



FCC RADIO TEST REPORT

FCC ID : A4RG025I
Equipment : Phone
Model Name : G025I, G025H
Applicant : Google LLC
1600 Amphitheatre Parkway,
Mountain View, California, 94043 USA
Standard : FCC Part 15 Subpart E §15.407

The product was received on May 08, 2020 and testing was started from Jun. 11, 2020 and completed on Jul. 02, 2020. We, SPORTON INTERNATIONAL INC., EMC & Wireless Communications 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 variant report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Louis Wu

Approved by: Louis Wu

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)



Table of Contents

History of this test report..... 3

Summary of Test Result..... 4

1 General Description 5

 1.1 Product Feature of Equipment Under Test..... 5

 1.2 Product Specification of Equipment Under Test..... 5

 1.3 Modification of EUT 5

 1.4 Testing Location 6

 1.5 Applicable Standards..... 6

2 Test Configuration of Equipment Under Test 7

 2.1 Carrier Frequency and Channel 7

 2.2 Test Mode..... 8

 2.3 Connection Diagram of Test System..... 9

 2.4 EUT Operation Test Setup 9

3 Test Result 10

 3.1 Maximum Conducted Output Power Measurement 10

 3.2 Unwanted Emissions Measurement 11

 3.3 Antenna Requirements..... 17

4 List of Measuring Equipment..... 18

5 Uncertainty of Evaluation..... 20

Appendix A. Conducted Test Results

Appendix B. Radiated Spurious Emission

Appendix C. Radiated Spurious Emission Plots

Appendix D. Duty Cycle Plots



Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
-	15.403 (i)	6dB & 26dB Bandwidth	Not Required	-
-	2.1049	99% Occupied Bandwidth	Not Required	-
3.1	15.407 (a)	Maximum Conducted Output Power	Pass	-
-	15.407 (a)	Power Spectral Density	Not Required	-
3.2	15.407(b)	Unwanted Emissions	Pass	Under limit 5.46 dB at 11570.000 MHz
-	15.207	AC Conducted Emission	Not Required	-
-	15.407 (c)	Automatically Discontinue Transmission	Not Required	-
3.3	15.203 & 15.407 (a)	Antenna Requirement	Pass	-

Note:

1. Not required means after assessing, test items are not necessary to carry out.
2. This is a variant report which can be referred Product Equality Declaration. After spot-checking the tests, the parent test results were worse than variant test results, thus this test report was reuse parent test data, all the test cases were performed on original report which can be referred to Sporton Report Number FR022521-02F.

3.

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Wii Chang

Report Producer: Amy Chen



1 General Description

1.1 Product Feature of Equipment Under Test

Product Feature	
Equipment	Phone
Model Name	G025I, G025H
FCC ID	A4RG025I
EUT supports Radios application	GSM/EGPRS/WCDMA/HSPA/LTE/NFC/GNSS/5G NR WLAN 11b/g/n HT20 WLAN 11a/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE

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

EUT Information List	
S/N	Performed Test Item
04271FQCB00001	RF Conducted Measurement
04241FQCB00343	Radiated Spurious Emission

1.2 Product Specification of Equipment Under Test

Standards-related Product Specification							
Tx/Rx Channel Frequency Range	5745 MHz ~ 5825 MHz						
Maximum Output Power	MIMO <Ant. 4 + 3> 802.11a : 20.96 dBm / 0.1247 W 802.11n HT20 : 21.07 dBm / 0.1279 W 802.11n HT40 : 20.17 dBm / 0.1040 W 802.11ac VHT20: 20.97 dBm / 0.1250 W 802.11ac VHT40: 20.07 dBm / 0.1016 W 802.11ac VHT80: 19.27 dBm / 0.0845 W						
Type of Modulation	802.11a/n : OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11ac : OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)						
Antenna Type / Gain	<Ant. 4> : Monopole Antenna with gain -1.80 dBi <Ant. 3> : PIFA Antenna with gain -0.50 dBi						
Antenna Function Description	<table border="1"> <thead> <tr> <th></th> <th>Ant. 4</th> <th>Ant. 3</th> </tr> </thead> <tbody> <tr> <td>802.11 a/n/ac MIMO</td> <td>V</td> <td>V</td> </tr> </tbody> </table>		Ant. 4	Ant. 3	802.11 a/n/ac MIMO	V	V
	Ant. 4	Ant. 3					
802.11 a/n/ac MIMO	V	V					

Remark: MIMO Ant. 4+3 is a calculated result from sum of the power MIMO Ant. 4 and MIMO Ant. 3.

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. EMC & Wireless Communications Laboratory	
Test Site Location	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978	
Test Site No.	Sporton Site No.	
	TH05-HY	03CH07-HY

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

FCC designation No.: TW1190

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 KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
- ♦ FCC KDB 414788 D01 Radiated Test Site v01r01.
- ♦ FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- ♦ ANSI C63.10-2013

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
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

- a. 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). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (X plane) were recorded in this report.

2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5725-5850 MHz Band 4 (U-NII-3)	149	5745	157	5785
	151*	5755	159*	5795
	153	5765	161	5805
	155 [#]	5775	165	5825

Note:

- 1. The above Frequency and Channel in "*" were 802.11n HT40 and 802.11ac VHT40.
- 2. The above Frequency and Channel in "[#]" were 802.11ac VHT80.



2.2 Test Mode

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

Modulation	Data Rate
802.11a	6 Mbps
802.11n HT20	MCS0
802.11n HT40	MCS0
802.11ac VHT20	MCS0
802.11ac VHT40	MCS0
802.11ac VHT80	MCS0

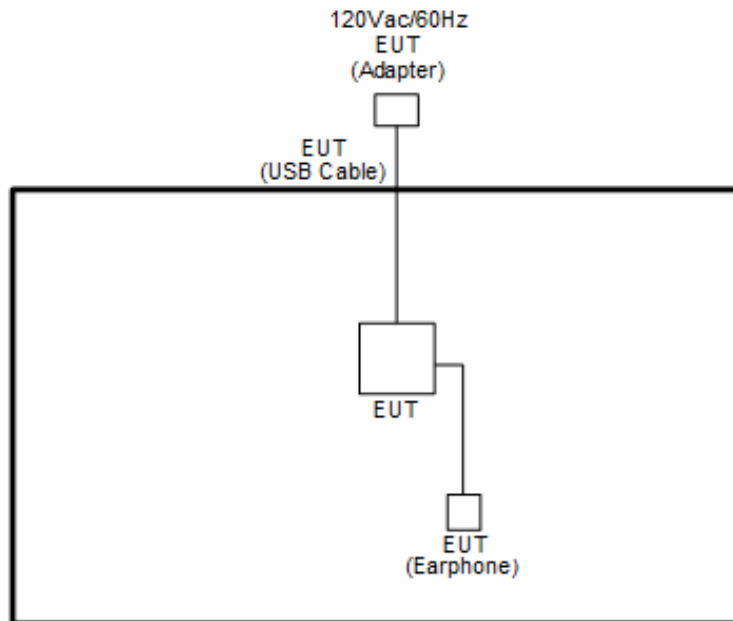
Ch. #		Band IV : 5725-5850 MHz
		802.11a
L	Low	-
M	Middle	157
H	High	-

Remark:

1. For radiation spurious emission, the final modulation and the worst data rate was reference the max RF conducted power.
2. For Radiated Test Cases, the tests were performed with Adapter 1 and USB Cable 1.

2.3 Connection Diagram of Test System

<WLAN Tx Mode>



2.4 EUT Operation Test Setup

The RF test items, utility "QRCT4 v4.0.00158.0" 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 Maximum Conducted Output Power Measurement

3.1.1 Limit of Maximum Conducted Output Power

For the band 5.725–5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.1.2 Measuring Instruments

See list of measuring equipment of this test report.

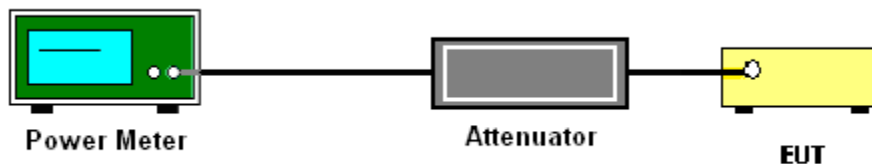
3.1.3 Test Procedures

The testing follows Method PM-G of FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

Method PM-G (Measurement using a gated RF average power meter):

1. Measurement is performed using a wideband RF power meter.
2. The EUT is configured to transmit at its maximum power control level.
3. Measure the average power of the transmitter
4. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

3.1.4 Test Setup



3.1.5 Test Result of Maximum Conducted Output Power

Please refer to Appendix A.



3.2 Unwanted Emissions Measurement

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

3.2.1 Limit of Unwanted Emissions

- (1) For transmitters operating in the 5.725-5.85 GHz band:
 15.407(b)(4)(i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.
- (2) 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.

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



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

(3) 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.

3.2.2 Measuring Instruments

See list of measuring equipment of this test report.

3.2.3 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 1000MHz

- 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 1000MHz

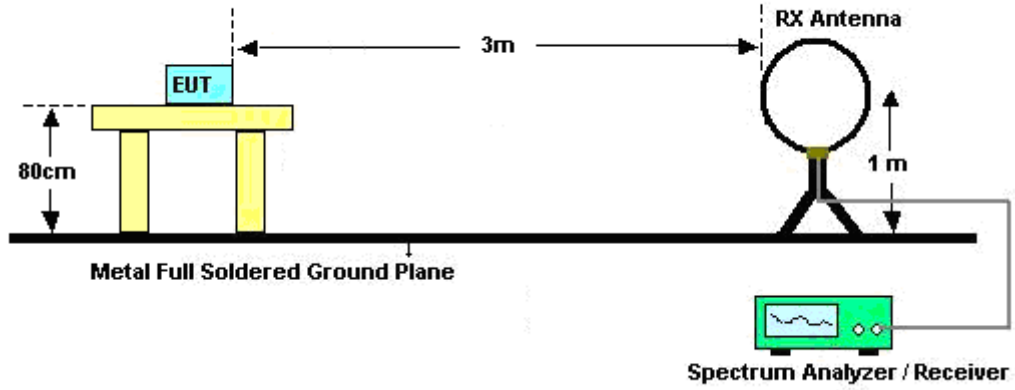
- RBW = 1 MHz
- VBW = 10 Hz, when duty cycle is no less than 98 percent.
- VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.



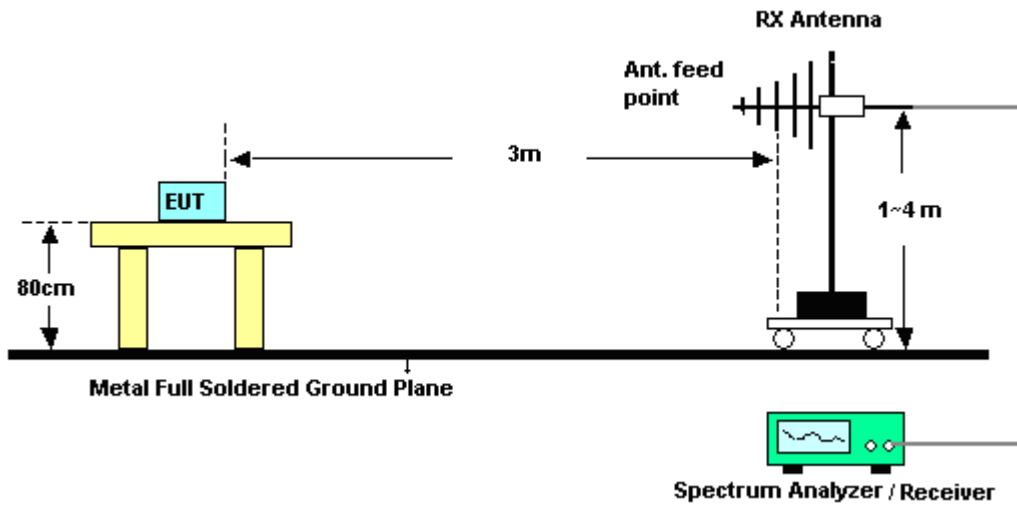
2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband 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 was 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. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

3.2.4 Test Setup

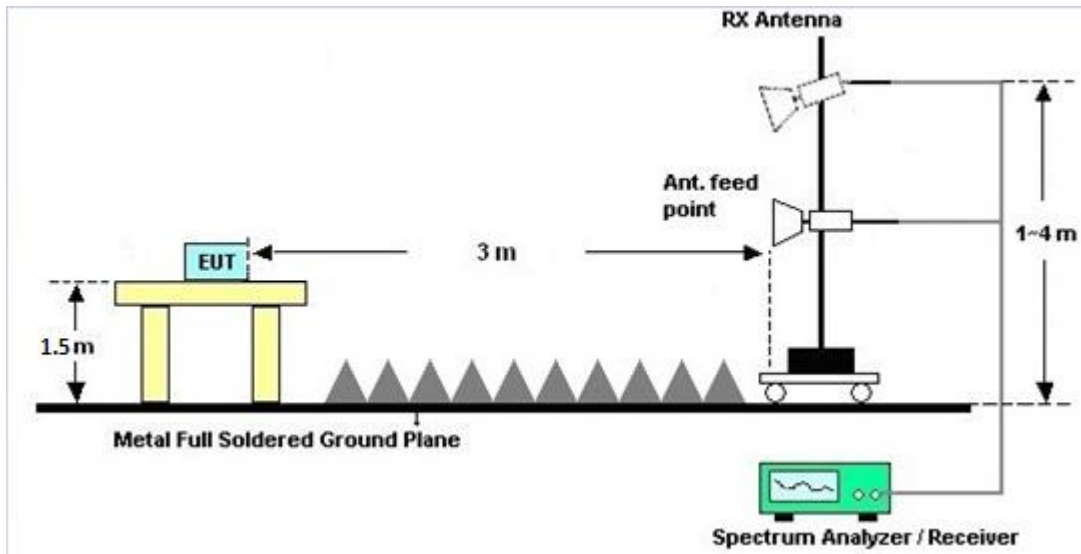
For radiated emissions below 30MHz



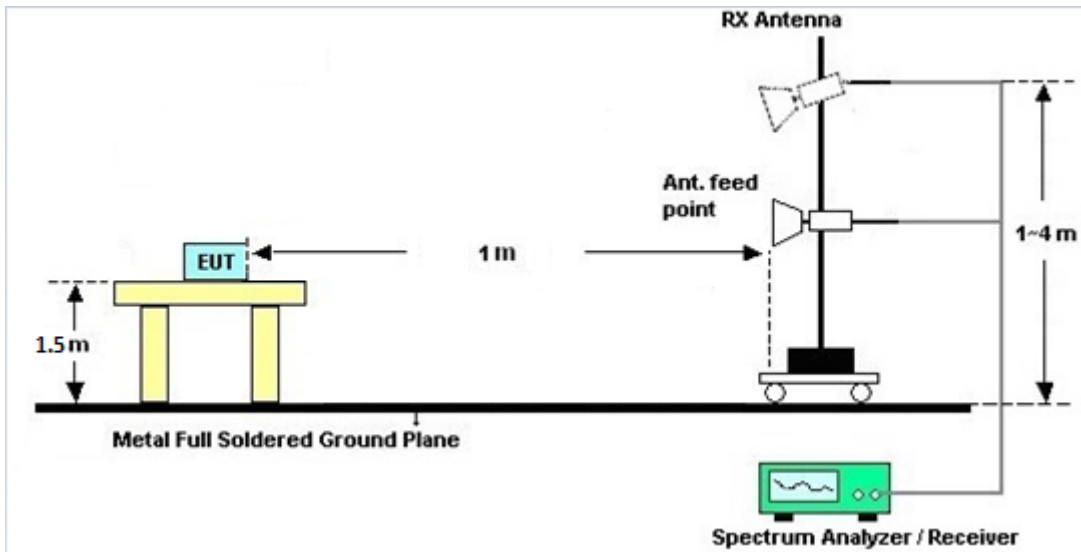
For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



For radiated emissions above 18GHz





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

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

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

3.2.6 Test Result of Radiated Band Edges

Please refer to Appendix B and C.

3.2.7 Duty Cycle

Please refer to Appendix D.

3.2.8 Test Result of Unwanted Radiated Emission (30MHz ~ 10th Harmonic)

Please refer to Appendix B and C.



3.3 Antenna Requirements

3.3.1 Standard Applicable

If transmitting antenna directional gain is greater than 6 dBi, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.3.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.3.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.



4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D0 1N-06	35419 & 03	30MHz~1GHz	Apr. 29, 2020	Jun. 11, 2020~ Jul. 02, 2020	Apr. 28, 2021	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	00075962	1GHz ~ 18GHz	Dec. 06, 2019	Jun. 11, 2020~ Jul. 02, 2020	Dec. 05, 2020	Radiation (03CH07-HY)
EMI Test Receiver	Agilent	N9038A (MXE)	MY53290053	20Hz~26.5GHz	Jan. 18, 2020	Jun. 11, 2020~ Jul. 02, 2020	Jan. 17, 2021	Radiation (03CH07-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Dec. 26, 2019	Jun. 11, 2020~ Jul. 02, 2020	Dec. 25, 2020	Radiation (03CH07-HY)
Preamplifier	MITEQ	AMF-7D-001 01800-30-10 P	1590075	1GHz~18GHz	Apr. 23, 2020	Jun. 11, 2020~ Jul. 02, 2020	Apr. 22, 2021	Radiation (03CH07-HY)
Preamplifier	COM-POWER	PA-103A	161241	10MHz~1GHz	May 19, 2020	Jun. 11, 2020~ Jul. 02, 2020	May 18, 2021	Radiation (03CH07-HY)
Preamplifier	Agilent	8449B	3008A02362	1GHz~26.5GHz	Nov. 01, 2019	Jun. 11, 2020~ Jul. 02, 2020	Oct. 31, 2020	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY2858/2,801 606/2	18GHz~40GHz	Feb. 25, 2020	Jun. 11, 2020~ Jul. 02, 2020	Feb. 24, 2021	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY24971/4, MY28655/4	9kHz~30MHz	Feb. 25, 2020	Jun. 11, 2020~ Jul. 02, 2020	Feb. 24, 2021	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY28655/4, MY24971/4, MY15682/4	30MHz~1GHz	Feb. 25, 2020	Jun. 11, 2020~ Jul. 02, 2020	Feb. 24, 2021	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY28655/4, MY24971/4, MY15682/4	1GHz~18GHz	Feb. 25, 2020	Jun. 11, 2020~ Jul. 02, 2020	Feb. 24, 2021	Radiation (03CH07-HY)
Controller	ChainTek	Chaintek 3000	N/A	Control Turn table	N/A	Jun. 11, 2020~ Jul. 02, 2020	N/A	Radiation (03CH07-HY)
Controller	Max-Full	MF7802	MF780208368	Control Ant Mast	N/A	Jun. 11, 2020~ Jul. 02, 2020	N/A	Radiation (03CH07-HY)
Antenna Mast	Max-Full	MFA520BS	N/A	1m~4m	N/A	Jun. 11, 2020~ Jul. 02, 2020	N/A	Radiation (03CH07-HY)
Turn Table	ChainTek	Chaintek 3000	N/A	0~360 Degree	N/A	Jun. 11, 2020~ Jul. 02, 2020	N/A	Radiation (03CH07-HY)
USB Data Logger	TECPEL	TR-32	HE17XB2495	N/A	N/A	Jun. 11, 2020~ Jul. 02, 2020	N/A	Radiation (03CH07-HY)
Spectrum Analyzer	Keysight	N9010A	MY54200486	10Hz~44GHz	Oct. 28, 2019	Jun. 11, 2020~ Jul. 02, 2020	Oct. 27, 2020	Radiation (03CH07-HY)
SHF-EHF Horn Antenna	SCHWAR ZBECK	BBHA 9170	BBHA9170584	18GHz~40GHz	Dec. 10, 2019	Jun. 11, 2020~ Jul. 02, 2020	Dec. 09, 2020	Radiation (03CH07-HY)
Software	Audix	E3 6.2009-8-24	N/A	N/A	N/A	Jun. 11, 2020~ Jul. 02, 2020	N/A	Radiation (03CH07-HY)
Preamplifier	EMEC	EM18G40G	060715	18GHz~40GHz	Dec. 13, 2019	Jun. 11, 2020~ Jul. 02, 2020	Dec. 12, 2020	Radiation (03CH07-HY)



Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Hygrometer	TECPEL	DYM-303B	TP161250	N/A	May 08, 2020	Jun. 18, 2020	May 07, 2021	Conducted (TH05-HY)
Power Sensor	DARE	RPR3006W	16I00054SNO10	10MHz~6GHz	Dec. 23, 2019	Jun. 18, 2020	Dec. 22, 2020	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP40	100055	9kHz-40GHz	Aug. 14, 2019	Jun. 18, 2020	Aug. 13, 2020	Conducted (TH05-HY)
Switch Box & RF Cable	Burgeon	ETF-058	EC1300484	N/A	Aug. 22, 2019	Jun. 18, 2020	Aug. 21, 2020	Conducted (TH05-HY)
Power Supply	GW Instek	SPS-606	GES842931	NA	Aug. 19, 2019	Jun. 18, 2020	Aug. 18, 2020	Conducted (TH05-HY)



5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.6
---	-----

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

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

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.3
---	-----

Appendix A. Test Result of Conducted Test Items

Test Engineer:	Kathy Chen	Temperature:	20.1~22.1	°C
Test Date:	2020/6/18	Relative Humidity:	45.7~58.8	%

TEST RESULTS DATA
Average Power Table

Band IV MIMO												
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)		Pass/Fail
					Ant 4	Ant 3	SUM	Ant 4	Ant 3	Ant 4	Ant 3	
11a	6Mbps	2	149	5745	17.60	18.10	20.87	30.00	30.00	-0.50	-0.50	Pass
11a	6Mbps	2	157	5785	17.80	18.10	20.96	30.00	30.00	-0.50	-0.50	Pass
11a	6Mbps	2	165	5825	17.60	17.90	20.76	30.00	30.00	-0.50	-0.50	Pass
HT20	MCS0	2	149	5745	17.80	18.30	21.07	30.00	30.00	-0.50	-0.50	Pass
HT20	MCS0	2	157	5785	17.60	18.00	20.81	30.00	30.00	-0.50	-0.50	Pass
HT20	MCS0	2	165	5825	17.80	18.10	20.96	30.00	30.00	-0.50	-0.50	Pass
HT40	MCS0	2	151	5755	16.90	17.40	20.17	30.00	30.00	-0.50	-0.50	Pass
HT40	MCS0	2	159	5795	16.70	17.20	19.97	30.00	30.00	-0.50	-0.50	Pass
VHT20	MCS0	2	149	5745	17.70	18.20	20.97	30.00	30.00	-0.50	-0.50	Pass
VHT20	MCS0	2	157	5785	17.50	17.90	20.71	30.00	30.00	-0.50	-0.50	Pass
VHT20	MCS0	2	165	5825	17.70	18.00	20.86	30.00	30.00	-0.50	-0.50	Pass
VHT40	MCS0	2	151	5755	16.80	17.30	20.07	30.00	30.00	-0.50	-0.50	Pass
VHT40	MCS0	2	159	5795	16.60	17.10	19.87	30.00	30.00	-0.50	-0.50	Pass
VHT80	MCS0	2	155	5775	15.90	16.60	19.27	30.00	30.00	-0.50	-0.50	Pass



Appendix B. Radiated Spurious Emission

Test Engineer :	Jesse Wang, Stan Hsieh, and Ken Wu	Temperature :	23~26°C
		Relative Humidity :	45~52%

Band 4 - 5725~5850MHz
WIFI 802.11a (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.	
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.		
4+3		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)	
802.11a CH 157 5785MHz		5601.2	49.67	-18.53	68.2	37.94	35	12.04	35.31	100	304	P	H	
		5666.2	48.5	-31.72	80.22	36.97	34.7	12.15	35.32	100	304	P	H	
		5703	49.82	-56.22	106.04	37.93	35	12.21	35.32	100	304	P	H	
		5722.8	49.62	-67.56	117.18	37.7	35	12.24	35.32	100	304	P	H	
	*	5785	111.87	-	-	99.85	35	12.35	35.33	100	304	P	H	
	*	5785	104.19	-	-	92.17	35	12.35	35.33	100	304	A	H	
		5854.8	50.3	-60.96	111.26	38.17	35.07	12.4	35.34	100	304	P	H	
		5870.8	51.14	-55.23	106.37	38.94	35.13	12.41	35.34	100	304	P	H	
		5900.8	52.1	-33.97	86.07	39.82	35.2	12.42	35.34	100	304	P	H	
		5943.6	49.19	-19.01	68.2	36.89	35.2	12.44	35.34	100	304	P	H	
														H
														H
			5615.6	48.42	-19.78	68.2	36.76	34.9	12.07	35.31	362	243	P	V
			5658.6	48.26	-26.33	74.59	36.74	34.7	12.14	35.32	362	243	P	V
			5712.6	50.01	-58.72	108.73	38.1	35	12.23	35.32	362	243	P	V
			5723.6	47.17	-71.84	119.01	35.25	35	12.24	35.32	362	243	P	V
	*		5785	107.65	-	-	95.63	35	12.35	35.33	362	243	P	V
	*		5785	100.87	-	-	88.85	35	12.35	35.33	362	243	A	V
			5852.4	47.62	-69.11	116.73	35.56	35	12.4	35.34	362	243	P	V
			5871	49.18	-57.14	106.32	36.98	35.13	12.41	35.34	362	243	P	V
		5902.8	49.71	-34.88	84.59	37.43	35.2	12.42	35.34	362	243	P	V	
		5932.6	51.46	-16.74	68.2	39.16	35.2	12.44	35.34	362	243	P	V	
													V	
													V	



Band 4 5725~5850MHz

WIFI 802.11a (Harmonic @ 3m)

WIFI Ant. 4+3	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)
802.11a CH 157 5785MHz		11570	53.67	-20.33	74	54.13	38.33	18.55	57.34	100	30	P	H
		11570	44.87	-9.13	54	45.33	38.33	18.55	57.34	100	30	A	H
		17355	49.28	-18.92	68.2	41.11	41.5	23.02	56.35	100	0	P	H
													H
		11570	57.38	-16.62	74	57.84	38.33	18.55	57.34	100	39	P	V
		11570	48.54	-5.46	54	49	38.33	18.55	57.34	100	39	A	V
		17355	50.27	-17.93	68.2	42.1	41.5	23.02	56.35	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Emission above 18GHz

WIFI 802.11a (SHF @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.	
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.		
4+3		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)	
802.11a SHF		39934	44.68	-29.32	74	42.9	44.1	12.08	54.4	150	0	P	H	
													H	
													H	
													H	
													H	
													H	
														H
			39846	46.25	-27.75	74	44.5	44.24	12.05	54.54	150	0	P	V
														V
														V
													V	
													V	
													V	
Remark	1. No other spurious found. 2. All results are PASS against limit line.													



Emission below 1GHz

WIFI 802.11a (LF @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.	
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.		
4+3		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)	
802.11a LF		30.27	22.76	-17.24	40	27.51	24.32	0.94	30.01	-	-	P	H	
		107.49	20.87	-22.63	43.5	32.17	16.82	1.85	29.97	-	-	P	H	
		173.64	32.73	-10.77	43.5	45	15.3	2.37	29.94	100	0	P	H	
		852.3	32.42	-13.58	46	27.65	28.78	5.2	29.21	-	-	P	H	
		882.4	33.01	-12.99	46	27.88	28.86	5.34	29.07	-	-	P	H	
		946.1	33.87	-12.13	46	27.12	29.9	5.57	28.72	-	-	P	H	
														H
														H
														H
														H
														H
														H
			30	32.65	-7.35	40	37.4	24.32	0.94	30.01	100	0	P	V
			57.81	24.16	-15.84	40	40.96	11.89	1.3	29.99	-	-	P	V
			206.85	22.25	-21.25	43.5	34.59	15.07	2.52	29.93	-	-	P	V
			878.2	32.58	-13.42	46	27.48	28.87	5.32	29.09	-	-	P	V
			937	33.74	-12.26	46	27.48	29.51	5.53	28.78	-	-	P	V
			957.3	33.88	-12.12	46	26.47	30.47	5.6	28.66	-	-	P	V
														V
													V	
													V	
													V	
													V	
													V	
Remark	1. No other spurious found. 2. All results are PASS against limit line.													



Note symbol

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



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.	
1+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
CH 01													
2412MHz		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)
2. Level(dBμV/m) = Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
3. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)
= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)
= 55.45 (dBμV/m)
2. Over Limit(dB)
= Level(dBμV/m) – Limit Line(dBμV/m)
= 55.45(dBμV/m) – 74(dBμV/m)
= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)
= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)
= 43.54 (dBμV/m)
2. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)
= 43.54(dBμV/m) – 54(dBμV/m)
= -10.46(dB)

Both peak and average measured complies with the limit line, so test result is “PASS”.



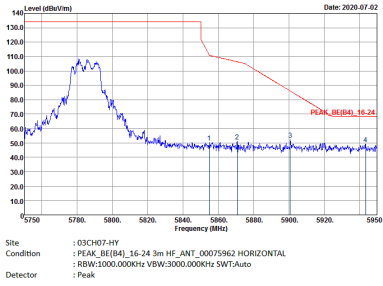
Appendix C. Radiated Spurious Emission Plots

Test Engineer :	Jesse Wang, Stan Hsieh, and Ken Wu	Temperature :	23~26°C
		Relative Humidity :	45~52%

Band 4 - 5725~5850MHz
WIFI 802.11a (Band Edge @ 3m)

WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH157 5785MHz	
4+3	Horizontal	Fundamental
Peak	<p>Site : 03CH07-HY Condition : PEAK_BE(B4)_16-24 3m HF_ANT_00075962 HORIZONTAL Detector : Peak</p>	<p>Site : 03CH07-HY Condition : PEAK(LUNII) 3m HF_ANT_00075962 HORIZONTAL Detector : Peak</p>



WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH157 5785MHz	
4+3	Horizontal	Fundamental
Peak		Left blank



WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH157 5785MHz	
4+3	Vertical	Fundamental
Peak	<p>Site : 03CH07-HY Condition : PEAK_BE(B4)_16-24 3m HF_ANT_00075962 VERTICAL RBW:1000.000kHz VBW:3000.000kHz SWT:Auto Detector : Peak</p>	<p>Site : 03CH07-HY Condition : PEAK(B4)_16-24 3m HF_ANT_00075962 VERTICAL RBW:1000.000kHz VBW:3000.000kHz SWT:Auto Detector : Peak</p>
Peak	<p>Site : 03CH07-HY Condition : PEAK_BE(B4)_16-24 3m HF_ANT_00075962 VERTICAL RBW:1000.000kHz VBW:3000.000kHz SWT:Auto Detector : Peak</p>	Left blank



Band 4 - 5725~5850MHz
WIFI 802.11a (Harmonic @ 3m)

WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11a CH157 5785MHz	
4+3	Horizontal	Vertical
Peak Avg.	<p>Site : 03CH07-HY Condition : PEAK(UNII) 3m HF_ANT_00075962 HORIZONTAL Detector : Peak</p>	<p>Site : 03CH07-HY Condition : PEAK(UNII) 3m HF_ANT_00075962 VERTICAL Detector : Peak</p>



Emission above 18GHz
5GHz WIFI 802.11a (SHF)

WIFI	5GHz WIFI	
ANT	802.11a SHF	
4+3	Horizontal	Vertical
<p>Peak</p> <p>Avg.</p>	<p>Site : 03CH07-HY Condition : PEAK(UNII) 1m SHF-EHF_9170584 HORIZONTAL Detector : Peak</p>	<p>Site : 03CH07-HY Condition : PEAK(UNII) 1m SHF-EHF_9170576 VERTICAL Detector : Peak</p>



Emission below 1GHz
5GHz WIFI 802.11a (LF)

WIFI	5GHz WIFI	
ANT	802.11a LF	
4+3	Horizontal	Vertical
QP / Peak	<p>Site : 03CH07-HY Condition : QP 3m LF-ANT-35419(6) HORIZONTAL Detector : Peak</p>	<p>Site : 03CH07-HY Condition : QP 3m LF-ANT-35419(6) VERTICAL Detector : Peak</p>



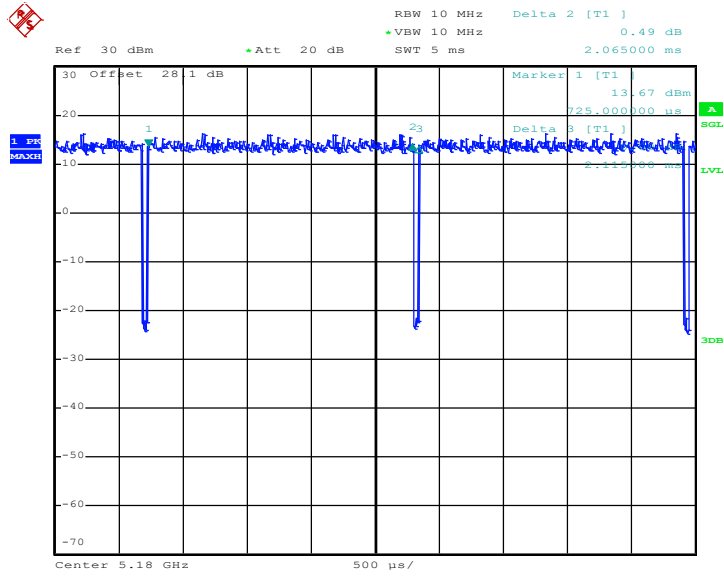
Appendix D. Duty Cycle Plots

Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting	Duty Factor(dB)
4+3	802.11a for Ant. 4	97.64	2065	0.48	1kHz	0.10
4+3	802.11a for Ant. 3	97.87	2070	0.48	1kHz	0.09



MIMO <Ant. 4>

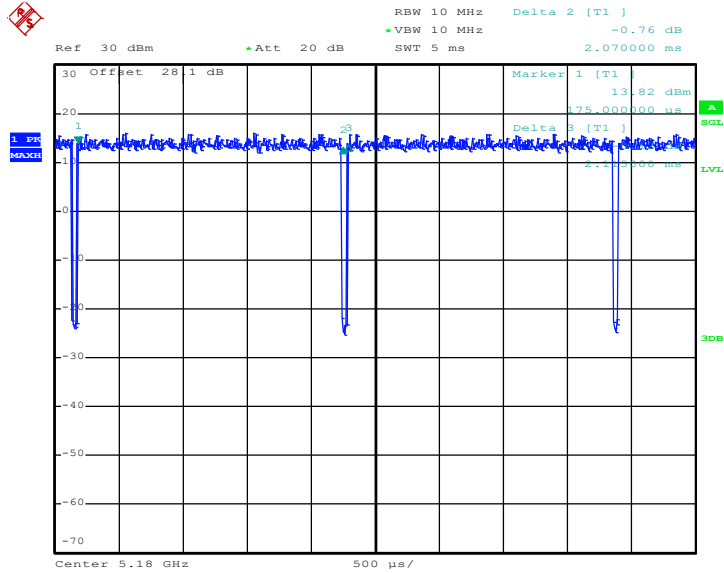
802.11a



Date: 18.JUN.2020 16:53:13

MIMO <Ant. 3>

802.11a



Date: 18.JUN.2020 16:54:22

—THE END—