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ilac-MRA ENAC ENSAYOS Nº 51/LE147

Test report No:

NIE: 47376RRF.001

Test report
REFERENCE STANDARDS:
FCC 47CFR Part 2.1093, Published RF Exposure KDB Procedures, IC RSS -102 Issue 5:2015

Identification of item tested.................................:	Aircraft pitot static tester (hand terminal)
Trade ....:	ADTS
Model and /or type reference ....:	ADTS TOUCH-ER
Other identification of the product ....:	Hand terminal for ADTS base unit – used to test pilot static ports on aircraft FCC ID: 2AAVWADTSTOUCH-02 IC: 12097A-ADTSTOUCH02
Final HW version ....:	IA4532-2-V0 revA
Final SW version ....:	V02.00.16
Features ....:	Bluetooth
Manufacturer...:	Company name: DRUCK LTD. Postal Address: Fir Tree Lane, Groby, LEICESTER, Leicestershire, LE6 0FH Contact Person: Tom Piggin Telephone: 0116 231 7100 e-mail: tom.piggin@ge.com
Test method requested, standard........................:	1. FCC 47 CFR Part 2.1093. (10-1-14 Edition) Radiofrequency radiation exposure evaluation: portable devices. 2. FCC OET KDB 447498 D01 General RF Exposure Guidance v05r02 (February 2014) 3. FCC OET KDB 865664 D01 v01r03 – SAR Measurement Requirements for 100 MHz to 6 GHz (February 2014). 4. FCC OET KDB 616217 D04 SAR for laptop and tablets v01r01 (May 2013) 5. IC RSS-102 Issue 5 (2015-03) – Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)

Summary ....:	Considering the results of the performed test according to FCC 47CFR Part 2.1093, the item under test is IN COMPLIANCE with the requested specifications specified in the standards. The maximum 1g volume averaged SAR found during this test has been 0.163 W/kg, for Bluetooth BR mode. NOTE: The results presented in this Test Report apply only to the particular item under test established in page 1 of this document, as presented for test on the date(s) shown in section, "USAGE OF SAMPLES, TESTING PERIOD AND ENVIRONMENTAL CONDITIONS".
Approved by (name / position & signature) ......:	A. Llamas RF Lab. Manager  Firmado digitalmente por Alejandro Llamas Rodríguez Fecha: 2015.10.30 11:50:15 +01'00'
Date of issue ....:	2015-10-30
Report template No...:	FDT08_17

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Competences and guarantees

AT4 wireless is a testing laboratory accredited by the National Accreditation Body (ENAC -Entidad Nacional de Acreditación), to perform the tests indicated in the Certificate No. 51/LE 147.

In order to assure the traceability to other national and international laboratories, AT4 wireless has a calibration and maintenance program for its measurement equipment.

AT4 wireless guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at AT4 wireless at the time of performance of the test.

AT4 wireless is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of AT4 wireless.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of AT4 wireless and the Accreditation Bodies.

Uncertainty

Uncertainty (factor k=2) was calculated according to the following documents:

1. FCC OET KDB 865664 D01 - SAR Measurement 100 MHz to 6 GHz (February 2014).

Usage of samples

Samples undergoing test have been selected by: the client

Sample M/01 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
47376B/001	Demonstrator	ADTSS552F	4407046	11/09/2015
47376B/002	Mains cord	--	--	11/09/2015
47376B/003	ADTS Touch	ADTSTOUCH-ER	4434050	11/09/2015

1. Sample M/01 has undergone the test(s) specified in subclause “Test method requested”: SAR evaluation for Bluetooth BR mode.

Test sample description

The test sample consists of an Aircraft pitot static tester (hand terminal).

Identification of the client

Company name: TÜV SÜD Product Service

Postal Address: Octagon House, Concorde Way, Segensworth North, Fareham, Hampshire, PO15 5RL

Contact Person: Ryan Henley

Job title / Department: Project Manager / Telecoms Business Line

Telephone: +44 1489 558310

e-mail: ryan.henley@tuv-sud.co.uk

Testing period

The performed test started on 2015-09-11 and finished on 2015-09-11.

The tests have been performed at AT4 wireless.

Environmental conditions

In the laboratory for measurements, the following limits were not exceeded during the test:

Temperature	Min. = 21.62 ºC Max. = 23.90 ºC
Relative humidity	Min. = 47.46 % Max. = 59.48 %

Remarks and comments

1: Only the highest output power mode for this technology has been tested, due to a reported 1-g SAR far below to 0.8 W/Kg and a maximum measured conducted output power more than 0.5 dB higher than the other modes.

2: Edges with a distance far above 25 mm from the radiating antenna haven’t been tested.

3: Testing of other required channels within the operating mode of current frequency band is not required according to “FCC OET KDB 447498 D01 General RF Exposure Guidance v05r02”, paragraph “4.3.3. SAR test reduction considerations”.

4: Only the plots of the highest reported SAR for each test position and mode/band are included in appendix C.

Used instrumentation

1. Dosimetric E-field probes SPEAG ES3DV3
2. Data acquisition device SPEAG DAE4
3. Electro-optical converter SPEAG EOC3
4. 2450 MHz dipole validation kit SPEAG D2450V2
5. Robot Stäubli RX60BL
6. Robot controller Stäubli CM7MB
7. SAR measurement software SPEAG DASY52 V52.8.8.1222
8. SAR post processing software SPEAG SEMCAD X
9. Measurement server SPEAG DASY5 SE UMS 011 BS
10. Oval flat phantom SPEAG ELI 4
11. Body Tissue Equivalent Liquid for 2450MHz band
12. Vector network analyzer Agilent FieldFox N9923A and Agilent E5071C.
13. Dielectric probe kit SPEAG DAK-3.5
14. Power meter Agilent E4419B
15. RF Generator R&S SMU200A
16. DC Power supply Agilent U8002A
17. Dual directional coupler NARDA FSCM 99899
18. Power amplifier MITEQ AMF-4D-00400600-50-30P
19. Device positioner SM LH1 001 AC

Testing verdicts

Not applicable .... :	N/A
Pass .... :	P
Fail .... :	F
Not measured .... :	N/M

2450 MHz band

FCC 47CFR Part 2.1093 Paragraph	VERDICT			
	NA	P	F	NM
(d)(2) Bluetooth BR		P		
(d)(2) Bluetooth EDR2		P[1]		
(d)(2) Bluetooth EDR3		P[1]		

1: See Remarks and Comments

Appendix A – Test configuration

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1. GENERAL INTRODUCTION

1.1. Application Standard

The Federal Communications Commission (FCC) sets the limits for General Population / Uncontrolled exposure to radio frequency electromagnetic fields for transmitting devices designed to be used within 20 centimetres of the body of the user under FCC 47 CFR Part 2.1093 - "Radiofrequency radiation exposure evaluation: portable devices", paragraph (d)(2).

1.2. General requirements

The SAR measurement has been performed continuing the following considerations and environment conditions:

- The ambient temperature shall be in the range of 18ºC to 25ºC and the variation shall not exceed +/- 2ºC during the test.
- The ambient humidity shall be in the range of and 30% - 70%.
- The device battery shall be fully charged before each measurement.

1.3. Measurement system requirements

The measurement system used for SAR tests fulfils the procedural and technical requirements described at the reference standards used.

1.4. Phantom requirements

The phantom model for body measurements is an elliptical open-top container with a flat bottom, with the following shape and dimension:

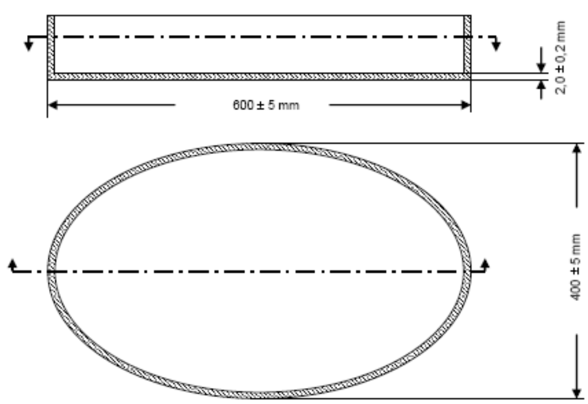

Figure 1: Proportions and shape of Phantom shell

1.5. Measurement Liquids requirements.

The liquids used to simulate the human tissues, must fulfils the requirements of the dielectric properties required. These target dielectric properties per FCC OET KDB 450824 instructions come from the dipole and probe calibration data which are included in Appendix B, Section 3, of this document.

To minimize the effect of reflections on peak spatial-average SAR values, from the upper surface of the tissue-equivalent liquid, the depth of the liquid should be at least 15 cm.

2. MEASUREMENT SYSTEM

2.1. Measurement System

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

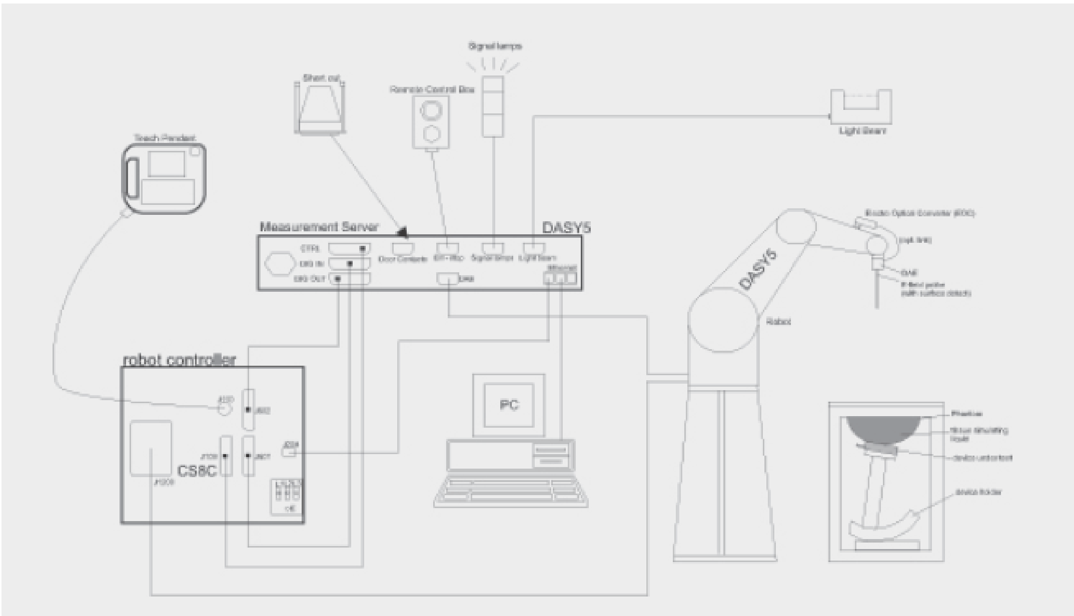

Figure 2: SAR Measurement system

- A standard high precision 6-axis robot (Stäubli TX=RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (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.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running Win7 professional operating system and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

Manufacturer	Device	Type
Schmid & Partner Engineering AG	Dosimetric E-Field Probe	ES3DV3
Schmid & Partner Engineering AG	Data Acquisition Electronics	DAE4
Schmid & Partner Engineering AG	Electro-Optical Converter	EOC3
Stäubli	Robot	RX60BL
Stäubli	Robot controller	CS7MB
Schmid & Partner Engineering AG	Measurement Server	DASY5 SE UMS 011 BS
Schmid & Partner Engineering AG	Oval flat phantom	SPEAG ELI 4
Schmid & Partner Engineering AG	Notebook Positioner	SM LH1 001 AC
Schmid & Partner Engineering AG	Measurement Software	DASY52 V52.8.8.1222
Schmid & Partner Engineering AG	Postprocessing Software	SEMCAD X
Rohde & Schwarz	RF Generator	SMU 200A
MITEQ	Power amplifier	AMF-4D-00400600-50-30P
Agilent	DC Power supply	U8002A
NARDA	Directional coupler	FSCM 99899
Weinschel	6dB attenuator	75A-6-11
Agilent	Power Meter	E4419B
Schmid & Partner Engineering AG	2450 MHz System Validation Dipole	D2450V2
Agilent	Vector Network Analyser	FieldFox N9923A
Schmid & Partner Engineering AG	Dielectric Probe Kit	DAK-3.5

Table 1: Measurement Equipment

DOSIMETRIC E-FIELD PROBE

ES3DV3
Isotropic E-Field Probe for Dosimetric Measurements

	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC 17025
Frequency	10 MHz to 4 GHz; Linearity: ± 0.2 dB (30 MHz to 4 GHz)
Directivity	± 0.2 dB in TSL (rotation around probe axis) ± 0.3 dB in TSL (rotation normal to probe axis)
Dynamic Range	5 µW/g to > 100 mW/g; Linearity: ± 0.2 dB
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 3.9 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.0 mm

DATA ACQUISITION ELECTRONICS

DAE4 - Data Acquisition Electronics

	Signal amplifier, multiplexer, A/D converter, and control logic Serial optical link for communication with DASY4/5 embedded system (fully remote controlled) Two-step probe touch detector for mechanical surface detection and emergency robot stop
Measurement Range	-100 to +300 mV (16 bit resolution and two range settings: 4mV, 400mV)
Input Offset Voltage	< 5 µV (with auto zero)
Input Resistance	200 MOhm
Input Bias Current	< 50 fA

OVAL FLAT PHANTOM

ELI

	Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles. ELI V5.0 has the same shell geometry and is manufactured from the same material as ELI4, but has reinforced top structure.
Material	Vinylester, glass fiber reinforced (VE-GF)
Liquid Compatibility	Compatible with all SPEAG tissue simulating liquids (incl. DGBE type)
Shell Thickness	2.0 ± 0.2 mm (bottom plate)
Dimensions	Major axis: 600 mm Minor axis: 400 mm
Filling Volume	approx. 30 liters
Wooden Support	SPEAG standard phantom table

NOTEBOOK POSITIONER

MD4LAPV5 - Mounting Device for Laptops and other Body-Worn Transmitters

In combination with the Twin SAM V5.0/V5.0c or ELI Phantoms, the Mounting Device (Body-Worn) enables testing of ransmitter devices according to IEC 62209-2 specifications. The device holder can be locked for positioning at flat phantom section.

Material: Polyoxymethylene (POM), PET-G, Foam

DIPOLES

System Validation Kits 300 MHz – 6 GHz

Symmetrical dipole with l/4 balun
Enables measurement of feedpoint impedance with NWA
Matched for use near flat phantoms filled with tissue simulating solutions

Calibration	ISO/IEC 17025
Frequency	300, 400, 450, 600, 733, 750, 835, 850, 900, 1300, 1450, 1500, 1640, 1750, 1800, 1900, 1950, 2000, 2100, 2300, 2450, 2550, 2600, 3000, 3300, 3500, 3700 MHz and D5GHz (5100-5800 MHz)
Return Loss	> 20 dB at specified validation position
Power Capability	> 100 W (f < 1GHz); > 40 W (f > 1GHz)

Dimensions (length and overall height in mm)

Product	Dipole length	Overall height
D750V3	179.0	330.0
D900V2	148.5	340.0
D1800V2	72.5	300.0
D2000V2	65.0	300.0
D2450V2	52.0	290.0
D2600V2	49.2	290.0
D5GHzV2	20.6	300.0

2.2. Test Positions of device relative to body

Following the FCC OET KDB 616217 D04 "SAR for laptop and tablets v01r01", the device has been tested for 1-g SAR at 0 mm distance to the flat phantom on all surfaces and side edges with a transmitting antenna located at ≤ 25 mm from that surface or edge.

2.3. Test to be performed

DUT will be placed at the center of flat phantom. The DUT position using during the body SAR tests will be the one where the maximum peak SAR was found. Each data mode, wireless technology and frequency band supported by the device must be tested. Low and high channels for each band should be tested at this position.

If the DUT is also designed to transmit with other configurations (antenna fully extended/retracted, keypad cover opened/closed…), all tests described above shall be performed for each configuration. When considering multi-mode and multi-band mobile phones, all of the tests shall be performed at each transmitting mode/band with the corresponding maximum peak power level.

2.4. Description of interpolation/extrapolation scheme

The local SAR inside the Phantom is measured using small dipole sensing elements inside a probe element. The probe tip must not be in contact with the Phantoms surface in order to minimise measurement errors, but the highest local SAR is obtained from measurements at a certain distances from the shell trough extrapolation. The accurate assessment of the maximum SAR averaged over 1 gr and 10 gr. requires a very fine resolution in the three dimensional scanned data array. Since the measurements have to be performed over a limited time, the measured data have to be interpolated to provide an array of sufficient resolution.

The interpolation of 2D area scan is used after the initial area scan, at a fixed distance from the Phantom shell wall. The initial scan data is collected with approx. 15 mm spatial resolution and this interpolation is used to find the location of the local maximum for positioning the subsequent 3D scanning within a 1 mm resolution.

For the 3D scan, data is collected on a spatially regular 3D grid having 5 mm steps in both directions. After the data collection by the SAR probe, the data are extrapolated in the depth direction to assign values to points in the 3D array closer to the shell wall. A notional extrapolation value is also assigned to the first point outside the shell wall so that subsequent interpolation schemes will be applicable right up to the shell wall boundary.

2.5. Determination of the largest peak spatial-average SAR

To determine the maximum value of the peak spatial-average SAR of a DUT, all device positions, configurations and operational modes should be tested for each frequency band.

The averaging volume shall be chosen as 1gr. of contiguous tissue. The cubic volumes, over which the SAR measurements are averaged after extrapolation and interpolation, are chosen in order to include the highest values of local SAR.

The maximum SAR level for the DUT will be the maximum level obtained of the performed measurements, and indicated in the previous points.

2.6. System Validation

Prior to the SAR measurements, system verification is done to verify the system accuracy. A complete SAR evaluation is done using a half-wavelength dipole as source with the frequency of the mid-band channel of the operating band, or within 10% of this channel.

The measured 1 gr. and 10 gr. SAR should be within 10% of the expected target values specified in the calibration certificate of the dipole, for the specific tissue and frequency used.

3. UNCERTAINTY

Uncertainty for 300 MHz – 6 GHz

ERROR SOURCES	Uncertainty value (± %)	Probability distribution	Divisor	(c_i) 1g	(c_i) 10g	Standard uncertainty (1g) (± %)	Standard uncertainty (10g) (± %)
Measurement Equipment							
Probe Calibration	6.550	N	1	1	1	6.550	6.550
Isotropy	7.558	R	√3	1	1	4.364	4.364
Linearity	4.700	R	√3	1	1	2.714	2.714
Probe modulation response	2.300	R	√3	1	1	1.328	1.328
Detection limits	0.250	R	√3	1	1	0.144	0.144
Boundary effect	2.000	R	√3	1	1	1.155	1.155
Readout electronics	0.300	N	1	1	1	0.300	0.300
Response time	0.000	R	√3	1	1	0.000	0.000
Integration time	1.900	R	√3	1	1	1.097	1.097
RF Ambien conditions - noise	3.000	R	√3	1	1	1.732	1.732
RF Ambien conditions – reflections	3.000	R	√3	1	1	1.732	1.732
Probe positioner mech. restrictions	0.400	R	√3	1	1	0.231	0.231
Probe positioning with respect to phantom shell	6.700	R	√3	1	1	3.868	3.868
Post-processing	4.000	R	√3	1	1	2.309	2.309
Test Sample Related							
Device holder uncertainty	2.900	N	1	1	1	2.900	2.900
Test sample positioning	3.600	N	1	1	1	3.600	3.600
Drift of output power	5.000	R	√3	1	1	2.887	2.887
Phantom and Setup							
Phantom uncertainty (shape and thickness tolerances)	7.900	R	√3	1	1	4.561	4.561
Algorithm for correcting SAR for deviations in permittivity and conductivity	1.900	N	1	1	0.84	1.900	1.596
Liquid conductivity (meas.)	3.350	N	1	0.78	0.71	2.613	2.379
Liquid permittivity (meas.)	1.500	N	1	0.23	0.26	0.345	0.390
Liquid conductivity – temperature uncertainty	0.440	R	√3	0.78	0.71	0.198	0.180
Liquid permittivity – temperature uncertainty	3.120	R	√3	0.23	0.26	0.414	0.468
Combined standard uncertainty	$u_c = \sqrt{\sum_{1=1}^{m} c_i^2 \cdot u_i^2}$					**12.70**	**12.62**
Expanded uncertainty (confidence interval of 95%)	*ue =2.00 uc*					**25.40**	**25.23**

Table 2: Uncertainty Assessment for 300 MHz - 6 GHz

4. SAR LIMIT

Having a worst case measurement, the SAR limit is valid for general population/uncontrolled exposure.

The SAR values have to be averaged over a mass of 1 gr. (SAR 1 gr.) with the shape of a cube and averaged over a mass of 10 gr (Extremity SAR 10 gr). These levels couldn't exceed the values indicated in the application Standard:

Standard	SAR	SAR Limit (W/Kg)
FCC 47 CFR Part 2.1093 Paragraph (d)(2)	$SAR_{1\ gr.}$	1.6

Table 3: SAR limit

5. DEVICE UNDER TEST

5.1. Dimensions

Dimensions	Millimetres
Height x Width x Depth	220.0 x 150.0 x 55.0
Overall Diagonal:	250
Display Diagonal:	175.0

Table 4: DUT dimensions

5.2. Wireless Technology

Wireless Technology	Frequency Bands	Modes
Bluetooth	2.4 GHz	BR, EDR2, EDR3

Table 5: DUT supported modes

5.3. DUT Antenna Location

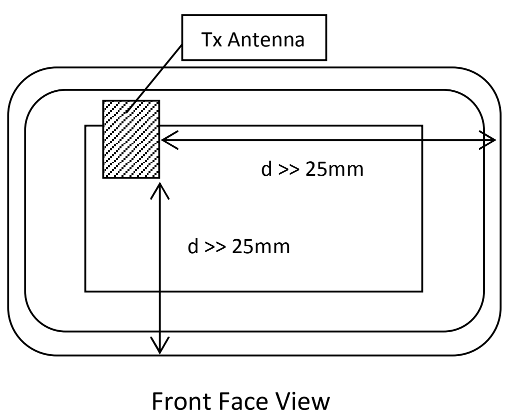

Figure 3: DUT Antenna diagram location

Appendix B – Test results

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1. TEST CONDITIONS

1.1. Power supply (V):

V_n = 10.8 V rechargeable battery

Type of power supply = DC Voltage from rechargeable Li-Ion 10.8 V battery.

1.2. Temperature (ºC):

T_n = +21.00 to +25.00

The subscript n indicates normal test conditions.

1.3. Test signal, Output Power and Frequencies

For Bluetooth mode, the device was put into operation by using a manufacturer proprietary test mode, setting the maximum output power for each mode.

A fully charged battery was used for every test sequence. In all operating bands and test positions, the measurements were performed on the channel with maximum average output power. In each band, for those positions where the maximum averaged SAR was found, measurements were performed on the remaining required channels except those with applicable test reductions [2]

2: See remarks and comments

The target power alignment for RF components declared by the manufacturer is:

Protocol	Declared Target Power		
	Max. Average Power (dBm)	Tuning tolerance (dB)	Max. Output Power (dBm)
Bluetooth	9	+0/-0	9

1.4. DUT and test-site configurations

The DUT incorporates a Bluetooth transmitter, supporting BR, EDR2 and EDR3 modes, with GFSK, π/4-DQPSK and 8-DQPSK modulations respectively.

For body exposure testing the device under test was placed with each face and edge against the flat phantom at 0 mm test separation distance, except for those edges with a distance far above 25 mm distance from a radiating antenna.

2. CONDUCTED AVERAGE POWER MEASUREMENTS

2.1. Bluetooth

These measured conducted output power values have been measured by the client: TÜV SÜD Product Service.

Band	Mode	Modulation	Freq (MHz)	Average Output Power (dBm)
2.4 GHz	BR	GFSK	2402	6.52
			2441	8.41
			2480	8.97
	EDR2	π/4-DQPSK	2402	6.22
			2441	7.31
			2480	6.69
	EDR3	8-DPSK	2402	5.61
			2441	7.31
			2480	6.67

3. TISSUE PARAMETERS MEASUREMENTS

Frequency (MHz)	Target Body Tissue: Parameters used in Probe Calibration		Target Body Tissue: Parameters used in Dipole Calibration		Measured Body Tissue		Measured Date
	Permittivity	Conductivity [S/m]	Permittivity	Conductivity [S/m]	Permittivity	Conductivity [S/m]	
2450	52.7 ± 5%	1.95 ± 5%	52.4 ± 6%	2.03 ± 6%	51.00 ± 5%	1.94 ± 5%	2015-09-10

Note: The dielectric properties have been measured by the contact probe method at 23° C.

- <u>Composition / Information on ingredients</u>

<u>Head and Muscle Tissue Simulation Liquids HBBL1900-3800V3/M HBBL1900-3800V3</u>

Water	50 – 73 %
Non-ionic detergents	27 – 50 % polyoxyethylenesorbitan monolaurate
NaCl	0 – 2 %
Preservative	0.05 – 0.1% Preventol-D7
Safety relevant ingredients:	
CAS-No. 55965-84-9	< 0.1 % aqueous preparation, containing 5-chloro-2-methyl-3(2H)-isothiazolone and 2-methyyl-3(2H)-isothiazolone
CAS-No. 9005-64-5	<50 % polyoxyethylenesorbitan monolaurate

4. SYSTEM CHECK MEASUREMENTS

4.1. Validation results in 2450 MHz Band for Body TSL

DATE	SAR over	Target SAR	Measured SAR	Drift (%)	± 10% Limit	SAR
10/09/2015	1 gr.	52.1	48.97	-6.00	√	12.30
	10 gr.	24.4	22.74	-6.82	√	5.71

5. MEASUREMENT RESULTS FOR SAR (SPECIFIC ABSORPTION RATE)

5.1. Summary maximum results for 1-g body SAR measurements.

Band	Mode[1]	Modulation	Side / Position	Channel (Frequency)	Reported SAR (1g avg) (W/Kg)	SAR limit (1g avg) (W/Kg)
2450 MHz	BR	GFSK	Top edge 0 mm	CH 79 (2480 MHz)	0.163	1.6

1: See Remarks and Comment

5.2. Results for Bluetooth, 2450 MHz Band.

Side / Position	Dist (mm)	Mode	Modulation	Ch #. (Freq)	1-g SAR (W/Kg)	Power Drift (%)	Max Output Power (dBm)	Max. Reported 1-g SAR	Plot No.
Front face	0	BR	GFSK	CH 79 (2480 Mhz)	0.059	-0.12	9	0.059	
Back face	0	BR	GFSK	CH 79 (2480 Mhz)	0.102	1.86	9	0.103	
Left edge	0	BR	GFSK	CH 79 (2480 Mhz)	0.094	0.58	9	0.095	
Right edge	0	BR	GFSK	CH 79 (2480 Mhz)	NM[2]	-	9	-	
Top edge	0	BR	GFSK	CH 79 (2480 Mhz)	0.162	-0.46	9	0.163	1
Bottom edge	0	BR	GFSK	CH 79 (2480 Mhz)	NM[2]	-	9	-	
Top edge	0	BR	GFSK	CH 1 (2402 Mhz)	NM[3]	-	9	-	
Top edge	0	BR	GFSK	CH 40 (2441 Mhz)	NM[3]	-	9	-	

2 and 3: See remarks and comments

Appendix C – Measurement report

BT- BR - GFSK – 2450MHz –Body – Top Edge, d=0 mm – Highest Channel – Plot Nº 1

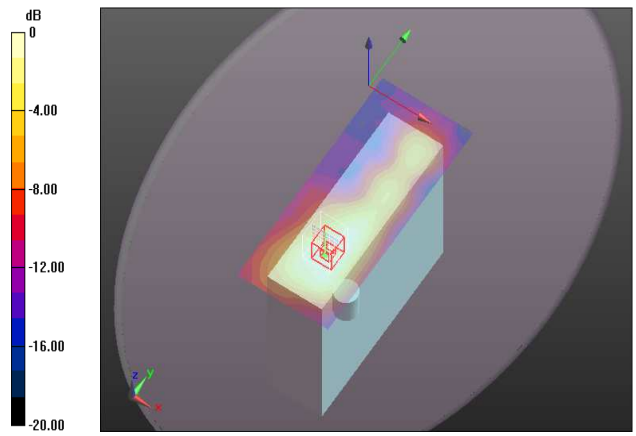
Test Laboratory: AT4 Wireless; Date: 11/09/2015

DUT: ADTS ; Type: ADTS TOUCH; Serial: 4434050

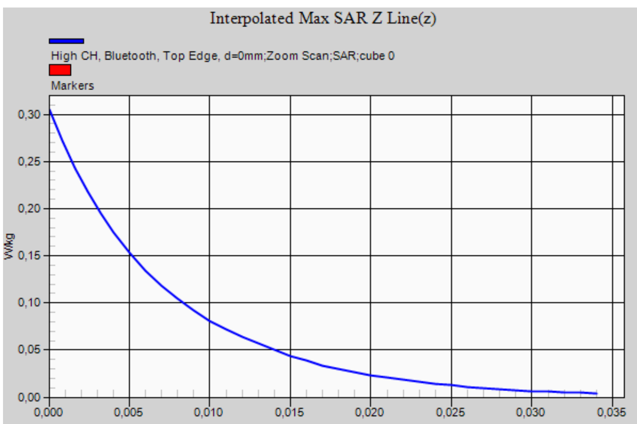
Communication System: UID 10032 - CAA, IEEE 802.15.1 Bluetooth (GFSK, DH5); Frequency: 2480 MHz; Duty Cycle: 1:1.30617
Medium parameters used: f = 2480 MHz; σ = 1.99 S/m; ε_r = 50.89; ρ = 1000 kg/m^3
Phantom section: Flat Section
DASY5 Configuration:
- Probe: ES3DV3 - SN3052; ConvF(4.31, 4.31, 4.31); Calibrated: 20/07/2015;
- Sensor-Surface: 3mm (Mechanical Surface Detection), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 13/07/2015
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1060
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Flat Phantom Side - 2450MHz/High CH, Bluetooth, Top Edge, d=0mm/Area Scan (101x241x1):
Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.202 W/kg

Flat Phantom Side - 2450MHz/High CH, Bluetooth, Top Edge, d=0mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.732 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 0.305 W/kg
SAR(1 g) = 0.162 W/kg; SAR(10 g) = 0.090 W/kg (SAR corrected for target medium)
Maximum value of SAR (measured) = 0.175 W/kg



0 dB = 0.175 W/kg = -7.57 dBW/kg



Appendix D – System Validation Reports

Validation results in 2450 MHz Band for Body TSL

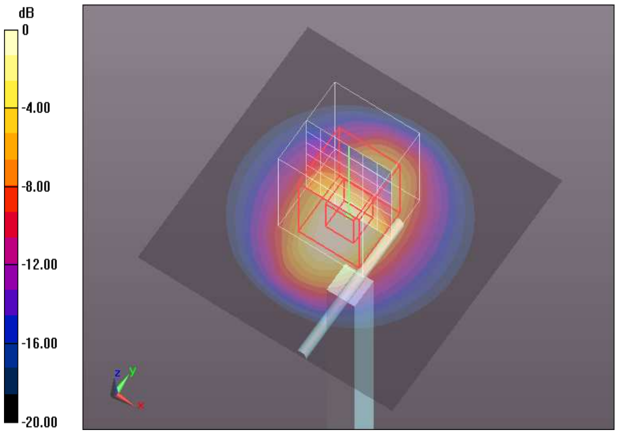
Test Laboratory: AT4 Wireless; Date: 10/09/2015

DUT: Dipole 2450 MHz D2450V2; Type: D2450V2; Serial: D2450V2 - SN:756
Communication System: UID 0, CW (0); Frequency: 2450 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.94 S/m; ε_r = 51; ρ = 1000 kg/m^3
Phantom section: Flat Section

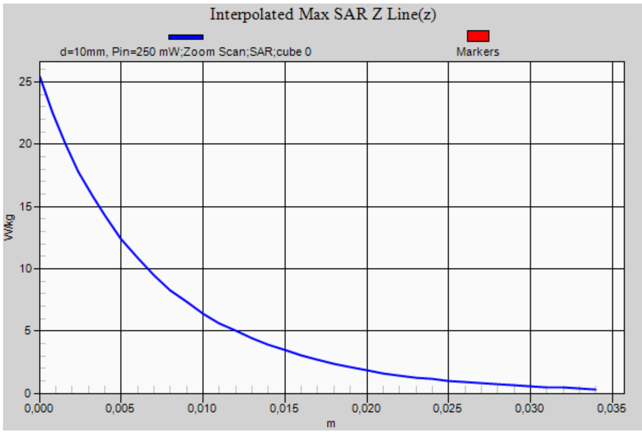
DASY5 Configuration:
- Probe: ES3DV3 - SN3052; ConvF(4.31, 4.31, 4.31); Calibrated: 20/07/2015;
- Sensor-Surface: 3mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn669; Calibrated: 13/07/2015
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1060
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

System Validation Configuration 2450MHz Dipole Body/d=10mm, Pin=250 mW/Area Scan (91x91x1):
Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 17.3 W/kg

System Validation Configuration 2450MHz Dipole Body/d=10mm, Pin=250 mW/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 87.05 V/m; Power Drift = -0.10 dB
Peak SAR (extrapolated) = 25.4 W/kg
SAR(1 g) = 12.3 W/kg; SAR(10 g) = 5.71 W/kg (SAR corrected for target medium)
Maximum value of SAR (measured) = 14.3 W/kg



0 dB = 14.3 W/kg = 11.55 dBW/kg



Appendix E – Calibration data

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Accreditation No.: SCS 0108

Client **AT4 Wireless**

Certificate No: DAE4-669_Jul15

CALIBRATION CERTIFICATE

Object	DAE4 - SD 000 D04 BM - SN: 669
Calibration procedure(s)	QA CAL-06.v29 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	July 13, 2015

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Keithley Multimeter Type 2001	SN: 0810278	03-Oct-14 (No:15573)	Oct-15

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Auto DAE Calibration Unit	SE UWS 053 AA 1001	06-Jan-15 (in house check)	In house check: Jan-16
Calibrator Box V2.1	SE UMS 006 AA 1002	06-Jan-15 (in house check)	In house check: Jan-16

	Name	Function	Signature
Calibrated by:	Eric Hainfeld	Technician	
Approved by:	Fin Bomholt	Deputy Technical Manager	i.V.

Issued: July 13, 2015

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

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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	403.316 ± 0.02% (k=2)	403.856 ± 0.02% (k=2)	404.236 ± 0.02% (k=2)
Low Range	3.95586 ± 1.50% (k=2)	3.97459 ± 1.50% (k=2)	3.97433 ± 1.50% (k=2)

Connector Angle

Connector Angle to be used in DASY system	192.5 ° ± 1 °

Appendix (Additional assessments outside the scope of SCS0108)

1. DC Voltage Linearity

High Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	200039.20	0.36	0.00
Channel X	+ Input	20009.81	5.49	0.03
Channel X	- Input	-20001.49	3.94	-0.02
Channel Y	+ Input	200034.48	-4.78	-0.00
Channel Y	+ Input	20009.04	4.84	0.02
Channel Y	- Input	-20002.50	3.09	-0.02
Channel Z	+ Input	200039.88	4.95	0.00
Channel Z	+ Input	20008.37	4.22	0.02
Channel Z	- Input	-20004.02	1.52	-0.01

Low Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	2000.99	0.18	0.01
Channel X	+ Input	201.17	0.42	0.21
Channel X	- Input	-198.81	0.15	-0.08
Channel Y	+ Input	2000.78	-0.00	-0.00
Channel Y	+ Input	200.28	-0.43	-0.22
Channel Y	- Input	-199.96	-0.88	0.44
Channel Z	+ Input	2000.74	0.05	0.00
Channel Z	+ Input	199.41	-1.31	-0.65
Channel Z	- Input	-200.05	-0.90	0.45

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	2.14	0.76
	- 200	-0.53	-1.17
Channel Y	200	11.12	11.00
	- 200	-12.56	-12.76
Channel Z	200	-9.30	-9.86
	- 200	7.61	7.45

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	-	-1.77	-3.34
Channel Y	200	9.21	-	-1.30
Channel Z	200	4.15	6.67	-

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	16075	15845
Channel Y	15795	15291
Channel Z	15997	15303

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	0.38	-1.20	1.34	0.45
Channel Y	0.48	-0.62	1.36	0.40
Channel Z	0.10	-1.36	1.40	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

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Accreditation No.: **SCS 0108**

Client **AT4 Wireless**

Certificate No: **ES3-3052_Jul15**

CALIBRATION CERTIFICATE

Object: ES3DV3 - SN:3052

Calibration procedure(s): QA CAL-01.v9, QA CAL-12.v9, QA CAL-23.v5, QA CAL-25.v6
Calibration procedure for dosimetric E-field probes

Calibration date: July 20, 2015

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	01-Apr-15 (No. 217-02128)	Mar-16
Power sensor E4412A	MY41498087	01-Apr-15 (No. 217-02128)	Mar-16
Reference 3 dB Attenuator	SN: S5054 (3c)	01-Apr-15 (No. 217-02129)	Mar-16
Reference 20 dB Attenuator	SN: S5277 (20x)	01-Apr-15 (No. 217-02132)	Mar-16
Reference 30 dB Attenuator	SN: S5129 (30b)	01-Apr-15 (No. 217-02133)	Mar-16
Reference Probe ES3DV2	SN: 3013	30-Dec-14 (No. ES3-3013_Dec14)	Dec-15
DAE4	SN: 660	14-Jan-15 (No. DAE4-660_Jan15)	Jan-16
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

	Name	Function	Signature
Calibrated by:	Israe Elnaouq	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: July 21, 2015

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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.e., ϑ = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
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 ES3DV3

SN:3052

Manufactured: September 30, 2003
Calibrated: July 20, 2015

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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3052

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm (µV/(V/m)^2)[A]	1.13	0.42	1.10	± 10.1 %
DCP (mV)[B]	105.6	103.0	104.7	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√µV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	196.8	±3.5 %
		Y	0.0	0.0	1.0		195.5	
		Z	0.0	0.0	1.0		190.9	
10011-CAB	UMTS-FDD (WCDMA)	X	3.28	67.5	19.0	2.91	134.3	±0.5 %
		Y	3.02	65.2	17.2		132.7	
		Z	3.21	66.9	18.4		131.4	
10012-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	3.20	71.2	20.2	1.87	135.6	±0.7 %
		Y	2.41	65.5	16.8		132.2	
		Z	2.69	67.7	18.2		133.4	
10013-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	10.80	70.2	23.2	9.46	129.4	±3.0 %
		Y	10.48	68.4	21.5		127.3	
		Z	10.64	69.8	22.9		126.0	
10021-DAB	GSM-FDD (TDMA, GMSK)	X	8.94	85.5	23.0	9.39	128.9	±2.2 %
		Y	1.93	64.2	13.0		81.7	
		Z	8.27	84.0	22.0		147.6	
10023-DAB	GPRS-FDD (TDMA, GMSK, TN 0)	X	11.80	90.3	24.8	9.57	145.8	±2.2 %
		Y	1.85	63.9	13.3		77.7	
		Z	8.69	85.2	22.7		141.4	
10024-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	30.54	99.9	24.9	6.56	134.0	±1.9 %
		Y	2.66	70.1	14.2		131.9	
		Z	8.78	82.5	19.3		131.5	
10025-DAB	EDGE-FDD (TDMA, 8PSK, TN 0)	X	13.11	100.0	39.2	12.62	137.2	±3.0 %
		Y	4.64	68.8	23.6		54.0	
		Z	12.46	98.9	38.8		133.8	
10026-DAB	EDGE-FDD (TDMA, 8PSK, TN 0-1)	X	11.91	94.5	33.8	9.55	133.4	±2.2 %
		Y	4.88	72.4	23.4		112.2	
		Z	9.35	88.0	30.9		130.6	
10027-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	36.19	99.9	23.5	4.80	125.9	±2.2 %
		Y	7.11	80.8	16.5		138.0	
		Z	44.98	99.6	22.5		126.0	
10028-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	47.58	100.0	22.2	3.55	138.3	±2.5 %
		Y	1.96	68.0	11.0		130.2	
		Z	68.44	99.7	20.9		136.7	
10029-DAB	EDGE-FDD (TDMA, 8PSK, TN 0-1-2)	X	9.15	87.4	29.4	7.78	128.1	±1.9 %
		Y	4.67	72.7	22.5		135.1	
		Z	10.25	90.6	30.6		126.8	

10032-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	12.49	99.0	22.5	1.16	132.4	±1.9 %
		Y	0.19	57.1	3.6		128.4	
		Z	99.74	91.8	15.1		132.7	
10035-CAA	IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH5)	X	4.62	73.2	21.7	3.83	145.0	±0.7 %
		Y	3.53	67.5	18.5		140.4	
		Z	4.35	71.9	20.9		145.0	
10038-CAA	IEEE 802.15.1 Bluetooth (8-DPSK, DH5)	X	4.62	72.1	21.5	4.10	145.3	±0.9 %
		Y	3.67	67.0	18.5		142.5	
		Z	4.37	70.9	20.7		145.0	
10048-CAA	DECT (TDD, TDMA/FDM, GFSK, Full Slot, 24)	X	6.02	80.0	24.4	13.80	81.1	±1.4 %
		Y	1.92	61.0	14.1		30.0	
		Z	5.26	77.4	23.1		79.5	
10049-CAA	DECT (TDD, TDMA/FDM, GFSK, Double Slot, 12)	X	12.05	90.8	25.8	10.79	127.7	±1.7 %
		Y	2.25	65.9	14.9		60.7	
		Z	12.63	91.6	25.7		148.9	
10058-DAB	EDGE-FDD (TDMA, 8PSK, TN 0-1-2-3)	X	7.97	84.6	27.5	6.52	135.1	±1.9 %
		Y	4.16	71.4	21.3		128.6	
		Z	7.97	84.8	27.3		135.0	
10097-CAB	UMTS-FDD (HSDPA)	X	4.59	67.1	19.0	3.98	139.7	±0.7 %
		Y	4.40	65.5	17.6		141.5	
		Z	4.49	66.6	18.5		140.0	
10098-CAB	UMTS-FDD (HSUPA, Subtest 2)	X	4.59	67.0	18.9	3.98	140.4	±0.7 %
		Y	4.44	65.7	17.7		142.1	
		Z	4.51	66.6	18.5		140.7	
10100-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.53	68.2	20.3	5.67	148.2	±1.4 %
		Y	6.32	66.8	19.0		147.7	
		Z	6.43	67.8	19.9		148.2	
10102-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM)	X	7.58	67.7	20.2	6.60	134.6	±1.4 %
		Y	7.48	66.7	19.2		135.0	
		Z	7.51	67.5	20.0		135.0	
10101-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM)	X	7.58	67.7	20.2	6.42	134.6	±12.2 %
		Y	7.48	66.7	19.2		135.0	
		Z	7.51	67.5	20.0		135.0	
10108-CAC	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.38	67.8	20.2	5.80	146.1	±1.7 %
		Y	6.21	66.3	18.8		145.5	
		Z	6.28	67.4	19.8		145.6	
10110-CAC	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	X	6.01	67.1	19.8	5.75	141.5	±1.2 %
		Y	5.86	65.7	18.6		141.5	
		Z	5.95	66.8	19.6		141.4	
10154-CAC	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	6.01	67.1	19.8	5.75	141.5	±12.2 %
		Y	5.86	65.7	18.6		141.5	
		Z	5.95	66.8	19.6		141.4	
10112-CAC	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM)	X	7.27	67.3	20.1	6.59	130.6	±1.4 %
		Y	7.21	66.4	19.1		130.3	
		Z	7.19	67.0	19.8		130.8	

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10109-CAC	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM)	X	7.27	67.3	20.1	6.43	130.6	±12.2 %
		Y	7.21	66.4	19.1		130.3	
		Z	7.19	67.0	19.8		130.8	
10150-CAB	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM)	X	7.27	67.3	20.1	6.60	130.6	±12.2 %
		Y	7.21	66.4	19.1		130.3	
		Z	7.19	67.0	19.8		130.8	
10149-CAB	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM)	X	7.27	67.3	20.1	6.42	130.6	±12.2 %
		Y	7.21	66.4	19.1		130.3	
		Z	7.19	67.0	19.8		130.8	
10117-CAB	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	10.22	69.2	21.6	8.07	136.5	±2.2 %
		Y	10.07	68.1	20.5		135.4	
		Z	10.17	69.1	21.5		136.3	
10140-CAB	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM)	X	7.51	67.7	20.2	6.49	135.6	±1.4 %
		Y	7.45	66.8	19.3		136.7	
		Z	7.43	67.4	20.0		135.7	
10141-CAB	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM)	X	7.51	67.7	20.2	6.53	135.6	±12.2 %
		Y	7.45	66.8	19.3		136.7	
		Z	7.43	67.4	20.0		135.7	
10158-CAC	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM)	X	7.03	67.1	20.1	6.62	127.5	±1.4 %
		Y	6.93	66.1	19.1		127.0	
		Z	6.98	67.0	19.9		127.3	
10111-CAC	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM)	X	7.03	67.1	20.1	6.44	127.5	±12.2 %
		Y	6.93	66.1	19.1		127.0	
		Z	6.98	67.0	19.9		127.3	
10113-CAC	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM)	X	7.03	67.1	20.1	6.62	127.5	±12.2 %
		Y	6.93	66.1	19.1		127.0	
		Z	6.98	67.0	19.9		127.3	
10155-CAC	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM)	X	7.03	67.1	20.1	6.43	127.5	±12.2 %
		Y	6.93	66.1	19.1		127.0	
		Z	6.98	67.0	19.9		127.3	
10161-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM)	X	7.03	67.1	20.1	6.43	127.5	±12.2 %
		Y	6.93	66.1	19.1		127.0	
		Z	6.98	67.0	19.9		127.3	
10162-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM)	X	7.03	67.1	20.1	6.58	127.5	±12.2 %
		Y	6.93	66.1	19.1		127.0	
		Z	6.98	67.0	19.9		127.3	
10173-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)	X	8.13	78.1	28.1	9.48	136.8	±2.5 %
		Y	6.23	70.5	23.4		146.9	
		Z	7.81	77.0	27.5		135.6	
10226-CAA	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM)	X	8.13	78.1	28.1	9.49	136.8	±12.2 %
		Y	6.23	70.5	23.4		146.9	
		Z	7.81	77.0	27.5		135.6	
10235-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)	X	8.13	78.1	28.1	9.48	136.8	±12.2 %
		Y	6.23	70.5	23.4		146.9	
		Z	7.81	77.0	27.5		135.6	

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10229-CAB	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM)	X	8.13	78.1	28.1	9.48	136.8	±12.2 %
		Y	6.23	70.5	23.4		146.9	
		Z	7.81	77.0	27.5		135.6	
10232-CAB	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM)	X	8.13	78.1	28.1	9.48	136.8	±12.2 %
		Y	6.23	70.5	23.4		146.9	
		Z	7.81	77.0	27.5		135.6	
10238-CAB	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM)	X	8.13	78.1	28.1	9.48	136.8	±12.2 %
		Y	6.23	70.5	23.4		146.9	
		Z	7.81	77.0	27.5		135.6	
10179-CAC	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM)	X	5.69	68.4	21.0	6.50	143.1	±1.7 %
		Y	5.23	66.3	19.4		138.0	
		Z	5.63	68.2	20.8		143.0	
10170-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)	X	5.69	68.4	21.0	6.52	143.1	±12.2 %
		Y	5.23	66.3	19.4		138.0	
		Z	5.63	68.2	20.8		143.0	
10176-CAC	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)	X	5.69	68.4	21.0	6.52	143.1	±12.2 %
		Y	5.23	66.3	19.4		138.0	
		Z	5.63	68.2	20.8		143.0	
10188-CAC	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM)	X	5.69	68.4	21.0	6.52	143.1	±12.2 %
		Y	5.23	66.3	19.4		138.0	
		Z	5.63	68.2	20.8		143.0	
10180-CAC	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM)	X	5.69	68.4	21.0	6.50	143.1	±12.2 %
		Y	5.23	66.3	19.4		138.0	
		Z	5.63	68.2	20.8		143.0	
10178-CAC	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM)	X	5.69	68.4	21.0	6.52	143.1	±12.2 %
		Y	5.23	66.3	19.4		138.0	
		Z	5.63	68.2	20.8		143.0	
10182-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM)	X	5.69	68.4	21.0	6.52	143.1	±12.2 %
		Y	5.23	66.3	19.4		138.0	
		Z	5.63	68.2	20.8		143.0	
10185-CAC	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM)	X	5.69	68.4	21.0	6.51	143.1	±12.2 %
		Y	5.23	66.3	19.4		138.0	
		Z	5.63	68.2	20.8		143.0	
10187-CAC	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK)	X	5.01	67.6	20.3	5.73	144.7	±1.2 %
		Y	4.57	65.2	18.5		137.4	
		Z	4.93	67.1	19.9		144.3	
10166-CAC	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK)	X	5.01	67.6	20.3	5.46	144.7	±12.2 %
		Y	4.57	65.2	18.5		137.4	
		Z	4.93	67.1	19.9		144.3	
10181-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	5.01	67.6	20.3	5.72	144.7	±12.2 %
		Y	4.57	65.2	18.5		137.4	
		Z	4.93	67.1	19.9		144.3	
10169-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	5.01	67.6	20.3	5.73	144.7	±12.2 %
		Y	4.57	65.2	18.5		137.4	
		Z	4.93	67.1	19.9		144.3	

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10175-CAC	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	5.01	67.6	20.3	5.72	144.7	±12.2 %
		Y	4.57	65.2	18.5		137.4	
		Z	4.93	67.1	19.9		144.3	
10177-CAE	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, QPSK)	X	5.01	67.6	20.3	5.73	144.7	±12.2 %
		Y	4.57	65.2	18.5		137.4	
		Z	4.93	67.1	19.9		144.3	
10184-CAC	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, QPSK)	X	5.01	67.6	20.3	5.73	144.7	±12.2 %
		Y	4.57	65.2	18.5		137.4	
		Z	4.93	67.1	19.9		144.3	
10196-CAB	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	9.79	68.8	21.5	8.10	129.9	±2.5 %
		Y	9.69	67.7	20.3		128.7	
		Z	9.73	68.7	21.3		128.8	
10225-CAB	UMTS-FDD (HSPA+)	X	6.84	66.9	19.5	5.97	132.7	±1.2 %
		Y	6.84	66.2	18.7		132.9	
		Z	6.81	66.8	19.4		132.4	
10228-CAA	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK)	X	7.79	77.2	27.7	9.22	140.4	±2.2 %
		Y	6.01	69.8	23.0		149.6	
		Z	7.63	76.7	27.4		138.3	
10237-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	7.79	77.2	27.7	9.21	140.4	±12.2 %
		Y	6.01	69.8	23.0		149.6	
		Z	7.63	76.7	27.4		138.3	
10172-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	7.79	77.2	27.7	9.21	140.4	±12.2 %
		Y	6.01	69.8	23.0		149.6	
		Z	7.63	76.7	27.4		138.3	
10231-CAB	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, QPSK)	X	7.79	77.2	27.7	9.19	140.4	±12.2 %
		Y	6.01	69.8	23.0		149.6	
		Z	7.63	76.7	27.4		138.3	
10234-CAB	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK)	X	7.79	77.2	27.7	9.21	140.4	±12.2 %
		Y	6.01	69.8	23.0		149.6	
		Z	7.63	76.7	27.4		138.3	
10240-CAB	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	7.79	77.2	27.7	9.21	140.4	±12.2 %
		Y	6.01	69.8	23.0		149.6	
		Z	7.63	76.7	27.4		138.3	
10246-CAB	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, QPSK)	X	8.17	74.0	26.0	9.30	133.6	±2.2 %
		Y	6.81	68.0	22.0		146.0	
		Z	7.98	73.4	25.6		132.0	
10249-CAB	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, QPSK)	X	8.17	74.0	26.0	9.29	133.6	±12.2 %
		Y	6.81	68.0	22.0		146.0	
		Z	7.98	73.4	25.6		132.0	
10258-CAA	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK)	X	8.17	74.0	26.0	9.34	133.6	±12.2 %
		Y	6.81	68.0	22.0		146.0	
		Z	7.98	73.4	25.6		132.0	
10256-CAA	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM)	X	8.92	74.4	26.6	9.96	136.3	±3.0 %
		Y	7.58	68.8	22.7		149.4	
		Z	8.78	74.1	26.3		135.0	

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