

# Technical Data Sheet for GNSS/BLE/WiFi/LoRa Type1WL Measurement result

Kanazawa Murata Mfg. Co., Ltd  
Antenna Technical Support Section



# Summary

<Content>  
Antenna performance of EVB for Type1WL was measured.

Condition	Memo
1	Default

Condition	Comment	Antenna	Total efficiency (Ave.) [dB]				Peak gain (Max.) [dBi]			
			LoRa (1)	LoRa (2)	GNSS	BLE/WiFi	LoRa (1)	LoRa (2)	GNSS	BLE/WiFi
			800MHz band	900MHz band			800MHz band	900MHz band		
1	Default	LoRa	-2.6	-2.4			0.4	0.0		
		GNSS			-5.1				0.4	
		BLE/WiFi				-1.4				1.7

<Comment>  
Antenna performance of LoRa, GNSS and BLE/WiFi is shown in above table.

# Content

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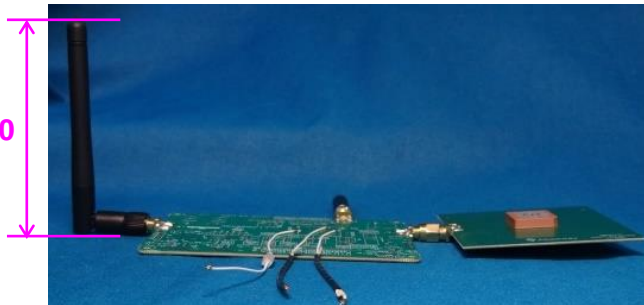
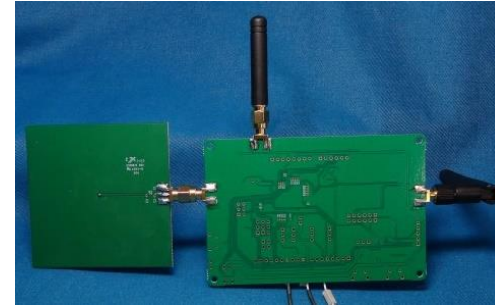
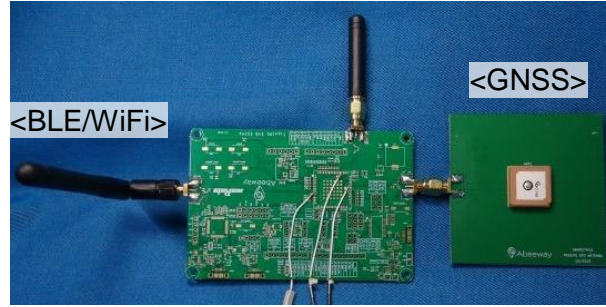
1. Appearance
2. Measurement condition
3. Measurement direction
4. Measurement result

# 1. Appearance



<LoRa>

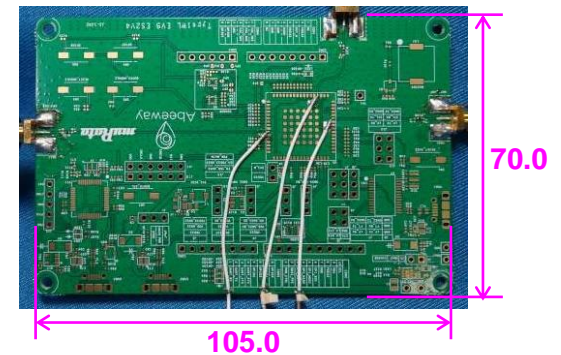
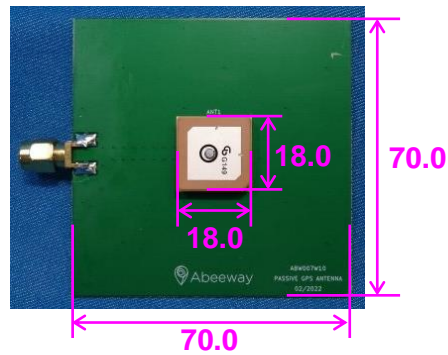
UNIT : mm



<BLE/WiFi>

<GNSS>

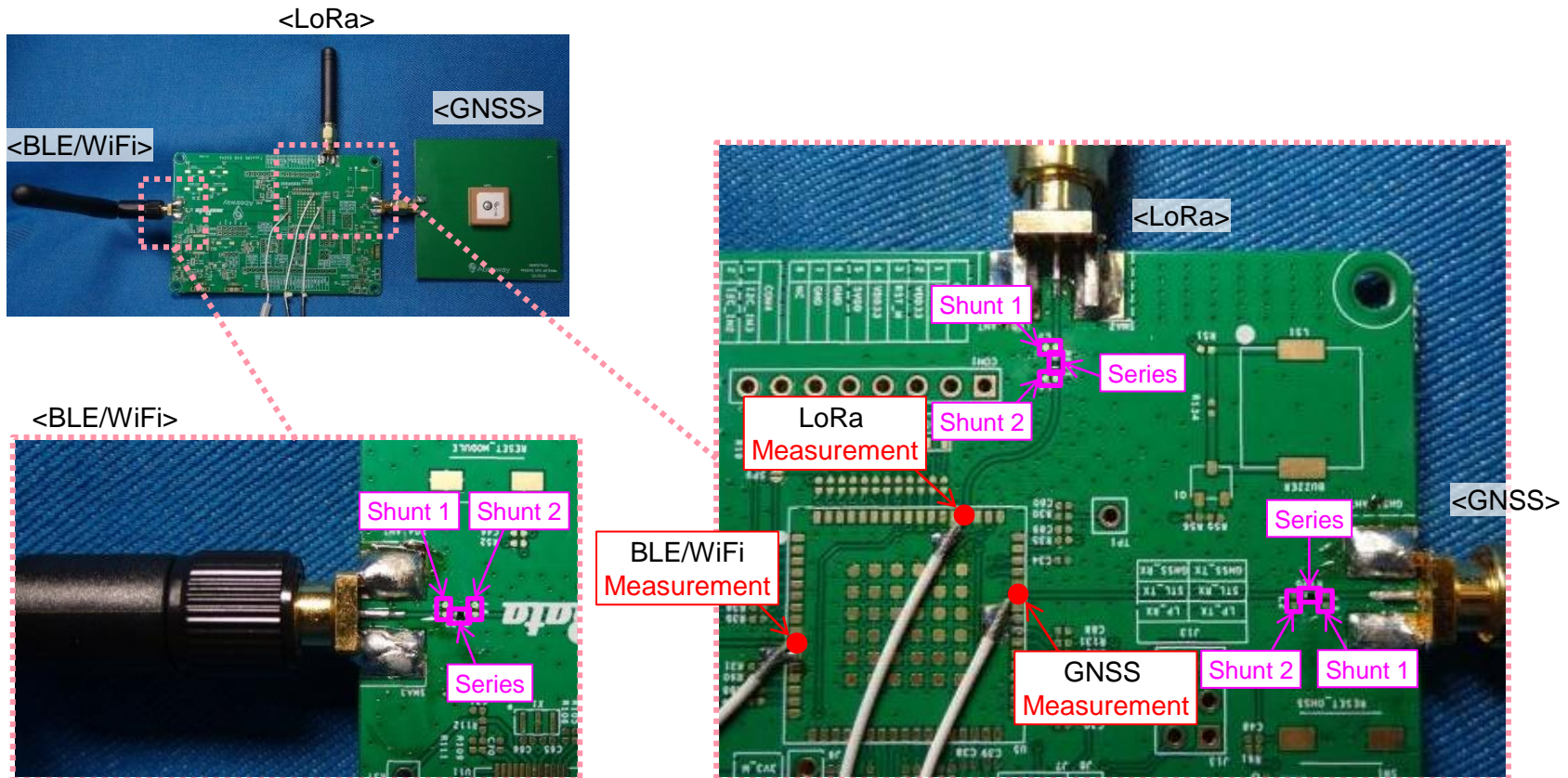
<LoRa>



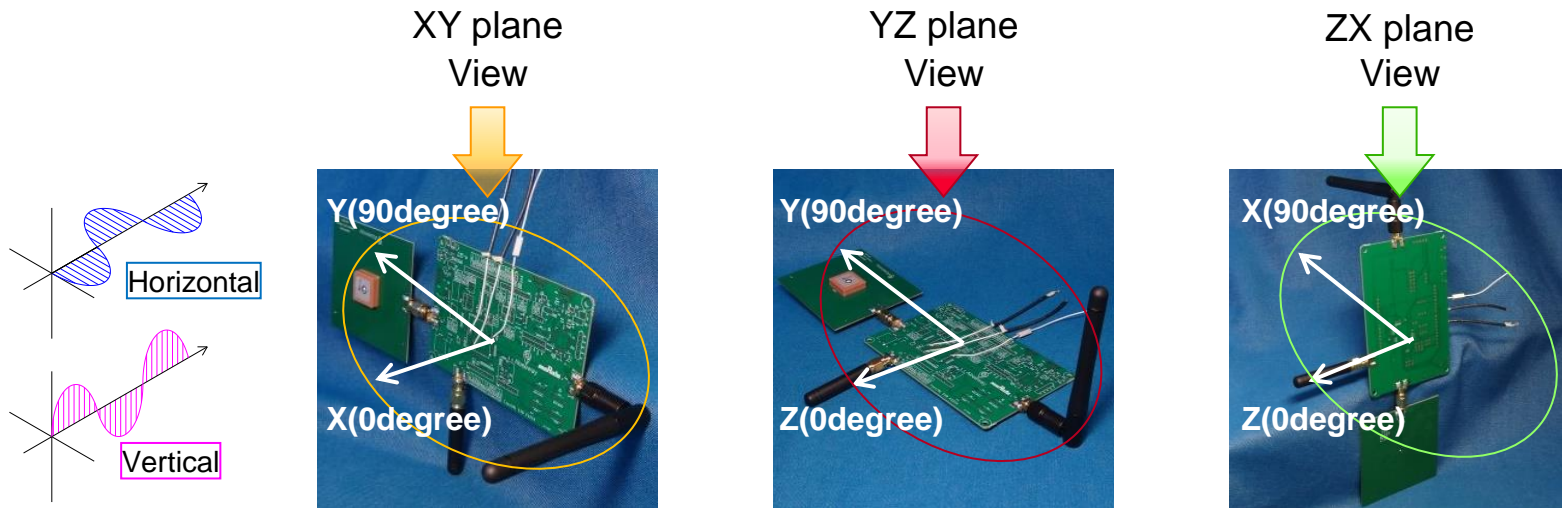
## 2. Measurement condition

Condition	Memo	Matching circuit		
		Shunt 1	Series	Shunt 2
Condition 1	LoRa	None	0ohm	None
	GNSS	None	0ohm	None
	BLE/WiFi	None	0ohm	None

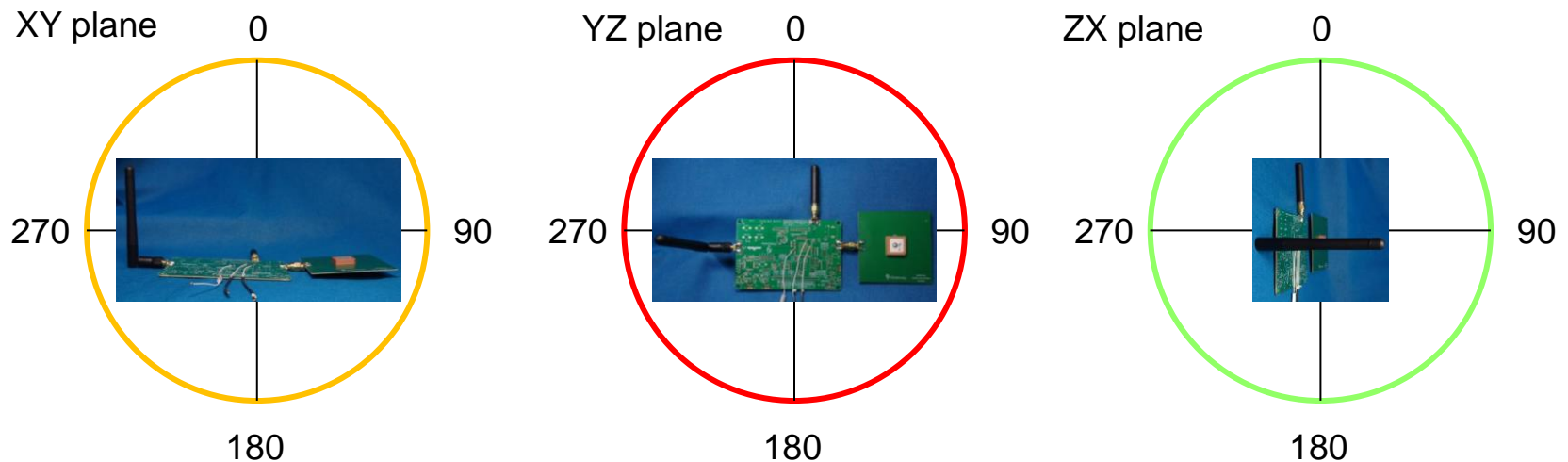
Size:1005 LQG15HS / GRM15 / Resistor



# 3. Measurement direction

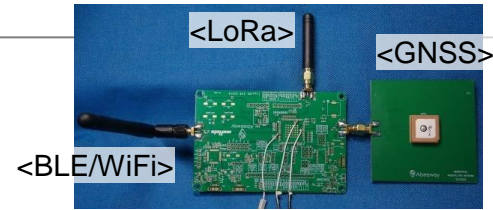


## 2D Directional indication

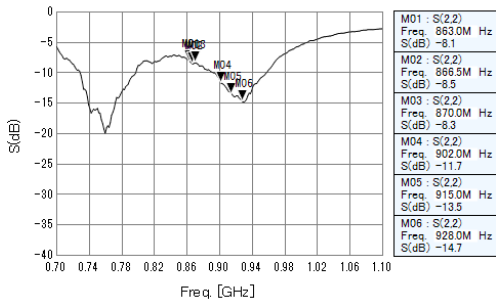


# 4. Measurement result

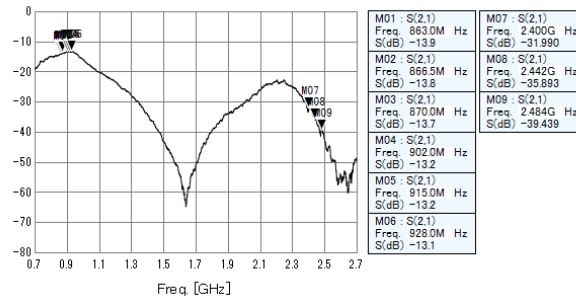
## Condition 1: Default\_LoRa



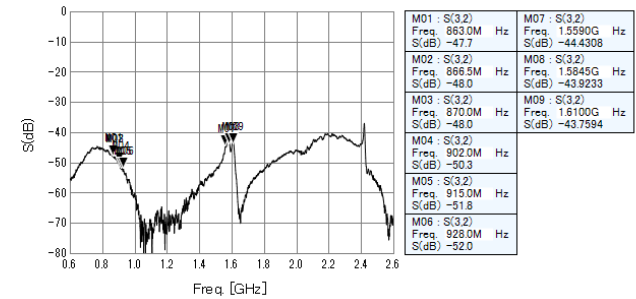
<Return Loss>



<Isolation> LoRa-BLE/WiFi



<Isolation> LoRa-GNSS

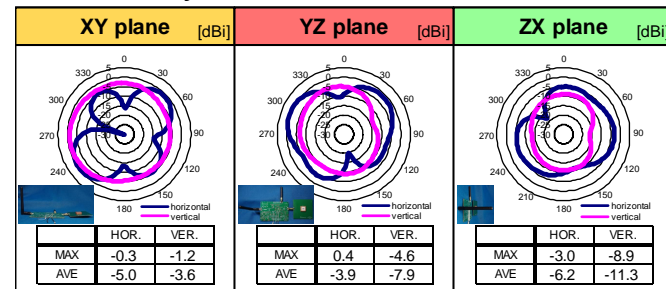


<Efficiency>

\*Red color shows peak gain

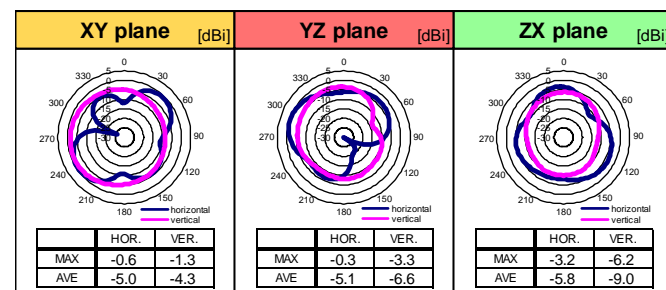
LINEAR POLAMIZATION		XY-plane [dBi]		YZ-plane [dBi]		ZX-plane [dBi]		Total Efficiency [dB]
		hor.	ver.	hor.	ver.	hor.	ver.	
863 MHz	MAX.	-0.9	-1.9	-0.3	-5.2	-3.7	-9.8	-2.9
	AVE.	-5.7	-4.3	-4.6	-8.6	-6.9	-12.3	
866.5 MHz	MAX.	<b>-0.3</b>	<b>-1.2</b>	<b>0.4</b>	<b>-4.6</b>	<b>-3.0</b>	<b>-8.9</b>	<b>-2.3</b>
	AVE.	<b>-5.0</b>	<b>-3.6</b>	<b>-3.9</b>	<b>-7.9</b>	<b>-6.2</b>	<b>-11.3</b>	
870 MHz	MAX.	-0.6	-1.6	0.0	-4.7	-3.4	-9.0	-2.6
	AVE.	-5.3	-4.1	-4.4	-8.1	-6.6	-11.5	

<Directivity>



LoRa (1)

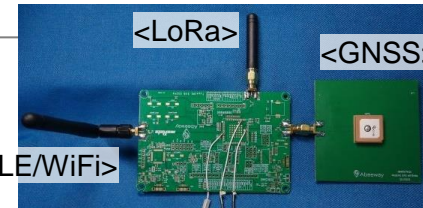
LINEAR POLAMIZATION		XY-plane [dBi]		YZ-plane [dBi]		ZX-plane [dBi]		Total Efficiency [dB]
		hor.	ver.	hor.	ver.	hor.	ver.	
902 MHz	MAX.	-0.7	-1.3	<b>0.0</b>	-3.7	-3.8	-6.7	-2.5
	AVE.	-5.1	-4.3	-4.8	-7.0	-6.2	-9.6	
915 MHz	MAX.	<b>-0.6</b>	<b>-1.3</b>	<b>-0.3</b>	<b>-3.3</b>	<b>-3.2</b>	<b>-6.2</b>	<b>-2.5</b>
	AVE.	<b>-5.0</b>	<b>-4.3</b>	<b>-5.1</b>	<b>-6.6</b>	<b>-5.8</b>	<b>-9.0</b>	
928 MHz	MAX.	-0.5	-1.1	-0.2	-3.0	-2.8	-5.6	-2.1
	AVE.	-4.8	-3.8	-4.9	-6.2	-5.3	-8.3	



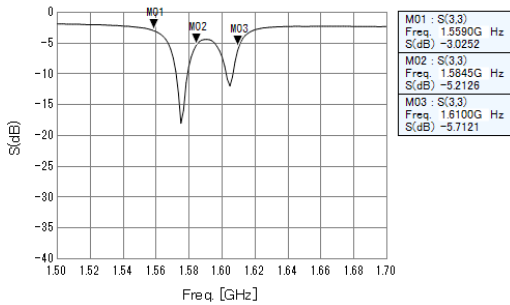
LoRa (2)

# 4. Measurement result

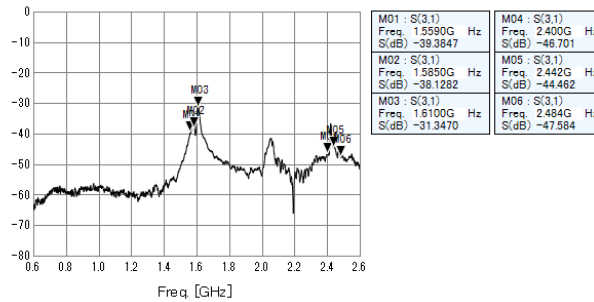
## Condition 1: Default\_GNSS



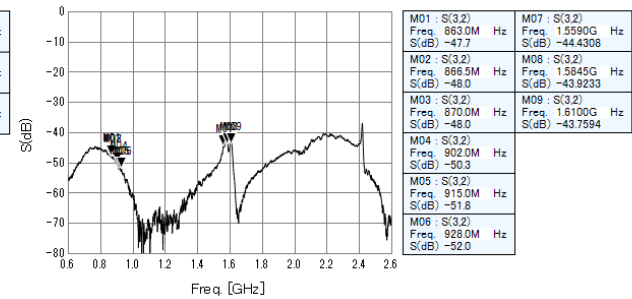
<Return Loss>



<Isolation> GNSS-BLE/WiFi



<Isolation> GNSS-LoRa

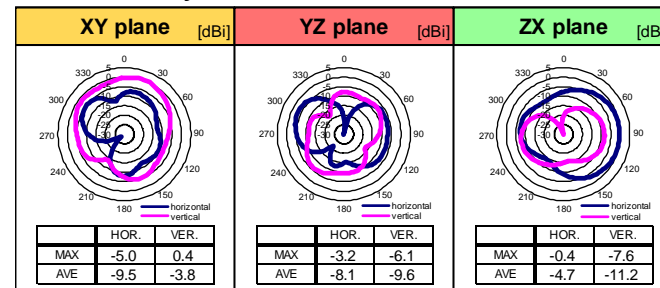


<Efficiency>

\*Red color shows peak gain

LINEAR POLAMIZATION		XY-plane		YZ-plane		ZX-plane		Total Efficiency
		hor.	ver.	hor.	ver.	hor.	ver.	
1559 MHz	MAX.	-5.8	-9.3	-8.6	-9.8	-10.3	-7.6	-9.4
	AVE.	-9.5	-13.2	-14.6	-13.3	-14.6	-11.2	
1584.5 MHz	MAX.	-5.0	0.4	-3.2	-6.1	-0.4	-7.6	-3.9
	AVE.	-9.5	-3.8	-8.1	-9.6	-4.7	-11.2	
1610 MHz	MAX.	-1.7	-1.9	-3.8	-4.1	-1.9	-3.4	-3.9
	AVE.	-5.6	-5.8	-9.5	-8.3	-6.5	-7.2	

<Directivity>

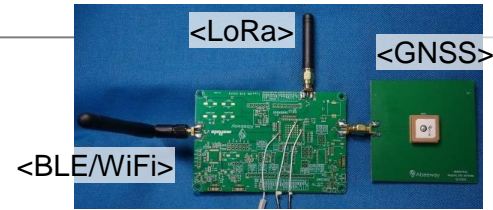


@ 1584.5MHz

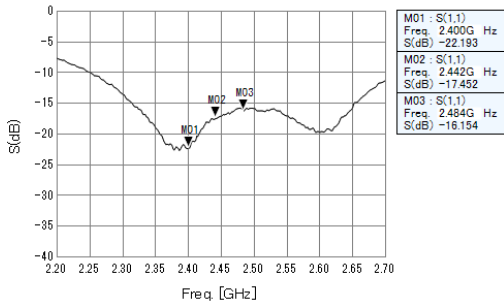


# 4. Measurement result

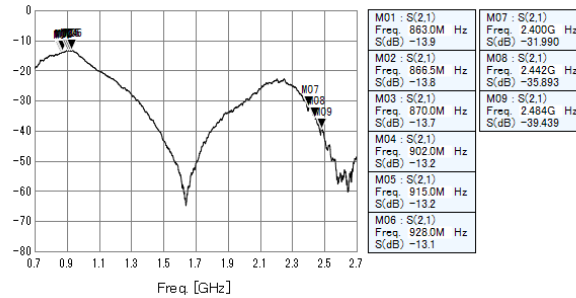
## Condition 1: Default\_BLE/WiFi



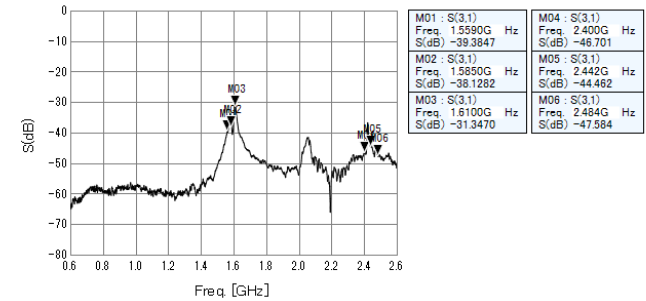
<Return Loss>



<Isolation> BLE/WiFi-LoRa



<Isolation> BLE/WiFi-GNSS

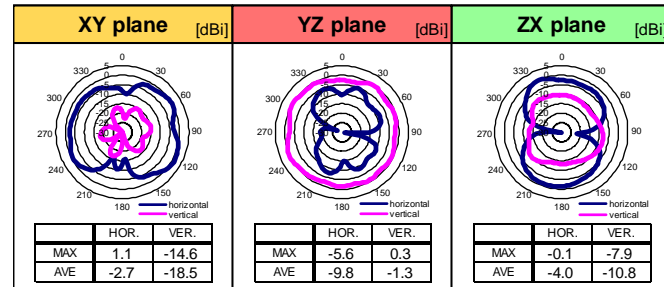


<Efficiency>

\*Red color shows peak gain  
[dBi] [dB]

LINEAR POLAMIZATION		XY-plane		YZ-plane		ZX-plane		Total Efficiency
		hor.	ver.	hor.	ver.	hor.	ver.	
2400 MHz	MAX.	1.0	-13.1	-4.5	-0.2	-0.2	-7.9	-1.4
	AVE.	-2.8	-17.3	-8.5	-1.8	-4.4	-10.1	
2442 MHz	MAX.	1.1	-14.6	-5.6	0.3	-0.1	-7.9	-1.4
	AVE.	-2.7	-18.5	-9.8	-1.3	-4.0	-10.8	
2484 MHz	MAX.	1.7	-16.2	-6.2	-0.2	-0.2	-8.1	-1.3
	AVE.	-2.4	-19.5	-11.1	-0.9	-3.7	-11.0	

<Directivity>



@2442MHz

# 4. Measurement result

## <Measurement condition>

Condition	Memo
Condition 1	Default

## <Measurement result>

Condition	Frequency [MHz]												[dB]				[%]			
	LoRa (1)			LoRa (2)			GNSS			BLE/WiFi			Average	Average	Average	Average	Average	Average	Average	Average
	863	866.5	870	902	915	928	1559	1584.5	1610	2400	2442	2484	LoRa(1)	LoRa(2)	GNSS	BLE/WiFi	LoRa(1)	LoRa(2)	GNSS	BLE/WiFi
Condition 1_LoRa	-2.9	-2.3	-2.6	-2.5	-2.5	-2.1							-2.6	-2.4			55.2	57.7		
Condition 1_GNSS							-9.4	-3.9	-3.9						-5.1				30.9	
Condition 1_BLE/WiFi										-1.4	-1.4	-1.3				-1.4				72.8

## Peak gain

Condition	Frequency [MHz]												Max.	Max.	Max.	Max.
	LoRa (1)			LoRa (2)			GNSS			BLE/WiFi			LoRa(1)	LoRa(2)	GNSS	BLE/WiFi
	863	866.5	870	902	915	928	1559	1584.5	1610	2400	2442	2484	LoRa(1)	LoRa(2)	GNSS	BLE/WiFi
Condition 1_LoRa	-0.3	0.4	0.0	0.0	-0.3	-0.2							0.4	0.0		
Condition 1_GNSS							-5.8	0.4	-1.7						0.4	
Condition 1_BLE/WiFi										1.0	1.1	1.7				1.7

## Annex: Antenna Vendor Information

LoRa antenna

Vendor: Low Power Radio Solutions Ltd

Addr: Two River Industrial Estate, Station Lane, Witney, Oxfordshire OX28 4BH, UK

BLE/WiFi antenna

Vendor: Pulse Finland Oy

Addr: Takatie 6, 90440 Kempele, Finland

GNSS antenna

Vendor: Abeeway

Addr: 2000 Rte des Lucioles, 06410 Biot, France