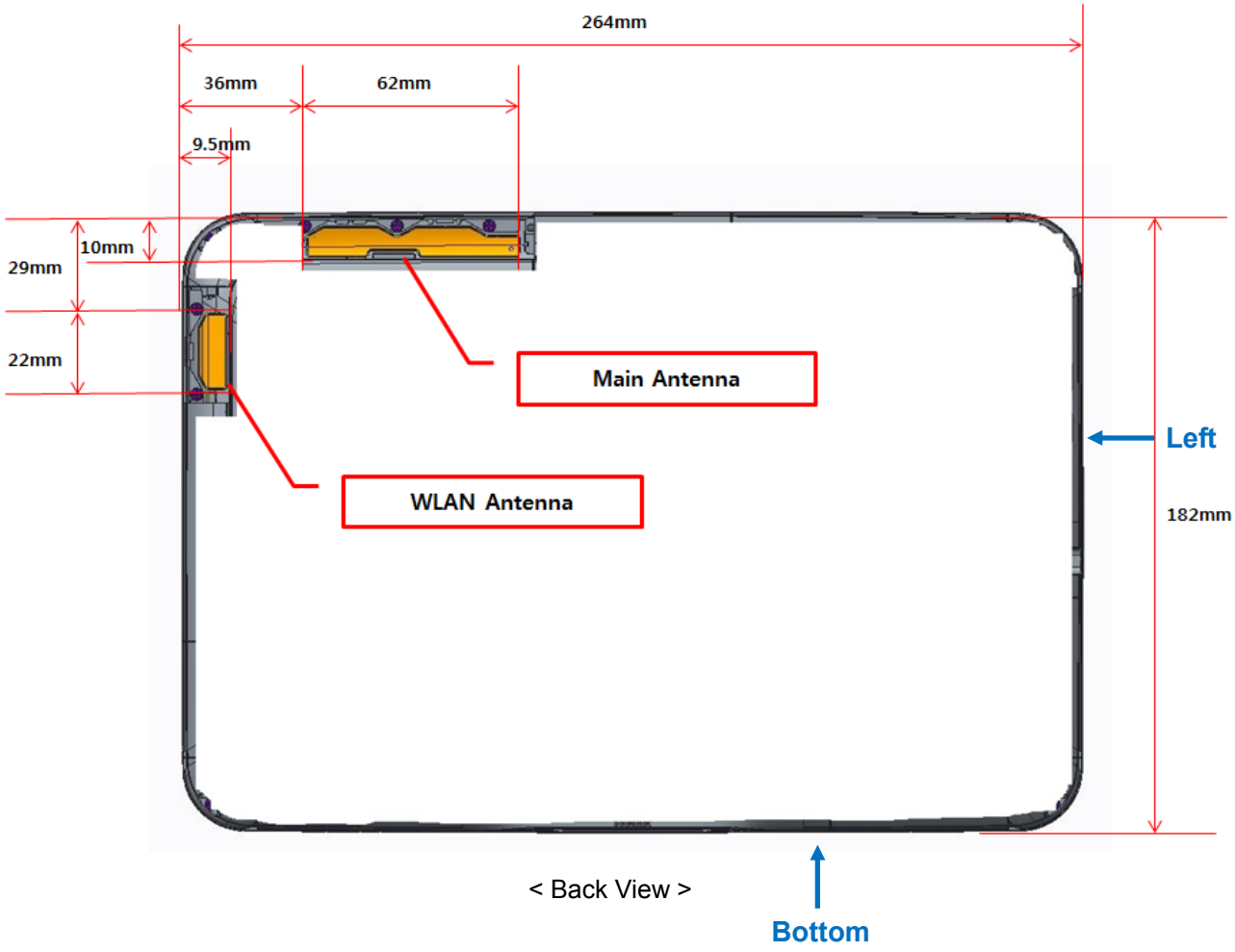
ANNEX D. ANTENNA INFORMATION

< Antenna location >



HEAD OFFICE : 301-14 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)
EMC Testing Div. : 307-51 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-765-8289, FAX: 82-31-766-2904)

< Antenna Data Sheet >

1. WWAN Antenna Data Sheet

Document NO.	KAT-1501-IN001P
Maker Code	KIN-MAIN-BS1401
DATE	2015. 01. 29
Page	1 / 13

Model	Type	Rev.	DONGNAM	IR
BP80S (MAIN)	INTENNA		BLUEBIRD	A

APPROVAL SHEET

Customer : BLUEBIRD

Company : DONGNAM

Item : INTENNA

Model : BP80S (MAIN)

Customer P/N :

Maker Code : KIN-MAIN-BS1401

Department	Investigation	Verification	Approval
RF			
Machine			

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HEAD OFFICE : 301-14 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)
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Document NO.	KAT-1501-IN001P
Maker Code	KIN-MAIN-BS1401
DATE	2015. 01. 29
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Model	Type	Rev.	DONGNAM	IR
BP80S (MAIN)	INTENNA		BLUEBIRD	A

▶ Contents ◀

HEAD OFFICE : 301-14 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)
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Document NO.	KAT-1501-IN001P
Maker Code	KIN-MAIN-BS1401
DATE	2015. 01. 29
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Model	Type	Rev.	DONGNAM	IR
BP80S (MAIN)	INTENNA		BLUEBIRD	A

1. Revison History of Product Specification

1.1 History List of Approval Sheet

History List of Approval Sheet

NO.	Rev.		Rev. DATE	Detailed Contents of Revision	Amount	Request Dept.	Progress Stage
	BLUEBIRD	DONGNAM					
1	A	IR	2015. 01. 29	Pre Apploval sheet	–	-	Stage 2

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HEAD OFFICE : 301-14 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)
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Document NO.	KAT-1501-IN001P
Maker Code	KIN-MAIN-BS1401
DATE	2015. 01. 29
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Model	Type	Rev.	DONGNAM	IR
BP80S (MAIN)	INTENNA		BLUEBIRD	A

2. Circuit Specification

2.1 Test Setting

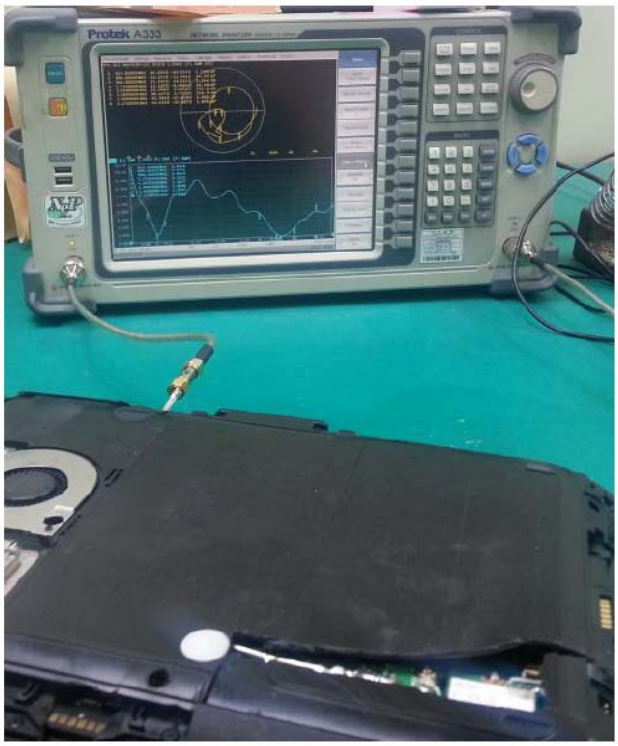
2.1.1 Test Environment (Condition PROTEK A333)

① VSWR

Step 1. Connect ANT port with cable included adaptor to port1 of Network analyzer.

Step 2. Point out markers on network analyzer display at target frequencies.

Step 3. Inspect VSWR



HEAD OFFICE : 301-14 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)
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Document NO.	KAT-1501-IN001P
Maker Code	KIN-MAIN-BS1401
DATE	2015. 01. 29
Page	5 / 13

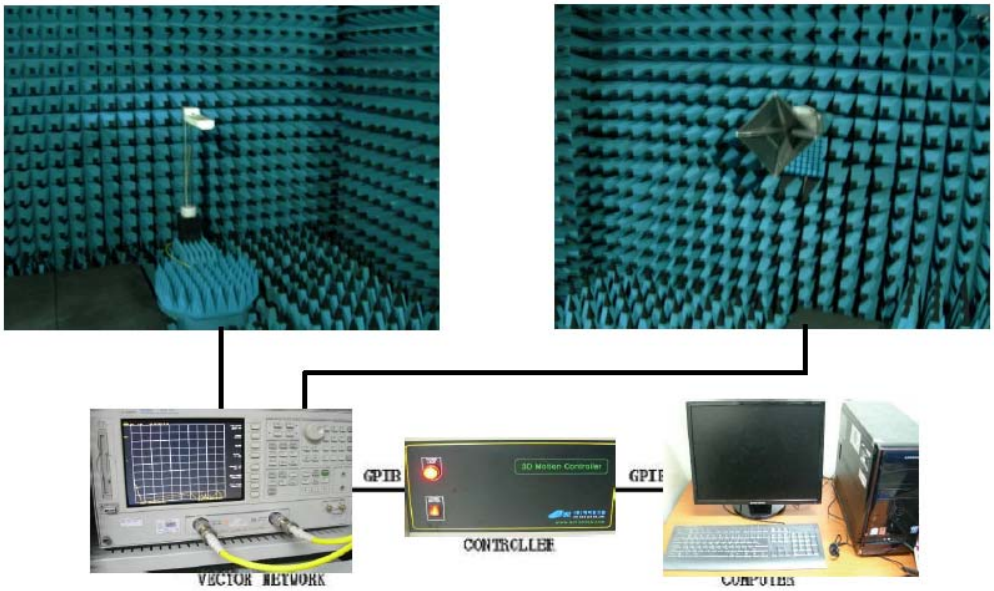
Model	Type	Rev.	DONGNAM	IR
BP80S (MAIN)	INTENNA		BLUEBIRD	A

② Radiation Pattern and Gain

Step 1. Calibrate chamber system for gain measurement using horn antenna.
At the same time set up software program for chamber system control.

Step 2. Change over from a horn antenna to measuring antenna on target positioner

Step 3. Start a software program for chamber system control & measuring.



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HEAD OFFICE : 301-14 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)
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Document NO.	KAT-1501-IN001P
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Model	Type	Rev.	DONGNAM	IR
BP80S (MAIN)	INTENNA		BLUEBIRD	A

2.2 Electrical Specification

Frequency Band	GSM850, GSM900			
	824MHz	880MHz	894MHz	960MHz
VSWR	≤ 6.0	≤ 3.5	≤ 3.0	≤ 5.0
Average Gain	≥ -9.5dBi	≥ -5.5dBi	≥ -5.0dBi	≥ -10.0dBi
Frequency Band	DCS, PCS,WCDMA2100			
	1710MHz	1850MHz	1880MHz	2170MHz
VSWR	≤ 5.5	≤ 2.5	≤ 2.0	≤ 5.0
Average Gain	≥ -9.0dBi	≥ -5.0dBi	≥ -5.5dBi	≥ -9.0dBi
Directivity	Omni-directional			
Polarization	Linear			
Matching Value	 			

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HEAD OFFICE : 301-14 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)
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Document NO.	KAT-1501-IN001P
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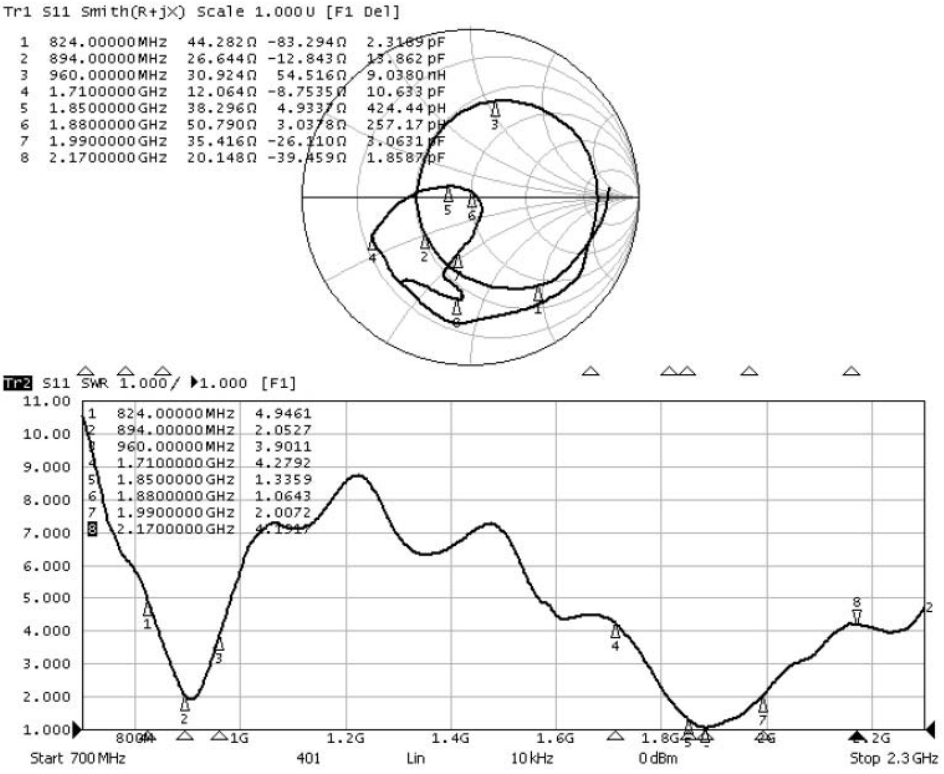
Model	Type	Rev.	DONGNAM	IR
BP80S (MAIN)	INTENNA		BLUEBIRD	A

2.2.1 Electrical Spec. of Set (With VSWR)



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HEAD OFFICE : 301-14 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)
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Document NO.	KAT-1501-IN001P
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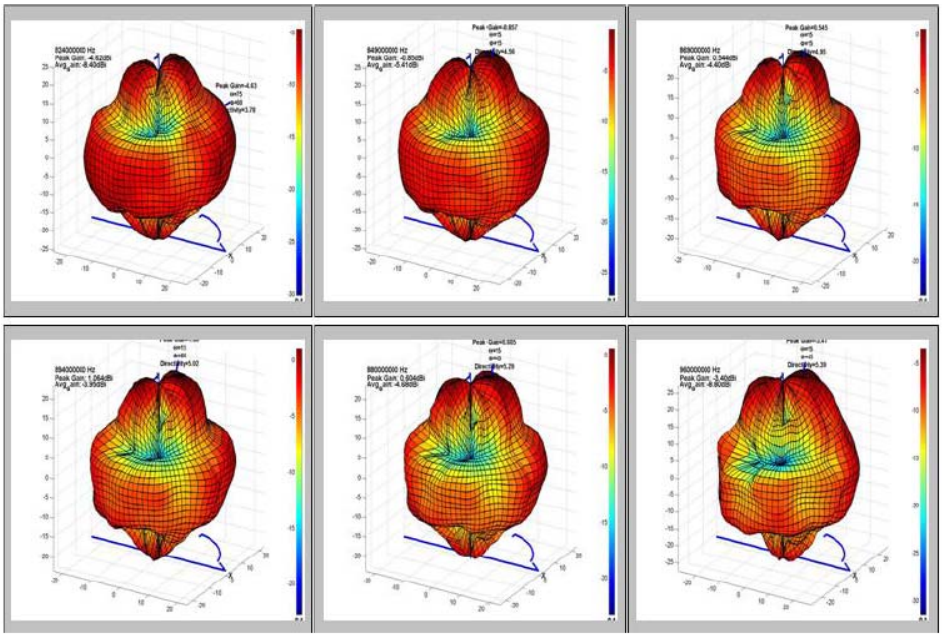
Model	Type	Rev.	DONGNAM	IR
BP80S (MAIN)	INTENNA		BLUEBIRD	A

2.2.2 Passive Gain & 3D Pattern

GSM850, GSM900 Band

3D Pattern



3D Gain

Frequency	Efficiency	Average Gain			Max Gain			Max Position	Directivity
		Ver	Hor	Total	Ver	Hor	Total		
824,000,000 Hz	14.4 %	-13.5 dBi	-10.0 dBi	-8.4 dBi	-11.2 dBi	-5.7 dBi	-4.6 dBi	Theta75/Pie60	3.78 dB
849,000,000 Hz	28.7 %	-9.7 dBi	-7.4 dBi	-5.4 dBi	-2.8 dBi	-5.3 dBi	-0.9 dBi	Theta15/Pie15	4.56 dB
869,000,000 Hz	36.3 %	-8.4 dBi	-6.6 dBi	-4.4 dBi	-1.5 dBi	-3.8 dBi	0.5 dBi	Theta15/Pie15	4.95 dB
894,000,000 Hz	40.2 %	-8.3 dBi	-6.0 dBi	-4.0 dBi	-1.5 dBi	-2.4 dBi	1.1 dBi	Theta15/Pie60	5.02 dB
880,000,000 Hz	34.0 %	-8.4 dBi	-7.1 dBi	-4.7 dBi	-1.9 dBi	-3.0 dBi	0.6 dBi	Theta15/Pie45	5.29 dB
960,000,000 Hz	13.2 %	-12.6 dBi	-11.1 dBi	-8.8 dBi	-7.3 dBi	-5.7 dBi	-3.4 dBi	Theta15/Pie45	5.39 dB

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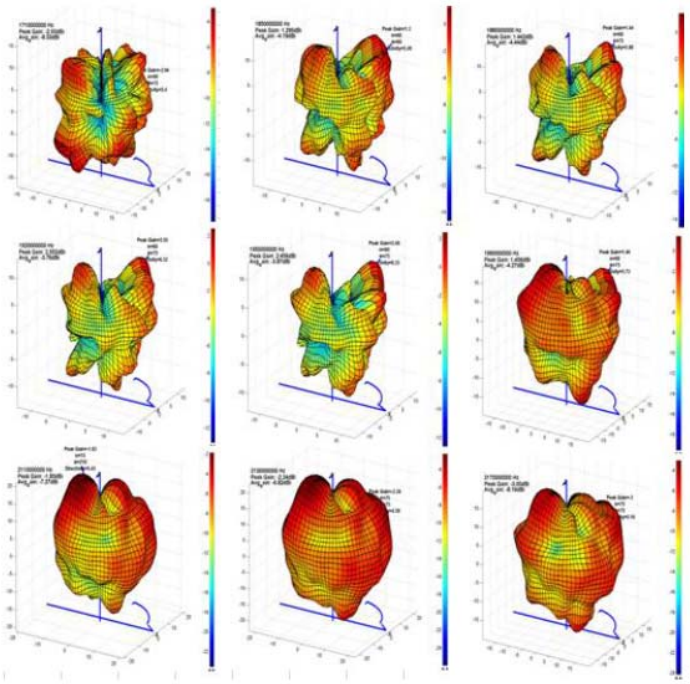
Model	Type	Rev.	DONGNAM	IR
BP80S (MAIN)	INTENNA		BLUEBIRD	A

2.2.2 Passive Gain & 3D Pattern

DCS, PCS Band , WCDMA2100

3D Pattern



3D Gain

Frequency	Efficiency	Average Gain			Max Gain			Max Position	Directivity
		Ver	Hor	Total	Ver	Hor	Total		
1,710,000,000 Hz	14.7 %	-12.0 dBi	-10.8 dBi	-8.3 dBi	-6.6 dBi	-5.4 dBi	-2.9 dBi	Theta90/Pie75	5.40 dB
1,850,000,000 Hz	38.0 %	-8.4 dBi	-6.3 dBi	-4.2 dBi	-4.4 dBi	-0.1 dBi	1.3 dBi	Theta60/Pie60	5.49 dB
1,870,000,000 Hz	38.3 %	-8.2 dBi	-6.4 dBi	-4.2 dBi	-4.1 dBi	0.2 dBi	1.6 dBi	Theta60/Pie60	5.77 dB
1,880,000,000 Hz	36.0 %	-8.5 dBi	-6.6 dBi	-4.4 dBi	-4.3 dBi	0.1 dBi	1.4 dBi	Theta60/Pie75	5.88 dB
1,900,000,000 Hz	52.6 %	-6.7 dBi	-5.1 dBi	-2.8 dBi	-2.5 dBi	2.1 dBi	3.4 dBi	Theta60/Pie75	6.17 dB
1,920,000,000 Hz	42.0 %	-7.6 dBi	-6.1 dBi	-3.8 dBi	-3.7 dBi	1.4 dBi	2.6 dBi	Theta60/Pie75	6.32 dB
1,950,000,000 Hz	41.0 %	-7.9 dBi	-6.0 dBi	-3.9 dBi	-4.2 dBi	1.4 dBi	2.5 dBi	Theta60/Pie75	6.33 dB
1,990,000,000 Hz	37.4 %	-8.3 dBi	-6.5 dBi	-4.3 dBi	-5.6 dBi	0.5 dBi	1.5 dBi	Theta60/Pie75	5.73 dB
2,110,000,000 Hz	18.7 %	-10.3 dBi	-10.3 dBi	-7.3 dBi	-5.9 dBi	-4.0 dBi	-1.8 dBi	Theta15/Pie210	5.45 dB
2,130,000,000 Hz	20.8 %	-10.0 dBi	-9.7 dBi	-6.8 dBi	-5.3 dBi	-5.2 dBi	-2.2 dBi	Theta75/Pie75	4.58 dB
2,140,000,000 Hz	20.7 %	-10.1 dBi	-9.6 dBi	-6.8 dBi	-5.0 dBi	-5.0 dBi	-2.0 dBi	Theta75/Pie75	4.86 dB
2,170,000,000 Hz	15.3 %	-11.7 dBi	-10.7 dBi	-8.2 dBi	-6.4 dBi	-5.6 dBi	-3.0 dBi	Theta75/Pie75	5.16 dB

HEAD OFFICE : 301-14 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)
EMC Testing Div. : 307-51 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-765-8289, FAX: 82-31-766-2904)

Document NO.	KAT-1501-IN001P
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DATE	2015. 01. 29
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Model	Type	Rev.	DONGNAM	IR
BP80S (MAIN)	INTENNA		BLUEBIRD	A

3. Mechanical Specification

3.1 Material Certification

Model		BP80S (MAIN)						
Ant Type		Main Intenna						
No	Part Name	Raw Material (Plating Spec.)	Raw Material color	Raw Material Company	Manufacture Company	Post Processing	Post Processing Company	Cavity
1	Carrier	Polycarbonate (SC1004A-KPA1)	Black	LG chemical	HANKOOK QDM	-	-	1X1
2	Pattern	Cu Plating (9~15㎛)	-	EC TECH	Bukwang Plating	-	-	-
		Ni Plating (2~3.5㎛)	-	EC TECH	Bukwang Plating	-	-	-

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Maker Code	KIN-MAIN-BS1401
DATE	2015. 01. 29
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Model	Type	Rev.	DONGNAM	IR
BP80S (MAIN)	INTENNA		BLUEBIRD	A

3.2 Mechanical Specification

3.2.1 Part List

PARTS LIST

SIGN	DRAWN	CHECK	APPROVE

PRODUCT NAME/MODEL	KIN-MAIN-BS1401 / BP80S INTENNA	ESTABLISH. DATE	2015.01.28
CUSTOMER	BLUEBIRD	REVISION DATE	-
FREQUENCY	MAIN	REVISION No	IR

No.	PART NAME	PART NO.	PART SIZE (mm)	MATERIAL	MATERIAL PROVIDER	Q'TY	Rev.	CHANGE CONTENT	SECTION	COMPANY	REMARK
1	CARRIER	BS-1401IPCRRP1	61.93 X 8.64 X 1.0	PC	LG chemical	1EA	IR	-	MOLD	HANKOOK QOM	1X1
2	PATTERN	BS-1401IPELPLD	57.7 x 5.1	LDP (Cu : 9-15㎛, Ni : 2-3.5㎛)	EC TECH	1EA	IR	-	-	Bukwang Plating	
3	TRAY	-	420 X 300 X 11.5	PP	-	1EA	IR	-	-		
4	OUT BOX	-	445 X 442 X 360	DW2	-	1EA	IR	-	-		

(NOTE)

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HEAD OFFICE : 301-14 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)
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Document NO.	KAT-1501-IN001P
Maker Code	KIN-MAIN-BS1401
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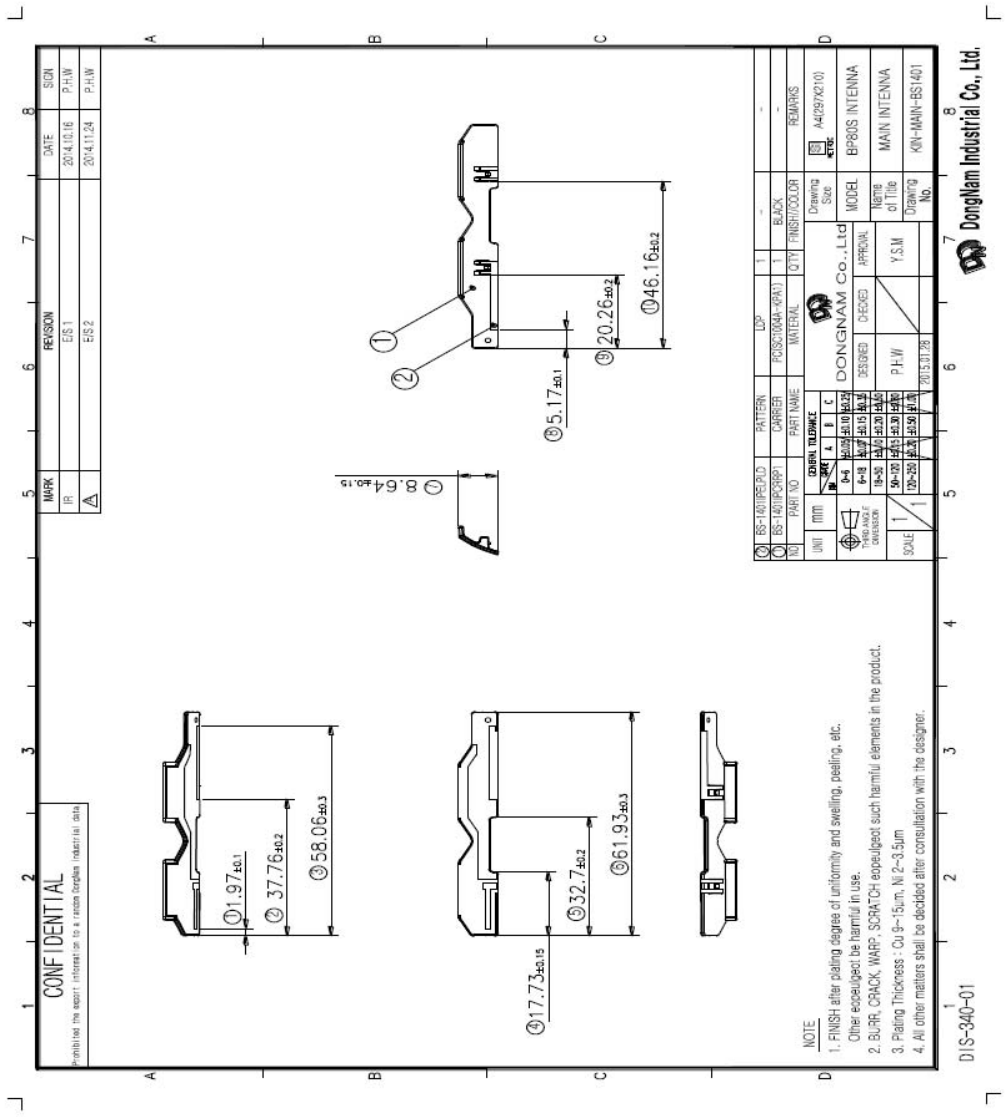
Model	Type	Rev.	DONGNAM	IR
BP80S (MAIN)	INTENNA		BLUEBIRD	A

3.2.2 Assy Drawing



HEAD OFFICE : 301-14 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)
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Document NO.	KAT-1501-IN001P
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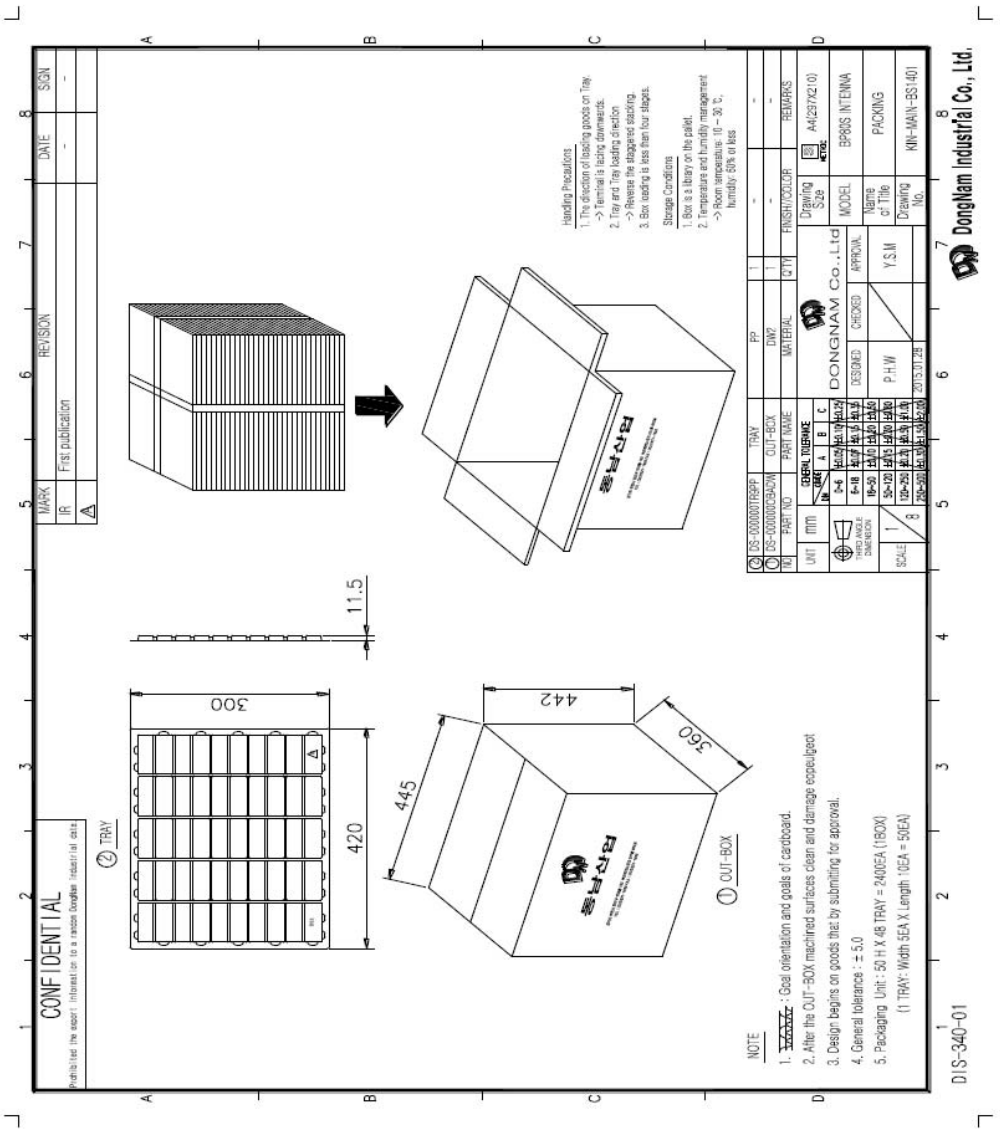
DATE	2015. 01. 29
Page	13 / 13

Model	Type	Rev.	DONGNAM	IR
BP80S (MAIN)	INTENNA		BLUEBIRD	A

3.2.3 Packing Spec. & Drawing



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2. WLAN Antenna Data Sheet

Document NO.	KAT-1501-IN002P
Maker Code	KIN-WIFI-BS1402
DATE	2015. 1. 29
Page	1 / 13

Model	Type	Rev.	DONGNAM	IR
BP 80S (WiFi)	INTENNA		BLUEBIRD	A

APPROVAL SHEET

Customer : BLUEBIRD

Company : DONGNAM

Item : INTENNA

Model : BP80S (WiFi)

Customer P/N :

Maker Code : KIN-MAIN-BS1401

Department	Investigation	Verification	Approval
RF			
Machine			
Safety			

KRD01-00A10-01A 1

HEAD OFFICE : 301-14 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)
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Model	Type	Rev.	DONGNAM	IR
BP 80S (WiFi)	INTENNA		BLUEBIRD	A

▶ Contents ◀

HEAD OFFICE : 301-14 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)
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PART NO.	KAT-1501-IN002P
Maker Code	KIN-WIFI-BS1402
DATE	2015. 1. 29
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Model	Type	Rev.	DONGNAM	IR
BP 80S (WiFi)	INTENNA		BLUEBIRD	A

1. Revison History of Product Specification

1.1 History List of Approval Sheet

History List of Approval Sheet

NO.	Rev.		Rev. DATE	Detailed Contents of Revision	Amount	Request Dept.	Progress Stage
	Bulebird	DONGNAM					
1	A	IR	2015.01.29	Pre Apploval sheet			Stage 2

HEAD OFFICE : 301-14 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)
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PART NO.	KAT-1501-IN002P
Maker Code	KIN-WIFI-BS1402
DATE	2015. 1. 29
Page	4 / 13

Model	Type	Rev.	DONGNAM	IR
BP 80S (WiFi)	INTENNA		BLUEBIRD	A

2. Circuit Specification

2.1 Test Setting

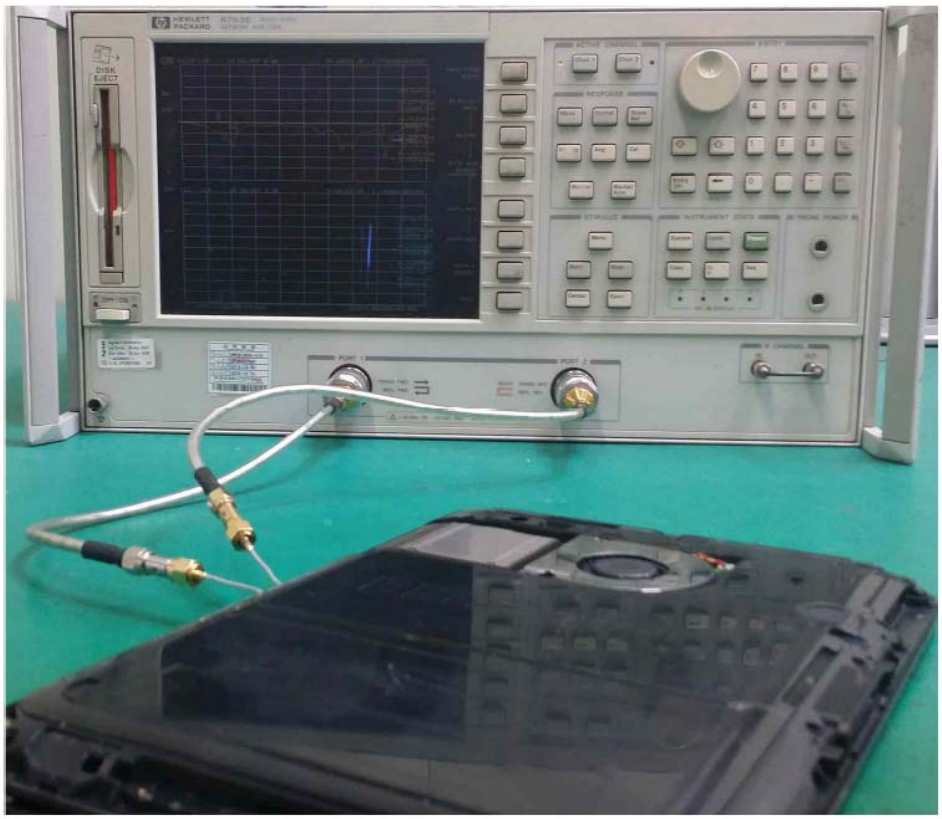
2.1.1 Test Environment (Condition/Method)

① VSWR

Step 1. Connect ANT port with cable included adaptor to port1 of Network analyzer

Step 2. Point out markers on network analyzer display at target frequencies.

Step 3. Inspect VSWR



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HEAD OFFICE : 301-14 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)
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PART NO.	KAT-1501-IN002P
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DATE	2015. 1. 29
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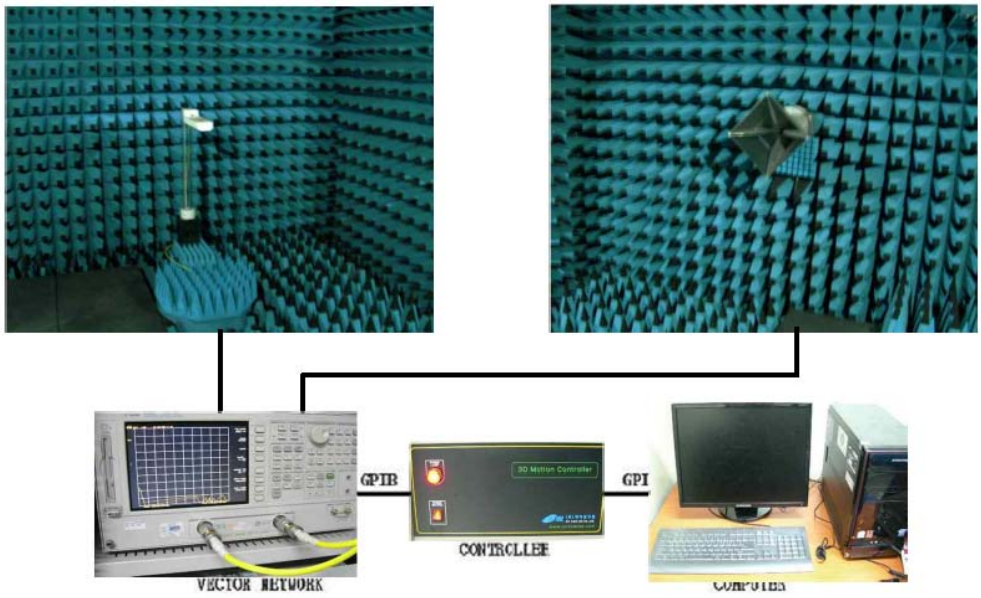
Model	Type	Rev.	DONGNAM	IR
BP 80S (WiFi)	INTENNA		BLUEBIRD	A

② Radiation Pattern and Gain

Step 1. Calibrate chamber system for gain measurement using horn antenna.
At the same time set up software program for chamber system control.

Step 2. Change over from a horn antenna to measuring antenna on target positioner

Step 3. Start a software program for chamber system control & measuring.



KRD01-00A10-01A 5

HEAD OFFICE : 301-14 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)
EMC Testing Div. : 307-51 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-765-8289, FAX: 82-31-766-2904)

PART NO.	KAT-1501-IN002P
Maker Code	KIN-WIFI-BS1402
DATE	2015. 1. 29
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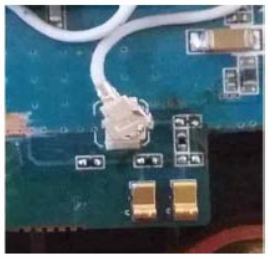
Model	Type	Rev.	DONGNAM	IR
BP 80S (WiFi)	Cable Antenna		BLUEBIRD	A

2.2 Electrical Specification

Frequency	**2400MHz**	**2480MHz**	**5200MHz**	**5800MHz**
VSWR	**≤ 1.61**	**≤ 1.50**	**≤ 1.37**	**≤ 4.04**
Peak Gain (dBi)	**≤ 1.3**	**≤ 2.6**	**≤ 1.7**	**≤ 3.6**
Average Gain (dBi)	**≥ -3.7**	**≥ -3.3**	**≥ -5.0**	**≥ -2.7**
Directivity	Omni-directional			
Polarization	Linear			
Matching Value	 			

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PART NO.	KAT-1501-IN002P
Maker Code	KIN-WIFI-BS1402
DATE	2015. 1. 29
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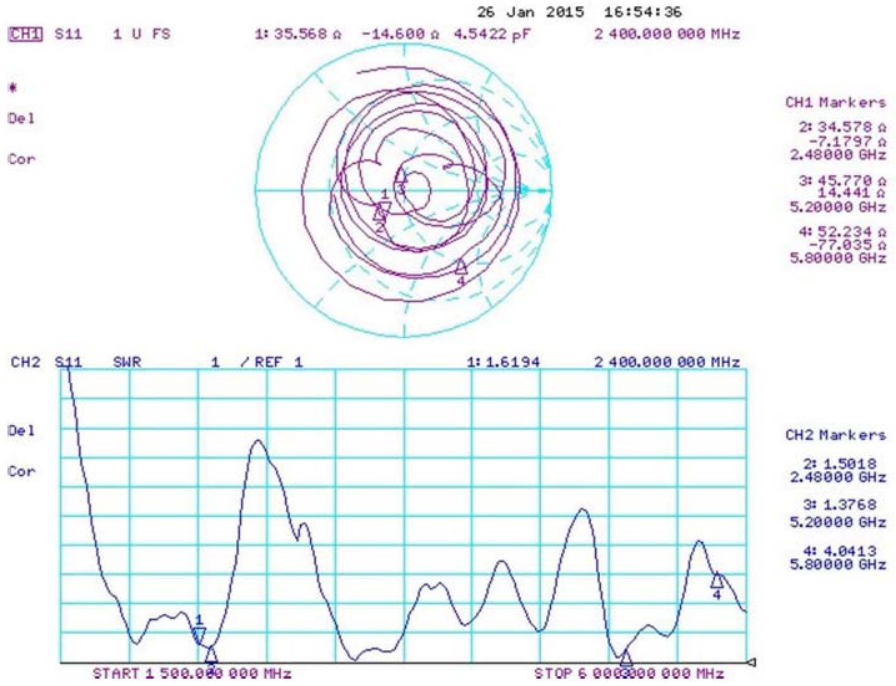
Model	Type	Rev.	DONGNAM	IR
BP 80S (WiFi)	Cable Antenna		BLUEBIRD	A

2.2.1 Electrical Spec. of Set (With VSWR)



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EMC Testing Div. : 307-51 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-765-8289, FAX: 82-31-766-2904)

PART NO.	KAT-1501-IN002P
Maker Code	KIN-WIFI-BS1402
DATE	2015. 1. 29
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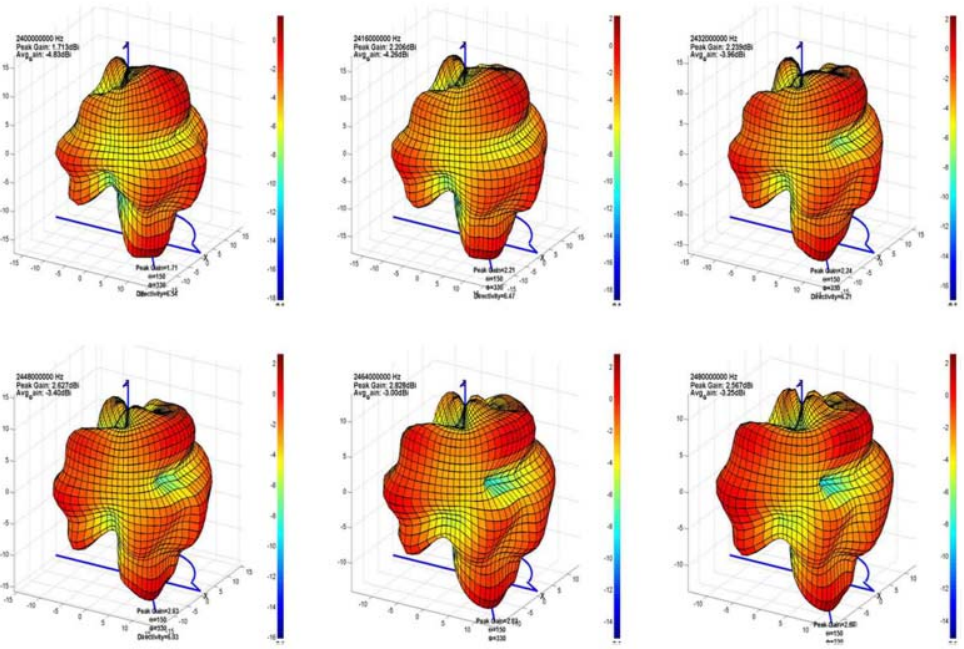
Model	Type	Rev.	DONGNAM	IR
BP 80S (WiFi)	Cable Antenna		BLUEBIRD	A

2.2.2 2.4GHz Passive Gain & 3D Pattern

3D Pattern



Passive Gain

Frequency	Efficiency	Average Gain			Max Gain			Max Position	Directivity
		Ver	Hor	Total	Ver	Hor	Total		
2,400,000,000 Hz	42.5 %	-7.3 dBi	-6.2 dBi	-3.7 dBi	-0.7 dBi	0.7 dBi	1.3 dBi	Theta150/Pie60	6.54 dB
2,416,000,000 Hz	43.0 %	-7.5 dBi	-6.0 dBi	-3.6 dBi	-0.3 dBi	2.5 dBi	2.5 dBi	Theta150/Pie60	6.47 dB
2,432,000,000 Hz	45.6 %	-6.8 dBi	-6.1 dBi	-3.4 dBi	0.0 dBi	0.7 dBi	1.6 dBi	Theta150/Pie60	6.21 dB
2,448,000,000 Hz	45.7 %	-7.9 dBi	-5.3 dBi	-3.4 dBi	-0.1 dBi	2.6 dBi	2.6 dBi	Theta150/Pie60	6.03 dB
2,464,000,000 Hz	50.0 %	-7.7 dBi	-4.8 dBi	-3.0 dBi	0.2 dBi	2.8 dBi	2.8 dBi	Theta150/Pie60	5.84 dB
2,480,000,000 Hz	47.3 %	-8.3 dBi	-4.9 dBi	-3.3 dBi	-0.5 dBi	2.5 dBi	2.6 dBi	Theta150/Pie60	5.82 dB

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PART NO.	KAT-1501-IN002P
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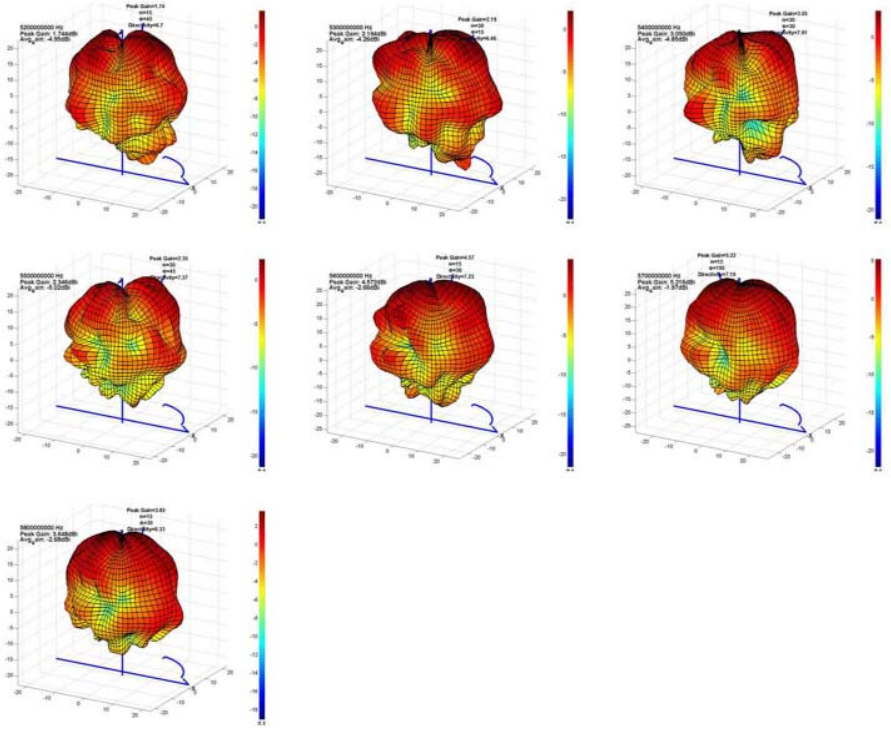
Model	Type	Rev.	DONGNAM	IR
BP 80S (WiFi)	Cable Antenna		BLUEBIRD	A

2.2.3 5GHz Passive Gain & 3D Pattern

3D Pattern



Passive Gain

Frequency	Efficiency	Average Gain			Max Gain			Max Position	Directivity
		Ver	Hor	Total	Ver	Hor	Total		
5,200,000,000 Hz	31.9 %	-8.0 dBi	-7.9 dBi	-5.0 dBi	-1.0 dBi	1.3 dBi	1.7 dBi	Theta15/Pie135	6.70 dB
5,300,000,000 Hz	37.5 %	-7.3 dBi	-7.2 dBi	-4.3 dBi	-0.3 dBi	0.8 dBi	2.2 dBi	Theta30/Pie105	6.46 dB
5,400,000,000 Hz	32.7 %	-9.6 dBi	-6.6 dBi	-4.9 dBi	-3.0 dBi	2.0 dBi	3.1 dBi	Theta30/Pie120	7.91 dB
5,500,000,000 Hz	31.4 %	-8.4 dBi	-7.7 dBi	-5.0 dBi	-2.3 dBi	1.6 dBi	2.3 dBi	Theta30/Pie135	7.37 dB
5,600,000,000 Hz	54.2 %	-7.6 dBi	-4.3 dBi	-2.7 dBi	-1.6 dBi	4.0 dBi	4.6 dBi	Theta15/Pie120	7.23 dB
5,700,000,000 Hz	63.5 %	-5.5 dBi	-4.5 dBi	-2.0 dBi	1.0 dBi	4.2 dBi	5.2 dBi	Theta15/Pie285	7.19 dB
5,800,000,000 Hz	53.9 %	-5.4 dBi	-6.0 dBi	-2.7 dBi	1.1 dBi	2.6 dBi	3.6 dBi	Theta15/Pie120	6.33 dB

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EMC Testing Div. : 307-51 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-765-8289, FAX: 82-31-766-2904)

PART NO.	KAT-1501-IN002P
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DATE	2015. 1. 29
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Model	Type	Rev.	DONGNAM	IR
BP 80S (WiFi)	Cable Antenna		BLUEBIRD	A

3. Mechanical Specification

3.1 Material Certification

Model		BP80S (WiFi)						
Ant Type		WiFi Intenna						
No	Part Name	Raw Material (Plating Spec.)	Raw Material color	Raw Material Company	Manufacture Company	Post Processing	Post Processing Company	Cavity
1	Carrier	Polycarbonate (SC1004A-KPA1)	Black	LG chemical	HANKOOK QDM	-	-	1X1
2	Pattern	Cu Plating (9~15㎛)	-	EC TECH	Bukwang Plating	-	-	-
		Ni Plating (2~3.5㎛)	-	EC TECH	Bukwang Plating	-	-	-

HEAD OFFICE : 301-14 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)
EMC Testing Div. : 307-51 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-765-8289, FAX: 82-31-766-2904)

PART NO.	KAT-1501-IN002P
Maker Code	KIN-WIFI-BS1402
DATE	2015. 1. 29
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Model	Type	Rev.	DONGNAM	IR
BP 80S (WiFi)	Cable Antenna		BLUEBIRD	A

3.2 Mechanical Specification

3.2.1 Part List

PARTS LIST

PRODUCT NAME/MODEL	KIN-WIFI-BS1402 / BP80S INTENNA	ESTABLISH. DATE	2015.01.28
CUSTOMER	BLUEBIRD	REVISION DATE	-
FREQUENCY	WiFi	REVISION No	IR

SIGN	DRAWN	CHECK	APPROVE
	(signature)		(signature)

No.	PART NAME	PART NO.	PART SIZE (mm)	MATERIAL	MATERIAL PROVIDER	Q'TY	Rev.	CHANGE CONTENT	SECTION	COMPANY	REMARK
1	CARRIER	BS-1402IFCRRP1	21.79 X 9.28 X 0.8	PC	LG chemical	1EA	IR	-	MOLD	HANKOOK QDM	1X1
2	PATTERN	BS-1402IFELPLD	7.95 x 8.4	LDP (Cu : 9~15μm, Ni : 2~3.5μm)	EC TECH	1EA	IR	-	-	Bukwang Plating	
3	TRAY	-	300 X 220 X 13.0	PP	-	1EA	IR	-	-	-	
4	OUT BOX	-	330 X 255 X 390	DW2	-	1EA	IR	-	-	-	

(NOTE)

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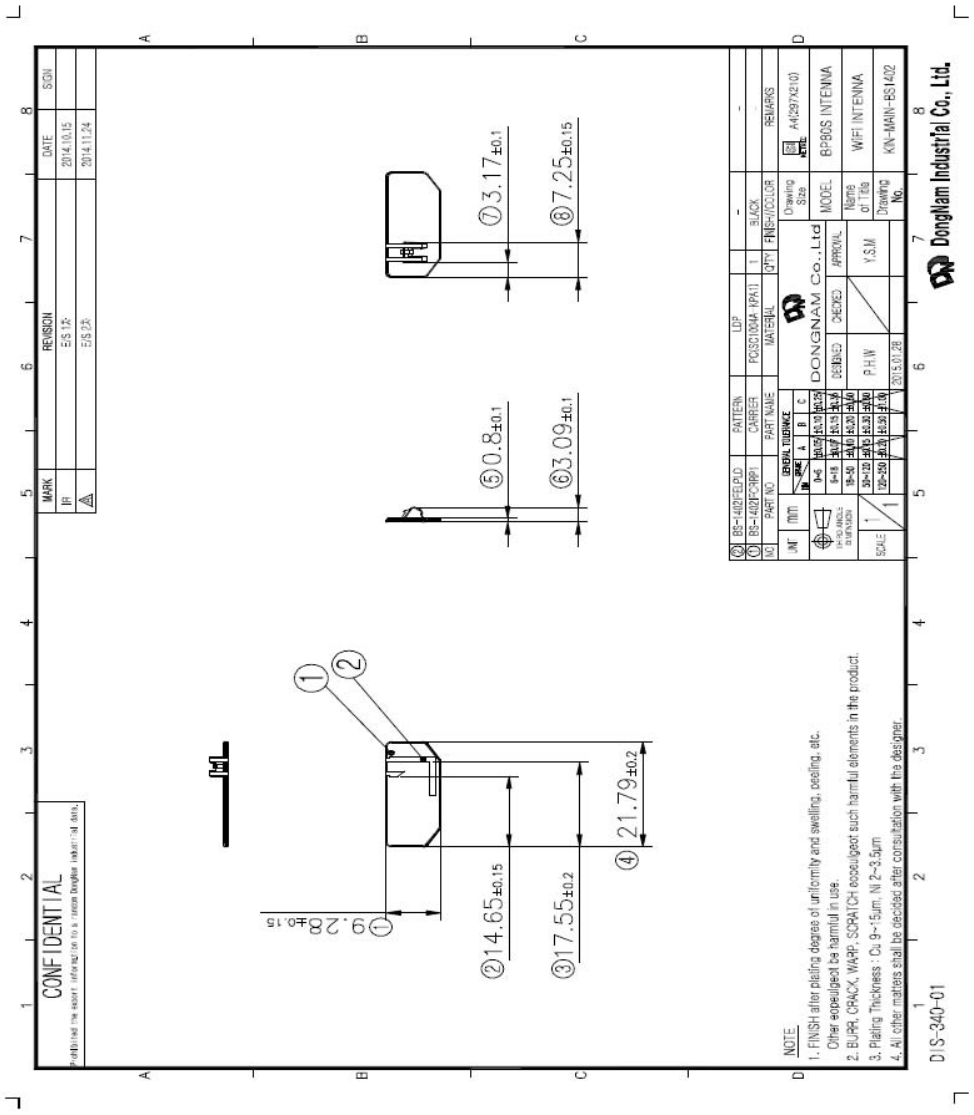
EMC Testing Div. : 307-51 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-765-8289, FAX: 82-31-766-2904)

PART NO.	KAT-1501-IN002P
Maker Code	KIN-WIFI-BS1402
DATE	2015. 1. 29
Page	12 / 13

Model	Type	Rev.	DONGNAM	IR
BP 80S (WiFi)	Cable Antenna		BLUEBIRD	A

3.2.2 Assy Drawing

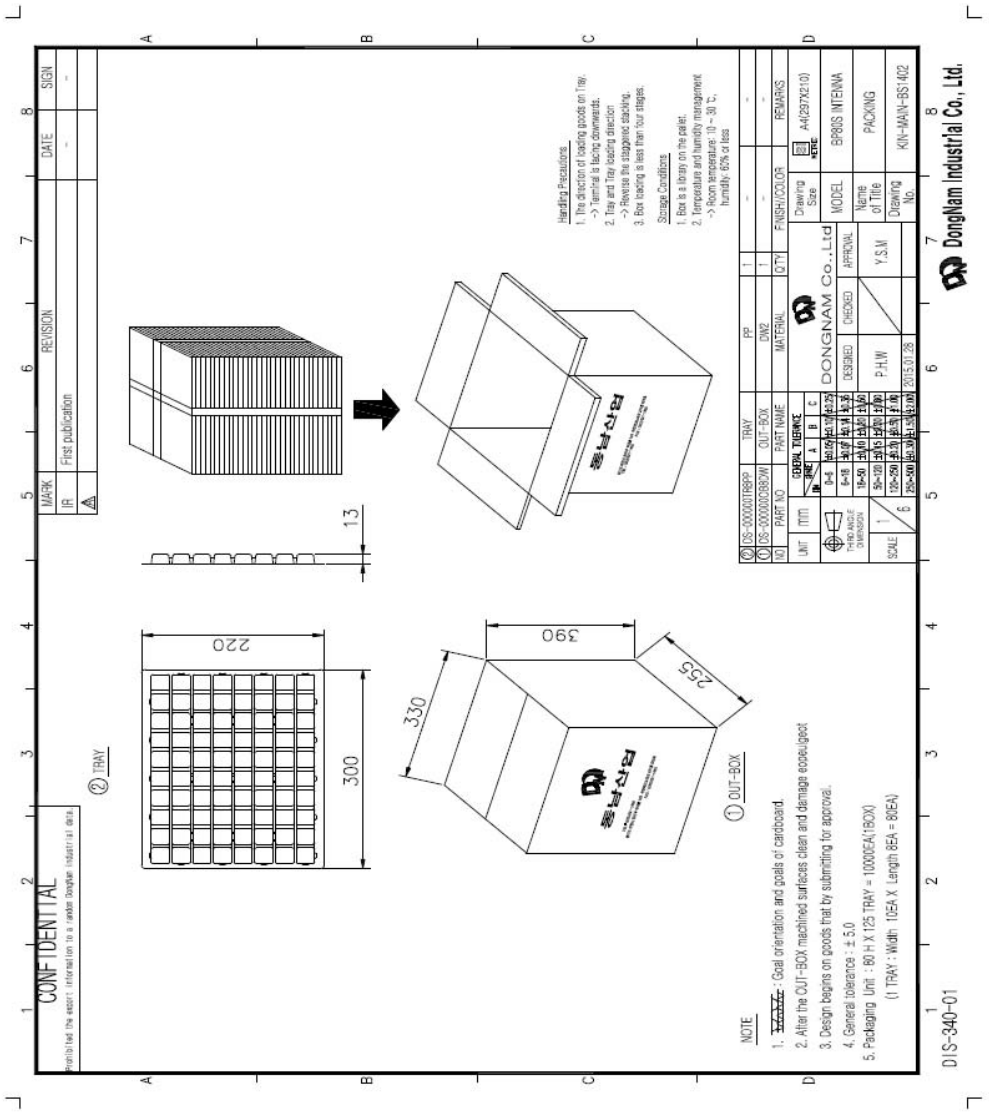


HEAD OFFICE : 301-14 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)
EMC Testing Div. : 307-51 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-765-8289, FAX: 82-31-766-2904)

PART NO.	KAT-1501-IN002P
Maker Code	KIN-WIFI-BS1402
DATE	2015. 1. 29
Page	13 / 13

Model	Type	Rev.	DONGNAM	IR
BP 80S (WiFi)	Cable Antenna		BLUEBIRD	A

3.2.3 Packing Spec. & Drawing



HEAD OFFICE : 301-14 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)
EMC Testing Div. : 307-51 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-765-8289, FAX: 82-31-766-2904)

ANNEX E. PROBE AND DIPOLE CALIBRATION CERTIFICATES

< E-Field Probe : ES3DV3 – SN 3171 >

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client One-Tech (Dymstec)

Certificate No: ES3-3171_Jul14

CALIBRATION CERTIFICATE

Object: ES3DV3 - SN:3171

Calibration procedure(s): QA CAL-01.v9, QA CAL-23.v5, QA CAL-25.v6
Calibration procedure for dosimetric E-field probes

Calibration date: July 18, 2014

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	03-Apr-14 (No. 217-01911)	Apr-15
Power sensor E4412A	MY41498087	03-Apr-14 (No. 217-01911)	Apr-15
Reference 3 dB Attenuator	SN: S5054 (3c)	03-Apr-14 (No. 217-01915)	Apr-15
Reference 20 dB Attenuator	SN: S5277 (20x)	03-Apr-14 (No. 217-01919)	Apr-15
Reference 30 dB Attenuator	SN: S5129 (30b)	03-Apr-14 (No. 217-01920)	Apr-15
Reference Probe ES3DV2	SN: 3013	30-Dec-13 (No. ES3-3013_Dec13)	Dec-14
DAE4	SN: 660	13-Dec-13 (No. DAE4-660_Dec13)	Dec-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: July 22, 2014

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: ES3-3171_Jul14 Page 1 of 11

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Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

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Probe ES3DV3

SN:3171

Manufactured: January 23, 2008
Calibrated: July 18, 2014

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

HEAD OFFICE : 301-14 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do 464-862 Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)
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DASY/EASY - Parameters of Probe: ES3DV3 - SN:3171

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.06	1.20	1.20	± 10.1 %
DCP (mV)[B]	103.5	98.0	101.8	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB$\sqrt{\mu V}$	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	195.4	±3.8 %
		Y	0.0	0.0	1.0		204.9	
		Z	0.0	0.0	1.0		205.0	

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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DASY/EASY - Parameters of Probe: ES3DV3 - SN:3171

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
835	41.5	0.90	6.20	6.20	6.20	0.57	1.33	± 12.0 %
1750	40.1	1.37	5.35	5.35	5.35	0.80	1.15	± 12.0 %
1950	40.0	1.40	4.92	4.92	4.92	0.76	1.17	± 12.0 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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DASY/EASY - Parameters of Probe: ES3DV3 - SN:3171

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
835	55.2	0.97	6.08	6.08	6.08	0.31	1.90	± 12.0 %
1750	53.4	1.49	5.03	5.03	5.03	0.47	1.77	± 12.0 %
1950	53.3	1.52	4.86	4.86	4.86	0.60	1.47	± 12.0 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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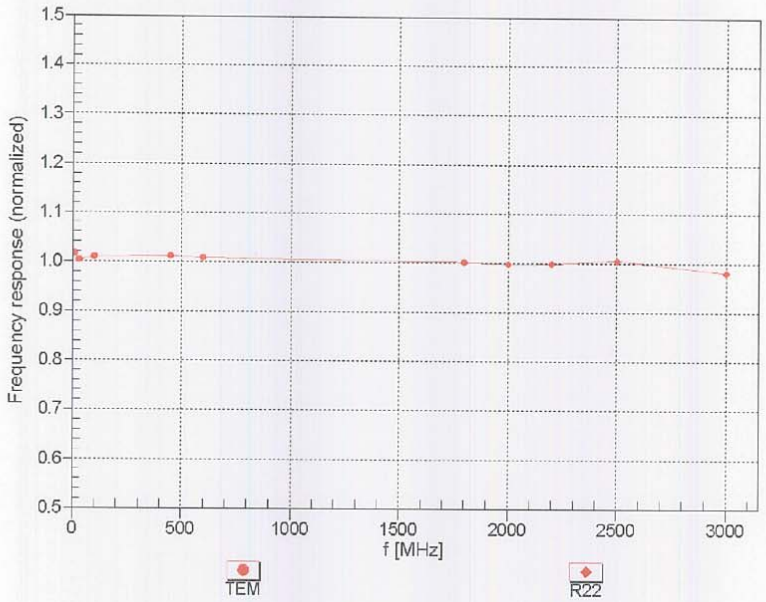
ES3DV3– SN:3171 July 18, 2014

Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

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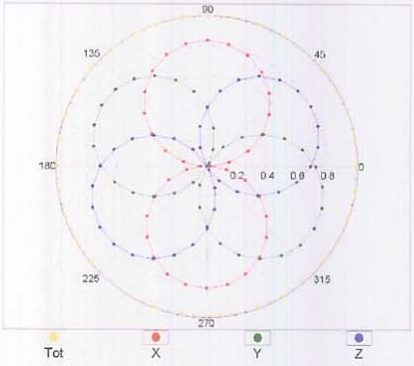
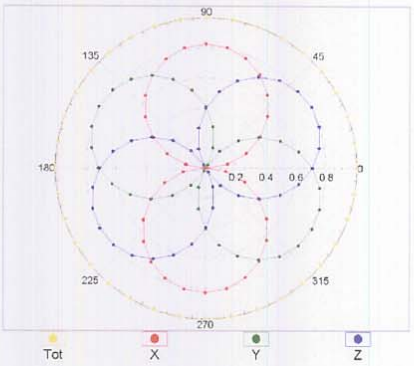
ES3DV3– SN:3171 July 18, 2014

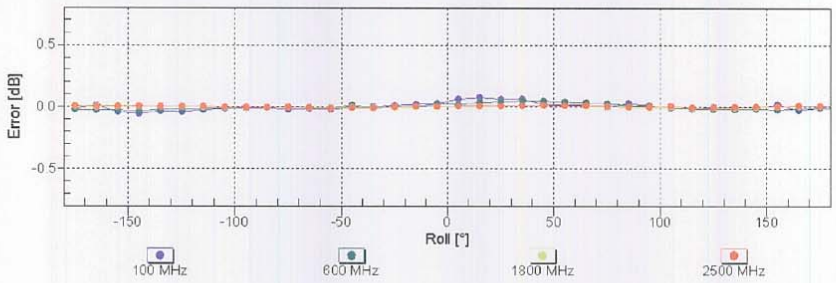
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



f=1800 MHz,R22





Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Certificate No: ES3-3171_Jul14 Page 8 of 11

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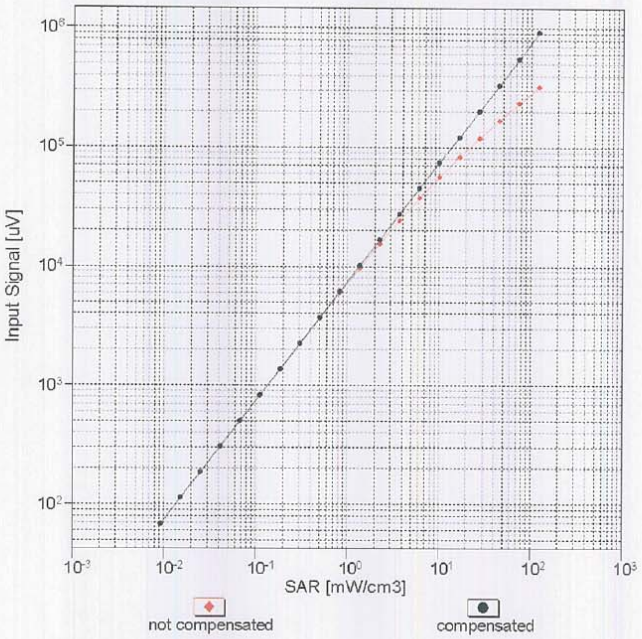
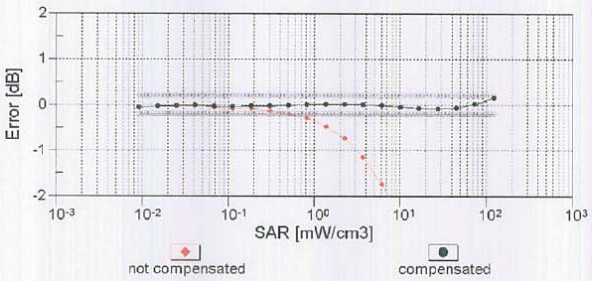
ES3DV3– SN:3171 July 18, 2014

Dynamic Range f(SAR$_{head}$)
(TEM cell , f_{eval}= 1900 MHz)





Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Certificate No: ES3-3171_Jul14 Page 9 of 11

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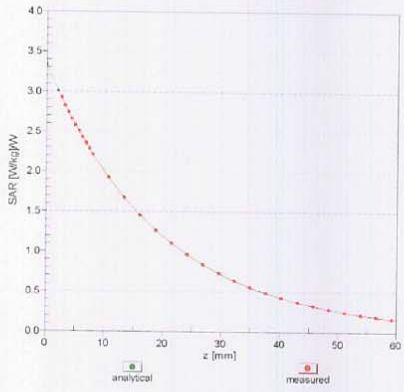
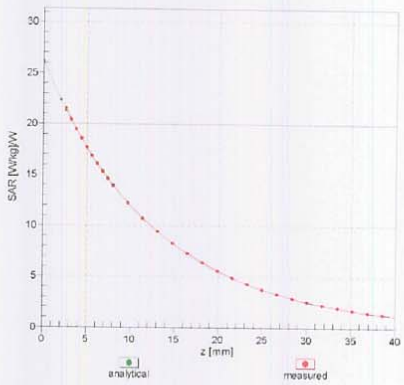
ES3DV3– SN:3171 July 18, 2014

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

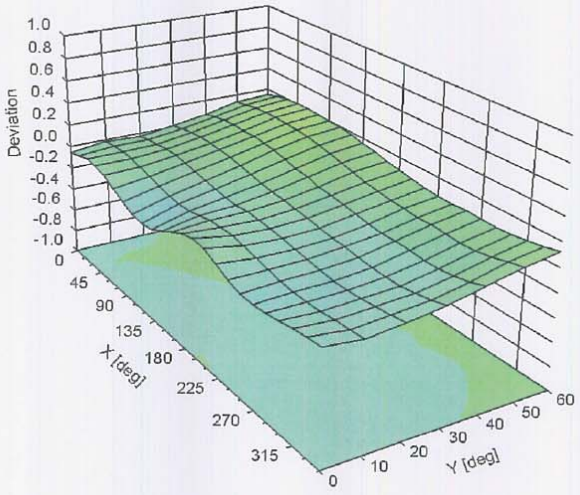


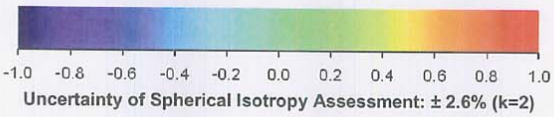
f = 1750 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz





Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

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DASY/EASY - Parameters of Probe: ES3DV3 - SN:3171

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-74.8
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

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< Probe : EX3DV4 – SN 3716 >

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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Accreditation No.: SCS 108

Client One-Tech (Dymstec)

Certificate No: EX3-3716_Nov14

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3716

Calibration procedure(s): QA CAL-01.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6
Calibration procedure for dosimetric E-field probes

Calibration date: November 18, 2014

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	03-Apr-14 (No. 217-01911)	Apr-15
Power sensor E4412A	MY41498087	03-Apr-14 (No. 217-01911)	Apr-15
Reference 3 dB Attenuator	SN: S5054 (3c)	03-Apr-14 (No. 217-01915)	Apr-15
Reference 20 dB Attenuator	SN: S5277 (20x)	03-Apr-14 (No. 217-01919)	Apr-15
Reference 30 dB Attenuator	SN: S5129 (30b)	03-Apr-14 (No. 217-01920)	Apr-15
Reference Probe ES3DV2	SN: 3013	30-Dec-13 (No. ES3-3013_Dec13)	Dec-14
DAE4	SN: 660	13-Dec-13 (No. DAE4-660_Dec13)	Dec-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: November 18, 2014

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Accreditation No.: SCS 108

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

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Probe EX3DV4

SN:3716

Manufactured: August 14, 2009
Calibrated: November 18, 2014

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

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EX3DV4– SN:3716 November 18, 2014

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3716

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.48	0.54	0.48	± 10.1 %
DCP (mV)[B]	97.9	98.9	97.7	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	137.7	±2.5 %
		Y	0.0	0.0	1.0		134.9	
		Z	0.0	0.0	1.0		135.3	

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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DASY/EASY - Parameters of Probe: EX3DV4 - SN:3716

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
2450	39.2	1.80	6.94	6.94	6.94	0.54	0.70	± 12.0 %
5200	36.0	4.66	4.97	4.97	4.97	0.35	1.80	± 13.1 %
5300	35.9	4.76	4.74	4.74	4.74	0.35	1.80	± 13.1 %
5500	35.6	4.96	4.56	4.56	4.56	0.35	1.80	± 13.1 %
5600	35.5	5.07	4.30	4.30	4.30	0.35	1.80	± 13.1 %
5800	35.3	5.27	4.29	4.29	4.29	0.40	1.80	± 13.1 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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DASY/EASY - Parameters of Probe: EX3DV4 - SN:3716

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
2450	52.7	1.95	7.13	7.13	7.13	0.76	0.58	± 12.0 %
5200	49.0	5.30	4.41	4.41	4.41	0.45	1.90	± 13.1 %
5300	48.9	5.42	4.22	4.22	4.22	0.45	1.90	± 13.1 %
5500	48.6	5.65	3.89	3.89	3.89	0.50	1.90	± 13.1 %
5600	48.5	5.77	3.85	3.85	3.85	0.50	1.90	± 13.1 %
5800	48.2	6.00	4.03	4.03	4.03	0.50	1.90	± 13.1 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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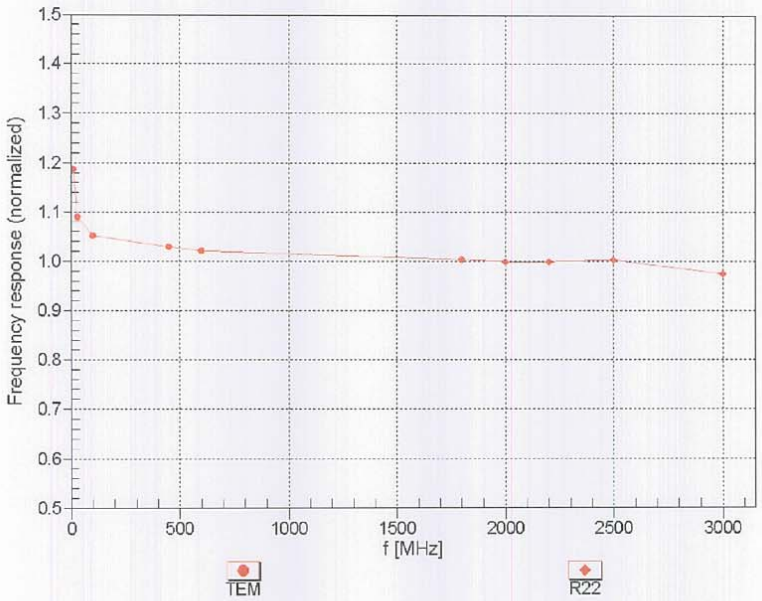
EX3DV4– SN:3716 November 18, 2014

Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

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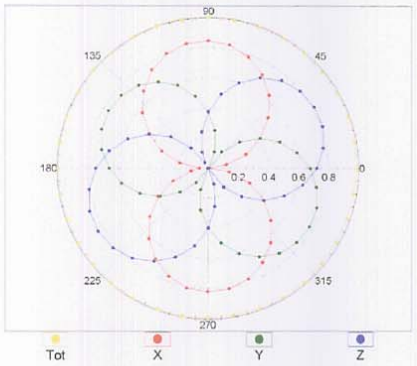
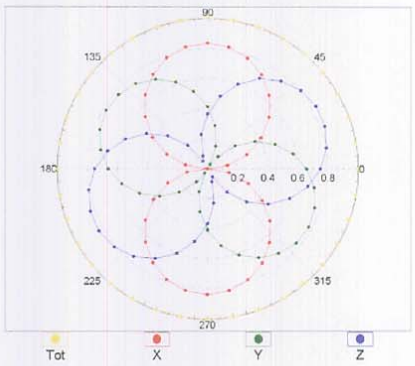
EX3DV4– SN:3716 November 18, 2014

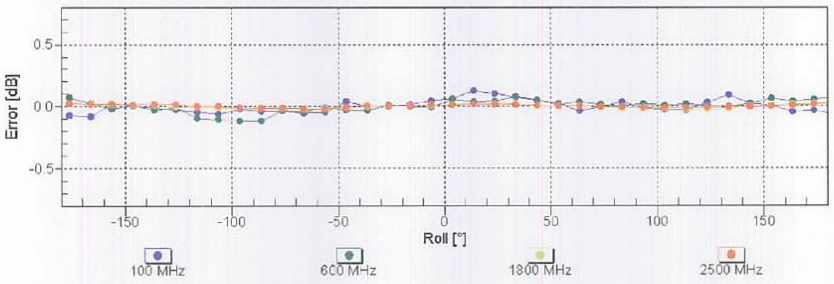
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



f=1800 MHz,R22





Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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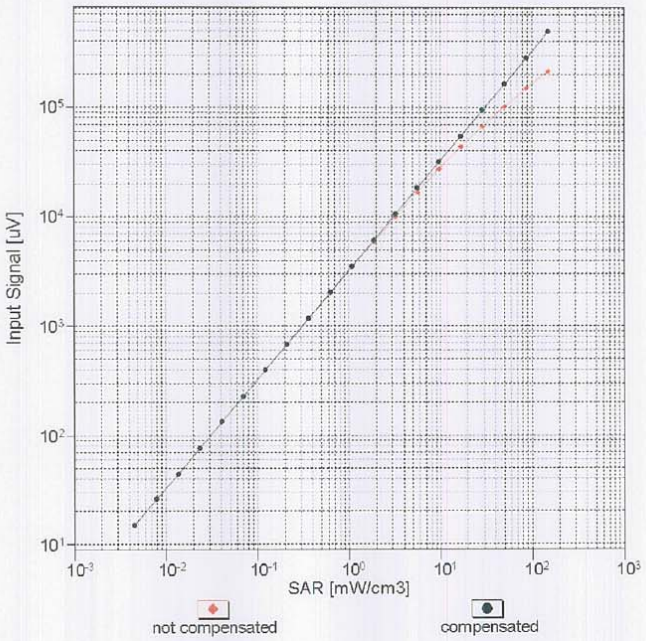
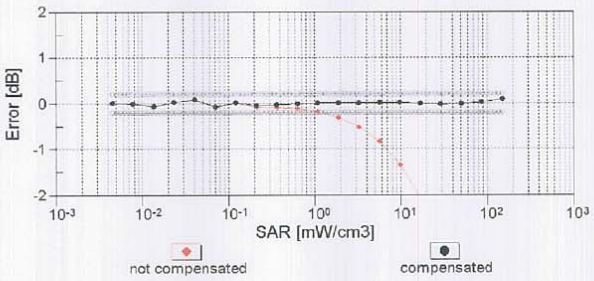
EX3DV4– SN:3716 November 18, 2014

Dynamic Range f(SAR$_{head}$)

(TEM cell , f_{eval}= 1900 MHz)





Uncertainty of Linearity Assessment: ± 0.6% (k=2)

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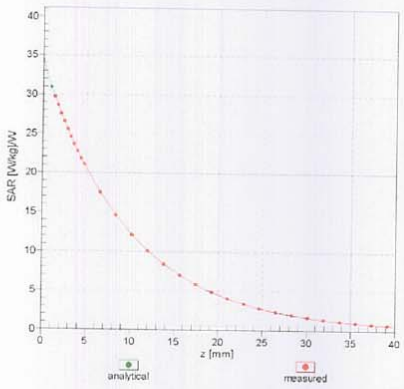
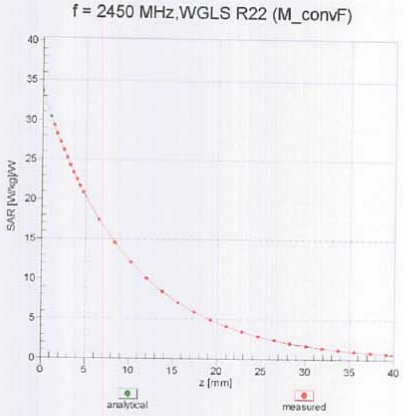
EX3DV4– SN:3716 November 18, 2014

Conversion Factor Assessment

f = 2450 MHz,WGLS R22 (H_convF)

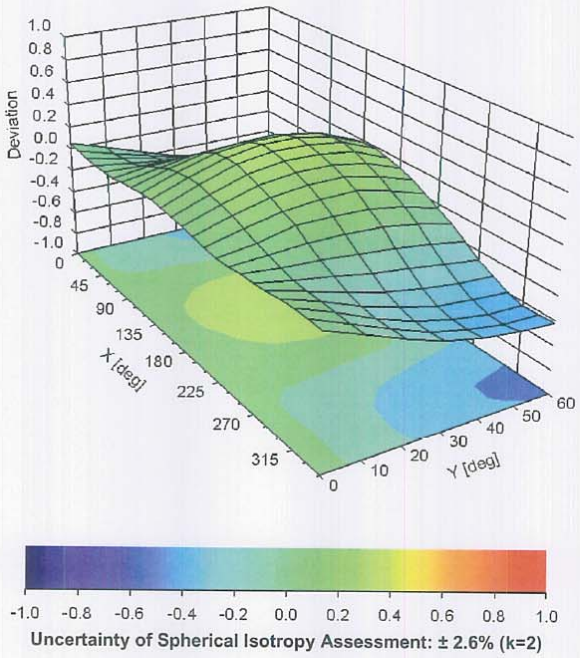


f = 2450 MHz,WGLS R22 (M_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

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DASY/EASY - Parameters of Probe: EX3DV4 - SN:3716

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-76.3
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm

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