

Internal Antenna

Approval Paper

MODEL : CDM7126 BT

Part No. : KI-24414

Komatech R&D Center

Written by Tae Ho Kim

Dec 26, 2007



KOMATECH Co., Ltd.

		Subject	Internal Antenna Approval Paper	
Document No.	KOEX-PO-7101-170		Rev.	IR
Part No.	KI-24414		Date	Dec 26, 2007
Application System	Bluetooth		Customer	UTSTARCOM
Notice			Model Name	CDM7126 BT
KOMA-TECH Co., Ltd. R&D Center, 600, Gamjung-Dong, Kimpo, Kyonggi-Do 415-010, Korea Tel : +82-31-988-1100, Fax : +82-31-997-7908				

	Check	Check	Check	Approval
KOMA-TECH				

	Check	Check	Check	Approval
UTSTARCOM				

- CONTENTS -

- 1. Approval Revision Sheet**
- 2. General Outline**
 - 2-1 Applicability**
 - 2-2 Introduction**
 - 2-3 SI Unit**
- 3. Electrical & Mechanical Specifications**
- 4. Mechanical Specifications**
 - 4-1 Drop Test**
 - 4-2 A tension test of Contact point**
 - 4-3 Vibration Resistance test**
- 5. Environmental Specifications**
 - 5-1 Temperature Cycling**
 - 5-2 Heat Resistance and High Static Humidity Test**
 - 5-3 Low Temperature Test**
 - 5-4 Static Humidity Test**
 - 5-5 Corrosion (Salt Spray) Test**
 - 5-6 High Temperature Test**
- 6. Measurement Setup**
 - 6-1 Test Equipments**
 - 6-2 Test Equipments Setting**
 - 6-3 Calibration**
- 7. Test Procedures**
 - 7-1 VSWR**
 - 7-1-1 Test Method (Engineering)**
 - 7-2 Gain and Pattern**
 - 7-2-1 Test Method (Engineering)**
 - 7-2-2 Measurement of Radiation Pattern**
- 8. Measurement Data**
 - 8-1 VSWR**
 - 8-2 Smith Chart**
 - 8-3 Radiation Pattern**
- 9. Mechanical Drawing**
- 10. Packaging**
- 11. Caution for Use**
 - 11-1 Storage**
 - 11-2 Handling**

	Document No. KOEX-PO-7101-170	Rev. No. IR	Part NO. KI - 24414
---	----------------------------------	----------------	------------------------

Internal Antenna

1. Approval Revision Sheet

Approval History Sheet

NO	DATA	Front	After	Reason	REV
1	Dec 26, 2007			Approval	IR
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

	Document No. KOEX-PO-7101-170	Rev. No. IR	Part NO. KI - 24414
---	----------------------------------	----------------	------------------------

Internal Antenna

2. General Outline

2-1 Applicability

This specification is applicable to Planar Inverted F Antenna Module carried in the CDMA phone terminal of Bluetooth Band

2-2 Introduction

The purpose of this document is to establish a design specification for the antenna product that Koma-tech is developing for the CDM7126 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 Koma-tech and UTSTARCOM before being incorporated into the specification.

Upon agreement of this specification, Koma-tech will make no changes without the written approval from UTSTARCOM.

2-3 SI Unit

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

℃	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

Komatech	Document No. KOEX-PO-7101-170	Rev. No. IR	Part NO. KI - 24414
-----------------	----------------------------------	----------------	------------------------

Internal Antenna

3. Electrical & Mechanical Specifications

Specification Sheet				
Electrical Specification		Frequency Range		
		Bluetooth Band		
		2402 ~ 2480 MHz		
Band Width		78 MHz		
V.S.W.R (Min)	Close		3.1 : 1	
	Open		3.3 : 1	
Average Gain (Min)	Close	H-plane	-15.2 dBi	
		E1-plane	-19.5 dBi	
		E2-plane	-7.8 dBi	
	Open	H-plane	-18.8 dBi	
		E1-plane	-20.4 dBi	
		E2-plane	-6.4 dBi	
Input Impedance		50 (Ω)		
Polarization		Vertical / Linear		
Power (Max)		2W		
Mechanical Specification				
Dimension		21.10(±0.2) x 3.45(±0.2) x 6.29(±0.2) mm		
Weight		0.1 ±0.1 (g)		
Radiator Material		SUS 301 3/4H		
Operation Temperature		-30 ~ 80 (°C)		
Operation Humidity		10 ~ 95 (%)		
Others				

Internal Antenna

4. Mechanical Specifications

4-1 Drop Test

The antenna is attached to a dummy weighted radio (95)g.

It drops a dummy with the antenna directed to a steel plate that is 1,000mm x 1,000mm with thickness 20mm. (Fig. 1)

The drop will be done at six different planes by 5 times each.

- After test is completed : There shall be no visual deterioration or esthetical and mechanical performance.

The antenna shall satisfy the electrical Specifications

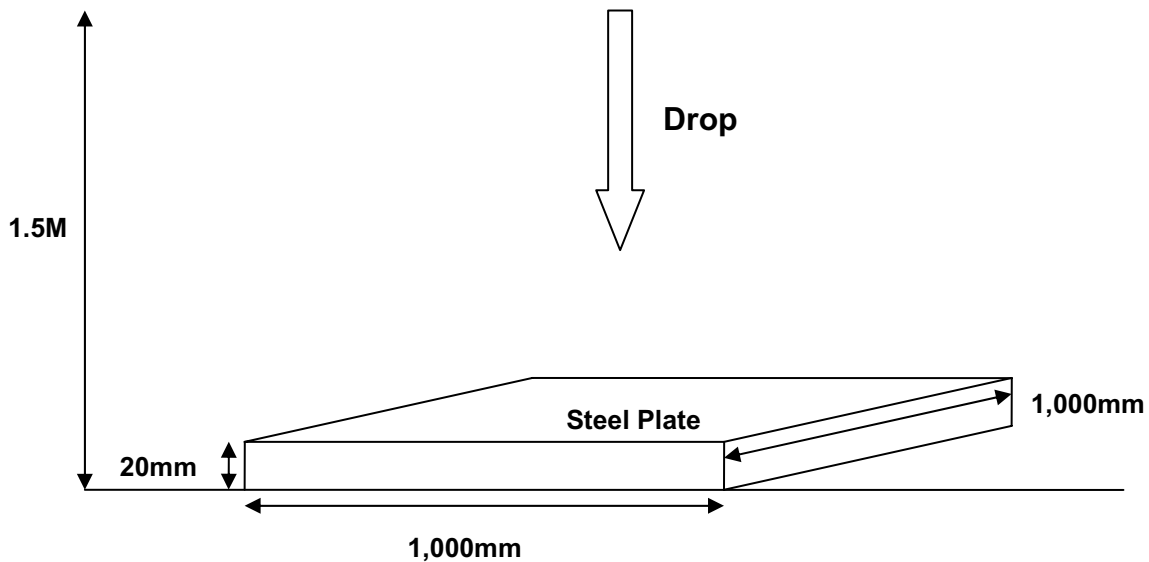


Fig. 1

4-2 A tension test of Contact point

Measure reaction force of the antenna spring contacts with $180\text{gf} \pm 100/-50$ by 500 times.
(Fig.2)

- After test is completed : There will be no evidence of mechanical damage.
The antenna shall satisfy the electrical Specifications.

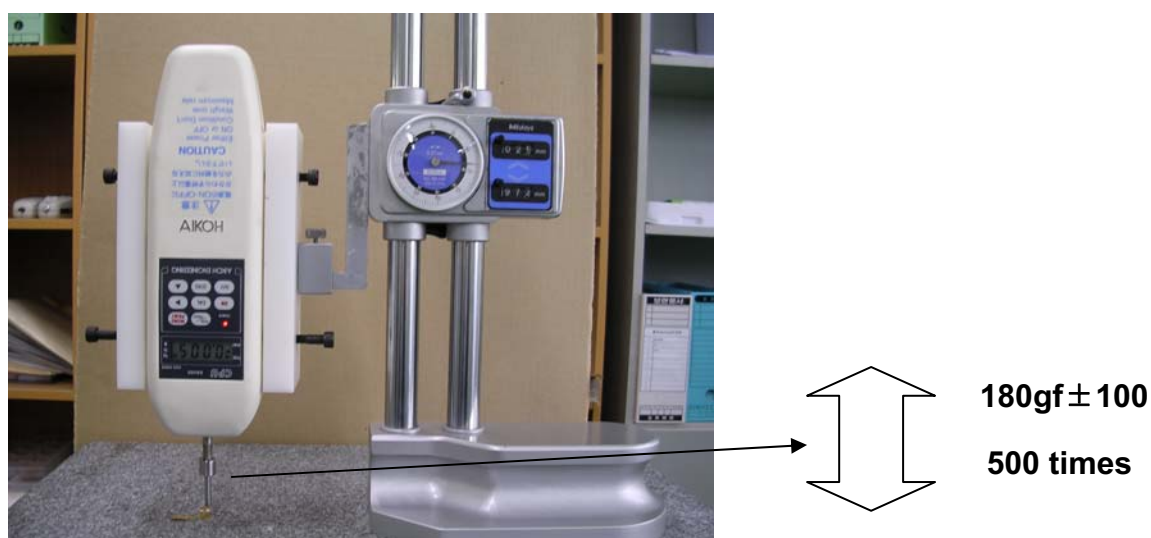


Fig. 2

4-3 Vibration Resistance test

Place antennas mounted into the rear housing (enclosure) onto the vibration table.
The vibration test will be carried out for 30 minutes in the directions of X, Y and Z under condition shown below.

- After test is completed : There shall be no visual deterioration or esthetical and mechanical performance.
The antenna shall satisfy the electrical Specifications

Oscillating frequency	Sweep Time	Amplitude	The maximum acceleration
5 ~ 55 ~ 5 Hz	10 min	1.5 mm	2 g

Komatech	Document No. KOEX-PO-7101-170	Rev. No. IR	Part No. KI - 24414
-----------------	----------------------------------	----------------	------------------------

Internal Antenna

5. Environmental Specifications

○ Standard Temperature Range (IEC Specifications)

- Standard Temperature : 15 ~ 35 °C
- Humidity : 25 ~ 85%
- Atmospheric : 86~106 kPa

○ Environmental Specifications

- Specification : No evidence of mechanical damage.

Satisfy the electrical Specifications.

Item	Test Method
Temperature Cycling	Perform 10 cycles as follows : · -30±2°C for 2 hour · +80±2°C for 2 hour
Heat resistance and High static humidity	· Increase temperature +60°C during 1 hour with humidity increasing to 90±5% RH. · Dwell in +60°C, 90±5%RH chamber for 96 hours.
Low temperature Test	· Set temperature -30°C during 1 hour. · Dwell in -30°C chamber for 96 hours then stabilize at room temperature for measurement
Static Humidity Test	· Set temperature +60°C during 1 hour with humidity increasing to 90±5% RH · Dwell in +60°C chamber for 24 hours then stabilize at room temperature for measurement
Corrosion (Salt spray) Test	· Exposed to the salt fog of NaCl solution(5%) at 35°C for 48 hours.
High temperature Test	· Increase temperature +80°C during 1 hour. · Dwell in +80°C chamber for 96 hours then stabilize at room temperature for measurement

5-1 Temperature Cycling

Place the antennas in an environmental chamber. Set temperature cycles between $-30^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for 2 hour and $+80^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for 2 hour.

Complete this cycle 10 times. Then remove antennas from chamber and allow to stabilize at room temperature before measurement.

5-1-1. Test Method

(1) Firstly, leaving an antenna to the temperature t_1 for 1 hour.

(2) Secondly, the antenna is left to the temperature of t_2 by same method for 1 hour.

10 cycles of this operation (Fig. 3) are to be repeated.

(Relative humidity must be maintained 50%.)

- After test is completed : There shall be no visual deterioration or esthetical and mechanical performance.

The antenna shall satisfy the electrical Specifications.

Display	Division	Temperature
t1	Lower temperature cycling	-30°C
t2	Higher temperature cycling	$+80^{\circ}\text{C}$

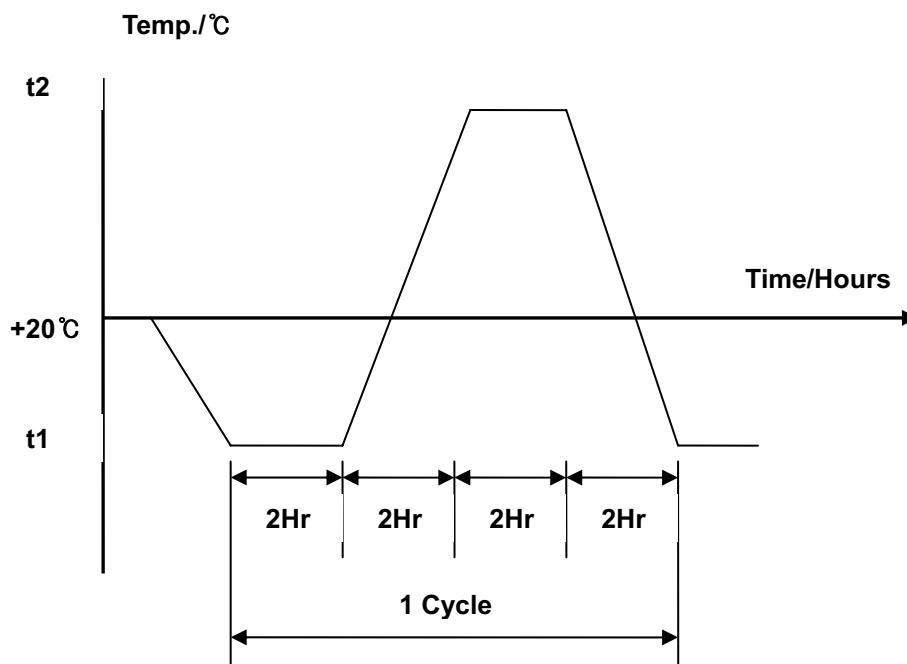


Fig. 3 Temperature cycling

5-2 Heat Resistance and High Static Humidity Test

Place the antennas in an environmental chamber at temperature $t_1=20^{\circ}\text{C}$ expose antenna to this temperature during 1 minutes.

Increase temperature at value of $t_2=+60^{\circ}\text{C}$ during 1 hours with humidity Increasing to $90\pm 5\%$ RH and soak antenna with these parameters for 96 hours continually. (Fig. 4)

- After test is completed : There shall be no visual deterioration or esthetical and mechanical performance.

The antenna shall satisfy the electrical Specifications.

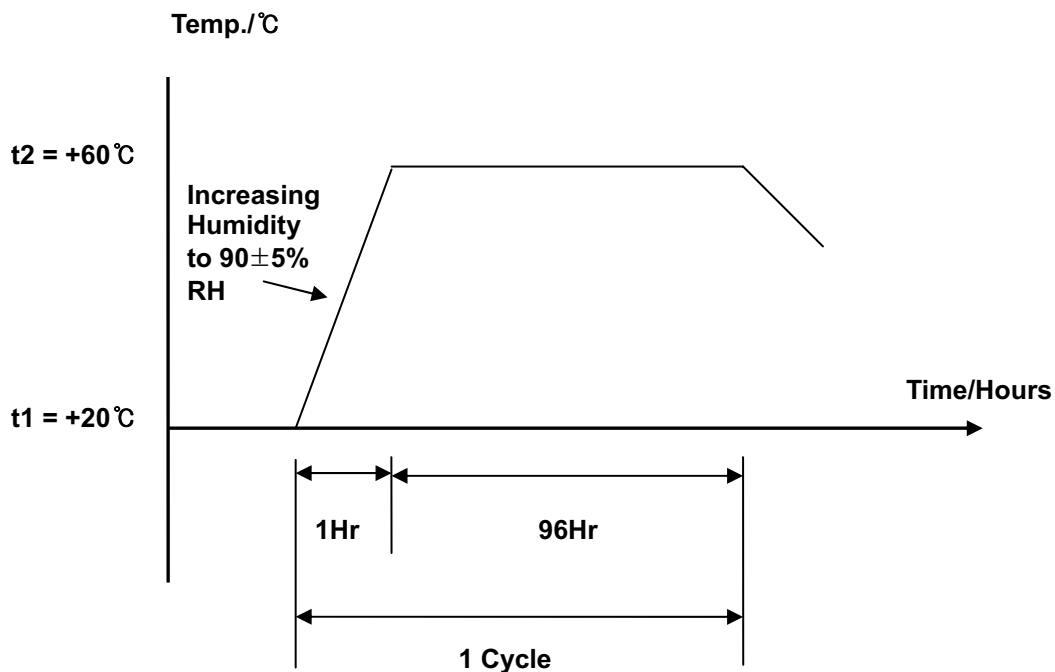


Fig. 4 Heat resistance and High static humidity test cycling

5-3 Low Temperature Test

Place the antennas in an environmental chamber at temperature $t_1 = 20^{\circ}\text{C}$ expose antenna to this temperature during 1 minutes.

Increase temperature to value of $t_2 = -30^{\circ}\text{C}$ during 1 hour, and soak at this temperature during 96 hours continue. (Fig. 5)

- After test is completed : There shall be no visual deterioration or esthetical and mechanical performance.

The antenna shall satisfy the electrical Specifications.

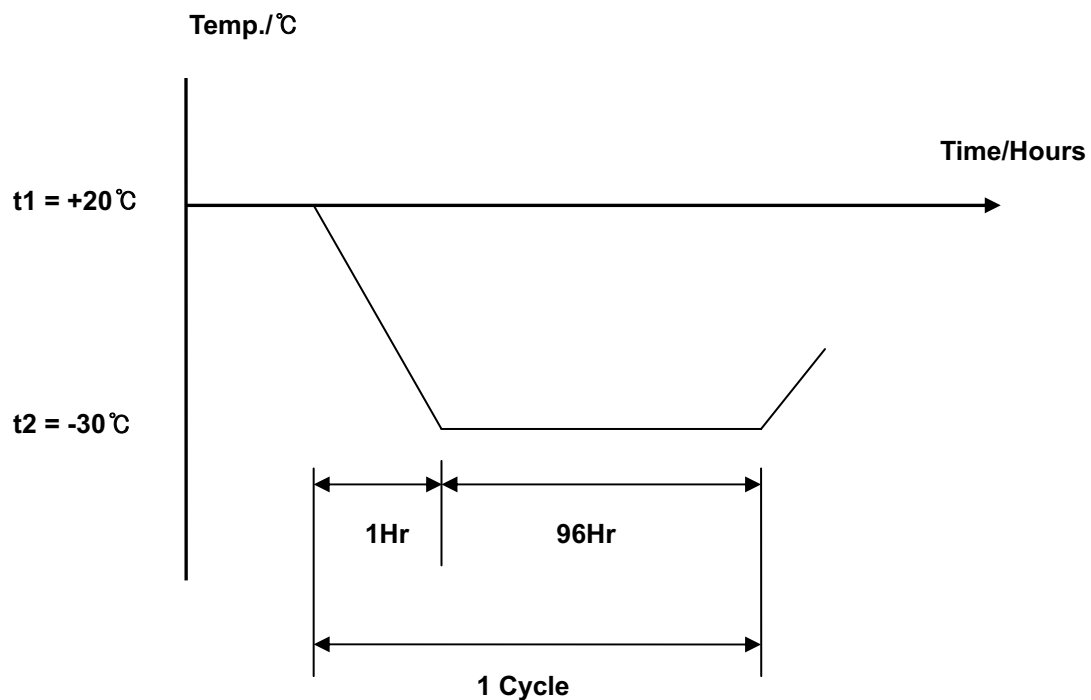


Fig. 5 Low Temperature Test

5-4 Static Humidity Test

Place complete antenna in an environmental chamber at $t_1=+20^{\circ}\text{C}$.

Increase temperature at $t_2=60\pm 5^{\circ}\text{C}$ during 1 hour with humidity increasing to $90\pm 5\%$ RH and soak antenna with these parameters for 24 hours. After the finish initial ambient parameters should be achieved during 1 hour. (Fig. 6)

After the test perform an inspection of the tested samples.

- After test is completed : There shall be no visual deterioration or esthetical and mechanical performance.

The antenna shall satisfy the electrical Specifications.

Temperature	Relative Humidity	Testing time
$60\pm 5^{\circ}\text{C}$	$90\pm 5\%$ RH	24 hours

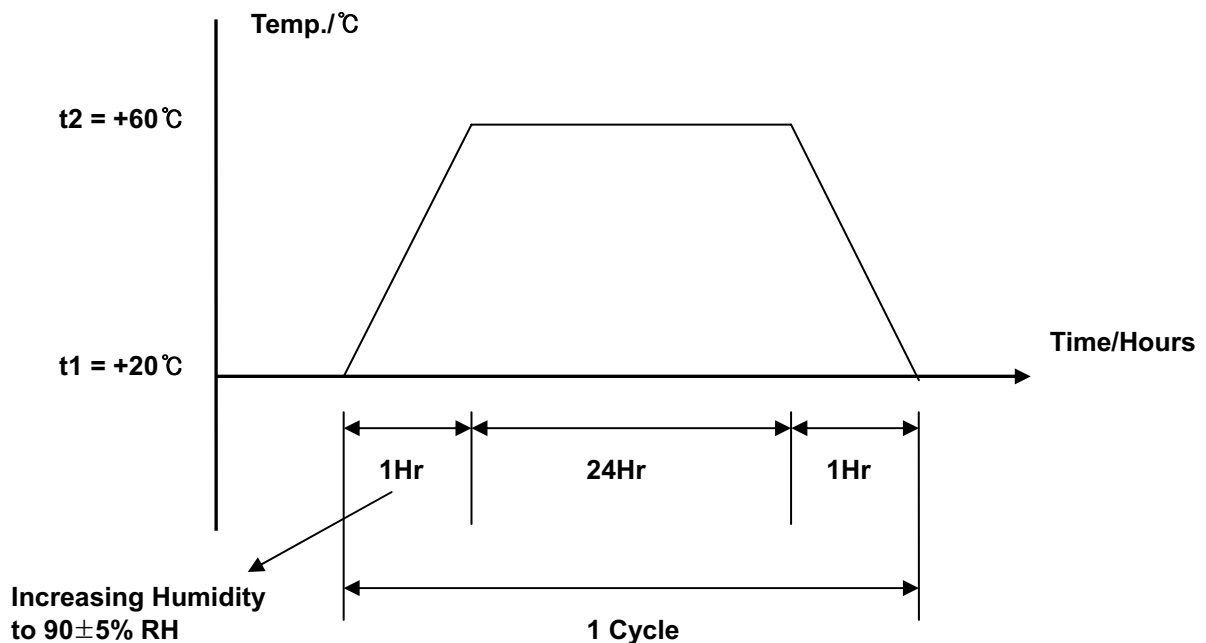


Fig. 6 Static Humidity Test

5-5 Corrosion (Salt Spray) Test

Place complete antenna in salt spray cabinet at temperature +35°C with the salt fog of NaCl solution(5%) : soak time 48 hours.

Then remove antennas from chamber and all to stabilize at room temperature before measurement.

Temperature	Concentration	Testing time
35°C	5%	48 hours

- After test is completed : There shall be no visual deterioration or esthetical and mechanical performance.

The antenna shall satisfy the electrical Specifications

5-6 High Temperature Test

Place the antennas in an environmental chamber at temperature $t_1 = 20^{\circ}\text{C}$ expose antenna to this temperature during 1 minutes.

Increase temperature to value of $t_2 = +80^{\circ}\text{C}$ during 1 hour, and soak at this temperature during 96 hours continue. (Fig. 7)

- After test is completed : There shall be no visual deterioration or esthetical and mechanical performance.

The antenna shall satisfy the electrical Specifications.

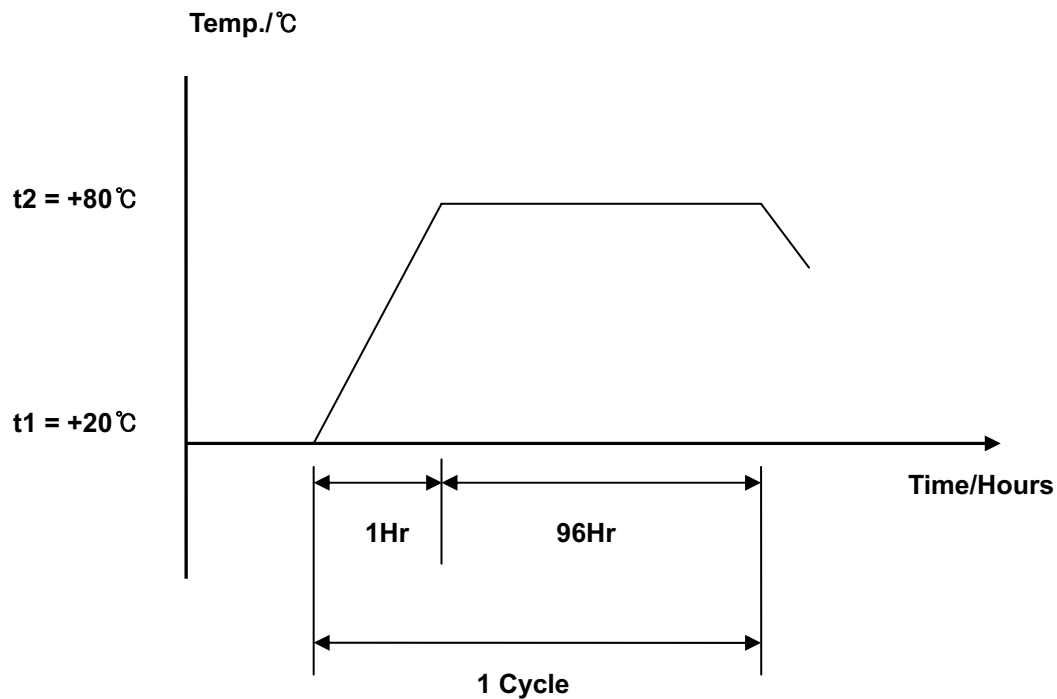


Fig. 7 High Temperature Test

	Document No. KOEX-PO-7101-170	Rev. No. IR	Part No. KI - 24414
---	----------------------------------	----------------	------------------------

Internal Antenna

6. Measurement Setup

6-1 Test Equipments

Network Analyzer	HP8753ES
Calibration Kit	HP85033D
Adaptor	SMA Type Female ↔ SMA male
Measurement Cable	SPS-2801-400-SPS (Insulated Wire Inc.)

6-2 Test Equipments Setting

6.2.1 Display	Dual channel : On Split display : On
6.2.2 Menu	Number of points : 201 Power : 0 dBm
6.2.3 Measure	Channel 1 : S11 Channel 2 : S21

6-3 Calibration

Calibration	Cal. Kit : 50 Ω Calibration menu → Full-2 Port Reflection Forward : Open → Short → Load Reverse : Open → Short → Load Done Transmission Do Both → FWD + REV Done Isolation Omit Isolation Done
-------------	---

Komatech	Document No. KOEX-PO-7101-170	Rev. No. IR	Part No. KI - 24414
-----------------	----------------------------------	----------------	------------------------

Internal Antenna

7. Test Procedures

7-1. VSWR

7-1-1. Test Method (Engineering)

The antenna is tested while mounted in the handset. The handset is set up with a 50 Ohm 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. (Fig. 8)

- 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 Bluetooth frequency band.
- Step 3. Inspect $VSWR < 3.1(\text{close}) / 3.3(\text{open})$
- Step 4. Measurement.



Fig. 8

7-2. Gain and Pattern (Far Field Chamber)

7-2-1. 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. (Fig. 10)

- 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

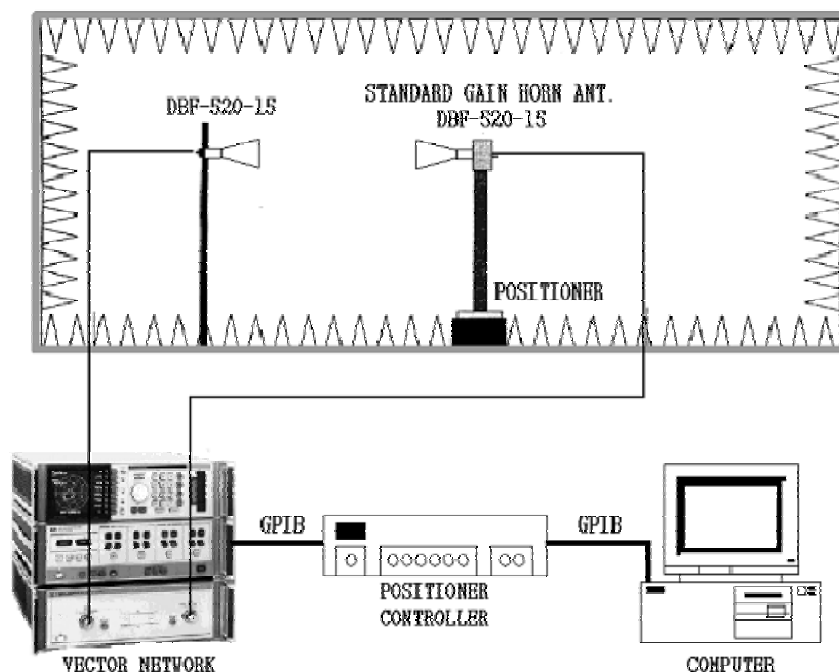


Fig. 10

7-2-2. Measurement of Radiation Pattern

Coordinates and Measurement plane at radiation pattern measurement are defined in Fig. 11(a) and Fig. 11(b)

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

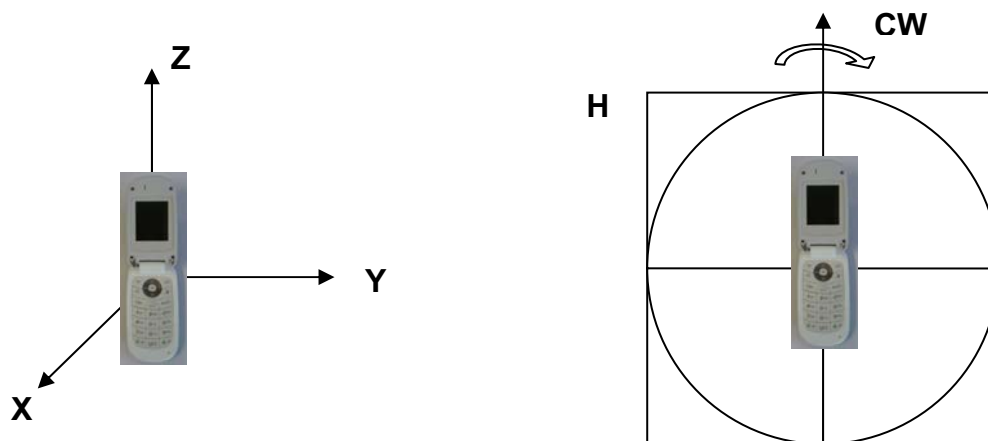


Fig. 11(a)

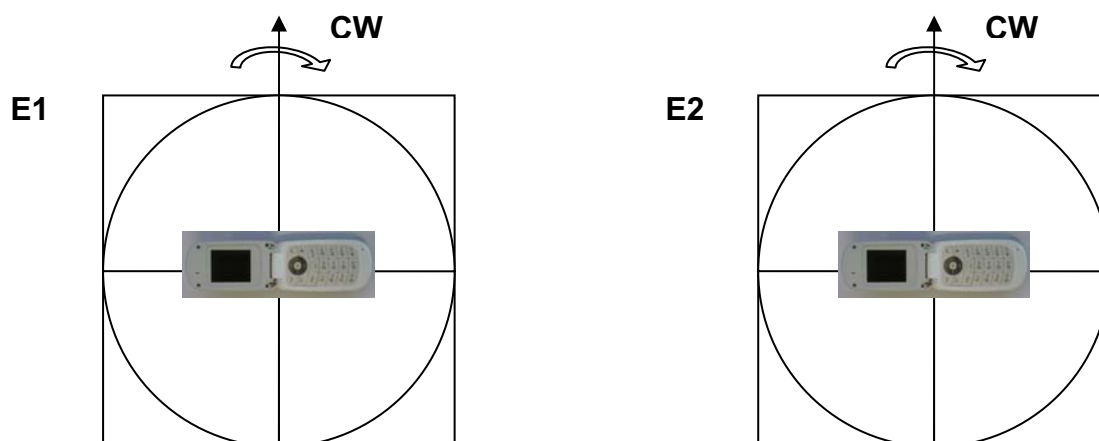


Fig. 11(b)

Komatech	Document No. KOEX-PO-7101-170	Rev. No. IR	Part No. KI - 24414
-----------------	---	-----------------------	-------------------------------

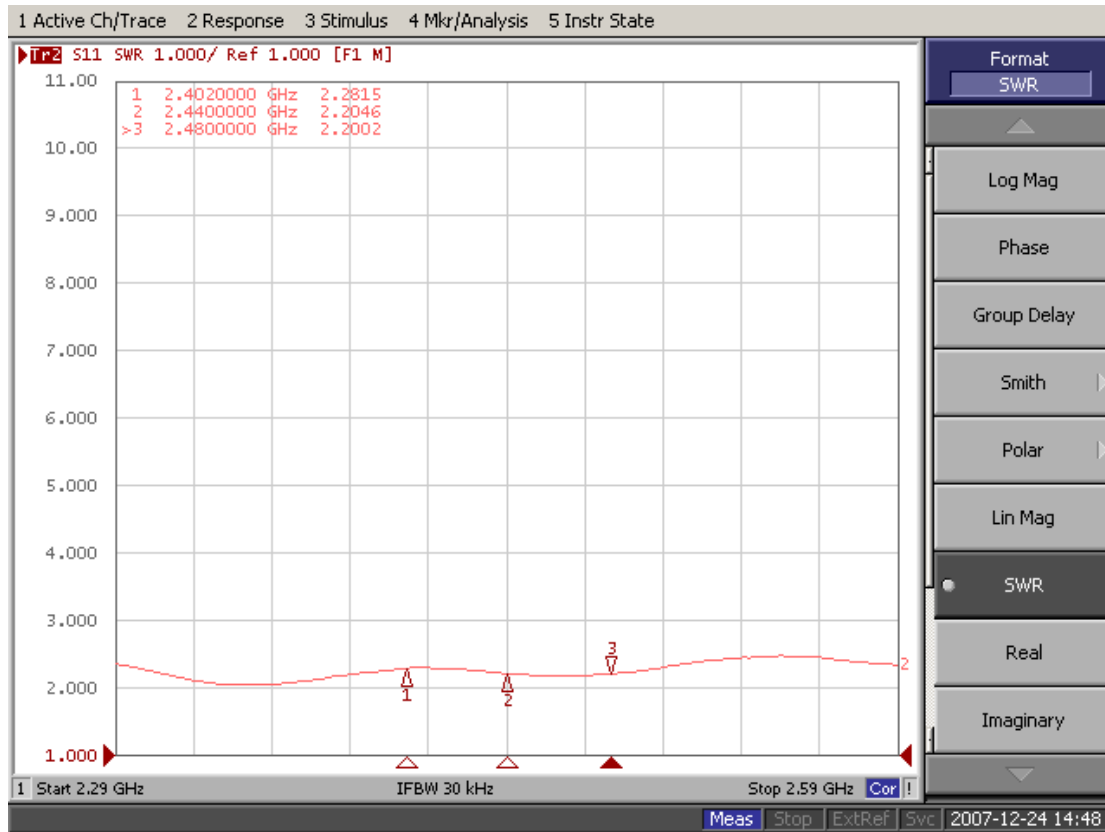
Internal Antenna

8. Measurement Data

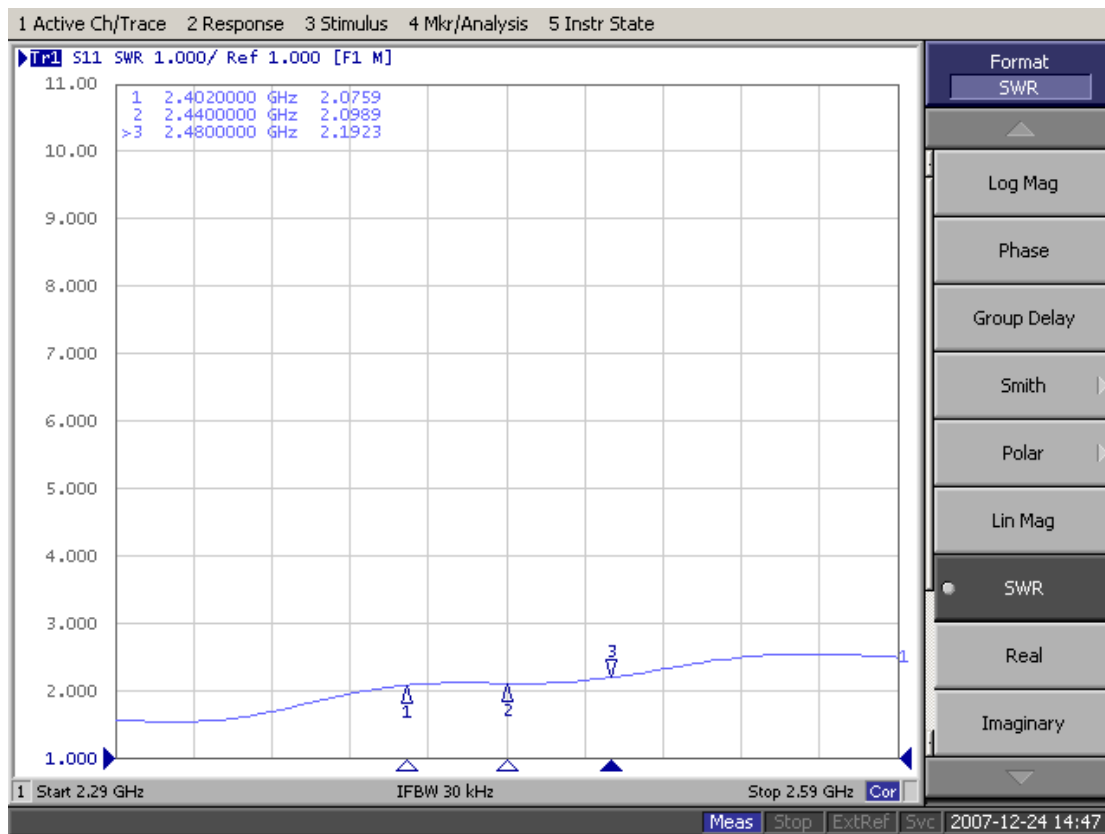
Model	CDM7126 BT	Part No.	KI – 24414
Written by	Tae-Ho Kim	Authorized by	Jae-Kwan Song
Instrument	Network Analyzer: 8753ES (HP)		
Subject	Internal Antenna		
Frequency	2402~2480 MHz (Bluetooth)		

Items			Test Result
Frequency Range			Bluetooth Band
			2402 ~ 2480 MHz
V.S.W.R (Min)	Close		2.19 : 1
	Open		2.28 : 1
Peak Gain (Max)	Close	H-plane	-7.71 dBi
		E1-plane	-11.04 dBi
		E2-plane	-0.22 dBi
	Open	H-plane	-10.20 dBi
		E1-plane	-14.46 dBi
		E2-plane	-0.55 dBi
Average Gain (Min)	Close	H-plane	-14.19 dBi
		E1-plane	-18.50 dBi
		E2-plane	-6.78 dBi
	Open	H-plane	-17.82 dBi
		E1-plane	-19.40 dBi
		E2-plane	-5.36 dBi

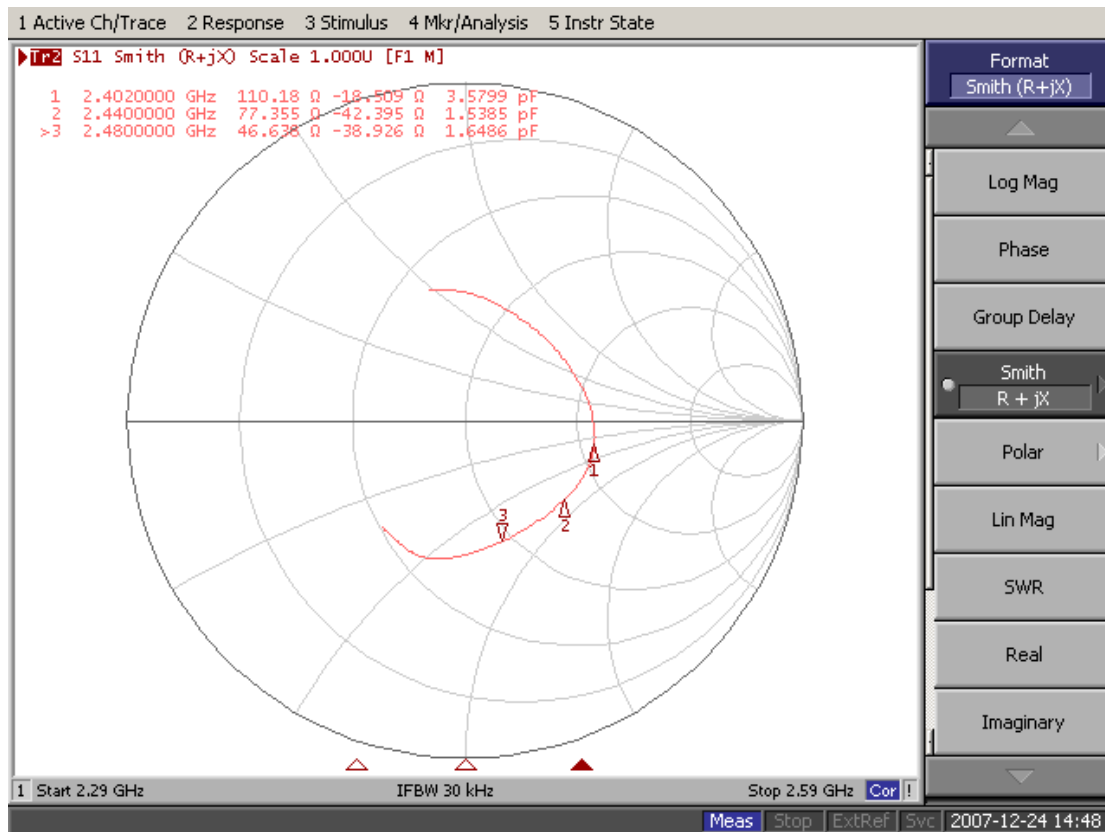
8-1 VSWR



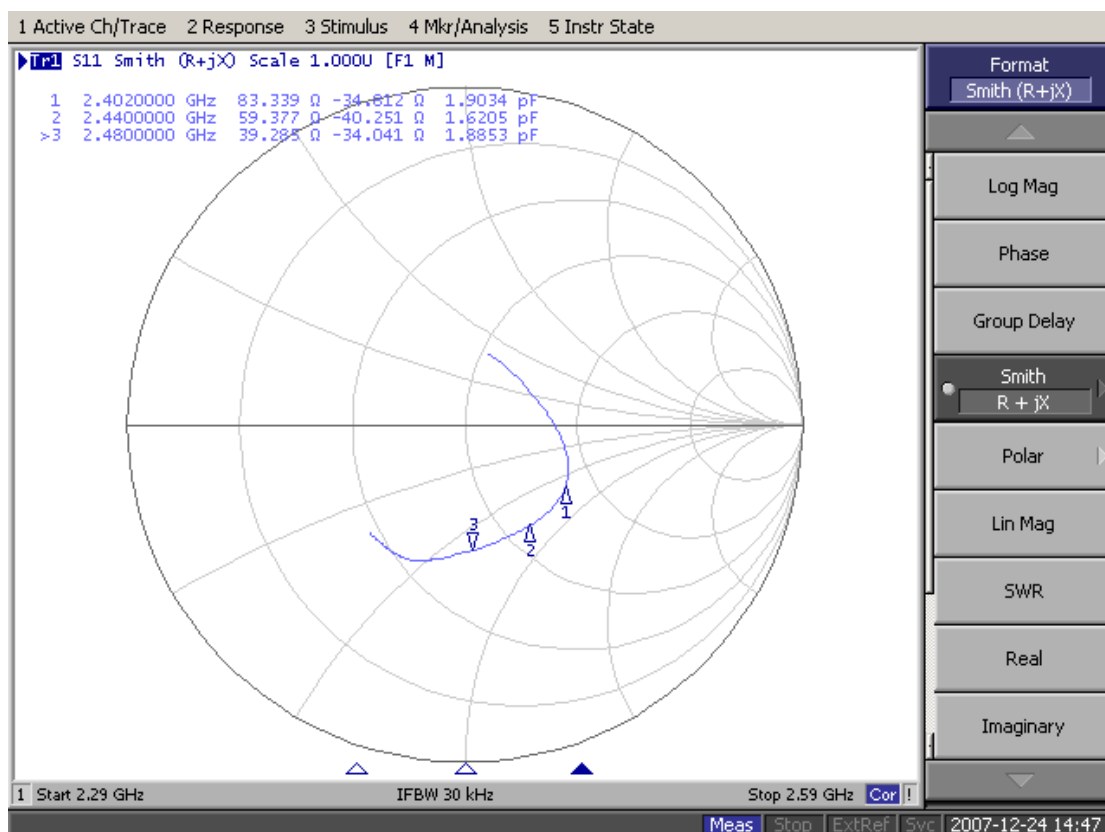
(Folder Open)



(Folder Close)

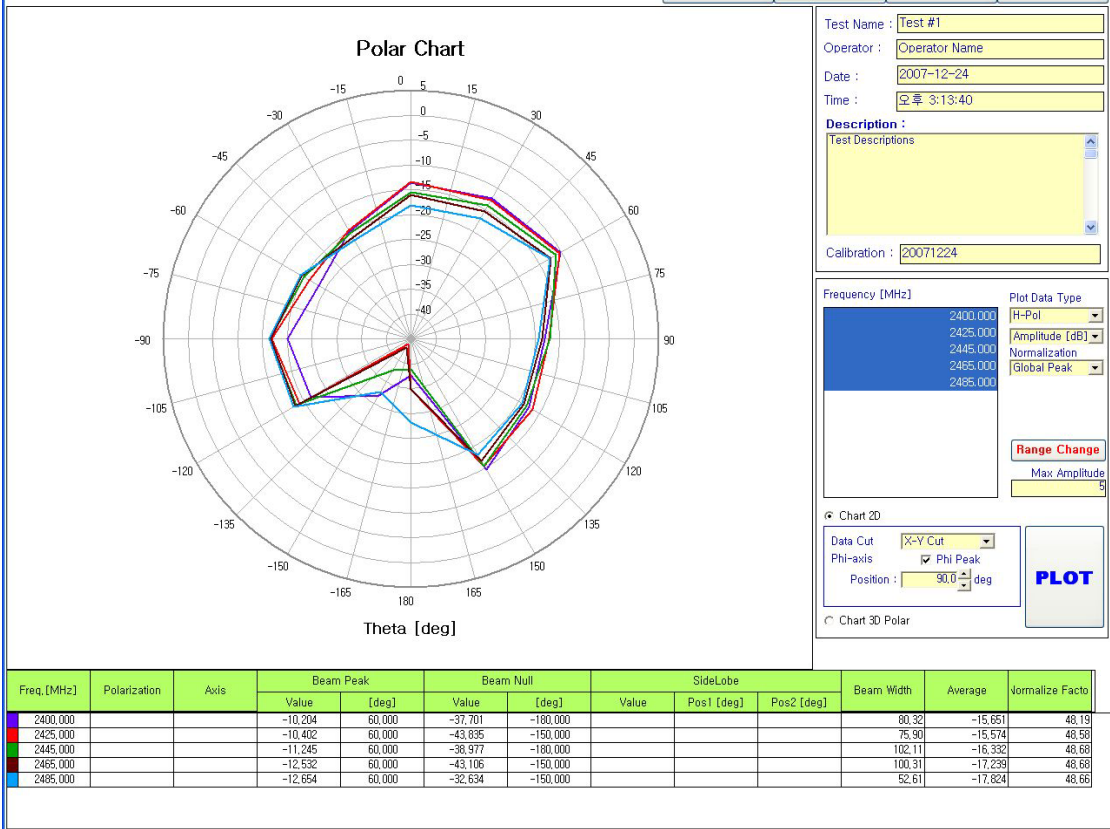


(Folder Open)

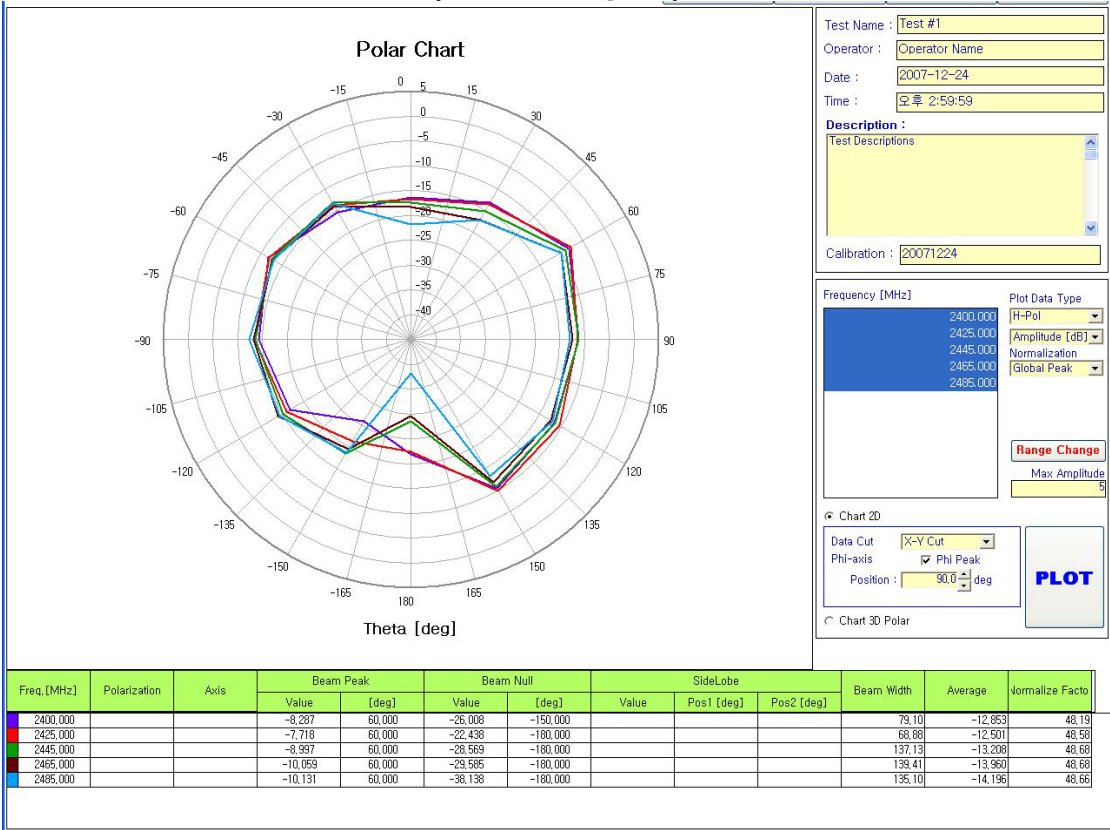


(Folder Close)

8-3-1 Radiation Pattern (H-plane)

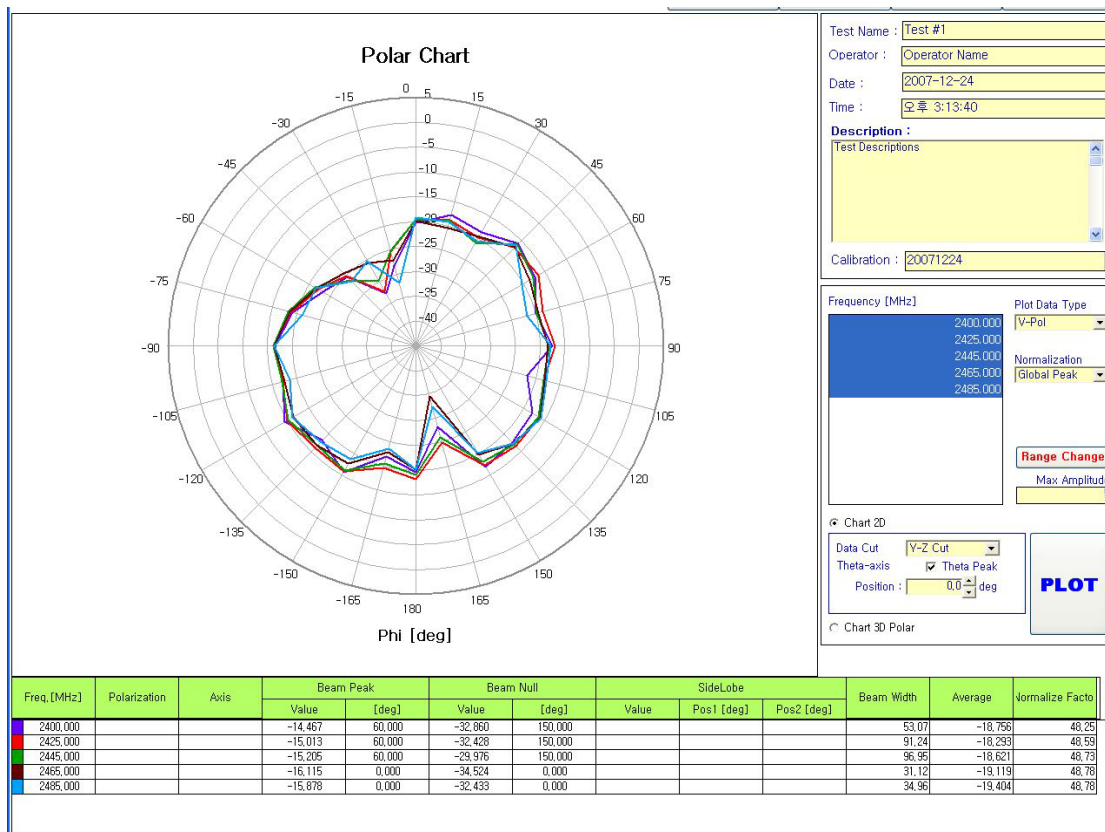


(Folder Open)

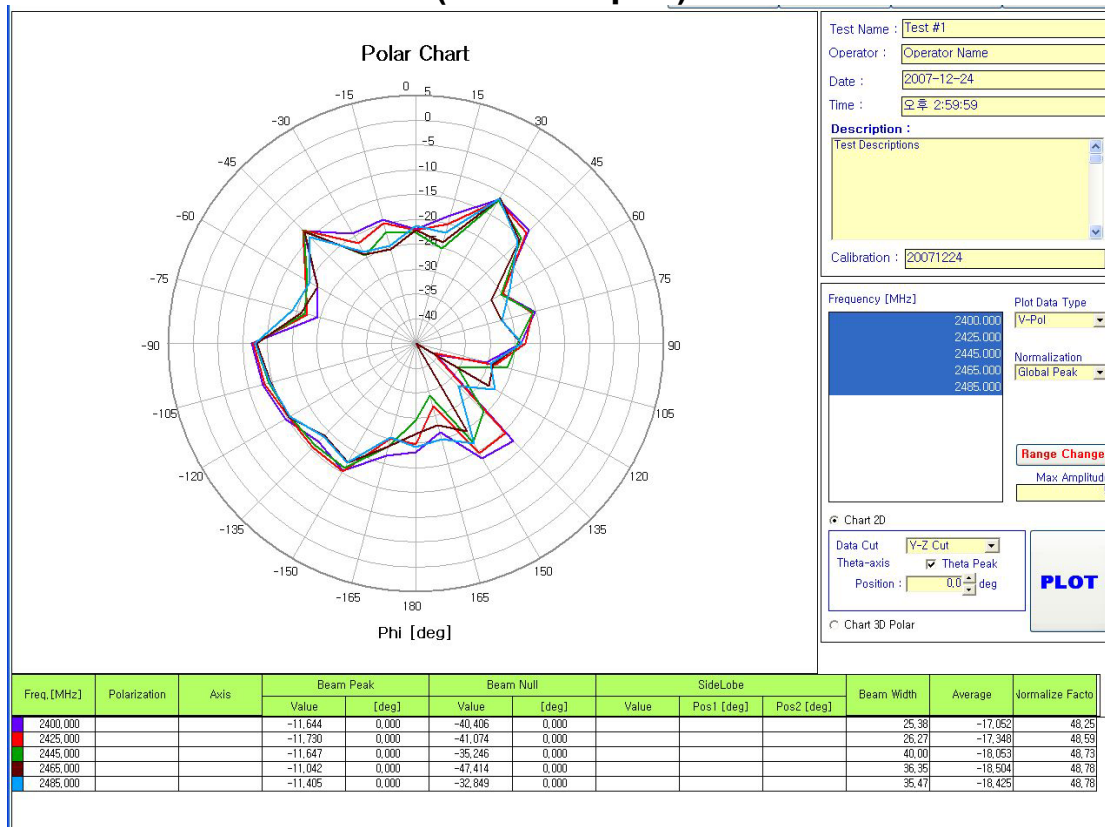


(Folder Close)

8-3-2 Radiation Pattern (E1-plane)

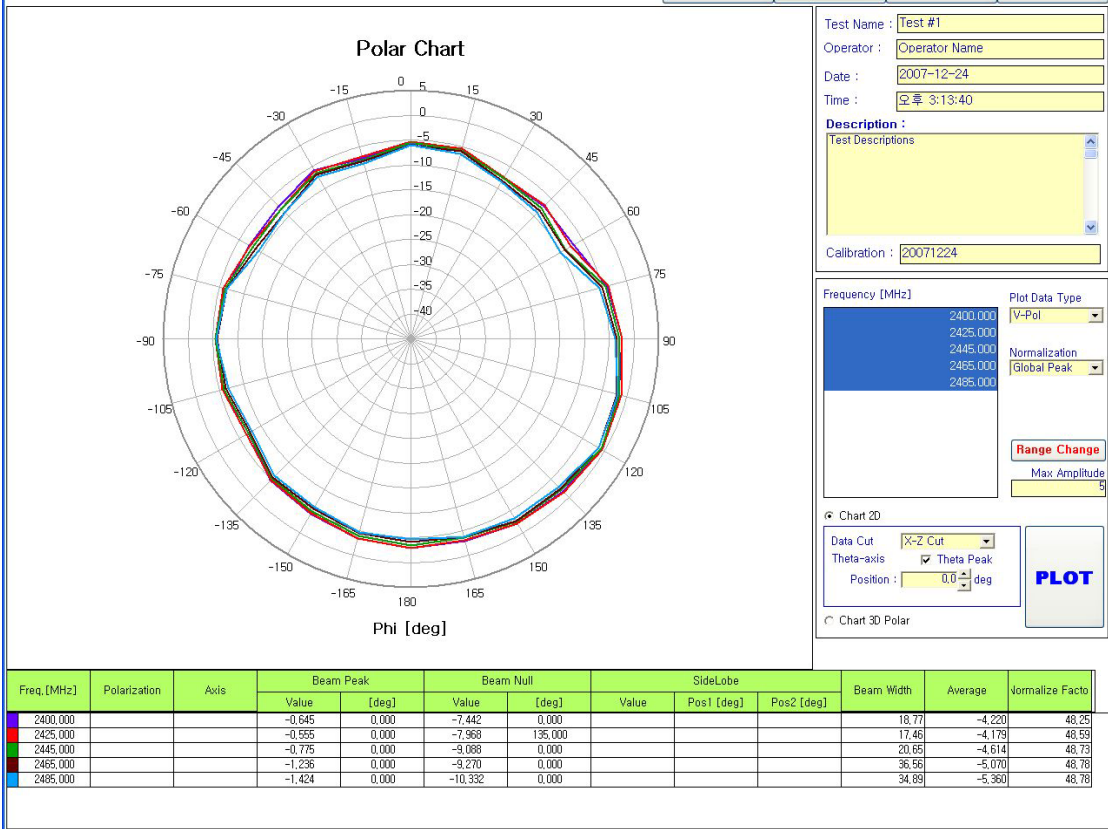


(Folder Open)

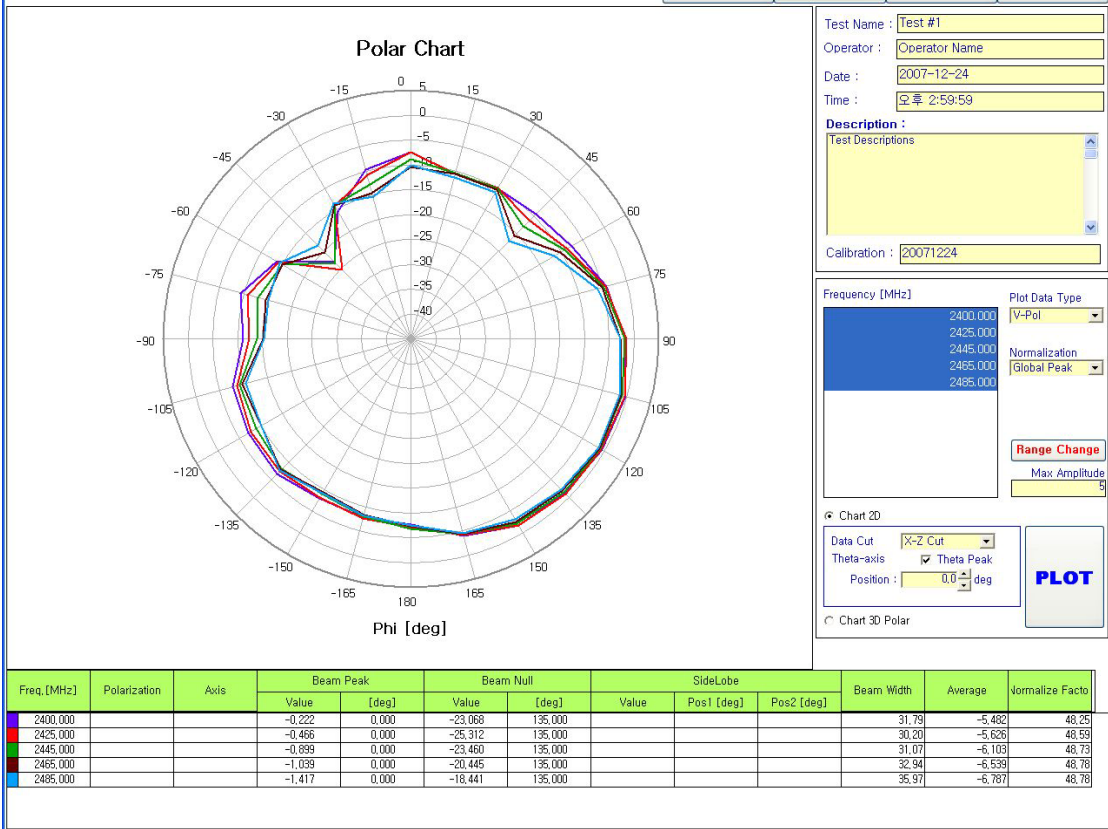


(Folder Close)

8-3-3 Radiation Pattern (E2-plane)



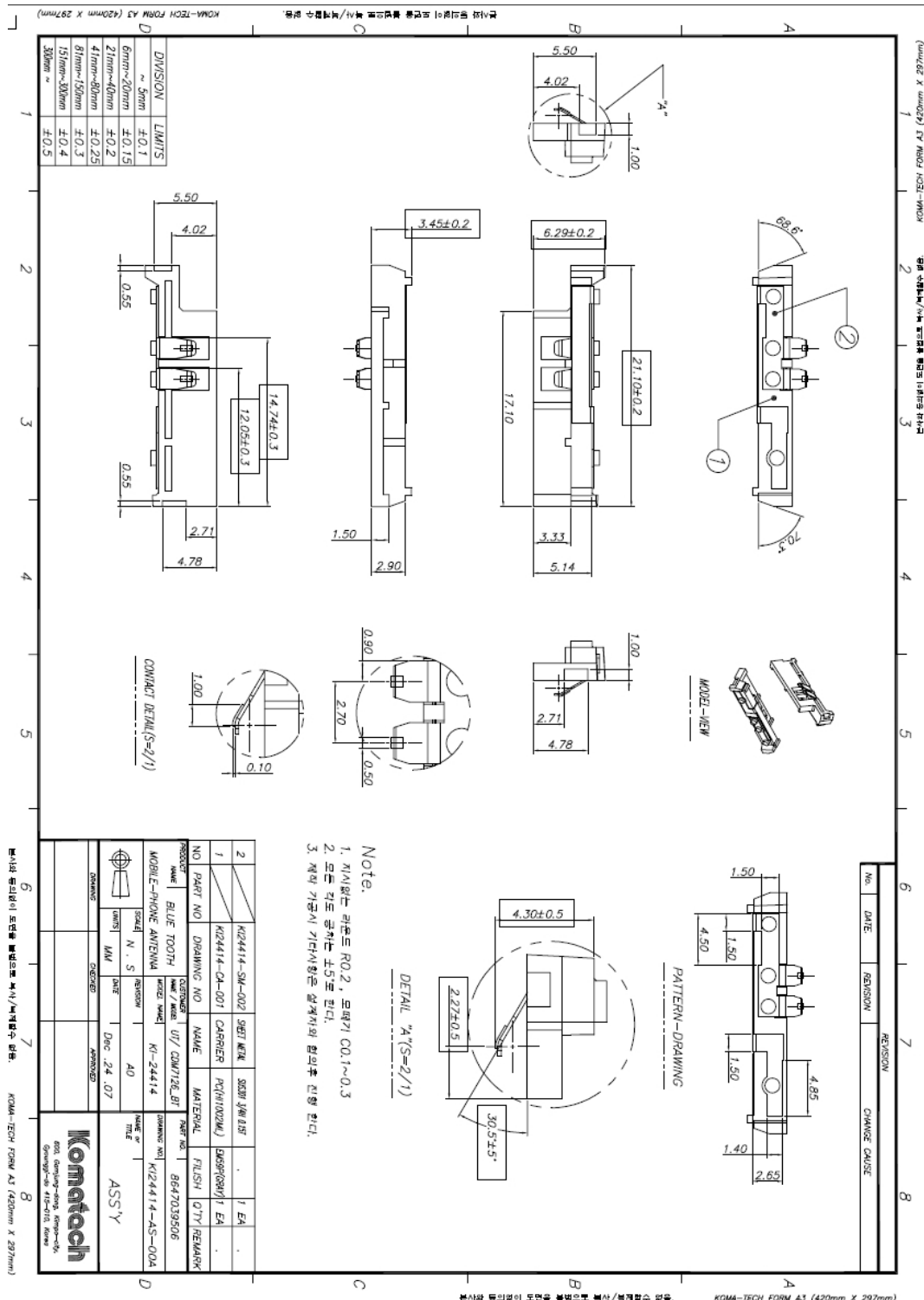
(Folder Open)

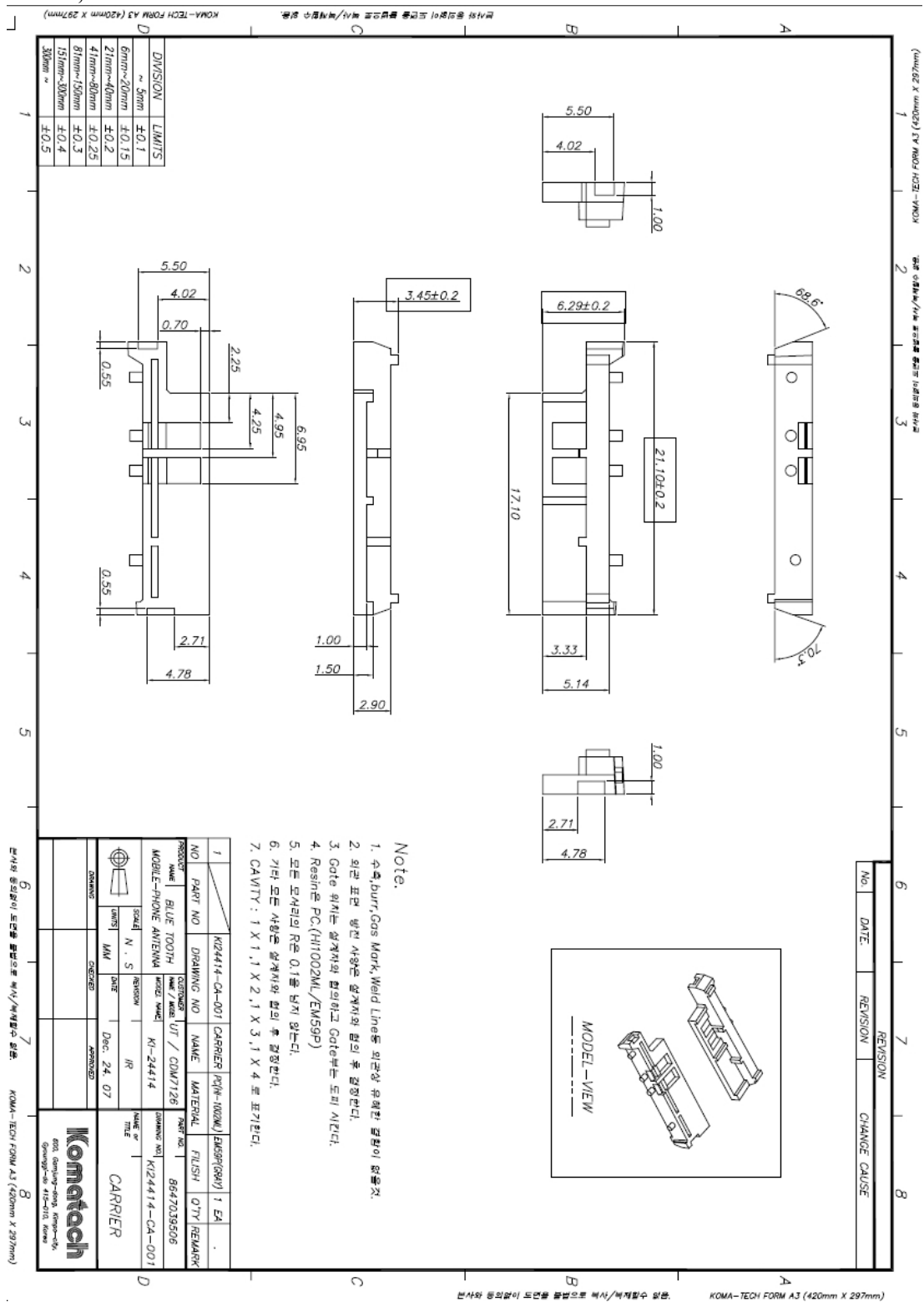


(Folder Close)

Internal Antenna

9. Mechanical Drawing





[Carrier Drawing]

[illegible]

[Sheet Metal Drawing]

fiTi 환경자원분석센터
FITI Testing & Research Institute

서울특별시 동대문구 제기2동 892-64 (우)1130-864
Tel : 02-3299-8006/9 Fax : 02-3299-8150/1
www.fiti-rd.com

시 험 성 적 서

의뢰자 : 코마테크(주)

주 소 : 경기 김포시 감정동 600

접수번호 : N215-07-00953

접수일자 : 2007-10-29

시험일자 : 2007-10-29

발급일자 : 2007-11-05

제 출 처 : 엘지전자(주)

쪽 번 호 : 1 OF 3

시 료 명 : CARRIER PC (SC-1004A)

시험결과 : 의뢰하신 시료에 대한 시험결과는 첨부과 같습니다.

* 첨부내역은 유럽의회의 전기전자제품 유해물질 규제 기준인 2002/95/EC RoHS(Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment)의 규정에 의거한 내용임

- 이 성적서는 제시된 시료에 대한 시험결과로서 전체제품에 대한 품질을 보증하지 않으며, 시료명은 의뢰자가 제시한 명칭입니다.
- 이 성적서는 FITI와 사전 서면동의 없이 홍보, 선전, 광고 및 소송용으로 사용될 수 없으며, 용도 이외의 사용을 금합니다.

Youn soo SHIN

기술책임자 : 신연수

Woo Jung Shim

원장 : 심우정

FITI시험연구원

전자문서 서비스

접수번호 : N215-07-00953
쪽 번호 : 2 OF 3

시 험 항 목

시 험 결 과

(01) PBBs(POLYBROMINATED BIPHENYLS) 함량 : mg/kg

성 분	함 량	시험방법	검출한계
BROMOBIPHENYL	검출안됨	US EPA 3540C	1.0mg/kg
DIBROMOBIPHENYL	검출안됨		
TRIBROMOBIPHENYL	검출안됨		
TETRABROMOBIPHENYL	검출안됨		
PENTABROMOBIPHENYL	검출안됨		
HEXABROMOBIPHENYL	검출안됨		
HEPTABROMOBIPHENYL	검출안됨		
OCTABROMOBIPHENYL	검출안됨		
NONABROMOBIPHENYL	검출안됨		
DECABROMOBIPHENYL	검출안됨		

주) DICHLOROMETHANE으로 속슬렛 추출하여 GC-MSD로 분석한 후 HPLC-DAD로 확인하였음.

(02) PBDEs(POLYBROMINATED DIPHENYL ETHERS) 함량 : mg/kg

성 분	함 량	시험방법	검출한계
BROMODIPHENYL ETHER	검출안됨	US EPA 3540C	1.0mg/kg
DIBROMODIPHENYL ETHER	검출안됨		
TRIBROMODIPHENYL ETHER	검출안됨		
TETRABROMODIPHENYL ETHER	검출안됨		
PENTABROMODIPHENYL ETHER	검출안됨		
HEXABROMODIPHENYL ETHER	검출안됨		
HEPTABROMODIPHENYL ETHER	검출안됨		
OCTABROMODIPHENYL ETHER	검출안됨		
NONABROMODIPHENYL ETHER	검출안됨		
DECABROMODIPHENYL ETHER	검출안됨		

주) DICHLOROMETHANE으로 속슬렛 추출하여 GC-MSD로 분석한 후 HPLC-DAD로 확인하였음.

전자문서 서비스

fi-i 환경자원분석센터
EPA Testing & Research Institute

서울특별시 동대문구 제2동 892-64 (우)130-864
Tel : 02-3299-8006/9 Fax : 02-3299-8150/1
www.fii.co.kr

접수번호 : N215-07-00953

쪽 번호 : 3 OF 3

시 험 항 목

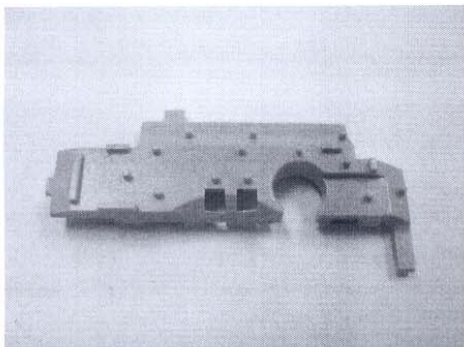
시 험 결 과

(03) 중금속함량 : mg/kg

성 분	함 량	시험방법	검출한계
카드뮴 (Cd)	검출안됨	EN 1122	1.0mg/kg
납 (Pb)	검출안됨	USEPA 3052	
수은 (Hg)	검출안됨	USEPA 3052	
크롬 VI (Cr VI)	검출안됨	USEPA 3060A	0.1mg/kg

주) 각 항목별 시험방법으로 산/알칼리 분해한 후 ICP-OES 와 UV-VIS SPECTROMETER로 측정하였음.

시료사진 :



전자문서 서비스

fiTi 환경자원분석센터
FITI Testing & Research Institute

서울특별시 동대문구 제기2동 892-64 (우)130-864
Tel: 02-3299-8006/9 Fax: 02-3299-8150/1
www.fiti.re.kr

시 험 성 적 서

의뢰자 : 코마테크(주)

주 소 : 경기 김포시 감정동 600

접수번호 : N215-07-00951

접수일자 : 2007-10-29

시험일자 : 2007-10-29

발급일자 : 2007-11-05

제 출 처 : 엘지전자(주)

쪽 번 호 : 1 OF 2

시 료 명 : SHEETMETAL SUS 301 3/4H

시험결과 : 의뢰하신 시료에 대한 시험결과는 첨부와 같습니다.

* 첨부내역은 유럽의회의 전기전자제품 유해물질 규제 기준인 2002/95/EC RoHS(Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment)의 규정에 의거한 내용임

- 이 성적서는 제시된 시료에 대한 시험결과로서 전체제품에 대한 품질을 보증하지 않으며, 시료명은 의뢰자가 제시한 명칭입니다.
- 이 성적서는 FITI와 사전 서면동의 없이 홍보, 선전, 광고 및 소송용도로 사용될 수 없으며, 용도 이외의 사용을 금합니다.

Youn soo SHIN

기술책임자 : 신연수

Woo Jung Shim

원장 : 심우정

FITI시험연구원

전자문서 서비스

fi-i 환경자원분석센터
EIT Testing & Research Institute

서울특별시 동대문구 제2동 892-64 (우)130-864
Tel : 02-3299-8006/9 Fax : 02-3299-8150/1
www.fi-i.co.kr

접수번호 : N215-07-00951

쪽 번호 : 2 OF 2

시 험 항 목

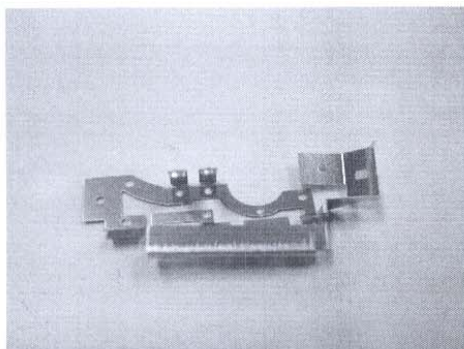
시 험 결 과

(01) 중금속함량 : mg/kg

성 분	함 량	시험방법	검출한계
카드뮴 (Cd)	검출 안됨	USEPA 3050B	1.0mg/kg
납 (Pb)	검출 안됨	USEPA 3052	
수은 (Hg)	검출 안됨	USEPA 3052	
크롬 VI (Cr VI)	검출 안됨	USEPA 3060A	0.1mg/kg

주) 각 항목별 시험방법으로 산/알칼리 분해한 후 ICP-OES 와 UV-VIS SPECTROMETER로 측정하였음.

시료사진 :



전자문서 서비스

Komatech	Document No. KOEX-PO-7101-170	Rev. No. IR	Part No. KI - 24414
-----------------	----------------------------------	----------------	------------------------

Internal Antenna

10. Packaging

The antennas will be packed in compartmentalized formed trays. (Fig. 12)

There are 75 pcs per tray. (1Tray = 75EA)

The trays are packed in a corrugated board box, 34 trays per a box. (Fig. 13)

A front of a box will be labeled for shipping according to the standards outlined list.

(1BOX = 2,500EA)

Materials used for packaging		Measurement	Qty	Remarks
1	Tray	438 X 300 X 20 (mm)	75 pcs	
2	Box	440 X 300 X 345 (mm)	34 stacks	

- 1 tray = 75 antennas

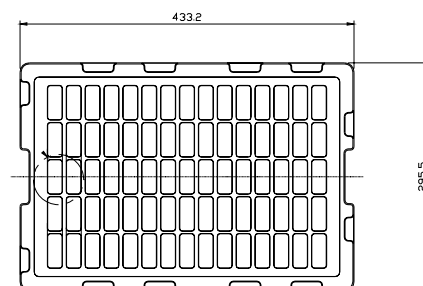


Fig. 12

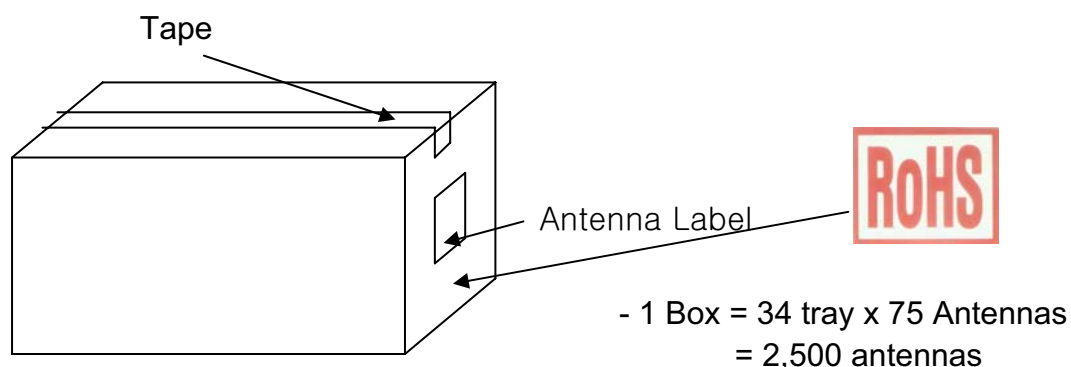


Fig. 13

	Document No. KOEX-PO-7101-170	Rev. No. IR	Part No. KI - 24414
---	----------------------------------	----------------	------------------------

Internal Antenna

11. Caution for Use

11-1. Storage

1) Please keep the product away from high temperature and high humidity.

2) Please keep product away from corrosive gases such as hydrogen sulfide, sulfurous acid, chlorine, ammonia, etc... The acid could cause the metal antenna to corrode degrading antenna performance.

[Storage condition 1]

- Temperature : 5 to 35℃
- Humidity : 45 to 75% RH
- Period : 6 months from date of packaging

[Storage condition 2]

- Temperature : -40 to 90℃
- Humidity : 96% RH max
- Period : 96 hours.

11-2. Handling

- 1) Since the antenna has a contact point it is important not to bend or push on the spring as it will degrade the spring response and could cause poor contact.
- 2) It is important to handle the antenna carefully and bending or dents made into the metal will cause the antenna to detune and could cause performance issues.
- 3) Please do not touch product directly with bare hands. This will put fingerprints on the antennas and the acids in the hand will cause the antenna to discolor. While this will not have a performance effect it does have a cosmetic effect on the part.