

TEST REPORT

Test Report No.: 1-9708-25-01-12_TR1-R01



Deutsche
Akkreditierungsstelle
D-PL-12047-01-00

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D-PL-12047-01-00.

ISED Testing Laboratory Recognized Listing Number: DE0001

FCC designation number: DE0002

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Test Standards

IEC/IEEE
62209-1528-2020

Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Part 1528: Human models, instrumentation, and procedures (Frequency range of 4 MHz to 10 GHz)

RSS-102 Issue 6

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:

e-Bike component

Device type:

portable device

Model name:

BCM3101

S/N serial number:

1 / 9

FCC-ID:

2AWRC-BCM3101

ISED Number:

26294-BCM3101

Product Marketing Name (PMN):

BCM3101

Hardware Version Identification No. (HVIN):

BCM3101

IMEI-Number:

868675060626462

Hardware status:

3.1.0

Software status:

Certification App 19.7.2

Firmware status:

BG951AGLAAR02A01_15.300.01.300

Frequency:

see technical details

Antenna:

integrated antenna

Battery option:

Li-ion Battery 3.8V 550mAh

Power supply:

13.5V/DC

Test sample status:

identical prototype

Exposure category:

general population / uncontrolled environment

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Test Report authorised:



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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. cetecom 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 cetecom advanced GmbH.

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2.2 Application details

Date of receipt of order:	2025-04-29
Date of receipt of test item:	2026-01-05
Start of test:	2026-01-15
End of test:	2026-01-19

2.3 Statement of compliance

The SAR values found for the e-Bike component BCM3101 are below the maximum recommended levels of 1.6 or 4 W/Kg as averaged over any 1 or 10 g tissue according to the FCC rule §2.1093, 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	Test channel low	Test channel middle	Test channel high	Maximum P_{avg}/dBm
☐	LTE FDD 1	1920	1980	2110	2170	QPSK	3	max	18100	18300	18500	22.9
☒	LTE FDD 2	1850	1910	1930	1990	QPSK	3	max	18700	18900	19100	22.7
☐	LTE FDD 3	1710	1785	1805	1880	QPSK	3	max	19300	19575	19850	22.4
☒	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	24.1
☐	LTE FDD 8	880	915	925	960	QPSK	3	max	21500	21625	21750	24.0
☒	LTE FDD 12	704	711	734	741	QPSK	3	max	23060	23095	23130	23.9
☒	LTE FDD 13	777	787	746	756	QPSK	3	max	23205	23230	23255	23.6
☐	LTE FDD 20	832	862	791	821	QPSK	3	max	24250	24300	24350	23.7
☐	LTE FDD 28	703	748	758	803	QPSK	3	max	27310	27435	27560	23.8
☒	BT LE	2402	2480	2402	2480	GFSK	3	max	0	19	39	7.1

2.5 Transmitter and Antenna Operating Configurations

Simultaneous transmission conditions
LTE + BLE ¹

Table 1: Simultaneous transmission conditions

BLE¹ - Bluetooth low energy

3 Test standards/ procedures references

Test Standard	Version	Test Standard Description
RSS-102 Issue 6	2023-12	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
IEC/IEEE 62209-1528-2020	2020-10-19	Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Part 1528: Human models, instrumentation, and procedures (Frequency range of 4 MHz to 10 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

3.1 RF exposure limits

RF Exposure levels according CFR 47 – Part 1, §1.1310 / RSS 102 Issue 06 / safety Code 6:

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

Table 2: RF exposure limits (100 kHz to 6 GHz)

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.

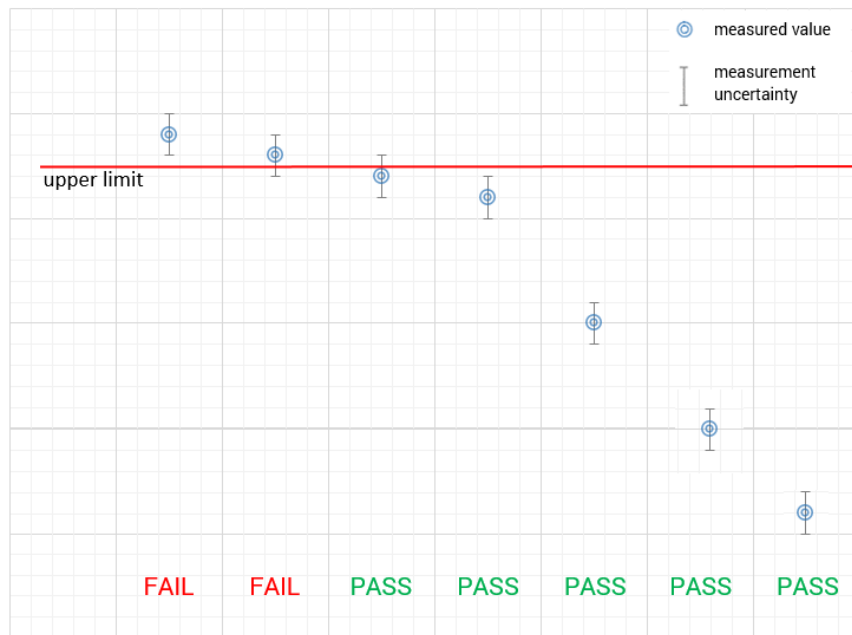
Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation).

4 Reporting statements of conformity – decision rule

Only the measured values related to their corresponding limits will be used to decide whether the equipment under test meets the requirements of the test standards listed in chapter 3.

The measurement uncertainty is mentioned in this test report, see chapter 9, but is not taken into account - neither to the limits nor to the measurement results. Measurement results with a smaller margin to the corresponding limits than the measurement uncertainty have a potential risk of more than 20% that the decision might be wrong."

measured value, measurement uncertainty, verdict



5 Summary of Measurement Results

☒	No deviations from the technical specifications ascertained			
☐	Deviations from the technical specifications ascertained			
Maximum SAR value reported for 1g (W/kg)				
		PCB	DTS	LIMIT
body worn 0 mm distance		0.586	0.088	1.6
collocated situations	ΣSAR evaluation PCB & DTS	0.662		1.6
Maximum SAR value reported for 10g (W/kg)				
		PCB	DTS	LIMIT
extremity 0 mm distance		0.333	0.038	4
collocated situations	ΣSAR evaluation PCB & DTS	0.371		4

5.1 Maximum reported SAR values

frequency band:	SAR _{1g} (W/kg)	limit	SAR _{10g} (W/kg)	limit
LTE FDD 2	0.586	1.6	0.333	4
LTE FDD 4	0.446	1.6	0.260	4
LTE FDD 5	0.533	1.6	0.302	4
LTE FDD 12	0.327	1.6	0.189	4
LTE FDD 13	0.445	1.6	0.281	4
BLE	0.088	1.6	0.038	4
max:	0.586	1.6	0.333	4

6 Test Environment

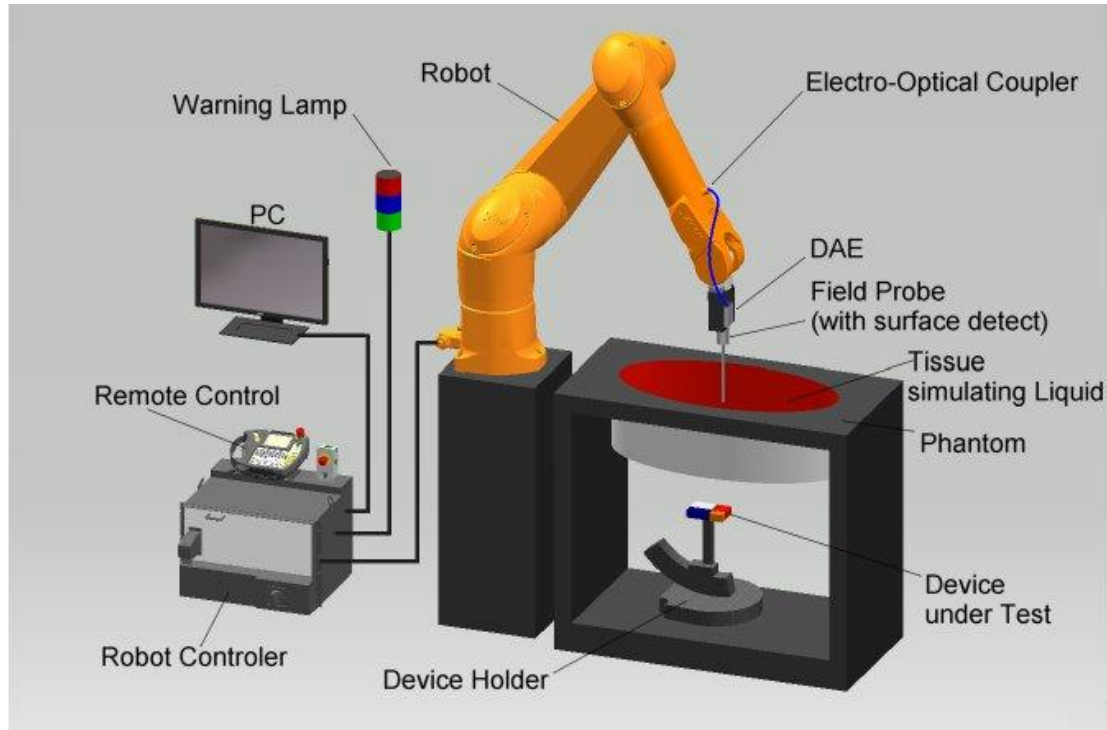
Ambient temperature:	20 – 24 °C
Tissue Simulating liquid:	20 – 24 °C
Relative humidity content:	40 – 50 %
Air pressure:	not relevant for this kind of testing
Power supply:	230 V / 50 Hz

NOTE: For the SAR measurements the exact temperature values for each test are shown in the SAR result tables and are also at the bottom of each measurement plot.

7 Test Set-up

7.1 Measurement system

7.1.1 System Description



- The DAS system for performing compliance tests consists of the following items:
- A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e. an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
- A data acquisition electronic (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- A unit to operate the optical surface detector which is connected to the EOC.
- The Electro-Optical Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DAS measurement server.
- The DAS 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.
- DAS software and SEMCAD data evaluation software.
- Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.
- The generic twin phantom enabling the testing of left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- System check dipoles allowing to validate the proper functioning of the system.

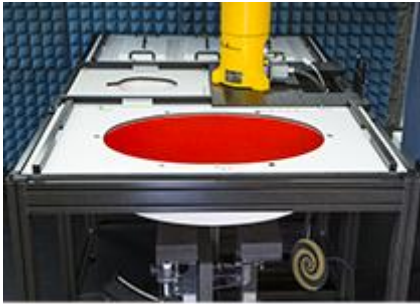
7.1.2 Test environment

The DASY measurement system is placed at the head end of a room with dimensions: 5 x 2.5 x 3 m³, the SAM phantom is placed in a distance of 75 cm from the side walls and 1.1m from the rear wall. Above the test system a 1.5 x 1.5 m² array of pyramid absorbers is installed to reduce reflections from the ceiling. Picture 1 of the photo documentation shows a complete view of the test environment. The system allows the measurement of SAR values larger than 0.005 W/kg.

7.1.3 Probe description

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 μ W/g to > 100 W/kg; Linearity: ± 0.2 dB (noise: typically <1 μ W/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%.

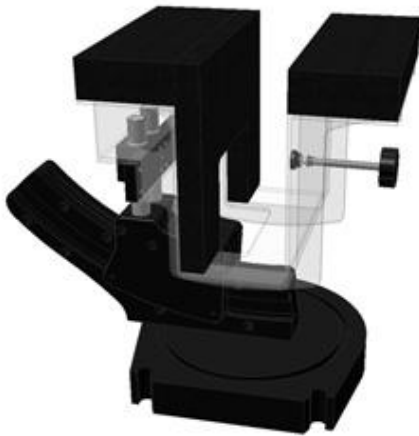
7.1.4 Phantom description



The used ELI Phantom is fully compatible with the IEC/IEEE 62209-1528 and all known tissue stimulating liquids. It meets the requirements specified in KDB865664 D01 for Specific Absorption Rate (SAR) measurements and is fully compatible with the standard IEC 62209-2. The phantom consists of a fibreglass shell integrated in a wooden table. The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 4MHz to 10 GHz.

7.1.5 Laptop Extension Kit for Device holder

SPEAG released a simple but effective extension for their Mounting Device that facilitates the testing of larger devices according to IEC 62209-2 (e.g., laptops, cameras, etc).



The extension is lightweight and made of POM, PET-G acrylic glass and foam. It fits easily on the upper part of the Mounting Device in place of the phone positioner.

Larger DUT's 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.

7.1.6 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. Measurements can be performed in a fixed plane or by following an arbitrary surface.
- For an automatic and accurate detection of the phantom surface, the DASY system uses Mechanical Surface Detection:

Mechanical Surface Detection

Mechanical surface detection uses the probe collision detector built into the DAE. It is extremely accurate if the probe is normal to the surface (0.05 mm). For angled probes, the distance increases, because the detection is at the edge of the probe tip. It can be used in any liquid with any kind of probe. If the surface is strongly angled with respect to the probe, the probe slides along the surface and is deflected sideways. The second switch system in the DAE will detect this situation and the probe will move backward until the touch condition is cleared. However, there will be some remaining uncertainty in the final probe position. In the job description, the desired distance from the probe sensors to the phantom surface can be entered. The detection is always at touch, but the probe will move backward from the surface the indicated distance before starting the measurement.

Mother Scan in cDASY6/DASY8 Module SAR

The cDASY6/DASY8 Module SAR provides the possibility to do a Mother Scan in which a high resolution Area Scan is done in the phantom filled with liquid to a fixed level using a special teaching probe. This mother scan data is used to recreate the phantom inner surface in software, and all future area and/or zoom scans, and a surface detection check is no longer required.

- 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 ≤ 2 GHz 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 provides an auto-extending feature to expand the size of the measurement area of the zoom scan as long as the maximum is found too close to the edge of the measured range, which eliminates the need to re-measure cubes whose maximum is found on the boundary of the defined measurement cube.
- To meet the requirements of **IEC 62209-2 AMD1 from 2019** it is necessary to perform graded grid measurements to avoid measurement mistakes.

Below 3 GHz it defines:

Horizontal grid step ≤ 8 mm

Vertical grid step ≤ 5 mm for uniform spacing

For variable spacing in vertical direction the maximum distance between the two closest measured points to the phantom shell (M1 and M2) shall be ≤ 4 mm and the spacing between farther points shall increase by a factor ≤ 1.5 . Zoom Scan size ≤ 30 mm by 30 mm by 30 mm.

Above 3 GHz it defines:

Horizontal grid step $\leq (24/f [\text{GHz}])$ mm

Vertical grid step $\leq (10/(f [\text{GHz}] - 1))$ mm for uniform spacing

For variable spacing in vertical direction the maximum distance between the two closest measured points to the phantom shell (M1 and M2) shall be $\leq (12/f [\text{GHz}])$ mm and the spacing between farther points shall increase by a factor ≤ 1.5 . Zoom Scan size ≤ 22 mm by 22 mm by 22 mm.

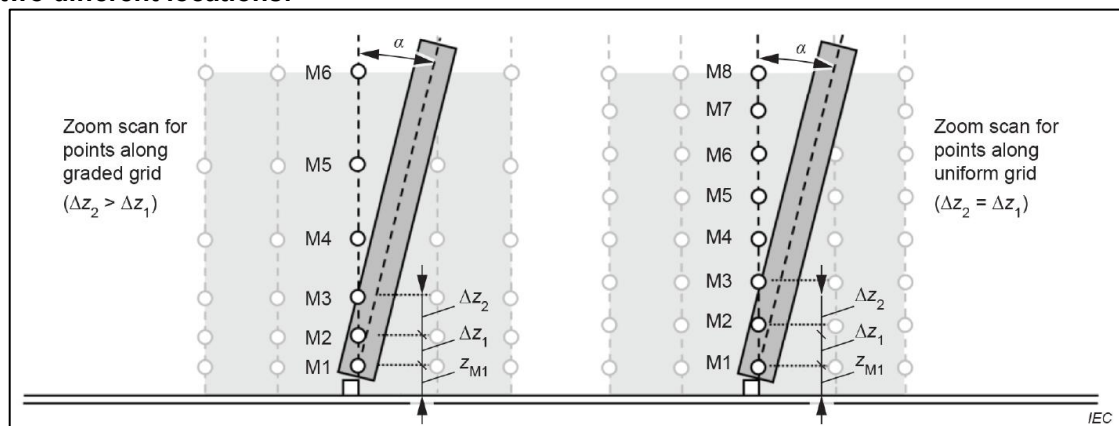
If the zoom scan measured as defined above complies with both of the following criteria, or if the peak spatial-average SAR is below 0.1 W/kg, no additional measurements are needed:

- the smallest horizontal distance from the local SAR peaks to all points 3 dB below the SAR peak shall be larger than the horizontal grid steps in both x and y directions (Δx , Δy). This shall be checked for the measured zoom scan plane conformal to the phantom at the distance z_{M1} . The minimum distance shall be recorded in the SAR test report;
- the ratio of the SAR at the second measured point (M2) to the SAR at the closest measured point (M1) at the x-y location of the measured maximum SAR value shall be at least 30 %. This ratio (in %) shall be recorded in the SAR test report.

If one or both of the above criteria are not met, the zoom scan measurement shall be repeated using a finer resolution while keeping the other zoom scan parameters compatible with the basic requirements for zoom scans.

New horizontal and vertical grid steps shall be determined from the measured SAR distribution so that the above criteria are met. Compliance with the above two criteria shall be demonstrated for the new measured zoom scan. The size of the higher resolution zoom scan and all other parameters shall apply. The closest point to the phantom shell shall be 2 mm or less for graded grids and the grading factor shall be 1.5 or less. Uncertainties due to field distortion between the media boundary and the dielectric enclosure of the probe should also be minimized, which is achieved if the distance between the phantom surface and physical tip of the probe is larger than the probe tip diameter. Other methods may utilize correction procedures to compensate for boundary effects that enable high precision measurements closer than half the probe tip diameter. For all measurement points, the angle of the probe normal to the flat phantom surface shall be less than 5° . If this cannot be achieved, an additional uncertainty evaluation is required.

Orientation of the probe with respect to the line normal to the phantom surface, shown at two different locations:



NOTE M1 to M8 are example measurement points used for extrapolation to the surface. The maximum of the angle α between the evaluation axis and the surface normal line is called the probe angle. The distance z_{M1} is from the phantom shell to the first measurement point M1, and its maximum value is 1.4mm fixed for the DASY system equipped with an EX-Probe. The distances Δz_i ($i = 1, 2, 3, \dots$) are the distances from measurement points M_i to M_{i-1} . For uniform grids, Δz_i are equal. For graded grids, $\Delta z_{i+1} > \Delta z_i$. $R_z = \Delta z_{i+1}/\Delta z_i$ is a ratio with a maximum value (defined in the table below). The z direction corresponds to the vertical direction, the x direction is horizontal and the y direction is horizontal into the page.

NOTE 1: The evaluation of the zoom scan is typically done by the post-processor by interpolation and extrapolation and without reconstruction of the field. More focused induced SAR distributions (e.g., for more localized sources such as capacitively coupled sources) require a more dense grid such that the same integration and extrapolation algorithms can be used for the same assessment uncertainty.

NOTE 2: The minimum ratio of 30 % is derived from the plane wave penetration depth at 6 GHz.

Detailed parameters can be seen in the following table:

Zoom scan parameters

Parameter	DUT transmit frequency being tested	
	$f \leq 3 \text{ GHz}$	$3 \text{ GHz} < f \leq 6 \text{ GHz}$ (f in GHz)
Maximum distance between the closest measured points and the phantom surface (z_{M1} in Figure 18 and Table 1, in mm)	5	$\delta \ln(2)/2^a$
Maximum angle between the probe axis and the phantom surface normal (α in Figure 20)	5° (flat phantom only) 30° (other phantoms)	5° (flat phantom only) 20° (other phantoms)
Maximum spacing between measured points in the x- and y-directions (Δx and Δy , in mm)	8	$24 / f^b$
For uniform grids: Maximum spacing between measured points in the direction normal to the phantom shell (Δz_1 in Figure 20, in mm)	5	$10 / (f - 1)$
For graded grids: Maximum spacing between the two closest measured points in the direction normal to the phantom shell (Δz_1 in Figure 20, in mm)	4	$12/f$
For graded grids: Maximum incremental increase in the spacing between measured points in the direction normal to the phantom shell ($R_z = \Delta z_2/\Delta z_1$ in Figure 20)	1.5	1.5
Minimum edge length of the zoom scan volume in the x- and y-directions (L_z in O.8.3.2, in mm)	30	22
Minimum edge length of the zoom scan volume in the direction normal to the phantom shell (L_h in O.8.3.2 in mm)	30	22
Tolerance in the probe angle	1°	1°

^a δ is the penetration depth for a plane-wave incident normally on a planar half-space.
^b This is the maximum spacing allowed, which might not work for all circumstances.

Minimum probe requirements as a function of frequency and parameters of the tissue equivalent liquid

1	2	3	4	5	6	7	8
Frequency MHz	Relative permittivity	Conductivity S/m	Wavelength in the medium (λ) mm	Plane wave Skin Depth (δ) mm	Maximum Diameter mm	50% Distance for M1 ($z_{50\%} = \delta \ln(2)/2$) mm	Min. distance for M1 (z_{M1}) mm
300	45.3	0.87	148.6	46.1	8.0	16.0	5.0
450	43.5	0.87	101.1	42.9	8.0	14.9	5.0
750	41.9	0.89	61.8	39.8	8.0	13.8	5.0
835	41.5	0.90	55.8	38.9	8.0	13.5	5.0
900	41.5	0.97	51.7	36.1	8.0	12.5	5.0
1450	40.5	1.20	32.5	28.6	8.0	9.9	5.0
1800	40.0	1.40	26.4	24.3	8.0	8.4	5.0
2000	40.0	1.40	23.7	24.2	8.0	8.4	5.0
2450	39.2	1.80	19.6	18.7	6.5	6.5	5.0
2600	39.0	1.96	18.5	17.2	6.2	5.9	5.0
3000	38.5	2.40	16.1	13.9	5.4	4.8	5.0
4000	37.4	3.43	12.3	9.6	4.1	3.3	3.3
5000	36.2	4.45	10.0	7.3	3.3	2.5	2.5
5200	36.0	4.66	9.6	7.0	3.2	2.4	2.4
5400	35.8	4.86	9.3	6.7	3.1	2.3	2.3
5600	35.5	5.07	9.0	6.4	3.0	2.2	2.2
5800	35.3	5.27	8.7	6.1	2.9	2.1	2.1
6000	35.1	5.48	8.4	5.9	2.8	2.0	2.0

Further probe parameters can be seen in Annex M of IEC 62209-2.

7.1.7 Spatial Peak SAR Evaluation

The cDASY6/DASY8 Module SAR software includes all numerical procedures necessary to evaluate the spatial peak SAR values. Based on the IEEE 1528 standard, a new algorithm has been implemented. The spatial-peak SAR can be computed over any required mass.

The base for the evaluation is a "cube" measurement in a volume of 30mm³ below 3GHz or 22mm³ above 3GHz. The measured volume must include the 1 g and 10 g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan. If the 10g cube or both cubes are not entirely inside the measured volumes, the system issues a warning regarding the evaluated spatial peak values within the post-processing engine. This means that if the measured volume is shifted, higher values might be possible. To get the correct values a finer measurement grid for the area scan is used. In complicated field distributions, a large grid spacing for the area scan might miss some details and give an incorrectly interpolated peak location. cDASY6/DASY8 Module SAR allows to automatically extend the grid to make sure that both cubes are inside the measured volume.

The entire evaluation of the spatial peak values is performed within the application in case of cDASY6/DASY8 Module SAR software. The system always gives the maximum values for the 1 g and 10 g cubes. The DASY6 software allow to automatically extend the grid to make sure that both cubes are inside the measured volume. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

1. extraction of the measured data (grid and values) from the Zoom Scan
2. calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
3. generation of a high-resolution mesh within the measured volume
4. interpolation of all measured values from the measurement grid to the high-resolution grid
5. extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
6. calculation of the averaged SAR within masses of 1 g and 10 g The significant parts are outlined in more detail within the following sections.

Interpolation, Extrapolation and Detection of Maxima

The probe is calibrated at the center of the dipole sensors which is located 1 to 2.7mm away from the probe tip. During measurements, the probe stops shortly above the phantom surface, depending on the probe and the surface detecting system. Both distances are included as parameters in the probe configuration file. The software always knows exactly how far away the measured point is from the surface. As the probe cannot directly measure at the surface, the values between the deepest measured point and the surface must be extrapolated.

The choice of the coordinate system defining the location of the measurement points has no influence on the uncertainty of the interpolation, Maxima Search and extrapolation routines. The interpolation, extrapolation and maximum search routines are all based on the modified Quadratic Shepard's method [Robert J. Renka, "Multivariate Interpolation Of Large Sets Of Scattered Data", University of North Texas ACM Transactions on Mathematical Software, vol. 14, no. 2, June 1988, pp. 139-148.].

Thereby, the interpolation scheme combines a least-square fitted function method and a weighted average method which are the two basic types of computational interpolation and approximation. The DASY6 routines construct a once-continuously differentiable function that interpolates the measurement values as follows:

- For each measurement point a trivariate (3-D) / bivariate (2-D) quadratic is computed. It interpolates the measurement values at the data point and forms a least-square fit to neighbouring measurement values.
- the spatial location of the quadratic with respect to the measurement values is attenuated by an inverse distance weighting. This is performed since the calculated quadratic will fit measurement values at nearby points more accurate than at points located further away.
- After the quadratics are calculated at all measurement points, the interpolating function is calculated as a weighted average of the quadratics.

There are two control parameters that govern the behavior of the interpolation method.

One specifies the number of measurement points to be used in computing the least-square fits for the local quadratics. These measurement points are the ones nearest the input point for which the quadratic is being computed.

The second parameter specifies the number of measurement points that will be used in calculating the weights for the quadratics to produce the final function. The input data points used there are the ones nearest the point at which the interpolation is desired. Appropriate defaults are chosen for each of the control parameters.

The trivariate quadratics that have been previously computed for the 3-D interpolation and whose input data are at the closest distance from the phantom surface, are used in order to extrapolate the fields to the surface of the phantom.

In order to determine all the field maxima in 2-D (Area Scan) and 3-D (Zoom Scan), the measurement grid is refined by a default factor of 10 (area) and 5 (zoom), respectively, and the interpolation function is used to evaluate all field values between corresponding measurement points. Subsequently, a linear search is applied to find all the candidate maxima. In a last step, non physical maxima are removed and only those maxima which are within 2 dB of the global maximum value are retained.

Important: To be processable by the interpolation/extrapolation scheme, the Area Scan requires at least 6 measurement points. The Zoom Scan requires at least 10 measurement points to allow the application of these algorithms.

In the Area Scan, the gradient of the interpolation function is evaluated to find all the extrema of the SAR distribution. The uncertainty on the locations of the extrema is less than 1/20 of the grid size. Only local maxima within 2 dB of the global maximum are searched and passed for the Zoom Scan measurement.

In the Zoom Scan, the interpolation function is used to extrapolate the Peak SAR from the lowest measurement points to the inner phantom surface (the extrapolation distance). The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1 g and 10 g cubes, the extrapolation distance should not be larger than 5 mm.

Averaging and Determination of spatial Peak SAR

Within cDASY6/DASY8 Module SAR software, the measured grid is interpolated to a high resolution grid, where the resolution is around 1mm and chosen such that the cube volume is a multiple of the resolution. Points which are outside of the measured grid are masked out and set to zero. Then, the antiderivative of the interpolated grid is computed by using a Gaussian quadrature consecutively for all spatial dimensions.

The antiderivative is used to compute all cube averages of the volume with the same resolution as the interpolated grid. The maximum of these SAR averages is reported. If the cube containing the maximum averaged SAR touches the surface of the measured volume, an appropriate warning is issued within the Post-processing engine.

7.1.8 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], [W/kg], [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	$\text{Norm}_i, a_{i0}, a_{i1}, a_{i2}$
	- 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 (i = x, y, z)
[mV/(V/m)²] for E-field Probes
 $ConvF$ = 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 W/kg
 E_{tot} = total field strength in V/m
 σ = conductivity in [mho/m] or [Siemens/m]
 ρ = equivalent tissue density in g/cm³

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid. The power flow density is calculated assuming the excitation field to be a free space field.

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

with P_{pwe} = equivalent power density of a plane wave in mW/cm²
 E_{tot} = total electric field strength in V/m
 H_{tot} = total magnetic field strength in A/m

Data Evaluation in cDASY6/DASY8

cDASY6/DASY8 features basic evaluation capabilities comparable to the above described SEMCAD evaluation.

7.1.9 Tissue simulating liquids: dielectric properties

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

HBBL600-10000MHz Simulating Head Liquid, Manufactured by SPEAG:

Ingredients	(% by weight)
Water	50-65%
Mineral oil	10-30%
Emulsifiers	8-25%
Sodium salt	0-1.5%

Table 3: Head tissue dielectric properties

7.1.10 Tissue simulating liquids: parameters

Freq. (MHz)	Target head tissue		Measurement head tissue						Measurement date
	Permittivity	Conductivity [S/m]	Permittivity	Dev. %	Conductivity		Dev. %		
					ε''	[S/m]			
704	42.15	0.89	43.9	4.1	22.12	0.87	-2.3	2026-01-15	
707	42.13	0.89	43.9	4.1	22.06	0.87	-2.2		
715	42.09	0.89	43.9	4.2	21.88	0.87	-2.0		
750	41.90	0.89	43.7	4.4	21.09	0.88	-1.1		
780	41.76	0.89	43.7	4.6	20.52	0.89	-0.4		
782	41.75	0.89	43.7	4.6	20.48	0.89	-0.4		
785	41.74	0.89	43.7	4.6	20.42	0.89	-0.3		
829	41.53	0.90	43.6	5.0	19.68	0.91	0.9	2026-01-16	
835	41.50	0.90	43.6	5.0	19.58	0.91	1.1		
837	41.50	0.90	43.6	5.0	19.55	0.91	0.9		
844	41.50	0.91	43.6	5.0	19.44	0.91	0.3		
1720	40.11	1.35	41.8	4.1	14.10	1.35	-0.3	2026-01-15	
1732	40.10	1.36	41.7	4.1	14.07	1.36	-0.4		
1745	40.08	1.37	41.7	4.0	14.04	1.36	-0.4		
1750	40.07	1.37	41.7	4.0	14.02	1.37	-0.5		
1860	40.00	1.40	41.5	3.8	13.76	1.42	1.7	2026-01-16	
1880	40.00	1.40	41.5	3.7	13.72	1.43	2.5		
1900	40.00	1.40	41.5	3.7	13.68	1.45	3.3		
2402	39.28	1.76	40.5	3.2	13.34	1.78	1.4	2026-01-19	
2440	39.22	1.79	40.5	3.2	13.34	1.81	1.1		
2450	39.20	1.80	40.5	3.2	13.34	1.82	1.0		
2480	39.16	1.83	40.4	3.2	13.34	1.84	0.5		

Table 4: Parameter of the head tissue simulating liquid (HSL)

Note: The dielectric properties have been measured using the contact probe method at 22°C.

*) as the liquid parameters deviation is $\geq \pm 5\%$ an extrapolation according IEC / IEEE 62209-1528 chapter 7.8.2 approach 3 is necessary. The DASY software is capable to perform the necessary corrections directly from the tissue and measurement data. The uncertainties in this document have been adjusted accordingly.

For detailed information see chapter 8.2.4 SAR correction for deviations of complex permittivity from target on page 50.

7.1.11 Measurement uncertainty evaluation for SAR test

DASY6/8 Uncertainty Budget										
According to IEC/IEEE 62209-1528 (Frequency band: 300 MHz - 3 GHz range)										
Symbol	Error Description	Uncertainty Value		Probability Distribution	Divisor	c _i	c _i	Standard Uncertainty		
						(1g)	(10g)	± %, (1g)	± %, (10g)	
Measurement System Errors										
CF	Probe Calibration Repeat.	±	12.0	%	Normal	2	1	1	± 6.0 %	± 6.0 %
CFdrift	Probe Calibration Drift	±	1.7	%	Rectangular	√ 3	1	1	± 1.0 %	± 1.0 %
LIN	Probe linearity	±	4.7	%	Rectangular	√ 3	1	1	± 2.7 %	± 2.7 %
BBS	Broadband Signal	±	3.0	%	Rectangular	√ 3	1	1	± 1.7 %	± 1.7 %
ISO	Probe Isotropy (axial)	±	7.6	%	Rectangular	√ 3	1	1	± 4.4 %	± 4.4 %
DAE	Data Acquisition	±	0.3	%	Normal	1	1	1	± 0.3 %	± 0.3 %
AMB	RF Ambient	±	1.8	%	Normal	1	1	1	± 1.8 %	± 1.8 %
Δ _{sys}	Probe Positioning	±	0.006	mm	Normal	1	0.14	0.14	± 0.1 %	± 0.1 %
DAT	Data Processing	±	1.2	%	Normal	1	1	1	± 1.2 %	± 1.2 %
Phantom and Device Errors										
LIQ(σ)	Conductivity (meas.) ^{DAK}	±	2.5	%	Normal	1	0.78	0.71	± 2.0 %	± 1.8 %
LIQ(Tσ)	Conductivity (temp.) ^{BB}	±	3.3	%	Rectangular	√ 3	0.78	0.71	± 1.5 %	± 1.4 %
EPS	Phantom Permittivity	±	14.0	%	Rectangular	√ 3	0	0	± 0.0 %	± 0.0 %
DIS	Distance DUT - TSL	±	2.0	%	Normal	1	2	2	± 4.0 %	± 4.0 %
D _{xyz}	Device Positioning	±	1.0	%	Normal	1	1	1	± 1.0 %	± 1.0 %
H	Device Holder	±	3.6	%	Normal	1	1	1	± 3.6 %	± 3.6 %
MOD	DUT Modulation ^m	±	2.4	%	Rectangular	√ 3	1	1	± 1.4 %	± 1.4 %
TAS	Time-average SAR	±	1.7	%	Rectangular	√ 3	1	1	± 1.0 %	± 1.0 %
RF _{drift}	DUT drift	±	2.5	%	Normal	1	1	1	± 2.5 %	± 2.5 %
VAL	Val Antenna Unc. ^{val}	±	0.0	%	Normal	1	1	1	± 0.0 %	± 0.0 %
RF _{in}	Unc. Input Power ^{val}	±	0.0	%	Normal	1	1	1	± 0.0 %	± 0.0 %
Correction to the SAR results										
C(ε, σ)	Deviation to Target	±	1.9	%	Normal	1	1	0.84	± 1.9 %	± 1.6 %
C(R)	SAR scaling ^p	±	0.0	%	Rectangular	√ 3	1	1	± 0.0 %	± 0.0 %
u(ΔSAR)	Combined Uncertainty								± 11.0 %	± 10.9 %
U	Expanded Uncertainty								± 21.9 %	± 21.7 %

Table 5: Measurement uncertainties

Worst-Case uncertainty budget for DASY6/8 assessed according to IEC/IEEE 62209-1528 [4]. 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. All listed error components have ν_{eff} equal to ∞ .

Footnote details:

^m SMC calibration is a new method for determining the total deviation from linearity. The uncertainty is $\leq 2.4\%$ for $psSAR \leq 2 \text{ W/kg}$, $\leq 4.8\%$ for $psSAR_{1g/10g} \leq 4 \text{ W/kg}$ and $\leq 9.6\%$ for $psSAR_{1g/10g} \leq 10 \text{ W/kg}$ (see modulation calibration parameter uncertainty in the probe calibration certificate);

^{BB} if SPEAG's broad-band liquids (BBL) are used that have low temperature coefficients;

^{DAK} if SPEAG's high precision dielectric probe kit (DAK) is applied;

^p if power scaling is used, error item "SAR Scaling" must be adjusted accordingly;

^{val} only applies in case of validation measurements.

DASY8 Uncertainty Budget									
According to IEC/IEEE 62209-1528 (Frequency band: 3 GHz - 6 GHz range)									
Symbol	Error Description	Uncertainty Value	Probability Distribution	Divisor	c _i	c _i	Standard Uncertainty		
					(1g)	(10g)	± %, (1g)	± %, (10g)	
Measurement System Errors									
CF	Probe Calibration Repeat.	± 13.1 %	Normal	2	1	1	± 6.6 %	± 6.6 %	
CFdrift	Probe Calibration Drift	± 1.7 %	Rectangular	√ 3	1	1	± 1.0 %	± 1.0 %	
LIN	Probe linearity	± 4.7 %	Rectangular	√ 3	1	1	± 2.7 %	± 2.7 %	
BBS	Broadband Signal	± 2.6 %	Rectangular	√ 3	1	1	± 1.5 %	± 1.5 %	
ISO	Probe Isotropy (axial)	± 7.6 %	Rectangular	√ 3	1	1	± 4.4 %	± 4.4 %	
DAE	Data Acquisition	± 0.3 %	Normal	1	1	1	± 0.3 %	± 0.3 %	
AMB	RF Ambient	± 1.8 %	Normal	1	1	1	± 1.8 %	± 1.8 %	
Δ _{sys}	Probe Positioning	± 0.005 mm	Normal	1	0.29	0.29	± 0.2 %	± 0.2 %	
DAT	Data Processing	± 2.3 %	Normal	1	1	1	± 2.3 %	± 2.3 %	
Phantom and Device Errors									
LIQ(σ)	Conductivity (meas.) ^{DAK}	± 2.5 %	Normal	1	0.78	0.71	± 2.0 %	± 1.8 %	
LIQ(Tσ)	Conductivity (temp.) ^{BB}	± 3.4 %	Rectangular	√ 3	0.78	0.71	± 1.5 %	± 1.4 %	
EPS	Phantom Permittivity	± 14.0 %	Rectangular	√ 3	0.25	0.25	± 2.0 %	± 2.0 %	
DIS	Distance DUT - TSL	± 2.0 %	Normal	1	2	2	± 4.0 %	± 4.0 %	
D _{xyz}	Device Positioning	± 1.0 %	Normal	1	1	1	± 1.0 %	± 1.0 %	
H	Device Holder	± 3.6 %	Normal	1	1	1	± 3.6 %	± 3.6 %	
MOD	DUT Modulation ^m	± 2.4 %	Rectangular	√ 3	1	1	± 1.4 %	± 1.4 %	
TAS	Time-average SAR	± 1.7 %	Rectangular	√ 3	1	1	± 1.0 %	± 1.0 %	
RF _{drift}	DUT drift	± 2.5 %	Normal	1	1	1	± 2.5 %	± 2.5 %	
VAL	Val Antenna Unc. ^{val}	± 0.0 %	Normal	1	1	1	± 0.0 %	± 0.0 %	
RF _{in}	Unc. Input Power ^{val}	± 0.0 %	Normal	1	1	1	± 0.0 %	± 0.0 %	
Correction to the SAR results									
C(ε, σ)	Deviation to Target	± 1.9 %	Normal	1	1	0.84	± 1.9 %	± 1.6 %	
C(R)	SAR scaling ^p	± 0.0 %	Rectangular	√ 3	1	1	± 0.0 %	± 0.0 %	
u(ΔSAR)	Combined Uncertainty						± 11.6 %	± 11.5 %	
U	Expanded Uncertainty						± 23.2 %	± 23.0 %	

Table

6: Measurement uncertainties

Worst-Case uncertainty budget for DASY8 assessed according to IEC/IEEE 62209-1528 [4]. The budget is valid for the frequency range 3 GHz – 6 GHz and represents a worst-case analysis. For specific tests and configurations, the uncertainty could be considerable smaller. All listed error components have *veff* equal to ∞.

Footnote details:

^m SMC calibration is a new method for determining the total deviation from linearity. The uncertainty is ≤ 2.4% for psSAR ≤ 2 W/kg, ≤ 4.8% for psSAR1g/10g ≤ 4 W/kg and ≤ 9.6% for psSAR1g/10g ≤ 10 W/kg (see modulation calibration parameter uncertainty in the probe calibration certificate);

^{BB} if SPEAG's broad-band liquids (BBL) are used that have low temperature coefficients;

^{DAK} if SPEAG's high precision dielectric probe kit (DAK) is applied;

^p if power scaling is used, error item "SAR Scaling" must be adjusted accordingly;

^{val} only applies in case of validation measurements.

7.1.12 Measurement uncertainty evaluation for System Check

Repeatability Budget for System Check (Frequency band: 300MHz - 6GHz range) with DASY6/8 System									
Symbol	Error Description	Uncertainty Value		Probability Distribution	Divisor	c _i	c _i	Standard Uncertainty	
						(1g)	(10g)	± %, (1g)	± %, (10g)
Measurement System Errors									
CF	Probe Calibration Repeat.	± 3.6	%	Normal	2	2	1	± 5.1 %	± 2.5 %
CFdrift	Probe Calibration Drift	± 1.7	%	Rectangular	√ 3	1	1	± 1.0 %	± 1.0 %
LIN	Probe linearity	± 4.7	%	Rectangular	√ 3	0	0	± 0.0 %	± 0.0 %
BBS	Broadband Signal	± 0.0	%	Rectangular	√ 3	0	0	± 0.0 %	± 0.0 %
ISO	Probe Isotropy (axial)	± 4.7	%	Rectangular	√ 3	0	0	± 0.0 %	± 0.0 %
DAE	Data Acquisition	± 0.3	%	Normal	1	0	0	± 0.0 %	± 0.0 %
AMB	RF Ambient	± 0.6	%	Normal	1	0	0	± 0.0 %	± 0.0 %
Δ _{sys}	Probe Positioning	± 0.2	%	Normal	1	0.33	0.33	± 0.1 %	± 0.1 %
DAT	Data Processing	± 0.0	%	Normal	1	1	1	± 0.0 %	± 0.0 %
Phantom and Device Errors									
LIQ(σ)	Conductivity (meas.) ^{DAK}	± 2.5	%	Normal	1	0.78	0.71	± 2.0 %	± 1.8 %
LIQ(Tσ)	Conductivity (temp.) ^{BB}	± 3.4	%	Rectangular	√ 3	0.78	0.71	± 1.5 %	± 1.4 %
EPS	Phantom Permittivity	± 14.0	%	Rectangular	√ 3	0	0	± 0.0 %	± 0.0 %
DIS	Distance Phantom - DUT	± 1.0	%	Normal	1	2	2	± 2.0 %	± 2.0 %
MOD	DUT Modulation ^m	± 0.0	%	Rectangular	√ 3	1	1	± 0.0 %	± 0.0 %
TAS	Time-average SAR	± 0.0	%	Rectangular	√ 3	1	1	± 0.0 %	± 0.0 %
VAL	Validation antenna	± 0.0	%	Normal	1	1	1	± 0.0 %	± 0.0 %
P _{in}	Accepted power	± 1.2	%	Normal	1	1	1	± 1.2 %	± 1.2 %
Correction to the SAR results									
C(ε, σ)	Deviation to Target	± 1.9	%	Normal	1	1	0.84	± 1.9 %	± 1.6 %
u(ΔSAR)	Combined Uncertainty							± 6.5 %	± 4.5 %
U	Expanded Uncertainty							± 13.0 %	± 9.1 %

Table 7: Repeatability of the system check (300MHz - 6 GHz).

All listed error components have v_{eff} equal to ∞ .

Footnote details:

^{BB} if SPEAG's broad-band liquids (BBL) are used that have low temperature coefficients;

^{DAK} if SPEAG's high precision dielectric probe kit (DAK) is applied.

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

7.1.13 System check

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

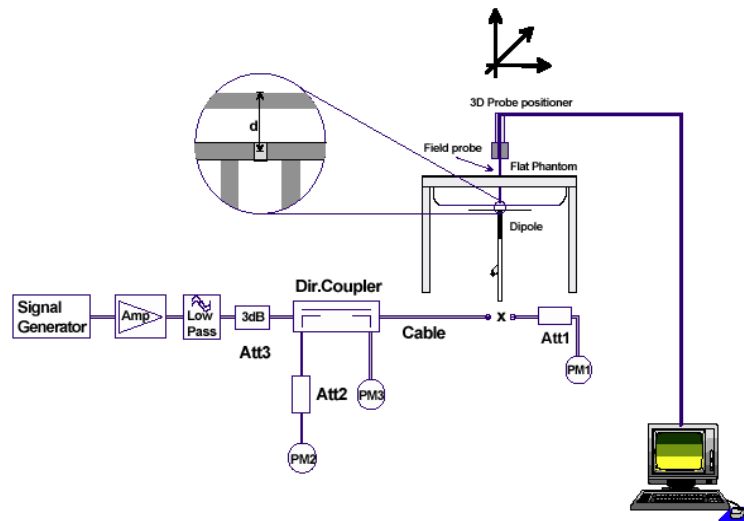
System performance check (1000 mW)									
System validation Kit	Probe	Frequency	Target SAR _{1g}	Target SAR _{10g}	Measured SAR _{1g}	SAR _{1g}	Measured SAR _{10g}	SAR _{10g}	Measured date
		MHz	W/kg (+/- 10%)		W/kg	dev.	W/kg	dev.	
D750V3 S/N: 1041	EX3DV4 S/N: 3944	750	8.52	5.60	7.80	-8.5%	5.20	-7.1%	2026-01-15
D835V2 S/N: 4d153	EX3DV4 S/N: 3944	835	9.63	6.27	9.60	-0.3%	6.36	1.4%	2026-01-16
D1750V2 S/N: 1093	EX3DV4 S/N: 3944	1750	36.10	19.30	33.40	-7.5%	17.94	-7.0%	2026-01-15
D1900V2 S/N: 5d009	EX3DV4 S/N: 3944	1900	39.10	20.60	38.00	-2.8%	20.00	-2.9%	2026-01-16
D2450V2 S/N: 710	EX3DV4 S/N: 3944	2450	52.60	24.50	51.20	-2.7%	24.20	-1.2%	2026-01-19

Table 8: Results system check

7.1.14 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 100 mW or 50 mW if used Powersource1. 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.



7.1.15 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.

8 Detailed Test Results

8.1 Conducted power measurements

8.1.1 Conducted power measurements LTE FDD 2 1900 MHz

Channel	Frequency [MHz]	Channel	Bandwidth [MHz]	Resource block allocation	Modulation	P _{avg} [dBm]
low	1850.7	18607	1.4	1RB_low_NBposLow	QPSK	22.40
low	1850.7	18607	1.4	1RB_low_NBposLow	16QAM	20.90
low	1850.7	18607	1.4	1RB_mid_NBposMid	QPSK	20.93
low	1850.7	18607	1.4	1RB_mid_NBposMid	16QAM	20.27
low	1850.7	18607	1.4	1RB_high_NBposHigh	QPSK	22.09
low	1850.7	18607	1.4	1RB_high_NBposHigh	16QAM	21.53
low	1850.7	18607	1.4	100%RB_NBposLow	QPSK	19.89
low	1850.7	18607	1.4	100%RB_NBposLow	16QAM	19.36
low	1850.7	18607	1.4	100%RB_NBposMid	QPSK	20.17
low	1850.7	18607	1.4	100%RB_NBposMid	16QAM	19.63
low	1850.7	18607	1.4	100%RB_NBposHigh	QPSK	20.33
low	1850.7	18607	1.4	100%RB_NBposHigh	16QAM	19.38
mid	1880	18900	1.4	1RB_low_NBposLow	QPSK	21.86
mid	1880	18900	1.4	1RB_low_NBposLow	16QAM	20.34
mid	1880	18900	1.4	1RB_mid_NBposMid	QPSK	21.61
mid	1880	18900	1.4	1RB_mid_NBposMid	16QAM	20.43
mid	1880	18900	1.4	1RB_high_NBposHigh	QPSK	21.99
mid	1880	18900	1.4	1RB_high_NBposHigh	16QAM	20.76
mid	1880	18900	1.4	100%RB_NBposLow	QPSK	20.36
mid	1880	18900	1.4	100%RB_NBposLow	16QAM	20.13
mid	1880	18900	1.4	100%RB_NBposMid	QPSK	20.28
mid	1880	18900	1.4	100%RB_NBposMid	16QAM	20.14
mid	1880	18900	1.4	100%RB_NBposHigh	QPSK	20.32
mid	1880	18900	1.4	100%RB_NBposHigh	16QAM	20.05
high	1909.3	19193	1.4	1RB_low_NBposLow	QPSK	22.10
high	1909.3	19193	1.4	1RB_low_NBposLow	16QAM	21.54
high	1909.3	19193	1.4	1RB_mid_NBposMid	QPSK	21.35
high	1909.3	19193	1.4	1RB_mid_NBposMid	16QAM	21.62
high	1909.3	19193	1.4	1RB_high_NBposHigh	QPSK	22.46
high	1909.3	19193	1.4	1RB_high_NBposHigh	16QAM	20.86
high	1909.3	19193	1.4	100%RB_NBposLow	QPSK	20.60
high	1909.3	19193	1.4	100%RB_NBposLow	16QAM	20.62
high	1909.3	19193	1.4	100%RB_NBposMid	QPSK	20.32
high	1909.3	19193	1.4	100%RB_NBposMid	16QAM	19.70
high	1909.3	19193	1.4	100%RB_NBposHigh	QPSK	20.51
high	1909.3	19193	1.4	100%RB_NBposHigh	16QAM	20.00
low	1851.5	18615	3	1RB_low_NBposLow	QPSK	21.86
low	1851.5	18615	3	1RB_low_NBposLow	16QAM	20.72
low	1851.5	18615	3	1RB_mid_NBposMid	QPSK	21.54
low	1851.5	18615	3	1RB_mid_NBposMid	16QAM	20.88
low	1851.5	18615	3	1RB_high_NBposHigh	QPSK	22.06
low	1851.5	18615	3	1RB_high_NBposHigh	16QAM	20.94
low	1851.5	18615	3	100%RB_NBposLow	QPSK	20.37
low	1851.5	18615	3	100%RB_NBposLow	16QAM	20.04
low	1851.5	18615	3	100%RB_NBposMid	QPSK	20.24
low	1851.5	18615	3	100%RB_NBposMid	16QAM	19.49
low	1851.5	18615	3	100%RB_NBposHigh	QPSK	20.21
low	1851.5	18615	3	100%RB_NBposHigh	16QAM	19.94
mid	1880	18900	3	1RB_low_NBposLow	QPSK	21.98
mid	1880	18900	3	1RB_low_NBposLow	16QAM	20.49

Channel	Frequency [MHz]	Channel	Bandwidth [MHz]	Resource block allocation	Modulation	P _{avg} [dBm]
mid	1880	18900	3	1RB_mid_NBposMid	QPSK	21.65
mid	1880	18900	3	1RB_mid_NBposMid	16QAM	20.90
mid	1880	18900	3	1RB_high_NBposHigh	QPSK	22.03
mid	1880	18900	3	1RB_high_NBposHigh	16QAM	20.58
mid	1880	18900	3	100%RB_NBposLow	QPSK	20.53
mid	1880	18900	3	100%RB_NBposLow	16QAM	19.97
mid	1880	18900	3	100%RB_NBposMid	QPSK	20.45
mid	1880	18900	3	100%RB_NBposMid	16QAM	20.04
mid	1880	18900	3	100%RB_NBposHigh	QPSK	20.44
mid	1880	18900	3	100%RB_NBposHigh	16QAM	19.85
high	1908.5	19185	3	1RB_low_NBposLow	QPSK	22.03
high	1908.5	19185	3	1RB_low_NBposLow	16QAM	21.28
high	1908.5	19185	3	1RB_mid_NBposMid	QPSK	21.36
high	1908.5	19185	3	1RB_mid_NBposMid	16QAM	21.34
high	1908.5	19185	3	1RB_high_NBposHigh	QPSK	22.49
high	1908.5	19185	3	1RB_high_NBposHigh	16QAM	20.84
high	1908.5	19185	3	100%RB_NBposLow	QPSK	20.33
high	1908.5	19185	3	100%RB_NBposLow	16QAM	20.44
high	1908.5	19185	3	100%RB_NBposMid	QPSK	20.22
high	1908.5	19185	3	100%RB_NBposMid	16QAM	19.84
high	1908.5	19185	3	100%RB_NBposHigh	QPSK	20.68
high	1908.5	19185	3	100%RB_NBposHigh	16QAM	20.03
low	1852.5	18625	5	1RB_low_NBposLow	QPSK	21.91
low	1852.5	18625	5	1RB_low_NBposLow	16QAM	22.32
low	1852.5	18625	5	1RB_mid_NBposMid	QPSK	21.28
low	1852.5	18625	5	1RB_mid_NBposMid	16QAM	22.36
low	1852.5	18625	5	1RB_high_NBposHigh	QPSK	22.00
low	1852.5	18625	5	1RB_high_NBposHigh	16QAM	21.66
low	1852.5	18625	5	100%RB_NBposLow	QPSK	21.10
low	1852.5	18625	5	100%RB_NBposLow	16QAM	19.46
low	1852.5	18625	5	100%RB_NBposMid	QPSK	21.05
low	1852.5	18625	5	100%RB_NBposMid	16QAM	20.04
low	1852.5	18625	5	100%RB_NBposHigh	QPSK	21.25
low	1852.5	18625	5	100%RB_NBposHigh	16QAM	20.00
mid	1880	18900	5	1RB_low_NBposLow	QPSK	22.37
mid	1880	18900	5	1RB_low_NBposLow	16QAM	22.42
mid	1880	18900	5	1RB_mid_NBposMid	QPSK	22.26
mid	1880	18900	5	1RB_mid_NBposMid	16QAM	22.11
mid	1880	18900	5	1RB_high_NBposHigh	QPSK	22.48
mid	1880	18900	5	1RB_high_NBposHigh	16QAM	22.31
mid	1880	18900	5	100%RB_NBposLow	QPSK	21.32
mid	1880	18900	5	100%RB_NBposLow	16QAM	20.17
mid	1880	18900	5	100%RB_NBposMid	QPSK	21.31
mid	1880	18900	5	100%RB_NBposMid	16QAM	20.05
mid	1880	18900	5	100%RB_NBposHigh	QPSK	21.39
mid	1880	18900	5	100%RB_NBposHigh	16QAM	19.98
high	1907.5	19175	5	1RB_low_NBposLow	QPSK	22.29
high	1907.5	19175	5	1RB_low_NBposLow	16QAM	22.57
high	1907.5	19175	5	1RB_mid_NBposMid	QPSK	21.61
high	1907.5	19175	5	1RB_mid_NBposMid	16QAM	22.54
high	1907.5	19175	5	1RB_high_NBposHigh	QPSK	22.34
high	1907.5	19175	5	1RB_high_NBposHigh	16QAM	21.97

Channel	Frequency [MHz]	Channel	Bandwidth [MHz]	Resource block allocation	Modulation	P _{avg} [dBm]
high	1907.5	19175	5	100%RB_NBposLow	QPSK	21.36
high	1907.5	19175	5	100%RB_NBposLow	16QAM	19.93
high	1907.5	19175	5	100%RB_NBposMid	QPSK	21.30
high	1907.5	19175	5	100%RB_NBposMid	16QAM	20.00
high	1907.5	19175	5	100%RB_NBposHigh	QPSK	21.66
high	1907.5	19175	5	100%RB_NBposHigh	16QAM	20.29
low	1855	18650	10	1RB_low_NBposLow	QPSK	21.98
low	1855	18650	10	1RB_low_NBposLow	16QAM	22.31
low	1855	18650	10	1RB_mid_NBposMid	QPSK	21.44
low	1855	18650	10	1RB_mid_NBposMid	16QAM	22.40
low	1855	18650	10	1RB_high_NBposHigh	QPSK	22.06
low	1855	18650	10	1RB_high_NBposHigh	16QAM	21.75
low	1855	18650	10	100%RB_NBposLow	QPSK	21.13
low	1855	18650	10	100%RB_NBposLow	16QAM	20.67
low	1855	18650	10	100%RB_NBposMid	QPSK	21.14
low	1855	18650	10	100%RB_NBposMid	16QAM	20.83
low	1855	18650	10	100%RB_NBposHigh	QPSK	21.27
low	1855	18650	10	100%RB_NBposHigh	16QAM	20.93
mid	1880	18900	10	1RB_low_NBposLow	QPSK	22.06
mid	1880	18900	10	1RB_low_NBposLow	16QAM	21.70
mid	1880	18900	10	1RB_mid_NBposMid	QPSK	21.95
mid	1880	18900	10	1RB_mid_NBposMid	16QAM	21.92
mid	1880	18900	10	1RB_high_NBposHigh	QPSK	22.26
mid	1880	18900	10	1RB_high_NBposHigh	16QAM	21.90
mid	1880	18900	10	100%RB_NBposLow	QPSK	21.44
mid	1880	18900	10	100%RB_NBposLow	16QAM	20.76
mid	1880	18900	10	100%RB_NBposMid	QPSK	21.43
mid	1880	18900	10	100%RB_NBposMid	16QAM	20.71
mid	1880	18900	10	100%RB_NBposHigh	QPSK	21.57
mid	1880	18900	10	100%RB_NBposHigh	16QAM	20.83
high	1905	19150	10	1RB_low_NBposLow	QPSK	22.04
high	1905	19150	10	1RB_low_NBposLow	16QAM	22.33
high	1905	19150	10	1RB_mid_NBposMid	QPSK	21.75
high	1905	19150	10	1RB_mid_NBposMid	16QAM	22.74
high	1905	19150	10	1RB_high_NBposHigh	QPSK	22.39
high	1905	19150	10	1RB_high_NBposHigh	16QAM	21.95
high	1905	19150	10	100%RB_NBposLow	QPSK	21.17
high	1905	19150	10	100%RB_NBposLow	16QAM	20.64
high	1905	19150	10	100%RB_NBposMid	QPSK	21.41
high	1905	19150	10	100%RB_NBposMid	16QAM	21.15
high	1905	19150	10	100%RB_NBposHigh	QPSK	21.59
high	1905	19150	10	100%RB_NBposHigh	16QAM	21.28
low	1857.5	18675	15	1RB_low_NBposLow	QPSK	21.94
low	1857.5	18675	15	1RB_low_NBposLow	16QAM	22.35
low	1857.5	18675	15	1RB_mid_NBposMid	QPSK	21.44
low	1857.5	18675	15	1RB_mid_NBposMid	16QAM	22.47
low	1857.5	18675	15	1RB_high_NBposHigh	QPSK	22.03
low	1857.5	18675	15	1RB_high_NBposHigh	16QAM	21.77
low	1857.5	18675	15	100%RB_NBposLow	QPSK	22.16
low	1857.5	18675	15	100%RB_NBposLow	16QAM	21.51
low	1857.5	18675	15	100%RB_NBposMid	QPSK	22.15
low	1857.5	18675	15	100%RB_NBposMid	16QAM	21.77

Channel	Frequency [MHz]	Channel	Bandwidth [MHz]	Resource block allocation	Modulation	P _{avg} [dBm]
low	1857.5	18675	15	100%RB_NBposHigh	QPSK	22.26
low	1857.5	18675	15	100%RB_NBposHigh	16QAM	21.89
mid	1880	18900	15	1RB_low_NBposLow	QPSK	22.02
mid	1880	18900	15	1RB_low_NBposLow	16QAM	21.66
mid	1880	18900	15	1RB_mid_NBposMid	QPSK	22.06
mid	1880	18900	15	1RB_mid_NBposMid	16QAM	21.96
mid	1880	18900	15	1RB_high_NBposHigh	QPSK	22.18
mid	1880	18900	15	1RB_high_NBposHigh	16QAM	21.76
mid	1880	18900	15	100%RB_NBposLow	QPSK	22.36
mid	1880	18900	15	100%RB_NBposLow	16QAM	21.59
mid	1880	18900	15	100%RB_NBposMid	QPSK	22.45
mid	1880	18900	15	100%RB_NBposMid	16QAM	21.67
mid	1880	18900	15	100%RB_NBposHigh	QPSK	22.37
mid	1880	18900	15	100%RB_NBposHigh	16QAM	21.78
high	1902.5	19125	15	1RB_low_NBposLow	QPSK	22.14
high	1902.5	19125	15	1RB_low_NBposLow	16QAM	22.43
high	1902.5	19125	15	1RB_mid_NBposMid	QPSK	21.54
high	1902.5	19125	15	1RB_mid_NBposMid	16QAM	22.55
high	1902.5	19125	15	1RB_high_NBposHigh	QPSK	22.30
high	1902.5	19125	15	1RB_high_NBposHigh	16QAM	21.95
high	1902.5	19125	15	100%RB_NBposLow	QPSK	22.38
high	1902.5	19125	15	100%RB_NBposLow	16QAM	21.68
high	1902.5	19125	15	100%RB_NBposMid	QPSK	22.20
high	1902.5	19125	15	100%RB_NBposMid	16QAM	22.16
high	1902.5	19125	15	100%RB_NBposHigh	QPSK	22.51
high	1902.5	19125	15	100%RB_NBposHigh	16QAM	22.26
low	1860	18700	20	1RB_low_NBposLow	QPSK	22.04
low	1860	18700	20	1RB_low_NBposLow	16QAM	22.31
low	1860	18700	20	1RB_mid_NBposMid	QPSK	21.50
low	1860	18700	20	1RB_mid_NBposMid	16QAM	22.45
low	1860	18700	20	1RB_high_NBposHigh	QPSK	21.99
low	1860	18700	20	1RB_high_NBposHigh	16QAM	21.73
low	1860	18700	20	100%RB_NBposLow	QPSK	22.23
low	1860	18700	20	100%RB_NBposLow	16QAM	21.57
low	1860	18700	20	100%RB_NBposMid	QPSK	22.09
low	1860	18700	20	100%RB_NBposMid	16QAM	21.89
low	1860	18700	20	100%RB_NBposHigh	QPSK	22.28
low	1860	18700	20	100%RB_NBposHigh	16QAM	21.95
mid	1880	18900	20	1RB_low_NBposLow	QPSK	22.06
mid	1880	18900	20	1RB_low_NBposLow	16QAM	21.70
mid	1880	18900	20	1RB_mid_NBposMid	QPSK	22.06
mid	1880	18900	20	1RB_mid_NBposMid	16QAM	21.98
mid	1880	18900	20	1RB_high_NBposHigh	QPSK	22.27
mid	1880	18900	20	1RB_high_NBposHigh	16QAM	21.89
mid	1880	18900	20	100%RB_NBposLow	QPSK	22.32
mid	1880	18900	20	100%RB_NBposLow	16QAM	21.53
mid	1880	18900	20	100%RB_NBposMid	QPSK	22.40
mid	1880	18900	20	100%RB_NBposMid	16QAM	21.69
mid	1880	18900	20	100%RB_NBposHigh	QPSK	22.42
mid	1880	18900	20	100%RB_NBposHigh	16QAM	21.78
high	1900	19100	20	1RB_low_NBposLow	QPSK	22.20
high	1900	19100	20	1RB_low_NBposLow	16QAM	22.51

Channel	Frequency [MHz]	Channel	Bandwidth [MHz]	Resource block allocation	Modulation	P _{avg} [dBm]
high	1900	19100	20	1RB_mid_NBposMid	QPSK	21.48
high	1900	19100	20	1RB_mid_NBposMid	16QAM	22.50
high	1900	19100	20	1RB_high_NBposHigh	QPSK	22.29
high	1900	19100	20	1RB_high_NBposHigh	16QAM	22.01
high	1900	19100	20	100%RB_NBposLow	QPSK	22.25
high	1900	19100	20	100%RB_NBposLow	16QAM	21.71
high	1900	19100	20	100%RB_NBposMid	QPSK	22.12
high	1900	19100	20	100%RB_NBposMid	16QAM	21.86
high	1900	19100	20	100%RB_NBposHigh	QPSK	22.52
high	1900	19100	20	100%RB_NBposHigh	16QAM	22.23

Table 9: Test results conducted power measurement LTE FDD 2 Cat. M1 1900 MHz.

Channel	Frequency [MHz]	Channel	Bandwidth [MHz]	Resource block allocation	P _{avg} [dBm]
low	1850.1	18601	0.18	SC_1_low_BPSK	22.04
low	1850.1	18601	0.18	SC_1_low_QPSK	21.81
low	1850.1	18601	0.18	SC_1_high_BPSK	22.08
low	1850.1	18601	0.18	SC_1_high_QPSK	21.83
low	1850.1	18601	0.18	SC_1_100%_QPSK	19.93
mid	1880	18900	0.18	SC_1_low_BPSK	22.18
mid	1880	18900	0.18	SC_1_low_QPSK	21.94
mid	1880	18900	0.18	SC_1_high_BPSK	22.19
mid	1880	18900	0.18	SC_1_high_QPSK	22.03
mid	1880	18900	0.18	SC_1_100%_QPSK	20.10
high	1909.9	19199	0.18	SC_1_low_BPSK	22.31
high	1909.9	19199	0.18	SC_1_low_QPSK	22.20
high	1909.9	19199	0.18	SC_1_high_BPSK	22.41
high	1909.9	19199	0.18	SC_1_high_QPSK	22.40
high	1909.9	19199	0.18	SC_1_100%_QPSK	20.19

Table 10: Test results conducted power measurement LTE FDD 2 NB IoT 1900 MHz.

8.1.2 Conducted power measurements LTE FDD 4 1700 MHz

Channel	Frequency [MHz]	Channel	Bandwidth [MHz]	Resource block allocation	Modulation	P _{avg} [dBm]
low	1710.7	19957	1.4	1RB_low_NBposLow	QPSK	21.57
low	1710.7	19957	1.4	1RB_low_NBposLow	16QAM	21.08
low	1710.7	19957	1.4	1RB_mid_NBposMid	QPSK	20.58
low	1710.7	19957	1.4	1RB_mid_NBposMid	16QAM	20.94
low	1710.7	19957	1.4	1RB_high_NBposHigh	QPSK	21.81
low	1710.7	19957	1.4	1RB_high_NBposHigh	16QAM	20.55
low	1710.7	19957	1.4	100%RB_NBposLow	QPSK	20.18
low	1710.7	19957	1.4	100%RB_NBposLow	16QAM	19.97
low	1710.7	19957	1.4	100%RB_NBposMid	QPSK	19.87
low	1710.7	19957	1.4	100%RB_NBposMid	16QAM	19.15
low	1710.7	19957	1.4	100%RB_NBposHigh	QPSK	19.97
low	1710.7	19957	1.4	100%RB_NBposHigh	16QAM	19.49
mid	1732.5	20175	1.4	1RB_low_NBposLow	QPSK	21.67
mid	1732.5	20175	1.4	1RB_low_NBposLow	16QAM	20.16
mid	1732.5	20175	1.4	1RB_mid_NBposMid	QPSK	21.27
mid	1732.5	20175	1.4	1RB_mid_NBposMid	16QAM	20.21
mid	1732.5	20175	1.4	1RB_high_NBposHigh	QPSK	21.64
mid	1732.5	20175	1.4	1RB_high_NBposHigh	16QAM	20.38
mid	1732.5	20175	1.4	100%RB_NBposLow	QPSK	19.89
mid	1732.5	20175	1.4	100%RB_NBposLow	16QAM	19.74
mid	1732.5	20175	1.4	100%RB_NBposMid	QPSK	19.85
mid	1732.5	20175	1.4	100%RB_NBposMid	16QAM	19.73
mid	1732.5	20175	1.4	100%RB_NBposHigh	QPSK	19.85
mid	1732.5	20175	1.4	100%RB_NBposHigh	16QAM	19.69
high	1754.3	20393	1.4	1RB_low_NBposLow	QPSK	22.24
high	1754.3	20393	1.4	1RB_low_NBposLow	16QAM	20.78
high	1754.3	20393	1.4	1RB_mid_NBposMid	QPSK	21.52
high	1754.3	20393	1.4	1RB_mid_NBposMid	16QAM	20.99
high	1754.3	20393	1.4	1RB_high_NBposHigh	QPSK	22.09
high	1754.3	20393	1.4	1RB_high_NBposHigh	16QAM	20.96
high	1754.3	20393	1.4	100%RB_NBposLow	QPSK	20.39
high	1754.3	20393	1.4	100%RB_NBposLow	16QAM	20.00
high	1754.3	20393	1.4	100%RB_NBposMid	QPSK	20.27
high	1754.3	20393	1.4	100%RB_NBposMid	16QAM	20.20
high	1754.3	20393	1.4	100%RB_NBposHigh	QPSK	19.98
high	1754.3	20393	1.4	100%RB_NBposHigh	16QAM	19.33
low	1711.5	19965	3	1RB_low_NBposLow	QPSK	21.77
low	1711.5	19965	3	1RB_low_NBposLow	16QAM	21.00
low	1711.5	19965	3	1RB_mid_NBposMid	QPSK	21.06
low	1711.5	19965	3	1RB_mid_NBposMid	16QAM	20.87
low	1711.5	19965	3	1RB_high_NBposHigh	QPSK	22.01
low	1711.5	19965	3	1RB_high_NBposHigh	16QAM	20.67
low	1711.5	19965	3	100%RB_NBposLow	QPSK	19.99
low	1711.5	19965	3	100%RB_NBposLow	16QAM	19.91

Channel	Frequency [MHz]	Channel	Bandwidth [MHz]	Resource block allocation	Modulation	P _{avg} [dBm]
low	1711.5	19965	3	100%RB_NBposMid	QPSK	19.80
low	1711.5	19965	3	100%RB_NBposMid	16QAM	19.43
low	1711.5	19965	3	100%RB_NBposHigh	QPSK	20.30
low	1711.5	19965	3	100%RB_NBposHigh	16QAM	19.66
mid	1732.5	20175	3	1RB_low_NBposLow	QPSK	21.79
mid	1732.5	20175	3	1RB_low_NBposLow	16QAM	20.45
mid	1732.5	20175	3	1RB_mid_NBposMid	QPSK	21.44
mid	1732.5	20175	3	1RB_mid_NBposMid	16QAM	20.80
mid	1732.5	20175	3	1RB_high_NBposHigh	QPSK	21.85
mid	1732.5	20175	3	1RB_high_NBposHigh	16QAM	20.54
mid	1732.5	20175	3	100%RB_NBposLow	QPSK	20.23
mid	1732.5	20175	3	100%RB_NBposLow	16QAM	19.65
mid	1732.5	20175	3	100%RB_NBposMid	QPSK	20.24
mid	1732.5	20175	3	100%RB_NBposMid	16QAM	19.61
mid	1732.5	20175	3	100%RB_NBposHigh	QPSK	20.21
mid	1732.5	20175	3	100%RB_NBposHigh	16QAM	19.50
high	1753.5	20385	3	1RB_low_NBposLow	QPSK	21.88
high	1753.5	20385	3	1RB_low_NBposLow	16QAM	21.18
high	1753.5	20385	3	1RB_mid_NBposMid	QPSK	21.14
high	1753.5	20385	3	1RB_mid_NBposMid	16QAM	20.98
high	1753.5	20385	3	1RB_high_NBposHigh	QPSK	21.99
high	1753.5	20385	3	1RB_high_NBposHigh	16QAM	20.68
high	1753.5	20385	3	100%RB_NBposLow	QPSK	20.13
high	1753.5	20385	3	100%RB_NBposLow	16QAM	20.16
high	1753.5	20385	3	100%RB_NBposMid	QPSK	20.04
high	1753.5	20385	3	100%RB_NBposMid	16QAM	19.74
high	1753.5	20385	3	100%RB_NBposHigh	QPSK	20.33
high	1753.5	20385	3	100%RB_NBposHigh	16QAM	19.77
low	1712.5	19975	5	1RB_low_NBposLow	QPSK	21.82
low	1712.5	19975	5	1RB_low_NBposLow	16QAM	22.17
low	1712.5	19975	5	1RB_mid_NBposMid	QPSK	21.32
low	1712.5	19975	5	1RB_mid_NBposMid	16QAM	22.13
low	1712.5	19975	5	1RB_high_NBposHigh	QPSK	21.89
low	1712.5	19975	5	1RB_high_NBposHigh	16QAM	21.77
low	1712.5	19975	5	100%RB_NBposLow	QPSK	21.10
low	1712.5	19975	5	100%RB_NBposLow	16QAM	19.47
low	1712.5	19975	5	100%RB_NBposMid	QPSK	21.00
low	1712.5	19975	5	100%RB_NBposMid	16QAM	19.53
low	1712.5	19975	5	100%RB_NBposHigh	QPSK	21.18
low	1712.5	19975	5	100%RB_NBposHigh	16QAM	19.78
mid	1732.5	20175	5	1RB_low_NBposLow	QPSK	21.79
mid	1732.5	20175	5	1RB_low_NBposLow	16QAM	21.62
mid	1732.5	20175	5	1RB_mid_NBposMid	QPSK	21.84
mid	1732.5	20175	5	1RB_mid_NBposMid	16QAM	21.96
mid	1732.5	20175	5	1RB_high_NBposHigh	QPSK	21.83
mid	1732.5	20175	5	1RB_high_NBposHigh	16QAM	21.69

Channel	Frequency [MHz]	Channel	Bandwidth [MHz]	Resource block allocation	Modulation	P _{avg} [dBm]
mid	1732.5	20175	5	100%RB_NBposLow	QPSK	21.09
mid	1732.5	20175	5	100%RB_NBposLow	16QAM	19.35
mid	1732.5	20175	5	100%RB_NBposMid	QPSK	21.14
mid	1732.5	20175	5	100%RB_NBposMid	16QAM	19.46
mid	1732.5	20175	5	100%RB_NBposHigh	QPSK	21.12
mid	1732.5	20175	5	100%RB_NBposHigh	16QAM	19.52
high	1752.5	20375	5	1RB_low_NBposLow	QPSK	21.95
high	1752.5	20375	5	1RB_low_NBposLow	16QAM	22.31
high	1752.5	20375	5	1RB_mid_NBposMid	QPSK	21.46
high	1752.5	20375	5	1RB_mid_NBposMid	16QAM	22.38
high	1752.5	20375	5	1RB_high_NBposHigh	QPSK	21.96
high	1752.5	20375	5	1RB_high_NBposHigh	16QAM	21.78
high	1752.5	20375	5	100%RB_NBposLow	QPSK	21.16
high	1752.5	20375	5	100%RB_NBposLow	16QAM	19.46
high	1752.5	20375	5	100%RB_NBposMid	QPSK	21.15
high	1752.5	20375	5	100%RB_NBposMid	16QAM	19.69
high	1752.5	20375	5	100%RB_NBposHigh	QPSK	21.22
high	1752.5	20375	5	100%RB_NBposHigh	16QAM	19.87
low	1715	20000	10	1RB_low_NBposLow	QPSK	21.85
low	1715	20000	10	1RB_low_NBposLow	16QAM	22.24
low	1715	20000	10	1RB_mid_NBposMid	QPSK	21.36
low	1715	20000	10	1RB_mid_NBposMid	16QAM	22.20
low	1715	20000	10	1RB_high_NBposHigh	QPSK	21.97
low	1715	20000	10	1RB_high_NBposHigh	16QAM	21.86
low	1715	20000	10	100%RB_NBposLow	QPSK	21.17
low	1715	20000	10	100%RB_NBposLow	16QAM	20.47
low	1715	20000	10	100%RB_NBposMid	QPSK	21.05
low	1715	20000	10	100%RB_NBposMid	16QAM	20.74
low	1715	20000	10	100%RB_NBposHigh	QPSK	21.24
low	1715	20000	10	100%RB_NBposHigh	16QAM	20.86
mid	1732.5	20175	10	1RB_low_NBposLow	QPSK	21.83
mid	1732.5	20175	10	1RB_low_NBposLow	16QAM	22.10
mid	1732.5	20175	10	1RB_mid_NBposMid	QPSK	21.77
mid	1732.5	20175	10	1RB_mid_NBposMid	16QAM	22.23
mid	1732.5	20175	10	1RB_high_NBposHigh	QPSK	21.77
mid	1732.5	20175	10	1RB_high_NBposHigh	16QAM	21.99
mid	1732.5	20175	10	100%RB_NBposLow	QPSK	20.98
mid	1732.5	20175	10	100%RB_NBposLow	16QAM	20.12
mid	1732.5	20175	10	100%RB_NBposMid	QPSK	20.95
mid	1732.5	20175	10	100%RB_NBposMid	16QAM	20.28
mid	1732.5	20175	10	100%RB_NBposHigh	QPSK	20.87
mid	1732.5	20175	10	100%RB_NBposHigh	16QAM	20.35
high	1750	20350	10	1RB_low_NBposLow	QPSK	21.80
high	1750	20350	10	1RB_low_NBposLow	16QAM	22.21
high	1750	20350	10	1RB_mid_NBposMid	QPSK	21.39
high	1750	20350	10	1RB_mid_NBposMid	16QAM	22.21

Channel	Frequency [MHz]	Channel	Bandwidth [MHz]	Resource block allocation	Modulation	P _{avg} [dBm]
high	1750	20350	10	1RB_high_NBposHigh	QPSK	22.05
high	1750	20350	10	1RB_high_NBposHigh	16QAM	21.88
high	1750	20350	10	100%RB_NBposLow	QPSK	21.10
high	1750	20350	10	100%RB_NBposLow	16QAM	20.32
high	1750	20350	10	100%RB_NBposMid	QPSK	21.02
high	1750	20350	10	100%RB_NBposMid	16QAM	20.63
high	1750	20350	10	100%RB_NBposHigh	QPSK	21.33
high	1750	20350	10	100%RB_NBposHigh	16QAM	20.81
low	1717.5	20025	15	1RB_low_NBposLow	QPSK	21.89
low	1717.5	20025	15	1RB_low_NBposLow	16QAM	22.28
low	1717.5	20025	15	1RB_mid_NBposMid	QPSK	21.42
low	1717.5	20025	15	1RB_mid_NBposMid	16QAM	22.37
low	1717.5	20025	15	1RB_high_NBposHigh	QPSK	21.80
low	1717.5	20025	15	1RB_high_NBposHigh	16QAM	21.66
low	1717.5	20025	15	100%RB_NBposLow	QPSK	22.12
low	1717.5	20025	15	100%RB_NBposLow	16QAM	21.40
low	1717.5	20025	15	100%RB_NBposMid	QPSK	22.14
low	1717.5	20025	15	100%RB_NBposMid	16QAM	21.88
low	1717.5	20025	15	100%RB_NBposHigh	QPSK	22.16
low	1717.5	20025	15	100%RB_NBposHigh	16QAM	21.76
mid	1732.5	20175	15	1RB_low_NBposLow	QPSK	21.93
mid	1732.5	20175	15	1RB_low_NBposLow	16QAM	21.76
mid	1732.5	20175	15	1RB_mid_NBposMid	QPSK	21.83
mid	1732.5	20175	15	1RB_mid_NBposMid	16QAM	21.97
mid	1732.5	20175	15	1RB_high_NBposHigh	QPSK	21.83
mid	1732.5	20175	15	1RB_high_NBposHigh	16QAM	21.65
mid	1732.5	20175	15	100%RB_NBposLow	QPSK	22.14
mid	1732.5	20175	15	100%RB_NBposLow	16QAM	21.37
mid	1732.5	20175	15	100%RB_NBposMid	QPSK	22.11
mid	1732.5	20175	15	100%RB_NBposMid	16QAM	21.40
mid	1732.5	20175	15	100%RB_NBposHigh	QPSK	21.93
mid	1732.5	20175	15	100%RB_NBposHigh	16QAM	21.39
high	1747.5	20325	15	1RB_low_NBposLow	QPSK	21.81
high	1747.5	20325	15	1RB_low_NBposLow	16QAM	22.19
high	1747.5	20325	15	1RB_mid_NBposMid	QPSK	21.34
high	1747.5	20325	15	1RB_mid_NBposMid	16QAM	22.32
high	1747.5	20325	15	1RB_high_NBposHigh	QPSK	21.91
high	1747.5	20325	15	1RB_high_NBposHigh	16QAM	21.73
high	1747.5	20325	15	100%RB_NBposLow	QPSK	22.00
high	1747.5	20325	15	100%RB_NBposLow	16QAM	21.38
high	1747.5	20325	15	100%RB_NBposMid	QPSK	22.04
high	1747.5	20325	15	100%RB_NBposMid	16QAM	21.63
high	1747.5	20325	15	100%RB_NBposHigh	QPSK	22.24
high	1747.5	20325	15	100%RB_NBposHigh	16QAM	21.75
low	1720	20050	20	1RB_low_NBposLow	QPSK	21.93
low	1720	20050	20	1RB_low_NBposLow	16QAM	22.30
low	1720	20050	20	1RB_mid_NBposMid	QPSK	21.37
low	1720	20050	20	1RB_mid_NBposMid	16QAM	22.26

Channel	Frequency [MHz]	Channel	Bandwidth [MHz]	Resource block allocation	Modulation	P _{avg} [dBm]
low	1720	20050	20	1RB_high_NBposHigh	QPSK	21.72
low	1720	20050	20	1RB_high_NBposHigh	16QAM	21.59
low	1720	20050	20	100%RB_NBposLow	QPSK	22.19
low	1720	20050	20	100%RB_NBposLow	16QAM	21.56
low	1720	20050	20	100%RB_NBposMid	QPSK	22.09
low	1720	20050	20	100%RB_NBposMid	16QAM	21.74
low	1720	20050	20	100%RB_NBposHigh	QPSK	22.02
low	1720	20050	20	100%RB_NBposHigh	16QAM	21.71
mid	1732.5	20175	20	1RB_low_NBposLow	QPSK	21.89
mid	1732.5	20175	20	1RB_low_NBposLow	16QAM	21.69
mid	1732.5	20175	20	1RB_mid_NBposMid	QPSK	21.78
mid	1732.5	20175	20	1RB_mid_NBposMid	16QAM	21.84
mid	1732.5	20175	20	1RB_high_NBposHigh	QPSK	21.76
mid	1732.5	20175	20	1RB_high_NBposHigh	16QAM	21.57
mid	1732.5	20175	20	100%RB_NBposLow	QPSK	22.28
mid	1732.5	20175	20	100%RB_NBposLow	16QAM	21.44
mid	1732.5	20175	20	100%RB_NBposMid	QPSK	22.13
mid	1732.5	20175	20	100%RB_NBposMid	16QAM	21.34
mid	1732.5	20175	20	100%RB_NBposHigh	QPSK	22.12
mid	1732.5	20175	20	100%RB_NBposHigh	16QAM	21.42
high	1745	20300	20	1RB_low_NBposLow	QPSK	21.89
high	1745	20300	20	1RB_low_NBposLow	16QAM	22.18
high	1745	20300	20	1RB_mid_NBposMid	QPSK	21.33
high	1745	20300	20	1RB_mid_NBposMid	16QAM	22.24
high	1745	20300	20	1RB_high_NBposHigh	QPSK	21.97
high	1745	20300	20	1RB_high_NBposHigh	16QAM	21.74
high	1745	20300	20	100%RB_NBposLow	QPSK	22.05
high	1745	20300	20	100%RB_NBposLow	16QAM	21.33
high	1745	20300	20	100%RB_NBposMid	QPSK	21.88
high	1745	20300	20	100%RB_NBposMid	16QAM	21.70
high	1745	20300	20	100%RB_NBposHigh	QPSK	22.22
high	1745	20300	20	100%RB_NBposHigh	16QAM	21.71

Table 11: Test results conducted power measurement LTE FDD 4 Cat. M1 1700 MHz.

Channel	Frequency [MHz]	Channel	Bandwidth [MHz]	Resource block allocation	P _{avg} [dBm]
low	1710.1	19951	0.18	SC 1 low BPSK	21.73
low	1710.1	19951	0.18	SC 1 low QPSK	21.55
low	1710.1	19951	0.18	SC 1 high BPSK	21.68
low	1710.1	19951	0.18	SC 1 high QPSK	21.59
low	1710.1	19951	0.18	SC 1 100% QPSK	19.69
mid	1732.5	20175	0.18	SC 1 low BPSK	21.63
mid	1732.5	20175	0.18	SC 1 low QPSK	21.61
mid	1732.5	20175	0.18	SC 1 high BPSK	21.57
mid	1732.5	20175	0.18	SC 1 high QPSK	21.53
mid	1732.5	20175	0.18	SC 1 100% QPSK	19.63
high	1754.9	20399	0.18	SC 1 low BPSK	21.87
high	1754.9	20399	0.18	SC 1 low QPSK	21.61
high	1754.9	20399	0.18	SC 1 high BPSK	21.78
high	1754.9	20399	0.18	SC 1 high QPSK	21.71
high	1754.9	20399	0.18	SC 1 100% QPSK	19.88

Table 12: Test results conducted power measurement LTE FDD 4 NB IoT 1700 MHz.

8.1.3 Conducted power measurements LTE FDD 5 850 MHz

Channel	Frequency [MHz]	Channel	Bandwidth [MHz]	Resource block allocation	Modulation	P _{avg} [dBm]
low	824.7	20407	1.4	1RB_low_NBposLow	QPSK	23.10
low	824.7	20407	1.4	1RB_low_NBposLow	16QAM	21.76
low	824.7	20407	1.4	1RB_mid_NBposMid	QPSK	22.57
low	824.7	20407	1.4	1RB_mid_NBposMid	16QAM	22.19
low	824.7	20407	1.4	1RB_high_NBposHigh	QPSK	23.25
low	824.7	20407	1.4	1RB_high_NBposHigh	16QAM	21.86
low	824.7	20407	1.4	100%RB_NBposLow	QPSK	21.63
low	824.7	20407	1.4	100%RB_NBposLow	16QAM	20.99
low	824.7	20407	1.4	100%RB_NBposMid	QPSK	21.56
low	824.7	20407	1.4	100%RB_NBposMid	16QAM	21.30
low	824.7	20407	1.4	100%RB_NBposHigh	QPSK	21.35
low	824.7	20407	1.4	100%RB_NBposHigh	16QAM	21.28
low	825.5	20415	3	1RB_low_NBposLow	QPSK	23.17
low	825.5	20415	3	1RB_low_NBposLow	16QAM	22.77
low	825.5	20415	3	1RB_mid_NBposMid	QPSK	23.05
low	825.5	20415	3	1RB_mid_NBposMid	16QAM	22.15
low	825.5	20415	3	1RB_high_NBposHigh	QPSK	23.32
low	825.5	20415	3	1RB_high_NBposHigh	16QAM	22.26
low	825.5	20415	3	100%RB_NBposLow	QPSK	21.40
low	825.5	20415	3	100%RB_NBposLow	16QAM	21.34
low	825.5	20415	3	100%RB_NBposMid	QPSK	21.18
low	825.5	20415	3	100%RB_NBposMid	16QAM	21.29
low	825.5	20415	3	100%RB_NBposHigh	QPSK	21.36
low	825.5	20415	3	100%RB_NBposHigh	16QAM	21.26
low	826.5	20425	5	1RB_low_NBposLow	QPSK	23.14
low	826.5	20425	5	1RB_low_NBposLow	16QAM	23.34
low	826.5	20425	5	1RB_mid_NBposMid	QPSK	22.76
low	826.5	20425	5	1RB_mid_NBposMid	16QAM	23.64
low	826.5	20425	5	1RB_high_NBposHigh	QPSK	23.48
low	826.5	20425	5	1RB_high_NBposHigh	16QAM	23.70
low	826.5	20425	5	100%RB_NBposLow	QPSK	22.30
low	826.5	20425	5	100%RB_NBposLow	16QAM	21.39
low	826.5	20425	5	100%RB_NBposMid	QPSK	22.35
low	826.5	20425	5	100%RB_NBposMid	16QAM	21.38
low	826.5	20425	5	100%RB_NBposHigh	QPSK	22.58
low	826.5	20425	5	100%RB_NBposHigh	16QAM	21.42
low	829	20450	10	1RB_low_NBposLow	QPSK	23.20
low	829	20450	10	1RB_low_NBposLow	16QAM	23.35
low	829	20450	10	1RB_mid_NBposMid	QPSK	23.01
low	829	20450	10	1RB_mid_NBposMid	16QAM	23.42
low	829	20450	10	1RB_high_NBposHigh	QPSK	23.58
low	829	20450	10	1RB_high_NBposHigh	16QAM	23.56
low	829	20450	10	100%RB_NBposLow	QPSK	22.30
low	829	20450	10	100%RB_NBposLow	16QAM	22.38
low	829	20450	10	100%RB_NBposMid	QPSK	22.49
low	829	20450	10	100%RB_NBposMid	16QAM	22.55
low	829	20450	10	100%RB_NBposHigh	QPSK	22.49
low	829	20450	10	100%RB_NBposHigh	16QAM	22.18
mid	836.5	20525	1.4	1RB_low_NBposLow	QPSK	23.22
mid	836.5	20525	1.4	1RB_low_NBposLow	16QAM	21.89

Channel	Frequency [MHz]	Channel	Bandwidth [MHz]	Resource block allocation	Modulation	P _{avg} [dBm]
mid	836.5	20525	1.4	1RB_mid_NBposMid	QPSK	23.05
mid	836.5	20525	1.4	1RB_mid_NBposMid	16QAM	22.42
mid	836.5	20525	1.4	1RB_high_NBposHigh	QPSK	23.22
mid	836.5	20525	1.4	1RB_high_NBposHigh	16QAM	21.97
mid	836.5	20525	1.4	100%RB_NBposLow	QPSK	21.70
mid	836.5	20525	1.4	100%RB_NBposLow	16QAM	21.36
mid	836.5	20525	1.4	100%RB_NBposMid	QPSK	21.76
mid	836.5	20525	1.4	100%RB_NBposMid	16QAM	21.28
mid	836.5	20525	1.4	100%RB_NBposHigh	QPSK	21.75
mid	836.5	20525	1.4	100%RB_NBposHigh	16QAM	21.28
mid	836.5	20525	3	1RB_low_NBposLow	QPSK	23.34
mid	836.5	20525	3	1RB_low_NBposLow	16QAM	22.35
mid	836.5	20525	3	1RB_mid_NBposMid	QPSK	23.25
mid	836.5	20525	3	1RB_mid_NBposMid	16QAM	22.56
mid	836.5	20525	3	1RB_high_NBposHigh	QPSK	23.25
mid	836.5	20525	3	1RB_high_NBposHigh	16QAM	22.30
mid	836.5	20525	3	100%RB_NBposLow	QPSK	21.60
mid	836.5	20525	3	100%RB_NBposLow	16QAM	21.53
mid	836.5	20525	3	100%RB_NBposMid	QPSK	21.55
mid	836.5	20525	3	100%RB_NBposMid	16QAM	21.47
mid	836.5	20525	3	100%RB_NBposHigh	QPSK	21.56
mid	836.5	20525	3	100%RB_NBposHigh	16QAM	21.36
mid	836.5	20525	5	1RB_low_NBposLow	QPSK	23.59
mid	836.5	20525	5	1RB_low_NBposLow	16QAM	23.89
mid	836.5	20525	5	1RB_mid_NBposMid	QPSK	22.85
mid	836.5	20525	5	1RB_mid_NBposMid	16QAM	24.12
mid	836.5	20525	5	1RB_high_NBposHigh	QPSK	23.32
mid	836.5	20525	5	1RB_high_NBposHigh	16QAM	23.48
mid	836.5	20525	5	100%RB_NBposLow	QPSK	22.40
mid	836.5	20525	5	100%RB_NBposLow	16QAM	21.57
mid	836.5	20525	5	100%RB_NBposMid	QPSK	22.35
mid	836.5	20525	5	100%RB_NBposMid	16QAM	21.58
mid	836.5	20525	5	100%RB_NBposHigh	QPSK	22.22
mid	836.5	20525	5	100%RB_NBposHigh	16QAM	21.49
mid	836.5	20525	10	1RB_low_NBposLow	QPSK	23.45
mid	836.5	20525	10	1RB_low_NBposLow	16QAM	23.60
mid	836.5	20525	10	1RB_mid_NBposMid	QPSK	23.32
mid	836.5	20525	10	1RB_mid_NBposMid	16QAM	23.69
mid	836.5	20525	10	1RB_high_NBposHigh	QPSK	23.15
mid	836.5	20525	10	1RB_high_NBposHigh	16QAM	23.27
mid	836.5	20525	10	100%RB_NBposLow	QPSK	22.50
mid	836.5	20525	10	100%RB_NBposLow	16QAM	22.21
mid	836.5	20525	10	100%RB_NBposMid	QPSK	22.49
mid	836.5	20525	10	100%RB_NBposMid	16QAM	22.09
mid	836.5	20525	10	100%RB_NBposHigh	QPSK	22.24
mid	836.5	20525	10	100%RB_NBposHigh	16QAM	21.92
high	848.3	20643	1.4	1RB_low_NBposLow	QPSK	22.95
high	848.3	20643	1.4	1RB_low_NBposLow	16QAM	21.69
high	848.3	20643	1.4	1RB_mid_NBposMid	QPSK	22.42
high	848.3	20643	1.4	1RB_mid_NBposMid	16QAM	22.08
high	848.3	20643	1.4	1RB_high_NBposHigh	QPSK	23.03
high	848.3	20643	1.4	1RB_high_NBposHigh	16QAM	21.72

Channel	Frequency [MHz]	Channel	Bandwidth [MHz]	Resource block allocation	Modulation	P _{avg} [dBm]
high	848.3	20643	1.4	100%RB_NBposLow	QPSK	21.45
high	848.3	20643	1.4	100%RB_NBposLow	16QAM	21.17
high	848.3	20643	1.4	100%RB_NBposMid	QPSK	21.19
high	848.3	20643	1.4	100%RB_NBposMid	16QAM	20.89
high	848.3	20643	1.4	100%RB_NBposHigh	QPSK	21.47
high	848.3	20643	1.4	100%RB_NBposHigh	16QAM	20.88
high	847.5	20635	3	1RB_low_NBposLow	QPSK	23.11
high	847.5	20635	3	1RB_low_NBposLow	16QAM	22.05
high	847.5	20635	3	1RB_mid_NBposMid	QPSK	22.64
high	847.5	20635	3	1RB_mid_NBposMid	16QAM	22.02
high	847.5	20635	3	1RB_high_NBposHigh	QPSK	23.19
high	847.5	20635	3	1RB_high_NBposHigh	16QAM	22.51
high	847.5	20635	3	100%RB_NBposLow	QPSK	21.07
high	847.5	20635	3	100%RB_NBposLow	16QAM	21.17
high	847.5	20635	3	100%RB_NBposMid	QPSK	21.24
high	847.5	20635	3	100%RB_NBposMid	16QAM	21.31
high	847.5	20635	3	100%RB_NBposHigh	QPSK	21.28
high	847.5	20635	3	100%RB_NBposHigh	16QAM	20.95
high	846.5	20625	5	1RB_low_NBposLow	QPSK	23.06
high	846.5	20625	5	1RB_low_NBposLow	16QAM	23.20
high	846.5	20625	5	1RB_mid_NBposMid	QPSK	22.43
high	846.5	20625	5	1RB_mid_NBposMid	16QAM	23.52
high	846.5	20625	5	1RB_high_NBposHigh	QPSK	23.21
high	846.5	20625	5	1RB_high_NBposHigh	16QAM	23.42
high	846.5	20625	5	100%RB_NBposLow	QPSK	22.12
high	846.5	20625	5	100%RB_NBposLow	16QAM	21.27
high	846.5	20625	5	100%RB_NBposMid	QPSK	22.12
high	846.5	20625	5	100%RB_NBposMid	16QAM	21.16
high	846.5	20625	5	100%RB_NBposHigh	QPSK	22.35
high	846.5	20625	5	100%RB_NBposHigh	16QAM	21.15
high	844	20600	10	1RB_low_NBposLow	QPSK	23.18
high	844	20600	10	1RB_low_NBposLow	16QAM	23.35
high	844	20600	10	1RB_mid_NBposMid	QPSK	22.70
high	844	20600	10	1RB_mid_NBposMid	16QAM	23.18
high	844	20600	10	1RB_high_NBposHigh	QPSK	23.21
high	844	20600	10	1RB_high_NBposHigh	16QAM	23.34
high	844	20600	10	100%RB_NBposLow	QPSK	22.21
high	844	20600	10	100%RB_NBposLow	16QAM	22.40
high	844	20600	10	100%RB_NBposMid	QPSK	22.12
high	844	20600	10	100%RB_NBposMid	16QAM	22.27
high	844	20600	10	100%RB_NBposHigh	QPSK	22.11
high	844	20600	10	100%RB_NBposHigh	16QAM	21.90

Table 13: Test results conducted power measurement LTE FDD 5 Cat. M1 850 MHz.

Channel	Frequency [MHz]	Channel	Bandwidth [MHz]	Resource block allocation	P _{avg} [dBm]
low	824.1	20401	0.18	SC_1_low_BPSK	23.39
low	824.1	20401	0.18	SC_1_low_QPSK	23.25
low	824.1	20401	0.18	SC_1_high_BPSK	23.07
low	824.1	20401	0.18	SC_1_high_QPSK	23.16
low	824.1	20401	0.18	SC_1_100%_QPSK	21.21
mid	836.5	20525	0.18	SC_1_low_BPSK	23.33
mid	836.5	20525	0.18	SC_1_low_QPSK	23.43
mid	836.5	20525	0.18	SC_1_high_BPSK	23.33
mid	836.5	20525	0.18	SC_1_high_QPSK	23.39
mid	836.5	20525	0.18	SC_1_100%_QPSK	21.30
high	848.9	20649	0.18	SC_1_low_BPSK	23.19
high	848.9	20649	0.18	SC_1_low_QPSK	23.02
high	848.9	20649	0.18	SC_1_high_BPSK	23.11
high	848.9	20649	0.18	SC_1_high_QPSK	22.98
high	848.9	20649	0.18	SC_1_100%_QPSK	21.16

Table 14: Test results conducted power measurement LTE FDD 5 NB IoT 850 MHz.

8.1.4 Conducted power measurements LTE FDD 12 700 MHz

Channel	Frequency [MHz]	Channel	Bandwidth [MHz]	Resource block allocation	P _{avg} [dBm]
low	699.1	23011	0.18	SC_1_low_BPSK	22.71
low	699.1	23011	0.18	SC_1_low_QPSK	22.68
low	699.1	23011	0.18	SC_1_high_BPSK	22.68
low	699.1	23011	0.18	SC_1_high_QPSK	22.58
low	699.1	23011	0.18	SC_1_100%_QPSK	20.68
mid	707.5	23095	0.18	SC_1_low_BPSK	22.53
mid	707.5	23095	0.18	SC_1_low_QPSK	22.45
mid	707.5	23095	0.18	SC_1_high_BPSK	22.46
mid	707.5	23095	0.18	SC_1_high_QPSK	22.38
mid	707.5	23095	0.18	SC_1_100%_QPSK	20.49
high	715.9	23179	0.18	SC_1_low_BPSK	23.11
high	715.9	23179	0.18	SC_1_low_QPSK	23.20
high	715.9	23179	0.18	SC_1_high_BPSK	23.01
high	715.9	23179	0.18	SC_1_high_QPSK	23.27
high	715.9	23179	0.18	SC_1_100%_QPSK	21.13

Table 15: Test results conducted power measurement LTE FDD12 NB IoT 700 MHz.

Channel	Frequency [MHz]	Channel	Bandwidth [MHz]	Resource block allocation	Modulation	P _{avg} [dBm]
low	699.7	23017	1.4	1RB_low_NBposLow	QPSK	22.52
low	699.7	23017	1.4	1RB_low_NBposLow	16QAM	21.54
low	699.7	23017	1.4	1RB_mid_NBposMid	QPSK	21.55
low	699.7	23017	1.4	1RB_mid_NBposMid	16QAM	22.36
low	699.7	23017	1.4	1RB_high_NBposHigh	QPSK	23.29
low	699.7	23017	1.4	1RB_high_NBposHigh	16QAM	21.16
low	699.7	23017	1.4	100%RB_NBposLow	QPSK	20.80
low	699.7	23017	1.4	100%RB_NBposLow	16QAM	20.01
low	699.7	23017	1.4	100%RB_NBposMid	QPSK	20.96
low	699.7	23017	1.4	100%RB_NBposMid	16QAM	20.80
low	699.7	23017	1.4	100%RB_NBposHigh	QPSK	20.83
low	699.7	23017	1.4	100%RB_NBposHigh	16QAM	19.98
mid	707.5	23095	1.4	1RB_low_NBposLow	QPSK	22.36
mid	707.5	23095	1.4	1RB_low_NBposLow	16QAM	20.99
mid	707.5	23095	1.4	1RB_mid_NBposMid	QPSK	22.17
mid	707.5	23095	1.4	1RB_mid_NBposMid	16QAM	21.10
mid	707.5	23095	1.4	1RB_high_NBposHigh	QPSK	22.47
mid	707.5	23095	1.4	1RB_high_NBposHigh	16QAM	21.25
mid	707.5	23095	1.4	100%RB_NBposLow	QPSK	20.64
mid	707.5	23095	1.4	100%RB_NBposLow	16QAM	20.54
mid	707.5	23095	1.4	100%RB_NBposMid	QPSK	20.65
mid	707.5	23095	1.4	100%RB_NBposMid	16QAM	20.54
mid	707.5	23095	1.4	100%RB_NBposHigh	QPSK	20.68
mid	707.5	23095	1.4	100%RB_NBposHigh	16QAM	20.45
high	715.3	23173	1.4	1RB_low_NBposLow	QPSK	23.02
high	715.3	23173	1.4	1RB_low_NBposLow	16QAM	21.57
high	715.3	23173	1.4	1RB_mid_NBposMid	QPSK	23.12
high	715.3	23173	1.4	1RB_mid_NBposMid	16QAM	22.91
high	715.3	23173	1.4	1RB_high_NBposHigh	QPSK	23.88
high	715.3	23173	1.4	1RB_high_NBposHigh	16QAM	21.72
high	715.3	23173	1.4	100%RB_NBposLow	QPSK	21.27
high	715.3	23173	1.4	100%RB_NBposLow	16QAM	20.51
high	715.3	23173	1.4	100%RB_NBposMid	QPSK	21.14
high	715.3	23173	1.4	100%RB_NBposMid	16QAM	20.48
high	715.3	23173	1.4	100%RB_NBposHigh	QPSK	21.36
high	715.3	23173	1.4	100%RB_NBposHigh	16QAM	20.95
low	700.5	23025	3	1RB_low_NBposLow	QPSK	22.66
low	700.5	23025	3	1RB_low_NBposLow	16QAM	22.11
low	700.5	23025	3	1RB_mid_NBposMid	QPSK	22.35
low	700.5	23025	3	1RB_mid_NBposMid	16QAM	21.66
low	700.5	23025	3	1RB_high_NBposHigh	QPSK	22.62
low	700.5	23025	3	1RB_high_NBposHigh	16QAM	21.22
low	700.5	23025	3	100%RB_NBposLow	QPSK	20.67
low	700.5	23025	3	100%RB_NBposLow	16QAM	20.26
low	700.5	23025	3	100%RB_NBposMid	QPSK	20.97
low	700.5	23025	3	100%RB_NBposMid	16QAM	20.41
low	700.5	23025	3	100%RB_NBposHigh	QPSK	20.64
low	700.5	23025	3	100%RB_NBposHigh	16QAM	21.17
mid	707.5	23095	3	1RB_low_NBposLow	QPSK	22.44
mid	707.5	23095	3	1RB_low_NBposLow	16QAM	21.06
mid	707.5	23095	3	1RB_mid_NBposMid	QPSK	22.19
mid	707.5	23095	3	1RB_mid_NBposMid	16QAM	21.42

Channel	Frequency [MHz]	Channel	Bandwidth [MHz]	Resource block allocation	Modulation	P _{avg} [dBm]
mid	707.5	23095	3	1RB_high_NBposHigh	QPSK	22.59
mid	707.5	23095	3	1RB_high_NBposHigh	16QAM	21.31
mid	707.5	23095	3	100%RB_NBposLow	QPSK	20.90
mid	707.5	23095	3	100%RB_NBposLow	16QAM	20.29
mid	707.5	23095	3	100%RB_NBposMid	QPSK	20.88
mid	707.5	23095	3	100%RB_NBposMid	16QAM	20.18
mid	707.5	23095	3	100%RB_NBposHigh	QPSK	20.97
mid	707.5	23095	3	100%RB_NBposHigh	16QAM	20.21
high	714.5	23165	3	1RB_low_NBposLow	QPSK	23.00
high	714.5	23165	3	1RB_low_NBposLow	16QAM	22.23
high	714.5	23165	3	1RB_mid_NBposMid	QPSK	22.22
high	714.5	23165	3	1RB_mid_NBposMid	16QAM	22.04
high	714.5	23165	3	1RB_high_NBposHigh	QPSK	23.15
high	714.5	23165	3	1RB_high_NBposHigh	16QAM	21.95
high	714.5	23165	3	100%RB_NBposLow	QPSK	21.15
high	714.5	23165	3	100%RB_NBposLow	16QAM	21.21
high	714.5	23165	3	100%RB_NBposMid	QPSK	21.16
high	714.5	23165	3	100%RB_NBposMid	16QAM	20.59
high	714.5	23165	3	100%RB_NBposHigh	QPSK	21.17
high	714.5	23165	3	100%RB_NBposHigh	16QAM	20.71
low	701.5	23035	5	1RB_low_NBposLow	QPSK	22.78
low	701.5	23035	5	1RB_low_NBposLow	16QAM	23.17
low	701.5	23035	5	1RB_mid_NBposMid	QPSK	22.03
low	701.5	23035	5	1RB_mid_NBposMid	16QAM	22.91
low	701.5	23035	5	1RB_high_NBposHigh	QPSK	22.45
low	701.5	23035	5	1RB_high_NBposHigh	16QAM	22.24
low	701.5	23035	5	100%RB_NBposLow	QPSK	21.97
low	701.5	23035	5	100%RB_NBposLow	16QAM	20.19
low	701.5	23035	5	100%RB_NBposMid	QPSK	21.70
low	701.5	23035	5	100%RB_NBposMid	16QAM	20.53
low	701.5	23035	5	100%RB_NBposHigh	QPSK	21.76
low	701.5	23035	5	100%RB_NBposHigh	16QAM	20.30
mid	707.5	23095	5	1RB_low_NBposLow	QPSK	22.59
mid	707.5	23095	5	1RB_low_NBposLow	16QAM	22.46
mid	707.5	23095	5	1RB_mid_NBposMid	QPSK	22.57
mid	707.5	23095	5	1RB_mid_NBposMid	16QAM	22.70
mid	707.5	23095	5	1RB_high_NBposHigh	QPSK	22.73
mid	707.5	23095	5	1RB_high_NBposHigh	16QAM	22.61
mid	707.5	23095	5	100%RB_NBposLow	QPSK	21.79
mid	707.5	23095	5	100%RB_NBposLow	16QAM	20.06
mid	707.5	23095	5	100%RB_NBposMid	QPSK	21.90
mid	707.5	23095	5	100%RB_NBposMid	16QAM	20.12
mid	707.5	23095	5	100%RB_NBposHigh	QPSK	21.89
mid	707.5	23095	5	100%RB_NBposHigh	16QAM	20.33
high	713.5	23155	5	1RB_low_NBposLow	QPSK	22.92
high	713.5	23155	5	1RB_low_NBposLow	16QAM	23.30
high	713.5	23155	5	1RB_mid_NBposMid	QPSK	22.38
high	713.5	23155	5	1RB_mid_NBposMid	16QAM	23.29
high	713.5	23155	5	1RB_high_NBposHigh	QPSK	23.15
high	713.5	23155	5	1RB_high_NBposHigh	16QAM	23.08
high	713.5	23155	5	100%RB_NBposLow	QPSK	21.91
high	713.5	23155	5	100%RB_NBposLow	16QAM	20.44

Channel	Frequency [MHz]	Channel	Bandwidth [MHz]	Resource block allocation	Modulation	P _{avg} [dBm]
high	713.5	23155	5	100%RB_NBposMid	QPSK	22.03
high	713.5	23155	5	100%RB_NBposMid	16QAM	20.69
high	713.5	23155	5	100%RB_NBposHigh	QPSK	22.52
high	713.5	23155	5	100%RB_NBposHigh	16QAM	21.23
low	704	23060	10	1RB_low_NBposLow	QPSK	22.82
low	704	23060	10	1RB_low_NBposLow	16QAM	23.10
low	704	23060	10	1RB_mid_NBposMid	QPSK	21.96
low	704	23060	10	1RB_mid_NBposMid	16QAM	22.79
low	704	23060	10	1RB_high_NBposHigh	QPSK	22.51
low	704	23060	10	1RB_high_NBposHigh	16QAM	22.43
low	704	23060	10	100%RB_NBposLow	QPSK	22.00
low	704	23060	10	100%RB_NBposLow	16QAM	21.10
low	704	23060	10	100%RB_NBposMid	QPSK	21.56
low	704	23060	10	100%RB_NBposMid	16QAM	21.46
low	704	23060	10	100%RB_NBposHigh	QPSK	21.74
low	704	23060	10	100%RB_NBposHigh	16QAM	21.45
mid	707.5	23095	10	1RB_low_NBposLow	QPSK	22.64
mid	707.5	23095	10	1RB_low_NBposLow	16QAM	22.81
mid	707.5	23095	10	1RB_mid_NBposMid	QPSK	22.42
mid	707.5	23095	10	1RB_mid_NBposMid	16QAM	22.84
mid	707.5	23095	10	1RB_high_NBposHigh	QPSK	22.86
mid	707.5	23095	10	1RB_high_NBposHigh	16QAM	22.92
mid	707.5	23095	10	100%RB_NBposLow	QPSK	21.60
mid	707.5	23095	10	100%RB_NBposLow	16QAM	20.90
mid	707.5	23095	10	100%RB_NBposMid	QPSK	21.63
mid	707.5	23095	10	100%RB_NBposMid	16QAM	20.98
mid	707.5	23095	10	100%RB_NBposHigh	QPSK	21.94
mid	707.5	23095	10	100%RB_NBposHigh	16QAM	21.45
high	711	23130	10	1RB_low_NBposLow	QPSK	22.67
high	711	23130	10	1RB_low_NBposLow	16QAM	23.02
high	711	23130	10	1RB_mid_NBposMid	QPSK	22.17
high	711	23130	10	1RB_mid_NBposMid	16QAM	23.05
high	711	23130	10	1RB_high_NBposHigh	QPSK	23.12
high	711	23130	10	1RB_high_NBposHigh	16QAM	23.10
high	711	23130	10	100%RB_NBposLow	QPSK	21.72
high	711	23130	10	100%RB_NBposLow	16QAM	21.20
high	711	23130	10	100%RB_NBposMid	QPSK	21.88
high	711	23130	10	100%RB_NBposMid	16QAM	21.82
high	711	23130	10	100%RB_NBposHigh	QPSK	22.44
high	711	23130	10	100%RB_NBposHigh	16QAM	21.88

Table 16: Test results conducted power measurement LTE FDD12 Cat. M1 700 MHz.

8.1.5 Conducted power measurements LTE FDD 13 700 MHz

Channel	Frequency [MHz]	Channel	Bandwidth [MHz]	Resource block allocation	Modulation	P _{avg} [dBm]
low	779.5	23205	5	1RB_low_NBposLow	QPSK	22.86
low	779.5	23205	5	1RB_low_NBposLow	16QAM	23.10
low	779.5	23205	5	1RB_mid_NBposMid	QPSK	22.71
low	779.5	23205	5	1RB_mid_NBposMid	16QAM	23.04
low	779.5	23205	5	1RB_high_NBposHigh	QPSK	23.19
low	779.5	23205	5	1RB_high_NBposHigh	16QAM	23.47
low	779.5	23205	5	100%RB_NBposLow	QPSK	22.01
low	779.5	23205	5	100%RB_NBposLow	16QAM	21.14
low	779.5	23205	5	100%RB_NBposMid	QPSK	22.06
low	779.5	23205	5	100%RB_NBposMid	16QAM	21.20
low	779.5	23205	5	100%RB_NBposHigh	QPSK	22.22
low	779.5	23205	5	100%RB_NBposHigh	16QAM	21.09
mid	782	23230	5	1RB_low_NBposLow	QPSK	23.03
mid	782	23230	5	1RB_low_NBposLow	16QAM	23.38
mid	782	23230	5	1RB_mid_NBposMid	QPSK	23.18
mid	782	23230	5	1RB_mid_NBposMid	16QAM	23.63
mid	782	23230	5	1RB_high_NBposHigh	QPSK	23.36
mid	782	23230	5	1RB_high_NBposHigh	16QAM	23.63
mid	782	23230	5	100%RB_NBposLow	QPSK	22.15
mid	782	23230	5	100%RB_NBposLow	16QAM	20.96
mid	782	23230	5	100%RB_NBposMid	QPSK	22.21
mid	782	23230	5	100%RB_NBposMid	16QAM	20.96
mid	782	23230	5	100%RB_NBposHigh	QPSK	22.35
mid	782	23230	5	100%RB_NBposHigh	16QAM	21.26
high	784.5	23255	5	1RB_low_NBposLow	QPSK	23.17
high	784.5	23255	5	1RB_low_NBposLow	16QAM	23.29
high	784.5	23255	5	1RB_mid_NBposMid	QPSK	22.97
high	784.5	23255	5	1RB_mid_NBposMid	16QAM	23.48
high	784.5	23255	5	1RB_high_NBposHigh	QPSK	23.42
high	784.5	23255	5	1RB_high_NBposHigh	16QAM	23.60
high	784.5	23255	5	100%RB_NBposLow	QPSK	22.31
high	784.5	23255	5	100%RB_NBposLow	16QAM	21.46
high	784.5	23255	5	100%RB_NBposMid	QPSK	22.41
high	784.5	23255	5	100%RB_NBposMid	16QAM	21.49
high	784.5	23255	5	100%RB_NBposHigh	QPSK	22.41
high	784.5	23255	5	100%RB_NBposHigh	16QAM	21.26
mid	782	23230	10	1RB_low_NBposLow	QPSK	22.99
mid	782	23230	10	1RB_low_NBposLow	16QAM	23.27
mid	782	23230	10	1RB_mid_NBposMid	QPSK	23.06
mid	782	23230	10	1RB_mid_NBposMid	16QAM	23.62
mid	782	23230	10	1RB_high_NBposHigh	QPSK	23.34
mid	782	23230	10	1RB_high_NBposHigh	16QAM	23.64
mid	782	23230	10	100%RB_NBposLow	QPSK	21.96
mid	782	23230	10	100%RB_NBposLow	16QAM	21.77
mid	782	23230	10	100%RB_NBposMid	QPSK	22.26
mid	782	23230	10	100%RB_NBposMid	16QAM	21.99
mid	782	23230	10	100%RB_NBposHigh	QPSK	22.36
mid	782	23230	10	100%RB_NBposHigh	16QAM	22.27

Table 17: Test results conducted power measurement LTE FDD13 Cat. M1 700 MHz.

Channel	Frequency [MHz]	Channel	Bandwidth [MHz]	Resource block allocation	P _{avg} [dBm]
low	777.1	23181	0.18	SC_1_low_BPSK	22.92
low	777.1	23181	0.18	SC_1_low_QPSK	22.96
low	777.1	23181	0.18	SC_1_high_BPSK	22.87
low	777.1	23181	0.18	SC_1_high_QPSK	22.90
low	777.1	23181	0.18	SC_1_100%_QPSK	20.92
mid	782	23230	0.18	SC_1_low_BPSK	23.31
mid	782	23230	0.18	SC_1_low_QPSK	23.06
mid	782	23230	0.18	SC_1_high_BPSK	23.43
mid	782	23230	0.18	SC_1_high_QPSK	23.13
mid	782	23230	0.18	SC_1_100%_QPSK	21.25
high	786.9	23279	0.18	SC_1_low_BPSK	23.56
high	786.9	23279	0.18	SC_1_low_QPSK	23.48
high	786.9	23279	0.18	SC_1_high_BPSK	23.44
high	786.9	23279	0.18	SC_1_high_QPSK	23.42
high	786.9	23279	0.18	SC_1_100%_QPSK	21.43

Table 18: Test results conducted power measurement LTE FDD13 NB IoT 700 MHz.

8.1.6 Conducted average power measurements Bluetooth LE 2.4 GHz

Channel	Frequency (MHz)	Average power (dBm)
		GFSK
0	2402	6.9
19	2440	7.1
39	2480	7.1

Table 19: Test results conducted average power measurement Bluetooth LE 2.4 GHz

8.2 SAR test results

8.2.1 General description of test procedures

- BLE is tested using a test software to control test channels and maximum output power of the DUT.
- LTE is tested using a CMW 500 communications tester 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 below are in accordance with the specified test standard.
- According to IEC/IEEE 62209-1528 the SAR test shall be performed at the channel producing the highest rated output power.
 - When the width of the transmit frequency band ($\Delta f = f_{\text{high}} - f_{\text{low}}$) exceeds 1 % of its centre frequency f_c , the channels at the lowest and highest frequencies of the transmit band shall also be tested.
 - When the width of the transmit frequency band exceeds 10 % of its centre frequency. The following formula shall be used to determine the number of channels, N_c , to be tested:

$$N_c = 2 \times \text{roundup} \left[\frac{10 * (f_{\text{high}} - f_{\text{low}})}{f_c} \right] + 1$$

where

f_c is the centre frequency channel of the transmission band in Hz;

f_{high} is the highest frequency channel of the transmission band in Hz;

f_{low} is the lowest frequency channel of the transmission band in Hz;

N_c is the number of channels
- 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

8.2.2 Results overview

measured / extrapolated SAR numbers - LTE FDD 2 1900 MHz

Ch.	Freq. (MHz)	RB offset	modulation	Position	cond. P _{max} (dBm)		SAR _{1g} (W/kg)		SAR _{10g} (W/kg)		P _{drift} (dB)	liquid (°C)	dist. (mm)
					declared*	measured	meas.	extrap.	meas.	extrap.			
20MHz BW/1RB/QPSK													
19100	1900	1RB_low_NBposLow	16QAM	top	23.0	22.5	0.433	0.485	0.220	0.246	0.02	21.3	0
19100	1900	1RB_low_NBposLow	16QAM	left	23.0	22.5	0.281	0.315	0.156	0.175	-0.04	21.3	0
19100	1900	1RB_low_NBposLow	16QAM	right	23.0	22.5	0.325	0.364	0.165	0.185	0.00	21.3	0
19100	1900	1RB_low_NBposLow	16QAM	top	23.0	22.5	0.379	0.424	0.214	0.240	0.03	21.3	5
19100	1900	1RB_low_NBposLow	16QAM	left	23.0	22.5	0.381	0.427	0.210	0.235	0.10	21.3	5
18700	1860	1RB_mid_NBposMid	16QAM	top	23.0	22.5	0.516	0.586	0.293	0.333	-0.09	21.3	0
18900	1880	100%RB_NBposHigh	QPSK	top	23.0	22.4	0.415	0.474	0.239	0.273	-0.02	21.3	0

measured / extrapolated SAR numbers - LTE FDD 4 1700 MHz

Ch.	Freq. (MHz)	RB offset	modulation	Position	cond. P _{max} (dBm)		SAR _{1g} (W/kg)		SAR _{10g} (W/kg)		P _{drift} (dB)	liquid (°C)	dist. (mm)
					declared*	measured	meas.	extrap.	meas.	extrap.			
20MHz BW/1RB/QPSK													
20050	1720.0	1RB_low_NBposLow	16QAM	top	23.0	22.3	0.331	0.389	0.193	0.227	0.02	21.2	0
20050	1720.0	1RB_low_NBposLow	16QAM	left	23.0	22.3	0.232	0.273	0.138	0.162	0.01	21.2	0
20050	1720.0	1RB_low_NBposLow	16QAM	right	23.0	22.3	0.176	0.207	0.097	0.114	-0.02	21.2	0
20050	1720.0	1RB_low_NBposLow	16QAM	top	23.0	22.3	0.282	0.331	0.146	0.172	-0.04	21.2	5
20050	1720.0	1RB_low_NBposLow	16QAM	left	23.0	22.3	0.243	0.286	0.130	0.153	0.00	21.2	5
20175	1732.5	100%RB_NBposLow	QPSK	top	23.0	22.3	0.376	0.444	0.219	0.258	0.02	21.2	0
20300	1745.0	1RB_mid_NBposMid	16QAM	top	23.0	22.2	0.374	0.446	0.218	0.260	0.01	21.2	0

measured / extrapolated SAR numbers - LTE FDD 5 850 MHz

Ch.	Freq. (MHz)	RB offset	modulation	Position	cond. P _{max} (dBm)		SAR _{1g} (W/kg)		SAR _{10g} (W/kg)		P _{drift} (dB)	liquid (°C)	dist. (mm)
					declared*	measured	meas.	extrap.	meas.	extrap.			
5MHz BW/1RB/QPSK													
20525	836.5	1RB_mid_NBposMid	16QAM	top	24.5	24.1	0.406	0.443	0.261	0.285	-0.08	21.3	0
20525	836.5	1RB_mid_NBposMid	16QAM	left	24.5	24.1	0.485	0.529	0.271	0.296	0.02	21.3	0
20525	836.5	1RB_mid_NBposMid	16QAM	right	24.5	24.1	0.116	0.127	0.069	0.075	0.02	21.3	0
20525	836.5	1RB_mid_NBposMid	16QAM	top	24.5	24.1	0.182	0.199	0.121	0.132	-0.05	21.3	5
20525	836.5	1RB_mid_NBposMid	16QAM	left	24.5	24.1	0.115	0.126	0.074	0.081	0.09	21.3	5
10MHz BW/1RB/QPSK													
20450	829.0	1RB_high_NBposHigh	QPSK	left	24.5	23.6	0.431	0.533	0.244	0.302	0.01	21.3	0
20600	844.0	1RB_low_NBposLow	16QAM	left	24.5	23.4	0.406	0.529	0.230	0.300	0.03	21.3	0

measured / extrapolated SAR numbers - LTE FDD 12 700 MHz

Ch.	Freq. (MHz)	RB offset	modulation	Position	cond. P _{max} (dBm)		SAR _{1g} (W/kg)		SAR _{10g} (W/kg)		P _{drift} (dB)	liquid (°C)	dist. (mm)
					declared*	measured	meas.	extrap.	meas.	extrap.			
1.4MHz BW/1RB/QPSK													
23173	715.3	1RB_high_NBposHigh	QPSK	top	24.5	23.9	0.220	0.254	0.127	0.146	0.08	21.2	0
23173	715.3	1RB_high_NBposHigh	QPSK	left	24.5	23.9	0.161	0.186	0.095	0.110	0.01	21.2	0
23173	715.3	1RB_high_NBposHigh	QPSK	right	24.5	23.9	0.082	0.095	0.049	0.057	0.05	21.2	0
23173	715.3	1RB_high_NBposHigh	QPSK	top	24.5	23.9	0.176	0.203	0.120	0.138	0.07	21.2	5
23173	715.3	1RB_high_NBposHigh	QPSK	left	24.5	23.9	0.161	0.186	0.105	0.121	0.05	21.2	5
10MHz BW/1RB/QPSK													
23060	704.0	1RB_low_NBposLow	16QAM	top	24.5	23.1	0.237	0.327	0.137	0.189	0.02	21.2	0
23095	707.5	1RB_high_NBposHigh	16QAM	top	24.5	22.9	0.216	0.311	0.120	0.173	0.05	21.2	0

measured / extrapolated SAR numbers - LTE FDD 13 750 MHz													
Ch.	Freq. (MHz)	RB offset	modulation	Position	cond. P _{max} (dBm)		SAR _{1g} (W/kg)		SAR _{10g} (W/kg)		P _{drift} (dB)	liquid (°C)	dist. (mm)
					declared*	measured	meas.	extrap.	meas.	extrap.			
10MHz BW/1RB/QPSK													
23230	782.0	1RB_high_NBposHigh	16QAM	top	24.5	23.6	0.263	0.321	0.167	0.204	-0.19	21.2	0
23230	782.0	1RB_high_NBposHigh	16QAM	left	24.5	23.6	0.246	0.300	0.148	0.180	0.01	21.2	0
23230	782.0	1RB_high_NBposHigh	16QAM	right	24.5	23.6	0.118	0.144	0.072	0.088	0.01	21.2	0
23230	782.0	1RB_high_NBposHigh	16QAM	top	24.5	23.6	0.156	0.190	0.106	0.129	-0.01	21.2	5
23230	782.0	1RB_high_NBposHigh	16QAM	left	24.5	23.6	0.165	0.201	0.106	0.129	-0.01	21.2	5
5MHz BW/1RB/QPSK													
23205	779.5	1RB_high_NBposHigh	16QAM	top	24.5	23.5	0.351	0.445	0.222	0.281	0.16	21.2	0
23255	784.5	1RB_high_NBposHigh	16QAM	top	24.5	23.6	0.338	0.416	0.215	0.265	0.12	21.2	0

Table 20: SAR test results LTE CAT M1 (see max. SAR plot in Annex B.1: SAR results – LTE CAT M1 on page 57)

measured / extrapolated SAR numbers - BLE 2.4 GHz												
Ch.	Freq. (MHz)	modulation	Position	cond. P _{max} (dBm)		SAR _{1g} (W/kg)		SAR _{10g} (W/kg)		P _{drift} (dB)	liquid (°C)	dist. (mm)
				declared*	measured	meas.	extrap.	meas.	extrap.			
mid	2440	GFSK	top	8.0	7.1	0.062	0.076	0.031	0.038	0.00	21.7	0
mid	2440	GFSK	left	8.0	7.1	0.009	0.011	0.005	0.006	0.06	21.7	0
mid	2440	GFSK	right	8.0	7.1	0.070	0.086	0.031	0.038	0.01	21.7	0
mid	2440	GFSK	top	8.0	7.1	0.047	0.058	0.024	0.030	0.03	21.7	5
mid	2440	GFSK	left	8.0	7.1	0.016	0.020	0.009	0.011	-0.01	21.7	5
low	2402	GFSK	right	8.0	6.9	0.068	0.088	0.029	0.037	0.02	21.7	0
high	2480	GFSK	right	8.0	7.1	0.060	0.074	0.027	0.033	0.08	21.7	0

Table 21: SAR test results BLE (see max. SAR plot Annex B.2: SAR results – BLE on page 64)

* - maximum possible output power declared by manufacturer

8.2.3 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 LTE and Bluetooth 2.4GHz, Σ SAR _{1g} evaluation				
Frequency band	Position	SAR _{max} /W/kg		Σ SAR _{1g} <1.6W/kg
		LTE	Bluetooth	
LTE 2	top 0 mm	0.586	0.076	0.662
	left 0 mm	0.315	0.011	0.326
	right 0 mm	0.364	0.088	0.452
	top 5 mm	0.424	0.058	0.482
	left 5 mm	0.427	0.020	0.446
LTE 4	top 0 mm	0.446	0.076	0.522
	left 0 mm	0.273	0.011	0.284
	right 0 mm	0.207	0.088	0.295
	top 5 mm	0.331	0.058	0.389
	left 5 mm	0.286	0.020	0.305
LTE 5	top 0 mm	0.443	0.076	0.519
	left 0 mm	0.533	0.011	0.544
	right 0 mm	0.127	0.088	0.215
	top 5 mm	0.199	0.058	0.256
	left 5 mm	0.126	0.020	0.145
LTE 12	top 0 mm	0.327	0.076	0.403
	left 0 mm	0.186	0.011	0.197
	right 0 mm	0.095	0.088	0.183
	top 5 mm	0.203	0.058	0.261
	left 5 mm	0.186	0.020	0.205
LTE 13	top 0 mm	0.445	0.076	0.521
	left 0 mm	0.300	0.011	0.311
	right 0 mm	0.144	0.088	0.232
	top 5 mm	0.190	0.058	0.248
	left 5 mm	0.201	0.020	0.221

Table 22: SAR_{max} LTE CAT M1 and BLE 2.4GHz, Σ SAR_{1g} evaluation

reported SAR LTE and Bluetooth 2.4GHz, Σ SAR _{10g} evaluation				
Frequency band	Position	SAR _{max} /W/kg		Σ SAR _{10g} <4W/kg
		LTE	Bluetooth	
LTE 2	top 0 mm	0.333	0.038	0.371
	left 0 mm	0.175	0.006	0.181
	right 0 mm	0.185	0.038	0.223
	top 5 mm	0.240	0.030	0.269
	left 5 mm	0.235	0.011	0.246
LTE 4	top 0 mm	0.260	0.038	0.298
	left 0 mm	0.162	0.006	0.168
	right 0 mm	0.114	0.038	0.152
	top 5 mm	0.172	0.030	0.201
	left 5 mm	0.153	0.011	0.164
LTE 5	top 0 mm	0.285	0.038	0.323
	left 0 mm	0.302	0.006	0.308
	right 0 mm	0.075	0.038	0.113
	top 5 mm	0.132	0.030	0.162
	left 5 mm	0.081	0.011	0.092
LTE 12	top 0 mm	0.189	0.038	0.227
	left 0 mm	0.110	0.006	0.116
	right 0 mm	0.057	0.038	0.095
	top 5 mm	0.138	0.030	0.168
	left 5 mm	0.121	0.011	0.132
LTE 13	top 0 mm	0.281	0.038	0.319
	left 0 mm	0.180	0.006	0.187
	right 0 mm	0.088	0.038	0.126
	top 5 mm	0.129	0.030	0.159
	left 5 mm	0.129	0.011	0.140

Table 23: SAR_{max} LTE CAT M1 and BLE 2.4GHz, Σ SAR_{10g} evaluation**Conclusion:**

Σ SAR < 1.6 W/kg, therefore simultaneous transmissions SAR measurement with the enlarged zoom scan measurement and volume scan post-processing procedures is **not** required.

8.2.4 SAR correction for deviations of complex permittivity from targets

The max reported SAR values are once more corrected wherever the deviation of the liquid parameters is larger than $\pm 5\%$.

According IEC / IEEE 62209-1528 chapter 7.8.2 SAR correction formula

there is a linear relationship between the percentage change in SAR (denoted ΔSAR) and the percentage change in the permittivity and conductivity from the target values (denoted $\Delta\epsilon$ and $\Delta\sigma$, respectively).

The relationship is given by:

$$\Delta\text{SAR} = c_{\epsilon}\Delta\epsilon + c_{\sigma}\Delta\sigma$$

where

$c_{\epsilon} = \partial (\Delta\text{SAR}) / \partial (\Delta\epsilon)$ is the coefficient representing the sensitivity of SAR to permittivity where SAR is normalized to output power;

$c_{\sigma} = \partial (\Delta\text{SAR}) / \partial (\Delta\sigma)$ is the coefficient representing the sensitivity of SAR to conductivity, where SAR is normalized to output power.

The values of c_{ϵ} and c_{σ} have a simple relationship with frequency that can be described using polynomial equations. For dipole antennas at frequencies from 4 MHz to 6 GHz, the **1 g averaged SAR** c_{ϵ} and c_{σ} are given by

$$c_{\epsilon} = -7.854 \times 10^{-4} \times f^3 + 9.402 \times 10^{-3} \times f^2 - 2.742 \times 10^{-2} \times f - 0.2026$$

$$c_{\sigma} = 9.804 \times 10^{-3} \times f^3 - 8.661 \times 10^{-2} \times f^2 + 2.981 \times 10^{-2} \times f + 0.7829$$

where f is the frequency in GHz. Above 6 GHz, the sensitivity is non-varying with frequency due to the small penetration depth; the values of $c_{\epsilon} = -0,198$ and $c_{\sigma} = 0$ shall be used.

For frequencies from 4 MHz to 6 GHz, the **10 g averaged SAR** c_{ϵ} and c_{σ} are given by:

$$c_{\epsilon} = 3.456 \times 10^{-3} \times f^3 - 3.531 \times 10^{-2} \times f^2 + 7.675 \times 10^{-2} \times f - 0.1860$$

$$c_{\sigma} = 4.479 \times 10^{-3} \times f^3 - 1.586 \times 10^{-2} \times f^2 - 0.1972 \times f + 0.7717$$

where f is the frequency in GHz. Above 6 GHz, the sensitivity is non-varying with frequency due to the small penetration depth; the values of $c_{\epsilon} = -0,250$ and $c_{\sigma} = 0$ shall be used.

NOTE:

The Tables in the uncertainties of this report are updated accordingly with the values from table 6 – Root-mean-squared error SAR correction formula as a function of the maximum change in permittivity or conductivity:

Max. change in ϵ or σ	RMS uncertainty for SAR _{1g} %	RMS uncertainty for SAR _{10g} %
$\pm 5\%$	1.2	0.97
$\pm 10\%$	1.9	1.6

NOTE:

The DASY software is capable of directly correcting the measured values according to the above-described procedure, fully compliant to IEC / IEEE 62209-1528, so that no further evaluation is necessary.

9 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	EX3DV4	Schmid & Partner Engineering AG	3944	May 16, 2025	12
750 MHz System Validation Dipole	D750V3	Schmid & Partner Engineering AG	1041	May 11, 2023	36
835 MHz System Validation Dipole	D835V2	Schmid & Partner Engineering AG	4d153	May 11, 2023	36
1750 MHz System Validation Dipole	D1750V2	Schmid & Partner Engineering AG	1093	August 15, 2024	36
1900 MHz System Validation Dipole	D1900V2	Schmid & Partner Engineering AG	5d009	May 12, 2023	36
2450 MHz System Validation Dipole	D2450V2	Schmid & Partner Engineering AG	710	May 07, 2025	36
Data acquisition electronics	DAE4	Schmid & Partner Engineering AG	477	May 12, 2025	12
Software	V16.4.0.5005 V17.0.0.6455	Schmid & Partner Engineering AG	---	N/A	--
Phantom ELI 8.0	QD OVA 004 AA	Schmid & Partner Engineering AG	2101	N/A	--
Universal Radio Communication Tester	CMW500	Rohde & Schwarz	166977	December 13, 2025	24
Network Analyser 300 kHz to 6 GHz	8753ES	Agilent Technologies)*	US39174 436	December 10, 2025	24
Dielectric Assessment Kit (DAK)	DAK 200MHz – 20GHz Package	Schmid & Partner Engineering AG	1127	N/A	--
Powersource1	SE UMS 160 CC	Schmid & Partner Engineering AG	4342	May 15, 2024	24
Signal Generator	SML03	Rohde & Schwarz	102519	December 02, 2025	24
RF Power Amplifier	BLMA 0760-6 (6 Watt)	BONN Elektronik	1510273	N/A	--
Power Meter	NRP	Rohde & Schwarz	101367	December 02, 2025	12
Power Meter Sensor	NRP Z22	Rohde & Schwarz	100227	December 02, 2025	12
Power Meter Sensor	NRP Z22	Rohde & Schwarz	100234	December 02, 2025	12
Directional Coupler	778D	Hewlett Packard	19171	December 02, 2025	12

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

10 Observations

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

Annex A: System performance check

Date/Time: 2026-01-15, 08:26 2026-01-15, 08:31

SystemPerformanceCheck-D750**DUT: Dipole; Type: D750V3; Serial: SN1041**

Communication System: CW; Communication System Frequency: 750.0 MHz

Medium parameters used: $f = 750.0$ MHz, $\sigma = 0.880$ S/m; $\epsilon_r = 43.7$; $\rho = 1000$ kg/m³

Phantom Section: Flat

Measurement Standard: DASY 8

DASY Configuration:

- Probe: EX3DV4 - SN3944; ConvF(9.46, 9.79, 9.67); Calibrated: 2025-05-16
- Sensor-Surface: 1.4 mm
- DAE: DAE4 Sn477; Calibrated: 2025-05-12
- Phantom: ELI V8.0 (20deg probe tilt); Serial: 2101;
- Software: DASY8 Module SAR V17.0.2.6775

HBBL-600-10000/750.0MHz/Area Scan (10.0 x 15.0 x 1.0) :

Grid Extents [mm]: 40.0 x 90.0

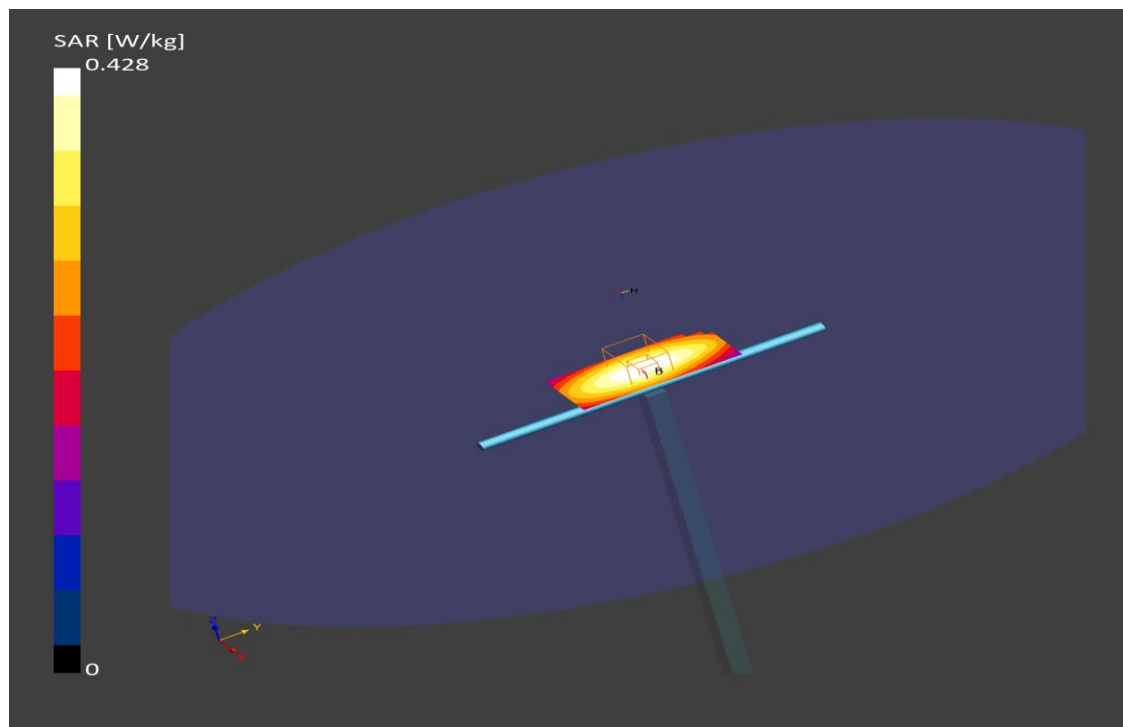
Maximum value of SAR (interpolated) - SAR(1 g) = 0.398 W/kg; SAR(10 g) = 0.265 W/kg

HBBL-600-10000/750.0MHz/Zoom Scan (6.0 x 6.0 x 1.5) :

Grid Extents [mm]: 30.0 x 30.0 x 30.0

SPCPower = 17.0 dBm

Power Drift = 0.06 dB

SAR(1 g) = 0.390 W/kg; SAR(10 g) = 0.260 W/kg**Additional information:**

ambient temperature: 22.0°C; liquid temperature: 21.3°C;

SystemPerformanceCheck-D835

DUT: Dipole; Type: D835V2; Serial: SN4d153

Communication System: CW; Communication System Frequency: 835.0 MHz

Medium parameters used: $f = 835.0$ MHz, $\sigma = 0.909$ S/m; $\epsilon_r = 43.6$; $\rho = 1000$ kg/m³

Phantom Section: Flat

Measurement Standard: DASY 8

DASY Configuration:

- Probe: EX3DV4 - SN3944; ConvF(8.97, 9.29, 9.17); Calibrated: 2025-05-16
- Sensor-Surface: 1.4 mm
- DAE: DAE4 Sn477; Calibrated: 2025-05-12
- Phantom: ELI V8.0 (20deg probe tilt); Serial: 2101;
- Software: DASY8 Module SAR V17.0.2.6775

HBBL-600-10000/835.0MHz/Area Scan (10.0 x 15.0 x 1.0) :

Grid Extents [mm]: 40.0 x 90.0

Maximum value of SAR (interpolated) - SAR(1 g) = 0.483 W/kg; SAR(10 g) = 0.318 W/kg

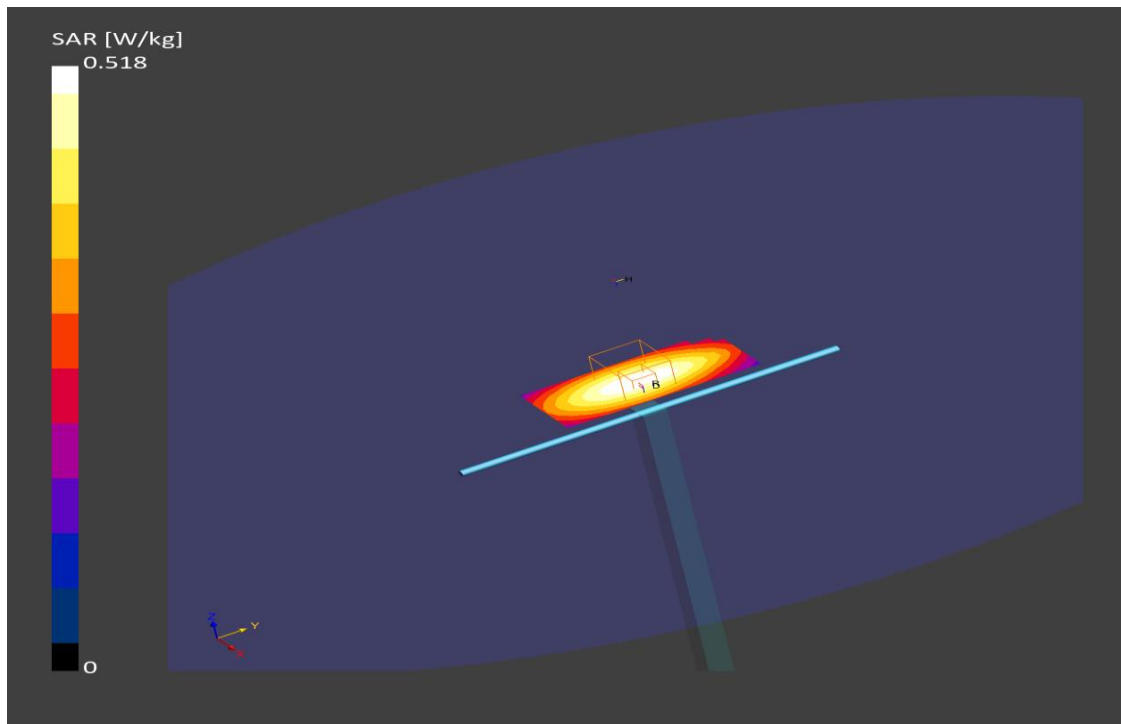
HBBL-600-10000/835.0MHz/Zoom Scan (6.0 x 6.0 x 1.5) :

Grid Extents [mm]: 30.0 x 30.0 x 30.0

SPCPower = 17.0 dBm

Power Drift = -0.00 dB

SAR(1 g) = 0.480 W/kg; SAR(10 g) = 0.318 W/kg



Additional information:

ambient temperature: 22.0°C; liquid temperature: 21.3°C;

SystemPerformanceCheck-D1750

DUT: Dipole; Type: D1750V2; Serial: SN1093

Communication System: CW; Communication System Frequency: 1750.0 MHz

Medium parameters used: $f = 1750.0$ MHz, $\sigma = 1.37$ S/m; $\epsilon_r = 41.7$; $\rho = 1000$ kg/m³

Phantom Section: Flat

Measurement Standard: DASY 8

DASY Configuration:

- Probe: EX3DV4 - SN3944; ConvF(8.0, 8.29, 8.19); Calibrated: 2025-05-16
- Sensor-Surface: 1.4 mm
- DAE: DAE4 Sn477; Calibrated: 2025-05-12
- Phantom: ELI V8.0 (20deg probe tilt); Serial: 2101;
- Software: DASY8 Module SAR V17.0.2.6775

HBBL-600-10000/1750.0MHz/Area Scan (10.0 x 15.0 x 1.0) :

Grid Extents [mm]: 40.0 x 90.0

Maximum value of SAR (interpolated) - SAR(1 g) = 1.69 W/kg; SAR(10 g) = 0.901 W/kg

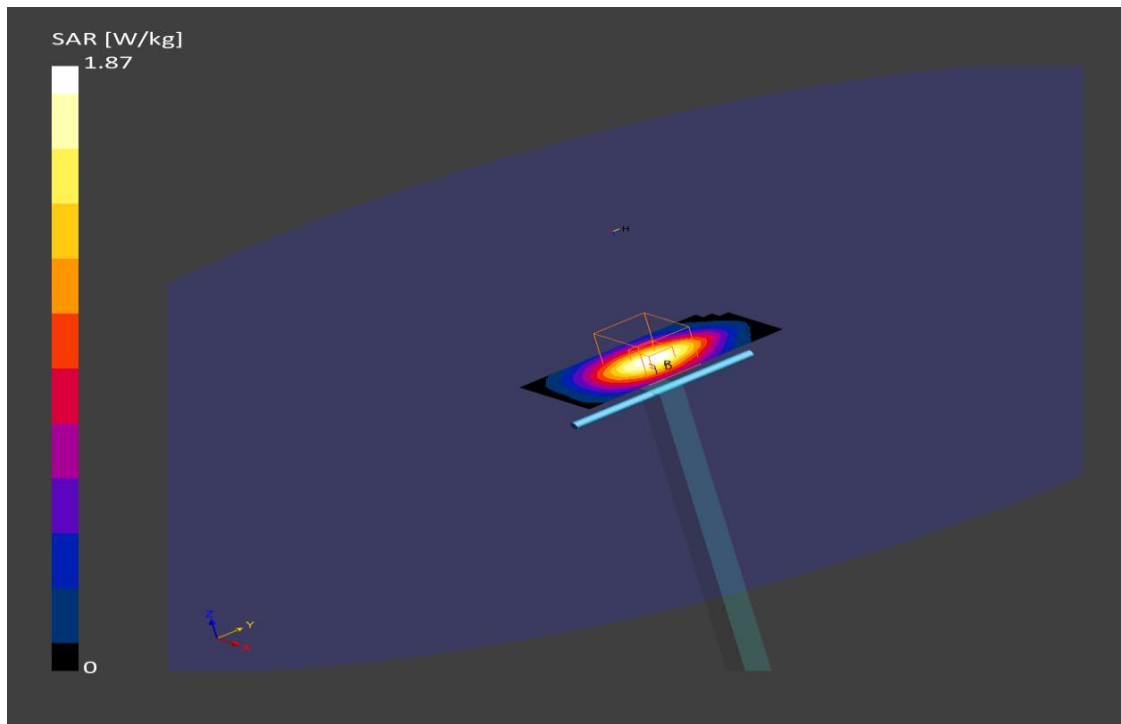
HBBL-600-10000/1750.0MHz/Zoom Scan (6.0 x 6.0 x 1.5) :

Grid Extents [mm]: 30.0 x 30.0 x 30.0

SPCPower = 17.0 dBm

Power Drift = -0.17 dB

SAR(1 g) = 1.67 W/kg; SAR(10 g) = 0.897 W/kg



Additional information:

ambient temperature: 22.4°C; liquid temperature: 21.2°C;

SystemPerformanceCheck-D1900

DUT: Dipole; Type: D1900V2; Serial: SN5d009

Communication System: CW; Communication System Frequency: 1900.0 MHz

Medium parameters used: $f = 1900.0$ MHz, $\sigma = 1.45$ S/m; $\epsilon_r = 41.5$; $\rho = 1000$ kg/m³

Phantom Section: Flat

Measurement Standard: DASY 8

DASY Configuration:

- Probe: EX3DV4 - SN3944; ConvF(7.67, 7.94, 7.85); Calibrated: 2025-05-16
- Sensor-Surface: 1.4 mm
- DAE: DAE4 Sn477; Calibrated: 2025-05-12
- Phantom: ELI V8.0 (20deg probe tilt); Serial: 2101;
- Software: DASY8 Module SAR V17.0.2.6775

HBBL-600-10000/1900.0MHz/Area Scan (10.0 x 15.0 x 1.0) :

Grid Extents [mm]: 40.0 x 90.0

Maximum value of SAR (interpolated) - SAR(1 g) = 1.90 W/kg; SAR(10 g) = 0.987 W/kg

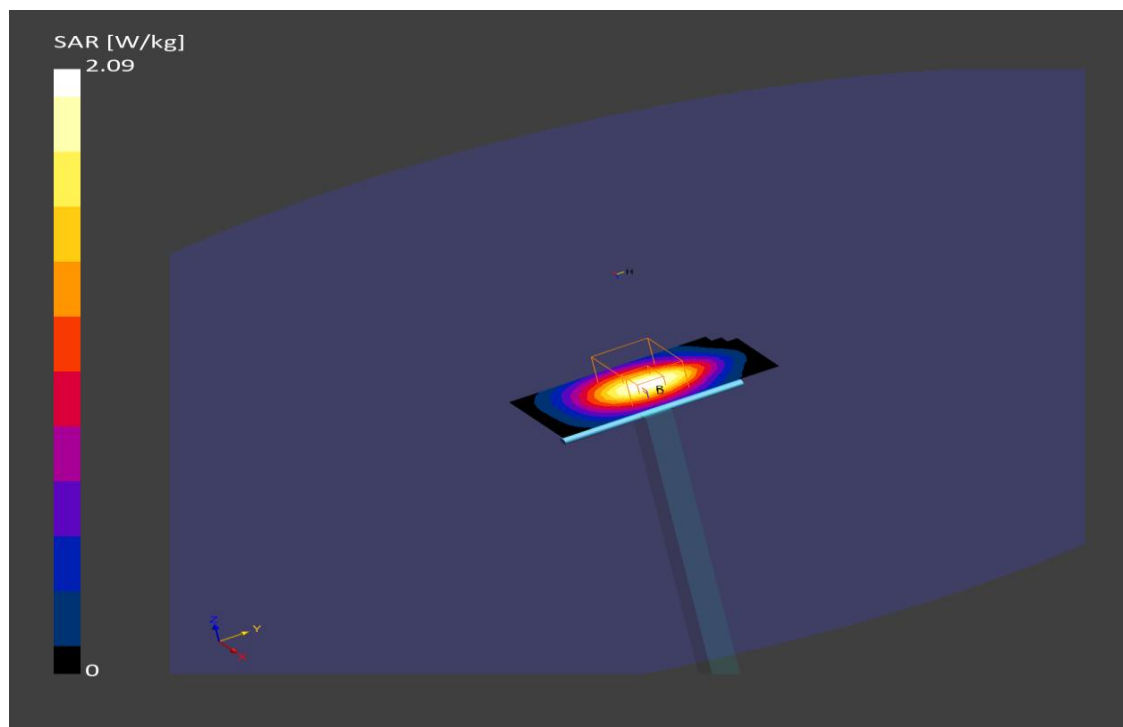
HBBL-600-10000/1900.0MHz/Zoom Scan (6.0 x 6.0 x 1.5) :

Grid Extents [mm]: 30.0 x 30.0 x 30.0

SPC Power = 17.0 dBm

Power Drift = 0.03 dB

SAR(1 g) = 1.90 W/kg; SAR(10 g) = 1.00 W/kg



Additional information:

ambient temperature: 22.0°C; liquid temperature: 21.3°C;

SystemPerformanceCheck-D2450

DUT: Dipole; Type: D2450V2; Serial: SN710

Communication System: CW; Communication System Frequency: 2450.0 MHz

Medium parameters used: $f = 2450.0$ MHz, $\sigma = 1.82$ S/m; $\epsilon_r = 40.5$; $\rho = 1000$ kg/m³

Phantom Section: Flat

Measurement Standard: DASY 8

DASY Configuration:

- Probe: EX3DV4 - SN3944; ConvF(7.53, 7.8, 7.71); Calibrated: 2025-05-16
- Sensor-Surface: 1.4 mm
- DAE: DAE4 Sn477; Calibrated: 2025-05-12
- Phantom: ELI V8.0 (20deg probe tilt); Serial: 2101;
- Software: DASY8 Module SAR V17.0.2.6775

HBBL-600-10000/2450.0MHz/Area Scan (10.0 x 10.0 x 1.0) :

Grid Extents [mm]: 40.0 x 80.0

Maximum value of SAR (interpolated) - SAR(1 g) = 5.14 W/kg; SAR(10 g) = 2.39 W/kg

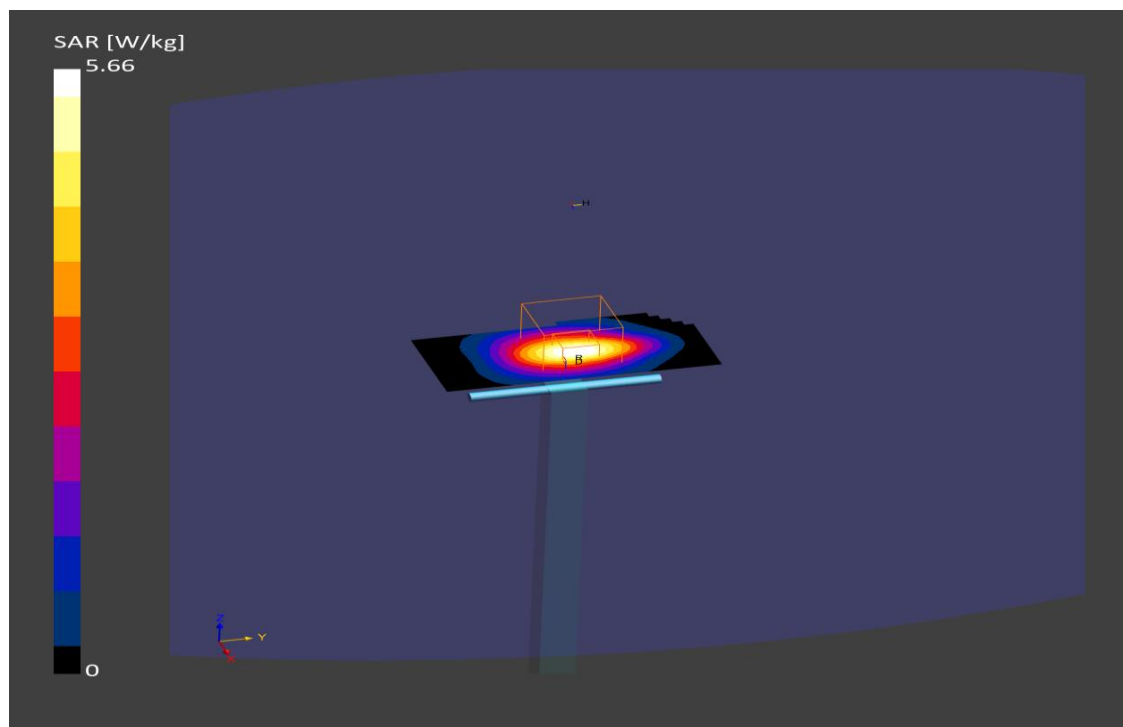
HBBL-600-10000/2450.0MHz/Zoom Scan (5.0 x 5.0 x 1.5) :

Grid Extents [mm]: 30.0 x 30.0 x 30.0

SPCPower = 20.0 dBm

Power Drift = -0.04 dB

SAR(1 g) = 5.12 W/kg; SAR(10 g) = 2.42 W/kg



Additional information:

ambient temperature: 23.5°C; liquid temperature: 21.7°C;

Annex B: DASY 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

Annex B.1: SAR results – LTE CAT M1

Date/Time: 2026-01-16, 13:48 2026-01-16, 13:55

IEC_IEEE 62209-1528-LTE FDD 2

DUT: E-Bike component; Type: BCM3101; Serial: 1

Communication System: LTE-FDD: 20.0 MHz, 16QAM, 1 RB (Mid); Communication System Band: Band 2;

Communication System Frequency: 1860.0 MHz

Medium parameters used: $f = 1860.0$ MHz, $\sigma = 1.42$ S/m; $\epsilon_r = 41.5$; $\rho = 1000$ kg/m³

Phantom Section: Flat

Measurement Standard: DASY 8

DASY Configuration:

- Probe: EX3DV4 - SN3944; ConvF(7.67, 7.94, 7.85); Calibrated: 2025-05-16
- Sensor-Surface: 1.4mm
- DAE: DAE4 Sn477; Calibrated: 2025-05-12
- Phantom: ELI V8.0 (20deg probe tilt); Serial: 2101;
- Software: DASY8 Module SAR V17.0.2.6775

HBBL-600-10000/EDGE TOP, 0 mm - Channel 18700/Area Scan (15.0 x 15.0 x 1.0) :

Grid Extents [mm]: 60.0 x 60.0

Maximum value of SAR (interpolated) - SAR(1 g) = 0.429 W/kg; SAR(10 g) = 0.239 W/kg

HBBL-600-10000/EDGE TOP, 0 mm - Channel 18700/Zoom Scan (5.0 x 5.0 x 1.5) :

Grid Extents [mm]: 30.0 x 30.0 x 30.0

Graded Grid: Ratio 1.5 - Distance Sensor to Surface 1.4 mm

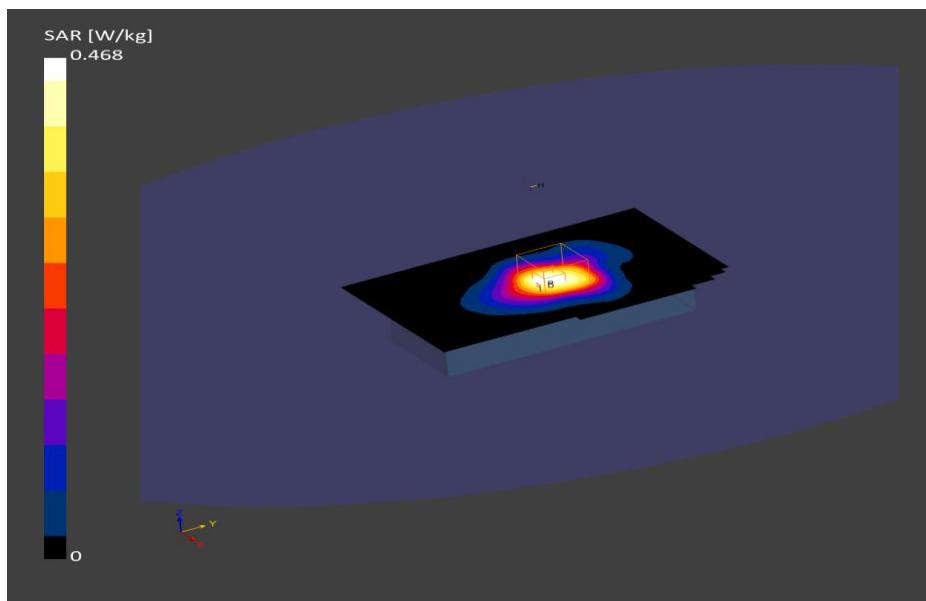
Power Drift = -0.09 dB

SAR(1 g) = 0.516 W/kg; SAR(10 g) = 0.293 W/kg

Additional Info for IEC 62209-2 AMD1:

TDist 3dB Peak [mm]: 13.2

M2/M1 [%]: 87.5



Additional information:

position or distance of DUT to SAM: 0 mm

ambient temperature: 23.1°C; liquid temperature: 21.3°C;

IEC_IEEE 62209-1528-LTE FDD 4**DUT: E-Bike component; Type: BCM3101; Serial: 1**

Communication System: LTE-FDD: 20.0 MHz, QPSK, 100% RB; Communication System Band: Band 4;

Communication System Frequency: 1732.5 MHz

Medium parameters used: $f = 1732.5$ MHz, $\sigma = 1.36$ S/m; $\epsilon_r = 41.7$; $\rho = 1000$ kg/m³

Phantom Section: Flat

Measurement Standard: DASY 8

DASY Configuration:

- Probe: EX3DV4 - SN3944; ConvF(8.0, 8.29, 8.19); Calibrated: 2025-05-16
- Sensor-Surface: 1.4mm
- DAE: DAE4 Sn477; Calibrated: 2025-05-12
- Phantom: ELI V8.0 (20deg probe tilt); Serial: 2101;
- Software: DASY8 Module SAR V17.0.2.6775

HBBL-600-10000/TOP, 0 mm - Channel 20175/Area Scan (15.0 x 15.0 x 1.0) :

Grid Extents [mm]: 60.0 x 60.0

Maximum value of SAR (interpolated) - SAR(1 g) = 0.364 W/kg; SAR(10 g) = 0.200 W/kg

HBBL-600-10000/TOP, 0 mm - Channel 20175/Zoom Scan (5.0 x 5.0 x 1.5) :

Grid Extents [mm]: 30.0 x 30.0 x 30.0

Graded Grid: Ratio 1.5 - Distance Sensor to Surface 1.4 mm

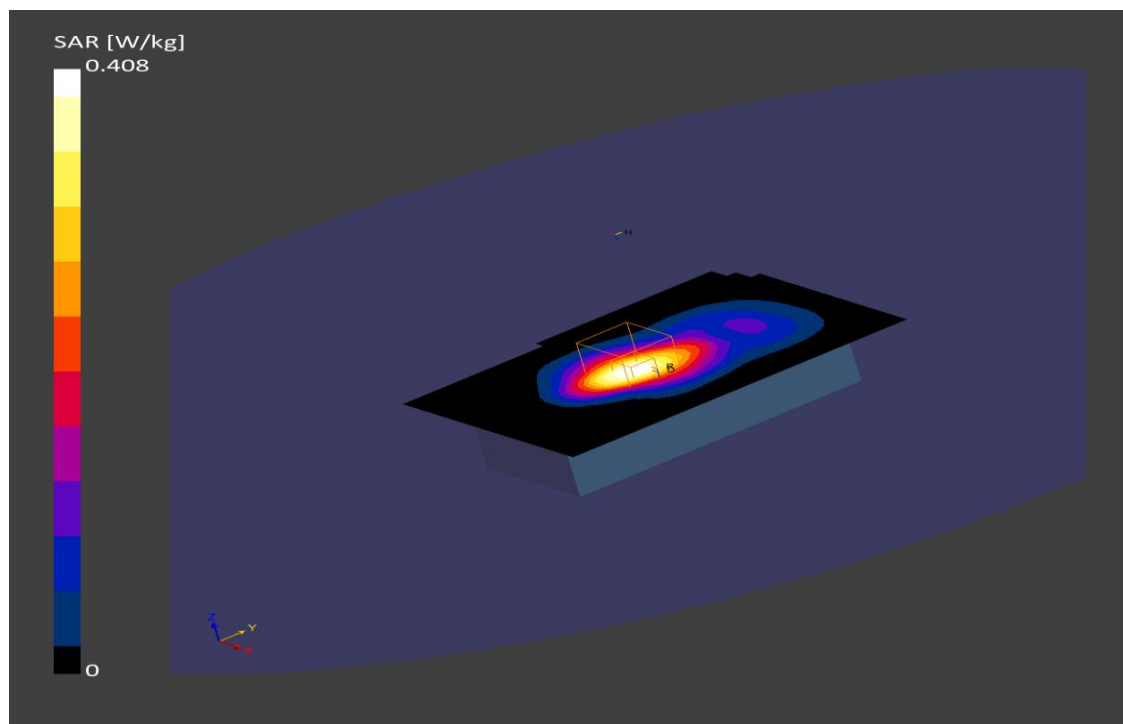
Power Drift = 0.02 dB

SAR(1 g) = 0.376 W/kg; SAR(10 g) = 0.219 W/kg

Additional Info for IEC 62209-2 AMD1:

TDist 3dB Peak [mm]: 14.0

M2/M1 [%]: 88.2

**Additional information:**

position or distance of DUT to SAM: 0 mm

ambient temperature: 22.4°C; liquid temperature: 21.2°C;

IEC_IEEE 62209-1528-LTE FDD 4**DUT: E-Bike component; Type: BCM3101; Serial: 1**

Communication System: LTE-FDD: 20.0 MHz, 16-QAM, 1 RB (Mid); Communication System Band: Band 4;

Communication System Frequency: 1745.0 MHz

Medium parameters used: $f = 1745.0$ MHz, $\sigma = 1.36$ S/m; $\epsilon_r = 41.7$; $\rho = 1000$ kg/m³

Phantom Section: Flat

Measurement Standard: DASY 8

DASY Configuration:

- Probe: EX3DV4 - SN3944; ConvF(8.0, 8.29, 8.19); Calibrated: 2025-05-16
- Sensor-Surface: 1.4mm
- DAE: DAE4 Sn477; Calibrated: 2025-05-12
- Phantom: ELI V8.0 (20deg probe tilt); Serial: 2101;
- Software: DASY8 Module SAR V17.0.2.6775

HBBL-600-10000/TOP, 0 mm - Channel 20300/Area Scan (15.0 x 15.0 x 1.0) :

Grid Extents [mm]: 60.0 x 60.0

Maximum value of SAR (interpolated) - SAR(1 g) = 0.357 W/kg; SAR(10 g) = 0.199 W/kg

HBBL-600-10000/TOP, 0 mm - Channel 20300/Zoom Scan (5.0 x 5.0 x 1.5) :

Grid Extents [mm]: 30.0 x 30.0 x 30.0

Graded Grid: Ratio 1.5 - Distance Sensor to Surface 1.4 mm

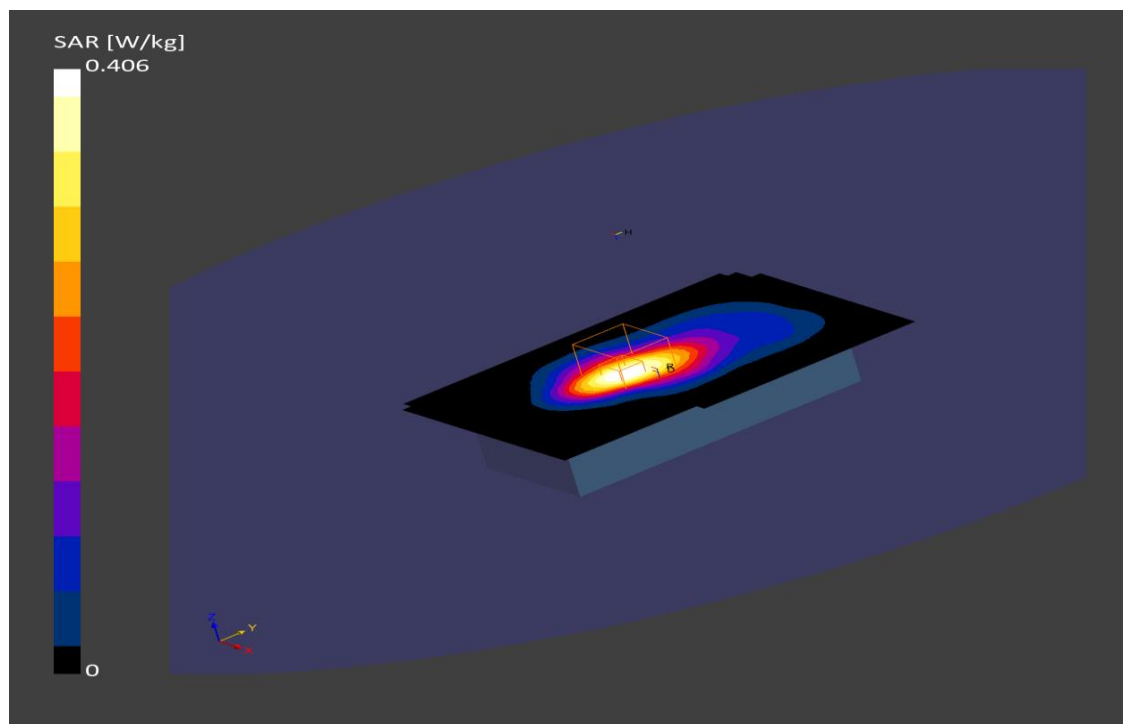
Power Drift = 0.01 dB

SAR(1 g) = 0.374 W/kg; SAR(10 g) = 0.218 W/kg

Additional Info for IEC 62209-2 AMD1:

TDist 3dB Peak [mm]: 13.4

M2/M1 [%]: 88.6

**Additional information:**

position or distance of DUT to SAM: 0 mm

ambient temperature: 22.4°C; liquid temperature: 21.2°C;

IEC_IEEE 62209-1528-LTE FDD 5**DUT: E-Bike component; Type: BCM3101; Serial: 1**

Communication System: LTE-FDD: 10.0 MHz, QPSK, 1 RB (High); Communication System Band: Band 5;

Communication System Frequency: 829.0 MHz

Medium parameters used: $f = 829.0$ MHz, $\sigma = 0.907$ S/m; $\epsilon_r = 43.6$; $\rho = 1000$ kg/m³

Phantom Section: Flat

Measurement Standard: DASY 8

DASY Configuration:

- Probe: EX3DV4 - SN3944; ConvF(8.97, 9.29, 9.17); Calibrated: 2025-05-16
- Sensor-Surface: 1.4mm
- DAE: DAE4 Sn477; Calibrated: 2025-05-12
- Phantom: ELI V8.0 (20deg probe tilt); Serial: 2101;
- Software: DASY8 Module SAR V17.0.2.6775

HBBL-600-10000/EDGE LEFT, 0 mm - Channel 20450/Area Scan (15.0 x 15.0 x 1.0) :

Grid Extents [mm]: 60.0 x 60.0

Maximum value of SAR (interpolated) - SAR(1 g) = 0.417 W/kg; SAR(10 g) = 0.249 W/kg

HBBL-600-10000/EDGE LEFT, 0 mm - Channel 20450/Zoom Scan (6.0 x 6.0 x 1.5) :

Grid Extents [mm]: 30.0 x 30.0 x 30.0

Graded Grid: Ratio 1.5 - Distance Sensor to Surface 1.4 mm

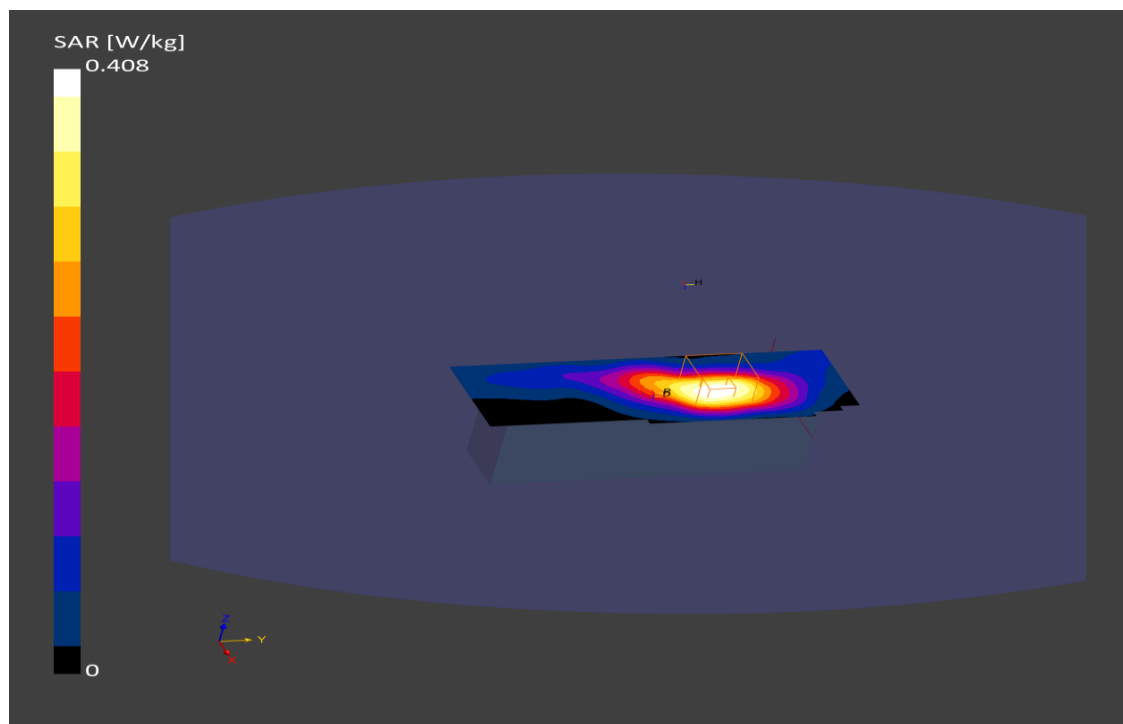
Power Drift = 0.01 dB

SAR(1 g) = 0.431 W/kg; SAR(10 g) = 0.244 W/kg

Additional Info for IEC 62209-2 AMD1:

TDist 3dB Peak [mm]: 9.7

M2/M1 [%]: 80.9

**Additional information:**

position or distance of DUT to SAM: 0 mm

ambient temperature: 23.4°C; liquid temperature: 21.3°C;

IEC_IEEE 62209-1528-LTE FDD 5**DUT: E-Bike component; Type: BCM3101; Serial: 1**

Communication System: LTE-FDD: 5.0 MHz, 16QAM, 1 RB (Mid); Communication System Band: Band 5;

Communication System Frequency: 836.5 MHz

Medium parameters used: $f = 836.5$ MHz, $\sigma = 0.910$ S/m; $\epsilon_r = 43.6$; $\rho = 1000$ kg/m³

Phantom Section: Flat

Measurement Standard: DASY 8

DASY Configuration:

- Probe: EX3DV4 - SN3944; ConvF(8.97, 9.29, 9.17); Calibrated: 2025-05-16
- Sensor-Surface: 1.4mm
- DAE: DAE4 Sn477; Calibrated: 2025-05-12
- Phantom: ELI V8.0 (20deg probe tilt); Serial: 2101;
- Software: DASY8 Module SAR V17.0.2.6775

HBBL-600-10000/EDGE LEFT, 0 mm - Channel 20525/Area Scan (15.0 x 15.0 x 1.0) :

Grid Extents [mm]: 60.0 x 60.0

Maximum value of SAR (interpolated) - SAR(1 g) = 0.477 W/kg; SAR(10 g) = 0.282 W/kg

HBBL-600-10000/EDGE LEFT, 0 mm - Channel 20525/Zoom Scan (6.0 x 6.0 x 1.5) :

Grid Extents [mm]: 30.0 x 30.0 x 30.0

Graded Grid: Ratio 1.5 - Distance Sensor to Surface 1.4 mm

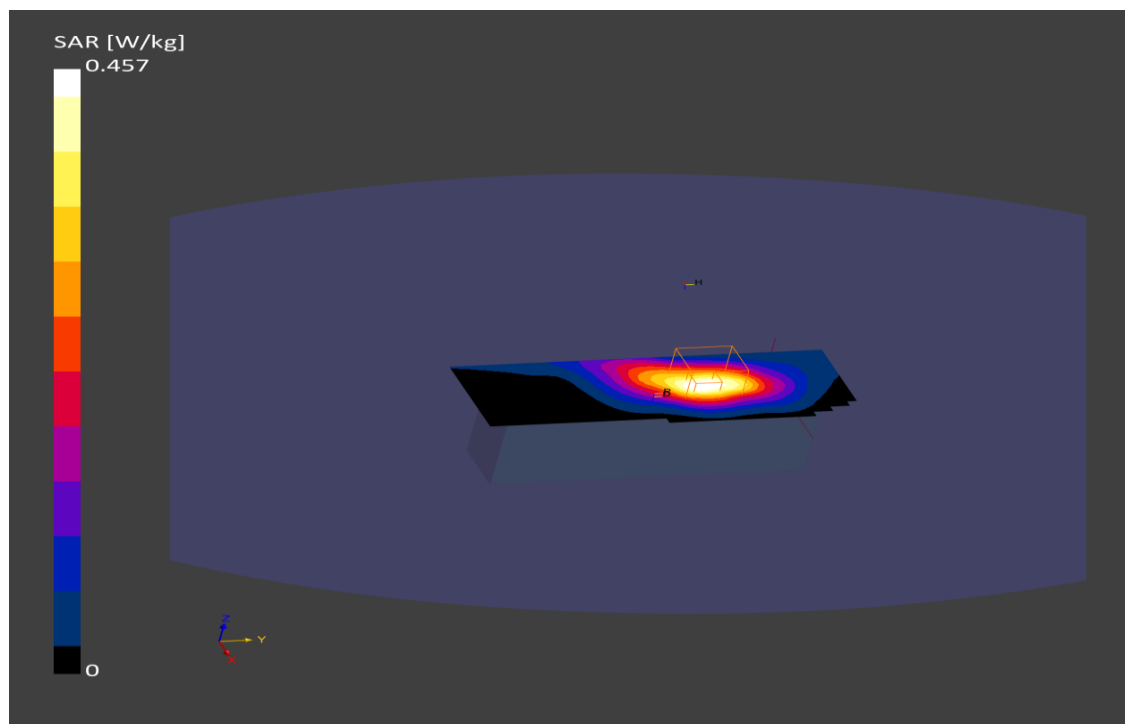
Power Drift = 0.02 dB

SAR(1 g) = 0.485 W/kg; SAR(10 g) = 0.271 W/kg

Additional Info for IEC 62209-2 AMD1:

TDist 3dB Peak [mm]: 9.6

M2/M1 [%]: 82.0

**Additional information:**

position or distance of DUT to SAM: 0 mm

ambient temperature: 23.4°C; liquid temperature: 21.3°C;

IEC_IEEE 62209-1528-LTE FDD 12**DUT: E-Bike component; Type: BCM3101; Serial: 1**

Communication System: LTE-FDD: 10.0 MHz, 16QAM, 1 RB (Low); Communication System Band: Band 12;

Communication System Frequency: 704.0 MHz

Medium parameters used: $f = 704.0$ MHz, $\sigma = 0.866$ S/m; $\epsilon_r = 43.9$; $\rho = 1000$ kg/m³

Phantom Section: Flat

Measurement Standard: DASY 8

DASY Configuration:

- Probe: EX3DV4 - SN3944; ConvF(9.46, 9.79, 9.67); Calibrated: 2025-05-16
- Sensor-Surface: 1.4mm
- DAE: DAE4 Sn477; Calibrated: 2025-05-12
- Phantom: ELI V8.0 (20deg probe tilt); Serial: 2101;
- Software: DASY8 Module SAR V17.0.2.6775

HBBL-600-10000/EDGE TOP, 0 mm - Channel 23060/Area Scan (15.0 x 15.0 x 1.0) :

Grid Extents [mm]: 60.0 x 60.0

Maximum value of SAR (interpolated) - SAR(1 g) = 0.217 W/kg; SAR(10 g) = 0.139 W/kg

HBBL-600-10000/EDGE TOP, 0 mm - Channel 23060/Zoom Scan (5.0 x 5.0 x 1.5) :

Grid Extents [mm]: 30.0 x 30.0 x 30.0

Graded Grid: Ratio 1.5 - Distance Sensor to Surface 1.4 mm

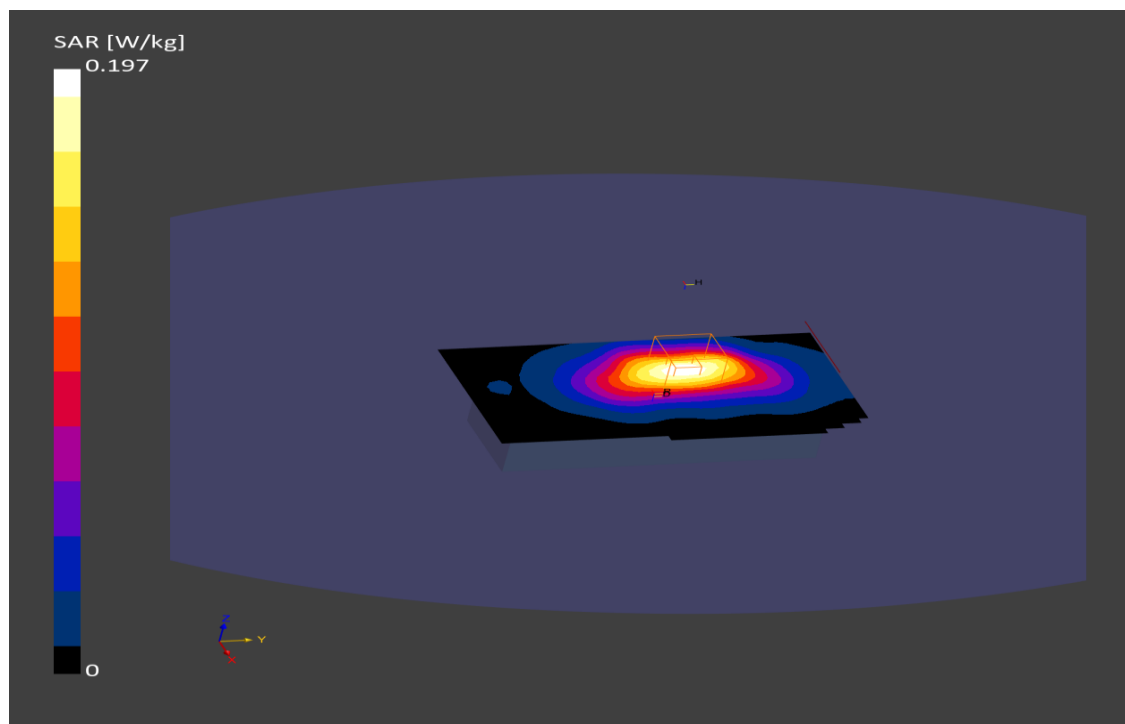
Power Drift = 0.02 dB

SAR(1 g) = 0.237 W/kg; SAR(10 g) = 0.137 W/kg

Additional Info for IEC 62209-2 AMD1:

TDist 3dB Peak [mm]: 11.2

M2/M1 [%]: 80.2

**Additional information:**

position or distance of DUT to SAM: 0 mm

ambient temperature: 22.4°C; liquid temperature: 21.2°C;

IEC_IEEE 62209-1528-LTE FDD 13**DUT: E-Bike component; Type: BCM3101; Serial: 1**

Communication System: LTE-FDD: 5.0 MHz, 16QAM, 1 RB (High); Communication System Band: Band 13;

Communication System Frequency: 779.5 MHz

Medium parameters used: $f = 779.5$ MHz, $\sigma = 0.890$ S/m; $\epsilon_r = 43.7$; $\rho = 1000$ kg/m³

Phantom Section: Flat

Measurement Standard: DASY 8

DASY Configuration:

- Probe: EX3DV4 - SN3944; ConvF(9.46, 9.79, 9.67); Calibrated: 2025-05-16
- Sensor-Surface: 1.4mm
- DAE: DAE4 Sn477; Calibrated: 2025-05-12
- Phantom: ELI V8.0 (20deg probe tilt); Serial: 2101;
- Software: DASY8 Module SAR V17.0.2.6775

HBBL-600-10000/EDGE TOP, 0 mm - Channel 23205/Area Scan (15.0 x 15.0 x 1.0) :

Grid Extents [mm]: 60.0 x 60.0

Maximum value of SAR (interpolated) - SAR(1 g) = 0.336 W/kg; SAR(10 g) = 0.218 W/kg

HBBL-600-10000/EDGE TOP, 0 mm - Channel 23205/Zoom Scan (5.0 x 5.0 x 1.5) :

Grid Extents [mm]: 30.0 x 30.0 x 30.0

Graded Grid: Ratio 1.5 - Distance Sensor to Surface 1.4 mm

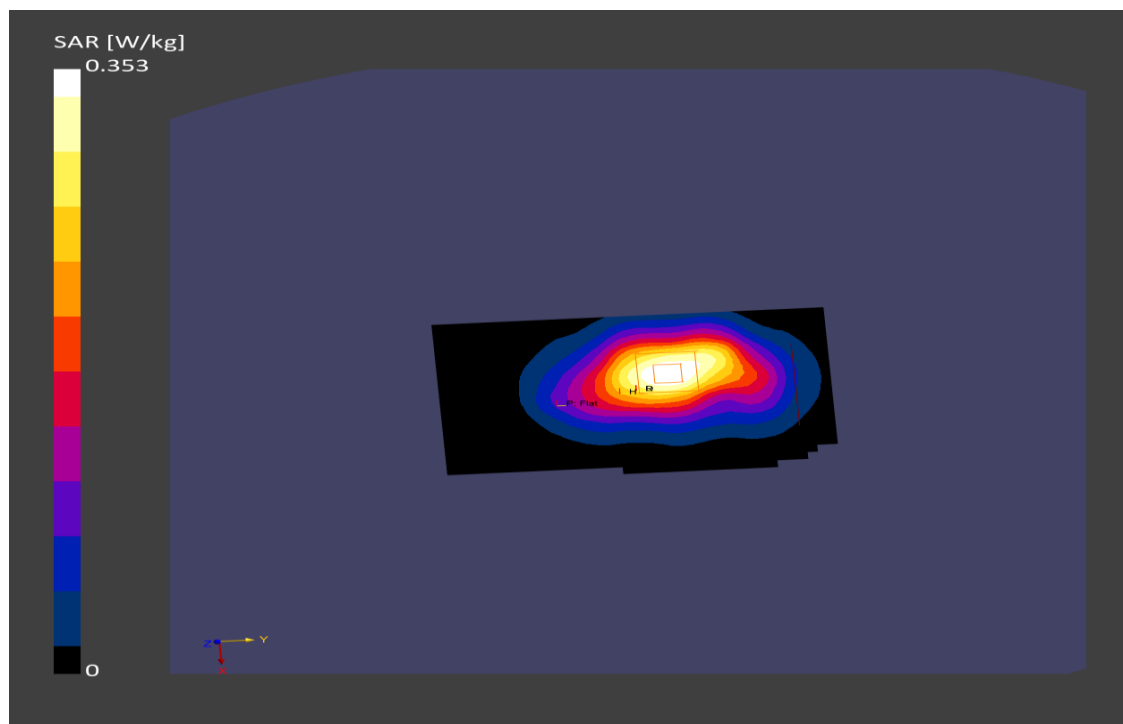
Power Drift = 0.16 dB

SAR(1 g) = 0.351 W/kg; SAR(10 g) = 0.222 W/kg

Additional Info for IEC 62209-2 AMD1:

TDist 3dB Peak [mm]: 12.4

M2/M1 [%]: 84.7

**Additional information:**

position or distance of DUT to SAM: 0 mm

ambient temperature: 22.4°C; liquid temperature: 21.2°C;

Annex B.2: SAR results – BLE

Date/Time: 2026-01-19, 14:17 2026-01-19, 14:24

IEC_IEEE 62209-1528-BLE

DUT: E-Bike component; Type: BCM3101; Serial: 9

Communication System: Bluetooth: BLE, GFSK; Communication System Band: ISM 2.4 GHz Band;

Communication System Frequency: 2402.0 MHz

Medium parameters used: $f = 2402.0$ MHz, $\sigma = 1.78$ S/m; $\epsilon_r = 40.5$; $\rho = 1000$ kg/m³

Phantom Section: Flat

Measurement Standard: DASYS 8

DASY Configuration:

- Probe: EX3DV4 - SN3944; ConvF(7.53, 7.8, 7.71); Calibrated: 2025-05-16
- Sensor-Surface: 1.4mm
- DAE: DAE4 Sn477; Calibrated: 2025-05-12
- Phantom: ELI V8.0 (20deg probe tilt); Serial: 2101;
- Software: DASY8 Module SAR V17.0.2.6775

HBBL-600-10000/EDGE RIGHT, 0 mm - Channel 0/Area Scan (10.0 x 10.0 x 1.0) :

Grid Extents [mm]: 60.0 x 60.0

Maximum value of SAR (interpolated) - SAR(1 g) = 0.073 W/kg; SAR(10 g) = 0.032 W/kg

HBBL-600-10000/EDGE RIGHT, 0 mm - Channel 0/Zoom Scan (5.0 x 5.0 x 1.5) :

Grid Extents [mm]: 30.0 x 30.0 x 30.0

Graded Grid: Ratio 1.5 - Distance Sensor to Surface 1.4 mm

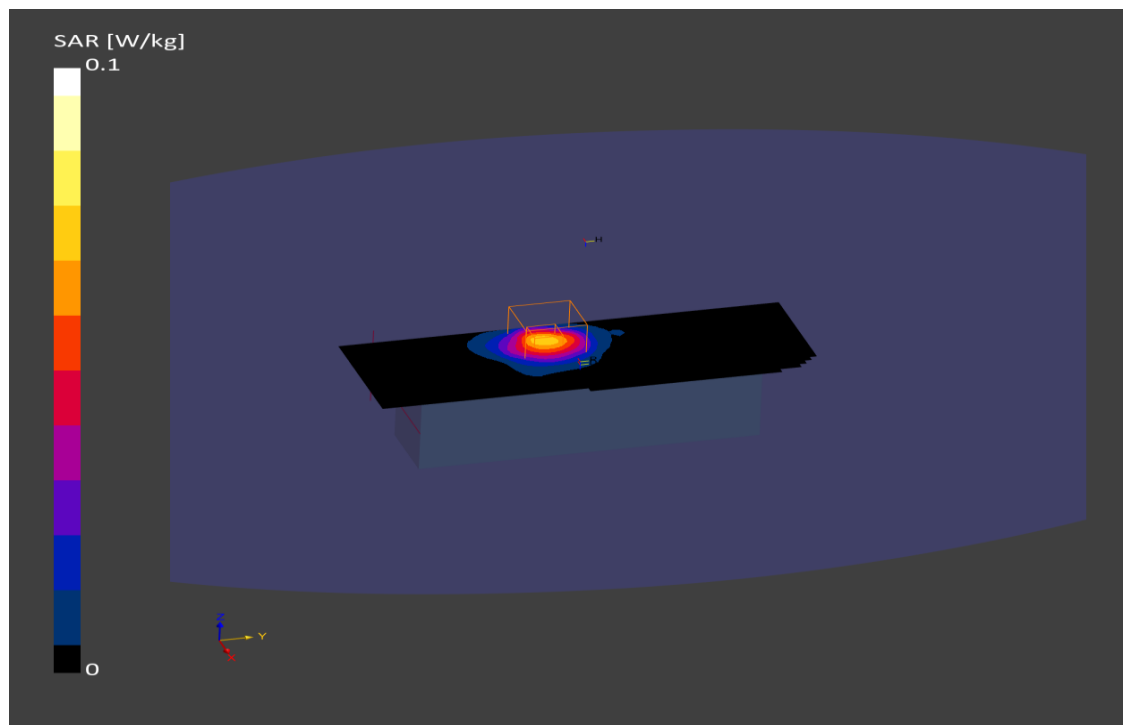
Power Drift = 0.02 dB

SAR(1 g) = 0.068 W/kg; SAR(10 g) = 0.029 W/kg

Additional Info for IEC 62209-2 AMD1:

TDist 3dB Peak [mm]: 7.1

M2/M1 [%]: 71.0



Additional information:

position or distance of DUT to SAM: 0 mm

ambient temperature: 23.5°C; liquid temperature: 21.7°C;

IEC_IEEE 62209-1528-BLE**DUT: E-Bike component; Type: BCM3101; Serial: 9**

Communication System: Bluetooth: BLE, GFSK; Communication System Band: ISM 2.4 GHz Band;

Communication System Frequency: 2440.0 MHz

Medium parameters used: $f = 2440.0$ MHz, $\sigma = 1.81$ S/m; $\epsilon_r = 40.5$; $\rho = 1000$ kg/m³

Phantom Section: Flat

Measurement Standard: DASY 8

DASY Configuration:

- Probe: EX3DV4 - SN3944; ConvF(7.53, 7.8, 7.71); Calibrated: 2025-05-16
- Sensor-Surface: 1.4mm
- DAE: DAE4 Sn477; Calibrated: 2025-05-12
- Phantom: ELI V8.0 (20deg probe tilt); Serial: 2101;
- Software: DASY8 Module SAR V17.0.2.6775

HBBL-600-10000/EDGE RIGHT, 0 mm - Channel mid/Area Scan (10.0 x 10.0 x 1.0) :

Grid Extents [mm]: 60.0 x 60.0

Maximum value of SAR (interpolated) - SAR(1 g) = 0.068 W/kg; SAR(10 g) = 0.030 W/kg

HBBL-600-10000/EDGE RIGHT, 0 mm - Channel mid/Zoom Scan (5.0 x 5.0 x 1.5) :

Grid Extents [mm]: 30.0 x 30.0 x 30.0

Graded Grid: Ratio 1.5 - Distance Sensor to Surface 1.4 mm

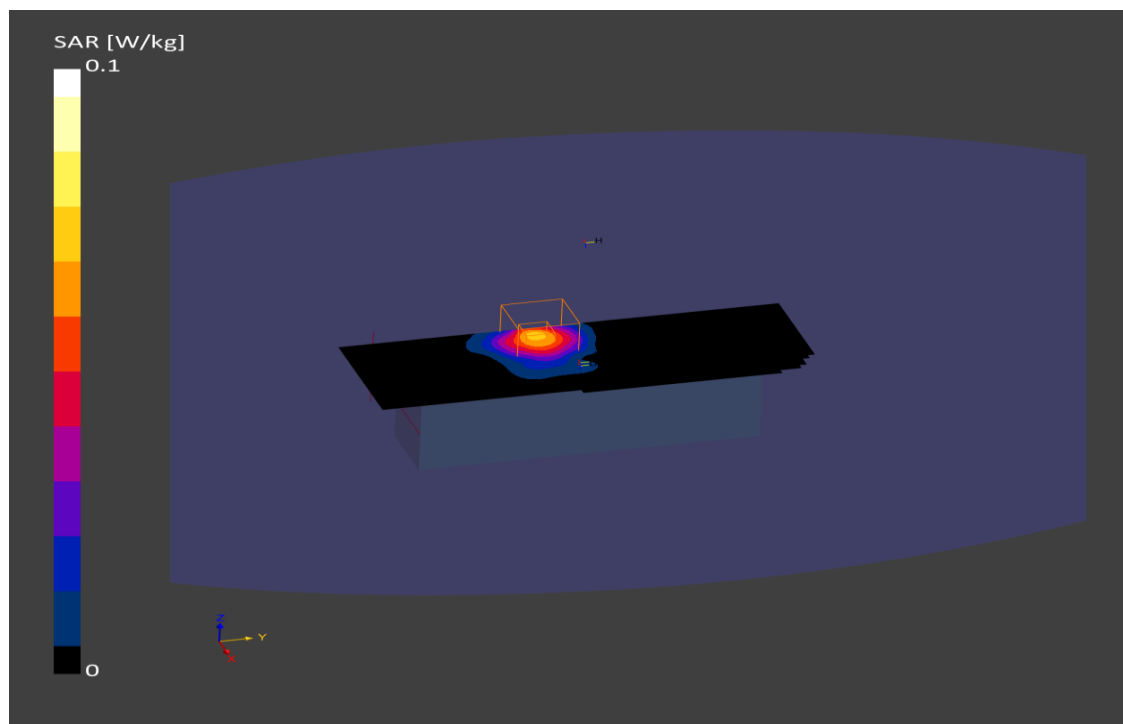
Power Drift = 0.01 dB

SAR(1 g) = 0.070 W/kg; SAR(10 g) = 0.031 W/kg

Additional Info for IEC 62209-2 AMD1:

TDist 3dB Peak [mm]: 7.0

M2/M1 [%]: 72.8

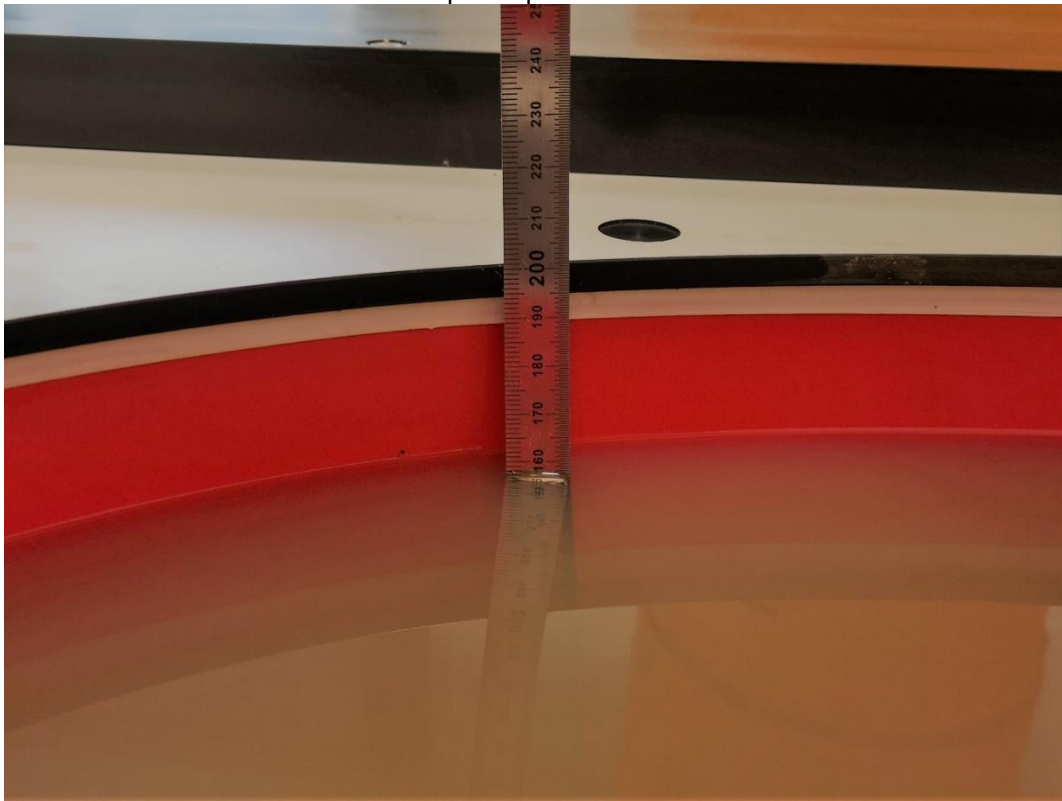
**Additional information:**

position or distance of DUT to SAM: 0 mm

ambient temperature: 23.5°C; liquid temperature: 21.7°C;

Annex B.3: Liquid depth

Photo 1: Liquid depth 600-10000 MHz



Annex C: Photo documentation

Photo documentation is described in the additional document:
1-9708-25-01-12_TR1-A101-R01_Photos

Annex D: Calibration parameters

Calibration parameters are described in the additional document:
1-9708-25-01-12_TR1-A201-R01_Caldata

Annex E: RSS-102 Annex A

ISED RF documents are described in the additional document:
1-9708-25-01-12_TR1-A301-R01_ISED - RSS-102 Annex A

Annex F: Document History

Version	Applied Changes	Date of Release
	Initial Release	2026-01-22

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	-	Combination of Grantee Code and Equipment Product Code
HW	-	Hardware
ISED	-	Innovation, Science and Economic Development Canada
LTE	-	Long Term Evolution
N/A	-	not applicable
PCB	-	PCS Licensed Transmitter
PCE	-	Personal Consumption Expenditure (PCS Licensed Transmitter held to ear)
PCS	-	Personal Consumption Services
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