
To: ALPSALPINE Co., Ltd

25CY-VOLVO
Level1
Report on Actual Machine Evaluation1

Sayaka Naka
Optical & Electronic Div.
Engineering Group
Engineering Dept.

24.11.18

25CY-VOLVO Report on Actual Machine Evaluation1

○Purpose

25CY VOLVO向け Level1実機にて、BT用アンテナ特性評価を行う。

We will conduct a Bluetooth antenna characteristic evaluation on the actual Level1 machines for 25CY VOLVO.

○Target

- Gain 2GHz Band : TRP $\geq$ -2.0dBi (360deg)
- Frequency 2GHz Band : 2400 / 2450 / 2500 MHz

○Result

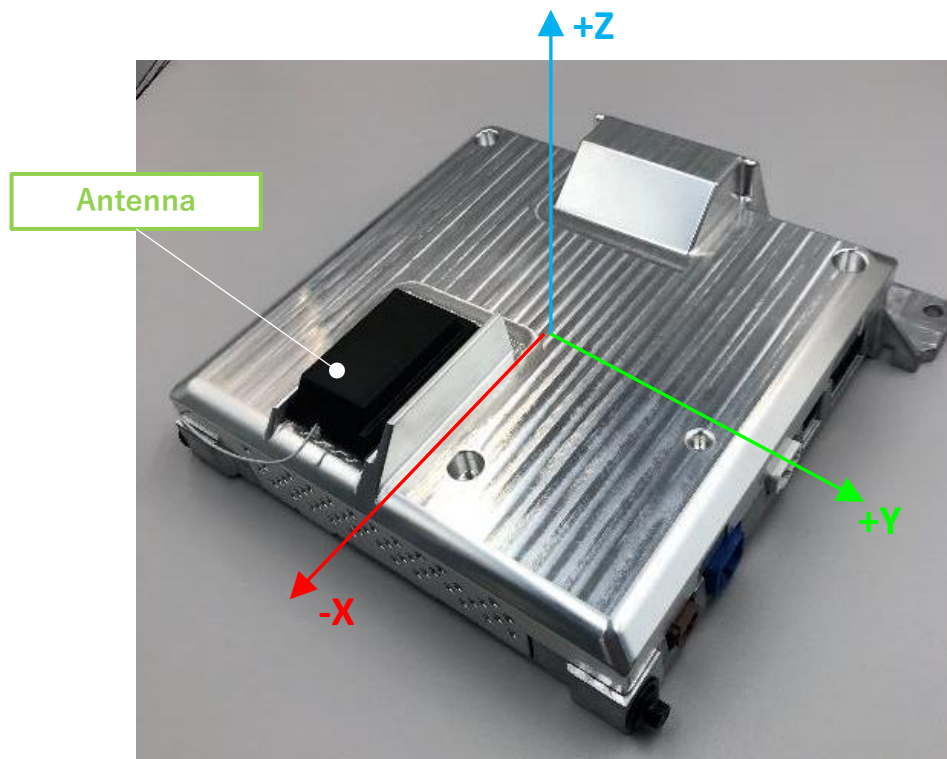
ご送付頂いた筐体にて評価を実施しました。

目標規格を満足する結果が得られ、良好な特性が確認されました。

We conducted an evaluation using the actual Level1 machines for 25CY VOLVO.

The results meet the target specifications, confirming favorable characteristics.

評価モデル / Evaluation model

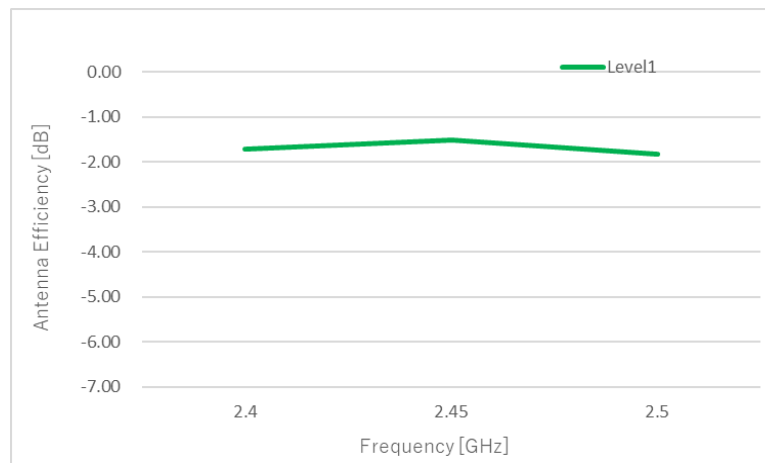


Level1

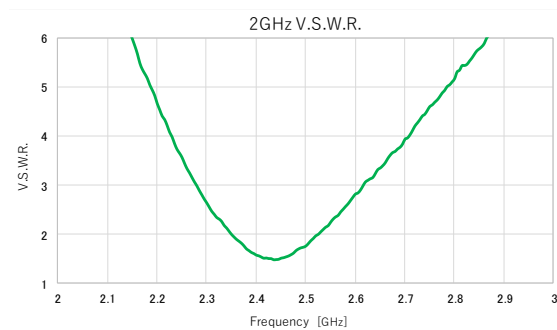
25CY-VOLVO Report on Actual Machine Evaluation1

Level1 : Result

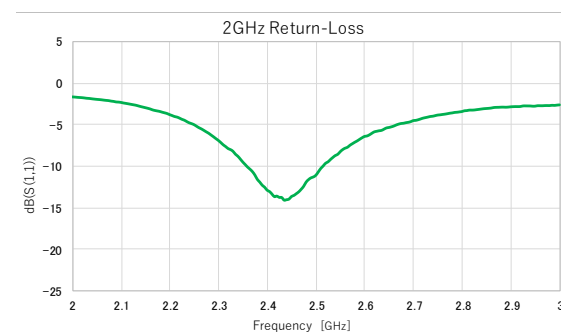
Level1	Antenna Efficiency	
Frequency [GHz]	[dB]	[%]
2.4	-1.71	67.44
2.45	-1.52	70.50
2.5	-1.82	65.71



Antenna Efficiency [dB] = Antenna Gain [dBi] as stated.



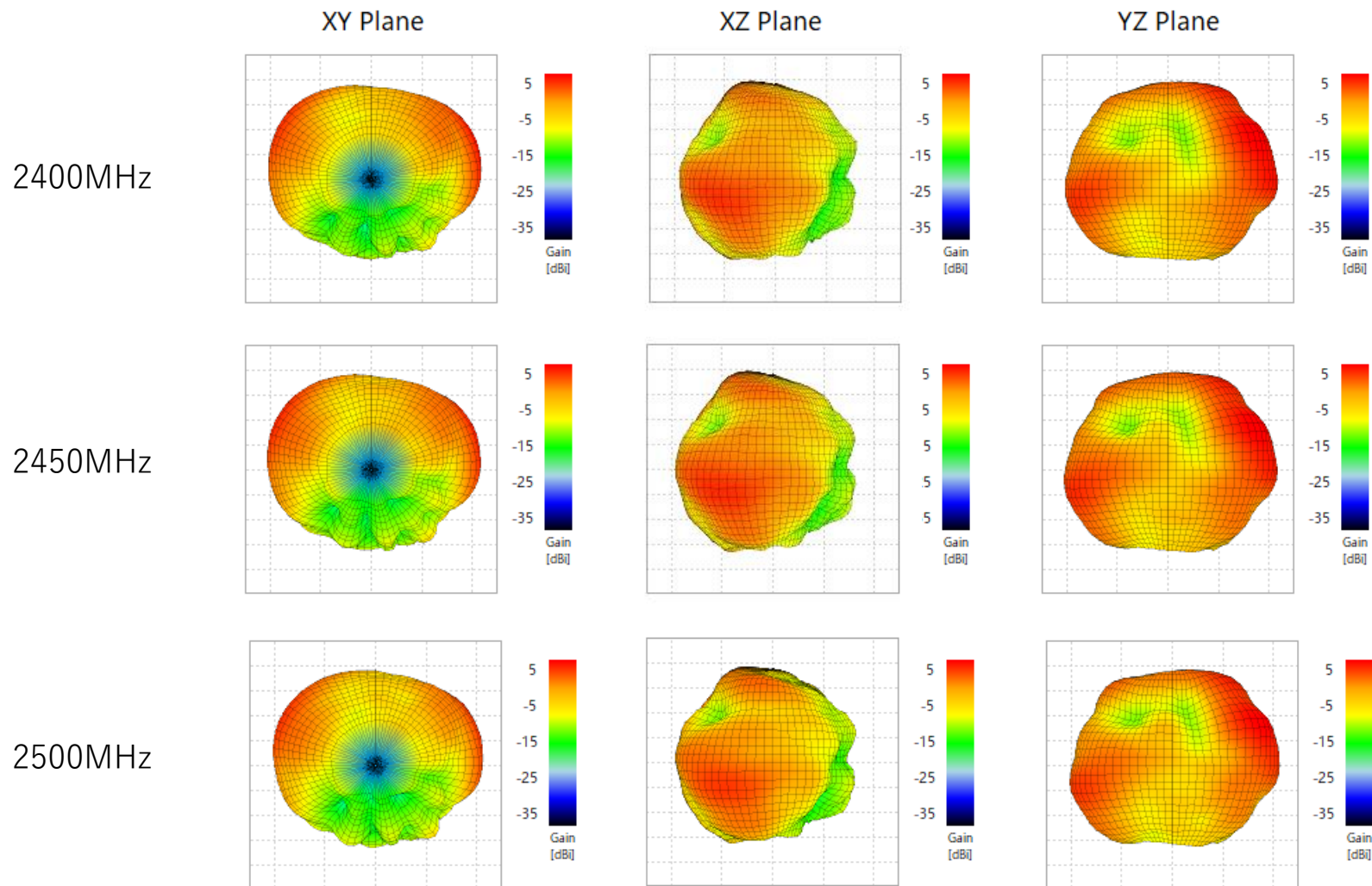
Frequency [GHz]	V.S.W.R.
① 2.400	1.58
② 2.450	1.52
③ 2.500	1.77
Min.Freq.	2.435



Frequency [GHz]	[dB]
① 2.400	12.95
② 2.450	13.72
③ 2.500	11.14
Min.Freq.	2.435

25CY-VOLVO Report on Actual Machine Evaluation1

3D Radiation Pattern



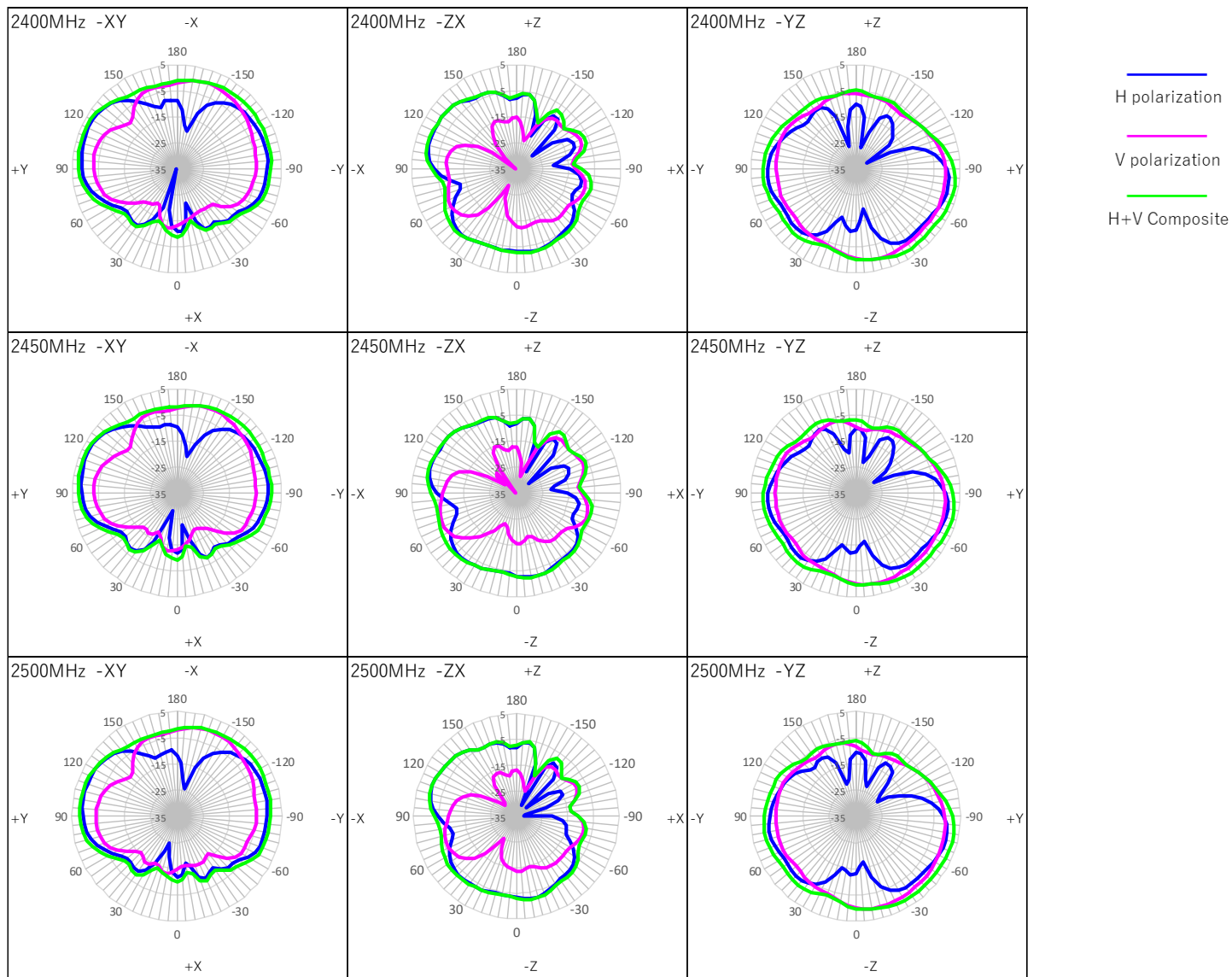
25CY-VOLVO Report on Actual Machine Evaluation1

Gain

Frequency [MHz]	Plane	Polarization H:Horizontal V:Vertical	Peak [dBi]	Average [dBi]	Ave.linear value	Composite linear value	Composite [dBi]	XY-ZX [dBi]	XY-ZX-YZ [dBi]	XY-ZX-YZ Composite Average [dBi]
2400	XY	H	2.56	-2.68	0.54	0.87	-0.61	-1.91	-1.41	-1.56
		V	-0.03	-4.84	0.33					
	ZX	H	0.03	-4.67	0.34	0.42	-3.77			XY-ZX Composite Average [dBi]
		V	-6.23	-11.08	0.08					
	YZ	H	1.28	-4.37	0.37	0.88	-0.56	-----		-2.09
		V	0.45	-2.90	0.51					
2450	XY	H	2.69	-2.73	0.53	0.85	-0.70	-1.97	-1.46	
		V	-0.06	-4.97	0.32					
	ZX	H	-0.62	-4.91	0.32	0.42	-3.79			
		V	-4.44	-10.21	0.10					
	YZ	H	0.99	-4.41	0.36	0.87	-0.59	-----		
		V	0.54	-2.92	0.51					
2500	XY	H	1.31	-3.36	0.46	0.77	-1.14	-2.40	-1.80	
		V	0.04	-5.12	0.31					
	ZX	H	-0.25	-5.05	0.31	0.38	-4.17			
		V	-5.80	-11.55	0.07					
	YZ	H	0.68	-4.80	0.33	0.83	-0.81	-----		
		V	0.85	-3.02	0.50					

25CY-VOLVO Report on Actual Machine Evaluation1

Gain



To: ALPSALPINE Co., Ltd

25CY-VOLVO Level2/Level3 Report on Actual Machine Evaluation1

2025.12.05
Additional Update
P12~P15

Sayaka Naka
Optical & Electronic Div.
Engineering Group
Engineering Dept.

24.11.20

25CY-VOLVO Report on Actual Machine Evaluation1

○Purpose

25CY VOLVO向け Level2 & Level3実機にて、BT用アンテナ特性評価を行う。

We will conduct a Bluetooth antenna characteristic evaluation on the actual Level2 and Level3 machines for 25CY VOLVO.

○Target

- Gain 2GHz Band : TRP $\geq$ -2.0dBi (360deg)
- Frequency 2GHz Band : 2400 / 2450 / 2500 MHz

○Result

ご送付頂いた筐体にて評価を実施しました。

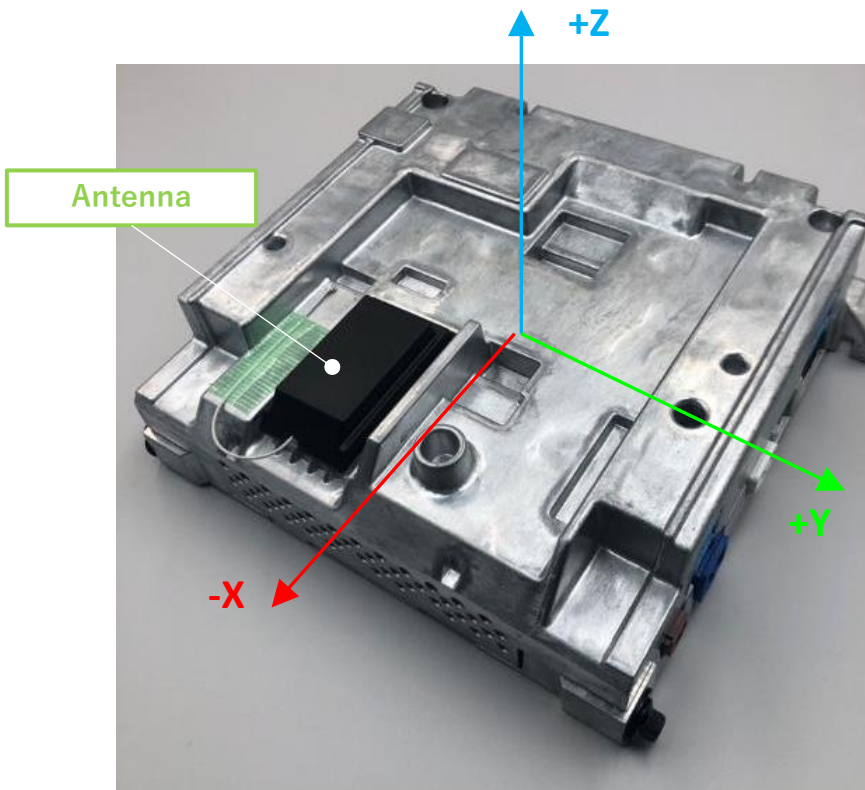
結果、2モデル(Level2, Level3)とも、目標規格を満足する結果が得られております。

We conducted an evaluation using the actual Level2 and Level3 machines for 25CY VOLVO you sent us.

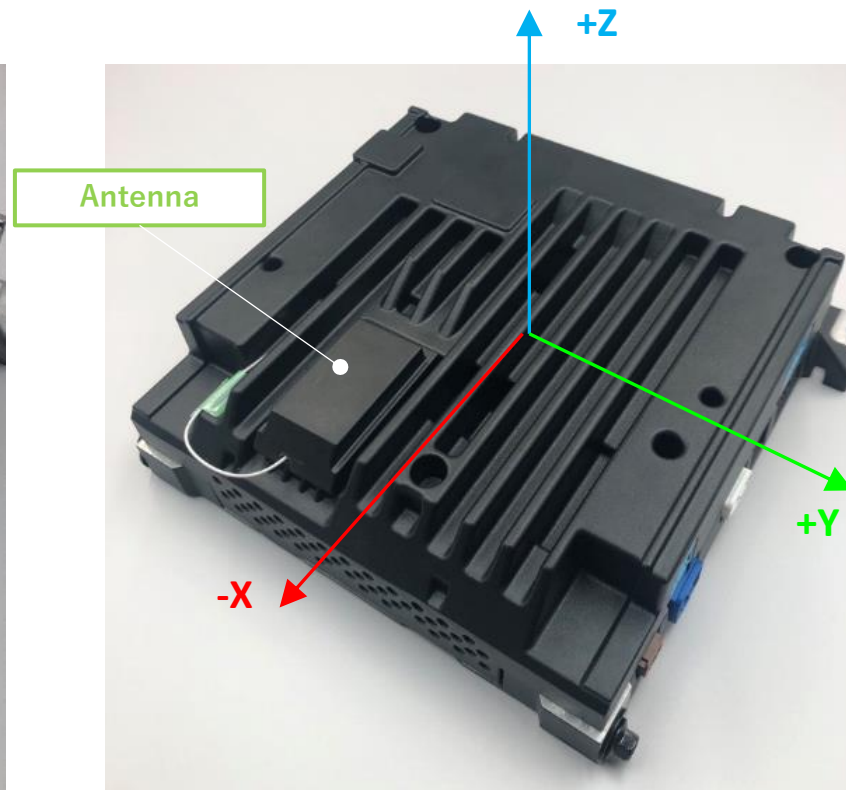
As a result, two models (Level2, Level3) have achieved satisfactory results according to the target specifications.

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評価モデル / Evaluation model



Level2

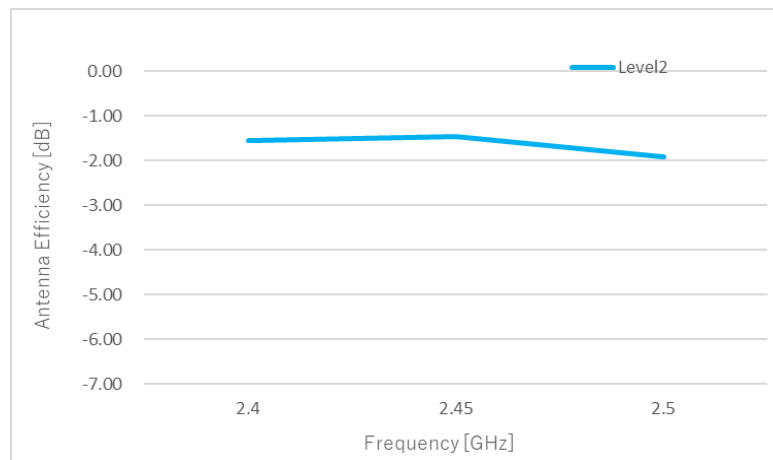


Level3

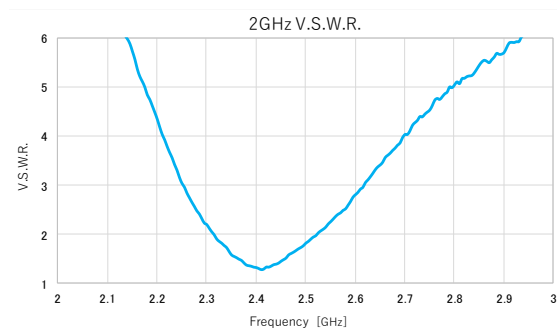
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Level2 : Result

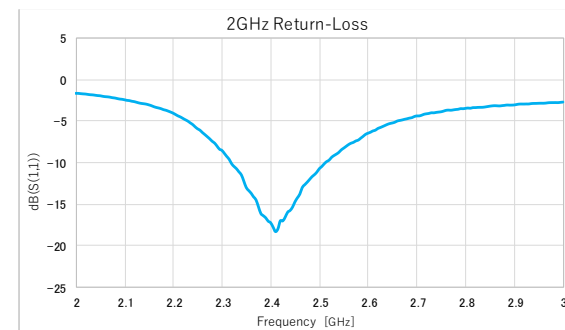
Level2	Antenna Efficiency	
Frequency [GHz]	[dB]	[%]
2.4	-1.54	70.15
2.45	-1.46	71.42
2.5	-1.91	64.40



Antenna Efficiency [dB] = Antenna Gain [dBi] as stated.



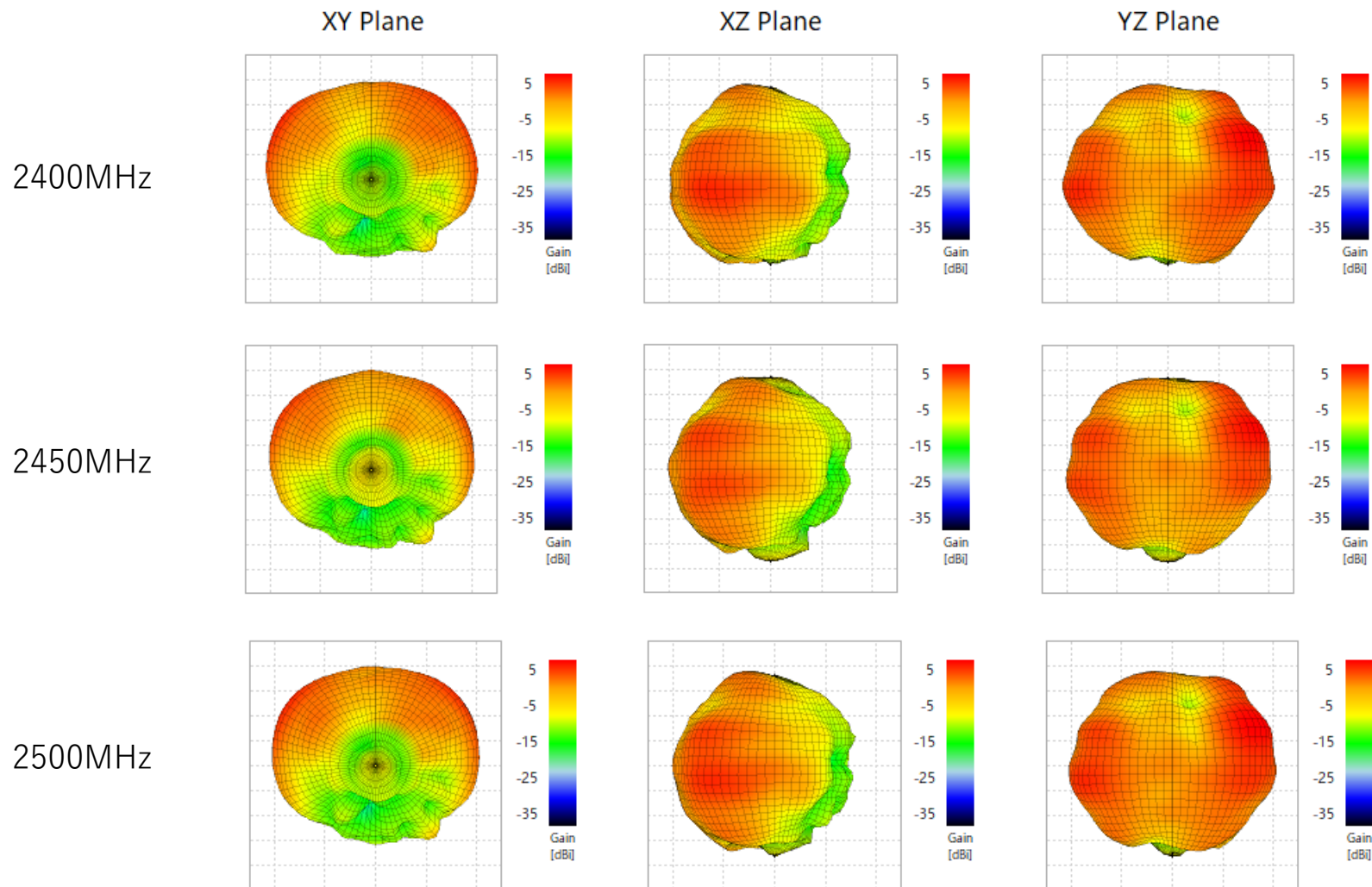
Frequency [GHz]	V.S.W.R.
① 2.400	1.32
② 2.450	1.45
③ 2.500	1.82
Min.Freq.	2.410
	1.28



Frequency [GHz]	[dB]
① 2.400	17.28
② 2.450	14.77
③ 2.500	10.77
Min.Freq.	2.410
	18.35

25CY-VOLVO Report on Actual Machine Evaluation1

3D Radiation Pattern



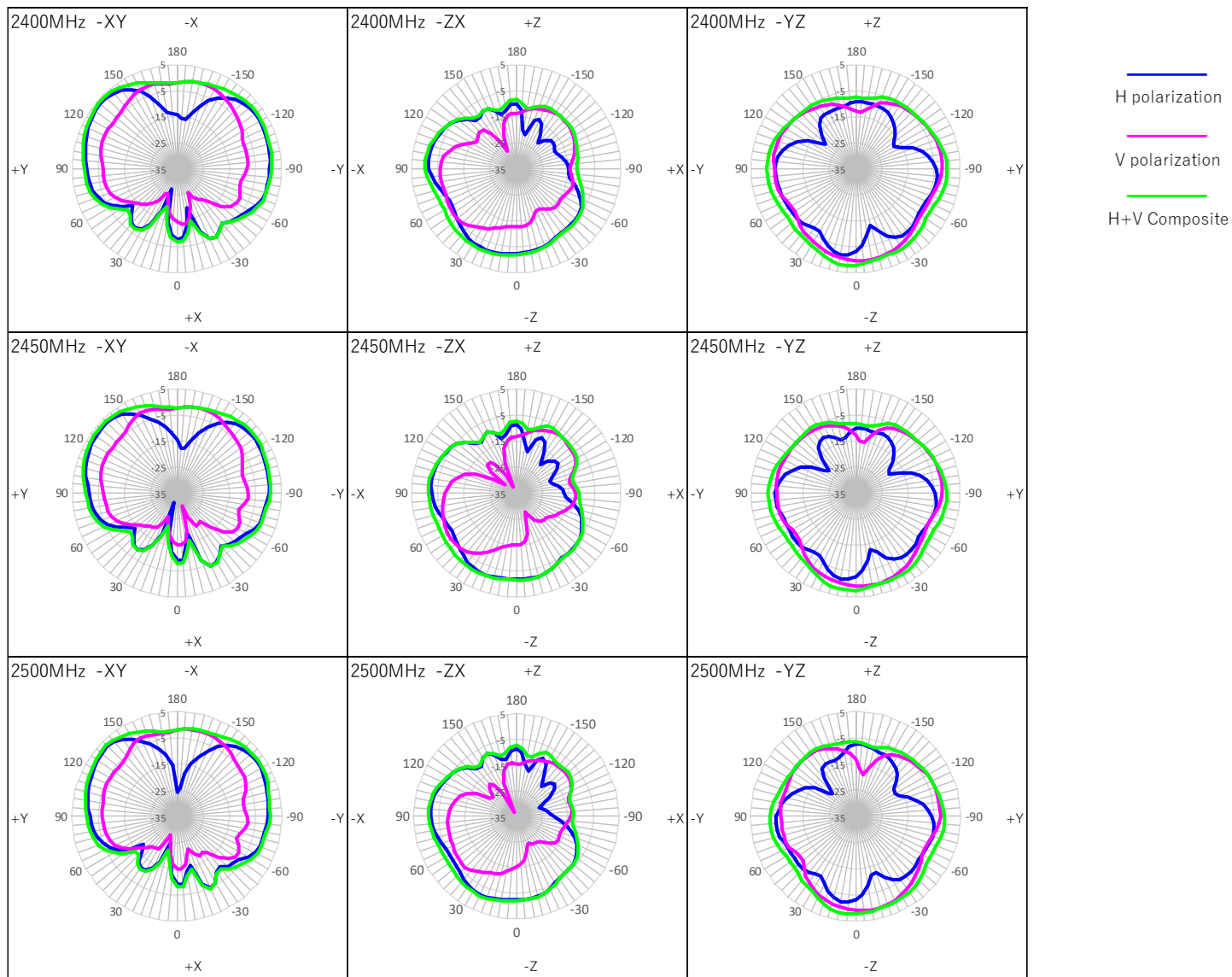
25CY-VOLVO Report on Actual Machine Evaluation1

Gain

Frequency [MHz]	Plane	Polarization H:Horizontal V:Vertical	Peak [dBi]	Average [dBi]	Ave.linear value	Composite linear value	Composite [dBi]	XY-ZX [dBi]	XY-ZX-YZ [dBi]	XY-ZX-YZ Composite Average [dBi]
2400	XY	H	3.50	-1.57	0.70	0.96	-0.17	-1.77	-1.73	-1.97
		V	-0.88	-5.78	0.26					
	ZX	H	-1.08	-5.61	0.27	0.37	-4.31	XY-ZX Composite Average [dBi]		
		V	-5.40	-10.20	0.10					
	YZ	H	-1.66	-6.45	0.23	0.68	-1.67	-----	-2.04	
		V	0.41	-3.43	0.45					
2450	XY	H	3.32	-1.92	0.64	0.89	-0.50	-1.96	-1.87	-2.04
		V	-1.17	-6.02	0.25					
	ZX	H	-1.49	-5.41	0.29	0.38	-4.19	-1.96		-2.04
		V	-4.31	-10.29	0.09					
	YZ	H	-1.69	-6.79	0.21	0.68	-1.68	-----	-2.04	
		V	1.03	-3.28	0.47					
2500	XY	H	2.67	-2.51	0.56	0.80	-0.98	-2.42	-2.34	-2.04
		V	-1.35	-6.25	0.24					
	ZX	H	-1.35	-5.51	0.28	0.35	-4.59	-2.42		-2.04
		V	-6.82	-11.78	0.07					
	YZ	H	-2.07	-7.23	0.19	0.60	-2.19	-----	-2.04	
		V	1.12	-3.82	0.41					

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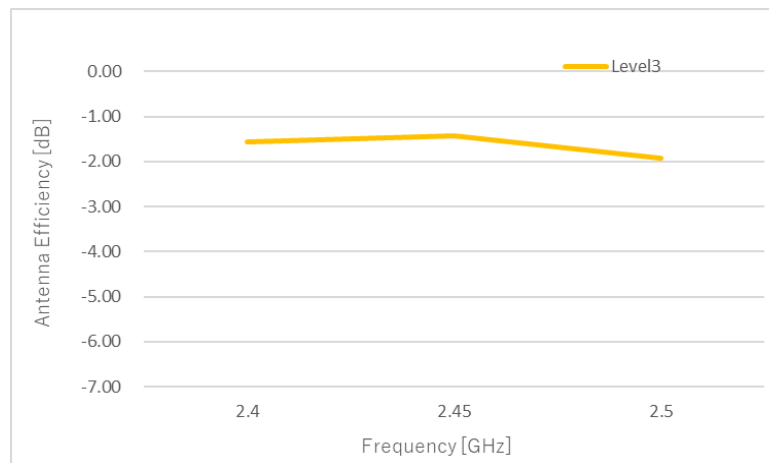
Gain



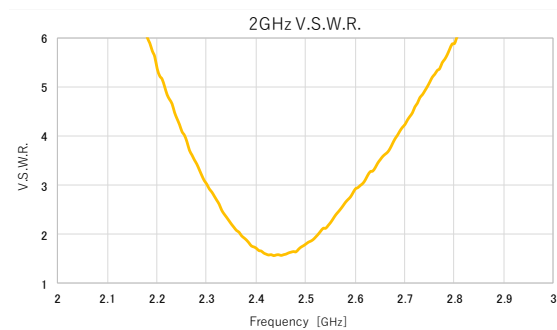
25CY-VOLVO Report on Actual Machine Evaluation1

Level3 : Result

Level3	Antenna Efficiency	
Frequency [GHz]	[dB]	[%]
2.4	-1.56	69.82
2.45	-1.42	72.17
2.5	-1.92	64.34



Antenna Efficiency [dB] = Antenna Gain [dBi] as stated.



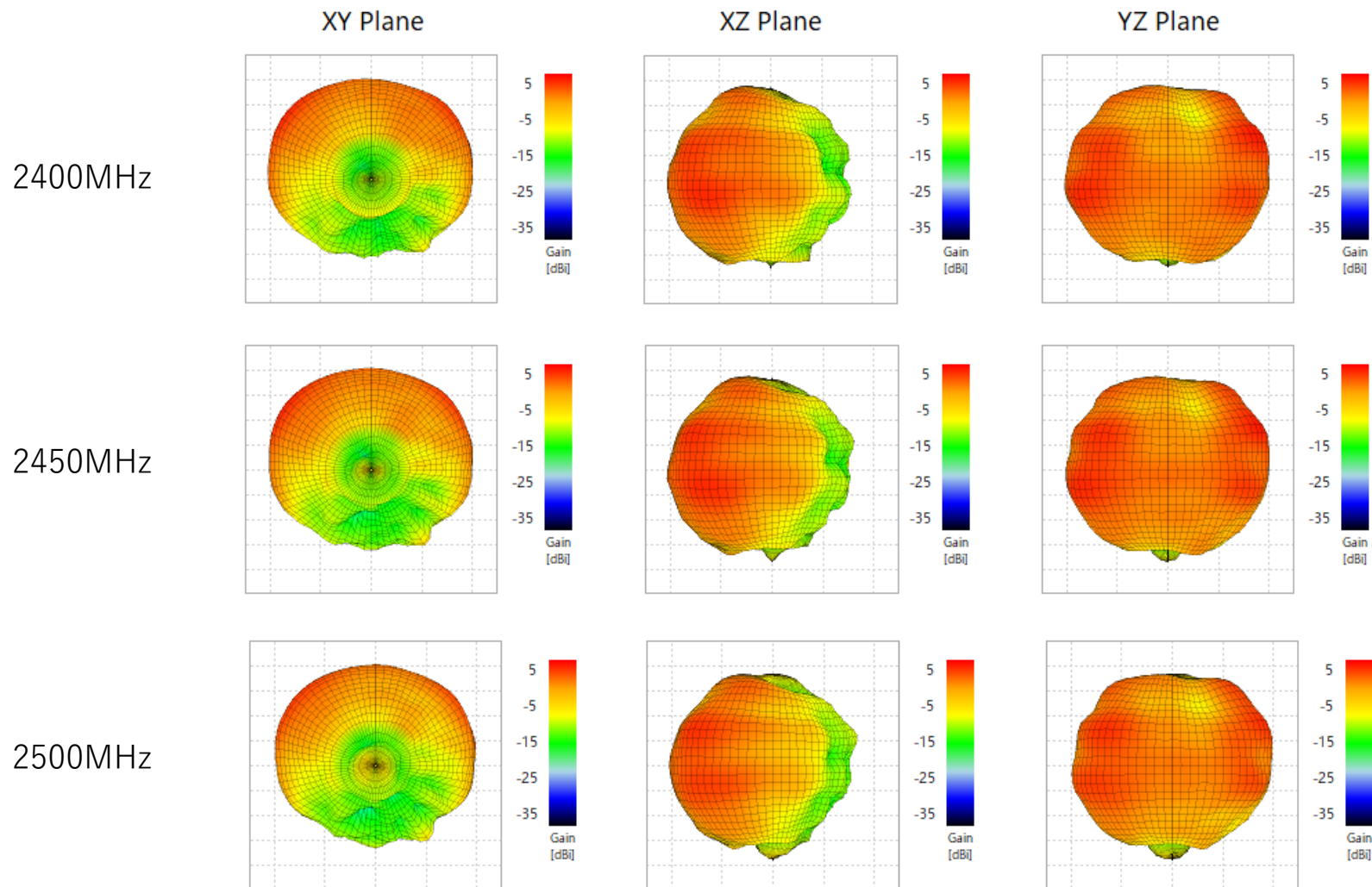
Frequency [GHz]	V.S.W.R.
① 2.400	1.72
② 2.450	1.57
③ 2.500	1.80
Min.Freq.	2.435



Frequency [GHz]	[dB]
① 2.400	11.58
② 2.450	13.07
③ 2.500	10.86
Min.Freq.	2.435

25CY-VOLVO Report on Actual Machine Evaluation1

3D Radiation Pattern



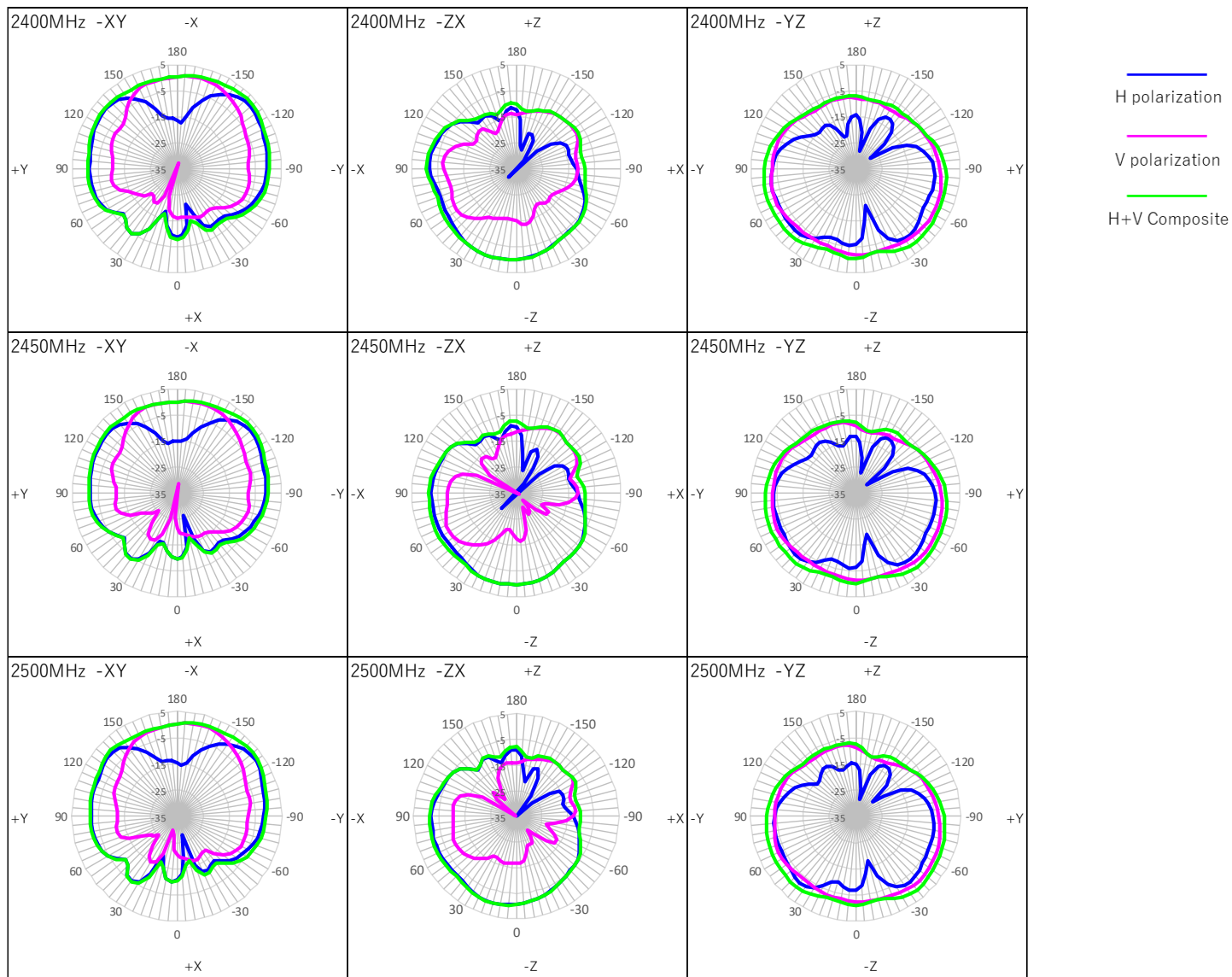
25CY-VOLVO Report on Actual Machine Evaluation1

Gain

Frequency [MHz]	Plane	Polarization H:Horizontal V:Vertical	Peak [dBi]	Average [dBi]	Ave.linear value	Composite linear value	Composite [dBi]	XY-ZX [dBi]	XY-ZX-YZ [dBi]	XY-ZX-YZ Composite Average [dBi]
2400	XY	H	2.11	-2.72	0.53	0.85	-0.72	-1.94	-1.82	-2.02
		V	1.02	-5.03	0.31					
	ZX	H	0.16	-4.49	0.36	0.43	-3.66	XY-ZX Composite Average [dBi]		
		V	-6.82	-11.28	0.07					
	YZ	H	-1.80	-6.06	0.25	0.69	-1.59	-----	-2.18	
		V	-0.69	-3.51	0.45					
2450	XY	H	2.08	-3.13	0.49	0.79	-1.04	-2.06	-1.85	
		V	0.65	-5.21	0.30					
	ZX	H	0.28	-4.22	0.38	0.46	-3.39			
		V	-5.30	-10.95	0.08					
	YZ	H	-2.05	-6.12	0.24	0.71	-1.46	-----		
		V	0.03	-3.28	0.47					
2500	XY	H	1.75	-3.74	0.42	0.71	-1.49	-2.58	-2.41	
		V	0.93	-5.41	0.29					
	ZX	H	-0.03	-4.62	0.34	0.39	-4.04			
		V	-8.61	-13.02	0.05					
	YZ	H	-2.05	-6.64	0.22	0.62	-2.09	-----		
		V	-0.53	-3.96	0.40					

25CY-VOLVO Report on Actual Machine Evaluation1

Gain



on Pattern , TRP

Control Unit

Network Analyzer

Measurement Antenna

$\theta = 0$

$\theta = 0 \sim 165^\circ$

$\phi = 0, \theta = 90$

$\phi = 90$

ϕ - axis

1.5m

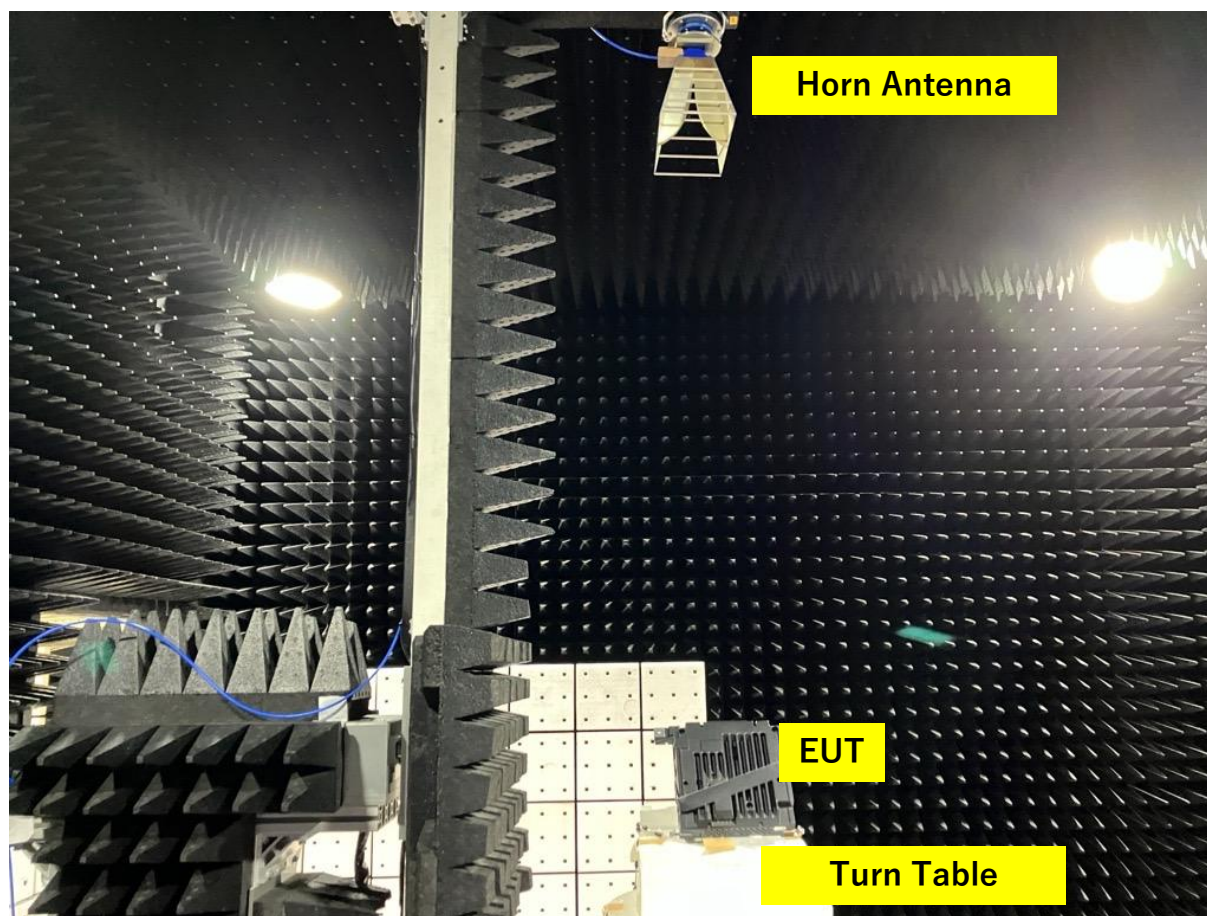
1.5m

Shielded Anechoic Chamber

Device	Type/Model	Serial	Manufacturer	Last Calibration
Anechoic chamber	-	-	NISSEI ELECTRIC CO., LTD.	N/A
Turn Table	-	-	NISSEI ELECTRIC CO., LTD.	N/A
Control Unit	-	-	NISSEI ELECTRIC CO., LTD.	N/A
Boresight antenna mast	-	-	NISSEI ELECTRIC CO., LTD.	N/A
Horn antenna	SH800	SH800-0126	SATIMO	2024/7
Sleeve Dipole	3126-2450	00046795	ETS-Lindgren	2024/6
Sleeve Dipole	3126-5500	00237284	ETS-Lindgren	2024/6
Wideband Dipole	WD6000	WD6000-22	Microwave Vision Italy s.r.l	2024/7
Port Cable 2m - 0.1GHz~18.5GHz	MCCA011-2000L	-	NISSEI ELECTRIC CO., LTD.	N/A
Port Cable 2m - 0.1GHz~18.5GHz	MCCA011-2000L	-	NISSEI ELECTRIC CO., LTD.	N/A
Port Cable 3m - 0.1GHz~18.5GHz	MCCA011-3000L	-	NISSEI ELECTRIC CO., LTD.	N/A
Port Cable 5m - 0.1GHz~18.5GHz	MCCA011-5000L	-	NISSEI ELECTRIC CO., LTD.	N/A
Port Cable 7m - 0.1GHz~18.5GHz	MCCA011-7000L	-	NISSEI ELECTRIC CO., LTD.	N/A
Ferrite Cable 2.5m - 0.1GHz~18.5GHz	X10511A	-	NISSEI ELECTRIC CO., LTD.	N/A
Network Analyzer	P9372A	MY57211112	Keysight	2024/4
Antenna gain measurement system	-	-	NISSEI ELECTRIC CO.,LTD.	2024/10

Test Date : 2024.11.13~2024.11.18

Test Operator : Sayaka Naka





Device	Type/Model	Serial	Manufacturer	Last Calibration
Anechoic chamber	-	602477-0	NISSEI ELECTRIC CO., LTD.	N/A
Turn Table	-	602477-0	NISSEI ELECTRIC CO., LTD.	N/A
Control Unit	-	602544-1	NISSEI ELECTRIC CO., LTD.	N/A
Boresight antenna mast	-	602477-0	NISSEI ELECTRIC CO., LTD.	N/A
Horn antenna	3115	9107-3687	ETS-Lindgren	N/A
Horn antenna for Cal.	SH800	SH800-0126	SATIMO	2024/7
Port Cable 0.1GHz~18.5GHz	MCCA011	-	NISSEI ELECTRIC CO., LTD.	N/A
Ferrite Cable 2.5m - 0.1GHZ~18.5GHz	X10511A	-	NISSEI ELECTRIC CO., LTD.	N/A
Network Analyzer	P9372A	MY57212766	Keysight	2024/6
Antenna gain measurement system	-	-	NISSEI ELECTRIC CO.,LTD.	2024/7

Test Date : 2024.11.13~2024.11.18

Test Operator : Sayaka Naka

