


MRW ANTENNA SPECIFICATION	Doc.No MRWPQR10420	Rev. No. 0
RETRACTABLE ANTENNA	Date 2003. 6.27	Page

ANTENNA SPECIFICATION

- Description: Cellular & US-PCS Dual Band Retractable Antenna**
- MODEL NO: TX-120**
- APPROVAL NO:**
- APPROVED DATE:**
- TERM OF VALIDITY:**

C U S T O M E R	PREPARED	CHECKED	APPROVED
			
S U P P L I E R	PREPARED	CHECKED	APPROVED

- SUPPLIER: MRW technologies,Ltd**
- ADDRESS: 137-5, Okum-ri, Tanhyon-myon, Paju-shi,Kyunggi-do,Korea**
- TEL: 031-940-9070 / FAX: 031-940-9090**
- PRESIDENT: M.J.Woo**
- CUSTOMER: Pantech & Curitel**



MRW ANTENNA SPECIFICATION	Doc.No MRWPQR10420	Rev. No. 0
RETRACTABLE ANTENNA	Date 2003. 6.27	Page

Contents

1. Specification
 - 1.1 Electrical Specification
 - 1.2 Mechanical Specification
 - 1.3 Packing Specification

2. Test Equipments

3. Electrical Specification
 - 3.1 V.S.W.R
 - 3.2 Radiation Pattern
 - 3.3 Gain

4. Mechanical Specification
 - 4.1 Dimension
 - 4.2 Bending Test
 - 4.3 Extraction and Retraction Force
 - 4.4 Drop Test
 - 4.5 Pull Test
 - 4.6 Torque Test
 - 4.7 Cycle Test

5. Enviromental Specification
 - 5.1 Thermal Shock
 - 5.2 Temperature Cycling
 - 5.3 Low temp. Test
 - 5.4 High temp. Test
 - 5.5 Humidity
 - 5.6 Vibration
 - 5.7 Salt Spray Test

Appendix A. : Reference of test methods

MRW ANTENNA SPECIFICATION	Doc.No MRWPQR10420	Rev. No. 0
RETRACTABLE ANTENNA	Date 2003. 6.27	Page

1. Specification

1.1 Electrical Specification

Frequency Range	Cellular: 824 ~894 MHz US - PCS: 1.85 ~ 1.99Ghz	
Gain	Cellular	Extended: > - 4.0 dBd (peak : - 1.0dBd)
		Retracted: > - 6.5 dBd (peak : - 2.5dBd)
	US - PCS	Extended::> - 2.0 dBi (peak : 3.6dBi)
		Retracted:> - 5.5 dBi(peak: - 0.7dBi)
V.S.W.R	Extended: < 4.5:1	
	Retracted: < 3.0:1	
Impedance	50Ω	
Radiation Pattern	Omni - directional	
Polarization	Vertical	
Max power	2W	

1.2 Mechanical Specification

Length	See the drawing
Temperature	- 40 °C - +70 °C
Connector type	Screw

1.3 Packing

Description	Q ' ty	Material	Remark
Tray	150EA	PVC	
Air Veenyl	-	Polyester	
Inner Box	1,500EA	SW 1 (A)	17.4Kgf/50mm min.
Master Carton Box	7,500EA	DW 1(A)	25.4Kgf/50mm min.

MRW ANTENNA SPECIFICATION	Doc.No MRWPQR10420	Rev. No. 0
RETRACTABLE ANTENNA	Date 2003. 6.27	Page

2. Test Equipment

Description	Purpose
Network Analyzer	V.S.W.R, Impedance
Standard Dipole	Gain, Impedance
Digital Calipers	Dimension
Torque Driver	Torque Test
Push Pull Gauge	Pull Test
Temp. Chamber	Temperature Test
Thermal Shock Chamber	Thermal Shock
Vibration Shaker	Vibration
Dummy Set	Drop Test

3. Electrical Specification

3.1 V.S.W.R

The performance of this antenna shall be in accordance with the best V.S.W.R requirements as followings ; in extended position, the maximum V.S.W.R shall be 3.0 and in retracted position, it shall be 4.5 over the entire band.

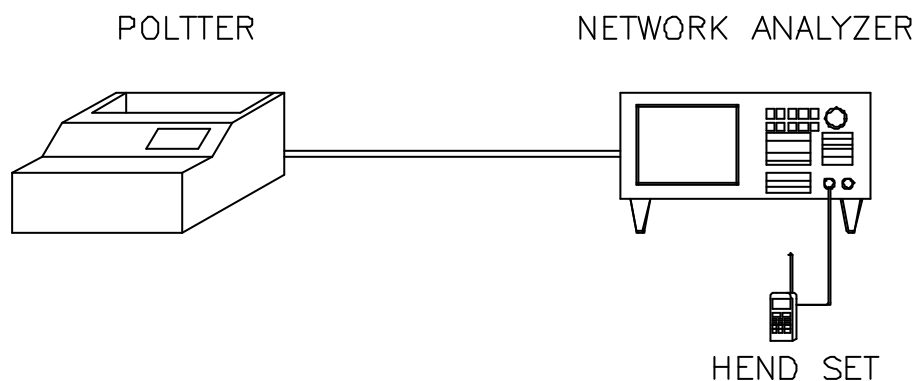


Figure 1 V.S.W.R Measurement System

MRW ANTENNA SPECIFICATION	Doc.No MRWPQR10420	Rev. No. 0
RETRACTABLE ANTENNA	Date 2003. 6.27	Page

3.2 Radiation Pattern

The radiation pattern of this antenna shall be omni - directional for the horizontal plane and bi - directional for the vertical plane in both position of extended and retracted.

3.3 Antenna Gain

Antenna gain shall be measured in decibels relative to a half wavelength dipole reference antenna and converted in unit of dBd or dBi. The gain of Cellular band, it shall be -4.0dBd min.(peak: -1.0dBd) in extended position and -6.5dBd (peak: -2.5dBd) in retracted position and the gain of US - PCS band, it shall be -2.0dBi min. (peak: 3.6dBi) in extended position and -5.5dBi min.(peak: -0.7dBi) in retracted position throughout the overall frequency.

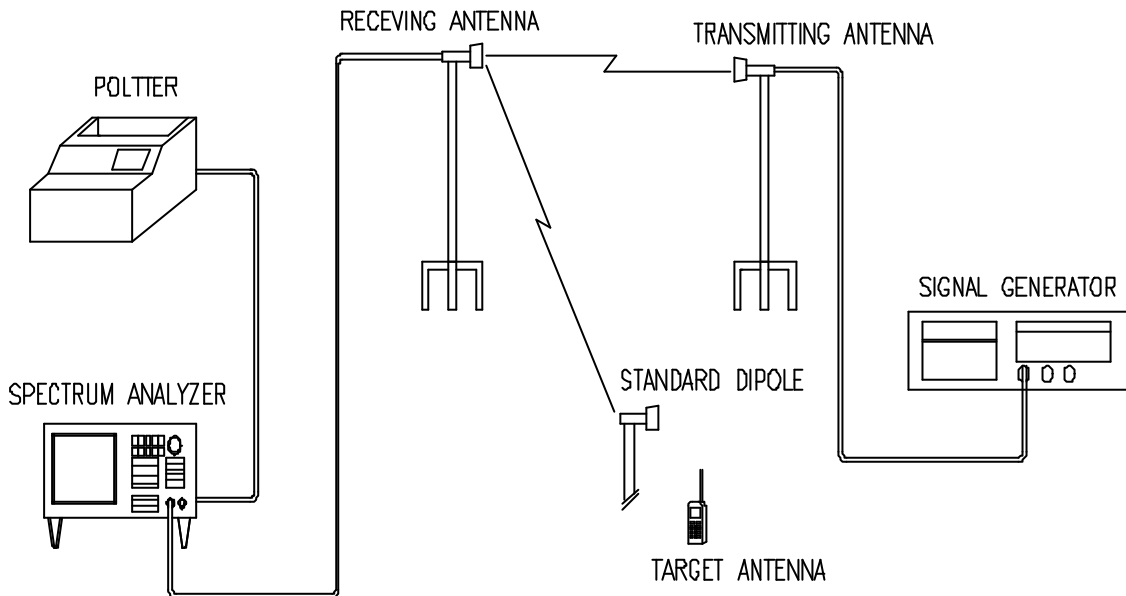


Figure. 2 Antenna Gain Measurement System

4. Mechanical Specification

4.1 Dimension

Refer to the attached drawing.

MRW ANTENNA SPECIFICATION	Doc.No MRWPQR10420	Rev. No. 0
RETRACTABLE ANTENNA	Date 2003. 6.27	Page

4.2 Bending Test

There shall not be any visible damage and shall met electrical specification after 500 times bending at 90° form side to side.

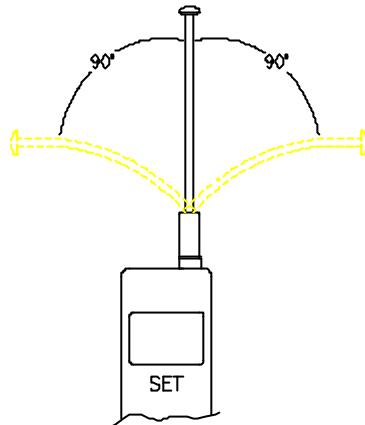


Figure. 3 Bending Test

4.3 Extraction / Retraction Test

When the tip of antenna is pulled up for extraction in retracted position, the force should be 150~350gf and when the tip of antenna is pushed down for retraction, he release force of stopper shall be 150 ~ 350gf.

4.4 Drop Test

The handset installed with antenna is dropped from 1.5m onto the concrete bottom for 1 time each in retracted and extended position at 45 degree.

There shall not be any major visible damage and the antenna shall perform normally as defined in this specification after the test.

4.5 Pull Test

The antenna is assembled in the test equipment and pulling force with 4kgf is applied to the antenna for 30 seconds.

No visual deterioration shall occur and the antenna shall satisfy the electrical demands after the test..

MRW ANTENNA SPECIFICATION	Doc.No MRWPQR10420	Rev. No. 0
RETRACTABLE ANTENNA	Date 2003. 6.27	Page

4.6 Torque Test

The antenna is assembled to the test equipment. After applying the torque force with 3kgf in clockwise direction between fitting and plastic, no visual deterioration shall occur, the antenna shall satisfy the electrical demands after the test.

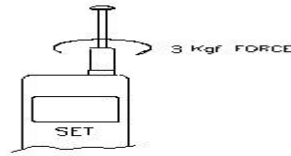


Figure 4. Torque Test

4.7 Cycle Test

The antenna is fully extended / retracted (1 cycle) with 10000 times and the extraction / retraction force is measured every 2000 cycles.

No visual deterioration shall occur and the extraction/retraction force of antenna shall keeps 150~350gf.

5. Enviromental Specification

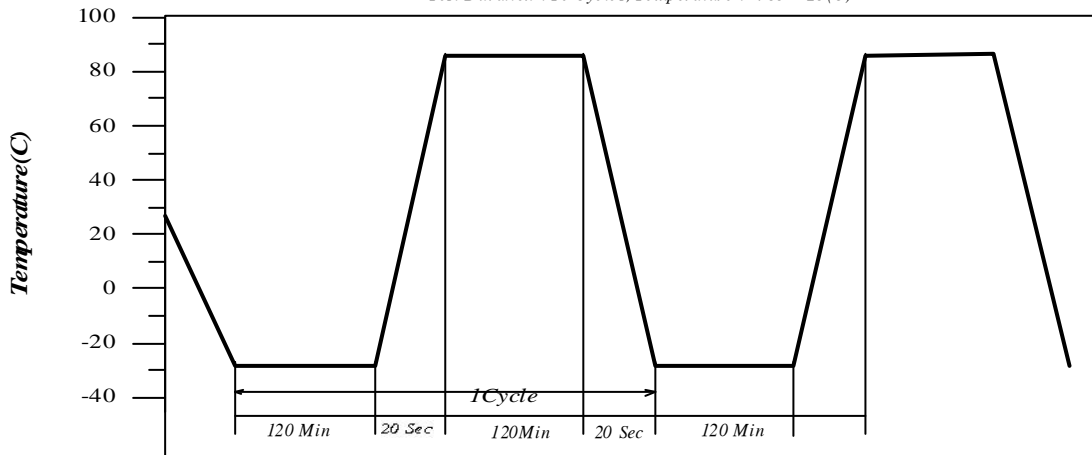
5.1 Thermal Shock

the antenna shall withstand 10 repeated cycles of 120 minutes at +25°C and 120 minutes at +85°C with a maximum transition time between temperature extremes of 20 seconds.

The antenna shall satisfy the electrical specification after the test. The antenna shall have no deterioration after the test.

Temperature Shock Test

Test Duration : 10 Cycles, Temperature : +85 - -25(C)



MRW ANTENNA SPECIFICATION	Doc.No MRWPQR10420	Rev. No. 0
RETRACTABLE ANTENNA	Date 2003. 6.27	Page

5.2 Temperature Cycling

The antenna is placed in the temperature chamber with - 40 for 3 hours and measured after taking out of chamber.

After that, the antenna is again placed in the temperature chamber with +70°C for 3 hours and measured after taking out of chamber.

The antenna shall not be any visible damage and it shall meet electrical spec.

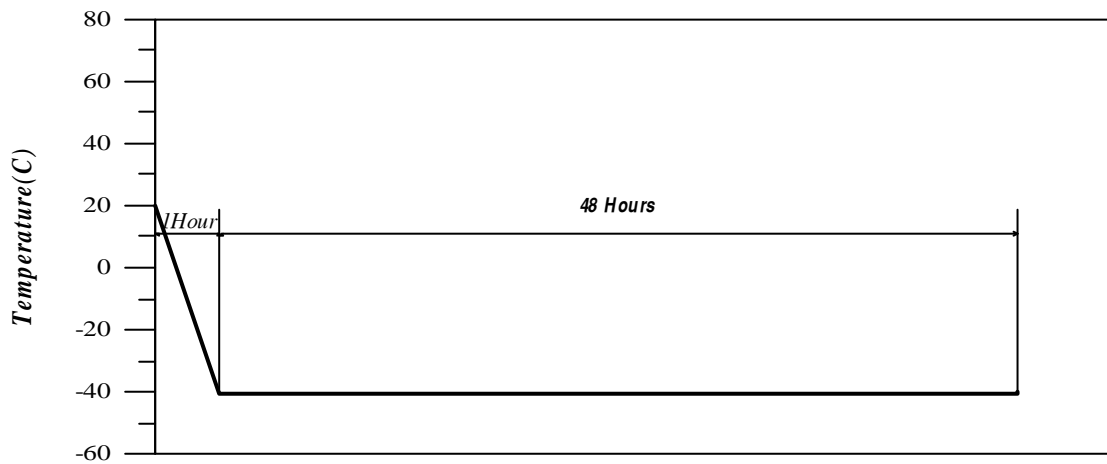
5.3 Low Temperature Test

The antenna is placed in the temperature chamber with - 40°C for 46 hours and measured after taking out of chamber.

The antenna shall not be any visible damage and it shall meet electrical spec.

Low Temperature Test

Duration : 48 Hours, Temperature : - 40(C)



5.4 High Temperature Test

The antenna is placed in the temperature chamber and test it under below condition and measured it after taking out of chamber.

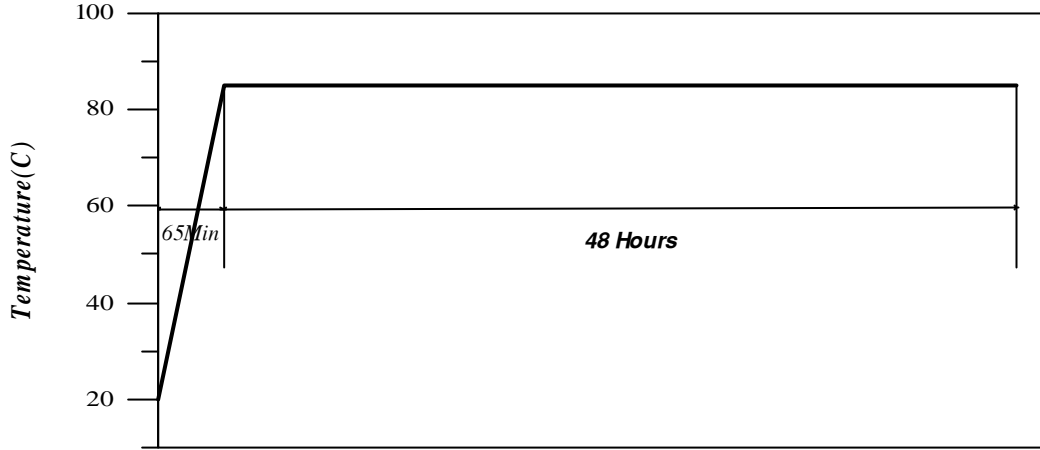
The antenna shall not be any visible damage and it shall meet electrical spec.



MRW ANTENNA SPECIFICATION	Doc.No MRWPQR10420	Rev. No. 0
RETRACTABLE ANTENNA	Date 2003. 6.27	Page

High Temperature Test

Duration : 48 Hours, Temperature : +85(C)



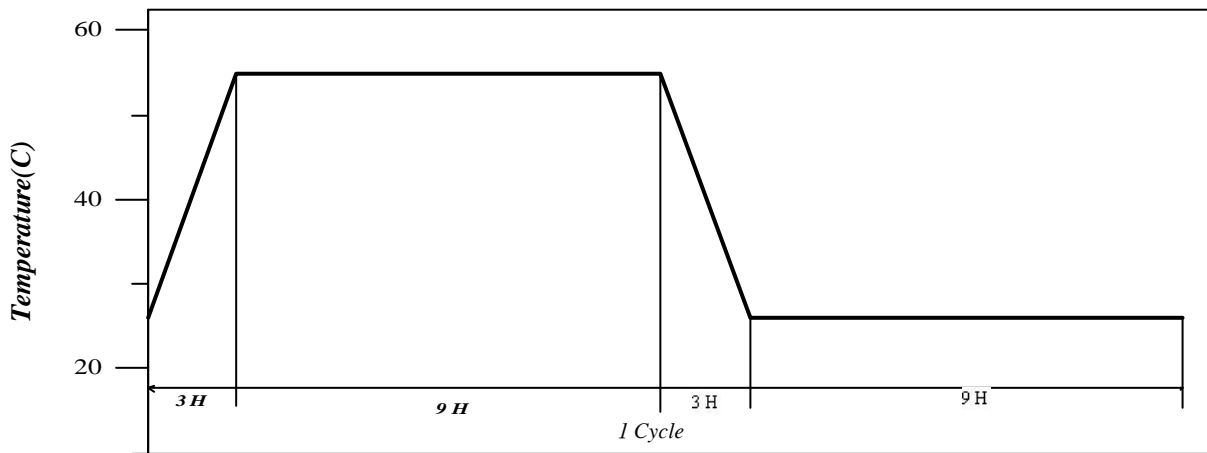
5.5 Humidity Test

The antenna is placed in the temperature chamber and test it under below condition and measured it after taking out of chamber.

The antenna shall not be any visible damage and it shall meet electrical spec.

Temperature Change in High Humidity

Test Duration : 1 Day, 1 Cycle --> 24 Hours, Temperature : +25 - +55(C), RH : 95%



MRW ANTENNA SPECIFICATION	Doc.No MRWPQR10420	Rev. No. 0
RETRACTABLE ANTENNA	Date 2003. 6.27	Page

5.6 Vibration Test

The antenna shall withstand 2G's RMS(10Hz - 150Hz - 10Hz / 1cycle) with 0.5 octave/min, 12cycles in X,Y,Z direction.

No appearance or function changes shall be found after the test.

5.7 Salt Spray Test

The antenna shall be exposed for 48 hours at +35°C to a5% Sodium Chloride fog and have no appearance or function changes after the test.

MRW ANTENNA SPECIFICATION	Doc.No MRWPQR10420	Rev. No. 0
RETRACTABLE ANTENNA	Date 2003. 6.27	Page

Appendix A. Reference of TestMethods

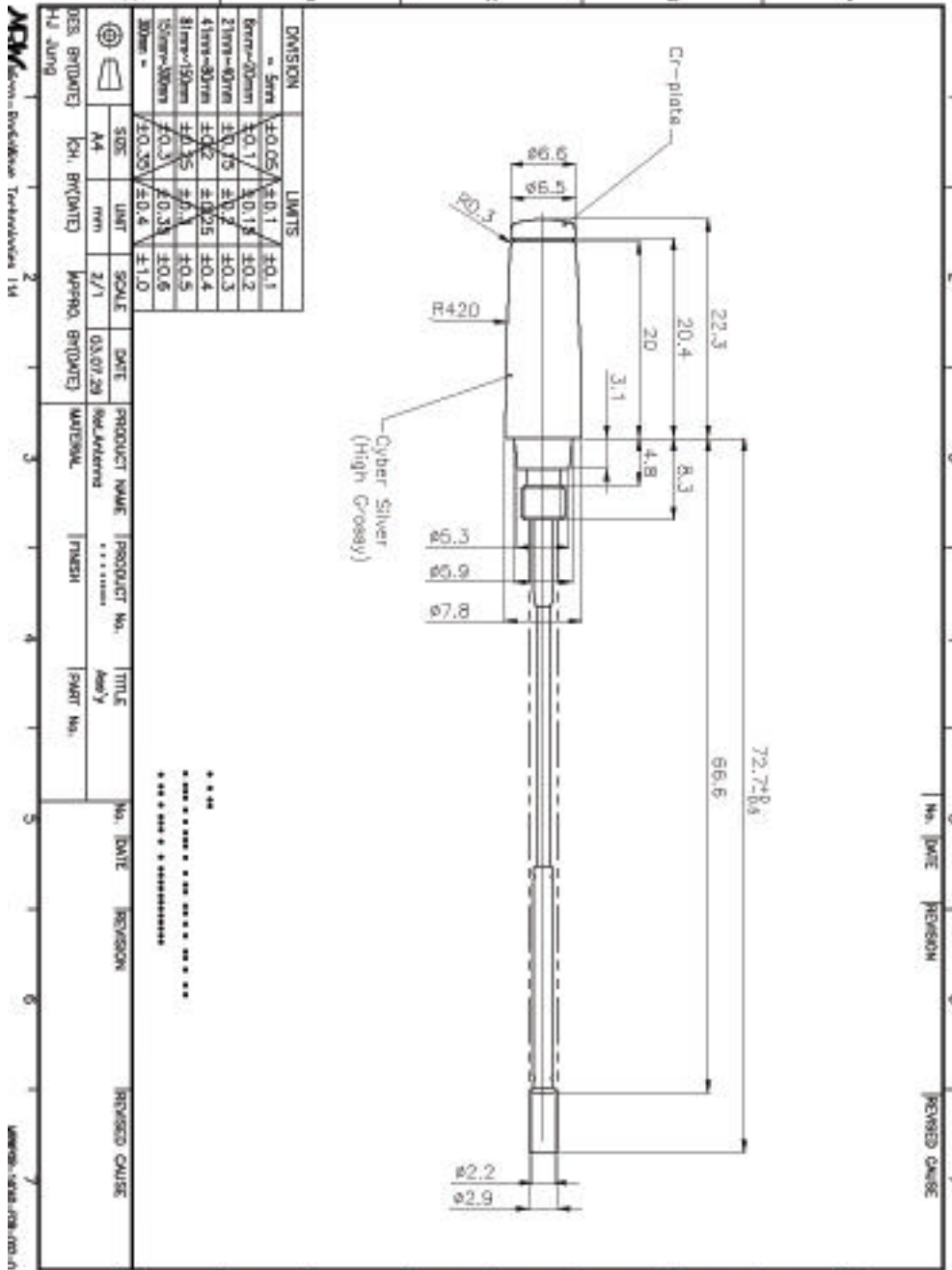
		Test Items	Reference
Mechanical	MRWS - Ma	Drop Test	IEC 68 - 2 - 31
	MRWS - Mb	Insertion/Extraction Test	-
	MRWS - Mc	Pulling Test	-
	MRWS - Md	Bending Test	-
	MRWS - Me	Torsion Test	-
	MRWS - Mf	Helix Breaking Test	-
	MRWS - Mg	Endurance Test	-
Enviromental	MRWES - Na	Temperature Shock Test	IEC 68 - 2 - 14
	MRWES - Nb	Temperature Cyclng Test	IEC 68 - 2 - 14
	MRWES - Ab	Low Temperature Test	IEC 68 - 2 - 1
	MRWES - Bb	Hot Temperature Test	IEC 68 - 2 - 2
	MRWES - D	Humidity Test	IEC 68 - 2 - 30
	MRWES - Fc	Sinusoidal Vibration Test	IEC 68 - 2 - 6

.MRWS -M : MRW Mechanical Standard

.MRWES - : MRW Environmental Standard



MRW ANTENNA SPECIFICATION	Doc.No MRWPQR10420	Rev. No. 0
RETRACTABLE ANTENNA	Date 2003. 6.27	Page



ACM Korea, Inc. 2003. 6. 27

2

3

4

5

6

7

8

No. DATE REVISION REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

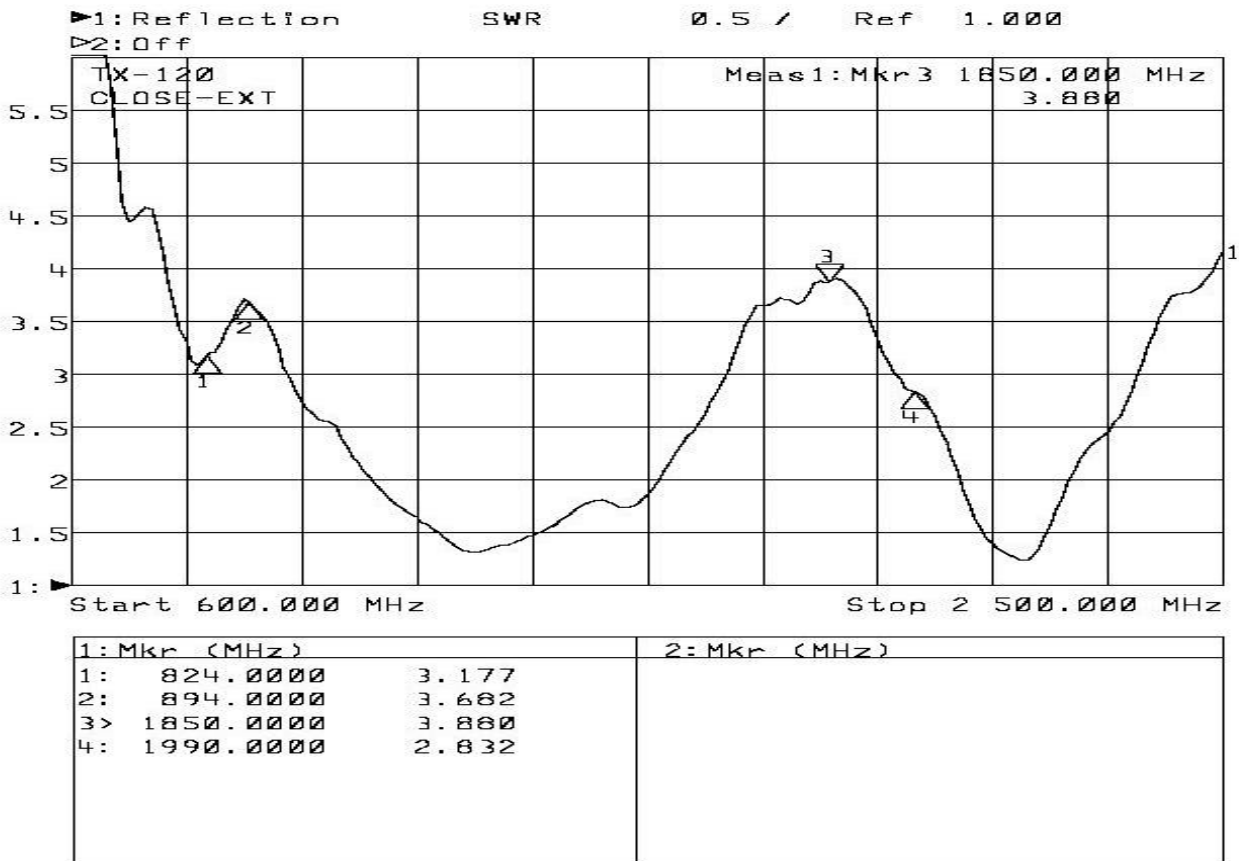
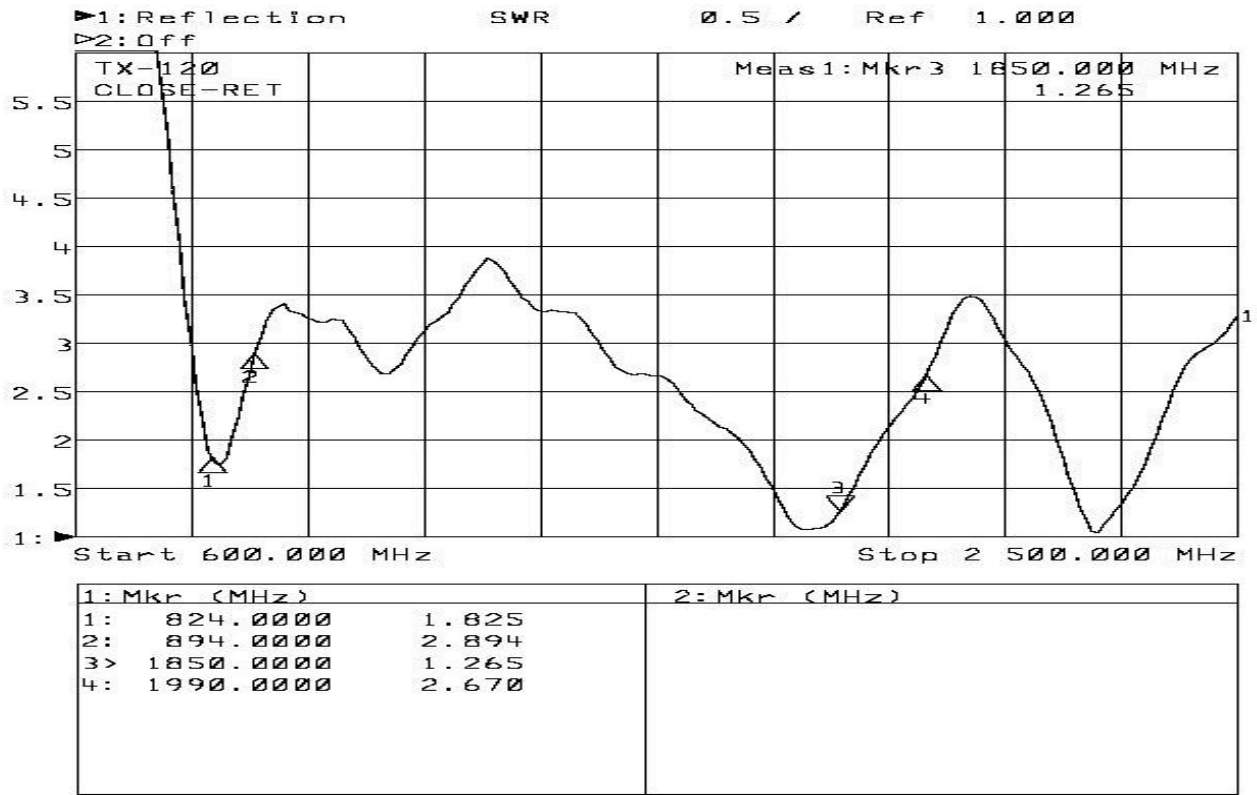
REVISION CAUSE

REVISION CAUSE

REVISION CAUSE

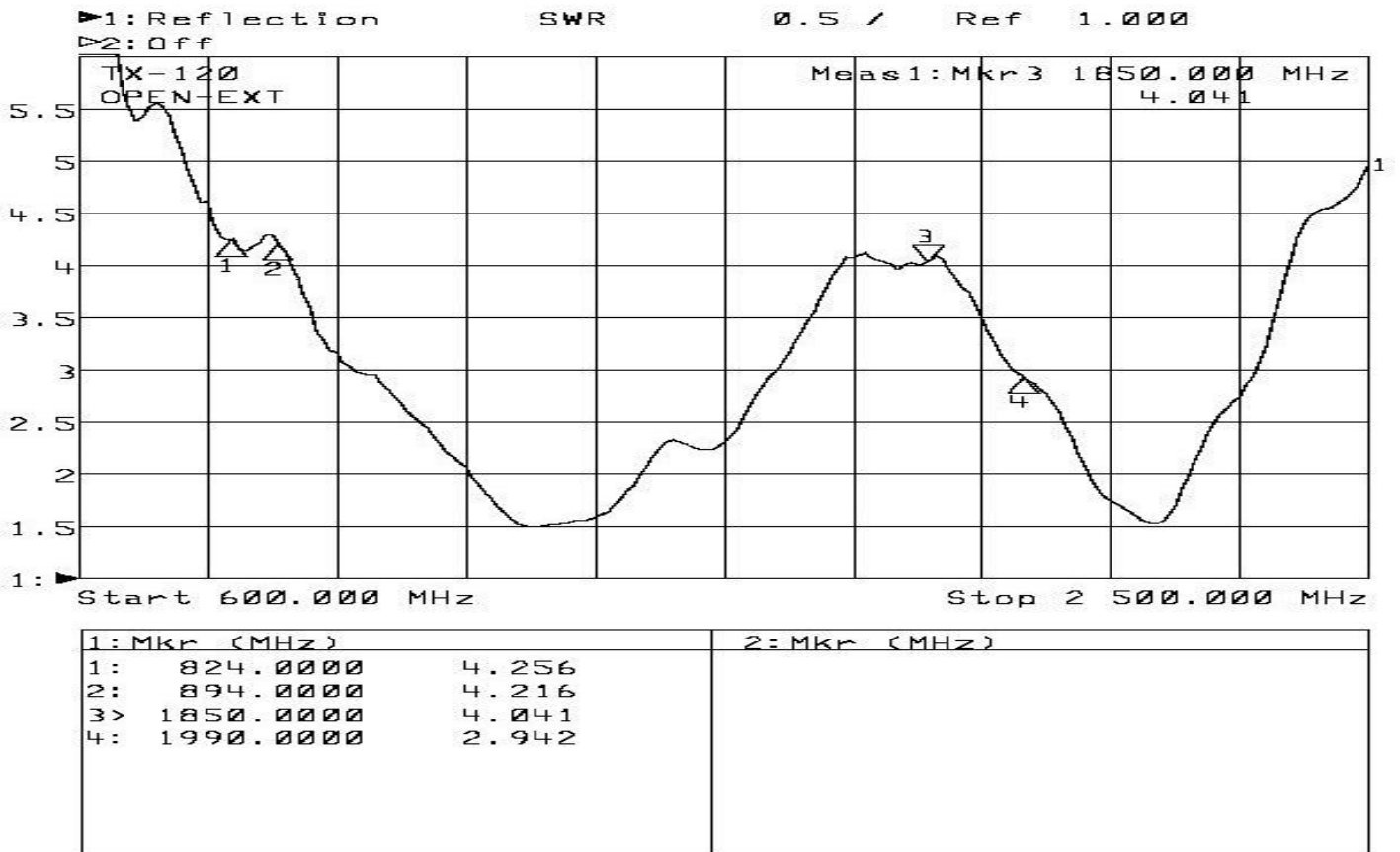
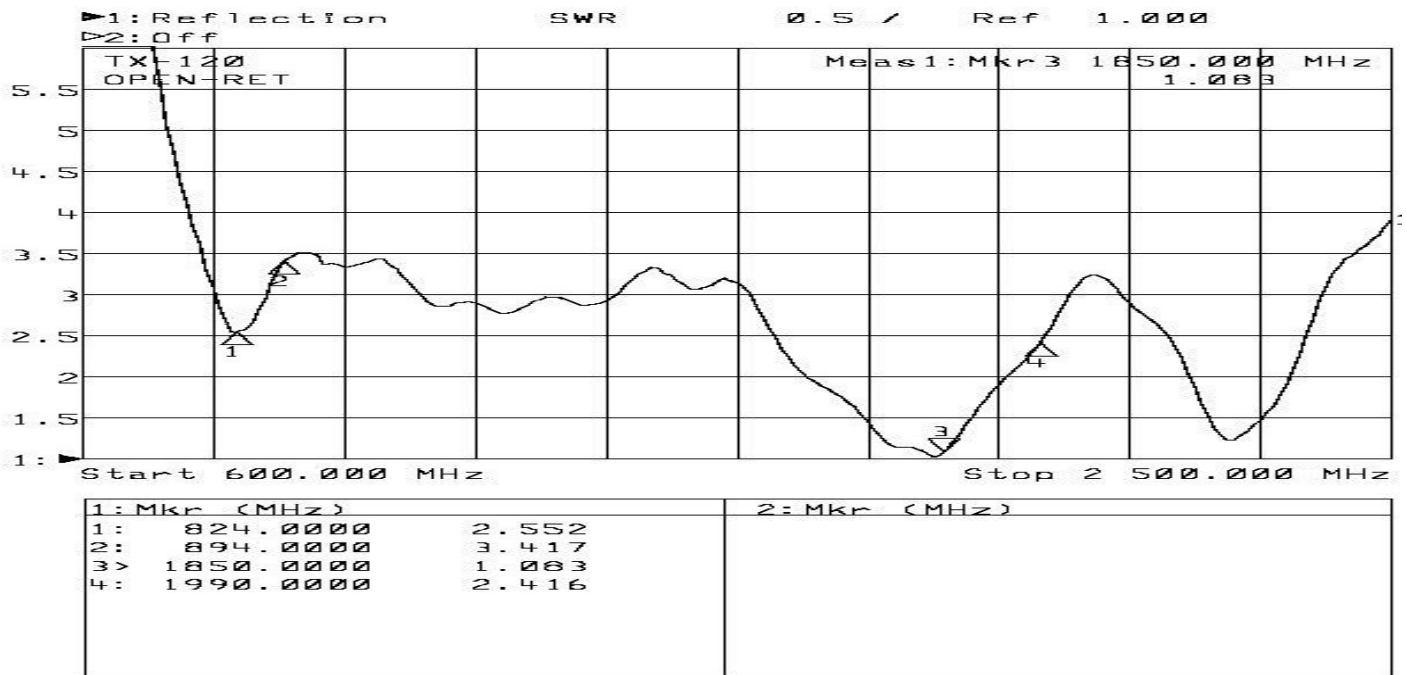


MRW ANTENNA SPECIFICATION	Doc.No MRWPQR10420	Rev. No. 0
	Date 2003. 6.27	Page





MRW ANTENNA SPECIFICATION	Doc.No MRWPQR10420	Rev. No. 0
RETRACTABLE ANTENNA	Date 2003. 6.27	Page



MRW ANTENNA SPECIFICATION	Doc.No MRWPQR10420	Rev. No. 0
RETRACTABLE ANTENNA	Date 2003. 6.27	Page

