TELSON ELECTRONICS CO., LTD.

No.

Date : 2003 / 04 / 07

PRODUCT SPECIFICATION

Product : FIXED HELICAL ANTENNA

Part No. : T1-1-T1-08400

Customer's Part No. :

APPROVAL

E.M.W.Antenna Co., Ltd. proposed this document to Telson Electronics Co., Ltd.

E.M.W.ANTENNA CO.,LTD.

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1. THE PRODUCT

1.1 FEATURES

A fixed helical antenna system, consisting of a helical element, for use in a hand portable cellular phone unit (referred to as a handset).

1.2 PRODUCT NUMBER

E.M.W.Antenna Part Number T1-1-T1-08400

1.3 UNITS AND DEFINITIONS

Unless otherwise stated, SI units are used.

Tx	Transmit Band
Rx	Receive Band
PCB	Printed Circuit Board
VSWR	Voltage Standing Wave Ratio
Room Temperature	+20 ± 3℃
dBi	dB relative to a isotropic
CW	Continuous Wave
g	acceleration of gravity 9.81 m/s2

2. ELECTRICAL DATA

2.1 FREQUENCY BANDS

Service / Band	DCN		GPS		US-PCS	
Tx (MHz)	824	849			1850	1910
Rx (MHz)	869	894	1574	1576	1930	1990

2.2 IMPEDANCE

2.2.1 Normal Value

50Ω

2.2.1 Method

E.M.W.Antenna will supply engineering assistance to get the best possible matching of the antenna system folder open mode, other way folder close mode in cellular phone.

The impedance over the frequency bands shall be as close as possible to 50Ω after matching. Both free space and talk position are considered.

2.3 VSWR

The impedance matching should be optimized in the more critical talk position, with restrictions below.

2.3.1 Free space

Typical Maximum Values

Mode	DCN		GPS	US-PCS	
	T x	Rx	Rx	T x	Rx
Closed Folder	2.5	2.0	3.0	2.0	2.0
Opened Folder	2.0	2.0	3.0	2.0	2.0

2.3.2 Measuring Method

A 50Ω coaxial cable is connected (soldered) to the 50Ω point, at the duplex-filter connection(ANT.), on the PCB. The connection of the coaxial cable shall be done to introduce a minimum of mismatch. As much as possible the coaxial cable arrangement shall prevent influences from induced currents on the cable. In the other end, the coaxial cable is connected to a network analyzer. The measurements are performed at room temperature. The handset, including the PCB, must not in any significant way differ from the mass produced handset, i.e. the antenna feeding network has to be equivalent to the network in mass production. The specification shall be met in the entire frequency band Free space means that the handset is placed on a non-conductive surface of cellular plastic. Talk position means that the handset is held in the left hand to the left ear with the microphone directed towards the mouth.

2.4 GAIN(dBi)

2.4.1 Typical Minimum Values in Maximum Direction

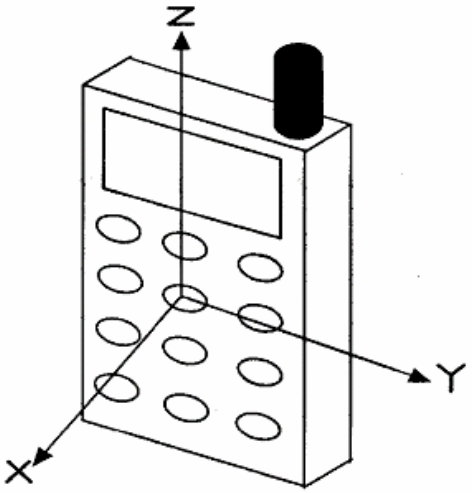
Mode	DCN		GPS	US-PCS	
	T x	Rx	Rx	T x	Rx
Closed Folder	-3.5	-2.0	0	2.0	2.0
Opened Folder	-1.0	0	0	1.0	1.0

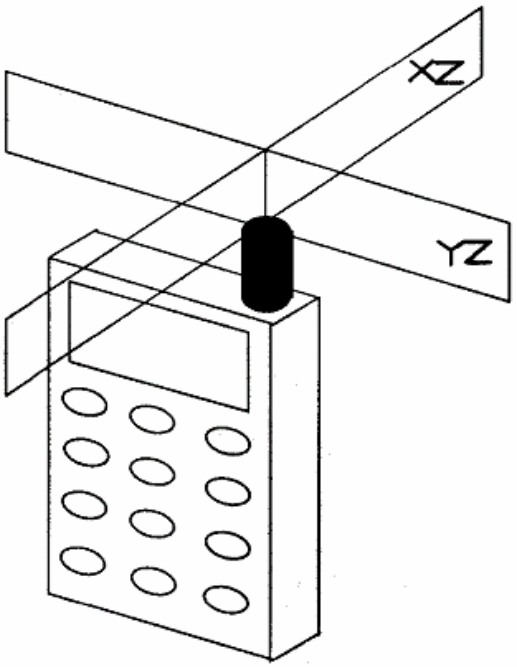
2.4.2 Measuring Method

The connection is done according 2.4.2. Radiation patterns are measured at 6 different frequencies : Txmin, Txmid, Txmax : Rxmin, Rxmid, and Rxmax.

The antenna is measure in 2 orthogonal E-planes(XZ Plane(E1), YZ Plane(E2)) in free space, according to figure 2.4.2 (b).

The antenna is also measured in the H-plane as well as in talk position.





(a) Coordinate system for the cellular phone (b) E-Plane

Figure 2.4.2 Gain Test into phone

2.5 POWER RATING

2.5.1 Maximum Value

P = 2W(CW)

2.5.2 Demands

No visual deterioration shall occur during the test. The antenna shall satisfy the electrical demands, according to 2.4.1, after the test.

2.5.3 Measuring Method

The connection is according to 2.4.2. The specified power, P, is applied for 10 minutes at room temperature.

3. MECHANICAL DATA

3.1 APPEARANCE

The appearance shall be according to the specification drawing on page 15. The antenna shall have no marks, cuts, abrasion or other mechanical damages.

3.2 HELIX DEFORMATION

3.2.1 Angle

$\alpha = 30°$

3.2.2 Bending Force

Fb = 40N

3.2.3 Demands

No visual deterioration shall occur, and the fitting and plastic shall remain mechanically bonded, during the test. The antenna shall satisfy the electrical demands, according to 2.4.1, after the test.

3.2.4 Measuring Method

The antenna is assembled to the test equipment according to figure 3.2.4. A force is applied perpendicular to the antenna 1/3 of "A" length below the top of the helix. The antenna is bent until the specified angle, α or the specified force, Fb is reached.

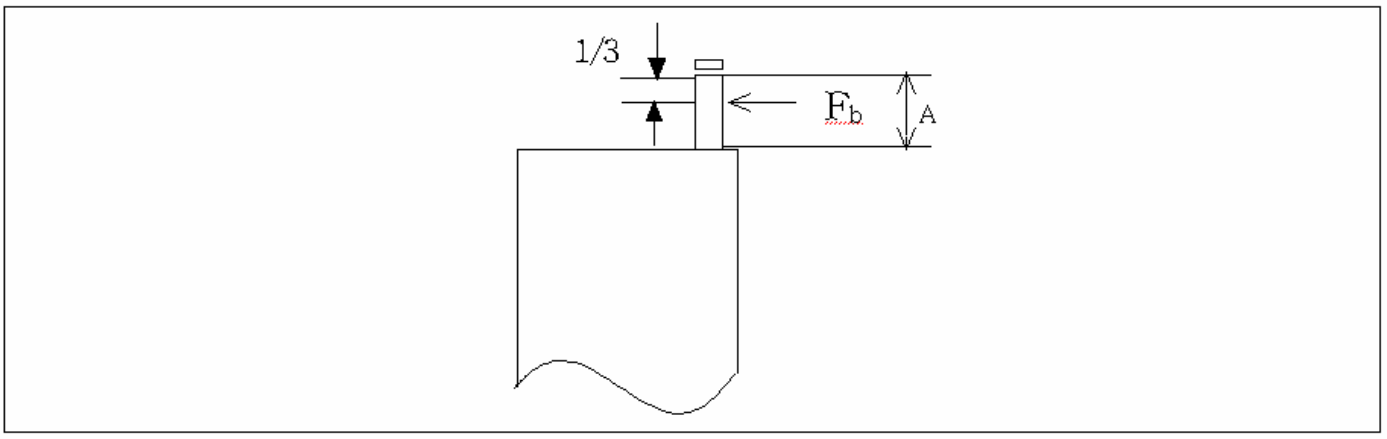


Figure 3.2.4. Helix Deformation

3.3 TORQUE

3.3.1 Minimum Value

T = 30N

3.3.2 Demands

No visual deterioration shall occur, and the fitting and plastic shall remain mechanically bonded, during the test. The antenna shall satisfy the electrical demands, according to 2.4.1, after the test.

3.3.3 Measuring Method

The antenna is assembled to the test equipment. A torque instrument is attached to the helical antenna. The antenna is exposed to the specified torque, T, between fitting and plastic in clockwise direction according to figure 3.3.3.

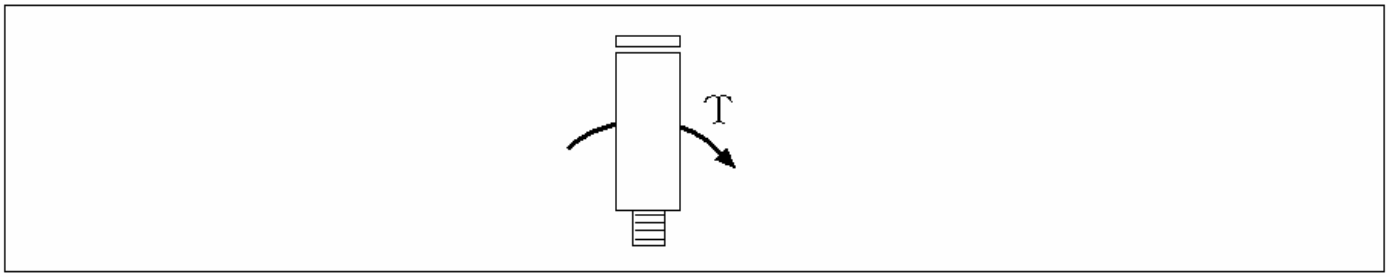


Figure 3.3.3. Torque

3.4 DROP

3.4.1 Drops

1 drop (3cycles)

3.4.2 Drop Height

1.5 m

3.4.3 Drop Angle

180 °

3.4.4 Actual Phone applyed

1 drop (3cycles)

3.4.5 Demands

The original shape shall be possible to restore. The antenna shall satisfy the electrical demands, according to 2.4.1, after the test.

3.4.6 Measuring Method

The antenna is attached to the handset or an equivalent test fixture.

The handset is dropped with the antenna downwards onto a metal plates of $1 \times 1 \times 0.05 m^3$.

4. ENVIRONMENT

4.1 OPERATIONAL TEMPERATURE

4.1.1. Low Operational Temperature

TLO = -30℃

4.1.2 High Operational Temperature

THO = +70℃

4.1.3 Demands

No visual deterioration shall occur, and the antenna shall satisfy the electrical demands, according to 2.4.1, during the test.

4.1.4 Measuring Method

The antenna is placed in a climatic chamber at temperature TLO.

The antenna is taken out after 1 hour, and VSWR is immediately measured.

The antenna is placed in a climatic chamber at temperature THO.

The antenna is taken out after 1 hour, and VSWR is immediately measured.

4.2 TEMPERATURE CYCLING

4.2.1 Low Cycling Temperature

TLC = -40℃

4.2.2 High Cycling Temperature

THC = +80 ℃

4.2.3 Demands

No visual deterioration shall occur during the test. The antenna shall satisfy the electrical demands, according to 2.4.1, and the mechanical demands, according to 3.2, 3.3, 3.4, 3.5 & 3.6, after the test.

4.2.4 Measuring Method

The antenna is placed in a climatic chamber. The temperature is cycled as follows : The temperature is kept constantly at TLC for 1 hour, increased to THC during 1 hour, kept constantly at THC for 1 hour, and then decreased to TLC during 1 hour. This procedure is repeated 10 times, ending at room temperature according to figure 4.2.4.

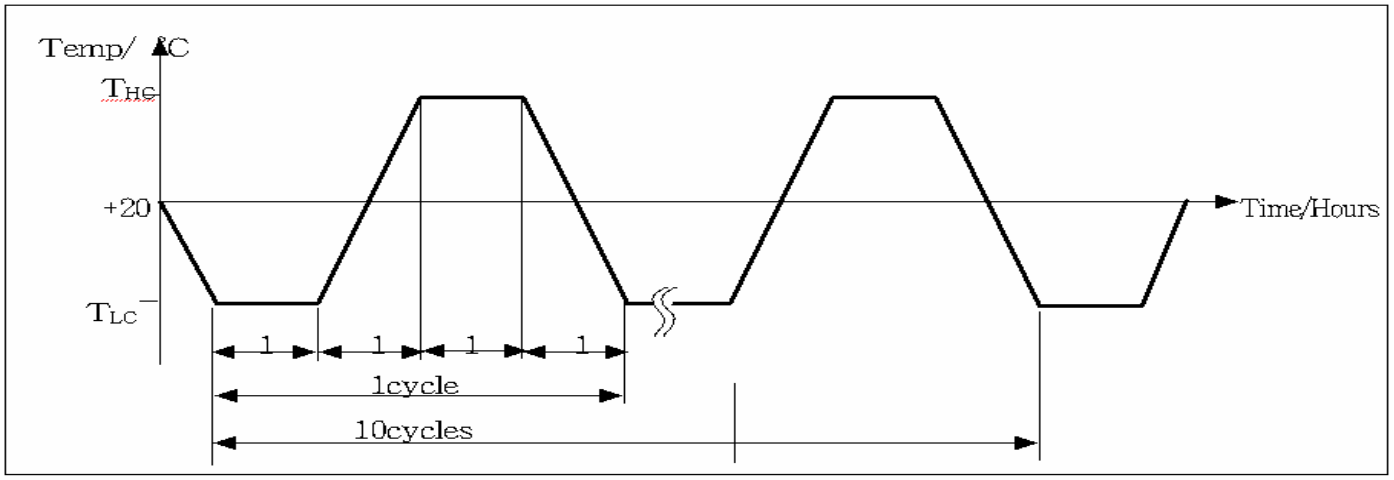


Figure 4.2.4. Temperature cycling.

4.3 HUMIDITY

4.3.1 Relative Humidity

95%

4.3.2 Temperature

+55℃

4.3.3 Demands

No visual deterioration shall occur during the test. The antenna shall satisfy the electrical demands, according to 2.4.1, after the test.

4.3.4 Measuring Method

The antenna is placed in a climatic chamber for 24 hours. The antenna is taken out from the chamber and measured after another 24 hours in room temperature.

4.4 SINUSOIDAL VIBRATION

4.4.1 Vibration Frequencies

10-55-10 ㎐(1cycle)

4.4.2 Sweep Rate

1 octave/min (logarithmic)

4.4.3 Maximum Amplitude

A = 1.52mm

4.4.4 Maxim Acceleration

2g

4.4.5 Crossover Frequency

18.2 ㎐

4.4.7 Measuring Method

The fixed antenna is assembled in the test equipment. The vibration is done both in x-and z-directions, according to figure 4.4.7 a), with a duration of 1 hour in each direction.

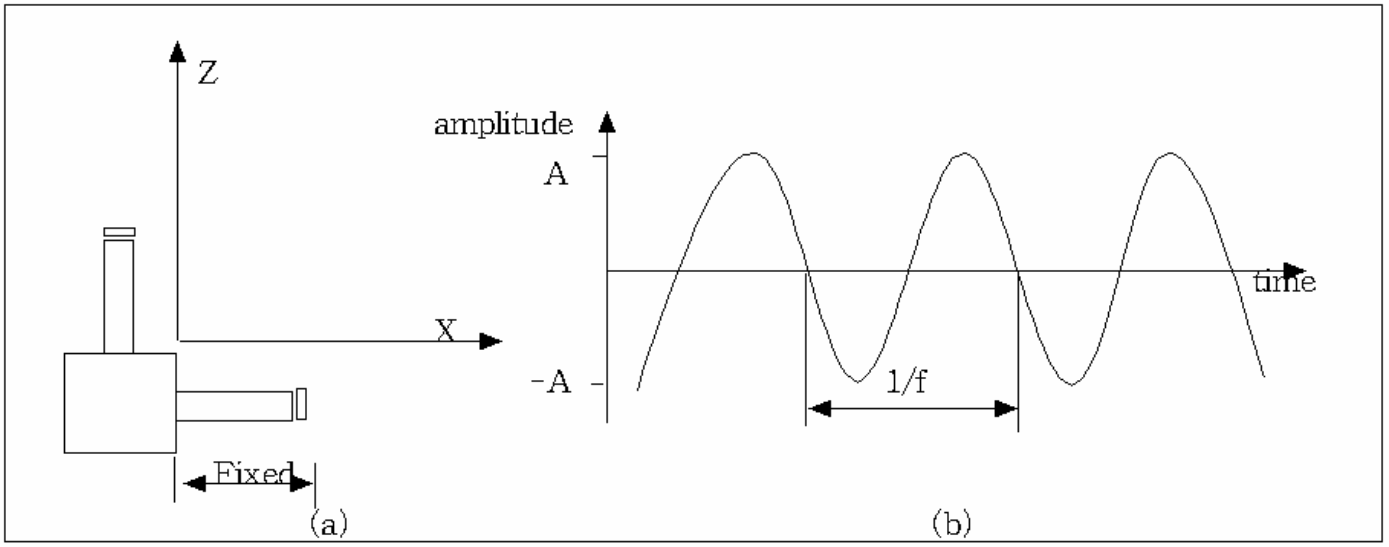


Figure 4.4.7. Sinusoidal vibrator. (a) Vibration directions. (b) Vibration form.

5. QUALITY

5.1 TEST SEQUENCE

The antenna are tested by E.M.W.Antenna's Quality Department according to table 5.1. Unless otherwise stated, all tests shall be performed at room temperature. These tests are repeated prior to approval of major changes in design or materials.

Class / Date	Q.C. Manager	Test Paragraph		Specification		
				DCN	GPS	US-PCS
2003. 1. 17.	Sung-Geun Kim	VSWR	Closed Folder	? 2.5	? 3.0	? 2.0
			Opened Folder	? 2.0	? 3.0	? 2.0
		MIM. Gain (dBi)	Closed Folder	-3.5 ?	0 ?	2 ?
			Opened Folder	-1 ?	0 ?	1 ?
		MAX. Power		1W 3W		

(a)

Test Paragraph / Sample Number	VSWR						MIM. Gain(dBi)						MAX. Power (W)
	Closed Folder			Opened Folder			Closed Folder			Opened Folder			
	DCN	GPS	US-PCS	DCN	GPS	US-PCS	DCN	GPS	US-PCS	DCN	GPS	US-PCS	
1	1.8	2.6	1.8	1.7	2.5	1.6	-3.0	0.2	2.1	-0.8	0.5	1.2	3.1
2	2.0	2.7	1.7	1.6	2.5	1.7	-3.2	0.5	2.3	-0.9	0.8	1.3	3.2

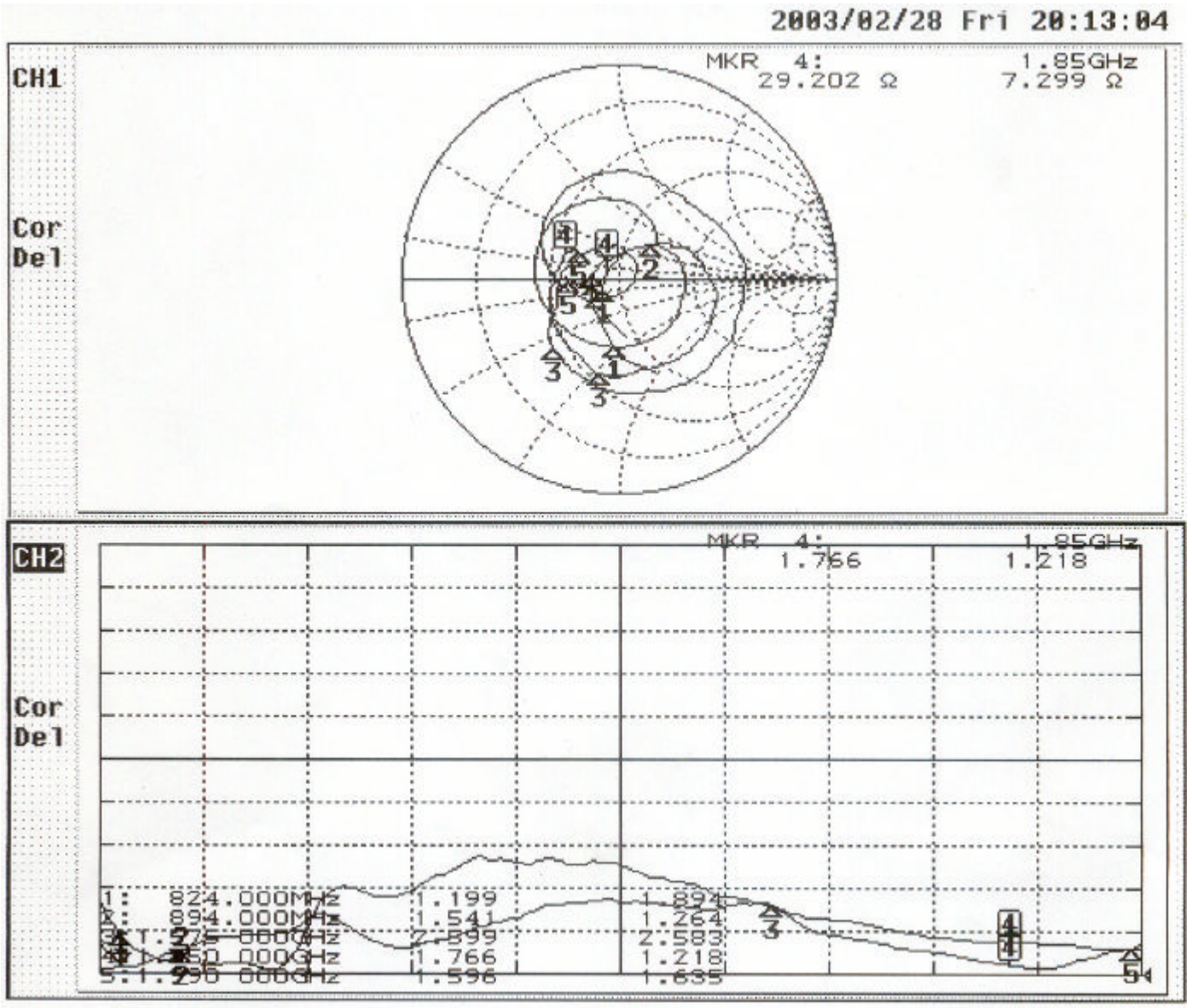
(b)

Table 5.1 (a)Test Specification. (b)Test Paragraph.

5.2 FIRST ARTICLE APPROVAL

From an early mass produced, 20 samples shall be sent to Telson. When approved in all matters, i.e. electrically and mechanically, incl. finish, form "First Article Approval" should be completed, and the specification should be signed. The signed specification and the form, mentioned above, should be sent back to E.M.W.Antenna. This procedure is repeated prior to a major change in design or materials.

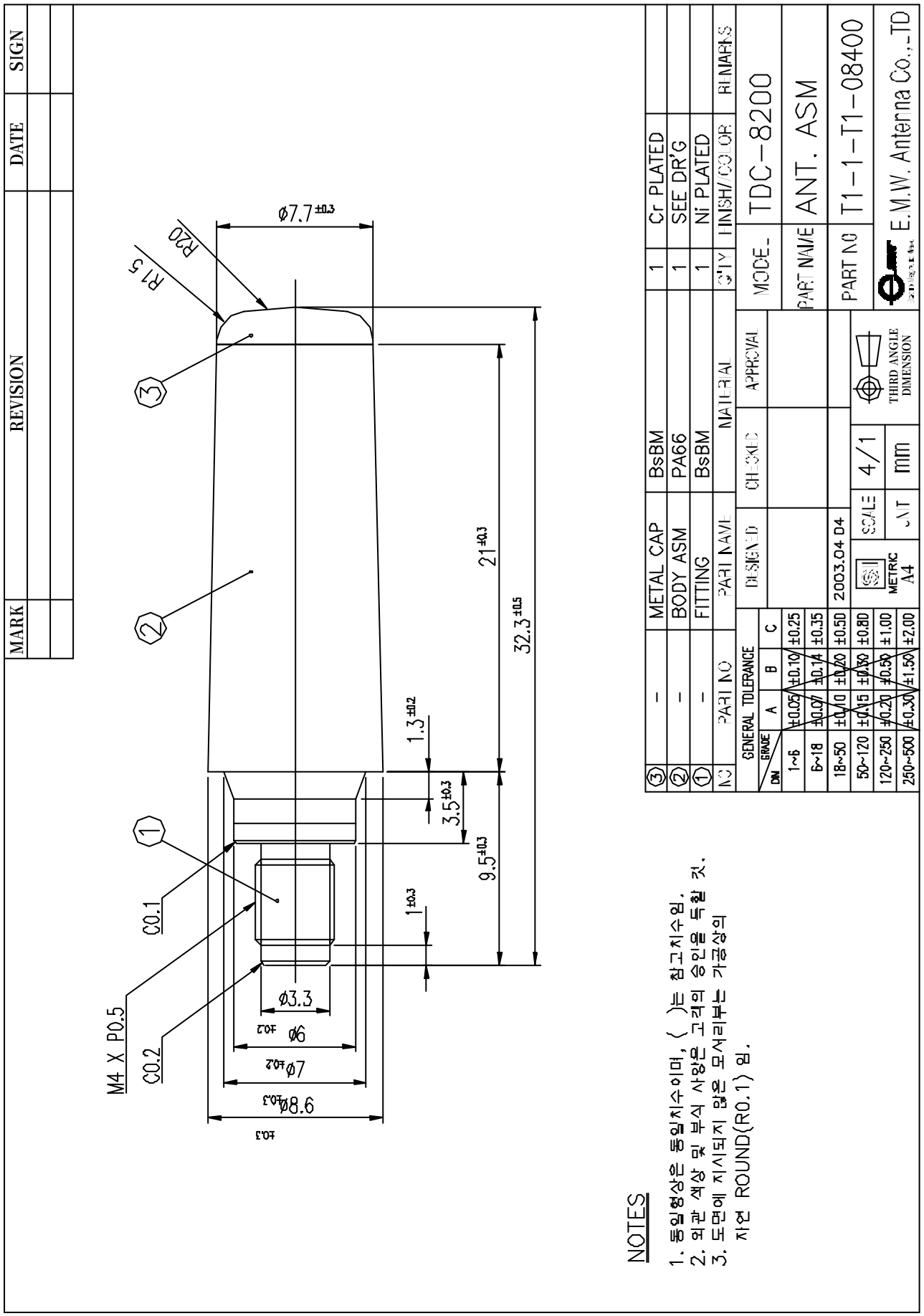
6. VSWR & Smith-Chart



✍Memory : Folder close

✍Marker : Folder Open

7. Drawing


MARK
REVISION
DATE
SIGN
Ø7.7±0.3
R20
R1.5
③
②
①
C0.1
C0.2
M4 X P0.5
Ø3.3
Ø6 +0.2
Ø7 +0.2
Ø8.6 +0.3
+0.3
1.3±0.2
3.5±0.3
9.5±0.3
1±0.3
21±0.3
32.3±0.5
NOTES
1. 동일형상은 동일치수이며, ( )는 참고치수임.
2. 외관 색상 및 부식 사양은 고객의 승인을 득할 것.
3. 도면에 지시되지 않은 모서리부는 가공상의
자연 ROUND(R0.1) 임.
③ - METAL CAP BsBM 1 Cr PLATED
② - BODY ASM PA66 1 SEE DR'G
① - FITTING BsBM 1 Ni PLATED
NO PART NAME MATERIAL QTY FINISH/COLOR REMARKS
GENERAL TOLERANCE
GRADE / DIM A B C
1~6 ±0.05 ±0.10 ±0.25
6~18 ±0.07 ±0.14 ±0.35
18~50 ±0.10 ±0.20 ±0.50
50~120 ±0.15 ±0.30 ±0.80
120~250 ±0.20 ±0.50 ±1.00
250~500 ±0.30 ±1.50 ±2.00
DESIGNED
CHECKED
APPROVAL
2003.04.04
SCALE 4/1
UNIT mm
METRIC A4
THIRD ANGLE DIMENSION
MODEL TDC-8200
PART NAME ANT. ASM
PART NO T1-1-T1-08400
E.M.W. Antenna Co.,LTD