REPORT No.：SZ19090175S01

RF EXPOSURE

ASSESSMENT REPORT

APPLICANT	:	DALU Robotech Technology (Beijing) Co., Ltd.
PRODUCT NAME	:	ANDI-Security Inspection Robot
MODEL NAME	:	ANDI-III
BRAND NAME	:	ANDI
FCC ID	:	2AVH4DLZYROBOT15422
STANDARD(S)	:	47CFR 2.1091 KDB 447498
RECEIPT DATE	:	2020-01-07
TEST DATE	:	2020-03-20
ISSUE DATE	:	2020-06-09

Edited by: Liang Yumei (Rapporteur)

Approved by: Peng Huarui (Supervisor)

MORLAB

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DIRECTORY

Change history		
Version	**Date**	**Reason of Changed**
1.0	2020-06-09	First edition

1. Technical Information

Note: Provide by applicant.

1.1 Applicant and Manufacturer Information

Applicant:	DALU Robotech Technology (Beijing) Co., Ltd.
Applicant Address:	Room 1905-2, Building1, No.32 North Xizhimen Street, Haidian District, Beijing, China
Manufacturer:	Suzhou DALU Robotech Technology Co., Ltd.
Manufacturer Address:	No.80 Lianfeng Road, Changfu Street, Changshu City,Suzhou City, Jiangsu Province, China

1.2 Equipment under Test (EUT) Description

EUT Name:	ANDI-Security Inspection Robot
Hardware Version:	20191106
Software Version:	v1.2.0
Frequency Bands:	WLAN 2.4GHz: 2412 MHz ~ 2472 MHz WLAN 5.2GHz: 5180 MHz ~ 5240 MHz WLAN 5.3GHz: 5260 MHz ~ 5320 MHz WLAN 5.5GHz: 5500 MHz ~ 5700 MHz WLAN 5.8GHz: 5745 MHz ~ 5825 MHz
Modulation Mode:	802.11b: DSSS 802.11g/n-HT20/40: OFDM 802.11a/ac-VHT20/40/80: OFDM
Antenna Type:	WLAN: Whip Antenna
Antenna Gain:	WLAN 2.4GHz: 2.5dBi WLAN 5GHz: 4dBi

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. RF Output Power

<WLAN 2.4GHz ANT 0>

	Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN ANT 0	802.11b 1Mbps	CH 1	2412	13.13	13.50	97.64
		CH 6	2437	13.86	14.50	
		CH 11	2462	14.55	15.00	
	802.11g 6Mbps	CH 1	2412	13.67	14.00	87.27
		CH 6	2437	13.53	14.00	
		CH 11	2462	14.11	14.50	
	802.11n-HT20 MCS0	CH 1	2412	12.36	13.00	87.10
		CH 6	2437	12.42	13.00	
		CH 11	2462	12.93	13.50	
	802.11n-HT40 MCS0	CH 3	2422	11.61	12.00	63.59
		CH 6	2437	11.73	12.00	
		CH 9	2452	12.30	12.50	

<WLAN 5.2GHz ANT 0>

	Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-Up Limit	Duty Cycle %
5.2GHz WLAN ANT 0	802.11a 6Mbps	CH 36	5180	12.94	13.50	100.00
		CH 40	5200	12.87	13.50	
		CH 48	5240	12.96	13.50	
	802.11n-HT20 MCS0	CH 36	5180	13.24	13.50	100.00
		CH 40	5200	13.16	13.50	
		CH 48	5240	13.40	13.50	
	802.11n-HT40 MCS0	CH 38	5190	12.96	13.50	100.00
		CH 46	5230	12.87	13.50	
	802.11ac-VHT20 MCS0	CH 36	5180	12.34	13.00	100.00
		CH 40	5200	12.43	13.00	
		CH 48	5240	12.46	13.00	
	802.11ac-VHT40 MCS0	CH 38	5190	13.06	13.50	100.00
		CH 46	5230	13.09	13.50	
	802.11ac-VHT80 MCS0	CH 42	5210	12.97	13.50	100.00

<WLAN 5.3GHz ANT 0>

	Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-Up Limit	Duty Cycle %
5.3GHz WLAN ANT 0	802.11a 6Mbps	CH 52	5260	11.52	12.00	100.00
		CH 60	5300	11.43	12.00	
		CH 64	5320	11.36	12.00	
	802.11n-HT20 MCS0	CH 52	5260	12.10	12.50	100.00
		CH 60	5300	12.12	12.50	
		CH 64	5320	12.17	12.50	
	802.11n-HT40 MCS0	CH 54	5270	11.62	12.50	100.00
		CH 62	5310	11.76	12.50	
	802.11ac-VHT20 MCS0	CH 52	5260	11.85	12.50	100.00
		CH 60	5300	11.97	12.50	
		CH 64	5320	11.76	12.50	
	802.11ac-VHT40 MCS0	CH 54	5270	12.14	12.50	100.00
		CH 62	5310	12.21	12.50	
	802.11ac-VHT80 MCS0	CH 58	5290	11.84	12.50	100.00

<WLAN 5.5GHz ANT 0>

	Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-Up Limit	Duty Cycle %
5.5GHz WLAN ANT 0	802.11a 6Mbps	CH 100	5500	11.14	12.00	100.00
		CH 120	5600	11.43	12.00	
		CH 144	5720	11.36	12.00	
	802.11n-HT20 MCS0	CH 100	5500	11.45	12.00	100.00
		CH 120	5600	11.57	12.00	
		CH 144	5720	11.62	12.00	
	802.11n-HT40 MCS0	CH 102	5510	11.27	12.00	100.00
		CH 118	5590	11.32	12.00	
		CH 142	5710	11.26	12.00	
	802.11ac-VHT20 MCS0	CH 100	5500	11.28	12.00	100.00
		CH 120	5600	11.34	12.00	
		CH 144	5720	11.12	12.00	
	802.11ac-VHT40	CH 102	5510	11.55	12.00	100.00

	MCS0	CH 118	5590	11.46	12.00	
		CH 142	5710	11.62	12.00	
	802.11ac-VHT80 MCS0	CH 106	5530	11.42	12.00	100.00
		CH 138	5690	11.54	12.00	

<WLAN 5.8GHz ANT 0>

	Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-Up Limit	Duty Cycle %
5.8GHz WLAN ANT 0	802.11a MCS0	CH 149	5745	15.29	15.50	100.00
		CH 157	5785	15.12	15.50	
		CH 165	5825	15.30	15.50	
	802.11n-HT20 MCS0	CH 149	5745	15.83	16.50	100.00
		CH 157	5785	15.76	16.50	
		CH 165	5825	15.86	16.50	
	802.11n-HT40 MCS0	CH 151	5755	15.57	16.00	100.00
		CH 159	5795	15.63	16.00	
	802.11ac-VHT20 MCS0	CH 149	5745	15.46	16.00	100.00
		CH 157	5785	15.32	15.50	
		CH 165	5825	15.40	15.50	
	802.11ac-VHT40 MCS0	CH 151	5755	15.79	16.00	100.00
		CH 159	5795	15.70	16.00	
	802.11ac-VHT80 MCS0	CH 155	5775	15.32	16.00	100.00

<WLAN 2.4GHz ANT 1>

	Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN ANT 1	802.11b 1Mbps	CH 1	2412	12.75	13.00	97.64
		CH 6	2437	12.88	13.00	
		CH 11	2462	12.57	13.00	
	802.11g 6Mbps	CH 1	2412	12.36	12.50	87.27
		CH 6	2437	12.40	12.50	
		CH 11	2462	12.03	12.50	
	802.11n-HT20 MCS0	CH 1	2412	11.72	12.50	87.10
		CH 6	2437	11.84	12.50	
		CH 11	2462	11.37	11.50	

	802.11n-HT40 MCS0	CH 3	2422	10.04	10.50	63.59
		CH 6	2437	10.12	10.50	
		CH 9	2452	9.68	10.50	

<WLAN 5.2GHz ANT 1>

	Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-Up Limit	Duty Cycle %
5.2GHz WLAN ANT 1	802.11a 6Mbps	CH 36	5180	14.60	15.00	100.00
		CH 40	5200	14.56	15.00	
		CH 48	5240	14.52	15.00	
	802.11n-HT20 MCS0	CH 36	5180	16.33	17.00	100.00
		CH 40	5200	16.43	17.00	
		CH 48	5240	16.51	17.00	
	802.11n-HT40 MCS0	CH 38	5190	16.02	16.50	100.00
		CH 46	5230	16.21	16.50	
	802.11ac-VHT20 MCS0	CH 36	5180	15.96	16.50	100.00
		CH 40	5200	15.76	16.50	
		CH 48	5240	15.54	16.00	
	802.11ac-VHT40 MCS0	CH 38	5190	15.50	16.00	100.00
		CH 46	5230	15.32	16.00	
	802.11ac-VHT80 MCS0	CH 42	5210	15.68	16.00	100.00

<WLAN 5.3GHz ANT 1>

	Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-Up Limit	Duty Cycle %
5.3GHz WLAN ANT 1	802.11a 6Mbps	CH 52	5260	15.26	15.50	100.00
		CH 60	5300	15.33	15.50	
		CH 64	5320	15.28	15.50	
	802.11n-HT20 MCS0	CH 52	5260	16.78	17.00	100.00
		CH 60	5300	16.67	17.00	
		CH 64	5320	16.53	17.00	
	802.11n-HT40 MCS0	CH 54	5270	15.87	16.00	100.00
		CH 62	5310	15.74	16.00	
	802.11ac-VHT20 MCS0	CH 52	5260	16.59	17.00	100.00
		CH 60	5300	16.42	17.00	

		CH 64	5320	16.23	16.50	
	802.11ac-VHT40 MCS0	CH 54	5270	15.87	16.50	100.00
		CH 62	5310	15.65	16.50	
	802.11ac-VHT80 MCS0	CH 58	5290	15.73	16.50	100.00

<WLAN 5.5GHz ANT 1>

	Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-Up Limit	Duty Cycle %
5.5GHz WLAN ANT 1	802.11a 6Mbps	CH 100	5500	15.18	15.50	100.00
		CH 116	5580	15.24	15.50	
		CH 144	5720	15.31	15.50	
	802.11n-HT20 MCS0	CH 100	5500	14.76	15.50	100.00
		CH 116	5580	14.43	15.00	
		CH 144	5720	14.65	15.00	
	802.11n-HT40 MCS0	CH 102	5510	14.50	15.00	100.00
		CH 118	5590	14.33	14.50	
		CH 142	5710	14.43	15.00	
	802.11ac-VHT20 MCS0	CH 100	5500	14.66	15.00	100.00
		CH 116	5580	14.63	15.00	
		CH 144	5720	14.52	15.00	
	802.11ac-VHT40 MCS0	CH 102	5510	14.16	14.50	100.00
		CH 118	5590	14.02	14.50	
		CH 142	5710	14.24	14.50	
	802.11ac-VHT80 MCS0	CH 106	5530	14.55	15.00	100.00
		CH 138	5690	14.42	14.50	

<WLAN 5.8GHz ANT 1>

	Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-Up Limit	Duty Cycle %
5.8GHz WLAN ANT 1	802.11a MCS0	CH 149	5745	17.78	18.00	100.00
		CH 157	5785	17.69	18.00	
		CH 165	5825	17.95	18.50	
	802.11n-HT20 MCS0	CH 149	5745	17.70	18.00	100.00
		CH 157	5785	17.67	18.00	
		CH 165	5825	17.87	18.00	
	802.11n-HT40 MCS0	CH 151	5755	17.54	18.00	100.00
		CH 159	5795	17.31	17.50	
	802.11ac-VHT20 MCS0	CH 149	5745	17.58	18.00	100.00
		CH 157	5785	17.25	17.50	
		CH 165	5825	17.37	17.50	
	802.11ac-VHT40 MCS0	CH 151	5755	17.36	17.50	100.00
		CH 159	5795	17.21	17.50	
	802.11ac-VHT80 MCS0	CH 155	5775	17.82	18.00	100.00

<2.4GHz WLAN ANT 0+1>

	Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN ANT 0+1	802.11n-HT20 MCS0	CH 1	2412	15.66	16.00	87.10
		CH 6	2437	15.75	16.00	
		CH 11	2462	15.83	16.00	
	802.11n-HT40 MCS0	CH 3	2422	15.87	16.00	63.59
		CH 6	2437	15.98	16.50	
		CH 9	2452	16.16	16.50	

<5.2GHz WLAN ANT 0+1>

	Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-Up Limit	Duty Cycle %
5.2GHz WLAN ANT 0+1	802.11a 6Mbps	CH 36	5180	16.90	17.00	100.00
		CH 40	5200	16.81	17.00	
		CH 48	5240	16.81	17.00	
	802.11n-HT20 MCS0	CH 36	5180	18.06	18.50	100.00
		CH 40	5200	18.13	18.50	
		CH 48	5240	18.26	18.50	
	802.11n-HT40 MCS0	CH 38	5190	17.78	18.50	100.00
		CH 46	5230	17.85	18.50	
	802.11ac-VHT20 MCS0	CH 36	5180	17.56	18.00	100.00
		CH 40	5200	17.40	18.00	
		CH 48	5240	17.24	17.50	
	802.11ac-VHT40 MCS0	CH 38	5190	17.48	18.00	100.00
		CH 46	5230	17.32	17.50	
	802.11ac-VHT80 MCS0	CH 42	5210	17.56	18.00	100.00

<5.32GHz WLAN ANT 0+1>

	Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-Up Limit	Duty Cycle %
5.3GHz WLAN ANT 0+1	802.11a 6Mbps	CH 52	5260	16.81	17.00	100.00
		CH 60	5300	16.81	17.00	
		CH 64	5320	16.72	17.00	
	802.11n-HT20 MCS0	CH 52	5260	18.06	18.50	100.00
		CH 60	5300	17.99	18.50	
		CH 64	5320	17.85	18.50	
	802.11n-HT40 MCS0	CH 54	5270	17.24	18.00	100.00
		CH 62	5310	17.16	18.00	
	802.11ac-VHT20 MCS0	CH 52	5260	17.85	18.00	100.00
		CH 60	5300	17.78	18.00	
		CH 64	5320	17.56	18.00	
	802.11ac-VHT40 MCS0	CH 54	5270	17.40	18.00	100.00
		CH 62	5310	17.24	17.50	
	802.11ac-VHT80	CH 58	5290	17.24	17.50	100.00

	MCS0					

<5.5GHz WLAN ANT 0+1>

	Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-Up Limit	Duty Cycle %
5.5GHz WLAN ANT 0+1	802.11a 6Mbps	CH 100	5500	16.63	17.00	100.00
		CH 116	5580	16.72	17.50	
		CH 144	5720	16.81	17.50	
	802.11n-HT20 MCS0	CH 100	5500	16.43	16.50	100.00
		CH 116	5580	16.23	16.50	
		CH 144	5720	16.43	16.50	
	802.11n-HT40 MCS0	CH 102	5510	16.23	16.50	100.00
		CH 118	5590	16.13	16.50	
		CH 142	5710	16.13	16.50	
	802.11ac-VHT20 MCS0	CH 100	5500	16.33	16.50	100.00
		CH 116	5580	16.33	16.50	
		CH 144	5720	16.13	16.50	
	802.11ac-VHT40 MCS0	CH 102	5510	16.02	16.50	100.00
		CH 118	5590	15.91	16.50	
		CH 142	5710	16.13	16.50	
	802.11ac-VHT80 MCS0	CH 106	5530	16.23	16.50	100.00
		CH 138	5690	16.23	16.50	

<5.8GHz WLAN ANT 0+1>

	Mode	Channel	Frequency (MHz)	Average Power (dBm)	Tune-Up Limit	Duty Cycle %
5.8GHz WLAN ANT 1+2	802.11a MCS0	CH 149	5745	19.73	20.00	100.00
		CH 157	5785	19.59	20.00	
		CH 165	5825	19.82	20.50	
	802.11n-HT20 MCS0	CH 149	5745	19.87	20.50	100.00
		CH 157	5785	19.82	20.50	
		CH 165	5825	20.00	20.50	
	802.11n-HT40 MCS0	CH 151	5755	19.68	20.50	100.00
		CH 159	5795	19.54	20.00	
	802.11ac-VHT20 MCS0	CH 149	5745	19.64	20.00	100.00
		CH 157	5785	19.40	20.00	

		CH 165	5825	19.49	20.00	
	802.11ac-VHT40 MCS0	CH 151	5755	19.64	20.00	100.00
		CH 159	5795	19.54	20.00	
	802.11ac-VHT80 MCS0	CH 155	5775	19.78	20.00	100.00

Note：The output power of WLAN is derived from the report SZ19090175W03/W04/W05.

4. RF Exposure Assessment

➢ **Standalone Transmission Assessment:**

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	2462	15.00	2.5	56.234	0.011	1.0
WLAN 5GHz	5825	18.50	4	177.828	0.035	1.0
2.4GHz WLAN ANT 0+1	2452	16.50	2.5	79.433	0.032	1.0
5GHz WLAN ANT 0+1	5825	20.50	4	281.838	0.056	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 assessment, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions.
2. MPE calculate method

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

Where: 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
	2.4GHz WLAN ANT 0+1
	5GHz WLAN ANT 0+1

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

Transmission Bands	Simultaneous Transmission Result
2.4GHz WLAN ANT 0+1	0.032
5GHz WLAN ANT 0+1	0.056

➢ **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
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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

3. Facilities and Accreditations

All measurement facilities used to collect the measurement data are located at FL.3, Building A, FeiYang Science Park, Block 67, BaoAn District, Shenzhen, 518101 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.10-2013 and CISPR Publication 22; the FCC designation number is CN1192, the test firm registration number is 226174.

END OF REPORT