



RF EXPOSURE EVALUATION REPORT

APPLICANT : Nortek Security & Control LLC
PRODUCT NAME : Edge Panel
MODEL NAME : 2GIG-EDG-NA-V
BRAND NAME : 2GIG
FCC ID : EF400217
STANDARD(S) : 47CFR 2.1091
: KDB 447498
RECEIPT DATE : 2020-07-10
TEST DATE : 2020-07-22 to 2021-01-10
ISSUE DATE : 2021-01-25

Edited by: Liang Yumei
Liang Yumei (Rapporteur)

Approved by: Peng Huarui
Peng Huarui (Supervisor)

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Change History		
Version	Date	Reason for Change
1.0	2021-01-25	First edition



1. Technical Information

Note: Provide by applicant.

1.1 Applicant and Manufacturer Information

Applicant:	Nortek Security & Control LLC
Applicant Address:	5919 Sea Otter Place, Carlsbad, CA 92010, United States
Manufacturer:	Flextronics Electronics Technology (Shenzhen) Co., Ltd
Manufacturer Address:	89 Yong Fu Road, Tong Fu Yu Industrial Park, Fu Yong Town, Bao An District, Shenzhen, Guangdong, 518103, China

1.2 Equipment under Test (EUT) Description

EUT Name:	Edge Panel
Hardware Version:	A
Software Version:	0
Frequency Bands:	LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 13: 777 MHz ~ 787 MHz WLAN 2.4GHz: 2412 MHz ~ 2462 MHz WLAN 5.2GHz: 5180 MHz ~ 5240 MHz WLAN 5.8GHz: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz Z-wave: 916MHz, 908.4MHz, 908.42MHz 900MHz: 904MHz, 906MHz, 910MHz, 912MHz, 914MHz, 918MHz, 920MHz, 922MHz
Modulation Mode:	LTE: QPSK/16QAM 802.11b: DSSS 802.11g/n-HT20/HT40: OFDM 802.11ac-VHT20/40/80: OFDM Bluetooth: GFSK, $\pi/4$ -DQPSK, 8-DPSK Z-wave: GFSK, FSK 900MHz: OQPSK
Antenna Type:	FPC Antenna
Antenna Gain:	LTE Band 4: 1.24dBi; LTE Band 13: 0.89dBi; WLAN 2.4GHz: 3.13dBi; WLAN 5.2GHz: 0.75dBi; WLAN 5.8GHz: 0.32dBi; Bluetooth: 3.13dBi;



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	Z-wave: 1.35dBi; 900MHz: 0.02dBi;
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1.3 Applied Reference Documents

Leading reference documents for testing:

No.	Identity	Document Title	Method Determination /Remark
1	47 CFR§2.1091	Radio Frequency Radiation Exposure Assessment: mobile devices	No deviation
2	KDB 447498 D01v06	General RF Exposure Guidance	No deviation
Note 1: The test item is not applicable. Note 2: Additions to, deviation, or exclusions from the method shall be judged in the "method determination" column of add, deviate or exclude from the specific method shall be explained in the "Remark" of the above table.			

2. Device Category and RF Exposure Limit

Per user manual, Based on 47CFR 2.1091, this device belongs to mobile device category with General Population/Uncontrolled exposure.

Mobile Devices:

47CFR 2.1091(b)

For purposes of this section, a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons. In this context, the term "fixed location" means that the device is physically secured at one location and is not able to be easily moved to another location. Transmitting devices designed to be used by consumers or workers that can be easily re-located, such as wireless devices associated with a personal computer, are considered to be mobile devices if they meet the 20 centimeter separation requirement.

General Population/Uncontrolled Exposure:

The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity. Warning labels placed on low-power consumer devices such as cellular telephones are not considered sufficient to allow the device to be considered under the occupational/controlled category, and the general population/uncontrolled exposure limits apply to these devices.

Table 1—Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(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

f = frequency in MHz* = Plane-wave equivalent power density



3. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
R&S	Network Emulator	CMW500	124534	2020.04.01	2021.03.31
Anritsu	Network Emulator	MT8820C	6200985414	2020.01.13	2021.01.12

Note:

The EUT was connected to Base Station Anritsu MT8820C referred to the Setup Configuration. For the maximum power, it was established between EUT and Base Station with following setting:

1. For LTE testing, the frequency band, channel bandwidth, RB allocation configuration, modulation type are set in the base station simulator to configure EUT transmitting at maximum power and different configurations which are requested to be reported to FCC.

4. RF Output Power

➤ LTE Output Power

<LTE Band 4>

BW [MHz]	Modulation	RB Size	RB Offset	Low Channel	Middle Channel	High Channel	Tune-up limit (dBm)
Channel				20050	20175	20300	
Frequency (MHz)				1720	1732.5	1745	
20	QPSK	1	0	23.87	23.79	23.91	24.50
20	QPSK	1	49	23.66	23.64	23.41	
20	QPSK	1	99	23.47	23.51	23.49	
20	QPSK	50	0	22.90	22.99	23.04	23.50
20	QPSK	50	24	23.13	23.01	22.79	
20	QPSK	50	50	22.98	23.02	22.80	
20	QPSK	100	0	22.96	23.05	22.93	
20	16QAM	1	0	22.67	22.63	22.89	23.50
20	16QAM	1	49	22.86	22.95	22.58	
20	16QAM	1	99	23.08	22.79	22.60	
20	16QAM	50	0	22.17	22.13	22.39	23.00
20	16QAM	50	24	22.36	22.45	22.08	
20	16QAM	50	50	22.48	22.29	22.10	
20	16QAM	100	0	22.35	22.44	22.32	
Channel				20025	20175	20325	Tune-up limit (dBm)
Frequency (MHz)				1717.5	1732.5	1747.5	
15	QPSK	1	0	23.74	23.66	23.78	24.50
15	QPSK	1	37	23.53	23.51	23.28	
15	QPSK	1	74	23.35	23.38	23.36	
15	QPSK	36	0	22.77	22.86	22.91	23.50
15	QPSK	36	20	23.00	22.87	22.66	
15	QPSK	36	39	22.85	22.89	22.67	
15	QPSK	75	0	22.83	22.92	22.80	
15	16QAM	1	0	22.54	22.50	22.75	23.50
15	16QAM	1	37	22.73	22.82	22.44	
15	16QAM	1	74	22.92	22.66	22.47	
15	16QAM	36	0	22.12	22.08	22.33	23.00
15	16QAM	36	20	22.31	22.40	22.02	



15	16QAM	36	39	22.50	22.24	22.05	
15	16QAM	75	0	22.42	22.51	22.39	
Channel				20000	20175	20350	Tune-up limit (dBm)
Frequency (MHz)				1715	1732.5	1750	
10	QPSK	1	0	23.60	23.52	23.64	24.50
10	QPSK	1	25	23.39	23.37	23.14	
10	QPSK	1	49	23.25	23.31	23.22	
10	QPSK	25	0	22.63	22.69	22.77	23.50
10	QPSK	25	12	22.86	22.76	22.52	
10	QPSK	25	25	22.71	22.74	22.53	
10	QPSK	50	0	22.69	22.78	22.66	
10	16QAM	1	0	22.40	22.36	22.61	23.50
10	16QAM	1	25	22.59	22.68	22.30	
10	16QAM	1	49	22.78	22.52	22.33	
10	16QAM	25	0	22.02	21.98	22.23	23.00
10	16QAM	25	12	22.21	22.30	21.92	
10	16QAM	25	25	22.40	22.14	21.95	
10	16QAM	50	0	22.32	22.41	22.29	
Channel				19975	20175	20375	Tune-up limit (dBm)
Frequency (MHz)				1712.5	1732.5	1752.5	
5	QPSK	1	0	23.48	23.40	23.52	24.00
5	QPSK	1	12	23.27	23.25	23.02	
5	QPSK	1	24	23.13	23.19	23.10	
5	QPSK	12	0	22.51	22.57	22.65	23.00
5	QPSK	12	7	22.74	22.64	22.40	
5	QPSK	12	13	22.59	22.62	22.41	
5	QPSK	25	0	22.57	22.66	22.54	
5	16QAM	1	0	22.28	22.24	22.49	23.00
5	16QAM	1	12	22.47	22.56	22.18	
5	16QAM	1	24	22.66	22.40	22.21	
5	16QAM	12	0	21.91	21.87	22.12	23.00
5	16QAM	12	7	22.10	22.19	21.81	
5	16QAM	12	13	22.29	22.03	21.84	
5	16QAM	25	0	22.21	22.30	22.18	
Channel				19965	20175	20385	Tune-up limit
Frequency (MHz)				1711.5	1732.5	1753.5	



							(dBm)
3	QPSK	1	0	23.37	23.29	23.41	24.00
3	QPSK	1	8	23.16	23.14	22.91	
3	QPSK	1	14	23.02	23.08	22.99	
3	QPSK	8	0	22.40	22.46	22.54	23.00
3	QPSK	8	4	22.63	22.53	22.29	
3	QPSK	8	7	22.48	22.51	22.30	
3	QPSK	15	0	22.46	22.55	22.43	
3	16QAM	1	0	22.17	22.13	22.38	23.00
3	16QAM	1	8	22.36	22.45	22.07	
3	16QAM	1	14	22.55	22.29	22.10	
3	16QAM	8	0	21.78	21.74	21.99	22.50
3	16QAM	8	4	21.97	22.06	21.68	
3	16QAM	8	7	22.16	21.90	21.71	
3	16QAM	15	0	22.08	22.17	22.05	
Channel				19957	20175	20393	Tune-up limit (dBm)
Frequency (MHz)				1710.7	1732.5	1754.3	
1.4	QPSK	1	0	23.23	23.15	23.27	24.00
1.4	QPSK	1	3	23.02	23.00	22.77	
1.4	QPSK	1	5	22.88	22.94	22.85	
1.4	QPSK	3	0	22.26	22.32	22.40	
1.4	QPSK	3	1	22.49	22.39	22.15	
1.4	QPSK	3	3	22.34	22.37	22.16	
1.4	QPSK	6	0	22.32	22.41	22.29	23.00
1.4	16QAM	1	0	22.03	21.99	22.24	23.00
1.4	16QAM	1	3	22.22	22.31	21.93	
1.4	16QAM	1	5	22.41	22.15	21.96	
1.4	16QAM	3	0	21.66	21.62	21.87	
1.4	16QAM	3	1	21.85	21.94	21.56	
1.4	16QAM	3	3	22.04	21.78	21.59	
1.4	16QAM	6	0	21.96	22.05	21.93	22.50



<LTE Band 13>

BW [MHz]	Modulation	RB Size	RB Offset	Low Channel	Middle Channel	High Channel	Tune-up limit (dBm)
Channel				23230			
Frequency (MHz)				782			
10	QPSK	1	0	23.73			24.50
10	QPSK	1	25	23.79			
10	QPSK	1	49	23.64			
10	QPSK	25	0	22.39			23.50
10	QPSK	25	12	22.66			
10	QPSK	25	25	22.77			
10	QPSK	50	0	22.70			
10	16QAM	1	0	21.69			22.50
10	16QAM	1	25	21.95			
10	16QAM	1	49	21.94			
10	16QAM	25	0	21.47			22.00
10	16QAM	25	12	21.42			
10	16QAM	25	25	21.53			
10	16QAM	50	0	21.48			
Channel				23205	23230	23255	Tune-up limit (dBm)
Frequency (MHz)				779.5	782	784.5	
5	QPSK	1	0	23.51	23.43	23.40	24.00
5	QPSK	1	12	23.22	23.26	23.36	
5	QPSK	1	24	23.51	23.53	23.42	
5	QPSK	12	0	22.38	22.32	22.41	23.00
5	QPSK	12	7	22.41	22.38	22.31	
5	QPSK	12	13	22.44	22.46	22.26	
5	QPSK	25	0	22.36	22.31	22.11	
5	16QAM	1	0	21.74	21.71	21.64	22.50
5	16QAM	1	12	21.91	21.88	21.71	
5	16QAM	1	24	21.54	21.58	21.59	
5	16QAM	12	0	21.34	21.31	21.24	22.00
5	16QAM	12	7	21.55	21.54	21.41	
5	16QAM	12	13	21.46	21.43	21.34	
5	16QAM	25	0	21.49	21.57	21.55	



➤ WLAN Output Power

<WLAN 2.4GHz>

2.4GHz WLAN	Mode	Channel	Frequency (MHz)	Test Value	Duty Factor Calculated	Tune-Up Limit
	802.11b 1Mbps	CH 1	2412	18.20	18.27	19.00
		CH 6	2437	18.32	18.39	19.00
		CH 11	2462	18.37	18.44	19.00
	802.11g 6Mbps	CH 1	2412	17.95	18.27	19.00
		CH 6	2437	18.19	18.51	19.00
		CH 11	2462	18.23	18.55	19.00
	802.11n-HT20 MCS0	CH 1	2412	18.45	18.79	19.50
		CH 6	2437	18.60	18.94	19.50
		CH 11	2462	18.77	19.11	19.50

<WLAN 5.2GHz>

5.2GHz WLAN	Mode	Channel	Frequency (MHz)	Test Value	Duty Factor Calculated	Tune-Up Limit
	802.11n-HT20 MCS0	CH 36	5180	15.99	16.32	17.00
		CH 40	5200	15.97	16.30	17.00
		CH 48	5240	16.07	16.40	17.00
	802.11n-HT40 MCS0	CH 38	5190	15.62	16.25	17.00
		CH 46	5230	15.55	16.18	17.00
	802.11ac-VHT20 MCS0	CH 36	5180	16.02	16.34	17.00
		CH 40	5200	16.07	16.39	17.00
		CH 48	5240	15.97	16.29	17.00
	802.11ac-VHT40 MCS0	CH 38	5190	16.01	16.64	17.00
		CH 46	5230	16.02	16.65	17.00
	802.11ac-VHT80 MCS0	CH 42	5210	16.06	17.27	17.50



<WLAN 5.8GHz>

5.8GHz WLAN	Mode	Channel	Frequency (MHz)	Test Value	Duty Factor Calculated	Tune-Up Limit
	802.11n-HT20 MCS0	CH 149	5745	16.02	16.35	17.00
		CH 157	5785	16.09	16.42	17.00
		CH 165	5825	16.10	16.43	17.00
	802.11n-HT40 MCS0	CH 151	5755	15.60	16.23	17.00
		CH 159	5795	15.51	16.14	17.00
	802.11ac-VHT20 MCS0	CH 149	5745	15.98	16.30	17.00
		CH 157	5785	16.09	16.41	17.00
		CH 165	5825	15.96	16.28	17.00
	802.11ac-VHT40 MCS0	CH 151	5755	16.08	16.71	17.00
		CH 159	5795	16.06	16.69	17.00
	802.11ac-VHT80 MCS0	CH 155	5775	16.06	17.27	17.50

**➤ Bluetooth Output Power**

Mode	Channel	Frequency (MHz)	Average power (dBm)					
			1Mbps		2Mbps		3Mbps	
			Test Value	Duty Factor Calculated	Test Value	Duty Factor Calculated	Test Value	Duty Factor Calculated
BR / EDR	CH 00	2402	4.09	5.24	1.00	2.13	1.07	2.20
	CH 39	2441	4.47	5.62	1.24	2.37	1.24	2.37
	CH 78	2480	4.26	5.41	1.05	2.18	1.17	2.30
Tune-up Limit (dBm)			5.00	6.00	2.00	3.00	2.00	3.00

Mode	Channel	Frequency (MHz)	Average power (dBm)	
			GFSK	
			Test Value	Duty Factor Calculated
LE	CH 00	2402	2.08	4.12
	CH 19	2440	2.27	4.31
	CH 39	2480	1.77	3.81
Tune-up Limit (dBm)			3.00	5.00

➤ Z-wave Output Power

Mode	Frequency (MHz)	Average power (dBm)	
		Test Value	Duty Factor Calculated
Z-wave	908.40	-15.83	1.34
	908.42	-15.98	1.19
	916.00	-15.53	-5.27
Tune-up Limit (dBm)		-15.00	2.00

➤ **900MHz Output Power**

Mode	Frequency (MHz)	Average power (dBm)	
		Test Value	Duty Factor Calculated
900MHz	904	-3.75	17.99
	912	-2.65	19.09
	922	-1.80	19.94
Tune-up Limit (dBm)		-1.00	20.50

Note:

The output power of WLAN & Bluetooth & Z-wave & 900MHz is derived from the report SZ20120328W03/04/05/06/07/08.

5. RF Exposure Assessment

➤ Standalone Transmission Assessment:

Bands	Frequency (MHz)	Maximum Tune-up Power (dBm)	Antenna Gain (dBi)	EIRP (mW)	Power Density (mW/cm ²)	Limit for MPE (mW/cm ²)
LTE Band 4	1745	24.50	1.24	374.973	0.075	1.000
LTE Band 13	782	24.50	0.89	345.939	0.069	0.521
WLAN 2.4GHz	2462	19.50	3.13	183.231	0.032	1.000
WLAN 5.2GHz	5210	17.50	0.75	66.834	0.013	1.000
WLAN 5.8GHz	5775	17.50	0.32	60.534	0.012	1.000
Bluetooth	2441	6.00	3.13	8.185	0.002	1.000
Z-wave	908.40	2.00	1.35	2.163	0.000	0.606
900MHz	922	20.50	0.02	112.720	0.022	0.615

Note:

1. According to KDB 447498, SAR test exclusion conditions are based on source-based time-averaged maximum conducted output power of the RF channel requiring assessment, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions.
2. MPE calculate method

$$\text{Power Density} = \text{EIRP} / 4\pi R^2$$

Where: $\text{EIRP} = P + G$

P = Output Power (dBm)

G = Antenna Gain (dBi)

R = Separation Distance (20cm)



➤ **Simultaneous Transmission Assessment:**

Multi-Band Simultaneous Transmission Consideration

Simultaneous Transmission Consideration	Applicable Combination
	WWAN + WLAN 2.4GHz
	WWAN + WLAN 5GHz
	WWAN + Bluetooth
	WLAN + Z-wave
	WLAN + 900MHz
	WWAN + WLAN + Z-wave + 900MHz
	WWAN + Bluetooth + Z-wave + 900MHz

1. This device contains transmitters that may be operated simultaneously, therefore simultaneous transmission analysis is required.
2. The worst condition for WWAN & WLAN/Bluetooth & Z-wave & 900MHz will be calculated for transmitting simultaneously.

Formula: $\text{Result} = \text{Power density}_1 / \text{limit}_1 + \text{Power density}_2 / \text{limit}_2 + \text{Power density}_3 / \text{limit}_3 + \text{Power density}_4 / \text{limit}_4 \leq 1$.

Transmission Bands	Power Density/ SAR	Limit	Simultaneous Transmission Result
WWAN	0.075	1	0.143
WLAN/Bluetooth	0.032	1	
Z-wave	0.000	0.606	
900MHz	0.022	0.615	

➤ **Conclusion:**

According to 47 CFR §2.1091, this device complies with human exposure basic restrictions.



Annex A General Information

1. Identification of the Responsible Testing Laboratory

Laboratory Name:	Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory
Laboratory Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, Guangdong Province, P. R. China
Telephone:	+86 755 36698555
Facsimile:	+86 755 36698525

2. Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, Guangdong Province, P. R. China

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