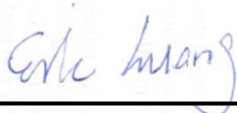


RF Exposure Evaluation Report

APPLICANT : Nest Labs Inc.
EQUIPMENT : Outdoor Security Camera
MODEL NAME : Nest Cam IQ
MODEL NUMBER : A0055
FCC ID : ZQANC41
STANDARD : 47 CFR Part 2.1091

We, SPORTON INTERNATIONAL INC., would like to declare that the device has been evaluated in accordance with 47 CFR Part 2.1091, and pass the limit. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.



Reviewed by: Eric Huang / Manager



Approved by: Jones Tsai / Manager



SPORTON INTERNATIONAL INC.

No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Taoyuan City, Taiwan (R.O.C.)



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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA6N0107-01	Rev. 01	Initial issue of report	Aug. 31, 2017
FA6N0107-01	Rev. 02	Updated Tune-up Limit of UNII Band 1_MIMO HT20 mode_ANT 2	Sep. 5, 2017



1. Administration Data

1.1. Testing Laboratory

Testing Laboratory	
Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978

Applicant	
Company Name	Nest Labs Inc.
Address	3400 Hillview Ave.Palo Alto, CA 94304 USA

2. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	Outdoor Security Camera
Model Name	Nest Cam IQ
Model Number	A0055
FCC ID	ZQANC41
Wireless Technology and Frequency Range	WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5720 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz 15.4: 2405 MHz ~ 2475 MHz
Mode	802.11a/b/g/n/ac HT20/HT40/VHT20/VHT40/VHT80 Bluetooth: LE 15.4: BPSK
HW Version	Rev A

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.



3. Maximum RF average output power among production units

<Bluetooth>

Mode / Band	Average Power (dBm)	Tune- up Limit (dBm)
	LE	
2.4 GHz Bluetooth	4.83	5.0

<15.4>

Mode / Band	Average Power (dBm)	Tune- up Limit (dBm)
	BPSK	
2.4 GHz 15.4	20.4	20.5



<WLAN (SISO)>

2.4 GHz WLAN				
Mode	Average Power (dBm)		Tune- up Limit (dBm)	
	Ant 1	Ant 2	Ant 1	Ant 2
11b	22.25	22.30	22.5	22.5
11g	22.06	22.10	22.5	22.5
HT20	22.06	22.04	22.5	22.5
VHT20	21.99	22.02	22.5	22.5

5.2 GHz WLAN				
Mode	Average Power (dBm)		Tune- up Limit (dBm)	
	Ant 1	Ant 2	Ant 1	Ant 2
11a	18.57	18.51	19.0	19.0
HT20	19.04	18.75	19.5	19.0
HT40	20.79	20.83	21.0	21.0
VHT20	18.91	18.71	19.0	19.0
VHT40	20.72	20.64	21.0	21.0
VHT80	17.80	18.08	18.0	18.5

5.3 GHz WLAN				
Mode	Average Power (dBm)		Tune- up Limit (dBm)	
	Ant 1	Ant 2	Ant 1	Ant 2
11a	18.92	18.79	19.0	19.0
HT20	19.11	19.12	19.5	19.5
HT40	20.88	20.60	21.0	21.0
VHT20	19.05	19.08	19.5	19.5
VHT40	20.78	20.55	21.0	21.0
VHT80	18.20	18.05	18.5	18.5

5.5 GHz WLAN				
Mode	Average Power (dBm)		Tune- up Limit (dBm)	
	Ant 1	Ant 2	Ant 1	Ant 2
11a	19.34	19.21	19.5	19.5
HT20	20.04	19.77	20.5	20.0
HT40	20.73	20.93	21.0	21.0
VHT20	19.99	19.73	20.0	20.0
VHT40	20.53	20.91	21.0	21.0
VHT80	20.50	20.83	21.0	21.0

5.8 GHz WLAN				
Mode	Average Power (dBm)		Tune- up Limit (dBm)	
	Ant 1	Ant 2	Ant 1	Ant 2
11a	25.78	25.94	26.0	26.0
HT20	25.82	25.77	26.0	26.0
HT40	24.81	24.69	25.0	25.0
VHT20	25.54	25.74	26.0	26.0
VHT40	24.36	24.48	24.5	24.5
VHT80	21.52	21.53	22.0	22.0



<WLAN (CDD)>

2.4 GHz WLAN						
Mode	Average Power (dBm)			Tune- up Limit (dBm)		
	Ant 1	Ant 2	Ant 1+2	Ant 1	Ant 2	Ant 1+2
11g	21.85	22.41	25.15	22.0	22.5	25.5
HT20	22.08	22.61	25.36	22.5	23.0	25.5
VHT20	22.04	22.62	25.35	22.5	23.0	25.5

5.2 GHz WLAN						
Mode	Average Power (dBm)			Tune- up Limit (dBm)		
	Ant 1	Ant 2	Ant 1+2	Ant 1	Ant 2	Ant 1+2
11a	18.80	18.33	21.58	19.0	19.0	22.0
HT20	19.36	18.69	22.05	19.5	19.0	22.5
HT40	20.92	20.97	23.95	21.0	21.0	24.0
VHT20	19.21	18.54	21.90	19.5	19.0	22.0
VHT40	20.92	20.66	23.80	21.0	21.0	24.0
VHT80	18.22	17.93	21.09	18.5	18.0	21.5

5.3 GHz WLAN						
Mode	Average Power (dBm)			Tune- up Limit (dBm)		
	Ant 1	Ant 2	Ant 1+2	Ant 1	Ant 2	Ant 1+2
11a	19.37	18.61	22.02	19.5	19.0	22.5
HT20	19.47	18.74	22.13	19.5	19.0	22.5
HT40	21.20	20.63	23.93	21.5	21.0	24.0
VHT20	19.49	18.69	22.12	19.5	19.0	22.5
VHT40	21.01	20.58	23.81	21.5	21.0	24.0
VHT80	18.49	17.90	21.22	18.5	18.0	21.5

5.5 GHz WLAN						
Mode	Average Power (dBm)			Tune- up Limit (dBm)		
	Ant 1	Ant 2	Ant 1+2	Ant 1	Ant 2	Ant 1+2
11a	19.34	19.33	22.35	19.5	19.5	22.5
HT20	20.07	20.11	23.10	20.5	20.5	23.5
HT40	20.77	21.12	23.96	21.0	21.5	24.0
VHT20	20.11	20.05	23.09	20.5	20.5	23.5
VHT40	20.71	21.14	23.94	21.0	21.5	24.0
VHT80	20.64	21.06	23.87	21.0	21.5	24.0

5.8 GHz WLAN						
Mode	Average Power (dBm)			Tune- up Limit (dBm)		
	Ant 1	Ant 2	Ant 1+2	Ant 1	Ant 2	Ant 1+2
11a	25.83	26.10	28.98	26.0	26.5	29.0
HT20	25.80	26.13	28.98	26.0	26.5	29.0
HT40	24.88	25.18	28.04	25.0	25.5	28.5
VHT20	25.73	26.09	28.93	26.0	26.5	29.0
VHT40	24.43	24.63	27.54	24.5	25.0	28.0
VHT80	21.53	21.63	24.59	22.0	22.0	25.0

Note : Ant 1+2 average power is a combined result from sum of the power Ant 1 and Ant 2.



4. RF Exposure Limit Introduction

According to ANSI/IEEE C95.1-1992, the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*(900/f ²)	6
30-300	61.4	0.163	1.0	6
300-1500			f/300	6
1500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f ²)	30
30-300	27.5	0.073	0.2	30
300-1500			f/1500	30
1500-100,000			1.0	30

The MPE was calculated at 20 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$S = \frac{PG}{4\pi R^2}$$

Where:

S = Power Density

P = Output Power at Antenna Terminals

G = Gain of Transmit Antenna (linear gain)

R = Distance from Transmitting Antenna



5. Radio Frequency Radiation Exposure Evaluation

5.1. Standalone Power Density Calculation

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 20cm (mW/cm ²)	Limit (mW/cm ²)	Power Density / Limit
Bluetooth	2402.0	4.48	5.00	9.480	0.009	8.872	0.002	1.000	0.002
15.4	2405.0	3.37	20.50	23.870	0.244	243.781	0.049	1.000	0.049
2.4GHz WLAN Ant 1 (SISO)	2412	4.48	22.50	26.980	0.499	498.884	0.099	1.000	0.099
5.2GHz WLAN Ant 1 (SISO)	5180	4.14	21.00	25.140	0.327	326.588	0.065	1.000	0.065
5.3GHz WLAN Ant 1 (SISO)	5260	3.83	21.00	24.830	0.304	304.089	0.061	1.000	0.061
5.5GHz WLAN Ant 1 (SISO)	5500	2.76	21.00	23.760	0.238	237.684	0.047	1.000	0.047
5.8GHz WLAN Ant 1 (SISO)	5745	3.43	26.00	29.430	0.877	877.001	0.175	1.000	0.175
2.4GHz WLAN Ant 2 (SISO)	2412	2.78	22.50	25.280	0.337	337.287	0.067	1.000	0.067
5.2GHz WLAN Ant 2 (SISO)	5180	3.93	21.00	24.930	0.311	311.172	0.062	1.000	0.062
5.3GHz WLAN Ant 2 (SISO)	5260	3.64	21.00	24.640	0.291	291.072	0.058	1.000	0.058
5.5GHz WLAN Ant 2 (SISO)	5500	3.59	21.00	24.590	0.288	287.740	0.057	1.000	0.057
5.8GHz WLAN Ant 2 (SISO)	5745	4.14	26.00	30.140	1.033	1032.761	0.206	1.000	0.206
2.4GHz WLAN Ant 1+2 (MIMO/CDD)	2412	4.48	25.50	29.980	0.995	995.405	0.198	1.000	0.198
5.2GHz WLAN Ant 1+2 (MIMO/CDD)	5180	4.14	24.00	28.140	0.652	651.628	0.130	1.000	0.130
5.3GHz WLAN Ant 1+2 (MIMO/CDD)	5260	3.83	24.00	27.830	0.607	606.736	0.121	1.000	0.121
5.5GHz WLAN Ant 1+2 (MIMO/CDD)	5500	3.59	24.00	27.590	0.574	574.116	0.114	1.000	0.114
5.8GHz WLAN Ant 1+2 (MIMO/CDD)	5745	4.14	29.00	33.140	2.061	2060.630	0.410	1.000	0.410

Note: For conservativeness, the lowest frequency of each band is used to determine the MPE limit of that band.



5.2. Collocated Power Density Calculation

The device has three simultaneous transmission states as following.

State 1 : Bluetooth and 15.4 can transmit simultaneously

State 2 : 2.4GHz WLAN and 15.4 can transmit simultaneously

State 3 : 5GHz WLAN and 15.4 can transmit simultaneously

<state 1 : Bluetooth with 15.4 >

Table with 3 columns: Bluetooth Power Density / Limit (0.002), 15.4 Power Density / Limit (0.049), and Sum of Power Density / Limit (0.051)

<state 2 : 2.4GHz WLAN with 15.4 >

Table with 3 columns: 2.4GHz WLAN Ant 1+2 Power Density / Limit (0.198), 15.4 Power Density / Limit (0.049), and Sum of Power Density / Limit (0.247)

<state 3 : 5GHz WLAN with 15.4 >

Table with 3 columns: 5GHz WLAN Ant 1+2 Power Density / Limit (0.410), 15.4 Power Density / Limit (0.049), and Sum of Power Density / Limit (0.459)

Note:

- 1. Sum (Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for state 1 / 2 / 3.
2. Considering the state 1 / 2 / 3 of the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1, and MPE of these collocated transmitters is compliant.

Conclusion:

According to 47 CFR §2.1091, the RF exposure analysis concludes that the RF Exposure is FCC compliant.