LBUA5QJ2AB Module Reference Antenna

Rev.2

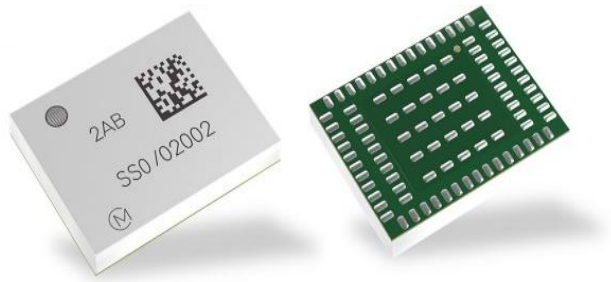
UWB Section, muRata/SCS

2024.10.15

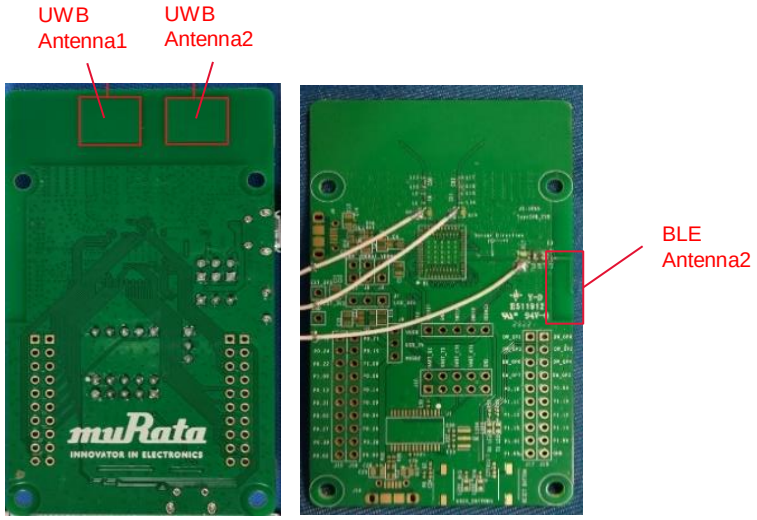
This document is subject to change without notice.

Introduction

Type2AB module is certified to meet the requirements of FCC(US), ISED(Canada), MIC(Japan) and CE(Europe).
Type2AB module does not contain an on-board UWB antenna or BLE antenna, so the external antennas are required when passing certification tests.
The antennas listed in this document are registered for MIC certification or actually used in the tests for FCC/ISED and CE certification.
In case an end product integrates Type2AB module and copies the reference antenna design exactly, Type2AB module's testing report can be reused as-is so the certification could be quite straightforward (no additional testing may be required).



Certified module



Example of the reference antennas

Reference UWB Antenna

No.	Antenna	Peak Gain @CH5 [dBi]	Peak Gain @CH9 [dBi]	MIC	FCC/ISED/CE
TWR/TDoA①	PCB antenna (Qorvo WB003, '*Mini-Hoe*')	3.9	2.8	√	√
TWR/TDoA②	PCB antenna (Qorvo WB005, '*CP Wings Ch5*')	3.6	1.7	√	
TWR/TDoA③	Taoglas UWC.01 SMD Chip Antenna	-	1.5	√	
TWR/TDoA④	Taoglas UWC.02 SMD Chip Antenna	3.5	2.5	√	
TWR/TDoA⑤	PCB antenna (Qorvo WB007, '*Duo-Hoe*')	2.5	2.0	√	
TWR/TDoA⑥	PCB antenna (Qorvo JL159, *'Jolie-Omini'*)	2.0	2.0	√	
AoA/PDoA①	PCB antenna (Qorvo ML005, '*Mona Lisa Ch_5*')	1.8	-1.7	√	√
AoA/PDoA②	PCB antenna (Qorvo ML009, '*Mona Lisa Ch_9*')	-	2.5	√	
AoA/PDoA③	PCB antenna (Murata JS-1055 2AB-828EVB antenna)	0.9	2.8	√	√
AoA/PDoA④	PCB antenna (Qorvo JL359, *'Jolie-AoA'*)	3.0	3.0	√	

Reference BLE Antenna

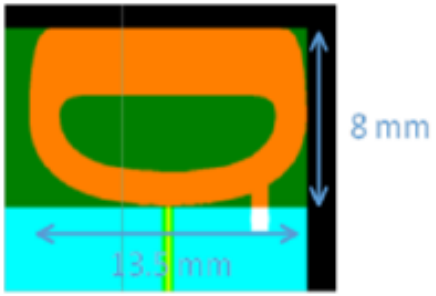
No.	Antenna	Peak Gain @2.4GHz [dBi]	MIC	FCC/ISED & CE
BLE①	PCB antenna (Murata JS-0938 MF1 Tag)	-2.8	√	
BLE②-TEMP*	PCB antenna (Murata JS-0979 Type2CU Tag)	-4.7		√
BLE②	PCB antenna (Murata JS-1055 2AB-828EVB)	-3.8	√	√
BLE③	Chip antenna (Abracon AMCA31-2R450G-S1F-T3)	0.5	√	

Note:
* BLE②-TEMP has the same antenna pattern as BLE② , but BLE② is optimized on the matching circuit for better performance. Therefore, it's recommended to use BLE② instead of BLE②-TEMP.

●UWB TWR/TDoA ①

< Appearance >

< Dimension >



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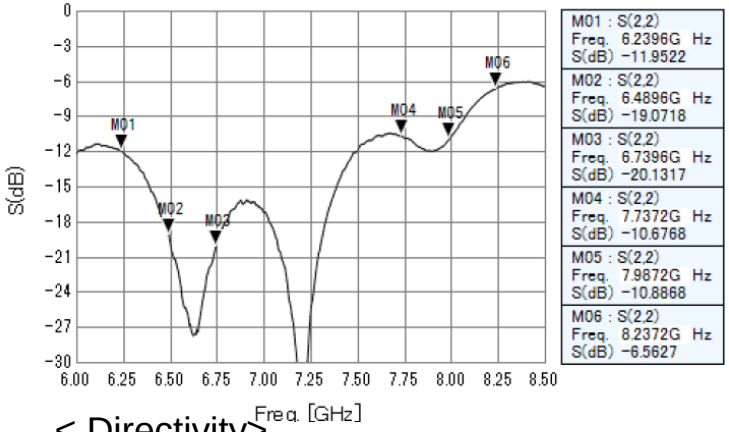
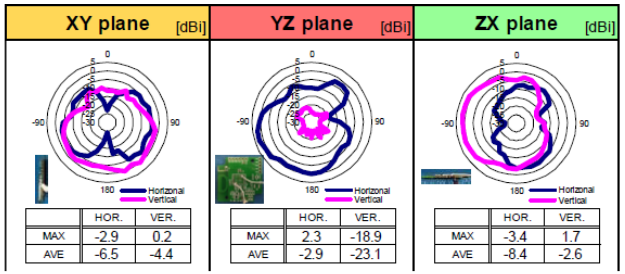


< Efficiency >

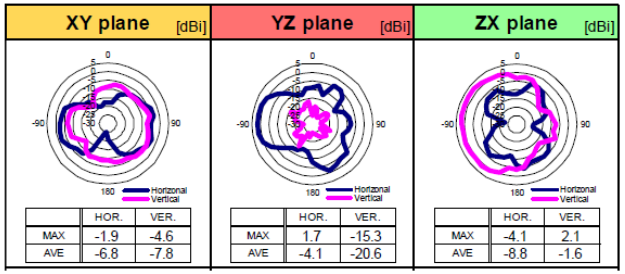
*The peak gains are marked in red

Frequency[MHz]	Efficiency[dB]	Peak Gain[dBi]
6239.6	-2.0	2.5
6489.6	-1.3	2.3
6739.6	-0.3	3.9
Ch.5Average	-1.2	-
7737.2	-1.0	2.8
7987.2	-1.5	2.1
8237.2	-2.3	1.1
Ch.9Average	-1.6	-

< Directivity>



@6489.6MHz



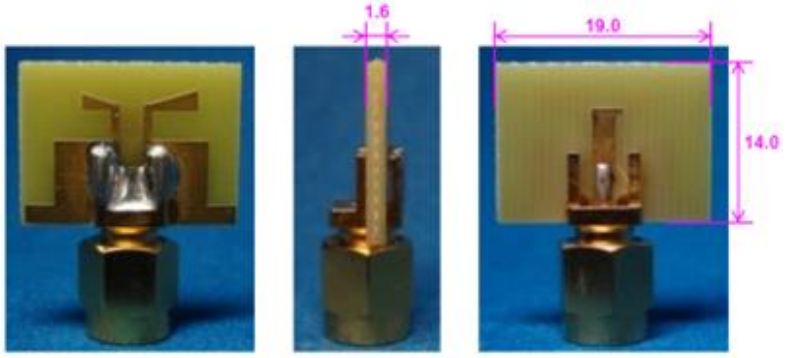
@7987.2MHz

Reference: RERC21045A-SE, Technical Data Sheet for BT Type2AB Measurement, Murata,18 Aug. 2021

NOTE: This antenna design is described in Type2AB Datasheet; for more information about this antenna, you can download from the website or contact Qorvo.

●UWB TWR/TDoA ②

< Appearance > < Dimension >



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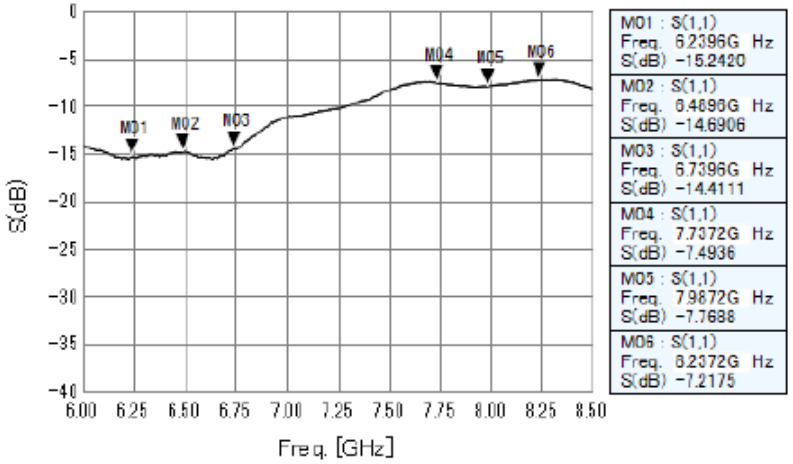
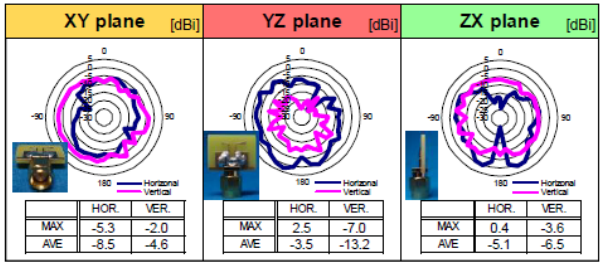


< Efficiency >

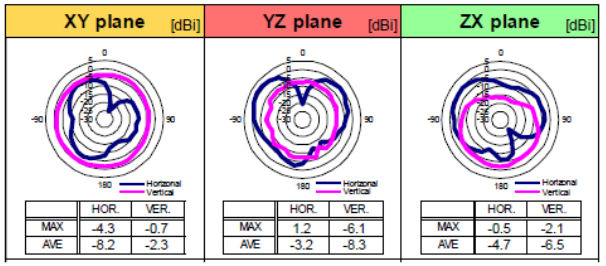
*The peak gains are marked in red

Frequency[MHz]	Efficiency[dB]	Peak Gain[dBi]
6239.6	-0.4	3.6
6489.6	-1.4	2.5
6739.6	-1.2	2.8
Ch.5Average	-1.0	-
7737.2	-1.2	**1.7**
7987.2	-1.5	1.2
8237.2	-2.0	0.6
Ch.9Average	-1.8	-

<Directivity>



@6489.6MHz



@7987.2MHz

Reference: RERC21115A-SE, Technical Data Sheet for UWB Type2AB Measurement, Murata, 14 Oct. 2021

NOTE: this antenna(*WB005*) is designed for Ch5; there's a variant, *WB009*, that is optimized for Ch9.

●UWB TWR/TDoA ③

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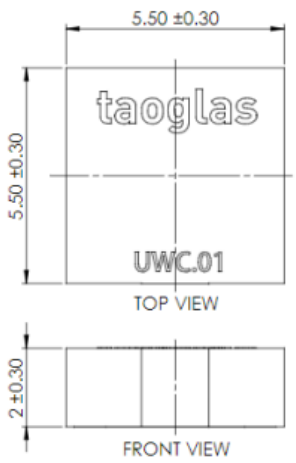
< Appearance >

< Dimension >



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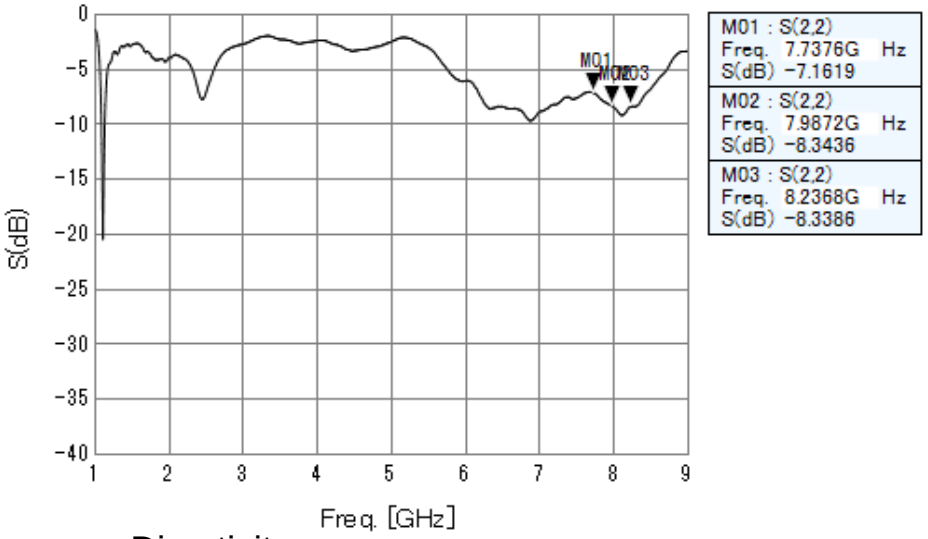


M01 : S(2,2)	
Freq.	7.7376G Hz
S(dB)	−7.1619
M02 : S(2,2)	
Freq.	7.9872G Hz
S(dB)	−8.3436
M03 : S(2,2)	
Freq.	8.2368G Hz
S(dB)	−8.3386

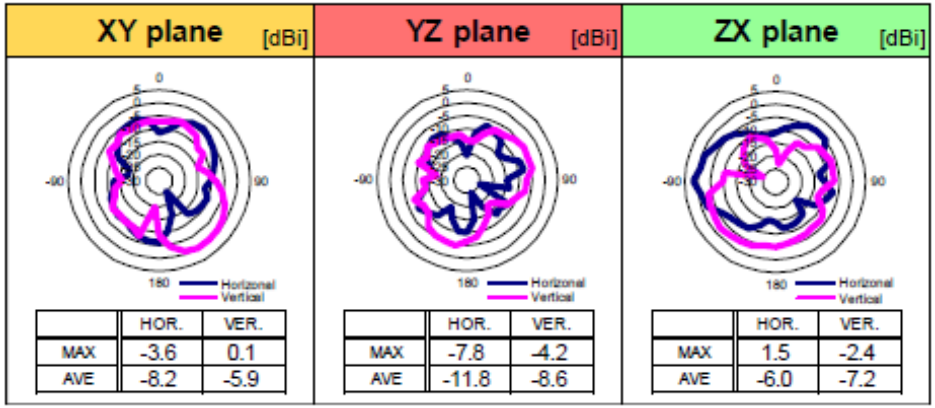
< Efficiency >

*The peak gains are marked in red

[dBi] [dB]

LINEAR POLARIZATION		XY-plane hor.	XY-plane ver.	YZ-plane hor.	YZ-plane ver.	ZX-plane hor.	ZX-plane ver.	Total Efficiency
7737.6 MHz	MAX.	-3.7	-0.2	-6.3	-3.0	0.5	-4.8	
	AVG.	-7.7	-5.4	-10.5	-8.4	-5.6	-8.2	-4.7
7987.2 MHz	**MAX.**	**-3.6**	**0.1**	**-7.8**	**-4.2**	**1.5**	**-2.4**	
	AVG.	**-8.2**	**-5.9**	**-11.8**	**-8.6**	**-6.0**	**-7.2**	**-4.8**
8236.8 MHz	MAX.	-5.0	-1.1	-6.5	-4.8	-1.3	-3.7	
	AVG.	-9.8	-7.0	-12.0	-9.5	-7.9	-8.4	-5.9

< Directivity>



	XY plane HOR.	XY plane VER.
MAX	-3.6	0.1
AVE	-8.2	-5.9

	YZ plane HOR.	YZ plane VER.
MAX	-7.8	-4.2
AVE	-11.8	-8.6

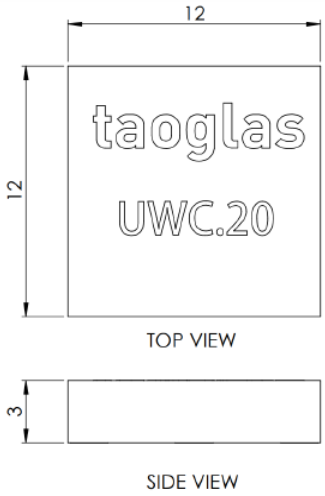
	ZX plane HOR.	ZX plane VER.
MAX	1.5	-2.4
AVE	-6.0	-7.2

Reference: UWC.01 6-8GHz Ultra Wideband SMD Chip Antenna (taoglas.com)

●UWB TWR/TDoA ④

< Appearance >

< Dimension >



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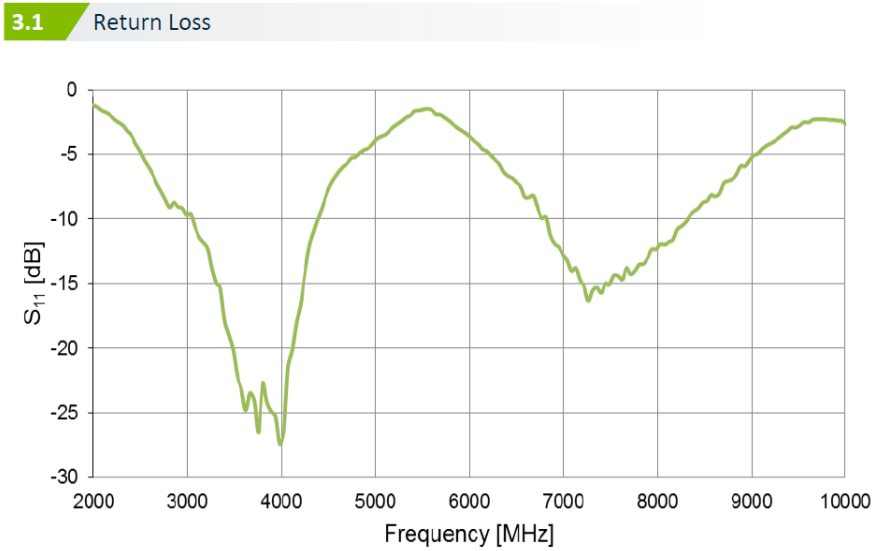

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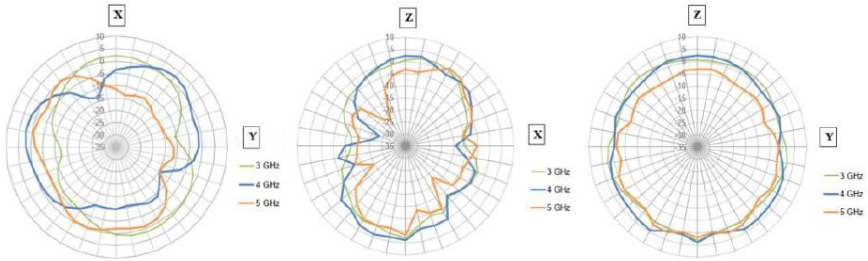


Electrical			
Standard	USA UWB channels 1-4	EU UWB/ USA UWB channels 5-8	USA UWB channels 9-10
Operation Frequency (GHz)	3.1–5.0	6.2–8.0	8.0–9.0
Return Loss (dB)	-10	-10	-6
Efficiency (%)	80	70	70
Peak Gain (dBi)	6	3.5	2.5
Max VSWR	2:1	2:1	3:1

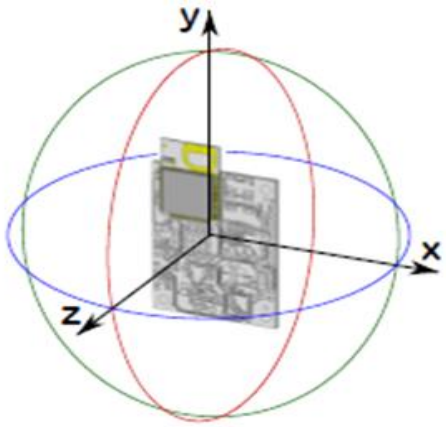
Reference: UWC.20.pdf (taoglas.com)

●UWB TWR/TDoA ⑤

< Brief Spec. >

Antenna Model	WB007 Dual-Hoe
Antenna Type	PCB Trace Monopole Antenna
Peak Gain (Measured on DWM3001CDK)	Ch5: 2.5dBi Ch9: 2.0dBi
Frequency Range	4000 – 9000MHz

< Appearance >



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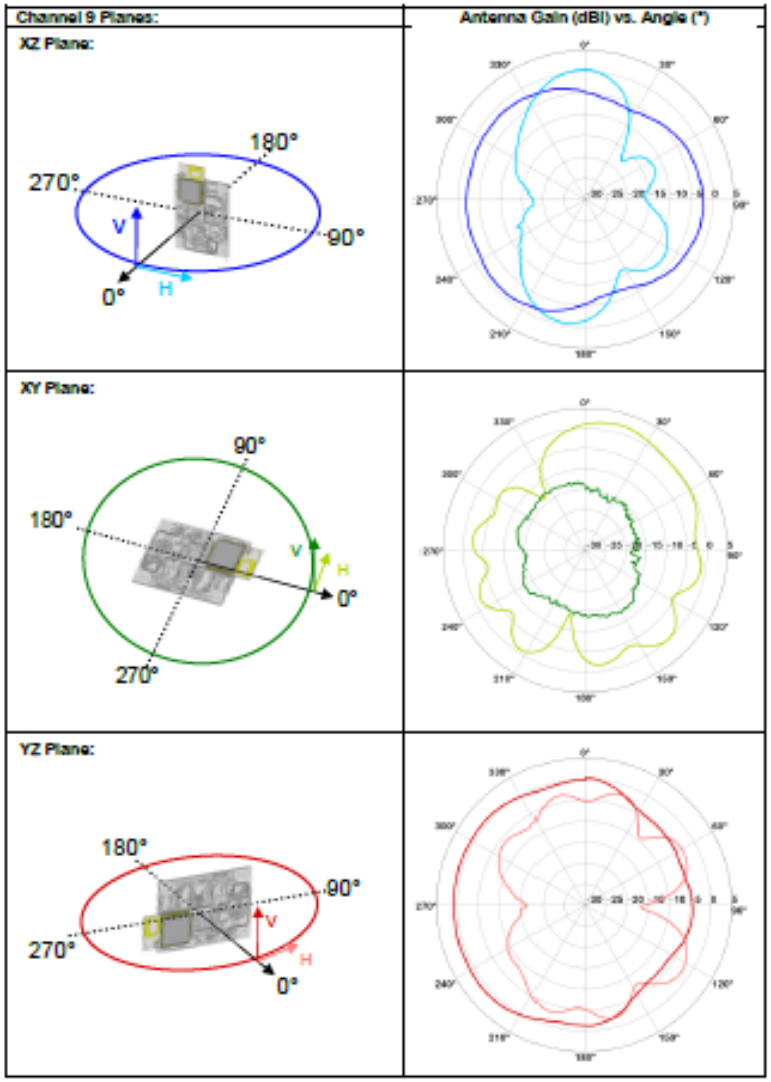


Reference: DWM3001C Data Sheet, Rev B, May 2022

●UWB TWR/TDoA ⑥

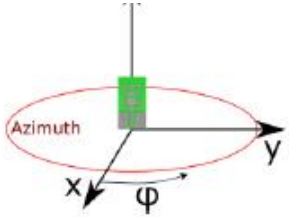
< Brief Spec. >

Operating Channel:	802.15.4 UWB Channel 5 and Channel 9
Center Frequency:	6489.6 MHz and 7987.2 MHz
Bandwidth:	499.2 MHz
Polarization:	Linear
Material:	FR4, ε_r = 4.4
Gain:	2 dBi

< Appearance >

Top Layer

Bottom Layer



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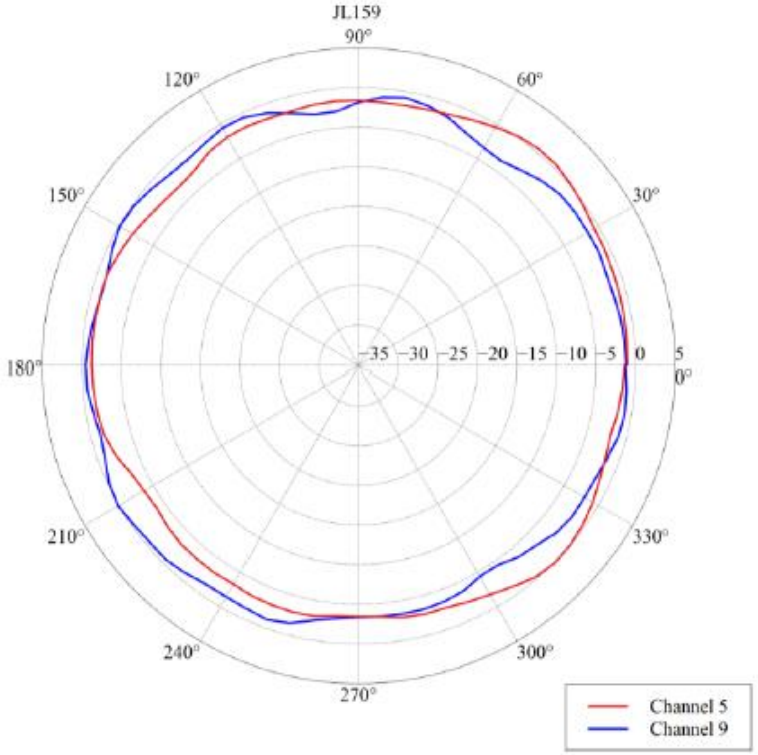
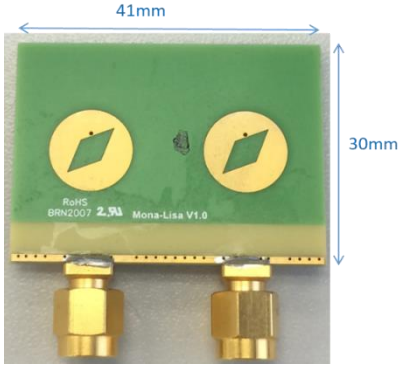


Reference: ARJL159, Antenna performance report for Jolie-Omni antenna array (JL159), Qorvo, Sep. 2022

●UWB AoA/PDoA ①

< Appearance >



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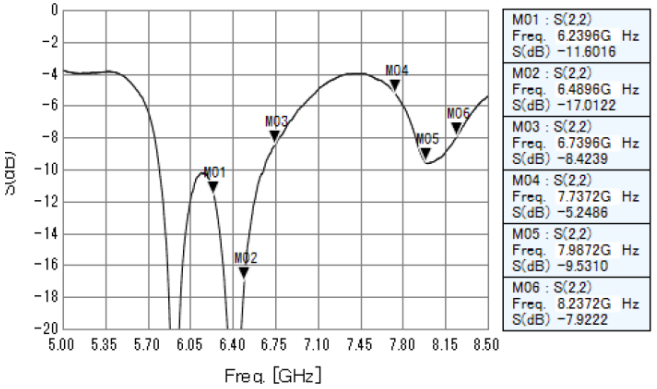
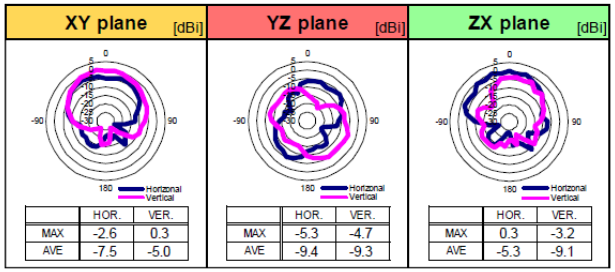


< Efficiency >

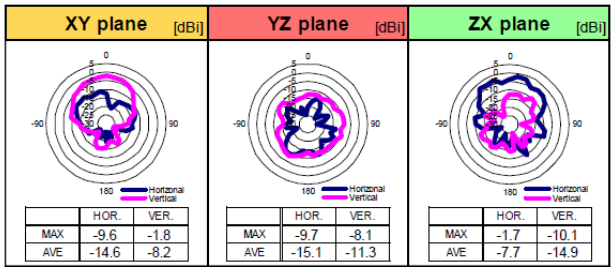
*The peak gains are marked in red

Frequency[MHz]	Efficiency[dB]	Peak Gain[dBi]
6239.6	-4.7	0.8
6489.6	-4.2	0.3
6739.6	-4.4	1.8
Ch.5Average	-4.4	-
7737.2	-7.7	-1.5
7987.2	-7.9	-1.7
8237.2	-7.4	-1.6
Ch.9Average	-7.6	-

< Directivity>



6489.6MHz



7987.2MHz

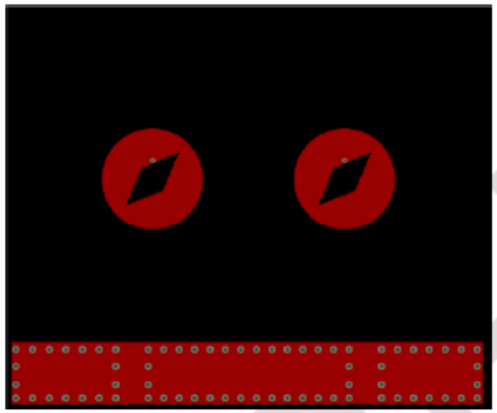
Reference: RERC21041-SE, Technical Data Sheet for UWB Measurement result, Murata, 31 Mar. 2021

NOTE:

1) This antenna (*ML005*) is designed for Ch5; *ML009* shown in next page is designed for Ch9
2) This antenna design is described in Type2AB datasheet, the design file is available on *myMurata*.

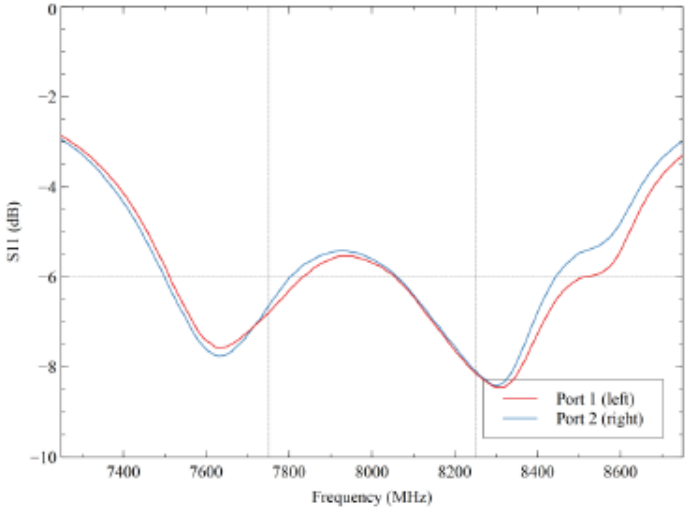
●UWB AoA/PDoA ②

< Appearance >



Top, Layer 1

< Return Loss >



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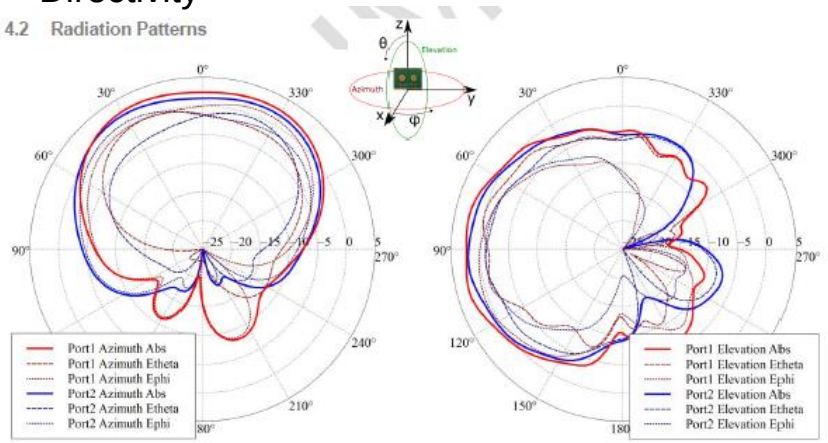

< Efficiency >

Frequency[MHz]	Peak Gain[dBi]
CH 5	-
CH 9	2.5dBi

Reference: ARML009, Antenna performance report for Mona Lisa antenna array (ML009), Qorvo, Aug 2021

NOTE:

The design file of ML009 is available on *myMurata*; please contact Qorvo for more details.

●UWB AoA/PDoA ③

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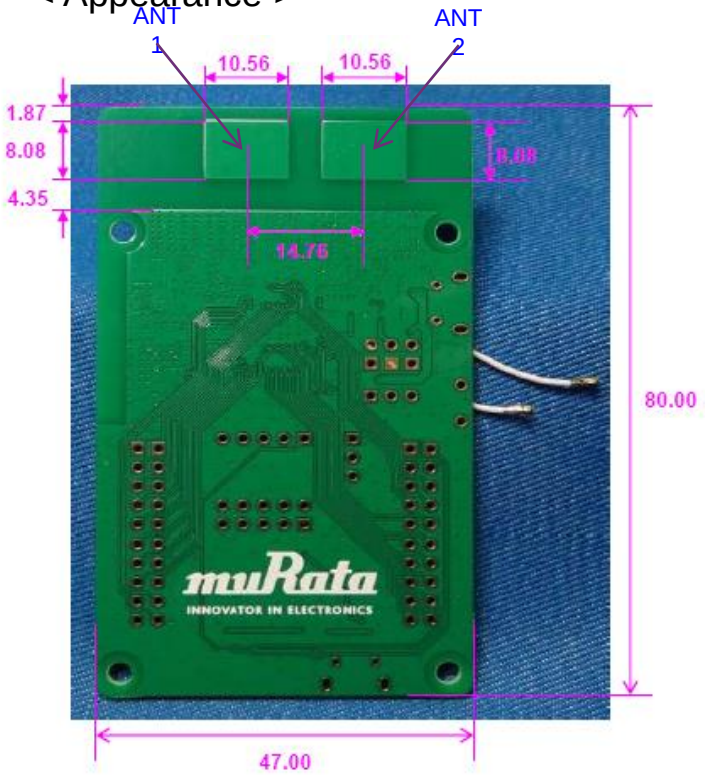
< Efficiency >

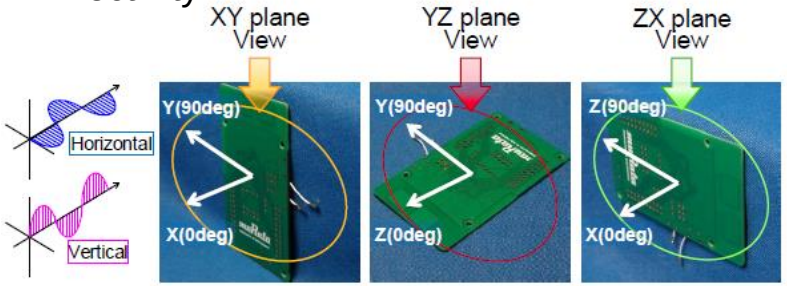
ANT	Total efficiency [dB]		Peak gain [dBi]	
	CH.5 (3point Ave.)	CH.9 (3point Ave.)	CH.5 (Max.)	CH.9 (Max.)
1	-5.0	-4.4	0.3	2.7
2	-5.1	-4.7	0.9	2.8

< Appearance >

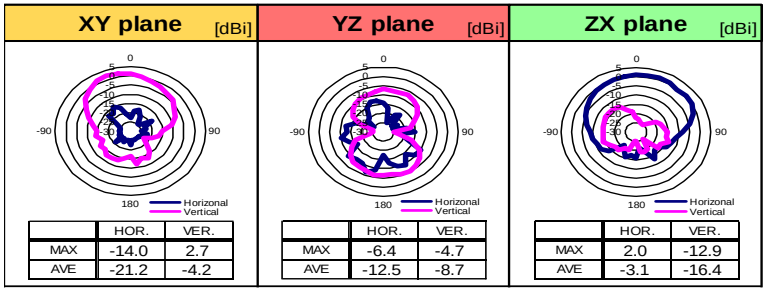


Host PCB: JS-1055 2AB-828EVB

< Directivity >

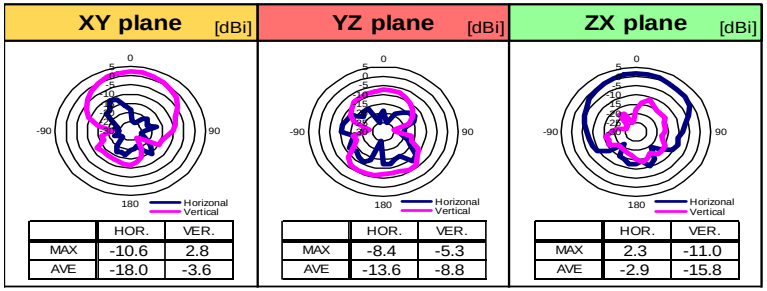


ANT1 @7987.2MHz



	XY plane HOR.	XY plane VER.	YZ plane HOR.	YZ plane VER.	ZX plane HOR.	ZX plane VER.
MAX	-14.0	2.7	-6.4	-4.7	2.0	-12.9
AVE	-21.2	-4.2	-12.5	-8.7	-3.1	-16.4

ANT2 @7987.2MHz



	XY plane HOR.	XY plane VER.	YZ plane HOR.	YZ plane VER.	ZX plane HOR.	ZX plane VER.
MAX	-10.6	2.8	-8.4	-5.3	2.3	-11.0
AVE	-18.0	-3.6	-13.6	-8.8	-2.9	-15.8

Reference: REMC22004C-SE, Technical Data Sheet for UWB Measurement result, Murata, 18 Aug. 2022

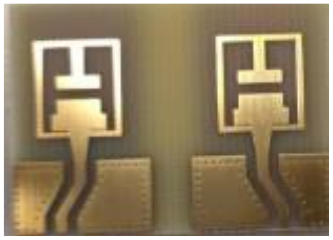
NOTE:
This antenna design is described in Type2AB datasheet; please refer to JS-1055 EVB's design file on *myMurata* for more details.

●UWB AoA/PDoA ④

< Brief Spec. >

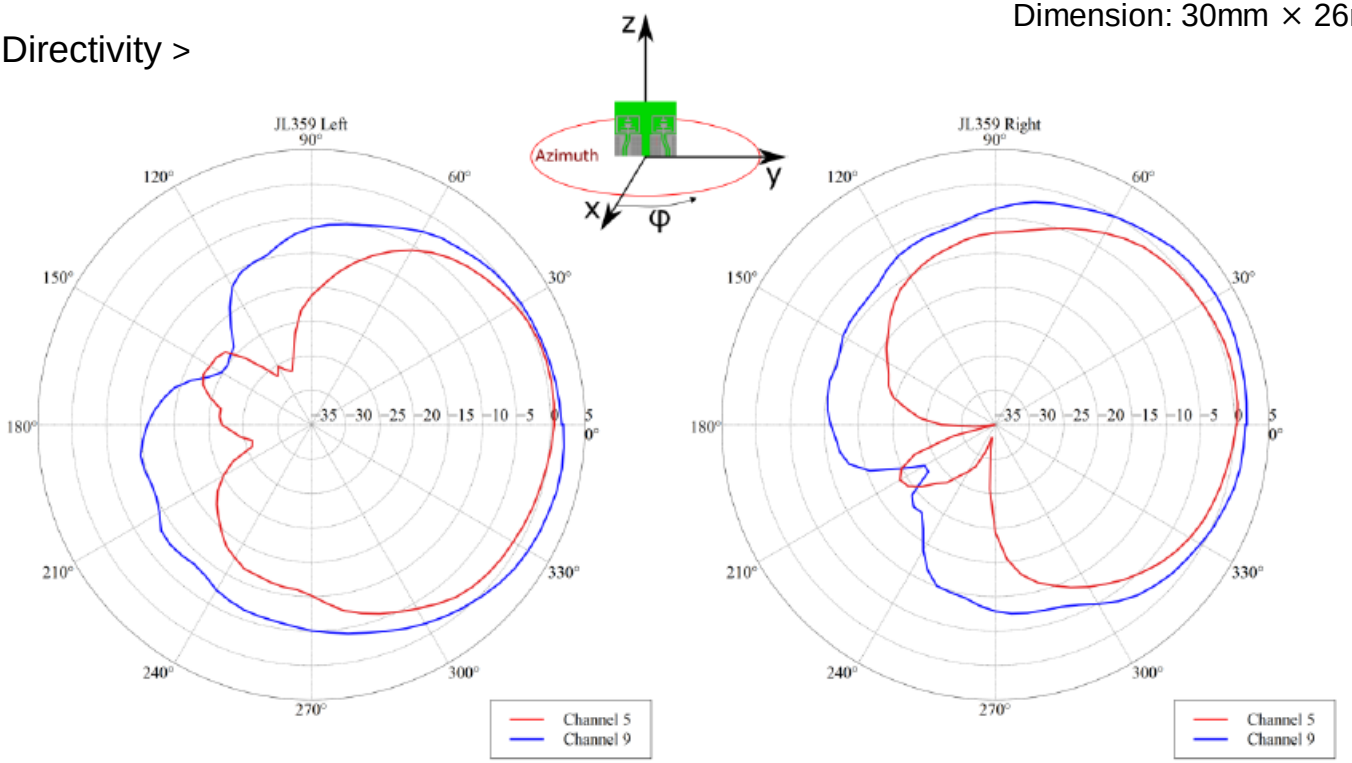
Operating Channel:	802.15.4 UWB Channel 9 and Channel 5
Center Frequency:	6489.6 MHz and 7987.2 MHz
Bandwidth:	499.2 MHz
Polarization:	Linear-vertical
Material:	FR4
SMA Connector spacing:	20.4 mm
Gain	3 dBi

< Appearance >



Dimension: 30mm × 26mm

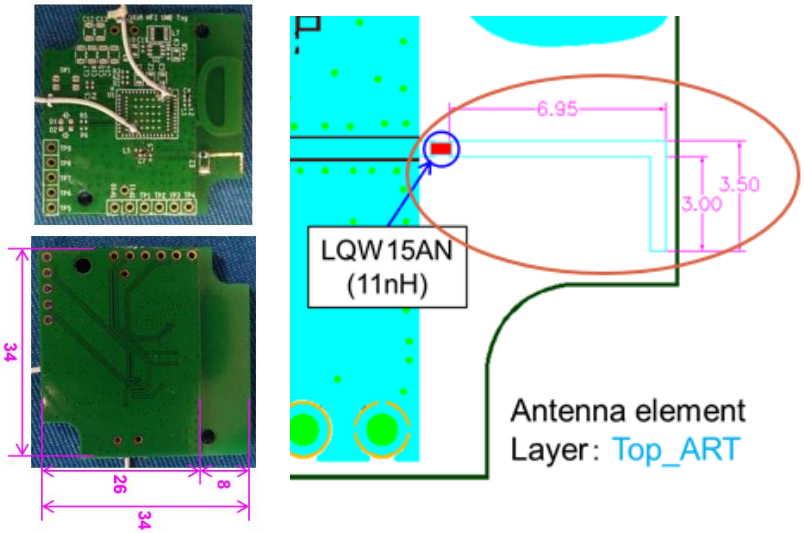
< Directivity >



Reference: ARJL359, Antenna performance report for Jolie-AoA antenna array (JL359), Qorvo, Sep. 2022

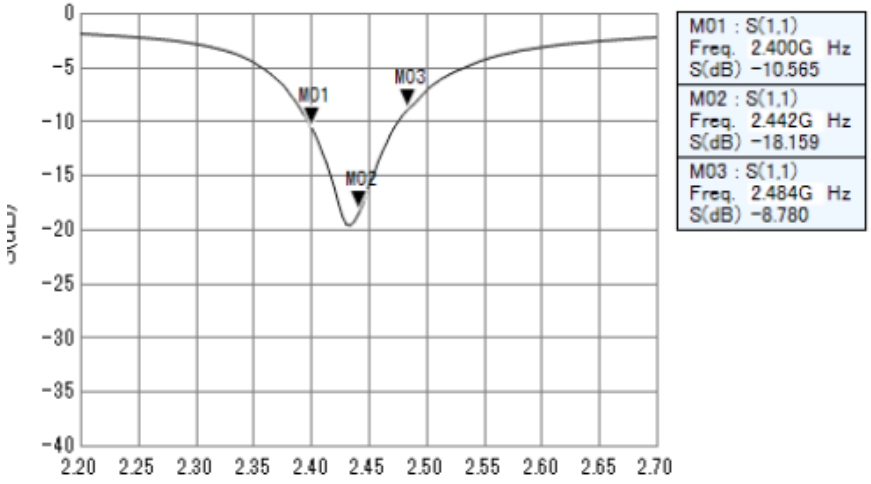
●BLE Antenna ①

< Appearance >

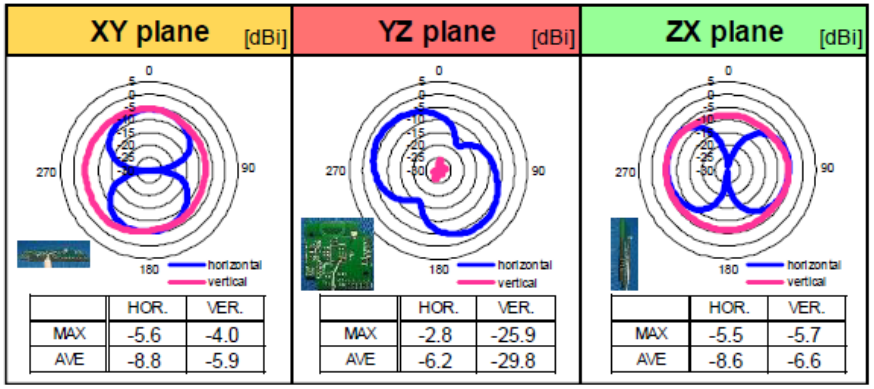


Host PCB: JS-0938 MF1 UWB Tag

<Return Loss>



< Directivity > @2442MHz



<Efficiency>

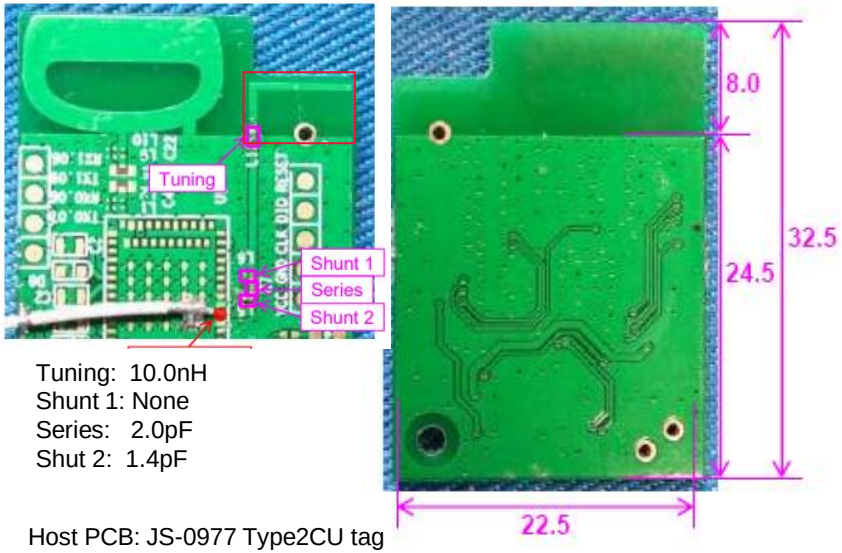
Frequency[MHz]	Efficiency[dB]	Peak Gain[dBi]
2400	-5.0	-3.1
2442	-4.9	-2.8
2484	-5.9	-3.9
Avg.	-5.2	

Please connect the module and antenna area with 50ohm line.
Please apply 1 matching component in antenna area.
Land size for component, please follow your design rule.

Reference: RERC21045A-SE, Technical Data Sheet for BT Type2AB Measurement, Murata, 18 Aug. 2021

●BLE Antenna ②-TEMP

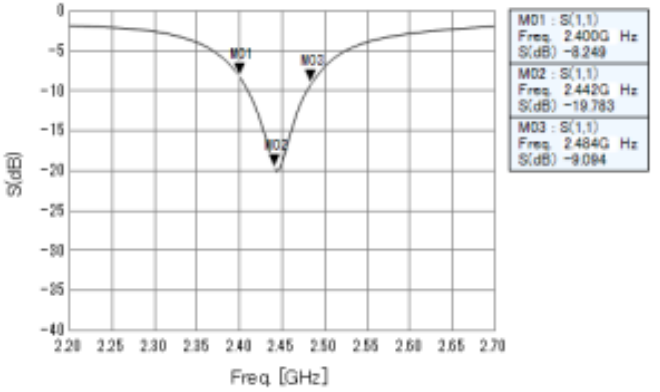
<Appearance>



Tuning: 10.0nH
Shunt 1: None
Series: 2.0pF
Shut 2: 1.4pF

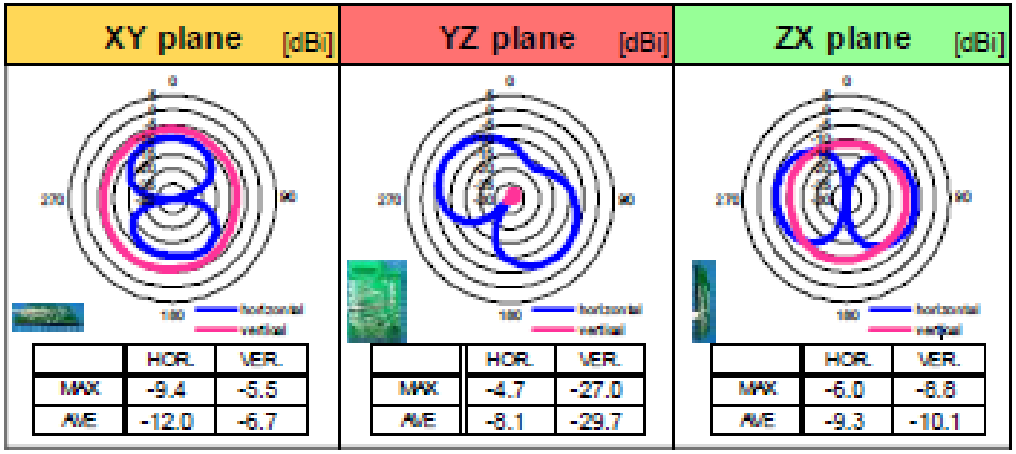
Host PCB: JS-0977 Type2CU tag

<Return Loss>



<Directivity>

@2242MHz



	XY plane HOR.	XY plane VER.	YZ plane HOR.	YZ plane VER.	ZX plane HOR.	ZX plane VER.
MAX.	-9.4	-5.5	-4.7	-27.0	-6.0	-6.8
AVE.	-12.0	-6.7	-8.1	-29.7	-9.3	-10.1

<Efficiency>

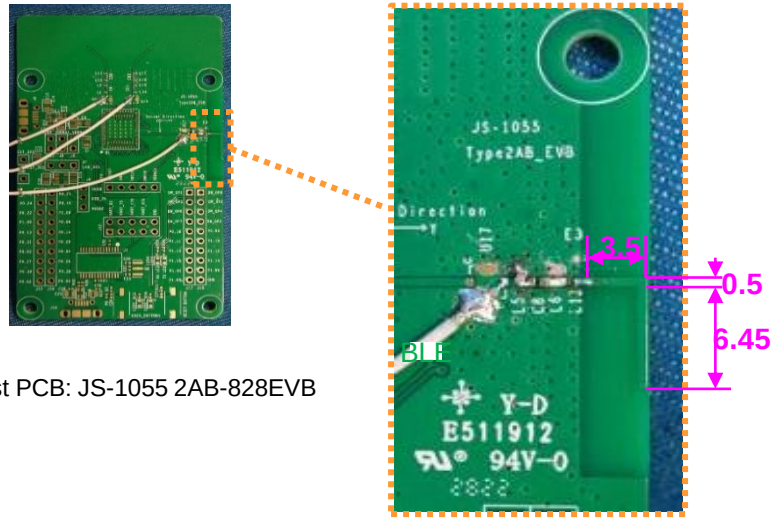
Frequency[MHz]	Efficiency[dB]	Peak Gain[dBi]
2400	-7.1	-5.2
2442	-6.6	-4.7
2484	-7.4	-5.1
Avg.	-7.0	

Reference: RERC21073-SE, Technical Data Sheet for BT Type2AB Measurement result, Murata 25 Jun. 2021

Note:
This antenna has the same pattern as BLE② but a different matching circuit, thus its performance is worse than BLE②.

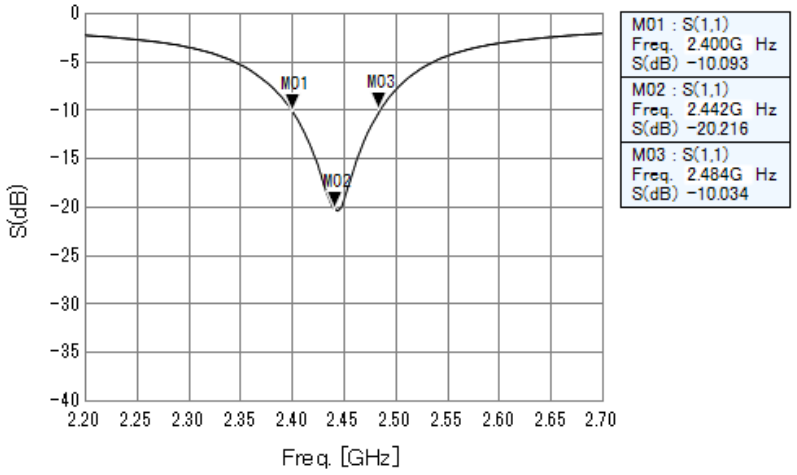
●BLE Antenna ②

< Appearance >



Host PCB: JS-1055 2AB-828EVB

<Return Loss>



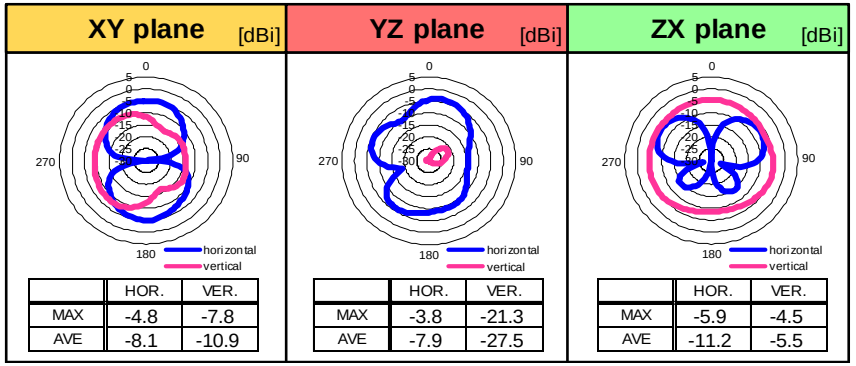
<Efficiency>

[dBi] [dB]

LINEAR POLARIZATION		XY-plane hor.	XY-plane ver.	YZ-plane hor.	YZ-plane ver.	ZX-plane hor.	ZX-plane ver.	Total Efficiency
2400 MHz	MAX.	-5.2	-8.1	-4.1	-21.9	-6.6	-4.9	
	AVE.	-8.7	-11.2	-8.3	-27.8	-11.8	-5.9	-6.4
2442 MHz	**MAX.**	**-4.8**	**-7.8**	**-3.8**	**-21.3**	**-5.9**	**-4.5**	
	AVE.	**-8.1**	**-10.9**	**-7.9**	**-27.5**	**-11.2**	**-5.5**	**-6.1**
2484 MHz	MAX.	-5.5	-8.3	-4.2	-22.8	-6.3	-4.8	
	AVE.	-8.8	-11.6	-8.5	-28.4	-11.9	-6.1	-6.7

*Red color shows peak gain

< Directivity > @2442MHz



Reference: REMC22004C-SE, Technical Data Sheet for UWB Measurement result, Murata, 18 Aug. 2022

NOTE:

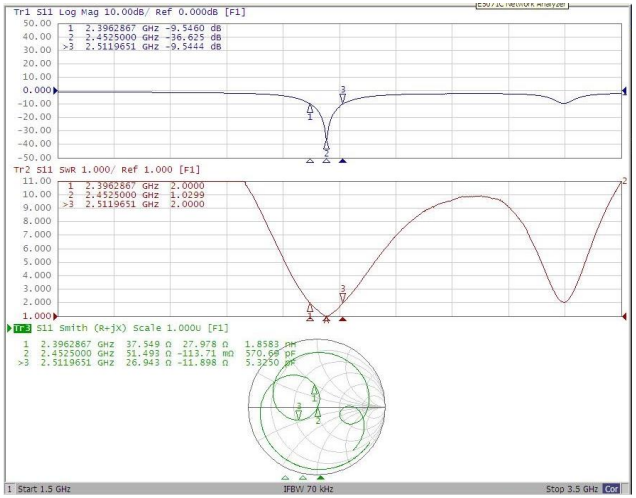
This antenna design is described in Type2AB datasheet; please refer to JS-1055 EVB's design file on *myMurata* for more details.

●BLE Antenna ③

< Appearance >

Dimension： 3.2 x 1.6 x 1.2mm

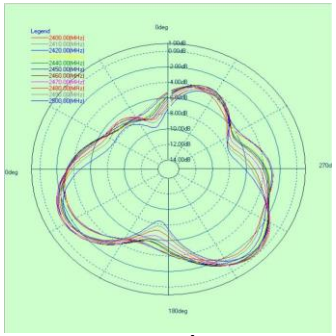
<Return Loss>



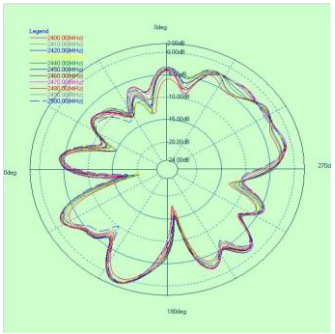
<Electrical Specifications>

Parameter	Min.	Typ.	Max.	Units
Frequency		2450		MHz
Bandwidth	100			MHz
Peak Gain		0.5		dBi
Average Gain		-1		dBi
VSWR			2	
Impedance		50		Ω
Power Capability			3	W

< Radiation Pattern and Gain >



< XY Plane>



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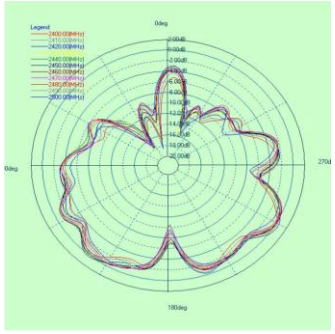

< YZ Plane>

Reference: AMCA31-2R450G-S1F-T3 Datasheet on Abracon website

Document History

Revision	Date	Notes
1	2022-09-23	Initial version for TELEC certification test
2	2024-10-15	• Updated the antenna list based on *LBUA5QJ2AB UWB Module Antenna Specification Rev3* • Updated for FCC/ISED and EU certifications • Add references of antenna measurement reports