TEST REPORT

Report Reference No. .... :	**TRE18100263** R/C…….: 22057
FCC ID .... :	**2AARFBFTD51601**
Applicant's name .... :	**Fujian BelFone Communications Technology Co., Ltd.**
Address...:	A15, Huaqiao Economic Development Zone, Shuangyang, Luojiang, Quanzhou, Fujian, China
Manufacturer.....................................:	Fujian BelFone Communications Technology Co., Ltd.
Address...:	A15, Huaqiao Economic Development Zone, Shuangyang, Luojiang, Quanzhou, Fujian, China
Test item description .... :	**DMR RADIO**
Trade Mark ....:	BelFone
Model/Type reference.......................:	BF-TD516（400-480MHz）
Listed Model(s) ....:	-
Standard .... :	**FCC 47 CFR Part2.1093** **IEEE Std C95.1, 1999 Edition** **IEEE 1528: 2013**
Date of receipt of test sample………:	Oct. 31, 2018
Date of testing…………………………..:	Nov. 01, 2018 - Nov. 28, 2018
Date of issue…………………………….:	Nov. 30, 2018
Result................. …………………...:	**PASS**

Compiled by (position+printed name+signature)..:	File administrators:Xiaodong Zhao	Xiaodong Zhao
Supervised by (position+printed name+signature)..:	Test Engineer: Xiaodong Zhao	Xiaodong Zhao
Approved by (position+printed name+signature)..:	Manager: Hans Hu	Hans Hu

Testing Laboratory Name .... :	**Shenzhen Huatongwei International Inspection Co., Ltd**
Address...:	1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China

Contents

1 . Test Standards and Report version

1.1. Test Standards

The tests were performed according to following standards:

FCC 47 Part 2.1093: Radiofrequency Radiation Exposure Evaluation:Portable Devices
IEEE Std C95.1, 1999 Edition: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz
IEEE Std 1528™-2013: IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.
KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04: SAR Measurement Requirements for 100 MHz to 6 GHz
KDB 865664 D02 RF Exposure Reporting v01r02: RF Exposure Compliance Reporting and Documentation Considerations
KDB 447498 D01 General RF Exposure Guidance v06: Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies

KDB 643646 D01:SAR Test for PTT Radios v01r03: SAR Test Reduction Considerations for Occupational PTT Radios

1.2. Report version

Version No.	Date of issue	Description
N/A	2018-11-30	Original

2. Summary

2.1. Client Information

Applicant:	Fujian BelFone Communications Technology Co., Ltd.
Address:	A15, Huaqiao Economic Development Zone, Shuangyang, Luojiang, Quanzhou, Fujian, China
Manufacturer:	Fujian BelFone Communications Technology Co., Ltd.
Address:	A15, Huaqiao Economic Development Zone, Shuangyang, Luojiang, Quanzhou, Fujian, China

2.2. Product Description

Name of EUT:	DMR RADIO			
Trade mark:	BelFone			
Model/Type reference:	BF-TD516（400-480MHz）			
Listed model(s):	-			
Power supply:	DC 7.4V			
Accessories	Belt Clip			
Device Category:	Portable			
RF Exposure Environment:	Occupational / Controlled			
Hardware version:	AP105A2			
Software version:	1.0.2			
Device Dimension:	Overall (Length x Width x Thickness):112 x 55 x 32mm Antenna(Length):145mm			
Maximum SAR Value				
Separation Distance:	Front-of-face:	25mm		
	Body:	0mm		
Maximun SAR Value (1g):	Front-of-face:	1.56 W/kg		
	Body:	2.28 W/kg		
PMR				
Operation Frequency Range:	From 400MHz to 480MHz			
Rated Output Power:	☒ High Power:	5W(36.99dBm)	☒ Low Power	1W (30dBm)
Modulation Type:	Digital:	4FSK		
Channel Separation:	Digital:	☐ 6.25kHz	☒ 12.5kHz	Digital:
Digital Type:	DMR			
Antenna type:	External			

2.3. Test frequency list

When the frequency channels required for SAR testing are not specified, the following should be applied to determine the number of required test channels.The test channels should be evenly spread across the transmission frequency band of each wireless mode.

$$N_c = Round\{[100(f_{high} - f_{low})/f_c]^{0.5} \times (f_c/100)^{0.2}\},$$

N_c is the number of test channels, rounded to the nearest integer,
f_{high} and f_{low} are the highest and lowest channel frequencies within the transmission band,
f_c is the mid-band channel frequency,
all frequencies are in MHz.

Operation Frequency		Test Frequency number
Start Frequency	Stop Frequency	
400	480	6

ModulationType	Channel Separation	Test Channel	Test Frequency (MHz)	
			TX	RX
Digital	12.5kHz	CH1	400.0125	400.0125
		CH2	416.0000	416.0000
		CH3	432.0000	432.0000
		CH4	448.0000	448.0000
		CH5	464.0000	464.0000
		CH6	479.9875	479.9875

3. Test Environment

3.1. Test laboratory

Laboratory:Shenzhen Huatongwei International Inspection Co., Ltd.
Address: 1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China

3.2. Test Facility

CNAS-Lab Code: L1225

Shenzhen Huatongwei International Inspection Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories.

A2LA-Lab Cert. No.: 3902.01

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

FCC-Registration No.: 762235

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Registration 762235.

IC-Registration No.: 5377B-1

Two 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 5377B-1.

ACA

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our A2LA accreditation.

3.3. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Ambient temperature	18 °C to 25 °C
Ambient humidity	30%RH to 70%RH
Air Pressure	950-1050mbar

4. Equipments Used during the Test

Used	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. date (YY-MM-DD)	Due date (YY-MM-DD)
●	Data Acquisition Electronics DAEx	SPEAG	DAE4	1549	2018/04/25	2019/04/24
●	E-field Probe	SPEAG	EX3DV4	7494	2018/02/26	2019/02/25
○	Universal Radio Communication Tester	R&S	CMW500	137681	2018/07/11	2019/07/10
● Tissue-equivalent liquids Validation						
●	Dielectric Assessment Kit	SPEAG	DAK-3.5	1267	2018/03/01	2019/02/28
○	Dielectric Assessment Kit	SPEAG	DAK-12	1130	2018/03/01	2019/02/28
●	Network analyzer	Keysight	E5071C	MY46733048	2018/09/19	2019/09/18
○ System Validation						
○	System Validation Antenna	SPEAG	CLA-150	4024	2018/02/21	2021/02/20
●	System Validation Dipole	SPEAG	D450V3	1102	2018/02/23	2021/02/22
○	System Validation Dipole	SPEAG	D750V3	1180	2018/02/07	2021/02/06
○	System Validation Dipole	SPEAG	D835V2	4d238	2018/02/19	2021/02/18
○	System Validation Dipole	SPEAG	D1750V2	1164	2018/02/06	2021/02/05
○	System Validation Dipole	SPEAG	D1900V2	5d226	2018/02/22	2021/02/21
○	System Validation Dipole	SPEAG	D2450V2	1009	2018/02/05	2021/02/04
○	System Validation Dipole	SPEAG	D2600V2	1150	2018/02/05	2021/02/04
○	System Validation Dipole	SPEAG	D5GHzV2	1273	2018/02/21	2021/02/20
●	Signal Generator	R&S	SMB100A	114360	2018/08/21	2019/08/20
●	Power Viewer for Windows	R&S	N/A	N/A	N/A	N/A
●	Power sensor	R&S	NRP18A	101010	2018/08/21	2019/08/20
●	Power sensor	R&S	NRP18A	101011	2018/08/21	2019/08/20
●	Power Amplifier	BONN	BLWA 0160-2M	1811887	2018/11/15	2018/11/14
●	Dual Directional Coupler	Mini-Circuits	ZHDC-10-62-S+	F975001814	2018/11/15	2018/11/14
●	Attenuator	Mini-Circuits	VAT-3W2+	1819	2018/11/15	2018/11/14
●	Attenuator	Mini-Circuits	VAT-10W2+	1741	2018/11/15	2018/11/14

Note:

1. *The Probe,Dipole and DAE calibration reference to the Appendix B and C.*
2. *Referring to KDB865664 D01, the dipole calibration interval can be extended to 3 years with justifcatio. The dipole are also not physically damaged or repaired during the interval.*

5. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg. The equivalent ratio (1.5/1.6) should be applied to extremity and occupational exposure conditions.The expanded SAR measurement uncertainty must be ≤ 30%, for a confidence interval of k = 2. If these conditions are met,extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval.

6. SAR Measurements System Configuration

6.1. SAR Measurement Set-up

The DASY5 system for performing compliance tests consists of the following items:

A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension for accommodating the data acquisition electronics (DAE).

A dosimetric probe, i.e. an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.

A data acquisition electronic (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.

A unit to operate the optical surface detector which is connected to the EOC.

The Electro-Optical Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASY5 measurement server.

The DASY5 measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. A computer operating Windows 2003.

DASY5 software and SEMCAD data evaluation software.

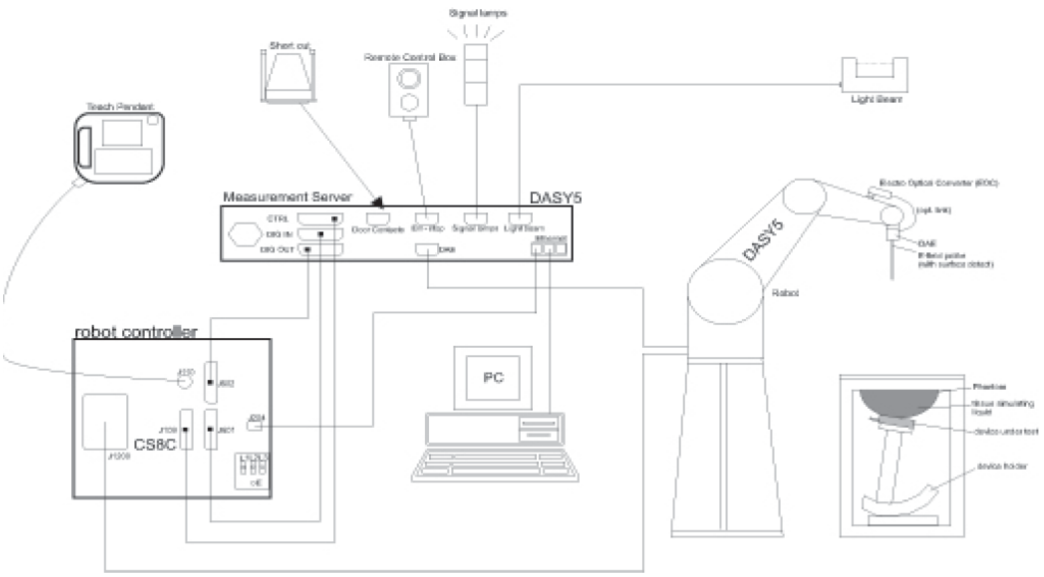
Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.

The generic twin phantom enabling the testing of left-hand and right-hand usage.

The device holder for handheld Mobile Phones.

Tissue simulating liquid mixed according to the given recipes.

System validation dipoles allowing to validate the proper functioning of the system.



6.2. DASY5 E-field Probe System

The SAR measurements were conducted with the dosimetric probe EX3DV4 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation.

- **Probe Specification**

ConstructionSymmetrical design with triangular core
Interleaved sensors
Built-in shielding against static charges
PEEK enclosure material (resistant to organic solvents, e.g., DGBE)

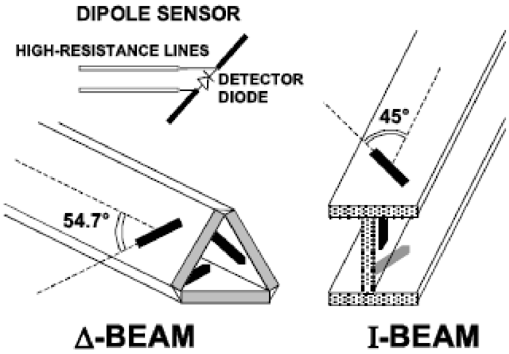
CalibrationISO/IEC 17025 calibration service available.

Frequency	10 MHz to 10 GHz; Linearity: ± 0.2 dB (30 MHz to 10 GHz)
Directivity	±0.1 dB in TSL (rotation around probe axis) ±0.3 dB in TSL (rotation normal to probe axis)
Dynamic Range	10 µW/g to > 100 mW/g; Linearity: ± 0.2 dB
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.0 mm
Application	General dosimetry up to 10 GHz Dosimetry in strong gradient fields Compliance tests of Mobile Phones
Compatibility	DASY3, DASY4, DASY52 SAR and higher, EASY4/MRI

- **Isotropic E-Field Probe**

The isotropic E-Field probe has been fully calibrated and assessed for isotropicity, and boundary effect within a controlled environment. Depending on the frequency for which the probe is calibrated the method utilized for calibration will change.

The E-Field probe utilizes a triangular sensor arrangement as detailed in the diagram below:



6.3. Phantoms

Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI isfully compatible with standard and all known tissuesimulating liquids. ELI has been optimized regarding its performance and can beintegrated into our standard phantom tables. A cover prevents evaporation ofthe liquid. Reference markings on the phantom allow installation of thecomplete setup, including all predefined phantom positions and measurementgrids, by teaching three points. The phantom is compatible with all SPEAGdosimetric probes and dipoles.

ELI Phantom

6.4. Device Holder

The device was placed in the device holder (illustrated below) that is supplied by SPEAG as an integral part of the DASY system.
The DASY device holder is designed to cope with the different positions given in the standard. It has two scales for device rotation (with respect to the body axis) and device inclination (with respect to the line between the ear reference points). The rotation centers for both scales is the ear reference point (ERP). Thus the device needs no repositioning when changing the angles.

Device holder supplied by SPEAG

7. SAR Test Procedure

7.1. Scanning Procedure

The DASY5 installation includes predefined files with recommended procedures for measurements and validation. They are read-only document files and destined as fully defined but unmeasured masks. All test positions (head or body-worn) are tested with the same configuration of test steps differing only in the grid definition for the different test positions.

The “reference” and “drift” measurements are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure. The indicated drift is mainly the variation of the DUT’s output power and should vary max. ± 5 %.

The “surface check” measurement tests the optical surface detection system of the DASY5 system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above ± 0.1mm). To prevent wrong results tests are only executed when the liquid is free of air bubbles. The difference between the optical surface detection and the actual surface depends on the probe and is specified with each probe (It does not depend on the surface reflectivity or the probe angle to the surface within ± 30°.)

Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values before running a detailed measurement around the hot spot.Before starting the area scan a grid spacing of 15 mm x 15 mm is set. During the scan the distance of the probe to the phantom remains unchanged. After finishing area scan, the field maxima within a range of 2 dB will be ascertained.

Zoom Scan

After the maximum interpolated values were calculated between the points in the cube, the SAR was averaged over the spatial volume (1g or 10g) using a 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the “Not a knot” condition (in x, y, and z directions). The volume was then integrated with the trapezoidal algorithm.

Spatial Peak Detection

The procedure for spatial peak SAR evaluation has been implemented and can determine values of masses of 1g and 10g, as well as for user-specific masses.The DASY5 system allows evaluations that combine measured data and robot positions, such as:
• maximum search
• extrapolation
• boundary correction
• peak search for averaged SAR
During a maximum search, global and local maxima searches are automatically performed in 2-D after each Area Scan measurement with at least 6 measurement points. It is based on the evaluation of the local SAR gradient calculated by the Quadratic Shepard’s method. The algorithm will find the global maximum and all local maxima within -2 dB of the global maxima for all SAR distributions.
Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. Several measurements at different distances are necessary for the extrapolation.
Extrapolation routines require at least 10 measurement points in 3-D space.
They are used in the Zoom Scan to obtain SAR values between the lowest measurement points and the inner phantom surface. The routine uses the modified Quadratic Shepard’s method for extrapolation.

A Z-axis scan measures the total SAR value at the x-and y-position of the maximum SAR value found during the cube scan. The probe is moved away in z-direction from the bottom of the SAM phantom in 5mm steps.

Table 1: Area and Zoom Scan Resolutions per FCC KDB Publication 865664 D01v04

<table>
<tr><td colspan="3"></td><td>$\leq$ 3 GHz</td><td>> 3 GHz</td></tr>
<tr><td colspan="3">Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface</td><td>5 mm ± 1 mm</td><td>½·δ·ln(2) mm ± 0.5 mm</td></tr>
<tr><td colspan="3">Maximum probe angle from probe axis to phantom surface normal at the measurement location</td><td>30° ± 1°</td><td>20° ± 1°</td></tr>
<tr><td colspan="3" rowspan="2">Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}</td><td>$\leq$ 2 GHz: $\leq$ 15 mm
2 – 3 GHz: $\leq$ 12 mm</td><td>3 – 4 GHz: $\leq$ 12 mm
4 – 6 GHz: $\leq$ 10 mm</td></tr>
<tr><td colspan="2">When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be $\leq$ the corresponding x or y dimension of the test device with at least one measurement point on the test device.</td></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}</td><td>$\leq$ 2 GHz: $\leq$ 8 mm
2 – 3 GHz: $\leq$ 5 mm*</td><td>3 – 4 GHz: $\leq$ 5 mm*
4 – 6 GHz: $\leq$ 4 mm*</td></tr>
<tr><td rowspan="3">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2">uniform grid: $\Delta z_{Zoom}(n)$</td><td>$\leq$ 5 mm</td><td>3 – 4 GHz: $\leq$ 4 mm
4 – 5 GHz: $\leq$ 3 mm
5 – 6 GHz: $\leq$ 2 mm</td></tr>
<tr><td rowspan="2">graded grid</td><td>$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface</td><td>$\leq$ 4 mm</td><td>3 – 4 GHz: $\leq$ 3 mm
4 – 5 GHz: $\leq$ 2.5 mm
5 – 6 GHz: $\leq$ 2 mm</td></tr>
<tr><td>$\Delta z_{Zoom}(n>1)$: between subsequent points</td><td colspan="2">$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$ mm</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>$\geq$ 30 mm</td><td>3 – 4 GHz: $\geq$ 28 mm
4 – 5 GHz: $\geq$ 25 mm
5 – 6 GHz: $\geq$ 22 mm</td></tr>
<tr><td colspan="5">Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see IEEE Std 1528-2013 for details.
* When zoom scan is required and the reported SAR from the area scan based 1-g SAR estimation procedures of KDB Publication 447498 is $\leq$ 1.4 W/kg, $\leq$ 8 mm, $\leq$ 7 mm and $\leq$ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.</td></tr>
</table>

7.2. Data Storage and Evaluation

Data Storage

The DASY5 software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension ".DA4". The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [°C], [mW/g], [mW/cm^2], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

Data Evaluation

The SEMCAD software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe parameters:	Sensitivity:	Normi, ai0, ai1, ai2
	Conversion factor:	ConvFi
	Diode compression point:	Dcpi
Device parameters:	Frequency:	f
	Crest factor:	cf
Media parameters:	Conductivity:	σ
	Density:	ρ

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY5 components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot \frac{cf}{dcp_i}$$

Vi: compensated signal of channel (i = x, y, z)
Ui: input signal of channel (i = x, y, z)
cf: crest factor of exciting field (DASY parameter)
dcpi: diode compression point (DASY parameter)

From the compensated input signals the primary field data for each channel can be evaluated:

$$\text{E} - \text{fieldprobes :} \qquad E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

$$\text{H} - \text{fieldprobes :} \qquad H_i = \sqrt{V_i} \cdot \frac{a_{i0} + a_{i1} f + a_{i2} f^2}{f}$$

Vi: compensated signal of channel (i = x, y, z)
Normi: sensor sensitivity of channel (i = x, y, z), [mV/(V/m)2] for E-field Probes
ConvF: sensitivity enhancement in solution
aij: sensor sensitivity factors for H-field probes
f: carrier frequency [GHz]
Ei: electric field strength of channel i in V/m
Hi: magnetic field strength of channel i in A/m

The RSS value of the field components gives the total field strength (Hermitian magnitude):

$$E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2}$$

The primary field data are used to calculate the derived field units.

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1'000}$$

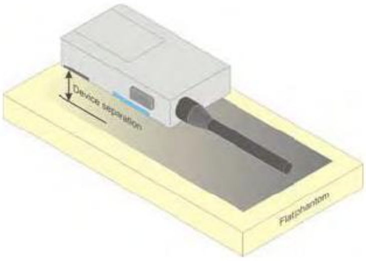
SAR: local specific absorption rate in mW/g
Etot: total field strength in V/m
σ: conductivity in [mho/m] or [Siemens/m]
ρ: equivalent tissue density in g/cm3

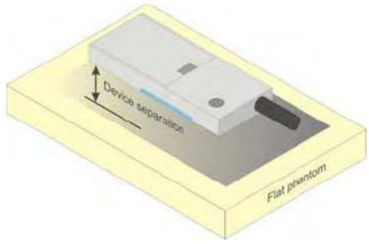
Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid.

8. Position of the wireless device in relation to the phantom

8.1. Front-of-face

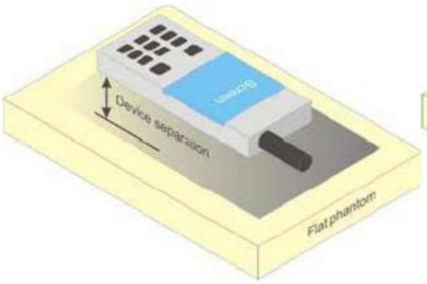
A typical example of a front-of-face device is a two-way radio that is held at a distance from the face of the user when transmitting. In these cases the device under test shall be positioned at the distance to the phantom surface that corresponds to the intended use as specified by the manufacturer in the user instructions. If the intended use is not specified, a separation distance of 25 mm between the phantom surface and the device shall be used.

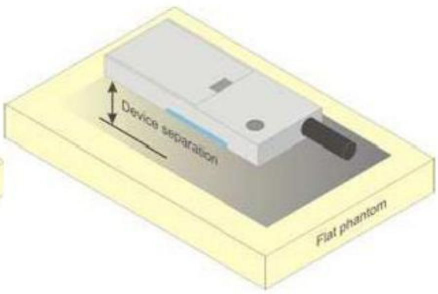




8.2. Body Position

A typical example of a body-worn device is a mobile phone, wireless enabled PDA or other battery operated wireless device with the ability to transmit while mounted on a person’s body using a carry accessory approved by the wireless device manufacturer.





9. System Check

9.1. Tissue Dielectric Parameters

It's satisfying the latest tissue dielectric parameters requirements proposed by the KDB865664 D01.

Targets for tissue simulating liquid

Tissue dielectric parameters for head and body				
Target Frequency	Head		Body	
(MHz)	εr	σ(s/m)	εr	σ(s/m)
450	43.50	0.87	56.70	0.94

CheckResult:

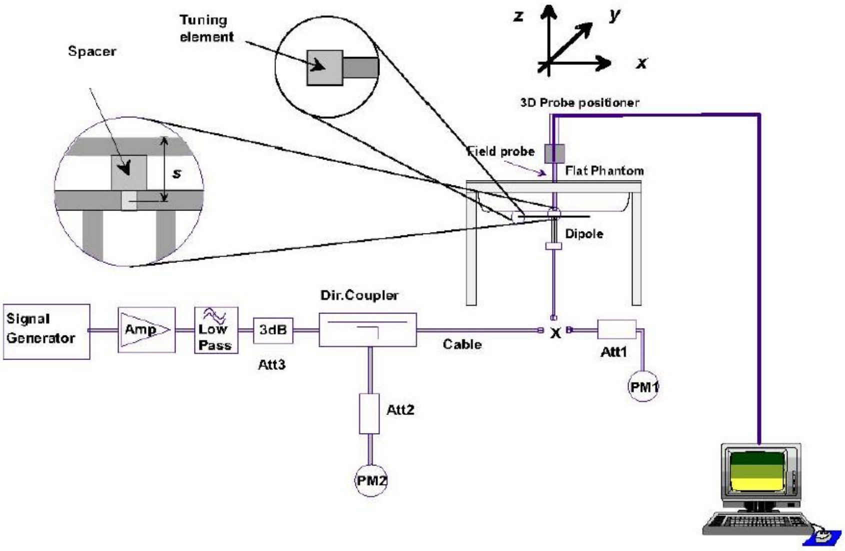
Dielectric performance of Head tissue simulating liquid									
Frequency (MHz)	εr		σ(s/m)		Delta (εr)	Delta (σ)	Limit	Temp (℃)	Date
	Target	Measured	Target	Measured					
450	43.50	44.49	0.87	0.86	2.28%	-1.26%	±5%	22	2018-11-16

Dielectric performance of Body tissue simulating liquid									
Frequency (MHz)	εr		σ(s/m)		Delta (εr)	Delta (σ)	Limit	Temp (℃)	Date
	Target	Measured	Target	Measured					
450	56.70	56.11	0.94	0.96	-1.05%	2.23%	±5%	22	2018-11-19

9.2. SAR System Check

The purpose of the system check is to verify that the system operates within its specifications at the decice test frequency.The system check is simple check of repeatability to make sure that the system works correctly at the time of the compliance test;

System check results have to be equal or near the values determined during dipole calibration with the relevant liquids and test system (±10%).
System check is performed regularly on all frequency bands where tests are performed with the DASY5 system.



System Performance Check Setup

Photo of Dipole Setup

Check Result:

Head											
Frequency (MHz)	1g SAR			10g SAR			Delta (1g)	Delta (10g)	Limit	Temp (℃)	Date
	Target 1W	Normalize to 1W	Measured 250mW	Target 1W	Normalize to 1W	Measured 250mW					
450	4.48	4.64	1.16	3.00	3.09	0.77	3.57%	3.07%	±10%	22	2018-11-16

Body											
Frequency (MHz)	1g SAR			10g SAR			Delta (1g)	Delta (10g)	Limit	Temp (℃)	Date
	Target 1W	Normalize to 1W	Measured 250mW	Target 1W	Normalize to 1W	Measured 250mW					
450	4.47	4.88	1.22	3.01	3.30	0.83	9.17%	9.77%	±10%	22	2018-11-19

Note:

1. *the graph results see follow.*

Plots of System Performance Check

SystemPerformanceCheck-Head 450MHz

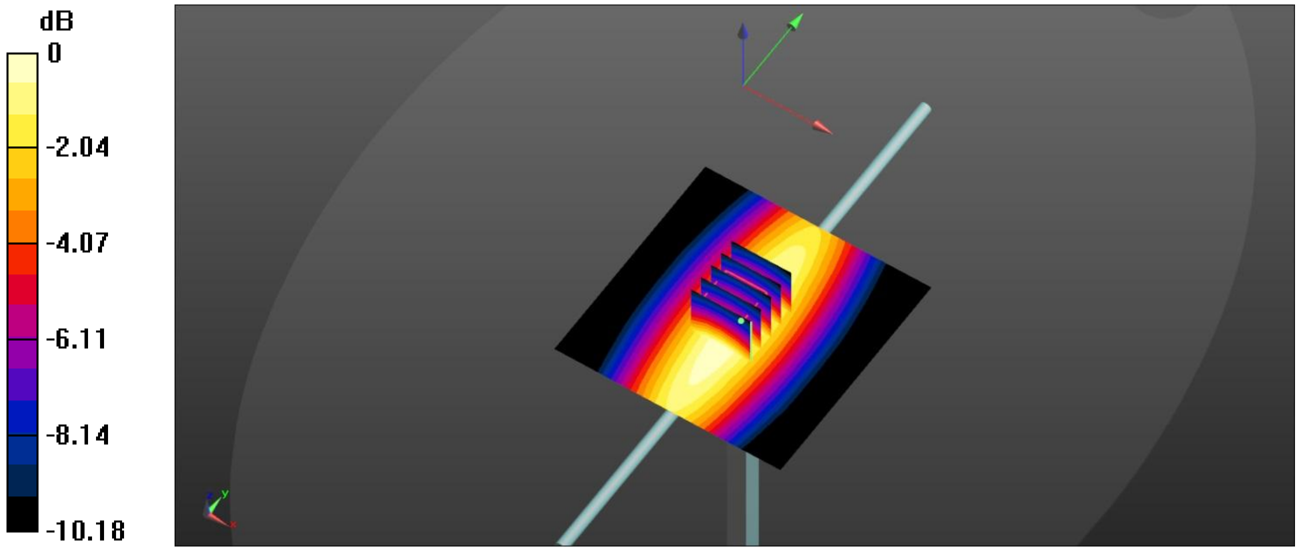
DUT: Dipole 450 MHz; Type: D450V3; Serial: 1102
Date: 2018-11-16
Communication System: UID 0, A-CW (0); Frequency: 450 MHz
Medium parameters used: f = 450 MHz; σ = 0.859 S/m; ε_r = 44.492; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN7494; ConvF(11.7, 11.7, 11.7); Calibrated: 2/26/2018;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1549; Calibrated: 4/25/2018
- Phantom: ELI V8.0 ; Type: QD OVA 004 AA ; Serial: 2078
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

Head/d=15mm, Pin=250mW/Area Scan (81x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.60 W/kg

Head/d=15mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 44.31 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 1.85 W/kg
SAR(1 g) = 1.16 W/kg; SAR(10 g) = 0.773 W/kg
Maximum value of SAR (measured) = 1.58 W/kg



0 dB = 1.58 W/kg = 1.99 dBW/kg

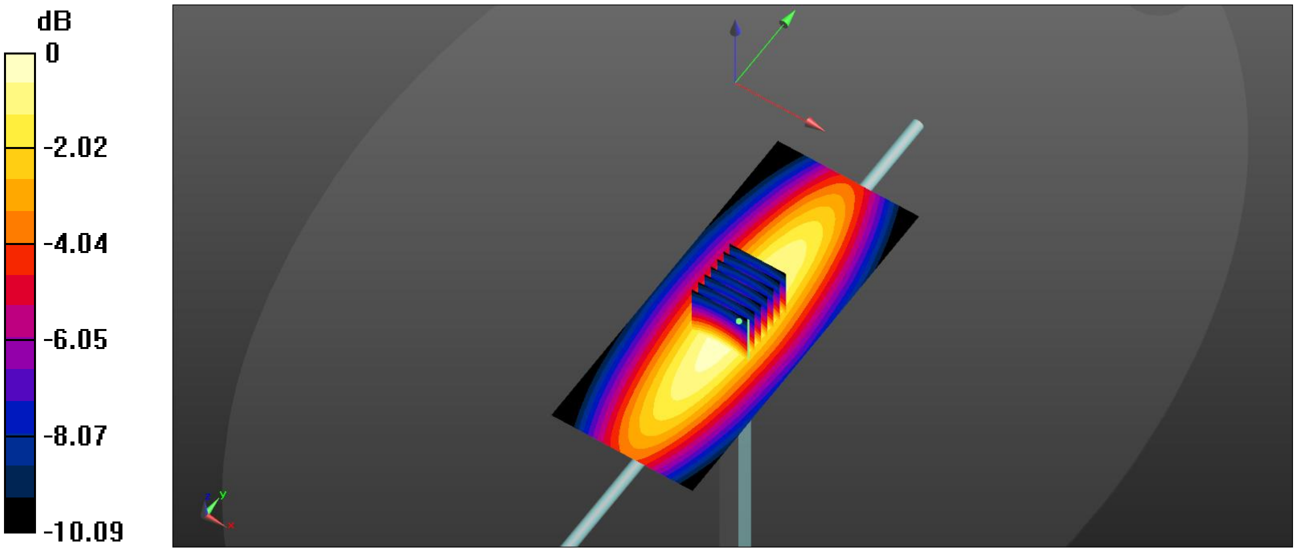
SystemPerformanceCheck-Body 450MHz

DUT: Dipole 450 MHz; Type: D450V3; Serial: 1102
Date: 2018-11-19
Communication System: UID 0, A-CW (0); Frequency: 450 MHz
Medium parameters used: f = 450 MHz; σ = 0.961 S/m; ε_r = 56.106; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN7494; ConvF(11.87, 11.87, 11.87); Calibrated: 2/26/2018;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1549; Calibrated: 4/25/2018
- Phantom: ELI V8.0 ; Type: QD OVA 004 AA ; Serial: 2078
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

Head/d=15mm, Pin=250mW/Area Scan (51x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.67 W/kg
Head/d=15mm, Pin=250mW /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 42.66 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 2.03 W/kg
SAR(1 g) = 1.22 W/kg; SAR(10 g) = 0.826 W/kg
Maximum value of SAR (measured) = 1.72 W/kg



0 dB = 1.72 W/kg = 2.36 dBW/kg

10. SAR Exposure Limits

SAR assessments have been made in line with the requirements of FCC 47 CFR § 2.1093.

Type Exposure	Limit (W/kg)	
	General Population / Uncontrolled Exposure Environment	Occupational / Controlled Exposure Environment
Spatial Average SAR (whole body)	0.08	0.4
Spatial Peak SAR (1g cube tissue for head and trunk)	1.6	8.0
Spatial Peak SAR (10g for limb)	4.0	20.0

Population/Uncontrolled Environments: are defined as locations where there is the exposure of individual who have no knowledge or control of their exposure.

Occupational/Controlled Environments: are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure (i.e. as a result of employment or occupation).

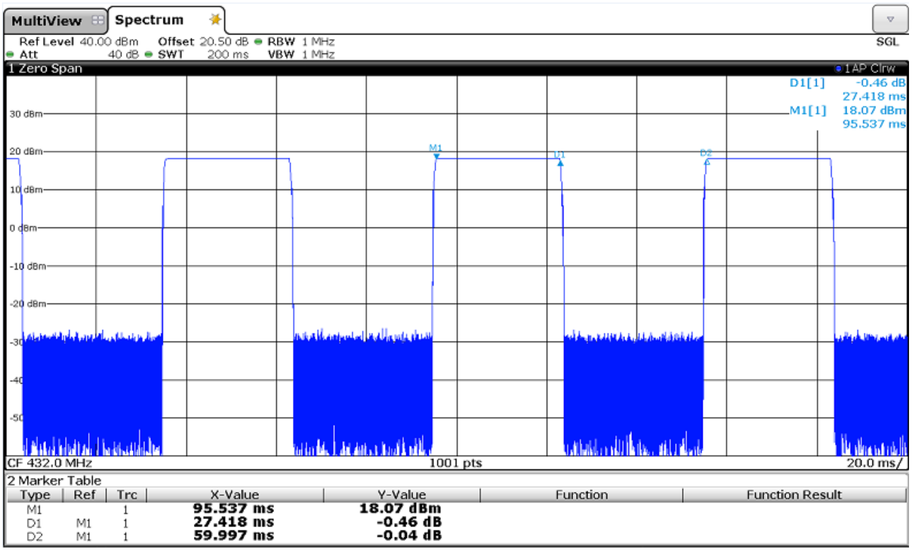
11. Conducted Power Measurement Results

PMR				
Mode	Channel Separation	Frequency		Conducted Power (dBm)
		Channel	MHz	
Digtal	12.5KHz	CH1	400.0125	36.50
		CH2	416.0000	36.60
		CH3	432.0000	36.60
		CH4	448.0000	36.70
		CH5	464.0000	36.50
		CH6	479.9875	36.50

Duty Factor Measured Results

Mode	Type	T on (ms)	Period (ms)	Duty Cycle	Crest Factor (1/duty cycle)
Digtal	4FSK	27.418	59.997	45.69%	2.18823

Duty Cycle plot



12. Maximum Tune-up Limit

This device operates using the following maximum output power specifications. SAR values were scaled to the maximum allowed power to determine compliance per KDB publication 447498 D01.

PMR			
Mode	Channel Separation (KHz)	Operation Frequency Range (MHz)	Maximum tune-up power (dBm)
Digtial	12.5	400~480	36.99

13. SAR Measurement Results

Front-of-face											
Mode	Channel Separation	Frequency		Conducted Power (dBm)	Tune-up limit (dBm)	Tune-up scaling factor	Power Drift(dB)	Measured SAR(1g)	Report SAR(1g)	50% Duty factor SAR	Test Plot
		CH	MHz					(W/kg)	(W/kg)	(W/kg)	
Digtial	12.5KHz	CH1	400.0125	36.50	36.99	1.12	-	-	-	-	-
		CH2	416.0000	36.60	36.99	1.09	-	-	-	-	-
		CH3	432.0000	36.60	36.99	1.09	-	-	-	-	-
		CH4	448.0000	36.70	36.99	1.07	0.05	2.91	3.11	1.56	1
		CH5	464.0000	36.50	36.99	1.12	-	-	-	-	-
		CH6	479.9875	36.50	36.99	1.12	-	-	-	-	-

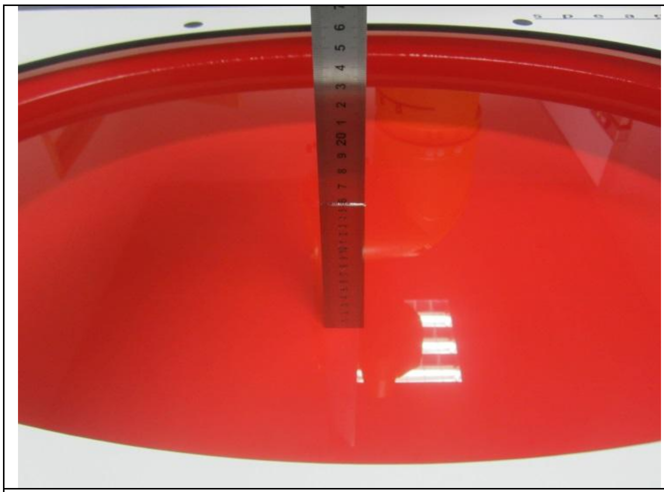
Body-worn (Rear)											
Mode	Channel Separation	Frequency		Conducted Power (dBm)	Tune-up limit (dBm)	Tune-up scaling factor	Power Drift(dB)	Measured SAR(1g)	Report SAR(1g)	50% Duty factor SAR	Test Plot
		CH	MHz					(W/kg)	(W/kg)	(W/kg)	
Digtial	12.5KHz	CH1	400.0125	36.50	36.99	1.12	-	-	-	-	-
		CH2	416.0000	36.60	36.99	1.09	-	-	-	-	-
		CH3	432.0000	36.60	36.99	1.09	-	-	-	-	-
		CH4	448.0000	36.70	36.99	1.07	-0.15	4.26	4.56	2.28	2
		CH5	464.0000	36.50	36.99	1.12	-	-	-	-	-
		CH6	479.9875	36.50	36.99	1.12	-	-	-	-	-

Note:

1. *The value with blue color is the maximum SAR Value of each test band.*
2. *Batteries are fully charged at the beginning of the SAR measurements.*
3. *The Body-worn SAR evaluation was performed with the Leather Case body-worn accessory attached to the DUT and touching the outer surface of the planar phantom.*
4. *When the SAR for all antennas tested using the default battery is ≤ 3.5 W/kg (50% PTT duty factor), testing of all other required channels is not necessary.*
5. *When the SAR of an antenna tested on the highest output power using the default battery is > 3.5 W/Kg and ≤ 4.0 W/Kg (50% PTT duty factor), testing of the immediately adjacent channel(s) is not necessary, but testing of other required channels may still be required.*
6. *When the SAR for all antennas tested using the default battery ≤ 4.0 W/kg(50% PTT duty factor), test additional batteries using the antenna and channel configuration that resulted in the highest SAR.*

SAR Test Data Plots to the Appendix A.

14. Test Setup Photos



Liquid depth in the ELI Phantom(450MHz)

Front-of-face(25mm)

Body-worn(0mm)

15. External and Internal Photos of the EUT

Please refer to the test report No. TRE18100262

-------------End of Report-------------

Test Laboratory: Huatongwei International Inspection Co., Ltd.,SAR Lab Date: 11/16/2018

Digital-Front of face

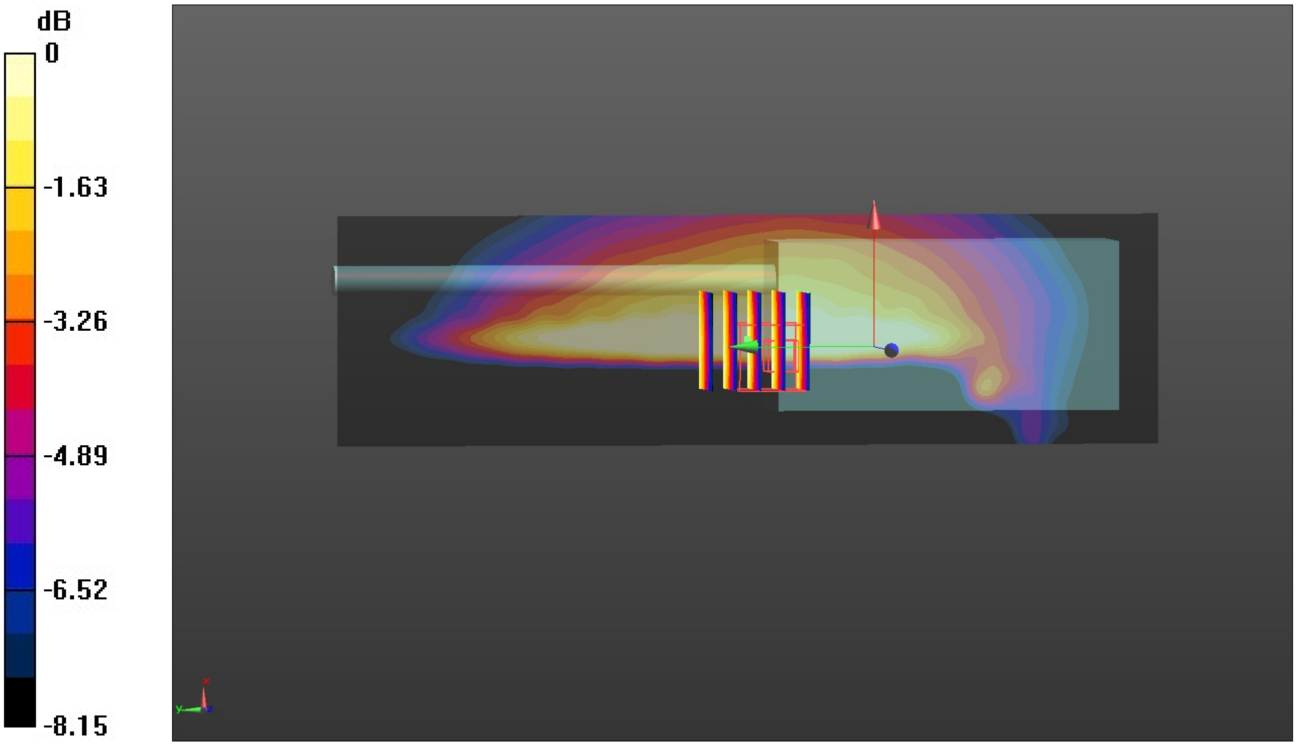
Communication System: UID 0, Digital (0); Frequency: 448 MHz;Duty Cycle: 1:2.18823
Medium parameters used: f = 448 MHz; σ = 0.857 S/m; ε_r = 44.536; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient Temperature:22.7°C;Liquid Temperature:22.3°C;

DASY Configuration:

- Probe: EX3DV4 - SN7494; ConvF(11.7, 11.7, 11.7) @ 448 MHz; Calibrated: 2/26/2018
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 4/25/2018
- Phantom: ELI V8.0 ; Type: QD OVA 004 AA ; Serial: 2078
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Front/Digital-CHU4/Area Scan (51x181x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 6.13 W/kg

Front/Digital-CHU4/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 58.71 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 4.17 W/kg
SAR(1 g) = 2.91 W/kg; SAR(10 g) = 2.16 W/kg
Maximum value of SAR (measured) = 3.08 W/kg



0 dB = 3.08 W/kg = 4.89 dBW/kg

Test Laboratory: Huatongwei International Inspection Co., Ltd.,SAR Lab Date: 11/19/2018

Digital-Body Worn

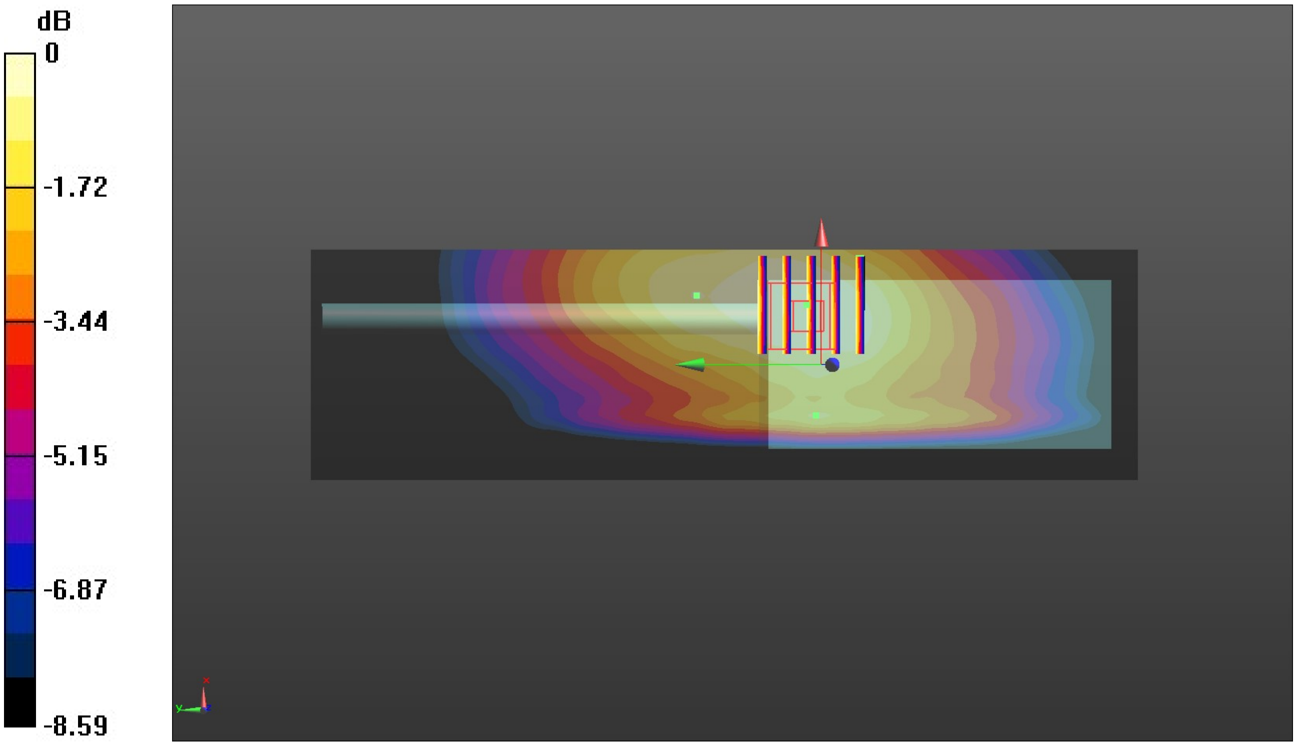
Communication System: UID 0, Digital (0); Frequency: 448 MHz;Duty Cycle: 1:2.18823
Medium parameters used: f = 448 MHz; σ = 0.959 S/m; ε_r = 56.106; ρ = 1000 kg/m^3
Phantom section: Flat Section
Ambient Temperature:22.6℃;Liquid Temperature:22.3℃;

DASY Configuration:

- Probe: EX3DV4 - SN7494; ConvF(11.87, 11.87, 11.87) @ 448 MHz; Calibrated: 2/26/2018
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 4/25/2018
- Phantom: ELI V8.0 ; Type: QD OVA 004 AA ; Serial: 2078
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Rear/Digital-CHU4/Area Scan (51x181x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 4.62 W/kg

Rear/Digital-CHU4/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 60.77 V/m; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 6.06 W/kg
SAR(1 g) = 4.26 W/kg; SAR(10 g) = 3.1 W/kg
Maximum value of SAR (measured) = 4.48 W/kg



0 dB = 4.48 W/kg = 6.51 dBW/kg

1.1. DAE4 Calibration Certificate

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Accreditation No.: SCS 0108

Client **CCIC - HTW (Auden)**

Certificate No: DAE4-1549_Apr18

CALIBRATION CERTIFICATE

Object	DAE4 - SD 000 D04 BN - SN: 1549
Calibration procedure(s)	QA CAL-06.v29 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	April 25, 2018

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	31-Aug-17 (No:21092)	Aug-18
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Auto DAE Calibration Unit	SE UWS 053 AA 1001	04-Jan-18 (in house check)	In house check: Jan-19
Calibrator Box V2.1	SE UMS 006 AA 1002	04-Jan-18 (in house check)	In house check: Jan-19

	Name	Function	Signature
Calibrated by:	Eric Hainfeld	Laboratory Technician	
Approved by:	Sven Kühn	Deputy Manager	i.V.

Issued: April 25, 2018

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

Certificate No: DAE4-1549_Apr18 Page 1 of 5

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Accreditation No.: **SCS 0108**

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 = 6.1μV , 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	406.286 ± 0.02% (k=2)	405.992 ± 0.02% (k=2)	406.121 ± 0.02% (k=2)
Low Range	3.98481 ± 1.50% (k=2)	3.99129 ± 1.50% (k=2)	3.99380 ± 1.50% (k=2)

Connector Angle

Connector Angle to be used in DASY system	19.5 ° ± 1 °

Appendix (Additional assessments outside the scope of SCS0108)

1. DC Voltage Linearity

High Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	200032.88	-6.49	-0.00
Channel X	+ Input	20007.86	2.59	0.01
Channel X	- Input	-19999.45	5.51	-0.03
Channel Y	+ Input	200041.48	8.18	0.00
Channel Y	+ Input	20005.02	-0.19	-0.00
Channel Y	- Input	-20006.61	-1.53	0.01
Channel Z	+ Input	200032.37	-0.87	-0.00
Channel Z	+ Input	20003.95	-1.15	-0.01
Channel Z	- Input	-20006.60	-1.44	0.01

Low Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	2001.67	0.37	0.02
Channel X	+ Input	201.82	0.29	0.15
Channel X	- Input	-198.25	0.31	-0.16
Channel Y	+ Input	2001.35	0.05	0.00
Channel Y	+ Input	200.82	-0.59	-0.29
Channel Y	- Input	-199.06	-0.48	0.24
Channel Z	+ Input	2000.94	-0.41	-0.02
Channel Z	+ Input	200.84	-0.55	-0.27
Channel Z	- Input	-199.79	-1.17	0.59

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 (μV)	Low Range Average Reading (μV)
Channel X	200	-15.83	-18.16
	- 200	21.36	19.06
Channel Y	200	20.98	20.64
	- 200	-22.25	-22.23
Channel Z	200	5.37	5.05
	- 200	-7.46	-7.54

3. Channel separation

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

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	-1.66	-2.66
Channel Y	200	5.97	-	-0.75
Channel Z	200	9.87	3.19	-

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	16424	16943
Channel Y	15770	17113
Channel Z	15616	15207

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec
Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	-0.33	-1.57	0.89	0.48
Channel Y	0.13	-0.93	1.54	0.52
Channel Z	-0.98	-2.13	0.50	0.47

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

1.2. Probe Calibration Certificate

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Accreditation No.: **SCS 0108**

Client **CCIC-HTW (Auden)**

Certificate No: **EX3-7494_Feb18**

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:7494
Calibration procedure(s)	QA CAL-01.v9, QA CAL-12.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6 Calibration procedure for dosimetric E-field probes
Calibration date:	February 26, 2018

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	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02525)	Apr-18
Reference 20 dB Attenuator	SN: S5277 (20x)	07-Apr-17 (No. 217-02528)	Apr-18
Reference Probe ES3DV2	SN: 3013	30-Dec-17 (No. ES3-3013_Dec17)	Dec-18
DAE4	SN: 660	21-Dec-17 (No. DAE4-660_Dec17)	Dec-18
Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-16)	In house check: Jun-18
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-16)	In house check: Jun-18
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-16)	In house check: Jun-18
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-16)	In house check: Jun-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-17)	In house check: Oct-18

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

Issued: February 27, 2018

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Certificate No: EX3-7494_Feb18 Page 1 of 39

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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) 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 ≤ 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).

Probe EX3DV4

SN:7494

Manufactured: March 20, 2017
Calibrated: February 26, 2018

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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7494

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.40	0.46	0.38	± 10.1 %
DCP (mV)[B]	96.1	100.9	97.7	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B $dB\sqrt{\mu V}$	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	139.9	±3.0 %
		Y	0.0	0.0	1.0		130.5	
		Z	0.0	0.0	1.0		141.2	

Note: For details on UID parameters see Appendix.

Sensor Model Parameters

	C1 fF	C2 fF	α V^{-1}	T1 $ms.V^{-2}$	T2 $ms.V^{-1}$	T3 ms	T4 V^{-2}	T5 V^{-1}	T6
X	35.16	262.6	35.64	5.712	0.042	5.019	0.180	0.312	1.002
Y	33.86	260.4	37.41	4.029	0.204	5.030	0.324	0.359	1.006
Z	29.60	221.1	35.61	5.101	0.000	5.027	0.562	0.186	1.003

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 Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7494

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)
150	52.3	0.76	13.63	13.63	13.63	0.00	1.00	± 13.3 %
450	43.5	0.87	11.70	11.70	11.70	0.14	1.25	± 13.3 %
750	41.9	0.89	11.02	11.02	11.02	0.43	0.86	± 12.0 %
835	41.5	0.90	10.73	10.73	10.73	0.44	0.82	± 12.0 %
1750	40.1	1.37	9.23	9.23	9.23	0.30	0.96	± 12.0 %
1900	40.0	1.40	8.83	8.83	8.83	0.36	0.84	± 12.0 %
2450	39.2	1.80	8.27	8.27	8.27	0.32	0.85	± 12.0 %
2600	39.0	1.96	7.92	7.92	7.92	0.35	0.84	± 12.0 %
5200	36.0	4.66	5.63	5.63	5.63	0.35	1.80	± 13.1 %
5300	35.9	4.76	5.40	5.40	5.40	0.35	1.80	± 13.1 %
5500	35.6	4.96	5.06	5.06	5.06	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.93	4.93	4.93	0.40	1.80	± 13.1 %
5800	35.3	5.27	4.90	4.90	4.90	0.40	1.80	± 13.1 %

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

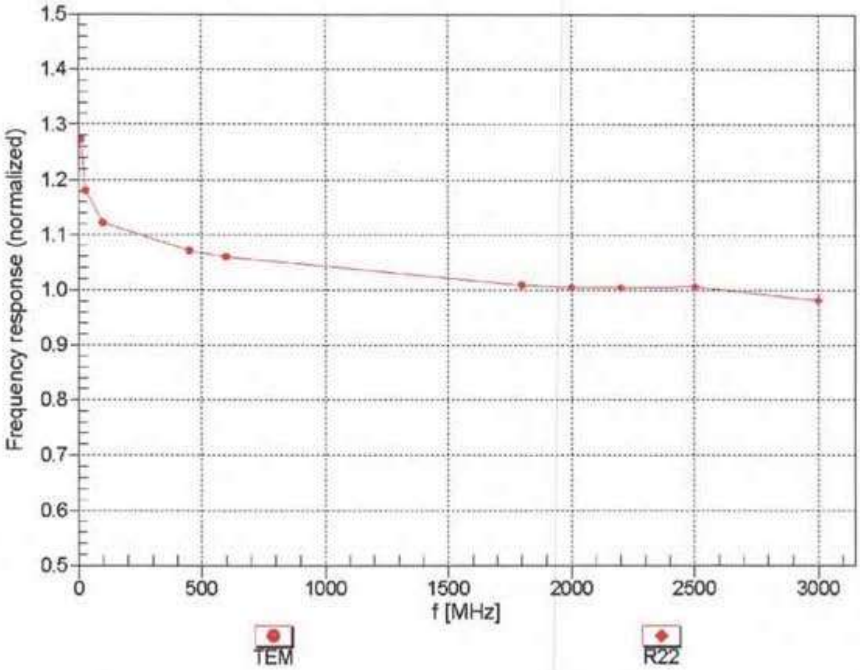
DASY/EASY - Parameters of Probe: EX3DV4 - SN:7494

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
150	61.9	0.80	12.81	12.81	12.81	0.00	1.00	± 13.3 %
450	56.7	0.94	11.87	11.87	11.87	0.08	1.25	± 13.3 %
750	55.5	0.96	10.87	10.87	10.87	0.41	0.85	± 12.0 %
835	55.2	0.97	10.50	10.50	10.50	0.38	0.85	± 12.0 %
1750	53.4	1.49	8.77	8.77	8.77	0.31	0.90	± 12.0 %
1900	53.3	1.52	8.42	8.42	8.42	0.36	0.84	± 12.0 %
2450	52.7	1.95	8.08	8.08	8.08	0.24	1.07	± 12.0 %
2600	52.5	2.16	7.51	7.51	7.51	0.19	1.10	± 12.0 %
5200	49.0	5.30	5.30	5.30	5.30	0.35	1.90	± 13.1 %
5300	48.9	5.42	4.97	4.97	4.97	0.40	1.90	± 13.1 %
5500	48.6	5.65	4.62	4.62	4.62	0.40	1.90	± 13.1 %
5600	48.5	5.77	4.51	4.51	4.51	0.40	1.90	± 13.1 %
5800	48.2	6.00	4.61	4.61	4.61	0.40	1.90	± 13.1 %

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

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



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

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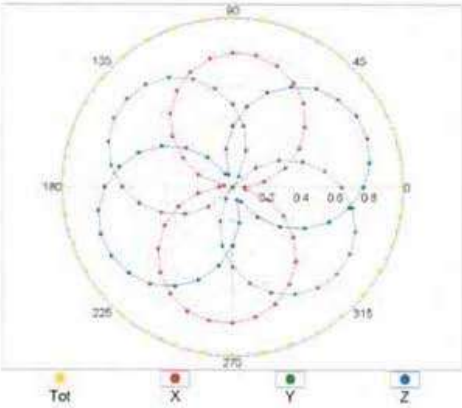
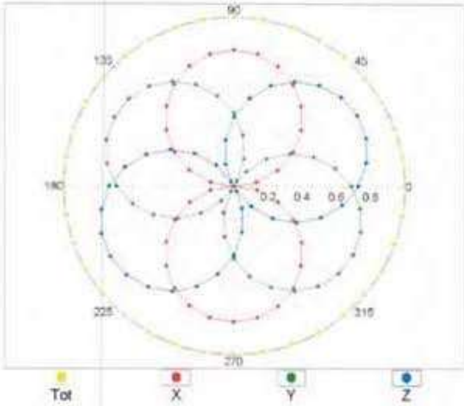
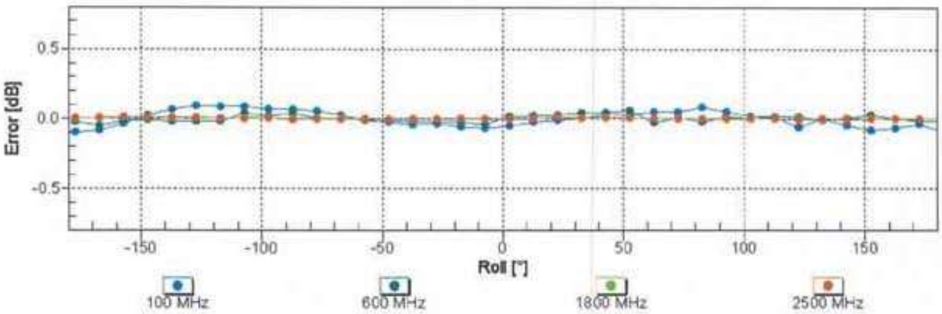
Receiving Pattern (ϕ), $\vartheta = 0°$

f=600 MHz,TEM



f=1800 MHz,R22

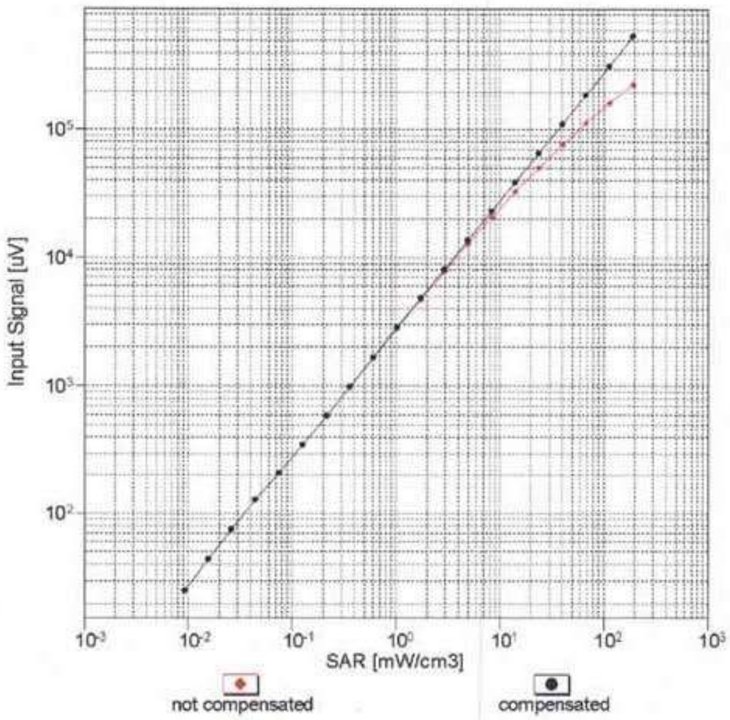


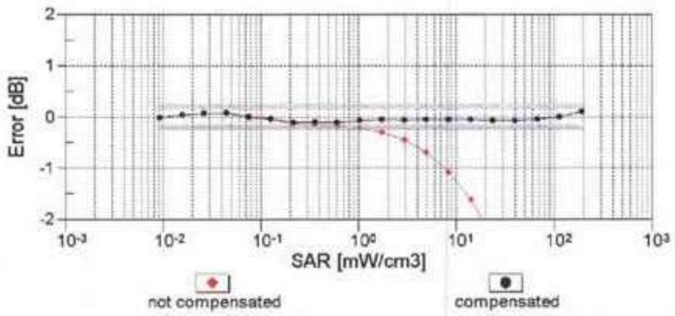


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

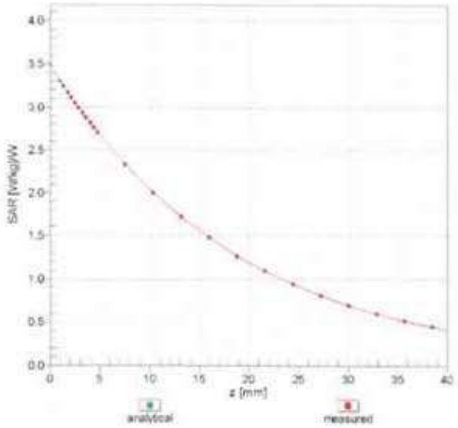
(TEM cell , f_{eval}= 1900 MHz)

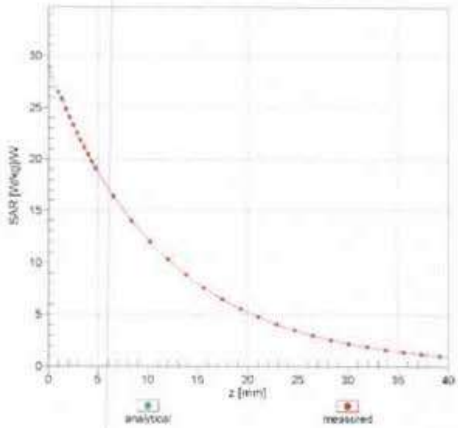




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

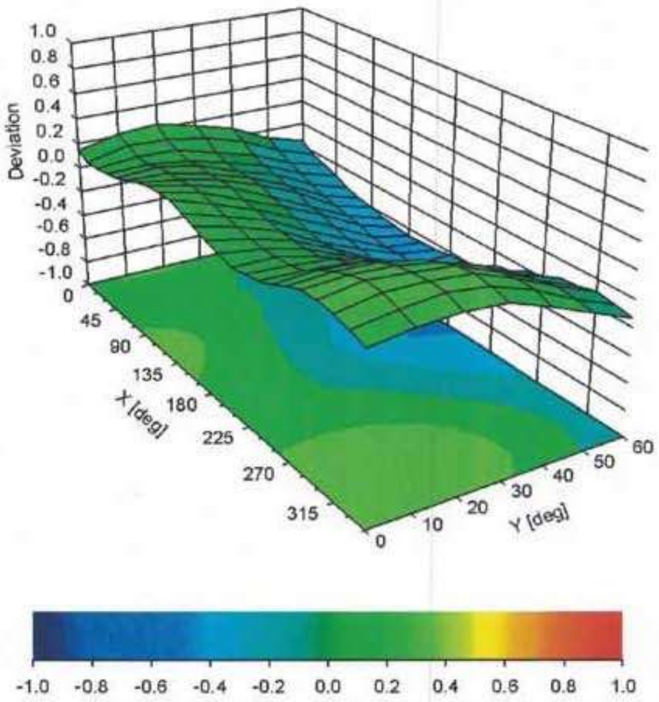
Conversion Factor Assessment





Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7494

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	22.8
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

Appendix: Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Max Unc^E (k=2)
0	CW	X	0.00	0.00	1.00	0.00	139.9	± 3.0 %
		Y	0.00	0.00	1.00		130.5	
		Z	0.00	0.00	1.00		141.2	
10010-CAA	SAR Validation (Square, 100ms, 10ms)	X	1.49	62.54	7.67	10.00	20.0	± 9.6 %
		Y	1.40	61.40	6.89		20.0	
		Z	1.51	62.75	7.79		20.0	
10011-CAB	UMTS-FDD (WCDMA)	X	0.98	67.35	15.11	0.00	150.0	± 9.6 %
		Y	0.81	65.02	13.17		150.0	
		Z	0.93	66.90	14.65		150.0	
10012-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	1.11	63.45	14.96	0.41	150.0	± 9.6 %
		Y	1.01	62.50	14.08		150.0	
		Z	1.10	63.40	14.81		150.0	
10013-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	4.64	66.63	16.93	1.46	150.0	± 9.6 %
		Y	4.55	66.39	16.76		150.0	
		Z	4.54	66.74	16.91		150.0	
10021-DAC	GSM-FDD (TDMA, GMSK)	X	100.00	105.24	22.43	9.39	50.0	± 9.6 %
		Y	7.56	78.16	14.98		50.0	
		Z	100.00	105.86	22.69		50.0	
10023-DAC	GPRS-FDD (TDMA, GMSK, TN 0)	X	100.00	104.66	22.23	9.57	50.0	± 9.6 %
		Y	5.00	73.77	13.48		50.0	
		Z	100.00	105.06	22.39		50.0	
10024-DAC	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	100.00	105.71	21.52	6.56	60.0	± 9.6 %
		Y	6.98	78.84	13.84		60.0	
		Z	100.00	107.13	22.08		60.0	
10025-DAC	EDGE-FDD (TDMA, 8PSK, TN 0)	X	4.17	73.26	28.42	12.57	50.0	± 9.6 %
		Y	3.36	65.73	23.63		50.0	
		Z	4.00	72.02	27.83		50.0	
10026-DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1)	X	5.43	82.70	29.77	9.56	60.0	± 9.6 %
		Y	5.01	80.20	28.37		60.0	
		Z	4.92	80.62	29.06		60.0	
10027-DAC	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	100.00	108.47	21.93	4.80	80.0	± 9.6 %
		Y	100.00	97.70	17.18		80.0	
		Z	100.00	111.35	23.07		80.0	
10028-DAC	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	100.00	113.56	23.37	3.55	100.0	± 9.6 %
		Y	0.84	65.84	7.87		100.0	
		Z	100.00	118.99	25.50		100.0	
10029-DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1-2)	X	3.69	73.69	24.54	7.80	80.0	± 9.6 %
		Y	3.47	72.25	23.68		80.0	
		Z	3.48	72.59	24.16		80.0	
10030-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH1)	X	100.00	103.93	20.28	5.30	70.0	± 9.6 %
		Y	1.23	65.73	8.63		70.0	
		Z	100.00	104.97	20.64		70.0	
10031-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH3)	X	100.00	106.93	19.48	1.88	100.0	± 9.6 %
		Y	0.22	60.00	2.94		100.0	
		Z	100.00	109.18	20.25		100.0	

10032-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	100.00	122.55	24.60	1.17	100.0	± 9.6 %
		Y	7.61	60.44	1.42		100.0	
		Z	100.00	126.07	25.78		100.0	
10033-CAA	IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH1)	X	6.59	87.18	22.06	5.30	70.0	± 9.6 %
		Y	3.47	76.95	17.71		70.0	
		Z	6.68	86.39	21.09		70.0	
10034-CAA	IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH3)	X	1.88	72.27	15.10	1.88	100.0	± 9.6 %
		Y	1.10	65.57	11.17		100.0	
		Z	1.53	69.51	13.02		100.0	
10035-CAA	IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH5)	X	1.40	69.50	13.68	1.17	100.0	± 9.6 %
		Y	0.87	63.95	10.05		100.0	
		Z	1.12	66.96	11.59		100.0	
10036-CAA	IEEE 802.15.1 Bluetooth (8-DPSK, DH1)	X	9.62	92.97	23.95	5.30	70.0	± 9.6 %
		Y	4.28	80.05	18.91		70.0	
		Z	10.09	92.34	23.01		70.0	
10037-CAA	IEEE 802.15.1 Bluetooth (8-DPSK, DH3)	X	1.68	71.06	14.59	1.88	100.0	± 9.6 %
		Y	1.03	65.05	10.91		100.0	
		Z	1.36	68.33	12.52		100.0	
10038-CAA	IEEE 802.15.1 Bluetooth (8-DPSK, DH5)	X	1.40	69.76	13.93	1.17	100.0	± 9.6 %
		Y	0.87	64.12	10.26		100.0	
		Z	1.13	67.19	11.84		100.0	
10039-CAB	CDMA2000 (1xRTT, RC1)	X	1.34	69.22	13.14	0.00	150.0	± 9.6 %
		Y	0.77	63.08	9.10		150.0	
		Z	0.85	64.80	10.09		150.0	
10042-CAB	IS-54 / IS-136 FDD (TDMA/FDM, PI/4-DQPSK, Halfrate)	X	100.00	102.28	20.38	7.78	50.0	± 9.6 %
		Y	1.72	65.50	9.21		50.0	
		Z	100.00	102.90	20.62		50.0	
10044-CAA	IS-91/EIA/TIA-553 FDD (FDMA, FM)	X	0.00	99.20	3.16	0.00	150.0	± 9.6 %
		Y	0.09	120.69	13.78		150.0	
		Z	0.00	99.13	4.03		150.0	
10048-CAA	DECT (TDD, TDMA/FDM, GFSK, Full Slot, 24)	X	6.20	72.28	14.23	13.80	25.0	± 9.6 %
		Y	4.17	67.17	12.27		25.0	
		Z	7.20	73.81	14.76		25.0	
10049-CAA	DECT (TDD, TDMA/FDM, GFSK, Double Slot, 12)	X	7.52	77.18	14.97	10.79	40.0	± 9.6 %
		Y	3.87	69.54	12.04		40.0	
		Z	10.31	80.47	16.03		40.0	
10056-CAA	UMTS-TDD (TD-SCDMA, 1.28 Mcps)	X	44.37	107.84	27.61	9.03	50.0	± 9.6 %
		Y	11.98	87.68	21.33		50.0	
		Z	50.57	108.48	27.27		50.0	
10058-DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1-2-3)	X	3.09	70.29	22.11	6.55	100.0	± 9.6 %
		Y	2.91	69.17	21.43		100.0	
		Z	2.96	69.57	21.87		100.0	
10059-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps)	X	1.11	64.07	15.34	0.61	110.0	± 9.6 %
		Y	1.00	63.03	14.40		110.0	
		Z	1.09	64.00	15.19		110.0	
10060-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps)	X	3.00	89.75	24.24	1.30	110.0	± 9.6 %
		Y	1.55	78.88	19.29		110.0	
		Z	2.52	87.33	23.49		110.0	

10061-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps)	X	1.60	73.10	19.62	2.04	110.0	± 9.6 %
		Y	1.35	70.56	17.98		110.0	
		Z	1.53	72.62	19.39		110.0	
10062-CAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps)	X	4.47	66.68	16.41	0.49	100.0	± 9.6 %
		Y	4.36	66.37	16.19		100.0	
		Z	4.36	66.73	16.35		100.0	
10063-CAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps)	X	4.47	66.74	16.49	0.72	100.0	± 9.6 %
		Y	4.37	66.45	16.27		100.0	
		Z	4.37	66.82	16.44		100.0	
10064-CAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps)	X	4.71	66.94	16.68	0.86	100.0	± 9.6 %
		Y	4.60	66.65	16.48		100.0	
		Z	4.58	66.99	16.62		100.0	
10065-CAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps)	X	4.57	66.74	16.73	1.21	100.0	± 9.6 %
		Y	4.47	66.46	16.54		100.0	
		Z	4.45	66.78	16.67		100.0	
10066-CAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps)	X	4.57	66.71	16.86	1.46	100.0	± 9.6 %
		Y	4.47	66.44	16.68		100.0	
		Z	4.45	66.73	16.80		100.0	
10067-CAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps)	X	4.85	66.96	17.32	2.04	100.0	± 9.6 %
		Y	4.75	66.72	17.16		100.0	
		Z	4.71	66.99	17.26		100.0	
10068-CAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps)	X	4.86	66.83	17.46	2.55	100.0	± 9.6 %
		Y	4.77	66.61	17.31		100.0	
		Z	4.75	66.91	17.45		100.0	
10069-CAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps)	X	4.93	66.84	17.64	2.67	100.0	± 9.6 %
		Y	4.84	66.64	17.50		100.0	
		Z	4.79	66.90	17.60		100.0	
10071-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 9 Mbps)	X	4.72	66.65	17.20	1.99	100.0	± 9.6 %
		Y	4.63	66.43	17.04		100.0	
		Z	4.63	66.78	17.20		100.0	
10072-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 12 Mbps)	X	4.66	66.84	17.36	2.30	100.0	± 9.6 %
		Y	4.57	66.61	17.20		100.0	
		Z	4.56	66.93	17.35		100.0	
10073-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 18 Mbps)	X	4.70	66.96	17.65	2.83	100.0	± 9.6 %
		Y	4.62	66.75	17.51		100.0	
		Z	4.61	67.10	17.68		100.0	
10074-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 24 Mbps)	X	4.69	66.86	17.79	3.30	100.0	± 9.6 %
		Y	4.62	66.67	17.65		100.0	
		Z	4.62	67.06	17.85		100.0	
10075-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 36 Mbps)	X	4.70	66.81	18.01	3.82	90.0	± 9.6 %
		Y	4.63	66.64	17.88		90.0	
		Z	4.63	67.02	18.07		90.0	
10076-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 48 Mbps)	X	4.73	66.67	18.17	4.15	90.0	± 9.6 %
		Y	4.66	66.51	18.05		90.0	
		Z	4.67	66.88	18.24		90.0	
10077-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 54 Mbps)	X	4.75	66.74	18.27	4.30	90.0	± 9.6 %
		Y	4.69	66.59	18.15		90.0	
		Z	4.70	66.98	18.36		90.0	

10081-CAB	CDMA2000 (1xRTT, RC3)	X	0.65	64.28	10.38	0.00	150.0	± 9.6 %
		Y	0.42	60.39	6.92		150.0	
		Z	0.48	61.97	8.16		150.0	
10082-CAB	IS-54 / IS-136 FDD (TDMA/FDM, PI/4-DQPSK, Fullrate)	X	0.61	60.00	2.85	4.77	80.0	± 9.6 %
		Y	0.27	125.15	3.93		80.0	
		Z	0.68	60.01	2.64		80.0	
10090-DAC	GPRS-FDD (TDMA, GMSK, TN 0-4)	X	100.00	105.71	21.53	6.56	60.0	± 9.6 %
		Y	7.96	79.91	14.17		60.0	
		Z	100.00	107.12	22.09		60.0	
10097-CAB	UMTS-FDD (HSDPA)	X	1.81	68.35	15.62	0.00	150.0	± 9.6 %
		Y	1.59	66.62	14.28		150.0	
		Z	1.75	68.38	15.28		150.0	
10098-CAB	UMTS-FDD (HSUPA, Subtest 2)	X	1.77	68.30	15.60	0.00	150.0	± 9.6 %
		Y	1.55	66.55	14.25		150.0	
		Z	1.71	68.32	15.26		150.0	
10099-DAC	EDGE-FDD (TDMA, 8PSK, TN 0-4)	X	5.47	82.85	29.83	9.56	60.0	± 9.6 %
		Y	5.04	80.32	28.42		60.0	
		Z	4.96	80.77	29.11		60.0	
10100-CAD	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	2.96	70.04	16.68	0.00	150.0	± 9.6 %
		Y	2.71	68.69	15.83		150.0	
		Z	2.82	69.64	16.51		150.0	
10101-CAD	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM)	X	3.10	67.35	15.86	0.00	150.0	± 9.6 %
		Y	2.94	66.61	15.35		150.0	
		Z	3.00	67.17	15.74		150.0	
10102-CAD	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM)	X	3.20	67.37	15.97	0.00	150.0	± 9.6 %
		Y	3.05	66.67	15.48		150.0	
		Z	3.10	67.22	15.85		150.0	
10103-CAD	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	5.04	73.87	19.92	3.98	65.0	± 9.6 %
		Y	4.45	71.80	18.94		65.0	
		Z	4.83	73.72	19.95		65.0	
10104-CAD	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM)	X	4.93	71.04	19.34	3.98	65.0	± 9.6 %
		Y	4.66	70.09	18.84		65.0	
		Z	4.74	70.79	19.24		65.0	
10105-CAD	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM)	X	4.89	70.60	19.44	3.98	65.0	± 9.6 %
		Y	4.42	68.79	18.52		65.0	
		Z	4.68	70.25	19.28		65.0	
10108-CAE	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	2.55	69.38	16.50	0.00	150.0	± 9.6 %
		Y	2.32	68.05	15.61		150.0	
		Z	2.42	69.06	16.32		150.0	
10109-CAE	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM)	X	2.74	67.33	15.73	0.00	150.0	± 9.6 %
		Y	2.57	66.48	15.09		150.0	
		Z	2.63	67.20	15.54		150.0	
10110-CAE	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	X	2.04	68.62	15.99	0.00	150.0	± 9.6 %
		Y	1.82	67.09	14.87		150.0	
		Z	1.91	68.30	15.65		150.0	
10111-CAE	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM)	X	2.48	68.58	15.98	0.00	150.0	± 9.6 %
		Y	2.26	67.29	15.00		150.0	
		Z	2.37	68.51	15.63		150.0	

10112-CAE	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM)	X	2.87	67.40	15.81	0.00	150.0	± 9.6 %
		Y	2.70	66.60	15.21		150.0	
		Z	2.76	67.33	15.64		150.0	
10113-CAE	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM)	X	2.63	68.77	16.12	0.00	150.0	± 9.6 %
		Y	2.40	67.53	15.19		150.0	
		Z	2.51	68.70	15.76		150.0	
10114-CAC	IEEE 802.11n (HT Greenfield, 13.5 Mbps, BPSK)	X	4.95	67.13	16.42	0.00	150.0	± 9.6 %
		Y	4.85	66.84	16.24		150.0	
		Z	4.85	67.12	16.40		150.0	
10115-CAC	IEEE 802.11n (HT Greenfield, 81 Mbps, 16-QAM)	X	5.19	67.19	16.45	0.00	150.0	± 9.6 %
		Y	5.10	66.92	16.29		150.0	
		Z	5.08	67.17	16.41		150.0	
10116-CAC	IEEE 802.11n (HT Greenfield, 135 Mbps, 64-QAM)	X	5.03	67.31	16.44	0.00	150.0	± 9.6 %
		Y	4.93	67.00	16.25		150.0	
		Z	4.91	67.26	16.39		150.0	
10117-CAC	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	4.94	67.08	16.41	0.00	150.0	± 9.6 %
		Y	4.84	66.75	16.22		150.0	
		Z	4.83	67.00	16.35		150.0	
10118-CAC	IEEE 802.11n (HT Mixed, 81 Mbps, 16-QAM)	X	5.26	67.38	16.55	0.00	150.0	± 9.6 %
		Y	5.18	67.15	16.41		150.0	
		Z	5.14	67.33	16.50		150.0	
10119-CAC	IEEE 802.11n (HT Mixed, 135 Mbps, 64-QAM)	X	5.03	67.31	16.45	0.00	150.0	± 9.6 %
		Y	4.93	67.03	16.27		150.0	
		Z	4.92	67.30	16.42		150.0	
10140-CAD	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM)	X	3.22	67.39	15.88	0.00	150.0	± 9.6 %
		Y	3.07	66.69	15.39		150.0	
		Z	3.11	67.25	15.76		150.0	
10141-CAD	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM)	X	3.35	67.56	16.08	0.00	150.0	± 9.6 %
		Y	3.20	66.89	15.61		150.0	
		Z	3.24	67.46	15.97		150.0	
10142-CAD	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, QPSK)	X	1.80	68.59	15.33	0.00	150.0	± 9.6 %
		Y	1.53	66.49	13.76		150.0	
		Z	1.64	67.93	14.59		150.0	
10143-CAD	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM)	X	2.29	69.05	15.16	0.00	150.0	± 9.6 %
		Y	1.94	66.78	13.54		150.0	
		Z	2.05	68.12	14.12		150.0	
10144-CAD	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM)	X	1.95	65.96	13.09	0.00	150.0	± 9.6 %
		Y	1.71	64.37	11.76		150.0	
		Z	1.71	64.91	11.94		150.0	
10145-CAE	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK)	X	0.80	61.66	8.31	0.00	150.0	± 9.6 %
		Y	0.63	60.00	6.42		150.0	
		Z	0.60	60.00	6.26		150.0	
10146-CAE	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM)	X	0.93	60.23	6.53	0.00	150.0	± 9.6 %
		Y	0.85	59.54	5.70		150.0	
		Z	0.78	60.00	5.45		150.0	
10147-CAE	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM)	X	0.97	60.53	6.79	0.00	150.0	± 9.6 %
		Y	0.90	60.00	6.07		150.0	
		Z	0.79	60.00	5.50		150.0	