Specification No.	Description		
2008-B4-PS016	Antenna Product Specification		
Customer	**Date**	**Rev**	**Reference**
UTStarcom	July. 28. 2008	1.0	

Antenna Specifications

(CDM7076)

Supplier: Laird Technologies Korea
Address: 4th Floor, Woorim Lions Vally A, 371-28, Gasan-dong, Geumcheon-gu, Seoul, Korea (Zip Code : 153-786)
Telephone: +82 2 830 2095

Specification No.	Description		
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Product Family:	**Internal Antenna**	
Model Name :	**CDM7076**	
Maker Part No.:	**712367.0001**	**Revision: 1.0**
Customer :	**UTStarcom**	
Customer Part No. :	**7083014206**	**Revision:**

Purpose

The product specification is a complete description of the product only together with the specification drawing.

Approval History

REV	DATA	Front	After	Reason
1.0	2008. July. 28			For Approval

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3. SPECIFICATIONS DRAWING

Specification No.	Description		
2008-B4-PS016	Antenna Product Specification		
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1 GENERAL

1.1 PRODUCT DESCRIPTION

Internal PIFA-Style Antenna Consisting of a Stamped Metal Radiator Heat-Staked to a Plastic Carrier.

1.2 PART NO.

Laird Technologies Part No.	712367.0001
UTStarcom Part No.	7083014206

1.3 PRINT ACCEPTANCE

Samples and a Page one drawing was sent to customer. When they are approved, the approval form should be completed, signed, and sent back to Laird Technologies before further mass production batches can be delivered.

1.4 UNITS, DEFINITIONS, AND ABBREVIATIONS

Unless otherwise stated, SI units are used.

Tx	Transmit Band
Rx	Receive Band
PCB	Printed Circuit Board
VSWR	Voltage Standing Wave Ratio
dBi	Antenna gain in dB (Isotropic)
CW	Continuous Wave
g	Acceleration of gravity (approx. 9.8 m/s^2)
RH	Relative Humidity

1.4.1 "Without mechanical damage"

Implies full mechanical functionality according to specification and compliance with visual requirements according to specification drawing.

1.4.2 "Without permanent mechanical damage"

As above but allows reversible misalignment or deformation and minor visual damage (no through-cuts or holes).

1.4.3 "Unimpaired functionality"

Implies full mechanical functionality according to specification but allows visual damage (no through-cuts or holes).

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1.5 INTERFACE

All properties are guaranteed under the condition that antenna/handset interface is designed in accordance with instructions provided by Laird Technologies. The whole interface should be included in the specification. Functionality with other equipment (such as couplers etc.) is not guaranteed unless this has been agreed upon separately.

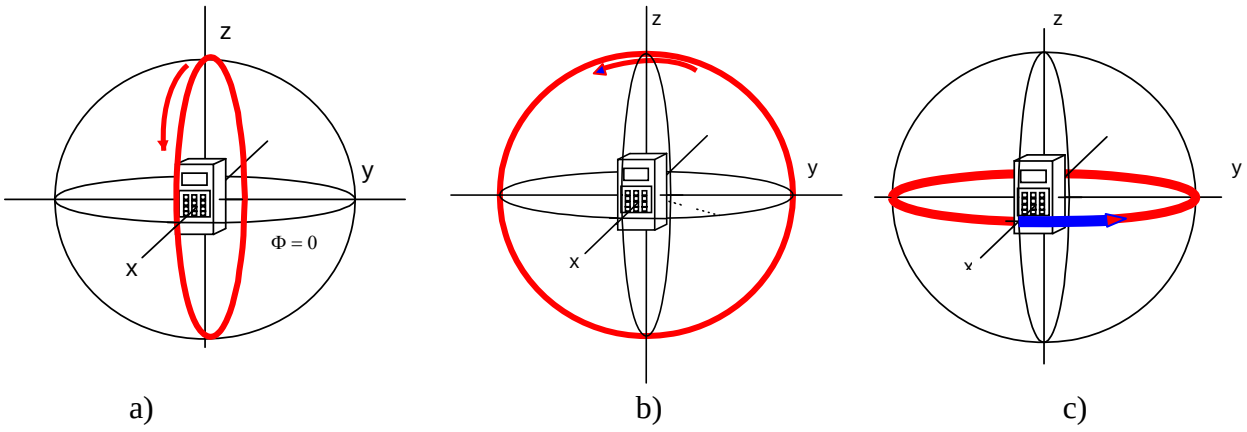
1.6 CONDITIONS

Unless otherwise stated all temperature tolerances are ±3℃ and all RH tolerances are ±5 % units.
Unless otherwise stated all values are valid at +20℃ and 50% RH.
Unless otherwise stated all values are valid for the radio defined in 2.4

1.7 COORDINATE SYSTEM

The coordinate system for the phone is defined as follows:

- Origin is in center of gravity.
- Positive X axis is perpendicular to, and directed from, front plane.
- Positive Y axis is perpendicular to, and directed from, right side plane (as seen from front).
- Positive Z axis is perpendicular to, and directed from, top plane.



a) b) c)

Figure 1-1: a) E_2-plane b) E_1-plane c) H-plane

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2 ELECTRICAL PROPERTIES

2.1 SAMPLES SIZE

All the tests will be conducted as below:

- The VSWR will be measured for 30 samples and a Cpk analysis will be conducted,
- The radiation patterns will be measured on one sample,.

2.2 FREQUENCY BANDS

CDMA	GPS	US-PCS
824 ~ 894 MHz	1575 MHz	1850 MHz ~ 1990 MHz

2.3 IMPEDANCE

2.3.1 Nominal Value:

50 Ohms

2.3.2 Method

Laird Technologies will supply engineering assistance to ensure that the impedance over the frequency bands is as close to 50 ohms as possible after matching.

2.4 THE RADIO (PHONE / HANDSET)

2.4.1 Radio Revision

Customer chassis I.D. : CDM7076

2.4.2 Matching circuit

The customer provided the matching circuit used. Customer is responsible for verifying operation and performance of matching circuit.

Matching network:

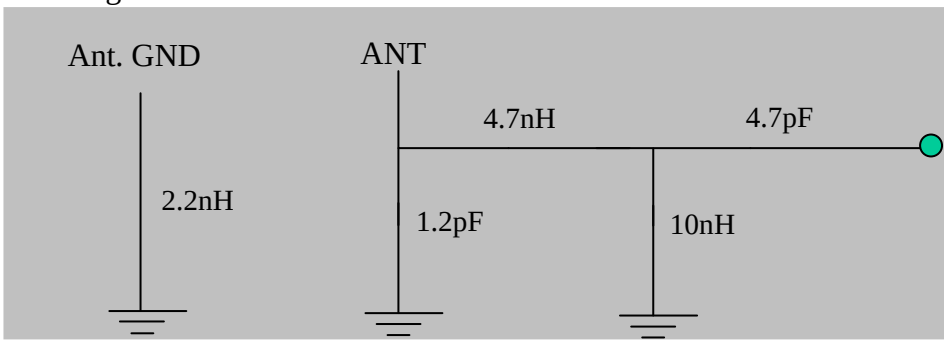

Figure 2-1 Matching Circuit

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2008-B4-PS016	Antenna Product Specification		
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2.5 VSWR

2.5.1 Method of Measurement

A 50 ohms coaxial cable is connected (soldered) to the 50 ohms feeding point on the PCB. The connection of the coaxial cable is done so as to introduce a minimum of mismatch. In the other end, the coaxial cable is connected to a network analyzer. The analyzer is calibrated so that the reference plane is at the 50 ohms feeding point. The radio, including the PCB must not in any significant way differ from the mass produced radio, e.g. the antenna feeding parts have to be equivalent to the parts in mass production. Free space means that the radio is attached to a nonconductive surface.

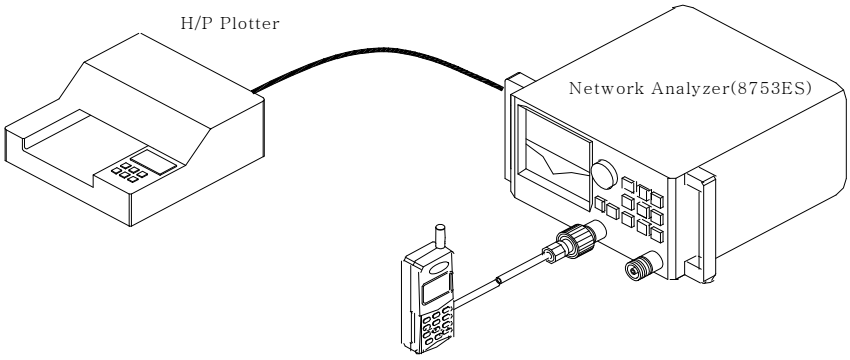

Figure 2-2 VSWR Measurement System

2.5.2 Electrical Performance Assurance

In order to guarantee the specified electrical performance in mass production the following procedure is used (example given for a single band antenna). During the development phase, two antennas are selected; one defining the lowest allowable resonance frequency (when measured on the handset), marked "low freq.", and one defining the highest allowable resonance frequency, marked "high freq.", see Figure 2-3. These antennas are reference antennas. These antennas are then measured on a ground plane used in mass production and define the highest and lowest allowable resonance frequencies on this ground plane and each produced antenna is automatically tested on this ground plane.

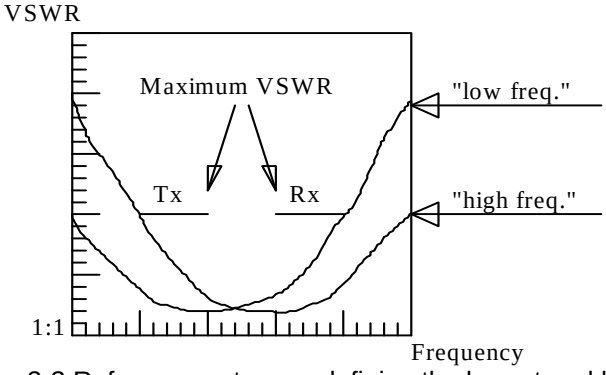

Figure 2-3 Reference antennas defining the lowest and highest

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2008-B4-PS016	Antenna Product Specification		
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2.6 GAIN (PEAK AND AVERAGE)

Below typical antenna gain values are based on the horn antenna measurement.

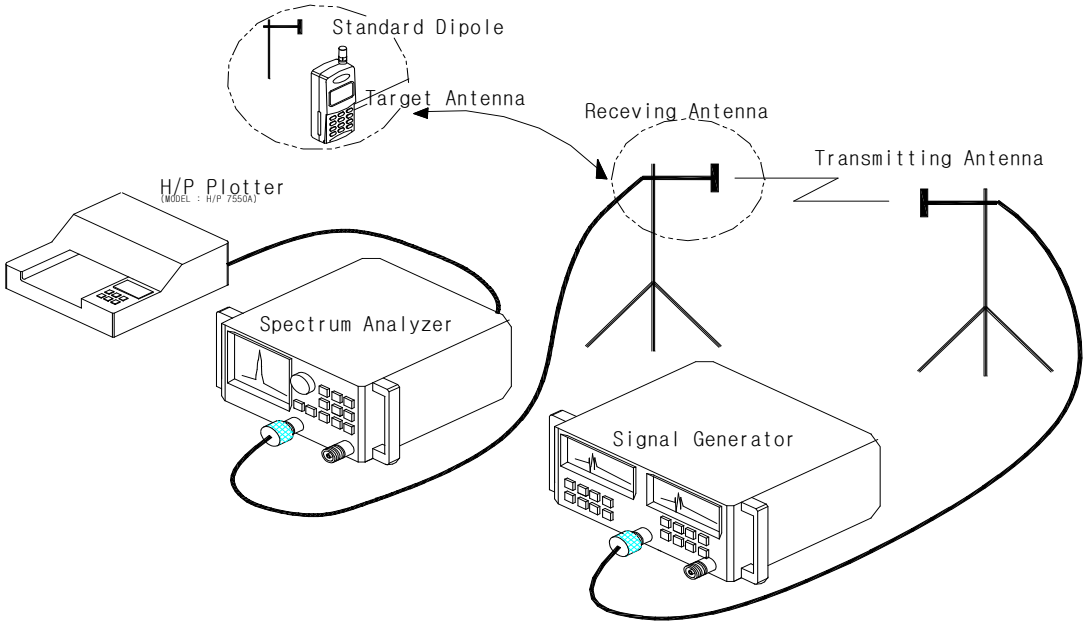

Figure 2-4 Gain Measurement System

2.7 POWER RATING

2.7.1 Maximum Value

P=2W (CW)

2.7.2 Method of Measurement

The connection is done according to 2.5.1. The specified power, P, is applied for 10 minutes at the middle frequency of each Tx band defined in 2.2. Immediately after the test the VSWR is measured.

2.7.3 Post Test Requirements

Neither mechanical damage nor electrical performance reduction should be observed after the test.

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2.8 ELECTRICAL SPECIFICATION & TEST DATA - OPEN

Electrical Spec.	CDMA		GPS	US-PCS	
	824 MHz (Tx)	894MHz (Rx)	1575 (MHz)	1850 MHz (Tx)	1990 MHz (Rx)
VSWR	Less than 4.0 : 1	Less than 2.5 : 1	Less than 3.0 : 1	Less than 3.0 : 1	Less than 3.5 : 1

Electrical Spec.		CDMA		GPS	US-PCS	
		824~849 (Tx)	869~894 (Rx)	1575MHz	1850~1910 (Tx)	1930~1990 (Rx)
Avg. gain (min)	H	-5.5 dBi	-4.0 dBi	-8.0 dBi	-8.5 dBi	-8.5 dBi
	E1	-9.0 dBi	-8.0 dBi	-5.5 dBi	-6.5 dBi	-7.0 dBi
	E2	-9.0 dBi	-7.0 dBi	-6.5 dBi	-9.0 dBi	-10.5 dBi

(Value : More than XX dBi)

Test Data	CDMA		GPS	US-PCS	
	824 MHz(Tx)	894Mhz(Rx)	1575 (MHz)	1850 MHz (Tx)	1990 MHz (Rx)
VSWR	2.6 : 1	1.2 : 1	1.5 : 1	1.4 : 1	2.0 : 1

Test Data		CDMA		GPS	US-PCS	
		824~849 (Tx)	869~894 (Rx)	1575Mhz	1850~1910 (Tx)	1930~1990 (Rx)
Avg. gain (min)	H	-4.3 dBi	-2.6 dBi	-6.6 dBi	-7.0 dBi	-6.9dBi
	E1	-7.4 dBi	-6.3 dBi	-3.8 dBi	-5.1 dBi	-5.4 dBi
	E2	-7.7 dBi	-5.3 dBi	-4.7 dBi	-7.7 dBi	-9.0 dBi

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ELECTRICAL SPECIFICATION & TEST DATA - CLOSE

Electrical Spec.	CDMA		GPS	US-PCS	
	824 MHz (Tx)	894MHz (Rx)	1575 (MHz)	1850 MHz (Tx)	1990 MHz (Rx)
VSWR	Less than 4.0 : 1	Less than 3.5 : 1	Less than 3.0 : 1	Less than 3.0 : 1	Less than 3.5 : 1

Electrical Spec.		CDMA		GPS	US-PCS	
		824~849 (Tx)	869~894 (Rx)	1575MHz	1850~1910 (Tx)	1930~1990 (Rx)
Avg. gain (min)	H	-5.5 dBi	-4.0 dBi	-5.5 dBi	-7.5 dBi	-8.0 dBi
	E1	-8.5 dBi	-7.5 dBi	-7.5 dBi	-7.5 dBi	-7.5 dBi
	E2	-8.5 dBi	-6.5 dBi	-8.0 dBi	-10.5 dBi	-11.5 dBi

(Value : More than XX dBi)

Test Data	CDMA		GPS	US-PCS	
	824 MHz(Tx)	894Mhz(Rx)	1575 (MHz)	1850 MHz (Tx)	1990 MHz (Rx)
VSWR	2.4 : 1	2.1 : 1	1.8 : 1	1.6 : 1	2.0 : 1

Test Data		CDMA		GPS	US-PCS	
		824~849 (Tx)	869~894 (Rx)	1575Mhz	1850~1910 (Tx)	1930~1990 (Rx)
Avg. gain (min)	H	-4.0 dBi	-2.6 dBi	-3.8 dBi	-6.1 dBi	-6.7dBi
	E1	-6.9 dBi	-6.3 dBi	-5.7 dBi	-6.2 dBi	-6.1 dBi
	E2	-7.1 dBi	-5.1 dBi	-6.7 dBi	-9.0 dBi	-10.1 dBi

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- VSWR & Smith Chart

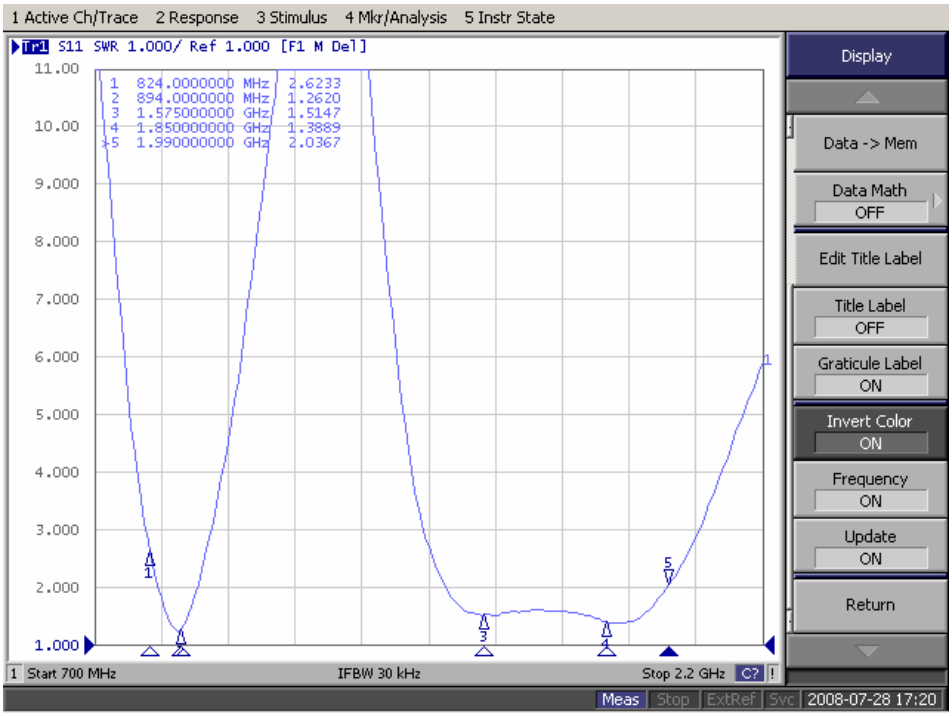

Figure 2-1: VSWR Plot _Open

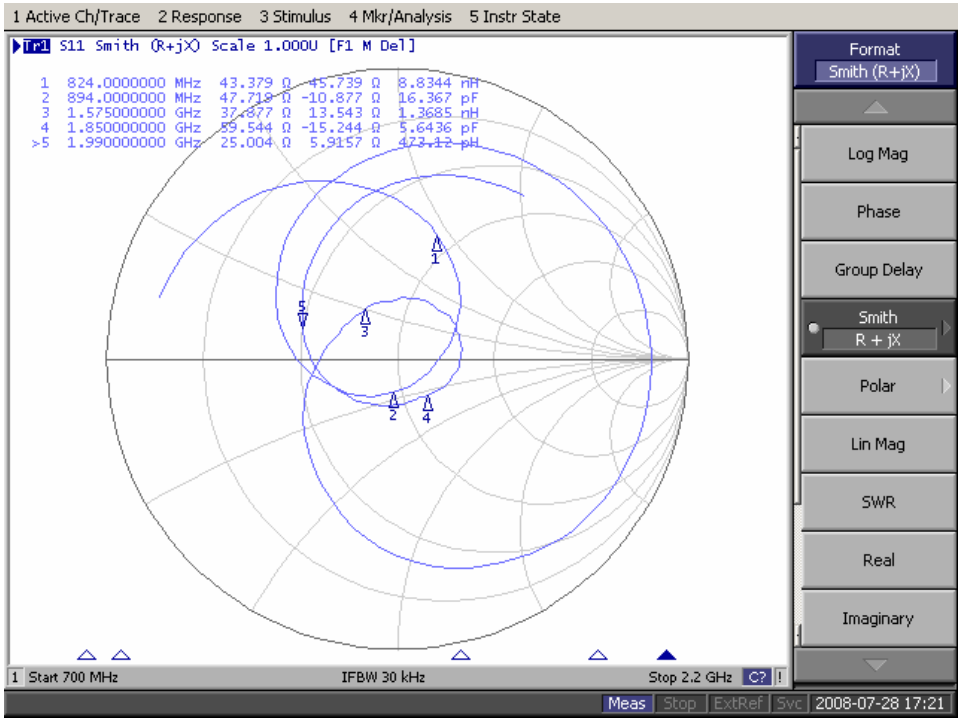

Figure 2-3: Smith Chart Plot _Open

Specification No.	Description		
2008-B4-PS016	Antenna Product Specification		
Customer	**Date**	**Rev**	**Reference**
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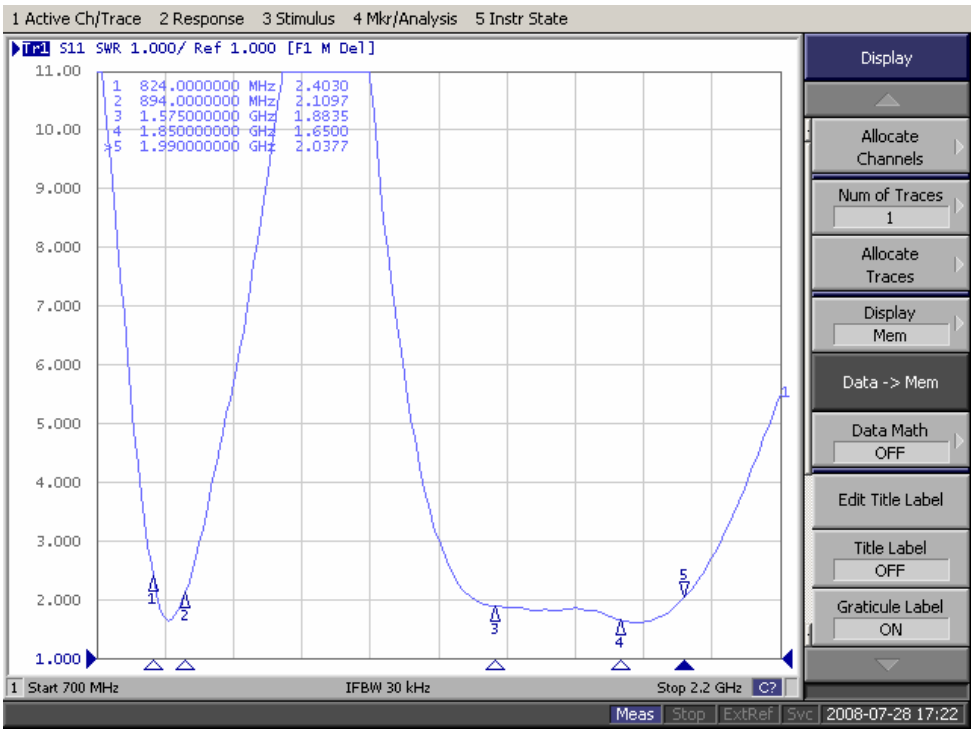

Figure 2-4: VSWR Plot _Close

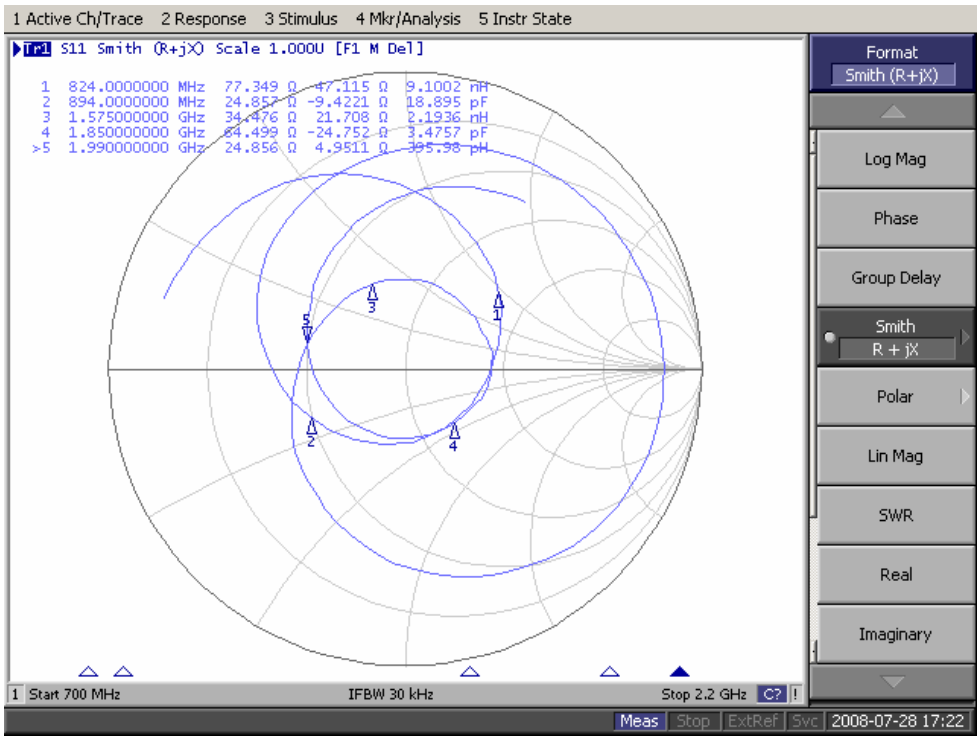

Figure 2-5: Smith Chart Plot _Close

Specification No.	Description		
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Customer	**Date**	**Rev**	**Reference**
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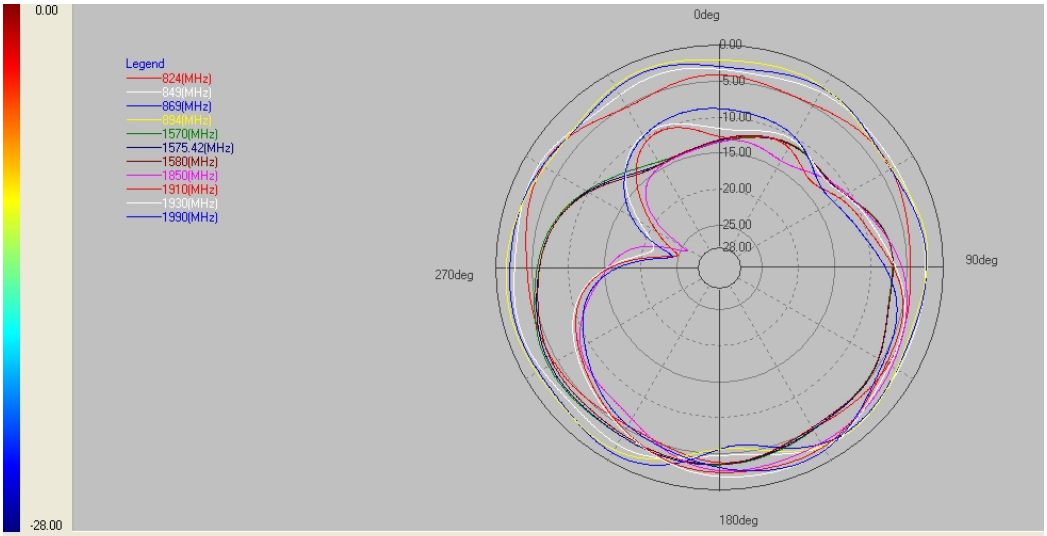
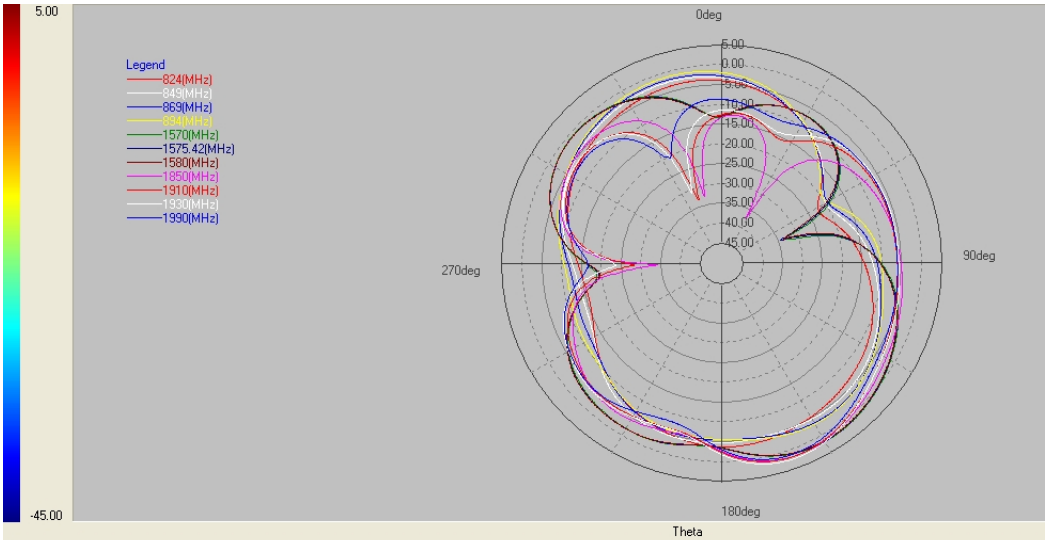
-Radiation Pattern

Open-State



Lager	Max value	Position	Min val...	Position	Beam...	Average	Standar...	Marker 1 pos	Marker 1 val...	Marker 2 pos	Marker 2 val...
824(MHz)	-2.72	-60.00 deg	-5.62	-151.40 ...	----	-4.34	5.23	----	----	----	----
849(MHz)	-1.89	140.00 deg	-4.93	177.15 d...	354.29 ...	-2.85	3.71	----	----	----	----
869(MHz)	-1.31	-151.43 deg	-6.23	174.29 d...	332.40 ...	-2.61	3.45	----	----	----	----
894(MHz)	-1.23	-100.00 deg	-5.86	177.15 d...	330.69 ...	-2.46	3.28	----	----	----	----
1570(MHz)	-3.58	-174.29 deg	-14.43	-19.98 d...	----	-6.50	7.33	----	----	----	----
1575.42(MHz)	-3.59	-171.43 deg	-14.51	-25.73 d...	----	-6.59	7.43	----	----	----	----
1580(MHz)	-3.70	-174.29 deg	-14.48	-28.59 d...	----	-6.75	7.59	----	----	----	----
1850(MHz)	-2.71	174.29 deg	-25.91	-62.87 d...	----	-7.08	7.83	----	----	----	----
1910(MHz)	-2.18	154.29 deg	-24.93	-74.28 d...	----	-6.80	7.55	----	----	----	----
1930(MHz)	-1.60	160.00 deg	-21.51	-74.28 d...	----	-6.29	7.03	----	----	----	----
1990(MHz)	-1.63	154.29 deg	-24.34	-77.14 d...	----	-6.92	7.68	----	----	----	----

H-Plane



Lager	Max value	Position	Min val...	Position	Beam...	Average	Standar...	Marker 1 pos	Marker 1 val...	Marker 2 pos	Marker 2 val...
824(MHz)	-3.81	-11.43 deg	-22.66	62.84 d...	74.57 d...	-7.38	8.20	----	----	----	----
849(MHz)	-2.74	-17.14 deg	-20.17	60.00 d...	74.50 d...	-6.63	7.45	----	----	----	----
869(MHz)	-2.15	-20.00 deg	-19.67	60.00 d...	71.57 deg	-6.28	7.08	----	----	----	----
894(MHz)	-1.42	-17.14 deg	-20.14	57.14 deg	68.34 d...	-5.83	6.61	----	----	----	----
1570(MHz)	1.74	148.57 deg	-33.70	68.60 d...	50.86 d...	-3.72	4.31	----	----	----	----
1575.42(MHz)	1.60	148.57 deg	-34.68	68.59 d...	50.81 deg	-3.81	4.41	----	----	----	----
1580(MHz)	1.50	148.57 deg	-33.70	68.55 d...	50.85 d...	-3.86	4.47	----	----	----	----
1850(MHz)	1.79	157.14 deg	-37.88	28.57 d...	45.21 deg	-4.82	5.41	----	----	----	----
1910(MHz)	1.77	157.14 deg	-33.71	-19.98 d...	41.65 deg	-5.13	5.73	----	----	----	----
1930(MHz)	2.32	160.00 deg	-31.31	-22.84 d...	39.64 d...	-4.67	5.23	----	----	----	----
1990(MHz)	1.18	160.00 deg	-20.87	-25.73 d...	39.44 d...	-5.47	6.13	----	----	----	----

E1-Plane

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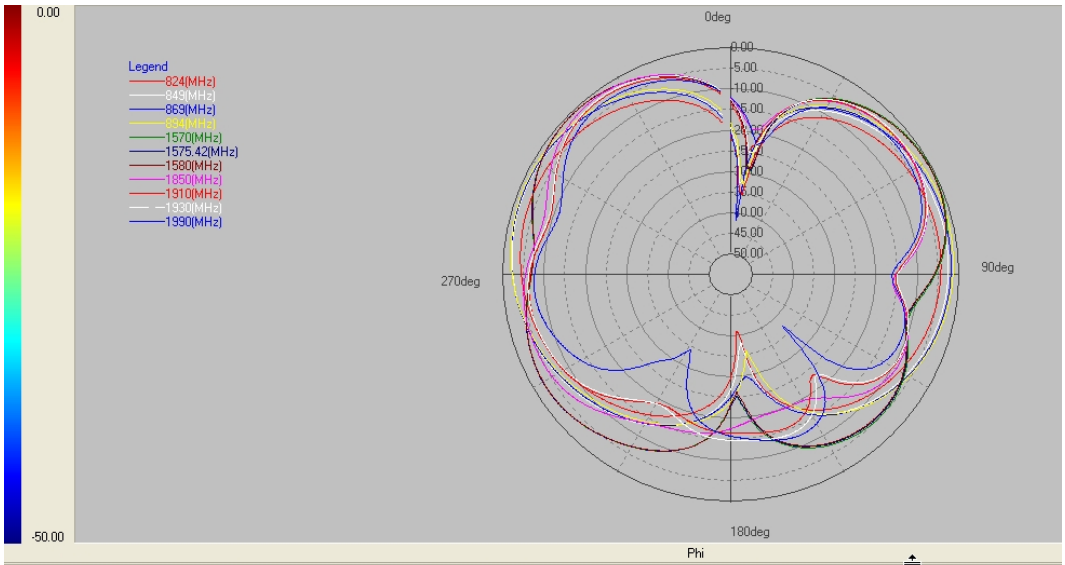
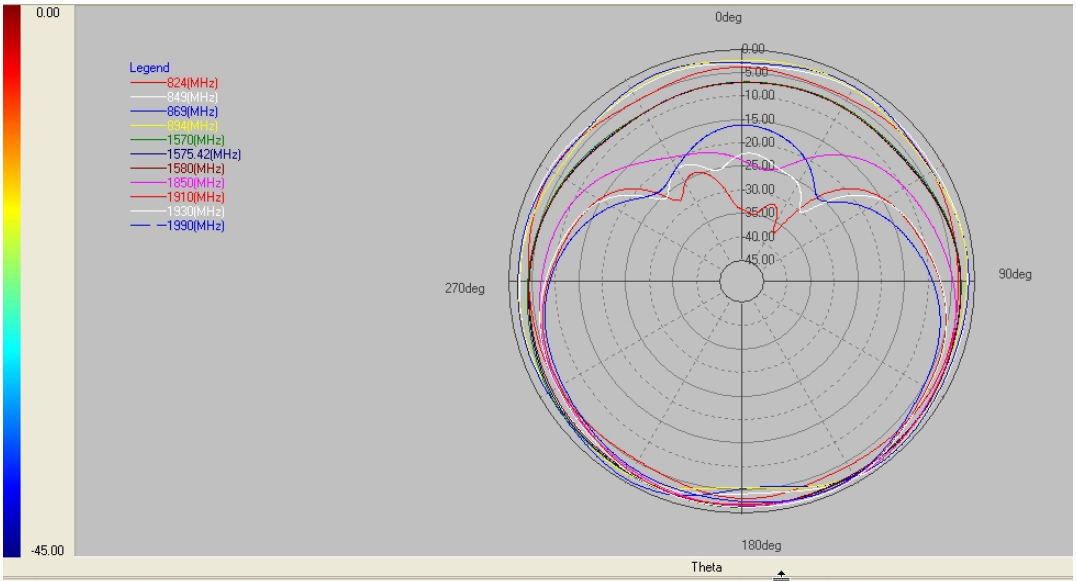


Layer	Max value	Position	Min val...	Position	Beam...	Average	Standar...	Marker 1 pos	Marker 1 val...	Marker 2 pos	Marker 2 val...
824(MHz)	-3.48	289.70 deg	-41.40	174.36 d...	70.83 d...	-7.67	8.47	----	----	----	----
849(MHz)	-1.39	289.70 deg	-38.64	171.58 d...	70.55 d...	-5.70	6.43	----	----	----	----
869(MHz)	-1.19	289.70 deg	-42.18	5.64 deg	67.94 d...	-5.36	6.08	----	----	----	----
894(MHz)	-0.92	292.49 deg	-36.27	168.76 d...	67.17 deg	-5.00	5.69	----	----	----	----
1570(MHz)	-0.24	61.88 deg	-29.88	11.24 deg	45.16 deg	-4.58	5.30	----	----	----	----
1575.42(MHz)	-0.47	61.88 deg	-29.75	11.24 deg	45.06 d...	-4.69	5.42	----	----	----	----
1580(MHz)	-0.47	61.88 deg	-29.41	8.46 deg	45.09 d...	-4.73	5.45	----	----	----	----
1850(MHz)	-1.32	320.64 deg	-20.22	163.11 deg	40.50 d...	-6.77	7.52	----	----	----	----
1910(MHz)	-2.38	323.41 deg	-24.95	8.43 deg	39.75 d...	-7.77	8.54	----	----	----	----
1930(MHz)	-1.99	323.42 deg	-25.38	8.46 deg	39.96 d...	-7.42	8.17	----	----	----	----
1990(MHz)	-3.43	323.42 deg	-38.19	135.00 d...	39.51 deg	-9.07	9.86	----	----	----	----

E2-Plane

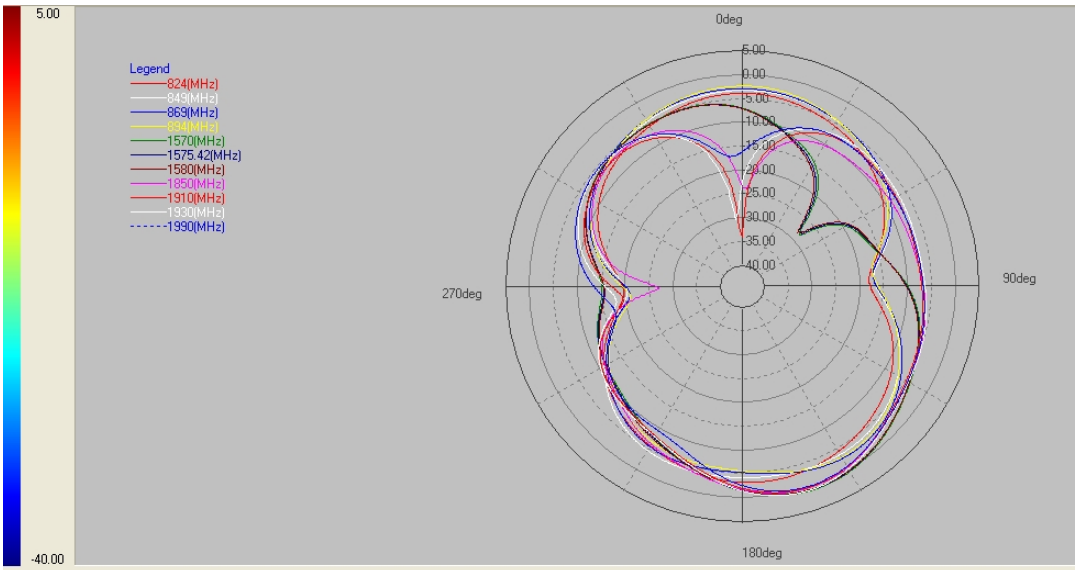
Specification No.	Description		
2008-B4-PS016	Antenna Product Specification		
Customer	**Date**	**Rev**	**Reference**
UTStarcom	July. 28. 2008	1.0	

Close-State



Layer	Max value	Position	Min val...	Position	Beam...	Average	Standar...	Marker 1 pos	Marker 1 val...	Marker 2 pos	Marker 2 val...
824(MHz)	-2.89	-62.86 deg	-5.54	-148.55 ...	----	-3.99	4.87	----	----	----	----
849(MHz)	-0.87	140.00 deg	-4.41	177.15 d...	340.20 ...	-2.38	3.21	----	----	----	----
869(MHz)	-0.92	-148.57 deg	-5.68	177.15 d...	335.02 ...	-2.23	3.04	----	----	----	----
894(MHz)	-1.31	137.14 deg	-5.76	180.00 d...	333.43 ...	-2.60	3.43	----	----	----	----
1570(MHz)	-1.55	-177.14 deg	-8.18	-31.43 d...	----	-3.73	4.54	----	----	----	----
1575.42(MHz)	-1.61	-174.29 deg	-8.30	-34.29 d...	----	-3.85	4.66	----	----	----	----
1580(MHz)	-1.72	-180.00 deg	-8.32	-34.30 d...	----	-4.00	4.82	----	----	----	----
1850(MHz)	-1.38	148.57 deg	-25.50	11.41 deg	----	-5.29	6.02	----	----	----	----
1910(MHz)	-1.55	154.29 deg	-37.32	34.27 d...	----	-6.11	6.83	----	----	----	----
1930(MHz)	-1.06	160.00 deg	-30.43	39.98 d...	----	-5.73	6.42	----	----	----	----
1990(MHz)	-1.47	157.14 deg	-25.78	42.88 d...	----	-6.70	7.42	----	----	----	----

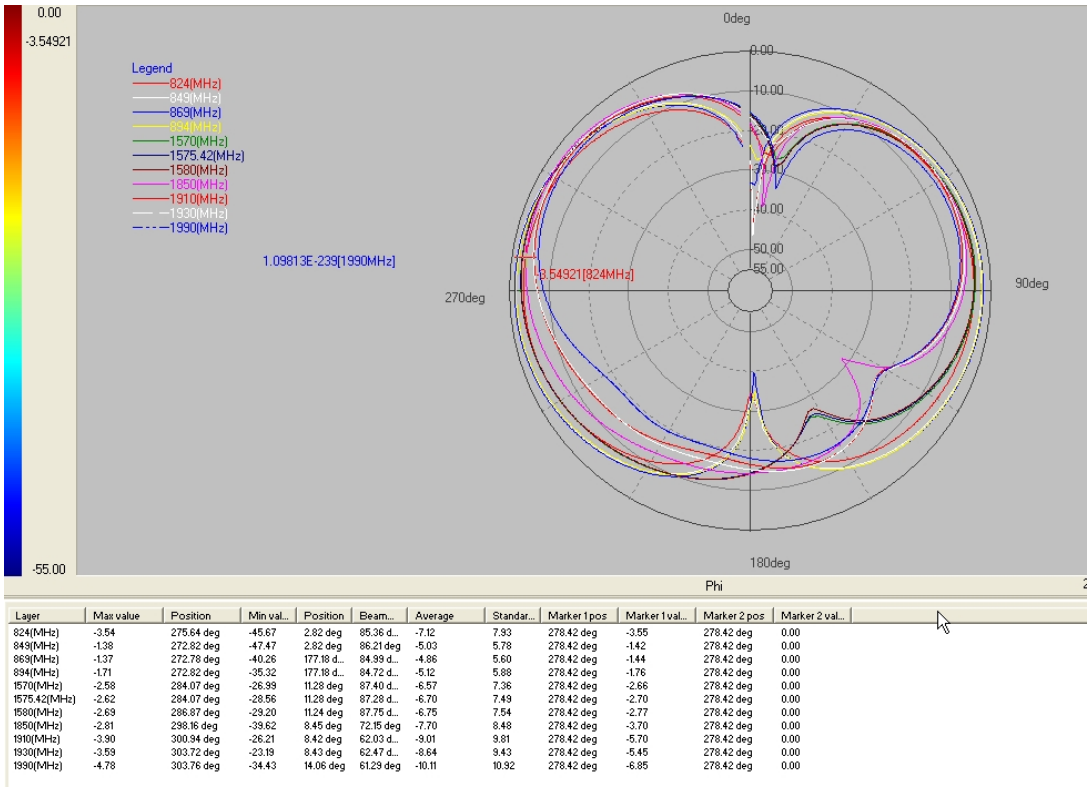
H-Plane



Layer	Max value	Position	Min val...	Position	Beam...	Average	Standar...	Marker 1 pos	Marker 1 val...	Marker 2 pos	Marker 2 val...
824(MHz)	-3.28	174.29 deg	-19.69	-91.45 d...	----	-6.95	7.78	----	----	----	----
849(MHz)	-3.49	2.86 deg	-20.41	-94.25 d...	95.54 d...	-6.28	7.11	----	----	----	----
869(MHz)	-2.71	145.71 deg	-21.11	-94.29 d...	----	-6.16	6.98	----	----	----	----
894(MHz)	-2.61	0.00 deg	-20.98	-97.11 deg	80.47 d...	-6.35	7.15	----	----	----	----
1570(MHz)	0.72	157.14 deg	-28.65	48.58 d...	----	-5.66	6.30	----	----	----	----
1575.42(MHz)	0.56	160.00 deg	-28.09	45.73 d...	----	-5.77	6.42	----	----	----	----
1580(MHz)	0.46	157.14 deg	-28.45	45.73 d...	----	-5.81	6.47	----	----	----	----
1850(MHz)	0.00	160.00 deg	-27.26	-91.44 d...	----	-6.10	6.79	----	----	----	----
1910(MHz)	-0.11	160.00 deg	-34.38	-0.01 deg	----	-6.19	6.91	----	----	----	----
1930(MHz)	0.53	160.00 deg	-30.57	-5.71 deg	----	-5.59	6.28	----	----	----	----
1990(MHz)	-0.29	160.00 deg	-17.48	-102.86 ...	----	-6.14	6.87	----	----	----	----

E1-Plane

Specification No.	Description		
2008-B4-PS016	Antenna Product Specification		
Customer	**Date**	**Rev**	**Reference**
UTStarcom	July. 28. 2008	1.0	

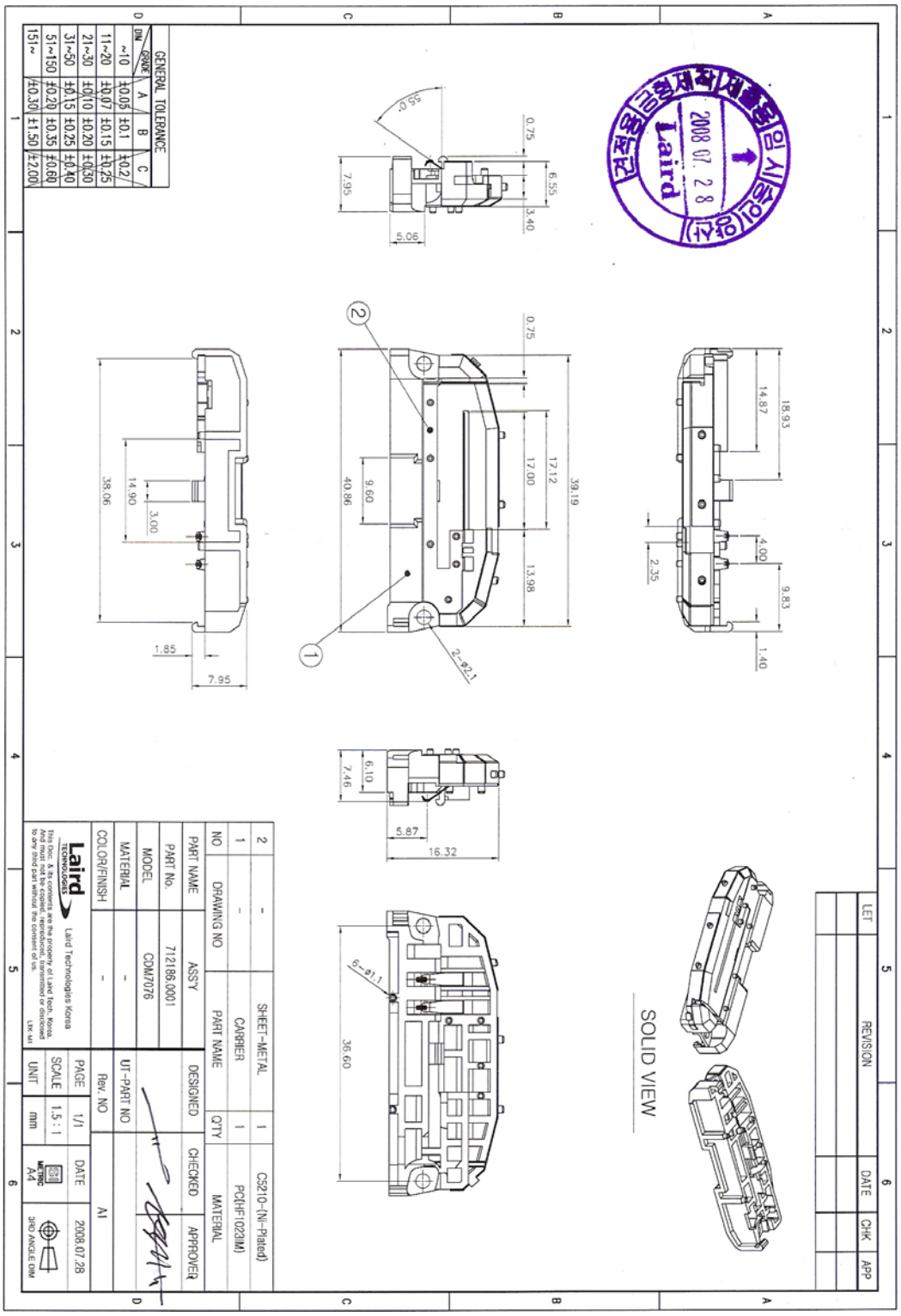


Layer	Max value	Position	Min val...	Position	Beam...	Average	Standar...	Marker 1 pos	Marker 1 val...	Marker 2 pos	Marker 2 val...
824(MHz)	-3.54	275.64 deg	-45.67	2.82 deg	85.36 d...	-7.12	7.93	278.42 deg	-3.55	278.42 deg	0.00
849(MHz)	-1.38	272.82 deg	-47.47	2.82 deg	86.21 deg	-5.03	5.78	278.42 deg	-1.42	278.42 deg	0.00
869(MHz)	-1.37	272.78 deg	-40.26	177.18 d...	84.99 d...	-4.86	5.60	278.42 deg	-1.44	278.42 deg	0.00
894(MHz)	-1.71	272.82 deg	-35.32	177.18 d...	84.72 d...	-5.12	5.88	278.42 deg	-1.76	278.42 deg	0.00
1570(MHz)	-2.58	284.07 deg	-26.99	11.28 deg	87.40 d...	-6.57	7.36	278.42 deg	-2.66	278.42 deg	0.00
1575.42(MHz)	-2.62	284.07 deg	-28.56	11.28 deg	87.28 d...	-6.70	7.49	278.42 deg	-2.70	278.42 deg	0.00
1580(MHz)	-2.69	286.87 deg	-29.20	11.24 deg	87.75 d...	-6.75	7.54	278.42 deg	-2.77	278.42 deg	0.00
1850(MHz)	-2.81	298.16 deg	-39.62	8.45 deg	72.15 deg	-7.70	8.48	278.42 deg	-3.70	278.42 deg	0.00
1910(MHz)	-3.90	300.94 deg	-26.21	8.42 deg	62.03 d...	-9.01	9.81	278.42 deg	-5.70	278.42 deg	0.00
1930(MHz)	-3.59	303.72 deg	-23.19	8.43 deg	62.47 d...	-8.64	9.43	278.42 deg	-5.45	278.42 deg	0.00
1990(MHz)	-4.78	303.76 deg	-34.43	14.06 deg	61.29 deg	-10.11	10.92	278.42 deg	-6.85	278.42 deg	0.00

E2-Plane

Specification No.	Description		
2008-B4-PS016	Antenna Product Specification		
Customer	**Date**	**Rev**	**Reference**
UTStarcom	July. 28. 2008	1.0	

3 SPECIFICATIONS DRAWING



[Assembly Drawing]