

Test Report

SATO Corporation
Printed Pattern Antenna



Model: CLSXR-RFID-FRONT COUPLER

Antenna Characteristic Test

Applicant: SATO Corporation
1-207 Onari, Omiya, Saitama, Saitama 330-0852, Japan

COMMERCIAL-IN-CONFIDENCE

Document Number: JPD-TR-24139-1

SIGNATURE			
NAME	JOB TITLE	RESPONSIBLE FOR	ISSUE DATE
Hiroaki Suzuki	RF Deputy Manager of EMC Lab	Approved Signatory	2024.09.05

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD Japan Ltd. document control rules.

NAME	RESPONSIBLE FOR	SIGNATURE
Tadahiro Seino	Testing	

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1 Study Overview

1.1 Test report revision history

Document Number	Change history	Issue date
JPD-TR-24139-0	First Edition	22-July-2024
JPD-TR-24139-1	Added test frequencies for antenna characteristic tests (Additional frequencies: 902MHz, 915MHz, 928MHz)	See cover page

1.2 Test Method

Conducted using temporary test method JPD_W_07.069J.

1.3 Test period

11-July-2024 - 12-July-2024 : (865MHz, 866.5MHz, 868MHz)
2-September-2024 - 3-September-2024 : (902MHz, 915MHz, 928MHz)

2 Overview of the equipment under test

2.1 EUT information

Applicant	SATO Corporation 1-207 Onari, Omiya, Saitama, Saitama 330-0852, Japan
Test equipment	Printed Pattern Antenna
Measurement frequency	865 MHz, 866.5 MHz, 868 MHz 902MHz, 915MHz, 928MHz

2.2 Change history of the EUT

The following is a history of changes made to the EUT during this test project:

Modification State	Modification details	Change Maker	Change implementation date
Model: CLSXR-RFID-FRONT COUPLER Serial Number: H04336100			
0	As supplied by the applicant	Not Applicable	Not Applicable

3 Test Results

3.1 Measurement data

Date of Test : 11-July-2024
Climatic condition : 22.9°C 64.3%
Test place : 3 m Semi-Anechoic Chamber Measurement by : Tadahiro Jono

Date of Test : 12-July-2024
Climatic condition : 23.6°C 64.8%
Test place : 3 m Semi-Anechoic Chamber Measurement by : Tadahiro Jono

Date of Test : 2-September-2024
Climatic condition : 21.3°C 62.4%
Test place : 3 m Semi-Anechoic Chamber Measurement by : Tadahiro Jono

Date of Test : 3-September-2024
Climatic condition : 22.3°C 68.2%
Test place : 3 m Semi-Anechoic Chamber Measurement by : Tadahiro Jono

3.2 Measurement results

3.2.1 Antenna gain

865MHz, 866.5MHz, 868MHz

Frequency	Position 1		Position 2		Position 3	
	Horizontal (H side)	Vertical (Side E)	Horizontal (H side)	Vertical (Side E)	Horizontal (H side)	Vertical (Side E)
865MHz	-14.96	-20.49	-14.36	-20.66	-16.67	-17.76
866.5MHz	-14.93	-20.64	-14.39	-20.71	-17.70	-17.98
868MHz	-14.62	-20.80	-14.21	-20.65	-16.82	-17.80

: MAX GAIN

Half-Power Beamwidth

Position	Position 1		Position 2		Position 3	
	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical
865MHz	31	41	35	42	26	24
866.5MHz	31	70	34	41	23	24
868MHz	32	37	36	41	27	39

902MHz, 915MHz, 928MHz

Frequency	Position 1		Position 2		Position 3	
	Horizontal (H side)	Vertical (Side E)	Horizontal (H side)	Vertical (Side E)	Horizontal (H side)	Vertical (Side E)
902MHz	-15.09	-19.72	-15.02	-19.66	-15.34	-17.89
915MHz	-16.71	-21.44	-16.71	-21.36	-16.84	-19.46
928MHz	-18.01	-22.28	-18.10	-22.45	-17.69	-20.52

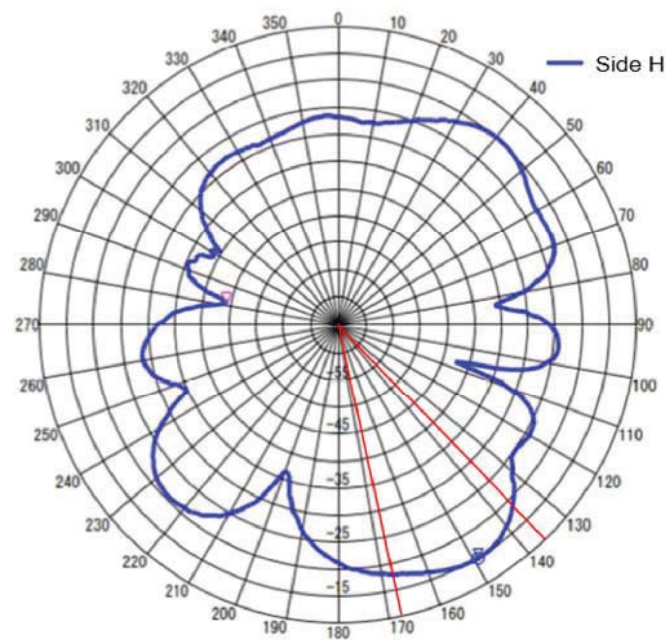
: MAX GAIN

Half-Power Beamwidth

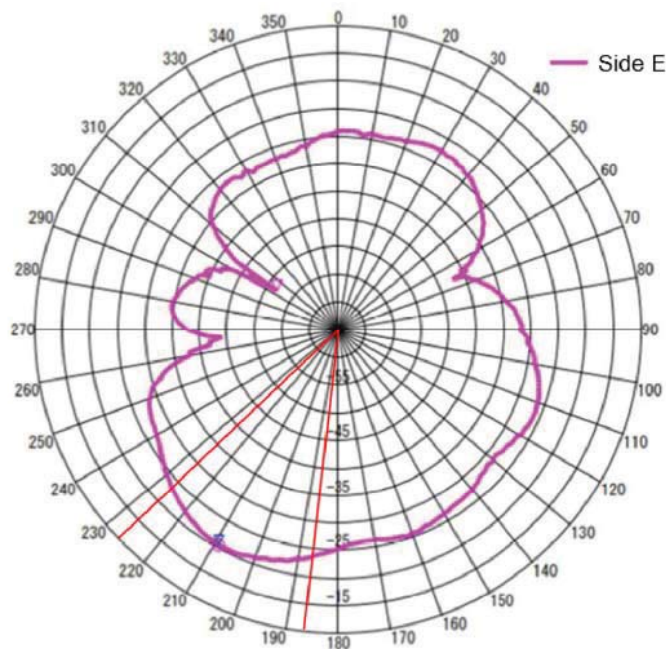
Position	Position 1		Position 2		Position 3	
	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical
902MHz	22	52	21	50	25	46
915MHz	21	57	21	54	23	49
928MHz	20	53	20	51	24	51

3.2.2 Antenna Pattern **Position 1**

865MHz



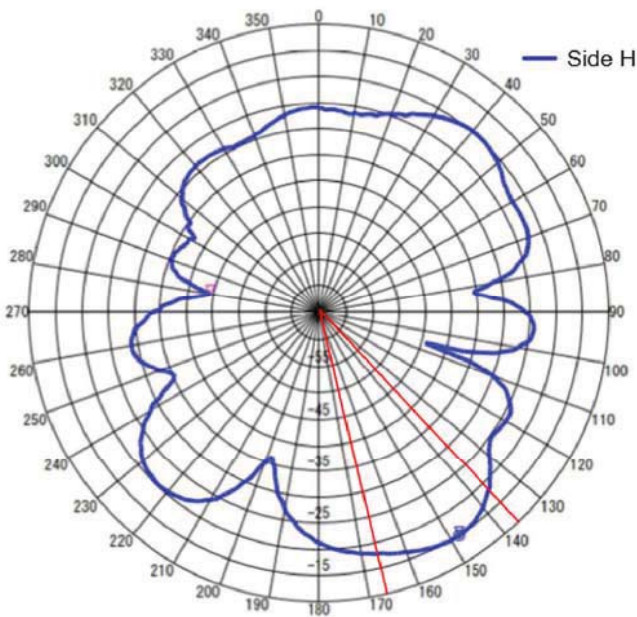
Side H Half-Power Beamwidth
31 degrees



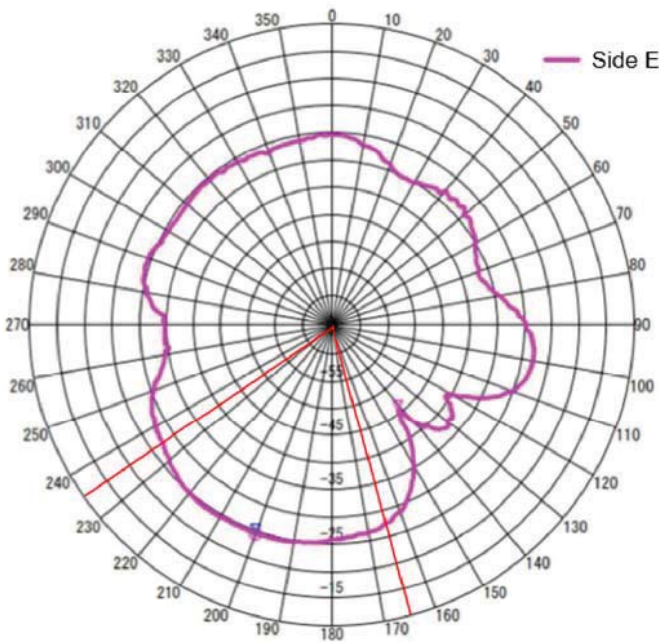
Side E Half-Power Beamwidth
41 degrees



866.5MHz



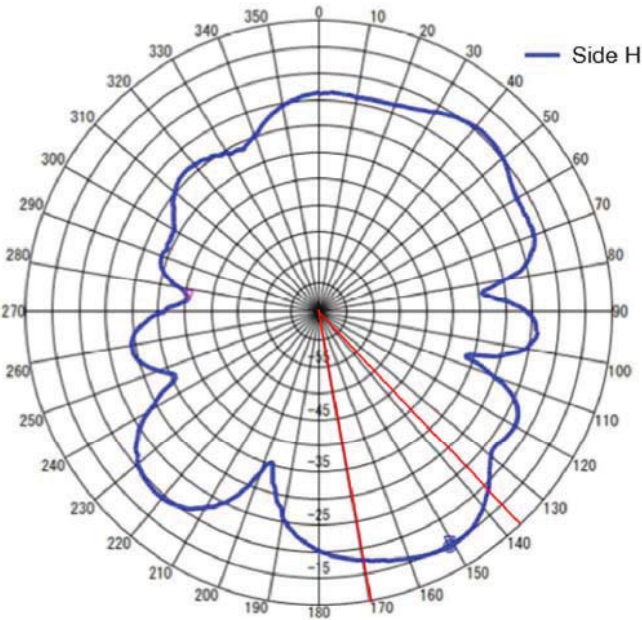
Side H Half-Power Beamwidth
31 degrees



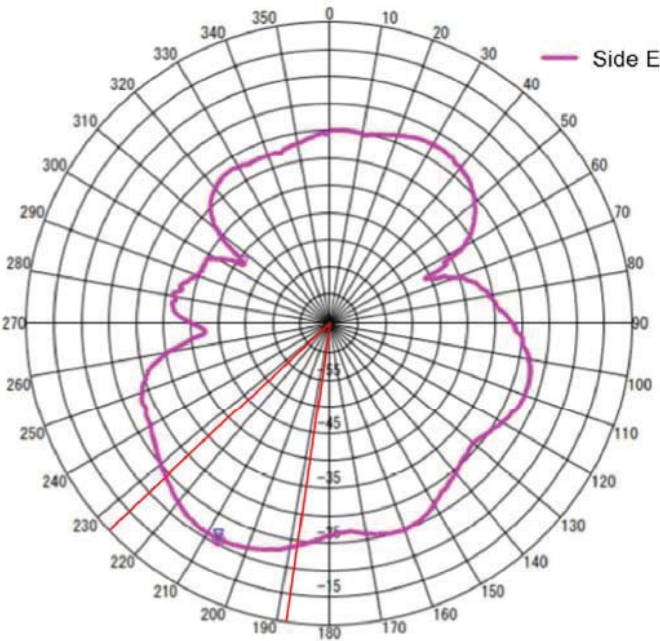
Side E Half-Power Beamwidth
70 degrees



868MHz



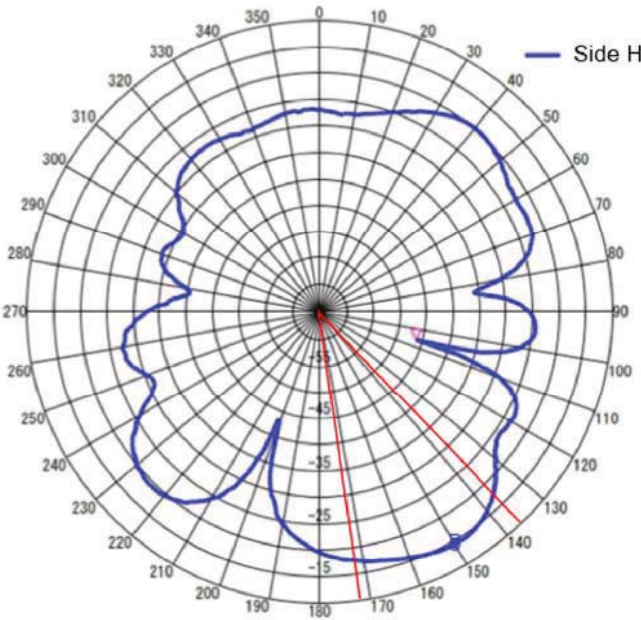
Side H Half-Power Beamwidth
32 degrees



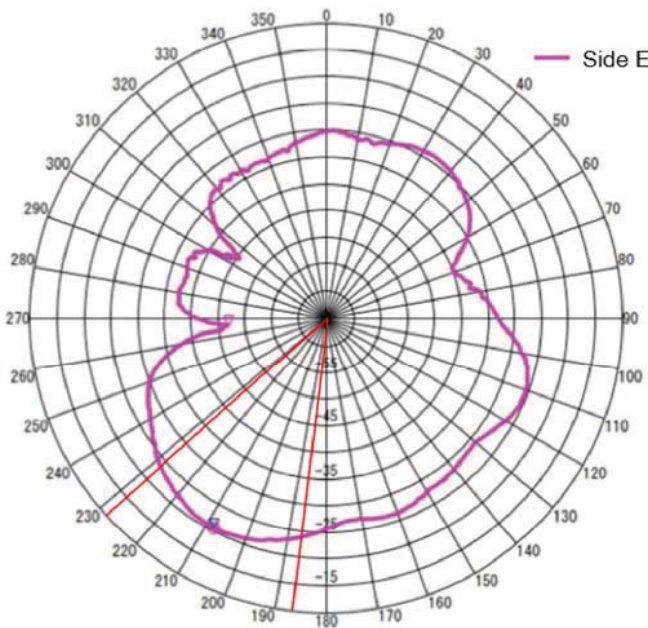
Side E Half-Power Beamwidth
37 degrees

3.2.3 Antenna Pattern **Position 2**

865MHz



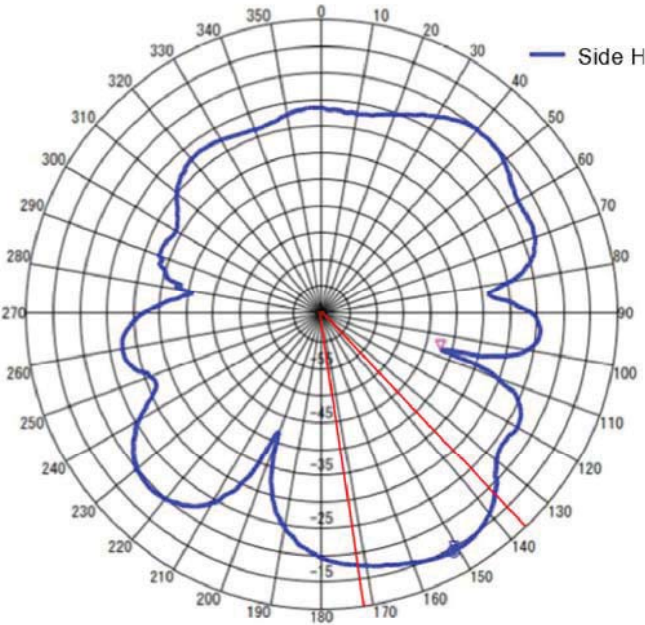
Side H Half-Power Beamwidth
35 degrees



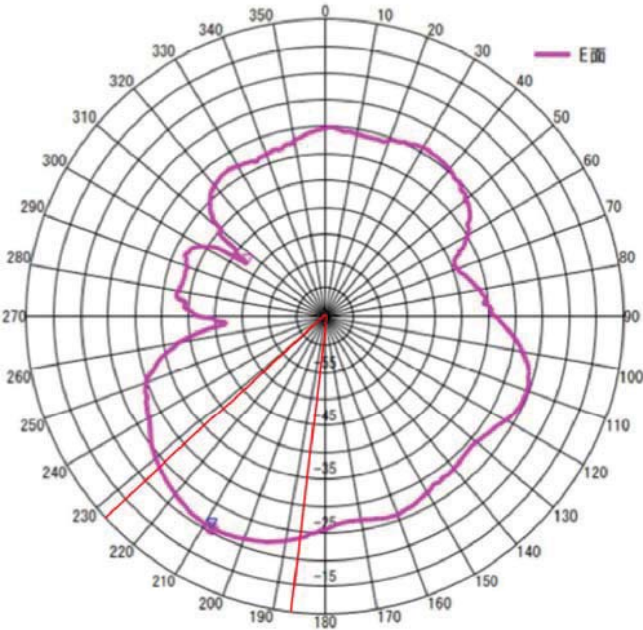
Side E Half-Power Beamwidth
42 degrees



866.5MHz



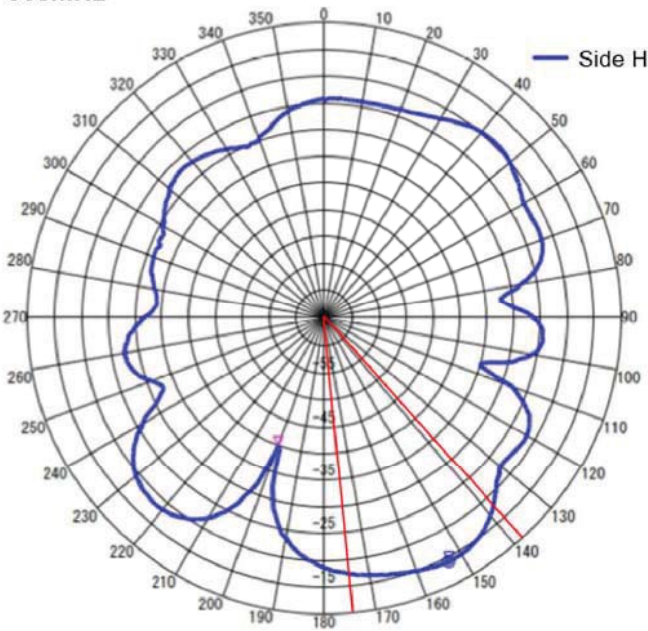
Side H Half-Power Beamwidth
34 degrees



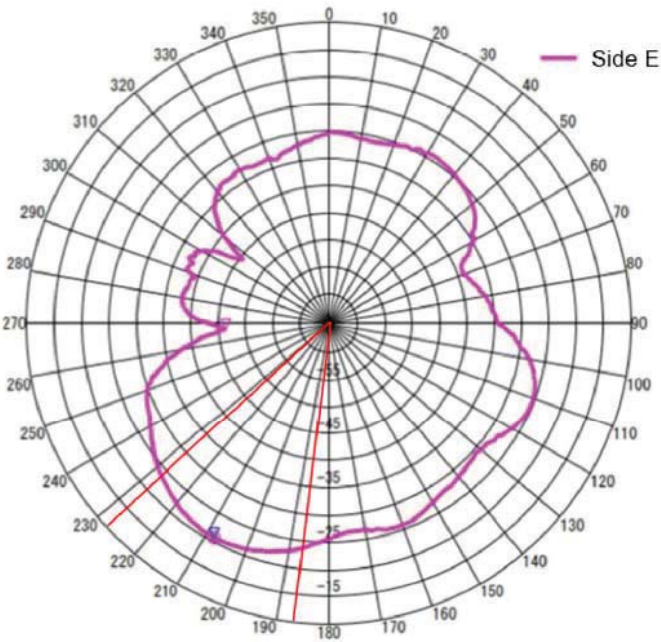
Side E Half-Power Beamwidth
41 degrees



868MHz



Side H Half-Power Beamwidth
36 degrees

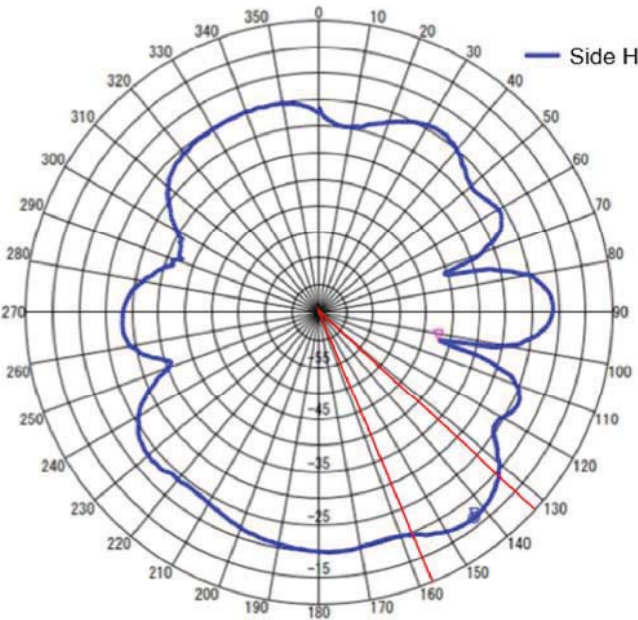


Side E Half-Power Beamwidth
41 degrees

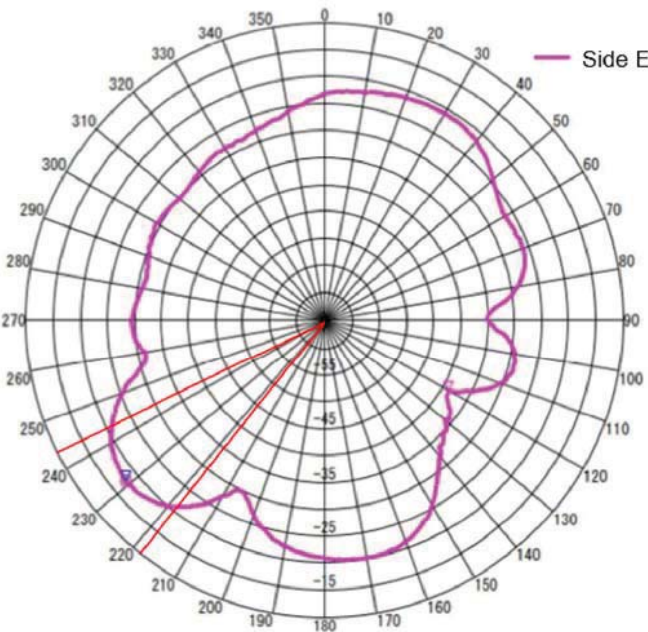


3.2.4 Antenna Pattern **Position 3**

865MHz



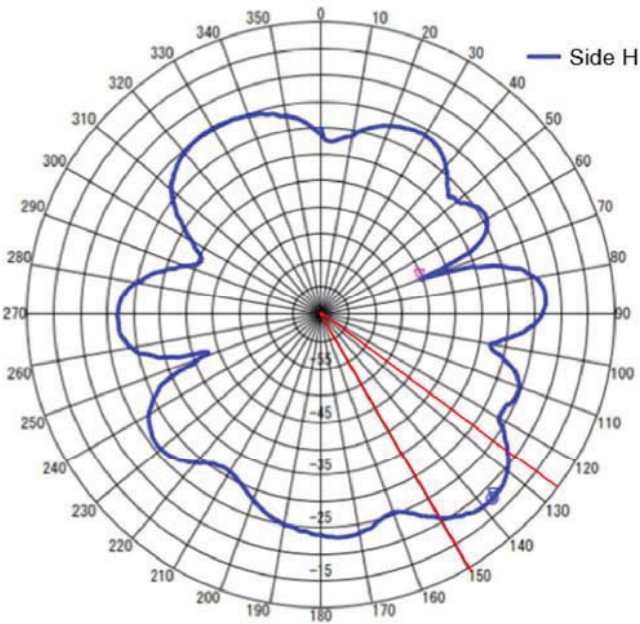
Side H Half-Power Beamwidth
26 degrees



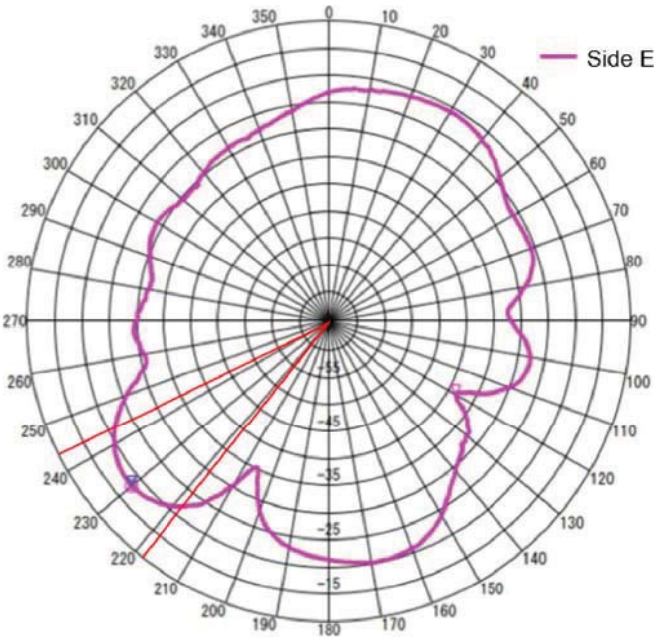
Side E Half-Power Beamwidth
24 degrees



866.5MHz



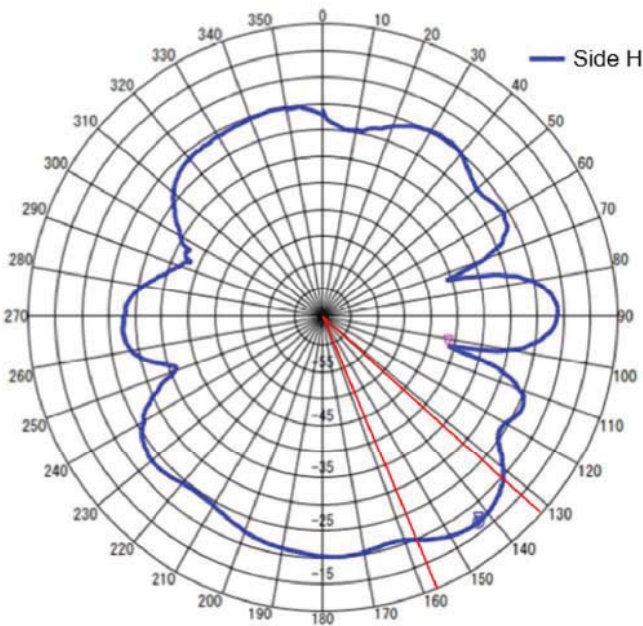
Side H Half-Power Beamwidth
23 degrees



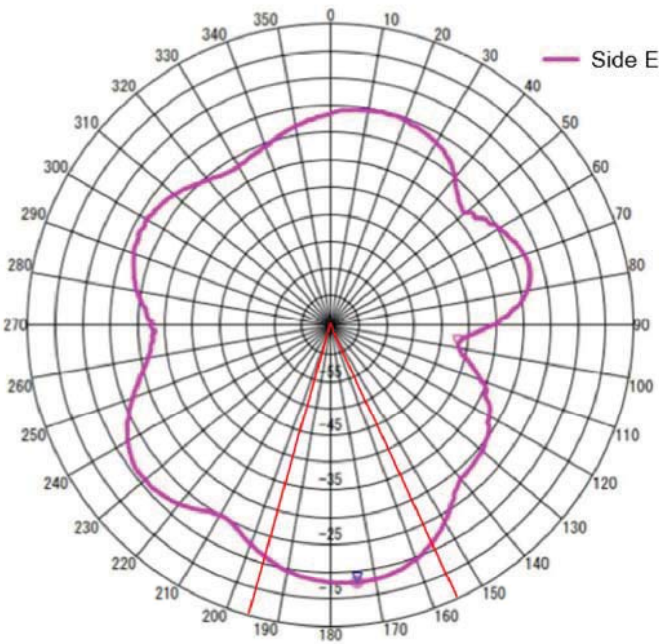
Side E Half-Power Beamwidth
24 degrees



868MHz



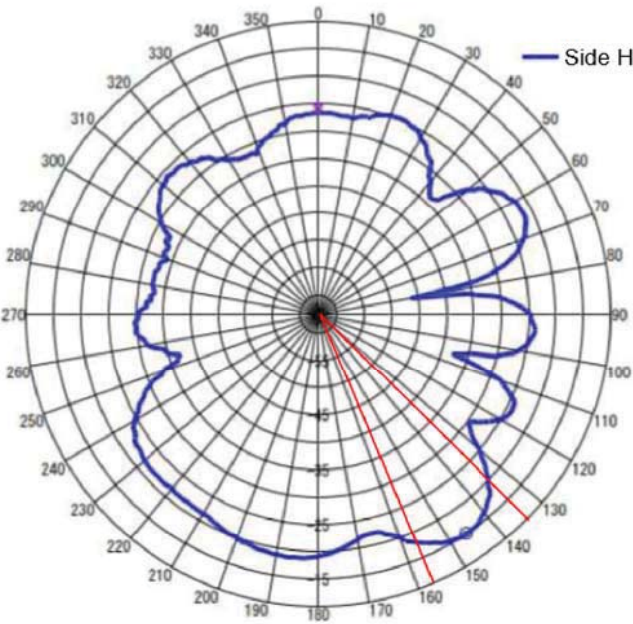
Side H Half-Power Beamwidth
27 degrees



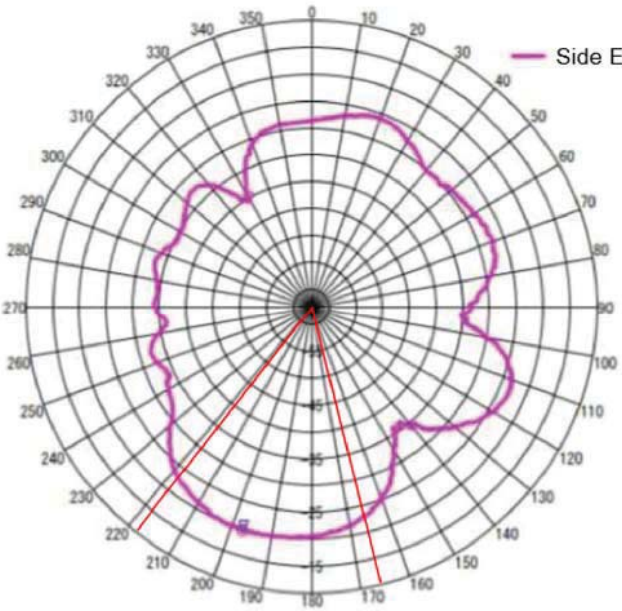
Side E Half-Power Beamwidth
39 degrees

3.2.5 Antenna Pattern **Position 1**

902MHz



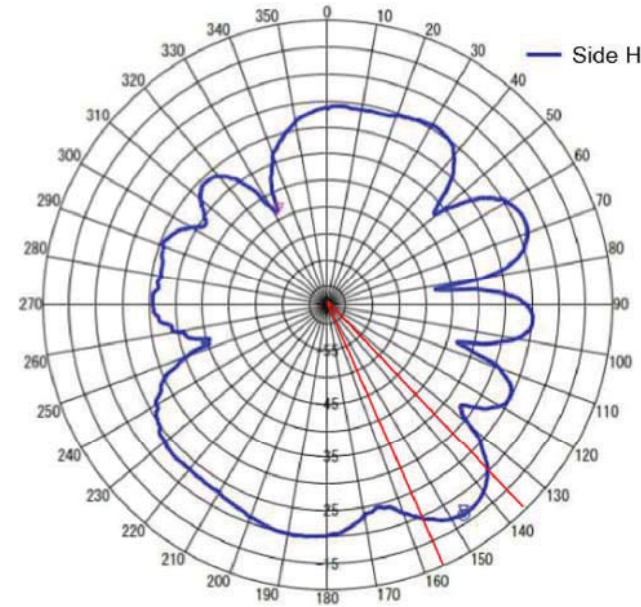
Side H Half-Power Beamwidth
22 degrees



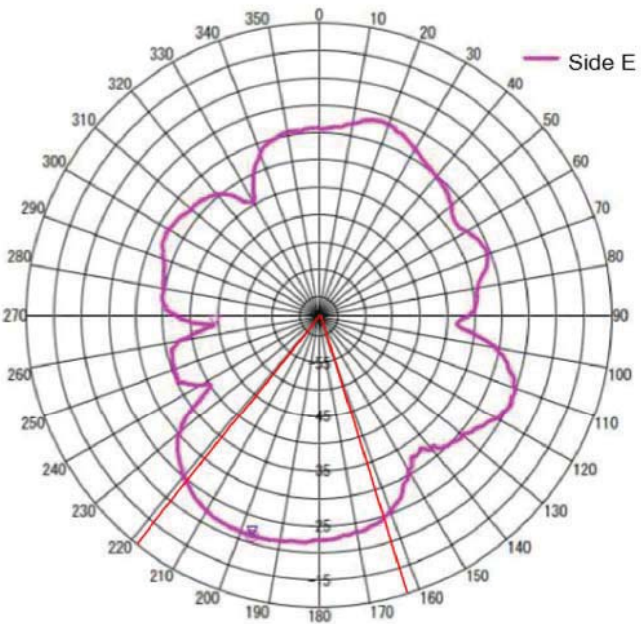
Side E Half-Power Beamwidth
52 degrees



915MHz



Side H Half-Power Beamwidth
21 degrees

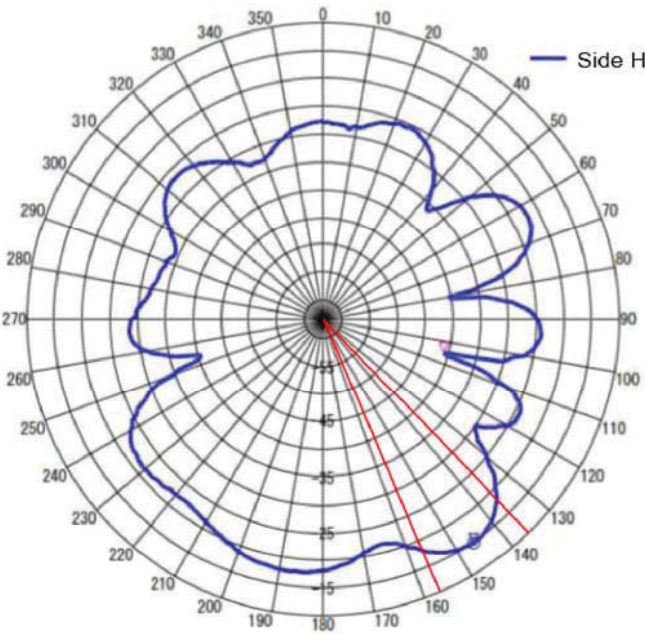


Side E Half-Power Beamwidth
57 degrees

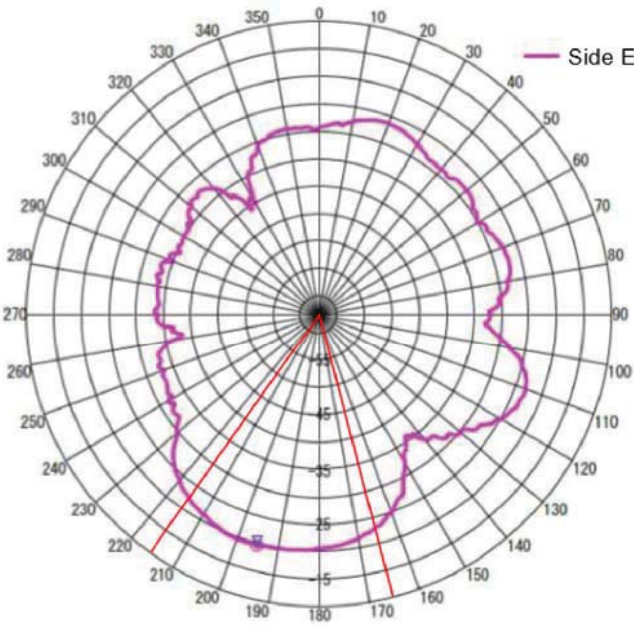
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3.2.6 Antenna Pattern **Position 2**

902MHz



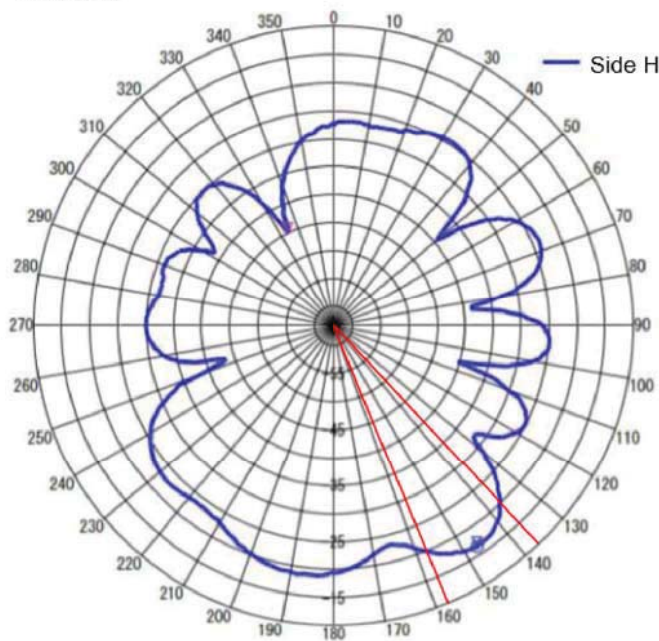
Side H Half-Power Beamwidth
21 degrees



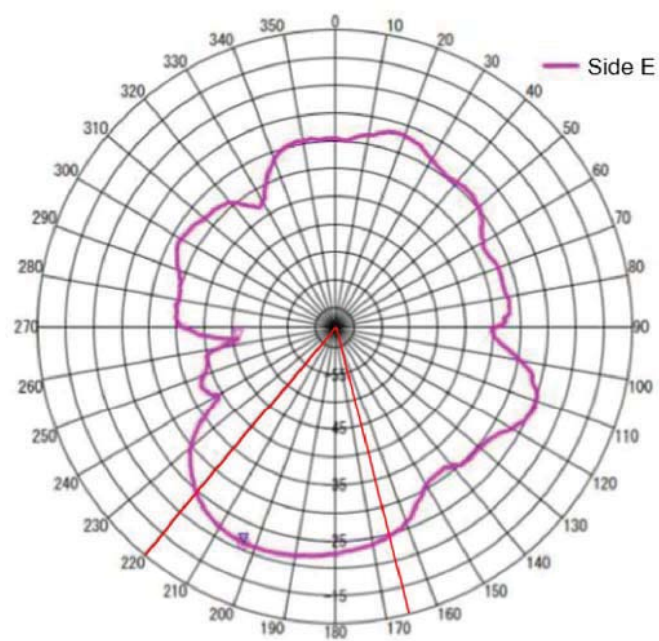
Side E Half-Power Beamwidth
50 degrees



915MHz



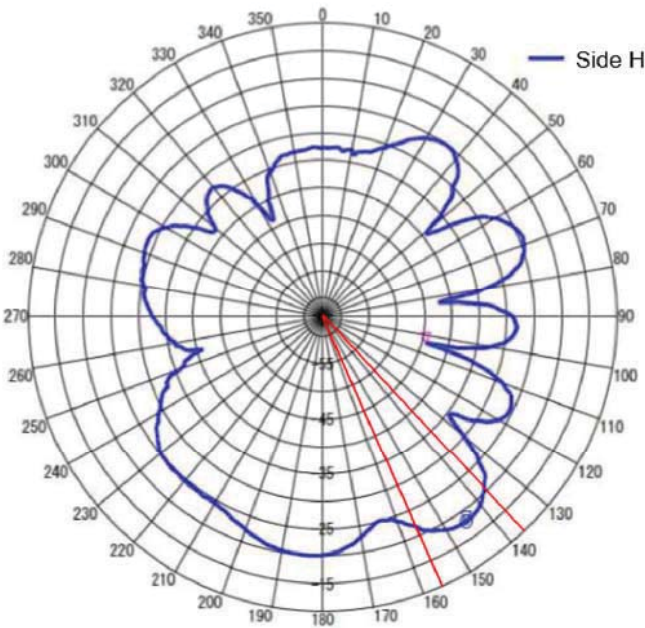
Side H Half-Power Beamwidth
21 degrees



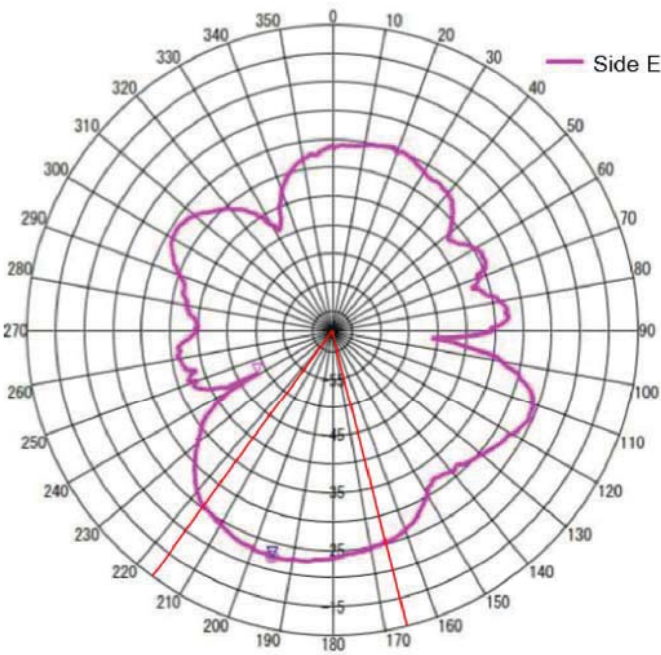
Side E Half-Power Beamwidth
54 degrees



928MHz



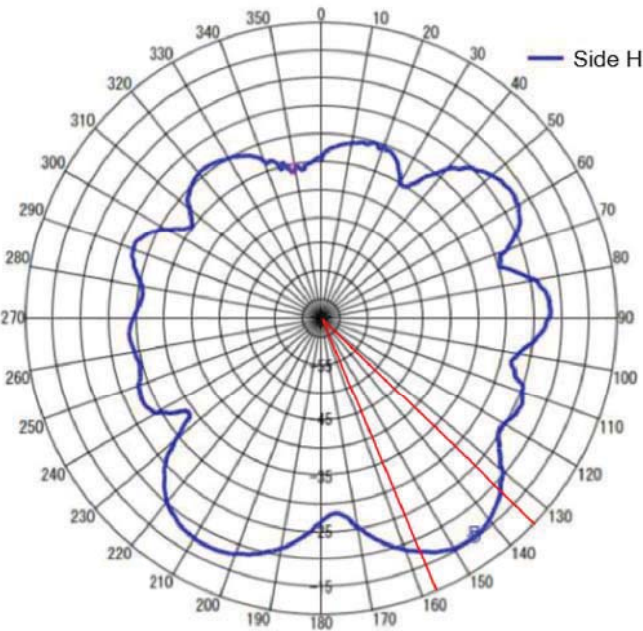
Side H Half-Power Beamwidth
20 degrees



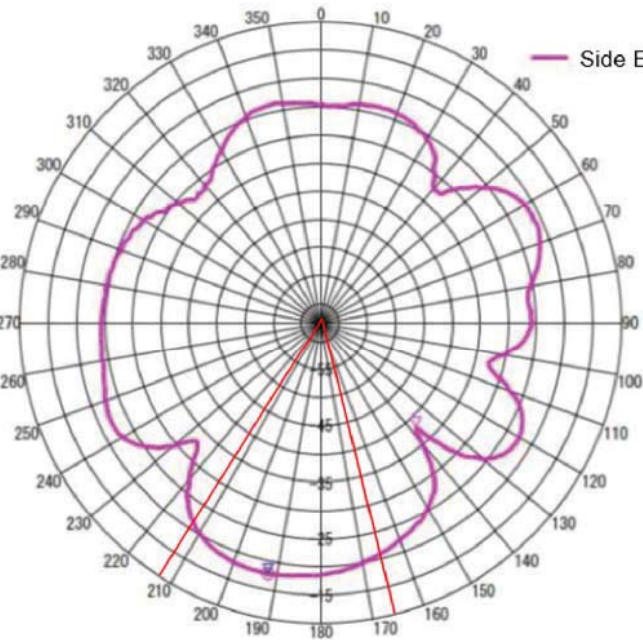
Side E Half-Power Beamwidth
51 degrees

3.2.7 Antenna Pattern **Position 3**

902MHz



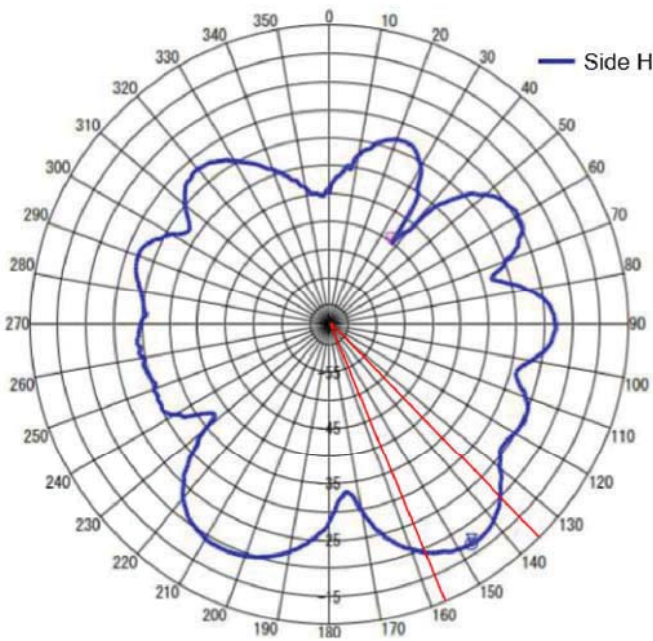
Side H Half-Power Beamwidth
25 degrees



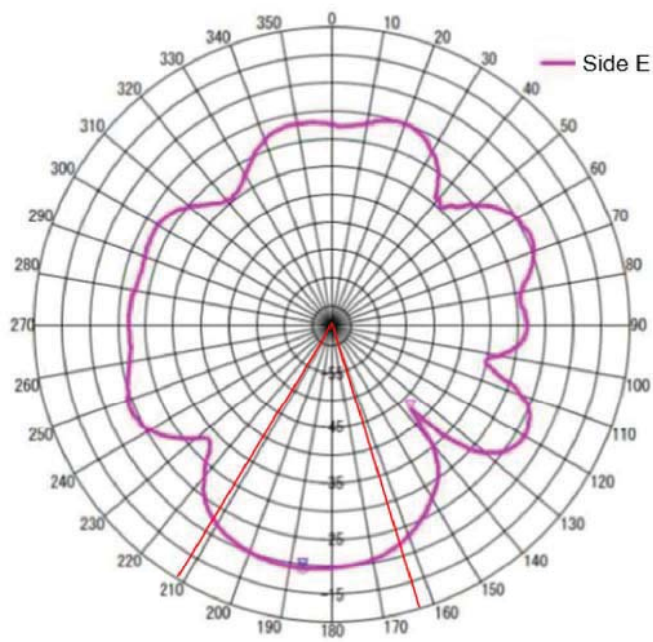
Side E Half-Power Beamwidth
46 degrees



915MHz



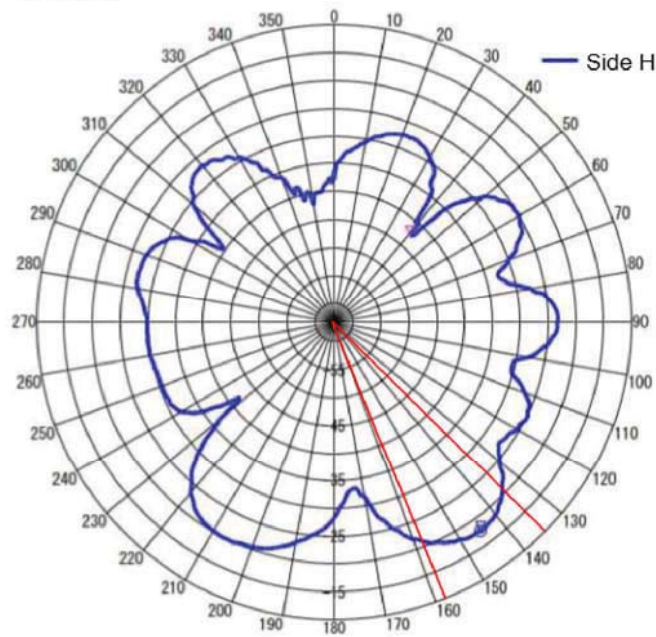
Side H Half-Power Beamwidth
23 degrees



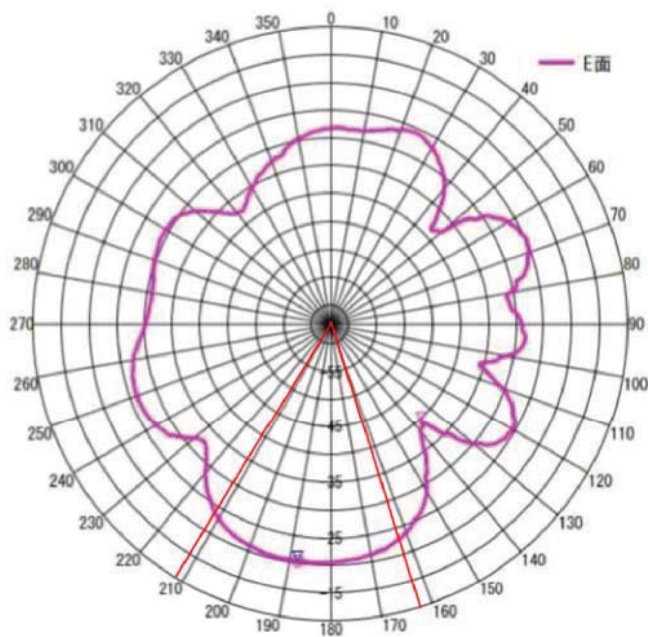
Side E Half-Power Beamwidth
49 degrees



928MHz



Side H Half-Power Beamwidth
24 degrees



Side E Half-Power Beamwidth
51 degrees

4 Measuring Equipment

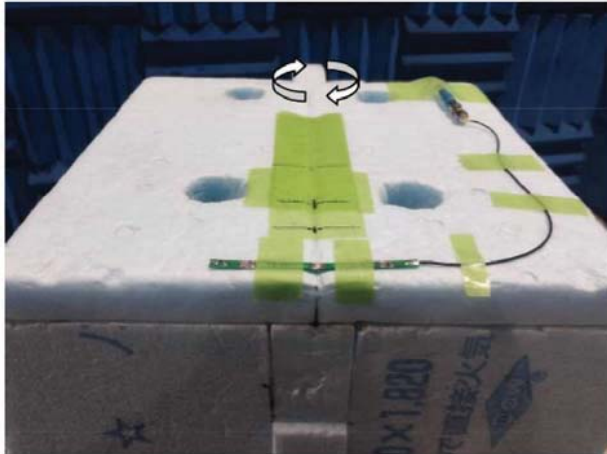
Equipment	Company	Model No.	Serial No.	Cal. Authority	Cal. Method	Cal. Date
EMI receiver	ROHDE&SCHWARZ	ESW44	103171	ROHDE&SCHWARZ	(d)	19-Oct-2023
Log-periodic antenna	Schwarzbeck	VUSLP9111B	346	Intertek	(d)	22-Dec-2023
Preamplifier	SONOMA	310	372170	Intertek	(d)	21-Sep-2023
Attenuator	HUBER+SUHNER	6803.17.B	N/A(2340)	Intertek	(d)	15-Dec-2023
Attenuator	AEROFLEX	26A-10	081217-08	Intertek	(d)	15-Dec-2023
Microwave cable	HUBER+SUHNER	SUCOFLEX104/9m	2001099/4	Intertek	(d)	15-Dec-2023
Microwave cable	HUBER+SUHNER	SUCOFLEX104/1m	MY32976/4	Intertek	(d)	15-Dec-2023
Microwave cable	HUBER+SUHNER	SUCOFLEX104/2m	SN MY28404/4	Intertek	(d)	15-Dec-2023
Microwave cable	HUBER+SUHNER	SUCOFLEX106/7m	41625/6	Intertek	(d)	15-Dec-2023
Dipole Antenna	Schwarzbeck	UHAP	994	Intertek	(d)	5-Jul-2024
Attenuator	Weinschel	56-10	J4993	Intertek	(d)	19-Dec-2023
Microwave cable	HUBER SUNER	Sucoflex 102/2m	31648	Intertek	(d)	7-Mar-2024
Vector Signal generator	ROHDE&SCHWARZ	SMBV100A	257406	ROHDE&SCHWARZ	(d)	7-Mar-2024
3m Semi an-echoic Chamber	TOKIN	N/A	N/A(NSA)	Intertek	(d)	14-May-2024
Absorber	NEC TOKIN	TFA	N/A	N/A	N/A	N/A
Software	Techno Science Japan	TEPTO-ANT	Version 1.3.0015	N/A	N/A	N/A

The calibration deadline is within one year from the month following the date of calibration.

Cal.Method ...

- a) : Calibration conducted by the National Institute of Information and Communications Technology~NICT~ or a designated calibration agency under Article 102-18 paragraph (1)~ Telecom Engineering Center, Intertek Japan K.K., Keysight Technologies, Inc~.
- b) : Correction conducted pursuant to the provisions of Article 135 or Article 144 of the Measurement Law (Law No. 51 of 1992)~Japan Calibration Service System~
- c) : Calibration conducted in foreign countries, which shall be equivalent to the calibration conducted by the NICT or a designated calibration agency under Article 102-18 paragraph (1)~ Telecom Engineering Center, Intertek Japan K.K.,
- d) : Calibration conducted by using other equipment that listed above from a) to c)

5 Antenna Position



Position 1



Position 2



Position 3

*Measurement plane relative to the receiving antenna.

*0° to 360° is clockwise relative to the receiving antenna.

6 Measurement environment

