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# User manual

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**Arcadyan Model: AIOS4.0S, AIOS4.0V, AIOS4.0R, AIOS4.0F**

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# 0. SUMMARY OF THIS PRODUCT

This product is AIOS-4.0X. There are 4 types of different audio product, AIOS4.0S, AIOS4.0V, AIOS4.0R, AIOS4.0F

## 1. SPECIFICATION

### 1-1 Basic Specification

2. Item		Contents		
Manufacture		Arcadyan		
Shipment Name		D&M JP	AIOS-4.0X	
		TYM	AIOS-4.0X	
		ANAM	AIOS-4.0X	
Product Name		Wireless LAN Network Module		
Series Name		Lego module		
Model Name	JP	AIOS-4.0		
	US	-		
Chip	SOC		Vendor	Model name
	CPU		Broadcom	BCM58305
	2.4GHz MAC/BB/RF		Broadcom	BCM4356
	2.4GHz PA(Tx)		Refer wireless spec	
	2.4GHz LNA(Rx)		Refer wireless spec	
	2.4GHz BPF(Rx)		Co-layout	
	5GHz MAC/BB/RF		Broadcom	BCM4356
	5GHz PA(Tx)		Refer wireless spec	
	5GHz LNA(Rx)		Refer wireless spec	
	5GHz BPF(Rx)		Co-layout	
	PHY	WAN	None	none
		LAN	Broadcom	BCM58305 internal
OS				
FW	ODM		Arcadyan	
	FW spec		Broadcom SDK AxC-FC2 for function test	
Driver/Utility	Driver		Utility	
	ODM		Arcadyan	
Support Band	Refer wireless spec			
	Item	Link Rate	Number of ports	

	Item	Link Rate	Number of ports
Interface	LAN	10/100M000M	1
	USB	2.0	1
Supply Voltage	5V		
Power consumption	9W		
Weight	Under 78g		
Dimensions	87 x 74 x 1.6mm		
Operating Environment	Temperature	0~70	degC
	Humidity	10~85	% (Non Condensing)
	Temperature	-10~85	degC
	Humidity	10~85	% (Non Condensing)
Design life time	5years at 25 degrees		
Made in	China		

## 1-2 Certification Requirement

### USA

FCC Parts15B/15C/15E

FCC ID Approval( with DFS)

DFS/TPC

FCC Bulletin OET-65C

### Canada

IC certificate

RSS RSS-247 RF report

RSS-102 MPE report

### European

CE EN 300 328/EN 301 893

EN 301 489-1/-17

EN62311

### Japan

ARIB STD-T66 / ARIB STD-T71 TELECOM ID

## 2. Detail Specification

### 2-1. Product Specification

Items		Contents		
CPU	Vendor	Broadcom		
	Parts number	BCM58305		
	Operation frequency	1.25GHz Dual Core		
RAM	Type	DDR3L		
	Width	16bit		
	Operation Freq	1600MHz		
	Capacity	256MB		
ROM	Type	NAND Flash		
	I/O speed	20ns		
	Capacity	4Gb		
Wired LAN	Number of port	2		
	Connector	Type	Color	
	Chip	Vendor	Chip	
		MAC	Broadcom	BCM58305
		PHY	Broadcom	BCM58305
	Standard	10BASE-T/100BASE-Tx/1000BASE-Tx		
USB	-	Standard	USB2.0	-
	-	Bus power	5V	-

### 2-2. FW Product Specification

For detail, refer to FW Specification Requirement sheet

### 2-3. I/O Specification

#### 2-3-1. LED Specification

Items	Name	Color
LED Interface	POWER/DIAG	Green

### 2-3-2. Connector Specification

Items	Contents
Box header connector	Female 40x2p
	Female 21x2p

#### J9091 – 40x2 pin connector

Pin	Define	Pin	Define	Pin	Define	Pin	Define
1	PWM0	2	PWM1	41	SPI0_MISO	42	TDP_PHY0_CH0
3	PWM2	4	VDD5_IN	43	GND	44	GND
5	VDD5_IN	6	VDD5_IN	45	SPI0_CLK	46	SPI0_MOSI
7	MCLK_I2S_0	8	SPDIF_OUT	47	UART1_TX	48	UART1_RTS
9	GND	10	GND	49	UART1_RX	50	UART1_CTS
11	WS_I2S_0	12	SDIN_I2S_0	51	USB2_VBUS_EN	52	PWM3
13	BITCLK_I2S_0	14	SDOUT_I2S_0	53	GPIO_02	54	GPIO_03
15	GND	16	GND	55	GPIO_04	56	GPIO_05
17	WS_I2S_1	18	SDIN_I2S_1	57	GPIO_06	58	GPIO_07
19	BITCLK_I2S_1	20	SDOUT_I2S_1	59	GPIO_08	60	GPIO_09
21	GND	22	GND	61	GPIO_10	62	GPIO_11
23	WS_I2S_2	24	SDIN_I2S_2	63	GPIO_12	64	GPIO_13
25	BITCLK_I2S_2	26	SDOUT_I2S_2	65	GPIO_14	66	GPIO_15
27	GND	28	GND	67	GPIO_16	68	GPIO_17
29	I2C0_SDA	30	USB2_P2_DM	69	GPIO_18	70	GPIO_19
31	I2C0_SCL	32	USB2_P2_DP	71	GPIO_20	72	GPIO_21
33	GND	34	GND	73	GPIO_22	74	RESET_BUTTON
35	I2C1_SDA	36	TDN_PHY0_CH1	75	GPIO_24	76	GPIO_25
37	I2C1_SCL	38	TDP_PHY0_CH1	77	ADC_AUXIN_0	78	ADC_AUXIN_1
39	SPI0_SS	40	TDN_PHY0_CH0	79	ADC_AUXIN_2	80	ADC_AUXIN_3

#### J9092 – 2x21 pin connector

Pin	Define	Pin	Define	Pin	Define	Pin	Define
1	LCD_CLCP	2	GND	23	LCD_CLD15	24	LCD_CLD14
3	GND	4	LCD_CLFP	25	LCD_CLD17	26	LCD_CLD16
5	LCD_CLLP	6	LCD_CLAC	27	LCD_CLD19	28	LCD_CLD18
7	GND	8	LCD_CLD00	29	LCD_CLD21	30	LCD_CLD20
9	LCD_CLD01	10	LCD_CLD02	31	LCD_CLD23	32	LCD_CLD22
11	LCD_CLD03	12	LCD_CLD04	33	GND	34	GND
13	LCD_CLD05	14	LCD_CLD06	35	TDN_PHY1_CH0	36	TDN_PHY1_CH1
15	LCD_CLD07	16	LCD_CLD08	37	TDP_PHY1_CH0	38	TDP_PHY1_CH1

17	LCD_CLD09	18	LCD_CLD10		39	TDN_PHY1_CH2	40	TDN_PHY1_CH3
19	LCD_CLD11	20	GND		41	TDP_PHY1_CH2	42	TDP_PHY1_CH3
21	LCD_CLD13	22	LCD_CLD12					

J4 - Console connector Footprint Pin Define

Pin	Pin Define
1	VDD3_3
2	UART3_TX
3	UART3_RX
4	GND

J2 - JTAG connector Footprint Pin Define

Pin	Pin Define	Pin	Pin Define
1	JTAG_RST	2	GND
3	JTAG_TDI	4	GND
5	JTAG_TDO	6	GND
7	JTAG_TMS	8	GND
9	JTAG_TCK	10	GND
11	SYS_RST_L	12	UART3_TX
13	UART3_RX	14	VDD3_3

● VDD5\_IN SPEC:

Item	Specification
Voltage input range	4.75 – 5.25 V
Nominal trimmed voltage <sup>[1]</sup>	5.0 V
Overshoot/Undershoot with 1A step	±100 mV
Maximum AC RMS at 1A (20 MHz bandwidth)	80 mV
Power on rise time (90%)	3 – 10 ms
Power off quiescent discharge (80%)	2000 ms

[1] The nominal voltage may be trimmed between 5.0 and 5.1 volts to accommodate potential voltage droop in the main board USB supply. The voltage will still remain in the specified voltage range.

2-3-3. GPIO Map

Item	Function	Connect to	I/O	Active	Using GPIO of XXXX
					XXXXX
					CPU
1	GPIO_05		I/O		
2	GPIO_022		I/O		
3	USB2_VBUS_EN		O		
4	GPIO_08		I/O		
5	GPIO_09		I/O		
6	GPIO_10		I/O		

7	GPIO_11		I/O		
8	GPIO_12		I/O		
9	GPIO_13		I/O	-	
10	RF1_GPIO_6		I/O	-	
11	RF1_BT_GPIO_5		I/O		
12	GPIO_14		I/O		
13	GPIO_15		I/O		
14	GPIO_16		I/O		
15	GPIO_17		I/O		
16	GPIO_18		I/O		
17	GPIO_19		I/O		
18	RF2_GPIO_6		I/O		
19	GPIO_21		I/O		
20	MODULE_TYPE_0		I		
21	MODULE_TYPE_1		I		
22	MODULE_TYPE_2		I		
23	GPIO_04		I/O		
24	WL2_REG_ON		O		
25	MODULE_REV0		I		
26	MODULE_REV1		I		
27	MODULE_REV2		I		
28	GPIO_20		I/O		
29	RF1_BT_DEV_WAKE		O		
30	FACTORY_RESET_BUTTON		I		
31	GPIO_07		I/O		
32	GPIO_24		I/O		
33	GPIO_25		I/O		
34	GPIO_02		I/O		
35	GPIO_06		I/O		
36	DSP_DDR_CLK_TERM_EN_L		O		
37	DSP_VDD_EN_L		O		
38	DSP_DDR_EN_L		O		
39	WL1_REG_ON		O		
40	BT1_REG_ON		O		
41	AON_GPIO5		I		

- Logic Input high/low Voltage:



Table 51: Standard 3.3V Signals

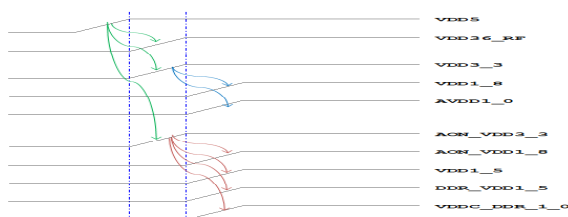
Parameter	Description	Min	Typ	Max	Units
V <sub>IN</sub>	Input voltage	0.3	-	3.6	V
V <sub>IL</sub>	Input low voltage	-	-	0.8	V
V <sub>IH</sub>	Input high voltage	2.0	-	-	V
V <sub>OL</sub>	Output low voltage	-	-	0.4	V
V <sub>OH</sub>	Output high voltage	2.4	-	-	V
C <sub>I</sub>	I/O pin capacitance	-	-	10	pF

● Drive IO Strength

Note that, for I/O Drive Strength Control, the Drive Strength Bit [2:0] filed in the related register are all defined as follows if there is no specific definition.

Drive	bit 2	bit 1	bit 0
2 mA	0	0	0
4 mA	0	0	1
6 mA	0	1	0
8 mA	0	1	1
10 mA	1	0	0
12 mA	1	0	1
14 mA	1	1	0
16 mA	1	1	1

2-3-4. Power Sequence



BCM 58305 Power Sequence Spec	Spec		Measurement
	min(us)	max	
Vdd3_3 ramp-up Time	100	-	711.19us
VDDC_DDR_1_0 ramp-up Time	-	15ms	671.58us
VDD1_35 ramp-up Time	-	15ms	699.80us
DDR_VDD1_35 ramp-up Time	-	15ms	716.31us

BCM 4356 Power Sequence Spec	Spec		Measurement
	min(us)	max	
RF_Vdd3_6 ramp-up Time	40	-	771.95us
RF_dd3_6 up before RF_Vdd3_3	0	-	2.12ms

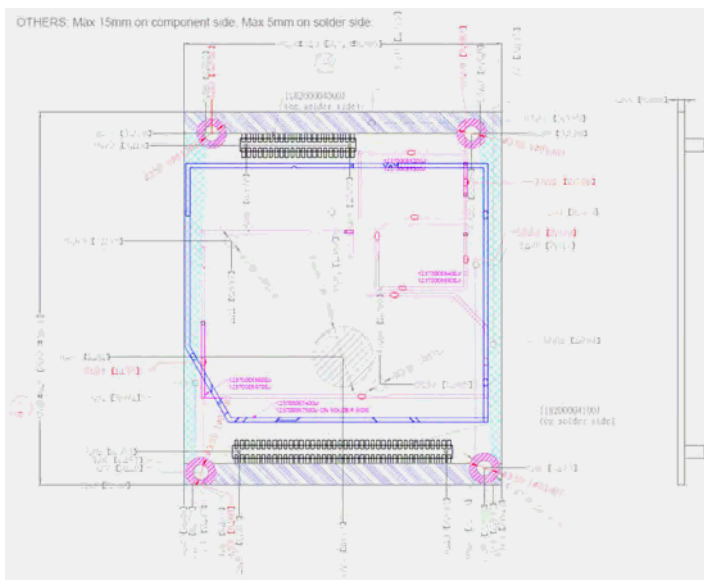
### 2-3-5. Power Consumption

Status	Active		Sleep echo standby > /sys/power/state		Deep Sleep echo mem > /sys/power/state		Power off poweroff	
Power	Irms(mA)	Watt(mW)	Irms(mA)	Watt(mW)	Irms(mA)	Watt(mW)	Irms(mA)	Watt(mW)
5V	518.5	2592.5	396.1	1980.5	87	435	15.3	76.5

### 2-3-6. ESD Transient SPEC

ESD Test SPEC : <1> Contact 4kV  
 <2> Air 8kV

### 2-3-7. PCB Dimension



### 3. Wireless Specification

There are two radios on module, radio 0 and radio 1. Radio 0 include a dual band (2.4 GHz and 5 GHz) WIFI and Bluetooth. Radio 1 is only 5 GHz WIFI.

Radio 0 is a Station (STA), it could have soft-AP function. Soft-AP does not use DFS channel. Radio 1 is a AP.

#### 3-1 Radio 0 specification

Radio 0 include a dual band (2.4 GHz and 5 GHz) WIFI and Bluetooth.

##### 3-1-1 WLAN0 specification

Item	Specification	Remark
Chip	BCM4356	
Interface	PCIe	
Frequency	2400~2483.5 MHz (FCC, CE, JP) 2471~2497 MHz (JP) 5150~5250 MHz (W52, U-NII-1, Band 1) 5250~5350 MHz (W53, U-NII-2A, Band 2) 5470~5725 MHz (W56, U-NII-2C, Band 3) 5725~5850 MHz (W58, U-NII-3, Band 4) DFS support	
Data Rate	IEEE 802.11b: 11, 5.5, 2, 1 Mbps IEEE 802.11a 54, 48, 36, 24,18 ,12, 9, 6 Mbps IEEE 802.11g 54, 48, 36, 24,18 ,12, 9, 6 Mbps IEEE 802.11n HT20 Up to 150 Mbps IEEE 802.11n HT40 Up to 300 Mbps IEEE 802.11ac VHT80 Up to 886.7 Mbps	
MIMO	2T2R	

Receiver Sensitivity	<p><b><u>2.4GHz Band</u></b></p> <p>IEEE 802.11b:          -97 dBm @1 Mbps          -88 dBm @11 Mbps</p> <p>IEEE 802.11g          -92 dBm @6 Mbps          -74 dBm @54 Mbps</p> <p>IEEE 802.11n HT20          -90 dBm @MCS0          -71 dBm @MCS7</p> <p>IEEE 802.11n HT40          -87 dBm @MCS0          -68 dBm @MCS7</p> <p><b><u>5GHz band</u></b></p> <p>IEEE 802.11a          -91 dBm @6 Mbps          -75 dBm @54 Mbps</p> <p>IEEE 802.11n HT20          -91 dBm @MCS0          -72 dBm @MCS7</p> <p>IEEE 802.11n HT40          -89 dBm @MCS0          -69 dBm @MCS7</p> <p>IEEE 802.11ac VHT20          -91 dBm @MCS0          -72 dBm @MCS8</p> <p>IEEE 802.11ac VHT40          -89 dBm @MCS0          -69 dBm @MCS9</p> <p>IEEE 802.11ac VHT80          -86 dBm @MCS0          -61 dBm @MCS7</p>	
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### 3-1-2 Bluetooth specification

Item	Specification	Remark
Chip	BCM4356	
Interface	UART	
Frequency	2400~2483.5 MHz	
Receive sensitivity	-80 dBm	

### 3-2 Radio 1 specification

Radio 1 is only 5 GHz WIFI.

#### 3-2-1 WLAN1 specification

Item	Specification	Remark
Chip	BCM4356	
Interface	PCIe	
Frequency	5150~5250 MHz (W52, U-NII-1, Band 1) 5250~5350 MHz (W53, U-NII-2A, Band 2) 5470~5725 MHz (W56, U-NII-2C, Band 3) 5725~5850 MHz (W58, U-NII-3, Band 4) DFS support	
Data Rate	IEEE 802.11a 54, 48, 36, 24, 18, 12, 9, 6 Mbps IEEE 802.11n HT20 Up to 150 Mbps IEEE 802.11n HT40 Up to 300 Mbps IEEE 802.11ac VHT80 Up to 866.7 Mbps	
MIMO	2T2R	
Receiver Sensitivity	<b>5GHz band</b> IEEE 802.11a -91 dBm @6 Mbps -75 dBm @54 Mbps IEEE 802.11n HT20 -91 dBm @MCS0 -72 dBm @MCS7	

	IEEE 802.11n HT40 -89 dBm @MCS0 -69 dBm @MCS7	
	IEEE 802.11ac VHT20 -91 dBm @MCS0 -72 dBm @MCS8	
	IEEE 802.11ac VHT40 -89 dBm @MCS0 -69 dBm @MCS9	
	IEEE 802.11ac VHT80 -86 dBm @MCS0 -61 dBm @MCS7	

**FCC & IC Statement:**

FCC Statement:

Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate this equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

For product available in the USA/Canada market, only channel 1~11 can be operated. Selection of other channels is not possible.

This device and its antennas(s) must not be co-located or operating in conjunction with any other antenna or transmitter except in accordance with FCC multi-transmitter product procedures.

This device is restricted for indoor use.

#### IMPORTANT NOTE:

##### FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator & your body.

#### IC Statement

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

For product available in the USA/Canada market, only channel 1~11 can be operated. Selection of other channels is not possible.

Pour les produits disponibles aux États-Unis / Canada du marché, seul le canal 1 à 11 peuvent être exploités. Sélection d'autres canaux n'est pas possible.

This device and its antennas(s) must not be co-located or operating in conjunction with any other antenna or transmitter except in accordance with IC multi-transmitter product procedures.

Cet appareil et son antenne (s) ne doit pas être co-localisés ou fonctionnement en association avec une autre antenne ou transmetteur.

Dynamic Frequency Selection (DFS) for devices operating in the bands 5250- 5350 MHz,  
5470-5600 MHz and 5650-5725 MHz

Sélection dynamique de fréquences (DFS) pour les dispositifs fonctionnant dans les bandes 5250-5350 MHz, 5470-5600 MHz et 5650-5725 MHz

The device for operation in the band 5150–5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems.

les dispositifs fonctionnant dans la bande 5150-5250 MHz sont réservés uniquement pour une utilisation à l'intérieur afin de réduire les risques de brouillage préjudiciable aux systèmes de satellites mobiles utilisant les mêmes canaux.

The maximum antenna gain permitted for devices in the bands 5250-5350 MHz and 5470-5725 MHz shall be such that the equipment still complies with the e.i.r.p. limit.

le gain maximal d'antenne permis pour les dispositifs utilisant les bandes 5250-5350 MHz et 5470-5725 MHz doit se conformer à la limite de p.i.r.e.

The maximum antenna gain permitted for devices in the band 5725-5850 MHz shall be such that the equipment still complies with the e.i.r.p. limits specified for point-to-point and non-point-to-point operation as appropriate.

le gain maximal d'antenne permis (pour les dispositifs utilisant la bande 5725-5850 MHz) doit se conformer à la limite de p.i.r.e. spécifiée pour l'exploitation point à point et non point à point, selon le cas.

Users should also be advised that high-power radars are allocated as primary users (i.e. priority users) of the bands 5250-5350 MHz and 5650-5850 MHz and that these radars could cause interference and/or damage to LE-LAN devices.

De plus, les utilisateurs devraient aussi être avisés que les utilisateurs de radars de haute puissance sont désignés utilisateurs principaux (c.-à-d., qu'ils ont la priorité) pour les bandes 5250-5350 MHz et 5650-5850 MHz et que ces radars pourraient causer du brouillage et/ou des dommages aux dispositifs LAN-EL.

For indoor use only.

Pour une utilisation en intérieur uniquement.

#### IMPORTANT NOTE:

##### IC Radiation Exposure Statement:

This equipment complies with IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator & your body.

Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.



This radio transmitter (IC ID: 4711A-AIOS40F) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Le présent émetteur radio (IC ID: 4711A-AIOS40F) a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

Antenna list:

Radio	Set	Brand	P/N	Type	Connector	Gain (dBi)	
						2.4GHz	5GHz
R0	1	Airgain	N2420DG3-T2L-PK1-G30U	PIFA	I-PEX	3.10	3.66
	2	Airgain	N2420DG3-T2L-PK1-G100U	PIFA	I-PEX	3.10	3.66
	3	Airgain	N2420DG3-T2L-PK1-G600U	PIFA	I-PEX	3.10	3.66
	4	Airgain	N2425D-T2L-PK1-G30U	PIFA	I-PEX	1.90	3.50
	5	Airgain	N2425D-T2R-PK1-G150U	PIFA	I-PEX	1.90	3.50
	6	Airgain	N2425D-T2R-PK1-G30U	PIFA	I-PEX	1.90	3.50
	7	Airgain	N2425D-T2R-PK1-G500U	PIFA	I-PEX	1.90	3.50
R1	8	Airgain	N5X20B-T2L-PK1-G100U	PIFA	I-PEX	-	2.90
	9	Airgain	N5X20B-T2L-PK1-G600U	PIFA	I-PEX	-	2.90
Radio	Set	Brand	Model No.	Type	Connector	Gain (dBi)	
						2.4GHz	5GHz
R0/ R1	10	Arcadyan	WN9722A-DM	Dipole	I-PEX	2.94	3.19
	11	Arcadyan	WN9722A-DM-300mm	Dipole	I-PEX	2.76	2.63
	12	Arcadyan	WN9722A-DM-500mm	Dipole	I-PEX	1.99	2.59

Note: The EUT has twelve sets of antenna, and each set contains two antennas.