 ~ 2480 MHz
	Thread	2405 ~ 2475 MHz
	60GHz Tx Transmitter	58.5 ~ 63 GHz
Number of Channel	WLAN	5180 ~ 5240 MHz: 4 for 802.11a, 802.11n (HT20) 2 for 802.11n (HT40) 1 for 802.11ac (VHT80) 5260 ~ 5320 MHz: 4 for 802.11a, 802.11n (HT20) 2 for 802.11n (HT40) 1 for 802.11ac (VHT80) 5500 ~ 5720 MHz: 12 for 802.11a, 802.11n (HT20) 6 for 802.11n (HT40) 3 for 802.11ac (VHT80) 5745 ~ 5825 MHz: 5 for 802.11a, 802.11n (HT20) 2 for 802.11n (HT40) 1 for 802.11ac (VHT80)
	Bluetooth EDR	79
	Thread	15
	60GHz Tx Transmitter	1
Output Power	WLAN	68.549 mW for 5180 ~ 5240 MHz 65.013 mW for 5260 ~ 5320 MHz 66.069 mW for 5500 ~ 5720 MHz 59.979 mW for 5745 ~ 5825 MHz
	Bluetooth EDR	8.511 mW
	Thread	104.954 mW
	60GHz Tx Transmitter	19.953 mW

Antenna Type	WLAN	PIFA antenna with 4.0 dBi gain (5180 ~ 5240 MHz) PIFA antenna with 4.0 dBi gain (5260 ~ 5320 MHz) PIFA antenna with 4.0 dBi gain (5500 ~ 5720 MHz) PIFA antenna with 4.8 dBi gain (5745 ~ 5825 MHz)
	Bluetooth EDR	PIFA antenna with 4.3 dBi gain
	Thread	PIFA antenna with 3.0 dBi gain
	60GHz Tx Transmitter	Microstrip Patch <input checked="" type="checkbox"/> Integral <input type="checkbox"/> Exremal
Antenna Connector	WLAN	i-pex(MHF)
	Bluetooth EDR	
	Thread	
	60GHz Tx Transmitter	N/A
SN	1J365004810040204Q00135(MLB SN) SEM000061016 (FATP SN)	
Accessory Device	Refer to Note as below	
Cable Supplied	Refer to Note as below	

Note:

- The EUT provides one completed transmitter and one receiver.

Modulation Mode	Tx Function
802.11a	1TX
802.11n (HT20)	1TX
802.11n (HT40)	1TX
802.11ac (VHT20)	1TX
802.11ac (VHT40)	1TX
802.11ac (VHT80)	1TX

\* The modulation and bandwidth are similar for 802.11n mode for HT20 / HT40 and 802.11ac mode for VHT20 / VHT40, therefore investigated worst case to representative mode in test report. (Final test mode refer section 3.2.1)

- The EUT accessories list refers to EUT Photo.pdf.
- The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.
- The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

### 3.2 Description of Test Modes

#### For 5180 ~ 5240 MHz

4 channels are provided for 802.11a, 802.11n (HT20):

Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	44	5220
40	5200	48	5240

2 channels are provided for 802.11n (HT40):

Channel	Frequency (MHz)	Channel	Frequency (MHz)
38	5190	46	5230

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency (MHz)
42	5210

#### For 5260 ~ 5320 MHz

4 channels are provided for 802.11a, 802.11n (HT20):

Channel	Frequency (MHz)	Channel	Frequency (MHz)
52	5260	60	5300
56	5280	64	5320

2 channels are provided for 802.11n (HT40):

Channel	Frequency (MHz)	Channel	Frequency (MHz)
54	5270	62	5310

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency (MHz)
58	5290



**For 5500 ~ 5720 MHz**

12 channels are provided for 802.11a, 802.11n (HT20):

Channel	Frequency (MHz)	Channel	Frequency (MHz)
100	5500	124	5620
104	5520	128	5640
108	5540	132	5660
112	5560	136	5680
116	5580	140	5700
120	5600	144	5720

6 channels are provided for 802.11n (HT40):

Channel	Frequency (MHz)	Channel	Frequency (MHz)
102	5510	126	5630
110	5550	134	5670
118	5590	142	5710

3 channels are provided for 802.11ac (VHT80):

Channel	Frequency (MHz)	Channel	Frequency (MHz)
106	5530	138	5690
122	5610		

**For 5745 ~ 5825 MHz:**

5 channels are provided for 802.11a, 802.11n (HT20):

Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	161	5805
153	5765	165	5825
157	5785		

2 channels are provided for 802.11n (HT40):

Channel	Frequency (MHz)	Channel	Frequency (MHz)
151	5755	159	5795

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency (MHz)
155	5775

**For Bluetooth EDR:**

79 channels are provided to this EUT:

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461		

**For Thread:**

15 channels are provided to this EUT:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
11	2405	19	2445
12	2410	20	2450
13	2415	21	2455
14	2420	22	2460
15	2425	23	2465
16	2430	24	2470
17	2435	25	2475
18	2440		

### 3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To			Description
	RE $\geq$ 1G	RE $<$ 1G	OB	
-	√	√	√	-

Where **RE $\geq$ 1G**: Radiated Emission above 1 GHz **RE $<$ 1G**: Radiated Emission below 1 GHz

**OB**: Conducted Out-Band Emission Measurement

Note: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Z-plane**.

Note: For radiated emission test items chosen the worst maximum power 5G and BT radio channel.

#### **Radiated Emission Test (Above 1GHz):**

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Freq. Range (MHz)	Available Channel	Tested Channel	Modulation Technology
-	BT EDR + 802.11 a + Thread	2402 ~ 2480	0 to 78	78 + 40 + 11	FHSS
		5180-5240	36 to 48		BPSK
		2450 ~ 2475	11 to 25		O-QPSK

Note: 60GHz Tx Transmitter is always on.

#### **Radiated Emission Test (Below 1GHz):**

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Freq. Range (MHz)	Available Channel	Tested Channel	Modulation Technology
-	BT EDR + 802.11 a + Thread	2402 ~ 2480	0 to 78	78 + 40 + 11	FHSS
		5180-5240	36 to 48		BPSK
		2450 ~ 2475	11 to 25		O-QPSK

Note: 60GHz Tx Transmitter is always on.

#### **Conducted Out-Band Emission Measurement**

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Freq. Range (MHz)	Available Channel	Tested Channel	Modulation Technology
-	BT EDR + 802.11a	2402 ~ 2480	0 to 78	78 + 40	FHSS
		5180-5240	36 to 48		BPSK

Note: Both of the BT EDR and 802.11a can transmit simultaneously at same antenna.

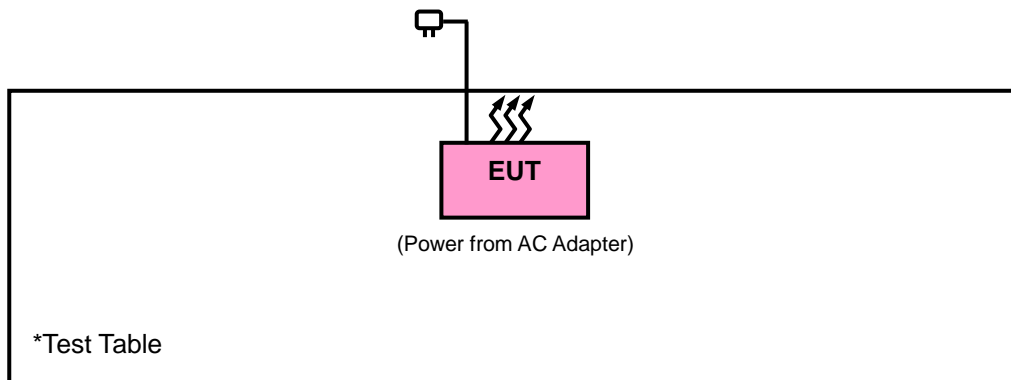
**Test Condition:**

Applicable to	Environmental Conditions	Input Power	Tested by
RE≥1G	25 deg. C, 65 % RH	120Vac, 60Hz	Tim Chen
RE<1G	25 deg. C, 65 % RH	120Vac, 60Hz	Tim Chen
OB	25 deg. C, 65 % RH	120Vac, 60Hz	Tim Chen

**3.3 Description of Support Units**

The EUT has been tested as an independent unit together with other necessary accessories or support units.

**3.3.1 Configuration of System under Test**



**3.4 General Description of Applied Standards**

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards and references:

**Test Standard:**

**FCC Part 15, Subpart C (15.247)**

**FCC Part 15, Subpart E (15.407)**

ANSI C63.10-2013

All test items have been performed and recorded as per the above standards.

**References Test Guidance:**

**KDB 558074 D01 15.247 Meas Guidance v05r02**

**KDB 789033 D02 General UNII Test Procedures New Rules v02r01**

**KDB 414788 D01 Radiated Test Site v01r01**

All test items have been performed as a reference to the above KDB test guidance.

## 4 Test Types and Results

### 4.1 Radiated Emission and Bandedge Measurement

#### 4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table.

Frequencies (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:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

Limits of unwanted emission out of the restricted bands

Applicable To		Limit	
789033 D02 General UNII Test Procedure New Rules v02r01		Field Strength at 3m	
		PK: 74 (dBµV/m)	AV: 54 (dBµV/m)
Frequency Band	Applicable To	EIRP Limit	Equivalent Field Strength at 3m
5150~5250 MHz	15.407(b)(1)	PK: -27 (dBm/MHz)	PK: 68.2(dBµV/m)
5250~5350 MHz	15.407(b)(2)		
5470~5725 MHz	15.407(b)(3)		
5725~5850 MHz	<input checked="" type="checkbox"/> 15.407(b)(4)(i)	PK: -27 (dBm/MHz) <sup>*1</sup> PK: 10 (dBm/MHz) <sup>*2</sup> PK: 15.6 (dBm/MHz) <sup>*3</sup> PK: 27 (dBm/MHz) <sup>*4</sup>	PK: 68.2(dBµV/m) <sup>*1</sup> PK: 105.2 (dBµV/m) <sup>*2</sup> PK: 110.8(dBµV/m) <sup>*3</sup> PK: 122.2 (dBµV/m) <sup>*4</sup>
	<input type="checkbox"/> 15.407(b)(4)(ii)	Emission limits in section 15.247(d)	
*1 beyond 75 MHz or more above of the band edge.		*2 below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above.	
*3 below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above.		*4 from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.	

Note: The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

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

#### 4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent	N9038A	MY51210203	Mar. 18, 2020	Mar. 17, 2021
Spectrum Analyzer Agilent	N9010A	MY52220314	Dec. 12, 2019	Dec. 11, 2020
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Apr. 16, 2020	Apr. 15, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSW26	102023	Oct. 08, 2019	Oct. 07, 2020
Broadband Horn Antenna SCHWARZBECK	BBHA 9170	148	Nov. 24, 2019	Nov. 23, 2020
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-969	Nov. 24, 2019	Nov. 23, 2020
BILOG Antenna SCHWARZBECK	VULB 9168	9168-472	Nov. 08, 2019	Nov. 07, 2020
Fixed Attenuator WOKEN	MDCS18N-10	MDCS18N-10-01	Apr. 14, 2020	Apr. 13, 2021
Loop Antenna	HLA 6121	45745	Jul. 01, 2019	Jun. 30, 2020
Preamplifier EMCI	EMC001340	980201	Oct. 14, 2019	Oct. 13, 2020
Bluetooth Tester R&S	CBT	100946	Aug. 09, 2018	Aug. 08, 2020
Preamplifier EMCI	EMC 012645	980115	Oct. 08, 2019	Oct. 07, 2020
Preamplifier EMCI	EMC 184045	980116	Oct. 08, 2019	Oct. 07, 2020
Preamplifier EMCI	EMC 330H	980112	Oct. 08, 2019	Oct. 07, 2020
RF Coaxial Cable HUBER+SUHNNER	EMC104-SM-SM- 8000&3000	140811+170717	Oct. 08, 2019	Oct. 07, 2020
RF Coaxial Cable HUBER+SUHNNER	SUCOFLEX 104	EMC104-SM-SM- 1000(140807)	Oct. 08, 2019	Oct. 07, 2020
RF Coaxial Cable WOKEN	8D-FB	Cable-Ch10-01	Oct. 08, 2019	Oct. 07, 2020
Software BV ADT	E3 6.120103	NA	NA	NA
Antenna Tower MF	MFA-440H	NA	NA	NA
Turn Table MF	MFT-201SS	NA	NA	NA
Antenna Tower & Turn Table Controller MF	MF-7802	NA	NA	NA

- Note: 1. The calibration interval of the above test instruments is 12 / 24 months and the calibrations are traceable to NML/ROC and NIST/USA.  
2. The test was performed in HwaYa Chamber 10.

### 4.1.3 Test Procedures

#### For Radiated emission below 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

#### For Radiated emission above 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

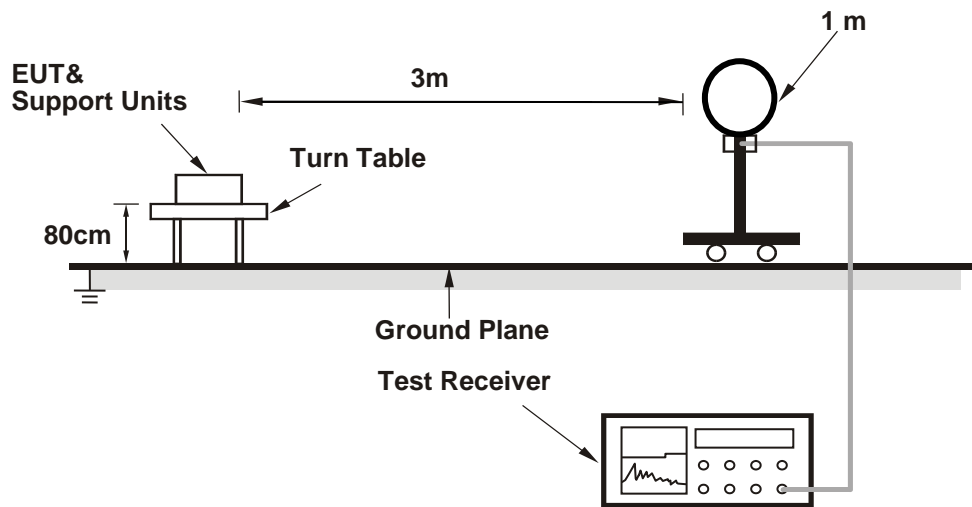
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) or Peak detection (PK) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is  $\geq 1/T$  (Duty cycle < 98%) or 10Hz (Duty cycle  $\geq 98\%$ ) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

### 4.1.4 Deviation from Test Standard

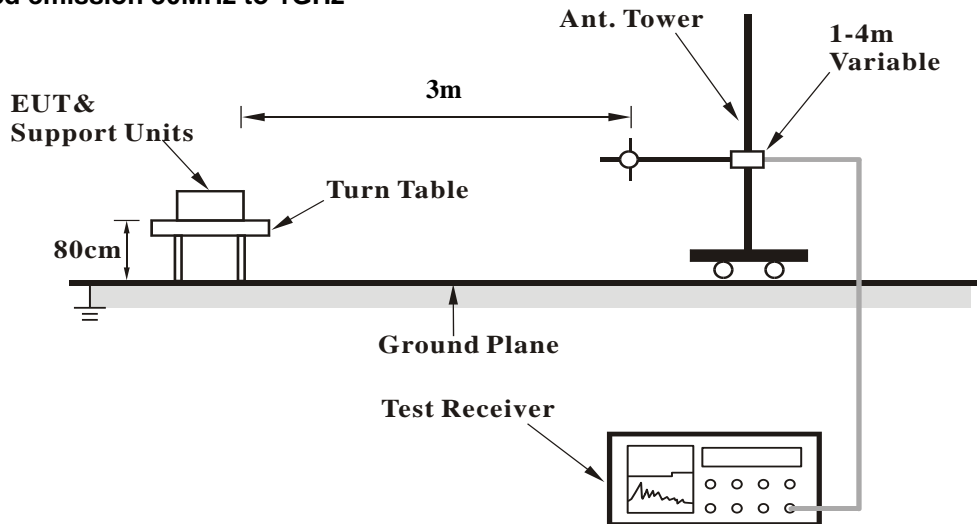
No deviation.

#### 4.1.5 Test Setup

##### For Radiated emission below 30MHz

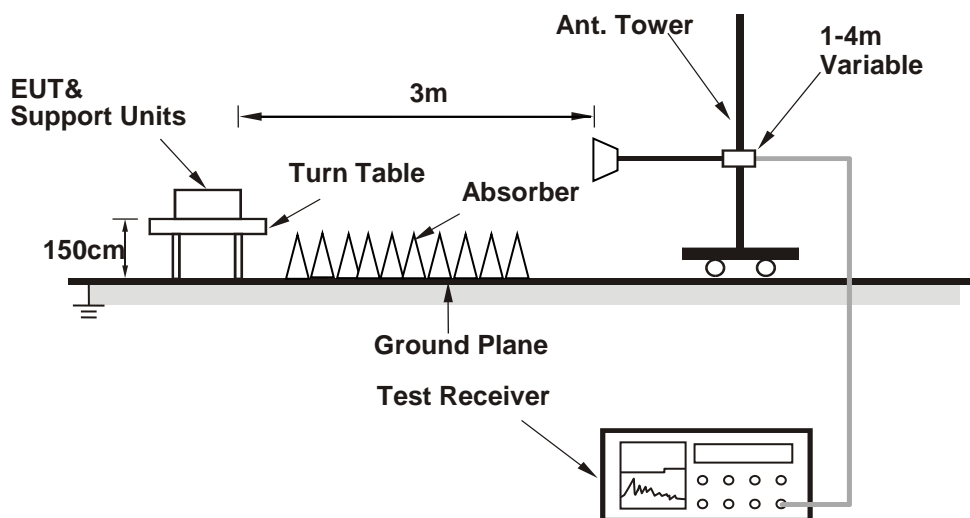


##### For Radiated emission 30MHz to 1GHz





### For Radiated emission above 1GHz



For the actual test configuration, please refer to the attached file (Test Setup Photo).

#### KDB 414788 OATS and Chamber Correlation Justification

- Based on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in regulations; however, an attempt should be made to avoid making measurements in the near field.
- Open-field site and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

#### 4.1.6 EUT Operating Conditions

- a. Placed the EUT on the testing table.
- b. Prepared a notebook to act as a communication partner and placed it outside of testing area.
- c. The communication partner connected with EUT via a RJ45 cable and ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.
- d. The communication partner sent data to EUT by command "PING".

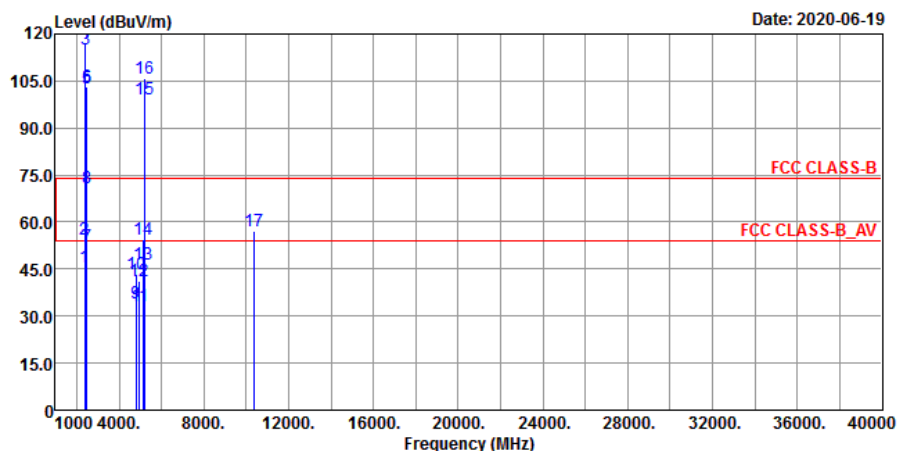
### 4.1.7 Test Results

Above 1 GHz Data :

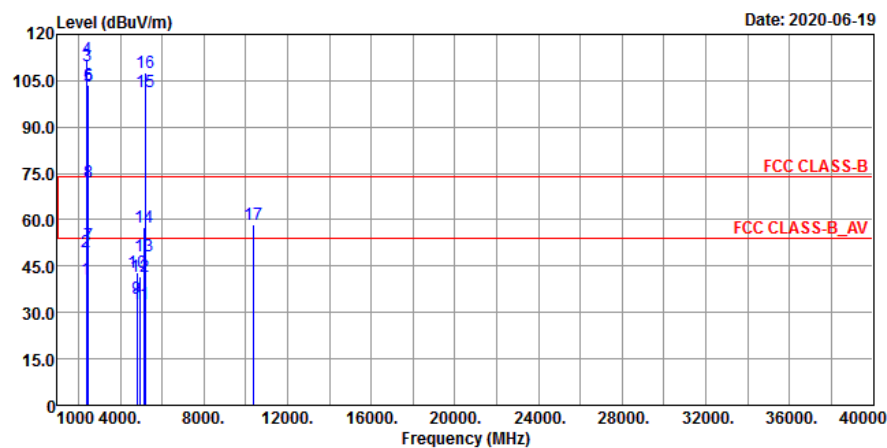
BT EDR + 802.11a + Thread

EUT Test Condition		Measurement Detail	
Channel	CH 78 + CH 40 + CH 11	Frequency Range	1 GHz ~ 40 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Tim Chen

#### Horizontal



#### Vertical



Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	45.82	67.39	-21.57	54	-8.18	111	103	Average
2390	54.35	75.92	-21.57	74	-19.65	111	103	Peak
2405	115.31	136.88	-21.57	-----	-----	111	103	Average
2405	117.54	139.11	-21.57	-----	-----	111	103	Peak
2480	102.8	124.26	-21.46	-----	-----	100	128	Average
2480	103.24	124.7	-21.46	-----	-----	100	128	Peak
2483.5	52.31	73.78	-21.47	54	-1.69	100	128	Average
2483.5	70.74	92.21	-21.47	74	-3.26	100	128	Peak
4810	34.3	49.94	-15.64	54	-19.7	102	134	Average
4810	43.25	58.89	-15.64	74	-30.75	102	134	Peak
4960	33.08	48.53	-15.45	54	-20.92	118	29	Average
4960	41.04	56.49	-15.45	74	-32.96	118	29	Peak
5150	46.62	61.17	-14.55	54	-7.38	142	202	Average
5150	54.53	69.08	-14.55	74	-19.47	142	202	Peak
5200	99.03	113.75	-14.72	-----	-----	142	202	Average
5200	105.72	120.44	-14.72	-----	-----	142	202	Peak
10400	57.21	59.03	-1.82	68.2	-10.99	123	152	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	40.79	62.36	-21.57	54	-13.21	100	313	Average
2390	49.47	71.04	-21.57	74	-24.53	100	313	Peak
2405	109.97	131.54	-21.57	-----	-----	100	313	Average
2405	112.24	133.81	-21.57	-----	-----	100	313	Peak
2480	103.09	124.55	-21.46	-----	-----	312	230	Average
2480	103.78	125.24	-21.46	-----	-----	312	230	Peak
2483.5	51.7	73.17	-21.47	54	-2.3	312	230	Average
2483.5	72.31	93.78	-21.47	74	-1.69	312	230	Peak
4810	34.4	50.04	-15.64	54	-19.6	123	164	Average
4810	42.94	58.58	-15.64	74	-31.06	123	164	Peak
4960	32.69	48.14	-15.45	54	-21.31	112	267	Average
4960	41.53	56.98	-15.45	74	-32.47	112	267	Peak
5150	48.34	62.89	-14.55	54	-5.66	192	92	Average
5150	57.43	71.98	-14.55	74	-16.57	192	92	Peak
5200	101.28	116	-14.72	-----	-----	192	92	Average
5200	107.41	122.13	-14.72	-----	-----	192	92	Peak
10400	58.44	60.26	-1.82	68.2	-9.76	107	15	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- 2405 MHz & 2480 MHz & 5200 MHz: Fundamental Frequency
- \*: Out of Restricted Band
- The emission levels of other frequencies were very low against the limit

**9 kHz ~ 30 MHz Data:**

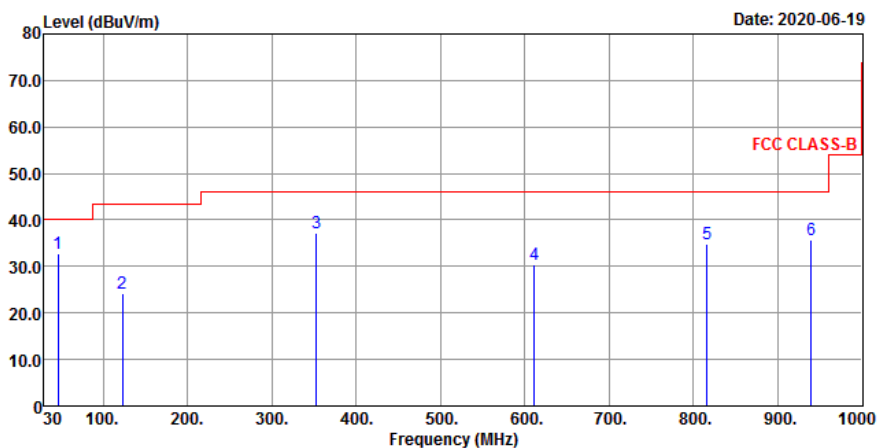
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

**30 MHz ~ 1 GHz Worst-Case Data:**

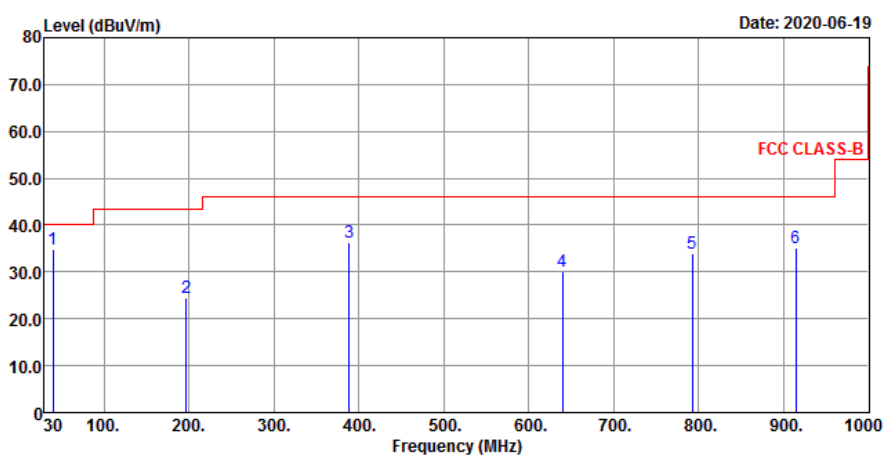
**BT EDR + 802.11a + Thread**

EUT Test Condition		Measurement Detail	
Channel	CH 78 + CH 40 + CH 11	Frequency Range	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Quasi-peak (QP)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Tim Chen

**Horizontal**



**Vertical**



Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
46.49	32.9	44.67	-11.77	40	-7.1	112	134	Peak
123.12	24.13	37.67	-13.54	43.5	-19.37	124	155	Peak
353.01	37.22	46.89	-9.67	46	-8.78	132	168	Peak
611.03	30.37	32.76	-2.39	46	-15.63	103	18	Peak
815.7	34.97	32.92	2.05	46	-11.03	178	231	Peak
939.86	35.65	32.17	3.48	46	-10.35	102	55	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
39.7	34.95	47.2	-12.25	40	-5.05	102	153	Peak
196.84	24.46	39.45	-14.99	43.5	-19.04	163	196	Peak
388.9	36.31	44.91	-8.6	46	-9.69	115	241	Peak
640.13	30.16	31.86	-1.7	46	-15.84	102	96	Peak
792.42	33.96	32.42	1.54	46	-12.04	118	25	Peak
914.64	35.15	31.92	3.23	46	-10.85	131	169	Peak

Remarks:

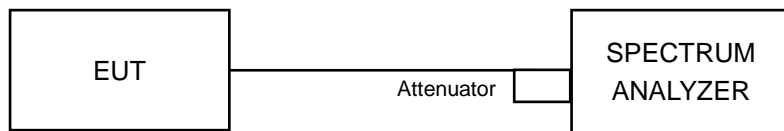
- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor  
Margin value = Emission level – Limit value
- The emission levels of other frequencies were very low against the limit

## 4.2 Conducted Out of Band Emission Measurement

### 4.2.1 Limits of Conducted Out of Band Emission Measurement

Below 20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

### 4.2.2 Test Setup



### 4.2.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 4.2.4 Test Procedure

#### MEASUREMENT PROCEDURE REF

- Set the RBW = 100 kHz.
- Set the VBW  $\geq$  300 kHz.
- Detector = average.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

#### MEASUREMENT PROCEDURE OOB

- Set RBW = 100 kHz.
- Set VBW  $\geq$  300 kHz.
- Detector = average.
- Sweep = auto couple.
- Trace Mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum amplitude level.

### 4.2.5 Deviation from Test Standard

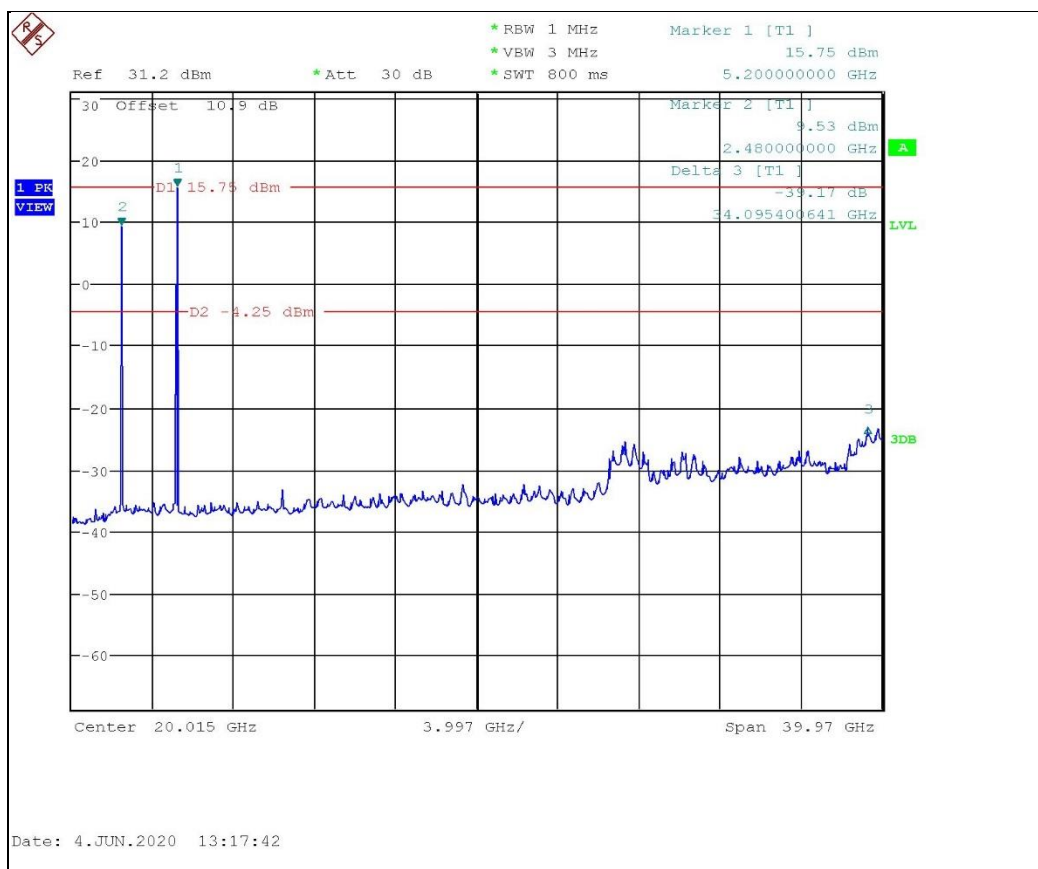
No deviation.

### 4.2.6 EUT Operating Condition

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

### 4.2.7 Test Results

The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.



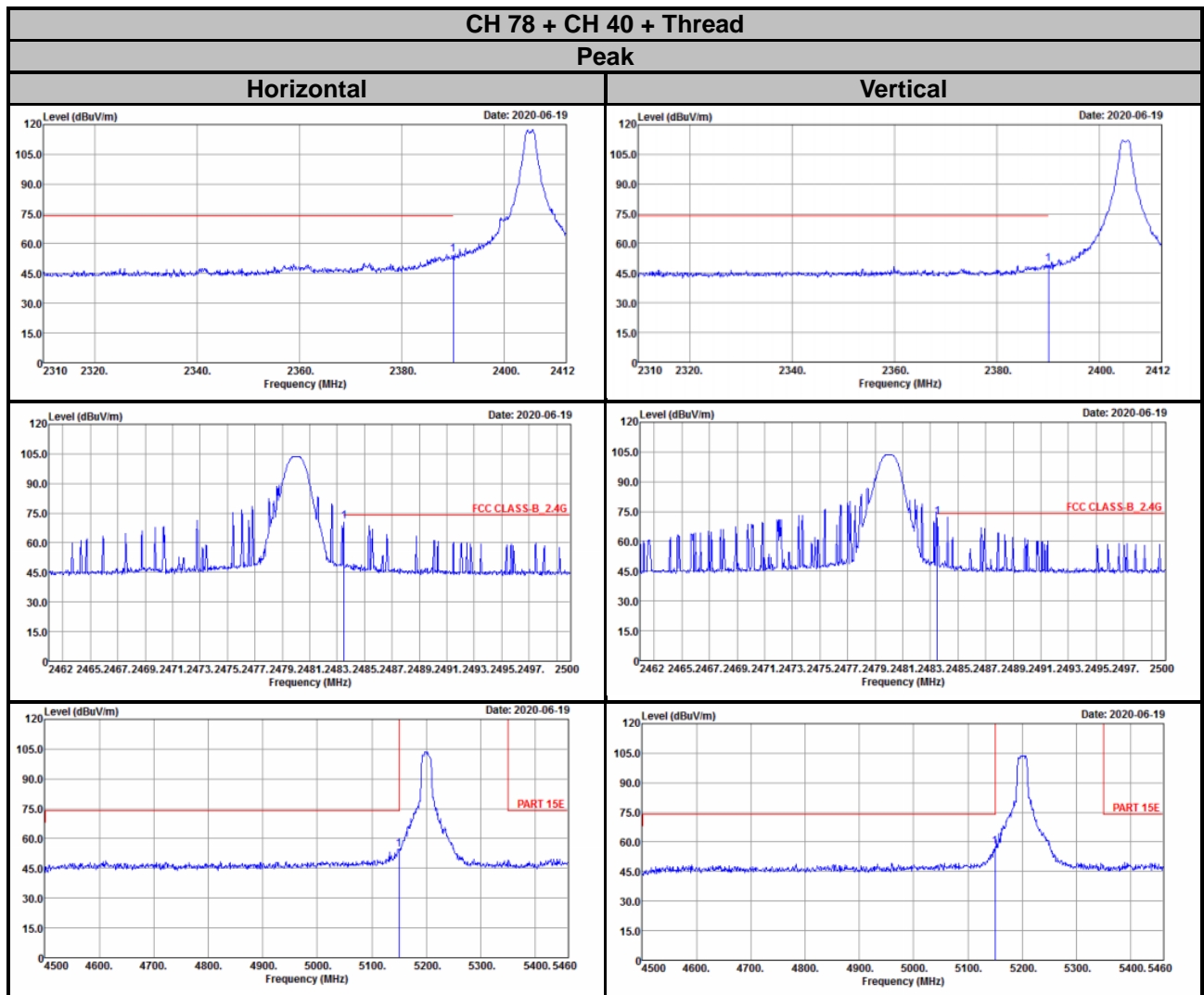
Note: Both of the BT EDR and 802.11a can transmit simultaneously at same antenna.

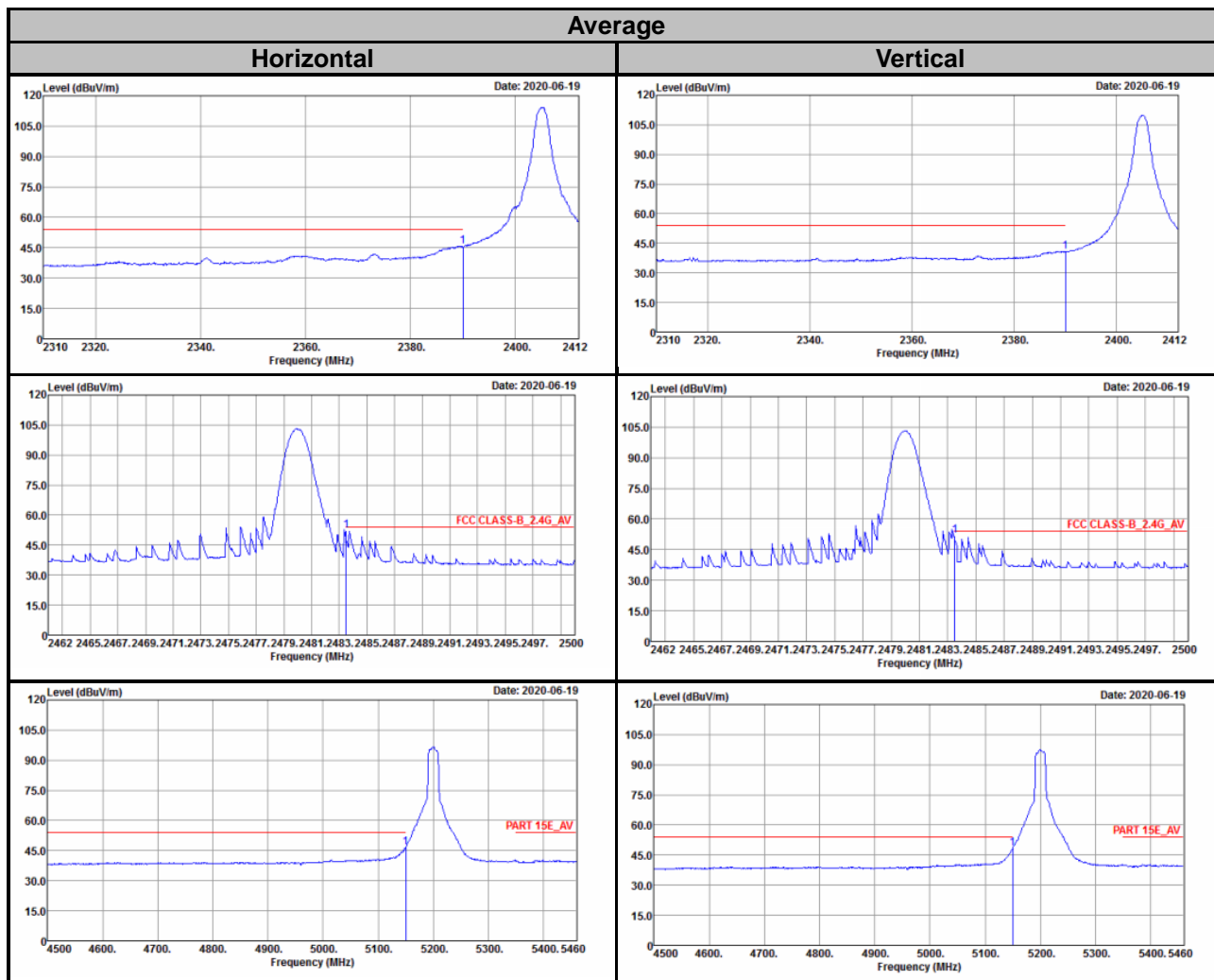
## 5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).



## Annex A- Band-edge measurement





## Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

### **Lin Kou EMC/RF Lab**

Tel: 886-2-26052180

Fax: 886-2-26051924

### **Hsin Chu EMC/RF/Telecom Lab**

Tel: 886-3-6668565

Fax: 886-3-6668323

### **Hwa Ya EMC/RF/Safety**

Tel: 886-3-3183232

Fax: 886-3-3270892

**Email:** [service.adt@tw.bureauveritas.com](mailto:service.adt@tw.bureauveritas.com)

**Web Site:** [www.bureauveritas-adt.com](http://www.bureauveritas-adt.com)

The address and road map of all our labs can be found in our web site also.

--- END ---