

ANTENNA SPECIFICATION		DATE	2006-01-27	REV.	IR
MODEL	PN-315	TYPE	RETRACTABLE	PAGE	1/20

APPROVAL SPECIFICATION	Prepared	Reviewed	Checked	Approved

TITLE	Retractable Antenna	Model	PN-315	CUSTOMER	Pantech & Curitel
--------------	---------------------	--------------	--------	-----------------	-------------------

DOCUMENT

NO.	CONTENTS	SHEETS
1	APPROVAL SPECIFICATION	1
2	ANTENNA SPECIFICATION	1

We want to approval the submitted product.

Apporved date : JAN. 27. 2006.

ANTENNA SPECIFICATION		DATE	2006-01-27	REV.	IR
MODEL	PN-315	TYPE	RETRACTABLE	PAGE	2/20

ANTENNA SPECIFICATION

ANTENNA SPECIFICATION		DATE	2006-01-27	REV.	IR
MODEL	PN-315	TYPE	RETRACTABLE	PAGE	3/20

– CONTENTS –

1. Revision LIST

2. Technical Items

2.1 Electrical Spec

2.2 Mechanical Spec

2.3 Packing Spec

3. Test Equipment

4. Electrical Demands

4.1 V.S.W.R.

4.2 Radiation Pattern

4.3 Gain

5. Mechanical Demands

5.1 Helix Deformation Test

5.2 Torque Test

5.3 Pulling force test

5.4 Drop test

5.5 Retraction/Extension force test

5.6 Retractions and Extension Force Consistency

5.7 Bend test

6. Environmental demands

6.1 Operation Temperature test

6.2 salt spray test

6.3 Temperature Change Test

6.4 High Humidity Test

7. Antenna Data

7.1 Electrical data (V.S.W.R, GAIN & Matching Circuit Diagram)

7.2 Antenna drawing

7.3 Packing Spec Drawing

ANTENNA SPECIFICATION		DATE	2006-01-27	REV.	IR
MODEL	PN-315	TYPE	RETRACTABLE	PAGE	4/20

1. REVISION LIST

REVISION LIST				
NO	DATE	CHANGE CONTENTS	CHANGE CAUSE	REV
1	01.27.2006	N/A	N/A	IR
2				
3				
4				
5				
6				
7				
8				
9				
10				

ANTENNA SPECIFICATION		DATE	2006-01-27	REV.	IR
MODEL	PN-315	TYPE	RETRACTABLE	PAGE	5/20

2. Technical Items

2.1 Electrical Spec

Electrical Spec.						
Frequency Range (MHz)		CDMA		GPS	USPCS	
		Tx	Rx	Center	Tx	Rx
		824 - 849 MHz	869 - 894 MHz	1575MHz	1850 - 1910 MHz	1930 - 1990 MHz
V.S.W.R (Max)	OPEN retracted	3.0	2.3	2.7	3.5	3.5
	OPEN extended	2.9	3.2	2.8	3.3	3.1
GAIN (E2, Max)	OPEN retracted	-1.9 dBi	0.3 dBi	1.3 dBi	2.6 dBi	1.1 dBi
	OPEN extended	-0.6 dBi	0.1 dBi	1.9 dBi	3.7 dBi	2.1 dBi
Impedance (Nominal)		50 ohms				
Polarization		VERTICAL				
Radiation Pattern		OMNI-DIRECTIONAL				
Maximum Power		2 Watts				

2.2 Mechanical Spec

Connector	Screw (M4.5 × 0.5P)
Overall length	See drawing
Operating Temperature	-20°C ~ +70°C
Weight	5.22g

2.3 Packing Spec

PRODUCT	QUALITY	MATERIAL
TRAY	50 EA	P.S
CARTON BOX	1,000 EA	DW 2 type (AB corrugated paper)

ANTENNA SPECIFICATION		DATE	2006-01-27	REV.	IR
MODEL	PN-315	TYPE	RETRACTABLE	PAGE	6/20

3. Test Equipment

The equipment for antenna test are as follows.

- ◆ Network Analyzer to measure the V.S.W.R and impedance of antenna.
- ◆ Network Analyzer to measure the receiving signal intensity.
- ◆ Standard horn antenna that is adjustable in the CDMA, GPS, USPCS band.
- ◆ Anechoic Chamber installed the cables, connectors and equipment for measurement.
- ◆ Torque Driver to measure the torque force of the helix.
- ◆ Push/Pull gauge to measure the pulling forces.
- ◆ Equipment to measure the retraction and extension force consistency.
- ◆ Climatic Chamber for environmental test.

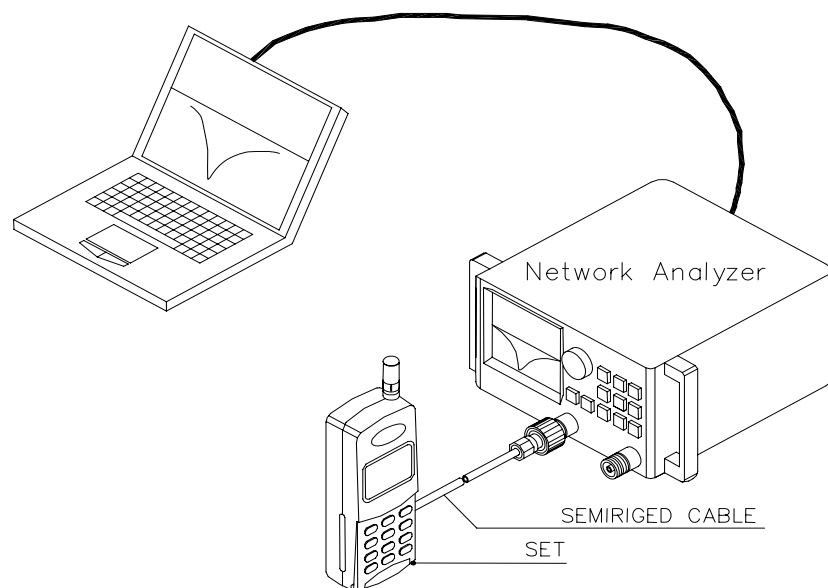
ANTENNA SPECIFICATION		DATE	2006-01-27	REV.	IR
MODEL	PN-315	TYPE	RETRACTABLE	PAGE	7/20

4. Electrical Demands

4.1 V.S.W.R

The V.S.W.R characteristics must satisfy the electrical demands table

Frequency Range		CDMA (824 ~ 894MHz)		GPS (1575MHz)	PCS (1850 ~ 1990MHz)	
		824MHz	894MHz		1850MHz	1990MHz
V.S.W.R	OPEN retracted	4.0:1	2.5:1	7.0:1	6.3:1	6.3:1
	OPEN extended	3.1:1	2.7:1	5.1:1	3.3:1	6.0:1
	OPEN retracted	3.7:1	2.3:1	5.4:1	6.9:1	7.0:1
	OPEN extended	2.9:1	2.4:1	3.2:1	3.7:1	6.1:1



ANTENNA SPECIFICATION		DATE	2006-01-27	REV.	IR
MODEL	PN-315	TYPE	RETRACTABLE	PAGE	8/20

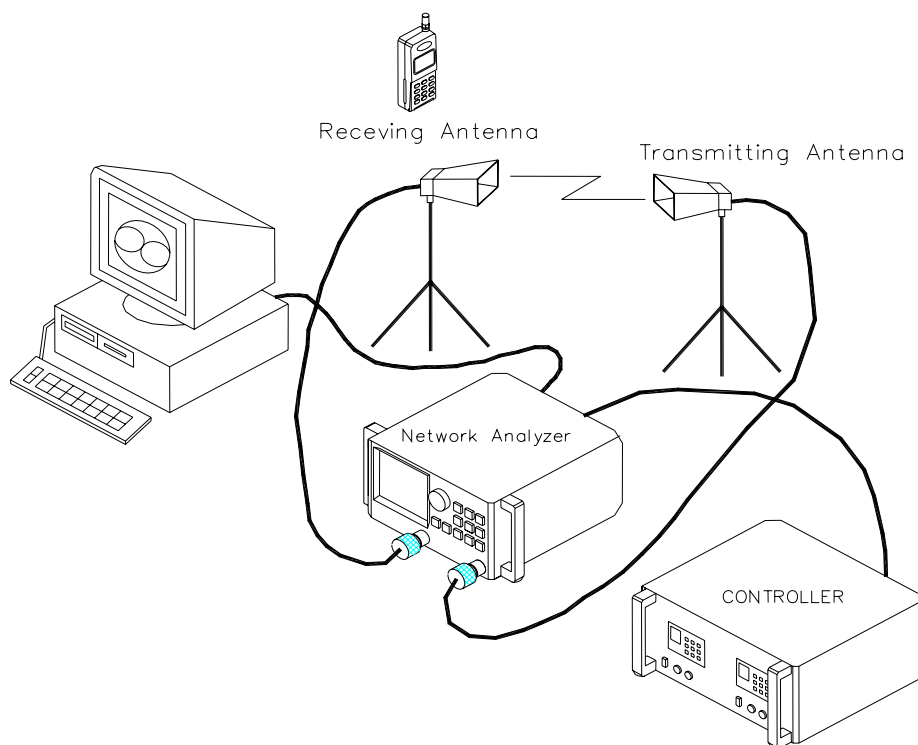
4.2 Radiation Pattern

The radiation pattern(H-plane) must be the Omni-Directional characteristic in the extended and retracted state in free space.

4.3 Gain

The gain is expressed as dBi that standardizes the horn antenna. The Gain characteristics must satisfy the electrical demands table

Frequency Range		CDMA (824 ~ 894MHz)		GPS (1575MHz)	PCS (1850 ~ 1990MHz)	
		824MHz	894MHz		1850MHz	1990MHz
Gain (dBi)	OPEN retracted	-5.4dBi	-3.6dBi	-4.7dBi	-0.5dBi	-0.8dBi
	OPEN extended	-4.0dBi	-1.9dBi	-2.6dBi	1.5dBi	-1.9dBi
	OPEN retracted	-4.8dBi	-2.8dBi	-3.0dBi	-5.2dBi	-5.2dBi
	OPEN extended	-3.4dBi	-1.8dBi	0.4dBi	0.2dBi	-2.0dBi



ANTENNA SPECIFICATION		DATE	2006-01-27	REV.	IR
MODEL	PN-315	TYPE	RETRACTABLE	PAGE	9/20

5. Mechanical Demands

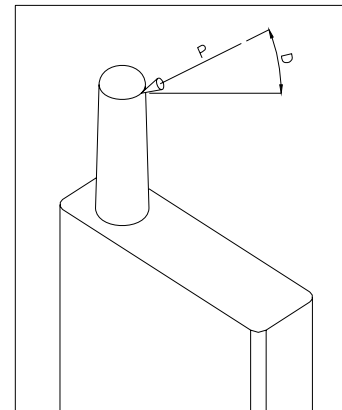
5.1 Helix Deformation Test.

The antenna is assembled to the test equipment. A 4Kgf force is applied up 30 angles from the top of the HELIX. And it' s applied with four directions for each 30 angles.

After the test, no visual deterioration shall occur.

Cover and metal shall remain mechanically bonded. After the test, the antenna shall satisfy the electrical demands.

F (Kgf)	10
P (Kgf)	7
L (mm)	2/3
etc	-

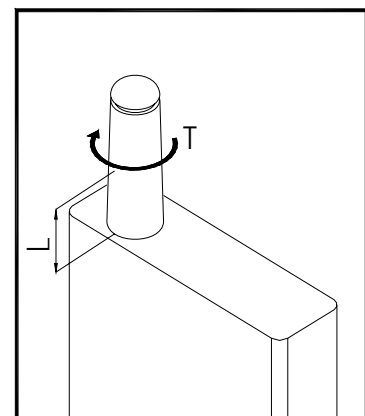


5.2 Torque Test

The antenna is assembled to the test equipment.

A 3Kgf.Cm force is applied to the antenna in clockwise direction. After the test, no visual deterioration shall occur and the part of the cover and the metal shall remain mechanically bonded. After the test, the antenna shall satisfy the electrical demands.

T (Kgf.mm)	3
L (mm)	2/3
바 고	-

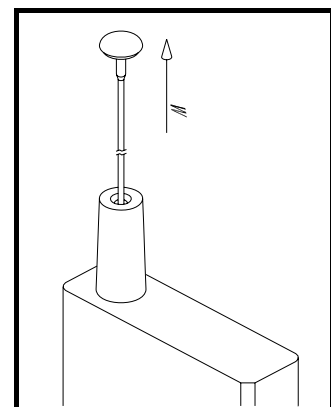


ANTENNA SPECIFICATION		DATE	2006-01-27	REV.	IR
MODEL	PN-315	TYPE	RETRACTABLE	PAGE	10/20

5.3 Pulling force test

In +22°C, Relative humidity 60% chamber, the antenna is exposed for 24 hours. The antenna is assembled to the test equipment. A 26 lb force is applied to the antenna. After the test, no visual deterioration shall occur and the knob and wire shall remain mechanically bonded.

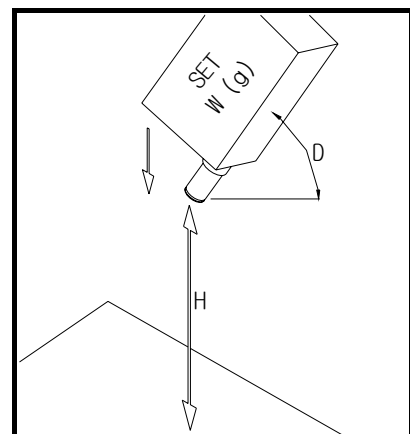
W (kgf)	7
etc	1MIN



5.4 Drop test

The antenna is assembled to phone (or the handset with 80g). The handset is dropped with the antenna downward onto a concrete surface at 150cm height. The number of drop is one time for retracted position and one time for extension position. After the test, the original shape shall be possible to restore. The antenna shall satisfy the electrical demands.

W (g)	W(SET WIGHT)g
D (°)	Within 90 ° /45 °
H (Cm)	150 / 120
Number (N)	per 2 time
etc	-



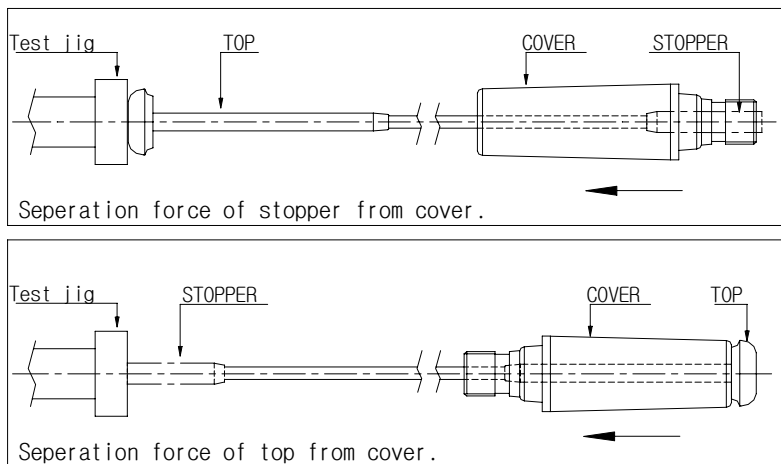
ANTENNA SPECIFICATION		DATE	2006-01-27	REV.	IR
MODEL	PN-315	TYPE	RETRACTABLE	PAGE	11/20

5.5 Retraction/Extension force test

The antenna shall have the extension force until 100gf to 500gf.

And retraction force until 100gf to 400gf.

This condition sets on the basis of force that the stopper is retracted or extended from the helix.



STOPPER FORCE(gf)	100gf ~ 400gf
TOP FORCE(gf)	100gf ~ 500gf
etc	-

ANTENNA SPECIFICATION		DATE	2006-01-27	REV.	IR
MODEL	PN-315	TYPE	RETRACTABLE	PAGE	12/20

5.6 Retractions and Extension Force Consistency

* 20,000 cycles

The antenna is assembled to the test equipment. The antenna is fully extended/retracted 10 cycle /min (1 cycle is extension / retraction).

After the test, no visual deterioration shall occur and both retraction and extension force will have 50 to 550gf.

The antenna will satisfy electrical demand after the test also.

Total retracted,extended time (M)	20,000 Time
TEST TIME	1Time
Measurement time segment (N)	5,000 Time
Retracted force, Extended force (gf)	100gf ~ 400gf
etc	20 cpm

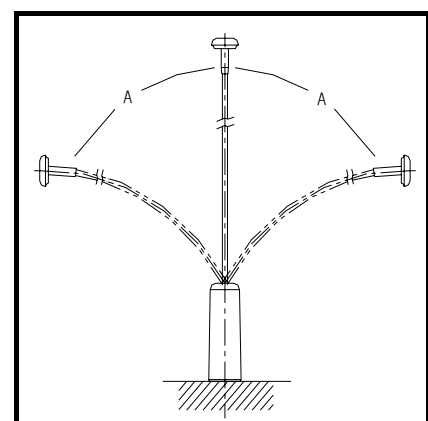
5.7 bend test

One flex cycle consists of two 90° bends from vertical over a 1" (25.4mm) mandrel.

After the test, the antenna shall be no degradation of the exterior or in continuity.

The antenna shall satisfy the electrical demands.

A (°)	90°
Number (N)	2,000time
etc	-



ANTENNA SPECIFICATION		DATE	2006-01-27	REV.	IR
MODEL	PN-315	TYPE	RETRACTABLE	PAGE	13/20

6.Environmental Demands

6.1 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.

6.2 Salt spray Test

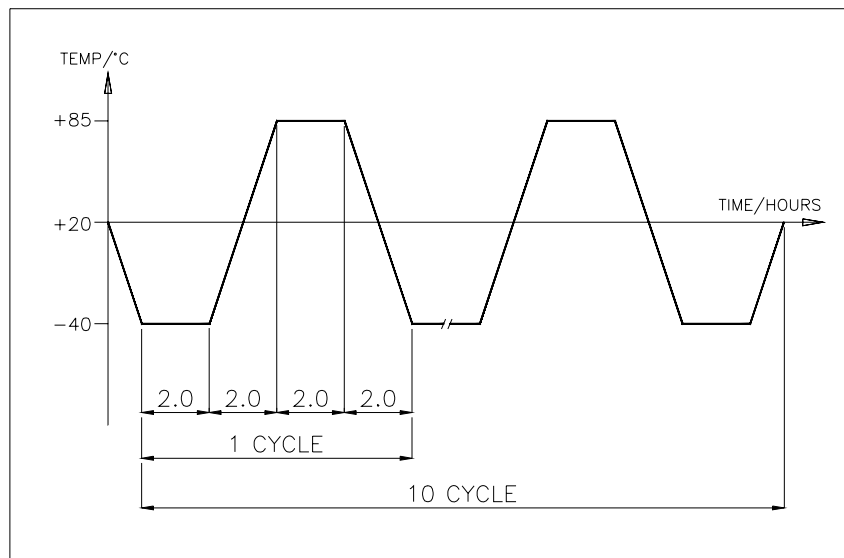
In salt fog chamber, expose test antennas to a 35°C, 5% salt fog atmosphere for 48 hours. After the test, the antenna shall be continued. The antenna shall satisfy the electrical demands

ANTENNA SPECIFICATION		DATE	2006-01-27	REV.	IR
MODEL	PN-315	TYPE	RETRACTABLE	PAGE	14/20

6.3 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 2 hours. 10 cycles.
- Final measurements: The antenna shall be visually inspected and electrically and mechanically checked as required by products standard.



6.4 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.

ANTENNA SPECIFICATION		DATE	2006-01-27	REV.	IR
MODEL	PN-315	TYPE	RETRACTABLE	PAGE	15/20

7. Antenna Data

7.1 Electrical data (V.S.W.R,GAIN & Matching Circuit Diagram)

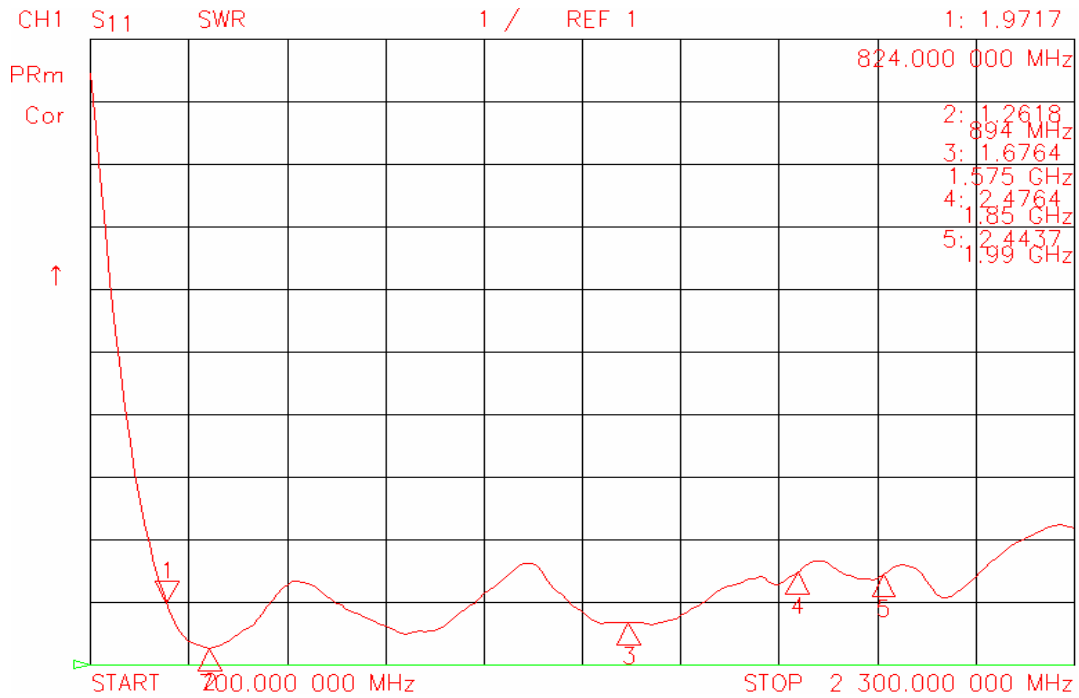
→ Electrical data

Electrical data.		CDMA		GPS	USPCS	
Frequency Range (MHz)		Tx	Rx	Center	Tx	Rx
		824 - 849 MHz	869 - 894 MHz	1575MHz	1850 - 1910 MHz	1930 - 1990 MHz
V.S.W.R	OPEN retracted	1.97	1.26	1.67	2.47	2.44
	OPEN extended	1.90	2.19	1.76	2.26	2.12
GAIN (E2,Peak)	OPEN retracted	-0.91 dBi	1.32 dBi	2.36 dBi	3.60 dBi	2.14 dBi
	OPEN extended	0.37 dBi	1.19 dBi	2.90 dBi	4.77 dBi	3.10 dBi

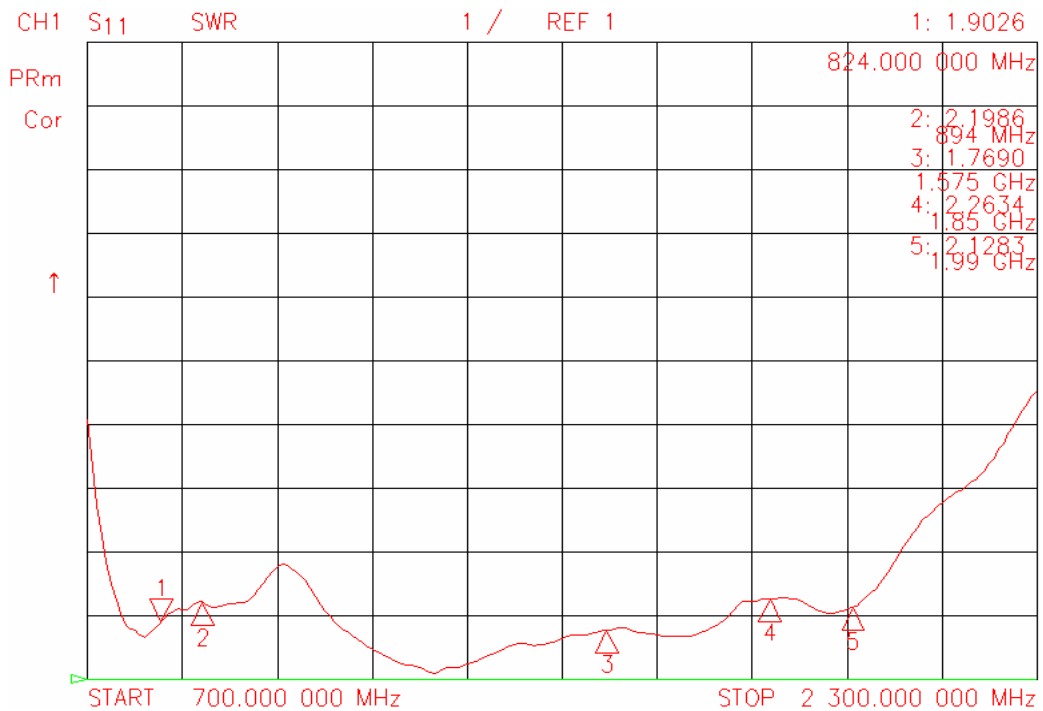
ANTENNA SPECIFICATION		DATE	2006-01-27	REV.	IR
MODEL	PN-315	TYPE	RETRACTABLE	PAGE	16/20

→ V.S.W.R

a. Folder Open(Retracted)

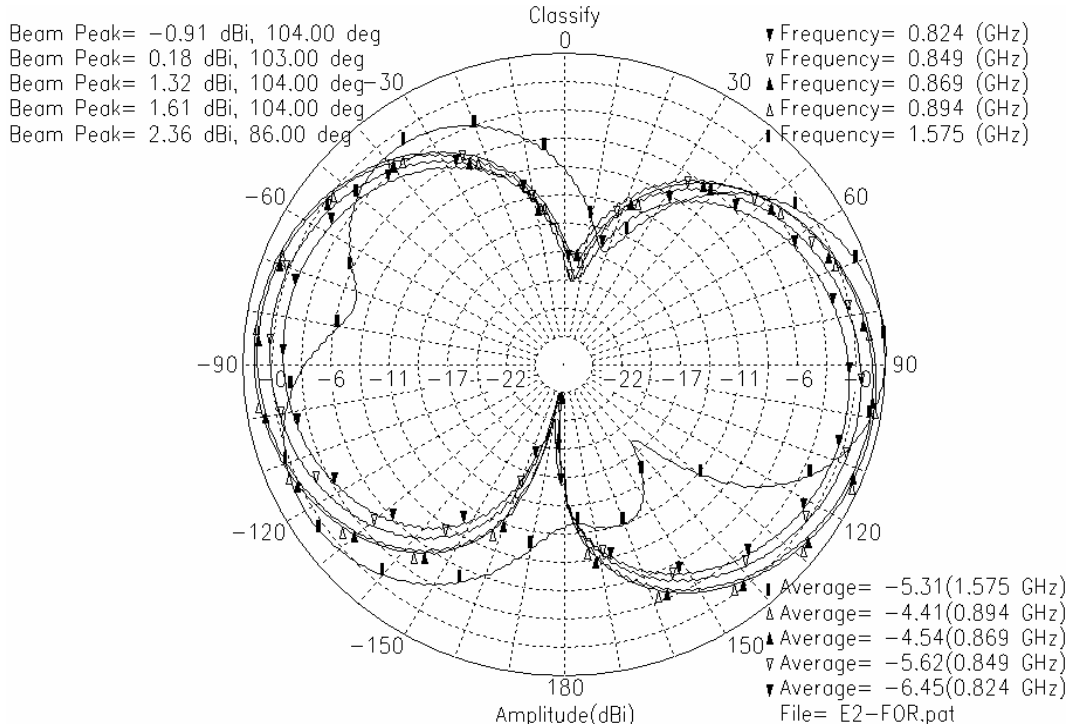


b. Folder Open(Extended)

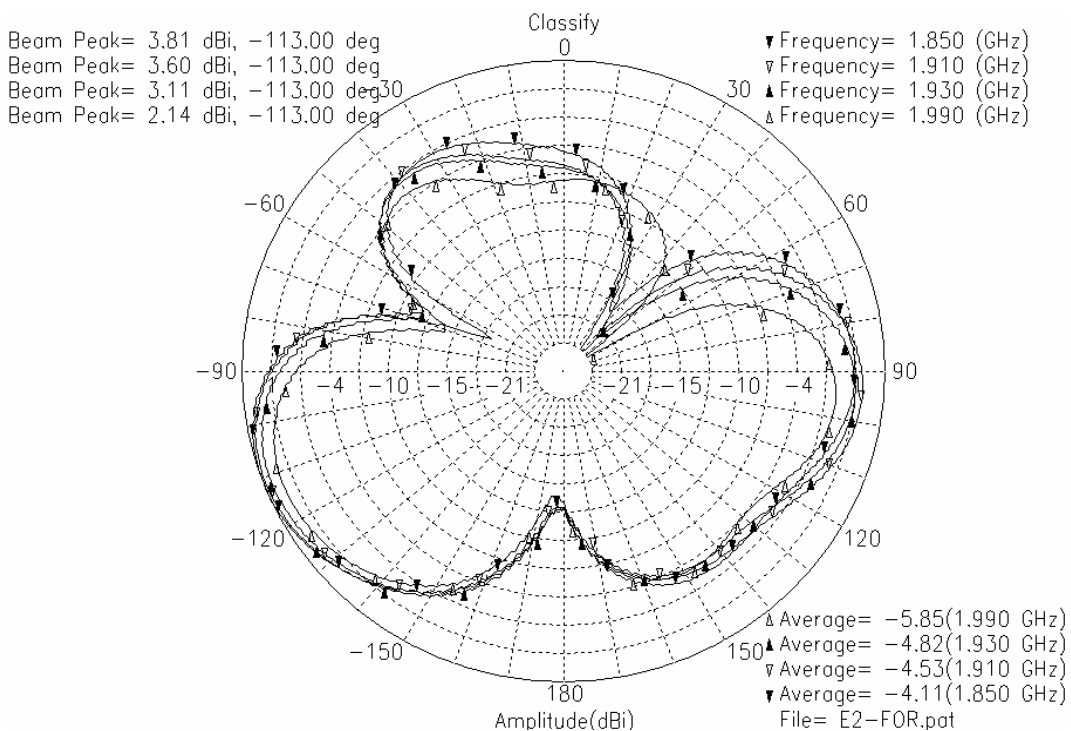


ANTENNA SPECIFICATION		DATE	2006-01-27	REV.	IR
MODEL	PN-315	TYPE	RETRACTABLE	PAGE	17/20

→ Radiation Gain

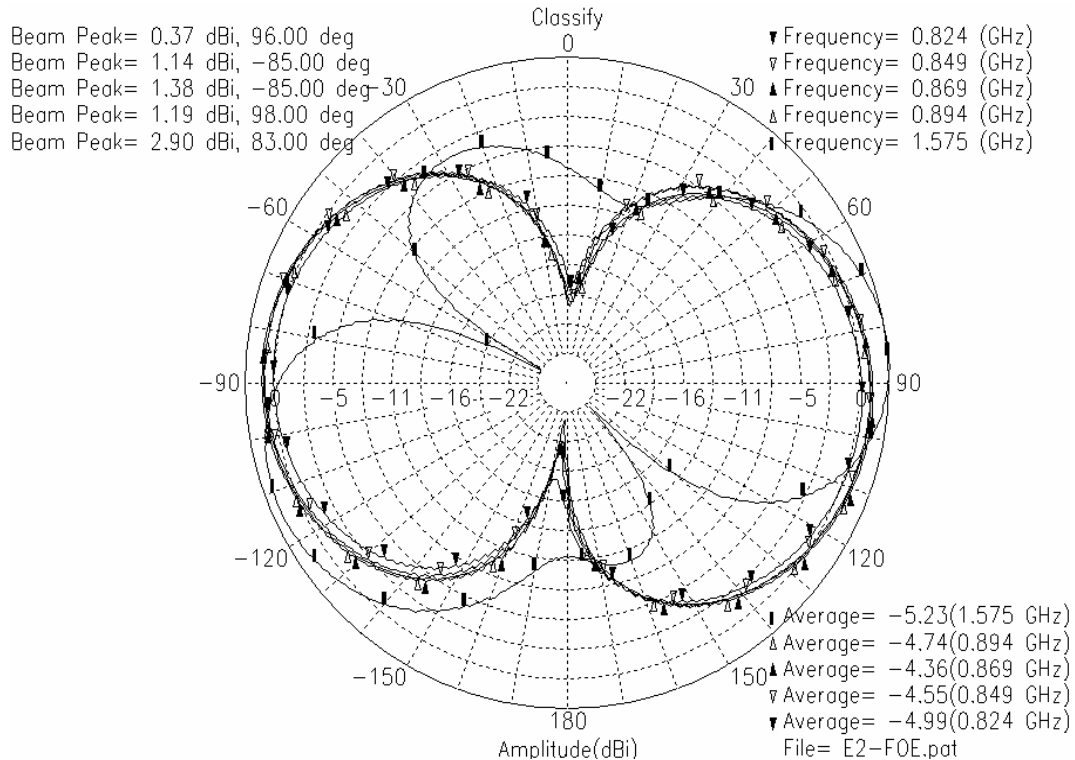


[CDMA,GPS Band : E2-plane, Folder-Opened retracted State]

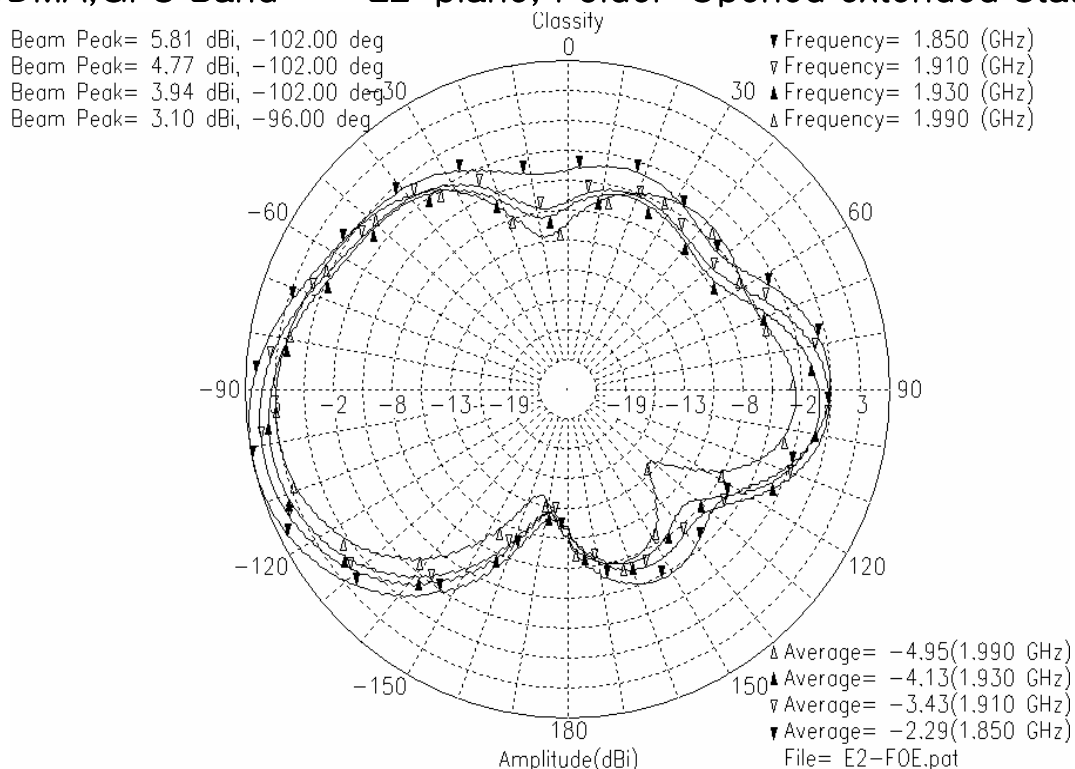


[USPCS Band : E2-plane, Folder-Opened retracted State]

ANTENNA SPECIFICATION		DATE	2006-01-27	REV.	IR
MODEL	PN-315	TYPE	RETRACTABLE	PAGE	18/20



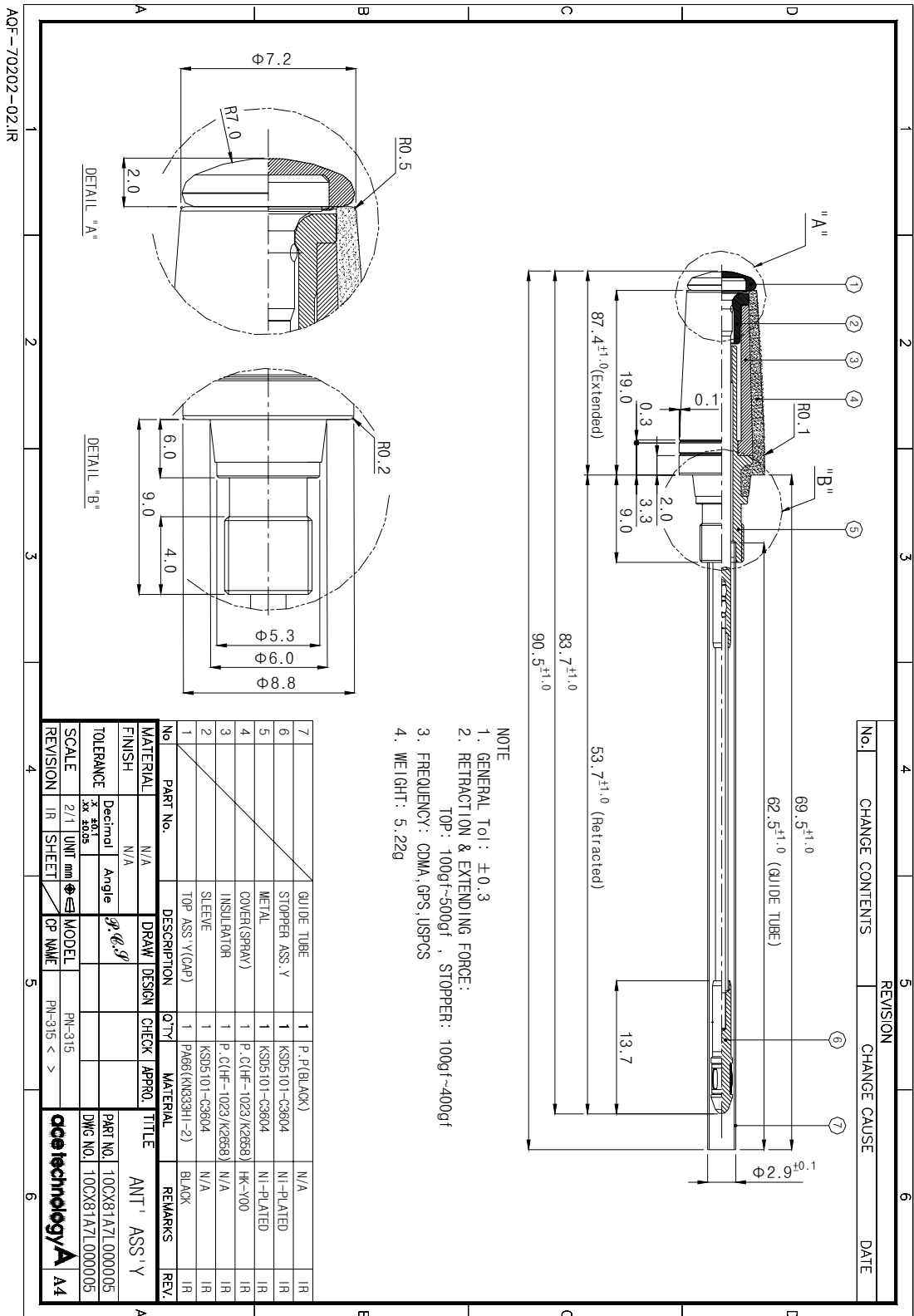
[CDMA, GPS Band : E2-plane, Folder-Opened extended State]



[USPCS Band : E2-plane, Folder-Opened extended State]

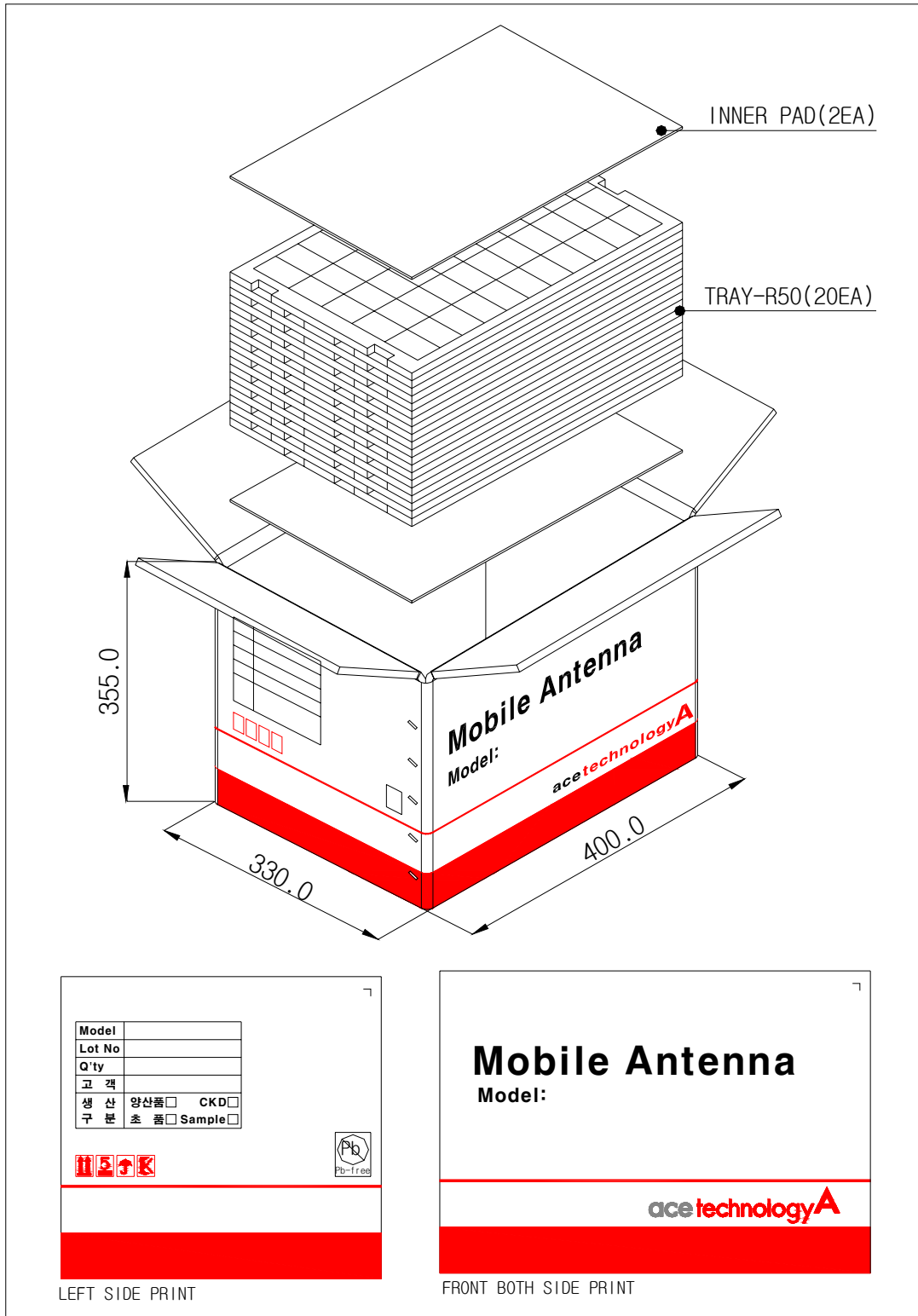
ANTENNA SPECIFICATION		DATE	2006-01-27	REV.	IR
MODEL	PN-315	TYPE	RETRACTABLE	PAGE	19/20

7.2 Antenna drawing



ANTENNA SPECIFICATION		DATE	2006-01-27	REV.	IR
MODEL	PN-315	TYPE	RETRACTABLE	PAGE	20/20

7.3 Packing Spec Drawing



AQF-80500-03. IR