REPORT No.: SZ19050100S01

RF EXPOSURE

EVALUATION REPORT

APPLICANT	:	dormakaba EAD GmbH
PRODUCT NAME	:	data collection terminal
MODEL NAME	:	9600-K6 BLE WiFi
BRAND NAME	:	dormakaba
FCC ID	:	NVI-KT9600K6BWL
STANDARD(S)	:	47CFR 2.1091 KDB 447498
RECEIPT DATE	:	2019-05-20
TEST DATE	:	2019-10-29 to 2019-11-06
ISSUE DATE	:	2019-11-21

Edited by: Liang Yumei (Rapporteur)

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MORLAB

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DIRECTORY

Change history		
Version	**Date**	**Reason of changed**
1.0	2019-11-21	Original

1. Technical Information

Note: Provide by manufacturer.

1.1 Applicant and Manufacturer Information

Applicant:	dormakaba EAD GmbH
Applicant Address:	Albertistr. 3, 78056 Villingen-Schwenningen, Germany
Manufacturer:	In-Tech Electronics Ltd
Manufacturer Address:	Unit A,13/F, Wing Tai Centre,12 Hing Yip Street, Kwun Tong Kowloon, Hong Kong

1.2 Equipment under Test (EUT) Description

EUT Name:	data collection terminal
Hardware Version:	02
Software Version:	V5
Frequency Bands:	WLAN 2.4GHz: 2412 MHz ~ 2462 MHz WLAN 5.2GHz: 5180 MHz ~ 5240 MHz WLAN 5.3GHz: 5260 MHz ~ 5320 MHz WLAN 5.5GHz: 5500 MHz ~ 5720 MHz WLAN 5.8GHz: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz RFID: 13.56MHz
Modulation Mode:	802.11b: DSSS 802.11a/g/n-HT20/HT40: OFDM Bluetooth LE: GFSK ASK
Antenna Type:	PCB Antenna
Antenna Gain:	WLAN 2.4GHz: 4.4 dBi WLAN 5GHz: 5.1 dBi Bluetooth: 0.35 dBi

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 Evaluation: mobile devices	No deviation
2	KDB 447498 D01v06	General RF Exposure Guidance	No deviation

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. RF Output Power

<WLAN 2.4GHz>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-up Power	Duty Cycle %
2.4GHz WLAN	802.11b 1Mbps	CH 1	2412	**13.09**	**13.5**	100.00
		CH 6	2437	12.45	13.0	
		CH 11	2462	12.28	13.0	
	802.11g 6Mbps	CH 1	2412	11.24	12.0	100.00
		CH 6	2437	10.66	11.0	
		CH 11	2462	10.37	11.0	
	802.11n-HT20 MCS0	CH 1	2412	11.28	11.5	100.00
		CH 6	2437	10.61	11.0	
		CH 11	2462	10.28	11.0	
	802.11n-HT40 MCS0	CH 3	2422	9.81	10.0	100.00
		CH 7	2442	9.38	10.0	
		CH 11	2462	9.15	10.0	

<WLAN 5GHz>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-up Power	Duty Cycle %
5.2GHz WLAN	802.11a 1Mbps	CH 36	5180	12.68	13.0	100.00
		CH 44	5220	12.07	13.0	
		CH 48	5240	12.16	13.0	
	802.11n-HT20 MCS0	CH 36	5180	**12.86**	**13.0**	100.00
		CH 44	5220	12.39	13.0	
		CH 48	5240	12.40	13.0	
	802.11n-HT40 MCS0	CH 38	5190	13.26	13.5	100.00
		CH 46	5230	12.45	13.0	
		CH 36	5180	12.68	13.0	

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-up Power	Duty Cycle %
5.3GHz WLAN	802.11a 1Mbps	CH 52	5260	12.20	13.0	100.00
		CH 60	5300	12.23	13.0	
		CH 64	5320	**12.52**	**13.0**	
	802.11n-HT20 MCS0	CH 52	5260	12.31	13.0	100.00
		CH 60	5300	12.48	13.0	
		CH 64	5320	12.42	13.0	
	802.11n-HT40 MCS0	CH 54	5270	12.26	13.0	100.00
		CH 62	5310	12.72	13.0	
		CH 52	5260	12.20	13.0	

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-up Power	Duty Cycle %
5.5GHz WLAN	802.11a 1Mbps	CH 100	5500	13.68	14.0	100.00
		CH 120	5600	12.58	13.0	
		CH 144	5720	12.71	13.0	
	802.11n-HT20 MCS0	CH 100	5500	**13.96**	**14.5**	100.00
		CH 120	5600	12.52	13.0	
		CH 144	5720	12.57	13.0	
	802.11n-HT40 MCS0	CH 102	5510	13.75	14.0	100.00
		CH 126	5630	12.63	13.0	
		CH 142	5710	12.35	13.0	

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-up Power	Duty Cycle %
5.5GHz WLAN	802.11a 1Mbps	CH 149	5745	12.92	13.5	100.00
		CH 157	5785	13.26	13.5	
		CH 165	5825	13.27	13.5	
	802.11n-HT20 MCS0	CH 149	5745	12.37	13.0	100.00
		CH 157	5785	**13.56**	**14.0**	
		CH 165	5825	13.49	14.0	
	802.11n-HT40 MCS0	CH 151	5755	12.84	13.5	100.00
		CH 159	5795	12.88	13.5	
		CH 149	5745	12.92	13.5	

<Bluetooth>

Mode	Channel	Frequency (MHz)	Average power (dBm)
			GFSK
LE	CH 00	2402	**2.51**
	CH 19	2440	2.39
	CH 39	2480	2.42
Tune-up Limit			3.0

<RFID 13.56MHz>

E(dBμV/m)	E(V/m)	d(m)	EIRP
33.07	0.000045	3	0.000001

Note：

1. The maximum radiated emission at 13.56MHz refers from RF report NO. SZ19050100W03.
2. The modular for RFID approach to certain low power transmitters that has low radiation, therefore the power density of RFID mode closes to zero.

4. RF Exposure Evaluation

➢ **Standalone Transmission Evaluation:**

Bands	Frequency (MHz)	Maximum Tune-up Power (dBm)	Antenna Gain (dBi)	EIRP (mW)	Power Density (mW/cm²)	Limit for MPE (mW/cm²)
WLAN 2.4GHz	2412	13.5	4.4	61.66	0.012	1.0
WLAN 5GHz	5500	14.5	5.1	91.2	0.018	1.0
Bluetooth	2402	3.0	0.35	1.08	0.002	1.0

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 evaluation, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions.
2. For 5GHz WLAN, only the worst case will be used for calculating the power density.
3. MPE calculate method

Power Density = EIRP/4πR²

Where: EIRP = P+G

P = Output Power (dBm)

G = Antenna Gain (dBi)

R = Separation Distance (20cm)

➢ **Simultaneous Transmission Evaluation:**

Multi-Band Simultaneous Transmission Consideration

Simultaneous Transmission Consideration	Position	Applicable Combination
	Hand/Body	WLAN 2.4GHz+ Bluetooth + RFID
		WLAN 5GHz+ Bluetooth + RFID

1. This device contains transmitters that may operate simultaneously, therefore simultaneous transmission analysis is required.
2. The worst condition for WLAN & Bluetooth & RFID will be calculated for transmitting simultaneously.

Formula: Result=Power density $_1$/ limit $_1$ + Power density $_2$/ limit $_2$ + Power density $_3$/ limit $_3$ ≤1.

Transmission Bands	Power Density/ SAR	Limit	Simultaneous Transmission Result
WLAN 5GHz	0.018	1	0.02
Bluetooth	0.002	1	
RFID 13.56MHz	0	0.979	

➢ **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
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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

END OF REPORT