

FCC SAR TEST REPORT

Client Name : UNION COMMUNITY

Address : 12F, Munjeong Daemyeong Valeon bldg, 127
Beobwon-ro Songpa-gu, Seoul, Korea

Product Name : Ubio tablet5

Date : Jul. 15, 2019

Shenzhen Anbotech Compliance Laboratory Limited

Contents

1. Statement of Compliance.....	6
2. General Information.....	7
2.1. Client Information.....	7
2.2. Testing Laboratory Information.....	7
2.3. Description of Equipment Under Test (EUT).....	7
2.4. Device Category and SAR Limits.....	10
2.5. Applied Standard.....	10
2.6. Environment of Test Site.....	10
2.7. Test Configuration.....	10
3. Specific Absorption Rate (SAR).....	11
3.1. Introduction.....	11
3.2. SAR Definition.....	11
4. SAR Measurement System.....	12
4.1. E-Field Probe.....	13
4.2. Data Acquisition Electronics (DAE).....	13
4.3. Robot.....	14
4.4. Measurement Server.....	14
4.5. Phantom.....	16
4.6. Device Holder.....	17
4.7. Data Storage and Evaluation.....	18
5. Test Equipment List.....	20
6. Tissue Simulating Liquids.....	21
7. System Verification Procedures.....	23
8. EUT Testing Position.....	25
8.1. Body Worn Position.....	25
9. Measurement Procedures.....	26
9.1. Spatial Peak SAR Evaluation.....	26
9.2. Power Reference Measurement.....	27
9.3. Area Scan Procedures.....	27
9.4. Zoom Scan Procedures.....	28
9.5. Volume Scan Procedures.....	29
9.6. Power Drift Monitoring.....	29
10. Conducted Power.....	30
11. Antenna Location.....	55
12. SAR Test Results Summary.....	56
12.1. Body SAR Results.....	56
13. Simultaneous Transmission Analysis.....	60
13.1. Simultaneous TX SAR Considerations.....	60
13.2. Evaluation of Simultaneous SAR.....	60

14. Measurement Uncertainty.....	64
Appendix A. EUT Photos and Test Setup Photos.....	65
Appendix B. Plots of SAR System Check.....	66
Appendix C. Plots of SAR Test Data.....	71
Appendix D. DASY System Calibration Certificate.....	81

TEST REPORT

Applicant : UNION COMMUNITY
Manufacturer : SHENZHEN HEROFUN BIO-TECH.,LTD
Product Name : Ubio tablet5
Model No. : Ubio tablet5
Trade Mark : UNION COMMUNITY
Rating(s) : DC 3.7V, 6000mAh Battery inside

Test Standard(s) : IEEE 1528-2013; IEC 62209-2:2010;
ANSI/IEEE C95.1:2005; FCC 47 CFR Part 2 (2.1093);

The device described above is tested by Shenzhen Anbotech Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotech Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the IEEE 1528-2013, IEC 62209-2:2010, ANSI/IEEE C95.1:2005 and FCC 47 CFR Part 2 (2.1093) requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotech Compliance Laboratory Limited.

Date of Receipt

Jun. 04, 2019

Date of Test

Jun. 04~24, 2019

Prepared By



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Version

Version No.	Date	Description
01	Jul. 15, 2019	Original

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1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing are as follows.

<Highest SAR Summary>

Frequency Band	Highest Reported 1g-SAR(W/Kg)		SAR Test Limit (W/Kg)
	Body Back (5mm)	Hot spot (5mm)	
GSM 850	0.379	0.379	1.6
PCS 1900	0.211	0.211	
WCDMA Band 2	0.559	0.559	
WCDMA Band 5	0.823	0.823	
LTE Band 7	0.940	0.940	
LTE Band 38	0.841	0.841	
LTE Band 40	0.636	0.636	
LTE Band 41	0.691	0.691	
WIFI 2.4G	0.351	/	
WIFI 5.8G	0.345	/	
Simultaneous SAR	1.291		
Test Result	PASS		

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-2005, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and IEC 62209-2:2010

2. General Information

2.1. Client Information

Applicant	:	UNION COMMUNITY
Address	:	12F, Munjeong Daemyeong Valeon bldg, 127 Beobwon-ro Songpa-gu, Seoul, Korea
Manufacturer	:	SHENZHEN HEROFUN BIO-TECH.,LTD
Address	:	7001B, 7th Floor, LaoBing Building, East Block 2, No. 3012 XingYe Road, BaoAn District, Shenzhen, China
Factory	:	SHENZHEN HEROFUN BIO-TECH.,LTD
Address	:	7001B, 7th Floor, LaoBing Building, East Block 2, No. 3012 XingYe Road, BaoAn District, Shenzhen, China

2.2. Testing Laboratory Information

Test Site:	:	Shenzhen Anbotech Compliance Laboratory Limited
Address:	:	1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518102

2.3. Description of Equipment Under Test (EUT)

Product Name	:	Ubio tablet5
Model No.	:	Ubio tablet5
Trade Mark	:	UNION COMMUNITY
Test Power Supply	:	DC 3.7V Battery inside
Test Sample No.	:	1-2-1(Normal Sample),
Product Description	:	Operation Frequency: BDR+EDR: 2402MHz~2480MHz 2.4G WIFI:2412~2462MHz 5.1G WIFI:5150~5250MHz 5.8G WIFI:5725~5850MHz GSM/GPRS 850 TX:824.2~848.8 MHz; RX:869.2~893.8 MHz PCS/GPRS 1900

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		TX:1850.2~1909.8 MHz; RX:1930.2~1989.8 MHz UMTS-FDD Band 5 TX: 826.4 ~ 846.6 MHz; RX: 871.4 ~ 891.6 MHz UMTS-FDD Band 2 TX:1852.4~1907.6 MHz; RX: 1932.4~1987.6 MHz LTE-FDD Band 7 TX:2502.5 ~ 2567.5 MHz; RX: 2625.5 ~ 2687.5 MHz LTE-FDD Band 38 TX:2570~2620MHz, RX:2570~2620MHz LTE-FDD Band 40 TX:2300~2400MHz, RX:2300~2400MHz LTE-FDD Band 41 TX:2496~2690MHz, RX:2496~2690MHz
	Transfer Rate:	BDR+EDR: 1/2/3 Mbits/s 802.11b: 11/5.5/2/1Mbps 802.11g: 54/48/36/24/18/12/9/6 Mbps 802.11n: up to 150Mbps 802.11a: 6,9,12,18,24,36,48,54 Mbps 802.11ac(VHT20): NSS1, MCS0-MCS8 802.11ac(VHT40): NSS1, MCS0-MCS9
	Number of Channel:	BDR+EDR: 79 Channels 802.11b/ g/ n(HT20): 11 Channels 802.11n(HT40): 7 Channels 4 Channels for 802.11ac(VHT20); 2 Channels for 802.11n(HT40); 2 Channels for 802.11ac(VHT40)
	GPRS Class	8/10/12
	Modulation Type:	GSM/GPRS: GMSK,8PSK WCDMA: BPSK, 16QAM; LTE: QPSK, 16QAM BDR+EDR: GFSK, $\pi/4$ -DQPSK, 8-DPSK 2.4G WiFi: CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 5G WiFi: OFDM with BPSK / QPSK / 16QAM / 64QAM for 802.11a/n OFDM with BPSK / QPSK / 16QAM /

		64QAM/256QAM for 802.11ac
	Antenna Type:	GSM/GPRS: FPCB Antenna WCDMA: FPCB Antenna LTE: FPCB Antenna BDR+EDR: FPCB Antenna 2.4G WiFi: FPCB Antenna 5G WiFi: FPCB Antenna
	Antenna Gain(Peak):	GSM 850: 0.85 dBi PCS 1900: 0.96 dBi UMTS-FDD Band 2: 1.0 dBi UMTS-FDD Band 5: 0.83 dBi LTE-FDD Band 7: 0.92 dBi LTE-FDD Band 38: 1.28 dBi LTE-FDD Band 40: 1.26 dBi LTE-FDD Band 41: 1.19 dBi BDR+EDR:0.82 dBi 2.4G WiFi: 0.82dBi 5G WiFi: 1.1dBi
	Hardware version :	HYF_BH502G_V4.0_20190415
	Software version :	SW01_BH502G_20190420
Remark: 1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.		

2. 4. Device Category and SAR Limits

This device belongs to portable device category because its radiating structure is allowed to be used within 20 centimeters of the body of the user. Limit for General Population/Uncontrolled exposure should be applied for this device, it is 1.6 W/kg as averaged over any 1 gram of tissue.

2. 5. Applied Standard

The Specific Absorption Rate (SAR) testing specification, method, and procedure for this device is in accordance with the following standards:

- IEEE 1528-2013
- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1:2005
- IEC 62209-2:2010
- KDB 248227 D01 802.11 Wi-Fi SAR v02r02
- KDB 447498 D01 General RF Exposure Guidance v06
- KDB 648474 D04 Handset SAR v01r03
- KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- KDB 941225 D01 3G SAR Procedures v03r01
- KDB 941225 D05 SAR for LTE Devices v02r05
- KDB 941225 D06 Hot Spot SAR v02r01

2. 6. Environment of Test Site

Items	Required	Actual
Temperature (°C)	18-25	22~23
Humidity (%RH)	30-70	55~65

2. 7. Test Configuration

The device was controlled by using a base station emulator. Communication between the device and the emulator was established by air link. The distance between the EUT and the antenna of the emulator is larger than 50 cm and the output power radiated from the emulator antenna is at least 30 dB smaller than the output power of EUT. The EUT was set from the emulator to radiate maximum output power during all tests. For WLAN SAR testing, WLAN engineering testing software installed on the EUT can provide continuous transmitting RF signal.

3. Specific Absorption Rate (SAR)

3.1. Introduction

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

3.2. SAR Definition

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density (ρ). The equation description is as below:

$$SAR = \frac{d}{dt} \left(\frac{dW}{dm} \right) = \frac{d}{dt} \left(\frac{dW}{\rho dv} \right)$$

SAR is expressed in units of Watts per kilogram (W/kg)

SAR measurement can be either related to the temperature elevation in tissue by

$$SAR = C \left(\frac{\delta T}{\delta t} \right)$$

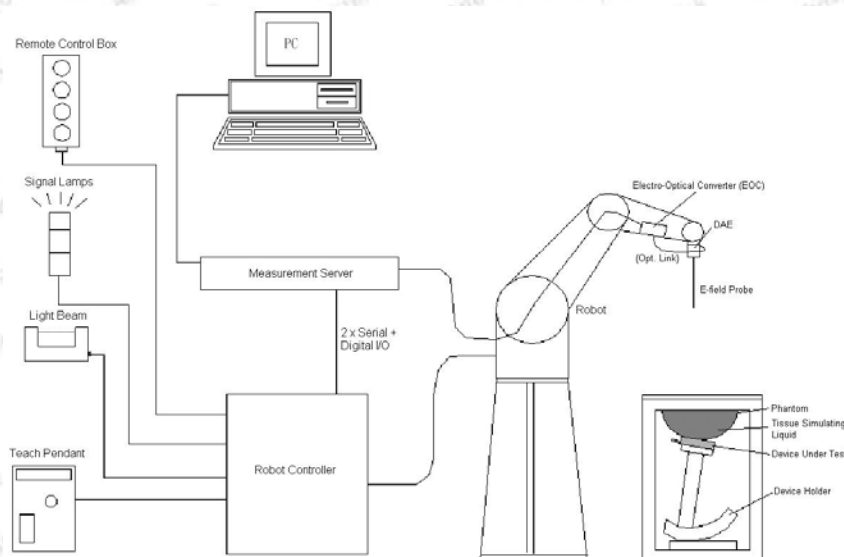
Where: C is the specific heat capacity, δT is the temperature rise and δt is the exposure duration, or related to the electrical field in the tissue by

$$SAR = \frac{\sigma |E|^2}{\rho}$$

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength.

However for evaluating SAR of low power transmitter, electrical field measurement is typically applied.

4. SAR Measurement System



DASY System Configurations

The DASY system for performance compliance tests is illustrated above graphically. This system consists of the following items:

- A standard high precision 6-axis robot with controller, a teach pendant and software
- A data acquisition electronic (DAE) attached to the robot arm extension
- A dosimetric probe equipped with an optical surface detector system
- The electro-optical converter (EOC) performs the conversion between optical and electrical signals
- A measurement server performs the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the accuracy of the probe positioning
- A computer operating Windows XP
- DASY software
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom
- A device holder
- Tissue simulating liquid
- Dipole for evaluating the proper functioning of the system

components are described in details in the following sub-sections.

4. 1. E-Field Probe

The SAR measurement is conducted with the dosimetric probe (manufactured by SPEAG).The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency. This probe has a built in optical surface detection system to prevent from collision with phantom.

➤ E-Field Probe Specification

<EX3DV4 Probe>

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	 Photo of EX3DV4
Frequency	10 MHz to 6 GHz; Linearity: ± 0.2 dB	
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 mW/g; Linearity: ± 0.2 dB (noise: typically < 1 μ W/g)	
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm	

➤ E-Field Probe Calibration

Each probe needs to be calibrated according to a dosimetric assessment procedure with accuracy better than $\pm 10\%$. The spherical isotropy shall be evaluated and within ± 0.25 dB. The sensitivity parameters (NormX, NormY, and NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested. The calibration data can be referred to appendix C of this report.

4. 2. Data Acquisition Electronics (DAE)

The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock.

The input impedance of the DAE is 200MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80dB.

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Photo of DAE

4. 3. Robot

The SPEAG DASY system uses the high precision robots (DASY5: TX60XL) type from Stäubli SA (France). For the 6-axis controller system, the robot controller version (DASY5: CS8c) from Stäubli is used. The Stäubli robot series have many features that are important for our application:

- High precision (repeatability ± 0.035 mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)



Photo of DASY5

4. 4. Measurement Server

The measurement server is based on a PC/104 CPU board with CPU (DASY5: 400 MHz, Intel Celeron), chip disk (DASY5: 128 MB), RAM (DASY5: 128 MB). The necessary circuits for communication with the DAE electronic box, as well as the 16 bit AD converter system for optical

detection and digital I/O interface are contained on the DASY I/O board, which is directly connected to the PC/104 bus of the CPU board.

The measurement server performs all the real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operations.



Photo of Server for DASY5

4.5. Phantom

<SAM Twin Phantom>

Shell Thickness	2 ± 0.2 mm; Center ear point: 6 ± 0.2 mm
Filling Volume	Approx. 25 liters
Dimensions	Length: 1000 mm; Width: 500 mm; Height: adjustable feet
Measurement Areas	Left Hand, Right Hand, Flat Phantom



Photo of SAM Phantom

The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

<ELI4 Phantom>

Shell Thickness	2 ± 0.2 mm (sagging: <1%)
Filling Volume	Approx. 30 liters
Dimensions	Major ellipse axis: 600 mm Minor axis: 400 mm



Photo of ELI4 Phantom

The ELI4 phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with standard and all known tissue simulating liquids.

4. 6. Device Holder

The SAR in the phantom is approximately inversely proportional to the square of the distance between the source and the liquid surface. For a source at 5 mm distance, a positioning uncertainty of $\pm 0.5\text{mm}$ would produce a SAR uncertainty of $\pm 20\%$. Accurate device positioning is therefore crucial for accurate and repeatable measurements. The positions in which the devices must be measured are defined by the standards.

The DASY device holder is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation center for both scales is the ear reference point (ERP). Thus the device needs no repositioning when changing the angles.

The DASY device holder is constructed of low-loss POM material having the following dielectric parameters: relative permittivity $\epsilon = 3$ and loss tangent $\delta = 0.02$. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.



Device Holder

4. 7. Data Storage and Evaluation

➤ Data Storage

The DASY software stores the assessed data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all the necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files. The post-processing 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 erroneous parameter settings. For example, if a measurement has been performed with an incorrect crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be reevaluated.

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

➤ Data Evaluation

The DASY post-processing software (SEMCAD) 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	dcp_i
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 multi-meter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

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

The formula for each channel can be given as:

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

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:

$$\text{E-field Probes: } E_i = \sqrt{\frac{V_i}{\text{Norm}_i \cdot \text{ConvF}}}$$

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

with V_i = compensated signal of channel i, (i = x, y, z)

Norm_i = sensor sensitivity of channel i, (i = x, y, z), $\mu\text{V}/(\text{V/m})^2$ 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):

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

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

$$\text{SAR} = E_{\text{tot}}^2 \cdot \frac{\sigma}{\rho \cdot 1000}$$

with SAR = local specific absorption rate in mW/g

E_{tot} = total field strength in V/m

σ = conductivity in [mho/m] or [Siemens/m]

ρ = equivalent tissue density in g/cm³

Note that the density is set to 1, to account for actual head tissue density rather than the density of the tissue simulating liquid.

5. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	835MHz System Validation Kit	D835V2	4d154	Jun. 16,2018	Jun. 15,2021
SPEAG	1900MHz System Validation Kit	D1900V2	5d175	Jun. 15,2019	Jun. 14,2022
SPEAG	2450MHz System Validation Kit	D2450V2	910	Jun. 15,2018	Jun. 14,2021
SPEAG	2600MHz System Validation Kit	D2600V2	1058	Jun. 19,2018	Jun. 18,2021
SPEAG	5GHz System Validation Kit	D5GHZV2	1160	Oct. 02, 2018	Oct. 01, 2021
SPEAG	Data Acquisition Electronics	DAE4	387	Sept. 06,2018	Sept. 05,2019
SPEAG	Dosimetric E-Field Probe	EX3DV4	7396	May 06,2019	May 05,2020
Agilent	ENA Series Network Analyzer	E5071C	MY46317418	May 22, 2019	May 21, 2020
SPEAG	DAK	DAK-3.5	1226	NCR	NCR
SPEAG	ELI Phantom	QDOVA004AA	2058	NCR	NCR
AR	Amplifier	ZHL-42W	QA1118004	NCR	NCR
Agilent	Power Meter	N1914A	MY50001102	Dec. 06, 2018	Nov. 06, 2019
Agilent	Power Sensor	N8481H	MY51240001	Dec. 06, 2018	Nov. 06, 2019
R&S	Spectrum Analyzer	N9020A	MY51170037	May.23, 2018	May. 22, 2019
Agilent	Signal Generation	N5182A	MY48180656	May.23, 2018	May. 22, 2019
Worken	Directional Coupler	0110A05601O-10	COM5BNW1A2	May.23, 2018	May. 22, 2019

Note:

1. The calibration certificate of DASY can be referred to appendix C of this report.
2. The dipole calibration interval can be extended to 3 years with justification. The dipoles are also not physically damaged, or repaired during the interval.
3. The Insertion Loss calibration of Dual Directional Coupler and Attenuator were characterized via the network analyzer and compensated during system check.
4. The dielectric probe kit was calibrated via the network analyzer, with the specified procedure (calibrated in pure water) and calibration kit (standard) short circuit, before the dielectric measurement. The specific procedure and calibration kit are provided by Agilent.
5. In system check we need to monitor the level on the power meter, and adjust the power amplifier level to have precise power level to the dipole; the measured SAR will be normalized to 1W input power according to the ratio of 1W to the input power to the dipole. For system check, the calibration of the power amplifier is deemed not critically required for correct measurement; the power meter is critical and we do have calibration for it

6. Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 6.1. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown as followed:

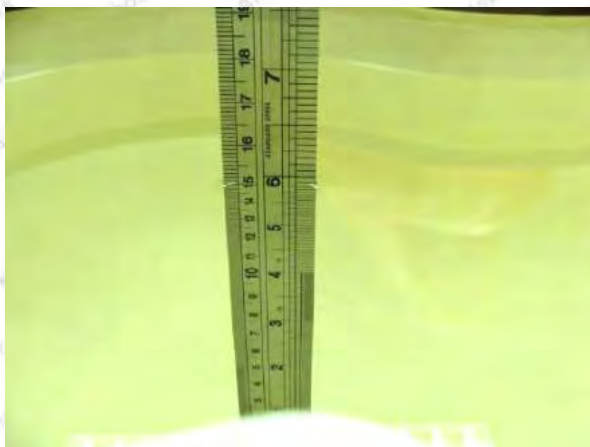


Photo of Liquid Height for Head SAR



Photo of Liquid Height for Body SAR

The following table gives the recipes for tissue simulating liquid.

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (ϵ_r)
For Head								
900	40.3	57.9	0.2	1.4	0.2	0	0.97	41.5
1750	55.2	0	0	0.3	0	44.5	1.37	40.1
1800,1900,2000	55.2	0	0	0.3	0	44.5	1.40	40.0
2450	55.0	0	0	0	0	45.0	1.80	39.2
2600	54.8	0	0	0.1	0	45.1	1.96	39.0
5800	65.5	0	17.2	0	17.3	0	6.00	48.2
For Body								
900	50.8	48.2	0	0.9	0.1	0	0.97	55.2
1750	70.2	0	0	0.4	0	29.4	1.49	53.4
1800,1900,2000	70.2	0	0	0.4	0	29.4	1.52	53.3

2450	68.6	0	0	0	0	31.4	1.95	52.7
2600	68.1	0	0	0.1	0	31.8	2.16	52.5
5000	78.6	0	10.7	0	10.7	0	6.00	48.2

The following table shows the measuring results for simulating liquid.

Tissue Type	Measured Frequency (MHz)	Target Tissue		Measured Tissue				Liquid Temp.	Test Data
		ϵ_r	σ	ϵ_r	Dev. (%)	σ	Dev. (%)		
900MSL	850	55.00	1.05	55.34	0.62	1.07	1.90	22.0	06/06/2019
1900MSL	1900	53.30	1.52	53.26	-0.08	1.51	-0.66	22.1	06/10/2019
2600MSL	2600	52.50	2.16	54.37	3.56	2.15	-0.46	21.8	06/12/2019
2450MSL	2450	52.70	1.95	51.97	-1.39	1.89	-3.08	21.3	06/14/2019
5000MSL	5800	48.20	6.00	48.53	0.68	5.95	-0.83	21.6	06/04/2019

7. System Verification Procedures

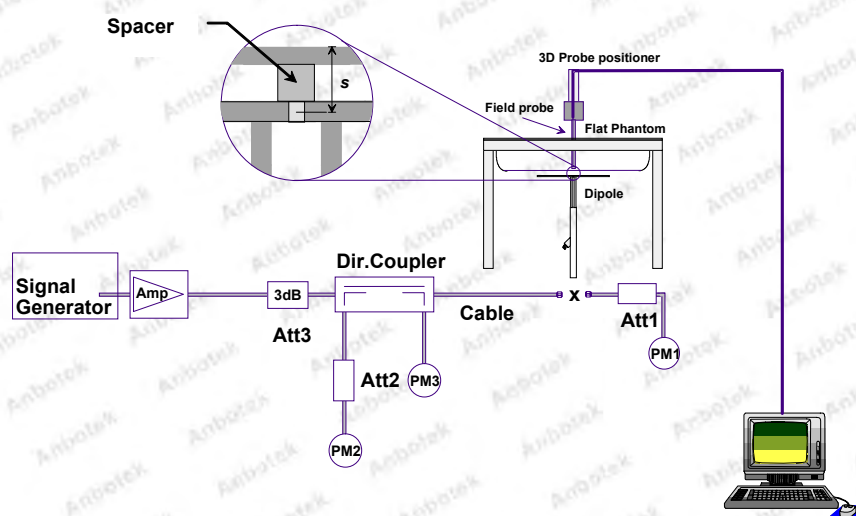
Each DASY system is equipped with one or more system validation kits. These units, together with the predefined measurement procedures within the DASY software, enable the user to conduct the system performance check and system validation. System validation kit includes a dipole, tripod holder to fix it underneath the flat phantom and a corresponding distance holder.

➤ Purpose of System Performance check

The system performance check verifies that the system operates within its specifications. System and operator errors can be detected and corrected. It is recommended that the system performance check be performed prior to any usage of the system in order to guarantee reproducible results. The system performance check uses normal SAR measurements in a simplified setup with a well characterized source. This setup was selected to give a high sensitivity to all parameters that might fail or vary over time. The system check does not intend to replace the calibration of the components, but indicates situations where the system uncertainty is exceeded due to drift or failure.

➤ System Setup

In the simplified setup for system evaluation, the EUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave that comes from a signal generator. The calibrated dipole must be placed beneath the flat phantom section of the SAM twin phantom with the correct distance holder. The distance holder should touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The equipment setup is shown below:



System Setup for System Evaluation

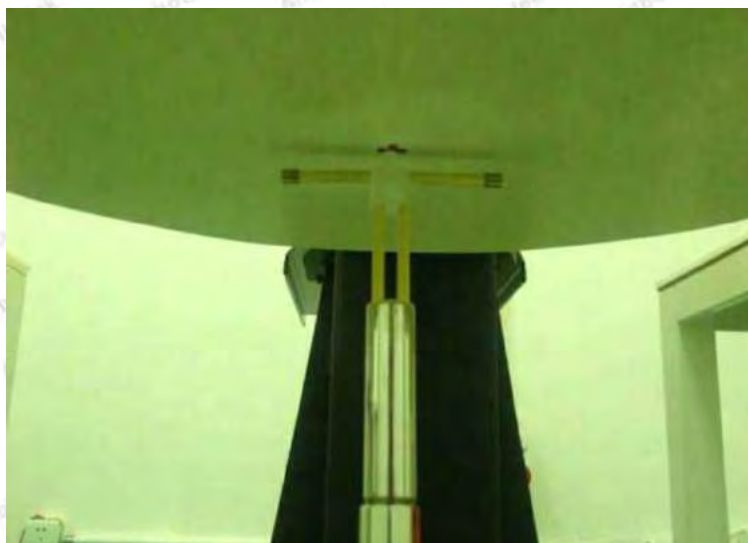


Photo of Dipole Setup

➤ Validation Results

Comparing to the original SAR value provided by SPEAG, the verification data should be within its specification of 10%. The table below shows the target SAR and measured SAR after normalized to 1W input power. It indicates that the system performance check can meet the variation criterion and the plots can be referred to Appendix A of this report.

Frequency (MHz)	Liquid Type	Power fed onto reference dipole (mW)	Targeted SAR (W/kg)	Measured SAR (W/kg)	Normalized SAR (W/kg)	Deviation (%)	Date
850	Body	250	9.52	2.53	10.12	6.30	06/06/2019
1900	Body	250	39.60	9.26	37.04	-6.46	06/10/2019
2600	Body	250	54.1	13.72	54.88	1.44	06/12/2019
2450	Body	250	51.10	12.10	48.40	-5.28	06/14/2019
5800	Body	100	78.3	7.85	78.5	0.26	06/04/2019

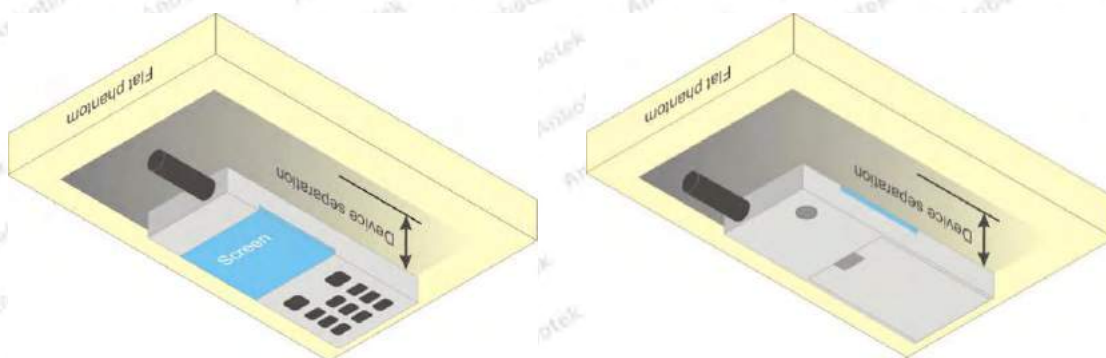
Target and Measurement SAR after Normalized

8. EUT Testing Position

8.1. Body Worn Position

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration. Per KDB 648474 D04, body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in FCC KDB 447498 D01 v06 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for body-worn accessory, measured without a headset connected to the handset is $< 1.2 \text{ W/kg}$, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a handset attached to the handset.

Accessories for body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that do contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then multiple accessories that contain metallic components are test with the device with each accessory. If multiple accessories share an identical metallic component (i.e. the same metallic belt-clip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.



Body Worn Position

9. Measurement Procedures

The measurement procedures are as follows:

- (a) Use base station simulator (if applicable) or engineering software to transmit RF power continuously (continuous Tx) in the middle channel.
- (b) Keep EUT to radiate maximum output power or 100% duty factor (if applicable)
- (c) Measure output power through RF cable and power meter.
- (d) Place the EUT in the positions as setup photos demonstrates.
- (e) Set scan area, grid size and other setting on the DASY software.
- (f) Measure SAR transmitting at the middle channel for all applicable exposure positions.
- (g) Identify the exposure position and device configuration resulting the highest SAR
- (h) Measure SAR at the lowest and highest channels at the worst exposure position and device configuration if applicable.

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

- (a) Power reference measurement
- (b) Area scan
- (c) Zoom scan
- (d) Power drift measurement

9. 1. Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g 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.

The entire evaluation of the spatial peak values is performed within the post-processing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

- (a) Extraction of the measured data (grid and values) from the Zoom Scan
- (b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
- (c) Generation of a high-resolution mesh within the measured volume
- (d) Interpolation of all measured values from the measurement grid to the high-resolution grid
- (e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from

sensor to surface

- (f) Calculation of the averaged SAR within masses of 1g and 10g

9. 2. Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

9. 3. Area Scan Procedures

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), if only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of zoom scans has to be increased accordingly.

Area scan parameters extracted from FCC KDB 865664 D01 SAR measurement 100 MHz to 6 GHz.

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	$30^\circ \pm 1^\circ$	$20^\circ \pm 1^\circ$
Maximum area scan spatial resolution: Δx_{Area} , Δy_{Area}	≤ 2 GHz: ≤ 15 mm $2 - 3$ GHz: ≤ 12 mm	$3 - 4$ GHz: ≤ 12 mm $4 - 6$ GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be $\leq$ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

9.4. Zoom Scan Procedures

Zoom scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 gram and 10gram of simulated tissue. The zoom scan measures points (refer to table below) within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the zoom scan evaluates the averaged SAR for 1 gram and 10 gram and displays these values next to the job's label.

Zoom scan parameters extracted from FCC KDB 865664 D01 SAR measurement 100 MHz to 6 GHz.

			$\leq 3 \text{ GHz}$	$> 3 \text{ GHz}$
Maximum zoom scan spatial resolution: $\Delta x_{\text{Zoom}}, \Delta y_{\text{Zoom}}$			$\leq 2 \text{ GHz}: \leq 8 \text{ mm}$ $2 - 3 \text{ GHz}: \leq 5 \text{ mm}^*$	$3 - 4 \text{ GHz}: \leq 5 \text{ mm}^*$ $4 - 6 \text{ GHz}: \leq 4 \text{ mm}^*$
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{\text{Zoom}}(n)$		$\leq 5 \text{ mm}$	$3 - 4 \text{ GHz}: \leq 4 \text{ mm}$ $4 - 5 \text{ GHz}: \leq 3 \text{ mm}$ $5 - 6 \text{ GHz}: \leq 2 \text{ mm}$
	graded grid	$\Delta z_{\text{Zoom}}(1)$: between 1 st two points closest to phantom surface	$\leq 4 \text{ mm}$	$3 - 4 \text{ GHz}: \leq 3 \text{ mm}$ $4 - 5 \text{ GHz}: \leq 2.5 \text{ mm}$ $5 - 6 \text{ GHz}: \leq 2 \text{ mm}$
		$\Delta z_{\text{Zoom}}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{\text{Zoom}}(n-1)$	
Minimum zoom scan volume	x, y, z		$\geq 30 \text{ mm}$	$3 - 4 \text{ GHz}: \geq 28 \text{ mm}$ $4 - 5 \text{ GHz}: \geq 25 \text{ mm}$ $5 - 6 \text{ GHz}: \geq 22 \text{ mm}$
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.				
* When zoom scan is required and the <u>reported</u> SAR from the <i>area scan based 1-g SAR estimation</i> procedures of KDB 447498 is $\leq 1.4 \text{ W/kg}$, $\leq 8 \text{ mm}$, $\leq 7 \text{ mm}$ and $\leq 5 \text{ mm}$ zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.				

9. 5. Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

9. 6. Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASY measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drift more than 5%, the SAR will be retested.

10. Conducted Power

<GSM Conducted power>

GSM850	Burst Average Power (dBm)			Frame-Average Power (dBm)		
TX Channel	128	190	251	128	190	251
Frequency (MHz)	824.2	836.6	848.6	824.2	836.6	848.6
GSM (GMSK, 1 Tx slot)	31.06	29.61	30.42	22.03	20.58	21.39
GPRS (GMSK, 1 Tx slot) – CS1	31.14	31.55	31.68	22.11	22.52	22.65
GPRS (GMSK, 2 Tx slots) – CS1	30.73	30.93	31.06	24.71	24.91	25.04
GPRS (GMSK, 3 Tx slots) – CS1	29.21	29.39	29.52	24.95	25.13	25.26
GPRS (GMSK, 4 Tx slots) – CS1	27.51	27.70	27.83	24.50	24.69	24.82
PCS1900	Burst Average Power (dBm)			Frame-Average Power (dBm)		
TX Channel	512	661	810	512	661	810
Frequency (MHz)	1850.2	1880.0	1909.8	1850.2	1880.0	1909.8
GSM (GMSK, 1 Tx slot)	28.92	29.24	29.24	19.89	20.21	20.21
GPRS (GMSK, 1 Tx slot) – CS1	28.98	29.25	29.21	19.95	20.22	20.18
GPRS (GMSK, 2 Tx slots) – CS1	28.32	28.69	28.82	22.30	22.67	22.80
GPRS (GMSK, 3 Tx slots) – CS1	27.14	27.24	27.20	22.88	22.98	22.94
GPRS (GMSK, 4 Tx slots) – CS1	25.49	25.76	25.72	22.48	22.75	22.71

Remark: The frame-averaged power is linearly scaled the maximum burst averaged power over 8 time slots.

The calculated method are shown as below:

Frame-averaged power = Maximum burst averaged power (1 Tx Slot) – 9.03 dB

Frame-averaged power = Maximum burst averaged power (2 Tx Slots) – 6.02 dB

Frame-averaged power = Maximum burst averaged power (3 Tx Slots) - 4.26 dB

Frame-averaged power = Maximum burst averaged power (4 Tx Slots) – 3.01 dB

Note:

1. Per KDB 447498 D01 v06, the maximum output power channel is used for SAR testing and for further SAR test reduction
2. For Head SAR testing, GSM should be evaluated, therefore the EUT was set in GSM Voice for GSM850 and PCS1900.
3. For Hotspot mode SAR testing, GPRS and EDGE should be evaluated, therefore the EUT was set in GPRS 3 Tx slots for GSM850 and PCS1900 due to its highest frame-average power.

<WCDMA Conducted Power>

The following tests were conducted according to the test requirements outlines in 3GPP TS 34.121 specification. A summary of these settings are illustrated below:

HSDPA Setup Configuration:

- The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.
- The RF path losses were compensated into the measurements.
- A call was established between EUT and Base Station with following setting:
 - Set Gain Factors (β_c and β_d) and parameters were set according to each
 - Specific sub-test in the following table, C10.1.4, quoted from the TS 34.121
 - Set RMC 12.2Kbps + HSDPA mode.
 - Set Cell Power = -86 dBm
 - Set HS-DSCH Configuration Type to FRC (H-set 1, QPSK)
 - Select HSDPA Uplink Parameters
 - Set Delta ACK, Delta NACK and Delta CQI = 8
 - Set Ack-Nack Repetition Factor to 3
 - Set CQI Feedback Cycle (k) to 4 ms
 - Set CQI Repetition Factor to 2
 - Power Ctrl Mode = All Up bits
- The transmitted maximum output power was recorded.

Table C.10.1.4: β values for transmitter characteristics tests with HS-DPCCH

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs} (Note 1, Note 2)	CM (dB) (Note 3)	MPR (dB) (Note 3)
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 (Note 4)	15/15 (Note 4)	64	12/15 (Note 4)	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5
Note 1: Δ_{ACK}, Δ_{NACK} and $\Delta_{CQI} = 30/15$ with $\beta_{hs} = 30/15 * \beta_c$. Note 2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA, Δ_{ACK} and $\Delta_{NACK} = 30/15$ with $\beta_{hs} = 30/15 * \beta_c$, and $\Delta_{CQI} = 24/15$ with $\beta_{hs} = 24/15 * \beta_c$. Note 3: CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$. For all other combinations of DPDCCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases. Note 4: For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 11/15$ and $\beta_d = 15/15$.							

Setup Configuration

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HSUPA Setup Configuration:

- The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.
- The RF path losses were compensated into the measurements.
- A call was established between EUT and Base Station with following setting * :
 - Call Configs = 5.2B, 5.9B, 5.10B, and 5.13.2B with QPSK
 - Set the Gain Factors (β_c and β_d) and parameters (AG Index) were set according to each specific sub-test in the following table, C11.1.3, quoted from the TS 34.121
 - Set Cell Power = -86 dBm
 - Set Channel Type = 12.2k + HSPA
 - Set UE Target Power
 - Power Ctrl Mode= Alternating bits
 - Set and observe the E-TFCl
 - Confirm that E-TFCl is equal to the target E-TFCl of 75 for sub-test 1, and other subtest's E-TFCl
- The transmitted maximum output power was recorded.

Table C.11.1.3: β values for transmitter characteristics tests with HS-DPCCH and E-DCH

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS} (Note 1)	β_{ec}	β_{ed} (Note 5) (Note 6)	β_{ed} (SF)	β_{ed} (Codes)	CM (dB) (Note 2)	MPR (dB) (Note 2)	AG Index (Note 6)	E-TFCl
1	11/15 (Note 3)	15/15 (Note 3)	64	11/15 (Note 3)	22/15	209/225	1309/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed1} : 47/15 β_{ed2} : 47/15	4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15 (Note 4)	15/15 (Note 4)	64	15/15 (Note 4)	30/15	24/15	134/15	4	1	1.0	0.0	21	81
Note 1: Δ_{ACK} , Δ_{NACK} and $\Delta_{CQI} = 30/15$ with $\beta_{ts} = 30/15 * \beta_c$. Note 2: CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{HS}/\beta_c = 24/15$. For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference. Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 10/15$ and $\beta_d = 15/15$. Note 4: For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 14/15$ and $\beta_d = 15/15$. Note 5: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g. Note 6: β_{ed} can not be set directly, it is set by Absolute Grant Value.													

Setup Configuration

<WCDMA Conducted Power>

Band	WCDMA Band 2			WCDMA Band 5		
TX Channel	9262	9400	9538	4132	4183	4233
Frequency (MHz)	1852.4	1880.0	1907.6	826.4	836.6	846.6
RMC 12.2Kbps	21.59	21.44	21.89	21.93	21.85	22.02
HSDPA Subtest-1	19.89	20.18	20.15	21.22	21.35	20.73
HSDPA Subtest-2	19.46	19.72	19.68	20.74	20.51	20.20
HSDPA Subtest-3	19.47	19.73	19.71	20.73	20.50	20.27
HSDPA Subtest-4	19.46	19.71	19.67	20.69	20.49	20.23
HSUPA Subtest-1	18.46	18.76	18.82	19.21	19.39	19.08
HSUPA Subtest-2	19.01	19.26	19.26	19.75	19.86	19.60
HSUPA Subtest-3	19.49	19.76	20.00	20.21	20.41	20.08
HSUPA Subtest-4	18.48	18.77	18.76	19.18	19.38	19.13
HSUPA Subtest-5	20.42	20.72	20.78	21.14	21.34	21.04

General Note

1. Per KDB 941225 D01 v03r01, RMC 12.2kbps setting is used to evaluate SAR. If AMR 12.2kbps power is < 0.25dB higher than RMC 12.2kbps, SAR tests with AMR 12.2kbps can be excluded.
2. By design, AMR and HSDPA/HSUPA RF power will not be larger than RMC 12.2kbps, detailed information is included in Tune-up Procure exhibit.
3. It is expected by the manufacturer that MPR for some HSDPA/HSUPA subtests may differ from the specification of 3GPP, according to the chipset implementation in this model. The implementation and expected deviation are detailed in tune-up procedure exhibit.

<LTE Conducted Power>

Band	Bandwidth	Modulation	Channel	RB Configuration	Result(dBm)	Verdict
Band7	5MHz	QPSK	20775	1RB#0	23.47	PASS
Band7	5MHz	QPSK	20775	1RB#12	23.56	PASS
Band7	5MHz	QPSK	20775	1RB#24	23.46	PASS
Band7	5MHz	QPSK	20775	12RB#0	22.48	PASS
Band7	5MHz	QPSK	20775	12RB#6	22.47	PASS
Band7	5MHz	QPSK	20775	12RB#13	22.45	PASS
Band7	5MHz	QPSK	20775	25RB#0	22.53	PASS
Band7	5MHz	QPSK	21100	1RB#0	23.04	PASS
Band7	5MHz	QPSK	21100	1RB#12	23.03	PASS
Band7	5MHz	QPSK	21100	1RB#24	22.94	PASS
Band7	5MHz	QPSK	21100	12RB#0	21.99	PASS

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Band7	5MHz	QPSK	21100	12RB#6	22.01	PASS
Band7	5MHz	QPSK	21100	12RB#13	21.83	PASS
Band7	5MHz	QPSK	21100	25RB#0	21.97	PASS
Band7	5MHz	QPSK	21425	1RB#0	23.22	PASS
Band7	5MHz	QPSK	21425	1RB#12	23.33	PASS
Band7	5MHz	QPSK	21425	1RB#24	23.25	PASS
Band7	5MHz	QPSK	21425	12RB#0	22.24	PASS
Band7	5MHz	QPSK	21425	12RB#6	22.25	PASS
Band7	5MHz	QPSK	21425	12RB#13	22.19	PASS
Band7	5MHz	QPSK	21425	25RB#0	22.27	PASS
Band7	5MHz	16QAM	20775	1RB#0	22.60	PASS
Band7	5MHz	16QAM	20775	1RB#12	22.69	PASS
Band7	5MHz	16QAM	20775	1RB#24	22.60	PASS
Band7	5MHz	16QAM	20775	12RB#0	22.50	PASS
Band7	5MHz	16QAM	20775	12RB#6	22.48	PASS
Band7	5MHz	16QAM	20775	12RB#13	22.47	PASS
Band7	5MHz	16QAM	20775	25RB#0	21.48	PASS
Band7	5MHz	16QAM	21100	1RB#0	22.00	PASS
Band7	5MHz	16QAM	21100	1RB#12	21.99	PASS
Band7	5MHz	16QAM	21100	1RB#24	21.89	PASS
Band7	5MHz	16QAM	21100	12RB#0	22.02	PASS
Band7	5MHz	16QAM	21100	12RB#6	21.99	PASS
Band7	5MHz	16QAM	21100	12RB#13	21.84	PASS
Band7	5MHz	16QAM	21100	25RB#0	20.97	PASS
Band7	5MHz	16QAM	21425	1RB#0	22.16	PASS
Band7	5MHz	16QAM	21425	1RB#12	22.29	PASS
Band7	5MHz	16QAM	21425	1RB#24	22.10	PASS
Band7	5MHz	16QAM	21425	12RB#0	22.31	PASS
Band7	5MHz	16QAM	21425	12RB#6	22.24	PASS
Band7	5MHz	16QAM	21425	12RB#13	22.17	PASS
Band7	5MHz	16QAM	21425	25RB#0	21.23	PASS
Band7	10MHz	QPSK	20800	1RB#0	23.53	PASS
Band7	10MHz	QPSK	20800	1RB#24	23.68	PASS
Band7	10MHz	QPSK	20800	1RB#49	23.45	PASS
Band7	10MHz	QPSK	20800	25RB#0	22.62	PASS
Band7	10MHz	QPSK	20800	25RB#12	22.61	PASS
Band7	10MHz	QPSK	20800	25RB#25	22.60	PASS
Band7	10MHz	QPSK	20800	50RB#0	22.59	PASS
Band7	10MHz	QPSK	21100	1RB#0	23.14	PASS

Band7	10MHz	QPSK	21100	1RB#24	23.11	PASS
Band7	10MHz	QPSK	21100	1RB#49	22.89	PASS
Band7	10MHz	QPSK	21100	25RB#0	22.18	PASS
Band7	10MHz	QPSK	21100	25RB#12	22.18	PASS
Band7	10MHz	QPSK	21100	25RB#25	21.93	PASS
Band7	10MHz	QPSK	21100	50RB#0	22.05	PASS
Band7	10MHz	QPSK	21400	1RB#0	23.14	PASS
Band7	10MHz	QPSK	21400	1RB#24	23.38	PASS
Band7	10MHz	QPSK	21400	1RB#49	23.26	PASS
Band7	10MHz	QPSK	21400	25RB#0	22.43	PASS
Band7	10MHz	QPSK	21400	25RB#12	22.44	PASS
Band7	10MHz	QPSK	21400	25RB#25	22.26	PASS
Band7	10MHz	QPSK	21400	50RB#0	22.32	PASS
Band7	10MHz	16QAM	20800	1RB#0	22.64	PASS
Band7	10MHz	16QAM	20800	1RB#24	22.70	PASS
Band7	10MHz	16QAM	20800	1RB#49	22.53	PASS
Band7	10MHz	16QAM	20800	25RB#0	22.62	PASS
Band7	10MHz	16QAM	20800	25RB#12	22.61	PASS
Band7	10MHz	16QAM	20800	25RB#25	22.63	PASS
Band7	10MHz	16QAM	20800	50RB#0	21.58	PASS
Band7	10MHz	16QAM	21100	1RB#0	22.04	PASS
Band7	10MHz	16QAM	21100	1RB#24	21.97	PASS
Band7	10MHz	16QAM	21100	1RB#49	21.80	PASS
Band7	10MHz	16QAM	21100	25RB#0	22.17	PASS
Band7	10MHz	16QAM	21100	25RB#12	22.19	PASS
Band7	10MHz	16QAM	21100	25RB#25	21.95	PASS
Band7	10MHz	16QAM	21100	50RB#0	21.06	PASS
Band7	10MHz	16QAM	21400	1RB#0	22.29	PASS
Band7	10MHz	16QAM	21400	1RB#24	22.49	PASS
Band7	10MHz	16QAM	21400	1RB#49	22.32	PASS
Band7	10MHz	16QAM	21400	25RB#0	22.42	PASS
Band7	10MHz	16QAM	21400	25RB#12	22.43	PASS
Band7	10MHz	16QAM	21400	25RB#25	22.26	PASS
Band7	10MHz	16QAM	21400	50RB#0	21.28	PASS
Band7	15MHz	QPSK	20825	1RB#0	23.60	PASS
Band7	15MHz	QPSK	20825	1RB#38	23.69	PASS
Band7	15MHz	QPSK	20825	1RB#74	23.43	PASS
Band7	15MHz	QPSK	20825	38RB#0	22.84	PASS
Band7	15MHz	QPSK	20825	38RB#18	22.88	PASS

Band7	15MHz	QPSK	20825	38RB#37	22.71	PASS
Band7	15MHz	QPSK	20825	75RB#0	22.79	PASS
Band7	15MHz	QPSK	21100	1RB#0	23.35	PASS
Band7	15MHz	QPSK	21100	1RB#38	23.23	PASS
Band7	15MHz	QPSK	21100	1RB#74	22.99	PASS
Band7	15MHz	QPSK	21100	38RB#0	22.23	PASS
Band7	15MHz	QPSK	21100	38RB#18	22.08	PASS
Band7	15MHz	QPSK	21100	38RB#37	21.87	PASS
Band7	15MHz	QPSK	21100	75RB#0	22.29	PASS
Band7	15MHz	QPSK	21375	1RB#0	23.16	PASS
Band7	15MHz	QPSK	21375	1RB#38	23.38	PASS
Band7	15MHz	QPSK	21375	1RB#74	23.33	PASS
Band7	15MHz	QPSK	21375	38RB#0	22.31	PASS
Band7	15MHz	QPSK	21375	38RB#18	22.49	PASS
Band7	15MHz	QPSK	21375	38RB#37	22.43	PASS
Band7	15MHz	QPSK	21375	75RB#0	22.48	PASS
Band7	15MHz	16QAM	20825	1RB#0	22.87	PASS
Band7	15MHz	16QAM	20825	1RB#38	22.90	PASS
Band7	15MHz	16QAM	20825	1RB#74	22.71	PASS
Band7	15MHz	16QAM	20825	38RB#0	22.85	PASS
Band7	15MHz	16QAM	20825	38RB#18	22.91	PASS
Band7	15MHz	16QAM	20825	38RB#37	22.66	PASS
Band7	15MHz	16QAM	20825	75RB#0	21.74	PASS
Band7	15MHz	16QAM	21100	1RB#0	22.20	PASS
Band7	15MHz	16QAM	21100	1RB#38	22.09	PASS
Band7	15MHz	16QAM	21100	1RB#74	21.88	PASS
Band7	15MHz	16QAM	21100	38RB#0	22.21	PASS
Band7	15MHz	16QAM	21100	38RB#18	22.06	PASS
Band7	15MHz	16QAM	21100	38RB#37	21.90	PASS
Band7	15MHz	16QAM	21100	75RB#0	21.21	PASS
Band7	15MHz	16QAM	21375	1RB#0	22.30	PASS
Band7	15MHz	16QAM	21375	1RB#38	22.53	PASS
Band7	15MHz	16QAM	21375	1RB#74	22.43	PASS
Band7	15MHz	16QAM	21375	38RB#0	22.29	PASS
Band7	15MHz	16QAM	21375	38RB#18	22.53	PASS
Band7	15MHz	16QAM	21375	38RB#37	22.44	PASS
Band7	15MHz	16QAM	21375	75RB#0	21.33	PASS
Band7	20MHz	QPSK	20850	1RB#0	23.56	PASS
Band7	20MHz	QPSK	20850	1RB#49	23.27	PASS

Band7	20MHz	QPSK	20850	1RB#99	23.32	PASS
Band7	20MHz	QPSK	20850	50RB#0	22.66	PASS
Band7	20MHz	QPSK	20850	50RB#25	22.67	PASS
Band7	20MHz	QPSK	20850	50RB#50	22.72	PASS
Band7	20MHz	QPSK	20850	100RB#0	22.68	PASS
Band7	20MHz	QPSK	21100	1RB#0	23.14	PASS
Band7	20MHz	QPSK	21100	1RB#49	23.23	PASS
Band7	20MHz	QPSK	21100	1RB#99	22.78	PASS
Band7	20MHz	QPSK	21100	50RB#0	22.49	PASS
Band7	20MHz	QPSK	21100	50RB#25	22.47	PASS
Band7	20MHz	QPSK	21100	50RB#50	22.12	PASS
Band7	20MHz	QPSK	21100	100RB#0	22.36	PASS
Band7	20MHz	QPSK	21350	1RB#0	23.08	PASS
Band7	20MHz	QPSK	21350	1RB#49	23.51	PASS
Band7	20MHz	QPSK	21350	1RB#99	23.33	PASS
Band7	20MHz	QPSK	21350	50RB#0	22.31	PASS
Band7	20MHz	QPSK	21350	50RB#25	22.30	PASS
Band7	20MHz	QPSK	21350	50RB#50	22.22	PASS
Band7	20MHz	QPSK	21350	100RB#0	22.30	PASS
Band7	20MHz	16QAM	20850	1RB#0	22.61	PASS
Band7	20MHz	16QAM	20850	1RB#49	22.90	PASS
Band7	20MHz	16QAM	20850	1RB#99	22.37	PASS
Band7	20MHz	16QAM	20850	50RB#0	22.70	PASS
Band7	20MHz	16QAM	20850	50RB#25	22.69	PASS
Band7	20MHz	16QAM	20850	50RB#50	22.70	PASS
Band7	20MHz	16QAM	20850	100RB#0	21.64	PASS
Band7	20MHz	16QAM	21100	1RB#0	22.26	PASS
Band7	20MHz	16QAM	21100	1RB#49	22.31	PASS
Band7	20MHz	16QAM	21100	1RB#99	21.87	PASS
Band7	20MHz	16QAM	21100	50RB#0	22.51	PASS
Band7	20MHz	16QAM	21100	50RB#25	22.52	PASS
Band7	20MHz	16QAM	21100	50RB#50	22.15	PASS
Band7	20MHz	16QAM	21100	100RB#0	21.32	PASS
Band7	20MHz	16QAM	21350	1RB#0	22.08	PASS
Band7	20MHz	16QAM	21350	1RB#49	22.59	PASS
Band7	20MHz	16QAM	21350	1RB#99	22.24	PASS
Band7	20MHz	16QAM	21350	50RB#0	22.27	PASS
Band7	20MHz	16QAM	21350	50RB#25	22.34	PASS
Band7	20MHz	16QAM	21350	50RB#50	22.25	PASS

Band7	20MHz	16QAM	21350	100RB#0	21.24	PASS
Band38	5MHz	QPSK	37775	1RB#0	23.40	PASS
Band38	5MHz	QPSK	37775	1RB#12	23.53	PASS
Band38	5MHz	QPSK	37775	1RB#24	23.41	PASS
Band38	5MHz	QPSK	37775	12RB#0	22.45	PASS
Band38	5MHz	QPSK	37775	12RB#6	22.47	PASS
Band38	5MHz	QPSK	37775	12RB#13	22.43	PASS
Band38	5MHz	QPSK	37775	25RB#0	22.53	PASS
Band38	5MHz	QPSK	38000	1RB#0	23.20	PASS
Band38	5MHz	QPSK	38000	1RB#12	23.31	PASS
Band38	5MHz	QPSK	38000	1RB#24	23.17	PASS
Band38	5MHz	QPSK	38000	12RB#0	22.24	PASS
Band38	5MHz	QPSK	38000	12RB#6	22.22	PASS
Band38	5MHz	QPSK	38000	12RB#13	22.18	PASS
Band38	5MHz	QPSK	38000	25RB#0	22.21	PASS
Band38	5MHz	QPSK	38225	1RB#0	23.25	PASS
Band38	5MHz	QPSK	38225	1RB#12	23.37	PASS
Band38	5MHz	QPSK	38225	1RB#24	23.23	PASS
Band38	5MHz	QPSK	38225	12RB#0	22.29	PASS
Band38	5MHz	QPSK	38225	12RB#6	22.28	PASS
Band38	5MHz	QPSK	38225	12RB#13	22.23	PASS
Band38	5MHz	QPSK	38225	25RB#0	22.31	PASS
Band38	5MHz	16QAM	37775	1RB#0	22.59	PASS
Band38	5MHz	16QAM	37775	1RB#12	22.68	PASS
Band38	5MHz	16QAM	37775	1RB#24	22.63	PASS
Band38	5MHz	16QAM	37775	12RB#0	22.48	PASS
Band38	5MHz	16QAM	37775	12RB#6	22.48	PASS
Band38	5MHz	16QAM	37775	12RB#13	22.38	PASS
Band38	5MHz	16QAM	37775	25RB#0	21.48	PASS
Band38	5MHz	16QAM	38000	1RB#0	22.11	PASS
Band38	5MHz	16QAM	38000	1RB#12	22.23	PASS
Band38	5MHz	16QAM	38000	1RB#24	22.11	PASS
Band38	5MHz	16QAM	38000	12RB#0	22.23	PASS
Band38	5MHz	16QAM	38000	12RB#6	22.21	PASS
Band38	5MHz	16QAM	38000	12RB#13	22.20	PASS
Band38	5MHz	16QAM	38000	25RB#0	21.19	PASS
Band38	5MHz	16QAM	38225	1RB#0	22.34	PASS
Band38	5MHz	16QAM	38225	1RB#12	22.43	PASS
Band38	5MHz	16QAM	38225	1RB#24	22.32	PASS

Band38	5MHz	16QAM	38225	12RB#0	22.28	PASS
Band38	5MHz	16QAM	38225	12RB#6	22.29	PASS
Band38	5MHz	16QAM	38225	12RB#13	22.26	PASS
Band38	5MHz	16QAM	38225	25RB#0	21.28	PASS
Band38	10MHz	QPSK	37800	1RB#0	23.44	PASS
Band38	10MHz	QPSK	37800	1RB#24	23.60	PASS
Band38	10MHz	QPSK	37800	1RB#49	23.45	PASS
Band38	10MHz	QPSK	37800	25RB#0	22.52	PASS
Band38	10MHz	QPSK	37800	25RB#12	22.55	PASS
Band38	10MHz	QPSK	37800	25RB#25	22.64	PASS
Band38	10MHz	QPSK	37800	50RB#0	22.58	PASS
Band38	10MHz	QPSK	38000	1RB#0	23.20	PASS
Band38	10MHz	QPSK	38000	1RB#24	23.33	PASS
Band38	10MHz	QPSK	38000	1RB#49	23.25	PASS
Band38	10MHz	QPSK	38000	25RB#0	22.30	PASS
Band38	10MHz	QPSK	38000	25RB#12	22.29	PASS
Band38	10MHz	QPSK	38000	25RB#25	22.21	PASS
Band38	10MHz	QPSK	38000	50RB#0	22.23	PASS
Band38	10MHz	QPSK	38200	1RB#0	23.35	PASS
Band38	10MHz	QPSK	38200	1RB#24	23.49	PASS
Band38	10MHz	QPSK	38200	1RB#49	23.23	PASS
Band38	10MHz	QPSK	38200	25RB#0	22.35	PASS
Band38	10MHz	QPSK	38200	25RB#12	22.34	PASS
Band38	10MHz	QPSK	38200	25RB#25	22.27	PASS
Band38	10MHz	QPSK	38200	50RB#0	22.28	PASS
Band38	10MHz	16QAM	37800	1RB#0	22.58	PASS
Band38	10MHz	16QAM	37800	1RB#24	22.71	PASS
Band38	10MHz	16QAM	37800	1RB#49	22.63	PASS
Band38	10MHz	16QAM	37800	25RB#0	22.55	PASS
Band38	10MHz	16QAM	37800	25RB#12	22.56	PASS
Band38	10MHz	16QAM	37800	25RB#25	22.61	PASS
Band38	10MHz	16QAM	37800	50RB#0	21.60	PASS
Band38	10MHz	16QAM	38000	1RB#0	22.33	PASS
Band38	10MHz	16QAM	38000	1RB#24	22.39	PASS
Band38	10MHz	16QAM	38000	1RB#49	22.28	PASS
Band38	10MHz	16QAM	38000	25RB#0	22.26	PASS
Band38	10MHz	16QAM	38000	25RB#12	22.28	PASS
Band38	10MHz	16QAM	38000	25RB#25	22.19	PASS
Band38	10MHz	16QAM	38000	50RB#0	21.19	PASS

Band38	10MHz	16QAM	38200	1RB#0	22.27	PASS
Band38	10MHz	16QAM	38200	1RB#24	22.42	PASS
Band38	10MHz	16QAM	38200	1RB#49	22.15	PASS
Band38	10MHz	16QAM	38200	25RB#0	22.36	PASS
Band38	10MHz	16QAM	38200	25RB#12	22.35	PASS
Band38	10MHz	16QAM	38200	25RB#25	22.26	PASS
Band38	10MHz	16QAM	38200	50RB#0	21.28	PASS
Band38	15MHz	QPSK	37825	1RB#0	23.39	PASS
Band38	15MHz	QPSK	37825	1RB#38	23.50	PASS
Band38	15MHz	QPSK	37825	1RB#74	23.34	PASS
Band38	15MHz	QPSK	37825	38RB#0	22.59	PASS
Band38	15MHz	QPSK	37825	38RB#18	22.71	PASS
Band38	15MHz	QPSK	37825	38RB#37	22.58	PASS
Band38	15MHz	QPSK	37825	75RB#0	22.56	PASS
Band38	15MHz	QPSK	38000	1RB#0	23.20	PASS
Band38	15MHz	QPSK	38000	1RB#38	23.18	PASS
Band38	15MHz	QPSK	38000	1RB#74	23.04	PASS
Band38	15MHz	QPSK	38000	38RB#0	22.33	PASS
Band38	15MHz	QPSK	38000	38RB#18	22.27	PASS
Band38	15MHz	QPSK	38000	38RB#37	22.05	PASS
Band38	15MHz	QPSK	38000	75RB#0	22.30	PASS
Band38	15MHz	QPSK	38175	1RB#0	23.12	PASS
Band38	15MHz	QPSK	38175	1RB#38	23.20	PASS
Band38	15MHz	QPSK	38175	1RB#74	23.06	PASS
Band38	15MHz	QPSK	38175	38RB#0	22.13	PASS
Band38	15MHz	QPSK	38175	38RB#18	22.22	PASS
Band38	15MHz	QPSK	38175	38RB#37	22.09	PASS
Band38	15MHz	QPSK	38175	75RB#0	22.29	PASS
Band38	15MHz	16QAM	37825	1RB#0	22.64	PASS
Band38	15MHz	16QAM	37825	1RB#38	22.72	PASS
Band38	15MHz	16QAM	37825	1RB#74	22.59	PASS
Band38	15MHz	16QAM	37825	38RB#0	22.56	PASS
Band38	15MHz	16QAM	37825	38RB#18	22.74	PASS
Band38	15MHz	16QAM	37825	38RB#37	22.59	PASS
Band38	15MHz	16QAM	37825	75RB#0	21.55	PASS
Band38	15MHz	16QAM	38000	1RB#0	22.32	PASS
Band38	15MHz	16QAM	38000	1RB#38	22.27	PASS
Band38	15MHz	16QAM	38000	1RB#74	22.07	PASS
Band38	15MHz	16QAM	38000	38RB#0	22.28	PASS

Band38	15MHz	16QAM	38000	38RB#18	22.26	PASS
Band38	15MHz	16QAM	38000	38RB#37	22.06	PASS
Band38	15MHz	16QAM	38000	75RB#0	21.13	PASS
Band38	15MHz	16QAM	38175	1RB#0	22.16	PASS
Band38	15MHz	16QAM	38175	1RB#38	22.24	PASS
Band38	15MHz	16QAM	38175	1RB#74	22.09	PASS
Band38	15MHz	16QAM	38175	38RB#0	22.12	PASS
Band38	15MHz	16QAM	38175	38RB#18	22.22	PASS
Band38	15MHz	16QAM	38175	38RB#37	22.13	PASS
Band38	15MHz	16QAM	38175	75RB#0	21.11	PASS
Band38	20MHz	QPSK	37850	1RB#0	23.29	PASS
Band38	20MHz	QPSK	37850	1RB#49	23.10	PASS
Band38	20MHz	QPSK	37850	1RB#99	23.21	PASS
Band38	20MHz	QPSK	37850	50RB#0	22.46	PASS
Band38	20MHz	QPSK	37850	50RB#25	22.45	PASS
Band38	20MHz	QPSK	37850	50RB#50	22.55	PASS
Band38	20MHz	QPSK	37850	100RB#0	22.49	PASS
Band38	20MHz	QPSK	38000	1RB#0	23.19	PASS
Band38	20MHz	QPSK	38000	1RB#49	23.45	PASS
Band38	20MHz	QPSK	38000	1RB#99	22.95	PASS
Band38	20MHz	QPSK	38000	50RB#0	22.30	PASS
Band38	20MHz	QPSK	38000	50RB#25	22.29	PASS
Band38	20MHz	QPSK	38000	50RB#50	22.07	PASS
Band38	20MHz	QPSK	38000	100RB#0	22.13	PASS
Band38	20MHz	QPSK	38150	1RB#0	23.00	PASS
Band38	20MHz	QPSK	38150	1RB#49	23.45	PASS
Band38	20MHz	QPSK	38150	1RB#99	22.92	PASS
Band38	20MHz	QPSK	38150	50RB#0	22.18	PASS
Band38	20MHz	QPSK	38150	50RB#25	22.20	PASS
Band38	20MHz	QPSK	38150	50RB#50	21.98	PASS
Band38	20MHz	QPSK	38150	100RB#0	22.15	PASS
Band38	20MHz	16QAM	37850	1RB#0	22.24	PASS
Band38	20MHz	16QAM	37850	1RB#49	22.64	PASS
Band38	20MHz	16QAM	37850	1RB#99	22.15	PASS
Band38	20MHz	16QAM	37850	50RB#0	22.44	PASS
Band38	20MHz	16QAM	37850	50RB#25	22.41	PASS
Band38	20MHz	16QAM	37850	50RB#50	22.53	PASS
Band38	20MHz	16QAM	37850	100RB#0	21.44	PASS
Band38	20MHz	16QAM	38000	1RB#0	22.22	PASS

Band38	20MHz	16QAM	38000	1RB#49	22.33	PASS
Band38	20MHz	16QAM	38000	1RB#99	21.80	PASS
Band38	20MHz	16QAM	38000	50RB#0	22.33	PASS
Band38	20MHz	16QAM	38000	50RB#25	22.31	PASS
Band38	20MHz	16QAM	38000	50RB#50	22.08	PASS
Band38	20MHz	16QAM	38000	100RB#0	21.08	PASS
Band38	20MHz	16QAM	38150	1RB#0	22.01	PASS
Band38	20MHz	16QAM	38150	1RB#49	22.28	PASS
Band38	20MHz	16QAM	38150	1RB#99	21.95	PASS
Band38	20MHz	16QAM	38150	50RB#0	22.20	PASS
Band38	20MHz	16QAM	38150	50RB#25	22.20	PASS
Band38	20MHz	16QAM	38150	50RB#50	22.04	PASS
Band38	20MHz	16QAM	38150	100RB#0	21.06	PASS
Band40	5MHz	QPSK	38675	1RB#0	22.46	PASS
Band40	5MHz	QPSK	38675	1RB#12	22.716	PASS
Band40	5MHz	QPSK	38675	1RB#24	22.39	PASS
Band40	5MHz	QPSK	38675	12RB#0	21.55	PASS
Band40	5MHz	QPSK	38675	12RB#6	21.52	PASS
Band40	5MHz	QPSK	38675	12RB#13	21.50	PASS
Band40	5MHz	QPSK	38675	25RB#0	21.56	PASS
Band40	5MHz	QPSK	39150	1RB#0	22.41	PASS
Band40	5MHz	QPSK	39150	1RB#12	22.51	PASS
Band40	5MHz	QPSK	39150	1RB#24	22.41	PASS
Band40	5MHz	QPSK	39150	12RB#0	21.44	PASS
Band40	5MHz	QPSK	39150	12RB#6	21.43	PASS
Band40	5MHz	QPSK	39150	12RB#13	21.46	PASS
Band40	5MHz	QPSK	39150	25RB#0	21.49	PASS
Band40	5MHz	QPSK	39625	1RB#0	22.14	PASS
Band40	5MHz	QPSK	39625	1RB#12	22.26	PASS
Band40	5MHz	QPSK	39625	1RB#24	22.13	PASS
Band40	5MHz	QPSK	39625	12RB#0	21.25	PASS
Band40	5MHz	QPSK	39625	12RB#6	21.22	PASS
Band40	5MHz	QPSK	39625	12RB#13	21.21	PASS
Band40	5MHz	QPSK	39625	25RB#0	21.26	PASS
Band40	5MHz	16QAM	38675	1RB#0	21.66	PASS
Band40	5MHz	16QAM	38675	1RB#12	21.80	PASS
Band40	5MHz	16QAM	38675	1RB#24	21.61	PASS
Band40	5MHz	16QAM	38675	12RB#0	21.53	PASS
Band40	5MHz	16QAM	38675	12RB#6	21.49	PASS

Band40	5MHz	16QAM	38675	12RB#13	21.45	PASS
Band40	5MHz	16QAM	38675	25RB#0	20.49	PASS
Band40	5MHz	16QAM	39150	1RB#0	21.48	PASS
Band40	5MHz	16QAM	39150	1RB#12	21.53	PASS
Band40	5MHz	16QAM	39150	1RB#24	21.44	PASS
Band40	5MHz	16QAM	39150	12RB#0	21.45	PASS
Band40	5MHz	16QAM	39150	12RB#6	21.42	PASS
Band40	5MHz	16QAM	39150	12RB#13	21.44	PASS
Band40	5MHz	16QAM	39150	25RB#0	20.49	PASS
Band40	5MHz	16QAM	39625	1RB#0	21.19	PASS
Band40	5MHz	16QAM	39625	1RB#12	21.30	PASS
Band40	5MHz	16QAM	39625	1RB#24	21.19	PASS
Band40	5MHz	16QAM	39625	12RB#0	21.25	PASS
Band40	5MHz	16QAM	39625	12RB#6	21.24	PASS
Band40	5MHz	16QAM	39625	12RB#13	21.22	PASS
Band40	5MHz	16QAM	39625	25RB#0	21.35	PASS
Band40	10MHz	QPSK	38700	1RB#0	22.54	PASS
Band40	10MHz	QPSK	38700	1RB#24	22.51	PASS
Band40	10MHz	QPSK	38700	1RB#49	22.49	PASS
Band40	10MHz	QPSK	38700	25RB#0	21.58	PASS
Band40	10MHz	QPSK	38700	25RB#12	21.58	PASS
Band40	10MHz	QPSK	38700	25RB#25	21.67	PASS
Band40	10MHz	QPSK	38700	50RB#0	21.58	PASS
Band40	10MHz	QPSK	39150	1RB#0	22.50	PASS
Band40	10MHz	QPSK	39150	1RB#24	22.56	PASS
Band40	10MHz	QPSK	39150	1RB#49	22.50	PASS
Band40	10MHz	QPSK	39150	25RB#0	21.59	PASS
Band40	10MHz	QPSK	39150	25RB#12	21.61	PASS
Band40	10MHz	QPSK	39150	25RB#25	21.63	PASS
Band40	10MHz	QPSK	39150	50RB#0	21.60	PASS
Band40	10MHz	QPSK	39600	1RB#0	22.27	PASS
Band40	10MHz	QPSK	39600	1RB#24	22.36	PASS
Band40	10MHz	QPSK	39600	1RB#49	22.27	PASS
Band40	10MHz	QPSK	39600	25RB#0	21.45	PASS
Band40	10MHz	QPSK	39600	25RB#12	21.47	PASS
Band40	10MHz	QPSK	39600	25RB#25	21.42	PASS
Band40	10MHz	QPSK	39600	50RB#0	21.40	PASS
Band40	10MHz	16QAM	38700	1RB#0	21.71	PASS
Band40	10MHz	16QAM	38700	1RB#24	21.77	PASS

Band40	10MHz	16QAM	38700	1RB#49	21.68	PASS
Band40	10MHz	16QAM	38700	25RB#0	21.56	PASS
Band40	10MHz	16QAM	38700	25RB#12	21.57	PASS
Band40	10MHz	16QAM	38700	25RB#25	21.63	PASS
Band40	10MHz	16QAM	38700	50RB#0	20.59	PASS
Band40	10MHz	16QAM	39150	1RB#0	21.44	PASS
Band40	10MHz	16QAM	39150	1RB#24	21.49	PASS
Band40	10MHz	16QAM	39150	1RB#49	21.46	PASS
Band40	10MHz	16QAM	39150	25RB#0	21.57	PASS
Band40	10MHz	16QAM	39150	25RB#12	21.60	PASS
Band40	10MHz	16QAM	39150	25RB#25	21.64	PASS
Band40	10MHz	16QAM	39150	50RB#0	20.59	PASS
Band40	10MHz	16QAM	39600	1RB#0	21.50	PASS
Band40	10MHz	16QAM	39600	1RB#24	21.56	PASS
Band40	10MHz	16QAM	39600	1RB#49	21.47	PASS
Band40	10MHz	16QAM	39600	25RB#0	21.46	PASS
Band40	10MHz	16QAM	39600	25RB#12	21.45	PASS
Band40	10MHz	16QAM	39600	25RB#25	21.38	PASS
Band40	10MHz	16QAM	39600	50RB#0	20.38	PASS
Band40	15MHz	QPSK	38725	1RB#0	22.52	PASS
Band40	15MHz	QPSK	38725	1RB#38	22.52	PASS
Band40	15MHz	QPSK	38725	1RB#74	22.36	PASS
Band40	15MHz	QPSK	38725	38RB#0	21.81	PASS
Band40	15MHz	QPSK	38725	38RB#18	21.85	PASS
Band40	15MHz	QPSK	38725	38RB#37	21.66	PASS
Band40	15MHz	QPSK	38725	75RB#0	21.71	PASS
Band40	15MHz	QPSK	39150	1RB#0	22.46	PASS
Band40	15MHz	QPSK	39150	1RB#38	22.52	PASS
Band40	15MHz	QPSK	39150	1RB#74	22.42	PASS
Band40	15MHz	QPSK	39150	38RB#0	21.39	PASS
Band40	15MHz	QPSK	39150	38RB#18	21.49	PASS
Band40	15MHz	QPSK	39150	38RB#37	21.34	PASS
Band40	15MHz	QPSK	39150	75RB#0	21.70	PASS
Band40	15MHz	QPSK	39575	1RB#0	22.23	PASS
Band40	15MHz	QPSK	39575	1RB#38	22.29	PASS
Band40	15MHz	QPSK	39575	1RB#74	22.15	PASS
Band40	15MHz	QPSK	39575	38RB#0	21.45	PASS
Band40	15MHz	QPSK	39575	38RB#18	21.56	PASS
Band40	15MHz	QPSK	39575	38RB#37	21.41	PASS

Band40	15MHz	QPSK	39575	75RB#0	21.49	PASS
Band40	15MHz	16QAM	38725	1RB#0	21.83	PASS
Band40	15MHz	16QAM	38725	1RB#38	21.86	PASS
Band40	15MHz	16QAM	38725	1RB#74	21.66	PASS
Band40	15MHz	16QAM	38725	38RB#0	21.81	PASS
Band40	15MHz	16QAM	38725	38RB#18	21.82	PASS
Band40	15MHz	16QAM	38725	38RB#37	21.68	PASS
Band40	15MHz	16QAM	38725	75RB#0	20.62	PASS
Band40	15MHz	16QAM	39150	1RB#0	21.35	PASS
Band40	15MHz	16QAM	39150	1RB#38	21.47	PASS
Band40	15MHz	16QAM	39150	1RB#74	21.34	PASS
Band40	15MHz	16QAM	39150	38RB#0	21.37	PASS
Band40	15MHz	16QAM	39150	38RB#18	21.43	PASS
Band40	15MHz	16QAM	39150	38RB#37	21.38	PASS
Band40	15MHz	16QAM	39150	75RB#0	20.62	PASS
Band40	15MHz	16QAM	39575	1RB#0	21.46	PASS
Band40	15MHz	16QAM	39575	1RB#38	21.54	PASS
Band40	15MHz	16QAM	39575	1RB#74	21.40	PASS
Band40	15MHz	16QAM	39575	38RB#0	21.44	PASS
Band40	15MHz	16QAM	39575	38RB#18	21.50	PASS
Band40	15MHz	16QAM	39575	38RB#37	21.40	PASS
Band40	15MHz	16QAM	39575	75RB#0	20.39	PASS
Band40	20MHz	QPSK	38750	1RB#0	22.45	PASS
Band40	20MHz	QPSK	38750	1RB#49	22.66	PASS
Band40	20MHz	QPSK	38750	1RB#99	22.26	PASS
Band40	20MHz	QPSK	38750	50RB#0	21.52	PASS
Band40	20MHz	QPSK	38750	50RB#25	21.55	PASS
Band40	20MHz	QPSK	38750	50RB#50	21.54	PASS
Band40	20MHz	QPSK	38750	100RB#0	21.54	PASS
Band40	20MHz	QPSK	39150	1RB#0	22.19	PASS
Band40	20MHz	QPSK	39150	1RB#49	22.52	PASS
Band40	20MHz	QPSK	39150	1RB#99	22.18	PASS
Band40	20MHz	QPSK	39150	50RB#0	21.59	PASS
Band40	20MHz	QPSK	39150	50RB#25	21.61	PASS
Band40	20MHz	QPSK	39150	50RB#50	21.61	PASS
Band40	20MHz	QPSK	39150	100RB#0	21.55	PASS
Band40	20MHz	QPSK	39550	1RB#0	22.21	PASS
Band40	20MHz	QPSK	39550	1RB#49	22.54	PASS
Band40	20MHz	QPSK	39550	1RB#99	22.14	PASS

Band40	20MHz	QPSK	39550	50RB#0	21.51	PASS
Band40	20MHz	QPSK	39550	50RB#25	21.51	PASS
Band40	20MHz	QPSK	39550	50RB#50	21.44	PASS
Band40	20MHz	QPSK	39550	100RB#0	21.44	PASS
Band40	20MHz	16QAM	38750	1RB#0	21.59	PASS
Band40	20MHz	16QAM	38750	1RB#49	21.88	PASS
Band40	20MHz	16QAM	38750	1RB#99	21.50	PASS
Band40	20MHz	16QAM	38750	50RB#0	21.56	PASS
Band40	20MHz	16QAM	38750	50RB#25	21.57	PASS
Band40	20MHz	16QAM	38750	50RB#50	21.54	PASS
Band40	20MHz	16QAM	38750	100RB#0	20.48	PASS
Band40	20MHz	16QAM	39150	1RB#0	21.34	PASS
Band40	20MHz	16QAM	39150	1RB#49	21.73	PASS
Band40	20MHz	16QAM	39150	1RB#99	21.32	PASS
Band40	20MHz	16QAM	39150	50RB#0	21.58	PASS
Band40	20MHz	16QAM	39150	50RB#25	21.60	PASS
Band40	20MHz	16QAM	39150	50RB#50	21.62	PASS
Band40	20MHz	16QAM	39150	100RB#0	20.56	PASS
Band40	20MHz	16QAM	39550	1RB#0	21.26	PASS
Band40	20MHz	16QAM	39550	1RB#49	21.58	PASS
Band40	20MHz	16QAM	39550	1RB#99	21.18	PASS
Band40	20MHz	16QAM	39550	50RB#0	21.50	PASS
Band40	20MHz	16QAM	39550	50RB#25	21.52	PASS
Band40	20MHz	16QAM	39550	50RB#50	21.42	PASS
Band40	20MHz	16QAM	39550	100RB#0	20.39	PASS
Band41	5MHz	QPSK	39675	1RB#0	24.74	PASS
Band41	5MHz	QPSK	39675	1RB#2	24.40	PASS
Band41	5MHz	QPSK	39675	1RB#5	24.58	PASS
Band41	5MHz	QPSK	39675	3RB#0	24.77	PASS
Band41	5MHz	QPSK	39675	3RB#1	24.84	PASS
Band41	5MHz	QPSK	39675	3RB#3	24.68	PASS
Band41	5MHz	QPSK	39675	6RB#0	23.57	PASS
Band41	5MHz	QPSK	40620	1RB#0	24.40	PASS
Band41	5MHz	QPSK	40620	1RB#2	24.55	PASS
Band41	5MHz	QPSK	40620	1RB#5	24.31	PASS
Band41	5MHz	QPSK	40620	3RB#0	24.29	PASS
Band41	5MHz	QPSK	40620	3RB#1	24.32	PASS
Band41	5MHz	QPSK	40620	3RB#3	24.37	PASS
Band41	5MHz	QPSK	40620	6RB#0	23.09	PASS

Band41	5MHz	QPSK	41565	1RB#0	24.58	PASS
Band41	5MHz	QPSK	41565	1RB#2	24.51	PASS
Band41	5MHz	QPSK	41565	1RB#5	24.51	PASS
Band41	5MHz	QPSK	41565	3RB#0	24.59	PASS
Band41	5MHz	QPSK	41565	3RB#1	24.62	PASS
Band41	5MHz	QPSK	41565	3RB#3	24.54	PASS
Band41	5MHz	QPSK	41565	6RB#0	23.45	PASS
Band41	5MHz	16QAM	39675	1RB#0	23.77	PASS
Band41	5MHz	16QAM	39675	1RB#2	24.15	PASS
Band41	5MHz	16QAM	39675	1RB#5	23.92	PASS
Band41	5MHz	16QAM	39675	3RB#0	23.79	PASS
Band41	5MHz	16QAM	39675	3RB#1	23.64	PASS
Band41	5MHz	16QAM	39675	3RB#3	23.67	PASS
Band41	5MHz	16QAM	39675	6RB#0	22.50	PASS
Band41	5MHz	16QAM	40620	1RB#0	22.79	PASS
Band41	5MHz	16QAM	40620	1RB#2	22.99	PASS
Band41	5MHz	16QAM	40620	1RB#5	22.90	PASS
Band41	5MHz	16QAM	40620	3RB#0	22.82	PASS
Band41	5MHz	16QAM	40620	3RB#1	22.86	PASS
Band41	5MHz	16QAM	40620	3RB#3	23.78	PASS
Band41	5MHz	16QAM	40620	6RB#0	22.49	PASS
Band41	5MHz	16QAM	41565	1RB#0	23.15	PASS
Band41	5MHz	16QAM	41565	1RB#2	23.61	PASS
Band41	5MHz	16QAM	41565	1RB#5	23.33	PASS
Band41	5MHz	16QAM	41565	3RB#0	23.68	PASS
Band41	5MHz	16QAM	41565	3RB#1	23.48	PASS
Band41	5MHz	16QAM	41565	3RB#3	23.70	PASS
Band41	5MHz	16QAM	41565	6RB#0	22.26	PASS
Band41	10MHz	QPSK	39700	1RB#0	24.61	PASS
Band41	10MHz	QPSK	39700	1RB#8	24.52	PASS
Band41	10MHz	QPSK	39700	1RB#14	24.46	PASS
Band41	10MHz	QPSK	39700	8RB#0	23.58	PASS
Band41	10MHz	QPSK	39700	8RB#4	23.59	PASS
Band41	10MHz	QPSK	39700	8RB#7	23.44	PASS
Band41	10MHz	QPSK	39700	15RB#0	23.54	PASS
Band41	10MHz	QPSK	40620	1RB#0	24.21	PASS
Band41	10MHz	QPSK	40620	1RB#8	24.40	PASS
Band41	10MHz	QPSK	40620	1RB#14	24.12	PASS
Band41	10MHz	QPSK	40620	8RB#0	23.15	PASS

Band41	10MHz	QPSK	40620	8RB#4	23.06	PASS
Band41	10MHz	QPSK	40620	8RB#7	23.10	PASS
Band41	10MHz	QPSK	40620	15RB#0	23.05	PASS
Band41	10MHz	QPSK	41540	1RB#0	24.51	PASS
Band41	10MHz	QPSK	41540	1RB#8	24.39	PASS
Band41	10MHz	QPSK	41540	1RB#14	24.47	PASS
Band41	10MHz	QPSK	41540	8RB#0	23.48	PASS
Band41	10MHz	QPSK	41540	8RB#4	23.47	PASS
Band41	10MHz	QPSK	41540	8RB#7	23.41	PASS
Band41	10MHz	QPSK	41540	15RB#0	23.36	PASS
Band41	10MHz	16QAM	39700	1RB#0	23.60	PASS
Band41	10MHz	16QAM	39700	1RB#8	23.89	PASS
Band41	10MHz	16QAM	39700	1RB#14	23.68	PASS
Band41	10MHz	16QAM	39700	8RB#0	22.47	PASS
Band41	10MHz	16QAM	39700	8RB#4	22.87	PASS
Band41	10MHz	16QAM	39700	8RB#7	22.67	PASS
Band41	10MHz	16QAM	39700	15RB#0	22.34	PASS
Band41	10MHz	16QAM	40620	1RB#0	23.53	PASS
Band41	10MHz	16QAM	40620	1RB#8	23.24	PASS
Band41	10MHz	16QAM	40620	1RB#14	23.14	PASS
Band41	10MHz	16QAM	40620	8RB#0	22.21	PASS
Band41	10MHz	16QAM	40620	8RB#4	22.21	PASS
Band41	10MHz	16QAM	40620	8RB#7	22.25	PASS
Band41	10MHz	16QAM	40620	15RB#0	22.21	PASS
Band41	10MHz	16QAM	41540	1RB#0	23.79	PASS
Band41	10MHz	16QAM	41540	1RB#8	23.79	PASS
Band41	10MHz	16QAM	41540	1RB#14	23.85	PASS
Band41	10MHz	16QAM	41540	8RB#0	22.34	PASS
Band41	10MHz	16QAM	41540	8RB#4	22.71	PASS
Band41	10MHz	16QAM	41540	8RB#7	22.70	PASS
Band41	10MHz	16QAM	41540	15RB#0	22.51	PASS
Band41	15MHz	QPSK	39725	1RB#0	24.52	PASS
Band41	15MHz	QPSK	39725	1RB#12	24.85	PASS
Band41	15MHz	QPSK	39725	1RB#24	24.24	PASS
Band41	15MHz	QPSK	39725	12RB#0	23.48	PASS
Band41	15MHz	QPSK	39725	12RB#6	23.47	PASS
Band41	15MHz	QPSK	39725	12RB#13	23.35	PASS
Band41	15MHz	QPSK	39725	25RB#0	23.51	PASS
Band41	15MHz	QPSK	40620	1RB#0	24.00	PASS

Band41	15MHz	QPSK	40620	1RB#12	23.99	PASS
Band41	15MHz	QPSK	40620	1RB#24	23.93	PASS
Band41	15MHz	QPSK	40620	12RB#0	23.02	PASS
Band41	15MHz	QPSK	40620	12RB#6	23.09	PASS
Band41	15MHz	QPSK	40620	12RB#13	23.14	PASS
Band41	15MHz	QPSK	40620	25RB#0	23.06	PASS
Band41	15MHz	QPSK	41515	1RB#0	24.34	PASS
Band41	15MHz	QPSK	41515	1RB#12	24.34	PASS
Band41	15MHz	QPSK	41515	1RB#24	24.44	PASS
Band41	15MHz	QPSK	41515	12RB#0	23.31	PASS
Band41	15MHz	QPSK	41515	12RB#6	23.32	PASS
Band41	15MHz	QPSK	41515	12RB#13	23.31	PASS
Band41	15MHz	QPSK	41515	25RB#0	23.35	PASS
Band41	15MHz	16QAM	39725	1RB#0	23.29	PASS
Band41	15MHz	16QAM	39725	1RB#12	23.46	PASS
Band41	15MHz	16QAM	39725	1RB#24	23.16	PASS
Band41	15MHz	16QAM	39725	12RB#0	22.54	PASS
Band41	15MHz	16QAM	39725	12RB#6	22.38	PASS
Band41	15MHz	16QAM	39725	12RB#13	22.32	PASS
Band41	15MHz	16QAM	39725	25RB#0	22.65	PASS
Band41	15MHz	16QAM	40620	1RB#0	22.55	PASS
Band41	15MHz	16QAM	40620	1RB#12	22.82	PASS
Band41	15MHz	16QAM	40620	1RB#24	22.71	PASS
Band41	15MHz	16QAM	40620	12RB#0	21.90	PASS
Band41	15MHz	16QAM	40620	12RB#6	21.94	PASS
Band41	15MHz	16QAM	40620	12RB#13	21.83	PASS
Band41	15MHz	16QAM	40620	25RB#0	21.90	PASS
Band41	15MHz	16QAM	41515	1RB#0	22.96	PASS
Band41	15MHz	16QAM	41515	1RB#12	23.50	PASS
Band41	15MHz	16QAM	41515	1RB#24	23.07	PASS
Band41	15MHz	16QAM	41515	12RB#0	22.28	PASS
Band41	15MHz	16QAM	41515	12RB#6	22.12	PASS
Band41	15MHz	16QAM	41515	12RB#13	22.29	PASS
Band41	15MHz	16QAM	41515	25RB#0	22.44	PASS
Band41	20MHz	QPSK	39750	1RB#0	24.55	PASS
Band41	20MHz	QPSK	39750	1RB#24	24.37	PASS
Band41	20MHz	QPSK	39750	1RB#49	24.42	PASS
Band41	20MHz	QPSK	39750	25RB#0	23.52	PASS
Band41	20MHz	QPSK	39750	25RB#12	23.4	PASS

Band41	20MHz	QPSK	39750	25RB#25	23.45	PASS
Band41	20MHz	QPSK	39750	50RB#0	23.39	PASS
Band41	20MHz	QPSK	40620	1RB#0	24.41	PASS
Band41	20MHz	QPSK	40620	1RB#24	24.48	PASS
Band41	20MHz	QPSK	40620	1RB#49	24.1	PASS
Band41	20MHz	QPSK	40620	25RB#0	23.08	PASS
Band41	20MHz	QPSK	40620	25RB#12	23.14	PASS
Band41	20MHz	QPSK	40620	25RB#25	23.03	PASS
Band41	20MHz	QPSK	40620	50RB#0	23.13	PASS
Band41	20MHz	QPSK	41490	1RB#0	24.36	PASS
Band41	20MHz	QPSK	41490	1RB#24	24.42	PASS
Band41	20MHz	QPSK	41490	1RB#49	24.52	PASS
Band41	20MHz	QPSK	41490	25RB#0	23.38	PASS
Band41	20MHz	QPSK	41490	25RB#12	23.38	PASS
Band41	20MHz	QPSK	41490	25RB#25	23.33	PASS
Band41	20MHz	QPSK	41490	50RB#0	23.28	PASS
Band41	20MHz	16QAM	39750	1RB#0	23.71	PASS
Band41	20MHz	16QAM	39750	1RB#24	23.93	PASS
Band41	20MHz	16QAM	39750	1RB#49	23.7	PASS
Band41	20MHz	16QAM	39750	25RB#0	22.48	PASS
Band41	20MHz	16QAM	39750	25RB#12	22.46	PASS
Band41	20MHz	16QAM	39750	25RB#25	22.39	PASS
Band41	20MHz	16QAM	39750	50RB#0	22.37	PASS
Band41	20MHz	16QAM	40620	1RB#0	22.75	PASS
Band41	20MHz	16QAM	40620	1RB#24	22.96	PASS
Band41	20MHz	16QAM	40620	1RB#49	22.75	PASS
Band41	20MHz	16QAM	40620	25RB#0	22.12	PASS
Band41	20MHz	16QAM	40620	25RB#12	22.21	PASS
Band41	20MHz	16QAM	40620	25RB#25	21.93	PASS
Band41	20MHz	16QAM	40620	50RB#0	22.02	PASS
Band41	20MHz	16QAM	41490	1RB#0	23.44	PASS
Band41	20MHz	16QAM	41490	1RB#24	23.97	PASS
Band41	20MHz	16QAM	41490	1RB#49	23.4	PASS
Band41	20MHz	16QAM	41490	25RB#0	22.26	PASS
Band41	20MHz	16QAM	41490	25RB#12	22.23	PASS
Band41	20MHz	16QAM	41490	25RB#25	22.27	PASS
Band41	20MHz	16QAM	41490	50RB#0	22.35	PASS

Mode	Channel	Frequency (MHz)	E.I.R.P. Power(dBm)	Test Rate Data
802.11b	1	2412	14.41	1 Mbps
	6	2437	13.99	1 Mbps
	11	2462	14.05	1 Mbps
802.11g	1	2412	12.13	6 Mbps
	6	2437	13.93	6 Mbps
	11	2462	14.11	6 Mbps
802.11n(20MHz)	1	2412	12.26	MCS0
	6	2437	12.04	MCS0
	11	2462	11.91	MCS0
802.11n(40MHz)	3	2422	10.15	MCS0
	6	2437	9.82	MCS0
	9	2452	9.89	MCS0

Note:

1. Per KDB 447498 D01 v06, the 1-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$ for 1-g SAR, where

$f(\text{GHz})$ is the RF channel transmit frequency in GHz

Power and distance are rounded to the nearest mW and mm before calculation

The result is rounded to one decimal place for comparison

Mode	Frequency (GHz)	Tune-up Power (dBm)	Max. Power (mW)	Test distance (mm)	Result	exclusion thresholds for 1-g SAR
802.11b	2.412	14.41	27.61	5	8.57	3.0
802.11g	2.462	14.11	25.76	5	8.08	3.0

2. Base on the result of note1, RF exposure evaluation of 802.11 b and g mode is required.

3. Per KDB 248227 D01 v02r02, choose the highest output power channel to test SAR and determine further SAR exclusion.

4. Per KDB 248227 D01 v02r02, In the 2.4 GHz band, separate SAR procedures are applied to DSSS and OFDM configurations to simplify DSSS test requirements. SAR is not required for the following 2.4 GHz OFDM conditions:

1) When KDB Publication 447498 SAR test exclusion applies to the OFDM configuration.

2) When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

5. According to chapter 12 of this report, the max report SAR of 802.11b mode is 0.351 W/Kg, and

$0.351\text{W/Kg} \times \frac{25.76}{27.61} = 0.327\text{W/Kg}$ which is smaller than 1.2W/Kg, so SAR evaluation of 802.11g mode is not required. And the same for 802.11n.

<WIFI 5GHz Conducted Power>

Mode	Channel	Frequency (MHz)	E.I.R.P. Power(dBm)	Test Rate Data
WIFI 5.1G	36	5180	9.79	MCS0
	40	5200	9.93	MCS0
	48	5240	10.19	MCS0
WIFI5.8G	149	5745	10.10	MCS0
	157	5785	11.32	MCS0
	165	5825	11.38	MCS0

Note:

1. Per KDB 447498 D01 v06, the 1-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$ for 1-g SAR, where

f(GHz) is the RF channel transmit frequency in GHz

Power and distance are rounded to the nearest mW and mm before calculation

The result is rounded to one decimal place for comparison

Mode	Frequency (GHz)	Tune-up Power (dBm)	Max. Power (mW)	Test distance (mm)	Result	exclusion thresholds for 1-g SAR
WIFI 5.1G	5.240	10.19	10.45	5	4.78	3.0
WIFI5.8G	5.825	11.38	13.74	5	6.63	3.0

2. Base on the result of note1, RF exposure evaluation of WIFI 5.1G and 5.8G mode are required.

3. Per KDB 248227 D01 v02r02, choose the highest output power channel to test SAR and determine further SAR exclusion.

4. For devices that operate in both U-NII bands using the same transmitter and antenna(s), SAR test reduction is determined according to the following, with respect to the highest reported SAR and maximum output power specified for production units. The procedures are applied independently to each exposure configuration; for example, head, body, hotspot mode etc.

When different maximum output power is specified for the bands, begin SAR measurement in the band with higher specified maximum output power. The highest reported SAR for the tested configuration is adjusted by the ratio of lower to higher specified maximum output power for the two bands. When the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for the band with lower maximum output power in that test configuration; otherwise, each band is tested independently for SAR.

5. According to chapter 12 of this report, the max report SAR of WIFI 5.8G mode is 0.345 W/Kg, and

$0.345\text{W/Kg} \times \frac{10.45}{13.74} = 0.262\text{W/Kg}$ which is smaller than 1.2W/Kg, so SAR evaluation of WIFI 5.1G mode is not required.

<Bluetooth Conducted Power>

Mode	Channel	Frequency (MHz)	Conducted Average Power (dBm)
GFSK	00	2402	5.192
	39	2441	6.178
	78	2480	5.572
π/4DQPSK	00	2402	4.935
	39	2441	5.742
	78	2480	5.215
8DPSK	00	2402	5.432
	39	2441	5.854
	78	2480	4.795

Note:

Per KDB 447498 D01 v06, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

$$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}]$$

≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR

f(GHz) is the RF channel transmit frequency in GHz

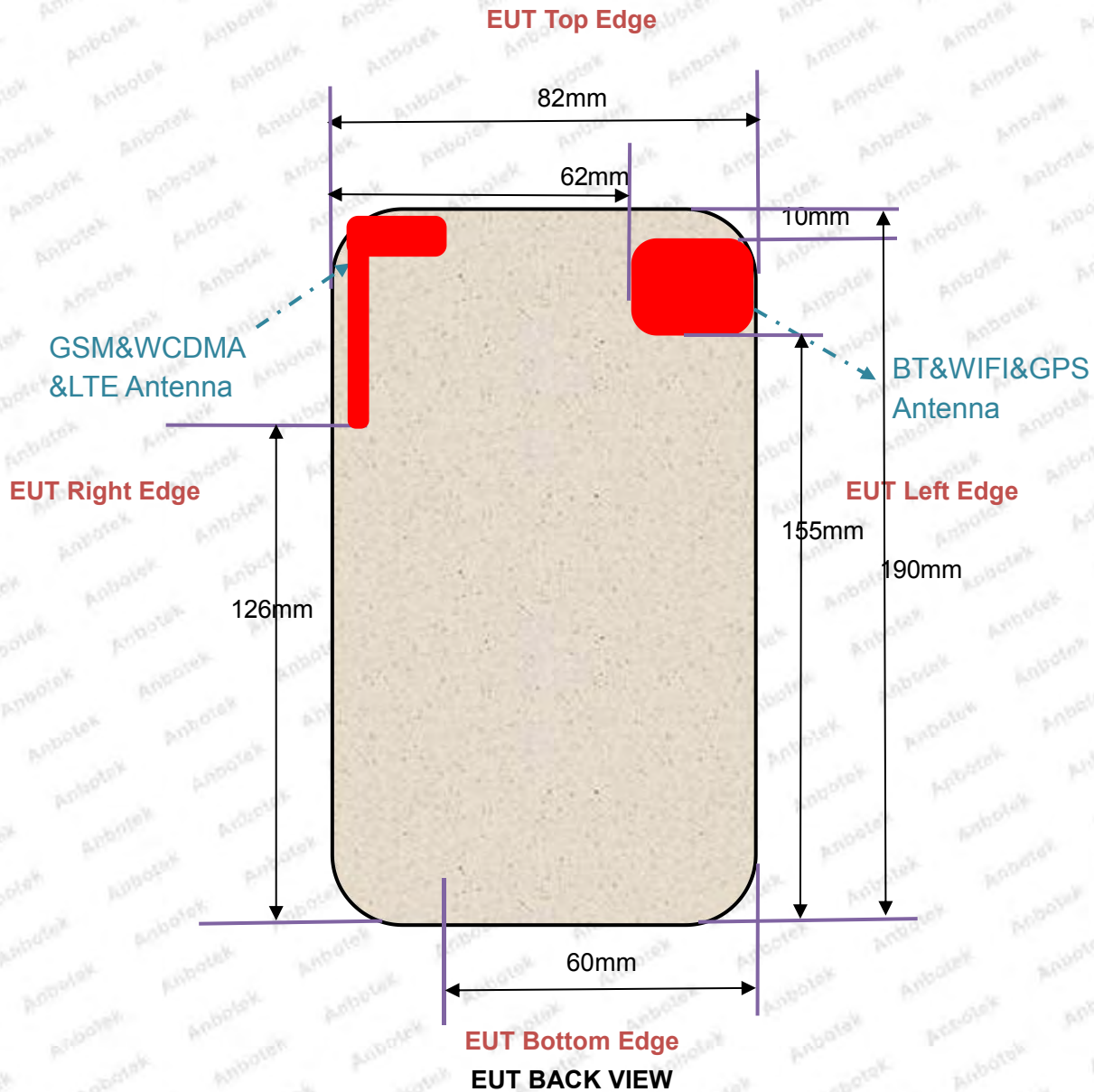
Power and distance are rounded to the nearest mW and mm before calculation

The result is rounded to one decimal place for comparison

Bluetooth Max Power (dBm)	Separation Distance (mm)	Frequency (GHz)	exclusion thresholds
6.178	0	2.441	1.296

Per KDB 447498 D01 v06, when the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion. The test exclusion threshold is 1.296 which is ≤ 3, SAR testing is not required.

11. Antenna Location



Distance of The Antenna to the EUT surface and edge

Antennas	Front	Back	Top Side	Bottom Side	Left Side	Right Side
BT&WIF&GPSI	/	/	10mm	155mm	0mm	62mm
GSM&WCMDA <E	/	/	0mm	126mm	60mm	0mm

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12. SAR Test Results Summary

General Note:

- Per IEEE 1528:2013, Section 6.3.3: SAR scaling is the extrapolation of the SAR of a DUT determined with a test signal (modX) to a SAR of the same device with a different signal (modY). The difference can be in the power level, modulation, or both. The time-averaged RF output power ratio of modX and modY shall be determined either by measuring the average power for both or by numerical integration of the power envelope if the signals are sufficiently well known. SAR scaling is possible if:

The time-averaged RF output power ratio (R_p) of modX and modY after the RF amplifier stage is known according to Equation (13):

$$R_p = \frac{P_{\max, \text{modY}}}{P_{\text{modX}}}$$

where $P_{\max, \text{modY}}$ corresponds to the highest time-averaged output power setting. If the two signals differ in modulation, then the test signal will be set at maximum time-averaged output power: $P_{\text{modX}} = P_{\max, \text{modX}}$.

If the previously mentioned requirements are fulfilled a scaling of the SAR from modX to modY shall be performed according to the Equation (15) and E.6.5: $SAR_{\text{modY}} = R_p \cdot SAR_{\text{modX}}$.

- Per KDB 447498 D01v06, for each exposure position, if the highest output channel reported $SAR \leq 0.8 \text{ W/kg}$, other channels SAR testing are not necessary

12.1. Body SAR Results

<GSM>

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR _{1g} (W/kg)	Reported SAR _{1g} (W/kg)
	GSM850	GPRS(3 Tx slots)	Front	0.5	251	848.6	29.52	30.00	1.12	0.03	0.251	0.280
#1	GSM850	GPRS(3 Tx slots)	Back	0.5	251	848.6	29.52	30.00	1.12	0.08	0.339	0.379
	GSM850	GPRS(3 Tx slots)	Left Side	0.5	251	848.6	29.52	30.00	N/A	N/A	N/A	N/A
	GSM850	GPRS(3 Tx slots)	Right Side	0.5	251	848.6	29.52	30.00	1.12	-0.06	0.233	0.261
	GSM850	GPRS(3 Tx slots)	Top Side	0.5	251	848.6	29.52	30.00	1.12	0.12	0.164	0.184
	GSM850	GPRS(3 Tx slots)	Bottom Side	0.5	251	848.6	29.52	30.00	N/A	N/A	N/A	N/A

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	PCS1900	GPRS(3 Tx slots)	Front	0.5	661	1880.0	27.24	28.00	1.19	0.09	0.135	0.161
#2	PCS1900	GPRS(3 Tx slots)	Back	0.5	661	1880.0	27.24	28.00	1.19	0.03	0.177	0.211
	PCS1900	GPRS(3 Tx slots)	Left Side	0.5	661	1880.0	27.24	28.00	N/A	N/A	N/A	N/A
	PCS1900	GPRS(3 Tx slots)	Right Side	0.5	661	1880.0	27.24	28.00	1.19	-0.05	0.112	0.133
	PCS1900	GPRS(3 Tx slots)	Top Side	0.5	661	1880.0	27.24	28.00	1.19	-0.11	0.104	0.124
	PCS1900	GPRS(3 Tx slots)	Bottom Side	0.5	661	1880.0	27.24	28.00	N/A	N/A	N/A	N/A

<WCDMA>

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR _{1g} (W/kg)	Reported SAR _{1g} (W/kg)
	WCDMA Band 2	RMC 12.2K	Front	0.5	9538	1907.6	21.89	22.00	1.03	0.03	0.372	0.382
#3	WCDMA Band 2	RMC 12.2K	Back	0.5	9538	1907.6	21.89	22.00	1.03	-0.07	0.545	0.559
	WCDMA Band 2	RMC 12.2K	Left Side	0.5	9538	1907.6	21.89	22.00	N/A	N/A	N/A	N/A
	WCDMA Band 2	RMC 12.2K	Right Side	0.5	9538	1907.6	21.89	22.00	1.03	0.13	0.466	0.478
	WCDMA Band 2	RMC 12.2K	Top Side	0.5	9538	1907.6	21.89	22.00	1.03	0.08	0.364	0.373
	WCDMA Band 2	RMC 12.2K	Bottom Side	0.5	9538	1907.6	21.89	22.00	N/A	N/A	N/A	N/A
	WCDMA Band 5	RMC 12.2K	Front	0.5	4233	846.6	22.02	23.00	1.25	0.06	0.518	0.649
	WCDMA Band 5	RMC 12.2K	Back	0.5	4132	826.4	21.93	23.00	1.28	-0.03	0.613	0.784
	WCDMA Band 5	RMC 12.2K	Back	0.5	4183	836.6	21.85	23.00	1.30	0.05	0.622	0.811
#4	WCDMA Band 5	RMC 12.2K	Back	0.5	4233	846.6	22.02	23.00	1.25	0.04	0.657	0.823
	WCDMA	RMC 12.2K	Left Side	0.5	4233	846.6	22.02	23.00	N/A	N/A	N/A	N/A

	Band 5											
	WCDMA Band 5	RMC 12.2K	Right Side	0.5	4233	846.6	22.02	23.00	1.25	-0.05	0.487	0.497
	WCDMA Band 5	RMC 12.2K	Top Side	0.5	4233	846.6	22.02	23.00	1.25	-0.02	0.436	0.445
	WCDMA Band 5	RMC 12.2K	Bottom Side	0.5	4233	846.6	22.02	23.00	N/A	N/A	N/A	N/A

<LTE>

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR _{1g} (W/kg)	Reported SAR _{1g} (W/kg)
	LTE Band 7	20MHz/1RB	Front	0	20850	2510.0	23.56	25.00	1.39	-0.11	0.496	0.691
#5	LTE Band 7	20MHz/1RB	Back	0	20850	2510.0	23.56	25.00	1.39	-0.06	0.675	0.940
	LTE Band 7	20MHz/1RB	Back	0	21100	2535.0	23.27	25.00	1.49	0.07	0.628	0.935
	LTE Band 7	20MHz/1RB	Back	0	21350	2560.0	23.32	25.00	1.47	-0.03	0.634	0.933
	LTE Band 7	20MHz/1RB	Left Side	0	20850	2510.0	23.56	25.00	N/A	N/A	N/A	N/A
	LTE Band 7	20MHz/1RB	Right Side	0	20850	2510.0	23.56	25.00	1.39	0.09	0.453	0.631
	LTE Band 7	20MHz/1RB	Top Side	0	20850	2510.0	23.56	25.00	1.39	0.01	0.408	0.568
	LTE Band 7	20MHz/1RB	Bottom Side	0	20850	2510.0	23.56	25.00	N/A	N/A	N/A	N/A
	LTE Band 38	20MHz/1RB	Front	0	37850	2580.0	23.29	25.00	1.48	-0.06	0.433	0.642
#6	LTE Band 38	20MHz/1RB	Back	0	37850	2580.0	23.29	25.00	1.48	0.08	0.567	0.841
	LTE Band 38	20MHz/1RB	Back	0	38000	2595.0	23.10	25.00	1.55	-0.01	0.532	0.824
	LTE Band 38	20MHz/1RB	Back	0	38150	2610.0	23.21	25.00	1.51	0.06	0.516	0.779
	LTE Band 38	20MHz/1RB	Left Side	0	37850	2580.0	23.29	25.00	N/A	N/A	N/A	N/A
	LTE Band 38	20MHz/1RB	Right Side	0	37850	2580.0	23.29	25.00	1.48	0.03	0.389	0.577
	LTE Band 38	20MHz/1RB	Top Side	0	37850	2580.0	23.29	25.00	1.48	-0.09	0.356	0.528
	LTE Band 38	20MHz/1RB	Bottom Side	0	37850	2580.0	23.29	25.00	N/A	N/A	N/A	N/A
	LTE Band 40	20MHz/1RB	Front	0	38750	2310.0	22.66	23.00	1.08	0.05	0.411	0.444
#7	LTE Band 40	20MHz/1RB	Back	0	38750	2310.0	22.66	23.00	1.08	-0.11	0.588	0.636
	LTE Band 40	20MHz/1RB	Left Side	0	38750	2310.0	22.66	23.00	N/A	N/A	N/A	N/A
	LTE Band 40	20MHz/1RB	Right	0	38750	2310.0	22.66	23.00	1.08	0.06	0.352	0.381

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			Side									
	LTE Band 40	20MHz/1RB	Top Side	0	38750	2310.0	22.66	23.00	1.08	-0.03	0.314	0.340
	LTE Band 40	20MHz/1RB	Bottom Side	0	38750	2310.0	22.66	23.00	N/A	N/A	N/A	N/A
	LTE Band 41	20MHz/1RB	Front	0	41490	2680.0	24.55	25.00	1.11	-0.04	0.568	0.630
#8	LTE Band 41	20MHz/1RB	Back	0	41490	2680.0	24.55	25.00	1.11	0.01	0.623	0.691
	LTE Band 41	20MHz/1RB	Left Side	0	41490	2680.0	24.55	25.00	N/A	N/A	N/A	N/A
	LTE Band 41	20MHz/1RB	Right Side	0	41490	2680.0	24.55	25.00	1.11	0.05	0.486	0.539
	LTE Band 41	20MHz/1RB	Top Side	0	41490	2680.0	24.55	25.00	1.11	0.02	0.431	0.478
	LTE Band 41	20MHz/1RB	Bottom Side	0	41490	2680.0	24.55	25.00	N/A	N/A	N/A	N/A

<WIFI 2.4GHz>

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR _{1g} (W/kg)	Reported SAR _{1g} (W/kg)
	WIFI 2.4GHz	802.11b	Front	0	1	2412	14.41	14.50	1.02	0.02	0.286	0.292
#9	WIFI 2.4GHz	802.11b	Back	0	1	2412	14.41	14.50	1.02	0.05	0.344	0.351
	WIFI 2.4GHz	802.11b	Left Side	0	1	2412	14.41	14.50	1.02	-0.06	0.277	0.283
	WIFI 2.4GHz	802.11b	Right Side	0	1	2412	14.41	14.50	N/A	N/A	N/A	N/A
	WIFI 2.4GHz	802.11b	Top Side	0	1	2412	14.41	14.50	1.02	0.08	0.293	0.299
	WIFI 2.4GHz	802.11b	Bottom Side	0	1	2412	14.41	14.50	N/A	N/A	N/A	N/A

<WIFI 5GHz>

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR _{1g} (W/kg)	Reported SAR _{1g} (W/kg)
	WIFI 5.8GHz	802.11a	Front	5	165	5825	11.38	11.50	1.03	-0.03	0.254	0.261
#10	WIFI 5.8GHz	802.11a	Back	5	165	5825	11.38	11.50	1.03	0.04	0.336	0.345
	WIFI 5.8GHz	802.11a	Left Side	5	165	5825	11.38	11.50	1.03	0.07	0.241	0.248
	WIFI 5.8GHz	802.11a	Right Side	5	165	5825	11.38	11.50	N/A	N/A	N/A	N/A
	WIFI 5.8GHz	802.11a	Top Side	5	165	5825	11.38	11.50	1.03	-0.02	0.265	0.272
	WIFI 5.8GHz	802.11a	Bottom Side	5	165	5825	11.38	11.50	N/A	N/A	N/A	N/A

13. Simultaneous Transmission Analysis

13.1. Simultaneous TX SAR Considerations

No.	Applicable Simultaneous Transmission
1.	GSM+WIFI 2.4GHz
2.	WCDMA+WIFI2.4GHz
3.	LTE+WIFI2.4GHz
4.	GSM+WIFI 5.8GHz
5.	WCDMA+WIFI5.8GHz
6.	LTE+WIFI5.8GHz

Note:

1. WIFI 2.4GHz and Bluetooth share the same antenna, and can not transmit simultaneously.

13.2. Evaluation of Simultaneous SAR

<Body Exposure Conditions>

Simultaneous transmission SAR for WIFI2.4G and GSM

Test Position	WiFi SAR _{1-g} (W/Kg)	GSM 850 _{1-g} (W/Kg)	PCS 1900 _{1-g} (W/Kg)	MAX. Σ SAR _{1-g} (W/Kg)	SAR _{1-g} Limit (W/Kg)	Simut. Meas. Required
Front	0.292	0.280	0.161	0.572	1.6	N/A
Back	0.351	0.379	0.211	0.730	1.6	N/A
Left Side	0.283	N/A	N/A	N/A	1.6	N/A
Right Side	N/A	0.261	0.133	N/A	1.6	N/A
Top side	0.299	0.184	0.124	0.483	1.6	N/A
Bottom Side	N/A	N/A	N/A	N/A	1.6	N/A

Simultaneous transmission SAR for WIFI2.4G and WCDMA

Test Position	WiFi SAR _{1-g} (W/Kg)	WCDMA Band 2 1-g (W/Kg)	WCDMA Band 5 1-g (W/Kg)	MAX. ΣSAR _{1-g} (W/Kg)	SAR _{1-g} Limit (W/Kg)	Simut. Meas. Required
Front	0.292	0.382	0.649	0.941	1.6	N/A
Back	0.351	0.559	0.823	1.174	1.6	N/A
Left Side	0.283	N/A	N/A	N/A	1.6	N/A
Right Side	N/A	0.478	0.497	N/A	1.6	N/A
Top side	0.299	0.373	0.445	0.744	1.6	N/A
Bottom Side	N/A	N/A	N/A	N/A	1.6	N/A

Simultaneous transmission SAR for WIFI2.4G and LTE

Test Position	WiFi SAR _{1-g} (W/Kg)	LTE Band 7 1-g (W/Kg)	LTE Band 38 1-g (W/Kg)	LTE Band 40 1-g (W/Kg)	LTE Band 41 1-g (W/Kg)	MAX. ΣSAR _{1-g} (W/Kg)	SAR _{1-g} Limit (W/Kg)	Simut. Meas. Required
Front	0.292	0.691	0.642	0.444	0.630	0.983	1.6	N/A
Back	0.351	0.940	0.841	0.636	0.691	1.291	1.6	N/A
Left Side	0.283	N/A	N/A	N/A	N/A	N/A	1.6	N/A
Right Side	N/A	0.631	0.577	0.381	0.539	N/A	1.6	N/A
Top side	0.299	0.568	0.528	0.340	0.478	0.867	1.6	N/A
Bottom Side	N/A	N/A	N/A	N/A	N/A	N/A	1.6	N/A

Simultaneous transmission SAR for WIFI5.8G and GSM

Test Position	WiFi SAR _{1-g} (W/Kg)	GSM 850 _{1-g} (W/Kg)	PCS 1900 _{1-g} (W/Kg)	MAX. Σ SAR _{1-g} (W/Kg)	SAR _{1-g} Limit (W/Kg)	Simut. Meas. Required
Front	0.261	0.280	0.161	0.541	1.6	N/A
Back	0.345	0.379	0.211	0.724	1.6	N/A
Left Side	0.248	N/A	N/A	N/A	1.6	N/A
Right Side	N/A	0.261	0.133	N/A	1.6	N/A
Top side	0.272	0.184	0.124	0.456	1.6	N/A
Bottom Side	N/A	N/A	N/A	N/A	1.6	N/A

Simultaneous transmission SAR for WIFI5.8G and WCDMA

Test Position	WiFi SAR _{1-g} (W/Kg)	WCDMA Band 2 _{1-g} (W/Kg)	WCDMA Band 5 _{1-g} (W/Kg)	MAX. Σ SAR _{1-g} (W/Kg)	SAR _{1-g} Limit (W/Kg)	Simut. Meas. Required
Front	0.261	0.382	0.649	0.910	1.6	N/A
Back	0.345	0.559	0.823	1.168	1.6	N/A
Left Side	0.248	N/A	N/A	N/A	1.6	N/A
Right Side	N/A	0.478	0.497	N/A	1.6	N/A
Top side	0.272	0.373	0.445	0.717	1.6	N/A
Bottom Side	N/A	N/A	N/A	N/A	1.6	N/A

Simultaneous transmission SAR for WIFI5.8G and LTE

Test Position	WiFi SAR _{1-g} (W/Kg)	LTE Band 7 1-g (W/Kg)	LTE Band 38 1-g (W/Kg)	LTE Band 40 1-g (W/Kg)	LTE Band 41 1-g (W/Kg)	MAX. ΣSAR _{1-g} (W/Kg)	SAR _{1-g} Limit (W/Kg)	Simut. Meas. Required
Front	0.261	0.691	0.642	0.444	0.630	0.952	1.6	N/A
Back	0.345	0.940	0.841	0.636	0.691	1.285	1.6	N/A
Left Side	0.248	N/A	N/A	N/A	N/A	N/A	1.6	N/A
Right Side	N/A	0.631	0.577	0.381	0.539	N/A	1.6	N/A
Top side	0.272	0.568	0.528	0.340	0.478	0.840	1.6	N/A
Bottom Side	N/A	N/A	N/A	N/A	N/A	N/A	1.6	N/A

14. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is $< 1.5 \text{ W/Kg}$, the extensive SAR measurement uncertainty analysis described in IEC 62209-2:2010 is not required in SAR reports submitted for equipment approval.

Appendix A. EUT Photos and Test Setup Photos



Body Front(5mm)



Body Back(5mm)



Top (5mm)



Bottom (5mm)



Left(5mm)



Right(5mm)

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Appendix B. Plots of SAR System Check

Date: 06/06/2019

835MHz Body System Check

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d160

Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 835$ MHz; $\sigma = 1.07$ S/m; $\epsilon_r = 55.34$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 – SN7396; ConvF(9.88, 9.88, 9.88); Calibrated: 06.05.2019;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 6.9.2018
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

Configuration/Pin=250mW/Area Scan (7x7x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 2.97 W/kg

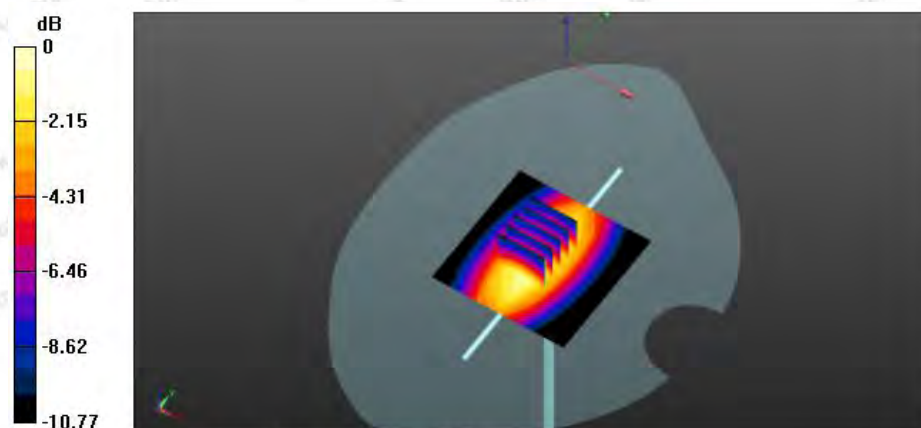
Configuration/Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 60.007 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 4.02 W/kg

SAR(1 g) = 2.53 W/kg; SAR(10 g) = 1.75 W/kg

Maximum value of SAR (measured) = 3.58 W/kg



Date: 06/10/2019

1900MHz Body System Check

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d179

Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.51$ S/m; $\epsilon_r = 53.26$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 – SN7396; ConvF(7.97, 7.97, 7.97); Calibrated: 06.05.2019;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 6.9.2018
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

Configuration/Pin=250mW/Area Scan (7x7x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 10.7 W/kg

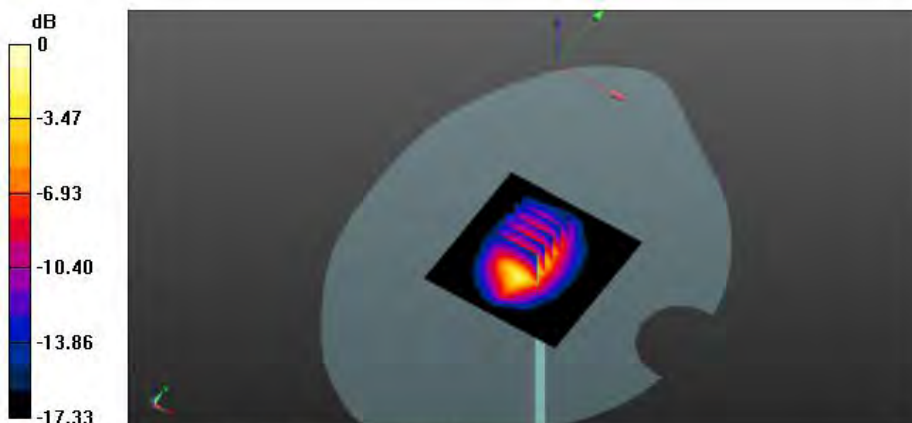
Configuration/Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 86.92 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 17.0 W/kg

SAR(1 g) = 9.26 W/kg; SAR(10 g) = 4.84 W/kg

Maximum value of SAR (measured) = 10.4 W/kg



0 dB = 14.7 W/kg = 11.67 dBW/kg

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Date: 06/12/2019

2600MHz Body System Check

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN:1067

Communication System: UID 0, CW (0); Frequency: 2600 MHz

Medium parameters used: $f = 2600$ MHz; $\sigma = 2.15$ S/m; $\epsilon_r = 54.37$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 – SN7396; ConvF(7.38, 7.38, 7.38); Calibrated: 06.05.2019;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 6.9.2018
- Phantom: SAM ; Type: QD000P40CD; Serial: TP: 1670
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Configuration/Pin=250mW/Area Scan (71x71x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) =23.2 W/kg

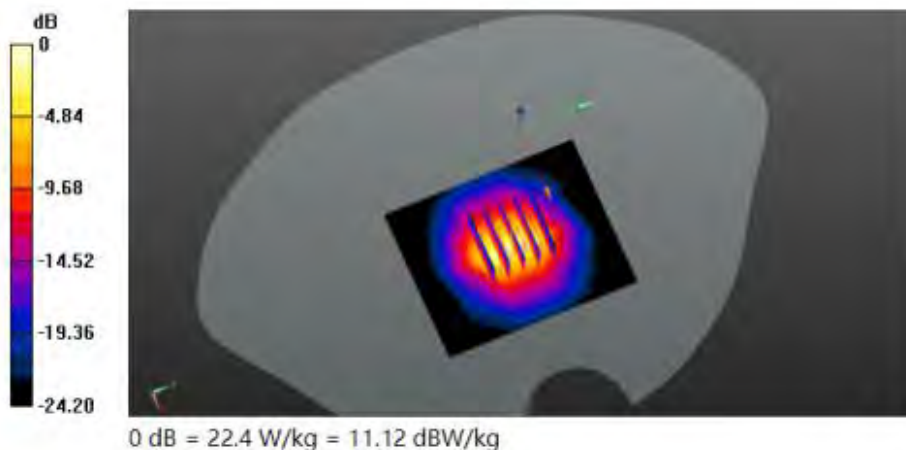
Configuration/Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 97.87 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 28.3 W/kg

SAR(1 g) = 13.72 W/kg; SAR(10 g) = 6.22 W/kg

Maximum value of SAR (measured) = 22.4 W/kg



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Date: 06/14/2019

2450MHz Body System Check

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:919

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.89$ S/m; $\epsilon_r = 51.97$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 – SN7396; ConvF(7.57, 7.57, 7.57); Calibrated: 06.05.2019;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 6.9.2018
- Phantom: SAM; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

Configuration/Pin=250mW/Area Scan (81x81x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 17.2 W/kg

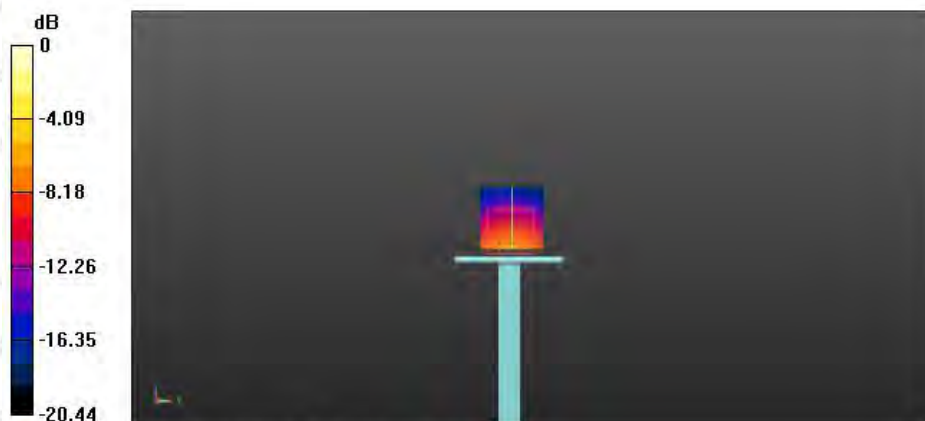
Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 82.205 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 24.5 W/kg

SAR(1 g) = 12.1 W/kg; SAR(10 g) = 5.68 W/kg

Maximum value of SAR (measured) = 18.3 W/kg



0 dB = 18.3 W/kg = 12.62 dBW/kg

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Date: 06/14/2019

5800MHz Body System Check

DUT: Dipole 5800 MHz; Type: D5GHzV2; Serial: D2450V2 - SN:1160

Communication System: UID 0, CW; Frequency: 5800 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5800$ MHz; $\sigma = 5.95$ S/m; $\epsilon_r = 48.53$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3819; ConvF(5.11, 5.11, 5.11); Calibrated: 06.05.2019;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 6.9.2018
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

Configuration/Pin=100mW/Area Scan (71x71x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 18.6 W/kg

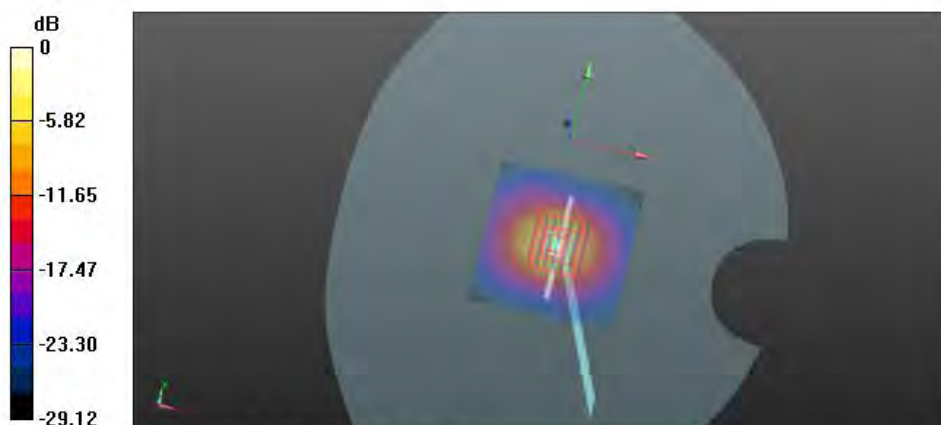
Configuration/Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 56.080 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 31.7 W/kg

SAR(1 g) = 7.85 W/kg; SAR(10 g) = 2.17 W/kg

Maximum value of SAR (measured) = 19.5 W/kg



0 dB = 18.6 W/kg = 12.70 dBW/kg

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Appendix C. Plots of SAR Test Data

#1

Date: 06/06/2019

GSM850_GPRS_3TX_Body Back_Ch251

Communication System: UID 0, GPRS(3 Tx slots) (0); Frequency: 848.6 MHz; Duty Cycle: 1:2.66686

Medium parameters used (interpolated): $f = 848.6$ MHz; $\sigma = 1.06$ S/m; $\epsilon_r = 55.32$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 – SN7396; ConvF(9.88, 9.88, 9.88); Calibrated: 06.05.2019;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 6.9.2018
- Phantom: SAM; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

BODY/3ST-BACK-H/Area Scan (8x14x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.382 W/kg

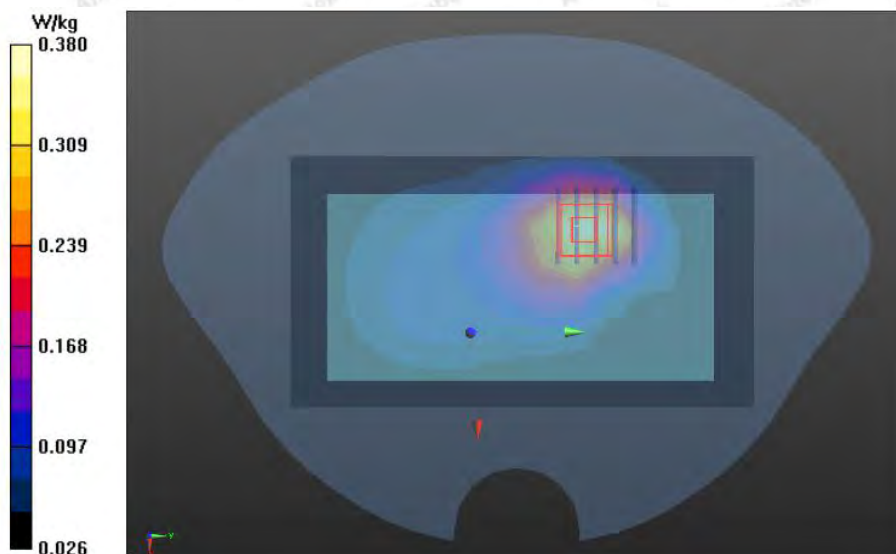
BODY/3ST-BACK-H/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 12.360 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 0.506 W/kg

SAR(1 g) = 0.339 W/kg; SAR(10 g) = 0.231 W/kg

Maximum value of SAR (measured) = 0.380 W/kg



PCS1900_GPRS_3TX_Body Back_Ch661

Communication System: UID 0, GPRS(3 Tx slots) (0); Frequency: 1880 MHz; Duty Cycle: 1:2.66686

Medium parameters used: $f = 1880 \text{ MHz}$; $\sigma = 1.51 \text{ S/m}$; $\epsilon_r = 53.26$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 – SN7396; ConvF(7.97, 7.97, 7.97); Calibrated: 06.05.2019;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 6.9.2018
- Phantom: SAM; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

BODY/3ST-BACK/Area Scan (8x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.181 W/kg

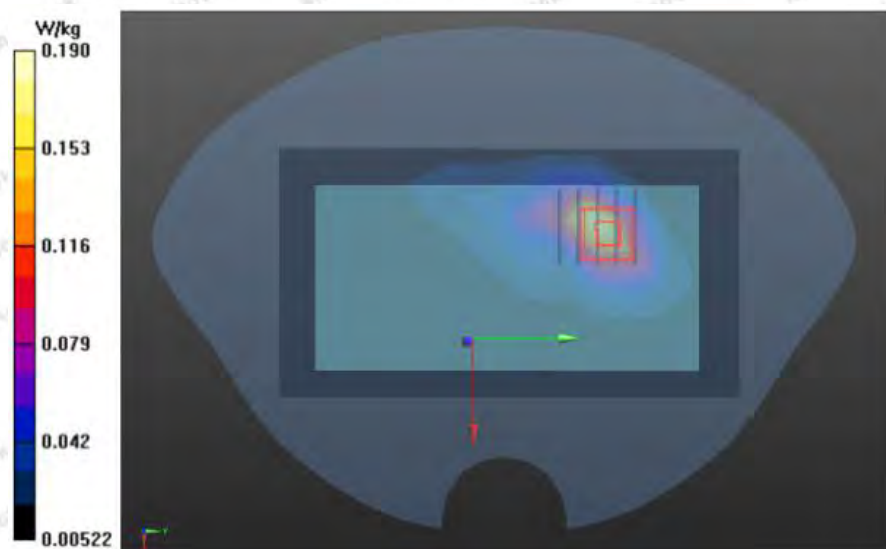
BODY/3ST-BACK/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 4.915 V/m ; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.282 W/kg

SAR(1 g) = 0.177 W/kg ; SAR(10 g) = 0.108 W/kg

Maximum value of SAR (measured) = 0.190 W/kg



WCDMA 1900_RMC 12.2K_Body Back_Ch9538

Communication System: UID 0, Generic WCDMA (0); Frequency: 1907.6 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1907.6$ MHz; $\sigma = 1.48$ S/m; $\epsilon_r = 54.12$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 – SN7396; ConvF(7.97, 7.97, 7.97); Calibrated: 06.05.2019;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 6.9.2018
- Phantom: SAM; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

BODY/BACK-H/Area Scan (8x14x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.931 W/kg

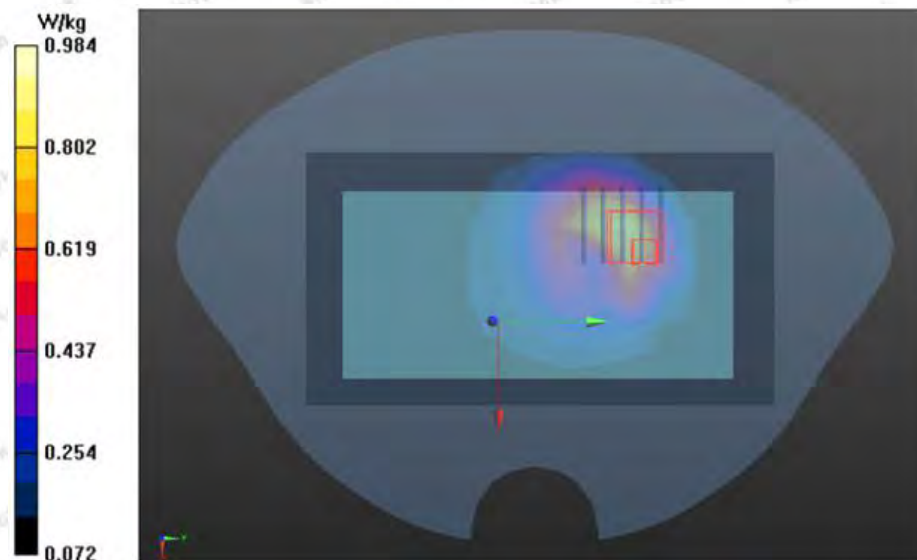
BODY/BACK-H/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 18.184 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 1.29 W/kg

SAR(1 g) = 0.545 W/kg; SAR(10 g) = 0.227 W/kg

Maximum value of SAR (measured) = 0.984 W/kg



WCDMA 850_RMC 12.2K_Body Back_Ch4233

Communication System: UID 0, Generic WCDMA (0); Frequency: 846.6 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 846.6$ MHz; $\sigma = 0.96$ S/m; $\epsilon_r = 55.858$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 – SN7396; ConvF(9.88, 9.88, 9.88); Calibrated: 06.05.2019;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 6.9.2018
- Phantom: SAM; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

BODY/BACK-H/Area Scan (8x14x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.895 W/kg

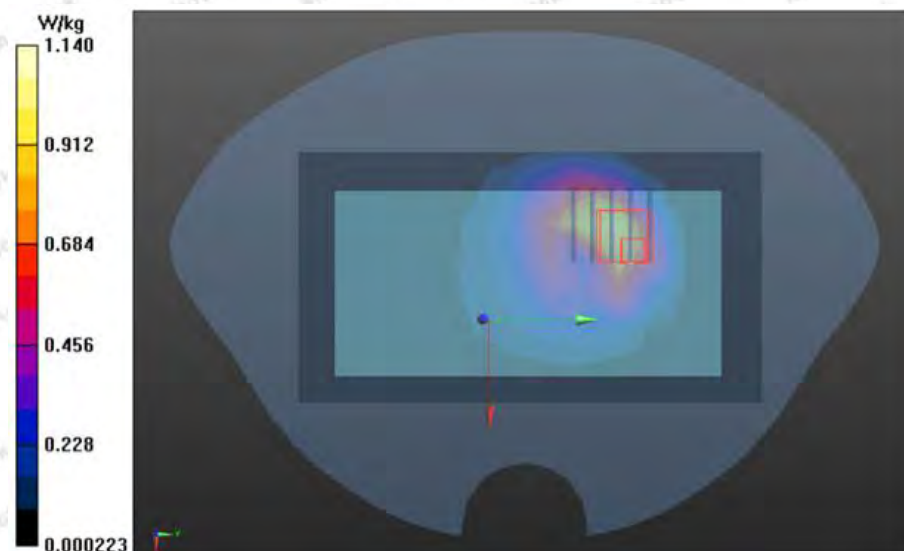
BODY/BACK-H/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 17.002 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 1.46 W/kg

SAR(1 g) = 0.657 W/kg; SAR(10 g) = 0.382 W/kg

Maximum value of SAR (measured) = 1.14 W/kg



#5

Date: 06/12/2019

LTE Band7_Body Back_Ch20850

Communication System: UID 0, Generic LTE (0); Frequency: 2510.0 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 2510.0$ MHz; $\sigma = 1.54$ S/m; $\epsilon_r = 52.84$; $\rho = 1000$

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 – SN7396; ConvF(7.38, 7.38, 7.38); Calibrated: 06.05.2019;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 6.9.2018
- Phantom: SAM; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

BODY/BACK-L/Area Scan (8x14x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.805 W/kg

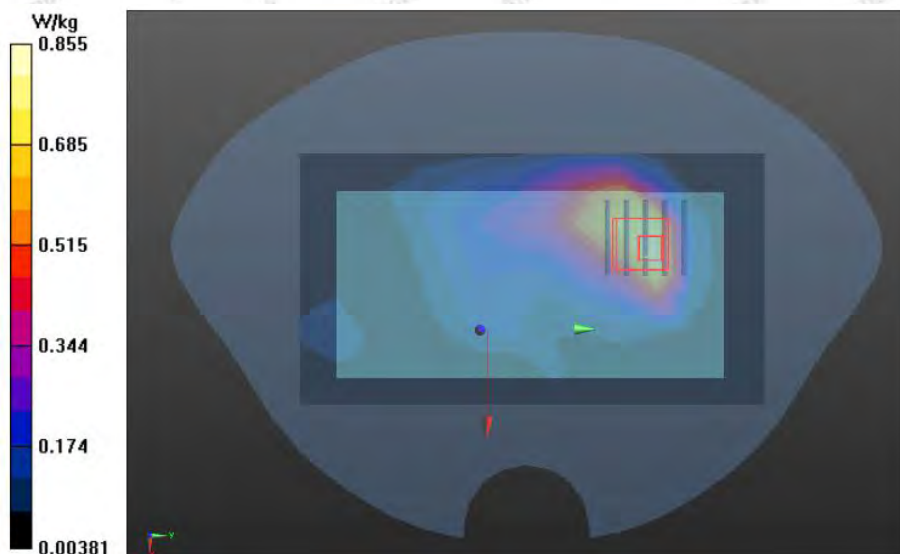
BODY/BACK-L/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 12.966 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 1.32 W/kg

SAR(1 g) = 0.675 W/kg; SAR(10 g) = 0.351 W/kg

Maximum value of SAR (measured) = 0.855 W/kg



#6

Date: 06/12/2019

LTE Band38_Body Back_Ch37850

Communication System: UID 0, Generic LTE (0); Frequency: 2580.0 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 2580.0$ MHz; $\sigma = 1.51$ S/m; $\epsilon_r = 53.17$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 – SN7396; ConvF(7.38, 7.38, 7.38); Calibrated: 06.05.2019;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 6.9.2018
- Phantom: SAM; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

BODY/BAKC-L/Area Scan (8x14x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.692 W/kg

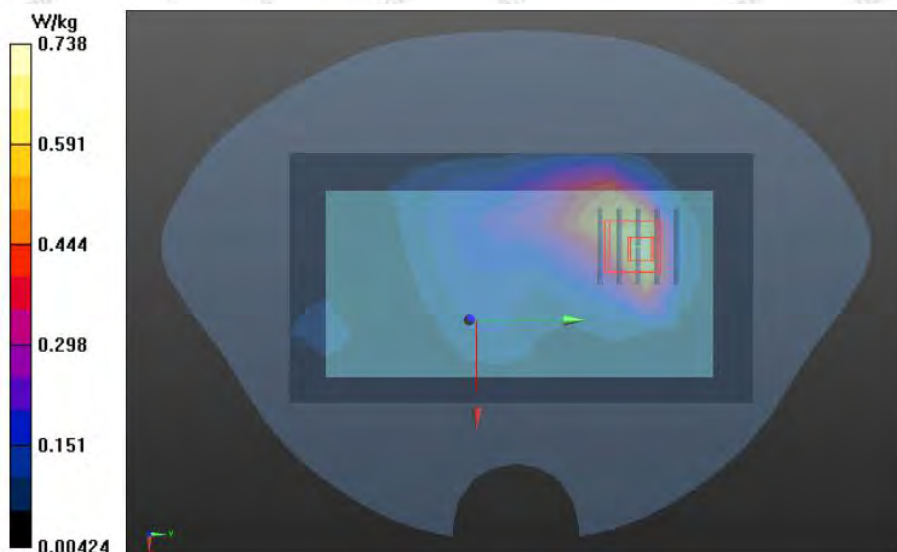
BODYBACK-L/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 9.529 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 1.11 W/kg

SAR(1 g) = 0.567 W/kg; SAR(10 g) = 0.292 W/kg

Maximum value of SAR (measured) = 0.738 W/kg



#7

Date: 06/14/2019

LTE Band 40_Body Back_Ch38750

Communication System: UID 0, CW (0); Frequency: 2310.0 MHz

Medium parameters used: $f = 2310.0$ MHz; $\sigma = 2.01$ S/m; $\epsilon_r = 50.35$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 – SN7396; ConvF(7.38, 7.38, 7.38); Calibrated: 06.05.2019;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 6.9.2018
- Phantom: SAM ; Type: QD000P40CD; Serial: TP: 1670
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

BODY/BACK-L/Area Scan (8x14x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.593 W/kg

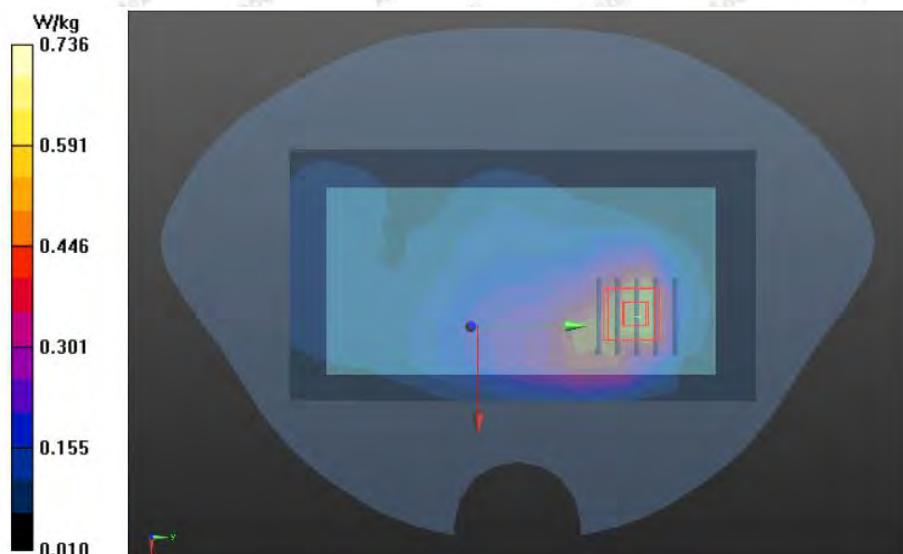
BODY/BACK-L/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 12.402 V/m; Power Drift = -0.11 dB

Peak SAR (extrapolated) = 1.07 W/kg

SAR(1 g) = 0.588 W/kg; SAR(10 g) = 0.320 W/kg

Maximum value of SAR (measured) = 0.736 W/kg



#8

Date: 06/12/2019

LTE Band 41_Body Back_Ch41490

Communication System: UID 0, CW (0); Frequency: 2680.0 MHz

Medium parameters used: $f = 2680.0$ MHz; $\sigma = 2.23$ S/m; $\epsilon_r = 50.63$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 – SN7396; ConvF(7.38, 7.38, 7.38); Calibrated: 06.05.2019;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn387; Calibrated: 6.9.2018
- Phantom: SAM ; Type: QD000P40CD; Serial: TP: 1670
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

BODY/BACK-H/Area Scan (8x14x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.704 W/kg

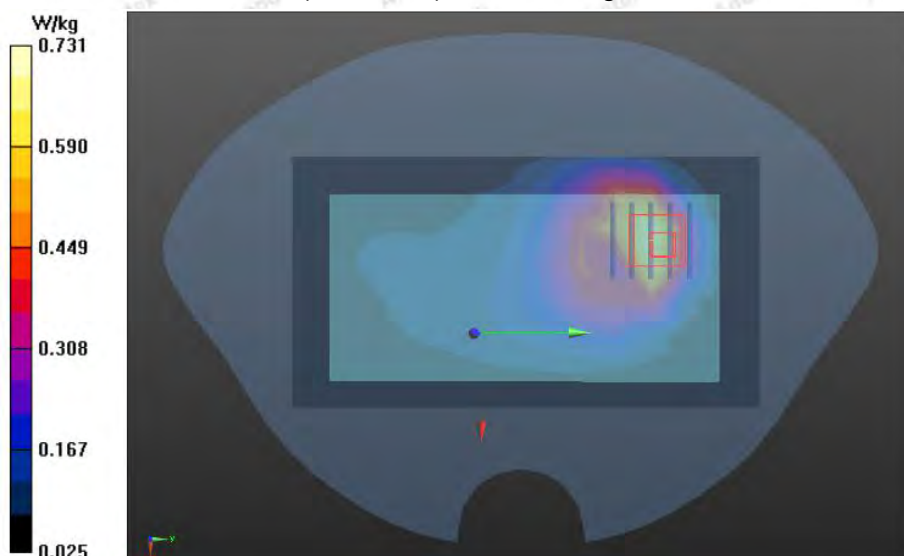
BODY/BACK-H/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 13.552 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 1.12 W/kg

SAR(1 g) = 0.623 W/kg; SAR(10 g) = 0.337 W/kg

Maximum value of SAR (measured) = 0.731 W/kg



WIFI 2.4G_Body Back_Ch1

Communication System: UID 0, wifi (fcc) (0); Frequency: 2412 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 2412$ MHz; $\sigma = 1.88$ S/m; $\epsilon_r = 52.01$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 – SN7396; ConvF(7.53, 7.53, 7.53); Calibrated: 06.05.2019;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 6.9.2018
- Phantom: SAM; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

BODY/BACK-L/Area Scan (8x14x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.294 W/kg

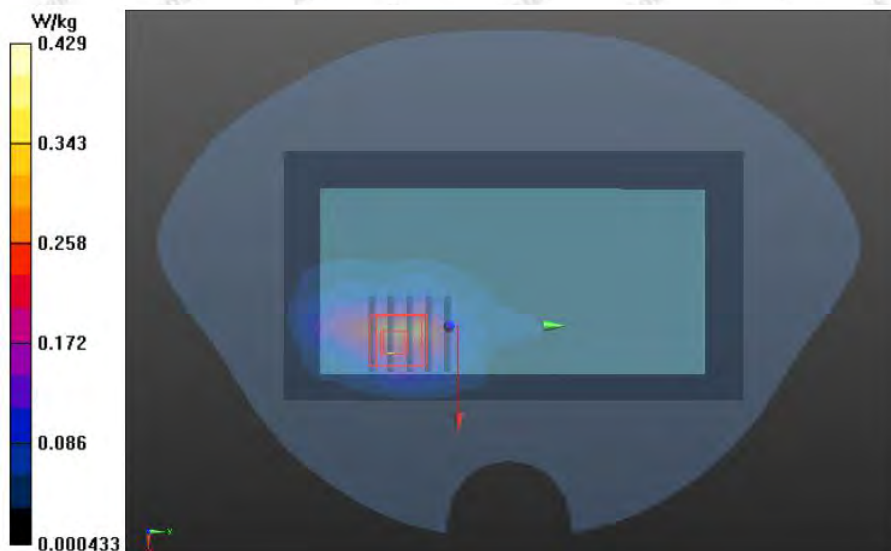
BODY/BACK-L/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 3.474 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.906 W/kg

SAR(1 g) = 0.344 W/kg; SAR(10 g) = 0.140 W/kg

Maximum value of SAR (measured) = 0.429 W/kg



WIFI 5.8G_Body Back_Ch165

Communication System: UID 0, wifi (fcc) (0); Frequency: 5825 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 5825$ MHz; $\sigma = 6.05$ S/m; $\epsilon_r = 48.13$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 – SN7396; ConvF(4.52, 4.52, 4.52); Calibrated: 06.05.2019;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 6.9.2018
- Phantom: SAM; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

BODY/BACK-H/Area Scan (12x21x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.311 W/kg

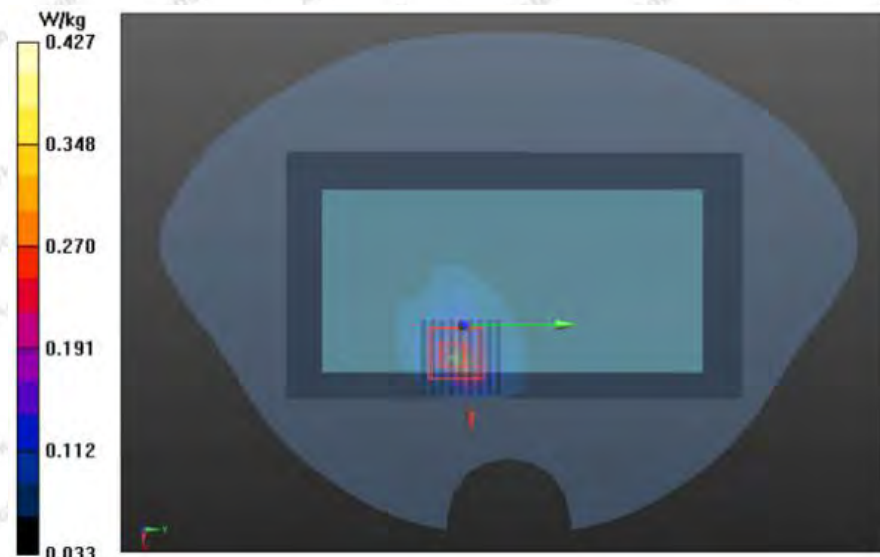
BODY/BACK-H/Zoom Scan (9x9x16)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 2.856 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 1.77 W/kg

SAR(1 g) = 0.336 W/kg; SAR(10 g) = 0.137 W/kg

Maximum value of SAR (measured) = 0.427 W/kg



Appendix D. DASY System Calibration Certificate

Schmid & Partner Engineering AG

s p e a g

Zeughausstrasse 43, 8004 Zurich, Switzerland
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info@speag.com, <http://www.speag.com>

IMPORTANT NOTICE

USAGE OF THE DAE 4

The DAE unit is a delicate, high precision instrument and requires careful treatment by the user. There are no serviceable parts inside the DAE. Special attention shall be given to the following points:

Battery Exchange: The battery cover of the DAE4 unit is closed using a screw, over tightening the screw may cause the threads inside the DAE to wear out.

Shipping of the DAE: Before shipping the DAE to SPEAG for calibration, remove the batteries and pack the DAE in an antistatic bag. This antistatic bag shall then be packed into a larger box or container which protects the DAE from impacts during transportation. The package shall be marked to indicate that a fragile instrument is inside.

E-Stop Failures: Touch detection may be malfunctioning due to broken magnets in the E-stop. Rough handling of the E-stop may lead to damage of these magnets. Touch and collision errors are often caused by dust and dirt accumulated in the E-stop. To prevent E-stop failure, the customer shall always mount the probe to the DAE carefully and keep the DAE unit in a non-dusty environment if not used for measurements.

Repair: Minor repairs are performed at no extra cost during the annual calibration. However, SPEAG reserves the right to charge for any repair especially if rough unprofessional handling caused the defect.

DASY Configuration Files: Since the exact values of the DAE input resistances, as measured during the calibration procedure of a DAE unit, are not used by the DASY software, a nominal value of 200 MOhm is given in the corresponding configuration file.

Important Note:

Warranty and calibration is void if the DAE unit is disassembled partly or fully by the Customer.

Important Note:

Never attempt to grease or oil the E-stop assembly. Cleaning and readjusting of the E-stop assembly is allowed by certified SPEAG personnel only and is part of the annual calibration procedure.

Important Note:

To prevent damage of the DAE probe connector pins, use great care when installing the probe to the DAE. Carefully connect the probe with the connector notch oriented in the mating position. Avoid any rotational movement of the probe body versus the DAE while turning the locking nut of the connector. The same care shall be used when disconnecting the probe from the DAE.

Schmid & Partner Engineering

TN_BR040315AD DAE4.doc

11.12.2009

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Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland



S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **Anbotech (Auden)**

Certificate No: **DAE4-387_Sep08**

CALIBRATION CERTIFICATE

Object **DAE4 - SD 000 D04 BM - SN: 387**

Calibration procedure(s) **QA CAL-06.v29**
Calibration procedure for the data acquisition electronics (DAE)

Calibration date: **September 06, 2018**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Keithley Multimeter Type 2001	SN: 0810278	15-Aug-18 (No:21092)	Aug-19
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Auto DAE Calibration Unit	SE UWS 053 AA 1001	05-Jan-18 (in house check)	In house check: Jan-19
Calibrator Box V2.1	SE UMS 006 AA 1002	05-Jan-18 (in house check)	In house check: Jan-19

Calibrated by:	Name Dominique Steffen	Function Laboratory Technician	Signature
Approved by:	Sven Kühn	Deputy Manager	

Issued: September 03, 2018

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Certificate No: DAE4-387_Sep08

Page 1 of 5

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Accreditation No.: SCS 0108

Glossary

DAE data acquisition electronics
Connector angle information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters

- **DC Voltage Measurement:** Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- **Connector angle:** The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
 - **DC Voltage Measurement Linearity:** Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
 - **Common mode sensitivity:** Influence of a positive or negative common mode voltage on the differential measurement.
 - **Channel separation:** Influence of a voltage on the neighbor channels not subject to an input voltage.
 - **AD Converter Values with inputs shorted:** Values on the internal AD converter corresponding to zero input voltage
 - **Input Offset Measurement:** Output voltage and statistical results over a large number of zero voltage measurements.
 - **Input Offset Current:** Typical value for information; Maximum channel input offset current, not considering the input resistance.
 - **Input resistance:** Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
 - **Low Battery Alarm Voltage:** Typical value for information. Below this voltage, a battery alarm signal is generated.
 - **Power consumption:** Typical value for information. Supply currents in various operating modes.



DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1μV, full range = -100...+300 mV

Low Range: 1LSB = 61nV, full range = -1.....+3mV

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

Calibration Factors	X	Y	Z
High Range	404.489 ± 0.02% (k=2)	404.852 ± 0.02% (k=2)	404.862 ± 0.02% (k=2)
Low Range	3.97827 ± 1.50% (k=2)	3.95875 ± 1.50% (k=2)	3.97982 ± 1.50% (k=2)

Connector Angle

Connector Angle to be used in DASY system	53.0 ° ± 1 °
---	--------------

Appendix (Additional assessments outside the scope of SCS0108)

1. DC Voltage Linearity

High Range	Reading (μV)	Difference (μV)	Error (%)
Channel X + Input	200032.85	-3.31	-0.00
Channel X + Input	20007.64	1.88	0.01
Channel X - Input	-20003.48	1.18	-0.01
Channel Y + Input	200034.23	-1.43	-0.00
Channel Y + Input	20006.60	0.91	0.00
Channel Y - Input	-20004.04	0.72	-0.00
Channel Z + Input	200035.38	-0.83	-0.00
Channel Z + Input	20003.69	-2.11	-0.01
Channel Z - Input	-20006.38	-1.59	0.01

Low Range	Reading (μV)	Difference (μV)	Error (%)
Channel X + Input	2001.63	0.08	0.00
Channel X + Input	202.29	0.70	0.35
Channel X - Input	-197.90	0.60	-0.30
Channel Y + Input	2001.33	-0.07	-0.00
Channel Y + Input	200.86	-0.60	-0.30
Channel Y - Input	-199.87	-1.23	0.62
Channel Z + Input	2001.61	0.27	0.01
Channel Z + Input	200.60	-0.70	-0.35
Channel Z - Input	-199.51	-0.85	0.43

2. Common mode sensitivity

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

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	13.50	11.56
	- 200	-8.64	-11.18
Channel Y	200	-0.81	-1.28
	- 200	1.05	0.09
Channel Z	200	7.17	6.91
	- 200	-9.46	-9.01

3. Channel separation

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

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	-1.70	0.33
Channel Y	200	10.70	-	-0.38
Channel Z	200	7.11	7.89	-

4. AD-Converter Values with inputs shorted

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

	High Range (LSB)	Low Range (LSB)
Channel X	15969	17466
Channel Y	15661	16162
Channel Z	15990	16190

5. Input Offset Measurement

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

Input 10M Ω

	Average (μ V)	min. Offset (μ V)	max. Offset (μ V)	Std. Deviation (μ V)
Channel X	0.73	-2.58	3.29	0.62
Channel Y	0.41	-0.49	1.23	0.40
Channel Z	-0.80	-1.88	0.30	0.42

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance (Typical values for information)

	Zeroing (kOhm)	Measuring (MOhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

8. Low Battery Alarm Voltage (Typical values for information)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+6	+14
Supply (- Vcc)	-0.01	-8	-9



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Client **Anbotech (Auden)**

Certificate No: **Z19-68716**

CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:7396**

Calibration Procedure(s) **FF-Z11-007-03**
Calibration Procedures for Dosimetric E-field Probes

Calibration date: **May06, 2019**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	20-Jun-18 (CTTL, No.J18X07447)	Jun-19
Power sensor NRP-Z91	101547	20-Jun-18 (CTTL, No.J18X07447)	Jun-19
Power sensor NRP-Z91	101548	20-Jun-18 (CTTL, No.J18X07447)	Jun-19
Reference10dBAttenuator	18N50W-10dB	13-Mar-19(CTTL, No.J19X01547)	Mar-20
Reference20dBAttenuator	18N50W-20dB	13-Mar-19(CTTL, No.J19X01548)	Mar-20
Reference Probe EX3DV4	SN 7433	26-Sep-18(SPEAG, No.EX3-7433_Sep18)	Sep-19
DAE4	SN 549	13-Dec-18(SPEAG, No.DAE4-549_Dec18)	Dec -19
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
SignalGeneratorMG3700A	6201052605	27-Jun-18 (CTTL, No.J18X04776)	Jun-19
Network Analyzer E5071C	MY46110673	13-Jan-19 (CTTL, No.J19X00285)	Jan -20

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

Issued: May07, 2019

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Certificate No: Z19-68716

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Client

Anbotek (Auden)

Certificate No: Z18-97089

CALIBRATION CERTIFICATE

Object D835V2 - SN: 4d154

Calibration Procedure(s) FD-Z11-2-003-01
Calibration Procedures for dipole validation kits

Calibration date: Jun 16, 2018

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	01-Jul-17 (CTTL, No.J17X04256)	Jun-18
Power sensor NRP-Z91	101547	01-Jul-17 (CTTL, No.J17X04256)	Jun-18
Reference Probe EX3DV4	SN 7307	19-Feb-18(SPEAG,No.EX3-7307_Feb18)	Feb-19
DAE4	SN 771	02-Feb-18(CTTL-SPEAG,No.Z18-97011)	Feb-19

Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	01-Feb-18 (CTTL, No.J18X00893)	Jan-19
Network Analyzer E5071C	MY46110673	26-Jan-18 (CTTL, No.J18X00894)	Jan-19

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Lu Bingsong	Deputy Director of the laboratory	

Issued: Jun 17, 2018

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Certificate No: Z18-97089

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Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORMx,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) For hand-held devices used in close proximity to the ear (frequency range of 300MHz to 3GHz)", February 2005
- IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:** Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:** The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:** These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:** One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:** SAR measured at the stated antenna input power.
- SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor $k=2$, which for a normal distribution Corresponds to a coverage probability of approximately 95%.





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Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY52	52.8.8.1258
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	41.0 $\pm$ 6 %	0.89 mho/m $\pm$ 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.30 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	9.24 mW / g $\pm$ 20.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.50 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	6.02 mW / g $\pm$ 20.4 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	55.4 $\pm$ 6 %	0.99 mho/m $\pm$ 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.43 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	9.57 mW / g $\pm$ 20.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	1.61 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	6.36 mW / g $\pm$ 20.4 % (k=2)

Certificate No: Z18-97089

Page 3 of 8





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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.2Ω- 3.11jΩ
Return Loss	- 29.8dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.6Ω- 2.33jΩ
Return Loss	- 27.4dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.508 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
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DASY5 Validation Report for Head TSL

Date: 06.16.2018

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d154

Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.891 \text{ S/m}$; $\epsilon_r = 40.97$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN7307; ConvF(10.01, 10.01, 10.01); Calibrated: 2/19/2018;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn771; Calibrated: 2018-02-02
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7372)

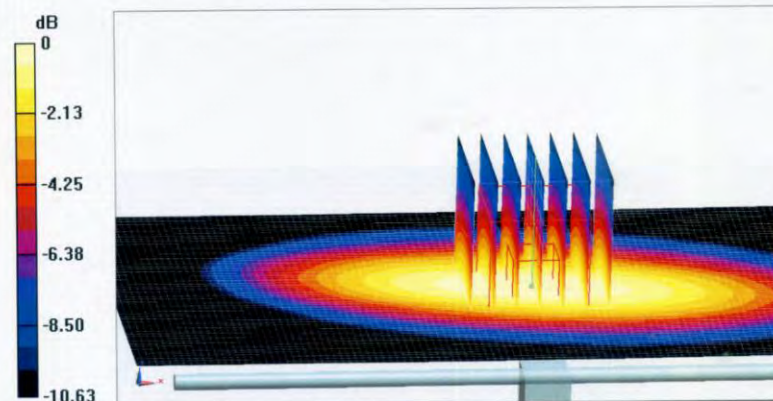
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 58.14V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 3.41 W/kg

SAR(1 g) = 2.3 W/kg; SAR(10 g) = 1.5 W/kg

Maximum value of SAR (measured) = 2.91 W/kg



0 dB = 2.91 W/kg = 4.64 dBW/kg

Certificate No: Z18-97089

Page 5 of 8

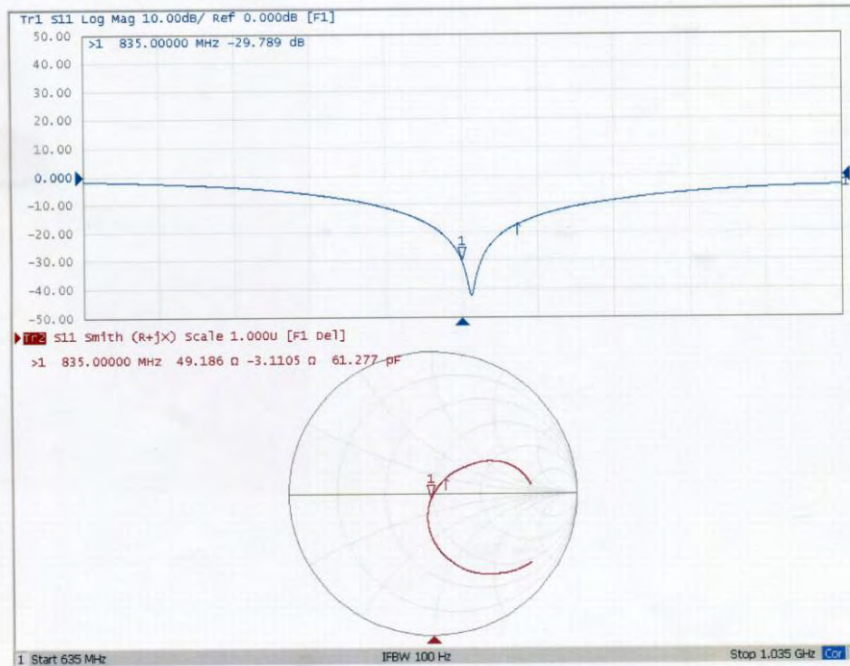




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Impedance Measurement Plot for Head TSL



Certificate No: Z18-97089

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DASY5 Validation Report for Body TSL

Date: 06.16.2018

Test Laboratory: CCTL, Beijing, China

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d154

Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 835$ MHz; $\sigma = 0.991$ S/m; $\epsilon_r = 55.41$; $\rho = 1000$ kg/m³

Phantom section: Center Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN7307; ConvF(9.83,9.83, 9.83); Calibrated: 2/19/2018;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn771; Calibrated: 2018-02-02
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7372)

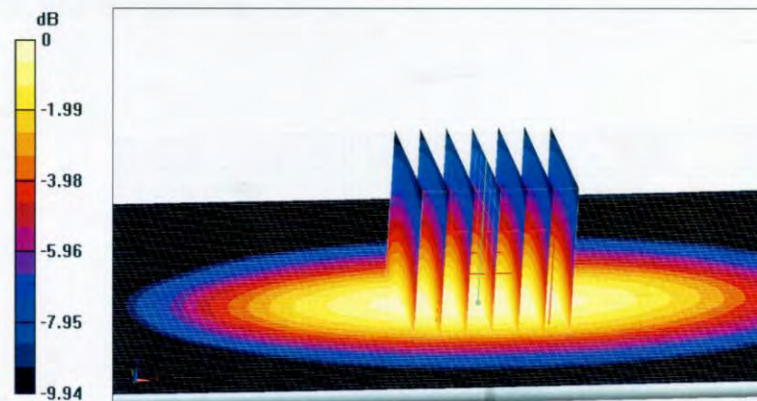
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm,
dy=5mm, dz=5mm

Reference Value = 54.01 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 3.53 W/kg

SAR(1 g) = 2.43 W/kg; SAR(10 g) = 1.61 W/kg

Maximum value of SAR (measured) = 3.04 W/kg



0 dB = 3.04 W/kg = 4.83 dBW/kg

Certificate No: Z18-97089

Page 7 of 8

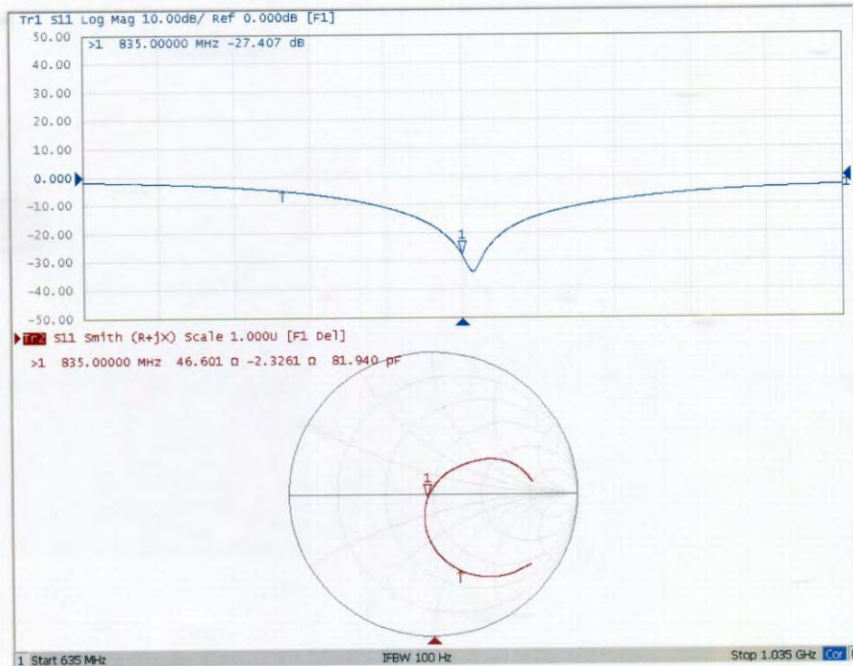




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Impedance Measurement Plot for Body TSL



Certificate No: Z18-97089

Page 8 of 8

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Schmid & Partner Engineering AG

s p e a g

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IMPORTANT NOTICE

USAGE OF THE DAE 4

The DAE unit is a delicate, high precision instrument and requires careful treatment by the user. There are no serviceable parts inside the DAE. Special attention shall be given to the following points:

Battery Exchange: The battery cover of the DAE4 unit is closed using a screw, over tightening the screw may cause the threads inside the DAE to wear out.

Shipping of the DAE: Before shipping the DAE to SPEAG for calibration, remove the batteries and pack the DAE in an antistatic bag. This antistatic bag shall then be packed into a larger box or container which protects the DAE from impacts during transportation. The package shall be marked to indicate that a fragile instrument is inside.

E-Stop Failures: Touch detection may be malfunctioning due to broken magnets in the E-stop. Rough handling of the E-stop may lead to damage of these magnets. Touch and collision errors are often caused by dust and dirt accumulated in the E-stop. To prevent E-stop failure, the customer shall always mount the probe to the DAE carefully and keep the DAE unit in a non-dusty environment if not used for measurements.

Repair: Minor repairs are performed at no extra cost during the annual calibration. However, SPEAG reserves the right to charge for any repair especially if rough unprofessional handling caused the defect.

DASY Configuration Files: Since the exact values of the DAE input resistances, as measured during the calibration procedure of a DAE unit, are not used by the DASY software, a nominal value of 200 MOhm is given in the corresponding configuration file.

Important Note:

Warranty and calibration is void if the DAE unit is disassembled partly or fully by the Customer.

Important Note:

Never attempt to grease or oil the E-stop assembly. Cleaning and readjusting of the E-stop assembly is allowed by certified SPEAG personnel only and is part of the annual calibration procedure.

Important Note:

To prevent damage of the DAE probe connector pins, use great care when installing the probe to the DAE. Carefully connect the probe with the connector notch oriented in the mating position. Avoid any rotational movement of the probe body versus the DAE while turning the locking nut of the connector. The same care shall be used when disconnecting the probe from the DAE.

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TN_BR040315AD DAE4.doc

11.12.2009

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **Anbotech (Auden)**

Certificate No: **DAE4-387_Sep08**

CALIBRATION CERTIFICATE

Object **DAE4 - SD 000 D04 BM - SN: 387**

Calibration procedure(s) **QA CAL-06.v29**
Calibration procedure for the data acquisition electronics (DAE)

Calibration date: **September 06, 2018**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Keithley Multimeter Type 2001	SN: 0810278	15-Aug-18 (No:21092)	Aug-19
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Auto DAE Calibration Unit	SE UWS 053 AA 1001	05-Jan-18 (in house check)	In house check: Jan-19
Calibrator Box V2.1	SE UMS 006 AA 1002	05-Jan-18 (in house check)	In house check: Jan-19

Calibrated by:	Name	Function	Signature
	Dominique Steffen	Laboratory Technician	

Approved by:	Name	Function	Signature
	Sven Kühn	Deputy Manager	

Issued: September 03, 2018

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Certificate No: DAE4-387_Sep18

Page 1 of 5

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Accreditation No.: **SCS 0108**

Glossary

DAE data acquisition electronics
Connector angle information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters

- **DC Voltage Measurement:** Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- **Connector angle:** The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
 - **DC Voltage Measurement Linearity:** Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
 - **Common mode sensitivity:** Influence of a positive or negative common mode voltage on the differential measurement.
 - **Channel separation:** Influence of a voltage on the neighbor channels not subject to an input voltage.
 - **AD Converter Values with inputs shorted:** Values on the internal AD converter corresponding to zero input voltage
 - **Input Offset Measurement:** Output voltage and statistical results over a large number of zero voltage measurements.
 - **Input Offset Current:** Typical value for information; Maximum channel input offset current, not considering the input resistance.
 - **Input resistance:** Typical value for information; DAE input resistance at the connector, during internal auto-zeroing and during measurement.
 - **Low Battery Alarm Voltage:** Typical value for information. Below this voltage, a battery alarm signal is generated.
 - **Power consumption:** Typical value for information. Supply currents in various operating modes.



DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1 μ V, full range = -100...+300 mV

Low Range: 1LSB = 61nV, full range = -1.....+3mV

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

Calibration Factors	X	Y	Z
High Range	404.489 $\pm$ 0.02% (k=2)	404.852 $\pm$ 0.02% (k=2)	404.862 $\pm$ 0.02% (k=2)
Low Range	3.97827 $\pm$ 1.50% (k=2)	3.95875 $\pm$ 1.50% (k=2)	3.97982 $\pm$ 1.50% (k=2)

Connector Angle

Connector Angle to be used in DASY system	53.0 $^{\circ}$ $\pm$ 1 $^{\circ}$
---	------------------------------------

Appendix (Additional assessments outside the scope of SCS0108)

1. DC Voltage Linearity

High Range	Reading (μV)	Difference (μV)	Error (%)
Channel X + Input	200032.85	-3.31	-0.00
Channel X + Input	20007.64	1.88	0.01
Channel X - Input	-20003.48	1.18	-0.01
Channel Y + Input	200034.23	-1.43	-0.00
Channel Y + Input	20006.60	0.91	0.00
Channel Y - Input	-20004.04	0.72	-0.00
Channel Z + Input	200035.38	-0.83	-0.00
Channel Z + Input	20003.69	-2.11	-0.01
Channel Z - Input	-20006.38	-1.59	0.01

Low Range	Reading (μV)	Difference (μV)	Error (%)
Channel X + Input	2001.63	0.08	0.00
Channel X + Input	202.29	0.70	0.35
Channel X - Input	-197.90	0.60	-0.30
Channel Y + Input	2001.33	-0.07	-0.00
Channel Y + Input	200.86	-0.60	-0.30
Channel Y - Input	-199.87	-1.23	0.62
Channel Z + Input	2001.61	0.27	0.01
Channel Z + Input	200.60	-0.70	-0.35
Channel Z - Input	-199.51	-0.85	0.43

2. Common mode sensitivity

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

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	13.50	11.56
	- 200	-8.64	-11.18
Channel Y	200	-0.81	-1.28
	- 200	1.05	0.09
Channel Z	200	7.17	6.91
	- 200	-9.46	-9.01

3. Channel separation

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

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	-1.70	0.33
Channel Y	200	10.70	-	-0.38
Channel Z	200	7.11	7.89	-

4. AD-Converter Values with inputs shorted

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

	High Range (LSB)	Low Range (LSB)
Channel X	15969	17466
Channel Y	15661	16162
Channel Z	15990	16190

5. Input Offset Measurement

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

Input 10M Ω

	Average (μ V)	min. Offset (μ V)	max. Offset (μ V)	Std. Deviation (μ V)
Channel X	0.73	-2.58	3.29	0.62
Channel Y	0.41	-0.49	1.23	0.40
Channel Z	-0.80	-1.88	0.30	0.42

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance (Typical values for information)

	Zeroing (kOhm)	Measuring (MOhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

8. Low Battery Alarm Voltage (Typical values for information)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+6	+14
Supply (- Vcc)	-0.01	-8	-9



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Client **Anbotek (Auden)**

Certificate No: **Z19-97090**

CALIBRATION CERTIFICATE

Object **D1900V2 - SN: 5d175**

Calibration Procedure(s) **FD-Z11-2-003-01**
Calibration Procedures for dipole validation kits

Calibration date: **Jun 15, 2019**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	01-Jul-18 (CTTL, No.J18X04256)	Jun-19
Power sensor NRP-Z91	101547	01-Jul-18 (CTTL, No.J18X04256)	Jun-19
Reference Probe EX3DV4	SN 7307	19-Feb-19(SPEAG,No.EX3-7307_Feb19)	Feb-20
DAE4	SN 771	02-Feb-19(CTTL-SPEAG,No.Z19-97011)	Feb-20

Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	01-Feb-19 (CTTL, No.J19X00893)	Jan-20
Network Analyzer E5071C	MY46110673	26-Jan-19 (CTTL, No.J19X00894)	Jan-20

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Lu Bingsong	Deputy Director of the laboratory	

Issued: Jun 17, 2019

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Certificate No: Z19-97090

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Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM _{x,y,z}
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) For hand-held devices used in close proximity to the ear (frequency range of 300MHz to 3GHz)", February 2005
- IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:** Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:** The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:** These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:** One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:** SAR measured at the stated antenna input power.
- SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor $k=2$, which for a normal distribution Corresponds to a coverage probability of approximately 95%.





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Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY52	52.8.8.1258
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	40.3 $\pm$ 6 %	1.38 mho/m $\pm$ 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.99 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	40.4 mW / g $\pm$ 20.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.28 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	21.3 mW / g $\pm$ 20.4 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	53.3 $\pm$ 6 %	1.54 mho/m $\pm$ 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.1 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	40.1 mW / g $\pm$ 20.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.39 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	21.5 mW / g $\pm$ 20.4 % (k=2)

Certificate No: Z19-97099

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.2Ω+ 5.44jΩ
Return Loss	- 24.3dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.9Ω+ 5.75jΩ
Return Loss	- 24.6dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.304 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard. No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

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DASY5 Validation Report for Head TSL

Date: 06.15.2019

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d175

Communication System: UTD 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.381$ S/m; $\epsilon_r = 40.33$; $\rho = 1000$ kg/m³

Phantom section: Right Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN7307; ConvF(8.1, 8.1, 8.1); Calibrated: 2/19/2019;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn771; Calibrated: 2/2/2019
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7372)

System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:

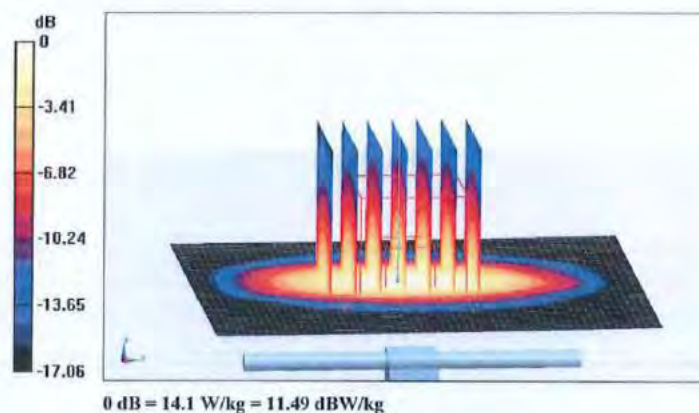
dx=5mm, dy=5mm, dz=5mm

Reference Value = 103.5V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 18.0W/kg

SAR(1 g) = 9.99 W/kg; SAR(10 g) = 5.28 W/kg

Maximum value of SAR (measured) = 14.1 W/kg

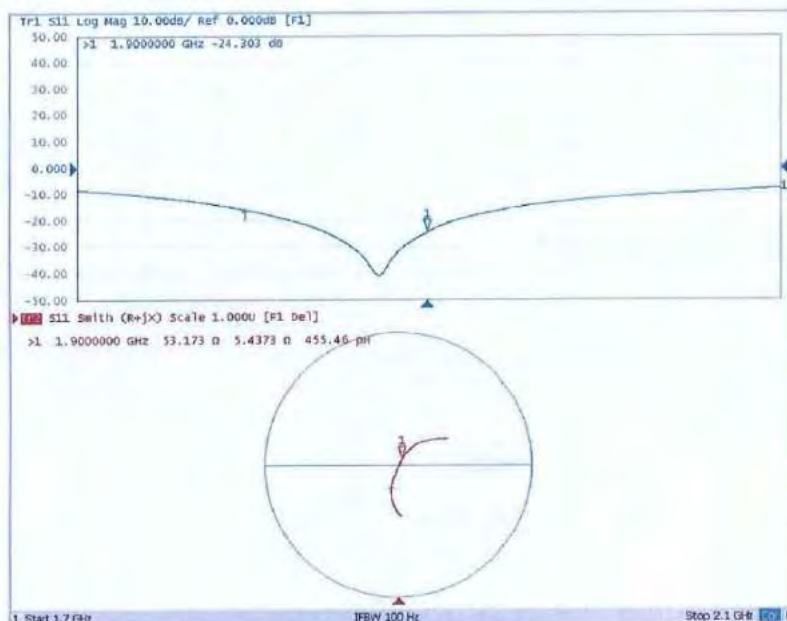




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Impedance Measurement Plot for Head TSL



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Page 6 of 8





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DASY5 Validation Report for Body TSL

Date: 06.15.2019

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d175

Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.537$ S/m; $\epsilon_r = 53.34$; $\rho = 1000$ kg/m³

Phantom section: Center Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN7307; ConvF(7.67, 7.67, 7.67); Calibrated: 2/19/2019;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn771; Calibrated: 2/2/2019
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7372)

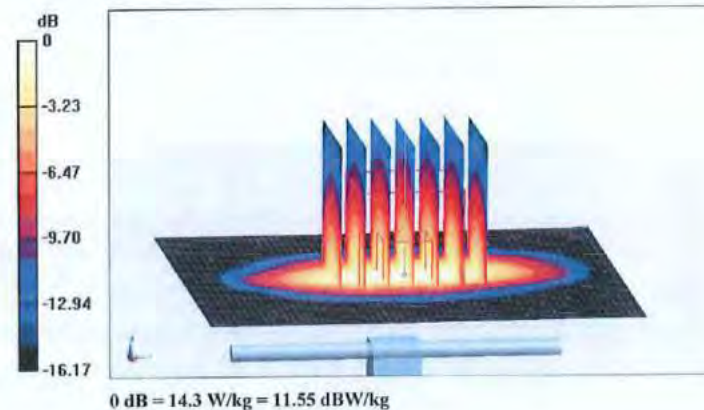
System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:
 $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 96.11 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 17.8 W/kg

SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.39 W/kg

Maximum value of SAR (measured) = 14.3 W/kg



Certificate No: Z19-97090

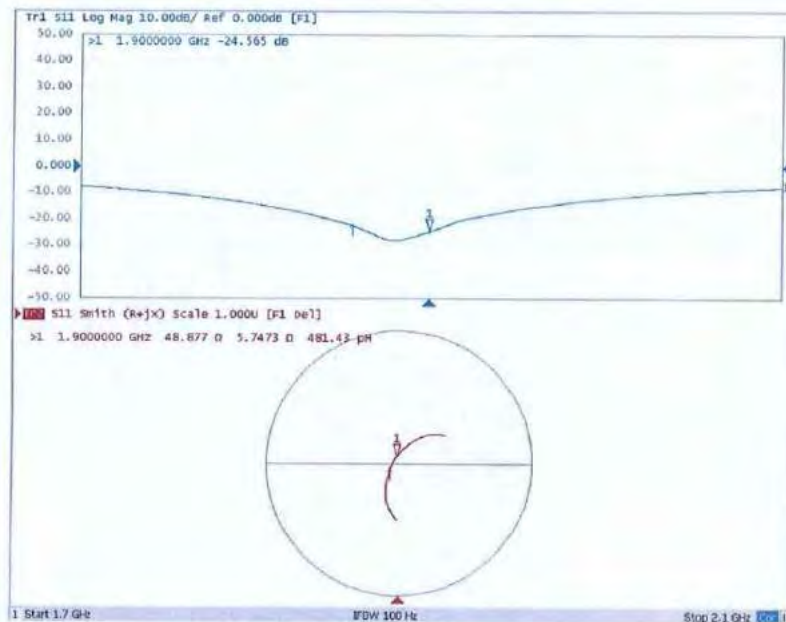
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Impedance Measurement Plot for Body TSL



Certificate No: Z19-97090

Page 8 of 8





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Client

Anbotek (Auden)

Certificate No: Z18-97091

CALIBRATION CERTIFICATE

Object D2450V2 - SN: 910

Calibration Procedure(s) FD-Z11-2-003-01
Calibration Procedures for dipole validation kits

Calibration date: Jun 15, 2018

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	01-Jul-17 (CTTL, No.J17X04256)	Jun-18
Power sensor NRP-Z91	101547	01-Jul-17 (CTTL, No.J17X04256)	Jun-18
Reference Probe EX3DV4	SN 7307	19-Feb-18(SPEAG,No.EX3-7307_Feb18)	Feb-19
DAE4	SN 771	02-Feb-18(CTTL-SPEAG,No.Z18-97011)	Feb-19

Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	01-Feb-18 (CTTL, No.J18X00893)	Jan-19
Network Analyzer E5071C	MY46110673	26-Jan-18 (CTTL, No.J18X00894)	Jan-19

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Lu Bingsong	Deputy Director of the laboratory	

Issued: Jun 17, 2018

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

Certificate No: Z18-97091

Page 1 of 8

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Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORMx,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) For hand-held devices used in close proximity to the ear (frequency range of 300MHz to 3GHz)", February 2005
- IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:** Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:** The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:** These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:** One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:** SAR measured at the stated antenna input power.
- SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor $k=2$, which for a normal distribution Corresponds to a coverage probability of approximately 95%.





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Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY52	52.8.8.1258
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	39.0 $\pm$ 6 %	1.77 mho/m $\pm$ 6 %
Head TSL temperature change during test	<1.0 °C	---	---

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.0 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	52.4 mW / g $\pm$ 20.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.06 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	24.3 mW / g $\pm$ 20.4 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	52.9 $\pm$ 6 %	1.97 mho/m $\pm$ 6 %
Body TSL temperature change during test	<1.0 °C	---	---

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.0 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	51.8 mW / g $\pm$ 20.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	6.18 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	24.7 mW / g $\pm$ 20.4 % (k=2)





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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.6Ω+ 2.77jΩ
Return Loss	- 25.8dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.7Ω+ 4.28jΩ
Return Loss	- 27.3dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.263 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
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DASY5 Validation Report for Head TSL

Date: 06.15.2018

Test Laboratory: CCTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 910

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.767$ S/m; $\epsilon_r = 39.01$; $\rho = 1000$ kg/m³

Phantom section: Right Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN7307; ConvF(7.36, 7.36, 7.36); Calibrated: 2/19/2018;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn771; Calibrated: 2018-02-02
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7372)

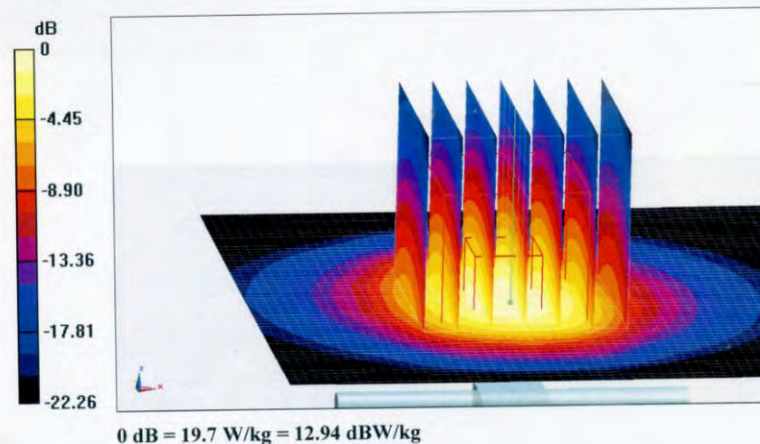
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 106.5 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 26.7 W/kg

SAR(1 g) = 13 W/kg; SAR(10 g) = 6.06 W/kg

Maximum value of SAR (measured) = 19.7 W/kg



Certificate No: Z18-97091

Page 5 of 8

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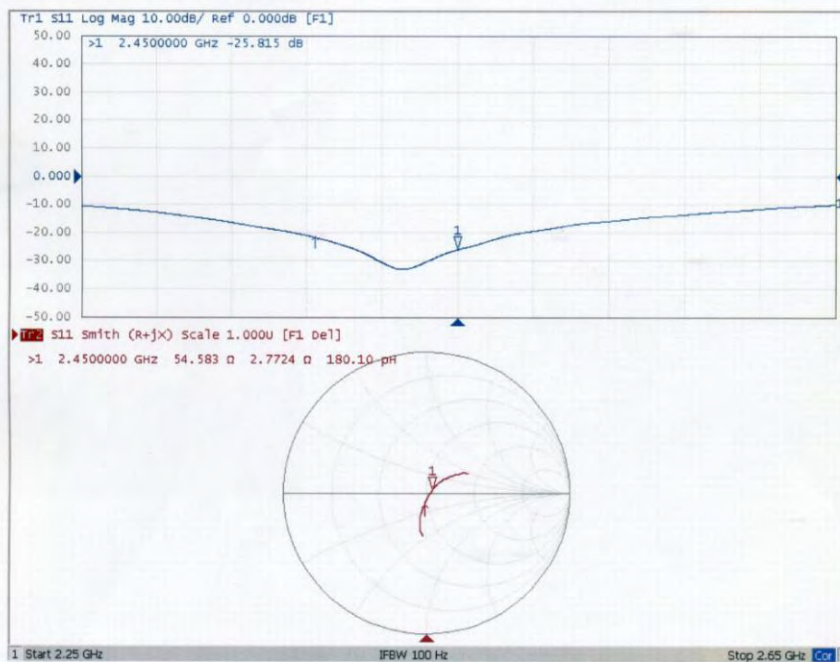
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Impedance Measurement Plot for Head TSL



Certificate No: Z18-97091

Page 6 of 8

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DASY5 Validation Report for Body TSL

Date: 06.15.2018

Test Laboratory: CCTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 910

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.972$ S/m; $\epsilon_r = 52.92$; $\rho = 1000$ kg/m³

Phantom section: Center Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN7307; ConvF(7.22, 7.22, 7.22); Calibrated: 2/19/2018;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn771; Calibrated: 2018-02-02
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7372)

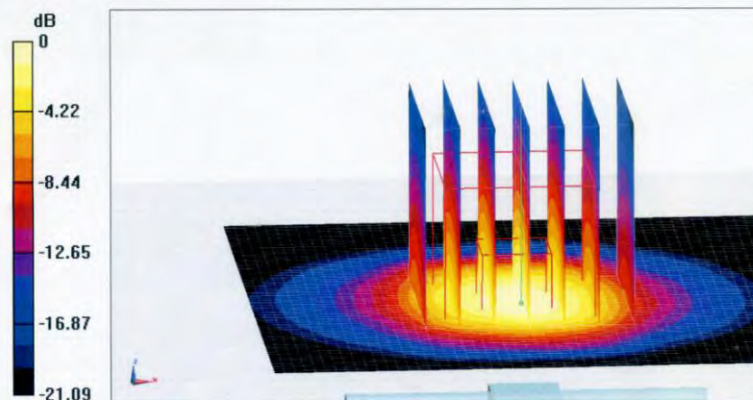
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 98.89 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 25.6 W/kg

SAR(1 g) = 13 W/kg; SAR(10 g) = 6.18 W/kg

Maximum value of SAR (measured) = 19.3 W/kg



Certificate No: Z18-97091

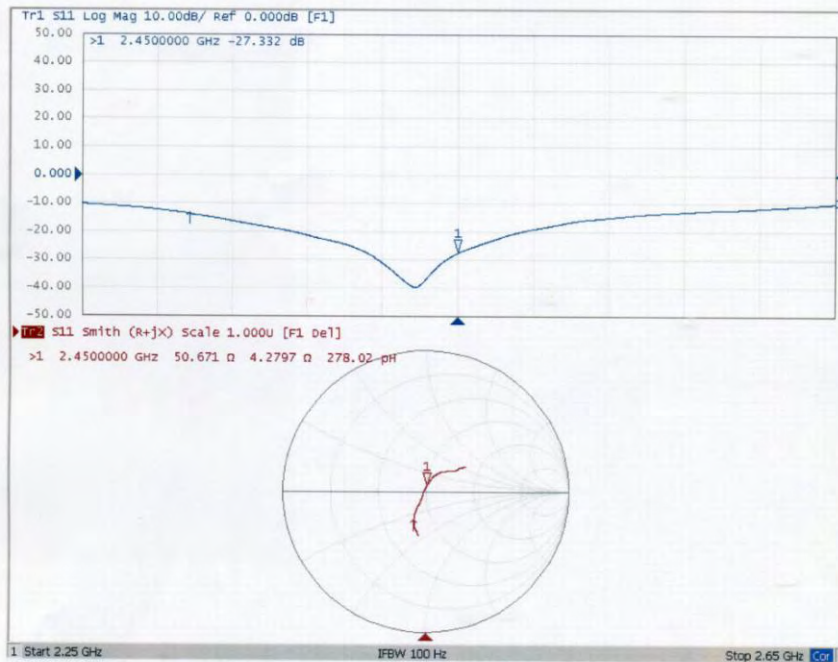
Page 7 of 8



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Impedance Measurement Plot for Body TSL



Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland



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The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **Anbotek (Auden)**

Certificate No: **D2600V2-1058_Jun18**

CALIBRATION CERTIFICATE

Object	D2600V2 - SN: 1058		
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz		
Calibration date:	June 19, 2018		
This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.			
All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.			
Calibration Equipment used (M&TE critical for calibration)			
Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	07-Oct-17 (No. 217-02020)	Oct-15
Power sensor HP 8481A	US37292783	07-Oct-17 (No. 217-02020)	Oct-15
Power sensor HP 8481A	MY41092317	07-Oct-17 (No. 217-02021)	Oct-15
Reference 20 dB Attenuator	SN: 5058 (20k)	01-Apr-17 (No. 217-02131)	Mar-16
Type-N mismatch combination	SN: 5047.2 / 06327	01-Apr-17 (No. 217-02134)	Mar-16
Reference Probe ES3DV3	SN: 3205	30-Dec-17 (No. ES3-3205_Dec14)	Dec-15
DAE4	SN: 601	18-Aug-17 (No. DAE4-601_Aug14)	Aug-15
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-14)	In house check: Oct-15
Calibrated by:	Name Leif Klynsner	Function Laboratory Technician	Signature
Approved by:	Katja Pokovic	Technical Manager	
			Issued: June 22, 2018
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Certificate No: D2600V2-1058_Jun18

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Accreditation No.: SCS 0108

Glossary:

TSL tissue simulating liquid
ConvF sensitivity in TSL / NORM x,y,z
N/A not applicable or not measured

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:** Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:** The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:** These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:** One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:** SAR measured at the stated antenna input power.
- SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Certificate No: D2600V2-1058_Jun18

Page 2 of 8

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Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2600 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.0	1.96 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	37.6 $\pm$ 6 %	2.05 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	14.7 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	57.2 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.57 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	25.9 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.5	2.16 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	50.4 $\pm$ 6 %	2.22 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	14.5 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	56.8 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.45 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	25.5 W/kg $\pm$ 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.5 Ω - 6.3 j Ω
Return Loss	- 24.0 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.7 Ω - 5.2 j Ω
Return Loss	- 24.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.151 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	August 14, 2012

DASY5 Validation Report for Head TSL

Date: 19.06.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1058

Communication System: UID 0 - CW; Frequency: 2600 MHz

Medium parameters used: $f = 2600$ MHz; $\sigma = 2.05$ S/m; $\epsilon_r = 37.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.49, 4.49, 4.49); Calibrated: 30.12.2017;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Head/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

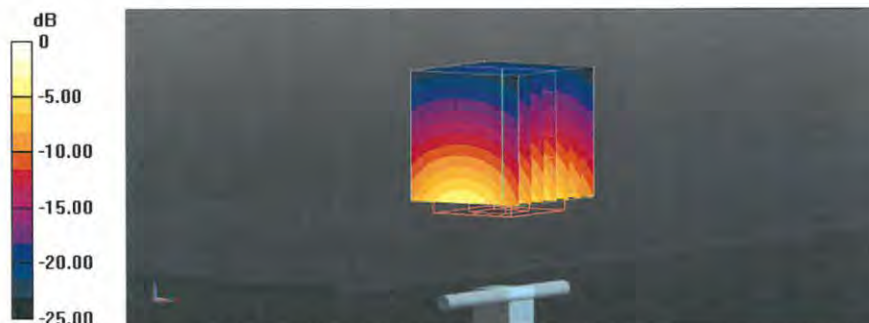
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 102.6 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 30.9 W/kg

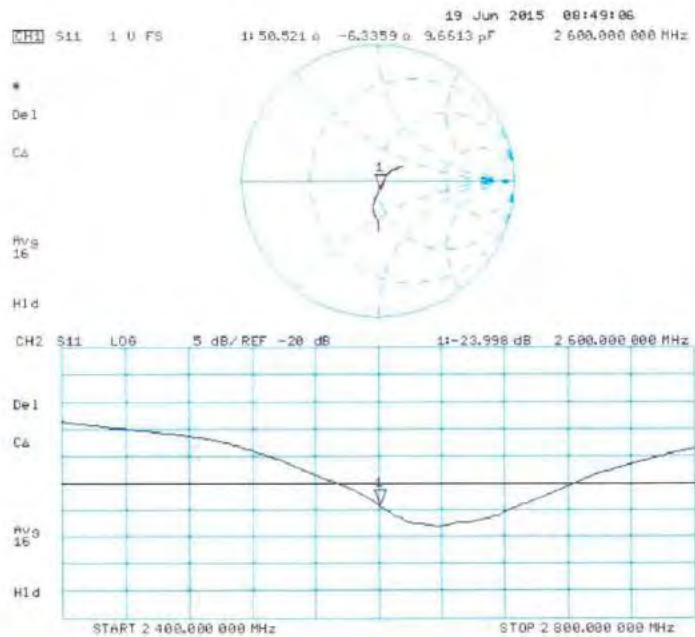
SAR(1 g) = 14.7 W/kg; SAR(10 g) = 6.57 W/kg

Maximum value of SAR (measured) = 19.6 W/kg



0 dB = 19.6 W/kg = 12.92 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 19.06.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1058

Communication System: UID 0 - CW; Frequency: 2600 MHz

Medium parameters used: $f = 2600$ MHz; $\sigma = 2.22$ S/m; $\epsilon_r = 50.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.13, 4.13, 4.13); Calibrated: 30.12.2017;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Body/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

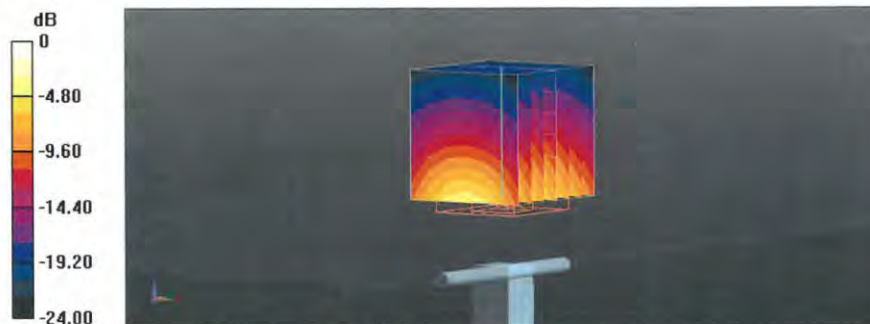
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 97.96 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 30.1 W/kg

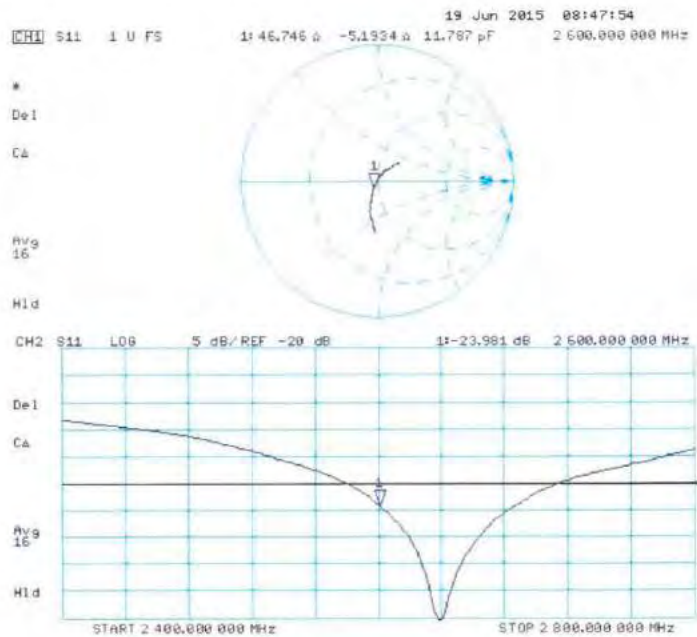
SAR(1 g) = 14.5 W/kg; SAR(10 g) = 6.45 W/kg

Maximum value of SAR (measured) = 19.5 W/kg



0 dB = 19.5 W/kg = 12.90 dBW/kg

Impedance Measurement Plot for Body TSL



Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Client Anbotek (Auden)

Certificate No: D5GHzV2-1160_Oct11

CALIBRATION CERTIFICATE

Object D5GHzV2 - SN: 1160

Calibration procedure(s) QA CAL-22.v2
Calibration procedure for dipole validation kits between 3-6 GHz

Calibration date: October 02, 2018

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

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^\circ\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&E: critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	07-Oct-17 (No. 217-02020)	Oct-15
Power sensor HP 8481A	US37292783	07-Oct-17 (No. 217-02020)	Oct-15
Power sensor HP 8481A	MY41092317	07-Oct-17 (No. 217-02021)	Oct-15
Reference 20 dB Attenuator	SN: 5058 (20K)	01-Apr-18 (No. 217-02131)	Mar-16
Type-N mismatch combination	SN: 5047.2 / 06327	01-Apr-18 (No. 217-02134)	Mar-16
Reference Probe EX3DV4	SN: 3503	30-Dec-17 (No. EX3-3503, Dec14)	Dec-15
DAE4	SN: 601	17-Aug-16 (No. DAE4-601, Aug15)	Aug-16

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100972	18-Jun-15 (in house check Jun-15)	In house check: Jun-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-15 (in house check Oct-14)	In house check: Oct-15

Calibrated by: Name Lelf Klynsner Function Laboratory Technician

Signature

Approved by: Katja Pokovic Technical Manager

Issued: October 8, 2018

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

Certificate No: D5GHzV2-1160_Oct11

Page 1 of 15

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Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:** Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:** The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:** These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:** One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:** SAR measured at the stated antenna input power.
- SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5200 MHz ± 1 MHz 5300 MHz ± 1 MHz 5600 MHz ± 1 MHz 5800 MHz ± 1 MHz	

Head TSL parameters at 5200 MHz

The following parameters and calculations were applied

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	36.0	4.66 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	36.4 ± 6 %	4.57 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	—	—

SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.06 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	80.7 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.31 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.1 W/kg ± 19.5 % (k=2)

Head TSL parameters at 5300 MHz

The following parameters and calculations were applied:

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.76 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	36.2 ± 6 %	4.68 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	—	—

SAR result with Head TSL at 5300 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.26 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	82.7 W / kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.39 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.9 W/kg ± 19.5 % (k=2)

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied:

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.7 ± 6 %	5.03 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	—	—

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.69 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	87.0 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.47 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.7 W/kg ± 19.5 % (k=2)

Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.3 ± 6 %	5.26 mho/m ± 6 %
Head TSL temperature change during test	≤ 0.5 °C	—	—

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.20 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	82.0 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.31 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.1 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.0	5.30 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.9 ± 6 %	5.35 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	—	—

SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.81 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	77.8 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.18 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.7 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.42 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.7 ± 6 %	5.49 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	—	—

SAR result with Body TSL at 5300 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.88 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	78.4 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.20 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.9 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.7 ± 6 %	5.99 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	—	—

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	8.20 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	81.5 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.30 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	22.8 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.2	6.00 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.4 ± 6 %	6.27 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	—	—

SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.88 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	76.3 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.20 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.8 W/kg ± 19.5 % (k=2)



Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	48.1 Ω - 8.5 $\mu\Omega$
Return Loss	-21.0 dB

Antenna Parameters with Head TSL at 5300 MHz

Impedance, transformed to feed point	50.2 Ω - 5.2 $\mu\Omega$
Return Loss	-25.7 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	54.8 Ω - 2.5 $\mu\Omega$
Return Loss	-25.7 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	53.0 Ω - 3.0 $\mu\Omega$
Return Loss	-27.7 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	48.6 Ω - 6.8 $\mu\Omega$
Return Loss	-23.0 dB

Antenna Parameters with Body TSL at 5300 MHz

Impedance, transformed to feed point	49.0 Ω - 4.2 $\mu\Omega$
Return Loss	-27.1 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	56.2 Ω - 0.7 $\mu\Omega$
Return Loss	-24.6 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	55.9 Ω - 1.7 $\mu\Omega$
Return Loss	-24.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.199 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	June 06, 2013

DASY5 Validation Report for Head TSL

Date: 24.09.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1160

Communication System: UID 0 - CW; Frequency: 5200 MHz; Frequency: 5300 MHz; Frequency: 5600 MHz; Frequency: 5800 MHz

Medium parameters used: $f = 5200$ MHz; $\sigma = 4.57$ S/m; $\epsilon_r = 36.4$; $\rho = 1000$ kg/m³. Medium parameters used: $f = 5300$ MHz; $\sigma = 4.68$ S/m; $\epsilon_r = 36.2$; $\rho = 1000$ kg/m³. Medium parameters used: $f = 5600$ MHz; $\sigma = 5.03$ S/m; $\epsilon_r = 35.7$; $\rho = 1000$ kg/m³. Medium parameters used: $f = 5800$ MHz; $\sigma = 5.26$ S/m; $\epsilon_r = 35.3$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.51, 5.51, 5.51); Calibrated: 30.12.2017, ConvF(5.21, 5.21, 5.21); Calibrated: 30.12.2017, ConvF(4.92, 4.92, 4.92); Calibrated: 30.12.2017, ConvF(4.9, 4.9, 4.9); Calibrated: 30.12.2017.
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 17.08.2018
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan,**dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 64.41 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 29.3 W/kg

SAR(1 g) = 8.06 W/kg; SAR(10 g) = 2.31 W/kg

Maximum value of SAR (measured) = 18.7 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan,**dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 65.31 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 31.1 W/kg

SAR(1 g) = 8.26 W/kg; SAR(10 g) = 2.39 W/kg

Maximum value of SAR (measured) = 19.4 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan,**dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

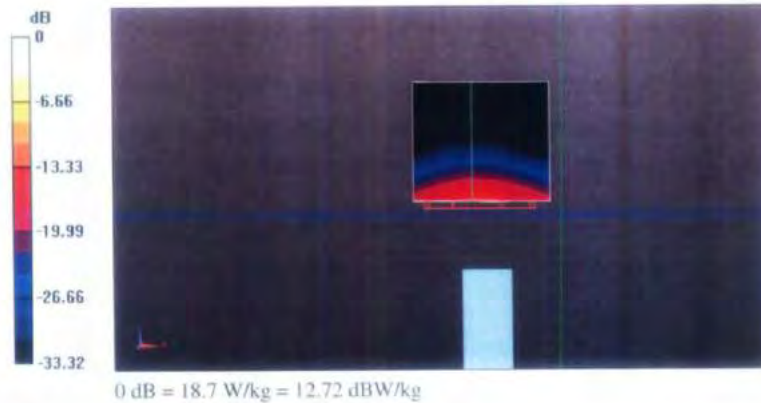
Reference Value = 65.34 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 34.7 W/kg

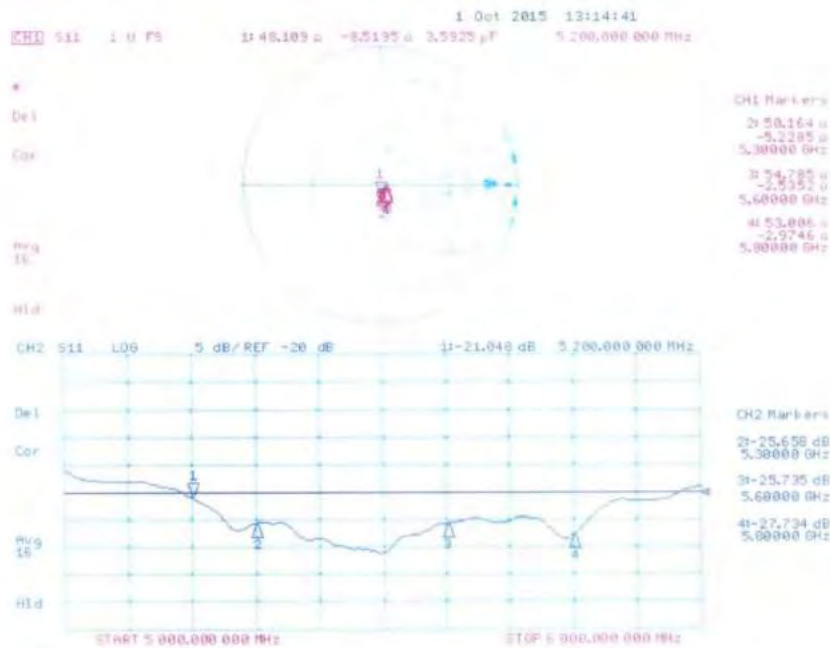
SAR(1 g) = 8.69 W/kg; SAR(10 g) = 2.47 W/kg

Maximum value of SAR (measured) = 21.0 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan,
dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 62.41 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 34.5 W/kg
SAR(1 g) = 8.2 W/kg; SAR(10 g) = 2.31 W/kg
Maximum value of SAR (measured) = 20.5 W/kg



Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 05.10.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1160

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz

Medium parameters used: $f = 5200$ MHz; $\sigma = 5.35$ S/m; $\epsilon_r = 47.9$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5300$ MHz; $\sigma = 5.49$ S/m; $\epsilon_r = 47.7$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5600$ MHz; $\sigma = 5.99$ S/m; $\epsilon_r = 46.7$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5800$ MHz; $\sigma = 6.27$ S/m; $\epsilon_r = 46.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(4.95, 4.95, 4.95); Calibrated: 30.12.2017; ConvF(4.78, 4.78, 4.78); Calibrated: 30.12.2017; ConvF(4.35, 4.35, 4.35); Calibrated: 30.12.2017; ConvF(4.32, 4.32, 4.32); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 17.08.2018
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan,**dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 67.32 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 30.4 W/kg

SAR(1 g) = 7.81 W/kg; SAR(10 g) = 2.18 W/kg

Maximum value of SAR (measured) = 18.2 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan,**dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 67.22 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 31.6 W/kg

SAR(1 g) = 7.88 W/kg; SAR(10 g) = 2.2 W/kg

Maximum value of SAR (measured) = 18.8 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan,**dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 67.36 V/m; Power Drift = -0.03 dB

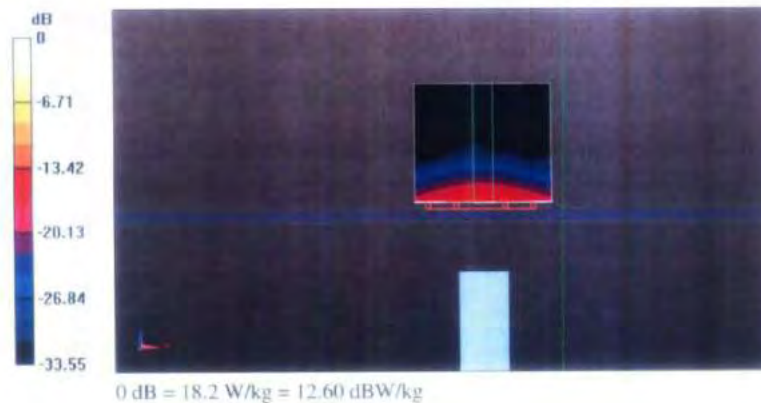
Peak SAR (extrapolated) = 36.6 W/kg

SAR(1 g) = 8.2 W/kg; SAR(10 g) = 2.3 W/kg

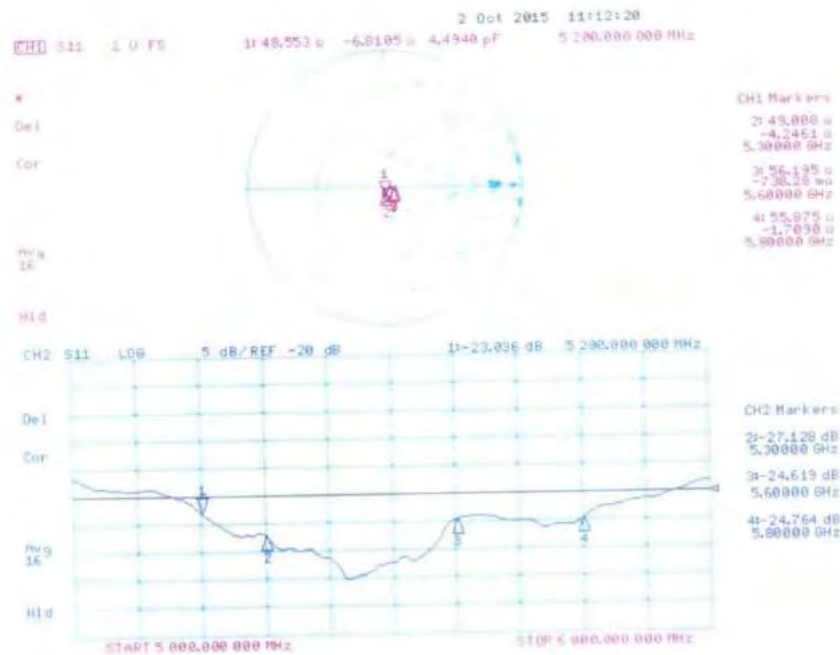
Maximum value of SAR (measured) = 20.2 W/kg



Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan,
dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.22 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 37.1 W/kg
SAR(1 g) = 7.88 W/kg; SAR(10 g) = 2.2 W/kg
Maximum value of SAR (measured) = 19.7 W/kg



Impedance Measurement Plot for Body TSL



*****END OF REPORT*****