

	<u>Date(s) of Evaluation</u> Aug 16-20, 2013	<u>Test Report Serial No.</u> 081413ALH-1249S	<u>Test Report Revision No.</u> Rev. 1.1	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> Aug. 23, 2013	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

APPENDIX D - SAR TEST SETUP & DUT PHOTOGRAPHS

Applicant:	Kenwood USA Corporation	FCC ID:	ALH468800	IC ID:	282D-468800	KENWOOD
DUT Type:	Portable 700/800 PTT Radio Transceiver	Models:	TK-5410D-K2/K3	768-869 MHz		
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Test Lab Certificate No. 2470.01

FACE-HELD SAR TEST SETUP PHOTOGRAPHS



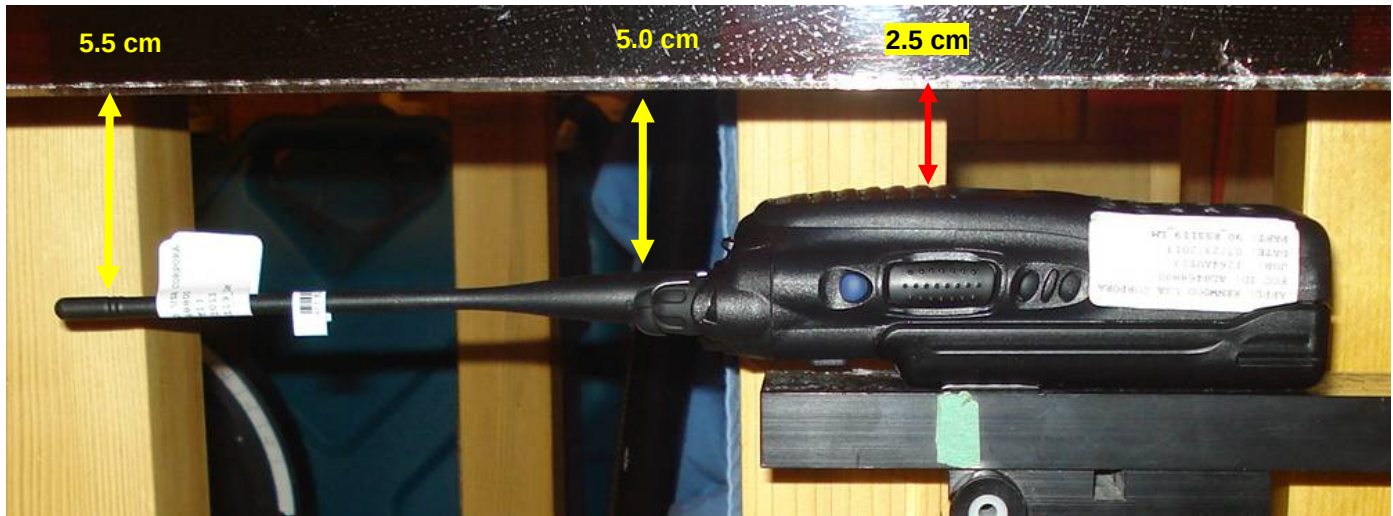
Face-held SAR Configuration Test Setup

Applicant:	Kenwood USA Corporation	FCC ID:	ALH468800	IC ID:	282D-468800	KENWOOD
DUT Type:	Portable 700/800 PTT Radio Transceiver	Models:	TK-5410D-K2/K3	768-869 MHz		
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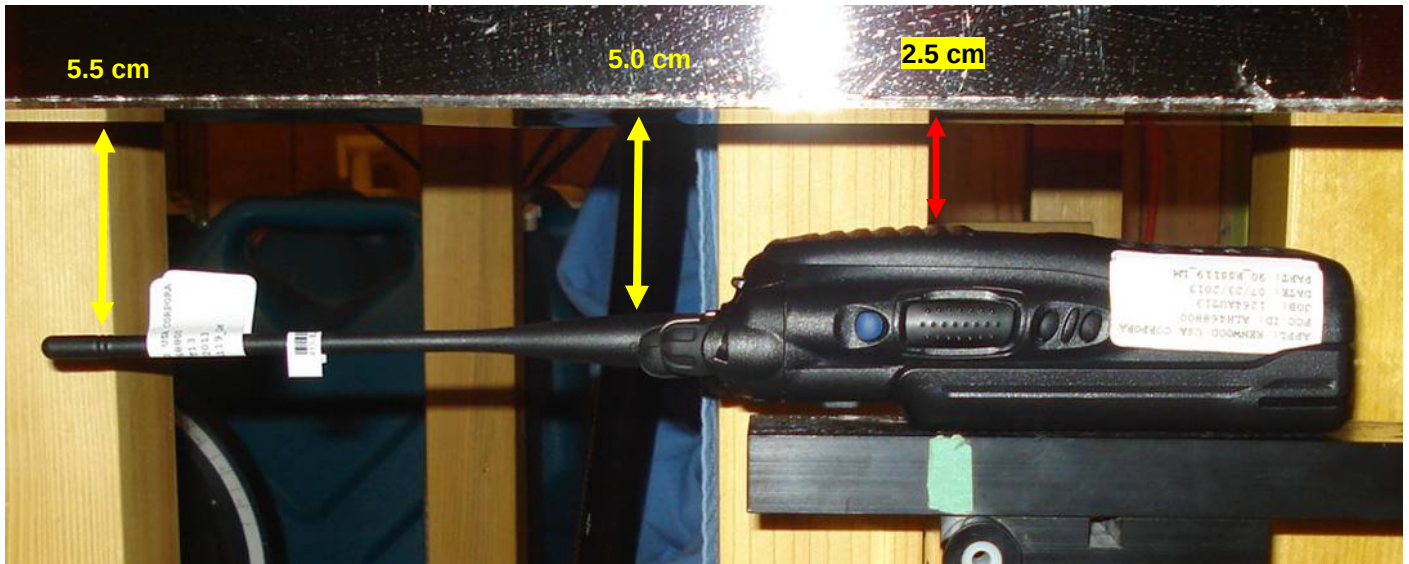
	Date(s) of Evaluation Aug 16-20, 2013	Test Report Serial No. 081413ALH-1249S	Test Report Revision No. Rev. 1.1	
	Test Report Issue Date Aug. 23, 2013	Description of Test(s) Specific Absorption Rate	RF Exposure Category Occupational (Controlled)	

Test Lab Certificate No. 2470.01

FACE-HELD SAR TEST SETUP PHOTOGRAPHS



Face-held SAR Configuration - Antenna 1, Battery b



Face-held SAR Configuration - Antenna 1, Battery a

Applicant:	Kenwood USA Corporation	FCC ID:	ALH468800	IC ID:	282D-468800	KENWOOD
DUT Type:	Portable 700/800 PTT Radio Transceiver	Models:	TK-5410D-K2/K3		768-869 MHz	
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	<u>Test Report Issue Date</u> Aug. 23, 2013	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

BODY-WORN SAR TEST SETUP PHOTOGRAPHS



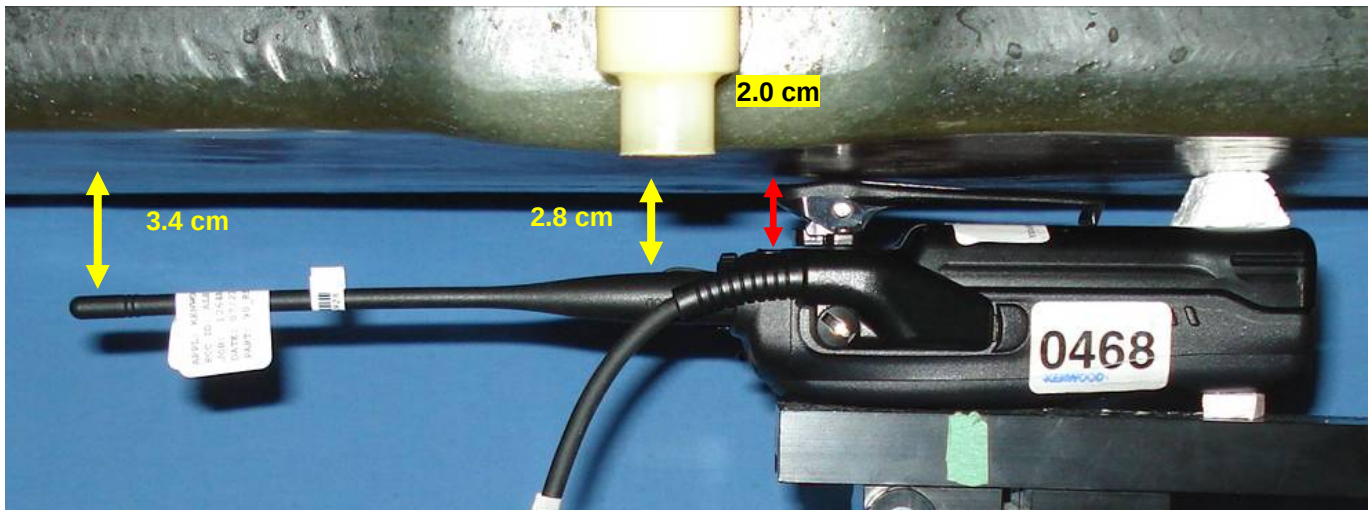
Body-worn SAR Configuration Test Setup with Belt-Clip

Applicant:	Kenwood USA Corporation	FCC ID:	ALH468800	IC ID:	282D-468800	KENWOOD
DUT Type:	Portable 700/800 PTT Radio Transceiver	Models:	TK-5410D-K2/K3	768-869 MHz		
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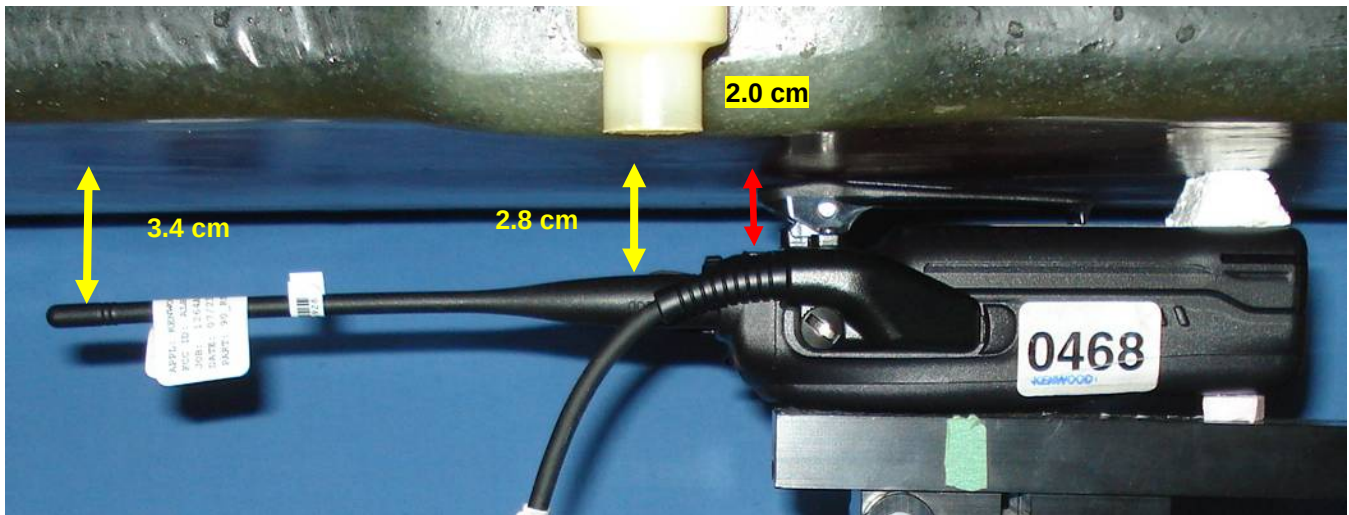
	Date(s) of Evaluation Aug 16-20, 2013	Test Report Serial No. 081413ALH-1249S	Test Report Revision No. Rev. 1.1	
	Test Report Issue Date Aug. 23, 2013	Description of Test(s) Specific Absorption Rate	RF Exposure Category Occupational (Controlled)	

Test Lab Certificate No. 2470.01

BODY-WORN SAR TEST SETUP PHOTOGRAPHS



Body-worn SAR Configuration - Antenna 1, Battery b, Audio G1a



Body-worn SAR Configuration - Antenna 1, Battery a, Audio G1a

Applicant:	Kenwood USA Corporation	FCC ID:	ALH468800	IC ID:	282D-468800	KENWOOD
DUT Type:	Portable 700/800 PTT Radio Transceiver	Models:	TK-5410D-K2/K3		768-869 MHz	
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Test Lab Certificate No. 2470.01

BODY-WORN SAR TEST SETUP PHOTOGRAPHS



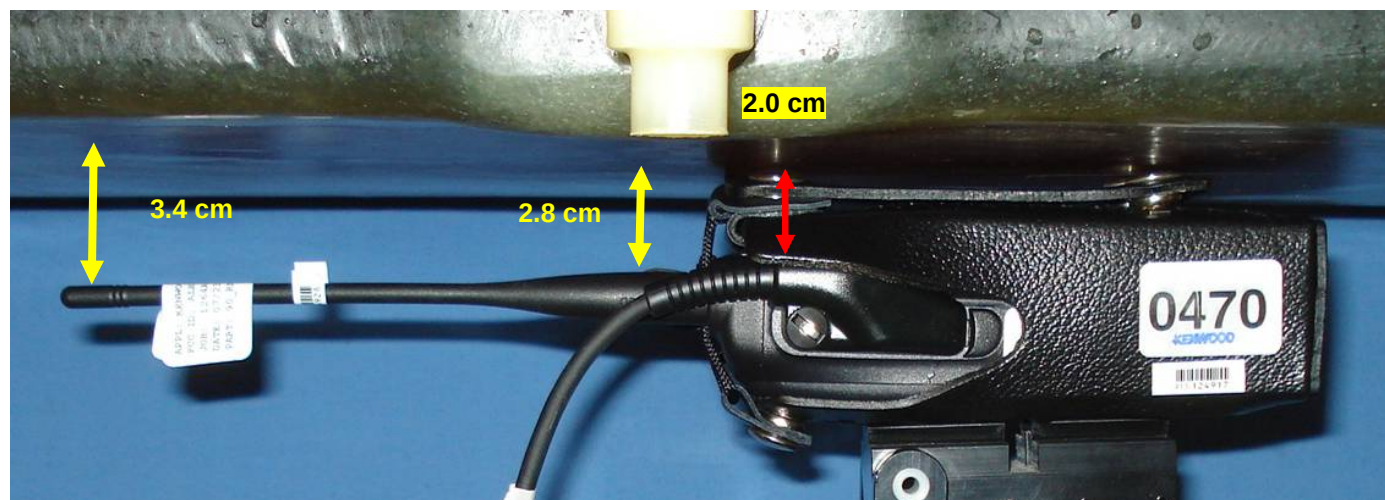
Body-worn SAR Configuration Test Setup with Leather Case

Applicant:	Kenwood USA Corporation	FCC ID:	ALH468800	IC ID:	282D-468800	KENWOOD
DUT Type:	Portable 700/800 PTT Radio Transceiver	Models:	TK-5410D-K2/K3	768-869 MHz		
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	<u>Test Report Issue Date</u> Aug. 23, 2013	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

Test Lab Certificate No. 2470.01

BODY-WORN SAR TEST SETUP PHOTOGRAPHS



Body-worn SAR Configuration - Antenna 1, Audio G1a

Applicant:	Kenwood USA Corporation	FCC ID:	ALH468800	IC ID:	282D-468800	KENWOOD
DUT Type:	Portable 700/800 PTT Radio Transceiver	Models:	TK-5410D-K2/K3	768-869 MHz		
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	<u>Test Report Issue Date</u> Aug. 23, 2013	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

DUT PHOTOGRAPHS



Radio Front



Radio Left Side



Radio Back



Radio Right Side



Radio Top



Radio Bottom

TK-5410D-K3 (16-keypad variant)

Applicant:	Kenwood USA Corporation	FCC ID:	ALH468800	IC ID:	282D-468800	KENWOOD
DUT Type:	Portable 700/800 PTT Radio Transceiver	Models:	TK-5410D-K2/K3	768-869 MHz		
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	<u>Test Report Issue Date</u> Aug. 23, 2013	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

Test Lab Certificate No. 2470.01

DUT PHOTOGRAPHS



Radio Front

Radio Left Side

Radio Back

Radio Right Side



Radio Top

Radio Bottom

TK-5410D-K2 (4-keypad variant)

Applicant:	Kenwood USA Corporation	FCC ID:	ALH468800	IC ID:	282D-468800	KENWOOD
DUT Type:	Portable 700/800 PTT Radio Transceiver	Models:	TK-5410D-K2/K3		768-869 MHz	
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	Test Report Issue Date Aug. 23, 2013	Description of Test(s) Specific Absorption Rate	RF Exposure Category Occupational (Controlled)	

Test Lab Certificate No. 2470.01

DUT PHOTOGRAPHS



Back of Radio without battery



Belt-Clip Body-worn Accessory 1



Belt-Clip Body-worn Accessory 1

Applicant:	Kenwood USA Corporation	FCC ID:	ALH468800	IC ID:	282D-468800	KENWOOD
DUT Type:	Portable 700/800 PTT Radio Transceiver	Models:	TK-5410D-K2/K3		768-869 MHz	
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	<u>Date(s) of Evaluation</u> Aug 16-20, 2013	<u>Test Report Serial No.</u> 081413ALH-1249S	<u>Test Report Revision No.</u> Rev. 1.1	 
	<u>Test Report Issue Date</u> Aug. 23, 2013	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

Test Lab Certificate No. 2470.01

DUT PHOTOGRAPHS



Antenna 1



Leather Case Body-worn Accessory 2

Applicant:	Kenwood USA Corporation	FCC ID:	ALH468800	IC ID:	282D-468800	KENWOOD
DUT Type:	Portable 700/800 PTT Radio Transceiver	Models:	TK-5410D-K2/K3	768-869 MHz		
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	Date(s) of Evaluation Aug 16-20, 2013	Test Report Serial No. 081413ALH-1249S	Test Report Revision No. Rev. 1.1	 
	Test Report Issue Date Aug. 23, 2013	Description of Test(s) Specific Absorption Rate	RF Exposure Category Occupational (Controlled)	

Test Lab Certificate No. 2470.01

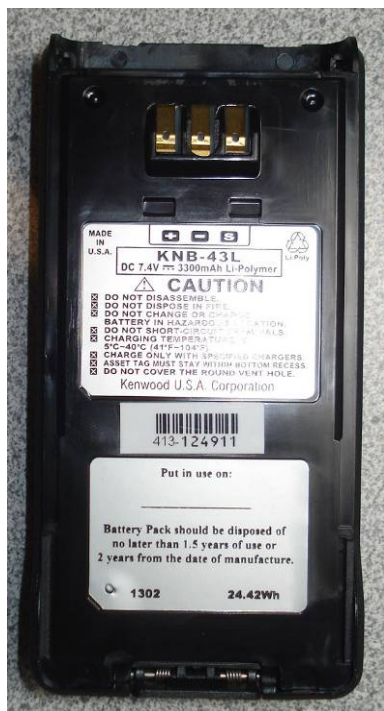
DUT PHOTOGRAPHS



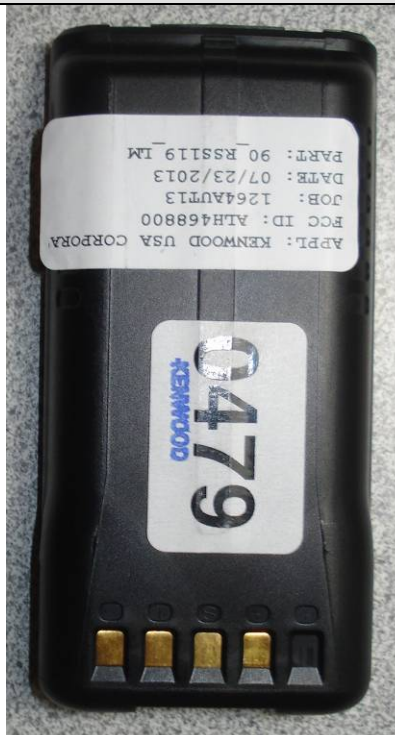
Battery a - Front



Battery a - Back



Battery b - Front



Battery b - Back

Applicant:	Kenwood USA Corporation	FCC ID:	ALH468800	IC ID:	282D-468800	KENWOOD
DUT Type:	Portable 700/800 PTT Radio Transceiver	Models:	TK-5410D-K2/K3		768-869 MHz	
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	<u>Date(s) of Evaluation</u> Aug 16-20, 2013	<u>Test Report Serial No.</u> 081413ALH-1249S	<u>Test Report Revision No.</u> Rev. 1.1	 
	<u>Test Report Issue Date</u> Aug. 23, 2013	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

Test Lab Certificate No. 2470.01

DUT PHOTOGRAPHS



Speaker-Mic Audio Accessory G1a

Applicant:	Kenwood USA Corporation	FCC ID:	ALH468800	IC ID:	282D-468800	KENWOOD
DUT Type:	Portable 700/800 PTT Radio Transceiver	Models:	TK-5410D-K2/K3	768-869 MHz		
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	<u>Date(s) of Evaluation</u> Aug 16-20, 2013	<u>Test Report Serial No.</u> 081413ALH-1249S	<u>Test Report Revision No.</u> Rev. 1.1	
	<u>Test Report Issue Date</u> Aug. 23, 2013	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

Test Lab Certificate No. 2470.01

APPENDIX E - DIPOLE CALIBRATION

Applicant:	Kenwood USA Corporation	FCC ID:	ALH468800	IC ID:	282D-468800	KENWOOD
DUT Type:	Portable 700/800 PTT Radio Transceiver	Models:	TK-5410D-K2/K3	768-869 MHz		
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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 **Celltech**

Certificate No: **D835V2-4d075_Apr12**

CALIBRATION CERTIFICATE

Object **D835V2 - SN: 4d075**

Calibration procedure(s) **QA CAL-05.v8**
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: **April 20, 2012**

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 EPM-442A	GB37480704	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Reference 20 dB Attenuator	SN: 5058 (20k)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.2 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ES3DV3	SN: 3205	30-Dec-11 (No. ES3-3205_Dec11)	Dec-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

	Name	Function	Signature
Calibrated by:	Israe El-Naouq	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 20, 2012

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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
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- 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
- c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

- d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

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%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.1
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	41.1 $\pm$ 6 %	0.90 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.36 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	9.42 mW / g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.55 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	6.19 mW / g $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	54.5 $\pm$ 6 %	1.01 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.47 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	9.56 mW / g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.62 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	6.31 mW / g $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.4 Ω - 4.6 j Ω
Return Loss	- 26.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.8 Ω - 6.2 j Ω
Return Loss	- 22.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.395 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	November 09, 2007

DASY5 Validation Report for Head TSL

Date: 20.04.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d075

Communication System: CW; Frequency: 835 MHz

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.9 \text{ mho/m}$; $\epsilon_r = 41.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.07, 6.07, 6.07); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

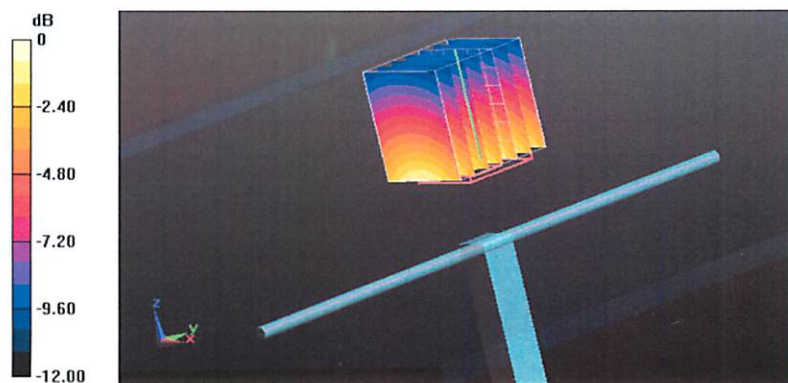
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 56.890 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 3.477 mW/g

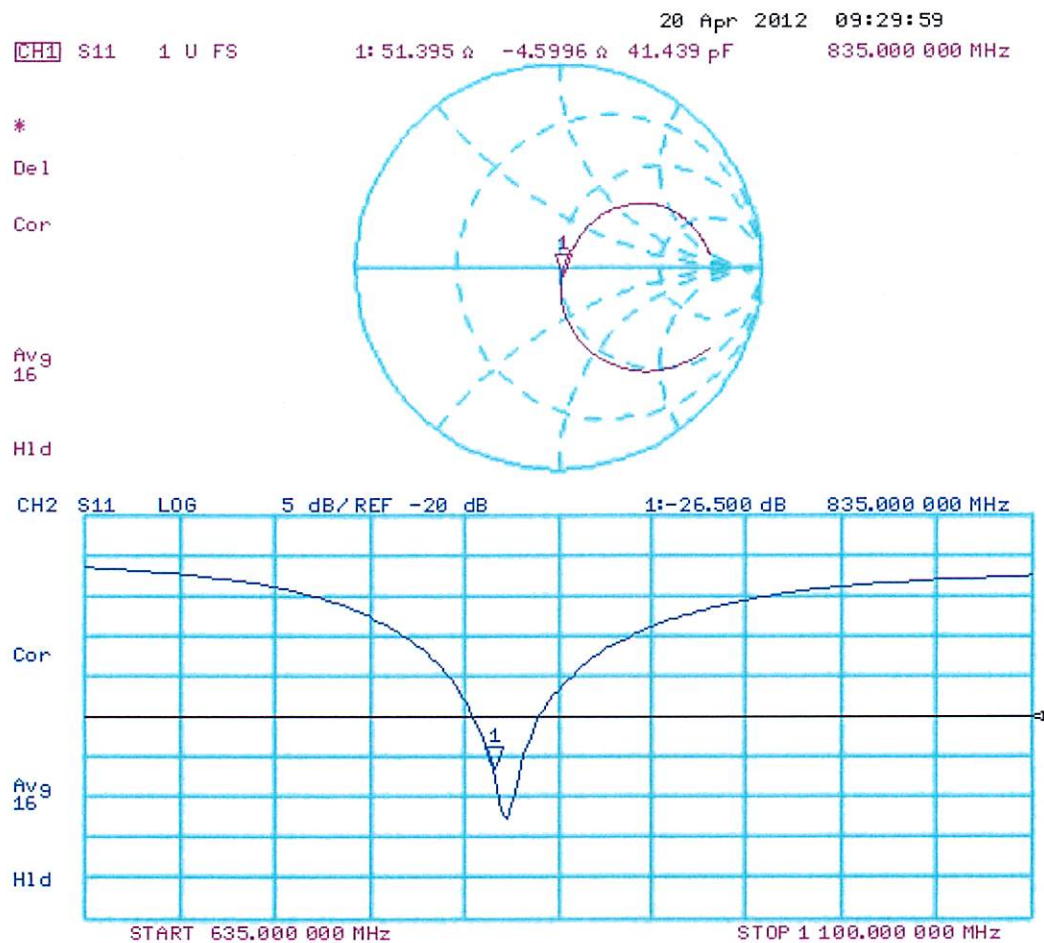
SAR(1 g) = 2.36 mW/g; SAR(10 g) = 1.55 mW/g

Maximum value of SAR (measured) = 2.74 mW/g



0 dB = 2.74 mW/g = 8.76 dB mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 19.04.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d075

Communication System: CW; Frequency: 835 MHz

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 1.01 \text{ mho/m}$; $\epsilon_r = 54.5$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.02, 6.02, 6.02); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

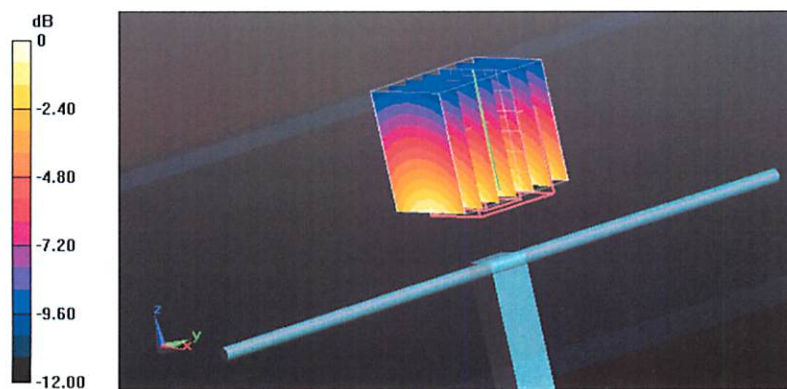
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 55.283 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 3.580 mW/g

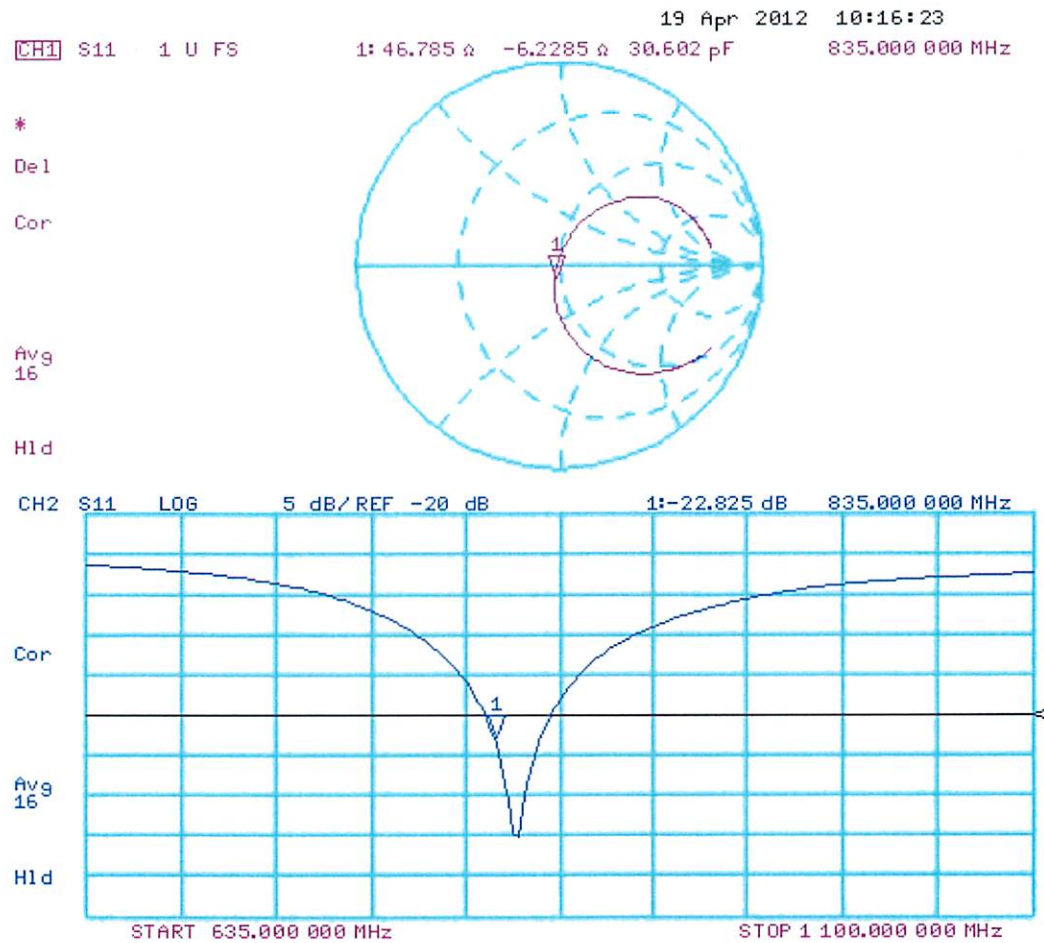
SAR(1 g) = 2.47 mW/g; SAR(10 g) = 1.62 mW/g

Maximum value of SAR (measured) = 2.87 mW/g



0 dB = 2.87 mW/g = 9.16 dB mW/g

Impedance Measurement Plot for Body TSL



	<u>Date:</u> Aug 19, 2013	<u>Revision No.</u> Rev. 1.1	 Test Lab Certificate No. 2470.01
	835 MHz Dipole Extended Calibration		

Dipole: D835V2
Serial Number: 4d075
Last Calibrated: Apr. 20, 2012

Antenna Parameters with Head TSL						
	Impedance Real (ohms)	Deviation from cal	Impedance Imaginary (ohms)	Deviation from cal	Return Loss (dB)	Deviation from Cal
Last Calibration	51.4	-	-4.6	-	-26.5	-
Extended Cal Aug 14, 2013	50.9	0.5	-3.6	1.0	-28.4	7.2%

Antenna Parameters with Body TSL						
	Impedance Real (ohms)	Deviation from cal (ohms)	Impedance Imaginary (ohms)	Deviation from cal (ohms)	Return Loss (dB)	Deviation from Cal (%)
Last Calibration	46.8	-	-6.2	-	-22.8	-
Extended Cal Aug. 19, 2013	45.9	0.9	-6.3	0.1	-22.2	2.6%

	<u>Date(s) of Evaluation</u> Aug 16-20, 2013	<u>Test Report Serial No.</u> 081413ALH-1249S	<u>Test Report Revision No.</u> Rev. 1.1	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> Aug. 23, 2013	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

APPENDIX F - PROBE CALIBRATION

Applicant:	Kenwood USA Corporation	FCC ID:	ALH468800	IC ID:	282D-468800	KENWOOD
DUT Type:	Portable 700/800 PTT Radio Transceiver	Models:	TK-5410D-K2/K3	768-869 MHz		
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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 **Celltech**

Certificate No: **ET3-1590_Apr13**

CALIBRATION CERTIFICATE

Object **ET3DV6 - SN:1590**

Calibration procedure(s) **QA CAL-01.v8, QA CAL-12.v7, QA CAL-23.v4, QA CAL-25.v4**
Calibration procedure for dosimetric E-field probes

Calibration date: **April 24, 2013**

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 $(22 \pm 3)^\circ\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	04-Apr-13 (No. 217-01733)	Apr-14
Power sensor E4412A	MY41498087	04-Apr-13 (No. 217-01733)	Apr-14
Reference 3 dB Attenuator	SN: S5054 (3c)	04-Apr-13 (No. 217-01737)	Apr-14
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-13 (No. 217-01735)	Apr-14
Reference 30 dB Attenuator	SN: S5129 (30b)	04-Apr-13 (No. 217-01738)	Apr-14
Reference Probe ES3DV2	SN: 3013	28-Dec-12 (No. ES3-3013_Dec12)	Dec-13
DAE4	SN: 660	31-Jan-13 (No. DAE4-660_Jan13)	Jan-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-15
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	
Issued: April 27, 2013			
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			



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Accreditation No.: **SCS 108**

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Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,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., $\vartheta = 0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- 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:

- NORM_{x,y,z}**: Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not affect the E^2 -field uncertainty inside TSL (see below *ConvF*).
- NORM(f)_{x,y,z}** = NORM_{x,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*.
- DCP_{x,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
- A_{x,y,z}; B_{x,y,z}; C_{x,y,z}; D_{x,y,z}; VR_{x,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 $f \leq 800$ 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 NORM_{x,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.

Probe ET3DV6

SN:1590

Manufactured: March 19, 2001
Calibrated: April 24, 2013

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

DASY/EASY - Parameters of Probe: ET3DV6 - SN:1590

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V/m})^2$) ^A	1.73	1.85	1.61	$\pm 10.1 \%$
DCP (mV) ^B	94.7	99.4	88.0	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB $\sqrt{\mu\text{V}}$	C	D dB	VR mV	Unc ^E (k=2)
0	CW	X	0.0	0.0	1.0	0.00	186.7	$\pm 2.7 \%$
		Y	0.0	0.0	1.0		151.0	
		Z	0.0	0.0	1.0		171.2	

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.

DASY/EASY - Parameters of Probe: ET3DV6 - SN:1590

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	Depth (mm)	Unct. (k=2)
450	43.5	0.87	7.53	7.53	7.53	0.21	2.23	± 13.4 %
750	41.9	0.89	7.24	7.24	7.24	0.25	3.00	± 12.0 %
835	41.5	0.90	6.84	6.84	6.84	0.26	3.00	± 12.0 %
900	41.5	0.97	6.68	6.68	6.68	0.28	3.00	± 12.0 %

^C Frequency validity 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.

^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.

DASY/EASY - Parameters of Probe: ET3DV6 - SN:1590

Calibration Parameter Determined in Body Tissue Simulating Media

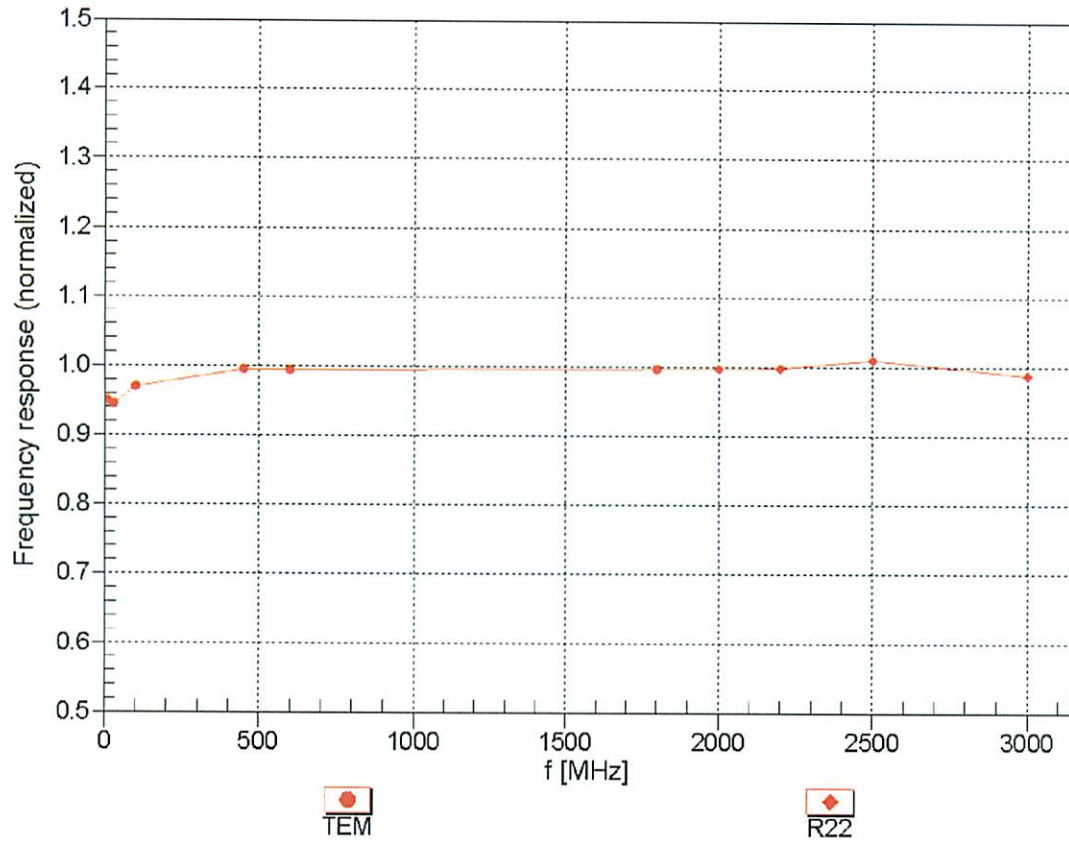
f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	56.7	0.94	7.98	7.98	7.98	0.13	2.14	± 13.4 %
750	55.5	0.96	6.84	6.84	6.84	0.31	2.49	± 12.0 %
835	55.2	0.97	6.67	6.67	6.67	0.29	2.67	± 12.0 %
900	55.0	1.05	6.63	6.63	6.63	0.26	3.00	± 12.0 %

^C Frequency validity 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.

^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.

Frequency Response of E-Field

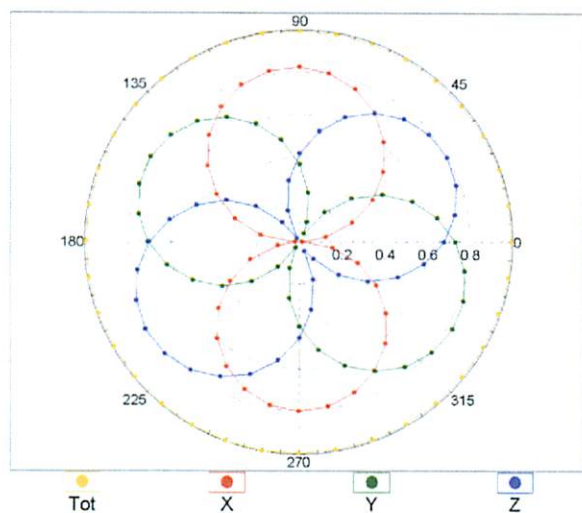
(TEM-Cell:ifi110 EXX, Waveguide: R22)



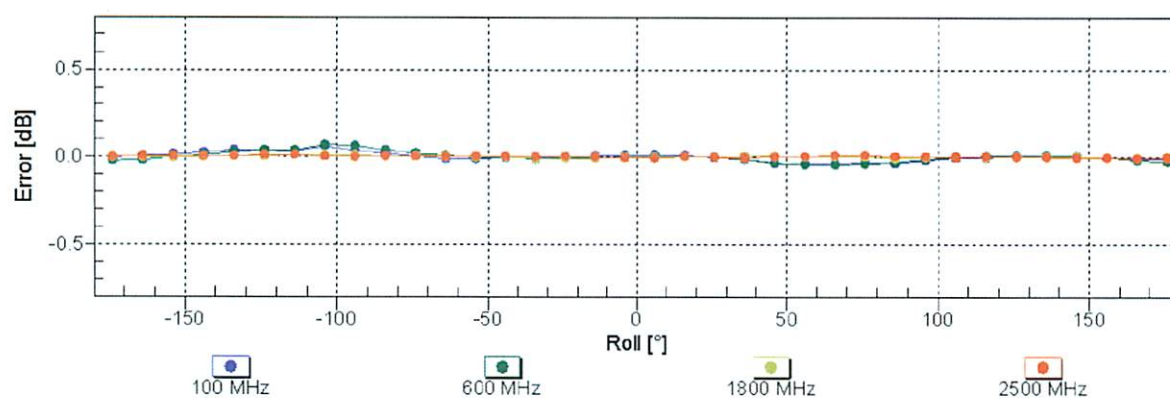
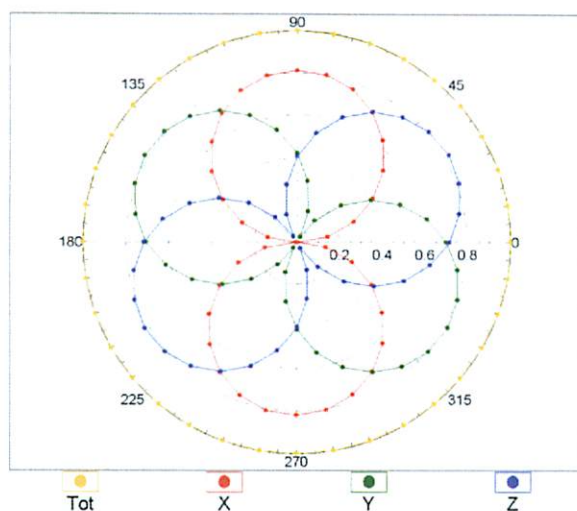
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

Receiving Pattern (ϕ), $\vartheta = 0^\circ$

f=600 MHz,TEM

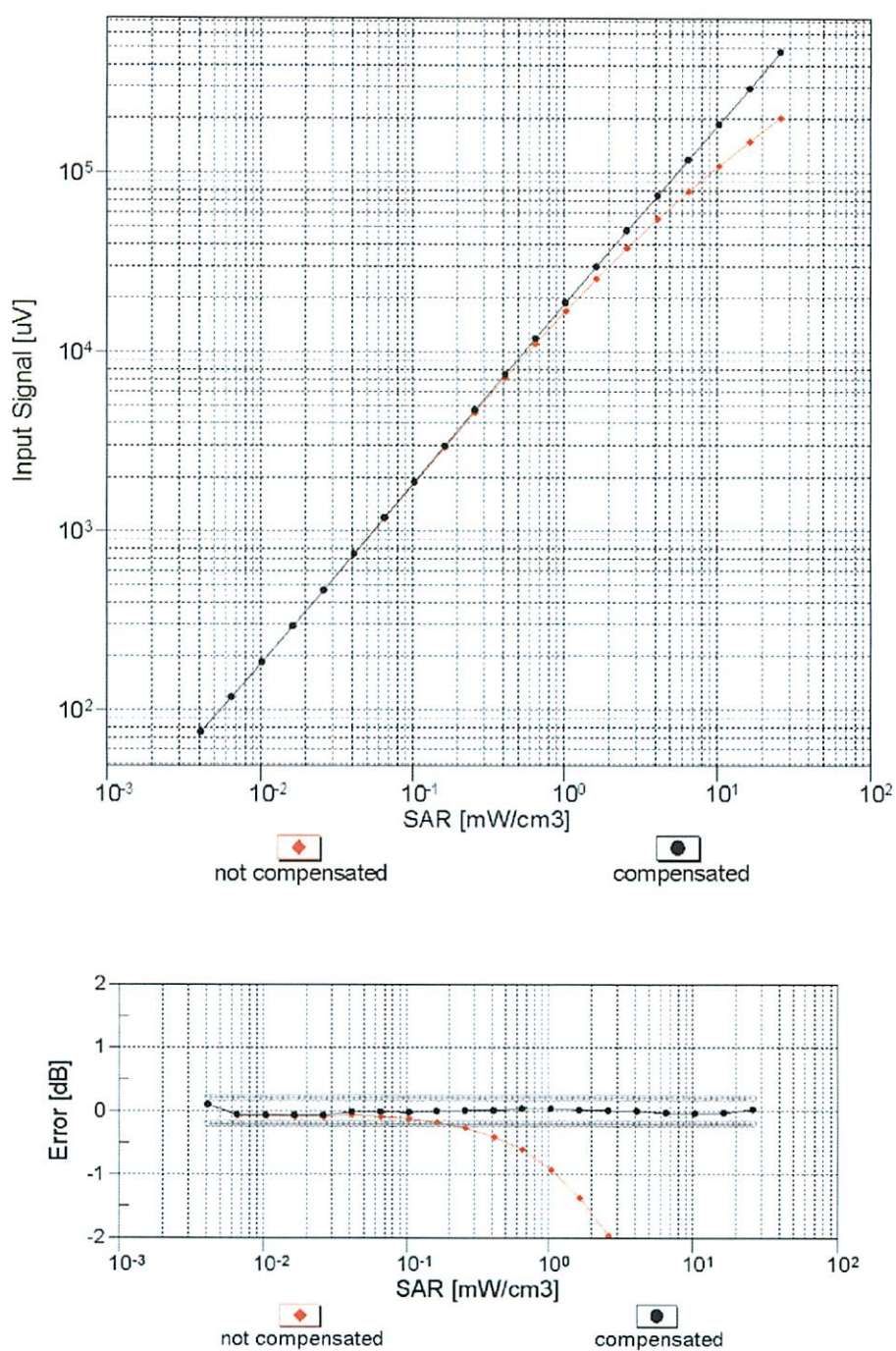


f=1800 MHz,R22



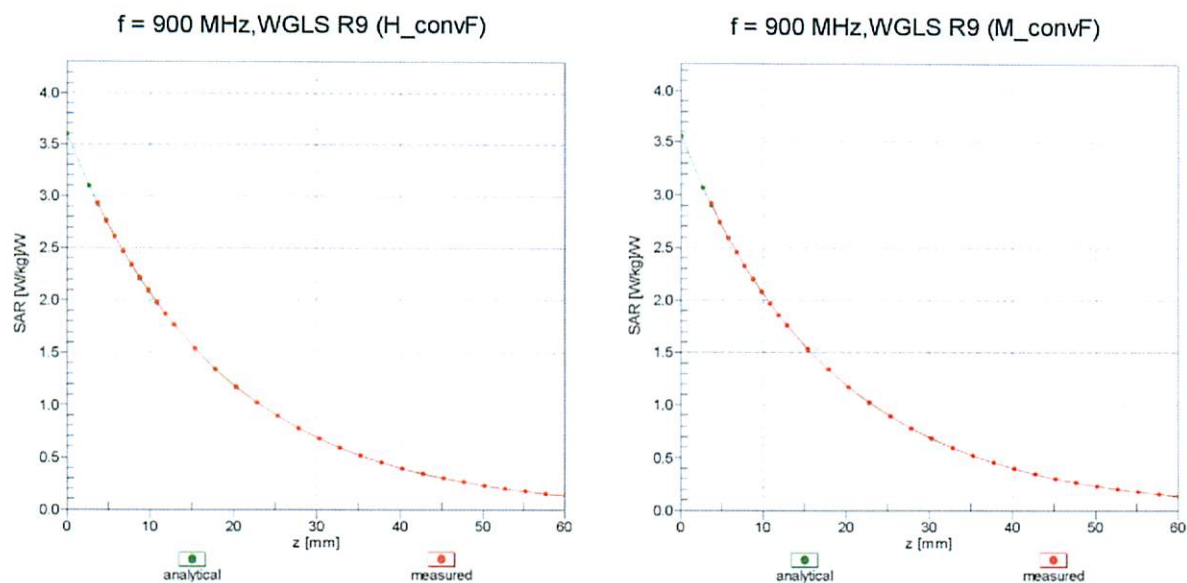
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

Dynamic Range $f(\text{SAR}_{\text{head}})$ (TEM cell , $f = 900 \text{ MHz}$)



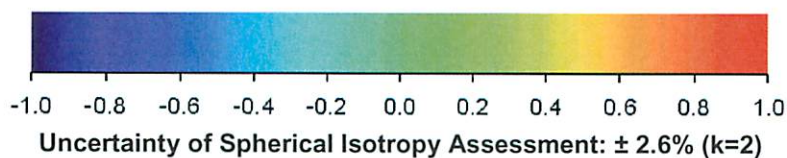
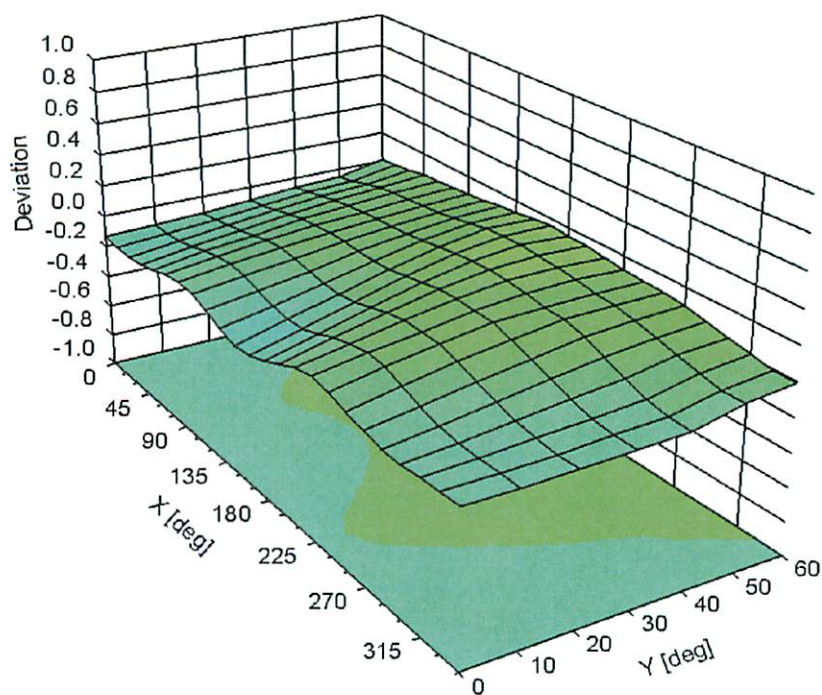
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ , θ), $f = 900 \text{ MHz}$



DASY/EASY - Parameters of Probe: ET3DV6 - SN:1590

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	6
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	6.8 mm
Probe Tip to Sensor X Calibration Point	2.7 mm
Probe Tip to Sensor Y Calibration Point	2.7 mm
Probe Tip to Sensor Z Calibration Point	2.7 mm
Recommended Measurement Distance from Surface	4 mm

Additional Conversion Factors

for Dosimetric E-Field Probe

Type:

ET3DV6

Serial Number:

1590

Place of Assessment:

Zurich

Date of Assessment:

April 29, 2013

Probe Calibration Date:

April 24, 2013

Schmid & Partner Engineering AG hereby certifies that conversion factor(s) of this probe have been evaluated on the date indicated above. The assessment was performed using the FDTD numerical code SEMCAD of Schmid & Partner Engineering AG. Since the evaluation is coupled with measured conversion factors, it has to be recalculated yearly, i.e., following the re-calibration schedule of the probe. The uncertainty of the numerical assessment is based on the extrapolation from measured value at 450, 835 and 900 MHz.

Assessed by:



Dosimetric E-Field Probe ET3DV6 SN:1590

Conversion factor ($\pm$ standard deviation)

150 $\pm$ 50 MHz *ConvF* 9.31 $\pm$ 10%

$\epsilon_r = 52.3 \pm 5\%$
 $\sigma = 0.76 \pm 5\%$ mho/m
 (head tissue)

300 $\pm$ 50 MHz *ConvF* 8.36 $\pm$ 9%

$\epsilon_r = 45.3 \pm 5\%$
 $\sigma = 0.87 \pm 5\%$ mho/m
 (head tissue)

150 $\pm$ 50 MHz *ConvF* 8.65 $\pm$ 10%

$\epsilon_r = 61.9 \pm 5\%$
 $\sigma = 0.80 \pm 5\%$ mho/m
 (body tissue)

300 $\pm$ 50 MHz *ConvF* 8.41 $\pm$ 9%

$\epsilon_r = 58.2 \pm 5\%$
 $\sigma = 0.92 \pm 5\%$ mho/m
 (body tissue)

Important Note:

For numerically assessed probe conversion factors, parameters Alpha and Delta in the DASY software must have the following entries: Alpha = 0 and Delta = 1.

Please see also DASY Manual.

	<u>Date(s) of Evaluation</u> Aug 16-20, 2013	<u>Test Report Serial No.</u> 081413ALH-1249S	<u>Test Report Revision No.</u> Rev. 1.1	
	<u>Test Report Issue Date</u> Aug. 23, 2013	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	
Test Lab Certificate No. 2470.01				

APPENDIX G - PHANTOM CERTIFICATE OF CONFORMITY

Applicant:	Kenwood USA Corporation	FCC ID:	ALH468800	IC ID:	282D-468800	KENWOOD
DUT Type:	Portable 700/800 PTT Radio Transceiver	Models:	TK-5410D-K2/K3	768-869 MHz		
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2378 Westlake Road
Kelowna, B.C. Canada
V1Z-2V2



Ph. # 250-769-6848
Fax # 250-769-6334
E-mail: barskiind@shaw.ca
Web: www.bcfiberglass.com

FIBERGLASS FABRICATORS

Certificate of Conformity

Item : Flat Planar Phantom Unit # 03-01
Date: June 16, 2003
Manufacturer: Barski Industries (1985 Ltd)

Test	Requirement	Details
Shape	Compliance to geometry according to drawing	Supplied CAD drawing
Material Thickness	Compliant with the requirements	2mm +/- 0.2mm in measurement area
Material Parameters	Dielectric parameters for required frequencies Based on Dow Chemical technical data	100 MHz-5 GHz Relative permittivity<5 Loss Tangent<0.05

Conformity

Based on the above information, we certify this product to be compliant to the requirements specified.

Signature: _____

A handwritten signature in black ink, appearing to read 'Daniel Chailier', is written over a horizontal line.

Daniel Chailier



Fiberglass Planar Phantom - Top View



Fiberglass Planar Phantom - Front View



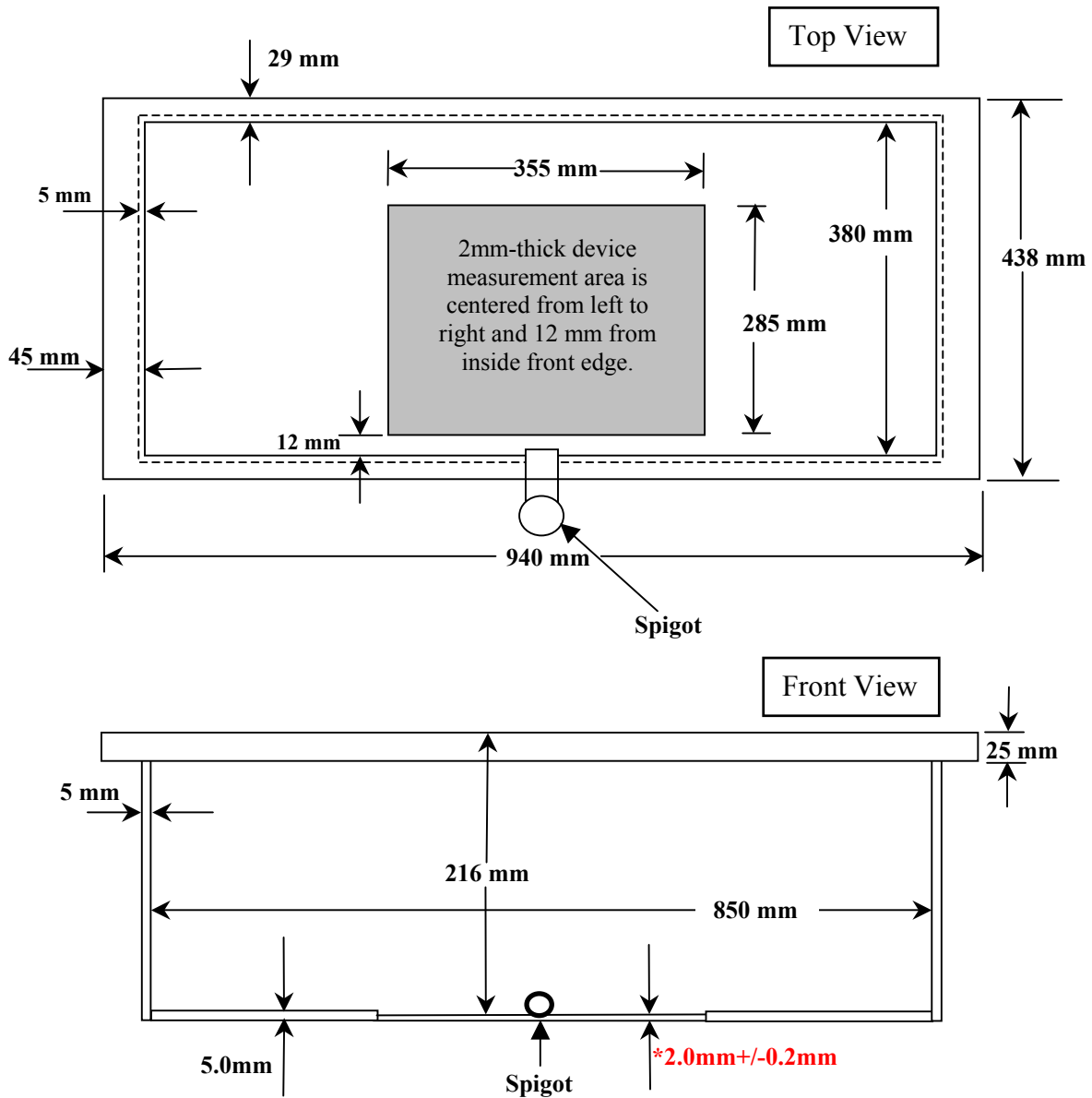
Fiberglass Planar Phantom - Back View



Fiberglass Planar Phantom - Bottom View

Dimensions of Fiberglass Planar Phantom

(Manufactured by Barski Industries Ltd. - Unit# 03-01)



**Note: Measurements that aren't repeated for the opposite sides are the same as the side measured.
This drawing is not to scale.**