

To: M7 SYSTEM Co. Ltd.

No.: EMW 2010-B2-001

Date : 2010.01.04

PRODUCT SPECIFICATION

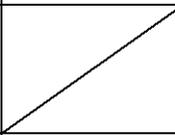
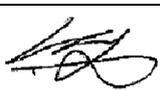
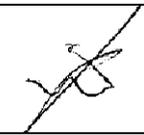
Product Name : ANTENNA ASS'Y (INTERNAL ANTENNA)

MODEL Name : STX-2_MAIN

E.M.W. Antenna PART No.:HIP-41851-0000AA

APPROVAL

* Requested approval for annexed sample.

A P P R O V A L	Submitted	Checked	Checked	Approved
L				
	10.01.04		10.01.04	10.01.04

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Table of Contents

1.	Log of Changes	2
2.	Part Number List	2
3.	Product Description	3
	3.1 Description	
	3.2 Product Number	
	3.3 Units, Definitions & Abbreviations	
	3.4 Co-ordinates System	
4.	Electrical Properties	4~8
	4.1 Frequency band	
	4.2 Impedance	
	4.3 Matching Circuit	
	4.4 V.S.W.R.	
	4.5 Directive ness	
	4.6 Maximum Power	
	4.7 Gain Table	
	4.8 Radiation Pattern	
5.	Mechanical Properties	9
	5.1 External Dimension	
6.	Environment Test	9~10
	6.1 Operating Temperature Test	
	6.2 Temperature Cycling Test	
	6.3 Corrosion Resistance Test	
7.	External Drawing	11
8.	Antenna Picture	12
9.	Packing	13
10.	Electric Performance data	14
	10.1 Smith-Chart & V.S.W.R.	
11.	Reliability Test Report	15

1. Log of Changes

No.	Date	Mark	Changes	Remark
1	2010.1.4		PRODUCT SPECIFICATION	V1.0
2				
3				
4				
5				
6				
7				
8				
9				

2. PART NUMBER LIST

No.	PART NO.	Color & Appearance	E.M.W. Antenna Product Number	Remark
1			HIP-41851-0000AA	
2				
3				
4				
5				
6				
7				
8				

3. Product Description & Terminology

3.1 Description

This is the product specification of Internal Antenna applied to Mobile Phone Set.

3.2 Product Number

E.M.W. Antenna Part Number:

3.3 Unit, Definitions & Abbreviations

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

Tx	Transmit Band
Rx	Receive Band
PCB	Printed Circuit Board
VSWR	Voltage Standing Wave Ratio
dBi	Antenna gain in dB relative to a isotropic antenna
Room Temperature	+20 ± 3°C
CW	Clock Wise
g	Acceleration of gravity 9.82 m/s ²
RH	Relative Humidity
gf / kgf	Gram weight (1gf=980.665dyn) / Kilogram weight (1kgf=9.80665N)
Ph	Potential of hydrogen
F	Force
T	Torque

3.4 Co-ordinates System

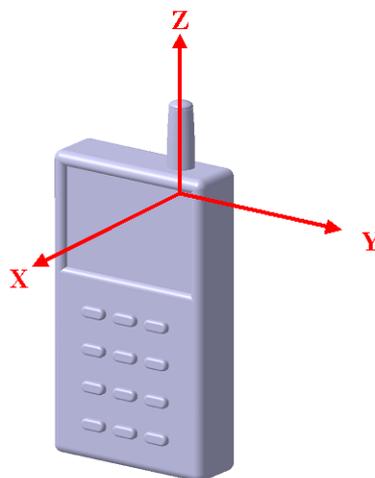


Figure 3.4.1 Coordinate within the Handset

4. Electrical Properties

4.1 Frequency Band

Service Frequency	GSM 850	PCS
Tx (MHz)	824 ~ 849	1850 ~ 1910
Rx (MHz)	869 ~ 894	1930 ~ 1990

4.2 Impedance

4.2.1 Nominal Impedance

- $R = 50\Omega$

4.2.2 Measuring Method

By using Network Analyzer, connect the antenna-installed handset to the reflection point of Analyzer and measure the impedance value within the designated frequency band.

4.3 Matching Circuit

Matching Circuit is composed in free space of 4.1 frequency band while satisfying customer's requirements. Matching Circuit is corresponded to the figure 4.3.1.

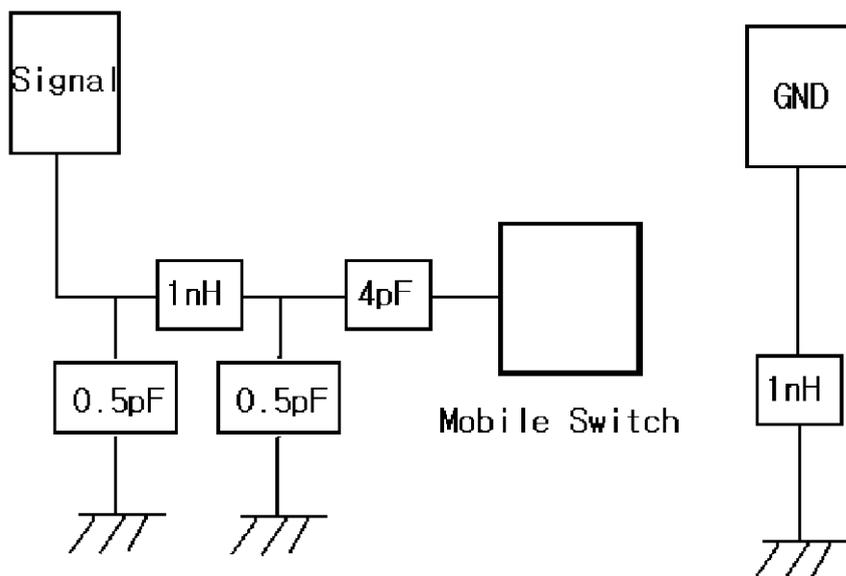


Figure 4.3.1 Matching circuit

4.4 V.S.W.R.

Impedance Matching optimization is performed under the below mentioned environment.

4.4.1 Free Space Environment

Mode \ Service	GSM850		PCS	
	Tx	Rx	Tx	Rx
V.S.W.R	4.5 : 1	4.5 : 1	4 : 1	3.5 : 1

4.4.2 Measuring Method

Connect (soldering) 50Ω copper cable to the 50Ω spot in handset. To minimize the loss of transmission, copper cable is used. Including PCB, the handset shouldn't be different from the one, which will be used for mass production.

Specification should be the same for all frequency bands. Free Space means that Handset is put on the surface of no conducting plastic.

4.5 Directive ness

Omni-directional (Horizontal)

4.6 Maximum Power

- P = 2W under

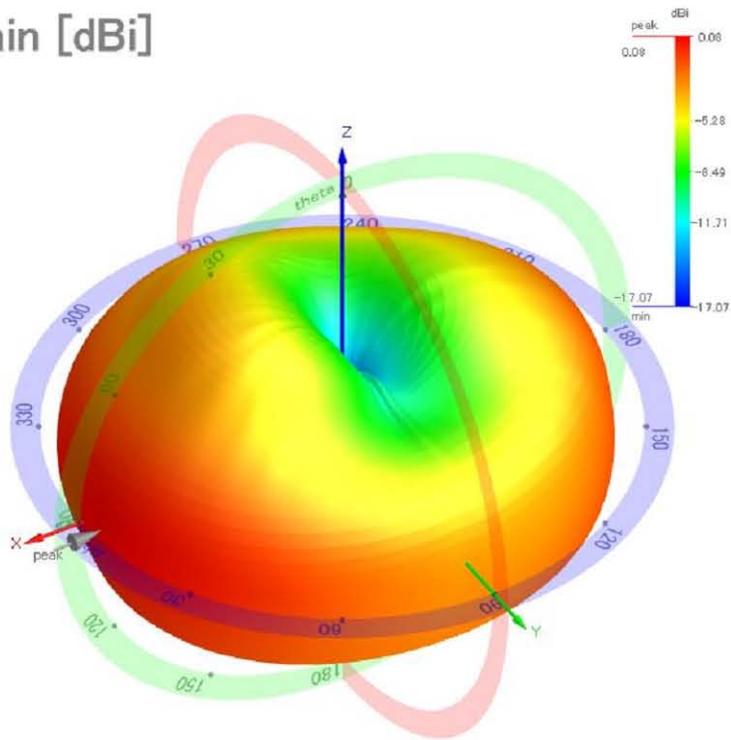
4.7 Gain Table

Freq[MHz]	Peak Gain[dBi]	Avg Gain[dBi]	Efficiency[%]
	3D	3D	
824	0.012	-4.021	39.6
849	1.221	-2.844	51.9
869	1.561	-2.575	55.3
894	1.013	-3.218	47.7
1850	2.494	-3.251	47.3
1910	3.602	-2.033	62.6
1930	3.832	-1.876	64.9
1990	2.886	-2.598	54.9

4.8 Radiation Pattern

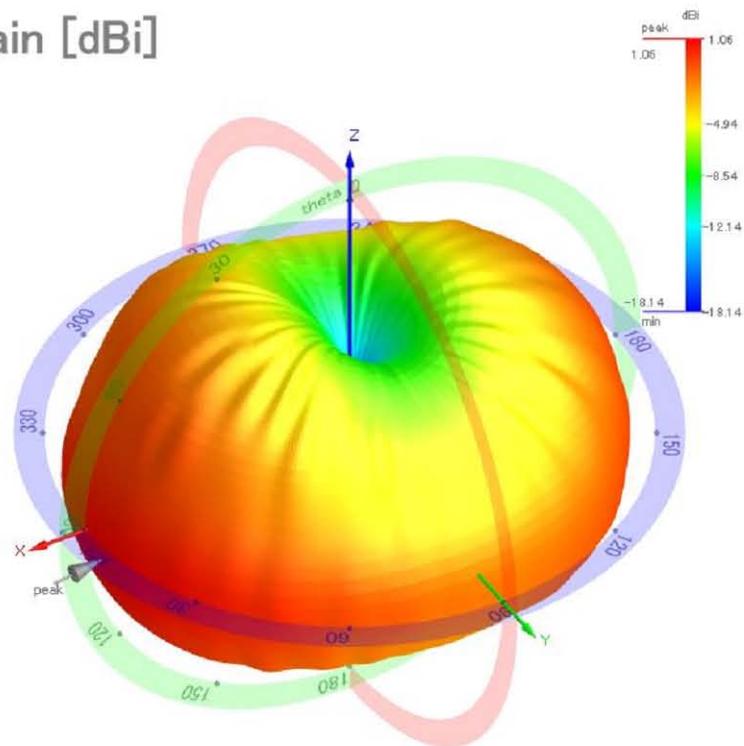
(1) 824 MHz

Gain [dBi]



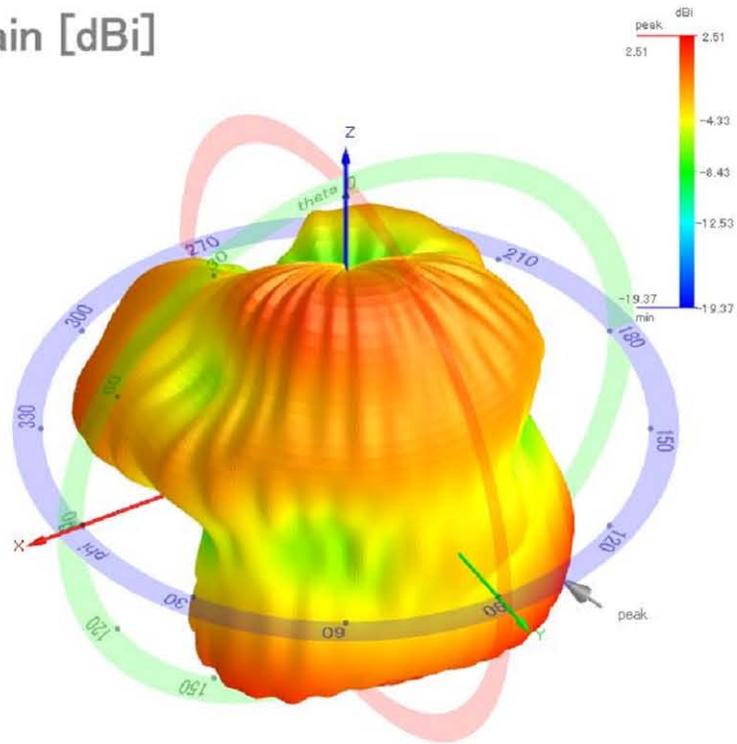
(2) 894 MHz

Gain [dBi]



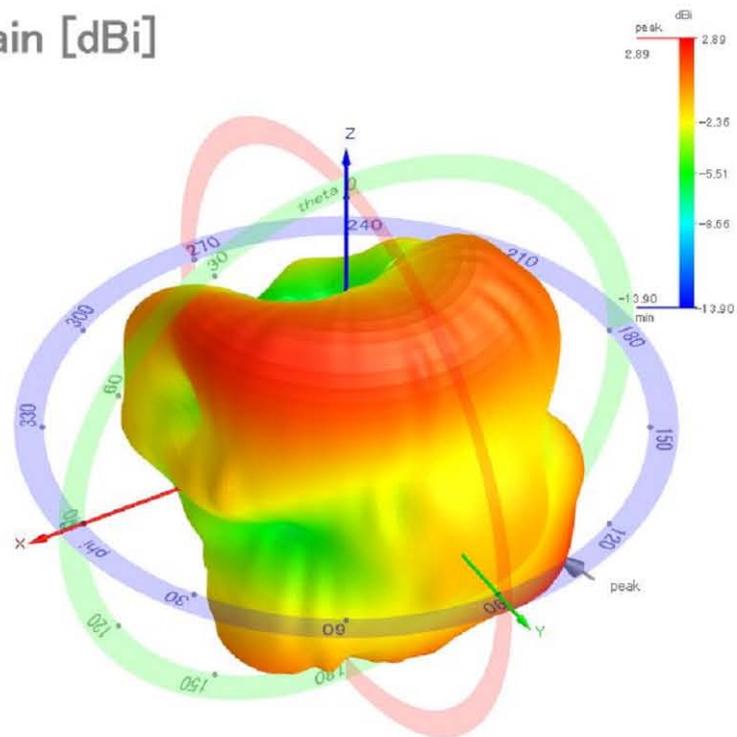
(3) 1850 MHz

Gain [dBi]



(4) 1990 MHz

Gain [dBi]



5. Mechanical Properties

5.1 External Dimension

External dimension of Internal Antenna is in accordance to the Drawing 7(including material & color)

6. Environmental Test

6.1 Operating Temperature Test

6.1.1 Test Condition

- Temperature = -30°C , $+80^{\circ}\text{C}$
- Duration time = 1hour

6.1.2 Demands

After the test, the antenna must not have an outer damage, and also it must pass requirement shown in 4.4.

6.1.3 Measuring Method

Antenna is kept at -30°C for 1 hour and $+80^{\circ}\text{C}$ for 1hour and than passed test of 4.4.

6.2 Temperature Cycling Test

6.2.1 Test Condition

- Low cycling temperature TLC = -40°C
- High cycling temperature THC = $+85^{\circ}\text{C}$
- 1Cycle = 5hours
- Test number = 15Cycles

6.2.2 Requirements

After the test, the antenna must not have an outer damage, and also it must pass requirement shown in 4.4.

6.2.3 Measuring Method

Antenna is kept at low temperature -40°C for 1 hours and increase the temperature up to $+85^{\circ}\text{C}$ within 1 hour and kept for 0.5 hour at the same temperature will be 1cycle. As shown in Figure 6.2.1 repeated 15cycles and kept for 1 hour in designated high temperature.

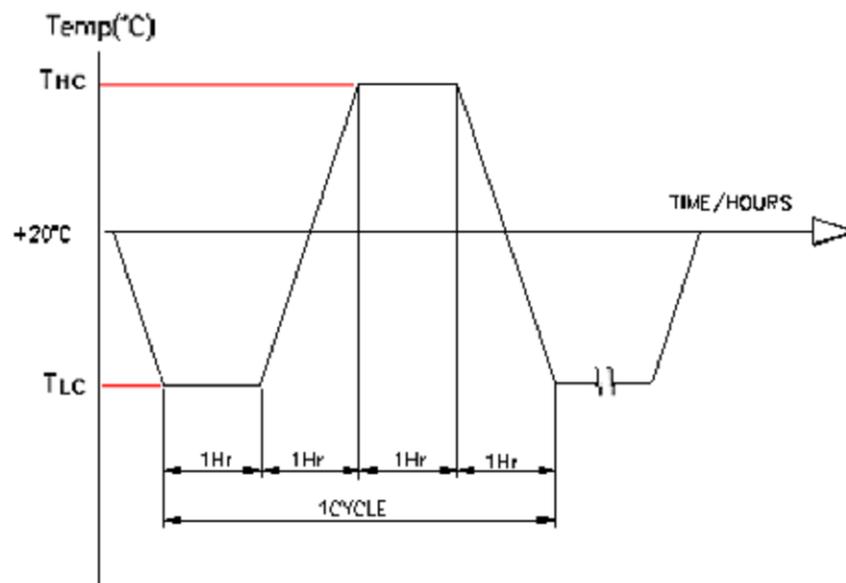


Figure 6.2.1 Temperature Cycling

6.3 Corrosion Resistance Test

6.3.1 Test Condition

- NaCl = 5%
- Water Temperature = $35^{\circ}C$
- Duration Time = 48hours

6.3.2 Demands

After the test, the antenna must not have an outer damage, and also it must pass requirement shown in 4.4.

6.3.3 Measuring Method

Antenna is soaked in sodium chloride solution at temperature $+35^{\circ}C$ and 5%(NaCl) for 48hours and dried out.

7. External Drawing

8. Antenna Picture

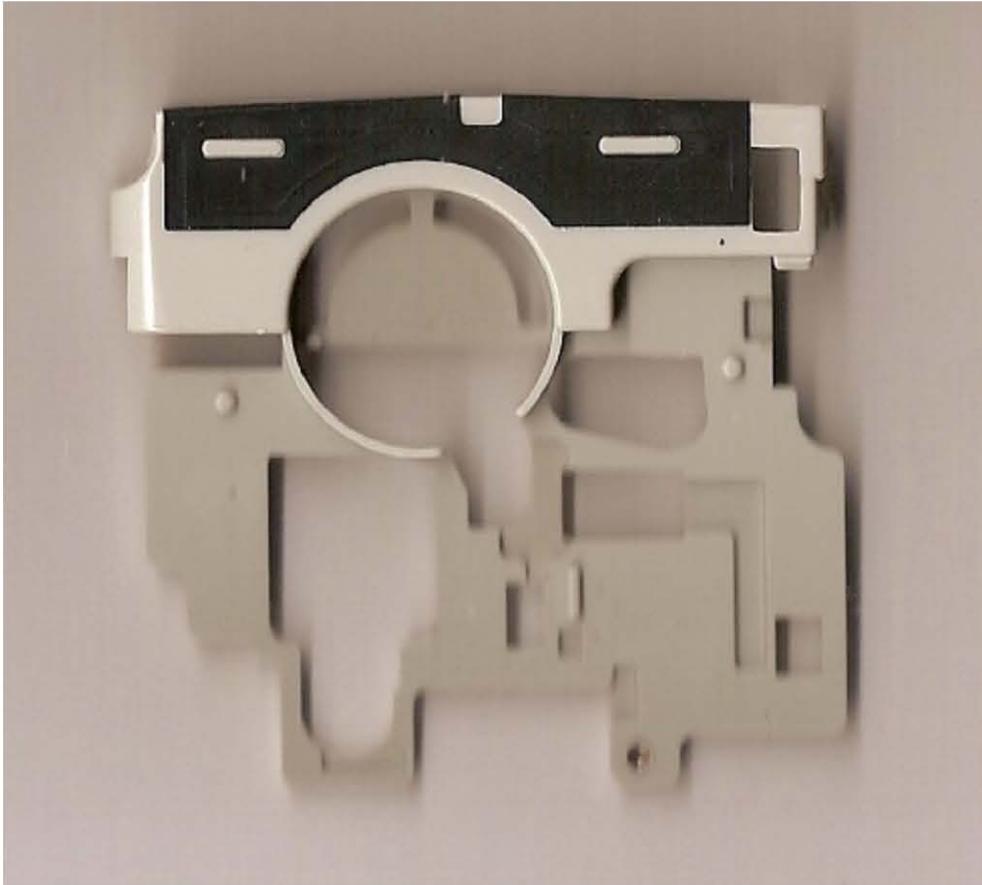
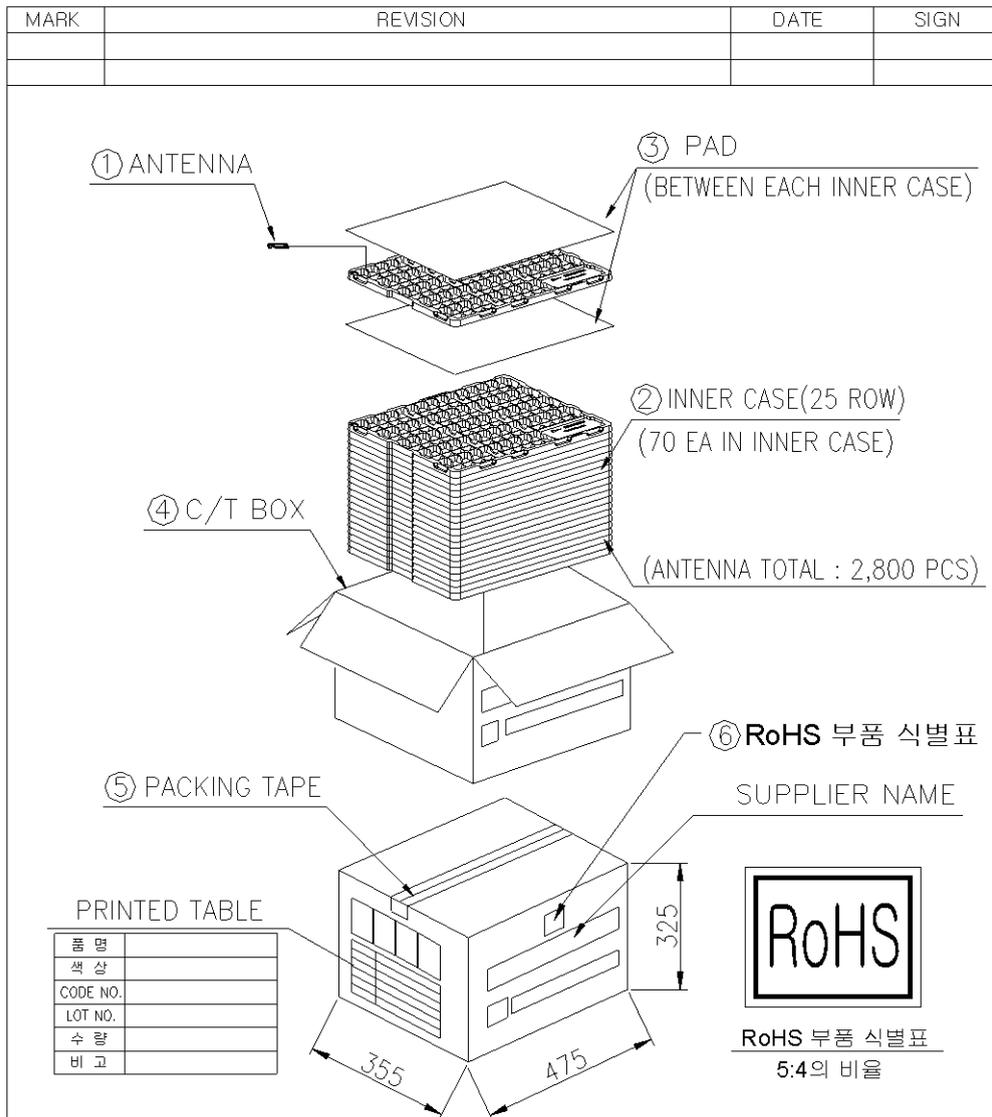


Fig 8.1 Antenna Picture

9. Packing



⑦	INK (MAGIC PEN MONAMI)	-	-		
⑥	RoHS 부품 식별표 외 10종 (LABEL)	-	-		
⑤	PACKING TAPE	-	-		
④	C/T BOX	SW2		1/2,800	
③	PAD (간지)	SW1		2/2,800	
②	INNER CASE	PS		1/70	
①	ANTENNA	-		2,800	

NO	PART NAME	MATERIAL	Q'TY	FINISH/COLOR	REMARKS
GENERAL TOLERANCE		DESIGNED	CHECKED	APPROVAL	MODEL
DIM	GRADE	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	

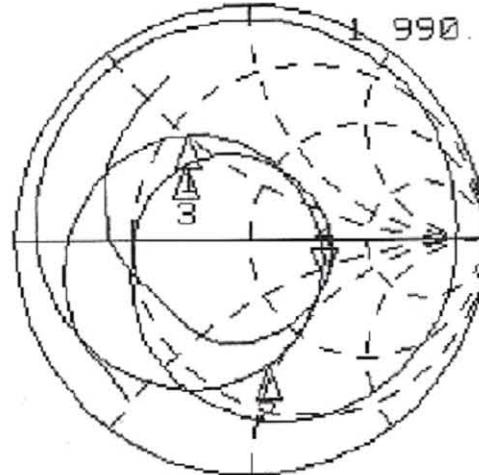
10. Electric Efficiency

10.1 Smith-Chart & V.S.W.R.

CH1 S_{11} 1 U FS 4: 86.687 Ω -37.543 Ω 2.1303 pF
 1 990.000 000 MHz

PRm

Cor



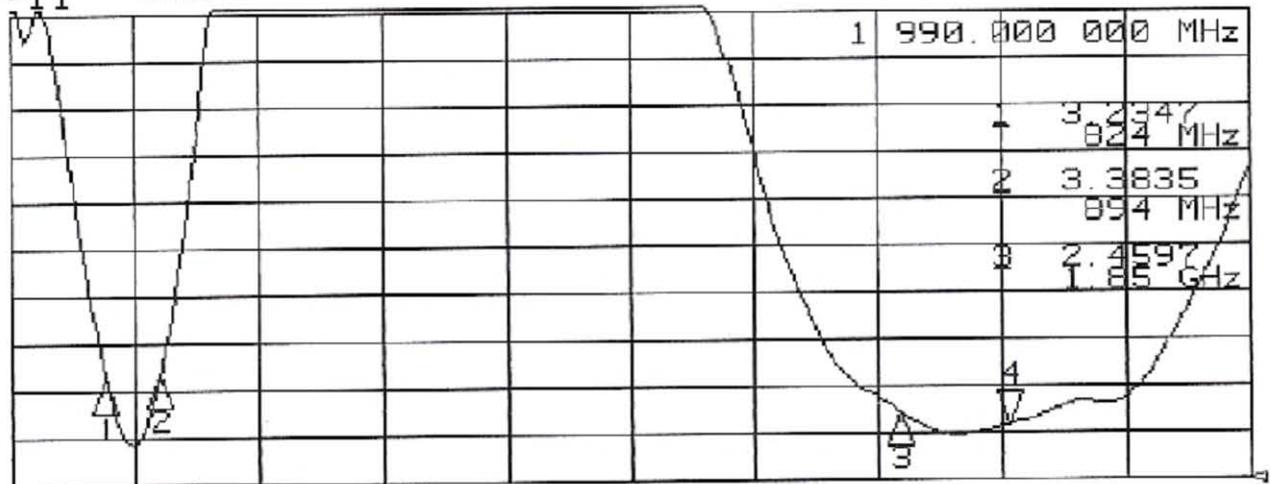
1: 20.328 Ω
 20.160 Ω
 824 MHz
 2: -31.051 Ω
 -40.797 Ω
 894 MHz
 3: 24.078 Ω
 19.08 Ω
 1.85 GHz

↑

CH2 S_{11} SWR 1 / REF 1 4 2.1798
 1 990.000 000 MHz

PRm

Cor



1 3.2347
 824 MHz
 2 3.3835
 894 MHz
 3 2.4597
 1.85 GHz
 4

↑

START 700.000 000 MHz

STOP 2 300.000 000 MHz

11. Reliability Test Report