

Clearwave Inc.

Model Name: U200




Date: June 08, 2009

PRODUCT SPECIFICATION

Product : Antenna

Part No. : KH-CMDI-CW001 (Primary)

Part No. : KH-CMTI-CW002 (Secondary)

RF Eng'r	Mfg. Eng'r	Approved By
		
2009. 06. 08.	2009. 06. 08.	2009. 06. 08.

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1. General

1.1 The Product

Model Name (Primary)	KH-CMDI-CW001
Model Name (Secondary)	KH-CMTI-CW002
Antenna Type	PIFA type
Applications	US CDMA / GPS / US PCS

1.2 Electrical Properties

1.2.1 Primary Antenna

Frequency Range(Tx)	US CDMA	824~849 MHz
	US PCS	1,850~1,910 MHz
Frequency Range(Rx)	US CDMA	869~894 MHz
	US PCS	1,930~1,990 MHz
Impedance	US CDMA	50Ω ± 10Ω
	US PCS	50Ω ± 10Ω
VSWR	US CDMA	Less Than 3.8:1
	US PCS	Less Than 3.3:1
Radiation Pattern	Omni-Directional	
Polarization	Vertical	

1.2.2 Secondary Antenna

Frequency Range(Rx)	US CDMA	869~894 MHz
	GPS	1,575 MHz
	US PCS	1,930~1,990 MHz
Impedance	US CDMA	50Ω ± 10Ω
	GPS	50Ω ± 10Ω
	US PCS	50Ω ± 10Ω
VSWR	US CDMA	Less Than 7.5:1
	GPS	Less Than 2.2:1
	US PCS	Less Than 8.2:1
Radiation Pattern	Omni-Directional	
Polarization	Vertical	

1.3 Mechanical Properties

Dimension (Primary)	23.7mm(L) x 11.3mm(W) x 6.25mm(H)
Dimension (Secondary)	21.7mm(L) x 33.55mm(W) x 0.2mm(H)
Operational Temperature	-30°C ~ +70°C

2. Electrical Properties

2.1 Frequency Band

Service Band	US CDMA	GPS	US PCS
Tx(MHz)	824 ~ 849	1,575	1,850 ~ 1,910
Rx(MHz)	869 ~ 894	1,575	1,930 ~ 1,990

2.2 Impedance

2.2.1 Normal Value

$50\Omega \pm 10\Omega$

2.2.2 Measuring Method

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

2.3.1 Maximum values in free space

Service VSWR	US CDMA		GPS		US PCS	
	Tx	Rx	Tx	Rx	Tx	Rx
Primary	3.8:1	1.7:1	•	•	3.3:1	1.9:1
Secondary	•	7.5:1	2.2:1	2.2:1	•	8.2:1

2.3.2 Measuring Method

A 50Ω coaxial cable is connected(soldered) to the 50Ω point, at the duplex-filter on the main 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 measurement is performed at room temperature. The handset, including the PCB, must not in any significant way differ from the mass production, i.e. the antenna feeding network has to be equivalent to the feeding network in mass production. The specification shall be met in the entire frequency band.

2.4 Gain(dBi)

2.4.1 Typical minimum values in maximum direction

Service Gain	US CDMA		GPS		US PCS	
	Tx	Rx	Tx	Rx	Tx	Rx
Primary	-7.06	-6.57	•	•	-4.9	-5.28
Secondary	•	-11.42	-7.67	-7.67	•	-23.35

2.4.2 Measuring Method

The connection is done according to 2.3.2.

Radiation patterns are measured at 6 different frequencies : Txmin, Txmid, Txmax, Rxmin, Rxmid and Rxmax.

The antenna is measured in the H-plane, E1-plane and E2-plane according to the figure 1 below.

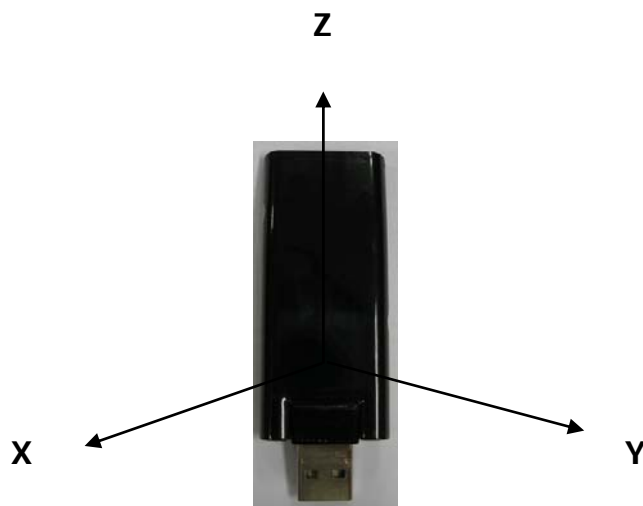


Figure 1. Gain Test

3. Mechanical Properties

3.1 Appearance

The appearance shall be according to the specification of the mechanical drawing.

The antenna shall have no cuts, abrasion or other mechanical damages.

3.2 Drop

3.2.1 Drops

1 drop in retracted mode(3cycles)

3.2.2 Drop Height

1.5m

3.2.3 Drop Angle

180°

3.2.4 Actual handset applied

3.2.5 Demands

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

3.2.6 Measuring Method

The antenna is placed in the handset or an equivalent test fixture.

The handset is dropped with the antenna downwards onto a metal plate.

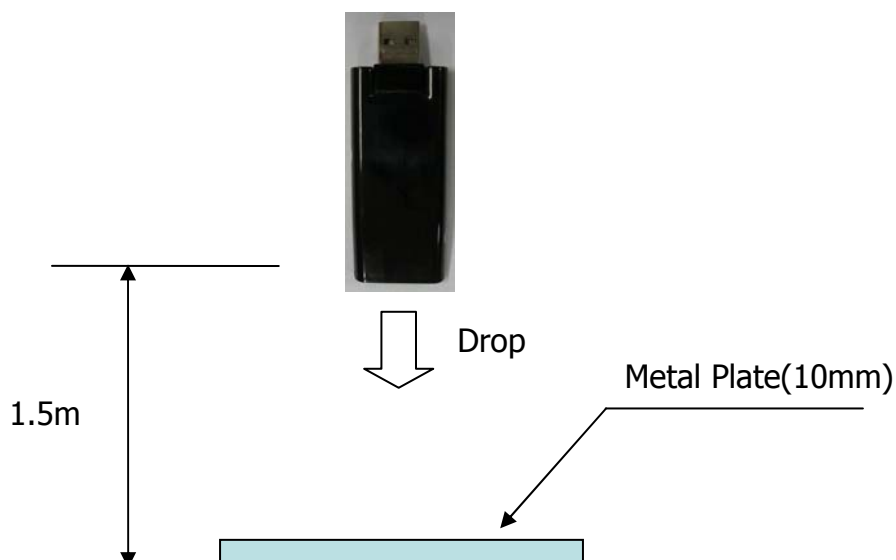


Figure 2. Drop Test

4. Environment Resistance Properties

4.1 Operational Temperature

4.1.1. Low Operational Temperature

TLO = -30°C

4.1.2 High Operational Temperature

THO = +70°C

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°C

4.2.2 High Cycling Temperature

THC = +80°C

4.2.3 Demands

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

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 3 below.

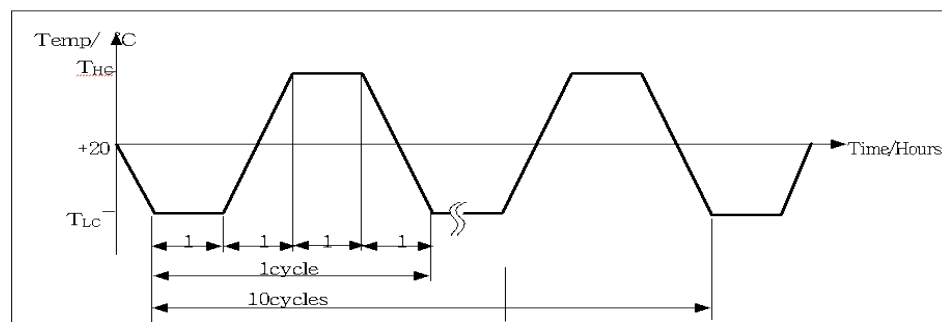


Figure 3. Temperature Cycling

4.3 Humidity

4.3.1 Relative Humidity

95%

4.3.2 Temperature

+55°C

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

10-55-10Hz(1cycle)

4.4.2 Sweep Rate

1 octave/min(logarithmic)

4.4.3 Maximum Amplitude

$A = 1.52\text{mm}$

4.4.4 Maxim Acceleration

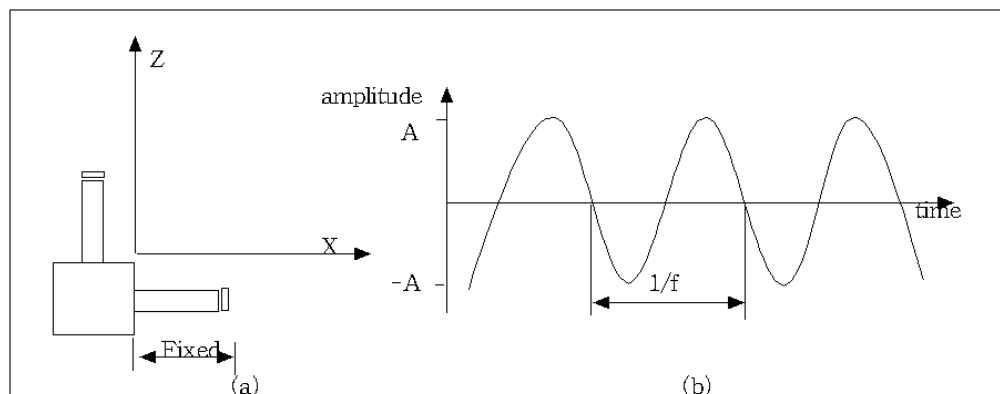
2g

4.4.5 Crossover Frequency

18.2Hz

4.4.6 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(a), with a duration of 1 hour in each direction.



(a) Vibration directions

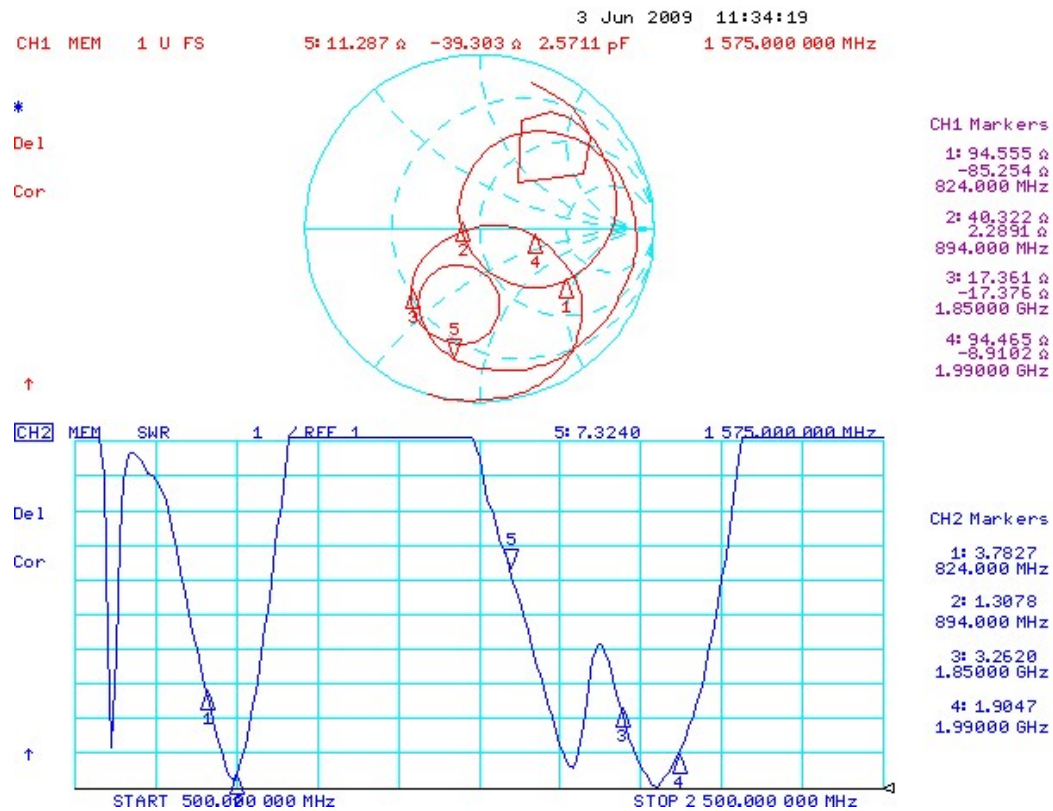
(b) Vibration form

Figure 4. Sinusoidal Vibrator

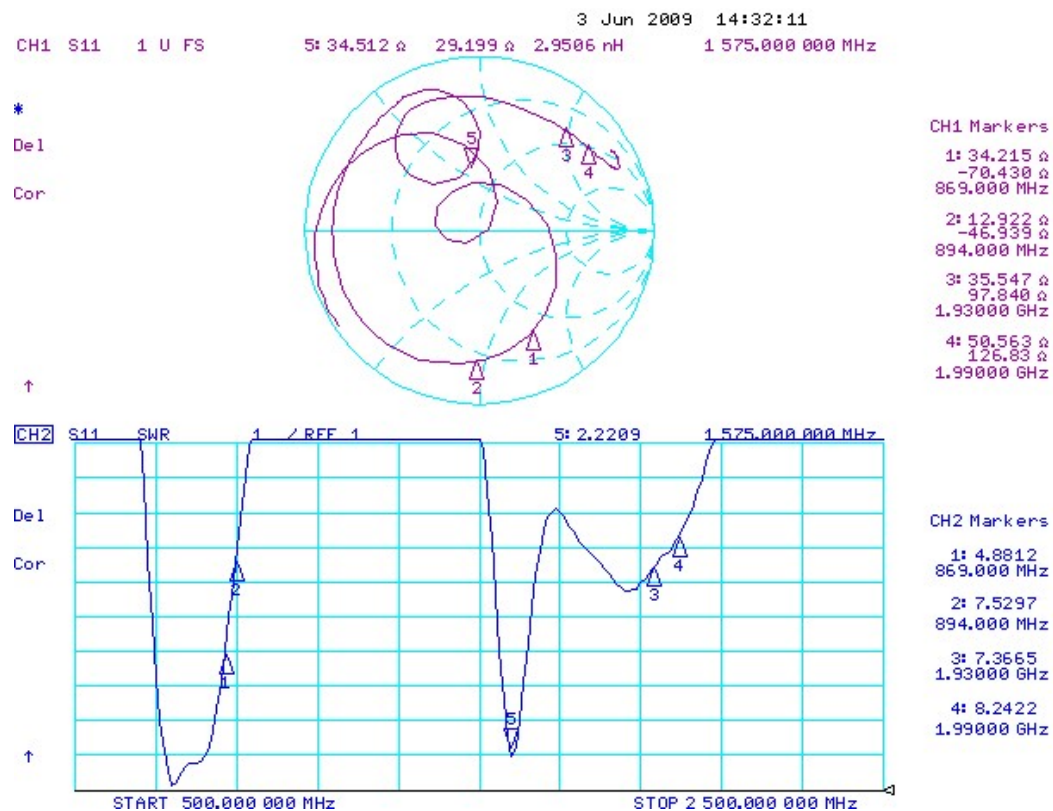
5. Test Data

5.1 Network Data

5.1.1 Primary Antenna

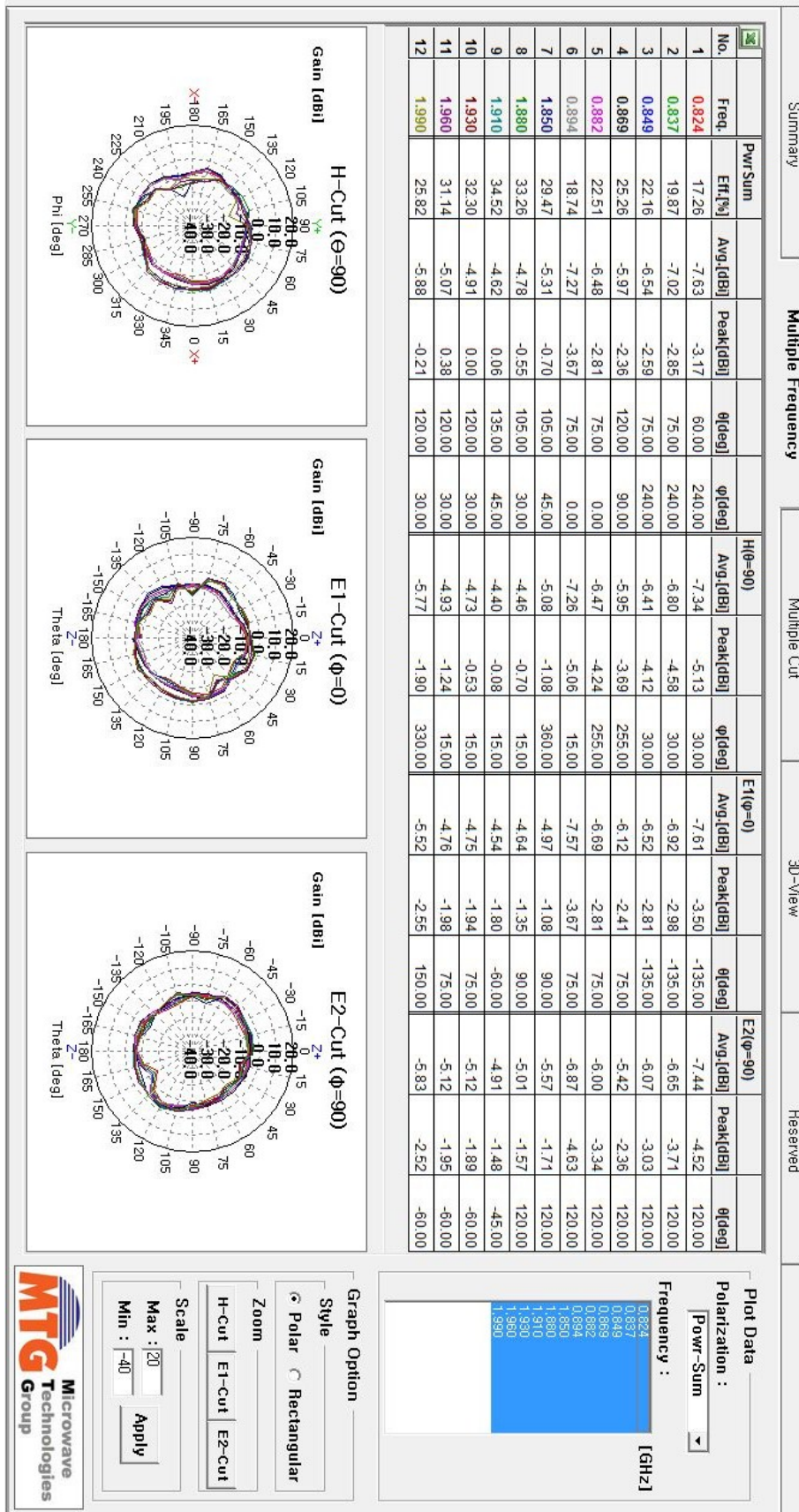


5.1.2 Secondary Antenna

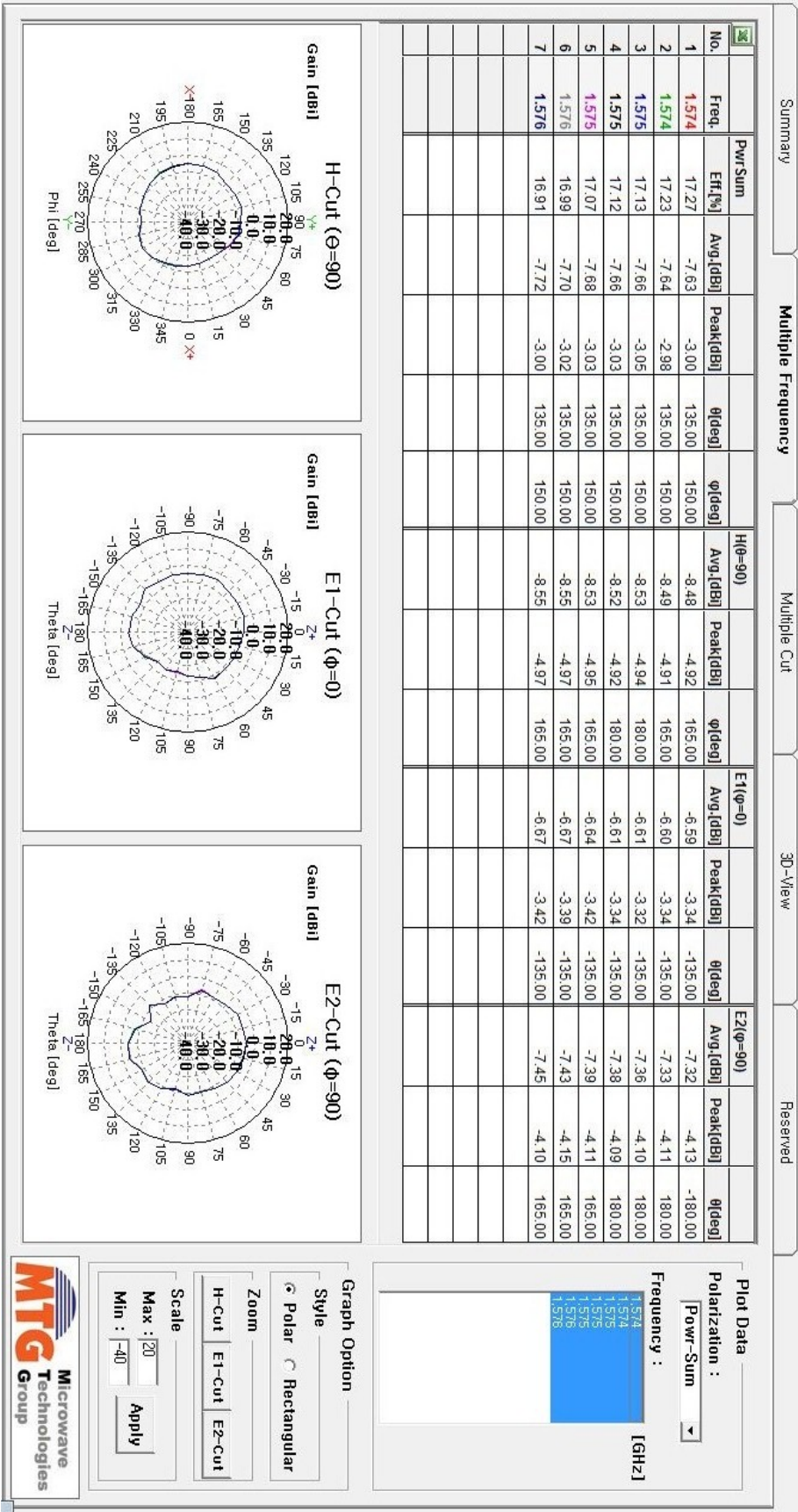


5.2 GAIN

5.2.1 US CDMA / US PCS (Primary)



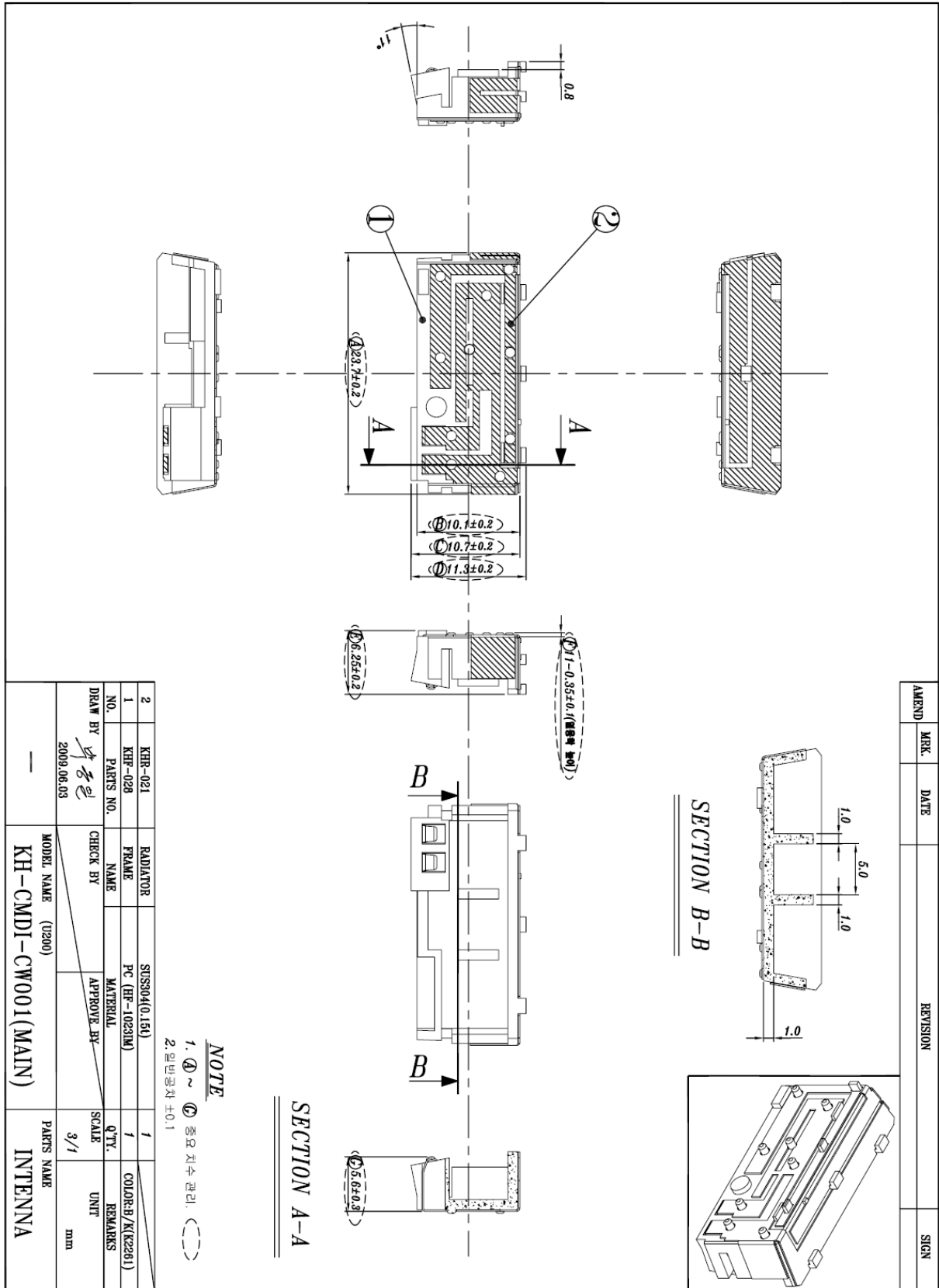
5.2.3 GPS (Secondary)



6. Mechanical Drawing

6.1 Primary

A3 (297 x 420)



7.2 Press

SGS

Test Report No. F690901/LF-CTSAYAA08-23634 Issued Date: August 25, 2008 Page 2 of 2

Sample No. : AYAA08-23634.001


Sample Description : Stainless

Item No./Part No. : 6TS304

Heavy Metals

Test Items	Unit	Test Method	MDL	Results
Cadmium (Cd)	mg/kg	US EPA 3052(1996), US EPA 6010B(1996), ICP	0.5	N.D.
Lead (Pb)	mg/kg	US EPA 3052(1996), US EPA 6010B(1996), ICP	5	N.D.
Mercury (Hg)	mg/kg	US EPA 3052(1996), US EPA 6010B(1996), ICP	2	N.D.
Hexavalent Chromium (Cr VI)	mg/kg	US EPA 3060A(1996), US EPA 7196A(1992), UV	1	N.D.
Barium (Ba)	mg/kg	US EPA 3050B(1996), US EPA 6010B(1996), ICP	0.5	N.D.
Antimony (Sb)	mg/kg	US EPA 3050B(1996), US EPA 6010B(1996), ICP	10	N.D.
Selenium (Se)	mg/kg	US EPA 3050B(1996), US EPA 6010B(1996), ICP	10	N.D.
Arsenic (As)	mg/kg	US EPA 3052(1996), US EPA 6010B(1996), ICP	10	N.D.

Picture of Sample as Received:



*** End ***

NOTE:

- (1) N.D. = Not detected, (<MDL)
- (2) mg/kg = ppm
- (3) MDL = Method Detection Limit
- (4) - = No regulation
- (5) ** = Qualitative analysis (No Link)
- (6) Negative = Undetectable / Positive = Detectable

7.3 FPCB



TEST REPORT

Report No. RT08R-9519-003-A

Page: 3 of 6

Date: Jul. 18, 2008

Sample ID No. : RT08R-9519-003

Sample Description : CCL

Test Items	Unit	Test Method	MDL	Results
Polybrominated Biphenyl (PBBs)				
Monobromobiphenyl	ng/kg	With reference to IEC 62321-111/95/CDV, by solvent extraction and determined by GC/MS	5	N.D.
Dibromobiphenyl	ng/kg		5	N.D.
Tribromobiphenyl	ng/kg		5	N.D.
Tetrabromobiphenyl	ng/kg		5	N.D.
Pentabromobiphenyl	ng/kg		5	N.D.
Hexabromobiphenyl	ng/kg		5	N.D.
Heptabromobiphenyl	ng/kg		5	N.D.
Octabromobiphenyl	ng/kg		5	N.D.
Nonabromobiphenyl	ng/kg		5	N.D.
Decabromobiphenyl	ng/kg		5	N.D.
Polybrominated Diphenyl Ether (PBDEs)				
Monobromodiphenyl ether	ng/kg	With reference to IEC 62321-111/95/CDV, by solvent extraction and determined by GC/MS	5	N.D.
Dibromodiphenyl ether	ng/kg		5	N.D.
Tribromodiphenyl ether	ng/kg		5	N.D.
Tetrabromodiphenyl ether	ng/kg		5	N.D.
Pentabromodiphenyl ether	ng/kg		5	N.D.
Hexabromodiphenyl ether	ng/kg		5	N.D.
Heptabromodiphenyl ether	ng/kg		5	N.D.
Octabromodiphenyl ether	ng/kg		5	N.D.
Nonabromodiphenyl ether	ng/kg		5	N.D.
Decabromodiphenyl ether	ng/kg		5	N.D.

Tested by : Ellen Jung

Notes : ng/kg = ppm = parts per million

< = Less than

N.D. = Not detected (<MDL)

MDL = Method detection limit

Remark : Tests were conducted with reference to 111/95/CDV version 2007-10-12 which is still a draft method and subject to future changes prior to publication.

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TEST REPORT

Report No. RT08R-9519-001-A

Page: 2 of 5

Date: Jul. 18, 2008

Sample ID No. : RT08R-9519-001

Sample Description : Coverlay

Test Items	Unit	Test Method	MDL	Results
Cadmium (Cd)	ng/kg	With reference to IEC 62321-111/95/CDV, by acid digestion and determined by ICP-OES	0.5	N.D.
Lead (Pb)	ng/kg		5	N.D.
Mercury (Hg)	ng/kg		2	N.D.
Hexavalent Chromium (Cr ⁶⁺) (For non-metal)	ng/kg	With reference to IEC 62321-111/95/CDV by alkaline digestion and determined by UV-VIS Spectrophotometer	1	N.D.
Polybrominated Biphenyl (PBBs)				
Monobromobiphenyl	ng/kg	With reference to IEC 62321-111/95/CDV, by solvent extraction and determined by GC/MS	5	N.D.
Dibromobiphenyl	ng/kg		5	N.D.
Tribromobiphenyl	ng/kg		5	N.D.
Tetrabromobiphenyl	ng/kg		5	N.D.
Pentabromobiphenyl	ng/kg		5	N.D.
Hexabromobiphenyl	ng/kg		5	N.D.
Heptabromobiphenyl	ng/kg		5	N.D.
Octabromobiphenyl	ng/kg		5	N.D.
Nonabromobiphenyl	ng/kg		5	N.D.
Decabromobiphenyl	ng/kg		5	N.D.
Polybrominated Diphenyl Ether (PBDEs)				
Monobromodiphenyl ether	ng/kg	With reference to IEC 62321-111/95/CDV, by solvent extraction and determined by GC/MS	5	N.D.
Dibromodiphenyl ether	ng/kg		5	N.D.
Tribromodiphenyl ether	ng/kg		5	N.D.
Tetrabromodiphenyl ether	ng/kg		5	N.D.
Pentabromodiphenyl ether	ng/kg		5	N.D.
Hexabromodiphenyl ether	ng/kg		5	N.D.
Heptabromodiphenyl ether	ng/kg		5	N.D.
Octabromodiphenyl ether	ng/kg		5	N.D.
Nonabromodiphenyl ether	ng/kg		5	N.D.
Decabromodiphenyl ether	ng/kg		5	N.D.

Tested by : Nikkie Lee, HR Kim, Ellen Jung

Notes : ng/kg = ppm = parts per million

< = Less than

N.D. = Not detected (< MDL)

MDL = Method detection limit

Remark : Tests were conducted with reference to 111/95/CDV version 2007-10-12 which is still a draft method and subject to future changes prior to publication.

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