

ANTENNA SPECIFICATION


Model : A300(Main Antenna)

MPN : QCA300MA

	Prepared by	Reviewed by	Checked by	Approved by
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	09/08/14	-	09/08/14	
R&D				
	-	-	-	09/08/14


Aug 14. 2009



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1. Approval History List

NO.	REV	DATE	PREVIOUS	AFTER	REASON
1	1.0	Aug 14. 2009	-	-	-
2					
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2. General Outline

2-1 Applicability

This specification is applicable to Planar Inverted F type Antenna Module carried in the CDMA phone terminal of DCN, UPCS, AWS Band.

2-2 Introduction

The purpose of this document is to establish a design specification for the antenna product that CAS TELECOM is developing for the A300 wireless handset.

This specification is preliminary.


Any changes or additions to this specification can affect schedule or cost or the product and should be negotiated between CAS TELECOM and ACTSCOM before being incorporated into the specification.

Upon agreement of this specification, CAS TELECOM will make no changes without the written approval from ACTSCOM.

2-3 SI Unit

SI unit will be used, unless any specialities are announced.

°C	Celsius (degrees Centigrade)
cm	Centimeter
g	Acceleration of gravity = 9.8 m/s ²
MHz	Mega Hertz
N	Newton
W	Watt
RH	Relative Humidity
Tx	Transmit Band
Rx	Receive Band
PCB	Printed Circuit Board
VSWR	Voltage Standing Wave Ratio

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3. Technical Specifications

3.1 Electrical Specifications.

Electrical Spec.		Frequency Range		
		DCN (824 ~ 894 MHz)	UPCS (1850 ~ 1990 MHz)	AWS (1710 ~ 2155 MHz)
VSWR (min)		3.2:1	3.9:1	2.9:1
Average Gain (min)	H-plane	-2.0dB	-3.8dB	-5.7dB
	E1-plane	-4.7dB	-5.0dB	-4.5dB
	E2-plane	-5.3dB	-5.6dB	-6.5dB
Input Impedance		50 (Ω)		
Polarization		VERTICAL		
Radiation Pattern		OMNI-DIRECTIONAL		
Maximum Power		2W		

3.2 Mechanical Specification


Carrier Material	PC(HF-10231IM) Black
Dimension	See drawing
Weight	1.86g
Radiator Material	SUS 304 1/2H
Operation Temperature	-30 ~ 80 ($^{\circ}$ C)
Operation Humidity	10 ~ 90 (%)

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4. Test Equipment

The equipment for antenna test is as follows,

- Network Analyzer (Agilent E5070B) to measure the V.S.W.R., Standing wave ratio(SWR) and impedance bandwidth of antenna
- Standard horn antennas adjustable to the CELLULAR bands
- Standard horn antennas adjustable to the PCS bands
- Standard horn antennas adjustable to the AWS bands
- Anechoic Chamber installed the cables, connectors and equipments for measurements
- Digital Caliper to measure the dimensions
- Push/Pull gauge to measure the pulling forces
- Climatic Chamber for environmental tests

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5. Electrical Demands

5.1. V.S.W.R

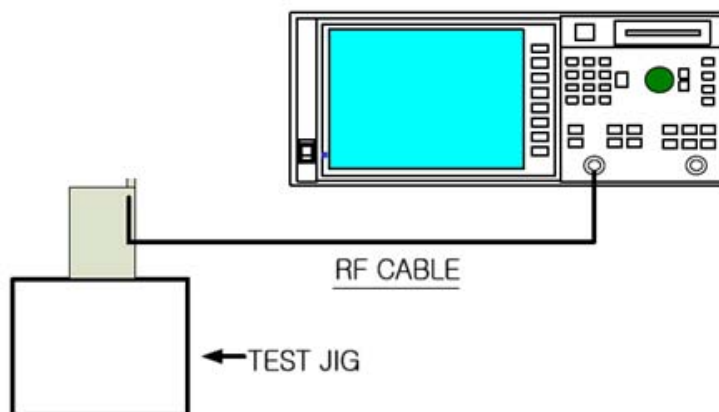
5-1-1. Test Method (Engineering)

The antenna is tested while mounted in the handset. The handset is set up with a 50Ohm coaxial cable connected to the 50 Ohm point. Calibration is done at this 50 Ohm point.

The other end of the 50 Ohm coaxial cable is connected to a network analyzer.

The handset is positioned on a non-conductive table for free space measurements.

- Step 1. Connect ANT Port with Cable included Adaptor to Port 1 of Network Analyzer.
- Step 2. Point out Markers on Network Analyzer Display at DCN / US-PCS / AWS frequency band.
- Step 3. Inspect V.S.W.R
- Step 4. Measure.



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5-2. Gain and Pattern (Far Field Chamber)

5-2-1. Test Method (Engineering)

The antenna is tested while mounted to the handset.

The antenna is tested in free space in the anechoic chamber.

Radiation patterns are measured at the center of transmit and receive bands.

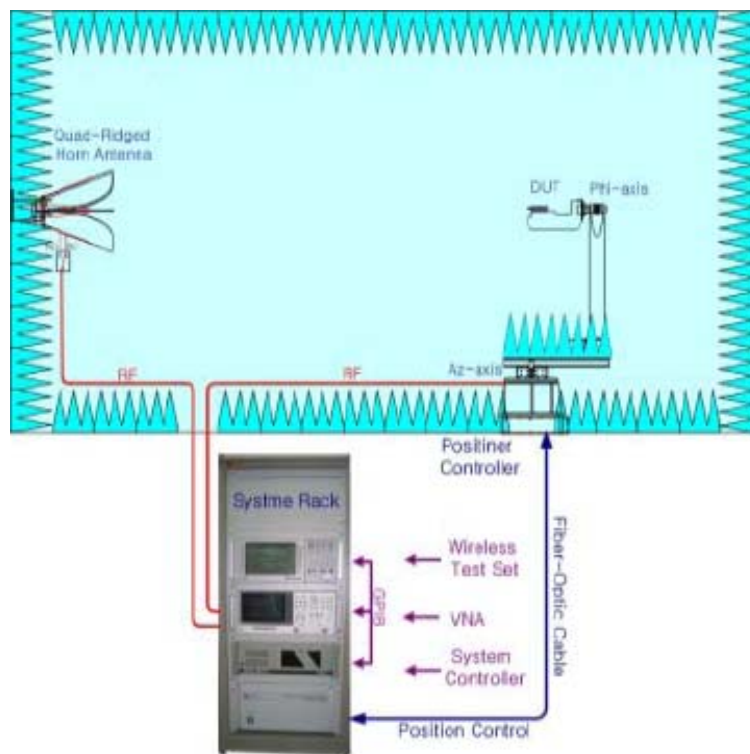
– Step 1. Calibrate Chamber System for Gain Measurement Using Dipole & Horn Antenna.


At the Same Time Set Up Software Program for Chamber System Control.

– Step 2. Change Over from a Dipole & Horn Antenna to Measuring Antenna on Target Positioner.

– Step 3. Start a Software Program for Chamber System Control & Measuring

– Step 4. Measurement Data

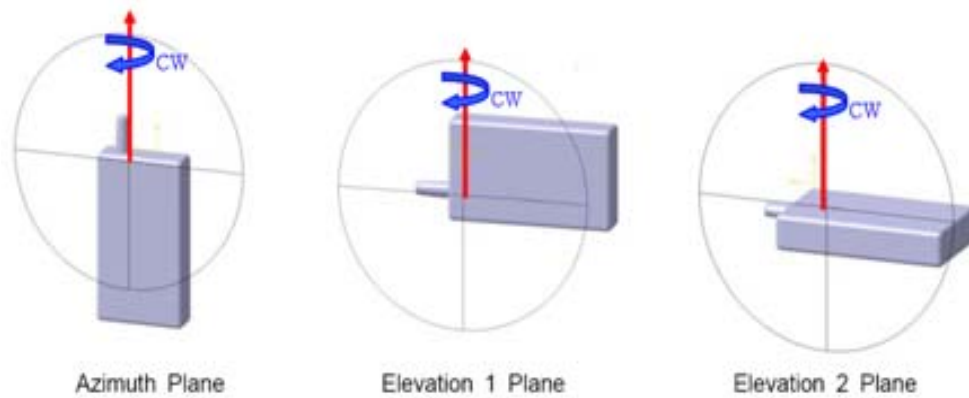



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5-2-2. Measurement of Radiation Pattern

Coordinates and Measurement plane at radiation pattern measurement are defined in below Fig.

Radiation pattern measurement is performed at more than 2 frequencies including the highest and lowest limit frequency of the band.



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6. Mechanical Demands

6.1. Contact Pin Force Test

Contact pin of antenna must keep 200g/f \pm 150 in operation distance.


6.2. Contact Pin Resistance Test.

After assemble antenna to test equipment, Contact pins are pressed to nominal assembly position 500 times. The antenna contact force must satisfy of (6.1) operation force. (Cycle time : 60 times/min)

6.3. Drop Test

The antenna is attached to the handset. The handset is dropped with the antenna downward onto a concrete surface at 1.5 m height and angle D(45°). The number of drop is 3 times.

After the test, the original shape shall be possible to restore. The antenna shall satisfy the electrical demands.

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7. Environmental Demands

7.1 Operation Temperature Test

– Test A : Place the antennas for testing in chamber. The chamber condition should be as follows: 1hours at -20°C .

– Final measurements: The antenna shall be visually inspected and electrically and also mechanically checked as required by products standard.

– Test B : Place the antennas for testing in chamber. The chamber condition should be as follows: 1hours at 70°C .

– Final measurements : The antenna shall be visually inspected and electrically and also mechanically checked as required by products standard.

7.2 Temperature Change Test

The object of temperature test is to evaluate the reliability of antenna component at temperature change.

–Test : Temperature cycle is as follows. 2 hours at -40°C .

2 hours at $+85^{\circ}\text{C}$.


Temperature increase/decrease time (Temperature change time) is 2hours. 10 cycles.

Final measurements : The antenna shall be visually inspected and electrically and mechanically checked as required by products standard.

7.3 High Humidity Test

Test : Place the antennas for testing in chamber. The chamber condition should be as follows: 24hours at $+55^{\circ}\text{C}$, Relative humidity is 95%.

Final measurements: The antenna shall be visually inspected and electrically and also mechanically checked as required by products standard.

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7.4 Vibration Test

After assemble antenna to test equipment, Do test in X, Z direction per 1hour as a under spec. The antenna shall be visually inspected and electrically and mechanically checked as required by products standard. The test must satisfy to IEC 68-2-6 spec

7.5 Salt spray Test


Sprayed with the salt spray solution for a period of 96 hours at a temperature of +35°C.

The antenna shall be visually inspected and electrically and mechanically checked as required by products standard. The test must satisfy to IEC 68-2-11 spec .

7.6 Storage temperature Test

After antenna are stored for a period of 96 hours at a temperature of -30 °C and a relative humidity of 95 %. Stored for a period of 96 hours at a temperature of +80 °C and a relative humidity of 95 % (total: 192 hour)


The antenna shall be visually inspected and electrically and mechanically checked as required by products standard.

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8. Antenna data

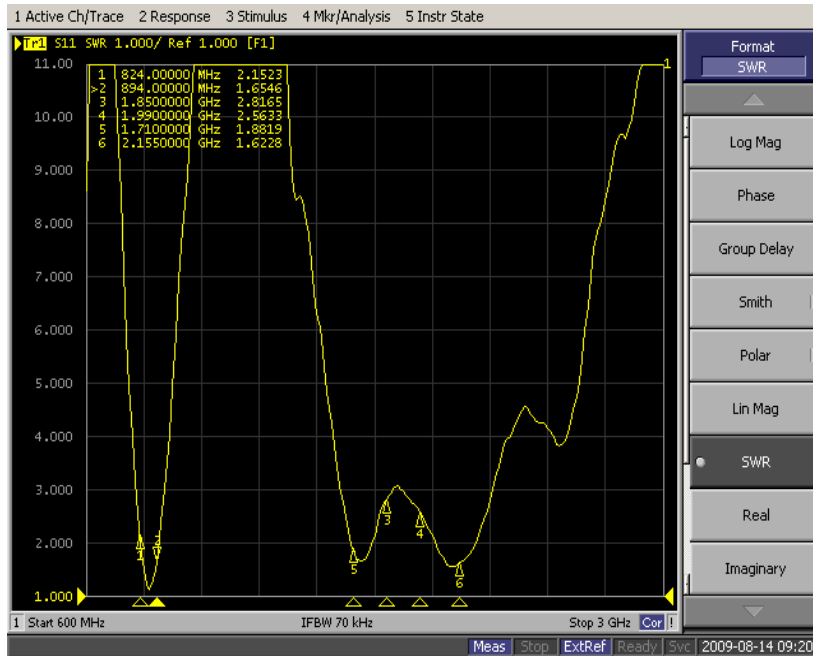
Item		Test Result		
Frequency Range		DCN (824 ~ 894 MHz)	UPCS (1850 ~ 1990 MHz)	AWS (1710 ~ 2155 MHz)
VSWR (min)		2.2:1	2.9:1	1.9:1
Peak Gain	H-plane	0.5dB	-0.1dB	-1.7dB
	E1-plane	-0.6dB	1.0dB	1.0dB
	E2-plane	0.2dB	1.1dB	1.3dB

Average Gain (min)	H-plane	-0.9dB	-2.89dB	-4.66dB
	E1-plane	-3.73dB	-4.08dB	-3.55dB
	E2-plane	-4.30dB	-4.65dB	-5.46dB

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8.1. Electrical data(V.S.W.R & GAIN)

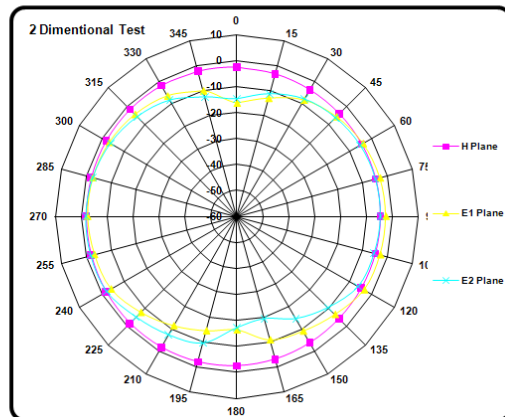
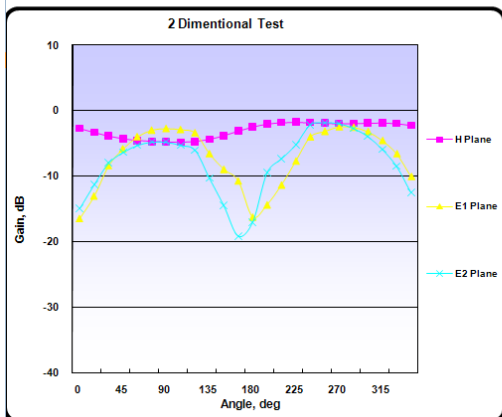
- V.S.W.R




- GAIN (with Matching Circuit)

DCN(824MHz)

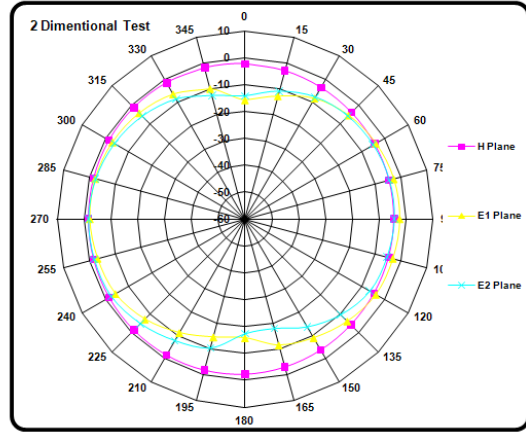
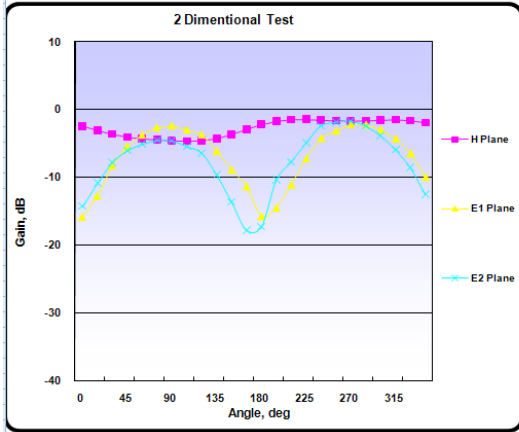
	Angle(deg)																AVG								
	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345	
H Plane	-2.7	-3.3	-3.9	-4.3	-4.5	-4.7	-4.8	-4.8	-4.7	-4.4	-3.8	-3.1	-2.5	-2.0	-1.8	-1.7	-1.8	-1.9	-1.9	-1.9	-1.9	-1.8	-1.9	-2.2	-2.86
E1 Plane	-16.5	-13.0	-8.4	-5.8	-4.0	-3.0	-2.7	-2.9	-3.4	-6.6	-8.0	-10.7	-16.3	-14.4	-11.4	-7.7	-4.0	-3.1	-2.5	-2.5	-3.2	-4.5	-6.6	-10.0	-6.48
E2 Plane	-14.9	-11.2	-8.0	-6.3	-5.3	-4.8	-4.8	-5.3	-8.0	-10.3	-14.5	-19.2	-17.1	-9.4	-7.3	-5.2	-2.1	-1.8	-1.9	-2.7	-3.9	-5.9	-8.5	-12.5	-6.95



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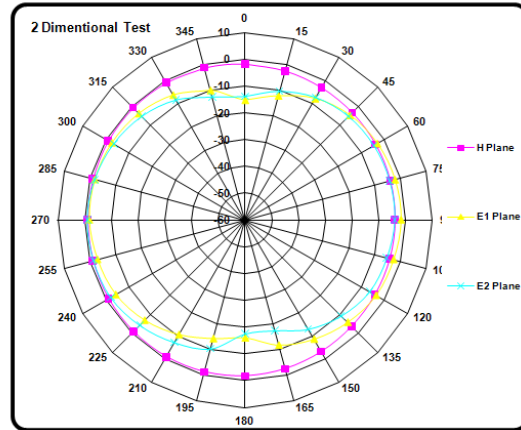
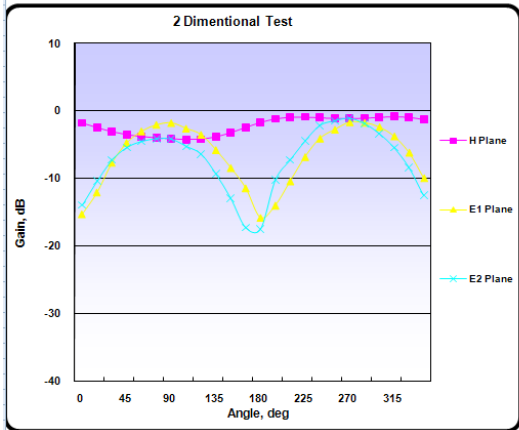
DCN(849MHz)


	Angle(deg)																												AVG
	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345					
H Plane	-2.4	-3.1	-3.6	-4.0	-4.3	-4.5	-4.6	-4.6	-4.6	-4.2	-3.6	-2.9	-2.2	-1.7	-1.5	-1.4	-1.5	-1.6	-1.7	-1.6	-1.5	-1.5	-1.6	-1.9	-2.60				
E1 Plane	-16.8	-12.7	-8.3	-5.5	-3.8	-2.7	-2.4	-3.0	-3.8	-6.1	-8.9	-11.3	-15.7	-14.5	-11.1	-7.2	-4.3	-3.2	-2.2	-2.3	-3.0	-4.3	-6.5	-9.9	-6.36				
E2 Plane	-14.3	-10.8	-7.7	-6.0	-5.1	-4.5	-4.6	-5.4	-6.4	-9.6	-13.6	-17.8	-17.3	-10.3	-7.7	-4.9	-2.4	-1.8	-1.7	-2.4	-3.8	-5.9	-8.6	-12.5	-6.88				



DCN(869MHz)

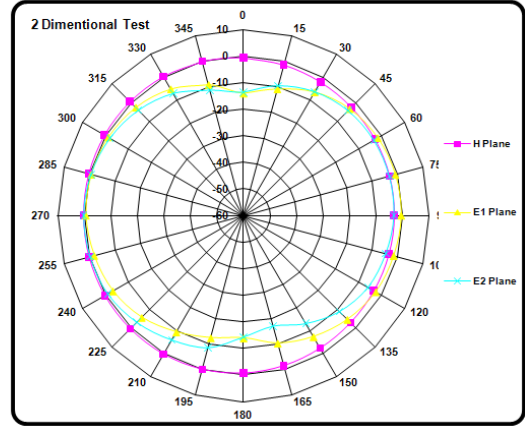
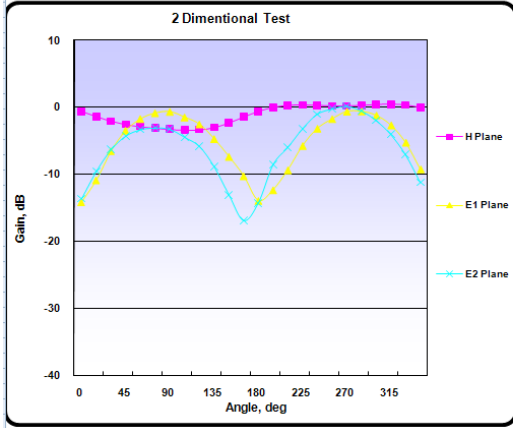
	Angle(deg)																												AVG
	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345					
H Plane	-1.8	-2.5	-3.1	-3.5	-3.8	-4.0	-4.2	-4.3	-4.2	-3.9	-3.2	-2.4	-1.7	-1.2	-0.9	-0.9	-1.0	-1.1	-1.1	-1.0	-0.9	-0.8	-0.9	-1.2	-2.05				
E1 Plane	-15.3	-12.0	-7.7	-4.7	-3.0	-2.1	-1.8	-2.6	-3.5	-5.8	-8.4	-11.4	-15.8	-14.0	-10.4	-6.8	-4.1	-2.8	-1.7	-1.8	-2.4	-3.8	-6.2	-9.9	-4.87				
E2 Plane	-13.9	-10.4	-7.3	-5.4	-4.5	-4.1	-4.2	-5.2	-6.4	-9.3	-12.9	-17.3	-17.5	-10.2	-7.3	-4.5	-2.2	-1.5	-1.1	-1.9	-3.3	-5.4	-8.4	-12.5	-5.48				



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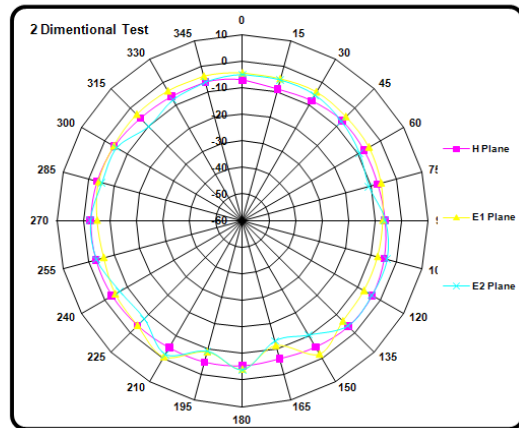
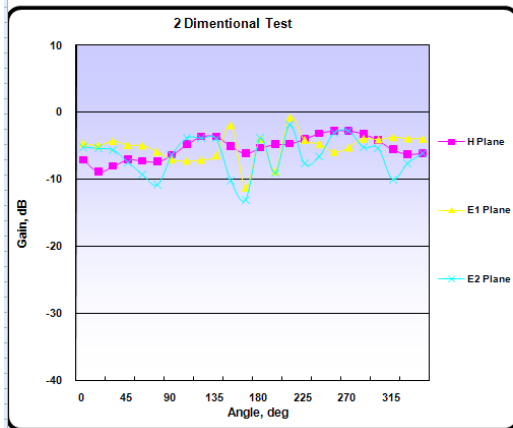
DCN(894MHz)


	Angle (deg)																				AVG				
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H Plane	-0.6	-1.4	-2.1	-2.5	-2.9	-3.1	-3.3	-3.4	-3.3	-3.0	-2.3	-1.4	-0.6	0.0	0.3	0.3	0.3	0.2	0.2	0.3	0.4	0.5	0.3	0.0	-0.90
E1 Plane	-14.1	-10.9	-6.5	-3.4	-1.7	-0.8	-0.6	-1.5	-2.5	-4.7	-7.3	-10.2	-13.9	-12.3	-9.4	-5.7	-3.2	-1.7	-0.6	-0.6	-1.2	-2.6	-5.2	-9.2	-3.73
E2 Plane	-13.6	-9.5	-6.3	-4.3	-3.3	-3.1	-3.3	-4.5	-5.8	-8.9	-13.1	-16.9	-14.3	-8.6	-6.0	-3.2	-1.0	-0.2	0.2	-0.5	-1.9	-4.0	-7.1	-11.2	-4.30



USPCS(1,851MHz)

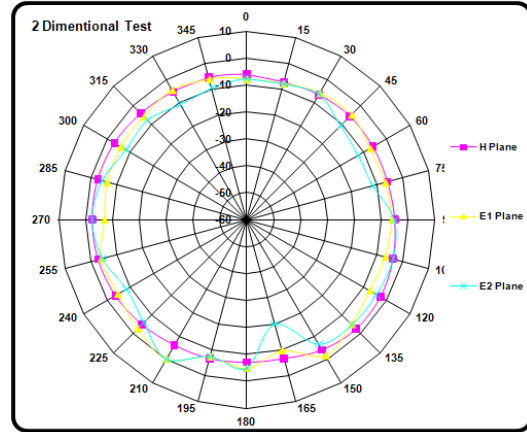
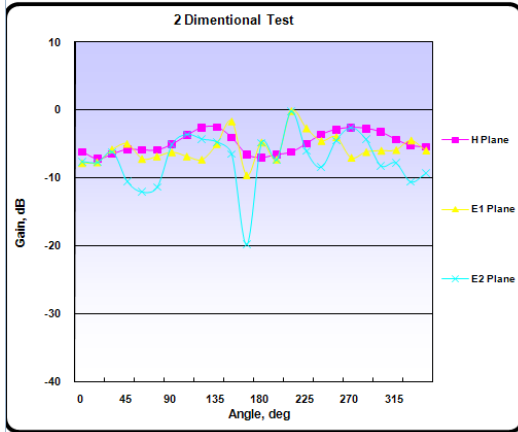
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H Plane	-7.1	-8.8	-8.0	-7.0	-7.2	-7.3	-6.4	-4.8	-3.6	-3.6	-5.0	-6.1	-5.3	-4.8	-4.7	-4.0	-3.1	-2.7	-2.7	-3.2	-4.2	-5.6	-6.2	-6.1	-5.00
E1 Plane	-4.7	-5.0	-4.3	-4.9	-5.0	-5.9	-7.1	-7.3	-7.1	-6.5	-1.9	-11.3	-4.0	-8.9	-0.8	-4.2	-4.7	-6.0	-5.3	-4.0	-4.1	-3.8	-3.9	-4.0	-4.72
E2 Plane	-5.2	-5.4	-5.6	-7.4	-9.3	-10.8	-6.4	-3.8	-3.9	-3.9	-10.2	-13.1	-3.8	-9.1	-1.8	-7.6	-6.6	-3.1	-2.7	-5.2	-5.3	-10.0	-7.6	-6.1	-5.62



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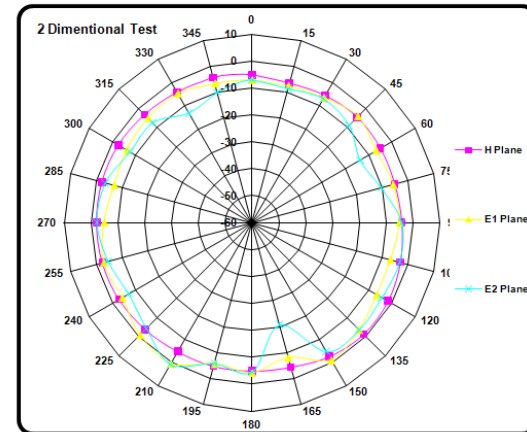
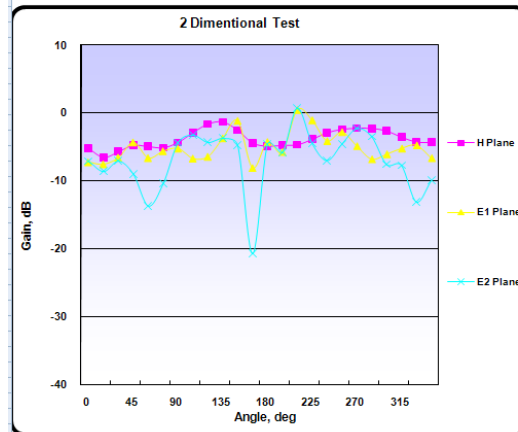
USPCS(1,908MHz)


	Angle (deg)																AVG								
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H Plane	-6.2	-7.2	-6.5	-5.8	-5.9	-5.9	-5.0	-3.7	-2.6	-2.5	-4.1	-6.5	-7.0	-6.6	-6.2	-5.0	-3.6	-2.9	-2.6	-2.7	-3.3	-4.3	-5.2	-5.4	-4.60
E1 Plane	-7.8	-7.7	-5.8	-5.0	-7.2	-6.8	-6.2	-6.6	-7.3	-5.0	-1.7	-9.6	-4.7	-7.2	-0.2	-2.7	-4.5	-4.0	-7.0	-6.2	-6.0	-5.9	-4.5	-5.9	-5.10
E2 Plane	-7.6	-7.7	-6.2	-10.6	-12.1	-11.3	-5.0	-3.6	-4.3	-4.7	-6.5	-19.8	-4.8	-7.4	-0.2	-6.0	-8.4	-4.5	-2.6	-4.3	-8.2	-7.8	-10.6	-9.4	-5.91



USPCS(1,931MHz)

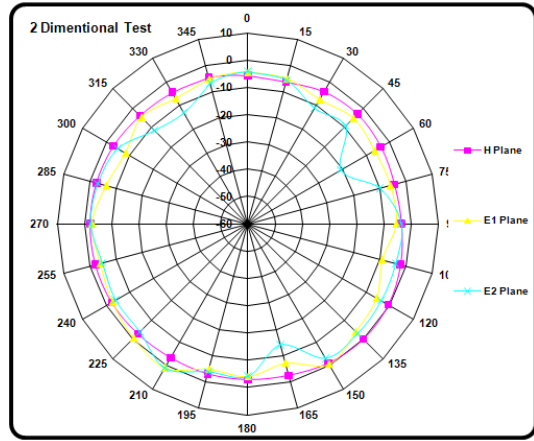
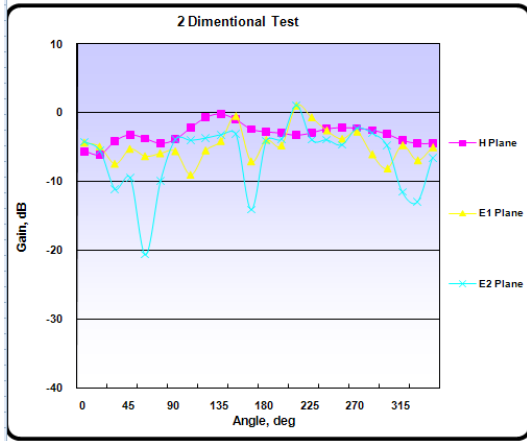
	Angle (deg)																AVG								
	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345	
H Plane	-5.2	-6.6	-5.7	-4.8	-4.9	-5.1	-4.3	-2.9	-1.6	-1.3	-2.5	-4.4	-4.9	-4.8	-4.7	-3.9	-2.9	-2.4	-2.3	-2.3	-2.6	-3.5	-4.2	-4.3	-3.63
E1 Plane	-7.3	-7.6	-6.6	-4.3	-6.6	-5.6	-5.2	-6.7	-6.4	-3.7	-1.1	-8.1	-4.3	-5.7	0.5	-1.0	-4.1	-2.8	-4.9	-6.8	-6.1	-5.2	-4.8	-6.6	-4.44
E2 Plane	-7.1	-8.6	-7.0	-9.0	-13.7	-10.4	-4.3	-3.2	-4.3	-3.7	-4.7	-20.7	-4.6	-5.8	0.7	-4.5	-7.0	-4.5	-2.3	-3.5	-7.6	-7.7	-13.1	-10.0	-6.33



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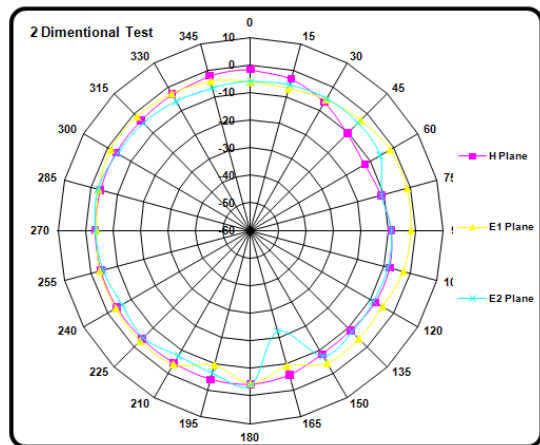
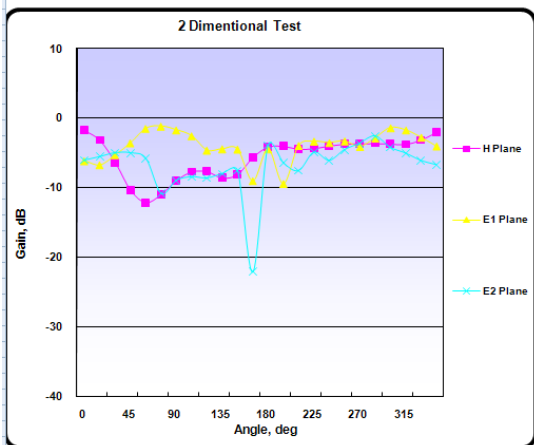
USPCS(1,988MHz)


	Angle(deg)																AVG								
	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345	
H Plane	-5.6	-6.1	-4.1	-3.2	-3.8	-4.5	-3.9	-2.2	-0.6	-0.1	-1.0	-2.4	-2.8	-3.0	-3.3	-2.9	-2.3	-2.2	-2.2	-2.5	-3.1	-4.0	-4.5	-4.5	-2.89
E1 Plane	-4.4	-5.0	-7.5	-5.3	-6.4	-5.9	-5.6	-9.1	-5.5	-4.1	-0.5	-7.1	-4.0	-4.8	1.0	-0.7	-2.6	-3.8	-2.8	-6.1	-8.1	-4.8	-6.9	-5.0	-4.08
E2 Plane	-4.2	-5.5	-11.1	-9.4	-20.6	-9.9	-3.9	-4.0	-3.7	-3.2	-3.1	-14.1	-4.1	-3.9	1.1	-3.9	-3.9	-4.6	-2.2	-3.0	-4.8	-11.5	-13.0	-6.5	-4.65



AWS(1,711MHz)

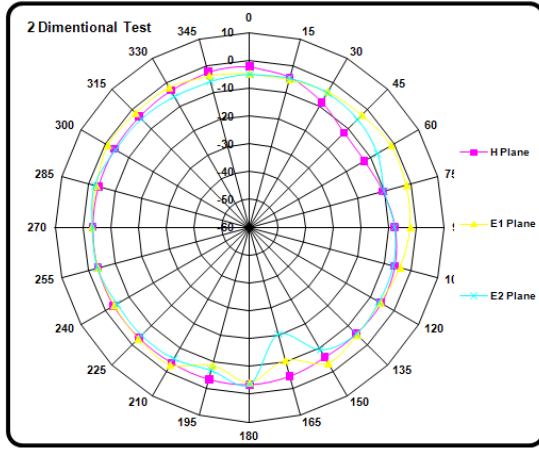
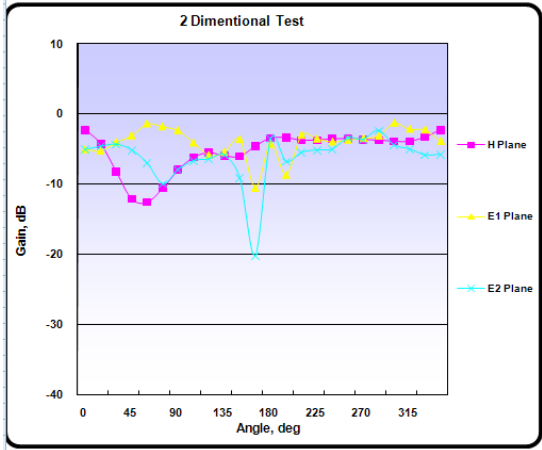
	Angle(deg)																AVG								
	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345	
H Plane	-1.7	-3.2	-6.4	-10.3	-12.1	-10.9	-9.0	-7.7	-7.7	-8.6	-8.1	-5.6	-4.1	-4.0	-4.4	-4.4	-3.9	-3.7	-3.6	-3.6	-3.7	-3.7	-3.1	-2.0	-4.86
E1 Plane	-6.2	-6.7	-5.3	-3.6	-1.5	-1.2	-1.7	-2.6	-4.6	-4.4	-4.5	-9.0	-4.5	-9.5	-3.9	-3.3	-3.5	-3.3	-4.1	-2.9	-1.4	-1.7	-2.8	-4.0	-3.57
E2 Plane	-6.1	-5.5	-5.0	-5.0	-5.8	-10.8	-9.0	-8.4	-8.6	-8.0	-7.5	-22.1	-3.9	-6.5	-7.6	-4.9	-6.1	-4.6	-3.6	-2.6	-4.2	-5.0	-6.1	-6.7	-5.94



	Description	Model	Date	Rev
	Antenna Product Specification	A300	Aug 14. 2009	1.0

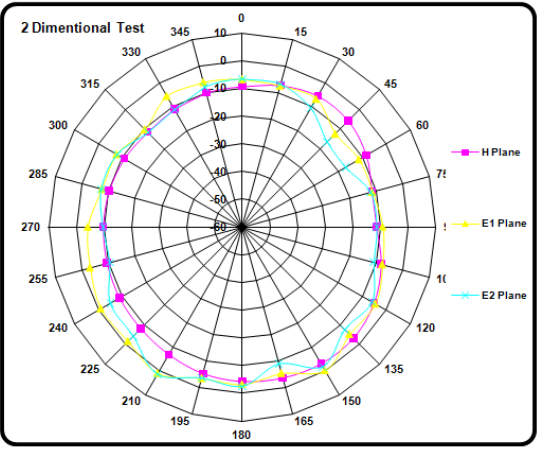
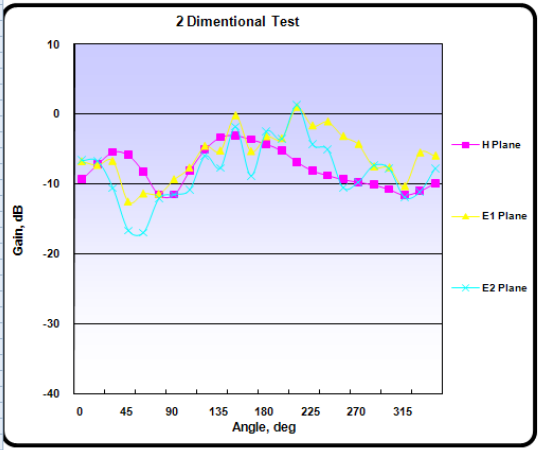
AWS(1,752MHz)


	Angle(deg)																				AVG				
	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345	
H Plane	-2.3	-4.3	-6.3	-12.1	-12.6	-10.6	-8.0	-6.2	-5.5	-6.0	-6.1	-4.6	-3.4	-3.4	-3.7	-3.7	-3.5	-3.5	-3.6	-3.7	-3.9	-3.9	-3.3	-2.3	-4.66
E1 Plane	-5.0	-5.2	-4.0	-3.0	-1.4	-1.8	-2.3	-4.1	-5.8	-5.4	-3.6	-10.6	-4.2	-8.6	-3.0	-3.5	-3.9	-3.7	-3.4	-3.1	-1.3	-2.1	-2.2	-3.8	-3.55
E2 Plane	-5.1	-4.6	-4.4	-5.2	-7.0	-10.0	-8.0	-8.7	-6.5	-5.9	-9.2	-20.2	-3.6	-8.8	-5.5	-5.2	-5.0	-3.4	-3.6	-2.4	-4.4	-5.0	-5.9	-5.8	-5.46



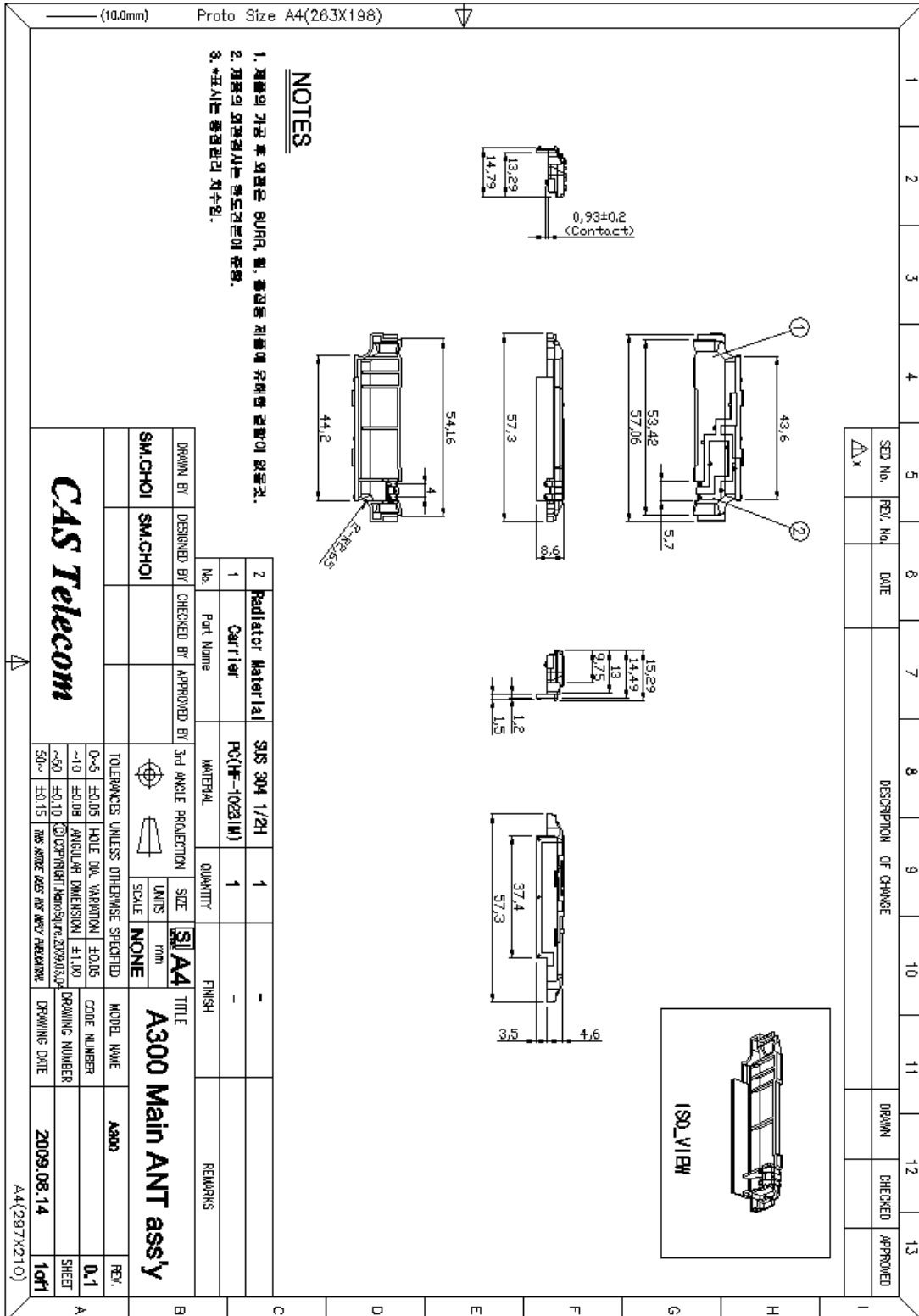
AWS(2,111MHz)


	Angle(deg)																				AVG				
	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345	
H Plane	-9.3	-7.2	-5.4	-5.9	-8.3	-11.5	-11.5	-8.1	-5.1	-3.3	-3.0	-3.6	-4.2	-5.2	-6.8	-8.1	-8.7	-9.3	-9.7	-10.1	-10.8	-11.6	-11.0	-9.9	-6.95
E1 Plane	-6.7	-7.2	-6.7	-12.5	-11.3	-11.4	-9.3	-7.6	-4.5	-5.2	-0.2	-5.3	-3.2	-3.4	1.0	-1.6	-1.0	-3.1	-4.2	-7.5	-7.6	-10.3	-5.5	-5.9	-4.48
E2 Plane	-6.6	-6.7	-10.6	-16.7	-17.0	-12.1	-11.5	-10.8	-6.0	-7.7	-1.8	-8.8	-2.5	-3.5	1.3	-4.3	-5.0	-10.5	-9.7	-7.3	-7.8	-11.9	-11.2	-7.8	-6.09



	Description	Model	Date	Rev
	Antenna Product Specification	A300	Aug 14, 2009	1.0

8.2. Mechanical Drawing



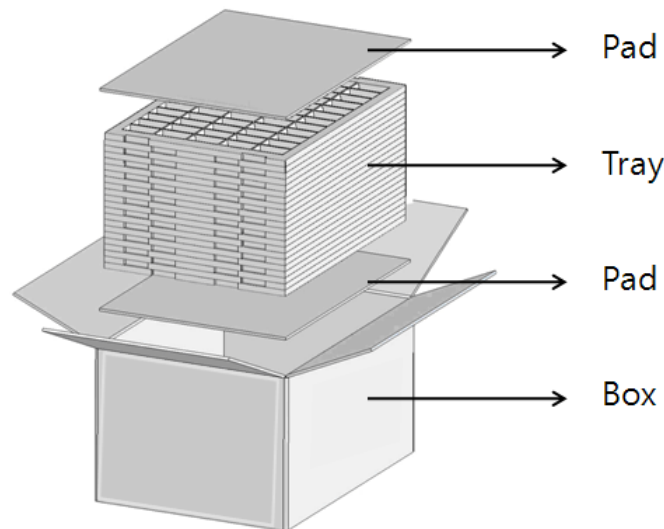
	Description	Model	Date	Rev
	Antenna Product Specification	A300	Aug 14. 2009	1.0

8.3 Packing Spec Drawing.

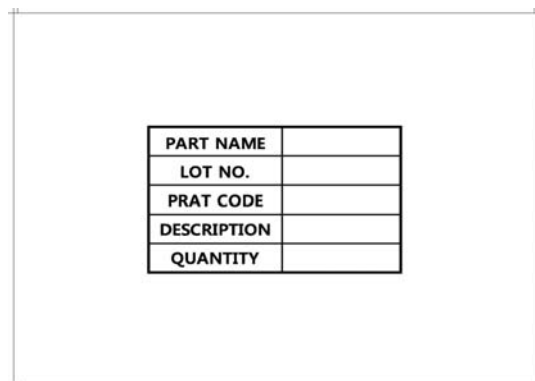
Antenna to be individually placed in compartmentalized plastic tray.
All the sizes and quantities are to be decided.

- 1 Tray = 50 Antennas
- 1 Box = 20 Tray = 1,000 Antennas

PRODUCT	QUANTITY	SIZE(mm)	MATERIAL
Tray	20/1,000	360 X 310 X 15	PE 0.5t
Inner Pad	2/1,000	370 X 320 X 5	-
Carton Box	1/1,000	380 X 330 X 250	-



- Printed Spec.(front, back)



- Printed Spec.(side)

	Description	Model	Date	Rev
	Antenna Product Specification	A300	Aug 14. 2009	1.0

8.4 Environment test report
 - Carrier (HF-1023IM, K2261)

ECO-058907

제일모직

유해물질 성적서

업체명 CAS telecom
사용용도 Antenna

시 료 명

구분	시료명	비고
수지	HF-1023IM	
칼라	K2261	B707,DK03

시 험 결 과


시험항목	시험기관	시험방법	시험장비	단위	M.D.L	합유량
중 금 속	Cd	제일모직 EN 1122:2001 Method.B	ICP-AES	mg/kg	0.5	N.D
	Pb	제일모직 CAT-OI-22:2007 (In-house method in compliance with IEC 62321 Ed.1)	ICP-AES	mg/kg	5	N.D
	Hg	제일모직 CAT-OI-24:2007 (In-house method in compliance with IEC 62321 Ed.1)	Hg Analyzer	mg/kg	0.03	N.D
	Cr(VI)	제일모직 CAT-OI-23:2007 (In-house method in compliance with IEC 62321 Ed.1)	UV-Vis	mg/kg	1	N.D
난 연 제	PBB	제일모직 CAT-OI-25:2007 (In-house method in compliance with IEC 62321 Ed.1)	GC/MS	mg/kg	5	N.D
	PBDE	제일모직 CAT-OI-25:2007 (In-house method in compliance with IEC 62321 Ed.1)	GC/MS	mg/kg	5	N.D
Total-Br	SGS	EN 14582:2007	IC	mg/kg	30	N.D

* 이 수치는 Eu 규정에 위배되지 않음 * M.D.L : Method Detection Limit * ND : Not Detected
 * 위의 시험방법 중 CAT-OI-XX:XXXX는 국제시험기관인정협력체(International Laboratory Accreditation Cooperation) 상호인정협정(Mutual Recognition Arrangement)에 서명한 한국인정기구 (KOLAS)로부터 공인 받은 시험방법입니다.

시험책임자 : 허수봉 승인자 : 김미곤

발행일자 : 2009년 07월 06일
 승인일자 : 2009년 01월 01일

품 질 관 리 팀

	Description	Model	Date	Rev
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- Pattern (SUS 304)



Test Report No. F690501/LF-CTSAYAA08-30907C

Issued Date: November 24, 2008 Page 1 of 4

To: TAIHAN STAINLESS STEEL CO., LTD
603 Seonggok-dong
Danwon-gu
Ansan-city
GYEONGGI-DO
Korea

The following merchandise was submitted and identified by the client as :

Product Name : STS 304
SGS File No. : AYAA08-30907C
Received Date : November 18, 2008
Test Performing Date : November 19, 2008
Test Performed : SGS Testing Korea tested the sample(s) selected by applicant with following results
Test Results : For further details, please refer to following page(s)

Pluto Kim
Monet Jeong
Billy Oh / Testing Person

SGS Testing Korea Co. Ltd.



Jeff Jang / Chemical Lab Mgr


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SGS Testing Korea Co., Ltd.

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t +82 (0)1 4608 000 f +82 (0)1 4608 059 <http://www.sglab.co.kr> www.kr.sgs.com/greenlab

Member of the SGS Group (Société Générale de Surveillance)

	Description	Model	Date	Rev
	Antenna Product Specification	A300	Aug 14, 2009	1.0



Test Report No. F690501/LF-CTSAYAA08-30907C

Issued Date: November 24, 2008 Page 2 of 4

Sample No. : AYAA08-30907C.001
Sample Description : STS 304
Item No./Part No. : N/A
Comments : Material is stainless steel.

Heavy Metals

Test Items	Unit	Test Method	MDL	Results
Cadmium (Cd)	mg/kg	US EPA 3052(1996), US EPA 6010B(1996), ICP	0.5	N.D.
Lead (Pb)	mg/kg	US EPA 3052(1996), US EPA 6010B(1996), ICP	5	N.D.
Mercury (Hg)	mg/kg	US EPA 3052(1996), US EPA 6010B(1996), ICP	2	N.D.
Hexavalent Chromium (Cr VI)	mg/kg	US EPA 3060A(1996), US EPA 7196A(1992), UV	1	N.D.

Flame Retardants-PBBs/PBDEs

Test Items	Unit	Test Method	MDL	Results
Monobromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Dibromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Tri bromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Tetrabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Pentabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Hexabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Heptabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Octabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Nonabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Decabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Monobromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Dibromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Tri bromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Tetrabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Pentabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Hexabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Heptabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Octabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Nonabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Decabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.

- NOTE: (1) N.D. = Not detected.(<MDL)
(2) mg/kg = ppm
(3) MDL = Method Detection Limit
(4) - = No regulation
(5) ** = Qualitative analysis (No Unit)
(6) Negative = Undetectable / Positive = Detectable


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	Description	Model	Date	Rev
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Test Report No. F690501/LF-CTSAYAA08-30907C

Issued Date: November 24, 2008

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Picture of Sample as Received:



- NOTE:
- (1) N.D. = Not detected.(<MDL)
 - (2) mg/kg = ppm
 - (3) MDL = Method Detection Limit
 - (4) - = No regulation
 - (5) ** = Qualitative analysis (No Unit)
 - (6) Negative = Undetectable / Positive = Detectable


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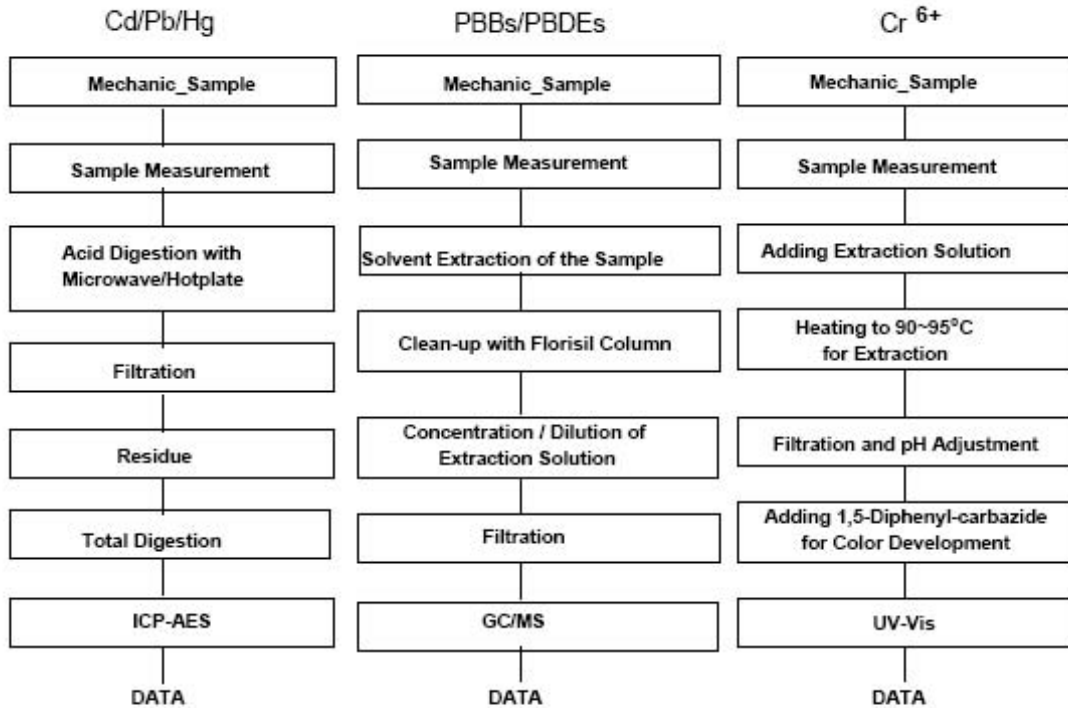
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	Description	Model	Date	Rev
	Antenna Product Specification	A300	Aug 14, 2009	1.0



Test Report No. F690501/LF-CTSAYAA08-30907C **Issued Date:** November 24, 2008 **Page 4 of 4**

Testing Flow Chart for RoHS: Cd/Pb/Hg/Cr⁶⁺/PBBs&PBDEs Testing



The samples were dissolved totally by pre-conditioning method according to above flow chart for Cd,Pb,Hg.

Operator Dami Yeom

Section Chief Jeff Jang

*** End ***

- NOTE:
- (1) N.D. = Not detected.(<MDL)
 - (2) mg/kg = ppm
 - (3) MDL = Method Detection Limit
 - (4) - = No regulation
 - (5) ** = Qualitative analysis (No Unit)
 - (6) Negative = Undetectable / Positive = Detectable


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	Description	Model	Date	Rev
	Antenna Product Specification	A300	Aug 14. 2009	1.0



Test Report No. F690501/LF-CTSAYAA08-30595

Issued Date: November 21, 2008 Page 1 of 2

To: YUHAN PRECISION
 #85-17 Dodang-dong
 Wonmi-gu
 Bucheon-city
 GYEONGGI-DO 420-803
 Korea

The following merchandise was submitted and identified by the client as :

Product Name : SUS (Stainless steel)
 SGS File No. : AYAA08-30595
 Received Date : November 17, 2008
 Test Performing Date : November 18, 2008
 Test Performed : SGS Testing Korea tested the sample(s) selected by applicant with following results
 Test Results : For further details, please refer to following page(s)
 Buyer(s) : SAMSUNG ELECTRO-MECHANICS CO.,LTD
 Comments : The client has confirmed that the described item No.s/part No.s are the same with the sample submitted.

Pluto Kim
 Monet Jeong
 Billy Oh / Testing Person

SGS Testing Korea Co. Ltd.



Jeff Jang / Chemical Lab Mgr


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	Description	Model	Date	Rev
	Antenna Product Specification	A300	Aug 14. 2009	1.0



Test Report No. F690501/LF-CTSAYAA08-30595 **Issued Date:** November 21, 2008 Page 2 of 2

Sample No. : AYAA08-30595.001
Sample Description : SUS (Stainless steel)
Item No./Part No. : SUS(301,304,316)

Halogen Contents

Test Items	Unit	Test Method	MDL	Results
Bromine(Br)	mg/kg	EN 14582:2007 , IC	30	N.D.
Chlorine(Cl)	mg/kg	EN 14582:2007 , IC	30	N.D.
Fluorine(F)	mg/kg	EN 14582:2007 , IC	30	N.D.
Iodine(I)	mg/kg	EN 14582:2007 , IC	30	N.D.



*** End ***

- NOTE:
- (1) N.D. = Not detected.(<MDL)
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 - (3) MDL = Method Detection Limit
 - (4) - = No regulation
 - (5) ** = Qualitative analysis (No Unit)
 - (6) Negative = Undetectable / Positive = Detectable

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