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Accreditation No.: **SCS 0108**

Client **Sporton**

Certificate No: **DAE4-1358\_Apr20**

**CALIBRATION CERTIFICATE**

Object **DAE4 - SD 000 D04 BN - SN: 1358**

Calibration procedure(s) **QA CAL-06.v30  
Calibration procedure for the data acquisition electronics (DAE)**

Calibration date: **April 28, 2020**

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
Keithley Multimeter Type 2001	SN: 0810278	03-Sep-19 (No:25949)	Sep-20
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Auto DAE Calibration Unit	SE UWS 053 AA 1001	09-Jan-20 (in house check)	In house check: Jan-21
Calibrator Box V2.1	SE UMS 006 AA 1002	09-Jan-20 (in house check)	In house check: Jan-21

Calibrated by:	Name <b>Eric Hainfeld</b>	Function Laboratory Technician	Signature 
Approved by:	Sven Kühn	Deputy Manager	

Issued: April 29, 2020

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## Glossary

DAE	data acquisition electronics
Connector angle	information used in DASY system to align probe sensor X to the robot coordinate system.

## Methods Applied and Interpretation of Parameters

- *DC Voltage Measurement:* Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle:* The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
  - *DC Voltage Measurement Linearity:* Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
  - *Common mode sensitivity:* Influence of a positive or negative common mode voltage on the differential measurement.
  - *Channel separation:* Influence of a voltage on the neighbor channels not subject to an input voltage.
  - *AD Converter Values with inputs shorted:* Values on the internal AD converter corresponding to zero input voltage
  - *Input Offset Measurement:* Output voltage and statistical results over a large number of zero voltage measurements.
  - *Input Offset Current:* Typical value for information; Maximum channel input offset current, not considering the input resistance.
  - *Input resistance:* Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
  - *Low Battery Alarm Voltage:* Typical value for information. Below this voltage, a battery alarm signal is generated.
  - *Power consumption:* Typical value for information. Supply currents in various operating modes.

## DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1 $\mu$ V , full range = -100...+300 mV

Low Range: 1LSB = 61nV , full range = -1.....+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	403.411 $\pm$ 0.02% (k=2)	403.452 $\pm$ 0.02% (k=2)	403.463 $\pm$ 0.02% (k=2)
Low Range	3.96158 $\pm$ 1.50% (k=2)	3.98747 $\pm$ 1.50% (k=2)	3.99174 $\pm$ 1.50% (k=2)

## Connector Angle

Connector Angle to be used in DASY system	113.5 $^{\circ}$ $\pm$ 1 $^{\circ}$
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## Appendix (Additional assessments outside the scope of SCS0108)

### 1. DC Voltage Linearity

High Range	Reading ( $\mu\text{V}$ )	Difference ( $\mu\text{V}$ )	Error (%)
Channel X + Input	200024.85	-8.32	-0.00
Channel X + Input	20005.36	0.39	0.00
Channel X - Input	-20003.50	2.72	-0.01
Channel Y + Input	200030.06	-2.90	-0.00
Channel Y + Input	20004.14	-0.70	-0.00
Channel Y - Input	-20008.00	-1.63	0.01
Channel Z + Input	200034.52	1.89	0.00
Channel Z + Input	20005.02	0.16	0.00
Channel Z - Input	-20007.28	-0.87	0.00

Low Range	Reading ( $\mu\text{V}$ )	Difference ( $\mu\text{V}$ )	Error (%)
Channel X + Input	2000.94	0.03	0.00
Channel X + Input	200.94	0.01	0.01
Channel X - Input	-198.93	0.16	-0.08
Channel Y + Input	2000.58	-0.17	-0.01
Channel Y + Input	199.97	-0.81	-0.40
Channel Y - Input	-200.24	-0.99	0.50
Channel Z + Input	2000.83	0.21	0.01
Channel Z + Input	199.97	-0.67	-0.34
Channel Z - Input	-199.90	-0.63	0.32

### 2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading ( $\mu\text{V}$ )	Low Range Average Reading ( $\mu\text{V}$ )
Channel X	200	23.26	21.16
	- 200	-21.29	-22.70
Channel Y	200	-27.83	-28.04
	- 200	26.48	26.49
Channel Z	200	-11.47	-11.06
	- 200	9.80	9.70

### 3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Input Voltage (mV)	Channel X ( $\mu\text{V}$ )	Channel Y ( $\mu\text{V}$ )	Channel Z ( $\mu\text{V}$ )
Channel X	200	-	1.92	-3.40
Channel Y	200	8.27	-	3.32
Channel Z	200	9.47	5.42	-

#### 4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	15579	16774
Channel Y	16044	14871
Channel Z	16074	16518

#### 5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Input 10M $\Omega$

	Average ( $\mu$ V)	min. Offset ( $\mu$ V)	max. Offset ( $\mu$ V)	Std. Deviation ( $\mu$ V)
Channel X	0.87	-0.93	1.98	0.46
Channel Y	-0.62	-1.71	0.15	0.38
Channel Z	-0.46	-1.45	0.52	0.39

#### 6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

#### 7. Input Resistance (Typical values for information)

	Zeroing (kOhm)	Measuring (MOhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

#### 8. Low Battery Alarm Voltage (Typical values for information)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

#### 9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+6	+14
Supply (- Vcc)	-0.01	-8	-9



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Accreditation No.: **SCS 0108**

Client **Sporton**

Certificate No: **EX3-3935\_May20**

## CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3935**

Calibration procedure(s) **QA CAL-01.v9, QA CAL-14.v5, QA CAL-23.v5, QA CAL-25.v7  
Calibration procedure for dosimetric E-field probes**

Calibration date: **May 27, 2020**

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 NRP	SN: 104778	01-Apr-20 (No. 217-03100/03101)	Apr-21
Power sensor NRP-Z91	SN: 103244	01-Apr-20 (No. 217-03100)	Apr-21
Power sensor NRP-Z91	SN: 103245	01-Apr-20 (No. 217-03101)	Apr-21
Reference 20 dB Attenuator	SN: CC2552 (20x)	31-Mar-20 (No. 217-03106)	Apr-21
DAE4	SN: 660	27-Dec-19 (No. DAE4-660_Dec19)	Dec-20
Reference Probe ES3DV2	SN: 3013	31-Dec-19 (No. ES3-3013_Dec19)	Dec-20
Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-18)	In house check: Jun-20
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-18)	In house check: Jun-20
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-18)	In house check: Jun-20
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-18)	In house check: Jun-20
Network Analyzer E8358A	SN: US41080477	31-Mar-14 (in house check Oct-19)	In house check: Oct-20

Calibrated by:	Name <b>Leif Klysner</b>	Function Laboratory Technician	Signature 
Approved by:	Name <b>Katja Pokovic</b>	Function Technical Manager	Signature 

Issued: June 1, 2020

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### Glossary:

TSL	tissue simulating liquid
NORM <sub>x,y,z</sub>	sensitivity in free space
ConvF	sensitivity in TSL / NORM <sub>x,y,z</sub>
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization $\varphi$	$\varphi$ rotation around probe axis
Polarization $\vartheta$	$\vartheta$ 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
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:

- 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
- IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

### Methods Applied and Interpretation of Parameters:

- NORM<sub>x,y,z</sub>**: Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not affect the E<sup>2</sup>-field uncertainty inside TSL (see below ConvF).
- NORM(f)<sub>x,y,z</sub>** = NORM<sub>x,y,z</sub> \* 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<sub>x,y,z</sub>**: 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<sub>x,y,z</sub>; B<sub>x,y,z</sub>; C<sub>x,y,z</sub>; D<sub>x,y,z</sub>; VR<sub>x,y,z</sub>**: 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<sub>x,y,z</sub> \* 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  $\pm 50$  MHz to  $\pm 100$  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 NORM<sub>x</sub> (no uncertainty required).

## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3935

### Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup>	0.49	0.53	0.48	± 10.1 %
DCP (mV) <sup>B</sup>	102.6	103.2	102.3	

### Calibration Results for Modulation Response

UID	Communication System Name		A dB	B dB $\sqrt{\mu\text{V}}$	C	D dB	VR mV	Max dev.	Unc <sup>E</sup> (k=2)
0	CW	X	0.0	0.0	1.0	0.00	137.0	± 3.3 %	± 4.7 %
		Y	0.0	0.0	1.0		150.1		
		Z	0.0	0.0	1.0		141.6		

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%.

<sup>A</sup> The uncertainties of Norm X,Y,Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Page 5).

<sup>B</sup> Numerical linearization parameter: uncertainty not required.

<sup>E</sup> 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: EX3DV4 - SN:3935

### Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	44.5
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

## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3935

### Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) <sup>C</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m) <sup>F</sup>	ConvF X	ConvF Y	ConvF Z	Alpha <sup>G</sup>	Depth (mm) <sup>G</sup>	Unc (k=2)
750	41.9	0.89	10.58	10.58	10.58	0.57	0.80	± 12.0 %
835	41.5	0.90	10.31	10.31	10.31	0.38	0.93	± 12.0 %
900	41.5	0.97	10.16	10.16	10.16	0.40	0.88	± 12.0 %
1750	40.1	1.37	8.60	8.60	8.60	0.27	0.86	± 12.0 %
1900	40.0	1.40	8.35	8.35	8.35	0.24	0.86	± 12.0 %
2000	40.0	1.40	8.25	8.25	8.25	0.34	0.86	± 12.0 %
2300	39.5	1.67	7.86	7.86	7.86	0.35	0.90	± 12.0 %
2450	39.2	1.80	7.60	7.60	7.60	0.33	0.90	± 12.0 %
2600	39.0	1.96	7.43	7.43	7.43	0.37	0.90	± 12.0 %
5250	35.9	4.71	5.04	5.04	5.04	0.40	1.80	± 14.0 %
5600	35.5	5.07	4.76	4.76	4.76	0.40	1.80	± 14.0 %
5750	35.4	5.22	4.67	4.67	4.67	0.40	1.80	± 14.0 %

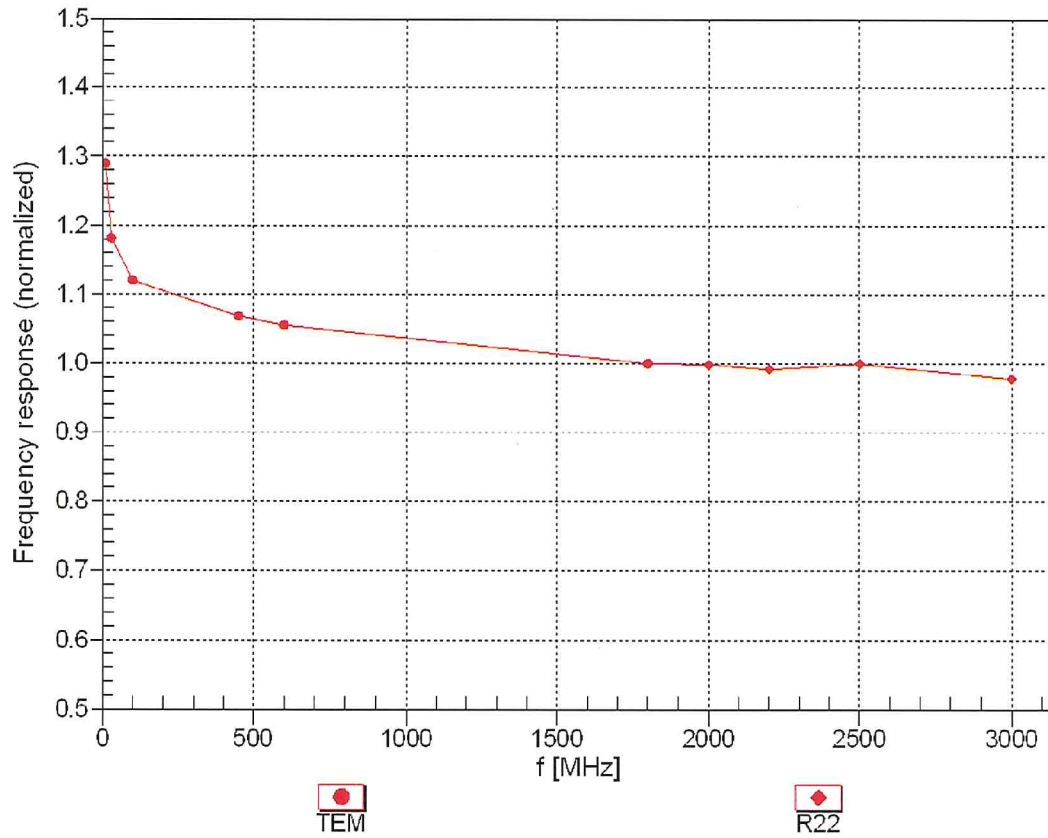
<sup>C</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Validity of ConvF assessed at 6 MHz is 4-9 MHz, and ConvF assessed at 13 MHz is 9-19 MHz. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<sup>F</sup> At frequencies up to 6 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> 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.

# Frequency Response of E-Field

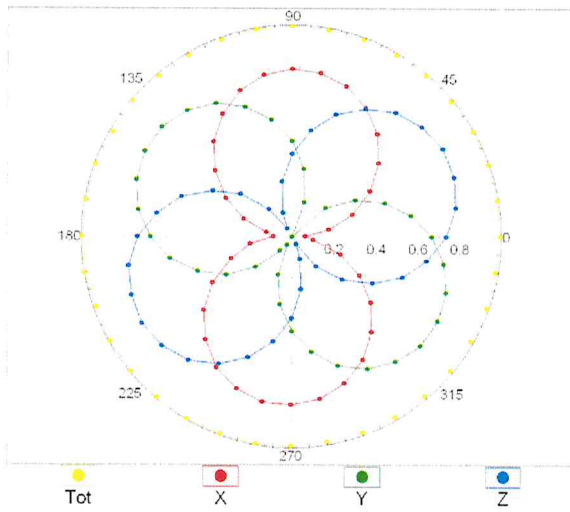
(TEM-Cell:ifi110 EXX, Waveguide: R22)



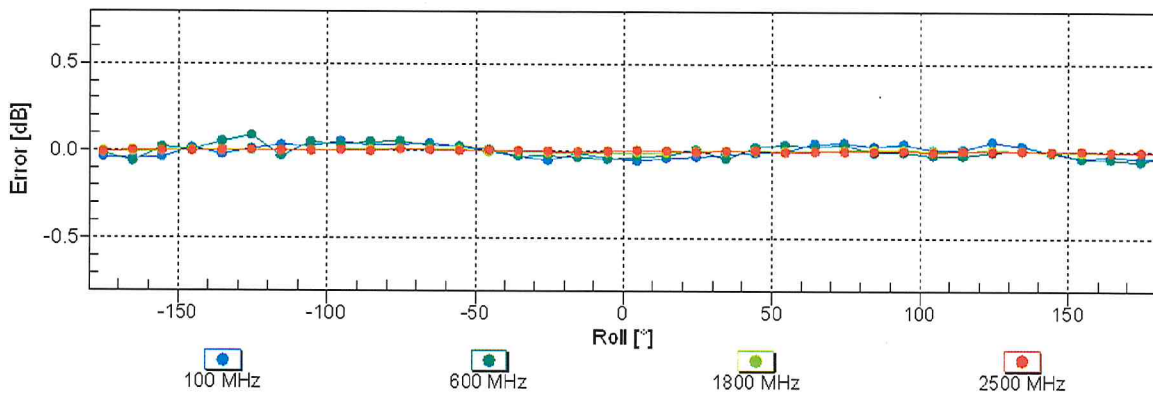
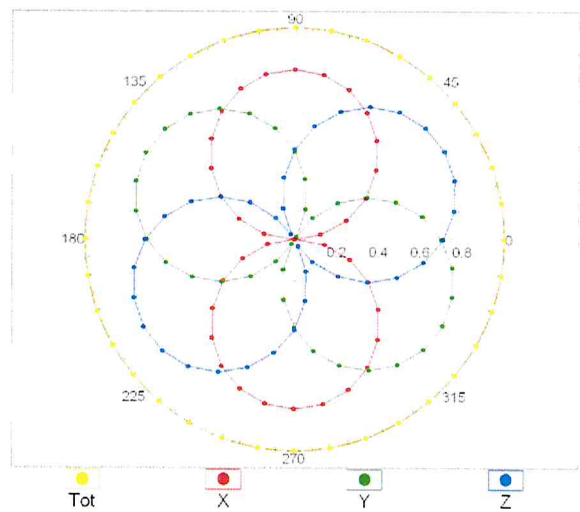
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  (k=2)

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

f=600 MHz,TEM

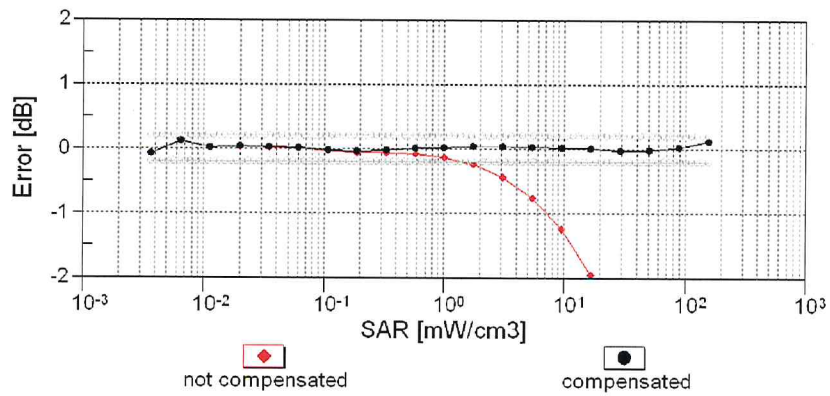
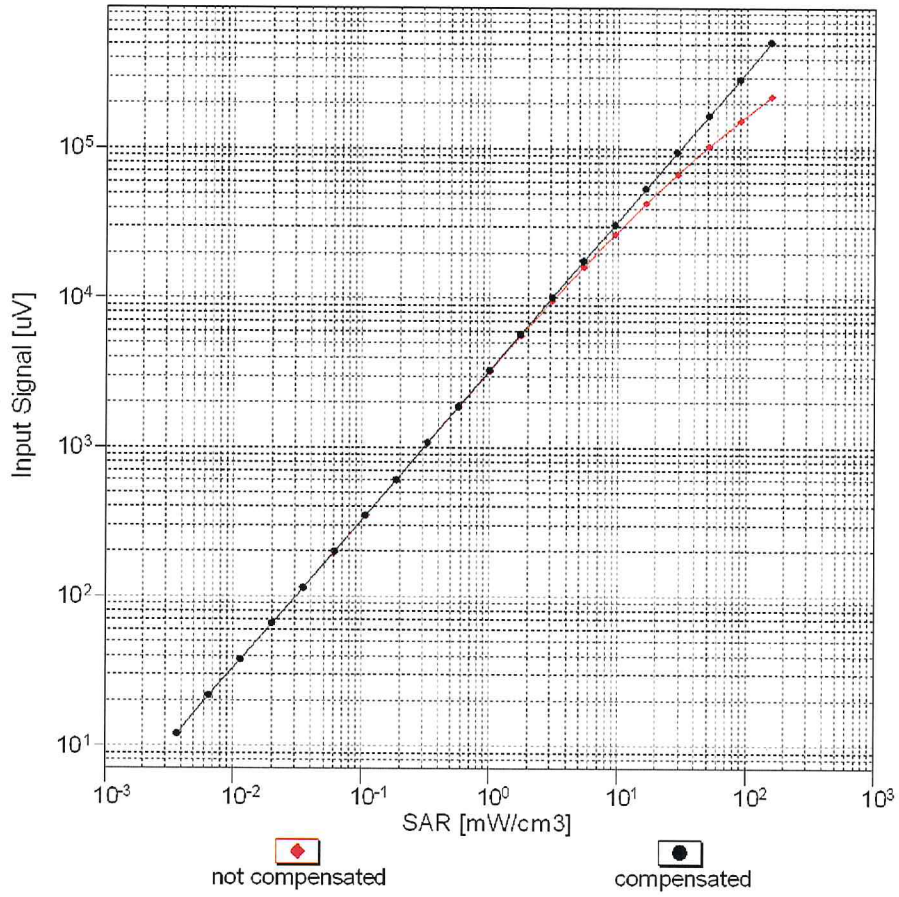


f=1800 MHz,R22



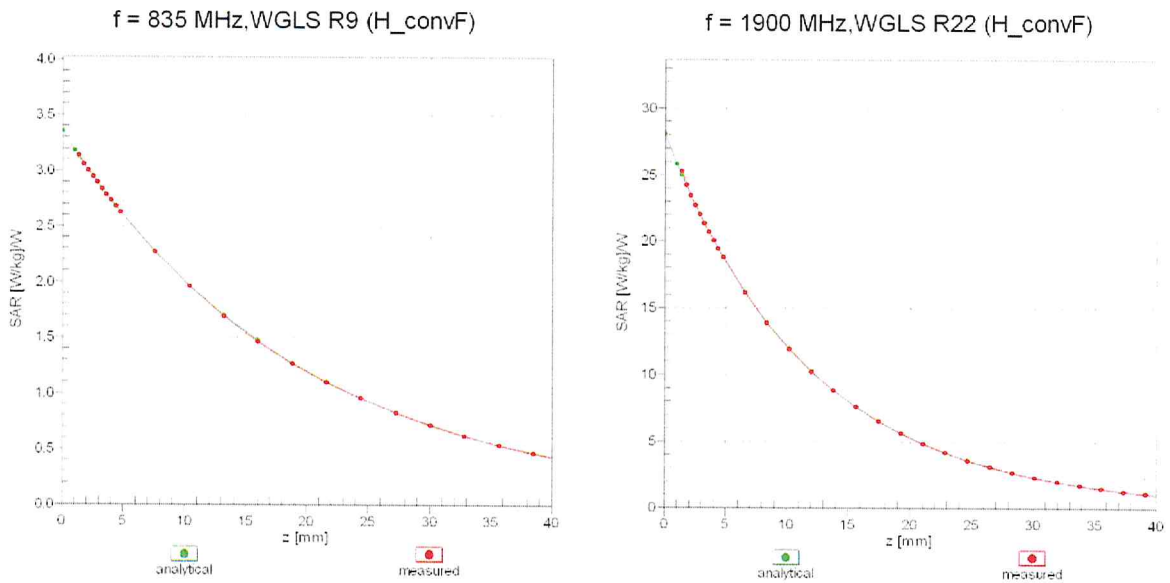
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  (k=2)

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

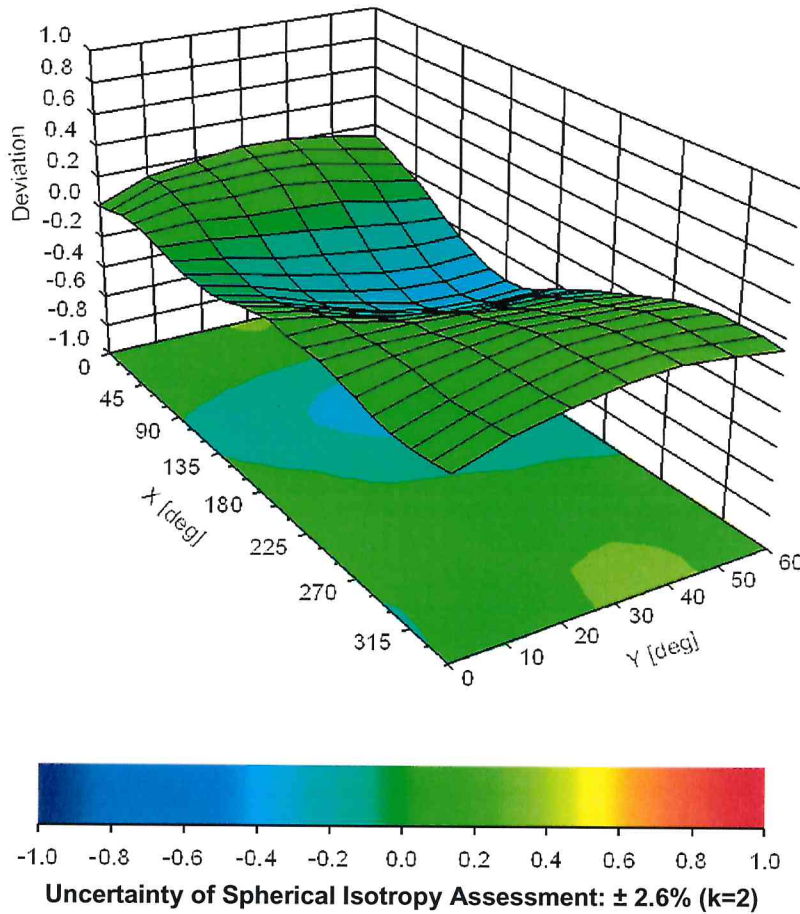


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

# Conversion Factor Assessment



## Deviation from Isotropy in Liquid Error ( $\phi, \vartheta$ ), f = 900 MHz





**Appendix E. Conducted RF Output Power Table**

The detailed power tables are shown as follows.



### Power Level for Receiver on

GSM850 TX Channel	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame Average Power (dBm)			Tune-up Limit (dBm)
	192	195	251		192	193	251	
Frequency (MHz)	824.2	838.4	848.8	33.50	824.2	838.4	848.8	24.50
GSM 1 Tx slot	32.36	32.39	32.32	33.50	23.36	23.39	23.32	24.50
GPRS 1 Tx slot	32.35	32.38	32.30	33.50	23.35	23.38	23.30	24.50
GPRS 2 Tx slots	31.57	31.60	31.51	32.50	25.57	25.60	25.51	26.50
GPRS 3 Tx slots	29.85	29.85	29.75	30.50	25.59	25.59	25.49	26.24
GPRS 4 Tx slots	28.68	28.69	28.59	29.50	25.68	25.69	25.59	26.56
EDGE 1 Tx slot	26.67	26.65	26.41	27.50	17.67	17.65	17.41	18.50
EDGE 2 Tx slots	25.41	25.34	25.16	26.50	19.41	19.34	19.16	20.50
EDGE 3 Tx slots	23.01	22.90	22.66	23.50	18.75	18.64	18.40	19.24
EDGE 4 Tx slots	21.81	21.71	21.45	22.50	18.81	18.71	18.45	19.50

GSM 1900 TX Channel	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame Average Power (dBm)			Tune-up Limit (dBm)
	512	661	810		512	661	810	
Frequency (MHz)	1850.2	1880	1909.8	30.50	1850.2	1880	1909.8	21.50
GSM 1 Tx slot	28.76	29.24	28.83	30.50	19.76	20.24	19.83	21.50
GPRS 1 Tx slot	28.75	29.23	28.80	30.50	19.75	20.23	19.80	21.50
GPRS 2 Tx slots	28.03	28.50	28.08	29.50	22.03	22.50	22.08	23.50
GPRS 3 Tx slots	26.23	26.50	26.36	27.50	21.97	22.24	22.10	23.24
GPRS 4 Tx slots	25.08	25.45	25.25	26.50	22.08	22.45	22.25	23.66
EDGE 1 Tx slot	24.69	25.11	25.06	26.50	15.69	16.11	16.06	17.50
EDGE 2 Tx slots	23.70	24.12	24.08	25.00	17.70	18.12	18.08	19.00
EDGE 3 Tx slots	21.74	22.14	22.08	23.00	17.48	17.88	17.82	18.74
EDGE 4 Tx slots	20.98	21.08	21.03	22.00	17.98	18.08	18.03	19.00

Band TX Channel	WCDMA II			Tune-up Limit (dBm)	WCDMA V			Tune-up Limit (dBm)
	9262	9400	9538		4132	4182	4233	
Rx Channel	9662	9800	9938		4357	4407	4458	
Frequency (MHz)	1852.4	1880	1907.6	30.50	826.4	836.4	846.6	24.00
3GPP Rel 99 AMR 12.2Kbps	22.61	22.88	22.85	24.00	22.94	23.04	23.01	24.00
3GPP Rel 99 RMC 12.2Kbps	22.62	22.89	22.88	24.00	22.99	23.06	23.04	24.00
3GPP Rel 6 HSDPA Subtest-1	21.58	21.69	21.66	23.00	21.95	21.79	21.82	23.00
3GPP Rel 6 HSDPA Subtest-2	21.59	21.58	21.65	23.00	21.88	21.82	21.83	23.00
3GPP Rel 6 HSDPA Subtest-3	21.06	21.11	21.20	22.50	21.40	21.34	21.35	22.50
3GPP Rel 6 HSDPA Subtest-4	21.07	21.04	21.14	22.50	21.41	21.35	21.33	22.50
3GPP Rel 8 DC-HSDPA Subtest-1	21.55	21.68	21.62	23.00	21.93	21.78	21.79	23.00
3GPP Rel 8 DC-HSDPA Subtest-2	21.56	21.57	21.61	23.00	21.86	21.81	21.80	23.00
3GPP Rel 8 DC-HSDPA Subtest-3	21.03	21.10	21.16	22.50	21.38	21.33	21.32	22.50
3GPP Rel 8 DC-HSDPA Subtest-4	21.04	21.03	21.10	22.50	21.39	21.34	21.30	22.50
3GPP Rel 6 HSUPA Subtest-1	21.69	21.51	21.39	23.00	22.03	22.02	21.81	23.00
3GPP Rel 6 HSUPA Subtest-2	19.78	19.53	19.51	21.00	20.01	19.90	19.97	21.00
3GPP Rel 6 HSUPA Subtest-3	20.67	20.54	20.34	22.00	20.81	20.78	20.71	22.00
3GPP Rel 6 HSUPA Subtest-4	19.82	19.51	19.51	21.00	19.92	19.79	19.79	21.00
3GPP Rel 6 HSUPA Subtest-5	21.70	21.68	21.56	23.00	22.03	21.92	21.90	23.00
3GPP Rel 7 HSPA+ (16QAM) Subtest-1	19.77	19.80	19.78	20.50	19.84	20.02	19.92	20.50









### Power Level for Receiver off

GSM850 TX Channel	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame Average Power (dBm)			Tune-up Limit (dBm)
	128	189	251		128	189	251	
Frequency (Mhz)	824.2	836.4	848.8		824.2	836.4	848.8	
GSM 1 Tx slot	32.36	32.39	32.32	33.50	23.36	23.39	23.32	24.50
GPRS 1 Tx slots	32.35	32.38	32.30	33.50	23.35	23.38	23.30	24.50
GPRS 2 Tx slots	31.57	31.60	31.51	32.50	25.57	25.60	25.51	26.50
GPRS 3 Tx slots	29.85	29.85	29.75	30.50	25.59	25.59	25.49	26.24
GPRS 4 Tx slots	28.68	28.69	28.59	29.50	25.68	25.69	25.59	26.50
EDGE 1 Tx slot	26.67	26.65	26.41	27.50	17.67	17.65	17.41	18.50
EDGE 2 Tx slots	25.41	25.34	25.16	26.50	19.41	19.34	19.16	20.50
EDGE 3 Tx slots	23.01	22.90	22.66	23.50	18.75	18.64	18.40	19.24
EDGE 4 Tx slots	21.81	21.71	21.45	22.50	18.81	18.71	18.45	19.50

GSM1900 TX Channel	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame Average Power (dBm)			Tune-up Limit (dBm)
	512	661	810		512	661	810	
Frequency (Mhz)	1850.2	1880	1909.8		1850.2	1880	1909.8	
GSM 1 Tx slot	27.06	27.15	27.14	28.00	18.06	18.15	18.14	19.00
GPRS 1 Tx slots	27.12	27.16	27.15	28.00	18.12	18.16	18.15	19.00
GPRS 2 Tx slots	26.19	26.22	26.24	27.00	20.19	20.22	20.24	21.00
GPRS 3 Tx slots	24.17	24.21	24.28	25.00	19.91	19.95	20.02	20.74
GPRS 4 Tx slots	23.09	23.14	23.22	24.00	20.09	20.14	20.22	21.00
EDGE 1 Tx slot	22.56	22.97	22.91	24.00	13.56	13.97	13.91	15.00
EDGE 2 Tx slots	21.56	21.97	21.96	22.50	15.56	15.97	15.96	16.50
EDGE 3 Tx slots	19.57	20.02	19.93	20.50	15.31	15.76	15.67	16.24
EDGE 4 Tx slots	18.84	18.93	18.91	19.50	15.84	15.93	15.91	16.50

Band TX Channel	WCDMA II			Tune-up Limit (dBm)	WCDMA V			Tune-up Limit (dBm)	
	9282	9400	9538		4132	4162	4233		
Rx Channel	9682	9600	9938		4357	4407	4458		
Frequency (Mhz)	1852.4	1880	1907.6		626.4	636.4	646.6		
3GPP Rel 99	AMR 12.2Kbps	16.90	17.03	16.91	18.50	22.94	23.04	23.01	24.00
3GPP Rel 99	RMC 12.2Kbps	17.02	17.05	16.99	18.50	22.99	23.05	23.04	24.00
3GPP Rel 6	HSDPA Subtest-1	16.00	15.91	15.99	17.50	21.95	21.79	21.82	23.00
3GPP Rel 6	HSDPA Subtest-2	15.97	15.83	15.94	17.50	21.88	21.82	21.83	23.00
3GPP Rel 6	HSDPA Subtest-3	15.51	15.48	15.46	17.00	21.40	21.34	21.35	22.50
3GPP Rel 6	HSDPA Subtest-4	15.54	15.45	15.44	17.00	21.41	21.35	21.33	22.50
3GPP Rel 8	DC-HSDPA Subtest-1	15.92	15.83	15.99	17.50	21.93	21.78	21.79	23.00
3GPP Rel 8	DC-HSDPA Subtest-2	16.03	15.81	15.93	17.50	21.86	21.81	21.80	23.00
3GPP Rel 8	DC-HSDPA Subtest-3	15.55	15.41	15.48	17.00	21.38	21.33	21.32	22.50
3GPP Rel 8	DC-HSDPA Subtest-4	15.54	15.48	15.52	17.00	21.39	21.34	21.30	22.50
3GPP Rel 6	HSUPA Subtest-1	15.92	15.91	16.03	17.50	22.03	22.02	21.81	23.00
3GPP Rel 6	HSUPA Subtest-2	14.11	14.05	14.18	15.50	20.01	19.90	19.97	21.00
3GPP Rel 6	HSUPA Subtest-3	15.18	15.03	14.98	16.50	20.81	20.78	20.71	22.00
3GPP Rel 6	HSUPA Subtest-4	14.11	14.18	14.21	15.50	19.92	19.79	19.79	21.00
3GPP Rel 6	HSUPA Subtest-5	15.80	15.70	15.70	17.50	22.03	21.92	21.90	23.00
3GPP Rel 7	HSPA+ (16QAM) Subtest-1	14.34	14.46	14.30	15.00	19.84	20.02	19.92	20.50





2.4GHz WLAN		Ant 1				
2.4GHz WLAN	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
	802.11b 1Mbps	1	2412	16.63	17.50	100.00
		6	2437	16.83	17.50	
		11	2462	16.59	17.50	
	802.11g 6Mbps	1	2412	16.26	17.50	96.97
		6	2437	16.67	17.50	
		11	2462	16.40	17.50	
	802.11n-HT20 MCS0	1	2412	16.19	17.50	96.24
		6	2437	16.59	17.50	
		11	2462	16.33	17.50	

Bluetooth BR/EDR					
Mode	Channel	Frequency (MHz)	Average power (dBm)		
			1Mbps	2Mbps	3Mbps
BR / EDR	CH 00	2402	9.50	8.12	8.05
	CH 39	2441	10.04	8.30	8.31
	CH 78	2480	10.28	8.71	8.74
Tune-up Limit			11	9.5	9.5

Bluetooth LE 4.0				
Mode	Channel	Frequency (MHz)	Average power (dBm)	
			GFSK	
LE	CH 00	2402	-2.95	
	CH 19	2440	-2.05	
	CH 39	2480	-2.60	
Tune-up Limit			0	

Bluetooth LE 5.0			
Mode	Channel	Frequency (MHz)	Average power (dBm)
			1Mbps
LE	CH 00	2402	-2.94
	CH 19	2440	-2.06
	CH 39	2480	-2.60
Tune-up Limit			0