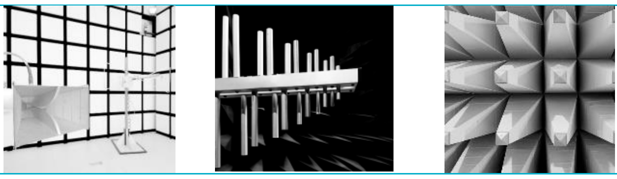


CTC advanced
member of RWTÜV group

Bundesnetzagentur

TEST REPORT

Test Report No.: 1-6927/18-01-06

DAkkS Deutsche Akkreditierungsstelle D-PL-12076-01-03

BNetzA-CAB-02/21-102

Testing Laboratory

CTC advanced GmbH
Untertuerkheimer Strasse 6 – 10
66117 Saarbruecken/Germany
Phone: + 49 681 5 98 - 0
Fax: + 49 681 5 98 - 9075
Internet: http://www.ctcadvanced.com
e-mail: mail@ctcadvanced.com

Accredited Test Laboratory:
The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2005) by the Deutsche Akkreditierungsstelle GmbH (DAkkS)
The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate with the registration number: D-PL-12076-01-03

Applicant

Ingenico Group
9 Avenue de la Gare Rovaltain
26958 Valence Cedex 9/FRANCE

Contact: Nicolas Jacquemont
e-mail: nicolas.jacquemont@ingenico.com
Phone: +33475842123

Manufacturer

Ingenico Group
9 Avenue de la Gare Rovaltain
26958 Valence Cedex 9/FRANCE

Test Standards

IEEE 1528-2013	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
RSS-102 Issue 5	Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)

For further applied test standards please refer to section 3 of this test report.

Test Item

Kind of test item:	Payment terminal
Device type:	portable device
Model name:	**AXIUM D7 CL/4G/WIFI/BT**
S/N serial number:	182677314201129703190743
FCC-ID:	XKB-AXICL4GWBT
IC:	2586D-AXICL4GWBT
Product Marketing Name (PMN):	Axium D7
Hardware Version Identification No. (HVIN):	AXIUM D7 CL/4G/WIFI/BT
Firmware Version Identification No. (FVIN):	4.19.1
IMEI-Number:	865067037802603
Hardware status:	296230079
Software status:	4.19.1
Frequency:	see technical details
Antenna:	integrated antenna
Battery option:	Li-ion Polymer Battery 3.7V / 4000mAh
Test sample status:	identical prototype
Exposure category:	general population / uncontrolled environment

This test report is electronically signed and valid without handwriting signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

Test Report authorised:

cn=Alexander Hnatovskiy, o=CTC advanced GmbH, ou=HNA-161129, email=Alexander.Hnatovskiy@ctcadvanced.com, c=DE
2019.04.26 09:35:38 +02'00'

Alexander Hnatovskiy
Lab Manager
Radio Communications & EMC

Test performed:

cn=Marco Scigliano, o=CTC advanced GmbH, ou=SCI-161125, email=marco.scigliano@ctcadvanced.com, c=DE
2019.04.26 09:38:30 +02'00'

Marco Scigliano
Testing Manager
Radio Communications & EMC

1 Table of contents

2 General information

2.1 Notes and disclaimer

The test results of this test report relate exclusively to the test item specified in this test report. CTC advanced GmbH does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CTC advanced GmbH.
This test report is electronically signed and valid without handwriting signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.
The testing service provided by CTC advanced GmbH has been rendered under the current "General Terms and Conditions for CTC advanced GmbH".
CTC advanced GmbH will not be liable for any loss or damage resulting from false, inaccurate, inappropriate or incomplete product information provided by the customer.
Under no circumstances does the CTC advanced GmbH test report include any endorsement or warranty regarding the functionality, quality or performance of any other product or service provided.
Under no circumstances does the CTC advanced GmbH test report include or imply any product or service warranties from CTC advanced GmbH, including, without limitation, any implied warranties of merchantability, fitness for purpose, or non-infringement, all of which are expressly disclaimed by CTC advanced GmbH.
All rights and remedies regarding vendor's products and services for which CTC advanced GmbH has prepared this test report shall be provided by the party offering such products or services and not by CTC advanced GmbH.
In no case this test report can be considered as a Letter of Approval.

2.2 Application details

Date of receipt of order:	2018-09-21
Date of receipt of test item:	2018-11-05
Start of test:	2018-11-13
End of test:	2019-04-03

2.3 Statement of compliance

The SAR values found for the AXIUM D7 CL/4G/WIFI/BT Payment terminal are below the maximum recommended levels of 4 W/Kg as averaged over any 10 g tissue according to the FCC rule §2.1093, the ANSI/IEEE C 95.1:1992, the NCRP Report Number 86 for uncontrolled environment, according to the Health Canada's Safety Code 6 and the Industry Canada Radio Standards Specification RSS-102 for General Population/Uncontrolled exposure.

2.4 Technical details

Band tested for this test report	Technology	Lowest transmit frequency/MHz	Highest transmit frequency/MHz	Lowest receive Frequency/MHz	Highest receive Frequency/MHz	Kind of modulation	Power Class	Tested power control level	GPRS/EGPRS mobile station class	GPRS/EGPRS multislot class	Test channel low	Test channel middle	Test channel high	Maximum output power/dBm)*
☒	GSM cellular	824.2	848.8	869.2	893.8	GMSK 8-PSK	4 E2	5	B	33	128	190	251	32.3
☒	GSM PCS	1850.2	1909.8	1930.2	1989.8	GMSK 8-PSK	1 E2	0	B	33	512	661	810	28.8
☒	UMTS FDD II	1852.4	1907.6	1932.4	1987.6	QPSK	3	max	--	--	9262	9400	9538	23.0
☒	UMTS FDD IV	1712.4	1752.6	2112.4	2152.6	QPSK	3	max	--	--	1312	1412	1513	23.3
☒	UMTS FDD V	826.4	846.6	871.4	891.6	QPSK	3	max	--	--	4132	4182	4233	23.6
☒	LTE FDD 2	1850	1910	1930	1990	QPSK	3	max	--	--	18700	18900	19100	22.9
☒	LTE FDD 4	1710	1755	2110	2155	QPSK	3	max	--	--	20050	20175	20300	22.4
☒	LTE FDD 5	824	849	869	894	QPSK	3	max	--	--	20450	20525	20600	23.1
☒	LTE FDD 7	2500	2570	2620	2690	QPSK	3	max	--	--	20850	21100	21350	22.1
☒	LTE FDD 12	704	711	734	741	QPSK	3	max	--	--	23060	23095	23130	23.3
☒	LTE FDD 13	777	787	746	756	QPSK	3	max	--	--	23205	23230	23255	23.0
☒	LTE FDD 25	1850	1915	1850	1915	QPSK	3	max	--	--	26140	26340	26590	22.7
☒	LTE FDD 26	814	849	859	894	QPSK	3	max	--	--	26765	26865	26965	23.0
☒	*WLAN US***	*2412*	*2462*	*2412*	*2462*	*CCK OFDM*	*--*	*max*	*--*	*--*	*1*	*6*	*11*	*19.0*
☒	*WLAN***	*5180*	*5240*	*5180*	*5240*	*OFDM*	*--*	*max*	*--*	*--*	*36*	*40*	*48*	*15.0*
☒	*WLAN***	*5260*	*5320*	*5260*	*5320*	*OFDM*	*--*	*max*	*--*	*--*	*52*	*56*	*64*	*15.1*
☒	*WLAN***	*5500*	*5700*	*5500*	*5700*	*OFDM*	*--*	*max*	*--*	*--*	*100*	*104*	*140*	*13.0*
☒	*WLAN***	*5745*	*5825*	*5745*	*5825*	*OFDM*	*--*	*max*	*--*	*--*	*--*	*157*	*--*	*13.5*
☒	*BT EDR***	*2402*	*2480*	*2402*	*2480*	*GFSK*	*3*	*max*	*--*	*--*	*0*	*39*	*78*	*10.7*
☐	*BT LE***	*2402*	*2480*	*2402*	*2480*	*GFSK*	*3*	*max*	*--*	*--*	*0*	*19*	*39*	*3.1*

)*: measured slotted peak power for GSM, averaged max. RMS power for UMTS, LTE, WLAN and BT.

**: measured in CTC Advanced report 1-6927/18-01-12

UMTS: Release 9, HSDPA Category 24, HSUPA Category 6
LTE: Release 10, Category 4

2.5 Transmitter and Antenna Operating Configurations

Simultaneous transmission conditions				
GSM / GPRS / EDGE	+	WLAN 2.4GHz	+	BT/BLE[1]
GSM / GPRS / EDGE	+	WLAN 5GHz	+	BT/BLE[1]
UMTS / HSPA	+	WLAN 2.4GHz	+	BT/BLE[1]
UMTS / HSPA	+	WLAN 5GHz	+	BT/BLE[1]
LTE	+	WLAN 2.4GHz	+	BT/BLE[1]
LTE	+	WLAN 5GHz	+	BT/BLE[1]

Table 1: Simultaneous transmission conditions

BLE[1] - Bluetooth low energy

3 Test standards/ procedures references

Test Standard	Version	Test Standard Description
IEEE 1528-2013	2013-06	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
RSS-102 Issue 5	2015-03	Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)
Canada's Safety Code No. 6	2015-06	Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz
IEEE Std. C95-3	2002	IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields – RF and Microwave
IEEE Std. C95-1	2005	IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.
IEC 62209-2	2010	Human exposure to radio frequency fields from hand-held and bodymounted wireless communication devices. Human models, instrumentation, and procedures. 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)

FCC KDBs:

KDB 865664D01v01	August 7, 2015	FCC OET SAR measurement requirements 100 MHz to 6 GHz
KDB 865664D02v01	October 23, 2015	RF Exposure Compliance Reporting and Documentation Considerations
KDB 447498D01v06	October 23, 2015	Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies
KDB 648474D04v01	October 23, 2015	SAR Evaluation Considerations for Wireless Handsets
KDB 941225D01v03	October 23, 2015	SAR Measurements Procedures for 3G Devices
KDB 941225D05v02	October 23, 2015	SAR for LTE Devices
KDB 941225D05Av01	October 23, 2015	LTE Rel. 10 KDB Inquiry Sheet
KDB 941225D07v01	October 23, 2015	UMPS Mini Tablet
KDB 248227D01v02	October 23, 2015	SAR Measurement Procedures for 802.11 a/b/g Transmitters
KDB 616217D04v01	October 23, 2015	SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers.

3.1 RF exposure limits

Human Exposure	Uncontrolled Environment General Population	Controlled Environment Occupational
Spatial Peak SAR* (Brain and Trunk)	1.60 mW/g	8.00 mW/g
Spatial Average SAR** (Whole Body)	0.08 mW/g	0.40 mW/g
Spatial Peak SAR*** (Hands/Feet/Ankle/Wrist)	**4.00 mW/g**	20.00 mW/g

Table 2: RF exposure limits

The limit applied in this test report is shown in bold letters

Notes:

* The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time

** The Spatial Average value of the SAR averaged over the whole body.

*** The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

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

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

4 Summary of Measurement Results

☒	**No deviations from the technical specifications ascertained**
☐	Deviations from the technical specifications ascertained

Maximum SAR value (W/kg)		
	reported	**limit**
extremity 0 mm distance for 10g	**3.341**	**4.0**
collocated situations ΣSAR evaluation	**3.562**	**4.0**

4.1 SAR measurement variability and measurement uncertainty analysis

This analysis is required for worst case results larger than 2 W/kg.

frequency band	highest original measurement result at worst case position (W/kg)	repeated measurement result at worst case position (W/kg)	ratio <1.2
GSM 1900	2.910	2.850	1.02
UMTS FDD II	2.820	2.810	1.00
LTE FDD 2	2.750	2.730	1.01
LTE FDD 25	2.770	2.880	1.04

5 Test Environment

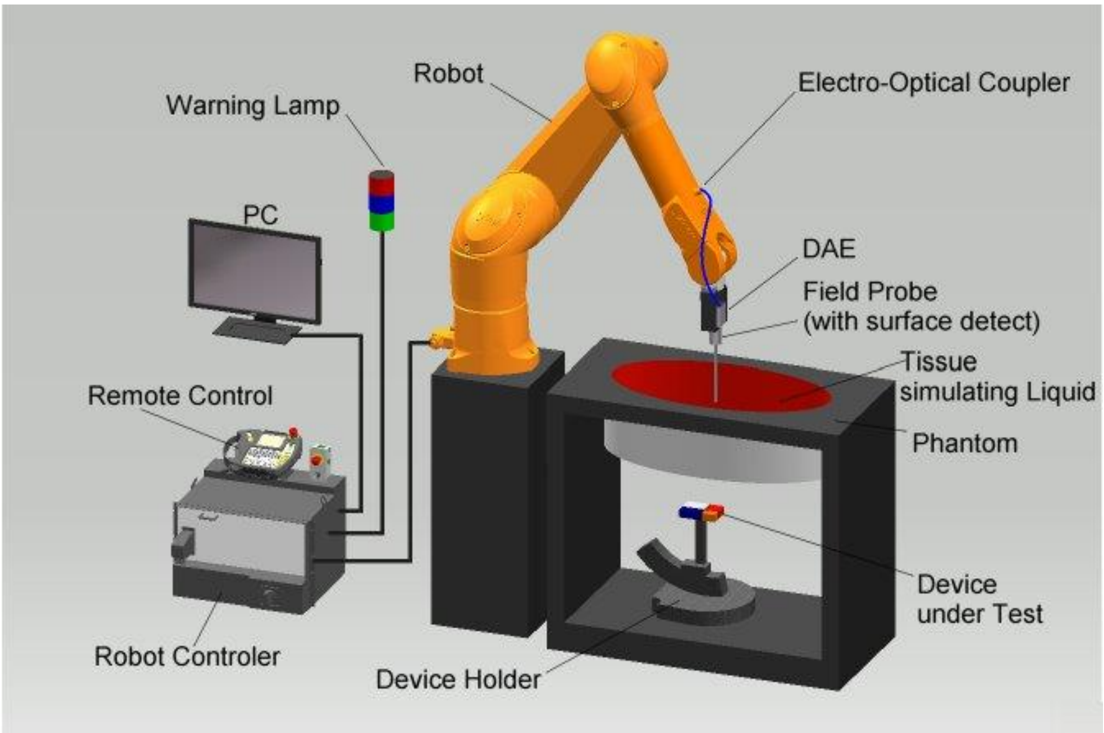
Ambient temperature:	20 – 24 °C
Tissue Simulating liquid:	20 – 24 °C
Relative humidity content:	40 – 50 %
Air pressure:	not relevant for this kind of testing
Power supply:	230 V / 50 Hz

Exact temperature values for each test are shown in the table(s) under 7.1 and/or on the measurement plots.

6 Test Set-up

6.1 Measurement system

6.1.1 System Description



- The DASY system for performing compliance tests consists of the following items:
- A standard high precision 6-axis robot (Stäubli RX/TX 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.
- 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.
- 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 DASY measurement server.
- The DASY 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 7.
- DASY 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 triple flat and eli phantom for the testing of handheld and body-mounted wireless devices.
- The device holder for handheld mobile phones and mounting device adaptor for laptops
- Tissue simulating liquid mixed according to the given recipes.
- System check dipoles allowing to validate the proper functioning of the system.

6.1.2 Test environment

The DASY measurement system is placed in a laboratory room within an environment which avoids influence on SAR measurements by ambient electromagnetic fields and any reflection from the environment. The pictures at the beginning of the photo documentation show a complete view of the test environment. The system allows the measurement of SAR values larger than 0.005 mW/g.

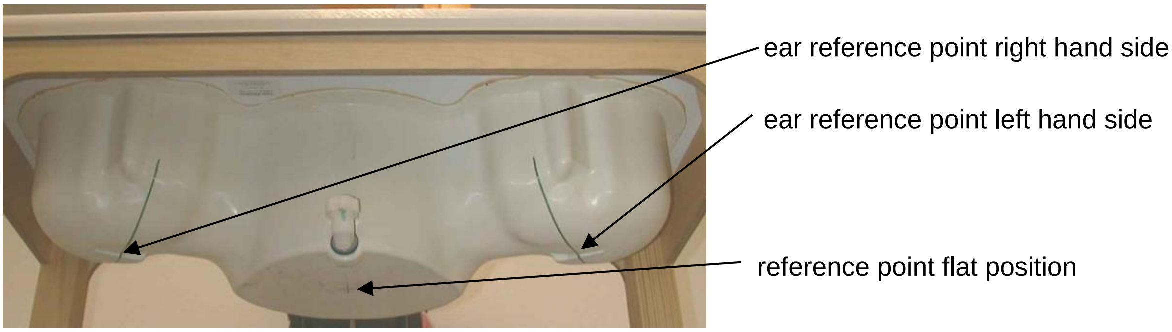
6.1.3 Probe description

Isotropic E-Field Probe ES3DV3 for Dosimetric Measurements	
Technical data according to manufacturer information	
Construction	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., butyl diglycol)
Calibration	Calibration certificate in Appendix D
Frequency	10 MHz to 3 GHz (dosimetry); Linearity: ± 0.2 dB (30 MHz to 3 GHz)
Directivity	± 0.2 dB in HSL (rotation around probe axis) ± 0.3 dB in HSL (rotation normal to probe axis)
Dynamic range	5 µW/g to > 100 mW/g; Linearity: ± 0.2 dB
Dimensions	Overall length: 330 mm Tip length: 20 mm Body diameter: 12 mm Tip diameter: 3.9 mm Distance from probe tip to dipole centers: 2.0 mm
Application	General dosimetry up to 3 GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms (ES3DV3)

Isotropic E-Field Probe EX3DV4 for Dosimetric Measurements	
Technical data according to manufacturer information	
Construction	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 calibration service available.
Frequency	10 MHz to >6 GHz (dosimetry); Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic range	10 µW/g to > 100 mW/g; Linearity: ± 0.2 dB (noise: typically<1 µW/g)
Dimensions	Overall length: 337 mm (Tip: 20mm) Tip length: 2.5 mm (Body: 12mm) Typical distance from probe tip to dipole centers: 1mm
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.

6.1.4 Phantom description

The used SAM Phantom meets the requirements specified in FCC KDB865664 D01 for Specific Absorption Rate (SAR) measurements.
The phantom consists of a fibreglass shell integrated in a wooden table. It allows left-hand and right-hand head as well as body-worn measurements with a maximum liquid depth of 18 cm in head position and 22 cm in planar position (body measurements). The thickness of the Phantom shell is 2 mm +/- 0.1 mm.



Triple Modular Phantom consists of three identical modules which can be installed and removed separately without emptying the liquid. It includes three reference points for phantom installation. Covers prevent evaporation of the liquid. Phantom material is resistant to DGBE based tissue simulating liquids.

6.1.5 Device holder description

The DASY device holder has two scales for device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear openings). The plane between the ear openings and the mouth tip has a rotation angle of 65°. The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. This device holder is used for standard mobile phones or PDA's only. If necessary an additional support of polystyrene material is used.

Larger DUT's (e.g. notebooks) cannot be tested using this device holder. Instead a support of bigger polystyrene cubes and thin polystyrene plates is used to position the DUT in all relevant positions to find and measure spots with maximum SAR values.
Therefore those devices are normally only tested at the flat part of the SAM.

6.1.6 Scanning procedure

- The DASY installation includes predefined files with recommended procedures for measurements and system check. 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 highest integrated SAR value is the main concern in compliance test applications. These values can mostly be found at the inner surface of the phantom and cannot be measured directly due to the sensor offset in the probe. To extrapolate the surface values, the measurement distances to the surface must be known accurately. A distance error of 0.5mm could produce SAR errors of 6% at 1800 MHz. Using predefined locations for measurements is not accurate enough. Any shift of the phantom (e.g., slight deformations after filling it with liquid) would produce high uncertainties. For an automatic and accurate detection of the phantom surface, the DASY5 system uses the mechanical surface detection. The detection is always at touch, but the probe will move backward from the surface the indicated distance before starting the measurement.
- The „area scan“ measures the SAR above the DUT or verification dipole on a parallel plane to the surface. It is used to locate the approximate location of the peak SAR with 2D spline interpolation. The robot performs a stepped movement along one grid axis while the local electrical field strength is measured by the probe. The probe is touching the surface of the SAM during acquisition of measurement values. The scan uses different grid spacings for different frequency measurements. Standard grid spacing for head measurements in frequency ranges ≤ 2GHz is 15 mm in x- and y-dimension. For higher frequencies a finer resolution is needed, thus for the grid spacing is reduced according the following table:

Area scan grid spacing for different frequency ranges	
Frequency range	Grid spacing
≤ 2 GHz	≤ 15 mm
2 – 4 GHz	≤ 12 mm
4 – 6 GHz	≤ 10 mm

  Grid spacing and orientation have no influence on the SAR result. For special applications where the standard scan method does not find the peak SAR within the grid, e.g. mobile phones with flip cover, the grid can be adapted in orientation. Results of this coarse scan are shown in annex B.
- A „zoom scan” measures the field in a volume around the 2D peak SAR value acquired in the previous „coarse“ scan. It uses a fine meshed grid where the robot moves the probe in steps along all the 3 axis (x, y and z-axis) starting at the bottom of the Phantom. The grid spacing for the cube measurement is varied according to the measured frequency range, the dimensions are given in the following table:

Zoom scan grid spacing and volume for different frequency ranges			
Frequency range	Grid spacing for x, y axis	Grid spacing for z axis	Minimum zoom scan volume
≤ 2 GHz	≤ 8 mm	≤ 5 mm	≥ 30 mm
2 – 3 GHz	≤ 5 mm*	≤ 5 mm	≥ 28 mm
3 – 4 GHz	≤ 5 mm*	≤ 4 mm	≥ 28 mm
4 – 5 GHz	≤ 4 mm*	≤ 3 mm	≥ 25 mm
5 – 6 GHz	≤ 4 mm*	≤ 2 mm	≥ 22 mm

  * When zoom scan is required and the reported SAR from the area scan based 1-g SAR estimation procedures of KDB Publication 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 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.

  DASY is also able to perform repeated zoom scans if more than 1 peak is found during area scan. In this document, the evaluated peak 1g and 10g averaged SAR values are shown in the 2D-graphics in annex B. Test results relevant for the specified standard (see section 3) are shown in table form in section 7.

6.1.7 Spatial Peak SAR Evaluation

The spatial peak SAR - value for 1 and 10 g is evaluated after the Cube measurements have been done. The basis of the evaluation are the SAR values measured at the points of the fine cube grid consisting of all points in the three directions x, y and z. The algorithm that finds the maximal averaged volume is separated into three different stages.

- The data between the dipole center of the probe and the surface of the phantom are extrapolated. This data cannot be measured since the center of the dipole is 1 to 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is about 1 mm (see probe calibration sheet). The extrapolated data from a cube measurement can be visualized by selecting 'Graph Evaluated'.

- The maximum interpolated value is searched with a straight-forward algorithm. Around this maximum the SAR - values averaged over the spatial volumes (1g or 10 g) are computed using the 3d-spline interpolation algorithm. If the volume cannot be evaluated (i.e., if a part of the grid was cut off by the boundary of the measurement area) the evaluation will be started on the corners of the bottom plane of the cube.

- All neighbouring volumes are evaluated until no neighbouring volume with a higher average value is found.

Extrapolation

The extrapolation is based on a least square algorithm [W. Gander, Computermathematik, p.168-180]. Through the points in the first 3 cm along the z-axis, polynomials of order four are calculated. These polynomials are then used to evaluate the points between the surface and the probe tip. The points, calculated from the surface, have a distance of 1 mm from each other.

Interpolation

The interpolation of the points is done with a 3d-Spline. The 3d-Spline is composed of three one-dimensional splines with the "Not a knot"-condition [W. Gander, Computermathematik, p.141-150] (x, y and z -direction) [Numerical Recipes in C, Second Edition, p.123ff].

Volume Averaging

At First the size of the cube is calculated. Then the volume is integrated with the trapezoidal algorithm. 8000 points (20x20x20) are interpolated to calculate the average.

Advanced Extrapolation

DASY uses the advanced extrapolation option which is able to compensate boundary effects on E-field probes.

6.1.8 Data Storage and Evaluation

Data Storage

The DASY 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", ".DA5x". 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/cm²], [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 by SEMCAD

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	$Norm_i$, a_{i0}, a_{i1}, a_{i2}
	- Conversion factor	$ConvF_i$
	- 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 DASY 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:

$$V_i = U_i + U_i^2 \cdot cf/dcp_i$$

with	V_i	= compensated signal of channel i	(i = x, y, z)
	U_i	= input signal of channel i	(i = x, y, z)
	cf	= crest factor of exciting field	(DASY parameter)
	dcp_i	= diode compression point	(DASY parameter)

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

E-field probes: $$E_i = (V_i / Norm_i \cdot ConvF)^{1/2}$$

H-field probes: $$H_i = (V_i)^{1/2} \cdot (a_{i0} + a_{i1}f + a_{i2}f^2)/f$$

with	V_i	= compensated signal of channel i	(i = x, y, z)
	$Norm_i$	= sensor sensitivity of channel i [mV/(V/m)^2] for E-field Probes	(i = x, y, z)
	ConvF	= sensitivity enhancement in solution	
	a_{ij}	= sensor sensitivity factors for H-field probes	
	f	= carrier frequency [GHz]	
	E_i	= electric field strength of channel i in V/m	
	H_i	= magnetic field strength of channel i in A/m	

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

$$E_{tot} = (E_x^2 + E_Y^2 + E_z^2)^{1/2}$$

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

$$SAR = (E_{tot}^2 \cdot \sigma) / (\rho \cdot 1000)$$

with	SAR	= local specific absorption rate in mW/g
	E_{tot}	= total field strength in V/m
	σ	= conductivity in [mho/m] or [Siemens/m]
	ρ	= equivalent tissue density in g/cm^3

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.The power flow density is calculated assuming the excitation field to be a free space field.

$$P_{pwe} = E_{tot}^2 / 3770 \qquad \text{or} \qquad P_{pwe} = H_{tot}^2 \cdot 37.7$$

with	P_{pwe}	= equivalent power density of a plane wave in mW/cm^2
	E_{tot}	= total electric field strength in V/m
	H_{tot}	= total magnetic field strength in A/m

6.1.9 Tissue simulating liquids: dielectric properties

The following materials are used for producing the tissue-equivalent materials.

MBBL600-6000V6 Body Tissue Simulating Liquid, manufactured by SPEAG**:**

Ingredients	(% by weight)
Water	60-80%
Esters, Emulsifiers, Inhibitors	20-40%
Sodium salt	0-1.5%

Table 3: Body tissue dielectric properties

6.1.10 Tissue simulating liquids: parameters

Liquid MSL	Freq. (MHz)	Target body tissue		Measurement **body** tissue					Measurement date
		Permittivity	Conductivity (S/m)	Permittivity	Dev.	Conductivity ε"	Conductivity (S/m)	Dev.	
750	704	55.71	0.96	56.0	0.6%	23.8	0.93	-3.1%	2019-03-11
	707	55.70	0.96	56.0	0.6%	23.7	0.93	-2.8%	
	711	55.68	0.96	56.0	0.6%	23.6	0.93	-2.8%	
	750	55.53	0.96	56.0	0.8%	22.72	0.95	-1.6%	
	779	55.42	0.97	55.9	0.9%	22.12	0.96	-0.7%	
	782	55.41	0.97	55.9	0.9%	22.03	0.96	-0.8%	
	784	55.40	0.97	55.9	0.9%	21.99	0.96	-0.7%	
850	822	55.25	0.97	55.8	1.0%	21.29	0.97	0.5%	2019-03-07
	824	55.24	0.97	55.8	1.0%	21.29	0.98	0.7%	
	826	55.24	0.97	55.8	1.0%	21.23	0.98	0.6%	
	829	55.22	0.97	55.8	1.0%	21.17	0.98	0.7%	
	832	55.21	0.97	55.8	1.0%	21.12	0.98	0.8%	
	835	55.20	0.97	55.8	1.1%	21.09	0.98	1.0%	
	837	55.19	0.97	55.8	1.0%	21.04	0.98	0.7%	
	842	55.18	0.98	55.8	1.0%	20.95	0.98	0.3%	
	844	55.17	0.98	55.8	1.0%	20.94	0.98	0.2%	
	847	55.16	0.98	55.8	1.1%	20.90	0.98	0.0%	
	849	55.16	0.99	55.7	1.0%	20.84	0.98	-0.3%	
1750	1712	53.53	1.46	52.7	-1.6%	14.76	1.41	-4.0%	2019-03-13
	1720	53.51	1.47	52.7	-1.6%	14.73	1.41	-4.1%	
	1732	53.48	1.48	52.7	-1.6%	14.67	1.41	-4.3%	
	1745	53.44	1.49	52.6	-1.5%	14.71	1.43	-3.9%	
	1750	53.43	1.49	52.6	-1.5%	14.72	1.43	-3.7%	
	1752	53.43	1.49	52.6	-1.6%	14.73	1.44	-3.6%	
1900	1852	53.30	1.52	52.3	-1.8%	14.55	1.50	-1.4%	2019-03-13
	1860	53.30	1.52	52.3	-1.8%	14.53	1.50	-1.1%	
	1882	53.30	1.52	52.4	-1.8%	14.47	1.51	-0.4%	
	1900	53.30	1.52	52.4	-1.8%	14.44	1.53	0.4%	
	1905	53.30	1.52	52.3	-1.8%	14.42	1.53	0.5%	
	1908	53.30	1.52	52.4	-1.8%	14.37	1.53	0.4%	
1900	1850	53.30	1.52	52.4	-1.7%	14.56	1.50	-1.4%	2019-04-03
	1880	53.30	1.52	52.4	-1.7%	14.46	1.51	-0.5%	
	1900	53.30	1.52	52.4	-1.8%	14.44	1.53	0.4%	
	1910	53.30	1.52	52.3	-1.8%	14.40	1.53	0.7%	
2450/ 2600	2510	52.62	2.04	50.2	-4.5%	14.49	2.02	-0.6%	2019-03-18
	2535	52.59	2.07	50.1	-4.7%	14.52	2.05	-1.1%	
	2560	52.56	2.11	50.1	-4.8%	14.51	2.07	-1.9%	
	2600	52.51	2.16	50.0	-4.8%	14.59	2.11	-2.4%	

Table 4: Parameter of the body tissue simulating liquid
Note: The dielectric properties have been measured using the contact probe method at 22°C.

6.1.11 Measurement uncertainty evaluation for SAR test

DASY5 Uncertainty Budget According to IEEE 1528/2003 and IEC 62209-1 for the 300 MHz - 3 GHz range								
Source of uncertainty	ncertainty Valu ± %	Probability Distribution	Divisor	c_i (1g)	c_i (10g)	Standard Uncertainty ± %, (1g)	± %, (10g)	v_i^2 or v_{eff}
Measurement System								
Probe calibration	± 6.0 %	Normal	1	1	1	± 6.0 %	± 6.0 %	∞
Axial isotropy	± 4.7 %	Rectangular	√ 3	0.7	0.7	± 1.9 %	± 1.9 %	∞
Hemispherical isotropy	± 9.6 %	Rectangular	√ 3	0.7	0.7	± 3.9 %	± 3.9 %	∞
Boundary effects	± 1.0 %	Rectangular	√ 3	1	1	± 0.6 %	± 0.6 %	∞
Probe linearity	± 4.7 %	Rectangular	√ 3	1	1	± 2.7 %	± 2.7 %	∞
System detection limits	± 1.0 %	Rectangular	√ 3	1	1	± 0.6 %	± 0.6 %	∞
Readout electronics	± 0.3 %	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Response time	± 0.8 %	Rectangular	√ 3	1	1	± 0.5 %	± 0.5 %	∞
Integration time	± 2.6 %	Rectangular	√ 3	1	1	± 1.5 %	± 1.5 %	∞
RF ambient noise	± 3.0 %	Rectangular	√ 3	1	1	± 1.7 %	± 1.7 %	∞
RF ambient reflections	± 3.0 %	Rectangular	√ 3	1	1	± 1.7 %	± 1.7 %	∞
Probe positioner	± 0.4 %	Rectangular	√ 3	1	1	± 0.2 %	± 0.2 %	∞
Probe positioning	± 2.9 %	Rectangular	√ 3	1	1	± 1.7 %	± 1.7 %	∞
Max.SAR evaluation	± 1.0 %	Rectangular	√ 3	1	1	± 0.6 %	± 0.6 %	∞
Test Sample Related								
Device positioning	± 2.9 %	Normal	1	1	1	± 2.9 %	± 2.9 %	145
Device holder uncertainty	± 3.6 %	Normal	1	1	1	± 3.6 %	± 3.6 %	5
Power drift	± 5.0 %	Rectangular	√ 3	1	1	± 2.9 %	± 2.9 %	∞
Phantom and Set-up								
Phantom uncertainty	± 4.0 %	Rectangular	√ 3	1	1	± 2.3 %	± 2.3 %	∞
Liquid conductivity (target)	± 5.0 %	Rectangular	√ 3	0.64	0.43	± 1.8 %	± 1.2 %	∞
Liquid conductivity (meas.)	± 5.0 %	Rectangular	√ 3	0.64	0.43	± 1.8 %	± 1.2 %	∞
Liquid permittivity (target)	± 5.0 %	Rectangular	√ 3	0.6	0.49	± 1.7 %	± 1.4 %	∞
Liquid permittivity (meas.)	± 5.0 %	Rectangular	√ 3	0.6	0.49	± 1.7 %	± 1.4 %	∞
Combined Std.						± 11.1 %	± 10.8 %	387
Expanded Std.						± **22.1** %	± **21.6** %	

Table 5: Measurement uncertainties
Worst-Case uncertainty budget for DASY5 assessed according to IEEE 1528/2003.
The budget is valid for 2G and 3G communication signals and frequency range 300MHz - 3 GHz.
For these conditions it represents a worst-case analysis. For specific tests and configurations, the uncertainty could be considerable smaller.

Relative DASY5 Uncertainty Budget for SAR Tests According to IEEE 1528/2013 and IEC62209/2011 for the 0.3 - 3GHz range								
Error Description	certainty Valu ± %	Probability Distribution	Divisor	c_i (1g)	c_i (10g)	Standard Uncertainty ± %, (1g)	 ± %, (10g)	v_i^2 or v_{eff}
Measurement System								
Probe calibration	± 6.0 %	Normal	1	1	1	± 6.0 %	± 6.0 %	∞
Axial isotropy	± 4.7 %	Rectangular	√3	0.7	0.7	± 1.9 %	± 1.9 %	∞
Hemispherical isotropy	± 9.6 %	Rectangular	√3	0.7	0.7	± 3.9 %	± 3.9 %	∞
Boundary effects	± 1.0 %	Rectangular	√3	1	1	± 0.6 %	± 0.6 %	∞
Probe linearity	± 4.7 %	Rectangular	√3	1	1	± 2.7 %	± 2.7 %	∞
System detection limits	± 1.0 %	Rectangular	√3	1	1	± 0.6 %	± 0.6 %	∞
Modulation Response	± 2.4 %	Rectangular	√3	1	1	± 1.4 %	± 1.4 %	∞
Readout electronics	± 0.3 %	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Response time	± 0.8 %	Rectangular	√3	1	1	± 0.5 %	± 0.5 %	∞
Integration time	± 2.6 %	Rectangular	√3	1	1	± 1.5 %	± 1.5 %	∞
RF ambient noise	± 3.0 %	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
RF ambient reflections	± 3.0 %	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
Probe positioner	± 0.4 %	Rectangular	√3	1	1	± 0.2 %	± 0.2 %	∞
Probe positioning	± 2.9 %	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
Max. SAR evaluation	± 2.0 %	Rectangular	√3	1	1	± 1.2 %	± 1.2 %	∞
Test Sample Related								
Device positioning	± 2.9 %	Normal	1	1	1	± 2.9 %	± 2.9 %	145
Device holder uncertainty	± 3.6 %	Normal	1	1	1	± 3.6 %	± 3.6 %	5
Power drift	± 5.0 %	Rectangular	√3	1	1	± 2.9 %	± 2.9 %	∞
Phantom and Set-up								
Phantom uncertainty	± 6.1 %	Rectangular	√3	1	1	± 3.5 %	± 3.5 %	∞
SAR correction	± 1.9 %	Rectangular	√3	1	0.84	± 1.1 %	± 0.9 %	∞
Liquid conductivity (meas.)	± 5.0 %	Rectangular	√3	0.78	0.71	± 2.3 %	± 2.0 %	∞
Liquid permittivity (meas.)	± 5.0 %	Rectangular	√3	0.26	0.26	± 0.8 %	± 0.8 %	∞
Temp. Unc. - Conductivity	± 3.4 %	Rectangular	√3	0.78	0.71	± 1.5 %	± 1.4 %	∞
Temp. Unc. - Permittivity	± 0.4 %	Rectangular	√3	0.23	0.26	± 0.1 %	± 0.1 %	∞
Combined Uncertainty						± 11.3 %	± 11.3 %	330
Expanded Std. Uncertainty						± **22.7** %	± **22.5** %	

Table 6: Measurement uncertainties
Worst-Case uncertainty budget for DASY5 assessed according to IEEE 1528/2013 and IEC 62209-1/2011 standards. The budget is valid for the frequency range 300MHz -3 GHz and represents a worst-case analysis. For specific tests and configurations, the uncertainty could be considerable smaller.

DASY5 Uncertainty Budget According to IEC 62209-2/2010 for the 300 MHz - 6 GHz range								
Source of uncertainty	Uncertainty Value	Probability Distribution	Divisor	c_i (1g)	c_i (10g)	Standard Uncertainty ± %, (1g)	Standard Uncertainty ± %, (10g)	v_i^2 or v_{eff}
Measurement System								
Probe calibration	± 6.6 %	Normal	1	1	1	± 6.6 %	± 6.6 %	∞
Axial isotropy	± 4.7 %	Rectangular	√3	0.7	0.7	± 1.9 %	± 1.9 %	∞
Hemispherical isotropy	± 9.6 %	Rectangular	√3	0.7	0.7	± 3.9 %	± 3.9 %	∞
Boundary effects	± 2.0 %	Rectangular	√3	1	1	± 1.2 %	± 1.2 %	∞
Probe linearity	± 4.7 %	Rectangular	√3	1	1	± 2.7 %	± 2.7 %	∞
System detection limits	± 1.0 %	Rectangular	√3	1	1	± 0.6 %	± 0.6 %	∞
Modulation Response	± 2.4 %	Rectangular	√3	1	1	± 1.4 %	± 1.4 %	∞
Readout electronics	± 0.3 %	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Response time	± 0.8 %	Rectangular	√3	1	1	± 0.5 %	± 0.5 %	∞
Integration time	± 2.6 %	Rectangular	√3	1	1	± 1.5 %	± 1.5 %	∞
RF ambient noise	± 3.0 %	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
RF ambient reflections	± 3.0 %	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
Probe positioner	± 0.8 %	Rectangular	√3	1	1	± 0.5 %	± 0.5 %	∞
Probe positioning	± 6.7 %	Rectangular	√3	1	1	± 3.9 %	± 3.9 %	∞
Post-processing	± 4.0 %	Rectangular	√3	1	1	± 2.3 %	± 2.3 %	∞
Test Sample Related								
Device positioning	± 2.9 %	Normal	1	1	1	± 2.9 %	± 2.9 %	145
Device holder uncertainty	± 3.6 %	Normal	1	1	1	± 3.6 %	± 3.6 %	5
Power drift	± 5.0 %	Rectangular	√3	1	1	± 2.9 %	± 2.9 %	∞
Phantom and Set-up								
Phantom uncertainty	± 7.9 %	Rectangular	√3	1	1	± 4.6 %	± 4.6 %	∞
SAR correction	± 1.9 %	Rectangular	√3	1	0.84	± 1.1 %	± 0.9 %	∞
Liquid conductivity (meas.)	± 5.0 %	Rectangular	√3	0.78	0.71	± 2.3 %	± 2.0 %	∞
Liquid permittivity (meas.)	± 5.0 %	Rectangular	√3	0.26	0.26	± 0.8 %	± 0.8 %	∞
Temp. Unc. - Conductivity	± 3.4 %	Rectangular	√3	0.78	0.71	± 1.5 %	± 1.4 %	∞
Temp. Unc. - Permittivity	± 0.4 %	Rectangular	√3	0.23	0.26	± 0.1 %	± 0.1 %	∞
Combined Uncertainty						± 12.7 %	± 12.6 %	330
Expanded Std. Uncertainty						± **25.4** %	± **25.3** %	

Table 7: Measurement uncertainties.
Worst-Case uncertainty budget for DASY5 assessed according to according to IEC 62209-2/2010 standard. The budget is valid for the frequency range 300MHz - 6 GHz and represents a worst-case analysis. For specific tests and configurations, the uncertainty could be considerable smaller.

Relative DASY5 Uncertainty Budget for SAR Tests								
According to IEEE 1528/2003 and IEC 62209-1 for the 3 - 6 GHz range								
Error Description	Uncertainty Value	Probability Distribution	Divisor	c_i (1g)	c_i (10g)	Standard Uncertainty ± %, (1g)	Standard Uncertainty ± %, (10g)	v_i^2 or v_{eff}
Measurement System								
Probe calibration	± 6.6 %	Normal	1	1	1	± 6.6 %	± 6.6 %	∞
Axial isotropy	± 4.7 %	Rectangular	√ 3	0.7	0.7	± 1.9 %	± 1.9 %	∞
Hemispherical isotropy	± 9.6 %	Rectangular	√ 3	0.7	0.7	± 3.9 %	± 3.9 %	∞
Boundary effects	± 2.0 %	Rectangular	√ 3	1	1	± 1.2 %	± 1.2 %	∞
Probe linearity	± 4.7 %	Rectangular	√ 3	1	1	± 2.7 %	± 2.7 %	∞
System detection limits	± 1.0 %	Rectangular	√ 3	1	1	± 0.6 %	± 0.6 %	∞
Readout electronics	± 0.3 %	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Response time	± 0.8 %	Rectangular	√ 3	1	1	± 0.5 %	± 0.5 %	∞
Integration time	± 2.6 %	Rectangular	√ 3	1	1	± 1.5 %	± 1.5 %	∞
RF ambient noise	± 3.0 %	Rectangular	√ 3	1	1	± 1.7 %	± 1.7 %	∞
RF ambient reflections	± 3.0 %	Rectangular	√ 3	1	1	± 1.7 %	± 1.7 %	∞
Probe positioner	± 0.8 %	Rectangular	√ 3	1	1	± 0.5 %	± 0.5 %	∞
Probe positioning	± 6.7 %	Rectangular	√ 3	1	1	± 3.9 %	± 3.9 %	∞
Max. SAR evaluation	± 4.0 %	Rectangular	√ 3	1	1	± 2.3 %	± 2.3 %	∞
Test Sample Related								
Device positioning	± 2.9 %	Normal	1	1	1	± 2.9 %	± 2.9 %	145
Device holder uncertainty	± 3.6 %	Normal	1	1	1	± 3.6 %	± 3.6 %	5
Power drift	± 5.0 %	Rectangular	√ 3	1	1	± 2.9 %	± 2.9 %	∞
Phantom and Set-up								
Phantom uncertainty	± 4.0 %	Rectangular	√ 3	1	1	± 2.3 %	± 2.3 %	∞
Liquid conductivity (target)	± 5.0 %	Rectangular	√ 3	0.64	0.43	± 1.8 %	± 1.2 %	∞
Liquid conductivity (meas.)	± 5.0 %	Rectangular	√ 3	0.64	0.43	± 1.8 %	± 1.2 %	∞
Liquid permittivity (target)	± 5.0 %	Rectangular	√ 3	0.6	0.49	± 1.7 %	± 1.4 %	∞
Liquid permittivity (meas.)	± 5.0 %	Rectangular	√ 3	0.6	0.49	± 1.7 %	± 1.4 %	∞
Combined Uncertainty						± 12.1 %	± 11.9 %	330
Expanded Std. Uncertainty						± **24.3** %	± **23.8** %	

Table 8: Measurement uncertainties
Worst-Case uncertainty budget for DASY5 valid for 3G communication signals and frequency range 3 - 6 GHz. Probe calibration error reflects uncertainty of the EX3D probe. For specific tests and configurations, the uncertainty could be considerable smaller.

Relative DASY5 Uncertainty Budget for SAR Tests								
According to IEEE 1528/2013 and IEC62209-1/2011 (3-6GHz range)								
Error Description	Uncertainty Value	Probability Distribution	Divisor	c_i (1g)	c_i (10g)	Standard Uncertainty ± %, (1g)	Standard Uncertainty ± %, (10g)	v_i^2 or v_{eff}
Measurement System								
Probe calibration	± 6.6 %	Normal	1	1	1	± 6.6 %	± 6.6 %	∞
Axial isotropy	± 4.7 %	Rectangular	√3	0.7	0.7	± 1.9 %	± 1.9 %	∞
Hemispherical isotropy	± 9.6 %	Rectangular	√3	0.7	0.7	± 3.9 %	± 3.9 %	∞
Boundary effects	± 2.0 %	Rectangular	√3	1	1	± 1.2 %	± 1.2 %	∞
Probe linearity	± 4.7 %	Rectangular	√3	1	1	± 2.7 %	± 2.7 %	∞
System detection limits	± 1.0 %	Rectangular	√3	1	1	± 0.6 %	± 0.6 %	∞
Modulation Response	± 2.4 %	Rectangular	√3	1	1	± 1.4 %	± 1.4 %	∞
Readout electronics	± 0.3 %	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Response time	± 0.8 %	Rectangular	√3	1	1	± 0.5 %	± 0.5 %	∞
Integration time	± 2.6 %	Rectangular	√3	1	1	± 1.5 %	± 1.5 %	∞
RF ambient noise	± 3.0 %	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
RF ambient reflections	± 3.0 %	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
Probe positioner	± 0.8 %	Rectangular	√3	1	1	± 0.5 %	± 0.5 %	∞
Probe positioning	± 6.7 %	Rectangular	√3	1	1	± 3.9 %	± 3.9 %	∞
Max. SAR evaluation	± 4.0 %	Rectangular	√3	1	1	± 2.3 %	± 2.3 %	∞
Test Sample Related								
Device positioning	± 2.9 %	Normal	1	1	1	± 2.9 %	± 2.9 %	145
Device holder uncertainty	± 3.6 %	Normal	1	1	1	± 3.6 %	± 3.6 %	5
Power drift	± 5.0 %	Rectangular	√3	1	1	± 2.9 %	± 2.9 %	∞
Phantom and Set-up								
Phantom uncertainty	± 6.6 %	Rectangular	√3	1	1	± 3.8 %	± 3.8 %	∞
SAR correction	± 1.9 %	Rectangular	√3	1	0.84	± 1.1 %	± 0.9 %	∞
Liquid conductivity (meas.)	± 5.0 %	Rectangular	√3	0.78	0.71	± 2.3 %	± 2.0 %	∞
Liquid permittivity (meas.)	± 5.0 %	Rectangular	√3	0.26	0.26	± 0.8 %	± 0.8 %	∞
Temp. Unc. - Conductivity	± 3.4 %	Rectangular	√3	0.78	0.71	± 1.5 %	± 1.4 %	∞
Temp. Unc. - Permittivity	± 0.4 %	Rectangular	√3	0.23	0.26	± 0.1 %	± 0.1 %	∞
Combined Uncertainty						± 12.4 %	± 12.4 %	330
Expanded Std. Uncertainty						± **24.9** %	± **24.8** %	

Table 9: Measurement uncertainties
Worst-Case uncertainty budget for DASY5 assessed according to IEEE 1528/2013
and IEC 62209-1/2011 standards. The budget is valid for the frequency range 3GHz -6GHz and represents a worst-case analysis. For specific tests and configurations, the uncertainty could be considerable smaller.

6.1.12 Measurement uncertainty evaluation for System Check

Uncertainty of a System Performance Check with DASY5 System for the 0.3 - 3 GHz range								
Source of uncertainty	Uncertainty Value	Probability Distribution	Divisor	c_i (1g)	c_i (10g)	Standard Uncertainty ± %, (1g)	Standard Uncertainty ± %, (10g)	v_i^2 or v_{eff}
Measurement System								
Probe calibration	± 6.0 %	Normal	1	1	1	± 6.0 %	± 6.0 %	∞
Axial isotropy	± 4.7 %	Rectangular	√ 3	0.7	0.7	± 1.9 %	± 1.9 %	∞
Hemispherical isotropy	± 0.0 %	Rectangular	√ 3	0.7	0.7	± 0.0 %	± 0.0 %	∞
Boundary effects	± 1.0 %	Rectangular	√ 3	1	1	± 0.6 %	± 0.6 %	∞
Probe linearity	± 4.7 %	Rectangular	√ 3	1	1	± 2.7 %	± 2.7 %	∞
System detection limits	± 1.0 %	Rectangular	√ 3	1	1	± 0.6 %	± 0.6 %	∞
Readout electronics	± 0.3 %	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Response time	± 0.0 %	Rectangular	√ 3	1	1	± 0.0 %	± 0.0 %	∞
Integration time	± 0.0 %	Rectangular	√ 3	1	1	± 0.0 %	± 0.0 %	∞
RF ambient conditions	± 3.0 %	Rectangular	√ 3	1	1	± 1.7 %	± 1.7 %	∞
Probe positioner	± 0.4 %	Rectangular	√ 3	1	1	± 0.2 %	± 0.2 %	∞
Probe positioning	± 2.9 %	Rectangular	√ 3	1	1	± 1.7 %	± 1.7 %	∞
Max. SAR evaluation	± 1.0 %	Rectangular	√ 3	1	1	± 0.6 %	± 0.6 %	∞
Test Sample Related								
Dev. of experimental dipole	± 0.0 %	Rectangular	√ 3	1	1	± 0.0 %	± 0.0 %	∞
Source to liquid distance	± 2.0 %	Rectangular	√ 3	1	1	± 1.2 %	± 1.2 %	∞
Power drift	± 3.4 %	Rectangular	√ 3	1	1	± 2.0 %	± 2.0 %	∞
Phantom and Set-up								
Phantom uncertainty	± 4.0 %	Rectangular	√ 3	1	1	± 2.3 %	± 2.3 %	∞
SAR correction	± 1.9 %	Rectangular	√ 3	1	0.84	± 1.1 %	± 0.9 %	∞
Liquid conductivity (meas.)	± 5.0 %	Normal	1	0.78	0.71	± 3.9 %	± 3.6 %	∞
Liquid permittivity (meas.)	± 5.0 %	Normal	1	0.26	0.26	± 1.3 %	± 1.3 %	∞
Temp. unc. - Conductivity	± 1.7 %	Rectangular	√ 3	0.78	0.71	± 0.8 %	± 0.7 %	∞
Temp. unc. - Permittivity	± 0.3 %	Rectangular	√ 3	0.23	0.26	± 0.0 %	± 0.0 %	∞
Combined Uncertainty						± 9.1 %	± 8.9 %	330
Expanded Std. Uncertainty						± **18.2** %	± **17.9** %	

Table 10: Measurement uncertainties of the System Check with DASY5 (0.3-3GHz)

Uncertainty of a System Performance Check with DASY5 System for the 3 - 6 GHz range								
Source of uncertainty	Uncertainty Value	Probability Distribution	Divisor	c_i (1g)	c_i (10g)	Standard Uncertainty ± %, (1g)	Standard Uncertainty ± %, (10g)	v_i^2 or v_{eff}
Measurement System								
Probe calibration	± 6.6 %	Normal	1	1	1	± 6.6 %	± 6.6 %	∞
Axial isotropy	± 4.7 %	Rectangular	√3	0.7	0.7	± 1.9 %	± 1.9 %	∞
Hemispherical isotropy	± 0.0 %	Rectangular	√3	0.7	0.7	± 0.0 %	± 0.0 %	∞
Boundary effects	± 1.0 %	Rectangular	√3	1	1	± 0.6 %	± 0.6 %	∞
Probe linearity	± 4.7 %	Rectangular	√3	1	1	± 2.7 %	± 2.7 %	∞
System detection limits	± 1.0 %	Rectangular	√3	1	1	± 0.6 %	± 0.6 %	∞
Readout electronics	± 0.3 %	Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Response time	± 0.0 %	Rectangular	√3	1	1	± 0.0 %	± 0.0 %	∞
Integration time	± 0.0 %	Rectangular	√3	1	1	± 0.0 %	± 0.0 %	∞
RF ambient conditions	± 3.0 %	Rectangular	√3	1	1	± 1.7 %	± 1.7 %	∞
Probe positioner	± 0.8 %	Rectangular	√3	1	1	± 0.5 %	± 0.5 %	∞
Probe positioning	± 6.7 %	Rectangular	√3	1	1	± 3.9 %	± 3.9 %	∞
Max. SAR evaluation	± 1.0 %	Rectangular	√3	1	1	± 0.6 %	± 0.6 %	∞
Test Sample Related								
Dev. of experimental dipole	± 0.0 %	Rectangular	√3	1	1	± 0.0 %	± 0.0 %	∞
Source to liquid distance	± 2.0 %	Rectangular	√3	1	1	± 1.2 %	± 1.2 %	∞
Power drift	± 3.4 %	Rectangular	√3	1	1	± 2.0 %	± 2.0 %	∞
Phantom and Set-up								
Phantom uncertainty	± 4.0 %	Rectangular	√3	1	1	± 2.3 %	± 2.3 %	∞
SAR correction	± 1.9 %	Rectangular	√3	1	0.84	± 1.1 %	± 0.9 %	∞
Liquid conductivity (meas.)	± 5.0 %	Normal	1	0.78	0.71	± 3.9 %	± 3.6 %	∞
Liquid permittivity (meas.)	± 5.0 %	Normal	1	0.26	0.26	± 1.3 %	± 1.3 %	∞
Temp. unc. - Conductivity	± 1.7 %	Rectangular	√3	0.78	0.71	± 0.8 %	± 0.7 %	∞
Temp. unc. - Permittivity	± 0.3 %	Rectangular	√3	0.23	0.26	± 0.0 %	± 0.0 %	∞
Combined Uncertainty						± 10.1 %	± 10.0 %	330
Expanded Std. Uncertainty						± **20.2** %	± **19.9** %	

Table 11: Measurement uncertainties of the System Check with DASY5 (3-6GHz)

Note: Worst case probe calibration uncertainty has been applied for all probes used during the measurements.

6.1.13 System check

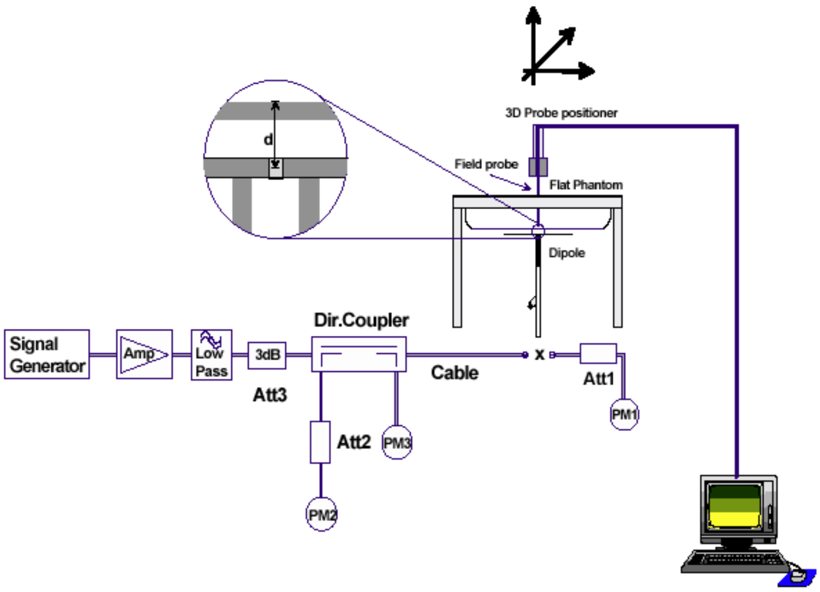
The system check is performed for verifying the accuracy of the complete measurement system and performance of the software. The system check is performed with tissue equivalent material according to IEEE 1528. The following table shows system check results for all frequency bands and tissue liquids used during the tests (plot(s) see annex A).

System performence check (1000 mW)										
System validation Kit	Probe	Frequency	Target SAR_{1g} /mW/g (+/-10%)	Target SAR_{10g} /mW/g (+/-10%)	Measured SAR_{1g} / mW/g	SAR_{1g} dev.	Measured SAR_{10g} / mW/g	SAR_{10g} dev.	Measured date
D750V3 S/N: 1041	EX3DV4 S/N: 3944	750 MHz MSL	8.75	5.74	8.21	-6.2%	5.44	-5.2%	2019-03-11
D750V3 S/N: 1041	EX3DV4 S/N: 3944	750 MHz MSL	8.75	5.74	8.40	-4.0%	5.55	-3.3%	2019-03-12
D835V2 S/N: 4d153	EX3DV4 S/N: 3944	835 MHz MSL	9.53	6.28	10.30	8.1%	6.76	7.6%	2019-03-07
D835V2 S/N: 4d153	EX3DV4 S/N: 3944	835 MHz MSL	9.53	6.28	10.30	8.1%	6.76	7.6%	2019-03-08
D1750V2 S/N: 1093	EX3DV4 S/N: 3944	1750 MHz MSL	36.50	19.40	37.30	2.2%	19.80	2.1%	2019-03-13
D1750V2 S/N: 1093	EX3DV4 S/N: 3944	1750 MHz MSL	36.50	19.40	37.30	2.2%	19.80	2.1%	2019-03-15
D1900V2 S/N: 5d009	EX3DV4 S/N: 3944	1900 MHz MSL	40.70	21.50	38.40	-5.7%	19.90	-7.4%	2019-03-13
D1900V2 S/N: 5d009	EX3DV4 S/N: 3944	1900 MHz MSL	40.70	21.50	40.50	-0.5%	20.90	-2.8%	2019-03-14
D1900V2 S/N: 5d009	EX3DV4 S/N: 3944	1900 MHz MSL	40.70	21.50	39.70	-2.5%	20.50	-4.7%	2019-03-15
D1900V2 S/N: 5d009	ES3DV3 S/N: 3326	1900 MHz MSL	40.70	21.50	40.30	-1.0%	21.00	-2.3%	2019-04-03
D2600V2 S/N: 1040	EX3DV4 S/N: 3944	2600 MHz MSL	55.60	24.80	53.80	-3.2%	24.00	-3.2%	2019-03-18

Table 12: Results system check

6.1.14 System check procedure

The system check is performed by using a validation dipole which is positioned parallel to the planar part of the SAM phantom at the reference point. The distance of the dipole to the SAM phantom is determined by a plexiglass spacer. The dipole is connected to the signal source consisting of signal generator and amplifier via a directional coupler, N-connector cable and adaption to SMA. It is fed with a power of 1000 mW for frequencies below 2 GHz or 100 mW for frequencies above 2 GHz. To adjust this power a power meter is used. The power sensor is connected to the cable before the system check to measure the power at this point and do adjustments at the signal generator. At the outputs of the directional coupler both return loss as well as forward power are controlled during the validation to make sure that emitted power at the dipole is kept constant. This can also be checked by the power drift measurement after the test (result on plot).
System check results have to be equal or near the values determined during dipole calibration (target SAR in table above) with the relevant liquids and test system.



6.1.15 System validation

The system validation is performed in a similar way as a system check. It needs to be performed once a SAR measurement system has been established and allows an evaluation of the system accuracy with all components used together with the specified system. It has to be repeated at least once a year or when new system components are used (DAE, probe, phantom, dipole, liquid type).
In addition to the procedure used during system check a system validation also includes checks of probe isotropy, probe modulation factor and RF signal.

The following table lists the system validations relevant for this test report:

Frequency (MHz)	DASY SW	Dipole Type /SN	Probe Type / SN	Calibrated signal type(s)	DAE unit Type / SN	body validation
750	V52.8.7	D750V2 / 1041	EX3DV4 / 3944	CW	DAE3/ 477	2018-06-20
835	V52.8.7	D835V2 / 4d153	EX3DV4 / 3944	CW	DAE3/ 477	2018-06-21
1750	V52.8.7	D1750V2 / 1093	EX3DV4 / 3944	CW	DAE3/ 477	2018-06-19
1900	V52.8.7	D1900V2 / 5d009	EX3DV4 / 3944	CW	DAE3/ 477	2018-06-19
2600	V52.8.7	D2600V2 / 1040	EX3DV4 / 3944	CW	DAE3/ 477	2018-06-25
1900	V52.8.7	D1900V2 / 5d009	ES3DV3 / 3326	CW	DAE4/ 1387	2019-03-26

7 Detailed Test Results

7.1 Conducted power measurements

For the measurements the Rohde & Schwarz Radio Communication Tester CMU 200 and CMW500 were used.
The output power was measured using an integrated RF connector and attached RF cable.
The conducted output power was also checked before and after each SAR measurement. The resulting power values were within a 0.2 dB tolerance of the values shown below.

Note: CMU200 measures GSM peak and average output power for active timeslots.
For SAR the time based average power is relevant. The difference in-between depends on the duty cycle of the TDMA signal:

No. of timeslots	***1***	***2***	***3***	***4***
Duty Cycle	1 : 8	1: 4	1 : 2.66	1 : 2
time based avg. power compared to slotted avg. power	- 9.03 dB	- 6.02 dB	- 4.26 dB	- 3.01 dB

The signalling modes differ as follows:

mode	***coding scheme***	***modulation***
GPRS	CS1 to CS4	GMSK
EGPRS (EDGE)	MCS1 to MCS4	GMSK
EGPRS (EDGE)	MCS5 to MCS9	8PSK

Apart from modulation change (GMSK/8PSK) coding schemes differ in code rate without influence on the RF signal. Therefore one coding scheme per mode was selected for conducted power measurements.

7.1.1 Conducted power measurements GSM 850 MHz

Conducted output power GSM 850 MHz (dBm)								
SN:			**Slotted avg. power**			**Time based avg. power**		
TS	mod.	upper limit	CH 128 824.2 MHz	CH 190 836.6 MHz	CH 251 848.8 MHz	CH 128 824.2 MHz	CH 190 836.6 MHz	CH 251 848.8 MHz
1	GMSK	**33.0**	32.3	32.3	32.3	23.27	23.27	23.27
2	GMSK	**33.0**	32.1	32.1	32.1	26.08	26.08	26.08
3	GMSK	**31.0**	30.3	30.3	30.4	26.04	26.04	26.14
4	**GMSK**	**29.5**	**29.1**	**29.1**	**29.2**	**26.09**	**26.09**	**26.19**
1	8PSK	**28.0**	26.5	26.5	26.5	17.47	17.47	17.47
2	8PSK	**28.0**	26.3	26.4	26.5	20.28	20.38	20.48
3	8PSK	**28.0**	26.2	26.2	26.3	21.94	21.94	22.04
4	8PSK	**27.0**	26.0	26.0	26.1	22.99	22.99	23.09

Table 13: Test results conducted power measurement GSM 850 MHz

7.1.2 Conducted power measurements GSM 1900 MHz

Conducted output power GSM 1900 MHz (dBm)								
SN:			**Slotted avg. power**			**Time based avg. power**		
TS	mod.	upper limit	CH 512 1850.2 MHz	CH 661 1880.0 MHz	CH 810 1909.8 MHz	CH 512 1850.2 MHz	CH 661 1880.0 MHz	CH 810 1909.8 MHz
1	GMSK	**30.0**	28.8	28.5	28.6	19.77	19.47	19.57
2	GMSK	**30.0**	28.2	27.9	28.0	22.18	21.88	21.98
3	GMSK	**29.0**	28.0	27.6	27.7	23.74	23.34	23.44
4	**GMSK**	**28.0**	**27.8**	**27.4**	**27.6**	**24.79**	**24.39**	**24.59**
1	8PSK	**27.0**	26.5	26.3	26.3	17.47	17.27	17.27
2	8PSK	**27.0**	25.8	25.5	25.4	19.78	19.48	19.38
3	8PSK	**27.0**	25.6	25.3	25.2	21.34	21.04	20.94
4	8PSK	**26.0**	25.4	25.0	25.0	22.39	21.99	21.99

Table 14: Test results conducted power measurement GSM 1900 MHz

7.1.3 Conducted power measurements WCDMA FDD V (850 MHz)

Max. RMS output power 850 MHz (FDD V) / dBm			
	Channel / frequency		
mode	4132 / 826.4 MHz	4182 / 836.6 MHz	4233 / 846.6 MHz
RMC 12.2 kbit/s	**23.6**	**23.5**	**23.6**
RMC 64 kbit/s	23.4	23.4	23.5
RMC 144 kbit/s	23.4	23.3	23.4
RMC 384 kbit/s	23.4	23.4	23.5
AMR 4.75 kbit/s	23.5	23.4	23.5
AMR 5.15 kbit/s	23.5	23.4	23.4
AMR 5.9 kbit/s	23.4	23.3	23.5
AMR 6.7 kbit/s	23.4	23.4	23.5
AMR 7.4 kbit/s	23.5	23.4	23.4
AMR 7.95 kbit/s	23.5	23.4	23.6
AMR 10.2 kbit/s	23.5	23.3	23.6
AMR 12.2 kbit/s	23.4	23.3	23.5
HSDPA Sub test 1	**23.6**	**23.3**	**23.5**
HSDPA Sub test 2	22.3	22.2	22.5
HSDPA Sub test 3	21.9	21.9	21.9
HSDPA Sub test 4	21.9	21.9	21.9
HSUPA Sub test 1	23.5	23.3	23.4
HSUPA Sub test 2	21.4	21.2	21.3
HSUPA Sub test 3	22.4	22.2	22.3
HSUPA Sub test 4	21.4	21.4	21.4
HSUPA Sub test 5	**23.5**	**23.3**	**23.5**

Table 15: Test results conducted power measurement UMTS FDD V 850MHz

7.1.4 Conducted power measurements WCDMA FDD IV (1700 MHz)

Max. RMS output power FDD IV (1700MHz) / dBm			
	Channel / frequency		
mode	1312 / 1712.4 MHz	1412 / 1732.4 MHz	1513 / 1752.6 MHz
RMC 12.2 kbit/s	**23.2**	**23.3**	**23.3**
RMC 64 kbit/s	23.1	23.0	23.1
RMC 144 kbit/s	23.1	23.2	23.2
RMC 384 kbit/s	23.0	23.2	23.2
AMR 4.75 kbit/s	23.1	23.1	23.2
AMR 5.15 kbit/s	23.0	23.2	23.2
AMR 5.9 kbit/s	23.0	23.2	23.2
AMR 6.7 kbit/s	23.1	23.2	23.2
AMR 7.4 kbit/s	23.0	23.1	23.1
AMR 7.95 kbit/s	23.0	23.2	23.3
AMR 10.2 kbit/s	23.1	23.2	23.3
AMR 12.2 kbit/s	23.0	23.1	23.1
HSDPA Sub test 1	**23.1**	**23.1**	**23.1**
HSDPA Sub test 2	21.9	22.2	22.2
HSDPA Sub test 3	21.5	21.6	21.6
HSDPA Sub test 4	21.5	21.5	21.6
HSUPA Sub test 1	23.0	23.2	23.1
HSUPA Sub test 2	20.9	21.0	21.1
HSUPA Sub test 3	21.9	22.1	22.1
HSUPA Sub test 4	20.9	21.1	21.1
HSUPA Sub test 5	**23.0**	**23.2**	**23.1**

Table 16: Test results conducted power measurement UMTS FDD IV 1700MHz

7.1.5 Conducted power measurements WCDMA FDD II (1900 MHz)

Max. RMS output power FDD II (1900MHz) / dBm			
	Channel / frequency		
mode	9262 / 1852.4 MHz	9400 / 1880.0 MHz	9538 / 1907.6 MHz
RMC 12.2 kbit/s	**22.9**	**23.0**	**23.2**
RMC 64 kbit/s	22.8	23.0	23.1
RMC 144 kbit/s	22.8	22.8	23.0
RMC 384 kbit/s	22.7	22.9	23.0
AMR 4.75 kbit/s	22.9	22.8	23.1
AMR 5.15 kbit/s	22.8	22.8	23.1
AMR 5.9 kbit/s	22.8	22.8	23.1
AMR 6.7 kbit/s	22.7	23.0	23.0
AMR 7.4 kbit/s	22.7	22.8	23.0
AMR 7.95 kbit/s	22.7	22.8	23.1
AMR 10.2 kbit/s	22.7	22.8	23.1
AMR 12.2 kbit/s	22.7	23.0	23.1
HSDPA Sub test 1	**22.8**	**22.8**	**23.1**
HSDPA Sub test 2	21.7	21.8	21.9
HSDPA Sub test 3	21.2	21.3	21.5
HSDPA Sub test 4	21.2	21.3	21.6
HSUPA Sub test 1	22.8	22.9	23.0
HSUPA Sub test 2	20.8	20.8	21.0
HSUPA Sub test 3	21.7	21.8	22.1
HSUPA Sub test 4	20.6	20.7	21.1
HSUPA Sub test 5	**22.7**	**22.8**	**23.2**

Table 17: Test results conducted power measurement UMTS FDD II 1900MHz

Remark: None of the HSDPA/HSUPA settings leads to conducted power values exceeding the conducted power in RMC mode by more than 0.25 dB.
Therefore no additional SAR measurements were performed in HSDPA/HSUPA mode.

7.1.6 Test-set-up information for WCDMA / HSPDA / HSUPA

a) WCDMA RMC

In RMC (reference measurement channel) mode the conducted power at 4 different bit rates was measured. They correspond with the used spreading factors as follows:

Bit rate	***12.2 kbit/s***	***64 kbit/s***	***144 kbit/s***	***384 kbit/s***
Spreading factor (SF)	64	16	8	4

In RMC mode only DPCCH and DPDCH are active. As bit rate changes do not influence the relative power of any code channel the measured RMS output power remains on the same level which is set to maximum by TPC (Transmit power control) pattern type 'All 1'.

b) HSDPA

HSDPA adds the HS-DPCCH in uplink as a control channel for high speed data transfer in downlink.
In HSDPA mode 4 sub-tests are defined by 3GPP 34.121 according to the following table:

Sub-test	β_c	β_d	β_d **(SF)**	β_c/β_d	$\beta_{hs}^{(1)}$	**CM(dB)**$^{(2)}$
1	2/15	15/15	64	2/15	4/15	0.0
2	12/15$^{(3)}$	15/15$^{(3)}$	64	12/15$^{(3)}$	24/15	1.0
3	15/15	8/15	64	15/8	30/15	1.5
4	15/15	4/15	64	15/4	30/15	1.5

Note 1: Δ_{ACK}, Δ_{NACK}, $\Delta_{CQI} = 8 \Longleftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Longleftrightarrow \beta_{hs} = 30/15 * \beta_c$
Note 2 : CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$
Note 3 : For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1,TF1) to $\beta_c = 11/15$ and $\beta_d = 15/15$

Table 18: Sub-tests for UMTS Release 5 HSDPA

The β_c and β_d gain factors for DPCCH and DPDCH were set according to the values in the above table, β_{hs} for HS-DPCCH is set automatically to the correct value when Δ_{ACK}, Δ_{NACK}, $\Delta_{CQI} = 8$. The variation of the β_c/β_d ratio causes a power reduction at sub-tests 2 - 4.
The measurements were performed with a Fixed Reference Channel (FRC) and H-Set 1 QPSK.

Parameter	***Value***
Nominal average inf. bit rate	534 kbit/s
Inter-TTI Distance	3 TTI's
Number of HARQ Processes	2 Processes
Information Bit Payload	3202 Bits
MAC-d PDU size	336 Bits
Number Code Blocks	1 Block
Binary Channel Bits Per TTI	4800 Bits
Total Available SMLs in UE	19200 SMLs
Number of SMLs per HARQ Process	9600 SMLs
Coding Rate	0.67
Number of Physical Channel Codes	5

Table 19: settings of required H-Set 1 QPSK acc. to 3GPP 34.121

c) HSUPA

In HSUPA mode additional code channels (E-DPCCH, E-DPDCHn) are added for data transfer in uplink at higher bit rates.

5 sub-tests are defined by 3GPP 34.121 according to the following table:

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs} (1)	β_{ec}	β_{ed}	β_{ec} (SF)	β_{ed} (code)	CM(2) (dB)	MPR (dB)	AG(4) Index	E-TFCI
1	11/15(3)	15/15(3)	64	11/15(3)	22/15	209/225	1039/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed1}:47/15 β_{ed2}:47/15	4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15(4)	15/15(4)	64	15/15(4)	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: Δ_{ACK}, Δ_{NACK}, Δ_{CQI} = 8 $\Longleftrightarrow$ A_{hs} = β_{hs}/β_c = 30/15 $\Longleftrightarrow$ β_{hs} = 30/15 * β_c

Note 2 : CM = 1 for β_c/β_d = 12/15, β_{hs}/β_c = 24/15. For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference

Note 3 : For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1,TF1) to β_c = 10/15 and β_d = 15/15

Note 4 : For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1,TF1) to β_c = 14/15 and β_d = 15/15

Note 5 : Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Table 5.1g

Note 6 : β_{ed} can not be set directly; it is set by Absolute Grant Value

Table 20: Subtests for UMTS Release 6 HSUPA

To achieve the settings above some additional procedures were defined by 3GPP 34.121. Those have been included in an application note for the CMU200 and were exactly followed:

- Test mode connection (BS signal tab):
RMC 12.2 kbit/s + HSPA 34.108 with loop mode 1
- HS-DSCH settings (BS signal tab):
- FRC with H-set 1 QPSK
- ACK-NACK repetition factor = 3
- CQI feedback cycle = 4ms
- CQI repetition factor = 2
- HSUPA-specific signalling settings (UE signal tab):
- E-TFCI table index = 0
- E-DCH minimum set E-TFCI = 9
- Puncturing limit non-max = 0.84
- max. number of channelisation codes = 2x SF4
- Initial Serving Grant Value = Off
- HSDPA and HSUPA Gain factors (UE signal tab)

Sub-test	β_c	β_d	Δ_{ACK}, Δ_{NACK}, Δ_{CQI}	ΔE–DPCCH)*
1	10	15	8	6
2	6	15	8	8
3	15	9	8	8
4	2	15	8	5
5	14	15	8	7

)* : β_{ec} and β_{ed} ratios (relative to β_c and β_d) are set by ΔE–DPCCH

- HSUPA Reference E-TFCIs (UE signal tab > HSUPA gain factors):

Sub-test	**1, 2, 4, 5**				
Number of E-TFCIs	5				
Reference E-TFCI	11	67	71	75	81
Reference E-TFCI power offset	4	18	23	26	27

Sub-test	**3**	
Number of E-TFCIs	2	
Reference E-TFCI	11	92
Reference E-TFCI power offset	4	18

- HSUPA-specific generator parameters (BS Signal tab > HSUPA > E-AGCH > AG Pattern)

Sub-test	***Absolute Grant Value (AG Index)***
1	20
2	12
3	15
4	17
5	21

- Power Level settings (BS Signal tab > Node B-settings):
- Level reference: Output Channel Power (lor)
- Output Channel Power (lor): -86 dBm

- Downlink Physical Channel Settings (BS signal tab)
- P-CPICH: -10 dB
- S-CPICH: Off
- P-SCH: -15 dB
- S-SCH : -15 dB
- P-CCPCH: -12 dB
- S-CCPCH: -12 dB
- PICH : -15 dB
- AICH : -12 dB
- DPDCH : -10 dB
- HS-SCCH : -8 dB
- HS-PDSCH : -3 dB
- E-AGCH : -20 dB
- E-RGCH/E-HICH - 20 dB
- E-RGCH Active: Off

The settings above were stored once for each sub-test and recalled before the measurement.

HSUPA test procedure:

To reach maximum output power in HSUPA mode the following procedures were followed:

3 different TPC patterns were defined:
Set 1 : Closed loop with target power 10 dBm
Set 2 : Single Pattern+Alternating with binary pattern '11111' for 1 dB steps 'up'
Set 3 : Single Pattern+Alternating with binary pattern '00000' for 1 dB steps 'down'

After recalling a certain HSUPA sub-test the HSUPA E-AGCH graph with E-TFCI event counter is displayed. After starting with the closed loop command the power is increased in 1 dB steps by activating pattern set 2 until the UE decreases the transmitted E-TFCI.
At this point set 3 is activated once to reduce the output power to the value at which the original E-TFCI, which is required for the sub-test, appears again.

For conducted power measurements the same steps are repeated in the power menu to read out the corresponding maximum RMS output power with the target E-TFCI.
For SAR measurements it is useful to switch to Code Domain Power vs. Time display.
Here the CMU200 shows relative power values (max. and min.) of each code channel which should roughly correspond to the numerators of the gain factors e.g.:

Sub-test	β_c	β_d	β_{hs}	β_{ec}	β_{ed}
5	15	15	30	24	134

By this way a surveillance of signalling conditions is possible to make sure that HSUPA code channels are active during the complete SAR measurement.

7.1.7 Conducted power measurements LTE FDD 2 1900 MHz

Bandwidth (MHz)	Channel / Frequency (MHz)	Resource block allocation	P_{avg} (dBm)	
			QPSK	16-QAM
1.4	18607 / 1850.7	1 RB low	22.6	21.9
		1 RB mid	22.8	22.3
		1 RB high	22.6	22.4
		50% RB low	22.7	21.6
		50% RB mid	22.7	21.6
		50% RB high	22.6	21.8
		100% RB	21.7	20.7
	18900 / 1880.0	1 RB low	22.6	21.7
		1 RB mid	22.7	21.8
		1 RB high	22.7	21.8
		50% RB low	22.4	21.3
		50% RB mid	22.4	21.5
		50% RB high	22.4	21.4
		100% RB	21.6	20.8
	19193 / 1909.3	1 RB low	22.6	22.3
		1 RB mid	22.6	22.2
		1 RB high	22.6	22.3
		50% RB low	22.5	21.7
		50% RB mid	22.6	21.7
		50% RB high	22.5	21.8
		100% RB	21.4	20.5
3.0	18615 / 1851.5	1 RB low	22.7	22.0
		1 RB mid	22.8	22.0
		1 RB high	22.8	22.1
		50% RB low	21.7	20.4
		50% RB mid	21.7	20.7
		50% RB high	21.7	20.7
		100% RB	21.7	20.8
	18900 / 1880.0	1 RB low	22.5	21.8
		1 RB mid	22.7	21.9
		1 RB high	22.8	21.9
		50% RB low	21.6	20.6
		50% RB mid	21.6	20.8
		50% RB high	21.6	20.7
		100% RB	21.5	20.4
	19185 / 1908.5	1 RB low	22.8	21.6
		1 RB mid	22.7	21.6
		1 RB high	22.8	21.4
		50% RB low	21.5	20.6
		50% RB mid	21.5	20.5
		50% RB high	21.4	20.5
		100% RB	21.6	20.6

Bandwidth (MHz)	Channel / Frequency (MHz)	Resource block allocation	P_{avg} (dBm)	
			QPSK	16-QAM
5.0	18625 / 1852.5	1 RB low	22.6	22.2
		1 RB mid	22.8	22.3
		1 RB high	22.8	21.6
		50% RB low	21.7	20.8
		50% RB mid	21.7	20.8
		50% RB high	21.7	20.9
		100% RB	21.8	20.8
	18900 / 1880.0	1 RB low	22.6	21.9
		1 RB mid	22.5	21.9
		1 RB high	23.0	22.3
		50% RB low	21.7	20.8
		50% RB mid	21.6	20.6
		50% RB high	21.8	20.8
		100% RB	21.6	20.6
	19175 / 1907.5	1 RB low	22.9	21.4
		1 RB mid	22.5	21.7
		1 RB high	22.7	21.6
		50% RB low	21.5	20.5
		50% RB mid	21.5	20.5
		50% RB high	21.5	20.5
		100% RB	21.5	20.6
10.0	18650 / 1855	1 RB low	22.8	22.2
		1 RB mid	22.6	22.1
		1 RB high	22.5	21.8
		50% RB low	21.8	20.8
		50% RB mid	21.6	20.8
		50% RB high	21.7	20.8
		100% RB	21.7	20.8
	18900 / 1880	1 RB low	22.7	21.8
		1 RB mid	22.8	21.8
		1 RB high	22.8	21.9
		50% RB low	21.5	20.7
		50% RB mid	21.5	20.7
		50% RB high	21.7	20.9
		100% RB	21.6	20.7
	19150 / 1905	1 RB low	22.7	22.0
		1 RB mid	23.2	22.3
		1 RB high	22.9	21.6
		50% RB low	21.6	20.5
		50% RB mid	21.7	20.6
		50% RB high	21.5	20.5
		100% RB	21.5	20.5

Bandwidth (MHz)	Channel / Frequency (MHz)	Resource block allocation	P_{avg} (dBm)	
			QPSK	16-QAM
15.0	18675 / 1857.5	1 RB low	22.9	22.2
		1 RB mid	22.6	22
		1 RB high	22.6	21.9
		50% RB low	21.8	20.7
		50% RB mid	21.7	20.7
		50% RB high	21.6	20.7
		100% RB	21.7	20.7
	18900 / 1880.0	1 RB low	22.7	22.0
		1 RB mid	22.7	22.1
		1 RB high	22.7	22
		50% RB low	21.5	20.5
		50% RB mid	21.6	20.5
		50% RB high	21.7	20.7
		100% RB	21.6	20.6
	19125 / 1902.5	1 RB low	22.9	22.0
		1 RB mid	22.6	21.7
		1 RB high	22.7	22.2
		50% RB low	21.5	20.6
		50% RB mid	21.6	20.5
		50% RB high	21.6	20.5
		100% RB	21.5	20.5
20.0	18700 / 1860	1 RB low	**22.9**	22.4
		1 RB mid	22.5	21.9
		1 RB high	22.8	21.9
		50% RB low	21.8	20.8
		50% RB mid	21.6	20.7
		50% RB high	21.6	20.7
		100% RB	21.7	20.7
	18900 / 1880	1 RB low	22.6	21.7
		1 RB mid	22.7	21.8
		1 RB high	**22.8**	22.2
		50% RB low	21.6	20.5
		50% RB mid	21.6	20.7
		50% RB high	21.7	20.7
		100% RB	21.7	20.8
	19100 / 1900	1 RB low	**22.9**	22.0
		1 RB mid	22.5	21.7
		1 RB high	22.9	21.8
		50% RB low	21.6	20.7
		50% RB mid	21.5	20.6
		50% RB high	21.6	20.5
		100% RB	21.5	20.6

Table 21: Test results conducted power measurement LTE FDD 2 1900 MHz.

7.1.8 Conducted power measurements LTE FDD 4 1700 MHz

Bandwidth (MHz)	Channel / Frequency (MHz)	Resource block allocation	P_{avg} (dBm)	
			QPSK	16-QAM
1.4	19957 / 1710.7	1 RB low	22.3	22.2
		1 RB mid	22.5	21.9
		1 RB high	22.3	21.5
		50% RB low	22.3	21.5
		50% RB mid	22.4	21.6
		50% RB high	22.3	21.5
		100% RB	21.4	20.5
	20175 / 1732.5	1 RB low	22.3	21.5
		1 RB mid	22.4	21.5
		1 RB high	22.1	21.4
		50% RB low	22.3	21.2
		50% RB mid	22.4	21.5
		50% RB high	22.2	21.4
		100% RB	21.3	20.4
	20393 / 1754.3	1 RB low	22.5	21.6
		1 RB mid	22.7	21.7
		1 RB high	22.5	21.5
		50% RB low	22.5	21.4
		50% RB mid	22.4	21.7
		50% RB high	22.4	21.5
		100% RB	21.5	20.7
3	19965 / 1711.5	1 RB low	22.5	21.6
		1 RB mid	22.4	22.4
		1 RB high	22.5	22.2
		50% RB low	21.2	20.2
		50% RB mid	21.4	19.9
		50% RB high	21.3	20.0
		100% RB	21.4	20.5
	20175 / 1732.5	1 RB low	22.6	21.7
		1 RB mid	22.3	21.7
		1 RB high	22.4	21.6
		50% RB low	21.5	20.7
		50% RB mid	21.4	20.6
		50% RB high	21.3	20.3
		100% RB	21.4	20.4
	20385 / 1753.5	1 RB low	22.7	21.7
		1 RB mid	22.7	21.9
		1 RB high	23.0	21.9
		50% RB low	21.4	20.8
		50% RB mid	21.6	20.7
		50% RB high	21.5	20.7
		100% RB	21.5	20.8

Bandwidth (MHz)	Channel / Frequency (MHz)	Resource block allocation	P_{avg} (dBm)	
			QPSK	16-QAM
5	19975 / 1712.5	1 RB low	22.3	21.3
		1 RB mid	22.4	22.0
		1 RB high	22.1	21.0
		50% RB low	21.3	20.4
		50% RB mid	21.4	20.6
		50% RB high	21.5	20.6
		100% RB	21.3	20.6
	20175 / 1732.5	1 RB low	22.3	21.1
		1 RB mid	22.4	21.5
		1 RB high	22.2	21.1
		50% RB low	21.5	20.5
		50% RB mid	21.4	20.6
		50% RB high	21.3	20.5
		100% RB	21.5	20.6
	20375 / 1752.5	1 RB low	22.4	21.4
		1 RB mid	22.2	21.5
		1 RB high	22.4	21.3
		50% RB low	21.5	20.6
		50% RB mid	21.5	20.4
		50% RB high	21.5	20.6
		100% RB	21.5	20.8
10	20000 / 1715.0	1 RB low	22.4	21.6
		1 RB mid	22.5	21.7
		1 RB high	22.4	22.4
		50% RB low	21.4	20.4
		50% RB mid	21.5	20.4
		50% RB high	21.5	20.4
		100% RB	21.4	20.5
	20175 / 1732.5	1 RB low	22.4	21.6
		1 RB mid	22.3	21.4
		1 RB high	22.4	21.4
		50% RB low	21.5	20.6
		50% RB mid	21.4	20.6
		50% RB high	21.3	20.4
		100% RB	21.4	20.5
	20350 / 1750.0	1 RB low	22.5	21.7
		1 RB mid	22.5	21.4
		1 RB high	22.7	21.8
		50% RB low	21.4	20.2
		50% RB mid	21.4	20.4
		50% RB high	21.6	20.5
		100% RB	21.4	20.5

Bandwidth (MHz)	Channel / Frequency (MHz)	Resource block allocation	P_{avg} (dBm)	
			QPSK	16-QAM
15	20025 / 1717.5	1 RB low	22.4	22.3
		1 RB mid	22.5	22.2
		1 RB high	22.4	21.6
		50% RB low	21.4	20.5
		50% RB mid	21.4	20.5
		50% RB high	21.4	20.4
		100% RB	21.3	20.3
	20175 / 1732.5	1 RB low	22.2	22.1
		1 RB mid	22.1	21.8
		1 RB high	22.2	21.7
		50% RB low	21.5	20.4
		50% RB mid	21.4	20.3
		50% RB high	21.3	20.3
		100% RB	21.4	20.4
	20325 / 1747.5	1 RB low	22.4	21.3
		1 RB mid	22.4	21.4
		1 RB high	22.6	21.7
		50% RB low	21.3	20.4
		50% RB mid	21.3	20.4
		50% RB high	21.5	20.5
		100% RB	21.4	20.4
20	20050 / 1720.0	1 RB low	**22.4**	21.8
		1 RB mid	22.3	21.8
		1 RB high	22.3	21.6
		50% RB low	21.4	20.5
		50% RB mid	21.4	20.5
		50% RB high	21.4	20.4
		100% RB	21.4	20.5
	20175 / 1732.5	1 RB low	**22.4**	21.6
		1 RB mid	22.2	21.6
		1 RB high	22.3	21.4
		50% RB low	21.5	20.5
		50% RB mid	21.4	20.4
		50% RB high	21.2	20.0
		100% RB	21.4	20.5
	20300 / 1745.0	1 RB low	**22.3**	21.7
		1 RB mid	22.2	21.8
		1 RB high	22.3	21.9
		50% RB low	21.3	20.3
		50% RB mid	21.3	20.5
		50% RB high	21.3	20.4
		100% RB	21.3	20.5

Table 22: Test results conducted power measurement LTE FDD 4 1700 MHz.

7.1.9 Conducted power measurements LTE FDD 5 850 MHz

Bandwidth (MHz)	Channel / Frequency (MHz)	Resource block allocation	P_{avg} (dBm)	
			QPSK	16-QAM
1.4	20407 / 824.7	1 RB low	22.6	22.0
		1 RB mid	22.8	22.2
		1 RB high	22.8	22.2
		50% RB low	22.8	22.0
		50% RB mid	22.9	22.0
		50% RB high	22.8	21.9
		100% RB	21.9	20.9
	20525 / 836.5	1 RB low	22.9	22.0
		1 RB mid	22.9	22.0
		1 RB high	22.8	21.9
		50% RB low	22.8	22.3
		50% RB mid	22.7	21.9
		50% RB high	22.8	22.0
		100% RB	21.8	20.9
	20643 / 848.3	1 RB low	22.9	22.6
		1 RB mid	22.9	22.8
		1 RB high	22.9	22.8
		50% RB low	23.0	21.8
		50% RB mid	23.0	22.0
		50% RB high	22.8	22.1
		100% RB	21.9	21.2
3.0	20415 / 825.5	1 RB low	22.8	22.7
		1 RB mid	23.0	22.8
		1 RB high	23.0	22.0
		50% RB low	21.8	20.6
		50% RB mid	21.9	20.8
		50% RB high	21.8	20.8
		100% RB	21.9	20.9
	20525 / 836.5	1 RB low	23.0	21.9
		1 RB mid	22.9	22.0
		1 RB high	22.9	22.2
		50% RB low	21.8	21.0
		50% RB mid	21.8	20.9
		50% RB high	21.7	21.0
		100% RB	21.8	20.7
	20635 / 847.5	1 RB low	22.8	21.7
		1 RB mid	22.8	22.0
		1 RB high	23.0	22.2
		50% RB low	21.7	20.7
		50% RB mid	21.8	20.8
		50% RB high	21.8	20.9
		100% RB	21.8	20.7

Bandwidth (MHz)	Channel / Frequency (MHz)	Resource block allocation	P_{avg} (dBm)	
			QPSK	16-QAM
5.0	20425 / 826.5	1 RB low	22.6	21.8
		1 RB mid	23.0	22.5
		1 RB high	22.9	21.8
		50% RB low	21.8	20.9
		50% RB mid	21.9	20.9
		50% RB high	21.8	20.9
		100% RB	21.8	20.9
	20525 / 836.5	1 RB low	22.7	21.6
		1 RB mid	22.9	21.9
		1 RB high	22.9	22.3
		50% RB low	21.7	20.7
		50% RB mid	21.9	20.8
		50% RB high	21.8	20.8
		100% RB	21.8	20.7
	20625 / 846.5	1 RB low	22.6	21.6
		1 RB mid	22.9	21.8
		1 RB high	23.1	21.6
		50% RB low	21.7	20.8
		50% RB mid	21.7	20.7
		50% RB high	21.9	21.0
		100% RB	21.9	20.9
10.0	20450 / 829	1 RB low	22.8	22.1
		1 RB mid	**22.9**	22.3
		1 RB high	22.8	22.0
		50% RB low	21.9	20.9
		50% RB mid	21.9	21.0
		50% RB high	21.8	20.8
		100% RB	21.8	20.8
	20525 / 836.5	1 RB low	22.9	22.1
		1 RB mid	22.7	21.9
		1 RB high	**23.0**	22.1
		50% RB low	21.9	21.1
		50% RB mid	21.8	20.9
		50% RB high	21.8	20.8
		100% RB	21.9	21.0
	20600 / 844	1 RB low	**23.1**	22.3
		1 RB mid	22.9	21.8
		1 RB high	22.9	21.8
		50% RB low	21.8	20.7
		50% RB mid	21.7	20.7
		50% RB high	21.8	20.6
		100% RB	21.8	20.8

Table 23: Test results conducted power measurement LTE FDD 5 850 MHz.

7.1.10 Conducted power measurements LTE FDD 7 2600 MHz

Bandwidth (MHz)	Channel / Frequency (MHz)	Resource block allocation	P_{avg} (dBm)	P_{avg} (dBm)
			QPSK	16-QAM
5.0	20775 / 2502.5	1 RB low	21.5	20.7
		1 RB mid	21.9	21.5
		1 RB high	21.8	20.6
		50% RB low	20.8	19.9
		50% RB mid	20.7	19.9
		50% RB high	20.8	19.9
		100% RB	20.8	20.0
	21100 / 2535	1 RB low	21.7	20.7
		1 RB mid	21.8	20.9
		1 RB high	21.7	20.8
		50% RB low	20.8	19.7
		50% RB mid	20.8	20.0
		50% RB high	20.9	20.0
		100% RB	20.8	19.9
	21425 / 2567.5	1 RB low	21.6	20.4
		1 RB mid	21.8	20.9
		1 RB high	21.7	20.7
		50% RB low	20.8	19.8
		50% RB mid	20.9	19.8
		50% RB high	20.7	19.7
		100% RB	20.8	20
10.0	20800 / 2505	1 RB low	21.7	21.1
		1 RB mid	21.8	21.3
		1 RB high	21.8	20.9
		50% RB low	20.9	19.8
		50% RB mid	20.7	19.9
		50% RB high	20.8	19.9
		100% RB	20.8	19.9
	21100 / 2535	1 RB low	22.1	21.2
		1 RB mid	21.9	20.8
		1 RB high	21.8	20.9
		50% RB low	20.9	19.9
		50% RB mid	20.8	19.9
		50% RB high	20.8	19.8
		100% RB	20.8	19.9
	21400 / 2565	1 RB low	21.8	20.7
		1 RB mid	21.9	21.2
		1 RB high	21.9	20.8
		50% RB low	20.8	19.9
		50% RB mid	20.9	20.0
		50% RB high	20.8	19.9
		100% RB	20.8	19.8

Bandwidth (MHz)	Channel / Frequency (MHz)	Resource block allocation	Pavg (dBm) QPSK	Pavg (dBm) 16-QAM
15.0	20825 / 2507.5	1 RB low	21.9	21.2
		1 RB mid	21.8	21.4
		1 RB high	22.0	21.1
		50% RB low	20.9	19.9
		50% RB mid	20.8	19.8
		50% RB high	20.7	19.7
		100% RB	20.7	19.8
	21100 / 2535	1 RB low	22.0	21.9
		1 RB mid	21.7	21.5
		1 RB high	21.7	21.6
		50% RB low	20.8	19.7
		50% RB mid	20.9	19.7
		50% RB high	20.7	19.7
		100% RB	20.8	19.8
	21375 / 2562.5	1 RB low	22.1	21.4
		1 RB mid	21.9	20.7
		1 RB high	22.0	20.9
		50% RB low	20.8	19.7
		50% RB mid	20.7	19.8
		50% RB high	20.9	19.7
		100% RB	20.9	19.8
20.0	20850 / 2510	1 RB low	**21.9**	21.2
		1 RB mid	21.7	21.5
		1 RB high	21.8	21.5
		50% RB low	20.9	19.9
		50% RB mid	20.8	19.8
		50% RB high	20.8	19.8
		100% RB	20.7	19.8
	21100 / 2535	1 RB low	**22.1**	21.1
		1 RB mid	22.0	21.0
		1 RB high	21.8	20.8
		50% RB low	21.0	20.0
		50% RB mid	20.8	19.8
		50% RB high	20.8	19.8
		100% RB	20.8	19.8
	21350 / 2560	1 RB low	**21.8**	21.3
		1 RB mid	21.7	20.7
		1 RB high	21.6	20.6
		50% RB low	20.8	19.7
		50% RB mid	20.7	19.7
		50% RB high	20.8	19.9
		100% RB	20.7	19.7

Table 24: Test results conducted power measurement LTE FDD 7 2600 MHz.

7.1.11 Conducted power measurements LTE FDD 12 700 MHz

Bandwidth (MHz)	Channel / Frequency (MHz)	Resource block allocation	P_{avg} (dBm)	
			QPSK	16-QAM
1.4	23017 / 699.7	1 RB low	22.6	22.0
		1 RB mid	22.8	22.2
		1 RB high	22.7	21.9
		50% RB low	22.6	21.7
		50% RB mid	22.9	22.0
		50% RB high	22.7	21.8
		100% RB	21.7	20.6
	23095 / 707.5	1 RB low	23.0	22.2
		1 RB mid	22.9	22.0
		1 RB high	22.9	22.1
		50% RB low	22.8	22.2
		50% RB mid	22.9	22.0
		50% RB high	22.7	21.8
		100% RB	21.8	21.0
	23173 / 715.3	1 RB low	22.8	22.6
		1 RB mid	22.7	22.7
		1 RB high	22.6	22.6
		50% RB low	22.8	21.5
		50% RB mid	22.6	21.5
		50% RB high	22.6	21.6
		100% RB	21.5	20.6
3	23025 / 700.5	1 RB low	22.7	22.0
		1 RB mid	22.9	22.1
		1 RB high	22.8	22.6
		50% RB low	21.9	20.5
		50% RB mid	21.8	20.9
		50% RB high	21.7	20.8
		100% RB	21.8	20.7
	23095 / 707.5	1 RB low	22.8	22.0
		1 RB mid	22.9	22.2
		1 RB high	22.8	22.0
		50% RB low	22.0	21.1
		50% RB mid	21.8	21.0
		50% RB high	21.9	21.1
		100% RB	21.7	20.6
	23165 / 714.5	1 RB low	22.9	22.0
		1 RB mid	22.8	22.0
		1 RB high	22.9	21.9
		50% RB low	21.7	20.9
		50% RB mid	21.7	20.9
		50% RB high	21.7	20.8
		100% RB	21.7	20.8

Bandwidth (MHz)	Channel / Frequency (MHz)	Resource block allocation	P_{avg} (dBm)	
			QPSK	16-QAM
5	21475 / 882.5	1 RB low	22.5	21.7
		1 RB mid	22.8	22.2
		1 RB high	22.8	21.6
		50% RB low	21.7	20.9
		50% RB mid	21.7	20.7
		50% RB high	21.6	20.8
		100% RB	21.8	20.8
	23095 / 707.5	1 RB low	22.7	21.4
		1 RB mid	22.7	21.8
		1 RB high	22.7	21.7
		50% RB low	21.8	20.6
		50% RB mid	21.7	20.6
		50% RB high	21.8	20.7
		100% RB	21.6	20.6
	23155 / 713.5	1 RB low	22.6	21.5
		1 RB mid	22.9	21.7
		1 RB high	22.4	21.5
		50% RB low	21.6	20.5
		50% RB mid	21.6	20.7
		50% RB high	21.6	20.5
		100% RB	21.7	20.8
10	23060 / 704.0	1 RB low	**22.9**	22.1
		1 RB mid	22.6	21.9
		1 RB high	22.6	22.0
		50% RB low	21.7	20.8
		50% RB mid	21.6	20.7
		50% RB high	21.6	20.8
		100% RB	21.7	20.7
	23095 / 707.5	1 RB low	**22.8**	21.8
		1 RB mid	22.7	21.8
		1 RB high	22.7	21.7
		50% RB low	21.7	20.9
		50% RB mid	21.7	20.8
		50% RB high	21.7	20.8
		100% RB	21.6	20.7
	23130 / 711.0	1 RB low	23.1	22.1
		1 RB mid	**23.3**	22.3
		1 RB high	22.7	21.9
		50% RB low	21.8	20.7
		50% RB mid	21.8	20.7
		50% RB high	21.7	20.7
		100% RB	21.7	20.7

Table 25: Test results conducted power measurement LTE FDD12 700 MHz.

7.1.12 Conducted power measurements LTE FDD 13 700 MHz

Bandwidth (MHz)	Channel / Frequency (MHz)	Resource block allocation	P_{avg} (dBm)	
			QPSK	16-QAM
5	23205 / 779.5	1 RB low	22.6	21.7
		1 RB mid	**22.7**	21.5
		1 RB high	22.7	21.5
		50% RB low	21.6	20.8
		50% RB mid	21.6	20.7
		50% RB high	21.6	20.8
		100% RB	21.7	20.8
	23230 / 782	1 RB low	22.4	21.4
		1 RB mid	22.6	22.0
		1 RB high	22.5	21.8
		50% RB low	21.6	20.8
		50% RB mid	21.6	20.8
		50% RB high	21.7	20.8
		100% RB	21.6	20.7
	23255 / 784.5	1 RB low	22.7	21.5
		1 RB mid	22.8	21.5
		1 RB high	22.6	21.5
		50% RB low	21.6	20.5
		50% RB mid	21.6	20.5
		50% RB high	21.5	20.8
		100% RB	21.6	20.6
10	23230 / 782	1 RB low	22.9	22.0
		1 RB mid	**23.0**	22.2
		1 RB high	22.9	21.9
		50% RB low	21.6	20.6
		50% RB mid	21.6	20.8
		50% RB high	21.6	20.7
		100% RB	21.7	20.6

Table 26: Test results conducted power measurement LTE FDD13 700 MHz.

7.1.13 Conducted power measurements LTE FDD 25 1900 MHz

Bandwidth (MHz)	Channel / Frequency (MHz)	Resource block allocation	P_{avg} (dBm)	
			QPSK	16-QAM
1.4	26047 / 1850.7	1 RB low	22.5	22.2
		1 RB mid	22.5	21.8
		1 RB high	22.4	21.8
		50% RB low	22.3	21.7
		50% RB mid	22.5	21.7
		50% RB high	22.4	21.6
		100% RB	21.4	20.3
	26340 / 1880.0	1 RB low	22.5	21.6
		1 RB mid	22.6	21.7
		1 RB high	22.5	21.6
		50% RB low	22.4	21.6
		50% RB mid	22.4	21.7
		50% RB high	22.5	21.6
		100% RB	21.6	20.7
	26683 / 1914.3	1 RB low	22.7	22.4
		1 RB mid	22.7	22.2
		1 RB high	22.6	22.0
		50% RB low	22.5	21.4
		50% RB mid	22.4	21.6
		50% RB high	22.5	21.4
		100% RB	21.4	20.2
3	26055 / 1851.5	1 RB low	22.3	21.9
		1 RB mid	22.4	21.7
		1 RB high	22.5	22.3
		50% RB low	21.4	20.4
		50% RB mid	21.5	20.4
		50% RB high	21.5	20.5
		100% RB	21.4	20.6
	26340 / 1880.0	1 RB low	22.5	21.5
		1 RB mid	22.7	21.9
		1 RB high	22.8	22.0
		50% RB low	21.6	20.6
		50% RB mid	21.5	20.7
		50% RB high	21.5	20.6
		100% RB	21.5	20.5
	26675 / 1913.5	1 RB low	22.6	22.4
		1 RB mid	22.6	21.7
		1 RB high	22.5	22.2
		50% RB low	21.5	20.3
		50% RB mid	21.6	20.5
		50% RB high	21.5	20.4
		100% RB	21.5	20.5

Bandwidth (MHz)	Channel / Frequency (MHz)	Resource block allocation	P_{avg} (dBm)	
			QPSK	16-QAM
5	26065 / 1852.5	1 RB low	22.4	21.4
		1 RB mid	22.6	21.4
		1 RB high	22.5	21.4
		50% RB low	21.3	20.4
		50% RB mid	21.4	20.6
		50% RB high	21.4	20.6
		100% RB	21.4	20.7
	26340 / 1880.0	1 RB low	22.4	21.7
		1 RB mid	22.6	21.6
		1 RB high	22.5	21.6
		50% RB low	21.6	20.7
		50% RB mid	21.7	20.8
		50% RB high	21.7	20.7
		100% RB	21.5	20.5
	26665 / 1912.5	1 RB low	22.4	21.4
		1 RB mid	22.5	21.7
		1 RB high	22.4	21.2
		50% RB low	21.6	20.6
		50% RB mid	21.5	20.7
		50% RB high	21.4	20.6
		100% RB	21.6	20.7
10	26090 / 1855.0	1 RB low	22.5	22.3
		1 RB mid	22.6	22.4
		1 RB high	22.5	21.8
		50% RB low	21.5	20.6
		50% RB mid	21.6	20.6
		50% RB high	21.5	20.8
		100% RB	21.5	20.5
	26340 / 1880.0	1 RB low	22.7	21.7
		1 RB mid	23.0	22.2
		1 RB high	22.7	21.8
		50% RB low	21.6	20.7
		50% RB mid	21.7	20.7
		50% RB high	21.6	20.6
		100% RB	21.6	20.5
	26640 / 1910.0	1 RB low	22.9	22.0
		1 RB mid	23.2	22.2
		1 RB high	22.8	22.0
		50% RB low	21.7	20.6
		50% RB mid	21.6	20.5
		50% RB high	21.6	20.5
		100% RB	21.6	20.5

Bandwidth (MHz)	Channel / Frequency (MHz)	Resource block allocation	P_{avg} (dBm)	
			QPSK	16-QAM
15	26115 / 1857.5	1 RB low	22.6	22.4
		1 RB mid	22.5	22.3
		1 RB high	22.6	22.0
		50% RB low	21.7	20.7
		50% RB mid	21.6	20.7
		50% RB high	21.6	20.7
		100% RB	21.6	20.6
	26340 / 1880.0	1 RB low	22.7	22.5
		1 RB mid	22.6	22.4
		1 RB high	22.5	21.9
		50% RB low	21.6	20.6
		50% RB mid	21.6	20.5
		50% RB high	21.7	20.6
		100% RB	21.6	20.7
	26615 / 1907.5	1 RB low	22.7	21.6
		1 RB mid	22.9	21.8
		1 RB high	22.7	21.6
		50% RB low	21.6	20.7
		50% RB mid	21.7	20.6
		50% RB high	21.6	20.4
		100% RB	21.7	20.6
20	26140 / 1860.0	1 RB low	22.4	21.7
		1 RB mid	**22.5**	22.0
		1 RB high	22.5	21.7
		50% RB low	21.6	20.6
		50% RB mid	21.6	20.6
		50% RB high	21.6	20.6
		100% RB	21.7	20.7
	26340 / 1880.0	1 RB low	22.5	21.9
		1 RB mid	**22.7**	21.9
		1 RB high	22.4	21.7
		50% RB low	21.7	20.5
		50% RB mid	21.6	20.5
		50% RB high	21.6	20.6
		100% RB	21.6	20.5
	26590 / 1905.0	1 RB low	22.4	21.8
		1 RB mid	**22.7**	22.3
		1 RB high	22.5	22.0
		50% RB low	21.6	20.6
		50% RB mid	21.6	20.7
		50% RB high	21.6	20.6
		100% RB	21.6	20.6

Table 27: Test results conducted power measurement LTE FDD 25 1900 MHz.

7.1.14 Conducted power measurements LTE FDD 26 850 MHz

Bandwidth (MHz)	Channel / Frequency (MHz)	Resource block allocation	P_{avg} (dBm)	
			QPSK	16-QAM
1.4	26697 / 814.7	1 RB low	21.8	20.8
		1 RB mid	21.9	20.8
		1 RB high	21.8	20.9
		50% RB low	21.9	20.8
		50% RB mid	22.0	20.9
		50% RB high	21.7	20.9
		100% RB	20.9	19.9
	26865 / 831.5	1 RB low	22.7	21.7
		1 RB mid	22.9	21.8
		1 RB high	22.6	21.7
		50% RB low	22.6	21.7
		50% RB mid	22.7	22.0
		50% RB high	22.6	21.8
		100% RB	21.6	20.8
	27033 / 848.3	1 RB low	22.4	22.2
		1 RB mid	22.4	22.0
		1 RB high	22.3	21.6
		50% RB low	22.4	21.5
		50% RB mid	22.3	21.5
		50% RB high	22.3	21.6
		100% RB	21.3	20.2
3	26705 / 815.5	1 RB low	22.0	21.1
		1 RB mid	22.2	21.3
		1 RB high	22.3	21.5
		50% RB low	20.9	19.7
		50% RB mid	20.9	19.9
		50% RB high	21.0	20.0
		100% RB	21.0	20.1
	26865 / 831.5	1 RB low	22.7	21.8
		1 RB mid	22.8	21.8
		1 RB high	22.9	22.0
		50% RB low	21.7	20.9
		50% RB mid	21.7	20.9
		50% RB high	21.6	20.7
		100% RB	21.6	20.7
	27025 / 847.5	1 RB low	22.7	21.9
		1 RB mid	22.6	21.8
		1 RB high	22.6	21.5
		50% RB low	21.5	20.7
		50% RB mid	21.4	20.7
		50% RB high	21.4	20.3
		100% RB	21.5	20.4

Bandwidth (MHz)	Channel / Frequency (MHz)	Resource block allocation	P_{avg} (dBm)	
			QPSK	16-QAM
5	26715 / 816.5	1 RB low	22.0	20.8
		1 RB mid	22.3	21.2
		1 RB high	22.2	21.3
		50% RB low	20.9	20.1
		50% RB mid	21.0	20.2
		50% RB high	21.3	20.5
		100% RB	21.2	20.4
	26865 / 831.5	1 RB low	22.5	21.4
		1 RB mid	22.9	21.9
		1 RB high	22.8	21.5
		50% RB low	21.7	20.8
		50% RB mid	21.7	20.8
		50% RB high	21.8	21.0
		100% RB	21.7	20.7
	27015 / 846.5	1 RB low	22.5	21.3
		1 RB mid	22.5	21.4
		1 RB high	22.3	21.1
		50% RB low	21.6	20.6
		50% RB mid	21.4	20.4
		50% RB high	21.4	20.3
		100% RB	21.5	20.6
10	26740 / 819.0	1 RB low	22.1	21.0
		1 RB mid	22.6	22.3
		1 RB high	22.7	21.8
		50% RB low	21.2	20.3
		50% RB mid	21.3	20.5
		50% RB high	21.6	20.6
		100% RB	21.2	20.3
	26865 / 831.5	1 RB low	22.8	22.0
		1 RB mid	22.6	21.8
		1 RB high	22.8	22.0
		50% RB low	21.7	20.8
		50% RB mid	21.7	20.9
		50% RB high	21.7	21.0
		100% RB	21.7	20.7
	26990 / 844.0	1 RB low	23.2	22.1
		1 RB mid	22.7	21.6
		1 RB high	22.5	21.6
		50% RB low	21.8	20.6
		50% RB mid	21.6	20.7
		50% RB high	21.4	20.4
		100% RB	21.6	20.6

Bandwidth (MHz)	Channel / Frequency (MHz)	Resource block allocation	P_{avg} (dBm)	
			QPSK	16-QAM
15	26765 / 821.5	1 RB low	22.1	21.8
		1 RB mid	22.6	21.7
		1 RB high	**22.8**	22.1
		50% RB low	21.4	20.5
		50% RB mid	21.4	20.6
		50% RB high	21.6	20.8
		100% RB	21.5	20.6
	26865 / 831.5	1 RB low	**22.7**	22.1
		1 RB mid	22.4	22.0
		1 RB high	22.6	22.3
		50% RB low	21.6	20.5
		50% RB mid	21.7	20.6
		50% RB high	21.7	20.8
		100% RB	21.6	-22.2
	26965 / 841.5	1 RB low	**23.0**	22.5
		1 RB mid	22.5	21.8
		1 RB high	22.4	22.3
		50% RB low	21.7	20.7
		50% RB mid	21.7	20.7
		50% RB high	21.6	20.6
		100% RB	21.6	20.5

Table 28: Test results conducted power measurement LTE FDD 26 850 MHz.

7.1.15 Justification of SAR measurements in LTE mode

According to Chapter 5 ‘SAR test procedures for LTE devices of FCC KDB Publication 941225 D05 the following test configurations for standalone measurements of the largest channel bandwidth (chapter 5.2) had to be taken into consideration:

5.2.1. QPSK with 1 RB allocation
Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and *required test channel* combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each *required test channel*. When the *reported* SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and *required test channels* is not required for 1 RB allocation; otherwise, SAR is required for the remaining *required test channels* and only for the RB offset configuration with the highest output power for that channel.6 When the *reported* SAR of a *required test channel* is > 1.45 W/kg, SAR is required for all three RB offset configurations for that *required test channel*.

5.2.2. QPSK with 50% RB allocation
The procedures required for 1 RB allocation in 5.2.1 are applied to measure the SAR for QPSK with 50% RB allocation.

5.2.3. QPSK with 100% RB allocation
For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest *reported* SAR for 1 RB and 50% RB allocation in 5.2.1 and 5.2.2 are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel and if the *reported* SAR is > 1.45 W/kg, the remaining *required test channels* must also be tested.

5.2.4. Higher order modulations
For each modulation besides QPSK; e.g., 16-QAM, 64-QAM, apply the QPSK procedures in sections 5.2.1, 5.2.2 and 5.2.3 to determine the QAM configurations that may need SAR measurement. For each configuration identified as required for testing, SAR is required only when the highest maximum output power for the configuration in the higher order modulation is > ½ dB higher than the same configuration in QPSK or when the *reported* SAR for the QPSK configuration is > 1.45 W/kg.

Testing of other channel bandwidths was not necessary because the output power of equivalent channel configurations was less than ½ dB larger compared to the largest channel bandwidth and reported SAR was < 1.45 W/kg.

Conducted and radiated measurements were performed with the maximum number of bundled TTIs supported by the DUT (see section 2.4 for details).

7.1.16 MPR information in LTE mode

There is a permanently applied MPR implemented by the manufacturer.
MPR is enabled for this device according to 3GPP TS36.101.

Modulation	Channel bandwidth / resource block configuration						Target MPR	3 GPP MPR
	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz		
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	1	≤ 1
16QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	1	≤ 1
16QAM	> 5	> 4	> 8	> 12	> 16	> 18	2	≤ 2

Therefore there is no power reduction at 1.4 MHz bandwidth with 50% RB allocation (3 RBs).

Additional differences in conducted power are not caused by implemented MPR but depend on measurement uncertainty and allowable tolerances per 3GPP or tune-up.
A-MPR was disabled for all SAR tests.

7.1.17 Conducted power measurements WLAN 2450 MHz

802.11b		maximum average conducted output power [dBm]			
Band	**Ch**	**1Mbps**	**2Mbps**	**5.5Mbps**	**11Mbps**
2450MHz	1	17.6	17.6	17.5	17.6
	6	**19.0**	18.9	19.8	18.4
	11	17.9	17.8	17.8	17.4

Table 29: Test results conducted power measurement 802.11b

802.11g		maximum average conducted output power [dBm]							
Band	**Ch**	**6Mbps**	**9Mbps**	**12Mbps**	**18Mbps**	**24Mbps**	**36Mbps**	**48Mbps**	**54Mbps**
2450MHz	1	8.1	7.9	7.7	7.3	6.9	6.3	5.8	5.6
	6	9.6	9.2	9.0	8.6	8.2	7.7	7.2	7.0
	11	8.6	8.4	8.1	7.7	7.3	6.7	6.2	6.0

Table 30: Test results conducted power measurement 802.11g

802.11n HT-20		maximum average conducted output power [dBm]							
Band	**Ch**	**MCS-0 6.5Mbps**	**MCS-1 13Mbps**	**MCS-2 19.5Mbps**	**MCS-3 26Mbps**	**MCS-4 39Mbps**	**MCS-5 52Mbps**	**MCS-6 58.5Mbps**	**MCS-7 65Mbps**
2450MHz	1	10.0	9.5	9.1	8.7	8.2	7.8	7.6	7.4
	6	10.2	9.7	9.5	9.1	8.3	8.0	7.8	7.7
	11	9.6	9.2	8.7	8.4	7.8	7.3	7.1	6.9

Table 31: Test results conducted power measurement 802.11n HT-20

802.11n HT-40		maximum average conducted output power [dBm]							
Band	**Ch**	**MCS-0 13.5Mbps**	**MCS-1 27Mbps**	**MCS-2 40.5Mbps**	**MCS-3 54Mbps**	**MCS-4 81Mbps**	**MCS-5 108Mbps**	**MCS-6 121.5Mbps**	**MCS-7 135Mbps**
2450MHz	3	6.7	6.0	5.3	4.8	4.1	3.6	3.4	3.2
	6	**7.2**	6.5	5.8	5.4	4.5	4.1	3.9	3.7
	11	7.1	6.4	5.7	5.3	4.5	4.0	3.8	3.6

Table 32: Test results conducted power measurement 802.11n HT-40

7.1.18 Conducted power measurements WLAN 5 GHz

802.11a		maximum average conducted output power [dBm]							
Band	**Ch**	**6Mbps**	**9Mbps**	**12Mbps**	**18Mbps**	**24Mbps**	**36Mbps**	**48Mbps**	**54Mbps**
5200	36	14.8	14.6	14.4	14.0	13.6	13.0	12.5	12.3
	40	**15.0**	14.9	14.7	14.5	14.3	14.2	14.0	13.8
	44	14.9	14.7	14.6	14.4	14.3	14.1	13.9	13.8
	48	14.8	14.7	14.5	14.4	14.3	14.2	14.0	13.9
5300	52	14.7	14.5	14.4	14.3	14.2	14.1	14.0	13.8
	56	**15.1**	14.8	14.6	14.2	13.8	13.2	12.7	12.5
	60	14.6	14.4	14.3	14.2	14.0	13.9	13.8	13.7
	64	14.5	14.3	14.2	14.1	14.0	13.8	13.7	13.6
5600	**100**	**13.0**	12.8	12.6	12.5	12.4	12.3	12.1	12.0
	104	12.9	12.7	12.5	12.4	12.3	12.1	12.0	11.8
	108	12.8	12.7	12.5	12.4	12.2	12.0	11.8	11.7
	112	12.8	12.7	12.6	12.5	12.4	12.2	12.0	11.8
	116	12.6	12.4	12.2	12.1	11.9	11.8	11.7	11.5
	120	12.6	12.4	12.3	12.1	12.0	11.9	11.8	11.7
	124	12.7	12.5	12.4	12.3	12.2	12.1	11.9	11.8
	128	12.7	12.5	12.4	12.2	12.0	11.8	11.7	11.5
	132	12.4	12.3	12.2	12.1	12.0	11.9	11.7	11.5
	136	12.4	12.2	12.1	11.9	11.8	11.6	11.5	11.3
	140	12.6	12.5	12.4	12.2	12.1	12.0	11.9	11.7
5800	149	13.2	13.1	13.0	12.8	12.7	12.6	12.5	12.4
	153	13.4	13.3	13.2	13.1	13.0	12.8	12.7	12.5
	157	**13.5**	13.3	13.1	12.9	12.7	12.6	12.4	12.3
	161	13.3	13.2	13.0	12.9	12.7	12.5	12.3	12.1
	165	13.4	13.2	13.1	13.0	12.9	12.8	12.7	12.6

Table 33: Test results conducted power measurement 802.11a

802.11n HT-20 / 802.11ac VHT-20 maximum average conducted output power [dBm]										
Band [MHz]	Ch	MCS-0 6.5Mbps	MCS-1 13Mbps	MCS-2 19.5Mbps	MCS-3 26Mbps	MCS-4 39Mbps	MCS-5 52Mbps	MCS-6 58.5Mbps	MCS-7 65Mbps	MCS-8 78Mbps
5200	36	14.7	14.5	14.3	13.8	13.4	12.9	12.3	12.1	14.7
	40	14.8	14.8	14.5	14.4	14.1	14.0	13.9	13.7	14.8
	44	14.8	14.6	14.4	14.3	14.1	14.0	13.8	13.7	14.8
	48	14.6	14.5	14.4	14.3	14.1	14.1	13.8	13.8	14.6
5300	52	14.6	14.4	14.3	14.2	14.0	13.9	13.8	13.6	14.6
	56	15.0	14.6	14.4	14.0	13.6	13.1	12.6	12.3	15.0
	60	14.5	14.2	14.2	14.0	13.8	13.8	13.6	13.6	14.5
	64	14.4	14.2	14.0	13.9	13.9	13.6	13.5	13.4	14.4
5600	100	12.8	12.7	12.5	12.3	12.3	12.1	12.0	11.9	12.8
	104	12.7	12.6	12.4	12.3	12.2	11.9	11.9	11.7	12.7
	108	12.6	12.5	12.3	12.2	12.1	11.8	11.7	11.6	12.6
	112	12.7	12.5	12.4	12.4	12.2	12.1	11.9	11.6	12.7
	116	12.5	12.3	12.1	11.9	11.8	11.6	11.5	11.3	12.5
	120	12.5	12.2	12.1	11.9	11.8	11.8	11.6	11.6	12.5
	124	12.5	12.4	12.2	12.2	12.1	11.9	11.8	11.6	12.5
	128	12.5	12.3	12.2	12.1	11.9	11.6	11.5	11.4	12.5
	132	12.2	12.2	12.1	12.0	11.9	11.8	11.5	11.4	12.2
	136	12.2	12.1	11.9	11.8	11.7	11.4	11.3	11.1	12.2
	140	12.5	12.3	12.3	12.1	12.0	11.8	11.7	11.6	12.5
5800	149	13.0	13.0	12.9	12.7	12.6	12.5	12.4	12.2	13.0
	153	13.3	13.2	13.0	13.0	12.9	12.6	12.6	12.3	13.3
	157	13.4	13.2	13.0	12.8	12.5	12.5	12.2	12.1	13.4
	161	13.2	13.0	12.8	12.8	12.6	12.4	12.2	12.0	13.2
	165	13.2	13.1	12.9	12.8	12.8	12.7	12.5	12.4	13.2

Table 34: Test results conducted power measurement 802.11n HT-20 / 802.11ac VHT-20

802.11n HT-40 / 802.11ac VHT-40 maximum average conducted output power [dBm]											
Band [MHz]	Ch	MCS-0 13.5Mbps	MCS-1 27Mbps	MCS-2 40.5Mbps	MCS-3 54Mbps	MCS-4 81Mbps	MCS-5 108Mbps	MCS-6 121.5Mbps	MCS-7 135Mbps	MCS-8 162Mbps	MCS-9 180Mbps
5200	38	**10.6**	9.8	9.2	8.7	8.0	7.5	7.3	7.1		
	46	10.5	9.6	8.9	8.2	7.3	6.6	6.2	5.8		
5300	54	**10.4**	10.2	10.0	9.6	9.3	9.0	8.6	8.3		
	62	10.2	9.9	9.7	9.4	9.1	8.8	8.5	8.3		
5600	102	8.5	8.2	8.0	7.8	7.5	7.1	6.9	6.6		
	110	8.4	8.2	8.0	7.7	7.4	7.0	6.7	6.4		
	118	8.2	8.0	7.7	7.4	7.1	6.7	6.3	6.1		
	126	**8.6**	8.3	8.0	7.7	7.5	7.2	6.9	6.7		
	134	8.0	7.6	7.4	7.1	6.8	6.5	6.2	6.0		
5800	151	8.6	8.2	8.0	7.7	7.3	6.9	6.5	6.3		
	159	**9.1**	8.8	8.5	8.2	7.9	7.6	7.3	7.1		

Table 35: Test results conducted power measurement 802.11n HT-40 / 802.11ac VHT-40

7.1.1 Conducted average power measurements Bluetooth Classic 2.4 GHz

Channel	Frequency (MHz)	Average power (dBm)		
		GFSK	π/4 DQPSK	8-DPSK
0	2402	9.9	9.9	10.4
39	**2441**	**10.3**	**10.3**	**10.7**
78	2480	9.5	9.6	9.9

Table 36: Test results conducted average power measurement BLUETOOTH CLASSIC 2.4 GHz

7.1.2 Conducted average power measurements Bluetooth LE 2.4 GHz

Channel	Frequency (MHz)	Average power (dBm)
		GFSK
0	2402	2.9
19	2440	**3.1**
39	2480	2.0

Table 37: Test results conducted average power measurement BLUETOOTH LE 2.4 GHz

7.1.3 SAR measurement positions

SAR measurement positions						
mode	front	bottom	right edge	left edge	top	rear
GSM 850 MHz	yes	yes	yes	yes	no	no
GSM 1900 MHz	yes	yes	yes	yes	no	no
UMTS FDD II 1880 MHz	yes	yes	yes	yes	no	no
UMTS FDD IV 1700 MHz	yes	yes	yes	yes	no	no
UMTS FDD V 850 MHz	yes	yes	yes	yes	no	no
LTE FDD 2 1900 MHz	yes	yes	yes	yes	no	no
LTE FDD 4 1750 MHz	yes	yes	yes	yes	no	no
LTE FDD 5 850 MHz	yes	yes	yes	yes	no	no
LTE FDD 7 2600 MHz	yes	yes	yes	yes	no	no
LTE FDD 12 700 MHz	yes	yes	yes	yes	no	no
LTE FDD 13 700 MHz	yes	yes	yes	yes	no	no
LTE FDD 25 1900 MHz	yes	yes	yes	yes	no	no
LTE FDD 26 850 MHz	yes	yes	yes	yes	no	no
*WLAN 2450**	*no*	*yes*	*yes*	*no*	*no*	*no*
*WLAN 5.2GHz**	*no*	*yes*	*yes*	*no*	*no*	*no*
*WLAN 5.3GHz**	*no*	*yes*	*yes*	*no*	*no*	*no*
*WLAN 5.6GHz**	*no*	*yes*	*yes*	*no*	*no*	*no*
*WLAN 5.8GHz**	*no*	*yes*	*yes*	*no*	*no*	*no*
*BT Classic 2450 MHz**	*no*	*yes*	*yes*	*no*	*no*	*no*

*) measured in CTC Advanced report 1-6927/18-01-12

The edges with less than 2.5 cm distance to the TX antennas need to be tested for SAR.
Antenna position see in photo documentation

7.2 SAR test results

7.2.1 General description of test procedures

- The DUT is tested using CMU 200 and CMW 500 communications testers as controller unit to set test channels and maximum output power to the DUT, as well as for measuring the conducted peak power.
- Test positions as described in the tables above are in accordance with the specified test standard.
- Tests were performed in that configuration, which generates the highest time based averaged output power (see conducted power results).
- UMTS was tested in RMC mode with 12.2 kbit/s and TPC bits set to 'all 1'.
- According to IEEE 1528 the SAR test shall be performed at middle channel. Testing of top and bottom channel is optional.
- According to KDB 447498 D01 testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:
  - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
  - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
  - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
- IEEE 1528-2013 requires the middle channel to be tested first. This generally applies to wireless devices that are designed to operate in technologies with tight tolerances for maximum output power variations across channels in the band. When the maximum output power variation across the required test channels is > ½ dB, instead of the middle channel, the highest output power channel must be used.

7.2.2 Results overview

measured / extrapolated SAR numbers - GSM 850 MHz - 0 mm distance									
Ch.	Freq. (MHz)	time slots	Position	cond. P_{max} (dBm)		SAR_{10g} (W/kg)		power drift (dB)	liquid (°C)
				declared**	meas.	meas.	extrap.		
190	836.6	4	front	29.5	29.1	0.562	0.616	-0.02	20.9
128	824.2	4	bottom	29.5	29.1	0.452	0.496	-0.02	20.9
190	836.6	4	bottom	29.5	29.1	0.571	0.626	0.00	20.9
251	848.8	4	bottom	29.5	29.2	**0.770**	**0.825**	0.01	20.9
190	836.6	4	left edge	29.5	29.1	0.250	0.274	0.03	20.9
190	836.6	4	right edge	29.5	29.1	0.036	0.039	-0.04	20.9

Table 38: Test results SAR GSM 850 MHz (see max. SAR plot in Annex B on page 87.)

measured / extrapolated SAR numbers - GSM 1900 MHz - 0 mm distance									
Ch.	Freq. (MHz)	time slots	Position	cond. P_{max} (dBm)		SAR_{10g} (W/kg)		power drift (dB)	liquid (°C)
				declared**	meas.	meas.	extrap.		
661	1880.0	4	front	28.0	27.4	1.370	1.573	0.01	22.5
512	1850.2	4	bottom	28.0	27.8	2.770	2.901	-0.12	22.5
661	1880.0	4	bottom	28.0	27.4	**2.910**	**3.341**	-0.07	22.5
810	1909.8	4	bottom	28.0	27.6	2.830	3.103	-0.07	22.5
661	1880.0	4	left edge	28.0	27.4	0.769	0.883	0.10	22.5
661	1880.0	4	right edge	28.0	27.4	0.016	0.018	0.04	22.5
661	1880.0	4	bottom*	28.0	27.4	2.850	3.272	-0.07	22.5

Table 39: Test results SAR GSM 1900 MHz (see max. SAR plot in Annex B on page 88.)

* - repeated at the highest SAR measurement according to the FCC KDB 865664
** - maximum possible output power declared by manufacturer

measured / extrapolated SAR numbers - UMTS FDD II 1880 MHz - 0 mm distance									
Ch.	Freq. (MHz)	test cond.	Position	cond. P_{max} (dBm)		SAR_{10g} (W/kg)		power drift (dB)	liquid (°C)
				declared**	meas.	meas.	extrap.		
9400	1880.0	RMC	front	23.5	23.0	1.110	1.245	0.03	22.2
9262	1852.4	RMC	bottom	23.5	22.9	2.090	2.400	0.04	22.2
9400	1880.0	RMC	bottom	23.5	23.0	2.450	2.749	0.11	22.2
9538	1907.6	RMC	bottom	23.5	23.2	**2.820**	**3.022**	0.04	22.2
9538	1907.6	RMC	bottom**	23.5	23.2	2.810	3.011	0.00	22.2
9400	1880.0	RMC	left edge	23.5	23.0	0.540	0.606	-0.03	22.2
9400	1880.0	RMC	right edge	23.5	23.0	0.010	0.011	0.17	22.2

Table 40: Test results SAR UMTS FDD II 1880 MHz (see max. SAR plot in Annex B on page 89.)

measured / extrapolated SAR numbers - UMTS FDD IV 1700 MHz - 0 mm distance									
Ch.	Freq. (MHz)	test cond.	Position	cond. P_{max} (dBm)		SAR_{10g} (W/kg)		power drift (dB)	liquid (°C)
				declared**	meas.	meas.	extrap.		
1413	1732	RMC	front	23.5	23.3	0.724	0.758	-0.09	22.2
1312	1712	RMC	bottom	23.5	23.2	1.530	1.639	-0.02	22.2
1413	1732	RMC	bottom	23.5	23.3	1.630	1.707	0.01	22.2
1513	1753	RMC	bottom	23.5	23.3	**1.760**	**1.843**	0.00	22.2
1413	1732	RMC	left edge	23.5	23.3	0.212	0.222	-0.04	22.2
1413	1732	RMC	right edge	23.5	23.3	0.010	0.010	0.17	22.2

Table 41: Test results SAR UMTS FDD IV 1700 MHz MHz (see max. SAR plot in Annex B on page 90.)

measured / extrapolated SAR numbers - UMTS FDD V 850 MHz - 0 mm distance									
Ch.	Freq. (MHz)	test cond.	Position	cond. P_{max} (dBm)		SAR_{10g} (W/kg)		power drift (dB)	liquid (°C)
				declared**	meas.	meas.	extrap.		
4132	826.4	RMC	front	24.0	23.6	0.425	0.466	0.08	20.9
4182	836.4	RMC	front	24.0	23.5	0.428	0.480	-0.11	20.9
4233	846.6	RMC	front	24.0	23.6	**0.450**	**0.493**	-0.11	20.9
4182	836.4	RMC	bottom	24.0	23.5	0.418	0.469	-0.19	20.9
4182	836.4	RMC	left edge	24.0	23.5	0.225	0.252	0.06	20.9
4182	836.4	RMC	right edge	24.0	23.5	0.034	0.038	0.12	20.9

Table 42: Test results SAR UMTS FDD V 850 MHz (see max. SAR plot in Annex B on page 91.)

* - repeated at the highest SAR measurement according to the FCC KDB 865664
** - maximum possible output power declared by manufacturer

measured / extrapolated SAR numbers - LTE FDD 2 1900 MHz - 0 mm distance										
Ch.	Freq. (MHz)	RB offset	Position	cond. P_{max} (dBm)		SAR_{10g} (W/kg)		power drift (dB)	liquid (°C)	dist. (mm)
				declared**	meas.	meas.	extrap.			
20MHz BW/1RB/QPSK										
18700	1860	0	front	23.0	22.9	1.220	1.248	0.01	22.6	0
18700	1860	0	bottom	23.0	22.9	2.230	2.282	-0.02	22.6	0
18900	1880	99	bottom	23.0	22.8	2.670	2.796	0.06	22.6	0
19100	1900	0	bottom	23.0	22.9	**2.750**	**2.814**	0.04	22.6	0
19100	1900	0	left edge	23.0	22.9	0.506	0.518	-0.16	22.6	0
19100	1900	0	right edge	23.0	22.9	0.019	0.019	0.04	22.6	0
19100	1900	0	bottom*	23.0	22.9	2.730	2.794	0.08	22.6	0
20MHz BW/50RB/QPSK										
18700	1860	0	front	22.0	21.8	0.974	1.020	-0.09	22.6	0
18700	1860	0	bottom	22.0	21.8	1.940	2.031	-0.02	22.6	0
18900	1880	50	bottom	22.0	21.7	2.160	2.314	-0.01	22.6	0
19100	1900	0	bottom	22.0	21.6	2.260	2.478	0.05	22.6	0
18700	1860	0	left edge	22.0	21.8	0.467	0.489	0.06	22.6	0
18700	1860	0	right edge	22.0	21.8	0.011	0.011	-0.16	22.6	0
20MHz BW/100RB/QPSK										
18900	1880	0	front	22.0	21.7	1.060	1.136	-0.04	22.6	0
18700	1860	0	bottom	22.0	21.7	1.900	2.036	0.15	22.6	0
18900	1880	0	bottom	22.0	21.7	2.130	2.282	0.06	22.6	0
19100	1900	0	bottom	22.0	21.5	2.330	2.614	0.06	22.6	0
18900	1880	0	left edge	22.0	21.7	0.442	0.474	-0.03	22.6	0
18900	1880	0	right edge	22.0	21.7	0.013	0.014	0.09	22.6	0

Table 43: Test results SAR LTE FDD 2 1900 MHz (see max. SAR plot in Annex B on page 92.)

* - repeated at the highest SAR measurement according to the FCC KDB 865664
** - maximum possible output power declared by manufacturer

measured / extrapolated SAR numbers - LTE FDD 4 1750 MHz - 0 mm distance										
Ch.	Freq. (MHz)	RB offset	Position	cond. P_{max} (dBm)		SAR_{10g} (W/kg)		power drift (dB)	liquid (°C)	dist. (mm)
				declared**	meas.	meas.	extrap.			
20MHz BW/1RB/QPSK										
20175	1732.5	0	front	23.0	22.4	0.697	0.800	-0.09	22.2	0
20050	1720.0	0	bottom	23.0	22.4	1.360	1.561	0.07	22.2	0
20175	1732.5	0	bottom	23.0	22.4	1.440	1.653	-0.05	22.2	0
20300	1745.0	0	bottom	23.0	22.3	**1.640**	**1.927**	0.17	22.2	0
20175	1732.5	0	left edge	23.0	22.4	0.200	0.230	-0.02	22.2	0
20175	1732.5	0	right edge	23.0	22.4	0.010	0.012	0.04	22.2	0
20MHz BW/50RB/QPSK										
20175	1732.5	0	front	22.0	21.5	0.540	0.606	0.12	22.2	0
20175	1732.5	0	bottom	22.0	21.5	1.020	1.144	-0.02	22.2	0
20175	1732.5	0	left edge	22.0	21.5	0.164	0.184	-0.04	22.2	0
20175	1732.5	0	right edge	22.0	21.5	0.011	0.012	0.01	22.2	0
20MHz BW/100RB/QPSK										
20175	1732.5	0	front	22.0	21.4	0.551	0.633	-0.08	22.2	0
20175	1732.5	0	bottom	22.0	21.4	1.170	1.343	0.01	22.2	0
20175	1732.5	0	left edge	22.0	21.4	0.165	0.189	0.07	22.2	0
20175	1732.5	0	right edge	22.0	21.4	0.009	0.011	-0.17	22.2	0

Table 44: Test results SAR LTE FDD 4 1750 MHz (see max. SAR plot in Annex B on page 93.)

measured / extrapolated SAR numbers - LTE FDD 5 850 MHz - 0 mm distance										
Ch.	Freq. (MHz)	RB offset	Position	cond. P_{max} (dBm)		SAR_{10g} (W/kg)		power drift (dB)	liquid (°C)	dist. (mm)
				declared**	meas.	meas.	extrap.			
10MHz BW/1RB/QPSK										
20450	829.0	25	front	24.0	22.9	0.303	0.390	-0.19	21.8	0
20525	836.5	49	front	24.0	23.0	**0.416**	**0.524**	-0.10	21.8	0
20600	844.0	0	front	24.0	23.1	0.393	0.483	-0.17	21.8	0
20600	844.0	0	bottom	24.0	23.1	0.356	0.438	-0.07	21.8	0
20600	844.0	0	left edge	24.0	23.0	0.205	0.258	-0.07	21.8	0
20600	844.0	0	right edge	24.0	23.0	0.023	0.029	0.08	21.8	0
10MHz BW/25RB/QPSK										
20525	836.5	0	front	23.0	21.9	0.319	0.411	0.01	21.8	0
20525	836.5	0	bottom	23.0	21.9	0.309	0.398	-0.04	21.8	0
20525	836.5	0	left edge	23.0	21.9	0.156	0.201	-0.02	21.8	0
20525	836.5	0	right edge	23.0	21.9	0.020	0.026	0.08	21.8	0

Table 45: Test results SAR LTE FDD 5 850 MHz (see max. SAR plot in Annex B on page 94 .)

** - maximum possible output power declared by manufacturer

measured / extrapolated SAR numbers - LTE FDD 7 2600 MHz - 0 mm distance										
Ch.	Freq. (MHz)	RB offset	Position	cond. P_{max} (dBm)		SAR_{10g} (W/kg)		power drift (dB)	liquid (°C)	dist. (mm)
				declared**	meas.	meas.	extrap.			
20MHz BW/1RB/QPSK										
21100	2535	0	front	23.0	22.1	0.312	0.384	0.09	21.4	0
20850	2510	0	bottom	23.0	21.9	0.329	0.424	-0.06	21.4	0
21100	2535	0	bottom	23.0	22.1	**0.562**	**0.691**	0.04	21.4	0
21350	2560	0	bottom	23.0	21.8	0.382	0.504	-0.08	21.4	0
21100	2535	0	left edge	23.0	22.1	0.464	0.571	0.04	21.4	0
21100	2535	0	right edge	23.0	22.1	0.019	0.023	0.14	21.4	0
20MHz BW/50RB/QPSK										
21100	2535	0	front	22.0	21.0	0.313	0.394	0.07	21.4	0
21100	2535	0	bottom	22.0	21.0	0.543	0.684	0.04	21.4	0
21100	2535	0	left edge	22.0	21.0	0.375	0.472	0.03	21.4	0
21100	2535	0	right edge	22.0	21.0	0.018	0.023	-0.09	21.4	0

Table 46: Test results SAR LTE FDD 7 2600 MHz (see max. SAR plot in Annex B on page 95.)

measured / extrapolated SAR numbers - LTE FDD 12 700 MHz - 0 mm distance										
Ch.	Freq. (MHz)	RB offset	Position	cond. P_{max} (dBm)		SAR_{10g} (W/kg)		power drift (dB)	liquid (°C)	dist. (mm)
				declared**	meas.	meas.	extrap.			
10MHz BW/1RB/QPSK										
23130	711.0	25	front	24.0	23.3	0.331	0.389	-0.09	20.4	0
23060	704.0	0	bottom	24.0	22.9	0.435	**0.560**	-0.09	20.4	0
23095	707.5	0	bottom	24.0	22.8	0.423	0.558	-0.11	20.4	0
23130	711.0	25	bottom	24.0	23.3	**0.438**	0.515	0.15	20.4	0
23130	711.0	25	left edge	24.0	23.3	0.189	0.222	-0.01	20.4	0
23130	711.0	25	right edge	24.0	23.3	0.026	0.031	-0.15	20.4	0
10MHz BW/25RB/QPSK										
23130	711.0	0	front	23.0	21.8	0.275	0.363	0.04	20.4	0
23130	711.0	0	bottom	23.0	21.8	0.360	0.475	-0.04	20.4	0
23130	711.0	0	left edge	23.0	21.8	0.171	0.225	0.08	20.4	0
23130	711.0	0	right edge	23.0	21.8	0.037	0.049	-0.10	20.4	0

Table 47: Test results SAR LTE FDD 12 700 MHz (see max. SAR plot in Annex B on page 96.)

** - maximum possible output power declared by manufacturer

measured / extrapolated SAR numbers - LTE FDD 13 700 MHz - 0 mm distance										
Ch.	Freq. (MHz)	RB offset	Position	cond. P_{max} (dBm)		SAR_{10g} (W/kg)		power drift (dB)	liquid (°C)	dist. (mm)
				declared**	meas.	meas.	extrap.			
5MHz BW/1RB/QPSK										
23205	779.5	12	front	24.0	22.7	0.265	0.357	-0.01	21.4	0
23230	782.0	25	front	24.0	23.0	0.269	0.339	0.01	21.4	0
23255	784.5	12	front	24.0	22.8	**0.280**	**0.369**	0.01	21.4	0
23230	782.0	25	bottom	24.0	23.0	0.272	0.342	-0.10	21.4	0
23230	782.0	25	left edge	24.0	23.0	0.169	0.213	-0.04	21.4	0
23230	782.0	25	right edge	24.0	23.0	0.027	0.033	0.00	21.4	0
10MHz BW/25RB/QPSK										
23230	782.0	0	front	22.0	21.6	0.200	0.219	0.01	21.4	0
23230	782.0	0	bottom	22.0	21.6	0.210	0.230	0.09	21.4	0
23230	782.0	0	left edge	22.0	21.6	0.115	0.126	-0.01	21.4	0
23230	782.0	0	right edge	22.0	21.6	0.022	0.024	-0.05	21.4	0

Table 48: Test results SAR LTE FDD 13 700 MHz (see max. SAR plot in Annex B on page 98.)

measured / extrapolated SAR numbers - LTE FDD 25 1900 MHz - 0 mm distance										
Ch.	Freq. (MHz)	RB offset	Position	cond. P_{max} (dBm)		SAR_{10g} (W/kg)		power drift (dB)	liquid (°C)	dist. (mm)
				declared**	meas.	meas.	extrap.			
20MHz BW/1RB/QPSK										
26365	1882.5	50	front	23.0	22.7	1.110	1.189	-0.17	22.2	0
26140	1860.0	50	bottom	23.0	22.5	2.340	2.626	0.09	22.2	0
26365	1882.5	50	bottom	23.0	22.7	2.480	2.657	0.10	22.2	0
26590	1905.0	50	bottom	23.0	22.7	2.770	2.968	0.11	22.2	0
26365	1882.5	50	left edge	23.0	22.7	0.621	0.665	-0.09	22.2	0
26365	1882.5	50	right edge	23.0	22.7	0.010	0.011	0.05	22.2	0
26590	1905.0	50	bottom**	23.0	22.7	**2.880**	**3.086**	-0.06	22.2	0
20MHz BW/50RB/QPSK										
26365	1882.5	0	front	22.0	21.7	0.985	1.055	-0.10	22.2	0
26140	1860.0	0	bottom	22.0	21.6	1.880	2.061	0.17	22.2	0
26365	1882.5	0	bottom	22.0	21.7	1.920	2.057	-0.04	22.2	0
26590	1905.0	0	bottom	22.0	21.6	1.600	1.754	0.05	22.2	0
26365	1882.5	0	left edge	22.0	21.7	0.468	0.501	0.12	22.2	0
26365	1882.5	0	right edge	22.0	21.7	0.008	0.009	-0.14	22.2	0
20MHz BW/100RB/QPSK										
26140	1860.0	0	front	22.0	21.7	0.943	1.010	-0.12	22.2	0
26140	1860.0	0	bottom	22.0	21.7	1.920	2.057	0.02	22.2	0
26365	1882.5	0	bottom	22.0	21.6	2.090	2.292	0.04	22.2	0
26590	1905.0	0	bottom	22.0	21.6	2.360	2.588	0.11	22.2	0
26140	1860.0	0	left edge	22.0	21.7	0.454	0.486	0.09	22.2	0
26140	1860.0	0	right edge	22.0	21.7	0.008	0.009	0.02	22.2	0

Table 49: Test results SAR LTE FDD 25 1900 MHz (see max. SAR plot in Annex B on page 99.)

* - repeated at the highest SAR measurement according to the FCC KDB 865664
** - maximum possible output power declared by manufacturer

measured / extrapolated SAR numbers - LTE FDD 26 850 MHz - 0 mm distance										
Ch.	Freq. (MHz)	RB offset	Position	cond. P_{max} (dBm)		SAR_{10g} (W/kg)		power drift (dB)	liquid (°C)	dist. (mm)
				declared**	meas.	meas.	extrap.			
15MHz BW/1RB/QPSK										
26765	821.5	74	front	24.0	22.8	**0.454**	**0.598**	0.13	21.8	0
26865	831.5	0	front	24.0	22.7	0.423	0.571	-0.03	21.8	0
26965	841.5	0	front	24.0	23.0	0.409	0.515	0.01	21.8	0
26965	841.5	0	bottom	24.0	23.0	0.373	0.470	-0.05	21.8	0
26965	841.5	0	left edge	24.0	23.0	0.190	0.239	0.06	21.8	0
26965	841.5	0	right edge	24.0	23.0	0.026	0.033	0.11	21.8	0
15MHz BW/36RB/QPSK										
26865	831.5	19	front	22.0	21.7	0.352	0.377	-0.12	21.8	0
26865	831.5	19	bottom	22.0	21.7	0.294	0.315	0.00	21.8	0
26865	831.5	19	left edge	22.0	21.7	0.152	0.163	0.04	21.8	0
26865	831.5	19	right edge	22.0	21.7	0.018	0.020	0.09	21.8	0

Table 50: Test results SAR WLAN 2450 MHz (see max. SAR plot in Annex B on page 100.)

** - maximum possible output power declared by manufacturer

7.2.3 Results added from CTC Advanced report (1-6927/18-01-12)

measured / extrapolated SAR numbers - WLAN 2450 MHz													
Ch.	*Freq. (MHz)*	*test cond.*	*Position*	*cond. P_{max} (dBm)*		*SAR_{1g} (W/kg)*			*SAR_{10g} (W/kg)*			*power drift (dB)*	*liquid (°C)*
				*decl.**	*meas.*	*meas.*	*extrap.*	*100% DF*	*meas.*	*extrap.*	*100% DF*		
6	*2437*	*1Mbit/s*	*bottom*	*19.5*	*19.0*	*0.451*	*0.506*	*0.516*	*0.178*	*0.200*	*0.204*	*-0.12*	*21.8*
1	*2412*	*1Mbit/s*	*side*	*19.5*	*17.6*	*0.724*	*1.121*	*1.144*	*0.307*	*0.475*	*0.485*	*0.11*	*21.8*
6	*2437*	*1Mbit/s*	*side*	*19.5*	*19.0*	*0.838*	*0.940*	*0.959*	*0.363*	*0.407*	*0.416*	*-0.18*	*21.8*
11	*2462*	*1Mbit/s*	*side*	*19.5*	*17.9*	*1.020*	*1.474*	*1.504*	*0.442*	*0.639*	*0.652*	*-0.10*	*21.8*
11	*2462*	*1Mbit/s*	*side***	*19.5*	*17.9*	*1.050*	*1.518*	*1.549*	***0.450***	***0.650***	***0.664***	*-0.16*	*21.8*

Table 51: Test results SAR WLAN 2450 MHz

measured / extrapolated SAR numbers - WLAN 5 GHz													
Ch.	*Freq. (MHz)*	*test cond.*	*Position*	*cond. P_{max} (dBm)*		*SAR_{1g} (W/kg)*			*SAR_{10g} (W/kg)*			*power drift (dB)*	*liquid (°C)*
				*decl.***	*meas.*	*meas.*	*extrap.*	*100% DF*	*meas.*	*extrap.*	*100% DF*		
40	*5200*	*6Mbit/s*	*bottom*	*16.0*	*15.0*	*0.293*	*0.369*	*0.376*	*0.086*	*0.108*	*0.111*	*-0.09*	*21.8*
56	*5280*	*6Mbit/s*	*bottom*	*16.0*	*15.1*	*0.322*	*0.396*	*0.404*	*0.097*	*0.119*	*0.121*	*-0.03*	*21.8*
100	*5500*	*6Mbit/s*	*bottom*	*14.0*	*13.0*	*0.302*	*0.380*	*0.388*	*0.151*	*0.190*	*0.194*	*-0.16*	*21.8*
157	*5785*	*6Mbit/s*	*bottom*	*14.0*	*13.5*	*0.214*	*0.240*	*0.245*	*0.065*	*0.072*	*0.074*	*0.03*	*21.8*
36	*5180*	*6Mbit/s*	*side*	*16.0*	*14.8*	*0.942*	*1.242*	*1.267*	*0.227*	*0.299*	*0.305*	*0.08*	*21.8*
40	*5200*	*6Mbit/s*	*side*	*16.0*	*15.0*	*0.866*	*1.090*	*1.112*	*0.214*	*0.269*	*0.275*	*0.03*	*21.8*
48	*5240*	*6Mbit/s*	*side*	*16.0*	*14.8*	*0.556*	*0.733*	*0.748*	*0.136*	*0.179*	*0.183*	*-0.05*	*21.8*
52	*5260*	*6Mbit/s*	*side*	*16.0*	*14.7*	*0.834*	*1.125*	*1.148*	*0.212*	*0.286*	*0.292*	*-0.18*	*21.8*
56	*5280*	*6Mbit/s*	*side*	*16.0*	*15.1*	*0.825*	*1.015*	*1.036*	*0.212*	*0.261*	*0.266*	*0.02*	*21.8*
64	*5320*	*6Mbit/s*	*side*	*16.0*	*14.5*	*0.787*	*1.112*	*1.134*	*0.205*	*0.290*	*0.295*	*-0.13*	*21.8*
100	*5500*	*6Mbit/s*	*side*	*14.0*	*13.0*	*0.769*	*0.968*	*0.988*	*0.224*	*0.282*	*0.288*	*-0.08*	*21.8*
104	*5520*	*6Mbit/s*	*side*	*14.0*	*12.9*	*0.750*	*0.966*	*0.986*	*0.227*	*0.292*	*0.298*	*-0.20*	*21.8*
124	*5620*	*6Mbit/s*	*side*	*14.0*	*12.7*	*0.623*	*0.840*	*0.858*	*0.196*	*0.264*	*0.270*	*-0.04*	*21.8*
140	*5700*	*6Mbit/s*	*side*	*14.0*	*12.6*	*0.557*	*0.769*	*0.785*	*0.183*	*0.253*	*0.258*	*-0.02*	*21.8*
157	*5785*	*6Mbit/s*	*side*	*14.0*	*13.5*	*0.413*	*0.463*	*0.473*	*0.131*	*0.147*	*0.150*	*-0.10*	*21.8*
36	*5180*	*6Mbit/s*	*side (wc)*	*16.0*	*14.8*	*0.995*	*1.312*	*1.338*	***0.238***	***0.314***	***0.320***	*-0.01*	*21.7*

Table 52: Test results SAR WLAN 5 GHz

measured / extrapolated SAR numbers - Bluetooth 2450 MHz										
Ch.	*Freq. (MHz)*	*Position*	*cond. P_{max} (dBm)*		*SAR_{1g} (W/kg)*		*SAR_{10g} (W/kg)*		*power drift (dB)*	*liquid (°C)*
			*decl.**	*meas.*	*meas.*	*extrap.*	*meas.*	*extrap.*		
39	*2441*	*bottom*	*11.0*	*10.7*	*0.039*	*0.042*	*0.016*	*0.017*	*-0.01*	*21.8*
0	*2402*	*side*	*11.0*	*10.4*	*0.072*	*0.083*	*0.028*	*0.033*	*0.01*	*21.8*
39	*2441*	*side*	*11.0*	*10.7*	*0.082*	*0.088*	***0.036***	***0.038***	*-0.03*	*21.8*
78	*2480*	*side*	*11.0*	*9.9*	*0.037*	*0.048*	*0.016*	*0.020*	*-0.08*	*21.8*

Table 53: Test results SAR Bluetooth 2.4 GHz

* - maximum possible output power declared by manufacturer
** - repeated at the highest SAR measurement according to the FCC KDB 865664

7.2.4 Multiple Transmitter Information

The following tables list information which is relevant for the decision if a simultaneous transmit evaluation is necessary according to FCC KDB 447498D01 General RF Exposure Guidance v05.

reported SAR WWAN, BT and WLAN 2.4GHz, ΣSAR evaluation					
Frequency band	Position	SAR_{max} /W/kg			ΣSAR
		WWAN	BT	WLAN	<4W/kg
GSM 850	front	0.616	0.000	0.000	0.616
	bottom	0.825	0.017	0.204	1.046
	left	0.274	0.000	0.000	0.274
	right	0.039	0.038	0.664	0.741
GSM 1900	front	1.573	0.000	0.000	1.573
	bottom	3.341	0.017	0.204	**3.562**
	left	0.883	0.000	0.000	0.883
	right	0.018	0.038	0.664	0.720
UMTS FDD II	front	1.245	0.000	0.000	1.245
	bottom	3.022	0.017	0.204	3.243
	left	0.606	0.000	0.000	0.606
	right	0.011	0.038	0.664	0.713
WCDMA FDD IV	front	0.758	0.000	0.000	0.758
	bottom	1.843	0.017	0.204	2.064
	left	0.222	0.000	0.000	0.222
	right	0.010	0.038	0.664	0.712
WCDMA FDD V	front	0.493	0.000	0.000	0.493
	bottom	0.469	0.017	0.204	0.690
	left	0.252	0.000	0.000	0.252
	right	0.038	0.038	0.664	0.740
LTE FDD 2	front	1.248	0.000	0.000	1.248
	bottom	2.814	0.017	0.204	3.035
	left	0.518	0.000	0.000	0.518
	right	0.019	0.038	0.664	0.721
LTE FDD 4	front	0.800	0.000	0.000	0.800
	bottom	1.927	0.017	0.204	2.148
	left	0.230	0.000	0.000	0.230
	right	0.012	0.038	0.664	0.714
LTE FDD 5	front	0.524	0.000	0.000	0.524
	bottom	0.438	0.017	0.204	0.659
	left	0.258	0.000	0.000	0.258
	right	0.029	0.038	0.664	0.731
LTE FDD 7	front	0.394	0.000	0.000	0.394
	bottom	0.691	0.017	0.204	0.912
	left	0.571	0.000	0.000	0.571
	right	0.023	0.038	0.664	0.725
LTE FDD 12	front	0.389	0.000	0.000	0.389
	bottom	0.560	0.017	0.204	0.781
	left	0.225	0.000	0.000	0.225
	right	0.049	0.038	0.664	0.751
LTE FDD 13	front	0.369	0.000	0.000	0.369
	bottom	0.342	0.017	0.204	0.563
	left	0.213	0.000	0.000	0.213
	right	0.033	0.038	0.664	0.735
LTE FDD 25	front	1.189	0.000	0.000	1.189
	bottom	3.086	0.017	0.204	3.307
	left	0.665	0.000	0.000	0.665
	right	0.011	0.038	0.664	0.713
LTE FDD 26	front	0.598	0.000	0.000	0.598
	bottom	0.470	0.017	0.204	0.691
	left	0.239	0.000	0.000	0.239
	right	0.033	0.038	0.664	0.735

Table 54: SAR_{max} WWAN, BT and **WLAN 2.4GHz**, ΣSAR evaluation

reported SAR WWAN, BT and WLAN 5GHz, ΣSAR evaluation					
Frequency band	Position	SAR_{max} /W/kg			ΣSAR
		WWAN	BT	WLAN	<4W/kg
GSM 850	front	0.616	0.000	0.000	0.616
	bottom	0.825	0.017	0.194	1.036
	left	0.274	0.000	0.000	0.274
	right	0.039	0.038	0.320	0.397
GSM 1900	front	1.573	0.000	0.000	1.573
	bottom	3.341	0.017	0.194	3.552
	left	0.883	0.000	0.000	0.883
	right	0.018	0.038	0.320	0.376
UMTS FDD II	front	1.245	0.000	0.000	1.245
	bottom	3.022	0.017	0.194	3.233
	left	0.606	0.000	0.000	0.606
	right	0.011	0.038	0.320	0.369
WCDMA FDD IV	front	0.758	0.000	0.000	0.758
	bottom	1.843	0.017	0.194	2.054
	left	0.222	0.000	0.000	0.222
	right	0.010	0.038	0.320	0.368
WCDMA FDD V	front	0.493	0.000	0.000	0.493
	bottom	0.469	0.017	0.194	0.680
	left	0.252	0.000	0.000	0.252
	right	0.038	0.038	0.320	0.396
LTE FDD 2	front	1.248	0.000	0.000	1.248
	bottom	2.814	0.017	0.194	3.025
	left	0.518	0.000	0.000	0.518
	right	0.019	0.038	0.320	0.377
LTE FDD 4	front	0.800	0.000	0.000	0.800
	bottom	1.927	0.017	0.194	2.138
	left	0.230	0.000	0.000	0.230
	right	0.012	0.038	0.320	0.370
LTE FDD 5	front	0.524	0.000	0.000	0.524
	bottom	0.438	0.017	0.194	0.649
	left	0.258	0.000	0.000	0.258
	right	0.029	0.038	0.320	0.387
LTE FDD 7	front	0.394	0.000	0.000	0.394
	bottom	0.691	0.017	0.194	0.902
	left	0.571	0.000	0.000	0.571
	right	0.023	0.038	0.320	0.381
LTE FDD 12	front	0.389	0.000	0.000	0.389
	bottom	0.560	0.017	0.194	0.771
	left	0.225	0.000	0.000	0.225
	right	0.049	0.038	0.320	0.407
LTE FDD 13	front	0.369	0.000	0.000	0.369
	bottom	0.342	0.017	0.194	0.553
	left	0.213	0.000	0.000	0.213
	right	0.033	0.038	0.320	0.391
LTE FDD 25	front	1.189	0.000	0.000	1.189
	bottom	3.086	0.017	0.194	3.297
	left	0.665	0.000	0.000	0.665
	right	0.011	0.038	0.320	0.369
LTE FDD 26	front	0.598	0.000	0.000	0.598
	bottom	0.470	0.017	0.194	0.681
	left	0.239	0.000	0.000	0.239
	right	0.033	0.038	0.320	0.391

Table 55: SAR_{max} WWAN and **WLAN 5GHz**, ΣSAR evaluation,

Conclusion:

ΣSAR < 4 W/kg, therefore simultaneous transmissions SAR measurement with the enlarged zoom scan measurement and volume scan post-processing procedures is **not** required.

8 Test equipment and ancillaries used for tests

To simplify the identification of the test equipment and/or ancillaries which were used, the reporting of the relevant test cases only refer to the test item number as specified in the table below.

Equipment	Type	Manufacturer	Serial No.	Last Calibration	Frequency (months)
Dosimetric E-Field Probe	ES3DV3	Schmid & Partner Engineering AG	3326	August 17, 2018	12
Dosimetric E-Field Probe	EX3DV4	Schmid & Partner Engineering AG	3944	May 18, 2018	12
750 MHz System Validation Dipole	D750V3	Schmid & Partner Engineering AG	1041	January 16, 2017	36
835 MHz System Validation Dipole	D835V2	Schmid & Partner Engineering AG	4d153	May 11, 2017	36
900 MHz System Validation Dipole	D900V2	Schmid & Partner Engineering AG	102	May 23, 2018	36
1750 MHz System Validation Dipole	D1750V2	Schmid & Partner Engineering AG	1093	May 15, 2018	36
1900 MHz System Validation Dipole	D1900V2	Schmid & Partner Engineering AG	5d009	May 10, 2017	36
2600 MHz System Validation Dipole	D2600V2	Schmid & Partner Engineering AG	1040	May 09, 2017	36
Data acquisition electronics	DAE3V1	Schmid & Partner Engineering AG	477	May 18, 2018	12
Data acquisition electronics	DAE4	Schmid & Partner Engineering AG	1387	August 10, 2018	12
Software	DASY52 52.8.7	Schmid & Partner Engineering AG	---	N/A	--
Triple Modular Flat Phantom V5.1	QD 000 P51 C	Schmid & Partner Engineering AG	1154	N/A	--
SAM Twin Phantom V5.0	QD 000 P40 C	Schmid & Partner Engineering AG	1813	N/A	--
Phantom ELI 4.0	QDOVA0 01BA	Schmid & Partner Engineering AG	1046	N/A	--
Universal Radio Communication Tester	CMU 200	Rohde & Schwarz	106826	December 17, 2018	24
Universal Radio Communication Tester	CMW500	Rohde & Schwarz	102375	January 11, 2018	24
Network Analyser 300 kHz to 6 GHz	8753ES	Agilent Technologies)*	US39174436	December 14, 2017	24
Dielectric Probe Kit	85070C	Hewlett Packard	US99360146	N/A	12
Signal Generator	8665A	Hewlett Packard	2833A00112	December 14, 2017	24
Amplifier	25S1G4 (25 Watt)	Amplifier Reasearch	20452	N/A	--
Power Meter	NRP	Rohde & Schwarz	101367	December 11, 2018	24
Power Meter Sensor	NRP Z22	Rohde & Schwarz	100227	December 11, 2018	12
Power Meter Sensor	NRP Z22	Rohde & Schwarz	100234	December 11, 2018	12
Directional Coupler	778D	Hewlett Packard	19171	December 10, 2017	12

)* : Network analyzer probe calibration against air, distilled water and a shorting block performed before measuring liquid parameters.

9 Observations

No observations exceeding those reported with the single test cases have been made.

Date/Time: 11.03.2019 08:45:12

SystemPerformanceCheck-D750 MSL 2019-03-11

DUT: Dipole 750 MHz; Type: D750V3; Serial: 1041

Communication System: UID 0, CW (0); Communication System Band: D750 (750.0 MHz); Frequency: 750 MHz; Communication System PAR: 0 dB; PMF: 1

Medium parameters used: f = 750 MHz; σ = 0.948 S/m; ε_r = 55.974; ρ = 1000 kg/m^3

Phantom section: Flat Section

Measurement Standard: DASY5

DASY5 Configuration:

- Probe: EX3DV4 - SN3944; ConvF(10.41, 10.41, 10.41); Calibrated: 18.05.2018;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 26.0
- Electronics: DAE3 Sn477; Calibrated: 18.05.2018
- Phantom: SAM; Type: SAM; Serial: 1043
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

MSL700to850/d=15mm, Pin=100 mW, dist=1.4mm/Area Scan (41x41x1):

Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 1.11 W/kg

MSL700to850/d=15mm, Pin=100 mW, dist=1.4mm/Zoom Scan (5x5x7)/Cube 0:

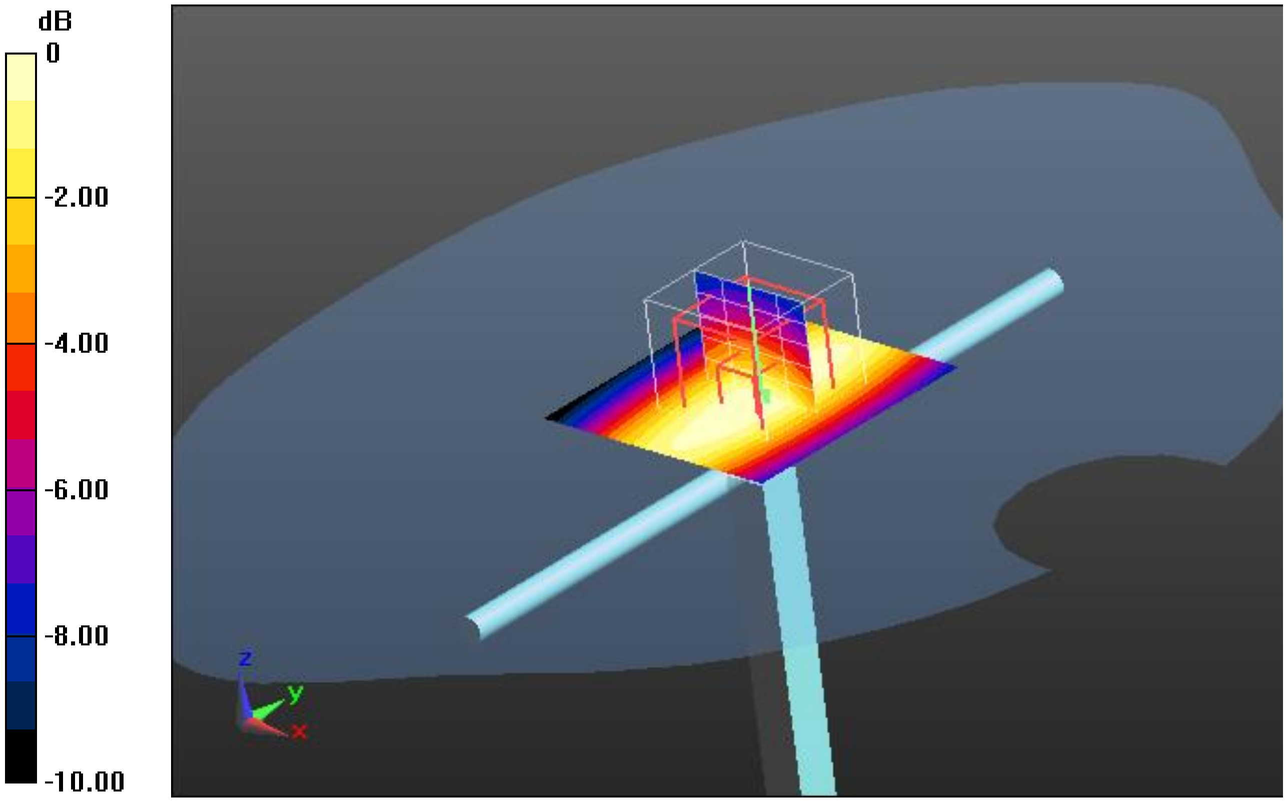
Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 35.113 V/m; Power Drift = -0.16 dB

Peak SAR (extrapolated) = 1.23 W/kg

SAR(1 g) = 0.821 W/kg; SAR(10 g) = 0.544 W/kg

Maximum value of SAR (measured) = 1.09 W/kg



0 dB = 1.09 W/kg = 0.37 dBW/kg

Additional information:

ambient temperature: 23.4°C; liquid temperature: 20.4°C

Date/Time: 12.03.2019 08:53:39

SystemPerformanceCheck-D750 MSL 2019-03-12

DUT: Dipole 750 MHz; Type: D750V3; Serial: 1041

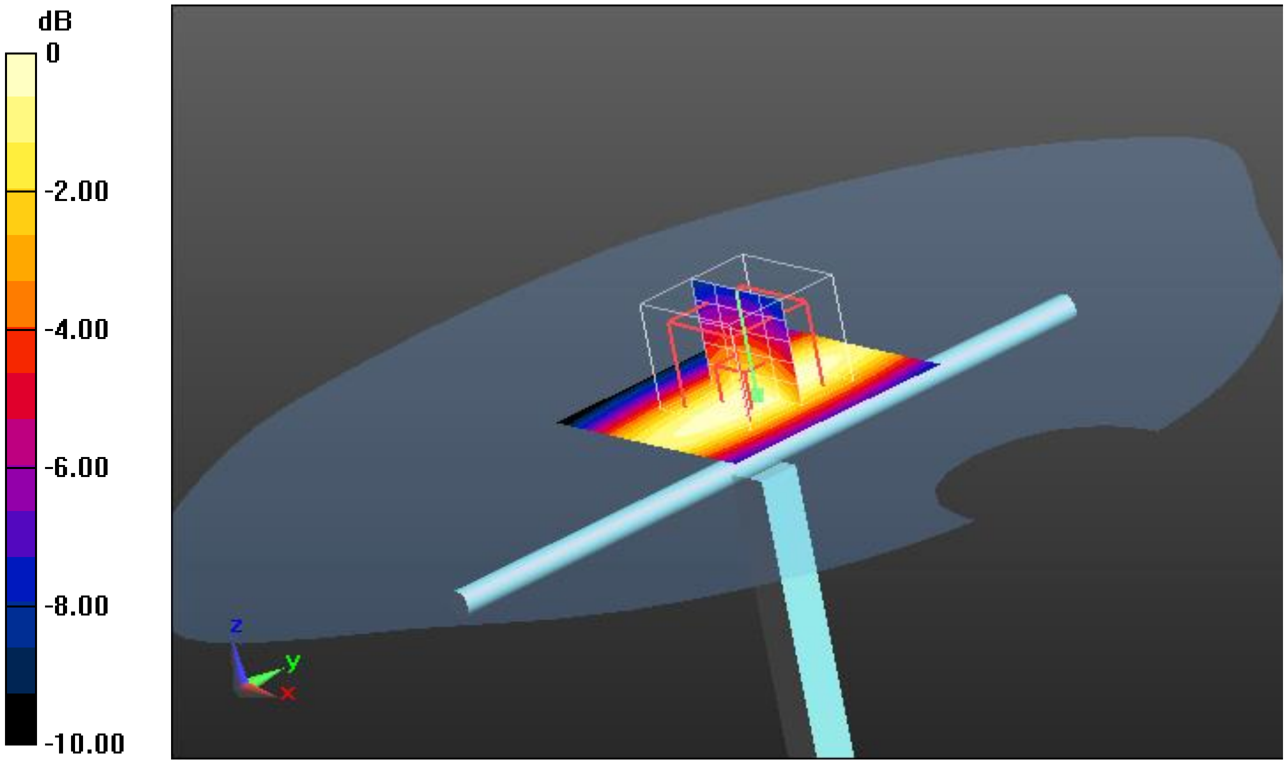
Communication System: UID 0, CW (0); Communication System Band: D750 (750.0 MHz); Frequency: 750 MHz; Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 750 MHz; σ = 0.948 S/m; ε_r = 55.974; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5
DASY5 Configuration:
- Probe: EX3DV4 - SN3944; ConvF(10.41, 10.41, 10.41); Calibrated: 18.05.2018;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 26.0
- Electronics: DAE3 Sn477; Calibrated: 18.05.2018
- Phantom: SAM; Type: SAM; Serial: 1043
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

MSL700to850/d=15mm, Pin=100 mW, dist=1.4mm/Area Scan (41x41x1):

Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.11 W/kg

MSL700to850/d=15mm, Pin=100 mW, dist=1.4mm/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 35.345 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 1.27 W/kg
SAR(1 g) = 0.840 W/kg; SAR(10 g) = 0.555 W/kg
Maximum value of SAR (measured) = 1.13 W/kg



0 dB = 1.13 W/kg = 0.53 dBW/kg

Additional information:
ambient temperature: 21.2°C; liquid temperature: 21.6°C

Date/Time: 07.03.2019 11:36:29

SystemPerformanceCheck-D835 MSL 2019-03-07

DUT: Dipole 835 MHz; Type: D835V2; Serial: 4d153

Communication System: UID 0, CW (0); Communication System Band: D835 (835.0 MHz); Frequency: 835 MHz; Communication System PAR: 0 dB; PMF: 1

Medium parameters used: f = 835 MHz; σ = 0.98 S/m; ε_r = 55.782; ρ = 1000 kg/m^3

Phantom section: Flat Section

Measurement Standard: DASY5

DASY5 Configuration:

- Probe: EX3DV4 - SN3944; ConvF(10.11, 10.11, 10.11); Calibrated: 18.05.2018;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 26.0
- Electronics: DAE3 Sn477; Calibrated: 18.05.2018
- Phantom: SAM; Type: SAM; Serial: 1043
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

MSL700to850/d=15mm, Pin=100 mW, dist=1.4mm/Area Scan (41x41x1):

Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 1.37 W/kg

MSL700to850/d=15mm, Pin=100 mW, dist=1.4mm/Zoom Scan (5x5x7)/Cube 0:

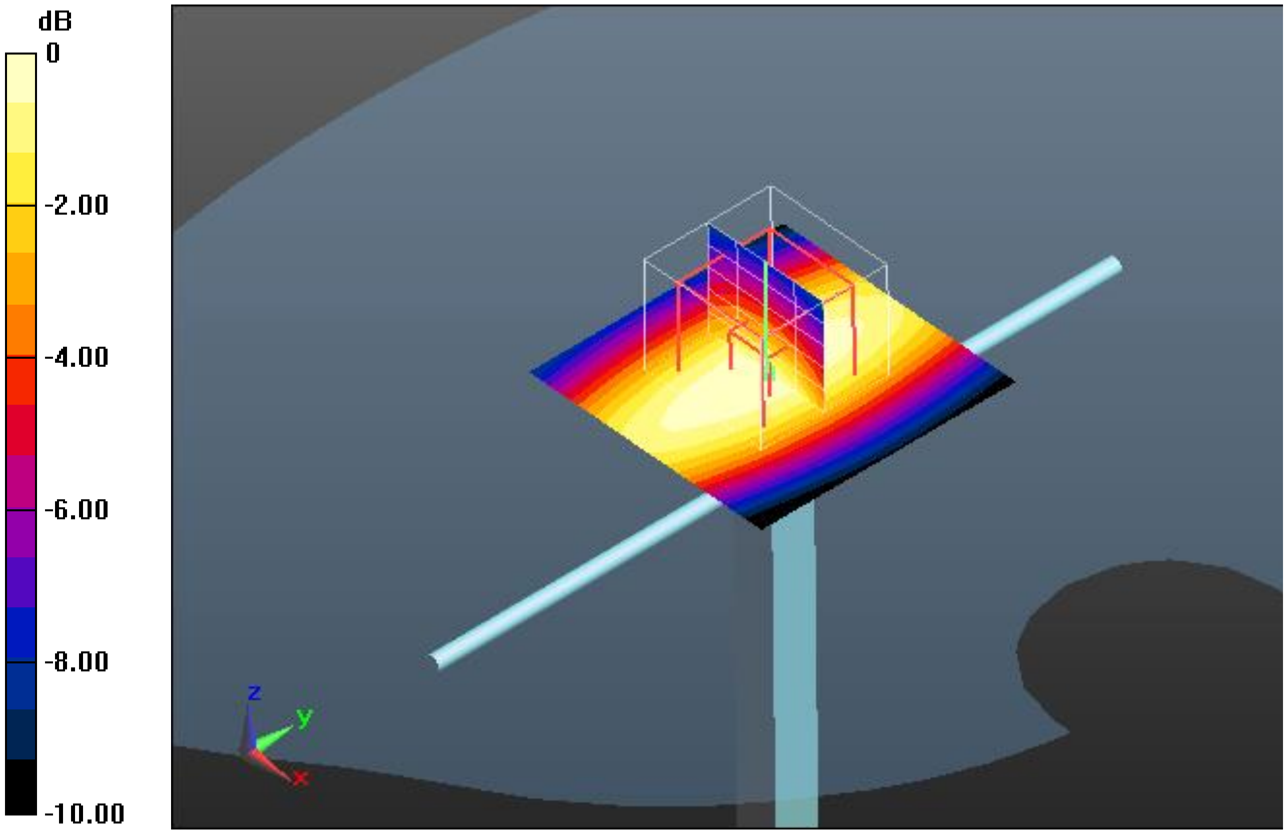
Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 39.036 V/m; Power Drift = -0.12 dB

Peak SAR (extrapolated) = 1.54 W/kg

SAR(1 g) = 1.03 W/kg; SAR(10 g) = 0.676 W/kg

Maximum value of SAR (measured) = 1.37 W/kg



0 dB = 1.37 W/kg = 1.37 dBW/kg

Additional information:

ambient temperature: 23.4°C; liquid temperature: 20.9°C

Date/Time: 08.03.2019 16:35:44

SystemPerformanceCheck-D835 MSL 2019-03-08

DUT: Dipole 835 MHz; Type: D835V2; Serial: 4d153

Communication System: UID 0, CW (0); Communication System Band: D835 (835.0 MHz); Frequency: 835 MHz; Communication System PAR: 0 dB; PMF: 1

Medium parameters used: f = 835 MHz; σ = 0.98 S/m; ε_r = 55.782; ρ = 1000 kg/m^3

Phantom section: Flat Section

Measurement Standard: DASY5

DASY5 Configuration:

- Probe: EX3DV4 - SN3944; ConvF(10.11, 10.11, 10.11); Calibrated: 18.05.2018;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 26.0
- Electronics: DAE3 Sn477; Calibrated: 18.05.2018
- Phantom: SAM; Type: SAM; Serial: 1043
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

MSL700to850/d=15mm, Pin=100 mW, dist=1.4mm/Area Scan (41x41x1):

Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 1.38 W/kg

MSL700to850/d=15mm, Pin=100 mW, dist=1.4mm/Zoom Scan (5x5x7)/Cube 0:

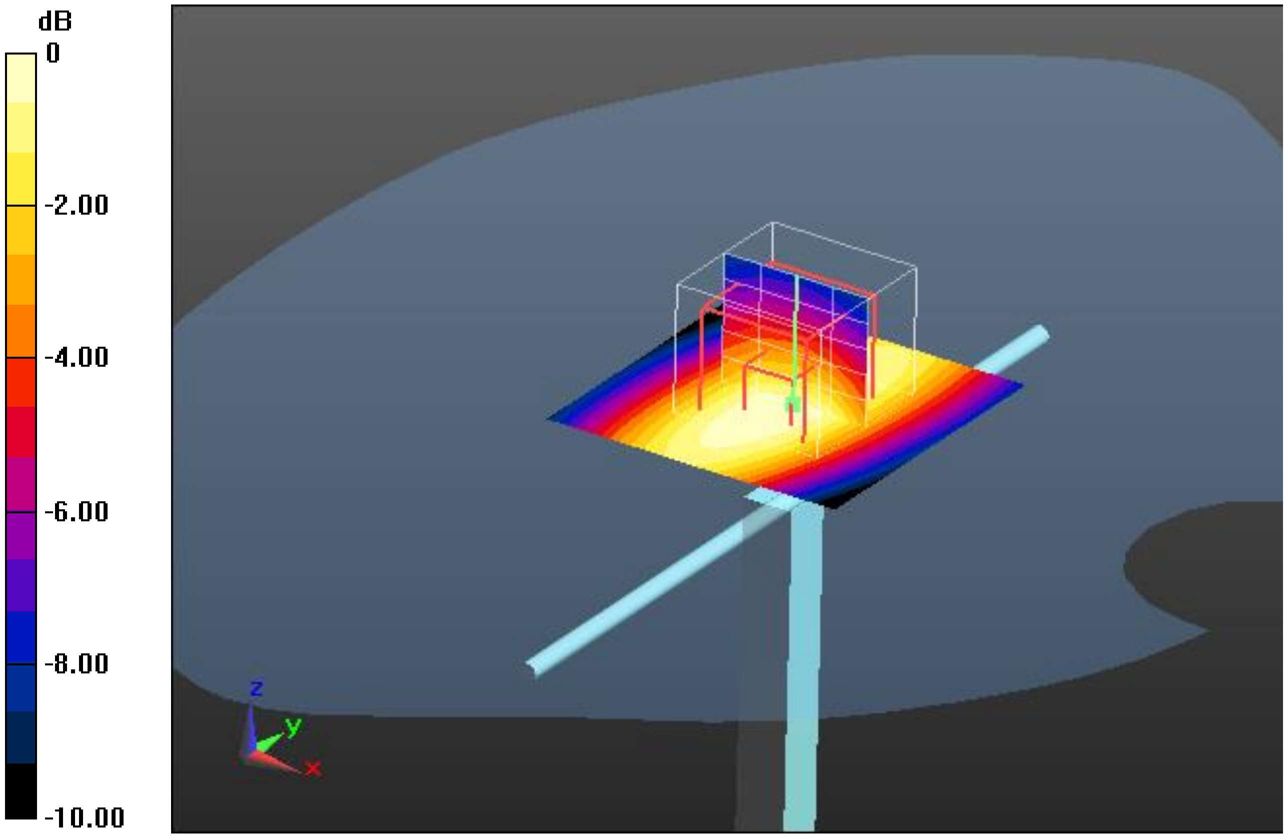
Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 39.242 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 1.56 W/kg

SAR(1 g) = 1.03 W/kg; SAR(10 g) = 0.676 W/kg

Maximum value of SAR (measured) = 1.37 W/kg



0 dB = 1.37 W/kg = 1.37 dBW/kg

Additional information:

ambient temperature: 23.9°C; liquid temperature: 21.8°C

Date/Time: 13.03.2019 15:41:09

SystemPerformanceCheck-D1750 HSL 2019-03-13

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: 1093

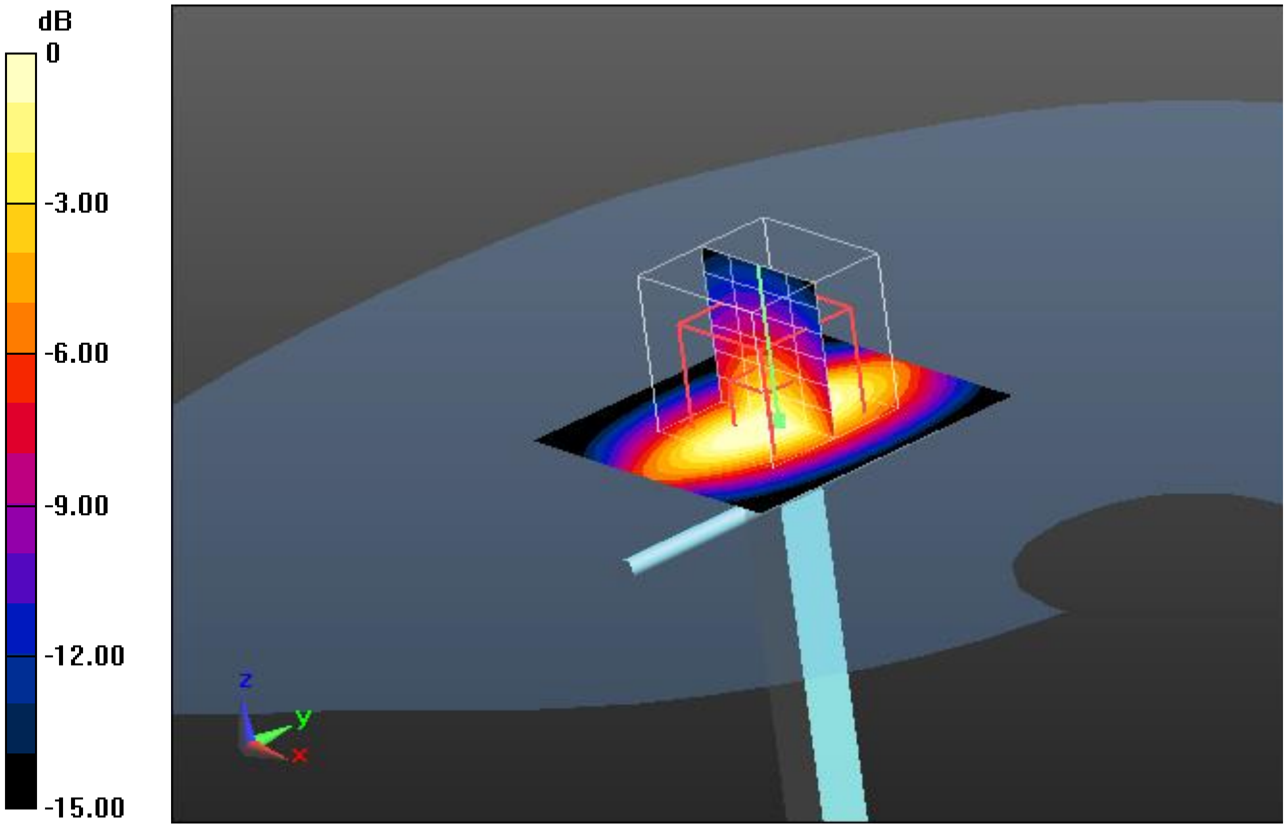
Communication System: UID 0, CW (0); Communication System Band: D1750 (1750.0 MHz); Frequency: 1750 MHz; Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 1750 MHz; σ = 1.433 S/m; ε_r = 52.605; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5
DASY5 Configuration:
- Probe: EX3DV4 - SN3944; ConvF(8.38, 8.38, 8.38); Calibrated: 18.05.2018;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE3 Sn477; Calibrated: 18.05.2018
- Phantom: SAM; Type: SAM; Serial: 1043
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

MSL1900/d=10mm, Pin=100 mW, dist=1.4mm/Area Scan (41x41x1):

Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 6.14 W/kg

MSL1900/d=10mm, Pin=100 mW, dist=1.4mm/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 64.762 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 6.74 W/kg
SAR(1 g) = 3.73 W/kg; SAR(10 g) = 1.98 W/kg
Maximum value of SAR (measured) = 5.72 W/kg



0 dB = 5.72 W/kg = 7.57 dBW/kg

Additional information:
ambient temperature: 23.4°C; liquid temperature: 22.2°C

Date/Time: 15.03.2019 12:11:57

SystemPerformanceCheck-D1750 MSL 2019-03-15

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: 1093

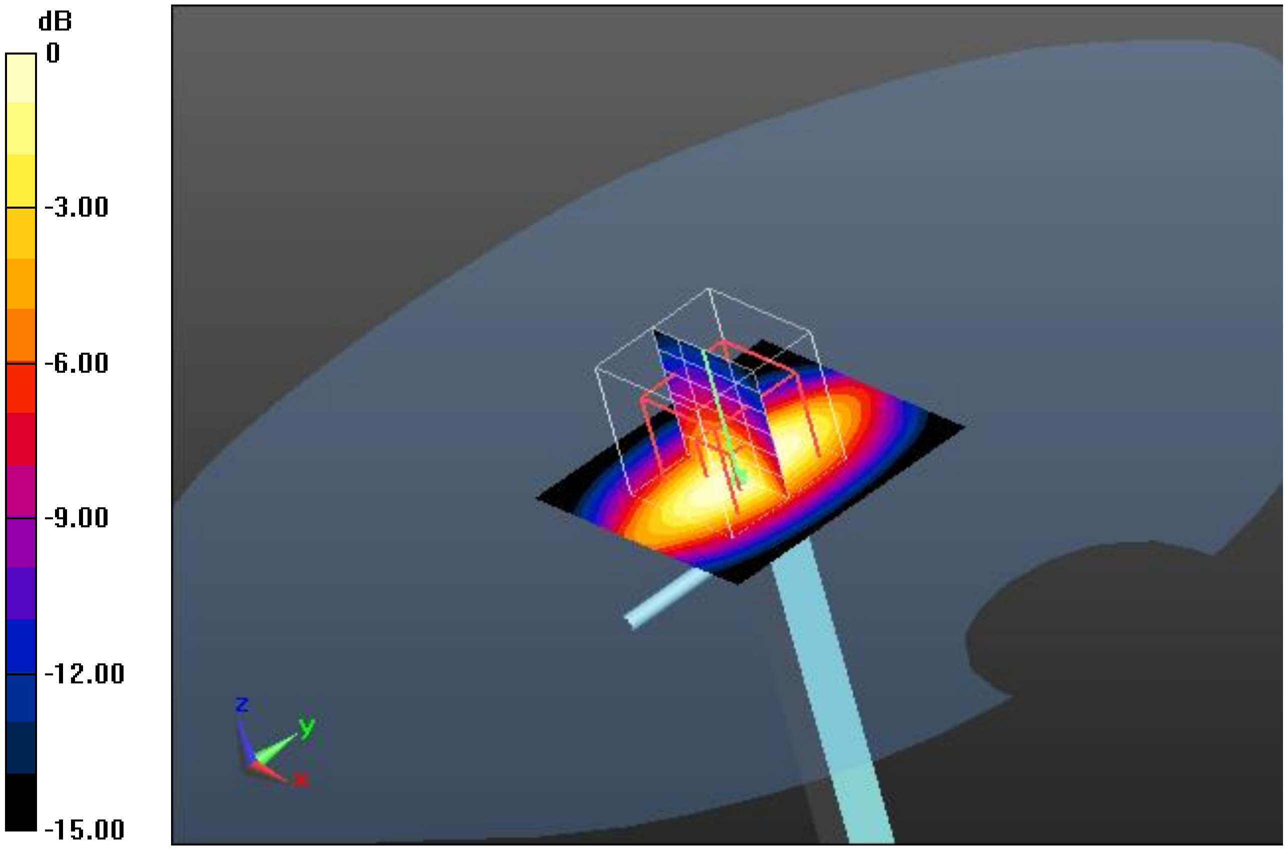
Communication System: UID 0, CW (0); Communication System Band: D1750 (1750.0 MHz); Frequency: 1750 MHz; Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 1750 MHz; σ = 1.433 S/m; ε_r = 52.605; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5
DASY5 Configuration:
- Probe: EX3DV4 - SN3944; ConvF(8.38, 8.38, 8.38); Calibrated: 18.05.2018;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE3 Sn477; Calibrated: 18.05.2018
- Phantom: SAM; Type: SAM; Serial: 1043
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

MSL1900/d=10mm, Pin=100 mW, dist=1.4mm/Area Scan (41x41x1):

Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 5.84 W/kg

MSL1900/d=10mm, Pin=100 mW, dist=1.4mm/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 64.387 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 6.68 W/kg
SAR(1 g) = 3.73 W/kg; SAR(10 g) = 1.98 W/kg
Maximum value of SAR (measured) = 5.61 W/kg



0 dB = 5.61 W/kg = 7.49 dBW/kg

Additional information:
ambient temperature: 23.4°C; liquid temperature: 22.2°C

Date/Time: 13.03.2019 15:18:46

SystemPerformanceCheck-D1900 HSL 2019-03-13

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d009

Communication System: UID 0, CW (0); Communication System Band: D1900 (1900.0 MHz); Frequency: 1900 MHz; Communication System PAR: 0 dB; PMF: 1

Medium parameters used: f = 1900 MHz; σ = 1.526 S/m; ε_r = 52.357; ρ = 1000 kg/m^3

Phantom section: Flat Section

Measurement Standard: DASY5

DASY5 Configuration:

- Probe: EX3DV4 - SN3944; ConvF(8.08, 8.08, 8.08); Calibrated: 18.05.2018;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE3 Sn477; Calibrated: 18.05.2018
- Phantom: SAM; Type: SAM; Serial: 1043
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

MSL1900/d=10mm, Pin=100 mW, dist=1.4mm/Area Scan (41x41x1):

Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 5.96 W/kg

MSL1900/d=10mm, Pin=100 mW, dist=1.4mm/Zoom Scan (5x5x7)/Cube 0:

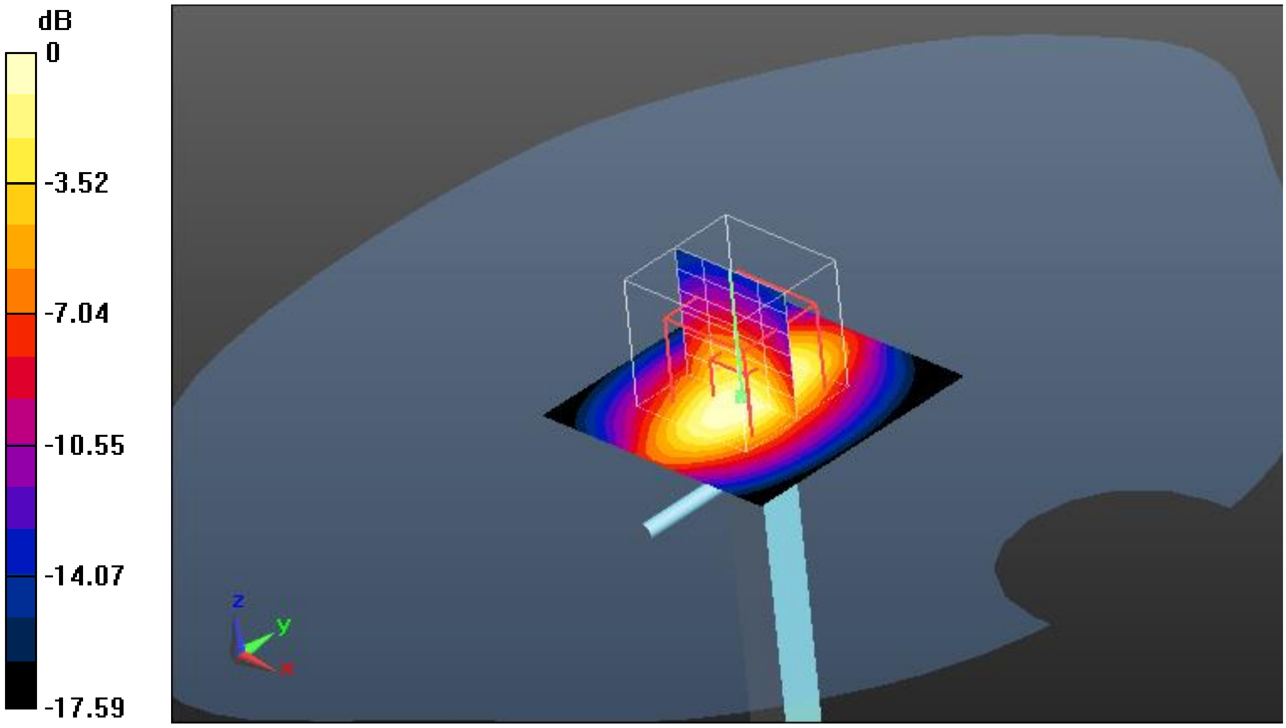
Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 64.753 V/m; Power Drift = -0.10 dB

Peak SAR (extrapolated) = 7.03 W/kg

SAR(1 g) = 3.84 W/kg; SAR(10 g) = 1.99 W/kg

Maximum value of SAR (measured) = 5.93 W/kg



0 dB = 5.93 W/kg = 7.73 dBW/kg

Additional information:

ambient temperature: 23.6°C; liquid temperature: 22.6°C

Date/Time: 14.03.2019 13:17:06

SystemPerformanceCheck-D1900 HSL 2019-03-14

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d009

Communication System: UID 0, CW (0); Communication System Band: D1900 (1900.0 MHz); Frequency: 1900 MHz; Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 1900 MHz; σ = 1.526 S/m; ε_r = 52.357; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5
DASY5 Configuration:

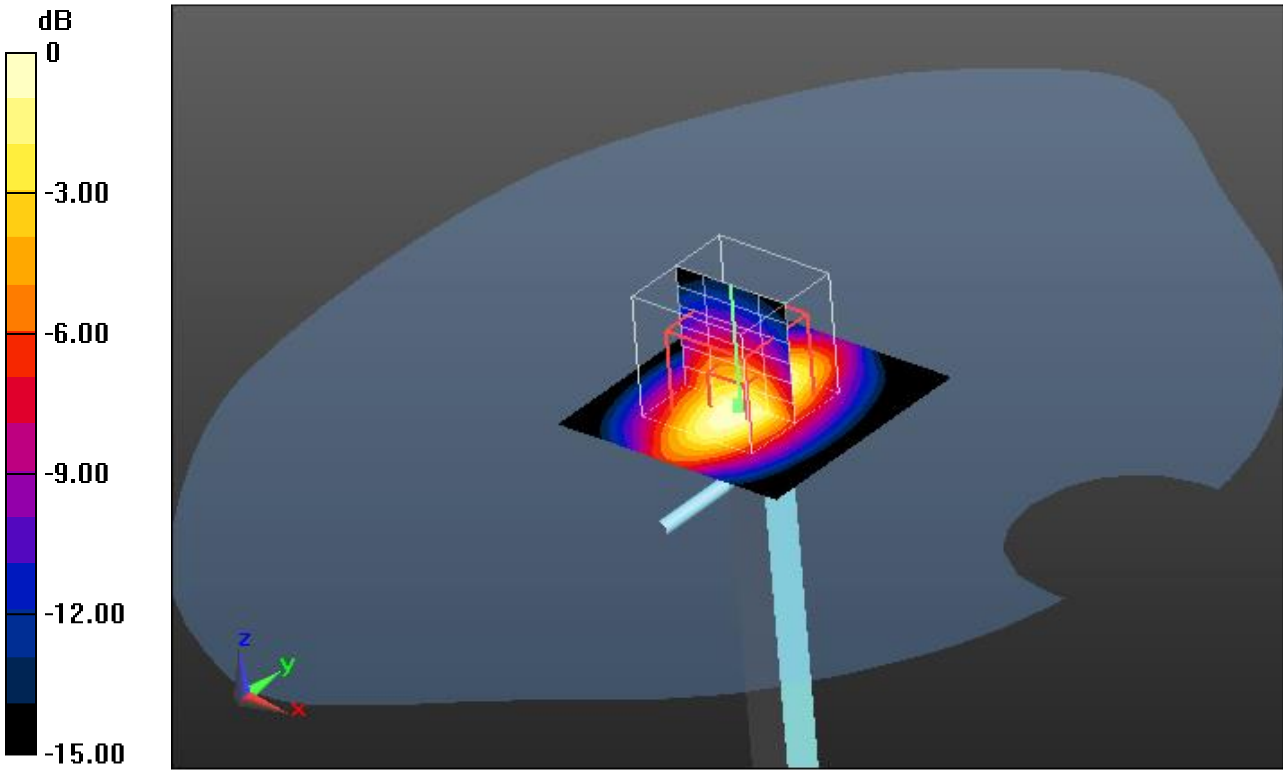
- Probe: EX3DV4 - SN3944; ConvF(8.08, 8.08, 8.08); Calibrated: 18.05.2018;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE3 Sn477; Calibrated: 18.05.2018
- Phantom: SAM; Type: SAM; Serial: 1043
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

MSL1900/d=10mm, Pin=100 mW, dist=1.4mm/Area Scan (41x41x1):

Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 6.26 W/kg

MSL1900/d=10mm, Pin=100 mW, dist=1.4mm/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 65.980 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 7.47 W/kg
SAR(1 g) = 4.05 W/kg; SAR(10 g) = 2.09 W/kg
Maximum value of SAR (measured) = 6.31 W/kg



0 dB = 6.31 W/kg = 8.00 dBW/kg

Additional information:
ambient temperature: 23.8°C; liquid temperature: 22.2°C

Date/Time: 15.03.2019 11:54:20

SystemPerformanceCheck-D1900 MSL 2019-03-15

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d009

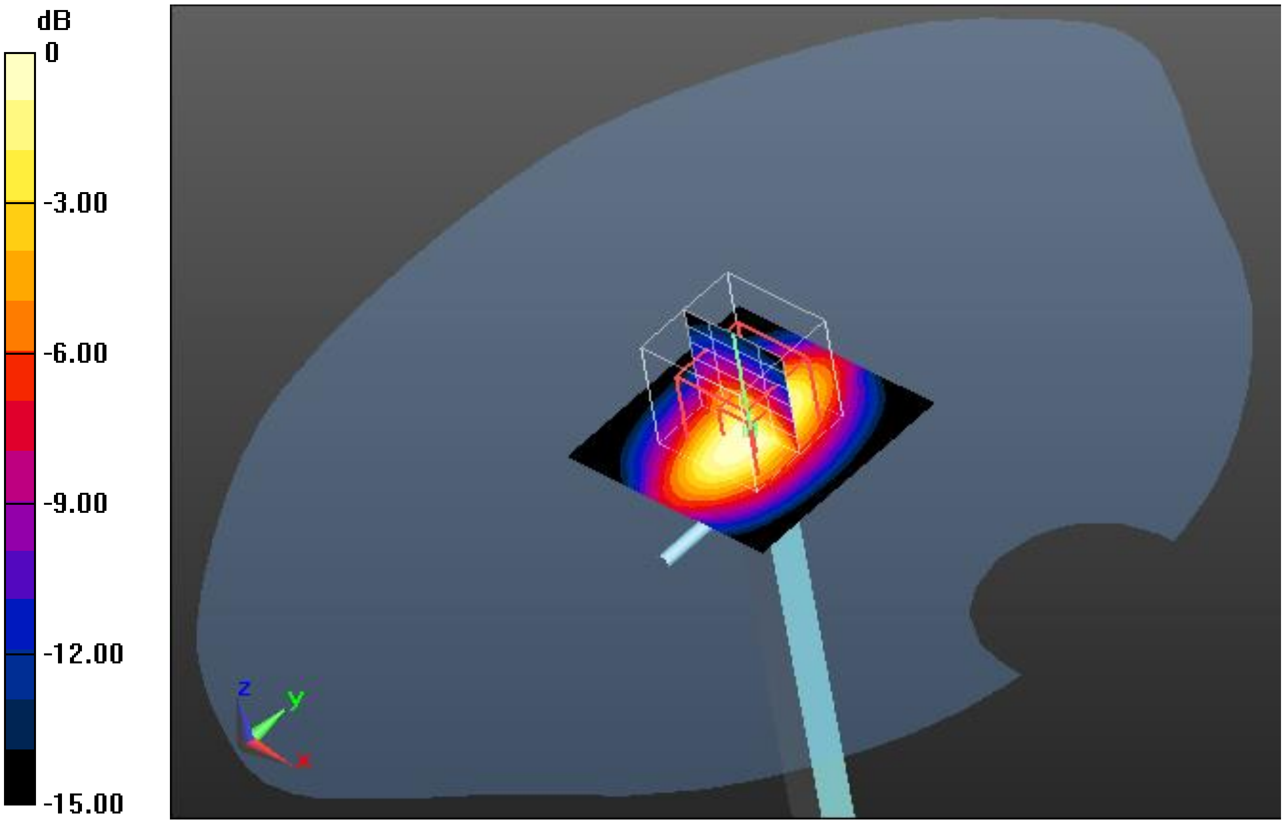
Communication System: UID 0, CW (0); Communication System Band: D1900 (1900.0 MHz); Frequency: 1900 MHz; Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 1900 MHz; σ = 1.526 S/m; ε_r = 52.357; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5
DASY5 Configuration:
- Probe: EX3DV4 - SN3944; ConvF(8.08, 8.08, 8.08); Calibrated: 18.05.2018;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE3 Sn477; Calibrated: 18.05.2018
- Phantom: SAM; Type: SAM; Serial: 1043
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

MSL1900/d=10mm, Pin=100 mW, dist=1.4mm/Area Scan (41x41x1):

Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 6.15 W/kg

MSL1900/d=10mm, Pin=100 mW, dist=1.4mm/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 65.905 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 7.26 W/kg
SAR(1 g) = 3.97 W/kg; SAR(10 g) = 2.05 W/kg
Maximum value of SAR (measured) = 6.14 W/kg



0 dB = 6.14 W/kg = 7.88 dBW/kg

Additional information:
ambient temperature: 23.4°C; liquid temperature: 22.2°C

Date/Time: 03/04/2019 08:05:36

SystemPerformanceCheck-D1900 MSL 2019-04-03

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d009

Communication System: UID 0, CW (0); Communication System Band: D1900 (1900.0 MHz); Frequency: 1900 MHz; Communication System PAR: 0 dB; PMF: 1

Medium parameters used: f = 1900 MHz; σ = 1.526 S/m; ε_r = 52.357; ρ = 1000 kg/m^3

Phantom section: Flat Section

Measurement Standard: DASY5

DASY5 Configuration:

- Probe: ES3DV3 - SN3326; ConvF(4.83, 4.83, 4.83); Calibrated: 17/08/2018;
- Sensor-Surface: 3mm (Mechanical Surface Detection), z = 2.0, 32.0
- Electronics: DAE4 Sn1387; Calibrated: 10/08/2018
- Phantom: SAM front; Type: QD000P40CC; Serial: TP:1041
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

MSL1900/d=10mm, Pin=100 mW, dist=3mm/Area Scan (51x51x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 5.30 W/kg

MSL1900/d=10mm, Pin=100 mW, dist=3mm/Zoom Scan (7x7x7)/Cube 0:

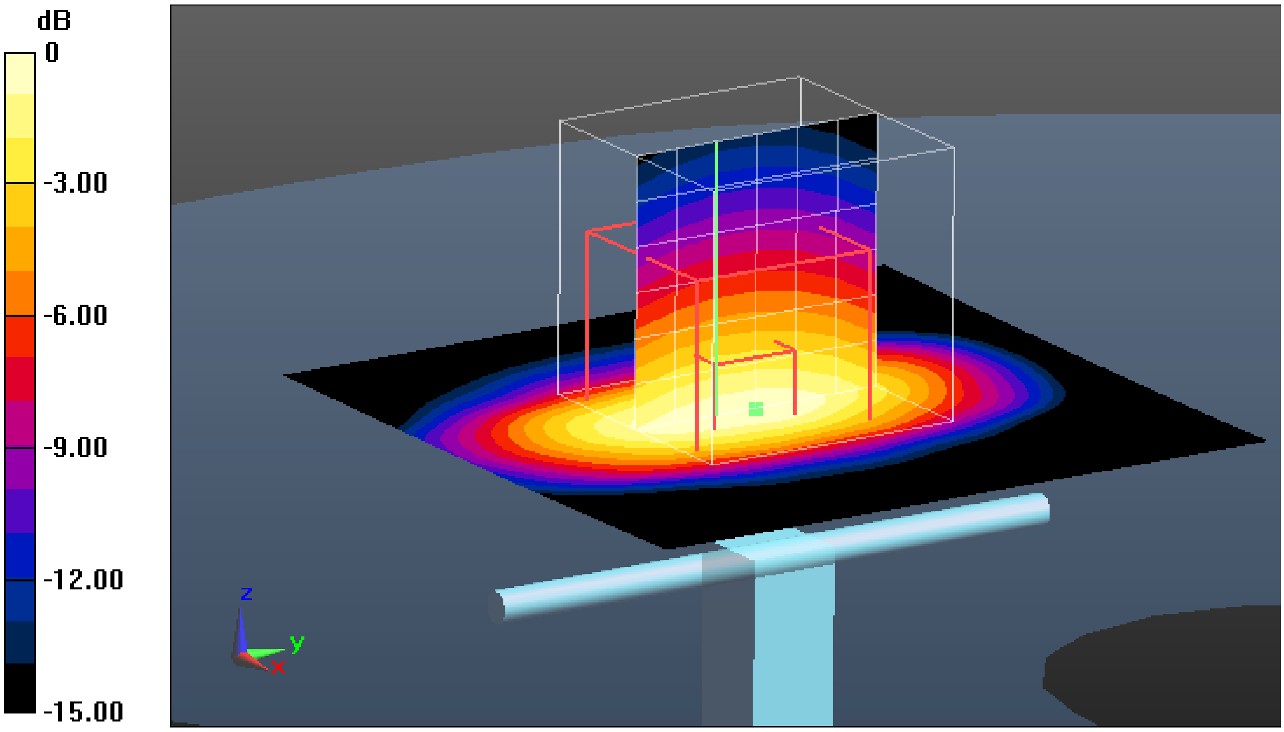
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 59.73 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 6.95 W/kg

SAR(1 g) = 4.03 W/kg; SAR(10 g) = 2.1 W/kg

Maximum value of SAR (measured) = 5.08 W/kg



0 dB = 5.08 W/kg = 7.06 dBW/kg

Additional information:

ambient temperature: 23.2°C; liquid temperature: 22.5°C

Date/Time: 18.03.2019 11:38:55

SystemPerformanceCheck-D2600 MSL 2019-03-18

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: 1040

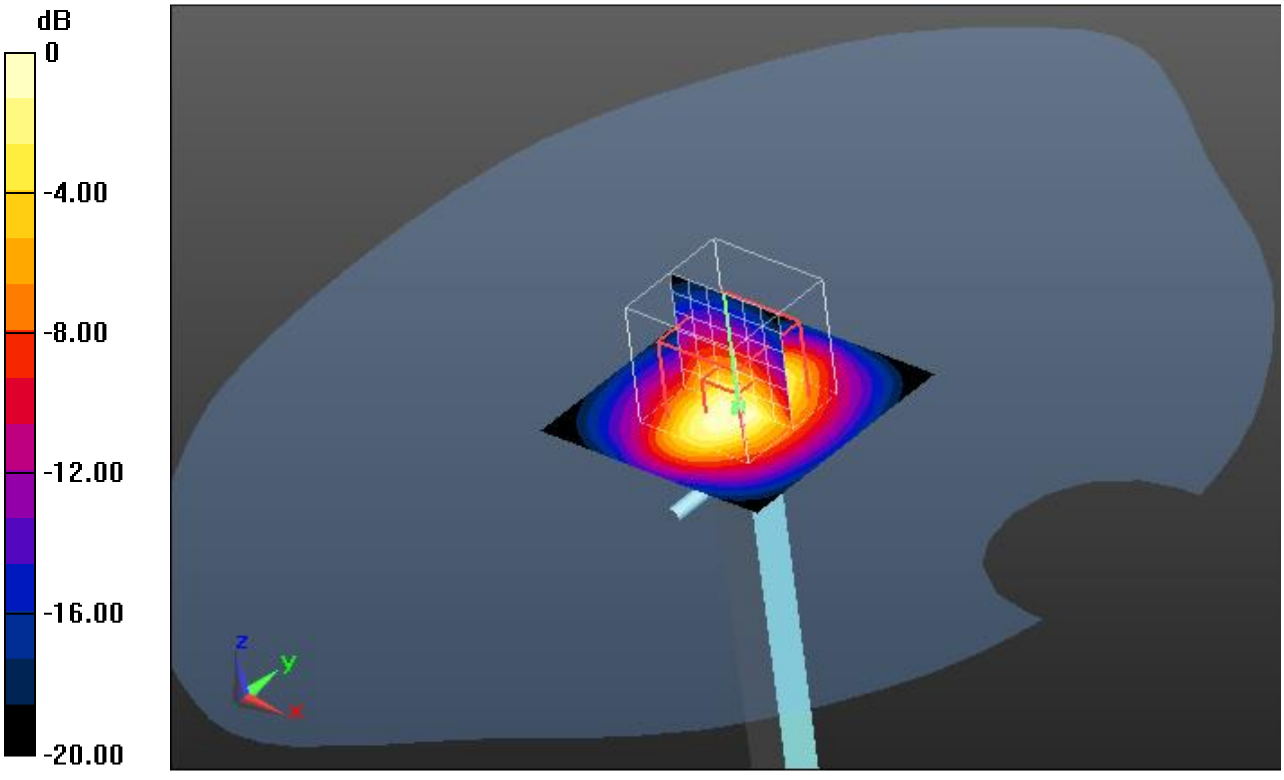
Communication System: UID 0, CW (0); Communication System Band: D2600 (2600.0 MHz); Frequency: 2600 MHz; Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 2600 MHz; σ = 2.111 S/m; ε_r = 50.012; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5
DASY5 Configuration:
- Probe: EX3DV4 - SN3944; ConvF(7.65, 7.65, 7.65); Calibrated: 18.05.2018;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE3 Sn477; Calibrated: 18.05.2018
- Phantom: SAM; Type: SAM; Serial: 1043
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

MSL2600/d=10mm, Pin=100 mW, dist=1.4mm/Area Scan (41x41x1):

Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 9.34 W/kg

MSL2600/d=10mm, Pin=100 mW, dist=1.4mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 67.622 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 11.7 W/kg
SAR(1 g) = 5.38 W/kg; SAR(10 g) = 2.4 W/kg
Maximum value of SAR (measured) = 9.32 W/kg



0 dB = 9.32 W/kg = 9.69 dBW/kg

Additional information:
ambient temperature: 22.3°C; liquid temperature: 21.4°C

Annex B: DASY5 measurement results

SAR plots for **the highest measured SAR** in each exposure configuration, wireless mode and frequency band combination according to FCC KDB 865664 D02

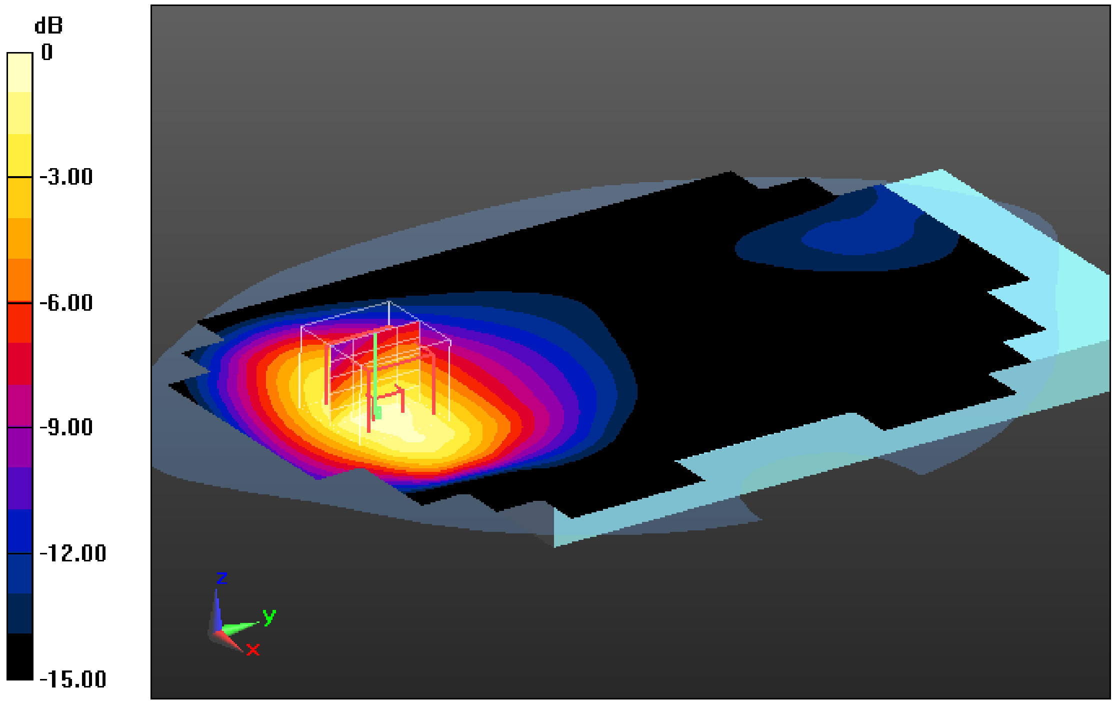
Date/Time: 07.03.2019 16:21:35

FCC_IEC62209-2_GSM850

DUT: Ingenico; Type: AXIUM D7; Serial: 1826773142011297031907 43
Communication System: UID 0, GSM/GPRS 4TS (0); Communication System Band: GSM 850; Frequency: 848.8 MHz; Communication System PAR: 3.01 dB; PMF: 1.41416
Medium parameters used: f = 849 MHz; σ = 0.984 S/m; ε_r = 55.724; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5
DASY5 Configuration:
- Probe: EX3DV4 - SN3944; ConvF(10.11, 10.11, 10.11); Calibrated: 18.05.2018;
- Sensor-Surface: 3mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 3mm (Mechanical Surface Detection), z = 1.0, 26.0
- Electronics: DAE3 Sn477; Calibrated: 18.05.2018
- Phantom: SAM; Type: SAM; Serial: 1043
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

MSL - 0mm/Bottom position - High/Area Scan (111x161x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.37 W/kg

MSL - 0mm/Bottom position - High/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 35.882 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 1.91 W/kg
SAR(1 g) = 1.2 W/kg; SAR(10 g) = 0.770 W/kg
Maximum value of SAR (measured) = 1.45 W/kg



0 dB = 1.45 W/kg = 1.61 dBW/kg

Additional information:
position or distance of DUT to SAM: 0 mm
ambient temperature: 23.4°C; liquid temperature: 20.9°C

Date/Time: 03/04/2019 15:39:19

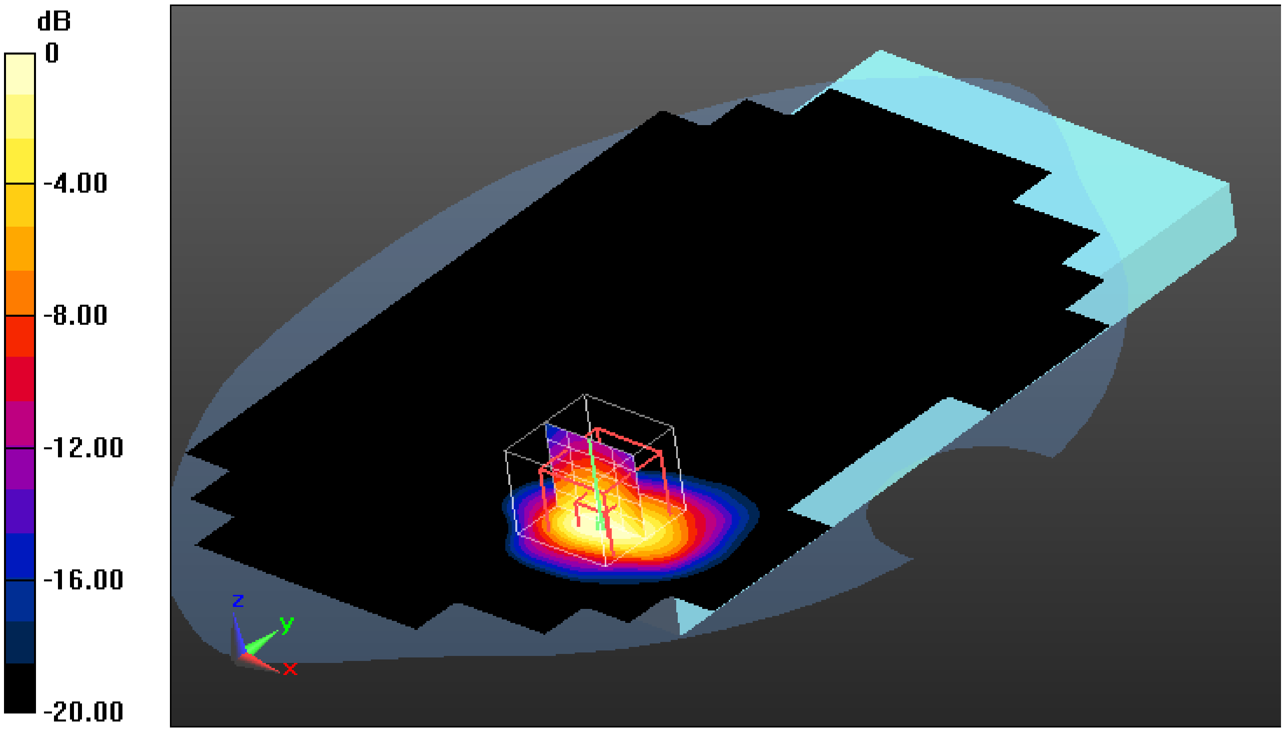
FCC_IEC62209-2_GSM1900 GPRS 4TS limb

DUT: Ingenico; Type: AXIUM D7; Serial: 182677314201129703190743

Communication System: UID 0, GSM/GPRS 4TS (0); Communication System Band: GSM 1900; Frequency: 1880 MHz; Communication System PAR: 3.01 dB; PMF: 1.41416
Medium parameters used: f = 1880 MHz; σ = 1.513 S/m; ε_r = 52.378; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5
DASY5 Configuration:
- Probe: ES3DV3 - SN3326; ConvF(4.83, 4.83, 4.83); Calibrated: 17/08/2018;
- Sensor-Surface: 3mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 3mm (Mechanical Surface Detection), z = 2.0, 27.0
- Electronics: DAE4 Sn1387; Calibrated: 10/08/2018
- Phantom: SAM front; Type: QD000P40CC; Serial: TP:1041
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

MSL - 0 mm/Bottom position - Middle/Area Scan (111x161x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 9.72 W/kg

MSL - 0 mm/Bottom position - Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 69.02 V/m; Power Drift = 0.14 dB
Peak SAR (extrapolated) = 11.4 W/kg
SAR(1 g) = 6.36 W/kg; SAR(10 g) = 2.91 W/kg
Maximum value of SAR (measured) = 8.17 W/kg



0 dB = 8.17 W/kg = 9.12 dBW/kg

Additional information:
position or distance of DUT to the phantom: 0 mm
ambient temperature: 23.8°C; liquid temperature: 22.5°C

Date/Time: 15.03.2019 08:05:36

FCC_IEC62209-2 UMTS FDD II

DUT: Ingenico; Type: AXIUM D7; Serial: 182677314201129703190743

Communication System: UID 0, UMTS FDD (0); Communication System Band: UMTS FDD II; Frequency: 1907.6 MHz; Communication System PAR: 0 dB; PMF: 1

Medium parameters used: f = 1908 MHz; σ = 1.526 S/m; ε_r = 52.357; ρ = 1000 kg/m^3

Phantom section: Flat Section

Measurement Standard: DASY5

DASY5 Configuration:

- Probe: EX3DV4 - SN3944; ConvF(8.08, 8.08, 8.08); Calibrated: 18.05.2018;
- Sensor-Surface: 3mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 3mm (Mechanical Surface Detection), z = 1.0, 26.0
- Electronics: DAE3 Sn477; Calibrated: 18.05.2018
- Phantom: SAM; Type: SAM; Serial: 1043
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

MSL - 0mm/Bottom position - High/Area Scan (111x161x1): Interpolated grid:

dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 8.60 W/kg

MSL - 0mm/Bottom position - High/Zoom Scan (6x5x7)/Cube 0: Measurement

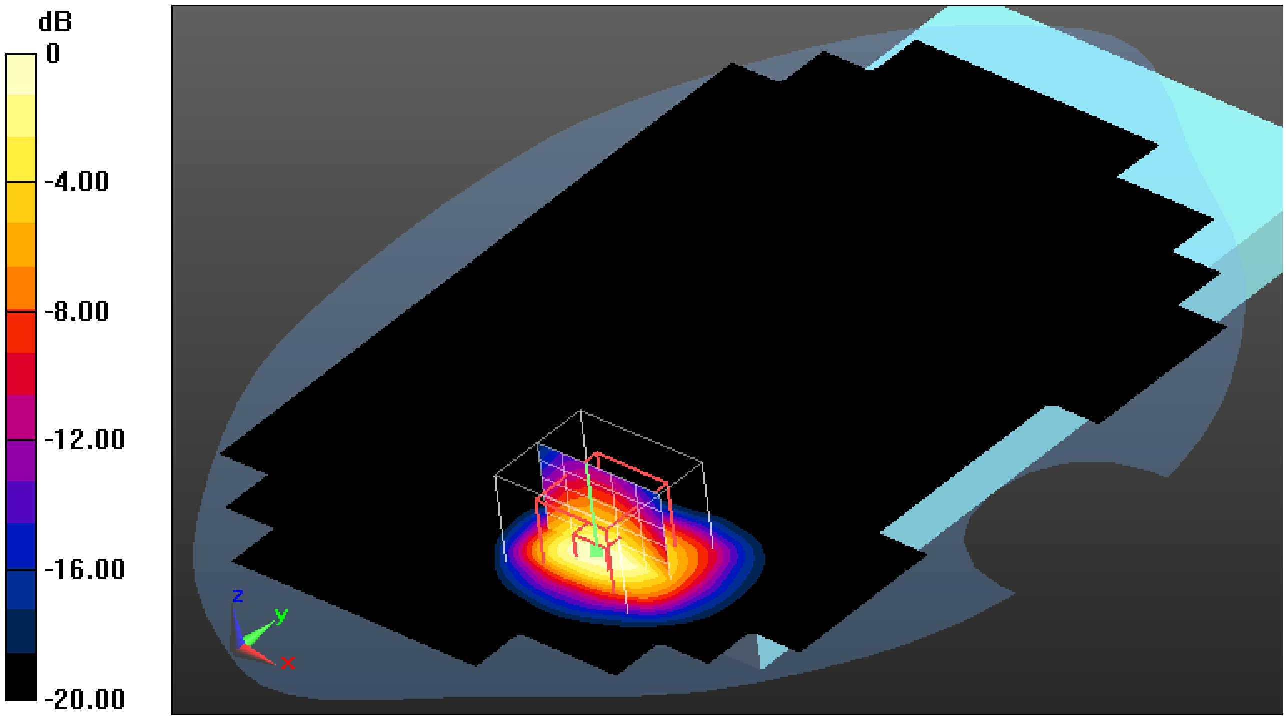
grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 64.011 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 12.7 W/kg

SAR(1 g) = 6.37 W/kg; SAR(10 g) = 2.82 W/kg

Maximum value of SAR (measured) = 8.20 W/kg



0 dB = 8.20 W/kg = 9.14 dBW/kg

Additional information:

position or distance of DUT to SAM: 0 mm

ambient temperature: 23.4°C; liquid temperature: 22.2°C

Date/Time: 15.03.2019 08:44:50

FCC_IEC62209-2 UMTS FDD IV

DUT: Ingenico; Type: AXIUM D7; Serial: 182677314201129703190743

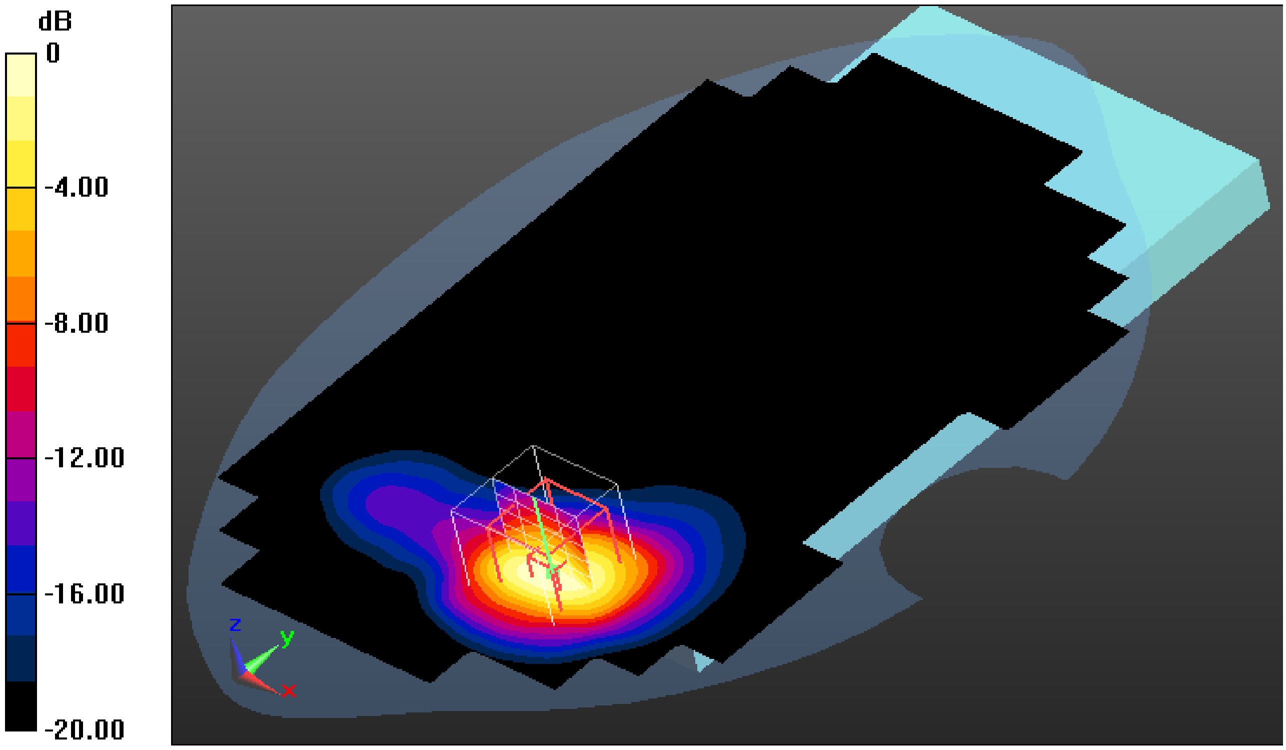
Communication System: UID 0, UMTS FDD (0); Communication System Band: UMTS FDD IV; Frequency: 1752.6 MHz; Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 1753 MHz; σ = 1.437 S/m; ε_r = 52.585; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5
DASY5 Configuration:
- Probe: EX3DV4 - SN3944; ConvF(8.38, 8.38, 8.38); Calibrated: 18.05.2018;
- Sensor-Surface: 3mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 3mm (Mechanical Surface Detection), z = 1.0, 26.0
- Electronics: DAE3 Sn477; Calibrated: 18.05.2018
- Phantom: SAM; Type: SAM; Serial: 1043
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

MSL - 0mm/Bottom position - High/Area Scan (111x161x1): Interpolated grid:

dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 4.51 W/kg

MSL - 0mm/Bottom position - High/Zoom Scan (5x5x7)/Cube 0: Measurement

grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 54.596 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 6.98 W/kg
SAR(1 g) = 3.68 W/kg; SAR(10 g) = 1.76 W/kg
Maximum value of SAR (measured) = 4.66 W/kg



0 dB = 4.66 W/kg = 6.68 dBW/kg

Additional information:
position or distance of DUT to SAM: 0 mm
ambient temperature: 23.4°C; liquid temperature: 22.2°C

Date/Time: 08.03.2019 10:19:03

FCC_IEC62209-2_UMTS FDD V

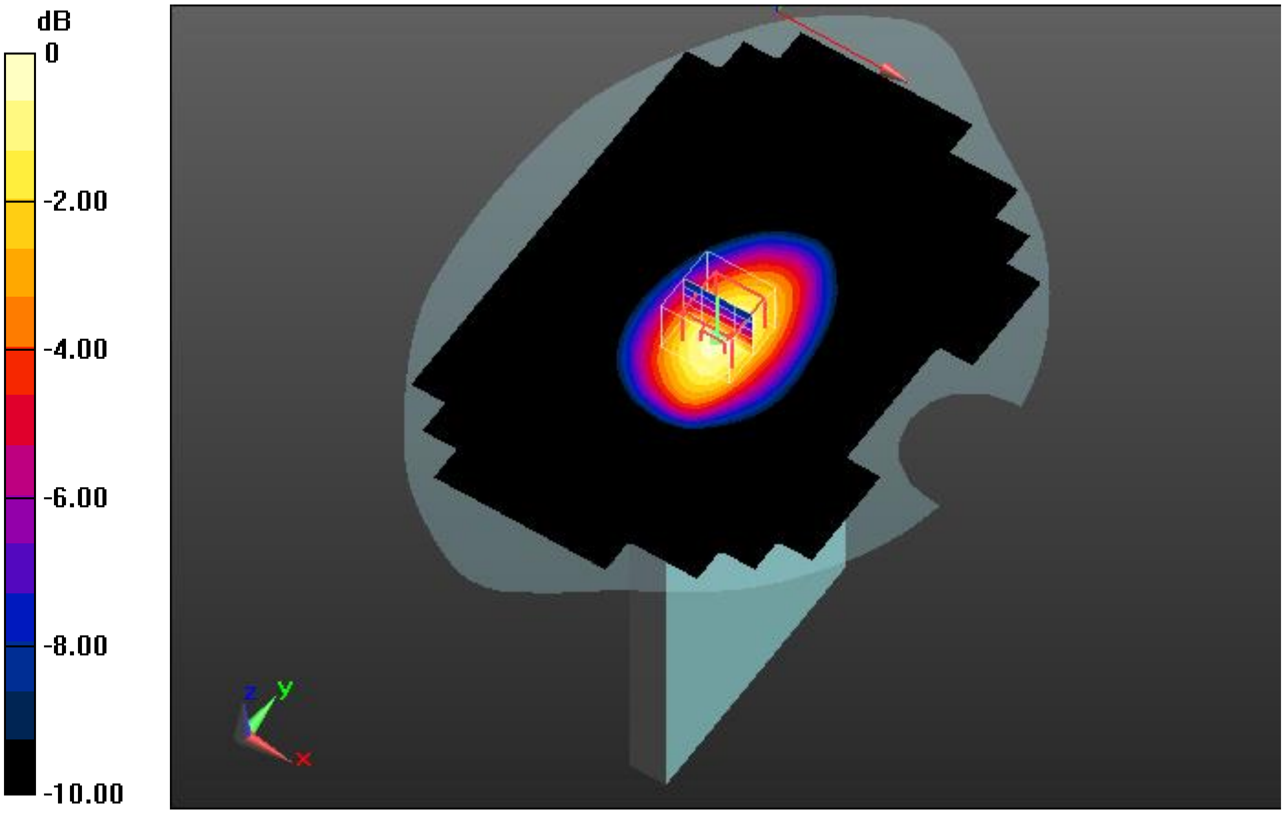
DUT: Ingenico; Type: AXIUM D7; Serial: 182677314201129703190743

Communication System: UID 0, UMTS FDD (0); Communication System Band: UMTS FDD V; Frequency: 846.6 MHz; Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 847 MHz; σ = 0.985 S/m; ε_r = 55.753; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5
DASY5 Configuration:

- Probe: EX3DV4 - SN3944; ConvF(10.11, 10.11, 10.11); Calibrated: 18.05.2018;
- Sensor-Surface: 3mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 3mm (Mechanical Surface Detection), z = 1.0, 26.0
- Electronics: DAE3 Sn477; Calibrated: 18.05.2018
- Phantom: SAM; Type: SAM; Serial: 1043
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

HSL - 0mm/Front position - High/Area Scan (111x161x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.817 W/kg

HSL - 0mm/Front position - High/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 27.431 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 1.19 W/kg
SAR(1 g) = 0.729 W/kg; SAR(10 g) = 0.450 W/kg
Maximum value of SAR (measured) = 0.879 W/kg



0 dB = 0.879 W/kg = -0.56 dBW/kg

Additional information:
position or distance of DUT to SAM: 0 mm
ambient temperature: 23.4°C; liquid temperature: 20.9°C

Date/Time: 13.03.2019 15:03:30

FCC_IEC62209-2_LTE FDD 2

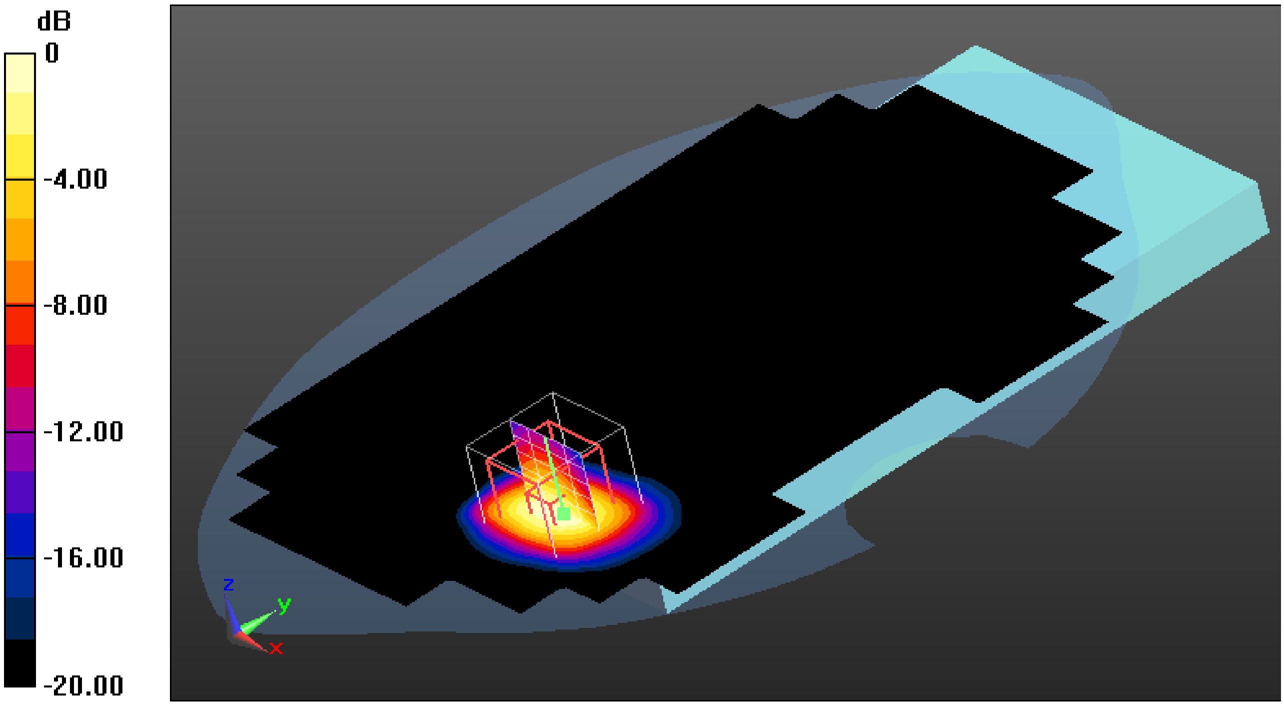
DUT: Ingenico; Type: AXIUM D7; Serial: 182677314201129703190743
Communication System: UID 0, LTE FDD (0); Communication System Band: LTE 2 (1900MHz); Frequency: 1900 MHz; Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 1900 MHz; σ = 1.526 S/m; ε_r = 52.357; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5
DASY5 Configuration:
- Probe: EX3DV4 - SN3944; ConvF(8.08, 8.08, 8.08); Calibrated: 18.05.2018;
- Sensor-Surface: 3mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 3mm (Mechanical Surface Detection), z = 1.0, 26.0
- Electronics: DAE3 Sn477; Calibrated: 18.05.2018
- Phantom: SAM; Type: SAM; Serial: 1043
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

MSL - 0mm - 1RB/Bottom position - High/Area Scan (111x161x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 8.60 W/kg

MSL - 0mm - 1RB/Bottom position - High/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 56.182 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 12.3 W/kg
SAR(1 g) = 6.2 W/kg; SAR(10 g) = 2.75 W/kg
Maximum value of SAR (measured) = 8.08 W/kg



0 dB = 8.08 W/kg = 9.07 dBW/kg

Additional information:
position or distance of DUT to SAM: 0 mm
ambient temperature: 23.6°C; liquid temperature: 22.6°C

Date/Time: 13.03.2019 13:58:46

FCC_IEC62209-2_LTE FDD 4

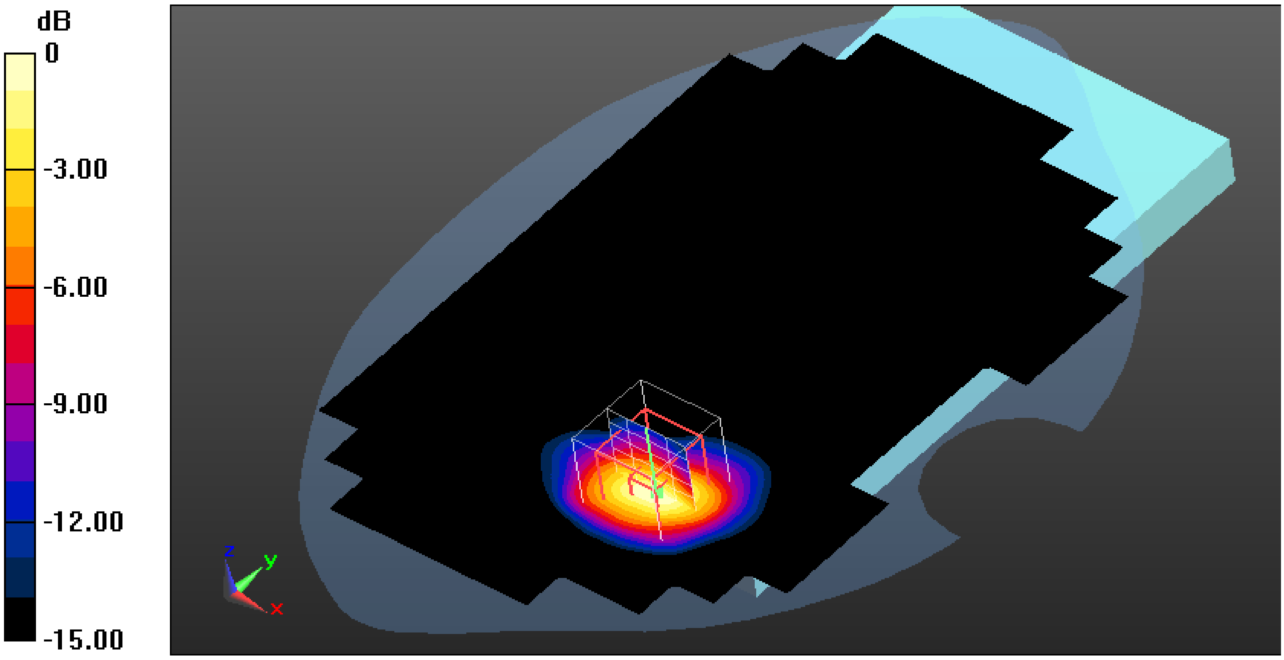
DUT: Ingenico; Type: AXIUM D7; Serial: 182677314201129703190743
Communication System: UID 0, LTE FDD (0); Communication System Band: LTE 4 (1700MHz); Frequency: 1745 MHz; Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 1745 MHz; σ = 1.428 S/m; ε_r = 52.621; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5
DASY5 Configuration:
- Probe: EX3DV4 - SN3944; ConvF(8.38, 8.38, 8.38); Calibrated: 18.05.2018;
- Sensor-Surface: 3mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 3mm (Mechanical Surface Detection), z = 1.0, 26.0
- Electronics: DAE3 Sn477; Calibrated: 18.05.2018
- Phantom: SAM; Type: SAM; Serial: 1043
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

MSL - 0mm - 1RB/Bottom position - High/Area Scan (111x161x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 4.43 W/kg

MSL - 0mm - 1RB/Bottom position - High/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 54.661 V/m; Power Drift = 0.17 dB
Peak SAR (extrapolated) = 6.60 W/kg
SAR(1 g) = 3.4 W/kg; SAR(10 g) = 1.64 W/kg
Maximum value of SAR (measured) = 4.47 W/kg



0 dB = 4.47 W/kg = 6.50 dBW/kg

Additional information:
position or distance of DUT to SAM: 0 mm
ambient temperature: 23.4°C; liquid temperature: 22.2°C

Date/Time: 08.03.2019 11:12:50

FCC_IEC62209-2_LTE FDD 5

DUT: Ingenico; Type: AXIUM D7; Serial: 182677314201129703190743

Communication System: UID 0, LTE FDD (0); Communication System Band: LTE 5 (850MHz); Frequency: 836.5 MHz; Communication System PAR: 0 dB; PMF: 1

Medium parameters used (interpolated): f = 836.5 MHz; σ = 0.98 S/m; ε_r = 55.764; ρ = 1000 kg/m^3

Phantom section: Flat Section

Measurement Standard: DASY5

DASY5 Configuration:

- Probe: EX3DV4 - SN3944; ConvF(10.11, 10.11, 10.11); Calibrated: 18.05.2018;
- Sensor-Surface: 3mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 3mm (Mechanical Surface Detection), z = 1.0, 26.0
- Electronics: DAE3 Sn477; Calibrated: 18.05.2018
- Phantom: SAM; Type: SAM; Serial: 1043
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

MSL - 0mm/Front position - Middle/Area Scan (111x161x1): Interpolated grid:

dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.778 W/kg

MSL - 0mm/Front position - Middle/Zoom Scan (5x5x7)/Cube 0: Measurement

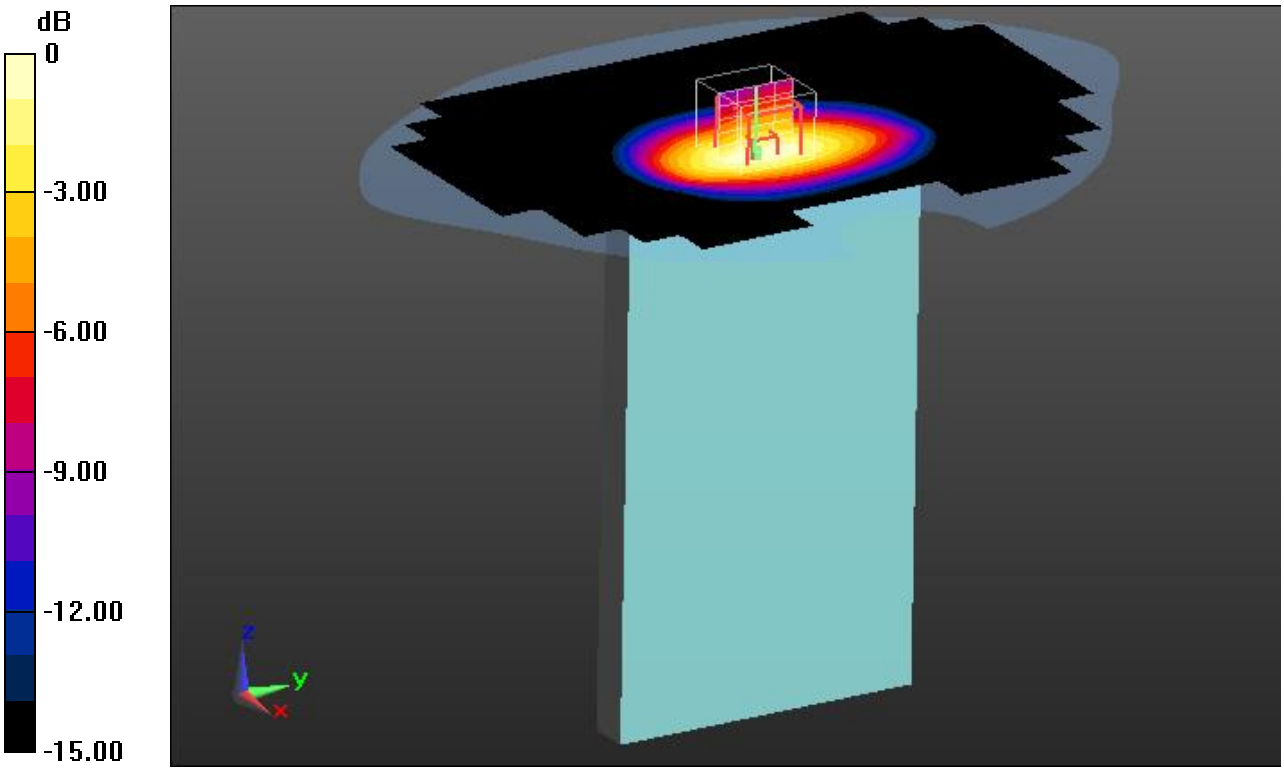
grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 27.247 V/m; Power Drift = -0.10 dB

Peak SAR (extrapolated) = 1.08 W/kg

SAR(1 g) = 0.665 W/kg; SAR(10 g) = 0.416 W/kg

Maximum value of SAR (measured) = 0.796 W/kg



0 dB = 0.796 W/kg = -0.99 dBW/kg

Additional information:

position or distance of DUT to SAM: 0 mm

ambient temperature: 23.9°C; liquid temperature: 21.8°C

Date/Time: 18.03.2019 12:52:13

FCC_IEC62209-2_LTE FDD 7

DUT: Ingenico; Type: AXIUM D7; Serial: 18267731420112970319074З

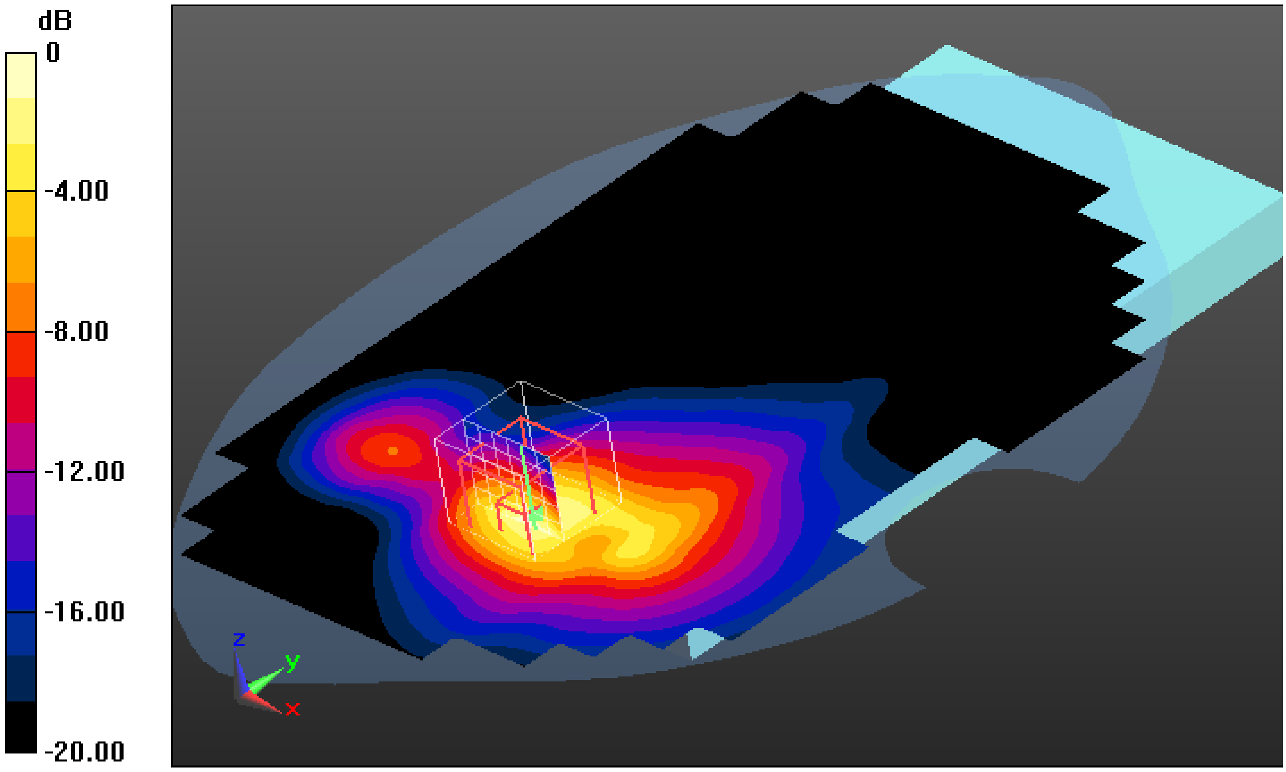
Communication System: UID 0, LTE FDD (0); Communication System Band: LTE 7 (2600MHz); Frequency: 2535 MHz; Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 2535 MHz; σ = 2.048 S/m; ε_r = 50.103; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5
DASY5 Configuration:
- Probe: EX3DV4 - SN3944; ConvF(7.65, 7.65, 7.65); Calibrated: 18.05.2018;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 26.0
- Electronics: DAE3 Sn477; Calibrated: 18.05.2018
- Phantom: SAM; Type: SAM; Serial: 1043
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

MSL - 0mm - 1RB/Bottom position - Middle/Area Scan (141x201x1):

Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 1.85 W/kg

MSL - 0mm - 1RB/Bottom position - Middle/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 30.161 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 2.82 W/kg
SAR(1 g) = 1.26 W/kg; SAR(10 g) = 0.562 W/kg
Maximum value of SAR (measured) = 2.27 W/kg



0 dB = 2.27 W/kg = 3.56 dBW/kg

Additional information:
position or distance of DUT to SAM: 0 mm
ambient temperature: 22.3°C; liquid temperature: 21.4°C

Date/Time: 11.03.2019 16:48:46

FCC_IEC62209-2_LTE FDD 12

DUT: Ingenico; Type: AXIUM D7; Serial: 1826773142011297031907 43

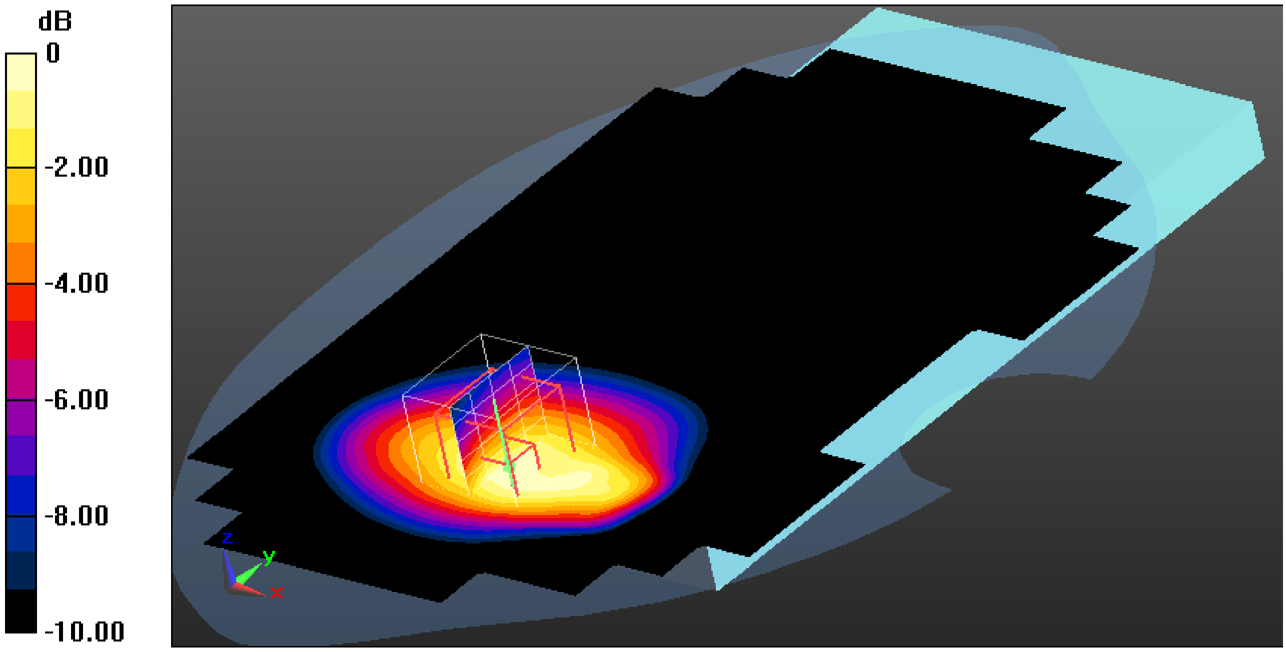
Communication System: UID 0, LTE FDD (0); Communication System Band: LTE 12 (700MHz); Frequency: 704 MHz; Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 704 MHz; σ = 0.931 S/m; ε_r = 56.037; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5
DASY5 Configuration:
- Probe: EX3DV4 - SN3944; ConvF(10.41, 10.41, 10.41); Calibrated: 18.05.2018;
- Sensor-Surface: 3mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 3mm (Mechanical Surface Detection), z = 1.0, 26.0
- Electronics: DAE3 Sn477; Calibrated: 18.05.2018
- Phantom: SAM; Type: SAM; Serial: 1043
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

MSL - 0mm - 1RB/Bottom position - Low/Area Scan (111x161x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.751 W/kg

MSL - 0mm - 1RB/Bottom position - Low/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 28.365 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 1.17 W/kg
SAR(1 g) = 0.682 W/kg; SAR(10 g) = 0.435 W/kg
Maximum value of SAR (measured) = 0.791 W/kg



0 dB = 0.791 W/kg = -1.02 dBW/kg

Additional information:
position or distance of DUT to SAM: 0 mm
ambient temperature: 23.4°C; liquid temperature: 20.4°C

Date/Time: 11.03.2019 15:44:36

FCC_IEC62209-2_LTE FDD 12

DUT: Ingenico; Type: AXIUM D7; Serial: 182677314201129703190743

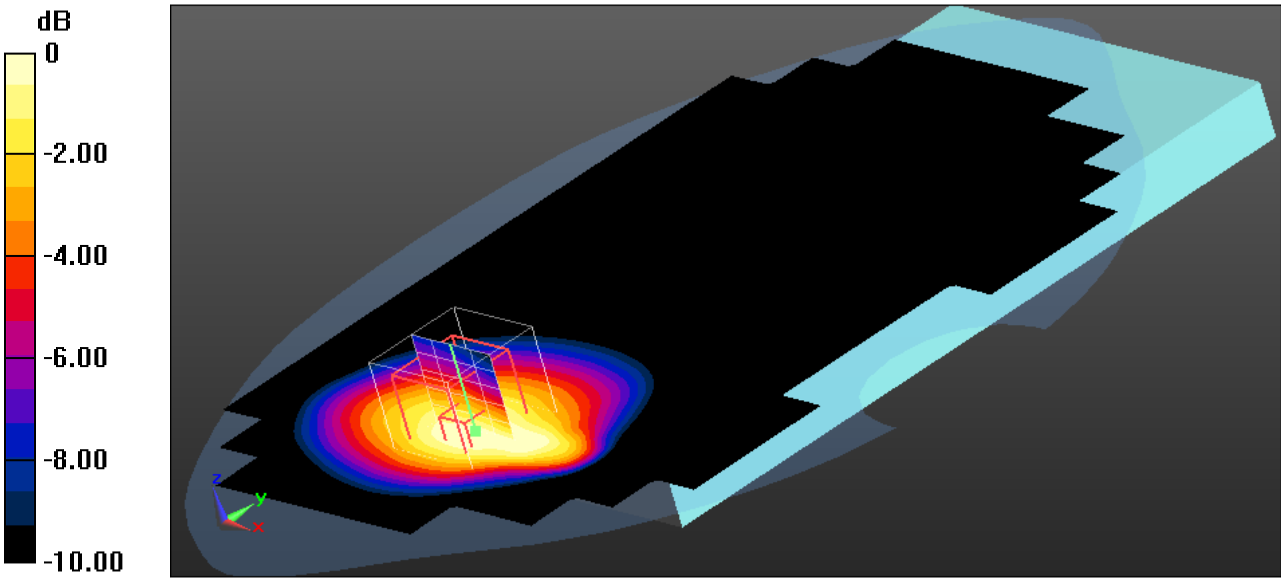
Communication System: UID 0, LTE FDD (0); Communication System Band: LTE 12 (700MHz); Frequency: 711 MHz; Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 711 MHz; σ = 0.934 S/m; ε_r = 56.008; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5
DASY5 Configuration:
- Probe: EX3DV4 - SN3944; ConvF(10.41, 10.41, 10.41); Calibrated: 18.05.2018;
- Sensor-Surface: 3mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 3mm (Mechanical Surface Detection), z = 1.0, 26.0
- Electronics: DAE3 Sn477; Calibrated: 18.05.2018
- Phantom: SAM; Type: SAM; Serial: 1043
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

MSL - 0mm - 1RB/Bottom position - High/Area Scan (111x161x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.861 W/kg

MSL - 0mm - 1RB/Bottom position - High/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 29.649 V/m; Power Drift = 0.15 dB
Peak SAR (extrapolated) = 1.14 W/kg
SAR(1 g) = 0.680 W/kg; SAR(10 g) = 0.438 W/kg
Maximum value of SAR (measured) = 0.808 W/kg



0 dB = 0.808 W/kg = -0.93 dBW/kg

Additional information:
position or distance of DUT to SAM: 0 mm
ambient temperature: 23.4°C; liquid temperature: 20.4°C

Date/Time: 12.03.2019 12:11:44

FCC_IEC62209-2_LTE FDD 13

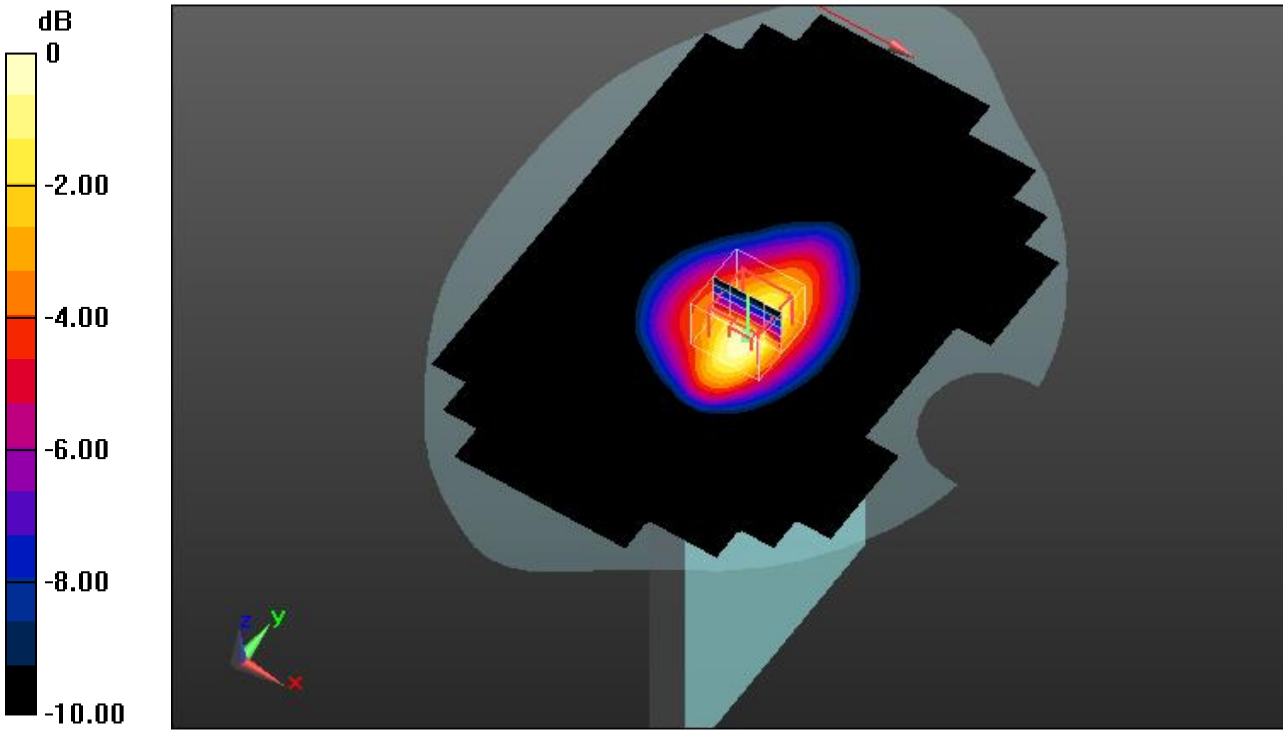
DUT: Ingenico; Type: AXIUM D7; Serial: 182677314201129703190743
Communication System: UID 0, LTE FDD (0); Communication System Band: LTE 13 (700MHz); Frequency: 784.5 MHz; Communication System PAR: 0 dB; PMF: 1
Medium parameters used (interpolated): f = 784.5 MHz; σ = 0.96 S/m; ε_r = 55.882; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5
DASY5 Configuration:
- Probe: EX3DV4 - SN3944; ConvF(10.41, 10.41, 10.41); Calibrated: 18.05.2018;
- Sensor-Surface: 3mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 3mm (Mechanical Surface Detection), z = 1.0, 26.0
- Electronics: DAE3 Sn477; Calibrated: 18.05.2018
- Phantom: SAM; Type: SAM; Serial: 1043
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

MSL - 0mm - 1RB/Front position - High/Area Scan (111x161x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.601 W/kg

MSL - 0mm - 1RB/Front position - High/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 25.061 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.869 W/kg
SAR(1 g) = 0.482 W/kg; SAR(10 g) = 0.280 W/kg
Maximum value of SAR (measured) = 0.601 W/kg



0 dB = 0.601 W/kg = -2.21 dBW/kg

Additional information:
position or distance of DUT to SAM: 0 mm
ambient temperature: 22.5°C; liquid temperature: 21.4°C

Date/Time: 14.03.2019 13:38:08

FCC_IEC62209-2_LTE FDD 25

DUT: Ingenico; Type: AXIUM D7; Serial: 182677314201129703190743

Communication System: UID 0, LTE FDD (0); Communication System Band: LTE 25 (1900 MHz); Frequency: 1905 MHz; Communication System PAR: 0 dB; PMF: 1

Medium parameters used: f = 1905 MHz; σ = 1.528 S/m; ε_r = 52.337; ρ = 1000 kg/m^3

Phantom section: Flat Section

Measurement Standard: DASY5

DASY5 Configuration:

- Probe: EX3DV4 - SN3944; ConvF(8.08, 8.08, 8.08); Calibrated: 18.05.2018;
- Sensor-Surface: 3mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 3mm (Mechanical Surface Detection), z = 1.0, 26.0
- Electronics: DAE3 Sn477; Calibrated: 18.05.2018
- Phantom: SAM; Type: SAM; Serial: 1043
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

MSL - 0mm - 1RB/Bottom position - High wc/Area Scan (111x161x1):

Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 7.28 W/kg

MSL - 0mm - 1RB/Bottom position - High wc/Zoom Scan (5x5x7)/Cube 0:

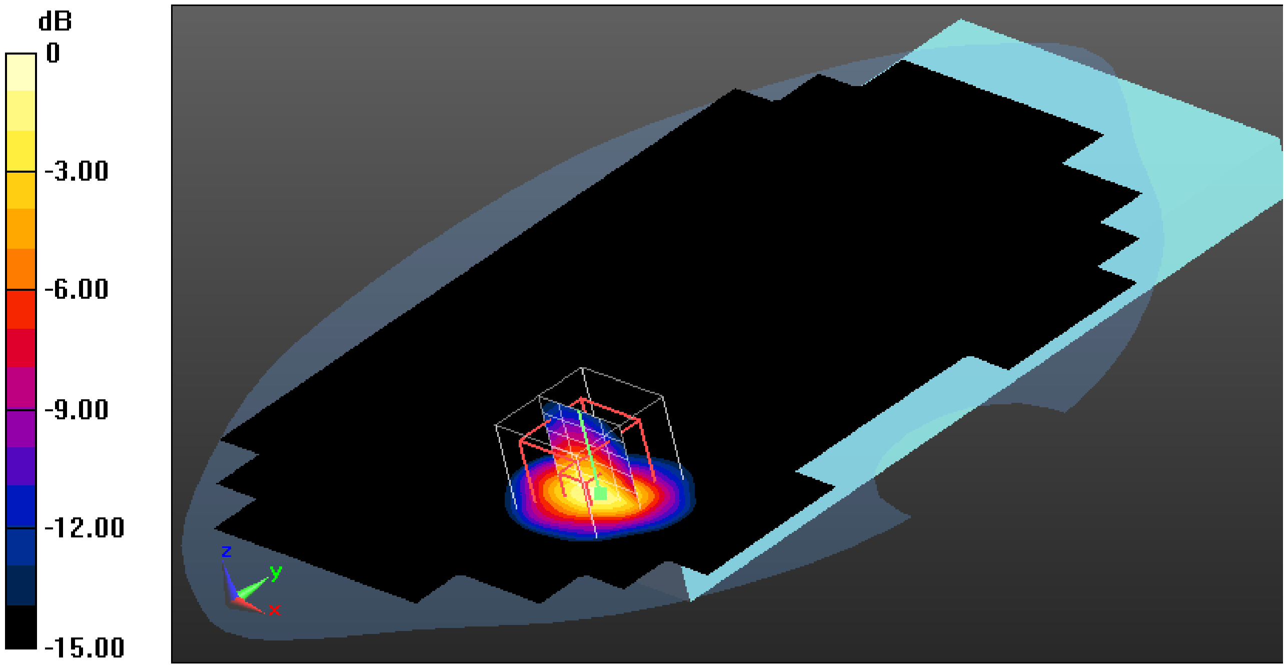
Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 73.009 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 13.2 W/kg

SAR(1 g) = 6.52 W/kg; SAR(10 g) = 2.88 W/kg

Maximum value of SAR (measured) = 8.59 W/kg



0 dB = 8.59 W/kg = 9.34 dBW/kg

Additional information:

position or distance of DUT to SAM: 0 mm

ambient temperature: 23.8°C; liquid temperature: 22.2°C

Date/Time: 08.03.2019 16:56:16

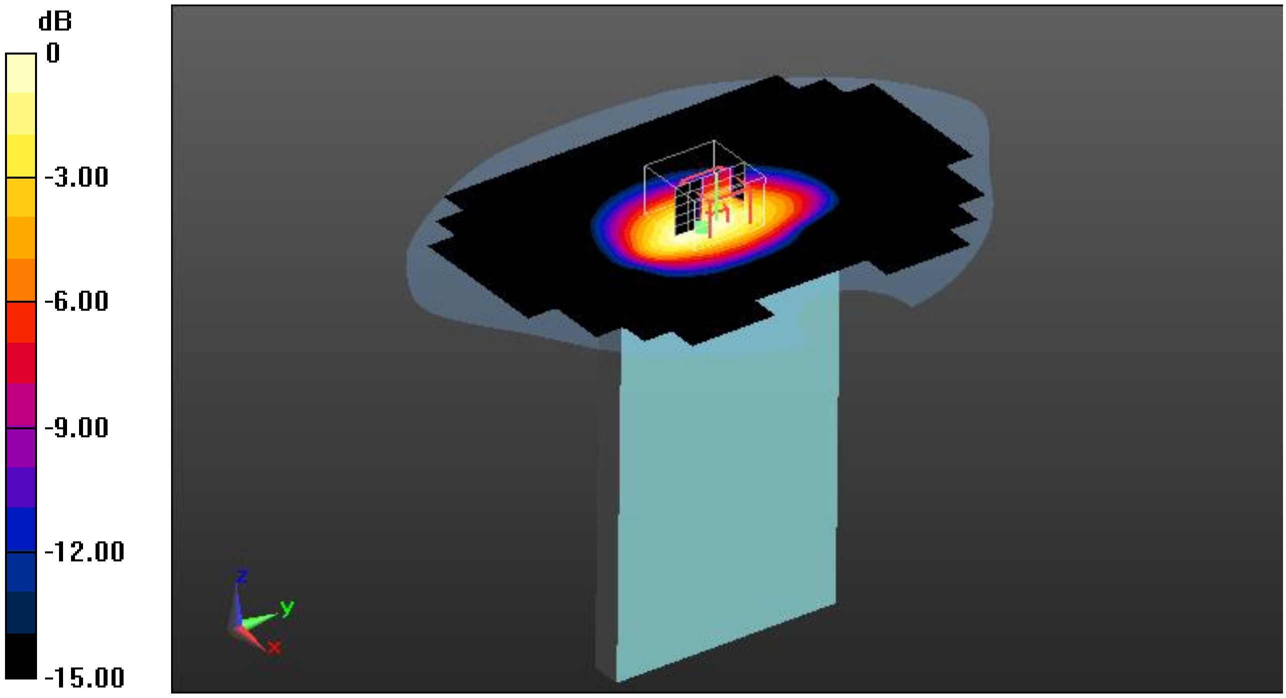
FCC_IEC62209-2_LTE FDD 26

DUT: Ingenico; Type: AXIUM D7; Serial: 182677314201129703190743

Communication System: UID 0, LTE FDD (0); Communication System Band: LTE 26 (850MHz); Frequency: 821.5 MHz; Communication System PAR: 0 dB; PMF: 1
Medium parameters used (interpolated): f = 821.5 MHz; σ = 0.973 S/m; ε_r = 55.815; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5
DASY5 Configuration:
- Probe: EX3DV4 - SN3944; ConvF(10.11, 10.11, 10.11); Calibrated: 18.05.2018;
- Sensor-Surface: 3mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 3mm (Mechanical Surface Detection), z = 1.0, 26.0
- Electronics: DAE3 Sn477; Calibrated: 18.05.2018
- Phantom: SAM; Type: SAM; Serial: 1043
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

MSL - 0mm/Front position - Low/Area Scan (111x161x1): Interpolated grid:
dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.875 W/kg

MSL - 0mm/Front position - Low/Zoom Scan (6x6x7)/Cube 0: Measurement grid:
dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 28.282 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 1.36 W/kg
SAR(1 g) = 0.824 W/kg; SAR(10 g) = 0.454 W/kg
Maximum value of SAR (measured) = 0.878 W/kg

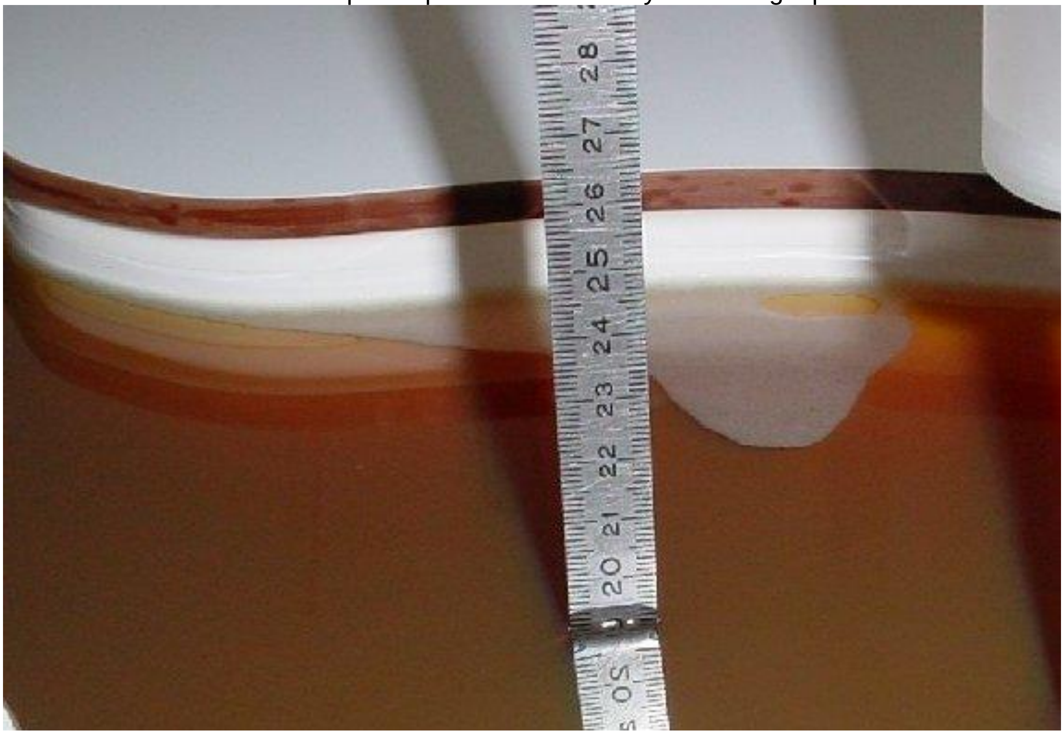


0 dB = 0.878 W/kg = -0.57 dBW/kg

Additional information:
position or distance of DUT to SAM: 0 mm
ambient temperature: 23.9°C; liquid temperature: 21.8°C

Annex B.1: Liquid depth

Photo 1: Liquid depth 0.6-6 GHz body simulating liquid



Annex C: Photo documentation

Photo documentation is described in the additional document:

Appendix to test report no. 1-6927/18-01-06 Photo documentation

Annex D: Calibration parameters

Calibration parameters are described in the additional document:

Appendix to test report no. 1-6927/18-01-06
Calibration data, Phantom certificate
and detail information of the DASY5 System

Annex E: RSS-102 Annex A and B

ICRF documents are described in the additional document:

Appendix to test report no. 1-6927/18-01-06_ICRF
RF Technical Brief Cover Sheet acc. To RSS-102 Annex A and
Declaration of RX Exposure Compliance Annex B

Annex F: Document History

Version	Applied Changes	Date of Release
	Initial Release	2019-04-25

Annex G: Further Information

Glossary

BW	-	Bandwidth
DTS	-	Distributed Transmission System
DUT	-	Device under Test
EUT	-	Equipment under Test
FCC	-	Federal Communication Commission
FCC ID	-	Company Identifier at FCC
HW	-	Hardware
IC	-	Industry Canada
Inv. No.	-	Inventory number
LTE	-	Long Term Evolution
N/A	-	not applicable
PCE	-	Personal Consumption Expenditure
OET	-	Office of Engineering and Technology
RB	-	resource block(s)
SAR	-	Specific Absorption Rate
S/N	-	Serial Number
SW	-	Software
UNII	-	Unlicensed National Information Infrastructure