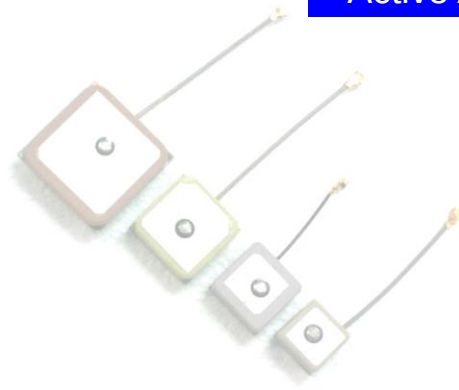




Approval Sheet

Type : Active Antenna (SDARS)
Part No : ASA252505-S0-A2
Customer Part No. :

	Designed	Checked		Approved
Date	/	/	/	/

Revision no	Content	Page	Date	Name
0	First, documented	-	2023.08.21	IJ. Jeong
1	Update the measurement data on customer set	-	2024.01.26	DS. Lee
2	Packing spec update	13	2024.08.08	IJ. Jeong
3	Overall Performance & Typical Characteristics update	3,5,6,7,8,9,10	2024.11.21	IJ. KIM



■ HEAD OFFICE 5B-1L, 617, NAMCHON-DONG, NAMDONG-GU, INCHOEN-CITY, KOREA TEL : 82-32-821-0363 FAX : 82-32-811-0283 ■ CHINA FACTORY WAISHANGGONGYEYUAN HIGH NEW TECHNOLOGY DEVELOPMENT AREA ZIBO SHANDONG P.R.CHINA 255086 TEL: 86-0533-358-7691 FAX: 86-0533-358-7689	Designed	Checked		Approved
	24.11.21			24.11.21

	SPECIFICATION	Page
	ASA252505-S0-A2	2/13

1. Specifications

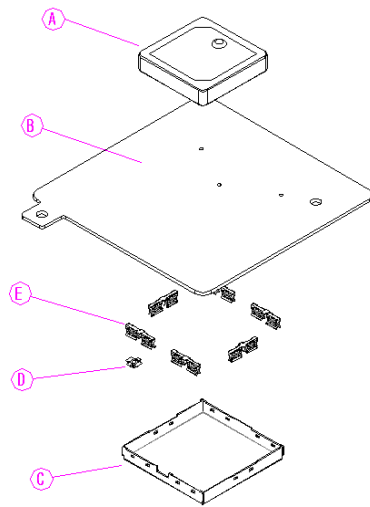
1.1 Patch Antenna Element Electrical Specifications

No	Item	Spec.	Unit	Remark
1	Frequency	2320.00 ~ 2345.00	MHz	Note: 1)
2	Polarization	LHCP	-	
3	LHCP Gain @ Zenith	Typ. 3.0~3.3	dBic	
4	Impedance	50	ohm	
5	Patch antenna	SH25-515E320-HM4	mm	

Note: 1) Measured on customer set **with Metal Bracket & Roof Glass**

1.2 LNA Electrical Specifications

No	Item	Spec.	Unit
1	Frequency	2320.00 ~ 2345.00	MHz
2	Gain @ 5V	Typ. 28.0 ~ 32.0	dB
3	Noise Figure @ 5V	Typ. 0.81	dB
4	Output VSWR	Typ. 2.0 : 1	-
5	Voltage	DC 4.0 ~ 5.1	V
6	Current @ 5.0V	Typ. 100~130 / Max. 185	mA
7	Impedance	50	ohm


Tear Down

	Part Name	Part No.	Remark
A	Patch Antenna	SH25-5152320-HM4	25x25x5mm
B	PCB	65x65x1.0mm, 2layer	FR4 T=1.0mm, color: black
C	Shieldcan	PES2018A	30x30x4mm (SUS)
D	MHF1 Receptacle	20279-001E-03	IPEX MHF1
E	Shieldcan Clip	PTC4944H	6pcs

2.2 Mechanical Specifications

No	Item	Spec.	Unit
1	Height	Max. 11.43	mm
2	Width	65.0 x 65.0 ± 0.1	mm
3	Connector	IPEX MHF1 Receptacle (20279-001E-03)	-

3. Part No

Part No: ASA XXXXXX - XX - XX
 (1) (2) (3) (4)

- (1) : AMOTECH SDARS Active Antenna
 (2) : Antenna Size
 (3) : Revision No.
 (4) : Model No.

4. Environmental Specifications

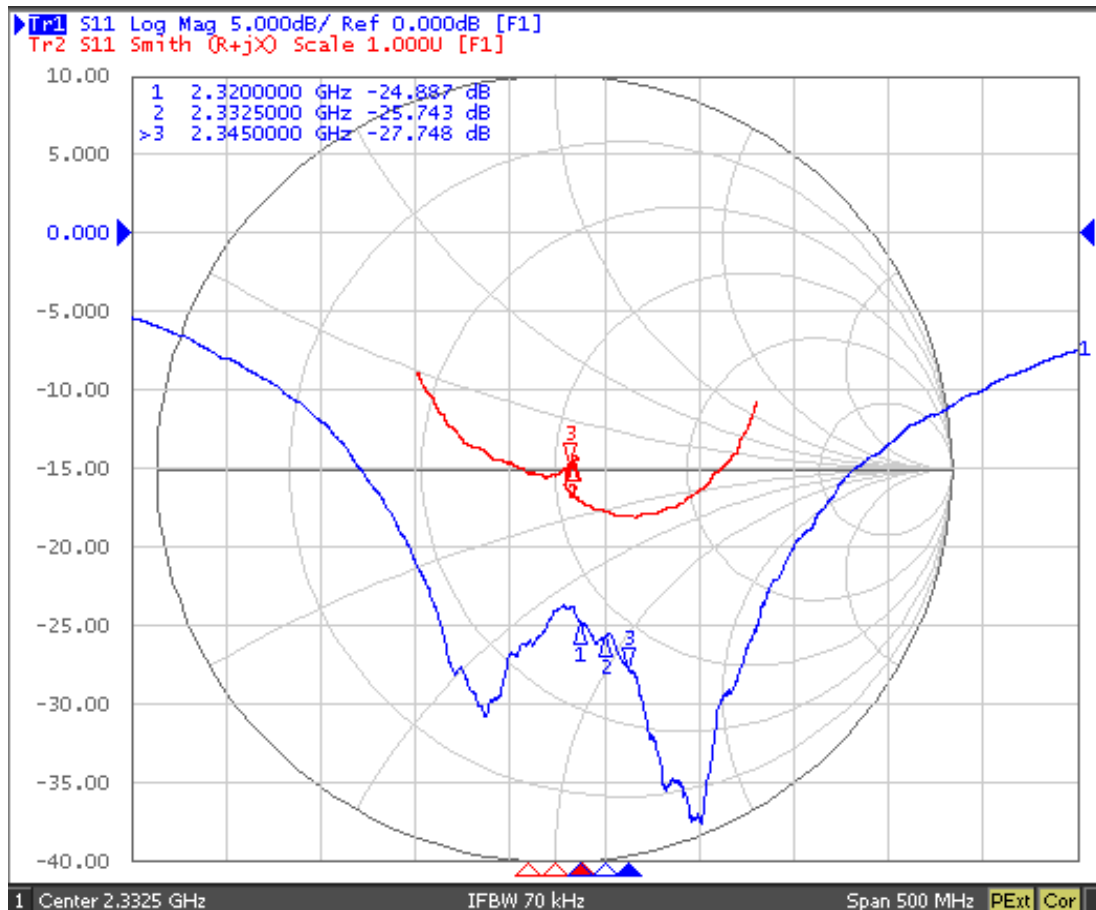
No	Item	Spec.	Unit
1	Operating Temp.	-40 ~ +105	°C
2	Storage Temp.	-40 ~ +105	°C

5. Typical Characteristics

5.1 Typical S11 of SDARS Patch Antenna rev.3

(Test condition: Customer set with Metal Bracket & Roof Glass)

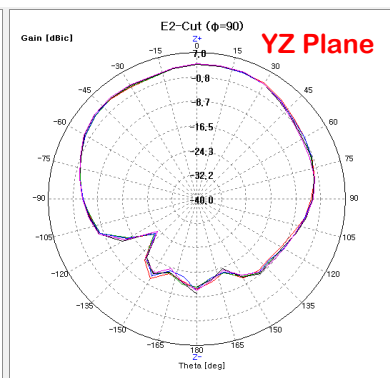
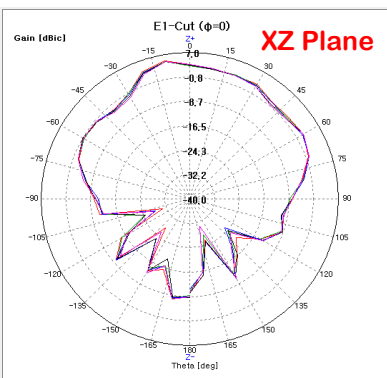
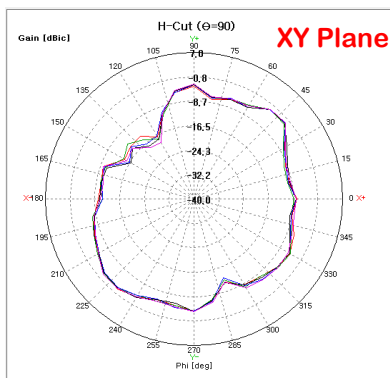
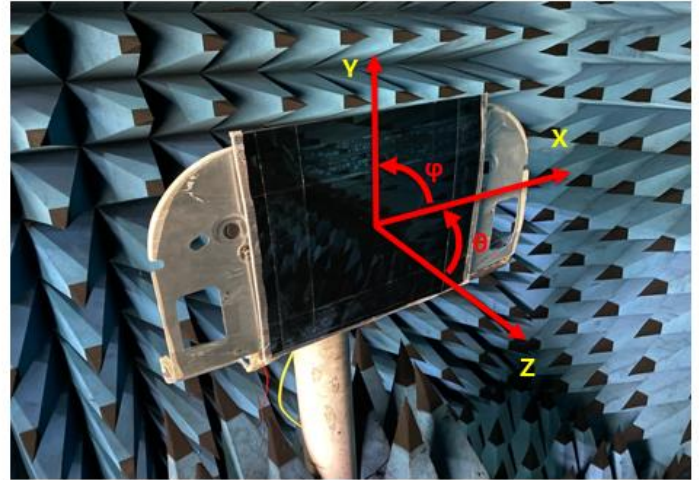
* SDARS Band (2320.00 ~ 2345.00MHz)



[Log & Smith Chart]

5.2 Radiation patterns of Passive Antenna rev.3

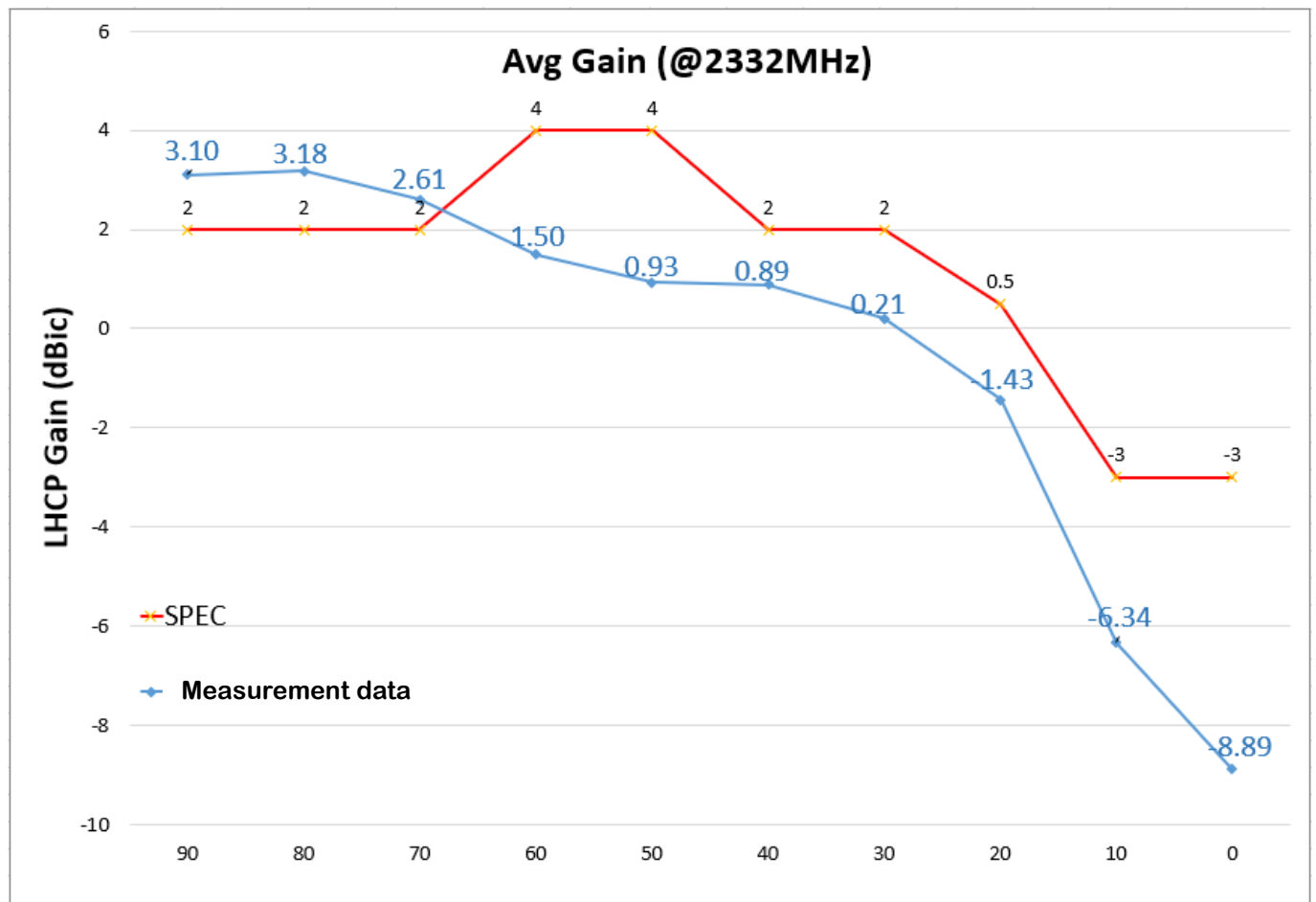
(Test condition: Customer set with Metal Bracket & Roof Glass)



Freq.
2320
2326
2332
2338
2345

5.3 Passive Gain over Elevation Angle (Test condition: Customer set with Metal Bracket & Roof Glass) rev.3

Polarization	Unit	Spec. [dBic]	degree	2320 MHz			2326 MHz			2332 MHz			2338 MHz			2345 MHz		
				Avg Gain	MAX Gain	MIN Gain	Avg Gain	MAX Gain	MIN Gain	Avg Gain	MAX Gain	MIN Gain	Avg Gain	MAX Gain	MIN Gain	Avg Gain	MAX Gain	MIN Gain
LHCP	dBic	2	90	3.17	3.49	2.93	3.11	3.35	2.76	3.10	3.44	2.67	3.08	3.40	2.66	3.22	3.55	2.96
			80	3.24	4.99	1.78	3.18	4.77	1.73	3.18	4.80	1.57	3.18	4.76	1.74	3.33	4.85	1.92
			70	2.74	4.48	1.35	2.65	4.28	1.28	2.61	4.24	1.36	2.60	4.08	1.40	2.67	4.12	1.64
		4	60	1.76	3.22	-2.57	1.56	3.07	-3.05	1.50	3.12	-3.49	1.40	3.28	-3.48	1.37	3.26	-4.17
			50	1.16	3.73	-3.56	0.96	3.51	-4.07	0.93	3.51	-4.00	0.77	3.47	-4.73	0.81	3.52	-4.66
			40	1.07	4.72	-2.31	0.95	4.61	-2.64	0.89	4.42	-3.07	0.84	4.35	-3.14	0.90	4.33	-3.50
		0.5	30	0.36	3.99	-3.57	0.21	3.95	-3.75	0.21	3.82	-4.11	0.18	3.81	-4.42	0.30	3.95	-4.59
			20	-1.37	2.94	-8.10	-1.40	2.70	-7.56	-1.43	2.79	-7.45	-1.35	2.83	-6.36	-1.33	2.76	-6.84
			10	-6.36	0.24	-20.53	-6.43	0.15	-23.20	-6.34	0.31	-22.08	-6.50	0.29	-27.13	-6.10	1.06	-24.12
			0	-8.73	-2.31	-24.95	-8.88	-2.30	-26.41	-8.89	-2.22	-23.83	-9.00	-2.27	-25.44	-8.71	-1.89	-26.06
VPOL	dB	-3	10	-6.36	0.24	-20.53	-6.43	0.15	-23.20	-6.34	0.31	-22.08	-6.50	0.29	-27.13	-6.10	1.06	-24.12
			0	-8.73	-2.31	-24.95	-8.88	-2.30	-26.41	-8.89	-2.22	-23.83	-9.00	-2.27	-25.44	-8.71	-1.89	-26.06



5.4 Typical LNA Measurement (Test condition: Only LNA Circuit) rev.3

◆ Power Supply Requirement

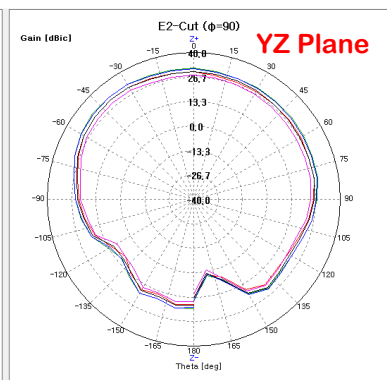
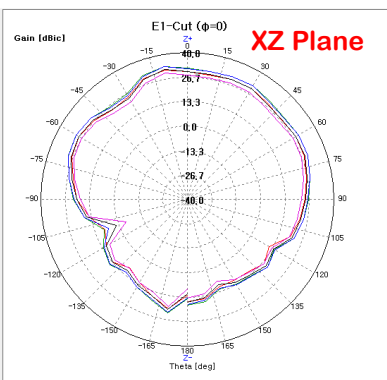
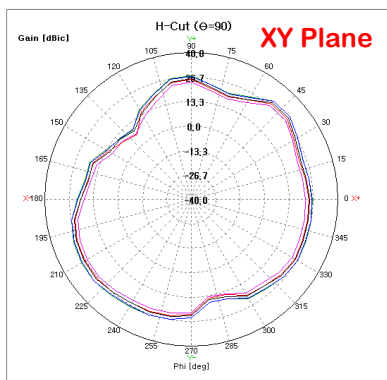
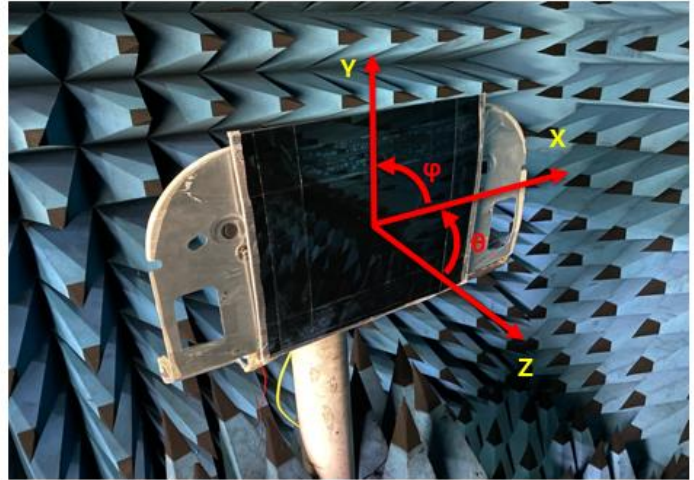
Symbol	Parameter	Test Condition	Limits (NGVA 3.0)			unit	Measurement			Measurement			Measurement		
			min	typ	max		min	typ	max	min	typ	max	min	typ	max
VCS	Power Supply voltage (from DLP)					V		4			4.7			5.1	
ICS	Power Supply current					mA		102.8			131.8			132.9	

◆ Antenna Performance Requirement

Symbol	Parameter	Test Condition	Limits (NGVA 3.0)			unit	IQS			IQS			IQS		
			min	typ	max		2320 MHz	2332.5 MHz	2345 MHz	2320 MHz	2332.5 MHz	2345 MHz	2320 MHz	2332.5 MHz	2345 MHz
GLNA+CABLE+COIN	LNA GAIN	CF	20.0	22.0	24.0	dB	27.7	29.5	26.6	28.0	29.7	26.9	27.9	29.7	26.8
Fmax	LNA Noise Figure	20dB attenuator on LNA output			0.8	dB	0.89	0.88	0.90	0.90	0.88	0.94	0.90	0.89	0.93
GRINA	Gain Ripple	2320~2324.5MHz			1.4	dB P/P	1.33			1.34			1.36		
		2324.2~2328.2MHz			1.2		0.35			0.36			0.35		
		2328~2332.5MHz			1.2		0.17			0.15			0.15		
		2332.5~2334.385MHz			1.2		0.01			0.03			0.03		
		2334.385~2336.25MHz			1.2		0.20			0.21			0.21		
		2336.25~2337.75MHz			1.2		0.26			0.26			0.26		
		2337.75~2341.25MHz			1.2		0.6			0.58			0.58		
		2341.25~2343.125MHz			1.2		0.62			0.68			0.65		
		2343.125~2345MHz			1.4		1.20			1.20			1.22		
IP1dB	LNA 1dB Compression Point, In Band	cfFrom LNA input to Cable Output	-18.0			dBm	-13.84			-13.31			-13.29		
OOB IP1dB	Out-of-Band LNA 1dB Compression Point for modules without Cellular The passive isolation between the cellular transmit and SDARS elements plus (+) the IP1dB point of the SDARS LNA at the cellular band of interest shall be a minimum of 30 dB	5925MHz	-10.0			dBm	>7			>7			>7		
		5725MHz	-10.0												
		3500MHz	-10.0				9.1			9.3			9.3		
		2690MHz	-4.0				6.3 @2690			6.8 @2690			6.8 @2690		
		2496MHz	-4.0												
		2484MHz	-4.0				>10			>10			>10		
		2400MHz	-4.0												
		2155MHz	-10.0				9.6 @2139			10.3 @2139			10.3 @2139		
		2110MHz	-10.0												
		1990MHz	-10.0				6.6 @1850			8.3 @1850			8.3 @1850		
		1850MHz	-10.0												
		1755MHz	-10.0				3.7 @1710			4.2 @1710			4.2 @1710		
		1710MHz	-10.0												
		894MHz	-10.0				1.9 @880			3.2 @880			3.2 @880		
		824MHz	-10.0												
IIP3	LNA Third Order Intercept	f1 : 2325.5MHz f2 : 2327.5MHz	-6.0			dBm	0.8			2.6			2.7		
		f1 : 2340.5MHz f2 : 2341.5MHz					1.4			3.2			3.2		
		f=2360MHz	-16.0	-22.0			-34.63			-34.48			-34.52		
Rej _{no}	LNA Selectivity, Narrow Band (dBc is with respect to the center frequency gain)	f=2355MHz	-16.0	-22.0		dBc	-27.69			-27.59			-27.61		
		f=2350MHz	-4.0	-6.0			-10.62			-10.58			-10.63		
		f=2315MHz	-4.0	-6.0			-7.64			-7.65			-7.65		
		f=2310MHz	-16.0	-22.0			-21.85			-21.92			-21.91		
		f=2305MHz	-16.0	-22.0			-27.79			-27.85			-27.87		
		f=2300MHz	-16.0	-22.0			-27.79			-27.85			-27.87		
Rej _{no}	LNA Selectivity, Wide Band (dBc is with respect to the center frequency gain)	f=1696.5MHz	-35.0			dBc	-44.71			-44.37			-44.35		
		f=1696.5MHz	-35.0				-68.77			-68.53			-68.72		
		f=2155MHz	-35.0				-64.07			-64.13			-64.02		
		f=2400MHz	-35.0				-86.07			-87.33			-87.22		
		f=2571MHz	-35.0				-67.17			-67.33			-67.62		
		f=2956MHz	-35.0				-64.57			-64.83			-64.82		
IMRR3 Case 1	3rd Order Intermodulation Rejection Ratio	F1=1883.565MHz F2=1433.565MHz 3rd order tone=2333.565MHz Amplitudes@ -20dBm	80.0			dB	81.9			83.7			83.7		
		F1=2154.565MHz F2=1975.565MHz 3rd order tone=2333.565MHz Amplitudes@ -20dBm	80.0				83.9			85.5			85.5		
IMRR3 Case 2	3rd Order Intermodulation Rejection Ratio	F1=2502.565MHz F2=2671.565MHz 3rd order tone=2333.565MHz Amplitudes@ -20dBm	80.0			dB	88.5			88.9			88.9		
		F1=2310MHz F2=2315MHz 3rd order tone=2320MHz Amplitudes@ -32dBm	68.0				73.5			74.4			74.4		
IMRR3 Case 3	3rd Order Intermodulation Rejection Ratio	F1=2350MHz F2=2355MHz 3rd order tone=2345MHz Amplitudes@ -32dBm	68.0			dB	74.2			75.4			75.4		
		F1=1883.565MHz F2=450MHz 2nd order tone=2333.565MHz Amplitudes@ -35dBm	65.0			dB	76.7			78.7			78.7		
IMRR2	2nd Order Intermodulation Rejection Ratio	F1=1883.565MHz F2=450MHz 2nd order tone=2333.565MHz Amplitudes@ -35dBm	65.0				76.7			78.7			78.7		
		F1=1883.565MHz F2=450MHz 2nd order tone=2333.565MHz Amplitudes@ -35dBm	65.0				76.7			78.7			78.7		
VSWR	VSWR at LNA O/P	Z _{in} = 50 Ω		2 : 1			1.49 : 1			1.49 : 1			1.49 : 1		

5.5 Radiation patterns of Active antenna rev.3

(Test condition: Customer set with Metal Bracket & Roof Glass, 5V Voltage)

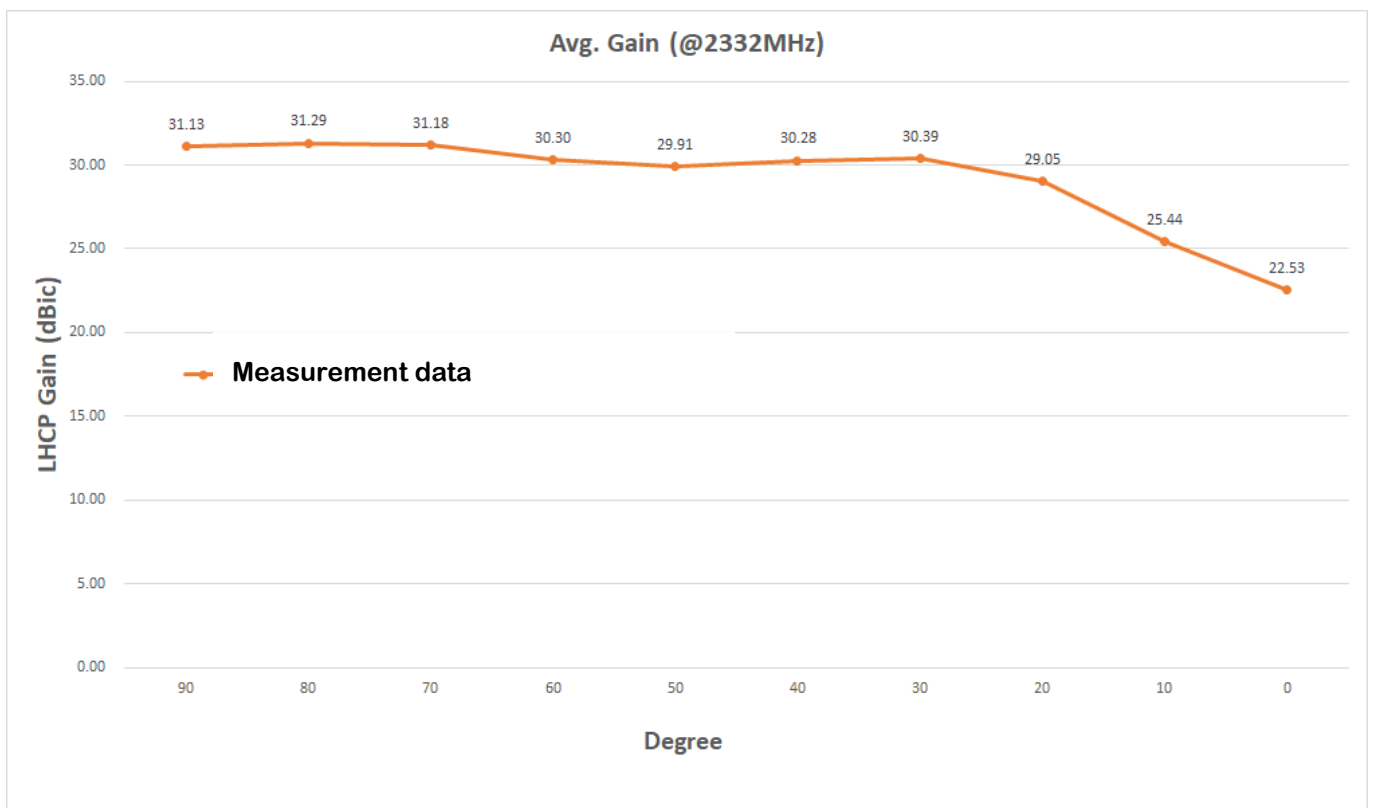


Freq.
2320
2326
2332
2338
2345

5.6 Active Antenna Overall Gain Over Elevation Angle rev.3

(Test condition: Customer set with Metal Bracket & Roof Glass, 5V Voltage)

Polarization	Unit	degree	2320MHz			2326MHz			2332.5MHz			2338.75MHz			2345MHz		
			Ava Gain	MAXGain	MIN Gain	Ava Gain	MAXGain	MIN Gain	Ava Gain	MAXGain	MIN Gain	Ava Gain	MAXGain	MIN Gain	Ava Gain	MAXGain	MIN Gain
LHCP	dBic	90	29.42	29.75	29.12	31.41	31.90	30.98	31.13	31.65	30.72	29.61	30.09	29.27	27.67	28.19	27.25
		80	29.60	31.70	27.94	31.58	33.72	29.83	31.29	33.35	29.56	29.79	31.79	28.16	27.89	29.93	26.20
		70	29.57	31.42	27.88	31.51	33.35	29.73	31.18	33.05	29.41	29.62	31.55	27.82	27.65	29.64	25.78
		60	28.79	31.63	23.44	30.70	33.55	25.28	30.30	32.95	24.65	28.71	31.32	22.97	26.70	29.34	20.90
		50	28.39	32.07	21.25	30.30	34.03	23.16	29.91	33.47	22.68	28.34	31.75	21.05	26.35	29.87	19.09
		40	28.71	32.32	25.26	30.63	34.13	27.28	30.28	33.85	26.98	28.72	32.33	25.53	26.76	30.31	23.49
		30	28.73	32.70	23.90	30.70	34.61	25.91	30.39	34.30	25.51	28.87	32.81	24.01	26.95	30.85	22.10
		20	27.32	31.86	20.65	29.33	34.06	22.38	29.05	33.73	21.65	27.58	32.21	19.88	25.71	30.49	17.68
VPOL	dBi	10	23.67	29.43	1.42	25.69	31.62	2.70	25.44	31.32	1.65	23.95	29.89	-1.12	22.04	28.08	-3.51
		0	20.46	27.95	-11.54	22.62	29.99	-6.82	22.53	29.98	-6.02	21.16	28.68	-8.76	19.24	26.87	-13.00



	SPECIFICATION	Page
	ASA252505-S0-A2	11/13

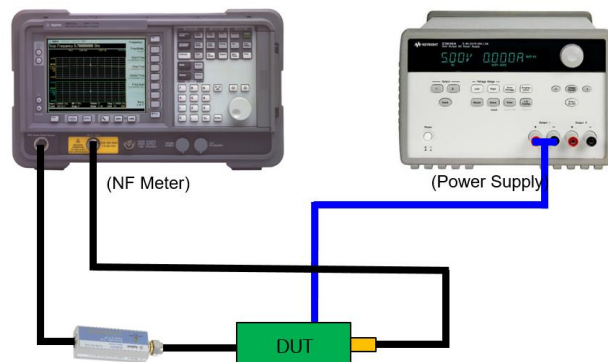
6. Test Method

6.1 LNA Gain and Noise Figure and Current Measurement

6.1.1 Measurement Equipment

- Noise Figure Analyzer, Power Supply, Bias Tee

6.1.2 Measurement Diagram

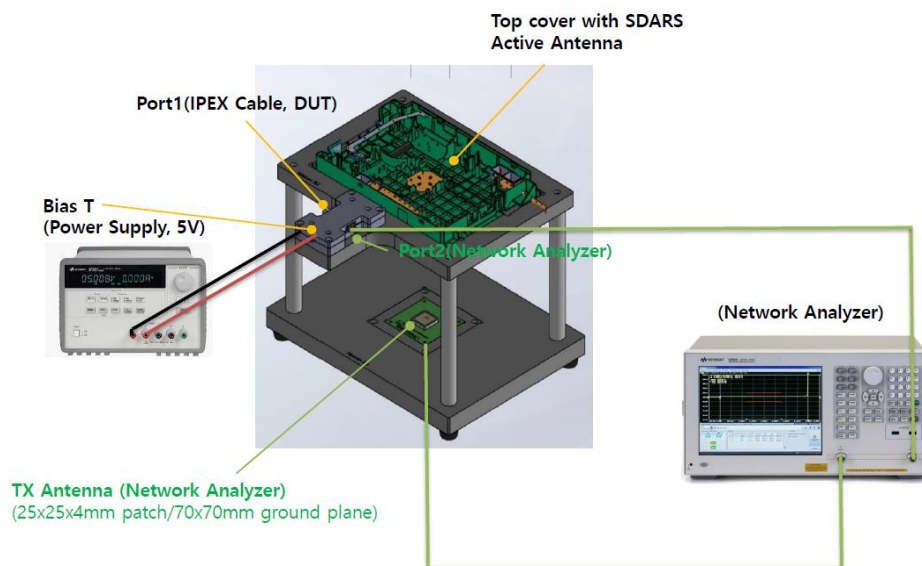


6.2 Radiation inspection

6.2.1 Measurement Equipment

- Manual Jig, Network Analyzer, DC power supply, Bias Tee

6.2.2 Measurement Diagram



<S21 measuement @ Amotech inspection Jig>

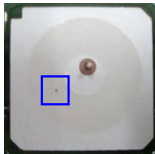
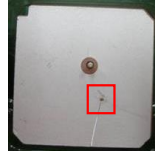
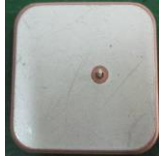
	SPECIFICATION	Page
	ASA252505-S0-A2	12/13

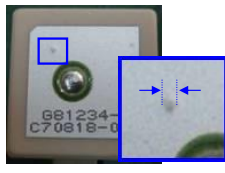
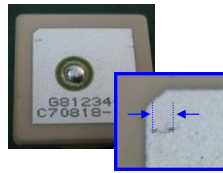
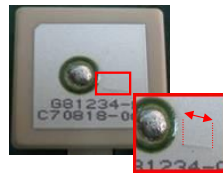
7. Cosmetic limit

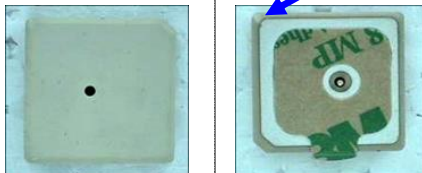
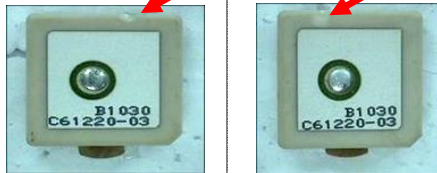
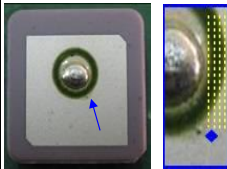
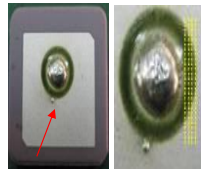
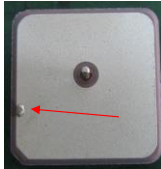
DOC. No.	15-Tuning Boundary-001	(25 by 25 type = Ceramic Patch) Manual top tuning procedure				Written by	Checked by	Approved by
Standard process	Mearurement process							
Product	Ceramic Patch Antenna							
Written by	Q.A PART							
Original Date	2015. 12. 14	Rev. No.	1	Rev. Date	2018. 02. 07	Page	1/1	

Top Tuning method 1	Top Tuning method 2	Top Tuning method 3
 ◆ Tuning standard - Tuning Point: Max 4 points only with method1 - Tuning Length : a ≤ 2.00mm - Tuning Wide: W1 ≤ 1.00mm.	 ◆ Tuning standard - Tuning Point: Max 4 points only with method2 - Tuning Length: b ≤ 4.00mm - Tuning Wide: W2 ≤ 1.00mm	 ◆ Tuning standard - Tuning Point: Max 2 points only with method3 - Tuning Wide: W3 ≤ 1.00mm
◆ The above criteria is for only tuning which is the manual mark by worker. The tuning made in Ag printing process is not applied to the above criteria. ◆ Total tuning points with all above 3 methods : Max 4 points ◆ Criteria of defective parts - If tuned antennas do not meet above standard, Amotech will regard them as defective part		

Doc No.	10Patch-Boundary-001	Limited Boundary (No Printing / Scratch)				Write	Check	Approve
Process	Appearance Inspect							
Product	All Model							
Write Dept	Quality Dept.							
Origin Date	2010. 02. 08	Revision Date	2018. 02. 07	Revision No	Rev. 2	Page	1 / 3	

Item	O K	N G		Etc
No Printing				
No printing must have entered allow SPEC. [SPEC : No limit on the number of size ≤ 1mm / 1mm < size ≤ 2mm: Allow Q'ty: 2ea / 2mm < size: NG]				
Item	O K	N G		Etc
Scratch				
Handle badness if there is <u>shape that rake</u> with picture.				
Noted items				

Doc No.	10Patch-Boundary-001	Limited Boundary (Foreign body)					
Process	Appearance Inspect						
Product	All Model						
Write Dept	Quality Dept.						
Origin Date	2010. 02. 08	Revision Date	2018. 02. 07	Revision No	Rev. 2	Page	2 / 3
Item	O K			N G		Etc	
Foreign body (Bottom)							
	The protruding foreign body is NG, and the non-protruding Foreign body must have entered allow SPEC [SPEC : No limit on the number of size≤2mm / 2mm<size≤ 3mm:Allow Q'ty:2ea / 3mm<size:NG]						
Item	O K			N G		Etc	
Foreign body (Top)	 						
	Foreign body must have entered allow SPEC. [SPEC : No limit on the number of size≤1mm / 1mm<size≤ 2mm:Allow Q'ty:2ea / 2mm<size:NG]						
Noted items							

Doc No.	10Patch-Boundary-001	Limited Boundary (Chipping / Solder ball)					
Process	Appearance Inspect						
Product	All Model						
Write Dept	Quality Dept.						
Origin Date	2010. 02. 08	Revision Date	2018. 02. 07	Revision No	Rev. 2	Page	3 / 3
Item	O K			N G		Etc	
Chipping							
	Chipping must have entered allow SPEC. [SPEC : No limit on the number of chipping≤1mm / 1mm<chipping size≤ 2mm:Allow Q'ty:2ea / 2mm<chipping:NG]						
Item	O K		N G		Etc		
Solder ball							
	Solder vall must have entered allow SPEC. [SPEC : Solder ball ≤ 0.3mm]			Solder ball of GND size irrelatively badness.			
Noted items							