FCC RF Co-location Test Report

APPLICANT	:	Nest Labs Inc.
EQUIPMENT	:	Nest Cam IQ
MODEL NAME	:	A0053
FCC ID	:	ZQANC31
STANDARD	:	FCC Part 15 Subpart E §15.407
CLASSIFICATION	:	(NII) Unlicensed National Information Infrastructure

The product was completed on May 05, 2017. We, SPORTON INTERNATIONAL INC., 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., the test report shall not be reproduced except in full.

Reviewed by: Joseph Lin / Supervisor

Approved by: Jones Tsai / Manager

Testing Laboratory 1190

SPORTON INTERNATIONAL INC.
No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C.

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR630207-02F	Rev. 01	Initial issue of report	Apr. 19, 2017
FR630207-02F	Rev. 02	Revising the antenna information in section 1.2, and remove section of automatically discontinue transmission and add loop antenna information in section 4 and add radiated spurious emission test data in appendix a and appendix b, and add description of radiated spurious emissions below 30MHz in section 3.1.5.	May 05, 2017
FR630207-02F	Rev. 03	Add Zigbee information in section 1.2 and revising connection diagram of test system in section 2.3.	May 09, 2017

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result
3.1	15.407(b)	Unwanted Emissions	≤ -17, -27 dBm (depend on band)&15.209(a)	Pass
3.2	15.203 & 15.407(a)	Antenna Requirement	N/A	Pass

1 General Description

1.1 Applicant

Nest Labs Inc.
3400 Hillview Ave.Palo Alto, CA 94304 USA

1.2 Product Feature of Equipment Under Test

Bluetooth- LE, Wi-Fi 2.4GHz 802.11b/g/n/ac, Wi-Fi 5GHz 802.11a/n/ac, Zigbee

Product Specification subjective to this standard	
Antenna Type	ANT FPC 1 2.4G/5G : Fixed Internal Antenna ANT FPC 2 2.4G/5G : Fixed Internal Antenna ANT FPC 15.4 2.4G : Fixed Internal Antenna

1.3 Modification of EUT

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

1.4 Testing Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW0007 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd Rd. Guishan Dist, Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	**Sporton Site No.**
	03CH13-HY

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

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 v01r03
- FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04
- ANSI C63.10-2013

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

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 (Y plane) were recorded in this report.

2.1 Carrier Frequency and Channel

2400-2483.5 MHz Bluetooth-LE		5150-5250 MHz Band 1 (U-NII-1)		2400-2483.5 MHz Zigbee	
Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
39	2480	38	5190	18	2440

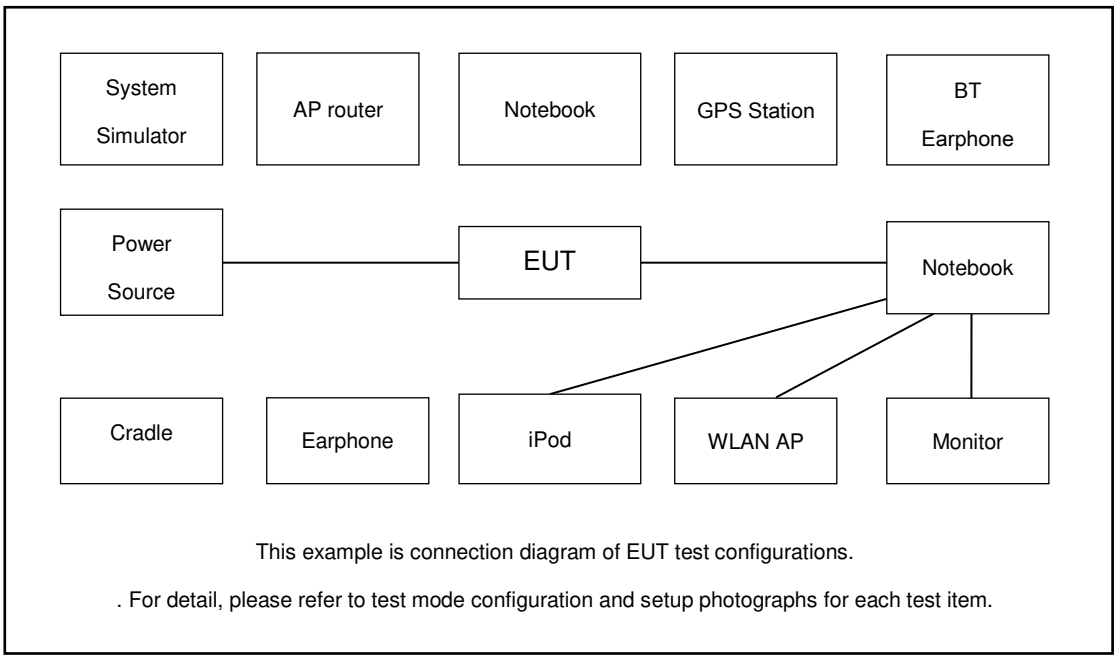
2.2 Test Mode

Final test mode of conducted test items and radiated spurious emissions are considering the modulation and worse data rates as below table.

<Co-Location>

Modulation	Data Rate
Bluetooth-LE + 802.11n HT40	1 Mbps + MCS0
Zigbee + 802.11n HT40	250kbps + MCS0
Bluetooth-LE + Zigbee	1 Mbps + 250kbps

2.3 Connection Diagram of Test System



This example is connection diagram of EUT test configurations.

. For detail, please refer to test mode configuration and setup photographs for each test item.

2.4 EUT Operation Test Setup

For RF function, programmed RF utility, “ADB” installed in the notebook make the EUT provide functions like channel selection and power level for continuous transmitting and receiving signals.

3 Test Result

3.1 Unwanted Emissions Measurement

3.1.1 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)
-17	78.3
- 27	68.3

(2) KDB789033 D02 v01r03 G)2)c)

(i) Section 15.407(b)(1-3) specifies the unwanted emissions limit for the U-NII-1 and 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. However, an out-of-band emission that complies with both the average and peak limits of Section 15.209 is not required to satisfy the -27 dBm/MHz dBm/MHz peak emission limit.

(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). An alternative to the band emissions mask is specified in Section 15.407(b)(4)(ii). The alternative limits are based on the highest antenna gain specified in the filing. There are also marketing and importation restrictions for the alternative limit

3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.1.3 Test Procedures

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r03. 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

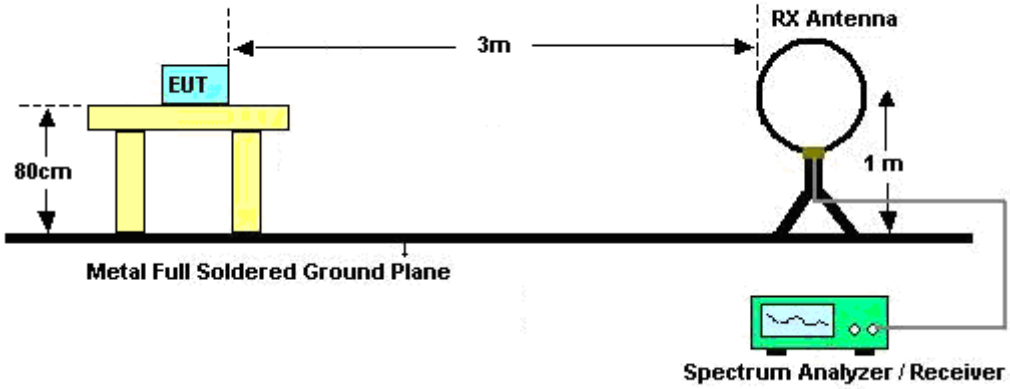
   (3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz

   - 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.

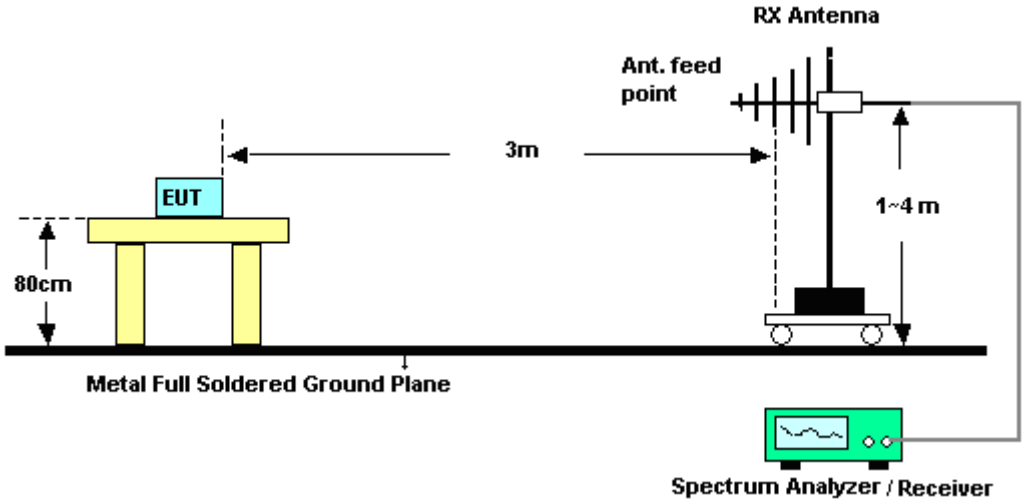
2. he EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband 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.

3.1.4 Test Setup

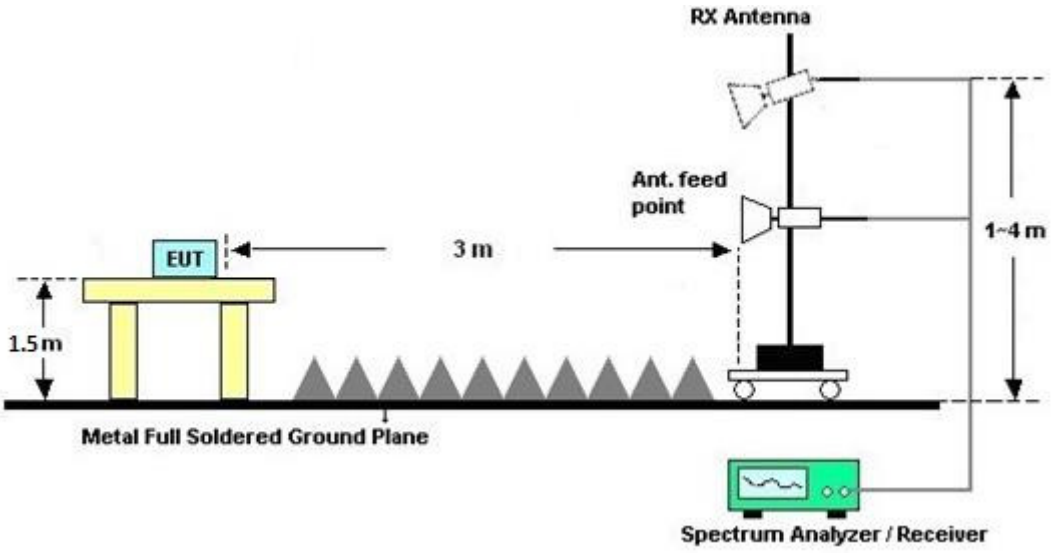
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



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

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

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

3.1.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix A and B.

3.1.7 Duty Cycle

Please refer to Appendix C.

3.1.8 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

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.

3.2.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.2.3 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
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1241	1GHz ~ 18GHz	Apr. 25, 2016	Apr. 05, 2017~ Apr. 14, 2017	Apr. 24, 2017	Radiation (03CH13-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1522	1GHz ~ 18GHz	Mar. 17, 2017	May 05, 2017	Mar. 16, 2018	Radiation (03CH13-HY)
Amplifier	Sonoma-Instrument	310 N	187282	9KHz~1GHz	Dec. 21, 2016	Apr. 05, 2017~ May 05, 2017	Dec. 20, 2017	Radiation (03CH13-HY)
Bilog Antenna	TESEQ	CBL 6111D&00800N1D01N-06	40103&04	30MHz to 1GHz	Jan. 07, 2017	Apr. 05, 2017~ May 05, 2017	Jan. 06, 2018	Radiation (03CH13-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY55420170	N/A	Mar. 03, 2017	Apr. 05, 2017~ May 05, 2017	Mar. 02, 2018	Radiation (03CH13-HY)
Hygrometer	TECPEL	DTM-303B	TP157151	N/A	Jul. 09, 2016	Apr. 05, 2017~ May 05, 2017	Jul. 08, 2017	Radiation (03CH13-HY)
Preamplifier	Keysight	83017A	MY53270147	1GHz~26.5GHz	Jan. 09, 2017	Apr. 05, 2017~ May 05, 2017	Jan. 08, 2018	Radiation (03CH13-HY)
Spectrum Analyzer	Keysight	N9010A	MY55370526	N/A	Mar. 15, 2017	Apr. 05, 2017~ May 05, 2017	Mar. 14, 2018	Radiation (03CH13-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1m~4m	N/A	Apr. 05, 2017~ May 05, 2017	N/A	Radiation (03CH13-HY)
Turn Table	EMEC	TT2000	N/A	0~360 Degree	N/A	Apr. 05, 2017~ May 05, 2017	N/A	Radiation (03CH13-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	18GHz- 40GHz	Nov. 08, 2016	Apr. 05, 2017~ May 05, 2017	Nov. 07, 2017	Radiation (03CH13-HY)
Preamplifier	MITEQ	AMF-7D-00101800	2025787	1GHZ~18GHZ	Feb. 13, 2017	Apr. 05, 2017~ May 05, 2017	Feb. 12, 2018	Radiation (03CH13-HY)
Preamplifier	MITEQ	JS44-18004000-33-8P	1840917	18GHz ~40GHz	Jun. 14, 2016	Apr. 05, 2017~ May 05, 2017	Jun. 13, 2017	Radiation (03CH13-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Oct. 20, 2016	Apr. 05, 2017~ May 05, 2017	Oct. 19, 2018	Radiation (03CH13-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))	**4.90**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.40**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.30**

Appendix A. Radiated Spurious Emission

Test Engineer :	Alex Jheng, Bill Chang, and Wilson Wu	Temperature :	24.5 ~ 25°C
		Relative Humidity :	44 ~ 47%

Co-location mode

WIFI 802.11n HT40 CDD and BLE (Harmonic @ 3m)

	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11n HT40 CH 38 5190MHz and BLE CH 39 2480MHz		3306	45.08	-28.92	74	72.77	28.74	8.28	64.71	100	0	P	H
		3460	44.42	-29.58	74	71.81	28.71	8.52	64.62	100	0	P	H
		4960	53.82	-20.18	74	76.84	31.44	10.17	64.63	203	307	P	H
		4960	49.22	-4.78	54	72.24	31.44	10.17	64.63	203	307	A	H
		10380	44.09	-29.91	74	54.64	39.61	15.04	65.2	100	0	P	H
		15570	42.68	-31.32	74	49.86	38.7	18.17	64.05	100	0	P	H
		3306	45.44	-28.56	74	73.13	28.74	8.28	64.71	100	0	P	V
		3460	42.33	-31.67	74	69.72	28.71	8.52	64.62	100	0	P	V
		4960	50.36	-23.64	74	73.38	31.44	10.17	64.63	187	50	P	V
		4960	45.41	-8.59	54	68.43	31.44	10.17	64.63	187	50	A	V
		10380	44.65	-29.35	74	55.2	39.61	15.04	65.2	100	0	P	V
		15570	42.49	-31.51	74	49.67	38.7	18.17	64.05	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

WIFI 802.11n HT40 CDD and Zigbee (Harmonic @ 3m)

	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT40 CH 38 5190MHz and Zigbee CH 18 2440MHz		3460	40.16	-33.84	74	68.48	28.71	6.48	64.62	100	0	P	H
		4880	38.83	-35.17	74	63.9	31.31	7.82	64.7	100	0	P	H
		7320	45.67	-28.33	74	63.65	36.32	9.68	64.83	100	0	P	H
		10380	47.74	-26.26	74	61.41	39.61	11.38	65.2	100	0	P	H
		15570	46.96	-27.04	74	57.58	38.7	13.98	64.05	100	0	P	H
													H
		3460	38.79	-35.21	74	67.11	28.71	6.48	64.62	100	0	P	V
		4880	37.57	-36.43	74	62.64	31.31	7.82	64.7	100	0	P	V
		7320	44.69	-29.31	74	62.67	36.32	9.68	64.83	100	0	P	V
		10380	47.78	-26.22	74	61.45	39.61	11.38	65.2	100	0	P	V
		15570	47.19	-26.81	74	57.81	38.7	13.98	64.05	100	0	P	V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

BLE and Zigbee (Harmonic @ 3m)

	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
BLE CH 39 2480MHz and Zigbee CH 18 2440MHz		3306	49.78	-24.22	74	78.12	28.78	6.32	64.71	100	0	P	H
		4880	39.52	-34.48	74	64.02	31.88	7.82	64.7	100	0	P	H
		4960	54.51	-19.49	74	78.63	32.04	7.98	64.63	225	301	P	H
		4960	51.82	-2.18	54	75.94	32.04	7.98	64.63	225	301	P	H
		7320	46.52	-27.48	74	63.99	37.22	9.68	64.83	100	0	P	H
		7440	45.28	-28.72	74	62.37	37.56	9.77	64.88	100	0	P	H
		3306	49.08	-24.92	74	77.46	28.74	6.32	64.71	100	0	P	V
		4880	38.76	-35.24	74	63.83	31.31	7.82	64.7	100	0	P	V
		4960	52.19	-21.81	74	76.91	31.44	7.98	64.63	258	63	P	V
		4960	49.56	-4.44	54	74.28	31.44	7.98	64.63	258	63	P	V
		7320	44.74	-29.26	74	63.11	36.32	9.68	64.83	100	0	P	V
		7440	44.42	-29.58	74	62.41	36.66	9.77	64.88	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Emission below 1GHz

WIFI 802.11n HT40 CDD and BLE (LF @ 3m)

	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11n HT40 CH 38 5190MHz and BLE CH 39 2480MHz		75.9	20.7	-19.3	40	42.04	10.07	0.89	32.3			P	H
		133.41	28.69	-14.81	43.5	45.98	13.77	1.22	32.28	100	0	P	H
		251.67	25.71	-20.29	46	40.72	15.48	1.71	32.2			P	H
		351.1	26.58	-19.42	46	39.57	17.15	2	32.14			P	H
		897.8	30.21	-15.79	46	31.85	26.44	3.44	31.52			P	H
		958.7	30.22	-15.78	46	29.27	28.46	3.46	30.97			P	H
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		40.8	31.56	-8.44	40	49.46	13.81	0.62	32.33	100	0	P	V
		96.69	24.54	-18.96	43.5	44.21	11.6	1.02	32.29			P	V
		240.6	19.81	-26.19	46	36.81	13.54	1.67	32.21			P	V
		364.4	21.74	-24.26	46	34.44	17.37	2.07	32.14			P	V
		843.2	28.32	-17.68	46	30.36	26.31	3.43	31.78			P	V
		895.7	34.1	-11.9	46	35.81	26.38	3.44	31.53			P	V
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Remark

1. No other spurious found.
2. All results are PASS against limit line.

WIFI 802.11n HT40 CDD and Zigbee (LF @ 3m)

	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT40 CH 38 5190MHz and Zigbee CH 18 2440MHz		126.66	29.5	-14	43.5	47.75	12.88	1.09	32.28			P	H
		200.1	31.15	-12.35	43.5	50.74	11.19	1.42	32.27	100	0	P	H
		256.8	28.84	-17.16	46	43.03	16.29	1.63	32.19			P	H
		313.3	33.13	-12.87	46	47.49	15.95	1.76	32.13			P	H
		450.5	30	-16	46	40.08	19.92	2.1	32.18			P	H
		959.4	31.21	-14.79	46	30.45	28.52	3.07	30.97			P	H
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													H
													H
													H
		58.08	23.95	-16.05	40	46.31	9.12	0.84	32.32	100	10	P	V
		127.47	26.48	-17.02	43.5	44.74	12.88	1.09	32.28			P	V
		220.89	24.92	-21.08	46	43.49	12.07	1.53	32.24			P	V
		363	27.11	-18.89	46	39.94	17.34	1.89	32.14			P	V
		451.2	27.5	-18.5	46	37.58	19.92	2.1	32.18			P	V
		960.8	30.99	-23.01	54	30.19	28.54	3.07	30.95			P	V
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Remark

1. No other spurious found.
2. All results are PASS against limit line.

BLE and Zigbee (LF @ 3m)

	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
BLE CH 39 2480MHz and Zigbee CH 18 2440MHz		86.7	27.12	-12.88	40	48.34	10.09	0.95	32.3	100	0	P	H
		185.25	25.11	-18.39	43.5	44.25	11.63	1.42	32.27			P	H
		226.02	24.76	-21.24	46	42.97	12.41	1.53	32.23			P	H
		451.2	24.44	-21.56	46	34.52	19.92	2.1	32.18			P	H
		868.4	29.47	-16.53	46	31.94	26.17	2.9	31.66			P	H
		953.1	31.5	-14.5	46	31.19	28.14	3.06	31.03			P	H
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													H
													H
		54.3	30.1	-9.9	40	51.5	10.16	0.74	32.32	100	0	P	V
		92.1	30.54	-12.96	43.5	51.37	10.39	0.95	32.29			P	V
		241.41	17.94	-28.06	46	34.78	13.7	1.59	32.21			P	V
		572.3	23.73	-22.27	46	31.01	22.47	2.36	32.21			P	V
		831.3	28.4	-17.6	46	31.46	25.81	2.84	31.84			P	V
		948.9	30.89	-15.11	46	30.92	27.83	3.06	31.06			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	**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	Cable	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 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. Level(dBμV/m) =

Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

2. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable 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) + Cable 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)

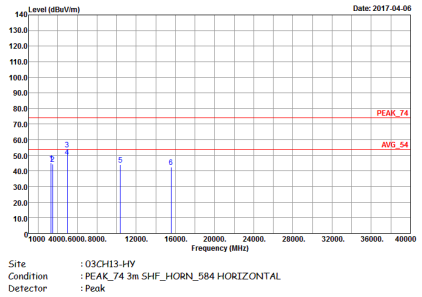
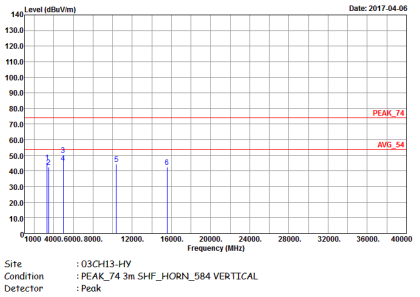
Both peak and average measured complies with the limit line, so test result is "PASS".

Appendix B. Radiated Spurious Emission

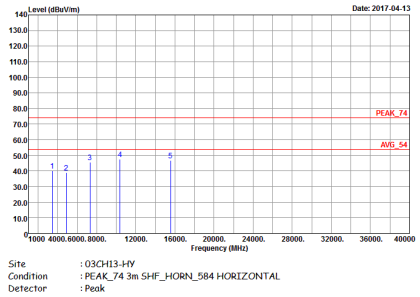
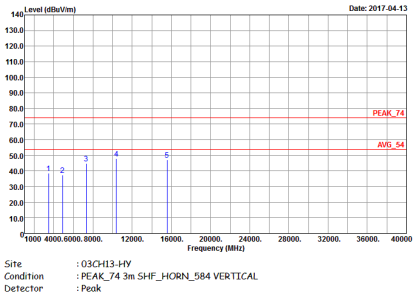
Test Engineer :	Alex Jheng, Bill Chang, and Wilson Wu	Temperature :	24.5 ~ 25°C
		Relative Humidity :	44 ~ 47%

Co-location mode

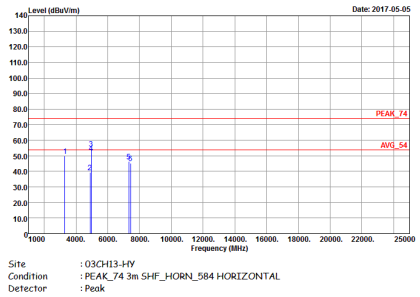
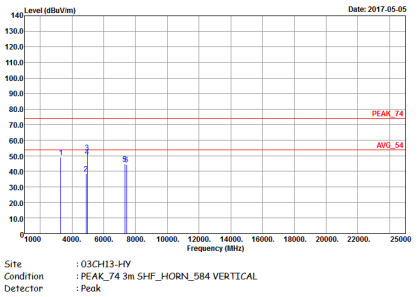
WIFI 802.11n HT40 CDD and BLE (Harmonic @ 3m)

	Co-location mode Harmonic @ 3m	
	802.11n HT40 CH 38 5190MHz and BLE CH 39 2480MHz	
	Horizontal	Vertical
Peak Avg.		

WIFI 802.11n HT40 CDD and Zigbee (Harmonic @ 3m)

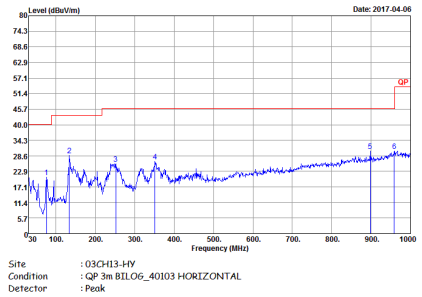
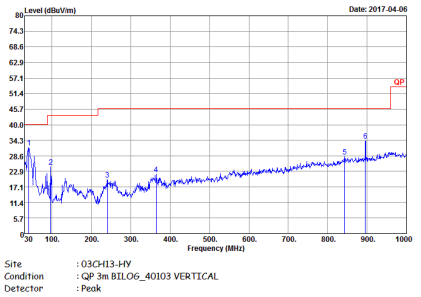
	Co-location mode Harmonic @ 3m	
	802.11n HT40 CH 38 5190MHz and Zigbee CH 18 2440MHz	
	Horizontal	Vertical
Peak Avg.		

BLE and Zigbee (Harmonic @ 3m)

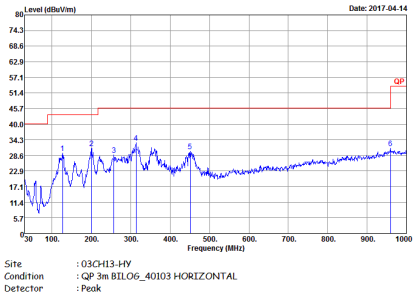
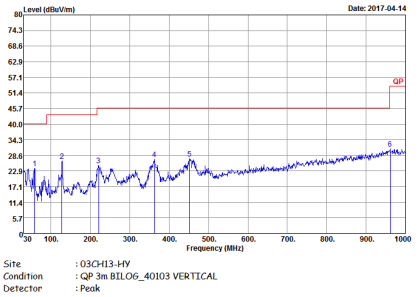
	Co-location mode Harmonic @ 3m	
	BLE CH 39 2480MHz and Zigbee CH 18 2440MHz	
	Horizontal	Vertical
Peak Avg.		

Emission below 1GHz

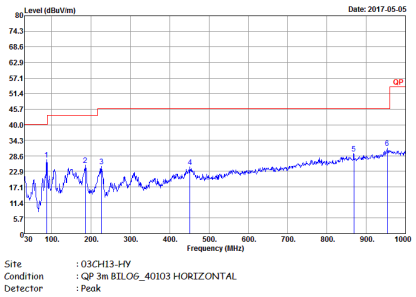
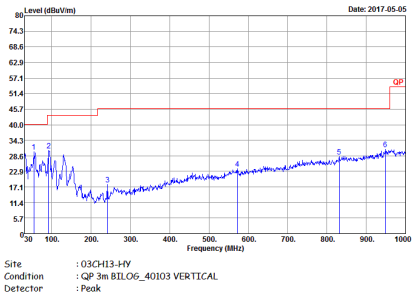
WIFI 802.11n HT40 CDD and BLE (LF)

	Co-location mode	
	WIFI 802.11n HT40 CDD and BLE LF	
	Horizontal	Vertical
QP / Peak		

WIFI 802.11n HT40 CDD and Zigbee (LF)

	Co-location mode	
	WIFI 802.11n HT40 CDD and Zigbee LF	
	Horizontal	Vertical
QP / Peak		

BLE and Zigbee (LF)

	Co-location mode	
	BLE and Zigbee LF	
	Horizontal	Vertical
QP / Peak		

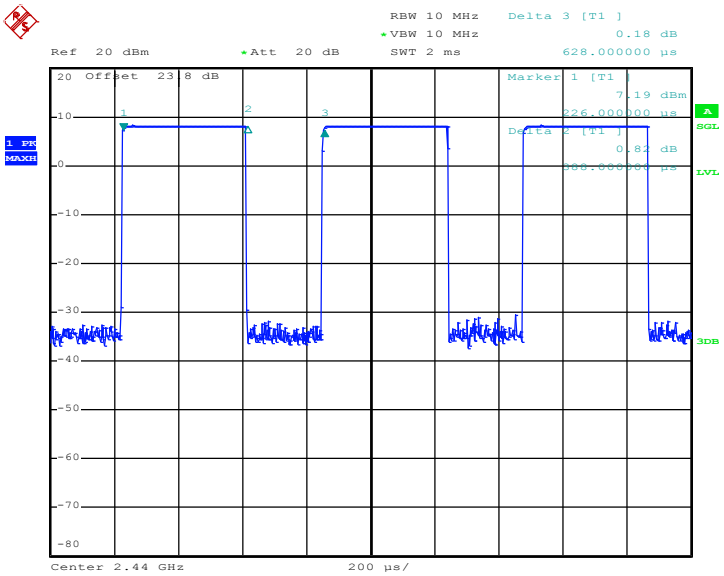
Appendix C. Duty Cycle Plots

Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
Bluetooth -LE	61.78	388	2.58	3KHz
Zigbee 2.4 GHz Band	10.77	2100	0.48	1kHz

<CDD Modes>

Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
5GHz 802.11n HT40 for Ant 1	77.01	670.00	1.49	3kHz

Bluetooth - LE



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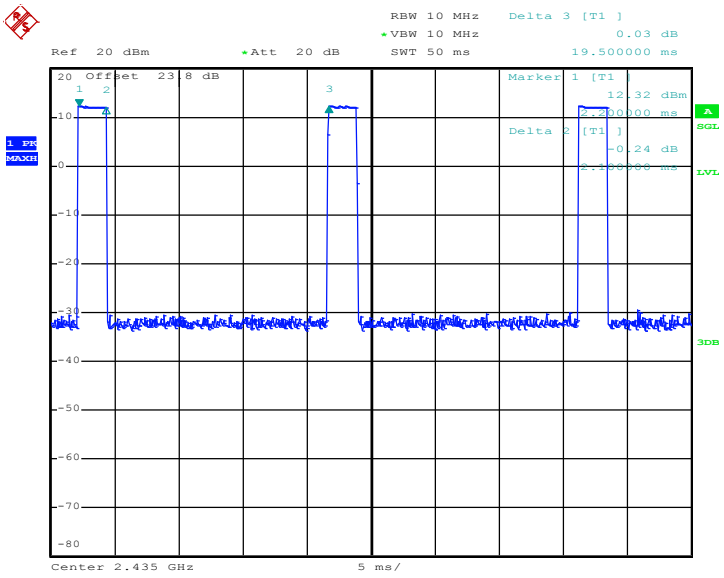
Zigbee 2.4 GHz



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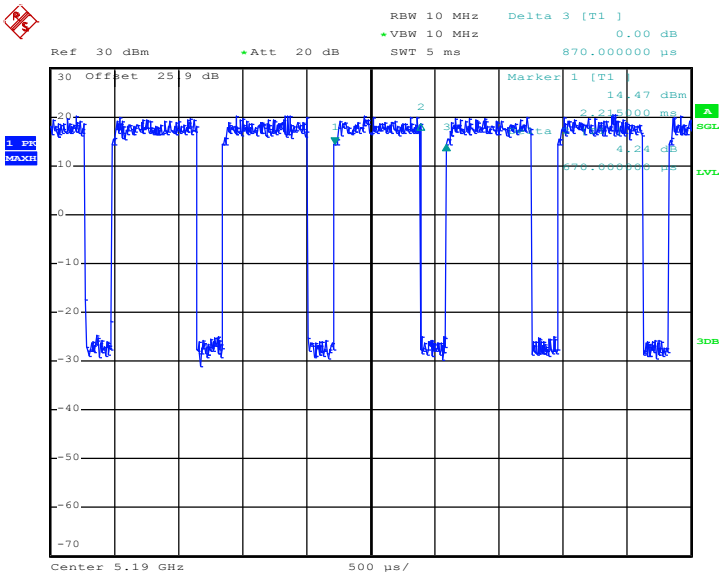
<CDD-MIMO Ant. 1>

802.11n HT40



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