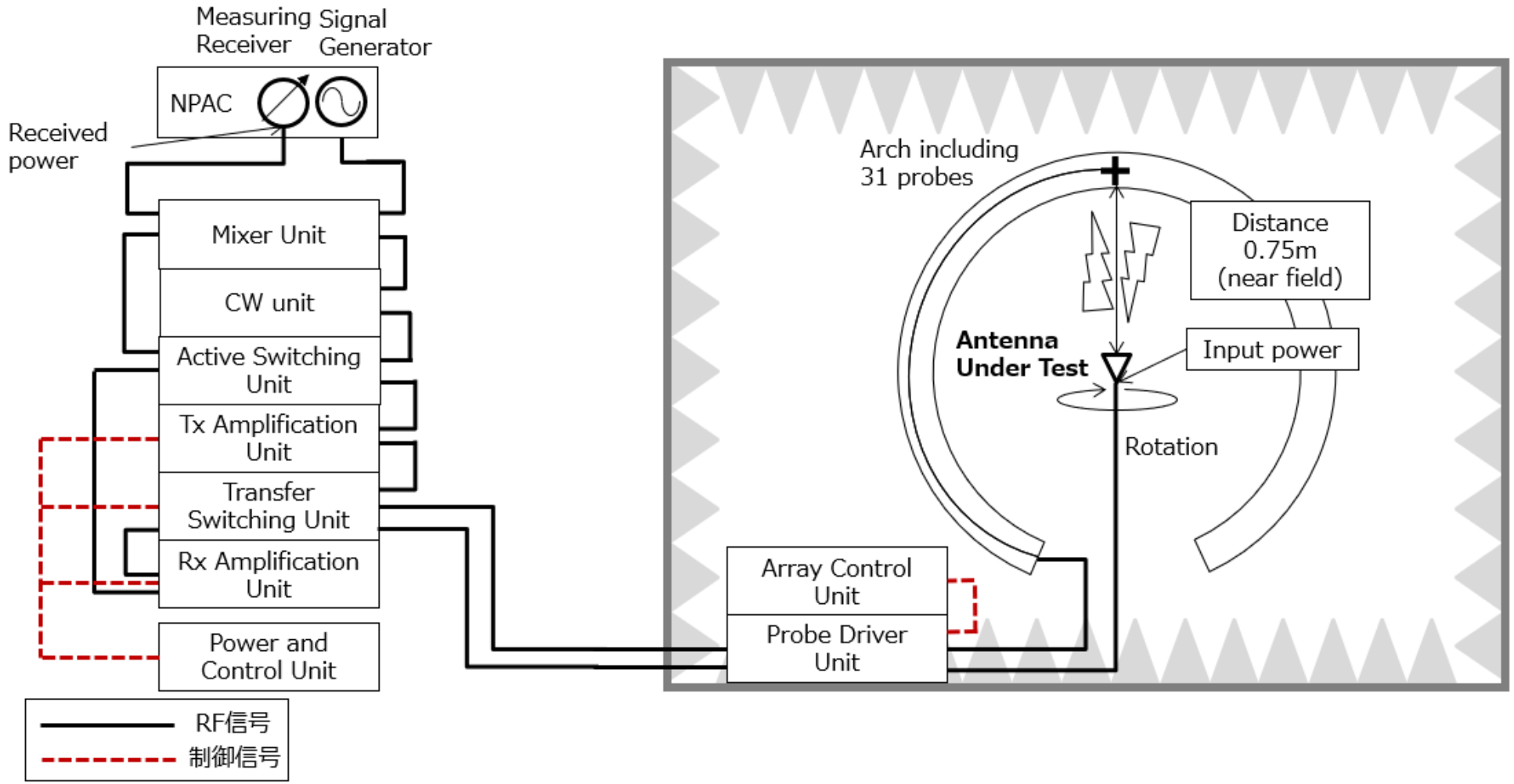
1.Measurement Procedure

- The antenna gain is measured in a fully anechoic chamber



2. Test Equipment and Measurement Software

Used	Equipment Description	Model No.	Serial No.	Manufacturer	Cal. Interval	Last Cal.	Remark
Y	Absorber Chamber	B83117-A1421-T161	21061	Albatross Projects	N/A	N/A	
Y	Multi-Probe Measurement System	SG32	1102611-0001	MVG	12 months	2023.09.25	
N	Dual-Ridge Horn Antenna (0.6-6.0 GHz)	SH600	30	MVG	N/A	N/A	Reference Antenna
N	Sleeve-Dipole Antenna (0.69-0.8 GHz)	SD740	32	MVG	N/A	N/A	Reference Antenna
N	Sleeve-Dipole Antenna (0.865-0.93 GHz)	SD900	153	MVG	N/A	N/A	Reference Antenna
N	Radio Communication Tester	MT8821A	6261711661	ANRITSU	12 months	2022.06.20	For OTA
Y	Signal Generator and Receiver	NPAC	1102249-2495	MVG	N/A	N/A	For Passive
Y	Mixer Unit	MU	1102545-2491	MVG	N/A	N/A	
Y	CW Unit	CWU	1102188-2573	MVG	N/A	N/A	
Y	Active Switching Unit	ASU	1101217-2569	MVG	12 months	2023.09.26	
Y	Tx Amplification Unit	TxAU	1102527-2493	MVG	N/A	N/A	
Y	Rx Amplification Unit	RxAU	1102537-2492	MVG	N/A	N/A	
Y	Transfer Switching Unit	TSU	1102181-2494	MVG	N/A	N/A	
Y	Probe Driver Unit	PDU	1102186-2487	MVG	N/A	N/A	
Y	Power and Control Unit	PACU	1102184-2529	MVG	N/A	N/A	
Y	Array Control Unit	ACU	1102345-2489	MVG	N/A	N/A	

- The calibration is valid until the end of the expiration month.

Used	Software Description	Model No.	Version	Manufacturer	Remark
Y	Automated Antenna and OTA Measurement Software Suite	MVG WaveStudio	22.5.5	MVG	
Y	Near-Field to Far-Field Transformation Software	MV-Sphere	3.0.1	MVG	

3. Antenna Specification

	Type	BAND	No.	Country	Frequency	Antenna Gain		Loss Correction	Antenna Gain + Cable + ATT (Measured value)	Antenna Pattern Loss
						Peak Gain	Measured Frequency			
Chain 1	Slot	6GHz	1	FCC/ISED	5955~7095	**-1.14 dBi**	6000MHz	0.15dB	+0.43 dBi	1.72 dB
		5GHz	3	FCC/ISED	5180~5825	**+1.13 dBi**	5500MHz	0.19dB	+2.67 dBi	1.73 dB
		2.4GHz	4	FCC/ISED	2412~2472	**+1.65 dBi**	2460MHz	---	+2.02 dBi	0.37 dB
	mono	6GHz	5	FCC/ISED	5955~7095	**-1.25 dBi**	6000MHz	0.15dB	+0.32 dBi	1.72 dB
		5GHz	7	FCC/ISED	5180~5825	**+0.57 dBi**	5600MHz	0.14dB	+2.15 dBi	1.72 dB
		2.4GHz	8	FCC/ISED	2412~2472	**+1.60 dBi**	2460MHz	---	+1.97 dBi	0.37 dB
Chain 0	mono	6GHz	9	FCC/ISED	5955~7095	**-1.36 dBi**	6100MHz	0.15dB	+0.50 dBi	2.01 dB
		5GHz	11	FCC/ISED	5180~5825	**+0.51 dBi**	5800MHz	0.14dB	+2.16 dBi	1.79 dB
		2.4GHz	12	FCC/ISED	2402~2480	**-0.23 dBi**	2460MHz	---	+0.20 dBi	0.43 dB

*Antenna1, 3, Antenna5, 7, Antenna9, 11 are connected exclusively to respective antenna ports. (5/6GHz)

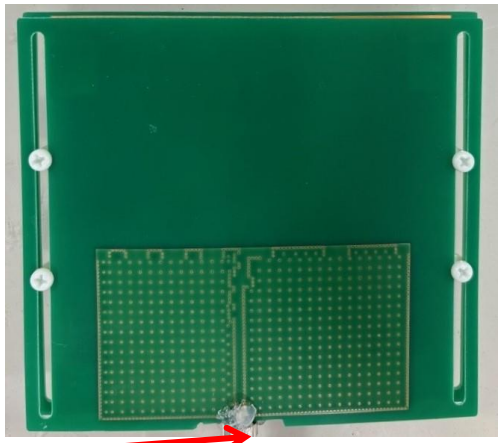
*Antenna Gain(Peak) = (Antenna Gain + Cable + ATT (Measured value)) + Loss Correction – Antenna Pattern Loss

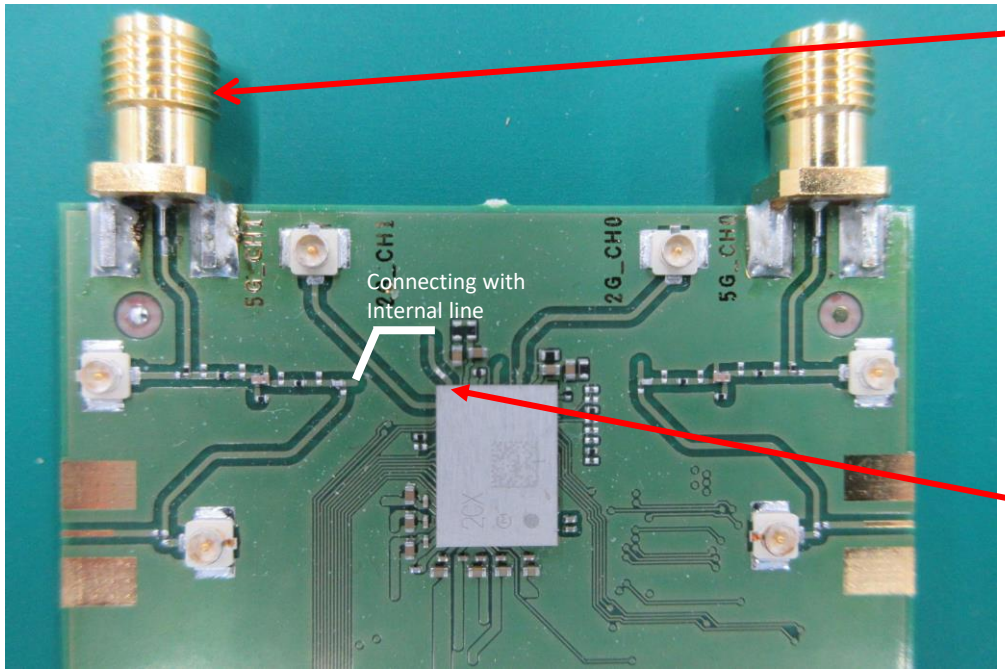
*Antenna pattern loss is the value in the Installation Manual Antenna section[From the RF OUT of the module Line loss information to each Port of board].

3. Antenna Specification

Antenna1

Antenna Item Name : Slot Antenna
Antenna Model Name : chain1_slot_6GHz
Antenna Type : Slot Antenna
Antenna Peak Gain : -1.14dBi @ 5955-7095MHz（FCC/ISED）
-1.14dBi @ 5955-6415MHz（EU/JPN）





Connecting with coaxial cable(length 200mm)

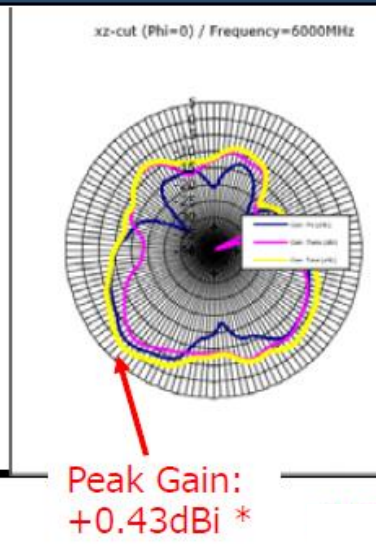
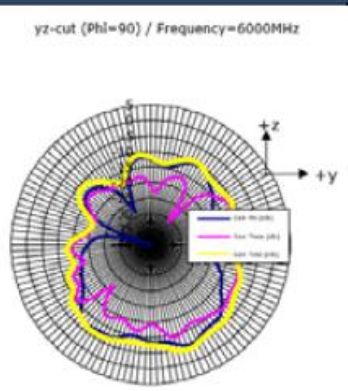
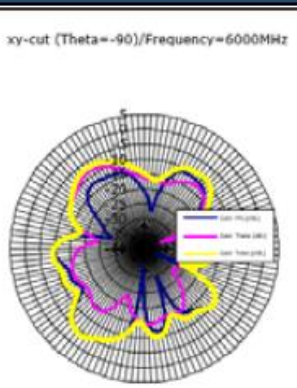
Feeding Point

Antenna1

Date of Testing: December 8, 2023

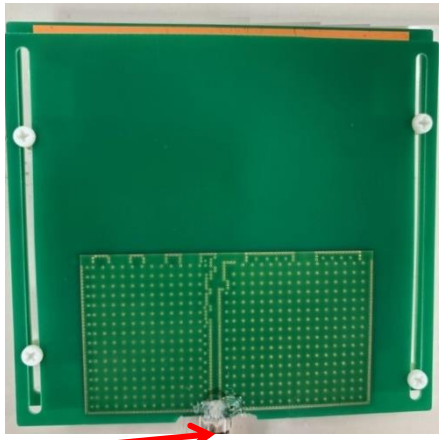
Tested Personnel: Takuma Asai

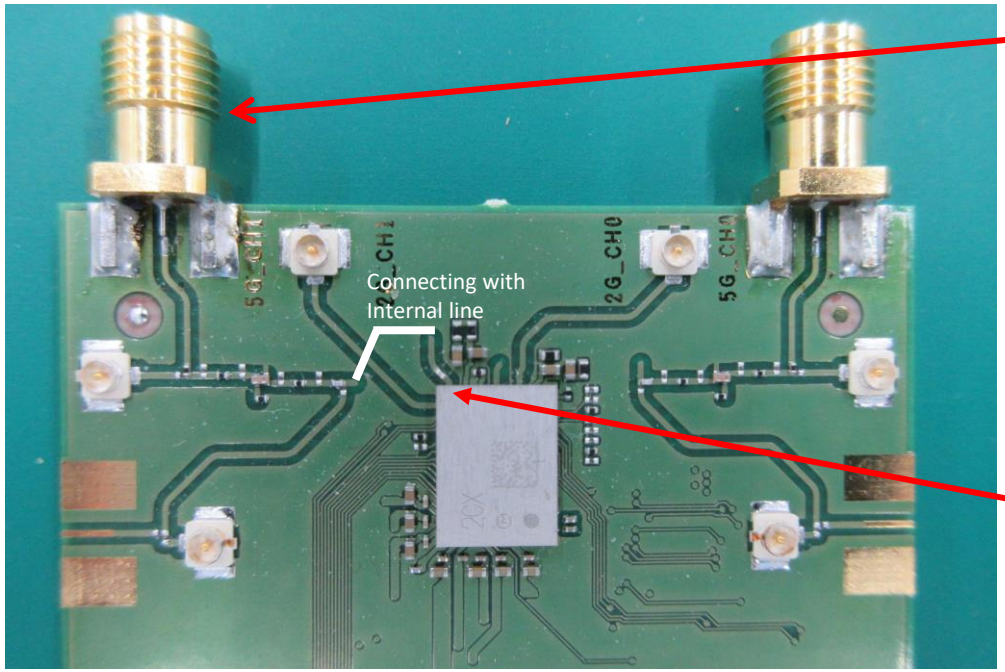
Antenna	Frequency (MHz)	Peak Gain (dBi)	Remark
Antenna 1	6000	+0.43	

Frequency Band	XZ-cut	YZ-cut	XY-cut
6.0 GHz			

Antenna 3

Antenna Item Name : Slot Antenna
Antenna Model Name : chain1_slot_5GHz
Antenna Type : Slot Antenna
Antenna Peak Gain : +1.13dBi @ 5180-5825MHz（FCC/ISED/EU/JPN）





Connecting with coaxial cable(length 200mm)

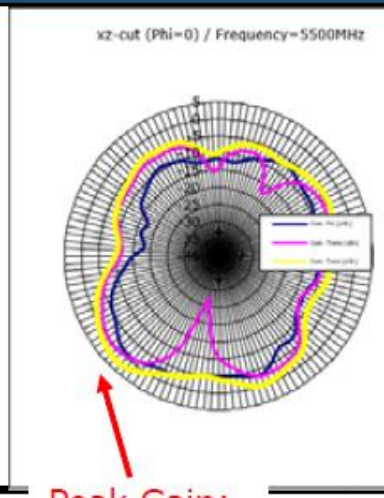
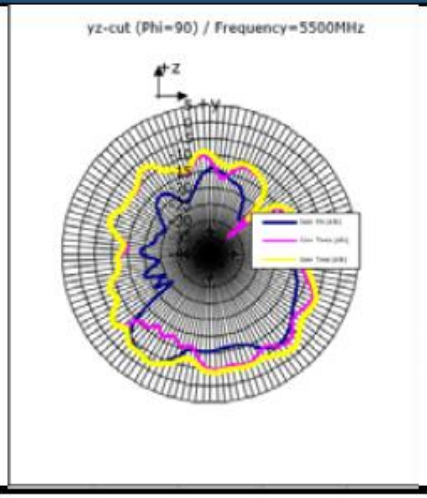
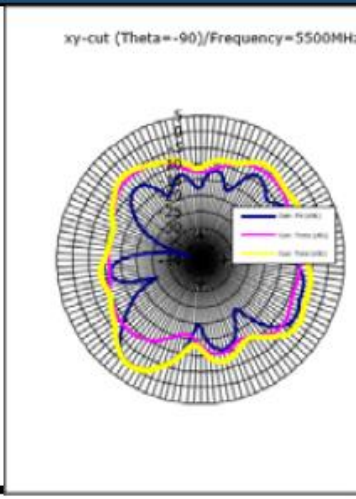
Feeding Point

Antenna 3

Date of Testing: December 7, 2023

Tested Personnel: Takuma Asai

Antenna	Frequency (MHz)	Peak Gain (dBi)	Remark
Antenna 3	5500	+2.67	

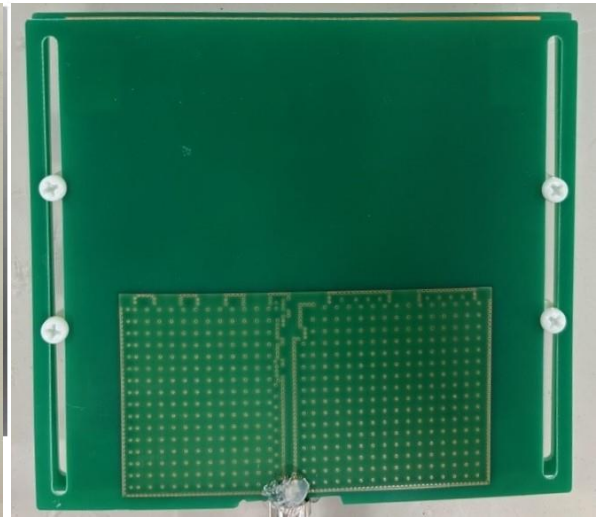
Frequency Band	XZ-cut	YZ-cut	XY-cut
5.5 GHz			

Peak Gain:
+2.67dBi *

Difference between Antenna 1 and Antenna 3

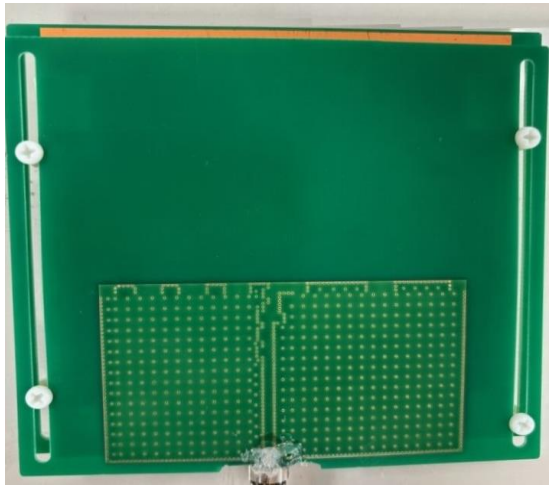
Antenna 1

Antenna Model Name:	①chain1_slot_6GHz
Antenna Type:	Slot
Input Impedance:	50 ohm



Antenna 3

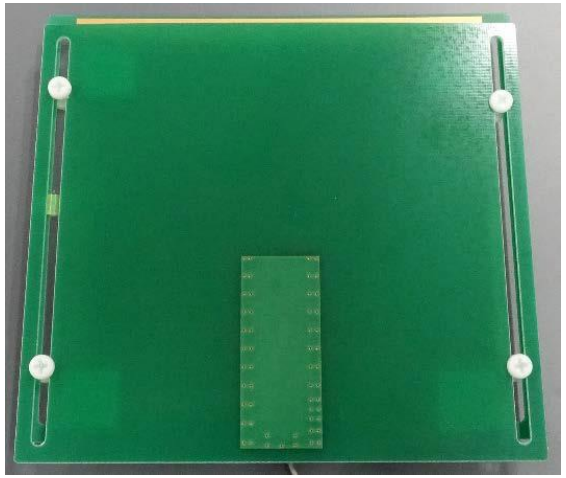
Antenna Model Name:	③chain1_slot_5GHz
Antenna Type:	Slot
Input Impedance:	50 ohm

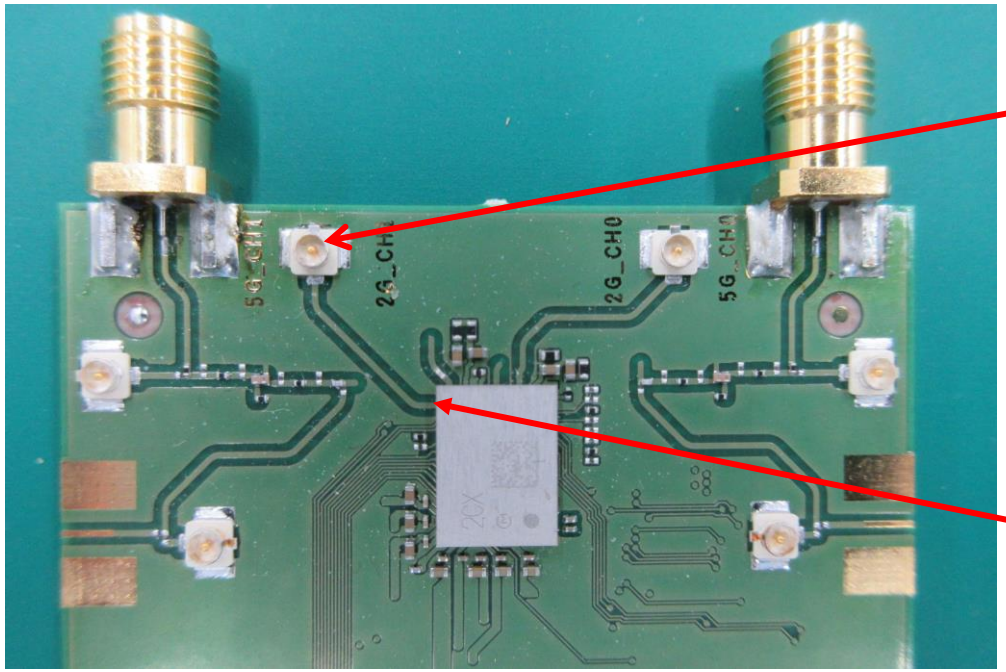


The antennas are the same. The frequency bands are different.

Antenna 4

Antenna Item Name : Slot Antenna
Antenna Model Name : chain1_slot_2.4GHz
Antenna Type : Slot Antenna
Antenna Peak Gain : +1.65dBi @ 2412-2472MHz（FCC/ISED/EU/JPN）





Connecting with coaxial cable(length 200mm)

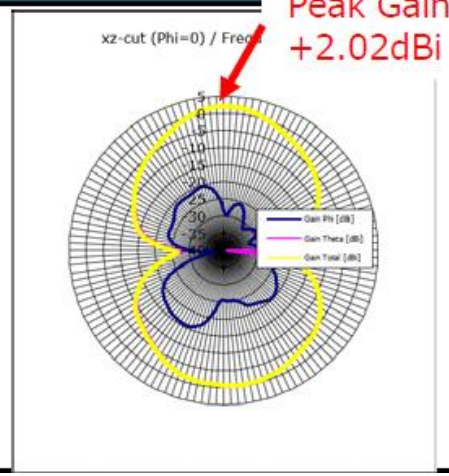
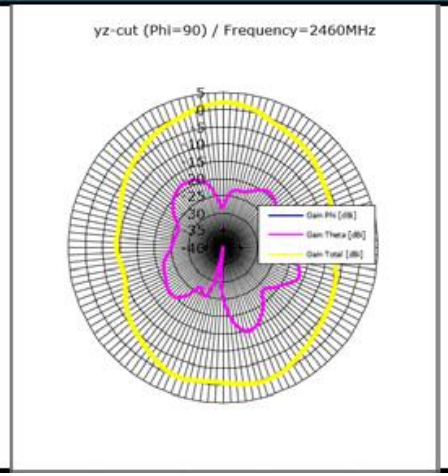
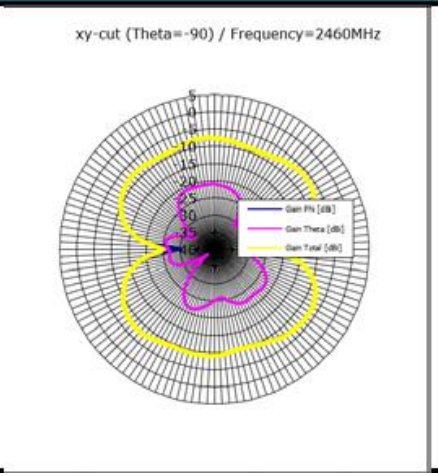
Feeding Point

Antenna 4

Date of Testing: June 14, 2023

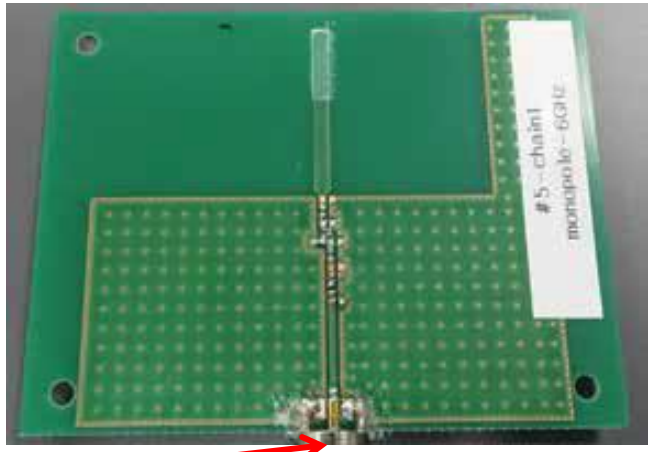
Tested Personnel: Takuma Asai

Antenna	Frequency (MHz)	Peak Gain (dBi)	Remark
Antenna 4	2460	+2.02	

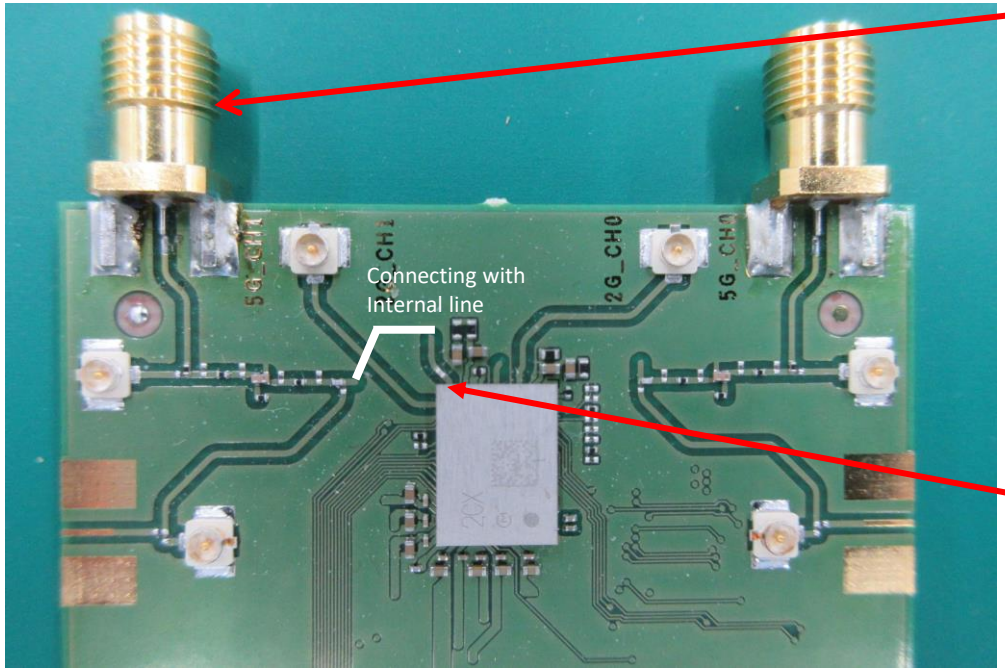
Frequency Band	XZ-cut	YZ-cut	XY-cut
2.460 GHz			

Antenna 5

Antenna Item Name : Monople Antenna
Antenna Model Name : chain1_monopole_6GHz
Antenna Type : Monople Antenna
Antenna Peak Gain : -1.25dBi @ 5955-7095MHz（FCC/ISED）
-1.25dBi @ 5955-6415MHz（EU/JPN）



Connecting with coaxial cable(length 200mm)



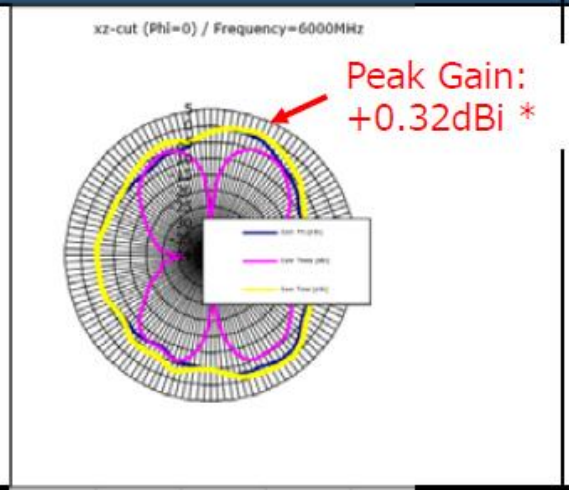
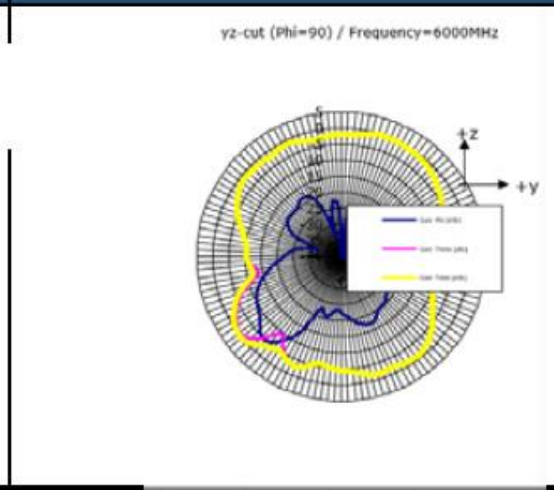
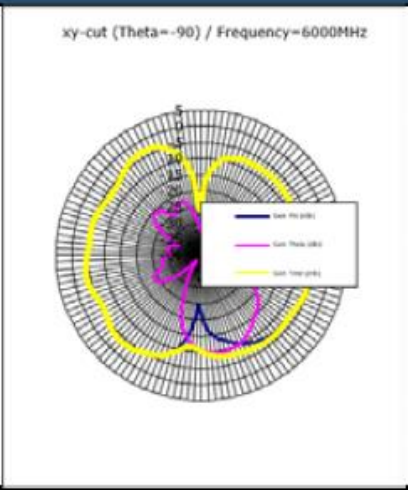
Feeding Point

Antenna 5

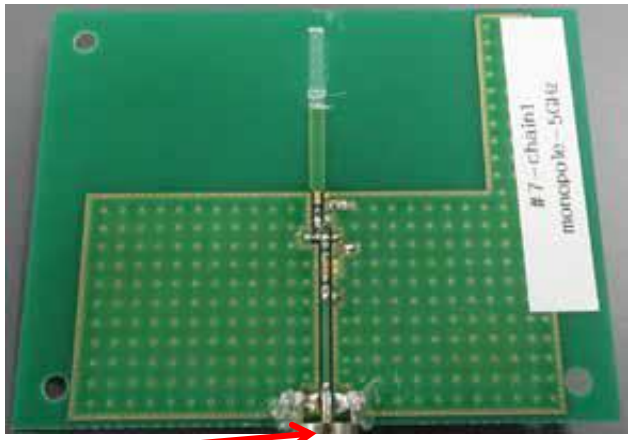
Date of Testing: December 8, 2023

Tested Personnel: Takuma Asai

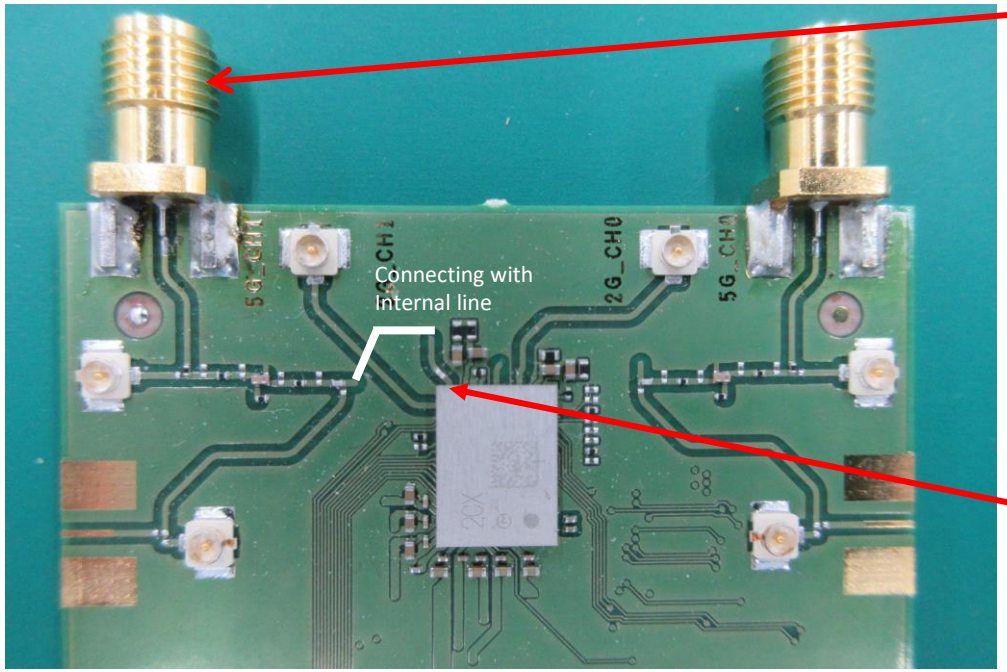
Antenna	Frequency (MHz)	Peak Gain (dBi)	Remark
Antenna 5	6000	+0.32	

Frequency Band	XZ-cut	YZ-cut	XY-cut
6.0 GHz			

Antenna Item Name : Monople Antenna
Antenna Model Name : chain1_monopole_5GHz
Antenna Type : Monople Antenna
Antenna Peak Gain : +0.57dBi @ 5180-5825MHz（FCC/ISED/EU/JPN）



Connecting with coaxial cable(length 200mm)



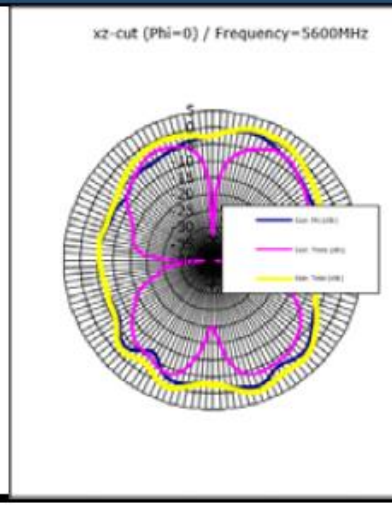
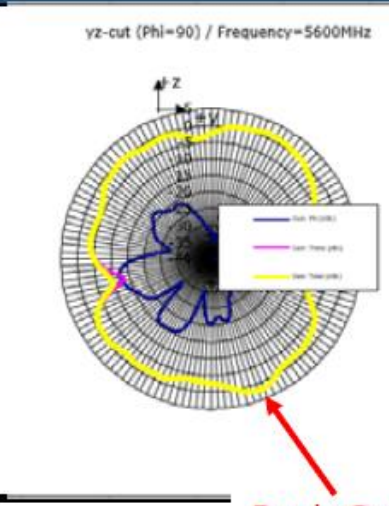
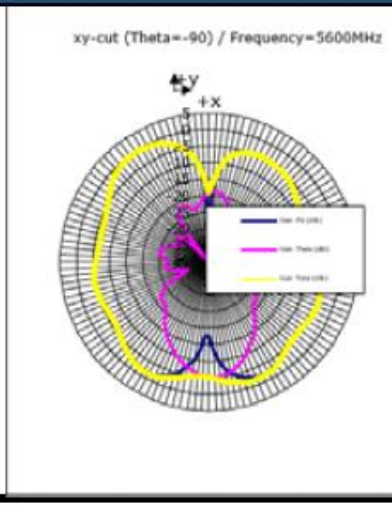
Feeding Point

Antenna 7

Date of Testing: November 16, 2023

Tested Personnel: Takuma Asai

Antenna	Frequency (MHz)	Peak Gain (dBi)	Remark
Antenna 7	5600	+2.15	

Frequency Band	XZ-cut	YZ-cut	XY-cut
5.6 GHz		 Peak Gain: +2.15dBi *	

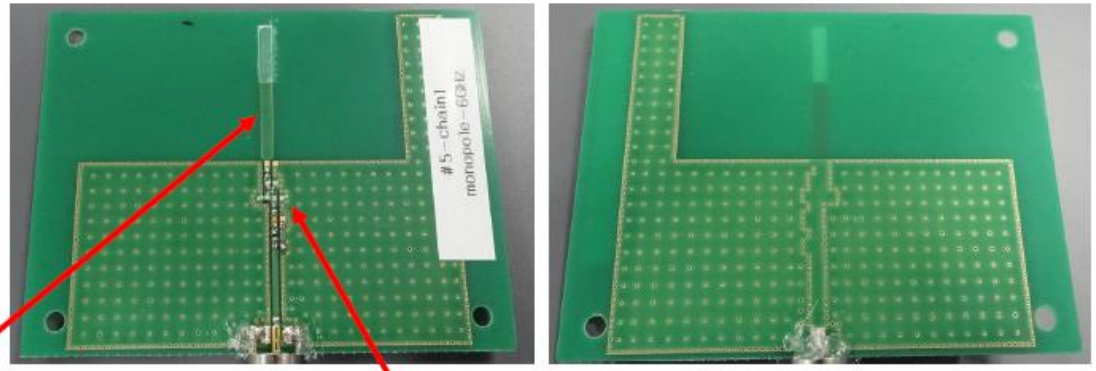
Difference between Antenna 5 and Antenna 7

Antenna 5

Antenna Model Name: ⑤chain1_monopole_6GHz

Antenna Type: Monopole

Input Impedance: 50 ohm



The pattern lengths are different.

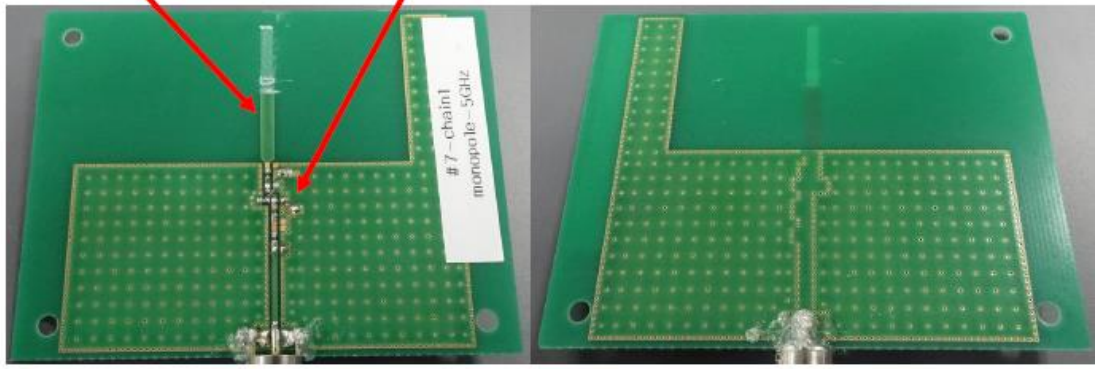
The circuit elements are different.

Antenna 7

Antenna Model Name: ⑦chain1_monopole_5GHz

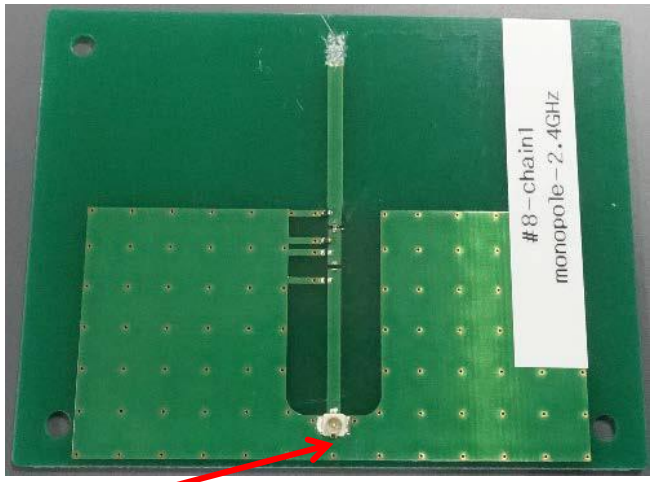
Antenna Type: Monopole

Input Impedance: 50 ohm

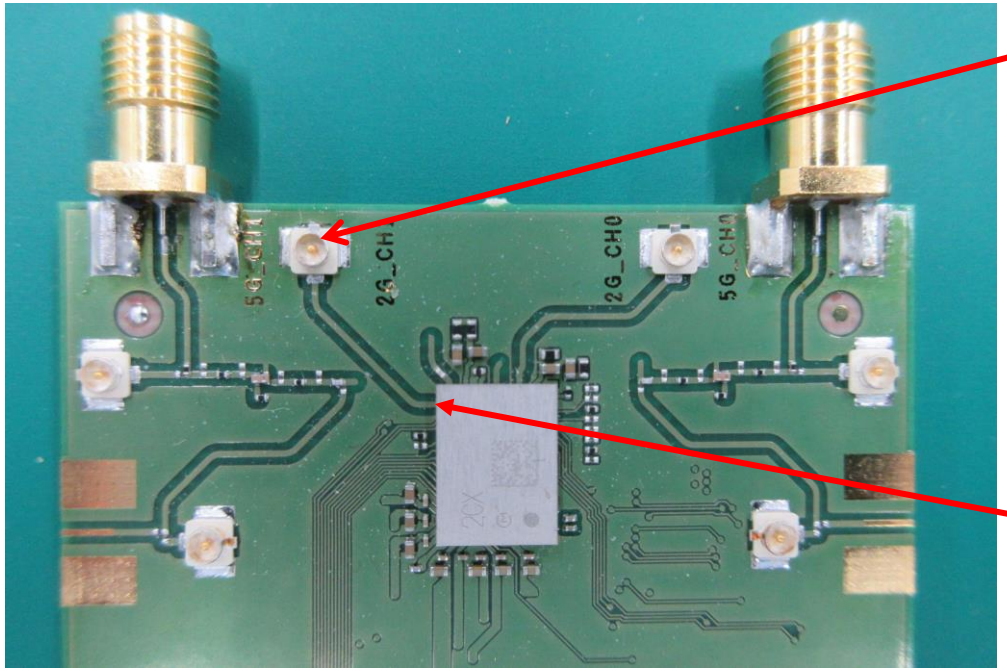


The pattern lengths and circuit elements are different.

Antenna Item Name : Monople Antenna
Antenna Model Name : chain1_monopole_2.4GHz
Antenna Type : Monople Antenna
Antenna Peak Gain : +1.60dBi @ 2412-2472MHz（FCC/ISED/EU/JPN）



Connecting with coaxial cable(length 200mm)



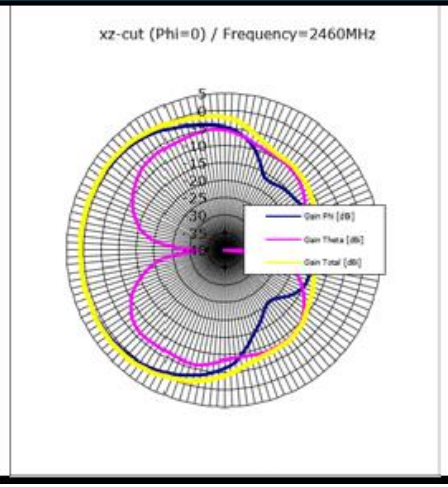
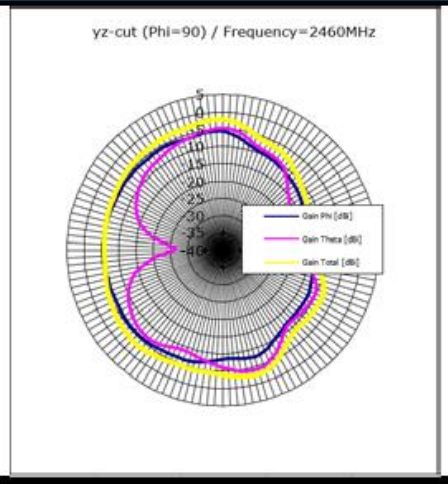
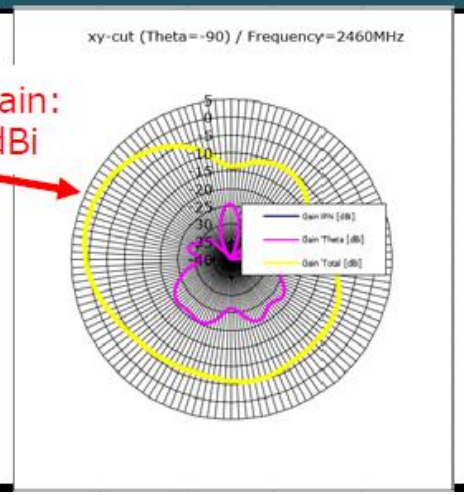
Feeding Point

Antenna 8

Date of Testing: June 12, 2023

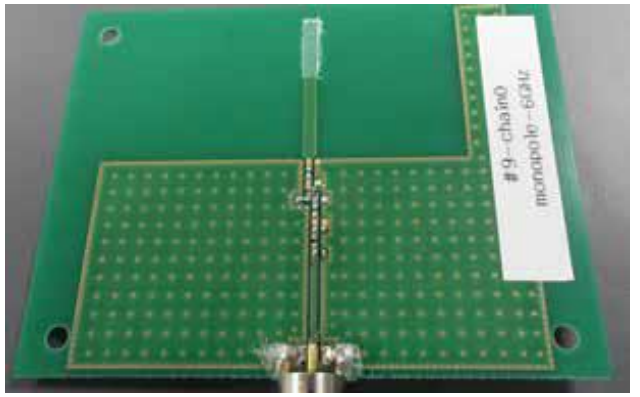
Tested Personnel: Takuma Asai

Antenna	Frequency (MHz)	Peak Gain (dBi)	Remark
Antenna 8	2460	+1.97	

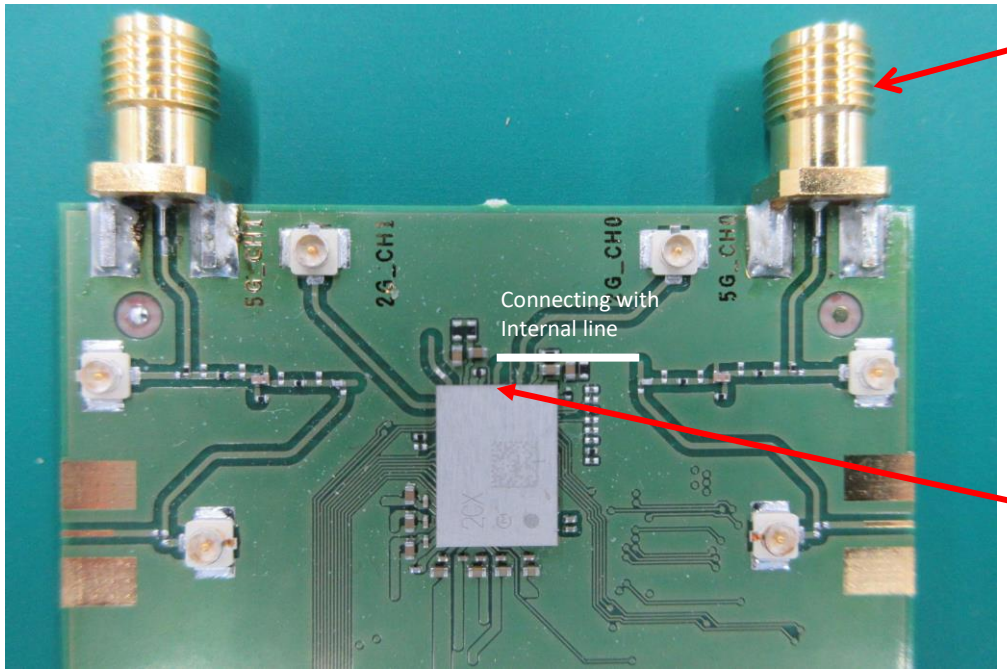
Frequency Band	XZ-cut	YZ-cut	XY-cut
2.460 GHz			Peak Gain: +1.97dBi 

2024/3/13

Antenna Item Name : Monople Antenna
Antenna Model Name : chain0_monopole_6GHz
Antenna Type : Monople Antenna
Antenna Peak Gain : -1.36dBi @ 5955-7095MHz（FCC/ISED）
-1.36dBi @ 5955-6415MHz（EU/JPN）



Connecting with coaxial cable(length 200mm)



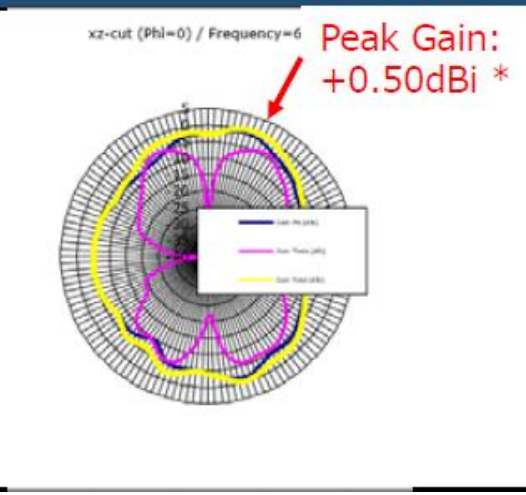
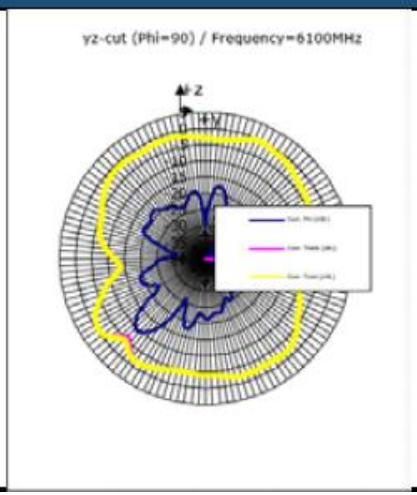
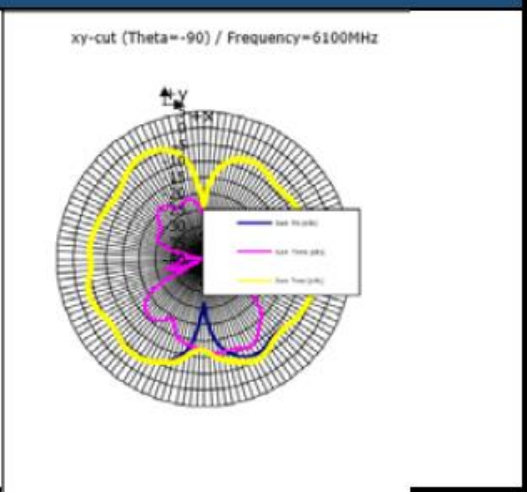
Feeding Point

Antenna 9

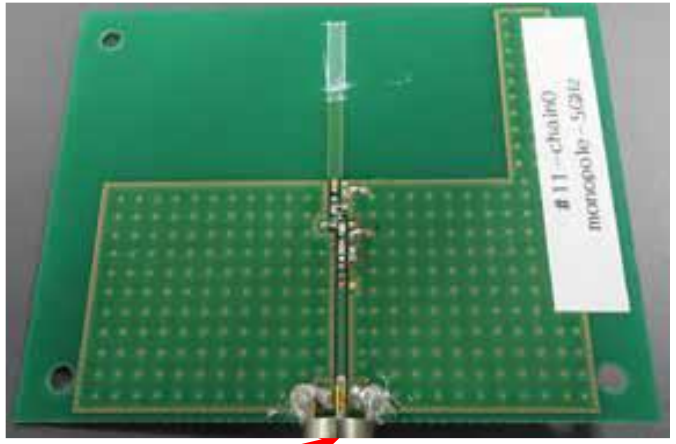
Date of Testing: December 7, 2023

Tested Personnel: Takuma Asai

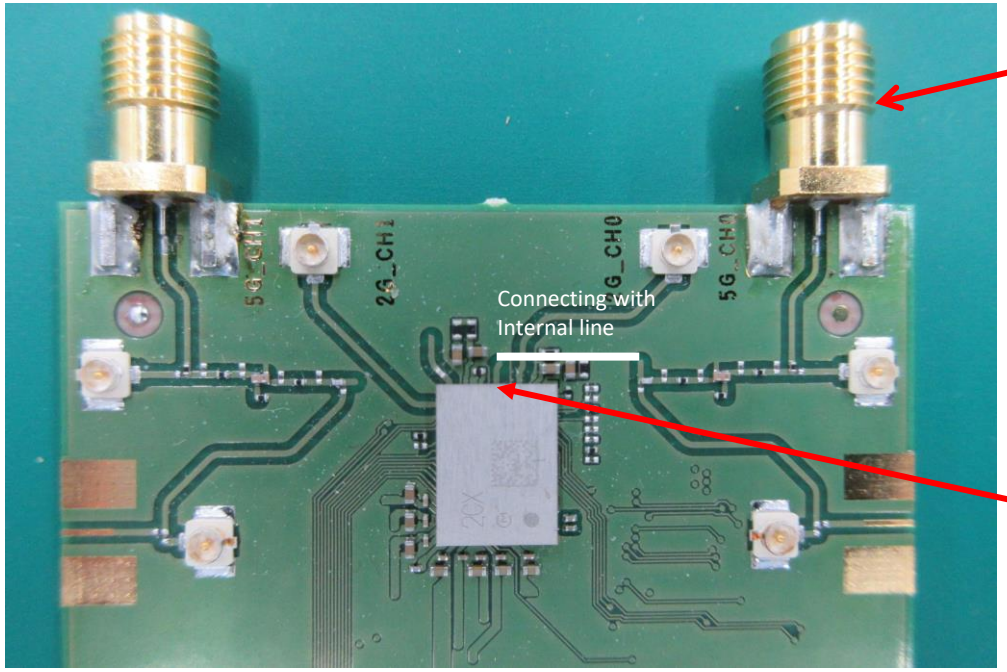
Antenna	Frequency (MHz)	Peak Gain (dBi)	Remark
Antenna 9	6100	+0.50	

Frequency Band	XZ-cut	YZ-cut	XY-cut
6.1 GHz			

Antenna Item Name : Monople Antenna
Antenna Model Name : chain0_monopole_5GHz
Antenna Type : Monople Antenna
Antenna Peak Gain : +0.51dBi @ 5180-5825MHz（FCC/ISED/EU/JPN）



Connecting with coaxial cable(length 200mm)



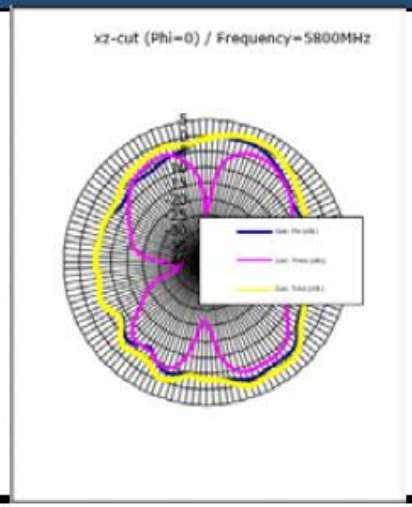
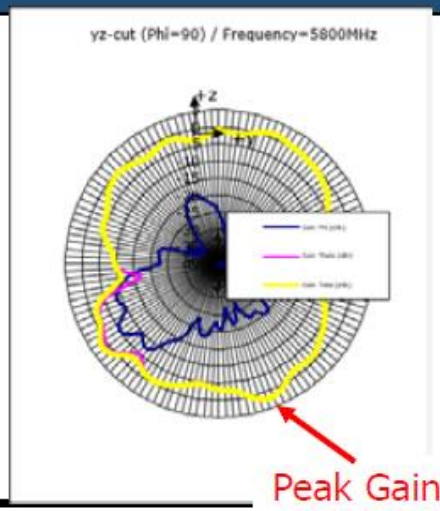
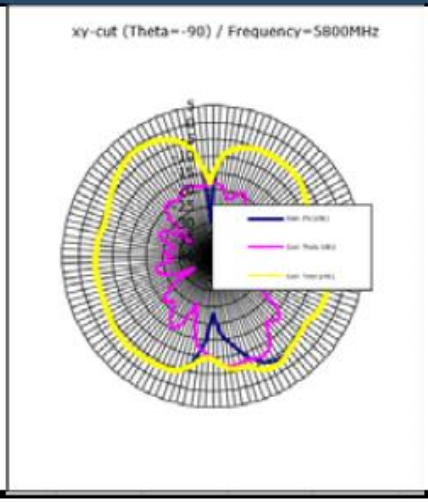
Feeding Point

Antenna 11

Date of Testing: November 15, 2023

Tested Personnel: Takuma Asai

Antenna	Frequency (MHz)	Peak Gain (dBi)	Remark
Antenna 11	5800	+2.16	

Frequency Band	XZ-cut	YZ-cut	XY-cut
5.8 GHz		 Peak Gain: +2.16dBi *	

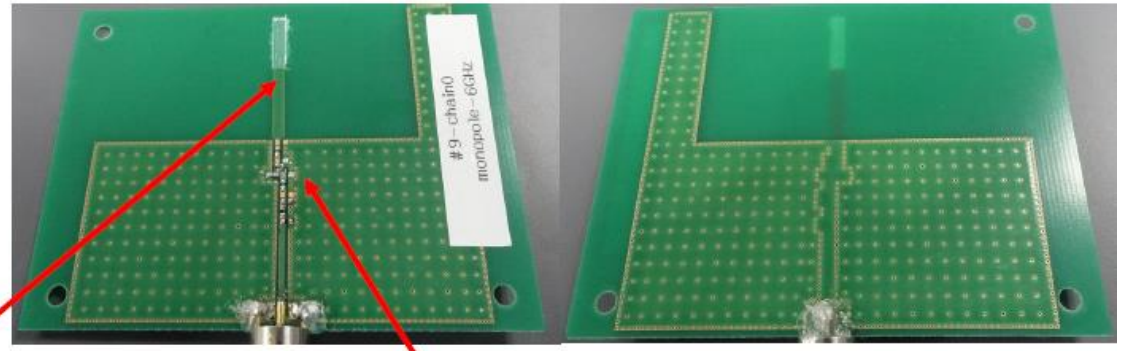
Difference between Antenna 9 and Antenna 11

Antenna 9

Antenna Model Name: ⑨chain0_monopole_6GHz

Antenna Type: Monopole

Input Impedance: 50 ohm



The pattern lengths are different.

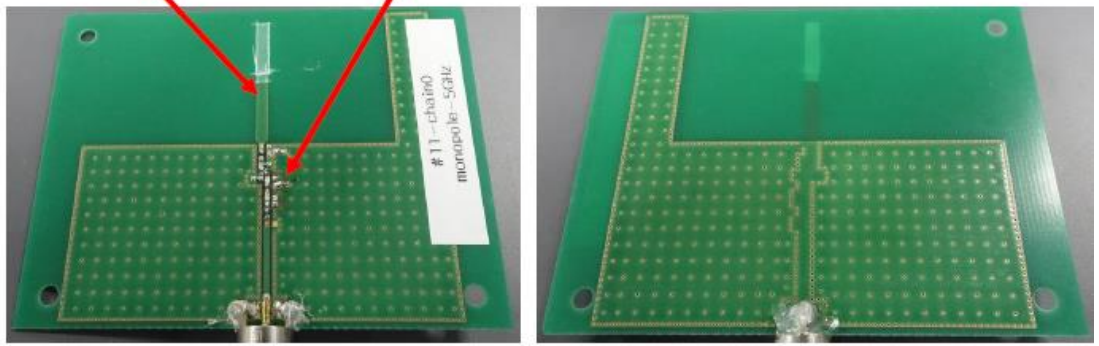
The circuit elements are different.

Antenna 11

Antenna Model Name: ⑪chain0_monopole_5GHz

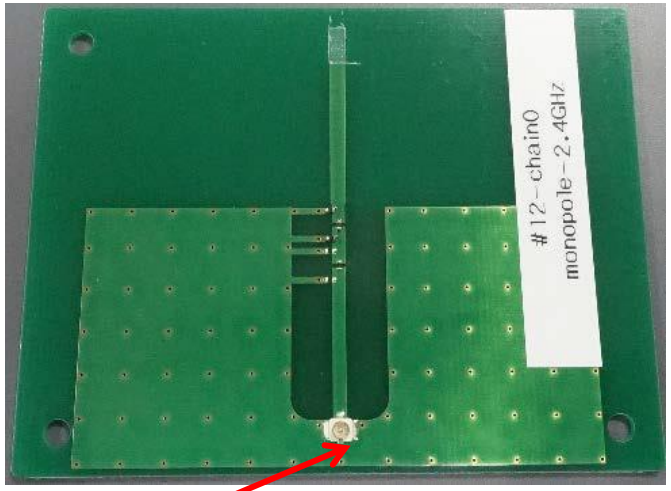
Antenna Type: Monopole

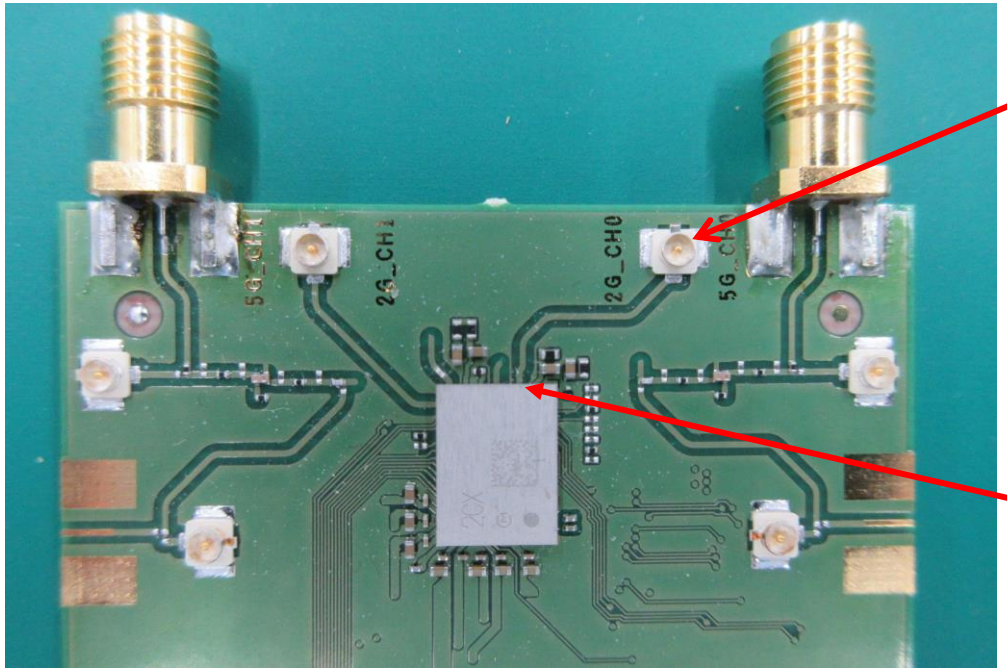
Input Impedance: 50 ohm



The pattern lengths and circuit elements are different.

Antenna Item Name : Monople Antenna
Antenna Model Name : chain0_monopole_2.4GHz
Antenna Type : Monople Antenna
Antenna Peak Gain : -0.23dBi @ 2412-2472MHz（FCC/ISED/EU/JPN）





Connecting with coaxial cable(length 200mm)

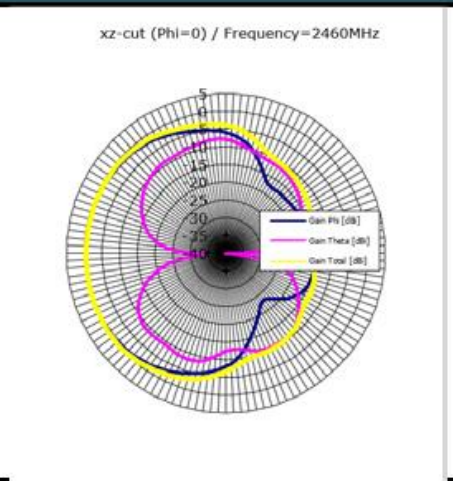
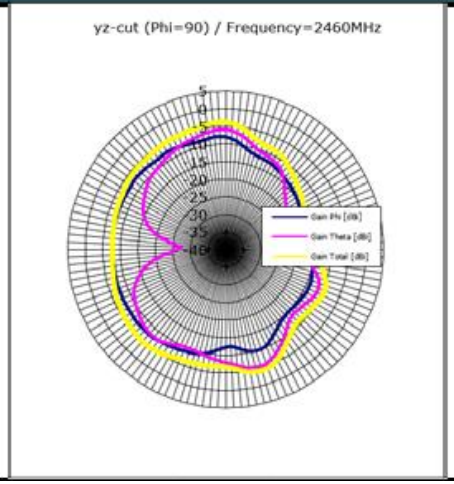
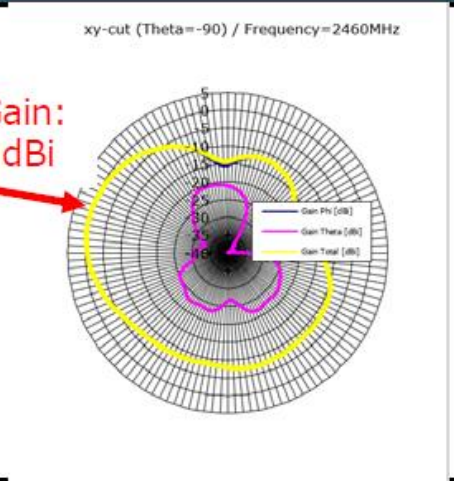
Feeding Point

Antenna 12

Date of Testing: June 20, 2023

Tested Personnel: Takuma Asai

Antenna	Frequency (MHz)	Peak Gain (dBi)	Remark
Antenna 12	2460	+0.20	

Frequency Band	XZ-cut	YZ-cut	XY-cut
2.460 GHz			

Appendix. Photographs of Test Setup