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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 report provide only calibration results for DAE, it does not contain other performance test results.

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DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1μV , 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	404.170 ± 0.15% (k=2)	404.438 ± 0.15% (k=2)	403.912 ± 0.15% (k=2)
Low Range	3.98794 ± 0.7% (k=2)	3.95138 ± 0.7% (k=2)	3.96549 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	173.5° ± 1 °

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CNAS L0570

Client : SGS Certificate No: Z21-60113

CALIBRATION CERTIFICATE

Object	DAE4 - SN: 1428
Calibration Procedure(s)	FF-Z11-002-01 Calibration Procedure for the Data Acquisition Electronics (DAEx)
Calibration date:	April 09, 2021

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)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Process Calibrator 753	1971018	16-Jun-20 (CTTL, No.J20X04342)	Jun-21

	Name	Function	Signature
Calibrated by:	Yu Zongying	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: April 11, 2021

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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 report provide only calibration results for DAE, it does not contain other performance test results.

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DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1μV , 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	405.135 ± 0.15% (k=2)	404.943 ± 0.15% (k=2)	404.956 ± 0.15% (k=2)
Low Range	3.98827 ± 0.7% (k=2)	3.97066 ± 0.7% (k=2)	4.01012 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	163° ± 1 °

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Client : SGS

Certificate No: Z21-60452

CALIBRATION CERTIFICATE

Object	DAE4 - SN: 1374
Calibration Procedure(s)	FF-Z11-002-01 Calibration Procedure for the Data Acquisition Electronics (DAEx)
Calibration date:	November 05, 2021

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(Calibrated by, Certificate No.)	Scheduled Calibration
Process Calibrator 753	1971018	15-Jun-21 (CTTL, No.J21X04465)	Jun-22

	Name	Function	Signature
Calibrated by:	Yu Zongying	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: November 07, 2021

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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 report provide only calibration results for DAE, it does not contain other performance test results.

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DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1μV , 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	403.656 ± 0.15% (k=2)	403.905 ± 0.15% (k=2)	404.182 ± 0.15% (k=2)
Low Range	3.98282 ± 0.7% (k=2)	3.96811 ± 0.7% (k=2)	3.98981 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	43° ± 1 °

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Client Innowave (Auden)

Certificate No: EX3-7620_Aug21

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:7620

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

Calibration date: August 24, 2021

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	09-Apr-21 (No. 217-03291/03292)	Apr-22
Power sensor NRP-Z91	SN: 103244	09-Apr-21 (No. 217-03291)	Apr-22
Power sensor NRP-Z91	SN: 103245	09-Apr-21 (No. 217-03292)	Apr-22
Reference 20 dB Attenuator	SN: CC2552 (20x)	09-Apr-21 (No. 217-03343)	Apr-22
DAE4	SN: 660	23-Dec-20 (No. DAE4-660_Dec20)	Dec-21
Reference Probe ES3DV2	SN: 3013	30-Dec-20 (No. ES3-3013_Dec20)	Dec-21
Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-20)	In house check: Jun-22
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-20)	In house check: Jun-22
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-20)	In house check: Jun-22
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-20)	In house check: Jun-22
Network Analyzer E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-21

	Name	Function	Signature
Calibrated by:	Leif Klysner	Laboratory Technician	
Approved by:	Niels Kuster	Quality Manager	

Issued: September 6, 2021

Calibration Laboratory of
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Accreditation No.: SCS 0108

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) IEC/IEEE 62209-1528, "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

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).

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7620

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.66	0.62	0.60	± 10.1 %
DCP (mV)[B]	108.9	109.7	108.6	

Calibration Results for Modulation Response

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Max dev.	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	147.0	±3.3 %	± 4.7 %
		Y	0.0	0.0	1.0		133.5		
		Z	0.0	0.0	1.0		132.8		

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 Norm X,Y,Z do not affect the E^2-field uncertainty inside TSL (see Page 5).
[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: EX3DV4 - SN:7620

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	148.1
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

Note: Measurement distance from surface can be increased to 3-4 mm for an *Area Scan* job.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7620

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)	Unc (k=2)
750	41.9	0.89	10.79	10.79	10.79	0.45	0.80	± 12.0 %
835	41.5	0.90	10.33	10.33	10.33	0.30	1.11	± 12.0 %
1750	40.1	1.37	8.97	8.97	8.97	0.32	0.85	± 12.0 %
1900	40.0	1.40	8.67	8.67	8.67	0.38	0.85	± 12.0 %
2300	39.5	1.67	8.58	8.58	8.58	0.36	0.90	± 12.0 %
2450	39.2	1.80	8.29	8.29	8.29	0.29	0.90	± 12.0 %
2600	39.0	1.96	7.97	7.97	7.97	0.37	0.90	± 12.0 %

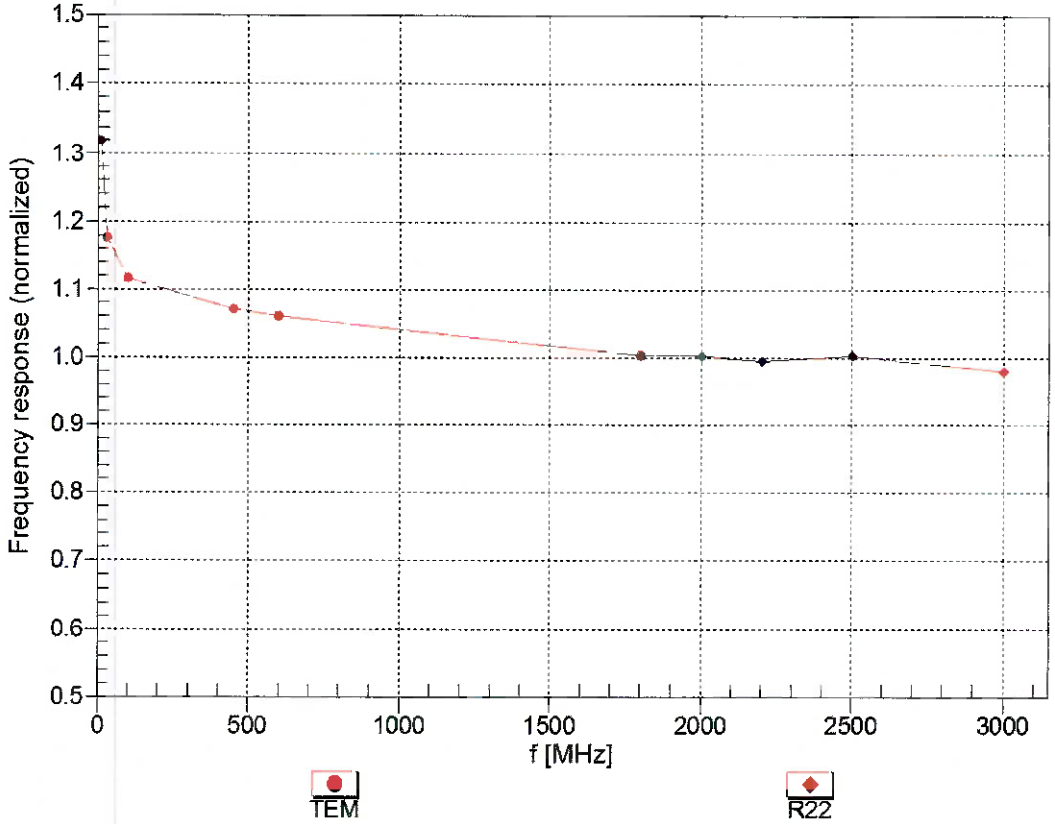
[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz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

[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.

Frequency Response of E-Field

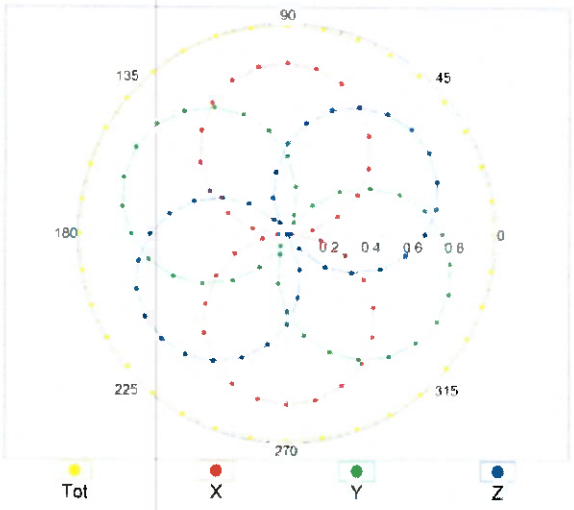
(TEM-Cell:ifi110 EXX, Waveguide: R22)



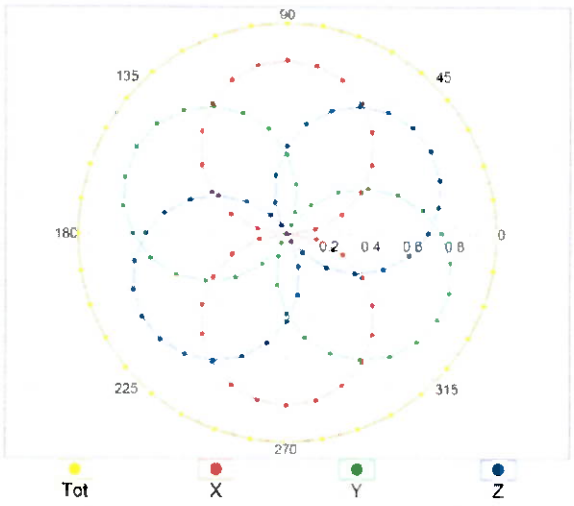
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

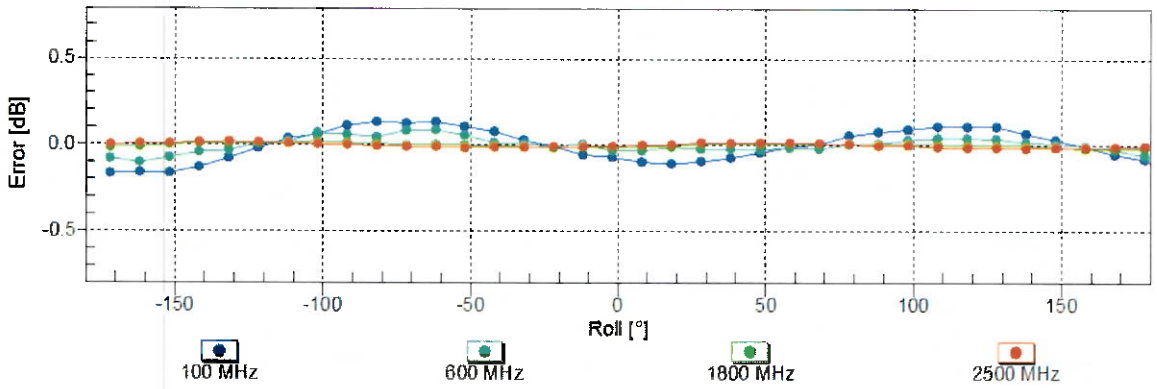
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



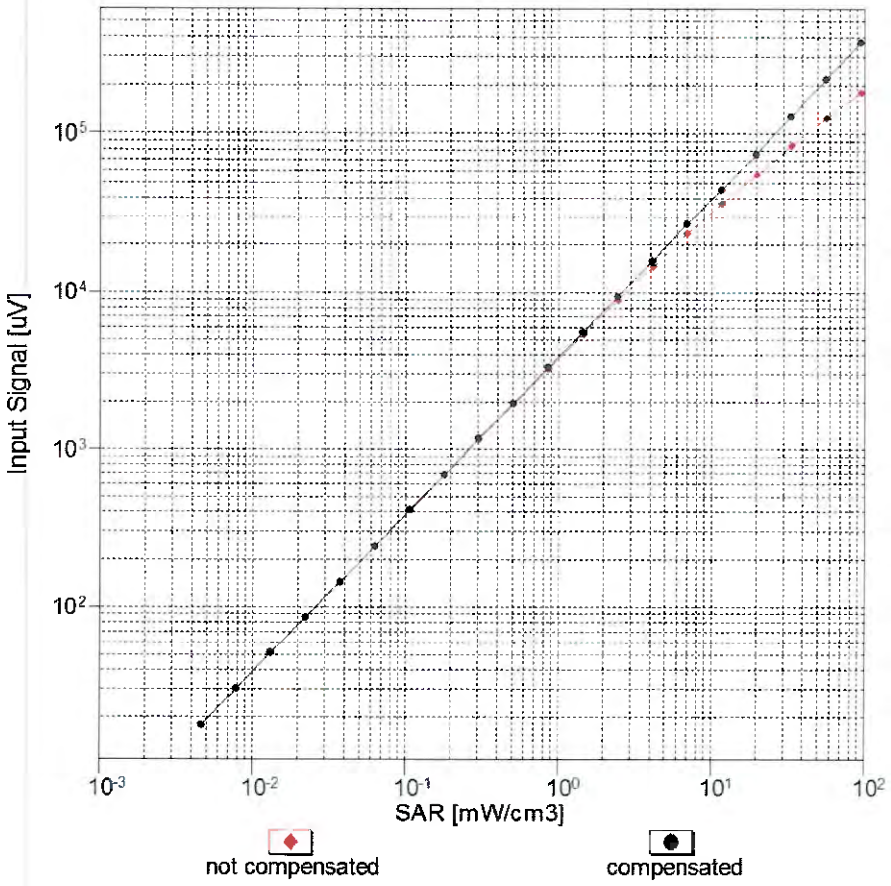
f=1800 MHz,R22

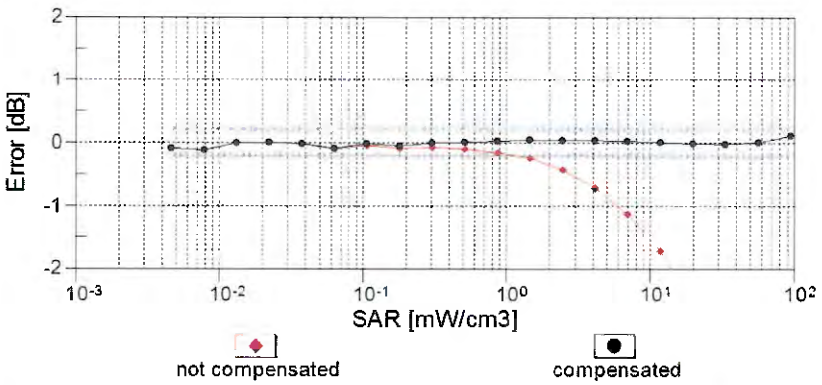




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

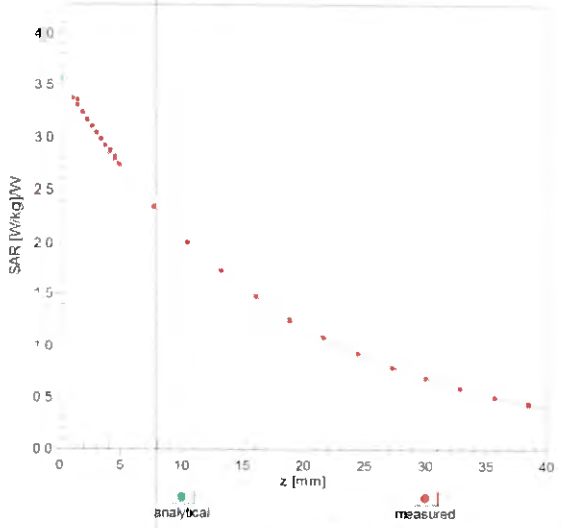




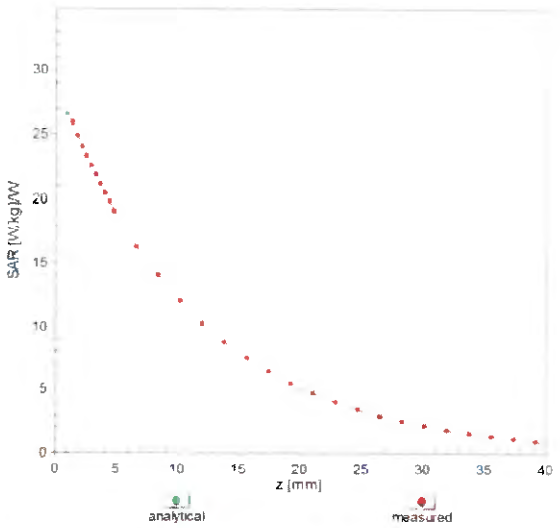
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

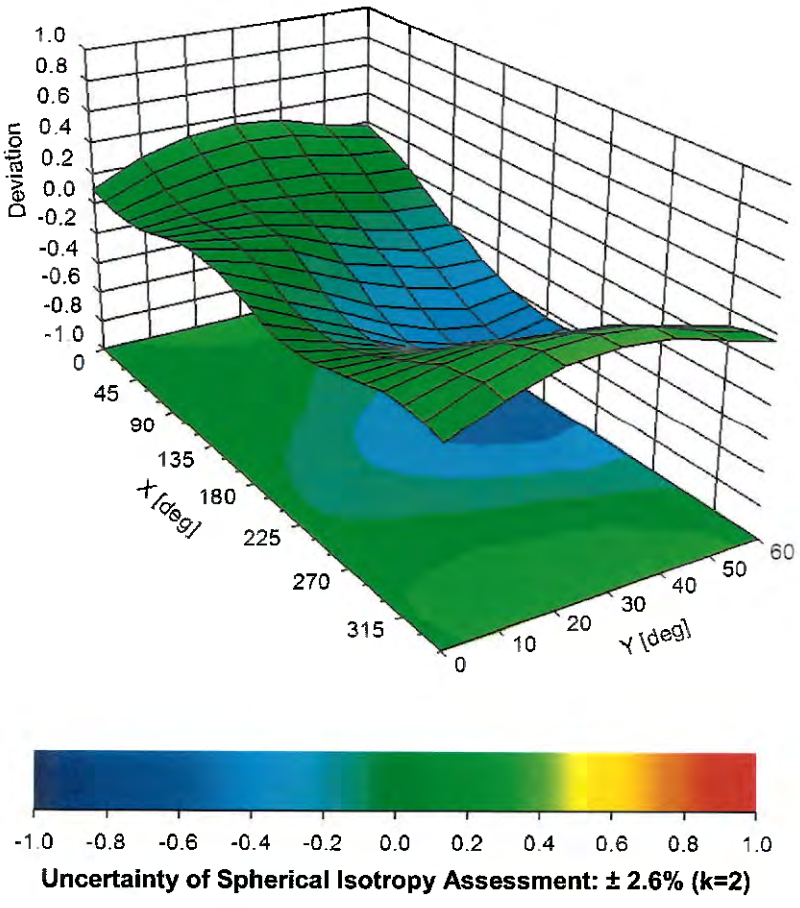


f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



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

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Client **SGS** **Certificate No: Z21-60083**

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN : 3962
Calibration Procedure(s)	FF-Z11-004-02 Calibration Procedures for Dosimetric E-field Probes
Calibration date:	April 26, 2021

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(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	16-Jun-20(CTTL, No.J20X04344)	Jun-21
Power sensor NRP-Z91	101547	16-Jun-20(CTTL, No.J20X04344)	Jun-21
Power sensor NRP-Z91	101548	16-Jun-20(CTTL, No.J20X04344)	Jun-21
Reference 10dBAttenuator	18N50W-10dB	10-Feb-20(CTTL, No.J20X00525)	Feb-22
Reference 20dBAttenuator	18N50W-20dB	10-Feb-20(CTTL, No.J20X00526)	Feb-22
Reference Probe EX3DV4	SN 3617	27-Jan-21(SPEAG, No.EX3-3617_Jan21)	Jan-22
DAE4	SN 1556	15-Jan-21(SPEAG, No.DAE4-1556_Jan21)	Jan-22
Reference Probe EX3DV4	SN 7307	29-May-20(SPEAG, No.EX3-7307_May20)	May-21
DAE4	SN 1555	25-Aug-20(SPEAG, No.DAE4-1555_Aug20)	Aug-21
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
SignalGenerator MG3700A	6201052605	23-Jun-20(CTTL, No.J20X04343)	Jun-21
Network Analyzer E5071C	MY46110673	21-Jan-21(CTTL, No.J20X00515)	Jan-22

	Name	Function	Signature
Calibrated by:	Yu Zongying	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: April 28, 2021

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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 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, "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

c) 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

d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization θ=0 (f≤900MHz in TEM-cell; f>1800MHz: waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect 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 (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;VRx,y,z:*A,B,C 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≤800MHz) and inside waveguide using analytical field distributions based on power measurements for f >800MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty valued 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±50MHz to±100MHz.
- *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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DASY/EASY – Parameters of Probe: EX3DV4 – SN:3962

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (*k*=2)
Norm(μV/(V/m)²)[A]	0.42	0.47	0.43	±10.0%
DCP(mV)[B]	101.4	103.6	94.1	

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	168.2	±3.2%
		Y	0.0	0.0	1.0		177.7	
		Z	0.0	0.0	1.0		164.7	

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 Norm X, Y, Z do not affect the E^2-field uncertainty inside TSL (see Page 4).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainly 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:3962

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)
750	41.9	0.89	10.26	10.26	10.26	0.40	0.80	±12.1%
835	41.5	0.90	9.96	9.96	9.96	0.14	1.33	±12.1%
1750	40.1	1.37	8.55	8.55	8.55	0.25	1.05	±12.1%
1900	40.0	1.40	8.28	8.28	8.28	0.24	1.10	±12.1%
2300	39.5	1.67	7.94	7.94	7.94	0.55	0.68	±12.1%
2450	39.2	1.80	7.69	7.69	7.69	0.45	0.81	±12.1%
2600	39.0	1.96	7.43	7.43	7.43	0.40	0.91	±12.1%
3300	38.2	2.71	7.37	7.37	7.37	0.39	1.00	±13.3%
3500	37.9	2.91	7.05	7.05	7.05	0.44	0.95	±13.3%
3700	37.7	3.12	6.65	6.65	6.65	0.41	1.03	±13.3%
3900	37.5	3.32	6.46	6.46	6.46	0.40	1.28	±13.3%
4100	37.2	3.53	6.48	6.48	6.48	0.40	1.18	±13.3%
4400	36.9	3.84	6.32	6.32	6.32	0.35	1.35	±13.3%
4600	36.7	4.04	6.16	6.16	6.16	0.45	1.25	±13.3%
4800	36.4	4.25	6.06	6.06	6.06	0.45	1.30	±13.3%
4950	36.3	4.40	5.85	5.85	5.85	0.40	1.40	±13.3%
5250	35.9	4.71	5.51	5.51	5.51	0.45	1.28	±13.3%
5600	35.5	5.07	4.81	4.81	4.81	0.45	1.50	±13.3%
5750	35.4	5.22	4.90	4.90	4.90	0.45	1.55	±13.3%

[C] Frequency validity above 300 MHz of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of 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 frequency 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 the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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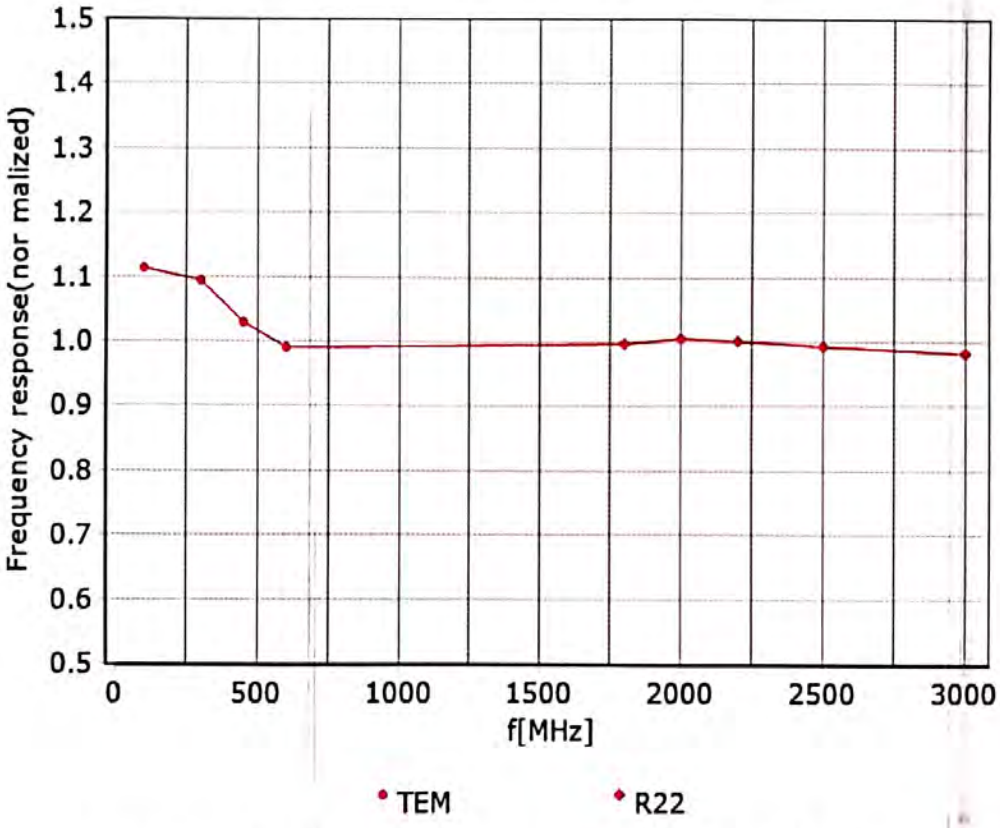
Frequency Response of E-Field
(TEM-Cell: ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: ±7.4% (*k*=2)

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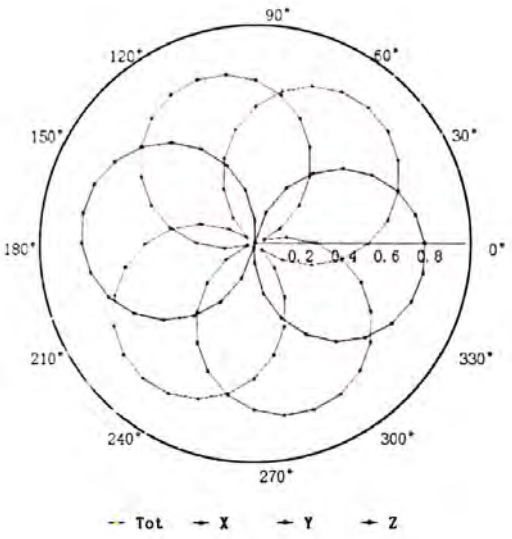
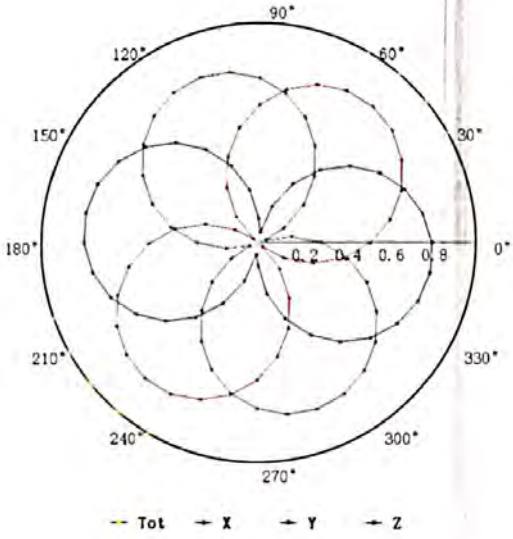
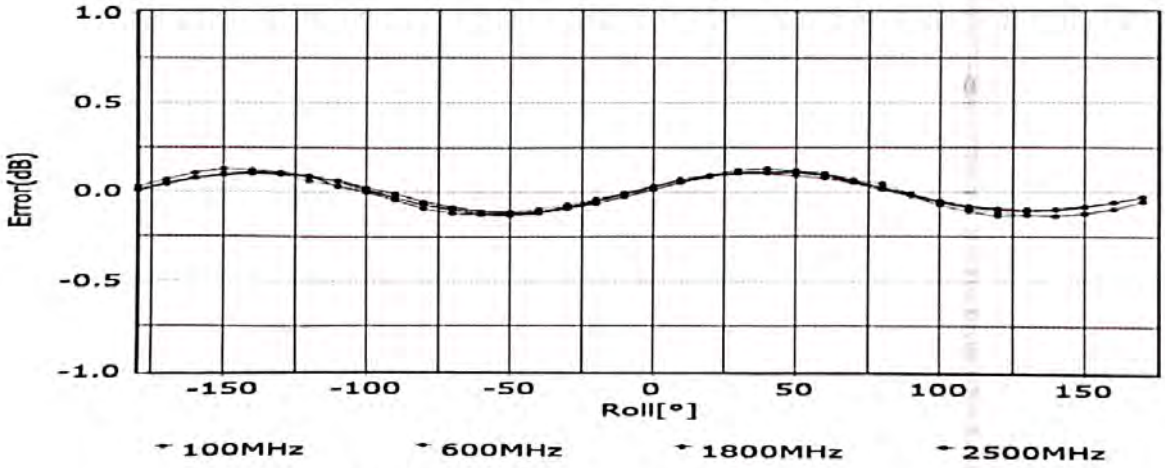
Receiving Pattern (Φ), θ=0°

f=600 MHz, TEM



f=1800 MHz, R22





Uncertainty of Axial Isotropy Assessment: ±1.2% (*k*=2)

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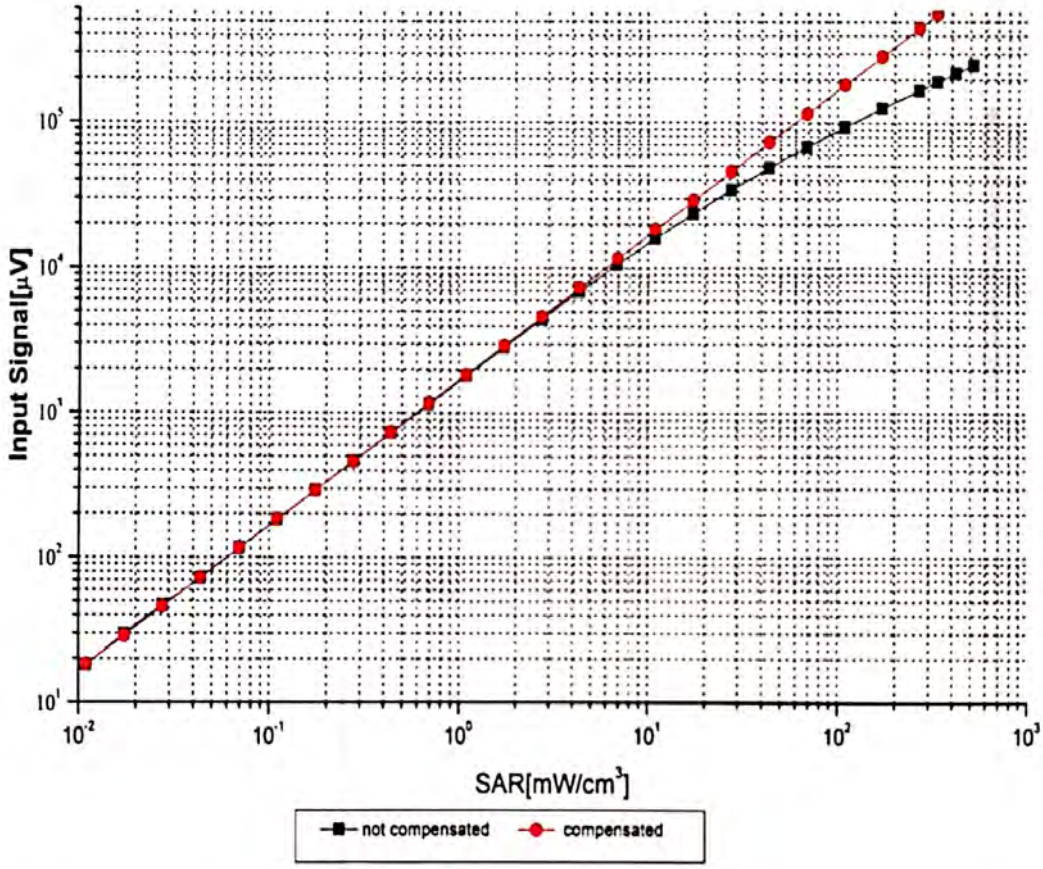
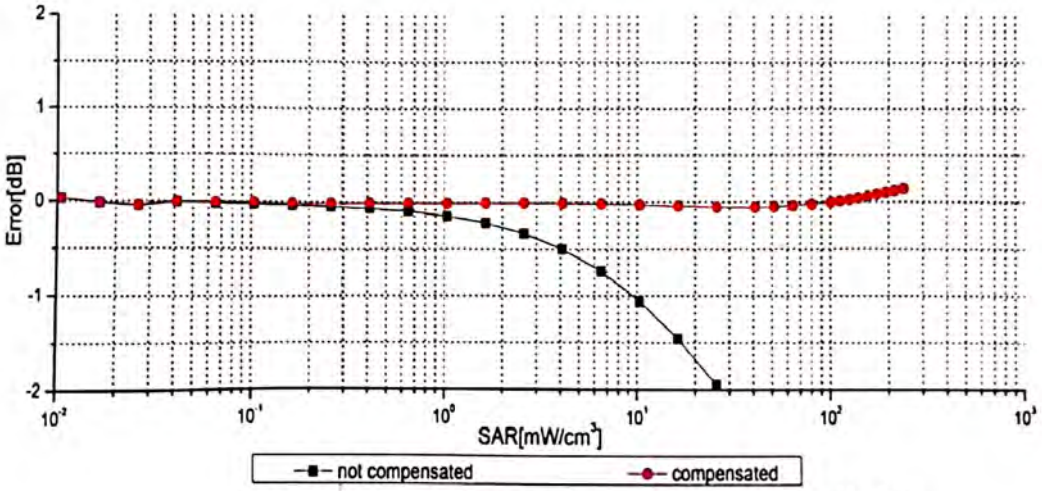
Dynamic Range f(SAR_{head})
(TEM cell, f = 900 MHz)





Uncertainty of Linearity Assessment: ±0.9% (*k*=2)

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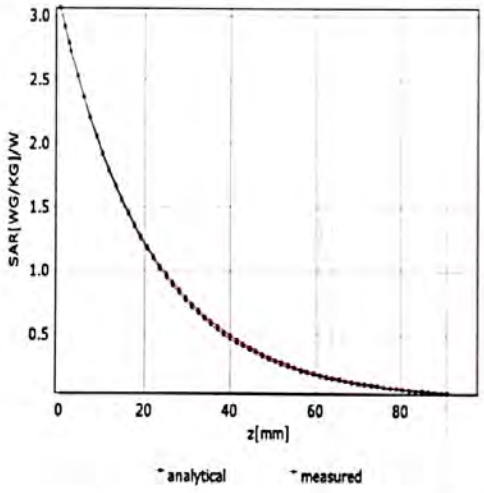
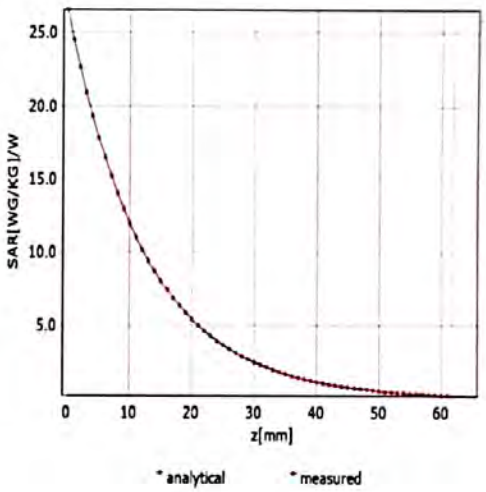
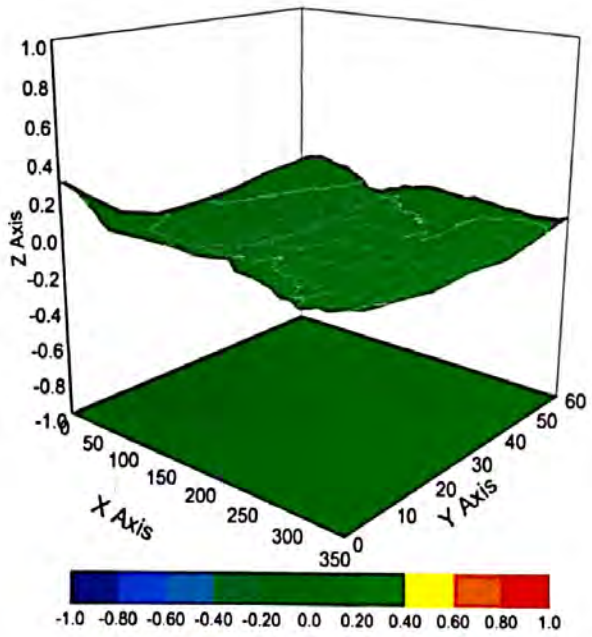
Conversion Factor Assessment

f=750 MHz,WGLS R9(H_convF) **f=1750 MHz,WGLS R22(H_convF)**





Deviation from Isotropy in Liquid



Uncertainty of Spherical Isotropy Assessment: ±3.2% (*k*=2)

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DASY/EASY – Parameters of Probe: EX3DV4 – SN:3962

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	151.5
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	9mm
Tip Diameter	2.5mm
Probe Tip to Sensor X Calibration Point	1mm
Probe Tip to Sensor Y Calibration Point	1mm
Probe Tip to Sensor Z Calibration Point	1mm
Recommended Measurement Distance from Surface	1.4mm

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CALIBRATION
CNAS L0570

Client SGS **Certificate No: Z21-60289**

CALIBRATION CERTIFICATE

Object EX3DV4 - SN : 3789

Calibration Procedure(s) FF-Z11-004-02
Calibration Procedures for Dosimetric E-field Probes

Calibration date: August 12, 2021

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(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	15-Jun-21(CTTL, No.J21X04466)	Jun-22
Power sensor NRP-Z91	101547	15-Jun-21(CTTL, No.J21X04466)	Jun-22
Power sensor NRP-Z91	101548	15-Jun-21(CTTL, No.J21X04466)	Jun-22
Reference 10dBAttenuator	18N50W-10dB	10-Feb-20(CTTL, No.J20X00525)	Feb-22
Reference 20dBAttenuator	18N50W-20dB	10-Feb-20(CTTL, No.J20X00526)	Feb-22
Reference Probe EX3DV4	SN 3617	27-Jan-21(SPEAG, No.EX3-3617_Jan21)	Jan-22
DAE4	SN 1556	15-Jan-21(SPEAG, No.DAE4-1556_Jan21)	Jan-22

Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
SignalGenerator MG3700A	6201052605	16-Jun-21(CTTL, No.J21X04467)	Jun-22
Network Analyzer E5071C	MY46110673	21-Jan-21(CTTL, No.J20X00515)	Jan-22

	Name	Function	Signature
Calibrated by:	Yu Zongying	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: August 14, 2021

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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 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, "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

c) 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

d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization θ=0 (f≤900MHz in TEM-cell; f>1800MHz: waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect 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.
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- 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; VRx,y,z:* A,B,C 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≤800MHz) and inside waveguide using analytical field distributions based on power measurements for f >800MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty valued 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±50MHz to±100MHz.
- *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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DASY/EASY – Parameters of Probe: EX3DV4 – SN:3789

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (*k*=2)
Norm(μV/(V/m)²)[A]	0.45	0.51	0.52	±10.0%
DCP(mV)[B]	102.8	102.2	98.9	

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	163.7	±2.2%
		Y	0.0	0.0	1.0		171.9	
		Z	0.0	0.0	1.0		176.9	

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 Norm X, Y, Z do not affect the E²-field uncertainty inside TSL (see Page 4).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainly 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:3789

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)
750	41.9	0.89	8.90	8.90	8.90	0.40	0.80	±12.1%
835	41.5	0.90	8.54	8.54	8.54	0.16	1.35	±12.1%
1750	40.1	1.37	7.59	7.59	7.59	0.20	1.12	±12.1%
1900	40.0	1.40	7.30	7.30	7.30	0.25	1.09	±12.1%
2000	40.0	1.40	7.38	7.38	7.38	0.20	1.21	±12.1%
2300	39.5	1.67	7.13	7.13	7.13	0.62	0.70	±12.1%
2450	39.2	1.80	6.88	6.88	6.88	0.62	0.72	±12.1%
2600	39.0	1.96	6.72	6.72	6.72	0.66	0.70	±12.1%

[C] Frequency validity above 300 MHz of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of 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 frequency 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 the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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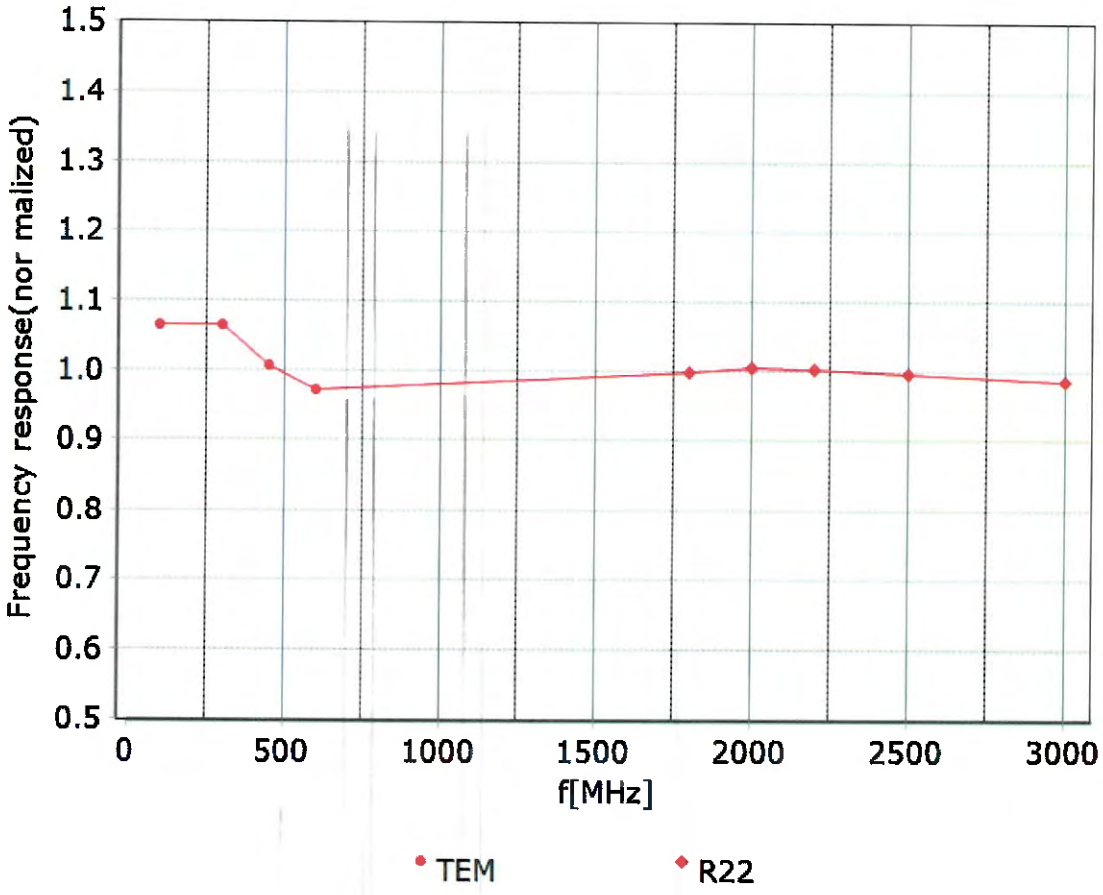
Frequency Response of E-Field
(TEM-Cell: ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: ±7.4% (*k*=2)

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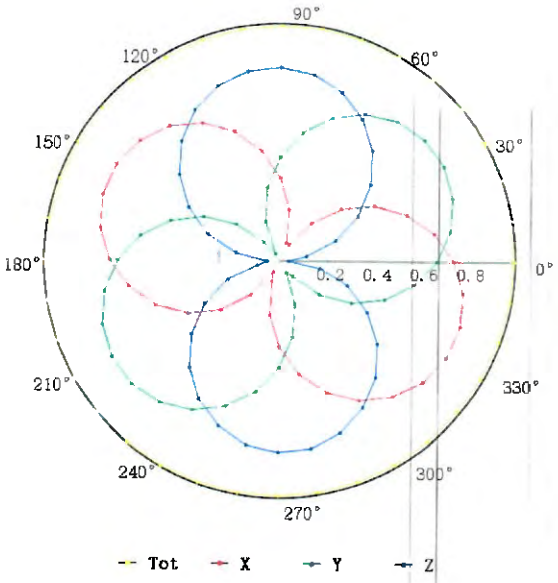
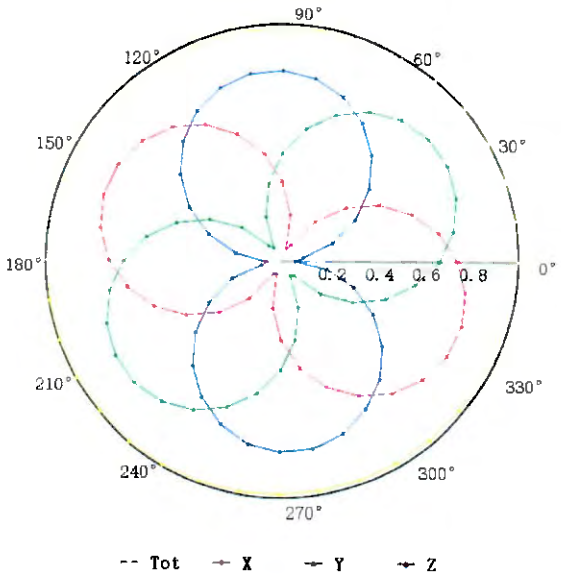
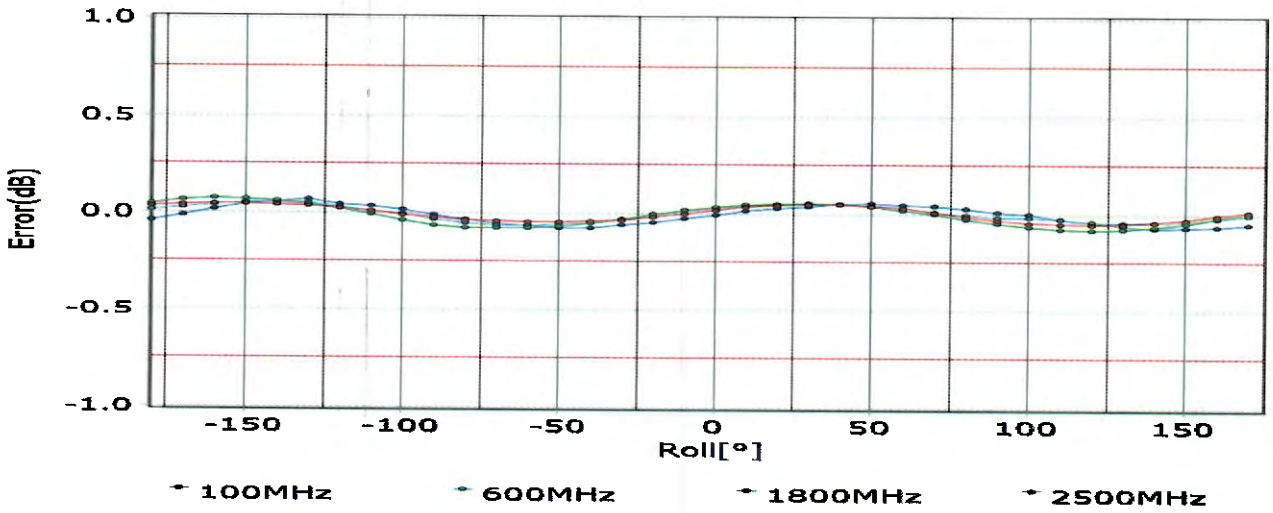
Receiving Pattern (Φ), θ=0°

f=600 MHz, TEM



f=1800 MHz, R22





Uncertainty of Axial Isotropy Assessment: ±1.2% (*k*=2)

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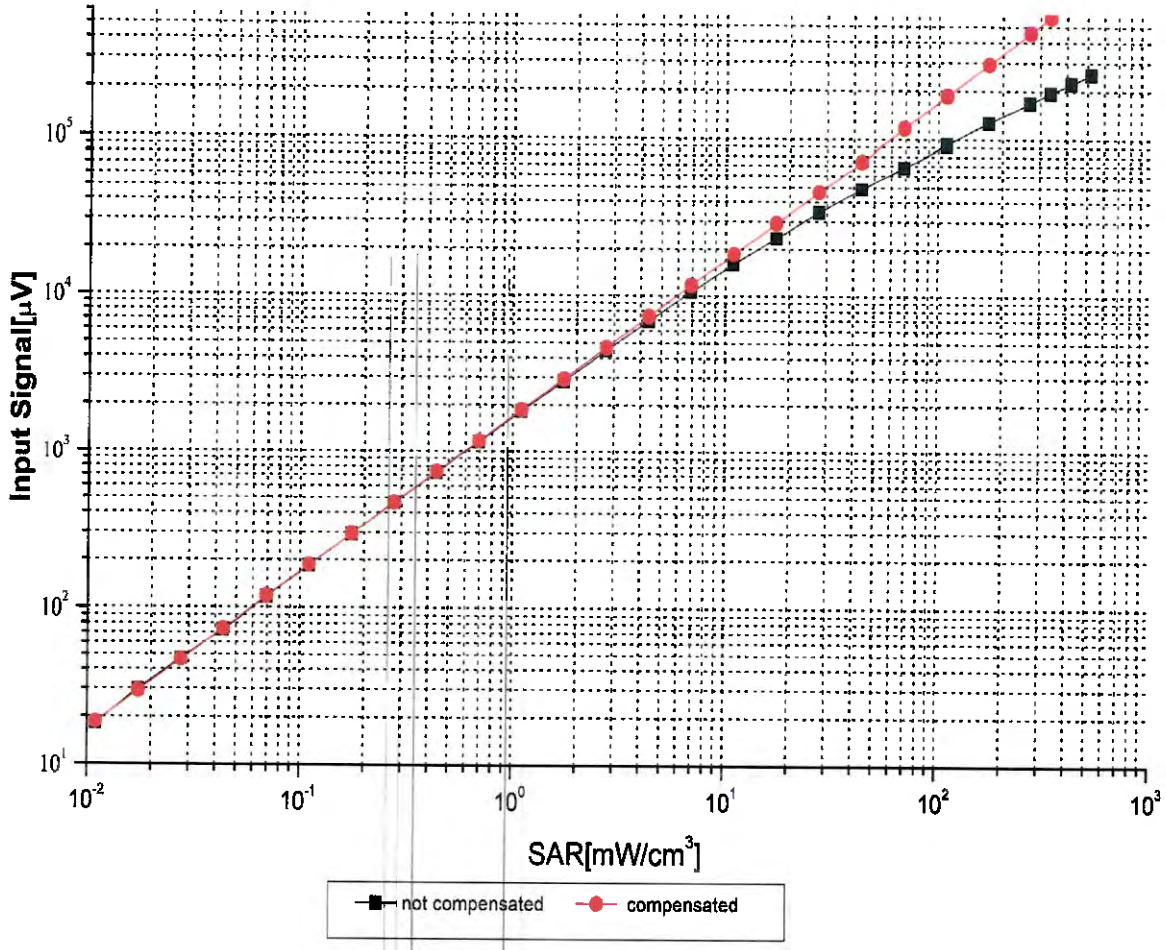
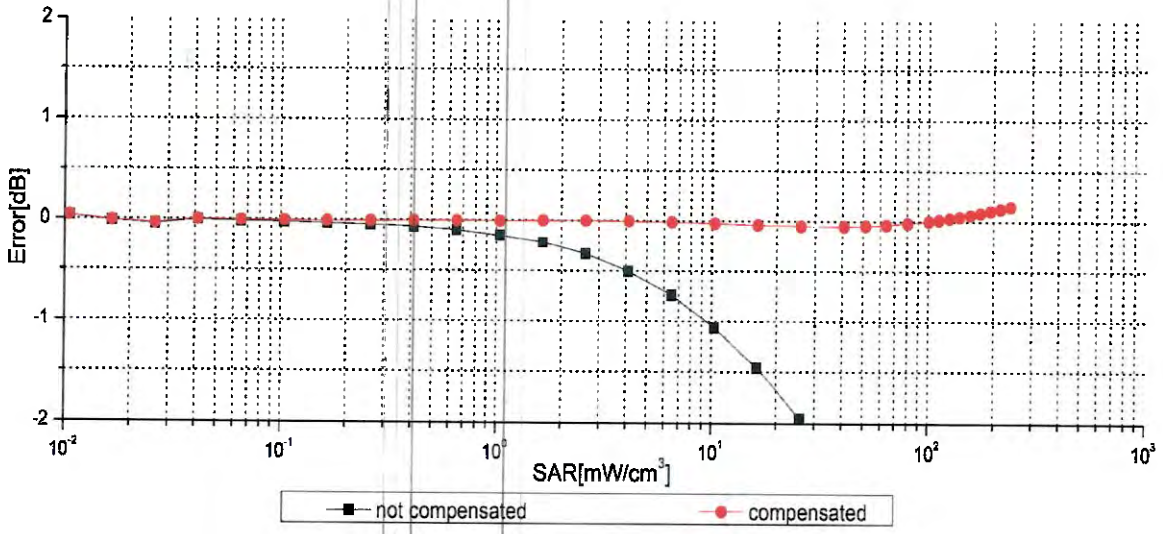
Dynamic Range f(SAR$_{head}$)
(TEM cell, f = 900 MHz)





Uncertainty of Linearity Assessment: ±0.9% (*k*=2)

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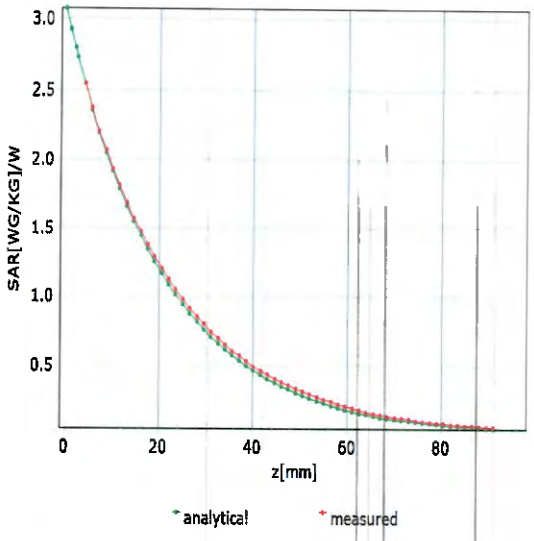
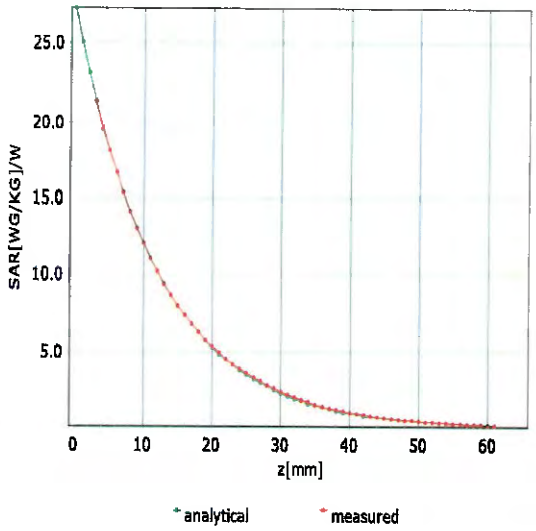
Conversion Factor Assessment

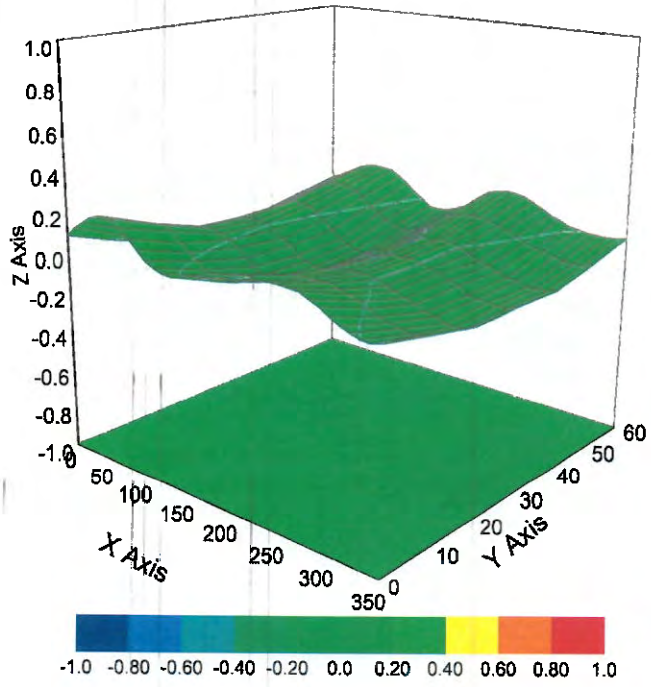
f=750 MHz,WGLS R9(H_convF)



f=1750 MHz,WGLS R22(H_convF)



Deviation from Isotropy in Liquid



Uncertainty of Spherical Isotropy Assessment: ±3.2% (*k*=2)

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DASY/EASY – Parameters of Probe: EX3DV4 – SN:3789

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	47.2
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	9mm
Tip Diameter	2.5mm
Probe Tip to Sensor X Calibration Point	1mm
Probe Tip to Sensor Y Calibration Point	1mm
Probe Tip to Sensor Z Calibration Point	1mm
Recommended Measurement Distance from Surface	1.4mm

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CNAS L0570

Client **SGS** **Certificate No: Z21-60450**

CALIBRATION CERTIFICATE

Object EX3DV4 - SN : 3982

Calibration Procedure(s) FF-Z11-004-02
Calibration Procedures for Dosimetric E-field Probes

Calibration date: December 29, 2021

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)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	15-Jun-21(CTTL, No.J21X04466)	Jun-22
Power sensor NRP-Z91	101547	15-Jun-21(CTTL, No.J21X04466)	Jun-22
Power sensor NRP-Z91	101548	15-Jun-21(CTTL, No.J21X04466)	Jun-22
Reference 10dBAttenuator	18N50W-10dB	10-Feb-20(CTTL, No.J20X00525)	Feb-22
Reference 20dBAttenuator	18N50W-20dB	10-Feb-20(CTTL, No.J20X00526)	Feb-22
Reference Probe EX3DV4	SN 3617	27-Jan-21(SPEAG, No.EX3-3617_Jan21)	Jan-22
DAE4	SN 1555	20-Aug-21(SPEAG, No.DAE4-1555_Aug21/2)	Aug-22

Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
SignalGenerator MG3700A	6201052605	16-Jun-21(CTTL, No.J21X04467)	Jun-22
Network Analyzer E5071C	MY46110673	21-Jan-21(CTTL, No.J20X00515)	Jan-22

	Name	Function	Signature
Calibrated by:	Yu Zongying	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: December 31, 2021

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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 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, "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

c) 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

d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization θ=0 (f≤900MHz in TEM-cell; f>1800MHz: waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect 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 (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;VRx,y,z:*A,B,C 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≤800MHz) and inside waveguide using analytical field distributions based on power measurements for f >800MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty valued 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 iate values, i.e., the uncertainties of NORMx,y,z do*Spherical isotropy (3D deviation from isotropy):* in
- *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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DASY/EASY – Parameters of Probe: EX3DV4 – SN:3982

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (*k*=2)
Norm(μV/(V/m)²)[A]	0.56	0.59	0.50	±10.0%
DCP(mV)[B]	101.9	103.8	103.4	

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	176.4	±2.1%
		Y	0.0	0.0	1.0		179.9	
		Z	0.0	0.0	1.0		164.2	

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 Norm X, Y, Z do not affect the E²-field uncertainty inside TSL (see Page 4).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainly 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:3982

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)
750	41.9	0.89	10.40	10.40	10.40	0.11	1.54	±12.1%
835	41.5	0.90	10.02	10.02	10.02	0.18	1.17	±12.1%
1750	40.1	1.37	8.50	8.50	8.50	0.21	1.02	±12.1%
1900	40.0	1.40	8.33	8.33	8.33	0.25	1.08	±12.1%
2300	39.5	1.67	8.06	8.06	8.06	0.43	0.86	±12.1%
2450	39.2	1.80	7.77	7.77	7.77	0.40	0.93	±12.1%
2600	39.0	1.96	7.58	7.58	7.58	0.49	0.80	±12.1%
3300	38.2	2.71	7.34	7.34	7.34	0.36	1.01	±13.3%
3500	37.9	2.91	7.07	7.07	7.07	0.30	1.05	±13.3%
3700	37.7	3.12	6.75	6.75	6.75	0.42	1.01	±13.3%
3900	37.5	3.32	6.62	6.62	6.62	0.35	1.35	±13.3%
4100	37.2	3.53	6.65	6.65	6.65	0.40	1.15	±13.3%
4400	36.9	3.84	6.46	6.46	6.46	0.35	1.35	±13.3%
4600	36.7	4.04	6.34	6.34	6.34	0.45	1.20	±13.3%
4800	36.4	4.25	6.29	6.29	6.29	0.40	1.30	±13.3%
4950	36.3	4.40	6.03	6.03	6.03	0.40	1.35	±13.3%
5250	35.9	4.71	5.55	5.55	5.55	0.45	1.35	±13.3%
5600	35.5	5.07	5.00	5.00	5.00	0.50	1.25	±13.3%
5750	35.4	5.22	5.10	5.10	5.10	0.55	1.15	±13.3%

[C] Frequency validity above 300 MHz of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of 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 frequency 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 the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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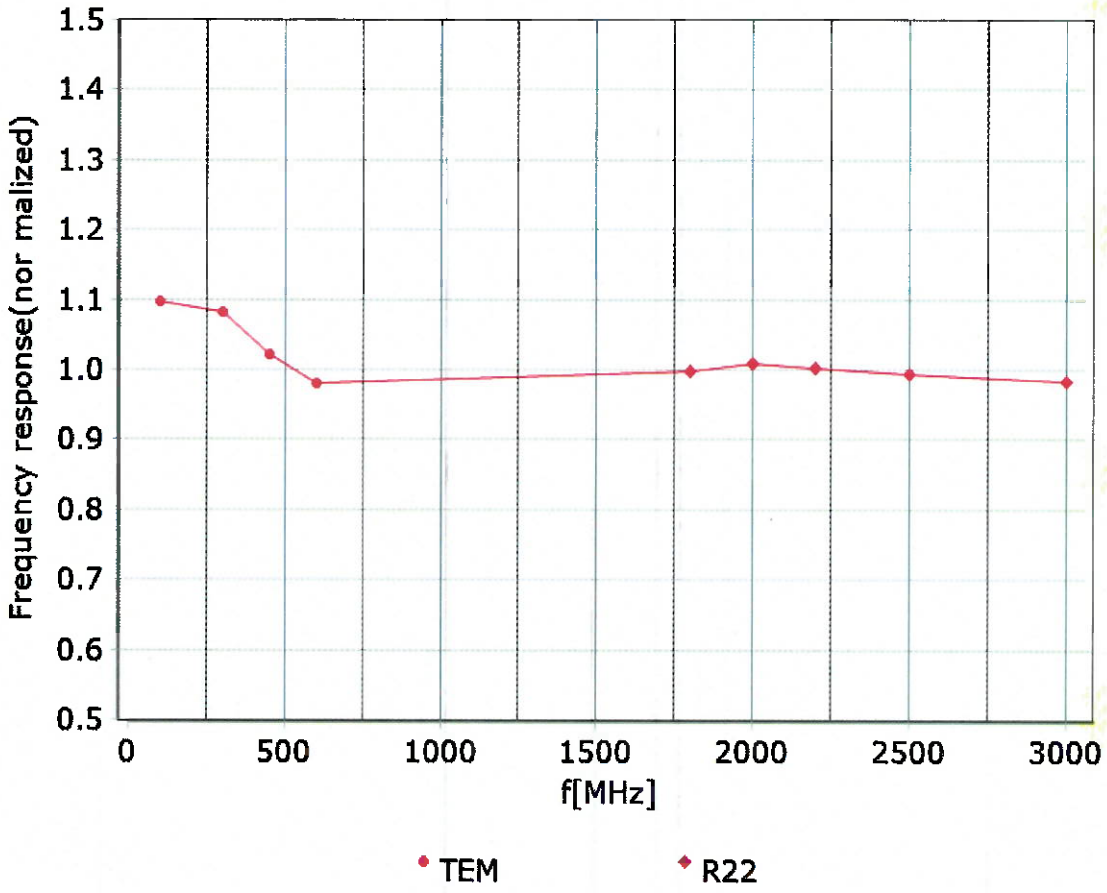
Frequency Response of E-Field
(TEM-Cell: ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: ±7.4% (*k*=2)

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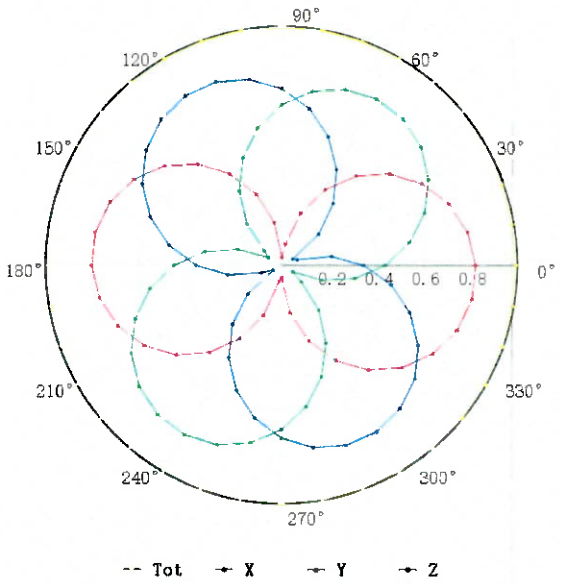
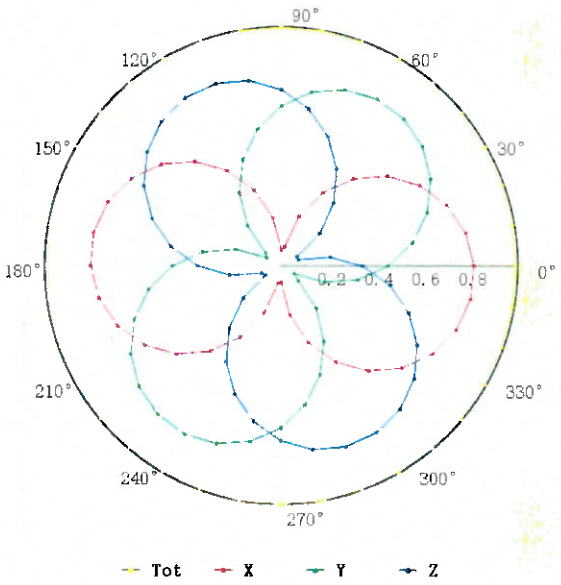
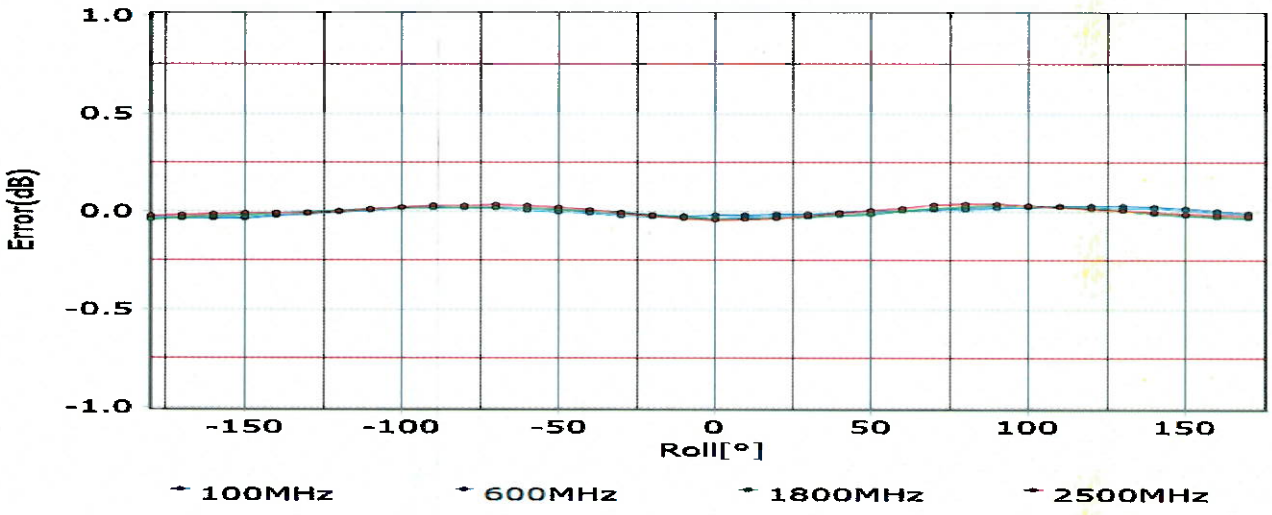
Receiving Pattern (Φ), θ=0°

f=600 MHz, TEM



f=1800 MHz, R22





Uncertainty of Axial Isotropy Assessment: ±1.2% (*k*=2)

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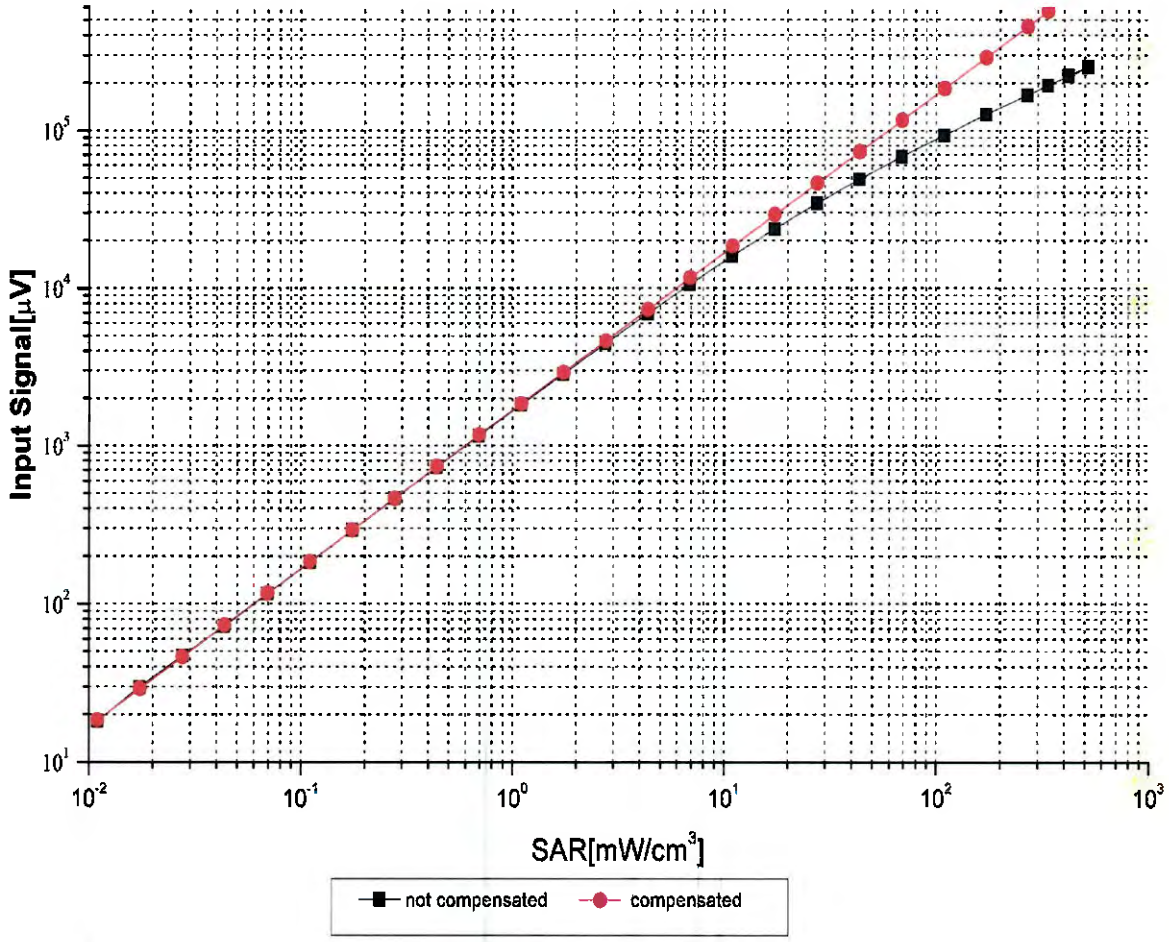
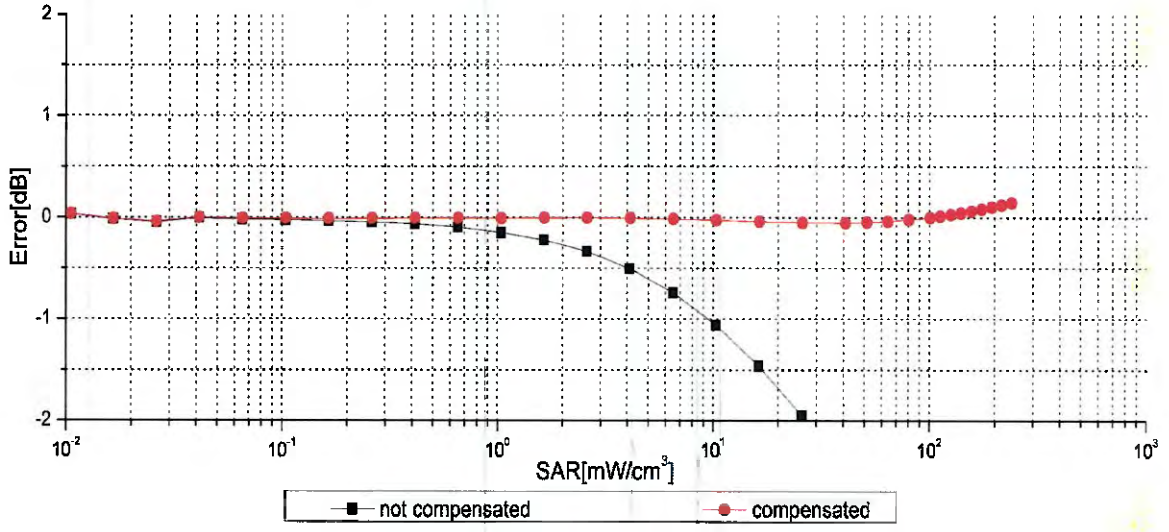
Dynamic Range f(SAR_{head})
(TEM cell, f = 900 MHz)





Uncertainty of Linearity Assessment: ±0.9% (*k*=2)

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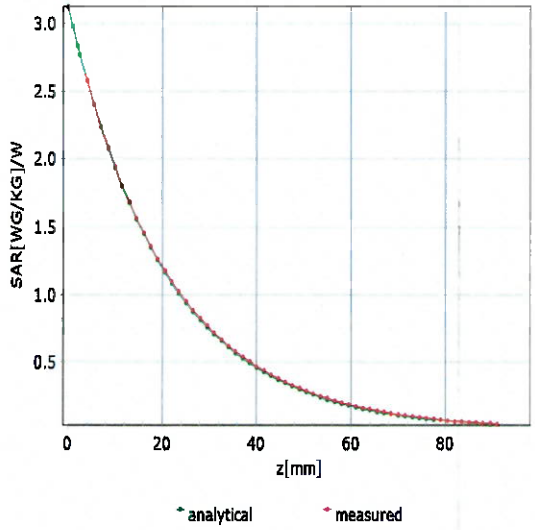
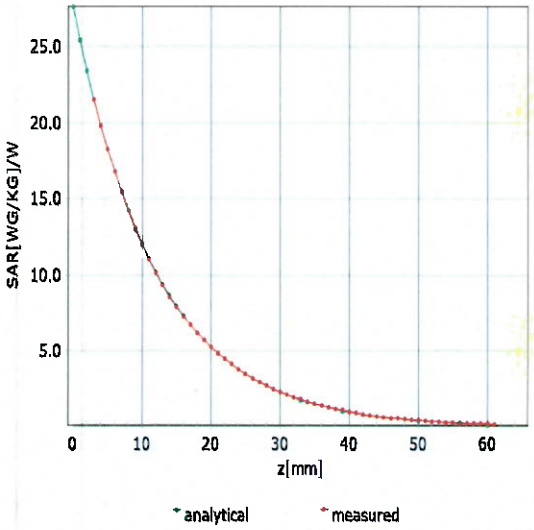
Conversion Factor Assessment

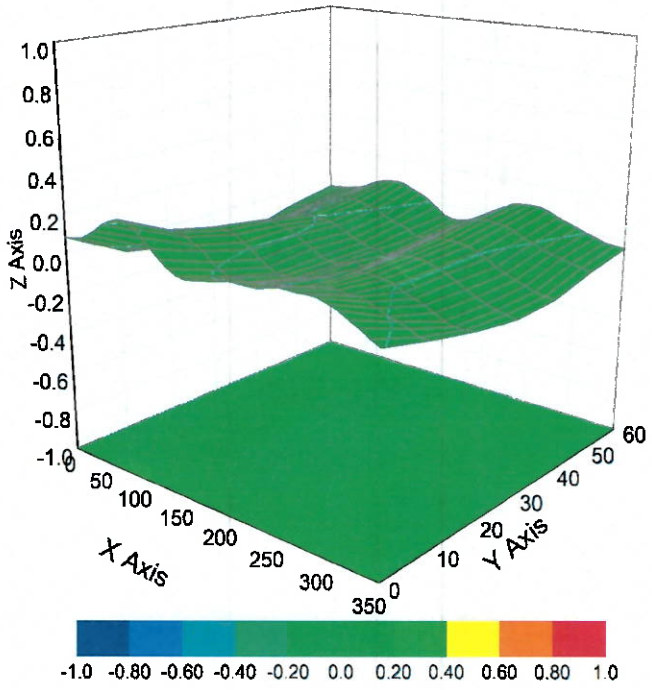
f=750 MHz,WGLS R9(H_convF)



f=1750 MHz,WGLS R22(H_convF)



Deviation from Isotropy in Liquid



Uncertainty of Spherical Isotropy Assessment: ±3.2% (*k*=2)

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DASY/EASY – Parameters of Probe: EX3DV4 – SN:3982

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	170.7
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	9mm
Tip Diameter	2.5mm
Probe Tip to Sensor X Calibration Point	1mm
Probe Tip to Sensor Y Calibration Point	1mm
Probe Tip to Sensor Z Calibration Point	1mm
Recommended Measurement Distance from Surface	1.4mm

Dipole D750V3 SN 1160				
Head Liquid				
Date of Measurement	Return Loss(dB)	Δ %	Impedance (Ω)	ΔΩ
2019-05-22	-29.1	/	51.8	/
2020-05-21	-29.4	1.03%	52.2	0.4Ω
2021-05-20	-29.3	1.00%	51.9	0.1Ω

Dipole D1750V2 SN 1105				
Head Liquid				
Date of Measurement	Return Loss(dB)	Δ %	Impedance (Ω)	ΔΩ
2020-08-29	-30.8	/	51.5	/
2021-08-28	-29.6	3.90%	52.3	1.7Ω

Dipole D1900V2 SN 5d114				
Head Liquid				
Date of Measurement	Return Loss(dB)	Δ %	Impedance (Ω)	ΔΩ
2020-08-27	-23.2	/	51.9	/
2021-08-26	-24.3	4.74%	52.6	0.7Ω

Dipole D2450V2 SN 1038				
Head Liquid				
Date of Measurement	Return Loss(dB)	Δ %	Impedance (Ω)	ΔΩ
2020-04-08	-30.5	/	52.3	/
2021-04-07	-31.7	3.93%	53.6	1.3Ω

Dipole D835V2 SN **4d256**				
Head Liquid				
Date of Measurement	Return Loss(dB)	Δ %	Impedance (Ω)	ΔΩ
2020-04-15	-33.2	/	49.5	/
2021-04-14	-34.1	2.71%	50.6	1.1Ω

Appendix E

Conducted RF Output Power Table

Measurement of RF conducted Power
1 Conducted Power of Main Antenna (Ant0)
2 Conducted Power of NR Antenna
2.1 Conducted Power of NR Antenna (Ant0)
2.2 Conducted Power of NR Antenna (Ant6)
3 Conducted Power of WiFi and Bluetooth
3.1 Conducted Power of WiFi(MIMO)
3.2 Conducted Power of Bluetooth

Measurement of RF conducted Power

1 Conducted Power of Main Antenna(Ant0)

1.1 Conducted Power of GSM

GSM 850										
Burst Output Power(dBm)					Tune up	Division Factors	Frame-Average Output Power(dBm)			Tune up
Channel		128	190	251			128	190	251	
GSM(GMSK)	GSM	32.37	32.42	32.43	33.50	-9.19	23.18	23.23	23.24	24.31
GPRS (GMSK)	1 TX Slot	32.46	32.29	32.26	33.50	-9.19	23.27	23.1	23.07	24.31
	2 TX Slots	29.33	29.30	29.28	30.50	-6.18	23.15	23.12	23.1	24.32
	3 TX Slots	27.39	27.39	27.35	28.50	-4.42	22.97	22.97	22.93	24.08
	4 TX Slots	26.06	26.24	26.18	27.50	-3.17	22.89	23.07	23.01	24.33
EGPRS (GMSK)	1 TX Slot	26.51	26.59	26.88	28.00	-9.19	17.32	17.4	17.69	18.81
	2 TX Slots	24.00	23.94	23.89	25.00	-6.18	17.82	17.76	17.71	18.82
	3 TX Slots	22.02	22.01	21.99	23.00	-4.42	17.6	17.59	17.57	18.58
	4 TX Slots	21.03	20.89	20.88	22.00	-3.17	17.86	17.72	17.71	18.83

GSM 1900										
Burst Output Power(dBm)					Tune up	Division Factors	Frame-Average Output Power(dBm)			Tune up
Channel		512	661	810			512	661	810	
GSM(GMSK)	GSM	29.14	29.19	29.20	30.50	-9.19	19.95	20	20.01	21.31
GPRS (GMSK)	1 TX Slot	29.12	29.10	29.05	30.50	-9.19	19.93	19.91	19.86	21.31
	2 TX Slots	26.00	25.99	25.94	27.50	-6.18	19.82	19.81	19.76	21.32
	3 TX Slots	24.68	24.65	24.59	26.00	-4.42	20.26	20.23	20.17	21.58
	4 TX Slots	23.45	23.41	23.39	25.00	-3.17	20.28	20.24	20.22	21.83
EGPRS (GMSK)	1 TX Slot	25.02	24.95	24.92	26.00	-9.19	15.83	15.76	15.73	16.81
	2 TX Slots	21.74	21.69	21.66	22.00	-6.18	15.56	15.51	15.48	15.82
	3 TX Slots	20.15	20.11	20.12	21.00	-4.42	15.73	15.69	15.7	16.58
	4 TX Slots	18.69	18.65	18.58	20.00	-3.17	15.52	15.48	15.41	16.83

1.2 Conducted Power of WCDMA

WCDMA Band II					
Average Conducted Power(dBm)					
Channel		9262	9400	9538	Tune up
WCDMA	12.2kbps RMC	22.80	22.95	22.93	23.50
	12.2kbps AMR	22.75	22.88	22.94	23.50
HSDPA	Subtest 1	21.79	21.72	21.84	22.50
	Subtest 2	21.77	21.80	21.72	22.50
	Subtest 3	21.44	21.46	21.40	22.00
	Subtest 4	21.43	21.36	21.37	22.00
DC-HSDPA	Subtest 1	21.75	21.79	21.75	22.50
	Subtest 2	21.75	21.84	21.72	22.50
	Subtest 3	21.33	21.44	21.40	22.00
	Subtest 4	21.42	21.31	21.34	22.00
HSUPA	Subtest 1	21.79	21.74	21.80	22.50
	Subtest 2	19.73	19.81	19.72	20.50
	Subtest 3	20.82	20.79	20.71	21.50
	Subtest 4	19.81	19.74	19.75	20.50
	Subtest 5	21.85	21.77	21.78	22.50

WCDMA Band IV					
Average Conducted Power(dBm)					
Channel		1312	1412	1513	Tune up
WCDMA	12.2kbps RMC	23.01	23.04	22.99	23.50
	12.2kbps AMR	22.94	23.00	22.95	23.50
HSDPA	Subtest 1	21.76	21.83	21.82	22.50

	Subtest 2	21.77	21.71	21.71	22.50
	Subtest 3	21.36	21.34	21.45	22.00
	Subtest 4	21.41	21.45	21.33	22.00
DC-HSDPA	Subtest 1	21.76	21.86	21.85	22.50
	Subtest 2	21.70	21.72	21.78	22.50
	Subtest 3	21.39	21.42	21.32	22.00
	Subtest 4	21.34	21.47	21.44	22.00
HSUPA	Subtest 1	21.83	21.81	21.77	22.50
	Subtest 2	19.74	19.84	19.70	20.50
	Subtest 3	20.77	20.76	20.84	21.50
	Subtest 4	19.84	19.84	19.77	20.50
	Subtest 5	21.86	21.72	21.73	22.50

WCDMA Band V					
Average Conducted Power(dBm)					
Channel		4132	4182	4233	Tune up
WCDMA	12.2kbps RMC	23.33	23.35	23.25	24.00
	12.2kbps AMR	23.24	23.3	23.21	24.00
HSDPA	Subtest 1	22.36	22.35	22.22	23.00
	Subtest 2	22.35	22.35	22.38	23.00
	Subtest 3	21.98	21.83	21.97	22.50
	Subtest 4	21.85	21.96	21.83	22.50
DC-HSDPA	Subtest 1	22.30	22.24	22.35	23.00
	Subtest 2	22.32	22.36	22.27	23.00
	Subtest 3	21.89	21.93	21.84	22.50
	Subtest 4	21.86	21.83	21.94	22.50
HSUPA	Subtest 1	22.32	22.21	22.20	23.00
	Subtest 2	20.32	20.24	20.20	21.00
	Subtest 3	21.20	21.36	21.22	22.00
	Subtest 4	20.24	20.29	20.25	21.00
	Subtest 5	22.20	22.27	22.25	23.00

1.3 Conducted Power of LTE

LTE Band 2				Conducted Power(dBm)			
Bandwidth	Modulation	RB size	RB offset	Channel 18607	Channel 18900	Channel 19193	Tune up
1.4MHz	QPSK	1	0	21.41	21.78	21.82	23.00
		1	2	21.47	21.81	21.68	23.00
		1	5	21.58	21.78	21.52	23.00
		3	0	21.33	21.69	21.64	23.00
		3	2	21.64	21.89	21.51	23.00
		3	3	21.53	21.88	21.42	23.00
		6	0	20.59	20.96	20.69	22.00
	16QAM	1	0	20.54	20.98	22.04	22.00
		1	2	20.71	21.09	21.78	22.00
		1	5	20.89	21.38	21.29	22.00
		3	0	20.43	20.97	20.92	22.00
		3	2	20.75	20.94	20.84	22.00
		3	3	20.69	20.93	20.83	22.00
		6	0	19.72	20.15	20.01	21.00
	64QAM	1	0	20.08	20.17	19.98	21.00
		1	2	20.02	19.98	19.92	21.00
		1	5	19.72	19.87	19.83	21.00
		3	0	19.83	19.91	19.76	21.00
		3	2	19.75	20.01	19.88	21.00
		3	3	19.86	19.95	19.92	21.00
		6	0	18.81	18.91	18.98	20.00
Bandwidth	Modulation	RB size	RB offset	Channel 18615	Channel 18900	Channel 19185	Tune up
3MHz	QPSK	1	0	21.37	21.82	21.36	23.00
		1	7	21.51	21.74	21.8	23.00
		1	14	21.84	21.85	22	23.00
		8	0	20.56	20.94	20.22	22.00
		8	4	20.73	21.02	20.02	22.00
		8	7	20.86	20.99	21.31	22.00
		15	0	20.7	20.9	21.49	22.00
	16QAM	1	0	20.95	20.69	20.22	22.00
		1	7	21.07	21.37	20.12	22.00
		1	14	21.33	21.39	21.41	22.00
		8	0	19.76	20.04	20.89	21.00
		8	4	19.73	20.18	20.75	21.00
		8	7	19.98	20.26	20.41	21.00
		15	0	19.76	20.09	20.67	21.00
	64QAM	1	0	20.01	20.19	20.51	21.00
		1	7	19.87	20.01	20.38	21.00
		1	14	19.92	20.05	20.29	21.00
		8	0	19.81	19.88	20.17	21.00

		8	4	18.88	18.96	19.21	20.00
		8	7	18.79	19.03	19.36	20.00
		15	0	18.92	18.99	19.27	20.00
Bandwidth	Modulation	RB size	RB offset	Channel 18625	Channel 18900	Channel 19175	Tune up
5MHz	QPSK	1	0	22.06	22.61	22.4	23.00
		1	13	22.33	22.54	21.67	23.00
		1	24	22.37	22.48	22.17	23.00
		12	0	21.19	21.62	21.25	22.00
		12	6	21.26	21.66	20.95	22.00
		12	13	21.4	21.61	20.38	22.00
		25	0	21.06	21.51	20.71	22.00
	16QAM	1	0	20.79	21.95	21.27	22.00
		1	13	21.41	21.91	20.41	22.00
		1	24	21.59	21.89	20.03	22.00
		12	0	20.26	20.71	19.93	21.00
		12	6	20.4	20.77	19.69	21.00
		12	13	20.56	20.9	19.25	21.00
		25	0	20.29	20.72	19.55	21.00
	64QAM	1	0	20.41	20.49	20.27	21.00
		1	13	20.32	20.38	20.21	21.00
		1	24	20.28	20.32	20.23	21.00
		12	0	20.33	20.42	20.18	21.00
		12	6	19.27	19.33	19.29	20.00
		12	13	19.19	19.28	19.31	20.00
		25	0	19.11	19.22	19.26	20.00
Bandwidth	Modulation	RB size	RB offset	Channel 18650	Channel 18900	Channel 19150	Tune up
10MHz	QPSK	1	0	22	22.51	22.28	23.00
		1	25	22.28	22.52	21.64	23.00
		1	49	22.47	22.52	22.37	23.00
		25	0	21.16	21.57	20.62	22.00
		25	13	21.38	21.51	21.4	22.00
		25	25	21.66	21.43	21.16	22.00
		50	0	21.24	21.38	20.84	22.00
	16QAM	1	0	20.68	21.68	21.47	22.00
		1	25	21.65	21.49	21.02	22.00
		1	49	21.67	21.59	21.59	22.00
		25	0	20.42	20.74	20.55	21.00
		25	13	20.66	20.71	20.89	21.00
		25	25	20.72	20.65	20.95	21.00
		50	0	20.52	20.75	20.75	21.00
	64QAM	1	0	20.26	20.58	20.37	21.00
		1	25	20.11	20.51	20.21	21.00
		1	49	20.23	20.47	20.33	21.00
		25	0	20.34	20.56	20.42	21.00

		25	13	19.31	19.43	19.32	20.00
		25	25	19.22	19.38	19.21	20.00
		50	0	19.13	19.33	19.17	20.00
Bandwidth	Modulation	RB size	RB offset	Channel 18675	Channel 18900	Channel 19125	Tune up
15MHz	QPSK	1	0	21.93	22.75	21.68	23.00
		1	38	22.39	22.35	22.88	23.00
		1	74	22.63	22.67	21.38	23.00
		36	0	21.32	21.63	20.94	22.00
		36	18	21.54	21.53	20.49	22.00
		36	39	21.66	21.57	20.47	22.00
		75	0	21.5	21.62	21.34	22.00
	16QAM	1	0	21.1	21.99	20.58	22.00
		1	38	20.96	21.66	20.39	22.00
		1	74	21.74	21.92	20.54	22.00
		36	0	20.45	20.59	20.42	21.00
		36	18	20.66	20.74	19.91	21.00
		36	39	20.58	20.73	20.25	21.00
		75	0	20.65	20.68	19.64	21.00
	64QAM	1	0	20.55	20.71	20.29	21.00
		1	38	20.47	20.62	20.18	21.00
		1	74	20.49	20.66	20.13	21.00
		36	0	20.38	20.59	20.21	21.00
		36	18	19.41	19.61	18.87	20.00
		36	39	19.33	19.53	18.82	20.00
		75	0	19.28	19.55	18.89	20.00
Bandwidth	Modulation	RB size	RB offset	Channel 18700	Channel 18900	Channel 19100	Tune up
20MHz	QPSK	1	0	21.8	22.79	22.39	23.00
		1	50	22.24	22.31	22.04	23.00
		1	99	22.42	22.63	22.46	23.00
		50	0	21.09	21.51	20.99	22.00
		50	25	21.39	21.44	21.34	22.00
		50	50	21.55	21.55	21.51	22.00
		100	0	21.35	21.52	20.58	22.00
	16QAM	1	0	21.04	21.76	21.4	22.00
		1	50	21.84	21.74	21.57	22.00
		1	99	21.95	21.96	21.99	22.00
		50	0	20.41	20.5	20.59	21.00
		50	25	20.7	20.74	20.69	21.00
		50	50	20.7	20.74	20.65	21.00
		100	0	20.38	20.56	19.7	21.00
	64QAM	1	0	20.26	20.63	20.44	21.00
		1	50	20.11	20.51	20.32	21.00
		1	99	20.19	20.58	20.39	21.00
		50	0	20.21	20.55	20.28	21.00

		50	25	19.27	19.43	19.21	20.00
		50	50	19.13	19.38	19.11	20.00
		100	0	19.02	19.29	19.08	20.00

LTE Band 4				Conducted Power(dBm)			
Bandwidth	Modulation	RB size	RB offset	Channel 19957	Channel 20175	Channel 20393	Tune up
1.4MHz	QPSK	1	0	22.95	22.88	22.9	23.00
		1	2	22.99	22.93	22.85	23.00
		1	5	22.92	22.86	22.77	23.00
		3	0	21.93	21.92	21.86	22.00
		3	2	21.98	21.89	21.88	22.00
		3	3	21.85	21.83	21.8	22.00
		6	0	21.87	21.93	21.93	22.00
	16QAM	1	0	21.47	21.64	21.41	22.00
		1	2	21.58	21.74	21.98	22.00
		1	5	21.6	21.31	21.54	22.00
		3	0	20.81	20.91	20.97	21.00
		3	2	20.84	20.99	20.82	21.00
		3	3	20.93	21	20.92	21.00
		6	0	20.99	20.97	20.92	21.00
	64QAM	1	0	20.73	20.81	20.78	21.00
		1	2	20.66	20.73	20.68	21.00
		1	5	20.62	20.79	20.62	21.00
		3	0	20.69	20.72	20.73	21.00
		3	2	20.71	20.55	20.61	21.00
		3	3	20.58	20.68	20.59	21.00
		6	0	19.59	19.81	19.78	20.00
Bandwidth	Modulation	RB size	RB offset	Channel 19965	Channel 20175	Channel 20385	Tune up
3MHz	QPSK	1	0	22.89	22.92	22.87	23.00
		1	7	22.91	22.81	22.85	23.00
		1	14	22.88	22.87	22.83	23.00
		8	0	21.92	21.99	21.92	22.00
		8	4	21.97	21.88	21.84	22.00
		8	7	21.88	21.81	21.75	22.00
		15	0	21.86	21.81	21.79	22.00
	16QAM	1	0	21.7	21.99	21.61	22.00
		1	7	21.89	21.65	21.5	22.00
		1	14	21.65	21.96	21.86	22.00
		8	0	20.94	21	20.83	21.00
		8	4	20.86	20.91	20.94	21.00
		8	7	20.98	20.84	20.83	21.00
		15	0	20.9	20.79	20.74	21.00
	64QAM	1	0	20.71	20.77	20.72	21.00

		1	7	20.61	20.69	20.63	21.00
		1	14	20.59	20.62	20.59	21.00
		8	0	20.69	20.71	20.67	21.00
		8	4	19.59	19.73	19.62	20.00
		8	7	19.52	19.66	19.58	20.00
		15	0	19.47	19.62	19.55	20.00
Bandwidth	Modulation	RB size	RB offset	Channel 19975	Channel 20175	Channel 20375	Tune up
5MHz	QPSK	1	0	22.94	22.94	22.86	23.00
		1	13	23.1	22.87	22.93	23.00
		1	24	22.89	22.87	22.9	23.00
		12	0	21.94	21.88	21.93	22.00
		12	6	21.99	21.93	21.91	22.00
		12	13	21.88	21.87	21.84	22.00
		25	0	21.9	21.79	21.89	22.00
	16QAM	1	0	21.47	21.56	21.99	22.00
		1	13	21.98	21.61	21.79	22.00
		1	24	21.46	21.91	21.48	22.00
		12	0	20.91	20.98	20.94	21.00
		12	6	20.89	20.95	20.9	21.00
		12	13	20.88	20.87	20.87	21.00
		25	0	20.86	20.73	20.76	21.00
	64QAM	1	0	20.69	20.87	20.71	21.00
		1	13	20.71	20.82	20.62	21.00
		1	24	20.59	20.79	20.66	21.00
		12	0	20.63	20.81	20.69	21.00
		12	6	19.58	19.71	19.58	20.00
		12	13	19.52	19.63	19.52	20.00
		25	0	19.57	19.69	19.55	20.00
Bandwidth	Modulation	RB size	RB offset	Channel 20000	Channel 20175	Channel 20350	Tune up
10MHz	QPSK	1	0	22.54	22.75	22.62	23.00
		1	25	22.91	22.79	22.9	23.00
		1	49	22.86	22.6	22.73	23.00
		25	0	21.9	21.86	21.79	22.00
		25	13	21.97	21.9	21.97	22.00
		25	25	21.87	21.83	21.73	22.00
		50	0	21.89	21.75	21.79	22.00
	16QAM	1	0	21.61	21.99	22	22.00
		1	25	21.26	21.94	21.97	22.00
		1	49	21.58	21.21	21.33	22.00
		25	0	20.78	20.74	20.76	21.00
		25	13	20.99	20.83	20.91	21.00
		25	25	20.82	20.7	20.68	21.00
		50	0	20.83	20.71	20.57	21.00
	64QAM	1	0	20.77	20.68	20.49	21.00

		1	25	20.71	20.62	20.37	21.00
		1	49	20.62	20.65	20.41	21.00
		25	0	20.69	20.58	20.45	21.00
		25	13	19.69	19.52	19.31	20.00
		25	25	19.58	19.41	19.28	20.00
		50	0	19.53	19.49	19.27	20.00
Bandwidth	Modulation	RB size	RB offset	Channel 20025	Channel 20175	Channel 20325	Tune up
15MHz	QPSK	1	0	22.78	22.74	22.67	23.00
		1	38	22.93	22.89	22.8	23.00
		1	74	22.97	22.66	22.78	23.00
		36	0	21.91	21.79	21.89	22.00
		36	18	21.69	21.66	22	22.00
		36	39	21.89	21.89	21.78	22.00
		75	0	21.94	21.96	21.91	22.00
	16QAM	1	0	21.95	21.82	21.76	22.00
		1	38	21.88	21.97	21.89	22.00
		1	74	21.96	21.94	21.93	22.00
		36	0	21	20.95	20.91	21.00
		36	18	20.8	20.97	20.95	21.00
		36	39	20.98	20.93	20.9	21.00
		75	0	20.97	20.99	20.92	21.00
	64QAM	1	0	20.69	20.87	20.77	21.00
		1	38	20.61	20.82	20.62	21.00
			74	20.58	20.88	20.59	21.00
		36	0	20.67	20.71	20.71	21.00
		36	18	19.38	19.58	19.61	20.00
		36	39	19.29	19.63	19.58	20.00
		75	0	19.27	19.71	19.52	20.00
Bandwidth	Modulation	RB size	RB offset	Channel 20050	Channel 20175	Channel 20300	Tune up
20MHz	QPSK	1	0	22.75	22.95	22.59	23.00
		1	50	22.81	22.91	22.78	23.00
		1	99	22.63	22.68	22.66	23.00
		50	0	21.86	21.97	21.85	22.00
		50	25	21.79	21.9	21.88	22.00
		50	50	21.89	21.94	21.87	22.00
		100	0	21.9	21.88	21.89	22.00
	16QAM	1	0	21.82	21.76	21.99	22.00
		1	50	21.92	21.53	21.96	22.00
		1	99	21.65	21.42	21.99	22.00
		50	0	20.82	20.88	20.95	21.00
		50	25	20.97	20.97	20.91	21.00
		50	50	20.87	20.85	20.92	21.00
		100	0	20.98	20.77	20.89	21.00
	64QAM	1	0	20.69	20.71	20.63	21.00

		1	50	20.61	20.67	20.58	21.00
		1	99	20.57	20.61	20.53	21.00
		50	0	20.63	20.7	20.57	21.00
		50	25	19.59	19.69	19.58	20.00
		50	50	19.61	19.57	19.52	20.00
		100	0	19.51	19.59	19.49	20.00

LTE Band 5				**Conducted Power(dBm)**			
Bandwidth	Modulation	RB size	RB offset	Channel 20407	Channel 20525	Channel 20643	Tune up
1.4MHz	QPSK	1	0	22.81	22.86	22.79	23.00
		1	2	22.94	22.87	22.83	23.00
		1	5	22.79	22.8	22.71	23.00
		3	0	21.85	21.75	21.8	22.00
		3	2	21.89	21.93	21.79	22.00
		3	3	21.86	21.82	21.78	22.00
		6	0	21.98	21.97	21.85	22.00
	16QAM	1	0	21.92	21.45	21.54	22.00
		1	2	21.6	21.98	21.79	22.00
		1	5	21.66	21.6	21.49	22.00
		3	0	20.97	20.88	20.85	21.00
		3	2	20.85	20.99	20.96	21.00
		3	3	20.98	20.96	20.95	21.00
		6	0	20.09	20.03	19.92	21.00
	64QAM	1	0	20.55	20.56	20.49	21.00
		1	2	20.47	20.52	20.47	21.00
		1	5	20.41	20.47	20.42	21.00
		3	0	20.38	20.42	20.38	21.00
		3	2	19.51	19.55	19.51	20.00
		3	3	19.42	19.51	19.47	20.00
		6	0	19.39	19.47	19.42	20.00
Bandwidth	Modulation	RB size	RB offset	Channel 20415	Channel 20525	Channel 20635	Tune up
3MHz	QPSK	1	0	22.85	22.89	22.85	23.00
		1	7	22.98	22.78	22.75	23.00
		1	14	22.9	22.94	22.78	23.00
		8	0	21.95	21.81	21.97	22.00
		8	4	21.96	21.97	21.99	22.00
		8	7	21.91	21.92	21.99	22.00
		15	0	21.92	21.78	22	22.00
	16QAM	1	0	21.63	21.56	21.96	22.00
		1	7	21.99	21.94	21.97	22.00
		1	14	21.95	21.7	21.85	22.00
		8	0	20.86	20.82	20.89	21.00
		8	4	20.9	20.81	20.87	21.00

		8	7	20.9	20.72	20.8	21.00
		15	0	20.94	20.74	20.85	21.00
	64QAM	1	0	20.77	20.85	20.75	21.00
		1	7	20.81	20.86	20.72	21.00
		1	14	20.86	20.83	20.77	21.00
		8	0	20.76	20.82	20.84	21.00
		8	4	19.73	19.83	19.74	20.00
		8	7	19.84	19.73	19.85	20.00
		15	0	19.79	19.76	19.87	20.00
Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune up
				20425	20525	20625	
5MHz	QPSK	1	0	22.76	22.98	22.74	23.00
		1	13	22.78	22.95	22.97	23.00
		1	24	22.88	22.71	22.75	23.00
		12	0	21.96	21.91	21.91	22.00
		12	6	21.88	21.89	21.91	22.00
		12	13	21.94	21.95	21.95	22.00
		25	0	21.93	21.9	21.9	22.00
	16QAM	1	0	21.56	21.73	21.58	22.00
		1	13	21.65	21.91	21.63	22.00
		1	24	21.6	21.45	21.94	22.00
		12	0	20.38	20.45	20.37	21.00
		12	6	20.54	20.46	20.53	21.00
		12	13	21	21	20.9	21.00
		25	0	20.96	20.86	20.81	21.00
	64QAM	1	0	20.82	20.75	20.77	21.00
		1	13	20.71	20.74	20.78	21.00
		1	24	20.8	20.77	20.7	21.00
		12	0	20.86	20.87	20.87	21.00
		12	6	19.85	19.79	19.83	20.00
		12	13	19.75	19.83	19.71	20.00
		25	0	19.8	19.8	19.76	20.00
Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune up
				20450	20525	20600	
10MHz	QPSK	1	0	22.97	22.99	22.98	23.00
		1	25	22.84	22.87	22.72	23.00
		1	49	22.92	22.88	22.65	23.00
		25	0	21.89	21.99	21.93	22.00
		25	13	21.99	21.92	21.91	22.00
		25	25	21.95	21.94	21.89	22.00
		50	0	21.95	21.77	21.73	22.00
	16QAM	1	0	21.87	21.66	21.66	22.00
		1	25	21.96	21.8	21.46	22.00
		1	49	21.97	21.76	21.94	22.00
		25	0	20.97	20.86	20.91	21.00
		25	13	21	21	20.98	21.00

		25	25	20.91	20.91	20.85	21.00
		50	0	20.93	20.73	20.9	21.00
	64QAM	1	0	20.85	20.79	20.85	21.00
		1	25	20.71	20.8	20.74	21.00
		1	49	20.78	20.82	20.77	21.00
		25	0	20.83	20.81	20.77	21.00
		25	13	19.73	19.74	19.72	20.00
		25	25	19.73	19.75	19.8	20.00
		50	0	19.85	19.76	19.77	20.00

LTE Band 7				**Conducted Power(dBm)**			
Bandwidth	Modulation	RB size	RB offset	Channel 20775	Channel 21100	Channel 21425	Tune up
5MHz	QPSK	1	0	22.57	22.75	22.66	23.00
		1	13	22.73	22.56	22.68	23.00
		1	24	22.63	22.49	22.75	23.00
		12	0	22.57	22.63	22.76	23.00
		12	6	22.7	22.72	22.73	23.00
		12	13	22.76	22.57	22.79	23.00
		25	0	22.74	21.98	22.68	23.00
	16QAM	1	0	22.66	22.7	22.64	23.00
		1	13	22.64	22.7	22.67	23.00
		1	24	22.57	22.67	22.5	23.00
		12	0	21.16	21.32	20.94	22.00
		12	6	20.99	21.28	21.21	22.00
		12	13	21.35	21.31	21.44	22.00
		25	0	21.23	20.78	21.22	22.00
	64QAM	1	0	20.36	20.30	20.22	21.00
		1	13	20.16	20.34	20.02	21.00
		1	24	20.41	20.29	20.29	21.00
		12	0	19.34	19.04	19.09	20.00
		12	6	19.30	19.26	19.13	20.00
		12	13	19.61	19.37	19.27	20.00
		25	0	19.08	19.34	19.01	20.00
Bandwidth	Modulation	RB size	RB offset	Channel 20800	Channel 21100	Channel 21400	Tune up
10MHz	QPSK	1	0	22.62	22.6	22.62	23.00
		1	25	22.81	22.75	22.66	23.00
		1	49	22.63	22.57	22.64	23.00
		25	0	22.66	22.58	22.75	23.00
		25	13	22.77	22.76	22.89	23.00
		25	25	22.82	22.69	22.64	23.00
		50	0	22.72	22.79	22.85	23.00
	16QAM	1	0	22.68	22.62	22.69	23.00
		1	25	22.62	22.78	22.57	23.00
		1	49	22.65	22.76	22.58	23.00

		25	0	21.18	21.37	21.29	22.00
		25	13	21.17	21.26	21.21	22.00
		25	25	21.28	21.32	21.44	22.00
		50	0	21.34	21.29	21.19	22.00
	64QAM	1	0	20.45	20.33	20.38	21.00
		1	25	20.31	20.36	20.05	21.00
		1	49	20.39	20.35	20.28	21.00
		25	0	19.26	19.06	19.31	20.00
		25	13	19.25	19.22	19.02	20.00
		25	25	19.57	19.37	19.20	20.00
		50	0	19.28	19.30	19.17	20.00
Bandwidth	Modulation	RB size	RB offset	Channel 20825	Channel 21100	Channel 21375	Tune up
15MHz	QPSK	1	0	22.68	22.69	22.62	23.00
		1	38	22.73	22.66	22.83	23.00
		1	74	22.59	22.57	22.77	23.00
		36	0	22.72	22.71	22.6	23.00
		36	18	22.83	22.72	22.69	23.00
		36	39	22.72	22.62	22.82	23.00
		75	0	22.81	22.79	22.78	23.00
	16QAM	1	0	22.68	22.78	22.65	23.00
		1	38	22.61	22.69	22.68	23.00
		1	74	22.54	22.58	22.63	23.00
		36	0	21.33	21.37	21.17	22.00
		36	18	21.29	21.21	21.25	22.00
		36	39	21.27	21.24	21.39	22.00
		75	0	21.36	21.28	21.32	22.00
	64QAM	1	0	20.27	20.26	20.33	21.00
		1	38	20.15	20.25	20.10	21.00
		1	74	20.34	20.17	20.39	21.00
		36	0	19.32	19.15	19.10	20.00
		36	18	19.31	19.24	19.03	20.00
		36	39	19.43	19.25	19.39	20.00
		75	0	19.19	19.30	19.01	20.00
Bandwidth	Modulation	RB size	RB offset	Channel 20850	Channel 21100	Channel 21350	Tune up
20MHz	QPSK	1	0	22.67	22.94	22.58	23.00
		1	50	22.75	22.65	22.75	23.00
		1	99	22.69	22.59	22.69	23.00
		50	0	22.66	22.85	22.66	23.00
		50	25	22.79	22.77	22.79	23.00
		50	50	22.73	22.66	22.73	23.00
		100	0	22.76	22.84	22.76	23.00
	16QAM	1	0	22.68	22.72	22.68	23.00
		1	50	22.65	22.72	22.65	23.00
		1	99	22.57	22.66	22.57	23.00
		50	0	21.25	21.29	21.25	22.00
		50	25	21.24	21.29	21.24	22.00

		50	50	21.37	21.33	21.37	22.00
		100	0	21.27	21.31	21.27	22.00
	64QAM	1	0	20.34	20.21	20.32	21.00
		1	50	20.19	20.24	20.14	21.00
		1	99	20.45	20.24	20.30	21.00
		50	0	19.22	19.09	19.20	20.00
		50	25	19.29	19.19	19.12	20.00
		50	50	19.54	19.31	19.31	20.00
		100	0	19.19	19.29	19.09	20.00

LTE FDD Band 12				**Conducted Power(dBm)**			
Bandwidth	Modulation	RB size	RB offset	Channel 23017	Channel 23095	Channel 23173	Tune up
1.4MHz	QPSK	1	0	22.71	22.79	22.73	23.00
		1	2	22.57	22.73	22.71	23.00
		1	5	22.69	22.66	22.67	23.00
		3	0	22.78	22.72	22.61	23.00
		3	2	22.61	22.78	22.71	23.00
		3	3	22.5	22.72	22.51	23.00
		6	0	22.51	22.49	22.53	23.00
	16QAM	1	0	22.61	22.59	22.45	23.00
		1	2	22.7	22.69	22.75	23.00
		1	5	21.89	21.76	21.88	22.00
		3	0	21.75	21.89	21.72	22.00
		3	2	21.88	21.89	21.85	22.00
		3	3	21.96	21.96	21.92	22.00
		6	0	21.74	21.65	21.59	22.00
	64QAM	1	0	20.63	20.78	20.81	21.00
		1	2	20.65	20.86	20.65	21.00
		1	5	20.91	20.77	20.73	21.00
		3	0	19.51	19.76	19.88	21.00
		3	2	19.73	19.94	19.80	21.00
		3	3	20.02	19.96	19.77	21.00
		6	0	19.71	20.00	19.74	20.00
Bandwidth	Modulation	RB size	RB offset	Channel 23025	Channel 23095	Channel 23165	Tune up
3MHz	QPSK	1	0	22.92	22.9	22.9	23.00
		1	7	22.85	22.89	22.93	23.00
		1	14	22.29	22.42	22.31	23.00
		8	0	22.54	22.47	22.29	23.00
		8	4	22.71	22.75	22.69	23.00
		8	7	22.56	22.76	22.63	23.00
		15	0	22.77	22.65	22.58	23.00
	16QAM	1	0	22.89	22.78	22.74	23.00
		1	7	22.75	22.72	22.68	23.00
		1	14	21.82	21.81	21.84	23.00
		8	0	21.79	21.82	21.66	22.00

		8	4	21.98	21.91	21.86	22.00
		8	7	21.92	21.85	21.92	22.00
		15	0	21.81	21.7	21.72	22.00
	64QAM	1	0	20.65	20.77	20.89	21.00
		1	7	20.77	20.99	20.72	21.00
		1	14	20.98	20.97	20.84	21.00
		8	0	19.48	19.87	19.85	20.00
		8	4	19.64	19.80	19.75	20.00
		8	7	19.92	19.75	19.94	20.00
		15	0	19.69	19.85	19.68	20.00
Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune up
				23035	23095	23155	
5MHz	QPSK	1	0	22.87	22.92	22.75	23.00
		1	13	22.94	22.93	22.91	23.00
		1	24	22.73	22.87	22.8	23.00
		12	0	22.86	22.81	22.77	23.00
		12	6	22.89	22.91	22.88	23.00
		12	13	22.76	22.93	22.69	23.00
		25	0	22.6	22.61	22.64	23.00
	16QAM	1	0	22.93	22.72	22.8	23.00
		1	13	22.91	22.79	22.91	23.00
		1	24	21.91	21.84	21.82	23.00
		12	0	21.68	21.83	21.65	22.00
		12	6	21.9	21.96	21.78	22.00
		12	13	21.85	21.98	21.97	22.00
		25	0	21.81	21.63	21.64	22.00
	64QAM	1	0	20.65	20.83	20.96	21.00
		1	13	20.77	20.92	20.84	21.00
		1	24	20.92	20.89	20.73	21.00
		12	0	19.52	19.92	19.69	20.00
		12	6	19.71	19.78	19.87	20.00
		12	13	19.82	19.74	19.75	20.00
		25	0	19.53	19.90	19.66	20.00
Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune up
				23060	23095	23130	
10MHz	QPSK	1	0	22.95	22.98	22.97	23.00
		1	25	22.97	22.95	22.85	23.00
		1	49	22.84	22.93	22.92	23.00
		25	0	22.80	22.94	22.82	23.00
		25	13	22.84	22.86	22.86	23.00
		25	25	22.91	22.89	22.87	23.00
		50	0	22.78	22.87	22.78	23.00
	16QAM	1	0	22.67	22.68	22.66	23.00
		1	25	22.89	22.79	22.75	23.00
		1	49	22.90	22.89	22.94	23.00
		25	0	21.92	21.83	21.92	22.00
		25	13	21.73	21.79	21.75	22.00
		25	25	21.98	21.93	21.84	22.00

		50	0	21.86	21.89	21.99	22.00
	64QAM	1	0	20.59	20.73	20.91	21.00
		1	25	20.74	20.90	20.72	21.00
		1	49	20.95	20.88	20.79	21.00
		25	0	19.60	19.85	19.81	20.00
		25	13	19.72	19.89	19.77	20.00
		25	25	19.92	19.84	19.87	20.00
		50	0	19.65	19.95	19.63	20.00

LTE Band 13				**Conducted Power(dBm)**			
Bandwidth	Modulation	RB size	RB offset	Channel 23205	Channel 23230	Channel 23255	Tune up
5MHz	QPSK	1	0	22.65	22.65	22.73	23.00
		1	25	22.73	22.81	22.74	23.00
		1	49	22.69	22.67	22.73	23.00
		25	0	21.75	21.67	21.76	22.00
		25	13	21.78	22.91	21.79	22.00
		25	25	21.71	21.86	21.77	22.00
		50	0	21.79	21.78	21.79	22.00
	16QAM	1	0	21.95	21.92	21.98	22.00
		1	25	21.89	21.97	21.98	22.00
		1	49	21.98	21.94	21.89	22.00
		25	0	20.77	20.77	20.75	21.00
		25	13	20.85	20.93	20.76	21.00
		25	25	20.79	20.79	20.77	21.00
		50	0	20.81	20.74	20.82	21.00
	64QAM	1	0	20.78	20.71	20.74	21.00
		1	25	20.7	20.81	20.77	21.00
		1	49	20.71	20.8	20.85	21.00
		25	0	20.7	20.85	20.87	21.00
		25	13	19.87	19.71	19.78	20.00
		25	25	19.77	19.87	19.83	20.00
		50	0	19.83	19.76	19.72	20.00
Bandwidth	Modulation	RB size	RB offset	Channel 23205	Channel 23230	Channel 23255	Tune up
10MHz	QPSK	1	0	22.9	22.93	22.66	23.00
		1	25	22.68	22.56	22.82	23.00
		1	49	22.73	22.85	22.29	23.00
		25	0	21.71	21.85	21.74	22.00
		25	13	21.61	21.74	21.66	22.00
		25	25	21.82	21.72	21.77	22.00
		50	0	21.57	21.58	21.6	22.00
	16QAM	1	0	21.86	21.87	21.98	22.00
		1	25	21.97	22	21.55	22.00
		1	49	21.99	21.97	21.93	22.00
		25	0	20.67	20.69	20.77	21.00

		25	13	20.66	20.72	20.68	21.00
		25	25	20.67	20.88	20.81	21.00
		50	0	20.7	20.75	20.68	21.00
	64QAM	1	0	20.76	20.8	20.71	21.00
		1	25	20.79	20.8	20.71	21.00
		1	49	20.8	20.77	20.77	21.00
		25	0	20.78	20.88	20.71	21.00
		25	13	19.71	19.83	19.8	20.00
		25	25	19.87	19.8	19.73	20.00
		50	0	19.85	19.86	19.83	20.00

LTE Band 25				**Conducted Power(dBm)**			
Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune up
				26047	26365	26683	
1.4MHz	QPSK	1	0	22.91	22.88	22.93	23.00
		1	2	22.84	22.94	22.89	23.00
		1	5	22.93	22.89	22.85	23.00
		3	0	22.37	22.39	22.35	23.00
		3	2	22.38	22.49	22.32	23.00
		3	3	22.25	22.37	22.49	23.00
		6	0	22.24	22.28	22.42	23.00
	16QAM	1	0	22.41	22.45	22.48	23.00
		1	2	22.5	22.36	22.32	23.00
		1	5	22.27	22.27	22.17	23.00
		3	0	21.27	21.24	21.27	22.00
		3	2	21.22	21.27	21.32	22.00
		3	3	21.31	21.27	21.19	22.00
		6	0	21.39	21.4	21.5	22.00
	64QAM	1	0	21.15	21.07	21.29	22.00
		1	2	20.99	21.06	21.21	22.00
		1	5	21.3	21.05	21.02	22.00
		3	0	20.16	20.15	20.17	21.00
		3	2	20.02	20.14	20.15	21.00
		3	3	20	19.96	20.06	21.00
		6	0	20.09	20.17	20.14	21.00
Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune up
				26055	26365	26675	
3MHz	QPSK	1	0	22.86	22.75	22.87	23.00
		1	7	22.8	22.83	22.69	23.00
		1	14	22.73	22.57	22.69	23.00
		8	0	22.04	22.08	22.21	23.00
		8	4	22.14	22.17	22.01	23.00
		8	7	22.16	22.19	22.1	23.00
		15	0	21.93	22.2	22.18	23.00
	16QAM	1	0	22.28	22.28	22.2	23.00
		1	7	22.21	22.16	22.12	23.00
		1	14	21.92	21.98	21.99	23.00

		8	0	21.02	21.12	21.22	22.00
		8	4	21.1	21.12	21.08	22.00
		8	7	21.22	21.04	21.05	22.00
		15	0	21.21	21.11	21.25	22.00
		1	0	21.13	21.01	21.13	22.00
		1	7	20.99	21.09	21.07	22.00
		1	14	21.14	21.06	20.99	22.00
	64QAM	8	0	20.08	20.15	20.26	21.00
		8	4	19.96	20.23	20.32	21.00
		8	7	20.05	20.07	19.91	21.00
		15	0	20.13	20.13	20.13	21.00
Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune up
				26052	26365	26665	
5MHz		1	0	22.79	22.73	22.93	23.00
		1	13	22.78	22.83	22.8	23.00
		1	24	22.72	22.68	22.78	23.00
	QPSK	12	0	22.08	22.09	22.03	23.00
		12	6	22.19	22.15	22.07	23.00
		12	13	22.05	22.1	22.2	23.00
		25	0	21.99	22.11	22.12	23.00
		1	0	22.29	22.31	22.29	23.00
		1	13	22.21	22.16	22.05	23.00
		1	24	21.91	21.95	21.89	23.00
	16QAM	12	0	21.03	21.06	21.12	22.00
		12	6	21.01	21.19	21.15	22.00
		12	13	21.03	20.95	20.99	22.00
		25	0	21.23	21.2	21.19	22.00
		1	0	21.2	21.1	21.31	22.00
		1	13	21.04	20.98	21.09	22.00
		1	24	21.3	20.98	20.92	22.00
	64QAM	12	0	20.15	20.25	20.17	21.00
		12	6	20.07	20.18	20.25	21.00
		12	13	20.12	20.04	19.9	21.00
		25	0	20.1	20.21	20.07	21.00
Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune up
				26090	26365	26640	
10MHz		1	0	22.87	22.74	22.92	23.00
		1	25	22.84	22.72	22.88	23.00
		1	49	22.7	22.61	22.78	23.00
	QPSK	25	0	22.1	22.22	22.14	23.00
		25	13	22.19	22.09	22.11	23.00
		25	25	22.13	22.12	22.29	23.00
		50	0	22.08	22.13	22.23	23.00
		1	0	22.13	22.37	22.26	23.00
		1	25	22.28	22.1	22.06	23.00
	16QAM	1	49	21.88	21.99	21.88	23.00
		25	0	21.14	21.1	21.25	22.00
		25	13	21.15	21.08	21.17	22.00

		25	25	21.19	20.98	21.01	22.00
		50	0	21.16	21.09	21.22	22.00
	64QAM	1	0	21.06	21.1	21.15	22.00
		1	25	21.02	21.05	21.25	22.00
		1	49	21.23	21.07	20.93	22.00
		25	0	20.22	20.2	20.28	21.00
		25	13	20.03	20.21	20.16	21.00
		25	25	20.06	20.02	19.95	21.00
		50	0	20.13	20.09	19.95	21.00
Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune up
				26115	26365	26615	
15MHz	QPSK	1	0	22.82	22.77	22.82	23.00
		1	38	22.8	22.79	22.87	23.00
		1	74	22.86	22.7	22.76	23.00
		36	0	22.01	22.13	22.08	23.00
		36	18	22.07	22.17	22.19	23.00
		36	39	22.1	22.18	22.23	23.00
		75	0	22.03	22.07	22.06	23.00
	16QAM	1	0	22.12	22.26	22.17	23.00
		1	38	22.19	22.28	22.06	23.00
		1	74	21.98	22.01	21.92	23.00
		36	0	21.07	21.15	21.12	22.00
		36	18	21.12	21.03	21.23	22.00
		36	39	21.04	20.99	20.96	22.00
		75	0	21.17	21.14	21.34	22.00
	64QAM	1	0	21.09	21.04	21.27	22.00
		1	38	21.1	21.15	21.11	22.00
		1	74	21.21	21	21.07	22.00
		36	0	20.17	20.23	20.22	21.00
		36	18	19.96	20.1	20.21	21.00
		36	39	20.14	20.1	19.9	21.00
		75	0	20.14	20.04	20.17	21.00
Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune up
				26140	26365	26590	
20MHz	QPSK	1	0	22.81	22.75	22.76	23.00
		1	50	22.74	22.75	22.78	23.00
		1	99	22.79	22.64	22.68	23.00
		50	0	22.32	22.17	22.13	23.00
		50	25	22.19	22.11	22.09	23.00
		50	50	22.11	22.18	22.18	23.00
		100	0	22.13	22.11	22.16	23.00
	16QAM	1	0	22.19	22.29	22.24	23.00
		1	50	22.22	22.19	22.12	23.00
		1	99	21.98	21.99	21.93	23.00
		50	0	21.12	21.13	21.15	22.00
		50	25	21.06	21.09	21.18	22.00
		50	50	21.12	21.05	20.99	22.00
		100	0	21.13	21.15	21.25	22.00

	64QAM	1	0	21.09	21.08	21.2	22.00
		1	50	21.04	21.04	21.13	22.00
		1	99	21.18	21.08	21.02	22.00
		50	0	20.12	20.15	20.18	21.00
		50	25	20	20.16	20.25	21.00
		50	50	20.03	19.99	19.99	21.00
		100	0	20.13	20.13	20.05	21.00
TE Band 26				**Conducted Power(dBm)**			
Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune up
				26697	26865	27033	
1.4MHz	QPSK	1	0	22.88	22.92	22.9	23.00
		1	2	22.93	22.81	22.93	23.00
		1	5	22.91	22.85	22.86	23.00
		3	0	22.7	22.77	22.87	23.00
		3	2	22.92	22.94	22.95	23.00
		3	3	22.88	22.87	22.67	23.00
		6	0	22.66	22.45	22.6	23.00
	16QAM	1	0	22.65	22.68	22.57	23.00
		1	2	22.74	22.58	22.75	23.00
		1	5	22.5	22.58	22.66	23.00
		3	0	22.76	22.68	22.67	23.00
		3	2	22.57	22.38	22.57	23.00
		3	3	22.41	22.39	22.51	23.00
		6	0	21.48	21.42	21.58	22.00
	64QAM	1	0	20.56	20.43	20.69	21.00
		1	2	20.85	20.58	20.67	21.00
		1	5	20.80	20.70	20.69	21.00
		3	0	19.56	19.49	19.64	21.00
		3	2	19.84	19.65	19.69	21.00
		3	3	19.82	19.69	19.87	21.00
		6	0	19.72	19.72	19.80	20.00
Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune up
				26705	26865	27025	
3MHz	QPSK	1	0	22.68	22.91	22.91	23.00
		1	7	22.95	22.83	22.91	23.00
		1	14	22.92	22.81	22.88	23.00
		8	0	22.69	22.6	22.78	23.00
		8	4	22.45	22.57	22.63	23.00
		8	7	22.76	22.81	22.76	23.00
		15	0	22.47	22.45	22.61	23.00
	16QAM	1	0	22.56	22.58	22.62	23.00
		1	7	22.77	22.67	22.59	23.00
		1	14	21.64	21.68	21.52	22.00
		8	0	21.55	21.69	21.83	22.00
		8	4	21.8	21.74	21.77	22.00
		8	7	21.81	21.59	21.7	22.00
		15	0	21.51	21.54	21.58	22.00