Application Note

Type 2EA Wi-Fi™ + Bluetooth® Dual-Radio Module

Infineon Chipset CYW55573 for 802.11a/b/g/n/ac/ax 2x2 MIMO + Bluetooth 5.3

Radio Law Certification Application Note - Rev. 3.0

- Design Name: Type 2EA
- P/N: LBEE5XV2EA

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About This Document

Murata's Type 2EA is a small and very high-performance module based on Infineon combo chipset supporting IEEE 802.11a/b/g/n/ac/ax + Bluetooth 5.3 BR/EDR/LE. This application note provides Radio Law Certification user manual. It is designed to ensure that module manufacturers correctly communicate the necessary information to host manufacturers that incorporate their modules. Refer to Type 2EA Datasheet for module specification.

Audience & Purpose

The Intended audience of this document are the manufacturers and host manufacture that will integrate this module to their modules.

Document Conventions

Table 1 describes the document conventions.

Table 1: Document Conventions

Conventions	Description
	Warning Note Indicates very important note. Users are strongly recommended to review.
	Info Note Intended for informational purposes. Users should review.
	Menu Reference Indicates menu navigation instructions. **Example**: Insert➔Tables➔Quick Tables➔Save Selection to Gallery
	External Hyperlink This symbol indicates a hyperlink to an external document or website. **Example**: Murata Click on the text to open the external link.
	Internal Hyperlink This symbol indicates a hyperlink within the document. **Example**: Operating Conditions Click on the text to open the link.
`Console input/output or code snippet`	**Console I/O or Code Snippet** This text ***Style*** denotes console input/output or a code snippet.
`# Console I/O comment` `// Code snippet comment`	**Console I/O or Code Snippet Comment** This text ***Style*** denotes a console input/output or code snippet comment. • Console I/O comment (preceded by "#") is for informational purposes only and does not denote actual console input/output. • Code Snippet comment (preceded by "//") may exist in the original code.

1 General Information for Radio Regulatory Certification

This section contains the following topics:

- Application model part number
- Markings/Dimensions
- Pin Layout
- Operating Conditions
- Package Label
- Country of Origin

1.1 Application Model Part Number

Application model part number: **LBEE5XV2EA**

1.2 Labels

Figure 1 shows the module labels. **Table 2** and **Table 3** describes the labels.

Figure 1: Labels

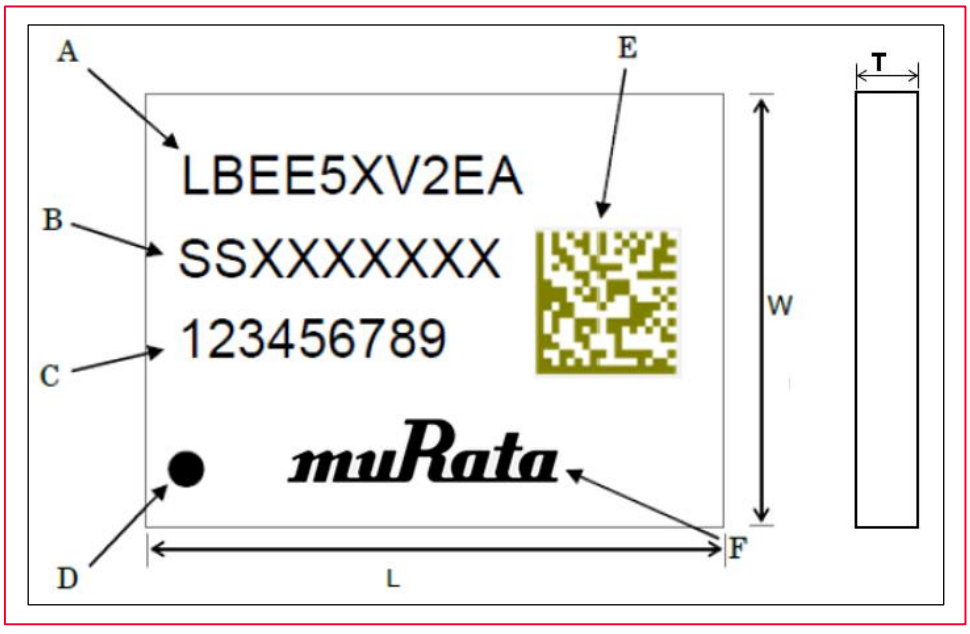


Table 2: Marking Labels

Marking Label	Meaning
A	Model Name abbreviation
B	Lot No.
C	Serial number
D	Pin 1 marking

Marking Label	Meaning
E	2D code
F	Name of manufacture (Murata Logo mark)

Table 3: Dimension Labels

L	W	T
12.5 mm	9.4 mm	1.2 mm

Since there is no space to describe the notational requirements of each country, we are applying for the notational requirements to be posted in the manual or package.

1.3 Pin Layout

Figure 2 shows the pin layout.

Figure 2: Pin Layout

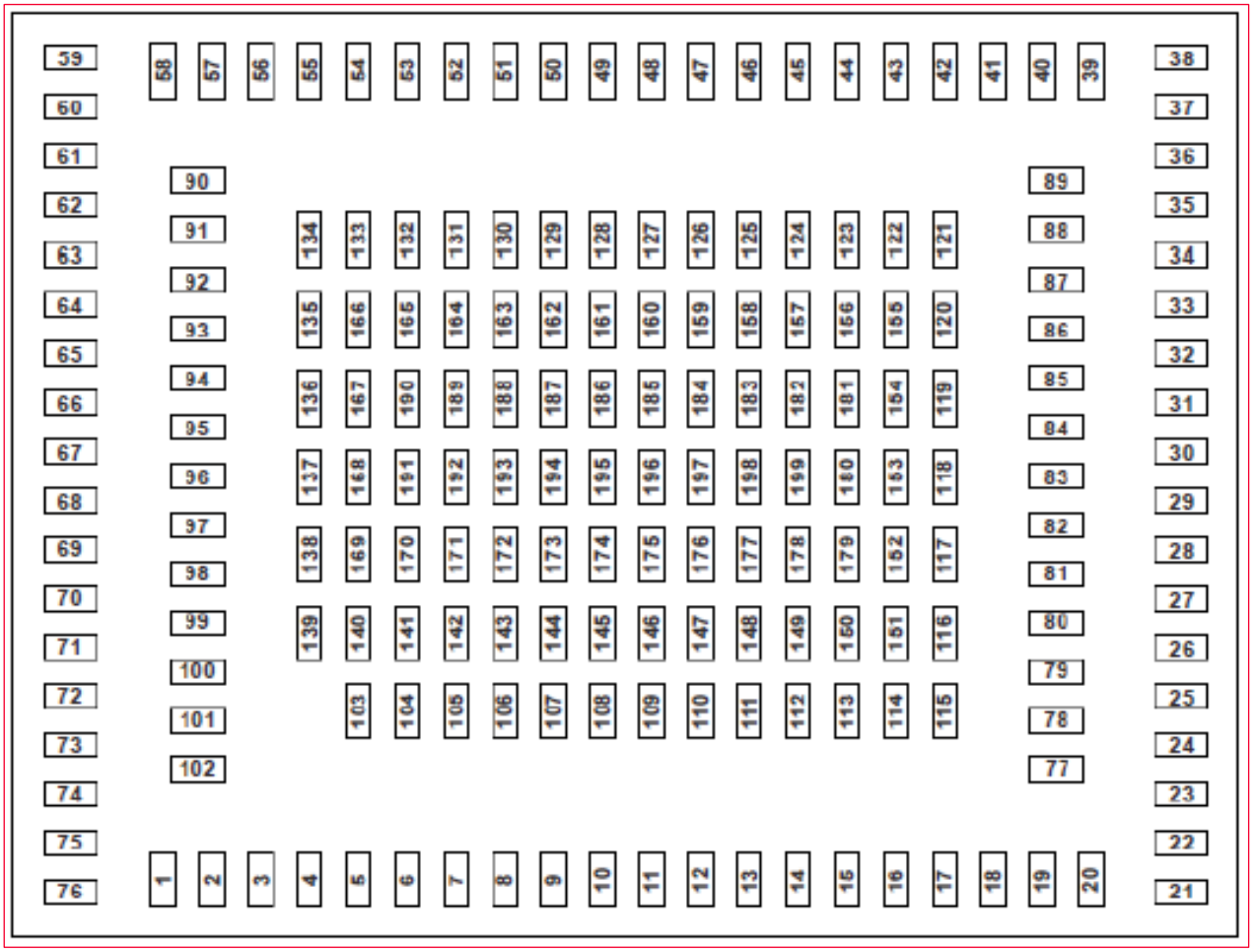


Table 4 describes the pins.

Table 4: Terminal Configurations

No.	Terminal Name	No.	Terminal Name	No.	Terminal Name	No.	Terminal Name
1	PCIE_PERST_L	28	BT_CLK_REQ	55	VDDIO	101	BT_I2S_CLK
2	PCIE_CLKREQ_L	29	GND	56	GND	102	BT_I2S_DI
3	PCIE_PME_L	30	ANT0	57	VBAT_1	103	GND
4	GND	31	GND	58	VBAT_2	104	GND
5	BT_PCM_SYNC	32	LHL_GPIO1	59	GND	105	DMIC_DATA
6	BT_PCM_IN	33	GPIO_10_WL_UART	60	WLREG_ON	106	DMIC_CLK
7	BT_PCM_CLK	34	GPIO_11_WL_UART	61	SDIO_DATA_2	107	GND
8	BT_PCM_OUT	35	GPIO_9_WL_UART	62	SDIO_DATA_0	108	GND
9	GND	36	GND	63	SDIO_DATA_1	109	BT_GPIO_2
10	I2S_DI	37	ANT1	64	SDIO_CMD	110	BT_GPIO_9
11	I2S_MCK	38	GND	65	SDIO_CLK	111	GND
12	I2S_SCK	39	GND	66	SDIO_DATA_3	112	GND
13	I2S_IRCK	40	GPIO_8_WL_UART	67	GND	113	GND
14	I2S_DO	41	GPIO_1_WL_DEV_WAKE	68	PCIE_RDP	114	BT_GPIO_11
15	GND	42	GND	69	PCIE_RDN	115-124	GND
16	BT_UART_RXD	43	GPIO_0_WL_HOST_WAKE	70	GND	125	LHL_GPIO2
17	BT_UART_RTS_N	44	GPIO_7	71	PCIE_TDP	126	LHL_GPIO3
18	BT_UART_TXD	45	BTREG_ON	72	PCIE_TDN	127	LHL_GPIO0
19	BT_UART_CTS_N	46	GND	73	GND	128	RF_SW_CTRL16
20	GND	47	GND	74	PCIE_REFCLKP	129	RF_SW_CTRL14
21	GND	48	GND	75	PCIE_REFCLKN	130	RF_SW_CTRL15
22	BT_OUT	49	GND	76-95	GND	131	GPIO_12
23	GND	50	GND	96	MIC_P	132	GND
24	BT_IN	51	LPO_IN	97	MIC_N	133	GND
25	GND	52	GND	98	GND	134	N.C
26	BT_DEV_WAKE	53	VDDOUT_RF3P3	99	BT_I2S_DO	135-199	GND
27	BT_HOST_WAKE	54	GND	100	BT_I2S_WS		

1.4 Operating Conditions

Table 5 describes the operating conditions.

Table 5: Operating Conditions

Parameter		Minimum	Typical	Maximum	Unit
Operating Temperature		-40	25	85	°C
Supply Voltage	VBAT	3.0	3.3	4.	V
	VDDIO	1.71	1.8	1.89	V

1.5 Package Label

Figure 3 shows the package and **Figure 4** shows an example of the package label.

Figure 3: Package (Humidity-proof packaging)

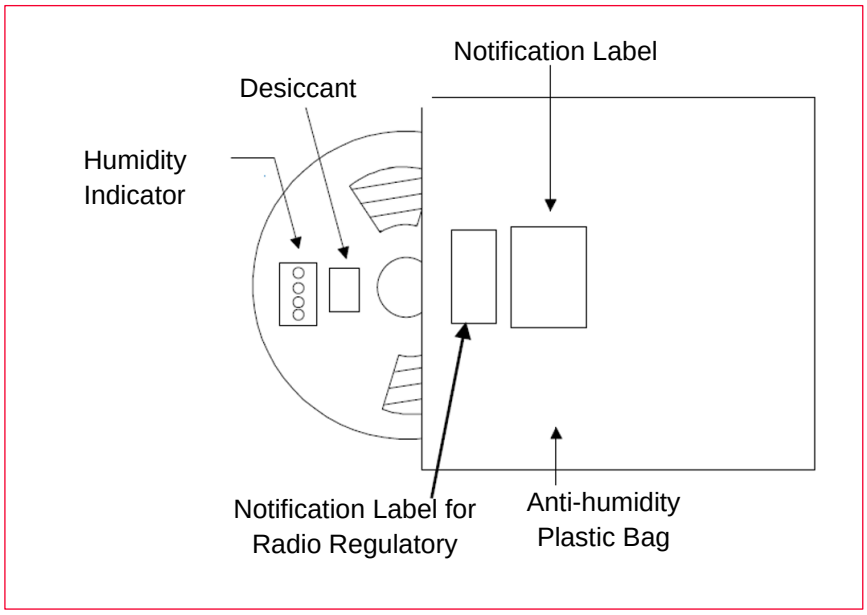


Figure 4: Package Label Display Example

The package label may be attached on one side only.

1.6 Country of Origin

China

SHENZHEN MURATA TECHNOLOGY CO., LTD.

Some countries have applied for certification in two countries, China and Japan, in preparation for future factory changes, but the production site in the delivery specifications is the above-mentioned factory in China.

2 Radio Regulatory Certification Information by Country

This section contains the following country/region specific information:

- FCC (USA)
- ISED (Canada)
- EU
- MIC (Japan)

2.1 FCC

Model Name: LBEE5XV2EA

FCC ID: VPYLBEE5XV2EA

This module is not sold to general end users directly. Therefore, there is no user manual of module. For the details about this module, please refer to the specification sheet of module. This module should be installed in the host device according to the interface specification (installation procedure)

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the end user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as shown in User manual.

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

FCC CAUTION: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This transmitter must not be co-located or operated in conjunction with any other antenna or transmitter.

This device complies with below part 15 of the FCC Rules.

- Part 15 Subpart C
- Part 15 Subpart E

Since there is no space which indicates FCC ID on this module, FCC ID is indicated in a manual. If the FCC ID is not visible when the module is installed inside another device, then the module is installed must also display a label referring to the enclosed module.

The modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

This module is designed for mounting inside of the end product by us professionally. Therefore, it complies with the antenna and transmission system requirements of §15.203.

Since there is no space which indicates FCC ID on this module, FCC ID is indicated in a manual. If the FCC ID is not visible when the module is installed inside another device, then the module is installed must also display a label referring to the enclosed module.

When the 6GHz capability built in,

FCC regulations restrict operation of this device to indoor use only.

The operation of this device is prohibited on oil platforms, cars, trains, boats, and aircraft, except that operation of this device is permitted in large aircraft while flying above 10,000 feet.

Operation of transmitters in the 5.925-7.125 GHz band is prohibited for control of or communications with unmanned aircraft systems.

2.1.1 Setting RF Power

This section describes the RF power settings.

2.1.1.1 RF Power Setting for 2.4 GHz WLAN

Table 6, **Table 7**, **Table 8**, **Table 9** describe the RF power settings for 2.4 GHz WLAN.

Table 6: WLAN RF Power Setting - 2.4 GHz 802.11 b/g/n (SISO) (FCC)

SISO/CDD/MIMO	Mode	Rate/MCS index	Channel	Maximum Tune Up Tolerance (dBm)
SISO	IEEE 802.11b	All Rate	1,2,10,11	15.0 + 2.0
			3~9	18.0 + 2.0
	IEEE 802.11g	All rate	1, 2, 10, 11	13.0 + 2.0
			3, 9	14.0 + 2.0
			4, 5, 8	15.0 + 2.0
			6	17.0 + 2.0
			7	16.0 + 2.0
	IEEE 802.11n (HT20)	All MCS index	1, 2	13.0 + 2.0
			3, 9	14.0 + 2.0
			4, 5, 8	15.0 + 2.0
			6, 7	16.0 + 2.0
			10, 11	12.0 + 2.0

Table 7: WLAN RF Power Setting - 2.4 GHz 802.11b/g/n (CDD/MIMO) (FCC)

SISO/CDD/MIMO	Mode	Rate/MCS index	Channel	Reference Power (dBm)/port	Maximum Tune Up Tolerance (dBm)/2port
CDD	IEEE 802.11b	N/A	N/A	N/A	N/A
	IEEE 802.11g	All rate	1, 2, 10, 11	10.0 + 2.0	13.0 + 2.0
			3 ~ 9	14.0 + 2.0	17.0 + 2.0
CDD/MIMO	IEEE 802.11n (HT20)	All MCS index	1, 2	10.0 + 2.0	13.0 + 2.0
			3 ~ 9	13.0 + 2.0	16.0 + 2.0
			10, 11	9.0 + 2.0	12.0 + 2.0

Table 8: WLAN RF Power Setting - 2.4 GHz 802.11ax (HE20) (SISO) (FCC)

SISO/ CDD/ MIMO	Mode	Rate / MCS index	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
SISO	IEEE 802.11ax (HE20)	All MCS index	1, 2, 10, 11	SU	11.0 + 2.0		
						242-tone (Full tone)	11.0 + 2.0
		MCS0 ~ MCS9	1, 2, 10, 11			26-tone	11.0 + 2.0
						52-tone	11.0 + 2.0
						106-tone	11.0 + 2.0
		MCS0 ~ MCS8	3 ~ 9	SU	14.0 + 2.0		
						242-tone (Full tone)	14.0 + 2.0
						26-tone	14.0 + 2.0
						52-tone	14.0 + 2.0
						106-tone	14.0 + 2.0
		MCS9 ~ MCS11	3 ~ 9	SU	12.0 + 2.0		
						242-tone (Full tone)	12.0 + 2.0
		MCS9	3 ~ 9			26-tone	12.0 + 2.0
						52-tone	12.0 + 2.0
						106-tone	12.0 + 2.0

MCS10 and MCS11 can only be used at 242-tone or higher.

Table 9: WLAN RF Power Setting - 2.4 GHz 802.11ax (HE20) (CDD/MIMO) (FCC)

SISO/CDD/ MIMO	Mode	Rate/ MCS index	Channel	SU	Reference power (dBm)/ Port	RU	Reference Power (dBm)/ Port	Maximum Tune Up Tolerance (dBm)/ 2 Port
CDD/ MIMO	IEEE 802. 11ax (HE20)	All MCS index	1, 2, 10, 11	SU	8.0 + 2.0			11.0 + 2.0
						242-tone (Full tone)	8.0 + 2.0	11.0 + 2.0
		MCS0 ~ MCS9	1, 2, 10, 11			26-tone	8.0 + 2.0	11.0 + 2.0
						52-tone	8.0 + 2.0	11.0 + 2.0
						106-tone	8.0 + 2.0	11.0 + 2.0
		All MCS index	3 ~ 9	SU	11.0 + 2.0			14.0 + 2.0
						242-tone (Full tone)	11.0 + 2.0	14.0 + 2.0
		MCS0 ~ MCS9	3 ~ 9			26-tone	11.0 + 2.0	14.0 + 2.0
						52-tone	11.0 + 2.0	14.0 + 2.0
						106-tone	11.0 + 2.0	14.0 + 2.0

MCS10 and MCS11 can only be used at 242-tone or higher.

2.1.1.2 RF Power Setting for BT (BR/EDR) / BLE

Table 10 describes the RF power settings for BT (BR/EDR) and BLE.

Table 10: BT / BLE RF Power Setting - FCC

Mode	Channel	Maximum Tune Up Tolerance (dBm)
BR	NA	8.0 +2.5
EDR	NA	4.0 +2.5
LE 125 kbps	NA	8.0 +2.5
LE 500 kbps	NA	8.0 +2.5
LE 1 Mbps	N/A	8.0 +2.5
LE 2 Mbps	N/A	8.0 +2.5

2.1.1.3 RF Power Setting for 5 GHz WLAN

Table 11 and **Table 12** describe the RF power settings for 5 GHz 802.11a WLAN.

Table 11: WLAN RF Power Setting - 5 GHz 802.11a (SISO) (FCC)

SISO/CDD/ MIMO	Mode	Rate	Band	Channel	Maximum Tune Up Tolerance (dBm)
SISO	IEEE 802.11a	All Rate	W52/W53	36, 40, 60, 64	13.0 + 2.0
		All Rate	W52/W53	44 ~ 56	16.0 + 2.0
		All Rate	W56	100, 104	13.0 + 2.0
		All Rate	W56	108 ~ 136, 144	16.0 + 2.0
		All Rate	W56	140	9.0 + 2.0
		All Rate	W58	149 ~ 157	16.0 + 2.0
		All Rate	W58	161, 165	13.0 + 2.0

Table 12: WLAN RF Power Setting - 5 GHz 802.11a (CDD) (FCC)

SISO/CDD/ MIMO	Mode	Rate	Band	Channel	Reference Power (dBm)/ Port	Maximum Tune Up Tolerance (dBm)/2Port
CDD	IEEE 802.11a	All Rate	W52/W53	36, 40, 60, 64	10.0 + 2.0	13.0 + 2.0
		All Rate	W52/W53	44 ~ 56	13.0 + 2.0	16.0 + 2.0
		All Rate	W56	100, 104	10.0 + 2.0	13.0 + 2.0
		All Rate	W56	108 ~ 136, 144	13.0 + 2.0	16.0 + 2.0
		All Rate	W56	140	9.0 + 2.0	12.0 + 2.0
		All Rate	W58	149 ~ 157	13.0 + 2.0	16.0 + 2.0
		All Rate	W58	161, 165	10.0 + 2.0	13.0 + 2.0

Table 13, Table 14, Table 15, and **Table 16** describe the RF power settings for 5 GHz 802.11n WLAN.

Table 13: WLAN RF Power Setting - 5 GHz 802.11n (HT20) (SISO) (FCC)

SISO/CDD/ MIMO	Mode	MCS Index	Band	Channel	Maximum Tune Up Tolerance (dBm)
SISO	IEEE 802.11n (HT20)	All MCS Index	W52/W53	36, 40, 60, 64	11.0 + 2.0
		All MCS Index	W52/W53	44 ~ 56	14.0 + 2.0
		All MCS Index	W56	100, 104	11.0 + 2.0
		All MCS Index	W56	108 ~ 136, 144	14.0 + 2.0
		All MCS Index	W56	140	8.0 + 2.0
		All MCS Index	W58	149 ~ 157	14.0 + 2.0
		All MCS Index	W58	161, 165	11.0 + 2.0

Table 14: WLAN RF Power Setting - 5 GHz 802.11n (HT20) (CDD/MIMO) (FCC)

SISO/CDD/ MIMO	Mode	MCS Index	Band	Channel	Reference Power (dBm)/ Port	Maximum Tune Up Tolerance (dBm)/2Port
CDD/MIMO	IEEE 802.11n (HT20)	All MCS Index	W52/W53	36, 40, 60, 64	8.0 + 2.0	11.0 + 2.0
		All MCS Index	W52/W53	44 ~ 56	11.0 + 2.0	14.0 + 2.0
		All MCS Index	W56	100, 104, 140	8.0 + 2.0	11.0 + 2.0
		All MCS Index	W56	108 ~ 136, 144	11.0 + 2.0	14.0 + 2.0
		All MCS Index	W58	149 ~ 157	11.0 + 2.0	14.0 + 2.0
		All MCS Index	W58	161, 165	8.0 + 2.0	11.0 + 2.0

Table 15: WLAN RF Power Setting - 5 GHz 802.11n (HT40) (SISO) (FCC)

SISO/CDD/ MIMO	Mode	MCS Index	Band	Channel	Maximum Tune Up Tolerance (dBm)
SISO	IEEE 802.11n (HT40)	All MCS index	W52/W53	38	11.0 + 2.0
		All MCS Index	W52/W53	46,54	14.0 + 2.0
		All MCS Index	W52/W53	62	7.0 + 2.0
		All MCS Index	W56	102	7.0 + 2.0
		All MCS Index	W56	110 ~ 126, 142	14.0 + 2.0
		All MCS Index	W56	134	12.0 + 2.0
		All MCS Index	W58	151	14.0 + 2.0
		All MCS index	W58	159	11.0 + 2.0

Table 16: WLAN RF Power Setting - 5 GHz 802.11n (HT40) (CDD/MIMO) (FCC)

SISO/CDD/ MIMO	Mode	MCS Index	Band	Channel	Reference Power (dBm)/ Port	Maximum Tune Up Tolerance (dBm)/ 2Port
CDD/MIMO	IEEE 802.11n (HT40)	All MCS index	W52/W53	38	8.0 + 2.0	11.0 + 2.0
		All MCS Index	W52/W53	46,54	11.0 + 2.0	14.0 + 2.0
		All MCS Index	W52/W53	62	5.0 + 2.0	8.0 + 2.0
		All MCS Index	W56	102	7.0 + 2.0	10.0 + 2.0
		All MCS Index	W56	110 ~ 126, 142	11.0 + 2.0	14.0 + 2.0
		All MCS Index	W56	134	9.0 + 2.0	12.0 + 2.0
		All MCS Index	W58	151	11.0 + 2.0	14.0 + 2.0
		All MCS index	W58	159	8.0 + 2.0	11.0 + 2.0

Table 17, **Table 18**, **Table 19**,

Table 20**, Table 21**, and **Table 22** describe the RF power settings for 5 GHz 802.11ac WLAN.

Table 17: WLAN RF Power Setting - 5 GHz 802.11ac (VHT20) (SISO) (FCC)

SISO/CDD/ MIMO	Mode	MCS Index	Band	Channel	Maximum Tune Up Tolerance (dBm)
SISO	IEEE 802.11ac (VHT20)	MCS0 ~ MCS7	W52/W53	36, 40, 60, 64	11.0 + 2.0
		MCS8	W52/W53	36, 40, 60, 64	10.0 + 2.0
		MCS0 ~ MCS7	W52/W53	44 ~ 56	14.0 + 2.0
		MCS8	W52/W53	44 ~ 56	10.0 + 2.0
		MCS0 ~ MCS7	W56	100, 104	11.0 + 2.0
		MCS8	W56	100, 104	10.0 + 2.0
		MCS0 ~ MCS7	W56	108 ~ 136, 144	14.0 + 2.0
		MCS8	W56	108 ~ 136, 144	10.0 + 2.0
		All MCS index	W56	140	8.0 + 2.0
		MCS0 ~ MCS7	W58	149 ~ 157	14.0 + 2.0
		MCS8	W58	149 ~ 157	10.0 + 2.0
		MCS0 ~ MCS7	W58	161, 165	11.0 + 2.0
		MCS8	W58	161, 165	10.0 + 2.0

Table 18: WLAN RF Power Setting - 5 GHz 802.11ac (VHT20) (CDD/MIMO) (FCC)

SISO/ CDD/ MIMO	Mode	MCS Index	Band	Channel	Reference Power (dBm) / Port	Maximum Tune Up Tolerance (dBm) / 2Port
CDD/ MIMO	IEEE 802.11ac (VHT20)	All MCS index	W52/W53	36, 40, 60, 64	8.0 + 2.0	11.0 + 2.0
		All MCS index	W52/W53	44 ~ 56	11.0 + 2.0	14.0 + 2.0
		All MCS index	W56	100, 104, 140	8.0 + 2.0	11.0 + 2.0
		All MCS index	W56	108 ~ 136, 144	11.0 + 2.0	14.0 + 2.0
		All MCS index	W58	149 ~ 157	11.0 + 2.0	14.0 + 2.0
		All MCS index	W58	161, 165	8.0 + 2.0	11.0 + 2.0

Table 19: WLAN RF Power Setting - 5 GHz 802.11ac (VHT40) (SISO) (FCC)

SISO/CDD/ MIMO	Mode	MCS Index	Band	Channel	Maximum Tune Up Tolerance (dBm)
SISO	IEEE 802.11ac (VHT40)	MCS0 ~ MCS7	W52/W53	38	11.0 + 2.0
		MCS8, MCS9	W52/W53	38	10.0 + 2.0
		MCS0 ~ MCS7	W52/W53	46, 54	14.0 + 2.0
		MCS8, MCS9	W52/W53	46, 54	10.0 + 2.0
		All MCS index	W52/W53	62	7.0 + 2.0
		All MCS index	W56	102	7.0 + 2.0
		MCS0 ~ MCS7	W56	110 ~ 126, 142	14.0 + 2.0
		MCS8, MCS9	W56	110 ~ 126, 142	10.0 + 2.0
		MCS0 ~ MCS7	W56	134	12.0 + 2.0
		MCS8, MCS9	W56	134	10.0 + 2.0
		MCS0 ~ MCS7	W58	151	14.0 + 2.0
		MCS8, MCS9	W58	151	10.0 + 2.0
		MCS0 ~ MCS7	W58	159	11.0 + 2.0

SISO/CDD/ MIMO	Mode	MCS Index	Band	Channel	Maximum Tune Up Tolerance (dBm)
		MCS8, MCS9	W58	159	10.0 + 2.0

Table 20: WLAN RF Power Setting - 5 GHz 802.11ac (VHT40) (CDD/MIMO) (FCC)

SISO/ CDD/ MIMO	Mode	MCS Index	Band	Channel	Reference Power (dBm) / Port	Maximum Tune Up Tolerance (dBm) / 2 Port
CDD/ MIMO	IEEE 802.11ac (VHT40)	All MCS index	W52/W53	38	8.0 + 2.0	11.0 + 2.0
		All MCS index	W52/W53	46, 54	11.0 + 2.0	14.0 + 2.0
		All MCS index	W52/W53	62	5.0 + 2.0	8.0 + 2.0
		All MCS index	W56	102	7.0 + 2.0	10.0 + 2.0
		All MCS index	W56	110 ~ 126, 142	11.0 + 2.0	14.0 + 2.0
		All MCS index	W56	134	9.0 + 2.0	12.0 + 2.0
		All MCS index	W58	151	11.0 + 2.0	14.0 + 2.0
		All MCS index	W58	159	8.0 + 2.0	11.0 + 2.0

Table 21: WLAN RF Power Setting - 5 GHz 802.11ac (VHT80) (SISO) (FCC)

SISO/CDD/ MIMO	Mode	MCS Index	Band	Channel	Maximum Tune Up Tolerance (dBm)
SISO	IEEE 802.11ac (VHT80)	MCS0 ~ MCS7	W52/W53	42	11.0 + 2.0
		MCS8, MCS9	W52/W53	42	10.0 + 2.0
		All MCS index	W52/W53	58	7.0 + 2.0
		All MCS index	W56	106	6.0 + 2.0
		MCS0 ~ MCS7	W56	122, 138	14.0 + 2.0
		MCS8, MCS9	W56	122, 138	10.0 + 2.0
		MCS0 ~ MCS7	W58	155	11.0 + 2.0
		MCS8, MCS9	W58	155	10.0 + 2.0

Table 22: WLAN RF Power Setting - 5 GHz 802.11ac (VHT80) (CDD/MIMO) (FCC)

SISO/ CDD/ MIMO	Mode	MCS Index	Band	Channel	Reference Power (dBm) / Port	Maximum Tune Up Tolerance (dBm) / 2 port
CDD/ MIMO	IEEE 802.11ac (VHT80)	All MCS index	W52/W53	42	8.0 + 2.0	11.0 + 2.0
		All MCS index	W52/W53	58	4.0 + 2.0	7.0 + 2.0
		All MCS index	W56	106	5.0 + 2.0	8.0 + 2.0
		All MCS index	W56	122, 138	11.0 + 2.0	14.0 + 2.0
		All MCS index	W58	155	8.0 + 2.0	11.0 + 2.0

Table 23, **Table 24**, **Table 25**, **Table 26**, **Table 27**, and **Table 28** describe the RF power settings for 5 GHz 802.11ax WLAN.

Table 23: WLAN RF Power Setting - 5 GHz 802.11ax (HE20) (SISO) (FCC)

SISO/ CDD/ MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
SISO			W52/W53		SU	9.0 + 2.0		

SISO/ CDD/ MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
	IEEE 802.11ax (HE20)	All MCS index		36, 40, 60, 64			242-tone (Full tone)	9.0 + 2.0
		MCS0 ~ MCS9	W52/W53	36, 40, 60, 64			26-tone	9.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	9.0 + 2.0
		MCS0 ~ MCS7	W52/W53	44, 48, 52, 56	SU	12.0 + 2.0		
							242-tone (Full tone)	12.0 + 2.0
							26-tone	12.0 + 2.0
							52-tone	12.0 + 2.0
							106-tone	12.0 + 2.0
		MCS8, MCS9	W52/W53	44, 48, 52, 56	SU	10.0 + 2.0		
							242-tone (Full tone)	10.0 + 2.0
							26-tone	10.0 + 2.0
							52-tone	10.0 + 2.0
							106-tone	10.0 + 2.0
		MCS10, MCS11	W52/W53	44, 48, 52, 56	SU	9.0 + 2.0		
							242-tone (Full tone)	9.0 + 2.0
		All MCS index	W56	100, 104	SU	9.0 + 2.0		
							242-tone (Full tone)	9.0 + 2.0
		MCS0 ~ MCS9	W56	100, 104			26-tone	9.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	9.0 + 2.0
		MCS0 ~ MCS7	W56	108 ~ 136, 144	SU	12.0 + 2.0		
							242-tone (Full tone)	12.0 + 2.0
							26-tone	12.0 + 2.0
							52-tone	12.0 + 2.0
							106-tone	12.0 + 2.0
		MCS8, MCS9	W56	108 ~ 136, 144	SU	10.0 + 2.0		
							242-tone (Full tone)	10.0 + 2.0
							26-tone	10.0 + 2.0
							52-tone	10.0 + 2.0
							106-tone	10.0 + 2.0
		MCS10, MCS11	W56	108 ~ 136, 144	SU	9.0 + 2.0		
							242-tone (Full tone)	9.0 + 2.0
		All MCS index	W56	140	SU	5.0 + 2.0		
							242-tone (Full tone)	5.0 + 2.0
		MCS0 ~ MCS9	W56	140			26-tone	5.0 + 2.0
							52-tone	5.0 + 2.0
							106-tone	5.0 + 2.0
		MCS0 ~ MCS7	W58	149 ~ 157	SU	12.0 + 2.0		
							242-tone (Full tone)	12.0 + 2.0
							26-tone	12.0 + 2.0

SISO/ CDD/ MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
							52-tone	12.0 + 2.0
							106-tone	12.0 + 2.0
		MCS8, MCS9	W58	149 ~ 157	SU	10.0 + 2.0		
							242-tone (Full tone)	10.0 + 2.0
							26-tone	10.0 + 2.0
							52-tone	10.0 + 2.0
							106-tone	10.0 + 2.0
		MCS10, MCS11	W58	149 ~ 157	SU	9.0 + 2.0		
							242-tone (Full tone)	9.0 + 2.0
		All MCS index	W58	161, 165	SU	9.0 + 2.0		
							242-tone (Full tone)	9.0 + 2.0
		MCS0 ~ MCS9	W58	161, 165			26-tone	9.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	9.0 + 2.0

MCS10 and MCS11 can only be used at 242-tone or higher.

Table 24: WLAN RF Power Setting - 5 GHz 802.11ax (HE20) (CDD/MIMO) (FCC)

SISO/CDD/ MIMO	Mode	MCS Index	Band	Channel	SU	Reference power (dBm)/ Port	RU	Reference power (dBm)/Port	Maximum Tune Up Tolerance (dBm)/2Port
CDD/MIMO	IEEE 802.11ax (HE20)	All MCS index	W52/W53	36, 40, 60, 64	SU	6.0 + 2.0			9.0 + 2.0
							242-tone (Full tone)	6.0 + 2.0	9.0 + 2.0
		MCS0 ~ MCS9	W52/W53	36, 40, 60, 64			26-tone	6.0 + 2.0	9.0 + 2.0
							52-tone	6.0 + 2.0	9.0 + 2.0
							106-tone	6.0 + 2.0	9.0 + 2.0
		All MCS index	W52/W53	44, 48, 52, 56	SU	9.0 + 2.0			12.0 + 2.0
							242-tone (Full tone)	9.0 + 2.0	12.0 + 2.0
		MCS0 ~ MCS9	W52/W53	44, 48, 52, 56			26-tone	9.0 + 2.0	12.0 + 2.0
							52-tone	9.0 + 2.0	12.0 + 2.0
							106-tone	9.0 + 2.0	12.0 + 2.0
		All MCS index	W56	100, 104	SU	6.0 + 2.0			9.0 + 2.0
							242-tone (Full tone)	6.0 + 2.0	9.0 + 2.0
		MCS0 ~ MCS9	W56	100, 104			26-tone	6.0 + 2.0	9.0 + 2.0
							52-tone	6.0 + 2.0	9.0 + 2.0
							106-tone	6.0 + 2.0	9.0 + 2.0
		All MCS index	W56	108 ~ 136, 144	SU	9.0 + 2.0			12.0 + 2.0
							242-tone (Full tone)	9.0 + 2.0	12.0 + 2.0
		MCS0 ~ MCS9	W56	108 ~ 136, 144			26-tone	9.0 + 2.0	12.0 + 2.0
							52-tone	9.0 + 2.0	12.0 + 2.0
							106-tone	9.0 + 2.0	12.0 + 2.0

SISO/CDD/ MIMO	Mode	MCS Index	Band	Channel	SU	Reference power (dBm)/ Port	RU	Reference power (dBm)/Port	Maximum Tune Up Tolerance (dBm)/2Port
		All MCS index	W56	140	SU	2.0 + 2.0			5.0 + 2.0
							242-tone (Full tone)	2.0 + 2.0	5.0 + 2.0
		MCS0 ~ MCS9	W56	140			26-tone	2.0 + 2.0	5.0 + 2.0
							52-tone	2.0 + 2.0	5.0 + 2.0
							106-tone	2.0 + 2.0	5.0 + 2.0
		All MCS index	W58	149 ~ 157	SU	9.0 + 2.0			12.0 + 2.0
							242-tone (Full tone)	9.0 + 2.0	12.0 + 2.0
		MCS0 ~ MCS9	W58	149 ~ 157			26-tone	9.0 + 2.0	12.0 + 2.0
							52-tone	9.0 + 2.0	12.0 + 2.0
							106-tone	9.0 + 2.0	12.0 + 2.0
		All MCS index	W58	161, 165	SU	6.0 + 2.0			9.0 + 2.0
							242-tone (Full tone)	6.0 + 2.0	9.0 + 2.0
		MCS0 ~ MCS9	W58	161, 165			26-tone	6.0 + 2.0	9.0 + 2.0
							52-tone	6.0 + 2.0	9.0 + 2.0
							106-tone	6.0 + 2.0	9.0 + 2.0

MCS10 and MCS11 can only be used at 242-tone or higher.

Table 25: WLAN RF Power Setting - 5 GHz 802.11ax (HE40) (SISO) (FCC)

SISO/CDD/ MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
SISO	IEEE 802.11ax (HE40)	All MCS index	W52/W53	38	SU	9.0 + 2.0		
							484-tone (Full tone)	9.0 + 2.0
							242-tone	9.0 + 2.0
		MCS0 ~ MCS9	W52/W53	38			26-tone	9.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	9.0 + 2.0
		MCS0 ~ MCS7	W52/W53	46, 54	SU	12.0 + 2.0		
							484-tone (Full tone)	12.0 + 2.0
							26-tone	12.0 + 2.0
							52-tone	12.0 + 2.0
							106-tone	12.0 + 2.0
							242-tone	12.0 + 2.0
		MCS8, MCS9	W52/W53	46, 54	SU	10.0 + 2.0		
							484-tone (Full tone)	10.0 + 2.0
							26-tone	10.0 + 2.0
							52-tone	10.0 + 2.0
							106-tone	10.0 + 2.0
							242-tone	10.0 + 2.0
		MCS10, MCS11	W52/W53	46, 54	SU	9.0 + 2.0		
							484-tone (Full tone)	9.0 + 2.0
							242-tone	9.0 + 2.0
		All MCS index	W52/W53	62	SU	7.0 + 2.0		
							484-tone	7.0 + 2.0

SISO/CDD/ MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
							(Full tone)	
							242-tone	9.0 + 2.0
		MCS0 ~ MCS9	W52/W53	62			26-tone	9.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	9.0 + 2.0
		All MCS index	W56	102	SU	5.0 + 2.0		
							484-tone (Full tone)	5.0 + 2.0
							242-tone	9.0 + 2.0
		MCS0 ~ MCS9	W56	102			26-tone	9.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	9.0 + 2.0
		MCS0 ~ MCS7	W56	110 ~ 126, 142	SU	12.0 + 2.0		
							484-tone (Full tone)	12.0 + 2.0
							26-tone	12.0 + 2.0
							52-tone	12.0 + 2.0
							106-tone	12.0 + 2.0
							242-tone	12.0 + 2.0
		MCS8, MCS9	W56	110 ~ 126, 142	SU	10.0 + 2.0		
							484-tone (Full tone)	10.0 + 2.0
							26-tone	10.0 + 2.0
							52-tone	10.0 + 2.0
							106-tone	10.0 + 2.0
							242-tone	10.0 + 2.0
		MCS10, MCS11	W56	110 ~ 126, 142	SU	9.0 + 2.0		
							484-tone (Full tone)	9.0 + 2.0
							242-tone	9.0 + 2.0
		MCS0 ~ MCS7	W56	134	SU	10.0 + 2.0		
							484-tone (Full tone)	10.0 + 2.0
							26-tone	12.0 + 2.0
							52-tone	12.0 + 2.0
							106-tone	12.0 + 2.0
							242-tone	12.0 + 2.0
		MCS8, MCS9	W56	134	SU	10.0 + 2.0		
							484-tone (Full tone)	10.0 + 2.0
							26-tone	10.0 + 2.0
							52-tone	10.0 + 2.0
							106-tone	10.0 + 2.0
							242-tone	10.0 + 2.0
		MCS10, MCS11	W56	134	SU	9.0 + 2.0		
							484-tone (Full tone)	9.0 + 2.0
							242-tone	9.0 + 2.0
		MCS0 ~ MCS7	W58	151	SU	12.0 + 2.0		
							484-tone (Full tone)	12.0 + 2.0
							26-tone	12.0 + 2.0
							52-tone	12.0 + 2.0
							106-tone	12.0 + 2.0
							242-tone	12.0 + 2.0
			W58	151	SU	10.0 + 2.0		

SISO/CDD/ MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
		MCS8, MCS9					484-tone (Full tone)	10.0 + 2.0
							26-tone	10.0 + 2.0
							52-tone	10.0 + 2.0
							106-tone	10.0 + 2.0
							242-tone	10.0 + 2.0
		MCS10, MCS11	W58	151	SU	9.0 + 2.0		
							484-tone (Full tone)	9.0 + 2.0
							242-tone	9.0 + 2.0
		All MCS index	W58	159	SU	9.0 + 2.0		
							484-tone (Full tone)	9.0 + 2.0
							242-tone	9.0 + 2.0
		MCS0 ~ MCS9	W58	159			26-tone	9.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	9.0 + 2.0

Table 26: WLAN RF Power Setting - 5 GHz 802.11ax (HE40) (CDD/MIMO) (FCC)

SISO/CDD/ MIMO	Mode	MCS Index	Band	Channel	SU	Reference power (dBm)/ Port	RU	Reference power (dBm)/ Port	Maximum Tune Up Tolerance (dBm)/ 2Port
CDD/ MIMO	IEEE 802.11ax (HE40)	All MCS index	W52/ W53	38	SU	6.0 + 2.0			9.0 + 2.0
							484-tone (Full tone)	6.0 + 2.0	9.0 + 2.0
							242-tone	6.0 + 2.0	9.0 + 2.0
		MCS0 ~ MCS9	W52/ W53	38			26-tone	6.0 + 2.0	9.0 + 2.0
							52-tone	6.0 + 2.0	9.0 + 2.0
							106-tone	6.0 + 2.0	9.0 + 2.0
		All MCS index	W52/W5 3	46, 54	SU	9.0 + 2.0			12.0 + 2.0
							484-tone (Full tone)	9.0 + 2.0	12.0 + 2.0
							242-tone	9.0 + 2.0	12.0 + 2.0
		MCS0 ~ MCS9	W52/W5 3	46, 54			26-tone	9.0 + 2.0	12.0 + 2.0
							52-tone	9.0 + 2.0	12.0 + 2.0
							106-tone	9.0 + 2.0	12.0 + 2.0
		All MCS index	W52/W5 3	62	SU	5.0 + 2.0			8.0 + 2.0
							484-tone (Full tone)	5.0 + 2.0	8.0 + 2.0
							242-tone	6.0 + 2.0	9.0 + 2.0
		MCS0 ~ MCS9	W52/W5 3	62			26-tone	6.0 + 2.0	9.0 + 2.0
							52-tone	6.0 + 2.0	9.0 + 2.0
							106-tone	6.0 + 2.0	9.0 + 2.0
		All MCS index	W56	102	SU	5.0 + 2.0			8.0 + 2.0
							484-tone (Full tone)	5.0 + 2.0	8.0 + 2.0
							242-tone	6.0 + 2.0	9.0 + 2.0
		MCS0 ~ MCS9	W56	102			26-tone	6.0 + 2.0	9.0 + 2.0
							52-tone	6.0 + 2.0	9.0 + 2.0
							106-tone	6.0 + 2.0	9.0 + 2.0
		All MCS index	W56	110 ~ 142	SU	9.0 + 2.0			12.0 + 2.0
							484-tone (Full tone)	9.0 + 2.0	12.0 + 2.0

SISO/CDD/ MIMO	Mode	MCS Index	Band	Channel	SU	Reference power (dBm)/ Port	RU	Reference power (dBm)/ Port	Maximum Tune Up Tolerance (dBm)/ 2Port
							242-tone	9.0 + 2.0	12.0 + 2.0
		MCS0 ~ MCS9	W56	110 ~ 142			26-tone	9.0 + 2.0	12.0 + 2.0
							52-tone	9.0 + 2.0	12.0 + 2.0
							106-tone	9.0 + 2.0	12.0 + 2.0
		All MCS index	W58	151	SU	9.0 + 2.0			12.0 + 2.0
							484-tone (Full tone)	9.0 + 2.0	12.0 + 2.0
							242-tone	9.0 + 2.0	12.0 + 2.0
		MCS0 ~ MCS9	W58	151			26-tone	9.0 + 2.0	12.0 + 2.0
							52-tone	9.0 + 2.0	12.0 + 2.0
							106-tone	9.0 + 2.0	12.0 + 2.0
		All MCS index	W58	159	SU	6.0 + 2.0			9.0 + 2.0
							484-tone (Full tone)	6.0 + 2.0	9.0 + 2.0
							242-tone	6.0 + 2.0	9.0 + 2.0
		MCS0 ~ MCS9	W58	159			26-tone	6.0 + 2.0	9.0 + 2.0
							52-tone	6.0 + 2.0	9.0 + 2.0
							106-tone	6.0 + 2.0	9.0 + 2.0

MCS10 and MCS11 can only be used at 242-tone or higher.

Table 27: WLAN RF Power Setting - 5 GHz 802.11ax (HE80) (SISO) (FCC)

SISO/ CDD/MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
SISO	IEEE 802.11ax (HE80)	All MCS index	W52/W53	42	SU	9.0 + 2.0		
							996-tone (Full tone)	9.0 + 2.0
							242-tone	9.0 + 2.0
							484-tone	9.0 + 2.0
		MCS0 ~ MCS9	W52/W53	42			26-tone	9.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	9.0 + 2.0
		All MCS index	W52/W53	58	SU	6.0 + 2.0		
							996-tone (Full tone)	6.0 + 2.0
							242-tone	9.0 + 2.0
							484-tone	7.0 + 2.0
		MCS0 ~ MCS9	W52/W53	58			26-tone	9.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	9.0 + 2.0
		All MCS index	W56	106	SU	5.0 + 2.0		
							996-tone (Full tone)	5.0 + 2.0
							242-tone	9.0 + 2.0
							484-tone	5.0 + 2.0
		MCS0 ~ MCS9	W56	106			26-tone	9.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	9.0 + 2.0
		MCS0 ~ MCS7	W56	122, 138	SU	12.0 + 2.0		
							996-tone	12.0 + 2.0

SISO/ CDD/MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
							(Full tone)	
							26-tone	12.0 + 2.0
							52-tone	12.0 + 2.0
							106-tone	12.0 + 2.0
							242-tone	12.0 + 2.0
							484-tone	12.0 + 2.0
		MCS8, MCS9	W56	122, 138	SU	10.0 + 2.0		
							996-tone (Full tone)	10.0 + 2.0
							26-tone	10.0 + 2.0
							52-tone	10.0 + 2.0
							106-tone	10.0 + 2.0
							242-tone	10.0 + 2.0
							484-tone	10.0 + 2.0
		MCS10, MCS11	W56	122, 138	SU	9.0 + 2.0		
							996-tone (Full tone)	9.0 + 2.0
							242-tone	9.0 + 2.0
							484-tone	9.0 + 2.0
		All MCS index	W58	155	SU	9.0 + 2.0		
							996-tone (Full tone)	9.0 + 2.0
							242-tone	9.0 + 2.0
							484-tone	9.0 + 2.0
		MCS0 ~ MCS9	W58	155			26-tone	9.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	9.0 + 2.0

Table 28: WLAN RF Power Setting - 5 GHz 802.11ax (HE80) (CDD/MIMO) (FCC)

SISO/ CDD/MIMO	Mode	MCS Index	Band	Channel	SU	Reference Power (dBm)/Port	RU	Reference power(dBm)/Port	Maximum Tune Up Tolerance (dBm)/ 2Port
CDD/MIMO	IEEE 802.11ax (HE80)	All MCS index	W52/W53	42	SU	6.0 + 2.0			9.0 + 2.0
							996-tone (Full tone)	6.0 + 2.0	9.0 + 2.0
							242-tone	6.0 + 2.0	9.0 + 2.0
							484-tone	6.0 + 2.0	9.0 + 2.0
		MCS0 ~ MCS9	W52/W53	42			26-tone	6.0 + 2.0	9.0 + 2.0
							52-tone	6.0 + 2.0	9.0 + 2.0
							106-tone	6.0 + 2.0	9.0 + 2.0
		All MCS index	W52/W53	58	SU	4.0 + 2.0			7.0 + 2.0
							996-tone (Full tone)	4.0 + 2.0	7.0 + 2.0
							242-tone	6.0 + 2.0	9.0 + 2.0
							484-tone	5.0 + 2.0	8.0 + 2.0
		MCS0 ~ MCS9	W52/W53	58			26-tone	6.0 + 2.0	9.0 + 2.0
							52-tone	6.0 + 2.0	9.0 + 2.0
							106-tone	6.0 + 2.0	9.0 + 2.0
		All MCS index	W56	106	SU	4.0 + 2.0			7.0 + 2.0
							996-tone (Full tone)	4.0 + 2.0	7.0 + 2.0
							242-tone	6.0 + 2.0	9.0 + 2.0
							484-tone	5.0 + 2.0	8.0 + 2.0
			W56	106			26-tone	6.0 + 2.0	9.0 + 2.0

SISO/ CDD/MIMO	Mode	MCS Index	Band	Channel	SU	Reference Power (dBm)/Port	RU	Reference power(dBm)/Port	Maximum Tune Up Tolerance (dBm)/ 2Port
		MCS0 ~ MCS9					52-tone	6.0 + 2.0	9.0 + 2.0
							106-tone	6.0 + 2.0	9.0 + 2.0
		All MCS index	W56	122, 138	SU	9.0 + 2.0			12.0 + 2.0
							996-tone (Full tone)	9.0 + 2.0	12.0 + 2.0
							242-tone	9.0 + 2.0	12.0 + 2.0
							484-tone	9.0 + 2.0	12.0 + 2.0
		MCS0 ~ MCS9	W56	122, 138			26-tone	9.0 + 2.0	12.0 + 2.0
							52-tone	9.0 + 2.0	12.0 + 2.0
							106-tone	9.0 + 2.0	12.0 + 2.0
		All MCS index	W58	155	SU	6.0 + 2.0			9.0 + 2.0
							996-tone (Full tone)	6.0 + 2.0	9.0 + 2.0
							242-tone	9.0 + 2.0	12.0 + 2.0
							484-tone	9.0 + 2.0	12.0 + 2.0
		MCS0 ~ MCS9	W58	155			26-tone	6.0 + 2.0	9.0 + 2.0
							52-tone	6.0 + 2.0	9.0 + 2.0
							106-tone	6.0 + 2.0	9.0 + 2.0

MCS10 and MCS11 can only be used at 242-tone or higher.

2.1.1.4 RF Power Setting for 6 GHz WLAN

Table 29 describes the RF power settings for 6 GHz 802.11a WLAN.

Table 29: WLAN RF Power Setting - 6 GHz 802.11a (SISO) (FCC)

STA/ AP	SISO/ MIMO	Mode	Rate	Band	Channel	Maximum Tune Up Tolerance (dBm)
STA	SISO	IEEE 802.11a	6, 9, 12, 18, 24 Mbps	UNII-5 / UNII-6 / UNII-7	1 ~ 181	1.0 + 2.0
			6, 9, 12, 18, 24 Mbps	UNII-7	185	2.0 + 2.0
			6, 9, 12, 18, 24 Mbps	UNII-8	189 ~ 229	2.0 + 2.0
AP	SISO	IEEE 802.11a	6, 9, 12, 18, 24 Mbps	UNII-5 / UNII-6 / UNII-7	1 ~ 181	7.0 + 2.0
			6, 9, 12, 18, 24 Mbps	UNII-7	185	8.0 + 2.0
			6, 9, 12, 18, 24 Mbps	UNII-8	189 ~ 229	8.0 + 2.0

Table 30, **Table 31**, **Table 32**, **Table 33**, **Table 34**, and **Table 35** describe the RF power settings for 6 GHz 802.11ax WLAN.

Table 30: WLAN RF Power Setting - 6 GHz 802.11ax (HE20) (SISO) (FCC)

STA/ AP	SISO/MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
STA	SISO	IEEE 802.11ax (HE20)	All MCS index	UNII-5	1 ~ 93	SU	4.0 + 2.0		
								242-tone (Full tone)	4.0 + 2.0
			MCS0 ~ MCS9	UNII-5	1 ~ 93			26-tone	-5.0 + 2.0
								52-tone	-3.0 + 2.0
								106-tone	0.0 + 2.0

STA/ AP	SISO/MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
			All MCS index	UNII-6	97 ~ 113	SU	3.0 + 2.0		
								242-tone (Full tone)	3.0 + 2.0
			MCS0 ~ MCS9	UNII-6	97 ~ 113			26-tone	-5.0 + 2.0
								52-tone	-3.0 + 2.0
								106-tone	0.0 + 2.0
			All MCS index	UNII-7/ UNII-8	117 ~ 229	SU	4.0 + 2.0		
								242-tone (Full tone)	4.0 + 2.0
			MCS0 ~ MCS9	UNII-7/ UNII-8	117 ~ 229			26-tone	-5.0 + 2.0
								52-tone	-3.0 + 2.0
								106-tone	0.0 + 2.0
AP	SISO	IEEE 802.11ax (HE20)	All MCS index	UNII-5 / UNII-6	1 ~ 113	SU	9.0 + 2.0		
								242-tone (Full tone)	9.0 + 2.0
			MCS0 ~ MCS9	UNII-5 / UNII-6	1 ~ 113			26-tone	0.0 + 2.0
								52-tone	3.0 + 2.0
								106-tone	6.0 + 2.0
			All MCS index	UNII-7	117 ~ 181	SU	9.0 + 2.0		
								242-tone (Full tone)	9.0 + 2.0
			MCS0 ~ MCS9	UNII-7	117 ~ 181			26-tone	0.0 + 2.0
								52-tone	2.0 + 2.0
								106-tone	5.0 + 2.0
			MCS0 ~ MCS9	UNII-7	185	SU	10.0 + 2.0		
								242-tone (Full tone)	10.0 + 2.0
								26-tone	1.0 + 2.0
								52-tone	4.0 + 2.0
								106-tone	6.0 + 2.0
			MCS10, MCS11	UNII-7	185	SU	9.0 + 2.0		
								242-tone (Full tone)	9.0 + 2.0
			MCS0 ~ MCS9	UNII-8	189 ~ 229	SU	10.0 + 2.0		
								242-tone (Full tone)	10.0 + 2.0
								26-tone	1.0 + 2.0
								52-tone	4.0 + 2.0
								106-tone	6.0 + 2.0
			MCS10, MCS11	UNII-8	189 ~ 229	SU	9.0 + 2.0		
								242-tone (Full tone)	9.0 + 2.0

MCS10 and MCS11 can only be used at 242-tone or higher.

Table 31: WLAN RF Power Setting - 6 GHz 802.11ax (HE20) (MIMO) (FCC)

STA/ AP	SISO/ MIMO	Mode	MCS Index	Band	Channel	SU	Reference Power (dBm)/ Port	RU	Reference Power (dBm)/Port	Maximum Tune Up Tolerance (dBm)/ 2Port
STA	MIMO		All MCS index	UNII-5	1 ~ 93	SU	1.0 + 2.0			4.0 + 2.0
								242-tone	1.0 + 2.0	4.0 + 2.0

STA/ AP	SISO/ MIMO	Mode	MCS Index	Band	Channel	SU	Reference Power (dBm)/ Port	RU	Reference Power (dBm)/Port	Maximum Tune Up Tolerance (dBm)/ 2Port
		IEEE 802.11ax (HE20)						(Full tone)		
			MCS0 ~ MCS9	UNII-5	1 ~ 93			26-tone	-8.0 + 2.0	-5.0 + 2.0
								52-tone	-6.0 + 2.0	-3.0 + 2.0
								106-tone	-3.0 + 2.0	0.0 + 2.0
			All MCS index	UNII-6 /UNII-7	97 ~ 181	SU	0.0 + 2.0			3.0 + 2.0
								242-tone (Full tone)	0.0 + 2.0	3.0 + 2.0
			MCS0 ~ MCS9	UNII-6 /UNII-7	97 ~ 181			26-tone	-8.0 + 2.0	-5.0 + 2.0
								52-tone	-6.0 + 2.0	-3.0 + 2.0
								106-tone	-3.0 + 2.0	0.0 + 2.0
			All MCS index	UNII-7	185	SU	-1.0 + 2.0			2.0 + 2.0
								242-tone (Full tone)	-1.0 + 2.0	2.0 + 2.0
			MCS0 ~ MCS9	UNII-7	185			26-tone	-9.0 + 2.0	-6.0 + 2.0
								52-tone	-7.0 + 2.0	-4.0 + 2.0
								106-tone	-4.0 + 2.0	-1.0 + 2.0
			All MCS index	UNII-8	189 ~ 229	SU	-1.0 + 2.0			2.0 + 2.0
								242-tone (Full tone)	-1.0 + 2.0	2.0 + 2.0
			MCS0 ~ MCS9	UNII-8	189 ~ 229			26-tone	-9.0 + 2.0	-6.0 + 2.0
								52-tone	-7.0 + 2.0	-4.0 + 2.0
								106-tone	-4.0 + 2.0	-1.0 + 2.0
AP	MIMO	IEEE 802.11ax (HE20)	All MCS index	UNII-5 / UNII-6	1 ~ 113	SU	6.0 + 2.0			9.0 + 2.0
								242-tone (Full tone)	6.0 + 2.0	9.0 + 2.0
			MCS0 ~ MCS9	UNII-5 / UNII-6	1 ~ 113			26-tone	-3.0 + 2.0	0.0 + 2.0
								52-tone	0.0 + 2.0	3.0 + 2.0
								106-tone	3.0 + 2.0	6.0 + 2.0
			All MCS index	UNII-7 /UNII-8	117 ~ 229	SU	6.0 + 2.0			9.0 + 2.0
								242-tone (Full tone)	6.0 + 2.0	9.0 + 2.0
			MCS0 ~ MCS9	UNII-7 /UNII-8	117 ~ 229			26-tone	-3.0 + 2.0	0.0 + 2.0
								52-tone	-1.0 + 2.0	2.0 + 2.0
								106-tone	2.0 + 2.0	5.0 + 2.0

MCS10 and MCS11 can only be used at 242-tone or higher.

Table 32: WLAN RF Power Setting - 6 GHz 802.11ax (HE40) (SISO) (FCC)

STA/ AP	SISO/ MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
STA	SISO	IEEE 802.11ax (HE40)	All MCS index	UNII-5 / UNII-6 / UNII-7 / UNII-8	3 ~ 227	SU	6.0 + 2.0		
								484-tone (Full tone)	6.0 + 2.0
								242-tone	3.0 + 2.0
			MCS0 ~ MCS9	UNII-5 / UNII-6 / UNII-7 / UNII-8	3 ~ 227			26-tone	-5.0 + 2.0
								52-tone	-3.0 + 2.0
								106-tone	0.0 + 2.0
AP	SISO				3 ~ 107	SU	12.0 + 2.0		

STA/ AP	SISO/ MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
		IEEE 802.11ax (HE40)	MCS0 ~ MCS7	UNII-5 / UNII-6				484-tone (Full tone)	12.0 + 2.0
								26-tone	0.0 + 2.0
								52-tone	3.0 + 2.0
								106-tone	6.0 + 2.0
								242-tone	9.0 + 2.0
			MCS8, MCS9	UNII-5 / UNII-6	3 ~ 107	SU	10.0 + 2.0		
								484-tone (Full tone)	10.0 + 2.0
								26-tone	0.0 + 2.0
								52-tone	3.0 + 2.0
								106-tone	6.0 + 2.0
								242-tone	9.0 + 2.0
			MCS10, MCS11	UNII-5 / UNII-6	3 ~ 107	SU	9.0 + 2.0		
								484-tone (Full tone)	9.0 + 2.0
								242-tone	9.0 + 2.0
			MCS0 ~ MCS7	UNII-6 / UNII-7	115 ~ 179	SU	12.0 + 2.0		
								484-tone (Full tone)	12.0 + 2.0
								26-tone	0.0 + 2.0
								52-tone	2.0 + 2.0
								106-tone	5.0 + 2.0
								242-tone	10.0 + 2.0
			MCS8, MCS9	UNII-6 / UNII-7	115 ~ 179	SU	10.0 + 2.0		
								484-tone (Full tone)	10.0 + 2.0
								26-tone	0.0 + 2.0
								52-tone	2.0 + 2.0
								106-tone	5.0 + 2.0
								242-tone	10.0 + 2.0
			MCS10, MCS11	UNII-6 / UNII-7	115 ~ 179	SU	9.0 + 2.0		
								484-tone (Full tone)	9.0 + 2.0
								242-tone	9.0 + 2.0
			MCS0 ~ MCS7	UNII-7 / UNII-8	187 ~ 227	SU	12.0 + 2.0		
								484-tone (Full tone)	12.0 + 2.0
								26-tone	1.0 + 2.0
								52-tone	4.0 + 2.0
								106-tone	6.0 + 2.0
								242-tone	10.0 + 2.0
					187 ~ 227	SU	10.0 + 2.0		

STA/ AP	SISO/ MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
			MCS8, MCS9	UNII-7 / UNII-8				484-tone (Full tone)	10.0 + 2.0
								26-tone	1.0 + 2.0
								52-tone	4.0 + 2.0
								106-tone	6.0 + 2.0
								242-tone	10.0 + 2.0
			MCS10, MCS11	UNII-7 / UNII-8	187 ~ 227	SU	9.0 + 2.0		
								484-tone (Full tone)	9.0 + 2.0
								242-tone	9.0 + 2.0

MCS10 and MCS11 can only be used at 242-tone or higher.

Table 33: WLAN RF Power Setting - 6 GHz 802.11ax (HE40) (MIMO) (FCC)

STA/ AP	SISO/ MIMO	Mode	MCS Index	Band	Channel	SU	Reference Power (dBm)/ Port	RU	Reference Power (dBm) /Port	Maximum Tune Up Tolerance (dBm)/ 2Port
STA	MIMO	IEEE 802.11ax (HE40)	All MCS index	UNII-5/ UNII-6/ UNII-7	3 ~ 179	SU	3.0 + 2.0			6.0 + 2.0
								484-tone (Full tone)	3.0 + 2.0	6.0 + 2.0
								242-tone	0.0 + 2.0	3.0 + 2.0
			MCS0 ~ MCS9	UNII-5/ UNII-6/ UNII-7	3 ~ 179			26-tone	-8.0 + 2.0	-5.0 + 2.0
								52-tone	-6.0 + 2.0	-3.0 + 2.0
								106-tone	-3.0 + 2.0	0.0 + 2.0
			All MCS index	UNII-8	187 ~ 227	SU	3.0 + 2.0			6.0 + 2.0
								484-tone (Full tone)	3.0 + 2.0	6.0 + 2.0
								242-tone	0.0 + 2.0	3.0 + 2.0
			MCS0 ~ MCS9	UNII-8	187 ~ 227			26-tone	-9.0 + 2.0	-6.0 + 2.0
								52-tone	-7.0 + 2.0	-4.0 + 2.0
								106-tone	-4.0 + 2.0	-1.0 + 2.0
AP	MIMO	IEEE 802.11ax (HE40)	All MCS index	UNII-5	3 ~ 107	SU	8.0 + 2.0			11.0 + 2.0
								484-tone (Full tone)	8.0 + 2.0	11.0 + 2.0
								242-tone	6.0 + 2.0	9.0 + 2.0
			MCS0 ~ MCS9	UNII-5	3 ~ 107			26-tone	-3.0 + 2.0	0.0 + 2.0
								52-tone	0.0 + 2.0	3.0 + 2.0
								106-tone	3.0 + 2.0	6.0 + 2.0
			All MCS index	UNII-6 / UNII-7 / UNII-8	115 ~ 227	SU	8.0 + 2.0			11.0 + 2.0
								484-tone (Full tone)	8.0 + 2.0	11.0 + 2.0
								242-tone	5.0 + 2.0	8.0 + 2.0
			MCS0 ~ MCS9	UNII-6 / UNII-7 / UNII-8	115 ~ 227			26-tone	-3.0 + 2.0	0.0 + 2.0
								52-tone	-1.0 + 2.0	2.0 + 2.0
								106-tone	2.0 + 2.0	5.0 + 2.0

MCS10 and MCS11 can only be used at 242-tone or higher.

Table 34 : WLAN RF Power Setting - 6 GHz 802.11ax (HE80) (SISO) (FCC)

STA/ AP	SISO/ MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
STA	SISO	IEEE 802.11ax (HE80)	All MCS index	UNII-5 / UNII-6 / UNII-7 / UNII-8	7 ~ 215	SU	6.0 + 2.0		
								996-tone (Full tone)	6.0 + 2.0
								242-tone	3.0 + 2.0
								484-tone	6.0 + 2.0
			MCS0 ~ MCS9	UNII-5 / UNII-6 / UNII-7 / UNII-8	7 ~ 215			26-tone	-5.0 + 2.0
								52-tone	-3.0 + 2.0
								106-tone	0.0 + 2.0
AP	SISO	IEEE 802.11ax (HE80)	MCS0 ~ MCS7	UNII-5 / UNII-6	7 ~ 103	SU	12.0 + 2.0		
								996-tone (Full tone)	12.0 + 2.0
								26-tone	0.0 + 2.0
								52-tone	3.0 + 2.0
								106-tone	6.0 + 2.0
								242-tone	12.0 + 2.0
								484-tone	12.0 + 2.0
			MCS8, MCS9	UNII-5 / UNII-6	7 ~ 103	SU	10.0 + 2.0		
								996-tone (Full tone)	10.0 + 2.0
								26-tone	0.0 + 2.0
								52-tone	3.0 + 2.0
								106-tone	6.0 + 2.0
								242-tone	10.0 + 2.0
								484-tone	10.0 + 2.0
			MCS10, MCS11	UNII-5 / UNII-6	7 ~ 103	SU	9.0 + 2.0		
								996-tone (Full tone)	9.0 + 2.0
								242-tone	9.0 + 2.0
								484-tone	9.0 + 2.0
			MCS0 ~ MCS7	UNII-7	119 ~ 183	SU	12.0 + 2.0		
								996-tone (Full tone)	12.0 + 2.0
								26-tone	0.0 + 2.0
								52-tone	2.0 + 2.0
								106-tone	5.0 + 2.0
								242-tone	12.0 + 2.0
								484-tone	12.0 + 2.0
			MCS8, MCS9	UNII-7	119 ~ 183	SU	10.0 + 2.0		
								996-tone (Full tone)	10.0 + 2.0
								26-tone	0.0 + 2.0
								52-tone	2.0 + 2.0
								106-tone	5.0 + 2.0
								242-tone	10.0 + 2.0

STA/ AP	SISO/ MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
								484-tone	10.0 + 2.0
			MCS10, MCS11	UNII-7	119 ~ 183	SU	9.0 + 2.0		
								996-tone (Full tone)	9.0 + 2.0
								242-tone	9.0 + 2.0
								484-tone	9.0 + 2.0
			MCS0 ~ MCS7	UNII-8	199 ~ 215	SU	12.0 + 2.0		
								996-tone (Full tone)	12.0 + 2.0
								26-tone	1.0 + 2.0
								52-tone	4.0 + 2.0
								106-tone	6.0 + 2.0
								242-tone	12.0 + 2.0
								484-tone	12.0 + 2.0
			MCS8, MCS9	UNII-8	199 ~ 215	SU	10.0 + 2.0		
								996-tone (Full tone)	10.0 + 2.0
								26-tone	1.0 + 2.0
								52-tone	4.0 + 2.0
								106-tone	6.0 + 2.0
								242-tone	10.0 + 2.0
								484-tone	10.0 + 2.0
			MCS10, MCS11	UNII-8	199 ~ 215	SU	9.0 + 2.0		
								996-tone (Full tone)	9.0 + 2.0
								242-tone	9.0 + 2.0
								484-tone	9.0 + 2.0

MCS10 and MCS11 can only be used at 242-tone or higher.

Table 35: WLAN RF Power Setting - 6 GHz 802.11ax (HE80) (MIMO) (FCC)

STA/ AP	SISO/ MIMO	Mode	MCS Index	Band	Channel	SU	Reference power (dBm)/ Port	RU	Reference power(dBm)/Port	Maximum Tune Up Tolerance (dBm)/ 2Port
STA	MIMO	IEEE 802.11ax (HE80)	All MCS index	UNII-5	7 ~ 87	SU	3.0 + 2.0			6.0 + 2.0
								996-tone (Full tone)	3.0 + 2.0	6.0 + 2.0
								242-tone	0.0 + 2.0	3.0 + 2.0
								484-tone	2.0 + 2.0	5.0 + 2.0
			MCS0 ~ MCS9	UNII-5	7 ~ 87			26-tone	-8.0 + 2.0	-5.0 + 2.0
								52-tone	-6.0 + 2.0	-3.0 + 2.0
								106-tone	-3.0 + 2.0	0.0 + 2.0
			All MCS index	UNII-6	103	SU	3.0 + 2.0			6.0 + 2.0
								996-tone (Full tone)	3.0 + 2.0	6.0 + 2.0
								242-tone	0.0 + 2.0	3.0 + 2.0
								484-tone	3.0 + 2.0	6.0 + 2.0

STA/ AP	SISO/ MIMO	Mode	MCS Index	Band	Channel	SU	Reference power (dBm)/ Port	RU	Reference power(dBm)/Port	Maximum Tune Up Tolerance (dBm)/ 2Port
			MCS0 ~ MCS9	UNII-6	103			26-tone	-8.0 + 2.0	-5.0 + 2.0
								52-tone	-6.0 + 2.0	-3.0 + 2.0
								106-tone	-3.0 + 2.0	0.0 + 2.0
			All MCS index	UNII-7	119 ~ 167	SU	3.0 + 2.0			6.0 + 2.0
								996-tone (Full tone)	3.0 + 2.0	6.0 + 2.0
								242-tone	0.0 + 2.0	3.0 + 2.0
								484-tone	2.0 + 2.0	5.0 + 2.0
			MCS0 ~ MCS9	UNII-7	119 ~ 167			26-tone	-8.0 + 2.0	-5.0 + 2.0
								52-tone	-6.0 + 2.0	-3.0 + 2.0
								106-tone	-3.0 + 2.0	0.0 + 2.0
			All MCS index	UNII-8	183 ~ 215	SU	3.0 + 2.0			6.0 + 2.0
								996-tone (Full tone)	3.0 + 2.0	6.0 + 2.0
								242-tone	0.0 + 2.0	3.0 + 2.0
								484-tone	3.0 + 2.0	6.0 + 2.0
			MCS0 ~ MCS9	UNII-8	183 ~ 215			26-tone	-9.0 + 2.0	-6.0 + 2.0
								52-tone	-7.0 + 2.0	-4.0 + 2.0
								106-tone	-4.0 + 2.0	-1.0 + 2.0
AP	MIMO	IEEE 802.11ax (HE80)	All MCS index	UNII-5	7 ~ 87	SU	9.0 + 2.0			12.0 + 2.0
								996-tone (Full tone)	9.0 + 2.0	12.0 + 2.0
								242-tone	6.0 + 2.0	9.0 + 2.0
								484-tone	8.0 + 2.0	11.0 + 2.0
			MCS0 ~ MCS9	UNII-5	7 ~ 87			26-tone	-3.0 + 2.0	0.0 + 2.0
								52-tone	0.0 + 2.0	3.0 + 2.0
								106-tone	3.0 + 2.0	6.0 + 2.0
			All MCS index	UNII-6	103	SU	9.0 + 2.0			12.0 + 2.0
								996-tone (Full tone)	9.0 + 2.0	12.0 + 2.0
								242-tone	6.0 + 2.0	9.0 + 2.0
								484-tone	7.0 + 2.0	10.0 + 2.0
			MCS0 ~ MCS9	UNII-6	103			26-tone	-3.0 + 2.0	0.0 + 2.0
								52-tone	0.0 + 2.0	3.0 + 2.0
								106-tone	3.0 + 2.0	6.0 + 2.0
			All MCS index	UNII-7 / UNII-8	119 ~ 215	SU	9.0 + 2.0			12.0 + 2.0
								996-tone (Full tone)	9.0 + 2.0	12.0 + 2.0
								242-tone	5.0 + 2.0	8.0 + 2.0
								484-tone	7.0 + 2.0	10.0 + 2.0
			MCS0 ~ MCS9	UNII-7 / UNII-8	119 ~ 215			26-tone	-3.0 + 2.0	0.0 + 2.0
								52-tone	-1.0 + 2.0	2.0 + 2.0
								106-tone	2.0 + 2.0	5.0 + 2.0

MCS10 and MCS11 can only be used at 242-tone or higher.

2.1.2 Theory of Operation

Table 36 describes the theory of operation.

Table 36: Theory of Operation - FCC

Frequency of Operation			Scan	Ad hoc Mode	Indoor/Outdoor
2.4 GHz	11b/g/n/ax (BW20)	2412-2462 MHz	Active	Yes	Both
	BT	2402-2480 MHz	N/A	N/A	Both
	BLE	2402-2480 MHz	N/A	N/A	Both
W52	11a/n/ac/ax (BW20)	5180-5240 MHz	Active	Yes	Both
	11n/ac/ax (BW40)	5190-5230 MHz	Active	Yes	Both
	11ac/ax (BW80)	5210 MHz	Active	Yes	Both
W53[1] [2]	11a/n/ac/ax (BW20)	5260-5320 MHz	Passive	No	Both
	11n/ac/ax (BW40)	5270-5310 MHz	Passive	No	Both
	11ac/ax (BW80)	5290 MHz	Passive	No	Both
W56[1] [2]	11a/n/ac/ax (BW20)	5500-5720 MHz	Passive	No	Both
	11n/ac/ax (BW40)	5510-5710 MHz	Passive	No	Both
	11ac/ax (BW80)	5530-5690 MHz	Passive	No	Both
W58	11a/n/ac/ax (BW20)	5745-5825 MHz	Active	Yes	Both
	11n/ac/ax (BW40)	5755-5795 MHz	Active	Yes	Both
	11ac/ax (BW80)	5775 MHz	Active	Yes	Both
UNII-5/UNII-6/ UNII-7/UNII-8	11a	5955-7095 MHz	Active(6XD)	Yes (6ID)	Indoor only
	11ax (BW20)	5955-7095 MHz	Active(6XD)	Yes (6ID)	Indoor only
	11ax (BW40)	5965-7085 MHz	Active (6XD)	Yes (6ID)	Indoor only
	11ax (BW80)	5985-7025 MHz	Active (6XD)	Yes (6ID)	Indoor only

2.1.3 Integration Instructions

This manual is based on KDB 996369. It is designed to ensure that module manufacturers correctly communicate the necessary information to host manufacturers that incorporate their modules.

2.1.3.1 General: Applicable

Sections 2 through 10 describe the items that must be provided in the integration instructions for host product manufacturers (e.g., OEM instruction manual) to use when integrating a module in a host product. This Modular transmitter applicant (muRata) should include information in their instructions for all these items indicating clearly when they are not applicable.

2.1.3.2 List of Applicable FCC Rules: Applicable

This device complies with below part 15 of FCC Rules.

- Part 15 Subpart C
- Part 15 Subpart E

2.1.3.3 Summarize the specific operational use conditions: Applicable

This module is designed for mounting inside of the end product by us professionally. Therefore, it complies with the antenna and transmission system requirements of §15.203.

[1] DFS MASTER function not available. DFS client function available.
[2] There is a TPC function.

2.1.3.4 Limited Module Procedures: Applicable

Since there is no space which indicates FCC ID on this module, FCC ID is indicated in a manual. If the FCC ID is not visible when the module is installed inside another device, then the module is installed must also display a label referring to the enclosed module.

2.1.3.5 Trace Antenna Designs: Applicable

Please perform the Trace antenna design that followed the specifications of the antenna.
The concrete contents of a check are the following three points.

1. It is the same type as the antenna type of antenna specifications.
   Confirm the same size as the Gerber file.
2. An antenna gain is lower than a gain given in antenna specifications.
   Measure the gain, and confirm the peak gain is less than the application value.
3. The emission level is not getting worse.
   Measure the spurious and confirm degradation of less than 3dB than spurious value of worst of report used for the application. However, it is spurious defined below.

Please send those reports to Murata. And please refer to the Antenna in Section 2.1.6.7.

2.1.3.6 RF Exposure Considerations: Applicable

This equipment is only authorized for use in devices that are used at a distance of at least 20 centimeters between the RF source's radiating structure(s) and the body of the user or nearby persons.

It is necessary to take a SAR test with your set mounting this module (except to use only Bluetooth). Class II permissive change application is necessary using the SAR report. Please contact Murata. And an application for a Class II permissive change from a Mobile equipment to a Portable equipment is also required.

1. **Portable equipment:** Equipment for which the spaces between human body and antenna are used within 20 cm.
2. **Mobile equipment:** Equipment used at position in which the spaces between human body and antenna exceeded 20 cm.

2.1.3.7 Antennas: Applicable

Table 37 describes the antennas.

Table 37: Antennas - FCC

No.	Part number	Vendor	Peak Gain [dBi]			Type	Connector
			2.4 GHz	5 GHz	6 GHz		
1	146153	Moldex	3.2	4.25	5.8	Dipole	u.FL
2	219611	Molex	2.67	3.67	4.0	Dipole	u.FL
3	WT32D1-KX	Unictron	3.0	4.0	4.0	Dipole	MHF I
4	W24P-U	Inventek	3.2	N/A	N/A	Dipole	u.FL
5	Type2EA_Antenna	Murata	2.9	2.9	2.5	Monopole	Trace

No. 4 W24P-U can only be used at 2.4 GHz.
No. 5 Type2EA_Antenna can only be used for ANT0 (Antenna port0).

2.1.3.8 Label and Compliance Information: Applicable

The following statements must be described on the user manual of the host device of this module:

Contains Transmitter Module FCC ID: VPYLBEE5XV2EA	OR	Contains FCC ID: VPYLBEE5XV2EA

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.

If it is difficult to describe this statement on the host product due to the size, please describe in the User's manual.

FCC CAUTION
Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Compliance with FCC requirement 15.407(c)
Data transmission is always initiated by software, which is passed down through the MAC, through the digital and analog baseband, and finally to the RF chip. Several special packets are initiated by the MAC. These are the only ways the digital baseband portion will turn on the RF transmitter, which then turns off at the end of the packet. Therefore, the transmitter will be on only while one of the aforementioned packets is being transmitted. In other words, this device automatically discontinue transmission in case of either absence of information to transmit or operational failure.

Frequency Tolerance: + 2.0 ppm

This transmitter must not be co-located or operated in conjunction with any other antenna or transmitter.

When this module being integrated in any finished product with 6GHz AP function, compliance according to KDB 987594 D01 must be ensured for equipment class 6ID by following measures.

FCC regulations restrict the operation of this device to indoor use only, a weatherized enclosure cannot be used.
The operation of this device is prohibited on oil platforms, cars, trains, boats, and aircraft, except that operation of this device is permitted in large aircraft while flying above 10,000 feet.
Operation of transmitters in the 5.925-7.125 GHz band is prohibited for control of or communications with unmanned aircraft systems.

Only the integrated antennas specified in the section 7 of this manual is allowed, when changes of antenna is requested, please contact Murata as further verification by Class II application is required.

The finished product must be powered by a wired connection and not by battery power.

The host device must be labeled with "Contains FCC ID:VPYLBEE5XV2EA" alone with "Indoor Use Only".

When installing it in mobile equipment, please describe the following warning to the manual.

> This equipment is only authorized for use in devices that are used at a distance of at least 20 centimeters between the RF source's radiating structure(s) and the body of the user or nearby persons.

This module is only approved as mobile equipment. Therefore, do not install it on portable equipment.

If you wish to use it as a portable equipment, please contact Murata in advance as Class II application accompanied by SAR testing using the final product are required.

2.1.3.9 Information On Test Modes and Additional Testing Requirements: Applicable

Please check the installation manual first. Please contact Murata if you have any questions when conducting the RF certification test on the host. We (Murata) are ready to present the control manual and others for the RF certification test.

2.1.3.10 Additional Testing, Part 15 Subpart B Disclaimer: Applicable

> The modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification.
>
> The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

If the final product with this module is FCC Class A digital device, include the following in the manual of the final product.

> Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

If the final product with this module is FCC Class B digital device, include the following in the manual of the final product.

> Note: 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 or more 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.

2.1.3.11 Note on EMI Considerations: Applicable

A host manufacture is recommended to use KDB 996369 D04 Module Integration Guide recommending as "best practice" RF design engineering testing and evaluation in case non-linear interactions generate additional non-compliant limits due to module placement to host components or properties.

For standalone mode, reference the guidance in D04 Module Integration Guide and for simultaneous mode7; see D02 Module Q&A Question 12, which permits the host manufacturer to confirm compliance.

2.1.3.12 How to Make Changes: Applicable

When changing from the conditions of approval, please present technical documentation that it is equivalent to a Class I change. For example, when adding or changing an antenna, the following technical documents are required.

1. The document indicating the same type as the original antenna.
2. Technical document showing that the gain is the same or lower than the gain at the time of the original approval.
3. Technical document showing that the spurious is no more than 3 dB worse than when it was originally certified.

2.1.4 About Power Supply

Please supply a stable power supply so that the voltage shown in **Table 38** is applied.

Table 38: Power Supply Voltages - FCC

Parameter		Minimum	Typical	Maximum	Unit
Supply Voltage	VBAT	3.0	3.3	4.8	V
	VDDIO	1.71	1.8	1.89	V

2.1.5 Trace Antenna and Feed Line

2.1.5.1 Signal Line Between an Antenna and a Module

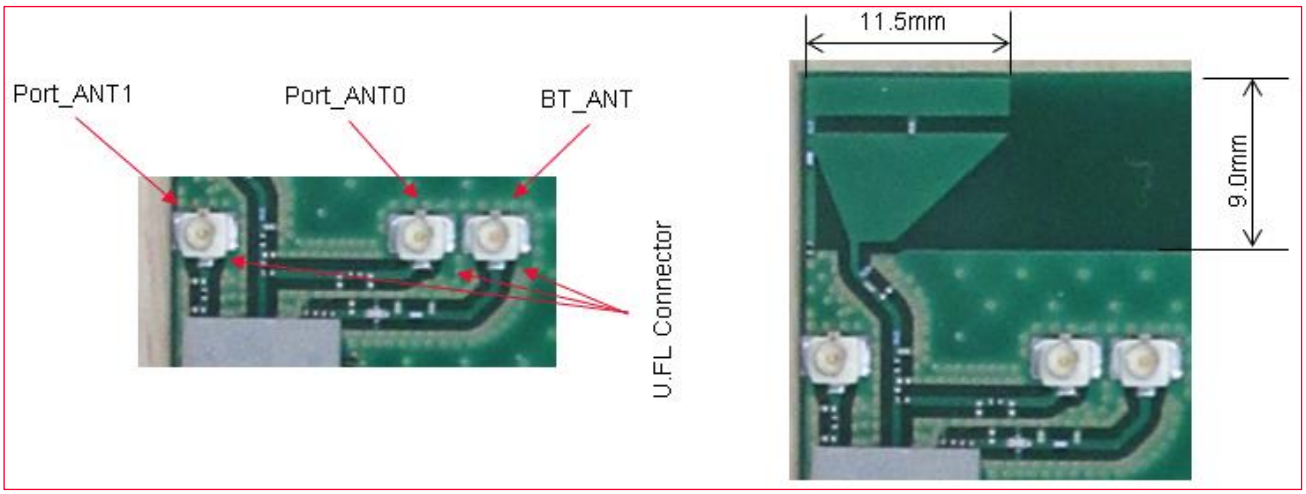
It is a 50 Ω line design. Fine tuning of return loss etc. can be performed using a matching network. However, it is required to check "Class1 change" and "Class2 change" which the authorities define then.

The concrete contents of a check are the following three points.

1. It is the same type as the antenna type of antenna specifications.
2. An antenna gain is lower than a gain given in antenna specifications.
3. The emission level is not getting worse.

50 Ω line (microstrip line length) and Trace Antenna (Type2EA_Antenna) are used as the design of the EVB used for the test. **Figure 5** shows the pattern used in the certification test.

Figure 5: EVB Design Used for Testing - FCC



The 50 Ω microstrip line and Type2EA_Antenna needs to be copied when module is installed in the End product.

Murata provides set makers with Gerber data or something similar.

2.1.5.2 Trace Antenna and Feed Line of The Jig Where the Certification Test is Conducted

- Substrate type name of certification test jig: **P2ML9990**
- Feed line width: **0.5 mm**
- Substrate thin: **0.8 ± 0.1 mm**
- Substrate material: **FR-4**
- Number of substrate layers: **6**

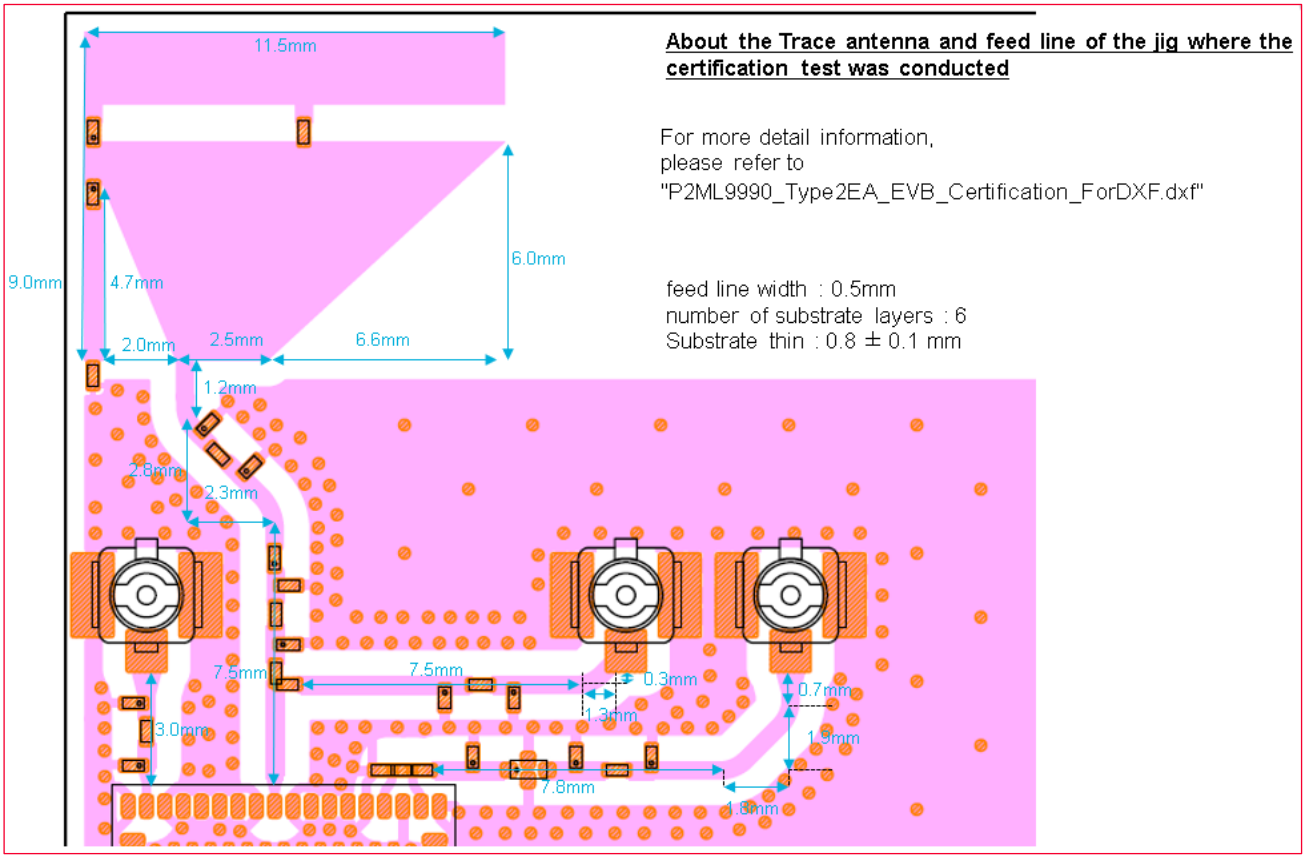


Figure 6: Trace Antenna and Feed Line of The Jig - FCC

2.1.6 Layout Guidance for Microstrip Design and External Antenna

2.1.6.1 Trace Antenna (Type2EA_Antenna)

The LBEE5XV2EA (LBEE5XV2EB) module is certified with a PCB antenna (Type2EA_Antenna).

The following precautions should be taken when using this PCB antenna (Type2EA_Antenna)

- Type2EA_Antenna can only be used for port_ANT0 side.
- When the module is installed in the final product, the 50 Ω microstrip line and Type2EL_Antenna, outlined in right red in **Figure 7**, must be copied to the state shown in **Figure 8** where it was certified.
- Port_ANT1 can use the following four antennas when it is in Dedicated Usage.
  - 219611, WT32D1-KX, W24P-U.

Murata provides set makers with Gerber data or something similar.

Figure 7: 50 Ω Microstrip Line and Type2EA Antenna - FCC

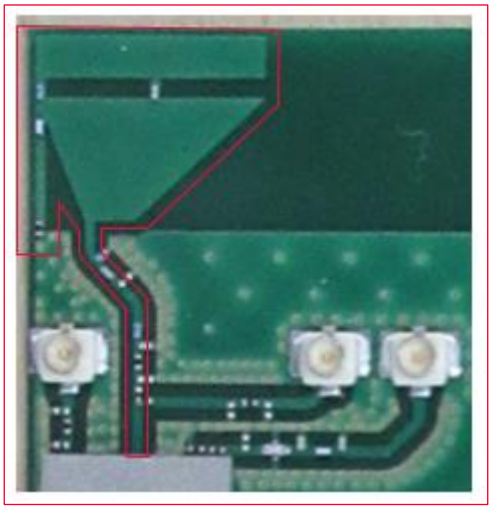
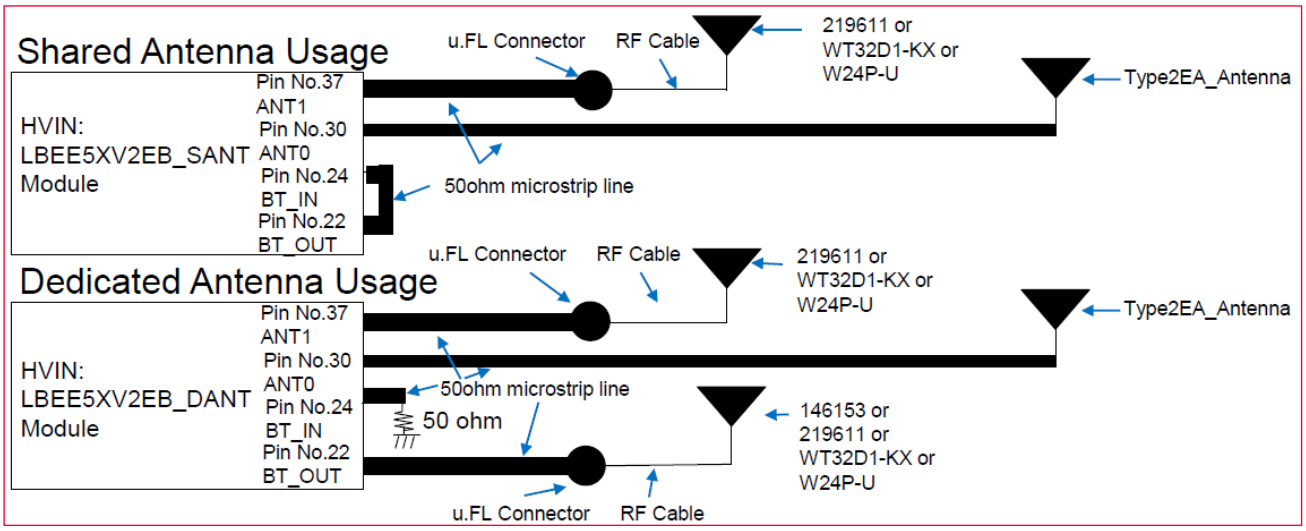


Figure 8: Type2EA Trace Antenna Layout Guide - FCC



2.1.6.2 Antenna With u.FL Connector and Cables and Feed Lines (146153, 219611, WT32D1-KX, W24P-U)

- The LBEE5XV2EA (LBEE5XV2EB) module is certified with four external antennas.

> The external antenna should be connected to the LBEE5XV2EA (LBEE5XV2EB) module using 50 Ω microstrip RF trace and a u.FL RF connector as described below.

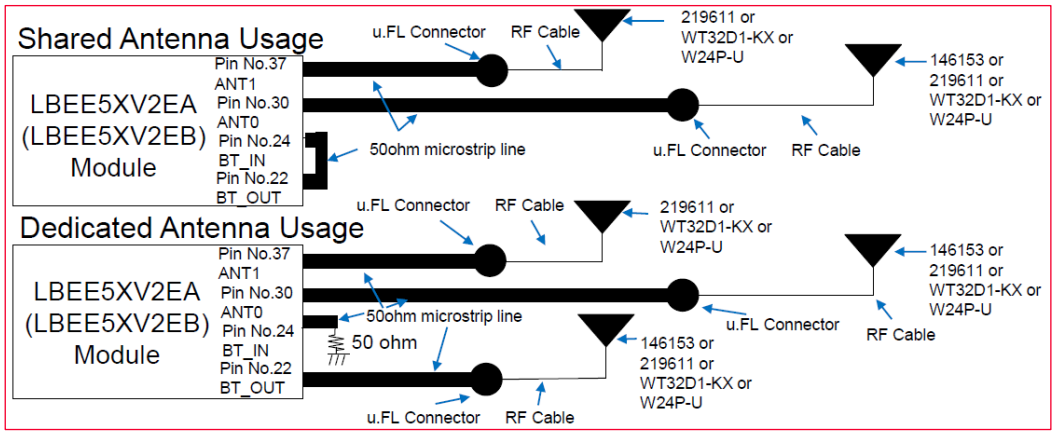
- The microstrip RF trace and u.FL connector are placed on the customer‘s PCB and are external to the LBEE5XV2EA(LBEE5XV2EB) module.
- The antenna is then connected to this u.FL Connector via a 50 Ω RF adapter cable.
- The design of the 50 Ω microstrip RF trace on the customer’s PCB is crucially important.

Compliant operation of the LBEE5XV2EA (LBEE5XV2EB) module is dependent on proper construction of this 50 Ω line and the following guidelines must be followed to ensure legal operation of the product.

Figure 9 shows the required microstrip structure to be routed between module pin 22, 24 and the u.FL connector.

The top PCB trace carries the RF energy from module to u.FL connector.

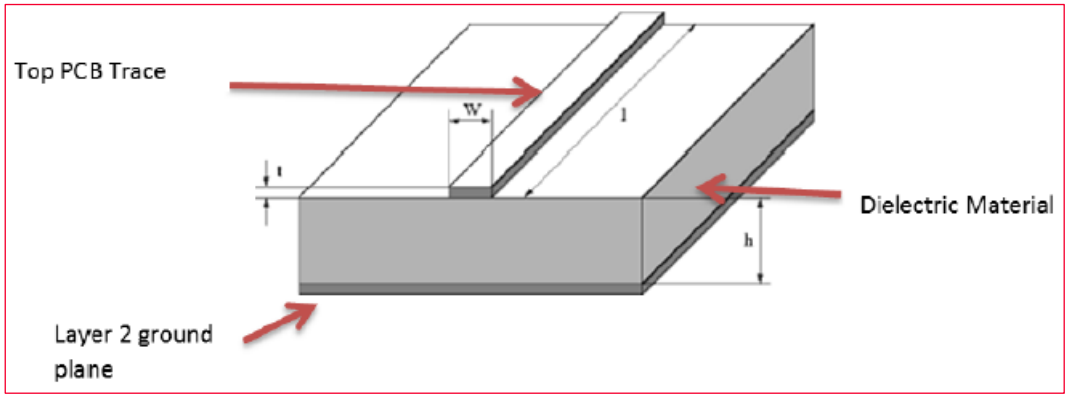
Figure 9: Antenna with u.FL Connector Layout Guide - FCC



50 Ω microstrip RF trace: Murata provides set makers with Gerber data or something similar.

As shown in **Figure 10**, the Layer2 ground plane provides a return path for the circuit. The Dielectric material (along with the dimensions of the microstrip structures) determines the characteristic impedance of the microstrip transmission line.

Figure 10: Microstrip RF Trace Structure - FCC



Note the representative dimensions shown in the drawing above. It is imperative that the module customer (the integrator) use the exact dimensions we recommend ensuring a 50 Ω impedance for this transmission line.

The following dimensions and/or ratios should be used to set the microstrip impedance to 50 Ω:

- Dielectric (PCB) Material: We recommend standard FR4 PCB material. Other dielectrics will work but will require recalculation of microstrip dimensions.

  The following guidance is predicated on the use of FR4 Dielectric:

  - If FR4 is not used for PCB material, please contact Murata to determine new dimensions for microstrip structure.

- **h** (Dielectric Height) - this is the thickness of dielectric between the trace layer (layer 1) and the ground plane on layer 2.

  Note that layer 2 must be electrical ground. We recommend a dielectric thickness of 8-15 mils. This range provides the customer with some flexibility in board construction.

- **t** (**trace thickness**): Microstrip impedance is not severely affected by the thickness dimension. Standard 102 or 202 copper deposition is recommended. Equivalent thickness is 1-2 mils.

- **W** (**trace width**): this is the crucial dimension. This width must be set correctly to obtain the desired 50 Ω impedance.

  When using FR-4 dielectric, the width (W) of the microstrip trace should be set to: W = H* 1.8, where W is microstrip trace width and H is Dielectric height. Note that both values must be measured in identical units (mils or mm).

  Example:

  H = 12 mils, W =12 * 1.8 = 21.6 mils

  H = 0.4 mm, W = 0.4*1.8 = 0.72 mm

  In any event, the microstrip line must operate over the same Dielectric-Ground Plane configuration shown above to act as a 50 Ω transmission line.

  Do not run the microstrip trace through sections of PCB that do not have the Dielectric-Ground plane configuration shown above.

A reliable 50 Ω transmission line will be produced if the above guidance is closely followed.

Any deviations from the guidance above may cause the module to operate in noncompliant manner.

Any implementation questions or concerns should be directed to Murata module technical support.

About Software SECURITY

Updates must be systematized to be deployed by your device management system to qualify for this approval.

A condition for using this authorization is that the update package is systematized, managed by digital signatures, individual identification numbers, etc. Inform our company that we have designed the FW and configuration files specified by Murata to be installed correctly when you are implemented in the final product.

2.2 ISED

PMN: LBEE5XV2EA	**HVIN:** LBEE5XV2EA_SANT LBEE5XV2EA_DANT	**IC:** 722C-LBEE5XV2EA

This device contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's license-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique 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;
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

English Version
For indoor use only (5150-5250 MHz band and channel 52, 54, 58).
French Version
Pour usage intérieur seulement (5150-5250 MHz band and channel 52, 54, 58)

English Version
Data transmission is always initiated by software, which is then passed down through the MAC, through the digital and analog baseband, and finally to the RF chip. Several special packets are initiated by the MAC. These are the only ways the digital baseband portion will turn on the RF transmitter, which then turns off at the end of the packet. Therefore, the transmitter will be on only while one of the aforementioned packets is being transmitted. In other words, this device automatically discontinue transmission in case of either absence of information to transmit or operational failure.
French Version
La transmission des données est toujours initiée par le logiciel, puis les données sont transmises par l'intermédiaire du MAC, par la bande de base numérique et analogique et, enfin, à la puce RF. Plusieurs paquets spéciaux sont initiés par le MAC. Ce sont les seuls moyens pour qu'une partie de la bande de base numérique active l'émetteur RF, puis désactive celui-ci à la fin du paquet. En conséquence, l'émetteur reste uniquement activé lors de la transmission d'un des paquets susmentionnés. En d'autres termes, ce dispositif interrompt automatiquement toute transmission en cas d'absence d'information à transmettre ou de défaillance.

English Version
This radio transmitter (IC: 772C-LBEE5XV2EA) has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.
French Version
Le présent émetteur radio (IC: 772C-LBEE5XV2EA) a été approuvé par Innovation, Sciences et Développement économique Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal. Les types d'antenne non inclus dans cette liste, et dont le gain est supérieur au gain maximal indiqué pour

2.2.1 Low-power client device (STA mode)

English Version Devices shall not be used for control of or communications with unmanned aircraft systems.
French Version Les dispositifs ne doivent pas être utilisés pour commander des systèmes d'aéronef sans pilote ni pour communiquer avec de tels systèmes.

2.2.2 Low-power indoor AP (AP mode)

English Version 1. Devices shall not be used for control of or communications with unmanned aircraft systems. 2. Operation shall be limited to indoor use only. 3. Operation on oil platforms, automobiles, trains, maritime vessels and aircraft shall be prohibited except for on large aircraft flying above 3,048 m (10,000 ft).
French Version 1. Les dispositifs ne doivent pas être utilisés pour commander des systèmes d'aéronef sans pilote ni pour communiquer avec de tels systèmes. 2. leur utilisation doit être limitée à l'intérieur seulement 3. leur utilisation à bord de plateformes de forage pétrolier, d'automobiles, de trains, de navires maritimes et d'aéronefs doit être interdite, sauf à bord d'un gros aéronef volant à plus de 3 048 m (10 000 pi) d'altitude.

When installing it in mobile equipment:

English Version This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment and meets RSS-102 of the IC radio frequency (RF) Exposure rules. This equipment should be installed and operated keeping the radiator at least 20cm or more away from person's body.
French Version Cet équipement est conforme aux limites d'exposition aux rayonnements énoncées pour un environnement non contrôlé et respecte les règles d'exposition aux fréquences radioélectriques (RF) CNR-102 de l'IC. Cet équipement doit être installé et utilisé en gardant une distance de 20 cm ou plus entre le radiateur et le corps humain.

When installing it in a portable equipment:

1. It is necessary to take a SAR test with your set mounting this module.
2. Class 4 permissive change application is necessary using the SAR report.

Please contact Murata.

- **Portable equipment:** Equipment for which the spaces between human body and antenna are used within 20 cm.
- **Mobile equipment:** Equipment used at position in which the spaces between human body and antenna exceeded 20 cm.

2.2.3 Antenna List

English Version This radio transmitter (772C-LBEE5XV2EA) has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device. Dipole Antenna Gain: 3.2 dBi@2.4GHz/4.25 dBi@5GHz/5.8 dBi@6GHz Dipole Antenna Gain: 2.67 dBi@2.4GHz/3.67 dBi@5GHz/4.0 dBi@6GHz Dipole Antenna Gain: 3.0 dBi@2.4GHz/4.0 dBi@5GHz/4.0 dBi@6GHz

Dipole Antenna	Gain: 3.2 dBi@2.4GHz
Monopole Antenna	Gain: 2.9 dBi@2.4GHz/2.9 dBi@5GHz/2.5 dBi@6GHz

French Version

Le présent émetteur radio (772C-LBEE5XV2EA) a été approuvé par Innovation, Sciences et Développement économique Canada pour fonctionner avec les types d'antenne énumérés ci dessous et ayant un gain admissible maximal.

Les types d'antenne non inclus dans cette liste, et dont le gain est supérieur au gain maximal indiqué pour tout type figurant sur la liste, sont strictement interdits pour l'exploitation de l'émetteur.

Dipole Antenna	Gain: 3.2 dBi@2.4GHz/4.25 dBi@5GHz/5.8 dBi@6GHz
Dipole Antenna	Gain: 2.67 dBi@2.4GHz/3.67 dBi@5GHz/4.0 dBi@6GHz
Dipole Antenna	Gain: 3.0 dBi@2.4GHz/4.0 dBi@5GHz/4.0 dBi@6GHz
Dipole Antenna	Gain: 3.2 dBi@2.4GHz
Monopole Antenna	Gain: 2.9 dBi@2.4GHz/2.9 dBi@5GHz/2.5 dBi@6GHz

2.2.4 Setting RF Power

This section describes the RF power settings.

2.2.4.1 RF Power Setting for 2.4 GHz WLAN

Table 39, **Table 40**, **Table 41**, and **Table 42** describe the RF Power Settings for 2.4 GHz WLAN.

Table 39: WLAN RF Power Setting - 2.4 GHz 802.11 b/g/n (SISO) (ISED)

SISO/CDD/MIMO	Mode	Rate/MCS index	Channel	Maximum Tune Up Tolerance (dBm)
SISO	IEEE 802.11b	All Rate	1,2,10,11	15.0 + 2.0
			3~9	18.0 + 2.0
	IEEE 802.11g	All rate	1, 2, 10, 11	13.0 + 2.0
			3, 9	14.0 + 2.0
			4, 5, 8	15.0 + 2.0
			6	17.0 + 2.0
			7	16.0 + 2.0
	IEEE 802.11n (HT20)	All MCS index	1, 2	13.0 + 2.0
			3, 9	14.0 + 2.0
			4, 5, 8	15.0 + 2.0
			6, 7	16.0 + 2.0
			10, 11	12.0 + 2.0

Table 40: WLAN RF Power Setting - 2.4 GHz 802.11 b/g/n (CDD/MIMO) (ISED)

SISO/ CDD/ MIMO	Mode	Rate/MCS index	Channel	Reference power (dBm) / Port	Maximum Tune Up Tolerance (dBm) / 2 Port
CDD	IEEE 802.11b	N/A	N/A	N/A	N/A
	IEEE 802.11g	All rate	1, 2, 10, 11	10.0 + 2.0	13.0 + 2.0
			3 ~ 9	14.0 + 2.0	17.0 + 2.0
CDD/ MIMO	IEEE 802.11n (HT20)	All MCS index	1, 2	10.0 + 2.0	13.0 + 2.0
			3 ~ 9	13.0 + 2.0	16.0 + 2.0
			10, 11	9.0 + 2.0	12.0 + 2.0

Table 41: WLAN RF Power Setting - 2.4 GHz 802.11ax (HE20) (SISO) (ISED)

SISO/ CDD/ MIMO	Mode	Rate / MCS index	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
SISO	IEEE 802.11ax (HE20)	All MCS index	1, 2, 10, 11	SU	11.0 + 2.0		
						242-tone (Full tone)	11.0 + 2.0
		MCS0 ~ MCS9	1, 2, 10, 11			26-tone	11.0 + 2.0
						52-tone	11.0 + 2.0
						106-tone	11.0 + 2.0
		MCS0 ~ MCS8	3 ~ 9	SU	14.0 + 2.0		
						242-tone (Full tone)	14.0 + 2.0
						26-tone	14.0 + 2.0
						52-tone	14.0 + 2.0
						106-tone	14.0 + 2.0
		MCS9 ~ MCS11	3 ~ 9	SU	12.0 + 2.0		
						242-tone (Full tone)	12.0 + 2.0
		MCS9	3 ~ 9			26-tone	12.0 + 2.0
						52-tone	12.0 + 2.0
						106-tone	12.0 + 2.0

MCS10 and MCS11 can only be used at 242-tone or higher.

Table 42: WLAN RF Power Setting - 2.4 GHz 802.11ax (HE20) (CDD/MIMO) (ISED)

SISO/ CDD/ MIMO	Mode	Rate/ MCS index	Channel	SU	Reference Power (dBm) / Port	RU	Reference Power (dBm) / Port	Maximum Tune Up Tolerance (dBm) / 2 Port
CDD/ MIMO	IEEE 802.11ax (HE20)	ALL MCS index	1, 2, 10, 11	SU	8.0 + 2.0			11.0 + 2.0
						242-tone (Full tone)	8.0 + 2.0	11.0 + 2.0
		MCS0 ~ MCS9	1, 2, 10, 11			26-tone	8.0 + 2.0	11.0 + 2.0
						52-tone	8.0 + 2.0	11.0 + 2.0
						106-tone	8.0 + 2.0	11.0 + 2.0
		ALL MCS index	3 ~ 9	SU	11.0 + 2.0			14.0 + 2.0
						242-tone (Full tone)	11.0 + 2.0	14.0 + 2.0
		MCS0 ~ MCS9	3 ~ 9			26-tone	11.0 + 2.0	14.0 + 2.0
						52-tone	11.0 + 2.0	14.0 + 2.0
						106-tone	11.0 + 2.0	14.0 + 2.0

MCS10 and MCS11 can only be used at 242-tone or higher.

2.2.4.2 RF Power Setting for BT (BR/EDR) / BLE

Table 43 describes the RF power settings for BT (BR/EDR) and BLE.

Table 43: BT / BLE RF Power Setting - ISED

Mode	Channel	Maximum Tune Up Tolerance (dBm)
BR	NA	8.0 +2.5
EDR	NA	4.0 +2.5
LE 125 kbps	NA	8.0 +2.5
LE 500 kbps	NA	8.0 +2.5
LE 1 Mbps	N/A	8.0 +2.5
LE 2 Mbps	N/A	8.0 +2.5

2.2.4.3 RF Power Setting for 5 GHz WLAN

Table 44 and **Table 45** describe the RF power settings for 5 GHz WLAN.

Table 44: WLAN RF Power Setting - 5 GHz 802.11a (SISO) (ISED)

SISO/ CDD/ MIMO	Mode	Rate	Band	Channel	Maximum Tune Up Tolerance (dBm)
SISO	IEEE 802.11a	All Rate	W52/W53	36, 40, 60, 64	13.0 + 2.0
		All Rate	W52/W53	44, 48	14.0 + 2.0
		All Rate	W52/W53	52, 56	16.0 + 2.0
		All Rate	W56	100, 104	13.0 + 2.0
		All Rate	W56	108 ~ 136, 144	16.0 + 2.0
		All Rate	W56	140	9.0 + 2.0
		All Rate	W58	149 ~ 157	16.0 + 2.0
		All Rate	W58	161, 165	13.0 + 2.0

- For STA mode, ISED does not support 120ch, 124ch, 128ch.
- For STA mode, 36ch, 40ch, 44ch, 48ch, 52ch are indoor use only.
- For AP mode, 36ch, 40ch, 44ch, 48ch are indoor use only.

Table 45: WLAN RF Power Setting - 5 GHz 802.11a (CDD/MIMO) (ISED)

SISO/ CDD/ MIMO	Mode	Rate	Band	Channel	Reference Power (dBm)/Port	Maximum Tune Up Tolerance (dBm)/2Port
CDD	IEEE 802.11a	All Rate	W52/W53	36, 40, 44, 48	8.0 + 2.0	11.0 + 2.0
		All Rate	W52/W53	52, 56	13.0 + 2.0	16.0 + 2.0
		All Rate	W52/W53	60, 64	10.0 + 2.0	13.0 + 2.0
		All Rate	W56	100, 104	10.0 + 2.0	13.0 + 2.0
		All Rate	W56	108 ~ 136, 144	13.0 + 2.0	16.0 + 2.0
		All Rate	W56	140	9.0 + 2.0	12.0 + 2.0
		All Rate	W58	149 ~ 157	13.0 + 2.0	16.0 + 2.0
		All Rate	W58	161, 165	10.0 + 2.0	13.0 + 2.0

- For STA mode, ISED does not support 120ch, 124ch, 128ch.
- For STA mode, 36ch, 40ch, 44ch, 48ch, 52ch are indoor use only.
- For AP mode, 36ch, 40ch, 44ch, 48ch are indoor use only.

Table 46, Table 47, Table 48, and **Table 49** describe the RF power settings for 5 GHz 802.11n WLAN.

Table 46: WLAN RF Power Setting - 5 GHz 802.11n (HT20) (SISO) (ISED)

SISO/ CDD/ MIMO	Mode	MCS Index	Band	Channel	Maximum Tune Up Tolerance (dBm)
SISO	IEEE 802.11n (HT20)	All MCS Index	W52/W53	36, 40, 60, 64	11.0 + 2.0
		All MCS Index	W52/W53	44 ~ 56	14.0 + 2.0
		All MCS Index	W56	100, 104	11.0 + 2.0
		All MCS Index	W56	108 ~ 136, 144	14.0 + 2.0
		All MCS Index	W56	140	8.0 + 2.0
		All MCS Index	W58	149 ~ 157	14.0 + 2.0
		All MCS Index	W58	161, 165	11.0 + 2.0

- For STA mode, ISED does not support 120ch, 124ch, 128ch.
- For STA mode, 36ch, 40ch, 44ch, 48ch, 52ch are indoor use only.
- For AP mode, 36ch, 40ch, 44ch, 48ch are indoor use only.

Table 47: WLAN RF Power Setting - 5 GHz 802.11n (HT20) (CDD/MIMO) (ISED)

SISO/ CDD/ MIMO	Mode	MCS Index	Band	Channel	Reference Power (dBm) / Port	Maximum Tune Up Tolerance (dBm) / 2 Port
CDD/ MIMO	IEEE 802.11n (HT20)	All MCS Index	W52/W53	36 ~ 48, 60, 64	8.0 + 2.0	11.0 + 2.0
		All MCS Index	W52/W53	52, 56	11.0 + 2.0	14.0 + 2.0
		All MCS Index	W56	100, 104	8.0 + 2.0	11.0 + 2.0
		All MCS Index	W56	108 ~ 136, 144	11.0 + 2.0	14.0 + 2.0
		All MCS Index	W56	140	8.0 + 2.0	11.0 + 2.0
		All MCS Index	W58	149 ~ 157	11.0 + 2.0	14.0 + 2.0
		All MCS Index	W58	161, 165	8.0 + 2.0	11.0 + 2.0

- For STA mode, ISED does not support 120ch, 124ch, 128ch.
- For STA mode, 36ch, 40ch, 44ch, 48ch, 52ch are indoor use only.
- For AP mode, 36ch, 40ch, 44ch, 48ch are indoor use only.

Table 48: WLAN RF Power Setting - 5 GHz 802.11n (HT40) (SISO) (ISED)

SISO/ CDD/MIMO	Mode	MCS Index	Band	Channel	Maximum Tune Up Tolerance (dBm)
SISO	IEEE 802.11n (HT40)	All MCS index	W52/W53	38	11.0 + 2.0
		All MCS Index	W52/W53	46,54	14.0 + 2.0
		All MCS Index	W52/W53	62	7.0 + 2.0
		All MCS Index	W56	102	7.0 + 2.0
		All MCS Index	W56	110 ~ 126, 142	14.0 + 2.0
		All MCS Index	W56	134	12.0 + 2.0
		All MCS Index	W58	151	14.0 + 2.0
		All MCS index	W58	159	11.0 + 2.0

- For STA mode, ISED does not support 118ch, 126ch.
- For STA mode, 38ch, 46ch, 54ch are indoor use only.
- For AP mode, 38ch, 46ch are indoor use only.

Table 49: WLAN RF Power Setting - 5 GHz 802.11n (HT40) (CDD/MIMO) (ISED)

SISO/ CDD/ MIMO	Mode	MCS Index	Band	Channel	Reference Power (dBm) / Port	Maximum Tune Up Tolerance (dBm) / 2 Port
CDD/ MIMO	IEEE 802.11n (HT40)	All MCS index	W52/W53	38	8.0 + 2.0	11.0 + 2.0
		All MCS Index	W52/W53	46,54	11.0 + 2.0	14.0 + 2.0
		All MCS Index	W52/W53	62	5.0 + 2.0	8.0 + 2.0
		All MCS Index	W56	102	7.0 + 2.0	10.0 + 2.0
		All MCS Index	W56	110,142	11.0 + 2.0	14.0 + 2.0
		All MCS Index	W56	134	9.0 + 2.0	12.0 + 2.0
		All MCS Index	W58	151	11.0 + 2.0	14.0 + 2.0
		All MCS index	W58	159	8.0 + 2.0	11.0 + 2.0

- For STA mode, ISED does not support 118ch, 126ch.
- For STA mode, 38ch, 46ch, 54ch are indoor use only.
- For AP mode, 38ch, 46ch are indoor use only.

Table 50, Table 51, Table 52, Table 53, Table 54, and **Table 55** describe the RF power settings for 5 GHz 802.11ac WLAN.

Table 50: WLAN RF Power Setting - 5 GHz 802.11ac (VHT20) (SISO) (ISED)

SISO/ CDD/MIMO	Mode	MCS Index	Band	Channel	Maximum Tune Up Tolerance (dBm)
SISO	IEEE 802.11ac (VHT20)	MCS0 ~ MCS7	W52/W53	36, 40, 60, 64	11.0 + 2.0
		MCS8	W52/W53	36, 40, 60, 64	10.0 + 2.0
		MCS0 ~ MCS7	W52/W53	44 ~ 56	14.0 + 2.0
		MCS8	W52/W53	44 ~ 56	10.0 + 2.0
		MCS0 ~ MCS7	W56	100, 104	11.0 + 2.0
		MCS8	W56	100, 104	10.0 + 2.0
		MCS0 ~ MCS7	W56	108 ~ 136, 144	14.0 + 2.0
		MCS8	W56	108 ~ 136, 144	10.0 + 2.0
		All MCS index	W56	140	8.0 + 2.0
		MCS0 ~ MCS7	W58	149 ~ 157	14.0 + 2.0
		MCS8	W58	149 ~ 157	10.0 + 2.0
		MCS0 ~ MCS7	W58	161, 165	11.0 + 2.0
		MCS8	W58	161, 165	10.0 + 2.0

- For STA mode, ISED does not support 120ch, 124ch, 128ch.
- For STA mode, 36ch, 40ch, 44ch, 48ch, 52ch are indoor use only.
- For AP mode, 36ch, 40ch, 44ch, 48ch are indoor use only.

Table 51: WLAN RF Power Setting - 5 GHz 802.11ac (VHT20) (CDD/MIMO) (ISED)

SISO/ CDD/ MIMO	Mode	MCS Index	Band	Channel	Reference Power (dBm) / Port	Maximum Tune Up Tolerance (dBm) / 2 Port
CDD/ MIMO	IEEE 802.11ac (VHT20)	All MCS index	W52/W53	36 ~ 48, 60, 64	8.0 + 2.0	11.0 + 2.0
		All MCS index	W52/W53	52, 56	11.0 + 2.0	14.0 + 2.0
		All MCS index	W56	100, 104	8.0 + 2.0	11.0 + 2.0
		All MCS index	W56	108 ~ 136, 144	11.0 + 2.0	14.0 + 2.0
		All MCS index	W56	140	8.0 + 2.0	11.0 + 2.0
		All MCS index	W58	149 ~ 157	11.0 + 2.0	14.0 + 2.0
		All MCS index	W58	161, 165	8.0 + 2.0	11.0 + 2.0

- For STA mode, ISED does not support 120ch, 124ch, 128ch.
- For STA mode, 36ch, 40ch, 44ch, 48ch, 52ch are indoor use only.
- For AP mode, 36ch, 40ch, 44ch, 48ch are indoor use only.

Table 52: WLAN RF Power Setting - 5 GHz 802.11ac (VHT40) (SISO) (ISED)

SISO/ CDD/MIMO	Mode	MCS Index	Band	Channel	Maximum Tune Up Tolerance (dBm)
SISO	IEEE 802.11ac (VHT40)	MCS0 ~ MCS7	W52/W53	38	11.0 + 2.0
		MCS8,MCS9	W52/W53	38	10.0 + 2.0
		All MCS index	W52/W53	62	7.0 + 2.0
		MCS0 ~ MCS7	W52/W53	46, 54	14.0 + 2.0
		MCS8,MCS9	W52/W53	46, 54	10.0 + 2.0
		All MCS index	W56	102	7.0 + 2.0
		MCS0 ~ MCS7	W56	110 ~ 126, 142	14.0 + 2.0
		MCS8,MCS9	W56	110 ~ 126, 142	10.0 + 2.0
		All MCS index	W56	134	10.0 + 2.0
		MCS0 ~ MCS7	W58	151	14.0 + 2.0
		MCS8,MCS9	W58	151	10.0 + 2.0
		MCS0 ~ MCS7	W58	159	11.0 + 2.0
		MCS8,MCS9	W58	159	10.0 + 2.0

- For STA mode, ISED does not support 118ch, 126ch.
- For STA mode, 38ch, 46ch, 54ch are indoor use only.
- For AP mode, 38ch, 46ch are indoor use only.

Table 53: WLAN RF Power Setting - 5 GHz 802.11ac (VHT40) (CDD/MIMO) (ISED)

SISO/ CDD/ MIMO	Mode	MCS Index	Band	Channel	Reference Power (dBm) / Port	Maximum Tune Up Tolerance (dBm) / 2 Port
CDD/ MIMO	IEEE 802.11ac (VHT40)	All MCS index	W52/W53	38	8.0 + 2.0	11.0 + 2.0
		All MCS index	W52/W53	62	5.0 + 2.0	8.0 + 2.0
		All MCS index	W52/W53	46, 54	11.0 + 2.0	14.0 + 2.0
		All MCS index	W56	102	7.0 + 2.0	10.0 + 2.0
		All MCS index	W56	110 ~ 126, 142	11.0 + 2.0	14.0 + 2.0
		All MCS index	W56	134	9.0 + 2.0	12.0 + 2.0
		All MCS index	W58	151	11.0 + 2.0	14.0 + 2.0
		All MCS index	W58	159	8.0 + 2.0	11.0 + 2.0

- For STA mode, ISED does not support 118ch, 126ch.
- For STA mode, 38ch, 46ch, 54ch are indoor use only.
- For AP mode, 38ch, 46ch are indoor use only.

Table 54: WLAN RF Power Setting - 5 GHz 802.11ac (VHT80) (SISO) (ISED)

SISO/ CDD/MIMO	Mode	MCS Index	Band	Channel	Maximum Tune Up Tolerance (dBm)
SISO	IEEE 802.11ac (VHT80)	MCS0 ~ MCS7	W52/W53	42	11.0 + 2.0
		MCS8, MCS9	W52/W53	42	10.0 + 2.0
		All MCS index	W52/W53	58	7.0 + 2.0
		All MCS index	W56	106	6.0 + 2.0
		MCS0 ~ MCS7	W56	122, 138	14.0 + 2.0
		MCS8, MCS9	W56	122, 138	10.0 + 2.0
		MCS0 ~ MCS7	W58	155	11.0 + 2.0
		MCS8, MCS9	W58	155	10.0 + 2.0

- For STA mode, ISED does not support 122ch.
- For STA mode, 42ch, 58ch are indoor use only.
- For AP mode, 42ch is indoor use only.

Table 55: WLAN RF Power Setting - 5 GHz 802.11ac (VHT80) (CDD/MIMO) (ISED)

SISO/ CDD/ MIMO	Mode	MCS Index	Band	Channel	Reference Power (dBm) / Port	Maximum Tune Up Tolerance (dBm) / 2 port
CDD/ MIMO	IEEE 802.11ac (VHT80)	All MCS index	W52/W53	42	8.0 + 2.0	11.0 + 2.0
		All MCS index	W52/W53	58	4.0 + 2.0	7.0 + 2.0
		All MCS index	W56	106	5.0 + 2.0	8.0 + 2.0
		All MCS index	W56	122, 138	11.0 + 2.0	14.0 + 2.0
		All MCS index	W58	155	8.0 + 2.0	11.0 + 2.0

- For STA mode, ISED does not support 122ch.
- For STA mode, 42ch, 58ch are indoor use only.
- For AP mode, 42ch is indoor use only.

Table 56, Table 57, Table 58, Table 59, Table 60, and **Table 61** describe the RF power settings for 5 GHz 802.11ax WLAN.

Table 56: WLAN RF Power Setting - 5 GHz 802.11ax (HE20) (SISO) (ISED)

SISO/ CDD/ MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
SISO	IEEE 802.11ax (HE20)	All MCS index	W52/W53	36, 40	SU	9.0 + 2.0		
							242-tone (Full tone)	9.0 + 2.0
		MCS0 ~ MCS9	W52/W53	36, 40			26-tone	7.0 + 2.0
							52-tone	9.0 + 2.0

SISO/ CDD/ MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
							106-tone	9.0 + 2.0
		MCS0 ~ MCS7	W52/W53	44, 48	SU	12.0 + 2.0		
							242-tone (Full tone)	12.0 + 2.0
							26-tone	7.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	9.0 + 2.0
		MCS8, MCS9	W52/W53	44, 48	SU	10.0 + 2.0		
							242-tone (Full tone)	10.0 + 2.0
							26-tone	7.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	9.0 + 2.0
		MCS10, MCS11	W52/W53	44, 48	SU	9.0 + 2.0		
							242-tone (Full tone)	9.0 + 2.0
		MCS0 ~ MCS7	W52/W53	52, 56	SU	12.0 + 2.0		
							242-tone (Full tone)	12.0 + 2.0
							26-tone	12.0 + 2.0
							52-tone	12.0 + 2.0
							106-tone	12.0 + 2.0
		MCS8, MCS9	W52/W53	52, 56	SU	10.0 + 2.0		
							242-tone (Full tone)	10.0 + 2.0
							26-tone	10.0 + 2.0
							52-tone	10.0 + 2.0
							106-tone	10.0 + 2.0
		MCS10, MCS11	W52/W53	52, 56	SU	9.0 + 2.0		
							242-tone (Full tone)	9.0 + 2.0
		All MCS index	W52/W53	60, 64	SU	9.0 + 2.0		
							242-tone (Full tone)	9.0 + 2.0
		MCS0 ~ MCS9	W52/W53	60, 64			26-tone	9.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	9.0 + 2.0
		All MCS index	W56	100, 104	SU	9.0 + 2.0		
							242-tone (Full tone)	9.0 + 2.0
		MCS0 ~ MCS9	W56	100, 104			26-tone	9.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	9.0 + 2.0
		MCS0 ~ MCS7	W56	108 ～ 116, 132, 136, 144	SU	12.0 + 2.0		
							242-tone (Full tone)	12.0 + 2.0
							26-tone	12.0 + 2.0
							52-tone	12.0 + 2.0
							106-tone	12.0 + 2.0
		MCS8, MCS9	W56	108 ～ 116, 132, 136, 144	SU	10.0 + 2.0		
							242-tone (Full tone)	10.0 + 2.0
							26-tone	10.0 + 2.0
							52-tone	10.0 + 2.0
							106-tone	10.0 + 2.0
			W56		SU	9.0 + 2.0		

SISO/ CDD/ MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
		MCS10, MCS11		108 ~ 116, 132, 136, 144			242-tone (Full tone)	9.0 + 2.0
		All MCS index	W56	140	SU	5.0 + 2.0		
							242-tone (Full tone)	5.0 + 2.0
		MCS0 ~ MCS9	W56	140			26-tone	5.0 + 2.0
							52-tone	5.0 + 2.0
							106-tone	5.0 + 2.0
		MCS0 ~ MCS7	W58	149 ~ 157	SU	12.0 + 2.0		
							242-tone (Full tone)	12.0 + 2.0
							26-tone	12.0 + 2.0
							52-tone	12.0 + 2.0
							106-tone	12.0 + 2.0
		MCS8, MCS9	W58	149 ~ 157	SU	10.0 + 2.0		
							242-tone (Full tone)	10.0 + 2.0
							26-tone	10.0 + 2.0
							52-tone	10.0 + 2.0
							106-tone	10.0 + 2.0
		MCS10, MCS11	W58	149 ~ 157	SU	9.0 + 2.0		
							242-tone (Full tone)	9.0 + 2.0
		All MCS index	W58	161, 165	SU	9.0 + 2.0		
							242-tone (Full tone)	9.0 + 2.0
		MCS0 ~ MCS9	W58	161, 165			26-tone	9.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	9.0 + 2.0

- For STA mode, MCS10 and MCS11 can only be used at 242-tone or higher
- For STA mode, 36ch, 40ch, 44ch, 48ch, 52ch are indoor use only.
- For AP mode, 36ch, 40ch, 44ch, 48ch are indoor use only.

Table 57: WLAN RF Power Setting - 5 GHz 802.11ax (HE20) (CDD/MIMO) (ISED)

SISO/ CDD/ MIMO	Mode	MCS Index	Band	Channel	SU	Reference Power (dBm)/ Port	RU	Reference Power (dBm) / Port	Maximum Tune Up Tolerance (dBm) / 2 Port
CDD/ MIMO	IEEE 802.11ax (HE20)	All MCS index	W52/W53	36, 40	SU	6.0 + 2.0			9.0 + 2.0
							242-tone (Full tone)	6.0 + 2.0	9.0 + 2.0
		MCS0 ~ MCS9	W52/W53	36, 40			26-tone	1.0 + 2.0	4.0 + 2.0
							52-tone	4.0 + 2.0	7.0 + 2.0
							106-tone	6.0 + 2.0	9.0 + 2.0
		All MCS index	W52/W53	44, 48	SU	9.0 + 2.0			12.0 + 2.0
							242-tone (Full tone)	9.0 + 2.0	12.0 + 2.0
		MCS0 ~ MCS9	W52/W53	44, 48			26-tone	1.0 + 2.0	4.0 + 2.0
							52-tone	4.0 + 2.0	7.0 + 2.0
							106-tone	6.0 + 2.0	9.0 + 2.0
		All MCS index	W52/W53	52, 56	SU	9.0 + 2.0			12.0 + 2.0
							242-tone (Full tone)	9.0 + 2.0	12.0 + 2.0

SISO/ CDD/ MIMO	Mode	MCS Index	Band	Channel	SU	Reference Power (dBm)/ Port	RU	Reference Power (dBm) / Port	Maximum Tune Up Tolerance (dBm) / 2 Port
		MCS0 ~ MCS9	W52/W53	52, 56			26-tone	9.0 + 2.0	12.0 + 2.0
							52-tone	9.0 + 2.0	12.0 + 2.0
							106-tone	9.0 + 2.0	12.0 + 2.0
		All MCS index	W52/W53	60, 64	SU	6.0 + 2.0			9.0 + 2.0
							242-tone (Full tone)	6.0 + 2.0	9.0 + 2.0
		MCS0 ~ MCS9	W52/W53	60, 64			26-tone	6.0 + 2.0	9.0 + 2.0
							52-tone	6.0 + 2.0	9.0 + 2.0
							106-tone	6.0 + 2.0	9.0 + 2.0
		All MCS index	W56	100, 104	SU	6.0 + 2.0			9.0 + 2.0
							242-tone (Full tone)	6.0 + 2.0	9.0 + 2.0
		MCS0 ~ MCS9	W56	100, 104			26-tone	6.0 + 2.0	9.0 + 2.0
							52-tone	6.0 + 2.0	9.0 + 2.0
							106-tone	6.0 + 2.0	9.0 + 2.0
		All MCS index	W56	108 ~ 116, 132, 136, 144	SU	9.0 + 2.0			12.0 + 2.0
							242-tone (Full tone)	9.0 + 2.0	12.0 + 2.0
		MCS0 ~ MCS9	W56	108 ~ 116, 132, 136, 144			26-tone	9.0 + 2.0	12.0 + 2.0
							52-tone	9.0 + 2.0	12.0 + 2.0
							106-tone	9.0 + 2.0	12.0 + 2.0
		All MCS index	W56	140	SU	2.0 + 2.0			5.0 + 2.0
							242-tone (Full tone)	2.0 + 2.0	5.0 + 2.0
		MCS0 ~ MCS9	W56	140			26-tone	2.0 + 2.0	5.0 + 2.0
							52-tone	2.0 + 2.0	5.0 + 2.0
							106-tone	2.0 + 2.0	5.0 + 2.0
		All MCS index	W58	149 ~ 157	SU	9.0 + 2.0			12.0 + 2.0
							242-tone (Full tone)	9.0 + 2.0	12.0 + 2.0
		MCS0 ~ MCS9	W58	149 ~ 157			26-tone	9.0 + 2.0	12.0 + 2.0
							52-tone	9.0 + 2.0	12.0 + 2.0
							106-tone	9.0 + 2.0	12.0 + 2.0
		All MCS index	W58	161, 165	SU	6.0 + 2.0			9.0 + 2.0
							242-tone (Full tone)	6.0 + 2.0	9.0 + 2.0
		MCS0 ~ MCS9	W58	161, 165			26-tone	6.0 + 2.0	9.0 + 2.0
							52-tone	6.0 + 2.0	9.0 + 2.0
							106-tone	6.0 + 2.0	9.0 + 2.0

- For STA mode, MCS10 and MCS11 can only be used at 242-tone or higher
- For STA mode, 36ch, 40ch, 44ch, 48ch, 52ch are indoor use only.
- For AP mode, 36ch, 40ch, 44ch, 48ch are indoor use only.

Table 58: WLAN RF Power Setting - 5 GHz 802.11ax (HE40) (SISO) (ISED)

SISO/ CDD/ MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
SISO	IEEE 802.11ax (HE40)	All MCS index	W52/W53	38	SU	9.0 + 2.0		
							484-tone (Full tone)	9.0 + 2.0

SISO/ CDD/ MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
							242-tone	9.0 + 2.0
		MCS0 ~ MCS9	W52/W53	38			26-tone	7.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	9.0 + 2.0
		MCS0 ~ MCS7	W52/W53	46	SU	12.0 + 2.0		
							484-tone (Full tone)	12.0 + 2.0
							26-tone	7.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	9.0 + 2.0
							242-tone	12.0 + 2.0
		MCS8, MCS9	W52/W53	46	SU	10.0 + 2.0		
							484-tone (Full tone)	10.0 + 2.0
							26-tone	7.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	9.0 + 2.0
							242-tone	10.0 + 2.0
		MCS10, MCS11	W52/W53	46	SU	9.0 + 2.0		
							484-tone (Full tone)	9.0 + 2.0
							242-tone	9.0 + 2.0
		MCS0 ～MCS7	W52/W53	54	SU	12.0 + 2.0		
							484-tone (Full tone)	12.0 + 2.0
							26-tone	12.0 + 2.0
							52-tone	12.0 + 2.0
							106-tone	12.0 + 2.0
							242-tone	12.0 + 2.0
		MCS8, MCS9	W52/W53	54	SU	10.0 + 2.0		
							484-tone (Full tone)	10.0 + 2.0
							26-tone	10.0 + 2.0
							52-tone	10.0 + 2.0
							106-tone	10.0 + 2.0
							242-tone	10.0 + 2.0
		MCS10, MCS11	W52/W53	54	SU	9.0 + 2.0		
							484-tone (Full tone)	9.0 + 2.0
							242-tone	9.0 + 2.0
		All MCS index	W52/W53	62	SU	7.0 + 2.0		
							484-tone (Full tone)	7.0 + 2.0
							242-tone	9.0 + 2.0
		MCS0 ~ MCS9	W52/W53	62			26-tone	9.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	9.0 + 2.0
		All MCS index	W56	102	SU	5.0 + 2.0		
							484-tone (Full tone)	5.0 + 2.0
							242-tone	9.0 + 2.0
		MCS0 ~ MCS9	W56	102			26-tone	9.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	9.0 + 2.0
		MCS0 ～ MCS7	W56	110, 142	SU	12.0 + 2.0		
							484-tone (Full tone)	12.0 + 2.0

SISO/ CDD/ MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
							26-tone	12.0 + 2.0
							52-tone	12.0 + 2.0
							106-tone	12.0 + 2.0
							242-tone	12.0 + 2.0
		MCS8, MCS9	W56	110, 142	SU	10.0 + 2.0		
							484-tone (Full tone)	10.0 + 2.0
							26-tone	10.0 + 2.0
							52-tone	10.0 + 2.0
							106-tone	10.0 + 2.0
							242-tone	10.0 + 2.0
		MCS10, MCS11	W56	110, 142	SU	9.0 + 2.0		
							484-tone (Full tone)	9.0 + 2.0
							242-tone	9.0 + 2.0
		MCS0 ~ MCS7	W56	134	SU	10.0 + 2.0		
							484-tone (Full tone)	10.0 + 2.0
							26-tone	12.0 + 2.0
							52-tone	12.0 + 2.0
							106-tone	12.0 + 2.0
							242-tone	12.0 + 2.0
		MCS8, MCS9	W56	134	SU	10.0 + 2.0		
							484-tone (Full tone)	10.0 + 2.0
							26-tone	10.0 + 2.0
							52-tone	10.0 + 2.0
							106-tone	10.0 + 2.0
							242-tone	10.0 + 2.0
		MCS10, MCS11	W56	134	SU	9.0 + 2.0		
							484-tone (Full tone)	9.0 + 2.0
							242-tone	9.0 + 2.0
		MCS0 ~ MCS7	W58	151	SU	12.0 + 2.0		
							484-tone (Full tone)	12.0 + 2.0
							26-tone	12.0 + 2.0
							52-tone	12.0 + 2.0
							106-tone	12.0 + 2.0
							242-tone	12.0 + 2.0
		MCS8, MCS9	W58	151	SU	10.0 + 2.0		
							484-tone (Full tone)	10.0 + 2.0
							26-tone	10.0 + 2.0
							52-tone	10.0 + 2.0
							106-tone	10.0 + 2.0
							242-tone	10.0 + 2.0
		MCS10, MCS11	W58	151	SU	9.0 + 2.0		
							484-tone (Full tone)	9.0 + 2.0
							242-tone	9.0 + 2.0
		All MCS index	W58	159	SU	9.0 + 2.0		
							484-tone (Full tone)	9.0 + 2.0
							242-tone	9.0 + 2.0
		MCS0 ~ MCS9	W58	159			26-tone	9.0 + 2.0
							52-tone	9.0 + 2.0

SISO/ CDD/ MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
							106-tone	9.0 + 2.0

- For STA mode, MCS10 and MCS11 can only be used at 242-tone or higher.
- For STA mode, 38ch, 46ch, 54ch are indoor use only.
- For AP mode, 38ch, 46ch are indoor use only.

Table 59: WLAN RF Power Setting - 5 GHz 802.11ax (HE40) (CDD/MIMO) (ISED)

SISO/ CDD/ MIMO	Mode	MCS Index	Band	Channel	SU	Reference Power (dBm)/ Port	RU	Reference Power (dBm)/ Port	Maximum Tune Up Tolerance (dBm)/ 2Port
CDD/ MIMO	IEEE 802.11ax (HE40)	All MCS index	W52/W53	38	SU	6.0 + 2.0			9.0 + 2.0
							484-tone (Full tone)	6.0 + 2.0	9.0 + 2.0
							242-tone	6.0 + 2.0	9.0 + 2.0
		MCS0 ~ MCS9	W52/W53	38			26-tone	1.0 + 2.0	4.0 + 2.0
							52-tone	4.0 + 2.0	7.0 + 2.0
							106-tone	6.0 + 2.0	9.0 + 2.0
		All MCS index	W52/W53	46	SU	9.0 + 2.0			12.0 + 2.0
							484-tone (Full tone)	9.0 + 2.0	12.0 + 2.0
							242-tone	9.0 + 2.0	12.0 + 2.0
		MCS0 ~ MCS9	W52/W53	46			26-tone	1.0 + 2.0	4.0 + 2.0
							52-tone	4.0 + 2.0	7.0 + 2.0
							106-tone	6.0 + 2.0	12.0 + 2.0
		All MCS index	W52/W53	54	SU	9.0 + 2.0			12.0 + 2.0
							484-tone (Full tone)	9.0 + 2.0	12.0 + 2.0
							242-tone	9.0 + 2.0	12.0 + 2.0
		MCS0 ~ MCS9	W52/W53	54			26-tone	9.0 + 2.0	12.0 + 2.0
							52-tone	9.0 + 2.0	12.0 + 2.0
							106-tone	9.0 + 2.0	12.0 + 2.0
		All MCS index	W52/W53	62	SU	5.0 + 2.0			8.0 + 2.0
							484-tone (Full tone)	5.0 + 2.0	8.0 + 2.0
							242-tone	6.0 + 2.0	9.0 + 2.0
		MCS0 ~ MCS9	W52/W53	62			26-tone	6.0 + 2.0	9.0 + 2.0
							52-tone	6.0 + 2.0	9.0 + 2.0
							106-tone	6.0 + 2.0	9.0 + 2.0
		All MCS index	W56	102	SU	5.0 + 2.0			8.0 + 2.0
							484-tone (Full tone)	5.0 + 2.0	8.0 + 2.0
							242-tone	6.0 + 2.0	9.0 + 2.0
		MCS0 ~ MCS9	W56	102			26-tone	6.0 + 2.0	9.0 + 2.0
							52-tone	6.0 + 2.0	9.0 + 2.0
							106-tone	6.0 + 2.0	9.0 + 2.0
		All MCS index	W56	110, 134, 142	SU	9.0 + 2.0			12.0 + 2.0
							484-tone (Full tone)	9.0 + 2.0	12.0 + 2.0
							242-tone	9.0 + 2.0	12.0 + 2.0
		MCS0 ~ MCS9	W56	110, 134, 142			26-tone	9.0 + 2.0	12.0 + 2.0
							52-tone	9.0 + 2.0	12.0 + 2.0

SISO/ CDD/ MIMO	Mode	MCS Index	Band	Channel	SU	Reference Power (dBm)/ Port	RU	Reference Power (dBm)/ Port	Maximum Tune Up Tolerance (dBm)/ 2Port
							106-tone	9.0 + 2.0	12.0 + 2.0
		All MCS index	W58	151	SU	9.0 + 2.0			12.0 + 2.0
							484-tone (Full tone)	9.0 + 2.0	12.0 + 2.0
							242-tone	9.0 + 2.0	12.0 + 2.0
		MCS0 ~ MCS9	W58	151			26-tone	9.0 + 2.0	12.0 + 2.0
							52-tone	9.0 + 2.0	12.0 + 2.0
							106-tone	9.0 + 2.0	12.0 + 2.0
		All MCS index	W58	159	SU	6.0 + 2.0			9.0 + 2.0
							484-tone (Full tone)	6.0 + 2.0	9.0 + 2.0
							242-tone	6.0 + 2.0	9.0 + 2.0
		MCS0 ~ MCS9	W58	159			26-tone	6.0 + 2.0	9.0 + 2.0
							52-tone	6.0 + 2.0	9.0 + 2.0
							106-tone	6.0 + 2.0	9.0 + 2.0

- For STA mode, MCS10 and MCS11 can only be used at 242-tone or higher.
- For STA mode, 38ch, 46ch, 54ch are indoor use only.
- For AP mode, 38ch, 46ch are indoor use only.

Table 60: WLAN RF Power Setting - 5 GHz 802.11ax (HE80) (SISO) (ISED)

SISO/ CDD/ MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
SISO	IEEE 802.11ax (HE80)	All MCS index	W52	42	SU	9.0 + 2.0		
							996-tone (Full tone)	9.0 + 2.0
							242-tone	9.0 + 2.0
							484-tone	9.0 + 2.0
		MCS0 ~ MCS9	W52	42			26-tone	7.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	9.0 + 2.0
		All MCS index	W53	58	SU	6.0 + 2.0		
							996-tone (Full tone)	6.0 + 2.0
							242-tone	9.0 + 2.0
							484-tone	7.0 + 2.0
		MCS0 ~ MCS9	W53	58			26-tone	9.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	9.0 + 2.0
		All MCS index	W56	106	SU	5.0 + 2.0		
							996-tone (Full tone)	5.0 + 2.0
							242-tone	9.0 + 2.0
							484-tone	5.0 + 2.0
		MCS0 ~ MCS9	W56	106			26-tone	9.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	9.0 + 2.0
		MCS0 ~ MCS7	W56	138	SU	12.0 + 2.0		
							996-tone (Full tone)	12.0 + 2.0

SISO/ CDD/ MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
							26-tone	12.0 + 2.0
							52-tone	12.0 + 2.0
							106-tone	12.0 + 2.0
							242-tone	12.0 + 2.0
							484-tone	12.0 + 2.0
		MCS8, MCS9	W56	138	SU	10.0 + 2.0		
							996-tone (Full tone)	10.0 + 2.0
							26-tone	10.0 + 2.0
							52-tone	10.0 + 2.0
							106-tone	10.0 + 2.0
							242-tone	10.0 + 2.0
							484-tone	10.0 + 2.0
		MCS10, MCS11	W56	138	SU	9.0 + 2.0		
							996-tone (Full tone)	9.0 + 2.0
							242-tone	9.0 + 2.0
							484-tone	9.0 + 2.0
		All MCS index	W58	155	SU	9.0 + 2.0		
							996-tone (Full tone)	9.0 + 2.0
							242-tone	9.0 + 2.0
							484-tone	9.0 + 2.0
		MCS0 ~ MCS9	W58	155			26-tone	9.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	9.0 + 2.0

- For STA mode, MCS10 and MCS11 can only be used at 242-tone or higher.
- For STA mode, 42ch, 58ch are indoor use only.
- For AP mode, 42ch is indoor use only.

Table 61: WLAN RF Power Setting - 5 GHz 802.11ax (HE80) (CDD/MIMO) (ISED)

SISO/ CDD /MIMO	Mode	MCS Index	Band	Channel	SU	Reference Power (dBm)/Port	RU	Reference Power(dBm)Port	Maximum Tune Up Tolerance (dBm)/ 2Port
CDD/ MIMO	IEEE 802.11ax (HE80)	All MCS index	W52	42	SU	6.0 + 2.0			9.0 + 2.0
							996-tone (Full tone)	6.0 + 2.0	9.0 + 2.0
							242-tone	6.0 + 2.0	9.0 + 2.0
							484-tone	6.0 + 2.0	9.0 + 2.0
		MCS0 ~ MCS9	W52	42			26-tone	1.0 + 2.0	4.0 + 2.0
							52-tone	4.0 + 2.0	1.0 + 2.0
							106-tone	6.0 + 2.0	9.0 + 2.0
		All MCS index	W53	58	SU	4.0 + 2.0			7.0 + 2.0
							996-tone (Full tone)	4.0 + 2.0	7.0 + 2.0

SISO/ CDD /MIMO	Mode	MCS Index	Band	Channel	SU	Reference Power (dBm)/Port	RU	Reference Power(dBm)Port	Maximum Tune Up Tolerance (dBm)/ 2Port
							242-tone	6.0 + 2.0	9.0 + 2.0
							484-tone	5.0 + 2.0	8.0 + 2.0
		MCS0 ~ MCS9	W53	58			26-tone	6.0 + 2.0	9.0 + 2.0
							52-tone	6.0 + 2.0	9.0 + 2.0
							106-tone	6.0 + 2.0	9.0 + 2.0
		All MCS index	W56	106	SU	4.0 + 2.0			7.0 + 2.0
							996-tone (Full tone)	4.0 + 2.0	7.0 + 2.0
							242-tone	6.0 + 2.0	9.0 + 2.0
							484-tone	5.0 + 2.0	8.0 + 2.0
		MCS0 ~ MCS9	W56	106			26-tone	6.0 + 2.0	9.0 + 2.0
							52-tone	6.0 + 2.0	9.0 + 2.0
							106-tone	6.0 + 2.0	9.0 + 2.0
		All MCS index	W56	138	SU	9.0 + 2.0			12.0 + 2.0
							996-tone (Full tone)	9.0 + 2.0	12.0 + 2.0
							242-tone	9.0 + 2.0	12.0 + 2.0
							484-tone	9.0 + 2.0	12.0 + 2.0
		MCS0 ~ MCS9	W56	138			26-tone	9.0 + 2.0	12.0 + 2.0
							52-tone	9.0 + 2.0	12.0 + 2.0
							106-tone	9.0 + 2.0	12.0 + 2.0
		All MCS index	W58	155	SU	6.0 + 2.0			9.0 + 2.0
							996-tone (Full tone)	6.0 + 2.0	9.0 + 2.0
							242-tone	6.0 + 2.0	9.0 + 2.0
							484-tone	6.0 + 2.0	9.0 + 2.0
		MCS0 ~ MCS9	W58	155			26-tone	6.0 + 2.0	9.0 + 2.0
							52-tone	6.0 + 2.0	9.0 + 2.0
							106-tone	6.0 + 2.0	9.0 + 2.0

- For STA mode, MCS10 and MCS11 can only be used at 242-tone or higher.
- For STA mode, 42ch, 58ch are indoor use only.
- For AP mode, 42ch is indoor use only.

2.2.4.4 RF Power Setting for 6 GHz WLAN

Table 62 describes the RF power settings for 6 GHz 802.11a WLAN.

Table 62: WLAN RF Power Setting - 6 GHz 802.11a (SISO) (ISED)

STA/AP	SISO/MIMO	Mode	Rate	Band	Channel	Maximum Tune Up Tolerance (dBm)
STA	SISO	IEEE 802.11a	6, 9, 12, 18, 24 Mbps	UNII-5/ UNII-6/ UNII-7	1 ~ 181	1.0 + 2.0
			6, 9, 12, 18, 24 Mbps	UNII-7	185	2.0 + 2.0
			6, 9, 12, 18, 24 Mbps	UNII-8	189 ~ 229	2.0 + 2.0
AP	SISO	IEEE 802.11a	6, 9, 12, 18, 24 Mbps	UNII-5/ UNII-6/ UNII-7	1 ~ 181	7.0 + 2.0
			6, 9, 12, 18, 24 Mbps	UNII-7	185	8.0 + 2.0

STA/AP	SISO/MIMO	Mode	Rate	Band	Channel	Maximum Tune Up Tolerance (dBm)
			6, 9, 12, 18, 24 Mbps	UNII-8	189 ~ 229	8.0 + 2.0

Table 63, Table 64, Table 65, Table 66, Table 67, and **Table 68** describe the RF power settings for 6 GHz 802.11ax WLAN.

Table 63: WLAN RF Power Setting - 6 GHz 802.11ax (HE20) (SISO) (ISED)

STA/ AP	SISO/ MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
STA	SISO	IEEE 802.11ax (HE20)	All MCS index	UNII-5	1 ~ 93	SU	4.0 + 2.0		
								242-tone (Full tone)	4.0 + 2.0
			MCS0 ~ MCS9	UNII-5	1 ~ 93			26-tone	-5.0 + 2.0
								52-tone	-3.0 + 2.0
								106-tone	0.0 + 2.0
			All MCS index	UNII-6	97 ~ 113	SU	3.0 + 2.0		
								242-tone (Full tone)	3.0 + 2.0
			MCS0 ~ MCS9	UNII-6	97 ~ 113			26-tone	-5.0 + 2.0
								52-tone	-3.0 + 2.0
								106-tone	0.0 + 2.0
			All MCS index	UNII-7 / UNII-8	117 ~ 229	SU	4.0 + 2.0		
								242-tone (Full tone)	4.0 + 2.0
			MCS0 ~ MCS9	UNII-7 / UNII-8	117 ~ 229			26-tone	-5.0 + 2.0
								52-tone	-3.0 + 2.0
								106-tone	0.0 + 2.0
AP	SISO	IEEE 802.11ax (HE20)	All MCS index	UNII-5 / UNII-6	1 ~ 113	SU	9.0 + 2.0		
								242-tone (Full tone)	9.0 + 2.0
			MCS0 ~ MCS9	UNII-5 / UNII-6	1 ~ 113			26-tone	0.0 + 2.0
								52-tone	3.0 + 2.0
								106-tone	6.0 + 2.0
			All MCS index	UNII-7	117 ~ 181	SU	9.0 + 2.0		
								242-tone (Full tone)	9.0 + 2.0
			MCS0 ~ MCS9	UNII-7	117 ~ 181			26-tone	0.0 + 2.0
								52-tone	2.0 + 2.0
								106-tone	5.0 + 2.0
			MCS0 ~ MCS9	UNII-7	185	SU	10.0 + 2.0		
								242-tone (Full tone)	10.0 + 2.0
								26-tone	1.0 + 2.0
								52-tone	4.0 + 2.0
								106-tone	6.0 + 2.0
			MCS10, MCS11	UNII-7	185	SU	9.0 + 2.0		
								242-tone (Full tone)	9.0 + 2.0
			MCS0 ~ MCS9	UNII-8	189 ~ 229	SU	10.0 + 2.0		
								242-tone (Full tone)	10.0 + 2.0
								26-tone	1.0 + 2.0
								52-tone	4.0 + 2.0

STA/ AP	SISO/ MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
								106-tone	6.0 + 2.0
			MCS10, MCS11	UNII-8	189 ~ 229	SU	9.0 + 2.0		
								242-tone (Full tone)	9.0 + 2.0

MCS10 and MCS11 can only be used at 242-tone or higher.

Table 64: WLAN RF Power Setting - 6 GHz 802.11ax (HE20) (MIMO) (ISED)

STA/ AP	SISO/ MIMO	Mode	MCS Index	Band	Channel	SU	Reference Power (dBm)/ Port	RU	Reference Power (dBm)/ Port	Maximum Tune Up Tolerance (dBm)/2Port
STA	MIMO	IEEE 802.11ax (HE20)	All MCS index	UNII-5	1 ~ 93	SU	1.0 + 2.0			4.0 + 2.0
								242-tone (Full tone)	1.0 + 2.0	4.0 + 2.0
			MCS0 ~ MCS9	UNII-5	1 ~ 93			26-tone	-8.0 + 2.0	-5.0 + 2.0
								52-tone	-6.0 + 2.0	-3.0 + 2.0
								106-tone	-3.0 + 2.0	0.0 + 2.0
			All MCS index	UNII-6 / UNII-7	97 ~ 181	SU	0.0 + 2.0			3.0 + 2.0
								242-tone (Full tone)	0.0 + 2.0	3.0 + 2.0
			MCS0 ~ MCS9	UNII-6 / UNII-7	97 ~ 181			26-tone	-8.0 + 2.0	-5.0 + 2.0
								52-tone	-6.0 + 2.0	-3.0 + 2.0
								106-tone	-3.0 + 2.0	0.0 + 2.0
			All MCS index	UNII-7	185	SU	-1.0 + 2.0			2.0 + 2.0
								242-tone (Full tone)	-1.0 + 2.0	2.0 + 2.0
			MCS0 ~ MCS9	UNII-7	185			26-tone	-9.0 + 2.0	-6.0 + 2.0
								52-tone	-7.0 + 2.0	-4.0 + 2.0
								106-tone	-4.0 + 2.0	-1.0 + 2.0
			All MCS index	UNII-8	189 ~ 229	SU	-1.0 + 2.0			2.0 + 2.0
								242-tone (Full tone)	-1.0 + 2.0	2.0 + 2.0
			MCS0 ~ MCS9	UNII-8	189 ~ 229			26-tone	-9.0 + 2.0	-6.0 + 2.0
								52-tone	-7.0 + 2.0	-4.0 + 2.0
								106-tone	-4.0 + 2.0	-1.0 + 2.0
AP	MIMO	IEEE 802.11ax (HE20)	All MCS index	UNII-5	1 ~ 113	SU	6.0 + 2.0			9.0 + 2.0
								242-tone (Full tone)	6.0 + 2.0	9.0 + 2.0
			MCS0 ~ MCS9	UNII-5	1 ~ 113			26-tone	-3.0 + 2.0	0.0 + 2.0
								52-tone	0.0 + 2.0	3.0 + 2.0
								106-tone	3.0 + 2.0	6.0 + 2.0
			All MCS index	UNII-6/ UNII-7/ UNII-8	117 ~ 229	SU	6.0 + 2.0			9.0 + 2.0
								242-tone (Full tone)	6.0 + 2.0	9.0 + 2.0
			MCS0 ~ MCS9	UNII-6/ UNII-7/ UNII-8	117 ~ 229			26-tone	-3.0 + 2.0	0.0 + 2.0
								52-tone	-1.0 + 2.0	2.0 + 2.0
								106-tone	2.0 + 2.0	5.0 + 2.0

MCS10 and MCS11 can only be used at 242-tone or higher.

Table 65: WLAN RF Power Setting - 6 GHz 802.11ax (HE40) (SISO) (ISED)

STA/ AP	SISO/ MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
STA	SISO	IEEE 802.11ax (HE40)	All MCS index	UNII-5/ UNII-6/ UNII-7/ UNII-8	3 ~ 227	SU	6.0 + 2.0		
								484-tone (Full tone)	6.0 + 2.0
								242-tone	3.0 + 2.0
			MCS0 ~ MCS9	UNII-5/ UNII-6/ UNII-7/ UNII-8	3 ~ 227			26-tone	-5.0 + 2.0
								52-tone	-3.0 + 2.0
								106-tone	0.0 + 2.0
AP	SISO	IEEE 802.11ax (HE40)	MCS0 ~ MCS7	UNII-5/ UNII-6	3 ~ 107	SU	12.0 + 2.0		
								484-tone (Full tone)	12.0 + 2.0
								26-tone	0.0 + 2.0
								52-tone	3.0 + 2.0
								106-tone	6.0 + 2.0
								242-tone	9.0 + 2.0
			MCS8, MCS9	UNII-5/ UNII-6	3 ~ 107	SU	10.0 + 2.0		
								484-tone (Full tone)	10.0 + 2.0
								26-tone	0.0 + 2.0
								52-tone	3.0 + 2.0
								106-tone	6.0 + 2.0
								242-tone	9.0 + 2.0
			MCS10, MCS11	UNII-5/ UNII-6	3 ~ 107	SU	9.0 + 2.0		
								484-tone (Full tone)	9.0 + 2.0
								242-tone	9.0 + 2.0
			MCS0 ~ MCS7	UNII-6/ UNII-7	115 ~ 179	SU	11.0 + 2.0		
								484-tone (Full tone)	11.0 + 2.0
								26-tone	0.0 + 2.0
								52-tone	2.0 + 2.0
								106-tone	5.0 + 2.0
								242-tone	10.0 + 2.0
			MCS8, MCS9	UNII-6/ UNII-7	115 ~ 179	SU	10.0 + 2.0		
								484-tone (Full tone)	10.0 + 2.0
								26-tone	0.0 + 2.0
								52-tone	2.0 + 2.0
								106-tone	5.0 + 2.0
								242-tone	10.0 + 2.0
						SU	9.0 + 2.0		

STA/ AP	SISO/ MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
			MCS10, MCS11	UNII-6 / UNII-7	115 ~ 179			484-tone (Full tone)	9.0 + 2.0
								242-tone	9.0 + 2.0
			MCS0 ~ MCS7	UNII-7 / UNII-8	187 ~ 227	SU	12.0 + 2.0		
								484-tone (Full tone)	12.0 + 2.0
								26-tone	1.0 + 2.0
								52-tone	4.0 + 2.0
								106-tone	6.0 + 2.0
								242-tone	10.0 + 2.0
			MCS8, MCS9	UNII-7 / UNII-8	187 ~ 227	SU	10.0 + 2.0		
								484-tone (Full tone)	10.0 + 2.0
								26-tone	1.0 + 2.0
								52-tone	4.0 + 2.0
								106-tone	6.0 + 2.0
								242-tone	10.0 + 2.0
			MCS10, MCS11	UNII-7/ UNII-8	187 ~ 227	SU	9.0 + 2.0		
								484-tone (Full tone)	9.0 + 2.0
								242-tone	9.0 + 2.0

MCS10 and MCS11 can only be used at 242-tone or higher.

Table 66: WLAN RF Power Setting - 6 GHz 802.11ax (HE40) (MIMO) (ISED)

STA/ AP	SISO/ MIMO	Mode	MCS Index	Band	Channel	SU	Reference Power (dBm)/ Port	RU	Reference Power (dBm)/Port	Maximum Tune Up Tolerance (dBm)/ 2Port
STA	MIMO	IEEE 802.11ax (HE40)	All MCS index	UNII-5/ UNII-6/ UNII-7	3 ~ 179	SU	3.0 + 2.0			6.0 + 2.0
								484-tone (Full tone)	3.0 + 2.0	6.0 + 2.0
								242-tone	0.0 + 2.0	3.0 + 2.0
			MCS0 ~ MCS9	UNII-5/ UNII-6/ UNII-7	3 ~ 179			26-tone	-8.0 + 2.0	-5.0 + 2.0
								52-tone	-6.0 + 2.0	-3.0 + 2.0
								106-tone	-3.0 + 2.0	0.0 + 2.0
			All MCS index	UNII-8	187 ~ 227	SU	3.0 + 2.0			6.0 + 2.0
								484-tone (Full tone)	3.0 + 2.0	6.0 + 2.0
								242-tone	0.0 + 2.0	3.0 + 2.0
			MCS0 ~ MCS9	UNII-8	187 ~ 227			26-tone	-9.0 + 2.0	-6.0 + 2.0
								52-tone	-7.0 + 2.0	-4.0 + 2.0
								106-tone	-4.0 + 2.0	-1.0 + 2.0
AP	MIMO			UNII-5	3 ~ 107	SU	8.0 + 2.0			11.0 + 2.0

STA/ AP	SISO/ MIMO	Mode	MCS Index	Band	Channel	SU	Reference Power (dBm)/ Port	RU	Reference Power (dBm)/Port	Maximum Tune Up Tolerance (dBm)/ 2Port
		IEEE 802.11ax (HE40)	All MCS index					484-tone (Full tone)	8.0 + 2.0	11.0 + 2.0
								242-tone	6.0 + 2.0	9.0 + 2.0
			MCS0 ~ MCS9	UNII-5	3 ~ 107			26-tone	-3.0 + 2.0	0.0 + 2.0
								52-tone	0.0 + 2.0	3.0 + 2.0
								106-tone	3.0 + 2.0	6.0 + 2.0
			All MCS index	UNII-6 / UNII-7 / UNII-8	115 ~ 227	SU	8.0 + 2.0			11.0 + 2.0
								484-tone (Full tone)	8.0 + 2.0	11.0 + 2.0
								242-tone	5.0 + 2.0	8.0 + 2.0
			MCS0 ~ MCS9	UNII-6 / UNII-7 / UNII-8	115 ~ 227			26-tone	-3.0 + 2.0	0.0 + 2.0
								52-tone	-1.0 + 2.0	2.0 + 2.0
								106-tone	2.0 + 2.0	5.0 + 2.0

MCS10 and MCS11 can only be used at 242-tone or higher.

Table 67: WLAN RF Power Setting - 6 GHz 802.11ax (HE80) (SISO) (ISED)

STA/ AP	SISO/ MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
STA	SISO	IEEE 802.11ax (HE80)	All MCS index	UNII-5/ UNII-6/ UNII-7/ UNII-8	7 ~ 215	SU	6.0 + 2.0		
								996-tone (Full tone)	6.0 + 2.0
								242-tone	3.0 + 2.0
								484-tone	6.0 + 2.0
			MCS0 ~ MCS9	UNII-5/ UNII-6/ UNII-7/ UNII-8	7 ~ 215			26-tone	-5.0 + 2.0
								52-tone	-3.0 + 2.0
								106-tone	0.0 + 2.0
AP	SISO	IEEE 802.11ax (HE80)	MCS0 ~ MCS7	UNII-5 / UNII-6	7 ~ 103	SU	12.0 + 2.0		
								996-tone (Full tone)	12.0 + 2.0
								26-tone	0.0 + 2.0
								52-tone	3.0 + 2.0
								106-tone	6.0 + 2.0
								242-tone	12.0 + 2.0
								484-tone	12.0 + 2.0
			MCS8, MCS9	UNII-5 / UNII-6	7 ~ 103	SU	10.0 + 2.0		
								996-tone (Full tone)	10.0 + 2.0
								26-tone	0.0 + 2.0
								52-tone	3.0 + 2.0
								106-tone	6.0 + 2.0
								242-tone	10.0 + 2.0
								484-tone	10.0 + 2.0
					7 ~ 103	SU	9.0 + 2.0		

STA/ AP	SISO/ MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
			MCS10, MCS11	UNII-5 / UNII-6				996-tone (Full tone)	9.0 + 2.0
								242-tone	9.0 + 2.0
								484-tone	9.0 + 2.0
			MCS0 ~ MCS7	UNII-7	119 ~ 183	SU	12.0 + 2.0		
								996-tone (Full tone)	12.0 + 2.0
								26-tone	0.0 + 2.0
								52-tone	2.0 + 2.0
								106-tone	5.0 + 2.0
								242-tone	12.0 + 2.0
								484-tone	12.0 + 2.0
			MCS8, MCS9	UNII-7	119 ~ 183	SU	10.0 + 2.0		
								996-tone (Full tone)	10.0 + 2.0
								26-tone	0.0 + 2.0
								52-tone	2.0 + 2.0
								106-tone	5.0 + 2.0
								242-tone	10.0 + 2.0
								484-tone	10.0 + 2.0
			MCS10, MCS11	UNII-7	119 ~ 183	SU	9.0 + 2.0		
								996-tone (Full tone)	9.0 + 2.0
								242-tone	9.0 + 2.0
								484-tone	9.0 + 2.0
			MCS0 ~ MCS7	UNII-8	199 ~ 215	SU	12.0 + 2.0		
								996-tone (Full tone)	12.0 + 2.0
								26-tone	1.0 + 2.0
								52-tone	4.0 + 2.0
								106-tone	6.0 + 2.0
								242-tone	12.0 + 2.0
								484-tone	12.0 + 2.0
			MCS8, MCS9	UNII-8	199 ~ 215	SU	10.0 + 2.0		
								996-tone (Full tone)	10.0 + 2.0
								26-tone	1.0 + 2.0
								52-tone	4.0 + 2.0
								106-tone	6.0 + 2.0
								242-tone	10.0 + 2.0
								484-tone	10.0 + 2.0
			MCS10, MCS11	UNII-8	199 ~ 215	SU	9.0 + 2.0		
								996-tone (Full tone)	9.0 + 2.0
								242-tone	9.0 + 2.0
								484-tone	9.0 + 2.0

MCS10 and MCS11 can only be used at 242-tone or higher.

Table 68: WLAN RF Power Setting - 6 GHz 802.11ax (HE80) (MIMO) (ISED)

STA/ AP	SISO/ MIMO	Mode	MCS Index	Band	Channel	SU	Reference Power (dBm)/ Port	RU	Reference power (dBm)/Port	Maximum Tune Up Tolerance (dBm)/ 2Port
STA	MIMO	IEEE 802.11ax (HE80)	All MCS index	UNII-5	7 ~ 87	SU	3.0 + 2.0			6.0 + 2.0
								996-tone (Full tone)	3.0 + 2.0	6.0 + 2.0
								242-tone	0.0 + 2.0	3.0 + 2.0
								484-tone	2.0 + 2.0	5.0 + 2.0
			MCS0 ~ MCS9	UNII-5	7 ~ 87			26-tone	-8.0 + 2.0	-5.0 + 2.0
								52-tone	-6.0 + 2.0	-3.0 + 2.0
								106-tone	-3.0 + 2.0	0.0 + 2.0
			All MCS index	UNII-6	103	SU	3.0 + 2.0			6.0 + 2.0
								996-tone (Full tone)	3.0 + 2.0	6.0 + 2.0
								242-tone	0.0 + 2.0	3.0 + 2.0
								484-tone	3.0 + 2.0	6.0 + 2.0
			MCS0 ~ MCS9	UNII-6	103			26-tone	-8.0 + 2.0	-5.0 + 2.0
								52-tone	-6.0 + 2.0	-3.0 + 2.0
								106-tone	-3.0 + 2.0	0.0 + 2.0
			All MCS index	UNII-7	119 ~ 167	SU	3.0 + 2.0			6.0 + 2.0
								996-tone (Full tone)	3.0 + 2.0	6.0 + 2.0
								242-tone	0.0 + 2.0	3.0 + 2.0
								484-tone	2.0 + 2.0	5.0 + 2.0
			MCS0 ~ MCS9	UNII-7	119 ~ 167			26-tone	-8.0 + 2.0	-5.0 + 2.0
								52-tone	-6.0 + 2.0	-3.0 + 2.0
								106-tone	-3.0 + 2.0	0.0 + 2.0
			All MCS index	UNII-8	183 ~ 215	SU	3.0 + 2.0			6.0 + 2.0
								996-tone (Full tone)	3.0 + 2.0	6.0 + 2.0
								242-tone	0.0 + 2.0	3.0 + 2.0
								484-tone	3.0 + 2.0	6.0 + 2.0
			MCS0 ~ MCS9	UNII-8	183 ~ 215			26-tone	-9.0 + 2.0	-6.0 + 2.0
								52-tone	-7.0 + 2.0	-4.0 + 2.0
								106-tone	-4.0 + 2.0	-1.0 + 2.0
AP	MIMO	IEEE 802.11ax (HE80)	All MCS index	UNII-5	7 ~ 87	SU	9.0 + 2.0			12.0 + 2.0
								996-tone (Full tone)	9.0 + 2.0	12.0 + 2.0
								242-tone	6.0 + 2.0	9.0 + 2.0
								484-tone	8.0 + 2.0	11.0 + 2.0
			MCS0 ~ MCS9	UNII-5	7 ~ 87			26-tone	-3.0 + 2.0	0.0 + 2.0
								52-tone	0.0+ 2.0	3.0 + 2.0
								106-tone	3.0 + 2.0	6.0 + 2.0
			All MCS index	UNII-6	103	SU	9.0 + 2.0			12.0 + 2.0
								996-tone (Full tone)	9.0 + 2.0	12.0 + 2.0
								242-tone	6.0 + 2.0	9.0 + 2.0
								484-tone	7.0 + 2.0	10.0 + 2.0
			MCS0 ~ MCS9	UNII-6	103			26-tone	-3.0 + 2.0	0.0 + 2.0
								52-tone	0.0 + 2.0	3.0 + 2.0
								106-tone	3.0 + 2.0	6.0 + 2.0

STA/ AP	SISO/ MIMO	Mode	MCS Index	Band	Channel	SU	Reference Power (dBm)/ Port	RU	Reference power (dBm)/Port	Maximum Tune Up Tolerance (dBm)/ 2Port
			All MCS index	UNII-7 / UNII-8	119 ~ 215	SU	9.0 + 2.0			12.0 + 2.0
								996-tone (Full tone)	9.0 + 2.0	12.0 + 2.0
								242-tone	5.0 + 2.0	8.0 + 2.0
								484-tone	7.0 + 2.0	10.0 + 2.0
			MCS0 ~ MCS9	UNII-7 / UNII-8	119 ~ 215			26-tone	-3.0 + 2.0	0.0 + 2.0
								52-tone	-1.0 + 2.0	2.0 + 2.0
								106-tone	2.0 + 2.0	5.0 + 2.0

MCS10 and MCS11 can only be used at 242-tone or higher

2.2.5 Theory of Operation

Table 69 describes the theory of operation.

Table 69: Theory of Operation - ISED

Frequency of Operation			Scan	Ad hoc Mode	Indoor/Outdoor
2.4 GHz	11b/g/n/ax(BW20)	2412-2462 MHz	Active	Yes	Both
	BT	2402-2480 MHz	N/A	N/A	Both
	BLE	2402-2480 MHz	N/A	N/A	Both
W52	11a/n/ac/ax (BW20)	5180-5240 MHz	Active	Yes	Indoor only
	11n/ac/ax (BW40)	5190-5230 MHz	Active	Yes	Indoor only
	11ac/ax (BW80)	5210 MHz	Active	Yes	Indoor only
W53[3] [4]	11a/n/ac/ax (BW20)	5260-5320 MHz	Passive	No	Both[5]
	11n/ac/ax (BW40)	5270-5310 MHz	Passive	No	Both[5]
	11ac/ax (BW80)	5290 MHz	Passive	No	Both[5]
W56[3] [4] [6]	11a/n/ac/ax (BW20)	5500-5720 MHz	Passive	No	Both
	11n/ac/ax (BW40)	5510-5710 MHz	Passive	No	Both
	11ac/ax (BW80)	5530-5690 MHz	Passive	No	Both
W58	11a/n/ac/ax (BW20)	5745-5825 MHz	Active	Yes	Both
	11n/ac/ax (BW40)	5755-5795 MHz	Active	Yes	Both
	11ac/ax (BW80)	5775 MHz	Active	Yes	Both
UNII-5/UNII-6 /UNII-7/UNII-8	11a	5955-7095 MHz	Active(6XD)	Yes(6ID)	Indoor only
	11ax(BW20)	5955-7095 MHz	Active(6XD)	Yes(6ID)	Indoor only
	11ax(BW40)	5965-7085 MHz	Active(6XD)	Yes(6ID)	Indoor only
	11ax(BW80)	5985-7025 MHz	Active(6XD)	Yes(6ID)	Indoor only

[3] DFS MASTER function not available. DFS client function available.
[4] There is a TPC function.
[5] 5260MHz (11a/n/ac/ax 20M band), 5270MHz (11n/ac/ax 40M band) and 5290MHz (11ac/ax 80M band) are Indoor only.
[6] The frequency band 5600MHz-5640MHz (11a/n/ac/ax 20M band), 5590MHz-5630MHz (11n/ac/ax 40M band) and 5610MHz (11ac/ax 80M band) is restricted in ISED.

Since this module is not sold to general end users directly, there is no user manual of module. For the details about this module, please refer to the specification sheet of module.

This module should be installed in the host device according to the interface specification (installation procedure).

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the end user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as shown in User manual.

- The following information must be indicated on the host device of this module.

Contains IC: 772C-LBEE5XV2EA 1. Operation shall be limited to indoor use only 2. Operation on oil platforms, automobiles, trains, maritime vessels and aircraft shall be prohibited except for on large aircraft flying above 3,048m(10,000 ft)

- In the case of the final product which can be carried around to outdoors. The following indication is necessary for the final product.
  - When the STA function is used in channel 52, 54, or 58.

    At the time of the channel 52, 54 or 58 setting, please indicate "for indoor use only channel". During connecting, please show the channel number which connects. And please indicate that the end user may find out "for indoor use only channel".
- If the final product uses the following frequency, please note that there is a limit.

English Version
For indoor use only (5150-5250 MHz band and channel 52, 54, 58).
French Version
Pour usage intérieur seulement (5150-5250 MHz band and channel 52, 54, 58)

English Version
Data transmission is always initiated by software, which is then passed down through the MAC, through the digital and analog baseband, and finally to the RF chip. Several special packets are initiated by the MAC. These are the only ways the digital baseband portion will turn on the RF transmitter, which it then turns off at the end of the packet. Therefore, the transmitter will be on only while one of the aforementioned packets is being transmitted. In other words, this device automatically discontinues transmission in case of either absence of information to transmit or operational failure.
French Version
La transmission des données est toujours initiée par le logiciel, puis les données sont transmises par l'intermédiaire du MAC, par la bande de base numérique et analogique et, enfin, à la puce RF. Plusieurs paquets spéciaux sont initiés par le MAC. Ce sont les seuls moyens pour qu'une partie de la bande de base numérique active l'émetteur RF, puis désactive celui-ci à la fin du paquet. En conséquence, l'émetteur reste uniquement activé lors de la transmission d'un des paquets susmentionnés. En d'autres termes, ce dispositif interrompt automatiquement toute transmission en cas d'absence d'information à transmettre ou de défaillance.

English Version
This radio transmitter (IC: 772C-LBEE5XV2EA) has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.
French Version

Le présent émetteur radio (IC: 772C-LBEE5XV2EA) a été approuvé par Innovation, Sciences et Développement économique Canada pour fonctionner avec les types d'antenne énumérés ci dessous et ayant un gain admissible maximal.

Les types d'antenne non inclus dans cette liste, et dont le gain est supérieur au gain maximal indiqué pour

2.2.5.1 Low-power Client Device (STA Mode)

English Version

Devices shall not be used for control of or communications with unmanned aircraft systems.

French Version

Les dispositifsne doiventpas êtreutiliséspour commander des systèmesd'aéronefsans pilotenipour communiqueravec de telssystèmes.

2.2.5.2 Low-power indoor AP (AP mode)

English Version

1. Devices shall not be used for control of or communications with unmanned aircraft systems.
2. Operation shall be limited to indoor use only.
3. Operation on oil platforms, automobiles, trains, maritime vessels and aircraft shall be prohibited except for on large aircraft flying above 3,048 m (10,000 ft).

French Version

1. Les dispositifsne doiventpas êtreutiliséspour commander des systèmesd'aéronefsans pilotenipour communiqueravec de telssystèmes.
2. leurutilisationdoit êtrelimitéeà l'intérieurseulement
3. leurutilisationà bord de plateformesde forage pétrolier, d'automobiles, de trains, de naviresmaritimeset d'aéronefsdoit êtreinterdite, saufà bord d'un grosaéronefvolant à plus de 3 048 m (10 000 pi) d'altitude.

- ISED regulations restrict the operation of this device to indoor use only, a weatherized enclosure cannot be used.
- Only the integrated antennas specified on the page 9 of this manual is allowed, when changes of antenna is requested, please contact Murata as further verification by Class II application is required.
- The finished product must be powered by a wired connection and not by battery power.
- The following statements must be described on the user manual of the host device of this module:

English Version

This device contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

French Version

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique 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.
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

- When installing it in a mobile equipment:

English Version

This equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment and meets RSS-102 of the IC radio frequency (RF) Exposure rules. This equipment should be installed and operated by keeping the radiator at least 20cm or more away from a person's body.

French Version

Cet équipement est conforme aux limites d'exposition aux rayonnements énoncées pour un environnement non contrôlé et respecte les règles d'exposition aux fréquences radioélectriques (RF) CNR-102 de l'ISED. Cet équipement doit être installé et utilisé en gardant une distance de 20 cm ou plus entre le radiateur et le corps humain.

- When installing it in a portable equipment:

  It is necessary to take a SAR test with your set mounting this module.
  Class 4 permissive change application is necessary using the SAR report.
  Please contact Murata.

- **Portable equipment:** Equipment for which the spaces between human body and antenna are used within 20cm.
- **Mobile equipment:** Equipment used at position in which the spaces between human body and antenna exceeded 20cm.

- If the antenna of the end product is removed, please describe the following warning on the manual of the end product which contains this module.

English Version

This radio transmitter (772C-LBEE5XV2EA) has been approved by Innovation, the Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated.

Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Dipole Antenna	Gain: 3.2 dBi@2.4GHz/4.25 dBi@5GHz/5.8 dBi@6GHz
Dipole Antenna	Gain: 2.67 dBi@2.4GHz/3.67 dBi@5GHz/4.0 dBi@6GHz
Dipole Antenna	Gain: 3.0 dBi@2.4GHz/4.0 dBi@5GHz/4.0 dBi@6GHz
Dipole Antenna	Gain: 3.2 dBi@2.4GHz
Monopole Antenna	Gain: 2.9 dBi@2.4GHz/2.9 dBi@5GHz/2.5 dBi@6GHz

French Version

Le présent émetteur radio (772C-LBEE5XV2EA) a été approuvé par Innovation, Sciences et Développement économique Canada pour fonctionner avec les types d'antenne énumérés ci dessous et ayant un gain admissible maximal.

Les types d'antenne non inclus dans cette liste, et dont le gain est supérieur au gain maximal indiqué pour tout type figurant sur la liste, sont strictement interdits pour l'exploitation de l'émetteur.

Dipole Antenna	Gain: 3.2 dBi@2.4GHz/4.25 dBi@5GHz/5.8 dBi@6GHz
Dipole Antenna	Gain: 2.67 dBi@2.4GHz/3.67 dBi@5GHz/4.0 dBi@6GHz
Dipole Antenna	Gain: 3.0 dBi@2.4GHz/4.0 dBi@5GHz/4.0 dBi@6GHz
Dipole Antenna	Gain: 3.2 dBi@2.4GHz
Monopole Antenna	Gain: 2.9 dBi@2.4GHz/2.9 dBi@5GHz/2.5 dBi@6GHz

- About FVIN and 6GHz WLAN RF function:

Table 70: Type 2EA Antenna Configuration - ISED

HVIN	FVIN	Antenna connector(s)				2.4GHz and 5GHz WLAN	6GHz WLAN function	Approval Date
			WLAN	BT classic	BLE			
LBEE5XV2EA_DANT	**1.1.2.1**	3(ANT0, ANT1, BT_ANT)	ANT0, ANT1	BT_ANT	BT_ANT	STA & AP	STA & AP	2023-06-29
LBEE5XV2EA_SANT	**1.1.1.1**	2(ANT0, ANT1)	ANT0, ANT1	ANT0	ANT0	STA & AP	STA & AP	2023-06-29

HVIN	FVIN	Antenna connector(s)				2.4GHz and 5GHz WLAN	6GHz WLAN function	Approval Date
			WLAN	BT classic	BLE			
LBEE5XV2EA_DANT	**1.1.2.3**	3(ANT0, ANT1, BT_ANT)	ANT0, ANT1	BT_ANT	BT_ANT	STA & AP	**STA only**	2023-09-11
LBEE5XV2EA_SANT	**1.1.1.3**	2(ANT0, ANT1)	ANT0, ANT1	ANT0	ANT0	STA & AP	**STA only**	2023-09-11

If the 6GHzWLAN AP feature is to be implemented in the final product, an application with a C4PC test to Canada will be required in the final product. Please contact your certification authority for details.

2.2.6 Antenna

The antenna models for ISED are described in **Table 71**.

Table 71: Antennas - ISED

No.	Part number	Vendor	Peak Gain [dBi]			Type	Connector
			2.4 GHz	5 GHz	6 GHz		
1	146153	Moldex	3.2	4.25	5.8	Dipole	u.FL
2	219611	Molex	2.67	3.67	4.0	Dipole	u.FL
3	WT32D1-KX	Unictron	3.0	4.0	4.0	Dipole	MHF I
4	W24P-U	Inventek	3.2	N/A	N/A	Dipole	u.FL
5	Type2EA_Antenna	Murata	2.9	2.9	2.5	Monopole	Trace

No. 4 W24P-U can only be used at 2.4 GHz band.
No. 5 Type2EA_Antenna can only be used for ANT0 (Antenna Port 0)

2.2.6.1 Signal Line Between an Antenna and a Module

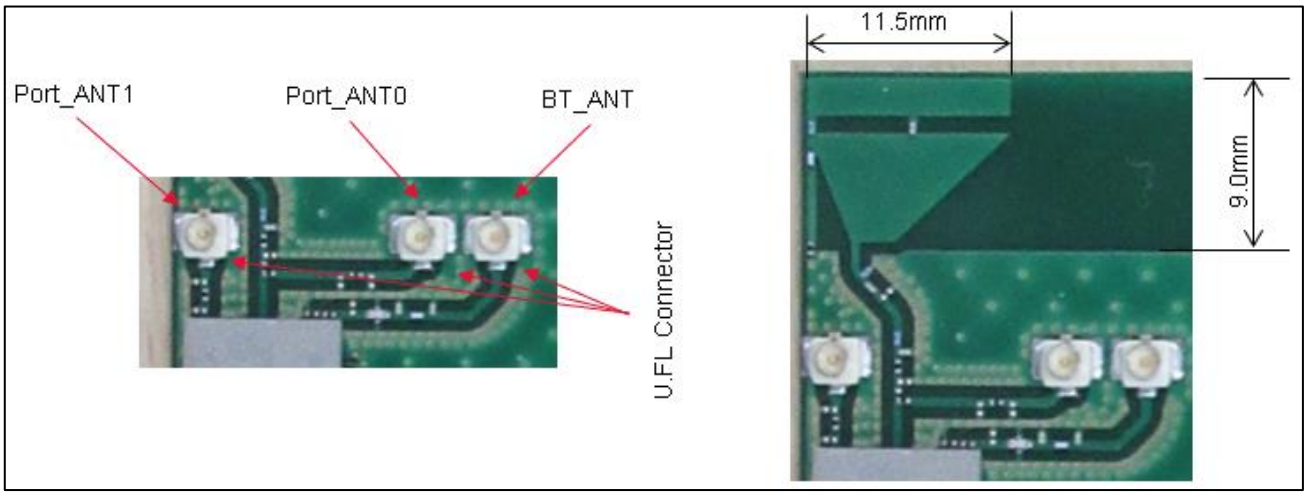
It is a 50 Ω line design. Fine tuning of return loss etc. can be performed using a matching network. However, it is required to check "Class1 change" and "Class2 change" which the authorities define then.

The concrete contents of a check are the following three points:

1. It is the same type as the antenna type of antenna specifications.
2. An antenna gain is lower than a gain given in antenna specifications.
3. The emission level is not getting worse.

50 Ω line (microstrip line length) and Trace Antenna (Type2EA_Antenna) are used as the design of the EVB used for the test. **Figure 11** shows the pattern used in the certification test.

Figure 11: EVB Design Used for Testing - ISED



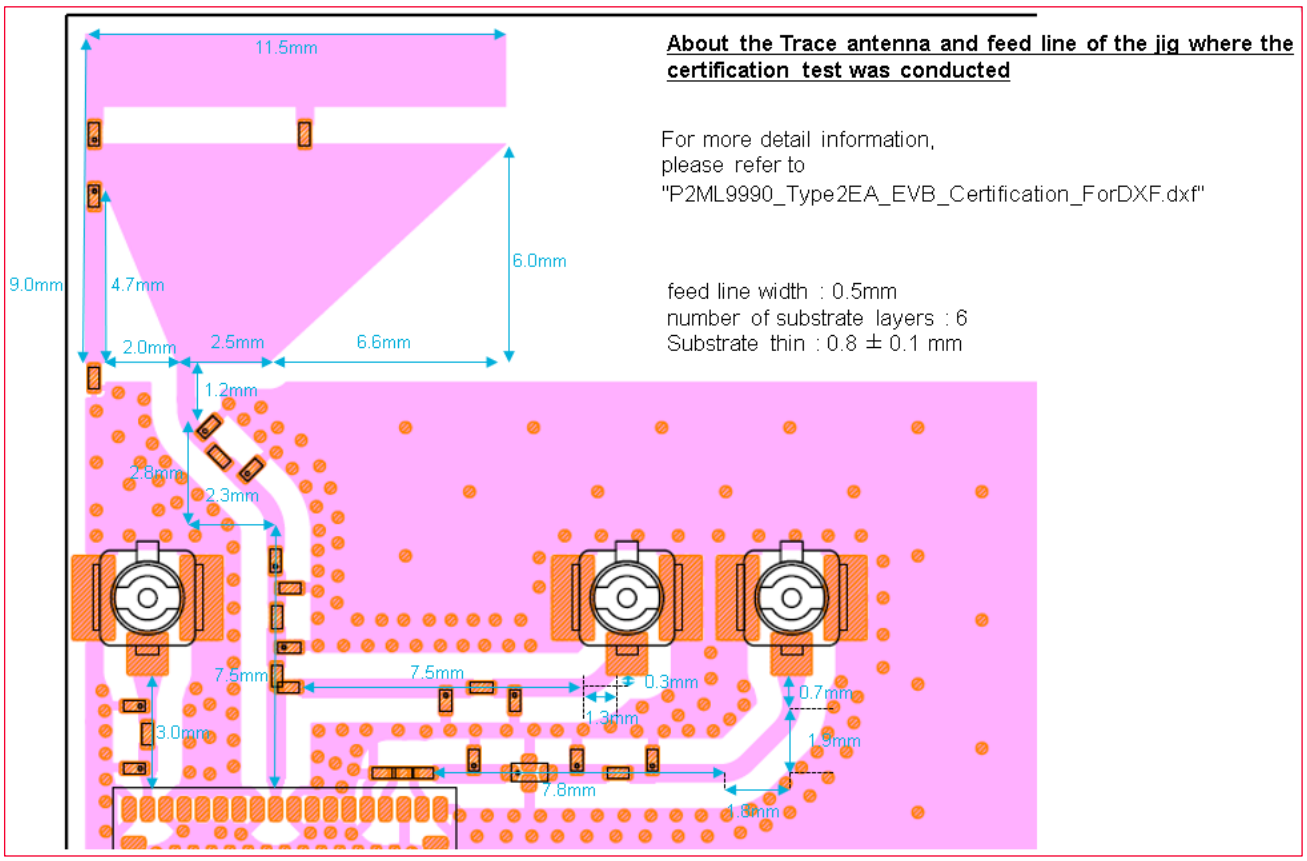
The 50 Ω microstrip line and Type2EA_Antenna needs to be copied when module is installed in the end product.

Murata provides set makers with Gerber data or something similar.

2.2.6.2 Trace Antenna and Feed Line of The Jig Where the Certification Test is Conducted

- Substrate type name of certification test jig: **P2ML9990-S** and **P2ML9990-D**
- Feed line width: **0.5 mm**
- Substrate thin: **0.8 ± 0.1 mm**
- Substrate material: **FR-4**
- Number of substrate layers: **6**

Figure 12: Trace Antenna and Feed Line of The Jig - ISED



2.2.6.3 Trace Antenna (Type2EA_Antenna)

The LBEE5XV2EA module is certified with a PCB antenna (Type2EA_Antenna).

The following precautions should be taken when using this PCB antenna (Type2EA_Antenna):

- Type2EA_Antenna can only be used for port_ANT0 side.
- When the module is installed in the final product, the 50 Ω microstrip line and Type2EA_Antenna, outlined in right red in **Figure 13**, must be copied to the state shown in **Figure 14** where it was certified.
- Port_ANT1 can use the following four antennas when it is in Dedicated Usage.
  - 219611, WT32D1-KX, W24P-U

Murata provides set makers with Gerber data or something similar.

Figure 13: 50 Ω Microstrip Line and Type2EA_Antenna - ISED

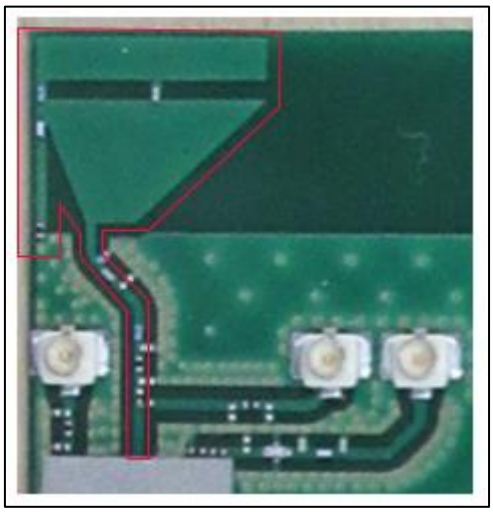
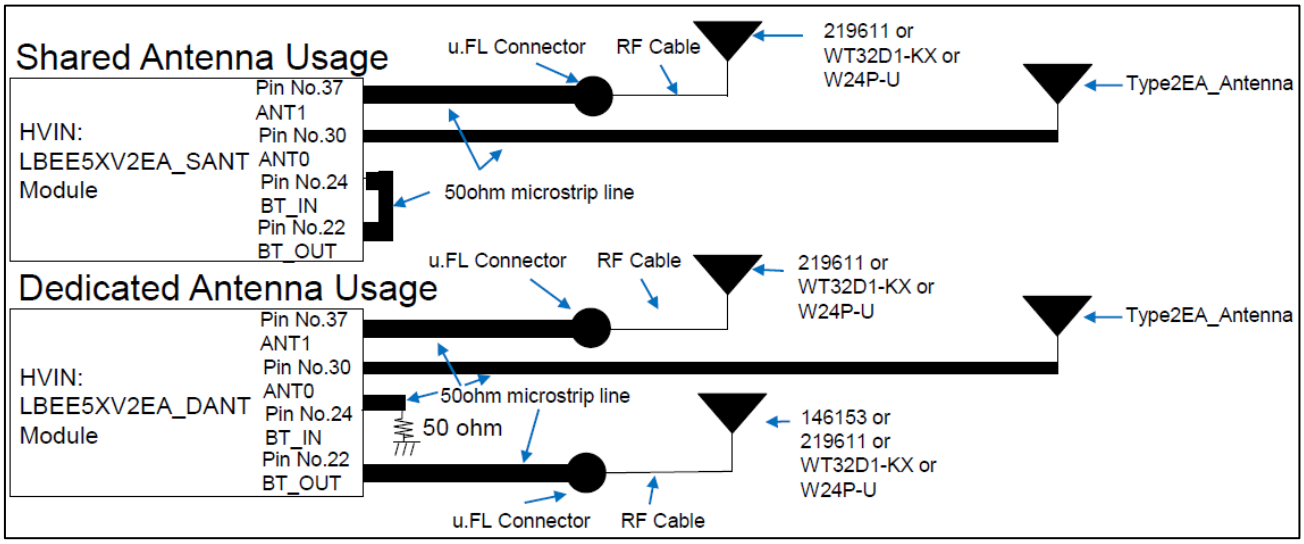


Figure 14: Type 2EA Trace Antenna Layout Guide - ISED



2.2.6.4 Antenna with u.FL Connector and Cables and Feed Lines (146153, 219611, WT32D1-KX, W24P-U)

- The LBEE5XV2EA module is certified with a PCB antenna and four external antennas.

> The external antenna should be connected to the LBEE5XV2EA module using 50 Ω microstrip RF trace and a u.FL RF connector as described below.

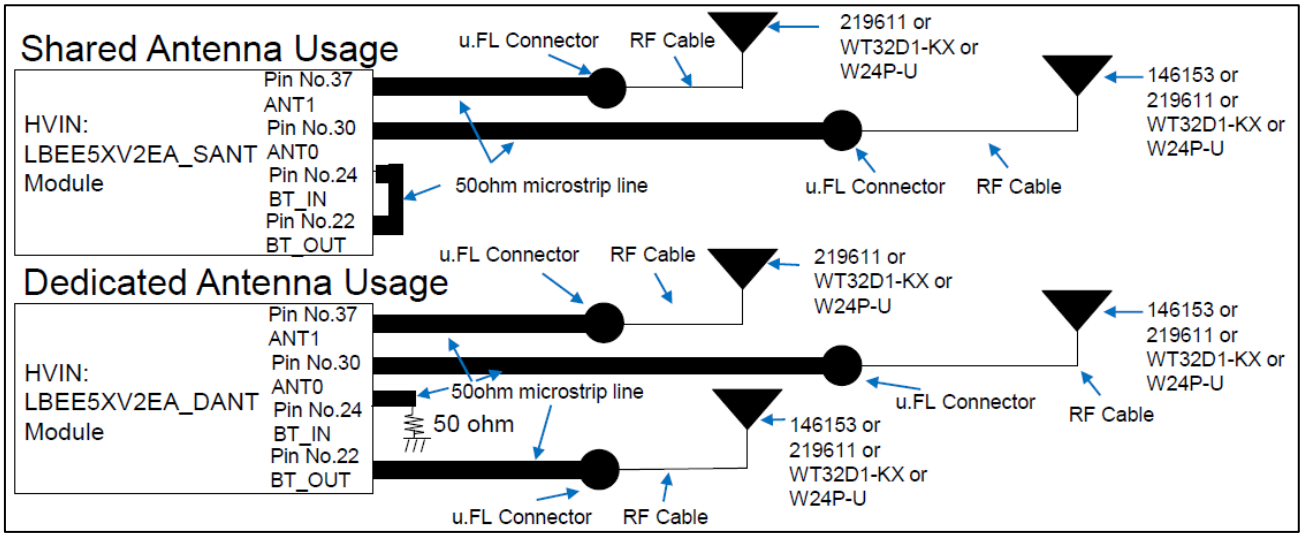
- The microstrip RF trace and u.FL connector are placed on the customer‘s PCB and are external to the LBEE5XV2EA module.
- The antenna is then connected to this u.FL Connector via a 50 Ω RF adapter cable.
- The design of the 50 Ω microstrip RF trace on the customer’s PCB is crucially important.

Compliant operation of the LBEE5XV2EA module is dependent on proper construction of this 50 Ω line and the following guidelines must be followed to ensure legal operation of the product.

Figure 15 shows the required microstrip structure to be routed between module pin 22, 24 and the u.FL connector.

The top PCB trace carries the RF energy from module to u.FL connector.

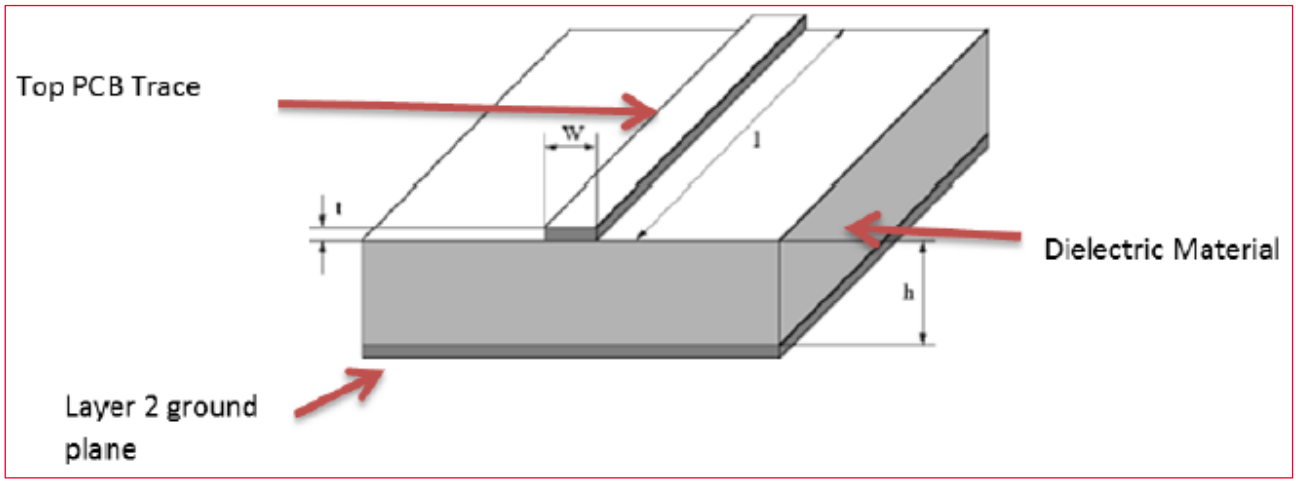
Figure 15: Antenna with u.FL Connector Layout Guide - ISED



50 Ω microstrip RF trace: Murata provides set makers with Gerber data or something similar.

As shown in **Figure 16**, The Layer2 ground plane provides a return path for the circuit. The Dielectric material (along with the dimensions of the microstrip structures) determines the characteristic impedance of the microstrip transmission line.

Figure 16: Microstrip RF Trace Structure - ISED



Note the representative dimensions shown in the drawing above. It is imperative that the module customer (the integrator) use the exact dimensions we recommend ensuring a 50 Ω impedance for this transmission line.

The following dimensions and/or ratios should be used to set the microstrip impedance to 50 Ω:

- Dielectric (PCB) Material: We recommend standard FR4 PCB material. Other dielectrics will work but will require recalculation of microstrip dimensions.

  The following guidance is predicated on the use of FR4 Dielectric:

  - If FR4 is not used for PCB material, please contact Murata to determine new dimensions for microstrip structure.

- **h** (Dielectric Height) - this is the thickness of dielectric between the trace layer (layer 1) and the ground plane on layer 2.

  Note that layer 2 must be electrical ground. We recommend a dielectric thickness of 8-15 mils. This range provides the customer with some flexibility in board construction.

- **t** (**trace thickness**): Microstrip impedance is not severely affected by the thickness dimension. Standard 102 or 202 copper deposition is recommended. Equivalent thickness is 1-2 mils.

- **W** (**trace width**): this is the crucial dimension. This width must be set correctly to obtain the desired 50 Ω impedance.

  When using FR-4 dielectric, the width (W) of the microstrip trace should be set to: W = H* 1.8, where W is microstrip trace width and H is Dielectric height. Note that both values must be measured in identical units (mils or mm).

  Example:

  H = 12 mils, W =12 * 1.8 = 21.6 mils

  H = 0.4 mm, W = 0.4*1.8 = 0.72 mm

  In any event, the microstrip line must operate over the same Dielectric-Ground Plane configuration shown above to act as a 50 Ω transmission line.

  Do not run the microstrip trace through sections of PCB that do not have the Dielectric-Ground plane configuration shown above.

A reliable 50 Ω transmission line will be produced if the above guidance is closely followed.

Any deviations from the guidance above may cause the module to operate in noncompliant manner.

Any implementation questions or concerns should be directed to Murata module technical support.

2.2.7 About Power Supply (Limited Condition)

This Module (LBEE5XV2EA) has been approved as Limited Modular Approval.
These modules do not have a voltage stabilizing circuit in the power path to the internal RF circuitry. Therefore, the Limited Condition must provide a stable power supply for the supply voltage to the module.
Please supply a stable power supply so that the voltage shown in **Table 72** is applied.

Table 72: Power Supply Voltages - ISED

Parameter		Minimum	Typical	Maximum	Unit
Supply Voltage	VBAT	3.0	3.3	4.8	V
	VDDIO	1.71	1.8	1.89	V

2.3 EU

The following report is issued:

Only the Antenna Terminated Conducted test section of each report is available for TCF of the final product.

The radiation characteristic data should be acquired by you in the final product.

Radio Equipment Directive (RED) 2014/53/EU Article 3.2

Conforms to: EN 300 328 v2.2.2:2019
Report No.: TERF2211002247E2
Report No.: TERF2211002248E2
Report No.: TERF2211002249E2
EN 301 893 v2.1.1:2017
Report No.: TERF2211002250E2
Report No.: TERF2211002251E2
EN 300 440 v2.1.1:2017
Report No.: TERF2211002252E2
Draft EN 303 687 v1.0.0:2022
Report No.: TERF2211002253E2
Report No.: TERF2211002254E2

“EN 303 687 v1.0.0:2022” is a draft standard.

The final product with the 6GHzWLAN feature requires NB verification.

Product name: Communication Module

Model: LBEE5XV2EA

Manufacture: Murata manufacturing Co., Ltd.

When shipping final products with this module to Europe, make a self-declaration that the product complies with European regulations and apply the CE mark.

2.3.1 Setting RF Power

This section describes the RF power settings.

2.3.1.1 RF Power Setting for 2.4 GHz WLAN

Table 73 and **Table 74** describe the RF Power Settings for 2.4 GHz WLAN.

Table 73: WLAN RF Power Setting - 2.4 GHz (SISO) (EU)

SISO/CDD/MIMO	Mode	Rate/MCS index	Channel	Maximum Tune Up Tolerance (dBm)
SISO	IEEE 802.11b	All Rate	1 ~ 13	13.0 + 2.0
	IEEE 802.11g	All rate	1 ~ 13	14.0 + 2.0
	IEEE 802.11n (HT20)	All MCS index	1 ~ 13	14.0 + 2.0

Table 74: WLAN RF Power Setting - 2.4 GHz (CDD/MIMO) (EU)

SISO/ CDD/MIMO	Mode	Rate/MCS index	Channel	Reference Power (dBm)/Port	Maximum Tune Up Tolerance (dBm)/ 2 Port
CDD	IEEE 802.11g	All rate	1 ～ 13	11.0 + 2.0	14.0 + 2.0
CDD/MIMO	IEEE 802.11n (HT20)	All MCS index	1 ～ 13	11.0 + 2.0	14.0 + 2.0

Table 75 and **Table 76** describe the RF power settings for 2.4 GHz 802.11ax WLAN.

Table 75: WLAN RF Power Setting - 2.4 GHz 802.11ax (HE20) (SISO) (EU)

SISO/ CDD/ MIMO	Mode	Rate / MCS index	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
SISO	IEEE 802.11ax (HE20)	MCS0 ~ MCS8	1 ~ 13	SU	14.0 + 2.0		
						242-tone (Full tone)	14.0 + 2.0
						26-tone	7.0 + 2.0
						52-tone	11.0 + 2.0
						106-tone	14.0 + 2.0
		MCS9	1 ~ 13	SU	12.0 + 2.0		
						242-tone (Full tone)	12.0 + 2.0
						26-tone	7.0 + 2.0
						52-tone	11.0 + 2.0
						106-tone	12.0 + 2.0
		MCS10, MCS11	1 ~ 13	SU	12.0 + 2.0		
						242-tone (Full tone)	12.0 + 2.0

MCS10 and MCS11 can only be used at 242-tone or higher.

Table 76: WLAN RF Power Setting - 2.4 GHz 802.11ax (HE20) (CDD/MIMO) (EU)

SISO/ CDD/ MIMO	Mode	Rate / MCS index	Channel	SU	Reference Power (dBm)/Port	RU	Reference Power (dBm)/ Port	Maximum Tune Up Tolerance (dBm)/ 2Port
CDD/ MIMO	IEEE 802.11ax (HE20)	All MCS index	1 ~ 13	SU	11.0 + 2.0			14.0 + 2.0
						242-tone (Full tone)	11.0 + 2.0	14.0 + 2.0
		MCS0 ~ MCS9	1 ~ 13			26-tone	4.0 + 2.0	7.0 + 2.0
						52-tone	8.0 + 2.0	11.0 + 2.0
						106-tone	11.0 + 2.0	14.0 + 2.0

MCS10 and MCS11 can only be used at 242-tone or higher.

2.3.1.2 RF Power Setting for BT (BR/EDR) / BLE

Table 77 describes the RF power settings for BT (BR/EDR) and BLE.

Table 77: BT / BLE RF Power Setting - EU

Mode	Channel	Maximum Tune Up Tolerance (dBm)
BR	NA	8.0 +2.5
EDR	NA	4.0 +2.5
LE 125 kbps	NA	3.5 +2.5
LE 500 kbps	NA	3.5 +2.5
LE 1 Mbps	NA	3.5 +2.5
LE 2 Mbps	NA	3.5 +2.5

2.3.1.3 RF Power Setting for 5 GHz WLAN (W52/W53/W56)

Table 78 and **Table 79** describe the RF power settings for 5 GHz 802.11a WLAN.

Table 78: WLAN RF Power Setting - 5 GHz 802.11a (SISO) (EU)

SISO/CDD/MIMO	Mode	Rate	Band	Channel	Maximum Tune Up Tolerance (dBm)
SISO	IEEE 802.11a	All Rate	W52/W53	36 ~ 64	12.0 + 2.0
		All Rate	W56	100 ~ 140	12.0 + 2.0
		All Rate	W58	149 ~ 165	6.0 + 2.0

Table 79: WLAN RF Power Setting - 5 GHz 802.11a (CDD/MIMO) (EU)

SISO/CDD/MIMO	Mode	Rate	Band	Channel	Reference Power(dBm) / port	Maximum Tune Up Tolerance (dBm) / 2 port
CDD/MIMO	IEEE 802.11a	All Rate	W52/W53	36 ~ 64	9.0 + 2.0	12.0 + 2.0
		All Rate	W56	100 ~ 140	9.0 + 2.0	12.0 + 2.0
		All Rate	W58	149 ~ 165	4.0 + 2.0	7.0 + 2.0

Table 80, Table 81, Table 82, and **Table 83** describe the RF Power settings for 5 GHz 802.11n WLAN.

Table 80: WLAN RF Power Setting - 5 GHz 802.11n (HT20) (SISO) (EU)

SISO/CDD/MIMO	Mode	MCS Index	Band	Channel	Maximum Tune Up Tolerance (dBm)
SISO	IEEE 802.11n (HT20)	All MCS Index	W52/W53	36 ~ 64	12.0 + 2.0
		All MCS Index	W56	100 ~ 140	12.0 + 2.0
		All MCS Index	W58	149 ~ 165	6.0 + 2.0

Table 81: WLAN RF Power Setting - 5 GHz 802.11n (HT20) (CDD/MIMO) (EU)

SISO/CDD/ MIMO	Mode	Rate	Band	Channel	Reference Power(dBm)/port	Maximum Tune Up Tolerance (dBm)/2port
CDD/MIMO	IEEE 802.11n (HT20)	All MCS Index	W52/W53	36 ~ 64	9.0 + 2.0	12.0 + 2.0
		All MCS Index	W56	100 ~ 140	9.0 + 2.0	12.0 + 2.0
		All MCS Index	W58	149 ~ 165	4.0 + 2.0	7.0 + 2.0

Table 82: WLAN RF Power Setting - 5 GHz 802.11n (HT40) (SISO) (EU)

SISO/CDD/MIMO	Mode	MCS Index	Band	Channel	Maximum Tune Up Tolerance (dBm)
SISO	IEEE 802.11n (HT40)	All MCS Index	W52/W53	38 ~ 62	12.0 + 2.0
		All MCS Index	W56	102 ~ 134	12.0 + 2.0
		All MCS Index	W58	151, 159	6.0 + 2.0

Table 83: WLAN RF Power Setting - 5 GHz 802.11n (HT40) (CDD/MIMO) (EU)

SISO/CDD/ MIMO	Mode	Rate	Band	Channel	Reference Power(dBm)/port	Maximum Tune Up Tolerance (dBm)/2port
CDD/MIMO	IEEE 802.11n (HT40)	All MCS Index	W52/W53	38 ~ 62	9.0 + 2.0	12.0 + 2.0
		All MCS Index	W56	102 ~ 134	9.0 + 2.0	12.0 + 2.0
		All MCS Index	W58	151, 159	4.0 + 2.0	7.0 + 2.0

Table 84, **Table 85**, **Table 86**, **Table 87**, **Table 88**, and **Table 89** describe the RF power setting for 5 GHz 802.11ac WLAN.

Table 84: WLAN RF Power Setting - 5 GHz 802.11ac (VHT20) (SISO) (EU)

SISO/CDD/MIMO	Mode	MCS Index	Band	Channel	Maximum Tune Up Tolerance (dBm)
SISO	IEEE 802.11ac (VHT20)	MCS0 ~ MCS7	W52/W53	36 ~ 64	12.0 + 2.0
		MCS8	W52/W53	36 ~ 64	10.0 + 2.0
		MCS0 ~ MCS7	W56	100 ~ 140	12.0 + 2.0
		MCS8	W56	100 ~ 140	10.0 + 2.0
		All MCS Index	W58	149 ~ 165	6.0 + 2.0

Table 85: WLAN RF Power Setting - 5 GHz 802.11ac (VHT20) (CDD/MIMO) (EU)

SISO/CDD/ MIMO	Mode	Rate	Band	Channel	Reference Power(dBm)/port	Maximum Tune Up Tolerance (dBm)/2port
CDD/MIMO	IEEE 802.11ac (VHT20)	All MCS Index	W52/W53	36 ~ 64	9.0 + 2.0	12.0 + 2.0
		All MCS Index	W56	100 ~ 140	9.0 + 2.0	12.0 + 2.0
		All MCS Index	W58	149 ~ 165	4.0 + 2.0	7.0 + 2.0

Table 86: WLAN RF Power Setting - 5 GHz 802.11ac (VHT40) (SISO) (EU)

SISO/CDD/MIMO	Mode	MCS Index	Band	Channel	Maximum Tune Up Tolerance (dBm)
SISO	IEEE 802.11ac (VHT40)	MCS0 ~ MCS7	W52/W53	38 ~ 62	12.0 + 2.0
		MCS8, MCS9	W52/W53	38 ~ 62	10.0 + 2.0
		MCS0 ~ MCS7	W56	102 ~ 134	12.0 + 2.0
		MCS8, MCS9	W56	102 ~ 134	10.0 + 2.0
		All MCS Index	W58	151, 159	6.0 + 2.0

Table 87: WLAN RF Power Setting - 5 GHz 802.11ac (VHT40) (CDD/MIMO) (EU)

SISO/CDD/ MIMO	Mode	Rate	Band	Channel	Reference Power(dBm)/port	Maximum Tune Up Tolerance (dBm)/2port
CDD/MIMO	IEEE 802.11ac (VHT40)	All MCS Index	W52/W53	38 ~ 62	9.0 + 2.0	12.0 + 2.0
		All MCS Index	W56	102 ~ 134	9.0 + 2.0	12.0 + 2.0
		All MCS Index	W58	151, 159	4.0 + 2.0	7.0 + 2.0

Table 88: WLAN RF Power Setting - 5 GHz 802.11ac (VHT80) (SISO) (EU)

SISO/CDD/MIMO	Mode	MCS Index	Band	Channel	Maximum Tune Up Tolerance (dBm)
SISO	IEEE 802.11ac (VHT80)	MCS0 ~ MCS7	W52/W53	42, 58	12.0 + 2.0
		MCS8, MCS9	W52/W53	42, 58	10.0 + 2.0
		MCS0 ~ MCS7	W56	106, 122	12.0 + 2.0
		MCS8, MCS9	W56	106, 122	10.0 + 2.0
		All MCS Index	W58	155	6.0 + 2.0

Table 89: WLAN RF Power Setting - 5 GHz 802.11ac (VHT80) (CDD/MIMO) (EU)

SISO/CDD/ MIMO	Mode	Rate	Band	Channel	Reference Power(dBm)/port	Maximum Tune Up Tolerance (dBm)/2port
CDD/MIMO	IEEE 802.11ac (VHT80)	All MCS Index	W52/W53	42, 58	9.0 + 2.0	12.0 + 2.0
		All MCS Index	W56	106, 122	9.0 + 2.0	12.0 + 2.0
		All MCS Index	W58	155	4.0 + 2.0	7.0 + 2.0

Table 90, Table 91, Table 92, Table 93, Table 94, and **Table 95** describe the RF power settings for 5 GHz 802.11ax WLAN.

Table 90: WLAN RF Power Setting - 5 GHz 802.11ax (HE20) (SISO) (EU)

SISO/ CDD/ MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
SISO	IEEE 802.11ax (HE20)	MCS0 ~ MCS7	W52/W53	36 ~ 64	SU	12.0 + 2.0		
							242-tone (Full tone)	12.0 + 2.0
							26-tone	6.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	12.0 + 2.0
		MCS8, MCS9	W52/W53	36 ~ 64	SU	10.0 + 2.0		
							242-tone (Full tone)	10.0 + 2.0
							26-tone	6.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	10.0 + 2.0
		MCS10, MCS11	W52/W53	36 ~ 64	SU	9.0 + 2.0		
							242-tone (Full tone)	9.0 + 2.0
		MCS0 ~ MCS7	W56	100 ~ 140	SU	12.0 + 2.0		
							242-tone (Full tone)	12.0 + 2.0
							26-tone	6.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	12.0 + 2.0
		MCS8, MCS9	W56	100 ~ 140	SU	10.0 + 2.0		
							242-tone (Full tone)	10.0 + 2.0
							26-tone	6.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	10.0 + 2.0
		MCS10, MCS11	W56	100 ~ 140	SU	9.0 + 2.0		
							242-tone (Full tone)	9.0 + 2.0
		All MCS Index	W58	149 ~ 165	SU	6.0 + 2.0		
							242-tone (Full tone)	6.0 + 2.0
		MCS0 ~ MCS9	W58	149 ~ 165			26-tone	6.0 + 2.0
							52-tone	6.0 + 2.0
							106-tone	6.0 + 2.0

MCS10 and MCS11 can only be used at 242-tone or higher.

Table 91: WLAN RF Power Setting - 5 GHz 802.11ax (HE20) (CDD/MIMO) (EU)

SISO/ CDD/ MIMO	Mode	MCS Index	Band	Channel	SU	Reference Power/(dBm)/Port	RU	Reference Power (dBm)/ Port	Maximum Tune Up Tolerance (dBm)/2Port
CDD/ MIMO	IEEE 802.11ax (HE20)	All MCS Index	W52/W53	36 ~ 64	SU	9.0 + 2.0			12.0 + 2.0
							242-tone (Full tone)	9.0 + 2.0	12.0 + 2.0
		MCS0 ~ MCS9	W52/W53	36 ~ 64			26-tone	3.0 + 2.0	6.0 + 2.0
							52-tone	6.0 + 2.0	9.0 + 2.0
							106-tone	9.0 + 2.0	12.0 + 2.0
		All MCS Index	W56	100 ~ 140	SU	9.0 + 2.0			12.0 + 2.0
							242-tone (Full tone)	9.0 + 2.0	12.0 + 2.0
		MCS0 ~ MCS9	W56	100 ~ 140			26-tone	3.0 + 2.0	6.0 + 2.0
							52-tone	6.0 + 2.0	9.0 + 2.0
							106-tone	9.0 + 2.0	12.0 + 2.0
		All MCS Index	W58	149 ~ 165	SU	4.0 + 2.0			7.0 + 2.0
							242-tone (Full tone)	4.0 + 2.0	7.0 + 2.0
		MCS0 ~ MCS9	W58	149 ~ 165			26-tone	3.0 + 2.0	6.0 + 2.0
							52-tone	4.0 + 2.0	7.0 + 2.0
							106-tone	4.0 + 2.0	7.0 + 2.0

MCS10 and MCS11 can only be used at 242-tone or higher.

Table 92: WLAN RF Power Setting - 5 GHz 802.11ax (HE40) (SISO) (EU)

SISO/ CDD/ MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
SISO	IEEE 802.11ax (HE40)	MCS0 ~ MCS7	W52/W53	38 ~ 62	SU	12.0 + 2.0		
							484-tone (Full tone)	12.0 + 2.0
							26-tone	6.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	12.0 + 2.0
							242-tone	12.0 + 2.0
		MCS8, MCS9	W52/W53	38 ~ 62	SU	10.0 + 2.0		
							484-tone	10.0 + 2.0

SISO/ CDD/ MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
							(Full tone)	
							26-tone	6.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	10.0 + 2.0
							242-tone	10.0 + 2.0
		MCS10, MCS11	W52/W53	38 ~ 62	SU	9.0 + 2.0		
							484-tone (Full tone)	9.0 + 2.0
							242-tone	9.0 + 2.0
		MCS0 ~ MCS7	W56	102 ~ 134	SU	12.0 + 2.0		
							484-tone (Full tone)	12.0 + 2.0
							26-tone	6.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	12.0 + 2.0
							242-tone	12.0 + 2.0
		MCS8, MCS9	W56	102 ~ 134	SU	10.0 + 2.0		
							484-tone (Full tone)	10.0 + 2.0
							26-tone	6.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	10.0 + 2.0
							242-tone	10.0 + 2.0
		MCS10, MCS11	W56	102 ~ 134	SU	9.0 + 2.0		
							484-tone (Full tone)	9.0 + 2.0
							242-tone	9.0 + 2.0
		All MCS Index	W58	151, 159	SU	6.0 + 2.0		
							484-tone (Full tone)	6.0 + 2.0
							242-tone	6.0 + 2.0
		MCS0 ~ MCS9	W58	151, 159			26-tone	6.0 + 2.0
							52-tone	6.0 + 2.0

SISO/ CDD/ MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
							106-tone	6.0 + 2.0

MCS10 and MCS11 can only be used at 242-tone or higher.

Table 93: WLAN RF Power Setting - 5 GHz 802.11ax (HE40) (CDD/MIMO) (EU)

SISO/CDD/ MIMO	Mode	MCS Index	Band	Channel	SU	Reference Power (dBm)/ Port	RU	Reference Power (dBm)/ Port	Maximum Tune Up Tolerance (dBm)/ 2Port
CDD/ MIMO	IEEE 802.11ax (HE40)	All MCS Index	W52/W53	38 ~ 62	SU	9.0 + 2.0			12.0 + 2.0
							484-tone (Full tone)	9.0 + 2.0	12.0 + 2.0
							242-tone	9.0 + 2.0	12.0 + 2.0
		MCS0 ~ MCS9	W52/W53	38 ~ 62			26-tone	3.0 + 2.0	6.0 + 2.0
							52-tone	6.0 + 2.0	9.0 + 2.0
							106-tone	9.0 + 2.0	12.0 + 2.0
		All MCS Index	W56	102 ~ 134	SU	9.0 + 2.0			12.0 + 2.0
							484-tone (Full tone)	9.0 + 2.0	12.0 + 2.0
							242-tone	9.0 + 2.0	12.0 + 2.0
		MCS0 ~ MCS9	W56	102 ~ 134			26-tone	3.0 + 2.0	6.0 + 2.0
							52-tone	6.0 + 2.0	9.0 + 2.0
							106-tone	9.0 + 2.0	12.0 + 2.0
		All MCS Index	W58	151, 159	SU	4.0 + 2.0			7.0 + 2.0
							484-tone (Full tone)	4.0 + 2.0	7.0 + 2.0
							242-tone	4.0 + 2.0	7.0 + 2.0
		MCS0 ~ MCS9	W58	151, 159			26-tone	3.0 + 2.0	6.0 + 2.0
							52-tone	4.0 + 2.0	7.0 + 2.0
							106-tone	4.0 + 2.0	7.0 + 2.0

MCS10 and MCS11 can only be used at 242-tone or higher.

Table 94: WLAN RF Power Setting - 5 GHz 802.11ax (HE80) (SISO) (EU)

SISO/ CDD/ MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
SISO	IEEE 802.11ax (HE80)	MCS0 ~ MCS7	W52/W53	42, 58	SU	12.0 + 2.0		
							996-tone (Full tone)	12.0 + 2.0
							26-tone	6.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	12.0 + 2.0
							242-tone	12.0 + 2.0
							484-tone	12.0 + 2.0

SISO/ CDD/ MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
		MCS8, MCS9	W52/W53	42, 58	SU	10.0 + 2.0		
							996-tone (Full tone)	10.0 + 2.0
							26-tone	6.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	10.0 + 2.0
							242-tone	10.0 + 2.0
							484-tone	10.0 + 2.0
		MCS10, MCS11	W52/W53	42, 58	SU	9.0 + 2.0		
							996-tone (Full tone)	9.0 + 2.0
							242-tone	9.0 + 2.0
							484-tone	9.0 + 2.0
		MCS0 ~ MCS7	W56	106, 122	SU	12.0 + 2.0		
							996-tone (Full tone)	12.0 + 2.0
							26-tone	6.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	12.0 + 2.0
							242-tone	12.0 + 2.0
							484-tone	12.0 + 2.0
		MCS8, MCS9	W56	106, 122	SU	10.0 + 2.0		
							996-tone (Full tone)	10.0 + 2.0
							26-tone	6.0 + 2.0
							52-tone	9.0 + 2.0
							106-tone	10.0 + 2.0
							242-tone	10.0 + 2.0
							484-tone	10.0 + 2.0
		MCS10, MCS11	W56	106, 122	SU	9.0 + 2.0		
							996-tone (Full tone)	9.0 + 2.0
							242-tone	9.0 + 2.0
							484-tone	9.0 + 2.0
		All MCS Index	W58	155	SU	6.0 + 2.0		
							996-tone (Full tone)	6.0 + 2.0
							242-tone	6.0 + 2.0
							484-tone	6.0 + 2.0
		MCS0 ~ MCS9	W58	155			26-tone	6.0 + 2.0
							52-tone	6.0 + 2.0
							106-tone	6.0 + 2.0

MCS10 and MCS11 can only be used at 242-tone or higher.

Table 95: WLAN RF Power Setting - 5 GHz 802.11ax (HE80) (CDD/MIMO) (EU)

SISO/ CDD/ MIMO	Mode	MCS Index	Band	Channel	SU	Reference Power (dBm)/ Port	RU	Reference Power (dBm)/Port	Maximum Tune Up Tolerance (dBm)/ 2Port
			W52/W53	42, 58	SU	9.0 + 2.0			12.0 + 2.0

SISO/ CDD/ MIMO	Mode	MCS Index	Band	Channel	SU	Reference Power (dBm)/ Port	RU	Reference Power (dBm)/Port	Maximum Tune Up Tolerance (dBm)/ 2Port
CDD/MIMO	IEEE 802.11ax (HE80)	All MCS Index					996-tone (Full tone)	9.0 + 2.0	12.0 + 2.0
							242-tone	9.0 + 2.0	12.0 + 2.0
							484-tone	9.0 + 2.0	12.0 + 2.0
		MCS0 ~ MCS9	W52/W53	42, 58			26-tone	3.0 + 2.0	6.0 + 2.0
							52-tone	6.0 + 2.0	9.0 + 2.0
							106-tone	9.0 + 2.0	12.0 + 2.0
		All MCS Index	W56	106,122	SU	9.0 + 2.0			12.0 + 2.0
							996-tone (Full tone)	9.0 + 2.0	12.0 + 2.0
							242-tone	9.0 + 2.0	12.0 + 2.0
							484-tone	9.0 + 2.0	12.0 + 2.0
		MCS0 ~ MCS9	W56	106,122			26-tone	3.0 + 2.0	6.0 + 2.0
							52-tone	6.0 + 2.0	9.0 + 2.0
							106-tone	9.0 + 2.0	12.0 + 2.0
		All MCS Index	W58	155	SU	4.0 + 2.0			7.0 + 2.0
							996-tone (Full tone)	4.0 + 2.0	7.0 + 2.0
							242-tone	4.0 + 2.0	7.0 + 2.0
							484-tone	4.0 + 2.0	7.0 + 2.0
		MCS0 ~ MCS9	W58	155			26-tone	3.0 + 2.0	6.0 + 2.0
							52-tone	4.0 + 2.0	7.0 + 2.0
							106-tone	4.0 + 2.0	7.0 + 2.0

MCS10 and MCS11 can only be used at 242-tone or higher.

2.3.1.4 RF Power Setting for 6 GHz WLAN

Table 96 describes the RF power setting for 6 GHz 802.11a WLAN.

Table 96: WLAN RF Power Setting - 6 GHz 802.11a (SISO) (EU)

LPI/VLP	SISO/MIMO	Mode	Rate	Band	Channel	Maximum Tune Up Tolerance (dBm)
LPI	SISO	IEEE 802.11a	6, 9, 12, 18, 24Mbps	UNII-5	1 ~ 93	12.0 + 2.0
VLP	SISO	IEEE 802.11a	6, 9, 12, 18, 24Mbps	UNII-5	1 ~ 93	4.0 + 2.0

6 GHz 11a is SISO only.

Table 97, Table 98, Table 99, Table 100, Table 101, and **Table 102** describe the RF power settings for 6 GHz 802.11ax WLAN.

Table 97: WLAN RF Power Setting - 6 GHz 802.11ax (HE20) (SISO) (EU)

LPI/VLP	SISO/MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
LPI	SISO	IEEE 802.11ax (HE20)	MCS0 ~ MCS7	UNII-5	1 ~ 93	SU	12.0 + 2.0		
								242-tone (Full tone)	12.0 + 2.0
								26-tone	5.0 + 2.0
								52-tone	8.0 + 2.0
								106-tone	11.0 + 2.0
			MCS8, MCS9	UNII-5	1 ~ 93	SU	10.0 + 2.0		
								242-tone (Full tone)	10.0 + 2.0
								26-tone	5.0 + 2.0
								52-tone	8.0 + 2.0
								106-tone	10.0 + 2.0
			MCS10, MCS11	UNII-5	1 ~ 93	SU	9.0 + 2.0		
								242-tone (Full tone)	9.0 + 2.0
VLP	SISO	IEEE 802.11ax (HE20)	All MCS Index	UNII-5	1 ~ 93	SU	6.0 + 2.0		
								242-tone (Full tone)	6.0 + 2.0
			MCS0 ~ MCS9	UNII-5	1 ~ 93			26-tone	-4.0 + 2.0
								52-tone	-1.0 + 2.0
								106-tone	2.0 + 2.0

MCS10 and MCS11 can only be used at 242-tone or higher.

Table 98: WLAN RF Power Setting - 6 GHz 802.11ax (HE20) (MIMO) (EU)

LPI/ VLP	SISO/ MIMO	Mode	MCS Index	Band	Channel	SU	Reference Power (dBm)/ Port	RU	Reference power (dBm)/port	Maximum Tune Up Tolerance (dBm)/ 2Port
LPI	MIMO	IEEE 802.11ax (HE20)	All MCS Index	UNII-5	1 ~ 93	SU	9.0 + 2.0			12.0 + 2.0
								242-tone (Full tone)	9.0 + 2.0	12.0 + 2.0
			MCS0 ~ MCS9	UNII-5	1 ~ 93			26-tone	2.0 + 2.0	5.0 + 2.0
								52-tone	5.0 + 2.0	8.0 + 2.0
								106-tone	8.0 + 2.0	11.0 + 2.0
VLP	MIMO	IEEE 802.11ax (HE20)	All MCS Index	UNII-5	1 ~ 93	SU	3.0 + 2.0			6.0 + 2.0
								242-tone (Full tone)	3.0 + 2.0	6.0 + 2.0
			MCS0 ~ MCS9	UNII-5	1 ~ 93			26-tone	-7.0 + 2.0	-4.0 + 2.0
								52-tone	-4.0 + 2.0	-1.0 + 2.0
								106-tone	-1.0 + 2.0	2.0 + 2.0

However, MCS10 and MCS11 can only be used at 242-tone or higher.

Table 99: WLAN RF Power Setting - 6 GHz 802.11ax (HE40) (SISO) (EU)

LPI/ VLP	SISO/MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
LPI	SISO	IEEE 802.11ax (HE40)	MCS0 ~ MCS7	UNII-5	3 ~ 91	SU	12.0 + 2.0		
								484-tone (Full tone)	12.0 + 2.0
								26-tone	5.0 + 2.0
								52-tone	8.0 + 2.0
								106-tone	11.0 + 2.0
								242-tone	12.0 + 2.0
			MCS8, MCS9	UNII-5	3 ~ 91	SU	10.0 + 2.0		
								484-tone (Full tone)	10.0 + 2.0
								26-tone	5.0 + 2.0
								52-tone	8.0 + 2.0
								106-tone	10.0 + 2.0
								242-tone	10.0 + 2.0
			MCS10, MCS11	UNII-5	3 ~ 91	SU	9.0 + 2.0		
								484-tone (Full tone)	9.0 + 2.0
								242-tone	9.0 + 2.0
VLP	SISO	IEEE 802.11ax (HE40)	MCS0 ~ MCS9	UNII-5	3 ~ 91	SU	6.0 + 2.0		
								484-tone (Full tone)	6.0 + 2.0
								26-tone	-4.0 + 2.0
								52-tone	-1.0 + 2.0
								106-tone	2.0 + 2.0
								242-tone	6.0 + 2.0

MCS10 and MCS11 can only be used at 242-tone or higher.

Table 100: WLAN RF Power Setting - 6 GHz 802.11ax (HE40) (MIMO) (EU)

LPI/VLP	SISO/ MIMO	Mode	MCS Index	Band	Channel	SU	Reference Power (dBm)/ Port	RU	Reference Power (dBm)/ Port	Maximum Tune Up Tolerance (dBm) /2Port
LPI	MIMO	IEEE 802.11ax (HE40)	All MCS Index	UNII-5	3 ~ 91	SU	9.0 + 2.0			12.0 + 2.0
								484-tone (Full tone)	9.0 + 2.0	12.0 + 2.0
								26-tone	2.0 + 2.0	5.0 + 2.0
			MCS0 ~ MCS9	UNII-5	3 ~ 91			52-tone	5.0 + 2.0	8.0 + 2.0
								106-tone	8.0 + 2.0	11.0 + 2.0

LPI/VLP	SISO/ MIMO	Mode	MCS Index	Band	Channel	SU	Reference Power (dBm)/ Port	RU	Reference Power (dBm)/ Port	Maximum Tune Up Tolerance (dBm) /2Port
								242-tone	9.0 + 2.0	12.0 + 2.0
VLP	MIMO	IEEE 802.11ax (HE40)	All MCS Index	UNII-5	3 ~ 91	SU	3.0 + 2.0			6.0 + 2.0
								484-tone (Full tone)	3.0 + 2.0	6.0 + 2.0
								26-tone	-7.0 + 2.0	-4.0 + 2.0
			MCS0 ~ MCS9	UNII-5	3 ~ 91			52-tone	-4.0 + 2.0	-1.0 + 2.0
								106-tone	-1.0 + 2.0	2.0 + 2.0
								242-tone	3.0 + 2.0	6.0 + 2.0

MCS10 and MCS11 can only be used at 242-tone or higher.

Table 101: WLAN RF Power Setting - 6 GHz 802.11ax (HE80) (SISO) (EU)

LPI/ VLP	SISO/ MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
LPI	SISO	IEEE 802.11ax (HE80)	MCS0 ~ MCS7	UNII-5	7 ~ 87	SU	12.0 + 2.0		
								996-tone (Full tone)	12.0 + 2.0
								26-tone	5.0 + 2.0
								52-tone	8.0 + 2.0
								106-tone	11.0 + 2.0
								242-tone	12.0 + 2.0
								484-tone	12.0 + 2.0
			MCS8, MCS9	UNII-5	7 ~ 87	SU	10.0 + 2.0		
								996-tone (Full tone)	10.0 + 2.0
								26-tone	5.0 + 2.0
								52-tone	8.0 + 2.0
								106-tone	10.0 + 2.0
								242-tone	10.0 + 2.0
								484-tone	10.0 + 2.0
			MCS10, MCS11	UNII-5	7 ~ 87	SU	9.0 + 2.0		
								996-tone (Full tone)	9.0 + 2.0
								242-tone	9.0 + 2.0
								484-tone	9.0 + 2.0
VLP	SISO	IEEE 802.11ax (HE80)	All MCS Index	UNII-5	7 ~ 87	SU	5.0 + 2.0		
								996-tone (Full tone)	5.0 + 2.0
								242-tone	5.0 + 2.0
								484-tone	5.0 + 2.0
			MCS0 ~ MCS9	UNII-5	7 ~ 87			26-tone	-4.0 + 2.0
								52-tone	-1.0 + 2.0

LPI/ VLP	SISO/ MIMO	Mode	MCS Index	Band	Channel	SU	Maximum Tune Up Tolerance (dBm)	RU	Maximum Tune Up Tolerance (dBm)
								106-tone	2.0 + 2.0

MCS10 and MCS11 can only be used at 242-tone or higher.

Table 102: WLAN RF Power Setting - 6 GHz 802.11ax (HE80) (MIMO) (EU)

LPI/ VLP	SISO/ MIMO	Mode	MCS Index	Band	Channel	SU	Reference power (dBm)/Port	RU	Reference power (dBm)/ Port	Maximum Tune Up Tolerance (dBm)/ 2 Port
LPI	MIMO	IEEE 802.11ax (HE80)	All MCS Index	UNII-5	7 ~ 87	SU	9.0 + 2.0			12.0 + 2.0
								996-tone (Full tone)	9.0 + 2.0	12.0 + 2.0
								242-tone	9.0 + 2.0	12.0 + 2.0
								484-tone	9.0 + 2.0	12.0 + 2.0
			MCS0 ~ MCS9	UNII-5	7 ~ 87			26-tone	2.0 + 2.0	5.0 + 2.0
								52-tone	5.0 + 2.0	8.0 + 2.0
								106-tone	8.0 + 2.0	11.0 + 2.0
VLP	MIMO	IEEE 802.11ax (HE80)	All MCS Index	UNII-5	7 ~ 87	SU	3.0 + 2.0			6.0 + 2.0
								996-tone (Full tone)	3.0 + 2.0	6.0 + 2.0
								242-tone	3.0 + 2.0	6.0 + 2.0
								484-tone	3.0 + 2.0	8.0 + 2.0
			MCS0 ~ MCS9	UNII-5	7 ~ 87			26-tone	-7.0 + 2.0	-4.0 + 2.0
								52-tone	-4.0 + 2.0	-1.0 + 2.0
								106-tone	-1.0 + 2.0	2.0 + 2.0

MCS10 and MCS11 can only be used at 242-tone or higher.

2.3.2 Theory of Operation

Table 103 describes the theory of operation.

Table 103: Theory of Operation - EU

Frequency of Operation			Scan	Ad hoc Mode	Indoor/outdoor
2.4 GHz	11b/g/n(BW20)/ax (BW20)	2412-2472 MHz	Active	Yes	Both
	BT	2402-2480 MHz	N/A	N/A	Both
	BLE	2402-2480 MHz	N/A	N/A	Both
W52	11a/n/ac/ax (BW20)	5180-5240 MHz	Active	Yes	Indoor only
	11n/ac/ax (BW40)	5190-5230 MHz	Active	Yes	Indoor only
	11ac/ax (BW80)	5210 MHz	Active	Yes	Indoor only
W53[7] [8]	11a/n/ac/ax (BW20)	5260-5320 MHz	Passive	No	Indoor only
	11n/ac/ax (BW40)	5270-5310 MHz	Passive	No	Indoor only
	11ac/ax (BW80)	5290 MHz	Passive	No	Indoor only
W56[7] [8]	11a/n/ac/ax (BW20)	5500-5720 MHz	Passive	No	Both
	11n/ac/ax (BW40)	5510-5710 MHz	Passive	No	Both
	11ac/ax (BW80)	5530-5690 MHz	Passive	No	Both
W58	11a/n/ac/ax (BW20)	5745-5825 MHz	Active	Yes	Both
	11n/ac/ax (BW40)	5755-5795 MHz	Active	Yes	Both
	11ac/ax (BW80)	5775 MHz	Active	Yes	Both
UNII-5 LPI	11a	5955-6415 MHz	Active	Yes	Indoor only
	11ax (BW20)	5955-6415 MHz	Active	Yes	Indoor only
	11ax (BW40)	5965-6405 MHz	Active	Yes	Indoor only
	11ax (BW80)	5985-6385 MHz	Active	Yes	Indoor only
UNII-5 VLP	11a	5955-6415 MHz	Active	Yes	Both
	11ax (BW20)	5955-6415 MHz	Active	Yes	Both
	11ax (BW40)	5965-6405 MHz	Active	Yes	Both
	11ax (BW80)	5985-6385 MHz	Active	Yes	Both

[7] DFS MASTER function not available. DFS client function available.
[8] There is a TPC function.

2.4 Japan

- **Manufacturer Name:** Murata Manufacturing Co., Ltd.
- **Model or Product Name:** LBEE5XV2EA

This module has received “CERTIFICATION for TYPE CERTIFICATION" under the Japanese Radio Act.

電波法の要求に基づく警告
（警告）5 GHz の周波数帯においては、5.2GHz/5.3GHz/5.6GHz 帯 (W52/W53/W56)の 3 種類の帯域を使用することができます。5.2 GHz/5.3 GHz 帯無線 LAN (W52/W53)の屋外使用は 5.2GHz 帯高出力データ通信システムの基地局又は陸上移動中継局と通信する場合を除き電波法で禁止されています

English Translation
Warning based on the requirements of Japanese Radio Act.
(Warning) In the 5GHz frequency band, you can use 3 bands: 5.2GHz/5.3GHz/5.6GHz(W52/W53/W56).
Outdoor use of 5.2 GHz/5.3 GHz band wireless LANs(W52/W53) is prohibited by the Radio Act except when communicating with 5.2 GHz band high-power data communication system base stations or land mobile relay stations.

2.4GHz と 5GHz(W52,W53,W56)および 6GHz（LPI/VLP）で使用するモジュールです。

W53/W56 は子局としてのみ動作させてください。

また 6GHz の LPI クラスでご使用時は子局としてのみ動作させてください。

English Translation
This is a module for use at 2.4 GHz and 5 GHz (W52, W53, W56), and 6GHz(LPI/VLP).
Operate the W53/W56 only as a client mode.
In addition, when using the 6GHz LPI class, operate only as a client mode.

2.4.1 Product Outline

This product has a function as IEEE802.11a/b/g/n/ac/ax tri-band W-LAN 2x2 MIMO + Bluetooth (BR/EDR/LE) combo module.

- **Product Size:** 12.5 x 9.4 mm (Typical), H = 1.2 mm (Maximum)
- **Wireless-IC:** Infineon CYW55573 inside
- **Reference Clock**: 37.4MHz X’tal
- **Weight:** 0.36 g

2.4.2 Feature

- **Product Name:** Communication Module
- **Model Name:** LBEE5XV2EA
- **Purpose of the equipment:** Telecommunication

- **Equipment Type:** Transceiver
- **Frequency band:** 2412-2472 MHz/ 2402-2480 MHz/
  5180-5320 MHz/ 5500-5720 MHz/ 5955-6415MHz
- **Channel:** (WLAN)1 ~ 13 ch/ 36 ~ 64 ch/ 100 ~ 144 ch/ 6GHz 1 ~ 93 ch(w/o 2ch)
  (BT)1 ~ 79 ch (BLE) 1 ~ 40 ch
- **Bandwidth:** (WLAN) 2.4 GHz 11b (20 MHz)/11g (20 MHz)/11n (20 MHz)/ 11ax(HE20)

  5 GHz 11a (20 MHz)/11n (20/40 MHz)/11ac (20/40/80 MHz)/11ax (20/40/80 MHz)
  (BT) Hopping off 1 MHz / Hopping on 79 MHz
  (BLE) 125 kbps/ 500kbps/ 1 Mbps / 2 Mbps
- **Input Voltage to RF parts:** VBAT Typical 3.3V

2.4.3 Setting RF Power

2.4.3.1 RF Power Setting for 2.4 GHz WLAN

RF Power Settings for 2.4 GHz WLAN are described in the following tables.

Table 104: WLAN RF Power Setting - 2.4 GHz 802.11 b/g/n (HT20) /ax (HE20) (SISO) (Japan)

Mode	Rate/MCS index	Channel	Output Power in dBm (typical)
IEEE 802.11b	All Rate	1 ~ 13	14.0
IEEE 802.11g	All Rate	1 ~ 13	15.0
IEEE 802.11n (HT20)	All MCS index	1 ~ 13	15.0
IEEE 802.11ax (HE20)	MCS0 ~ MCS8	1 ~ 13	14.0
	MCS9 ~ MCS11	1 ~ 13	12.0

Table 105: WLAN RF Power Setting - 2.4 GHz 802.11 b/g/n (HT20) /ax (HE20) (MIMO) (Japan)

Mode	Rate/MCS index	Channel	Output Power in dBm / port (typical)	Output Power in dBm / 2 port (typical)
IEEE 802.11g	All Rate	1 ~ 13	12.0	15.0
IEEE 802.11n (HT20)	All MCS index	1 ~ 13	12.0	15.0
IEEE 802.11ax (HE20)	MCS0 ~ MCS11	1 ~ 13	11.0	14.0

2.4.3.2 RF Power Setting BT (BR/EDR) / BLE

RF power settings for BT (BR/EDR) and BLE are described in the following tables.

Table 106: BT / BLE RF Power Setting (Japan)

Mode	Setting Power (dBm)/Port
BR	8
EDR	4
EDR	4
LE 125 kbps	3.5
LE 500 kbps	3.5
LE 1 Mbps	3.5
LE 2 Mbps	3.5

2.4.3.3 RF Power Setting for 5 GHz WLAN

RF power settings for 5 GHz WLAN are described in the following tables.

Table 107: WLAN RF Power Setting - 5 GHz 802.11a/n/ac/ax (SISO) (Japan)

Mode	Rate/MCS Index	Channel	Output Power in dBm (typical)
IEEE 802.11a	All Rate	36 ~ 144	13.0
IEEE 802.11n (HT20)	All MCS index	36 ~ 144	13.0
IEEE 802.11n (HT40)	All MCS index	38 ~ 142	13.0
IEEE 802.11ac (VHT20)	MCS0 ~ MCS7	36 ~ 144	13.0
	MCS8	36 ~ 144	10.0
IEEE 802.11ac (VHT40)	MCS0 ~ MCS7	38 ~ 142	13.0
	MCS8 ~ MCS9	38 ~ 142	10.0
IEEE 802.11ac (VHT80)	MCS0 ~ MCS7	42 ~ 138	13.0
	MCS8 ~ MCS9	42 ~ 138	10.0
IEEE 802.11ax (HE20)	MCS0 ~ MCS7	36 ~ 144	12.0
	MCS8 ~ MCS9	36 ~ 144	10.0
	MCS10 ~ MCS11	36 ~ 144	9.0
IEEE 802.11ax (HE40)	MCS0 ~ MCS7	38 ~ 142	12.0
	MCS8 ~ MCS9	38 ~ 142	10.0
	MCS10 ~ MCS11	38 ~ 142	9.0
IEEE 802.11ax (HE80)	MCS0 ~ MCS7	42 ~ 138	12.0
	MCS8, MCS9	42 ~ 138	10.0
	MCS10 ~ MCS11	42 ~ 138	9.0

Table 108: WLAN RF Power Setting - 5 GHz 802.11a/n/ac/ax (MIMO) (Japan)

Mode	Rate/MCS Index	Channel	Output Power in dBm / port (typical)	Output Power in dBm / 2 port (typical)
IEEE 802.11a	All Rate	36 ~ 144	10.0	13.0
IEEE 802.11n (HT20)	All MCS index	36 ~ 144	10.0	13.0
IEEE 802.11n (HT40)	All MCS index	38 ~ 142	10.0	13.0
IEEE 802.11ac (VHT20)	All MCS index	36 ~ 144	10.0	13.0
IEEE 802.11ac (VHT40)	All MCS index	38 ~ 142	10.0	13.0
IEEE 802.11ac (VHT80)	All MCS index	42 ~ 138	10.0	13.0
IEEE 802.11ax (HE20)	All MCS index	36 ~ 144	9.0	12.0
IEEE 802.11ax (HE40)	All MCS index	38 ~ 142	9.0	12.0
IEEE 802.11ax (HE80)	All MCS index	42 ~ 138	9.0	12.0

2.4.3.4 RF Power Setting for 6 GHz WLAN

RF power settings for 6 GHz WLAN are described in the following tables.

Table 109: WLAN RF Power Setting - 6 GHz 802.11a/ax (SISO) (Japan)

LPI/VLP	Mode	Rate/MCS Index	Channel	Output Power in dBm (typical)
VLP	IEEE 802.11a	All Rate	1 ~ 93	3.0
	IEEE 802.11ax (HE20)	All MCS index	1 ~ 93	3.0
	IEEE 802.11ax (HE40)	All MCS index	3 ~ 91	3.0
	IEEE 802.11ax (HE80)	All MCS index	7 ~ 87	3.0
LPI	IEEE 802.11a	All Rate	1 ~ 93	12.0
	IEEE 802.11ax (HE20)	MCS0 ~ MCS7	1 ~ 93	12.0
		MCS8 ~ MCS9	1 ~ 93	10.0
		MCS10 ~ MCS11	1 ~ 93	9.0
	IEEE 802.11ax (HE40)	MCS0 ~ MCS7	3 ~ 91	12.0
		MCS8 ~ MCS9	3 ~ 91	10.0
		MCS10 ~ MCS11	3 ~ 91	9.0
	IEEE 802.11ax (HE80)	MCS0 ~ MCS7	7 ~ 87	12.0
		MCS8, MCS9	7 ~ 87	10.0
		MCS10 ~ MCS11	7 ~ 87	9.0

Table 110: WLAN RF Power Setting - 6 GHz 802.11a/ax (MIMO) (Japan)

LPI/VLP	Mode	Rate/MCS Index	Channel	Output Power in dBm / port (typical)	Output Power in dBm / 2 port (typical)
VLP	IEEE 802.11ax (HE20)	All MCS index	1 ~ 93	0.0	3.0
	IEEE 802.11ax (HE40)	All MCS index	3 ~ 91	0.0	3.0
	IEEE 802.11ax (HE80)	All MCS index	7 ~ 87	0.0	3.0
LPI	IEEE 802.11ax (HE20)	All MCS index	1 ~ 93	9.0	12.0
	IEEE 802.11ax (HE40)	All MCS index	3 ~ 91	9.0	12.0
	IEEE 802.11ax (HE80)	All MCS index	7 ~ 87	9.0	12.0

2.4.4 Types of Radio Emissions

Table 111 describes the types of radio emissions.

Table 111: Types of Radio Emissions

Mode	Rate/MCS Index	Modulation System	Types of Radio Emissions
Bluetooth	BR	GFSK	F1D
	EDR 2Mbps	π/4DQPSK	G1D
	EDR 3Mbps	8DPSK	G1D
	LE 125 kbps, LE 500 kbps LE 1 Mbps, LE 2 Mbps	GFSK	F1D
IEEE 802.11b	1 Mbps	DBPSK	G1D
	2 Mbps	DQPSK	G1D
	5.5 Mbps, 11 Mbps	CCK	G1D
IEEE 802.11g IEEE 802.11a	6Mbps, 9 Mbps	BPSK	G1D
	12Mbps, 18 Mbps	QPSK	G1D
	24Mbps, 36 Mbps	16 QAM	D1D
	48Mbps, 54 Mbps	64 QAM	D1D

Mode	Rate/MCS Index	Modulation System	Types of Radio Emissions
IEEE 802.11n IEEE 802.11ac IEEE 802.11ax	MCS0	BPSK	G1D
	MCS1, MCS2	QPSK	G1D
	MCS3, MCS4	16 QAM	D1D
	MCS5, MCS6, MCS7	64 QAM	D1D
IEEE 802.11ac IEEE 802.11ax	MCS8, MCS9	256 QAM	D1D
IEEE 802.11ax	MCS10, MCS11	1024QAM	D1D

2.4.5 Theory of Operation

Table 112 describes the theory of operation.

Table 112: Theory of Operation (Japan)

Frequency of Operation			Scan	Ad hoc Mode	indoor/outdoor
2.4 GHz	11b/g/n/ax (BW20)	2412-2472 MHz	Active	Yes	Both
	BT BR/EDR	2402-2480 MHz	N/A	N/A	Both
	BT LE	2402-2480 MHz	N/A	N/A	Both
W52	11a/n/ac/ax (BW20)	5180-5240 MHz	Active	Yes	Indoor only
	11n/ac/ax (BW40)	5190-5230 MHz	Active	Yes	Indoor only
	11ac/ax (BW80)	5210 MHz	Active	Yes	Indoor only
W53[9] [10]	11a/n/ac/ax (BW20)	5260-5320 MHz	Passive	No	Indoor only
	11n/ac/ax (BW40)	5270-5310 MHz	Passive	No	Indoor only
	11ac/ax (BW80)	5290 MHz	Passive	No	Indoor only
W56[9] [10]	11a/n/ac/ax (BW20)	5500-5720 MHz	Passive	No	Both
	11n/ac/ax (BW40)	5510-5710 MHz	Passive	No	Both
	11ac/ax (BW80)	5530-5690 MHz	Passive	No	Both
6GHz(LPI)	11a/ax(BW20)	5955-6415 MHz	Active	No	Indoor only
	11ax(BW40	5965-6405 MHz	Active	No	Indoor only
	11ax(BW80)	5985-6385 MHz	Active	No	Indoor only
6GHz(VLP)	11a/ax(BW20)	5955-6415 MHz	Active	No	Both
	11ax(BW40	5965-6405 MHz	Active	No	Both
	11ax(BW80)	5985-6385 MHz	Active	No	Both

2.4.6 Antenna

The antenna registered under the Radio Act Certification of Japan are described in **Table 113**.

Table 113: Antenna (Japan)

No.	Antenna Model	Antenna Type	Antenna Manufacturer	Peak Gain [dBi]		
				2.4-2.5GHz	5.15-5.85 MHz	5.90-6.425 MHz
1	146153	Dipole	Molex	3.2	4.25	5.8
2	219611	Dipole	Molex	2.67	3.67	4.0
3	WT32D1-KX	Dipole	Unictron	3.0	4.0	4.0
4	W24P-U	Dipole	Invetek	3.2	N/A	N/A
5	Type2EA_Antenna	Monopole	Murata	2.9	2.9	2.5

[9] DFS MASTER function not available. DFS client function available.
[10] There is a TPC function.

No. 4 W24P-U can only be used at 2.4 GHz band.

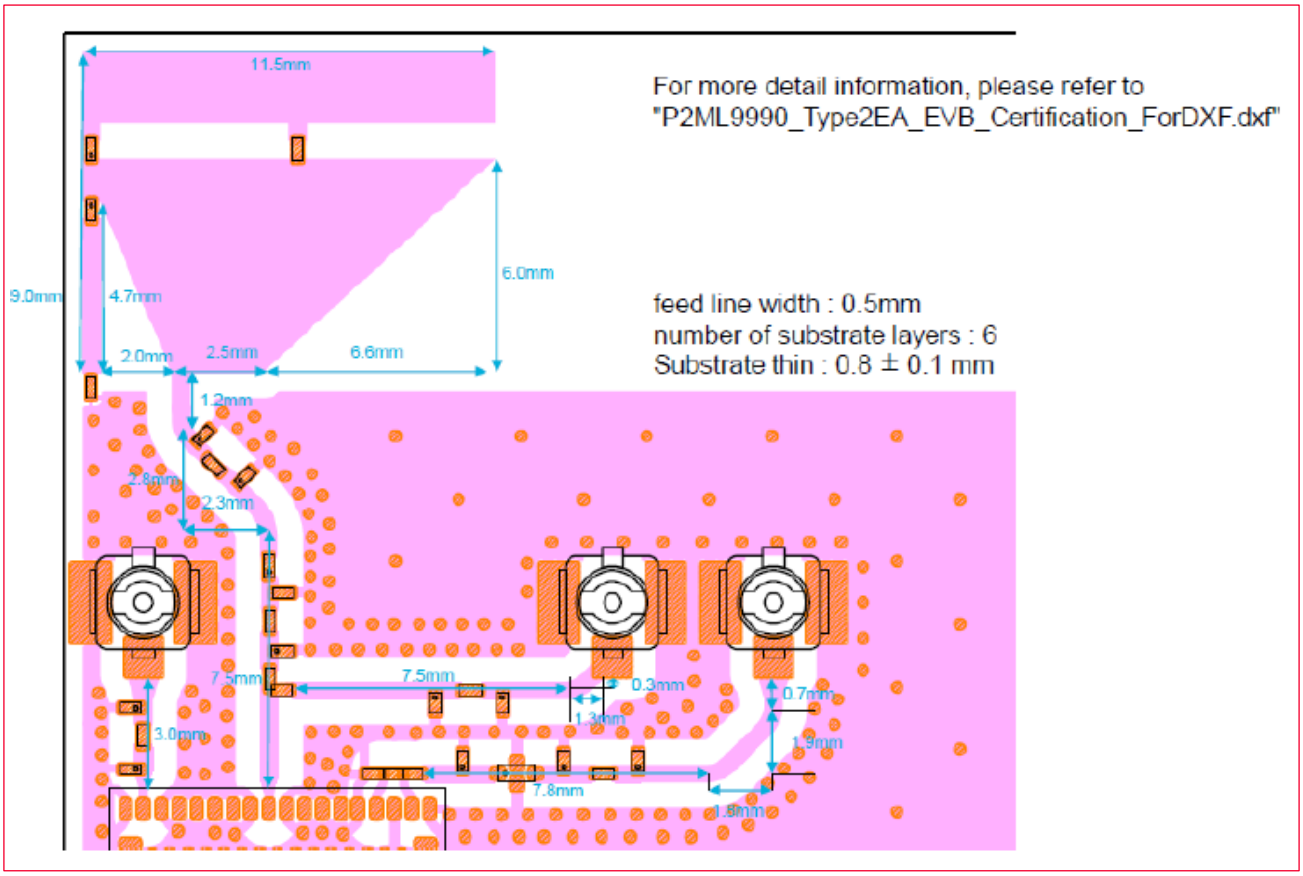
For No. 1 ~ No. 4 and No. 6 antennas, obtain a data sheet from the antenna manufacturer's website, as given below. Refer to Section 2.4.5.1 for details of the No. 5 antenna from Murata.

- Molex Electronic Solutions
- Unictron Technologies Corporation
- Inventek Systems, LLC

2.4.6.1 Type2EA_Antenna

When using Type2EA_Antenna, make sure to match the drawings shown in **Figure 17** below.

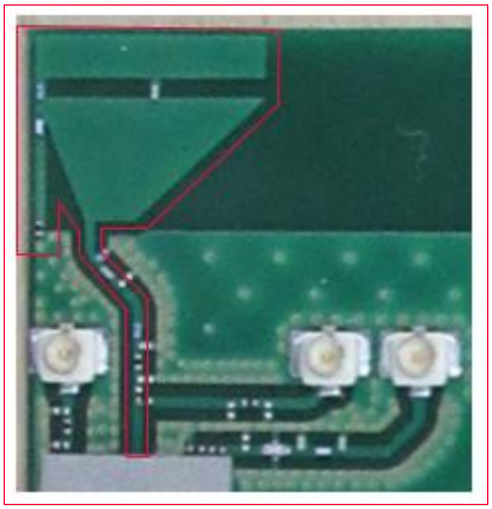
Figure 17: Type2EA_Antenna Drawing (Japan)



2.4.6.2 Appearance

Figure 18 shows the antenna appearance.

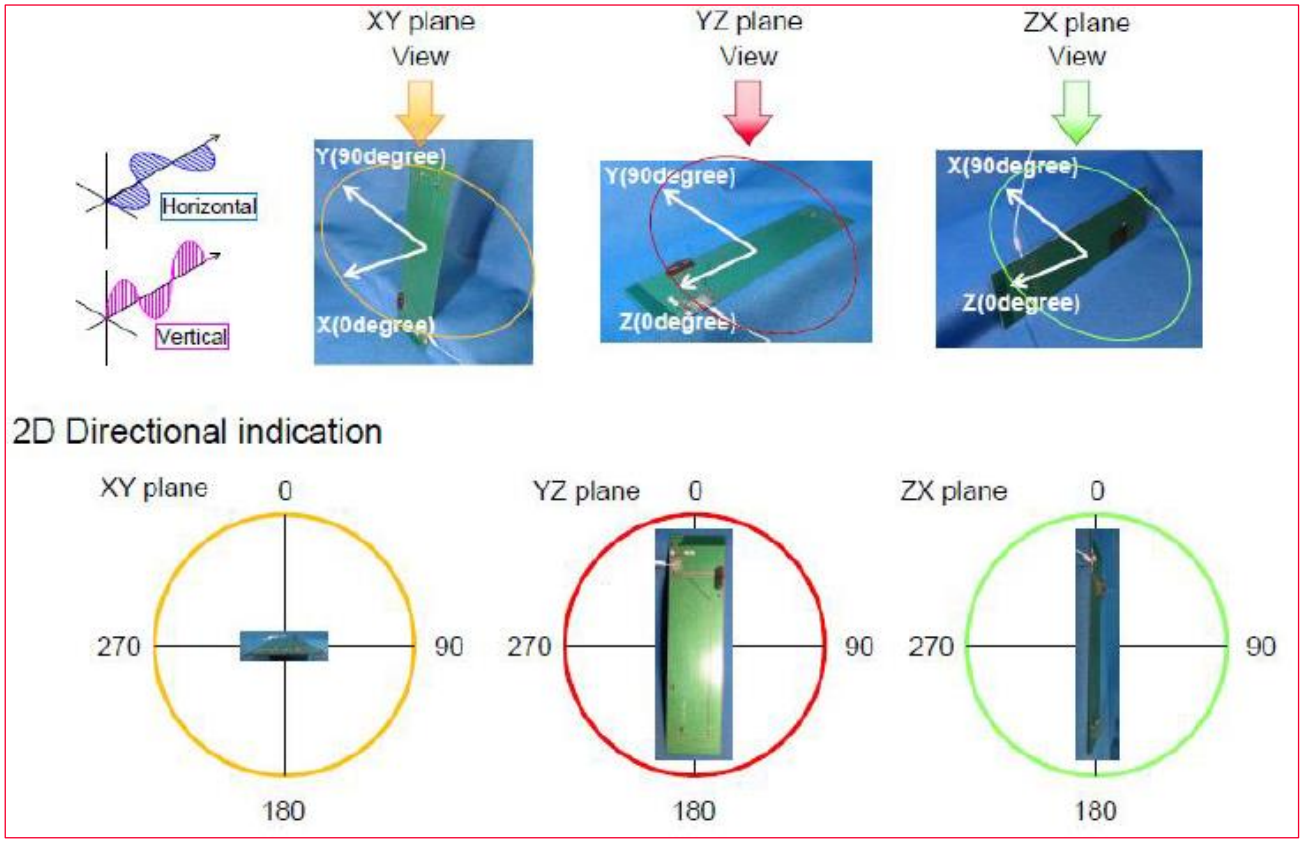
Figure 18: Type2EA_Antenna Appearance (Japan)



2.4.6.3 Measurement Directions

Figure 19 shows the measurement directions.

Figure 19: Antenna Measurement Directions (Japan)



2.4.6.4 Measurement Result

The measurement results are shown in **Figure 20**.

Figure 20: Antenna Measurement Result (Japan)

2.4 GHz/5 GHz

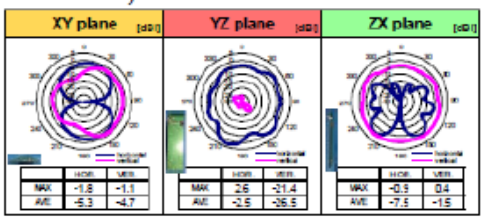
<Efficiency>

*Red color shows peak gain

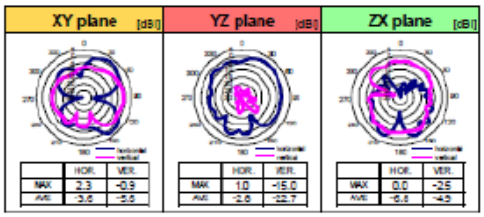
LINEAR POLAMIZATION		XY-plane hor. [dBi]	XY-plane ver. [dBi]	YZ-plane hor. [dBi]	YZ-plane ver. [dBi]	ZX-plane hor. [dBi]	ZX-plane ver. [dBi]	Total Efficiency [dB]
2400 MHz	MAX.	-1.6	-0.7	2.3	-20.0	-1.0	0.4	
	AVE.	-5.3	-4.5	-2.5	-20.3	-7.0	-1.5	-1.4
2442 MHz	**MAX.**	**-1.8**	**-1.1**	**2.6**	**-21.4**	**-0.9**	**0.4**	
	AVE.	**-5.3**	**-4.7**	**-2.5**	**-26.5**	**-7.5**	**-1.5**	**-1.4**
2484 MHz	MAX.	-2.0	-1.4	2.9	-21.4	-0.7	0.3	
	AVE.	-5.4	-4.8	-2.2	-26.2	-7.0	-1.6	-1.3

LINEAR POLAMIZATION		XY-plane hor. [dBi]	XY-plane ver. [dBi]	YZ-plane hor. [dBi]	YZ-plane ver. [dBi]	ZX-plane hor. [dBi]	ZX-plane ver. [dBi]	Total Efficiency [dB]
5150 MHz	MAX.	1.4	-0.3	0.5	-17.7	-1.3	-1.3	
	AVE.	-4.6	-5.5	-3.1	-22.5	-7.8	-4.3	-2.2
5500 MHz	**MAX.**	**2.3**	**-0.9**	**1.0**	**-15.0**	**0.0**	**-2.5**	
	AVE.	**-3.6**	**-3.5**	**-2.8**	**-22.7**	**-6.8**	**-4.9**	**-1.7**
5850 MHz	MAX.	2.9	-1.9	-0.9	-18.0	0.8	-2.2	
	AVE.	-3.5	-6.3	-3.8	-24.1	-6.1	-5.7	-2.1

<Directivity>



@2442MHz



@5500MHz

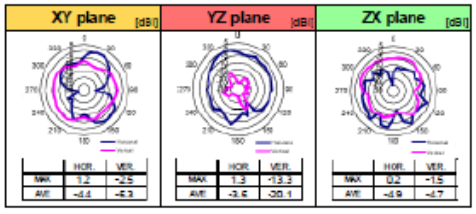
6 GHz

<Efficiency>

*Red color shows peak gain

LINEAR POLAMIZATION		XY-plane hor. [dBi]	XY-plane ver. [dBi]	YZ-plane hor. [dBi]	YZ-plane ver. [dBi]	ZX-plane hor. [dBi]	ZX-plane ver. [dBi]	Total Efficiency [dB]
5935 MHz	MAX.	2.3	-0.9	0.9	-13.5	-0.1	-0.4	
	AVE.	-2.7	-4.6	-2.7	-20.5	-5.0	-3.8	-1.9
6530 MHz	**MAX.**	**1.2**	**-2.5**	**1.3**	**-13.3**	**0.2**	**-1.5**	
	AVE.	**-4.4**	**-5.3**	**-3.5**	**-20.1**	**-4.9**	**-4.7**	**-2.5**
7125 MHz	MAX.	0.7	-3.5	0.3	-11.5	0.2	-2.3	
	AVE.	-5.0	-5.5	-4.4	-19.3	-5.5	-5.4	-3.5

<Directivity>



@6530MHz

2.4.7 Notification

It is recommended that the indication of (1) or (2) below is described on the product incorporating this module in Japanese. If there is any problem with the indication of (1) or (2) on the product, we recommend indicating (1) or (2) in the user manual or on the package of the product incorporating this module, or electronic display on the product. In the case of the electronic display, it is necessary to describe "using the electronic display" + "how to reach to below indication" in the user manual of the product.

(1)

本製品は、電波法に基づく工事設計認証(認証番号:001-P01862)を受けた特定無線設備を内蔵しています。

(2)

For 6GHz band and VLP class only

R 001-P01862

W52/W53は屋内使用限定

5.2GHz/5.3GHz 帯無線 LAN(W52/W53)の屋外使用は 5.2GHz 帯高出力データ通信システムの基地局又は陸上移動中継局と通信する場合を除き電波法で禁止されています。

Using the LPI class in the 6GHz band

5.2GHz/5.3GHz 帯無線 LAN(W52/W53)の屋外使用は 5.2GHz 帯高出力データ通信システムの基地局又は陸上移動中継局と通信する場合を除き電波法で禁止されています。

(English Translation)
(1)

This product incorporates specified radio equipment that has received CERTIFICATION for TYPE CERTIFICATION (certification number: 001-P01964) based on the Japan Radio Act.

(2)

For 6GHz band and VLP class only

Outdoor use of 5.2GHz/5.3GHz band wireless LANs (W52/W53) is prohibited by the Radio Act except when communicating with 5.2GHz band high-power data communication system base stations or land mobile relay stations.

Using the LPI class in the 6GHz band

Outdoor use of 5.2GHz/5.3GHz band wireless LANs (W52/W53) is prohibited by the Radio Act except when communicating with 5.2GHz band high-power data communication system base stations or land mobile relay stations.

Revision History

Revision	Date	Changed Item	Comments
1.0	Sep 8, 2023	Issued as Application Note.	Initial Release
2.0	Mar 21, 2025	Updated to New Format 2.1.1 Setting RF Power 2.2.4 Setting RF Power	 Corrected part of MIMO power at High Data Rate.
3.0	Sep 11, 2025	2.3 EU	Removed EN62311 related information

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Specifications are subject to change without notice.